1993→

TOYOTA

HILUX

REPAIR MANUAL

- ENGINE
- CHASSIS
- BODY
- ELECTRICAL

INTRODUCTION

HOW TO USE THIS MANUAL

IN002–09

INDEX

An INDEX is provided on the first page of each section to guide you to the item to be repaired.
To assist you in finding your way through the manual, the Section Title and major heading are given at the top of every page.

GENERAL DESCRIPTION

At the beginning of each section, a General Description is given that pertains to all repair operations contained in that section.
Read these precautions before starting any repair task.

TROUBLESHOOTING

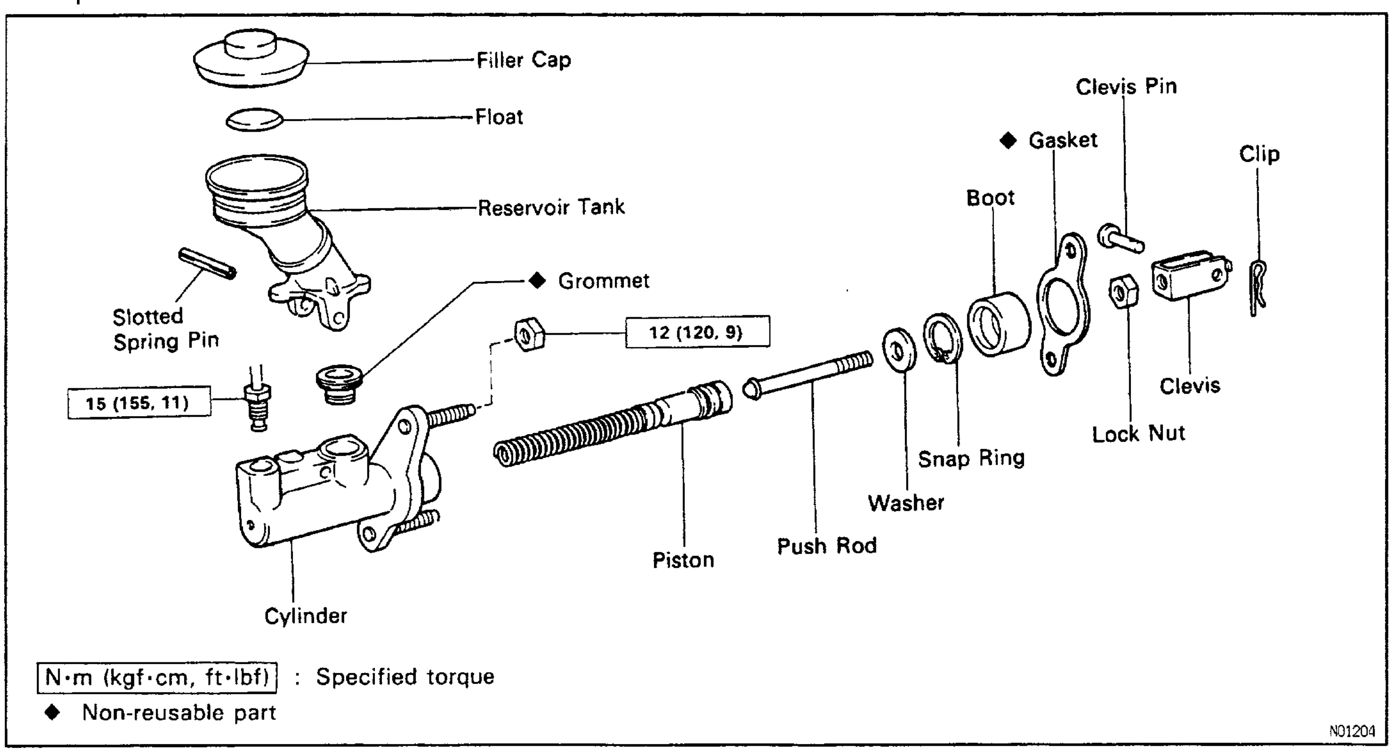
TROUBLESHOOTING tables are included for each system to help you diagnose the problem and find the cause.

PREPARATION

Preparation lists the SST (Special Service Tools), recommended tools, equipment, lubricant and SSM (Special Service Materials) which should be prepared before beginning the operation and explains the purpose of each one.

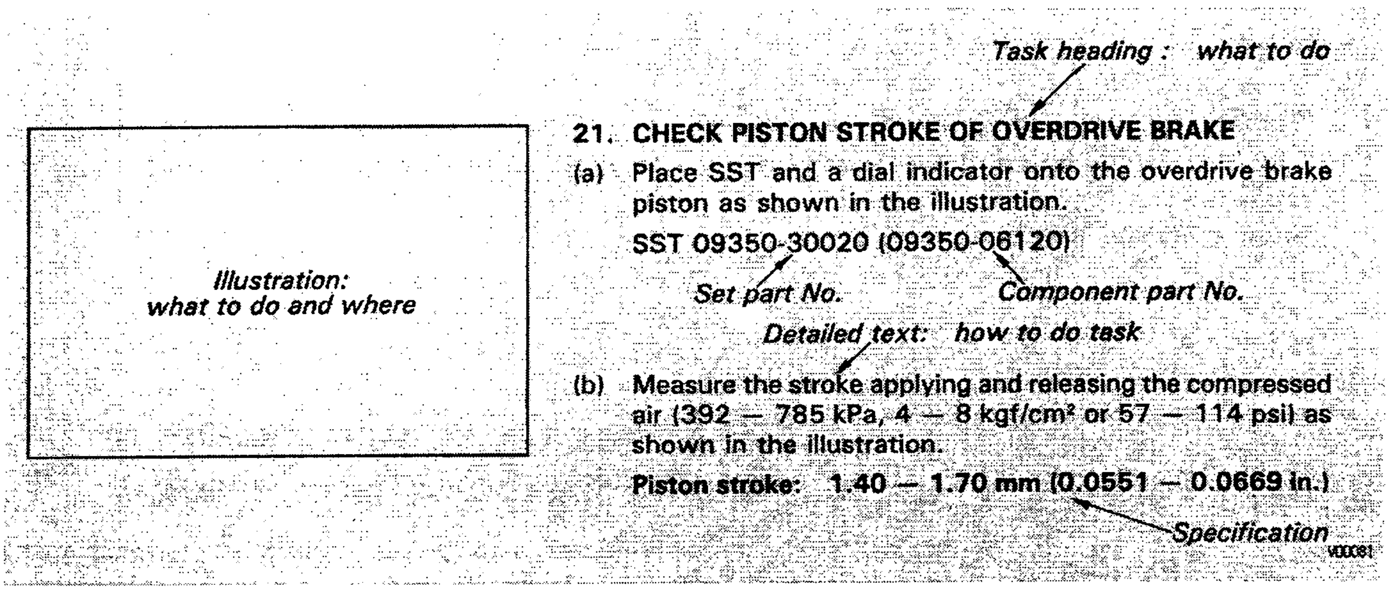
REPAIR PROCEDURES

Most repair operations begin with an overview illustration. It identifies the components and shows how the parts fit together.
Example:



The procedures are presented in a step–by–step format:
Example:

- The illustration shows what to do and where to do it.
- The task heading tells what to do.
- The detailed text tells how to perform the task and gives other information such as specifications and warnings.



This format provides the experienced technician with a FAST TRACK to the information needed. The upper case task heading can be read at a glance when necessary, and the text below it provides detailed information. Important specifications and warnings always stand out in bold type.

REFERENCES

References have been kept to a minimum. However, when they are required you are given the page to refer to.

SPECIFICATIONS

Specifications are presented in bold type throughout the text where needed. You never have to leave the procedure to look up your specifications. They are also found at the end of each section, for quick reference.

CAUTIONS, NOTICES, HINTS:

- CAUTIONS are presented in bold type, and indicate there is a possibility of injury to you or other people.
- NOTICES are also presented in bold type, and indicate the possibility of damage to the components being repaired.
- HINTS are separated from the text but do not appear in bold. They provide additional information to help you perform the repair efficiently.

SI UNIT

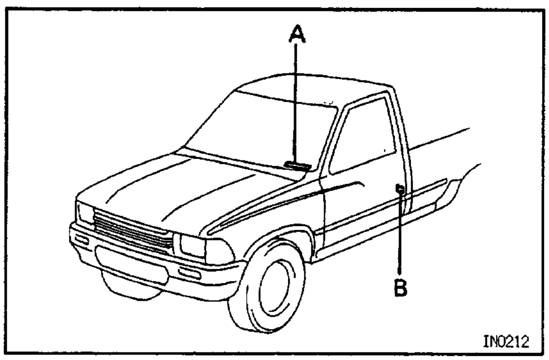
The UNITS given in this manual are primarily expressed according to the SI UNIT(Internationai System of Unit), and alternately expressed in the metric system and in the English System.
Example:

Torque: 30 N–m (310 kgf–cm, 22 ft–lbf)

IDENTIFICATION INFORMATION

VEHICLE IDENTIFICATION NUMBER

IN003–01

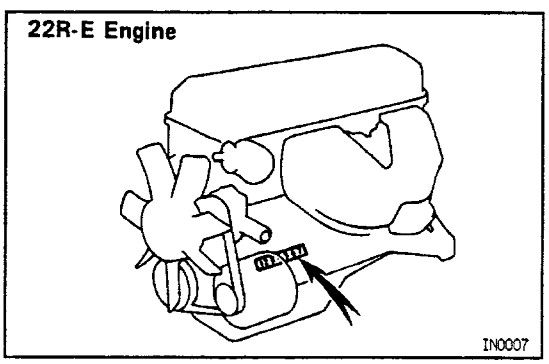


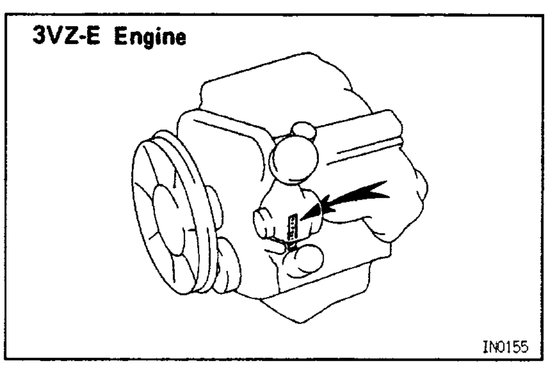
The vehicle identification number is stamped on the vehicle identification number plate and certification label.

A. Vehicle Identification Number Plate
B. Certification Label

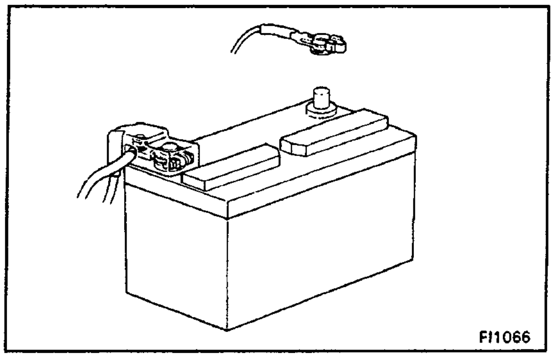
ENGINE SERIAL NUMBER

IN00A–01



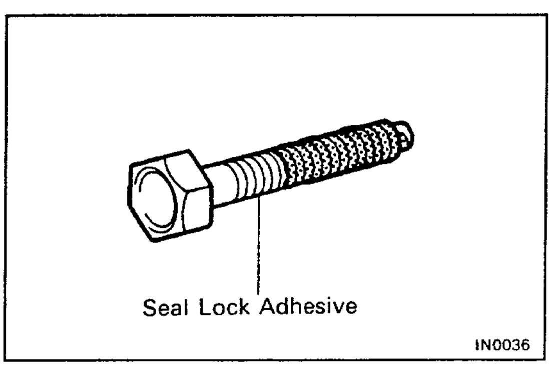


The engine serial number is stamped on the engine block as shown.



GENERAL REPAIR INSTRUCTIONS

1. Use fender, seat and floor covers to keep the vehicle clean and prevent damage.
2. During disassembly, keep parts in the appropriate order to facilitate reassembly.
3. Observe the following:
   (a) Before performing electrical work, disconnect. the negative cable from the battery terminal.
   (b) If it is necessary to disconnect the battery for inspection or repair, always disconnect the cable from the negative (–) terminal which is grounded to the vehicle body.
   (c) To prevent damage to the battery terminal post, loosen the terminal nut and raise the cable str– aight up without twisting or prying it.
   (d) Cleah the battery terminal posts and cable ter– minals with a clean shop rag. Do not scrape them with a file or other abrasive objects.
   (e) Install the cable terminal to the battery post with the nut loose, and tighten the nut after installa– tion. Do not use a hammer to tap the terminal onto the post.
   (f) Be sure the cover for the positive (+) terminal is properly in place.
4. Check hose and wiring connectors to make sure that they are secure and correct.
5. Non–reusable parts
   (a) Always replace cotter pins, gaskets, 0– rings and oil seals etc. with new ones.
   (b) Non–reusable parts are indicated in the com– ponent illustrations by the“♦” symbol.

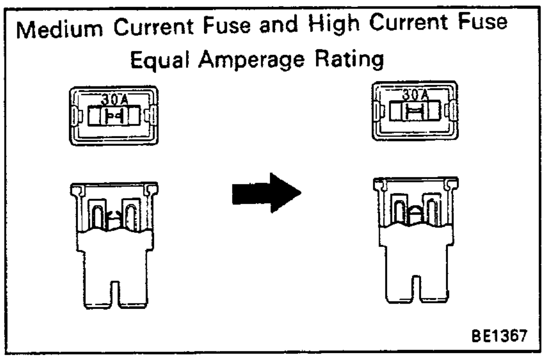


6. Precoated parts
   Precoated parts are bolts and nuts, etc. that are coated with a seal lock adhesive at the factory.
   (a) If a precoated part is retightened, loosened or caused to move in any way, it must be recoated with the specified adhesive.

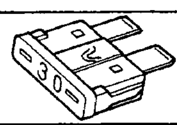
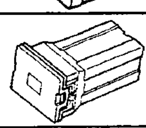
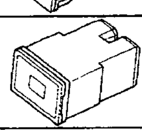
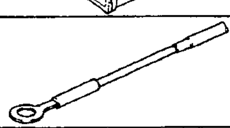
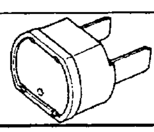
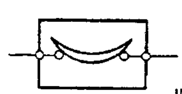
(b) When reusing precoated parts, clean off the old adhesive and dry with compressed air. Then apply the specified seal lock adhesive to the bolt, nut or threads.

(c) Precoated parts are indicated in the component illustrations by the "*" symbol.

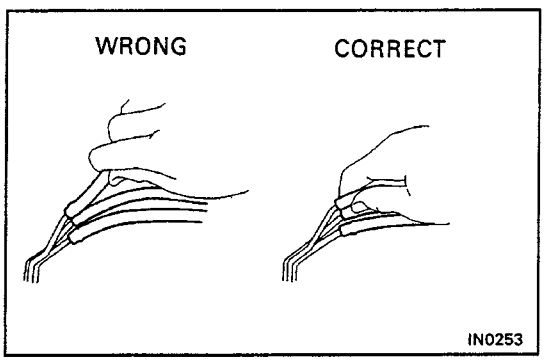
7. When necessary, use a sealer on gaskets to prevent leaks.
8. Carefully observe all specifications for bolt tightening torques. Always use a torque wrench.
9. Use of special service tools (SST) and special service materials (SSM) may be required, depending on the nature of the repair. Be sure to use SST and SSM where specified and follow the proper work procedure. A list of SST and SSM can be found in the preparation part at the front of each section in this manual.



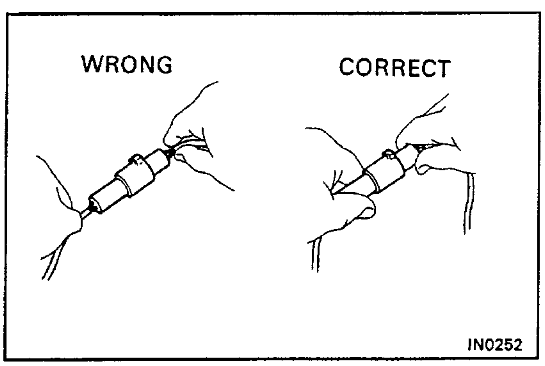
10. When replacing fuses, be sure the new fuse has the correct amperage rating. DO NOT exceed the rating or use one with a lower rating.

Illustration	Symbol	Part Name	Abbreviation
 BE5594	 IN0365	FUSE	FUSE
 BE5595	 IN0366	MEDIUM CURRENT FUSE	M–FUSE
 BE5596	 IN0367	HIGH CURRENT FUSE	H–FUSE
 BE5597	 IN0367	FUSIBLE L!1VK	FL
 BE5598	 IN0368	CIRCUIT BREAKER	CB

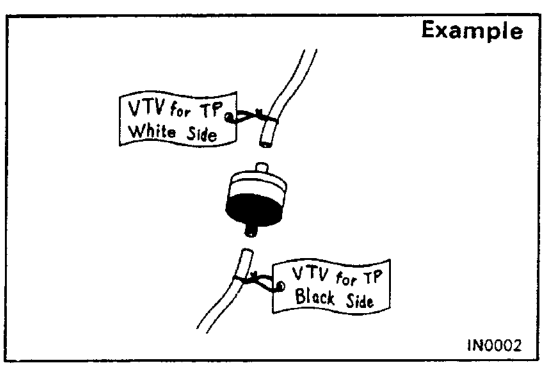
11. Care must be taken when jacking up and supporting the vehicle. Be sure to lift and support the vehicle at the proper locations (See page IN–9).
    (a) If the vehicle is to be jacked up only at the front or rear end, be sure to block the wheels at the opposite end in order to ensure safety.
    (6) After the vehicle is jacked up, be sure to support it on stands. It is extremely dangerous to do any work on a vehicle raised on a jack alone, even for a small job that can be finished quickly.
12. Observe the following precautions to avoid damage to the parts:
    (a) Do not open the cover or case of the ECU, ECM, PCM or TCM unless absolutely necessary. (If the IC terminals are touched, the IC may be destr–oyed by static electricity.)



    (b) To disconnect vacuum hoses, pull on the end, not the middle of the hose.
    (c) To pull apart electrical connectors, pull on the connector itself, not the wires.
    (d) Be careful not to drop electrical components, such as sensors or relays. If they are dropped on a hard floor, they should be replaced and not reused.
    (e) When steam cleaning an engine, protect the distributor, air filter, and VCV from water.
    (f) Never use an impact wrench to remove or install temperature switches or temperature sensors.



    (g) When checking continuity at the wire connector, insert the tester probe carefully to prevent ter–minals from bending.
    (h) When using a vacuum gauge, never force the hose onto a connector that is too large. Use a step–down adapter instead. Once the hose has been stretched, it may leak.



13. Tag hoses before disconnecting them:
    (a) When disconnecting vacuum hoses, use tags to identify how they should be reconnected.
    (b) After completing a job, double check that the vacuum hoses are properly connected. A label under the hood shows the proper layout.

PRECAUTION

IN006–01

FOR VEHICLES EQUIPPED WITH A CATALYTIC CONVERTER

CAUTION: If large amounts of unburned gasoline flow into the converter, it may overheat and create a fire hazard. To prevent this, observe the following precautions and explain them to your customer.

1. Use only unleaded gasoline.

2. Avoid prolonged idling.

Avoid running the engine at idle speed for more than 20 minutes.

3. Avoid spark jump test.

(a) Perform spark jump test only when absolutely necessary. Perform this test as rapidly as possible.

(b) While testing, never race the engine.

4. Avoid prolonged engine compression measurement.

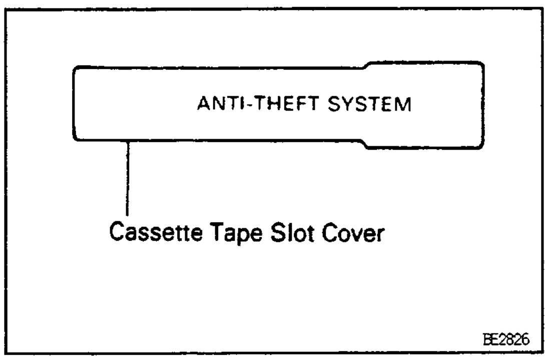
Engine compression tests must be done as rapidly as possible.

5. Do not run engine when fuel tank is nearly empty.

This may cause the engine to misfire and create an extra load on the converter.

6. Avoid coasting with ignition turned off and prolonged braking.

7. Do not dispose of used catalyst along with parts contaminated with gasoline or oil.



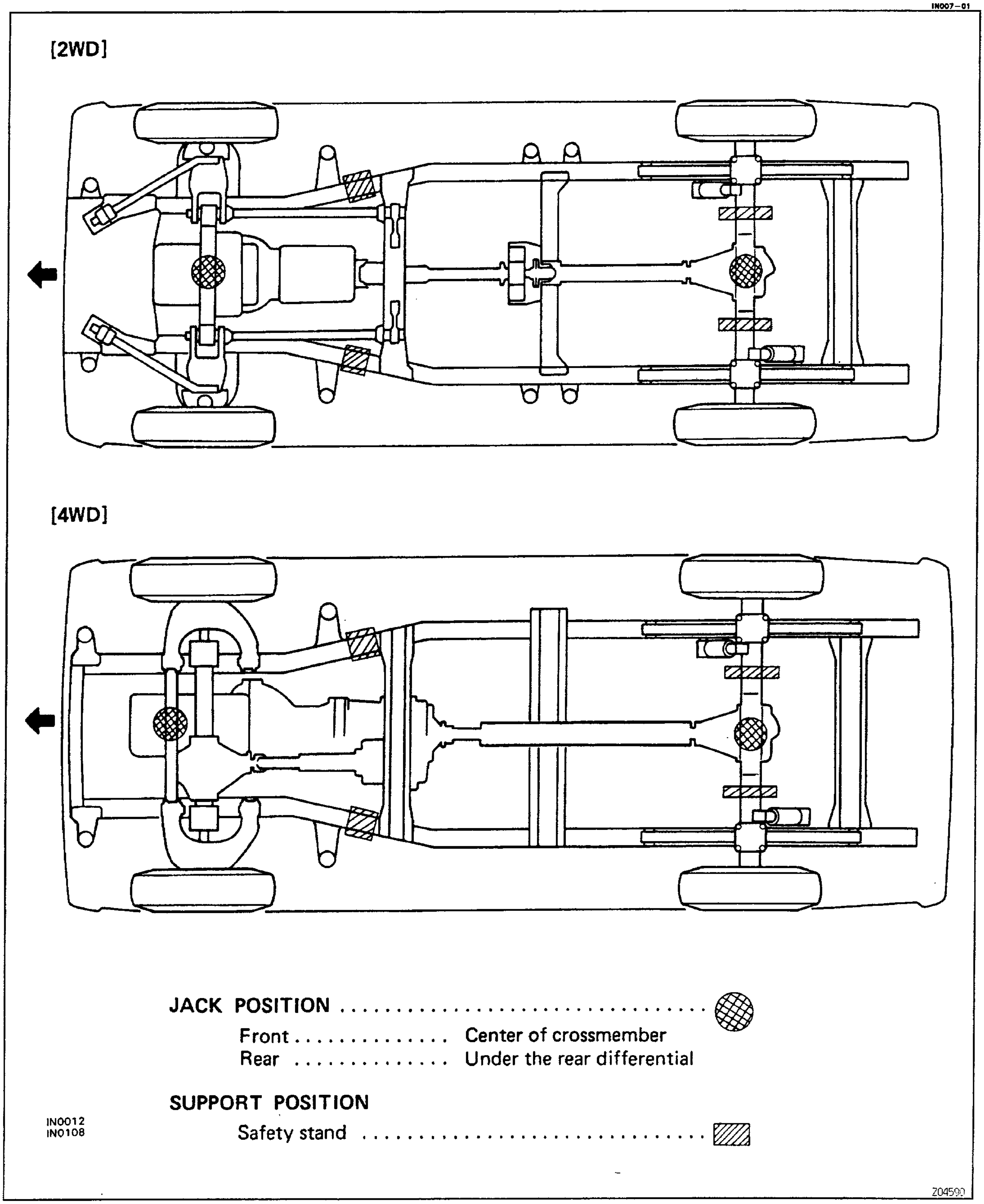
IN=–01

FOR VEHICLES WITH AN AUDIO SYSTEM WITH BUILT–IN ANTI–THEFT SYSTEM

Audio System displaying the sign ”ANTI –THEFT SYSTEM” shown on the left has a built–in anti–theft system which makes the audio system soundless if stolen.

If the power source for the audio system is cut even once, the anti–theft system operates so that even if the power source is reconnected, the audio system will not produce any sound unless the ID number selected by the customer is input again. Accordingly, when performing repairs on vehicles equipped with this system, before disconnecting the battery termi– nals or removing the audio system the customer should be asked for the ID number so that the tech– nician can input the ID number afterwards, or else a request made to the customer to input the ID number. For the method to input the ID number or cancel the anti–theft system, refer to the Owner’s Manual.

VEHICLE LIFT AND SUPPORT LOCATIONS



ABBREVIATIONS USED IN THIS MANUAL

IN01D–0C

ADD	Automatic Disconnecting Differential
ALR	Automatic Locking Retractor
A/T	Automatic Transmission
ATF	Automatic Transmission Fluid
BTDC	Before Top Dead Center
Calif.	California
CB	Circuit Breaker
C&C	Cab and Chassis
DP	Dash Pot
DRW	Double Rear Wheel
ECU	Electronic Control Unit
ELR	Emergency Locking Retractor
ESA	Electronic Spark Advance
EX	Exhaust (Manifold, Valve)
Ex.	Except
Fed.	Vehicles Sold in USA except California
FIPG	Formed in Place Gasket
FL	Fusible Link
Fr	Front
IG	Ignition
IN	Intake (Manifold, Valve)
J/6	Junction Block
LH	Left–Hand
LSPV	Load Sensing Proportioning Valve
LSP & BV	Load Sensing Proportioning and By–Pass Valve
Max.	Maximum
Min.	Minimum
MP	Multipurpose
M/T	Manual Transmission
0/D, OD	Overdrive
OHC	Over Head Camshaft
o/s	Oversize
PCV	Positive Crankcase Ventilation
PPS	Progressive Power Steering
PS	Power Steering
RH	Right–Hand
Rr	Rear
SRW	Single Rear Wheel
SSM	Special Service Materials
SST	Special Service Tools
STD	Standard
SW	Switch

TCCS	Toyota Computer Controlled System
TDC	Top Dead Center
TEMP.	Temperature
T/M	Transmission
U/S	Undersize
VCV	Vacuum Control Valve
VSV	Vacuum Switching Valve
VTV	Vacuum Transmitting Valve
w/	With
w/o	Without
2WD	Two Wheel Drive Vehicles (4 x 2)
4WD	Four Wheel Drive Vehicles (4 x 4)

GLOSSARY OF SAE AND TOYOTA TERMS

M076–03

This glossary lists all SAE–J 1930 terms and abbreviations used in this manual in compliance with SAE recommendations, as well as their Toyota equivalents.

SAE ABBRE–VIATIONS	SAE TERMS	TOYOTA TERMS ( )—ABBREVIATIONS
A/C	Air Conditioning	Air Conditioner
ACL	Air Cleaner	Air Cleaner
AIR	Secondary Air Injection	Air Injection (AD
AP	Accelerator Pedal	–
B+	Battery Positive Voltage	+ B, Battery Voltage
BARO	Barometric Pressure	–
CAC	Charge Air Cooler	Intercooler
CARB	Carburetor	Carburetor
CFI	Continuous Fuel Injection	–
CKP	Crankshaft Position	Crank Angle
CL	Closed Loop	Closed Loop
CMP	Camshaft Position	Cam Angle
CPP	Clutch Pedal Position	–
CTOX	Continuous Trap Oxidizer	–
CT P	Closed Throttle Position	–
D F!	Direct Fuel Injection (Diesel)	Direct Injection (DI)
DI	Distributor ignition	–
DLC1 DLC2 DLC3	Data Link Connector 1 Data Link Connector 2 Data Link Connector 3	1: Check Connector 2: Toyota Diagnosis Communication Link (TDCL) 3: OBDII Diagnostic Connector
DTC	Diagnostic Trouble Code	Diagnostic Code
DTM	Diagnostic Test Mode	–
ECL	Engine Control Level	–
ECM	Engine Control Module	Engine ECU (Electronic Control Unit)
ECT	Engine Coolant Temperature	Coolant Temperature, Water Temperature (THW)
EEPROM	Electrically Erasable Programmable Read Only Memory	Electrically Erasable Programmable Read Only Memory (EEPROM), Erasable Programmable Read Only Memory (EPROM)
EFE	Early Fuel Evaporation	Cold Mixture Heater (CMH), Heat Control Valve (HCV)
EGR	Exhaust Gas Recirculation	Exhaust Gas Recirculation (EGR)
EI	Electronic Ignition	Toyota Distributable Ignition (TDI)
EM	Engine Modification	Engine Modification (EM)
EPROM	Erasable Programmable Read Only Memory	Programmable Read Only Memory (PROM)
EVAP	Evaporative Emission	Evaporative Emission Control (EVAP)
FC	Fan Control	–
FEEPROM	Flash Electrically Erasable Programmable Read Only Memory	–
FEPROM	Flash Erasable Programmable Read Only Memory	–
FF	Flexible Fuel	–
FP	Fuel Pump	Fuel Pump
GEN	Generator	Alternator
GND	Ground	Ground (GND)
H02S	Heated Oxygen Sensor	Heated Oxygen Sensor (H02S)

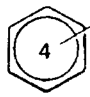
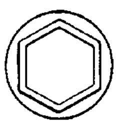
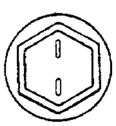
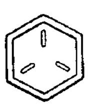
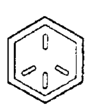
IAC	Idle Air Control	Idle Speed Control (ISC)
I AT	Intake Air Temperature	Intake or Inlet Air Temperature
ICM	Ignition Control Module	–
IFI	Indirect Fuel Injection	Indirect injection
IFS	Inertia Fuel–Shutoff	–
ISC	Idle Speed Control	–
KS	Knock Sensor	Knock Sensor
MAF	Mass Air Flow	Air Flow Meter
MAP	Manifold Absolute Pressure	Manifold Pressure Intake Vacuum
MC	Mixture Control	Electric Bleed Air Control Valve (EBCV) Mixture Control Valve (MCV) Electric Air Control Valve (EACV)
M DP	Manifold Differential Pressure	–
M Ft	Multiport Fuel Injection	Electronic Fuel Injection (EFI)
MIL	Malfunction Indicator Lamp	Check Engine Light
MST	Manifold Surface Temperature	–
MVZ	Manifold Vacuum Zone	–
NVRAM	Non–Volatile Random Access Memory	–
02S	Oxygen Sensor	Oxygen Sensor, O_2 Sensor (02S)
OBD	On–Board Diagnostic	On–Board Diagnostic (OBD)
OC	Oxidation Catalytic Converter	Oxidation Catalyst Converter (OC), CCo
OP	Open Loop	Open Loop
PAIR	Pulsed Secondary Air Injection	Air Suction (AS)
PCM	Powertrain Control Module	–
PNP	Park/Neutral Position	–
PROM	Programmable Read Only Memory	–
PSP	Power Steering Pressure	–
PTOX	Periodic Trap Oxidizer	Diesel Particulate Filter (DPF) Diesel Particulate Trap (DPT)
RAM	Random Access Memory	Random Access Memory (RAM)
RM	Relay Module	–
ROM	Read Only Memory	Read Only Memory (ROM)
RPM	Engine Speed	Engine Speed
SC	Supercharger	Supercharger
SCB	Supercharger Bypass	–
SFI	Sequential Multiport Fuel Injection	Electronic Fuel Injection (EFI), Sequential Injection
SPL	Smoke Puff Limiter	–
SRI	Service Reminder Indicator	–
S RT	System Readiness Test	–
ST	Scan Tool	–
TB	Throttle Body	Throttle Body
TBI	Throttle Body Fuel Injection	Single Point Injection Central Fuel Injection (Ci)
TC	Turbocharger	Turbocharger
TCC	Torque Converter Clutch	Torque Converter
TCM	Transmission Control Module	Transmission ECU (Electronic Control Unit)
TP	Throttle Position	Throttle Position
TR	Transmission Range	–

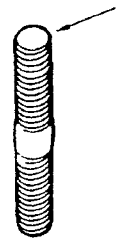
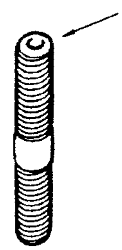
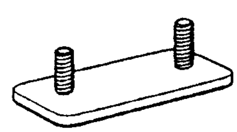
TVV	Thermal Vacuum Valve	Bimetal Vacuum Switching Valve (BVSV) Thermostatic Vacuum Switching Valve (TVSV)
twc	Three–Way Catalytic Converter	Three–Way Catalyst (TWC) CCRO
TWC+OC	Three–Way + Oxidation Catalytic Converter	CC_R + CCo
VAF	Volume Air Flow	Air Flow Meter
VR	Voltage Regulator	Voltage Regulator
VSS	Vehicle Speed Sensor	Vehicle Speed Sensor (Read Switch Type)
wot	Wide Open Throttle	Full Throttle
WU –OC	Warm Up Oxidation Catalytic Converter	–
WU–TWC	Warm Up Three–Way Catalytic Converter	Manifold Converter
3GR	Third Gear	–
4GR	Fourth Gear	–

STANDARD BOLT TORQUE SPECIFICATIONS

IN008–01

HOW TO DETERMINE BOLT STRENGTH

	Mark	Class
Hexagon head bolt	 4– 5– 6– 8– 9– 10– 11–	4T 5T fiT 7T 8T 9T 10T 11T
	 No mark	4T
Hexagon flange bolt w/ washer hexagon bolt	 No mark	4T
Hexagon head bolt	 Two protruding lines	5T
Hexagon flange bolt w/ washer hexagon bolt	 Two protruding lines	6T
Hexagon head bolt	 Three protruding lines	7T
Hexagon head bolt	 Four protruding lines	8T

	Mark	Class
Stud bolt		4T
		6T
Welded bolt		4T

V00078

SPECIFIED TORQUE FOR STANDARD BOLTS

Class	Diameter mm	Pitch mm	Specified torque					
			Hexagon head bolt			Hexagon flange bolt		
			N·m	kgf·cm	ft·lbf	N·m	kgf·cm	ft·lbf
4T	6	1	5	55	48 in.·lbf	6	60	52 in.·lbf
	8	1.25	12.5	130	9	14	145	10
	10	1.25	26	260	19	29	290	21
	12	1.25	47	480	35	53	540	39
	14	1.5	74	760	55	84	850	61
	16	1.5	115	1,150	83	–	–	–
5T	6	1	6.5	65	56 in.·lbf	7.5	75	65 in.·lbf
	8	1.25	15.5	160	12	17.5	175	13
	10	1.25	32	330	24	36	360	26
	12	1.25	59	600	43	65	670	48
	14	1.5	91	930	67	100	1,050	76
	16	1.5	140	1,400	101	–	–	–
6T	6	1	8	80	69 in.·lbf	9	90	78 in.·lbf
	8	1.25	19	195	14	21	210	15
	10	1.25	39	400	29	44	440	32
	12	1.25	71	730	53	80	810	59
	14	1.5	110	1,100	80	125	1,250	90
	16	1.5	170	1,750	127	–	–	–
7T	6	1	10.5	110	8	12	120	9
	8	1.25	25	260	19	28	290	21
	10	1.25	52	530	38	58	590	43
	12	1.25	95	970	70	105	1,050	76
	14	1.5	145	1,500	108	165	1,700	123
	16	1.5	230	2,300	166	–	–	–
8T	8	1.25	29	300	22	33	330	24
	10	1.25	61	620	45	68	690	50
	12	1.25	110	1,100	80	120	1,250	90
9T	8	1.25	34	340	25	37	380	27
	10	1.25	70	710	51	78	790	57
	12	1.25	125	1,300	94	140	1,450	105
1 OT	8	1.25	38	390	28	42	430	31
	10	1.25	78	800	58	88	890	64
	12	1.25	140	1,450	105	155	1,600	116
11T	8	1.25	42	430	31	47	480	35
	10	1.25	87	890	64	97	990	72
	12	1.25	155	1,600	116	175	1,800	130

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MAINTENANCE

GENERAL NOTES:

- Every service item in the periodic maintenance list must be performed.
- Failure to do even one item can cause the engine to run poorly and increase exhaust emissions.

MAINTENANCE SCHEDULE

Maintenance operations: A = Check and/or adjust if necessary;
R = Replace, change or lubricate;
I = Inspect and correct or replace if necessary

NORMAL CONDITION SCHEDULE

System	Service interval (Odometer reading or months, whichever comes first) / Maintenance items		Maintenance services beyond 60,000 miles (96,000 km) should be performed at the same intervals shown in each maintenance schedule.								See page (item No.)
		Miles x 1,000	10	15	20	30	40	45	50	60	
		Km x 1,000	16	24	32	48	64	72	80	96	
		Months	12	18	24	36	48	54	60	72	
ENGINE	Valve clearance*					A				A	MA-7 (item 13)
	Drive belts [1]					I				I	MA-4 (item 1)
	Engine oil and oil filter*		R		R	R	R		R	R	MA-5 (item 6)
	Engine coolant [2]									R	MA-5 (item 7)
	Exhaust pipes and mountings					I				I	MA-7 (item 11)
FUEL	Idle speed	22R-E engine [3]	A			A				A	MA-8 (item 14
	Idle speed and fast idle speed	22R engine [4]				A					MA-8 (item 14) MA-9 (item 15)
	Air filter*					R				R	MA-5 (item 5)
	Fuel lines and connections					I				I	MA-7 (item 10)
	Fuel filler cap gasket									R	MA-7 (item 9)
IGNITION	Spark plugs**					R				R	MA-4 (item 2)
EVAP	Charcoal canister	Calif. only								I	MA-6 (item 8)
EXHAUST	Oxygen sensor* [5]	Fed. 22R-E engine only								R	MA-7 (item 12
BRAKES	Brake linings and drums			I		I		I		I	MA-11 (item 1
	Brake pads and discs			I		I		I		I	MA-11 (item 18)
	Brake line pipes and hoses			I		I		I		I	MA-11 (item 16)
CHASSIS	Steering linkage			I		I		I		I	MA-11 (item 19)
	Ball joints and dust covers (RN 2WD)			I		I		I		I	MA-12 (item 21)
	Automatic transmission [6], manual transmission, transfer (RN 4WD), differential and steering gear box [6] oil			I		I		I		I	MA-12 (item 20) MA-12 (item 22) MA-13 (item 23)
	Front wheel bearing grease					R				R	MA-14 (item 26)
	Steering knuckle and chassis grease (RN 4WD)			R		R		R		R	MA-14 (item 27)
	Propeller shaft grease (RN 4WD) [7]			R		R		R		R	MA-14 (item 27)
	Bolts and nuts on chassis and body			I		I		I		I	MA-16 (item 28)

Maintenance services indicated by a star (★) or asterisk (∗) are required under the terms of the Emission Control Systems Warranty. See Owner's Guide for complete warranty information.

★ For vehicles sold in California

∗ For vehicles sold outside California

NOTE:

(1) After 60,000 miles (96,000 km) or 72 months, inspect every 10,000 miles (16,000 km) or 12 months.
(2) After 60,000 miles (96,000 km) or 72 months, replace every 30,000 miles (48,000 km) or 36 months.
(3) After 30,000 miles (48,000 km) or 36 months, adjust every 30,000 miles (48,000 km) or 36 months.
(4) Adjustment at 30,000 miles (48,000 km) or 36 months only
(5) Replace at 60,000 miles (96,000 km) or 72 months only.
(6) Inspect the automatic transmission and steering gear box for oil leakage only.
(7) If the propeller shaft has been immersed in water, it should be re-greased within 24 hours.

Follow the severe condition schedule if vehicle is operated mainly under one or more of the following severe conditions:

- Pulling a trailer
- Repeated short trips
- Driving on rough and/or muddy roads
- Driving on dusty roads
- Driving in extremely cold weather and/or on salted roads

SEVERE CONDITION SCHEDULE

System	Service interval (Odometer reading or months, whichever comes first) / Maintenance items		Maintenance services beyond 60,000 miles (96,000 km) should be performed at the same intervals shown in each maintenance schedule.																See page (item No.)
		Miles x 1,000	5	7.5	10	15	20	22.5	25	30	35	37.5	40	45	50	52.5	55	60	
		Km x 1,000	8	12	16	24	32	36	40	48	56	60	64	72	80	84	88	96	
		Months	6	9	12	18	24	27	30	36	42	45	48	54	60	63	66	72	
ENGINE	Valve clearance★									A								A	MA-7 (item 13)
	Drive belts (1)									I								I	MA-4 (item 1)
	Engine oil and oil filter★		R		R	R	R		R	R	R		R	R	R		R	R	MA-5 (item 6)
	Engine coolant (2)																	R	MA-5 (item 7)
	Exhaust pipes and mountings					I				I				I				I	MA-7 (item 11)
FUEL	Idle speed	22R-E engine (3)			A					A								A	MA-8 (item 14)
	Idle speed and fast idle speed	22R engine (4)								A									MA-8 (item 14) MA-9 (item 15)
	Air filter★ (9)		I		I	I	I		I	R	I		I	I	I		I	R	MA-5 (item 4, 5)
	Fuel lines and connections									I								I	MA-7 (item 10)
	Fuel filler cap gasket																	R	MA-7 (item 9)
IGNITION	Spark plugs★*									R								R	MA-4 (item 2)
	Ignition wiring and distributor cap★*									(5)									MA-5 (item 3)
EVAP	Charcoal canister	Calif. only																I	MA-6 (item 8)
EXHAUST	Oxygen sensor*(6)	Fed. 22R-E engine only																R	MA-7 (item 12)
KES	Brake linings and drums			I		I		I		I		I		I		I		I	MA-11 (item 17)
	Brake pads and discs			I		I		I		I		I		I		I		I	MA-11 (item 18)
	Brake line pipes and hoses					I				I				I				I	MA-11 (item 16)
CHASSIS	Steering linkage (10)			I		I		I		I		I		I		I		I	MA-11 (item 19)
	Ball joints and dust covers (RN 2WD)			I		I		I		I		I		I		I		I	MA-12 (item 21)
	Automatic transmission(7), manual transmission, transfer (RN 4WD), differential and steering gear box (7) oil					R				R				R				R	MA-12 (item 20) MA-13 (item 24) MA-14 (item 25)
	Front wheel bearing grease									R								R	MA-14 (item 26)
	Steering knuckle and chassis grease (RN 4WD)			R		R		R		R		R		R		R		R	MA-14 (item 27)
	Propeller shaft grease (RN 4WD)(8)			R		R		R		R		R		R		R		R	MA-14 (item 27)
	Bolts and nuts on chassis and body (10)			I		I		I		I		I		I		I		I	MA-16 (item 28)

Maintenance services indicated by a star (★) or asterisk (✱) are required under the terms of the Emission Control Systems Warranty. See Owner's Guide for complete warranty information.

★ For vehicles sold in California
✱ For vehicles sold outside California

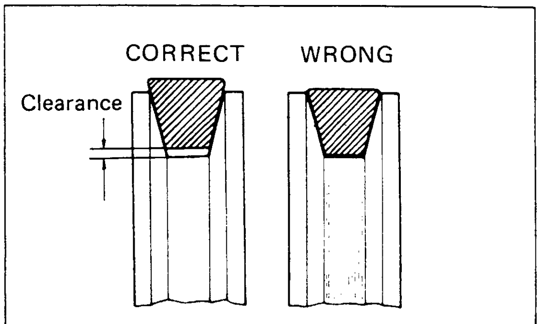
NOTE:
(1) After 60,000 miles (96,000 km) or 72 months, inspect every 10,000 miles (16,000 km) or 12 months.
(2) After 60,000 miles (96,000 km) or 72 months, replace every 30,000 miles (48,000 km) or 36 months.
(3) After 30,000 miles (48,000 km) or 36 months, adjust every 30,000 miles (48,000 km) or 36 months.
(4) Adjustment at 30,000 miles (48,000 km) or 36 months only.
(5) In areas where road salt is used, inspect and clean each year just after the snow season.
(6) Replace at 60,000 miles (96,000 km) or 72 months only
(7) Inspect the automatic transmission and steering gear box for oil leakage only.
(8) If the propeller shaft has been immersed in water, it should be re-greased within 24 hours.
(9) Applicable when operating mainly on dusty roads. If not, follow the normal condition schedule.
) Applicable when operating mainly on rough and/or muddy roads. If not, follow the normal condition schedule.

MAINTENANCE OPERATIONS

ENGINE

Cold Engine Operations

1. **INSPECT DRIVE BELTS**
   (a) Visually check the drive belt for cracks, oiliness or wear. Check that the belt does not touch the bottom of the pulley groove.
   If necessary, replace the drive belt.



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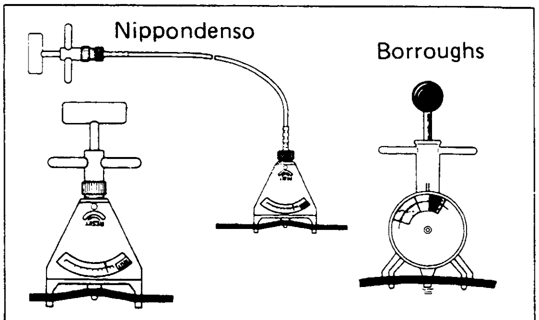
   (b) Using a belt tension gauge, check the drive belt tension.

Belt tension gauge:
Nippondenso BTG-20 (95506-00020) or
Borroughs No.BT-33-73F

Drive belt tension: Used belt 80 ± 20 lb
New belt 125 ± 25 lb

If necessary, adjust the drive belt tension.



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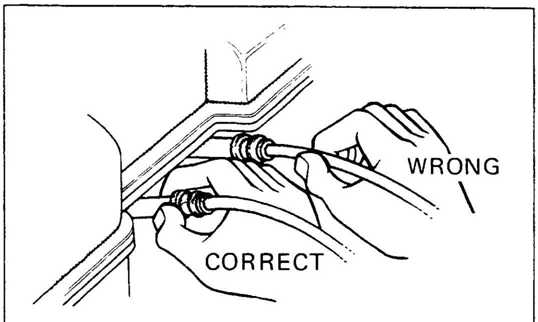
2. **REPLACE SPARK PLUGS**
   (a) Disconnect the spark plug wires at the boot. DO NOT pull on the wires.
   (b) Remove the spark plugs.



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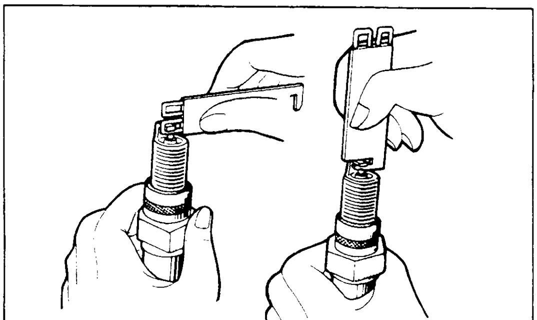
   (c) Set the gap on the new plugs.

Gap: 0.8 mm (0.031 in.)

Recommended spark plugs:
ND W16EXR-U
NGK BPR5EY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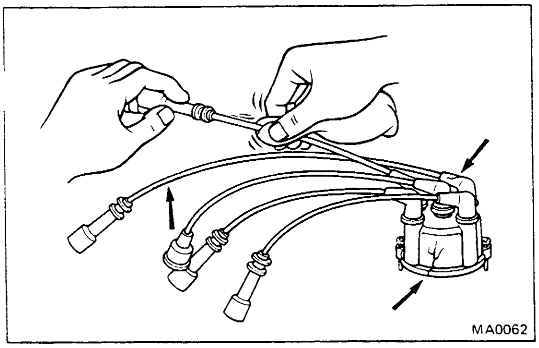
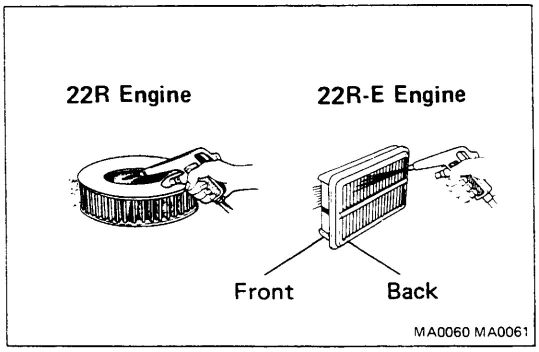


3. **INSPECT IGNITION WIRING AND DISTRIBUTOR CAP**
   (a) Remove the distributor cap with the wire.
   (b) Clean the distributor cap and wires with a clean cloth.
   (c) Visually inspect the wiring for cracks or damage.
   (d) Visually inspect the cap for cracks, carbon tracks or wear.

   NOTE: In areas where road salt is used, inspection and cleaning should be performed each year just after the snow season.



4. **INSPECT AIR FILTER**
   (a) Visually check that the air cleaner element is not excessively dirty, damaged or oily.

   NOTE: Oiliness may indicate a stuck PCV valve.

   If necessary, replace the air cleaner element.

   (b) Clean the element with compressed air.

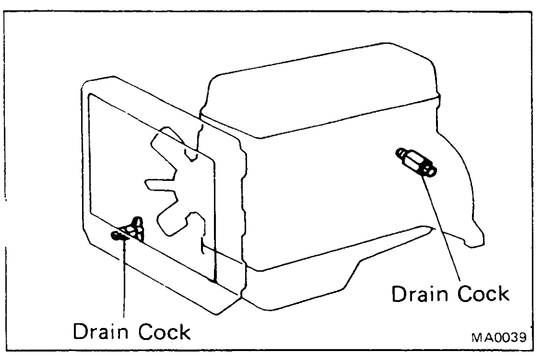
   First blow from inside (or back side) thoroughly, then blow off the outside (or front side) of the element.

5. **REPLACE AIR FILTER**
   Replace the used air cleaner element with a new one.

6. **REPLACE ENGINE OIL AND OIL FILTER**
   (See page LU-3)

   Oil grade: API grade SF or SF/CC multigrade, fuel-efficient and recommended viscosity oil.

   Engine oil capacity (Drain and refill with oil filter change): 4.6 liters (4.9 US qts, 4.0 Imp. qts)



7. **REPLACE ENGINE COOLANT**
   (a) Drain the coolant from the radiator and engine drain cocks. (Engine drain is at left rear of engine block.)
   (b) Close the drain cocks.
   (c) Fill system with coolant.

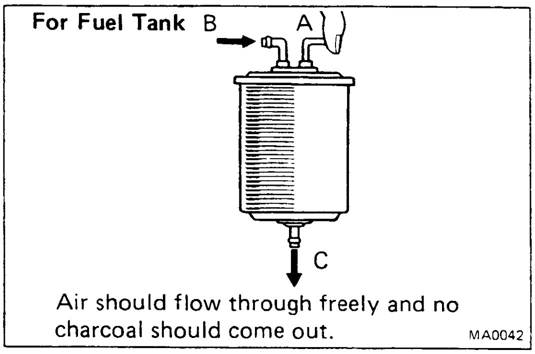
   Coolant capacity (w/heater or air conditioner):
   8.4 liters (8.9 US qts, 7.4 Imp. qts)

   Use a good brand of ethylene-glycol base coolant, mixed according to the manufacturers instruction.

8. CALIFORNIA VEHICLES ONLY: INSPECT CHARCOAL CANISTER

A. 22R-E ENGINE

(a) Disconnect the hoses to the charcoal canister. Label hoses for correct installation.



Air should flow through freely and no charcoal should come out.

(b) Plug pipe A with your finger and blow compressed air (3 kg/cm², 43 psi or 294 kPa) through pipe B (fuel tank side).

- Check that air comes out of the bottom pipe C without resistance.
- Check that no activated charcoal comes out.

If necessary, replace the charcoal canister.

NOTE: Do not attempt to wash the charcoal.

(c) Connect the hoses to the charcoal canister.

B. 22R ENGINE

(a) Inspect the fuel tank and carburetor charcoal canisters.

For Fuel Tank

(b) Disconnect the hoses to the fuel tank charcoal canister. Label hoses for correct installation.

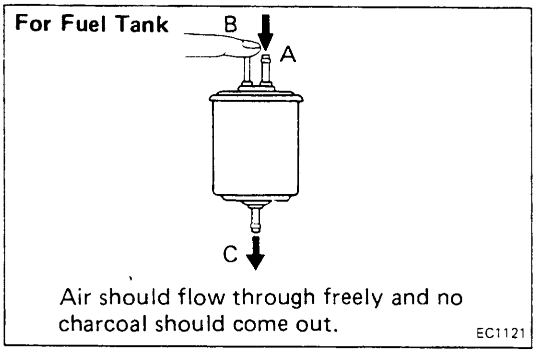
(c) Plug pipe A with your finger and blow compressed air (3 kg/cm², 43 psi or 294 kPa) through pipe B (fuel tank side).

- Check that air comes out of the bottom pipe C without resistance.
- Check that no activated charcoal comes out.

If necessary, replace the charcoal canister.

NOTE: Do not attempt to wash the charcoal.

(d) Connect the hoses to the charcoal canister.



Air should flow through freely and no charcoal should come out.

For Carburetor

(e) Disconnect the hoses to the carburetor charcoal canister located below the battery. Label hoses for correct installation.

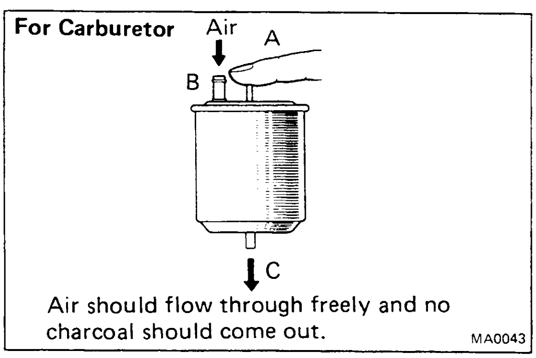
(f) Plug pipe A with your finger and blow compressed air (3 kg/cm², 43 psi or 294 kPa) through pipe B (Outer vent control valve side).

- Check that air comes out of the bottom pipe C without resistance.
- Check that no activated charcoal comes out.

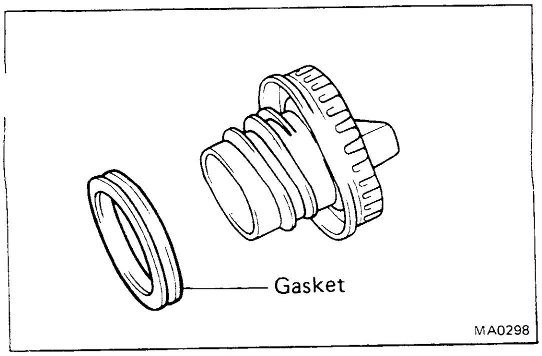
If necessary, replace the charcoal canister.

NOTE: Do not attempt to wash the charcoal.

(g) Connect the hoses to the charcoal canister.



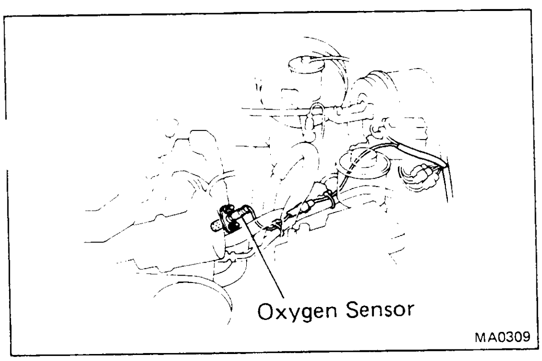
Air should flow through freely and no charcoal should come out.



9. **REPLACE GASKET IN FUEL FILLER CAP**
   (a) Remove the old gasket (O-ring) from the fuel filler cap. Do not damage the cap.
   (b) Install the new gasket by hand.
   (c) Inspect the cap for damage or cracks.
   (d) Install the cap and check the torque limiter.

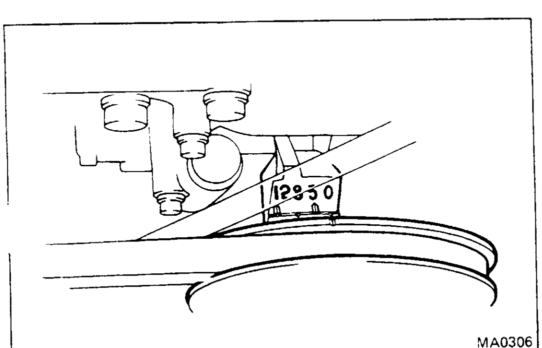
10. **INSPECT FUEL LINES AND CONNECTIONS**
    (22R Engine: See page FU-30)
    (22R-E Engine: See page FI-53)
    Visually inspect the fuel lines for cracks, leakage or loose connections.

11. **INSPECT EXHAUST PIPES AND MOUNTINGS**
    Visually inspect the pipes, hangers and connections for severe corrosion, leaks or damage.



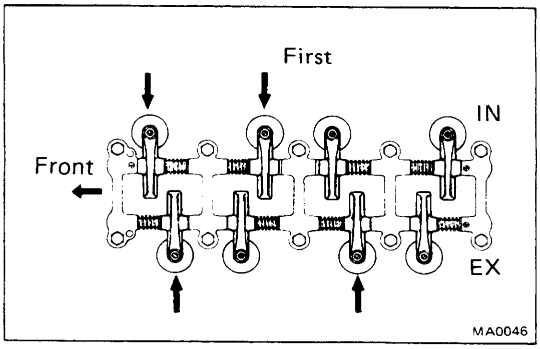
12. **FEDERAL 22R-E ENGINE ONLY:**
    REPLACE OXYGEN SENSOR
    (a) Disconnect the oxygen sensor wiring connector.
    (b) Remove the oxygen sensor and gasket from the exhaust manifold.
    (c) Install the new gasket and oxygen sensor to the exhaust manifold.
    Torque: 200 kg-cm (14 ft-lb, 20 N·m)
    (d) Inspect oxygen sensor operation.
    Inspect feed back control.
    (See page FI-69)

Hot Engine Operations



13. **ADJUST VALVE CLEARANCE**
    (a) Warm up the engine to normal operating temperature.
    (b) Stop the engine and remove the valve cover.
    (c) Set No. 1 cylinder to TDC/compression.
    - Turn the crankshaft with a wrench to align the timing marks at TDC. Set the groove on the pulley to the O position.
    - Check that the rocker arms on No. 1 cylinder are loose and rockers on No. 4 are tight.

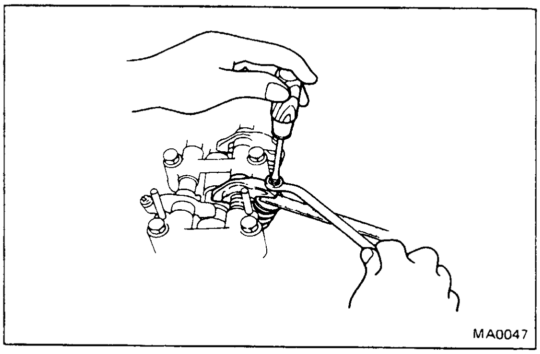
    If not, turn the crankshaft one complete revolution and align marks as above.



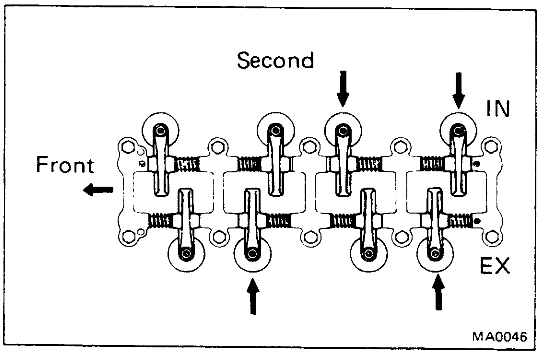
(d) Adjust the clearance of half of the valves.

- Adjust only those valves indicated by arrows.

Valve clearance: Intake 0.20 mm (0.008 in.)
Exhaust 0.30 mm (0.012 in.)



- Use a feeler gauge to measure between the valve stem and rocker arm. Loosen the lock nut and turn the adjusting screw to set the proper clearance. Hold the adjusting screw in position, and tighten the lock nut.
- Recheck the clearance. The feeler gauge should move with a very slight drag.



(e) Turn the crankshaft one complete revolution (360°) and align timing marks in the manner mentioned above. Adjust only the valves indicated by arrows.

(f) Reinstall the valve cover.

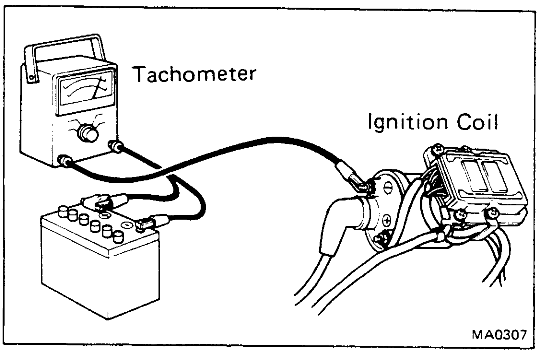
(g) Reinstall the air cleaner (22R engine).

14. ADJUST IDLE SPEED

A. 22R-E ENGINE

(a) Preparation

- Air cleaner installed
- All pipes and hoses of air intake system connected
- All vacuum lines connected (i. e., SC, EGR systems, etc.)
- EFI system wiring connectors fully plugged
- Engine at normal operating temperature
- Accessories switched off
- Transmission in N range

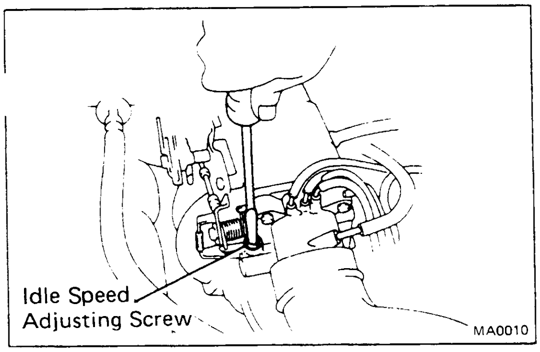


(b) Connect a tachometer to the engine.

Connect the tachometer positive (+) terminal to the ignition coil negative (−) terminal.

CAUTION:

1. **NEVER allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ig· tion coil.**
2. **As some tachometers are not compatible with this ignition system, it is recommended that you consult with the manufacturer.**



(c) Race the engine at 2,500 rpm for about 2 minutes.

(d) Set the idle speed by turning the IDLE SPEED ADJUSTING SCREW.

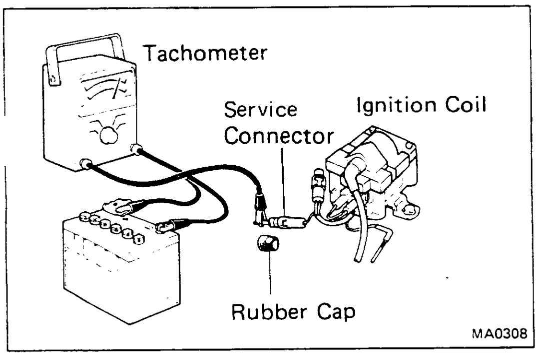
Idle speed: 750 rpm

(e) Remove the tachometer.

B. 22R ENGINE

(a) Preparation

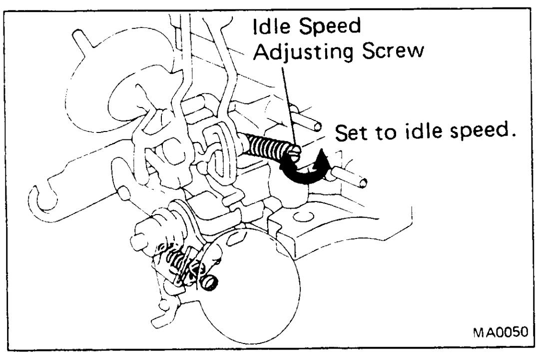
- Air cleaner installed
- Choke valve fully open
- Accessories switched off
- All vacuum lines connected (i.e., AS, EGR systems, etc.)
- Transmission in N range
- Engine idling at normal operating temperature



(b) Connect a tachometer to the engine.
Remove the rubber cap and connect the tachometer positive (+) terminal to the service connector at the igniter.

CAUTION:

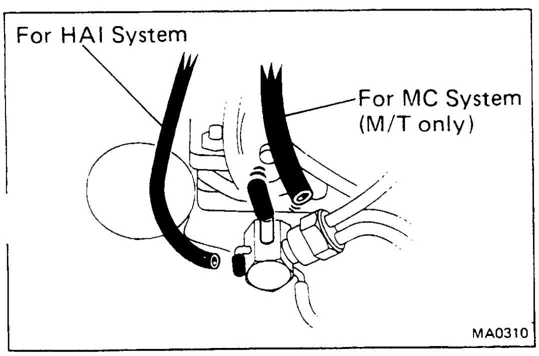
1. **NEVER allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ignition coil.**
2. **As some tachometers are not compatible with this ignition system, it is recommended that you consult with the manufacturer.**



(c) Set the idle speed by turning the IDLE SPEED ADJUSTING SCREW.

Idle speed: 700 rpm M/T
750 rpm A/T

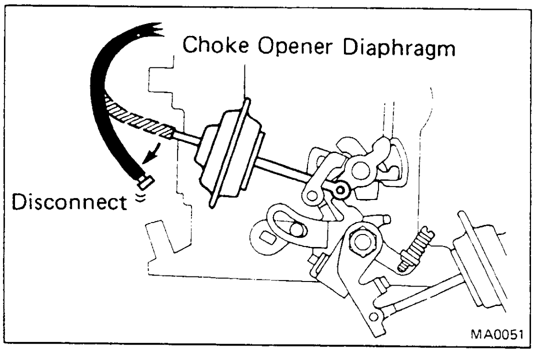
NOTE: Leave the tachometer connected for further adjustment.



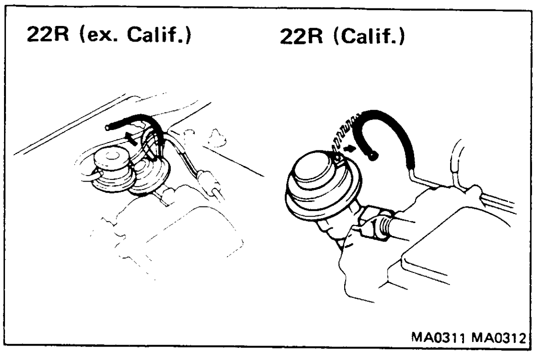
15. 22R ENGINE ONLY:
ADJUST FAST IDLE SPEED

(a) Stop the engine and remove the air cleaner.

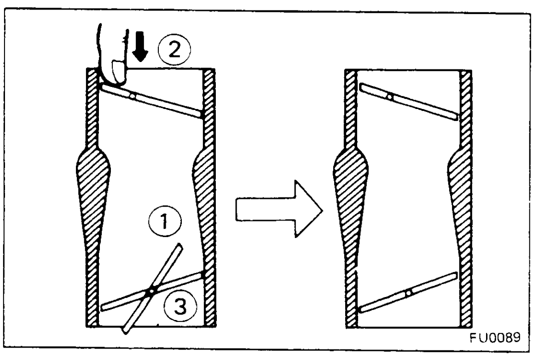
(b) Plug the hose connections for HAI system and MC system (w/M/T only) to prevent rough idling.



(c) Disconnect the hose from the choke opener diaphragm and plug the hose end.
This will shut off the choke opener system.

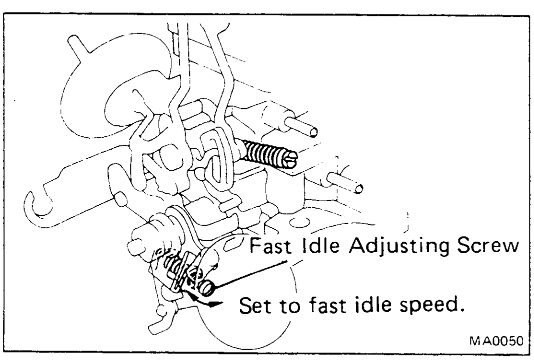


(d) Disconnect the hose from the EGR valve.
This will shut off the EGR system.



(e) Set the fast idle cam.
While holding the throttle valve slightly open, push the choke valve closed, and hold it closed as you release the throttle valve.

(f) Start the engine, but do NOT touch the accelerat… pedal.



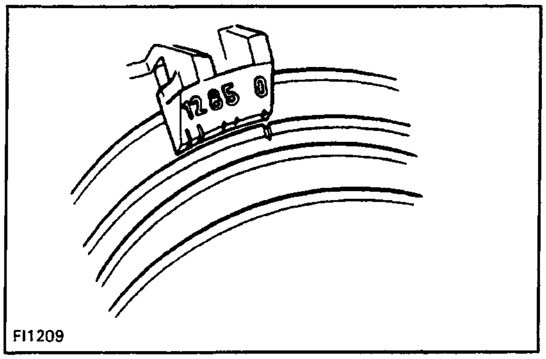
(g) Set the fast idle speed by turning the fast idle adjusting screw.

Fast idle speed: 2,600 rpm

(h) Reconnect the vacuum hoses to the proper locations.

(i) Reinstall the air cleaner.

(j) Stop the engine and remove the tachometer.



Hot Engine Operations

14. (22R–E ENGINE)

ADJUST VALVE CLEARANCE

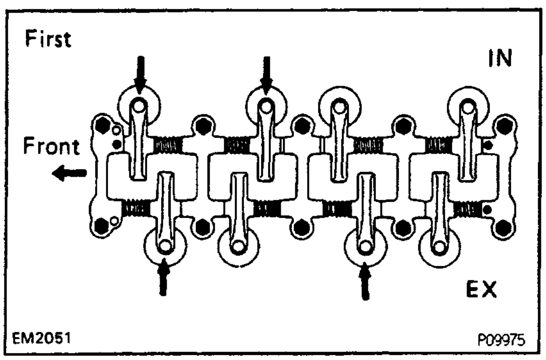
(a) Warm up the engine to normal operating temperature.

(b) Stop the engine and remove the cylinder head cover.

(c) Set No.1 cylinder to TDC/compression.

- Turn the crankshaft with a wrench to align the timing marks at TDC. Set the groove on the pulley to the ”O” position.
- Check that the rocker arms on No.1 cylinder are loose and rocker arms on No.4 cylinder are tight.

If not, turn the crankshaft one complete revolution and align marks as above.



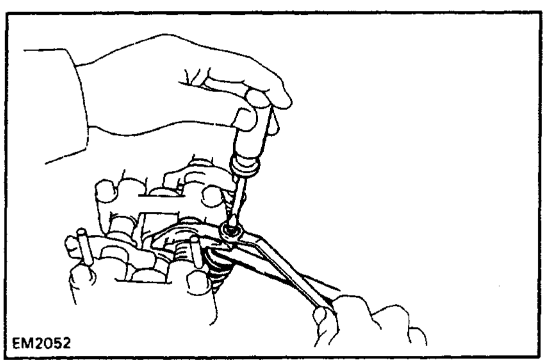
(d) Adjust the clearance of half of the valves.

- Adjust only the valves indicated by arrows.

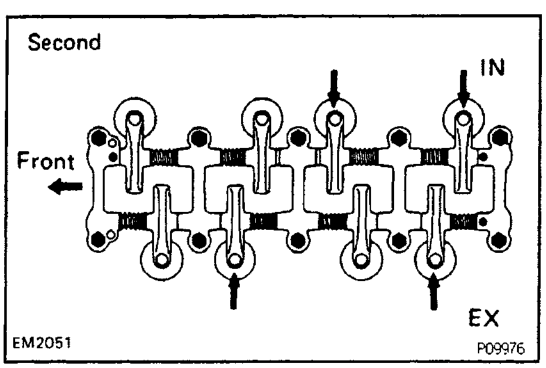
Valve clearance:

Intake 0.20 mm (0.008 in.)

Exhaust 0.30 mm (0.012 in.)



- Use a thickness gauge to measure between the valve stem and rocker arm. Loosen the lock nut and turn the adjusting screw to set the proper clearance. Hold the adjusting screw in position, and tighten the lock nut.
- Recheck the clearance. The thickness– gauge should move with a very slight drag.



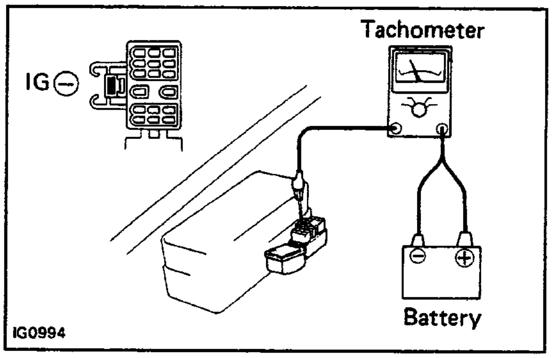
(e) Turn the crankshaft one complete revolution (360 ®) and align timing marks in the manner mentioned above. Adjust only the valves indicated by arrows.

(f) Reinstall the cylinder head cover.

16. ADJUST IDLE SPEED

(a) Preparation

- Install air cleaner
- Connect all pipes and hoses of air intake system



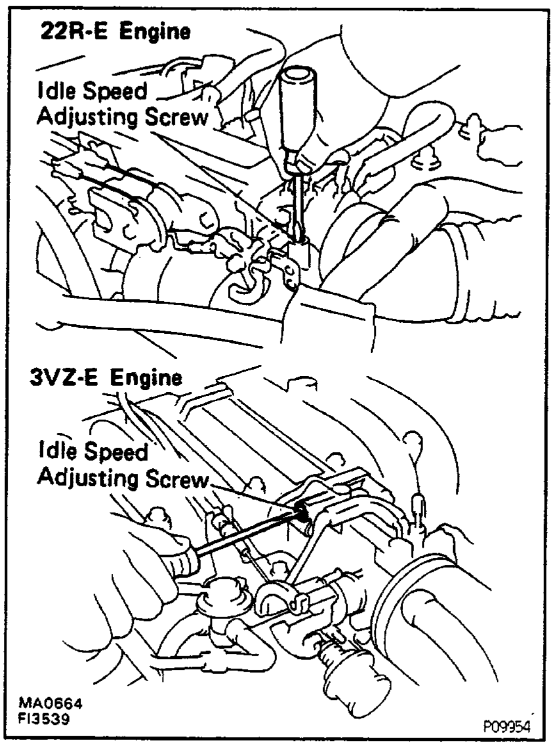
- Connect all vacuum lines (i.e., EVAP, EGR system, etc.)
- Make sure all MFI system wiring connectors are fully connected
- Engine should be at normal operating tempera– ture
- Switch off accessories
- Set transmission in neutral

(b) Connect a tachometer– to the engine

Connect the tachometer– test probe to the iG E) ter– .rninal of the DLC1.

NOTICE:

- **NEVER allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ignition coil.**
- **As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before use.**



(c) Race the engine at 2,500 rpm for approx. 2 minutes.

(d) Set the idle speed by turning the idle speed adjusting screws.

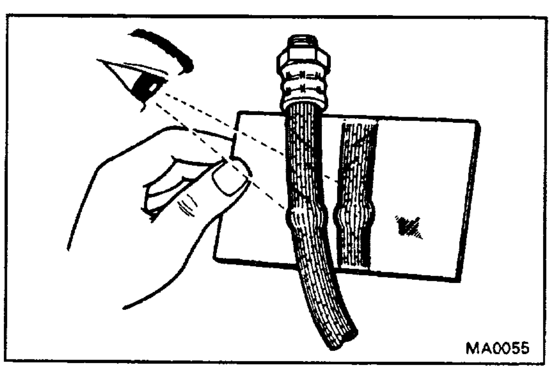
Idle speed:

22R–E 4WD A/T 850 rpm

Ex. 4WD A/T 750 rpm

3VZ–E 800 rpm

(e) Remove the tachometer.



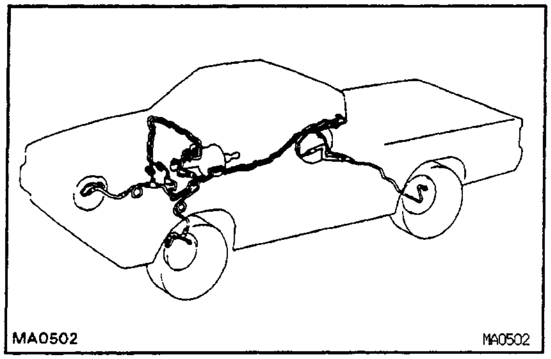
BRAKES

16. INSPECT BRAKE LINE PIPES AND HOSES

HINT: Inspect in a well – lighted area. Inspect the entire circumference and length of the brake hoses using a mirror as required. Turn the front wheels fully right or left before inspecting the front brake.

(a) Check all brake lines and hoses for:

- Damage

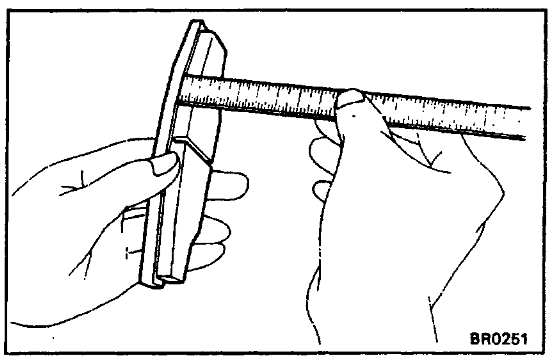


- Wear
- Deformation
- Cracks
- Corrosion
- Leaks
- Bends
- Twists

(b) Check all clamps for tightness and connections for leakage. .

(c) Check that the hoses and lines are clear of sharp edges, moving parts and the exhaust system.

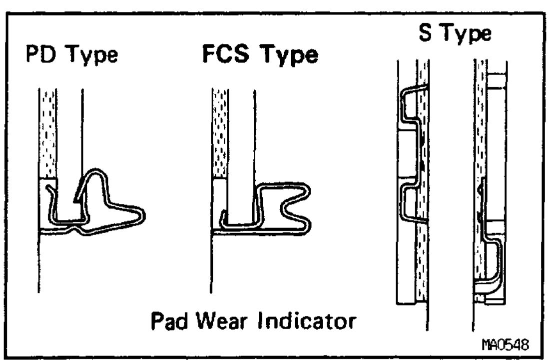
(d) Check that the lines installed in grommets pass thr– ough the center of the grommets.



17. INSPECT FRONT BRAKE PADS AND DISCS (See BR section)

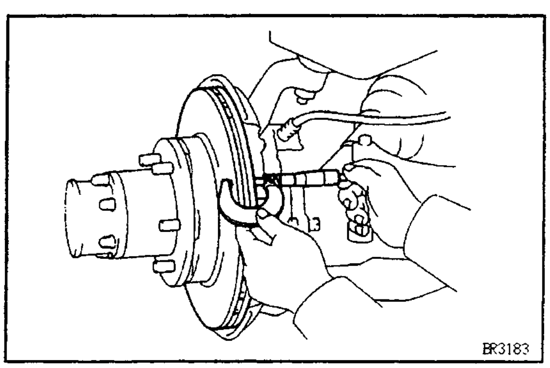
(a) Check the thickness of the disc brake pad and check for irregular wear.

Minimum lining thickness:
1.0 mm (0.039 in.)



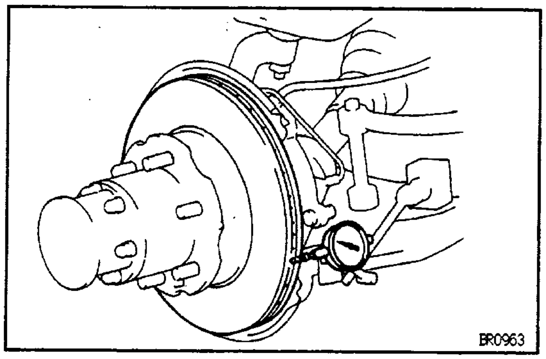
.

HINT: If a squealing or scraping noise occurs from the brake during driving, check the pad wear indicator. If there are traces of the indicator contacting the disc rotor, the disc pad should be replaced.



(b) Check the disc for wear.

Minimum disc thickness:
2WD FS17 type 21.0 mm (0.827 in.)
FS18 type 20.0 mm (0.787 in.)
PD60 type 23.0 mm (0.906 in.)
PD66 type 28.0 m m (1.102 in.)
4WD S 12 + 12 Type 18.0 mm (0.790 in.)

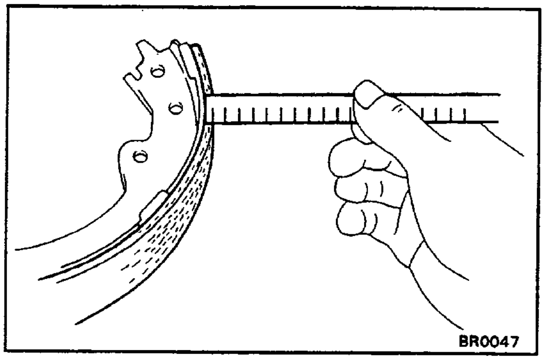


(c) Check the disc for runout.

Minimum disc runout:

Ex. C & C 0.09 mm (0.0035 in.)

C & C 0.12 mm (0.0047 in.)

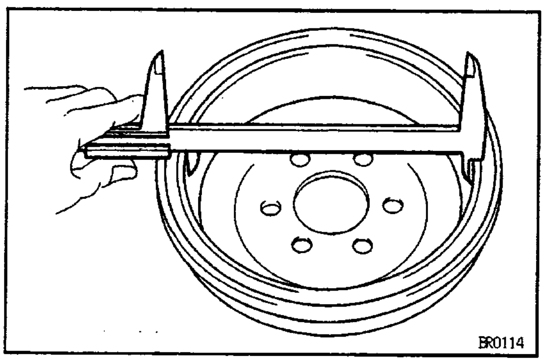


18. INSPECT REAR BRAKE LININGS AND DRUMS (See BR section)

(a) Check the lining – to – drum contact condition and lining wear.

Minimum lining thickness:

1.0 mm (0.0039 in.)



(b) Check the brake drum for scoring or wear.

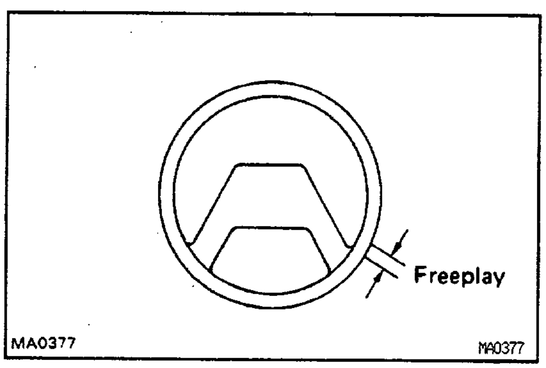
Maximum drum inside diameter:

2WD 256.0 mm (10.079 in.)

4WD 297.0 mm (11.693 in.)

(c) Clean the brake parts with a damp cloth.

NOTICE: Do not use compressed air to clean the brake parts.



CHASSIS

19. INSPECT STEERING LINKAGE

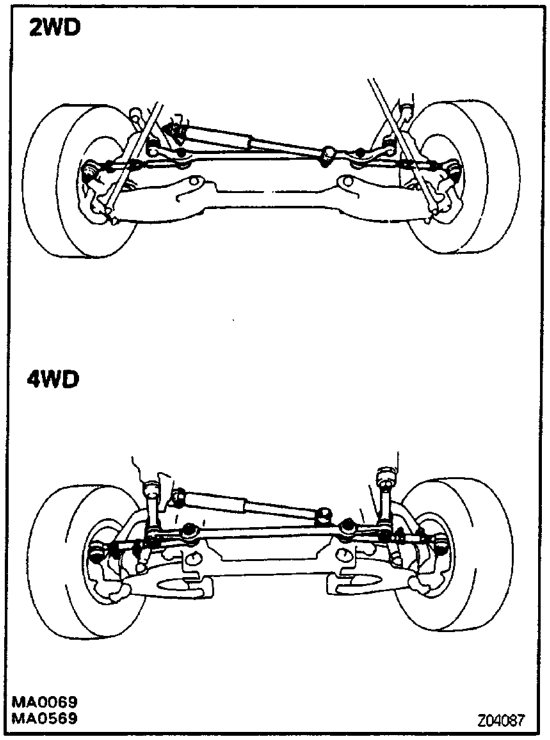
(a) Check the steering wheel freeplay.

Maximum:

30 mm (1.18 in.)

With the vehicle stopped and pointed straight ahead, rock the steering wheel gently back and forth with light finger pressure.

If incorrect, adjust or repair.

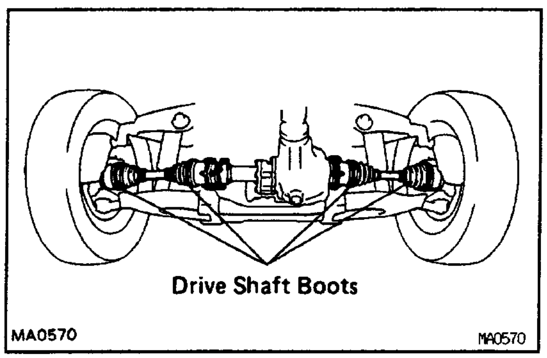


(b) Check the steering linkage for looseness or damage.
Check that:

- Tie rod ends and relay rod ends do not have excessive play.
- Dust seals are not damaged.

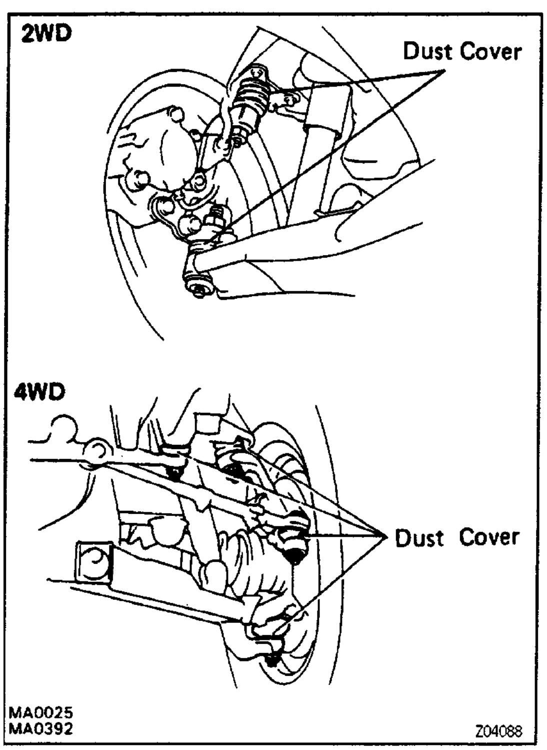
20. INSPECT STEERING GEAR HOUSING

Check the steering gear housing for oil leaks.
If leakage is found, check for cause and repair.



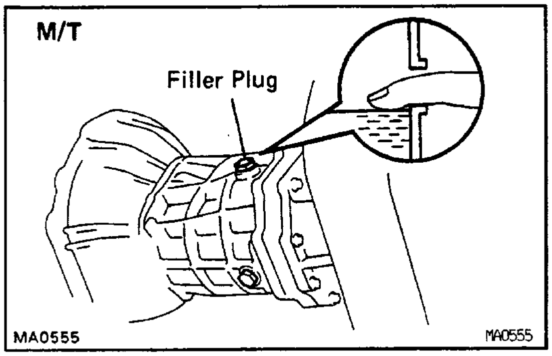
21. (4WD)
INSPECT DRIVE SHAFT BOOTS

Inspect the drive shaft boots for clamp looseness, grease leakage or damage.



22. INSPECT BALL JOINTS AND DUST COVERS

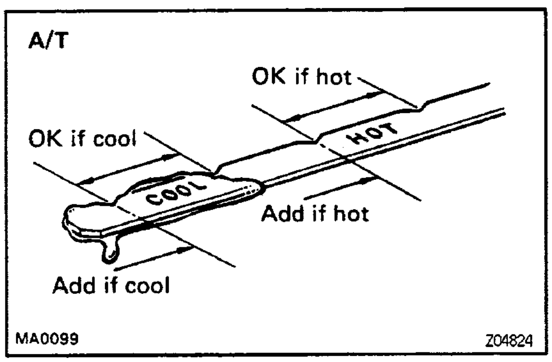
(a) Inspect the ball joints for excessive looseness.
(See SA section)
(b) Inspect the dust cover for damage.



23. (2WD)
CHECK OIL LEVEL IN MANUAL TRANSMISSION, AUTOMATIC TRANSMISSION AND DIFFERENTIAL

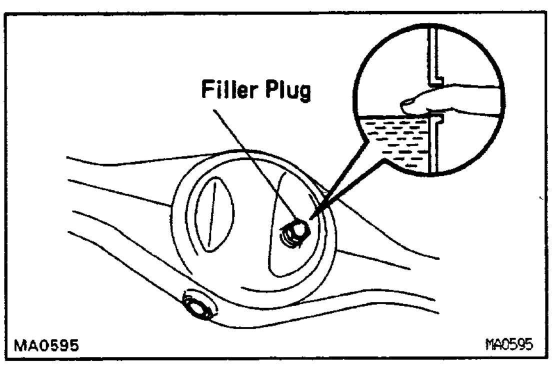
Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole. If the level is low, add oil until it begins to run out of the filler hole.

Transmission oil (M/T) –
Oil grade:
API GL–4 or GL–5
Viscosity:
SAE 75W–90



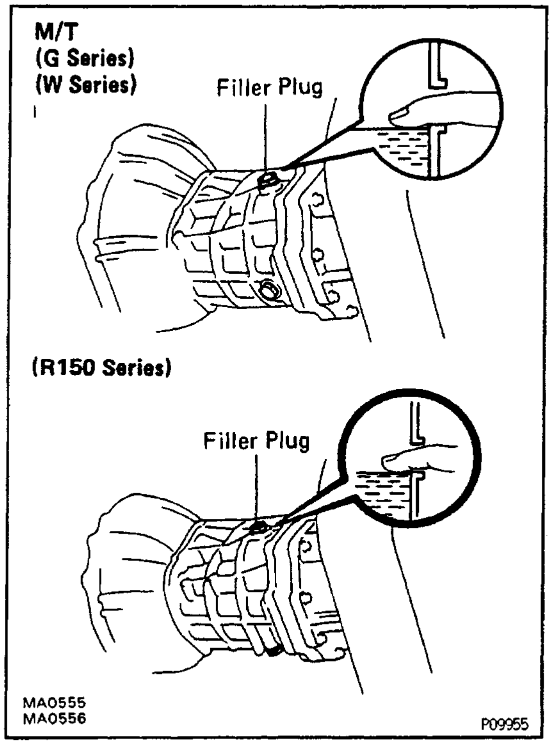
Check the automatic transmission for oil leakage. If leakage is found, check for cause .and repair.

Transmission fluid (A/T):
ATF DEXRON• II



Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole. If the level is low, add oil until it begins to run out of the filler hole.

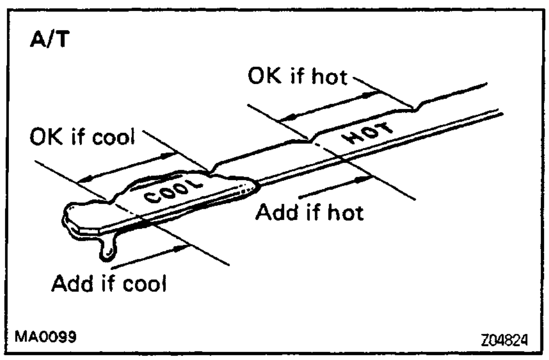
Differential oil – –
Oil grade:
AN GL–5 hypoid gear oil
Viscosity:
Above –18 ® C (0 ® F) SAE 90
Below –18 ® C (0® F) SAE 80W–90 or 80W



24. (4WD)
CHECK OIL LEVEL IN MANUAL TRANSMISSION, AUTOMATIC TRANSMISSION, TRANSFER AND DIFFERENTIAL

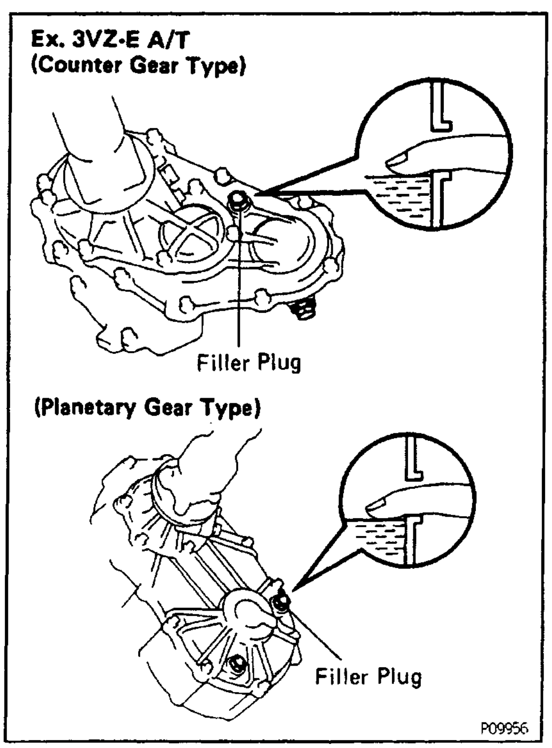
Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole. If the level is low, add oil until it begins to run out of the filler hole.

Transmission oil (M/T) –
Oil grade:
API GL–4 or GL–5
Viscosity:
SAE 75W–90



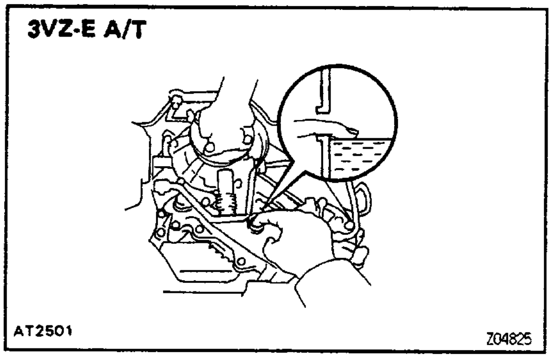
Check the automatic transmission for oil leakage. If leakage is found, check for cause and repair.

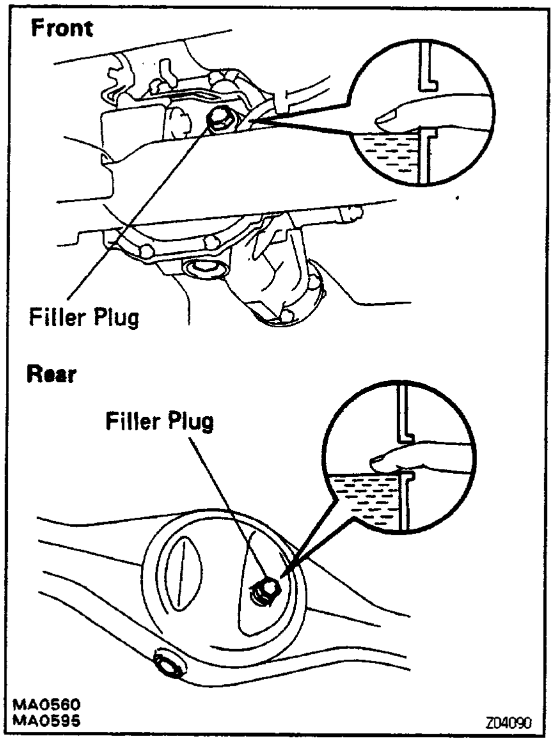
Transmission fluid (A/T):
ATF DEXRON ® II



Remove the filler– plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole. If the level is low, add oil until it begins to run out of the filler hole.

Transfer oil (Ex. 3vZ – E A/T) –
Oil grade: AN GL–4 or GL–5
Viscosity: SAE 75W–90
Transfer fluid (3VZ– E A/T):
ATF DEXRON ® II





Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole. If the level is low, add oil until it begins to run out of the filler hole.

Differential oil –

Standard differential

Oil grade:

API GL–5 hypoid gear oil

Viscosity:

Above –18 ® C (0®F) SAE 90

Below –18 ® C (0 ® F) SAE 80W – 90 or 80W

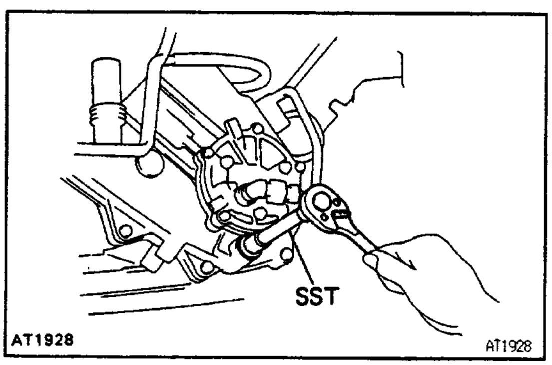
A.D.D.

Oil grade:

Toyota ’GEAR OIL SUPER’ oil or hypoid gear oil API GL–5

Viscosity:

SAE 75W–90



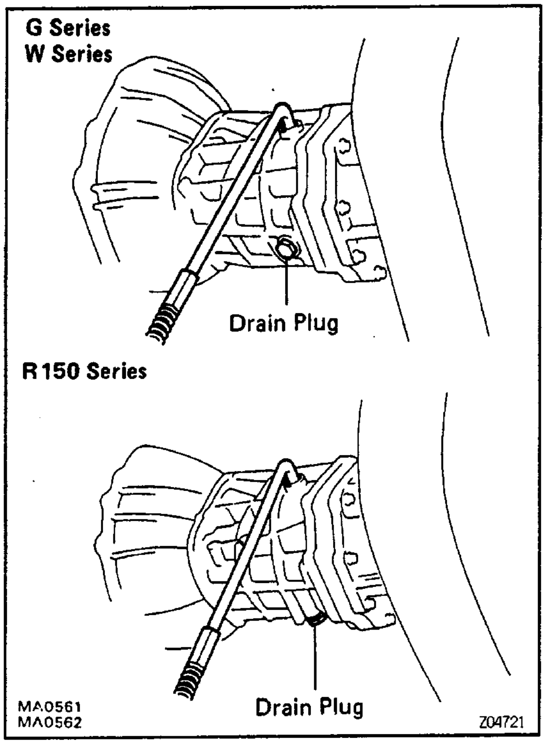
25. REPLACE MANUAL TRANSMISSION. TRANSFER (4 WD) AND DIFFERENTIAL OIL

(a) (Transfer)
Remove the transfer cover.

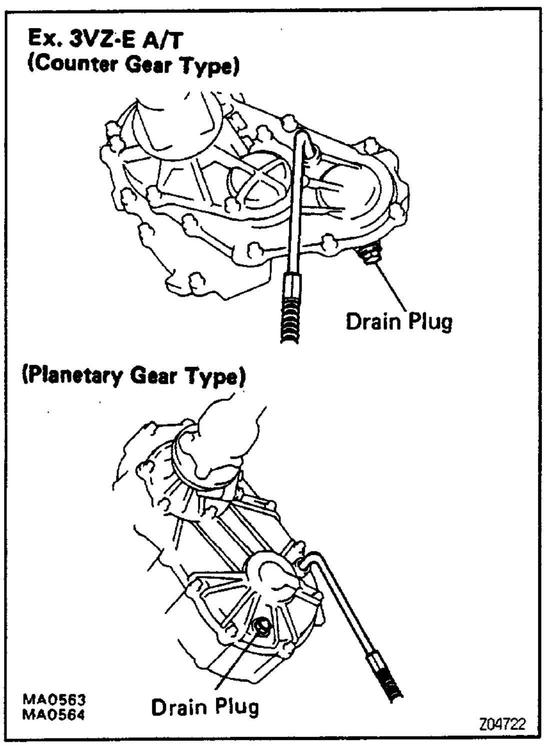
(b) Using SST (A340H Transfer), remove the drain plug and drain the oil.
SST 09043–38100

(c) Reinstall drain plug securely.

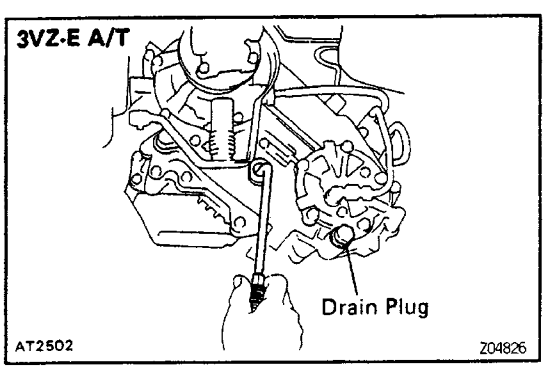
(d) Add new oil until it begins to run out of the filler hole.
Oil grade and viscosity:
See pages MA –16 to 18

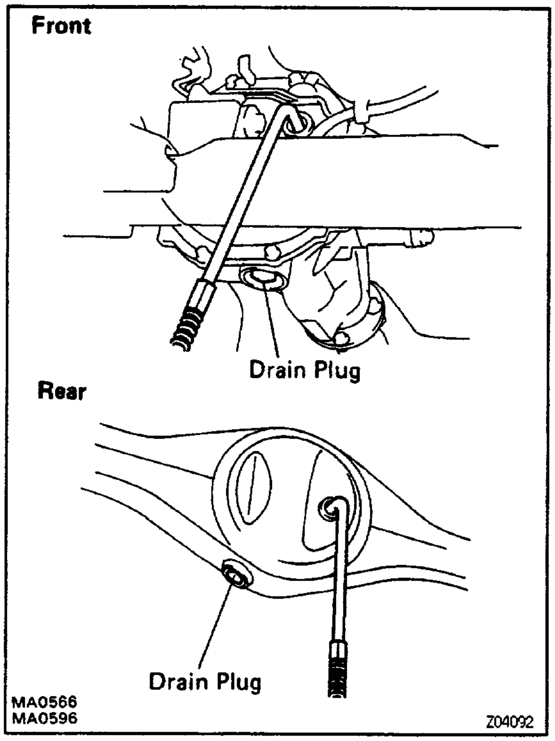


Oil capacity:
Transmission –
2WD
W55 2.6 liters (2.7 US qts, 2.3 Imp. qts)
R150 3.0 liters (3.2 US qts, 2.6 Imp. qts)
4WD
G58 3.9 liters (4.1 US qts, 3.4 Imp. qts)
W56 2.9 liters (3.1 US qts, 2.5 Imp. qts)
RI 50F 3.0 liters (3.2 US qts, 2.6 Imp. qts)



Transfer –
Counter Gear Type
1.6 liters (1.7 US qts, 1.4 Imp. qts)
Planetary Gear Type
1.1 liters (1.2 US qts, 1.0 Imp. qts)
A340H
0.8 liters (0.8 US qts, 0.7 Imp. qts)





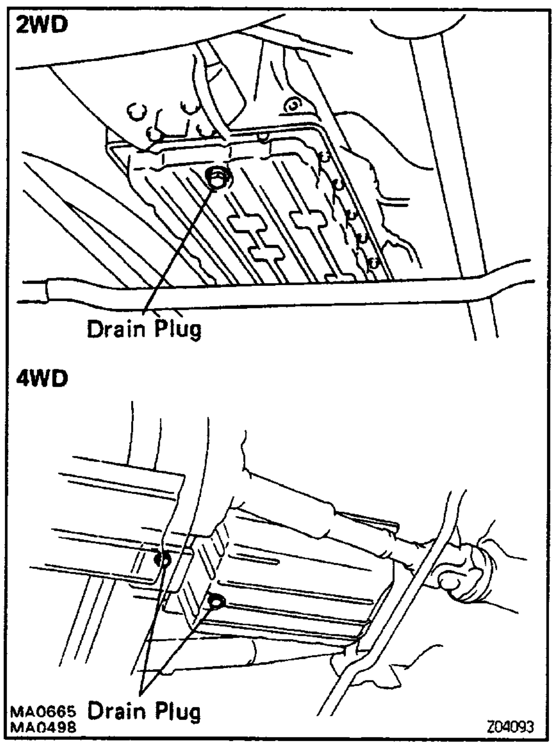
Differential –

2WD

7.5 in. 1.35 liters (1.4 US qts, 1.2 Imp. qts)
8.0 in. 1.8 liters (1.9 US qts, 1.6 Imp. qts)

4WD

Front Standard differential
1.6 liters (1.7 US qts, 1.4 Imp. qts)
A.D.D.
1.86 liters (2.0 US qts, 1.6 Imp. qts)
Rear
2.2 liters 2.3 US qts, 1.9 Imp. qts)



26. REPLACE AUTOMATIC TRANSMISSION FLUID

(a) Remove the drain plug(s) and drain the fluid.
(b) Reinstall the drain plug(s) securely.
(c) With the engine OFF, add new fluid through the dip–stick tube.

Fluid:

ATP DEXRON ® II

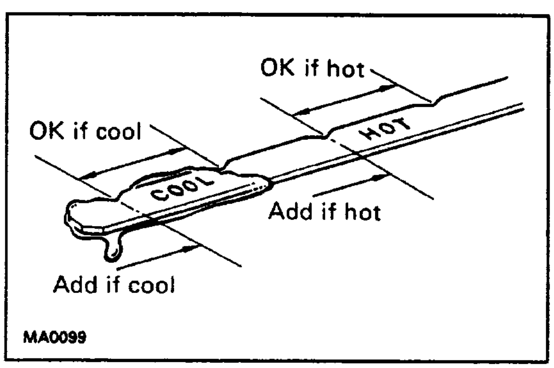
Drain and refill capacity:

2WD

A43D 2.4 liters (2.5 US qts, 2.1 Imp. qts)
A340E 1.6 liters (1.7 US qts, 1.4 Imp. qts)

4WD

A340H 4.5 liters (4.8 US qts, 4.0 Imp. qts)
A340F 2.0 liters (2.1 US qts, 1.8 Imp. qts)



(d) Start the engine and shift the selector into ail posi–tions from ”P” through ”L” and then shift into ”P”.
(e) (A340H)
Shift the transfer lever position: H2→H4→L4 and L4 →H4→H2.
(f) With the engine idling, check the fluid level.
Add fluid up to the cool level on the dipstick.

(g) Check that the fluid level is in the ”HOT” range at the normal operating temperature (70 – 80 ® C or 158 – 176 *F) and add as necessary.

NOTICE: Do not overfill.

27. REPACK FRONT WHEEL BEARINGS AND THRUST BUSH

(a) Change the front wheel bearing grease.
(See SA section)

2WD –

Grease grade:

Lithium base multipurpose grease (NLGI No.2)

Wheel bearing friction preload (at starting):

5.9–18N(0.6–1.8kgf,1.3–4.OIbf)

4WD –

Grease grade:

Lithium base multipurpose grease (NLGI No.2)

Wheel bearing friction preload (at starting):

27 – 55 N (2.8 – 5.6 kgf, 6.2 – 12.3 lbf)

(b) Repack the drive shaft thrust bush grease.
(See SA section)

28. (4WD)
LUBRICATE PROPELLER SHAFT

Lubricate propeller shaft, referring to the lubrication chart. Before pumping in grease, wipe off any mud and dust on the grease fitting.

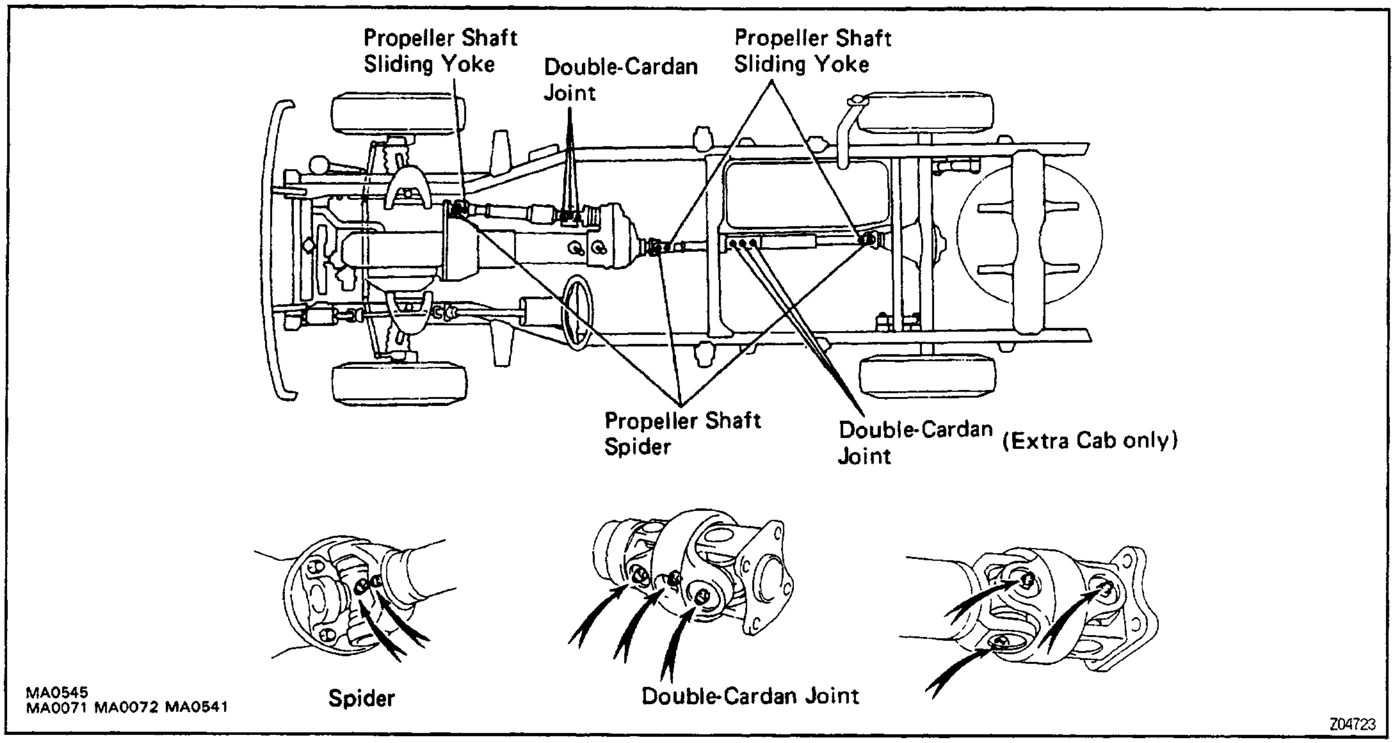
Grease grade:

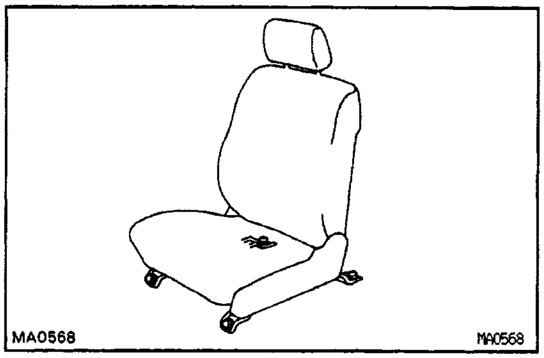
Propeller shaft (ex. Double–cardan joint) –

Lithium base chassis grease (NLGI No.2)

Double–cardan joint – Molybdenum disulphide

Lithium base chassis grease (NLGI No.2)



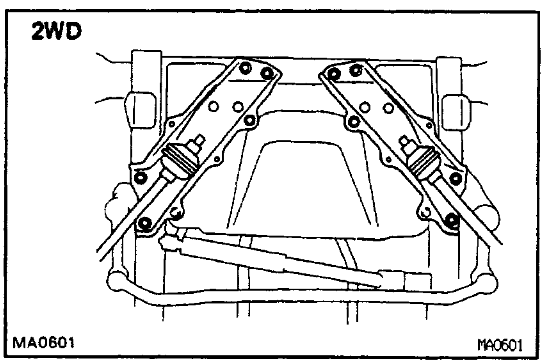


29. TIGHTEN BOLTS AND NUTS ON CHASSIS AND BODY

Tighten the following parts:

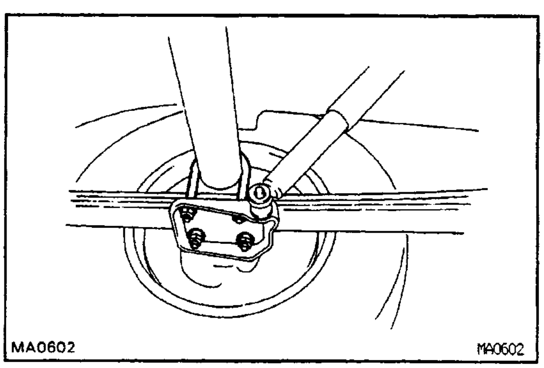
- Seat mounting bolts

Torque: 37 N–m (375 kgf–cm, 27 ft–lbf)



- Strut bar bracket–to –frame mounting bolts (2 WD)

Torque: 52 N–m (530 kgf–cm, 38 ft–lbf)



- Leaf spring U – bolt mounting nuts

Torque:

2WD 0.5 ton 147 N–m (1,500 kgf–cm, 108 ft–lbf)

Others 123 N–m (1,250 kgf–cm, 90 ft–lbf)

Under Severe Conditions:

In addition to the above maintenance items, check for loose or missing bolts and nuts on the following.

- Steering system
- Drive train

- Suspension system
- Fuel tank mounts
- Engine mounts, etc.

30. FINAL INSPECTION

(a) Check operation of body parts:

- Hood
  Auxiliary catch operates properly
- Hood locks securely when closed
  Doors
  Door locks operate properly
- Doors close properly
  Seats
- Seat adjusts easily and locks securely in any positions
  Seat backs lock securely at any angle
  Fold–down seat backs lock securely

(b) Road test

- Engine and chassis parts do not have abnormal noises.
- Vehicle does not wander or pull to one side.
- Brakes work properly and do not drag.

(c) Be sure to deliver a clean vehicle and especially check:

- Steering wheel
- Shift lever knob
- All switch knobs
- Door handles
- Seats

ENGINE MECHANICAL

TROUBLESHOOTING (22R-E)

ENGINE OVERHEATING

Problem	Possible cause	Remedy	Page
Engine overheats	Cooling system faulty Incorrect ignition timing	Troubleshoot cooling system Reset timing	CO-2 IG-10

HARD STARTING

Problem	Possible cause	Remedy	Page
Engine will not crank or cranks slowly	Starting system faulty	Troubleshoot starting system	ST-2
Engine will not start/ Hard to start (cranks OK)	No fuel supply to injector • No fuel in tank • Fuel pump not working • Fuel filter clogged • Fuel line clogged or leaking	Troubleshoot EFI system	FI-9
	EFI system problems	Repair as necessary	
	Ignition problems	Perform spark test	
	• Ignition coil	Inspect coil	IG-5,7
	• Igniter	Inspect igniter	IG-6,8
	• Distributor	Inspect distributor	IG-9
	Spark plugs faulty	Inspect plugs	IG-4
	High tension wires disconnected or broken	Inspect wires	IG-4
	Vacuum leaks • PCV hoses • EGR valve • Intake manifold • Air intake chamber • Throttle body	Repair as necessary	
	Pulling in air between air flow meter and throttle body	Repair as necessary	
	Compression low	Check compression	EM-11

ROUGH IDLING

Problem	Possible cause	Remedy	Page
Rough idle, stalls or misses	Spark plugs faulty	Inspect plugs	IG-4
	High tension wires faulty	Inspect wires	IG-4
	Ignition problems		
	• Ignition coil	Inspect coil	IG-5,7
	• Igniter	Inspect igniter	IG-6,8
	• Distributor	Inspect distributor	IG-9,10
	Incorrect ignition timing	Reset timing	IG-10
	Vacuum leaks • PCV hoses • EGR valve • Intake manifold • Air intake chamber • Throttle body	Repair as necessary	
	Pulling in air between air flow meter and throttle body	Repair as necessary	
	Incorrect idle speed	Adjust idle	MA-8
	EFI system problems	Repair as necessary	

ROUGH IDLING (CONT'D)

Problem	Possible cause	Remedy	Page
Rough idle, stalls or misses (cont'd)	Engine overheats Compression low Incorrect valve clearance	Check cooling system Check compression Adjust valve clearance	CO-2 EM-11 MA-7

ENGINE HESITATES/POOR ACCELERATION

Problem	Possible cause	Remedy	Page
Engine hesitates/ Poor acceleration	Spark plugs faulty	Inspect plugs	IG-4
	High tension wires faulty	Inspect wires	IG-4
	Vacuum leaks • PCV hoses • EGR valve • Intake manifold • Air intake chamber • Throttle body	Repair as necessary	
	Pulling in air between air flow meter and throttle body	Repair as necessary	
	Incorrect ignition timing	Reset timing	IG-10
	Fuel system clogged	Check fuel system	
	Air cleaner clogged	Check air cleaner	
	EFI system problems	Repair as necessary	
	Emission control system problem (cold engine) • EGR system always on	Check EGR system	
	Engine overheats	Check cooling system	CO-2
	Compression low	Check compression	EM-11

ENGINE DIESELING

Problem	Possible cause	Remedy	Page
Engine dieseling (run after ignition switch is turned off)	EFI system problems	Repair as necessary	

AFTER FIRE, BACKFIRE

Problem	Possible cause	Remedy	Page
Muffler explosion (after fire) on deceleration only	Deceleration fuel cut system always off	Check EFI (fuel cut) system	FI-74
Muffler explosion (after fire) all the time	Air cleaner clogged EFI system problem Incorrect ignition timing Incorrect valve clearance	Check air cleaner Repair as necessary Reset timing Adjust valve clearance	 IG-10 MA-7

AFTER FIRE, BACKFIRE (CONT'D)

Problem	Possible cause	Remedy	Page
Engine backfires	EFI system problem	Repair as necessary	
	Vacuum leak • PCV hoses • EGR valve • Intake manifold • Air intake chamber • Throttle body	Check hoses and repair as necessary	
	Pulling in air between air flow meter and throttle body	Repair as necessary	
	Insufficient fuel flow	Troubleshoot fuel system	FI-9
	Incorrect ignition timing	Reset timing	IG-10
	Incorrect valve clearance	Adjust valve clearance	MA-7
	Carbon deposits in combustion chambers	Inspect cylinder head	EM-18

EXCESSIVE OIL CONSUMPTION

Problem	Possible cause	Remedy	Page
Excessive oil consumption	Oil leak	Repair as necessary	
	PCV line clogged	Check PCV system	
	Piston ring worn or damaged	Check rings	EM-57
	Valve stem and guide worn	Check valves	EM-19
	Valve stem seal worn	Check seals	

POOR GASOLINE MILEAGE

Problem	Possible cause	Remedy	Page
Poor gasoline mileage	Fuel leak	Repair as necessary	
	Air cleaner clogged	Check air cleaner	MA-5
	Incorrect ignition timing	Reset timing	IG-10
	EFI system problems • Injector faulty • Deceleration fuel cut system faulty	Repair as necessary	
	Spark plugs faulty	Inspect plugs	IG-4
	EGR system always on	Check EGR system	
	Compression low	Check compression	EM-11
	Tires improperly inflated	Inflate tires to proper pressure	FA-3
	Clutch slips	Troubleshoot clutch	CL-2
	Brakes drag	Troubleshoot brakes	BR-2
Unpleasant odor	Incorrect idle speed	Adjust idle	MA-8
	Incorrect ignition timing	Reset timing	IG-10
	Vacuum leaks • PCV hoses • EGR valve • Intake manifold • Air intake chamber • Throttle body	Repair as necessary	
	EFI system problems	Repair as necessary	

TROUBLESHOOTING (22R)

ENGINE OVERHEATING

Problem	Possible cause	Remedy	Page
Engine overheats	Cooling system faulty Incorrect ignition timing	Troubleshoot cooling system Reset timing	CO-2 IG-10

HARD STARTING

Problem	Possible cause	Remedy	Page
Engine will not crank or cranks slowly	Starting system faulty	Troubleshoot starting system	ST-2
Engine will not start/ Hard to start (cranks OK)	No fuel supply to carburetor Carburetor problems • Choke operating • Flooding • Needle valve sticking or clogged • Vacuum hose disconnected or damaged • Fuel cut solenoid valve not open • Secondary throttle valve not close Ignition problems • Ignition coil • Igniter • Distributor Spark plugs faulty Ignition wiring disconnected or broken Vacuum leaks • PCV line • EGR line • MC line • Intake manifold • CMH Compression low	Troubleshoot fuel system Repair as necessary Perform spark test Inspect coil Inspect igniter Inspect distributor Inspect plugs Inspect wiring Repair as necessary Chek compression	FU-2 FU-4 IG-4 IG-5,7 IG-6,8 IG-9,10 IG-4 IG-4 EM-11

ROUGH IDLING

Problem	Possible cause	Remedy	Page
Rough idle or stalls	Spark plugs faulty Ignition wiring faulty Vacuum leaks • PCV line • MC line • EGR line • Intake manifold • HAC line • CMH Incorrect ignition timing Ignition problems • Ignition coil • Igniter • Distributor	Inspect plugs Inspect wiring Repair as necessary Reset timing Perform spark test Inspect coil Inspect igniter Inspect distributor	IG-4 IG-4 IG-10 IG-4 IG-5,7 IG-6,8 IG-9,10

ROUGH IDLING (CONT'D)

Problem	Possible cause	Remedy	Page
Rough idle or stalls	Carburetor problems	Perform on-vehicle inspection of carburetor	FU-3
	• Idle speed incorrect		
	• Slow jet clogged		
	• Idle mixture incorrect		
	• Fuel cut solenoid valve not open		
	• Fast idle speed setting incorrect (cold engine)		
	• Choke system faulty		
	HAI system faulty	Check compression	EC-53
	Engine overheats	Troubleshoot cooling system	CO-2
	EGR valve faulty	Check EGR valve	EC-30
	MC valve faulty	Check MC valve	EC-26
	Incorrect valve clearance	Adjust valve clearance	MA-7
	Compression low	Check compression	EM-11

ENGINE HESITATES/POOR ACCELERATION

Problem	Possible cause	Remedy	Page
Engine hesitates/ Poor acceleration	Spark plugs faulty	Inspect plugs	IG-4
	Ignition wiring faulty	Inspect wiring	IG-4
	Vacuum leaks	Repair as necessary	
	• PCV line		
	• EGR line		
	• HAC line		
	• Intake manifold		
	• CMH		
	• MC		
	Incorrect ignition timing	Reset timing	IG-10
	Air filter clogged	Check air filter	MA-5
	Fuel line clogged	Check fuel line	
	Carburetor problems	Repair as necessary	FU-4
	• Float level too low		
	• Accelerator pump faulty		
	• Power valve faulty		
	• Choke valve closed (hot engine)		
	• Choke system		
	• Secondary throttle stopper operation faulty (cold engine)		
	CMH system faulty (cold engine)		
	Emission control system problem		
	• HAI system always on (hot engine)	Check HAI system	EC-53
	• AAP system faulty	Check AAP system	EC-61
	• EGR system always on (cold engine)	Check EGR system	EC-30
	• HAC system faulty	Check HAC system	EC-48
	Engine overheats	Check cooling system	CO-2
	Compression low	Check compression	EM-11

ENGINE DIESELING

Problem	Possible cause	Remedy	Page
Engine dieseling (runs after ignition switch is turned off)	Carburetor problems • Linkage sticking • Idle speed or fast idle speed out of adjustment • Fuel cut solenoid faulty	Repair as necessary	FU-4
	Incorrect ignition timing	Reset timing	IG-10
	EGR system faulty	Check EGR system	EC-30

AFTER FIRE, BACKFIRE

Problem	Possible cause	Remedy	Page
Muffler explosion (after fire) on deceleration only	AS system faulty MC system faulty Deceleration fuel cut system always off	Check AS system Check MC system Check fuel cut system	EC-43 EC-26 EC-63
Muffler explosion (after fire) all the time	Air filter clogged Choke system faulty Incorrect ignition timing Incorrect valve clearance	Check air filter Check choke Reset timing Adjust valves clearance	MA-5 EC-55 IG-10 MA-7
Engine backfires	Choke valve open (cold engine) Carburetor vacuum leak Insufficient fuel flow Incorrect ignition timing Incorrect valve clearance Carbon deposits in combustion chambers	Check choke system Check hoses and repair as necessary Troubleshoot fuel system Reset timing Adjust valve clearance Inspect cylinder head	EC-55 FU-2 IG-10 MA-7 EM-18

EXCESSIVE OIL CONSUMPTION

Problem	Possible cause	Remedy	Page
Excessive oil consumption	Oil leak PCV line clogged Piston ring worn or damaged Valve stem and guide worn Valve stem oil seal worn or damaged	Repair as necessary Check PCV system Check rings Check valves and guides Check oil seal	 EC-19 EM-57 EM-19

POOR FUEL MILEAGE

Problem	Possible cause	Remedy	Page
Poor fuel mileage	Fuel leak	Repair as necessary	
	Air filter clogged	Check air filter	MA-5
	Incorrect ignition timing	Reset timing	IG-10
	Carburetor problems • Choke system faulty • Idle speed too high • Deceleration fuel cut system faulty • Power valve always open	Perform on-vehicle inspection of carburetor	FU-4
	Spark plugs faulty Inspect plugs	Inspect plugs	IG-4
	EGR system always on	Check EGR system	EC-30
	Compression low	Check compression	EM-11
	Tires improperly inflated	Inflate tires to proper pressure	FA-3
	Clutch slips	Troubleshoot clutch	CL-2
	Brakes drag	Troubleshoot brakes	BR-2

ENGINE TUNE-UP

1. **INSPECT ENGINE OIL LEVEL**
2. **INSPECT AIR CLEANER** **(See page MA-5)**
3. **INSPECT SPARK PLUGS** **(See page IG-4)**
4. **INSPECT VALVE CLEARANCE** **(See page MA-7)**

   Valve clearance: Intake 0.20 mm (0.008 in.)
   Exhaust 0.30 mm (0.012 in.)

5. **INSPECT IGNITION TIMING** **(See step 3 on page IG-10)**

   Ignition timing:
   22R 0° TDC @ Max. 950 rpm
   (w/vacuum advancer OFF)
   22R-E 5° BTDC (w/short terminal "T")

6. **INSPECT CARBURETOR FLOAT LEVEL**
   (with Carburetor)
   (See step 3 on page FU-3)

7. **INSPECT FAST IDLE SPEED**
   (with Carburetor)
   (See step 15 on page MA-9)

8. **ADJUST IDLE SPEED** **(See page MA-8)**

   Idle speed: with EFI
   750 rpm
   with carburetor
   700 rpm for M/T
   750 rpm for A/T

   NOTE: Adjust idle mixture as necessary.

IDLE HC/CO CONCENTRATION CHECK METHOD

NOTE: This check method is used only to determine whether or not the idle HC/CO complies with regulations.

PRECHECK

INITIAL CONDITIONS

(a) Normal engine operating temperature
(b) Choke fully open (with carburetor)
(c) Air cleaner installed
(d) All pipe and hoses of air intake system connected (with EFI)
(e) All accessories switched off
(f) All vacuum lines properly connected
(g) EFI system wiring connectors fully plugged.
(h) Idle speed set correctly
(i) Carburetor fuel level about even with correct level in the sight glass
(j) Tachometer and HC/CO meter calibrated and at hand

MEASUREMENT

1. **INSERT TESTING PROBE OF HC/CO METER INTO TAILPIPE AT LEAST 40 cm (1.3 ft)**

2. **MEASURE HC/CO CONCENTRATION AT IDLE**

Wait at least one minute before measuring to allow the concentration to stabilize.

Complete the measuring within three minutes.

If the HC/CO concentration does not conform to regulation, see the table below for possible causes.

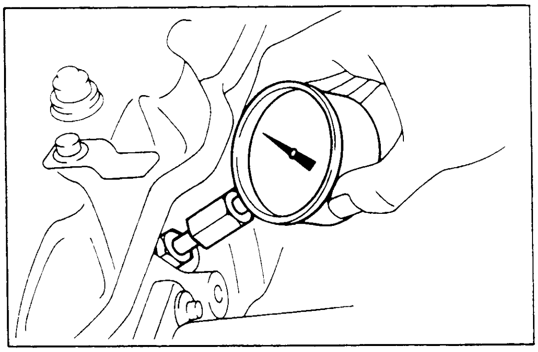
TROUBLESHOOTING

HC	CO	Problems	Causes
High	Normal	Rough idle	1. Faulty ignition: • Incorrect timing • Fouled, shorted or improperly gapped plugs • Open or crossed ignition wires • Cracked distributor cap 2. Incorrect valve clearance 3. Leaky EGR valve 4. Leaky exhaust valves 5. Leaky cylinder
High	Low	Rough idle Fluctuating HC reading	1. Vacuum leak: • Vacuum hose • Intake manifold • Air chamber (with EFI) • PCV line • Carburetor base (with carburetor) • Throttle body (with EFI) • CMH (with carburetor) 2. Leaky MC valve (with carburetor)
High	High	Rough idle Black smoke from exhaust	1. Restricted air filter 2. Plugged PCV valve 3. AS system problem (with carburetor) 4. Faulty carburetion: (with carburetor) • Faulty choke action • Incorrect float setting • Leaking needle or seat • Leaking power valve 5. Faulty EFI system: (with EFI) • Faulty pressure regulator • Clogged fuel return line • Faulty air flow meter • Defective water thermo sensor • Defective air thermo sensor • Faulty EFI computer • Faulty injector • Faulty cold start injector

COMPRESSION CHECK

NOTE: If there is lack of power, excessive oil consumption or poor fuel mileage, measure the cylinder compression pressure.

1. **WARM UP ENGINE**
2. **REMOVE FOUR SPARK PLUGS**
3. **DISCONNECT HIGH TENSION WIRE FROM IGNITION COIL**



4. **MEASURE CYLINDER COMPRESSION PRESSURE**

(a) Insert a compression gauge into the spark plug hole.

(b) Fully open the throttle.

(c) While cranking the engine with the starter motor, measure the compression pressure.

CAUTION: This test must be done for as short a time as possible to avoid overheating of the catalytic converter.

NOTE: A fully changed battery must be used to obtain at least 250 rpm.

(d) Repeat steps (a) through (c) for each cylinder.

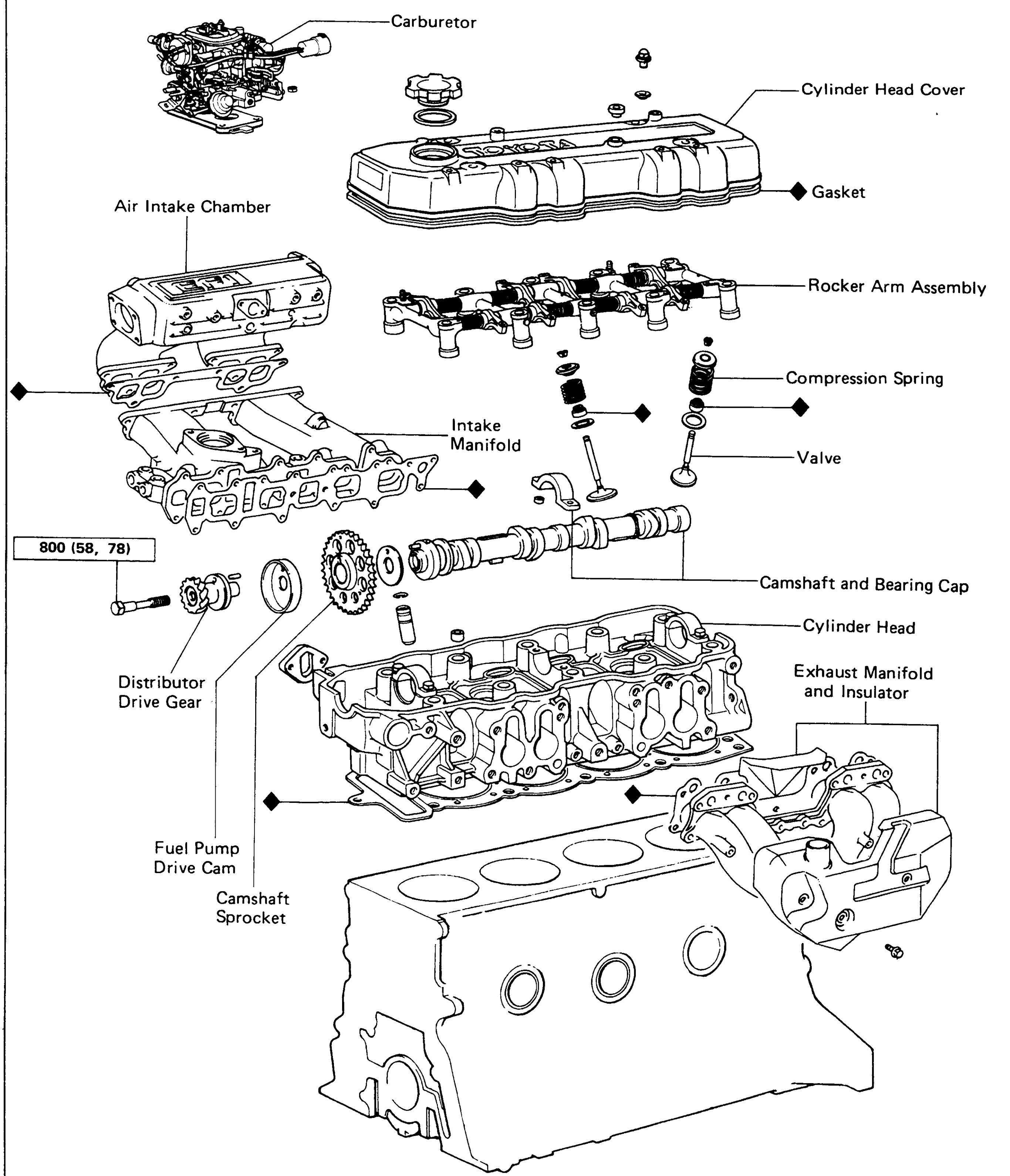
Compression pressure: 12 kg/cm² (171 psi, 1,177 kPa)
Minimum pressure: 10 kg/cm² (142 psi, 981 kPa)
Difference between each cylinder:
Less than 1.0 kg/cm² (14 psi, 98 kPa)

(e) If cylinder compression in one or more cylinders is low, pour a small amount of engine oil into the cylinder through the spark plug hole and repeat steps (a) through (c) for the low compression cylinder.

- If adding oil helps the compression, chances are that the piston rings and/or cylinder bore are worn or damaged.
- If pressure stays low, a valve may be sticking or seating improperly, or there may be leakage past the gasket.

CYLINDER HEAD

COMPONENTS



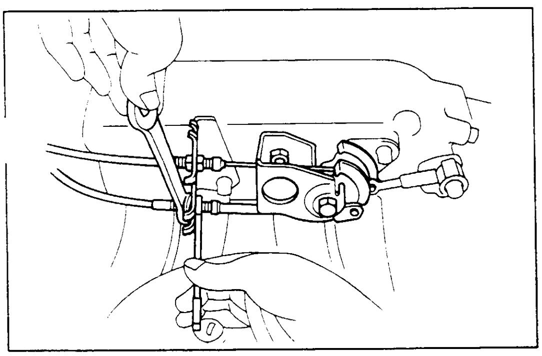
kg-cm (ft-lb, N·m) : Tightening torque

◆ : Non-reusable part

EM0817

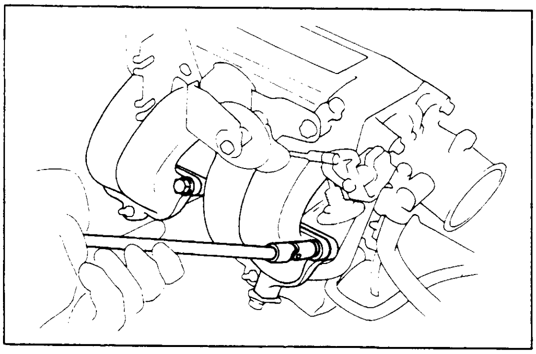
22R-E
PREPARATION FOR REMOVAL

1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**
2. **DRAIN COOLANT FROM RADIATOR AND CYLINDER BLOCK**
3. **DRAIN ENGINE OIL**
4. **REMOVE AIR CLEANER HOSE**
5. **DISCONNECT EXHAUST PIPE FROM EXHAUST MANIFOLD**
   (a) Disconnect the Ox sensor wire.
   (b) Remove three nuts holding exhaust manifold to the exhaust pipe.
6. **DISCONNECT RADIATOR UPPER HOSE FROM THERMOSTAT HOUSING**
7. **DISCONNECT TWO HEATER HOSES**
8. **DISCONNECT ACCELERATOR CABLE**



Disconnect the accelerator cable and throttle cable for A/T from the bracket.

9. **DISCONNECT FOLLOWING PARTS:**
   (a) PCV hoses No.1 and No.2
   (b) Brake booster hose
   (c) Air control valve hoses
   (d) EVAP hose (from canister)
   (e) Actuator hose (with cruise control)
   (f) EGR vacuum modulator hose
   (g) Air valve hose No.1 from the throttle body
   (h) Air valve hose No.2 from the chamber
   (i) Water by-pass hoses No.2 and No.3 from the throttle body
   (j) Air control valve hose for actuator
   (k) Pressure regulator hose from the chamber
   (l) Cold start injection pipe
   (m) BVSV hoses
10. **DISCONNECT FOLLOWING WIRES:**
   (a) Cold start injection wire
   (b) Throttle position wire
   (c) Air valve wire



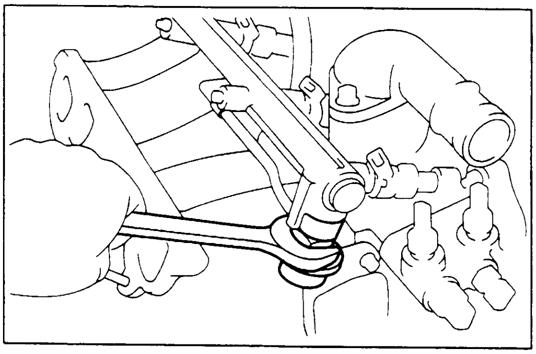
11. REMOVE CHAMBER WITH THROTTLE BODY

(a) Remove the bolt holding the EGR valve to the chamber.

(b) Disconnect the chamber and stay.

(c) Remove the bolts and nuts holding the chamber to the intake manifold.

(d) Remove the chamber with the throttle body.



12. DISCONNECT FOLLOWING WIRES:

(a) Water temperature sender gauge wire

(b) Temperature sensor wire

(c) Start injection time switch wire

(d) OD thermo switch wire (with A/T)

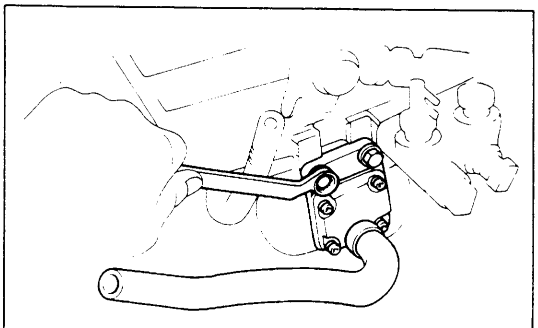
(e) Injection wires

13. DISCONNECT FUEL HOSE FROM DELIVERY PIPE

(a) Remove the pulsation damper.

(b) Remove the bolt holding the fuel hose to the delivery pipe.

(c) Disconnect the fuel hose from the delivery pipe.



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14. REMOVE AIR VALVE FROM INTAKE MANIFOLD

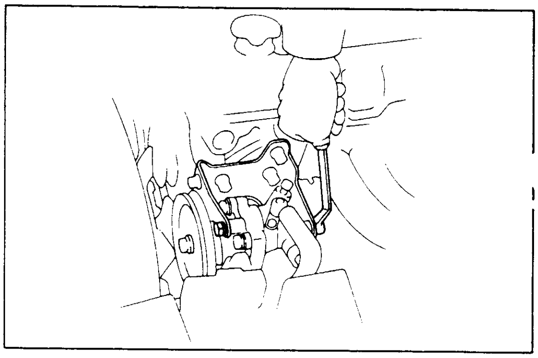
(a) Disconnect the No.4 by-pass hose.

(b) Remove the air valve from intake manifold.

15. DISCONNECT BY-PASS HOSE FROM INTAKE MANIFOLD

16. REMOVE DISTRIBUTOR AND SPARK PLUGS

17. DISCONNECT BOND CABLE FROM VANE PUMP BRACKET



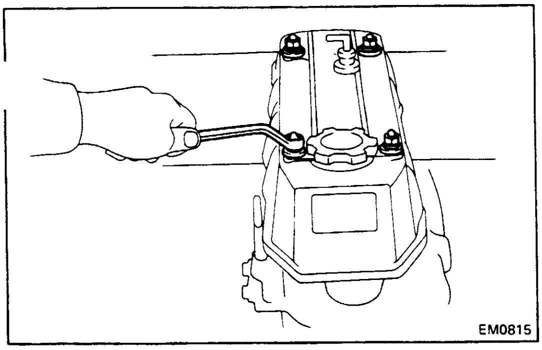
18. IF VEHICLE HAS POWER STEERING, REMOVE VANE PUMP WITH BRACKET

(a) Disconnect the vacuum hose from the air control valve.

(b) Loosen and remove the drive belt.

(c) Remove the vane pump to one side without disconnecting the hoses.

19. DISCONNECT BOND CABLE ON REAR SIDE



REMOVAL OF CYLINDER HEAD

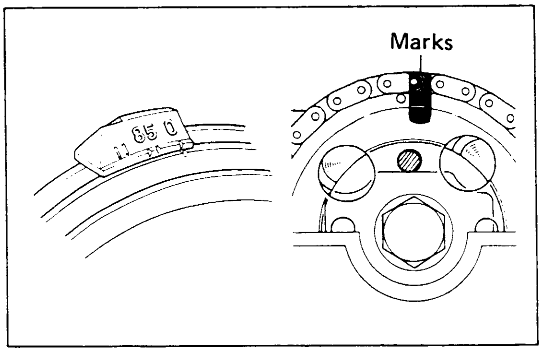
1. REMOVE HEAD COVER

(a) Remove the bond cable from the body.

(b) Remove the four nuts and seals.

(c) Remove the head cover.

CAUTION: Cover the oil return hole in the head with a rag to prevent objects from falling in.

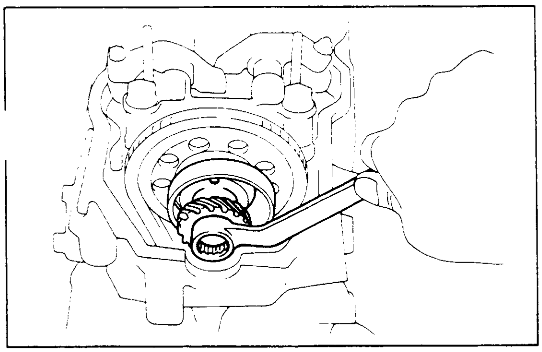


2. REMOVE CAM SPROCKET BOLT

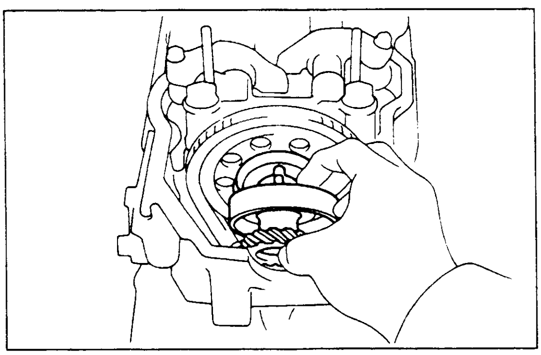
(a) Turn the crankshaft until the No.1 cylinder position is set at T.D.C. compression.

(b) Place matchmarks on the sprocket and chain.

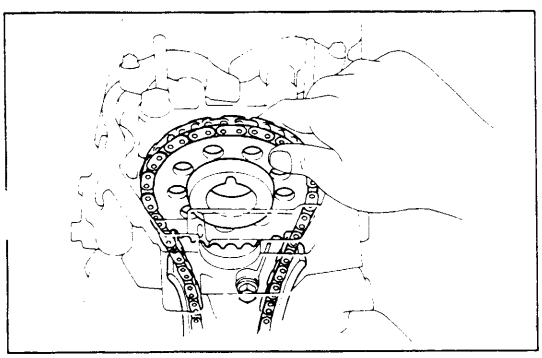
(c) Remove the semi-circular plug.



(d) Remove the cam sprocket bolt.

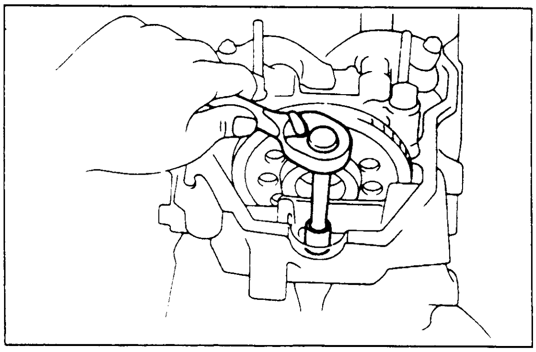


3. REMOVE DISTRIBUTOR DRIVE GEAR AND FUEL PUMP DRIVE CAM (22R) or CAMSHAFT THRUST PLATE (22R-E)



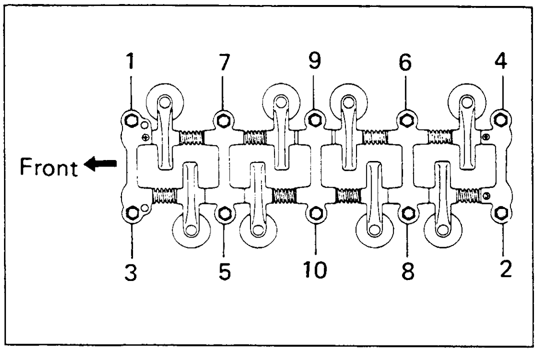
4. REMOVE CAM SPROCKET

Remove the cam sprocket and chain from the camshaft and leave on the vibration damper.



5. **REMOVE CHAIN COVER BOLT**

Remove the bolt in front of the head before the other head bolts are removed.



6. **REMOVE CYLINDER HEAD BOLTS**

Remove the head bolts gradually in two or three passes and in the numerical order shown.

CAUTION: Head warpage or cracking could result from removing in incorrect order.

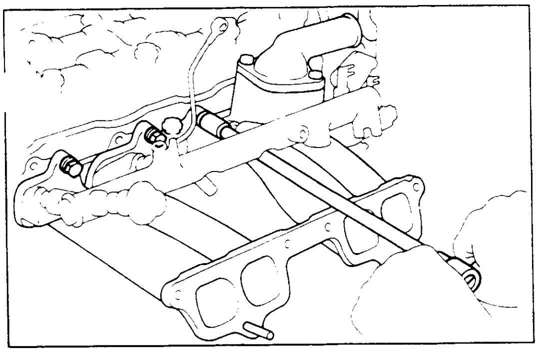
7. **REMOVE ROCKER ARM ASSEMBLY**

It may be necessary to use a pry bar on the front and rear of the rocker arm assembly to separate it from the head.

8. **REMOVE CYLINDER HEAD**

Lift the cylinder head from the dowels on the cylinder block and place the head on wooden blocks on a bench.
NOTE: If the cylinder head is difficult to lift off, pry with a screwdriver between the head and block saliences.

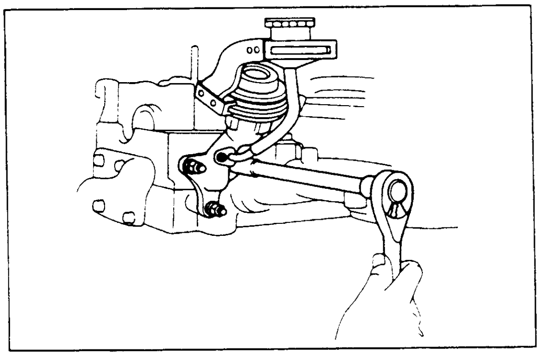
CAUTION: Be careful not to damage the cylinder head and block surfaces of the cylinder head gasket side.



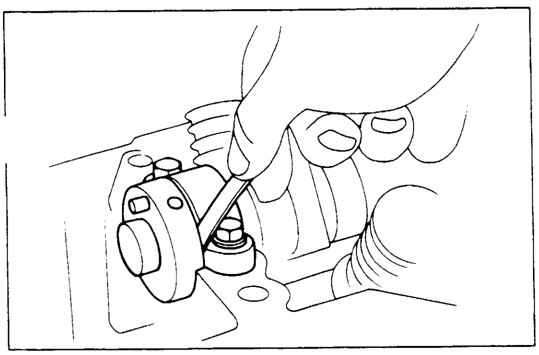
DISASSEMBLY OF CYLINDER HEAD

(See page EM-12)

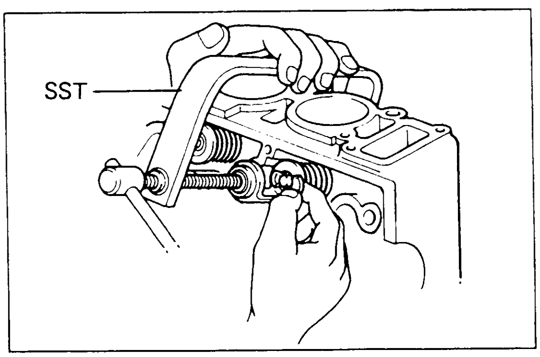
1. **REMOVE INTAKE MANIFOLD WITH DELIVERY PIPE AND INJECTION NOZZLE**
   (a) Remove the six bolts, one hexagon bolt and two nuts.
   (b) Remove the intake manifold together with the delivery pipe and the injection nozzles.



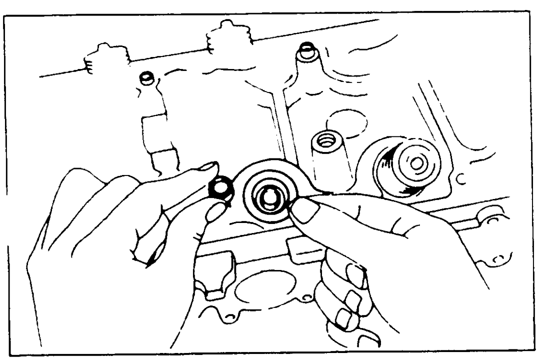
2. **REMOVE EGR VALVE WITH VACUUM MODULATOR FROM CYLINDER HEAD**
3. **REMOVE EXHAUST MANIFOLD FROM CYLINDER HEAD**



4. **MEASURE CAMSHAFT THRUST CLEARANCE**
   Using a feeler gauge, measure the camshaft thrust clearance between the thrust bearing and camshaft.
   If clearance is greater than the maximum, replace the head.
   Maximum clearance: 0.25 mm (0.010 in.)
   Standard clearance: 0.08 — 0.18 mm (0.003 — 0.007 in.)
5. **REMOVE CAM BEARING CAPS AND SHAFT**

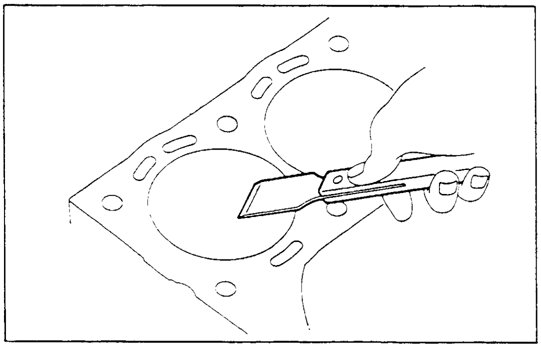


6. **REMOVE VALVES**
   (a) Using SST, compress the valve retainer until the two keepers can be removed.
   SST 09202-43013
   (b) Remove the valve keepers, retainers, springs and valves.

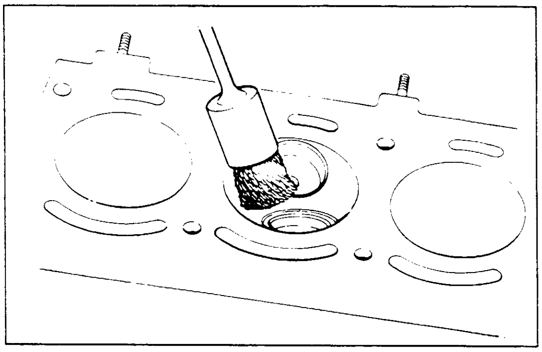


   (c) Remove the valve seals.
   (d) Using a small screwdriver or magnet, remove the valve spring seats.
   NOTE: Keep the valves arranged so they can be installed in the same order as removed.

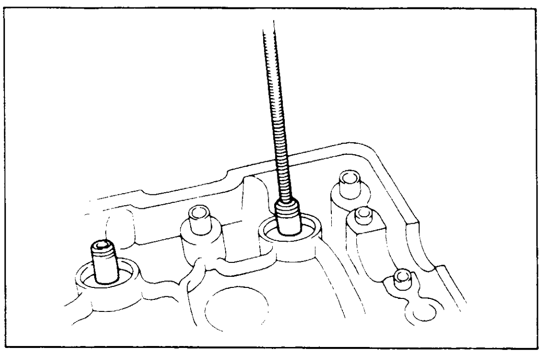
INSPECTION AND CLEANING OF CYLINDER HEAD COMPONENTS



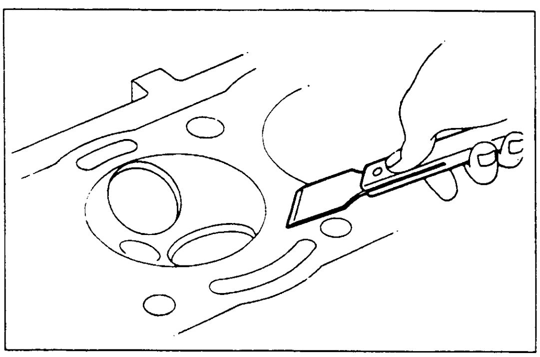
1. **CLEAN TOP OF PISTONS AND TOP OF BLOCK**
   (a) Turn the crankshaft and bring each piston to top dead center. Scrape the carbon from the piston top.
   (b) Remove all gasket material from the top of the block. Blow carbon and oil from the bolt holes.



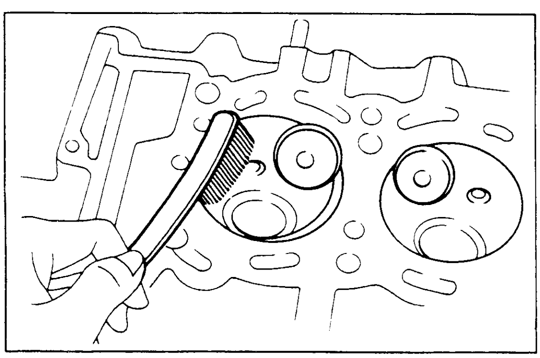
2. **CLEAN COMBUSTION CHAMBER**
   Using a wire brush, remove all the carbon from the combustion chambers.
   CAUTION: Be careful not to scratch the head gasket contact surface.



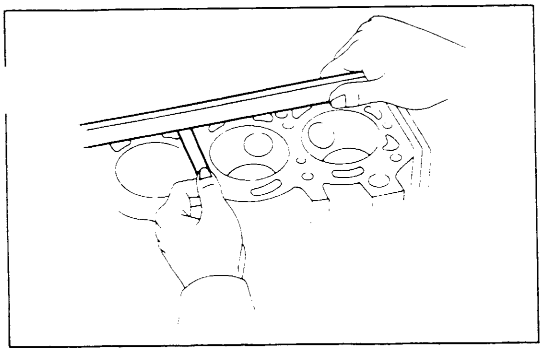
3. **CLEAN VALVE GUIDES**
   Using a valve guide brush and solvent, clean all valve guides.



4. **REMOVE GASKET MATERIAL**
   Using a gasket scraper, remove all gasket material from the manifold and head surfaces.
   CAUTION: Do not scratch the surfaces.

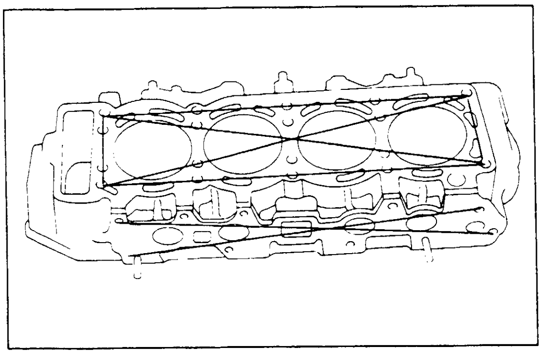


5. **CLEAN CYLINDER HEAD**
   Using a soft brush and solvent, clean the head.
   CAUTION: Do not clean the head in a hot tank as this will seriously damage it.



6. **INSPECT HEAD FOR FLATNESS**

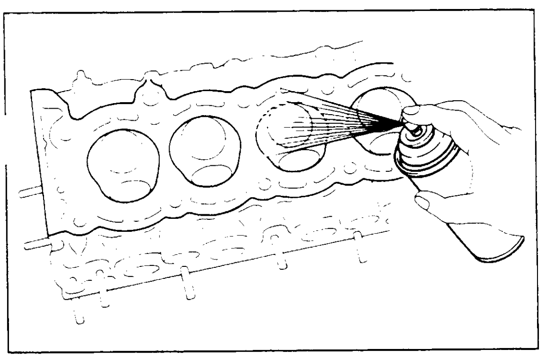
(a) Using a precision straightedge and feeler gauge, check that the head and manifold surfaces are not warped.



(b) Measure warpage along the four edges and diagonally as illustrated.

If warpage is greater than specified value, replace the head.

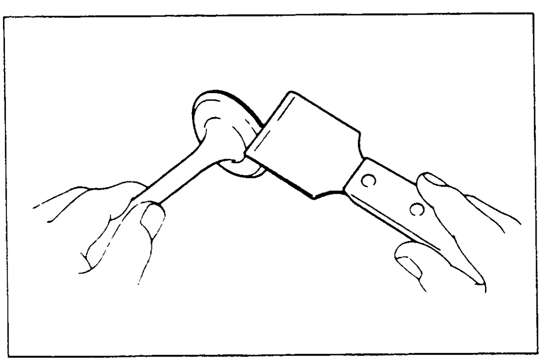
Maximum head surface warpage:	**0.15 mm (0.0059 in.)**
Maximum manifold surface warpage:	**0.20 mm (0.0079 in.)**



7. **INSPECT CYLINDER HEAD FOR CRACKS**

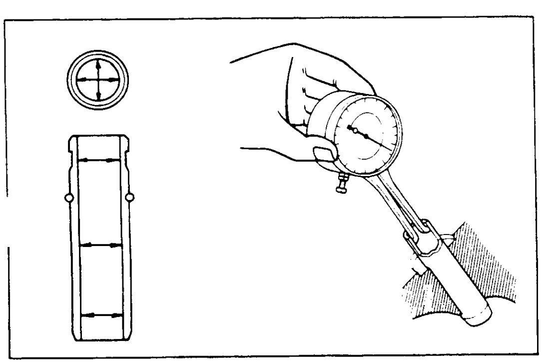
Using a dye penetrant, check the combustion chamber, intake and exhaust ports, head surface and the top of the head for cracks.

If a crack is found, replace the head.



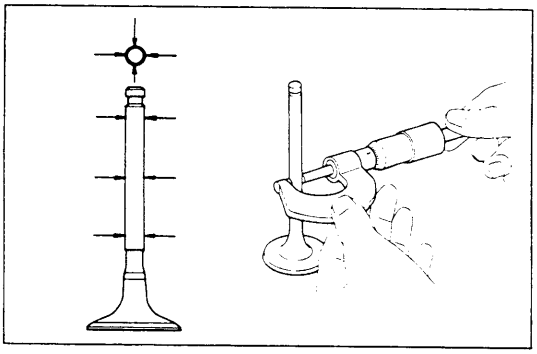
8. **CLEAN VALVES**

Use an old valve to chip any carbon from the valve head. Using a gasket scraper, clean the valve thoroughly.



9. **INSPECT VALVE STEM GUIDE WEAR**

(a) Using a dial indicator or telescoping gauge, measure the inside diameter of the valve guide.

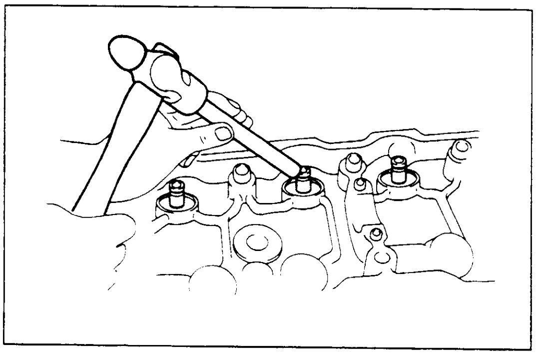


(b) Using a micrometer, measure the diameter of the valve stem.

(c) Subtract the valve stem measurement from the va guide measurement.

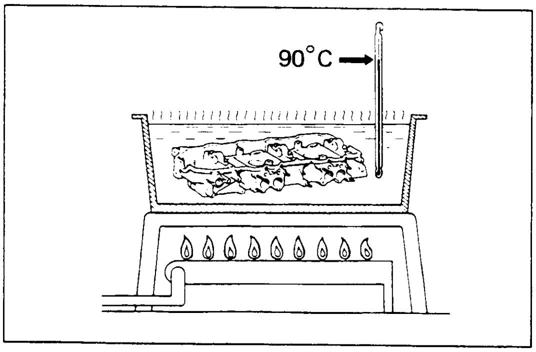
If the clearance is greater than the following values, replace the valve and guide:

Maximum intake clearance: 0.08 mm (0.0031 in.)
Maximum exhaust clearance: 0.10 mm (0.0039 in.)

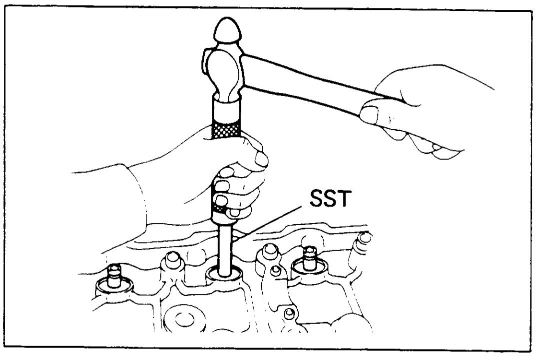


10. IF NECESSARY, REPLACE VALVE GUIDE

(a) Using a brass punch and hammer, break the valve guide.



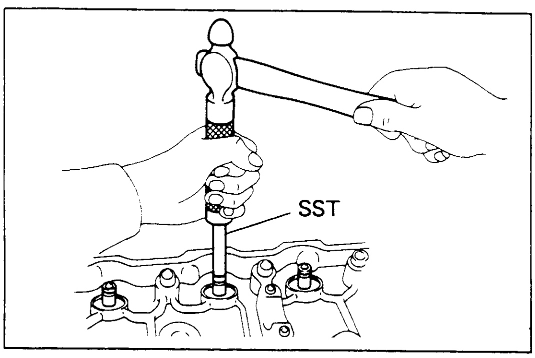
(b) Heat the cylinder head to about 90°C (194°F).



(c) Using SST and hammer, drive out the valve guide.

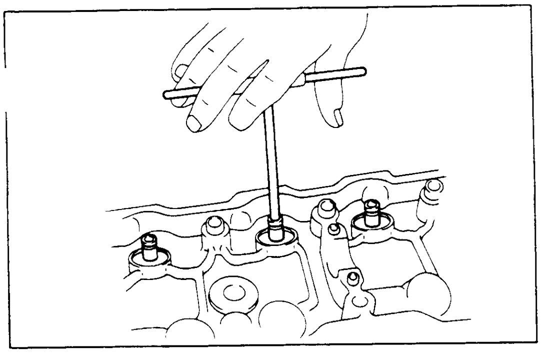
SST 09201-60011

(d) Heat the cylinder head to about 90°C (194°F).



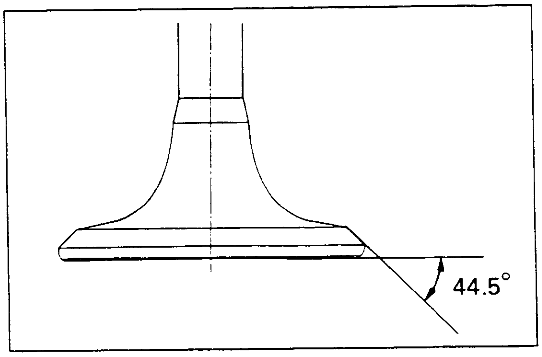
(e) Using SST and hammer, drive in a new valve guide until the snap ring makes contact with the cylinder head.

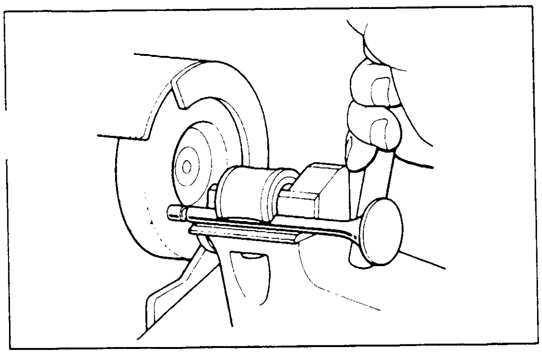
SST 09201-60011



(f) Using a sharp 8 mm reamer, ream the valve guide to obtain the specified clearance between the guide and new valve.

Intake clearance: 0.02 – 0.06 mm (0.0008 – 0.0024 in.)
Exhaust clearance: 0.03 – 0.07 mm (0.0012 – 0.0028 in.)





11. INSPECT AND GRIND VALVES

(a) Grind the valves only enough to remove pits and carbon.

Make sure the valves are ground at the correct valve face angle.

Valve face angle: 44.5°

(b) Check the valve head margin.

If the valve head margin is less than specified, replace the valve.

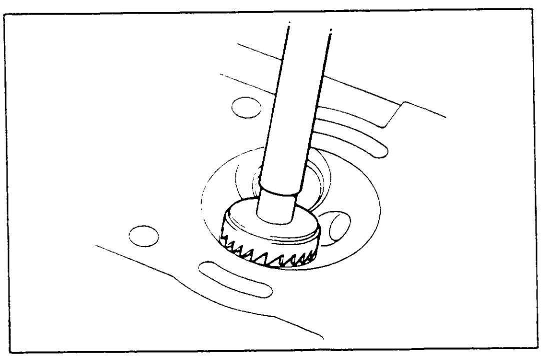
Minimum margin: 0.6 mm (0.024 in.)

(c) Check the surface of the valve stem tip for wear.

If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.

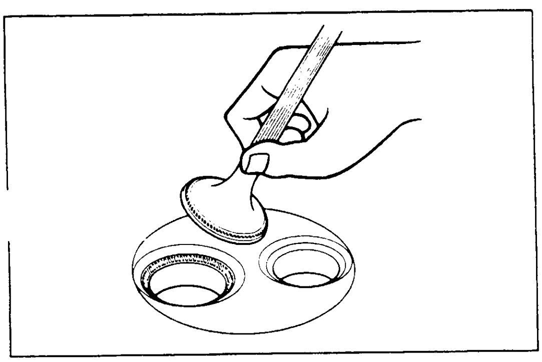
CAUTION: Do not grind more than 0.5 mm (0.020 in.)

Standard overall length:
Intake 113.5 mm (4.468 in.)
Exhaust 112.4 mm (4.425 in.)



12. INSPECT AND CLEAN VALVE SEATS

(a) Using a 45° carbide cutter, resurface the valve seats. Remove enough metal to clean the seats.

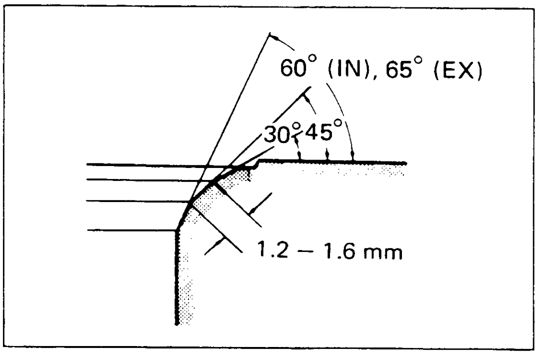


(b) Check the valve seating position.

Apply a thin coat of prussian blue (or white lead) to the valve face. Install the valve. While applying light pressure to the valve, rorate the valve against the seat.

(c) Check the valve face and seat for the following:

- If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
- If blue appears 360° around the valve seat, the guide and seat are concentric. If not, resurface the seat.



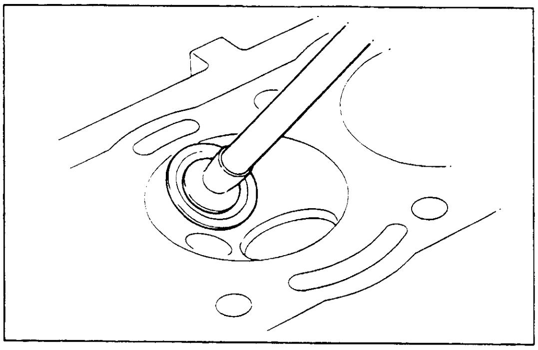
- Check that the seat contact is on the middle of the valve face with the following width:

  1.2 – 1.6 mm (0.047 – 0.063 in.)

  If not, correct the valve seat as follows:

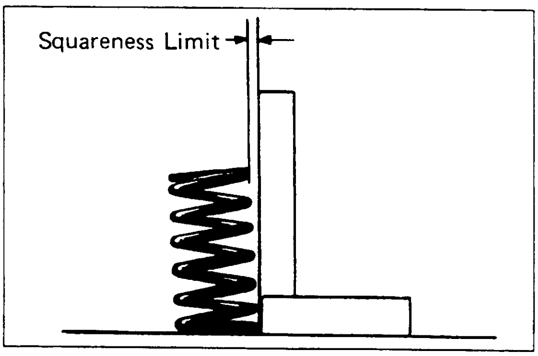
  If seating is too high on the valve face, use 30° and 45° cutters to correct the seat.

  If seating is too low on the valve face, use 60° (IN) or 65° (EX) and 45° cutters to correct the seat.



(d) Hand-lap the valve and valve seat together with abrasive compound.

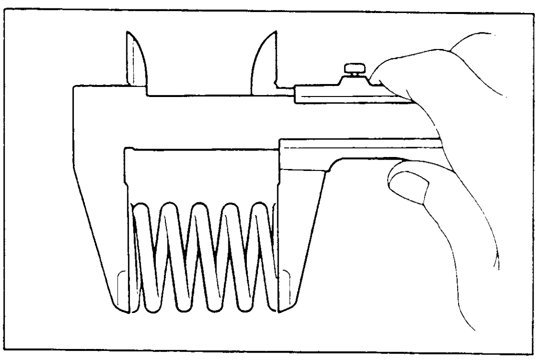
(e) Clean the valve and valve seat after hand-lapping.



13. INSPECT VALVE SPRINGS

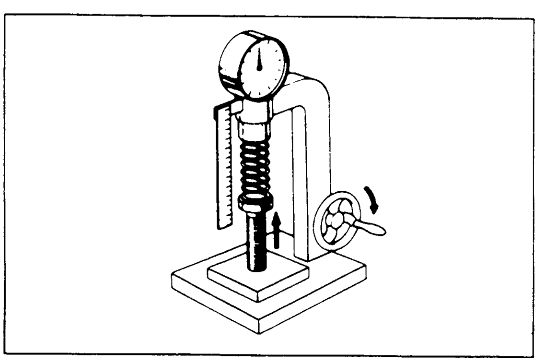
(a) Using a steel square, check the squareness of the valve springs. If a spring is out of square more than the maximum allowable, replace the spring.

Maximum allowable: 1.6 mm (0.063 in.)



(b) Measure the free height of all springs. Replace any spring that is not correct.

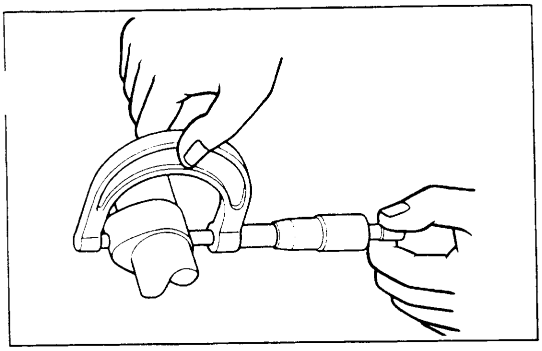
Free height: 48.5 mm (1.909 in.)



(c) Using a spring tester, check the tension of each spring at the specified installed height.

If the installed tension is less than the minimum, replace the spring.

Installed height: 40.5 mm (1.594 in.)
Minimum installed tension: 28.5 kg (62.8 lb, 279 N)



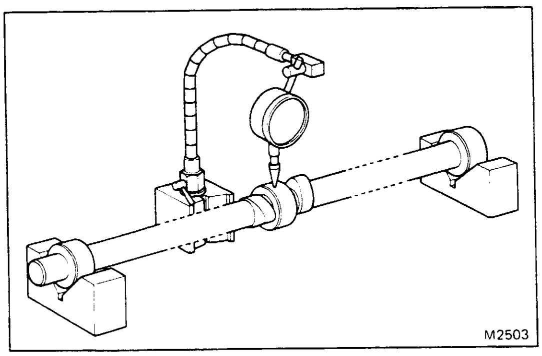
14. INSPECT CAMSHAFT AND BEARING CAPS

(a) Using a micrometer, measure the cam lobes.

If the lobe height is less than the minimum allowable, the camshaft is worn and must be replaced.

Minimum intake lobe height: 42.63 – 42.72 mm (1.6783 – 1.6819 in.)

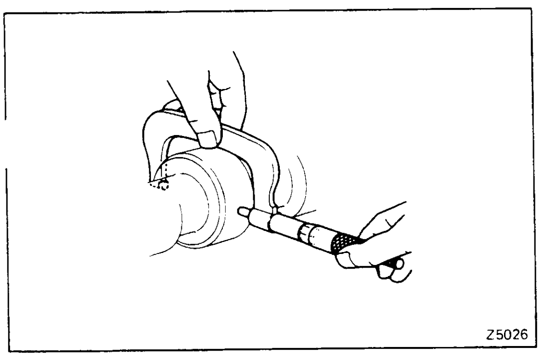
Minimum exhaust lobe height: 42.69 – 42.78 mm (1.6807 – 1.6842 in.)



(b) Place the camshaft on V-blocks and measure the runout at the center journal.

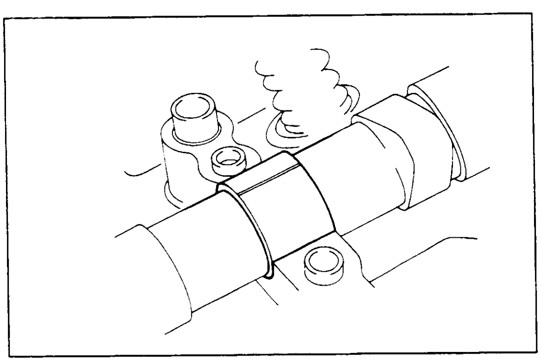
If the runout is greater than the maximum allowable, replace the camshaft.

Maximum circle runout: 0.2 mm (0.008 in.)



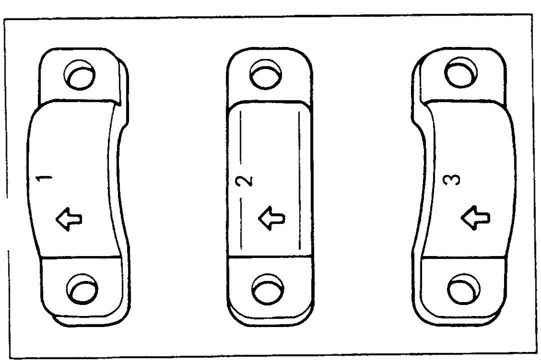
(c) Using a micrometer, measure the journal diameter.

Standard diameter: 32.98 – 33.00 mm (1.2984 – 1.2992 in.)



(d) Measure the camshaft journal oil clearance.

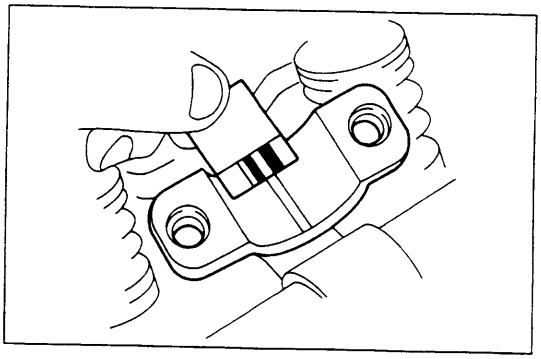
- Clean the bearing caps and camshaft journal.
- Lay a strip of Plastigage across each journal.



- Install the correct numbered bearing cap on each journal with the arrows pointing toward the front. Torque each bolt.

Torque: 200 kg-cm (14 ft-lb, 20 N·m)

NOTE: Do not turn the camshaft while the Plastigage is in place.

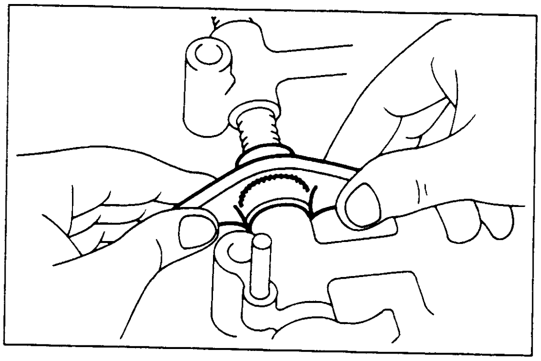


- Remove the caps. Measure the Plastigage at its widest point.

If clearance is greater than the maximum, replace head and/or camshaft.

Maximum clearance: **0.1 mm (0.004 in.)**
Standard clearance: **0.01 – 0.05 mm (0.0004 – 0.0020 in.)**

- Clean out the pieces of Plastigage from the bearings and journals.

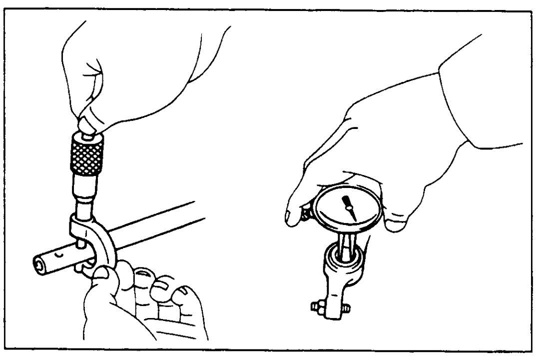


15. INSPECT ROCKER ARMS

Check the clearance between the rocker arms and shaft by moving the rocker arms as shown. Little or no movement should be felt.

If movement is felt, disassemble the rocker arm assembly and measure the oil clearance as follows:

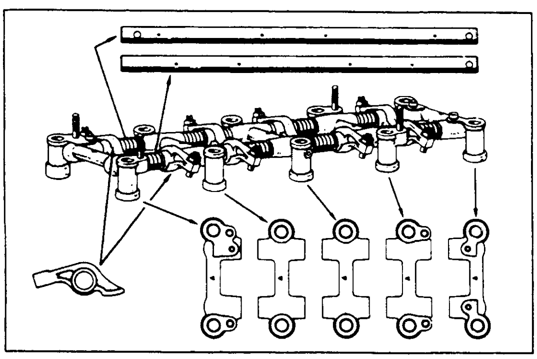
(a) Disassemble rocker arm assembly.
- Remove the three screws.
- Slide the rocker stands, springs and rocker arms off the shafts.



(b) Using a dial indicator, measure the inside diameter of the rocker arm. Using a micrometer, measure the outside diameter of the shaft. Subtract the shaft diameter from the rocker arm diameter.

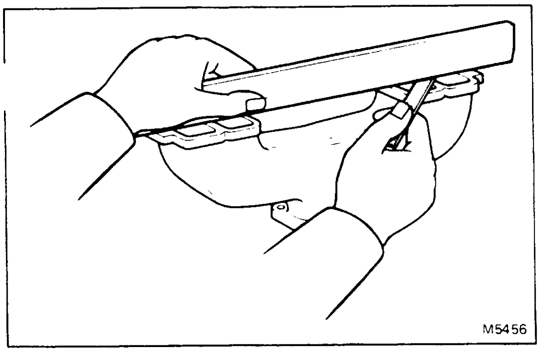
If the oil clearance is not within specification, replace the rocker arm and/or shaft.

Maximum oil clearance: **0.08 mm (0.0031 in.)**



(c) Assemble the rocker arm assembly as shown, and install the three screws.

NOTE: All rocker arms are the same but all rocker stands are different and must be assembled in the correct order.



16. **INSPECT INTAKE AND EXHAUST MANIFOLDS**

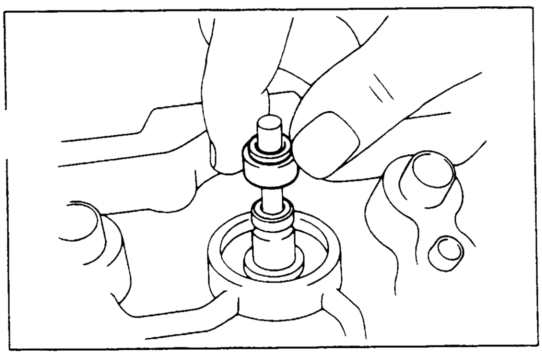
Using a precision straightedge and feeler gauge, check the surfaces contacting the cylinder head for warpage. If warpage is greater than maximum, replace the manifold.

Maximum intake warpage: **0.20 mm (0.0079 in.)**
Maximum exhaust warpage: **0.70 mm (0.0276 in.)**

ASSEMBLY OF CYLINDER HEAD

(See page EM-12)

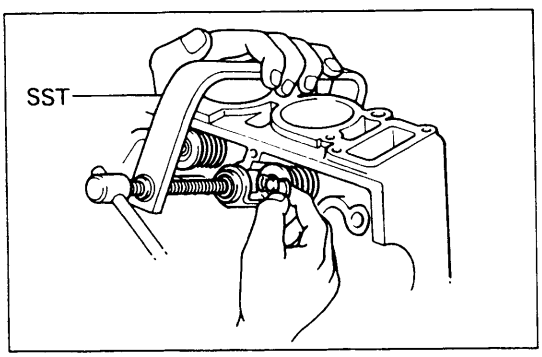
NOTE:
- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets and oil seals with new parts.



1. **INSTALL VALVES**

(a) Lubricate and insert valves in the cylinder head valve guides. Make sure the valves are installed in the correct order.

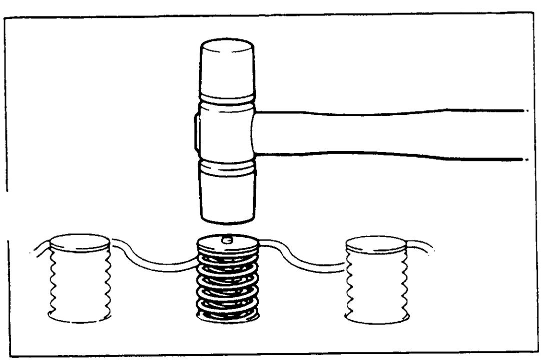
(b) Install the valve spring seats and seals.



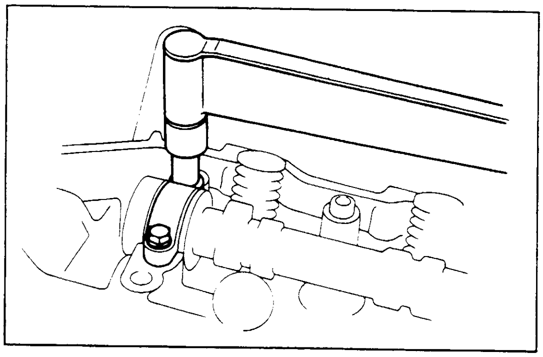
(c) Install springs and spring retainers on the valves.

(d) Using SST, compress valve retainers and place two keepers around the valve stem.

SST 09202-43013

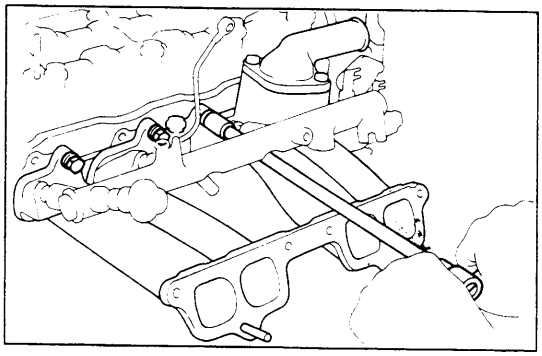


(e) Tap the stem lightly to assure proper fit.



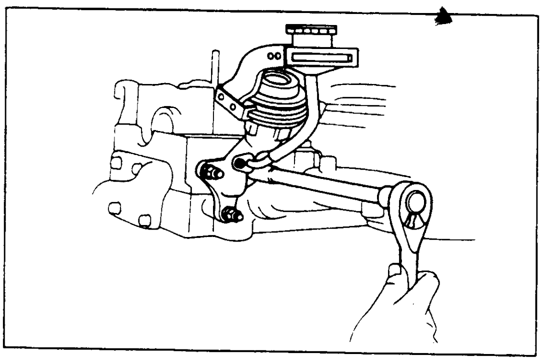
2. **INSTALL CAMSHAFT**
   (a) Place the camshaft in the cylinder head and install the bearing caps in numbered order from the front w arrows pointing toward the front.
   (b) Install and torque the cap bolts.

Torque: 200 kg-cm (14 ft-lb, 20 N·m)

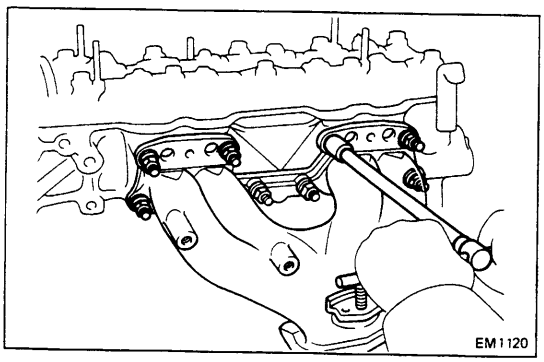


3. **INSTALL INTAKE MANIFOLD**
   (a) Position a new gasket on the cylinder head.
   (b) Install the intake manifold with the delivery pipe and injection nozzles.
   (c) Install the six bolts, one hexagon bolt and two nuts. Torque the bolts and nuts.

Torque: 195 kg-cm (14 ft-lb, 19 N·m)

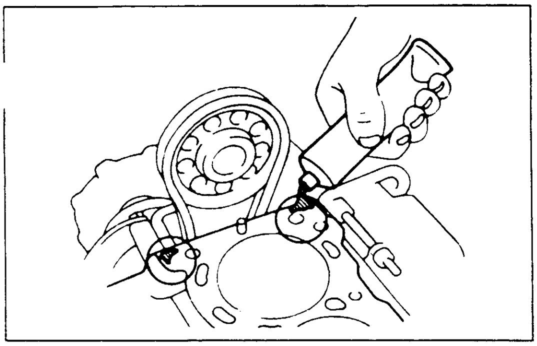


4. **INSTALL EGR VALVE WITH VACUUM MODULATOR**
   (a) Position a new gasket on the cylinder head.
   (b) Apply a sealer to the upper right bolt.
   (c) Place the EGR with vacuum modulator valve in t installed position and tighten the two bolts on the intake manifold side of EGR pipe.
   (d) Install the vacuum hose to the top of the EGR valve.



5. **INSTALL EXHAUST MANIFOLD**
   (a) Position a new gasket on the cylinder head.
   (b) Install the exhaust manifold with eight nuts. Torque the nuts.

Torque: 450 kg-cm (33 ft-lb, 44 N·m)

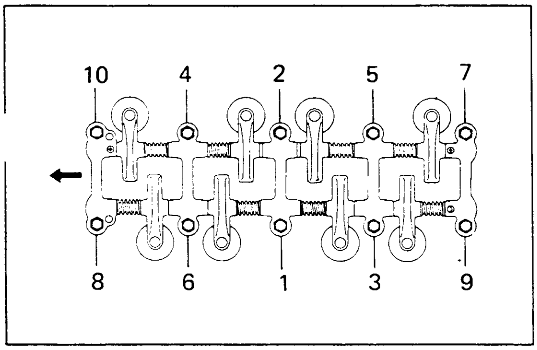


INSTALLATION OF CYLINDER HEAD

(See page EM-12)

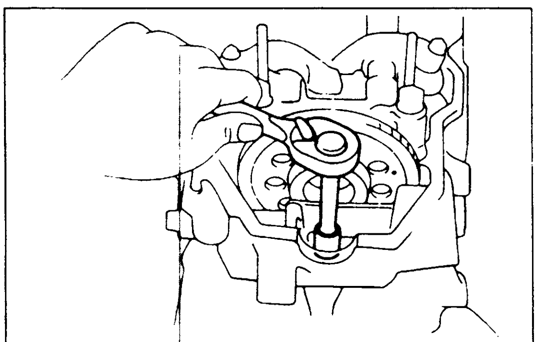
1. **APPLY SEALER TO CYLINDER BLOCK**
   (a) Apply liquid sealer to two locations as shown.
   (b) Place a new head gasket over dowels on the cylinder block.

2. **INSTALL CYLINDER HEAD**
   (a) If the sprocket was removed, align the alignment marks placed on the sprocket and chain during removal.
   (b) Position the cylinder head over dowels on the block.



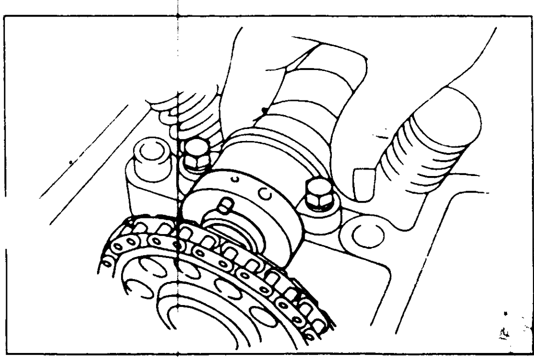
3. **INSTALL ROCKER ARM ASSEMBLY**
   (a) Place the rocker arm assembly over the dowels on the cylinder head.
   (b) Install and tighten the head bolts gradually in three passes and in the sequence shown. Torque the bolts on the final pass.

   Torque: 800 kg-cm (58 ft-lb, 78 N·m)

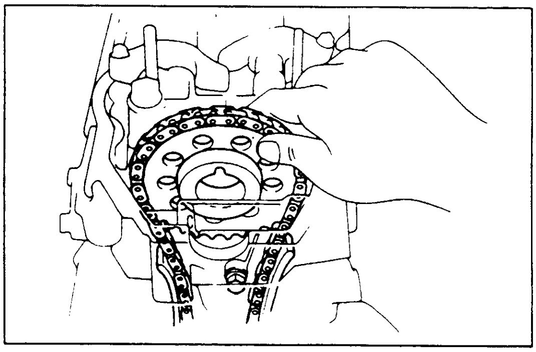


4. **INSTALL CHAIN COVER BOLT**
   Torque the bolt.

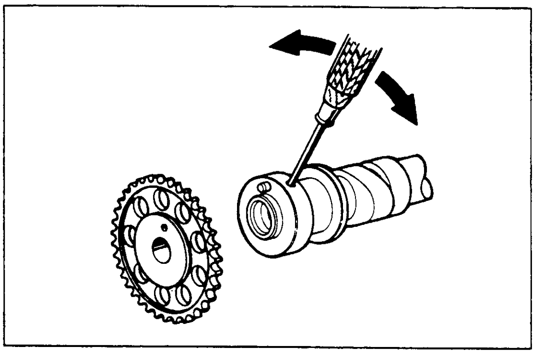
   Torque: 130 kg-cm (9 ft-lb, 13 N·m)



5. **INSTALL CAM SPROCKET ON CAMSHAFT**
   (a) Turn the camshaft to position the dowel at the top.

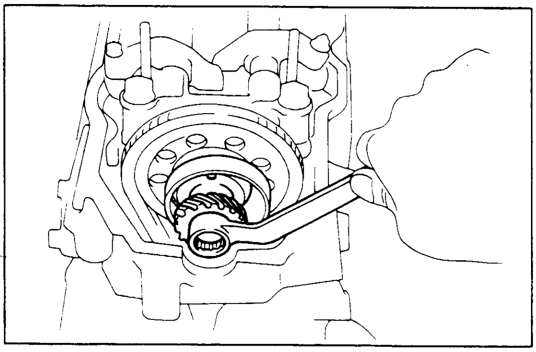


(b) While holding up on the sprocket and chain, turn the crankshaft until the No.1 and No.4 cylinders are at top dead center.



(c) Place the chain sprocket over the camshaft dowel.

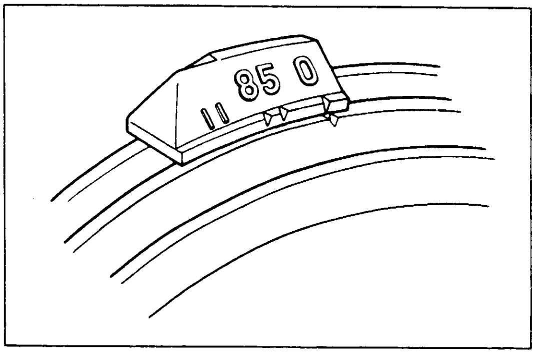
NOTE: If the chain does not seem long enough, turn the camshaft back and forth while pulling up on the chain and sprocket.



6. **INSTALL DISTRIBUTOR DRIVE GEAR AND FUEL PUMP DRIVE CAM (22R) OR CAMSHAFT THRUST PLATE (22R-E)**

Place the distributor drive gear and fuel pump drive cam over the chain sprocket. Torque the bolt.

Torque: 800 kg-cm (58 ft-lb, 78 N·m)

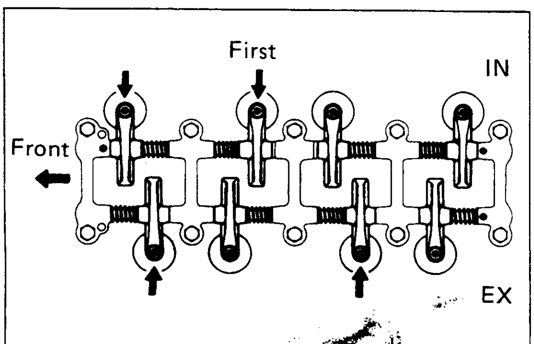


7. **ADJUST VALVES CLEARANCE**

(a) Set the No.1 cylinder to TDC/compression.

- Turn the crankshaft with a wrench to align the timing marks at TDC. Set the groove on the pulley at the 0 mark position timing mark.
- Check that the rocker arms on the No.1 cylinder are loose and the rockers on No.4 are tight.

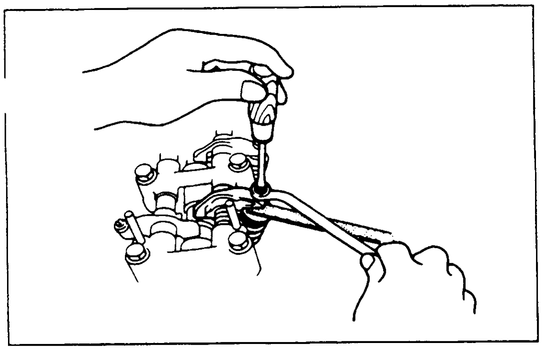
If not, turn the crankshaft one complete revolution and align the marks as above.



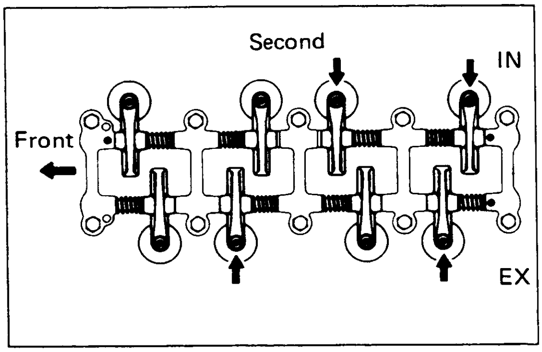
(b) Adjust the clearance of half of the valves.

- Adjust only those valves indicated by arrows as shown.

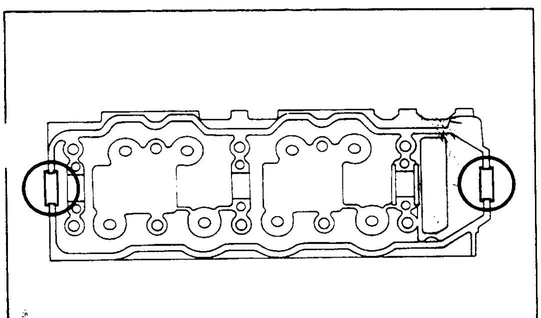
Intake clearance: 0.20 mm (0.008 in.)
Exhaust clearance: 0.30 mm (0.012 in.)



- Use a feeler gauge to measure between the valve stem and rocker arm. Loosen the lock nut and turn the adjusting screw to set the proper clearance. Hold the adjusting screw in position and tighten the lock nut.
- Recheck the clearance. The feeler gauge should move with a very slight drag.

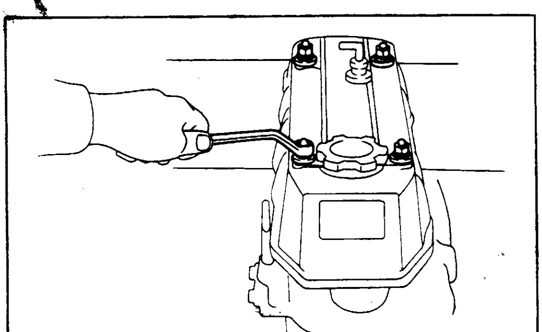


(c) Turn the crankshaft one revolution and adjust the other valves.


EM0846

8. INTALL SEMI-CIRCULAR PLUG

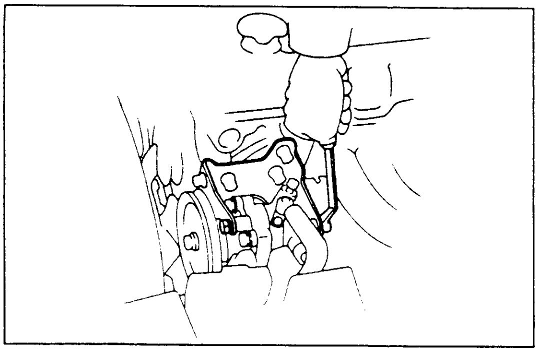
Apply liquid sealer to the cylinder head installation surface of the plug.


EM0815

9. INSTALL HEAD COVER

(a) Install the gasket to the cylinder head.

(b) Place the head cover on the cylinder head and install the four seals and nuts.



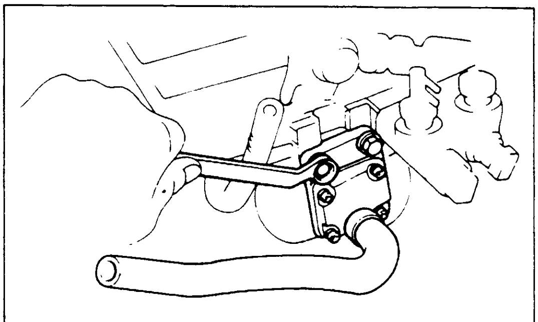
POST INSTALLATION

1. **INSTALL VANE PUMP WITH BRACKET (With power steering)**
   (a) Position the vane pump with the bracket.
   (b) Install the five bolts and one bolt with the bond cable. Torque the bolts.

   Torque: 450 kg-cm (33 ft-lb, 44 N·m)

2. **INSTALL DRIVE BELT AND ADJUST BELT TENSION** **(See step 1 on page MA-17)**

3. **CONNECT BY-PASS HOSE TO INTAKE MANIFOLD**



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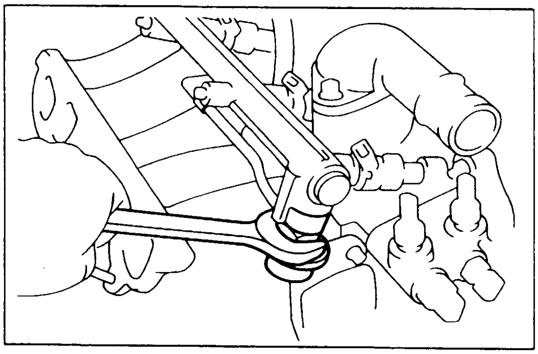
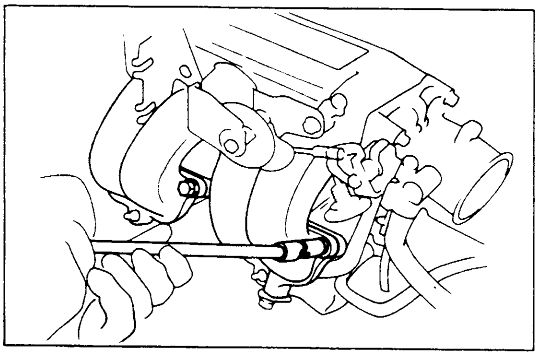
4. **INSTALL AIR VALVE TO INTAKE MANIFOLD**
   (a) Install the air valve to the intake manifold.
   (b) Connect by-pass hose No.4.



5. **CONNECT FUEL HOSE TO DELIVERY PIPE**
   (a) Install the fuel hose with a bolt.
   (b) Install the pulsation damper and new gaskets and torque the damper.

   Torque: 450 kg-cm (33 ft-lb, 44 N·m)

6. **CONNECT FOLLOWING WIRES:**
   (a) Injection wires
   (b) OD thermo switch wire (with A/T)
   (c) Start injection time switch wire
   (d) Temperature sensor wire
   (e) Water temperature sender gauge wire

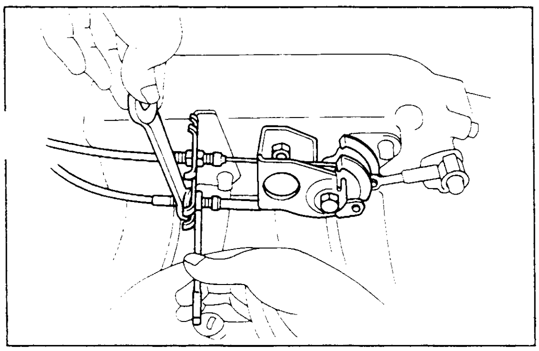


7. **INSTALL CHAMBER WITH THROTTLE BODY**
   (a) Position a new gasket on the intake manifold.
   (b) Install the chamber and throttle body with four bolts and two nuts.
   (c) Connect the chamber and stay with a bolt.
   (d) Install the EGR valve to the chamber.

8. **CONNECT FOLLOWING WIRES:**
   (a) Air valve wire
   (b) Throttle position wire
   (c) Cold start injection wire

9. **CONNECT FOLLOWING PARTS:**
   (a) BVSV hoses
   (b) Cold start injection pipe
   (c) Pressure regulator hose to the chamber.
   (d) Air control valve hose to the actuator
   (e) Water by-pass hoses No.2 and No.3 from the throttle body.
   (f) Air valve hose No.2 to the chamber
   (g) Air valve hose No.1 to the throttle body
   (h) EGR vacuum modulator hose
   (i) Actuater hose (with cruise control)
   (j) EVAP hose (to canister)
   (k) Air control valve hoses
   (l) Brake booster hose
   (m) PCV hoses No.1 and No.2

10. **CONNECT BOND CABLE OF REAR SIDE**



11. **CONNECT ACCELERATOR CABLE**

    Connect the accelerator cable and throttle cable for A/T to the bracket.

12. **CONNECT TWO HEATER HOSES**

13. **CONNECT RADIATOR UPPER HOSE FOR THERMOSTAT HOUSING**

14. **CONNECT EXHAUST PIPE TO EXHAUST MANIFOLD**
    (a) Connect the exhaust pipe and exhaust manifold with the three bolts.
    (b) Connect the Ox sensor wire.

15. **INSTALL AIR CLEANER HOSE**

16. **INSTALL DISTRIBUTOR AND SPARK PLUGS, AND SET TIMING (See page IG-10)**

17. **FILL WITH ENGINE OIL**

    Fill the engine with new oil, API grade SF or SF/CC multigrade, fuel efficient, and recommended viscosity oil.

    Oil capacity:

Dry fill	**4.8 liters (5.1 US qts, 4.2 Imp. qts)**
Drain and refill	
w/o Oil filter change	**4.0 liters (4.2 US qts, 3.5 Imp. qts)**
w/ Oil filter change	**4.6 liters (4.9 US qts, 4.0 Imp. qts)**

18. **FILL WITH COOLANT**

Close the radiator and engine drain cocks and fill with coolant.

Total capacity: w/Heater 8.4 liters (8.9 US qts, 7.4 Imp. qts)

19. **CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY**

20. **START ENGINE**

Warm up the engine and inspect for leaks.

21. **PERFORM ENGINE ADJUSTMENT**

(a) Retighten the cylinder head bolts. (See step 3 on page EM-27)

(b) Readjust the valve clearance. (See page MA-13)

(c) Recheck ignition timing. (See step 1 on page IG-10)

(d) Adjust idle speed. (See step 14 on page MA-14)

22. **RECHECK COOLANT AND ENGINE OIL LEVEL**

23. **ROAD TEST**

Perform a road test.

22R
PREPARATION FOR REMOVAL

(See page EM-12)

1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**

2. **DRAIN COOLANT FROM RADIATOR AND CYLINDER BLOCK**

3. **DRAIN ENGINE OIL**

4. **REMOVE AIR CLEANER**
   (a) Disconnect air hoses and air duct from the air cleaner.
   (b) Remove the two nuts and wing nut.
   (c) Remove the air cleaner.

5. **DISCONNECT EXHAUST PIPE FROM EXHAUST MANIFOLD**
   Remove three nuts holding the exhaust manifold to the exhaust pipe.

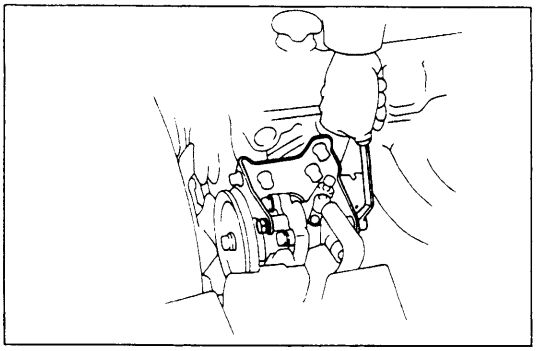
6. **DISCONNECT RADIATOR UPPER HOSE FROM THERMOSTAT HOUSING**

7. **DISCONNECT TWO HEATER HOSES**

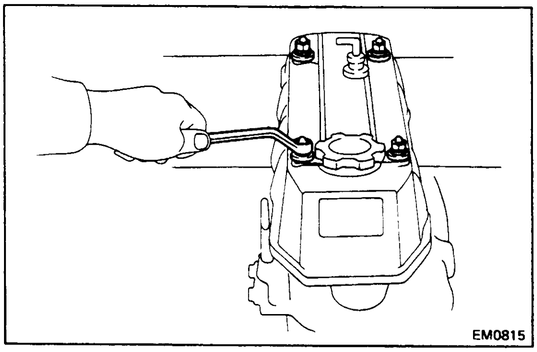
8. **DISCONNECT ACCELERATOR CABLE FROM CARBURETOR**
   Disconnect the cable from the carburetor and bracket.

9. **DISCONNECT FOLLOWING WIRES:**
   (a) VSV wire for A/C
   (b) Vacuum switch wire
   (c) VSV wire for EVAP
   (d) Water temperature sender gauge wire
   (e) Cold mixture heater wire
   (f) Thermo switch wire
   (g) Fuel cut solenoid valve wire
   (h) EACV wire (for Calif.)

10. **DISCONNECT FOLLOWING PARTS:**
    (a) Charcoal canister hose
    (b) Brake booster hose
    (c) Fuel main hose from the fuel inlet pipe
    (d) Fuel return hose from the fuel return pipe
    (e) HAC from the bracket (Ex. Calif.)
    (f) Vacuum switch, EBCV (For Calif.) and VSV with the bracket



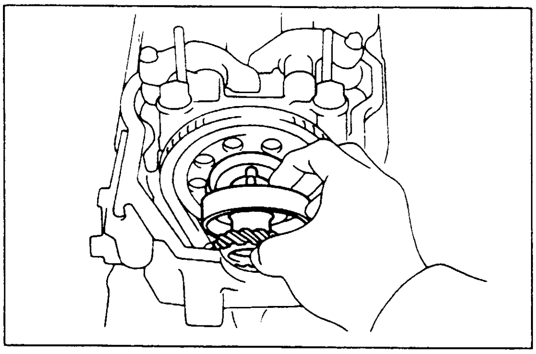
11. **REMOVE BOND CABLE OF REAR SIDE**
12. **REMOVE DISTRIBUTOR AND SPARK PLUGS**
13. **IF VEHICLE HAS POWER STEERING, REMOVE VANE PUMP WITH BRACKET**
    (a) Remove the drive belt.
    (b) Remove the vane pump with the bracket.
    NOTE: Lay the vane pump to one side without disconnecting the hoses.



REMOVAL OF CYLINDER HEAD

(See page EM-12)

1. **REMOVE HEAD COVER (See step 1 on page EM-15)**
2. **REMOVE CAM SPROCKET BOLT (See step 2 on page EM-15)**



3. **REMOVE DISTRIBUTOR DRIVE GEAR AND FUEL PUMP DRIVE CAM (See step 3 on page EM-15)**
4. **REMOVE CAM SPROCKET (See step 4 on page EM-16)**
5. **REMOVE CHAIN COVER BOLT (See step 5 on page EM-16)**
6. **REMOVE CYLINDER HEAD BOLTS (See step 6 on page EM-16)**
7. **REMOVE ROCKER ARM ASSEMBLY (See step 7 on page EM-16)**
8. **REMOVE CYLINDER HEAD (See step 8 on page EM-16)**

DISASSEMBLY OF CYLINDER HEAD

(See page EM-12)

1. REMOVE HEAT INSULATER FROM EXHAUST MANIFOLD

2. REMOVE CHECK VALVE WITH AIR PIPE

(a) Disconnect the air pipe from the exhaust manifold.

(b) Disconnect air hose No.3 from the EACV.

(c) Remove the check valve with the air pipe.

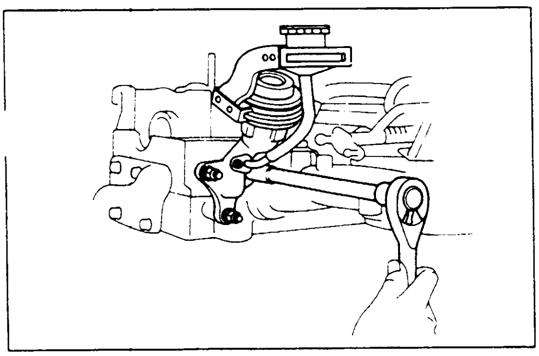
3. REMOVE FUEL PUMP FROM CYLINDER HEAD

(a) Remove the three fuel hoses from the fuel pump.

(b) Remove the fuel pump from the cylinder head.

4. REMOVE FUEL PIPE FROM INTAKE MANIFOLD

5. REMOVE ENGINE HANGER AND AIR PIPE FROM CYLINDER HEAD



6. REMOVE EGR PIPE AND EGR VALVE WITH VACUUM MODULATOR (Ex.Calif.)

(a) Remove the vacuum hose from the air pipe.

(b) Disconnect the EGR pipe from the intake manifold.

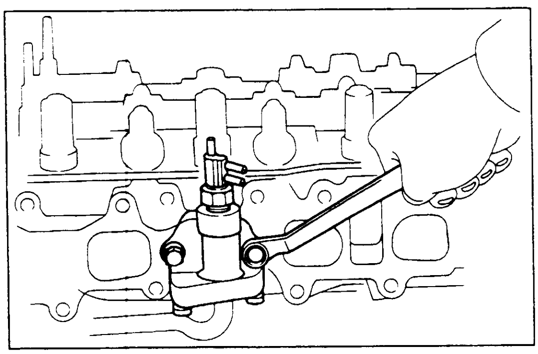
(c) Remove the EGR valve with the EGR pipe.

7. REMOVE INTAKE MANIFOLD WITH CARBURETOR

(a) Remove the bond cable from the cylinder head.

(b) Remove the six bolts and two nuts.

(c) Remove the intake manifold with the carburetor.



8. REMOVE THERMOSTATIC VALVE

9. REMOVE EXHAUST MANIFOLD FROM CYLINDER HEAD

10. MEASURE CAMSHAFT THRUST CLEARANCE
(See step 4 on page EM-17)

11. REMOVE CAM BEARING CAPS AND SHAFT
(See step 5 on pagd EM-17)

12. REMOVE VALVES
(See step 6 on page EM-17)

INSPECTION OF CYLINDER HEAD

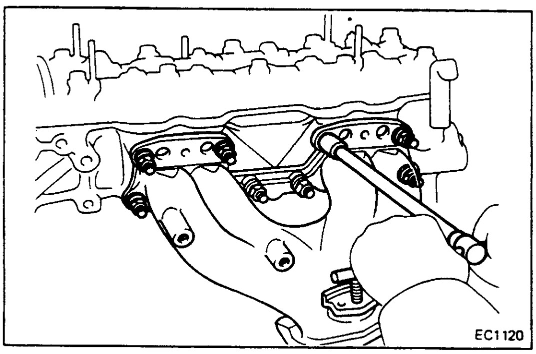
(See page EM-18)

ASSEMBLY OF CYLINDER HEAD

(See page EM-12)

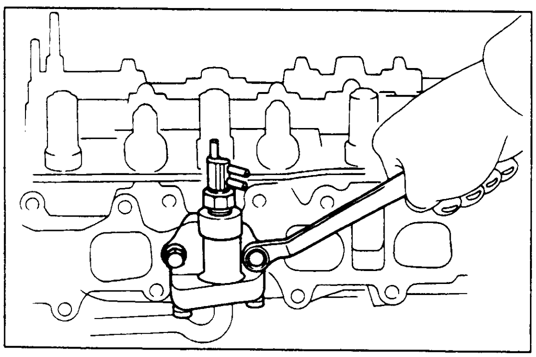
NOTE:
- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets and oil seals with new parts.

1. **INSTALL VALVE (See step 1 on page EM-25)**
2. **INSTALL CAMSHAFT (See step 2 on page EM-26)**



3. **INSTALL EXHAUST MANIFOLD TO CYLINDER HEAD**
   (a) Position a new gasket on the cylinder head.
   (b) Install the exhaust manifold with eight nuts. Torque the nuts.

   Torque: 450 kg-cm (33 ft-lb, 44 N·m)



4. **INSTALL THERMOSTATIC VALVE**
   (a) Position a new gasket on the cylinder head.
   (b) Install the thermostatic valve with two bolts. Torque the bolts.

   Torque: 220 kg-cm (16 ft-lb, 22 N·m)

5. **INSTALL INTAKE MANIFOLD WITH CARBURETOR**
   (a) Install the intake manifold with the carburetor.
   (b) Install the six bolts and two nuts. Torque the bolts and nuts.

   Torque: 195 kg-cm (14 ft-lb, 19 N·m)

   (c) Install the bond cable with the bolt.
6. **INSTALL FUEL PIPE TO INTAKE MANIFOLD**
7. **INSTALL EGR PIPE AND EGR VALVE WITH VACUUM MODULATOR (Ex. Calif.)**
   (a) Install the EGR valve with EGR pipe to the intake manifold.
   (b) Connect the vacuum hose to the air pipe.

8. **INSTALL FUEL PUMP TO CYLINDER HEAD**
   (a) Install the fuel pump with the two bolts. Torque the bolts.
   Torque: 220 kg-cm (16 ft-lb, 22 N·m)
   (b) Connect the three fuel pipes.

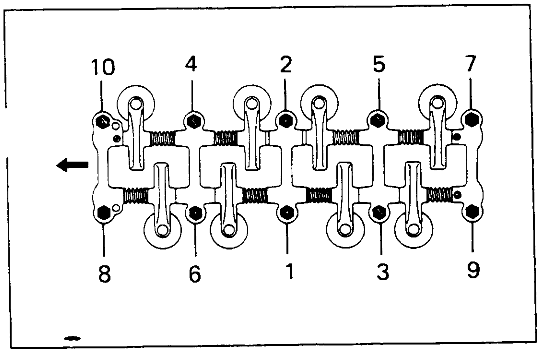
9. **INSTALL CHECK VALVE WITH AIR PIPE**
   (a) Install the check valve with the air pipe.
   (b) Connect air hose No.3 to the EACV.
   (c) Connect the air pipe to the exhaust manifold.

10. **INSTALL HEAT INSULATER TO EXHAUST MANIFOLD**

INSTALLATION OF CYLINDER HEAD

1. **APPLY SEALER TO CYLINDER BLOCK**
   (See step 1 on page EM-26)

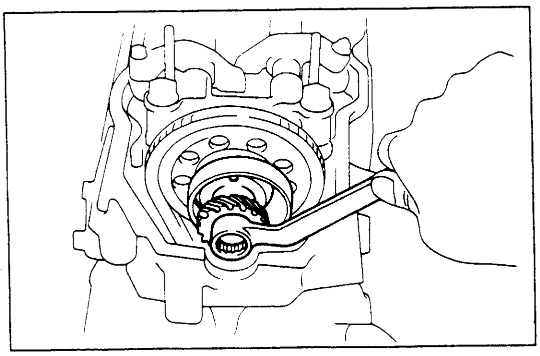
2. **INSTALL CYLINDER HEAD**
   (See step 2 on page EM-27)



3. **INSTALL ROCKER ARM ASSEMBLY**
   (See step 3 on page EM-27)

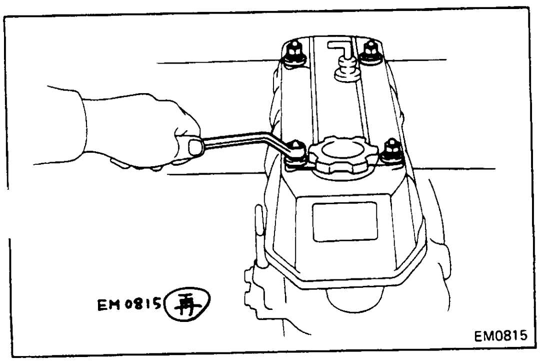
4. **INSTALL CHAIN COVER BOLT**
   (See step 4 on page EM-27)

5. **INSTALL CAM SPROCKET ON CAMSHAFT**
   (See step 5 on page EM-27)

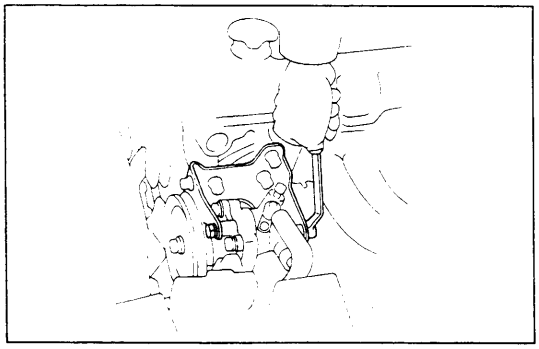


6. **INSTALL DISTRIBUTOR DRIVE GEAR**
   (See step 6 on page EM-28)

7. **ADJUST VALVES CLEARANCE**
   (See step 7 on page EM-28)



8. **INSTALL HEAD COVER**
   (See step 8 on page EM-29)



POST INSTALLATION

1. **INSTALL VANE PUMP WITH BRACKET (WITH POWER STEERING)**

   Install the vane pump with the six bolts. Torque the bolts.

   Torque: 450 kg-cm (33 ft-lb, 44 N·m)

2. **INSTALL DRIVE BELT AND ADJUST BELT TENSION (See page MA-17)**

3. **INSTALL DISTRIBUTOR AND SPARK PLUGS**

4. **INSTALL BOND CABLE OF REAR SIDE**

5. **CONNECT FOLLOWING PARTS:**
   (a) Vacuum switch, EBCV (Ex. Calif.) and VSV with the bracket
   (b) HAC to bracket (Ex. Calif.)
   (c) Fuel return hose to the fuel return pipe
   (d) Fuel main hose to the fuel inlet pipe
   (e) Brake booster hose
   (f) Charcoal canister hose

6. **CONNECT FOLLOWING WIRES:**
   (a) EACV wire (for Calif.)
   (b) Fuel cut solenoid valve wire
   (c) Thermo switch wire
   (d) Cold mixture heater wire
   (e) Water temperature sender gauge wire
   (f) VSV wire for EVAP
   (g) Vacuum switch wire
   (h) VSV wire for A/C

7. **CONNECT ACCELERATOR CABLE TO CARBURETOR**

   Connect the cable to the carburetor and bracket.

8. **CONNECT TWO HEATER HOSES**

9. **CONNECT RADIATOR UPPER HOSE TO THERMOSTAT HOUSING**

10. **CONNECT EXHAUST PIPE TO EXHAUST MANIFOLD**

    Connect the exhaust pipe with the three nuts to the exhaust manifold.

11. INSTALL AIR CLEANER

(a) Install the air cleaner on the carburetor.

(b) Connect the air hoses and air duct.

12. FILL WITH ENGINE OIL

Fill the engine with new oil, API grade SF or SF/CC multigrade, fuel efficient and recommended viscosity oil.

Capacity:

Dry fill	**4.8 liters (5.1 US qts, 4.2 Imp. qts)**
Drain and refill	
w/o Oil filter change	**4.0 liters (4.2 US qts, 3.5 Imp. qts)**
w/ Oil filter change	**4.6 liters (4.9 US qts, 4.0 Imp. qts)**

13. FILL WITH COOLANT

Close the radiator and engine drain cocks and fill with coolant.

Total capacity: w/Heater 8.4 liters (8.9 US qts, 7.4 Imp. qts)

14. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

15. START ENGINE

Warm up the engine and inspect for leaks.

16. PERFORM ENGINE ADJUSTMENT

(a) Retighten the cylinder head bolts. (See step 3 on page EM-27)

(b) Readjust the valve clearance. (See page MA-13)

(c) Recheck ignition timing. (See step 1 on page IG-10)

(d) Adjust idle speed. (See step 14 on page MA-14)

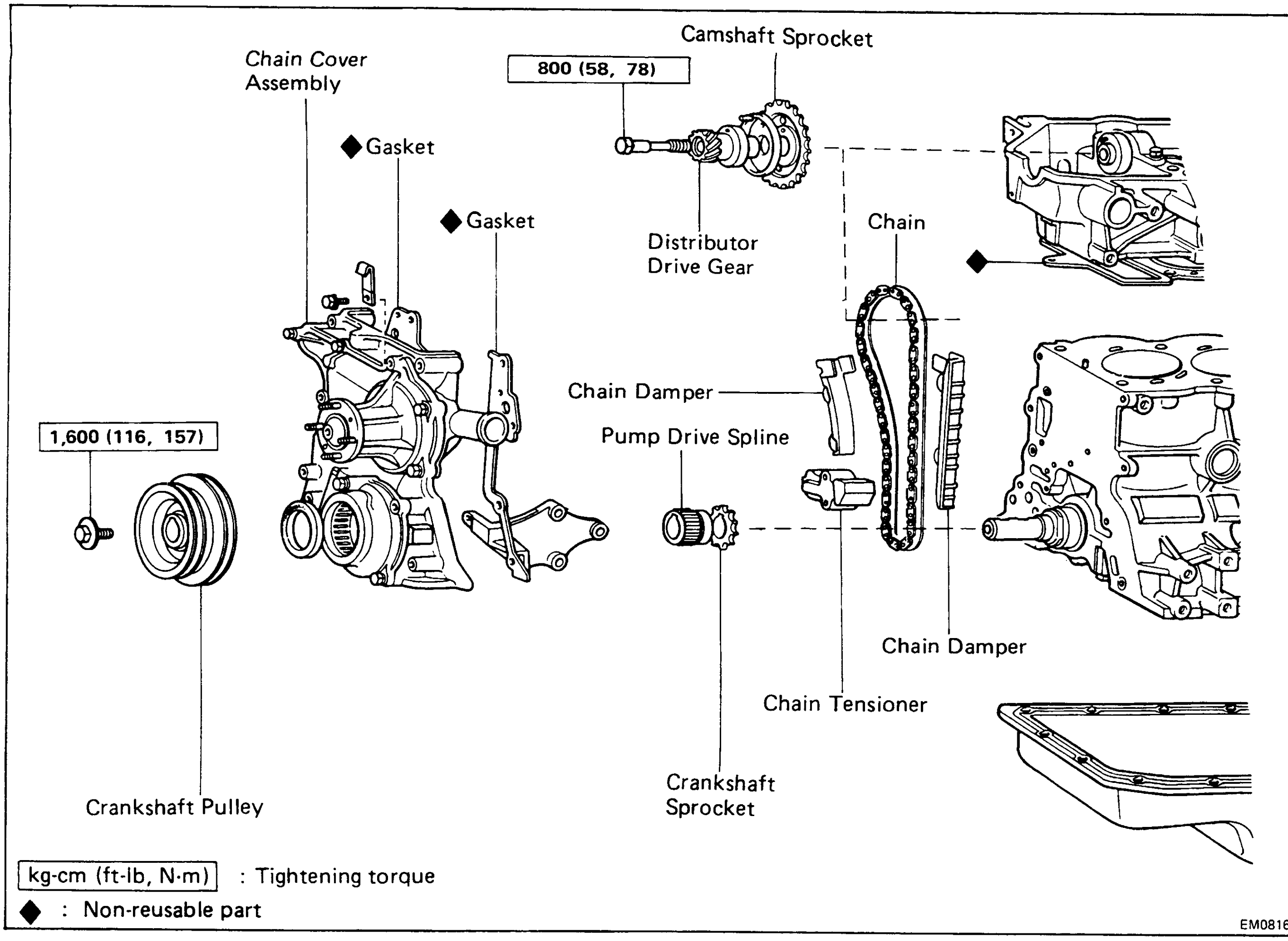
17. RECHECK COOLANT AND ENGINE OIL LEVEL

18. ROAD TEST

Perform a road test.

TIMING CHAIN

COMPONENTS



PREPARATION OF REMOVAL

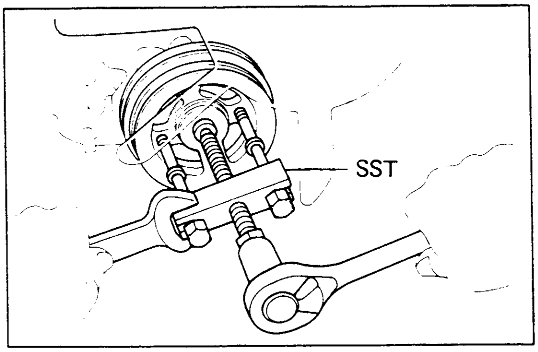
1. **REMOVE CYLINDER HEAD**
   (22R-E See page EM-13)
   (22R See page EM-33)

2. **REMOVE RADIATOR**
   (See page CO-6)

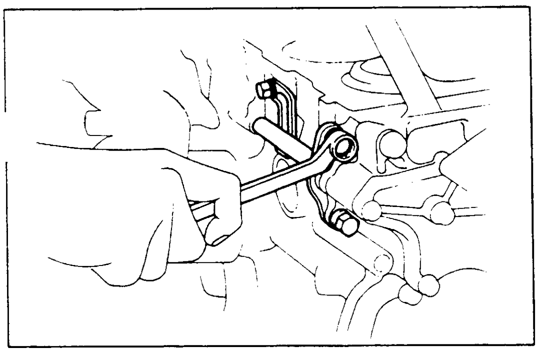
3. **REMOVE OIL PAN (ON VEHICLE)**
   (a) Remove the engine undercover.
   (b) Remove the engine mounting bolts.
   (c) Place a jack under the transmission and raise the engine about 25 mm (0.98 in.).
   (d) Remove the fifteen bolts, three nuts, oil pan.

REMOVAL OF TIMING CHAIN

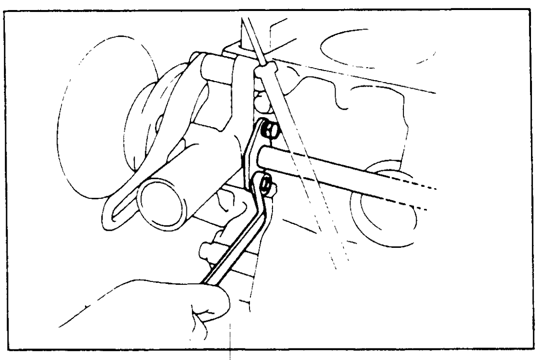
1. **REMOVE DRIVE BELTS**
   (a) Loosen the belt adjusting bolt and pivot bolt of the alternator.
   (b) Remove the two belts.



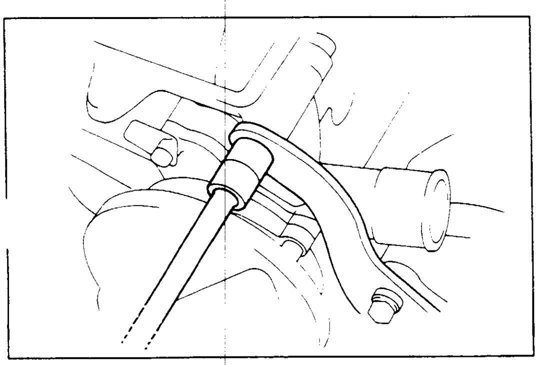
2. **REMOVE CRANKSHAFT PULLEY**
   (a) Remove the pulley center bolt.
   (b) Using SST, remove the pulley.
   SST 09213-31021
   NOTE: If the front seal is to be replaced, see page LU-5.



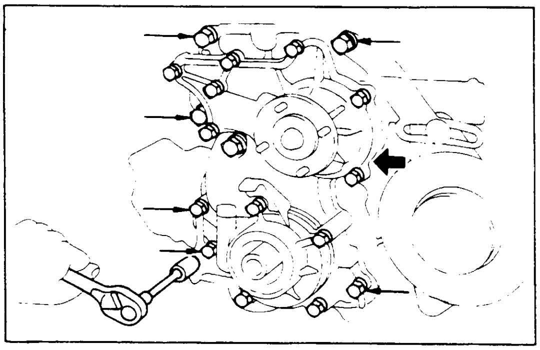
3. **REMOVE WATER BY-PASS TUBE**
   Remove the three bolts.



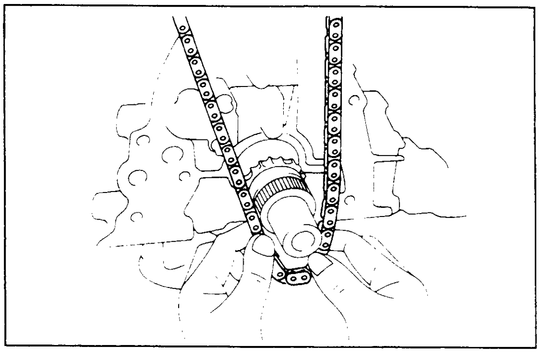
4. **REMOVE HEATER TUBE**
   Remove the two bolts.



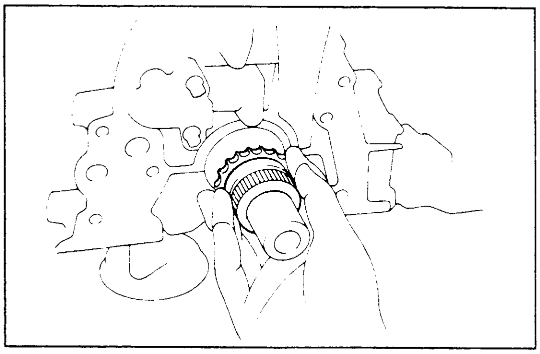
5. **REMOVE BOLT HOLDING ALTERNATOR ADJUSTER BRACKET**
   Remove the bolt holding the alternator adjuster bracket to the chain cover. Move the bracket toward the alternator.



6. **REMOVE CHAIN COVER ASSEMBLY**
   (a) Remove six timing chain cover bolts shown by the arrows.
   (b) Using a plastic faced hammer, loosen the chain cover and remove it.



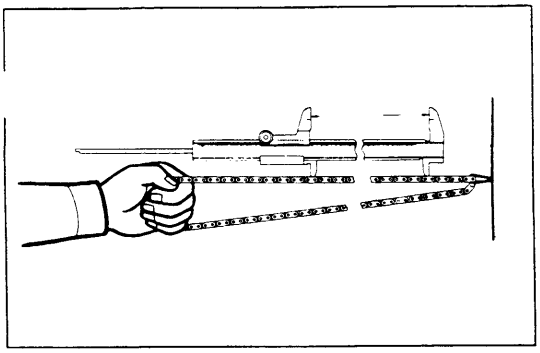
7. **REMOVE CHAIN AND CAMSHAFT SPROCKET**
   (a) Remove the chain from the damper.
   (b) Remove the cam sprocket and chain together.



8. **REMOVE PUMP DRIVE SPLINE AND CRANKSHAFT SPROCKET**
   If the pump drive and sprocket cannot be removed by hand, use SST to remove them together.
   SST 09213-36020

9. **REMOVE GASKET MATERIAL ON CYLINDER BLOCK**

INSPECTION OF COMPONENTS



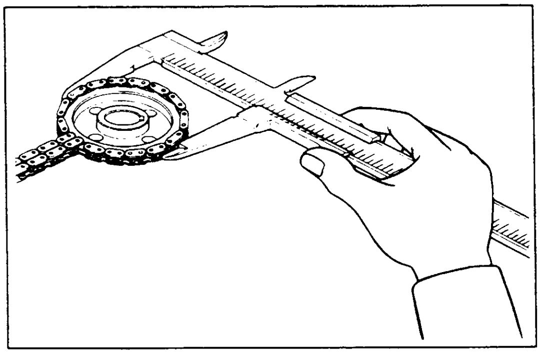
1. MEASURE CHAIN AND SPROCKET WEAR

(a) Measure the length of 17 links with the chain fully stretched.

(b) Make the same measurements at least three other places selected at random.

If over the limit at any one place, replace the chain.

Chain elongation limit at 17 links: 147.0 mm (5.787 in.)

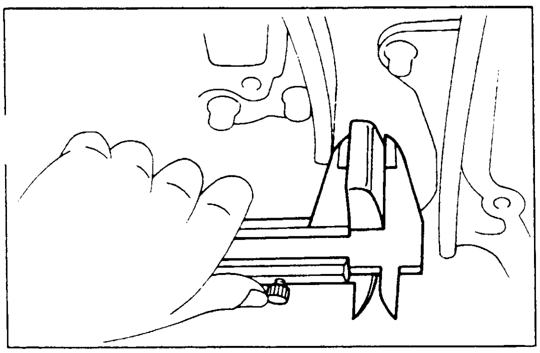


(c) Wrap the chain around the sprocket.

(d) Using a vernier caliper, measure the outer sides of the chain rollers as shown. Measure both sprockets.

If the measurement is less than the minimum, replace the chain and two sprockets.

Crankshaft sprocket minimum: 59.4 mm (2.339 in.)
Camshaft sprocket minimum: 113.8 mm (4.480 in.)

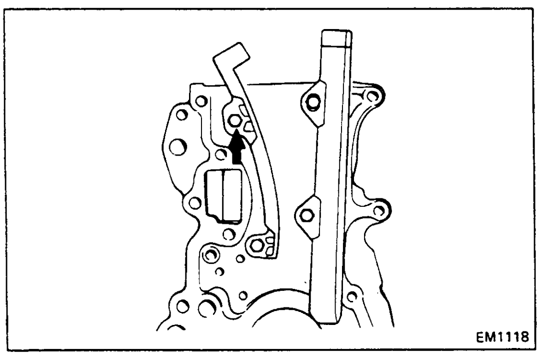


2. MEASURE CHAIN TENSIONER

Using a vernier caliper, measure the tensioner as shown.

If the tensioner is worn or less than the minimum, replace the chain tensioner.

Tensioner minimum: 11.0 mm (0.433 in.)



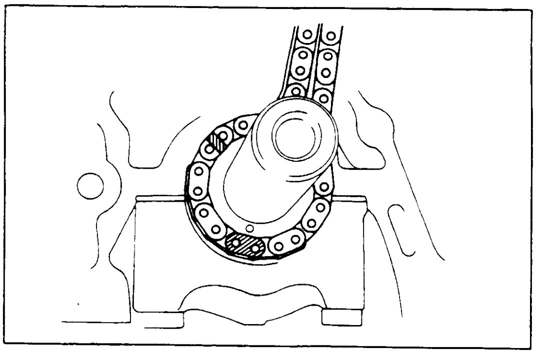
3. MEASURE CHAIN DAMPERS

(a) Using a micrometer, measure each damper.

Damper wear limit: 0.5 mm (0.020 in.)

If either damper is worn or less than the minimum, replace the damper as follows:

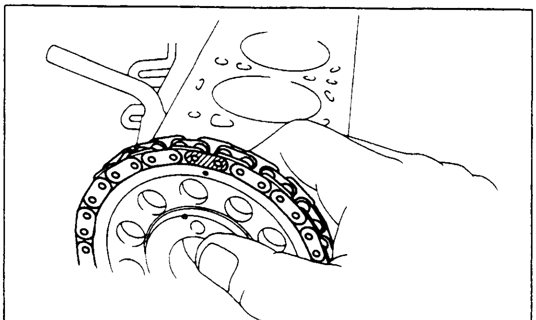
(b) Tighten down the new damper bolts as shown.



INSTALLATION OF TIMING CHAIN

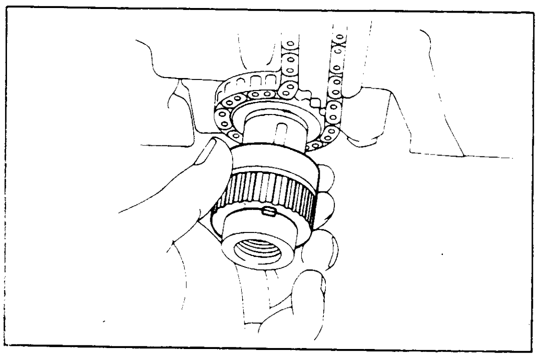
(See page EM-40)

1. **INSTALL CRANKSHAFT SPROCKET AND CHAIN**
   (a) Turn the crankshaft until the shaft key is on top.
   (b) Slide the sprocket over the key on the crankshaft.
   (c) Place the timing chain on the sprocket with the single bright link aligned with the timing mark on the sprocket.

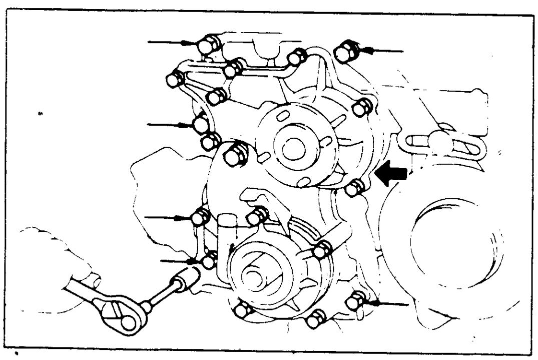


EM1119

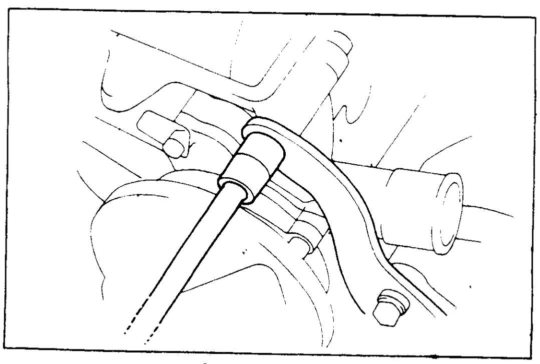
2. **PLACE CHAIN ON CAMSHAFT SPROCKET**
   (a) Place the timing chain on the sprocket so that the timing mark is bright chain links.
   (b) Make sure the chain is positioned between the two dampers.
   (c) Turn the camshaft sprocket counterclockwise to take the slack out of the chain.



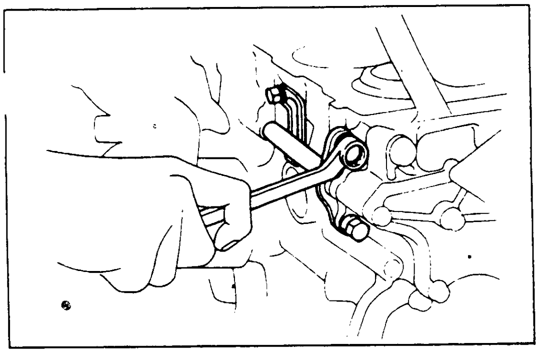
3. **INSTALL OIL PUMP DRIVE SPLINE**
   Slide the oil pump drive spline over the crankshaft key.



4. **INSTALL TIMING CHAIN COVER ASSEMBLY**
   (a) Remove the old cover gaskets. Clean the gasket surface. Install new gaskets over the dowels.
   (b) Slide the cover assembly over the dowels and pump spline.
   (c) Insert the bolts as shown and torque them.
   Torque:
   8 mm bolt 130 kg-cm (9 ft-lb, 13 N·m)
   10 mm bolt 400 kg-cm (29 ft-lb, 39 N·m)

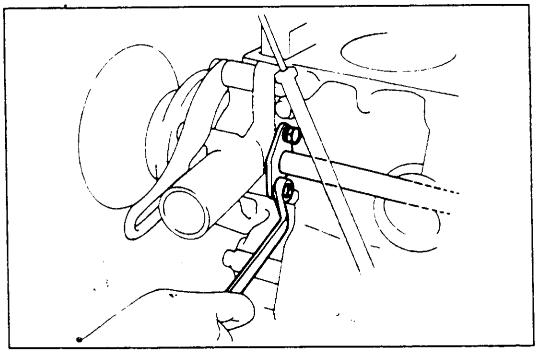


5. **INSTALL BOLT HOLDING ALTERNATOR ADJUSTER BRACKET**
   Install the bolt holding the alternator adjuster bracket to the chain cover.
   Torque the bolt.
   Torque: 130 kg-cm (9 ft-lb, 13 N·m)



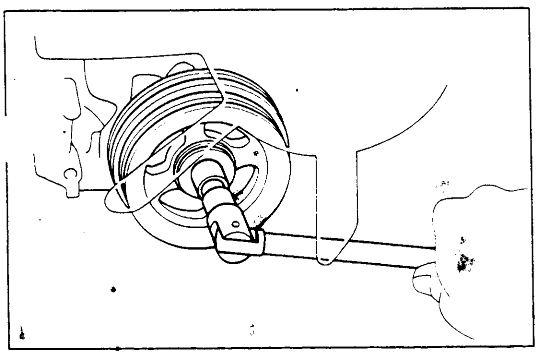
6. **INSTALL WATER BY-PASS TUBE TO CHAIN COVER**

Install the three bolts.



7. **INSTALL HEATER TUBE TO CHAIN COVER**

Install the two bolts.



8. **INSTALL CRANKSHAFT PULLEY**

(a) Install the pulley over the crankshaft key.

CAUTION: Do not turn the crankshaft.

(b) Torque the pulley center bolt.

Torque: 1,600 kg-cm (116 ft-lb, 157 N·m)

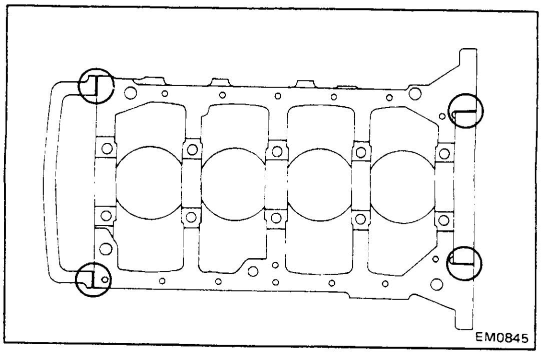
9. **INSTALL DRIVE BELTS**

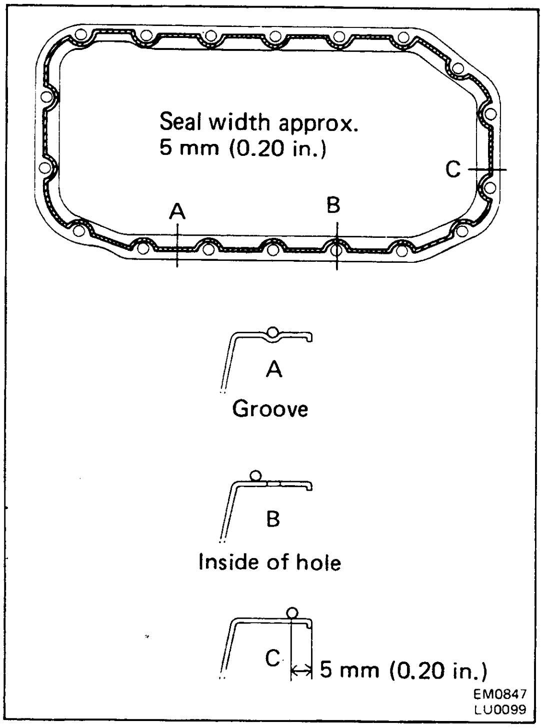
Using a belt tension gauge, check the drive belt tension.

Belt tension gauge:

Nippondenso BTG-20 (95506-00020) or
Borroughs No. BT-33-73F

Drive belt tension: New belt 125 ± 25 lb
Used belt 80 ± 20 lb





10. INSTALL OIL PAN

(a) Remove any old packing material and be careful no to drop any oil on the contacting surfaces of the pan and cylinder block.

- Using a razor blade and gasket scraper, remove all the packing (FIPG) material from the gasket surfaces.
- Thoroughly clean all components to remove all the loose material.
- Clean both sealing surfaces with a non-residue solvent.

CAUTION: Do not use a solvent which will affect the painted surfaces.

(b) Apply liquid sealer to the joint part of the cylinder block and chain cover, cylinder block and rear oil seal retainer.

(c) Apply No. 102 seal packing (Part No. 08826-00080 or equivalent to the oil pan as shown in the figure.

- Install a nozzle that has been cut to a 5-mm (0.20 in.) opening.

NOTE: Avoid applying an excess amount to the surface. Be especially careful near oil passages.

- Parts must be assembled within 5 minutes of application. Otherwise, the material must be removed and re-applied.
- Immediately remove nozzle from tube and reinstall cap.

(d) Install the oil pan over the studs on the block with sixteen bolts and two nuts. Torque the bolts and nuts.

Torque: 130 kg-cm (9 ft-lb, 13 N·m)

(e) Lower the engine and install the engine mounting bolts.

(f) Intall the engine under cover.

POST INSTALLATION

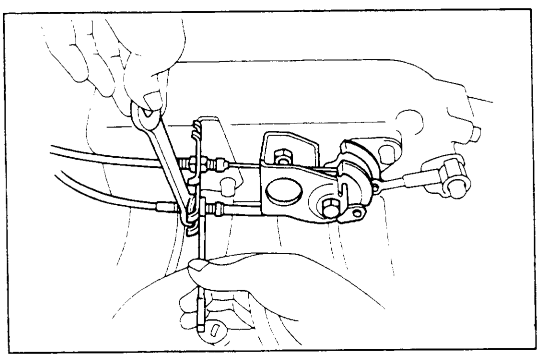
11. INSTALL RADIATOR (See page CO-12)

12. INSTALL CYLINDER HEAD
(22R-E See page EM-25)
(22R See page EM-36)

22R-E CYLINDER BLOCK

PREPARATION FOR REMOVAL

1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**
2. **REMOVE ENGINE UNDER COVER**
3. **REMOVE ENGINE HOOD**
   Disconnect the washer hose from the hood.
4. **DRAIN COOLANT FROM RADIATOR AND CYLINDER BLOCK**
5. **DRAIN AUTOMATIC TRANSMISSION FLUID (with A/T)**
6. **REMOVE AIR CLEANER HOSE AND AIR CLEANER**
7. **REMOVE COUPLING FAN WITH FAN**
8. **REMOVE TWO HEATER HOSES**
9. **REMOVE RADIATOR WITH SHROUD**
   (a) Disconnect the two cooler hoses. (with A/T)
   (b) Disconnect the radiator upper and lower hoses from the engine.
   (c) Disconnect the reservoir hose.
   (d). Remove the radiator with the shroud.



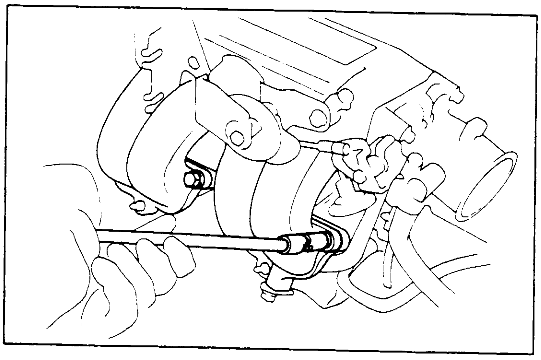
10. **DISCONNECT CABLES FROM BRACKET**
    Disconnect the accelerator cable and throttle cable for A/T from the bracket.
11. **DISCONNECT FOLLOWING PARTS:**
    (a) PCV hose No.1 and No.2
    (b) Brake booster hose
    (c) Air control valve hoses
    (d) EVAP hose (from canister)
    (e) Actuater hose (with cruise control)
    (f) EGR vacuum modulator hose
    (g) Air valve hose No.1 from the throttle body
    (h) Air valve hose No.2 from the chamber
    (i) Water by-pass hose No.2 and No.3 from the throttle body
    (j) Air control valve hose for the actuator
    (k) Pressure regulator hose from the chamber
    (l) Cold start injection pipe
    (m) BVSV hoses

12. DISCONNECT FOLLOWING WIRES:

(a) Cold start injection wire

(b) Throttle position sensor wire

(c) Air valve wire



13. REMOVE CHAMBER WITH THROTTLE BODY

(a) Remove the two bolts holding the EGR valve to the chamber.

(b) Disconnect the chamber from the stay.

(c) Remove the bolts and nuts holding the chamber to the intake manifold.

(d) Remove the chamber with the throttle body.

14. DISCONNECT FOLLOWING WIRES:

(a) Cold start injector time switch wire

(b) Water thermo sensor wire

(c) OD thermo switch wire (with A/T)

(d) Injector wires

(e) Thermo sensor wire

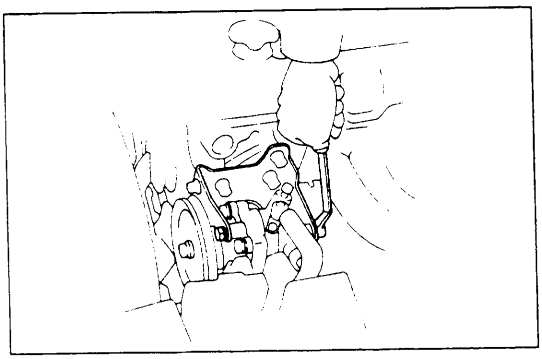
(f) Vacuum switch wire

(g) Oil pressure switch wire

(h) Starter wire

REMOVAL OF CYLINDER BLOCK

1. **DISCONNECT FOLLOWING PARTS:**
   (a) Alternator wires
   (b) High-tension cord for ignition coil
   (c) Distributor wire from igniter
   (d) Ox sensor wire



2. **IF VEHICLE HAS POWER STEERING, REMOVE VANE PUMP FROM BRACKET**
   (a) Remove the drive belt.
   (b) Remove the four bolts.
   (c) Remove the vane pump.
   NOTE: Lay the vane pump to one side without disconnecting the hoses.

3. **DISCONNECT BOND CABLE FROM VANE PUMP BRACKET**

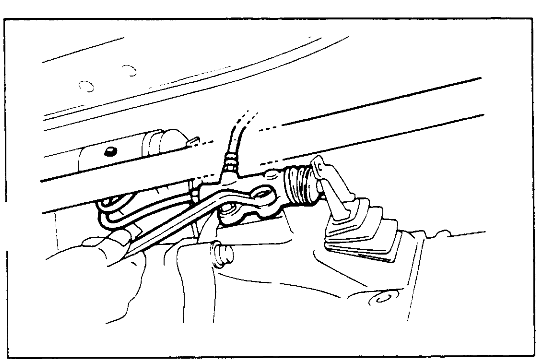
4. **REMOVE COMPRESSOR FROM BRACKET (with A/C)**
   (a) Loosen the drive belt adjusting bolt and remove the drive belt.
   (b) Remove the compressor on the front side without disconnecting the hoses.

5. **DISCONNECT BOND CABLES FROM ENGINE REAR SIDE AND RH SIDE**

6. **REMOVE SHIFT LEVER FROM INSIDE OF VEHICLE (with M/T)**

7. **RAISE VEHICLE**
   CAUTION: Be sure the vehicle is securely supported.

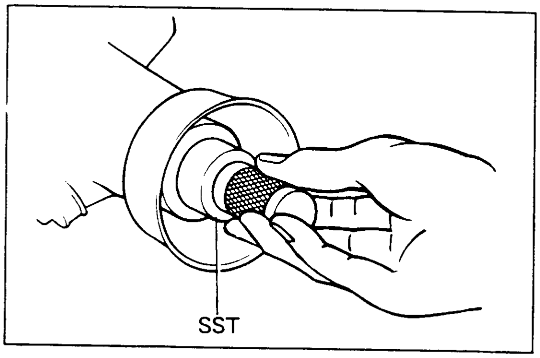
8. **REMOVE EXHAUST PIPE**
   (a) Disconnect the exhaust pipe from the exhaust manifold.
   (b) Remove the exhaust pipe clamp from the clutch housing.
   (c) Remove the exhaust pipe from the catalytic converter.



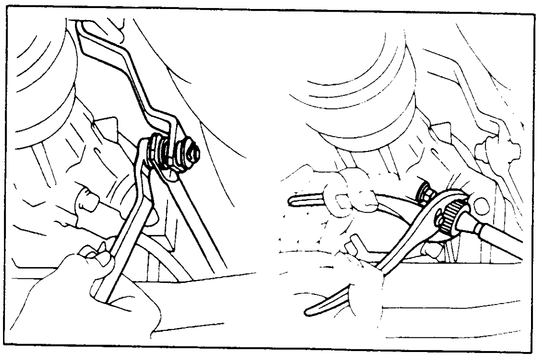
9. **REMOVE CLUTCH RELEASE CYLINDER WITH BRACKET FROM TRANSMISSION (with M/T)**

10. **REMOVE ENGINE MOUNTING BOLTS ON EACH SIDE OF ENGINE**

11. **DISCONNECT FOLLOWING PARTS:**
    (a) Oil pressure sender gauge wire
    (b) Neutral start switch wire (with A/T)
    (c) Back-up light switch wire
    (d) Fuel hose



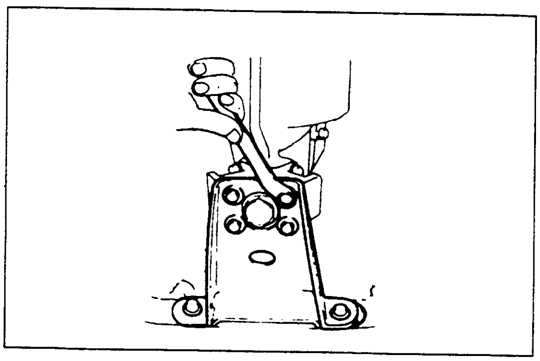
12. **REMOVE INTERMEDIATE SHAFT**
    (a) Put alignment marks on the flanges.
    (b) Remove the four bolts and nuts.
    (c) Remove the two bolts holding the center support bearing to the body.
    (d) Pull the sleeve yoke from the transmission.
    (e) Insert SST in the transmission to prevent oil leakage.
    SST 09325-20010



13. **DISCONNECT SHIFT LINKAGE FROM SHIFT LEVER (with A/T)**

14. **DISCONNECT SPEEDOMETER CABLE**
    CAUTION: Do not lose the felt dust protector and washers.

15. **PLACE JACK UNDER TRANSMISSION**
    Be sure to put a wooden block between the jack and the transmission pan.

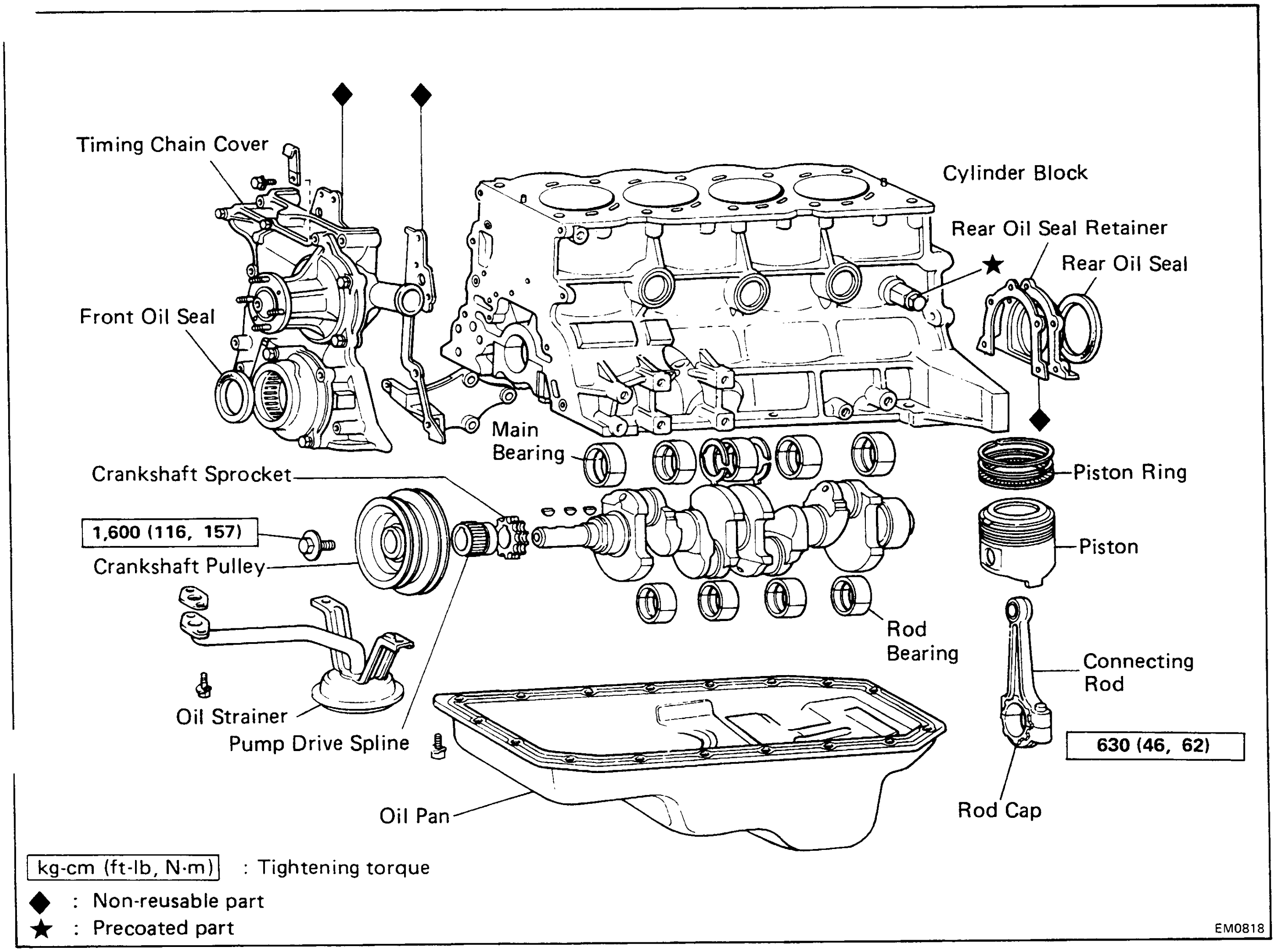


16. **REMOVE ENGINE REAR MOUNTING BRACKET**
    (a) Remove the four bolts holding the bracket to the member.
    (b) Remove the four bolts holding the bracket to the transmission and remove the bracket.

17. **REMOVE ENGINE WITH TRANSMISSION FROM VEHICLE**
    (a) Attach the engine hoist chain to the lift brackets of the engine.
    (b) Lift the engine out of the vehicle slowly and carefully.
    NOTE: Make sure the engine is clear of all wiring and hoses.

18. **REMOVE TRANSMISSION FROM ENGINE**
    (a) Remove the starter.
    (b) Remove the two stiffener plates and exhaust pipe bracket from engine.
    (c) Remove the transmission from the engine.

COMPONENTS



PREPARATION FOR DISASSEMBLY

1. **REMOVE CLUTCH COVER AND DISC FOR M/T (See page CL-7)**
2. **REMOVE FLYWHEEL OR DRIVE PLATE AND REAR END PLATE**
3. **INSTALL ENGINE STAND FOR DISASSEMBLY**
4. **REMOVE CYLINDER HEAD (See page EM-15)**
5. **REMOVE OIL PAN**

   Remove the sixteen bolts and two nuts, and then remove the oil pan and gasket.
6. **REMOVE TIMING CHAIN (See page EM-41)**
7. **REMOVE ALTERNATOR (See page CH-6)**

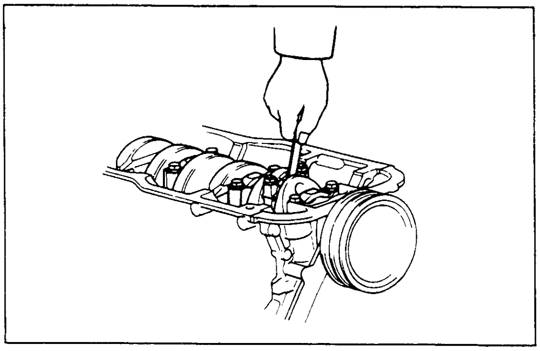
DISASSEMBLY OF CYLINDER BLOCK

1. **REMOVE OIL STRAINER**

   Remove the four bolts holding the oil strainer.

2. **REMOVE REAR OIL SEAL RETAINER**

   Remove the five bolts, rear oil seal retainer and gasket.

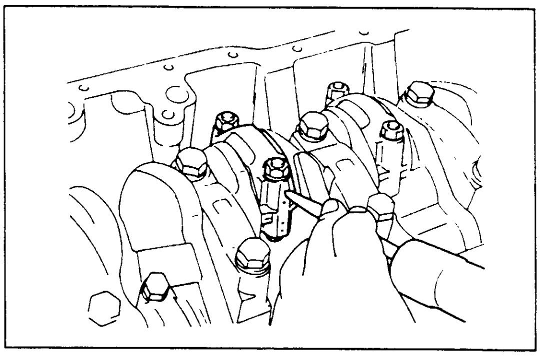


3. **MEASURE CONNECTING ROD THRUST CLEARANCE**

   Using a feeler gauge, measure the rod thrust clearance.

   If clearance is greater than the maximum, replace the connecting rod.

   Rod thrust maximum clearance: 0.30 mm (0.0118 in.)

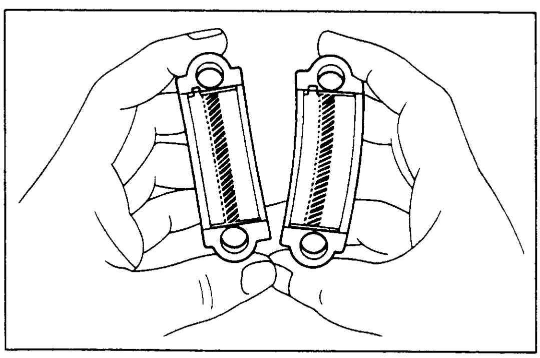


4. **REMOVE CONNECTING ROD CAPS AND MEASURE OIL CLEARANCE**

   (a) Using a punch or numbering stamp, mark the connecting rods and caps to ensure correct reassemb'

   (b) Remove the rod caps.

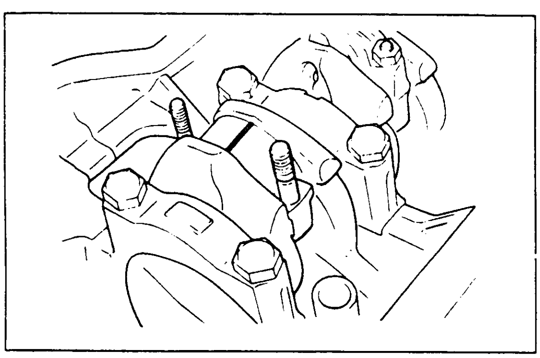
   Remove the rod cap nuts. Using a plastic hammer, tap the rod bolts lightly and lift off the rod caps. Keep the bearing inserted with the cap.



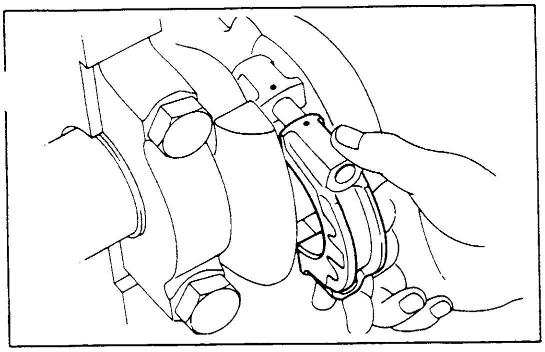
   (c) Clean the bearings and crankshaft pins.

   (d) Inspect each bearing for pitting and radial scratches.

   If bearings are damaged, replace them.



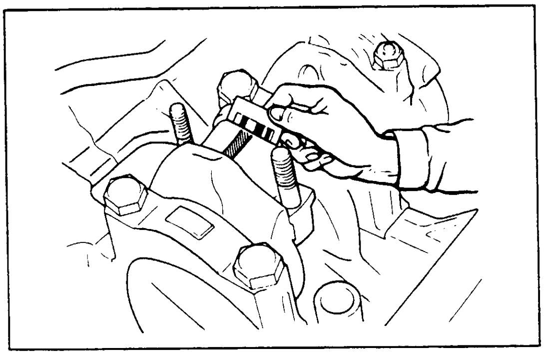
   (e) Lay a strip of Plastigage across the crankshaft pin.



(f) Align the rod and cap marks and fit on the cap. Torque the rod cap nuts.

Torque: 630 kg-cm (46 ft-lb, 62 N·m)

NOTE: Do not turn the crankshaft.



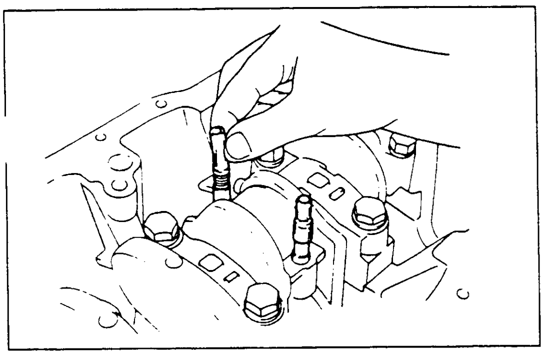
(g) Remove the rod cap.

(h) Measure the plastigage at its widest point.

If the clearance is greater than the maximum, replace the bearings and/or grind the crank pins.

Maximum clearance: 0.10 mm (0.0039 in.)
Standard clearance: 0.025 – 0.055 mm (0.0010 – 0.0022 in.)

(i) Clean out the pieces of plastigage from the bearings and journals.

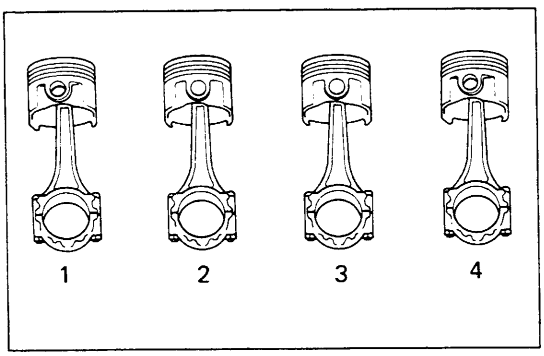


5. PUSH OUT PISTON AND CONNECTING ROD ASSEMBLY

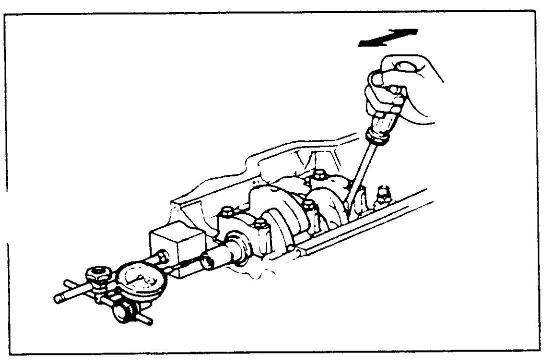
(a) Remove all carbon from the top of the cylinders.

(b) Cover the rod bolts with a short piece of hose to protect the crankshaft from damage.

(c) Push the piston and connecting rod assembly out through the top of the cylinder block.



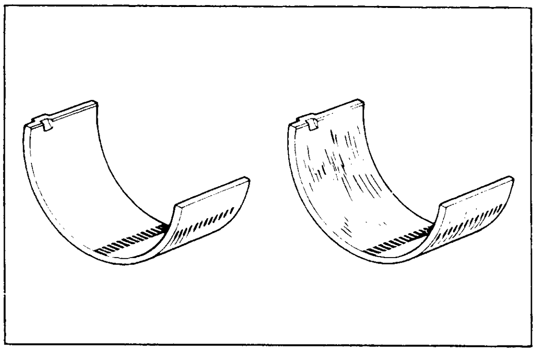
(d) Arrange the piston and connecting rod caps in order.



6. MEASURE CRANKSHAFT THRUST CLEARANCE

Using a dial indicator, measure the clearance at the center bearing. If it exceeds the maximum clearance, replace the thrust washer as a set.

Maximum clearance: 0.30 mm (0.0118 in.)
Standard clearance: 0.02 – 0.22 mm (0.0008 – 0.0087 in.)



7. REMOVE MAIN BEARING CAPS AND MEASURE OIL CLEARANCE

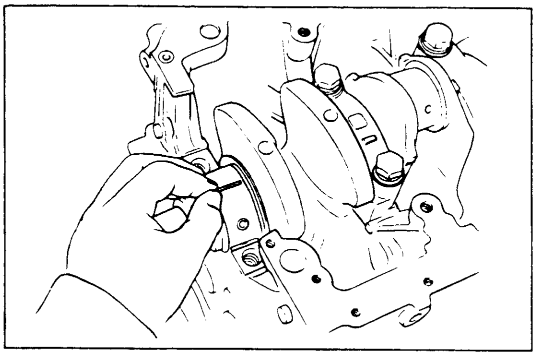
(a) Remove the main bearing caps by removing two bc

(b) Lift out the crankshaft and remove the upper main bearings from the cylinder block.

(c) Clean the bearing and main journals.

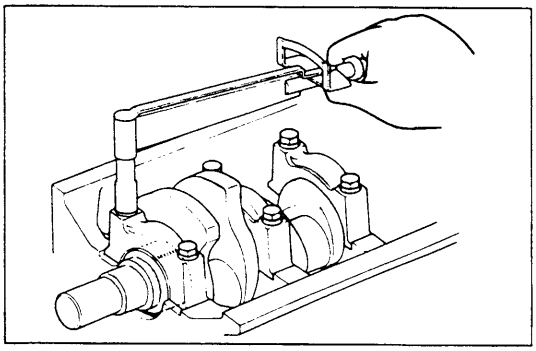
Inspect each bearing for pitting and radial scratches.

If bearings are damaged, replace them.



(d) Install the upper main bearings on the cylinder block and crankshaft.

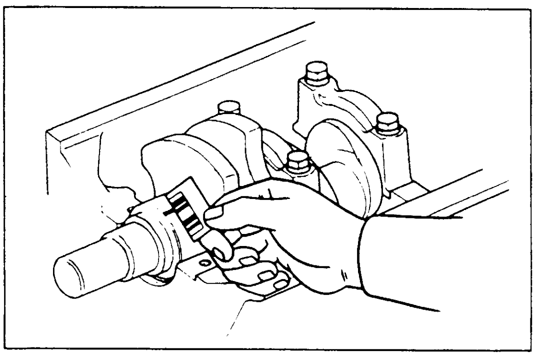
(e) Lay a strip of plastigage across the main journals.



(f) Install the main bearing caps. Torque the cap bolts.

Torque: 1,050 kg-cm (76 ft-lb, 103 N·m)

NOTE: Do not turn the crankshaft.



(g) Remove the main bearing caps.

(h) Measure the plastigage at its widest point.

If the clearance is greater than the maximum, replace the bearings and/or grind the main journals.

Maximum clearance: 0.08 mm (0.0031 in.)
Standard clearance: 0.025 – 0.055 mm (0.0010 – 0.0022 in.)

(i) Clean out the pieces of plastigage from the bearings and journals.

8. REMOVE CRANKSHAFT

(a) Lift out the crankshaft.

(b) Remove the upper main bearings from the cylinder block.

(c) Arrange the caps and bearings in order.

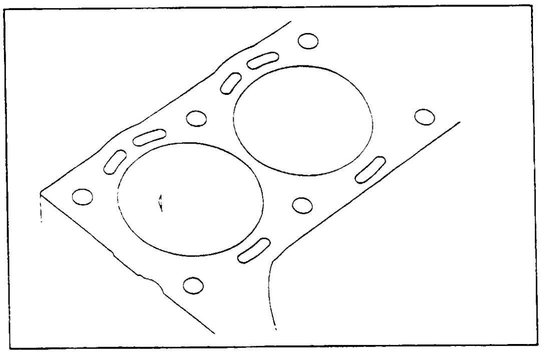
INSPECTION OF CYLINDER BLOCK

1. REMOVE GASKET MATERIAL

Using a gasket scraper, remove all gasket material from cylinder block surfaces.

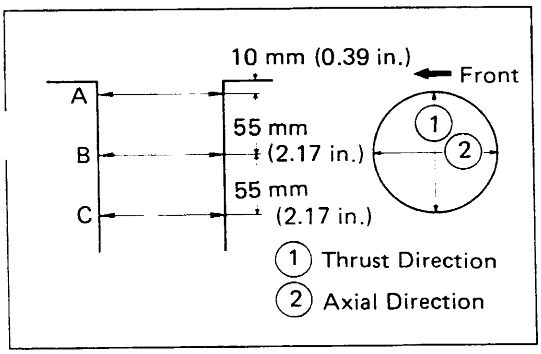
2. CLEAN CYLINDER BLOCK

Using a soft brush and solvent, clean the block.



3. INSPECT CYLINDERS

Visually inspect cylinders for vertical scratches. If deep scratches are present, rebore all four cylinders.



4. MEASURE CYLINDER BORE

Using a cylinder micrometer, measure the cylinder bore at positions A, B and C in the thrust and axial directions. If any of the following measurements is not within specifications rebore all four cylinders.

(a) Cylinder diameter greater than maximum.

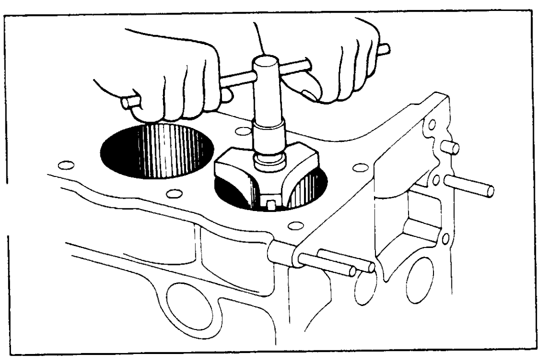
Standard size piston
Maximum diameter: 92.03 mm (3.6232 in.)
Oversized piston (O/S 0.50)
Maximum diameter: 92.53 mm (3.6429 in.)
Oversized piston (O/S 1.00)
Maximum diameter: 93.03 mm (3.6626 in.)

(b) Difference between measurements A, B and C is greater than the taper limit.

Taper limit: 0.01 mm (0.0004 in.)

(c) Difference between the thrust and axial measurements is greater than the out-of-round limit.

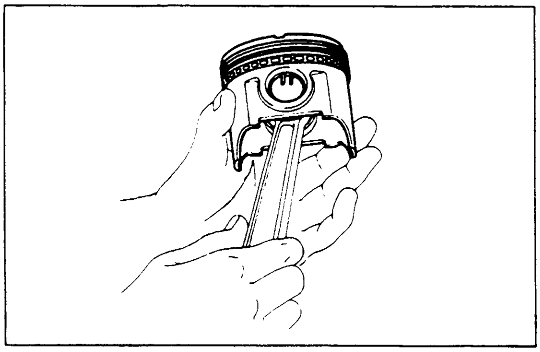
Out-of-round limit: 0.02 mm (0.0008 in.)



5. REMOVE CYLINDER RIDGE

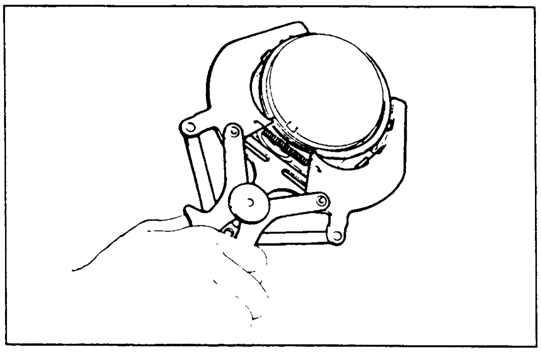
If wear is less than 0.2 mm (0.008 in.), use a ridge reamer to machine the top of the cylinders.

DISASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLY



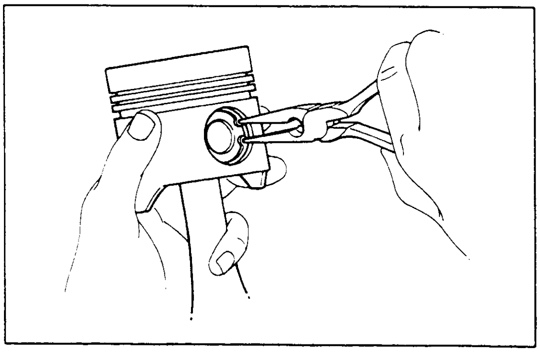
1. CHECK FIT BETWEEN PISTON AND PIN

Try to move the piston back and forth on the piston pin. If any movement is felt, replace the piston and pin.



2. REMOVE PISTON RINGS

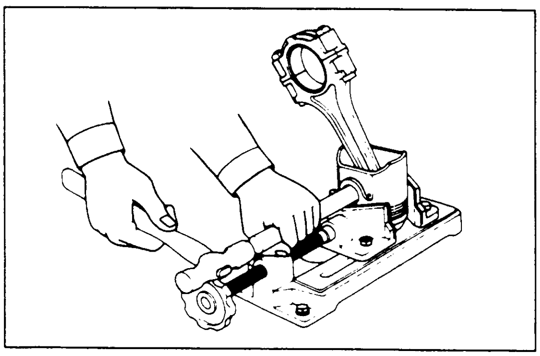
Using a piston ring expander, remove the piston rings. Keep the rings for each cylinder separated.



3. DISCONNECT CONNECTING ROD FROM PISTON

(a) Using needle-nose pliers, remove the snap rings from the piston.

(b) Heat the piston in hot water to about 80°C (176°F).

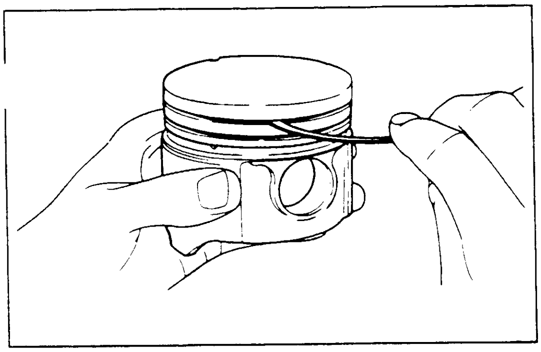


(c) Using a hammer and driver, tap the pin lightly to remove the pin from the piston.

NOTE:

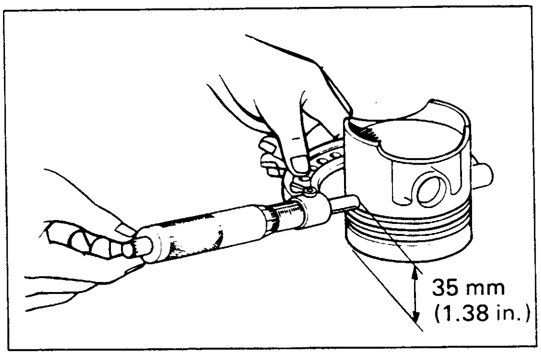
- The piston and pin are a matched set.
- Keep the piston, piston pin and rings and connecting rod together for each cylinder.

INSPECTION OF PISTON AND CONNECTING ROD ASSEMBLY



1. **CLEAN PISTON**
   (a) Scrape off carbon from the piston top.
   (b) Using a groove cleaning tool or broken ring, clean the ring grooves.
   (c) Using solvent and a brush,clean the piston thoroughly.

CAUTION: Do not use a wire brush.



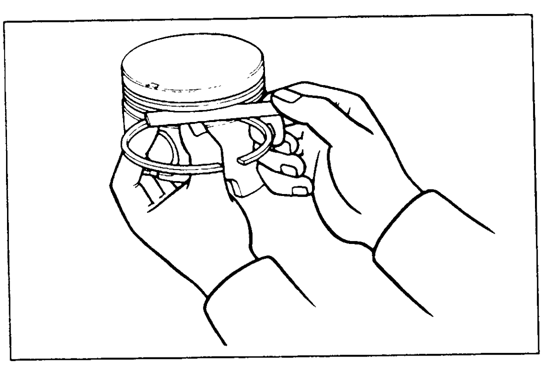
2. **MEASURE PISTON DIAMETER**
   (a) Using a micrometer, measure the piston diameter as shown.

Standard diameter: 91.960 – 91.990 mm (3.6205 – 3.6216 in.)

   (b) Check that the difference between the cylinder diameter and the piston diameter is within specification.

If not within specification, replace the piston and/or rebore the cylinder.

Piston clearance: 0.02 – 0.04 mm (0.0008 – 0.0016 in.)

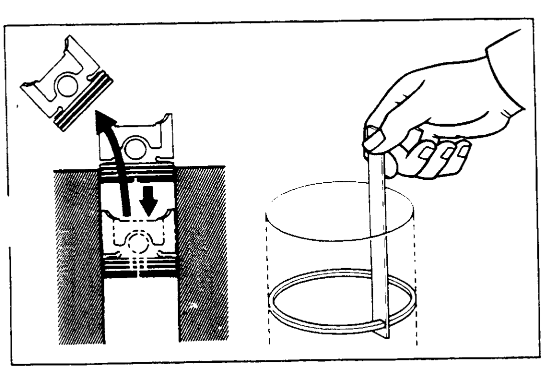


3. **MEASURE CLEARANCE BETWEEN PISTON GROOVE AND PISTON RING**

Using a feeler gauge, measure the clearance between the piston ring and the ring land.

If the clearance is greater than the maximum, replace the piston.

Maximum clearance between compression ring No.1 or 2 and ring land: 0.2 mm (0.008 in.)



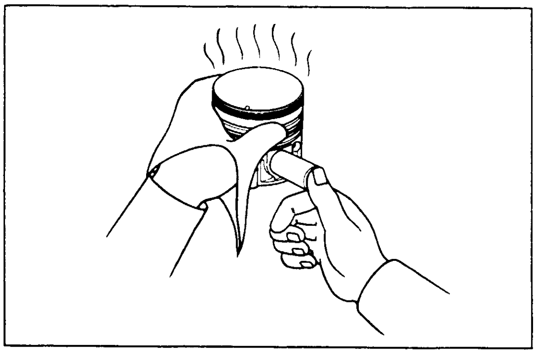
4. **MEASURE RING END GAP**

Measure the ring end gap.
   (a) Insert the piston ring into the cylinder.
   (b) Using a piston, push the ring to the bottom of the ring travel.
   (c) Using a feeler gauge, measure the end gap.

If not within specification, replace the ring. Do not file the ring end.

Ring end gap:

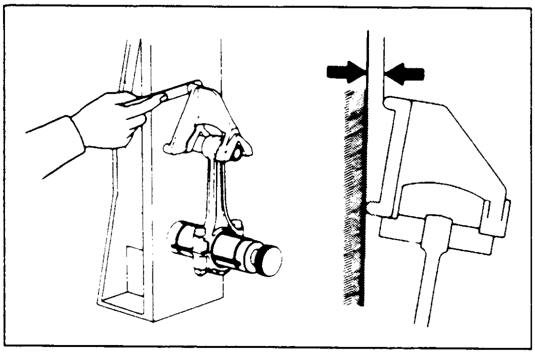
Standard	**No.1**	**0.24–0.39 mm (0.009–0.015 in.)**
	No.2	**0.18–0.42 mm (0.007–0.017 in.)**
	Oil	**0.20–0.82 mm (0.008–0.032 in.)**
Maximum	**No.1**	**0.99 mm (0.039 in.)**
	No.2	**1.02 mm (0.040 in.)**
	Oil	**1.42 mm (0.056 in.)**



5. **INSPECT PISTON PIN FIT**

At 80°C (176°F), you should be able to push the pin into the piston with your thumb.

If the pin can be installed at a lower temperature, replace it and the piston.



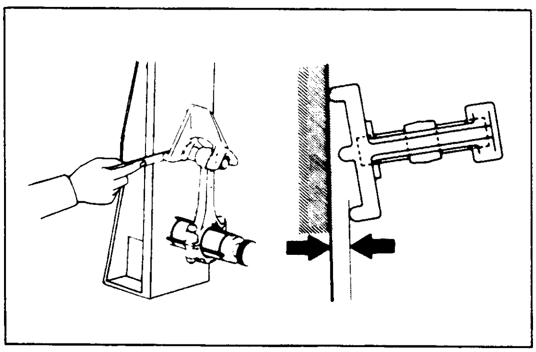
6. **INSPECT CONNECTING RODS**

(a) Using a rod aligner, check the connecting rod alignment.

If the rod is bent or twisted, replace the connecting rod.

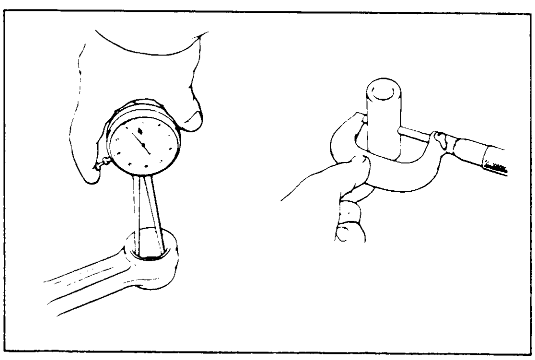
- Check that the rod is not bent.

Bend limit: **0.05 mm (0.0020 in.) per 100 mm (3.94 in.)**



- Check that the rod is not twisted.

Twist limit: **0.15 mm (0.0059 in.) per 100 mm (3.94 in.)**



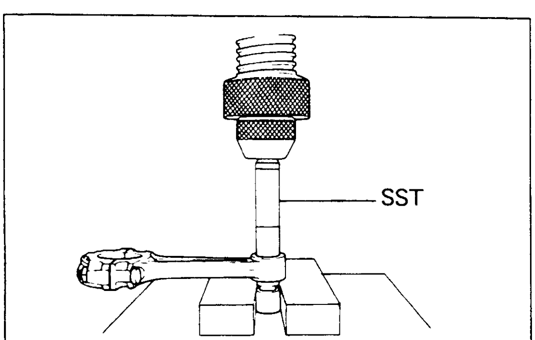
(b) Measure the oil clearance between the rod bushing and piston pin.

- Using an inside dial indicator, measure the inside diameter of the rod bushing.
- Using a micrometer, measure the diameter of the piston pin.
- Check that the difference between the measurements is less than the oil clearance limit.

If the clearance is greater than the limit, replace the rod bushing.

Oil clearance limit: 0.015 mm (0.0006 in.)

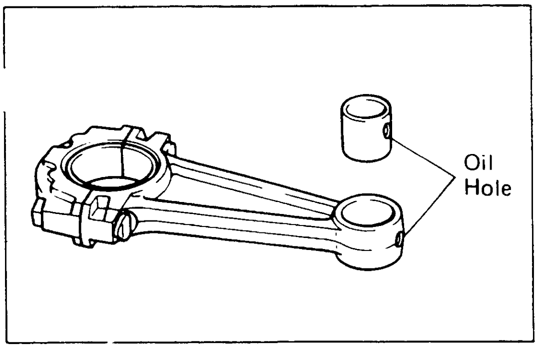
REPLACEMENT OF ROD BUSHING



1. **REMOVE ROD BUSHING**

Using SST, remove the rod bushing from the connecting rod.

SST 09222-30010

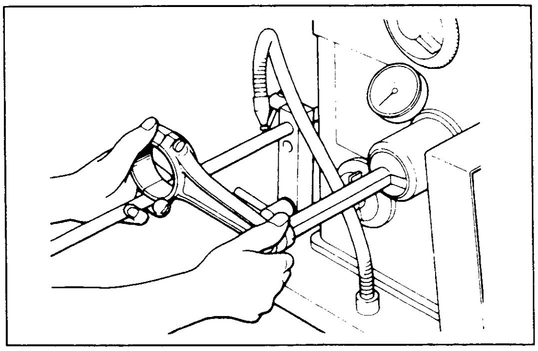


2. **INSTALL NEW ROD BUSHING**

Using SST, install the rod bushing to the connecting rod.

SST 09222-30010

NOTE: Align the bushing oil hole with the connecting rod oil hole.



3. **HONE NEW BUSHING AND CHECK PIN FIT IN CONNECTING ROD**

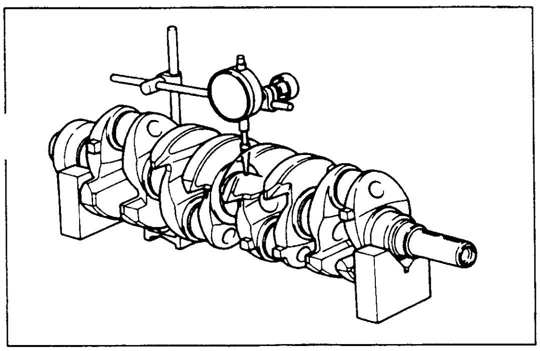
(a) Hone the new bushing and check that the oil clearance is within standard specification.

Oil clearance standard: 0.005 – 0.011 mm (0.0002 – 0.0004 in.)

(b) Check the pin fit at the normal room temperature.

Coat the pin with engine oil and push the pin into the rod with thumb pressure.

INSPECTION AND REPAIR OF CRANKSHAFT



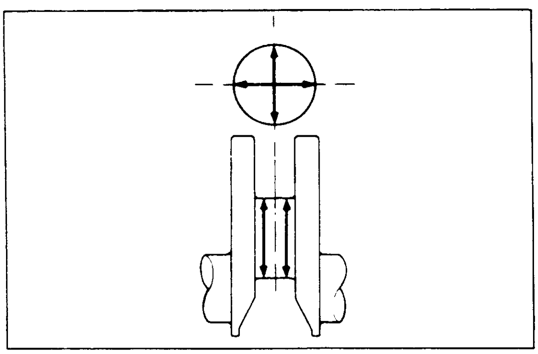
1. **MEASURE CRANKSHAFT**

(a) Place the crankshaft on V-blocks.

(b) Using a runout gauge, measure the runout at the center journal.

If the runout is greater than the maximum, replace the crankshaft.

Circle runout maximum: 0.1 mm (0.004 in.)



(c) Using a micrometer, check the diameter of the main and crank pin journal.

Measure the journals for out-of-round and taper as shown.

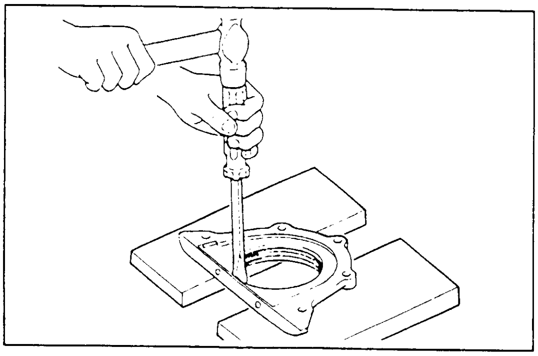
If journals are worn, regrind or replace the crankshaft.

Main journal diameter: 59.984 – 60.000 mm (2.3616 – 2.3622 in.)
Crank pin diameter: 52.988 – 53.000 mm (2.0861 – 2.0866 in.)
Taper and out-of-round limit: 0.01 mm (0.0004 in.)

2. **GRIND CRANK PIN AND/OR MAIN JOURNAL, IF NECESSARY**

Grind the crank pins and/or main journals to the under-sized finished diameter. Install a new pin and/or main under-size bearings.

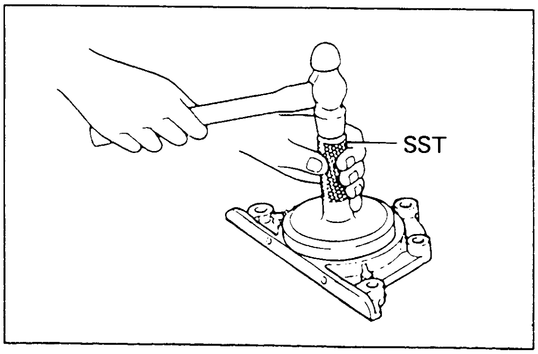
Bearing size (U/S 0.25)
Main journal finished diameter: 59.70 – 59.71 mm (2.3504 – 2.3508 in.)
Crank pin finished diameter: 52.70 – 52.71 mm (2.0748 – 2.0752 in.)
Taper and out-of-round limit: 0.01 mm (0.0004 in.)



REPLACEMENT OF REAR OIL SEAL

1. REMOVE OIL SEAL FROM OIL SEAL RETAINER

Using a screwdriver, remove the oil seal.



2. INSTALL NEW OIL SEAL ON OIL SEAL RETAINER

(a) Using SST, install a new oil seal.

SST 09223-41020

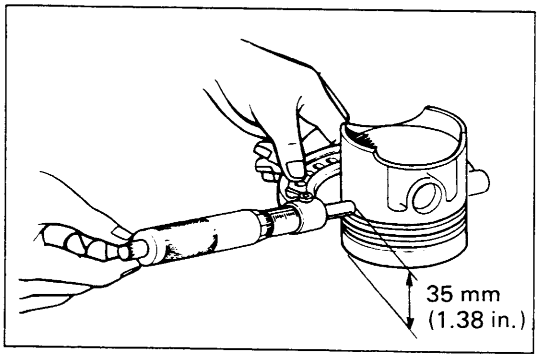
(b) Coat the seal lightly with multipurpose grease.

Size	Outside Diameter mm (in.)
O/S 0.50	92.460 – 92.490 (3.6402 – 3.6413)
O/S 1.00	92.960 – 92.990 (3.6598 – 3.6610)

BORING OF CYLINDERS

1. SELECT OVERSIZED PISTON

O/S pistons with pins are available in the sizes listed. Replace pistons in matched sets. Take the largest bo. measured and select the oversized piston for that bore. Bore all cylinders for the oversized piston selected.



2. CALCULATE DIMENSION TO BORE CYLINDERS

(a) Using a micrometer, measure the piston diameter as shown.

(b) Calculate the size each cylinder is to be rebored as follows:

Size to be rebored = P + C - H
P = piston diameter
C = piston clearance

0.02 – 0.04 mm (0.0008 – 0.0016 in.)

H = allowance for honing

Less than 0.02 mm (0.0008 in.)

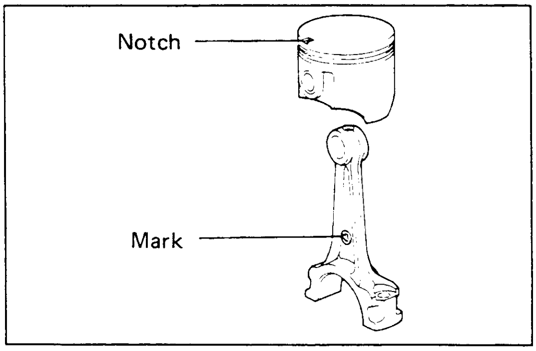
3. BORE AND HONE CYLINDERS TO CALCULATED DIMENSIONS

Honing amount: 0.02 mm (0.0008 in.) maximum

CAUTION: Excess honing will destroy the finished roundness.

GENERAL ASSEMBLY NOTE:

Thoroughly clean all parts to be assembled. Before installing parts, apply new engine oil to all sliding and rotating surfaces.



ASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLY

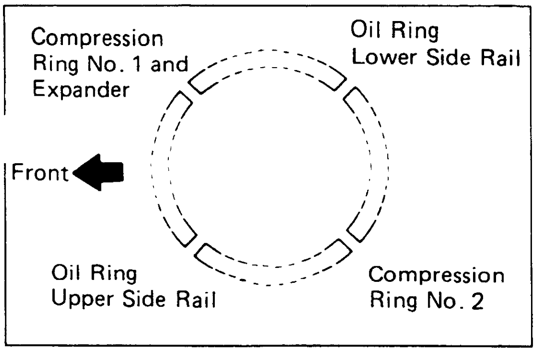
1. ASSEMBLY PISTON AND CONNECTING ROD

(a) Install a new snap ring on one side of the piston pin hole.

(b) Heat the piston in hot water to about 80°C (176°F).

(c) Align the notch on the piston with the mark on the rod and push the piston pin in with your thumb.

(d) Install a new snap ring on the other side of the pin.

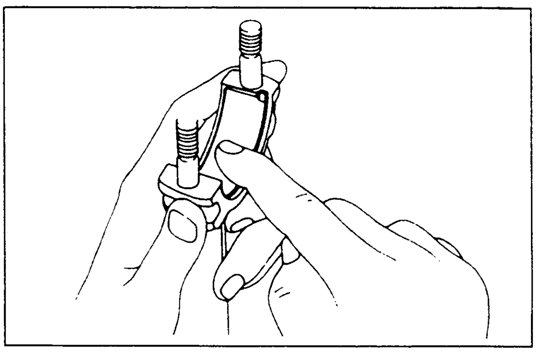


2. PLACE RINGS ON PISTON

(a) Using a ring expander, install the top two compression rings with the code marks facing upward.

(b) Position the piston rings so that the ring end gaps are in the shaded area as shown.

CAUTION: Do not align the end gaps.



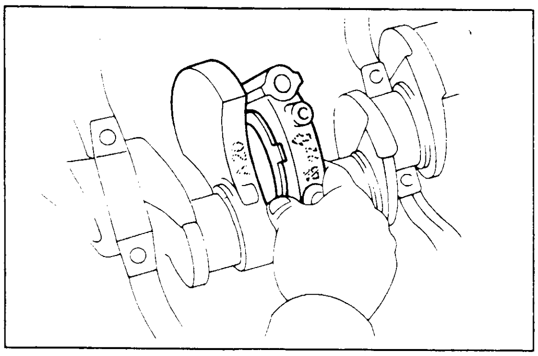
3. INSTALL BEARING INSERTS

(a) Install the bearing inserts in the connecting rods and rod caps.

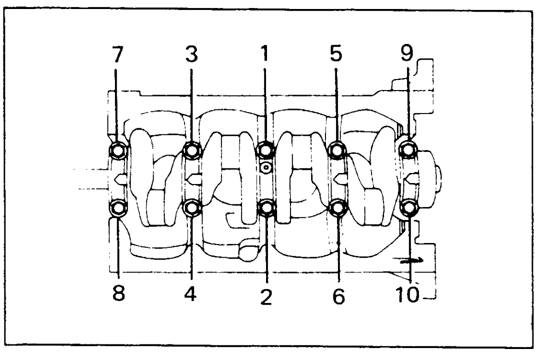
(b) Lubricate the face of the bearings with engine oil.

INSTALLATION OF CRANKSHAFT, PISTON AND CONNECTING ROD ASSEMBLY

1. **INSTALL UPPER MAIN BEARING IN CYLINDER BLOCK**
   (a) Place the upper main bearing in the block.
   (b) Install the upper thrust washers on the center main bearing with the oil grooves facing outward.
   (c) Lubricate the faces of the bearings with engine oil.



2. **PLACE CRANKSHAFT IN CYLINDER BLOCK**
3. **INSTALL MAIN BEARING CAPS**
   NOTE: Each bearing cap is numbered.
   (a) Install thrust washers on bearing cap No.3 with the oil grooves facing out ward.



   (b) Install the bearing caps in numbered order with the arrows facing forward. Tighten the bolts to the specified torque in the sequence shown in two or three passes.

Torque: 1,050 kg-cm (76 ft-lb, 103 N·m)

   (c) Measure the crankshaft thrust. (See step 6 on page EM-53)
   Using a feeler gauge, measure the clearance at the center bearing.
   If the clearance is greater than the maximum, replace the thrust washer.

Maximum clearance: 0.30 mm (0.0118 in.)

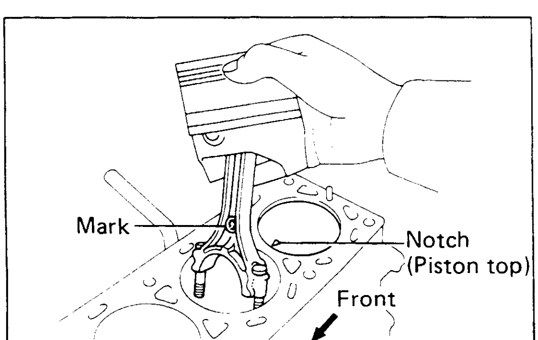
   Select a thrust washer to obtain the standard clearance.

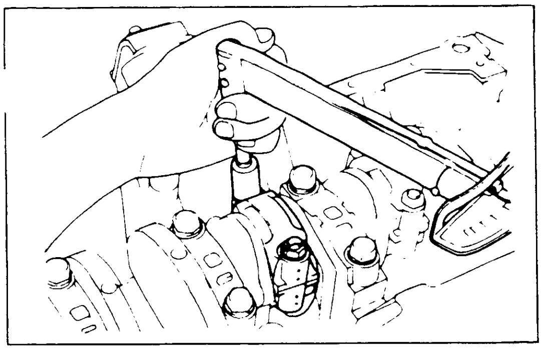
Standard clearance: 0.02 – 0.22 mm (0.0008 – 0.0087 in.)

   (d) Check that the crankshaft turns.

Size	Thickness mm (in.)
STD	2.00 (0.0787)
O/S 0.125	2.06 (0.0811)
O/S 0.250	2.13 (0.0839)

4. **INSTALL PISTON AND CONNECTING ROD ASSEMBLY**
   (a) Lubricate the cylinder bore and rod journal with clean engine oil.
   (b) Using a ring compressor, push the correctly numbered piston and rod assembly into each cylinder. Make sure the notch and mark are facing forward.



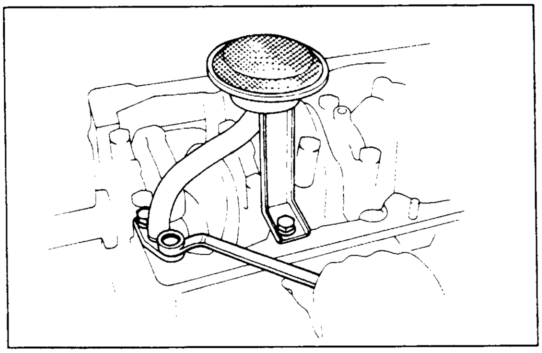


5. **INSTALL ROD BEARING CAPS**
   (a) Match the numbered cap with the numbered rod.
   (b) Align the marks punched on the rod and cap and tighten the cap nuts to specified torque alternately in two or three passes.

   Torque: 630 kg-cm (46 ft-lb, 62 N·m)

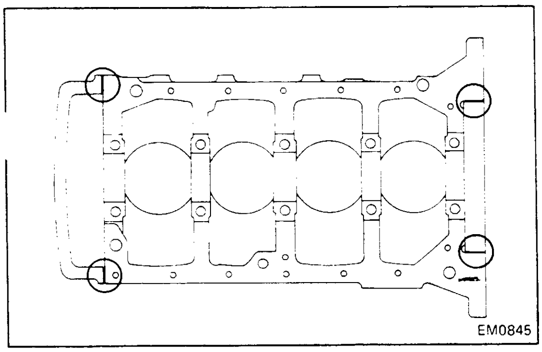
   NOTE: After tightening the caps, check that the crankshaft rotates smoothly.

6. **MEASURE ROD THRUST CLEARANCE (See step 3 on page EM-52)**



7. **INSTALL OIL STRAINER**
   (a) Clean the oil screen.
   (b) Place the oil screen gasket in place and install the oil screen assembly with four bolts. Torque the bolts.

   Torque: 130 kg-cm (9 ft-lb, 13 N·m)

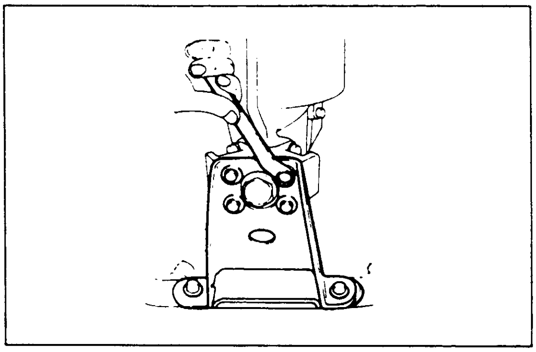


8. **INSTALL REAR OIL SEAL RETAINER**
9. **INSTALL TIMING CHAIN (See page EM-44)**
10. **INSTALL OIL PAN (See step 11 on page EM-46)**
11. **INSTALL CYLINDER HEAD (See page EM-27)**
12. **REMOVE ENGINE STANDS**
13. **INSTALL REAR END PLATE**
14. **INSTALL FLYWHEEL OR DRIVE PLATE ON CRANKSHAFT**
    Install the flywheel or drive plate on the crankshaft with the six bolts. Torque the bolts.

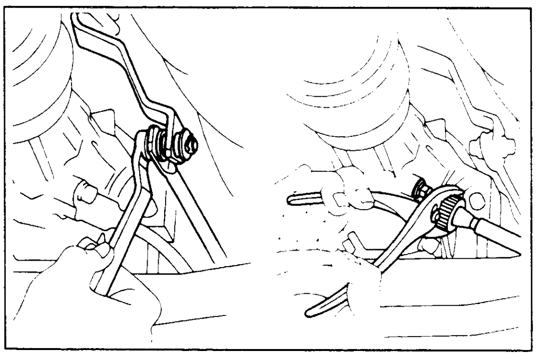
    Torque: 1,100 kg-cm (80 ft-lb, 108 N·m)
15. **INSTALL CLUTCH DISC AND COVER TO FLYWHEEL (for M/T) (See page CL-9)**

INSTALLATION OF ENGINE

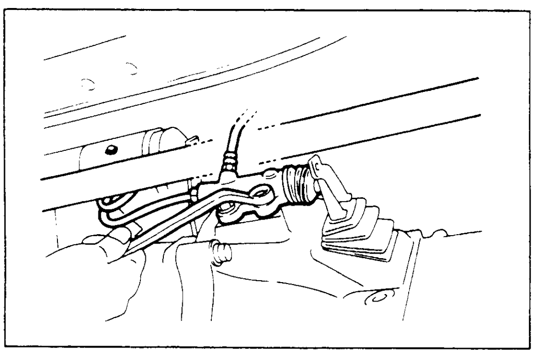
1. **CONNECT TRANSMISSION TO ENGINE**
2. **PLACE ENGINE WITH TRANSMISSION IN VEHICLE**
   (a) Attach the engine hoist chain to the lifting brackets on the engine.
   (b) Lower the engine with transmission into the engine compartment.
3. **PLACE JACK UNDER TRANSMISSION**
   Be sure to put a wooden block between the jack and the transmission pan.
4. **JACK UP AND PUT TRANSMISSION ONTO MEMBER**
5. **INSTALL ENGINE MOUNTING TO FRAME BRACKET**
   (a) Align the engine mounting and frame bracket.
   (b) Install the engine mounting bolts on each side of the engine.
   (c) Remove the hoist chain.



6. **INSTALL ENGINE REAR MOUNTING BRACKET**
   (a) Place the bracket between the transmission and member.
   (b) Install the eight bolts.
   (c) Torque the four transmission mount bolts.
   Torque: 260 kg-cm (19 ft-lb, 25 N·m)
   (d) Torque the four bracket bolts.
   Torque: 130 kg-cm (9 ft-lb, 13 N·m)



7. **CONNECT SPEEDOMETER CABLE**
8. **CONNECT SHIFT LINKAGE TO SHIFT LEVER (with A/T)**
9. **INSTALL CLUTCH RELEASE CYLINDER WITH BRACKET (with M/T)**
10. **INSTALL INTERMEDIATE SHAFT (See page PR-11)**
11. **INSTALL EXHAUST PIPE**
    (a) Connect the exhaust pipe to the catalytic converter.
    (b) Connect the exhaust pipe to the exhaust manifold.
    (c) Install the exhaust pipe clamp.



12. **CONNECT FOLLOWING PARTS:**
    (a) Neutral start switch wire (with A/T)
    (b) Back-up light switch wire
    (c) Fuel hose
    (d) Oil pressure sender gauge wire
13. **LOWER VEHICLE**

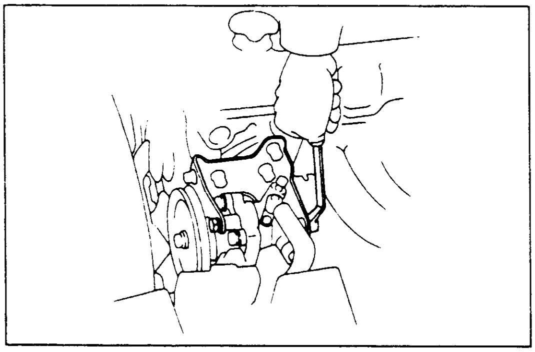
14. INSTALL SHIFT LEVER FOR INSIDE OF VEHICLE (with M/T)

15. CONNECT BOND CABLES TO ENGINE REAR SIDE AND RH SIDE

16. INSTALL COMPRESSOR TO BRACKET (with A/C)

(a) Install the compressor with four bolts.

(b) Install the drive belt and adjust the belt tension.



17. CONNECT BOND CABLE FOR VANE PUMP BRACKET

18. INSTALL VANE PUMP WITH VANE PUMP BRACKET (with power steering)

Install the vane pump with four bolts.

19. CONNECT FOLLOWING PARTS:

(a) Distributor wire

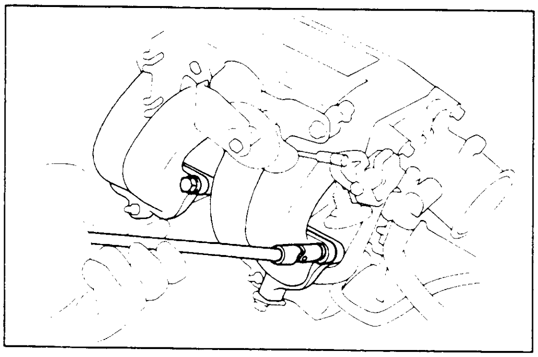
(b) High-tension cord

(c) Alternator wires

(d) Ox sensor wire

POST INSTALLATION

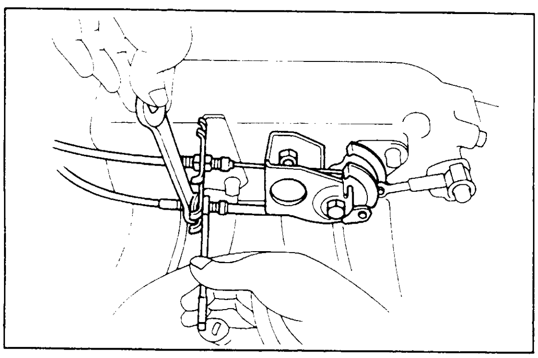
1. **CONNECT FOLLOWING WIRES:**
   (a) Starter wire
   (b) Oil pressure switch wire
   (c) Vacuum switch wire
   (d) Thermo sensor wire
   (e) Injector wires
   (f) OD thermo switch wire (with A/T)
   (g) Water thermo sensor wire
   (h) Cold start injector time switch wire



2. **INSTALL CHAMBER WITH THROTTLE BODY**
   (a) Position a new gasket on the intake manifold.
   (b) Install the chamber with throttle body.
   (c) Install the four bolts.
   (d) Install the two nuts with a bond cable.
   (e) Connect the chamber and stay with a bolt.
   (f) Install the EGR valve to the chamber with two bolts.

3. **CONNECT FOLLOWING WIRES:**
   (a) Air valve wire
   (b) Throttle position sensor wire
   (c) Cold start injection wire
   (d) Ox sensor wire

4. **CONNECT FOLLOWING PARTS:**
   (a) BVSV hoses
   (b) Cold start injection pipe
   (c) Pressure regulator hose to the chamber
   (d) Air control valve hose to actuator
   (e) Water by-pass hose No.2 and No.3 to the throttle body.
   (f) Air valve hose No.2 to the chamber
   (g) Air valve hose No.1 to the throttle body
   (h) EGR vacuum modulator hose
   (i) Actuator hose (with cruise control)
   (j) EVAP hose (for canister)
   (k) Air control valve hoses
   (l) Brake booster hose
   (m) PCV hose No.1 and No.2



5. **CONNECT CABLES TO BRACKET**
   Connect the accelerator cable and throttle cable for A/T to the bracket.

6. **INSTALL RADIATOR WITH SHROUD**
   (a) Install the radiator with the shroud.
   (b) Connect the reservoir hose.
   (c) Connect the radiator upper and lower hoses to the engine.
   (d) Connect the two cooler hoses (with A/T)

7. **INSTALL COUPLING FAN WITH FAN**

8. **INSTALL AIR CLEANER HOSE AND AIR CLEANER**

9. **FILL WITH ENGINE OIL**

   Fill the engine with new oil, API grade SF or SF/CC multi-grade, fuel efficient and recommended viscosity oil.

   Capacity:
   Dry fill **4.8 liters (5.1 US qts. 4.2 Imp. qts)**
   Drain and refill
   w/o Oil filter change
   4.0 liters (4.2 US qts, 3.5 Imp. qts)
   w/ Oil filter change
   4.6 liters (4.9 US qts, 4.0 Imp. qts)

10. **FILL WITH COOLANT**

    Close the radiator and engine drain cocks and fill with coolant.

    Total capacity: w/Heater 8.4 liters
    (8.9 US qts, 7.4 Imp. qts)

11. **INSTALL ENGINE UNDER COVER**

12. **INSTALL AND ADJUST HOOD (See page BO-2)**

13. **CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY**

14. **START ENGINE**

    Warm up the engine and inspect for leaks.

15. **PERFORM ENGINE ADJUSTMENT**

16. **ROAD TEST**

    Perform a road test

17. **RECHECK COOLANT AND ENGINE OIL LEVEL**

22R
CYLINDER BLOCK
PREPARATION OF REMOVAL

1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**
2. **REMOVE ENGINE UNDER COVER**
3. **REMOVE ENGINE HOOD**

   Disconnect the washer hose from the hood.
4. **DRAIN COOLANT FROM RADIATOR AND CYLINDER BLOCK**
5. **DRAIN AUTOMATIC TRANSMISSION FLUID (with A/T)**
6. **REMOVE AIR CLEANER**

   (a) Disconnect air hoses No.1 and No.4 from the air cleaner.

   (b) Remove the air cleaner.
7. **REMOVE COUPLING FAN WITH FAN**
8. **DISCONNECT TWO HEATER HOSES**
9. **REMOVE RADIATOR WITH SHROUD**

   (a) Disconnect the two cooler hoses. (with A/T)

   (b) Disconnect the radiator upper and lower hoses from the engine.

   (c) Disconnect the reservoir hose.

   (d) Remove the radiator with the shroud.
10. **DISCONNECT ACCELERATOR CABLE FROM CARBURETOR**

    Disconnect the cable from carburetor and bracket.
11. **DISCONNECT FOLLOWING WIRES:**

    (a) VSV wire for EVAP

    (b) VSV wire for A/C

    (c) Vacuum switch wire

    (d) HAC wire (Ex. Calif.)

    (e) Cold mixture heater wire

    (f) OD thermo switch wire (for A/T)

    (g) Fuel cut solenoid wire

    (h) Water temperature sender gauge wire

    (i) EACV wire (for Calif.)

    (j) Starter wire

    (k) Oil pressure switch wire

12. **DISCONNECT FOLLOWING PARTS:**
   (a) Brake booster hose
   (b) Fuel main hose from fuel inlet pipe
   (c) Fuel return hose from fuel return pipe
   (d) Charcoal canister hose

13. **REMOVE DRIVE BELT**

REMOVAL OF CYLINDER BLOCK
(See page EM-49)

PREPARATION FOR DISASSEMBLY
(See page EM-51)

DISASSEMBLY OF CYLINDER BLOCK
(See page EM-52)

INSPECTION OF CYLINDER BLOCK
(See page EM-55)

DISASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLY
(See page EM-56)

INSPECTION OF PISTON AND CONNECTING ROD ASSEMBLY
(See page EM-57)

REPLACEMENT OF ROD BUSHING
(See page EM-58)

INSPECTION AND REPAIR OF CRANKSHAFT
(See page EM-59)

REPLACEMENT OF REAR OIL SEAL
(See page EM-60)

BORING OF CYLINDERS
(See page EM-60)

ASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLY
(See page EM-61)

INSTALLATION OF CRANKSHAFT, PISTON AND CONNECTING ROD ASSEMBLY
(See page EM-62)

INSTALLATION OF ENGINE
(See page EM-64)

POSTINSTALLATION OF CYLINDER BLOCK

1. **CONNECT FOLLOWING WIRES:**
   (a) Starter wire
   (b) Oil pressure switch wire
   (c) VCS wire (Ex. Calif.)
   (d) EACV wire (for Calif.)
   (e) Water temperature sender gauge wire
   (f) Fuel cut solenoid wire
   (g) OD thermo switch wire (for A/T)
   (h) Cold mixture heater wire
   (i) HAC wire (Ex. Calif.)
   (j) Vacuum switch wire
   (k) VSV wire for A/C
   (l) VSV wire for EVAP
2. **CONNECT FOLLOWING PARTS:**
   (a) Charcoal canister hose from the VSV
   (b) Fuel return hose from the fuel return pipe
   (c) Fuel main hose from the fuel inlet pipe
   (d) Brake booster hose
3. **CONNECT ACCELERATOR CABLE TO CARBURETOR**
   (a) Connect the cable to the carburetor and bracket.
   (b) Install the tension spring.
4. **INSTALL RADIATOR WITH SHROUD**
   (a) Install the radiator with the shroud.
   (b) Connect the reservoir hose.
   (c) Connect the radiator upper and lower hoses to the engine.
   (d) Connect the two cooler hoses (with A/T)

5. **INSTALL COUPLING FAN WITH FAN**

6. **CONNECT TWO HEATER HOSES**

7. **INSTALL AIR CLEANER**

   (a) Connect air hoses No.1 and No.4 to the cleaner.

   (b) Install the air cleaner.

8. **FILL WITH ENGINE OIL**

   Fill the engine with new oil, API grade SF or SF/CC multi-grade, fuel efficient and recommended viscosity oil.

   Capacity:

Dry fill		**4.8 liters (5.1 US qts, 4.2 Imp. qts)**
Drain and refill		
	w/o Oil filter change	**4.0 liters (4.2 US qts, 3.5 Imp. qts)**
	w/ Oil filter change	**4.6 liters (4.9 US qts, 4.0 Imp. qts)**

9. **FILL WITH COOLANT**

   Close the radiator and engine drain cocks and fill with coolant.

   Total capacity: w/Heater 8.4 liters
   (8.9 US qts, 7.4 Imp. qts)

10. **INSTALL ENGINE UNDER COVER**

11. **INSTALL AND ADJUST HOOD (See page BO-2)**

12. **CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY**

13. **START ENGINE**

    Warm up the engine and inspect for leaks.

14. **PERFORM ENGINE ADJUSTMENT**

15. **ROAD TEST**

    Perform a road test.

16. **RECHECK COOLANT AND ENGINE OIL LEVEL**

EMISSION CONTROL SYSTEMS

NOTE: TROUBLESHOOTING

See page EM-2 (for EFI Engine)
See page EM-5 (for Carb. Engine)

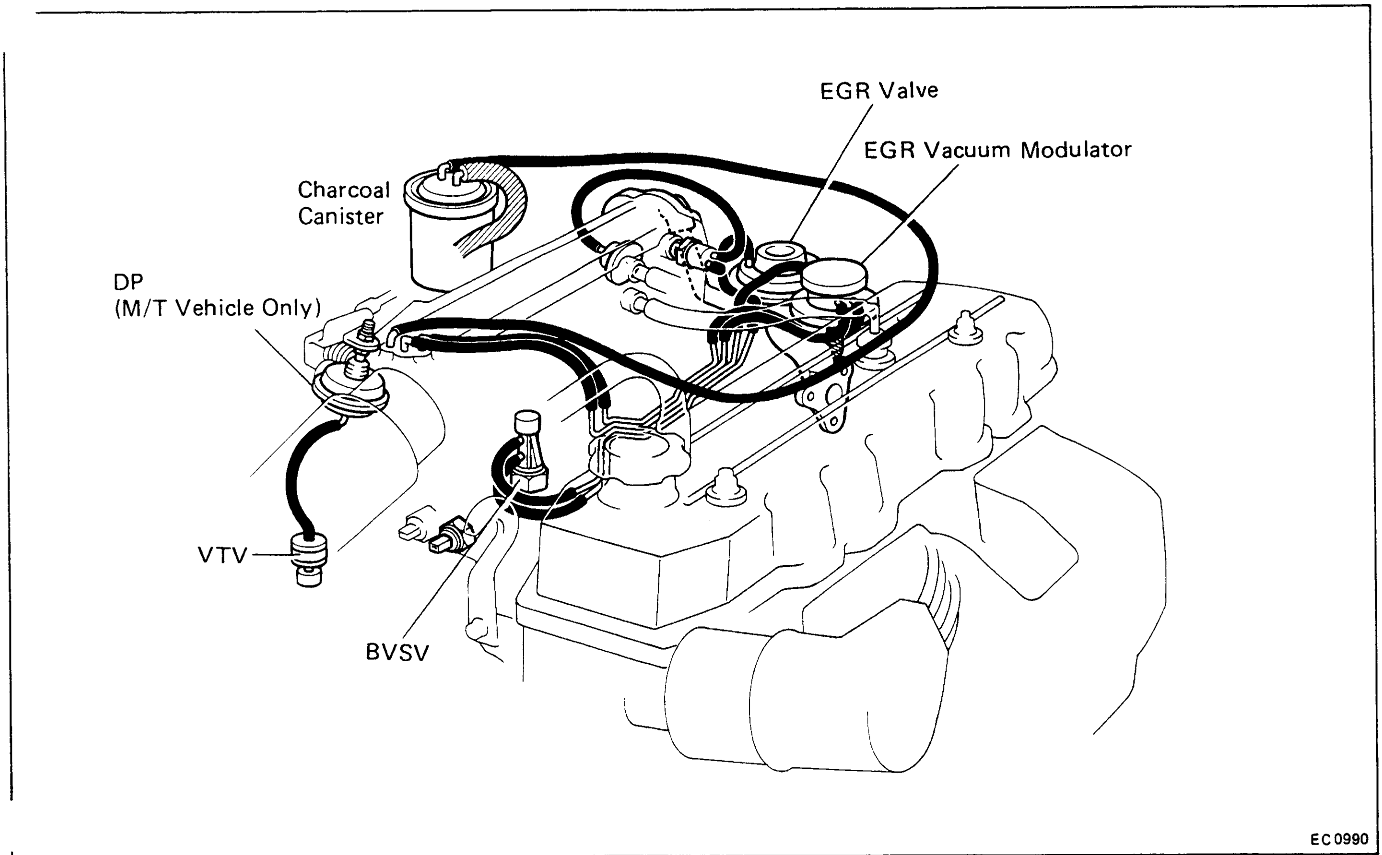
EC

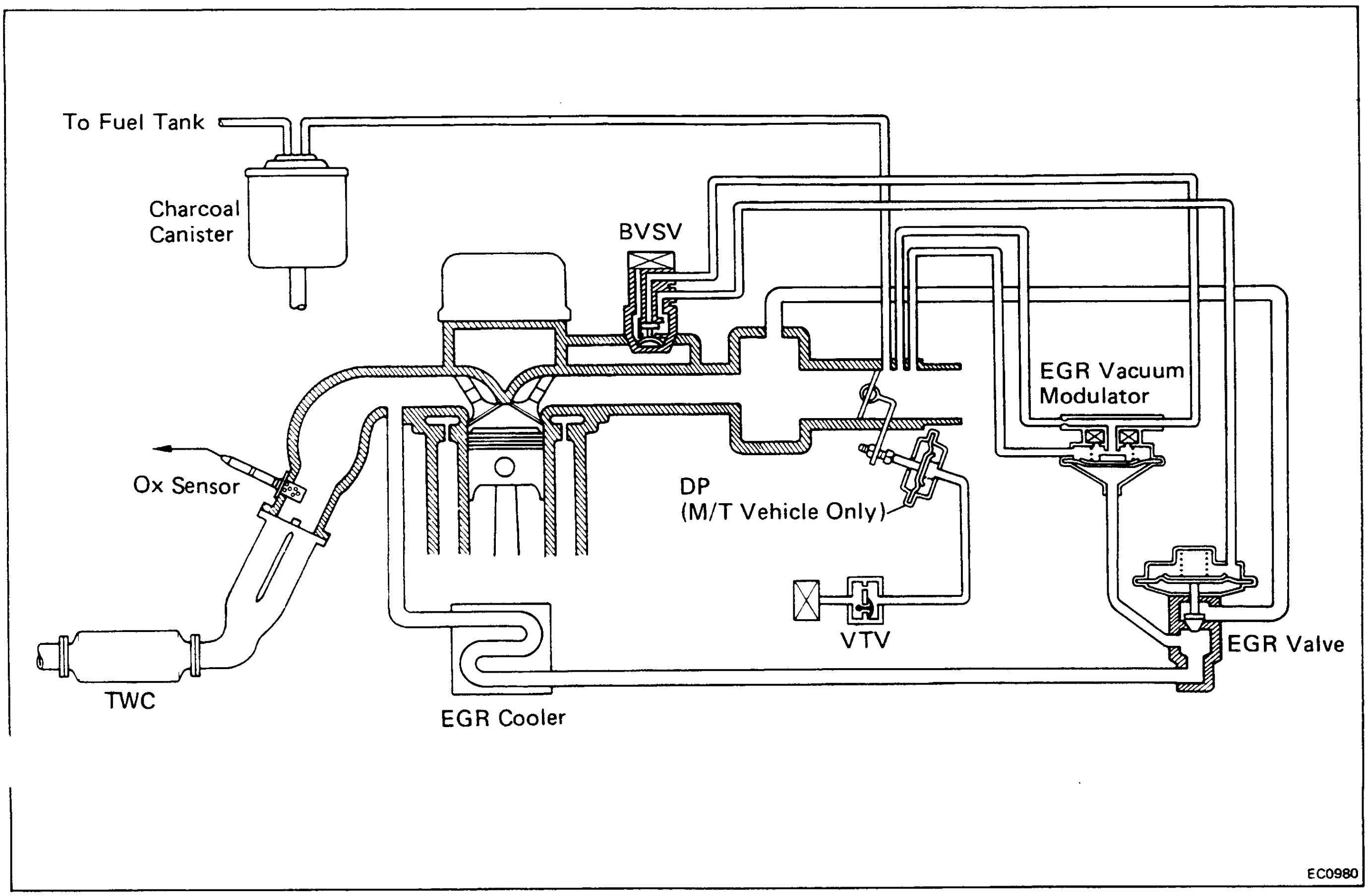
SYSTEM PURPOSE

System	Abbreviation	Purpose
Positive crankcase ventilation	PCV	Reduces blow-by gas (HC)
Fuel evaporative emission control	EVAP	Reduces evaporative HC
Dash pot *	DP	Reduces HC and CO performance at idle
Exhaust gas recirculation	EGR	Reduces NOx
Three-way catalyst	TWC	Reduces HC,CO and NOx
Electronic fuel injection	EFI	Regulates all engine conditions for reduction of exhaust emissions.

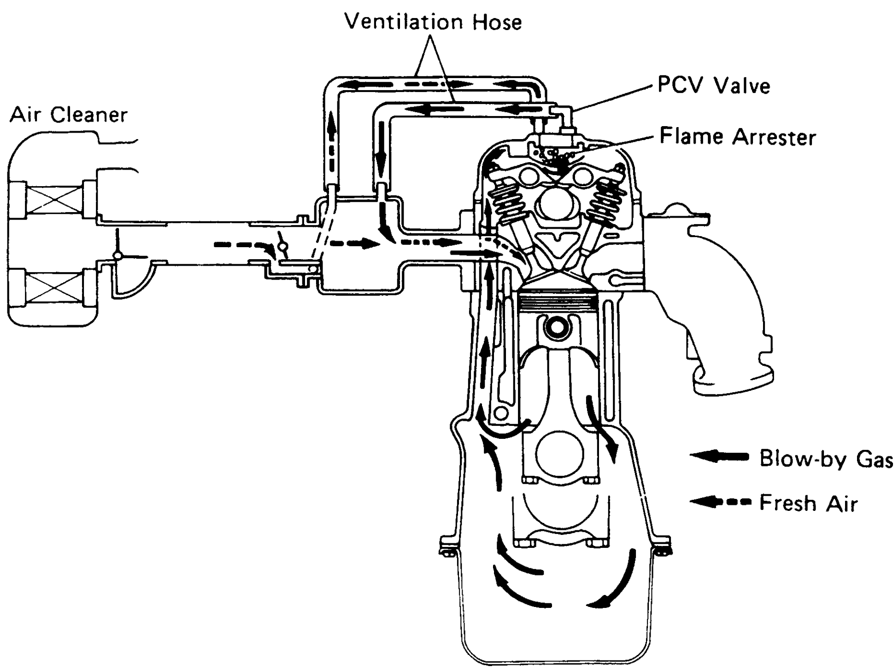
Remark: * M/T vehicles only

COMPONENT LAYOUT AND SCHEMATIC DRAWING





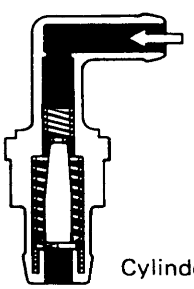
POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM



EC1036

To reduce HC emissions, crankcase blow-by gas (HC) is routed through the PCV valve to the intake manifold for combustion in the cylinders.

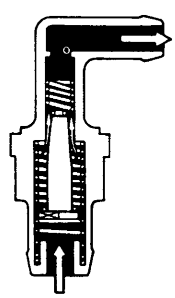
Engine not Running or Backfiring



○PCV VALVE IS CLOSED.

EC1013

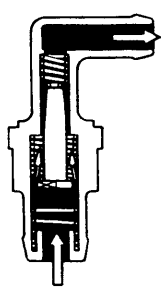
Normal Operation



○PCV VALVE IS OPEN.
○VACUUM PASSAGE IS LARGE.

EC1014

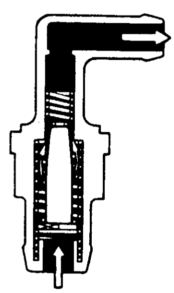
Idling or Decelerating



○PCV VALVE IS OPEN.
○VACUUM PASSAGE IS SMALL.

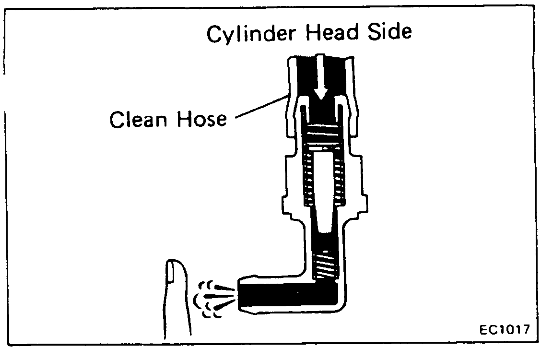
EC1015

Acceleration or Heavy Load



○PCV VALVE IS FULLY OPEN.

EC1016

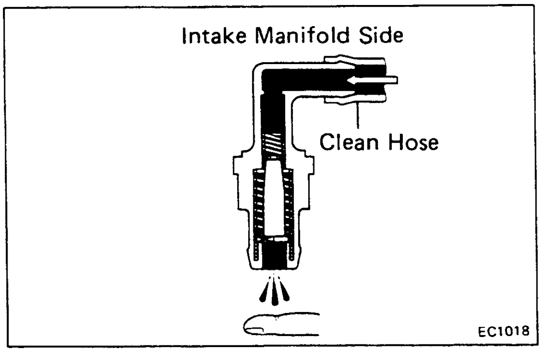


INSPECTION OF PCV VALVE

1. **REMOVE PCV VALVE**
2. **ATTACH CLEAN HOSE TO PCV VALVE**
3. **BLOW FROM CYLINDER HEAD SIDE**

   Check that air passes through easily.

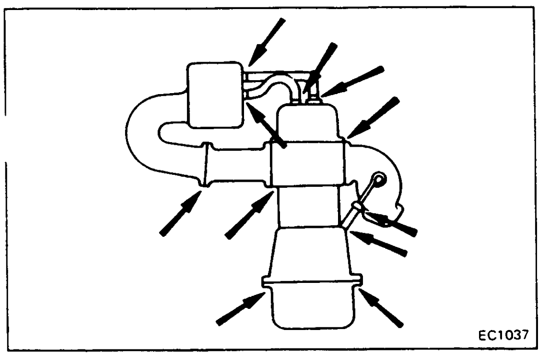
   CAUTION: Do not suck air through the valve. Petroleum substances inside the valve are harmful.



4. **BLOW FROM INTAKE MANIFOLD SIDE**

   Check that air passes through with difficulty.
   If the PCV valve fails either check, replace it.

5. **REINSTALL PCV VALVE**

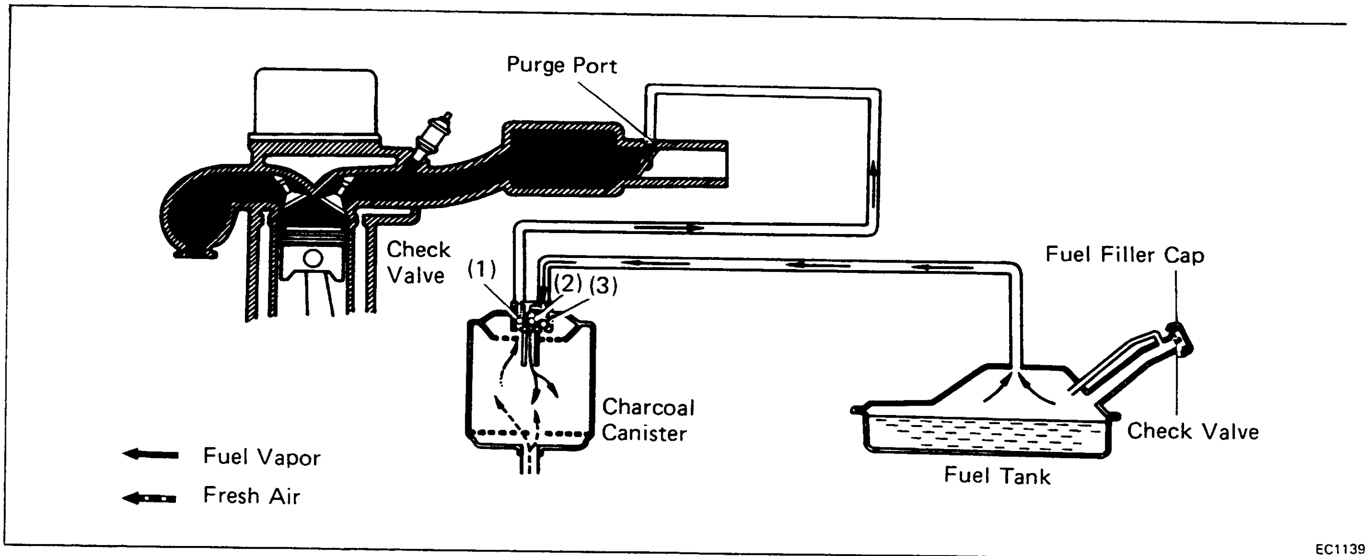


INSPECTION OF PCV HOSES AND CONNECTIONS

VISUALLY INSPECT HOSES, CONNECTIONS AND GASKETS

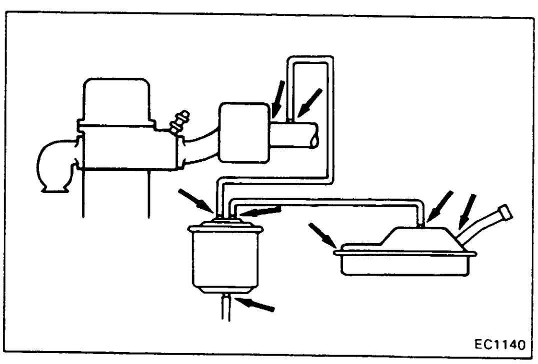
Check for cracks, leaks or damage.

FUEL EVAPORATIVE EMISSION CONTROL (EVAP) SYSTEM



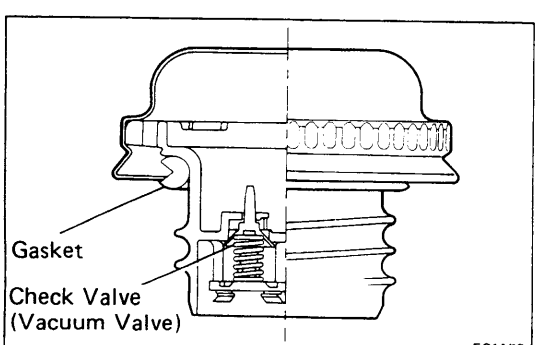
To reduce HC emission, evaporated fuel from the fuel tank is routed through the charcoal canister to the throttle body for combustion in the cylinders.

Condition	Check Valve in Charcoal Canister			Check valve in Fuel Filler Cap	Evaporated Fuel (HC)
	(1)	(2)	(3)		
Parking, idling and low speed	CLOSED	—	—	—	HC from tank is absorbed in the canister.
Medium and high speed	OPEN	—	—	—	HC from canister is led into throttle body.
High pressure in tank	—	OPEN	CLOSED	CLOSED	HC from tank is absorbed in the canister.
High vacuum in tank	—	CLOSED	OPEN	OPEN	(Air is led into the tank.)

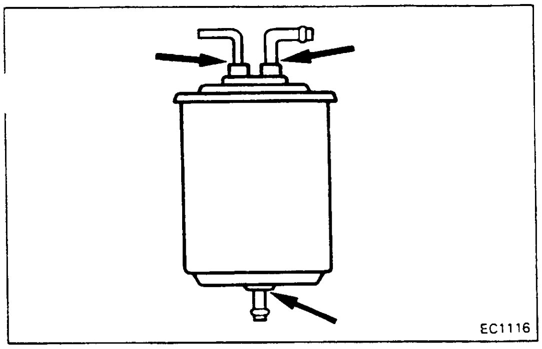


INSPECTION OF FUEL VAPOR LINES, FUEL TANK AND FILLER CAP

1. **VISUALLY INSPECT LINES AND CONNECTIONS**
   Look for loose connections, sharp bends or damage.
2. **VISUALLY INSPECT FUEL TANK**
   Look for deformation, cracks or fuel leakage.



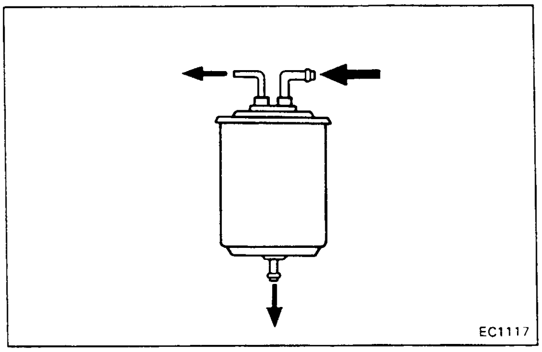
3. **VISUALLY INSPECT FUEL FILLER CAP**
   Look for a damaged or deformed gasket and cap.
   If necessary, repair or replace the cap.



INSPECTION OF CHARCOAL CANISTER

1. **REMOVE CHARCOAL CANISTER**
2. **VISUALLY INSPECT CHARCOAL CANISTER CASE**

Look for cracks or damage.

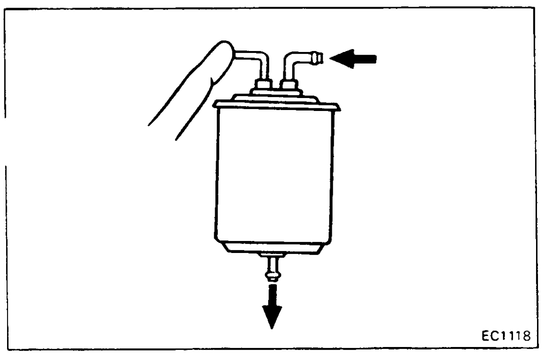


3. **CHECK FOR CLOGGED FILTER AND STUCK CHECK VALVE**

(a) Using low pressure compressed air, blow into the tank pipe and check that the air flows without resistance from the other pipes.

(b) Blow into the purge pipe and check that the air does not flow from the other pipes.

If a problem is found, replace the charcoal canister.



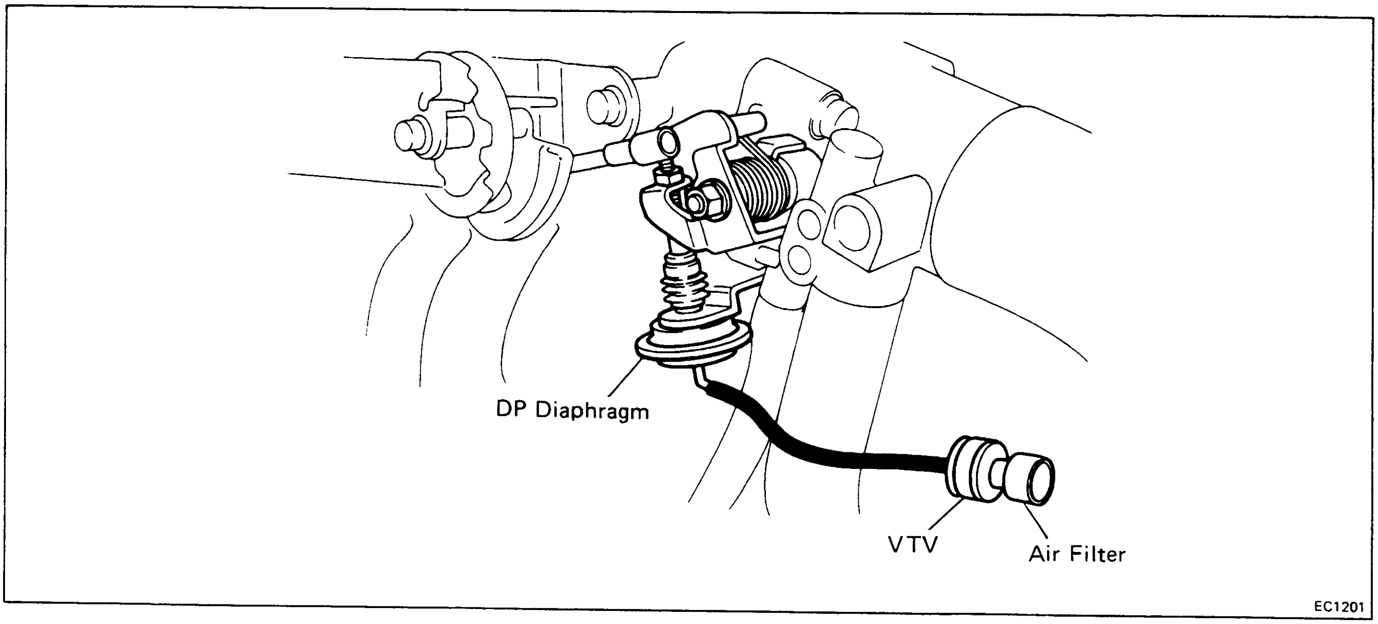
4. **CLEAN FILTER IN CANISTER**

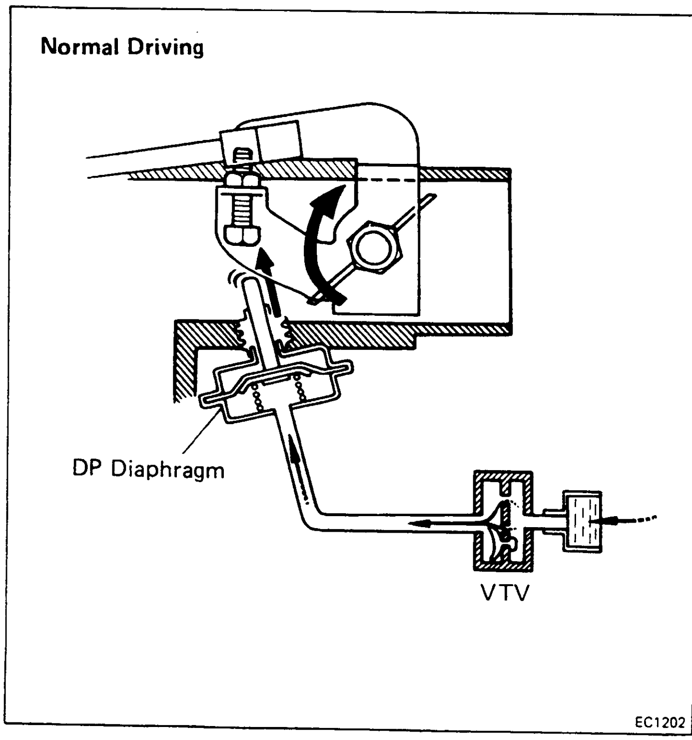
Clean the filter by blowing 3 kg/cm^2 (43 psi, 294 kPa) of compressed air into the tank pipe, while holding the purge pipe closed.

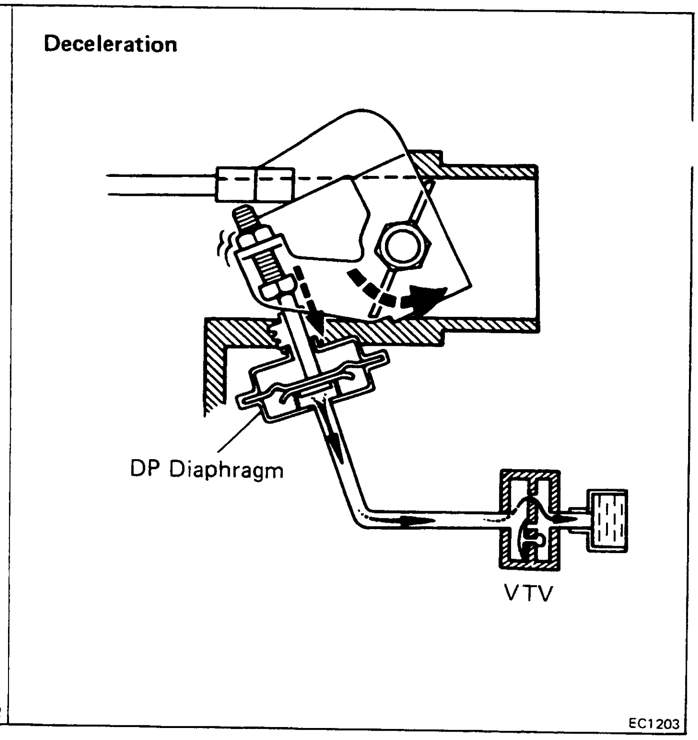
NOTE:
- Do not attempt to wash the canister.
- No activated carbon should come out.

5. **INSTALL CHARCOAL CANISTER**

DASH POT (DP) SYSTEM (M/T Vehicles Only)





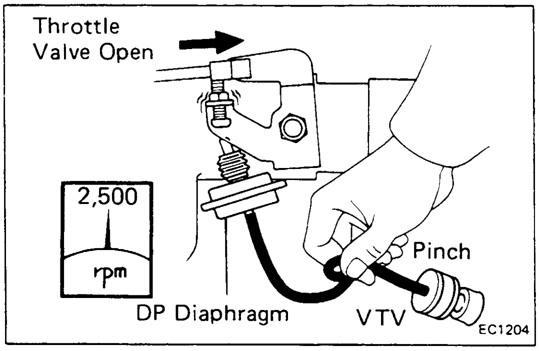


To reduce HC and CO emissions, when decelerating the dash pot opens the throttle valve slightly more than at idle. This causes the air-fuel mixture to burn completely.

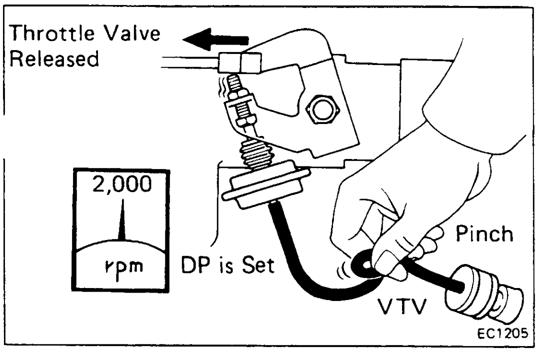
Condition	DP Diaphragm	VTV	Throttle Valve
Idling	Pushed in by return force of throttle valve	CLOSED	Idle speed position
Normal driving	Pushed out by diaphragm spring	OPEN	High speed position
Deceleration	Pushed in by return force of throttle valve	CLOSED	Slightly opens and then slowly closes to idle position

INSPECTION OF DP SYSTEM

1. **WARM UP ENGINE**
2. **CHECK IDLE SPEED AND ADJUST, IF NECESSARY**

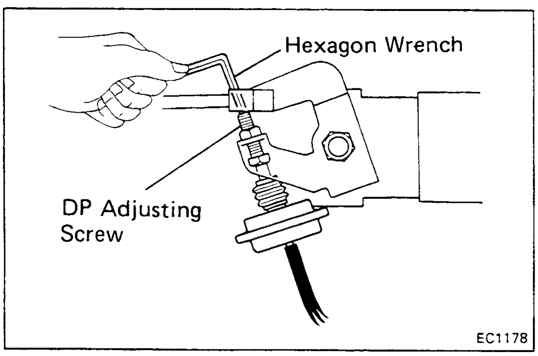


3. **CHECK DP SETTING SPEED**
   (a) Maintain the engine speed at 2,500 rpm.
   (b) Pinch the vacuum hose between the DP and VTV.

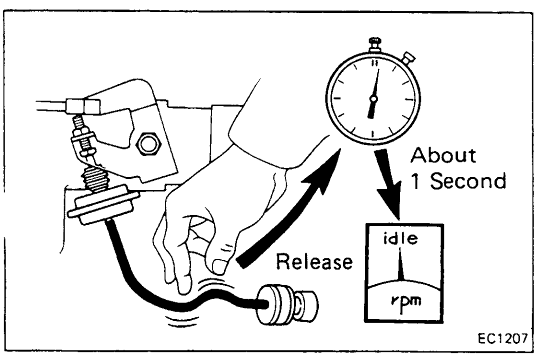


   (c) Release the throttle valve.
   (d) Check that the DP is set.

   DP setting speed: 2,000 rpm

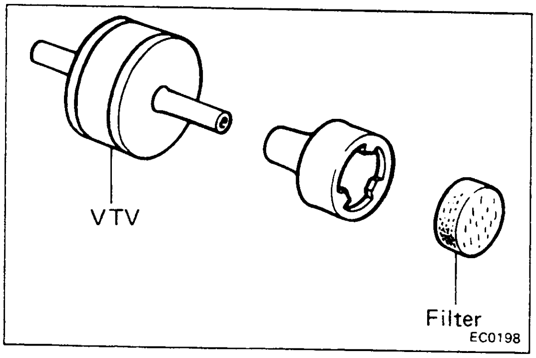


   If not at specified speed, adjust with the DP adjusting screw.



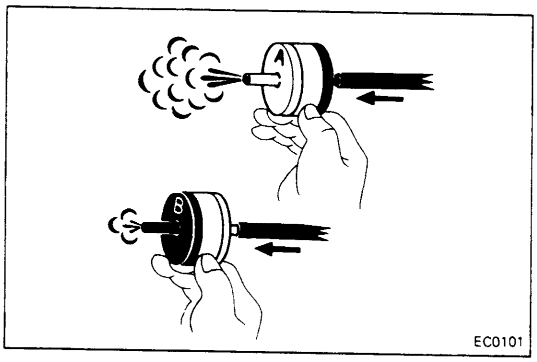
4. **CHECK OPERATION OF VTV**
   (a) Set the DP speed in the same procedure as above; 3. (a) to (c).
   (b) Release the pinched hose and check that the engine returns to idle speed in about 1 second.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART



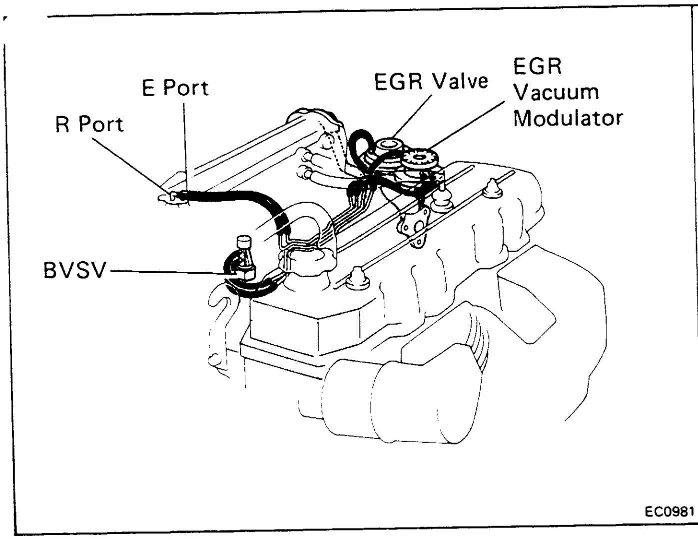
INSPECTION OF VTV

1. **CHECK AND CLEAN FILTER ON VTV**
   (a) Check the filter for contamination or damage.
   (b) Using compressed air, clean the filter.

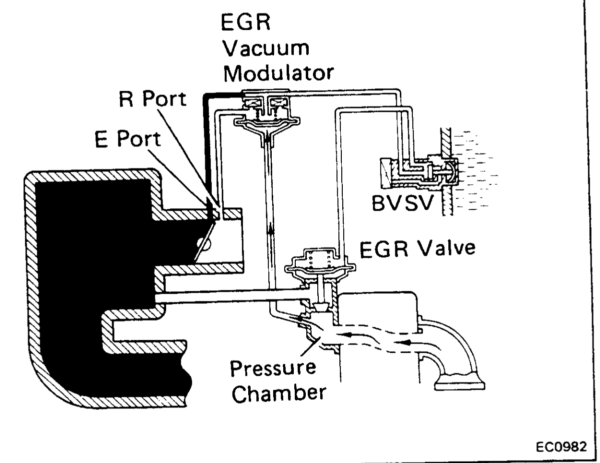


2. **CHECK VTV BY BLOWING AIR INTO EACH SIDE**
   (a) Check that air flows without resistance from B to A.
   (b) Check that air flows with difficulty from A to B.

EXHAUST GAS RECIRCULATION (EGR) SYSTEM



(1)



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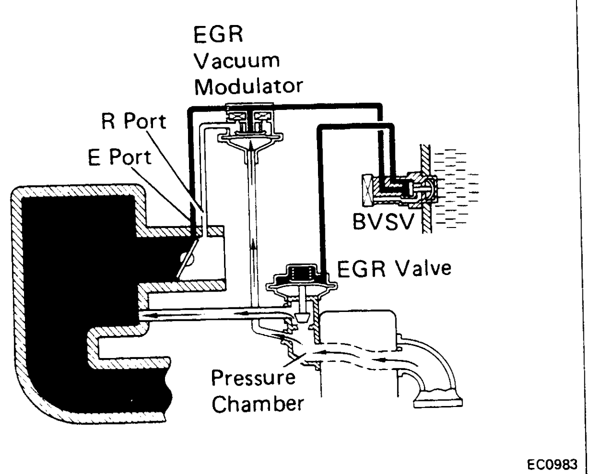
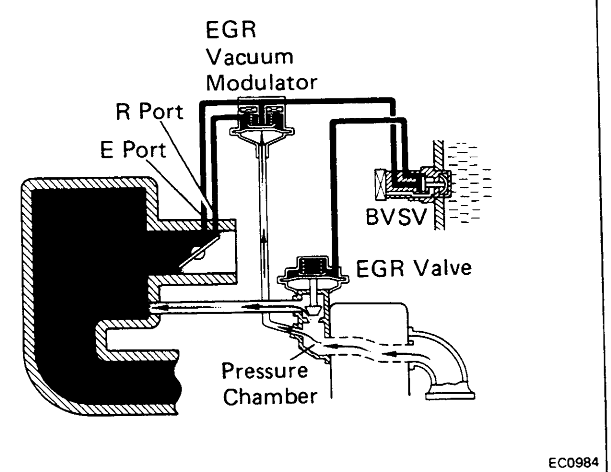


(3)



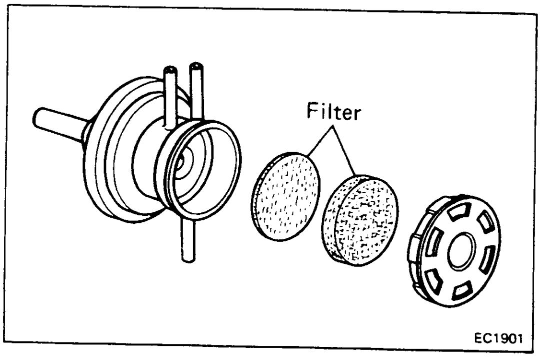
To reduce NOx emission, part of the exhaust gases are recirculated through the EGR valve to the intake manifold to lower the maximum combustion temperature.

Coolant Temp.	BVSV	Throttle Valve Opening Angle	Pressure in the EGR Valve Pressure Chamber		EGR Vacuum Modulator	EGR Valve	Exhaust Gas
Below 30°C (86°F)	CLOSED	—	—		—	CLOSED	Not recirculated
Above 44°C (111°F)	OPEN	Positioned below E port	—		—	CLOSED	Not recirculated
		Positioned between E port & R port	(1) LOW	*Pressure constantly alternating between low and high	OPENS passage to atmosphere	CLOSED	Not recirculated
			(2) HIGH		CLOSES passage to atmosphere	OPEN	Recirculated
		Positioned above R port	(3) HIGH	**	CLOSES passage to atmosphere	OPEN	Recirculated (increase)

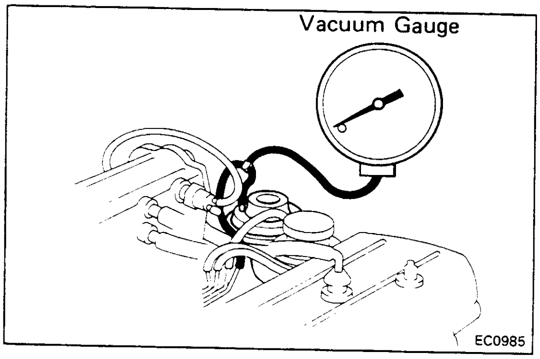
Remarks: *Pressure increase→Modulator closes→EGR valve opens→Pressure drops
EGR valve closes←Modulator opens

**When the throttle valve is positioned above the R port, the EGR vacuum modulator will close the atmosphere passage and open the EGR valve to increase the EGR gas, even if the exhaust pressure is insufficiently low.

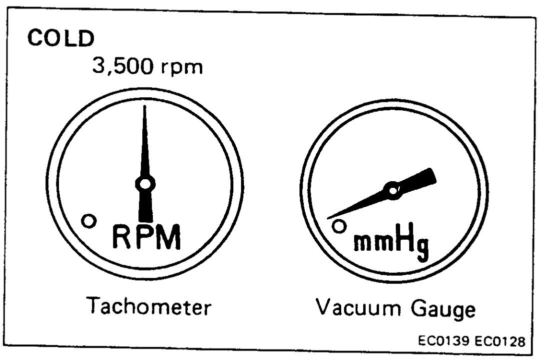
INSPECTION OF EGR SYSTEM



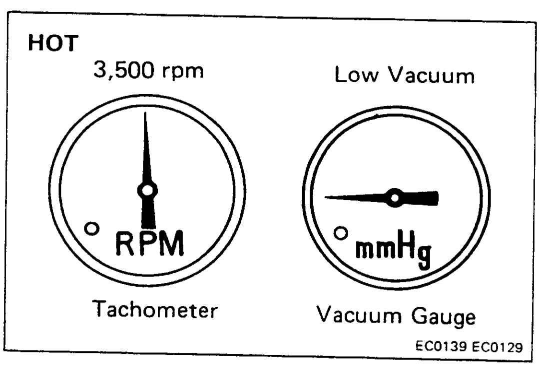
1. **CHECK AND CLEAN FILTER IN EGR VACUUM MODULATOR**
   (a) Check the filter for contamination or damage.
   (b) Using compressed air, clean the filter.



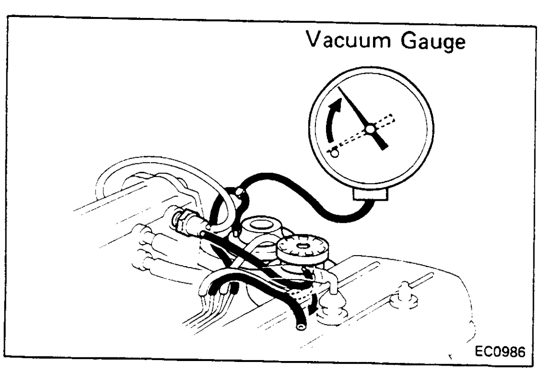
2. **PREPARATION**
   Disconnect the vacuum hose from the EGR valve and, using a three way union, connect a vacuum gauge to it.
3. **CHECK SEATING OF EGR VALVE**
   Start the engine and check that the engine starts and runs at idle.



4. **CHECK BVSV WITH COLD ENGINE**
   (a) The coolant temperature should be below 30°C (86°F).
   (b) Check that the vacuum gauge indicates zero at 3,5' rpm.



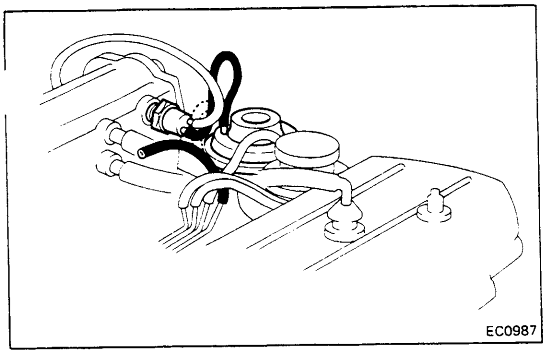
5. **CHECK BVSV AND EGR VACUUM MODULATOR WITH HOT ENGINE**
   (a) Warm up the engine.
   (b) Check that the vacuum gauge indicates low vacuum at 3,500 rpm.



   (c) Disconnect the vacuum hose from R port of the EGR vacuum modulator and connect R port directly to the intake manifold with another hose.
   (d) Check that the vacuum gauge indicates high vacuum at 3,500 rpm.

   NOTE: As a large amount of EGR gas enters, the engir will misfire slightly at this time.

   (e) Disconnect the vacuum gauge and reconnect the vacuum hoses to the proper locations.



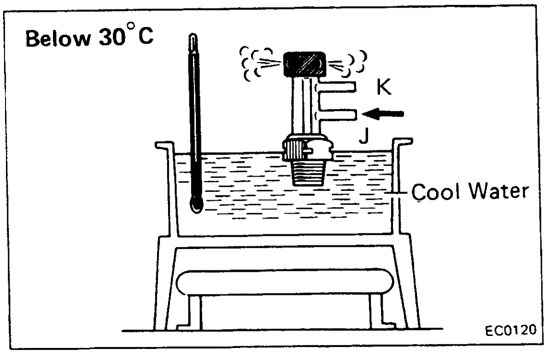
6. **CHECK EGR VALVE**

(a) Apply vacuum directly to the EGR valve with the engine idling.

(b) Check that the engine runs rough or dies.

(c) Reconnect the vacuum hoses to the proper location.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART



INSPECTION OF BVSV

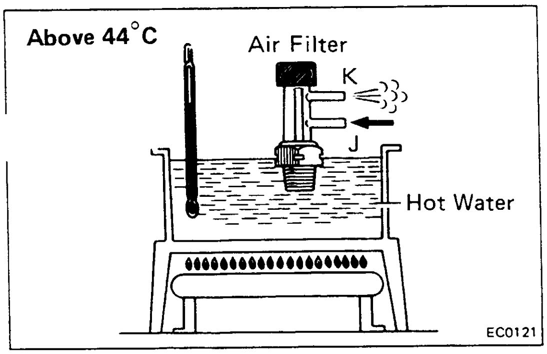
CHECK BVSV BY BLOWING AIR INTO PIPE

(a) Drain the coolant from the radiator into a suitable container.

(b) Remove the BVSV.

(c) Cool the BVSV to below 30°C (86°F).

(d) Check that air flows from pipe J to the air filter.



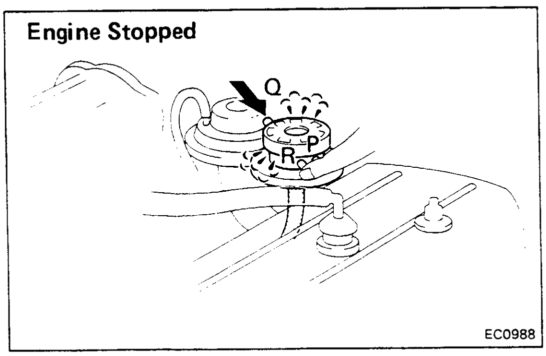
(e) Heat the BVSV to above 44°C (111°F).

(f) Check that air flows from pipe J to pipe K.

(g) Apply liquid sealer to the threads of the BVSV and reinstall.

(h) Fill the radiator with coolant.

If a problem is found, replace the BVSV.



INSPECTION OF EGR VACUUM MODULATOR

CHECK EGR VACUUM MODULATOR OPERATION

(a) Disconnect the vacuum hoses from port P, Q and R of the EGR vacuum modulator.

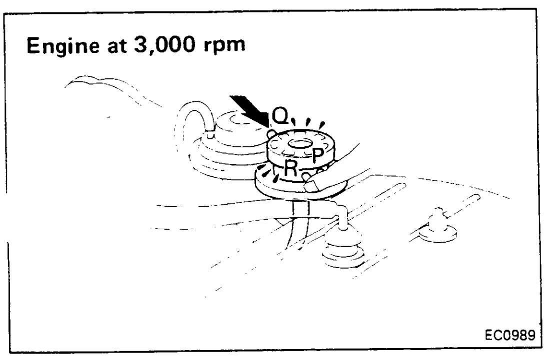
(b) Plug port P and R with your finger.

(c) Blow air into port Q. Check that the air passes through to the air filter side freely.

(d) Start the engine and maintain the speed at 3,000 rpm.

(e) Repeat the above test. Check that there is a strong resistance to air flow.

(f) Reconnect the vacuum hoses to the proper locations.



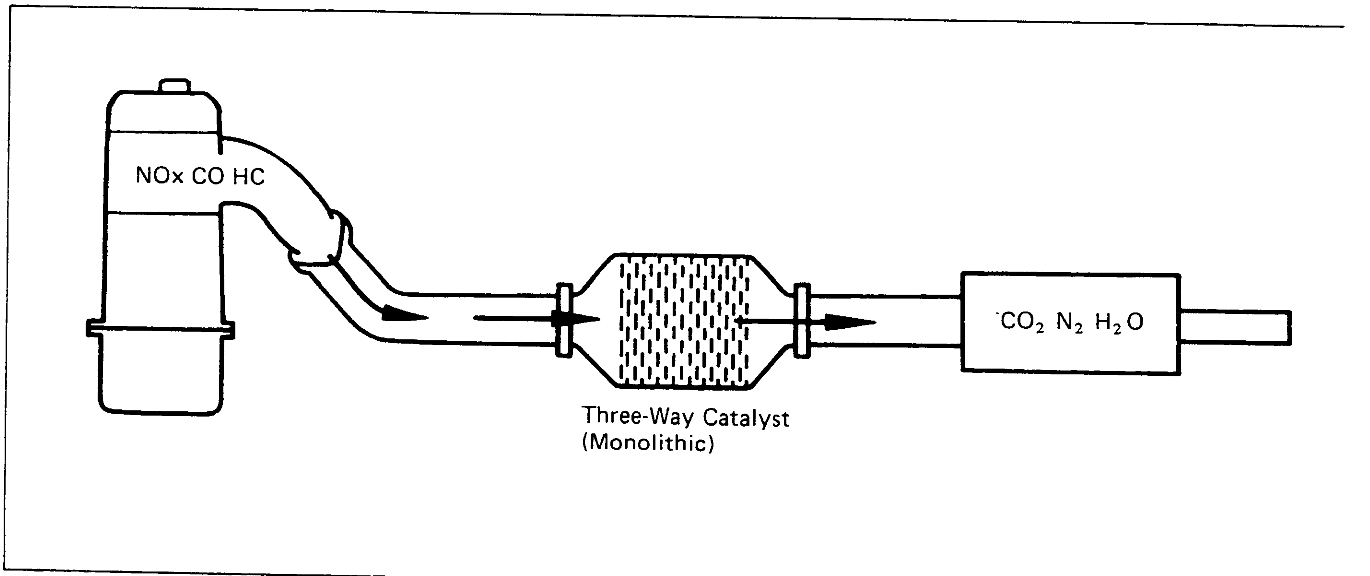
INSPECTION OF EGR VALVE

1. **REMOVE EGR VALVE**

Check the valve for sticking and heavy carbon deposits. If a problem is found, replace it.

2. **INSTALL EGR VALVE WITH NEW GASKET**

THREE-WAY CATALYST (TWC) SYSTEM



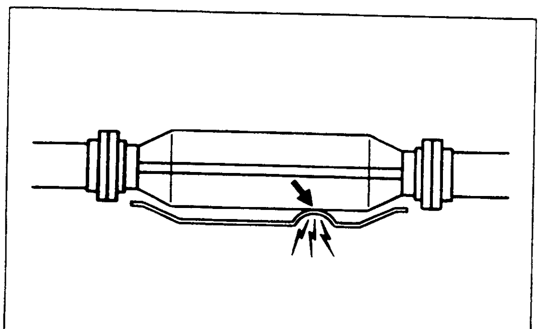
EC2901

To reduce HC, CO and NOx emissions, they are oxidized, reduced and converted to nitrogen (N_2), carbon dioxide (CO_2) and water (H_2O) by the catalyst.

Exhaust Port		TWC		Exhaust Gas
HC, CO and NOx	→	Oxidation and reduction	→	CO_2 H_2O N_2

INSPECTION OF EXHAUST PIPE ASSEMBLY

1. CHECK CONNECTIONS FOR LOOSENESS OR DAMAGE
2. CHECK CLAMPS FOR WEAKNESS, CRACKS OR DAMAGE

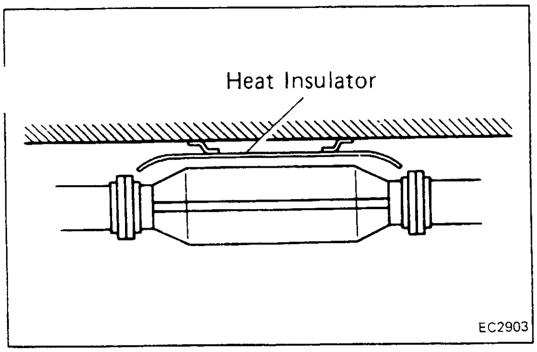


EC2902

INSPECTION OF CATALYTIC CONVERTER

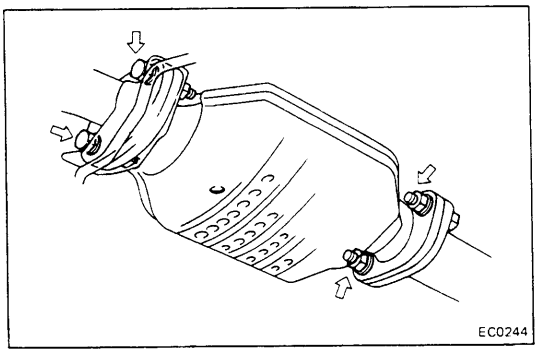
CHECK FOR DENTS OR DAMAGE

If any part of the protector is damaged or dented to the extent that it contacts the catalyst, repair or replace it.



INSPECTION OF HEAT INSULATOR

1. **CHECK HEAT INSULATOR FOR DAMAGE**
2. **CHECK FOR ADEQUATE CLEARANCE BETWEEN CATALYTIC CONVERTER AND HEAT INSULATOR**



REPLACEMENT OF CATALYTIC CONVERTER

1. **REMOVE CONVERTER**
   (a) Jack up the vehicle.
   (b) Check that the converter is cool.
   (c) Remove the bolts at the front and rear of the converter.
   (d) Remove the converter and gaskets.
2. **INSTALL CONVERTER**
   (a) Place new gaskets on the converter front and rear pipes, and connect the converter to the exhaust pipes.
   (b) Tighten the bolts.

   Torque: Catalyst — Exhaust pipe
   440 kg-cm (32 ft-lb, 43 N·m)

   (c) Reinstall the bracket bolts and tighten them.

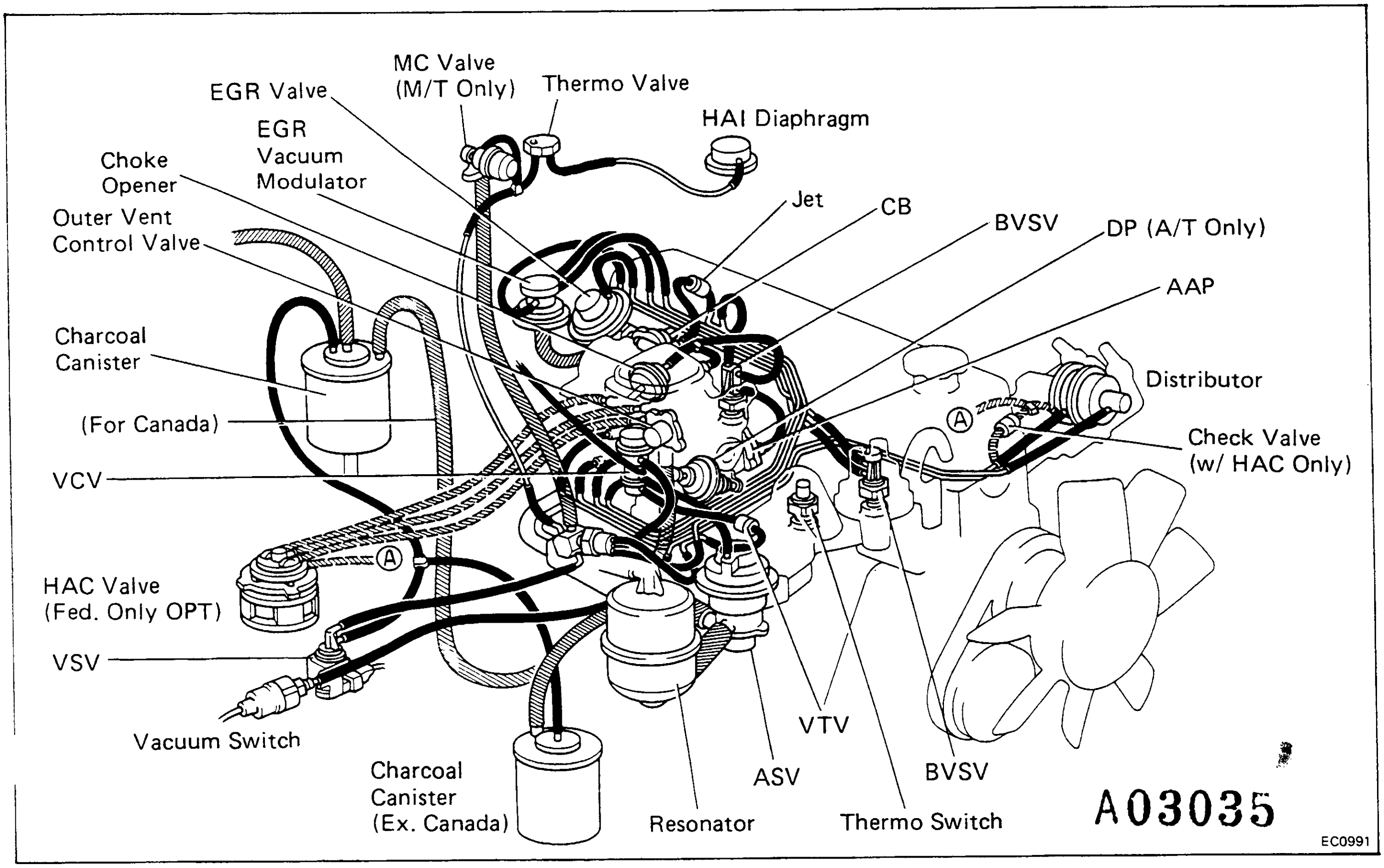
SYSTEM PURPOSE

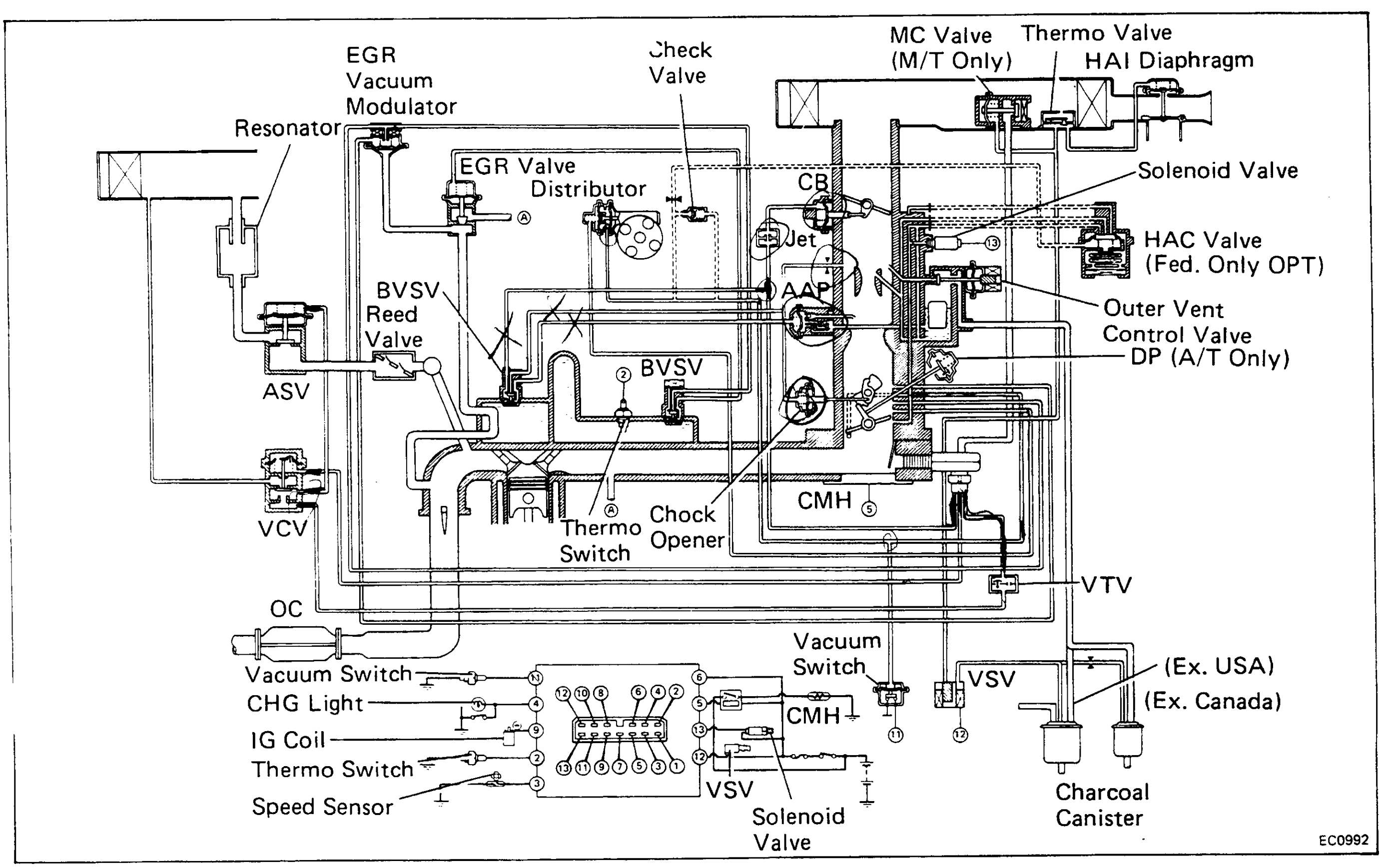
System	Abbre-viation	Purpose	Federal & Canada	California
Positive crankcase ventilation	PCV	Reduces blow-by gas (HC)	●	●
Fuel evaporative emission control	EVAP	Reduces evaporative HC	●	●
Mixture control*1	MC	Reduces HC & CO	●	●
Dash pot*2	DP	Reduces HC and CO performance at idle	●	●
Exhaust gas recirculation	EGR	Reduces NOx	●	●
Air suction and fuel system feedback control	—	Maintains air-fuel ratio for TWC and reduces HC, CO and NOx	—	●
Air suction	AS	Reduces HC & CO	●	—
Three-way catalyst	TWC	Reduces HC, CO & NOx	—	●
Oxidation catalyst	OC	Reduces HC & CO	●	—
High altitude compensation	HAC	Insures air-fuel mixture at high altitude	● (OPT)*3	—
Auxiliary system:				
Automatic hot air intake	HAI	Improves driveability—cold	●	●
Automatic choke	—	Improves driveability—cold	●	●
Choke breaker	CB	Improves driveability—cold	●	●
Choke opener	—	Improves driveability—hot	●	●
Auxiliary acceleration pump	AAP	Improves driveability—cold	●	●
Deceleration fuel cut	—	Prevents overheating OC or TWC, and after burning	●	●
Idle advance	—	Improves fuel economy at idle	●	●
Cold mixture heater	CMH	Improves driveability—cold	●	●

Remarks: *1 M/T vehicles only
*2 A/T vehicles only
*3 Option in USA only, except in California.

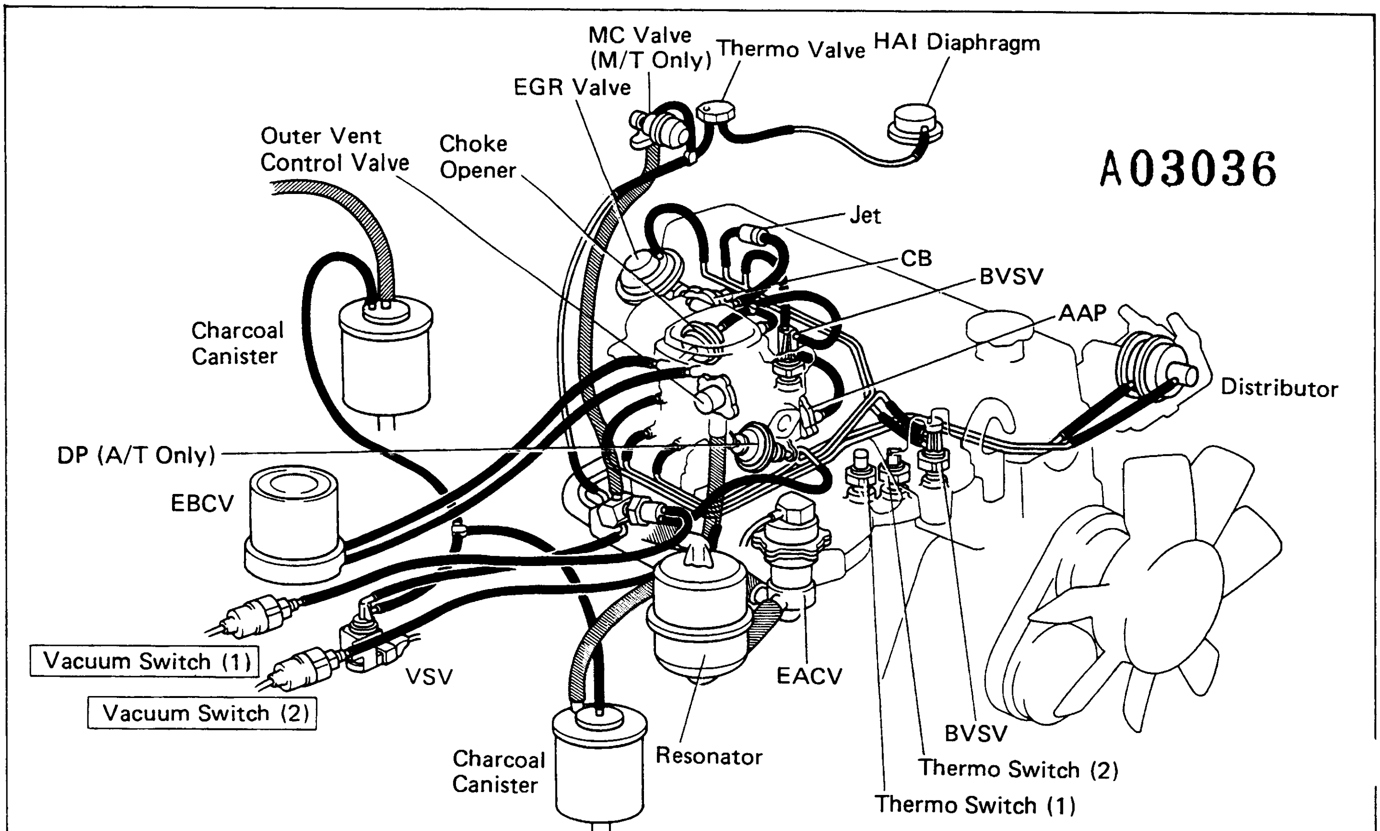
A03034

COMPONENT LAYOUT AND SCHEMATIC DRAWING
(Federal and Canada)

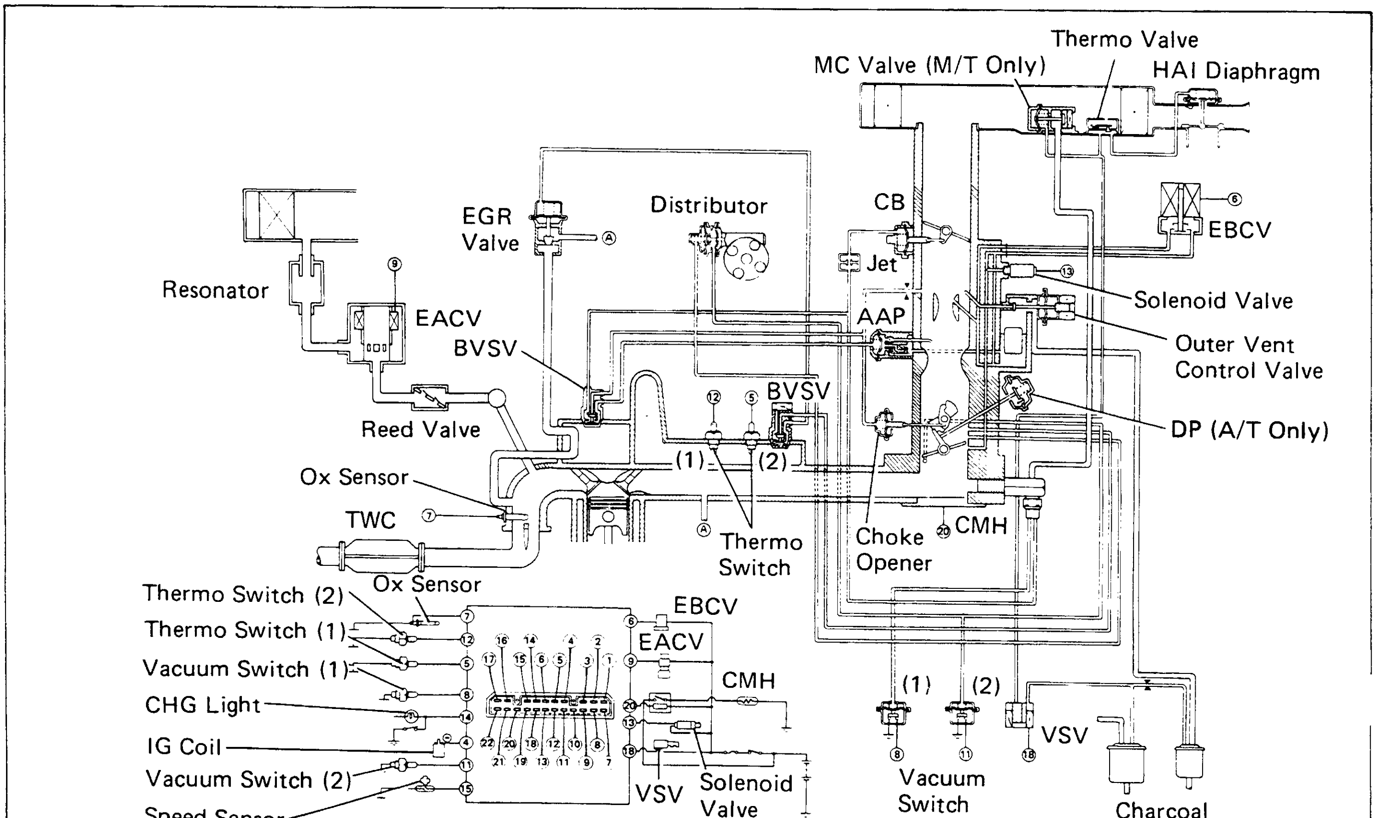




COMPONENT LAYOUT AND SCHEMATIC DRAWING
(Californi' `

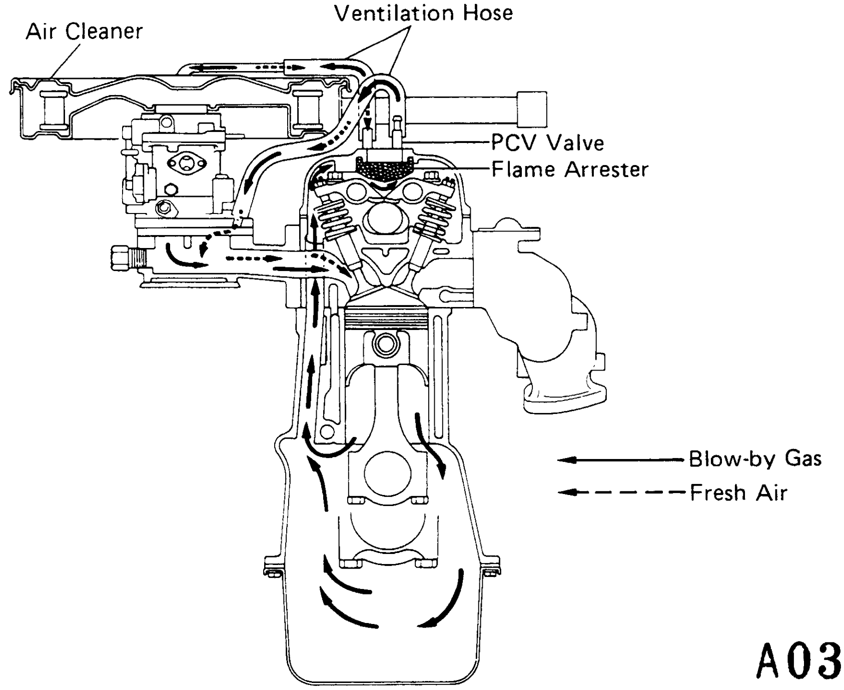


EC0993



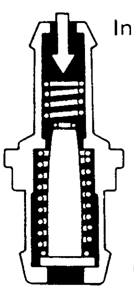
EC0994

POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM



To reduce HC emissions, crankcase blow-by gas (HC) is routed through the PCV valve to the intake manifold for combustion in the cylinders.

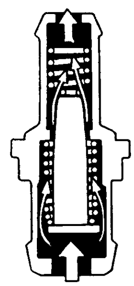
Engine not Running or if Backfiring



○PCV VALVE IS CLOSED.

EC1001

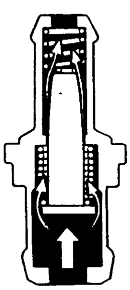
Normal Operation



○PCV VALVE IS OPEN.
○VACUUM PASSAGE IS LARGE.

EC1002

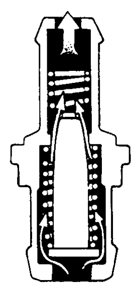
Idling or Decelerating



○PCV VALVE IS OPEN.
○VACUUM PASSAGE IS SMALL.

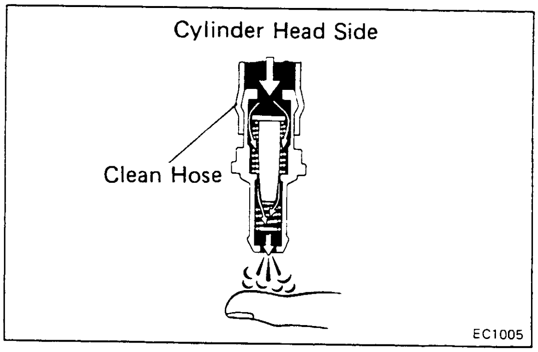
EC1003

Acceleration of Heavy Load



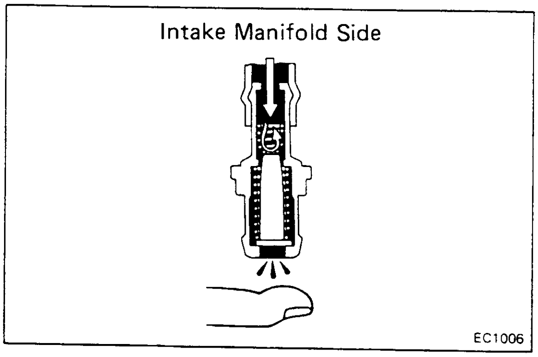
○PCV VALVE IS FULLY OPEN.

EC1004



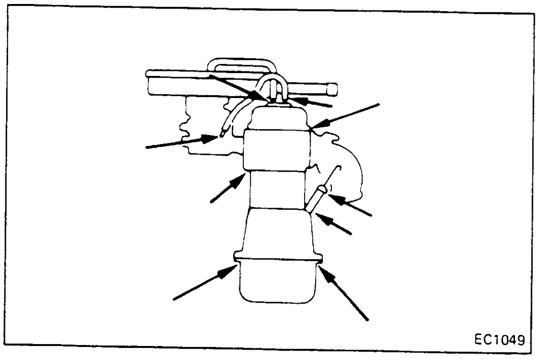
INSPECTION OF PCV VALVE

1. **REMOVE PCV VALVE**
2. **ATTACH CLEAN HOSE TO PCV VALVE**
3. **BLOW FROM CYLINDER HEAD SIDE**
   Check that air passes through easily.
   CAUTION: Do not suck air through the valve. Petroleum substances inside the valve are harmful.



4. **BLOW FROM INTAKE MANIFOLD SIDE**
   Check that air passes through with difficulty.
   If the PCV valve fails either of the checks, replace it.
5. **REINSTALL PCV VALVE**

A03038

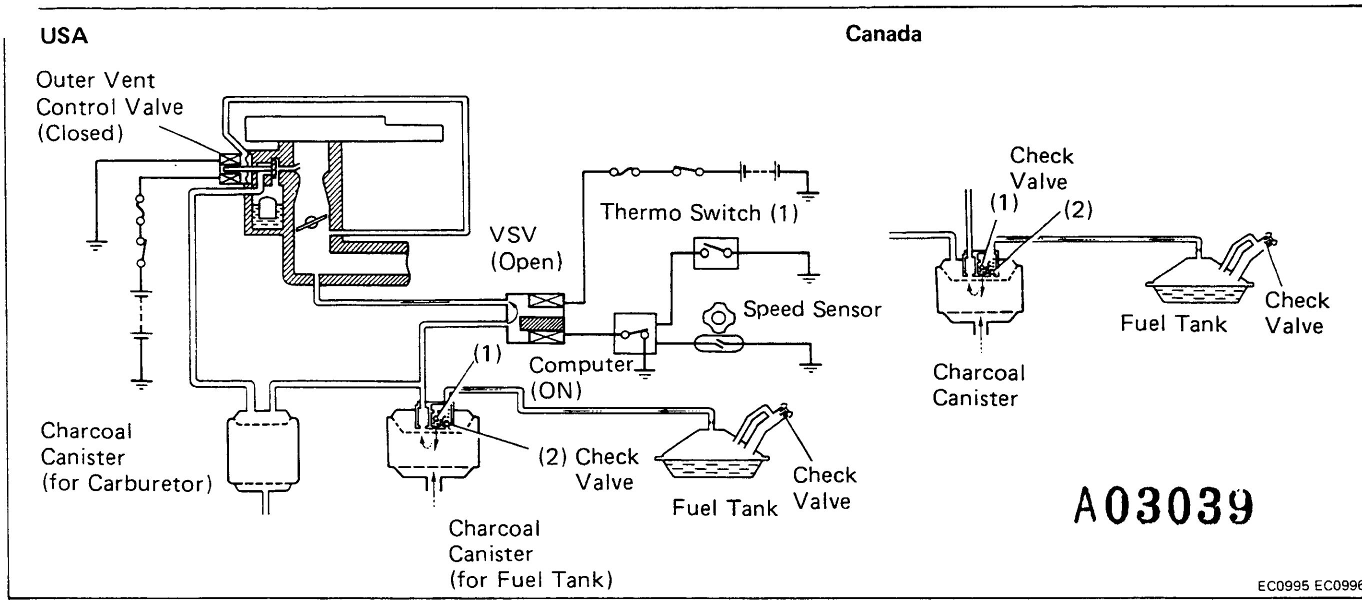


INSPECTION OF PCV HOSES AND CONNECTIONS

VISUALLY INSPECT HOSES, CONNECTIONS AND GASKET

Check for cracks, leaks or damage.

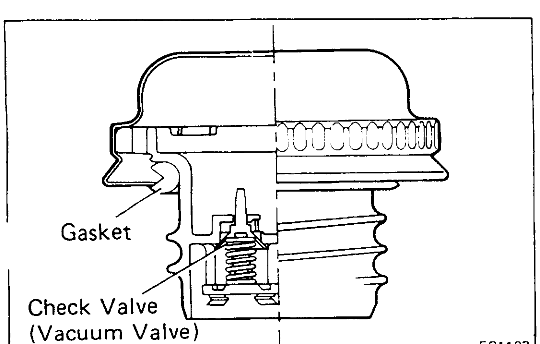
FUEL EVAPORATIVE EMISSION CONTROL (EVAP) SYSTEM



To reduce HC emissions, evaporated fuel from the fuel tank and float chamber is routed through the charcoal canister to the intake manifold for combustion in the cylinders.

IG S/W	Engine	*Outer Vent Control Valve	Coolant Temp.	Thermo S/W (1)	Vehicle Speed	Computer	VSV	Check (1)	Valve (2)	Check Valve in Cap	Evaporated Fuel (HC)
OFF	Not running	OPEN	–	–	–	–	–	–	–	—	HC from tank and float chamber is absorbed into the canister.
ON	Running	CLOSED	Below 43°C (109°F)	ON	–	OFF	CLOSED	–	–	–	HC from tank is absorbed into the canister
			Above 55°C (131°F)	OFF	Below 7 mph (11 km/h)	OFF	CLOSED	–	–	–	
					Above 16 mph (25 km/h)	ON	OPEN	–	–	–	HC from canister is led into the intake manifold.
High pressure in tank		–	–	–	–	–	–	OPEN	CLOSED	CLOSED	HC from tank is absorbed into the canister.
High vacuum in tank		–	–	–	–	–	–	CLOSED	OPEN	OPEN	(Air is led into the tank.)

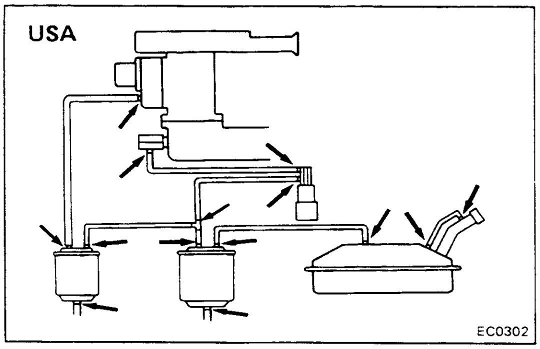
Remarks: *The outer vent control valve is pulled by intake manifold vacuum and held by the solenoid. The solenoid itself cannot pull the valve.



INSPECTION OF FUEL FILLER CAP, FUEL VAPOR LINES AND FUEL TANK

1. VISUALLY INSPECT FUEL FILLER CAP

Look for damaged or deformed gasket and cap.
If a problem is found, repair or replace the cap.



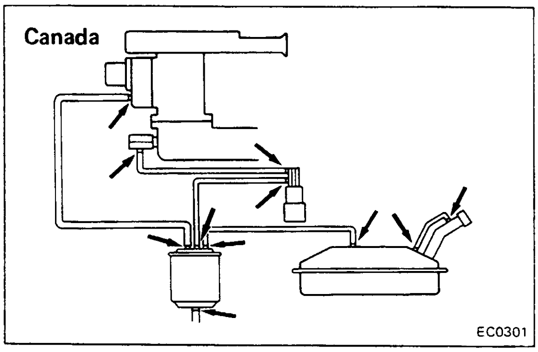
2. **VISUALLY INSPECT LINES AND CONNECTIONS**

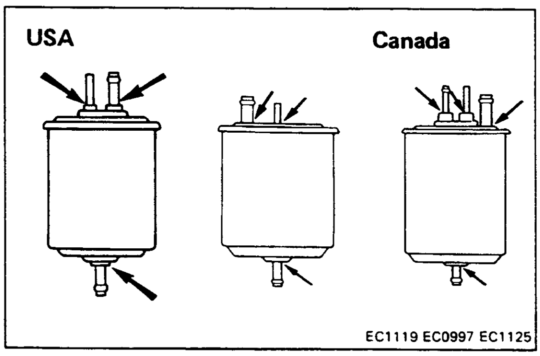
   Look for loose connections, sharp bends or damage.

3. **VISUALLY INSPECT FUEL TANK**

   Look for deformation, cracks or fuel leakage.

A03040



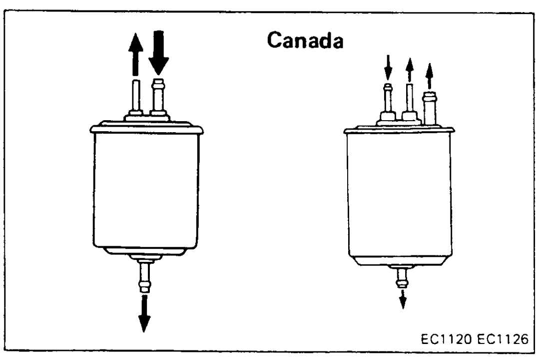


INSPECTION OF CHARCOAL CANISTER(S)

1. **REMOVE CHARCOAL CANISTER(S)**

2. **VISUALLY INSPECT CHARCOAL CANISTER(S)**

   Look for cracks or damage.

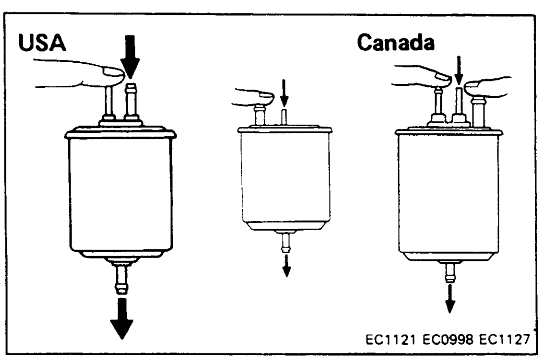


3. **CHECK FOR CLOGGED FILTER AND STUCK CHECK VALVE**

   (a) Using low pressure compressed air, blow into the tank pipe and check that the air flows without resistance from the other pipes.

   (b) Blow into the purge pipe and check that the air flows without resistance from the other pipes.

   If a problem is found, replace the charcoal canister.

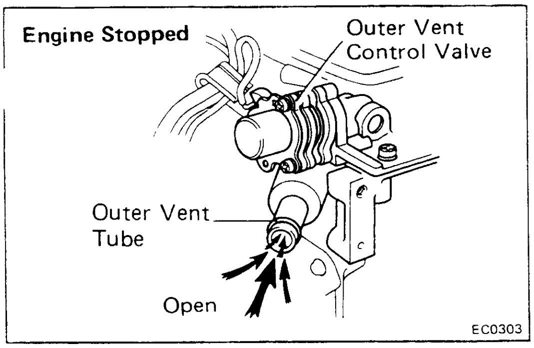


4. **CLEAN FILTER IN CANISTER(S)**

   Clean the filter by blowing 3 kg/cm² (43 psi, 294 kPa) of compressed air into the pipe, while holding the other upper canister pipes closed.

   NOTE:
   - Do not attempt to wash the canister.
   - No activated carbon should come out.

5. **REINSTALL CHARCOAL CANISTER(S)**



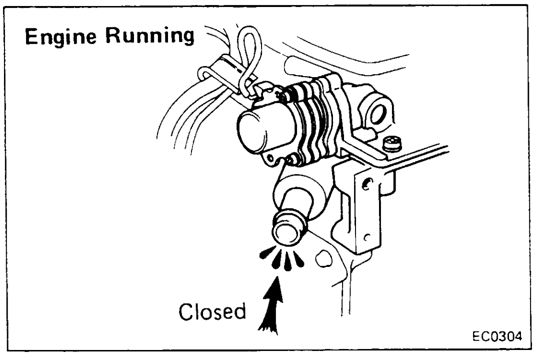
INSPECTION OF OUTER VENT CONTROL VALVE

1. CHECK OUTER VENT CONTROL VALVE OPERATION

(a) Disconnect the outer vent hose from the carburetor.

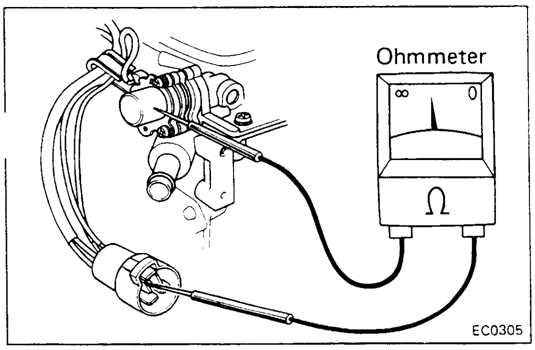
(b) Blow air into the outer vent pipe and check that the outer vent control valve is open.

A03041



(c) Start the engine.

(d) With the engine idling, blow air into the outer vent pipe and check that the outer vent control valve is closed.

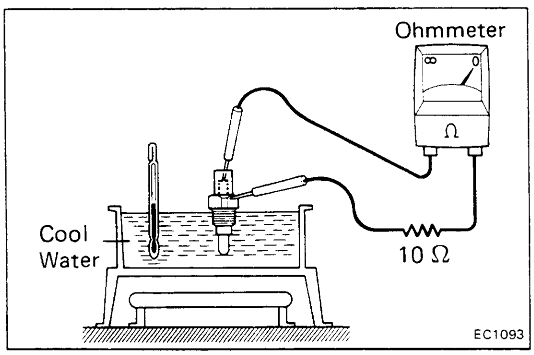


2. CHECK SOLENOID

(a) Unplug the wiring connector.

(b) Using an ohmmeter, measure the resistance between the positive(+) terminal and the solenoid body.

Specified resistance: 63 – 73 Ω at 20°C (68°F)



INSPECTION OF THERMO SWITCH (1)

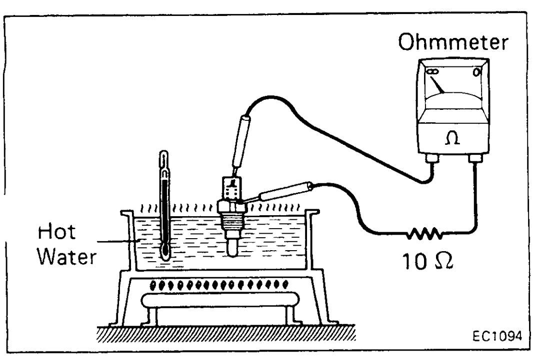
CHECK THERMO SWITCH BY USING OHMMETER

(a) Drain the coolant from the radiator into a suitable container.

(b) Remove the thermo switch from the intake manifold.

(c) Cool the thermo switch to below 43°C (109°F).

(d) Using an ohmmeter, check that there is continuity.

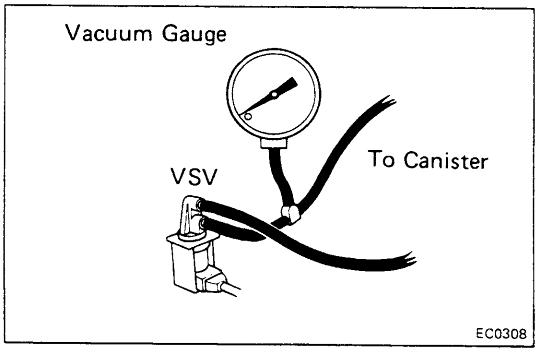


(e) Heat the switch to above 55°C (131°F) with hot water.

(f) Check that there is no continuity.

(g) Apply liquid sealer to the threads of the switch and reinstall.

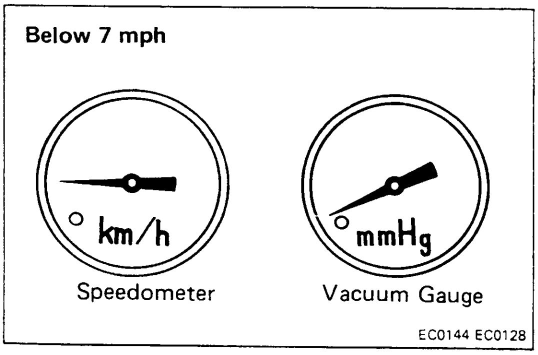
(h) Fill the radiator with coolant.



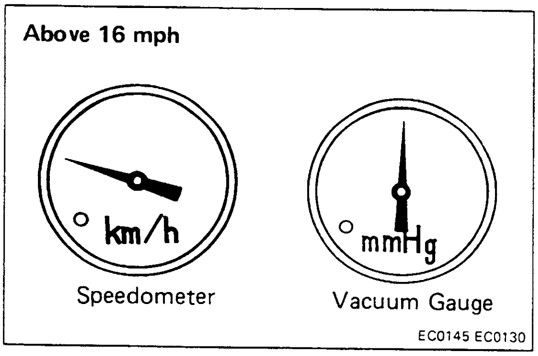
INSPECTION OF SPEED SENSOR TO VSV

1. **CONNECT VACUUM GAUGE**
   (a) Using a 3-way connector, connect the vacuum gauge to the hose between the VSV and canister.
   (b) Set the gauge at the driver's seat.

A03042



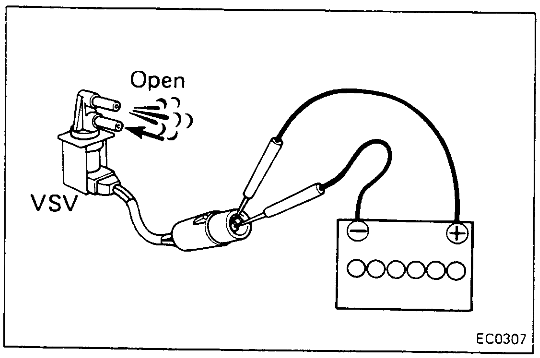
2. **PERFORM ROAD TEST, OBSERVING SPEEDOMETER AND VACUUM GAUGE**
   (a) Warm up the engine.
   (b) Check that the vacuum gauge indicates zero at low speed driving (below 7 mph or 11 km/h).



   (c) Check that the vacuum gauge indicates intake manifold vacuum at middle and high speed driving (above 16 mph or 25 km/h).

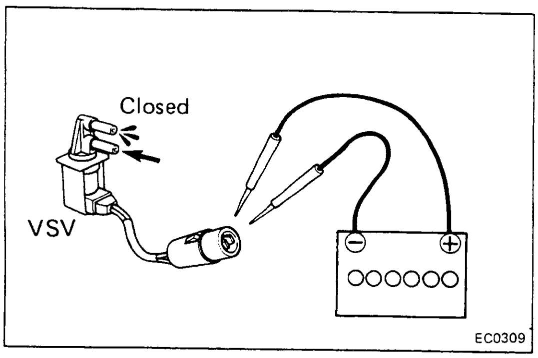
   If a problem is found, inspect speed sensor and VSV.

3. **REMOVE VACUUM GAUGE AND RECONNECT HOSE**

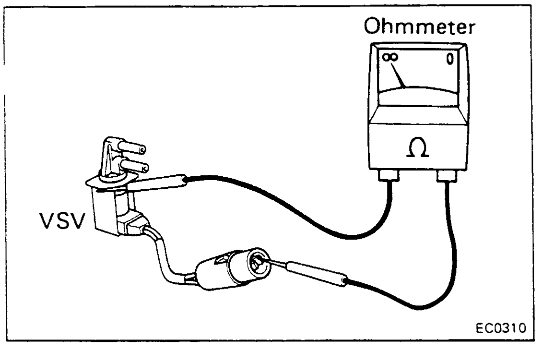


INSPECTION OF VSV

1. **CHECK VACUUM CIRCUIT CONTINUITY IN VSV BY BLOWING AIR INTO PIPE**
   (a) Connect the VSV terminals to the battery terminal as shown.
   (b) Blow into a pipe, and check that the VSV is open.



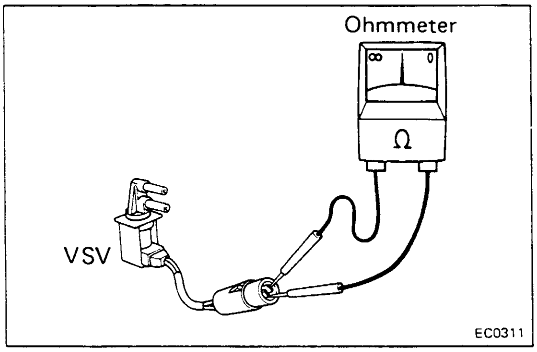
   (c) Disconnect the battery positive (+) terminal.
   (d) Blow into a pipe and check that the VSV is closed.



2. **CHECK FOR SHORT CIRCUIT**

   Using an ohmmeter, check that there is no continuity between the positive (+) terminal and the VSV body. If a short circuit is found, repair or replace the VSV.

A03043

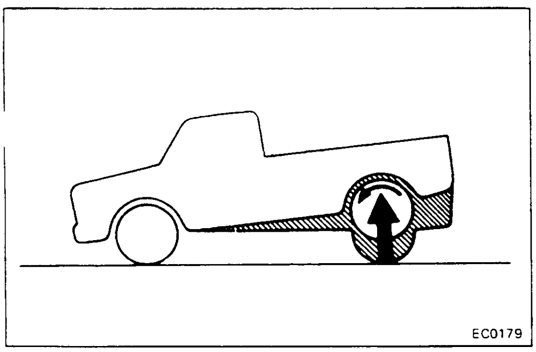


3. **CHECK FOR OPEN CIRCUIT**

   Using an ohmmeter, measure the resistance between the positive (+) terminal and the other terminals as shown.

   Specified resistance: 38 – 44 Ω at 20°C (68°F)

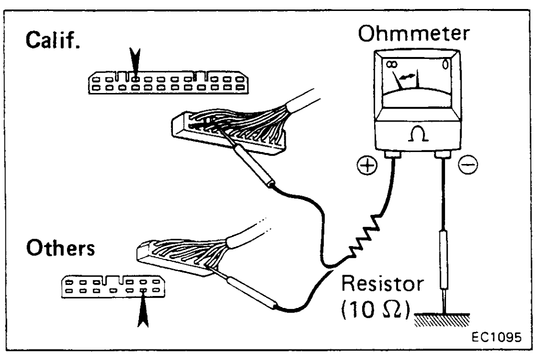
   If the resistance is not within specification, replace the VSV.



INSPECTION OF SPEED SENSOR

1. **JACK UP ONE REAR WHEEL TO CLEAR GROUND AND CHOCK FRONT WHEELS**
2. **RELEASE PARKING BRAKE**
3. **SET SHIFT LEVER INTO NEUTRAL**
4. **UNPLUG WIRING CONNECTOR FROM COMPUTER**

   Computer location: Left Cowl Side



5. **CHECK ON-OFF CYCLES OF SPEED SENSOR**

   (a) Place the positive (+) terminal of the ohmmeter on the wiring connector terminal and the negative (–) terminal on ground.

   (b) Turn the rear wheel slowly.

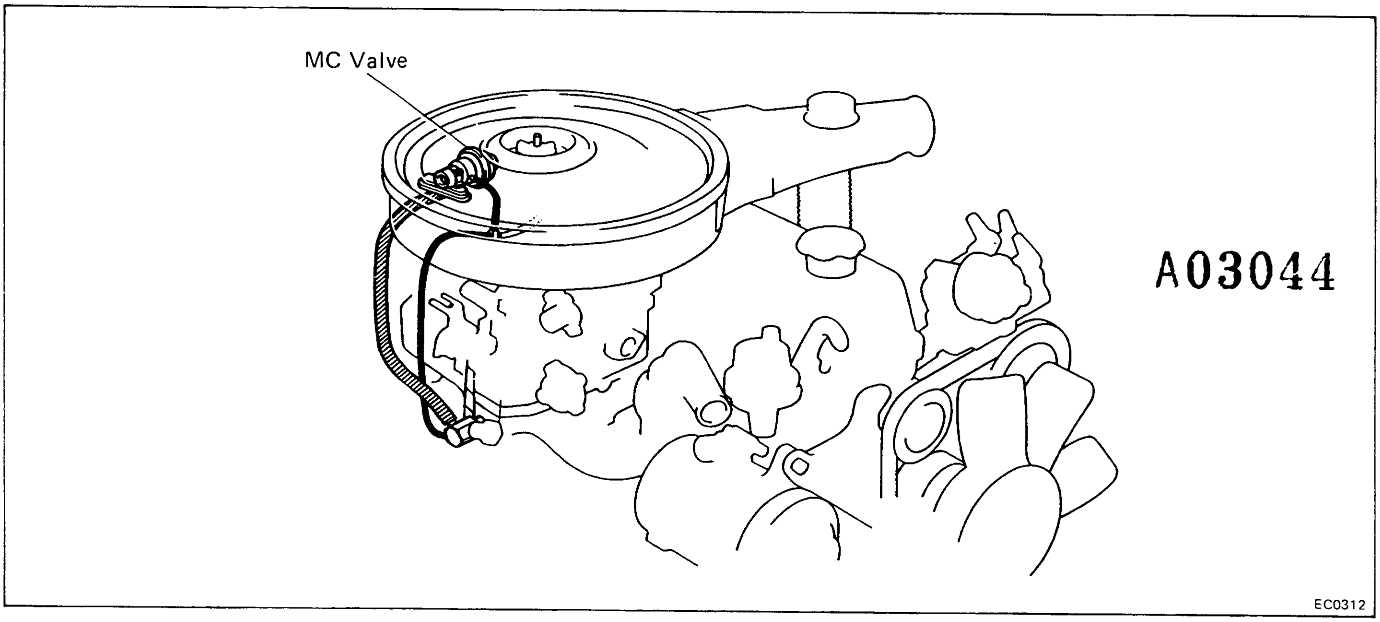
   (c) Check that the ohmmeter needle deflects consistently

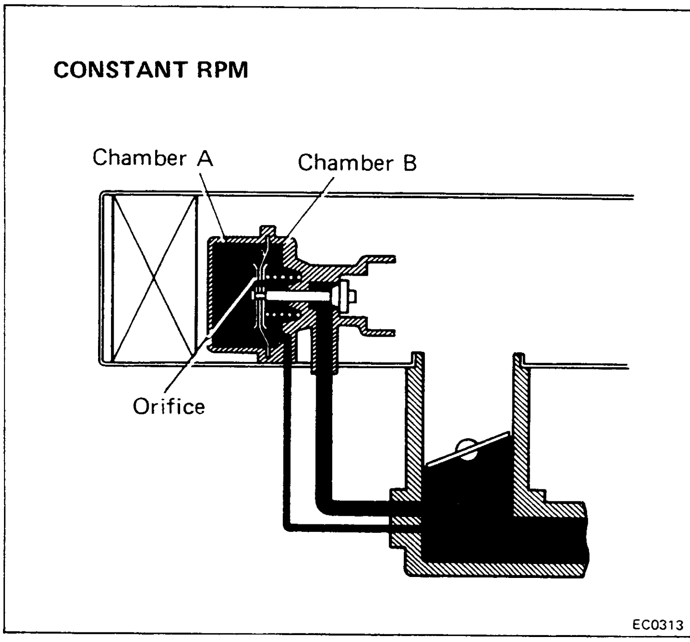
   CAUTION: The ohmmeter probe should be inserted from the rear side of the connector.

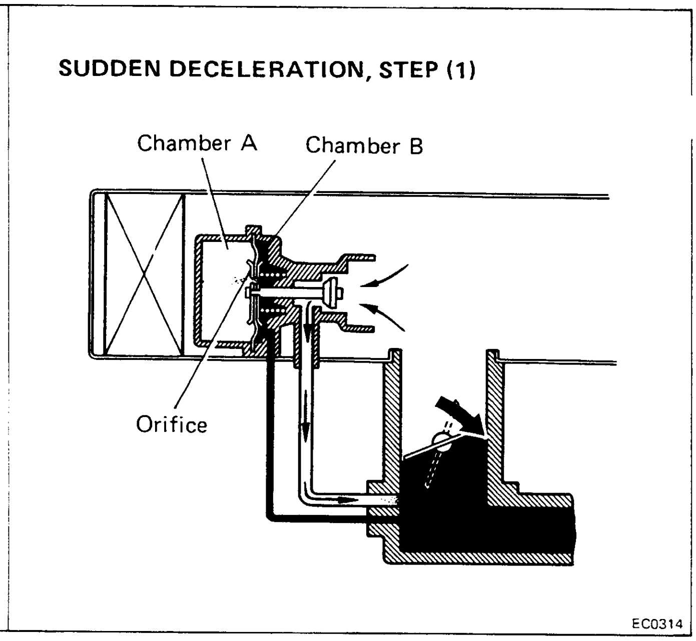
   If the ohmmeter needle does not deflect, check that the speed sensor terminals at the back side of the speedometer air properly connected. If the connection is OK, replace the speedometer assembly.

6. **RECONNECT WIRING CONNECTOR TO COMPUTER**

MIXTURE CONTROL (MC) SYSTEM
(M/T Vehicles Onl

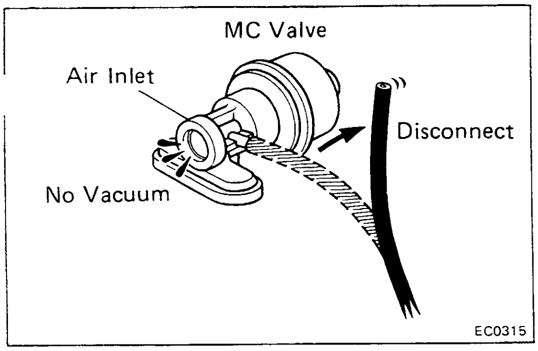


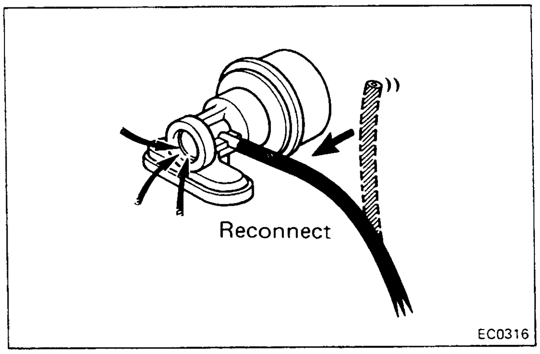




To reduce HC and CO emissions, this system allows air to enter the intake manifold on sudden deceleration.

Condition		Vacuum in Chambers A and B	MC Valve	Fresh Air
Constant RPM		Same vacuum	CLOSED	No air flow
Sudden deceleration	Step (1)	High vacuum acts on chamber B	OPEN	Air is routed through MC valve to intake manifold.
	Step (2)	After a few seconds, vacuum in both chambers equalizes through the orifice.	CLOSED	No air flow





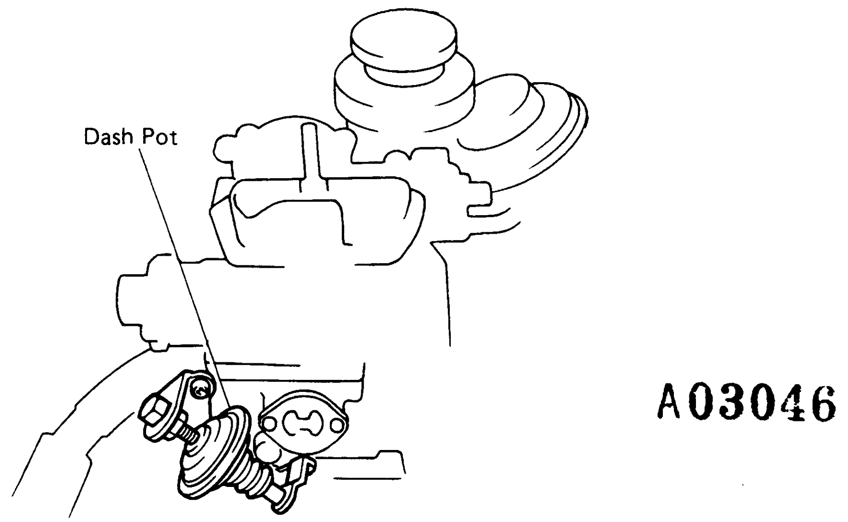
INSPECTION OF MC SYSTEM

1. **REMOVE AIR CLEANER COVER AND AIR FILTER**
2. **START ENGINE**
3. **CHECK MC VALVE**
   (a) Disconnect the vacuum hose from the MC valve.
   (b) Place your fingers over the air inlet of the MC valve.
   (c) Check that vacuum is not felt.
   (d) Reconnect the vacuum hose and check that vacuum is felt momentarily.

   NOTE: At this time, the engine will idle rough or die, but this is normal.
4. **REINSTALL AIR FILTER AND CLEANER COVER**

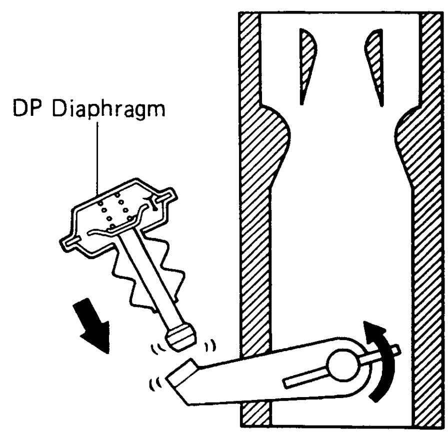
A03045

DASH POT (DP) SYSTEM (A/T Vehicles Only)



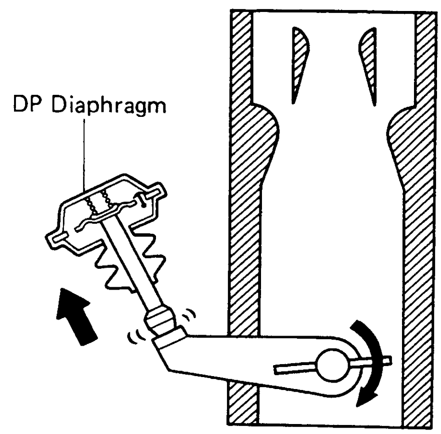
EC1187

Normal Driving



EC1188

Deceleration



EC1189

To reduce HC and CO emissions, when decelerating the dash pot opens the throttle valve slightly more than at idle. This causes the air-fuel mixture to burn completely.

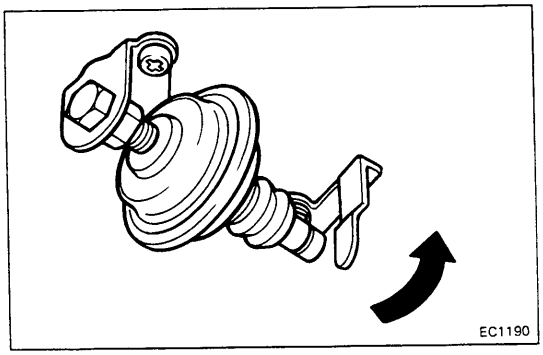
Condition	DP Diaphragm	Throttle Valve
Idling	Pushed in by return force of throttle valve	Idle speed position
Normal driving	Pushed out by diaphragm spring	High speed position
Deceleration	Pushed in by return force of throttle valve	Slightly opens and then slowly closes to idle position

INSPECTION OF DP SYSTEM

1. WARM UP ENGINE

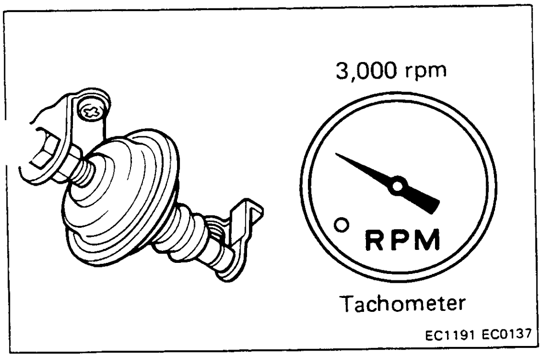
2. CHECK IDLE SPEED AND ADJUST, IF NECESSARY

A03047



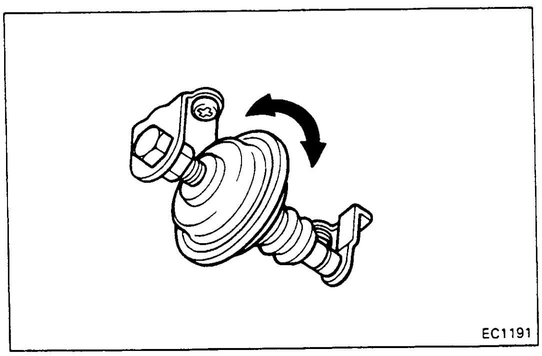
3. CHECK DP SETTING SPEED

(a) Open the throttle valve untill the throttle lever separates from the DP end.



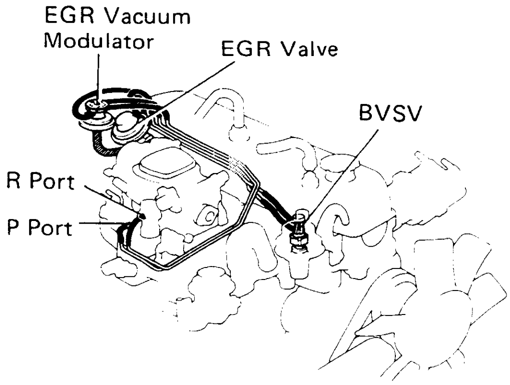
(b) Release the throttle valve gradually, and check the DP setting speed when the throttle lever touches the DP end.

DP setting speed: 3,000 rpm



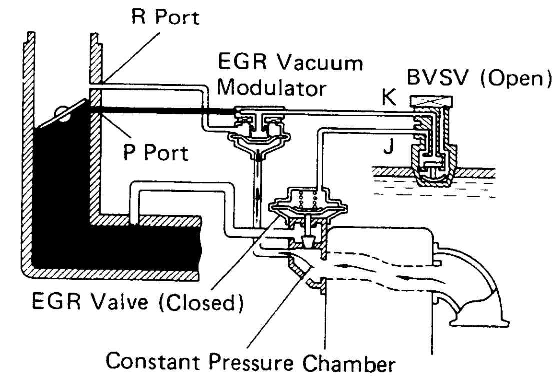
If the speed is not as specified, unlock the lock nut, and adjust the setting speed by turnning the DP diaphragm.

EXHAUST GAS RECIRCULATION (EGR) SYSTEM (Federal and Canad~~



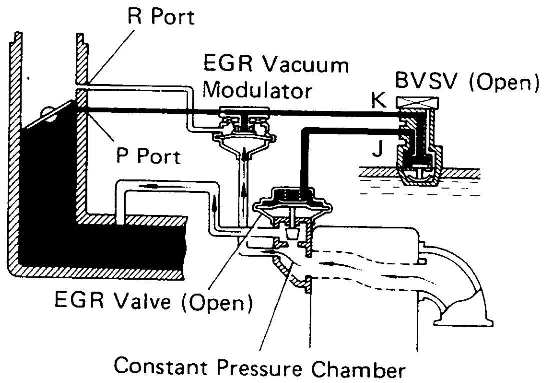
EC0328

(1)



EC0329

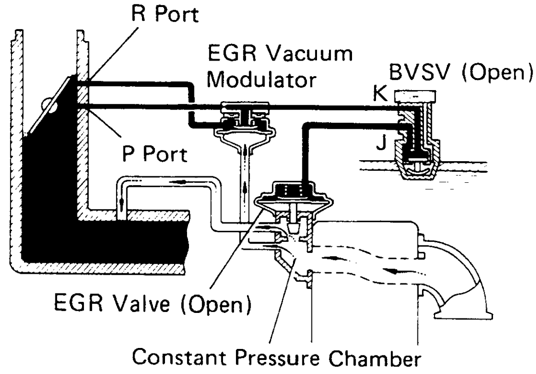
(2)



EC0330

(3)

A03048



EC0331

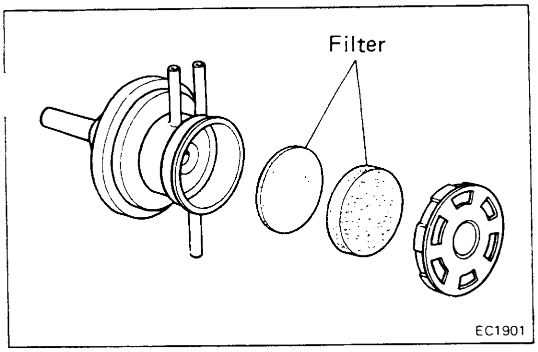
To reduce NOx emission, part of the exhaust gases are recirculated through the EGR valve to the intake manifold to lower the maximum combustion temperature.

Coolant Temp.	BVSV	Throttle Valve Opening Angle	Pressure in the EGR Valve Pressure Chamber		EGR Vacuum Modulator	EGR Valve	Exhaust Gas
Below 30°C (86°F)	CLOSED (J-K)	—	—		—	CLOSED	Not recirculated
Above 44°C (111°F)	OPEN (J-K)	Positioned below EGR port	—		—	CLOSED	Not recirculated
		Positioned between P port & R port	(1) LOW	*Pressure constantly alternating between low and high	OPENS passage to atmosphere	CLOSED	Not recirculated
			(2) HIGH		CLOSES passage to atmosphere	OPEN	Recirculated
		Positioned above EGR R port	(3) HIGH	**	CLOSES passage to atmosphere	OPEN	Recirculated (increase)

Remarks: *Pressure increase→Modulator closes→EGR valve opens→Pressure drops
←EGR valve closes←Modulator opens←

**When the throttle valve is positioned above the R port, the EGR vacuum modulator will close the atmosphere passage and open the EGR valve to increase the EGR gas, even if the exhaust pressure is insufficiently low.

INSPECTION OF EGR SYSTEM

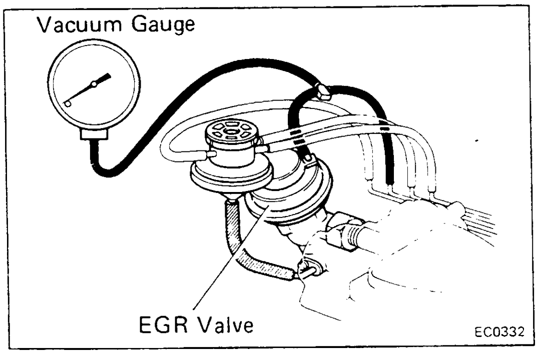


1. CHECK AND CLEAN FILTER IN EGR VACUUM MODULATOR

(a) Check the filter for contamination or damage.

(b) Using compressed air, clean the filter.

A03049

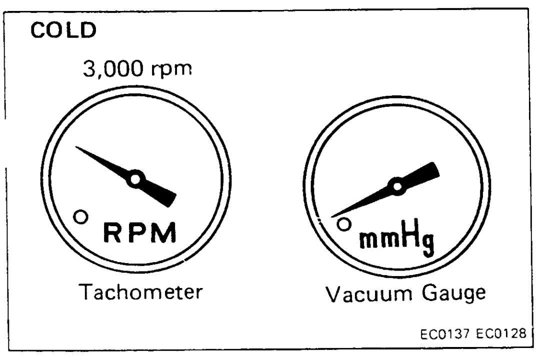


2. PREPARATION

Using a 3-way connector, connect a vacuum gauge to the hose between the EGR valve and vacuum pipe.

3. CHECK SEATING OF EGR VALVE

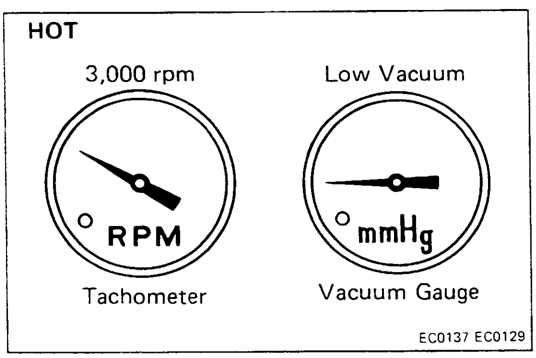
Start the engine and check that the engine starts and runs at idle.



4. CHECK BVSV WITH COLD ENGINE

(a) The coolant temperature should be below 30°C (86°F).

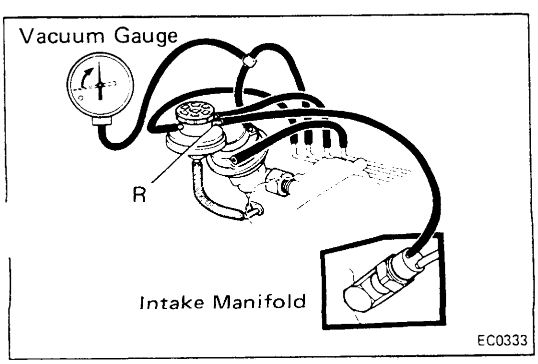
(b) Check that the vacuum gauge indicates zero at 3,000 rpm.



5. CHECK BVSV, VSV AND EGR VACUUM MODULATOR WITH HOT ENGINE

(a) Warm up the engine.

(b) Check that the vacuum gauge indicates low vacuum at 3,000 rpm.

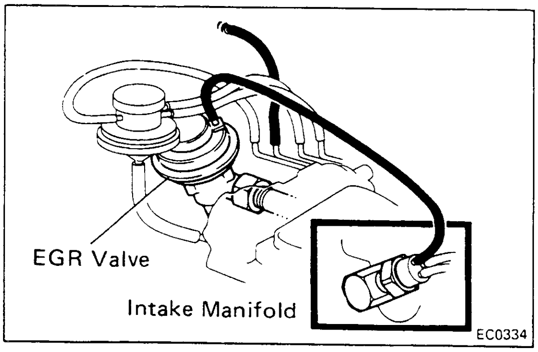


(c) Disconnect the vacuum hose from port R of the EGR vacuum modulator and connect port R directly to the intake manifold with another hose.

(d) Check that the vacuum gauge indicates high vacuum at 3,000 rpm.

NOTE: As a large amount of EGR gas enters, the engine will misfire slightly at this time.

(e) Disconnect the vacuum gauge and reconnect the vacuum hoses to the proper locations.



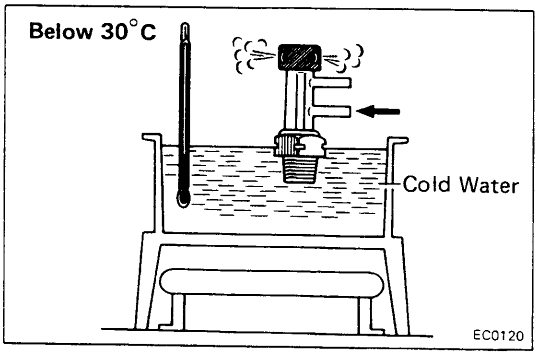
6. **CHECK EGR VALVE**
   (a) Apply vacuum directly to the EGR valve with the engine idling.
   (b) Check that the engine runs rough or dies.
   (c) Reconnect the vacuum hoses to the proper locations.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART

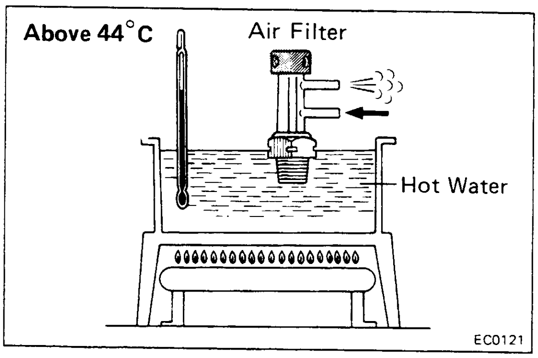
A03050

INSPECTION OF BVSV

CHECK BVSV BY BLOWING AIR INTO PIPE



(a) Drain the coolant from the radiator into a suitable container.
(b) Remove the BVSV.
(c) Cool the BVSV to below 30°C (86°F) with cool water.
(d) Blow air into a pipe and check that the BVSV is closed.

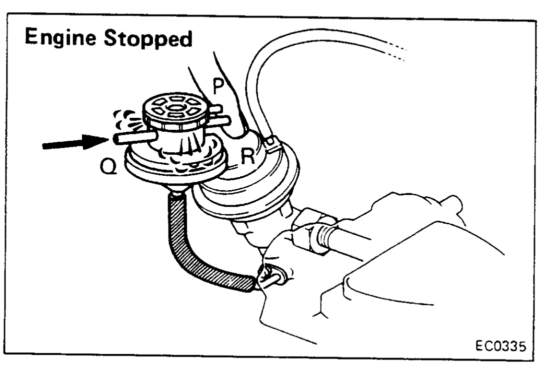


(e) Heat the BVSV to above 44°C (111°F) with hot water.
(f) Blow air into a pipe and check that the BVSV is open.
(g) Apply liquid sealer to the threads of the BVSV a reinstall.
(h) Fill the radiator with coolant.

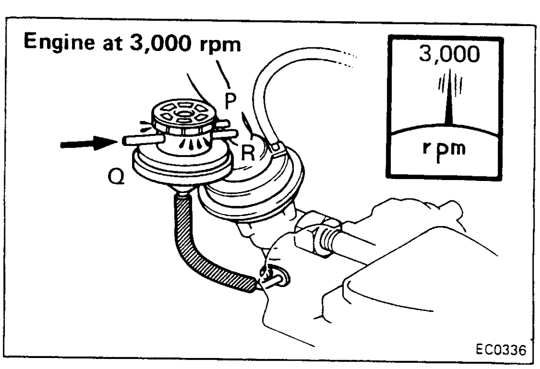
If a problem is found, replace the BVSV.

INSPECTION OF EGR VACUUM MODULATOR

CHECK EGR VACUUM MODULATOR OPERATION



(a) Disconnect the vacuum hoses from port P, Q and R of the EGR vacuum modulator.
(b) Plug port P and R with your finger.
(c) Blow air into port Q. Check that the air passes through to the air filter side freely.



(d) Start the engine and maintain the speed at 3,000 rpm.
(e) Repeat the above test. Check that there is a strong resistance to air flow.
(f) Reconnect the vacuum hoses to the proper locations.

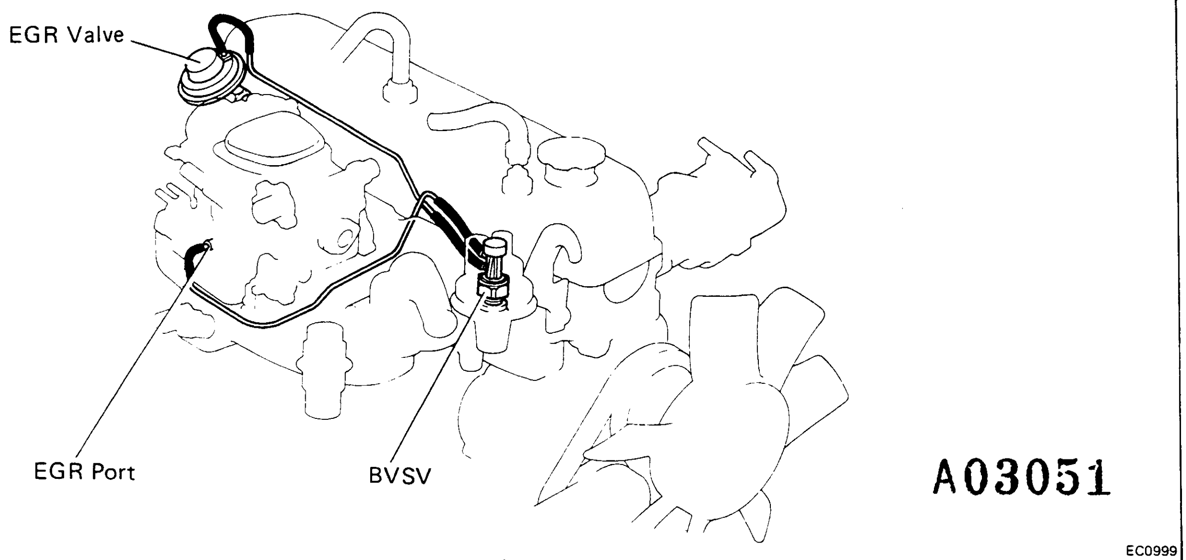
INSPECTION OF EGR VALVE

1. **REMOVE EGR VALVE**

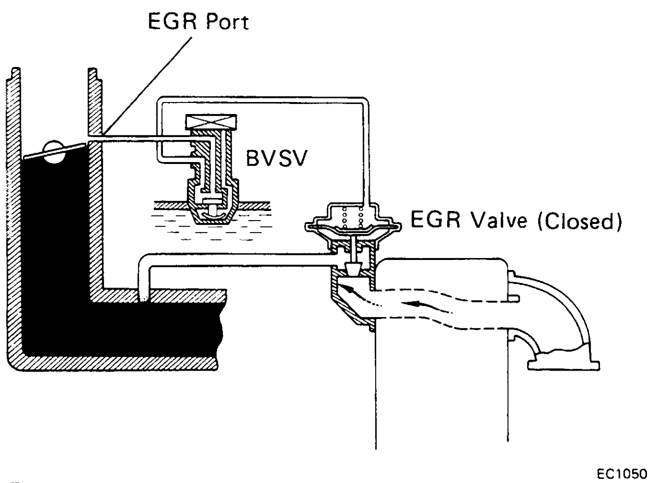
   Check the valve for sticking and heavy carbon deposi'
   If a problem is found, replace it.

2. **INSTALL EGR VALVE WITH A NEW GASKET**

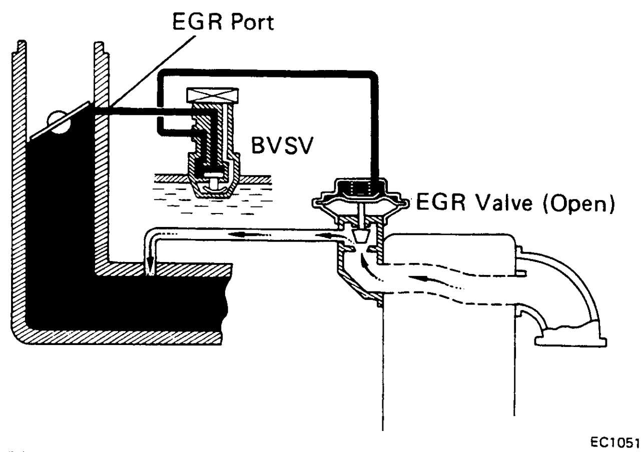
EXHAUST GAS RECIRCULATION (EGR) SYSTEM (California)



(1)



(2)



To reduce NOx emission, part of the exhaust gases are recirculated through the EGR valve to the intake manifold to lower the maximum combustion temperature.

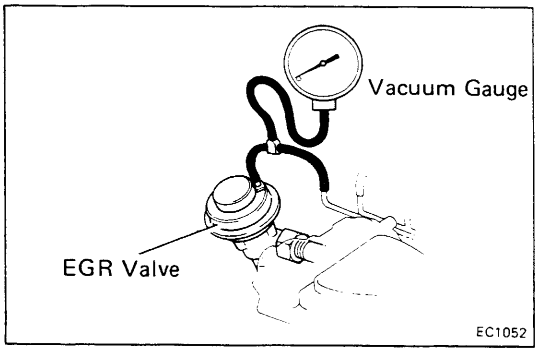
Coolant Temp.	BVSV	Throttle Valve Opening Angle	EGR Valve	Exhaust Gas
Below 30°C (86°F)	CLOSED (J-K)	—	CLOSED	Not recirculated
Above 44°C (111°F)	OPEN (J-K)	Positioned below EGR port	CLOSED	Not recirculated
		Positioned above EGR port	OPEN	Recirculated

INSPECTION OF EGR SYSTEM

1. PREPARATION

(a) Disconnect the hose from the distributor main-diaphragm, and plug the hose end.

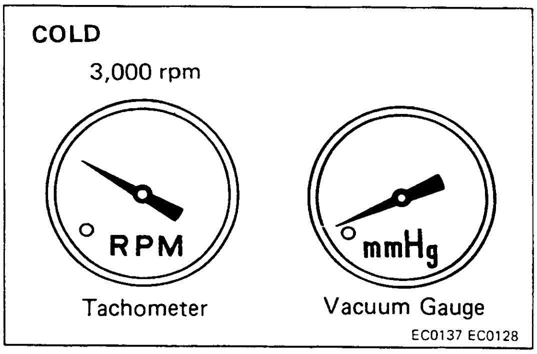
A03052



(b) Using a 3-way connector, connect a vacuum gauge to the hose between the EGR valve and EGR vacuum pipe.

2. CHECK SEATING OF EGR VALVE

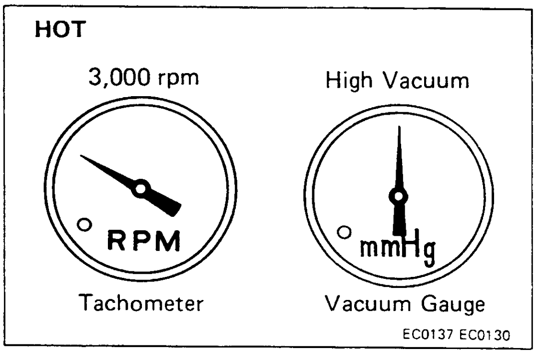
Start the engine and check that the engine starts and runs at idle.



3. CHECK BVSV WITH COLD ENGINE

(a) The coolant temperature should be below 30°C (86°F).

(b) Check that the vacuum gauge indicates zero at 3,000 rpm.

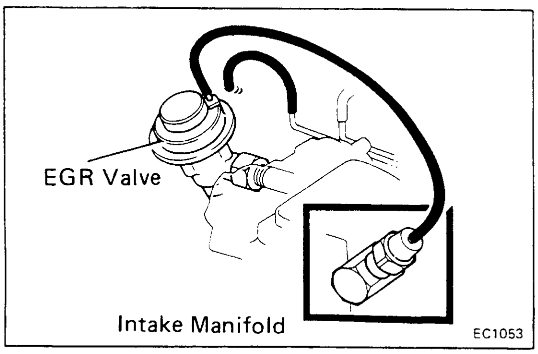


4. CHECK BVSV AND EGR VACUUM MODULATOR WITH HOT ENGINE

(a) Warm up the engine.

(b) Check that the vacuum gauge indicates high vacuum at 3,000 rpm.

(c) Disconnect the vacuum gauge and reconnect the vacuum hose to the proper location.



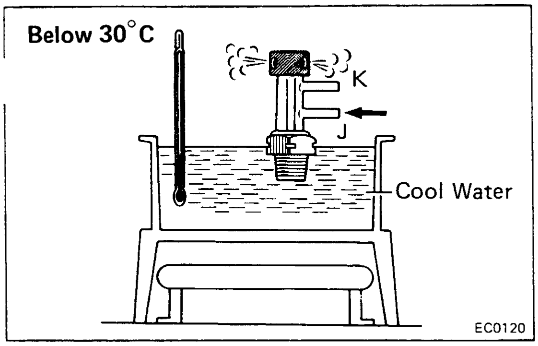
5. CHECK EGR VALVE

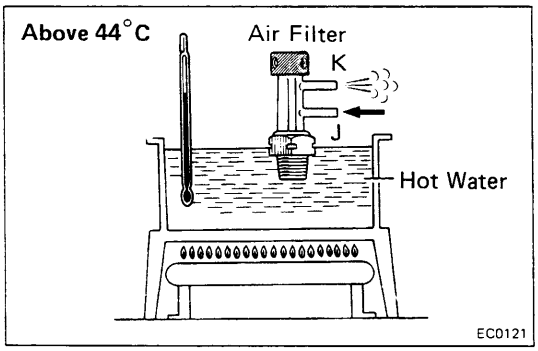
(a) Apply vacuum directly to the EGR valve with the engine idling.

(b) Check that the engine runs rough or dies.

(c) Reconnect the vacuum hoses to the proper locations.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART





INSPECTION OF BVSV

CHECK BVSV BY BLOWING AIR INTO PIPE

(a) Drain the coolant from the radiator into a suitable container.

(b) Remove the BVSV.

(c) Cool the BVSV to below 30°C (86°F).

(d) Check that air flows from pipe J to the air filter.

(e) Heat the BVSV to above 44°C (111°F).

(f) Check that air flows from pipe J to pipe K.

(g) Apply liquid sealer to the threads of the BVSV and reinstall.

(h) Fill the radiator with coolant.

If a problem is found, replace the BVSV.

A03053

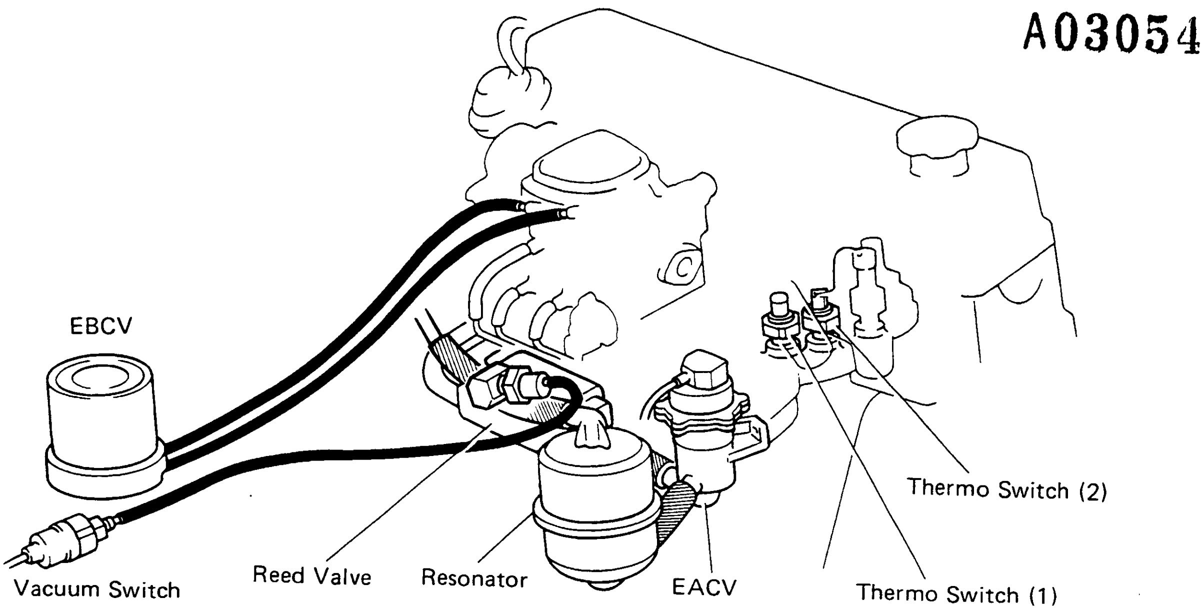
INSPECTION OF EGR VALVE

1. REMOVE EGR VALVE

Check the valve for sticking and heavy carbon deposits. If a problem is found, replace it.

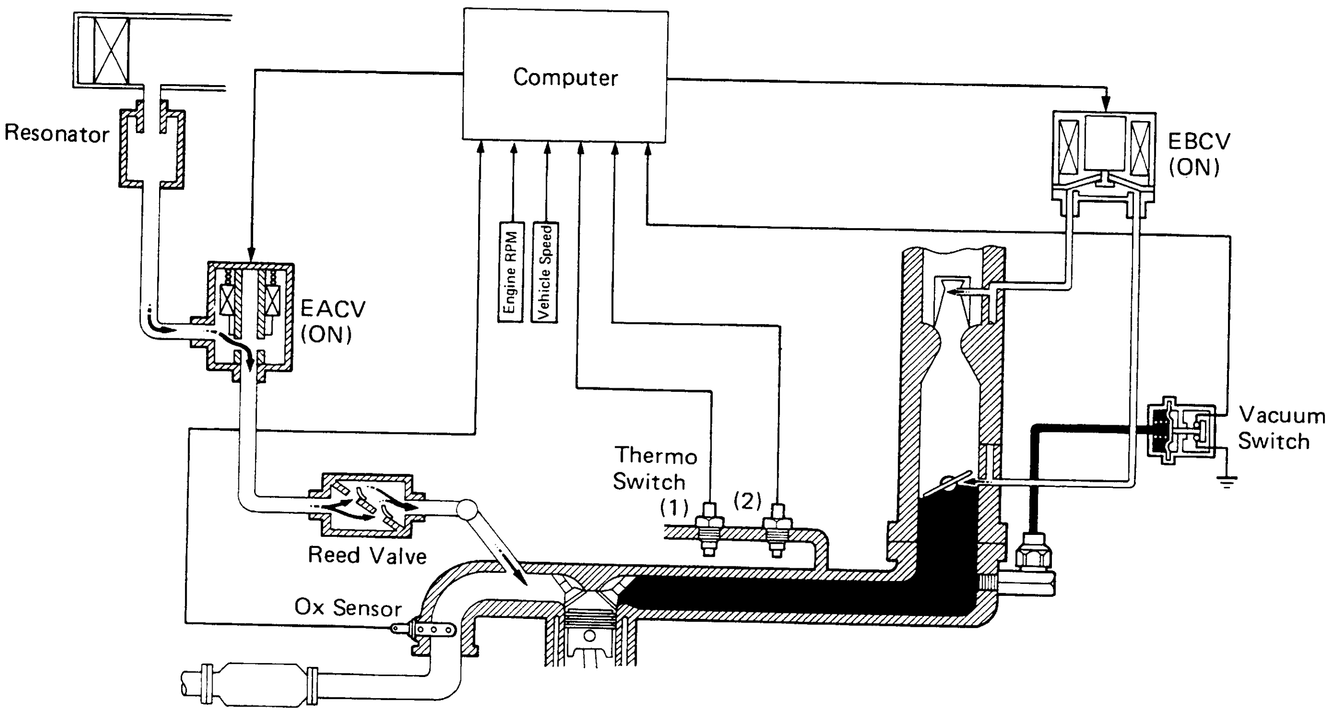
2. INSTALL EGR VALVE WITH NEW GASKET

AIR SUCTION AND FUEL SYSTEM FEEDBACK CONTROL SYSTEM (California)



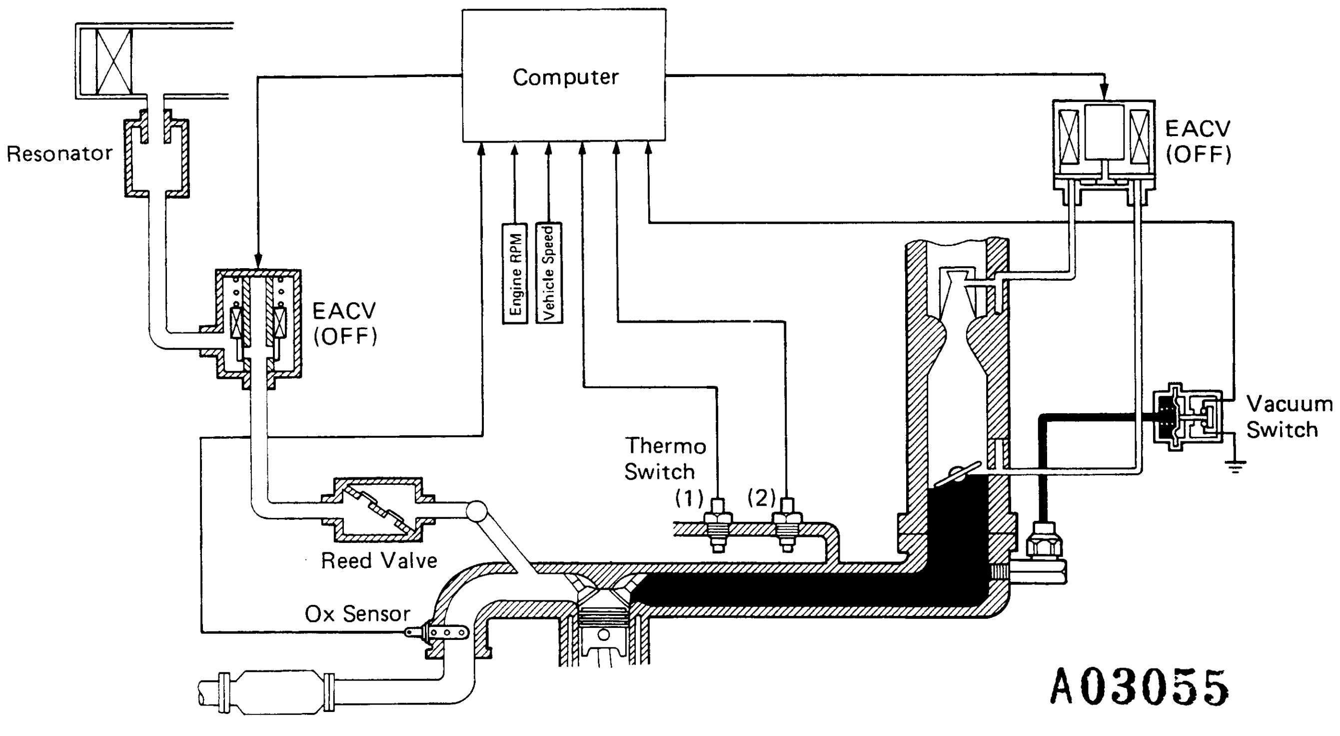
EC1097

FEEDBACK ON



EC1098

FEEDBACK OFF



EC1099

To maintain a stoichiometric air/fuel ratio in order to simultaneously reduce HC, CO and NO_x emissions by the three-way catalyst, consist of the fuel system feedback control system and air suction feedback system.

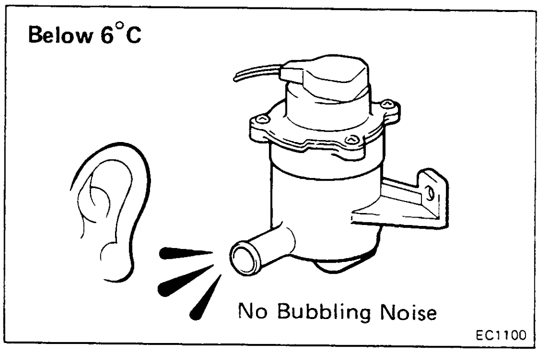
	*Vacuum Switch	Coolant Temp.	Thermo Switch (1)	Thermo Switch (2)	Engine RPM	Vehicle Speed	**Ox Sensor Signal	EACV	AS	
AS System Feedback Control System	OFF	—	—	—	—	—	—	CLOSED	OFF	
	ON	Below 6°C (43°F)	ON	ON	—	—	—			
		Between 18 – 44°C (64 – 111°F)		OFF	—	—	—	Always OPEN	Always ON	
		Above 55°C (131°F)	OFF		Below 1,000 rpm	Below 7 mph(11 km/h)	—			
						Above 16mph(26km/h)	RICH	OPEN	ON	***Feed BACK
					Above 1,390 rpm	—	LEAN	CLOSED	OFF	

	*Vacuum Switch	**Ox Sensor Signal	EBCV	Fuel Control System	
Fuel System Feedback Control System	OFF	—	CLOSED	OFF	
	ON	RICH	OPEN	ON	***Feedback
		LEAN	CLOSED	OFF	

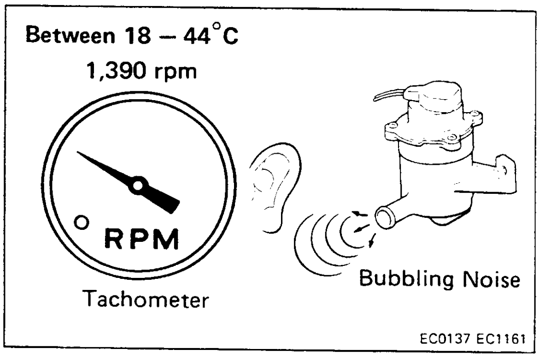
Remarks: * By means of vacuum switch, detects heavy load driving condition.
** Signal of air-fuel ratio of inlet gas for TWC.
*** By means of Ox sensor, detects oxygen concentration in exhaust manifold after combusion.
If air-fuel ratio is rich for TWC, opens EACV and EBCV. If lean, closes EACV and EBCV.

→ Air-fuel ratio RICH → O_x sensor RICH → EACV, EBCV open
EACV, EBCV close ← O_x sensor LEAN ← Air-fuel ratio LEAN ←

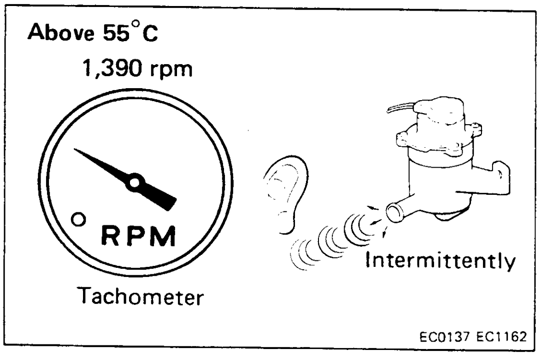
INSPECTION OF AS SYSTEM



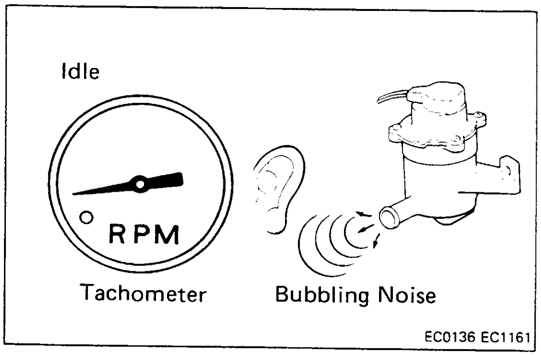
1. VISUALY CHECK HOSES AND TUBES FOR CRACKS, KINKS, DAMAGE OR LOOSE CONNECTION
2. DISCONNECT AS HOSE FROM EACV
3. CHECK COLD CONDITION
   (a) The coolant temperature should be below 6°C (43°F).
   (b) Check that a bubbling noise is not heard from the EACV.
   (c) Warm up the engine to between 18 – 44°C (64 – 111°F).
   (d) Maintain engine speed at above 1,390 rpm.
   (e) Check that a bubbling noise is heard from the EACV.



A03056

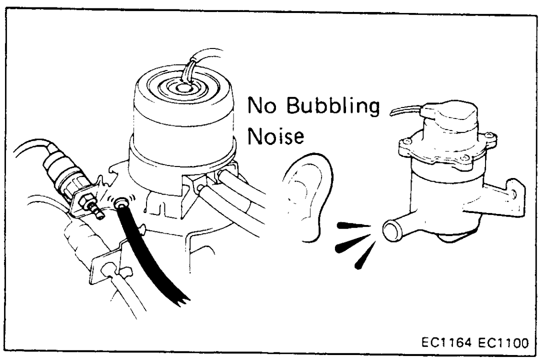


4. CHECK HOT CONDITION
   (a) Warm up the engine to above 55°C (131°F).
   (b) Maintain engine speed at above 1,390 rpm.
   (c) Check that a bubbling noise is heard intermitten from the EACV.



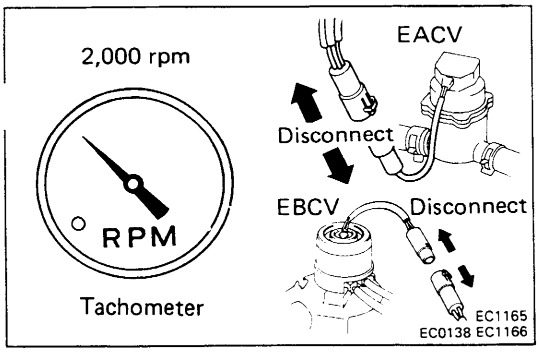
5. CHECK IDLE CONDITION

   With the engine idling (below 1,000 rpm, below 7 mph), check that a bubbling noise is heard from the EACV.



6. CHECK HEAVY LOAD CONDITION
   (a) The coolant temperature should be above 18°C (64°F)
   (b) Disconnect the vacuum hose from the vacuum switch and plug the hose end.
   (c) Check that a bubbling noise is not heard from t EACV.
7. RECONNECT HOSES TO PROPER LOCATION

INSPECTION OF FUEL FEEDBACK CONTROL SYSTEM

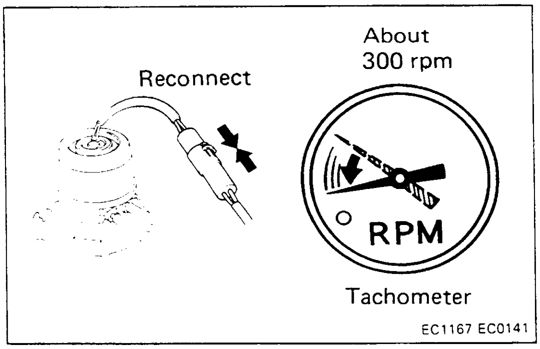


CHECK FEEDBACK CONDITION

(a) Maintain engine speed at 2,000 rpm.

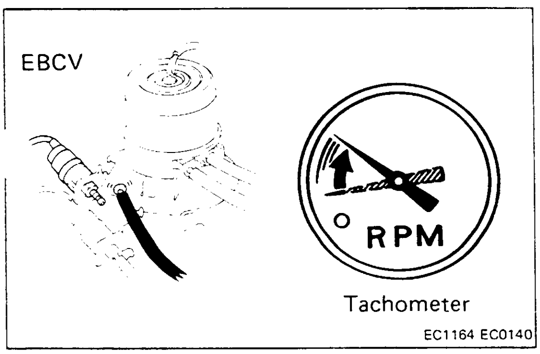
(b) Disconnect the connectors of EACV and EBCV.

A03057



(c) Wait a few seconds.

(d) Reconnect the EBCV connector and check that the engine drops about 300 rpm immediately.



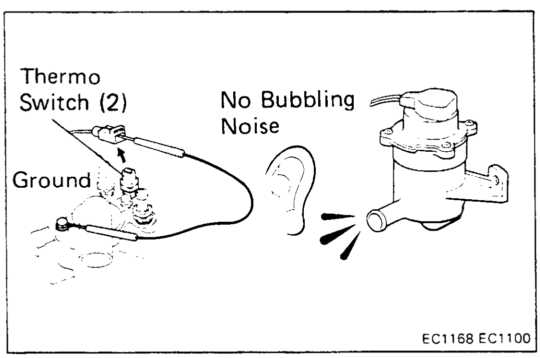
(e) Disconnect the vacuum hose from vacuum switch and plug the hose end.

(f) Check that the engine speed return to 2,000 rpm, after few seconds.

(g) Reconnect the vacuum hose and connector to the proper locations.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART

INSPECTION OF EACV



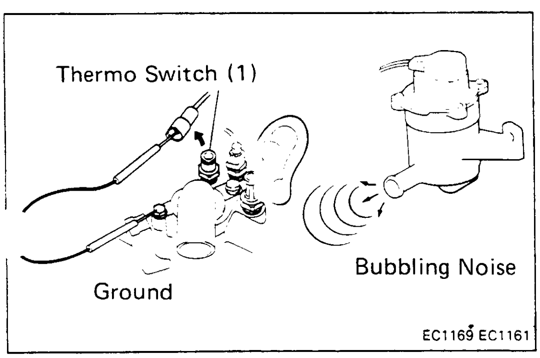
CHECK EACV

(a) Disconnect the AS hose from the EACV.

(b) Disconnect the connector from the thermo switch (2), and ground it.

(c) Check that a bubbling noise is not heard from the EACV.

(d) Reconnect the connector to thermo switch (2).



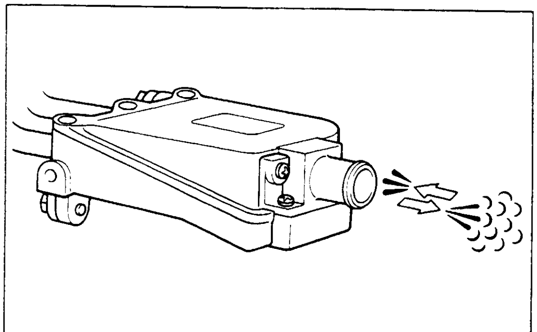
(e) Disconnect the connector from the thermo switch (1), and ground it.

(f) Maintain engine speed at above 1,390 rpm.

(g) Check that a bubbling noise is heard from the EACV.

(h) Reconnect the connector to thermo switch (1).

If a problem is found, replace the EACV.

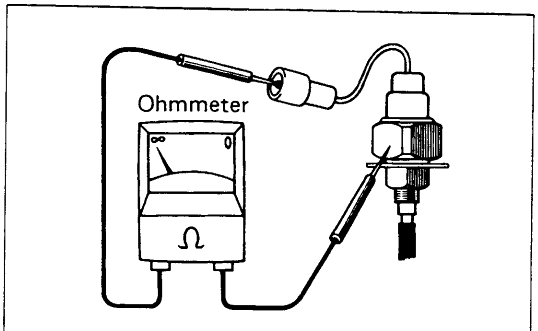

EC1170

INSPECTION OF REED VALVE

CHECK REED VALVE BY BLOWING AND SUCKING ON PIPE

Check that there is air passage when blown hard, and no air passage when sucked.

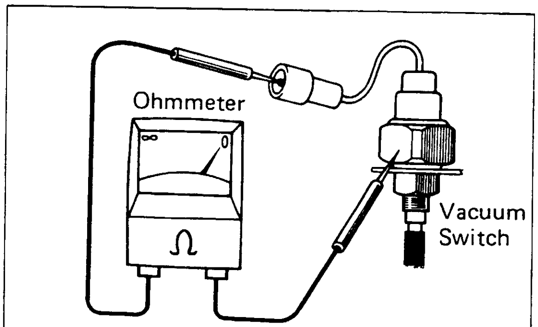
A03058



EC0487

INSPECTION OF VACUUM SWITCH

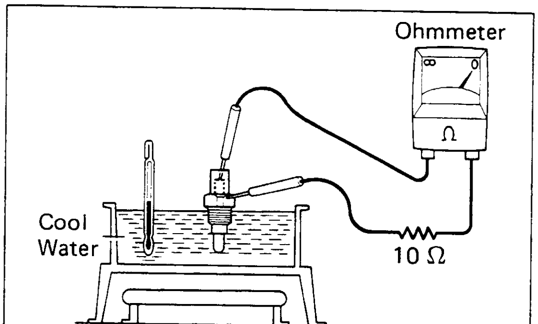
(a) Using an ohmmeter, check that there is no continuity between the switch terminal and switch body.



EC0486

(b) Warm up the engine to normal operating temperature.

(c) Using an ohmmeter, check for continuity between the switch terminal and the body.



EC1093

INSPECTION OF THERMO SWITCH (1)

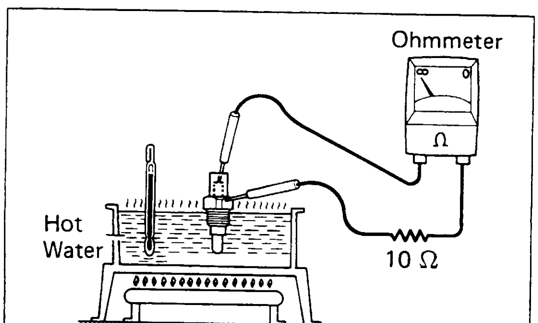
CHECK THERMO SWITCH BY USING OHMMETER

(a) Drain the coolant from the radiator into a suitable container.

(b) Remove the thermo switch.

(c) Cool the thermo switch to below 43°C (109°F).

(d) Using an ohmmeter, check that there is continuity.



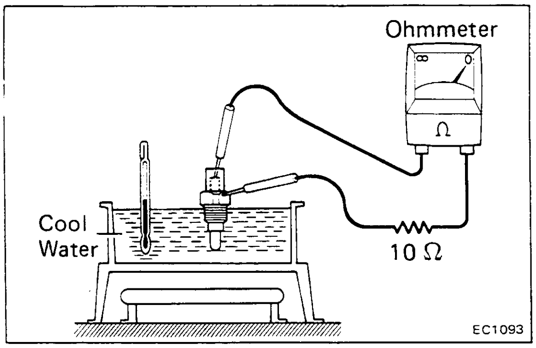
EC1094

(e) Heat the switch to above 55°C (131°F) with hot water.

(f) Check that there is no continuity.

(g) Apply liquid sealer to the threads of the switch and reinstall.

(h) Fill the radiator with coolant.



INSPECTION OF THERMO SWITCH (2)

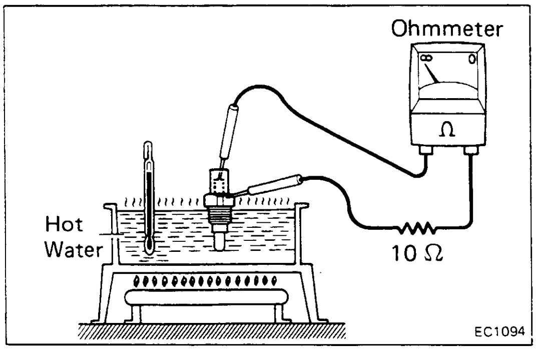
CHECK THERMO SWITCH BY USING OHMMETER

(a) Drain the coolant from the radiator into a suitable container.

(b) Remove the thermo switch from the intake manifold.

(c) Cool the thermo switch to below 6°C (43°F).

(d) Using an ohmmeter, check that there is continuity.



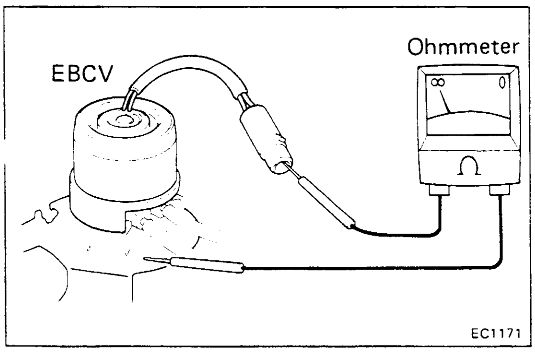
(e) Heat the switch to above 18°C (64°F) with hot water.

(f) Check that there is no continuity.

(g) Apply liquid sealer to the threads of the switch and reinstall.

(h) Fill the radiator with coolant.

A03059

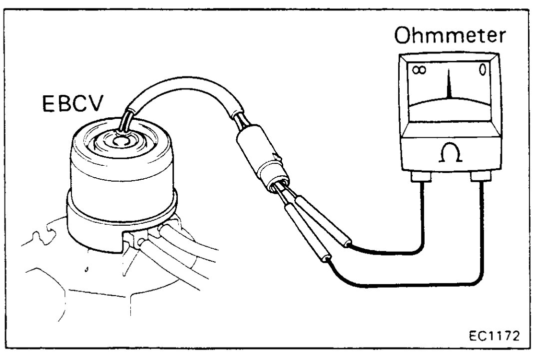


INSPECTION OF EBCV

1. **CHECK FOR SHORT CIRCUIT**

Using an ohmmeter, check that there is no continuity between the positive (+) terminal and the EBCV body.

If there is continuity, replace the EBCV.



2. **CHECK FOR OPEN CIRCUIT**

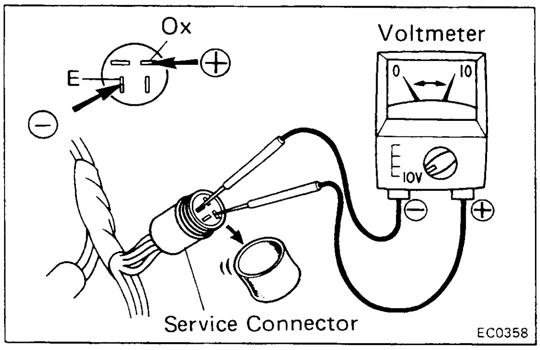
Using an ohmmeter, measure the resistance between the positive (+) terminal and the other terminal as shown.

Specified resistance: 11 – 13 Ω at 20°C (68°F)

If the resistance is not within specification. Replace the EBCV.

INSPECTION OF SPEED SENSOR

(See Page EC-25)



INSPECTION OF Ox SENSOR

CHECK Ox SENSOR WITH VOLTMETER

(a) Warm up the engine to normal operating temperatu...

(b) Connect the voltmeter to the service connector.

Service connector location: Left fender apron

Connect the positive (+) testing probe to the Ox terminal and negative (—) testing probe to terminal E.

(c) Race the engine at 2,500 rpm for about 90 seconds.

(d) Maintain engine speed at 2,500 rpm.

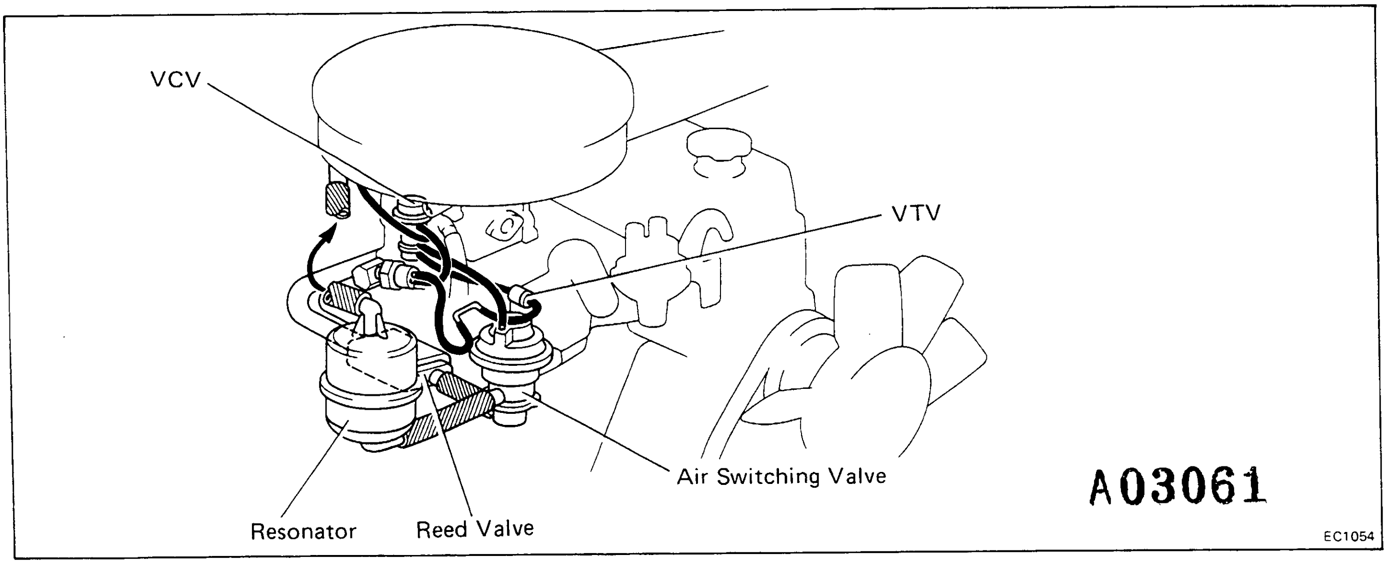
(e) Check that the needle of the voltmeter fluctuates 8 times or more in 10 seconds within 0 — 7 volts.

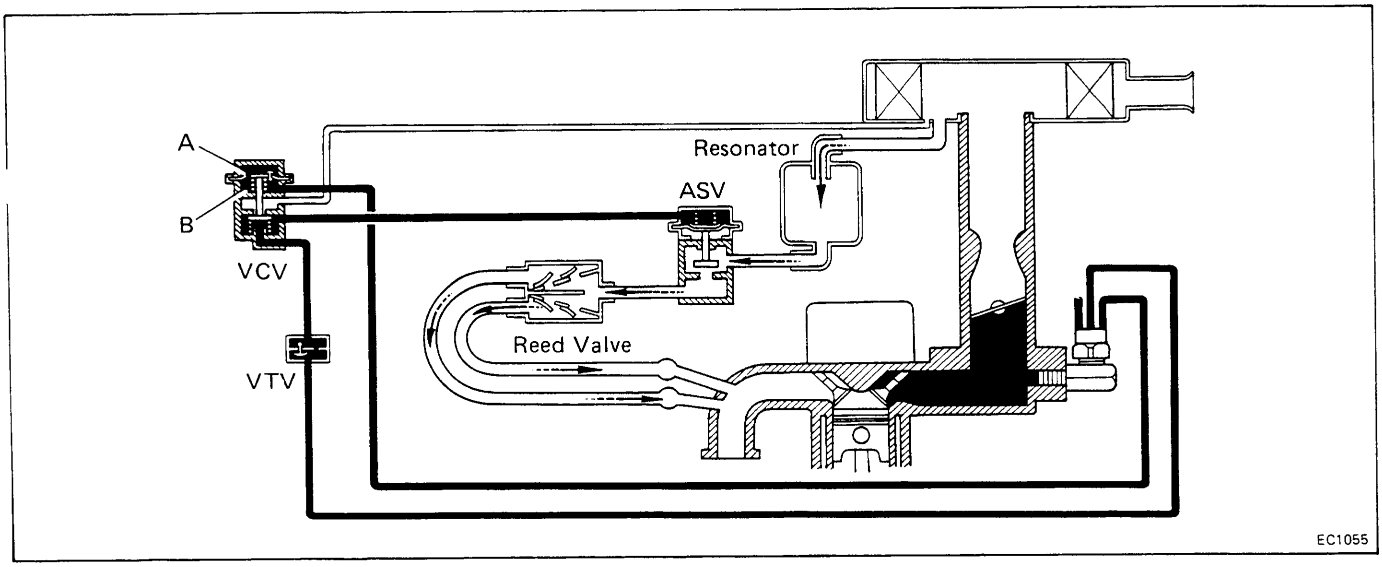
NOTE:
- If this test is positive, the Ox sensor is OK.
- If not, inspect the other parts, hose connections and wiring of air suction and fuel system feedback control system (EC-36).

If no problem is found, replace the Ox sensor.

A03060

AIR SUCTION (AS) SYSTEM
(Federal and Canada)

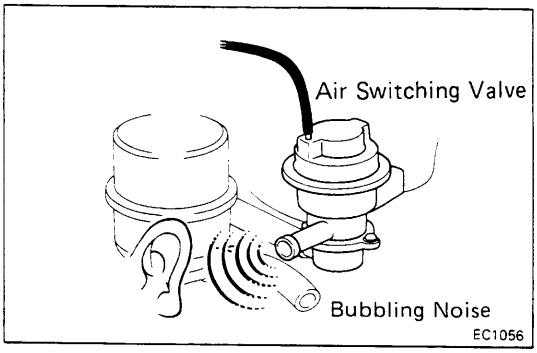


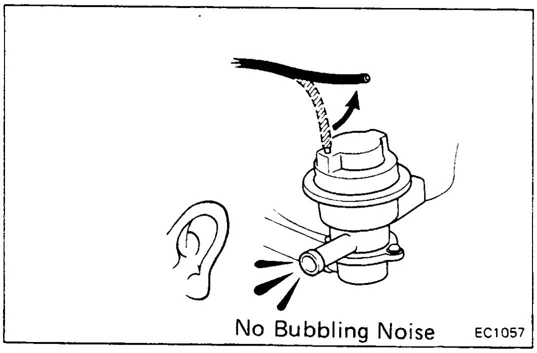


To reduce HC and CO emissions, this system draws in air into exhaust ports to accelerate oxidation, using vacuum generated by the exhaust pulsation in the exhaust manifold.

Condition	Intake Manifold Vacuum	Vacuum in VCV Chamber A and B	Air Switching Valve	AS
Normal driving	—	Same	OPEN	ON
Full load driving	Low vacuum	Same	*1 CLOSED	OFF
Sudden deceleration	High vacuum	*2 High vacuum acts on chamber B	CLOSED	Momentarily OFF

Remarks: *1 The air switching valve shuts off gradually by the VTV.
*2 After a few seconds, vacuum in both chambers of the VCV equalize through the orifice.

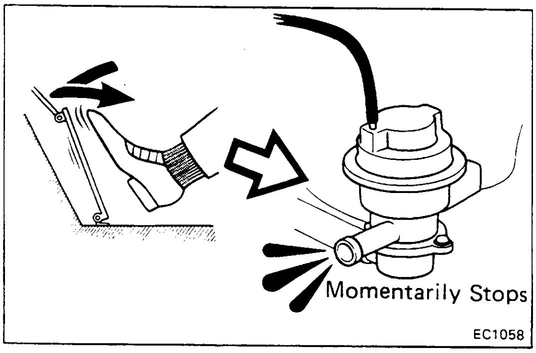




INSPECTION OF AS SYSTEM

1. **VISUALLY CHECK HOSES AND TUBES FOR CRACK KINKS, DAMAGE OR LOOSE CONNECTIONS**
2. **DISCONNECT AIR SUCTION HOSE FROM AIR SWITCHING VALVE**
3. **CHECK AIR SWITCHING VALVE**
   (a) Check that a bubbling noise is heard from the air switching valve at idle.
   (b) Disconnect the vacuum hose from the air switching valve.
   (c) Check that a bubbling noise is not heard from the air switching valve at idle.
   (d) Reconnect vacuum hose.

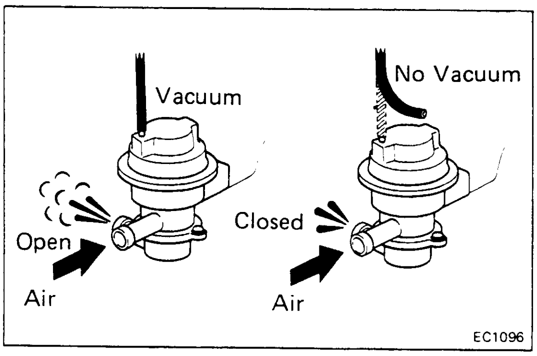
A03062



4. **CHECK VCV**

   Race the engine and quickly close the throttle valve. Check that the bubbling noise stops momentarily.

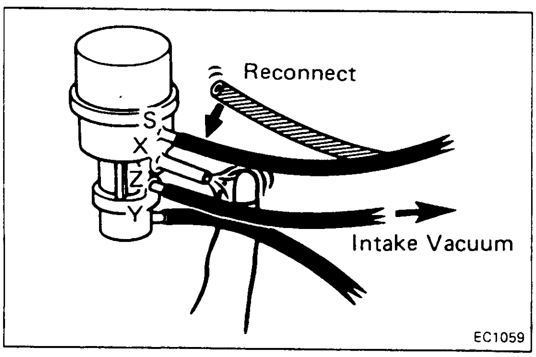
IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART



INSPECTION OF AIR SWITCHING VALVE

CHECK AIR SWITCHING VALVE BY BLOWING AIR INTO PIPE

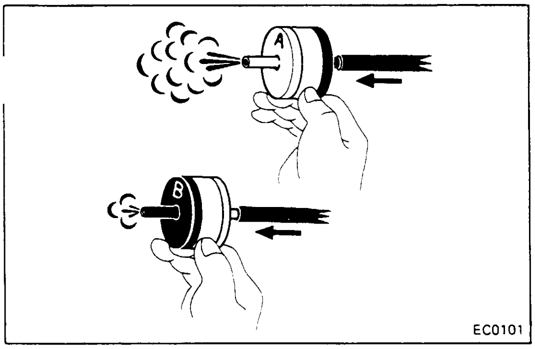
(a) Apply vacuum to the air switching valve diaphragm.
(b) Blow air into a pipe and check that the air switching valve is open.
(c) Release the vacuum and check that the air switching valve is closed.



INSPECTION OF VCV

CHECK VCV OPERATION

(a) Disconnect the vacuum hose from port Z of the VCV.
(b) Connect port Z directly to the intake manifold with another hose, and disconnect the vacuum hoses from ports S and X of the VCV.
(c) With the engine idling, place your finger over port X and check that vacuum is not felt.
(d) Check that vacuum is felt momentarily as the vacuum hose is reconnected to port S.



EC0101

INSPECTION OF VTV

CHECK VTV BY BLOWING AIR INTO EACH SIDE

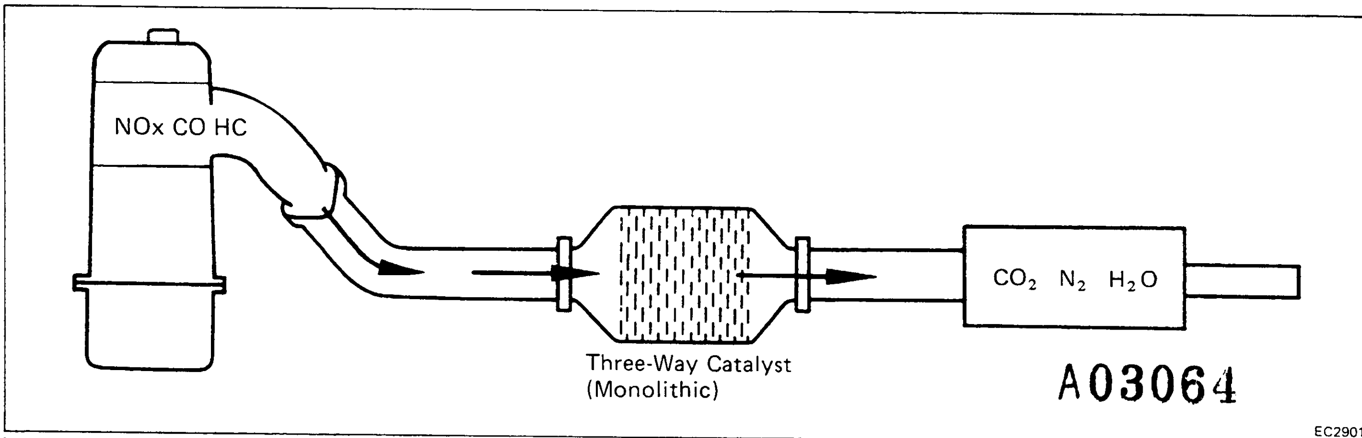
(a) Check that air flows without resistance from B to A.

(b) Check that air flows with difficulty from A to B.

If a problem is found, replace the VTV.

A03063

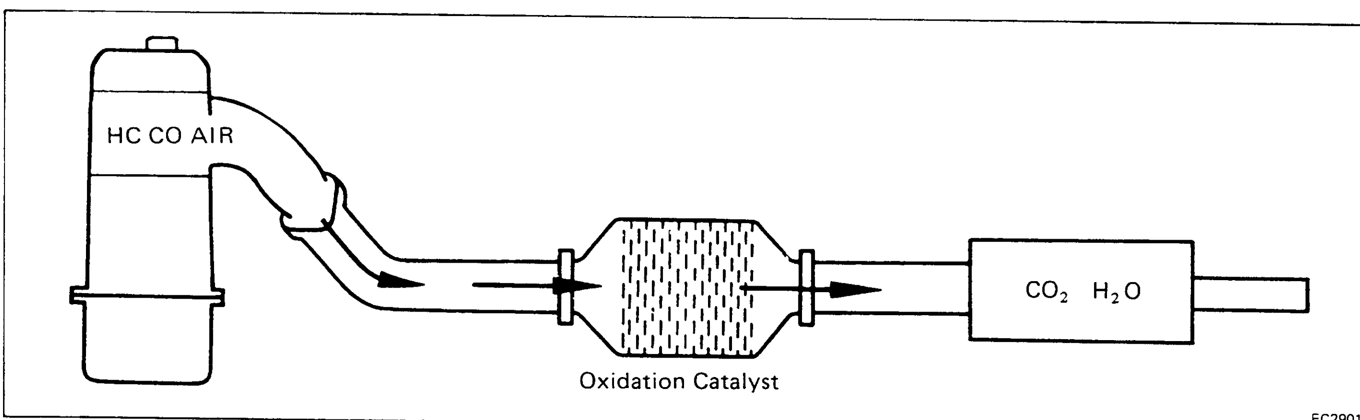
THREE-WAY CATALYST (TWC) SYSTEM
(Californi



To reduce HC, CO and NOx emissions, they are oxidized, reduced and converted to nitrogen (N_2), carbon dioxide (CO_2) and water (H_2O) by the catalyst.

Exhaust Port		TWC		Exhaust Gas
HC, CO and NO_x	→	Oxidation and reduction	→	CO_2 H_2O N_2

OXIDATION CATALYST (OC) SYSTEM
(Federal and Canada)



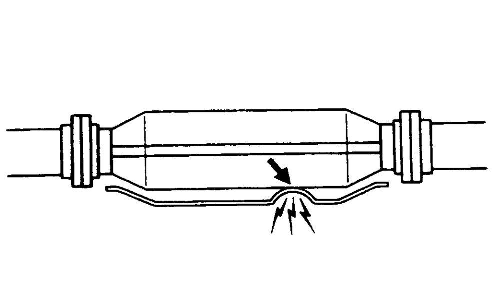
To reduce HC and CO emissions, HC and CO are oxidized and converted to water (H_2O) and carbon dioxide (CO_2) by the catalyst.

Exhaust		Converter		Exhaust Gas
Unburnt HC, CO and AIR	→	Oxidation	→	CO_2 H_2O

INSPECTION OF EXHAUST PIPE ASSEMBLY

1. CHECK CONNECTIONS FOR LOOSENESS OR DAMAGE
2. CHECK CLAMPS FOR WEAKNESS, CRACKS OR DAMAGE

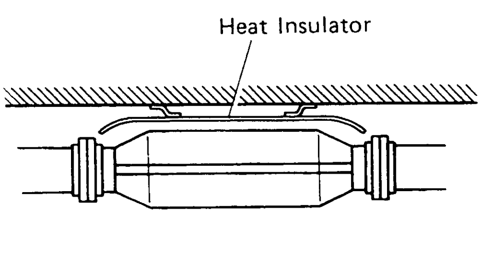
A03065


EC2902

INSPECTION OF CATALYTIC CONVERTER

CHECK FOR DENTS OR DAMAGE

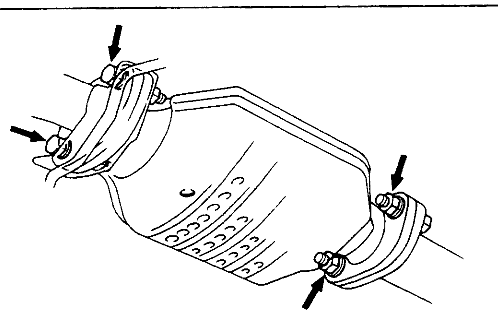
If any part of protector is damaged or dented to the extent that is contacts the catalyst, repair or replace it.



EC2903

INSPECTION OF HEAT INSULATOR

1. CHECK HEAT INSULATOR FOR DAMAGE
2. CHECK FOR ADEQUATE CLEARANCE BETWEEN CATALYTIC CONVERTER AND HEAT INSULATOR

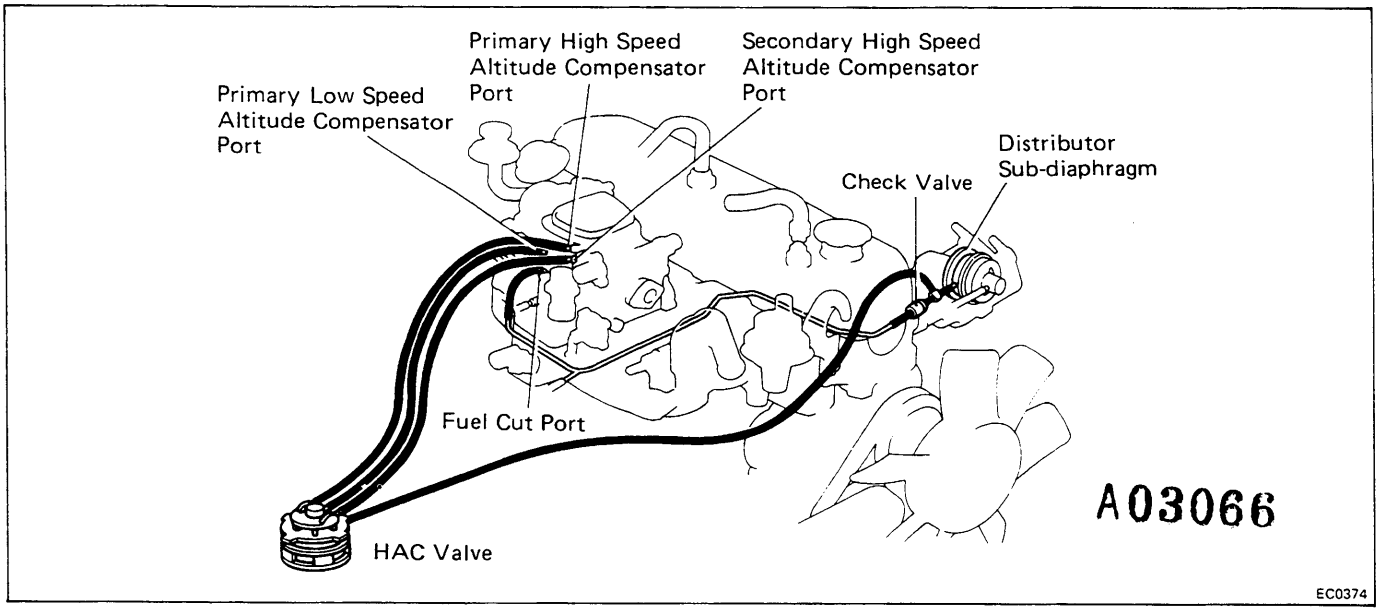

EC0244

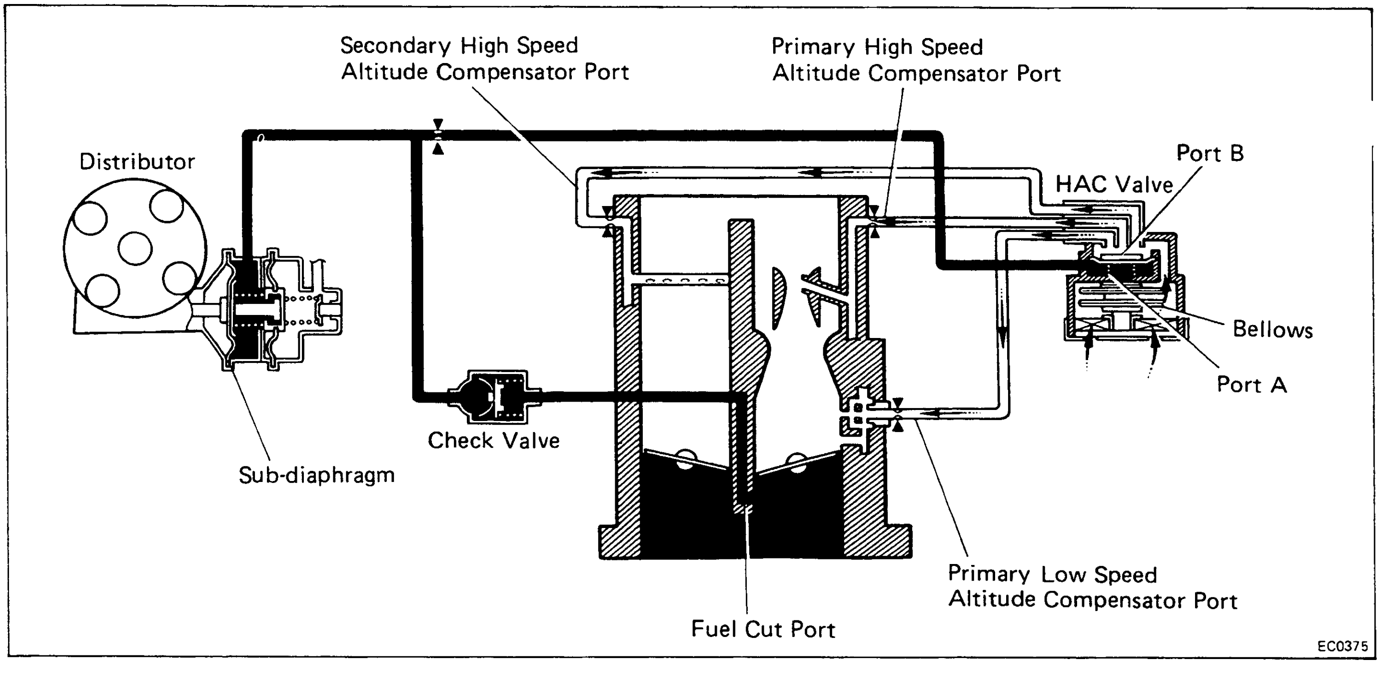
REPLACEMENT OF CATALYTIC CONVERTER

1. REMOVE CATALYTIC CONVERTER
   (a) Jack up the vehicle.
   (b) Check that the converter is cool.
   (c) Remove the bolts at the front and rear of the converter.
   (d) Remove the converter and gaskets.
2. INSTALL CATALYTIC CONVERTER
   (a) Place new gaskets on the converter front and rear pipes, and connect the converter to the exhaust pipes.
   (b) Tighten the bolts.

**Torque: Catalyst — Exhaust pipe
440 kg-cm (32 ft-lb, 43 N·m)**

HIGH ALTITUDE COMPENSATION (HAC) SYSTEM
(Federal (Optior

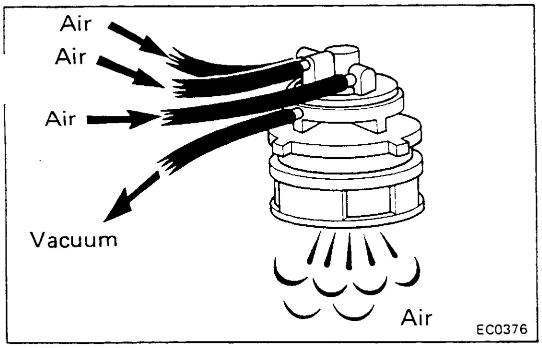




As altitude increases, the air-fuel mixture becomes richer. This system insures proper air-fuel mixture by supplying additional air to the primary low and high speed circuits and secondary high speed circuit of the carburetor, and advances the ignition timing to improve driveability at high altitude (above 1,198 m (3,930 ft)).

Altitude	Bellows in HAC Valve	Port A in HAC Valve	Distributor Sub-diaphragm	Port B in HAC Valve	Air from HAC Valve	Vacuum Ignition Timing
HIGH Above 1,198m (3,930 ft)	EXPANDED	CLOSED	PULLED (Always)	OPEN	Led into primary low and high speed circuits and secondary high speed circuit	ADVANCED (+1: (Always)
LOW Below 783m (2,570 ft)	CONTRACTED	OPEN	NOT PULLED (PULLED only during idling)	CLOSED	STOPPED	INITIAL TIMING (ADVANCED (+12°) only during idling)

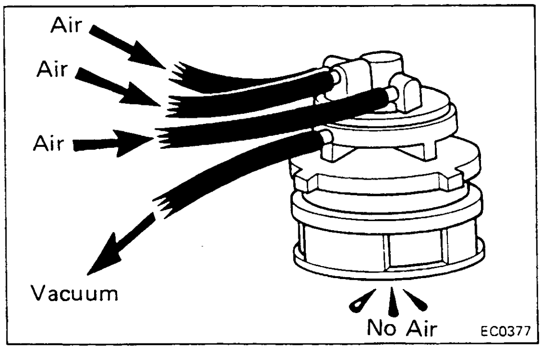
INSPECTION OF HAC SYSTEM



EC0376

PRECHECK:
Before checking the HAC system, determine the position of the HAC valve. This can be done by blowing into any one of the three ports on top of the HAC valve with the engine idling. If the passage is open, the valve is in the HIGH ALTITUDE position.

A03067

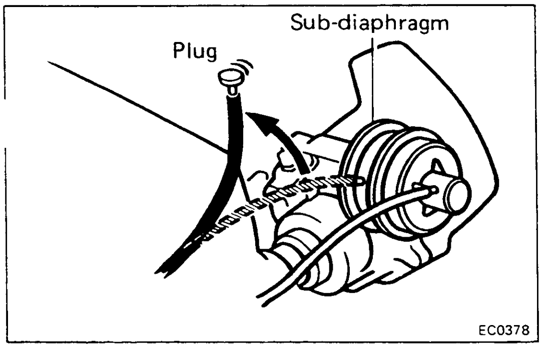


EC0377

If it is closed, the valve is in the LOW ALTITUDE position.

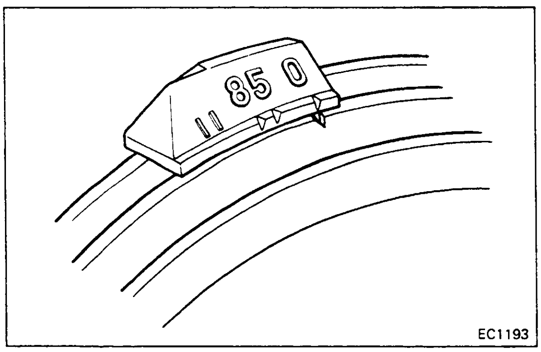
A. AT HIGH ALTITUDE

1. CHECK IGNITION TIMING AT IDLE

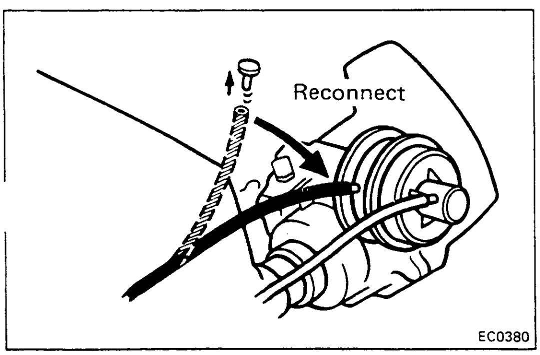


EC0378

(a) Warm up the engine.
(b) Disconnect the hose from the distributor subdiaphragm, and plug the hose end.

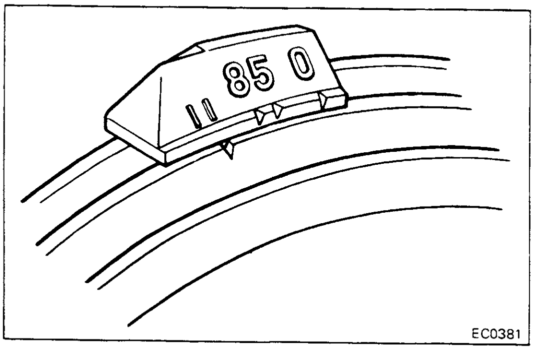

EC1193

(c) Check the ignition timing.
Ignition timing: 0° BTDC @ Max. 950 rpm



EC0380

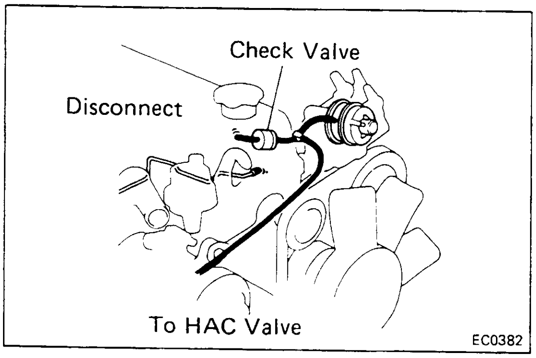
(d) Reconnect the hose to the sub-diaphragm.



(e) Check that the ignition timing advances.

Ignition timing: About 12° BTDC @ Max. 950 rpm

A03068

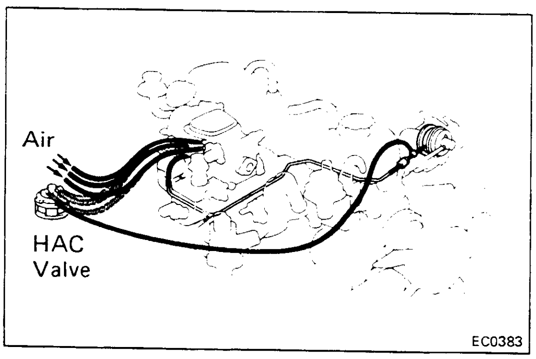


2. **CHECK THE CHECK VALVE**

(a) Disconnect the vacuum hose between the check valve and vacuum pipe at the vacuum pipe side, and plug the pipe end.

(b) Check that the ignition timing remains stationary for more than one minute.

(c) Stop the engine and reconnect the hose to the vacuum pipe.

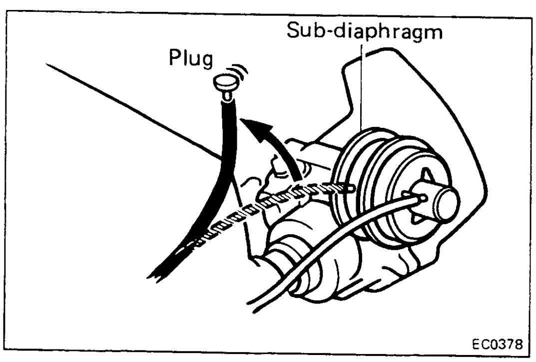


3. **CHECK CARBURETOR**

(a) Disconnect three hoses from the pipes on top of the HAC valve.

(b) Blow air into each hose and check that air flows in the carburetor.

(c) Reconnect the hoses to the proper locations.

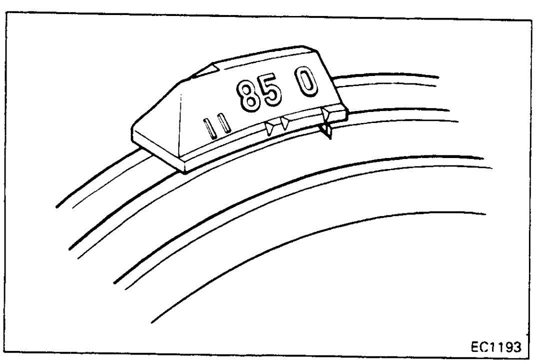


B. AT LOW ALTITUDE

1. **CHECK IGNITION TIMING AT IDLE**

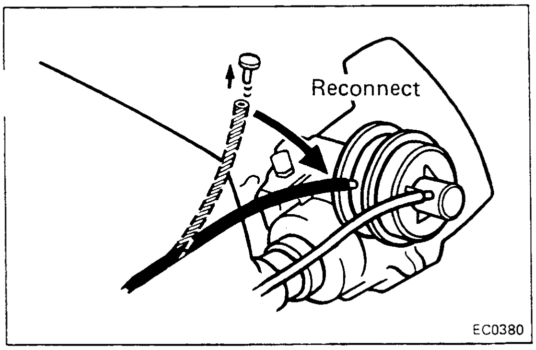
(a) Warm up the engine.

(b) Disconnect the hose from the distributor subdiaphragm, and plug the hose end.



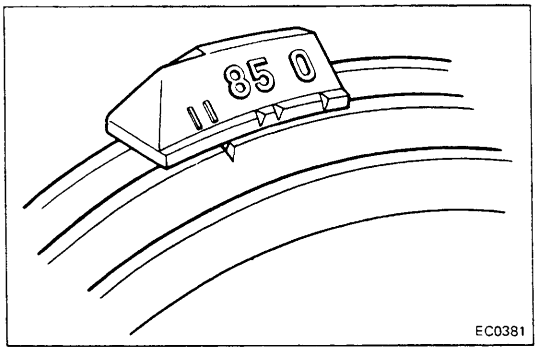
(c) Check the ignition timing.

Ignition timing: 0° BTDC @ Max. 950 rpm



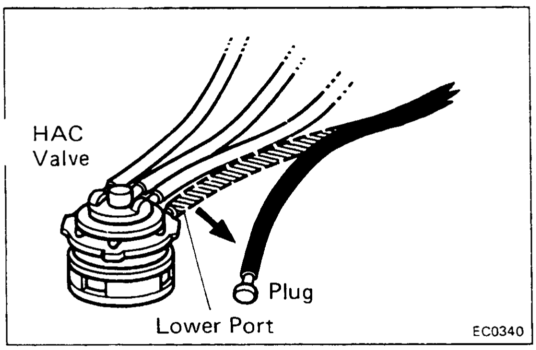
(d) Reconnect the hose to the sub-diaphragm.

A03069



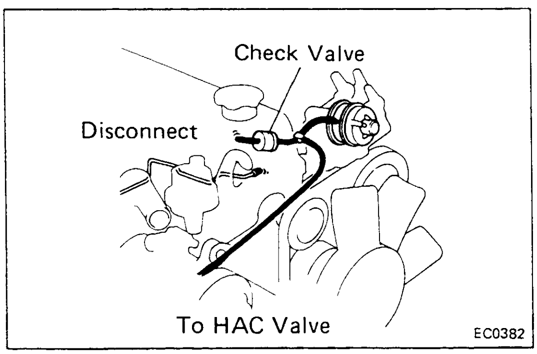
(e) Check that the ignition timing advances.

Ignition timing: About 12° BTDC @ Max. 950 rpm



2. CHECK THE CHECK VALVE

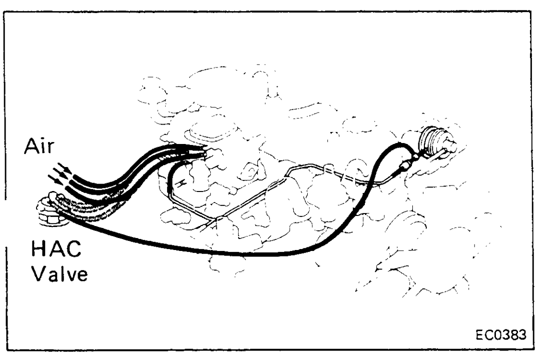
(a) Disconnect the vacuum hose from lowest port of the HAC valve, and plug the hose end.



(b) Disconnect the vacuum hose between the check valve and vacuum pipe at the pipe side, and plug the pipe end.

(c) Check that the ignition timing remains stationary for more than one minute.

(d) Stop the engine and reconnect the hoses to the vacuum pipe and HAC valve.



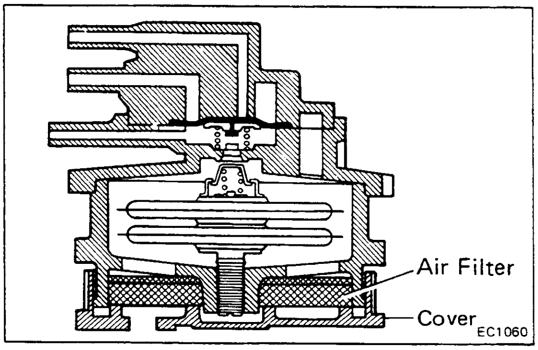
3. CHECK CARBURETOR

(a) Disconnect three hoses from the pipes on top of the HAC valve.

(b) Blow air into each hose and check that air flows into the carburetor.

(c) Reconnect the hoses to the proper locations.

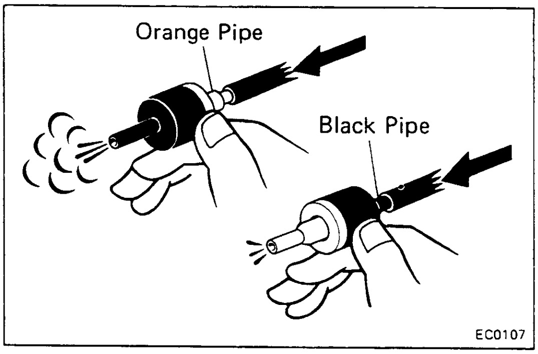
IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART



INSPECTION OF HAC VALVE

VISUALLY CHECK AND CLEAN AIR FILTER IN HAC VALVF

A03070

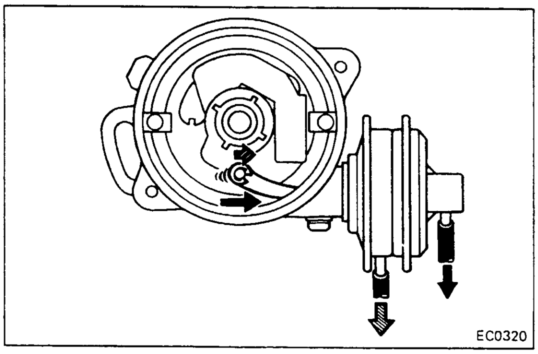


INSPECTION OF CHECK VALVE

CHECK VALVE BY BLOWING AIR INTO EACH PIPE

(a) Check that air flows from the orange pipe to the black pipe.

(b) Check that air does not flow from the black pipe to the orange pipe.



INSPECTION OF DISTRIBUTOR VACUUM ADVANCER

CHECK OPERATION OF VACUUM ADVANCER

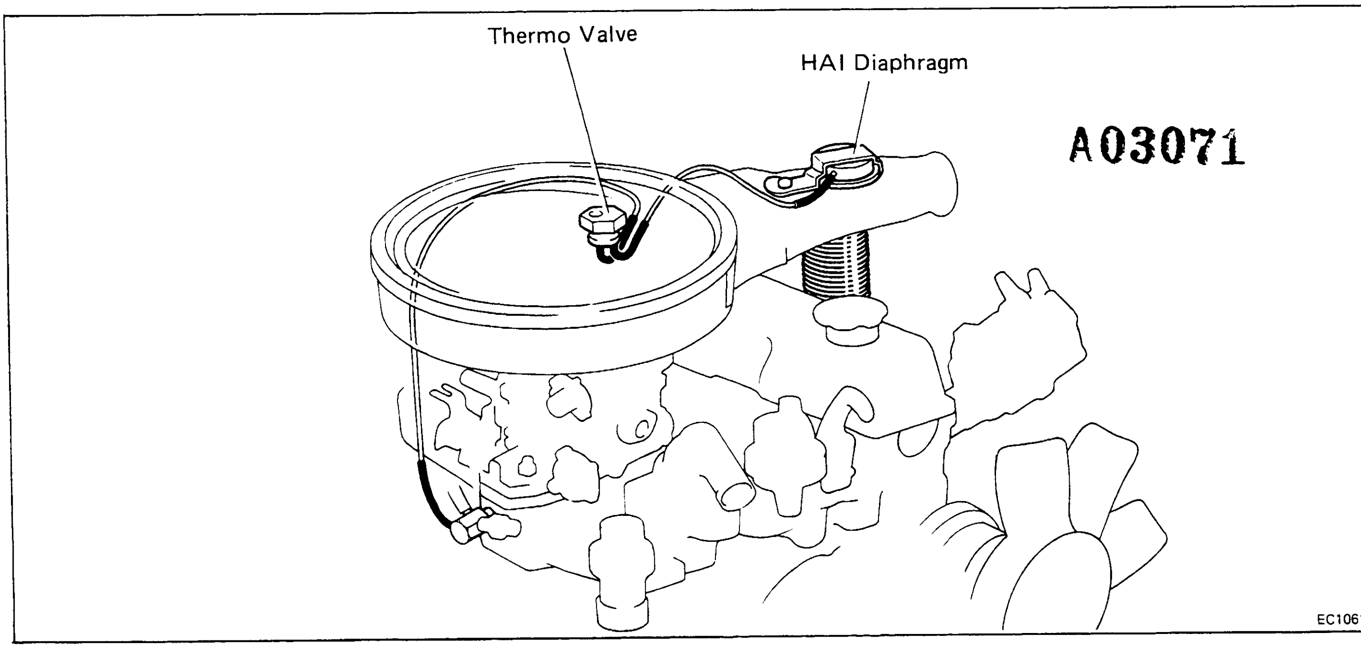
(a) Remove the distributor cap and rotor.

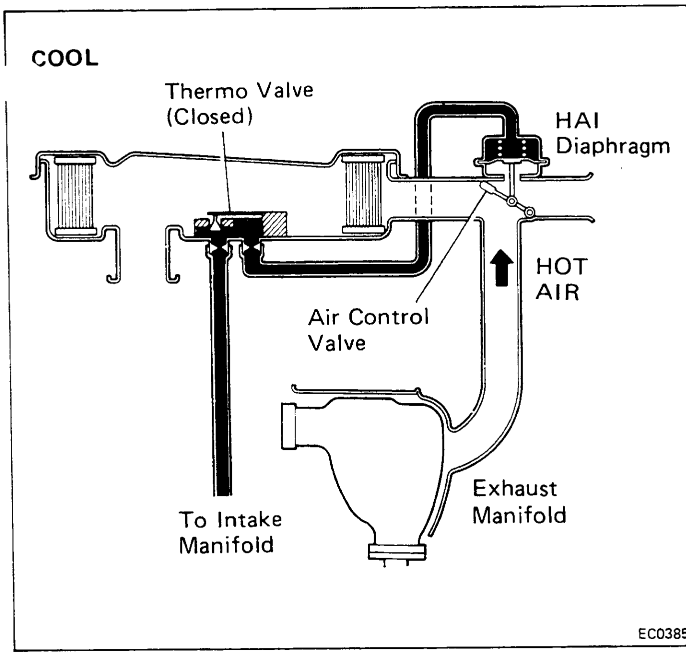
(b) Apply vacuum to the diaphragm, and check that the vacuum advancer moves in accordance with the vacuum.

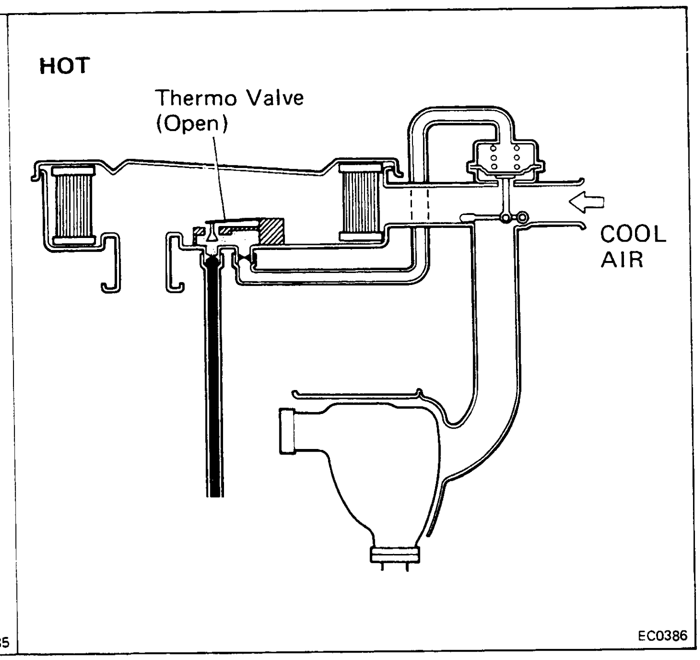
(c) Reinstall the rotor and distributor cap.

AUXILIARY SYSTEMS

1. Automatic Hot Air Intake (HAI) System

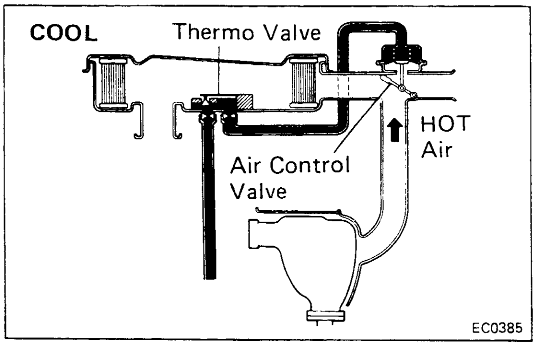


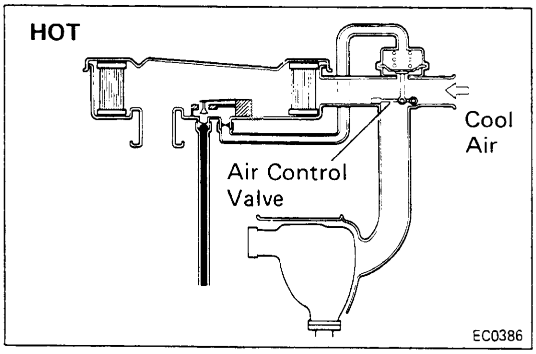




This system leads a hot air supply to the carburetor in cold weather to improve driveability and to prevent the carburetor from icing in extremely cold weather.

Temperature in Air Cleaner	Thermo Valve	Air Control Valve	Intake Air
Cool Below 30°C (86°F)	CLOSED	Hot air passage OPEN	HOT
Hot Above 45°C (113°F)	OPEN	Cool air passage OPEN	COOL





INSPECTION OF HAI SYSTEM

1. CHECK AIR CONTROL VALVE OPERATION

(a) Remove the air cleaner cover.

(b) Cool the thermo valve by blowing compressed air on it.

(c) Check that the air control valve closes the cool air passage at idle.

A03072

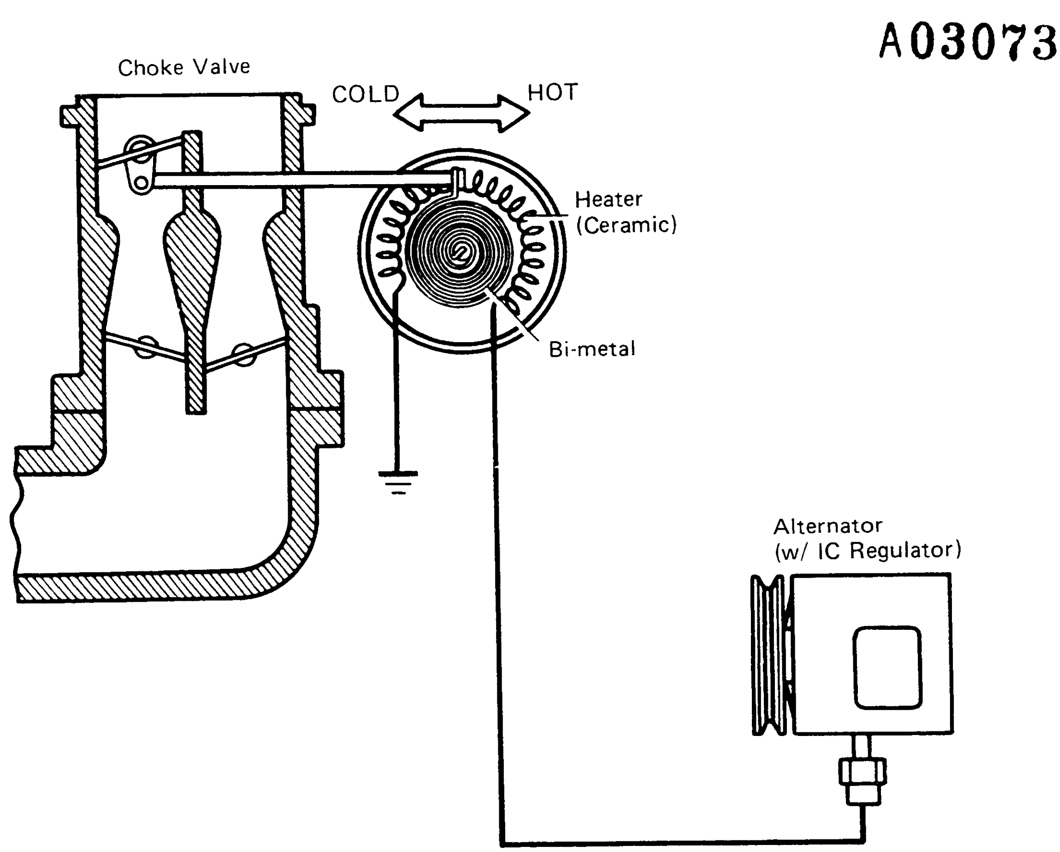
(d) Reinstall the air cleaner cover and warm up the engine.

(e) Check that the air control valve opens the cool air passage at idle.

2. CHECK HOSES AND CONNECTIONS

Visually check the hoses and connections for cracks, leaks or damage.

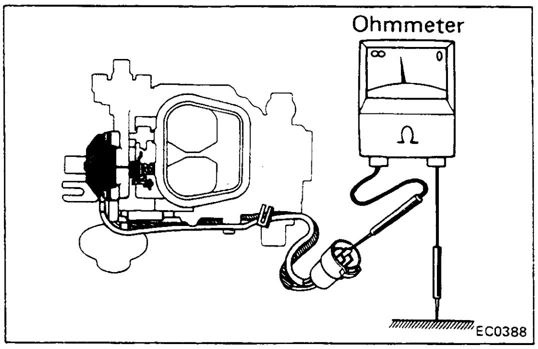
2. Automatic Choke System



This system temporarily supplies a rich mixture to the engine by closing the choke valve when the engine is cold.

IG S/W	Engine	Current from Terminal L to Heater	Bi-metal	Choke Valve
OFF	Not running	Not flowing	Expanded	CLOSED
ON	Not running	*Not flowing	Expanded	CLOSED
	Running	Flowing	Heated up and contracted	OPEN

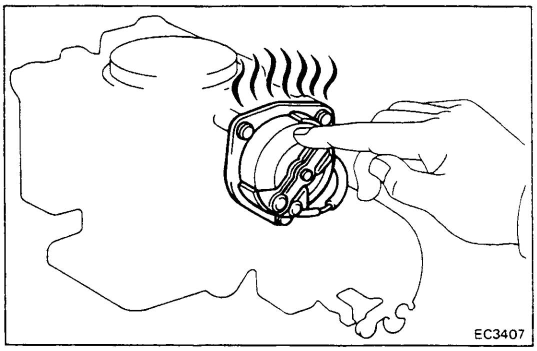
Remarks: *On alternators with an IC regulator, slight voltage will occur when the ignition switch is turned ON, but not sufficient current to warm up the heater.



INSPECTION OF HEATER (Ceramic)

1. UNPLUG WIRING CONNECTOR
2. MEASURE RESISTANCE WITH OHMMETER
   Resistance: 19 — 23 Ω at 20°C (68°F)

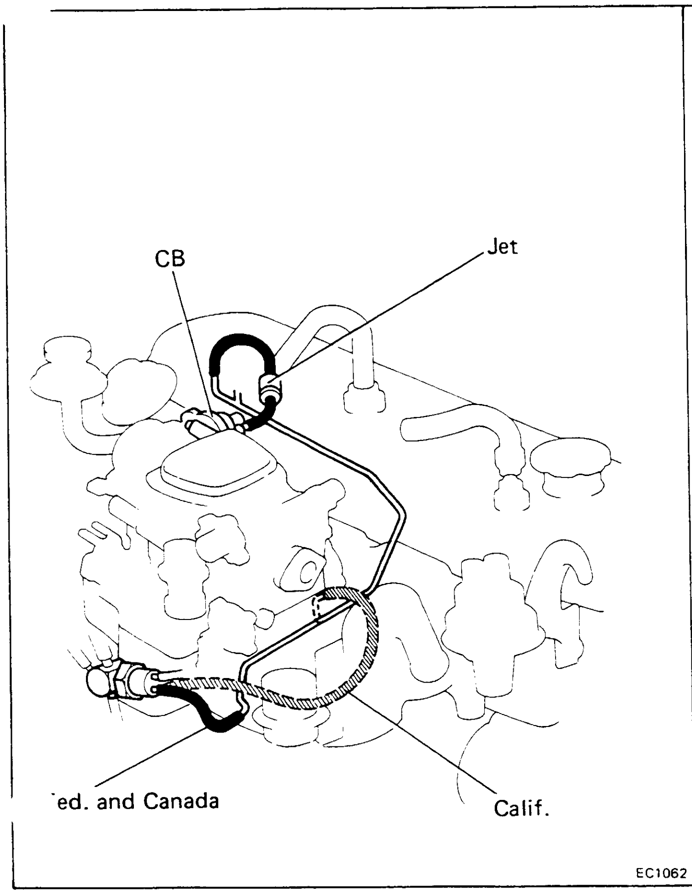
A03074

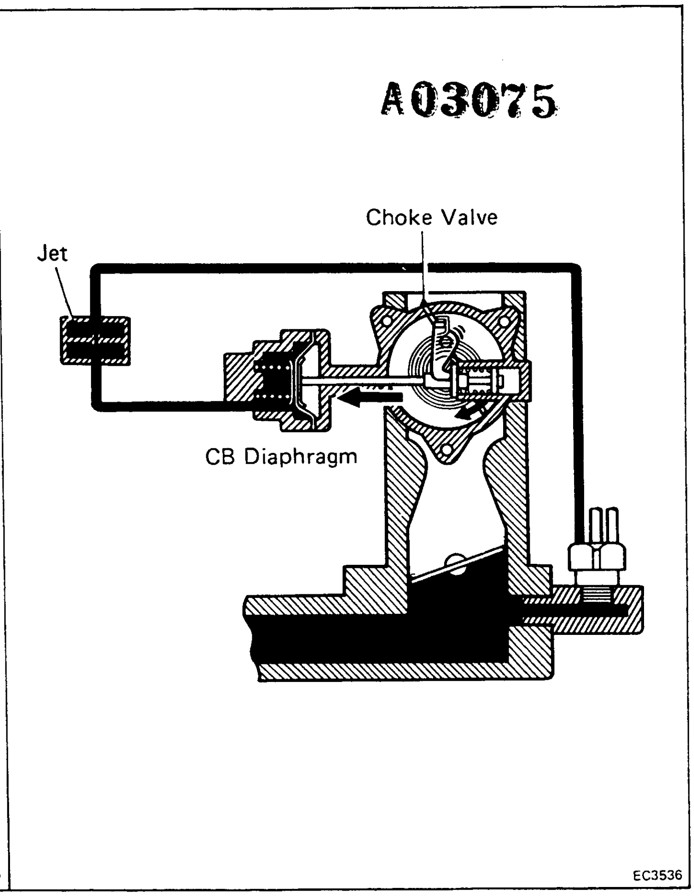


INSPECTION OF AUTOMATIC CHOKE SYSTEM

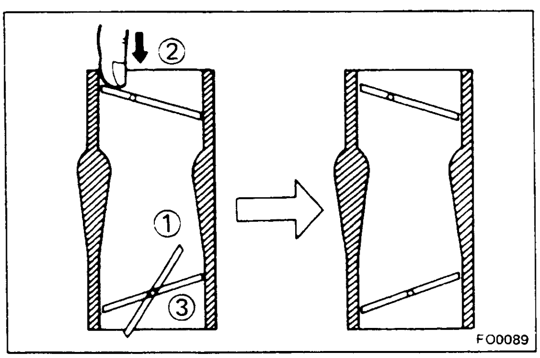
1. START ENGINE
2. SHORTLY AFTER, CHECK THAT CHOKE VALVE BEGINS TO OPEN AND CHOKE HOUSING IS HEATED

3. Choke Breaker (CB) System





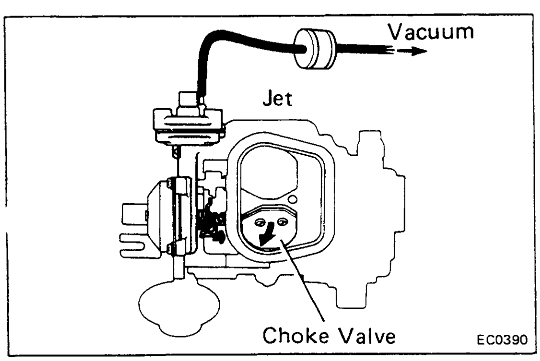
This system slightly opens the choke valve to prevent a too rich mixture after firing when the choke is closed.



INSPECTION OF CB SYSTEM

CHECK CHOKE LINKAGE AND DIAPHRAGM WITH COLD ENGINE

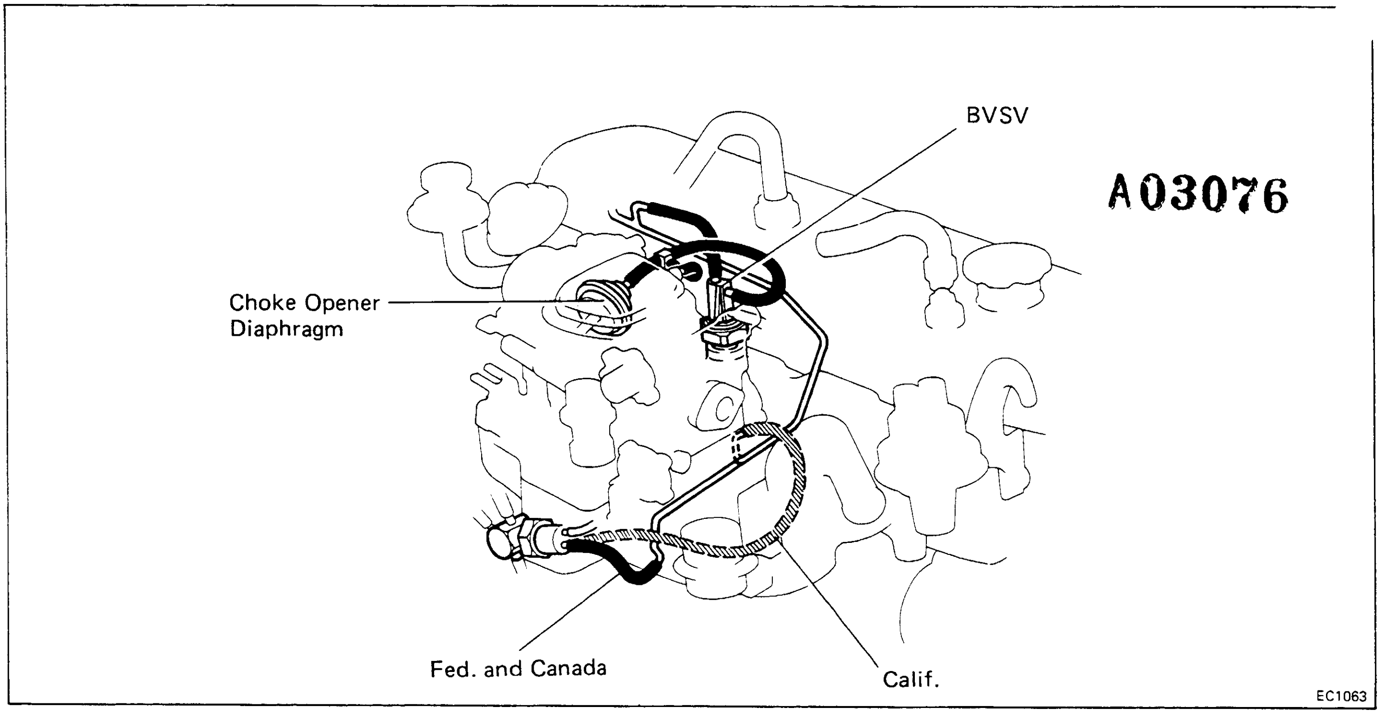
(a) While holding the throttle valve slightly open, push the choke valve closed, and hold it closed as you release the throttle valve.

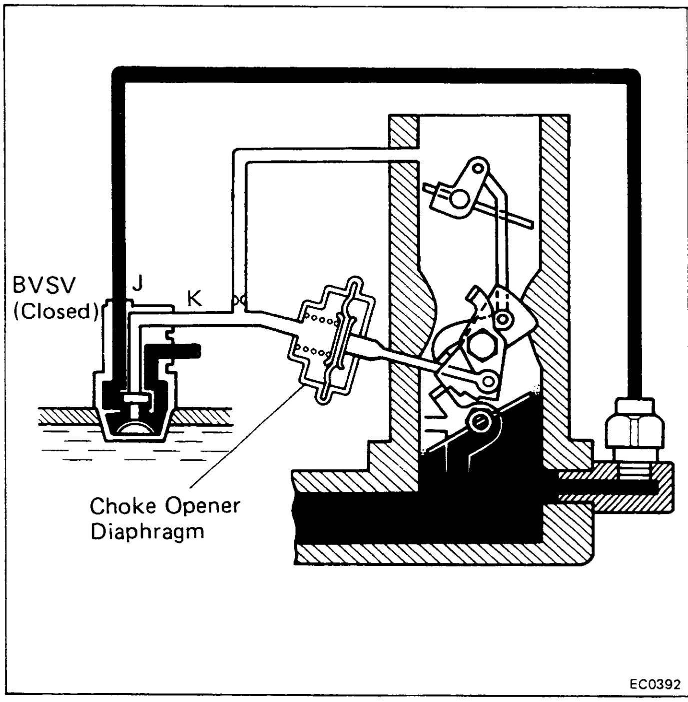


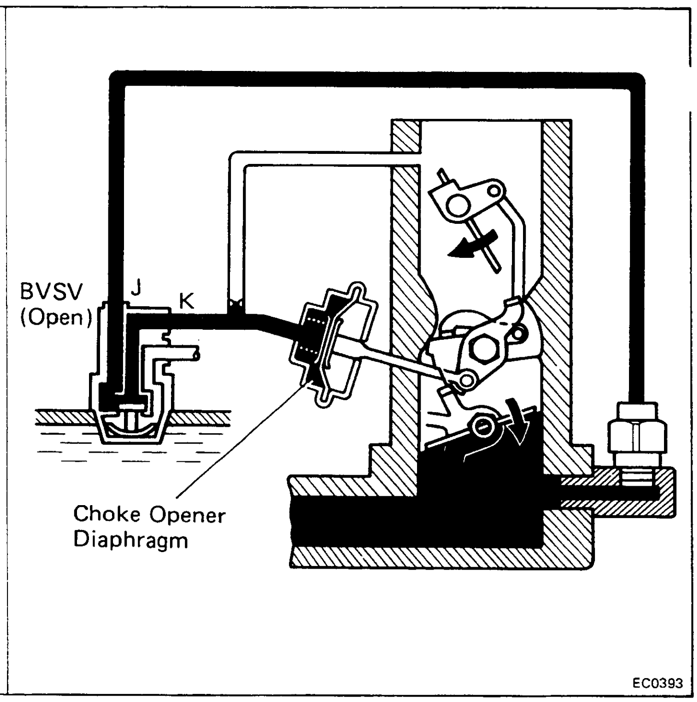
(b) Disconnect the vacuum hose between the jet and vacuum pipe.

(c) Apply vacuum to the jet and check that the choke valve slightly opens.

4. Choke Opener System

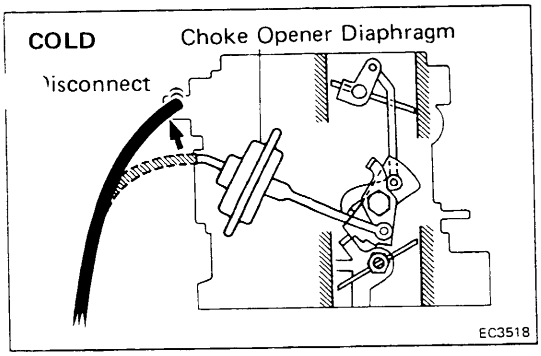






After warm-up, this system forcibly holds the choke valve open to prevent an over-rich mixture and release the fast idle cam to the 4th step to lower the engine rpm.

Coolant Temp.	BVSV	Diaphragm	Choke Valve	Fast Idle Cam	Engine RPM
Below 55°C (131°F)	CLOSED (J-K)	Released by spring tension	Closed by automatic choke	Set at 1st or 2nd step	HIGH
Above 74°C (165°F)	OPEN (J-K)	Pulled by manifold vacuum	OPEN	Released to 4th step	LOW



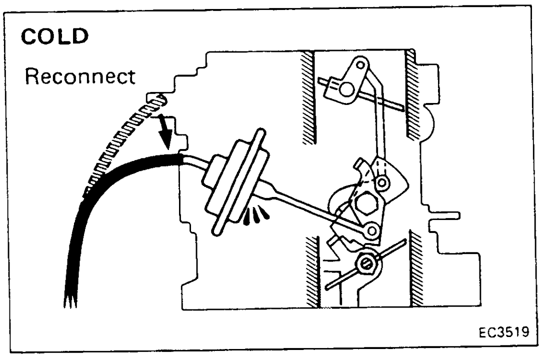
INSPECTION OF CHOKE OPENER SYSTEM

1. CHECK BVSV WITH COLD ENGINE

(a) The coolant temperature should be below 55°C (131°F).

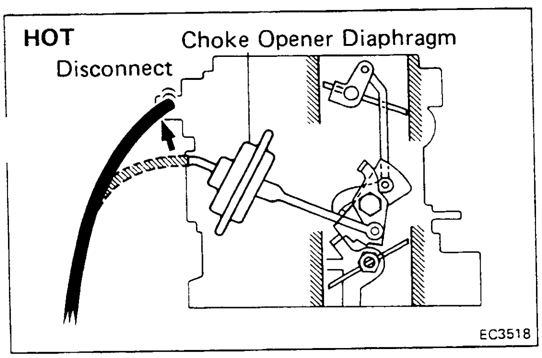
(b) Disconnect the vacuum hose from the choke opener diaphragm.

(c) Step down on the accelerator pedal and release it. Then start the engine.



(d) Reconnect the vacuum hose and check that the choke linkage does not move.

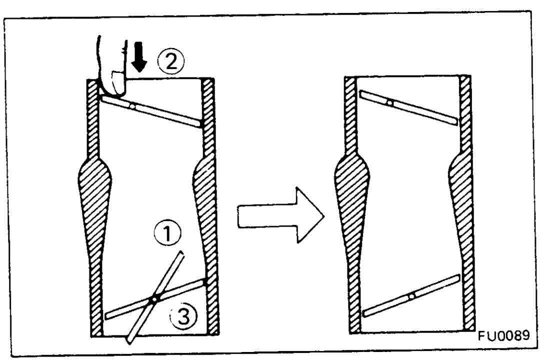
A03077



2. CHECK BVSV, DIAPHRAGM AND LINKAGE WITH WARM ENGINE

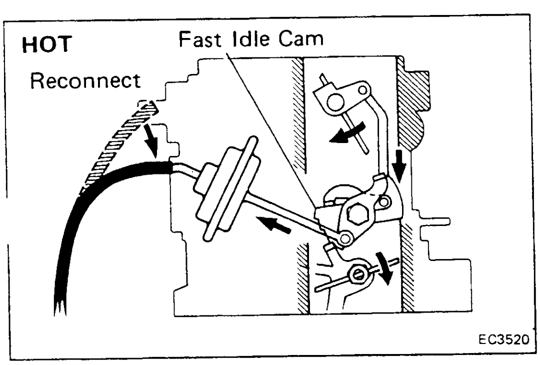
(a) Warm up the engine to normal operating temperature.

(b) Disconnect the vacuum hose from the choke opener diaphragm.



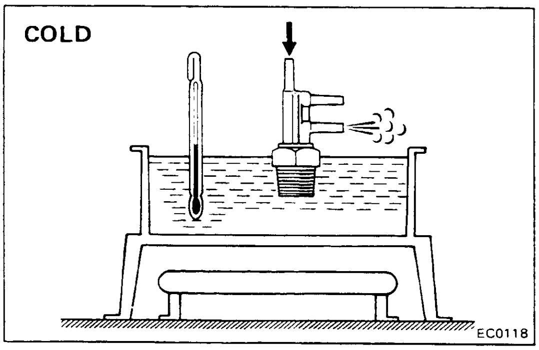
(c) Set the fast idle cam.
While holding the throttle slightly open, push the choke valve closed, and hold it closed as you release the throttle valve.

(d) Start the engine, but do not touch the accelerator pedal.



(e) Reconnect the vacuum hose, and check that the choke linkage moves, and that the fast idle cam is released to the 4th step.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART



INSPECTION OF BVSV

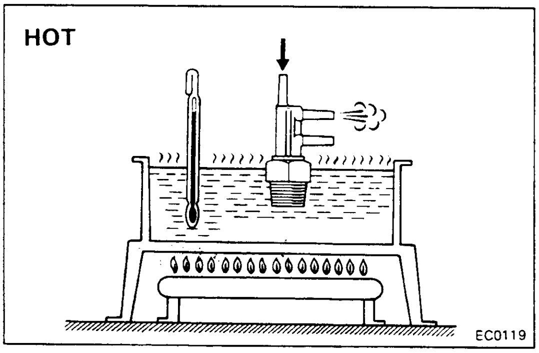
CHECK BVSV BY BLOWING AIR INTO PIPE

(a) Drain the coolant from the radiator into a suitable container.

(b) Remove the BVSV from the intake manifold.

(c) Cool the BVSV to below 55°C (131°F).

(d) Check that air flows from pipe J to pipe L.



(e) Heat the BVSV to above 74°C (165°F).

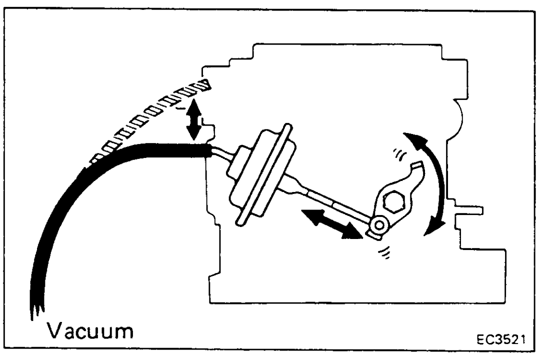
(f) Check that air flows from pipe J to pipe K.

If a problem is found replace the BVSV.

(g) Apply liquid sealer to the threads of the BVSV and reinstall.

(h) Fill the radiator with coolant.

A03078

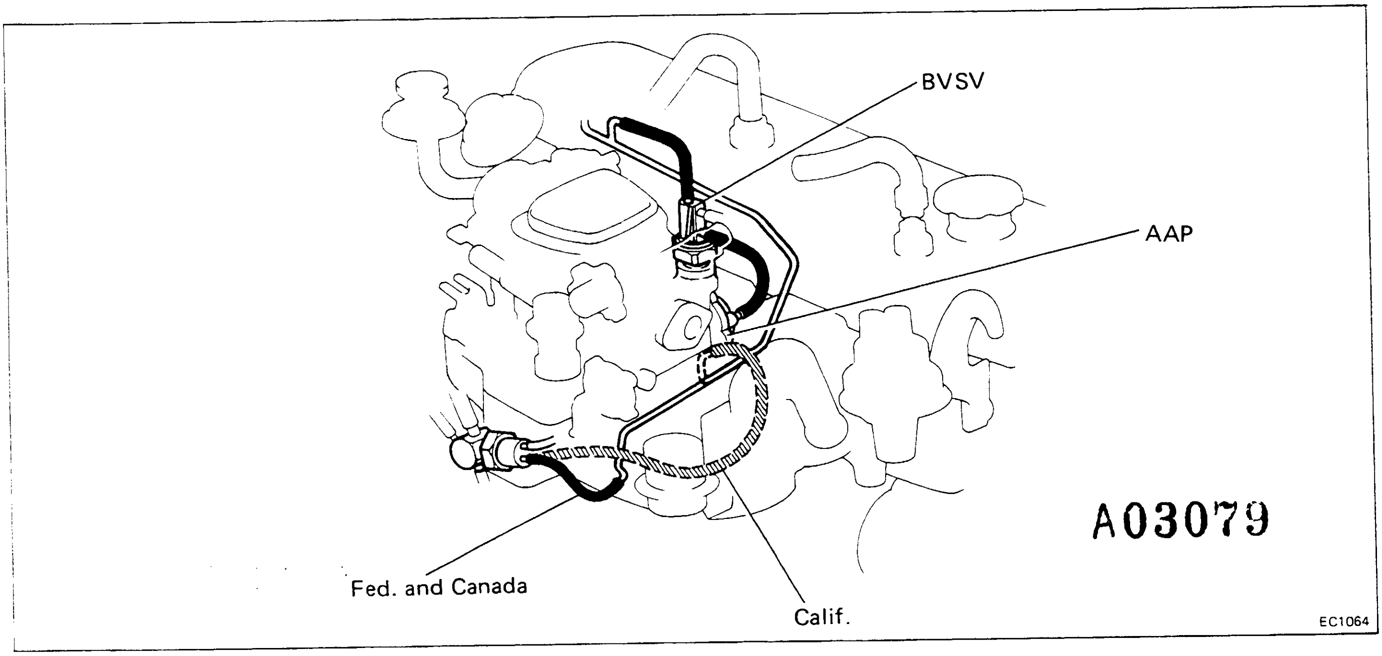


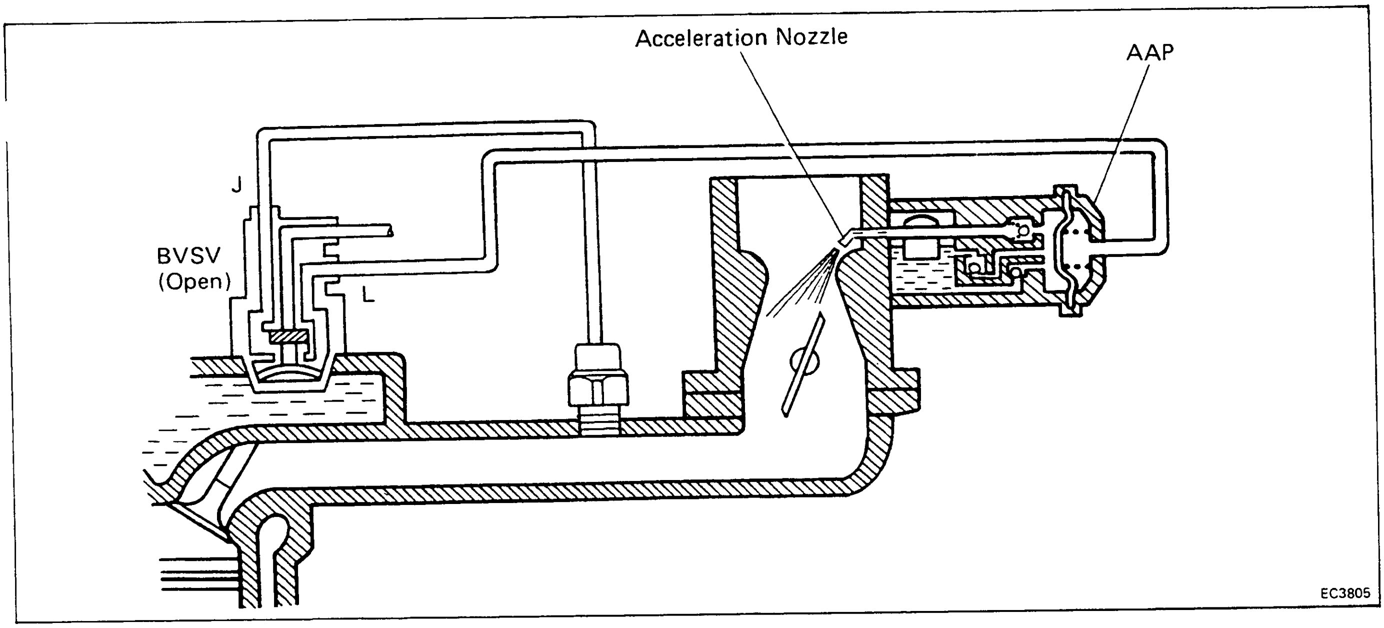
INSPECTION OF DIAPHRAGM

CHECK THAT CHOKE LINKAGE MOVES IN ACCORDANCE WITH APPLIED VACUUM

If a problem is found, replace the diaphragm.

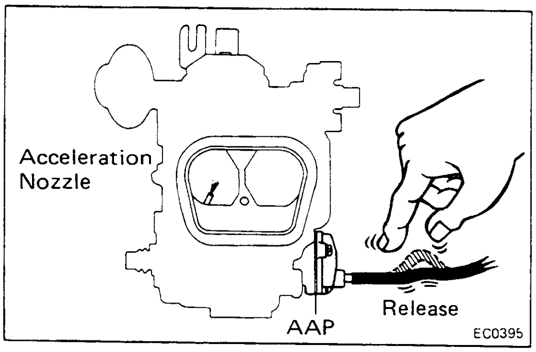
5. Auxiliary Acceleration Pump (AAP) System





The carburetor air-fuel mixture is very lean. When accelerating with a cold engine, the main acceleration pump capacity is insufficient to provide good acceleration. The AAP system compensates for this by forcing more fuel into the acceleration nozzle to obtain better cold engine performance.

Coolant Temp.	BVSV	Engine	Intake Vacuum	Diaphragm in AAP	Fuel
Below 55°C (131°F)	OPEN (J-L)	Constant RPM	HIGH	Pulled by vacuum	Drawn into AAP Chamber
		Accelerataion	LOW	Returned by spring tension	Forced into acceleration Nozzle
Above 74°C (165°F)	CLOSED (J-L)	—	—	No operation	—



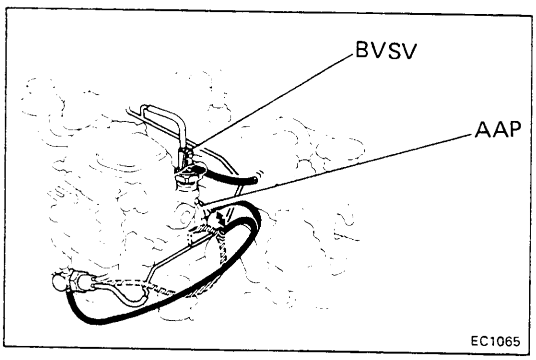
INSPECTION OF AAP SYSTEM

1. **CHECK SYSTEM WITH COLD ENGINE**
   (a) Check that the coolant temperature is below 55°C (131°F).
   (b) Remove the air cleaner.
   (c) Start the engine.
   (d) Pinch the AAP hose, and stop the engine.
   (e) Release the hose.
   (f) Check that gasoline spurts out from the acceleration nozzle.

A03080

2. **REPEAT (c), (d) AND (e) ABOVE AFTER WARM-UP**
   (a) Check that gasoline does not spurt out from the acceleration nozzle.
   (b) Reinstall the air cleaner.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY, OTHERWISE INSPECT EACH PART



INSPECTION OF AAP DIAPHRAGM

CHECK DIAPHRAGM OPERATION AT IDLE

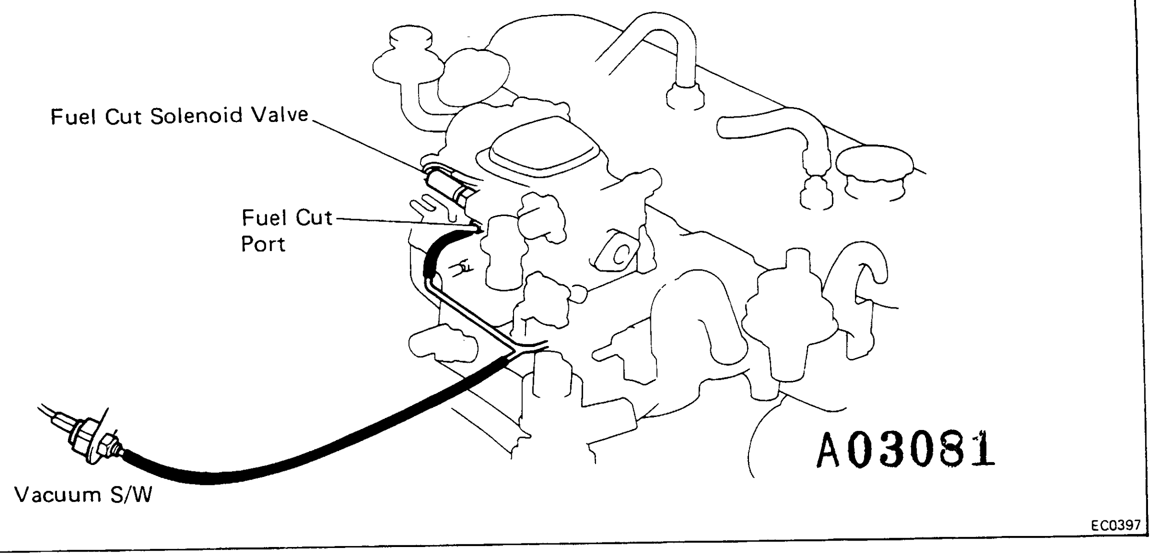
(a) Start the engine.
(b) Disconnect the vacuum hose from the AAP.
(c) Apply and release vacuum to the diaphragm at idle.
(d) Check that the engine rpm changes by releasing vacuum.
(e) Reconnect the AAP hose.

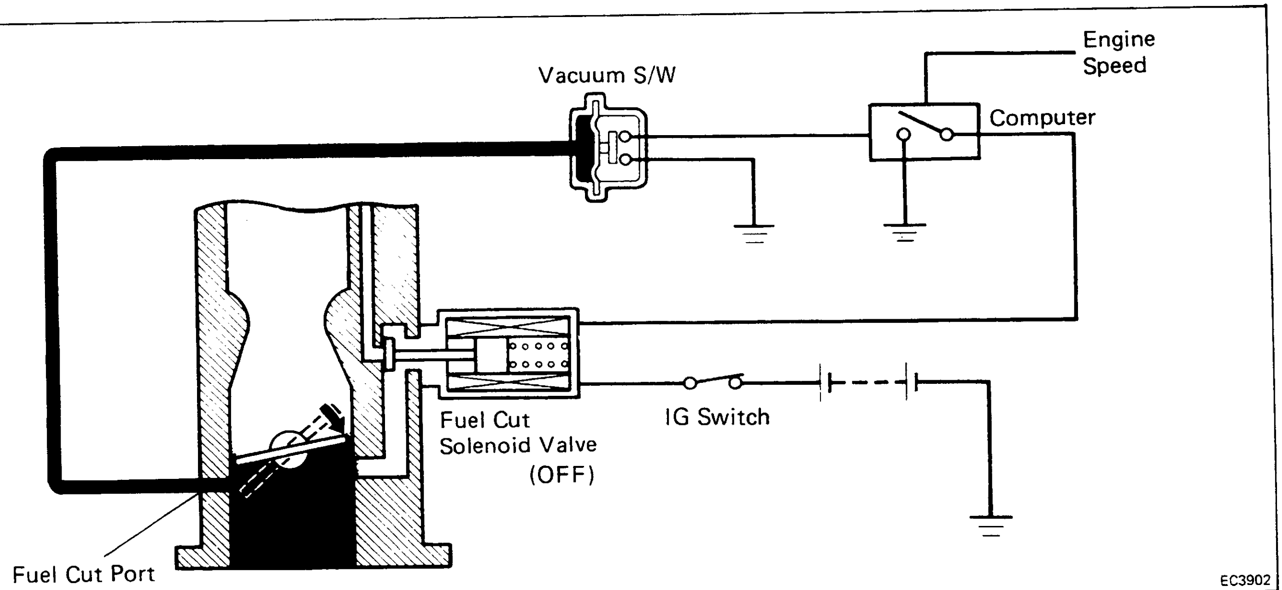
If a problem is found, replace the diaphragm.

INSPECTION OF BVSV

(See page EC-60)

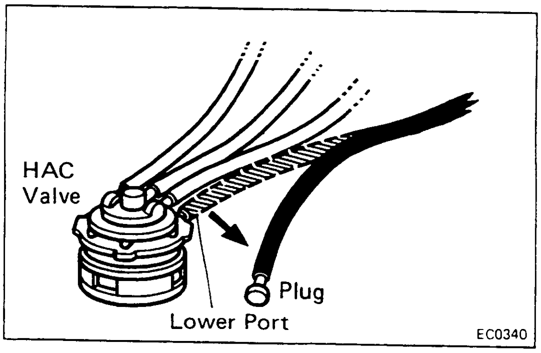
6. Deceleration Fuel Cut System





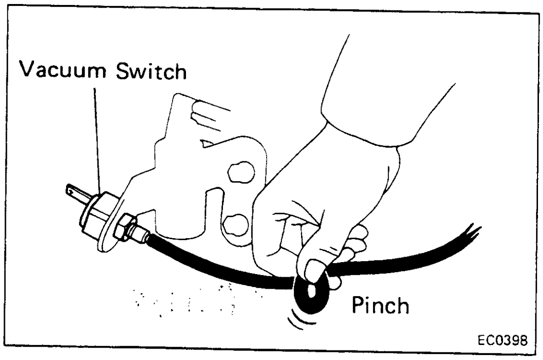
During deceleration this system cuts off part of the fuel in the slow circuit of the carburetor. This prevents overheating and afterburning in the exhaust system.

Engine RPM	Vacuum in the Vacuum S/W	Vacuum S/W	Computer	Fuel Cut Solenoid Valve	Slow Circuit in Carburetor
Below 1,810 rpm	Low vacuum below 360 mmHg (14.17 in.Hg, 48.0 kPa)	ON	ON	ON	OPEN
	High vacuum above 425 mmHg (16.73 in.Hg, 56.7 kPa)	OFF	ON	ON	OPEN
Above 2,200 rpm	Low vacuum below 360 mmHg (14.17 in.Hg, 48.0 kPa)	ON	ON	ON	OPEN
	High vacuum above 425 mmHg (16.73 in.Hg, 56.7 kPa)	OFF	OFF	OFF	CLOSED



PREPARATION:
(For vehicles with HAC system)
Disconnect the vacuum hose from the lower port of the H. valve, and plug the hose end.

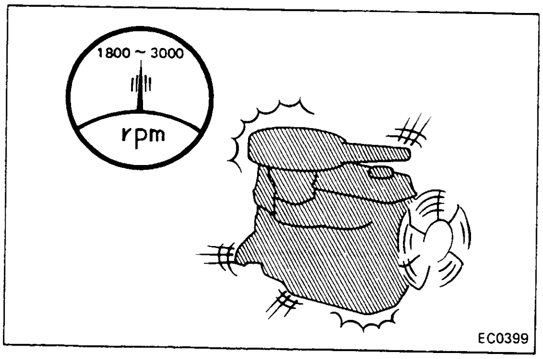
A03082



INSPECTION OF DECELERATION FUEL CUT SYSTEM

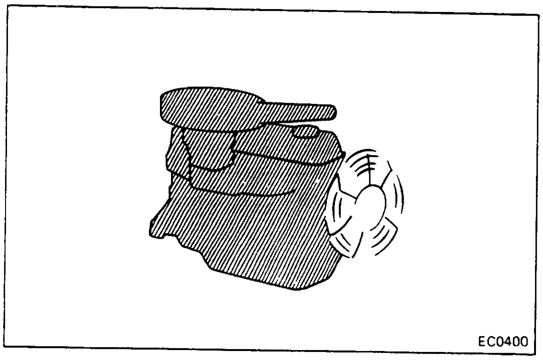
CHECK SYSTEM OPERATION

(a) Connect a tachometer to the engine.
(b) Start the engine.
(c) Check that the engine runs normally.
(d) Pinch off the vacuum hose to the vacuum switch.

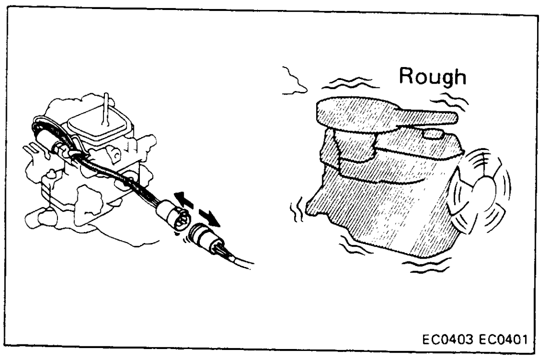


(e) Gradually increase engine speed to 3,000 rpm. Check that the engine misfires slightly between 1,800 and 3,000 rpm.

CAUTION: Perform this inspection quickly to avoid ovr heating the catalytic converter.



(f) Release the pinched hose. Again gradually increase the engine speed to 3,000 rpm and check that the engine operation returns to normal.

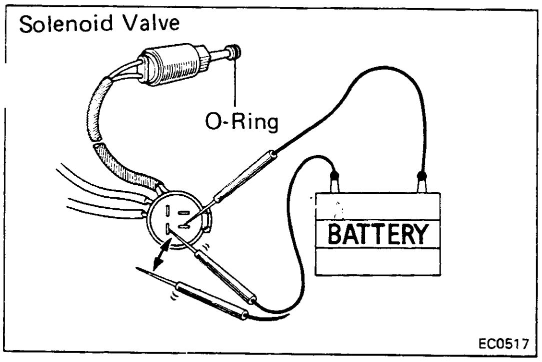


(g) With the engine idling, unplug the wiring connector to the solenoid valve. Check that the engine idles rough or dies.

CAUTION: Perform this inspection quickly to avoid otherheating the catalyst.

(h) Stop the engine, and reconnect the wiring. Remo' the tachometer.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY, OTHERWISE INSPECT EACH PART



EC0517

INSPECTION OF FUEL CUT SOLENOID VALVE

(a) Remove the solenoid valve.

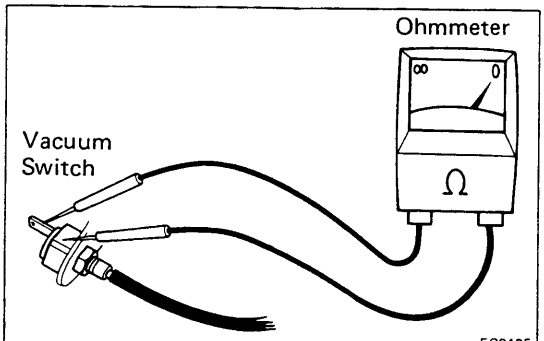
(b) Connect the two terminals and the battery terminals as shown.

(c) Check that you can feel a "click" from the solenoid valve when the battery is connected and disconnected.

(d) Check the O-ring for damage.

If problem is found, replace the solenoid valve or O-ring.

(e) Reinstall the valve and reconnect the wiring connector.

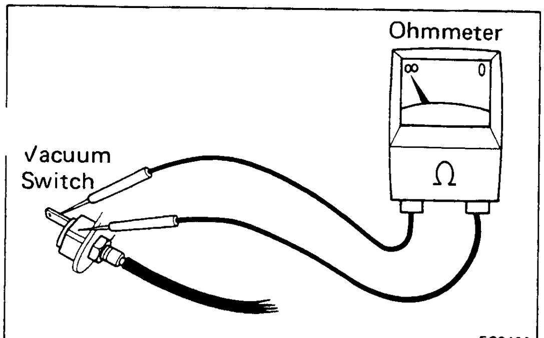


EC0405

INSPECTION OF VACUUM SWITCH

(a) Using an ohmmeter, check for continuity between the switch terminal and switch body.

A03083



EC0406

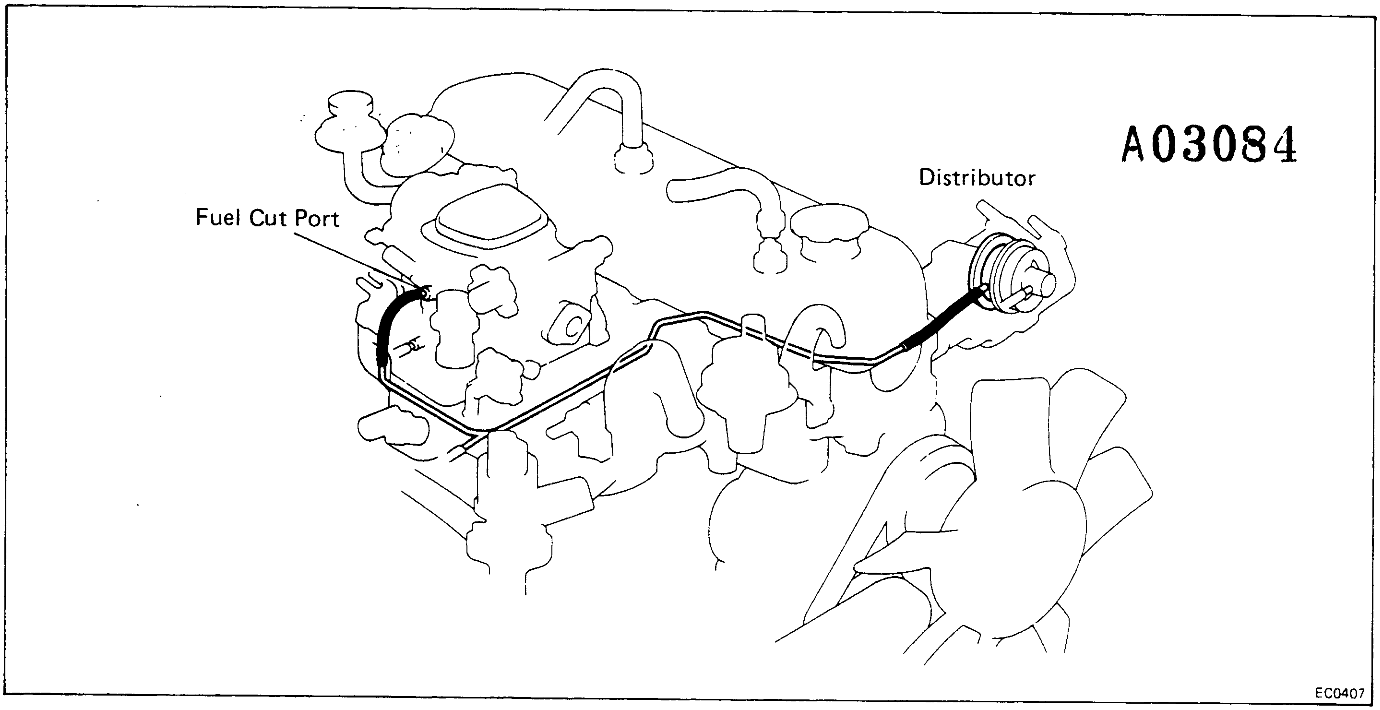
(b) Start the engine.

(c) Using an ohmmeter, check that there is no continuity between the switch terminal and the body.

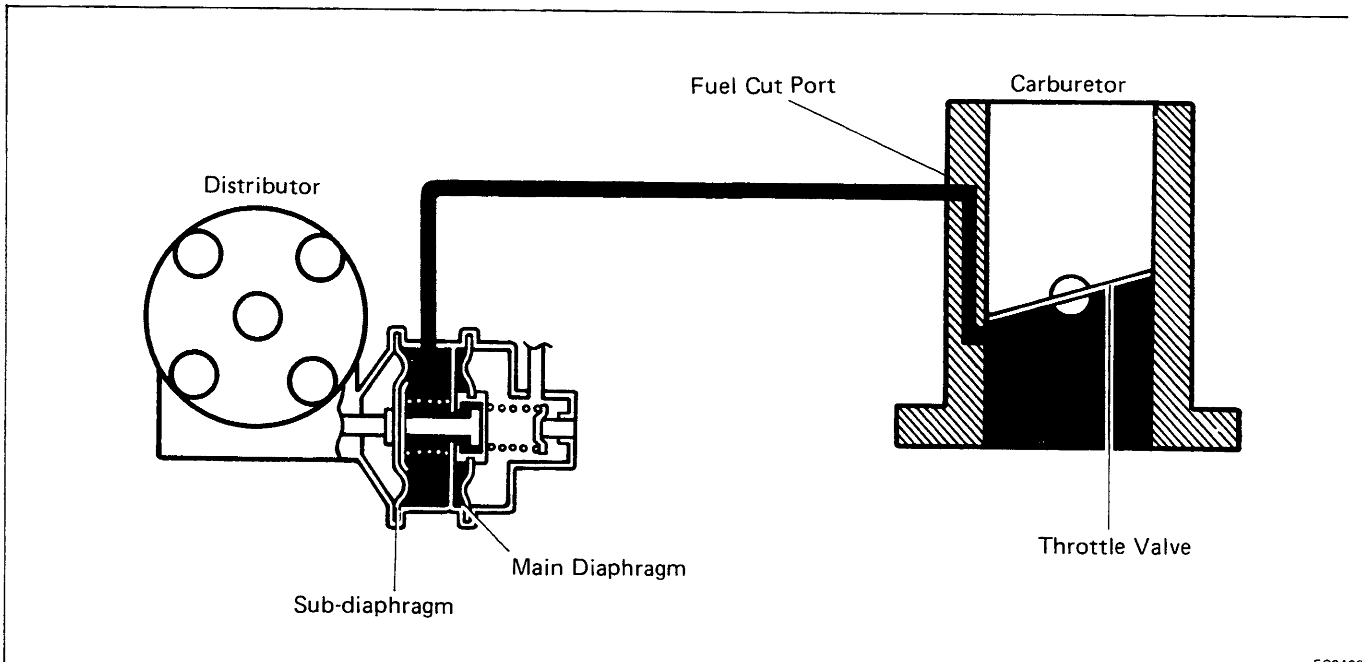
If a problem is found, replace the vacuum switch.

7. Idle Advance System

With HAC system: Refer to page EC-48 of HAC syste-



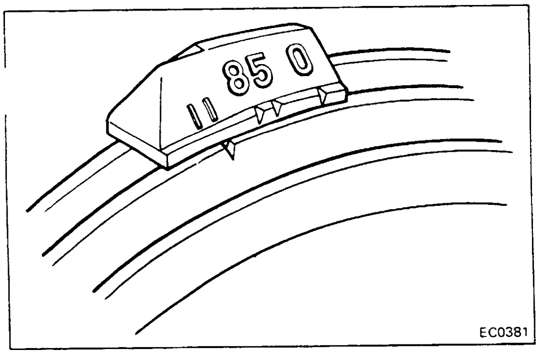
EC0407



EC0408

To improve fuel economy at idle, this system advances the ignition timing only while the engine is idling.

Condition	Distributor Sub-diaphragm	Sub-vacuum Advance
Idling	Pulled by fuel cut port vacuum	ADVANCED (+12°)
Cruising	Not pulled	NOT ADVANCED



EC0381

INSPECTION OF IDLE ADVANCE SYSTEM

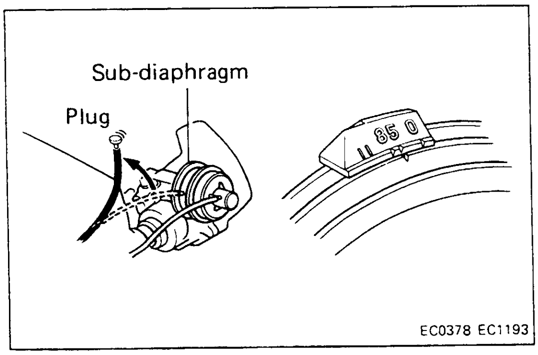
CHECK IDLE ADVANCE SYSTEM OPERATION

(a) Warm up the engine to normal operating temperature.

(b) Check the ignition timing at idle.

Ignition timing: About 12° BTDC @ Max. 950 rpm

A03085



EC0378 EC1193

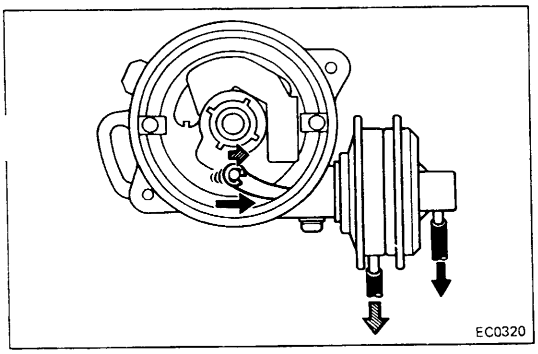
(c) Disconnect the vacuum hose from the distributor sub-diaphragm and plug the hose end.

(d) Check the ignition timing at idle.

Ignition timing: 0° BTDC @ Max. 950 rpm

(e) Reconnect the vacuum hose and remove the timing light.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART


EC0320

INSPECTION OF DISTRIBUTOR VACUUM ADVANCER

CHECK OPERATION OF VACUUM ADVANCER BY APPLYING VACUUM

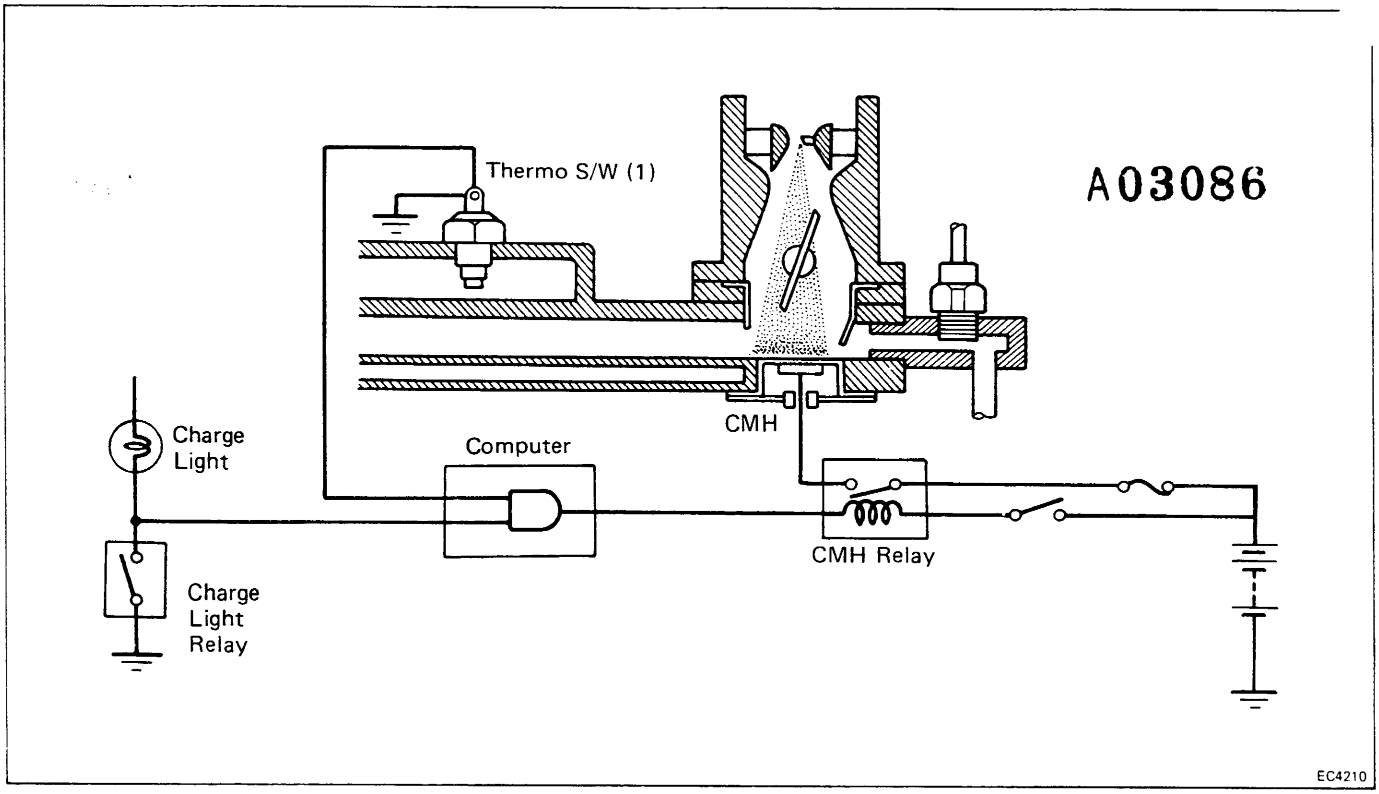
(a) Remove the distributor cap and rotor.

(b) Check that the vacuum advancer moves is accordance with the vacuum.

(c) Reinstall the rotor and distributor cap.

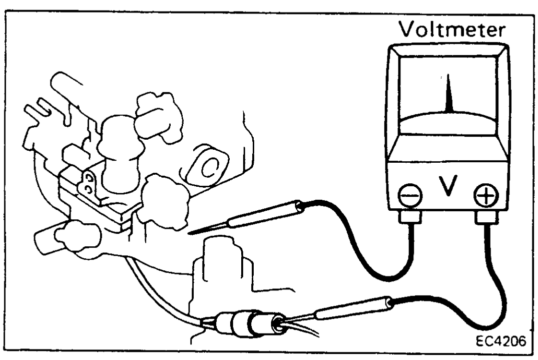
If a problem is found, repair or replace the distributor vacuum advancer.

8. Cold Mixture Heater (CMH) System



To reduce cold engine emission and improve drivability, the intake manifold riser is heated during cold engine operation to accelerate vaporization of the liquid fuel.

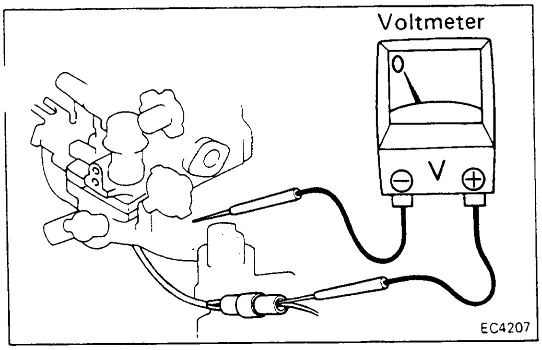
IG S/W	Engine	Coolant Temp.	Thermo S/W (1)	Computer	CMH Relay	CMH
OFF	Not running	—	—	—	OFF	OFF
ON	Not running	—	—	OFF	OFF	OFF
	Running	Below 43°C (109°F)	ON	ON	ON	ON (Heated)
		Above 55°C (131°F)	OFF	OFF	OFF	OFF



INSPECTION OF CMH SYSTEM

1. **START ENGINE**
2. **CHECK CMH WITH COLD ENGINE**
   (a) The coolant temperature should be below 43°C (109°F).
   (b) Using a voltmeter check that there is voltage between the positive (+) terminal and intake manifold.

   CAUTION: The voltmeter probe should be inserted from the rear side of the connector.



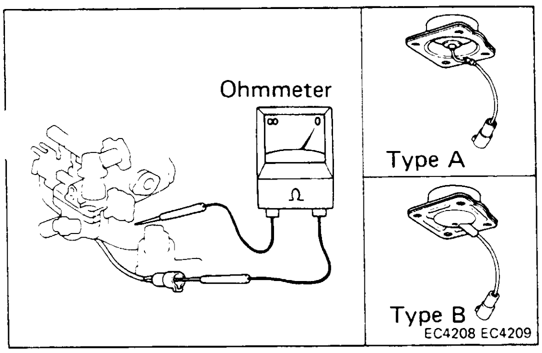
3. **CHECK CMH WITH WARM ENGINE**
   (a) Warm up the engine to above 55°C (131°F).
   (b) Check that there is no voltage.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART

A03087

INSPECTION OF THERMO SWITCH (1)

(See page EC-23)



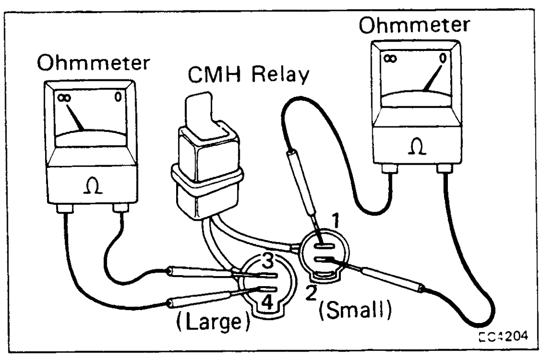
INSPECTION OF CMH

MEASURE RESISTANCE

(a) Unplug the wiring connector.
(b) Using an ohmmeter, measure the resistance between the positive (+) terminal and intake manifold.

Resistance at 20°C (68°F):
Type A (ND) 0.35 — 1.0 Ω
Type B (TDK) 0.5 — 2.0 Ω

(c) Plug in the wiring connector.

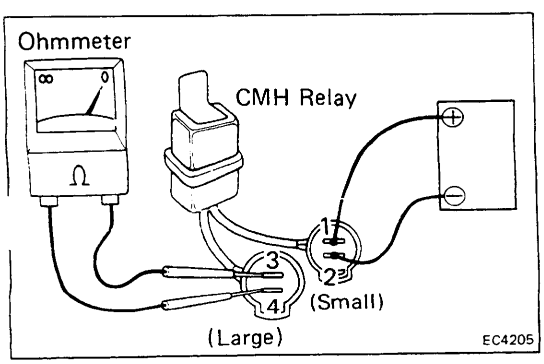


INSPECTION OF CMH RELAY

1. **INSPECT RELAY CONTINUITY**

   Check that there is continuity between terminals 1 and 2.
   Check that there is no continuity between terminals 3 and 4.

   Relay location: Right fender apron

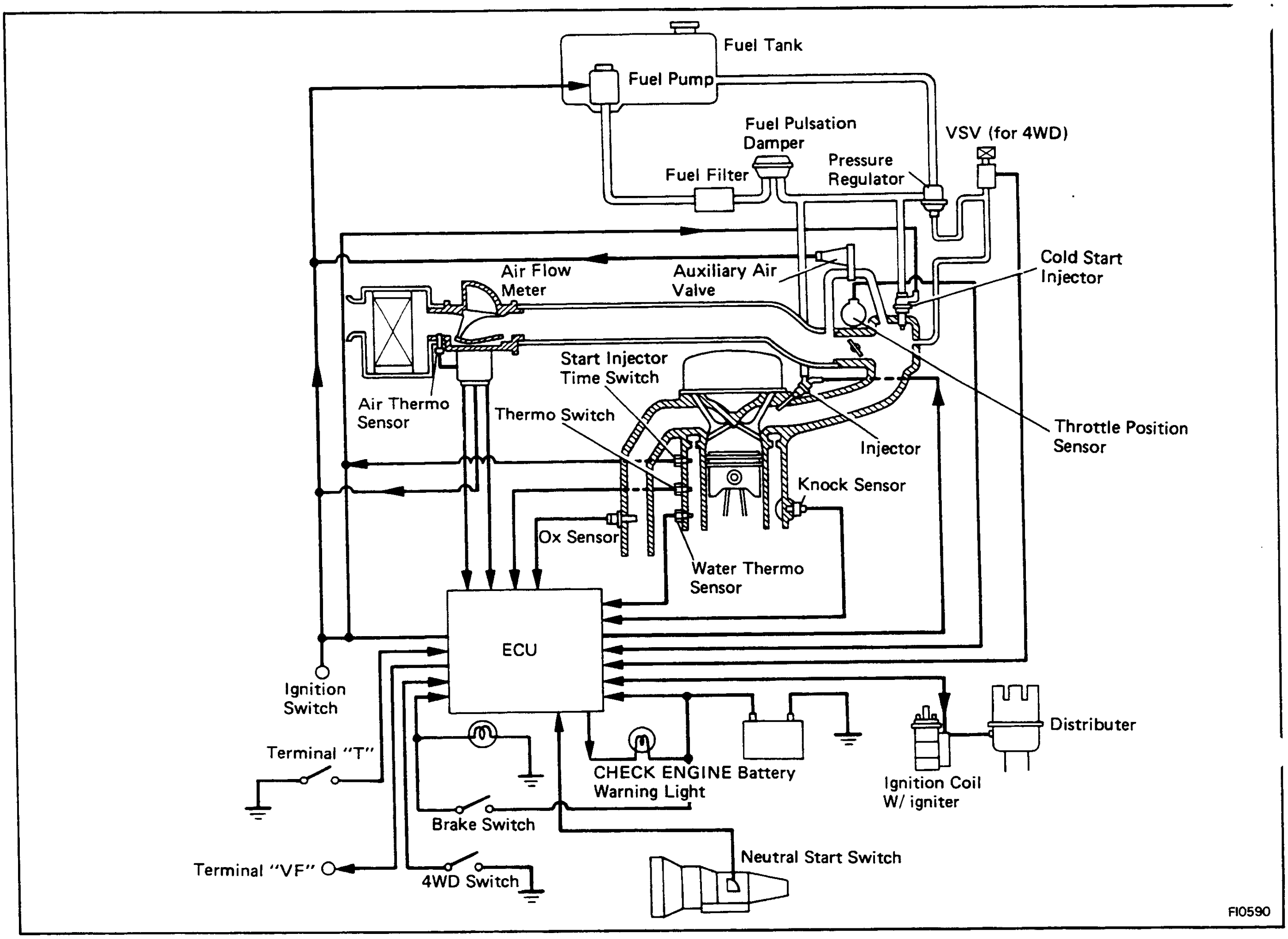


2. **INSPECT RELAY OPERATION**

   Check the continuity between terminals 3 and 4 with battery voltage applied between terminals 1 and 2.

EFI SYSTEM

SYSTEM DESCRIPTION



The EFI used on Toyotas has three basic systems.

FUEL SYSTEM

An electric fuel pump supplies sufficient fuel, under a constant pressure, to the EFI injectors.
These injectors inject a metered quantity of fuel into the intake manifold in accordance with signals from the ECU. Each injector injects, at the same time, one half of the fuel required for ideal combustion with each engine revolution.

AIR INDUCTION SYSTEM

The air induction system provides sufficient air for engine operation.

ELECTRONIC CONTROL SYSTEM

The 22R-EC engine is equipped with a Toyota Computer Control System (TCCS) which centrally controls the EFI, ESA, Diagnosis systems, etc. by means of an Electronic Control Unit (ECU — formerly EFI computer) employing a microcomputer.

By means of the ECU, the TCCS controls the following functions:

.. Electronic Fuel Injection (EFI)

The ECU receives signals from various sensors indicating changing engine operation conditions such as:

Intake air volume
Intake air temperature
Coolant temperature
Engine rpm
Acceleration/deceleration
Exhaust Ox content etc.

These signals are utilized by the ECU to determine the injection duration necessary for an optimum air-fuel ratio.

2. Electronic Spark Advance (ESA)

The ECU is programmed with data for optimum ignition timing under any and all operating conditions. Using data provided by sensors which monitor various engine functions (rpm, intake air volume coolant temperature, etc.), the microcomputer (ECU) triggers the spark at precisely the right instant.
(See IG section)

3. Diagnostics

The ECU detects any malfunctions or abnormalities in the sensor network and lights a "CHECK ENGINE" warning light on the instrument panel. At the same time, the trouble is identified and a diagnostic code is recorded by the ECU. There are 12 different diagnostic codes, including "normal operation" and these can be confirmed by use of an analog voltmeter.
(See page FI-22)

4. Fail-Safe Function

In the event of ECU malfunction, a back-up circuit will take over to provide minimal drivability. Simultaneously, the "CHECK ENGINE" warning light is activated.

PRECAUTIONS

1. **Before working on the fuel system, disconnect the negε terminal from the battery.**

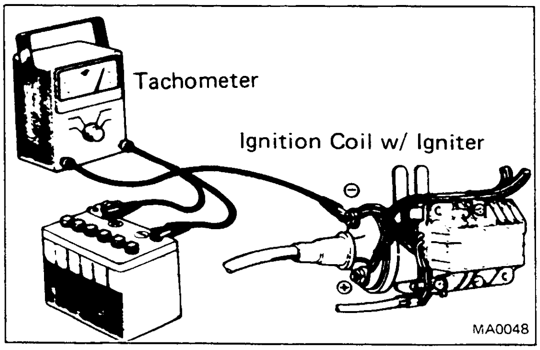
   NOTE: Any diagnosis code retained by the computer will be cleared when the battery terminal is removed. Therefore, if necessary, read the diagnosis before removing the battery terminal.

2. **When working on the fuel system, do not smoke or work near any fire hazard.**

3. **Keep gasoline off rubber or leather parts.**

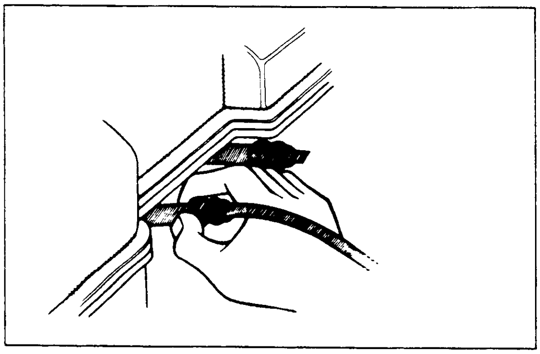
INSPECTION PRECAUTIONS

MAINTENANCE PRECAUTIONS



1. **INSURE CORRECT ENGINE TUNE-UP**

2. **PRECAUTIONS WHEN CONNECTING GAUGE**
   (a) Connect the tachometer (+) terminal to the ignition (−) terminal.
   (b) Use the battery as the power source for the timing light, tachometer, etc.



3. **IN EVENT OF ENGINE MISFIRE, THE CATALYTIC CONVERTER MAY OVERHEAT. THEREFORE, THE FOLLOWING PRECAUTIONS SHOULD BE TAKEN**
   (a) Insure correct drive belt adjustment.
   (b) Insure proper connection of battery terminals, etc.
   (c) Handle high-tension wires carefully.
   (d) After repair work, insure that the ignition coil terminals and all other ignition system lines are reconnected securely.
   When cleaning the engine compartment, be especially careful to protect the electrical system from water.

4. **PRECAUTIONS WHEN HANDLING Ox SENSOR**
   (a) Do not allow Ox sensor to receive an impact.
   (b) Do not allow water to come into contact with the sensor or attempt to cool it.

WHEN CAR IS EQUIPPED WITH A MOBILE RADIO SYSTEM (HAM, CB, ETC.)

The ECU has been designed so that it will not be affected by outside interference.
However, if your vehicle is equipped with an amature radio transceiver, etc. (even one with about 10 W output), it may, at times, have an effect upon ECU operation, especially if the antenna and feeder are installed nearby.
Therefore, observe the following precautions.

(a) Install the antenna as far as possible from the ECU. The ECU is located into the right side kick panel so the antenna should be installed at the rear, left side of the vehicle.
If installing in the bumper, do so on the right side, if possible.

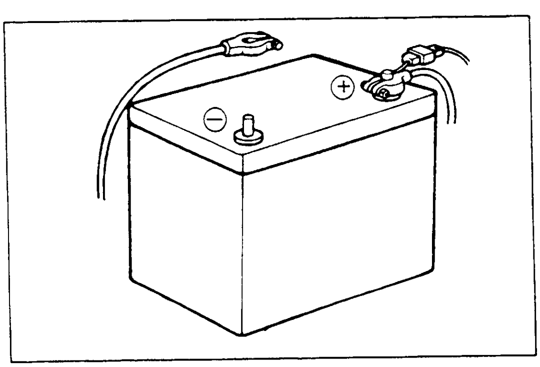
(b) Keep the antenna feeder as far away as possible from the ECU wires — at least 20 cm (7.87 in.) — and, especially, do not wind them together.

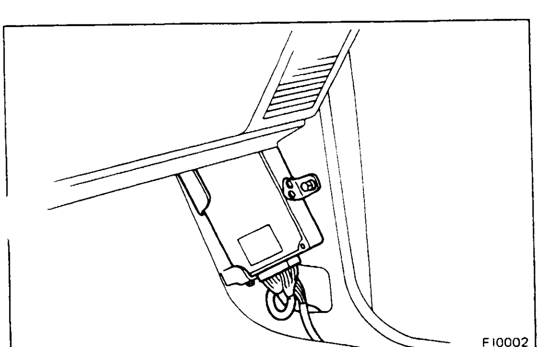
(c) Insure that the feeder and antenna are properly adjusted.

(d) Do not equip your vehicle with a powerful mobile radio system.

INTAKE SYSTEM

1. Separation of the engine oil level gauge, oil filler cap, PCV hose, etc. may cause the engine to run out of tune.
2. Disconnection, looseness or cracks in the parts of the air intake system between the air flow meter and cylinder head will allow air suction and cause bad engine tune.

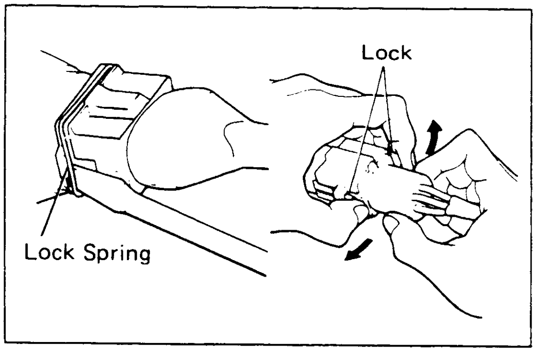




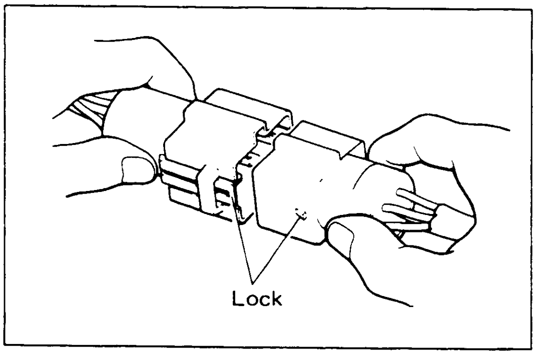
F10002

ELECTRONIC PARTS

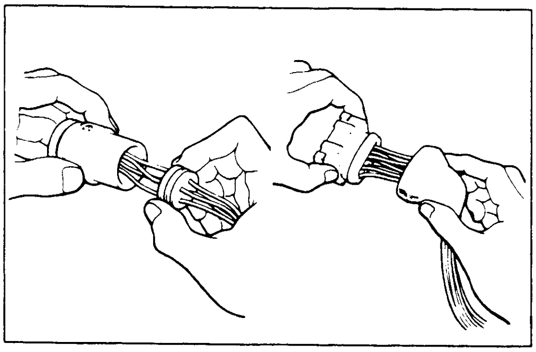
1. Before removing EFI wiring connectors, terminals, etc., first disconnect power by either turning OFF the ignition switch or disconnecting the battery terminals.
2. When installing a battery, be especially careful not to incorrectly connect the positive and negative cables.
3. Do not permit parts to receive a severe impact during removal or installation. Handle all EFI parts carefully and, in particular, the ECU.
4. Do not be careless during troubleshooting as there are numerous transistor circuits and even slight terminal contact can cause further troubles.
5. Do not open the ECU cover.
6. When inspecting during rainy weather, take care to prevent entry of water. Also, when washing the engine compartment, prevent water from getting on the EFI parts and wiring connectors.
7. Parts should be replaced as an assembly.



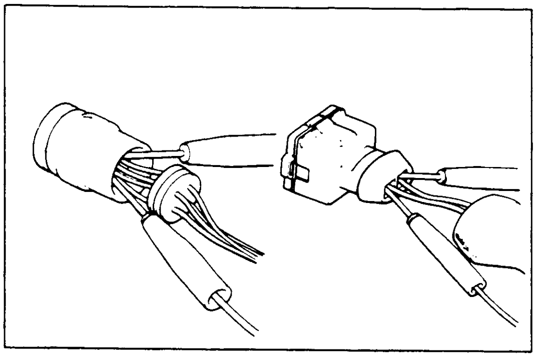
8. Sufficient care is required when pulling out and inserting wiring connectors.
   (a) Release the lock and pull out the connector, pul on the connectors.



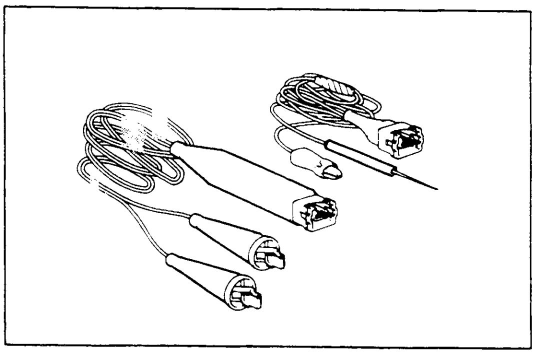
   (b) Fully insert the connector and insure that it is locked.



9. When inspecting a connector with a circuit tester.
   (a) Carefully take out the water-proofing rubber if it is a water-proof type connector.

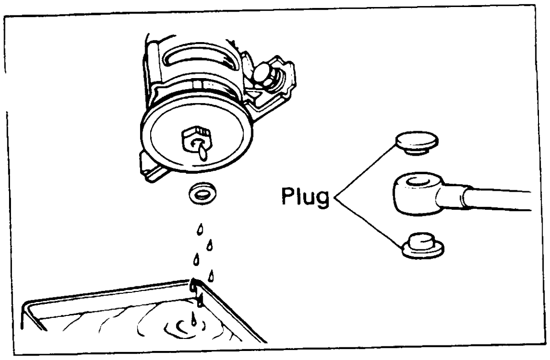


   (b) Insert the tester probe into the connector from the wiring side when checking the continuity, amperage or voltage.
   (c) Do not apply unnecessary force to the terminal.
   (d) After checking, install the water-proofing rubber on the connector securely.

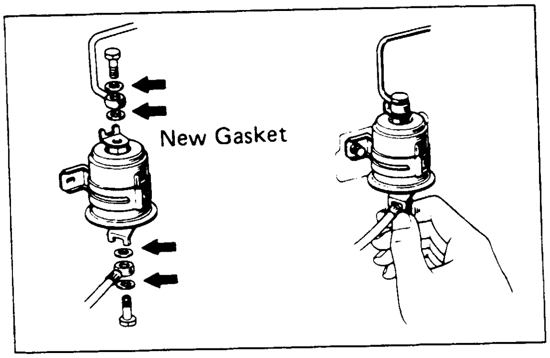


10. Use SST for inspection or test of the injector, cold start injector or its wiring connector.
    SST 09842-30020 and 09842-30050

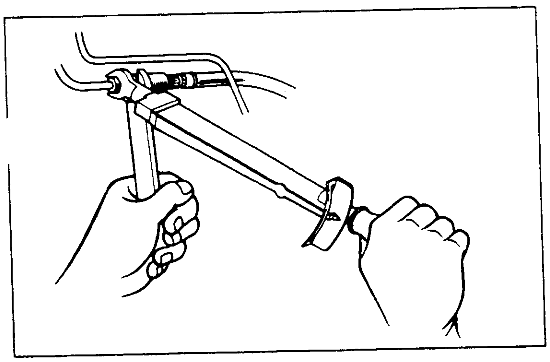
FUEL SYSTEM



1. When disconnecting the connection of the high fuel pressure line, a large amount of gasoline will come out so observe the following procedure.
   (a) Put a container under the connection.
   (b) Slowly loosen the connection.
   (c) Disconnect the connection.
   (d) Plug the connection with a rubber plug.

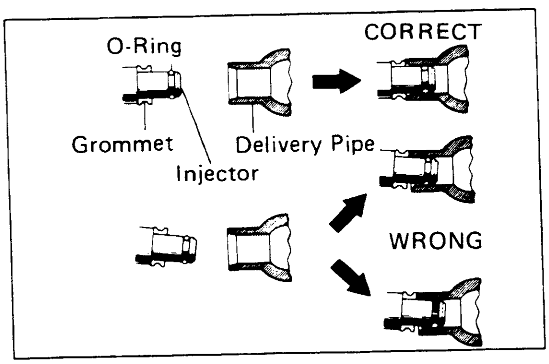


2. When connecting the flare nut on the high pressure pipe union, observe the following procedure.
   (a) Always use a new gasket.
   (b) Apply a thin coat of oil to the flare and first tighten the flare nut by hand.

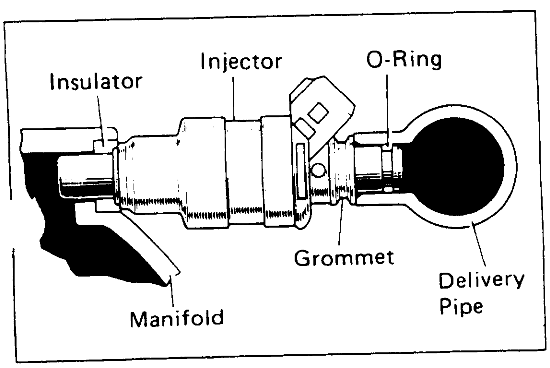


   (c) Then tighten the nut to the specified torque.

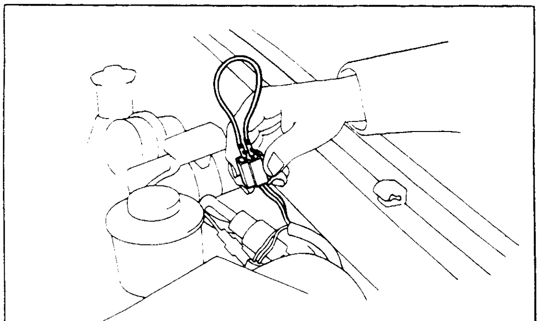
   Torque: 310 kg-cm (22 ft-lb, 30 N·m)



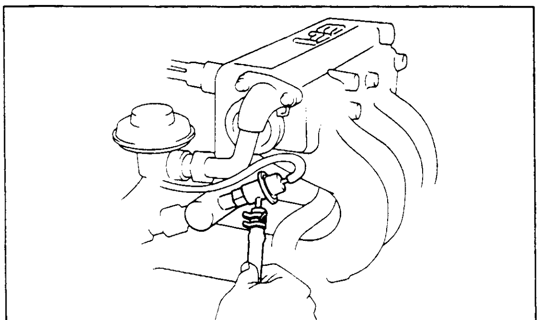
3. Take the following precautions when removing and installing the injectors.
   (a) Never re-use an O-ring.
   (b) When placing an O-ring on the injector,use care not to damage it in any way.
   (c) Lubricate the O-ring with spindle oil or gasoline before installing — never use engine, gear or brake oil.



4. Install the injector to the delivery pipe and intake manifold as shown in the figure.


FI0577

5. Confirm that there are no fuel leaks after performing maintenance on the fuel system.
   (a) With engine stopped, turn the ignition switch oı
   (b) Short circuit terminals of the fuel pump check connector.


FI0630

   (c) When the pressure regulator fuel return hose (shown in the figure at left), is pinched, the pressure within the high pressure line will rise to about 4 kg/cm^2 (57 psi, 392 kPa). In this state, check to see that there are no leaks from any part of the fuel system.

CAUTION: Always pinch the hose. Avoid bending as it may cause the hose to crack.

TROUBLESHOOTING

TROUBLESHOOTING HINTS

1. Engine troubles are usually not caused by the EFI system. When troubleshooting, always first check the condition of the other systems.
   (a) Electronic source
   - Battery
   - Fusible links
   - Fuses

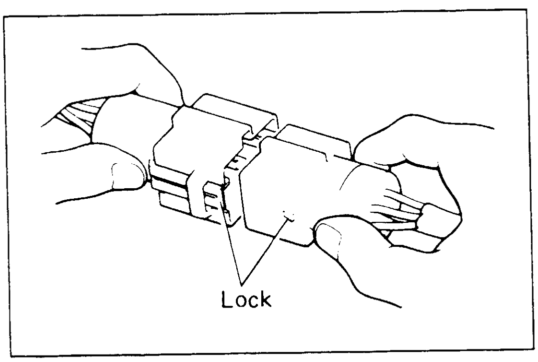
   (b) Fuel supply
   - Fuel leakage
   - Fuel filter
   - Fuel pump

   (c) Ignition system
   - Spark plug
   - High-tension cord
   - Distributor
   - Igniter and ignition coil

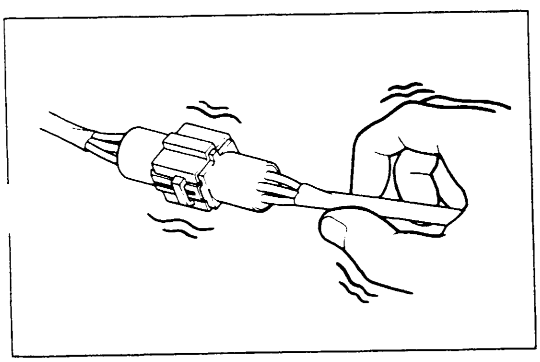
   (d) Air intake system
   - Vacuum leaks

   (e) Emission control system
   - EGR system
   - PCV system

   (f) Others
   - Ignition timing
   - Idle speed
   - etc.

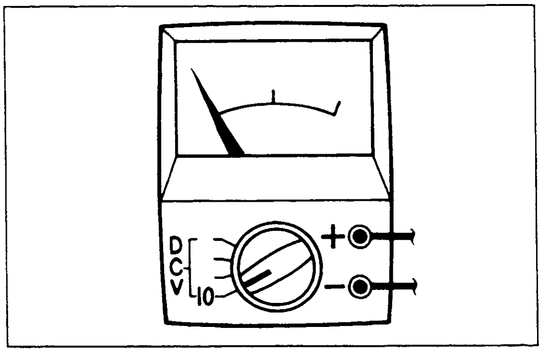


2. The most frequent cause of problems is simply a bad contact in wiring connectors. So always make sure that connections are secure.
   When inspecting the connector, pay particular attention to the following points:
   (a) Check to see that the terminals are not bent.
   (b) Check to see that the connector is pushed in completely and locked.



   (c) Check to see that there is no signal change when the connector is slightly tapped or wiggled.

3. Sufficiently troubleshoot for other causes before replacing the ECU. The ECU is of high quality and it is expensive.



4. Use a volt/ohmmeter with a high impedance (10 kΩ/V minimum) for troubleshooting an electrical circuit.

TROUBLESHOOTING PROCEDURES

SYMPTOM—DIFFICULT TO START OR NO START (ENGINE WILL NOT CRANK OR CRANKS SLOWLY)

CHECK ELECTRONIC SOURCE — BAD →

1. Battery
   (1) Connection
   (2) Gravity — Drive belt — Charging system
   (3) Voltage
2. Fusible link

↓ OK

CHECK STARTING SYSTEM — BAD →

1. Ignition switch
2. Neutral start switch for A/T
3. Starter
4. Wiring/Connection

SYMPTON — DIFFICULT TO START OR NO START (CRANKS OK)

CHECK DIAGNOSIS SYSTEM
Check for output of diagnostic code.
(See page FI-22)

- Malfunction code → Diagnostic code(s) (See page FI-25)
- Normal code ↓

CHECK FOR VACUUM LEAKS IN AIR INTAKE LINE

- BAD →
  1. Hose connections
  2. PCV hoses
  3. EGR system — EGR valve stays open
- OK ↓

CHECK IGNITION SPARK
1. Unplug connectors of injector resistor and start injector time switch.
2. Check by holding spark plug cord 8 — 10 mm (0.31 — 0.39 in.)away from engine block while engine is cranking.
   A strong spark should be noted.

- BAD →
  1. Plug cords
  2. High-tension cords
  3. Distributor
  4. Ignition coil, igniter
  5. ECU
- OK ↓

CHECK IGNITION TIMING
STD: 5° BTDC at idle
($T - E_1$ Short Circuit)

- NO → Adjust ignition timing
- OK ↓

CHECK FUEL SUPPLY TO INJECTOR
1. Fuel in tank
2. Fuel pressure in fuel line
   (1) Short fuel pump check terminals.
   (2) Fuel pressure at fuel hose of cold start injector can be felt.
   (See page FI-43)

- BAD →
  1. Fuel line — Leakage — Deformation
  2. Fuse
  3. Circuit opening relay (See page FI-65)
  4. Fuel pump (See page FI-42)
  5. Fuel filter
  6. Fuel pressure regulator (See page FI-49)
- OK ↓

CHECK FUEL PUMP SWITCH IN AIR FLOW METER
Check continuity between terminals Fc and E_1 while measuring plate of air flow meter is open.

- BAD → Air flow meter (See page FI-54)
- OK ↓

CHECK SPARK PLUGS
Plug gap: 0.8 mm (0.031 in.)
NOTE:
Check compression pressure if necessary.

- NO →
  1. Spark plug
  2. Compression pressure
     Limit: 10.0 kg/cm² (142 psi, 981 kPa) at 250 rpm
  3. Injector — Leakage (See page FI-50)
- NO (All Plugs Wet) →
  1. Injector(s) — Shorted
  2. Injector wiring between resistor and ECU shorted
  3. Cold start injector — Leakage (See page FI-47)
  4. Start injector time switch (See page FI-67)
- OK ↓

CONTINUED ON PAGE FI-12

OK CONTINUED FROM PAGE FI-11

CHECK AIR VALVE

1. Disconnect air hose from air valve.
2. Check that the air valve opens when cold.

Room temp.: Below 20°C (68°F)

NO →

1. Air valve (See page FI-58)
2. Water hoses
3. Air hoses

OK ↓

CHECK EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER

NO →

1. Wiring connection
2. Power to ECU
   (1) Fusible link
   (2) Fuse (EFI 15A)
   (3) Main relay
3. Air flow meter
4. Water thermo sensor
5. Injection signal
   (1) Injector wiring
   (2) Resistor
   (3) ECU

SYMPTOM — ENGINE OFTEN STALLS

CHECK DIAGNOSIS SYSTEM Check for output of diagnostic code. (See page FI-22)	Malfunction code	Diagnostic code(s) (See page FI-25)
↓ Normal code		
CHECK FOR VACUUM LEAKS IN AIR INTAKE LINE	BAD	1. Hose connections 2. PCV hoses 3. EGR system — EGR valve stays open
↓ OK		
CHECK FUEL SUPPLY TO INJECTOR 1. Fuel in tank 2. Fuel pressure in fuel line (1) Short fuel pump check terminals. (2) You can feel fuel pressure at fuel hose of fuel filter. (See page FI-6)	BAD	1. Fuel line — Leakage — Deformation 2. Fuse 3. Circuit opening relay (See page FI-65) 4. Fuel pump (See page FI-42) 5. Fuel filter 6. Fuel pressure regulator (See page FI-49)
↓ OK		
CHECK AIR FILTER ELEMENT	BAD	Element — Clean or replace
↓ OK		
CHECK IDLE SPEED **STD: 750 rpm**	BAD	Adjust idle speed
↓ OK		
CHECK IGNITION TIMING **STD: 5° BTDC at idle** **($T - E_1$ Short Circuit)**	BAD	Adjust ignition timing
↓ OK		
CHECK SPARK PLUGS Plug gap: 0.8 mm (0.031 in.) NOTE: Check compression pressure if necessary.	BAD	1. Spark plug 2. Compression pressure **Limit: 10.0 kg/cm² (142 psi, 981 kPa) at 250 rpm**
↓ OK		
CHECK COLD START INJECTOR (See page FI-47)	BAD	1. Cold start injector 2. Start injector time switch (See page FI-67)

↓ OK CONTINUED ON PAGE FI-14

OK CONTINUED FROM PAGE FI-13

Check	Result	Possible cause
CHECK AIR VALVE 1. Disconnect air hose from air valve. 2. Check that air valve opens when cold. **Room temp.: Below 20°C (68°F)**	BAD →	1. Air valve (See page FI-58) 2. Water hoses 3. Air hoses
↓ OK		
RECHECK FUEL PRESSURE (See page FI-42)	BAD →	1. Fuel pump (See page FI-42) 2. Fuel filter 3. Fuel pressure regulator (See page FI-49)
↓ OK		
CHECK INJECTORS (See page FI-50)	BAD →	Injection condition
↓ OK		
CHECK EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER	BAD →	1. Wiring connection 2. Power to ECU (1) Fusible link (2) Main relay 3. Air flow meter 4. Water thermo sensor 5. Injection signal (1) Injector wiring (2) Resistor (3) ECU

SYMPTOM — ENGINE SOMETIMES STALLS

Check	Result	Possible cause
CHECK DIAGNOSIS SYSTEM Check for output of diagnostic code. (See page FI-22)	Malfunction code →	Diagnostic code(s) (See page FI-25)
↓ Normal code		
CHECK AIR FLOW METER (See page FI-56)	BAD →	Air flow meter
↓ OK		
CHECK WIRING CONNECTORS AND RELAYS Check that there is a signal change when the connector or relay is slightly tapped or wiggled.	BAD →	1. Connector 2. Main relay (See page FI-64) 3. Circuit opening relay (See page FI-65)

SYMPTOM — ROUGH IDLING AND/OR MISSING

CHECK DIAGNOSIS SYSTEM Check for output of diagnostic code. (See page FI-22)	Malfunction code	Diagnostic code(s) (See page FI-25)
↓ Normal code		
CHECK FOR VACUUM LEAKS IN AIR INTAKE LINE	BAD	1. Hose connections 2. PCV hoses 3. EGR system — EGR valve stays open
↓ OK		
CHECK AIR FILTER ELEMENT	BAD	Element — Clean or replace
↓ OK		
CHECK IDLE SPEED **STD: 750 rpm**	BAD	Adjust idle speed
↓ OK		
CHECK IGNITION TIMING **STD: 5° BTDC at idle** **($T - E_1$ Short Circuit)**	BAD	Adjust ignition timing
↓ OK		
CHECK SPARK PLUGS AND PLUG CORDS **Plug gap: 0.8 mm (0.031 in.)** NOTE: Check compression pressure if necessary.	BAD	1. Spark plugs and plug cords 2. Compression pressure **Limit: 10.0 kg/cm² (142 psi, 981 kPa) at 250 rpm**
↓ OK		
CHECK COLD START INJECTOR (See page FI-47)	BAD	1. Cold start injector 2. Cold start injector time switch. (See page FI-65)
↓ OK		
CHECK FUEL PRESSURE (See page FI-42)	BAD	1. Fuel pump (See page FI-42) 2. Fuel filter 3. Fuel pressure regulator (See page FI-49)
↓ OK		
CHECK INJECTORS (See page FI-50)	BAD	Injection condition
↓ OK		

CONTINUED ON PAGE FI-16

OK CONTINUED FROM PAGE FI-15

CHECK EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER

BAD →

1. Wiring connection
2. Power to ECU
   (1) Fusible link
   (2) Main relay
3. Air flow meter
4. Water thermo sensor
5. Air thermo sensor
6. Throttle position sensor
7. Injection signal
   (1) Injector wiring
   (2) Resistor
   (3) ECU
8. Ox sensor

SYMPTOM — HIGH ENGINE IDLE SPEED (NO DROP)

CHECK ACCELERATOR LINKAGE	BAD	Linkage — Stuck
↓ OK		
CHECK IGNITION TIMING **STD: 5° BTDC at idle** **(T — E_1 Short Circuit)**	BAD	Adjust ignition timing
↓ OK		
CHECK AIR VALVE (See page FI-58)	BAD	Air valve — Always open
↓ OK		
CHECK AIR CONDITIONER AND POWER STEERING IDLE-UP CIRCUIT	BAD	Air valve for air conditioner — Leakage VSV for air conditioner — Leakage
↓ OK		
CHECK DIAGNOSIS SYSTEM Check for output of diagnostic code. (See page FI-22)	Malfunction code	Diagnostic code(s) (See page FI-25)
↓ Normal code		
CHECK FUEL PRESSURE (See page FI-43)	BAD	Fuel pressure regulator — High pressure
↓ OK		
CHECK COLD START INJECTOR (See page FI-47)	BAD	Start injector — Leakage
↓ OK		
CHECK INJECTORS (See page FI-50)	BAD	Injectors — Leakage, Injection quality
↓ OK		
CHECK EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER	BAD	1. Wiring connection 2. Power to ECU (1) Fusible link (2) Main relay 3. Air flow meter 4. Water thermo sensor 5. Air thermo sensor 6. Injection signal (1) Injector wiring (2) Resistor (3) ECU

SYMPTOM — ENGINE BACKFIRES-Lean Air Fuel Mixture

Check	Result	Action / Possible cause
CHECK DIAGNOSIS SYSTEM Check for output of diagnostic code. (See page FI-22)	Malfunction code	Diagnostic code(s) (See page FI-25)
↓ Normal code		
CHECK FOR VACUUM LEAKS IN AIR INTAKE LINE	BAD	1. Hose connections 2. PCV hoses 3. EGR system — EGR valve stays open
↓ OK		
CHECK IGNITION TIMING **STD: 5° BTDC at idle** **($T - E_1$ Short Circuit)**	BAD	Adjust ignition timing
↓ OK		
CHECK COLD START INJECTOR (See page FI-47)	BAD	1. Cold start injector 2. Cold start injector time switch. (See page FI-67)
↓ OK		
CHECK FUEL PRESSURE (See page FI-43)	BAD	1. Fuel pump (See page FI-42) 2. Fuel filter 3. Fuel pressure regulator (See page FI-49)
↓ OK		
CHECK INJECTORS (See page FI-50)	BAD	Injectors — Clogged
↓ OK		
CHECK EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER	BAD	1. Wiring connection 2. Power to ECU (1) Fusible link (2) Main relay 3. Air flow meter 4. Water thermo sensor 5. Air thermo sensor 6. Throttle position sensor 7. Injection signal (1) Injection wiring (2) Resistor (3) ECU (4) Fuel cut signal 8. Ox sensor

SYMPTOM — MUFFLER EXPLOSION (AFTER FIRE) -Rich Air Fuel Mixture-Misfire

CHECK DIAGNOSIS SYSTEM Check for output of diagnostic code. (See page FI-22)	Malfunction code	Diagnostic code(s) (See page FI-25)
↓ Normal code		
CHECK IGNITION TIMING **STD: 5° BTDC at idle** **($T - E_1$ Short Circuit)**	BAD	Adjust ignition timing
↓ OK		
CHECK COLD START INJECTOR (See page FI-47)	BAD	1. Cold start injector 2. Cold start injector time switch (See page FI-67)
↓ OK		
CHECK INJECTORS	BAD	Injectors — Leakage
↓ OK		
CHECK SPARK PLUGS AND PLUG CORDS Plug gap: 0.8 mm (0.031 in.) NOTE: Check compression pressure if necessary.	BAD	1. Spark plugs and plug cords 2. Compression pressure Limit: 10.0 kg/cm² (142 psi, 981 kPa) at 250 rpm
↓ OK		
CHECK EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER	BAD	1. Throttle position sensor 2. Injection signal (1) Fuel cut signal (2) Injector wiring (3) Resistor (4) ECU 3. Ox sensor

SYMPTOM — ENGINE HESITATES AND/OR POOR ACCELERATION

CHECK CLUTCH, BRAKE

BAD →
1. Clutch — Slips
2. Brakes — Drag

↓ OK

CHECK FOR VACUUM LEAKS IN AIR INTAKE LINE

BAD →
1. Hose connections
2. PCV hoses
3. EGR system — EGR valve stays open

↓ OK

CHECK AIR FILTER ELEMENT

BAD → Element — Clean or replace

↓ OK

CHECK DIAGNOSIS SYSTEM
Check for output of diagnostic code.
(See page FI-22)

Malfunction code → Diagnostic code(s) (See page FI-25)

↓ Normal code

CHECK IGNITION SPARK
1. Unplug connectors of injector resistor and cold start injector time switch.
2. Check by holding spark plug cord 8 — 10 mm (0.31 — 0.39 in.) away from engine block while engine cranking.
   A strong spark should be noted.

BAD →
1. Plug cord
2. High tension cord
3. Distributor
4. Ignition coil, Igniter

↓ OK

CHECK IGNITION TIMING
STD: 5° BTDC at idle
($T - E_1$ Short Circuit)

BAD → Adjust ignition timing

↓ OK

CHECK FUEL PRESSURE
(See page FI-43)

BAD →
1. Fuel pump (See page FI-42)
2. Fuel filter
3. Fuel pressure regulator (See page FI-49)

↓ OK CONTINUED ON PAGE FI-21

OK CONTINUED FROM PAGE FI-20

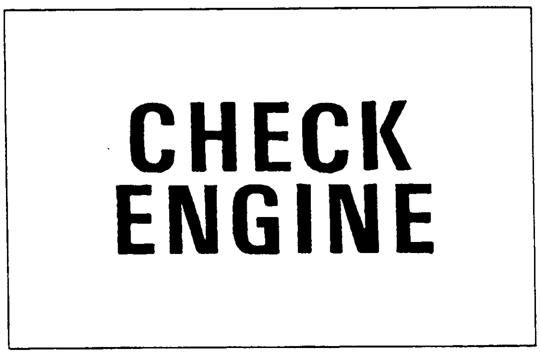
Check	Result	Possible cause
CHECK INJECTORS (See page FI-50)	BAD	Injection condition
OK ↓		
CHECK SPARK PLUGS **Plug gap: 0.8 mm (0.031 in.)** NOTE: Check compression pressure if necessary.	BAD	1. Spark plugs 2. Compression pressure **Limit: 10.0 kg/cm² (142 psi, 981 kPa) at 250 rpm**
OK ↓		
CHECK EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER	BAD	1. Wiring connection 2. Power to ECU (1) Fusible link (2) Main relay 3. Air flow meter 4. Water thermo sensor 5. Air thermo sensor 6. Throttle position sensor 7. Injection signal (1) Injector wiring (2) Resistor (3) ECU

DIAGNOSIS SYSTEM

DESCRIPTION

By analyzing various signals as shown in the later table (page FI-25) the ECU detects system malfunctions which are related to the various operating parameter sensors or to the actuator. The ECU stores the failure code associated with the detected failure until the diagnostic system is cleared by removing the EFI fuse with ignition switch off.

A "CHECK ENGINE" warning light on the instrument panel informs the driver that a malfunction has been detected. The light goes out automatically when the malfunction has been cleared.



"CHECK ENGINE" LIGHT CHECK

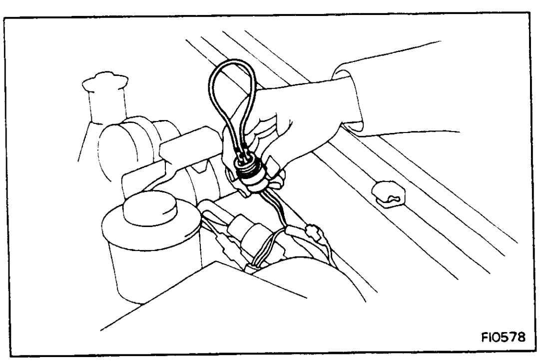
1. The "CHECK ENGINE" warning light will come on when the ignition switch is placed at ON and the engine is not running.
2. When the engine is started, the "CHECK ENGINE" warning light should go out.

   If the light remains on, the diagnosis system has detected a malfunction in or abnormality in the system.

OUTPUT OF DIAGNOSTIC CODES

To obtain an output of diagnostic codes, proceed as follows:

1. Initial conditions
   (a) Battery voltage above 11 volts.
   (b) Throttle valve fully closed (throttle position sensor IDL points closed).
   (c) Transmission in neutral postion.
   (d) Accessory switches OFF.
   (e) Engine at normal operating temperature.
2. Turn the ignition switch to ON. Do not start the engine.
3. Using a sub-wire short terminals T–E_1 of the Check Engine Connector located near the ignition coil.



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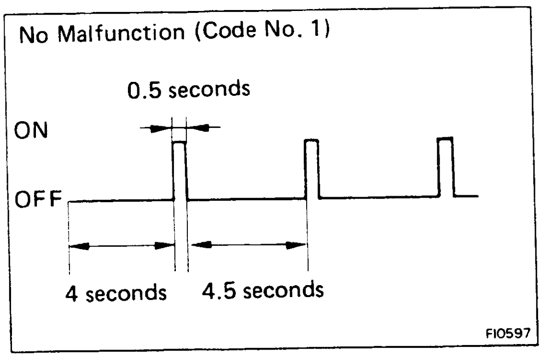
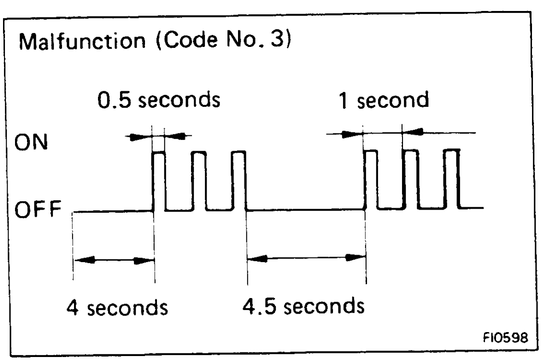
4. Read the diagnostic code as indicated by the number of flashes of the "CHECK ENGINE" warning light.



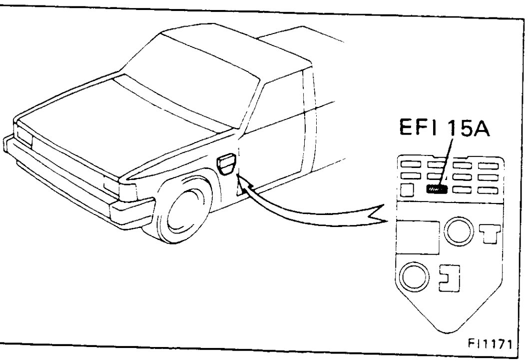
Diagnostic code (See page FI-25)

(a) Normal System Operation (code No.1) (no malfunction)
The light will blink once every 4.5 seconds.



(b) Malfunction Code Indication
The light will blink a number of times equal to the malfunction code indication every 4.5 seconds.
The diagnostic code series will be repeated as long as the check connector terminals (T and E_1) are shorted.

5. After the diagnosis check, remove the sub-wire.



CANCELLING OUT DIAGNOSTIC CODE

1. After repair of the trouble area, the diagnostic code retained in memory by the ECU must be cancelled out by removing the fuse EFI (15A) for 30 seconds or more, depending on ambient temperature (the lower the temperature, the longer the fuse must be left out) with the ignition switch off.

NOTE:

- Cancellation can also be done by removing the battery negative (–) terminal, but in this case other memory systems (radio ETR, etc.)will also be cancelled out.
- If the diagnostic code is not cancelled out, it will be retained by the ECU and appear along with a new code in event of future trouble.
- If it is necessary to work on engine components requiring removal of the battery terminal, a check must first be made to see if a diagnostic code has been recorded.

2. After cancellation, road test the vehicle, if necessary, confirm that a "normal" code (No. 1) is now read on the "CHECK ENGINE" warning light.

   If the same diagnostic code is still indicated, it indicates that the trouble area has not been repaired thoroughly.

DIAGNOSIS INDICATION

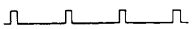
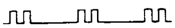
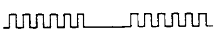
(1) Including "normal", the ECU is programmed with the following 13 (22R-E), 14 (22R-TE) diagnostic codes.

(2) When 2 or more codes are indicated, the lowest number (code) will appear first.

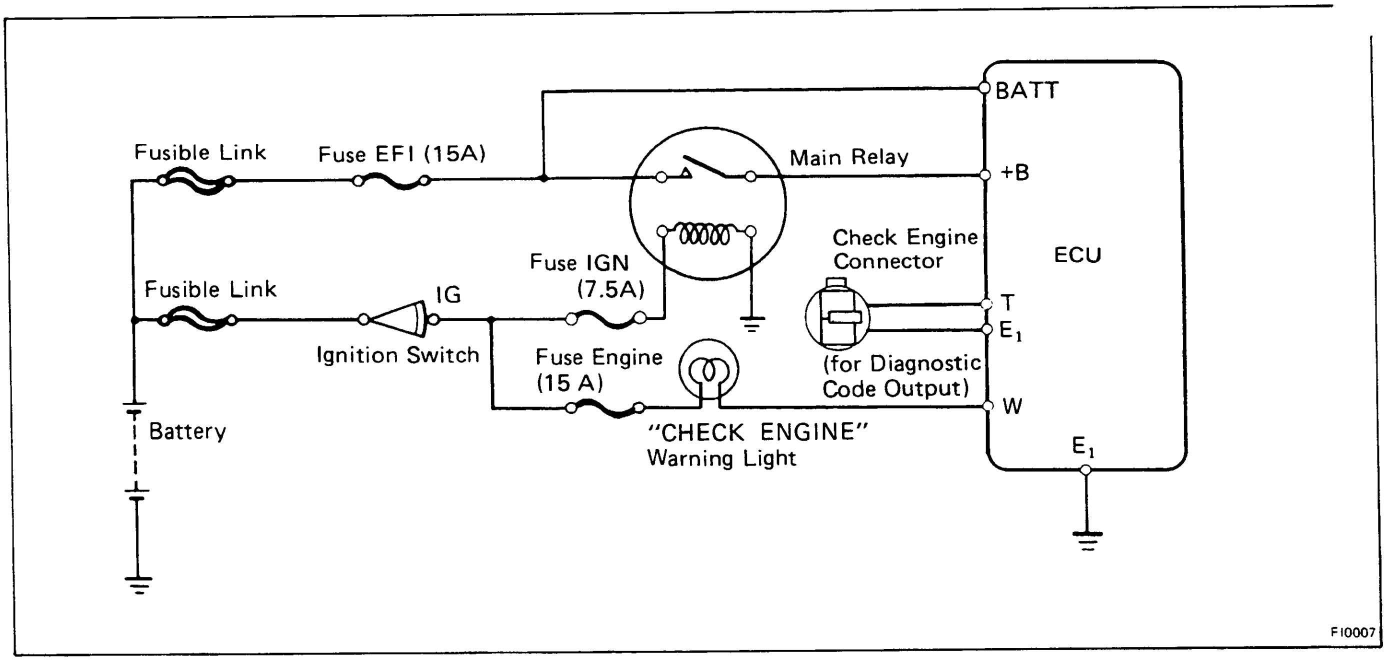
(3) All detected diagnostic codes, except 11 and 13, will be retained in memory be the ECU from the time of detection until cancelled out.

(4) Once the malfunction is cleared, the "CHECK ENGINE" warning light on the instrument panel will go out but the diagnostic code(s) remain stored in ECU memory (except for code 11 and 13).

DIAGNOSIS CODES

Code	Number of blinks "CHECK ENGINE"	System	Diagnosis	Trouble area	Page
1		Normal	This appears when none of other codes (2 thru 13) are identified.		
2		Air flow meter signal	• Open circuit in V_C, or $V_S - E_2$ short circuited. • Open circuit in E_2, or $V_C - V_S$ short circuited.	1. Air flow meter circuit 2. Air flow meter 3. ECU	FI-56 FI-56 FI-73
3		Ignition signal	No signal from IGF four times in succession	1. Igniter circuit (+B, IGT, IGF) 2. Igniter 3. ECU	FI-73
4		Water thermo sensor signal	Open or short circuit in water thermo sensor signal	1. Water thermo sensor circuit 2. Water thermo sensor 3. ECU	FI-68 FI-68 FI-73
5		Ox sensor signal	Sufficiented feed back condition but not changed Ox sensor signal	1. Ox sensor circuit 2. Ox sensor 3. ECU	FI-69 FI-69 FI-73
6		RPM signal (crank angle pulse)	No Ne signal to ECU within cranking, or Ne value being over 1,000 rpm in spite of no Ne signal to ECU	1. Igniter circuit 2. Igniter 3. Distributor 4. ECU	FI-73
7		Throttle position sensor signal	Open or short circuit in throttle position sensor signal	1. Throttle position sensor circuit 2. Throttle position sensor 3. ECU	FI-59 FI-59 FI-73
8		Intake air thermo sensor signal	Open or short circuit in intake air thermo sensor signal	1. Intake air thermo sensor circuit 2. Intake air thermo sensor 3. ECU	FI-73
10		Starter signal	No STA signal to ECU when vehicle speed 0 km/h and engine is running over 800 rpm	1. Speed sensor circuit 2. Main relay circuit 3. IG switch circuit (Starter) 4. IG switch 5. ECU	FI-64 FI-73
11		Switch signal	Short circuit in terminal T when air conditioner switch ON or IDL point OFF	1. Air conditioner switch 2. Throttle position sensor circuit 3. Throttle position sensor 4. ECU	FI-59 FI-59 FI-73
12		Knock control sensor signal	Knock control sensor signal is not reached judgement level in succession	1. Knock control sensor circuit 2. Knock control sensor 3. ECU	
13		Knock control CPU (ECU)	Knock CPU faulty	Knock control CPU (ECU)	

INSPECTION OF DIAGNOSIS CIRCUIT



1. Does CHECK ENG. light come on when ignition switch is at ON?
   - YES → System Normal
   - NO ↓

   Does CHECK ENG. light come on when ECU terminal W is grounded to the body ?
   - YES → Check wiring between ECU terminal E_1 and body ground.
     - OK → Try another ECU.
     - BAD ↓ Repair or replace
   - NO ↓

   Check bulb, fuse and wiring between ECU and ignition switch.
   - BAD ↓ Repair or replace

2. Does CHECK ENG. light go OFF when engine is started?
   - YES → System Normal
   - NO ↓

   Check wiring between ECU and CHECK ENG. light.
   - BAD → Repair
   - OK ↓

   Is there diagnosis code output when CHECK ENG. connector T-E_1 is short circuited?
   - NO → Try another ECU.
   - YES ↓

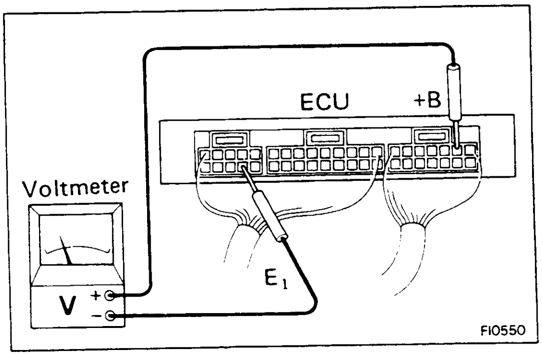
   Does CHECK ENG. light go out after repair according to malfunction code?
   - NO → Further repair required.
   - YES ↓

   System OK
   - NO → Cancel out diagnostic code.

TROUBLESHOOTING WITH VOLT/OHMMETER

PREPARATION FOR TROUBLESHOOTING

1. **Remove the glove box.**
2. **Remove the ECU with the wire harness.**



EFI SYSTEM CHECK PROCEDURE

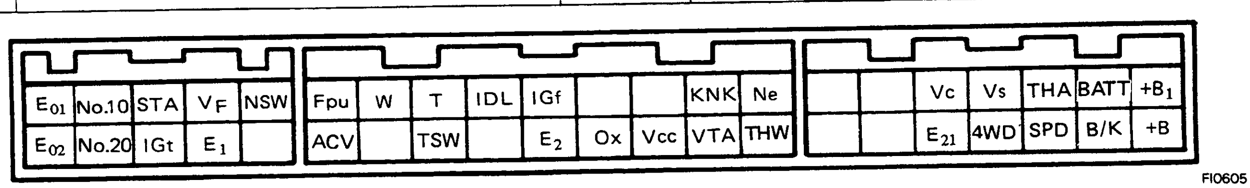
NOTE:
1. The EFI circuit can be checked by measuring the resistance and voltage at the wiring connectors of the ECU.
2. Perform all voltage measurement with the connectors connected.
3. Verify that the battery voltage is 11 V or above when the ignition switch is ON.

Using a voltmeter with high impedance (10 kΩ/V minimum) measure the voltage at each terminal of the wiring connector.

NOTE: If there is any problems, see TROUBLESHOOTING FOR EFI ELECTRONIC CIRCUIT WITH VOLT/OHMMETER.

Connectors of ECU

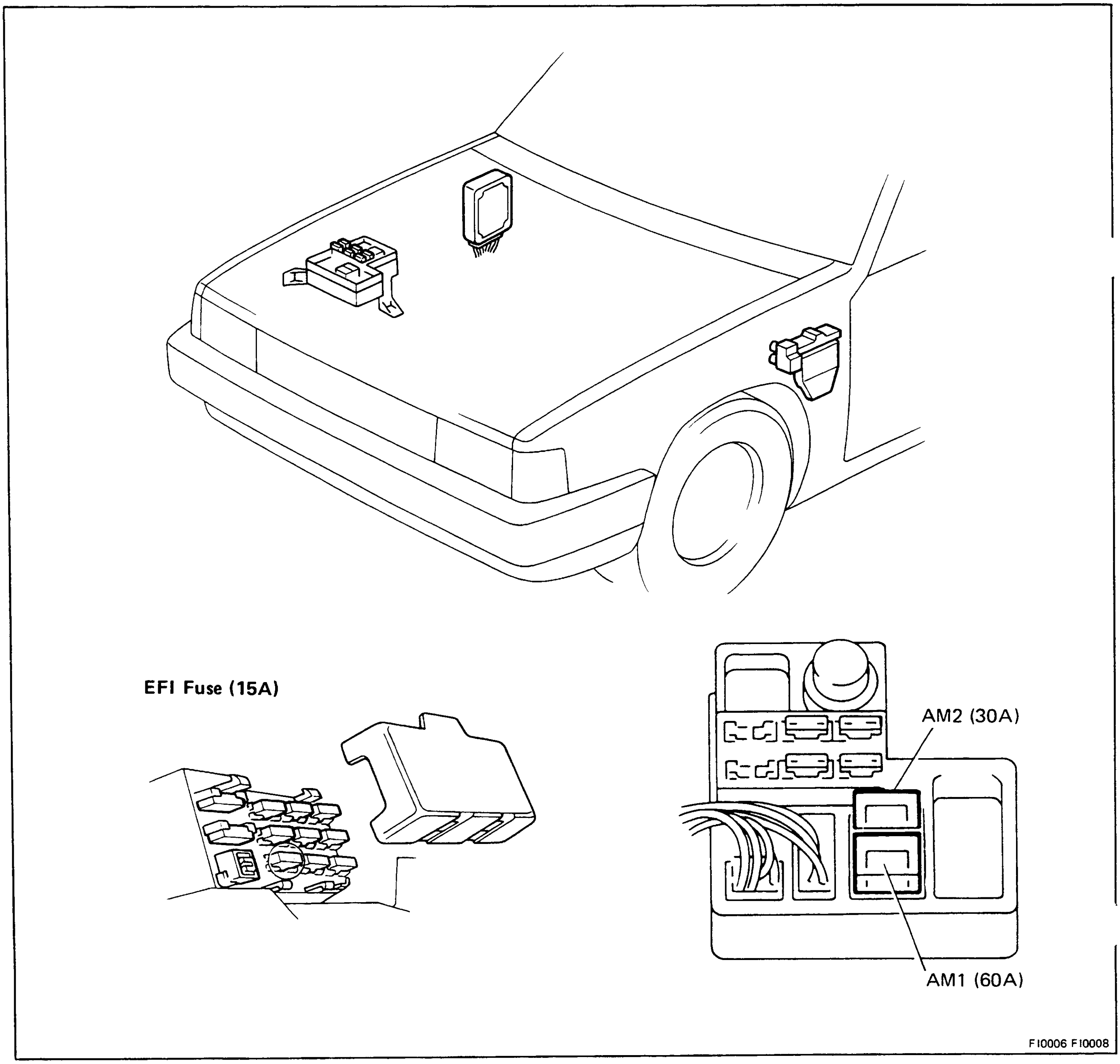
Symbol	Terminal Name	Symbol	Terminal Name
$+B_1$	MAIN RELAY	+B	MAIN RELAY
BATT	BATTERY +B	B/K	BRAKE SWITCH
THA	AIR THERMO SENSOR	SPD	SPEED SENSOR
Vs	AIR FLOW METER	4WD	4WD SWITCH
Vc	AIR FLOW METER	E_{21}	SENSOR EARTH
Ne	ENGINE REVOLUTION SENSOR	THW	WATER THERMO SENSOR
KNK	KNOCK SENSOR	VTA	THROTTLE
IGf	IGNITER	Vcc	THROTTLE SWITCH +B
IDL	THROTTLE SWITCH	Ox	Ox SENSOR
T	CHECK CONNECTOR	E_2	SENSOR EARTH
W	WARNING LIGHT	TSW	WATER THERMO SWITCH
Fpu	FUEL PRESSURE UP SWITCH	ACV	A/C IDLE UP
NSW	NEUTRAL START SWITCH	E_1	ENGINE EARTH
VF	CHECK CONNECTOR	IGt	IGNITER
STA	STARTER SWITCH	No. 20	INJECTOR
No. 10	INJECTOR	E_{02}	ENGINE GROUND
E_{01}	ENGINE GROUND		



TROUBLESHOOTING FOR EFI ELECTRONIC CIRCUIT WITH VOLT/OHMMETER

NOTE: Because the following troubleshooting procedures are designed for inspection of each separate system, the actual troubleshooting procedure may vary somewhat. However, please refer to these procedures and perform actual troubleshooting, conforming to the inspection methods described.
For example, it is better to first make a simple check of the fuses, fusible links and connecting condition of the connectors before making your inspection according to the procedures listed.

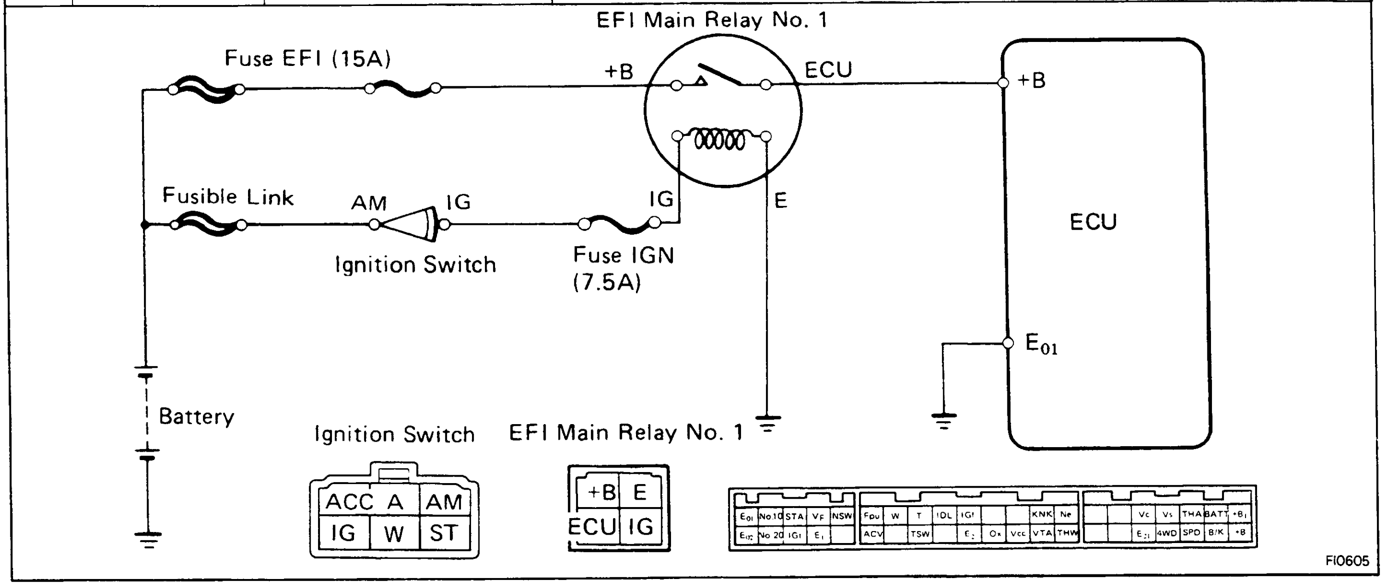
LOCATION OF FUSE AND FUSIBLE LINK

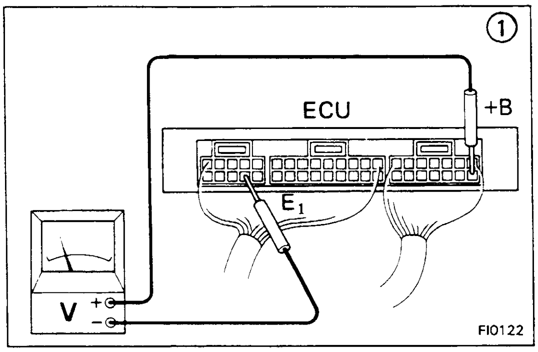


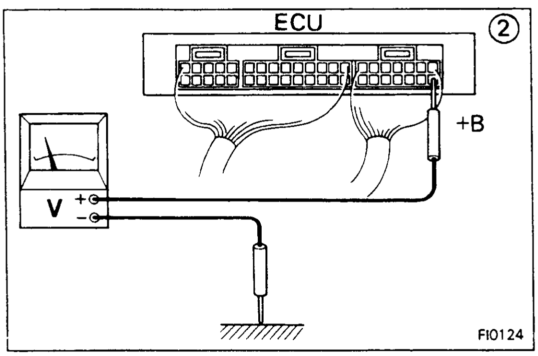
VOLTAGE AT ECU WIRING CONNECTORS

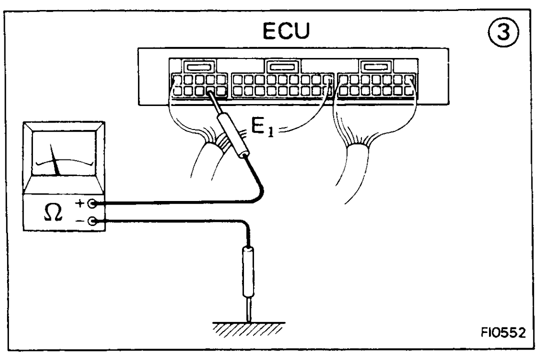
No.	Terminals	Condition		STD Voltage	See page
1	+B – E_1	Ignition switch ON		10 – 14	FI-30
2	BATT – E_1	–		10 – 14	FI-31
3	IDL – E_2	Ignition switch ON	Throttle valve open	4 – 10	FI-32
	VTA – E_2		Throttle valve fully closed	0.1 – 1.0	FI-33
			Throttle valve fully open	4 – 5	
	Vcc – E_2		–	4 – 6	
4	IGt – E_1	Idling		0.7 – 1.0	FI-34
5	STA – E_1	Ignition switch ST position		6 – 12	FI-35
6	No. 10 – E_1 No. 20 – E_1	Ignition switch ON		9 – 14	FI-36
7	W – E_1	No trouble (CHECK ENGINE light off) and engine running		8 – 14	FI-37
8	Vc – E_2	Ignition switch ON	–	4 – 9	FI-38
	Vs – E_2		Measuring plate fully closed	0.5 – 2.5	
			Measuring plate fully open	5 – 8	
		Idling		2.5 – 5.5	
9	THA – E_2	Ignition switch ON	Intake air temperature 20°C (68°F)	2 – 6	FI-39
10	THW – E_2	Ignition switch ON	Coolant temperature 80°C (176°F)	0.5 – 2.5	FI-40
11	B/K – E_1	Stop light switch ON		8 – 14	FI-41

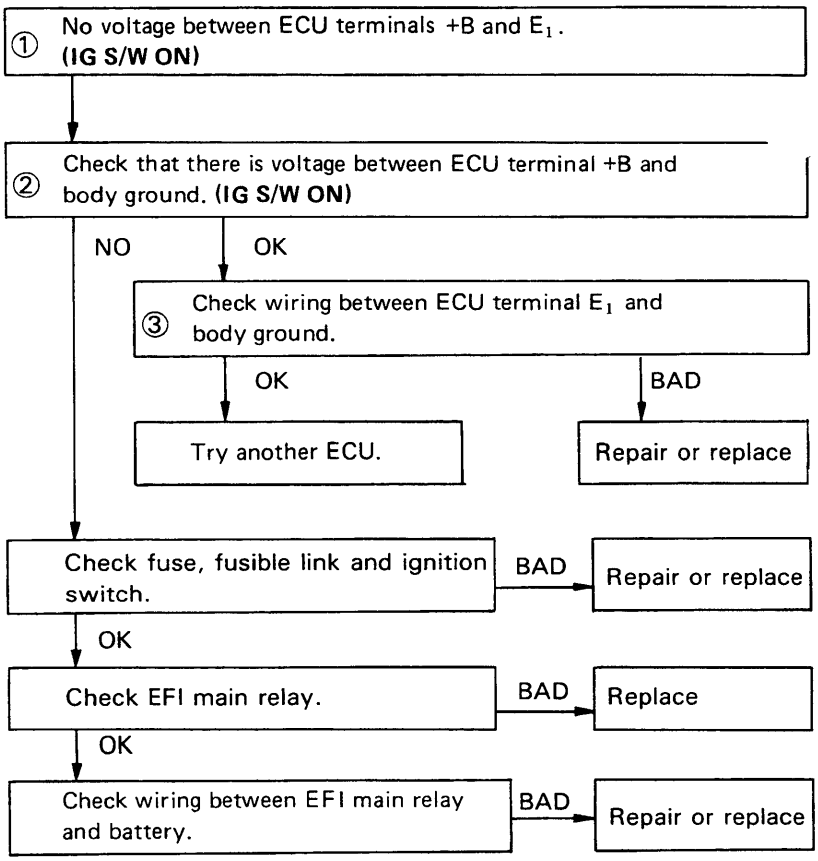
No.	Terminals	Trouble	Condition	STD Voltage
1	+B — E_1	No voltage	IG S/W ON	10 — 14 V



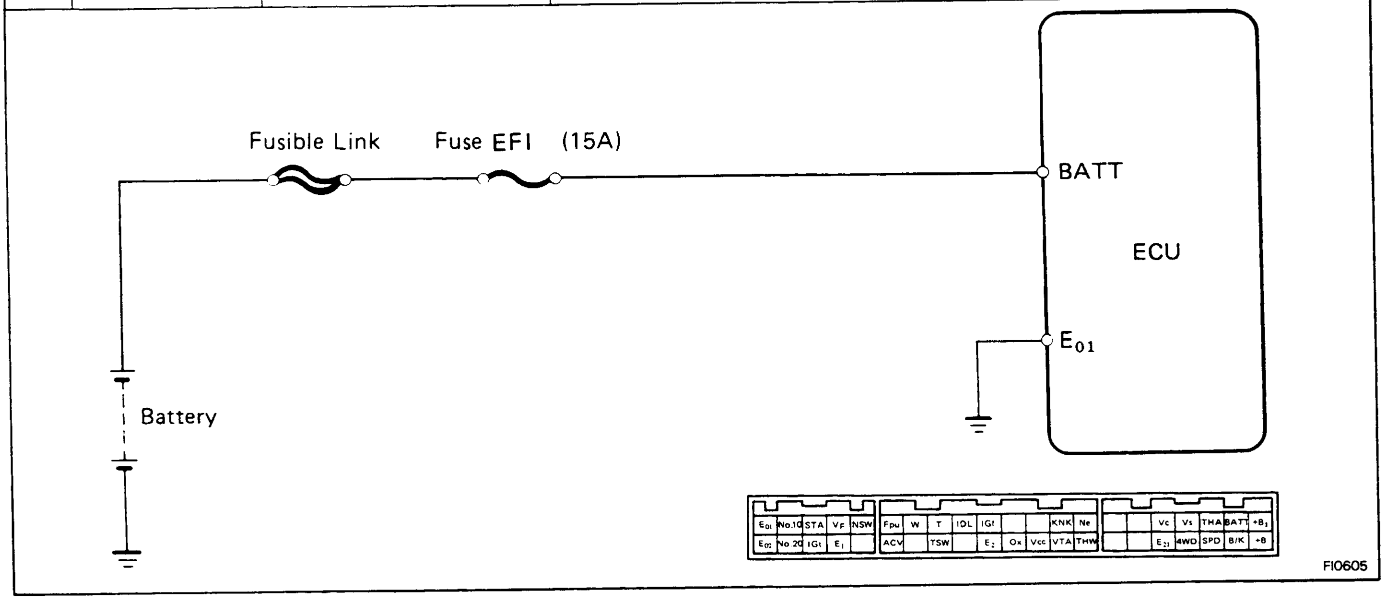


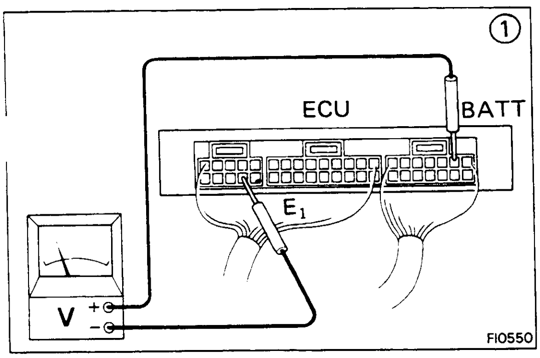


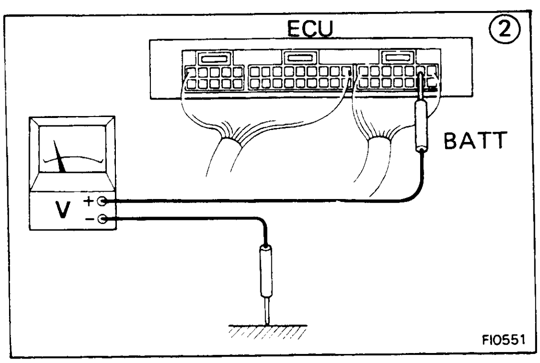


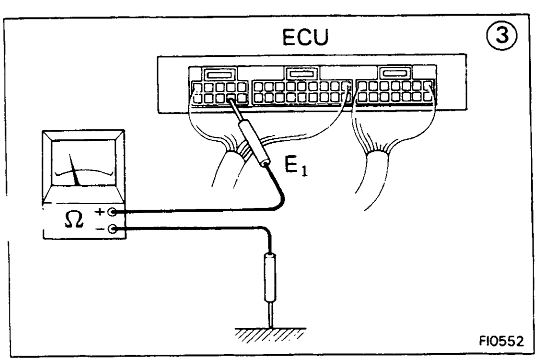


No.	Terminals	Trouble	Condition	STD Voltage
	BATT — E_1	No voltage	——	10 — 14 V









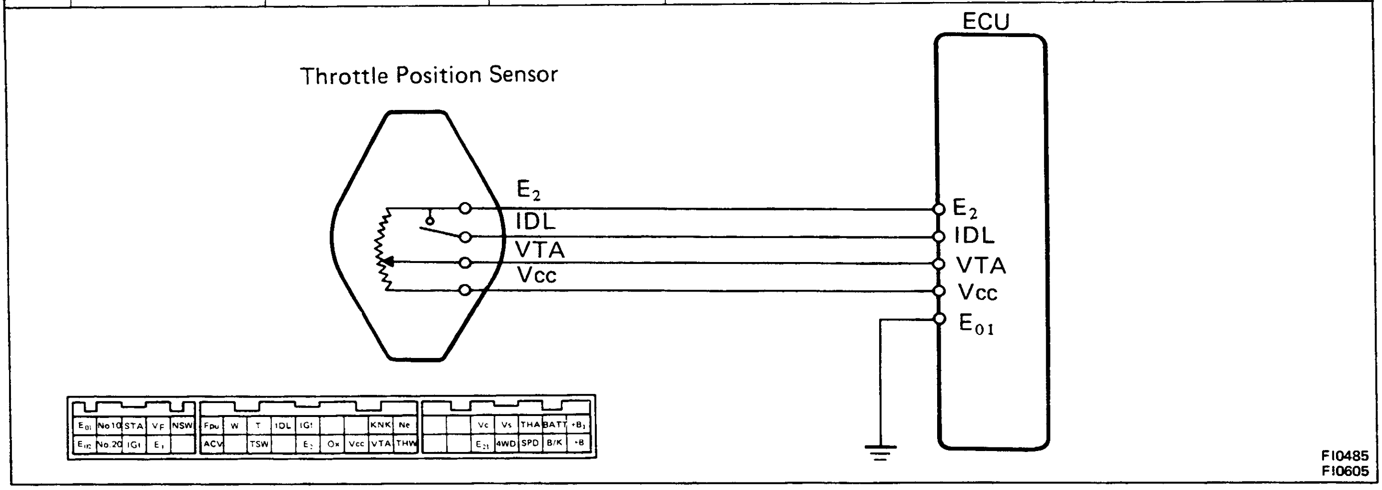
① No voltage between ECU terminals BATT and E_1.

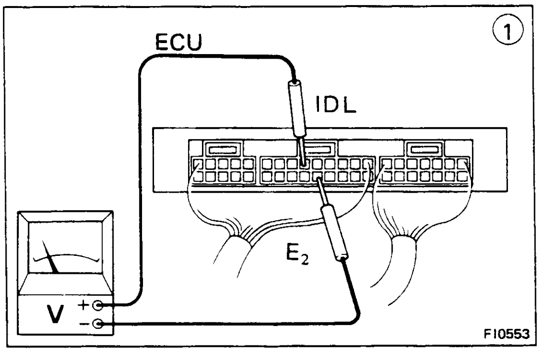
↓

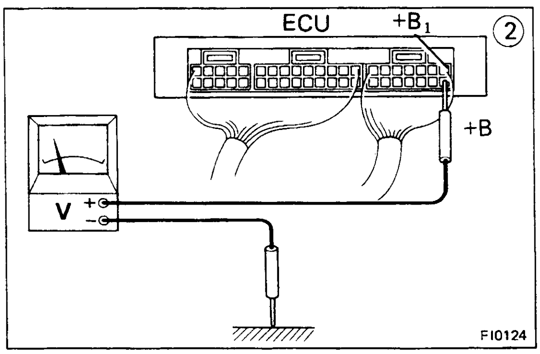
② Check that there is voltage between ECU terminal BATT and body ground.

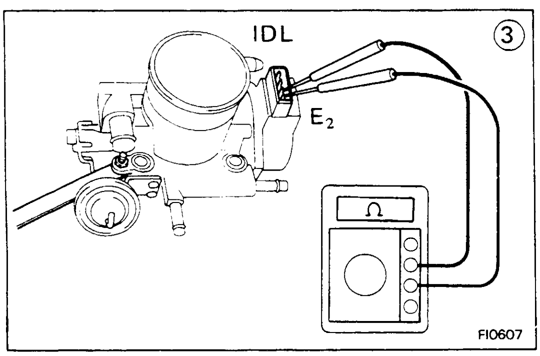
- OK → ③ Check wiring between ECU terminal E_1 and body ground.
  - OK → Try another ECU.
  - BAD → Repair or replace
- NO → Check fuse and fusible link.
  - BAD → Replace
  - OK → Check wiring between fuse and ECU.
    - BAD → Repair or replace

No.	Terminals	Trouble	Condition		STD Voltage
3	IDL – E_2	No voltage	Ignition switch ON	Throttle valve open	4 – 10 V
	VTA – E_2			Throttle valve fully closed	0.1 – 1.0 V
				Throttle valve fully open	4 – 5 V
	Vcc – E_2			–	4 – 6 V









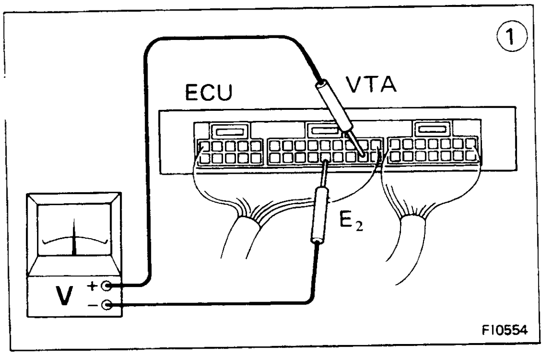
- **IDL ↔ E_2**

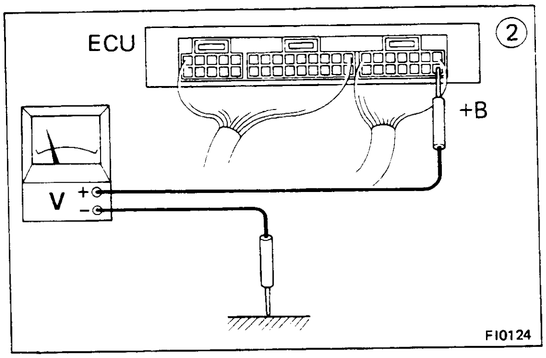
(1) There is no voltage between ECU terminals IDL and E_2. **(IG S/W ON)** (Throttle valve open)

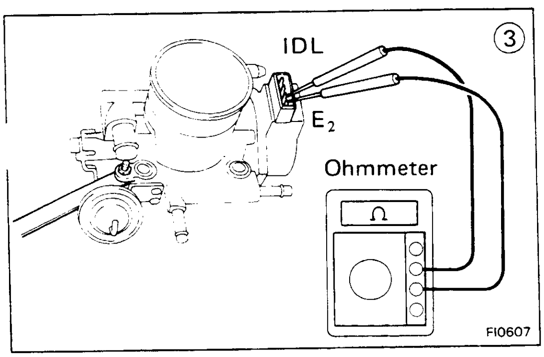
↓

(2) Check that there is voltage between ECU terminal $+B_1$ or +B and body ground. **(IG S/W ON)**

- OK → Check wiring between ECU terminal E_1 and body ground.
  - BAD → Replace or repair.
- NO → Refer to No. 1
  - BAD → Replace or repair.
  - OK → (3) Check throttle position sensor.
    - BAD → Replace or repair throttle position sensor.
    - OK → Check wiring between ECU and throttle position sensor.
      - BAD → Replace or repair.
      - OK → Try another ECU.







• VTA ↔ E_2

① There is no specified voltage at ECU terminals VTA and E_2. **(IG S/W ON)**

↓

② Check that there is voltage between ECU terminal $+B_1$ or +B and body ground. **(IG S/W ON)**

- OK → Check wiring between ECU terminal E_1 and body ground.
  - BAD → Replace or repair.
- NO → Refer to No. 1.
  - BAD → Repair or replace.
  - OK ↓

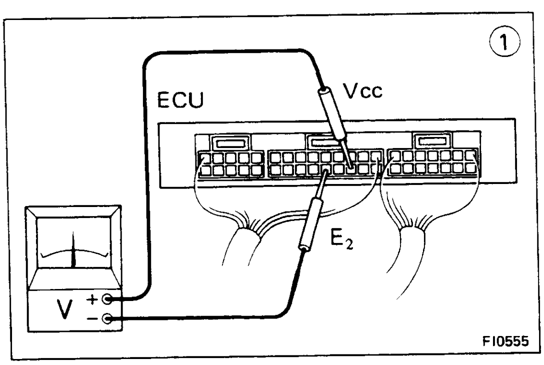
③ Check throttle position sensor.

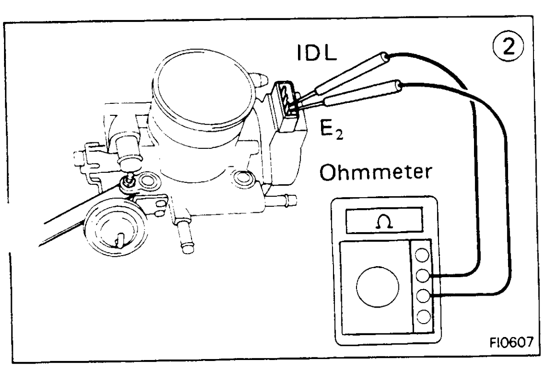
- BAD → Repair or replace.
- OK ↓

Check wiring between ECU and throttle position sensor.

- BAD → Repair or replace.
- OK ↓

Try another ECU.





• Vcc ↔ E_2

① There is no voltage between ECU terminals Vcc and E_2. **(IG S/W ON)**

↓

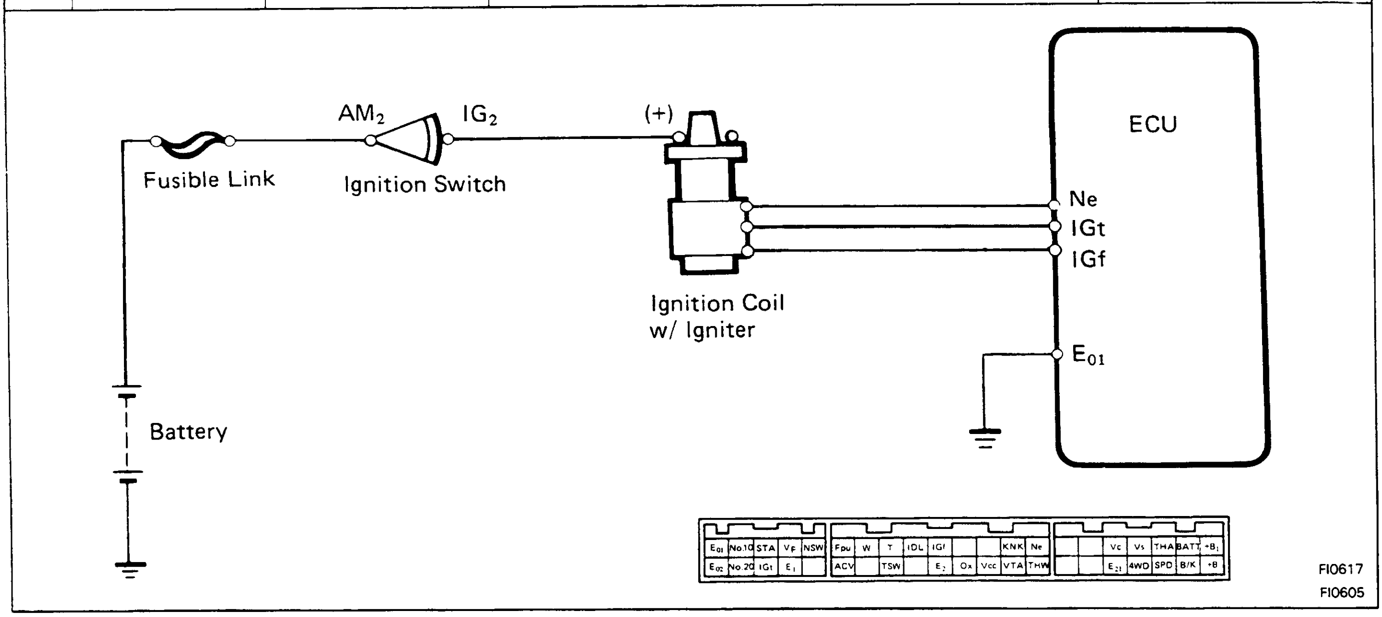
Check that there is voltage between ECU terminal $+B_1$ or +B and body ground. **(IG S/W ON)**

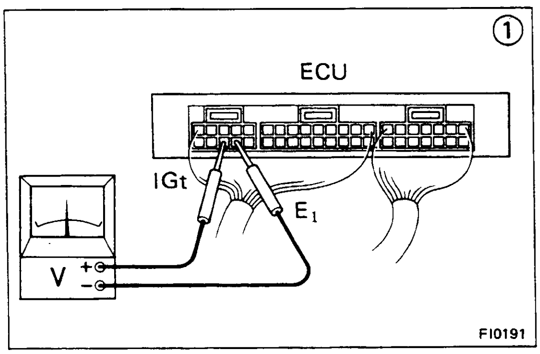
- NO → Refer to No. 1.
- OK ↓

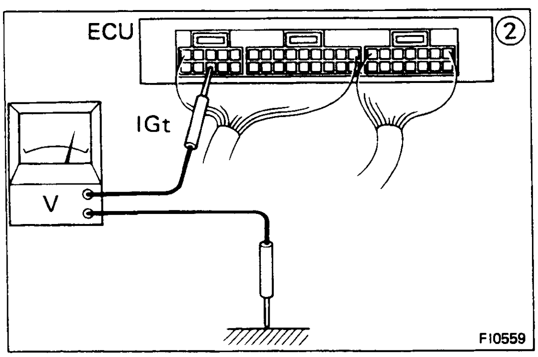
② Check throttle position sensor.

- BAD → Repair or replace.
- OK → Check wiring between ECU and throttle position sensor.
  - BAD → Repair or replace wiring.
  - OK → Try another ECU.

No.	Terminals	Trouble	Condition	STD Voltage
4	$IGt - E_1$	No voltage	Idling	0.7 – 1.0 V







① There is no voltage between ECU terminals IGt and E_1. (Idling)

↓

② Check that there is voltage between ECU terminal IGt and body ground. (Idling)

- OK → Check wiring between ECU terminal E_1 and body ground. — BAD → Repair or replace.

↓

Refer to No. 1. — BAD → Repair or replace.

↓ OK

Check wiring between igniter and distributor. — BAD → Repair or replace.

↓ OK

Check distributor. — BAD → Replace.

↓ OK

Check wiring between ECU and igniter. — BAD → Repair or replace.

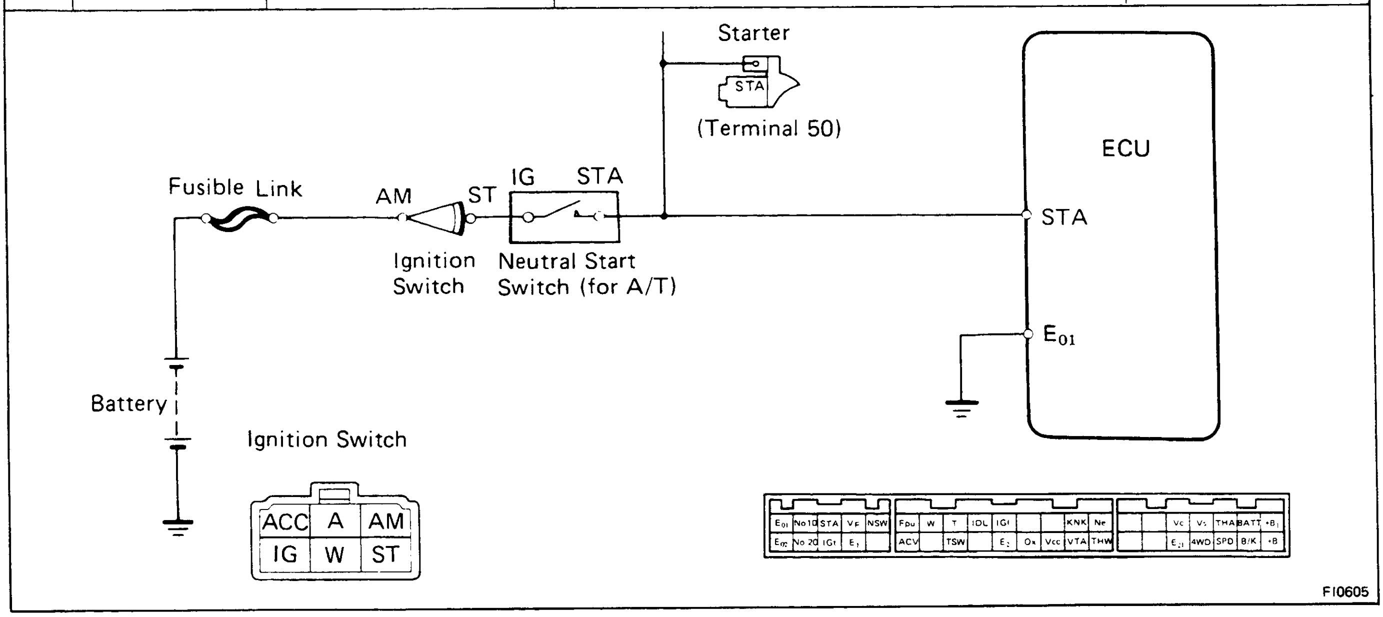
↓ OK

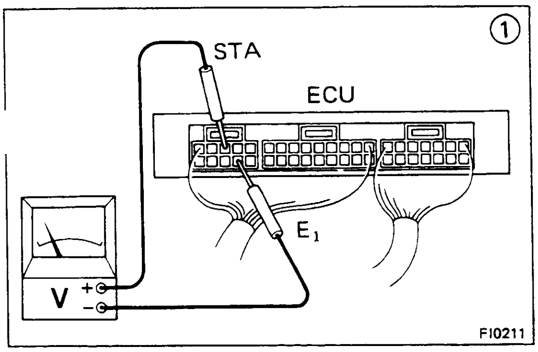
Check igniter. (See page IG-5) — BAD → Repair or replace.

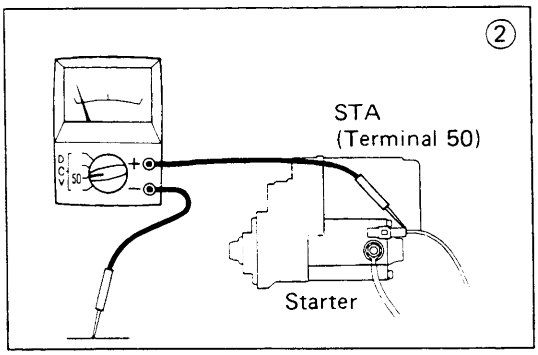
↓ OK

Try another ECU.

No.	Terminals	Trouble	Condition	STD Voltage
	STA – E_1	No voltage	Ignition switch ST position	6 – 12 V



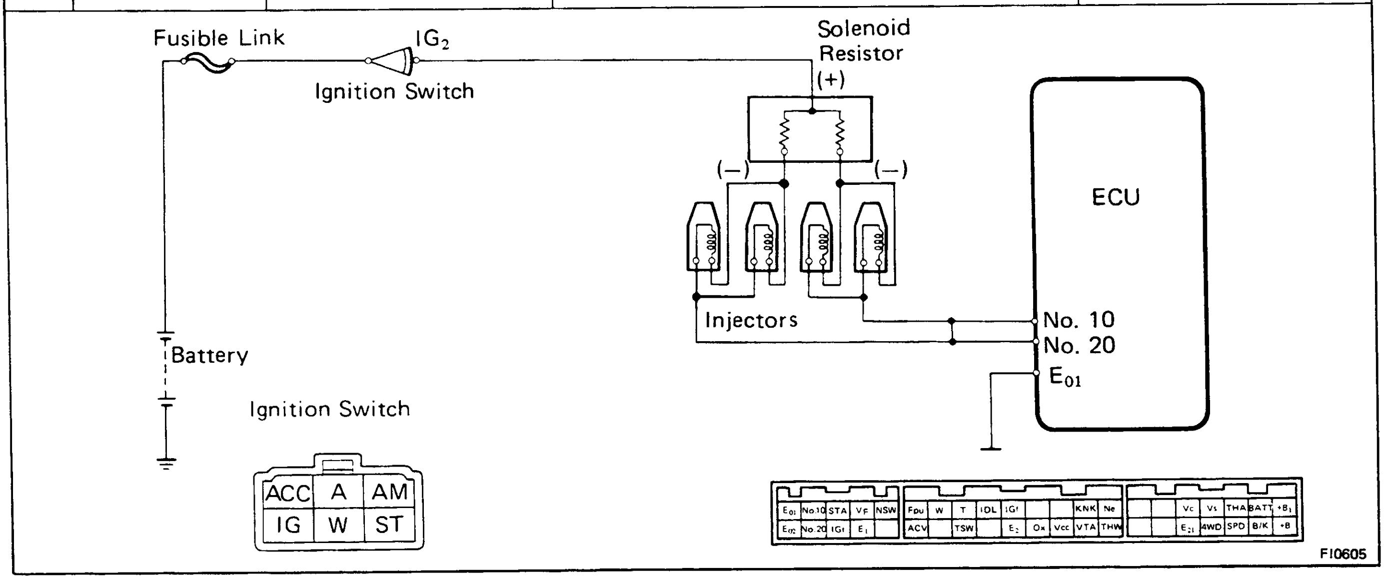


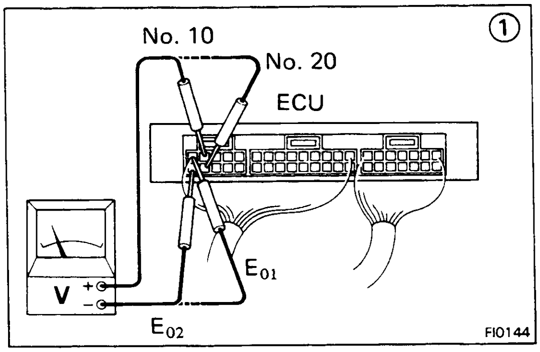


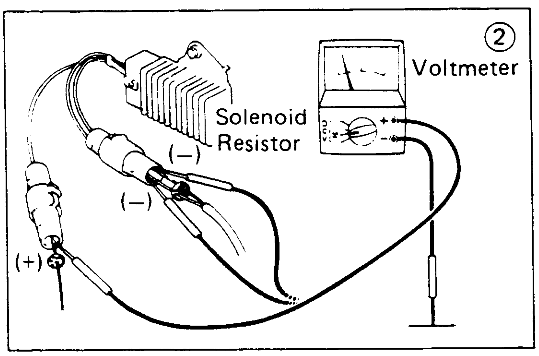
① No voltage between ECU terminals STA and E_1.
(IG S/W ST)

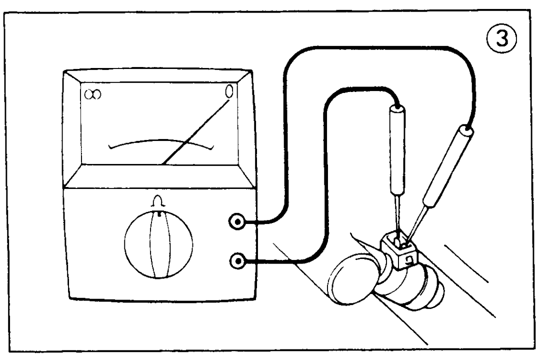
- Check starter operation.
  - OK → Check wiring between ECU and ignition switch terminal ST.
    - BAD → Repair or replace
    - OK → Check wiring between ECU terminal E_1 and body ground.
      - OK → Try another ECU.
      - BAD → Repair or replace
  - BAD → Check fusible link, battery, wiring and ignition switch.
    - BAD → Repair or replace
    - OK → ② Check that there is voltage at STA (50) terminal of starter. **(IG S/W ST) STD voltage: 6 – 12 V**
      - OK → Check starter. (See page ST-3)
      - NO → Check wiring between ignition switch ST terminal and starter STA (50) terminal.

No.	Terminals	Trouble	Condition	STD Voltage
6	No. 10 — E_1 No. 20 — E_1	No voltage	Ignition switch ON	9 — 14 V









① No voltage between ECU terminals No. 10 and/or No. 20 and E_{01}. **(IG S/W ON)**

↓

② Check that there is specified voltage between resistor terminal (+) and body ground. **STD voltage: 9 — 14 V**

- NO → Check fuse, fusible link and ignition switch. — BAD → Repair or replace
  - OK → Check wiring between solenoid resistor and battery. — BAD → Repair or replace
- OK ↓

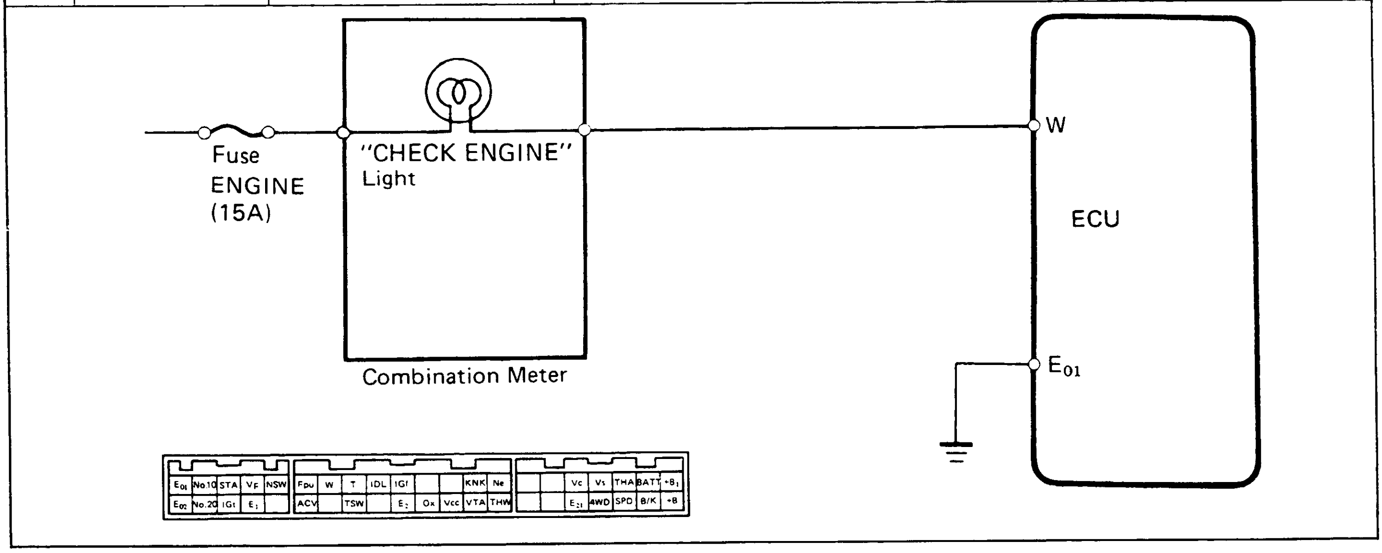
② Check that there is specified voltage between resistor terminal (—) and body ground. **STD voltage: 9 — 14 V**

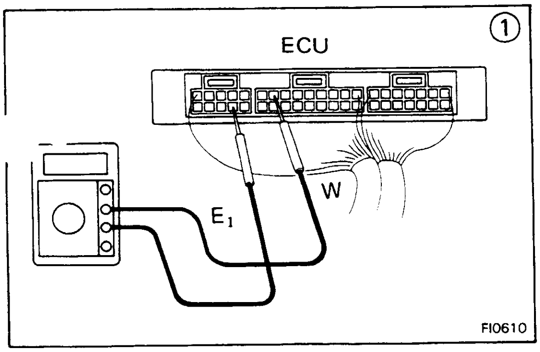
- NO → Replace resistor.
- OK ↓

③ Check resistance of magnetic coil in each injector. **STD resistance: 1.5—3.0 Ω**

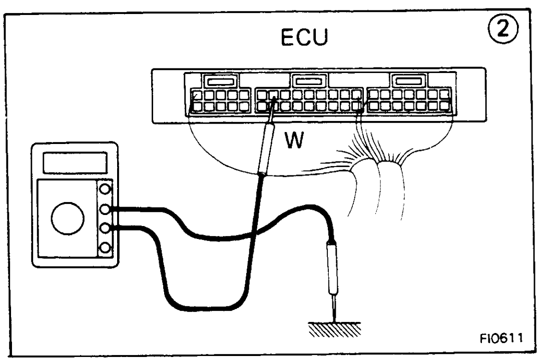
- BAD → Replace injector.
- OK → Check wiring between ECU and resistor.

No.	Terminals	Trouble	Condition	STD Voltage
	W — E_1	No voltage	No trouble (CHECK ENGINE light off) and engine running	8 — 14 V

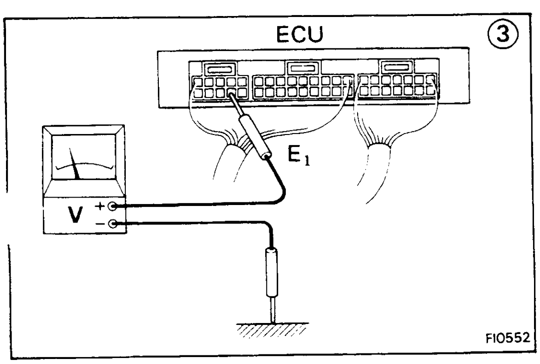




FI0610



FI0611



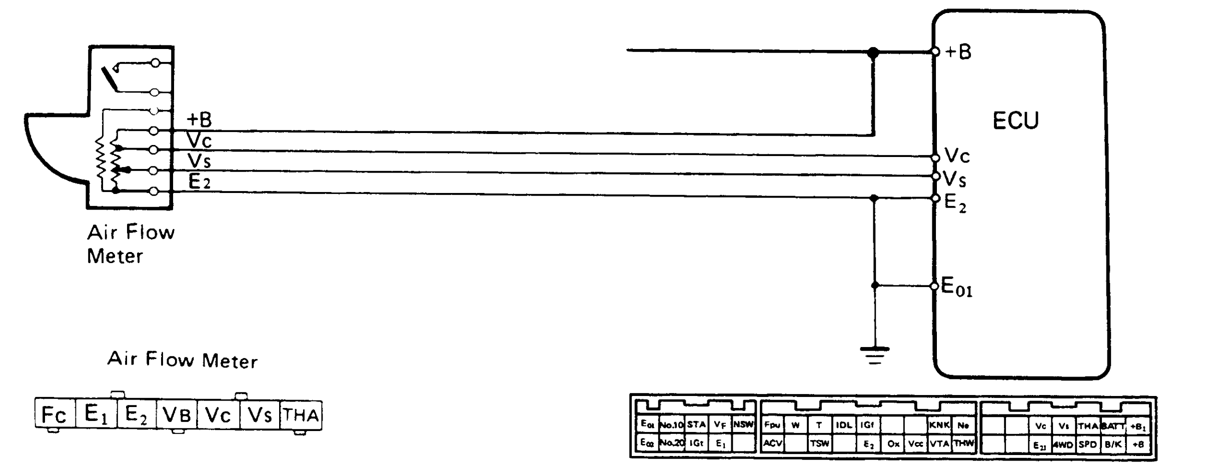
FI0552

① No voltage between ECU terminal W and E_1. (Idling)

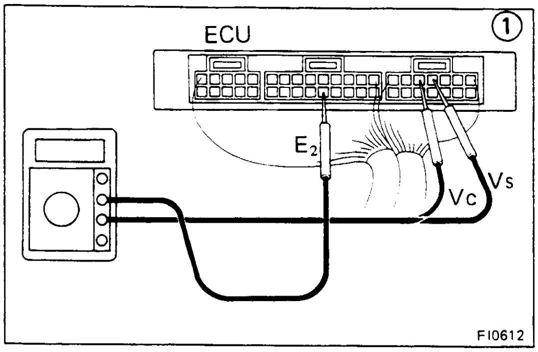
② Check that there is voltage between ECU terminal W and body ground.

- OK → ③ Check wiring between ECU terminal E_1 and body ground.
  - OK → Try another ECU.
  - BAD → Repair or replace
- NO → Check ENGINE fuse (15A) and Check Engine light.
  - BAD → Repair or replace
  - OK → Check wiring between ECU terminal W and fuse.
    - BAD → Repair or replace

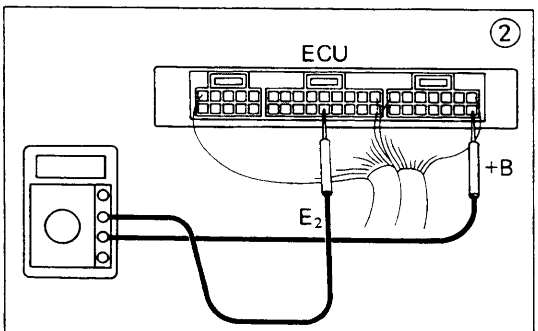
No.	Terminals	Trouble	Condition		STD Voltage
8	Vc – E2	No voltage	Ignition switch ON	–	4 – 9 V
	Vs – E2			Measuring plate fully closed	0.5 – 2.5 V
	Vs – E2			Measuring plate fully open	5 – 8 V
	Vs – E2		Idling	–	2.5 – 5.5 V



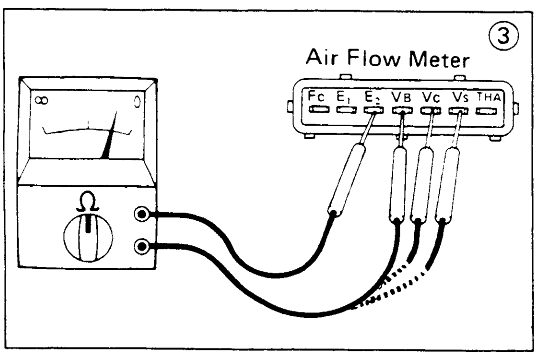
FI0605



FI0612



FI0613



- **Vc – E2, Vs – E2**

① No specified voltage at ECU terminals Vc or Vs and E_2
(IG S/W ON)

② Check that there is voltage between ECU terminals +B and E_2.
(IG S/W ON)

OK → ③ Check air flow meter.

NO → Refer to +B – E2 trouble section.

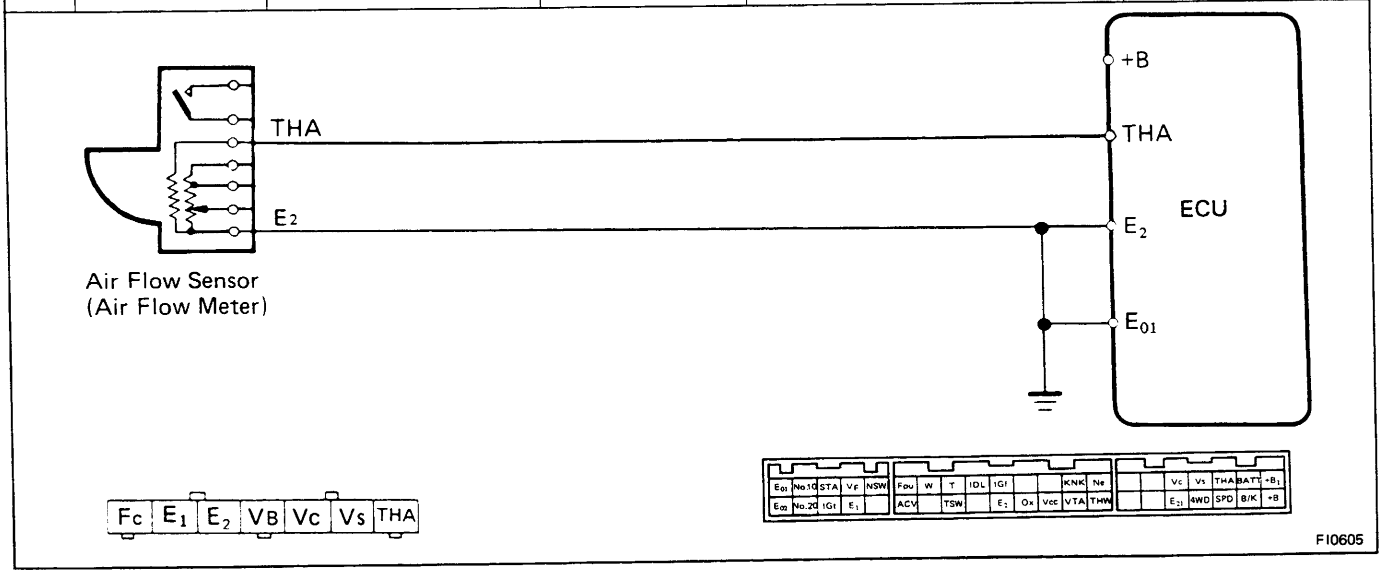
③ NO → Replace or repair air flow meter.

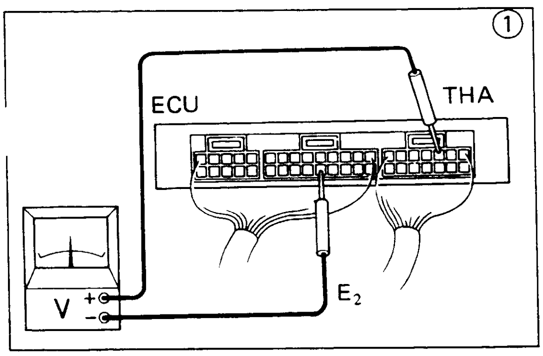
③ OK → Check wiring between ECU and air flow meter.

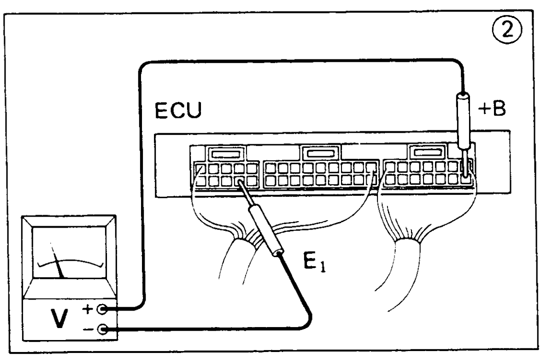
OK → Try another ECU.

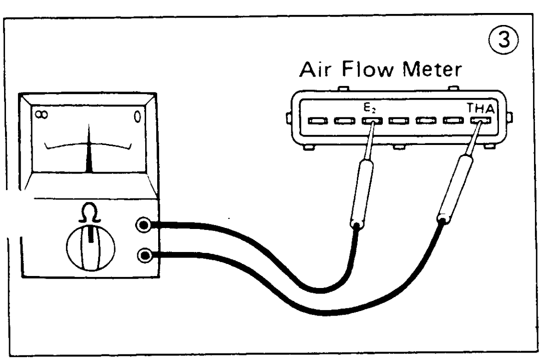
NO → Replace or repair wiring.

No.	Terminals	Trouble	Condition		STD Voltage
9	THA — E_2	No voltage	Ignition switch ON	Intake air temperature 20°C (68°F)	2 — 6 V









① No voltage between ECU terminals THA and E_2. **(IG S/W ON)**

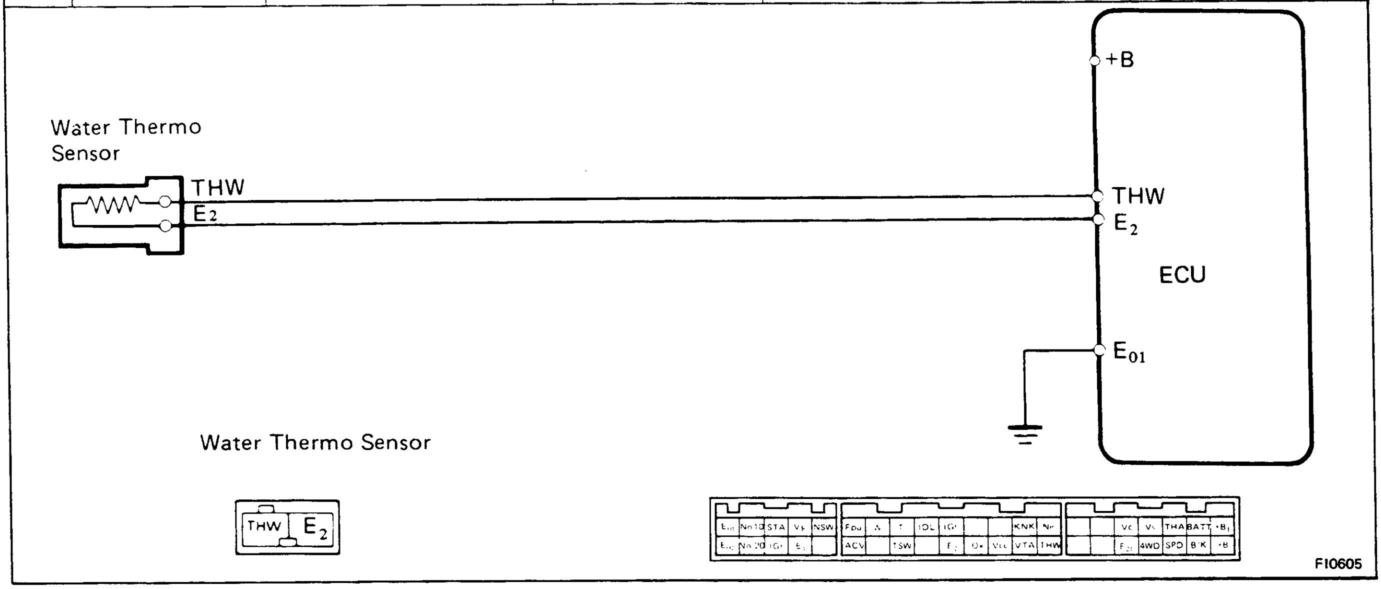
② Check that there is voltage between ECU terminal +B and body ground. **(IG S/W ON)**

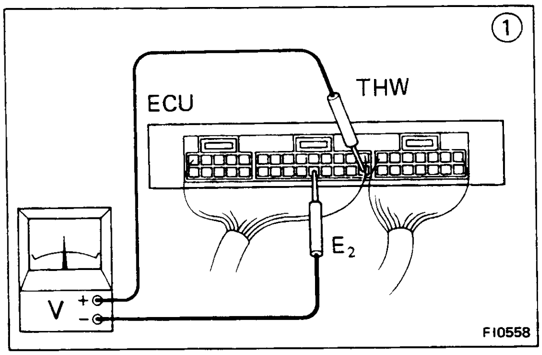
- OK → ③
- NO → Refer to section 1.

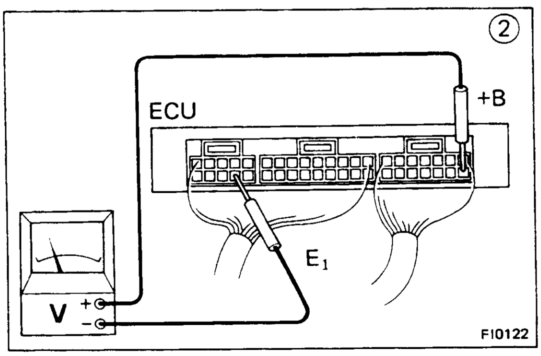
③ Check air thermo sensor.

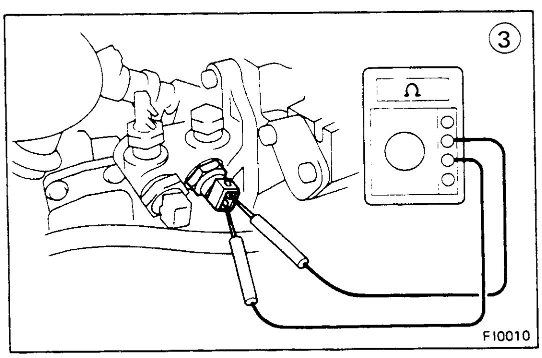
- BAD → Replace air flow meter.
- OK → Check wiring between ECU and air thermo sensor.
  - OK → Try another ECU.
  - BAD → Repair or replace wiring.

No.	Terminals	Trouble	Condition		STD Voltage
10	THW – E_2	No voltage	Ignition switch ON	Coolant temperature 80°C (176°F)	0.5 – 2.5 V









① No voltage between ECU terminals THW and E_2. **(IG S/W ON)**

↓

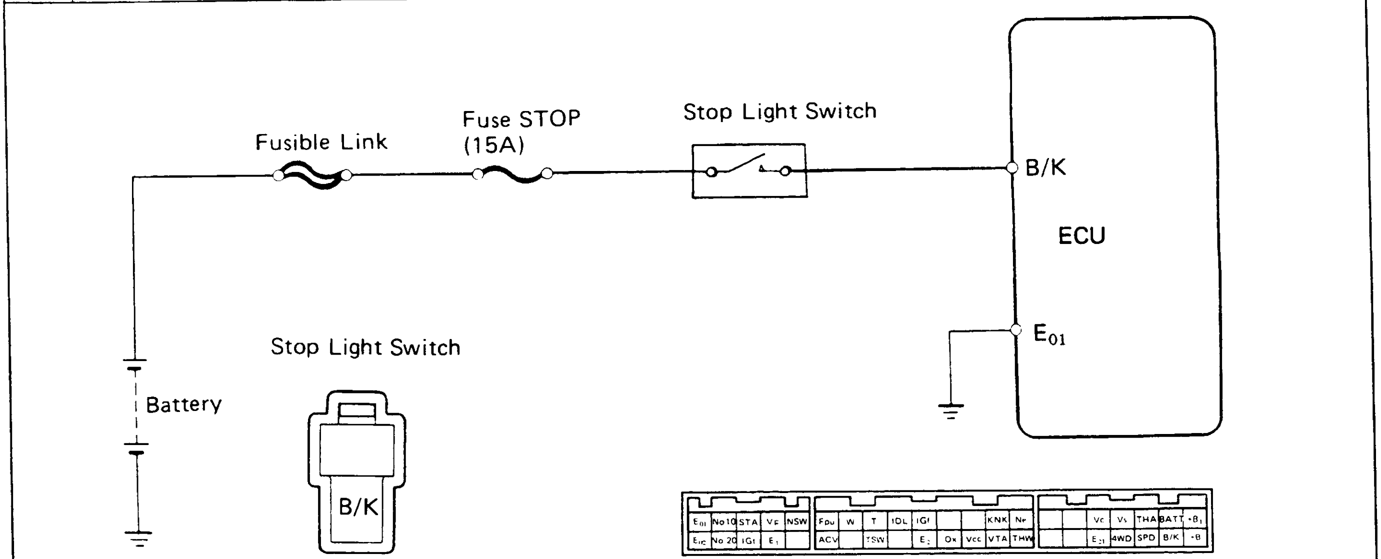
② Check that there is voltage between ECU terminal +B and body ground. **(IG S/W ON)**

- NO → Refer to section 1.
- OK ↓

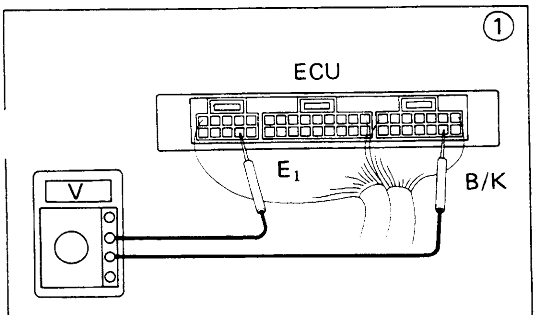
③ Check water thermo sensor.

- BAD → Replace water thermo sensor.
- OK → Check wiring between ECU and water thermo sensor.
  - OK → Try another ECU.
  - BAD → Repair or replace wiring

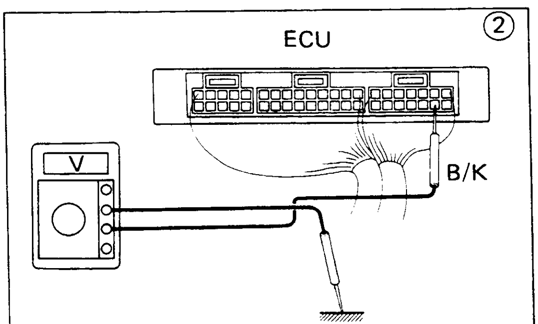
No.	Terminals	Trouble	Condition	STD Voltage
1	B/K — E_1	No voltage	Stop light switch ON	8 — 14 V



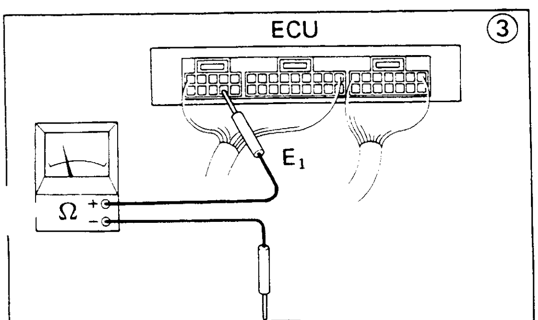
FI0605



FI0614



FI0615



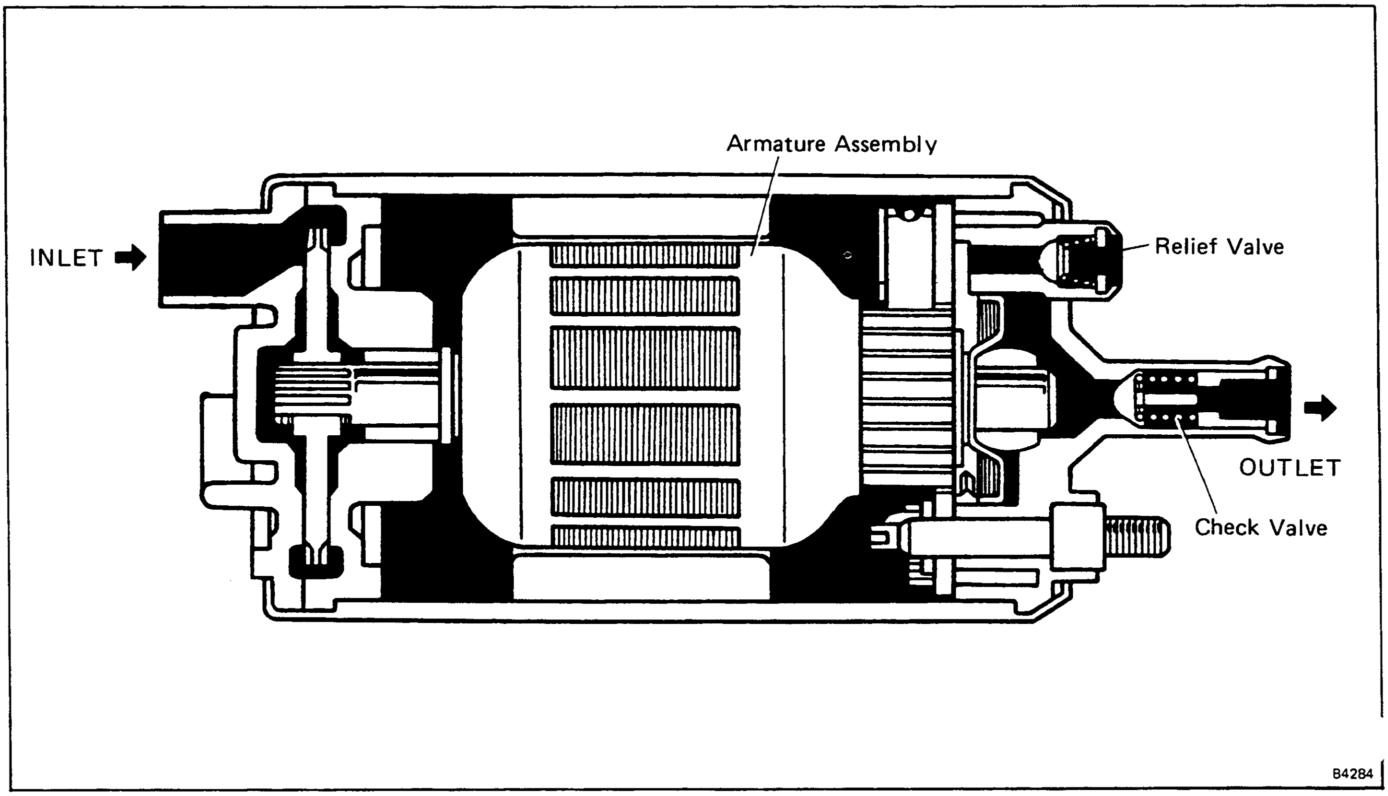
FI0552

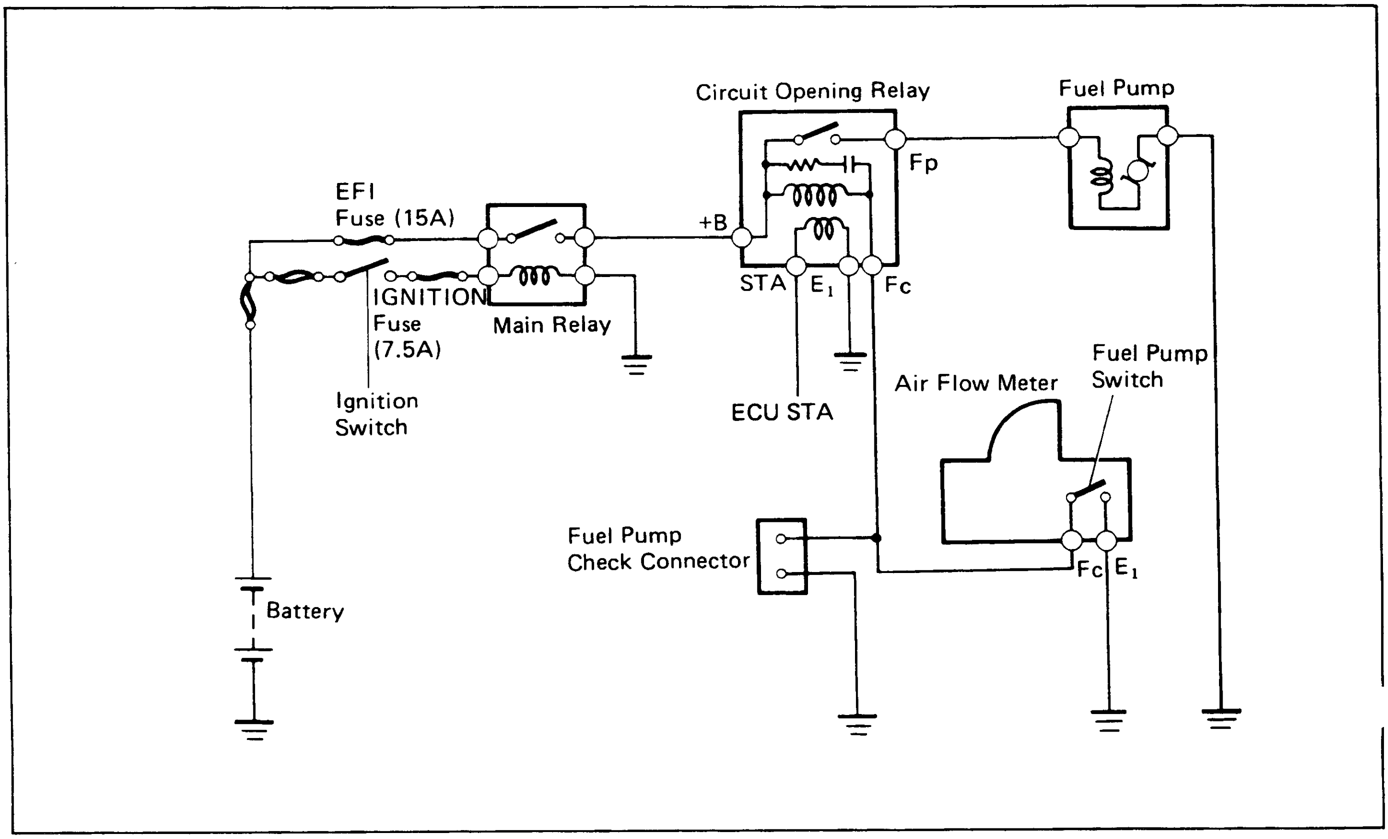
① No voltage between ECU terminals B/K and E_1.

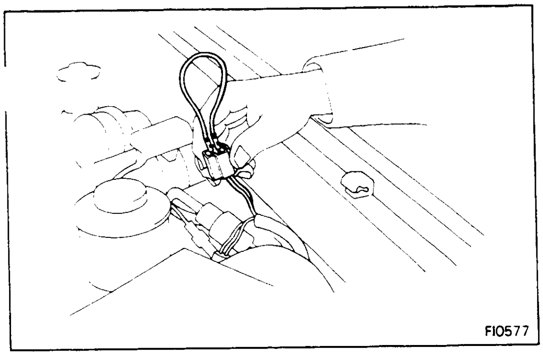
② Check that there is voltage between ECU terminal B/K and body ground when the brake pedal is depressed.

- OK → ③ Check wiring between ECU E_1 and body ground.
  - OK → Try another ECU.
  - BAD → Repair or replace
- NO → Check STOP fuse (15A) and stop light switch.
  - BAD → Repair or replace
  - OK → Check wiring between ECU terminal B/K and battery.
    - BAD → Repair or replace

FUEL SYSTEM
Fuel Pump







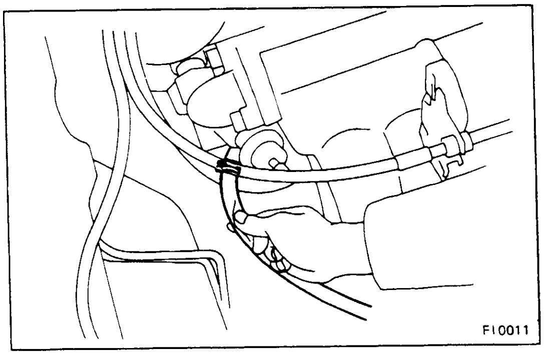
ON-VEHICLE INSPECTION

1. CHECK FUEL PUMP OPERATION

(a) Turn on the ignition switch.

NOTE: Do not start the engine.

(b) Short the terminals Fp and +B of the check connector (diagnosis).



(c) Check that there is a pressure in the hose to the cold start injector.

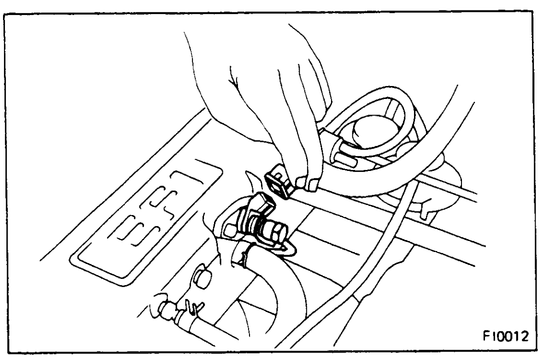
NOTE: At this time, you will hear fuel return noise from the pressure regulator.

(d) Remove service wire and install the rubber cap to the check connector.

(e) Turn off the ignition switch.

If there is no pressure, check the following parts.

- Fusible link
- Fuse (EFI 15A, IGN. 7.5A)
- Circuit opening relay
- Fuel pump
- Wiring connections



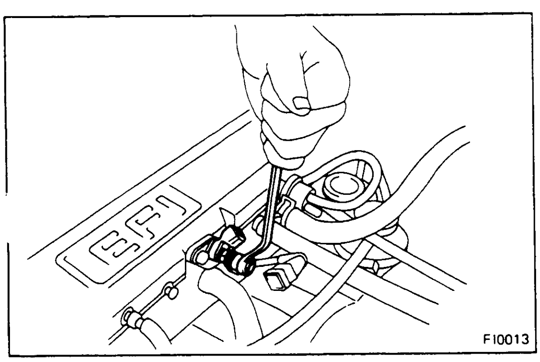
2. CHECK FUEL PRESSURE

(a) Check the battery voltage above 12 volts.

(b) Disonnect the cable from the negative terminal of the battery.

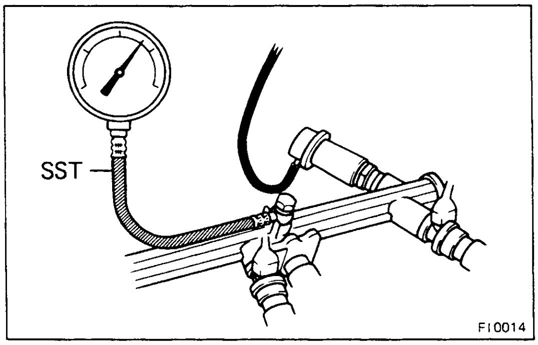
(c) Disconnect the wiring connector from the cold start injector.

(d) Put a suitable container or shop towel under rear end of the delivery pipe.



(e) Slowly loosen the union bolt of the cold start injector hose and remove the bolt and two gaskets from the delivery pipe.

(f) Drain the fuel from the delivery pipe.

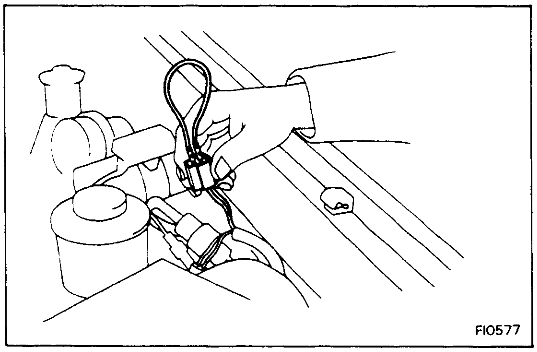


(g) Install a gasket, SST, another gasket and union bolt to the delivery pipe as shown in the figure.

SST 09268-45011

(h) Wipe off any splattered gasoline.

(i) Reconnect the battery cable.



(j) Short both terminals of the fuel pump check connector with a wire.

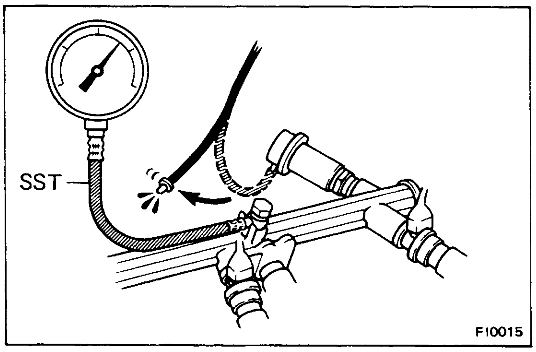
(k) Turn on the ignition switch.

(l) Measure the fuel pressure.

Fuel pressure: 2.3 – 2.7 kg/cm^2
(33 – 38 psi, 226 – 265 kPa)

If high pressure, replace the pressure regulator.
If low pressure, check the following parts.

- Fuel hoses and connection
- Fuel pump
- Fuel filter
- Pressure regulator



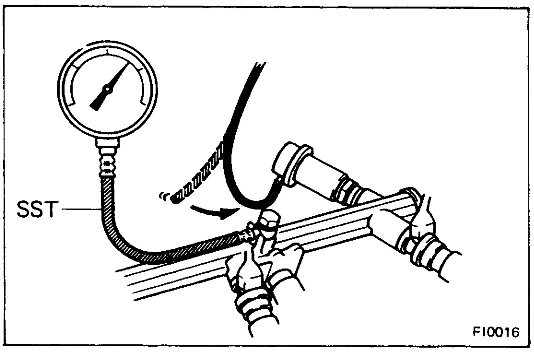
(m) Remove the service wire from the service connector

(n) Start the engine.

(o) Disconnect the vacuum sensing hose from the pressure regulator and plug it off.

(p) Measure the fuel pressure at idling.

Fuel pressure: 2.3 – 2.7 kg/cm^2
(33 – 38 psi, 226 – 265 kPa)



(q) Reconnect the vacuum sensing hose to the pressure regulator.

(r) Measure the fuel pressure at idling.

Fuel pressure: 1.9 – 2.2 kg/cm^2
(27 – 31 psi, 186 – 216 kPa)

If not pressure, check the vacuum sensing hose and pressure regulator.

(s) Stop the engine. Check that the fuel pressure remains above 1.5 kg/cm^2 (21 psi, 147 kPa) for 5 minutes after the engine is turned off.

If not within specification, check the fuel pump, pressure regulator and/or injectors.

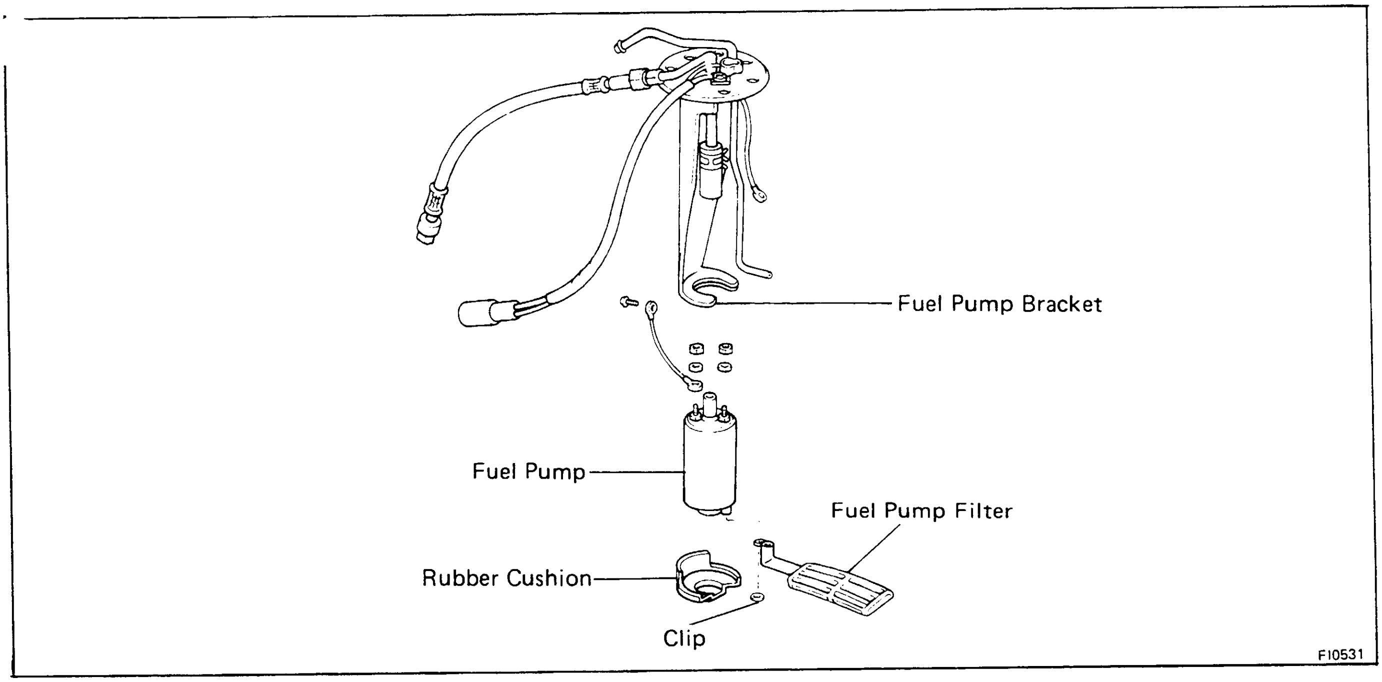
(t) After checking fuel pressure, disconnect the battery ground cable and carefully remove the SST to prevent gasoline from splashing.

(u) Using new gaskets, reconnect the cold start injector hose to the delivery pipe.

(v) Connect the wiring connector to the cold start injector.

(w) Check for fuel leakage.

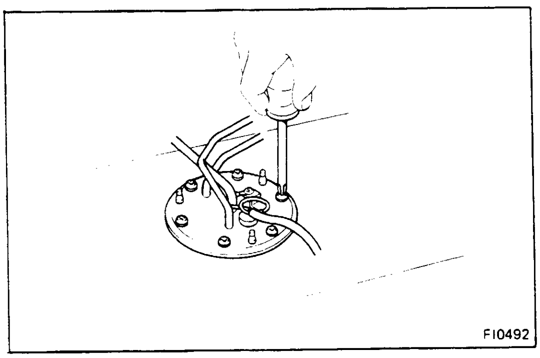
REMOVAL OF FUEL PUMP



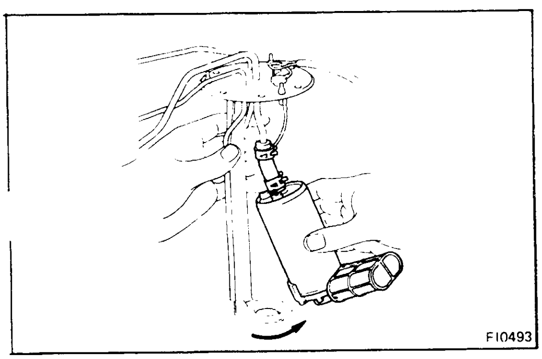
1. DRAIN FUEL FROM FUEL TANK

   WARNING: Avoid smoking and open flame when working on the fuel pump.

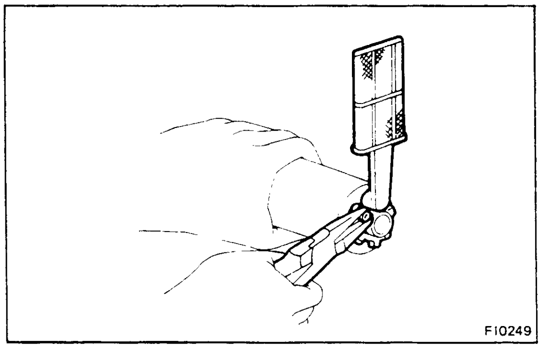
2. REMOVE FUEL TANK



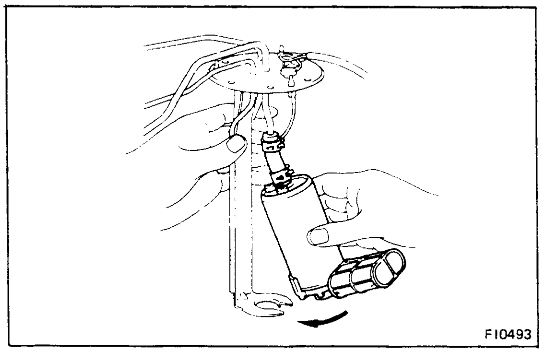
3. REMOVE FUEL PUMP BRACKET FROM FUEL TANK
   (a) Remove the seven bolts.
   (b) Pull out the fuel pump bracket.

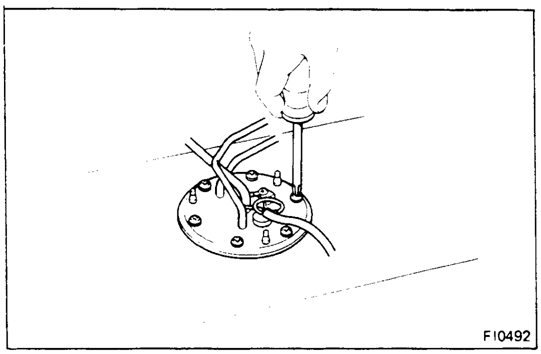


4. REMOVE FUEL PUMP FROM FUEL PUMP BRACKET
   (a) Remove the two nuts and disconnect the wires from the fuel pump.
   (b) Pull off the bracket from the lower side of the fuel pump.
   (c) Remove the fuel pump from the fuel hose.



5. REMOVE FUEL PUMP FILTER FROM FUEL PUMP
   (a) Remove the rubber cushion.
   (b) Remove the clip and pull out the filter.





INSTALLATION OF FUEL PUMP

(See page FI-45)

1. INSTALL FUEL PUMP FILTER TO FUEL PUMP

2. INSTALL FUEL PUMP TO FUEL PUMP BRACKET
   (a) Insert the outlet port of the fuel pump into the fuel hose.
   (b) Install the rubber cushion to the lower side of the fuel pump.
   (c) Push the lower side of the fuel pump, together with the rubber cushion, into the fuel pump bracket.

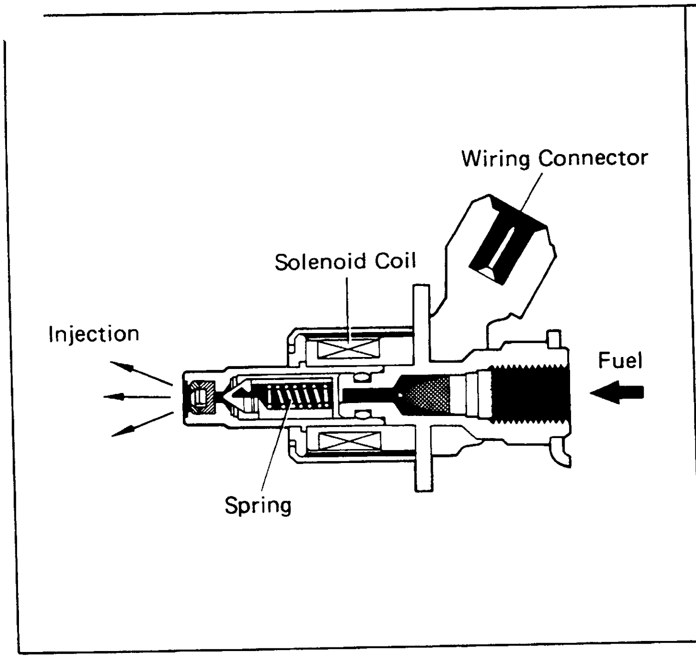
3. INSTALL FUEL PUMP BRACKET
   (a) Place the bracket with a new gasket on the fuel tank.
   (b) Install the tighten the seven bolts.

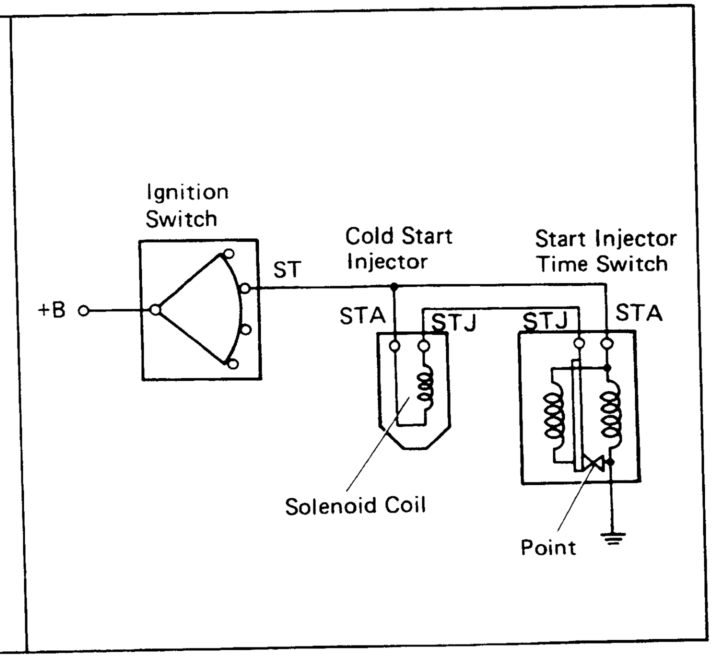
4. INSTALL FUEL TANK

   When installing the fuel tank, refer to FI-55 for the installation position of the protector and hose and the tightening torque.

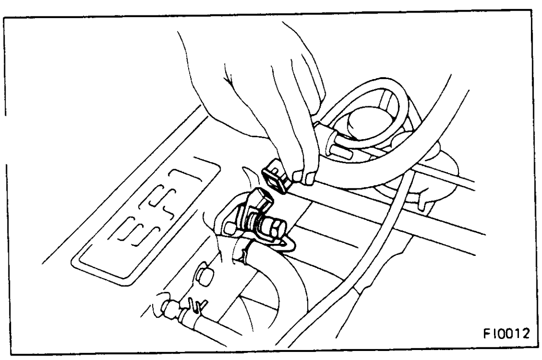
   After installation, check for leaks.

Cold Start Injector



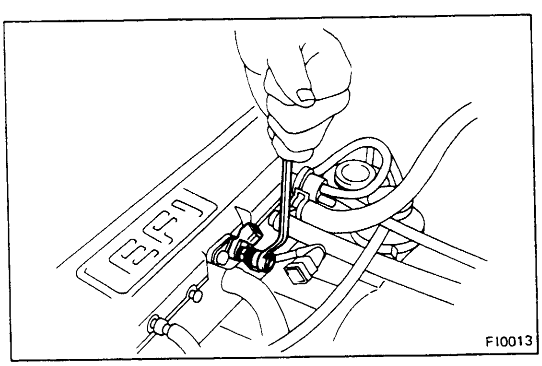


REMOVAL OF COLD START INJECTOR



REMOVE COLD START INJECTOR

(a) Disconnect the cold start injector wire.

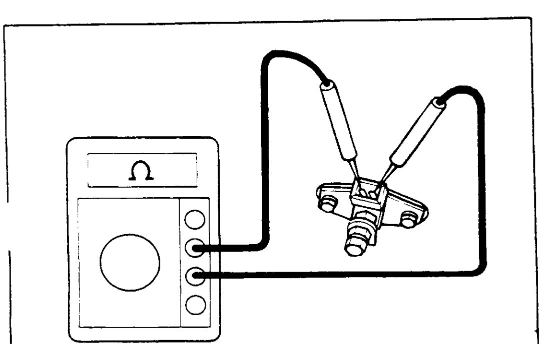


(b) Remove the fuel pipe between the cold start injector and fuel delivery pipe.

(c) Remove the cold start injector wire gasket.

(d) Put a suitable container or shop towel under rear end of the delivery pipe.

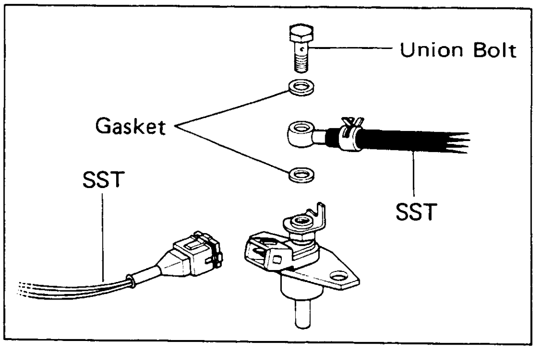
INSPECTION OF COLD START INJECTOR



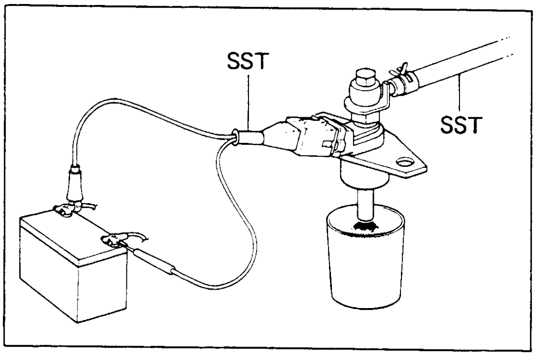
1. **MEASURE RESISTANCE OF COLD START INJECTOR**

Using an ohmmeter, check the resistance of the injector.

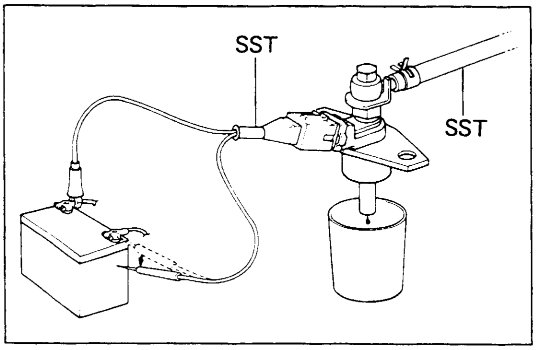
Resistance: 2 — 4 Ω



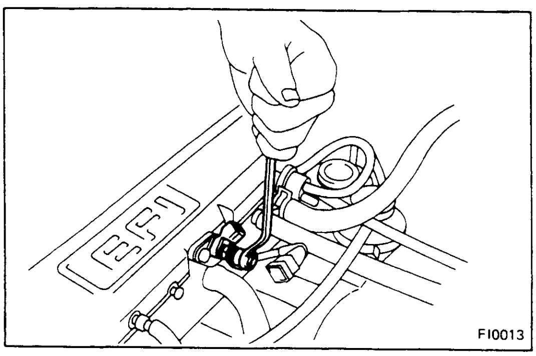
2. **CHECK INJECTION OF COLD START INJECTOR**
   (a) Install the gasket, SST (two unions), another gasket and two union bolts to the delivery pipe and injec
   (b) Connect the SST (hose) from the unions.
   SST 09268-41045
   (c) Connect the SST (wire) to the injector.
   SST 09842-30050
   NOTE: Position the injector as far away from the battery as possible.



   (d) Put a container under the injector.
   (e) Turn on the ignition switch.
   NOTE: Do not start the engine.
   (f) Short both terminals of the fuel pump check connector with a service wire.
   (g) Connect the test probes of the SST to the battery and check that the fuel spray is as shown.
   SST 09842-30050
   NOTE: Perform this check within the shortest possible time.



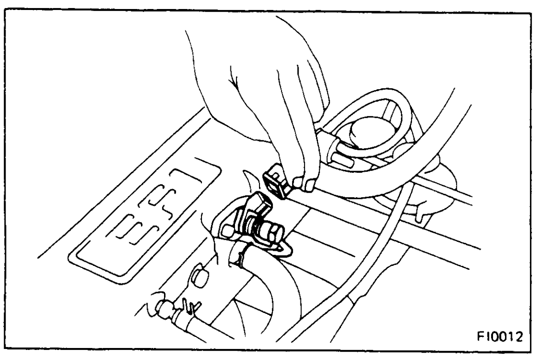
   (h) Disconnect the test probes from the battery and check that fuel does not leak from the injector.
   Fuel drop: Less than one drop of fuel per minute
   (i) After checking, restore the following to the previc state.
   - Fuel pump check connector
   - Ignition switch
   - SST
   - Cold Start injector
   - Injector wiring



INSTALLATION OF COLD START INJECTOR

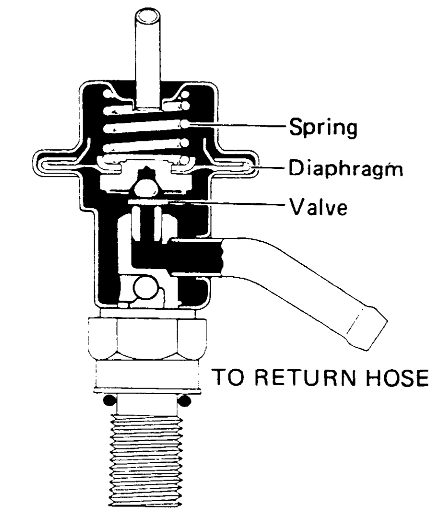
INSTALL COLD START INJECTOR

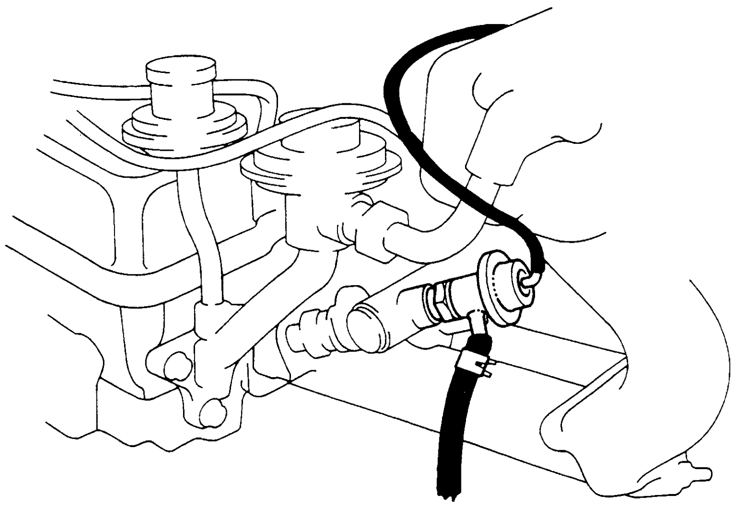
(a) Using new gaskets, install the cold start injector and two bolts.
(b) Install the fuel pipe between the cold start injector and fuel delivery pipe with new gaskets.



(c) Connect the cold start injector wire.

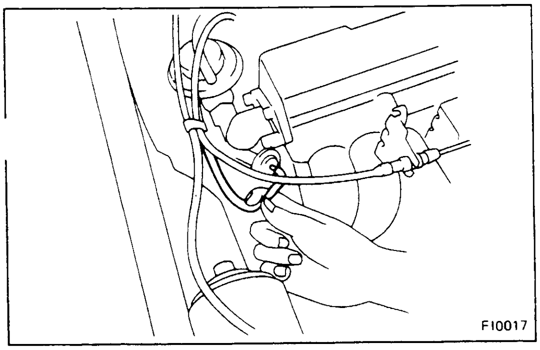
Pressure Regulator





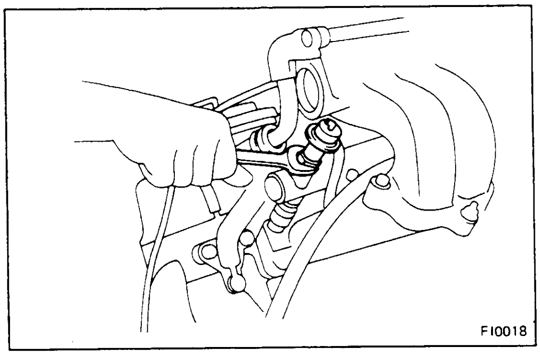
ON-VEHICLE INSPECTION

CHECK FUEL PRESSURE (See page FI-43)



REMOVAL OF PRESSURE REGULATOR

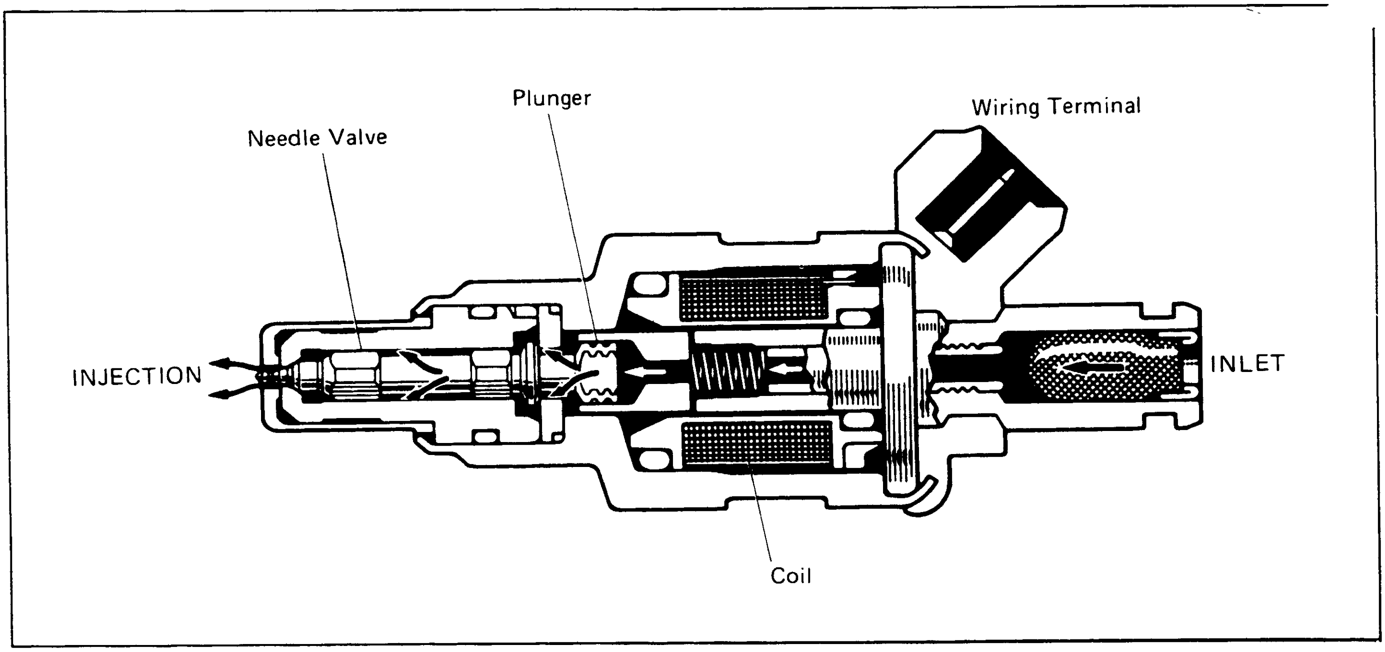
1. **DISCONNECT VACUUM SENSING HOSE**
2. **DISCONNECT FUEL HOSE**
   (a) Put a suitable container or shop towel under the pressure regulator.
   (b) Disconnect the fuel hose from the pressure regulator.
3. **REMOVE PRESSURE REGULATOR**
   Remove the lock nut, and remove pressure regulator.

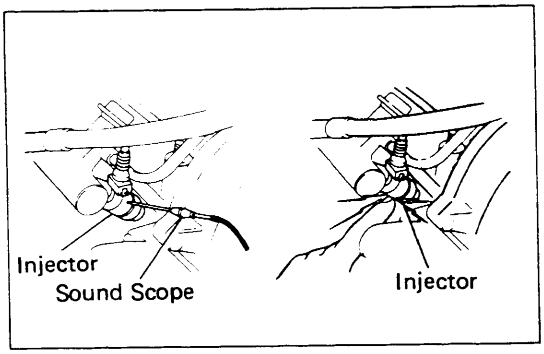


INSTALLATION OF PRESSURE REGULATOR

1. **INSTALL PRESSURE REGULATOR**
   Install the pressure regulator and lock nut.
   Torque the lock nut.
   Torque: 300 kg-cm (22 ft-lb, 29 N·m)
2. **CONNECT FUEL HOSE**
3. **CONNECT VACUUM SENSING HOSE**

Injector





ON-VEHICLE INSPECTION

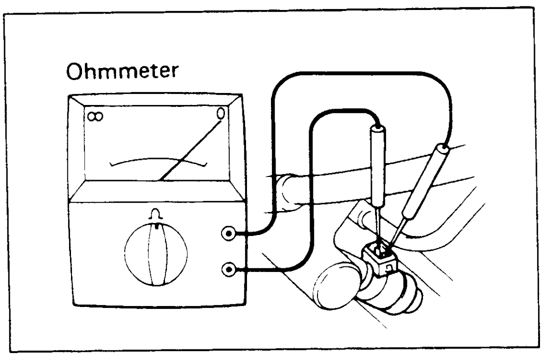
1. **CHECK INJECTOR OPERATION**

   Check for operating sound from each injector.

   (a) With the engine running or cranking, use a sound scope to check that there is normal operating noise in proportion to engine rpm.

   (b) If you have no sound scope, you can check the injector transmission operation with your finger.

   If no sound or an unusual sound is heard, check the wiring connector, injector, resistor or injection signal from ECU.

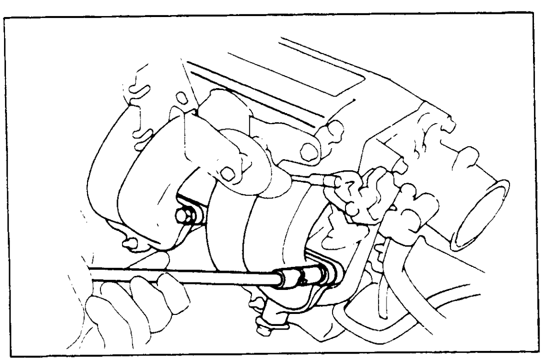


2. **MEASURE RESISTANCE OF INJECTOR**

   (a) Unplug the wiring connector from the injector.

   (b) Using an ohmmeter, check the continuity of both terminals.

   Resistance: 1.5 — 3.0 Ω

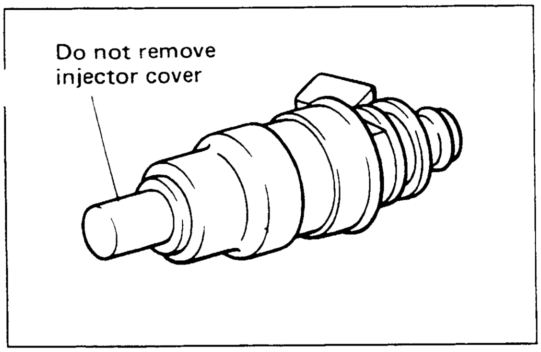


REMOVAL OF INJECTOR

1. **REMOVE CHAMBER WITH THROTTLE BODY**
   (See steps 8 to 12 on page EM-13)

2. **DISCONNECT WIRES**
   (See step 13 on page EM-13)

3. **DISCONNECT FUEL HOSE FROM DELIVERY PIPE**
   (See step 14 on page EM-13)



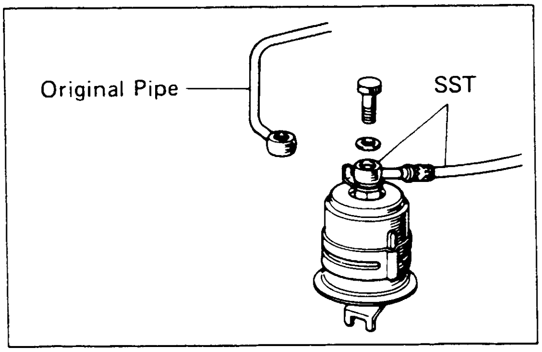
4. **REMOVE DELIVERY PIPE WITH INJECTORS**

Remove two bolts and then remove the delivery pipe with the injectors.

NOTE:

1. When removing the delivery pipe, be careful not to drop the injectors.
2. Do not remove the injector cover.

INSPECTION OF INJECTOR



1. **TEST INJECTION OF INJECTORS**

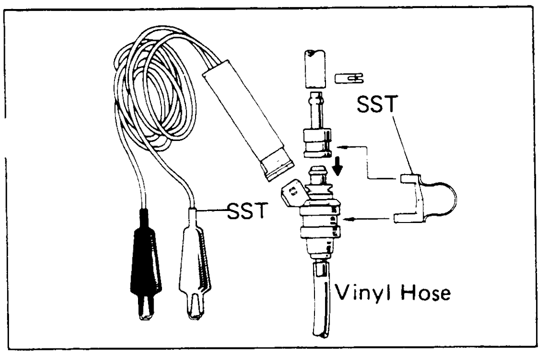
CAUTION: Keep clear of sparks during the test.

(a) Connect the SST to the fuel filter outlet.

SST 09268-41045

(b) Connect the SST to the pressure regulator and the injector.

SST 09268-41045



(c) Hold the injector and hose with SST.

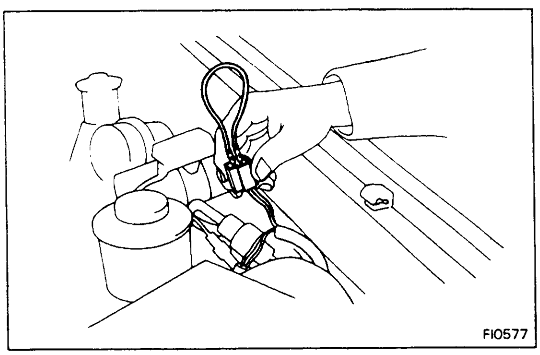
SST 09842-30020

(d) Put the injector into the graduated cylinder.

NOTE: Install a suitable vinyl hose onto the injector to prevent gasoline from splashing out.

(e) Connect the ground cable to the battery.

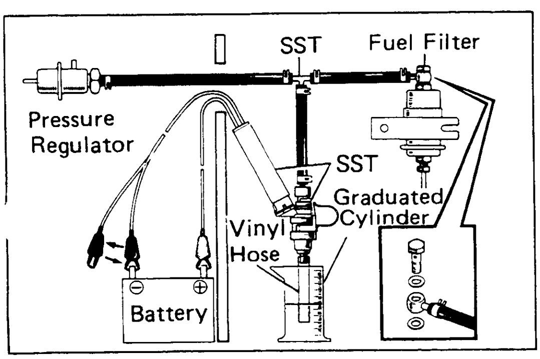
(f) Turn the ignition switch ON.



NOTE: Do not start the engine.

(g) Using a service wire, short both terminals of the fuel pump check connector.

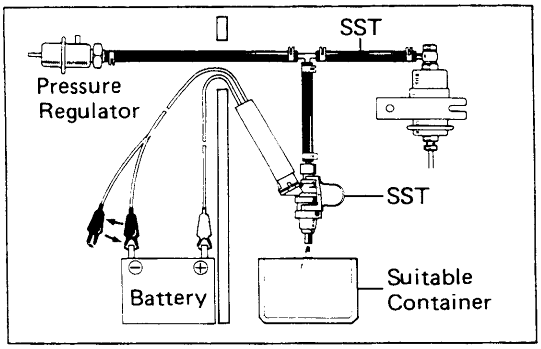
NOTE: Fuel pump will operate.



(h) Connect the SST to the battery for 15 seconds and measure the injection volume with a graduated cylinder.
Test each injector two or three times.If not within specified volume, clean or replace.

SST 09842-30020

Volume: 40 — 50 cc/15 sec. (2.4 — 3.1 cu in.)
Difference between each injector: Less than 6 cc (0.37 cu in.)



NOTE: If not within specified volume, clean or replace the injector.

(i) Remove the vinyl hose.

(j) Connect the SST to the battery, and test the injection spray pattern in a suitable container.

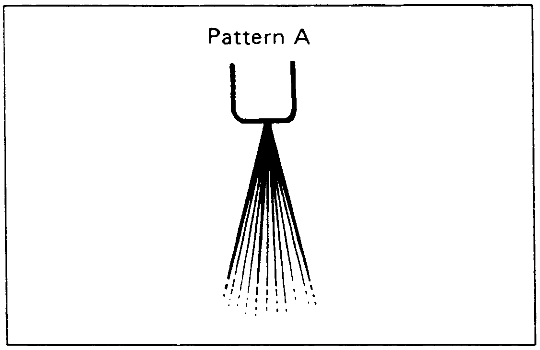
WARNING: Be careful to keep clear of sparks during the test.

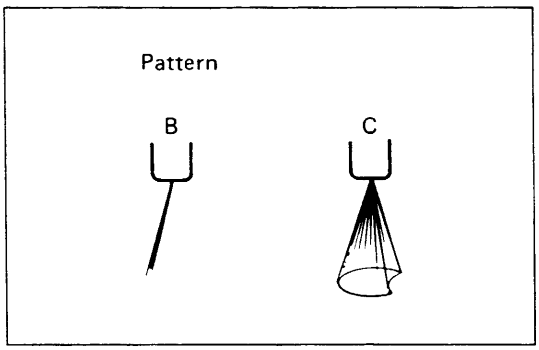
Proper injection spray pattern:

- A fine mist spreading out into a conical shape (pattern A).

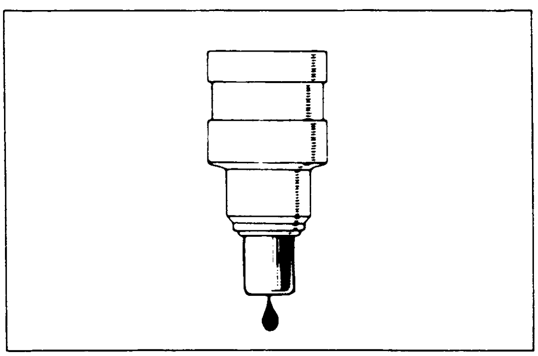
Faulty injection spray pattern:

- Injection is in 1 or more streams, not forming into a conical shape (pattern B).
- Imperfect conical shape (pattern C).





NOTE: If injection spray pattern is not within specification, clean or replace the injector.



2. **TEST LEAKAGE**

(a) From the previous condition, disconnect the SST from the battery and check the fuel leakage from the injection nozzle.

SST 09842-30020

Fuel drop: Less than one fuel drop of fuel per minute

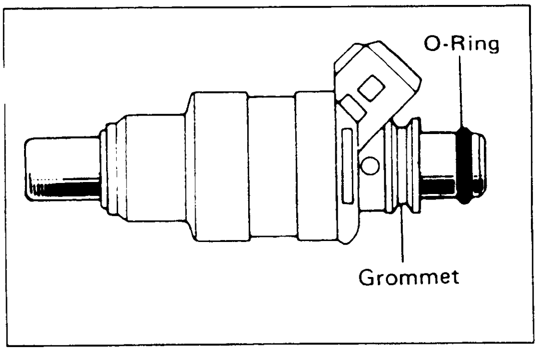
(b) Disconnect the battery ground cable.

Remove the SST and disconnect the service wire from the fuel pump service connector.

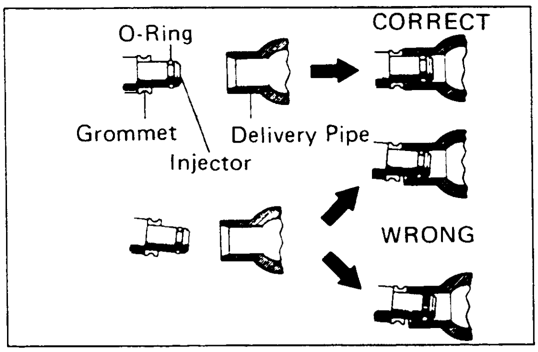
SST 09268-41045

INSTALLATION OF INJECTORS

1. INSTALL INJECTORS INTO DELIVERY PIPE

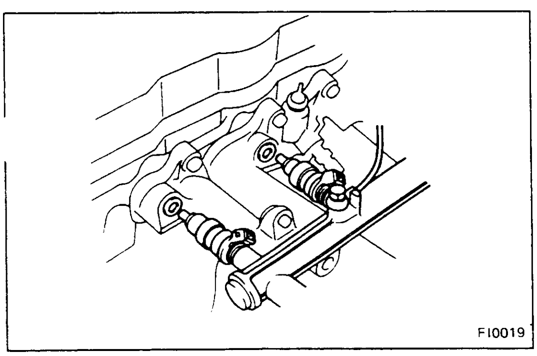


(a) Install the grommet and a new O-ring to the injector.



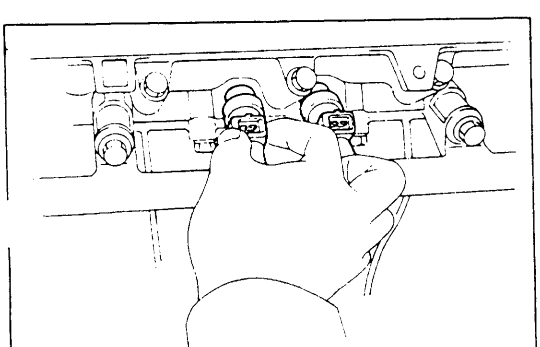
(b) Apply a thin coat of gasoline to the O-rings and install the injectors into the delivery pipe.

2. INSTALL DELIVERY PIPE WITH INJECTORS



(a) Install the four insulators into the injector hole of the intake manifold.

(b) Install the injectors together with the delivery pipe to the manifold.



(c) Make sure that the injectors rotate smoothly.

NOTE: If the injectors do not rotate smoothly, probable cause may be incorrect installation of O-rings. Replace O-rings again after removing the injectors.

(d) Install and torque the bolts.

Torque: 195 kg-cm (14 ft-lb, 19 N·m)

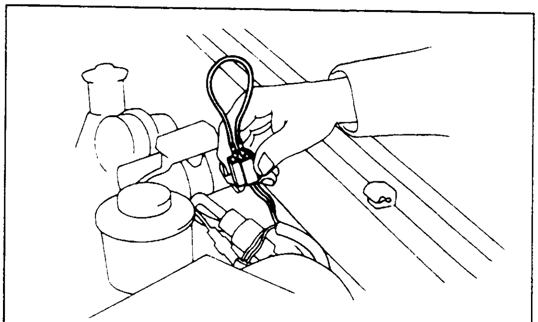
3. CONNECT FUEL HOSE TO DELIVERY PIPE

(See step 5 on page EM-30)

4. **CONNECT WIRES**
   (See step 5 on page EM-30)

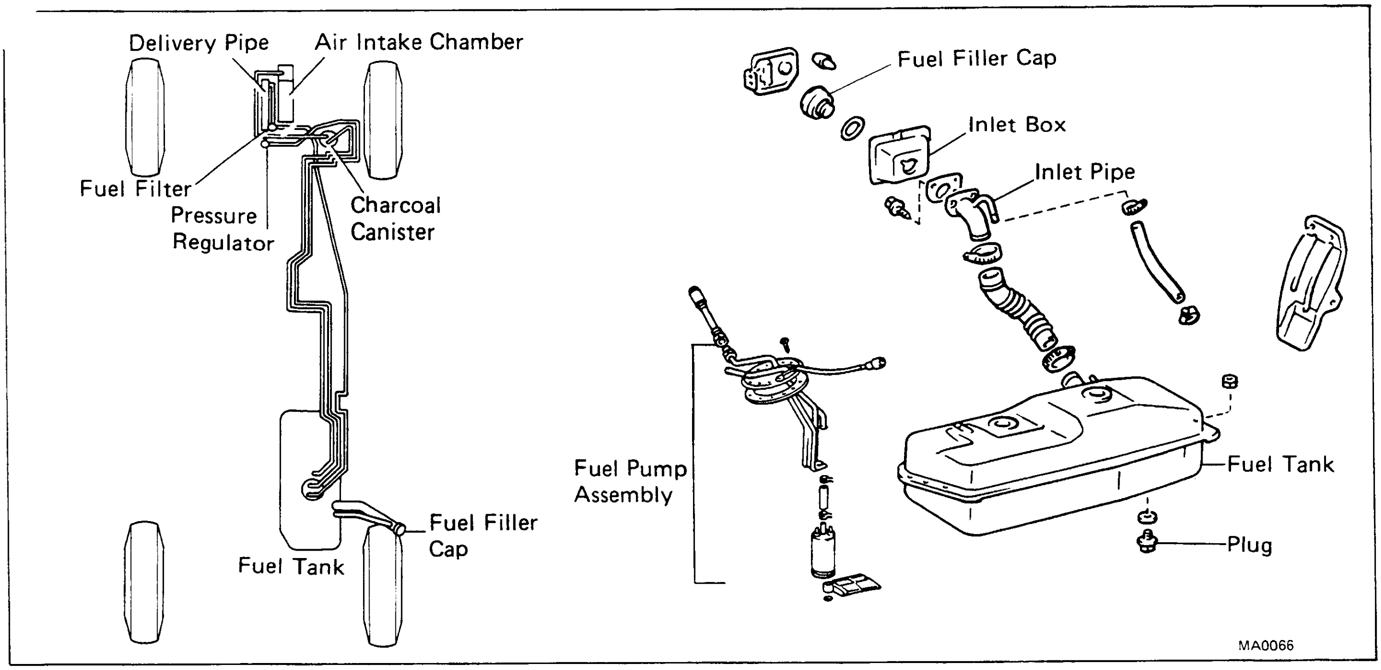
5. **INSTALL CHAMBER WITH THROTTLE BODY**
   (See step 7 on page EM-30)

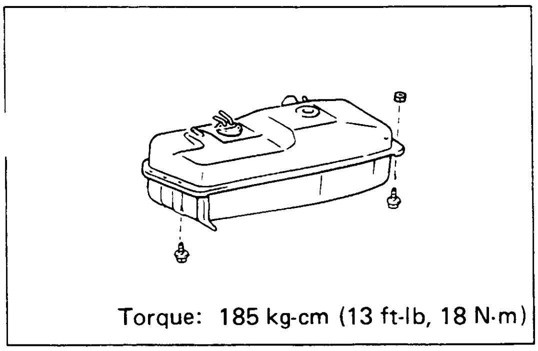
6. **CONNECT CABLES TO BRACKET**
   (See step 11 on page EM-31)


FI0577

7. **CHECK FOR FUEL LEAKAGE**
   (a) With the ignition switch ON, use a service wire to short both terminals of the fuel pump check connector.
   (b) Check for fuel leakage.
   (c) Remove the service wire from the fuel pump check connector.

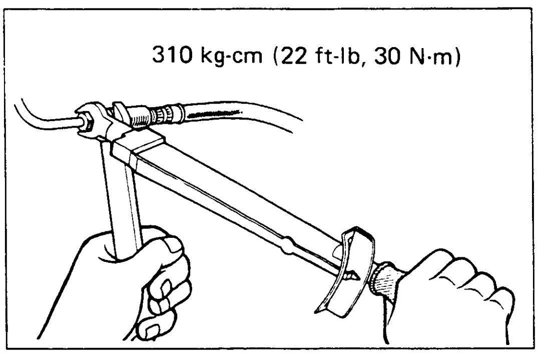
Fuel Tank and Line





PRECAUTIONS

1. **Always use new gaskets when replacing the fuel tank or component parts.**
2. **Apply the proper torque to all tightening parts.**



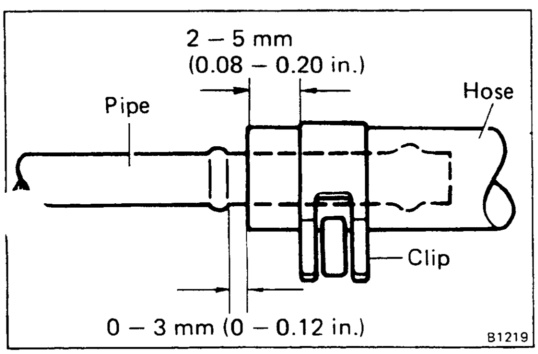
INSPECT FUEL LINES AND CONNECTIONS

(a) Inspect the fuel lines for cracks, or leakage and connections for deformation.

(b) Inspect the fuel tank vapor vent system hoses and connections for looseness, sharp bends or damage.

(c) Inspect the fuel tank for deformation, cracks, fuel leakage or tank band looseness.

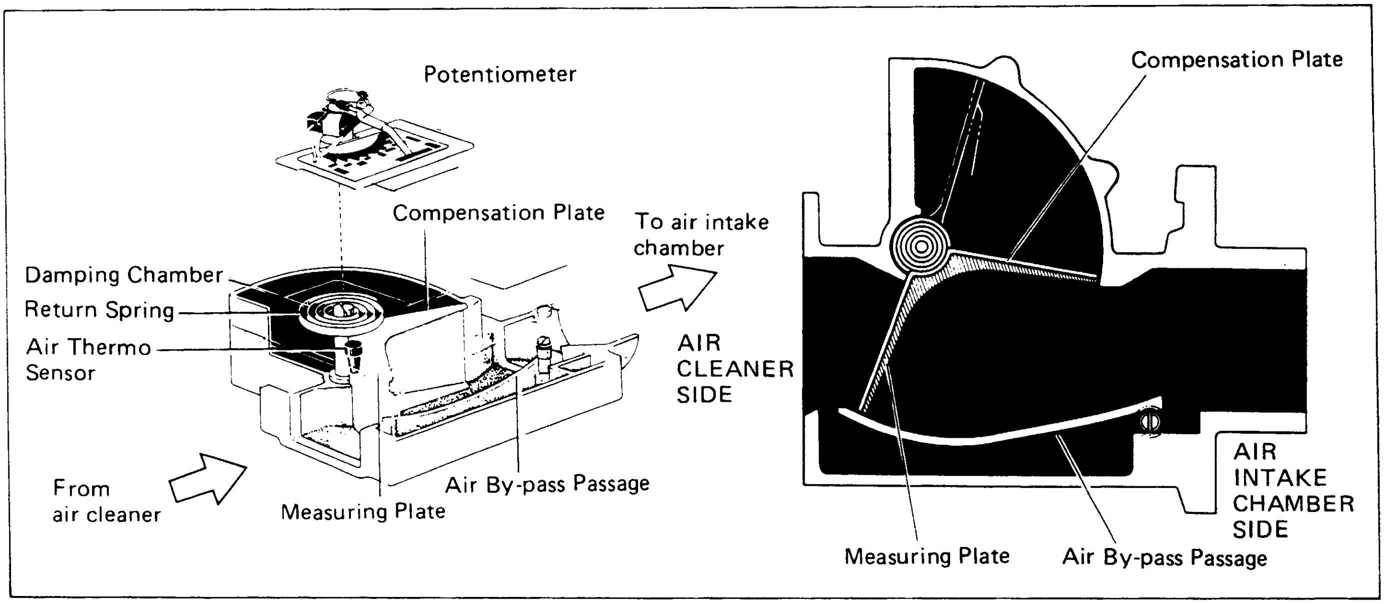
(d) Inspect the pipe for damage or fuel leakage.

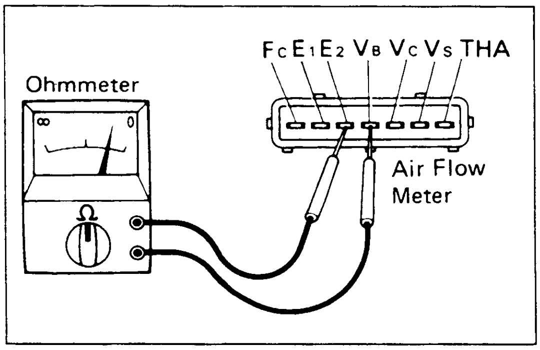


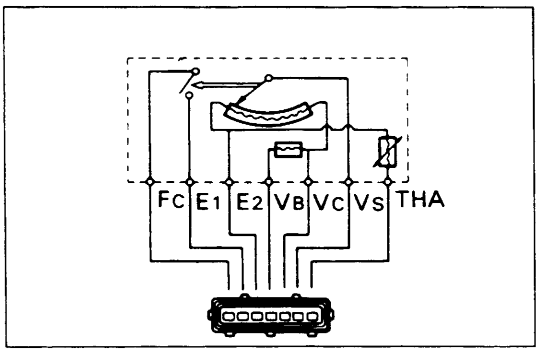
(e) The hose and tube connections are as shown in the illustration.

If a problem is found, repair or replace the parts as necessary.

AIR INTAKE SYSTEM
Air Flow Meter







ON-VEHICLE INSPECTION

MEASURE RESISTANCE OF AIR FLOW METER

(a) Unplug the wiring connector from the air flow met

(b) Using an ohmmeter, measure the resistance between each terminal.

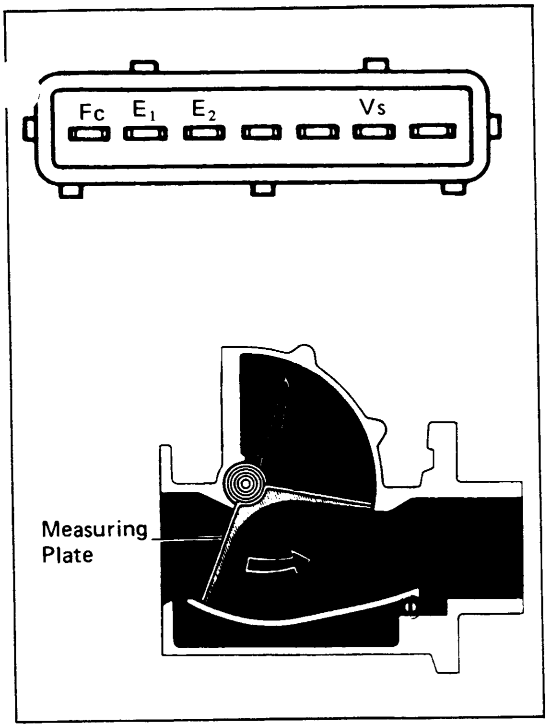
Between terminals	Resistance	Temperature
E_2 — V_S	20 — 400 Ω	—
E_2 — V_C	100 — 300 Ω	—
E_2 — V_B	200 — 400 Ω	—
E_2 — THA	10 — 20 KΩ 4 — 7 KΩ 2 — 3 KΩ 0.9 — 1.3 KΩ 0.4 — 0.7 KΩ	−20°C (−4°F) 0°C (32°F) 20°C (68°F) 40°C (104°F) 60°C (140°F)
E_1 — F_C	Infinity	—

If not within specification, replace the air flow meter.

REMOVAL OF AIR FLOW METER

1. **DISCONNECT AIR HOSES**
2. **DISCONNECT AIR FLOW METER CONNECTOR**
3. **REMOVE AIR FLOW METER**

Remove the bolt and three nuts.



INSPECTION OF AIR FLOW METER

MEASURE RESISTANCE OF AIR FLOW METER

Move the measuring plate and, using ohmmeter, measure the resistance between each terminal.

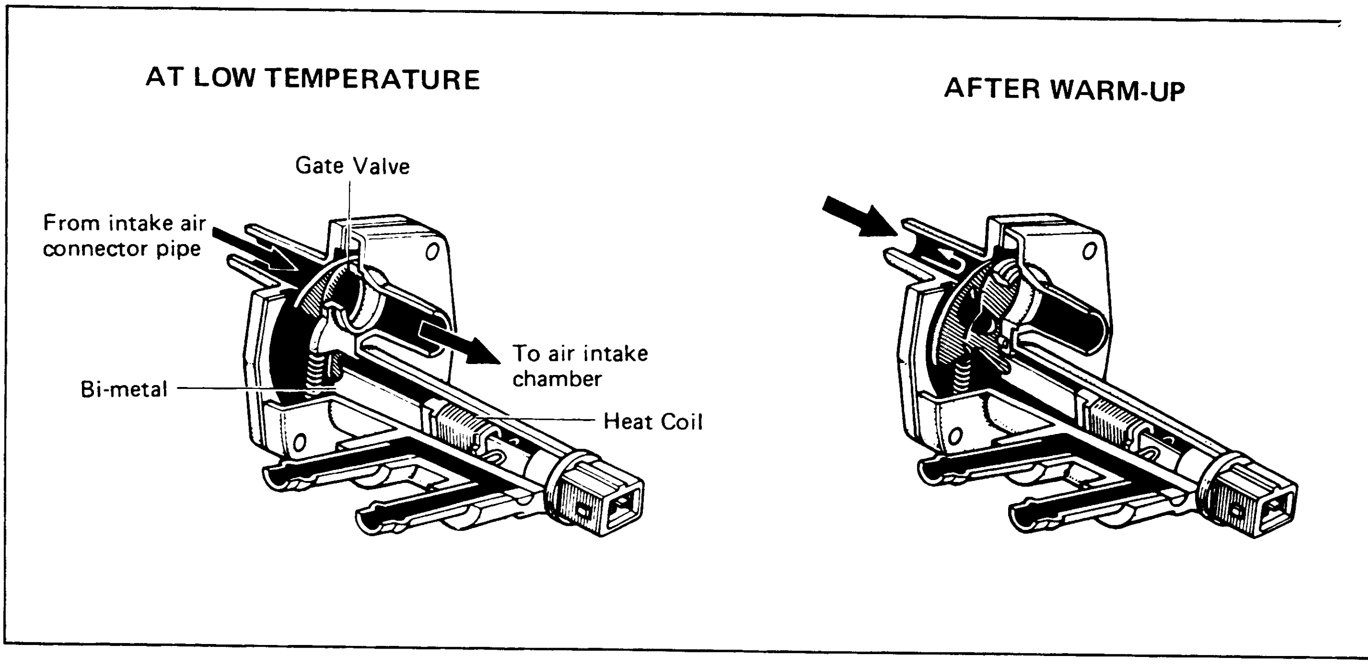
Between terminals	Resistance (Ω)	Measuring plate opening
E_1 — Fc	Infinity	Fully closed
	Zero	Other than closed position
E_2 — V_s	20 — 400	Fully closed
	20 — 1,000	Fully closed to fully open position

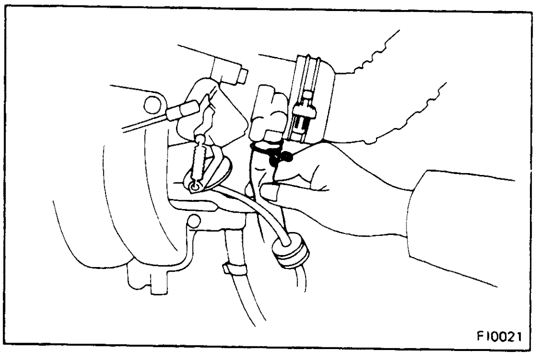
NOTE: Resistance between E_2 and V_s will change in accordance with the measuring plate opening.

INSTALLATION OF AIR FLOW METER

1. **INSTALL AIR FLOW METER**
   Install the three nuts and a bolt.
2. **CONNECT AIR FLOW METER CONNECTOR**
3. **INSTALL AIR HOSE**

Air Valve





ON-VEHICLE CHECK

1. **CHECK OPERATION OF AIR VALVE**

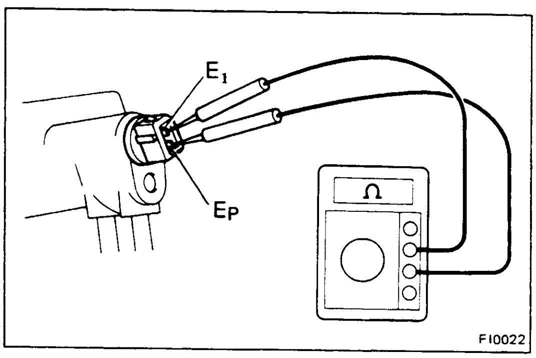
   Check the engine RPM by pinching shut the air hose.

   At Low Temp. (Coolant Temp. : below 60°C or 140°F)

   - When the hose is pinched, the engine RPM should drop.

   After warm-up

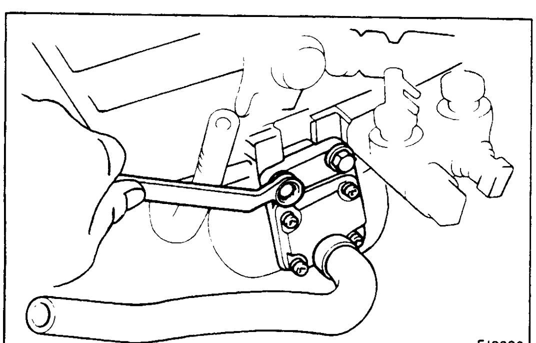
   - When the hose is pinched, check that the engine RPM does not drop more than 50 RPM.



2. **MEASURE RESISTANCE OF AIR VALVE**

   Using an ohmmeter, measure the heat coil resistance of the air valve.

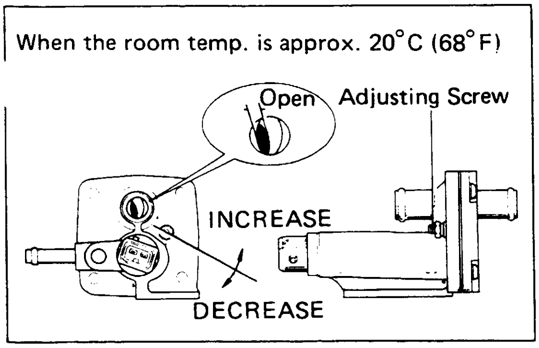
   Resistance (E_P–E_1): 39–59 Ω



REMOVAL OF AIR VALVE

1. **DISCONNECT TWO AIR VALVE HOSES**
2. **DISCONNECT AIR VALVE CONNECTOR**
3. **DISCONNECT WATER BY-PASS HOSE**
4. **REMOVE AIR VALVE**

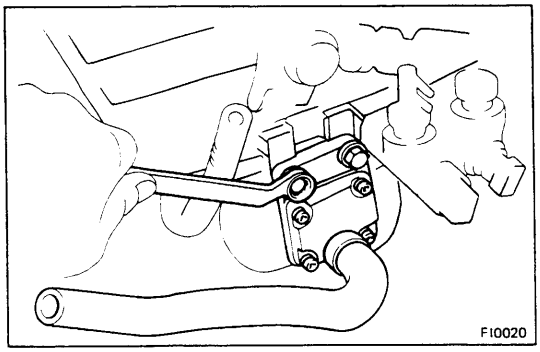
   Remove the two bolts and the air valve and gasket.



INSPECTION OF AIR VALVE

CHECK OPENING CONDITION OF AIR VALVE

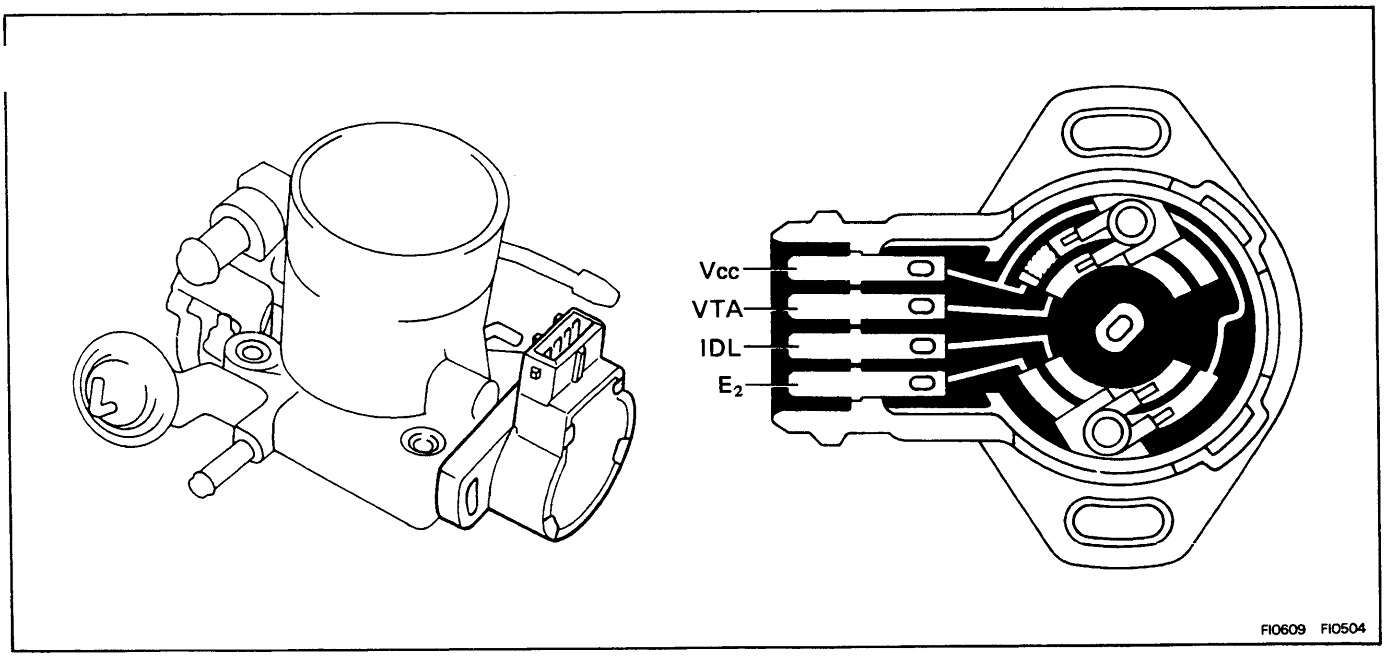
Check that the valve opens slightly, as illustrated, when room temp. is about 20°C (68°F).

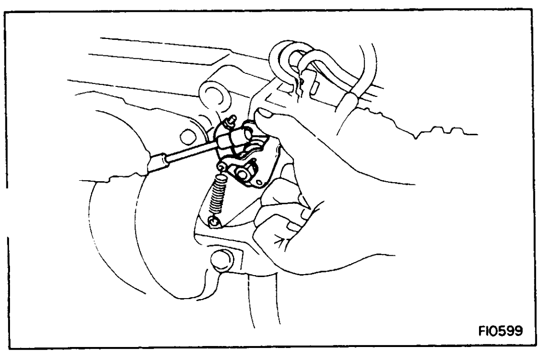


INSTALLATION OF AIR VALVE

1. **INSTALL AIR VALVE**
   Use a new gasket and install the air valve and two bolts.
2. **CONNECT WATER BY-PASS HOSE**
3. **CONNECT AIR VALVE CONNECTOR**
4. **CONNECT TWO AIR VALVE HOSES**

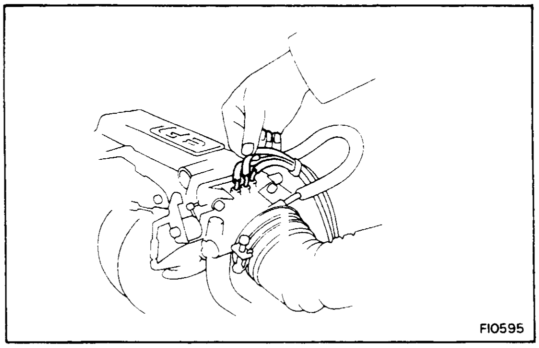
Throttle Body





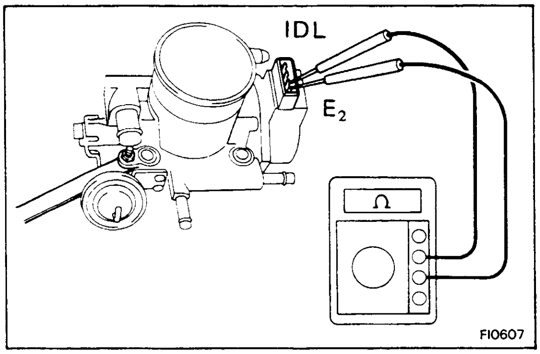
ON-VEHICLE CHECK

1. **CHECK THROTTLE BODY**
   (a) Check that the throttle linkage moves smoothly.



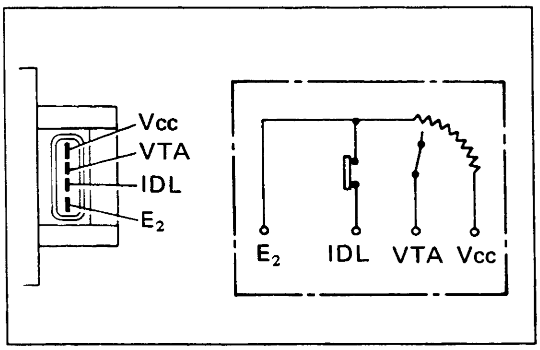
(b) Check the vacuum at each port.
- Start the engine.
- Check the vacuum with your finger.

Port No.	At idling	At 3,000 rpm
E	No vacuum	Vacuum
R	No vacuum	Vacuum
P	No vacuum	Vacuum



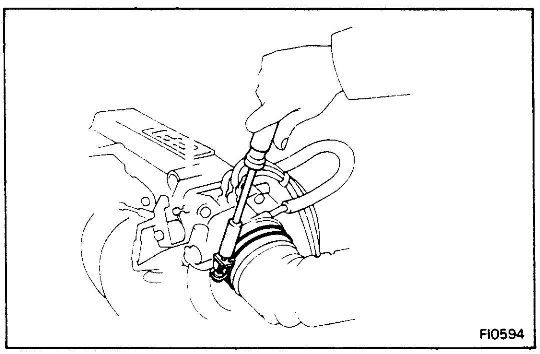
2. CHECK THROTTLE POSITION SENSOR

Check the resistance between the terminals.
- Unplug the connector from the sensor.
- Insert a thickness gauge between the throttle stop screw and stop lever.
- Using an ohmmeter, check the resistance between each terminal.



Clearance between lever and stop screw	Between terminals	Resistance
0 mm (0 in.)	VTA – E_2	0.2 – 0.8 kΩ
0.57 mm (0.0224 in.)	IDL – E_2	Less than 2.3 kΩ
0.85 mm (0.0335 in.)	IDL – E_2	Infinity
Throttle valve fully opened position	VTA – E_2	3.3 – 10 kΩ
–	Vcc – E_2	3 – 7 kΩ

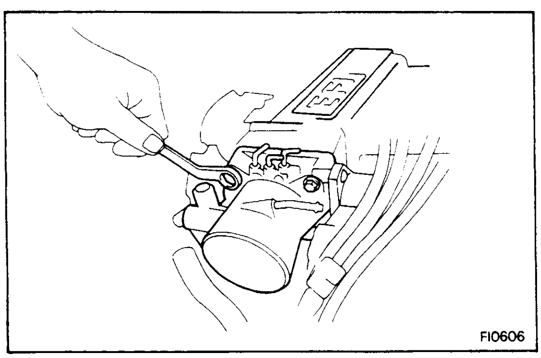
REMOVAL OF THROTTLE BODY



1. REMOVE AIR INTAKE CONNECTOR

2. DISCONNECT FOLLOWING HOSES:

(a) No. 1 and No. 2 water by-pass hoses
(b) PCV hose from the throttle body
(c) Label and disconnect the emission control hoses.

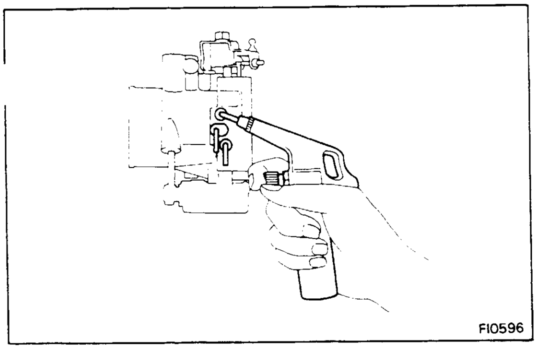


3. DISCONNECT THROTTLE SENSOR CONNECTOR

4. REMOVE THROTTLE BODY

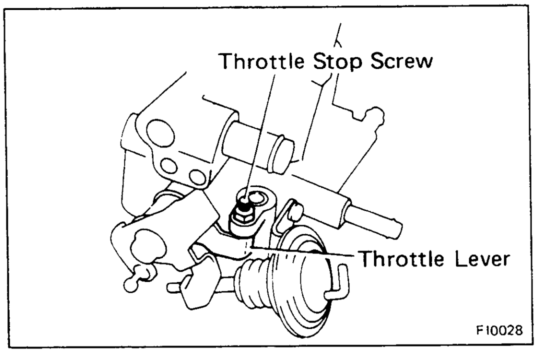
Remove the four bolts and remove the throttle body and gasket.

INSPECTION OF THROTTLE BODY

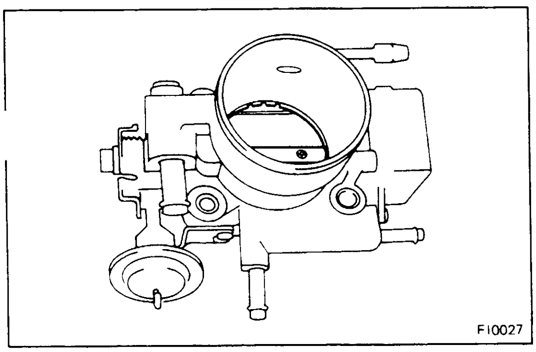


1. **CLEAN THROTTLE BODY BEFORE INSPECTION**
   (a) Wash and clean the cast parts with a soft brush in carburetor cleaner.
   (b) Using compressed air, blow all passages and apertures in the throttle body.

   CAUTION: To prevent deterioration, do not clean the throttle position sensor.

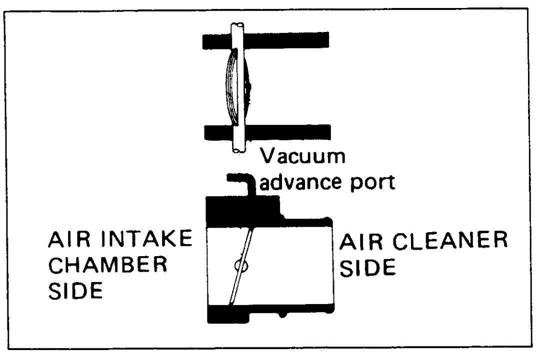


2. **CHECK THROTTLE VALVE**
   (a) Check that there is no clearance between the throttle stop screw and throttle lever when the throttle valve is fully closed.

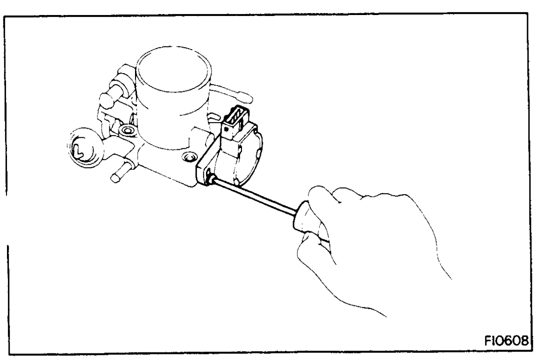


   (b) When the throttle valve is fully closed, check that advancer port is located on the air cleaner side as shown in the figure.
   If not, adjust the throttle valve closing angle.

   NOTE: Do not adjust the throttle valve closing angle if unnecessary.

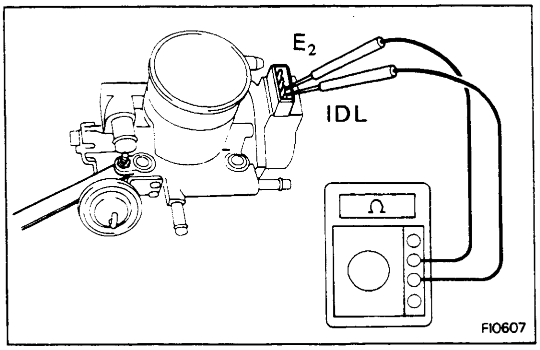


3. **IF NECESSARY, ADJUST THROTTLE STOP SCREW**
   (a) After loosening the lock nut of the throttle stop screw, loosen the stop screw until it is about to touch at the lever.
   (b) Have the throttle stopper screw touch the lever. Then screw it in 1/4 turns and lock it with the lock nut.
   (c) After installation of the throttle body, make sure that engine rpm.



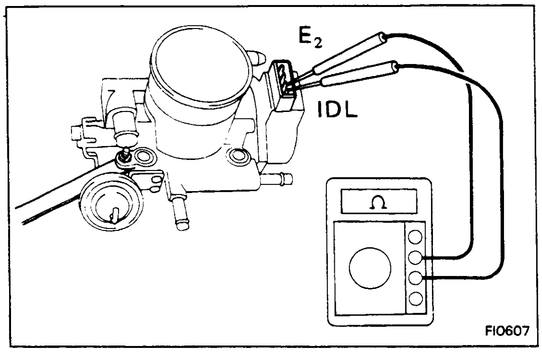
4. **CHECK THROTTLE POSITION SENSOR**
   (See step 2 on page FI-59)

5. **IF NECESSARY, ADJUST THROTTLE POSITION SENSOR**
   (a) Loosen the two screws of the sensor.



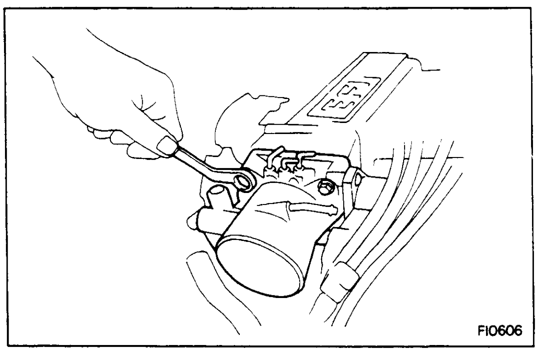
(b) Insert a thickness gauge (0.47 mm or 0.0185 in.) between the throttle stop screw and lever, and connect the ohmmeter to terminals IDL and E_2.

Gradually turn the sensor clockwise until the ohmmeter deflects, and secure the sensor with two screws.



(c) Using a thickness gauge, recheck the continuity between terminals IDL and E_2.

Clearance between lever and stop screw	Continuity (IDL – E_2)
0.57 mm (0.0224 in.)	Continuity
0.85 mm (0.0335 in.)	No continuity



INSTALLATION OF THROTTLE BODY

1. INSTALL THROTTLE BODY

Using new gaskets, install the throttle body and four bolts

2. CONNECT THROTTLE SENSOR CONNECTOR

3. CONNECT FOLLOWING HOSES:

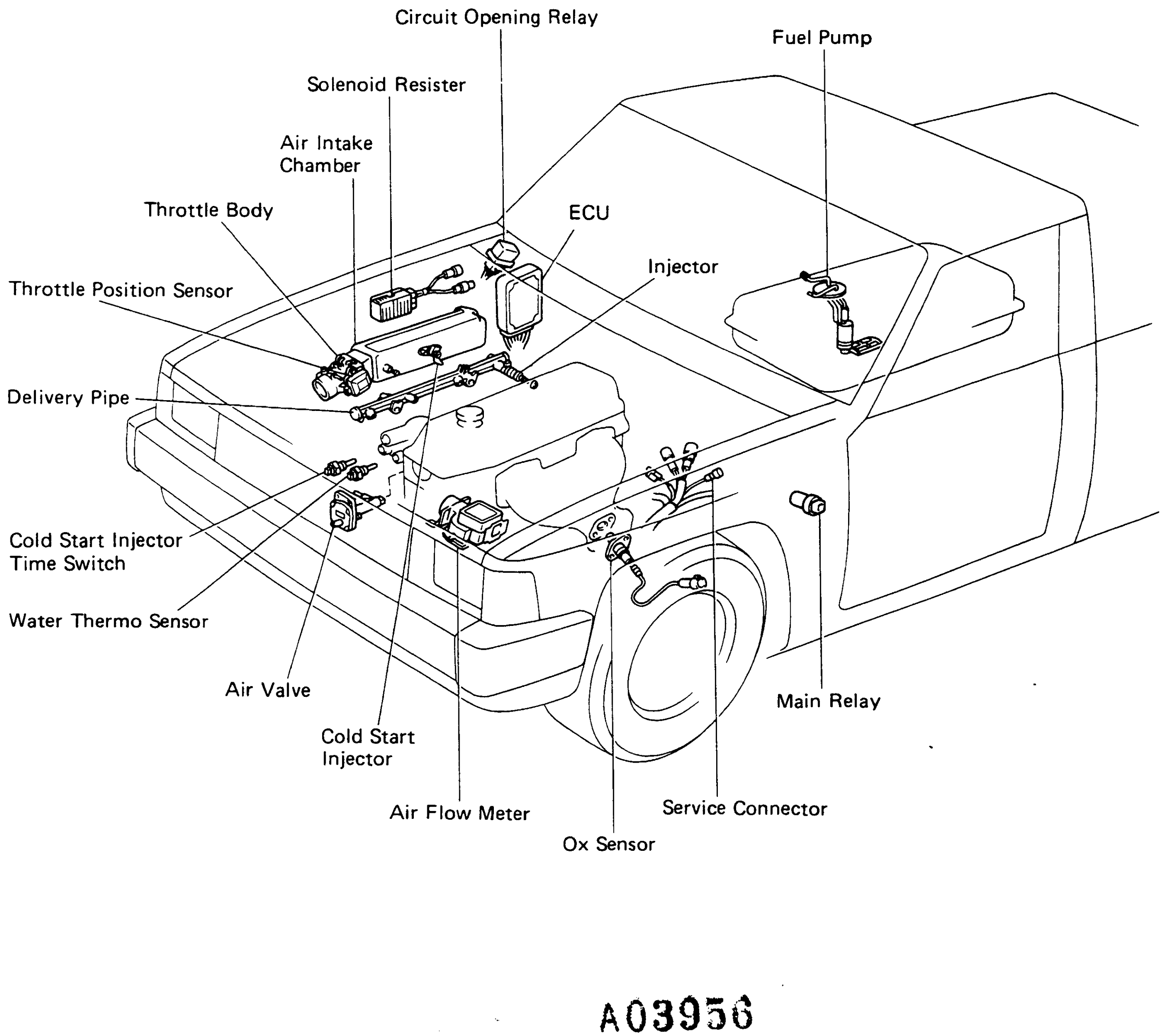
(a) Emission control hoses

(b) PCV hose to throttle body

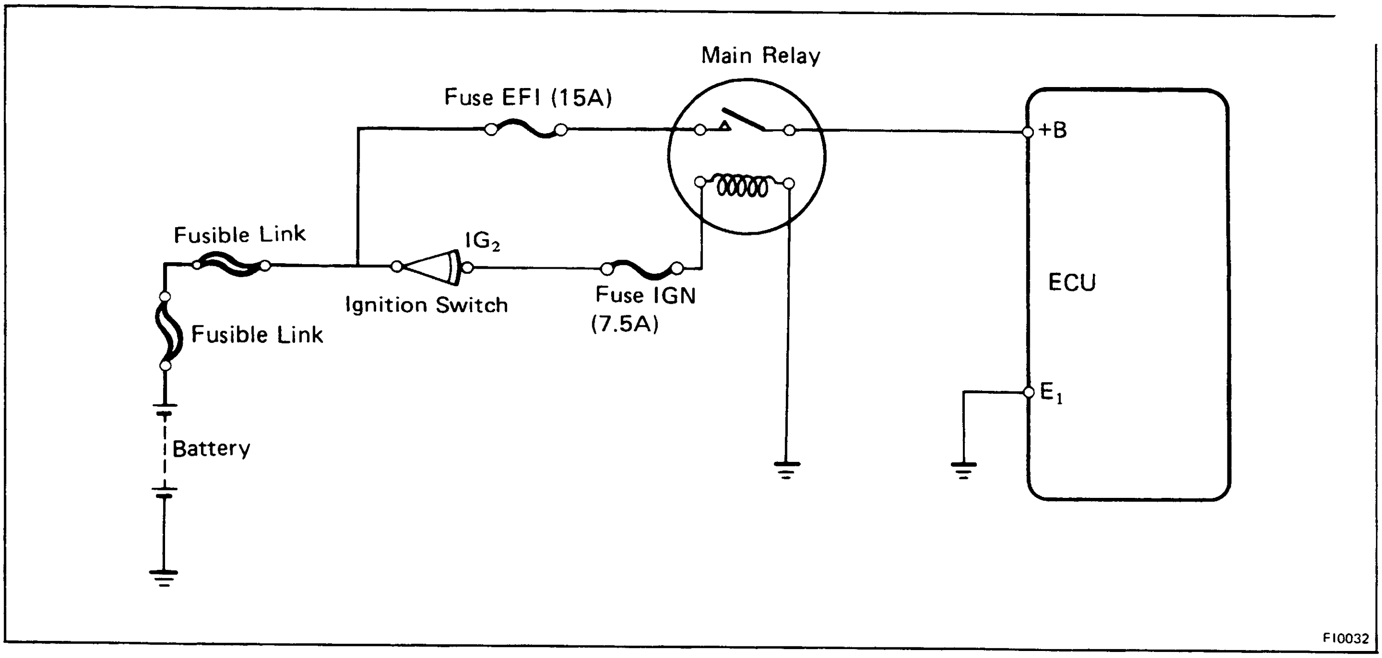
(c) No. 1 and No. 2 water by-pass hoses.

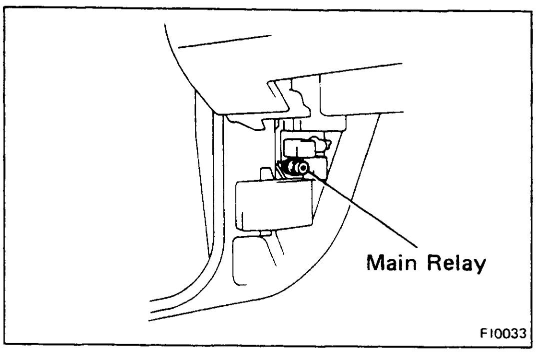
4. INSTALL AIR INTAKE CONNECTOR

ELECTRONIC CONTROL SYSTEM
Location of Electronic Control Parts



Main Relay



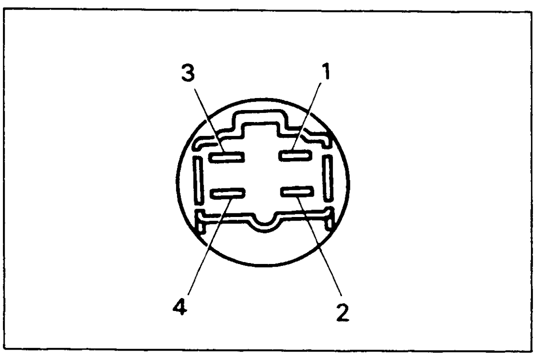


INSPECTION OF MAIN RELAY

1. CHECK MAIN RELAY OPERATION

(a) Turn on the ignition switch.

(b) At this time an operation noise will occur from the relay.



2. MEASURE RESISTANCE OF MAIN RELAYS

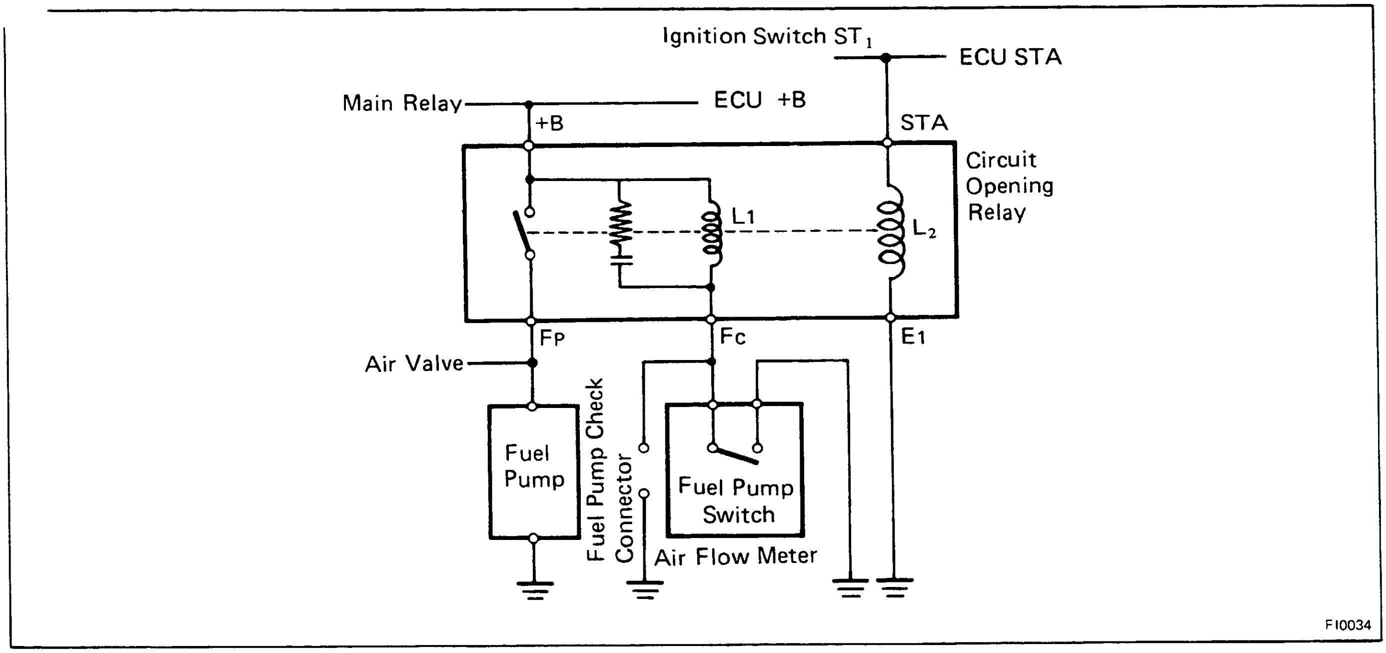
(a) Remove the main relay from the relay block.

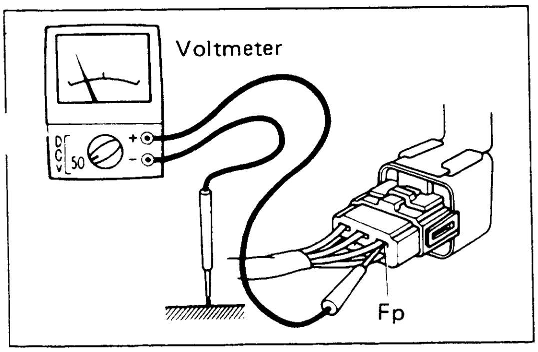
(b) Measure the resistance between each terminal.

	Between terminals	Resistance (Ω)
Main relay	1 – 2 3 – 4	60 – 80 Infinity

A03958

Circuit Opening Relay





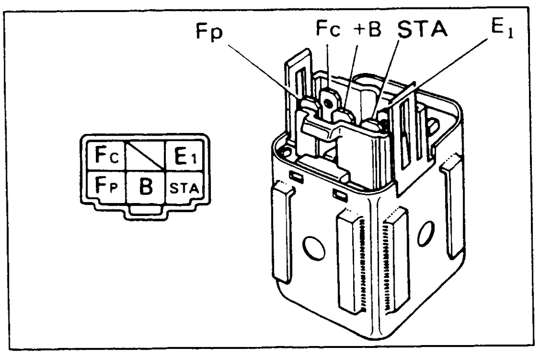
INSPECTION OF CIRCUIT OPENING RELAY

1. CHECK CIRCUIT OPENING RELAY OPERATION

(a) Remove the left kick panel.

(b) Using a voltmeter, check that the meter indicates voltage at Fp terminal during engine cranking and running.

(c) Stop the engine.



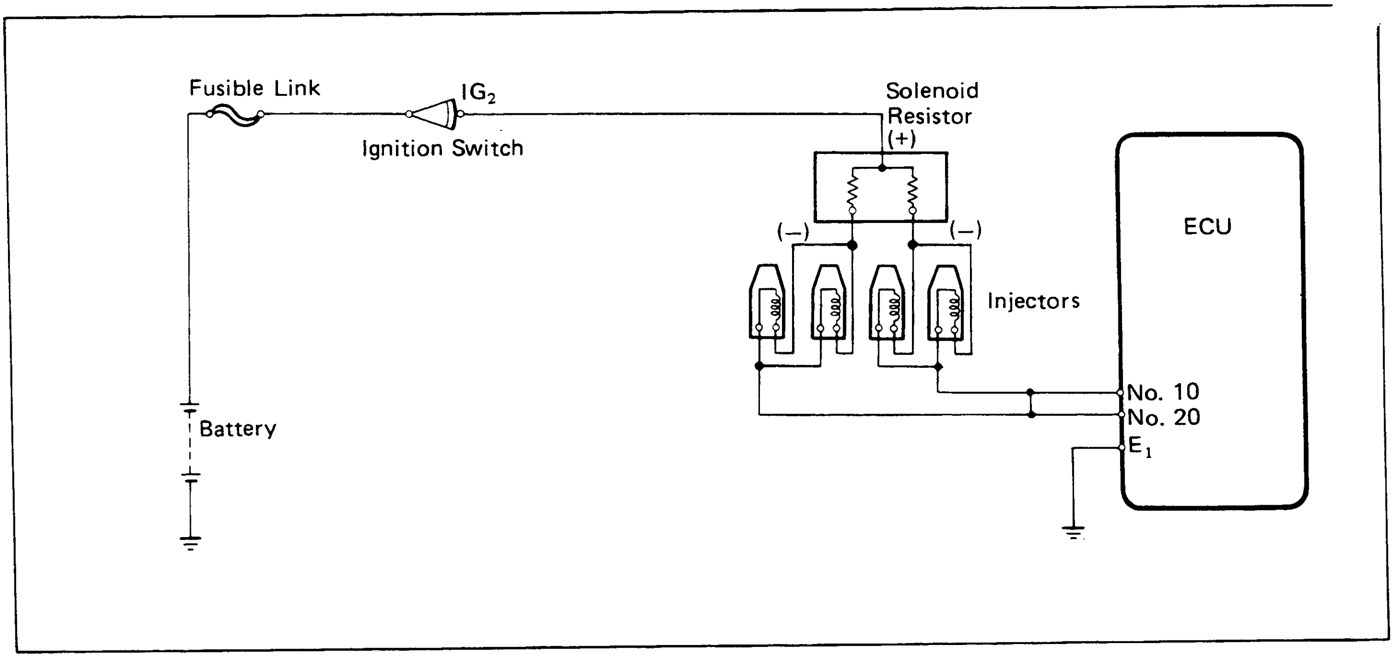
2. MEASURE RESISTANCE OF CIRCUIT OPENING RELAY

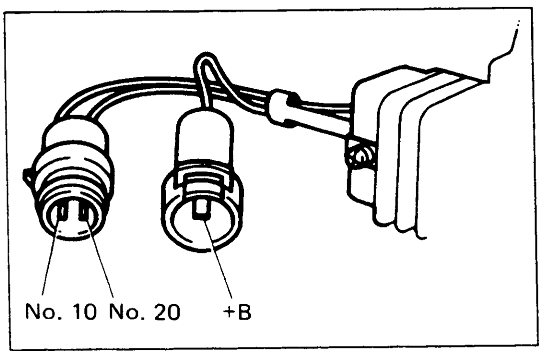
(a) Disconnect the connector.

(b) Measure the resistance between each terminal.

Between terminals	Resistance (Ω)
STA — E1	17 — 25
+B — Fc	88 — 132
+B — Fp	Infinity

Solenoid Resistor





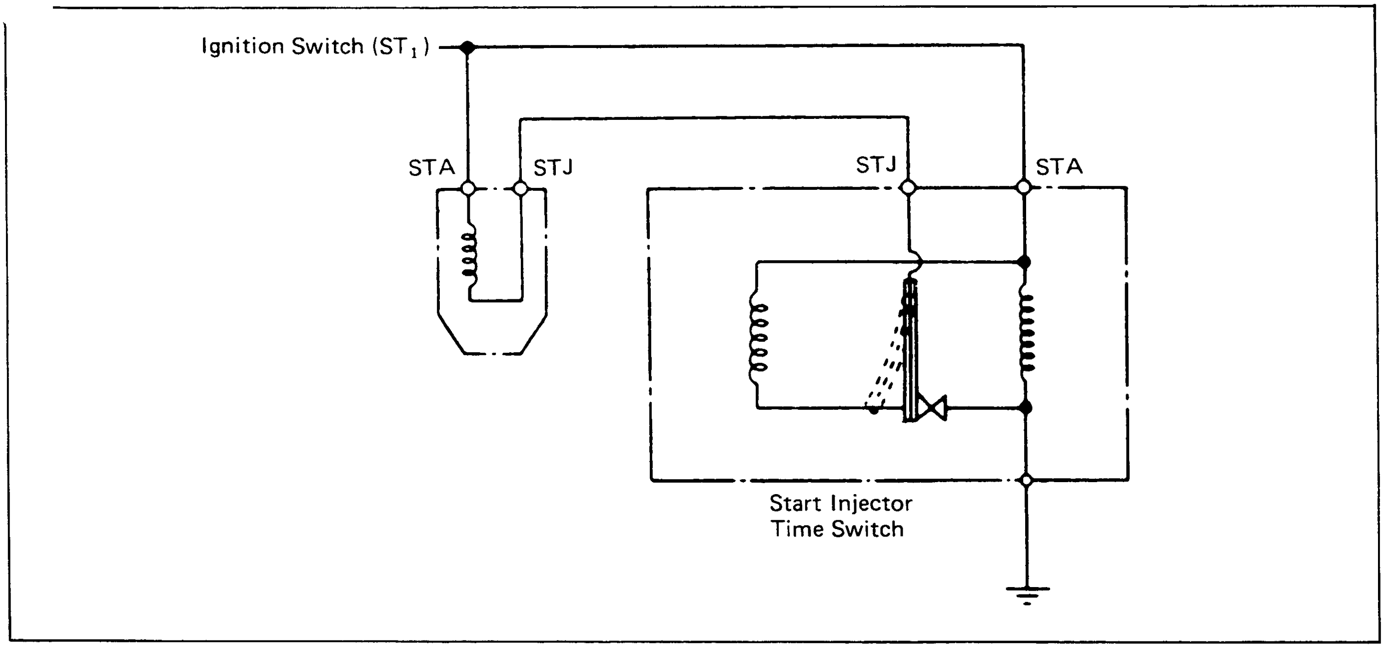
INSPECTION OF SOLENOID RESISTOR

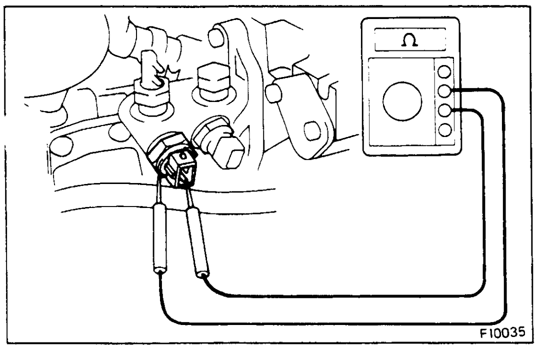
MEASURE RESISTANCE OF SOLENOID RESISTOR

Using an ohmmeter, measure the resistance between +B and other terminals.

Resistance: 2 – 3 Ω each

Start Injector Time Switch





FI0035

INSPECTION OF START INJECTOR TIME SWITCH

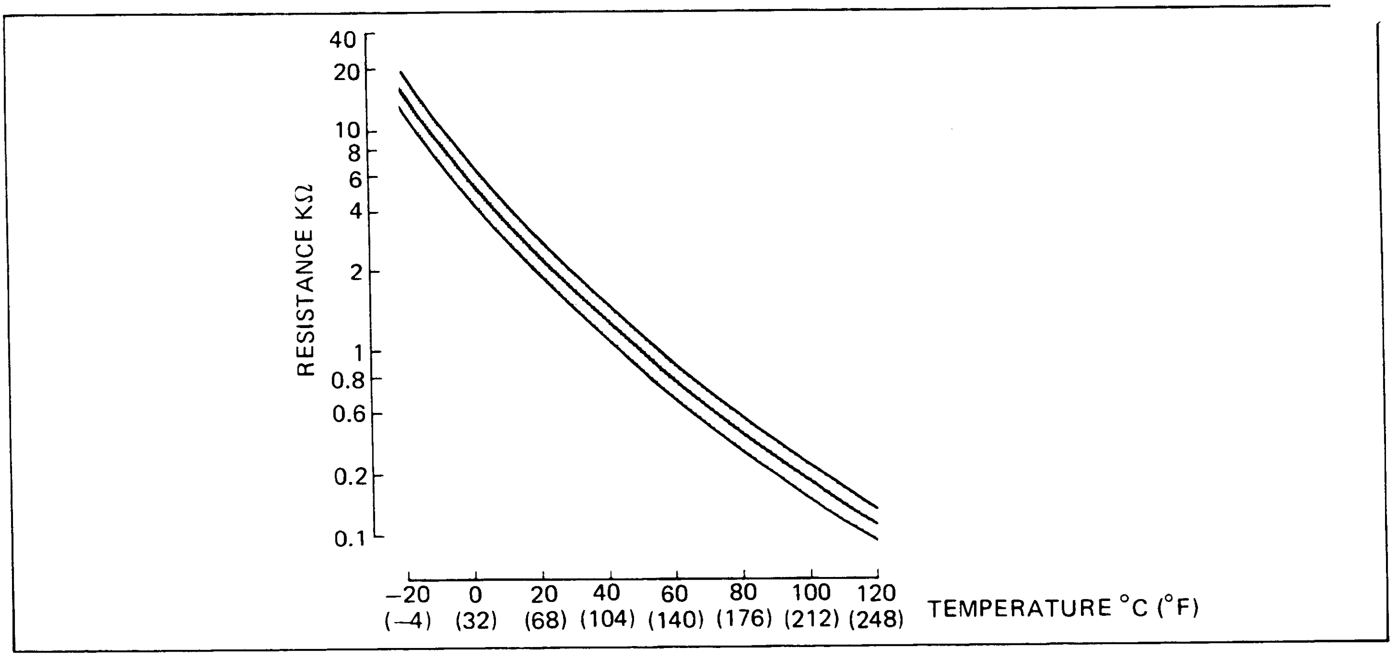
MEASURE RESISTANCE OF START INJECTOR TIME SWITCH

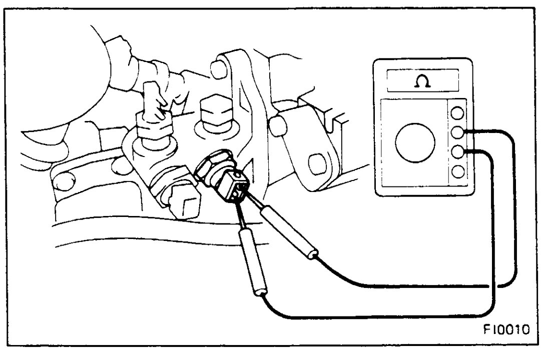
(a) Disconnect the connector.

(b) Using an ohmmeter, measure the resistance between each terminal.

Between terminals	Resistance (Ω)	Coolant temp.
STA – STJ	20 – 40	below 30°C (86°F)
	40 – 60	above 40°C (104°F)
STA – Ground	20 – 80	–

Water Thermo Sensor





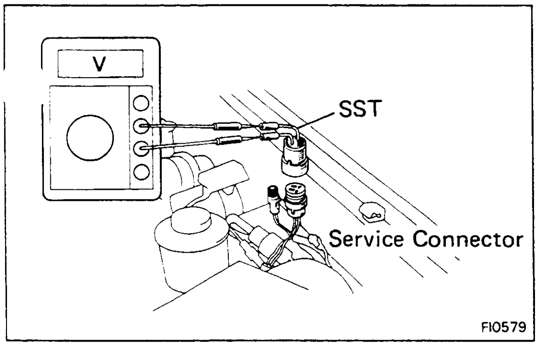
INSPECTION OF WATER THERMO SENSOR

MEASURE RESISTANCE OF WATER THERMO SENSOR

(a) Disconnect the connector.

(b) Using an ohmmeter, measure the resistance between both terminals.

Resistance: Refer to the chart



Ox Sensor

INSPECTION OF FEED BACK CONTROL

1. **CONNECT SST AND ANALOG VOLTMETER**

   Connect SST to the service connector and connect a voltmeter to SST.

   SST 09842-14010

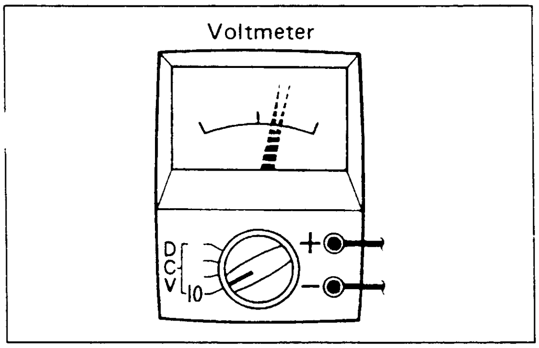
   Connect the (+) testing probe to the red wire of the SST and (−) testing probe to the black wire.

2. **WARM-UP ENGINE TO NORMAL OPERATING TEMPERATURE**

3. **CONNECT A TACHOMETER TO ENGINE**

4. **RACE ENGINE AT 2,500 RPM FOR ABOUT 90 SECONDS**

5. **MAINTAIN ENGINE SPEED AT 2,500 RPM**



6. **CHECK THAT NEEDLE OF VOLTMETER FLUCTUATES 8 TIMES OR MORE IN 10 SECONDS**

   If not, inspect the EFI system and replace the Ox sensor, if necessary.

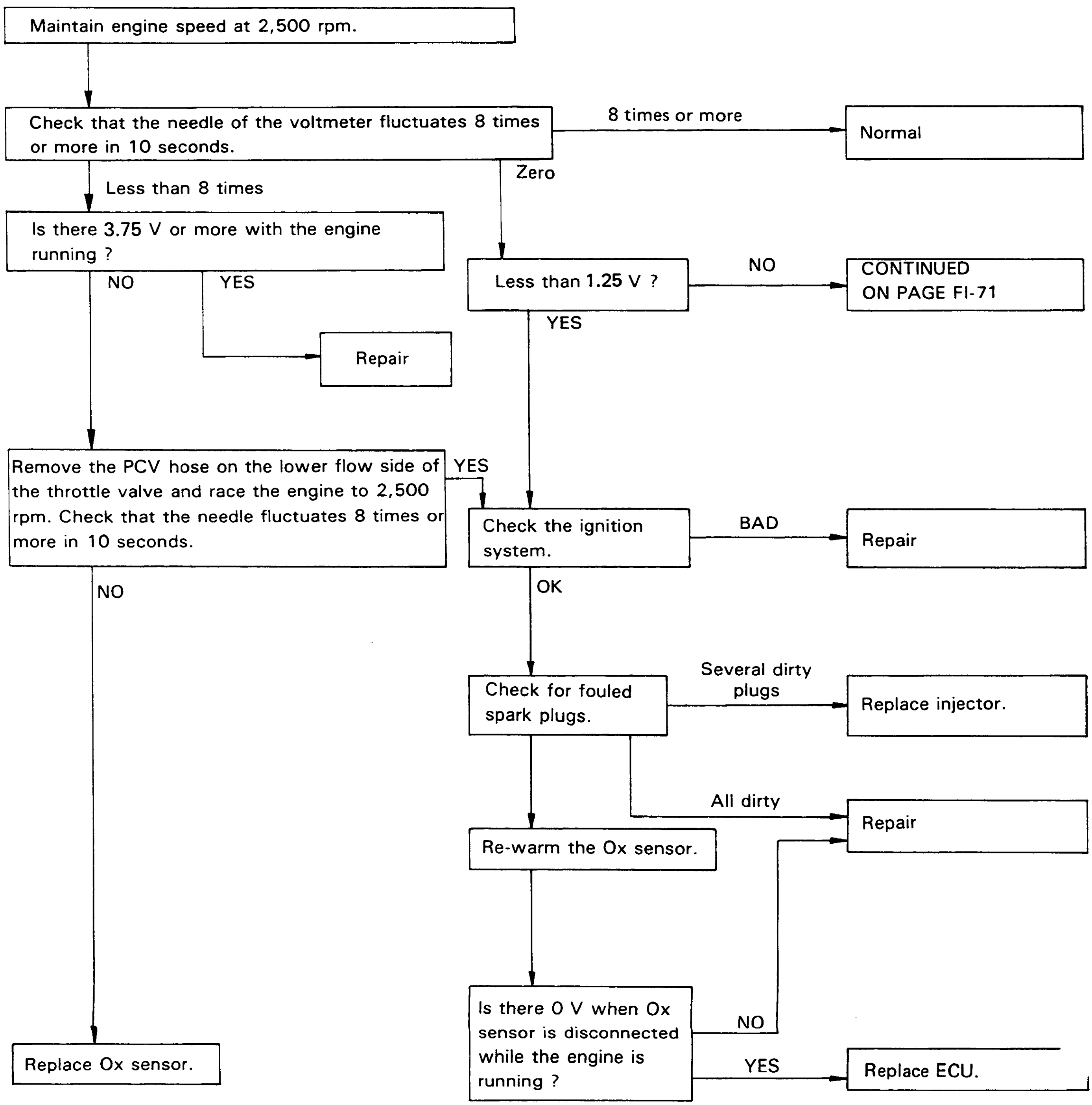
7. **STOP ENGINE**

8. **REMOVE VOLTMETER AND SST 09842-14010**

9. **INSTALL RUBBER CAP TO SERVICE CONNECTOR**

INSPECTION OF OX SENSOR

1. Warm-up the engine.
2. Connect a SST to the 4-terminal connector. SST 09842-14010
3. Using a voltmeter connect the positive probe to the red wire of the SST and negative testing probe to the block wire.
4. Warm up the Ox sensor with the engine at 2,500 rpm for about 90 seconds.



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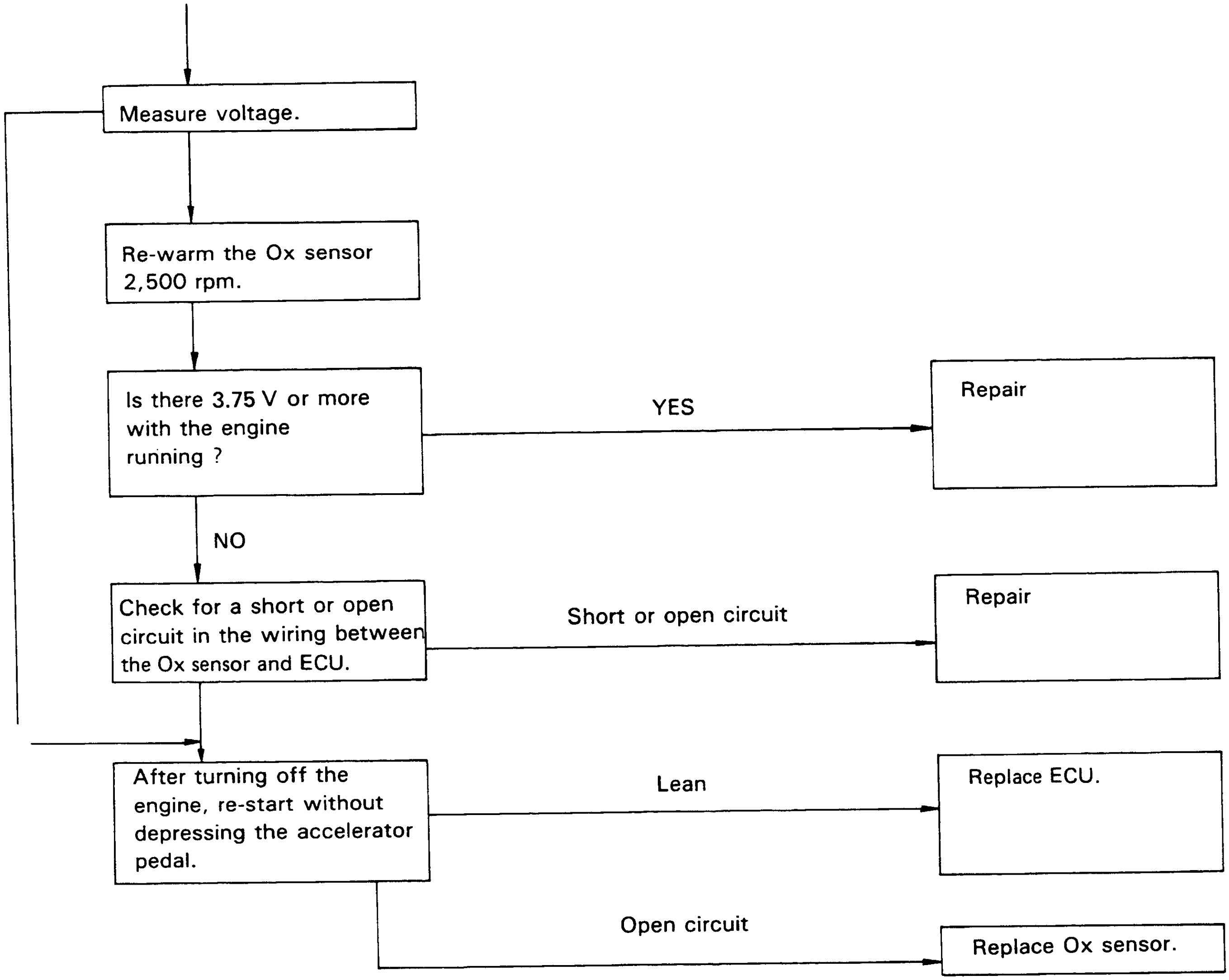
FROM PAGE FI-72



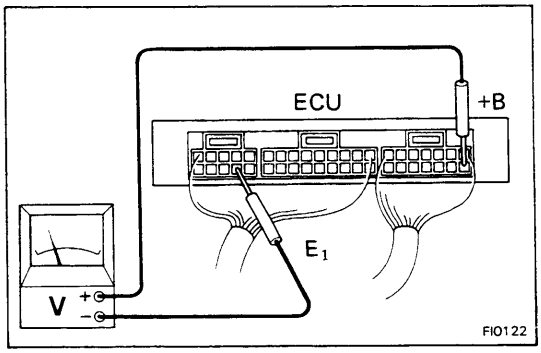
ECU

INSPECTION OF ECU

1. MEASURE VOLTAGE OF ECU

NOTE:

1. The ECU itself cannot be checked directly.
2. The EFI circuit can be checked by measuring the resistance and voltage at the wiring connectors of the ECU.



Check the voltages at the wiring connectors.

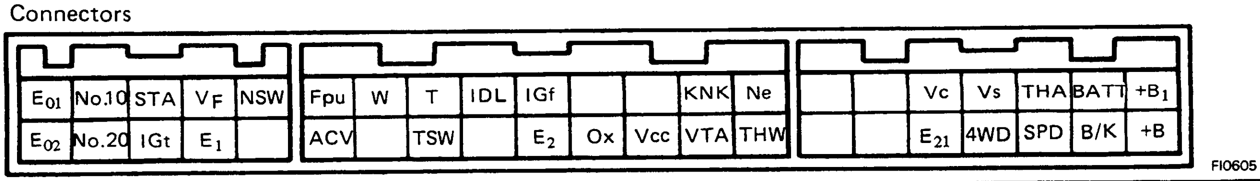
- Remove the right kick panel.
- Turn the igniton switch ON.
- Measure the voltage at each terminal.

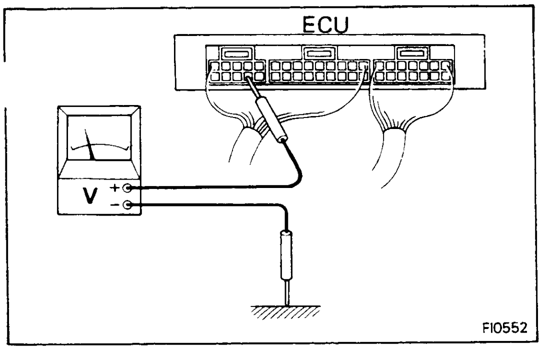
NOTE: 1. Perform all voltage measurements with the connectors connected.
2. Verify that the battery voltage is 11V or above when the ignition switch is ON.

Voltage at ECU Wiring Connectors

Terminals	Condition		STD voltage
+B – E_1	Ignition switch ON		10 – 14
BATT – E_1	–		10 –14
IDL – E_2	Ignition switch ON	Throttle valve open	4 – 10
VTA – E_2		Throttle valve fully closed	0.1 – 1.0
		Throttle valve fully open	4 – 5
Vcc – E_2		–	4 – 6
IGt – E_1	Idling		0.7 – 1.0
STA – E_1	Ignition switch ST position		6 – 12
No. 10 – E_1 No. 20 – E_1	Ignition switch ON		9 – 14
W – E_1	No trouble (CHECK ENGINE light off) and engine running		8 – 14
Vc – E_2	Ignition switch ON	–	4 – 9
Vs – E_2		Measuring plate fully closed	0.5 – 2.5
		Measuring plate fully open	5 – 8
	Idling		2.5 – 7.5
THA – E_2	Ignition siwtch ON	Intake air temperature 20°C (68°F)	2 – 6
THW – E_2	Ignition switch ON	Coolant temperature 80°C (176°F)	0.5 – 2.5
B/K – E_1	Stop light switch ON		8 – 14

ECU Connectors





2. MEASURE RESISTANCE OF ECU

CAUTION:

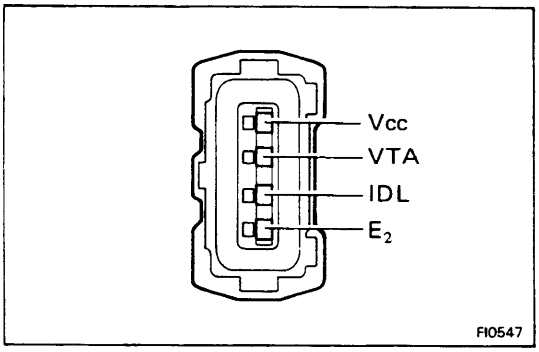
1. **Do not touch the ECU terminals.**
2. **The tester probe should be inserted into wiring connector from the wiring side.**

Check the resistance between each terminal of the wiring connector.

- Remove the right kick panel.
- Unplug the wiring connectors from the ECU.
- Measure the resistance between each terminal of the wiring connectors.

Resistance at ECU Wiring Connectors

Terminals	Condition	Resistance (kΩ)
IDL – E_2	Throttle valve open	Infinity
	Throttle valve fully closed	0 – 0.1
VTA – E_2	Throttle valve fully open	3.3 – 10
	Throttle valve fully closed	0.2 – 0.8
Vcc – E_2	–	3 – 7
THA – E_2	Intake air temperature 20°C (68°F)	2 – 3
THW – E_2	Coolant temperature 80°C (176°F)	0.2 – 0.4
+B – E_2	–	0.2 – 0.4
Vc – E_2	–	0.1 – 0.3
Vs – E_2	Measuring plate fully closed	0.02 – 0.1
	Measuring plate fully open	0.02 – 1
Ne – E_1	–	0.14 – 0.18



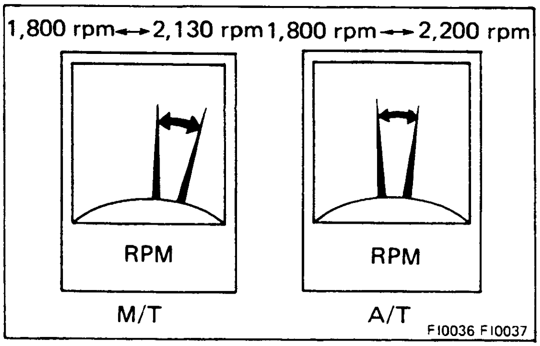
Fuel Cut RPM

INSPECTION OF FUEL CUT RPM

(a) Start and warm up the engine.

(b) Disconnect the throttle position sensor connector from the throttle position sensor.

(c) Short circuit termianls IDL and E_2 on wire connector side.



(d) Gradually raise the engine rpm and check that there is fluctuation between the fuel cut and fuel return points.

NOTE: The vehicle should be stopped.

	Fuel Cut rpm	Fuel Return rpm
M/T	2,130 rpm	1,800 rpm
A/T	2,200 rpm	1,800 rpm

FUEL SYSTEM

PRECAUTIONS

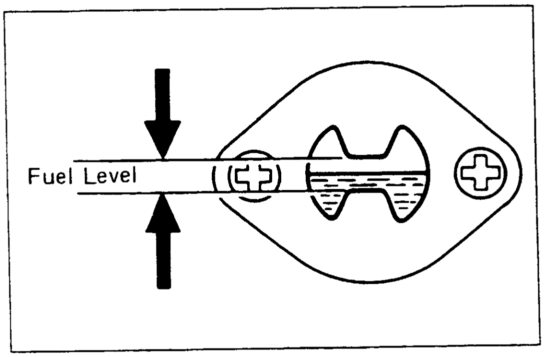
1. **Before working on the fuel system, disconnect the cat from the negative battery terminal.**
2. **When working on the fuel system, keep away from possible fire hazards and do not smoke.**
3. **Keep gasoline off rubber or leather parts.**
4. **Work on only one component group at a time to avoid confusion between similar looking parts.**
5. **Keep work area clean to avoid contamination of the carburetor and components.**
6. **Be careful not to mix up or lose clips or springs.**

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Engine will not start/ Hard to start (cranks ok)	Carburetor problems • Choke operating • Flooding • Needle valve sticking or clogged • Vacuum hose disconnected or damaged • Fuel cut solenoid valve not open	Repair as necessary	FU-4
Rough idle or stalls	Carburetor problems • Idle speed incorrect • Slow jet clogged • Idle mixture incorrect • Fuel cut solenoid valve not open • Fast idle speed setting incorrect (cold engine) • Choke system faulty • Secondary throttle valve not closed	Perform on-vehicle inspection of carburetor	FU-3
Engine hesitates/ Poor acceleration	Fuel line clogged Carburetor problems • Float level too low • Accelerator pump faulty • Power valve faulty • Choke valve closed (hot engine) • Choke system	Check fuel line Repair as necessary	FU-4
Engine dieseling (runs after ignition switch is turned off)	Carburetor problems • Linkage sticking • Idle speed or fast idle speed out of adjustment • Fuel cut solenoid faulty	Repair as necessary	FU-4
Poor gasoline mileage	Fuel leak Carburetor problems • Choke faulty • Idle speed too high • Deceleration fuel cut system faulty • Power valve always open	Repair as necessary Perform on-vehicle inspection of carburetor	FU-3
Insufficient fuel supply to carburetor	Fuel filter clogged Fuel pump faulty Fuel line clogged Fuel line bent or kinked	Replace fuel filter Replace fuel pump Check fuel line Replace fuel line	FU-28 FU-30

ON-VEHICLE INSPECTION

1. **REMOVE AIR CLEANER (See page FU-5)**
2. **CHECK CARBURETOR AND LINKAGE**
   (a) Check that the various set screws, plugs and union bolts are tight and installed correctly.
   (b) Check the linkage for excessive wear and missing snap rings.
   (c) Check that the throttle valves open fully when the accelerator pedal is fully depressed.



3. **CHECK FLOAT LEVEL**
   Check that the fuel level is about even with the correct level in the sight glass.
   If not, check the carburetor needle valve and float level, and adjust or repair, as necessary.

COLD ENGINE

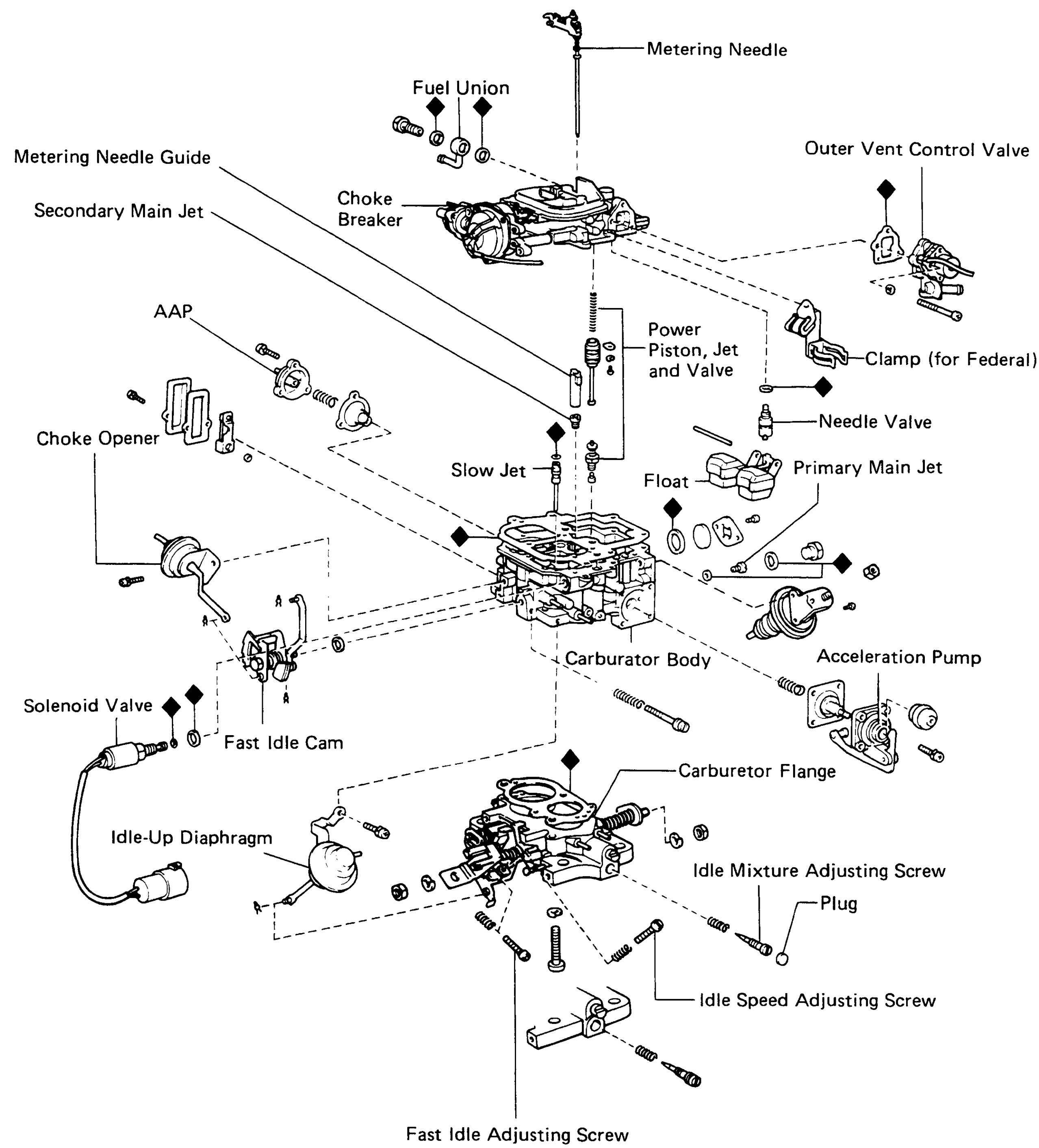
4. **CHECK AUTOMATIC CHOKE (See page EC-55)**
5. **CHECK CHOKE OPENER (See page EC-58)**
6. **CHECK CHOKE BREAKER (See page EC-57)**
7. **CHECK AAP SYSTEM (See page EC-61)**
8. **CHECK OUTER VENT CONTROL VALVE**

HOT ENGINE

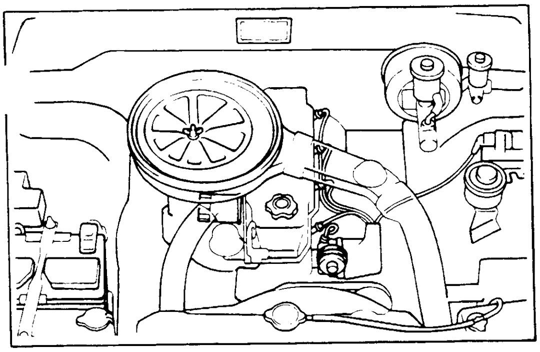
9. **CHECK AUTOMATIC CHOKE (See page EC-55)**
10. **CHECK CHOKE OPENER (See page EC-58)**
11. **CHECK AAP SYSTEM (See page EC-61)**
12. **CHECK ACCELERATION PUMP**
    Open the throttle valve, and check that gasoline spurts out from the acceleration nozzle.
13. **CHECK FUEL CUT SYSTEM (See page EC-63)**
14. **INSTALL AIR CLEANER (See page FU-24)**
15. **CHECK AND ADJUST THE IDLE SPEED (See page FU-24)**
16. **CHECK AND ADJUST FAST IDLE SPEED (See page FU-22)**

CARBURETOR

COMPONENTS



◆ : Non-reusable part

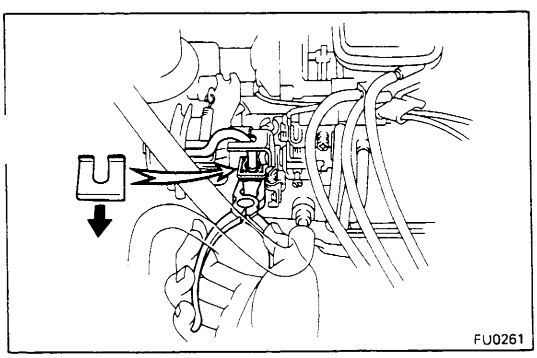


REMOVAL OF CARBURETOR

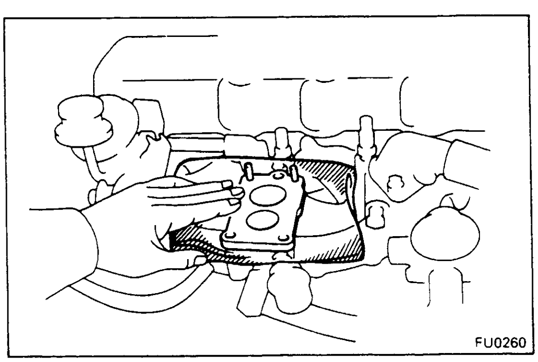
1. **REMOVE AIR CLEANER**
   (a) Disconnect the emission control hoses.
   (b) Disconnent the air intake hose.
   (c) Remove the two mounting nuts and butterfly nut.
   (d) Lift the air cleaner off the carburetor.

2. **DISCONNECT THROTTLE CABLE FOR AUTOMATIC TRANSMISSION (See page AT-20)**

3. **DISCONNECT FOLLOWING HOSES FROM CARBURETOR**
   (a) Emission control hoses
   (b) PCV hose from the flange
   (c) Fuel hose
   (d) Wiring connector



4. **DISCONNECT ACCELERATOR LINKAGE**



5. **REMOVE CARBURETOR**
   (a) Remove the carburetor mounting bolts and nuts.
   (b) Lift out the carburetor.
   (c) Cover the inlet hole of the intake manifold with a cloth.

DISASSEMBLY OF CARBURETOR

(See page FU-4)

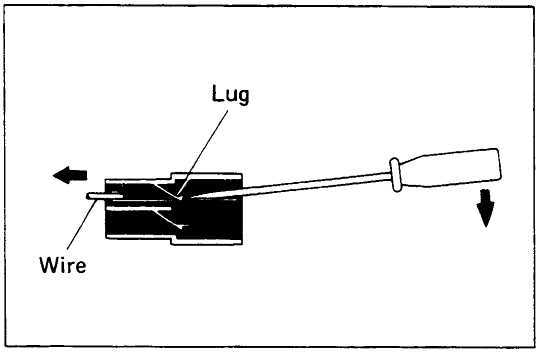
The following instructions are organized so that you work on only one component group at a time. This will help avoid confusion from similar looking parts from different subassemblies being on your workbench at the same time.

(a) To facilitate reassembly, arrange parts in order.

(b) Be careful not to mix up or lose clips or springs.

(c) Use SST (Carburetor Driver Set).

SST 09860-11011

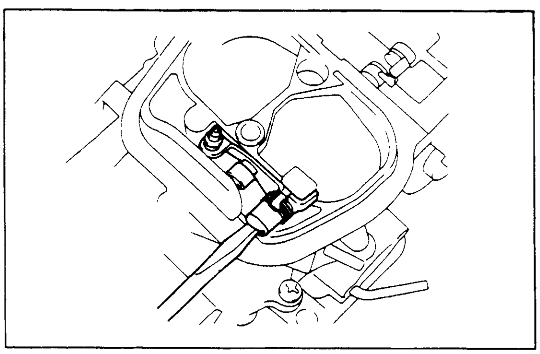


Disassembly of Air Horn

(See page FU-4)

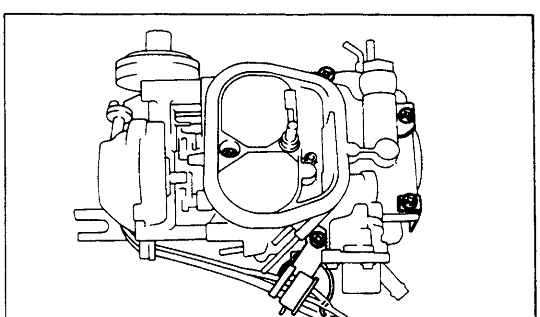
1. **DISCONNECT TERMINAL FROM CONNECTOR**

   Pry up the locking lugs with a screwdriver and pull out the terminals.



2. **REMOVE METERING NEEDLE**

   Loosen the screw and remove the metering needle.



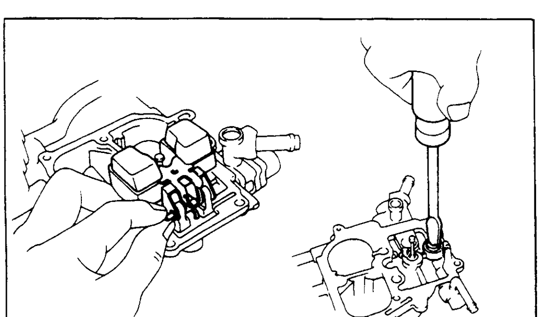
FU0262

3. **REMOVE AIR HORN ASSEMBLY**

   (a) Disconnect the fast idle link and air valve connecting rod.

   (b) Remove the five air horn screws and lift the air horn from the body.

   (c) Remove the air horn gasket.

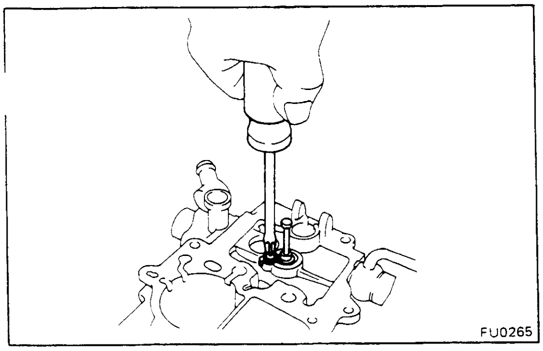


FU0264 FU0263

4. **REMOVE FLOAT AND NEEDLE VALVE**

   (a) Remove the pivot pin and float with the needle valve.

   (b) Remove the needle valve seat.

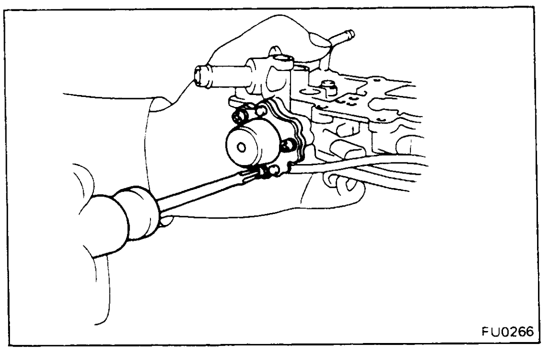

FU0265

5. REMOVE POWER PISTON

(a) Loosen the retainer screw.

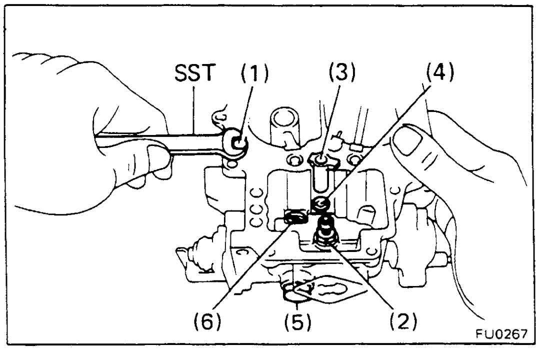
(b) While holding the piston, rotate the retainer.

(c) Remove the power piston and spring.


FU0266

6. REMOVE OUTER VENT CONTROL VALVE

Loosen the three screws and remove the outer vent control valve.



Disassembly of Carburetor Body

1. **REMOVE DASH POT WITH BRACKET (FOR A/T)**
2. **REMOVE JETS AND POWER VALVE**

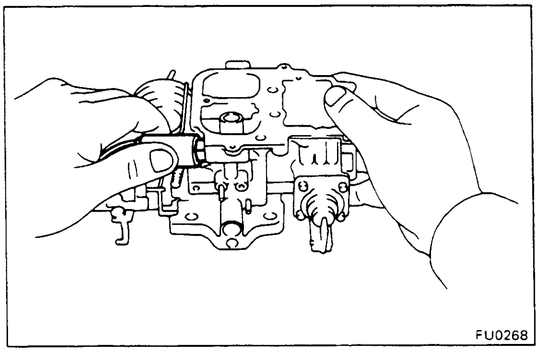
   (a) Using SST, remove the slow jet (1).

   SST 09922-00010

   (b) Remove the power valve with jet (2).

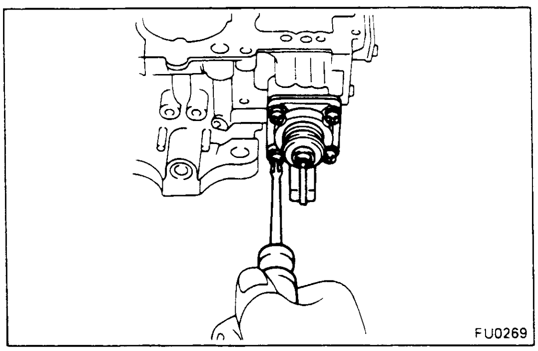
   (c) Remove the metering needle guide (3) and secondary main jet (4).

   (d) Remove the plug (5) and primary main jet (6).



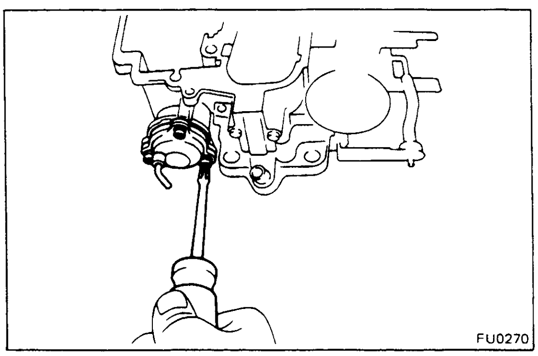
3. **REMOVE FUEL CUT SOLENOID VALVE**

   Remove the solenoid valve from the carburetor body.



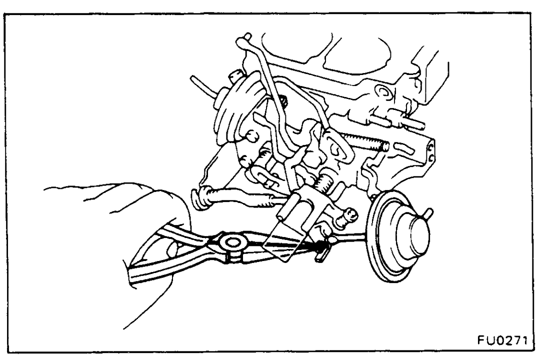
4. **REMOVE ACCELERATION PUMP**

   Remove the four screws, pump housing, diaphragm and spring.



5. **REMOVE AUXILIARY ACCELERATION PUMP**

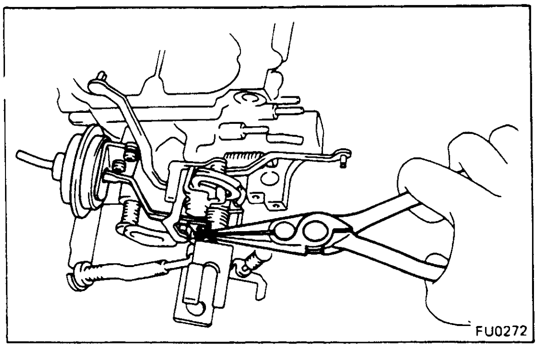
   Remove the three screws, pump housing, spring and diaphragm.



6. **REMOVE IDLE-UP DIAPHRAGM**

   (a) Disconnect the idle up diaphragm link.

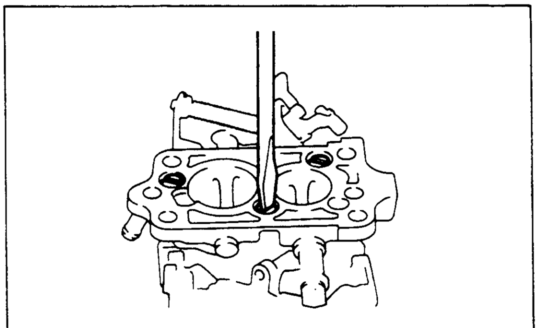
   (b) Remove the idle up diaphragm.


FU0272

7. REMOVE CHOKE OPENER

(a) Disconnect the choke opener link.

(b) Remove the choke opener.


FU0273

8. SEPARATE BODY AND FLANGE

(a) Remove the three screws.

(b) Separate the body and flange.

GENERAL CLEANING PROCEDURE

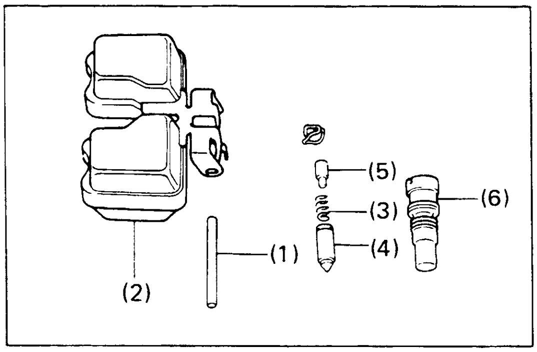
CLEAN DISASSEMBLED PARTS BEFORE INSPECTION

(a) Wash and clean the cast parts with a soft brush and carburetor cleaner.

(b) Clean off the carbon around the throttle valve.

(c) Wash the other parts thoroughly in carburetor cleaner.

(d) Blow all dirt and other foreign matter from the jets, fuel passages and restrictions in the body.



INSPECTION OF CARBURETOR

1. INSPECT FLOAT AND NEEDLE VALVE

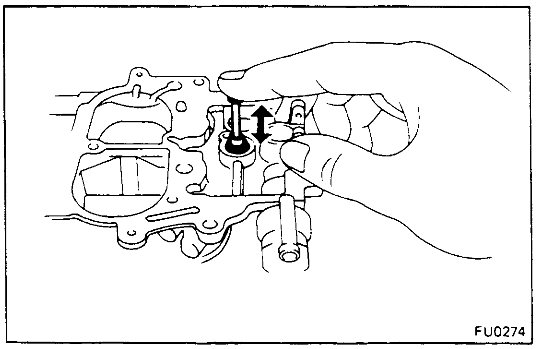
(a) Inspect the pivot pin (1) for scratches and excessive wear.

(b) Inspect the float (2) for broken lip or wear in the pivot pin holes.

(c) Inspect the spring (3) for breaks or deformation.

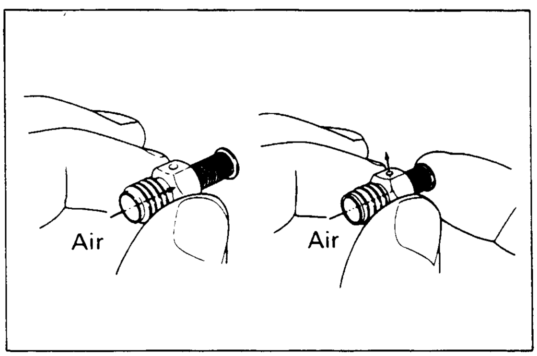
(d) Inspect the needle valve (4) and plunger (5) for wear or damage.

(e) Inspect the strainer (6) for rust or breaks.



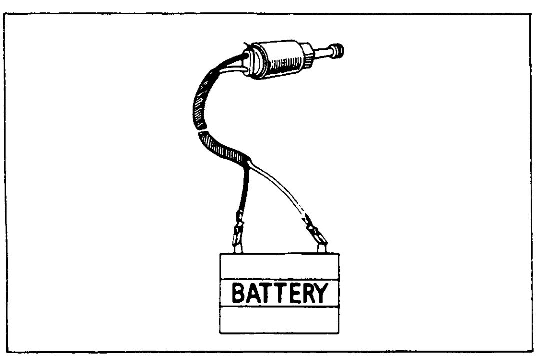
2. INSPECT POWER PISTON

Make sure that power piston moves smoothly.



3. INSPECT POWER VALVE

Check for faulty opening and closing action.



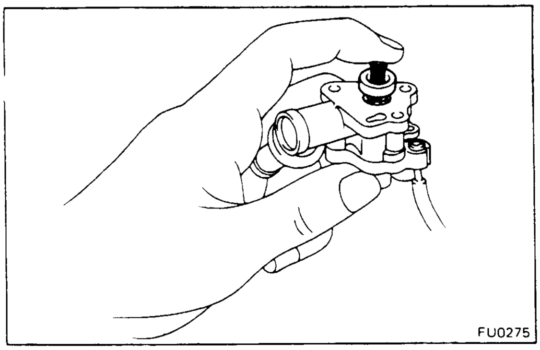
4. INSPECT FUEL CUT SOLENOID VALVE

(a) Connect the terminals to the battery terminals.

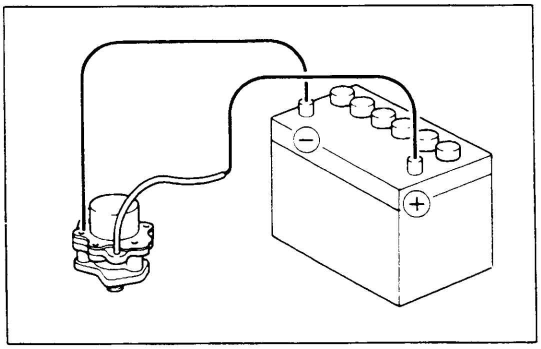
(b) You should feel a click from the solenoid valve when the battery power is connected and disconnected.

If the solenoid valve is not operating properly, replace it.

(c) Replace the O-ring.

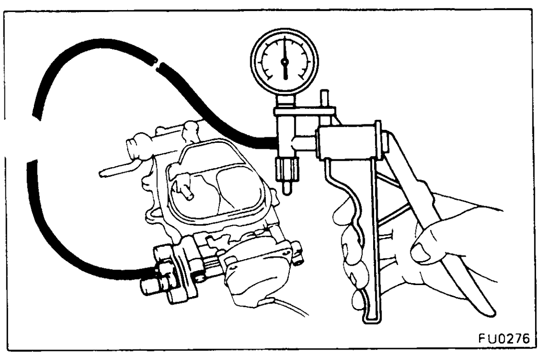

FU0275

5. **INSPECT OUTER VENT CONTROL VALVE**
   (a) Check the valve and valve seats for damage.
   (b) Check that the valve rod moves smoothly.

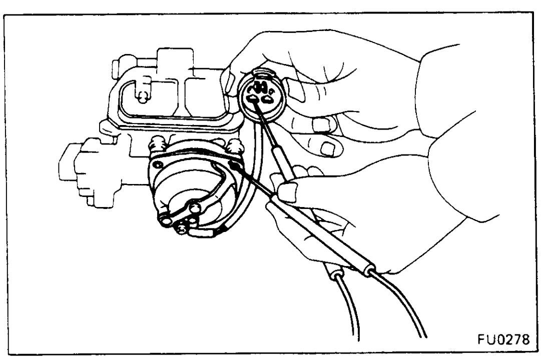


   (c) Connect the terminal to the battery terminal.
   (d) You should feel a click from the control valve when battery power is connected and disconnected.

If the control valve is not operating properly, replace it.


FU0276

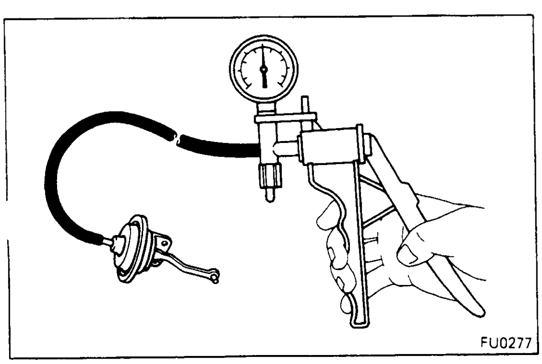
6. **INSPECT CHOKE BREAKER DIAPHRAGM**
   (a) Apply vacuum to the diaphragm.
   (b) Check that the vacuum does not drop immediately.
   (c) Check that the choke valve opens slightly when vacuum is applied.


FU0278

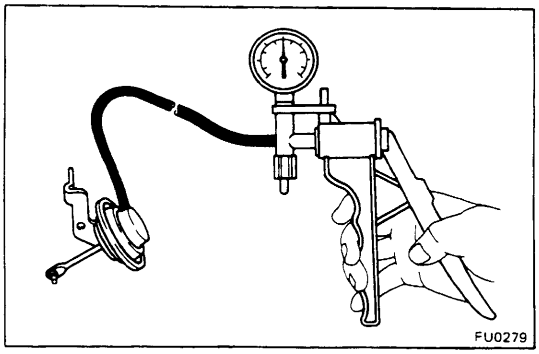
7. **INSPECT CHOKE HEATER**

Using an ohmmeter, measure the resistance, between the terminal and heater housing.

Resistance: 20 — 22Ω at 20°C (68°F)


FU0277

8. **INSPECT CHOKE OPENER DIAPHRAGM**
   (a) Apply vacuum to the diaphragm.
   (b) Check that the vacuum does not drop immediately.
   (c) Check that the link moves when vacuum is applied.



9. **INSPECT IDLE-UP DIAPHRAGM**

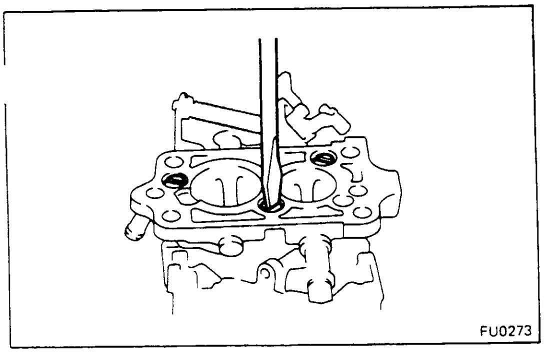
(a) Apply vacuum to the diaphragm.

(b) Check that the vacuum does not drop immediately.

(c) Check that the link moves when vacuum is applied.

ASSEMBLY OF CARBURETOR

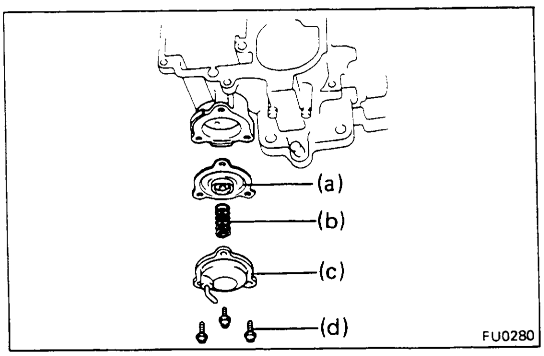
NOTE: Use new gaskets and O-rings throughout.



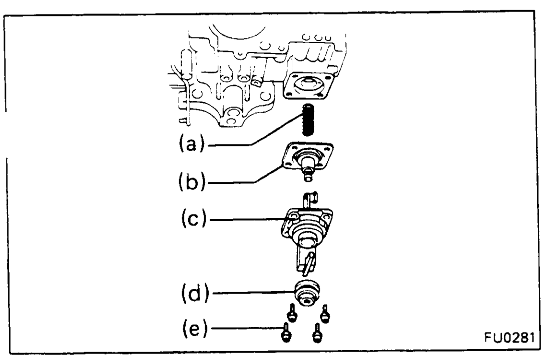
Assembly of Carburetor Body

(See page FU-4)

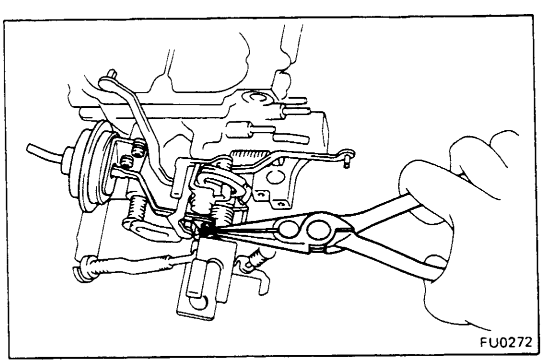
1. **ASSEMBLE CARBURETOR BODY AND FLANGE**
   - (a) Place a new gasket and flange in position on the body.
   - (b) Install the three screws.



2. **INSTALL AUXILIARY ACCELERATION PUMP IN ORDER, AS SHOWN:**
   - (a) Diaphragm (with outer gasket)
   - (b) Spring
   - (c) Cover
   - (d) Screws

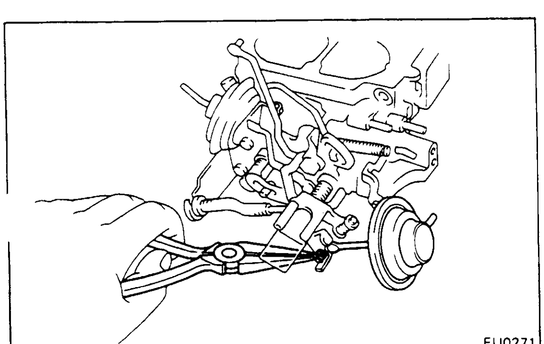


3. **INSTALL ACCELERATION PUMP IN ORDER AS SHOWN:**
   - (a) Spring
   - (b) Diaphragm (with outer gasket)
   - (c) Cover
   - (d) Boot
   - (e) Screws



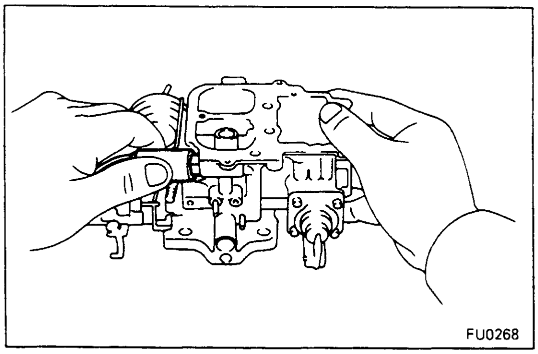
4. **INSTALL CHOKE OPENER**

   Install the choke opener, and connect the link.



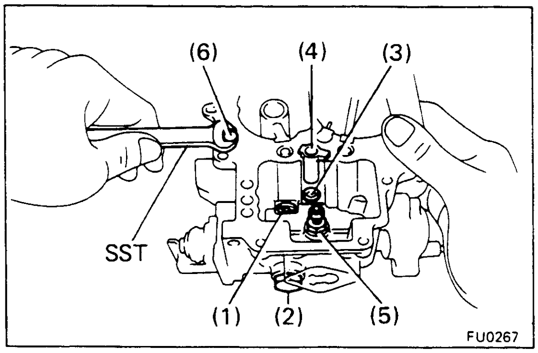
5. **INSTALL IDLE-UP DIAPHRAGM**

   Install the idle-up diaphragm, and connect the link.



6. INSTALL FUEL CUT SOLENOID VALVE

Install the solenoid valve with a new gasket into the carburetor body.



7. INSTALL MAIN JETS, SLOW JET AND POWER VALVE

(a) Install the primary main jet (1) over a new gasket.

(b) Install the plug (2) over a new gasket.

(c) Install the secondary main jet (3) and metering needle guide (4).

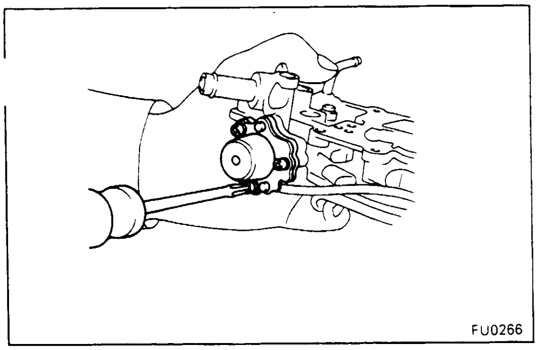
(d) Install the power valve (5).

(e) Assemble a new O-ring on the slow jet.

(f) Using SST, install the slow jet (6).

SST 09922-00010

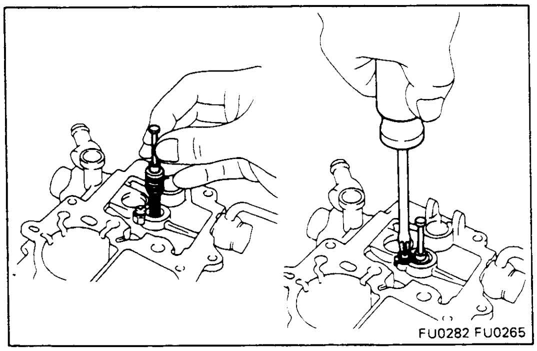
8. INSTALL DASH POT WITH BRACKET (FOR A/T)


FU0266

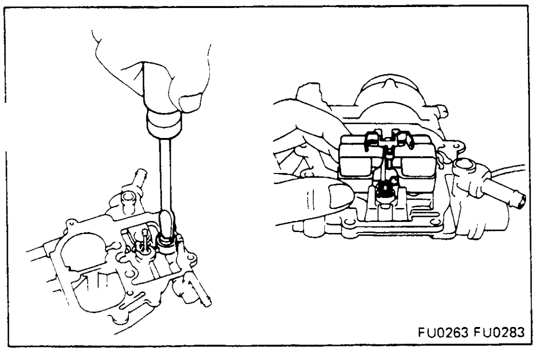
Assembly of Air Horn

(See page FU-4)

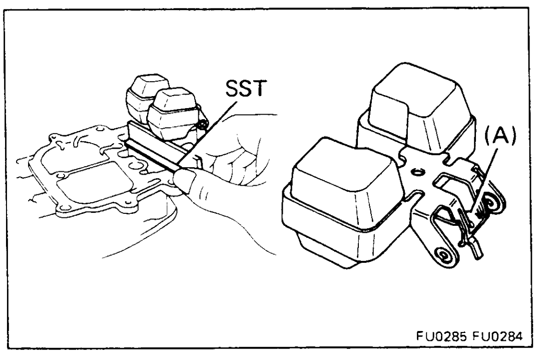
1. **INSTALL OUTER VENT CONTROL VALVE**
   (a) Place a new gasket in position on the air horn.
   (b) Install the outer vent control valve on the air horn with the three screws.


FU0282 FU0265

2. **INSTALL POWER PISTON**
   (a) Place the power piston spring and piston into the bore.
   (b) While pushing the piston, rotate the retainer over the piston.
   (c) Tighten the retainer screw.


FU0263 FU0283

3. **INSTALL FLOAT AND NEEDLE VALVE**
   (a) Install the valve seat over a new gasket into the fuel inlet.
   (b) Install the needle valve onto the valve seat.
   (c) Insert the lip of the float under the wire of the needle valve.
   (d) Install the float and secure it with the pivot pin.



FU0285 FU0284

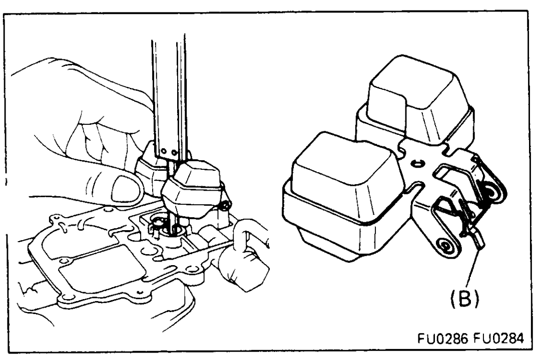
4. **ADJUST FLOAT LEVEL**
   (a) Allow the float to hang down by its own weight. Using SST, check the clearance between the float top and air horn.

   SST 09240-00014

   NOTE: This measurement should be made without a gasket on the air horn.

   Float level (raised position): 9.8 mm (0.386 in.)

   (b) Adjust by bending portion (A) of the float.

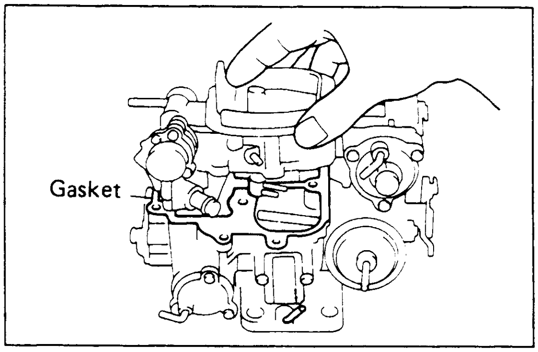


FU0286 FU0284

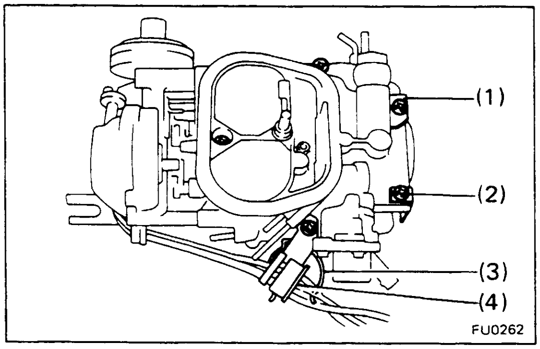
   (c) Lift up the float and, using vernier calipers, check the distance between the air horn and the float bottom.

   Float level (lowered position): 48 mm (1.89 in.)

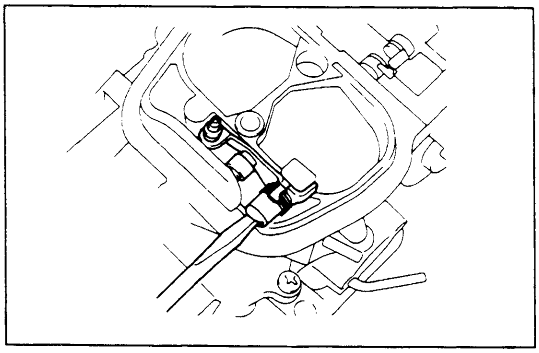
   (d) Adjust by bending portion (B) of the float.



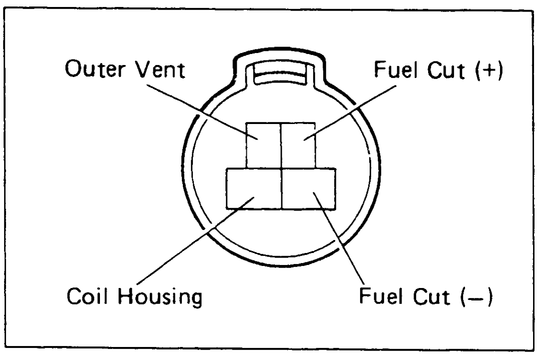
5. **ASSEMBLE AIR HORN AND BODY**
   (a) Put a new gasket on the body.
   (b) Carefully assemble the air horn and body.



6. **INSTALL FIVE SCREWS WITH OTHER PARTS AS FOLLOWS:**
   (a) Install the fuel inlet bracket (1).
   (b) Instal the number plate (2).
   (c) Install the VCV clamp (3) and wire clamp (4).
   (d) Connect the fast idle link.

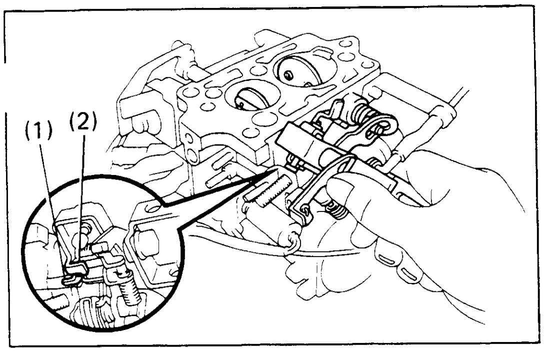


7. **INSTALL METERING NEEDLE**
   (a) Install the metering needle with a collar.
   (b) Hook the spring end into the hole.
   (c) Insert a washer and tighten the screw.



8. **INSTALL TERMINAL TO CONNECTOR**
   (a) Push in the terminal until it is securely locked in the connector lug.
   (b) Pull on the wire to confirm that it is securely locked.

ADJUSTMENT OF CARBURETOR



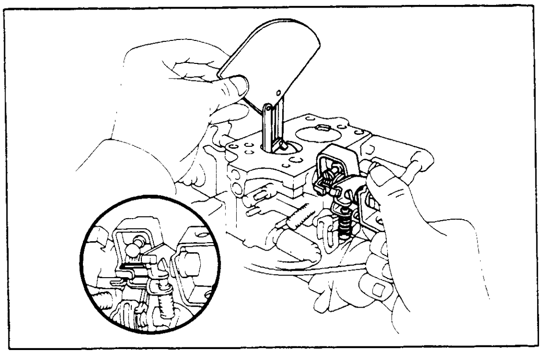
NOTE: Use SST 09240-00014 to make adjustment.

1. **CHECK AND ADJUST THROTTLE VALVE OPENING**

Check the full opening angle of the primary and secondary throttle valves.

Adjust by bending the respective first throttle arm levers for the primary (1) and secondary (2).

Standard angle:
Primary — 90° from horizontal plane
Secondary — 90° from horizontal plane

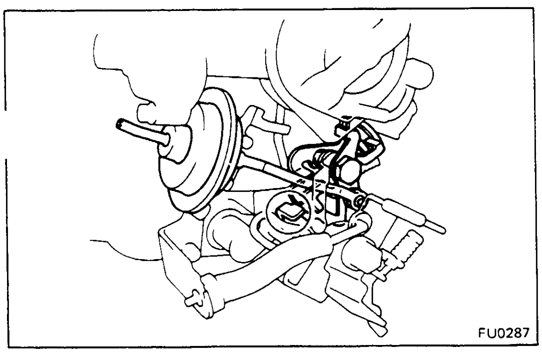


2. **CHECK SECONDARY TOUCH ANGLE**

Check the primary throttle valve opening at the same time the second throttle valve just starts to open.

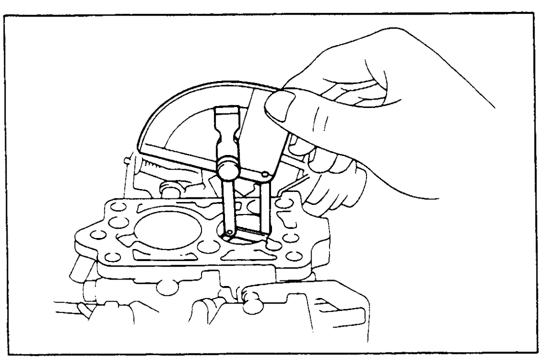
Standard angle: 59° from horizontal plane

NOTE: It is not necessary to adjust the secondary touch angle.



3. **CHECK AND ADJUST FAST IDLE SETTING**

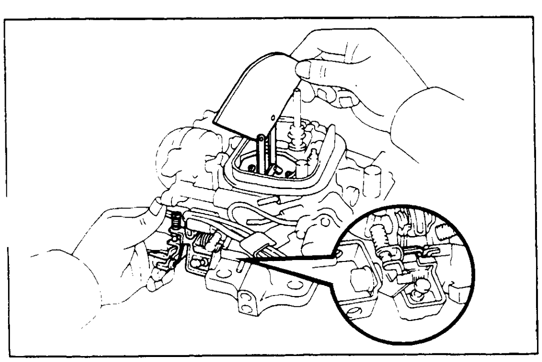
(a) Set the throttle shaft lever to the first step of the fast idle cam as shown.



(b) With the choke valve fully closed, check the primary throttle valve angle.

Adjust by turning the fast idle adjusting screw.

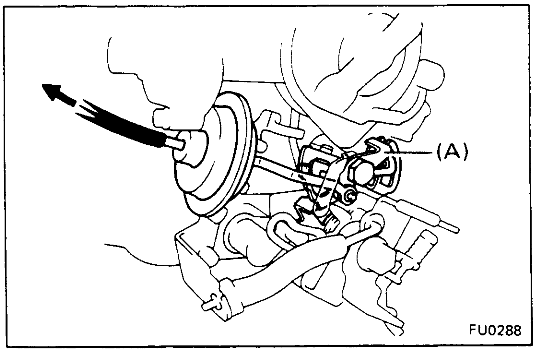
Standard angle: 23° from horizontal plane



4. **CHECK AND ADJUST UNLOADER**

With the primary throttle valve fully opened, check the choke valve angle. Adjust by bending the primary throttle arm.

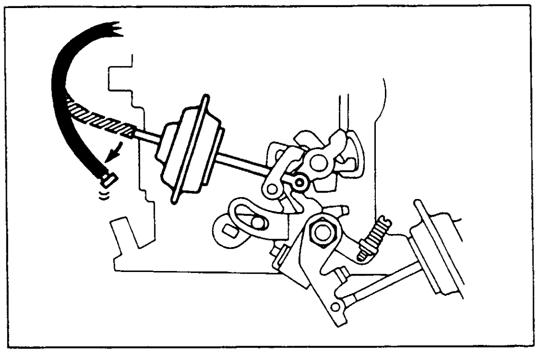
Standard angle: 45° from horizontal plane



5. CHECK AND ADJUST CHOKE OPENER

(a) Apply vacuum to the choke opener diaphragm.

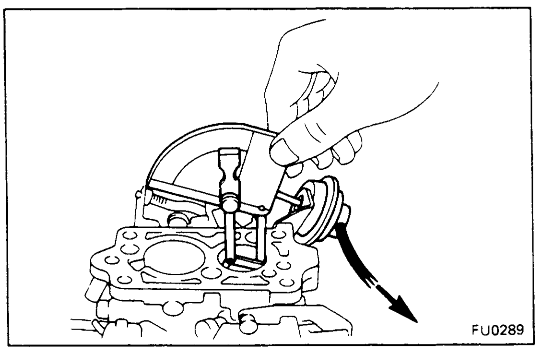
(b) Check that the fast idle cam is released to the four. step. Adjust by bending choke opener lever A.



(c) Disconnect the vacuum hose.

(d) Close the choke valve and set the fast idle lever to the first step.

(e) Check that there is clearance between the choke opener lever and fast idle cam.

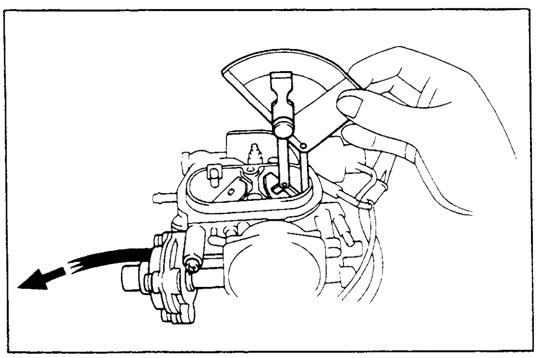


6. CHECK AND ADJUST IDLE-UP

(a) Apply vacuum to the idle-up diaphragm.

(b) Check the throttle valve opening angle. Adjust by turning the adjusting screw.

Standard angle: 16.5° from horizontal plane



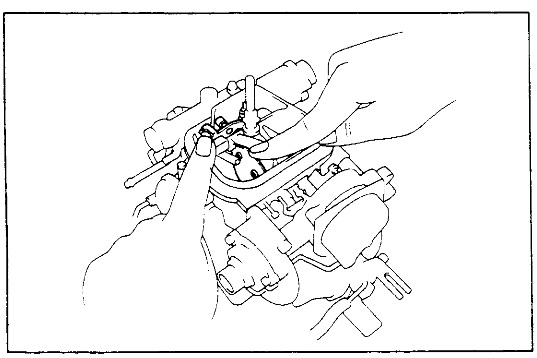
7. CHECK CHOKE BREAKER

(a) Apply vacuum to the choke breaker diaphragm.

(b) Close the choke valve by hand.

(c) Check the choke valve opening angle.

Standard angle: 42° from horizontal plane

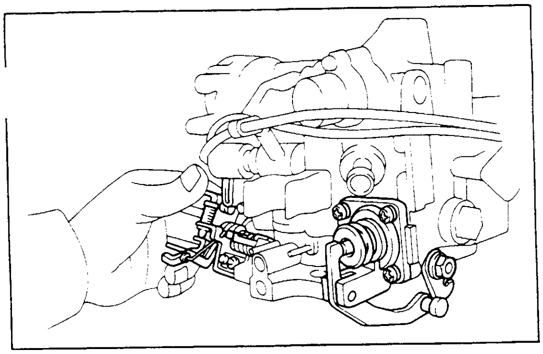


8. CHECK AIR VALVE AND METERING NEEDLE

(a) Check that the air valve and metering needle move smoothly together.

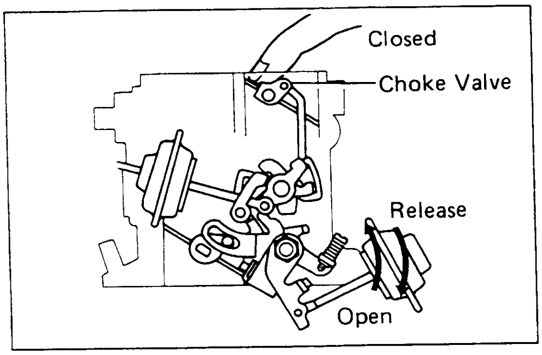
(b) While the primary throttle valve angle is idle position, check the air valve opening angle.

(c) While the primary throttle valve is full opening ang check that there is clearance between the connectinu rod and stopper.



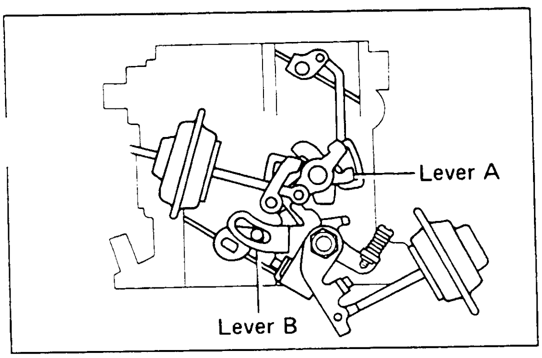
9. CHECK ACCELERATION PUMP

Rotate the throttle shaft and check that the pump lever and diaphragm rod move smoothly.

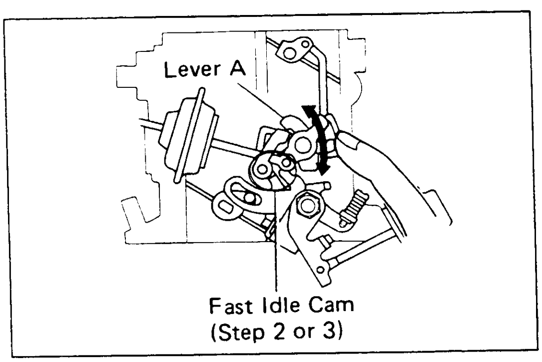


10. INSPECT AND ADJUST SECONDARY THROTTLE VALVE LOCK SYSTEM

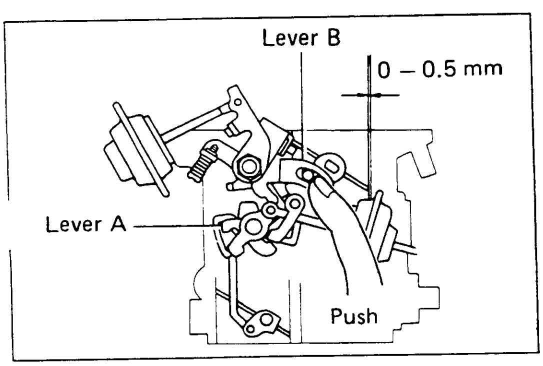
(a) While holding the throttle slightly open, push the choke valve closed, and hold it closed as you release the throttle valve.



(b) In condition (a), check that lever A is holding lever B locked as shown.

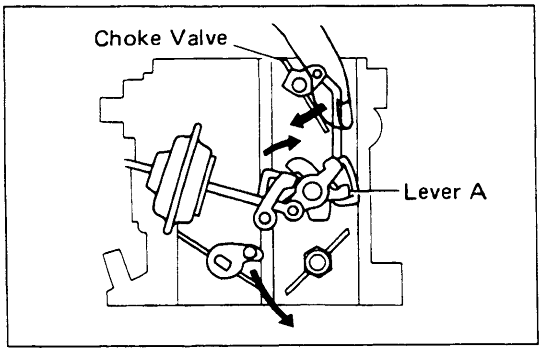


(c) Check that the lever A moves smoothly at step 2 or 3 of the fast idle cam. Adjust by bending the top of lever A.

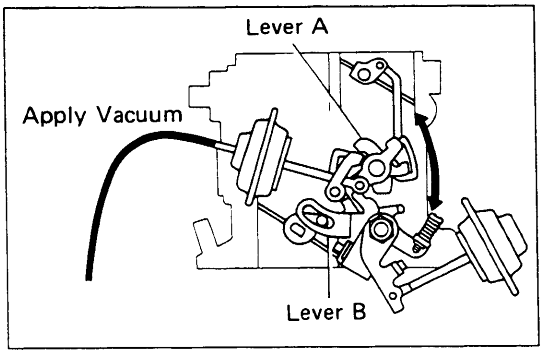


(d) In condition (a), rotate lever B to where it makes contact with lever A. In this position, measure the clearance between the secondary valve and bore. Adjust by bending the top of lever A.

Standard clearance: 0 – 0.5 mm
(0 – 0.020 in.)

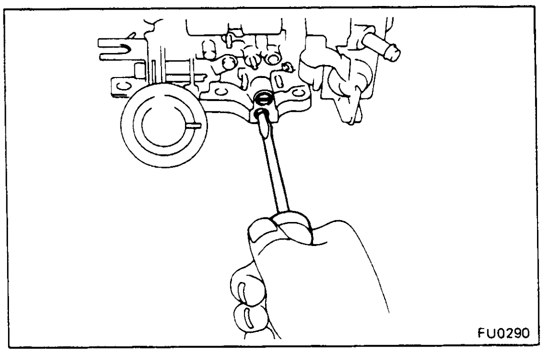


(e) With the choke valve opened (above 52°), check that lever A unlocks when the throttle valve is opened.



(f) Repeat step (a).

(g) Apply vacuum to the choke opener and check that lever A withdraws and that lever B unlocks.

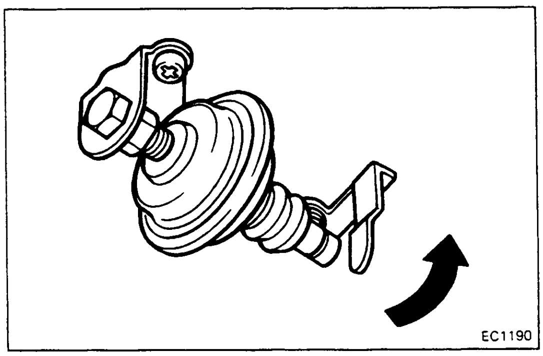


11. PRESET IDLE MIXTURE ADJUSTING SCREW

If the idle mixture adjusting screw plug has been removed, fully screw in the idle mixture screw and then unscrew it to the following amount.

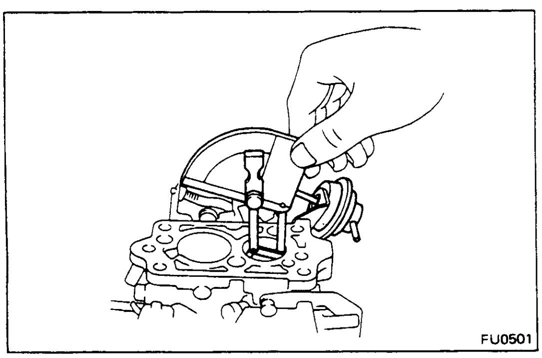
Standard: Return $3^1/_2$ turns from fully closed position

CAUTION: Use care not to screw it in too tightly and damage the screw tip.



12. CHECK AND ADJUST DASH POT

(a) Open the throttle valve untill the throttle lever separates from the dash pot end.



(b) Release the throttle valve gradually, and check the dash pot touch angle when the throttle lever touches the dash pot end.

Standard angle: 24.5° from horizontal plane

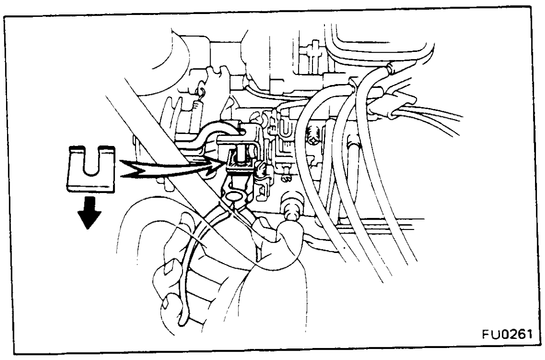
If the dash pot touch angle is not as specified, unlock the lock nut, and adjust the dash pot touch angle by turnin the dash pot diaphragm.

INSTALLATION OF CARBURETOR

1. INSTALL CARBURETOR

(a) Place the insulator on the intake manifold.

(b) Install the carburetor.Tighten the bolts and nuts securely.



2. CONNECT ACCELERATOR LINKAGE

Connect the linkage and install the clip.

3. CONNECT THROTTLE CABLE FOR AUTOMATIC TRANSMISSION (See page AT-20)

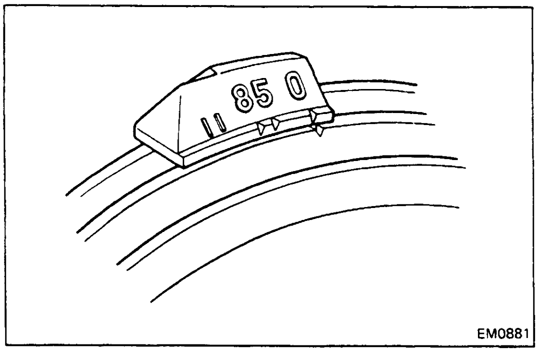
4. CONNECT FOLLOWING HOSES TO CARBURETOR:

(a) Fuel inlet hose

(b) PCV hose

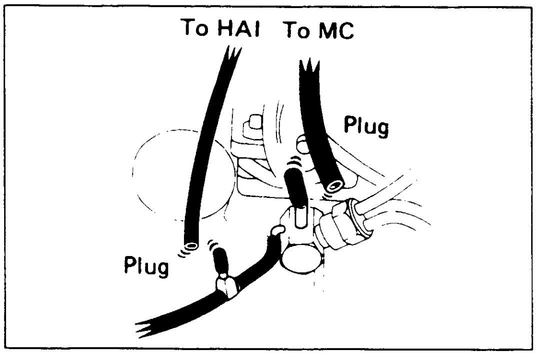
(c) Emission control hoses (see system layout in the emission control section or the layout printed under the hood)

(d) Wiring connector

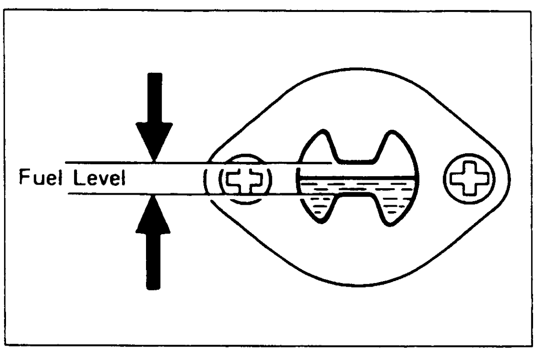


ADJUSTMENT OF CARBRETOR (ON-VEHICLE)

1. **INITIAL CONDITIONS OF CARBURETOR ADJUSTMENT**
   (a) All accessories switched off
   (b) Ignition timing set correctly
   (c) Transmission in N range

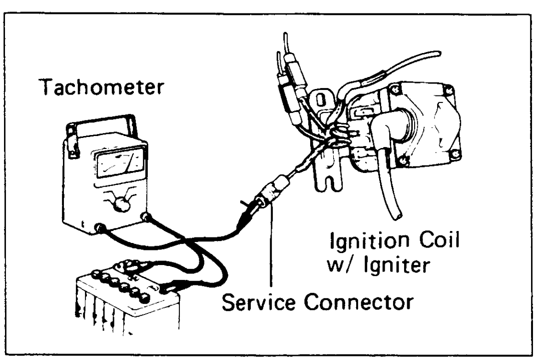


2. **START ENGINE**
   Start the engine and warm it up to normal operating temperature.
   NOTE: Plug the hose connections for HAI and MC (for M/T) systems to prevent rough idling.

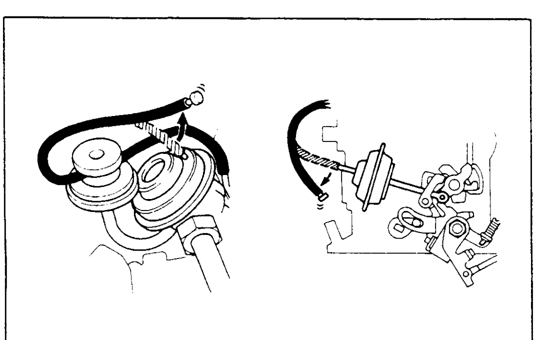


3. **CHECK FLOAT LEVEL**
   Fuel level should be about even with the correct level in the sight glass.

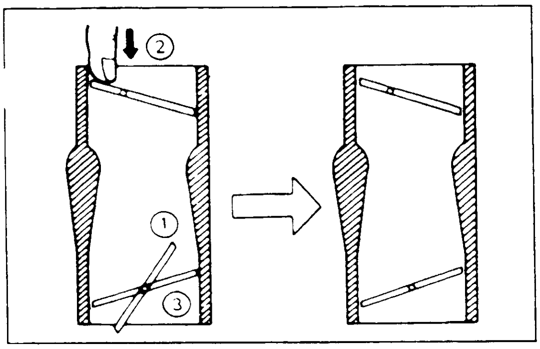
4. **CHECK THAT CHOKE VALVE OPENS FULLY**



5. **CONNECT TACHOMETER**
   Connect the tachometer test probe to the ignition coil negative terminal.
   CAUTION:
   1. **NEVER allow the ignition coil terminals to touch ground as it could result in damage to the igniter and/or ignition coil.**
   2. **As some tachometers are not compatible with this ignition system, it is recommended that you consult with the manufacturer.**

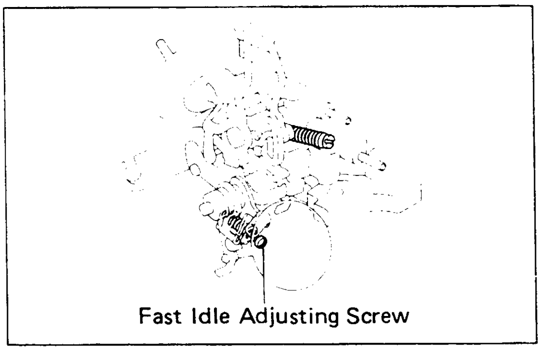


6. **ADJUST FAST IDLE SPEED**
   (a) Disconnect the vacuum hose from the choke opener diaphragm and EGR valve, and plug the hose end.



(b) Set the fast idle cam.
While holding the throttle valve slightly open, push the choke valve closed and hold it closed as you release the throttle valve.

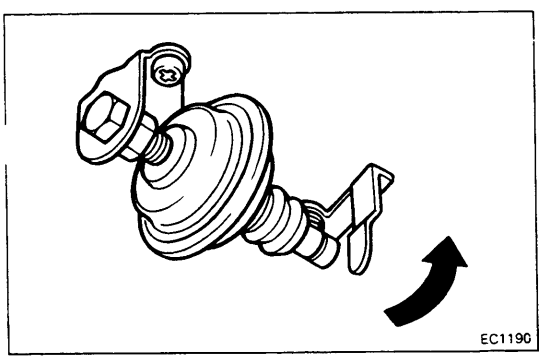
(c) Start the engine, but do NOT depress the accelerator pedal.



(d) Adjust the fast idle speed by turning the fast idle adjusting screw.

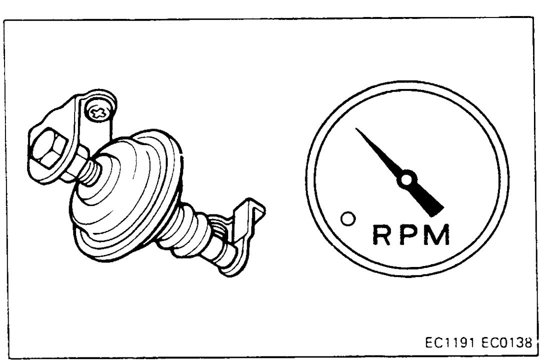
Fast idle speed: 2,600rpm

(e) Reconnect the vacuum hoses to the proper locations.



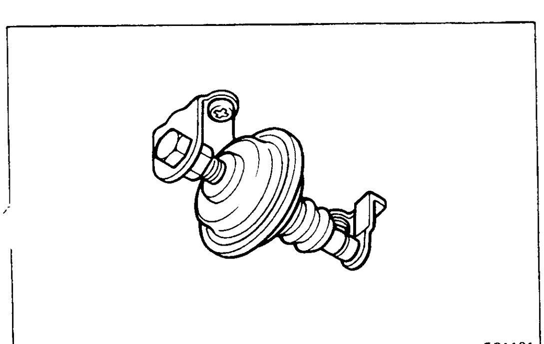
7. CHECK DASH POT SETTING SPEED

(a) Open the throttle valve until the throttle lever separates from the dash pot end.

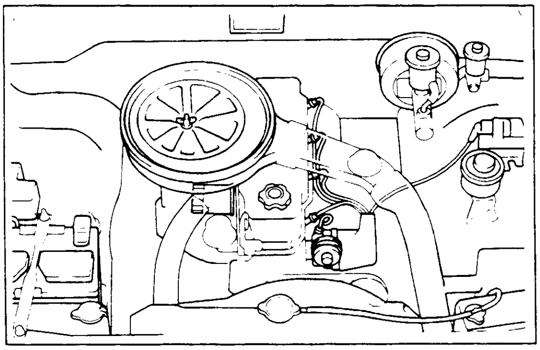


(b) Release the throttle valve gradually, and check the dash pot setting speed when the throttle lever touches the dash pot end.

Dash pot setting speed: 3,000 rpm



If the speed is not as specified, unlock the lock nut, and adjust the setting speed by turning the dash pot diaphragm.



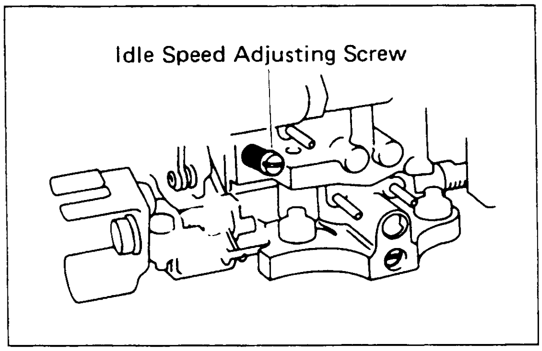
8. **STOP ENGINE**

9. **INSTALL AIR CLEANER**

(a) Place the air cleaner in position and install the two mounting nuts and butterfly nut.

(b) Connect the air intake hoses.

(c) Connect the emission control hoses.



10. **ADJUST IDLE SPEED**

Adjust the idle speed by turning the idle speed adjusting screw.

Idle speed: 700 rpm M/T
750 rpm A/T

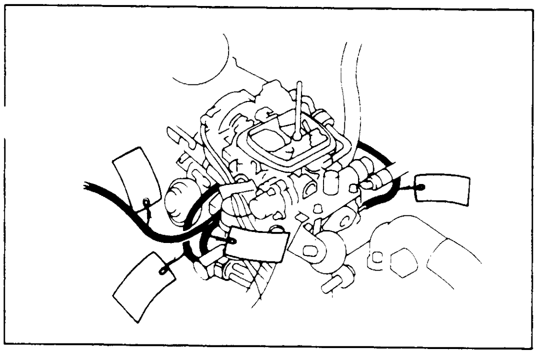
11. **IF NECESSARY, ADJUST IDLE MIXTURE**
(See page FU-25)

12. **REMOVE TACHOMETER**

Idle Mixture

ADJUSTMENT OF IDLE MIXTURE

NOTE:
- To conform with regulations, the idle mixture adjusting screw is adjusted and plugged with a steel plug by the manufacturer.
  Normally, this steel plug should not be removed.
- When troubleshooting rough idle, check all other possible causes before attempting to adjust the idle mixture. (See TROUBLESHOOTING on page FU-2)
  Only if no other factors are found to be at fault, should the idle mixture be adjusted and, when doing so, remove the plug and follow the procedure described below.

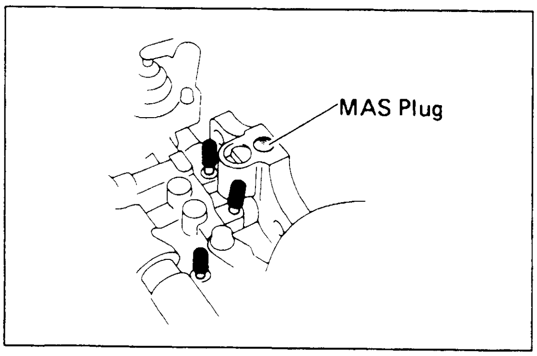


1. REMOVE CARBURETOR

(a) Before disconnecting the vacuum hoses, use tags to identify how they should be reconnected.

(b) Remove the carburetor from the engine.

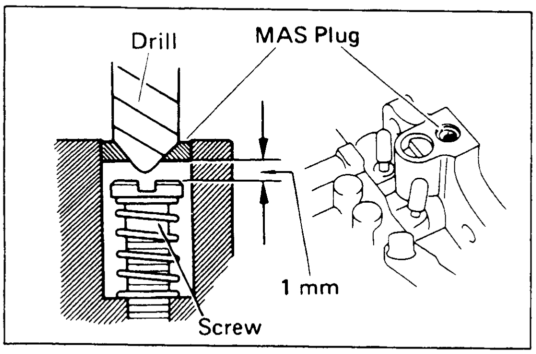
(c) After removing the carburetor, cover the intake manifold with a clean rag.



2. REMOVE MIXTURE ADJUSTING SCREW PLUG (MAS PLUG)

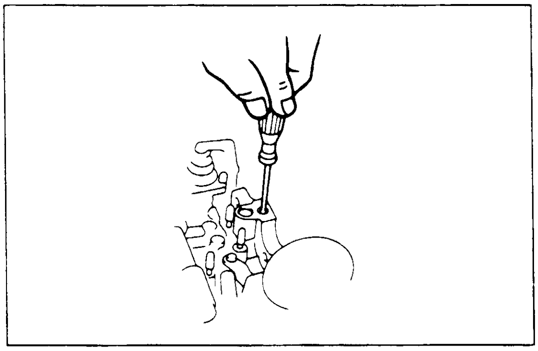
(a) Plug each carburetor vacuum port to prevent entry of steel particles when drilling.

(b) Mark the center of the plug with a punch.



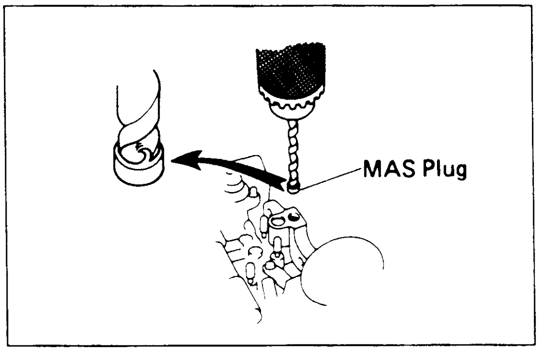
(c) Drill a 6.5mmϕ (0.256 in.ϕ)hole in the center of the plug.

NOTE:
- As there is only 1 mm (0.04 in.) clearance between the plug and screw, drill carefully and slowly to avoid drilling onto the screw.
- The drill may force the plug off at this time.

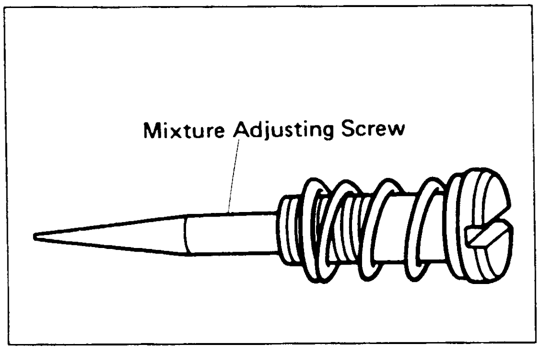


(d) Through the hole in the plug, fully screw in the mixture adjusting screw with a screwdriver.

NOTE: Be careful not to damage the screw tip by tightt ing the screw too tight.



(e) Use a 7.5mmϕ (0.295 in.ϕ) drill to force the plug off.

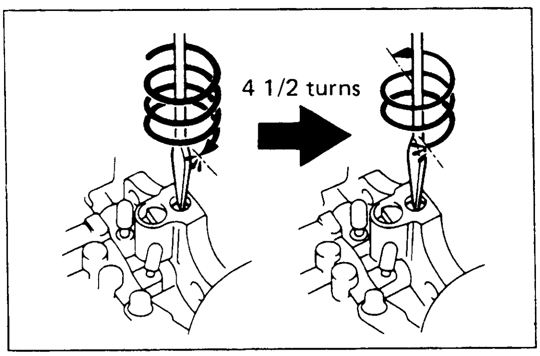


3. INSPECT MIXTURE ADJUSTING SCREW

(a) Blow off any steel particles with compressed air.

(b) Remove the screw and inspect it.

If the drill has gnawed into the screw top or if the tape. position is damaged, replace the screw.



4. REINSTALL MIXTURE ADJUSTING SCREW

Fully screw in the idle mixture adjusting screw and then unscrew it about $3^1/_2$ turns.

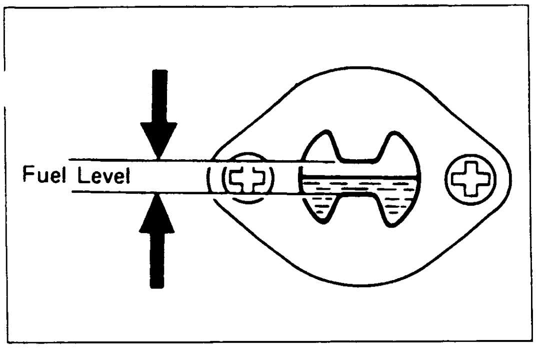
NOTE: Be careful not to damage the screw tip by tightening the screw too tight.

5. REINSTALL CARBURETOR

(a) Reinstall the carburetor on the engine.

(b) Reconnect the vacuum hoses to the proper locations. Refer to the information lable on the vacuum hose.

6. REINSTALL AIR CLEANER

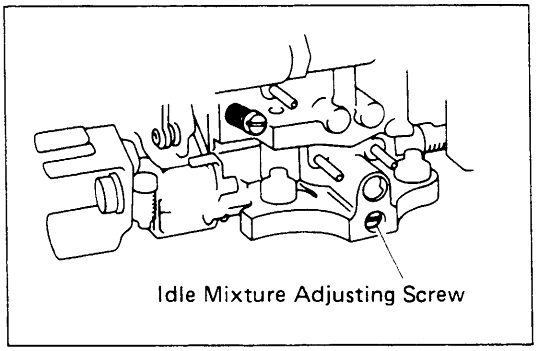


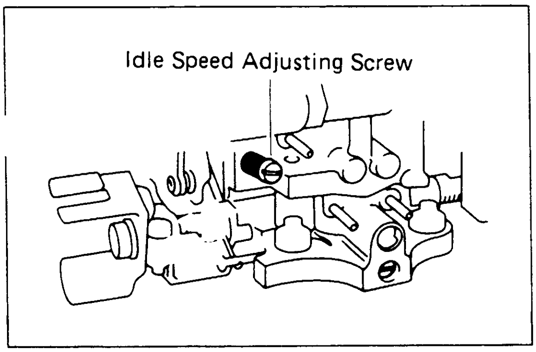
7. ADJUST IDLE SPEED AND IDLE MIXURE

(a) Initial conditions:
- Air cleaner installed
- Normal operating coolant temperature
- Choke fully open
- All accessories switched off
- All vacuum lines connected
- Ignition timing set correctly
- Transmission in N range
- Fuel level should be about even with the correct level in the sight glass.
- EBCV off (for Calif.)

(b) Start the engine.

(c) Set to the maximum speed by turning the IDLE MIXTURE ADJUSTING SCREW.

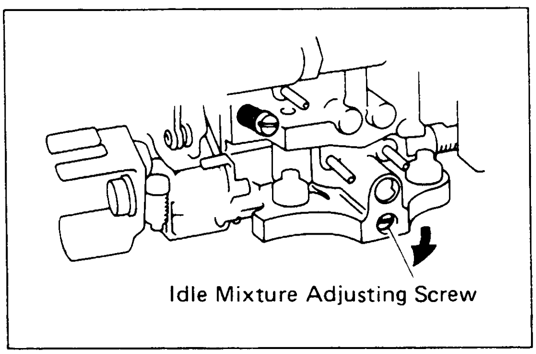




(d) Set to the idle mixture speed by turning the IDLE SPEED ADJUSTING SCREW.

Idle mixture speed:
740 rpm (M/T)
790 rpm (A/T)

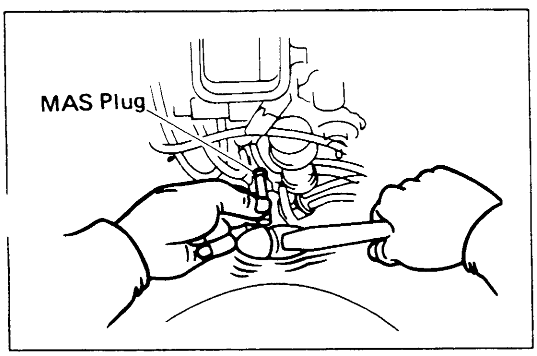
(e) Before moving to the next step,continue adjustments (c) and (d) until the maximum speed will not rise any further no matter how much the IDLE MIXTURE ADJUSTING SCREW is adjusted.



(f) Set to the idle speed by screwing in the IDLE MIXTURE ADJUSTING SCREW.

Idle speed:
700 rpm (M/T)
750 rpm (A/T)

NOTE: This is the Lean Drop Method for setting idle speed and mixture.



8. PLUG IDLE MIXTURE ADJUSTING SCREW

(a) Remove the air cleaner.

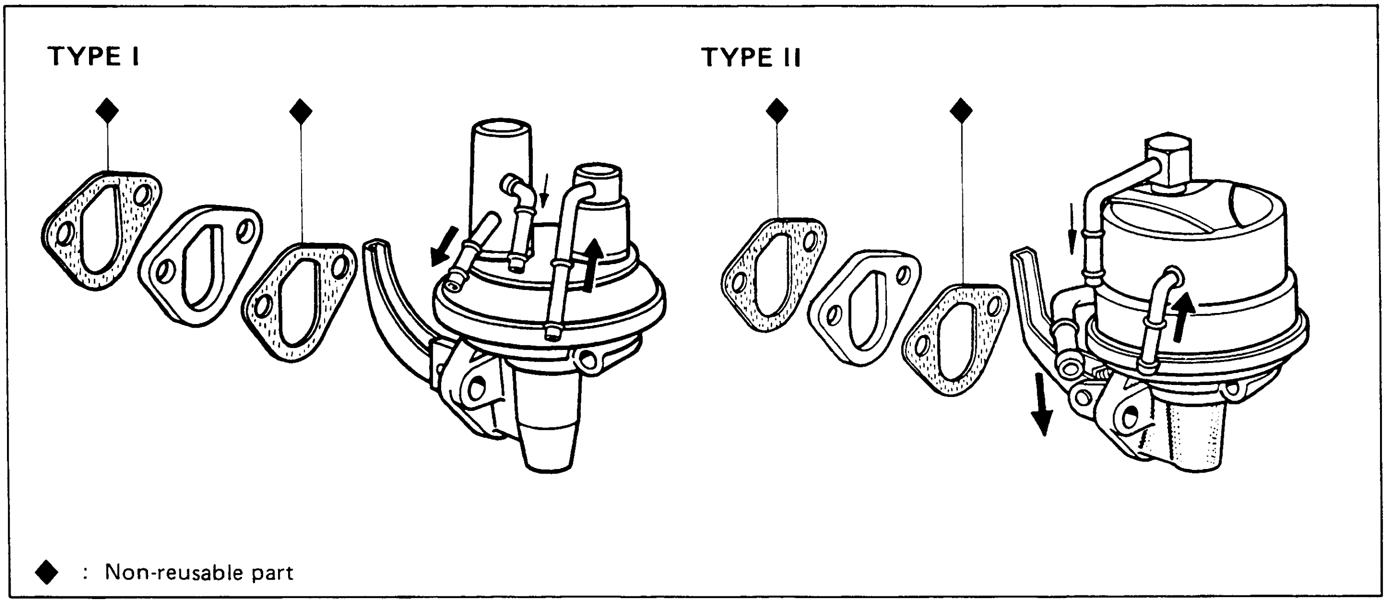
(b) Tap in new plug until it is even with carburetor surface.

(c) Reinstall the air cleaner.

9. CHECK AND ADJUST FAST IDLE SPEED
(See step 6 on page FU-22)

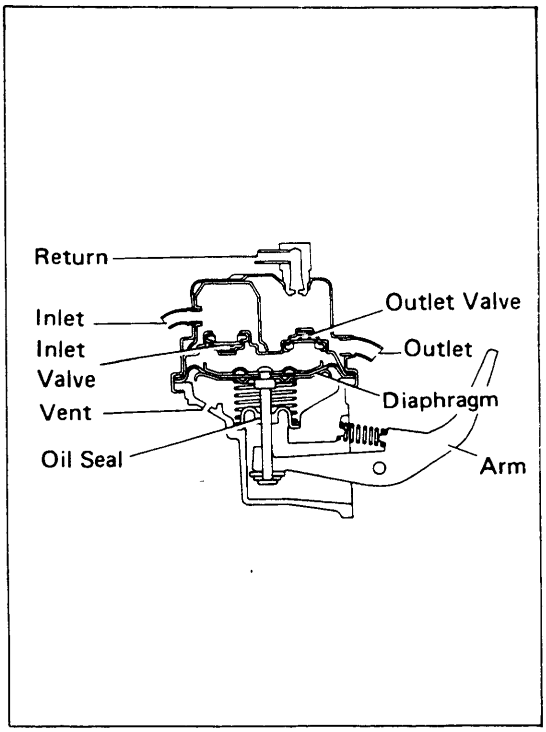
FUEL PUMP

COMPONENTS



REMOVAL OF FUEL PUMP

1. **DRAIN COOLANT**
   Open the radiator drain cock and allow the coolant to dr-' into a suitable container.
2. **DISCONNECT UPPER RADIATOR HOSE**
3. **DISCONNECT THREE FUEL HOSES FROM FUEL PUMP**
4. **REMOVE FUEL PUMP**
   Remove the two bolts, fuel pump and gasket.



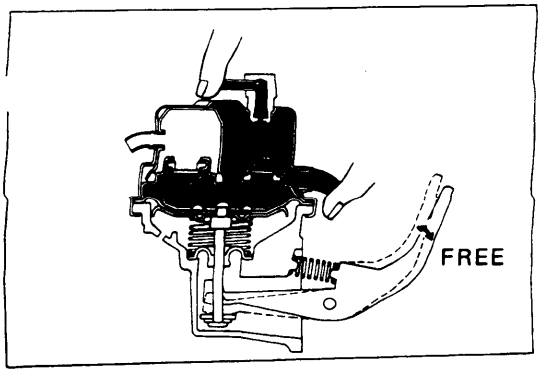
INSPECTION OF FUEL PUMP (Airtight Test)

PRECHECKS

Before preforming the following checks on the fuel pump:

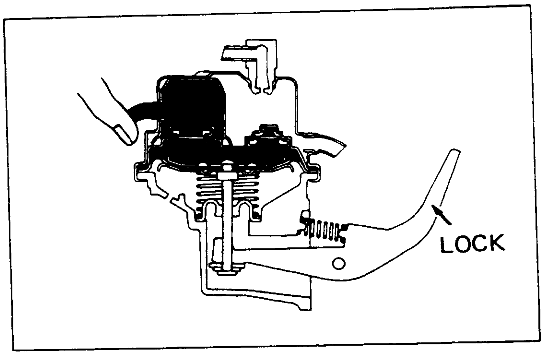
(a) Run some fuel through the pump to insure that the check valves seal tightly (a dry check valve may not seal properly).

(b) Without blocking off any pipe,operate the pump lever and check the amount of force necessary for operation and the amount of arm play.This same amount of force should be used in the checks.



1. **CHECK INLET VALVE**

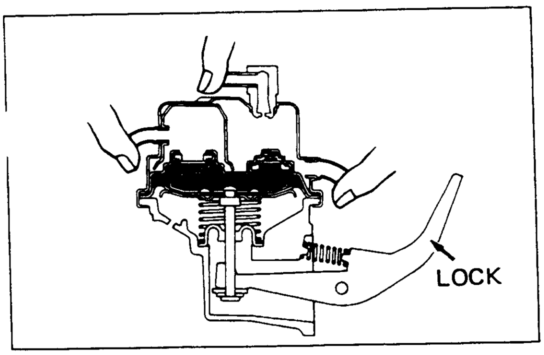
   Block off the outlet pipes with your finger and check that there is an increase in lever arm play and that the lever arm moves without tension.



2. **CHECK OUTLET VALVE**

   Block off the inlet pipe with your finger and check that the arm locks (does not operate with same amount of force used in the precheck above).

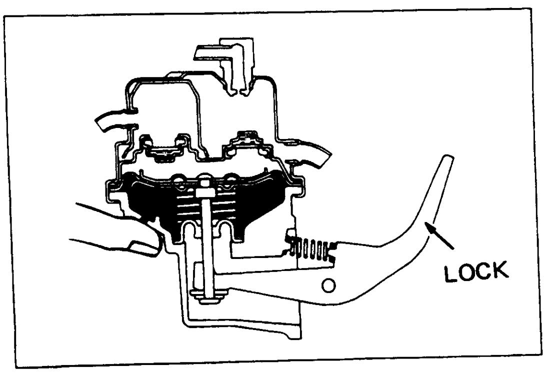
   NOTE: Never use more force than that used in the precheck (This applies to checks 3 and 4 also).



3. **CHECK DIAPHRAGM**

   Block off the inlet and outlet pipes and check that the pump arm locks.

   NOTE: If any of these checks are not as specified, the caulking (sealing) of the body and upper casing is defective.



4. **CHECK OIL SEAL**

   Block off the vent hole with your finger and check that the pump arm locks.

INSTALLATION OF FUEL PUMP

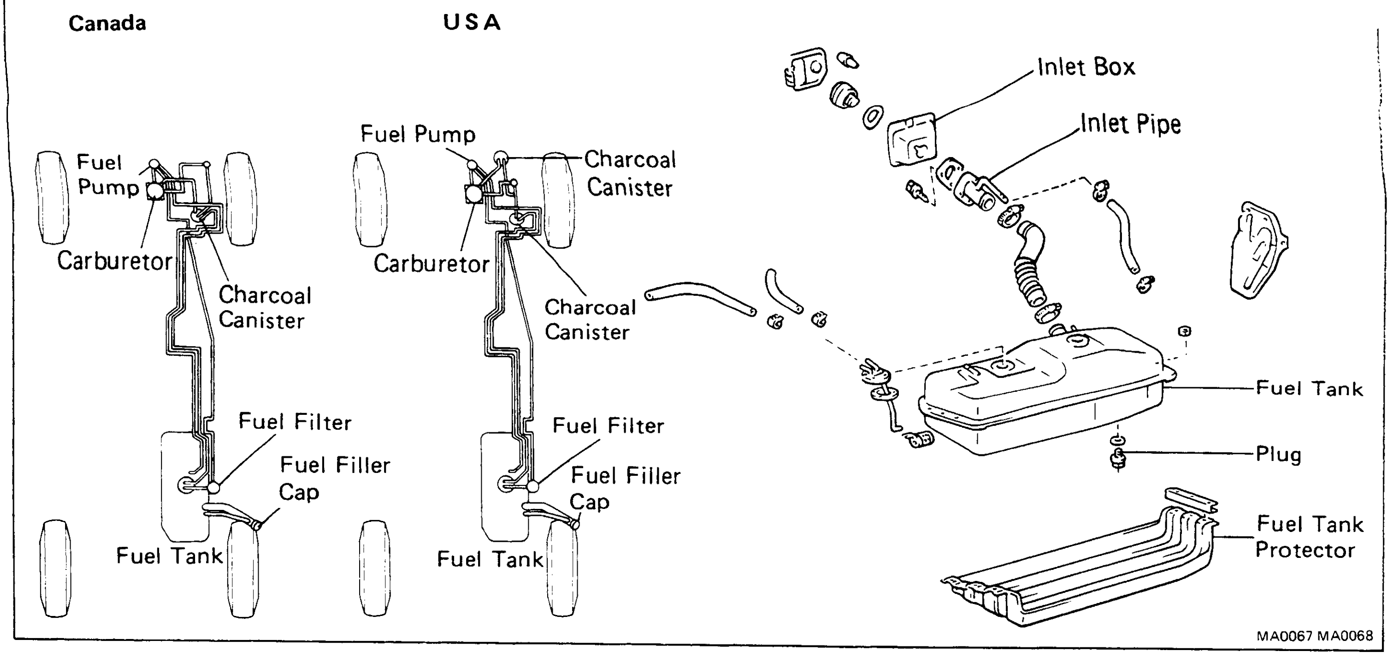
(See page FU-28)

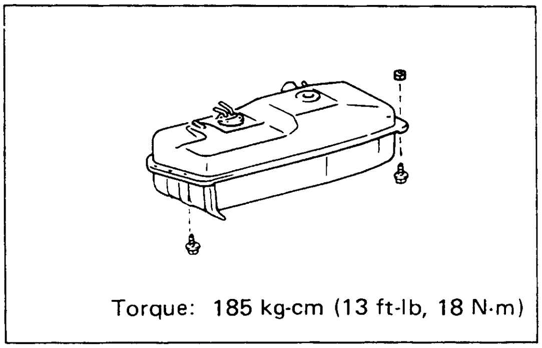
1. **INSTALL FUEL PUMP WITH NEW GASKET**
2. **INSTALL TWO BOLTS**
3. **CONNECT THREE FUEL HOSES TO FUEL PUMP**
4. **CONNECT UPPER RADIATOR HOSE**
5. **FILL WITH COOLANT**

   Close the radiator drain cock and fill the radiator with a good brand of ethylene-glycol coolant.

6. **START ENGINE AND CHECK FOR LEAKS**

Fuel Tank and Line





PRECAUTIONS

1. **Always use new gaskets when replacing the fuel tank or component parts.**
2. **When re-installing, be sure to include the rubber protectors on the upper surfaces of the fuel tank and tank band.**
3. **Apply the proper torque to all tightening parts.**

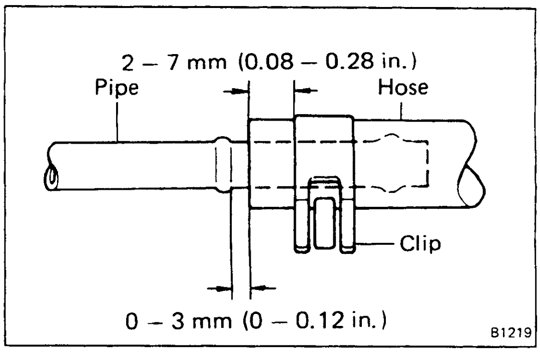
INSPECT FUEL LINES AND CONNECTIONS

(a) Inspect the fuel lines for cracks, or leakage and connections for deformation.

(b) Inspect the fuel tank vapor vent system hoses and connections for looseness, sharp bends or damage.

(c) Inspect the fuel tank for deformation, cracks, fuel leakage or tank band looseness.

(d) Inspect the inlet pipe for damage or fuel leakage.



(e) The hose and tube connections are as shown in the illustration.

If a problem is found, repair or replace the parts as necessary.

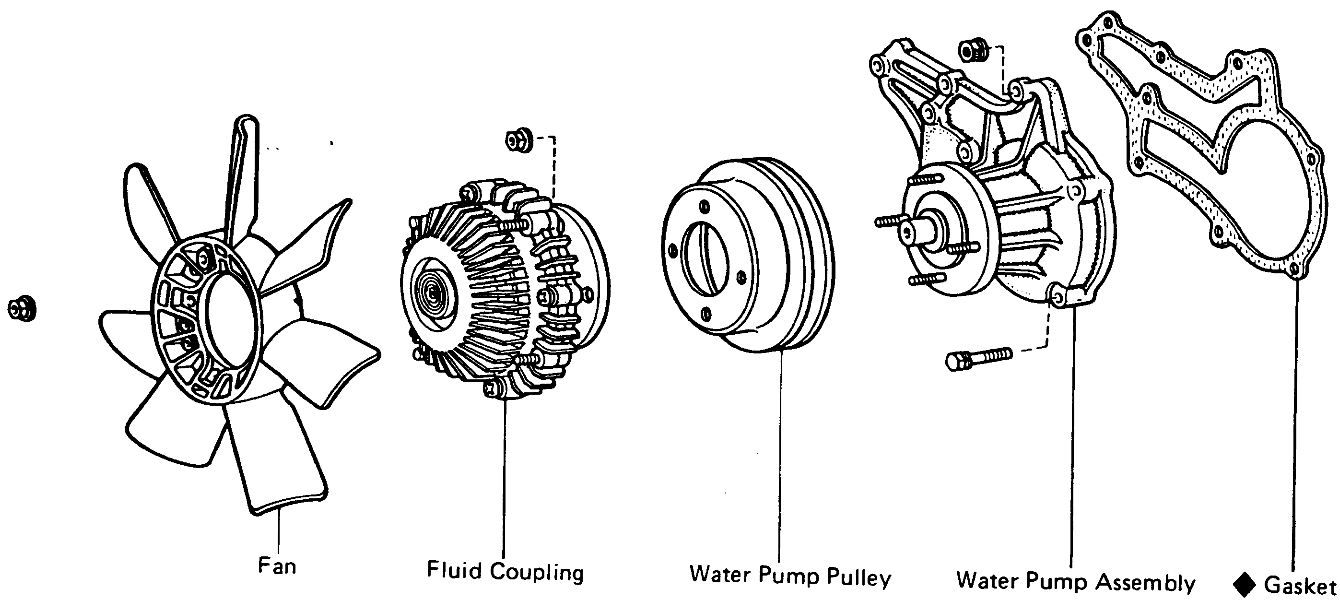
COOLING SYSTEM

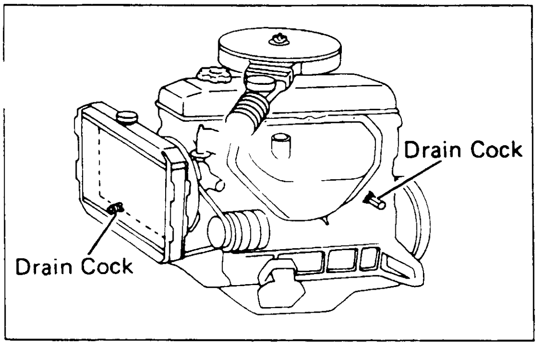
TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Engine overheats	Radiator plugged or cap faulty	Check radiator	CO-6
	Fan belt loose or missing	Adjust or replace belt	
	Dirt, leaves or insects on radiator or condenser	Clean radiator or condenser	CO-6
	Hoses, water pump, thermostat housing, radiator, heater, core plugs or head gasket leakage	Repair as necessary	
	Thermostat faulty	Check thermostat	CO-5
	Ignition timing retarded	Reset timing	IG-10
	Fluid coupling faulty	Replace fluid coupling	CO-3
	Radiator hose plugged or rotted	Replace hose	CO-6
	Water pump faulty	Replace water pump	CO-3
	Cylinder head or block cracked or plugged	Repair as necessary	

WATER PUMP

COMPONENTS

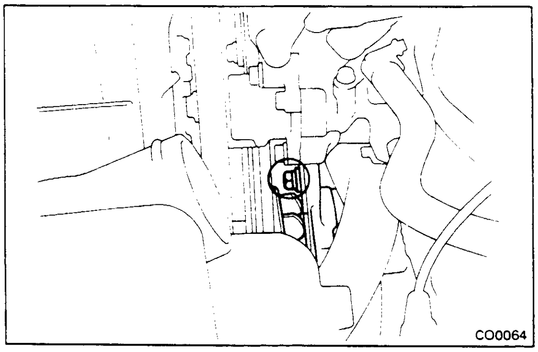




REMOVAL OF WATER PUMP

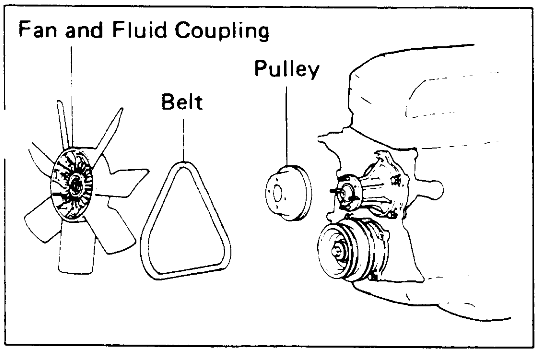
1. DRAIN COOLANT

Open the radiator and engine drain cocks, and allow coolant to drain into a suitable container.



2. LOOSEN FAN BELT

Loosen alternator pivot and adjusting bolts. Swing the alternator toward the engine.

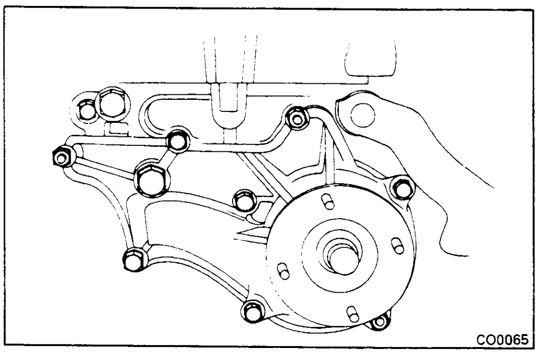


3. REMOVE FLUID COUPLING, FAN AND WATER PUMP PULLEY

(a) Remove the four nuts from the fluid coupling flange.

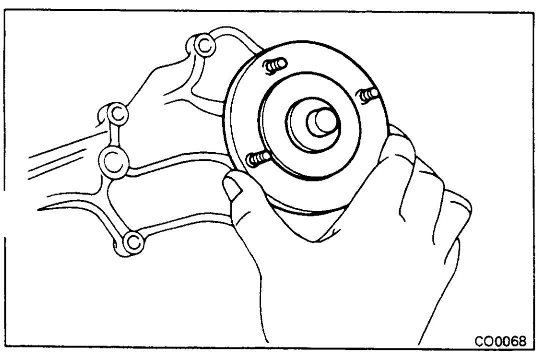
(b) Remove the fluid coupling, water pump pulley and fan belt.

(c) Remove the fan from the fluid coupling.



4. REMOVE WATER PUMP

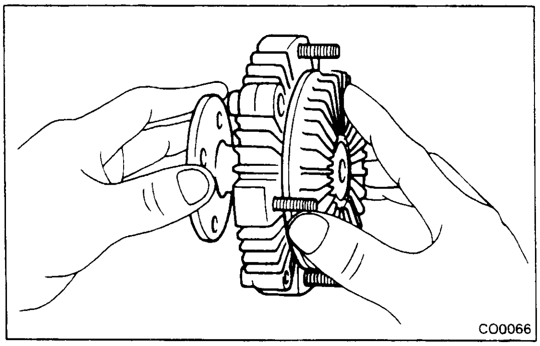
Remove the six bolts, three nuts, water pump and gasket.



INSPECTION OF WATER PUMP

1. INSPECT WATER PUMP BEARING

Check that water pump bearing operation is not rough or noisy.



2. **INSPECT FLUID COUPLING**

Check the fluid coupling for damage and silicone oil leakage

INSTALLATION OF WATER PUMP

(See page CO-2)

1. **INSTALL WATER PUMP OVER NEW GASKET**

Install the water pump and a new gasket with six bolts and three nuts.

2. **INSTALL FAN BELT AND PULLEY**

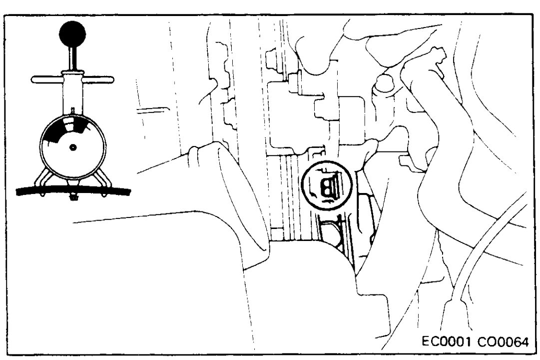
(a) Check the fan belt for cracks or damage.

(b) Place the fan belt on the pulley and place the pulley on the water pump bolts.

3. **INSTALL FAN ON FLUID COUPLING**

4. **INSTALL FLUID COUPLING**

Install the fluid coupling on the pulley with four nuts.



5. **ADJUST FAN BELT TENSION**

Using a belt tension gauge, check the drive belt tension.

Belt tension gauge:

Nippondenso BTG-20 (95506-00020) or
Borroughs No. BT-33-73F

Belt tension:

New belt 125 ± 25 lb
Used belt 80 ± 20 lb

6. **REFILL COOLANT**

Close the radiator and engine drain cocks. Fill with a good brand of ethylene-glycol coolant.

Total capacity: 8.4 liters (8.9 US qts, 7.4 Imp. qts)

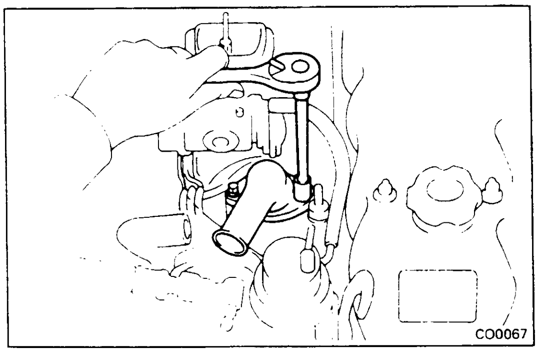
7. **START ENGINE AND CHECK FOR LEAKS**

THERMOSTAT

REMOVAL OF THERMOSTAT

1. **DRAIN COOLANT**

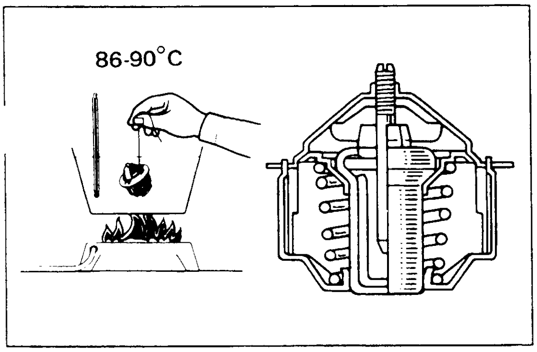
   Drain the coolant from the radiator into a clean container. The coolant may be reused if specific gravity is within specifications.

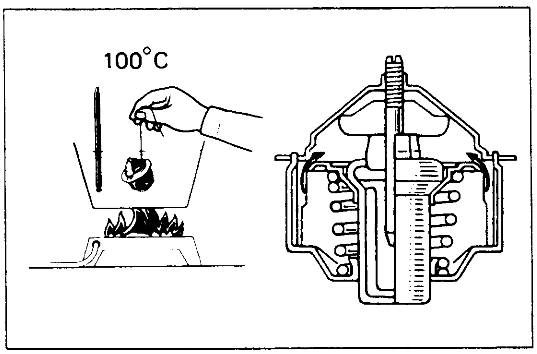


2. **REMOVE WATER OUTLET**

   Remove the two bolts and water outlet from the intake manifold.

3. **REMOVE THERMOSTAT AND GASKET**





INSPECTION OF THERMOSTAT

NOTE: The thermostat is marked with the valve opening temperature.

(a) Immerse the thermostat in water and heat the water gradually.

(b) Check the valve opening temperature and valve lift. If the valve opening temperature and valve lift are out of following specifications, replace the thermostat.

Valve opening temperature: 86 – 90 °C (187 – 194 °F)

Valve lift: More than 8 mm (0.31 in.) at 100 °C (212 °F)

(c) Check that the valve spring is tight when the thermostat is fully closed, and replace if necessary.

INSTALLATION OF THERMOSTAT

1. **PLACE THERMOSTAT IN INTAKE MANIFOLD**

2. **INSTALL WATER OUTLET**

   Install the water outlet on a new gasket with two bolts.

3. **REFILL COOLANT**

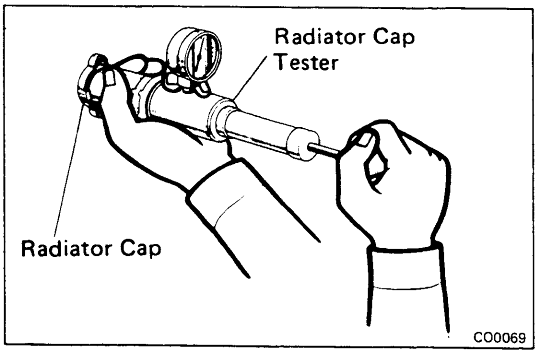
   Close the radiator drain cock. Fill with a good brand of ethylene-glycol coolant.

RADIATOR

CLEANING OF RADIATOR

Using water or a steam cleaner, remove mud and dust from radiator core.

CAUTION: If using high pressure type cleaner, be careful not to deform the radiator core fins. For example, keep a distance of at least 40 — 50 cm (15.75 — 19.69 in.) between the radiator core and cleaner nozzle when the cleaner nozzle pressure is 30 — 35 kg/cm² (427 — 498 psi, 2,942 — 3,432 kPa).



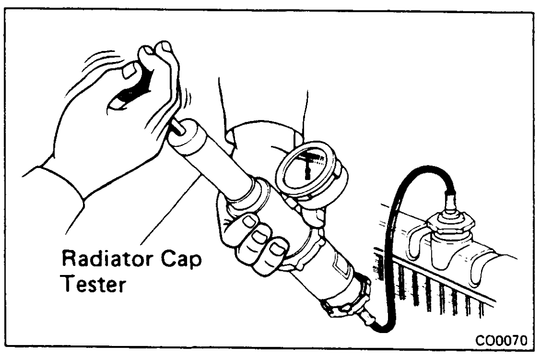
INSPECTION OF RADIATOR

1. **CHECK RADIATOR CAP**

   Using a pressure tester, pump the tester until the relief valve opens.
   Check that the valve opens between 0.75 kg/cm² (10.7 psi, 74 kPa) and 1.05 kg/cm² (15 psi, 103 kPa).

   Check that the pressure gauge does not drop rapidly when pressure on the cap is below 0.6 kg/cm² (8.5 psi, 59 kPa).

   If either check is not within limits, replace the cap.



2. **CHECK COOLING SYSTEM FOR LEAKS**

   Attach the pressure tester to the radiator and pump the tester to 0.9 kg/cm² (12.8 psi, 88 kPa). Check the pressure does not drop.
   If the pressure drop, check for leaks from the hoses, radiator or water pump. If no external leaks are found, check the heater core, block and intake manifold.

REMOVAL OF RADIATOR

1. **DRAIN COOLANT**

   Open radiator drain and engine drain cocks (located on the left of engine block). Drain the fluid into a suitable container.

2. **DISCONNECT TWO RADIATOR HOSES**

3. **REMOVE FAN SHROUD**

4. **DISCONNECT TWO COOLER HOSES (A/T only)**

   NOTE:

   (1) Be careful as some oil will leak out. Catch it in a suitable container.

   (2) Plug the hose to prevent oil from escaping.

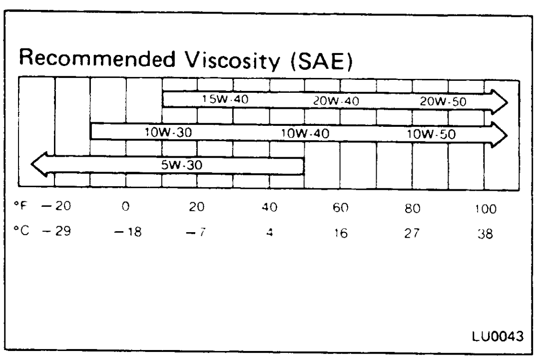
5. **DISCONNECT COOLANT RESERVOIR TUBE**

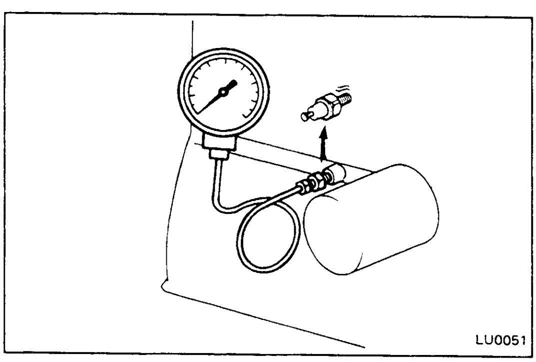
6. **REMOVE FOUR RADIATOR MOUNTING BOLTS AND RADIATOR**

LUBRICATION SYSTEM

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Oil leakage	Cylinder head, cylinder block or oil pump body damaged or cracked	Replace as necessary	
	Oil seal faulty	Replace oil seal	LU-4
	Gasket faulty	Replace gasket	
Low oil pressure	Oil leakage	Replace as necessary	
	Relief valve faulty	Replace relief valve	LU-4
	Oil pump faulty	Replace oil pump	LU-4
	Engine oil poor quality	Replace engine oil	LU-3
	Crankshaft bearing faulty	Replace bearing	
	Connecting rod bearing faulty	Replace bearing	
High oil pressure	Oil filter clogged	Replace oil filter	LU-3
	Relief valve faulty	Replace relief valve	LU-4





OIL PRESSURE CHECK

1. **CHECK OIL QUALITY**

   Check the oil for deterioration, entry of water, discolori· or thinning.

   If the quality is poor, change the oil.

   Use API grade SF or SF/CC multigrade, fuel-efficient and recommended viscosity oil.

2. **CHECK OIL LEVEL**

   The oil level should be between the L and F marks on the level gauge. If low, check for leakage and add oil up to the F mark.

3. **REMOVE OIL PRESSURE SWITCH OR SENDER GAUGE**

4. **INSTALL OIL PRESSURE GAUGE**

5. **START ENGINE**

   Start engine and warm it up to normal operating temperature.

6. **MEASURE OIL PRESSURE**

   Oil pressure:

At idle speed	**More than 0.3 kg/cm^2 (4.3 psi, 29 kPa)**
At 3,000 rpm	**2.5 — 5.0 kg/cm^2 (36 — 71 psi, 245 — 490 kPa)**

   NOTE: Check for oil leakage after reinstalling the oi pressure switch or sender guage.

REPLACEMENT OF ENGINE OIL AND OIL FILTER

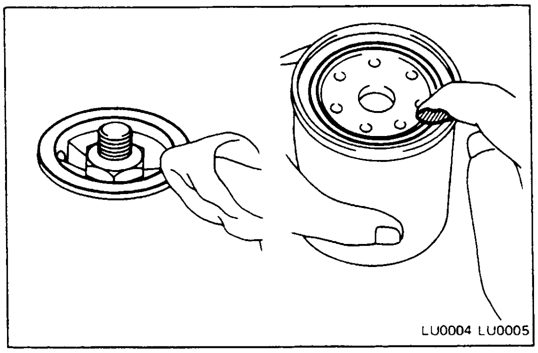
1. DRAIN ENGINE OIL

Remove the oil drain plug and drain the oil into a container.

2. REPLACE OIL FILTER

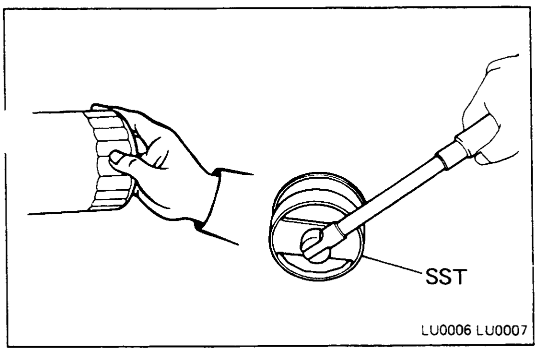
(a) Using SST, remove the oil filter (located on right side of the engine block).

SST 09228-44010



(b) Inspect and clean the oil filter installation surface.

(c) Apply clean engine oil to the gasket of the new oil filter.



(d) Lightly screw in the oil filter to where you feel resistance.

(e) Then, using SST, tighten the oil filter an extra 3/4 turn.

SST 09228-44010

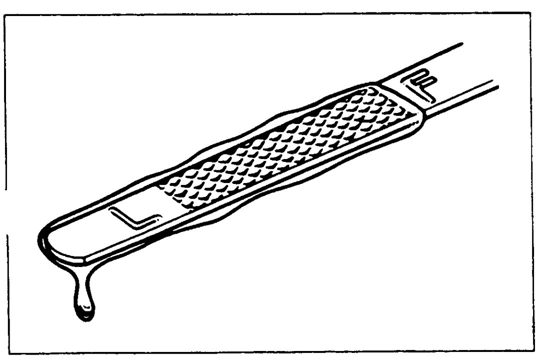
3. FILL WITH ENGINE OIL

(a) Clean and install the oil drain plug with a new gasket.

(b) Fill the engine with new oil API grade SF or SF/CC, multigrade, fuel efficient and recommended viscosity oil.

Oil capacity:

Dry fill	**4.8 liters (5.1 US qts, 4.2 Imp. qts)**
Drain and refill	
w/o Oil filter change	**4.0 liters (4.2 US qts, 3.5 Imp. qts)**
w/ Oil filter change	**4.6 liters (4.9 US qts, 4.0 Imp. qts)**



4. START ENGINE AND CHECK FOR LEAKS

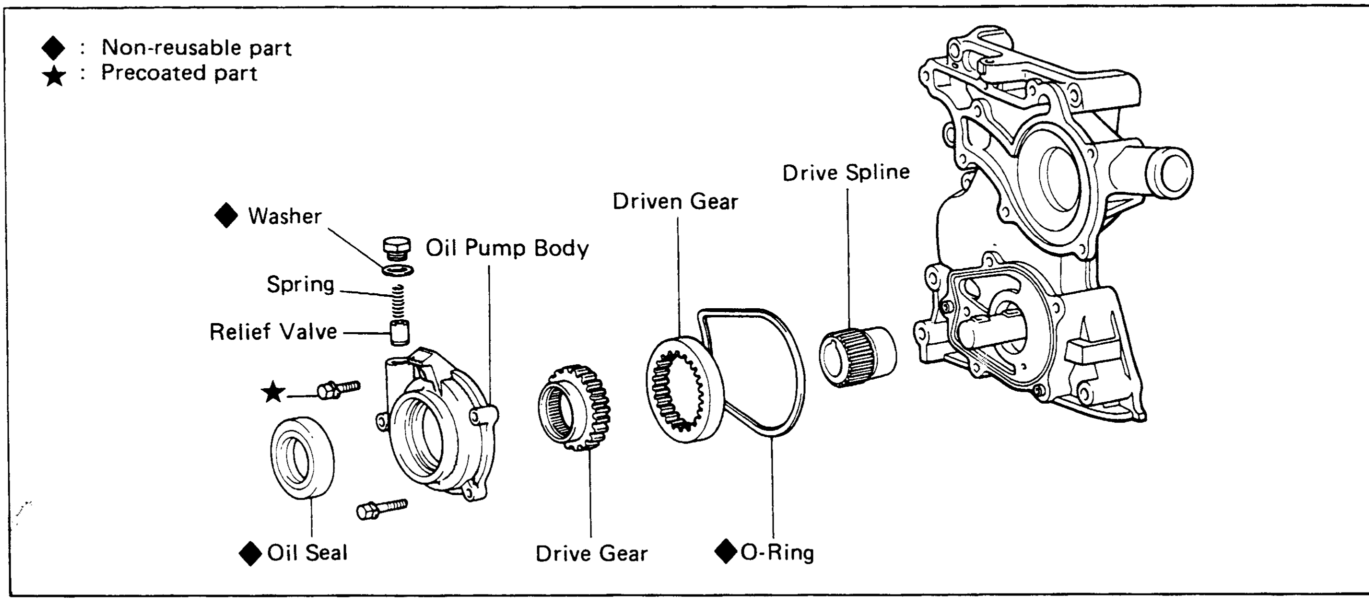
5. RECHECK ENGINE OIL LEVEL

Recheck the engine oil level and refill as necessary.

NOTE: Insert the oil level guage with the curved tip pointed toward the engine.

OIL PUMP

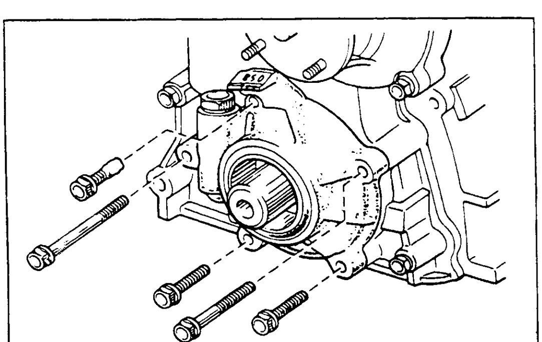
COMPONENTS



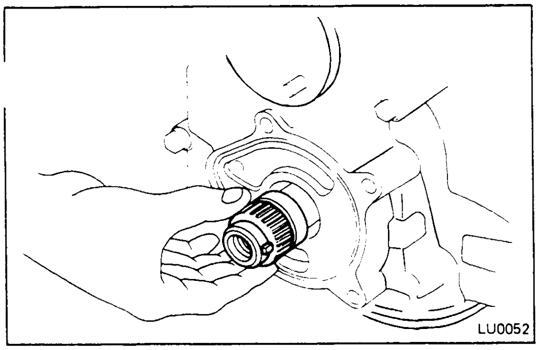
REMOVAL AND DISASSEMBLY OF OIL PUMP

NOTE: When repairing the oil pump, the oil pan and strainer should be removed and cleaned.

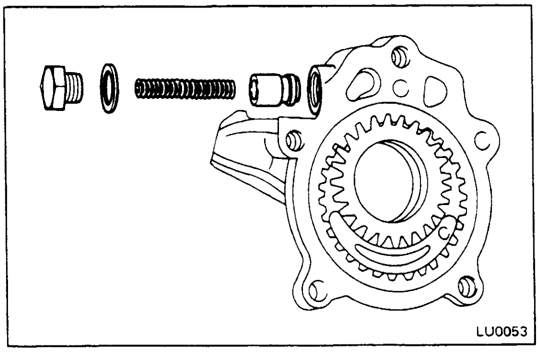
1. **REMOVE OIL PAN (ON-VEHICLE)**
   (See step 3 on page EM-40)
2. **REMOVE OIL STRAINER**
   Remove the four bolts holding the oil strainer.
3. **REMOVE DRIVE BELTS**
4. **REMOVE CRANKSHAFT PULLEY**
   (See step 3 on page EM-41)



5. **REMOVE OIL PUMP ASSEMBLY**
   Remove the five bolts and the oil pump assembly.



6. **REMOVE OIL PUMP DRIVE SPLINE AND O-RING**

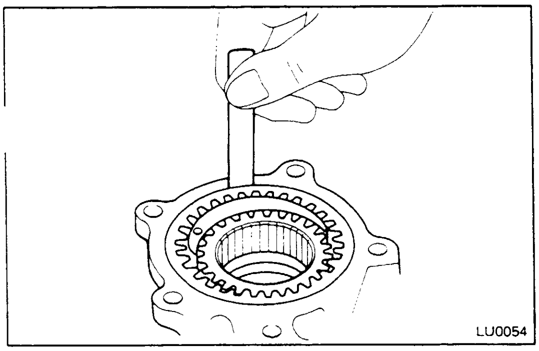


7. **DISASSEMBLE OIL PUMP ASSEMBLY**

   (a) Unscrew the relief valve plug, and remove the spring and the relief valve piston.

   (b) Remove the drive and the driven gears.

INSPECTION OF OIL PUMP

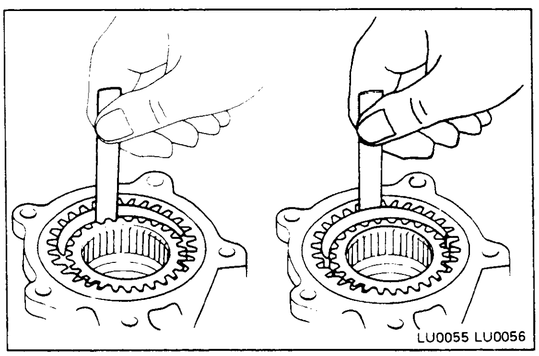


1. **MEASURE BODY CLEARANCE**

   Using a feeler gauge, measure the clearance between the driven gear and body.

   If the clearance is greater than the maximum, replace the gear and/or body.

   Maximum clearance: 0.2 mm (0.008 in.)

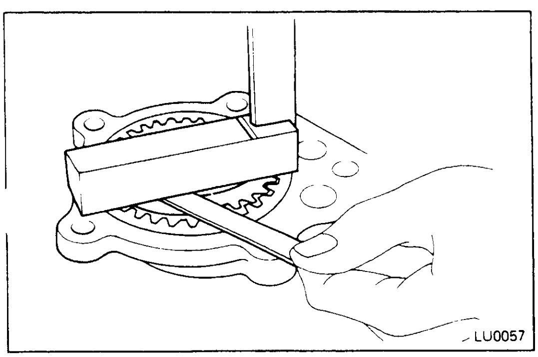


2. **MEASURE TIP CLEARANCE**

   Using a feeler gauge, measure the clearance between both gear tips and the crescent.

   If the clearance is greater than the maximum, replace the gears and/or body.

   Maximum clearance: 0.3 mm (0.012 in.)

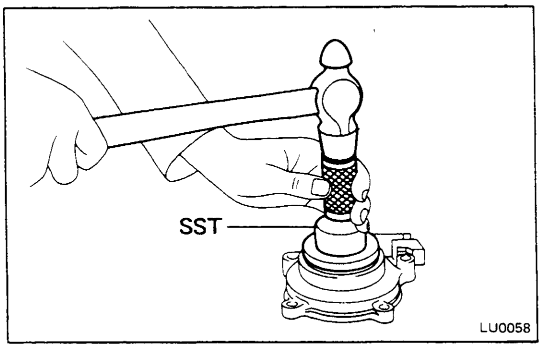


3. **MEASURE SIDE CLEARANCE**

   Using a feeler gauge and a flat block, measure the side clearance as shown.

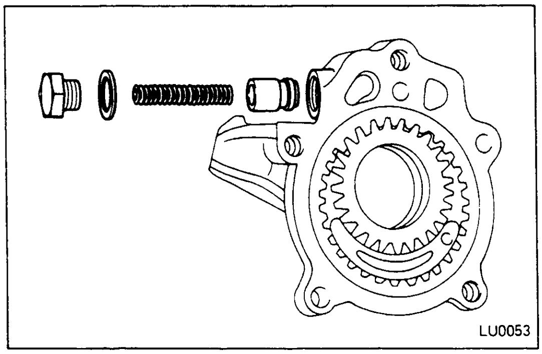
   If the clearance is greater than the maximum, replace the gears and/or body.

   Maximum clearance: 0.15 mm (0.0059 in.)



REPLACE FRONT OIL SEAL

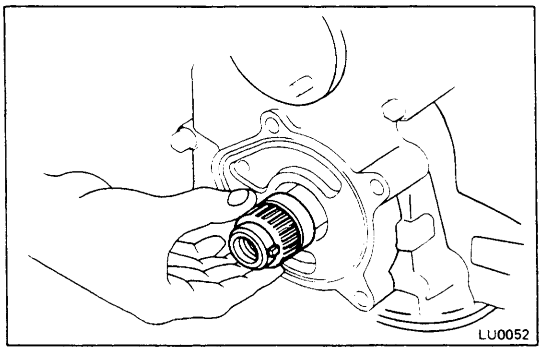
1. **REMOVE OIL SEAL**
   Remove the oil seal with a small screwdriver.
2. **INSTALL OIL SEAL**
   Drive in the new oil seal with SST.
   SST 09223-50010



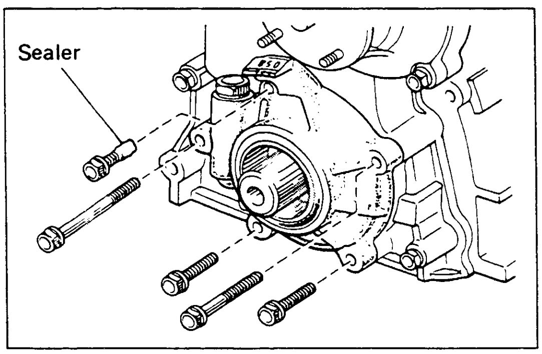
ASSEMBLY AND INSTALLATION OF OIL PUMP

(See page LU-4)

1. **ASSEMBLE OIL PUMP ASSEMBLY**
   (a) Install relief valve piston and the spring in the body, and screw on the relief valve plug with the gasket.
   (b) Insert the drive and driven gears into the pump body.

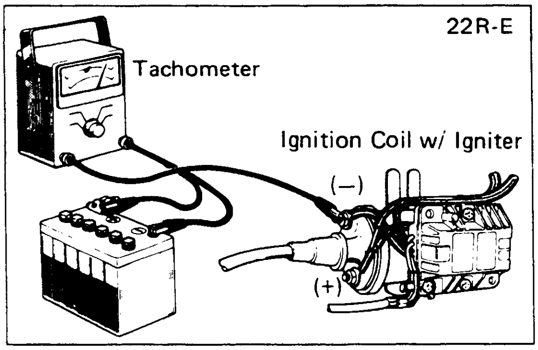


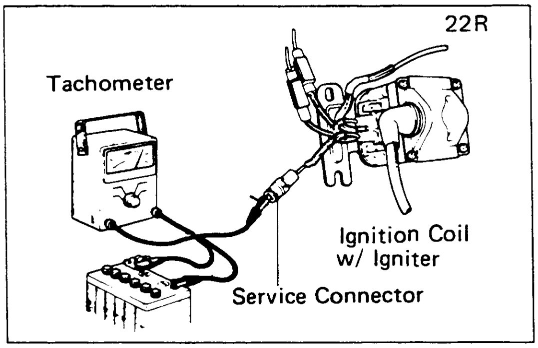
2. **INSTALL OIL PUMP DRIVE SPLINE AND O-RING**
   (a) Slide the pump drive spline onto the crankshaft.
   (b) Place the O-ring into the groove.



3. **INSTALL OIL PUMP**
   Apply the sealer to the upper bolt and tighten the five bolts.
4. **INSTALL FOLLOWING ITEMS:**
   (a) Clean oil strainer with four bolts.
   (b) Clean oil pan and cylinder block. (See step 10 on page EM-46)
   (c) Crankshaft pulley. (See step 8 on page EM-45)
   (d) Drive belts. (See step 9 on page EM-45)

IGNITION SYSTEM





PRECAUTIONS

1. **Do not allow the ignition switch to be ON for more th 10 minutes if the engine will not start.**
2. **As some tachometers are not compatible with this ignition system, it is recommended that you consult with the manufacturer.**
3. **NEVER allow the ignition coil terminals to touch ground as it could result in damage to the igniter and/or ignition coil.**
4. **Do not disconnect the battery when the engine is running.**
5. **Make sure that the igniter is properly grounded to the body.**
6. **When a tachometer is connected to the system, connect the tachometer test probe to the ignition coil negative terminal.**

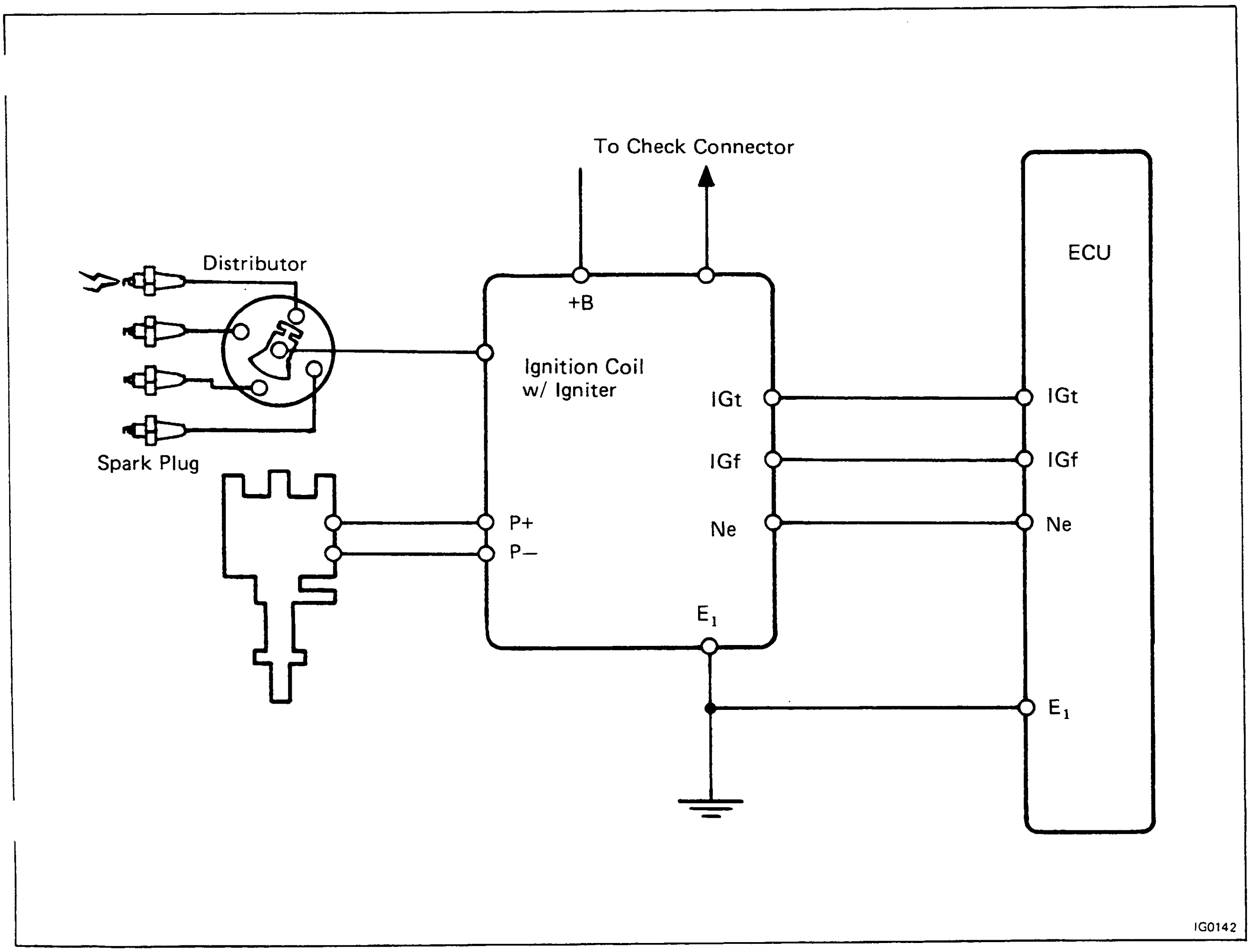
TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Engine will not start/ Hard to start (cranks ok)	Ignition problems • Ignition coil • Igniter • Distributor Spark plugs faulty Ignition wiring disconnected or broken	Perform spark test Inspect coil Inspect igniter Inspect distributor Inspect plugs Inspect wiring	IG-4 IG-5,7 IG-6,8 IG-9,10 IG-4 IG-4
Rough idle or stalls	Spark plugs faulty Ignition wiring faulty Incorrect ignition timing Ignition problems • Ignition coil • Igniter • Distributor	Inspect plugs Inspect wiring Reset timing Perform spark test Inspect coil Inspect igniter Inspect distributor	IG-4 IG-4 IG-10 IG-4 IG-5,7 IG-6,8 IG-9,10
Engine hesitates/ Poor acceleration	Spark plugs faulty Ignition wiring faulty Incorrect ignition timing	Inspect plugs Inspect wiring Reset timing	IG-4 IG-4 IG-10
Engine dieseling (for. carb.) (runs after ignition switch is turned off)	Fuel cut system faulty	Repair fuel cut system	
Muffler explosion (after fire) all the time	Incorrect ignition timing	Reset timing	IG-10
Engine backfires	Incorrect ignition timing	Reset timing	IG-10
Poor gasoline mileage	Spark plugs faulty Incorrect ignition timing	Inspect plugs Reset timing	IG-4 IG-10
Engine overheats	Incorrect ignition timing	Reset timing	IG-10

ELECTRONIC SPARK ADVANCE (ESA) FOR 22R-E

The ECU is programmed with data for optimum ignition timing under any and all operating conditions. Using data provided by sensors which monitor various engine functions (rpm, intake air volume, eng. temperature, etc.) the microcomputer (ECU) triggers the spark at precisely the right instant.

ESA SYSTEM CIRCUIT



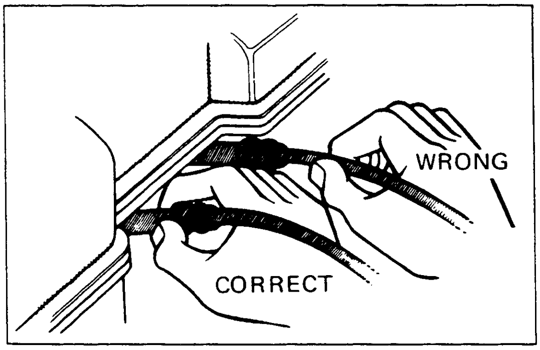
ON-VEHICLE INSPECTION

SPARK TEST

NOTE: Perform this test to check that current is coming from the distributor.

1. **CONNECT TIMING LIGHT TO EACH SPARK PLUG**
2. **CRANK ENGINE AND CHECK THAT LIGHT FLASHES**

   If the timing light does not flash, check the wiring connections, ignition coil, igniter, distributor or ignition switch.



INSPECTION OF HIGH TENSION CORD

1. **CAREFULLY REMOVE HIGH TENSION CORDS BY RUBBER BOOT**

   CAUTION: DO NOT pull on or bend the cords to avoid damaging the conductor inside.
2. **INSPECT CORD TERMINALS**

   Check the terminals for corrosion, breaks or distortion. Replace cords as required.
3. **CHECK CORD RESISTANCE**

   Using an ohmmeter, check that the resistance does not exceed the maximum. Replace cords as required.

   Maximum resistance: 25 kΩ per cord

INSPECTION OF SPARK PLUGS

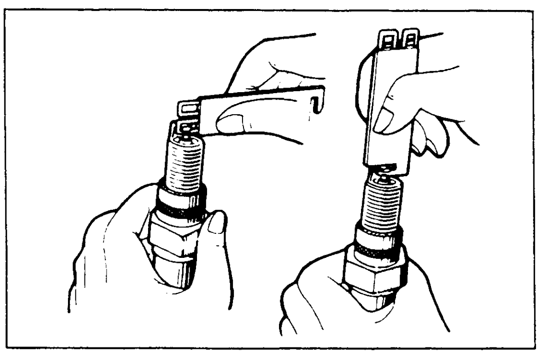
1. **REMOVE SPARK PLUGS**
2. **CLEAN AND INSPECT SPARK PLUGS**

   (a) Clean the spark plugs with a spark plug cleaner or wire brush.

   (b) Inspect the spark plugs for electrode wear, thread damage and insulator damage.

   If a problem is found, replace the plugs.

   Spark plug: ND W16EXR-U
   NGK BPR5EY



3. **ADJUST ELECTRODE GAP**

   Carefully bend the outer electrode to obtain the correct electrode gap.

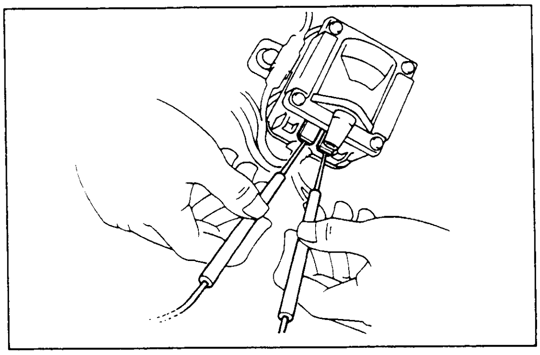
   Correct electrode gap: 0.8 mm (0.031 in.)
4. **INSTALL SPARK PLUGS**

[FOR 22R]

INSPECTION OF IGNITION COIL

1. **DISCONNECT HIGH TENSION WIRE AND IGNITION COIL CONNECTOR**

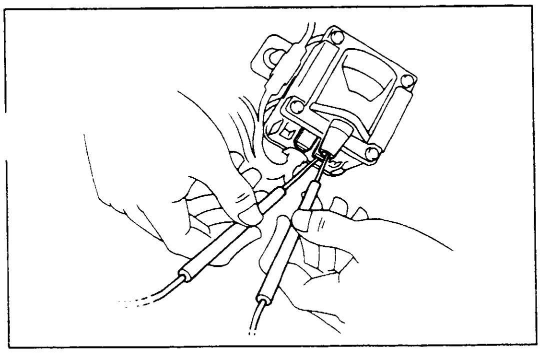
2. **CLEAN COIL AND CHECK FOLLOWING:**
   (a) Check for cracks or damage.
   (b) Check the terminals for carbon tracks.
   (c) Check the high-tension wire hole for carbon deposits and corrosion.



3. **MEASURE PRIMARY COIL RESISTANCE**

   Using an ohmmeter, measure the resistance between the positive (+) (brown side) and negative (—) (black side) terminals.

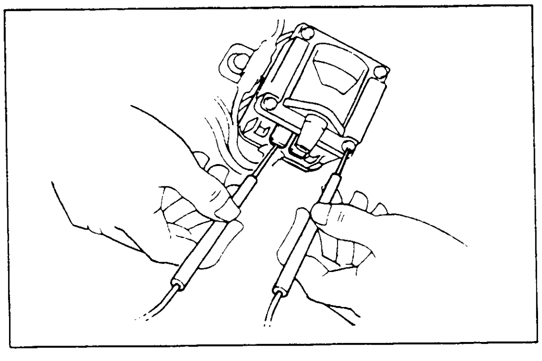
   Primary coil resistance (cold): 0.4 — 0.5 Ω



4. **MEASURE SECONDARY COIL RESISTANCE**

   Using an ohmmeter, measure the resistance between the positive (+) terminal (brown side) and the high tension terminal.

   Secondary coil resistance (cold): 8.5 — 11.5 kΩ



5. **MEASURE INSULATION RESISTANCE**

   Using an ohmmeter, measure the resistance between the positive (+) terminal and the igniter body.

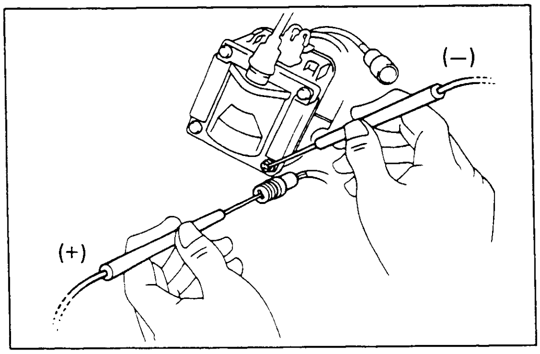
   Insulation resistance: Infinity

   If a problem with the coil is found, replace it.

6. **CONNECT HIGH TENSION WIRE AND IGNITION COIL CONNECTOR**

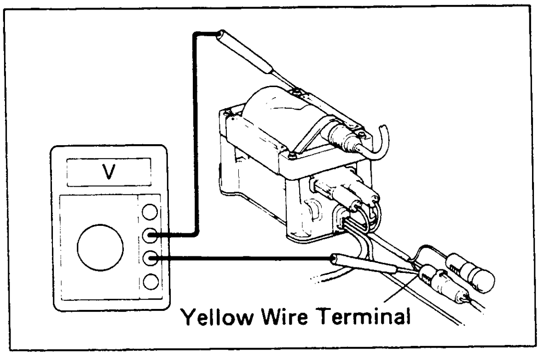
INSPECTION OF IGNITER

1. **TURN IGNITION SWITCH ON**



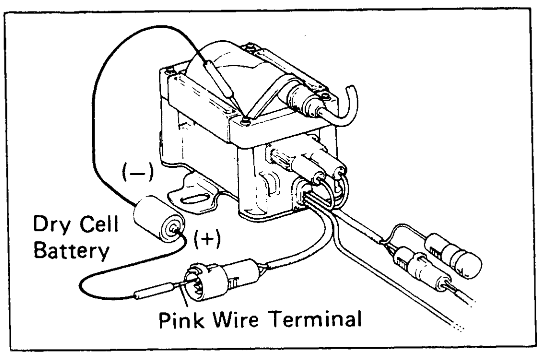
2. **CHECK POWER SOURCE LINE VOLTAGE**
   (a) Disconnect the wiring connector for brown wire and yellow wire.
   (b) Using a voltmeter, connect the positive (+) probe to the brown wire for the wire harness side and the negative (−) probe to body ground.

Voltage: Approx. 12 V



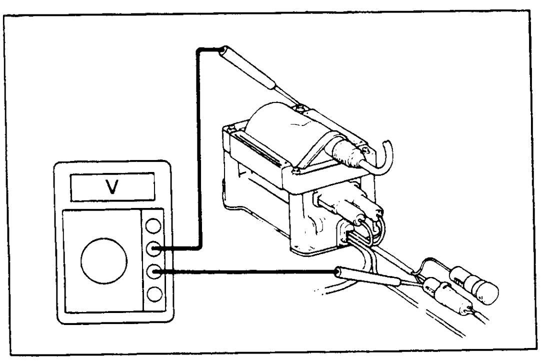
3. **CHECK POWER TRANSISTOR IN IGNITER**
   (a) Connect the wiring connector for brown wire and yellow wire.
   (b) Using a voltmeter, connect the positive (+) probe the yellow wire for the igniter side and the negative (−) probe to body ground.

Voltage: Approx. 12 V



   (c) Unplug the wiring connector from the distributor.
   (d) Using a dry cell battery (1.5 V), connect the positive (+) pole of the battery to the pink wire terminal and the negative (−) pole to the white wire terminal.

CAUTION: Do not apply voltage more than 5 seconds to avoid destroying the power transistor in the igniter.



   (e) Using a voltmeter, connect the positive (+) probe to the yellow connector for the igniter side and the negative (−) probe to body ground.

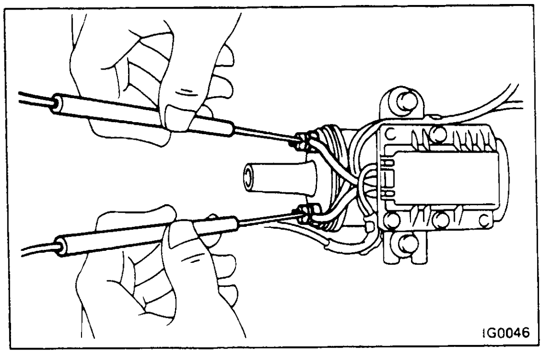
Voltage: 8 — 10 V

If a problem is found, replace the igniter.

4. **TURN IGNITION SWITCH OFF**
5. **REMOVE TEST EQUIPMENT AND RECONNECT WIRING**

[FOR 22R-E]
INSPECTION OF IGNITION COIL

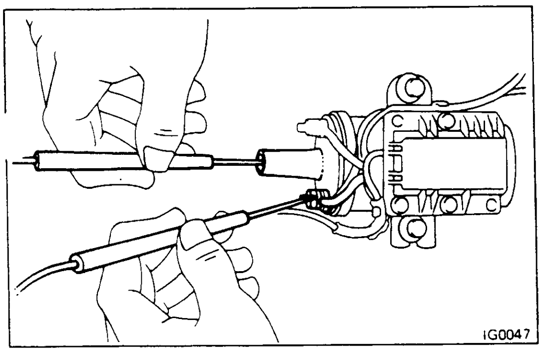
1. DISCONNECT HIGH TENSION WIRE



2. MEASURE PRIMARY COIL RESISTANCE

Using an ohmmeter, measure the resistance between the positive (+) and negative (−) terminals.

Primary coil resistance (cold): 0.5 — 0.7 Ω



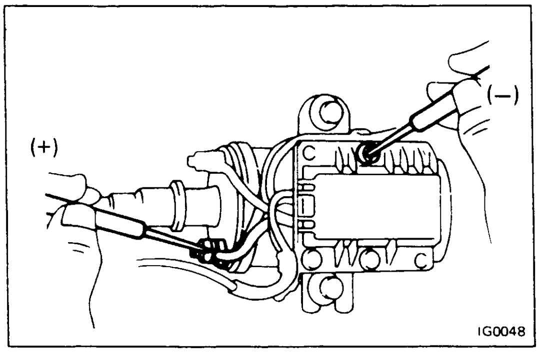
3. MEASURE SECONDARY COIL RESISTANCE

Using an ohmmeter, measure the resistance between the positive (+) terminal and high-tension terminal.

Secondary coil resistance (cold): 11.4 — 15.6 kΩ

INSPECTION OF IGNITER

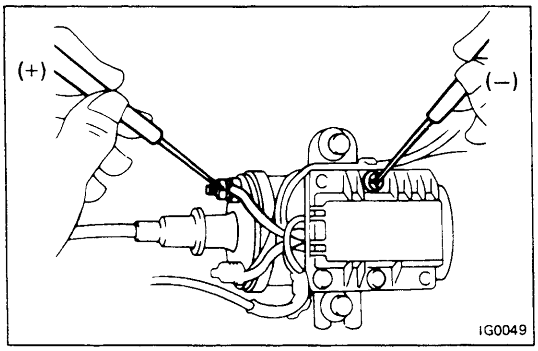
1. **TURN IGNITION SWITCH ON**



2. **CHECK POWER SOURCE LINE VOLTAGE**

Using a voltmeter, connect the positive (+) probe to the ignition coil positive (+) terminal and the negative (−) probe to body ground.

Voltage: Approx. 12V

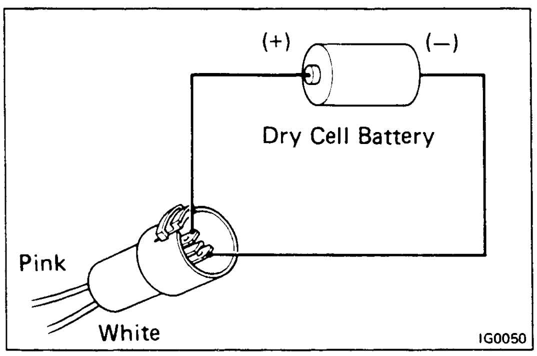


3. **CHECK POWER TRANSISTOR IN IGNITER**

(a) Using a voltmeter, connect the positive (+) probe to the ignition coil negative (−) terminal and the negative (−) probe to body ground.

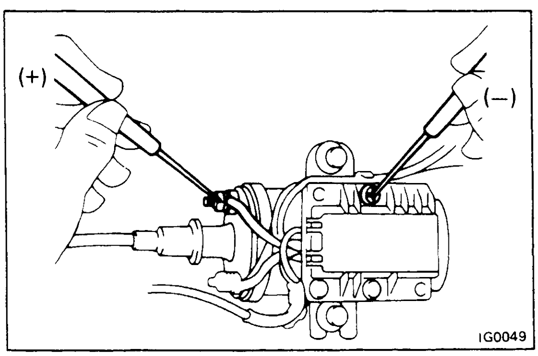
Voltage: Approx. 12V

(b) Unplug the wiring connector from the distributor.



(c) Using a dry cell battery (1.5V), connect the positive (+) pole of the battery to the pink wire terminal and the negative (−) pole to the white wire terminal.

CAUTION: Do not apply voltage more than 5 seconds to avoid destroying the power transistor in the igniter.



(d) Using a voltmeter, connect the positive (+) probe to the ignition coil negative (−) terminal and the negative (−) probe to the body ground.

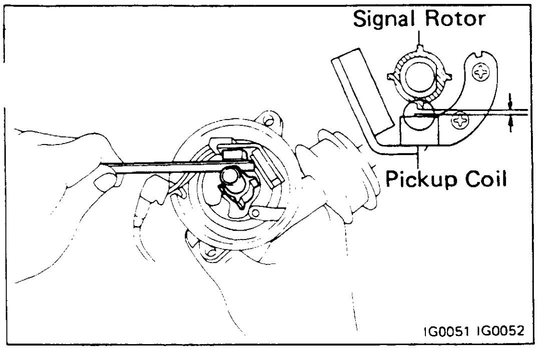
(e) Check the voltage reading.

Voltage: 5 — 8V

If a problem is found, replace the igniter.

4. **TURN IGNITION SWITCH OFF**

5. **REMOVE TEST EQUIPMENT AND RECONNECT WIRING**



ON-VEHICLE INSPECTION OF DISTRIBUTOR

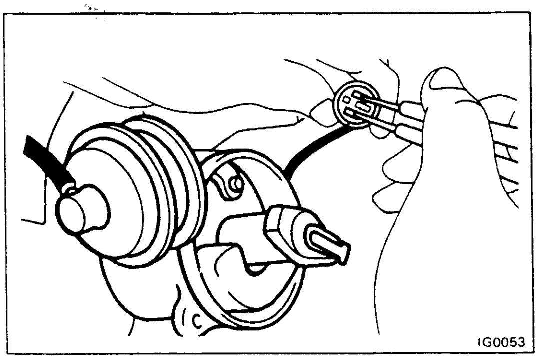
1. CHECK AIR GAP

(a) Using a feeler gauge, measure the gap between the signal rotor and the pickup coil projection.

Air gap: 0.2 – 0.4 mm (0.008 – 0.016 in.)

(b) Adjust the gap if necessary.

- Loosen the two screws and move the signal generator until the gap is correct. Tighten the screws and recheck the gap.

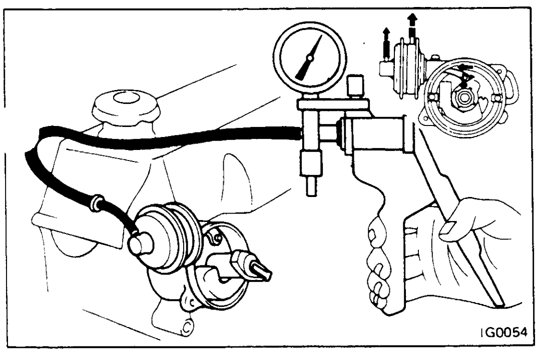


2. CHECK SIGNAL GENERATOR

Using an ohmmeter, check the resistance of the signal generator.

Generator resistance: 140 – 180Ω

If the resistance is not correct, replace the signal generator.

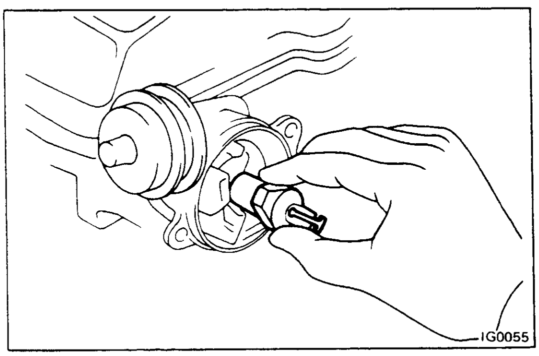


3. CHECK VACUUM ADVANCE (FOR 22R)

(a) Disconnect the vacuum hose and connect a vacuum pump to the diaphragms.

(b) Apply vacuum and check that the vacuum advance moves.

If the vacuum advance does not work, repair or replace as necessary.



4. CHECK GOVERNOR ADVANCE (FOR 22R)

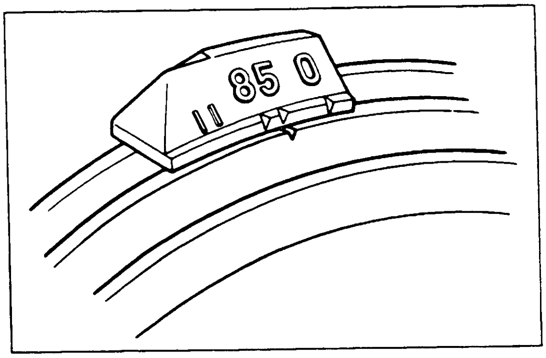
(a) Turn the rotor shaft clockwise, release it and check that the rotor returns slightly counterclockwise.

(b) Check that the rotor shaft is not excessively loose.

DISTRIBUTOR

REMOVAL OF DISTRIBUTOR

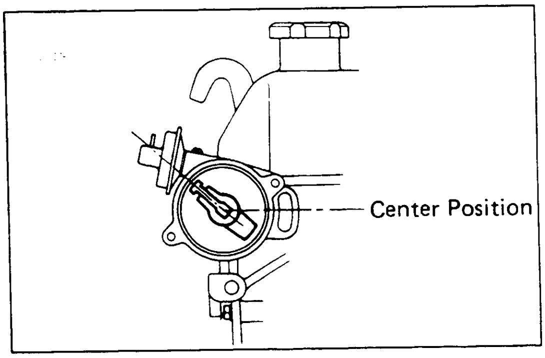
1. **DISCONNECT VACUUM HOSES (FOR 22R), HIGH TENSION CORDS AND WIRING CONNECTOR**
2. **REMOVE TWO SCREWS AND PULL OFF DISTRIBUTOR CAP**
3. **REMOVE HOLD-DOWN BOLT AND PULL OUT DISTRIBUTOR**



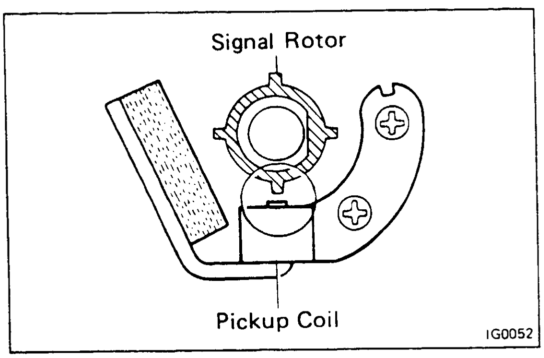
INSTALLATION OF DISTRIBUTOR

1. **INSTALL DISTRIBUTOR AND SET TIMING**
   (a) Turn the crankshaft pulley until the timing mark is aligned with 0° TDC (22R) and 5° BTDC (22R-E) mark.

   NOTE: Check that the rocker arms on the No.1 cylinder are loose. If not, turn the crankshaft one full turn.



   (b) Temporarily install the rotor.
   (c) Begin insertion of the distributor with the rotor pointing upward and the distributor mounting hole approximately at center position of the bolt hole.
   (d) When fully installed, the rotor will rotate to the position shown.

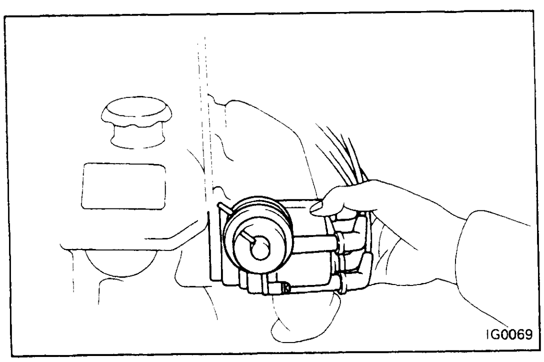


   (e) Align the rotor tooth with the pickup coil projection.
   (f) Coat the distributor set bolt with sealer and install the bolt. Torque the bolt.

   Torque: 220 kg-cm (16 ft-lb, 22 N·m)

   (g) Install the rotor and distributor cap with wires.

2. **INSTALL FOLLOWING PARTS:**
   (a) Vacuum hoses (for 22R)
   (b) Wiring connector



3. **ADJUST IGNITION TIMING**
   (a) Connect a timing light to the engine.
   (b) Start the engine and run it at idle.
   (c) Using a timing light, slowly turn the distributor until the timing mark on the crankshaft pulley is aligned with the 12° mark. Tighten the distributor bolt.
   (d) Recheck the ignition timing.

Ignition timing: 22R 0° TDC (Max. 950 rpm) (w/vacuum advance cut)
22R-E 5° BTDC at idle (short terminal "T")

STARTING SYSTEM

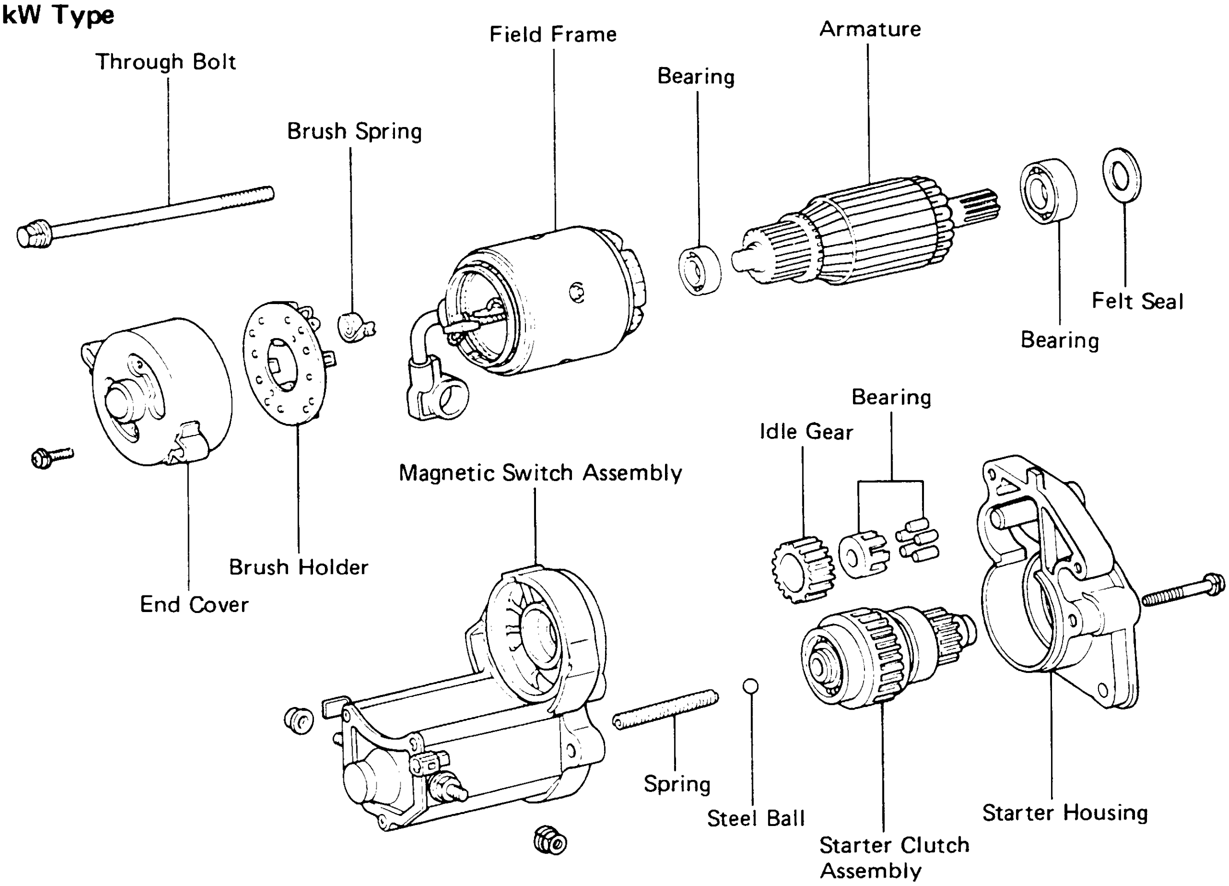
TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Engine will not crank	Battery charge low	Check battery specific gravity	CH-3
		Charge or replace battery	
	Battery cables loose, corroded or worn	Repair or replace cables	
	Neutral start switch faulty (A/T)	Replace switch	
	Fusible link blown	Replace fusible link	
	Starter faulty	Repair starter	ST-3
	Ignition switch faulty	Replace ignition switch	
Engine cranks slowly	Battery charge low	Check battery specific gravity	CH-3
		Charge or replace battery	
	Battery cables loose, corroded or worn	Repair or replace cables	
	Starter faulty	Repair starter	ST-3
Starter keeps running	Starter faulty	Repair starter	ST-3
	Ignition switch faulty	Replace ignition switch	
	Short in wiring	Repair wiring	
Starter spins — engine will not crank	Pinion gear teeth broken or faulty starter	Repair starter	ST-3
	Flywheel teeth broken	Replace flywheel	

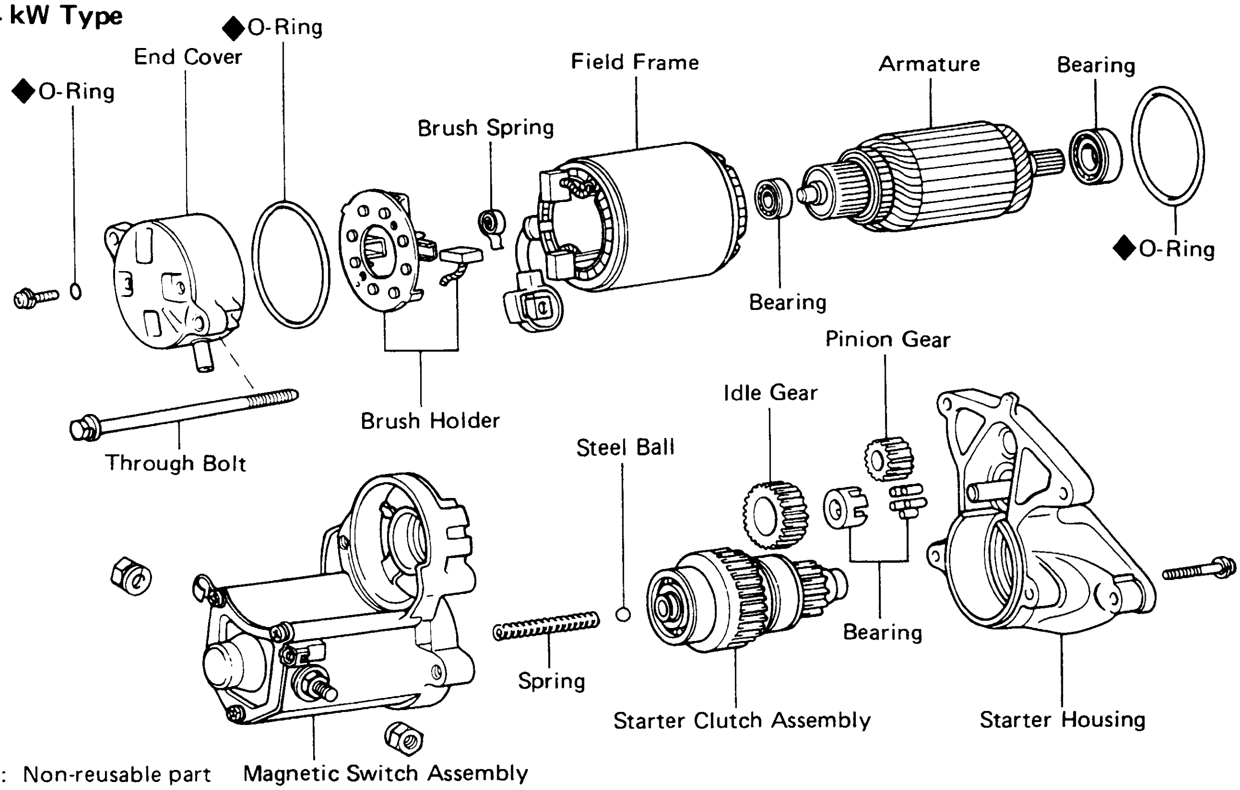
STARTER

COMPONENTS

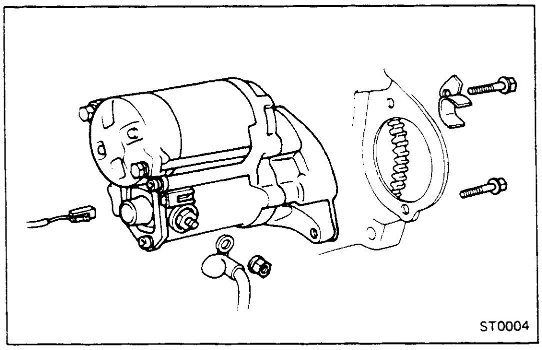
1.0 kW Type



1.4 kW Type



◆ : Non-reusable part

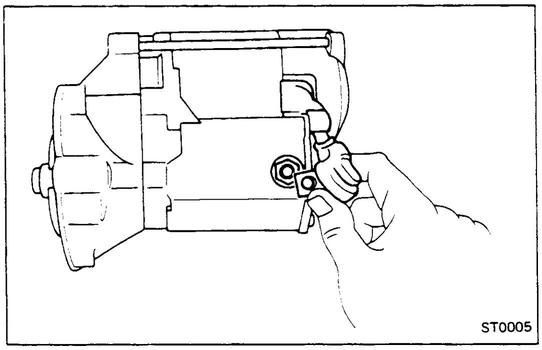


ST0004

REMOVAL OF STARTER

1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL BETTERY**
2. **REMOVE TRANSMISSION OIL FILLER TUBE (A/T only)**
3. **DISCONNECT TWO WIRES FROM STARTER**

   Remove the nut and disconnect the battery cable from the magnetic switch on the starter motor. Disconnect the other wire from terminal 50.



ST0005

4. **REMOVE STARTER MOTOR**

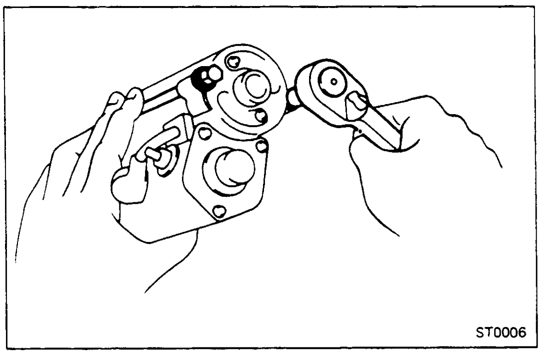
   Remove the two bolts, and remove the starter motor from the flywheel bellhousing.

DISASSEMBLY OF STARTER

(See page ST-3)

1. **REMOVE FIELD FRAME WITH ARMATURE FROM MAGNETIC SWITCH ASSEMBLY**

   (a) Disconnect the lead wire from the magnetic switch terminal.

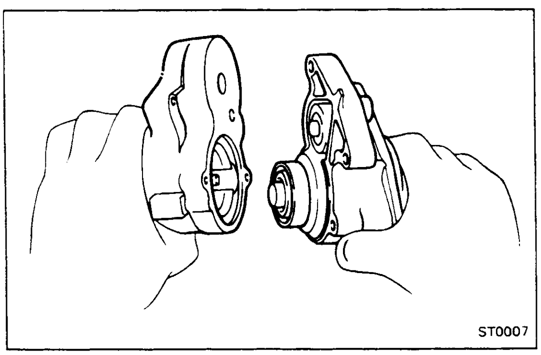


ST0006

   (b) Remove the two through bolts. Pull out the field frame with the armature from the magnetic switch assembly.

   (c) Remove the felt seal. (1.0 kW type only)

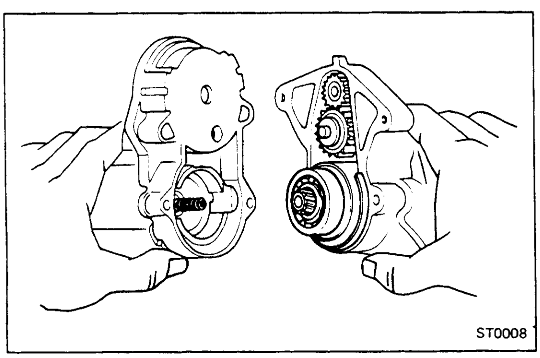
   (d) Remove the O-ring. (1.4 kW type only)



ST0007

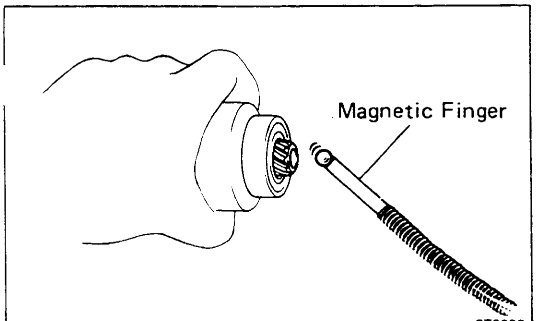
2. **REMOVE STARTER HOUSING FROM MAGNETIC SWITCH ASSEMBLY**

   [1.0 kW type]
   Remove the two screws and remove the starter housing with the idler gear and clutch assembly.



ST0008

   [1.4 kW type]
   Remove the two screws and remove the starter housing with the pinion gear, idler gear and clutch assembly.

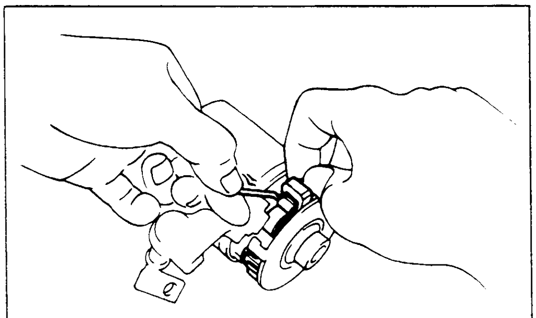


ST0009

3. **REMOVE CLUTCH ASSEMBLY AND GEARS FROM STARTER HOUSING**

4. **REMOVE STEEL BALL AND SPRING**

   Using a magnetic finger, remove the spring and steel ball from the clutch shaft hole.

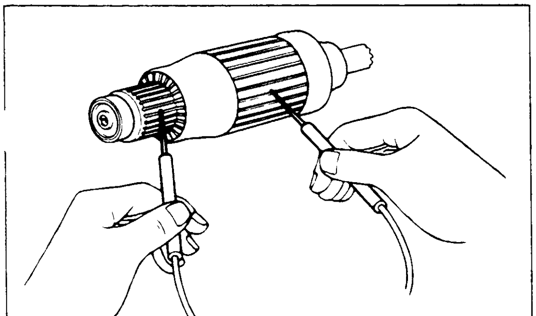

ST0010

5. **REMOVE BRUSHES AND BRUSH HOLDER**
   (a) Remove the end cover from the field frame.
   (b) Remove the O-ring (1.4 kW type only).
   (c) Using a screwdriver or steel wire, separate the brush springs, and remove the brushes from the brush holder.
   (d) Pull the brush holder off the field frame.

6. **REMOVE ARMATURE FROM FIELD FRAME**

INSPECTION OF STARTER

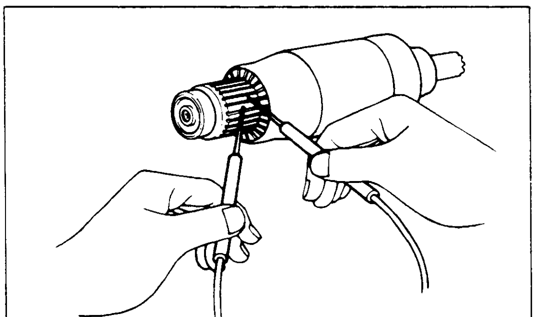
Armature Coil


ST0011

1. **INSPECT THAT COMMUTATOR IS NOT GROUNDED**

   Using an ohmmeter, check that there is no continuity between the commutator and armature coil core.

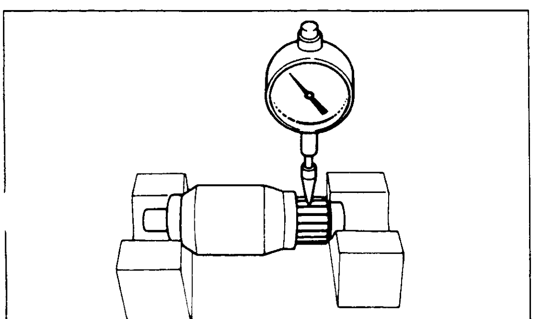
   If there is continuity, replace the armature.


ST0012

2. **INSPECT COMMUTATOR FOR OPEN CIRCUIT**

   Using an ohmmeter, check for continuity between the segments of the commutator.
   If there is no continuity between any segment, replace the armature.

Commutator


ST0013

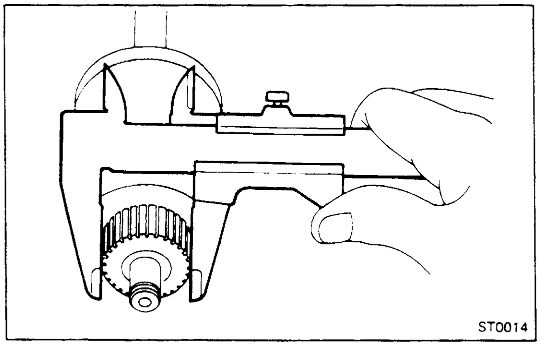
1. **INSPECT COMMUTATOR FOR DIRTY AND BURNT SURFACES**

   If the surface is dirty or burnt, correct with sandpaper (No. 400) or a lathe.

2. **INSPECT COMMUTATOR CIRCLE RUNOUT**

   If the circle runout is greater than the maximum, correct with a lathe.

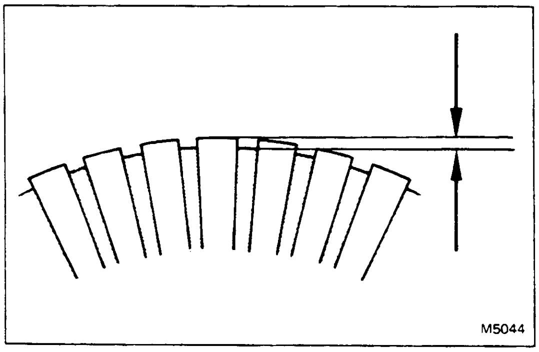
   Maximum circle runout: 0.05 mm (0.0020 in.)



3. MEASURE DIAMETER OF COMMUTATOR

If the diameter of the commutator is less than the minimu replace the armature.

Standard diameter: 30 mm (1.18 in.)
Minimum diameter: 29 mm (1.14 in.)



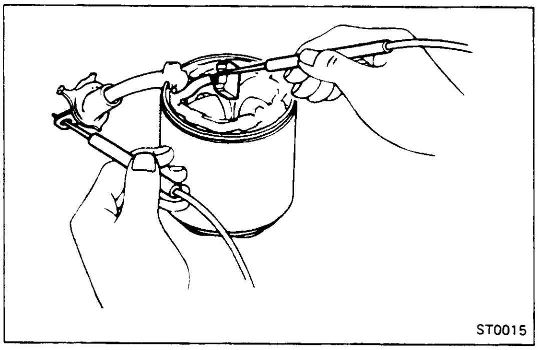
4. INSPECT UNDERCUT DEPTH

Check that the undercut depth is clean and free of foreign particles. Smooth out the edge.

If the undercut depth is less than the minimum, correct it with a hacksaw blade.

Standard undercut depth: 0.5 – 0.8 mm (0.020 – 0.031 in.)
Minimum undercut depth: 0.2 mm (0.008 in.)

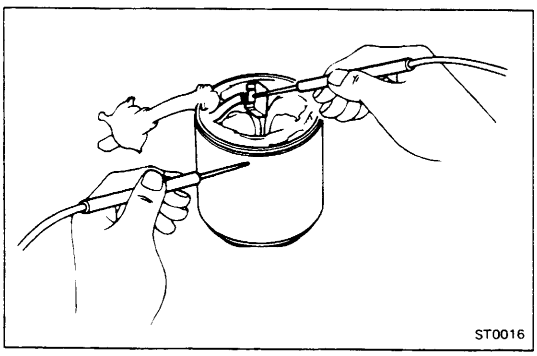
Field Coil



1. INSPECT FIELD COIL FOR OPEN CIRCUIT

Using an ohmmeter, check for continuity between the le wire and field coil brush lead.

If there is no continuity, replace the field frame.

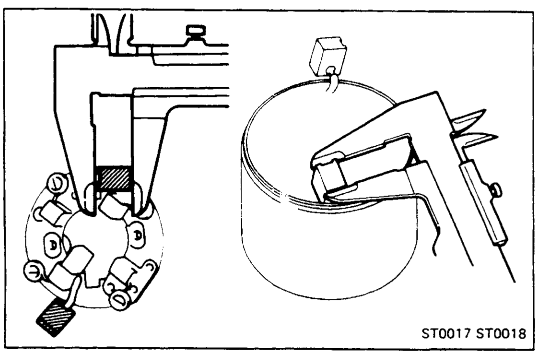


2. INSPECT THAT FIELD COIL IS NOT GROUNDED

Using an ohmmeter, check for continuity between the field coil end and field frame.

If there is continuity, replace the field frame.

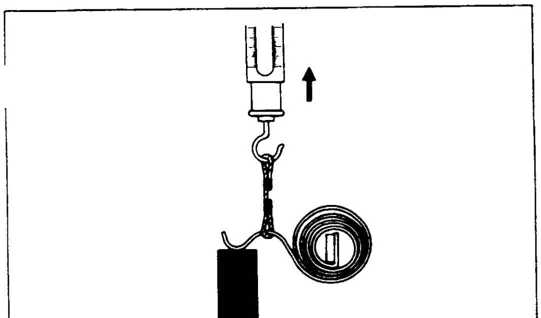
Brushes



MEASURE BRUSH LENGTH

If length is less than the minimum, replace the brush and dress with an emery cloth.

Standard length:	**1.0 kW**	**13.0 mm (0.512 in.)**
	1.4 kW	**15.0 mm (0.591 in.)**
Minimum length:	**1.0 kW**	**8.5 mm (0.335 in.)**
	1.4 kW	**10.0 mm (0.394 in.)**


ST0019

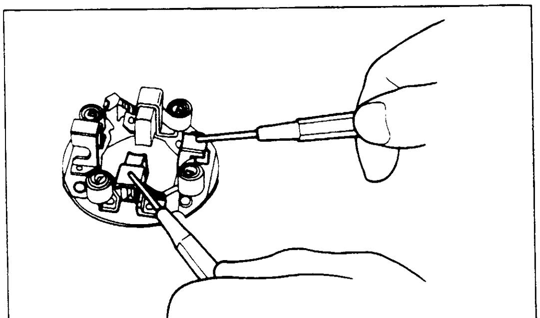
Brush Spring

MEASURE BRUSH SPRING LOAD WITH A PULL SCALE

If the reading is below standard, replace the brush spring.

Spring installed load: 1.785 – 2.415 kg (3.9 – 5.3 lb, 18 – 24 N)

NOTE: Take the pull scale reading at the very instant the brush spring separates from the brush.

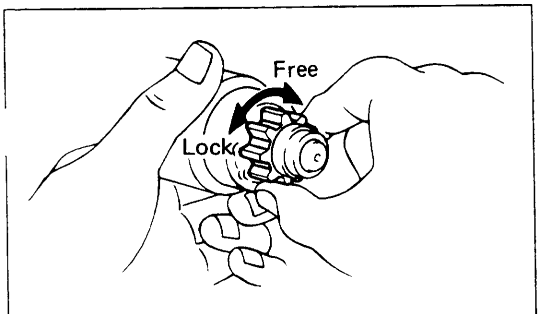

Z5255

Brush Holder

INSPECT INSULATION OF BRUSH HOLDER

Using an ohmmeter, check for continuity between the positive and negative brush holders.

If there is continuity, repair or replace the brush holder.



ST0020

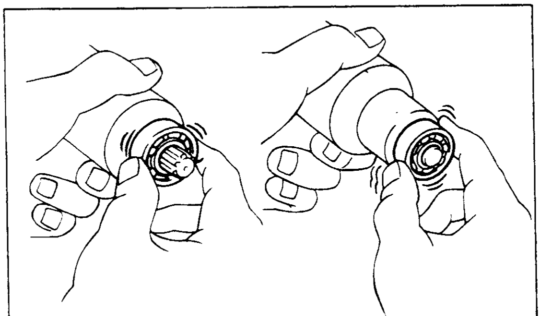
Clutch and Gears

1. **INSPECT GEAR TEETH**

   Check the gear teeth on the pinion gear, idler gear and clutch assembly for wear or damage. Replace if damaged. If damaged, also check the flywheel ring gear for wear or damage.

2. **INSPECT CLUTCH**

   Rotate the pinion clockwise and check that it turns freely. Try to rotate the pinion counterclockwise and check that it locks.

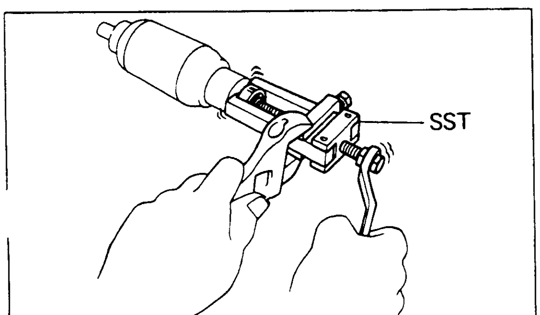

ST0021 B1417

Bearings

1. **INSPECT BEARINGS**

   Turn each bearing by hand while applying inward force.

   If resistance is felt or if the bearing sticks, replace the bearing.



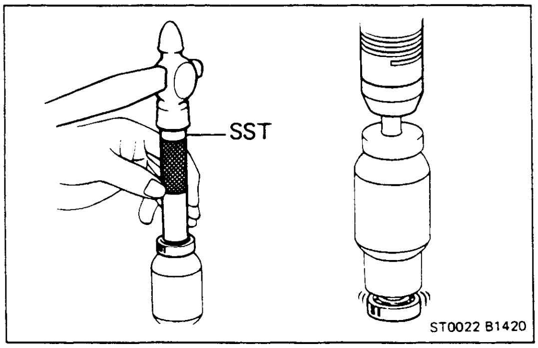
B1419

2. **IF NECESSARY, REPLACE BEARINGS**

   (a) Using SST, remove the bearing from the armature shaft.

   (b) Using SST, remove the other bearing on the opposite side.

   SST 09286-46011

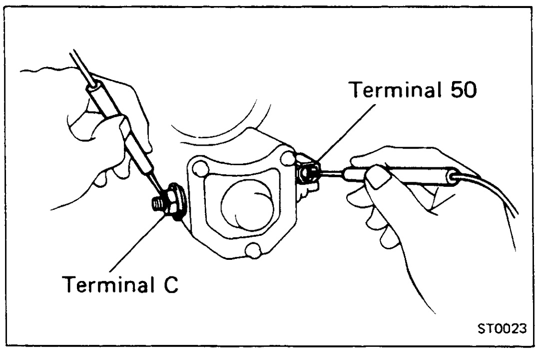


(c) Using SST and a hammer, tap a new large bearing onto the shaft.

SST 09285-76010

(d) Using a press, install a new small bearing onto the shaft.

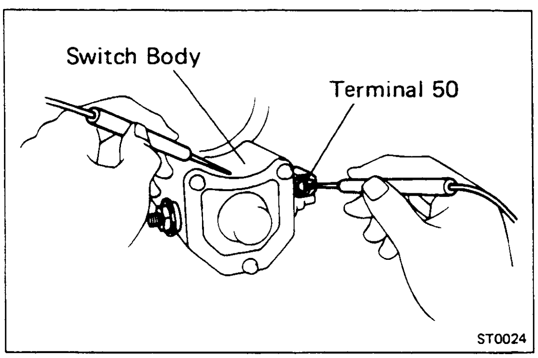
Magnetic Switch



1. **PERFORM PULL-IN COIL OPEN CIRCUIT TEST**

   Using an ohmmeter, check for continuity between terminal 50 and terminal C.

   If there is no continuity, replace the magnetic switch.



2. **PERFORM HOLD-IN COIL OPEN CIRCUIT TEST**

   Using an ohmmeter, check for continuity between terminal 50 and the switch body.

   If there is no continuity, replace the magnetic switch

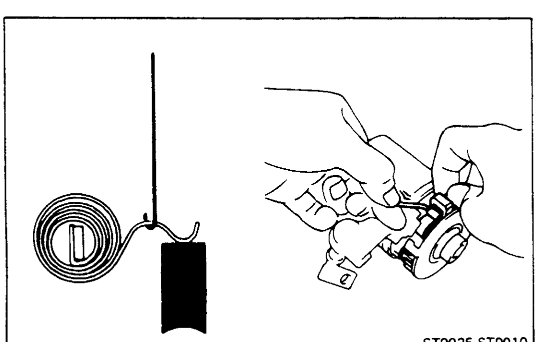
ASSEMBLY OF STARTER

(See page ST-3)

NOTE: Use high-temperature grease to lubricate the bearings and gears when assembling the starter.

1. **PLACE ARMATURE INTO FIELD FRAME**

   Apply grease to the armature bearings and insert the armature into the field frame.



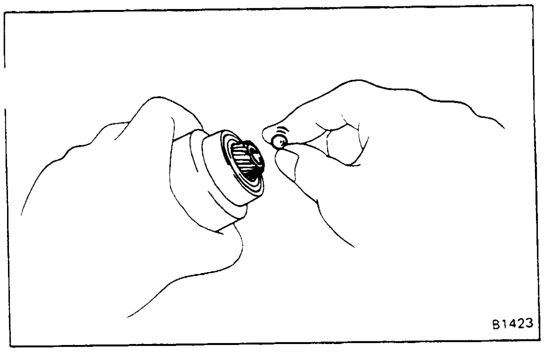
2. **INSTALL BRUSH HOLDER AND BRUSHES**

   (a) Using a screwdriver or steel wire, hold the brush spring back, and install the brush into the brush holder. Install four brushes.

   NOTE: Make sure that the positive lead wires are not grounded.

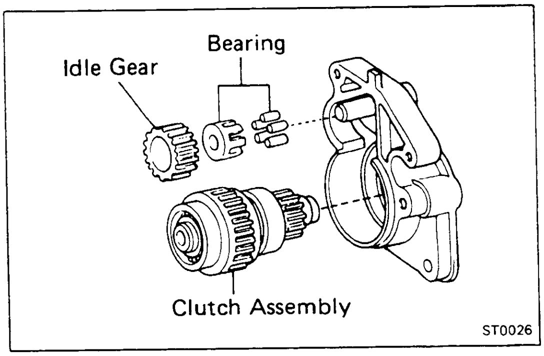
   (b) Place the O-ring on the field frame (1.4 kW type only).

   (c) Install the end cover to the field frame.



3. INSERT STEEL BALL INTO CLUTCH SHAFT HOLE

Apply grease to the ball and spring, and insert them into the clutch shaft hole.

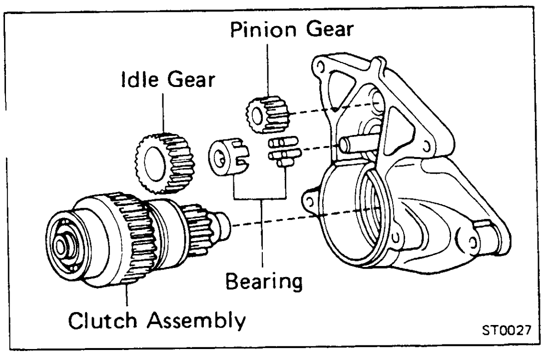


4. INSTALL GEARS AND CLUTCH ASSEMBLY TO STARTER HOUSING

[1.0 kW type]

(a) Apply grease to the gear and clutch assembly.

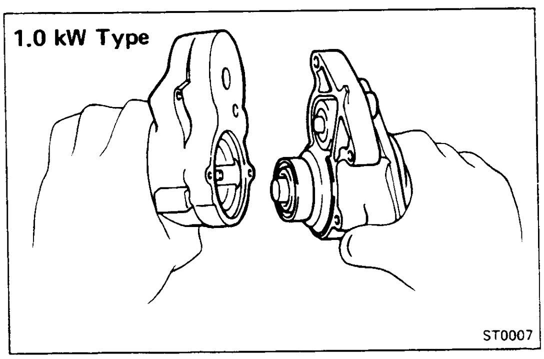
(b) Place the clutch assembly, idle gear and bearing in the starter housing.



[1.4 kW type]

(a) Apply grease to the gears and clutch assembly.

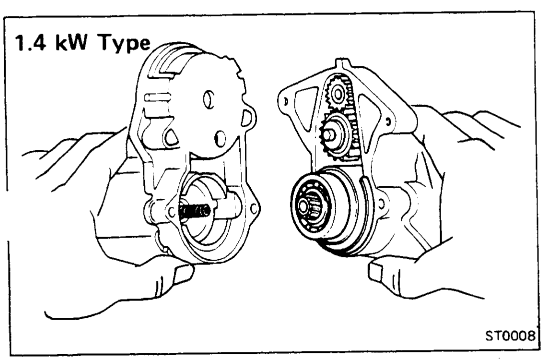
(b) Place the clutch assembly, idle gear, bearing and pinion gear in the starter housing.

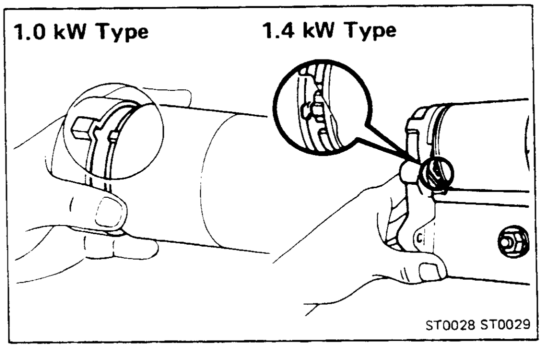


5. INSTALL STARTER HOUSING

(a) Insert the spring into the clutch shaft hole.

(b) Place the starter housing on the magnetic switch and install the two screws.



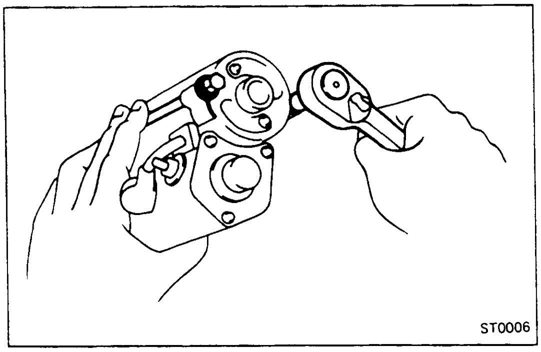


6. **INSTALL FIELD FRAME WITH ARMATURE IN MAGNETIC SWITCH ASSEMBLY**

(a) Place the felt seal on the armature shaft (1.0 kW t\ only).

(b) Place the O-ring on the field frame (1.4 kW type only).

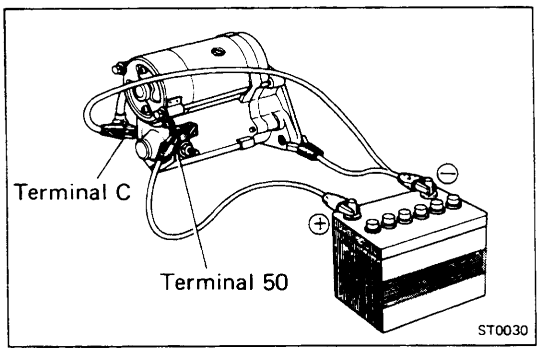
(c) Match the protrusion of the field frame with the magnetic switch assembly.



(d) Install the two through bolts.

(e) Connect the coil lead to the terminal on the magnetic switch assembly.

PERFORMANCE TEST OF STARTER

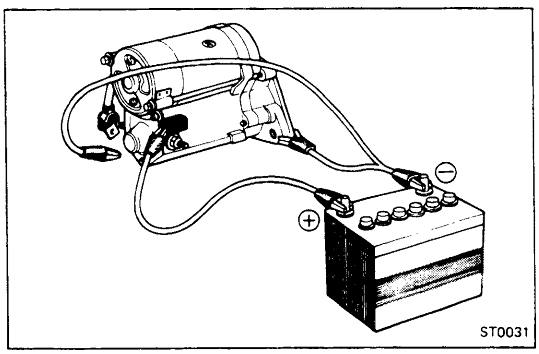


CAUTION: These tests must be performed within 3 to 5 seconds to avoid burning out the coil.

1. **PERFORM PULL-IN TEST**

(a) Disconnect the field coil lead from terminal C.

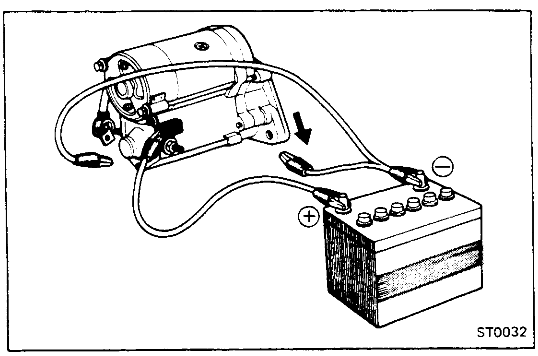
(b) Connect the battery to the magnetic switch as shown. Check that the plunger moves outward. If the plunger does not move, replace the magnetic switch.



2. **PERFORM HOLD-IN TEST**

While connected as above with the plunger out, disconnect the negative lead from terminal C. Check that the plunger remains out.

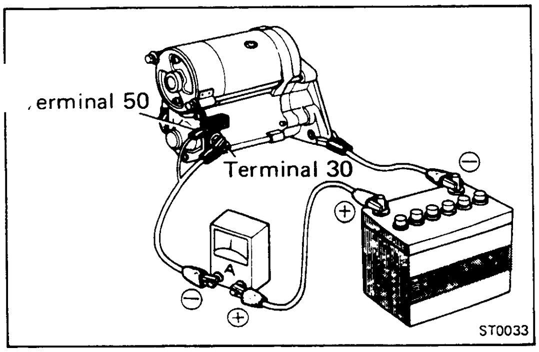
If the plunger returns inward, replace the magnetic switch.



3. **INSPECT PLUNGER RETURN**

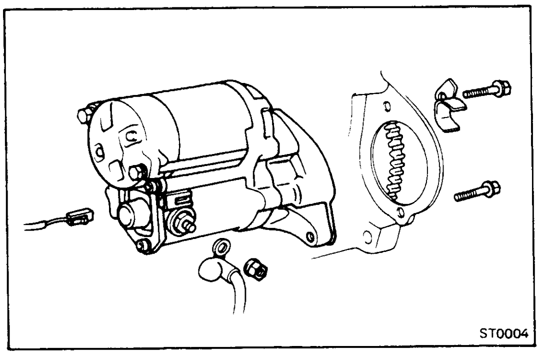
Disconnect the negative lead from the switch body. Check that the plunger returns inward.

If the plunger does not return, replace the magnetic switch.



4. **PERFORM NO-LOAD PERFORMANCE TEST**
   (a) Connect the battery and ammeter to the starter as shown.
   (b) Check that the starter rotates smoothly and steadily with the pinion moving out. Check that the ammeter reads the specified current.

   Specified current: Less than 90 A at 11.5 V



INSTALLATION OF STARTER

1. **INSTALL STARTER MOTOR IN FLYWHEEL BELL-HOUSING**
   Place the starter motor in the flywheel bellhousing. Install and torque the two bolts.
   Torque: 400 kg-cm (29 ft-lb, 39 N·m)
2. **CONNECT TWO WIRES TO STARTER**
   Connect the connector to the terminal on the magnetic switch. Connect the cable from the battery to the terminal on the switch, and install the nut.
3. **INSTALL TRANSMISSION OIL FILLER TUBE (A/T only)**
4. **CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY**
   Check that the car starts.

CHARGING SYSTEM

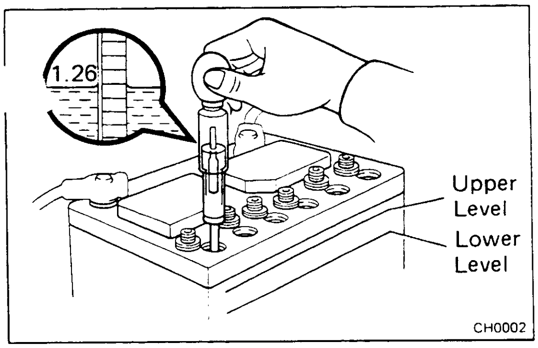
PRECAUTIONS

1. **Check that the battery cables are connected to the c rect terminals.**
2. **Disconnect the battery cables when the battery is given a quick charge.**
3. **Do not perform tests with a high voltage insulation resistance tester.**
4. **Never disconnect the battery when the engine is running.**

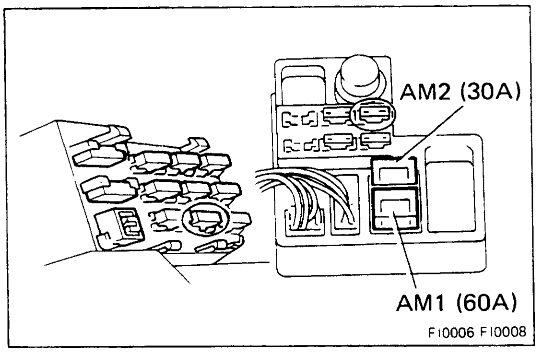
TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Discharge warning light does not light with ignition ON and engine off	Fuse blown	Check "CHARGE" and "IGN" fuses	
	Light burned out	Replace light	
	Wiring connection loose	Tighten loose connections	
	IC regulator faulty	Replace IC regulator	CH-6
Discharge warning light does not go out with engine running (battery requires frequent recharging)	Drive belt loose or worn	Adjust or replace drive belt	CH-3
	Battery cables loose, corroded or worn	Repair or replace cables	
	Fuse blown	Check "ENGINE" fuse	
	Fusible link blown	Replace fusible link	
	IC regulator or alternator faulty	Check charging system	CH-4
	Wiring faulty	Repair wiring	

ON-VEHICLE INSPECTION

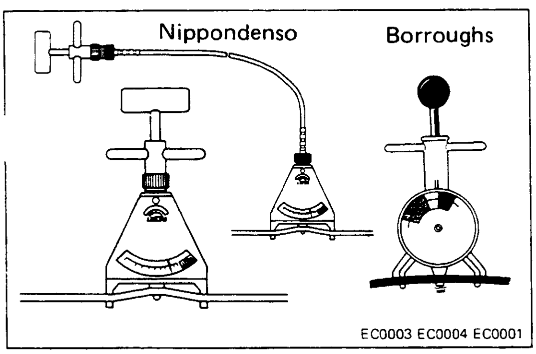


1. **CHECK BATTERY SPECIFIC GRAVITY AND ELECTROLYTE LEVEL**
   (a) Check the specific gravity of each cell.
   Standard specific gravity
   When fully charged at 20°C (68°F): 1.25 – 1.27
   (b) Check the electrolyte quantity of each cell.
   If insufficient, refill with distilled water (or purified water).



2. **CHECK BATTERY TERMINALS, FUSIBLE LINK AND FUSES**
   (a) Check that the battery terminals are not loose or corroded.
   (b) Check the fusible link and fuses for continuity.

FUSIBLE LINK	**AM1, AM2**
Fuse ENGINE	**(15A)**
Fuse CHARGE	**(7,5A)**



4. **INSPECT DRIVE BELT**
   (a) Visually check the drive belt for crack, oiliness or wear. Check that the belt does not touch the bottom of the pulley groove.
   If necessary, replace the drive belt.
   (b) Using a belt tension gauge, check the drive belt tension.

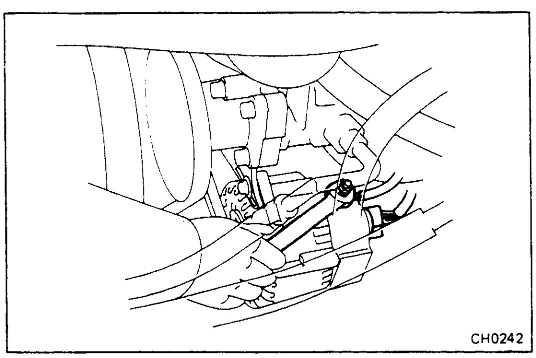
Belt tension gauge:

Nippondenso	BTG-20 (95506-00020) or
Borroughs	No. BT-33-73F

Drive belt tension:

New belt	**125 ± 25 lb**
Used belt	**80 ± 20 lb**

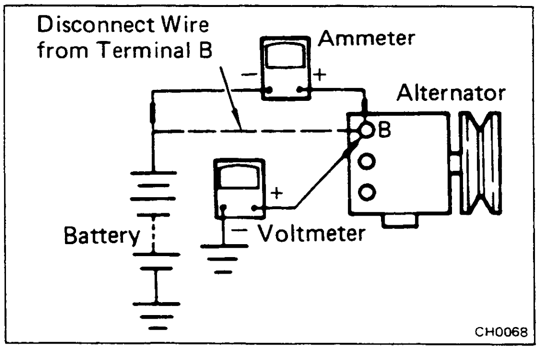
If necessary, adjust the drive belt tension.



5. **VISUALLY CHECK ALTERNATOR WIRING AND LISTEN FOR ABNORMAL NOISES**
   (a) Check that the wiring is in good condition.
   (b) Check that there is no abnormal noise from the alternator while the engine is running.

6. **CHECK DISCHARGE WARNING LIGHT CIRCUIT**
   (a) Warm up the engine and then turn it off.
   (b) Turn off all accessories.
   (c) Turn the ignition switch to ON. Check that the discharge warning light is lit.
   (d) Start the engine. Check that the light goes out.

If the light does not come on and go off as specified, troubleshoot the warning light circuit.

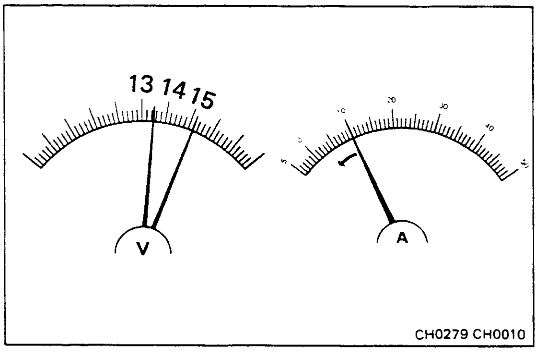


7. CHECK CHARGING CIRCUIT WITHOUT LOAD

NOTE: If a battery/alternator tester is available, connect the tester to the charging circuit according to the manufacturer's instructions.

(a) If a tester is not available, connect a voltmeter and ammeter to the charging circuit as follows:

- Disconnect the wire from terminal B of the alternator and connect it to the negative terminal of the ammeter.
- Connect the test lead from the positive terminal of the ammeter to terminal B of the alternator.
- Connect the positive lead of the voltmeter to terminal B of the alternator.
- Connect the negative lead of the voltmeter to ground.

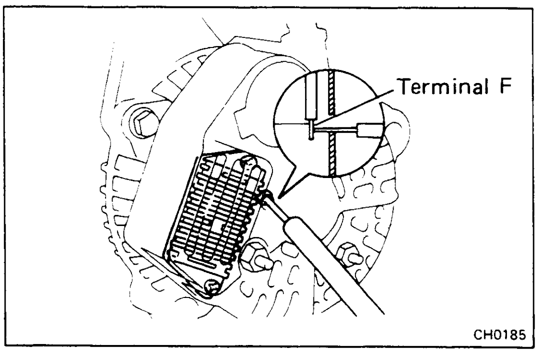


(b) Check the charging circuit as follows:

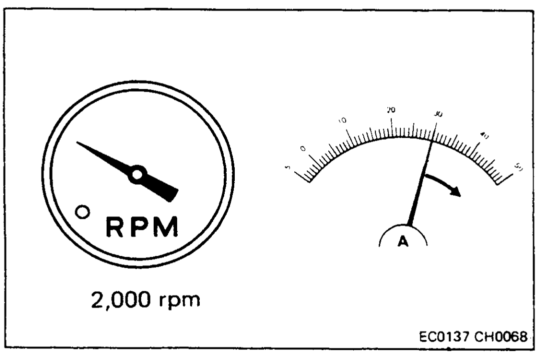
With the engine running from idling to 2,000 rpm, check the reading on the ammeter and voltmeter.

Standard amperage: Less than 10 A
Standard voltage: 13.5 — 15.1 V
(Regulator case 25°C or 77°F)

- If the voltage reading is greater than standard voltage, replace the IC regulator.



- If the voltage reading is less than standard voltage, check the IC regulator and alternator as follows: With terminal F grounded, start the engine and check the voltage reading of terminal B.
- If the voltage reading is greater than standard voltage, replace the IC regulator.
- If the voltage reading is less than standard voltage, check the alternator.



8. CHECK CHARGING CIRCUIT WITH LOAD

(a) With the engine running at 2,000 rpm, turn on the high beam headlights and place the heater fan control switch at HI.

(b) Check the reading on the ammeter.

Standard amperage: More than 30 A

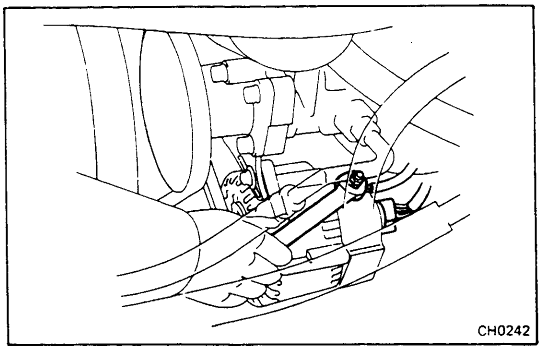
If the ammeter reading is less than 30 A, repair the alternator. (See page CH-5)

NOTE: With the battery fully charged, sometimes the indication will be less than 30 A.

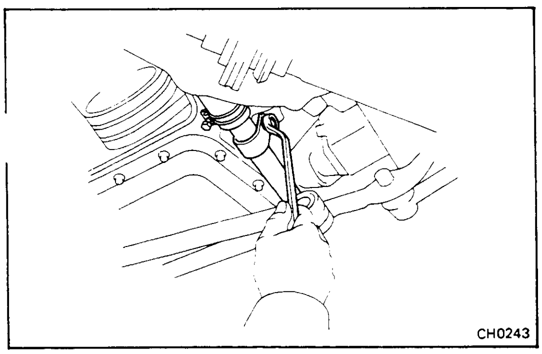
ALTERNATOR

REMOVAL OF ALTERNATOR

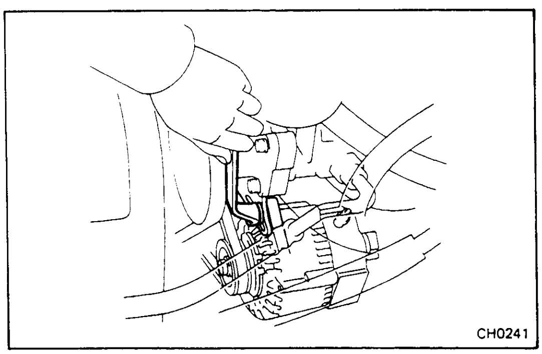
1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**
2. **DRAIN COOLANT**



3. **DISCONNECT WIRING FROM ALTERNATOR**
   (a) Disconnect the connector from the alternator.
   (b) Remove the nut and wire from the alternator.



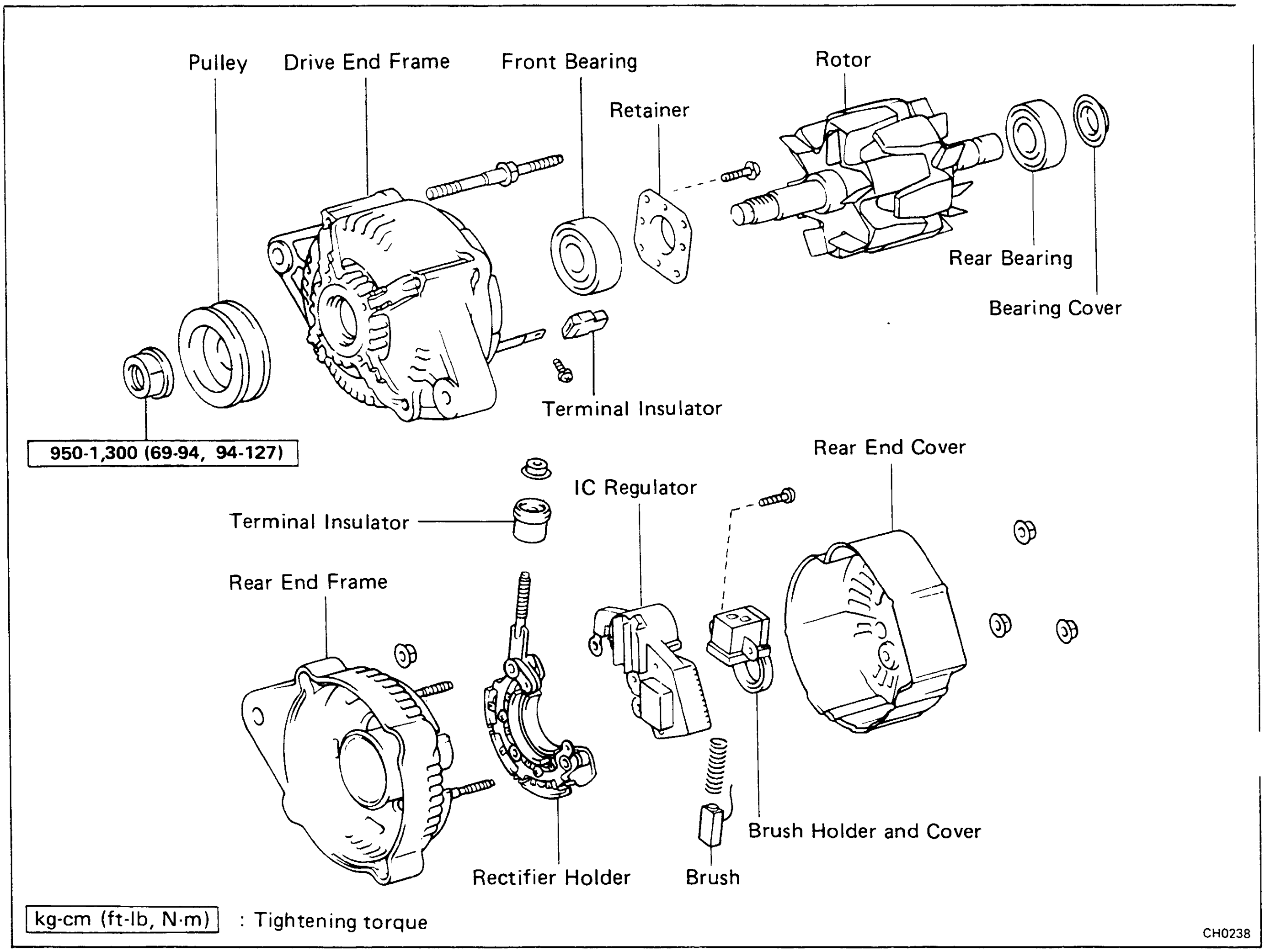
4. **DISCONNECT WATER INLET HOSE**
   (a) Remove the engine under cover.
   (b) Remove the two water inlet pipe bolts.
   (c) Disconnect the water inlet hose from the engine.



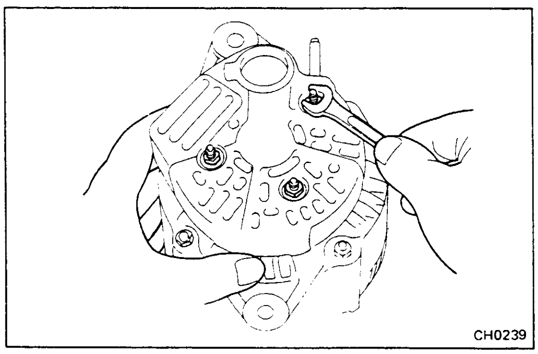
5. **REMOVE FAN BELT**
   (a) Loosen the alternator pivot and remove the adjust bolt.
   (b) Remove the fan belt.

6. **REMOVE ALTERNATOR**
   (a) Hold the alternator and remove the pivot.
   (b) Remove the alternator.

COMPONENTS



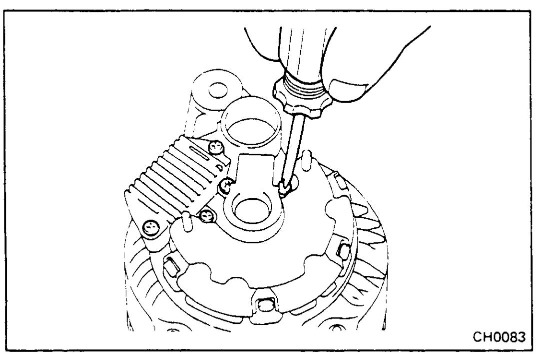
DISASSEMBLY OF ALTERNATOR



1. REMOVE REAR END COVER

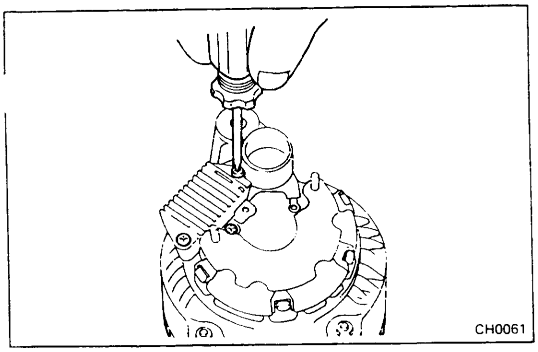
(a) Remove the nut and terminal insulator.

(b) Remove the three nuts and end cover.



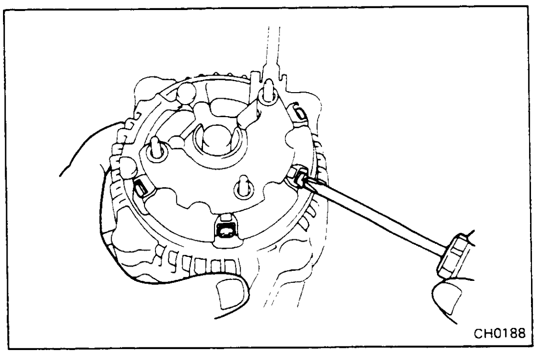
2. REMOVE BRUSH HOLDER

Remove the two screws, brush holder and brush holder cover.



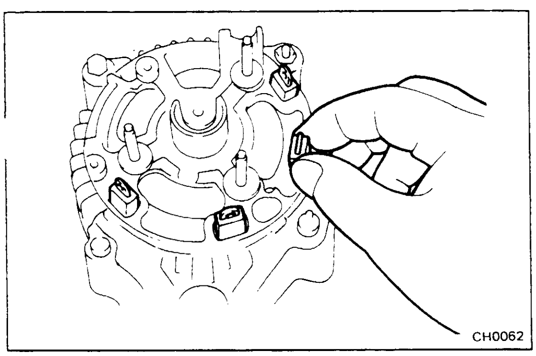
3. **REMOVE IC REGULATOR**

Remove the three screws and IC regulator.

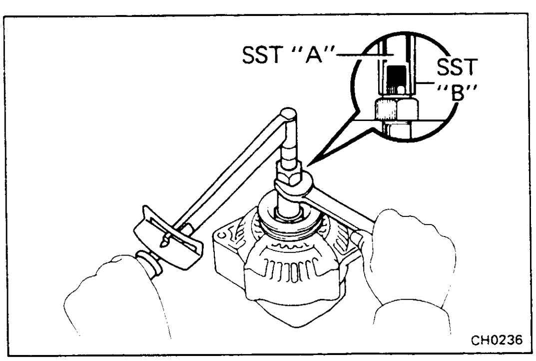


4. **REMOVE RECTIFIER HOLDER**

Remove the four screws and rectifier holder.



5. **REMOVE TERMINAL INSULATOR**



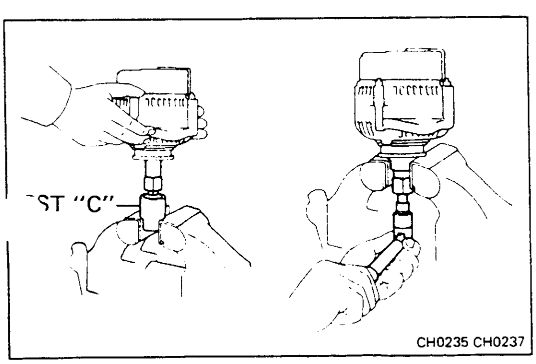
6. **REMOVE PULLEY**

(a) Hold SST "A" with a torque wrench and tighten SST "B" clockwise to the specified torque.

SST 09820-63010

Torque: 400 kg-cm (29 ft-lb, 39 N·m)

(b) Confirm that SST "A" is secured to the pulley shaft.



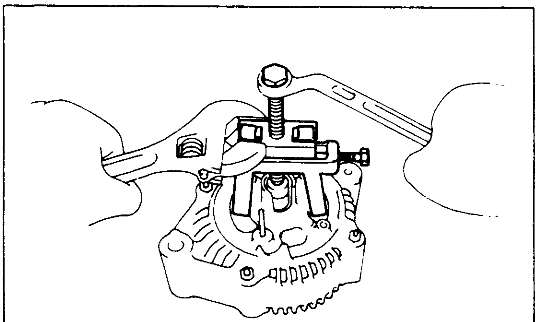
(c) As shown in the figure, grip SST "C" in a vise and then install the alternator to SST "C".

(d) To loosen the pulley nut turn SST "A" in the direction shown in the figure.

CAUTION: To prevent damage to the rotor shaft, do not loosen the pulley nut more than one-half of a turn.

(e) Turn SST "B" and remove all SSTs.

(f) Remove the pulley nut and the pulley.


CH0189

7. **REMOVE REAR END FRAME**

(a) Remove the four nuts.

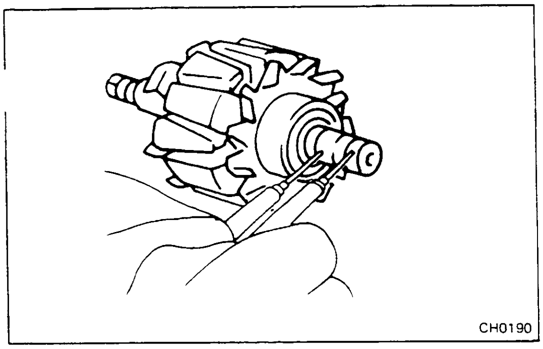
(b) Using SST, remove the rear end frame and four ˎ minal insulators.

SST 09286-46011

8. **REMOVE ROTOR FROM DRIVE END FRAME**

INSPECTION AND REPAIR OF ALTERNATOR

Rotor



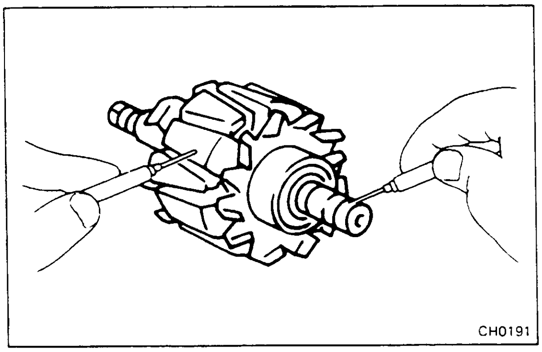
CH0190

1. **CHECK ROTOR FOR OPEN CIRCUIT**

   Using an ohmmeter, check for continuity between the slip rings.

   Standard resistance: 2.8 — 3.0 Ω

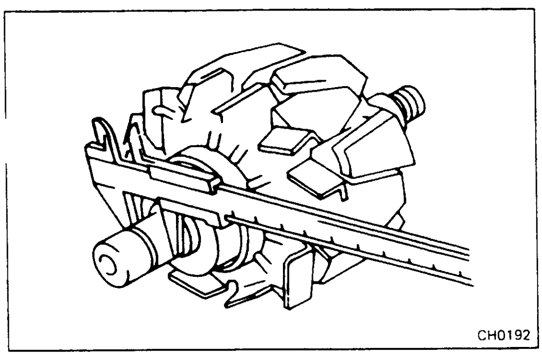
   If there is no continuity, replace the rotor.



CH0191

2. **CHECK ROTOR FOR GROUND**

   Using an ohmmeter, check that there is no continuity between the slip ring and the rotor. If there is continuity, replace the rotor.



CH0192

3. **INSPECT SLIP RINGS**

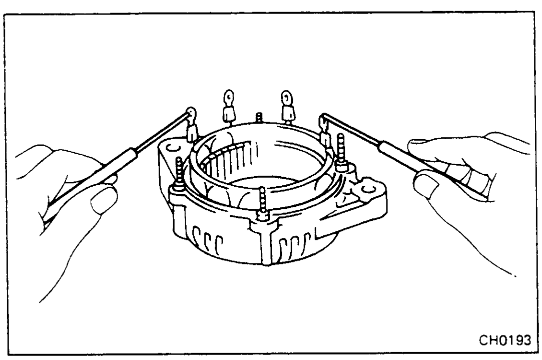
   (a) Check that the slip rings are not rough or scored. If rough or scored, replace the rotor.

   (b) Using calipers, measure the slip ring diameter.

   If the diameter of the slip ring is less than the minimum, replace the rotor.

   Minimum diameter: 14.0 mm (0.551 in.)
   Standard diameter: 14.4 mm (0.567 in.)

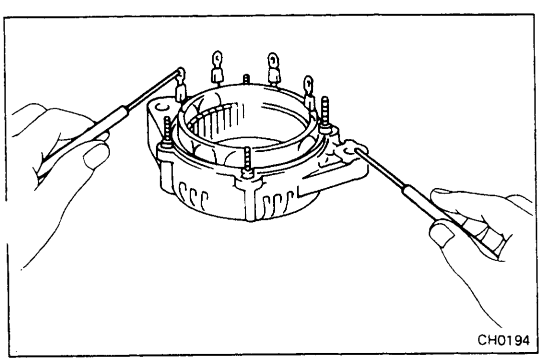
Stator



CH0193

1. **INSPECT STATOR FOR OPEN CIRCUIT**

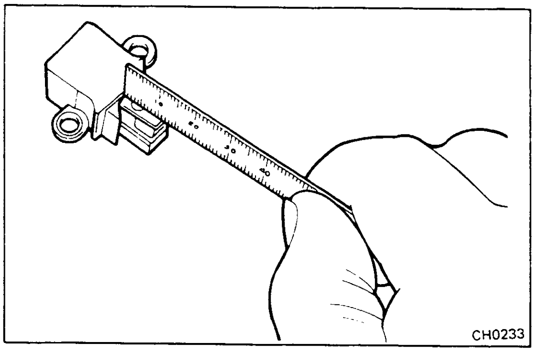
   Using an ohmmeter, check all leads for continuity. If there is no continuity, replace the drive end frame assembly.



CH0194

2. **INSPECT THAT STATOR IS NOT GROUNDED**

   Using an ohmmeter, check that there is no continuity between the coil leads and drive end frame. If there is continuity, replace the drive end frame assembly.

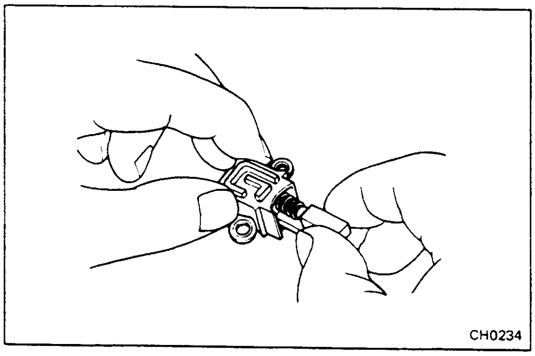


Brush and Brush Holder

1. **MEASURE EXPOSED BRUSH LENGTH**

   Minimum exposed length: 4.5 mm (0.177 in.)

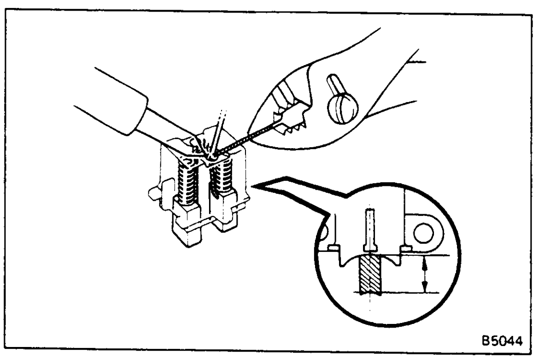
   If the brush length is less than the minimum, replace the brush.



2. **IF NECESSARY, REPLACE BRUSH**

   (a) Unsolder and remove the brush and the spring.

   (b) Put the brush wire through the spring and insert the brush holder.

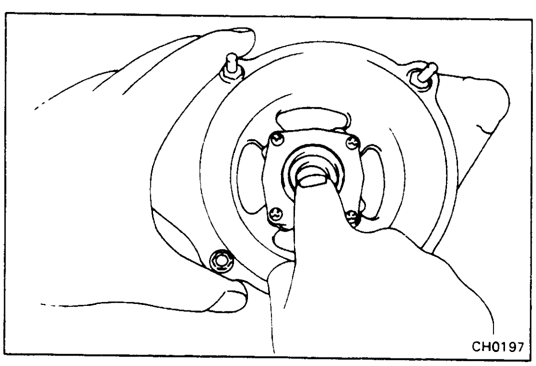


   (c) Solder the wire to the brush holder as shown.

   Standard exposed length: 10.5 mm (0.413 in.)

   (d) Check that the brush moves smoothly in the brush holder.

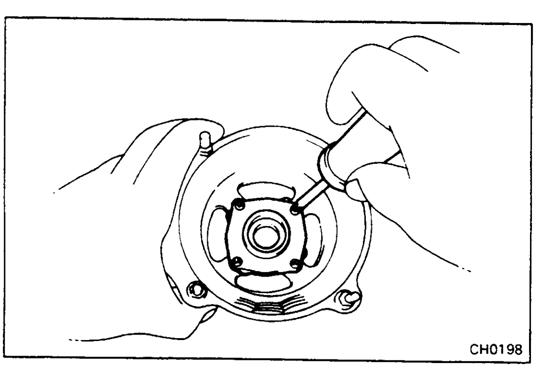
   (e) Cut off any excess wire.



Bearings

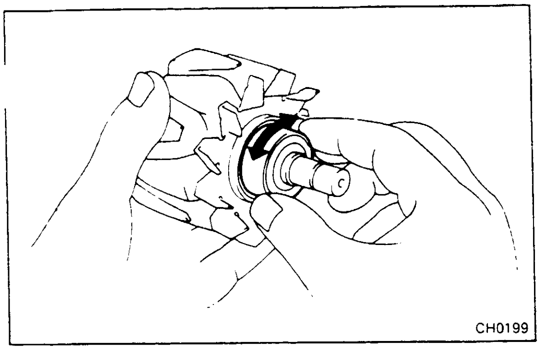
1. **INSPECT FRONT BEARING**

   Check that the front bearing is not rough or worn. Replace if necessary.



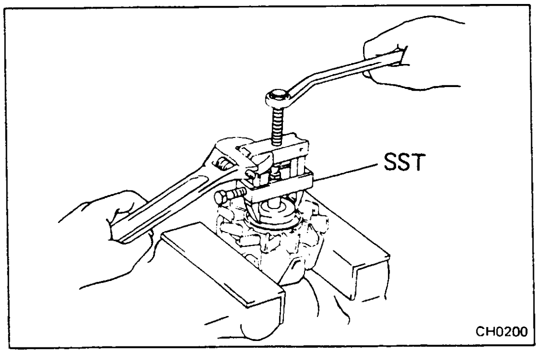
2. **IF NECESSARY, REPLACE FRONT BEARING**

   Remove the four screws and bearing retainer, and replace the front bearing.



3. **INSPECT REAR BEARING**

Check that the rear bearing is not rough or worn. Replace if necessary.

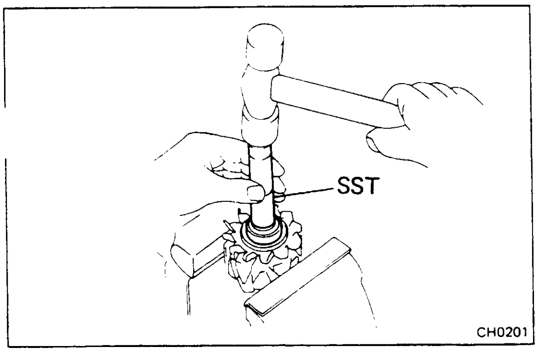


4. **IF NECESSARY, REPLACE REAR BEARING**

(a) Using SST, remove the rear bearing with the bearing cover from the rotor shaft.

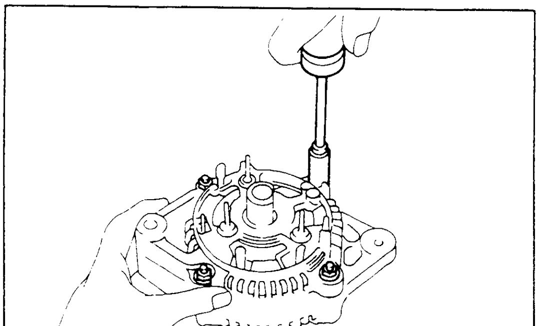
SST 09820-00020

CAUTION: Be careful not to damage the fan.



(b) Using SST, install the rear bearing and bearing cover onto the rotor shaft.

SST 09285-76010

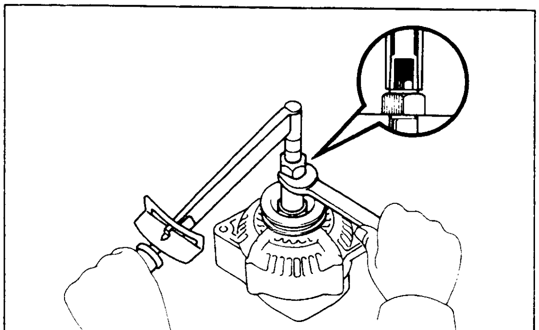

CH0218

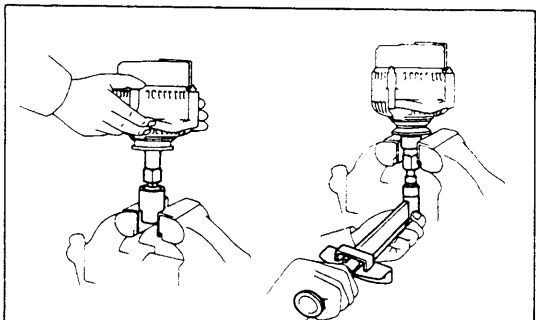
ASSEMBLY OF ALTERNATOR

(See page CH-6)

1. **INSTALL ROTOR TO DRIVE END FRAME**

2. **INSTALL REAR END FRAME**
   (a) Using a plastic hammer, lightly tap the rear end frame on the drive end frame.
   (b) Install the four nuts.


CH0236


CH0235 CH0240

3. **INSTALL PULLEY**
   (a) Install the pulley to the rotor shaft by tightening the pulley nut by hand.
   (b) Hold SST "A" with a torque wrench and tighten SST "B" clockwise to the specified torque.

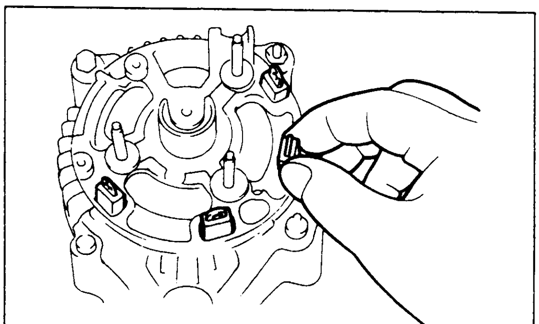
   SST 09820-63010

   Torque: 400 kg-cm (29 ft-lb, 39 N·m)

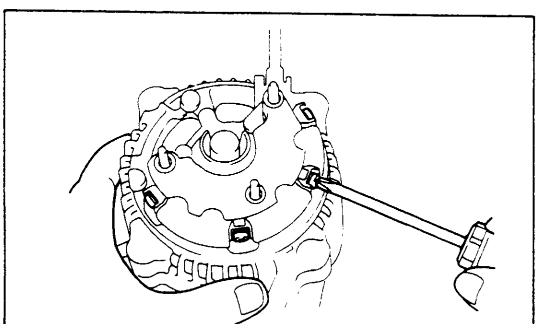
   (c) Confirm that SST "A" is secured to the pulley shaft.
   (d) As shown in the figure, grip SST "C" in a vise and then install the alternator to SST "C".
   (e) To torque the pulley nut turn SST "A" in the direction shown in the figure.

   Torque: 950 – 1,300 kg-cm
   (69 – 94 ft-lb, 94 – 127 N·m)

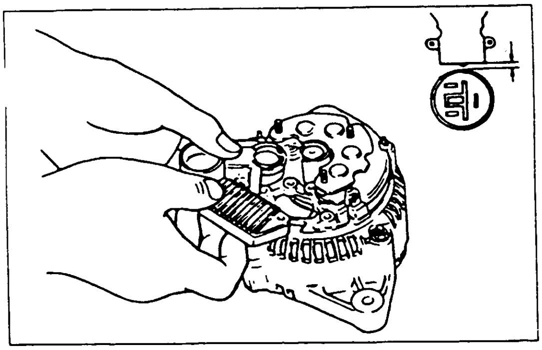
   (f) Turn SST "B" and remove all SSTs.


CH0062

4. **INSTALL FOUR TERMINAL INSULATORS**
   Install the four terminal insulators on the lead wires.


CH0188

5. **INSTALL RECTIFIER HOLDER**
   Install the rectifier holder with the four screws.



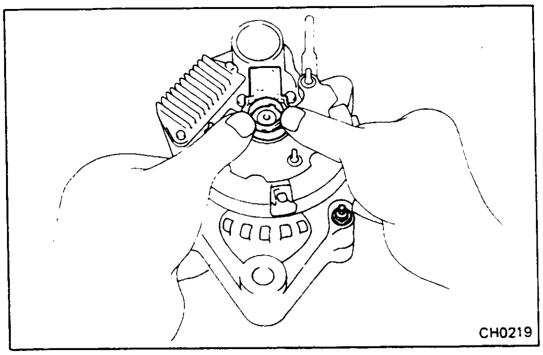
6. INSTALL BRUSH HOLDER WITH IC REGULATOR

(a) Install the brush holder with IC regulator.

(b) Install the two screws to IC regulator.

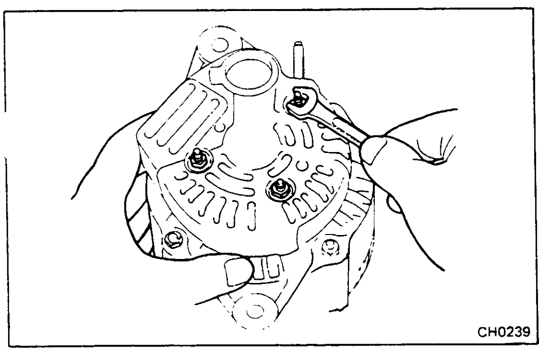
NOTE: Check the clearance between the brush holder and connector as 1 mm or more.

(c) Install the three screws.



CH0219

(d) Install the brush holder cover to the rear end frame.



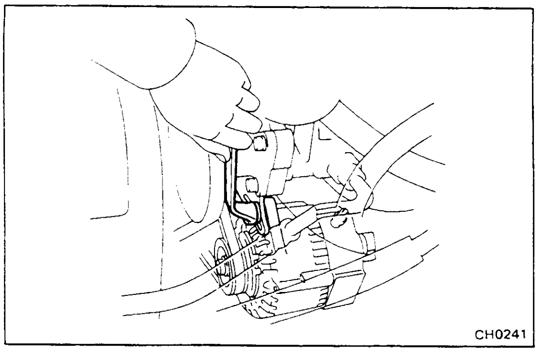
CH0239

7. INSTALL REAR END COVER

(a) Install the end cover with the three nuts.

(b) Install the terminal insulator with the nut.

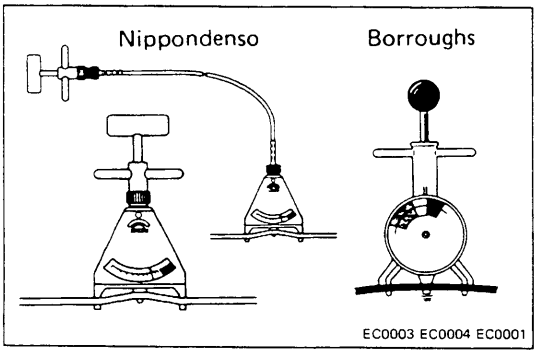
8. MAKE SURE ROTOR ROTATES SMOOTHLY



INSTALLATION OF ALTERNATOR

1. INSTALL ALTERNATOR

Mount the alternator on the bracket with the pivot and adjust bolt.



2. INSTALL DRIVE BELT

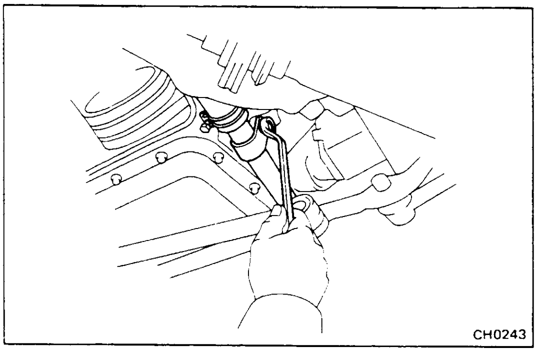
(a) Place the drive belt on the alternator, fan and crankshaft pulleys.

(b) Using a belt tension gauge, check the drive belt tension.

Belt tension gauge:
Nippondenso BTG-20 (95506-00020) or
Borroughs No. BT-33-73F

Drive belt tension:

New belt	**125 ± 25 lb**
Used belt	**80 ± 20 lb**

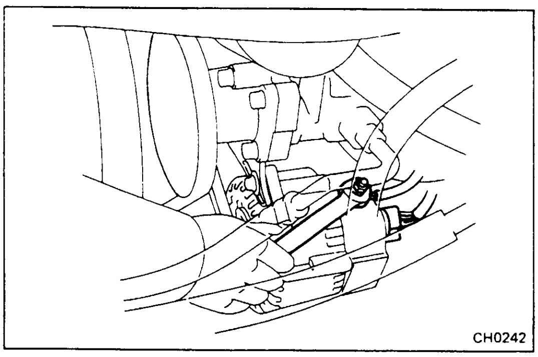


3. CONNECT WATER INLET HOSE

(a) Connect the water inlet hose to the engine.

(b) Install the two water inlet pipe bolts.

(c) Install the engine under cover.



4. CONNECT WIRING TO ALTERNATOR

(a) Connect the wire to the alternator and install the nut.

(b) Connect the connector to the alternator.

5. FILL WITH COOLANT

Close the radiator drain cock and fill with coolant.

6. CONNECT NEGATIVE CABLE TO BATTERY

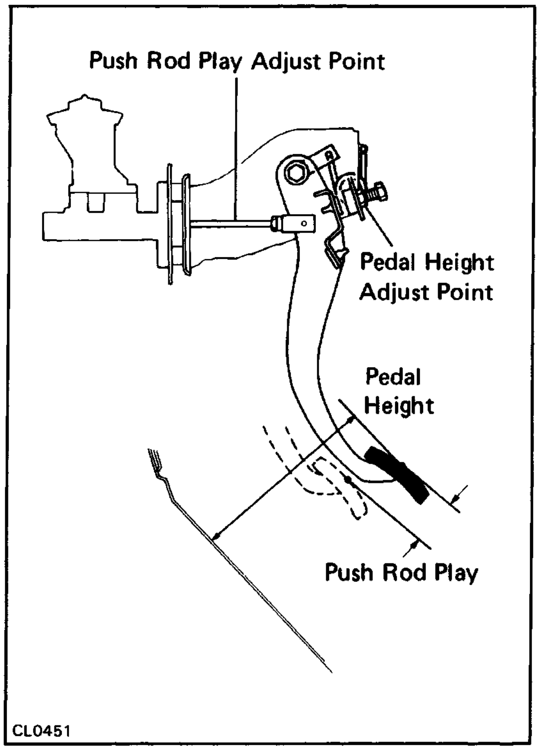
7. PERFORM ON-VEHICLE INSPECTION
(See page CH-3)

CLUTCH

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Hard to shift or will not shift	Clutch pedal freeplay excessive Air in clutch lines Clutch release cylinder faulty Clutch master cylinder faulty Clutch disc out of true, runout is exces–sive or lining broken Splines on input shaft or clutch disc dirty or burred Clutch pressure plate faulty	Adjust pedal freeplay Bleed clutch system Repair release cylinder Repair master cylinder Inspect clutch disc Repair as necessary Replace clutch cover	CL–3 CL–4 CL–10 CL–7 CL–13 CL–12 CL–14
Transmission jumps out of gear	Clutch pilot bearing worn	Replace pilot bearing	CL–14
Clutch slips	Clutch pedal freeplay insufficient Clutch disc lining oily or worn out Pressure plate faulty Release fork binding	Adjust pedal freeplay Inspect clutch disc Replace clutch cover Inspect release fork	CL–3 CL–13 CL–14
Clutch grabs/ chatters	Clutch disc lining oily or worn out Pressure plate faulty Clutch diaphragm spring bent Engine mounts loose	Inspect clutch disc Replace clutch cover Align clutch diaphragm Repair as necessary	CL–13 CL–14 CL–15
Clutch pedal spongy	Air in clutch lines Clutch release cylinder faulty Clutch master cylinder faulty	Bleed clutch system Repair release cylinder Repair master cylinder	CL–4 CL–10 CL–7
Clutch noisy	Loose part inside housing Release bearing worn or dirty Pilot bearing worn Release fork or linkage sticking	Repair as necessary Replace release bearing Replace pilot bearing Repair as necessary	CL–15 CL–14

CHECK AND ADJUSTMENT OF CLUTCH PEDAL



1. CHECK THAT PEDAL HEIGHT AND PUSH ROD PLAY ARE CORRECT

Pedal height

(from asphalt sheet): 2WD 154.5 mm (6.0827 in.)
4WD 151.5 mm (5.9646 in.)

(from floor panel): 157.5 mm (6.201 in.)

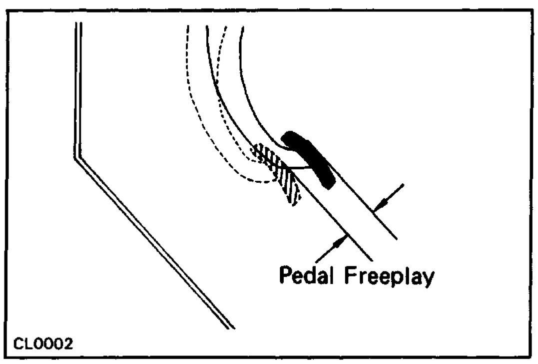
Push rod play at pedal top: 1.0 – 5.0 mm
(0.039 – 0.197 in.)

If incorrect, adjust the pedal height and push rod play.

2. IF NECESSARY, ADJUST PEDAL HEIGHT AND PUSH ROD PLAY

(a) Loosen the lock nut and turn the stopper bolt until the height is correct. Tighten the lock nut.

(b) Loosen the lock nut and turn the push rod until the push rod play is correct. Tighten the lock nut.



3. CHECK THAT PEDAL FREEPLAY IS CORRECT

Push in on the pedal until the beginning of clutch resis– tance is felt.

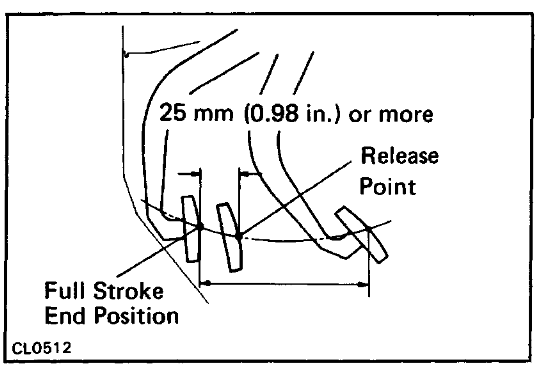
Pedal freeplay: 5 – 15 mm (0.20 – 0.59 in.)

4. IF NECESSARY, ADJUST PEDAL FREEPLAY

(a) Loosen the lock nut and turn the push rod until the freeplay is correct.

(b) Tighten the lock nut.

(c) After adjusting the pedal freeplay, check the pedal height.



5. INSPECT CLUTCH RELEASE POINT

(a) Pull the parking brake lever and install wheel stop– per.

(b) Start the engine and idle the engine.

(e) Without depressing the clutch pedal, slowly shift the shift lever into reverse position until the gears contact.

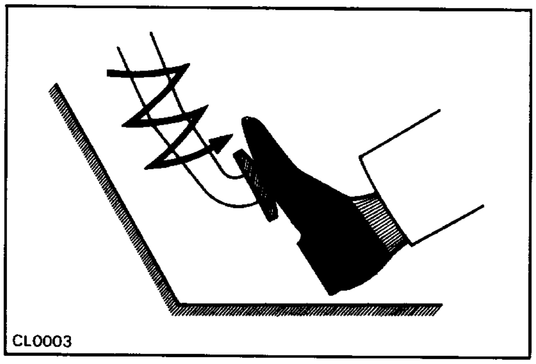
(d) Gradually depress the clutch pedal and measure the stroke distance from the point the gear noise stops (release point) up to the full stroke end position.

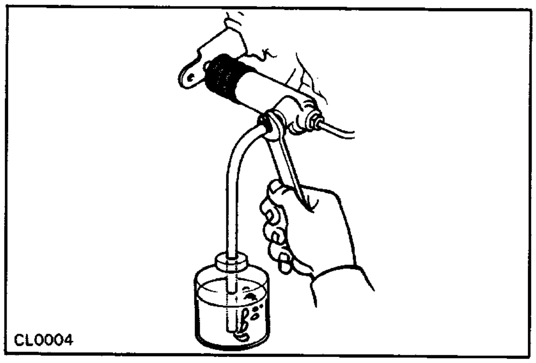
Standard distance: 25 mm (0.98 in.) or more
(From pedal stroke end position to release point)

If the distance not as specified, perform the following op– eration.

- Inspect pedal height.
- Inspect push rod play and pedal free play.
- Bleed the clutch line.
- Inspect the clutch cover and disc.

BLEEDING OF CLUTCH SYSTEM


CL0003


CL0004

HINT: If any work is done on the clutch system or if air is suspected in the clutch lines, bleed the system of air.

NOTICE: Do not let brake fluid remain on a painted sur– face. Wash it off immediately.

1. FILL CLUTCH RESERVOIR WITH BRAKE FLUID

Check the reservoir frequently. Add fluid if necessary.

2. CONNECT VINYL TUBE TO BLEEDER PLUG

Insert the other end of the tube in a half–full container of brake fluid.

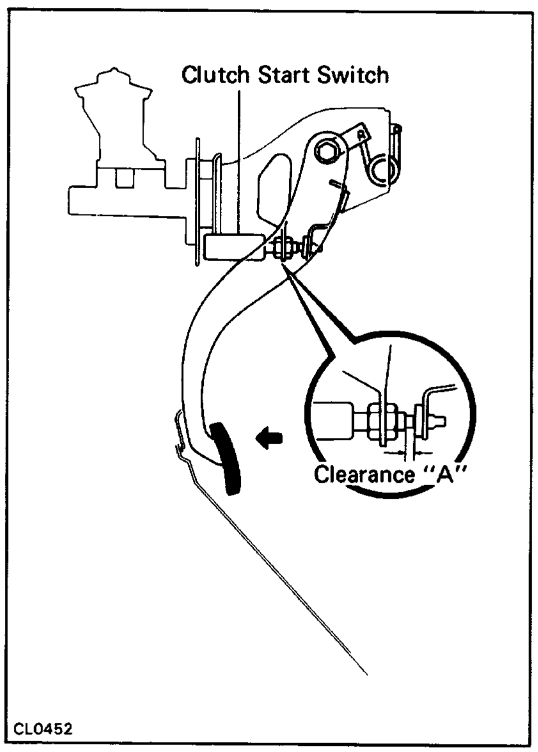
3. BLEED CLUTCH LINE

(a) Slowly pump the clutch pedal several times.

(b) While pressing on the pedal, loosen the bleeder plug until the fluid starts to run out. Then close the bleeder plug.

(c) Repeat this procedure until there are no more air bubbles in the fluid.

INSPECTION OF CLUTCH START SYSTEM



CL0452

CHECK CLUTCH PEDAL

1. CHECK THAT PEDAL HEIGHT IS CORRECT

(See page CL–3)

2. CHECK THAT PEDAL FREEPLAY AND PUSH ROD PLAY ARE CORRECT

(See page CL–3)

CHECK CLUTCH START SYSTEM

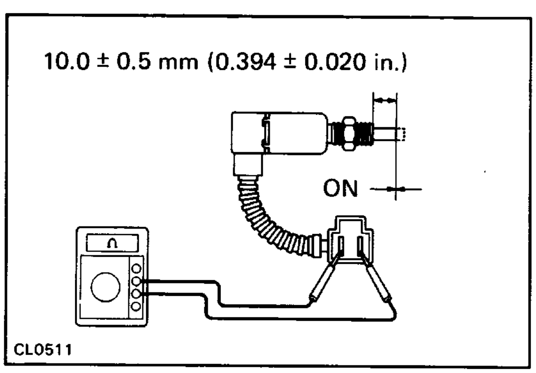
CHECK CLUTCH START SYSTEM

(a) Check that the engine does not start when the clutch pedal is released.

(b) Check that the engine starts when the clutch pedal is fully depressed.

(c) Check that clearance "A" is greater than 1 mm (0.04 in.) when the clutch is fully depressed.
If necessary, adjust or replace the clutch start switch.

INSPECTION AND ADJUSTMENT OF CLUTCH START SWITCH

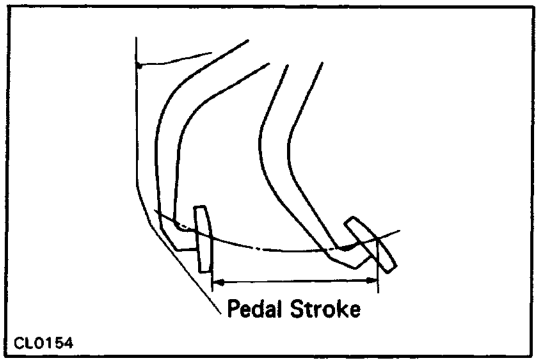


CL0511

1. INSPECT CONTINUITY OF CLUTCH START SWITCH

(a) Check that there is continuity between terminals when the switch is ON (pushed).

(b) Check that there is no continuity between terminals when the switch is OFF (free).
If continuity is not as specified, replace the switch.

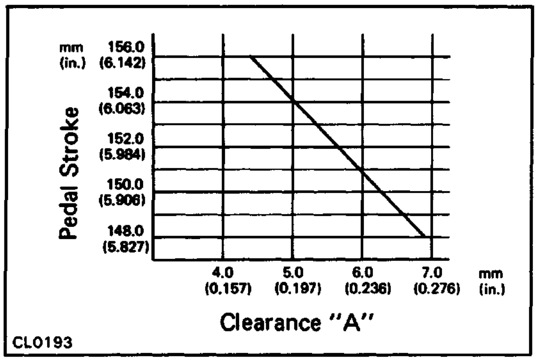


CL0154

2. ADJUST CLUTCH START SWITCH

(a) Measure the pedal stroke, and check the switch clearance "A" using the chart left.

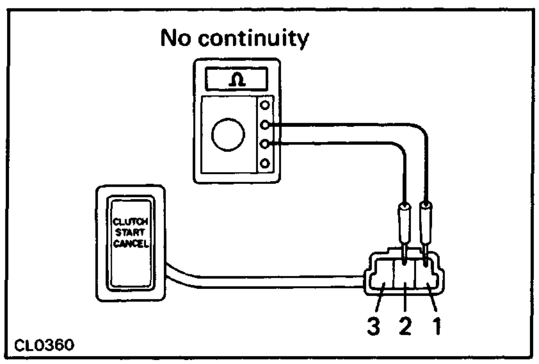
(b) Loosen and adjust the switch position.



CL0193

(c) Recheck that the engine does not start when the clutch pedal is released.

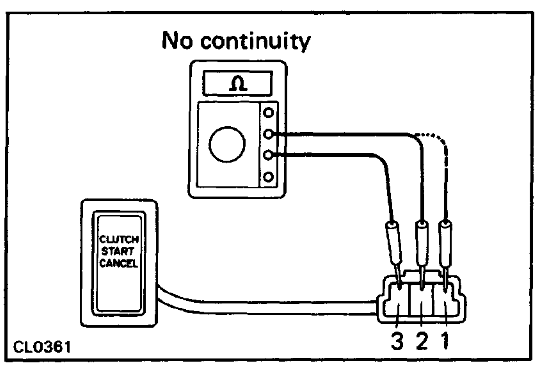
INSPECTION OF CLUTCH START CANCEL SWITCH



CL0360

1. INSPECT CONTINUITY OF CLUTCH START CANCEL SWITCH

(a) Check that there is no continuity when connect the positive (+) lead from the ohmmeter to terminal 2 and the negative (–) lead to terminal 1.

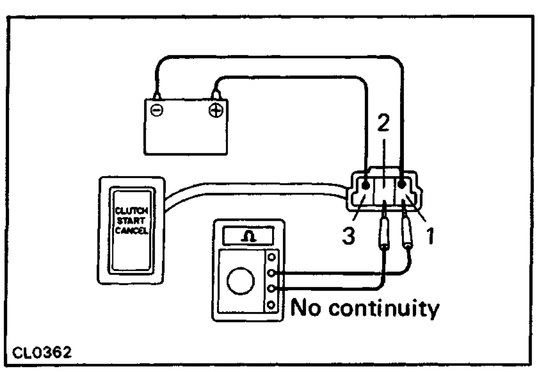


CL0361

(b) Check that there is no continuity when connect the positive (+) lead from the ohmmeter to terminal 3 and the negative (–) lead to terminal 1.

(c) Check that there is no continuity between terminals 2 and 3.

If continuity is not as specified, replace the clutch start cancel switch.

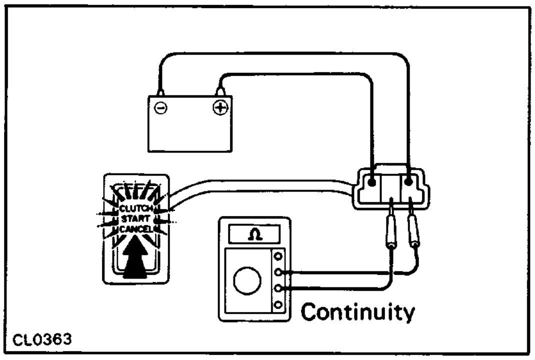


CL0362

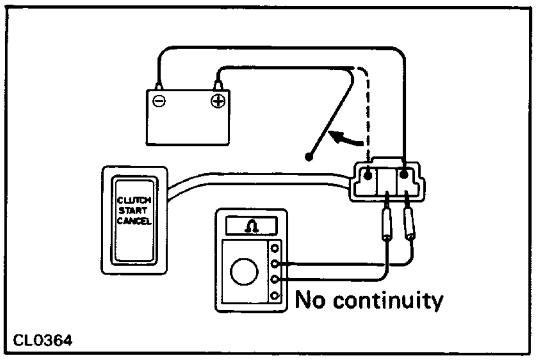
2. INSPECT OPERATION OF CLUTCH START CANCEL SWITCH

(a) Connect positive (+) lead from the battery to termi– nal 3 and connect negative (–) lead to terminal 1.

(b) Check that there is no continuity when connect the positive (+) lead from the ohmmeter to terminal 2 and the negative (–) lead to terminal 1.



(c) When pushing the switch, check that the indicator light comes on and there is continuity between ter–minals 1 and 2.

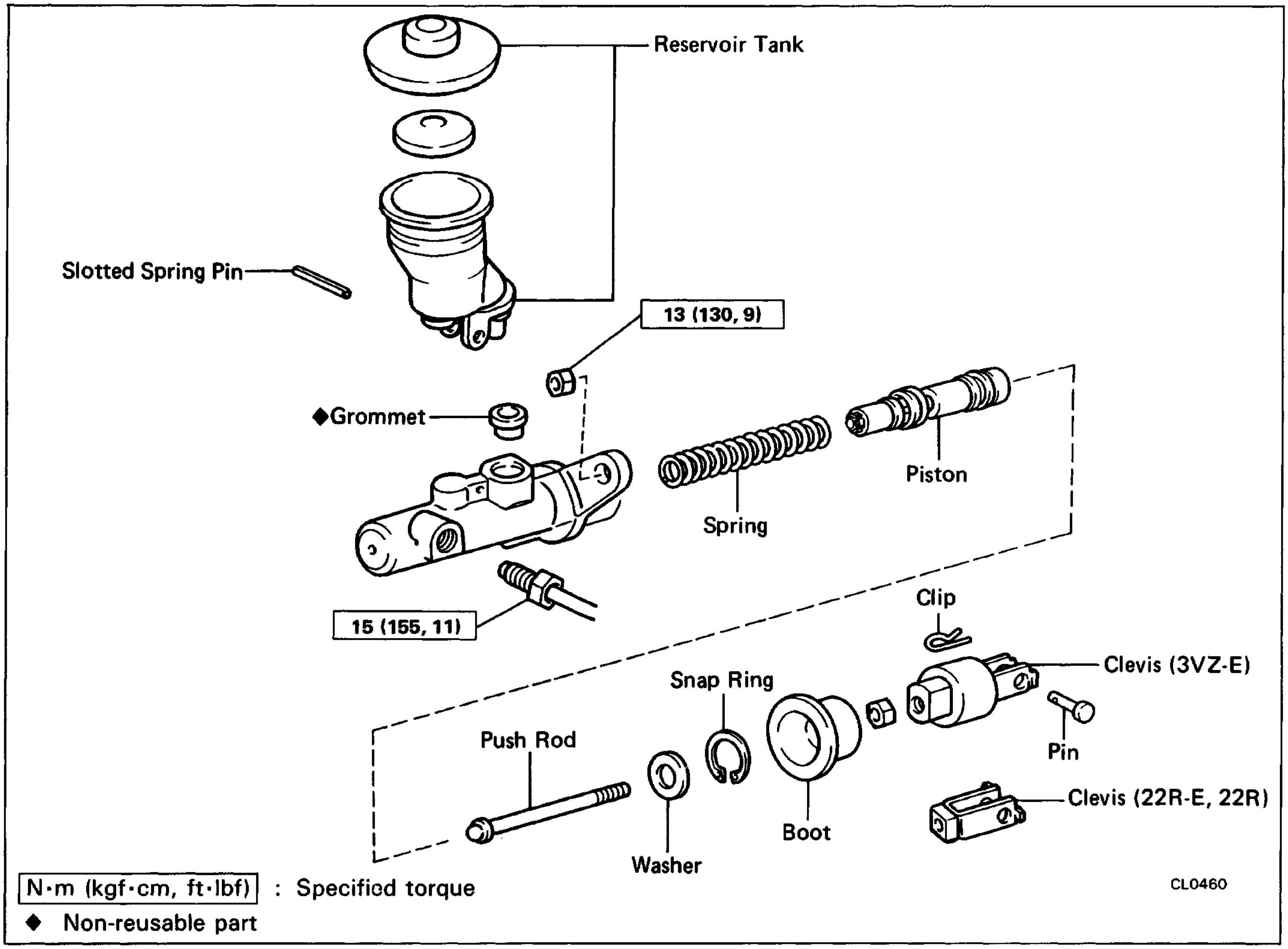


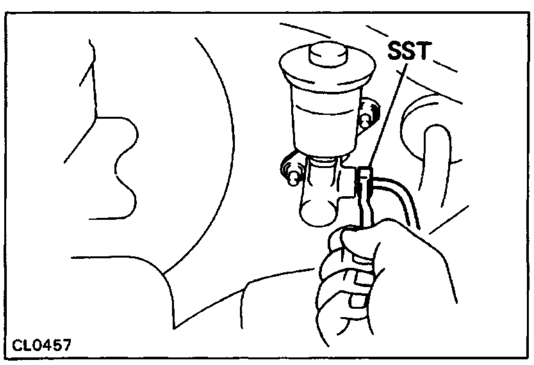
(d) Check that there is no continuity between terminals 1 and 2 when disconnect the battery lead.

If operation is not as specified, replace the clutch start cancel switch.

CLUTCH MASTER CYLINDER

COMPONENTS





REMOVAL OF MASTER CYLINDER

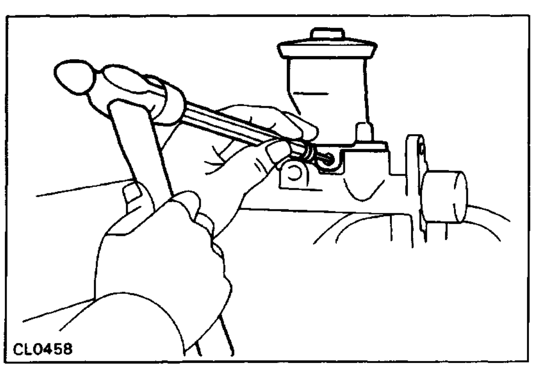
1. REMOVE PUSH ROD PIN

2. DISCONNECT CLUTCH LINE UNION

Using SST, disconnect the union nut.
SST 09751–36011

3. REMOVE MASTER CYLINDER

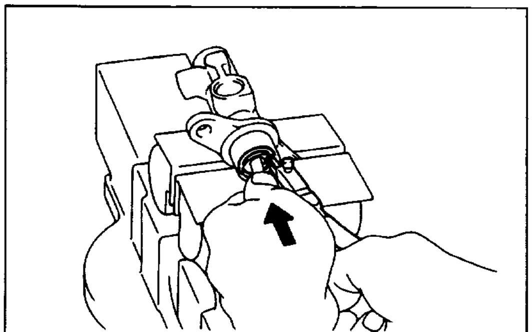
(a) Remove the mounting nut.
(b) Pull out the master cylinder.



DISASSEMBLY OF MASTER CYLINDER

1. REMOVE RESERVOIR TANK

(a) Using a pin punch and a hammer, drive out the slot–ted spring pin.
(b) Remove reservoir tank and grommet.


CL0445

2. REMOVE PUSH ROD
(a) Pull back the boot and, using snap ring pliers, re–move the snap ring.
(b) Pull out the push rod and washer.
(c) Remove the piston from the cylinder.

INSPECTION OF MASTER CYLINDER

HINT: Clean the disassembled parts with compressed air.

1. INSPECT MASTER CYLINDER BORE FOR SCORING OR CORROSION.

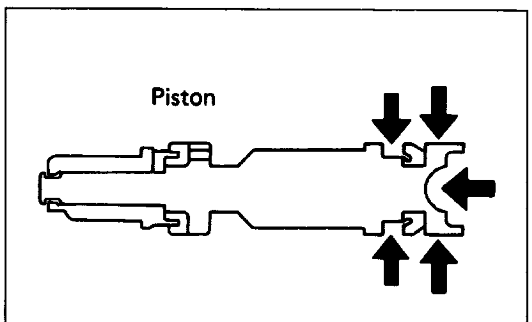
If a problem is found, clean or replace the cylinder.

2. INSPECT PISTON AND CUPS FOR WEAR, SCORING, CRACKS OR SWELLING

If either one requires replacement, use the parts from the cylinder kit.

3. INSPECT PUSH ROD FOR WEAR OR DAMAGE

If necessary, replace the push rod.

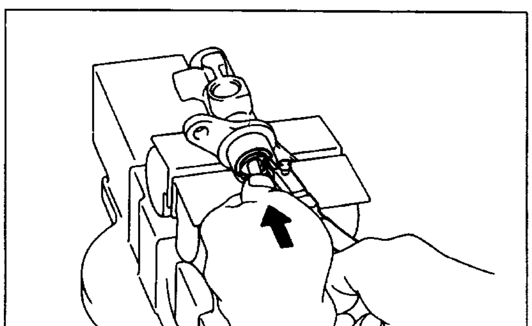


CL0442

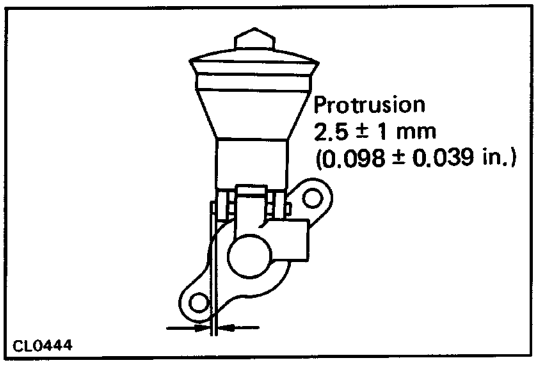
ASSEMBLY OF MASTER CYLINDER

1. COAT PARTS WITH LITHIUM SOAP BASE GLYCOL GREASE, AS SHOWN

2. INSERT PISTON INTO CYLINDER


CL0445

3. INSTALL PUSH ROD ASSEMBLY WITH SNAP RING



4. INSTALL RESERVOIR TANK

(a) Install reservoir tank and new grommet.

(b) Using a pin punch and a hammer, drive in the slotted spring pin.

INSTALLATION OF MASTER CYLINDER
(See page CL–7)

1. INSTALL MASTER CYLINDER

Install the mounting nut, and torque them.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)

2. CONNECT CLUTCH LINE UNION

Using SST, connect the union.

SST 09751–36011

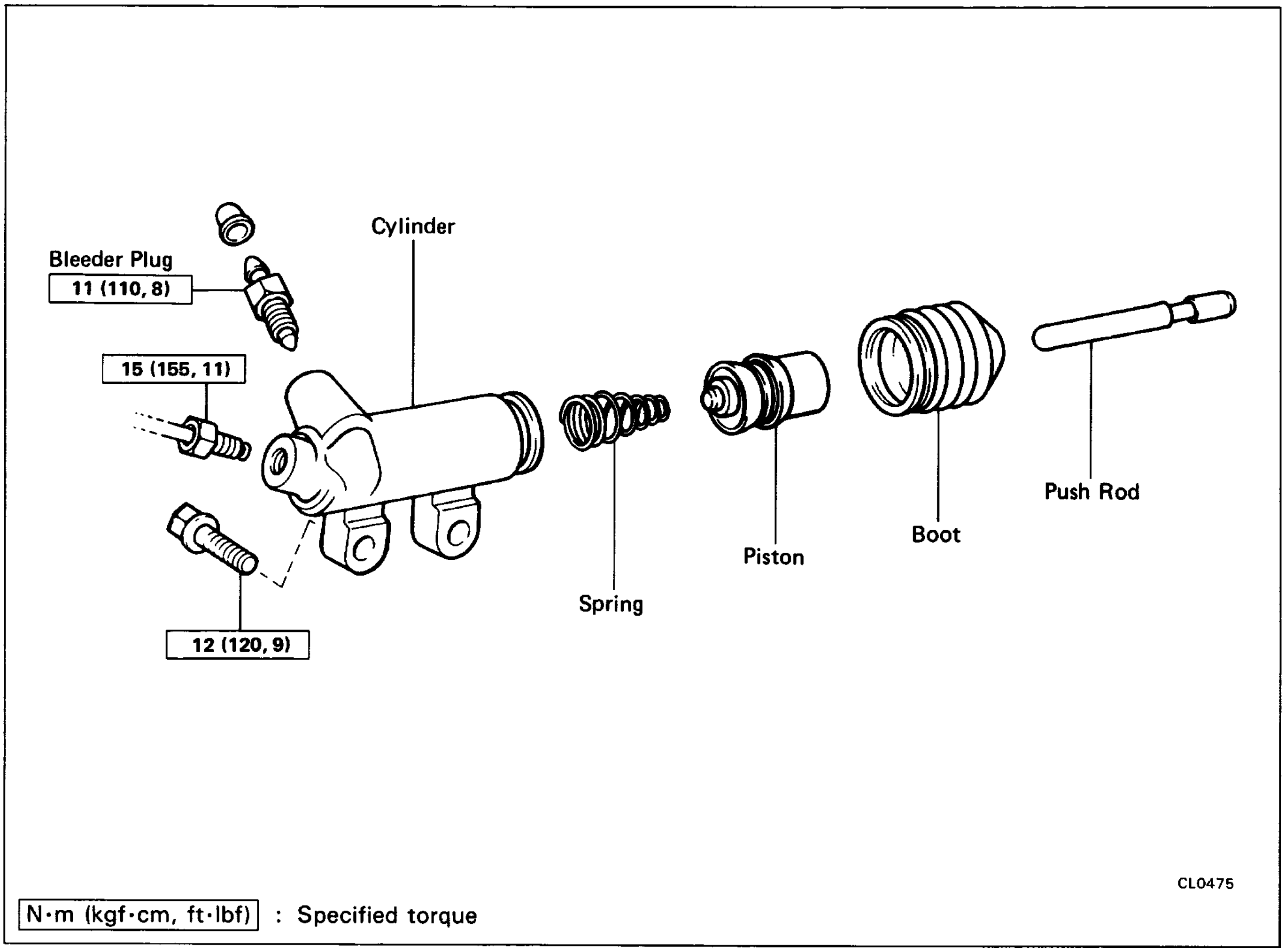
3. CONNECT PUSH ROD AND INSTALL PIN

Install the clip in the push rod pin.

4. BLEED SYSTEM AND ADJUST CLUTCH PEDAL
(See page CL–4)

CLUTCH RELEASE CYLINDER

COMPONENTS



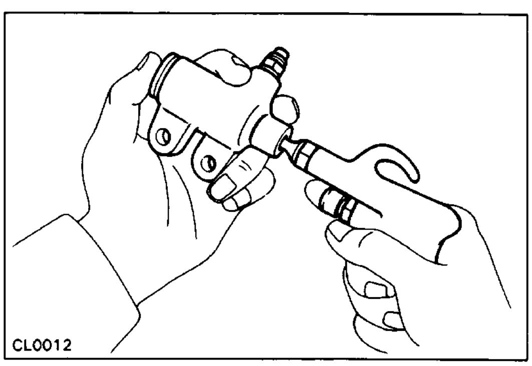
REMOVAL OF RELEASE CYLINDER

1. DISCONNECT CLUTCH LINE UNION

Using SST, disconnect the union.

SST 09751–36011

2. REMOVE TWO BOLTS AND PULL OFF RELEASE CYLINDER



DISASSEMBLY OF RELEASE CYLINDER

1. PULL OUT PUSH ROD

2. REMOVE BOOT

3. REMOVE PISTON

INSPECTION OF RELEASE CYLINDER

HINT: Clean the disassembled parts with compressed air.

1. INSPECT RELEASE CYLINDER BORE FOR SCORING OR CORROSION

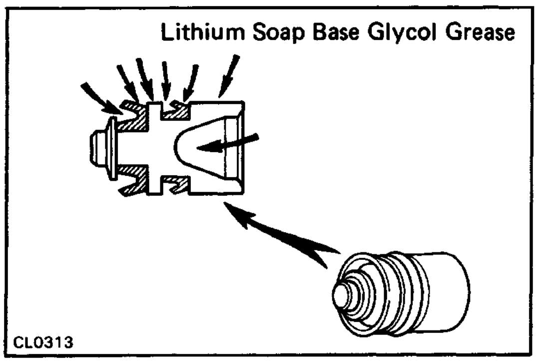
If a problem is found, clean or replace the cylinder.

2. INSPECT PISTON AND CUPS FOR WEAR, SCORING, CRACKS OR SWELLING

If either one requires replacement, use the parts from the cylinder kit.

3. INSPECT PUSH ROD FOR WEAR OR DAMAGE

If necessary, replace the push rod.



CL0313

ASSEMBLY OF RELEASE CYLINDER

(See page CL–10)

1. COAT PISTON WITH LITHIUM SOAP BASE GLYCOL GREASE, AS SHOWN

2. INSTALL PISTON

3. INSTALL BOOT AND INSERT PUSH ROD

INSTALLATION OF RELEASE CYLINDER

(See page CL–10)

1. INSTALL RELEASE CYLINDER WITH TWO BOLTS

Torque: 12 N–m (120 kgf–cm, 9 ft–lbf)

2. CONNECT CLUTCH LINE UNION

Using SST, connect the union.

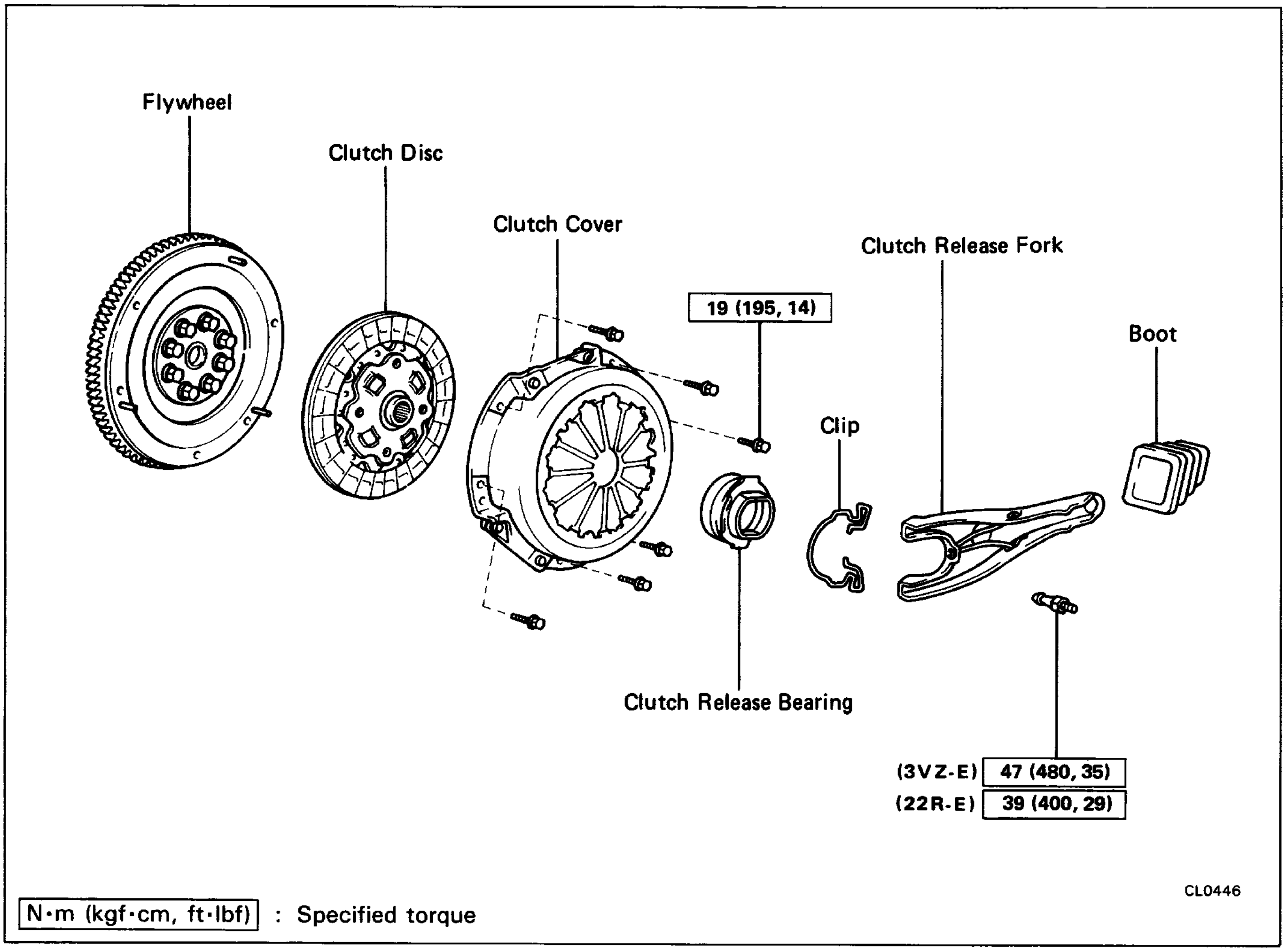
SST 09751–36011

3. BLEED CLUTCH SYSTEM

(See page CL–4)

CLUTCH UNIT

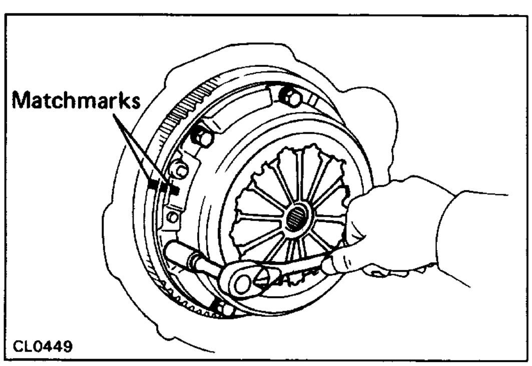
COMPONENTS



REMOVAL OF CLUTCH UNIT

1. REMOVE TRANSMISSION (See pages MT–4, TF–5)

HINT: Do not drain the transmission oil.

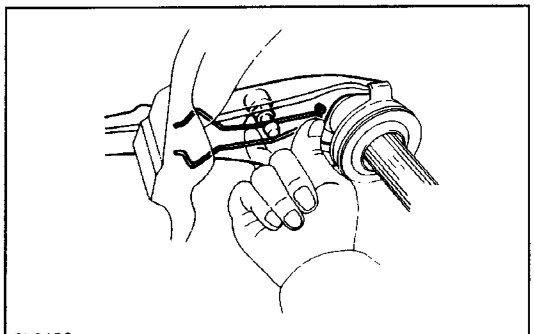


2. REMOVE CLUTCH COVER AND DISC

(a) Put matchmarks on the clutch cover and flywheel.

(b) Loosen the set bolts one turn at a time until spring tension is released.

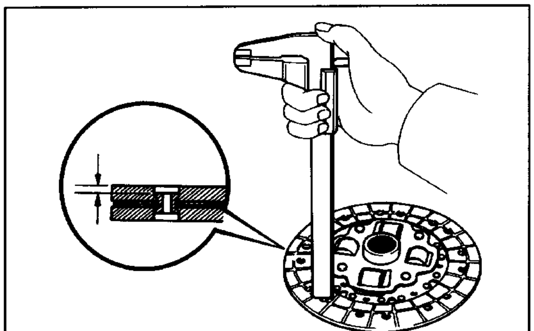
(c) Remove the set bolts and pull off the clutch cover and disc.


CL0438

3. REMOVE BEARING,HUB AND FORK FROM TRANSMISSION

(a) Remove the retaining clip pull off the bearing.

(b) Remove the fork and boot.


CL0239

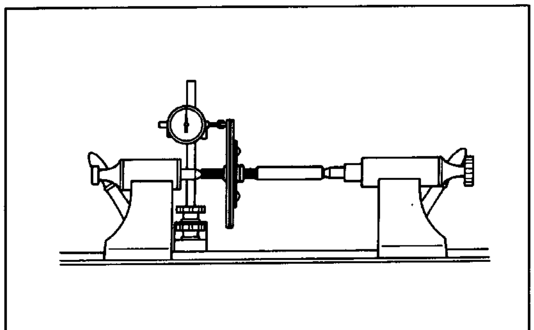
INSPECTION OF CLUTCH PARTS

1. INSPECT CLUTCH DISC FOR WEAR OR DAMAGE

Using calipers, measure the rivet head depth.

Minimum rivet depth: 0.3 mm (0.012 in.)

If a problem is found, repair or replace the clutch disc.

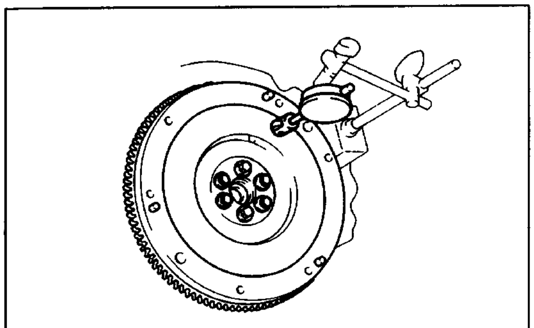

CL0373

2. INSPECT CLUTCH DISC RUNOUT

Using a dial indicator, check the disc runout.

Maximum runout: 0.8 mm (0.031 in.)

If runout is excessive, replace the disc.

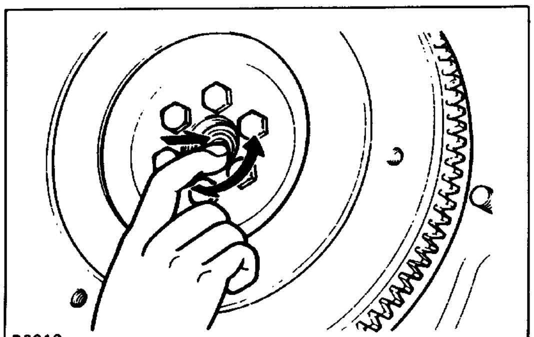

CL0448

3. INSPECT FLYWHEEL RUNOUT

Using a dial indicator, check the flywheel runout.

Maximum runout: 0.1 mm (0.004 in.)

If runout is excessive, repair or replace flywheel.

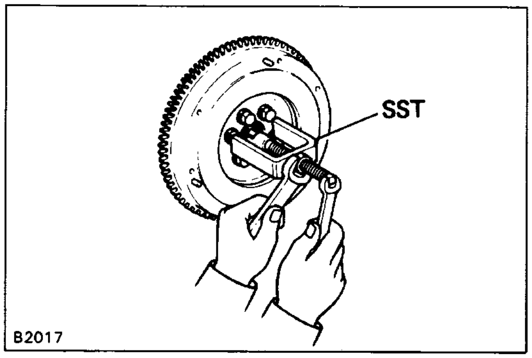

B2016

4. INSPECT PILOT BEARING

Turn the bearing by hand while applying force in the rota–tion direction.

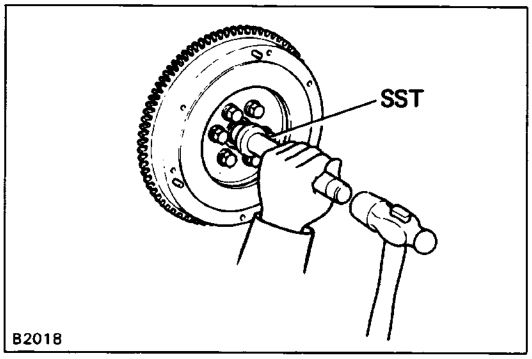
If the bearing sticks or has much resistance, replace the pilot bearing.

HINT: The bearing is permanently lubricated and re–quires no cleaning or lubrication.

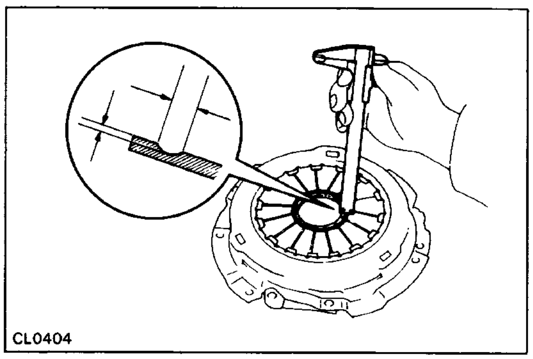


5. IF NECESSARY, REPLACE PILOT BEARING

(a) Using SST, remove the pilot bearing.
SST 09303–35011

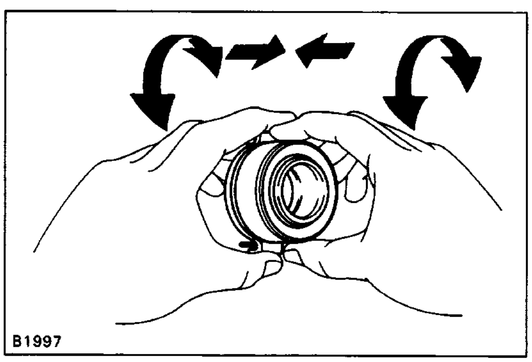


(b) Using SST, install the pilot bearing.
SST 09304–30012
HINT: After assembling the pilot bearing to the hud, in–sure that it rotates smoothly.



6. INSPECT DIAPHRAGM SPRING FOR WEAR

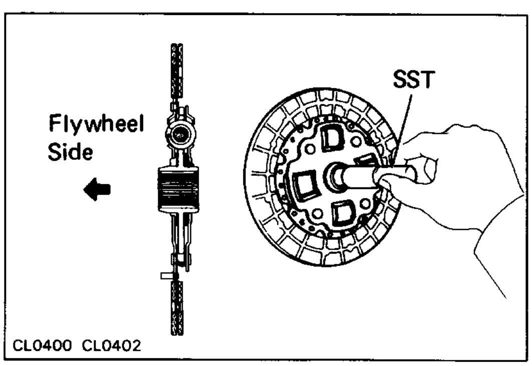
Using calipers, measure the diaphragm spring for depth and width of wear.
Maximum: Depth 0.6 mm (0.024 in.)
Width 5.0 mm I0.197 in.)



7. INSPECT RELEASE BEARING

Turn the bearing by hand while applying force in the rota–tion direction.
If the bearing sticks or has much resistance, replace the release bearing.

HINT: The bearing is permanently lubricated and re–quires no cleaning or lubrication.

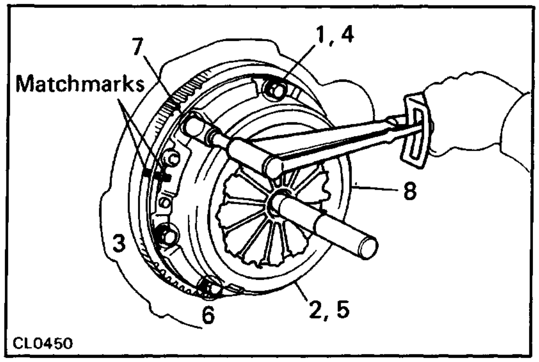


INSTALLATION OF CLUTCH UNIT

(See page CL–12)

1. INSTALL DISC ON FLYWHEEL

Using SST, install the disc on the flywheel.
SST 09301–20020



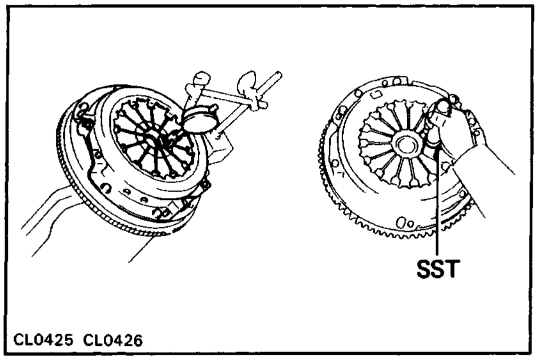
2. INSTALL CLUTCH COVER

(a) Align the matchmarks on the clutch cover and fly–wheel.

(b) Torque the bolts on the clutch cover in the order shown.

Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)

HINT: Temporarily tighten the No. 1 and No. 2 bolts.



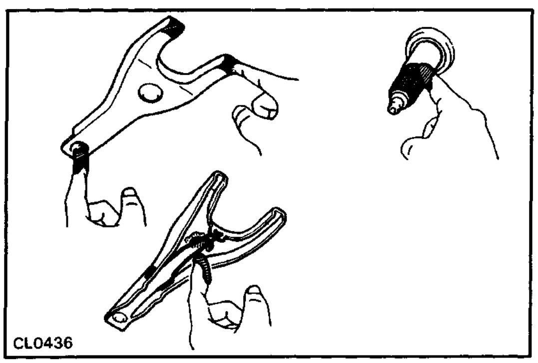
3. CHECK DIAPHRAGM SPRING TIP ALIGNMENT

Using a dial indicator with roller instrument, check the di–aphragm spring tip alignment.

Maximum non–alignment: 0.5 mm (0.020 in.)

If alignment is not as specified, using SST, adjust the di–aphragm spring tip alignment.

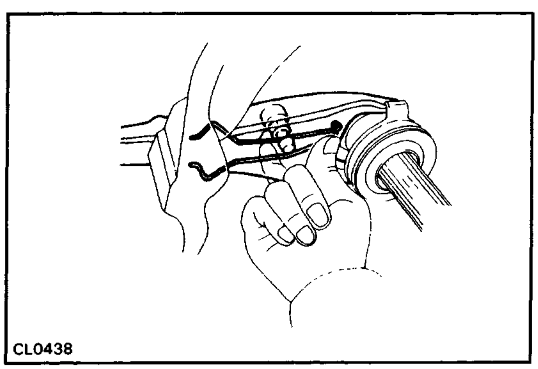
SST 09333–00013



4. APPLY MOLYBDENUM DISULPHIDE LITHIUM BASE GREASE (NLGI NO.2) OR MP GREASE

Apply molybdenum disulphide lithium base grease to the following parts:

- Release fork and hub contact point
- Release fork and push rod contact point
- Release fork pivot point
- Clutch disc spline



5. INSTALL BOOT, FORK, HUB AND BEARING ON TRANSMISSION

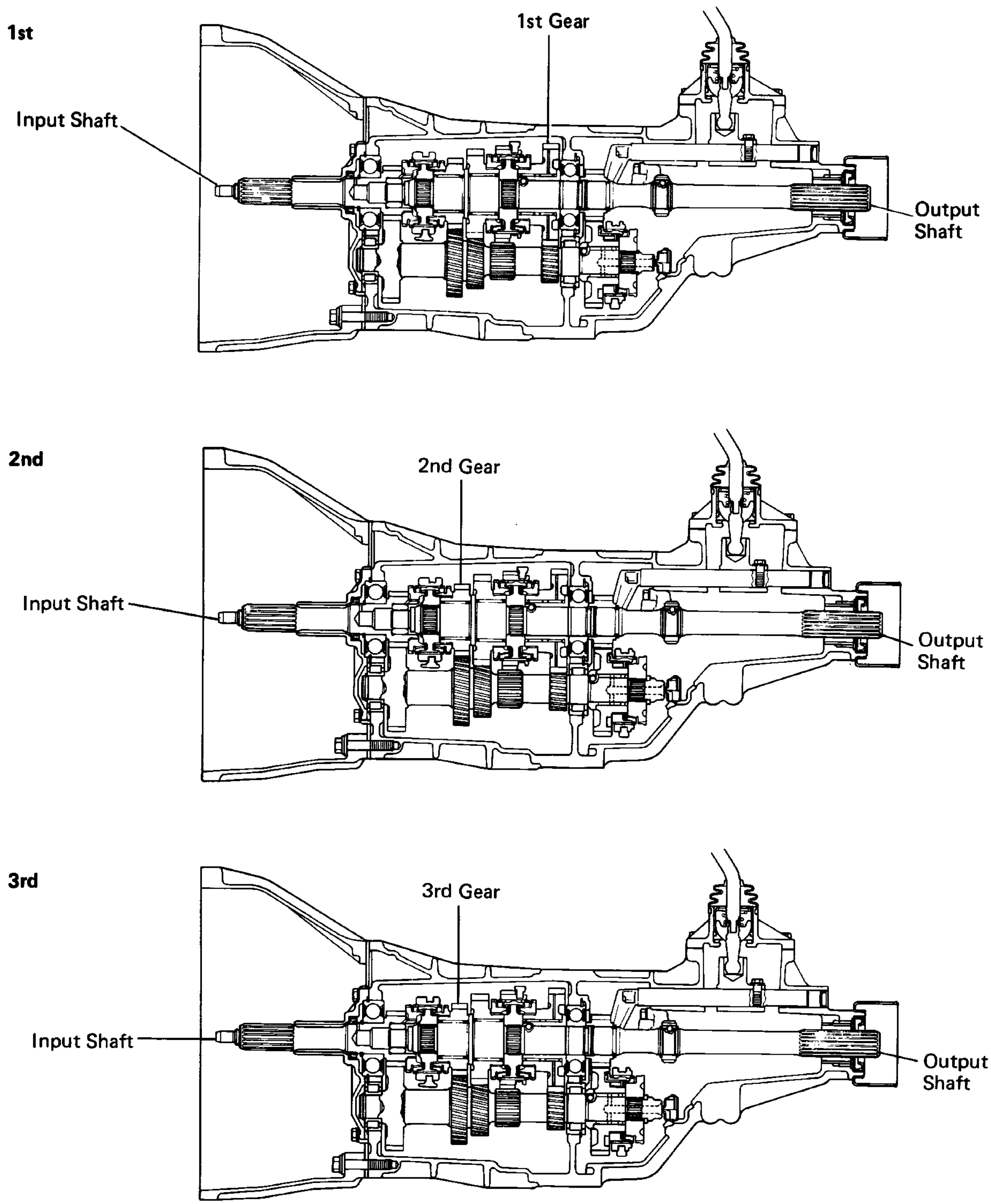
6. INSTALL TRANSMISSION

(See pages MT–5, TF–4)

G58, R150 and R150F MANUAL TRANSMISSION

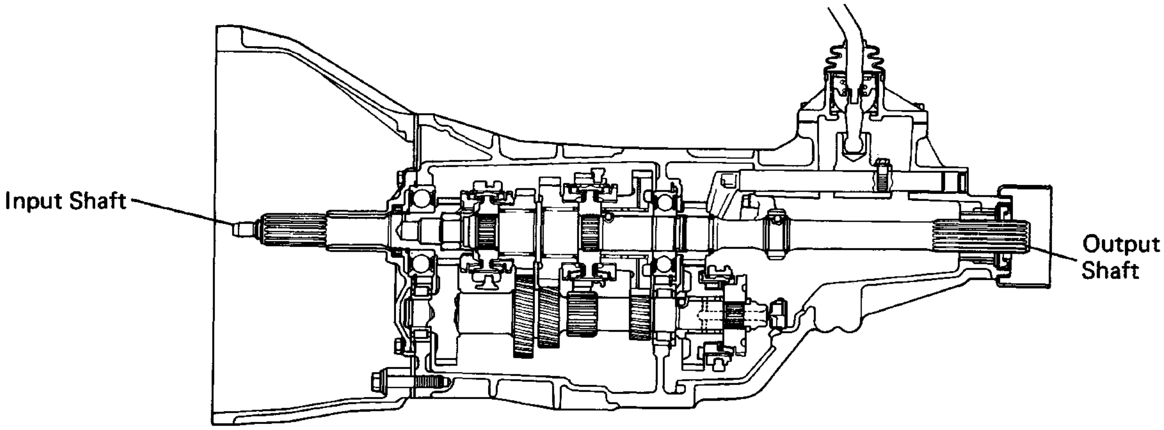
DESCRIPTION

- Transmission types, G58, W55, W56, R150 and R1 50F are constant mesh synchronizers for forward gears and a sliding mesh reverse gear.
- The illustrations below show the engagements of transmission gears.



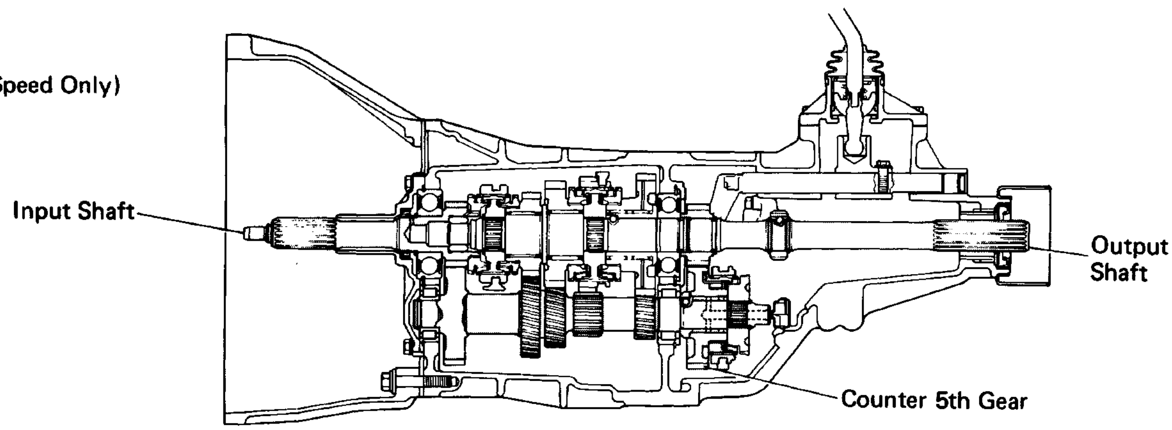
GM0358

4th

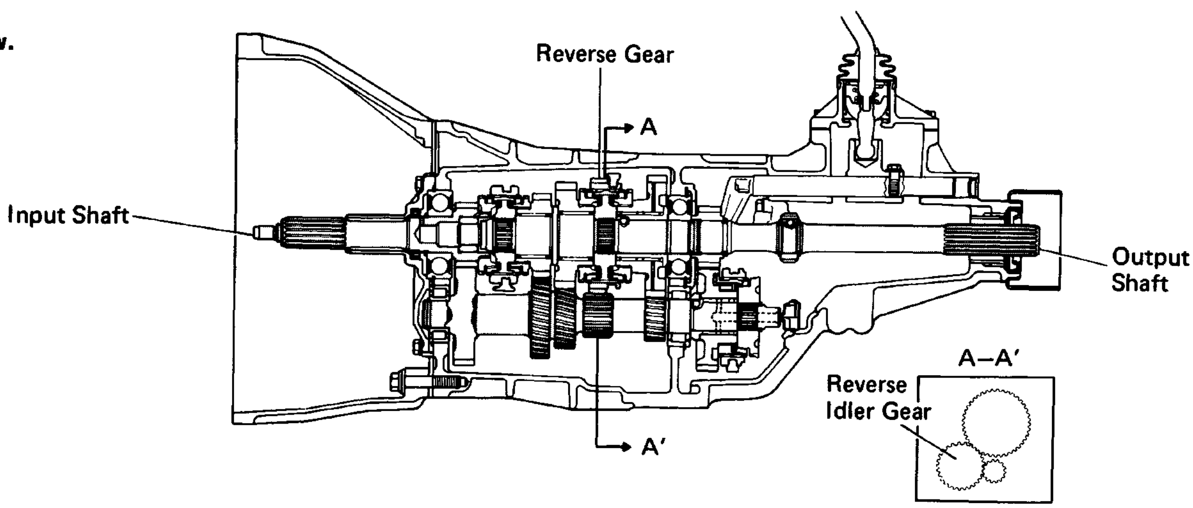


5th

(5-Speed Only)



Rev.



- The above illustrations show the engagements of a 5-speed transmission.
- The above illustration shows a G type transmission. The configuration of each gear is slightly different to W and R type transmissions but the gear engagements are the same.

MT0502 GM0358

PRECAUTIONS

When working with FIPG material, you must be observe the following.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket sur–faces.
- Thoroughly clean all components to remove all the loose material.
- Clean both sealing surfaces with a non–residue solvent.
- Apply the seal packing in approx. 1 mm (0.04 in.) bead along the sealing surface.
- Parts must be assembled within 10 minutes of application. Otherwise, the packing (FIPG) material must be removed and reapplied.

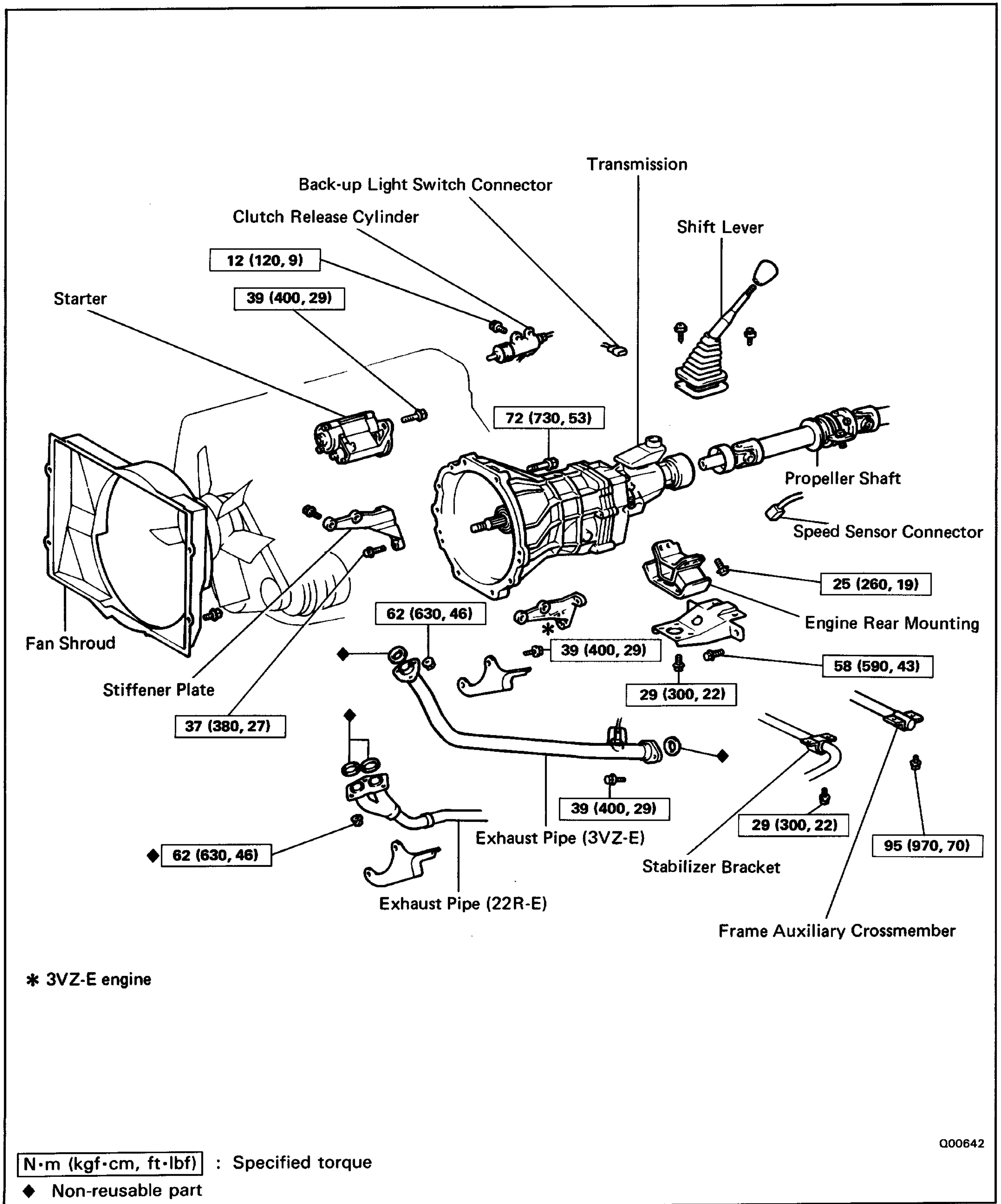
TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Hard to shift or will not shift	Splines on input shaft dirty or burred Transmission faulty	Repair as necessary Disassemble and inspect transmission	MT1–5 MT1–5
Transmission jumps out of gear	Transmission faulty	Disassemble and inspect transmission	MT1–5

REMOVAL AND INSTALLATION OF TRANSMISSION (2WD)

Remove and install the parts as shown

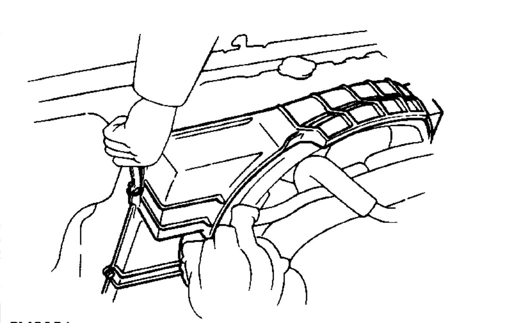
HINT: For the transmission with a transfer (4WD) refer to REMOVAL AND INSTALLATION OF TRANSMISSION WITH TRANSFER on Page MT1–14.



REMOVAL OF TRANSMISSION

HINT: For the transmission with a transfer (4WD) refer to REMOVAL OF TRANSMISSION WITH TRANSFER on page MT1– 16.

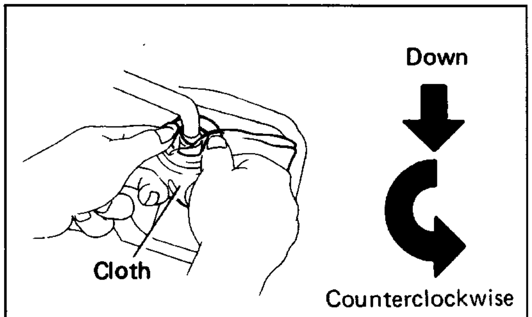
1. DISCONNECT BATTERY CABLE FROM NEGATIVE TERMINAL



EM5051

2. REMOVE FAN SHROUD SET BOLTS

Remove the four bolts.



MT0501

3. REMOVE TRANSMISSION SHIFT LEVER FROM INSIDE OF VEHICLE

(a) Remove the four screw and remove the shift lever boot retainer.
(b) Pull up the shift lever boot.
(c) Cover the shift lever cap with cloth.
(d) Then, pressing down on the shift lever cap, rotate it counterclockwise to remove.
(e) Remove the shift lever.

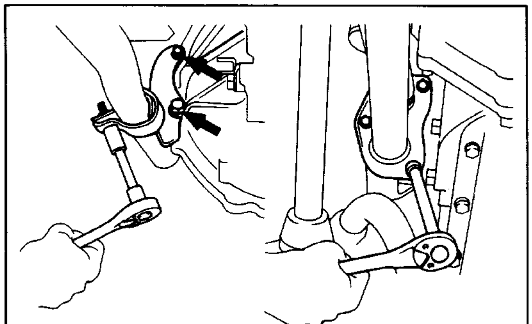
4. RAISE VEHICLE AND DRAIN TRANSMISSION OIL

NOTICE: Be sure the vehicle is securely supported.

5. DISCONNECT PROPELLER SHAFT
(SEE PR–5)

SST 09325–20010 (22R–E)
09325–40010 (3V Z–E)

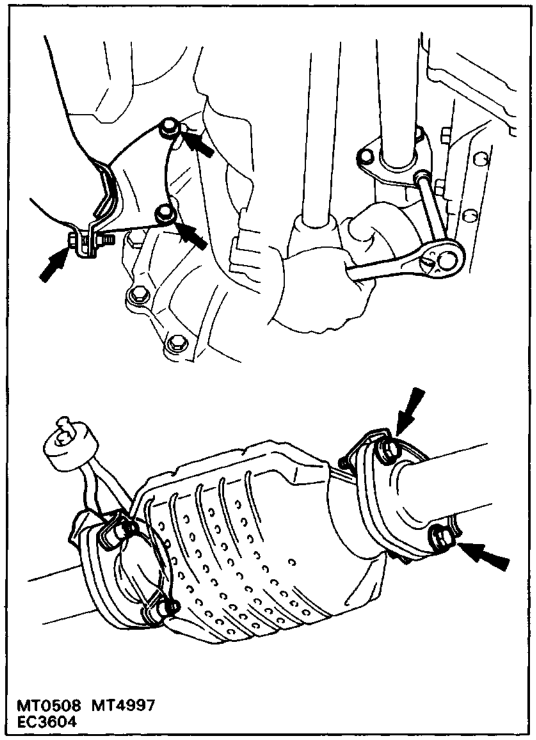
6. DISCONNECT SPEEDOMETER CABLE AND BACK–UP LIGHT SWITCH CONNECTOR



MT0020 MT0021

7.–1 (22R–E)
REMOVE EXHAUST PIPE CLAMP AND EXHAUST PIPE

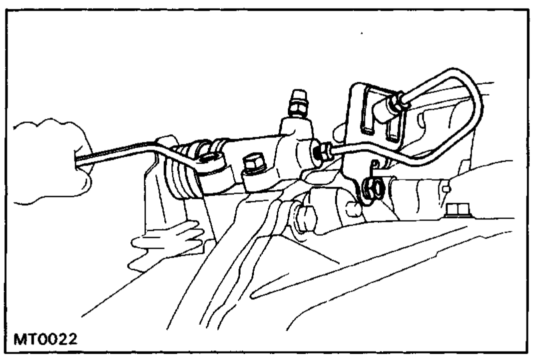
(a) Remove the exhaust pipe clamp from the bracket.
(b) Remove the exhaust pipe from the manifold.
(c) Remove the pipe clamp bracket from clutch housing.



7.–2 (3VZ–E)
REMOVE EXHAUST PIPE CLAMP AND EXHAUST PIPE

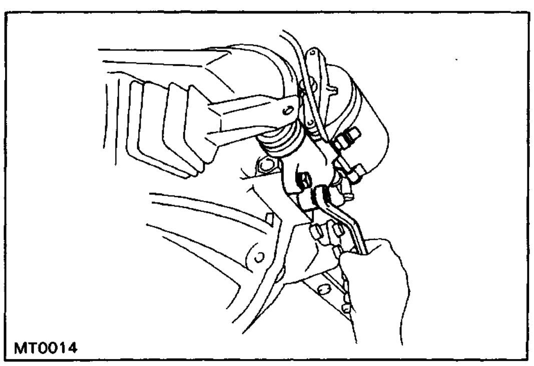
(a) Remove the exhaust pipe clamp from the bracket.
(b) Remove the exhaust pipe bracket from the clutch housing.
(c) Remove the exhaust pipe from the manifold.

(d) Disconnect exhaust pipe from catalytic converter front side.



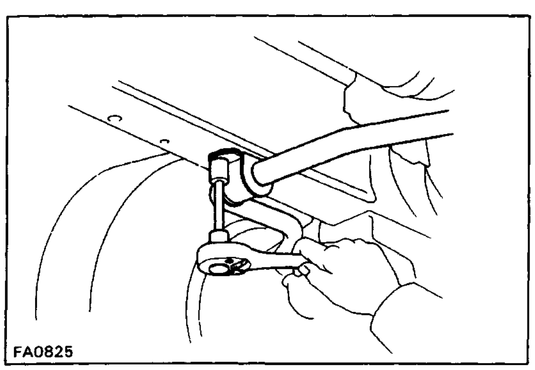
8.–1 (22R–E)
REMOVE CLUTCH RELEASE CYLINDER, TUBE BRACKET AND STARTER LOWER MOUNTING BOLT

Lay the release cylinder and tube bracket alongside the engine.
HINT: Do not disconnect the clutch line.



8.–2 (3VZ–E)
REMOVE CLUTCH RELEASE CYLNDER

Lay the release cylinder alongside engine.
HINT: Do not disconnect the clutch line.

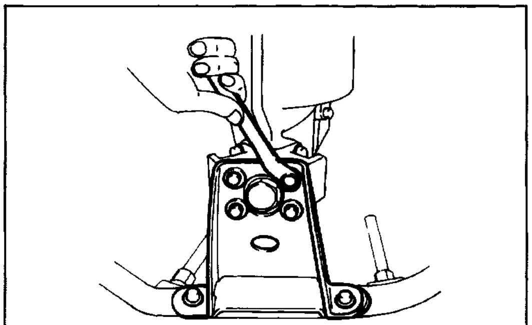


9. REMOVE STABILIZER BRACKET SET BOLTS

Remove the four bolts.

10. REMOVE FRAME AUXILIARY CROSSMEMBER

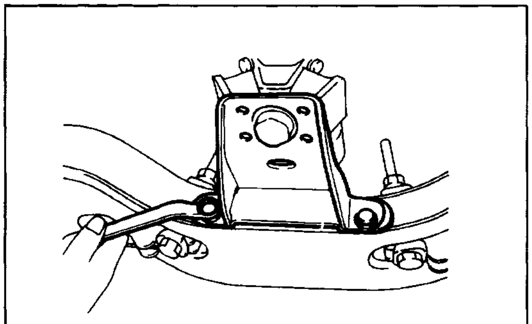
Remove the four bolts.


MT0015

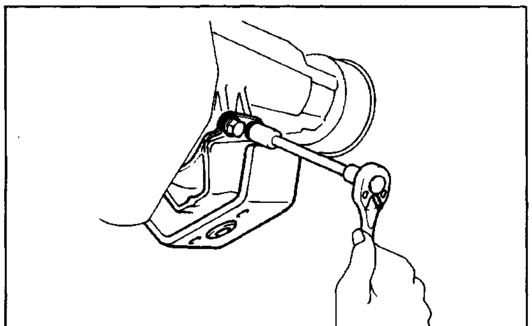
11. REMOVE ENGINE REAR MOUNTING AND BRACKET

(a) Remove the four bolts from the engine rear mount–ing.

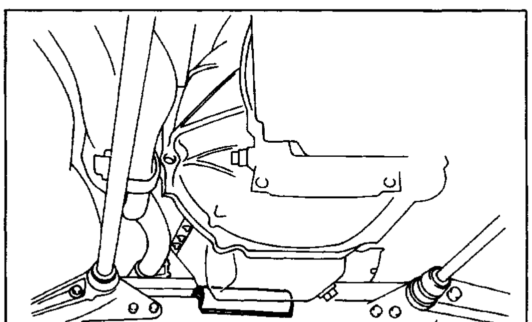
(b) Raise the transmission slightly by raising the engine with a jack.


MT0016

(c) Remove the four bolts from the support member and remove the mounting bracket.


MT0025

(d) Remove the engine rear mounting from the trans–mission.


MT0017

12. PLACE PIECE OF WOOD BETWEEN ENGINE OIL PAN AND FRONT CROSSMEMBER

HINT: Tape a piece of wood or such about 20 mm (0.79 in.) thick on the front crossmember.

13. LOWER TRANSMISSION

14. REMOVE STARTER

Lay the starter alongside the engine.

15. REMOVE STIFFENER PLATE BOLTS

16. REMOVE REMAINING TRANSMISSION BOLTS

17. REMOVE TRANSMISSION

(a) Draw out the transmission toward the rear.

(b) Lower the transmission front and remove the trans–mission from the vehicle.

HINT: Be careful not to damage the extension housing dust deflector.

(3VZ–E/R 150 only)

(a) Turn the transmission clockwise about 45 degrees.

(b) Slide the transmission toward the rear.

(c) Lower the transmission front and remove the trans–mission from the vehicle.

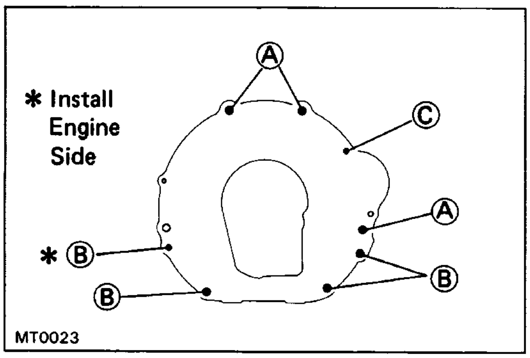
INSTALLATION OF TRANSMISSION

HINT: For the transmission with a transfer (4WD) refer to INSTALLATION OF TRANSMISSION WITH TRANSFER on page MT1–20.

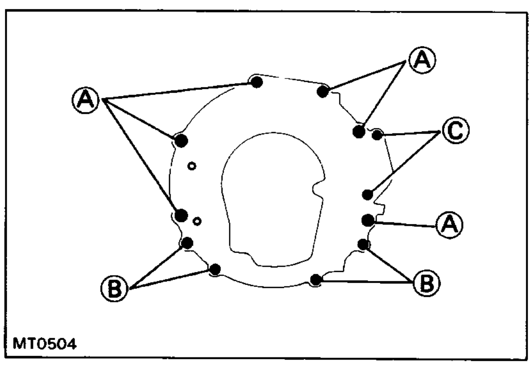
1. PLACE TRANSMISSION AT INSTALLATION POSITION

Insert the extension housing between the member and floor and then slide the transmission forward.

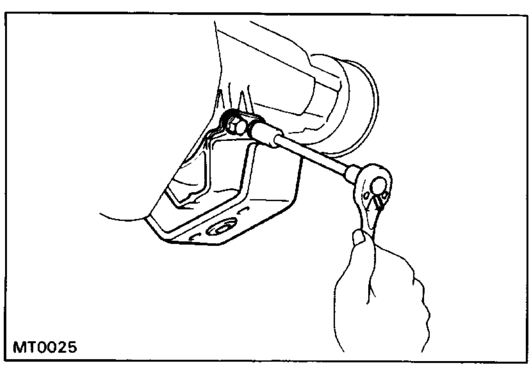
Align the input shaft spline with the clutch disc, and push the transmission fully into position.



2.–1 (22R–E)
INSTALL TRANSMISSION BOLTS AND STIFFENER BOLTS AND STARTER
Torque:
(A) Transmission mounting bolt
72 N–m (730 kgf–cm, 53 ft–lbf)
(B) Stiffener plate bolt
37 N–m (380 kgf–cm, 27 ft–lbf)
(C) Starter bolt 39 N–m (400 kgf–cm, 29 ft–lbf)



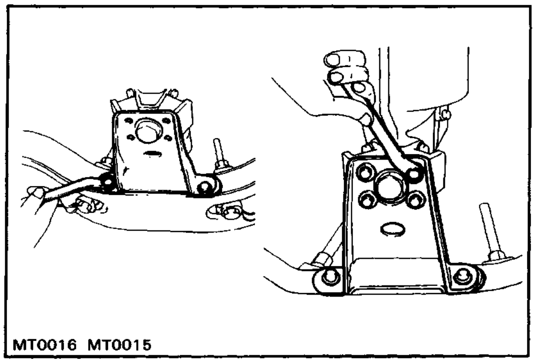
2.–2 (3VZ–E)
INSTALL TRANSMISSION BOLTS AND STIFFENER BOLTS
Torque:
(A) Transmission mounting bolt
72 N–m (730 kgf–cm, 53 ft–lbf)
(B) Stiffener plate bolt
37 N–m (380 kgf–cm, 27 ft–lbf)
(C) Starter bolt 39 N–m (400 kgf–cm, 29 ft–lbf)



3. INSTALL ENGINE REAR MOUNTING AND BRACKET

(a) Install the engine rear mounting. Torque the bolts.
Torque: 25 N – m (260 kgf–cm, 19 ft–lbf)

(b) Raise the transmission slightly by raising the engine with a jack and a wooden block under the transmis–sion.



(c) Install the engine rear mounting bracket to the support member. Torque the bolts.

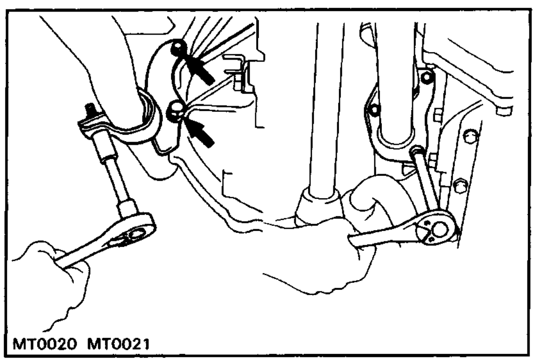
Torque: 59 N – m (590 kgf – cm, 43 ft – lbf)

(d) Lower the transmission and rest it on the extension housing.

(e) Install the bracket to the mounting. Torque the bolts.

Torque: 29 N – m (300 kgf – cm, 22 ft – lbf)

4. REMOVE PIECE OF WOOD FROM FRONT CROSSMEMBER

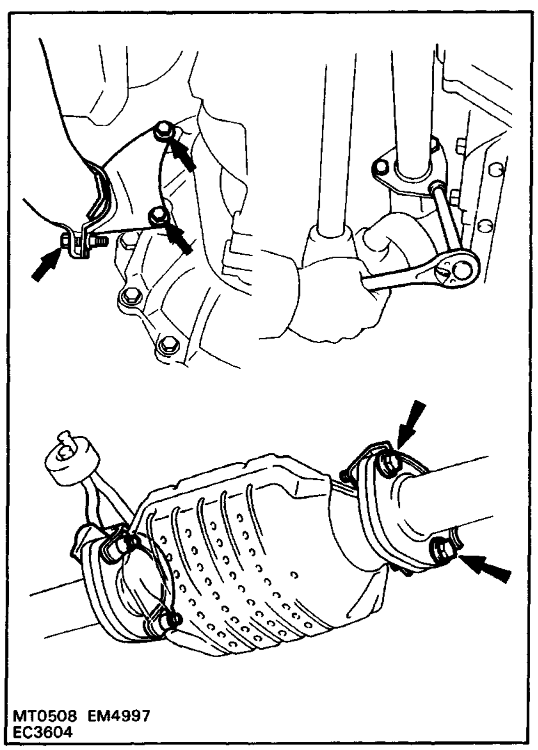


5.–1(22R–E)
INSTALL EXHAUST PIPE, BRACKET AND CLAMP

(a) Install the exhaust pipe to the manifold.
Torque: 62 N – m (630 kgf – cm, 46 ft – lbf)

(b) Install the pipe bracket to the clutch housing.
Torque: Upper 19 N – m (195 kgf – cm, 14 ft– lbf)
Lower 69 N – m (700 kgf – cm, 51 ft – lbf)

(c) Install the exhaust pipe clamp.



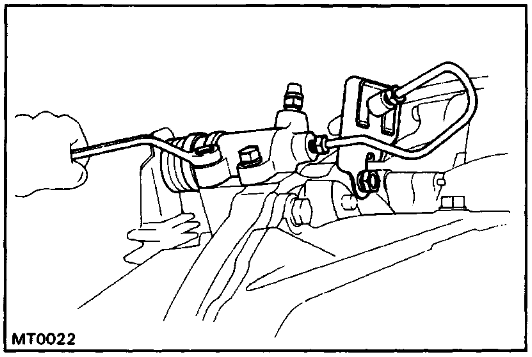
5.–2 (3VZ–E)
INSTALL EXHAUST PIPE, BRACKET AND CLAMP

(a) Install the exhaust pipe to the manifold.
Torque: 62 N – m (630 kgf – cm, 46 ft – lbf)

(b) Connect exhaust pipe to catalytic converter front side.
Torque: 39 N – m (400 kgf – cm, 29 ft – lbf)

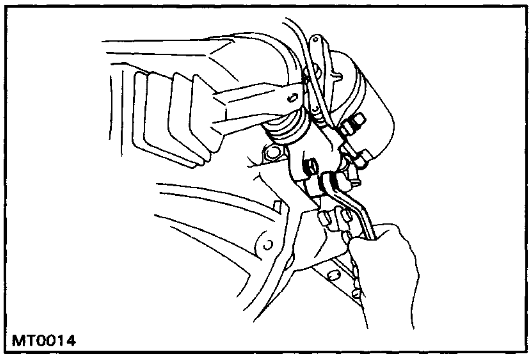
(c) Install the pipe bracket to the clutch housing.
Torque: 39 N–m (400 kgf–cm, 29 ft–lbf)

(d) Install the exhaust pipe clamp.


MT0022

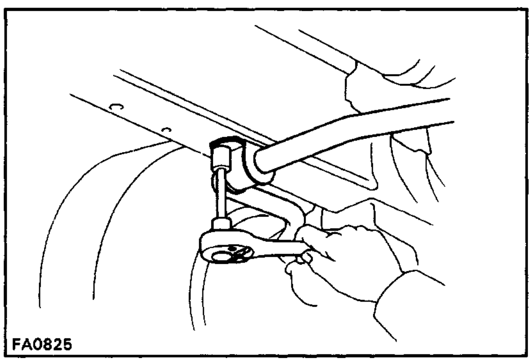
6.–1 (22R–E)
INSTALL STARTER LOWER MOUNTING BOLT AND CLUTCH RELEASE CYLINDER AND BRACKET

Torque:
Starter
39 N–m (400 kgf–cm, 29 ft – lbf)
Tube Bracket
72 N–m (730 kgf–cm, 53 ft–lbf)
Clutch Release Cylinder
12 N–m (120 kgf–cm, 9 ft–lbf)


MT0014

6.–2(3VZ–E)
INSTALL CLUTCH RELEASE CYLINDER

Torque:
Clutch Release Cylinder
12 N–m (120 kgf–cm, 9 ft–lbf)


FA0825

7. INSTALL STABILIZER BRACKET SET BOLTS

Install and torque the four bolts.

Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)

8. INSTALL FRAME AUXILIARY CROSSMEMBER

Install and torque the four bolts.

Torque: 95 N–m (970 kgf–cm, 70 ft–lbf)

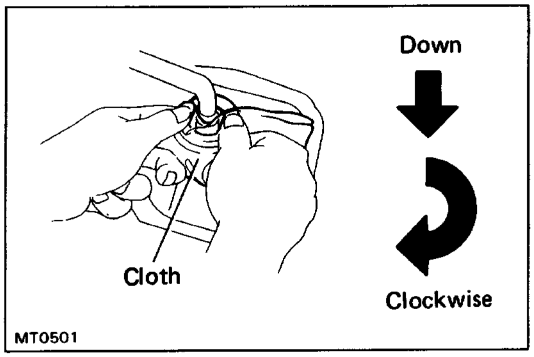
9. CONNECT SPEEDOMETER CABLE AND BACK–UP LIGHT SWITCH

10. CONNECT PROPELLER SHAFT

(See page PR–15)

11. FILL TRANSMISSION WITH OIL

Transmissions / Items	R 150	W55
Oil grade	API GL–4 or GL–5	API GL–4 or GL5
Viscosity	SEA 75W–90	SEA75W–90 or 80W–90
Transmission oil capacity	3.0 liters (3.2 US qts 2.6 Imp. qts)	2.4 liters (2.5 US qts 2.1 Imp. qts)



12. LOWER VEHICLE

13. INSTALL SHIFT LEVER

(a) Apply MP grease to the shift lever.

(b) Align the groove of the shift lever cap and the pin part of case cover.

(c) Cover the shift lever cap with a cloth.

(d) Then, pressing down on the shift lever cap, rotate it clockwise to install.

(e) Install the shift lever boot and retainer with four screws.

14. INSTALL FAN SHROUD SET BOLTS

Install and torque the four bolts.

15. CONNECT BATTERY CABLE TO NEGATIVE TERMINAL

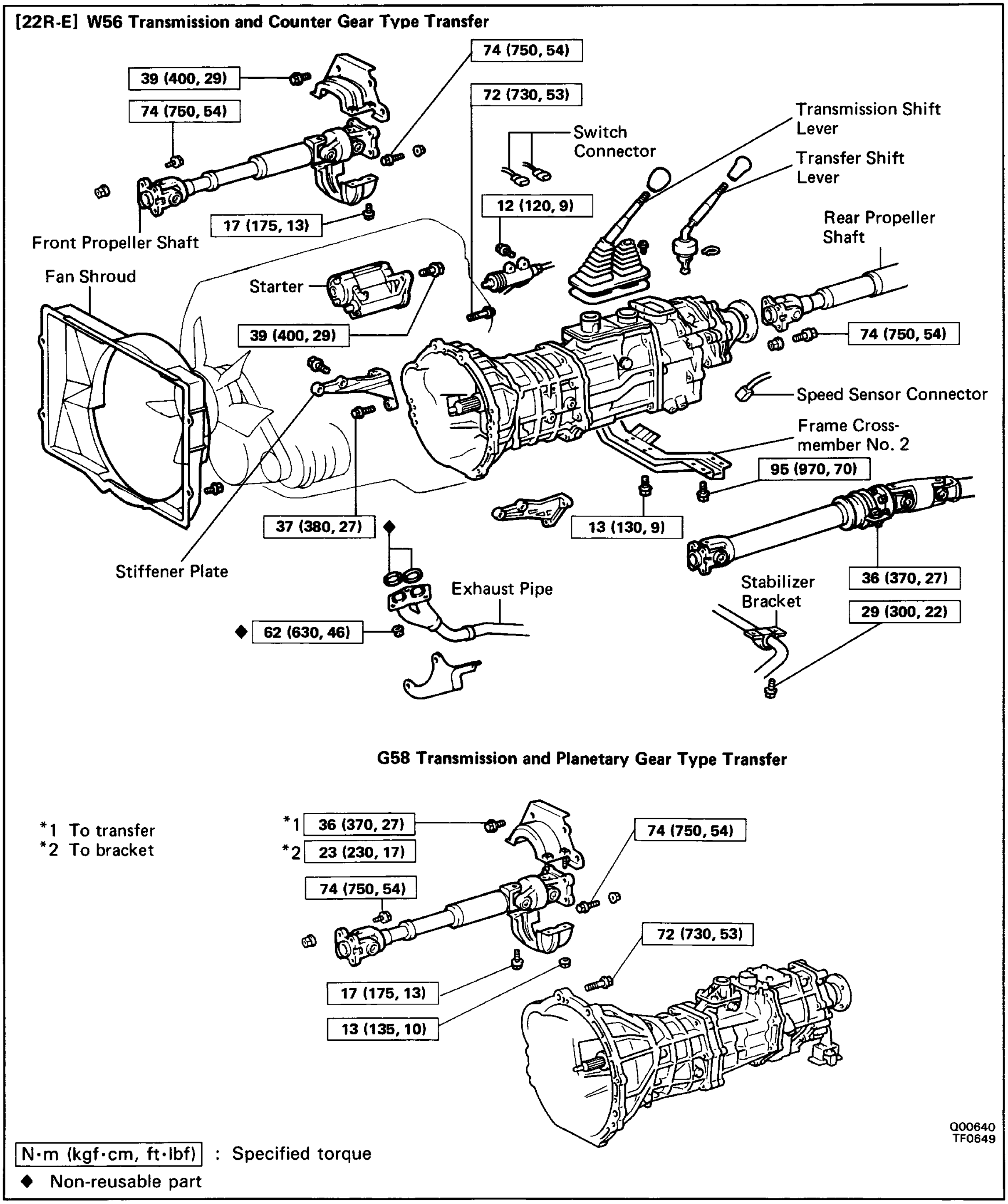
16. PERFORM ROAD TEST

Check for abnormal noise and smooth operation.

REMOVAL AND INSTALLATION OF TRANSMISSION WITH TRANSFER (4WD)

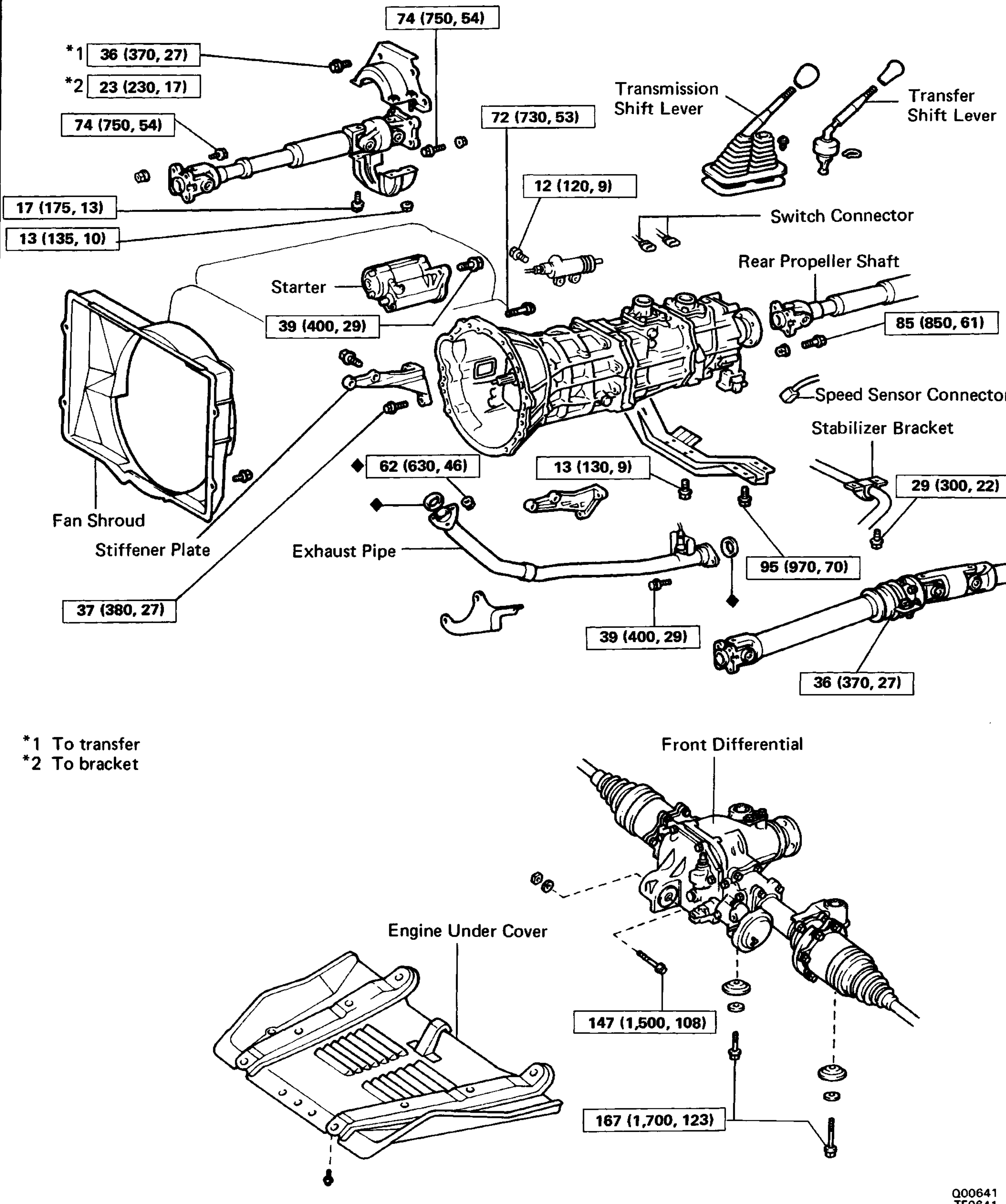
REMOVAL AND INSTALLATION OF TRANSMISSION WITH TRANSFER

Remove and install the parts as shown.



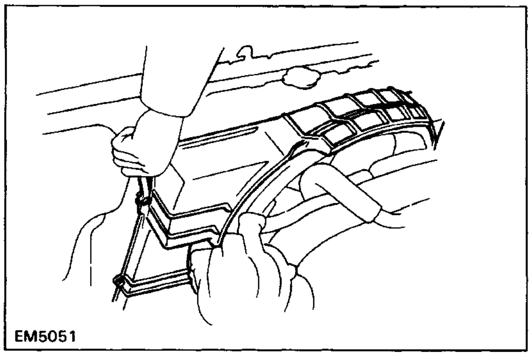
REMOVAL AND INSTALLATION OF TRANSMISSION WITH TRANSFER (Cont'd)
Remove and install the parts as shown.

[3VZ-E] R150F Transmission and Planetary Gear Type Transfer



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

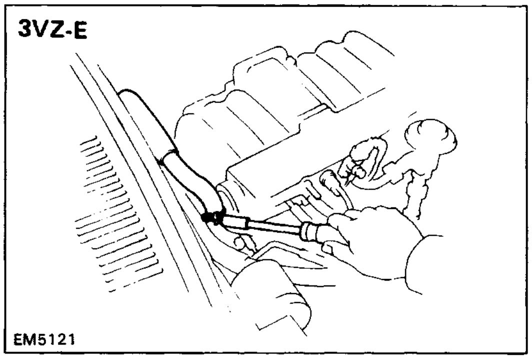


REMOVAL OF TRANSMISSION WITH TRANSFER

1. DISCONNECT BATTERY CABLE FROM NEGATIVE TERMINAL

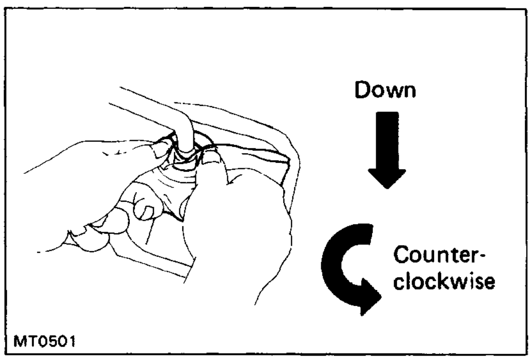
2. REMOVE FAN SHROUD SET BOLTS

Remove the four bolts.



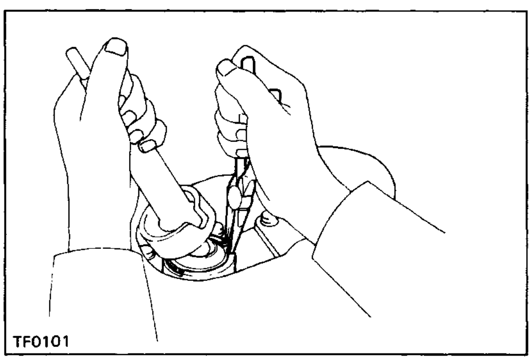
3. (3 VZ–E)
REMOVE HEATER HOSE CLAMP

(a) Loosen clamp bolt.
(b) Move the clamp upside.



4. REMOVE TRANSMISSION SHIFT LEVER FROM INSIDE OF VEHICLE

(a) Remove the four screws and remove the shift lever boot retainer.
(b) Pull up the shift lever boot.
(c) Cover the shift lever cap with cloth.
(d) Then, pressing down on the shift lever cap, rotate it counterclockwise to remove.
(e) Remove the shift lever.

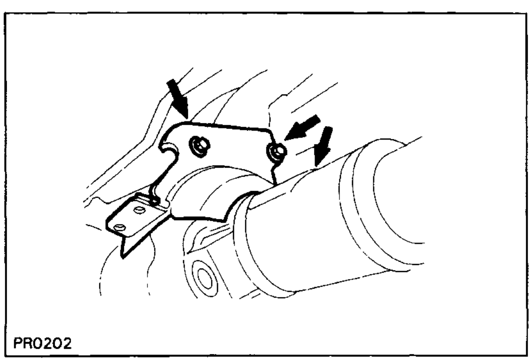


5. REMOVE TRANSFER SHIFT LEVER FROM INSIDE OF VEHICLE

Using pliers, remove the snap ring and pull out the shift lever from the transfer.

6. RAISE VEHICLE AND DRAIN TRANSMISSION AND TRANSFER OIL

NOTICE: Be sure the vehicle is securely supported.



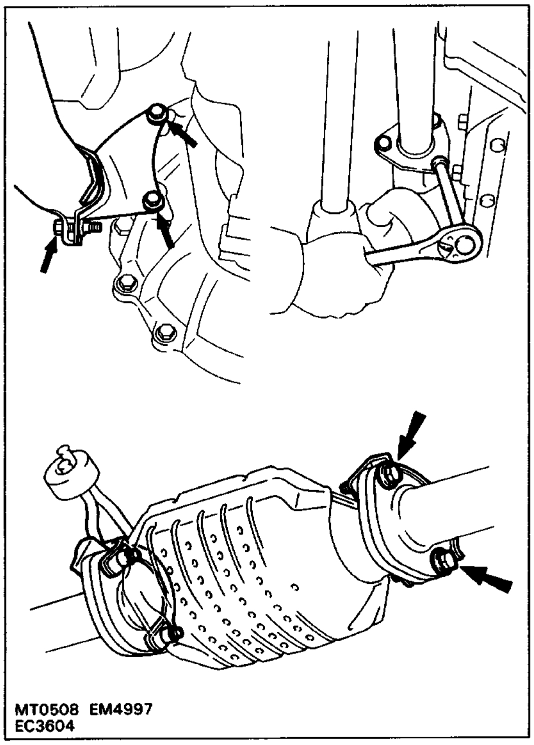
7. (R 150F, G58)
REMOVE PROPELLER SHAFT DUST COVER SUBASSEMBLY

Remove the three bolts and cover.

8. DISCONNECT PROPELLER SHAFT

(See page PR–5)

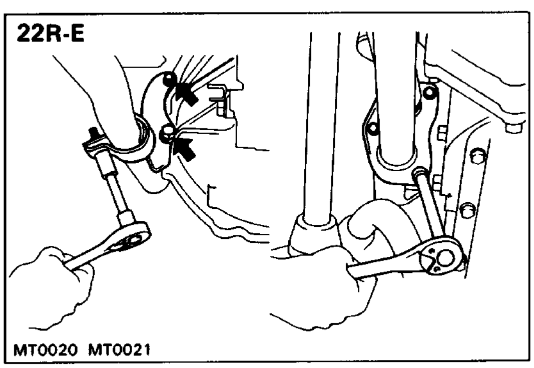
9. DISCONNECT SPEEDOMETER CABLE, BACK–UP LIGHT SWITCH CONNECTOR AND TRANSFER INDICATOR SWITCH CONNECTOR



10.–1(3VZ–E)
REMOVE EXHAUST PIPE, BRACKET AND CLAMP

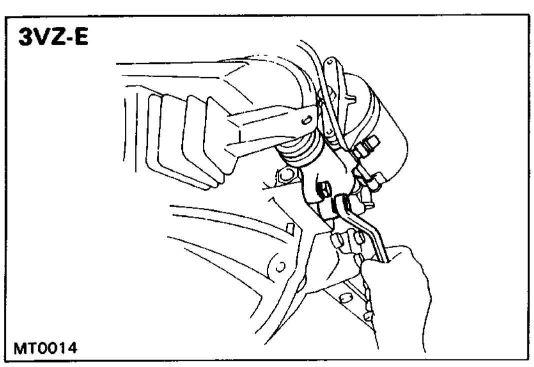
(a) Remove exhaust pipe clamp.
(b) Remove exhaust pipe bracket from clutch housing.
(c) Remove exhaust pipe from exhaust manifold.

(d) Disconnect exhaust pipe from catalytic converter front side.



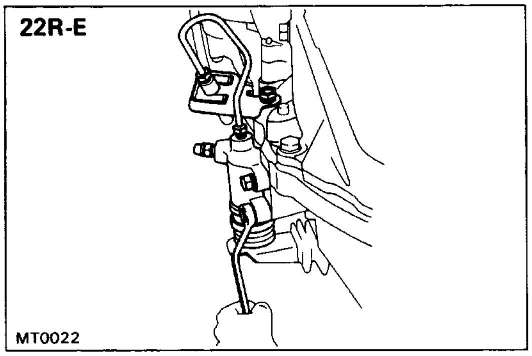
10.–2 (22R–E)
REMOVE EXHAUST PIPE CLAMP AND EXHAUST PIPE

(a) Remove exhaust pipe clamp.
(b) Remove exhaust pipe from exhaust manifold.

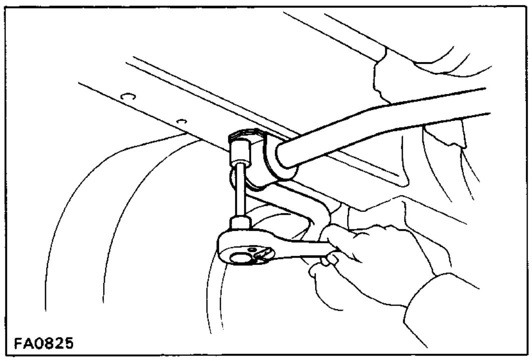


11.–1 (3VZ–E)
REMOVE CLUTCH RELEASE CYLINDER

Lay the release cylinder alongside the engine.
HINT: Do not disconnect the clutch line.

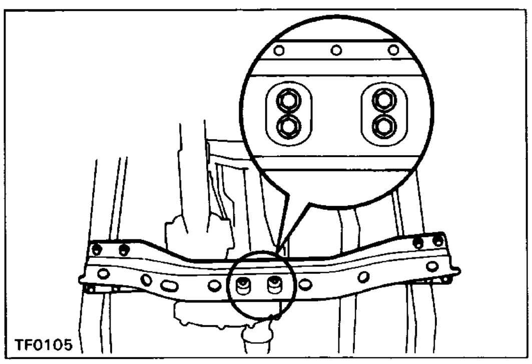


11.–2 (22R–E)
REMOVE CLUTCH RELEASE CYLINDER, TUBE BRACKET
Remove the mounting bolts and lay the cylinder alongside the engine.
HINT: Do not disconnect the clutch line.



12. (3VZ–E)
REMOVE THE FRONT DIFFERENTIAL SET BOLTS
(a) Remove the three bolts.
(b) Support the front differential.

13. REMOVE THE STABILIZER BRACKET SET BOLTS
Remove four bolts.



14. REMOVE NO.2 FRAME CROSSMEMBER FROM SIDE FRAME
(a) Remove the four bolts from the engine rear mount–ing.
(b) Raise the transmission slightly with a jack.
(c) Remove the eight bolts from the side frame and re–move the No.2 frame crossmember.

15. (22R–E)
PLACE PIECE OF WOOD BETWEEN ENGINE OIL PAN AND FRONT AXLE

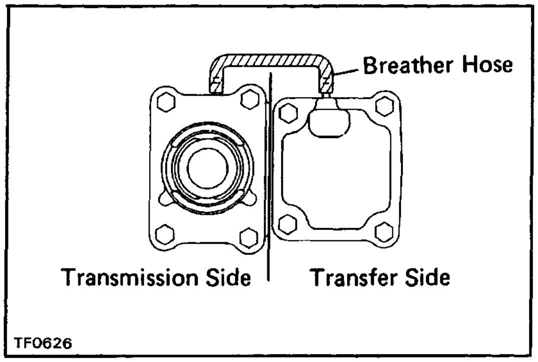
16. LOW TRANSMISSION WITH TRANSFER

17. REMOVE STARTER
(a) Remove the two bolts.
(b) Lay the starter alongside the engine.

18. REMOVE EXHAUST PIPE BRACKET AND STIFFENER PLATE BOLTS

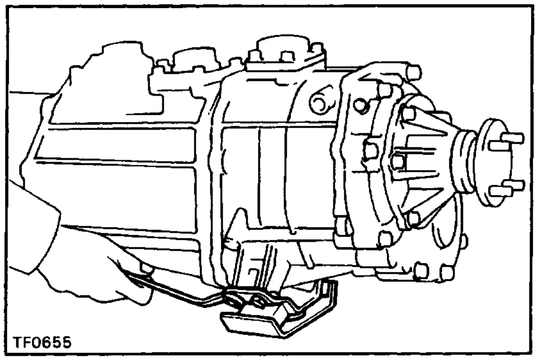
19. REMOVE REMAINING TRANSMISSION BOLTS

20. REMOVE TRANSMISSION WITH TRANSFER
(a) Draw out the transmission with the transfer toward the rear.
(b) Lower the transmission with the transfer front and remove it from the vehicle.

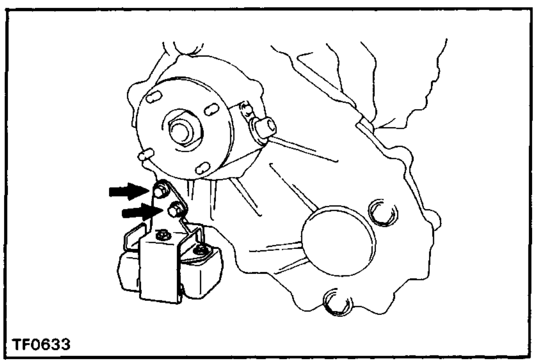


21. (22R–E/G58)
REMOVE BREATHER HOSE

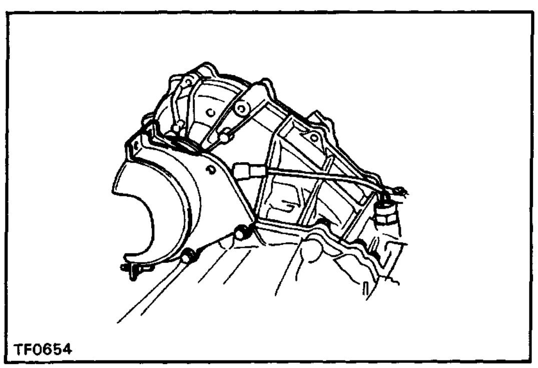
Disconnect the breather hose from transfer upper cover and transmission control retainer.



22. REMOVE ENGINE REAR MOUNTING

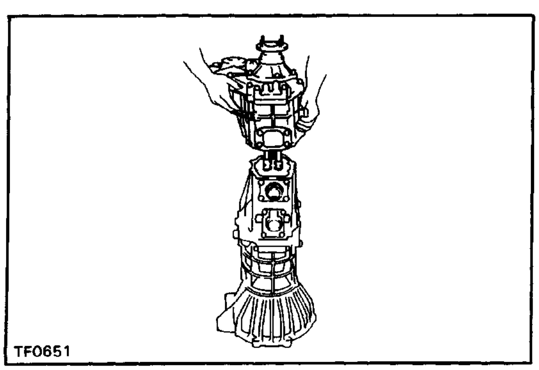


23. (Regular Cab w/ Planetary Gear Type Transfer)
REMOVE DYNAMIC DAMPER



24. REMOVE PROPELLER SHAFT UPPER DUST COVER AND
TRANSFER FROM TRANSMISSION

(a) Remove the dust cover bolt from the bracket.
(b) Remove the transfer adaptor rear mounting bolts.

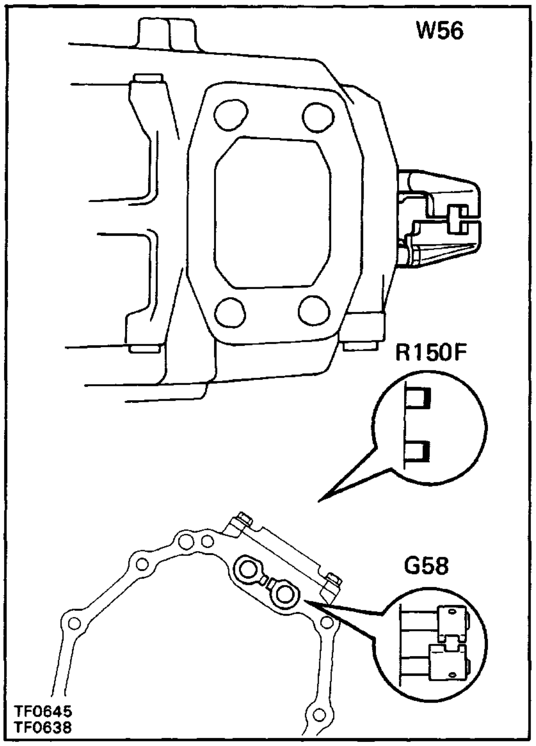


(c) Pull the transfer straight up and remove it from the transmission.

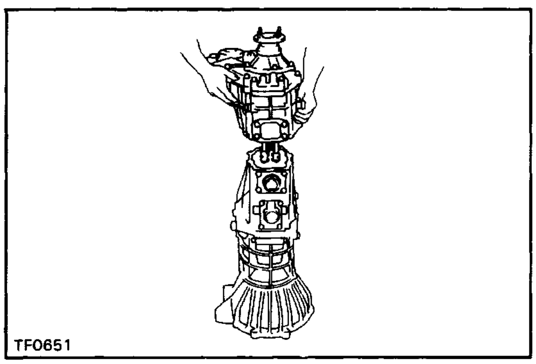
HINT: Take care not to damage the adaptor rear oil seal with the transfer input gear spline.

INSTALLATION OF TRANSMISSION WITH TRANSFER

1. INSTALL TRANSFER AND PROPELLER SHAFT UPPER DUST COVER TO TRANSMISSION WITH NEW GASKET



(a) Shift the two shift fork shafts to the high–four position.

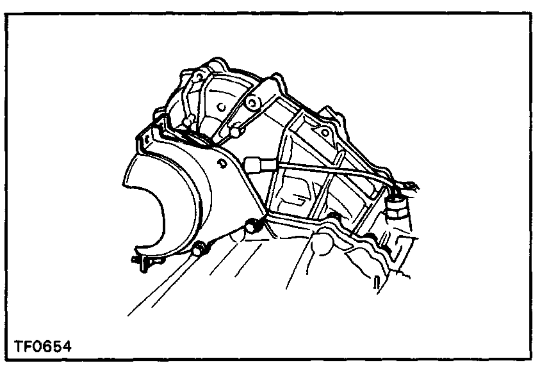


(b) Apply MP grease to the adaptor oil seal.

(c) Place a new gasket to the transfer adaptor.

(d) Install the transfer to the transmission.

HINT: Take care not to damage the oil seal by the input gear spline when installing the transfer.



(e) Install and torque the bolts with the propeller shaft upper dust cover.

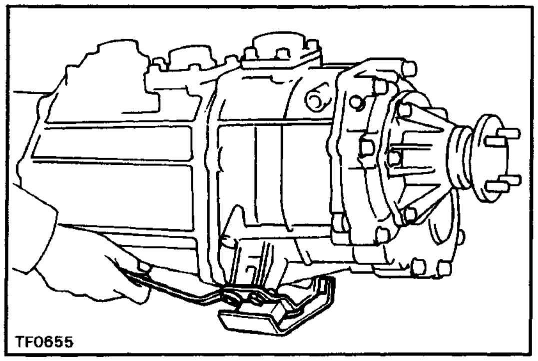
Torque:

W56	**39 N–m (400 kgf–cm, 29 ft–lbf)**
R150F, G58	**37 N–m (380 kgf–cm, 27 ft–lbf)**

(f) Install the dust cover bolt to the bracket.

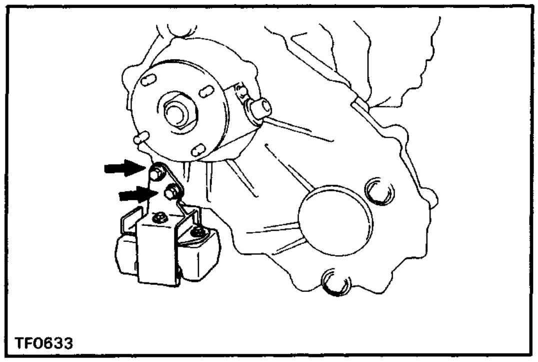
Torque:

R150F, G58	**23 N–m (230 kgf –cm, 17 ft–lbf)**
W56	**39 N–m (400 kgf–cm, 29 ft–lbf)**



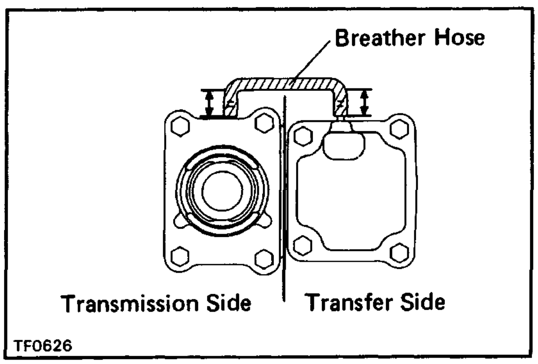
2. INSTALL ENGINE REAR MOUNTING

Torque: 25 N–m (260 kgf–cm, 19 ft–lbf)



3. (Regular Cab w/ Planetary Gear Type Transfer) INSTALL DYNAMIC DAMPER

Torque: 37 N–m (380 kgf–cm, 27 ft–lbf)



4. (22R–E/G 58) INSTALL BREATHER HOSE

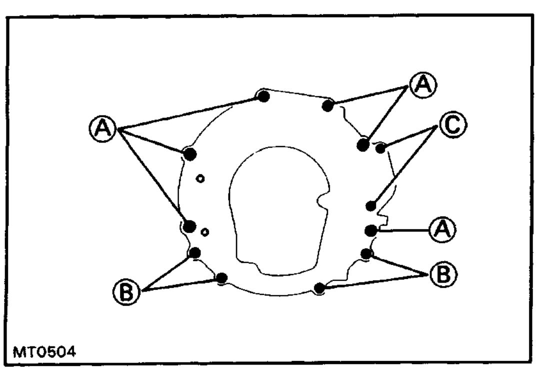
Connect the breather hose for transfer upper cover and transmission control retainer as shown.

Hose depth: 13 mm (0.51 in.)

5. PLACE TRANSMISSION WITH TRANSFER AT INSTALLATION POSITION

(a) Support the transmission with a jack.

(b) Align the input shaft spline with the clutch disc, and push the transmission with the transfer fully into po–sition.



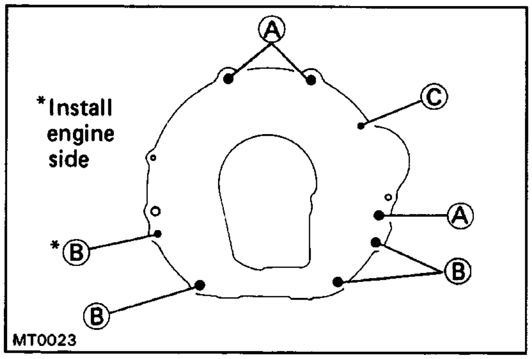
6.–1 (3VZ–E)
INSTALL TRANSMISSION BOLTS, STIFFENER BOLTS AND STARTER

Torque:

(A) Transmission bolt
72 N–m (730 kgf–cm, 53 ft–lbf)

(B) Stiffener plate bolt
37 N–m (380 kgf–cm, 27 ft–lbf)

(C) Starter bolt
39 N–m (400 kgf–cm, 29 ft–lbf)



6.–2(22R–E)

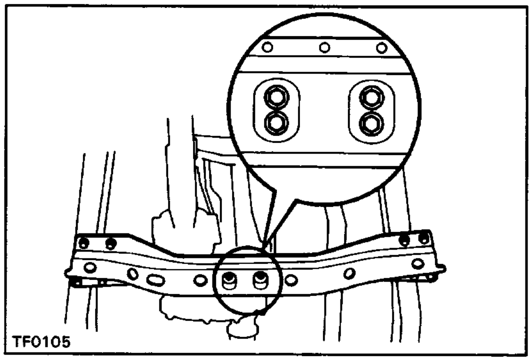
INSTALL TRANSMISSION BOLTS AND STIFFENER BOLTS

Torque:

(A) Transmission bolt
72 N–m (730 kgf–cm, 53 ft–lbf)

(B) Stiffener plate bolt
37 N–m (380 kgf–cm, 27 ft–lbf)

(C) Starter bolt
39 N–m (400 kgf–cm, 29 ft–lbf)



7. INSTALL NO.2 FRAME CROSSMEMBER

(a) Raise the transmission slightly with a jack.

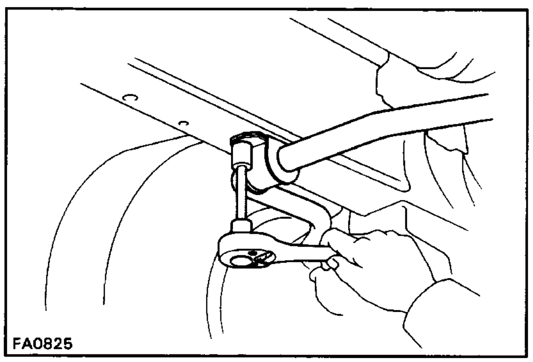
(b) Install the No.2 frame crossmember to the side frame with the bolts. Torque the bolts.

Torque: 95 N–m (970 kgf–cm, 70 ft–lbf)

(c) Lower the transmission and transfer.

(d) Install the four mounting bolts to the engine rear mounting. Torque the bolts.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



8. INSTALL STABILIZER BRACKET SET BOLTS

Torque: 29 N–m (300 kgf–cm, 22 ft –lbf)

9.(22R–E)

REMOVE PIECE OF WOOD FROM FRONT AXLE

10. (3VZ–E)

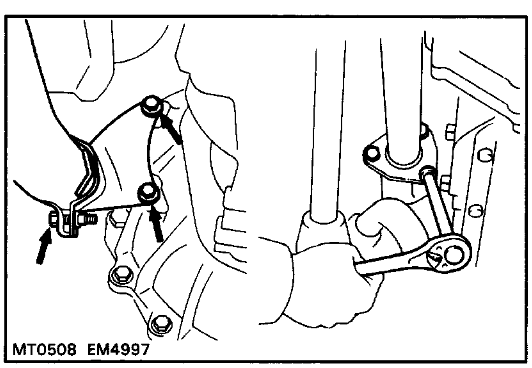
INSTALL THE FRONT DIFFERENTIAL ASSEMBLY

Install and torque the three bolts.

Torque:

Differential carrier cover to frame
147 N–m (1500 kgf–cm, 108 ft–lbf)

Others
167 N–m (1700 kgf–cm, 123 ft–lbf)



11.–1(3VZ–E)

INSTALL EXHAUST PIPE, BRACKET AND CLAMP

(a) Install exhaust pipe to the manifold.

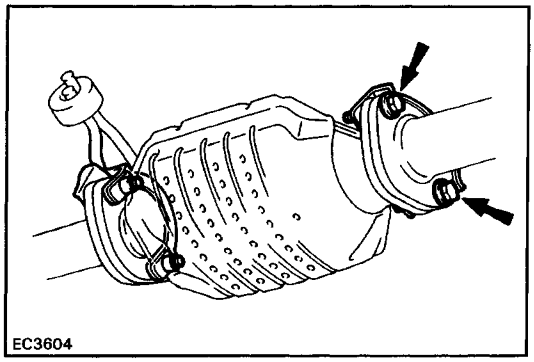
Torque: 62 N–m (630 kgf–cm, 46 ft–lbf)

(b) Install exhaust pipe bracket to the clutch housing.

Torque: 39 N–m (400 kgf–cm, 29 ft–lbf)

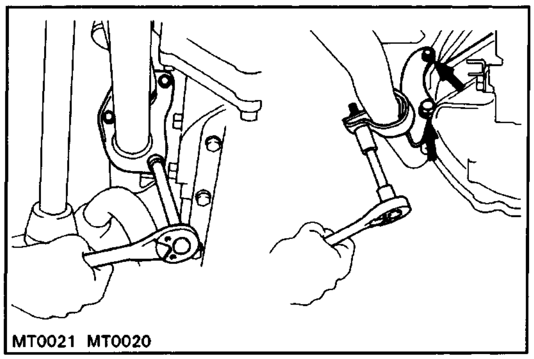
(c) Install exhaust pipe clamp.

Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)



(d) Connect the exhaust pipe to the catalytic converter front side, and torque the bolts.

Torque: 39 N . m (400 kgf–cm, 29 ft–lbf)



11.–2(22R–E)
INSTALL EXHAUST PIPE, BRACKET AND CLAMP

(a) Install the exhaust pipe to the manifold.

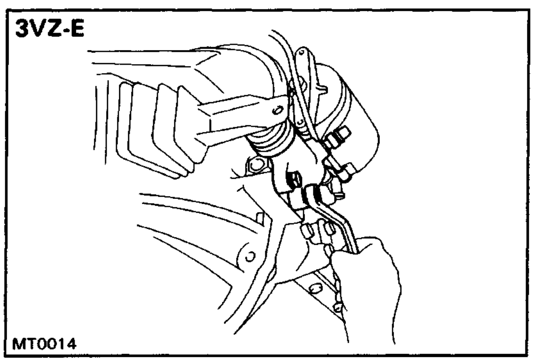
Torque: 62 N – m (630 kgf – cm, 46 ft – lbf)

(b) Install the pipe bracket to the clutch housing. Torque the bolts.

Torque: Upper 19 N–m (195 kgf–cm, 14 ft –lbf)
Lower 69 N – m (700 kgf – cm, 51 ft – lbf)

(c) Install the exhaust pipe clamp.

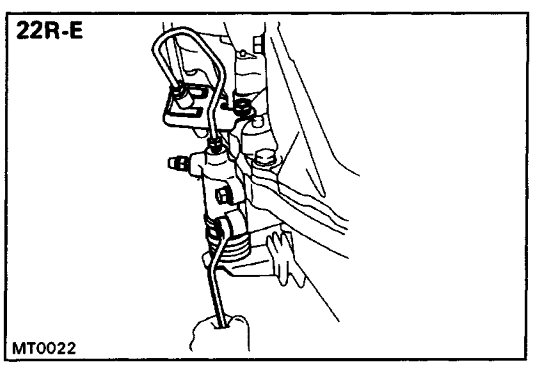
Torque: 19 N – m 1195 kgf – cm, 14 ft – lbf)



12.–1(3VZ–E)
INSTALL CLUTCH RELEASE CYLINDER

Install clutch release cylinder and torque the two bolts.

Torque: 12 N – m (120 kgf – cm, 9 ft – lbf)



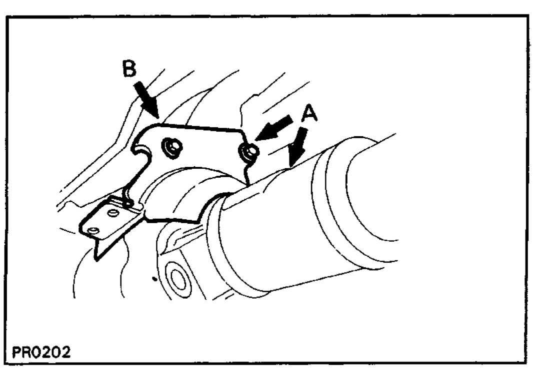
12.–2(22R–E)
INSTALL STARTER MOUNTING BOLTS, CLUTCH RELEASE CYLINDER AND TUBE BRACKET

(a) Install tube bracket and torque the starter lower mounting bolt and nut.

Torque: 39 N – m (400 kgf – cm, 29 ft – lbf)

(b) Install clutch release cylinder and torque the two bolts.

Torque: 12 N – m (120 kgf – cm, 9 ft – lbf)



13.(R150F, G58)
INSTALL PROPELLER SHAFT DUST COVER SUBASSEMBLY

(a) Install the cover.

(b) Install and torque the three bolts.

Torque:
A–bolt 36 N – m (370 kgf – cm, 27 ft–lbf)
B–bolt 23 N – m (230 kgf – cm, 17 ft – lbf)

14. CONNECT SPEEDOMETER CABLE, BACK–UP LIGHT SWITCH CONNECTOR AND TRANSFER INDICATOR SWITCH CONNECTOR

15. CONNECT PROPELLER SHAFT

(See page PR–15)

16. FILL TRANSMISSION AND TRANSFER WITH OIL

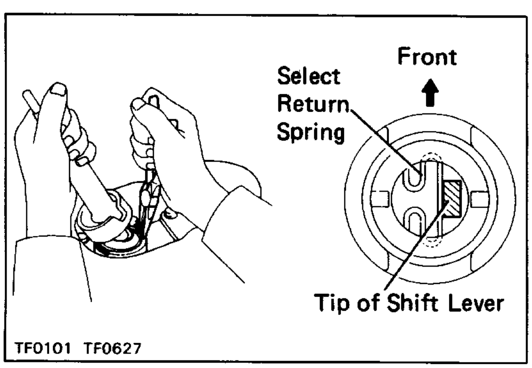
(Transmission oil)

TIM (Engine) / Items	R150F (3VZ–E)	G58 (22R–E)	W56 (22R–E)
Oil grade	API GL-4 or GL-5	API GL-4 or GL-5	API GL-4 or GL-5
Viscosity	SAE 75W-90	SAE 75W-90	SAE 75W-90 or 80W-90
Oil capacity	3.0 liters (3.2 US qts. 2.6 Imp. qts.)	3.9 liters (4.1 US qts. 3.4 Imp. qts.)	3.0 liters (3.2 US qts. 2.6 Imp. qts.)

(Transfer oil)

TIM (Engine) / Items	R 150F (3VZ–E)	G58 (22R–E)	W56 (22R–E)
Oil grade	API GL-4 or GL-5	API GL-4 or GL-5	API GL-4 or GL-5
Viscosity	SAE 75W-90	SAE 75W-90	SAE 75W-90
Oil capacity	1.1 liters (1.2 US qts. 1.0 Imp. qts)	1.1liters (1.2 US qts. 1.0 Imp. qts)	1.6 liters (1.7 US qts. 1.4 Imp. qts)

17. LOWER VEHICLE



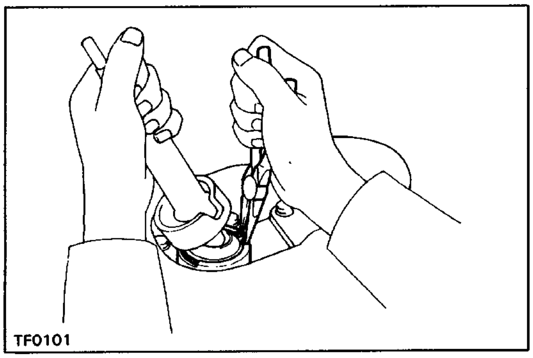
18.–1(R 150F, G58)

INSTALL TRANSFER SHIFT LEVER

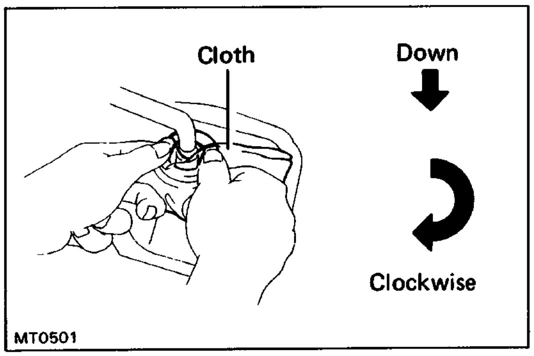
(a) Apply MP grease to the transfer shift lever.

(b) Install the shift lever as shown.

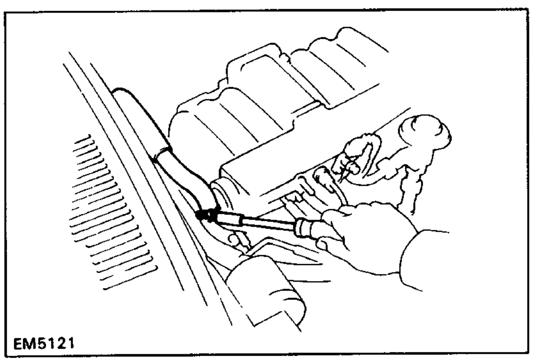
(c) Using pliers, install snap ring.



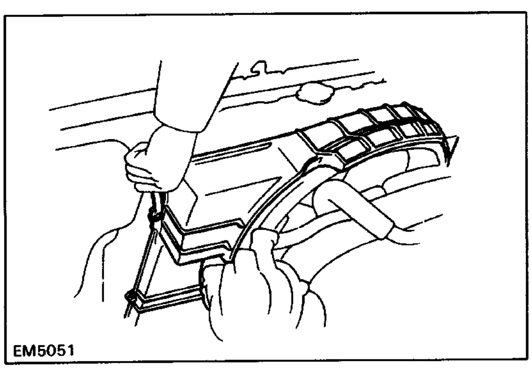
18.–2(W56)
INSTALL TRANSFER SHIFT LEVER
(a) Apply MP grease to the transfer shift lever.
(b) Using pliers, install the shift lever and snap ring.



19. INSTALL TRANSMISSION SHIFT LEVER
(a) Apply MP grease to the transmission shift lever.
(b) Align the groove of the shift lever cap and the pin part of the case cover.
(c) Cover the shift lever cap with a cloth.
(d) Then, pressing down on the shift lever cap, rotate it clockwise to install.

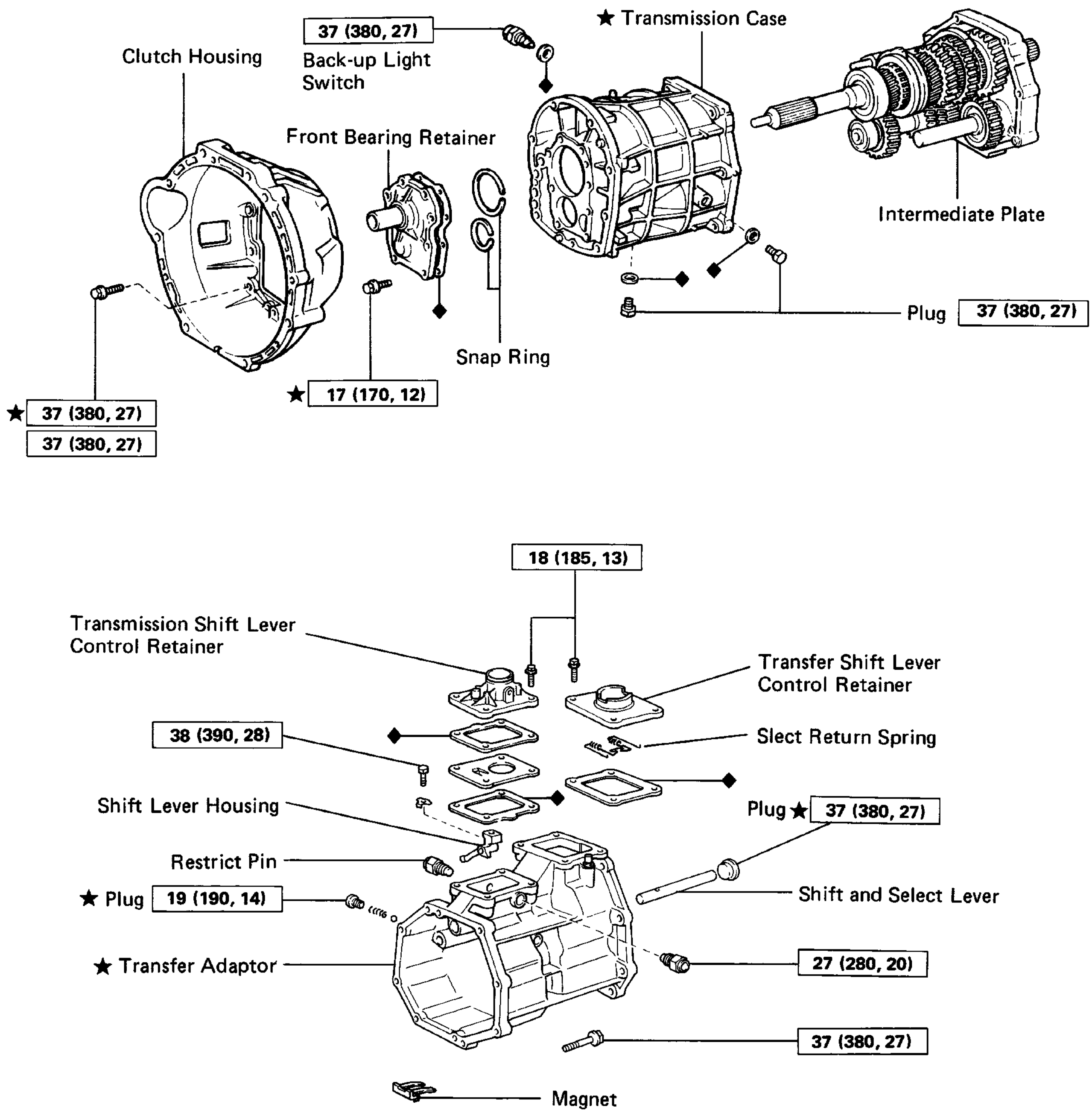


20. (3VZ–E)
INSTALL HEATER HOSE CLAMP,
(a) Move the clamp to correct position.
(b) Torque the clamp bolt.



21. INSTALL FAN SHROUD SET BOLTS
Install and torque the four bolts.
22. CONNECT BATTERY CABLE TO NEGATIVE TERMINAL
23. PERFORM ROAD TEST
Check for abnormal noise and smooth operation.

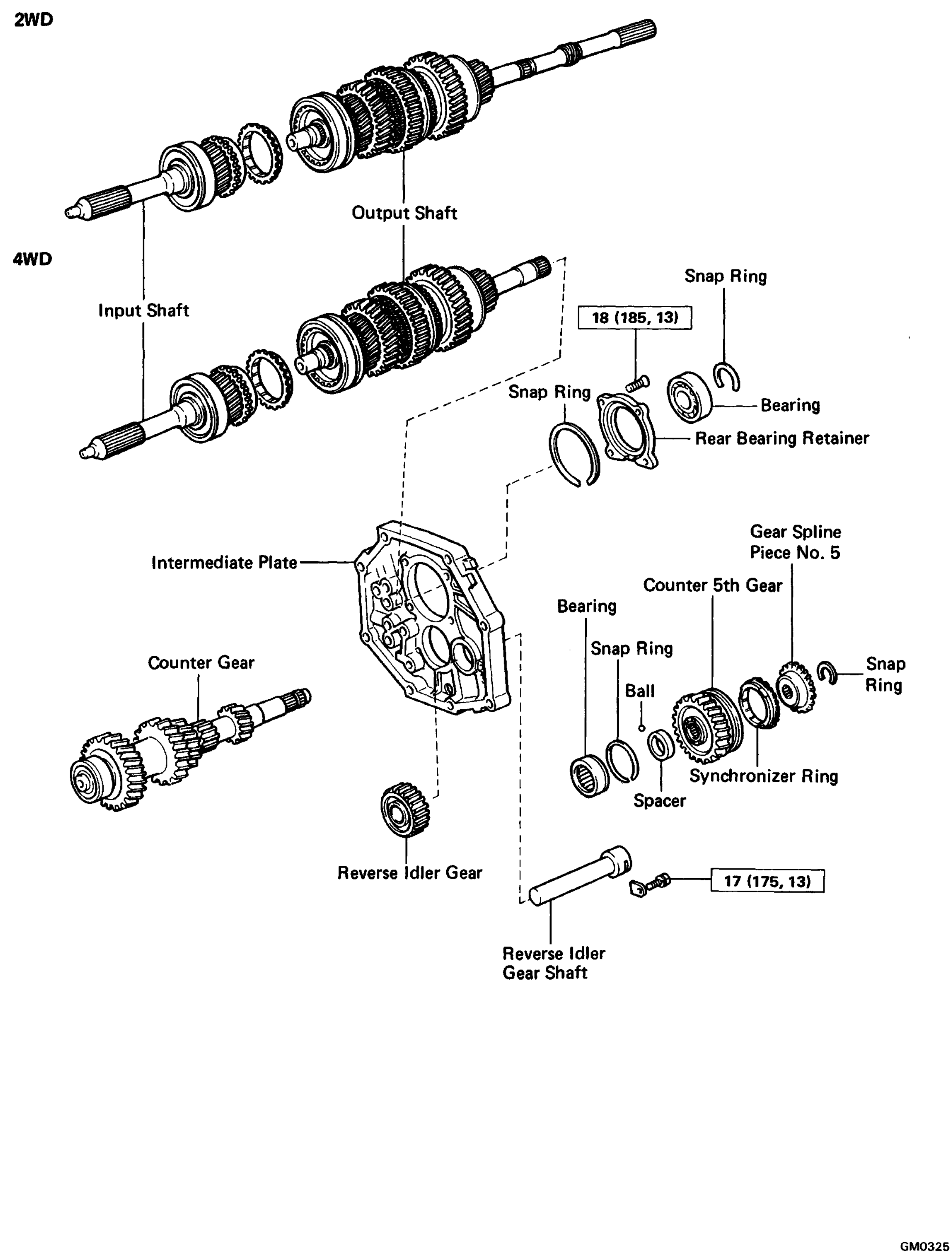
DISASSEMBLY OF TRANSMISSION (G58 TRANSMISSION)
Components



N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
★ Precoated part

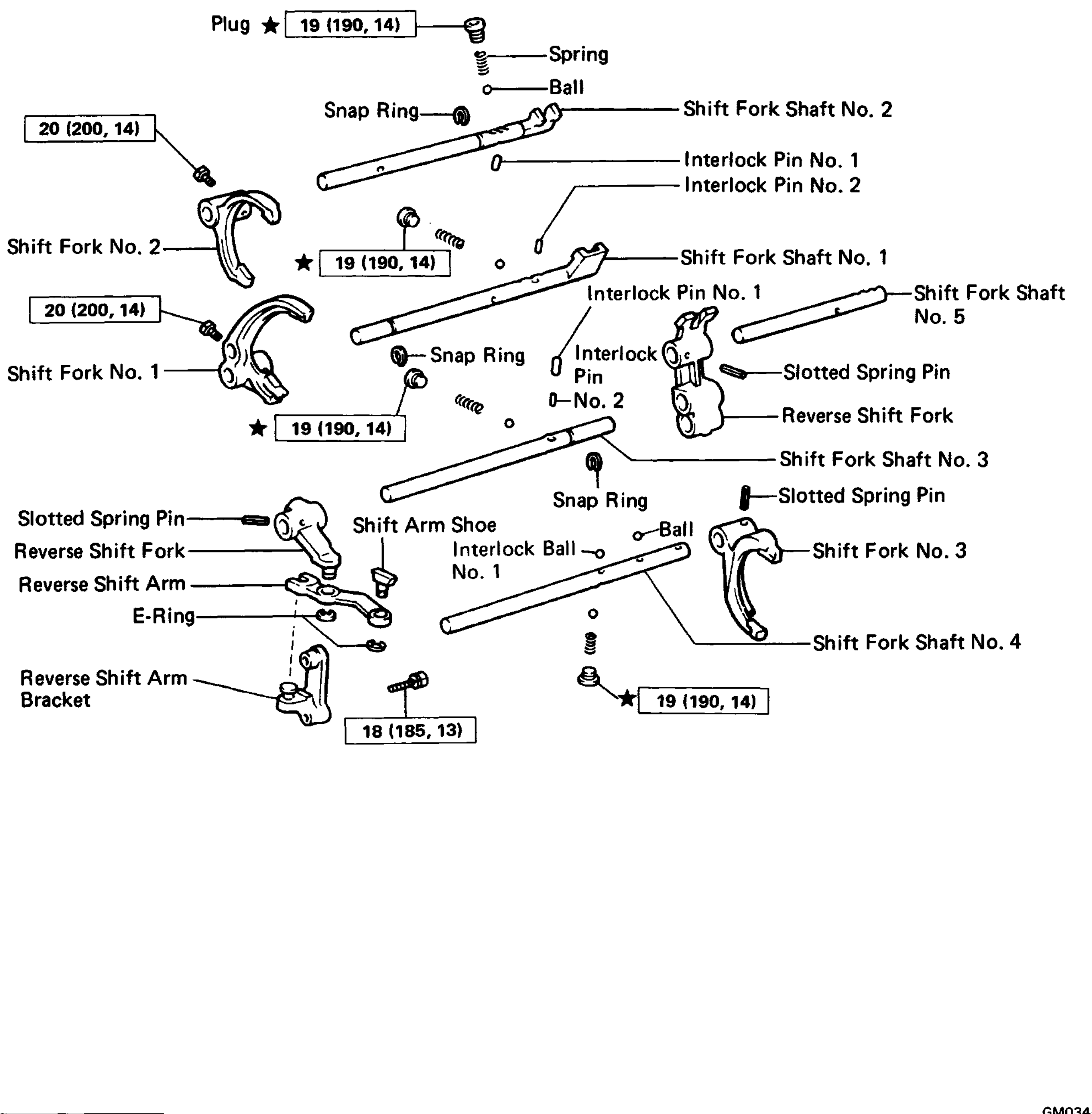
GM0321
GM0450

Components (Cont'd)



N·m (kgf·cm, ft·lbf) : Specified torque

Components (Cont'd)



N·m (kgf·cm, ft·lbf) : Specified torque

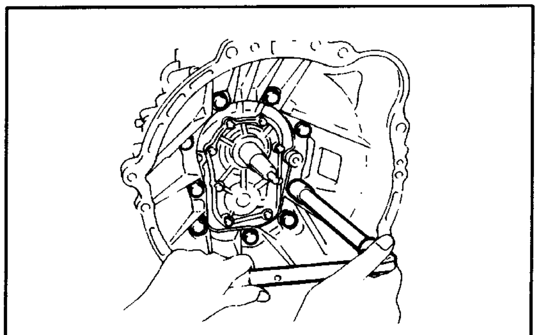
★ Precoated part

Disassembly of Transmission

(See pages MT1–26 to 28)

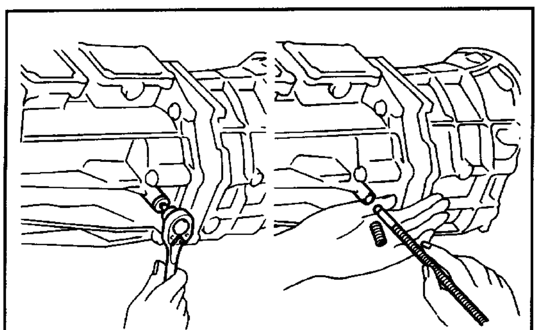
1. REMOVE RELEASE FORK AND BEARING

2. REMOVE BACK–UP LIGHT SWITCH


GM0001

3. REMOVE CLUTCH HOUSING FROM TRANSMISSION CASE

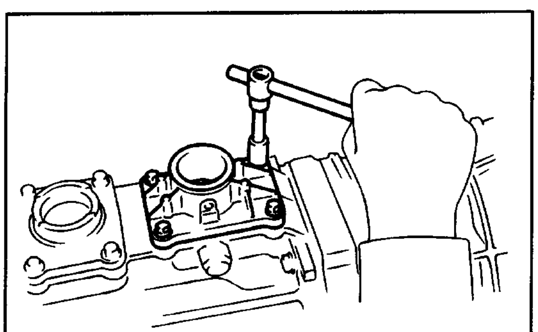
Remove the nine bolts and clutch housing.


GM0004 GM0005

4. REMOVE STRAIGHT SCREW PLUG, SPRING AND BALL

(a) Using a torx socket wrench, remove the screw plug from the transfer adaptor.
(Torx socket wrench T40 09042–00020)

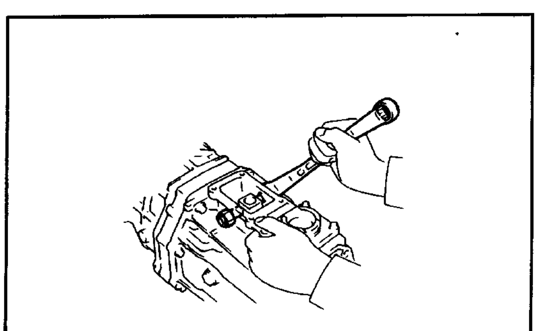
(b) Using a magnetic finger, remove the spring and ball.


E9226

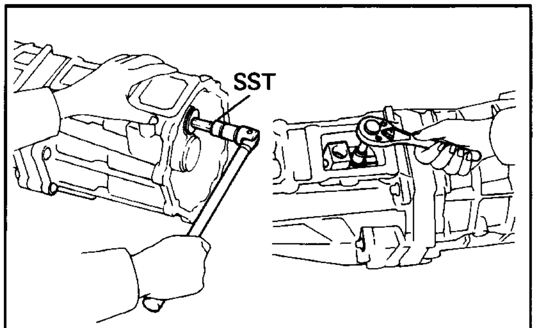
5. REMOVE SHIFT LEVER CONTROL RETAINER

(a) Remove the four bolts and transmission shift lever control retainer.

(b) Remove the four bolts, transfer shift lever control re–tainer and select return spring.


E9227

6. REMOVE RESTRICT PINS

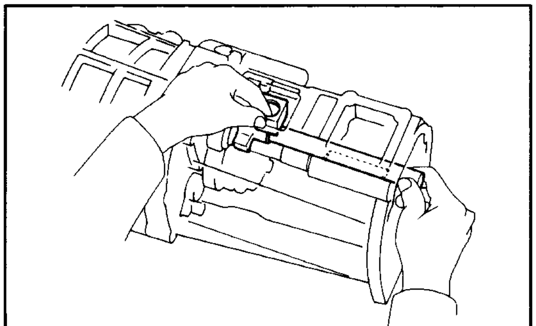


GM0368 GM0009

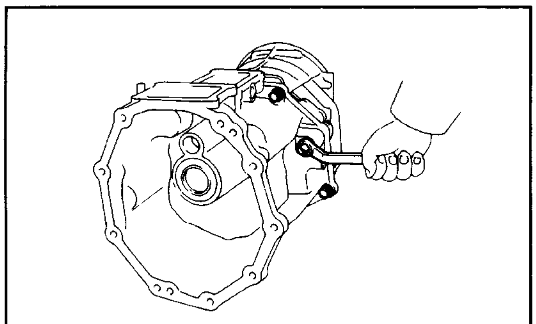
7. REMOVE TRANSFER ADAPTOR

(a) Using SST, remove the plug from the transfer adap–tor.
SST 09923–00010

(b) Remove the shift lever housing set bolt.

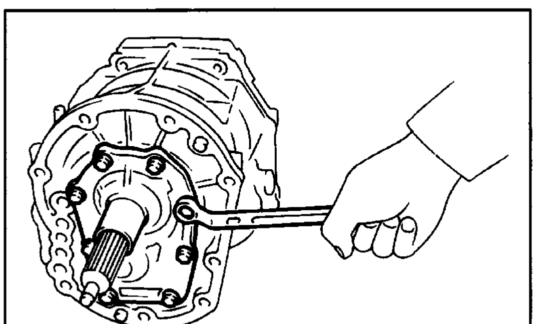

GM0010

(c) Remove the shift lever shaft and housing.


GM0362

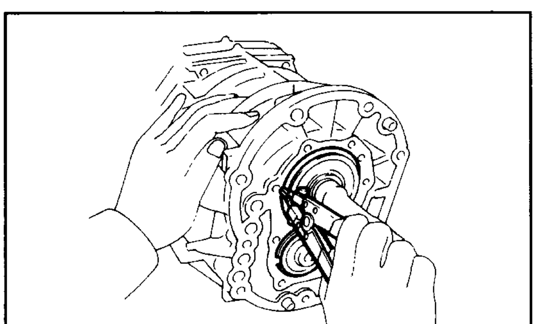
(d) Remove the eight bolts.

(e) Using a plastic hammer, carefully tap off the trans–fer adaptor.


E9234

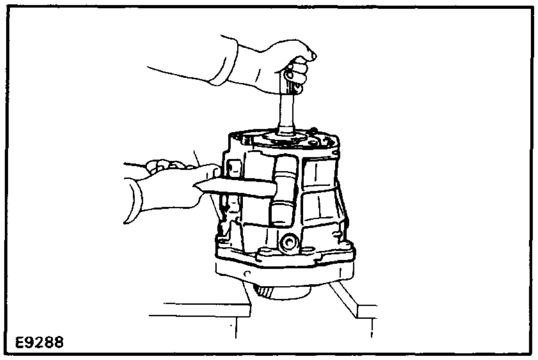
8. REMOVE FRONT BEARING RETAINER

Remove the eight bolts, and remove front bearing re–tainer and gasket.


GM0012

9. REMOVE TWO BEARING SNAP RINGS

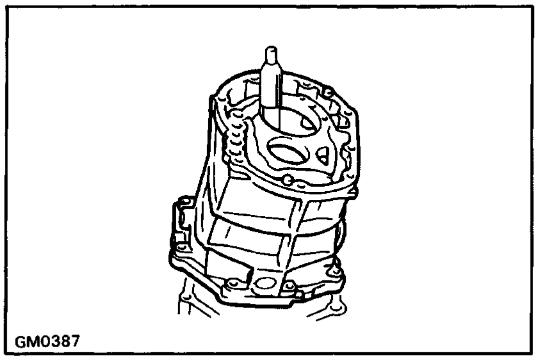
Using a snap ring expander, remove the two snap rings.



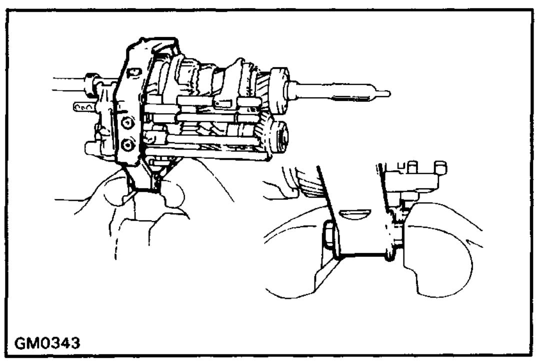
10. SEPARATE INTERMEDIATE PLATE FROM TRANSMISSION CASE

(a) Stand the transmission as shown.

(b) Using a plastic hammer, carefully tap off the trans– mission case.



(c) Remove the transmission case from the intermedi– ate plate as shown.

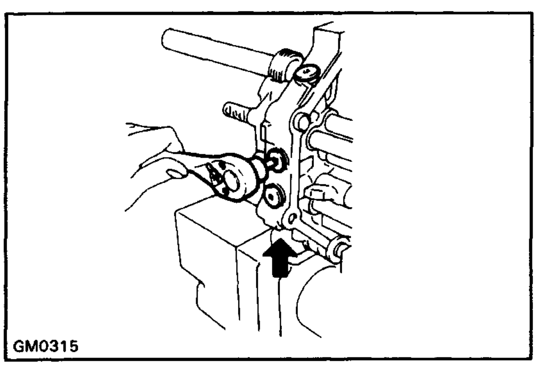


11. MOUNT INTERMEDIATE PLATE IN VISE

(a) Use two clutch housing bolts, plate washers and suitable nuts as shown.

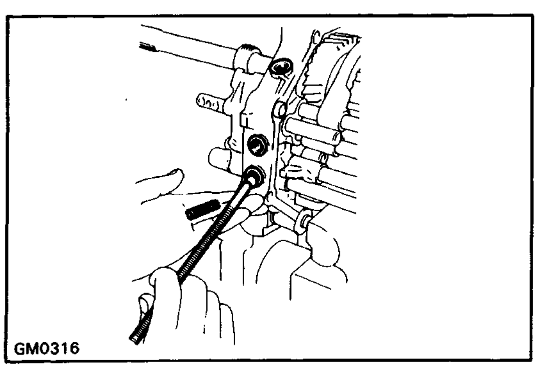
NOTICE: Install the plate washers in reverse of normal. Increase or decrease plate washers so that the bolt tip and front tip surface of the nut are aligned.

(b) Mount the intermediate plate in a vise.

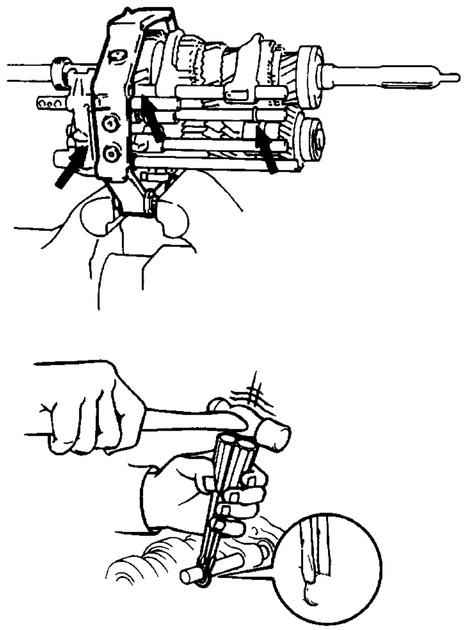


12. REMOVE STRAIGHT SCREW PLUGS, LOCKING BALLS AND SPRINGS

(a) Using a torx socket wrench, remove the four plugs. (Torx socket wrench T40 09042–00020)



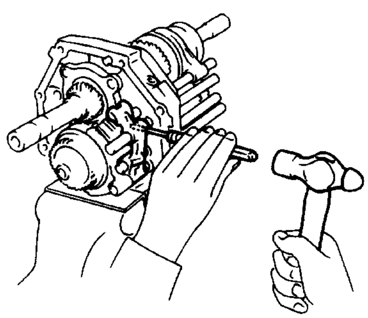
(b) Using a magnetic finger, remove the springs and balls.



GM0337
GM0344

13. REMOVE SHIFT FORK SHAFT SNAP RINGS

Using two screwdrivers and a hammer drive out the three snap rings.

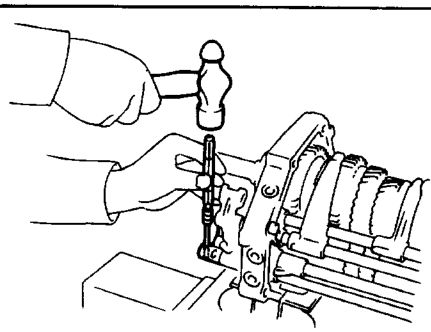


GM0332

14. REMOVE SHIFT FORK SHAFT NO.5

(a) Using a pin punch and hammer, drive out the slotted spring pin.

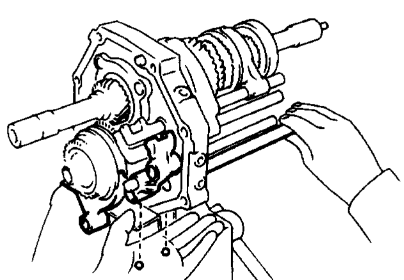
(b) Remove the shift fork shaft No.5.



E9256

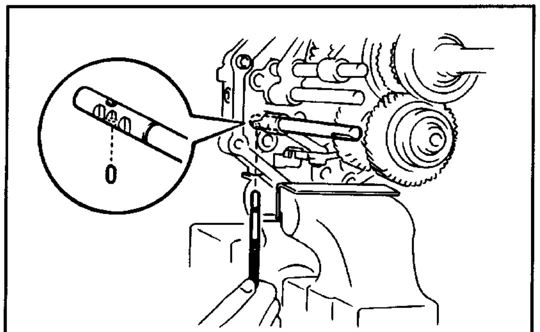
15. REMOVE SHIFT FORK NO.3, SHIFT FORK SHAFT NO.4 AND REVERSE SHIFT HEAD

(a) Using a pin punch and hammer, drive out the slotted spring pin.



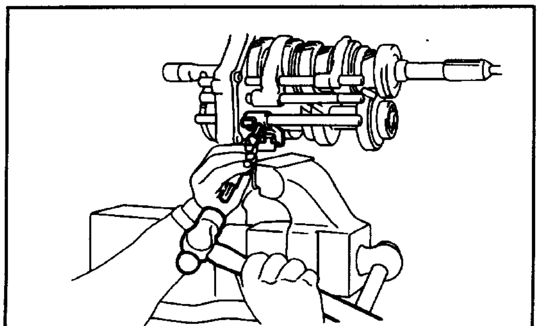
GM0334

(b) Remove the shift fork No.3, shift fork shaft No.4, re–verse shift head and two balls.

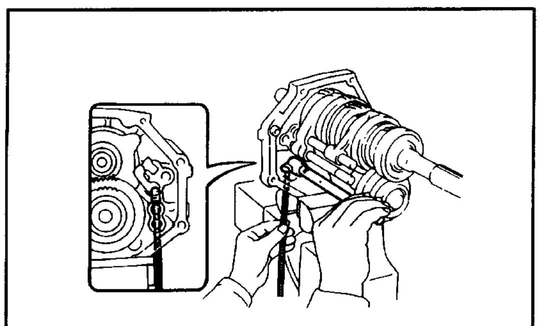

E9258

16. REMOVE REVERSE SHIFT ARM, REVERSE SHIFT FORK AND SHIFT FORK SHAFT NO–3

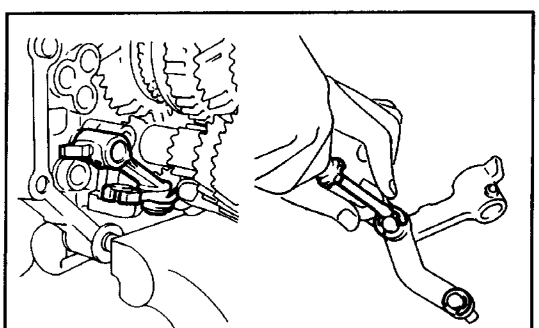
(a) Using a magnetic finger–, remove the interlock pin from shift fork shaft No.3.


E9260

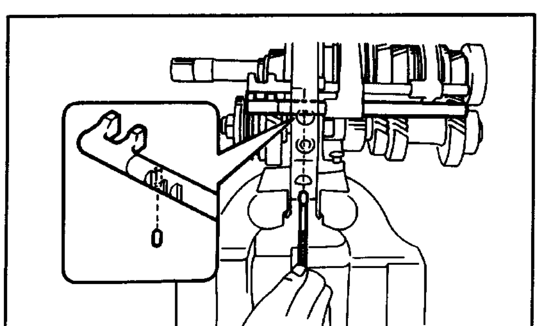
(b) Using a pin punch and hammer, drive out the slotted spring pin.


GM0335

(c) Remove the shift fork shaft No.3.
(d) Remove the interlock pin No. 1.

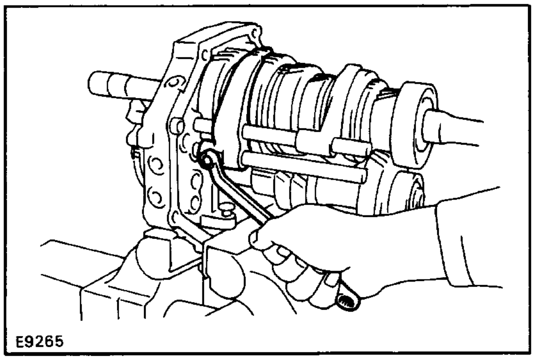

GM0320 E9247

(e) Remove the reverse shift arm and fork.
(f) Using a screwdriver, remove the two E–rings.
(g) Separate the shift arm, fork and shoe.

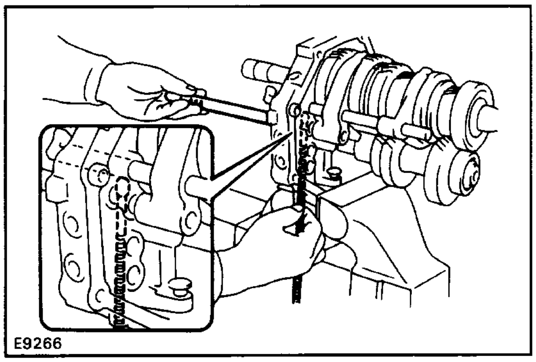

E9263

17. REMOVE SHIFT FORK SHAFT NO.1, NO.2 AND SHIFT FORK NO. 1, NO.2

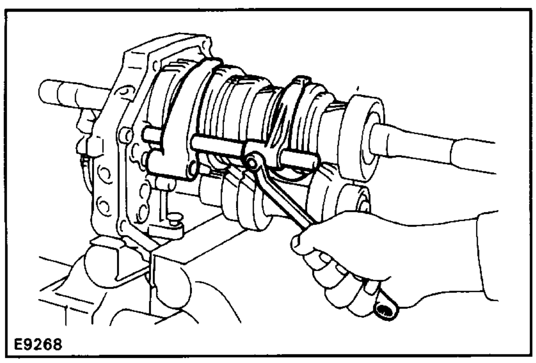
(a) Using a magnetic finger, remove the interlock pin No.2 from shift fork shaft No.2.



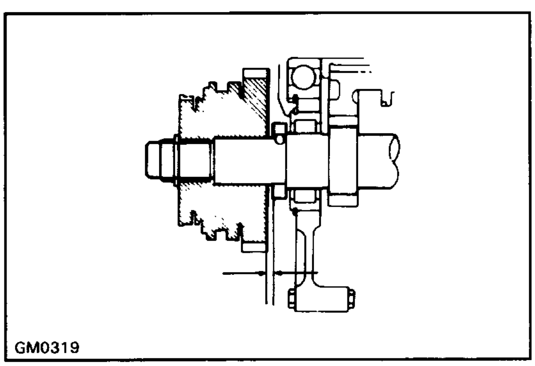
(b) Remove the shift fork No. 1 set bolt.



(c) Remove the shift fork shaft No. 1.
(d) Remove the interlock pin No. 1.



(e) Remove the shift fork No. 2 set bolt.
(f) Remove the shift fork No.1, No.2 and shift fork shaft No.2.

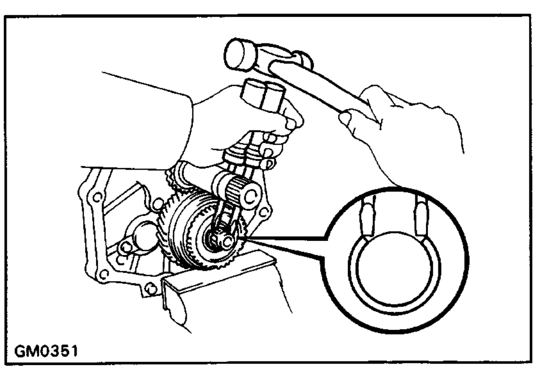


18. INSPECT COUNTER FIFTH GEAR THRUST CLEARANCE

Using a feeler gauge, measure the counter 5th gear thrust clearance.

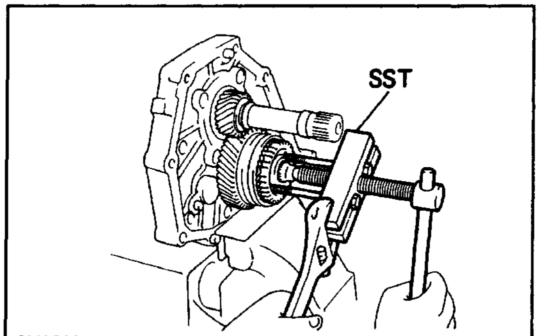
Standard clearance: 0.10 – 0.30 mm (0.0039 – 0.0118 in.)

Maximum clearance: 0.30 mm (0.0118 in.)



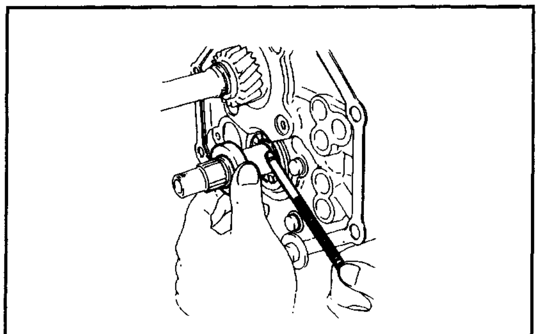
19. REMOVE GEAR SPLINE PIECE NO.5, SYNCHRONIZER RING, NEEDLE ROLLER BEARINGS AND COUNTER FIFTH GEAR WITH HUB SLEEVE NO.3

(a) Using two screwdrivers and a hammer, tap out the snap ring.

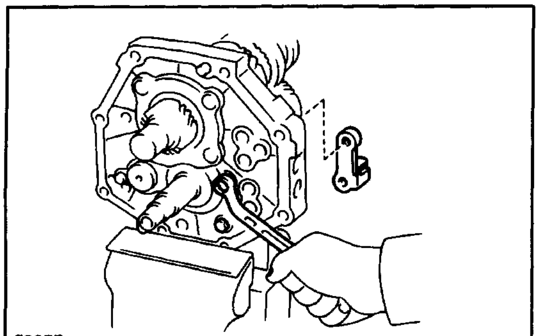


GM0339

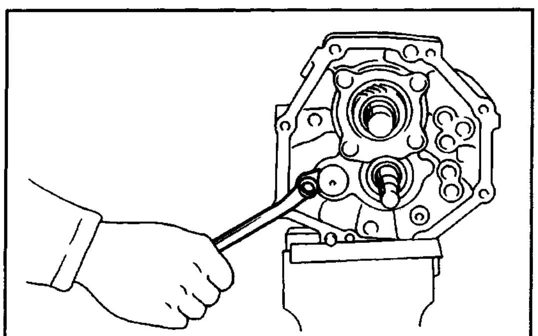
(b) Using SST, remove the gear spline piece No. 5.
SST 09213–60017 (09213–00020, 09213–00030, 09213–00060)
(c) Remove the synchronizer ring, needle roller bearing and counter 5th gear.


GM0033

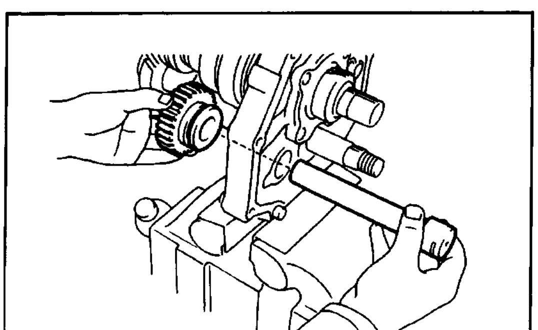
20. REMOVE SPACER AND BALL
(a) Remove the spacer.
(b) Using a magnetic finger, remove the ball.


E9277

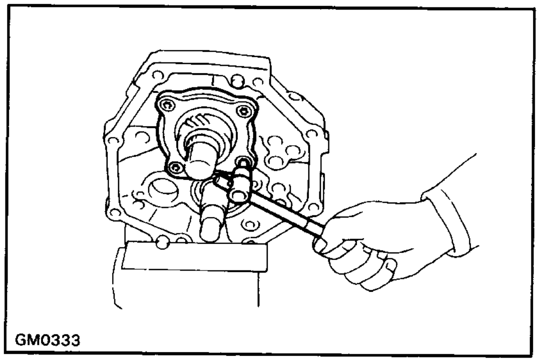
21. REMOVE REVERSE SHIFT ARM BRACKET
Remove the two bolts and reverse shift arm bracket.


E9279

22. REMOVE REVERSE IDLER GEAR AND SHAFT
(a) Remove the reverse idler gear shaft stopper set bolt and stopper.

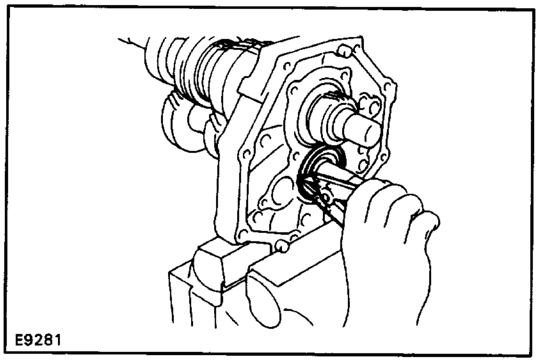

E9278

(b) Remove the reverse idler gear and shaft.



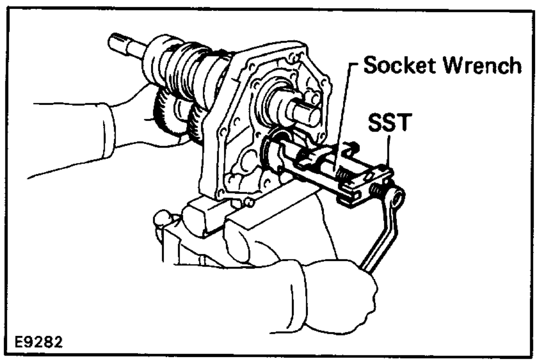
23. REMOVE REAR BEARING RETAINER

Using a torx socket wrench, remove the four bolts.
(Torx socket wrench T40 09042–00020)



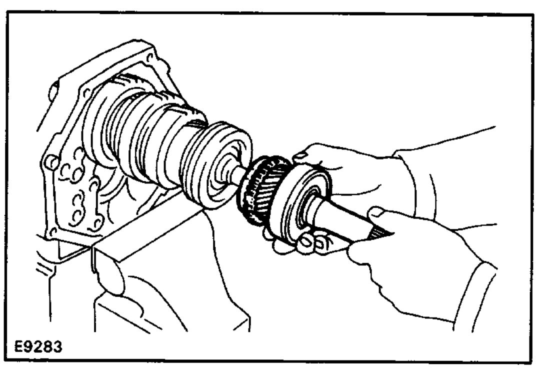
24. REMOVE COUNTER GEAR

(a) Using a snap ring expander, remove the counter gear rear bearing snap ring.



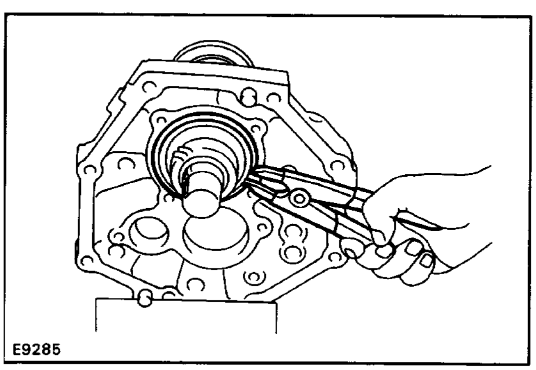
(b) Using SST and 12 mm socket wrench, remove the counter gear rear bearing.
SST 09602–35011

(c) Remove the counter gear.



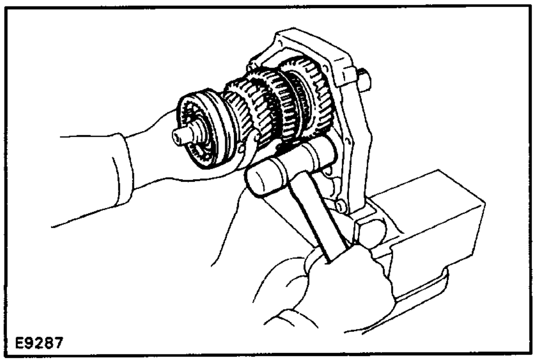
25. REMOVE INPUT SHAFT

Remove the input shaft with 13 needle roller bearings and synchronizer ring from output shaft.

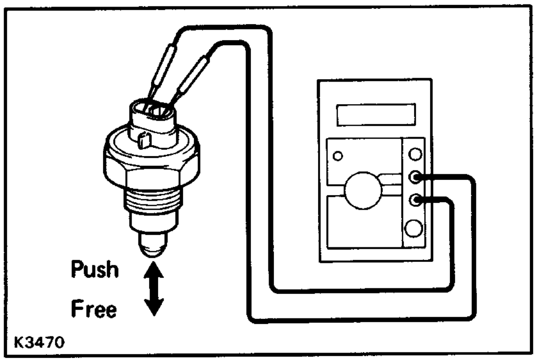


26. REMOVE OUTPUT SHAFT

(a) Using a snap ring expander, remove the output shaft center bearing snap ring.


E9287

(b) Remove the output shaft, from the intermediate plate by pulling on the output shaft and tapping on the intermediate plate with plastic hammer.



K3470

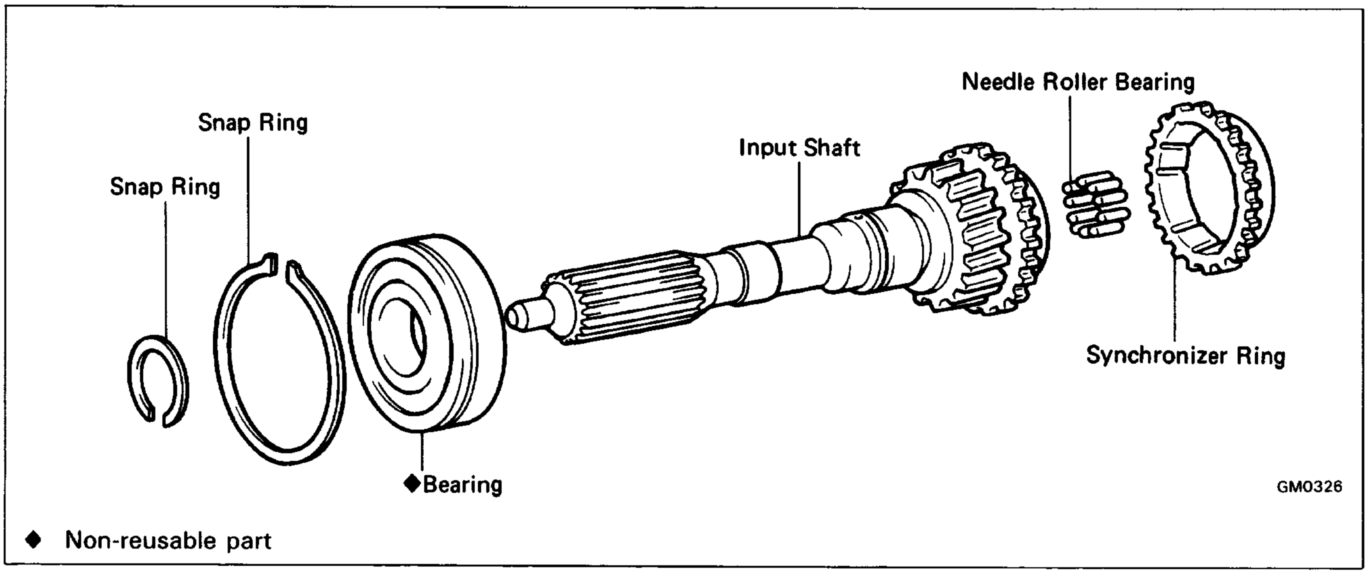
27. INSPECT BACK–UP LIGHT SWITCH

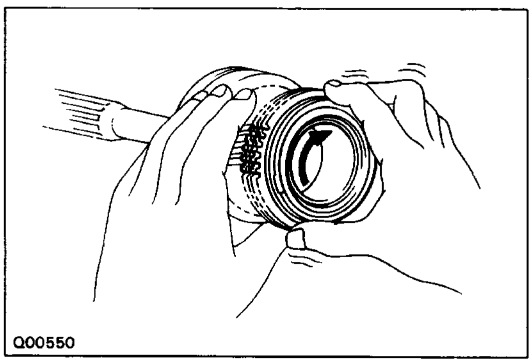
Check that there is continuity between terminals as shown.

Switch Position	Specified
Push	Continuity
Free	No continuity

If operation is not as specified, replace switch.

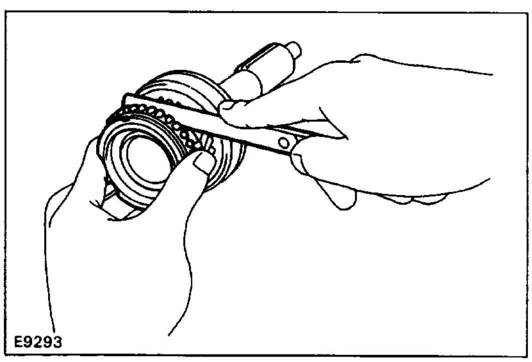
COMPONENT PARTS
Input Shaft Assembly
COMPONENTS





INSPECTION OF INPUT SHAFT ASSEMBLY
INSPECT SYNCHRONIZER RING

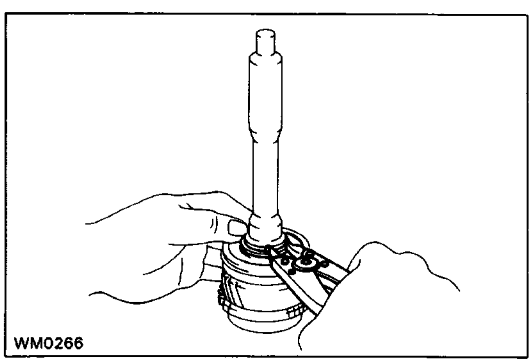
(a) Turn the ring and push it into check braking action.



(b) Using a feeler gauge, measure the clearance be–tween the synchronizer ring back and gear spline end.

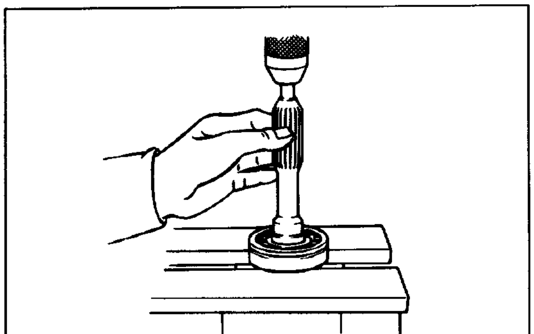
Standard clearance: 1.0 – 2.0 mm (0.040 – 0.079 in.)
Minimum clearance: 0.8 mm (0.031 in.)

If the clearance is less than the minimum, replace the synchronizer ring.

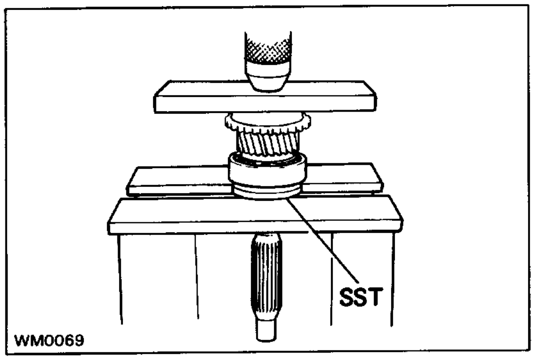


REPLACEMENT OF BEARING
IF NECESSARY, REPLACE INPUT SHAFT BEARING

(a) Using a snap ring expander, remove the snap ring.

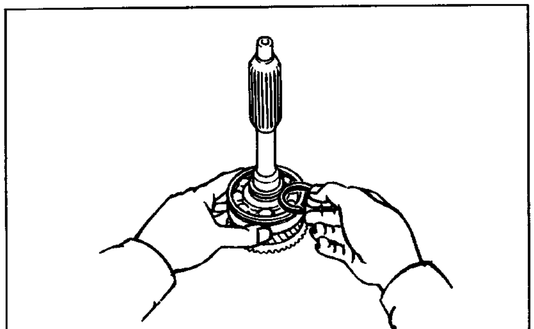

WM0068

(b) Using a press, remove the bearing.



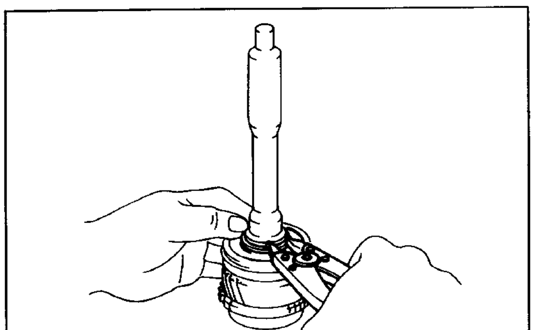
WM0069

(c) Using SST and a press, install a new bearing.
SST 09506–35010


WM0070

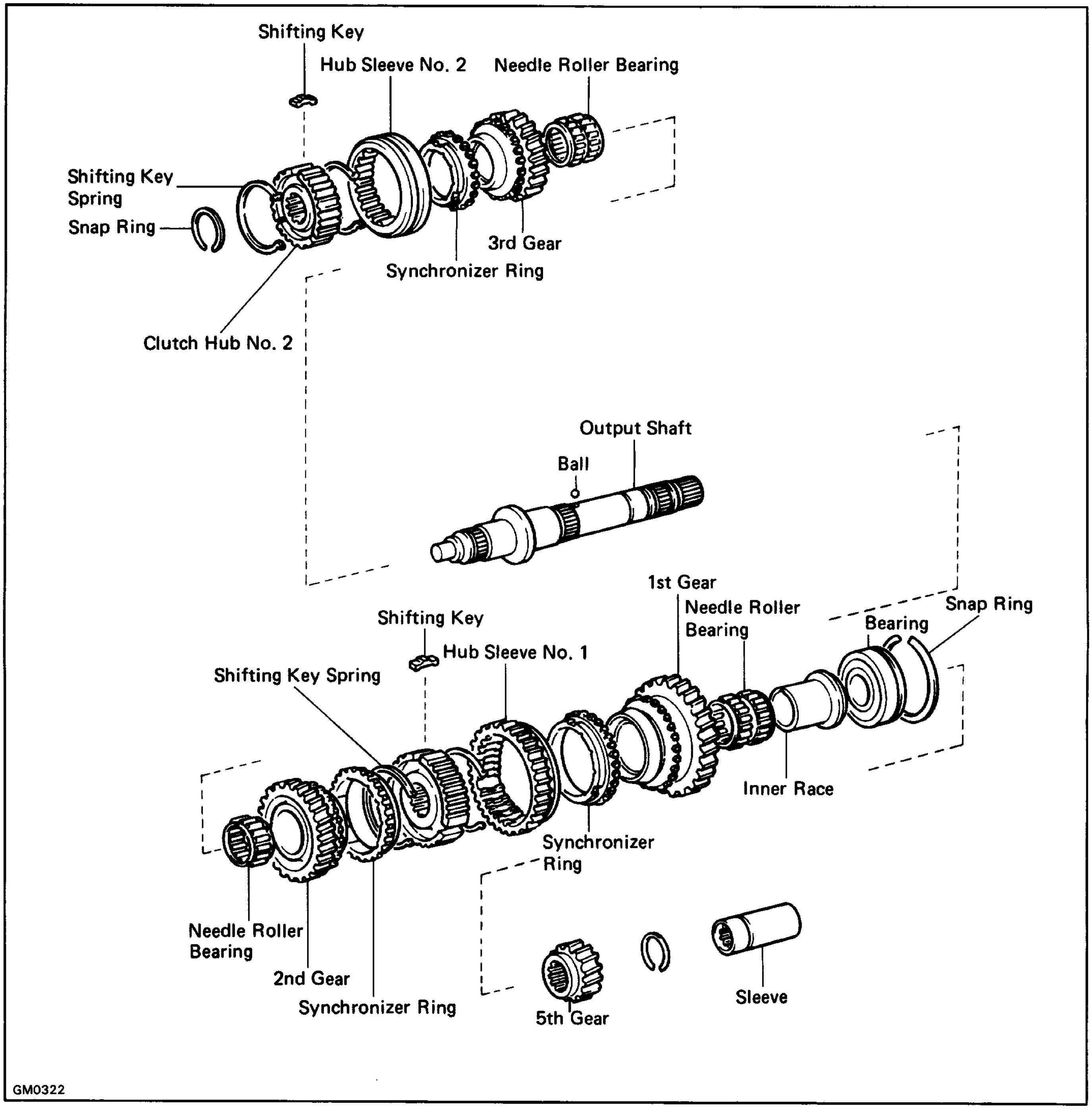
(d) Select a snap ring that will allow minimum axial play.

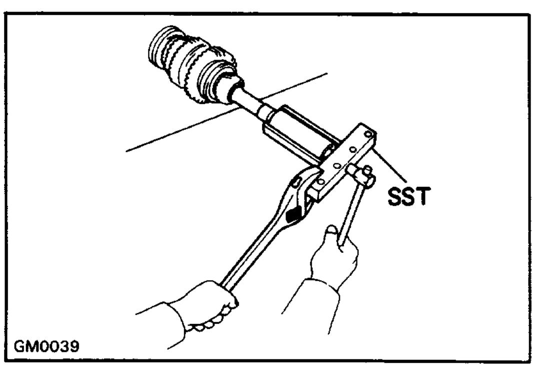
Mark	Thickness mm (in.)
0	2.05 – 2.10 (0.0807 – 0.0827)
1	2.10 – 2.15 (0.0827 – 0.0846)
2	2.15 – 2.20 (0.0846 – 0.0866)
3	2.20 – 2.25 (0.0866 – 0.0886)
4	2.25 – 2.30 (0.0886 – 0.0906)
5	2.30 – 2.35 (0.0906 – 0.0925)


WM0266

(e) Using a snap ring expander, install the snap ring.

Output Shaft Assembly
COMPONENTS

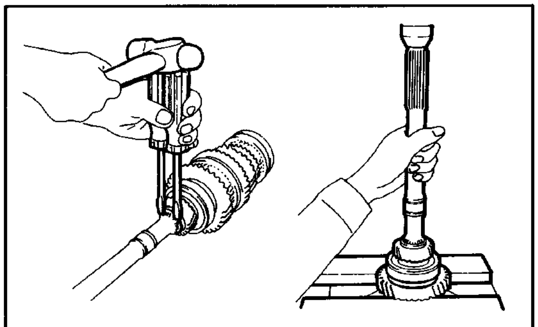




DISASSEMBLY OF OUTPUT SHAFT ASSEMBLY

1. REMOVE SLEEVE FROM OUTPUT SHAFT

Using SST, remove the sleeve from the output shaft.
SST 09950–20017

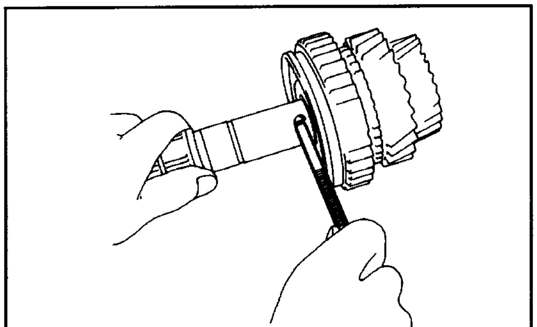

GM0041 GM0042

2. REMOVE FIFTH GEAR, REAR BEARING, FIRST GEAR, INNER RACE AND NEEDLE ROLLER BEARING

(a) Using two screwdrivers and a hammer, tap out the snap ring.

(b) Using a press, remove the 5th gear, rear bearing, 1st gear and inner race.

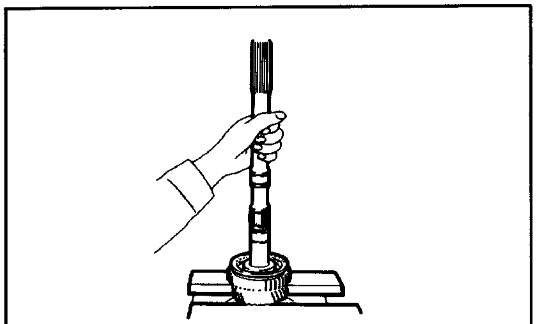
(c) Remove the needle roller bearing.


GM0045

3. REMOVE SYNCHRONIZER RING

4. REMOVE LOCKING BALL

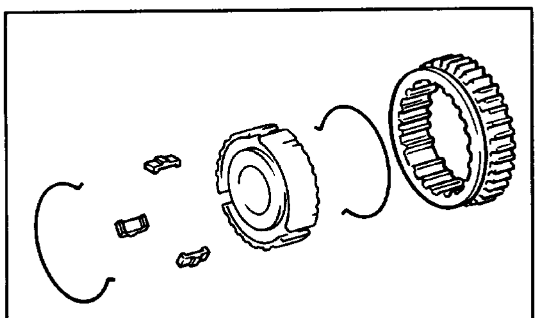
Using a magnetic finger, remove the locking ball.


GM0046

5. REMOVE HUB SLEEVE NO. 1 ASSEMBLY, SYNCHRONIZER RING, SECOND GEAR AND NEEDLE ROLLER BEARING

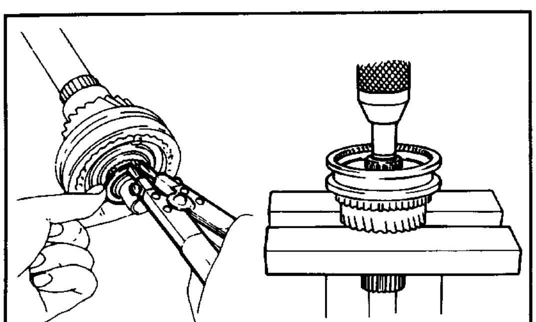
(a) Using a press, remove hub sleeve No.1, the syn– chronizer ring and 2nd gear.

(b) Remove the needle roller bearing.


E9307

6. REMOVE HUB SLEEVE NO. 1, SHIFTING KEYS AND SPRINGS FROM CLUTCH HUB NO. 1

Using a screwdriver, remove the three shifting keys and two springs from clutch hub No. 1.

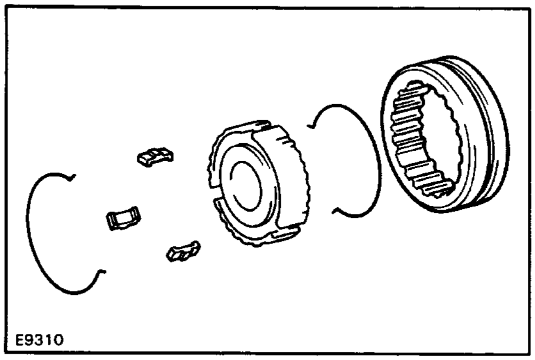

GM0047 WM0055

7. REMOVE HUB SLEEVE NO.2 ASSEMBLY, SYNCHRONIZER RING, THIRD GEAR AND NEEDLE ROLLER BEARING

(a) Using a snap ring expander, remove the snap ring.

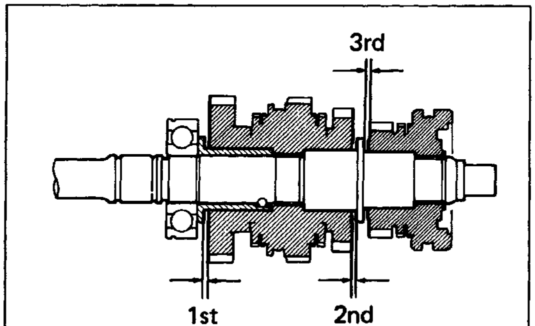
(b) Using a press, remove the hub sleeve No.2, the syn– chronizer ring and 3rd gear.

(c) Remove the needle roller bearing.



8. REMOVE HUB SLEEVE NO.2, SHIFTING KEYS AND SPRINGS FROM CLUTCH HUB NO.2

Using a screwdriver, remove the three shifting keys and springs from clutch hub No.2.



GM0040

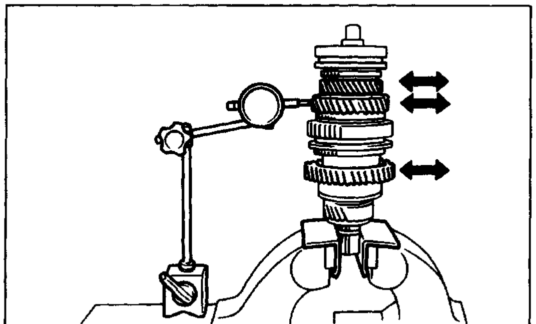
INSPECTION OF OUTPUT SHAFT ASSEMBLY

1. INSPECT EACH GEAR THRUST CLEARANCE

Using a feeler gauge, measure the thrust clearance of each gear.

Standard clearance: 0.10 – 0.25 mm (0.0039 – 0.0098 in.)

Maximum clearance: 0.25 mm (0.0098 in.)


E9298

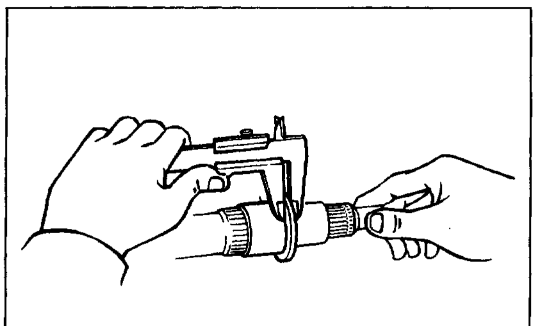
2. INSPECT EACH GEAR OIL CLEARANCE

Using a dial indicator, measure the each gear oil clear–ance.

Standard clearance: 0.009 – 0.032 mm (0.0004 – 0.0013 in.)

Maximum clearance: 0.032 mm (0.0013 in.)

If the clearance exceeds the maximum, replace the gear, needle roller bearing or shaft.

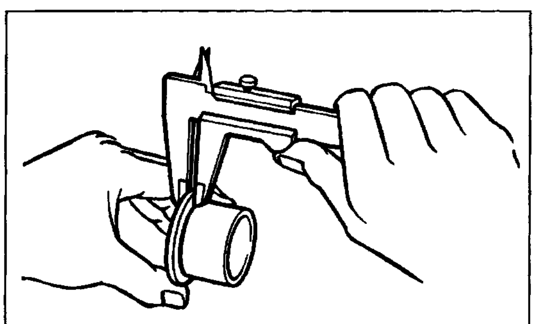

GM0048

3. INSPECT OUTPUT SHAFT AND INNER RACE

(a) Using calipers, measure the output shaft flange thickness.

Minimum thickness: 4.80 mm (0.1890 in.)

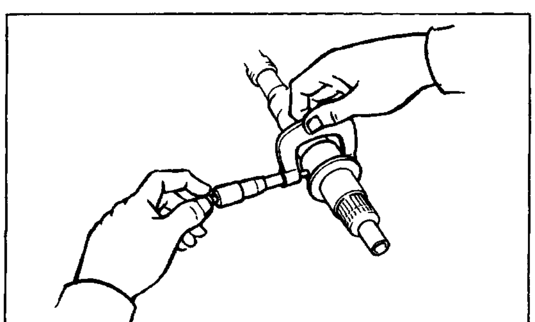
If the thickness exceeds the minimum, replace the output shaft.


WM0057

(b) Using calipers, measure the inner race flange thick–ness.

Minimum thickness: 3.99 mm (0.1571 in.)

If the thickness exceeds the minimum, replace the inner race.


GM0049

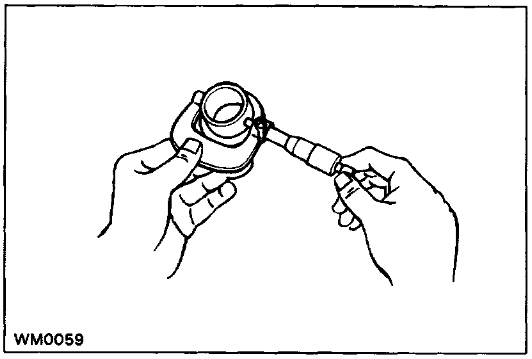
(c) Using a micrometer, measure the outer diameter of the output shaft journal.

Minimum diameter:

2nd gear 37.984 mm (1.4954 in.)

3rd gear 34.984 mm (1.3773 in.)

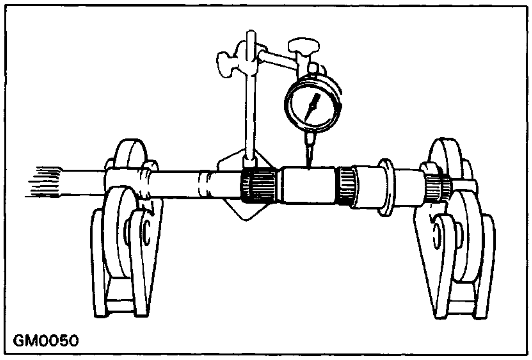
If the outer diameter exceeds the minimum, replace the output shaft.



(d) Using a micrometer, measure the outer diameter of the inner race.

Minimum diameter: 38.985 mm (1.5348 in.)

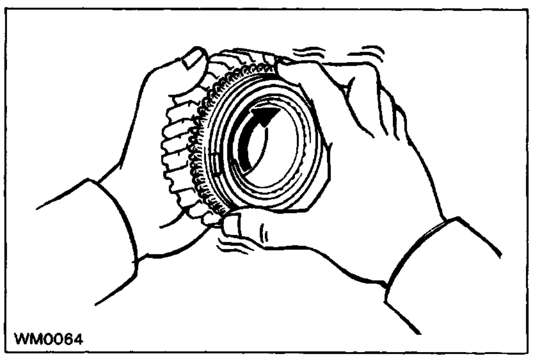
If the outer diameter exceeds the minimum, replace the inner race.



(e) Using a dial indicator, check the shaft runout.

Maximum runout: 0.05 mm (0.0020 in.)

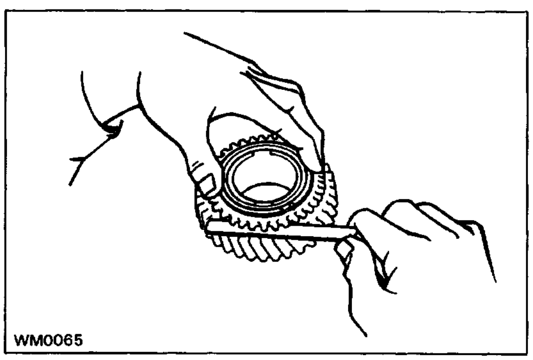
If the runout exceeds the maximum, replace the output shaft.



4. INSPECT SYNCHRONIZER RINGS

(a) Check for wear or damage.

(b) Turn the ring and push it in to check the braking ac–tion.

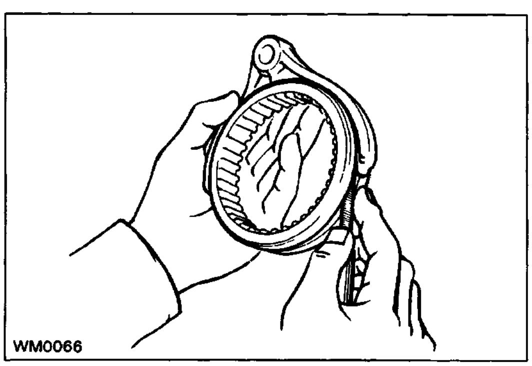


(c) Using a feeler gauge, measure the clearance bet–ween the synchronizer ring back and gear spline end.

Standard clearance: 1.0 – 2.0 mm (0.039 – 0.079 in.)

Minimum clearance: 0.8 mm (0.031 in.)

If the clearance exceeds the minimum, replace the syn–chronizer ring.

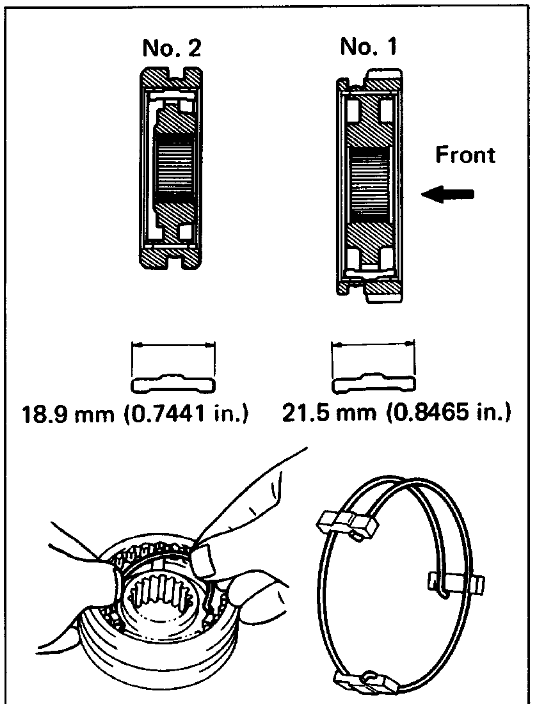


5. INSPECT CLEARANCE OF SHIFT FORKS AND HUB SLEEVES

Using a feeler gauge, measure the clearance between the hub sleeve and shift fork.

Maximum clearance: 1.0 mm (0.039 in.)

If the clearance exceeds the maximum, replace the shift fork or hub sleeve.



GM0331

ASSEMBLY OF OUTPUT SHAFT ASSEMBLY

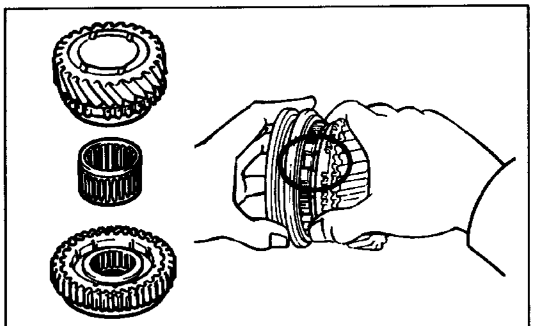
1. INSTALL CLUTCH HUB NO.1 AND NO.2 INTO HUB SLEEVE

HINT: Coat all of the sliding and rotating surface with gear oil before assembly.

(a) Install the clutch hub and shifting keys to the hub sleeve.

(b) Install the shifting key springs under the shifting keys.

NOTICE: Install the key springs positioned so that their end gaps are not in line.

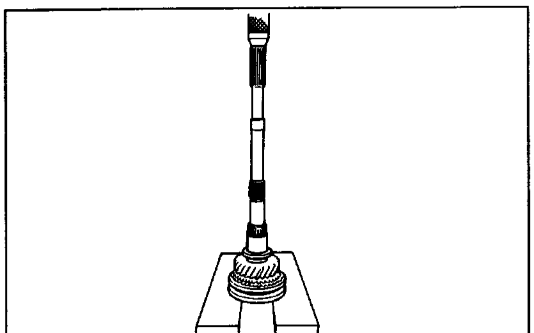

E9317 WM0114

2. INSTALL THIRD GEAR AND HUB SLEEVE NO.2 ON OUTPUT SHAFT

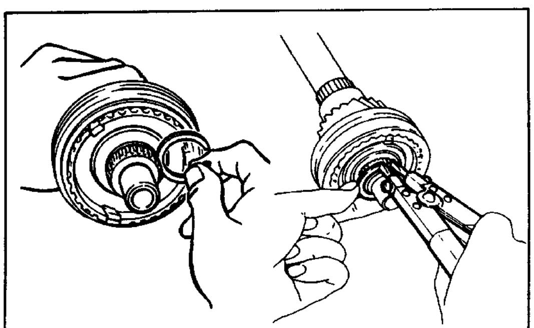
(a) Apply gear oil to the shaft and needle roller bearing.

(b) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.

(c) Install the needle roller bearing in the 3rd gear.


GM0060

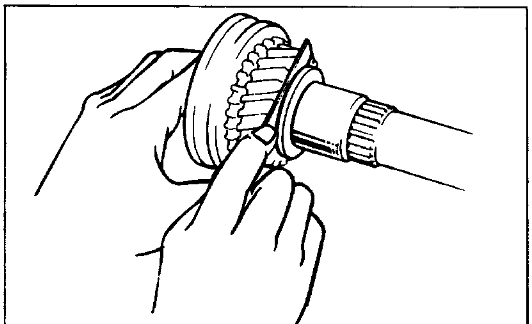
(d) Using a press, install the 3rd gear and hub sleeve No. 2.


WM0116 GM0047

3. INSTALL SNAP RING

Select a snap ring that will allow minimum axial play and install it on the shaft.

Mark	Thickness mm (in.)
C-1	1.75 – 1.80 (0.0689 – 0.0709)
D	1.80 – 1.85 (0.0709 – 0.0728)
D-1	1.85 – 1.90 (0.0728 – 0.0748)
E	1.90 – 1.95 (0.0748 – 0.0768)
E-1	1.95 – 2.00 (0.0768 – 0.0787)
F	2.00 – 2.05 (0.0787 – 0.0807)
F-1	2.05 – 2.10 (0.0807 – 0.0827)

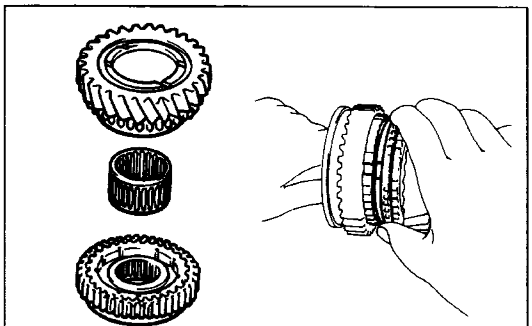

WM0117

4. INSPECT THIRD GEAR THRUST CLEARANCE

Using a feeler gauge, measure the 3rd gear thrust clear–ance.

Standard clearance: 0.10 – 0.25 mm (0.0039 – 0.0098 in.)

Maximum clearance: 0.25 mm (0.0098 in.)

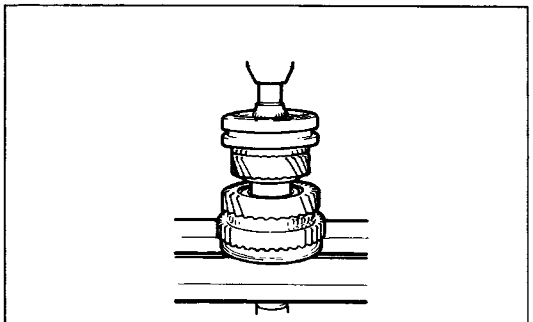

E9322 GM0061

5. INSTALL SECOND GEAR AND HUB SLEEVE NO. 1

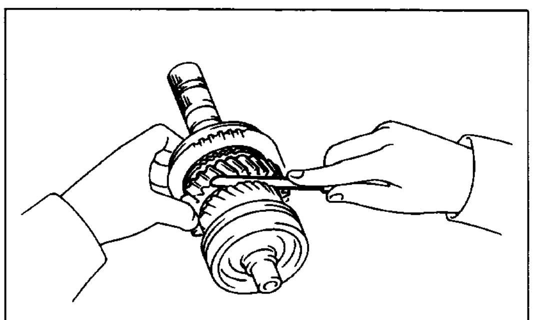
(a) Apply gear oil to the shaft and needle roller bearing.

(b) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.

(c) Install the needle roller bearing in the 2nd gear.


GM0062

(d) Using a press, install the 2nd gear and hub sleeve No. 1.

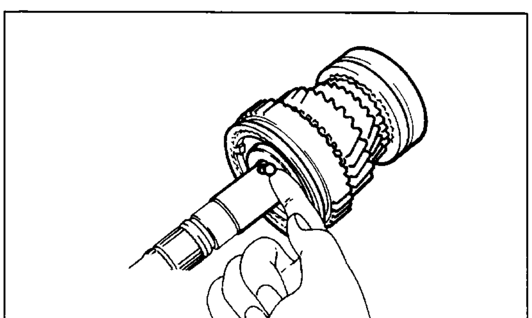

E9323

6. INSPECT SECOND GEAR THRUST CLEARANCE

Using a feeler gauge, measure the 2nd gear thrust clear–ance.

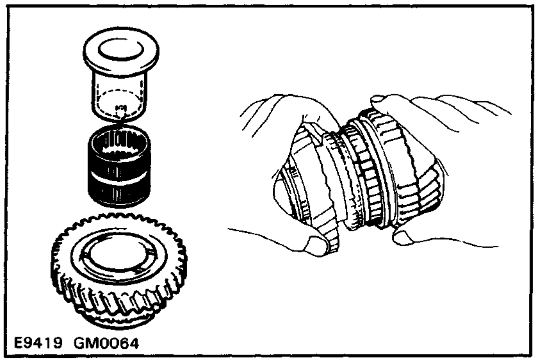
Standard clearance: 0.10 – 0.25 mm (0.0039 – 0.0098 in.)

Maximum clearance: 0.25 mm (0.0098 in.)

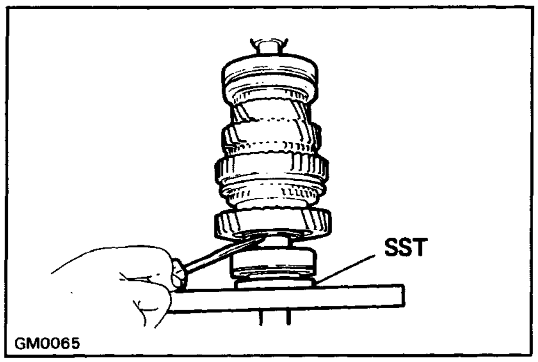

GM0063

7. INSTALL LOCKING BALL AND FIRST GEAR ASSEMBLY

(a) Install the locking ball in the shaft.

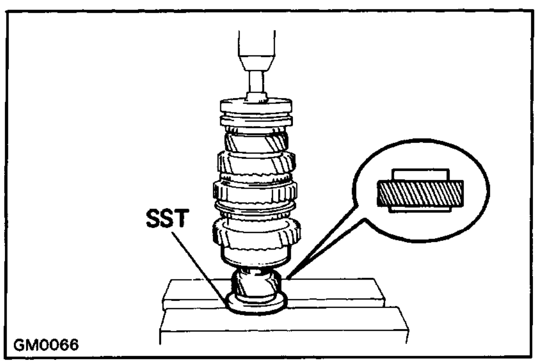


(b) Apply gear oil to the needle roller bearing.
(c) Assemble the 1st gear, synchronizer ring, needle roller bearing and bearing inner race.
(d) Install the assembly on the output shaft with the synchronizer ring slots aligned with shifting keys.
(e) Turn the inner race to align it with the locking ball.



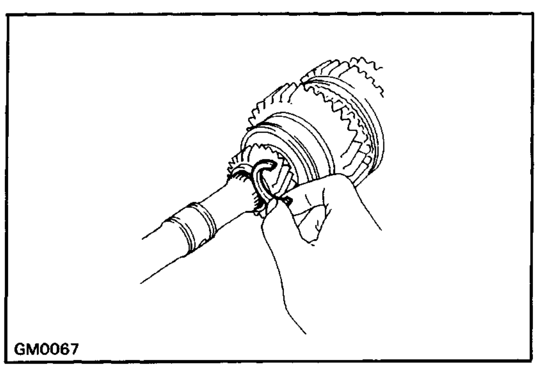
8. INSTALL OUTPUT SHAFT REAR BEARING

Using SST and a press, install the bearing on the output shaft with outer race snap ring groove toward the rear.
HINT: Hold the 1st gear inner race to prevent it from falling.
SST 09 506–3 5010



9. INSTALL FIFTH GEAR

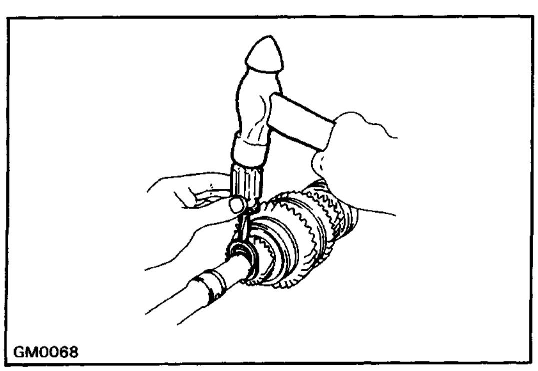
Using SST and a press, install the 5th gear.
SST 09506–35010



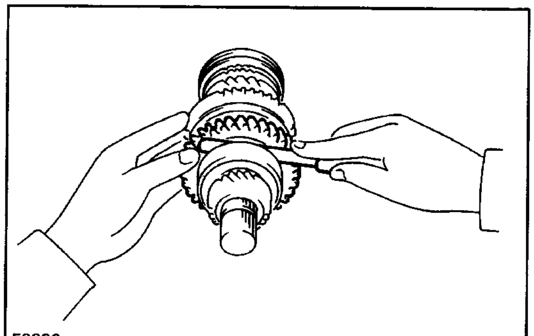
10. INSTALL SNAP RING

(a) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
A	2.67 – 2.72 (0.1051 – 0.1071)
B	2.73 – 2.78 (0.1075 – 0.1094)
C	2.79 – 2.84 (0.1098 – 0.1118)
D	2.85 – 2.90 (0.1122 – 0.1142)
E	2.91 – 2.96 (0.1146 – 0.1165)
F	2.97 – 3.02 (0.1169 – 0.1189)
G	3.03 – 3.08 (0.1193 – 0.1213)
H	3.09 – 3.14 (0.1217 – 0.1236)
J	3.15 – 3.20 (0.1240 – 0.1260)
K	3.21 – 3.26 (0.1264 – 0.1283)
L	3.27 – 3.32 (0.1287 – 0.1307)



(b) Using a screwdriver and hammer, tap in the snap ring.



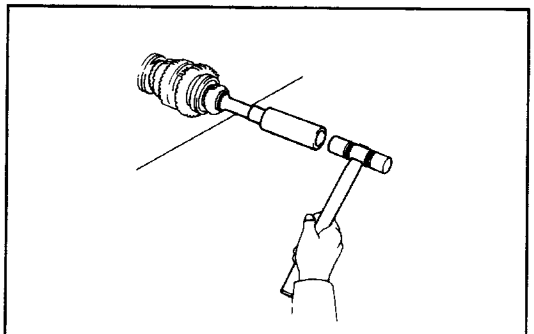
E9330

11. MEASURE FIRST GEAR THRUST CLEARANCE

Using a feeler gauge, measure the 1 st gear thrust clearance.

Standard clearance: 0.10 – 0.25 mm
(0.0039 – 0.0098 in.)

Maximum clearance: 0.25 mm (0.0098 in.)



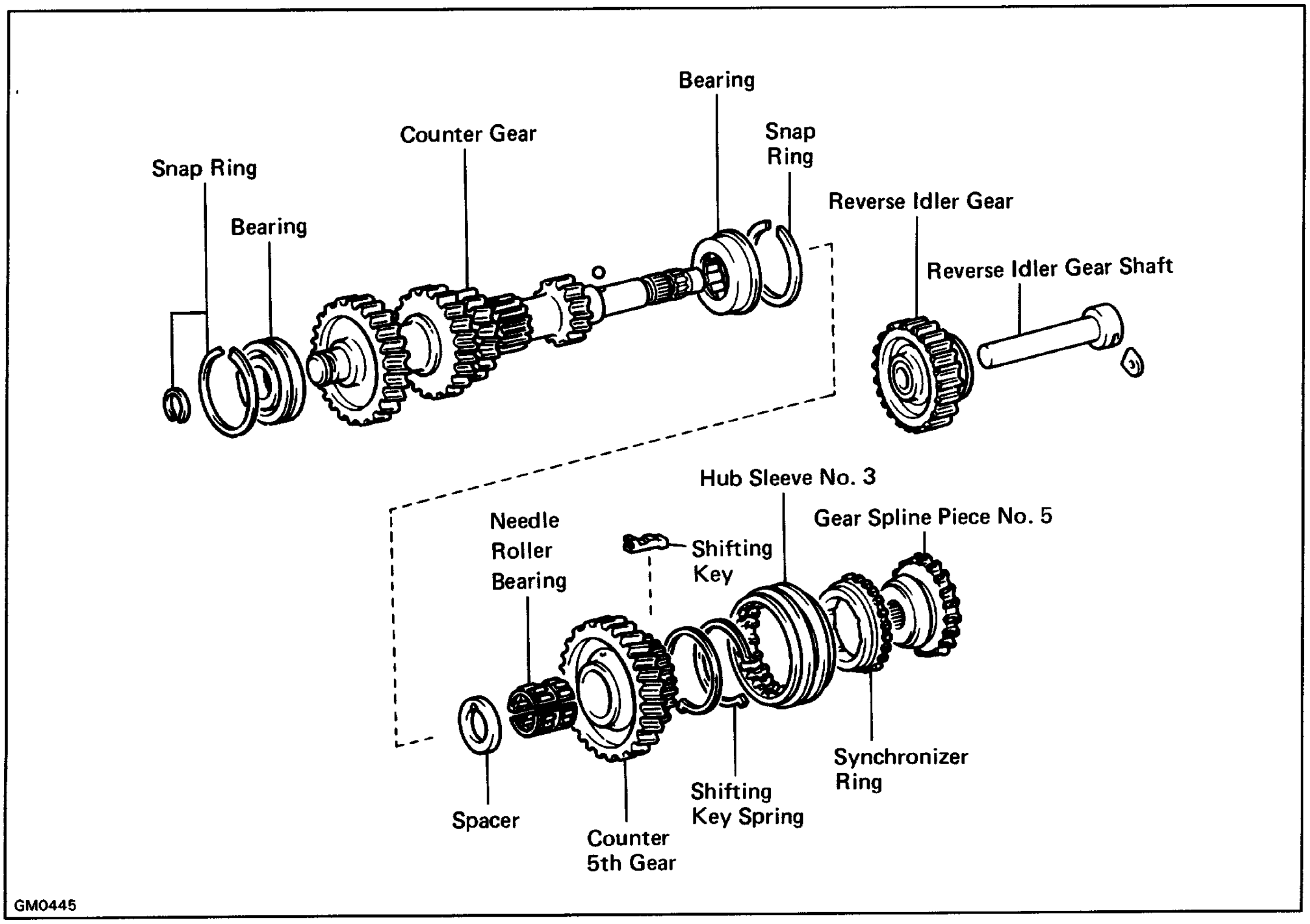
GM0071

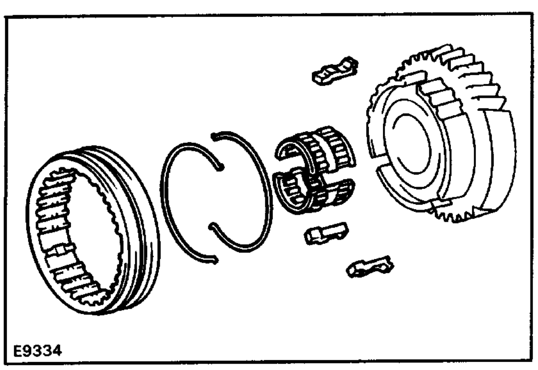
12. INSTALL SLEEVE TO OUTPUT SHAFT

Using a plastic hammer, tap the sleeve onto the output shaft.

Counter Gear Assembly and Reverse Idler Gear

COMPONENT

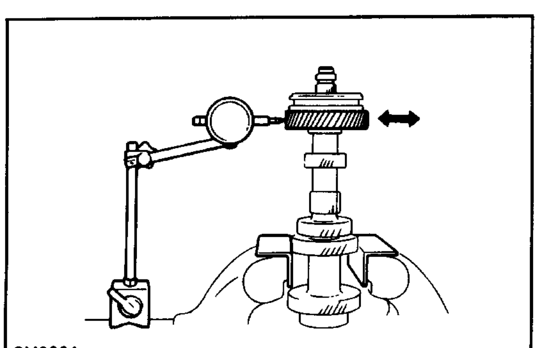




DISASSEMBLY OF COUNTER GEAR ASSEMBLY

REMOVE HUB SLEEVE NO.3 SHIFTING KEYS AND SPRINGS

Using a screwdriver, remove the hub sleeve No.3, three shifting keys and two springs.



INSPECTION OF COUNTER GEAR ASSEMBLY

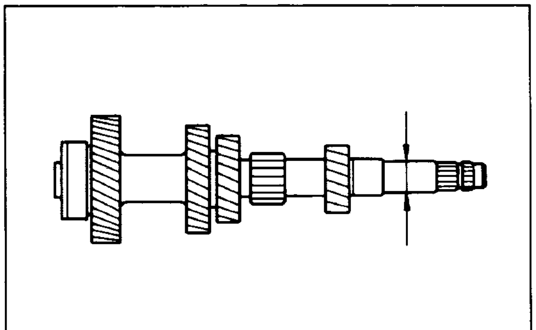
1. INSPECT COUNTER FIFTH GEAR OIL CLEARANCE

!ay Install the spacer, needle roller bearing and counter 5th gear to counter gear.

(b) Using a dial indicator, measure the counter 5th gear oil clearance.

Standard clearance: 0.009 – 0.032 mm
(0.0004 – 0.0013 in.)
Maximum clearance: 0.032 mm 10.0013 in.)

If the clearance exceeds the maximum, gear, needle roller bearing or counter gear assembly.



GM0323

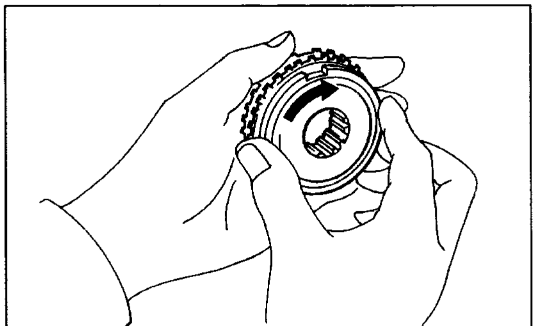
2. INSPECT COUNTER GEAR

Using a micrometer, measure the outer diameter of needle roller bearing race.

Standard clearance: 25.98 – 26.00 mm (1.0228 – 1.0236 in.)

Maximum clearance: 25.86 mm (1.0181 in.)

If the outer diameter exceeds the maximum, replace the counter gear.

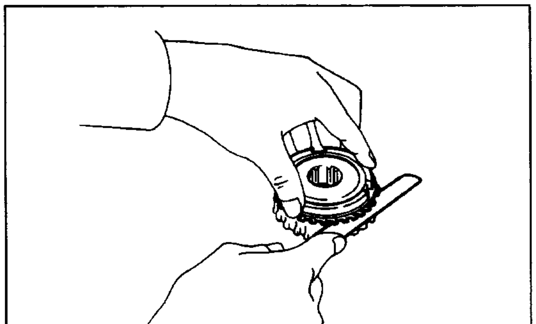


Q00552

3. INSPECT SYNCHRONIZER RING

(a) Check for wear or damage.

(b) Turn the ring and push it in to the check the braking action.



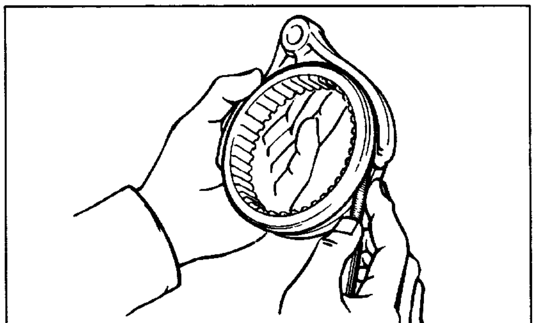
E9335

(c) Measure the clearance between the synchronizer ring back and the spline end.

Standard clearance: 1.0 – 2.0 mm (0.039 – 0.079 in.)

Minimum clearance: 0.8 mm (0.031 in.)

If the clearance is less than the minimum, replace the synchronizer ring.



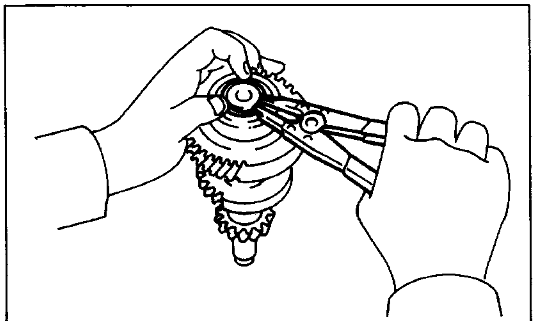
WM0066

4. MEASURE CLEARANCE OF SHIFT FORK AND HUB SLEEVE

Using a feeler gauge, measure the clearance between the hub sleeve and shift fork.

Maximum clearance: 1.0 mm (0.039 in.)

If the clearance exceeds the maximum, replace the shift fork or hub sleeve.

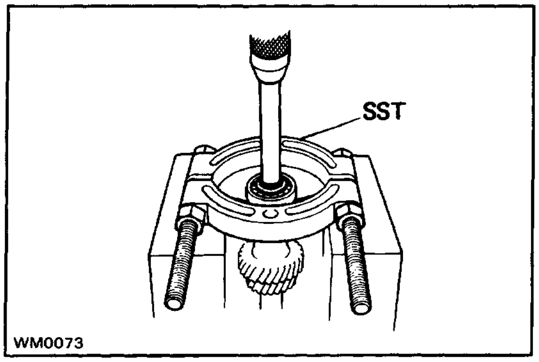


E9340

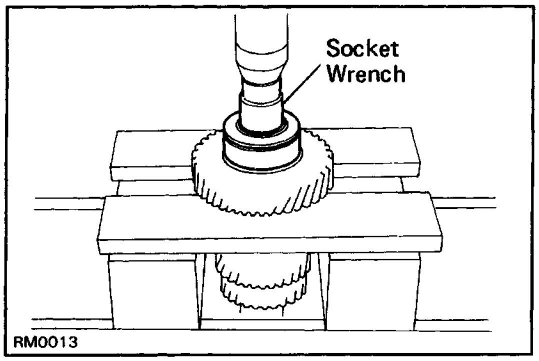
REPLACEMENT OF BEARING

IF NECESSARY, REPLACE COUNTER GEAR FRONT BEARING

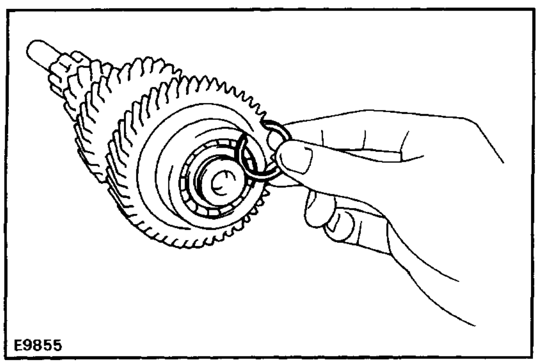
(a) Using a snap ring expander, remove the snap ring.



(b) Using SST and a press, remove the bearing.
SST 09950–00020
(c) Replace the side race.

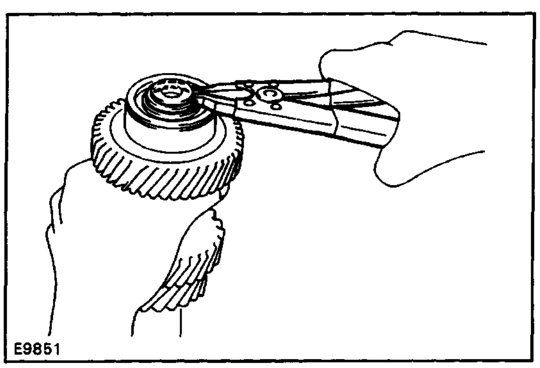


(d) Using a socket wrench and press, install the bear– ing, side race and innerrece.

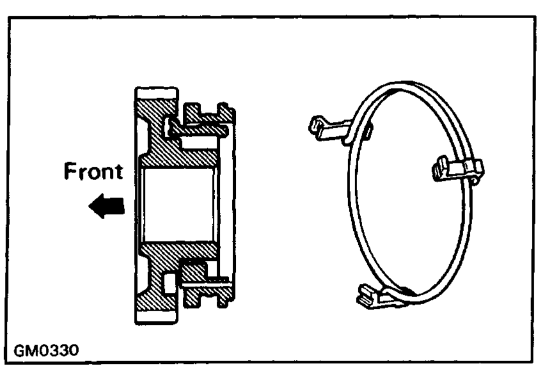


(e) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
1	2.05 – 2.10 (0.0807 – 0.0827)
2	2.10 – 2.15 (0.0827 – 0.0846)
3	2.15 – 2.20 (0.0846 – 0.0866)
4	2.20 – 2.25 (0.0866 – 0.0886)
5	2.25 – 2.30 (0.0886 – 0.0906)
6	2.30 – 2.35 (0.0906 – 0.0925)



(f) Using a snap ring expander, install the snap ring.

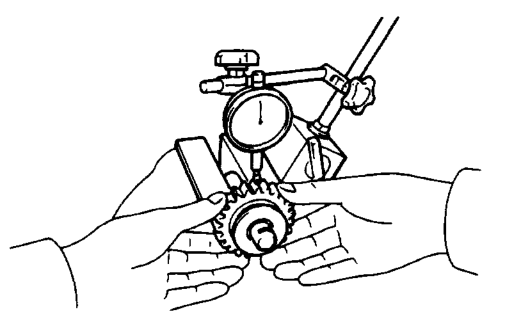


ASSEMBLY OF COUNTER GEAR ASSEMBLY

INSTALL HUB SLEEVE N0.3, SHIFTING KEYS AND SPRINGS

(a) Install the clutch hub and shifting keys to the hub sleeve.
(b) Install the shifting key springs under the shifting keys.

NOTICE: Install the key springs positioned so that their end gaps are not in line.


K0541

INSPECTION OF REVERSE IDLER GEAR

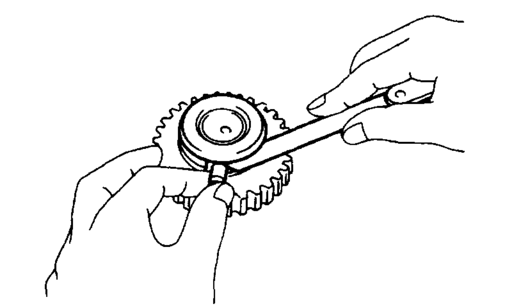
1. INSPECT REVERSE IDLER GEAR OIL CLEARANCE

Using a dial indicator measure reverse idler gear oil clear–ance .

Standard clearance: 0.04 – 0.08 mm (0.0016 – 0.0031 in.)

Maximum clearance: 0.13 mm (0.0051 in.)

If the clearance exceeds the maximum, replace the gear or shaft.


E9346

2. INSPECT CLEARANCE OF REVERSE IDLER GEAR AND SHIFT ARM SHOE

Using a feeler gauge, measure the clearance between the reverse idler gear and shift arm shoe.

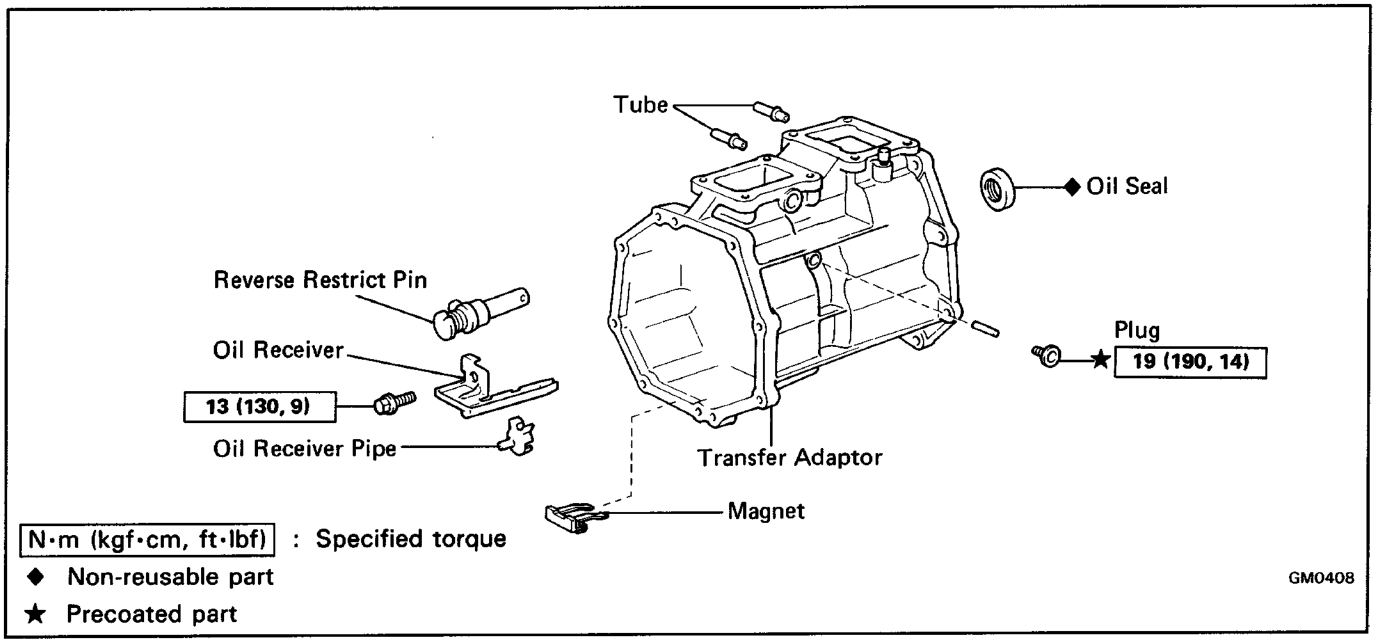
Standard clearance: 0.05 – 0.27 mm (0.0020 – 0.106 in.)

Maximum clearance: 0.5 mm (0.197 in.)

If the clearance exceeds the maximum, replace the gear or shift arm shoe.

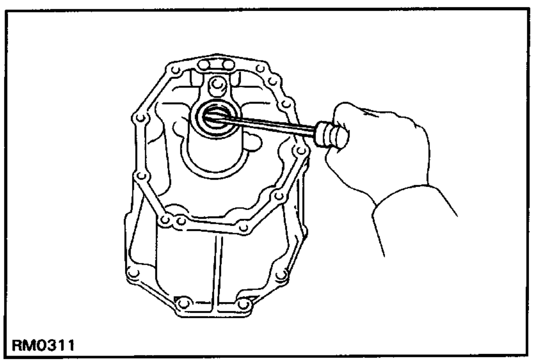
Transfer Adaptor

COMPONENTS

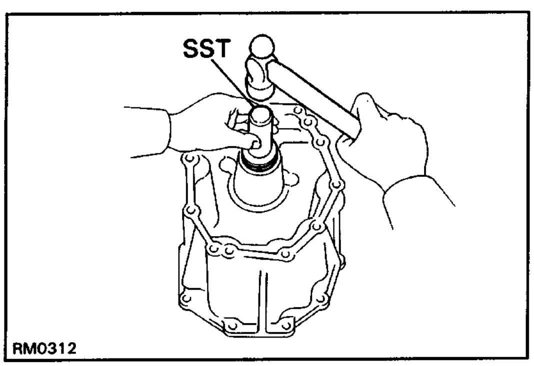


REPLACEMENT OF OIL SEAL

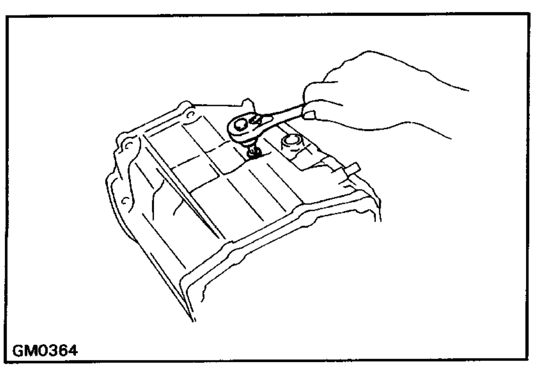
IF NECESSARY, REPLACE TRANSFER ADAPTOR OIL SEAL



(a) Using a screwdriver, pry out the oil seal.



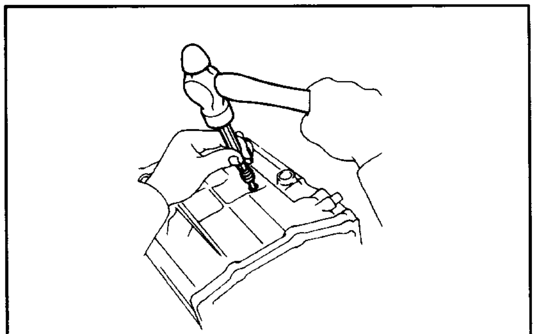
(b) Using SST and a hammer, drive in new oil seal.
SST 09325–12010



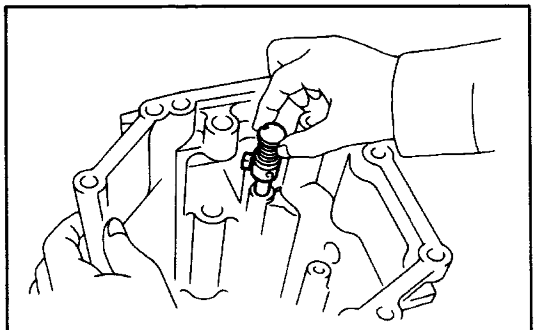
INSPECTION AND REPLACEMENT OF REVERSE RESTRICT PIN

1. REMOVE THE REVERSE RESTRICT PIN

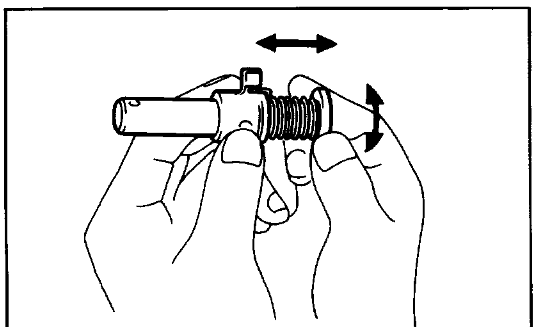
(a) Using a torx socket wrench remove the screw plug.
(Torx socket wrench T40 09042–00020)


GM0363

(b) Using a pin punch and hammer, drive out the slotted spring pin.

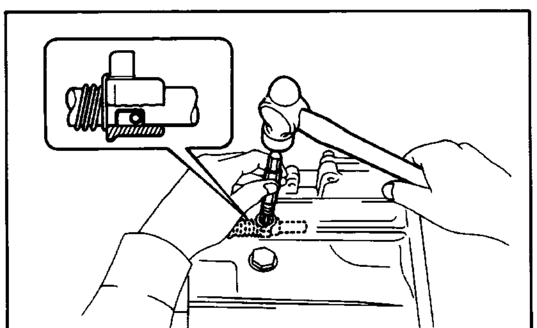

E9381

(c) Remove the reverse restrict pin.


E9382

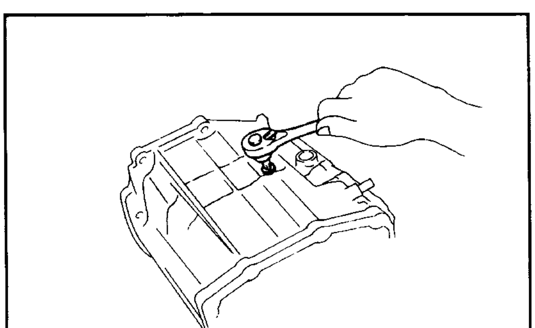
2. INSPECTION OF REVERSE RESTRICT PIN

Turn and push the reverse restrict pin by hand while ap– plying force in axial direction.


E9420

3. INSTALL THE REVERSE RESTRICT PIN

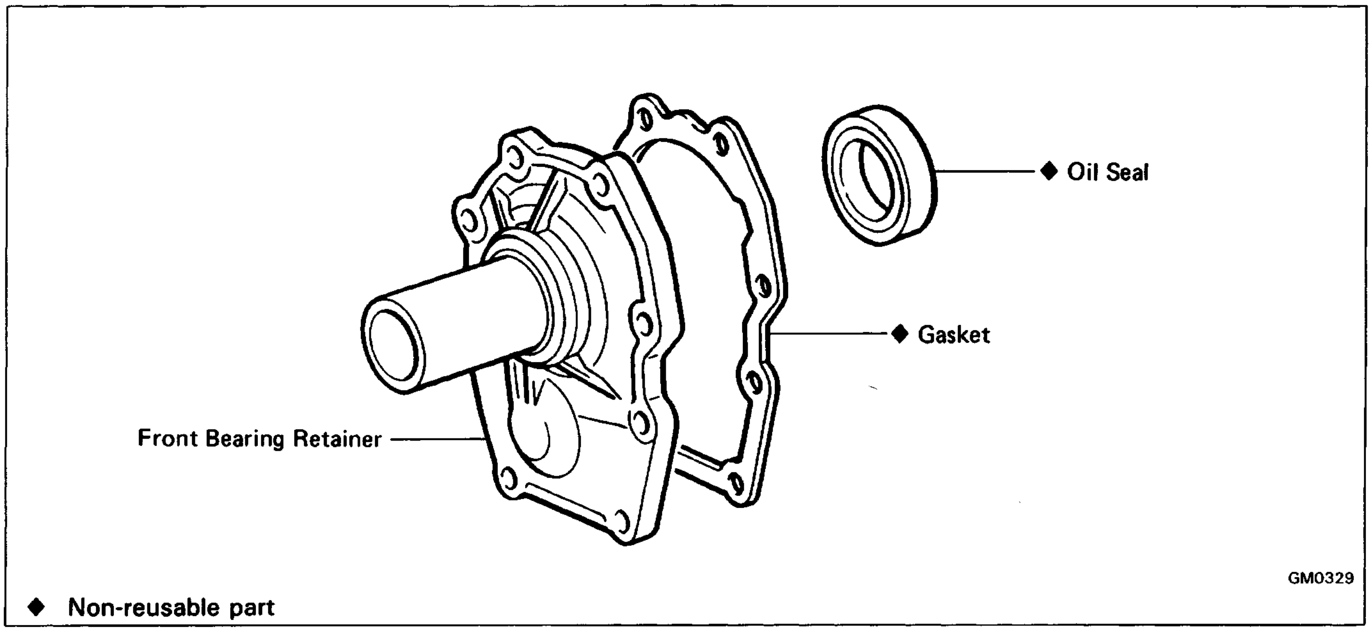
(a) Install the reverse restrict pin to the extension hous– ing or transfer adaptor.
(b) Using a pin punch and hammer, drive in the slotted spring pin as shown.

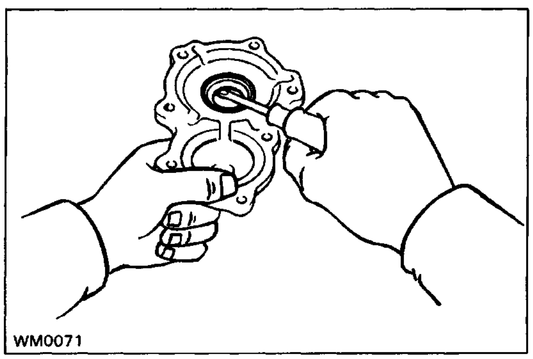

GM0364

(c) Apply liquid sealer to the plug threads.
Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent
(d) Using a torx socket wrench, install and torque the screw plug.
(Torx socket wrench T40 09042–00020)
Torque: 19 N – m (190 kgf –cm, 14 ft – lbf)

Front Bearing Retainer

COMPONENTS

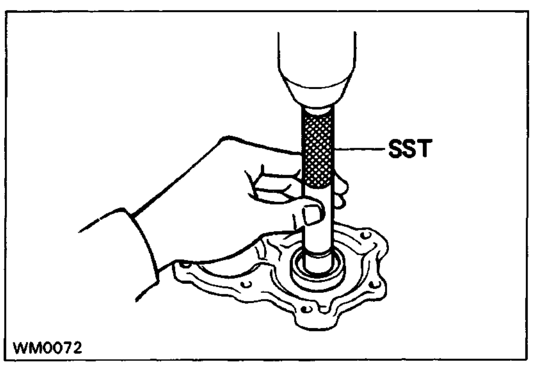




REPLACEMENT OF OIL SEAL

IF NECESSARY, REPLACE FRONT BEARING RETAINER OIL SEAL

(a) Using a screwdriver, pry out the oil seal.



(b) Using SST and a press, install a new oil seal.

SST 09223–50010

Oil seal depth: 12.2 – 13.2 mm (0.480 – 0.520 in.)

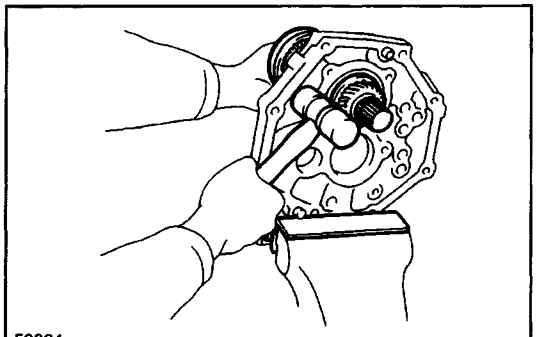
Transmission case installation surface

(c) Coat the lip of the oil seal with MP grease.

ASSEMBLY OF TRANSMISSION

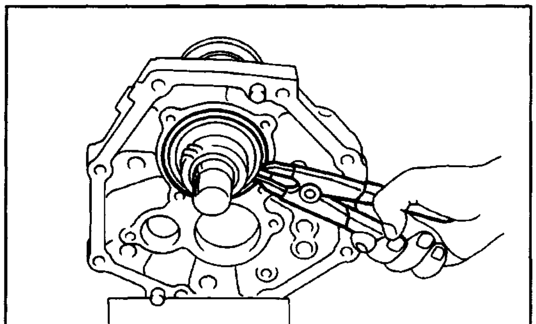
(See pages MT1–26 to 28)

HINT: Coat all of the sliding and rotating surface with gear oil before assembly.


E9384

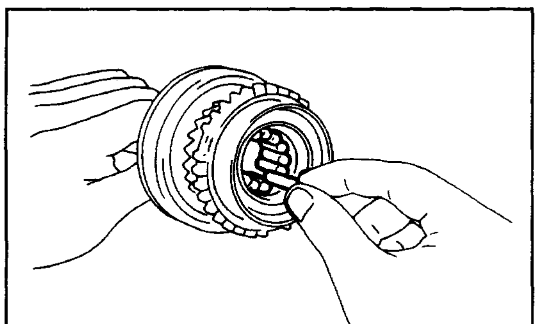
1. INSTALL OUTPUT SHAFT TO INTERMEDIATE PLATE

(a) Install the output shaft into the intermediate plate by pushing on the output shaft and tapping on the in–termediate plate.


E9285

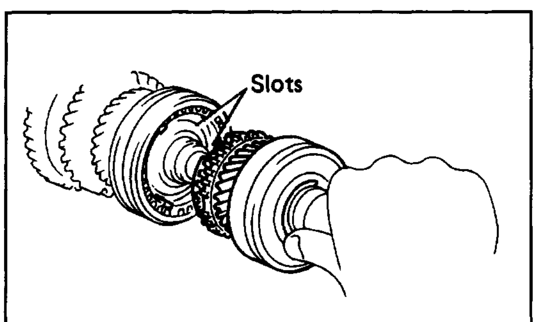
(b) Using a snap ring expander, install the output shaft center bearing snap ring.

HINT: Be sure the snap ring is flush with the intermedi–ate plate surface.


GM0072

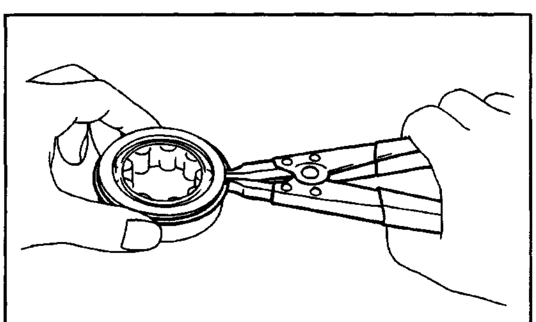
2. INSTALL INPUT SHAFT TO OUTPUT SHAFT

(a) Apply MP grease to the 13–needle roller bearing and install them into the input shaft.



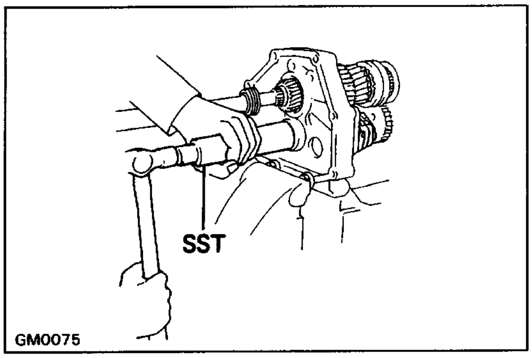
E9387

(b) Install the input shaft to the output shaft with the synchronizer ring slots aligned with the shifting keys.


D6665

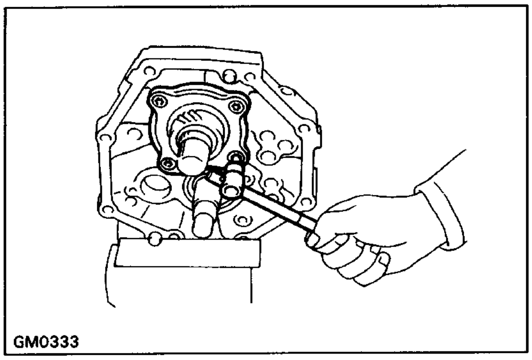
3. INSTALL COUNTER GEAR TO INTERMEDIATE PLATE

(a) Using a snap ring expander, install snap ring to counter gear rear bearing.



(b) Install the counter gear into the intermediate plate while holding the counter gear and install the counter break bearing with SST.

SST 09316–60010

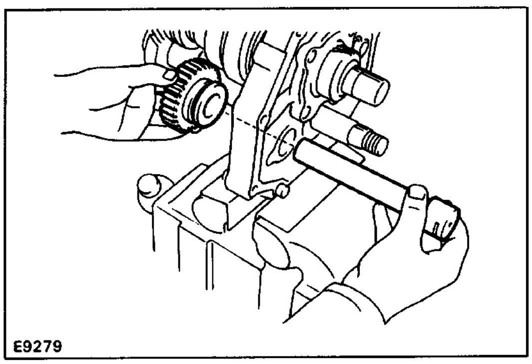


4. INSTALL REAR BEARING RETAINER

Using a torx socket wrench, install and torque the screws.

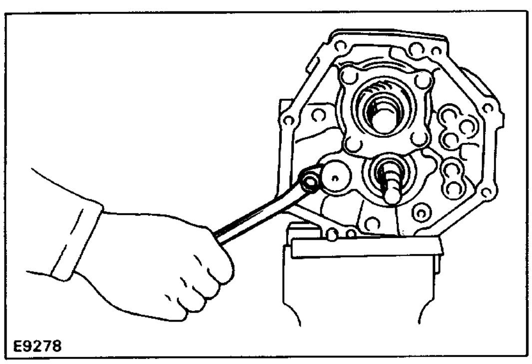
(Torx socket wrench T40 09042–00020)

Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)



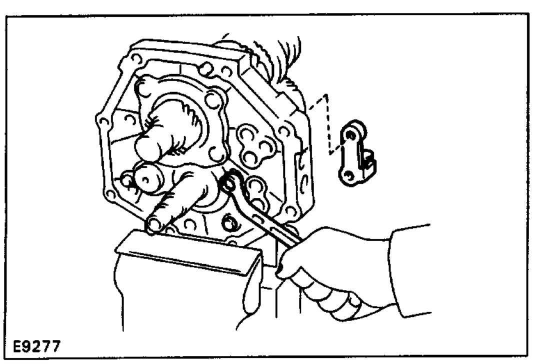
5. INSTALL REVERSE IDLER GEAR AND SHAFT

(a) Install reverse idler gear and shaft.



(b) Install the shaft stopper and torque the bolt.

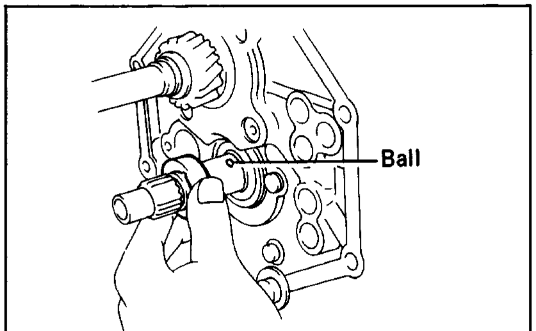
Torque: 17 N–m (175 kgf–cm, 13 ft–lbf)



6. INSTALL REVERSE SHIFT ARM BRACKET

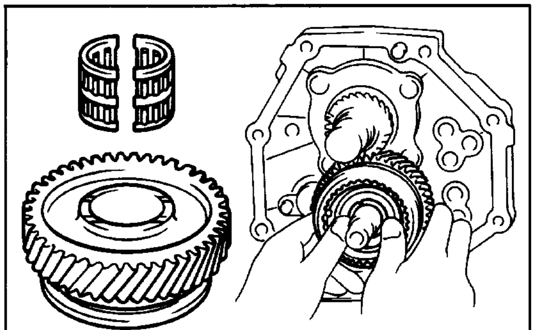
Install the reverse shift arm bracket and torque the two bolts.

Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)



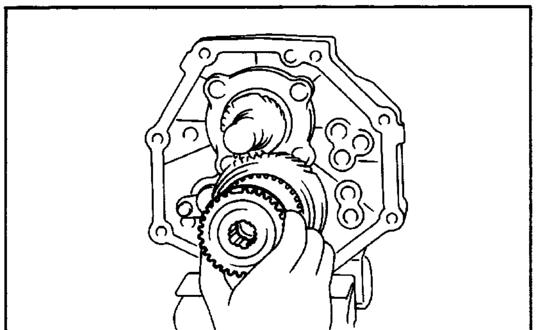
GM0239

7. INSTALL BALL AND SPACER


E9390 E9391

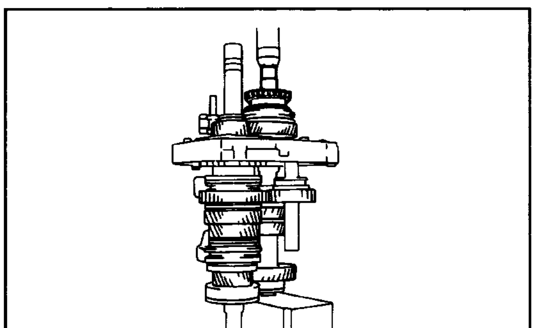
8. INSTALL COUNTER FIFTH GEAR WITH HUB SLEEVE NO.3 ASSEMBLY AND NEEDLE ROLLER BEARINGS

(a) Apply gear oil to the needle roller bearings.
(b) Install the counter 5th gear with hub sleeve No.3 and needle roller bearings.

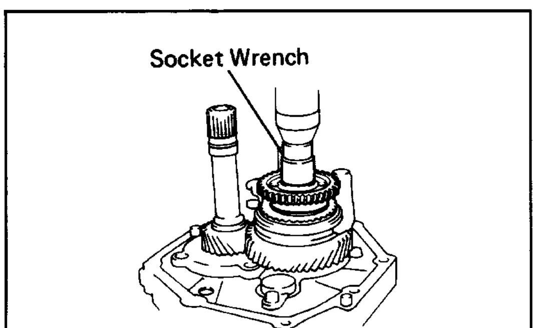

E9392

9. INSTALL SYNCHRONIZER RING AND GEAR SPLINE PIECE NO.5

(a) Install the synchronizer ring on gear spline piece No. 5.

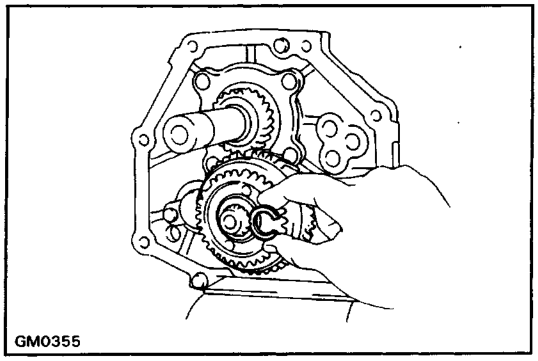

GM0353

(b) Dismount the intermediate plate from the vise.
(c) Stand the transmission as shown.



GM0354

(d) Using a press and 22 mm socket wrench, install gear spline piece No.5 with the synchronizer ring slots aligned with the shifting keys.
(e) Mount the intermediate plate to the vise.

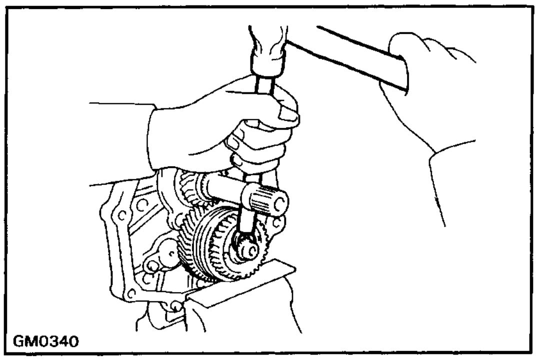


GM0355

10. INSTALL SNAP RING

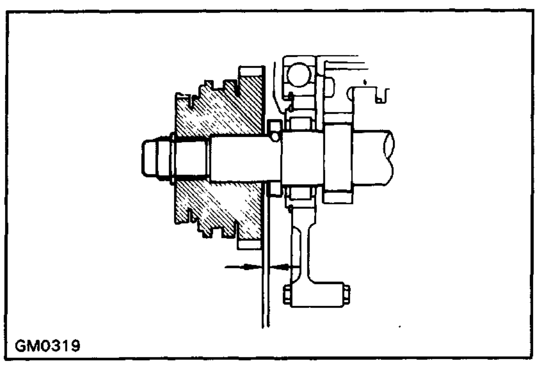
(a) Select snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
A	2.80 – 2.85 (0.110 – 0.112)
B	2.85 – 2.90 (0.112 – 0.114)
C	2.90 – 2.95 (0.114 – 0.116)
D	2.95 – 3.00 (0.116 – 0.118)
E	3.00 – 3.05 (0.118 – 0.120)
F	3.05 – 3.10 (0.120 – 0.122)
G	3.10 – 3.15 (0.122 – 0.124)



GM0340

(b) Using a brass bar and hammer, install the snap ring.



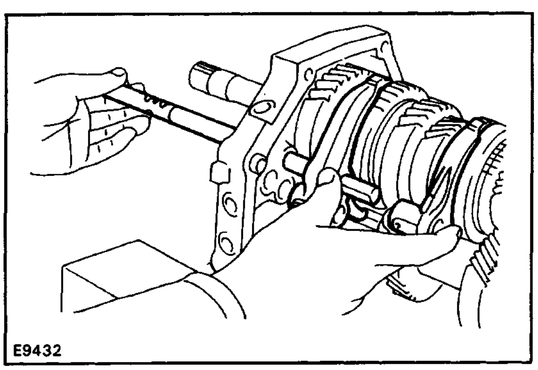
GM0319

11. MEASURE COUNTER FIFTH GEAR THRUST CLEARANCE

Using a feeler gauge, measure the counter 5th gear thrust clearance.

Standard clearance: 0.10 – 0.30 mm (0.0039 – 0.0118 in.)

Maximum clearance: 0.30 mm (0.0118 in.)

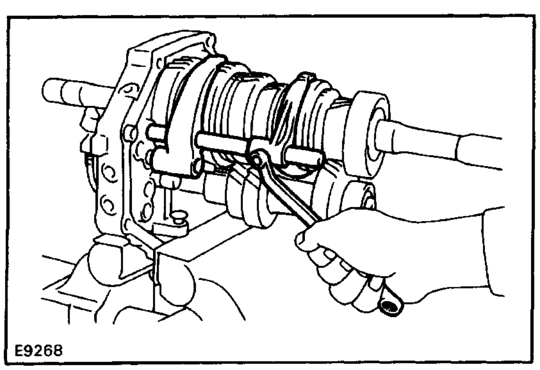


E9432

12. INSTALL SHIFT FORK SHAFT NO.2 AND SHIFT FORK NO.2

(a) Install the shift fork No. 1 and No. 2.

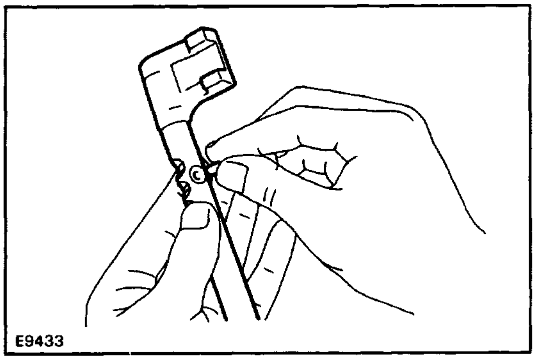
(b) Install the shift fork shaft No.2 through the interme–diate plate and shift forks.



E9268

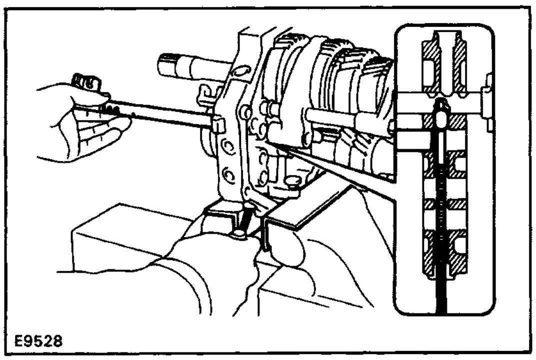
(c) Install the shift fork No.2 set bolt and torque the bolt.

Torque: 20 N–m (200 kgf –cm, 14 ft–lbf)



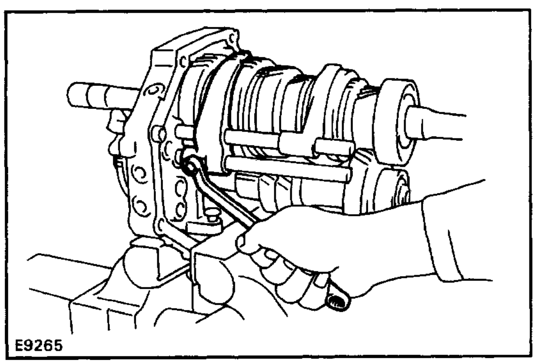
13. INSTALL SHIFT FORK SHAFT NO. 1 AND SHIFT FORK NO. 1

(a) Apply MP grease to the interlock pin No. 2 and install them into the shift fork shaft No. 1.



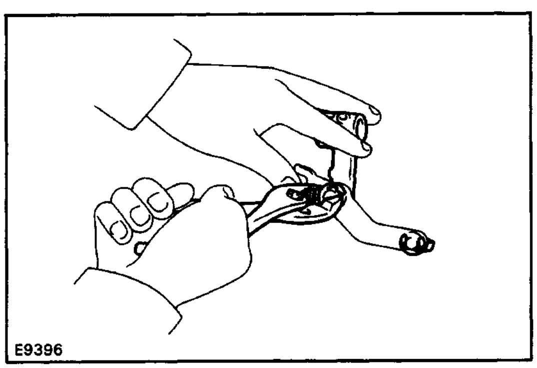
(b) Using a magnetic finger, install the interlock pin No–1 to intermediate plate.

(c) Install shift fork shaft No. 1 through the intermediate plate and shift fork No. 1.



(d) Install the shift fork No. 1 set bolt and torque the bolt.

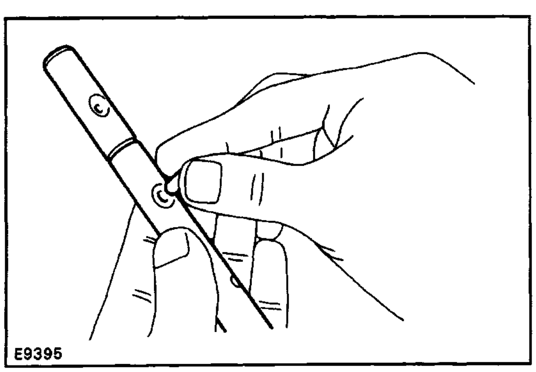
Torque: 20 N–m (200 kgf –cm, 14 ft–lbf)



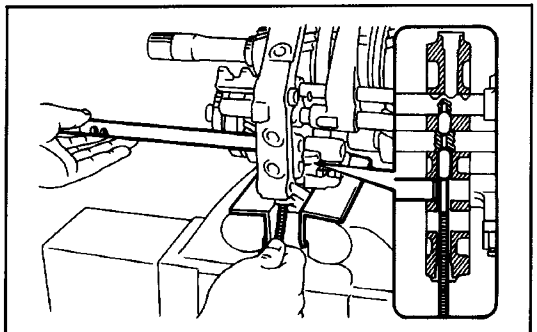
14. INSTALL SHIFT FORK SHAFT NO.3 AND REVERSE SHIFT FORK

(a) Install the shift arm shoe, shift fork and two E–rings to reverse shift arm.

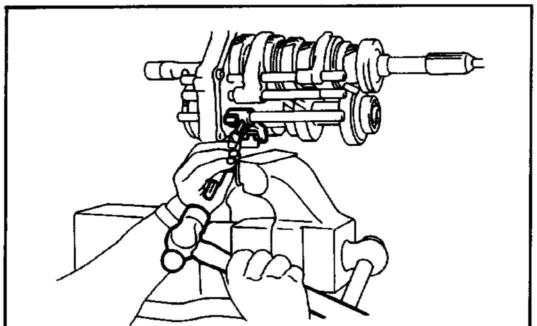
(b) Install the reverse shift arm to reverse shift arm bracket.



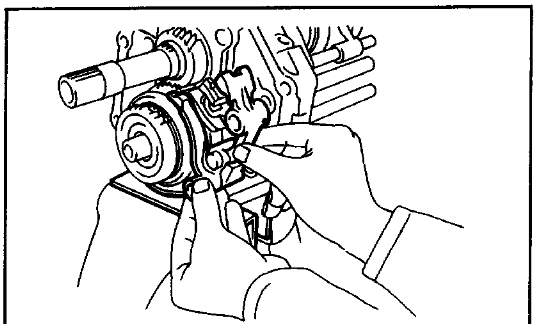
(c) Apply MP grease to the interlock pin No. 2 and install them into the shift fork shaft No.3.


E9529

(d) Using a magnetic finger, install the interlock pin No. 1 to the intermediate plate.
(e) Install the shift fork shaft No.3 through the interme–diate and reverse shift fork.

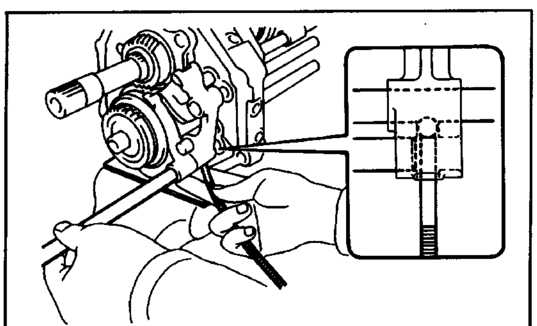

E9260

(f) Using a pin punch and hammer, drive in the slotted spring pin.

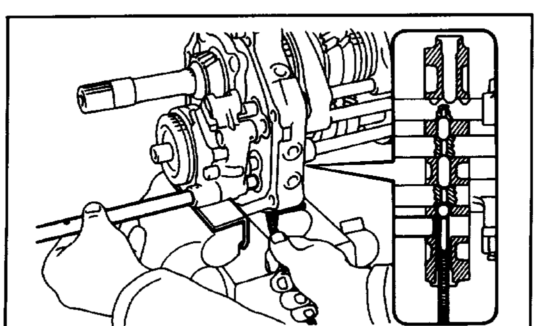

E9400

15. INSTALL REVERSE SHIFT HEAD, FIFTH SHIFT FORK, SHIFT FORK SHAFT NO.4 AND NO.5

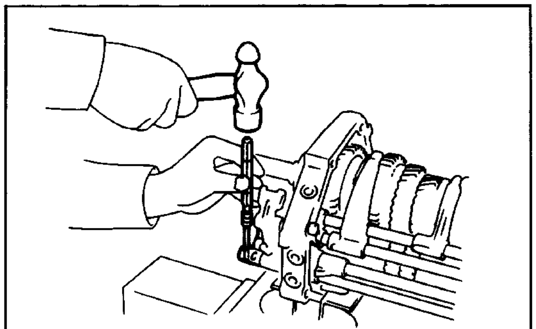
(a) Install the reverse shift head to shift fork shaft No.3.
(b) Install the shift fork No.3.


E9402

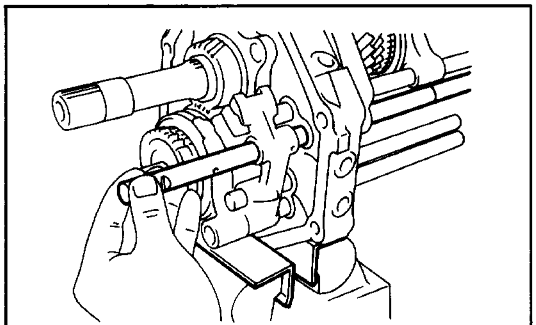
Using a magnetic finger, install the ball to reverse shift head.
(d) Install the shift fork shaft No.4 as shown.


E9403

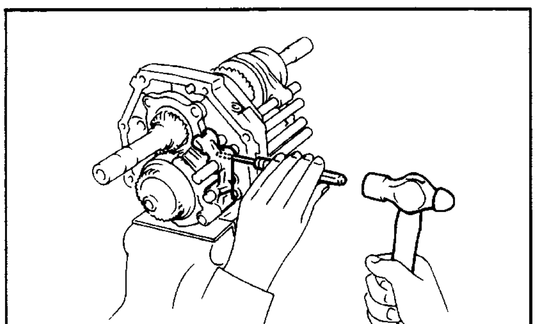
(e) Using a magnetic finger, install the interlock ball No.1 to intermediate plate.
(f) Install the shift fork shaft No.4 through the interme–diate plate.


E9256

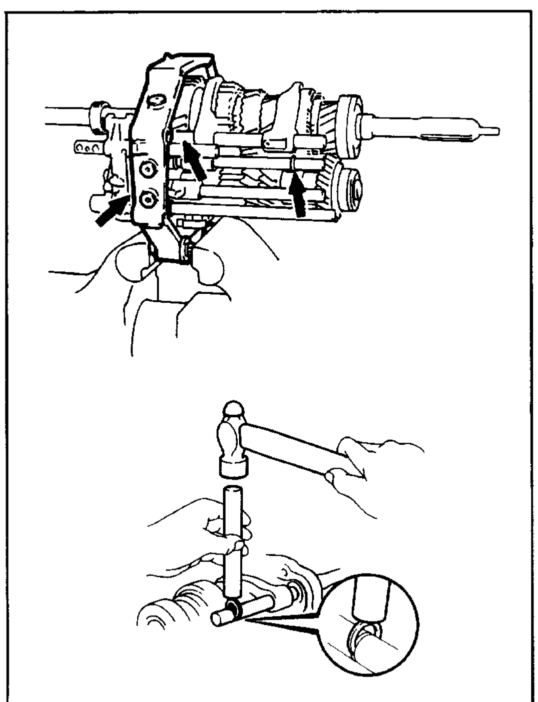
(g) Using a pin punch and hammer, drive in the slotted spring pin to the shift fork RIo.3.


E9438

(h) Install the shift fork shaft No.5 through the reverse shift head and intermediate plate.

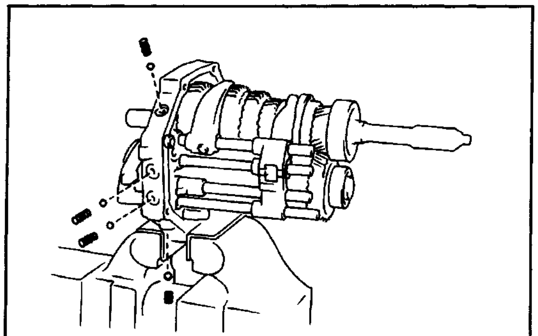

GM0332

(i) Using a pin punch and hammer, drive in the slotted spring pin to the reverse shift head.


GM0337 GM0357

16. INSTALL SHIFT FORK SHAFT SNAP RINGS

Using a brass bar and hammer tap in the three snap rings.

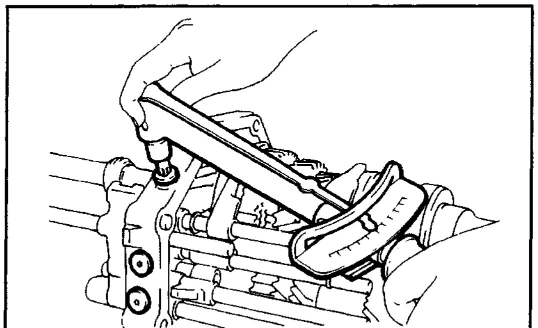


E9238

17. INSTALL LOCKING BALLS, SPRINGS AND SCREW PLUGS

(a) Install the four locking balls and four springs.

HINT: Install the short spring into the bottom of the intermediate plate.



GM0314

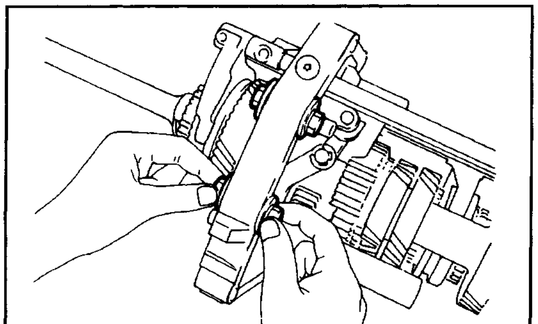
(b) Apply liquid sealer to the plug threads.

Sealant: Part No. 08833–00080, THREE BOND 1344 LOCTITE 242 or equivalent

(c) Install the screw plugs and torque the screw plugs with a torx socket wrench.

(Torx socket wrench T40 09042–00020)

Torque: 19 N – m (190 kgf – cm, 14 ft – lbf)

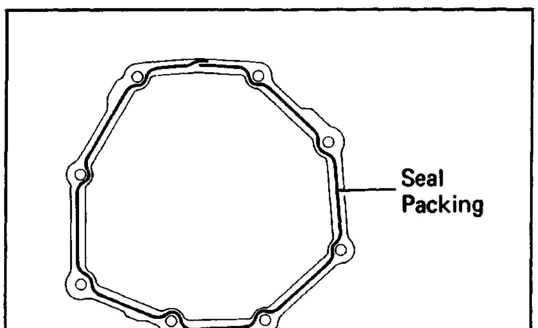


GM0318

18. DISMOUNT INTERMEDIATE PLATE FROM VISE

(a) Dismount the intermediate plate from the vise.

(b) Remove the bolts, nuts and plate washers.



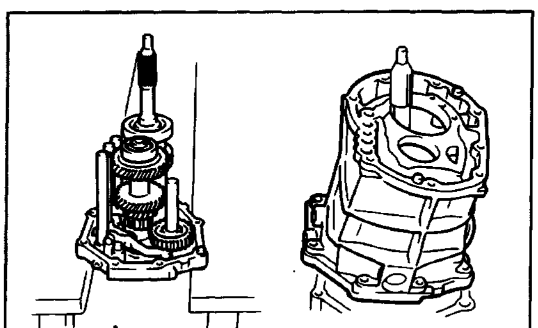
GM0349

19. INSTALL TRANSMISSION CASE

(a) Remove the any packing material and be careful not to drop oil on the contacting surfaces of the trans–mission case or intermediate plate.

(b) Apply seal packing to the transmission case as shown.

Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent

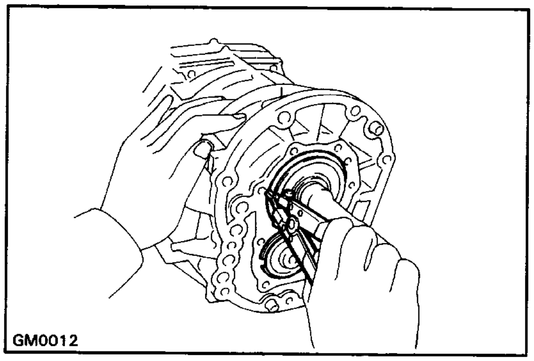


E9530 GM0387

HINT: Install the transmission case as soon as the seal packing is applied.

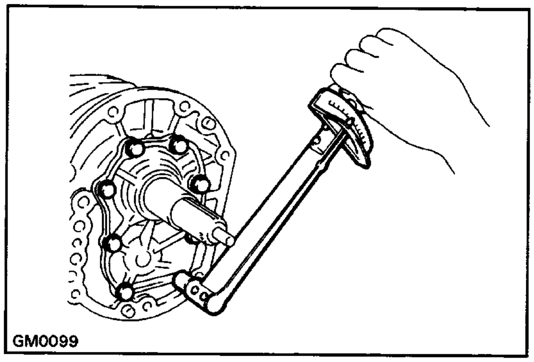
(c) Stand the intermediate plate as shown.

(d) Install the transmission case to the intermediate plate as shown.

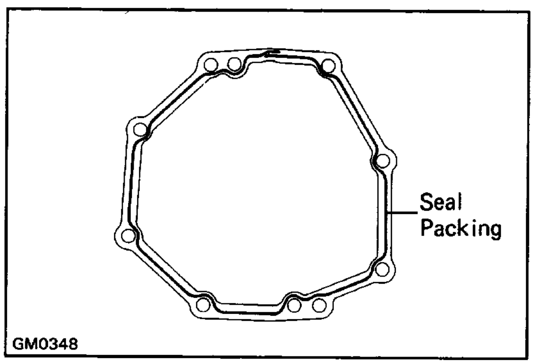


20. INSTALL FRONT BEARING RETAINER

(a) Using a snap ring expander, install the two snap rings to input shaft bearing and counter gear front bearing.



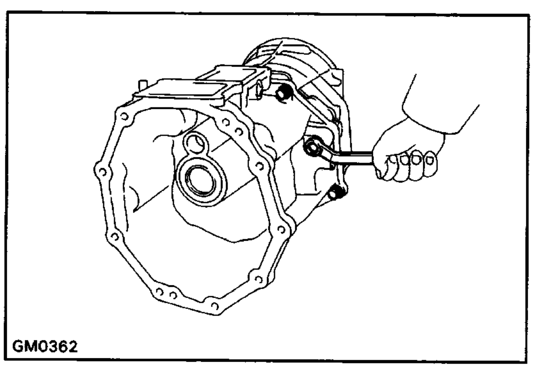
(b) Install the bearing retainer with a new gasket.
(c) Apply liquid sealer to the bolt threads.
Sealant: Part No. 08833–00080, THREE BOND 1344 LOCTITE 242 or equivalent
(d) Install and torque the bolts.
Torque: 17 N – m (170kgf – cm, 12ft – lbf)



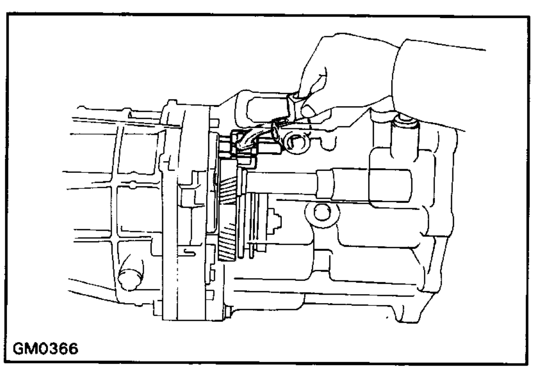
21. INSTALL TRANSFER ADAPTOR, SHIFT LEVER SHAFT AND SHIFT LEVER HOUSING

(a) Remove the any packing material and be careful not to drop oil on the contacting surfaces of the transfer adaptor or intermediate plate.
(b) Apply seal packing to the transfer adaptor as shown.
Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent

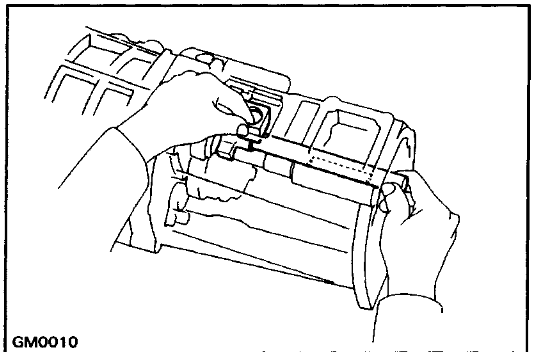
HINT: Install the transfer adaptor as soon as the seal packing is applied.



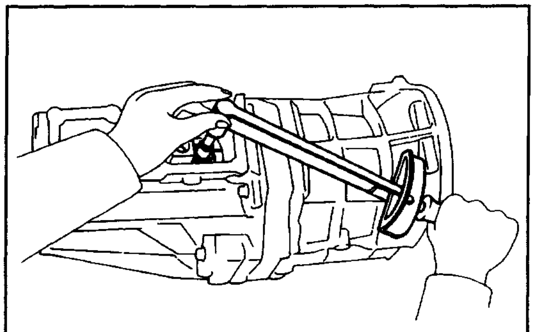
(c) Install and torque the transfer adaptor with the eight bolts.
Torque: 37 N–m (380 kgf–cm, 27 ft–lbf)



(d) Install the shift lever housing to the transfer adaptor and connect the fork shafts.

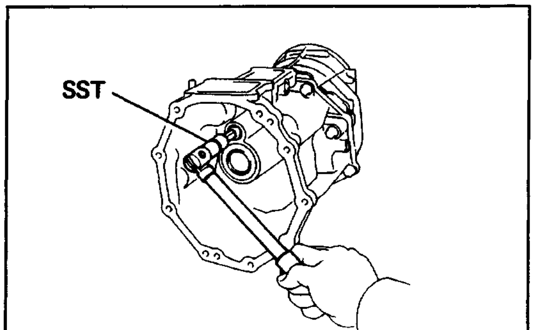

GM0010

(e) Install the shift lever shaft to the transfer adaptor and shift lever housing.


GM0106

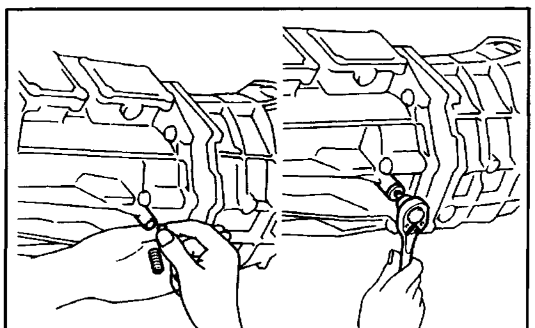
(f) Install and torque the shift lever housing bolt.

Torque: 38 N–m (390 kgf–cm, 28 ft–lbf)



GM0365

(g) Using SST, install and torque the plug.
SST 09923–00010
Torque: 37 N–m (380 kgf–cm, 27 ft–lbf)


GM0110 GM0004

22. INSTALL LOCKING BALL, SPRING AND SCREW PLUG

(a) Apply liquid sealer to the plug threads.
Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

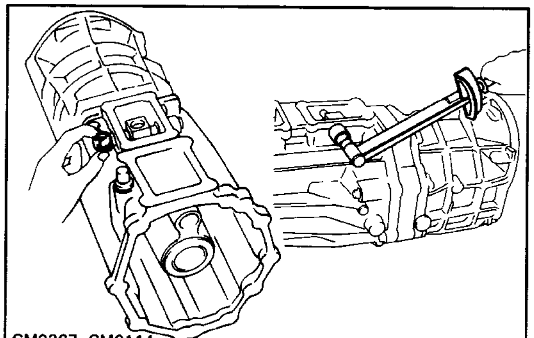
(b) Install the locking ball, spring and plug, and torque the plug.
(Torx socket wrench T40 09042–00020)

Torque: 19 N – m (190 kgf – cm, 14 ft – lbf)

23. AFTER INSTALLING TRANSFER ADAPTOR CHECK FOLLOWING ITEMS

(a) Check to see that the input and output shafts rotate smoothly.

(b) Check to see that shifting can be made smoothly to all positions.

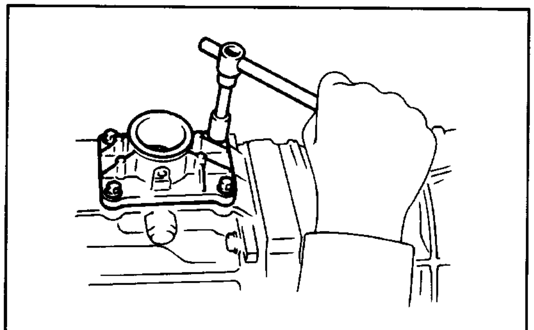

GM0367 GM0114

24. INSTALL RESTRICT PINS

(a) Install the black pin on the reverse gear/5th gear side.

(b) Install another pin and torque the pins.

Torque: 27 N–m (280 kgf–cm, 20 ft–lbf)

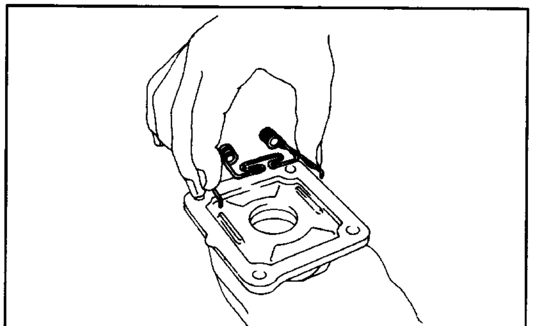

E9226

25. INSTALL TRANSMISSION SHIFT LEVER CONTROL RETAINER

(a) Install shift lever control retainer and new gasket.

(b) Install four bolts and torque the bolts.

Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)


TF0449

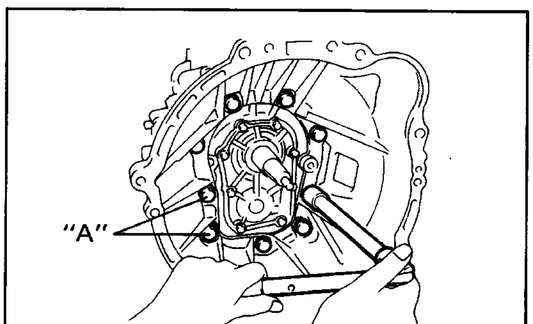
26. INSTALL TRANSFER SHIFT LEVER CONTROL RETAINER

(a) Install the select return spring from the retainer.

(b) Install shift lever control retainer and new gasket.

(c) Install four bolts and torque the bolts.

Torque: 18 N–m (185 kgf –cm, 13 ft–lbf)



GM0001

27. INSTALL CLUTCH HOUSING

(a) Install clutch housing.

(b) Apply liquid sealer to the "A" bolt threads.

Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent.

(c) Install nine bolts and torque the bolts.

Torque: 37 N – m (380 kgf – cm, 27 ft – lbf)

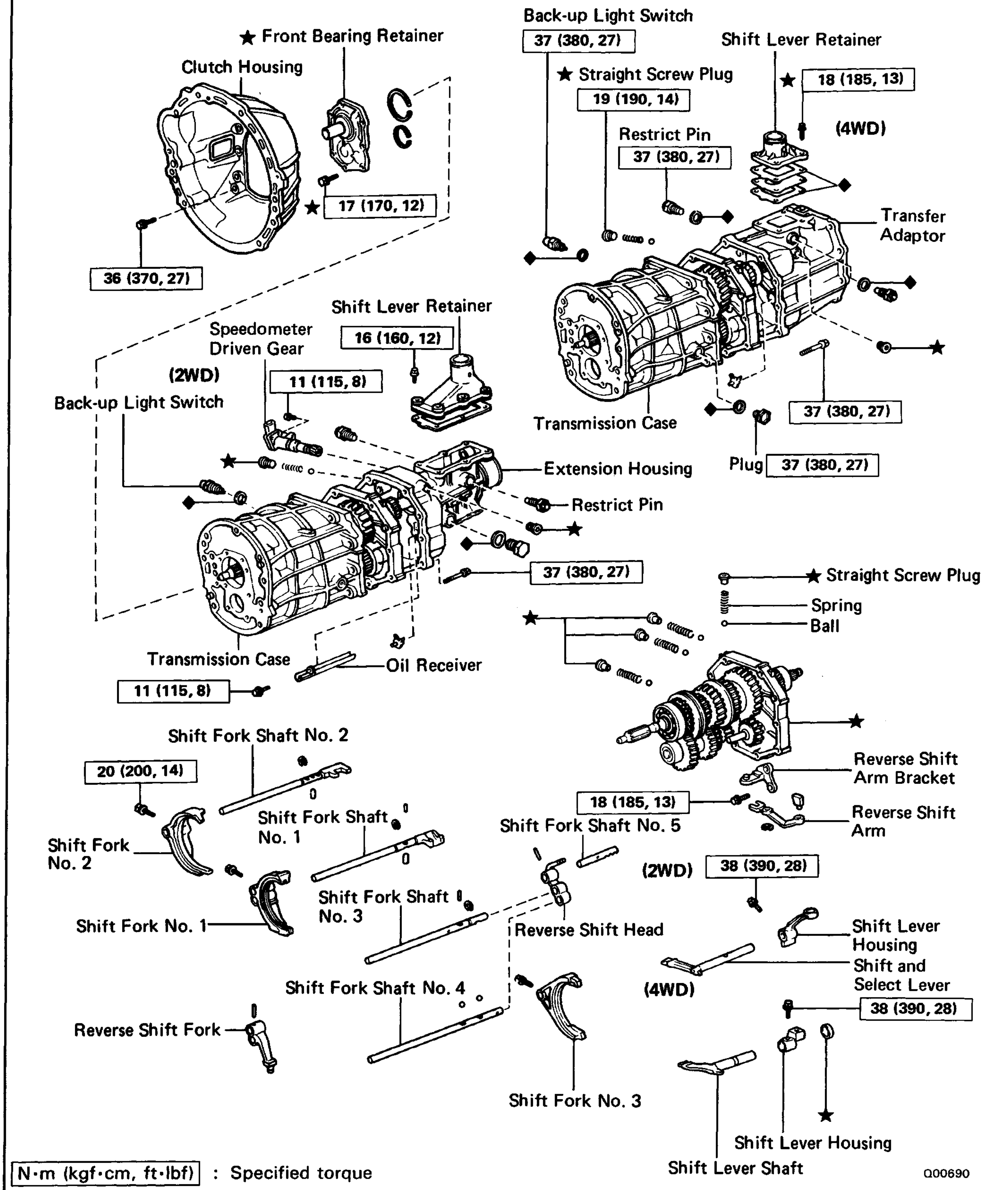
28. INSTALL BACK–UP LIGHT SWITCH

Torque: 37 N – m (380 kgf – cm, 27 ft–lbf)

29. INSTALL RELEASE FORK AND BEARING

(See page CL–14)

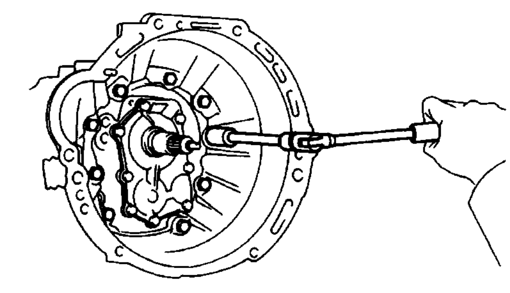
DISASSEMBLY OF TRANSMISSION (R150 AND R 150F TRANSMISSIONS)
Components



N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
★ Precoated part

Disassembly of Transmission

(See pages MT1–67, 68)


RM0051

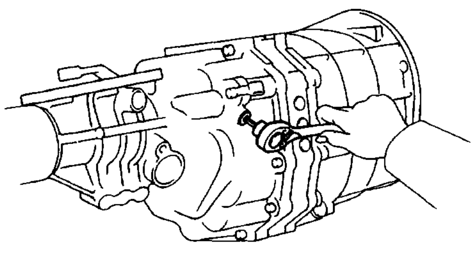
1. REMOVE RELEASE FORK AND BEARING

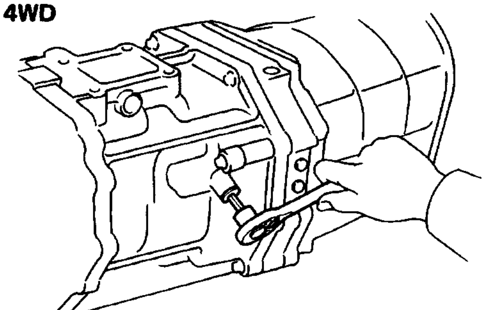
2. REMOVE BACK–UP LIGHT SWITCH, SPEEDOMETER DRIVEN GEAR (2WD). SHIFT LEVER RETAINER AND RESTRICT PINS

3. REMOVE CLUTCH HOUSING FROM TRANSMISSION CASE

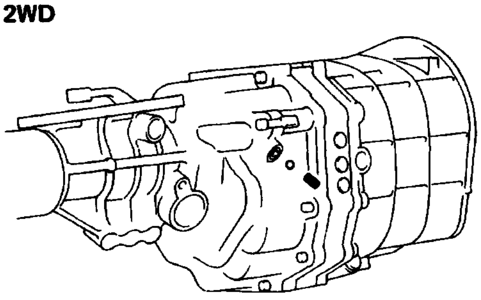
4. REMOVE STRAIGHT SCREW PLUG, SPRING AND BALL

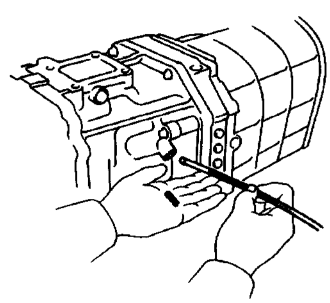
(a) Using a torx socket wrench, remove the screw plug from the extension housing or transfer adaptor.
(Torx socket wrench T40 09042–00020)

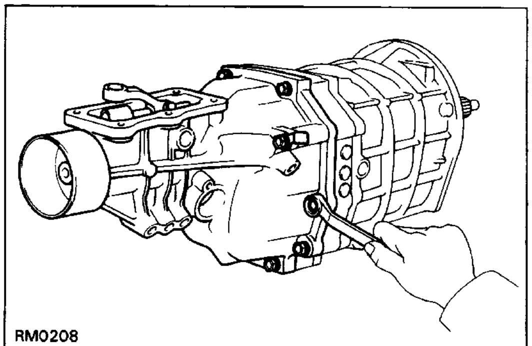
2WD

RM0166

4WD

RM0307

(b) Using a magnetic finger, remove the spring and ball.

2WD

RM0167

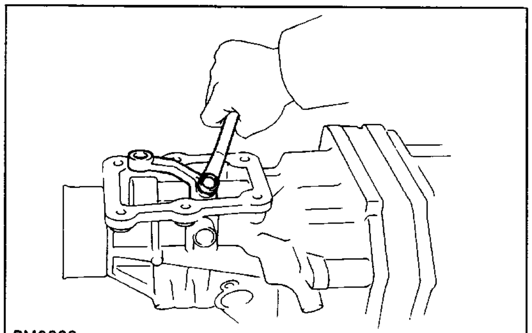
4WD

RM0308



RM0208

5.–1 (2WD)
REMOVE EXTENSION HOUSING

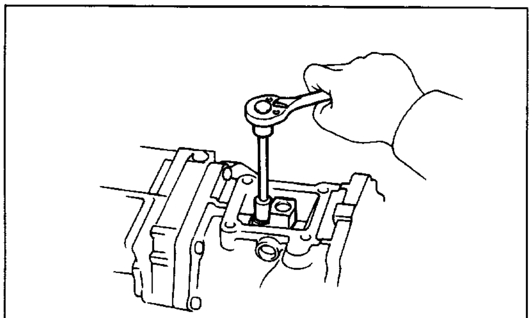
(a) Remove the ten bolts.



RM0209

(b) Remove the shift lever housing set bolt.

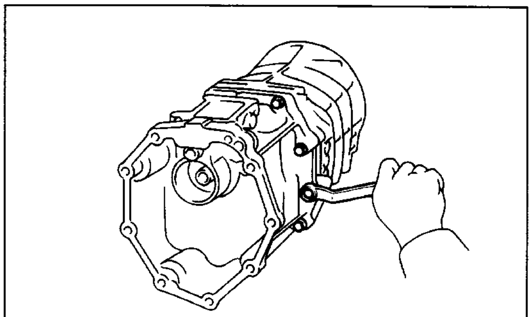
(c) Using a plastic hammer, tap the extension housing and remove the shift lever housing and shift and select lever.



RM0309

5.–2 (4WD)
REMOVE TRANSFER ADAPTOR

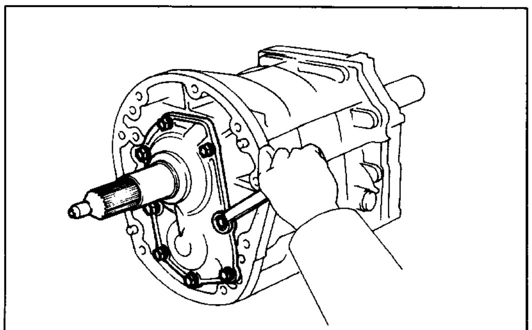
(a) Remove the shift lever housing set bolt.



RM0310

(b) Remove the ten bolts.

(c) Using a plastic hammer, tap the transfer adaptor and remove the shift lever housing and shift and select lever.

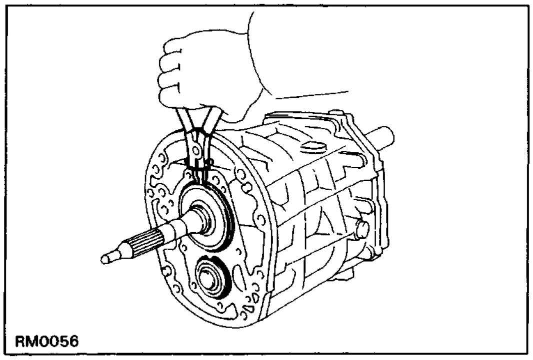


RM0039

6. REMOVE FRONT BEARING RETAINER

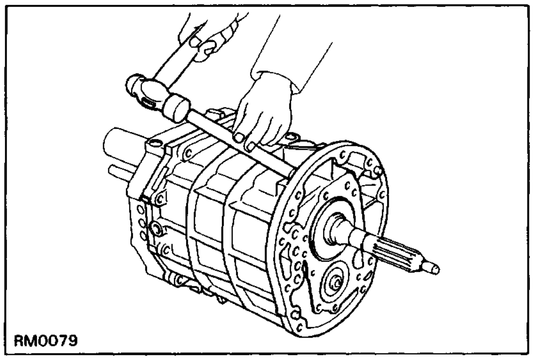
(a) Remove the eight bolts.

(b) Using a plastic hammer, tap the front bearing re–tainer.


RM0056

7. REMOVE BEARING SNAP RINGS

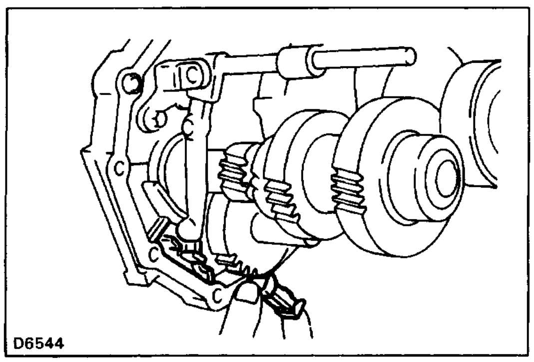
Using a snap ring expander, remove the two snap rings.


RM0079

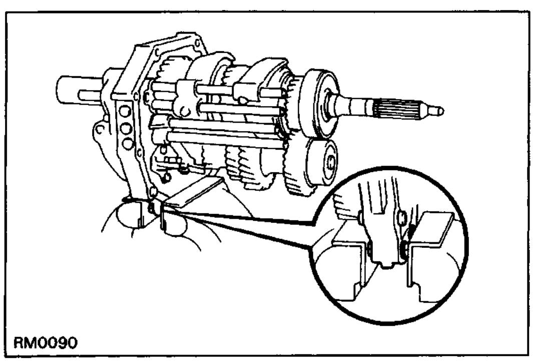
8. SEPARATE INTERMEDIATE PLATE FROM TRANSMIS–SION CASE

(a) Using a brass bar and hammer, carefully tap off the transmission case.

(b) Remove the transmission case from the intermedi–ate plate.


D6544

9. REMOVE MAGNET FROM INTERMEDIATE PLATE

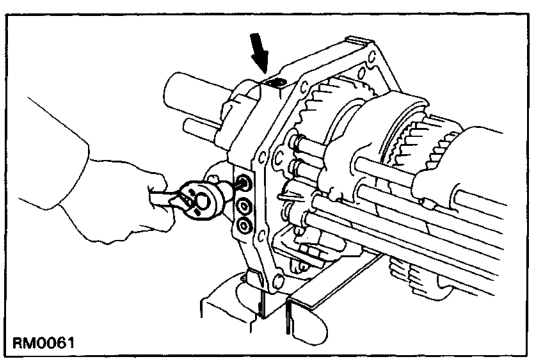

RM0090

10. MOUNT INTERMEDIATE PLATE IN VISE

(a) Use two clutch housing bolts, plate washers and suitable nuts as shown.

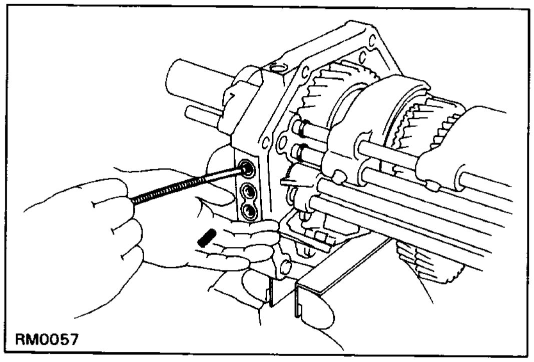
NOTICE: Install the plate washers in reverse of normal. Increase or decrease plate washers so that the bolt tip and front tip surface of the nut are aligned.

(b) Mount the intermediate plate in a vise.

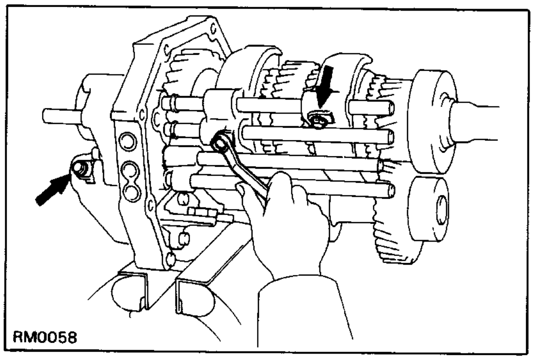

RM0061

11. REMOVE STRAIGHT SCREW PLUGS, LOCKING BALLS AND SPRINGS

(a) Using a torx socket wrench, remove the four plugs.
(Torx socket wrench T40 09042–00020)

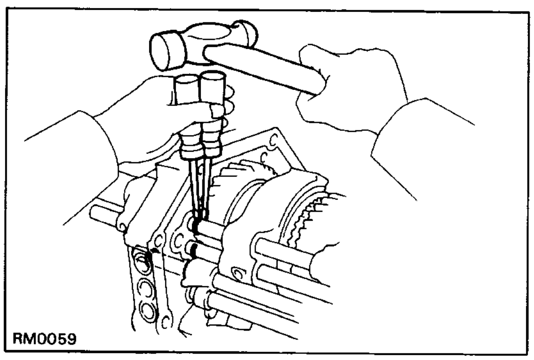


(b) Using a magnetic finger, remove the four springs and balls.



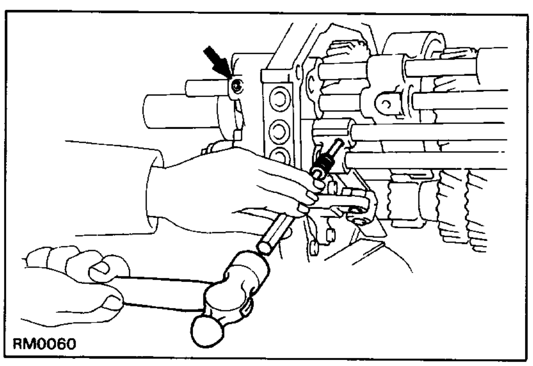
12. REMOVE SHIFT FORK SET BOLTS

Remove the three bolts.



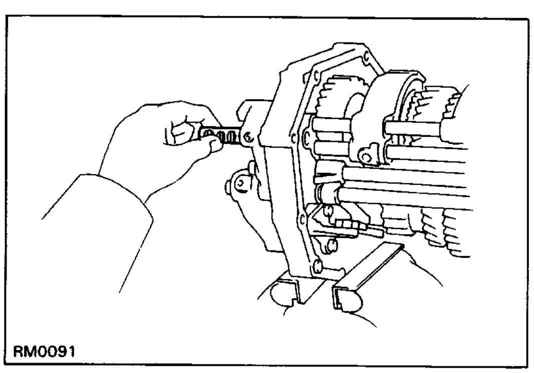
13. REMOVE SNAP RINGS

Using two screwdrivers and a hammer, tap out the three snap rings.



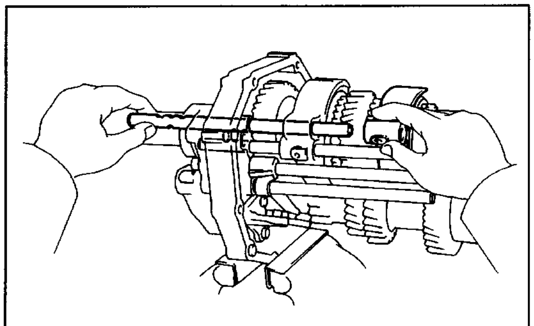
14. REMOVE SLOTTED SPRING PINS

Using a pin punch and hammer, drive out the two pins.



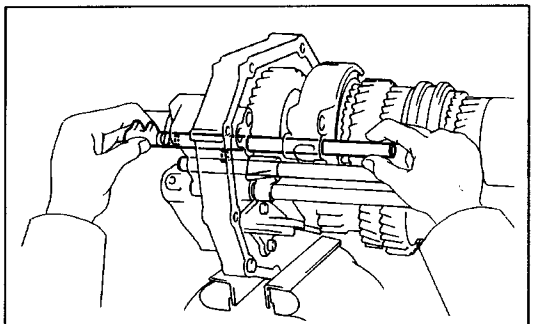
15. REMOVE SHIFT FORK SHAFT NO.5

Pull out the shift fork shaft No.5 from the intermediate plate.


RM0092

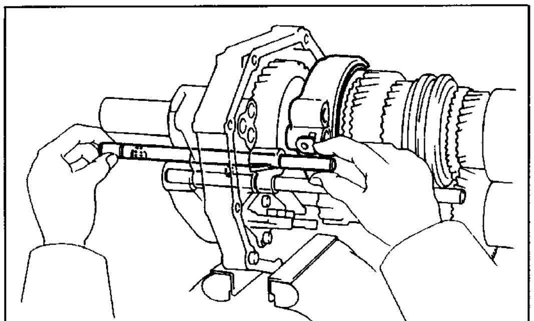
16. REMOVE SHIFT FORK SHAFT NO.2 AND SHIFT FORK

(a) Pull out the shift fork shaft No. 2 from the intermediate plate.
(b) Remove the shift fork No.2.
(c) Using a magnetic finger, remove the interlock pin from the intermediate plate.


RM0093

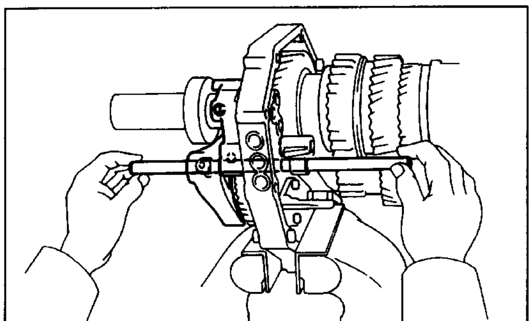
17. REMOVE SHIFT FORK SHAFT NO. 1

(a) Pull out the shift fork shaft No. 1 from the intermediate plate.
(b) Using a magnetic finger, remove the interlock pins from the shaft hole and intermediate plate.


RM0094

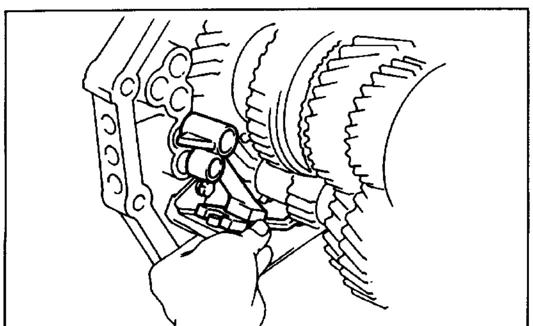
18. REMOVE SHIFT FORK SHAFT NO.3 AND SHIFT FORK NO. 1

(a) Pull out the shift fork shaft No.3 from the intermediate plate.
(b) Remove the shift fork No. 1.
(c) Using a magnetic finger, remove the interlock pin and locking ball from the shaft hole and intermediate plate.

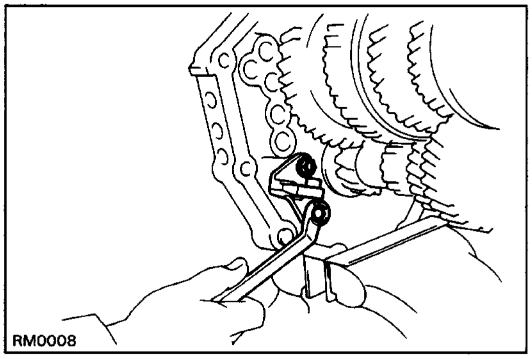

RM0080

19. REMOVE SHIFT FORK SHAFT NO.4, SHIFT FORK NO.3 AND REVERSE SHIFT HEAD

(a) Pull out the shift fork shaft No.4 from the intermediate plate.
(b) Remove the reverse shift head and locking ball.
(c) Remove the shift fork No.3.

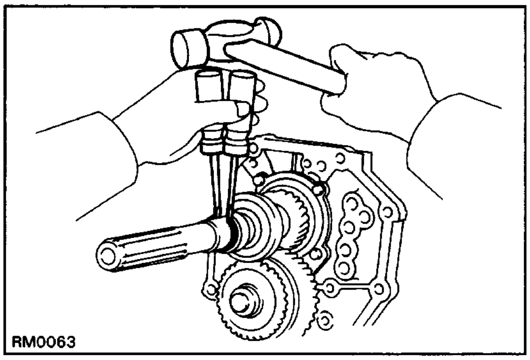

RM0033

20. REMOVE REVERSE SHIFT ARM FROM REVERSE SHIFT ARM BRACKET



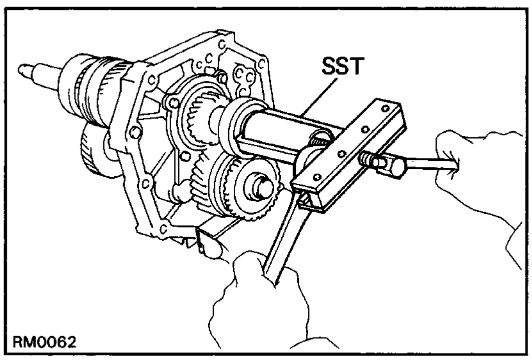
21. REMOVE REVERSE SHIFT ARM BRACKET

Remove the two bolts and the reverse shift arm bracket.



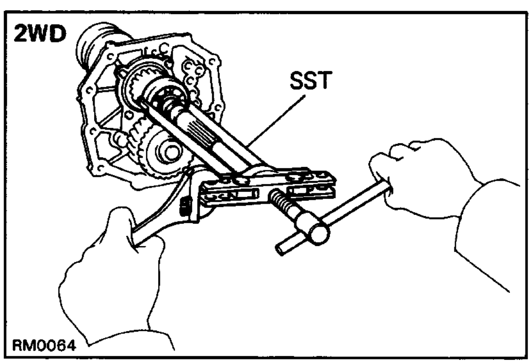
22.–1 (2WD)
REMOVE SPEEDOMETER DRIVE GEAR

(a) Using two screwdrivers and a hammer, tap out the rear snap ring.
(b) Remove the speedometer drive gear and ball.
(c) Using two screwdrivers and a hammer, tap out the front snap ring.



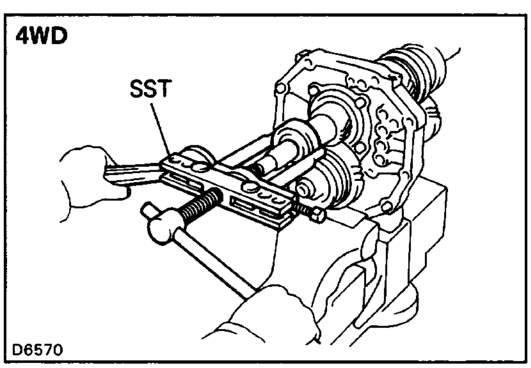
22.–2 (4WD)
REMOVE SLEEVE FROM OUTPUT SHAFT

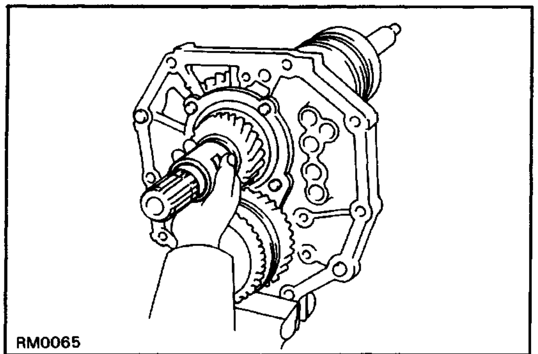
Using SST, remove the sleeve from the output shaft.
SST 09213–36020



23. REMOVE OUTPUT SHAFT REAR BEARING

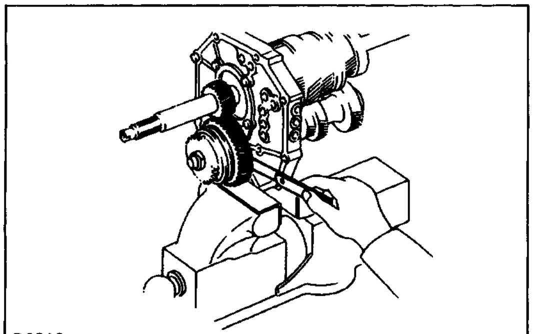
(a) Using two screwdrivers and a hammer, tap out the snap ring.
(b) Using SST, remove the rear bearing.
SST 09950–20017





RM0065

24. REMOVE SPACER



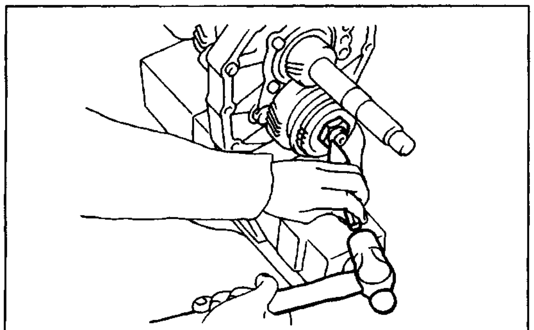
D6810

25. MEASURE COUNTER FIFTH GEAR THRUST CLEARANCE

Using a feeler gauge, measure the counter 5th gear thrust clearance.

Standard clearance: 0.10 – 0.35 mm
(0.0039 – 0.0138 in.)

Maximum clearance: 0.40 mm (0.0157 in.)

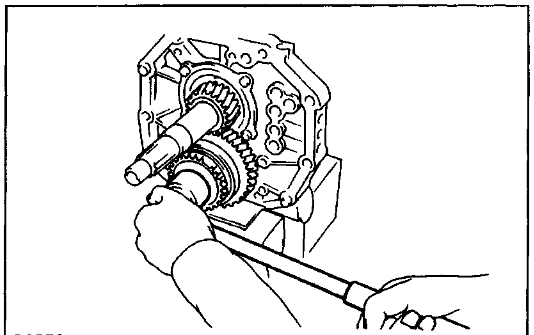


D6575

26. REMOVE GEAR SPLINE PIECE NO.5, SYNCHRONIZER RING, NEEDLE ROLLER BEARING AND COUNTER FIFTH GEAR WITH HUB SLEEVE NO.3

(a) Engage the gear double meshing.

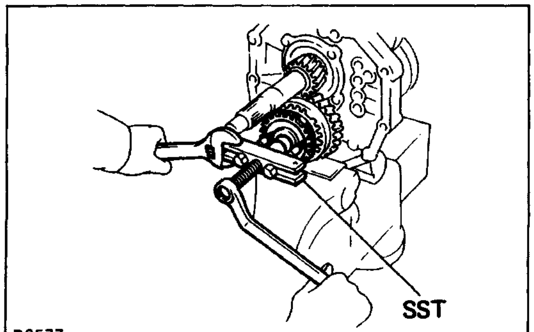
(b) Using a hammer and chisel, loosen the staked part of the nut.



D6576

(c) Remove the lock nut.

(d) Disengage the gear double meshing.



D6577

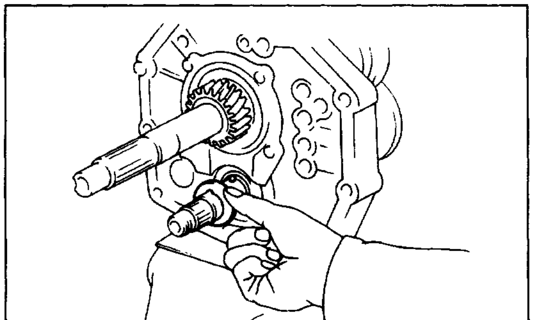
(e) Using SST, remove the gear spline piece No. 5.

SST 09213–31021

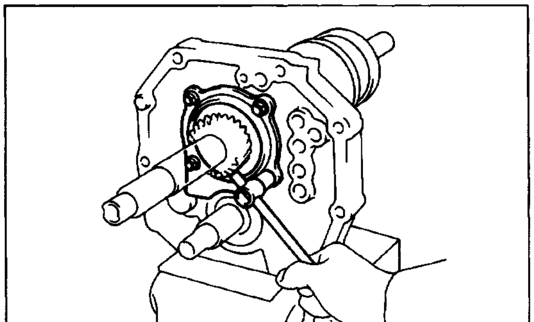
(f) Remove the counter 5th gear with hub sleeve No–3.

27. REMOVE THE SHIFTING KEYS AND SPRINGS FROM FIFTH GEAR AND HUB SLEEVE NO.3

Using a screwdriver, remove the three shifting keys and two rings.sp

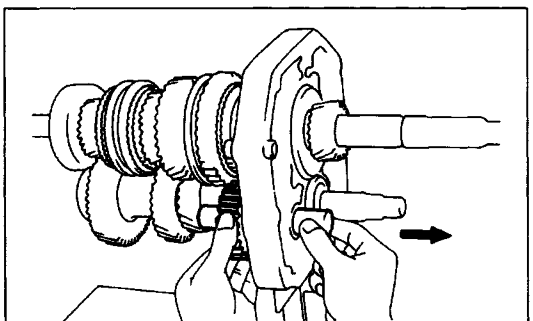

D6579

28. REMOVE THRUST WASHER AND BALL


D6581

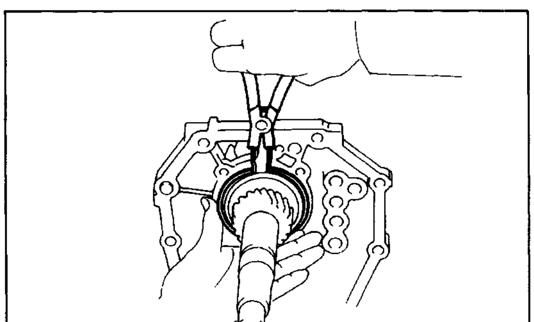
29. REMOVE REAR BEARING RETAINER

Remove the four bolts and rear bearing retainer.


D6852

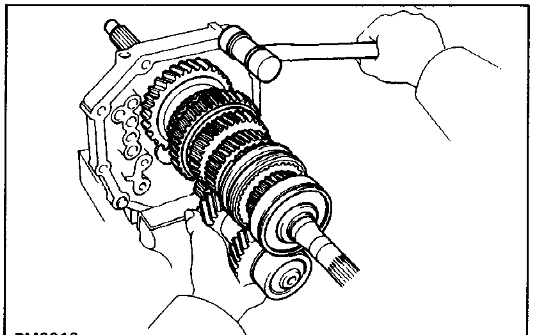
30. REMOVE REVERSE IDLER GEAR AND SHAFT

Pull out the shaft toward the rear.


RM0009

31. REMOVE BEARING SNAP RING

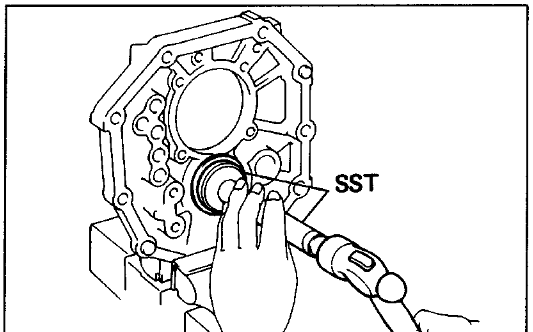
Using a snap ring expander, remove the snap ring.


RM0010

32. REMOVE OUTPUT SHAFT, COUNTER GEAR AND INPUT SHAFT AS A UNIT FROM INTERMEDIATE PLATE

(a) Remove the output shaft, counter gear and input shaft as a unit from the intermediate plate by pulling on the counter gear and tapping on the intermediate plate with a plastic hammer.

(b) Remove the input shaft with the needle roller bear–ing from the output shaft.

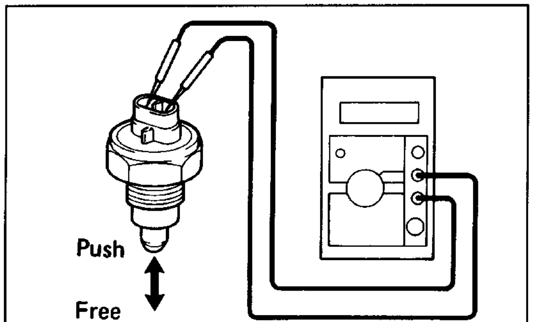


RM0011

33. REMOVE COUNTER REAR BEARING FROM INTERMEDIATE PLATE

Using SST and a hammer, remove the counter rear bear–ing.

SST 09608–12010 (09608–00020, 09608–00050)



K3470

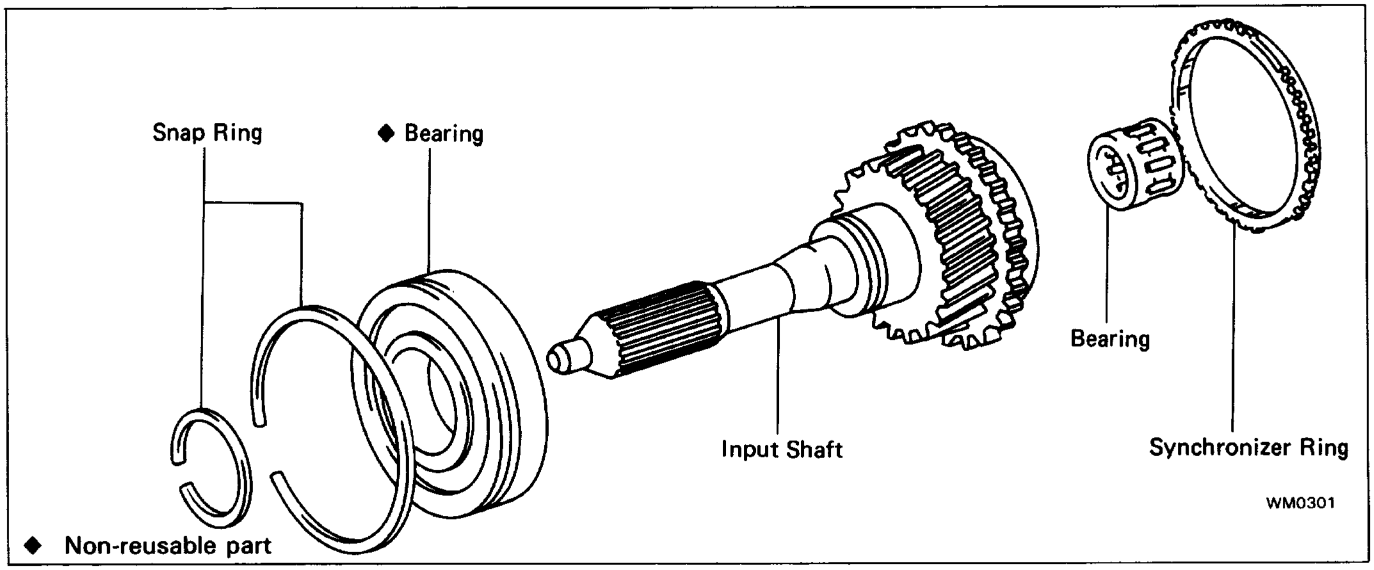
34. INSPECT BACK–UP LIGHT SWITCH

Check that there is continuity between terminals.

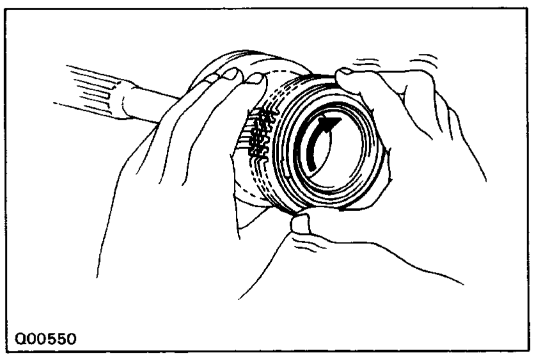
Switch Position	Specified
Push	Continuity
Free	No Continuity

If operation is not as specified replace switch.

COMPONENT PARTS
Input Shaft Assembly
COMPONENTS

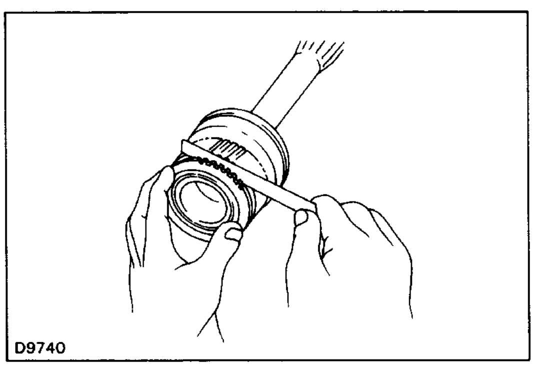


INSPECTION OF INPUT SHAFT



INSPECT SYNCHRONIZER RING

(a) Turn the ring and push it in to check the breaking ac–tion.



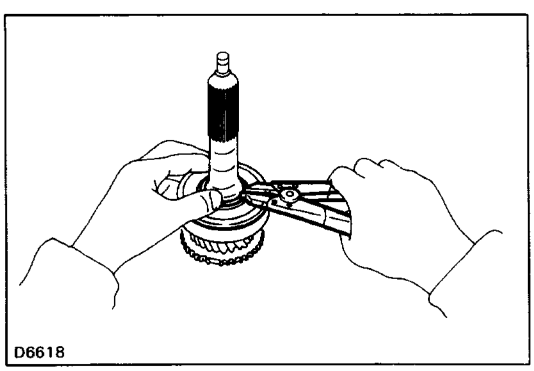
(b) Using a feeler gauge, measure the clearance be–tween the synchronizer ring back and the gear spline end.

Standard clearance: 0.8 – 1.6 mm (0.031 – 0.063 in.)

Minimum clearance: 0.6 mm (0.024 in.)

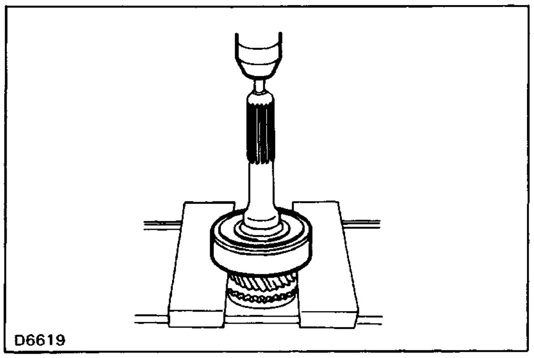
If the clearance is less than the minimum, replace the synchronizer ring.

REPLACEMENT OF BEARING

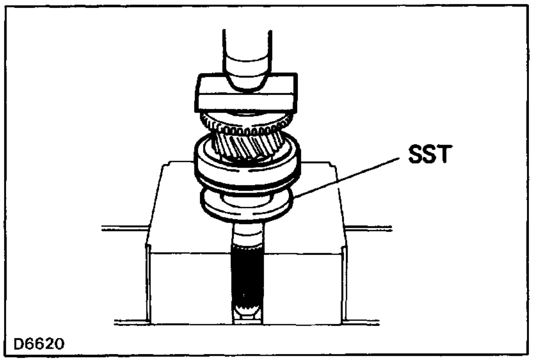


IF NECESSARY, REPLACE INPUT SHAFT BEARING

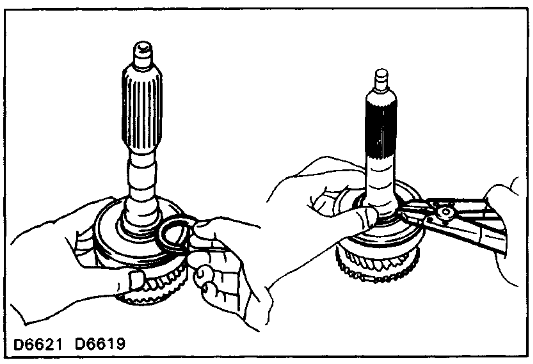
(a) Using snap ring pliers, remove the snap ring.



(b) Using a press, remove the bearing.



(c) Using SST and a press, install a new bearing.
SST 09506–35010

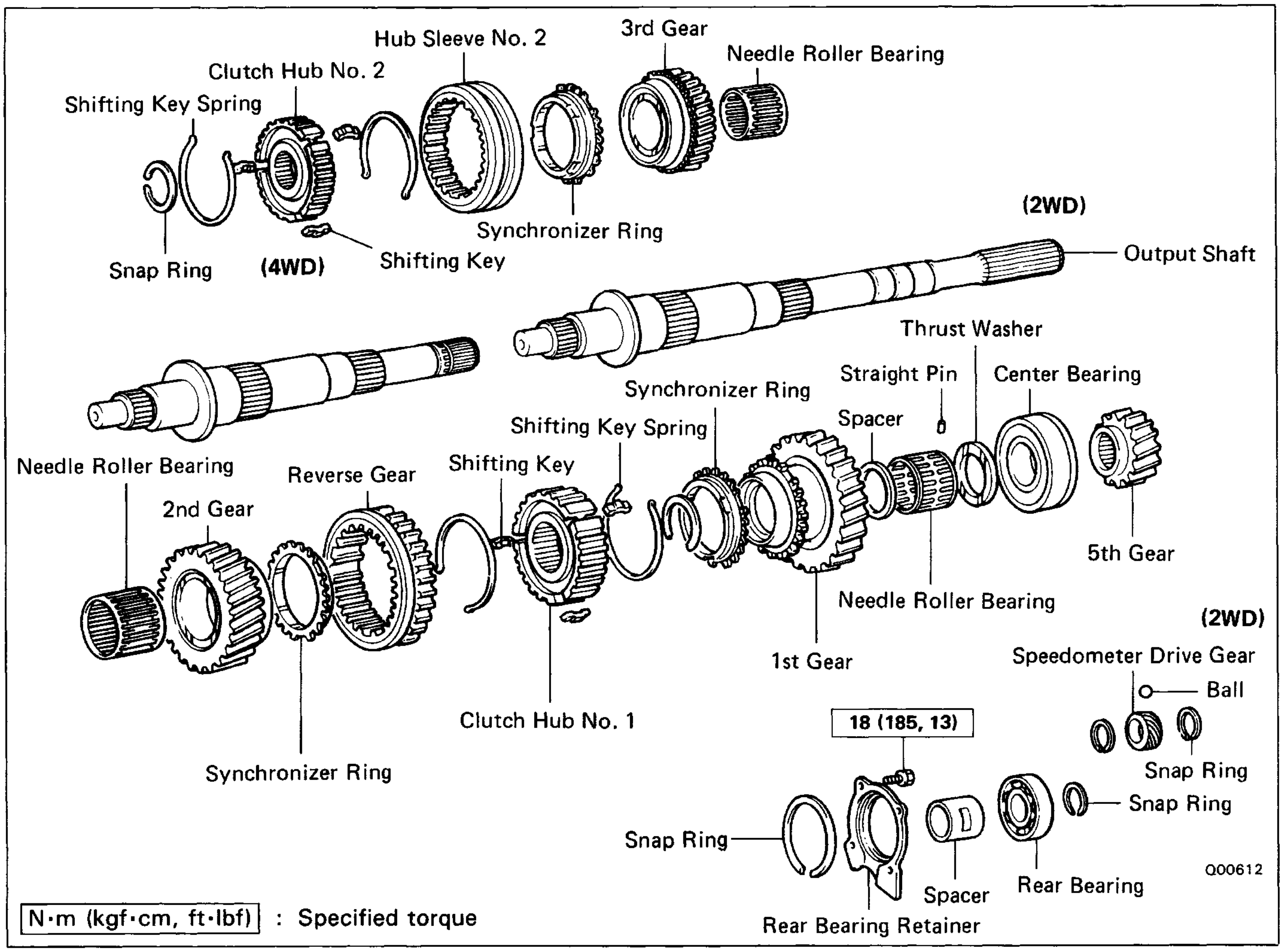


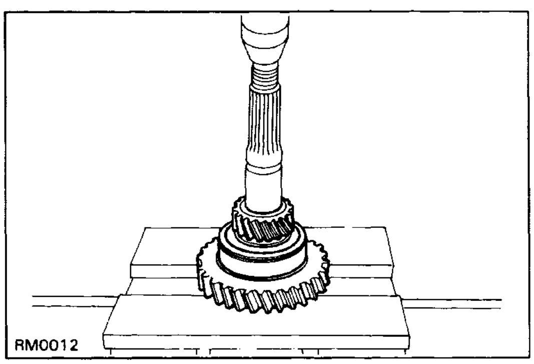
(d) Select a snap ring that will allow minimum axial play and install it on the shaft.

Mark	Thickness mm (in.)
A	2.10 – 2.15 (0.0827 – 0.0846)
B	2.15 – 2.20 (0.0846 – 0.0866)
C	2.20 – 2.25 (0.0866 – 0.0886)
D	2.25 – 2.30 (0.0886 – 0.0906)
E	2.30 – 2.35 (0.0906 – 0.0925)
F	2.35 – 2.40 (0.0925 – 0.0945)
G	2.40 – 2.45 (0.0945 – 0.0965)

Output Shaft Assembly

COMPONENTS

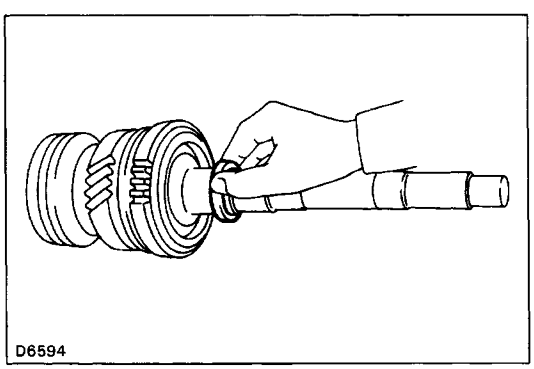




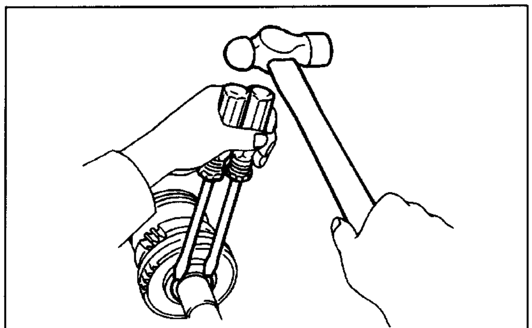
DISASSEMBLY OF OUTPUT SHAFT ASSEMBLY

1. REMOVE FIFTH GEAR, CENTER BEARING AND FIRST GEAR ASSEMBLY

(a) Using a press, remove the 5th gear, center bearing, thrust washer and 1 st gear.
(b) Remove the synchronizer ring.
(c) Remove the straight pin and needle roller bearing.

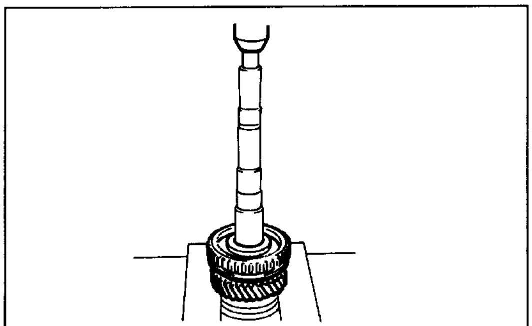


(d) Remove the spacer.


D6595

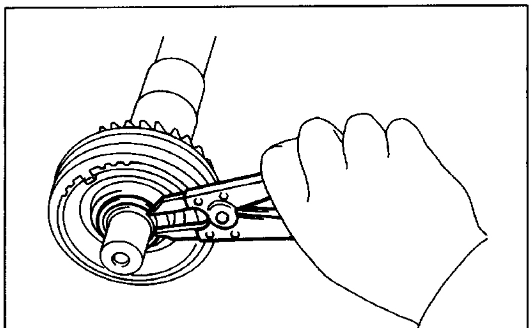
2. REMOVE HUB SLEEVE NO.1 ASSEMBLY AND SECOND GEAR ASSEMBLY

(a) Using two screwdrivers and a hammer, tap out the snap ring.


D6596

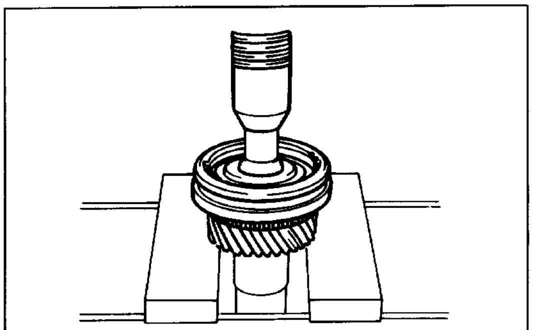
(b) Using a press, remove the hub sleeve No. 1, syn– chronizer ring and 2nd gear.

(c) Remove the needle roller bearing.


D6598

3. REMOVE HUB SLEEVE NO.2 ASSEMBLY AND THIRD GEAR ASSEMBLY

(a) Using a snap ring expander, remove the snap ring.


D6599

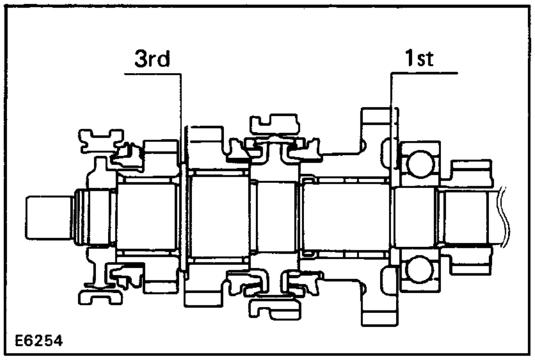
(b) Using a press, remove the hub sleeve No.2, syn– chronizer ring and 3rd gear.

(c) Remove the needle roller bearing.

4. REMOVE THE SHIFTING KEYS AND SPRINGS FROM HUB SLEEVE ASSEMBLY

Using screwdriver, remove the three shifting keys and two springs.

HINT: Hub sleeve No. 1 and hub sleeve No.2.

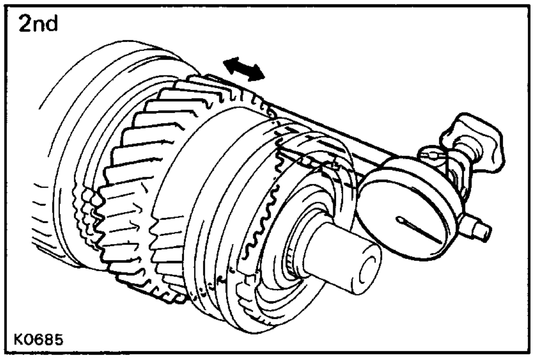


INSPECT OF OUTPUT SHAFT ASSEMBLY

1. INSPECT EACH GEAR THRUST CLEARANCE

(a) Using a feeler gauge, measure the thrust clearance of 1 st gear and 3rd gear.

(b) Using a dial indicator, measure the thrust clearance of 2nd gear.



1st gear

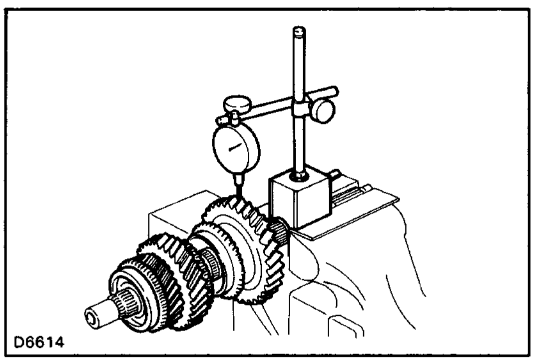
Standard clearance: 0.10 – 0.45 mm (0.0039 – 0.0177 in.)

Maximum clearance: 0.50 mm (0.0197 in.)

2nd and 3rd gears

Standard clearance: 0.10 – 0.25 mm (0.0039 – 0.0098 in.)

Maximum clearance: 0.30 mm (0.0118 in.)



2. INSPECT EACH GEAR OIL CLEARANCE

Using a dial indicator, measure the oil clearance between the gear and shaft with the needle roller bearing installed.

1st gear

Standard clearance: 0.020 – 0.073 mm (0.0008 – 0.0029 in.)

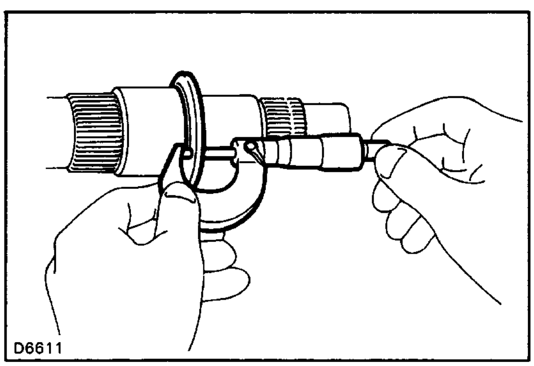
Maximum clearance: 0.16 mm (0.0063 in.)

2nd and 3rd gears

Standard clearance: 0.015 – 0.068 mm (0.0006 – 0.0027 in.)

Maximum clearance: 0.16 mm (0.0063 in.)

If the clearance exceeds the maximum, replace the gear needle roller bearing or shaft.

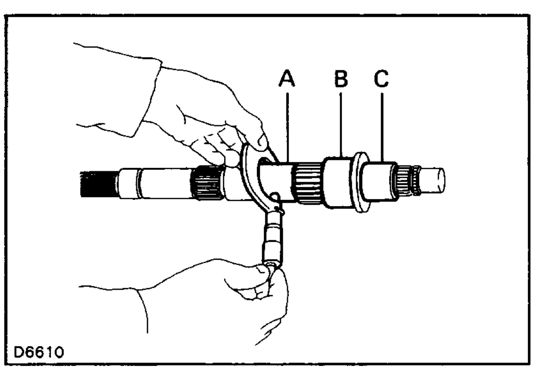


3. INSPECT OUTPUT SHAFT

(a) Using a micrometer, measure the output shaft flange thickness.

Minimum thickness: 4.70 mm (0.1850 in.)

If the thickness exceeds the minimum, replace the output shaft.



(b) Using a micrometer, measure the outer diameter of the output shaft journal.

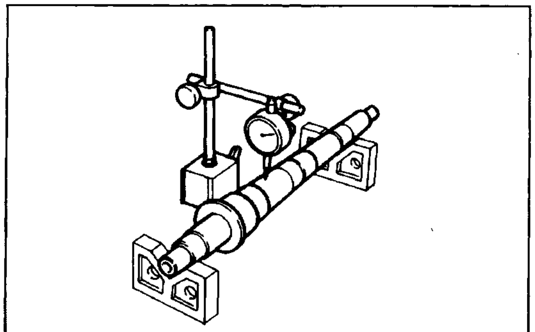
Minimum diameter:

(A) 1st gear 38.860 mm (1.5299 in.)

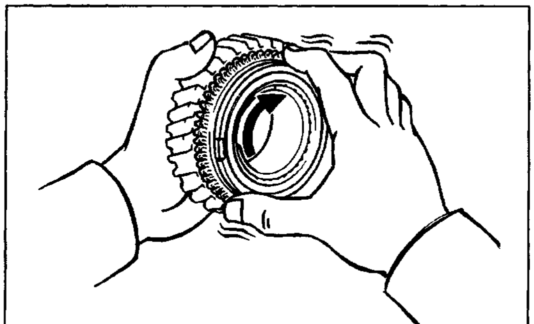
(B) 2nd gear 46.860 mm (1.8449 in.)

(C) 3rd gear 37.860 mm (1.4905 in.)

If the outer diameter exceeds the minimum, replace the output shaft.

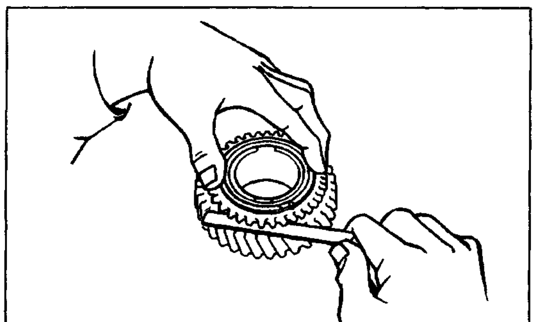

D6612

(c) Using a dial indicator, check the shaft runout.
Maximum runout: 0.06 mm (0.0024 in.)
If the runout exceeds the maximum, replace the output shaft.

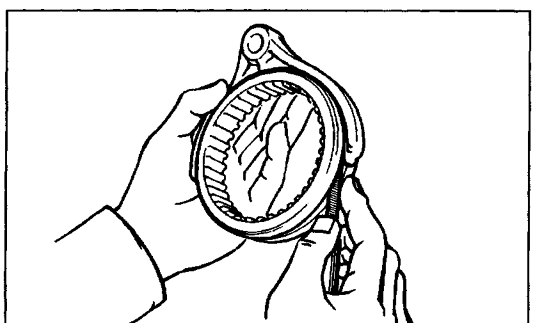

WM0064

4. INSPECT SYNCHRONIZER RINGS

(a) Turn the ring and push it in to check the braking ac–tion.

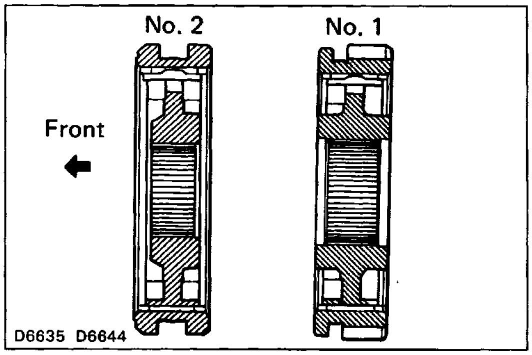

WM0065

(b) Using a feeler gauge, measure the clearance be–tween the synchronizer ring back and the gear spline end.
Standard clearance: 0.8 – 1.6 mm (0.031 – 0.063 in.)
Minimum clearance: 0.6 mm (0.024 in.)
If the clearance is less than the minimum, replace the synchronizer ring.


WM0066

5. INSPECT CLEARANCE OF SHIFT FORKS AND HUB SLEEVES

Using a feeler gauge, measure the clearance between the hub sleeve and shift fork.
Maximum clearance: 1.0 mm (0.039 in.)
If the clearance exceeds the maximum, replace the shift fork or hub sleeve.



D6635 D6644

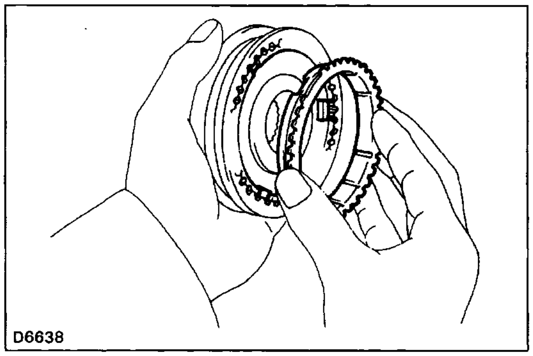
ASSEMBLY OF OUTPUT SHAFT ASSEMBLY

1. INSERT CLUTCH HUB NO. 1 AND NO.2 INTO HUB SLEEVE

(a) Install the clutch hub and shifting keys to the hub sleeve.

(b) Install the shifting key springs under the shifting keys.

NOTICE: Install the key springs positioned so that their end gaps are not in 1 line.

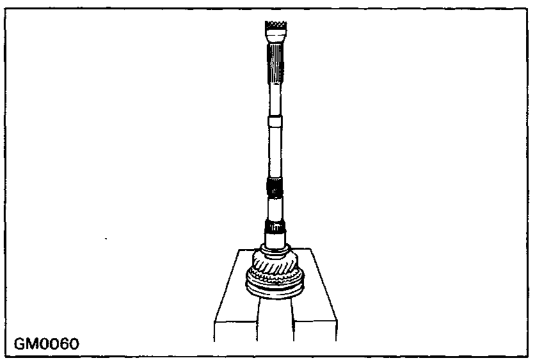

D6638

2. INSTALL THIRD GEAR AND HUB SLEEVE NO.2 ON OUTPUT SHAFT

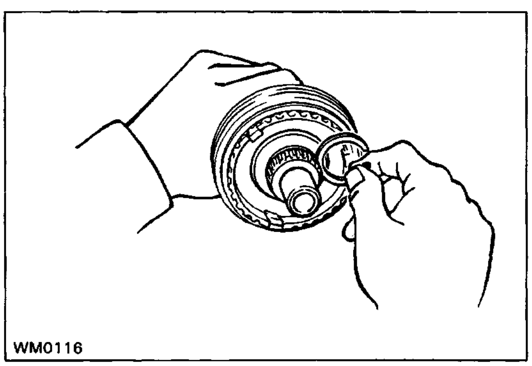
(a) Apply gear oil to the shaft and needle roller bearing.

(b) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.

(c) Install the needle roller bearing in the 3rd gear.


GM0060

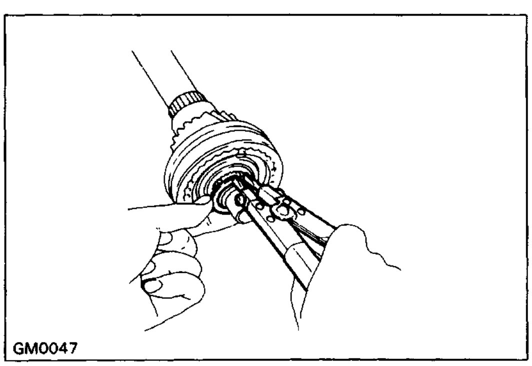
(d) Using a press, install the 3rd gear and No.2 hub sleeve.


WM0116

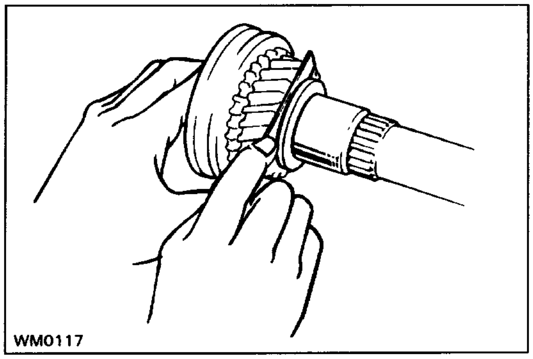
3. INSTALL SNAP RING

(a) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
A	1.80 – 1.85 (0.0709 – 0.0728)
B	1.85 – 1.90 (0.0728 – 0.0748)
C	1.90 – 1.95 (0.0748 – 0.0768)
D	1.95 – 2.00 (0.0768 – 0.0787)
E	2.00 – 2.05 (0.0787 – 0.0807)
F	2.05 – 2.10 (0.0807 – 0.0827)
G	2.10 – 2.15 (0.0827 – 0.0846)


GM0047

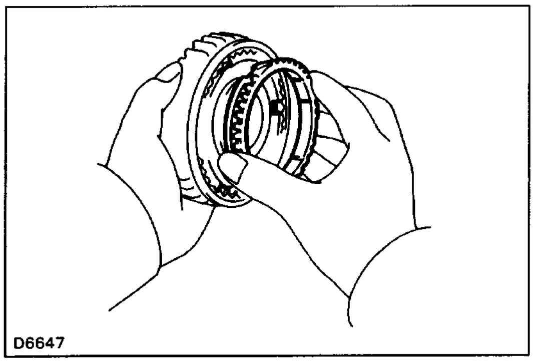
(b) Using snap ring pliers, install the snap ring.



4. INSPECT THIRD GEAR THRUST CLEARANCE

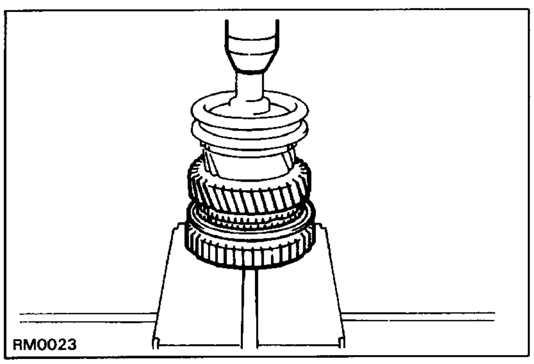
Using a feeler gauge, measure the 3rd gear thrust clear–ance.

Standard clearance: 0.10 – 0.25 mm
(0.0039 – 0.0098 in.)

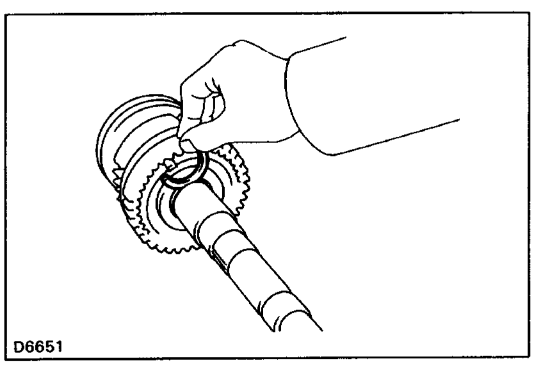


5. INSTALL SECOND GEAR AND HUB SLEEVE NO. 1

(a) Apply gear oil to the shaft and needle roller bearing.
(b) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.
(c) Install the needle roller bearing in the 2nd gear.



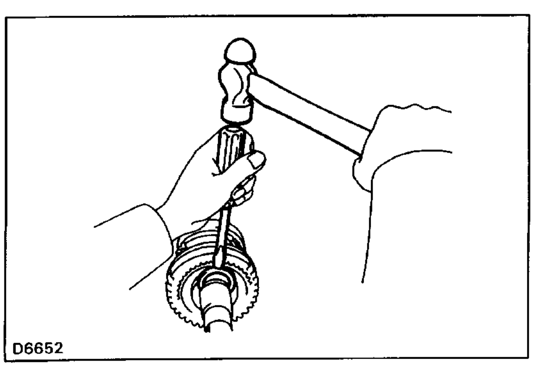
(d) Using a press, install the 2nd gear and hub sleeve No. 1.



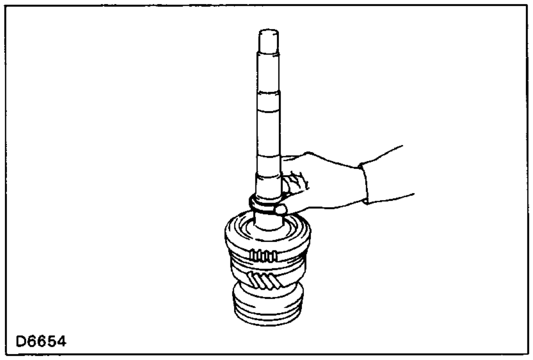
6. INSTALL SNAP RING

(a) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
A	2.30 – 2.35 (0.0906 – 0.0925)
B	2.35 – 2.40 (0.0925 – 0.0945)
C	2.40 – 2.45 (0.0945 – 0.0965)
D	2.45 – 2.50 (0.0965 – 0.0984)
E	2.50 – 2.55 (0.0984 – 0.1004)
F	2.55 – 2.60 (0.1004 – 0.1024)
G	2.60 – 2.65 (0.1024 – 0.1043)

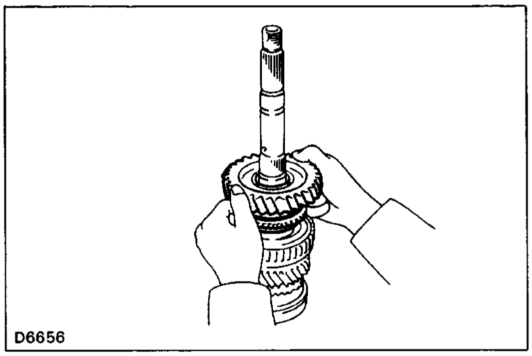


(b) Using a screwdriver and hammer, install the snap ring.


D6654

7. INSTALL SPACER AND FIRST GEAR ASSEMBLY

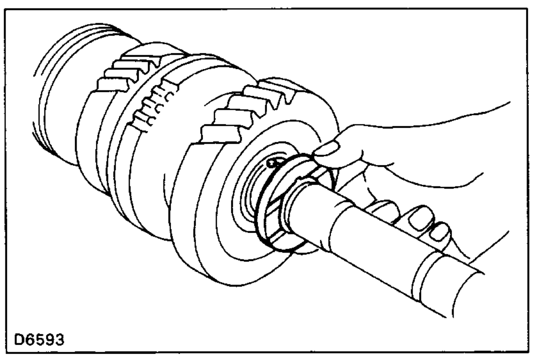
(a) Install the spacer on the output shaft.


D6656

(b) Apply gear oil to the needle roller bearing.

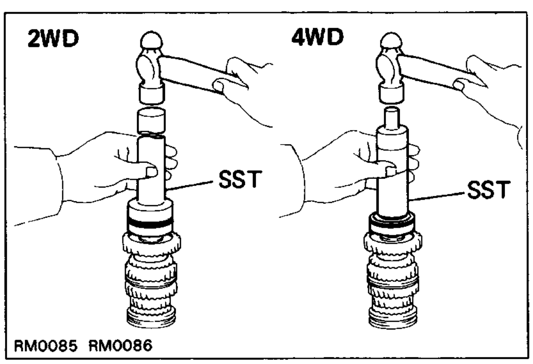
(c) Assemble the 1 st gear, synchronizer ring and needle roller bearing.

(d) Install the assembly on the output shaft with the synchronizer ring slots aligned with the shifting keys.


D6593

8. INSTALL STRAIGHT PIN AND FIRST GEAR THRUST WASHER

Install the 1st gear thrust washer onto the output shaft with the straight pin aligned with the 1st gear thrust washer.

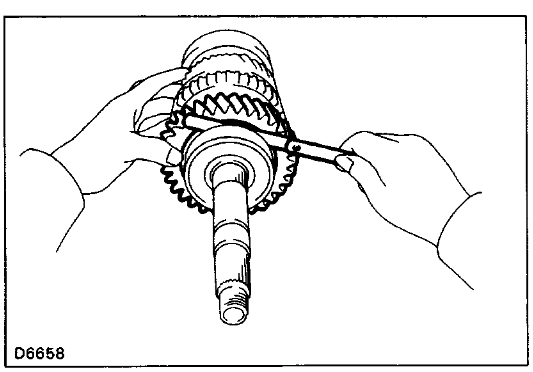


RM0085 RM0086

9. INSTALL OUTPUT SHAFT CENTER BEARING

Using SST and a hammer, drive in the bearing with the outer race snap ring groove toward the rear.

SST (2WD) 09309–35010
(4WD) 09316–60010
(09316–00010, 09316–00070)

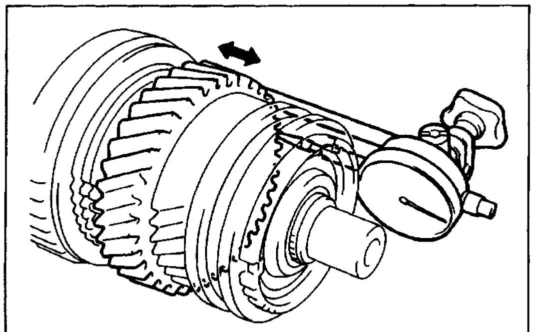

D6658

10. INSPECT FIRST GEAR THRUST CLEARANCE

Using a feeler gauge, measure the 1st clearance.

Standard clearance:

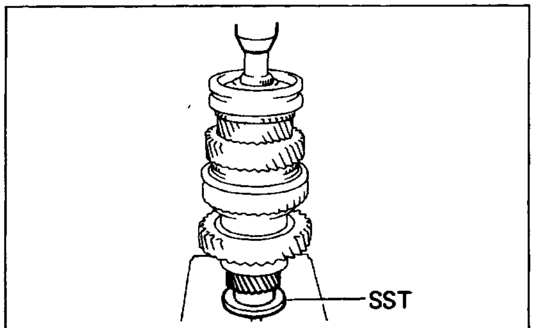
1st gear 0.10 – 0.45 mm (0.0039 – 0.0177 in.)


K0685

11. INSPECT SECOND GEAR THRUST CLEARANCE

Using a dial indicator, measure the 2nd gear thrust clear–ance.

Standard clearance:
2nd gear 0.10 – 0.25 mm (0.0039 – 0.0098 in.)



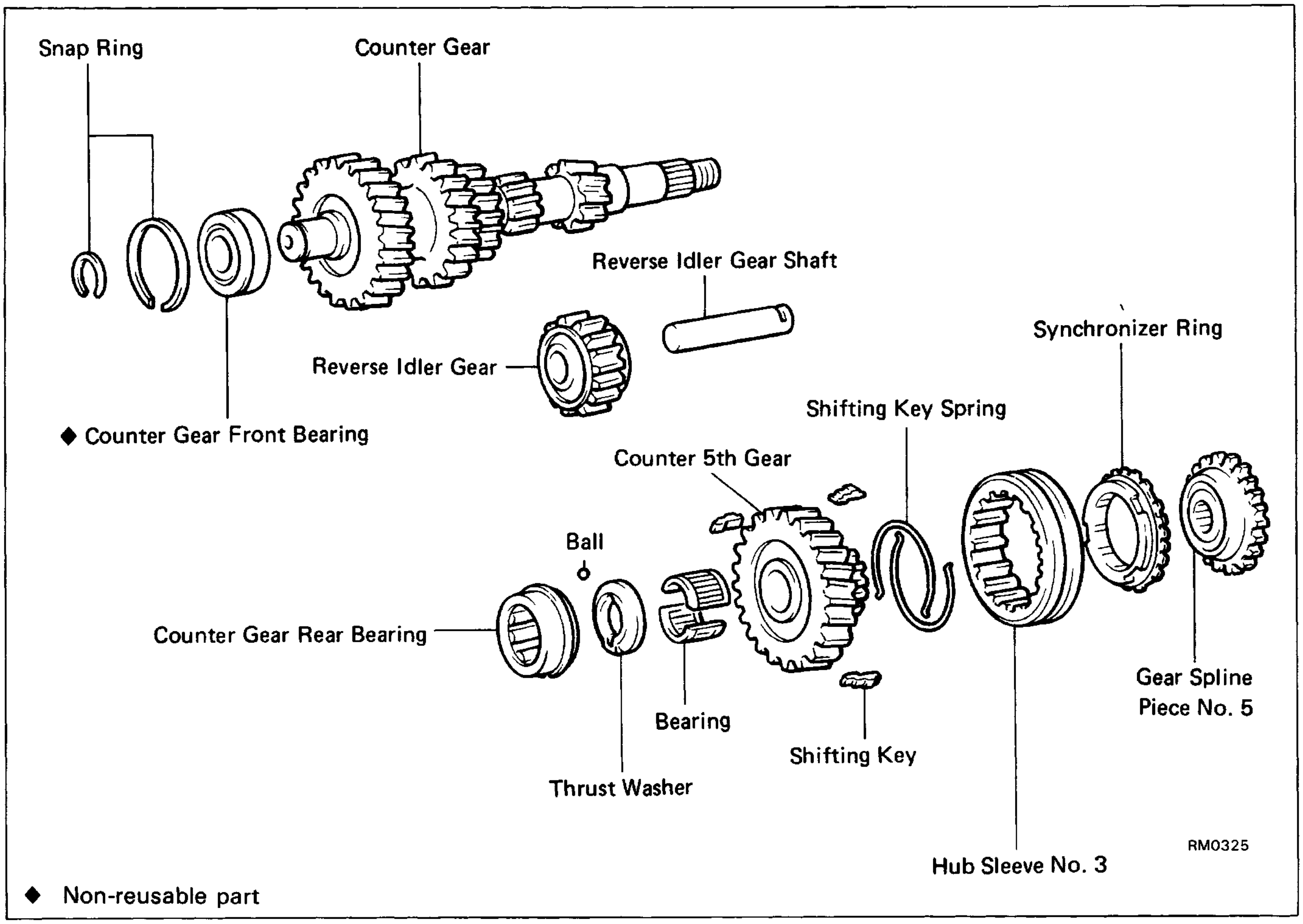
D6659

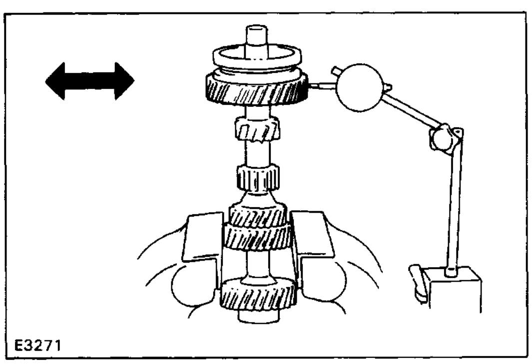
12. INSTALL FIFTH GEAR

Using SST and a press, install the 5th gear.
SST 09316–60010 (09316–00030)

Counter Gear Assembly and Reverse Idler Gear

COMPONENTS





INSPECTION OF COUNTER GEAR

1. INSPECT FIFTH GEAR OIL CLEARANCE

(a) Install the spacer, counter 5th gear and needle roller bearings.

(b) Using a dial indicator, measure the counter 5th gear oil clearance.

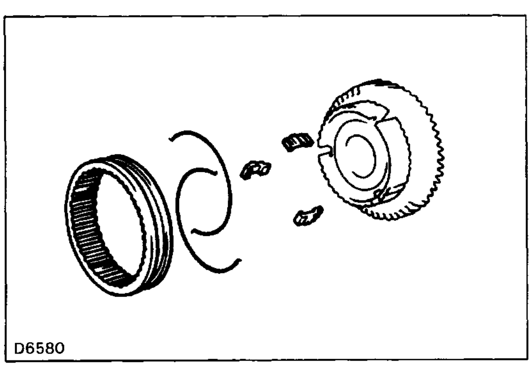
Standard clearance: 0.015 – 0.068 mm (0.006 – 0.0027 in.)

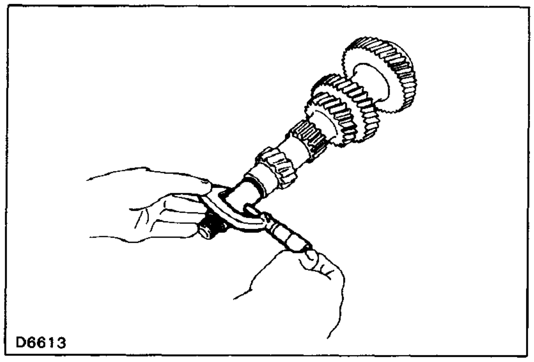
Maximum clearance: 0.16 mm (0.0063 in.)

If the clearance exceeds the maximum, replace the gear bearing or shaft.

2. REMOVE HUB SLEEVE NO.3, SHIFTING KEYS AND SPRINGS FROM COUNTER FIFTH GEAR.

Using a screwdriver, remove the three shifting keys and two springs from counter 5th gear.



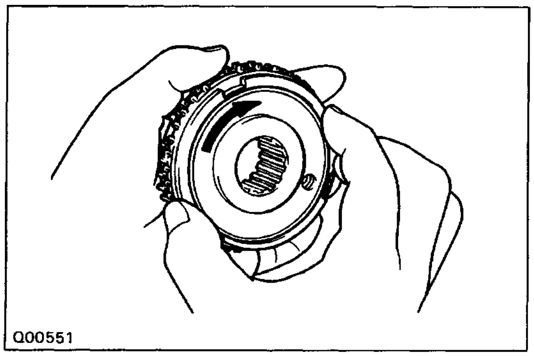


3. INSPECT COUNTER GEAR

Using a micrometer, measure the outer diameter of the counter gear journal.

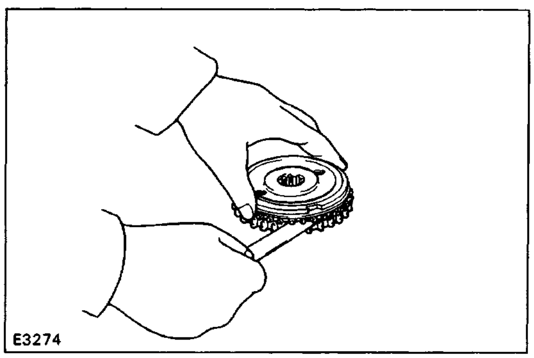
Minimum diameter: 27.860 mm (1.0968 in.)

If the outer diameter exceeds the minimum, replace the counter gear.



4. INSPECT SYNCHRONIZER RINGS

(a) Turn the ring and push it in to check the braking ac– tion.

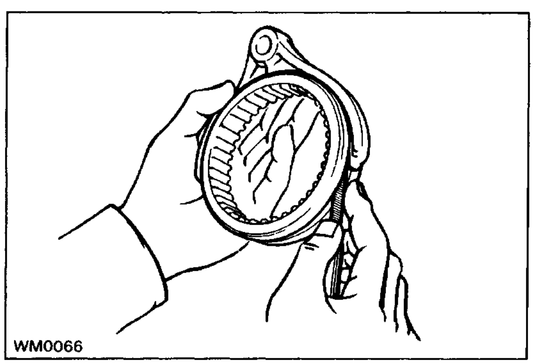


(b) Using a feeler gauge, measure the clearance be– tween the synchronizer ring back and the gear spline end.

Standard clearance: 0.8 – 1.6 mm (0.031 – 0.063 in.)

Minimum clearance: 0.6 mm (0.024 in.)

If the clearance is less than the minimum, replace the synchronizer ring.

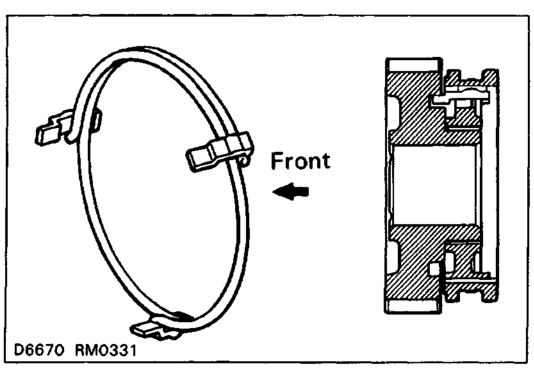


5. INSPECT CLEARANCE OF SHIFT FORKS AND HUB SLEEVES

Using a feeler– gauge, measure the clearance between the hub sleeve and shift fork.

Maximum clearance: 1.0 mm (0.039 in.)

If the clearance exceeds the maximum, replace the shift fork or hub sleeve.

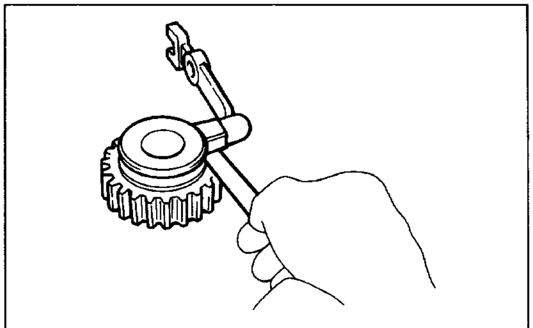


6. INSTALL HUB SLEEVE NO.3, SHIFTING KEYS AND SPRINGS TO COUNTER 5TH GEAR

(a) Install the counter 5th gear and shifting keys to the hub sleeve.

(b) Install the shifting key springs under the shifting keys.

NOTICE: Install the key springs positioned so that their end gaps are not in line.


E3217

INSPECTION OF REVERSE IDLER GEAR

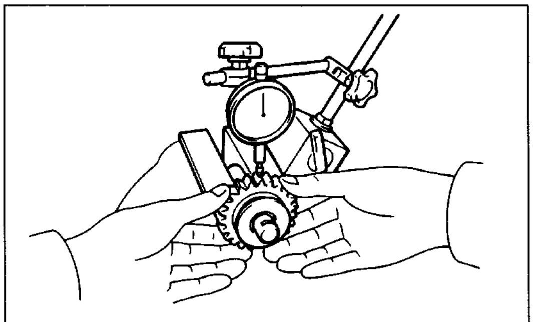
1. INSPECT CLEARANCE OF REVERSE IDLER GEAR AND SHIFT ARM SHOE

Using a feeler gauge, measure the clearance between the reverse idler gear and shift arm shoe.

Standard clearance: 0.05 – 0.25 mm
(0.0020 – 0.098 in.)

Maximum clearance: 0.5 mm (0.0197 in.)

If the clearance exceeds the maximum, replace the shift arm shoe or reverse idler gear.


K0541

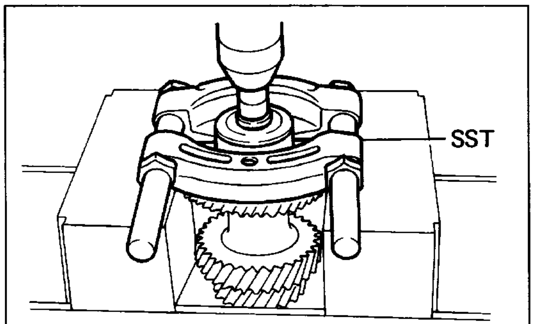
2. INSPECT REVERSE IDLER GEAR OIL CLEARANCE

Using a dial indicator, measure the reverse idler gear oil clearance.

Standard clearance: 0.040 – 0.082 mm
(0.0016 – 0.032 in.)

Maximum clearance: 0.13 mm (0.0051 in.)

If the clearance exceeds the maximum, replace the re–verse idler gear or reverse idler gear shaft.

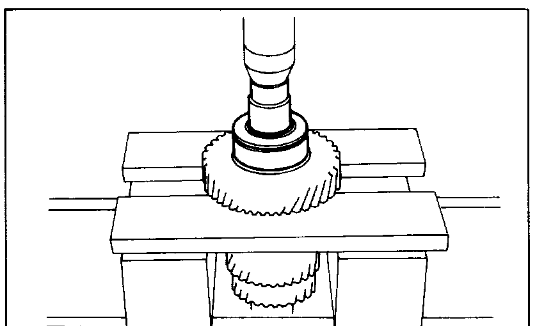


D6623

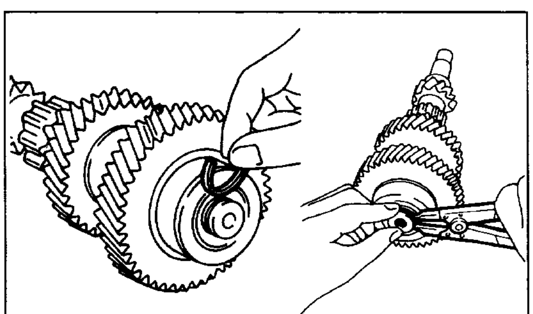
REPLACEMENT OF BEARING

IF NECESSARY, REPLACE COUNTER GEAR FRONT BEARING

(a) Using a snap ring expander, remove the snap ring.
(b) Using SST and a press, remove the bearing.
SST 09950–00020
(c) Replace the side race.


RM0013

(d) Using a 24 mm socket wrench, press in the bearing and inner race.

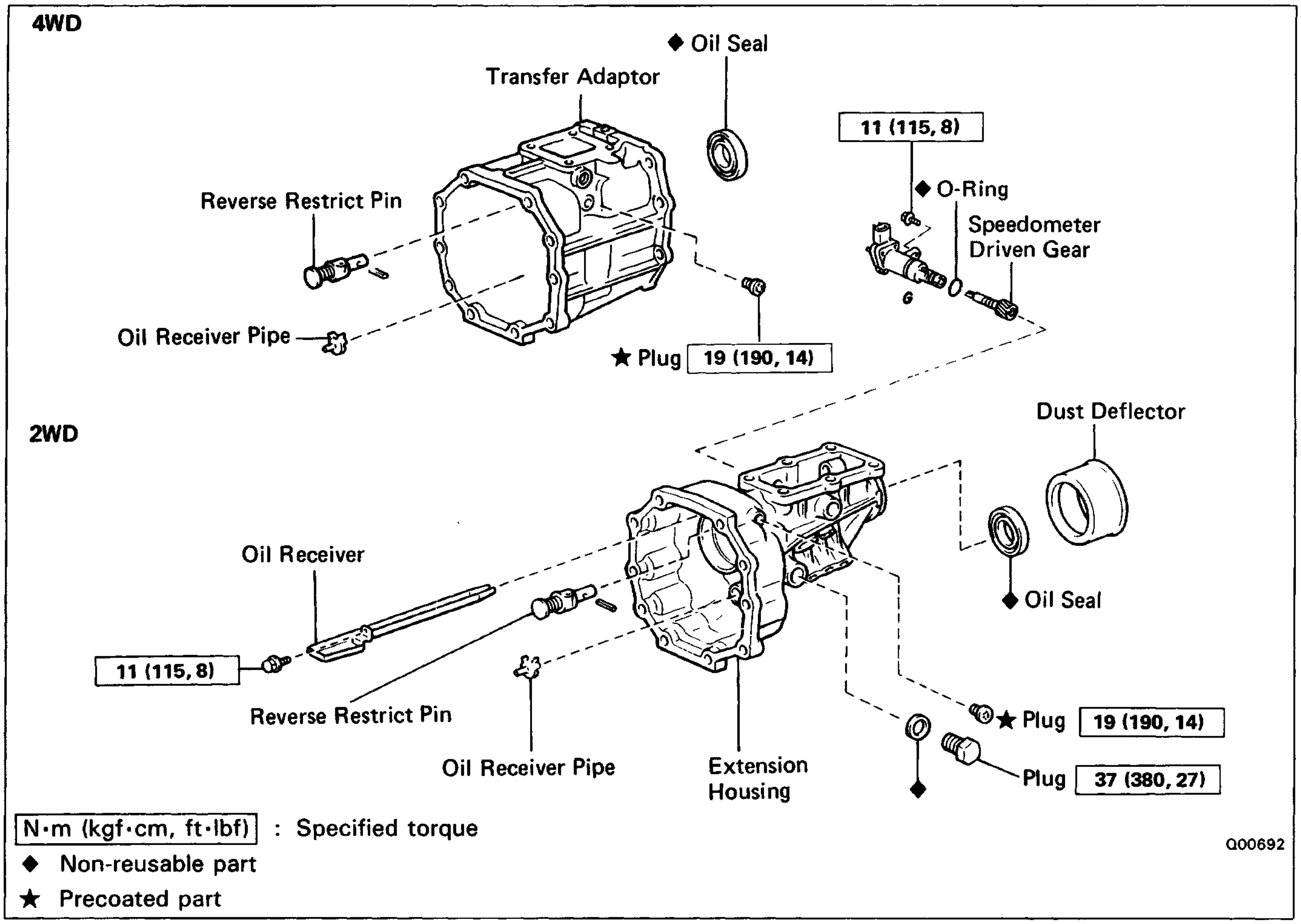

D6626 D6622

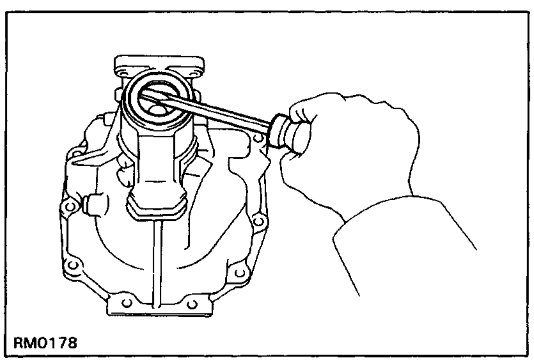
(e) Select a snap ring that will allow minimum axial play and install it on the shaft.

Mark	Thickness mm (in.)
A	2.00 – 2.05 (0.0787 – 0.0807)
B	2.05 – 2.10 (0.0807 – 0.0827)
C	2.10 – 2.15 (0.0827 – 0.0846)
D	2.15 – 2.20 (0.0846 – 0.0866)
E	2.20 – 2.25 (0.0866 – 0.0886)

Extension Housing and Transfer Adaptor

COMPONENTS





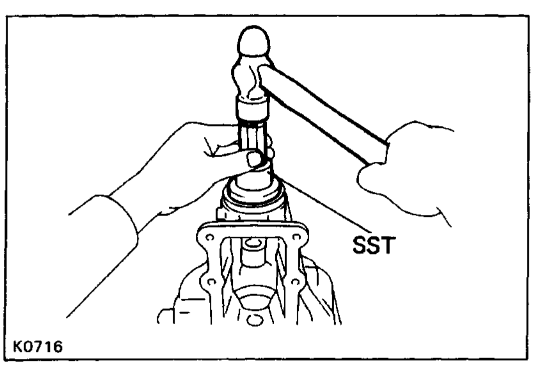
REPLACEMENT OF OIL SEAL

1. (2WD)

IF NECESSARY, REPLACE EXTENSION HOUSING OIL SEAL

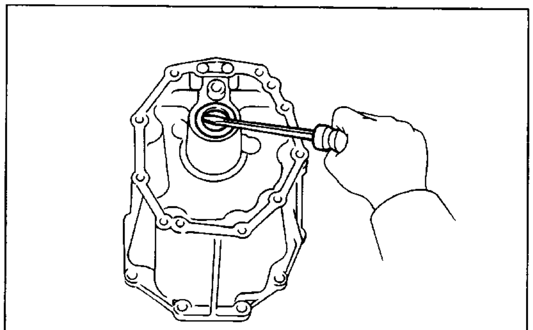
(a) Remove the dust deflector.

(b) Using a screwdriver, pry out the oil seal.



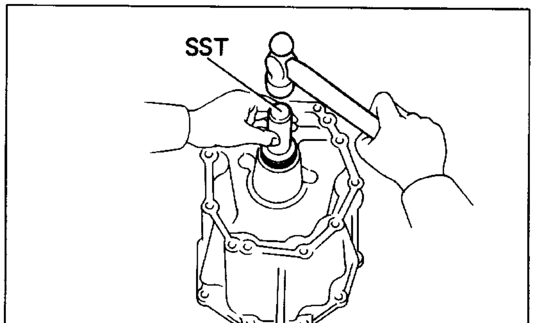
(c) Using SST and a hammer, drive in a new oil seal.
SST 0932 5–40010

(d) Install the dust deflector.


RM0311

2. (4WD)
IF NECESSARY, REPLACE TRANSFER ADAPTOR OIL SEAL

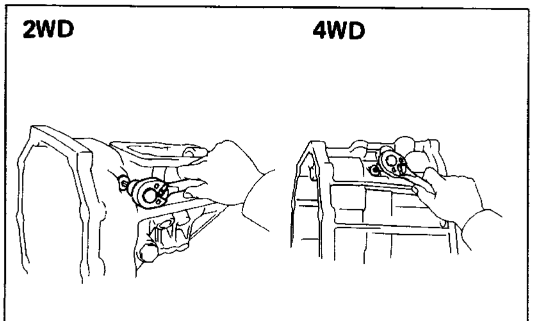
(a) Using a screwdriver, pry out the oil seal.



RM0312

(b) Using SST and a hammer, drive in a new oil seal.
SST 09325–12010

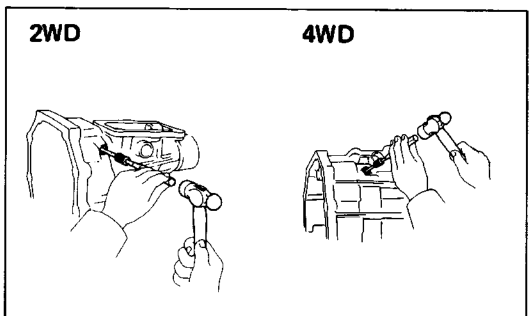
INSPECTION AND REPLACEMENT OF REVERSE RESTRICT PIN



RM0210 RM0313

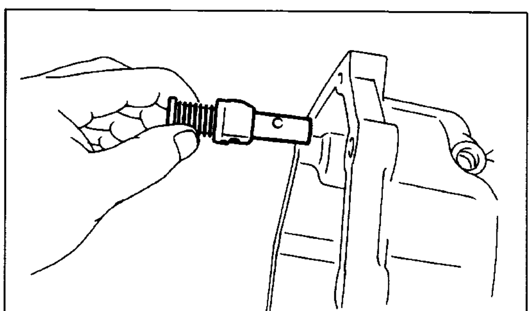
1. REMOVE THE REVERSE RESTRICT PIN

(a) Using a torx socket wrench, remove the screw plug.
(Torx socket wrench T40 09042–00020)

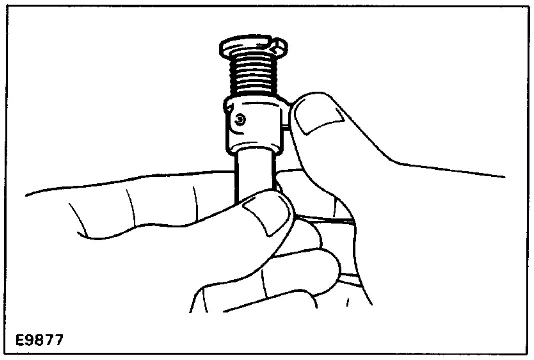


RM0211 RM0314

(b) Using a pin punch and hammer, drive out the slotted spring pin.

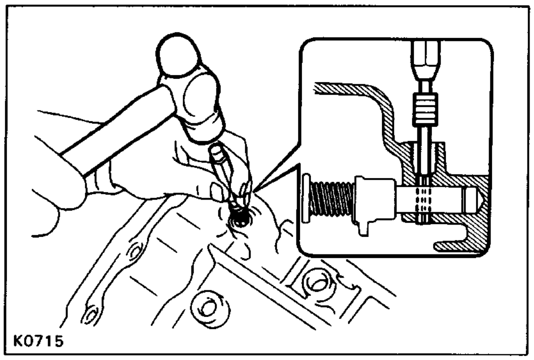

K0714

(c) Remove the reverse restrict pin.



2. INSPECTION OF REVERSE RESTRICT PIN

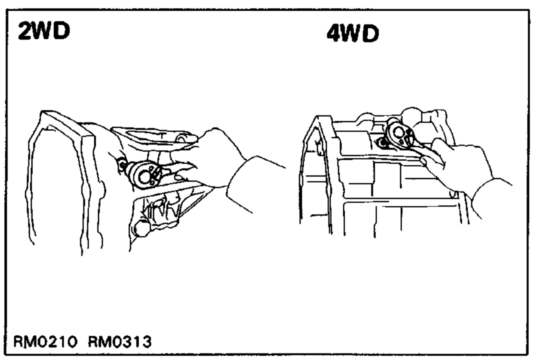
Turn and push the reverse restrict pin by hand while applying force in axial direction.



3. INSTALL THE REVERSE RESTRICT PIN

(a) Install the reverse restrict pin to the extension housing or transfer adaptor.

(b) Using a pin punch and hammer, drive in the slotted spring pin as shown.



(c) Apply liquid sealer to the plug threads.

Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

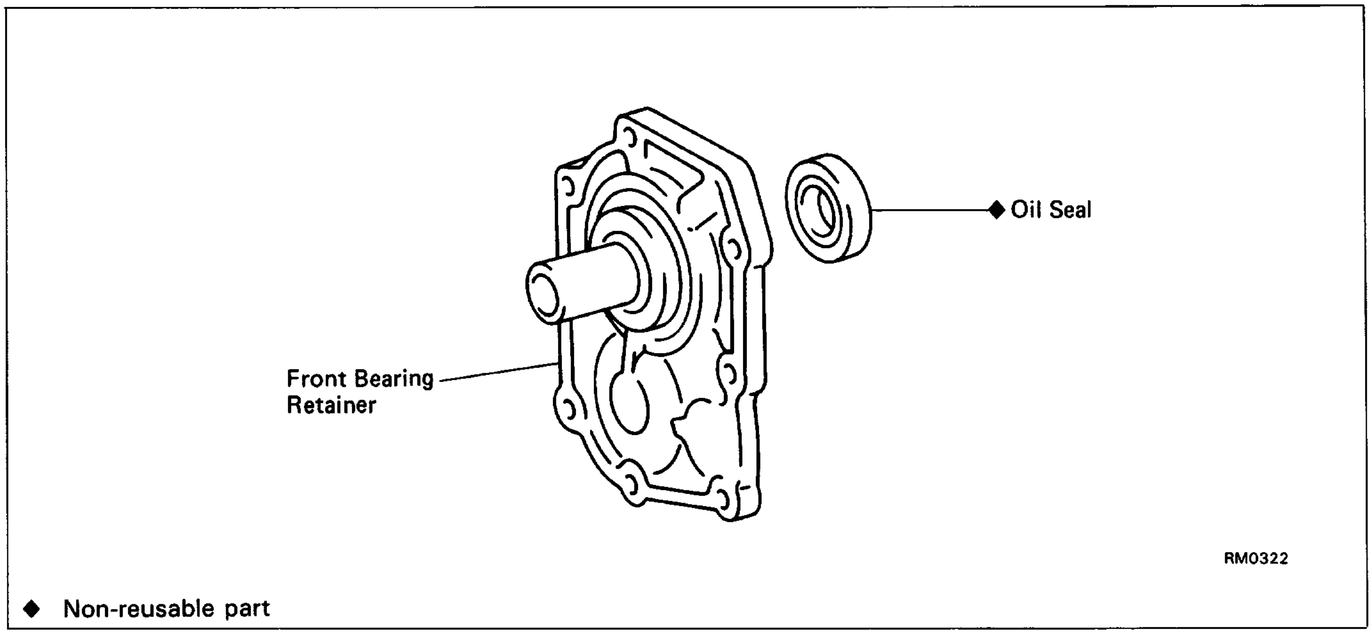
(d) Using a torx socket wrench, install and torque the screw plug.

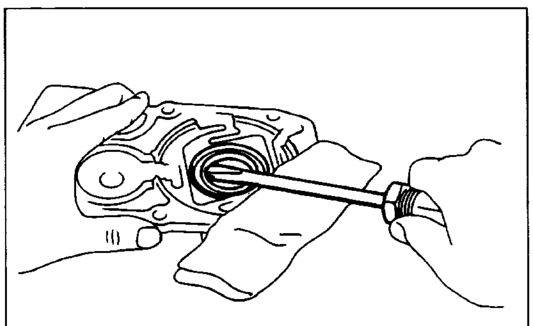
(Torx socket wrench T40 09042–00020)

Torque: 19 N–m (190 kgf –cm, 14 ft –lbf)

Front Bearing Retainer

COMPONENTS

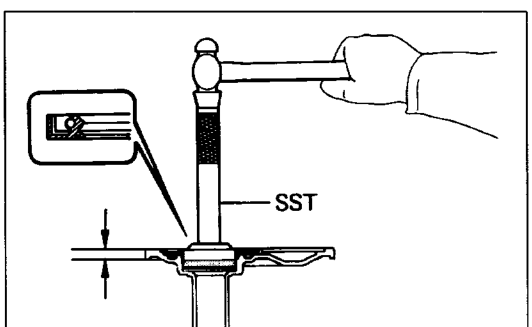



D6627

REPLACEMENT OF OIL SEAL

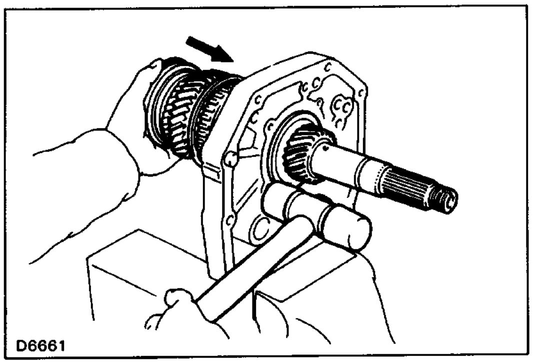
IF NECESSARY, REPLACE FRONT BEARING RETAINER OIL SEAL

(a) Using a screwdriver, pry out the oil seal.



D6628

(b) Using SST and a hammer, drive in a new oil seal.
SST 09608–35014 (09608–06020, 09608–06090)
Drive in depth: 11.2 – 12.2 mm (0.441 – 0.480 in.)
Transmission case installation surface

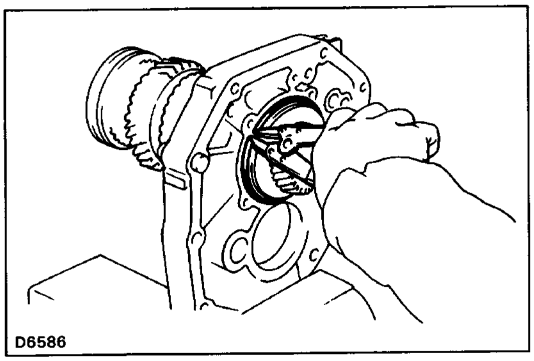


ASSEMBLY OF TRANSMISSION

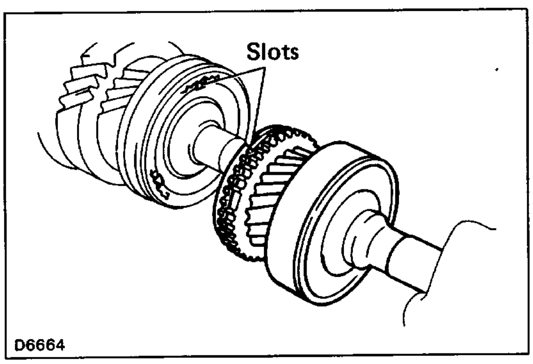
(See pages MT1–67, 68)

1. INSTALL OUTPUT SHAFT TO INTERMEDIATE PLATE

(a) Install the output shaft into the intermediate plate by pushing on the output shaft and tapping on the intermediate plate.



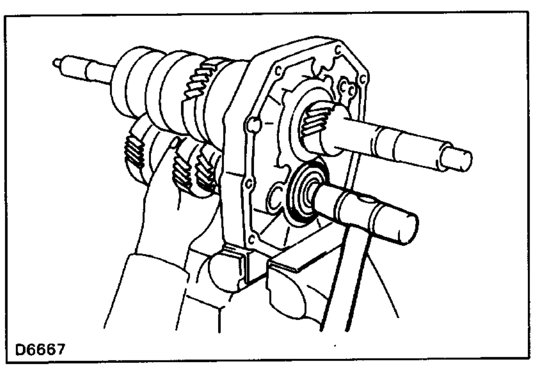
(b) Using snap ring pliers, install the snap ring.



2. INSTALL INPUT SHAFT

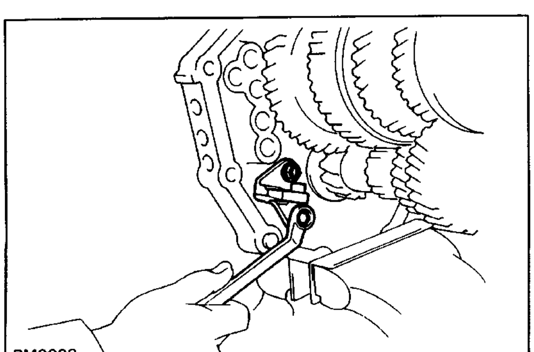
(a) Apply gear oil to the needle roller bearing and install it into the input shaft.

(b) Install the input shaft to the output shaft with the synchronizer ring slots aligned with the shifting keys.



3. INSTALL COUNTER GEAR

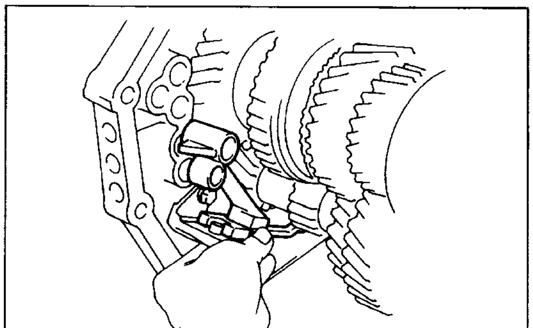
Install the counter gear into the intermediate plate while holding the counter gear, and install the counter rear bearing with a plastic hammer.



4. INSTALL REVERSE SHIFT ARM BRACKET

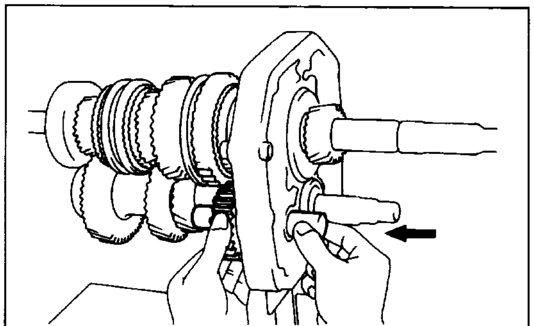
Install the reverse shift arm bracket and torque the bolts.

Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)


RM0033

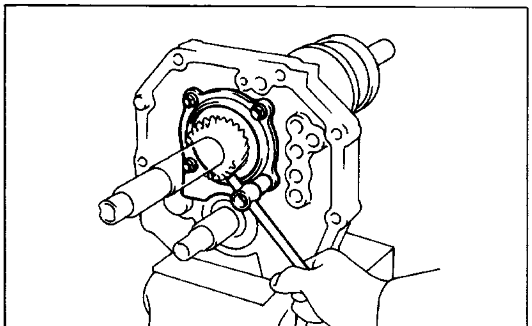
5. INSTALL REVERSE SHIFT ARM TO REVERSE SHIFT ARM BRACKET

Install the reverse shift arm to the pivot of the reverse shift arm bracket.


D6582

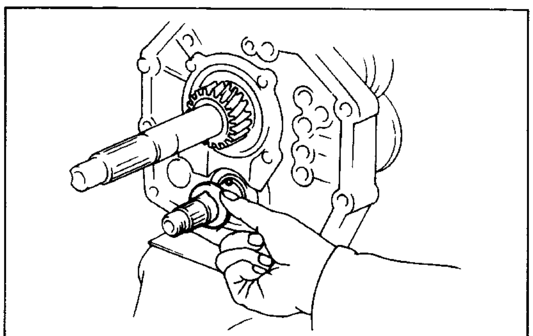
6. INSTALL REVERSE IDLER GEAR AND SHAFT

Align the reverse shift arm shoe to the reverse idler gear groove and insert the reverse idler gear shaft to the inter–mediate plate.

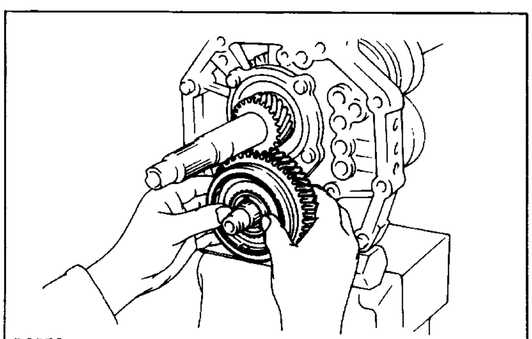

D6581

7. INSTALL REAR BEARING RETAINER

(a) Align the rear bearing retainer to the reverse idler gear shaft groove.
(b) Install and torque the bolts.
Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)

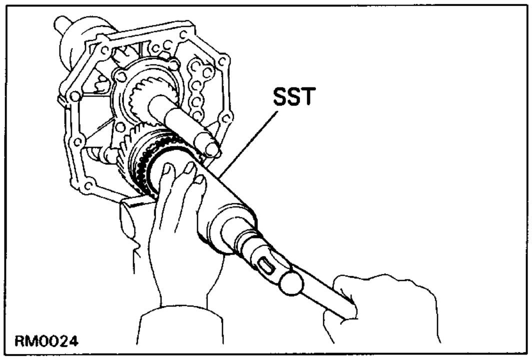

D6579

8. INSTALL BALL AND THRUST WASHER


D6578

9. INSTALL COUNTER FIFTH GEAR WITH NO.3 HUB SLEEVE ASSEMBLY AND NEEDLE ROLLER BEARINGS

(a) Apply gear oil to the needle roller bearings.
(b) Install the counter 5th gear with No.3 hub sleeve and needle roller bearings.



10. INSTALL SYNCHRONIZER RING AND GEAR SPLINE PIECE NO.5

(a) Install the synchronizer ring on gear spline piece No. 5.

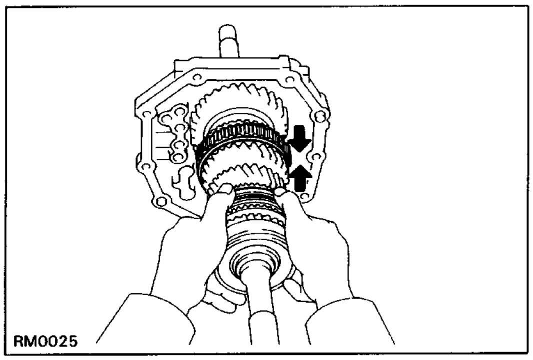
(b) Using SST and a hammer, drive in gear spline piece No. 5 with the synchronizer ring slots aligned with the shifting keys.

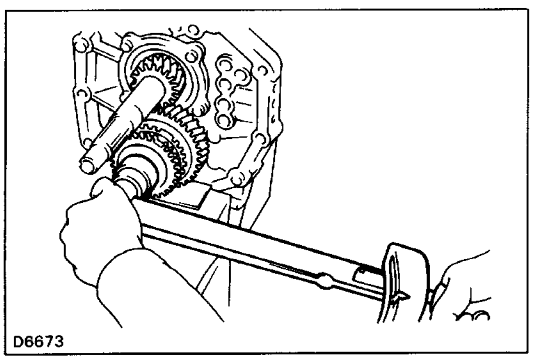
SST 09316–60010 (09316–00010)

HINT: When installing gear spline piece No.5, support the counter gear in front with a 3–5 Ib hammer or equiva– lent.

11. INSTALL LOCK NUT

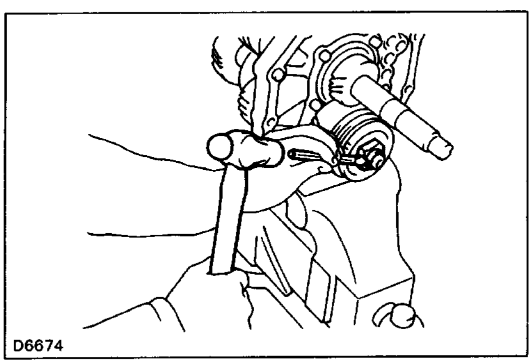
(a) Engage the gear double meshing.





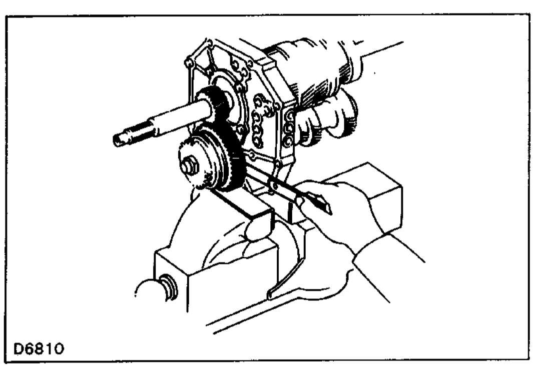
(b) Install and torque the lock nut.

Torque: 127 N–m (1, 300 kgf–cm, 94 ft–lbf)



(c) Stake the lock nut.

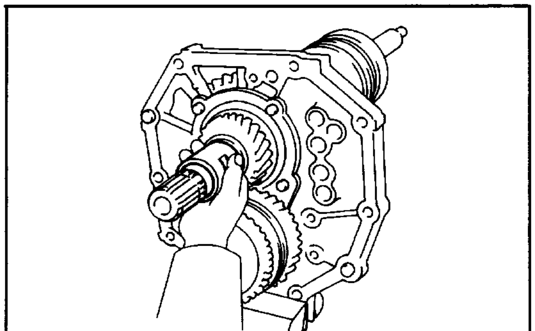
(d) Disengage the gear double meshing.



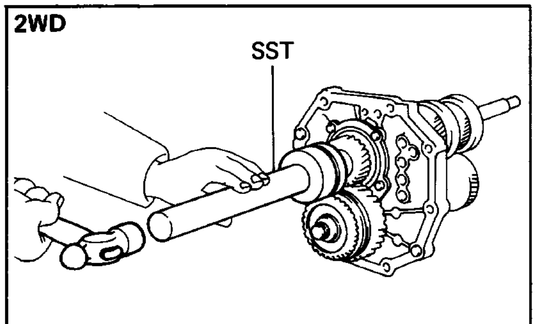
12. INSPECT COUNTER FIFTH GEAR THRUST CLEARANCE

Using a feeler gauge, measure the counter 5th gear thrust clearance.

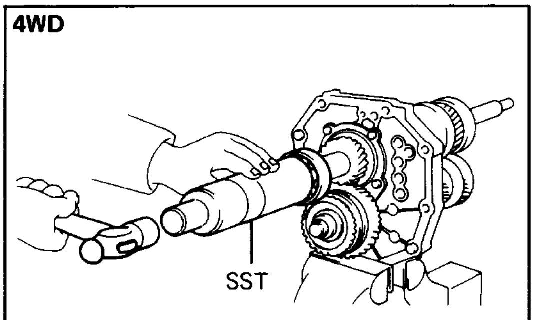
Standard clearance: 0.10 – 0.35 mm (0.0039 – 0.0138 in.)


RM0065

13. INSTALL SPACER



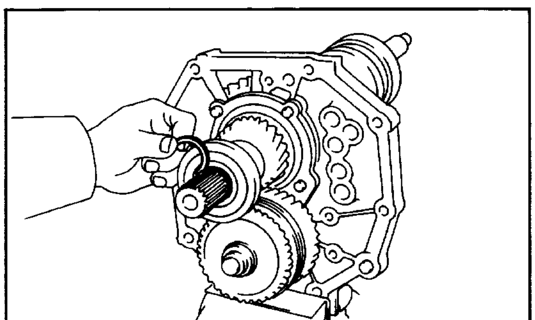
RM0070

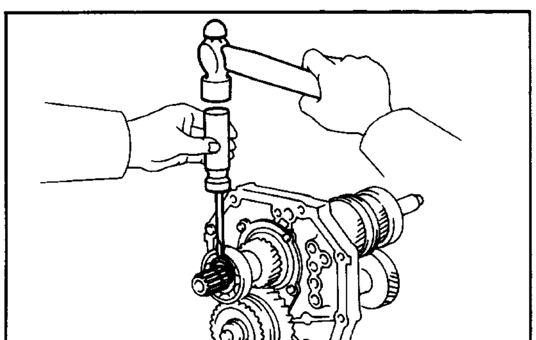


RM0071

14. INSTALL OUTPUT SHAFT REAR BEARING

Using SST and a hammer, drive in the rear bearing.
SST (2WD) 09309–35010
(4WD) 09316–60010
(09316–00010, 09316–00070)


RM0072

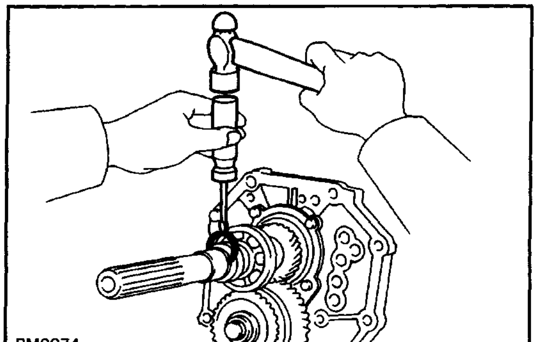

RM0073

15. INSTALL SNAP RING

(a) Select a snap ring that will allow minimum axial play.

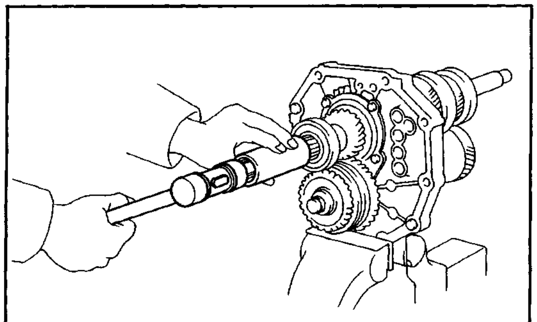
Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	2.65 – 2.70 (0.1043 – 0.1063)	K	3.10 – 3.15 (0.1220 – 0.1240)
B	2.70 – 2.75 (0.1063 – 0.1083)	L	3.15 – 3.20 (0.1240 – 0.1260)
C	2.75 – 2.80 (0.1083 – 0.1102)	M	3.20 – 3.25 (0.1260 – 0.1280)
D	2.80 – 2.85 (0.1102 – 0.1122)	N	3.25 – 3.30 (0.1280 – 0.1299)
E	2.85 – 2.90 (0.1122 – 0.1142)	P	3.30 – 3.35 (0.1299 – 0.1319)
F	2.90 – 2.95 (0.1142 – 0.1161)	Q	3.35 – 3.40 (0.1319 – 0.1339)
G	2.95 – 3.00 (0.1161 – 0.1181)	R	3.40 – 3.45 (0.1339 – 0.1358)
H	3.00 – 3.05 (0.1181 – 0.1201)	S	3.45 – 3.50 (0.1358 – 0.1378)
J	3.05 – 3.10 (0.1201 – 0.1220)		

(b) Using a screwdriver and hammer, install the snap ring.


RM0074

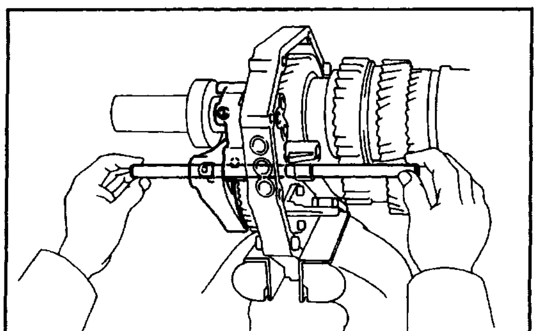
16.–1(2WD)
INSTALL SPEEDOMETER DRIVE GEAR

(a) Using a screwdriver and hammer, install the front snap ring.
(b) Install the ball and drive gear.
(c) Using a screwdriver and hammer, install the rear snap ring.


RM0075

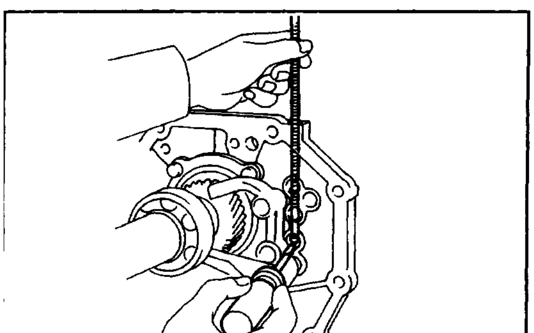
16.–2(4WD)
INSTALL SLEEVE TO OUTPUT SHAFT

Using a plastic hammer, drive in the sleeve onto the out–put shaft.


RM0080

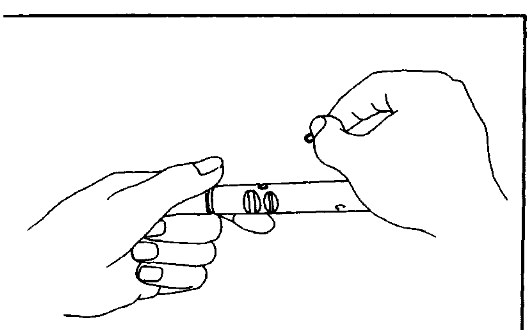
17. INSTALL SHIFT FORK SHAFT NO.4, REVERSE SHIFT HEAD AND SHIFT FORK NO.3

(a) Place the shift fork No.3 into the groove of hub sleeve No. 3.
(b) Install the shift fork shaft No.4 to shift fork No.3, re–verse shift head and shift fork through the interme–diate plate.
(c) Install the locking ball into the reverse shift head.

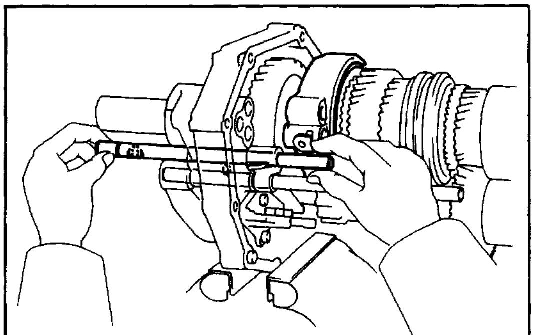

RM0081

18. INSTALL SHIFT FORK SHAFT NO.3 AND SHIFT FORK NO. 1

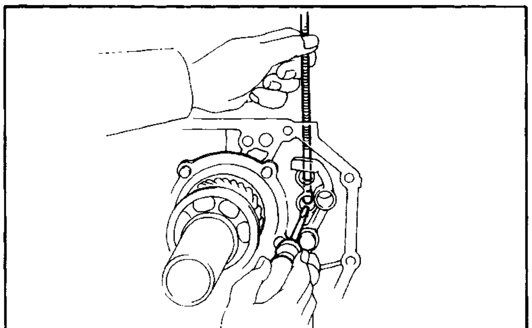
(a) Using a magnetic finger and screwdriver, install the locking ball into the intermediate plate.


RM0045

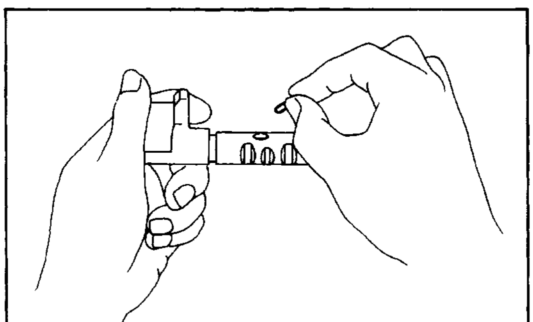
(b) Install the interlock pin into the shaft hole.


RM0094

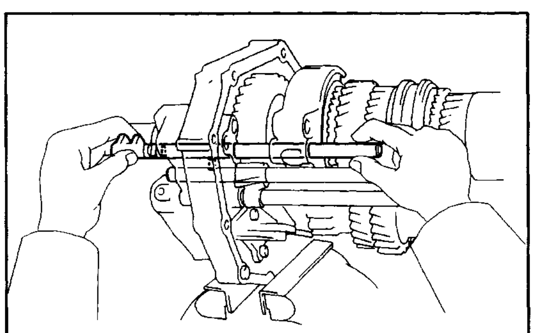
(c) Place the shift fork No.1 into the groove of hub sleeve No. 1.
(d) Install the fork shaft No.3 to the reverse shift fork and shift head through the intermediate plate.


RM0082

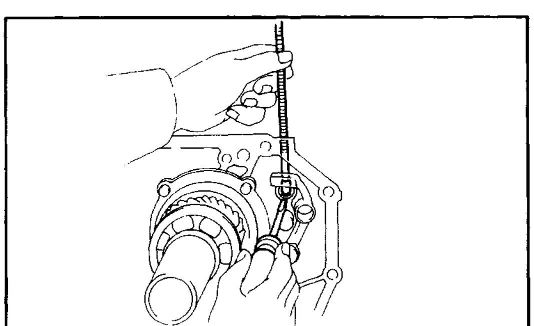
19. INSTALL SHIFT FORK SHAFT NO. 1
(a) Using a magnetic finger and screwdriver, install the interlock pin into the intermediate plate.


RM0046

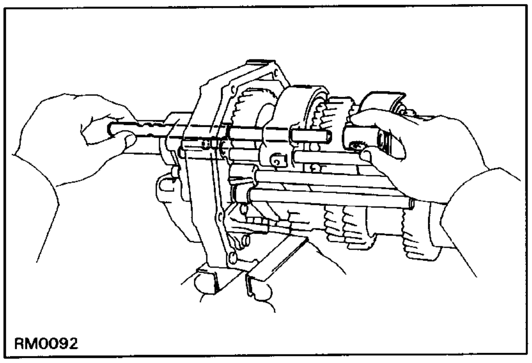
(b) Install the interlock pin into the shaft hole.


RM0093

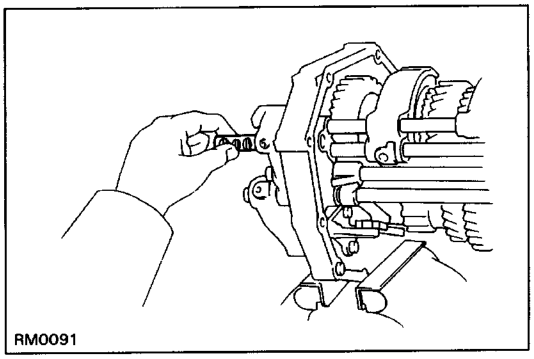
(c) Install the fork shaft No. 1 to shift fork No .1 through the intermediate plate.


RM0083

20. INSTALL SHIFT FORK SHAFT NO.2 AND SHIFT FORK
(a) Using a magnetic finger and screwdriver, install the interlock into the intermediate plate.

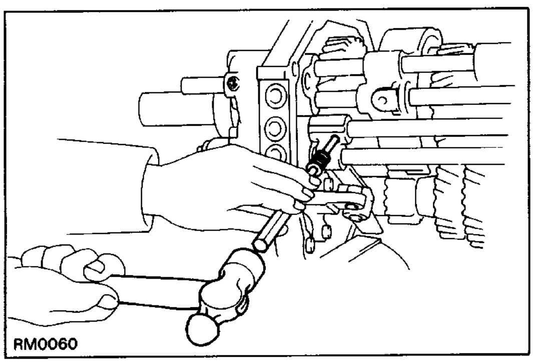


(b) Place the shift fork No.2 into the groove of hub sleeve No.2.
(c) Install fork shaft No.2 to shift fork No.1 and No.2 through the intermediate plate.



21. INSTALL SHIFT FORK SHAFT NO.5

Install the shift fork shaft No.5 to reverse shift head through the intermediate plate.

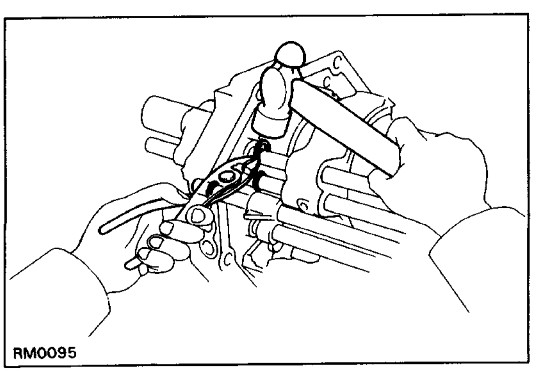


22. INSTALL SLOTTED SPRING PINS

Using a pin punch and hammer, drive in the two slotted spring pins to the reverse shift head and shift fork.

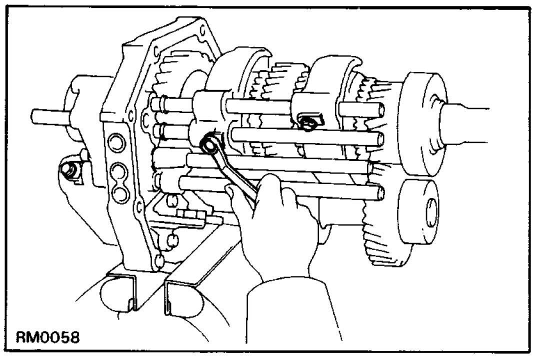
23. CHECK INTERLOCK

(a) Shift fork shaft No. 1 to the 1 st speed position.
(b) No.2, No.3, No.4 and No.5 fork shafts should not move.



24. INSTALL SNAP RINGS

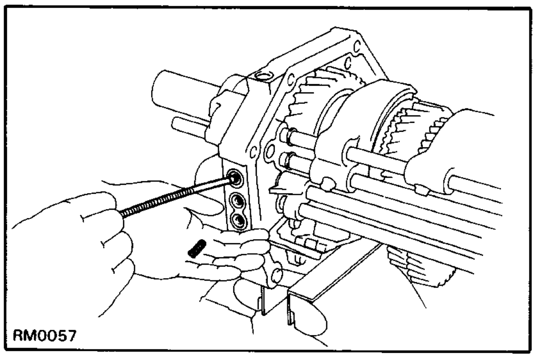
Using pliers and a hammer, install the three snap rings.


RM0058

25. INSTALL SET BOLTS

Install and torque the three bolts.

Torque: 20 N–m (200 kgf–cm, 14 ft–lbf)

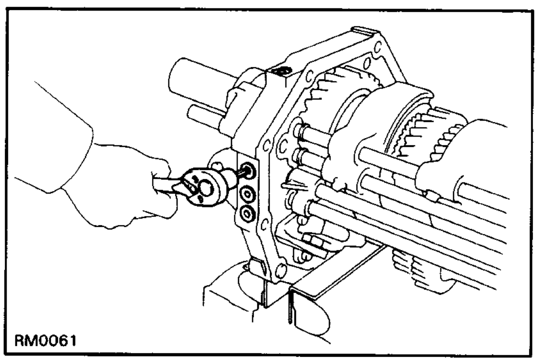

RM0057

26. INSTALL LOCKING BALLS, SPRINGS AND SCREW PLUGS

(a) Apply liquid sealer to the plug threads.

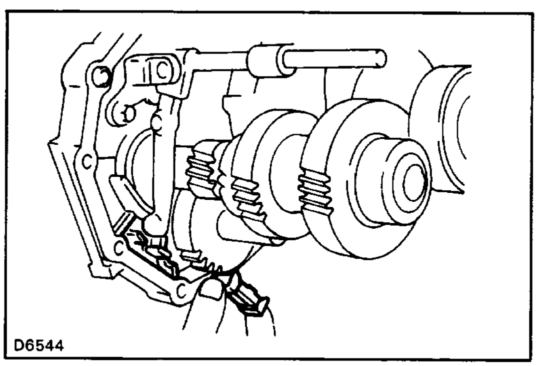
Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(b) Install the four locking balls, springs and screw plugs.


RM0061

(c) Using a torx socket wrench, torque the screw plugs. (Torx socket wrench T40 09042–00020)

Torque: 19 N – m (190 kgf – cm, 14 ft – lbf)

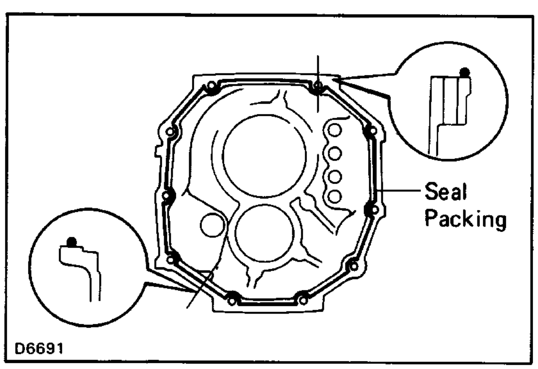

D6544

27. INSTALL MAGNET TO INTERMEDIATE PLATE

28. DISMOUNT INTERMEDIATE PLATE FROM VISE

(a) Dismount the intermediate plate from the vise.

(b) Remove the bolts, nuts and plate washers.



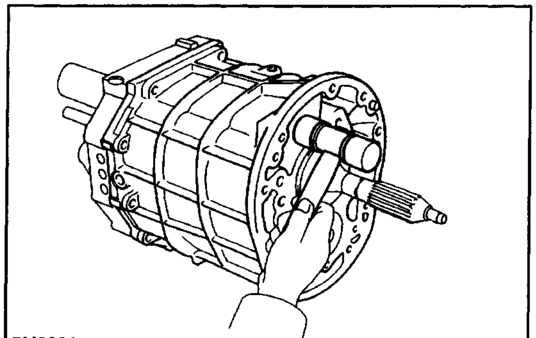
D6691

29. INSTALL TRANSMISSION CASE

(a) Remove the any packing material and be careful not to drop oil on the contacting surfaces of the interme–diate plate or transmission case.

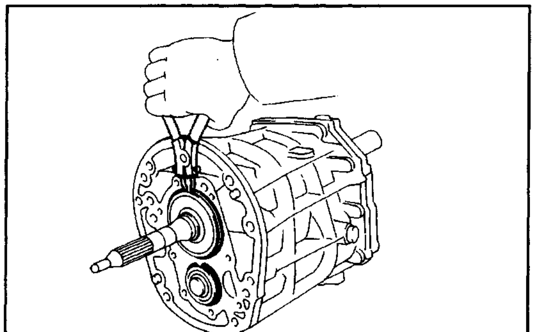
(b) Apply seal packing to the transmission case as shown.

Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent


RM0084

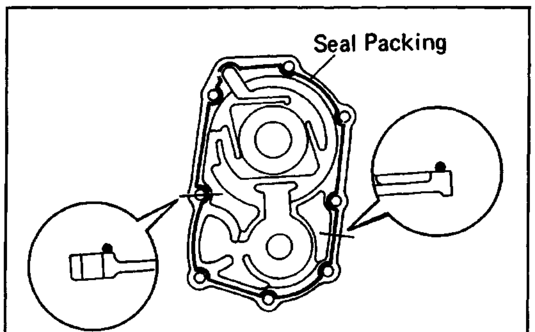
(c) Align the each bearing outer race, each fork shaft end and reverse idler gear shaft end with the case in–stallation holes, and install the case.

If necessary, tap on the case with a plastic hammer.


RM0056

30. INSTALL BEARING SNAP RINGS

Using a snap ring expander, install the two snap rings to the input shaft bearing and counter gear front bearing.



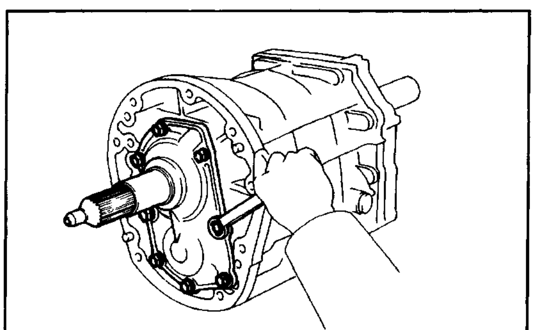
D6696

31. INSTALL FRONT BEARING RETAINER

(a) Remove the any packing material and be careful not to drop oil on the contacting surfaces of the front bearing retainer or transmission case.

(b) Apply seal packing to the retainer as shown.

Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent

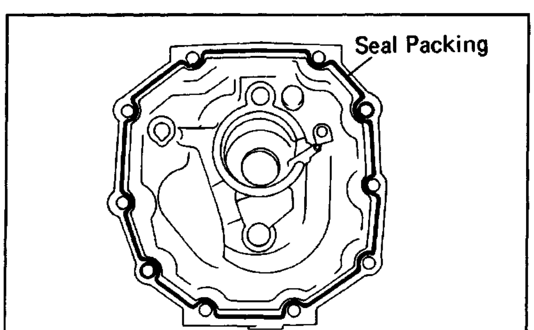

RM0039

(c) Apply liquid sealer to the bolt threads.

Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(d) Install and torque the bolts.

Torque: 17 N – m (170 kgf – cm, 12 ft – lbf)



RM0047

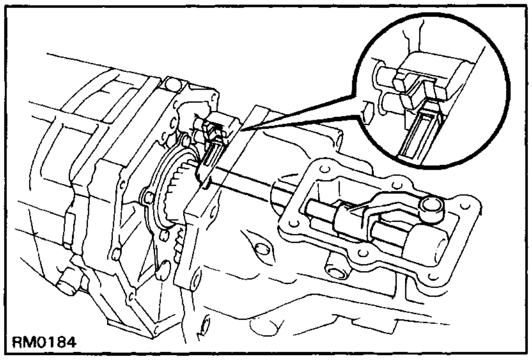
32.–1 (2WD)

INSTALL EXTENSION HOUSING, SHIFT AND SELECT LEVER AND SHIFT LEVER HOUSING

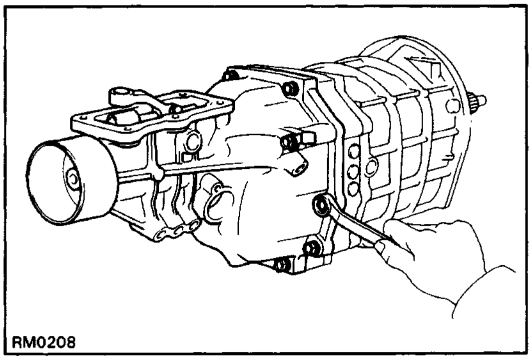
(a) Remove the any packing material and be careful not to drop oil on the contacting surfaces of the exten–sion housing or transmission case.

(b) Apply seal packing to the extension housing as shown.

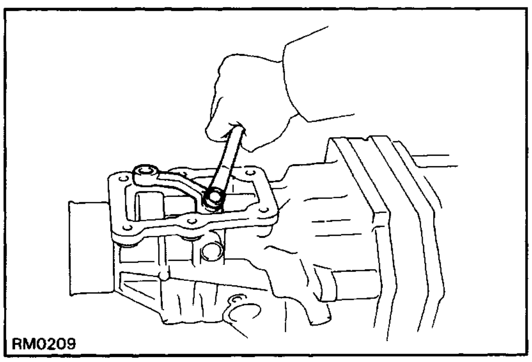
Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent


RM0184

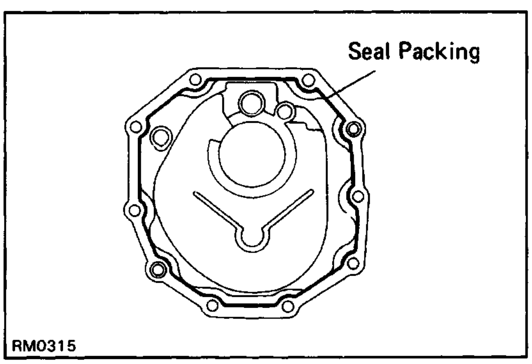
(c) Install the shift and select lever into the extension housing.
(d) Connect the shift and select lever to the fork shaft and put in the shift lever housing.
(e) Align the fork shaft No.5 to the extension housing installation hole and push in the extension housing.


RM0208

(f) Install and torque the extension housing bolts.
Torque: 37 N–m (380 kgf–cm, 27 ft–lbf)


RM0209

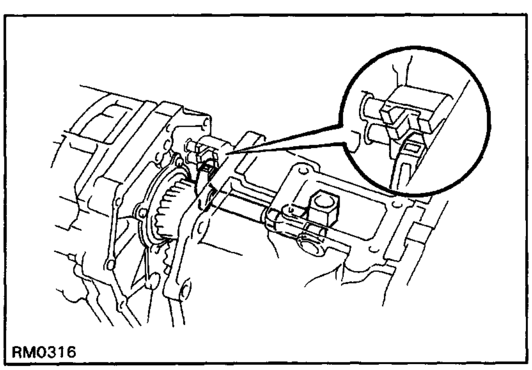
(g) Install and torque the shift lever housing bolt.
Torque: 38 N–m (390 kgf–cm, 28 ft–lbf)



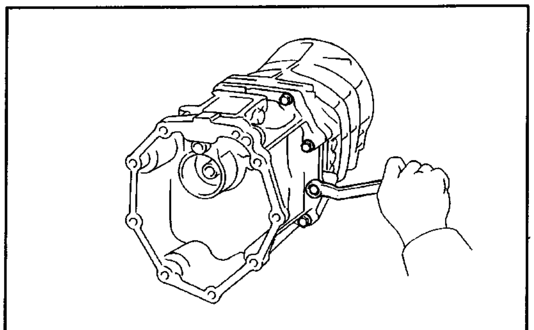
RM0315

32.–2(4WD)
INSTALL TRANSFER ADAPTOR, SHIFT LEVER SHAFT AND SHIFT LEVER HOUSING

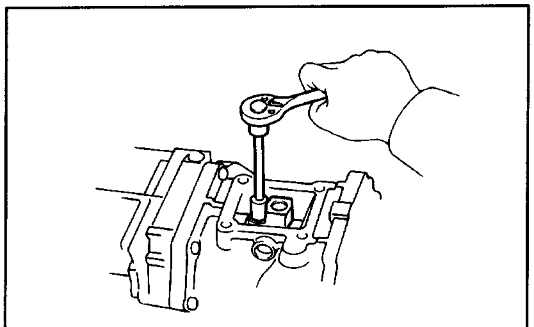
(a) Remove the any packing material and be careful not to drop oil on the contacting surfaces of the transfer adaptor or transmission case.
(b) Apply seal packing to the transfer adaptor as shown.
Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent


RM0316

(c) Install the shift and select lever into the transfer adaptor.
(d) Connect the shift and select lever to the fork shaft and put in the shift lever housing.
(e) Align the fork shaft No.5 to the transfer adaptor installation hole and push in the transfer adaptor.

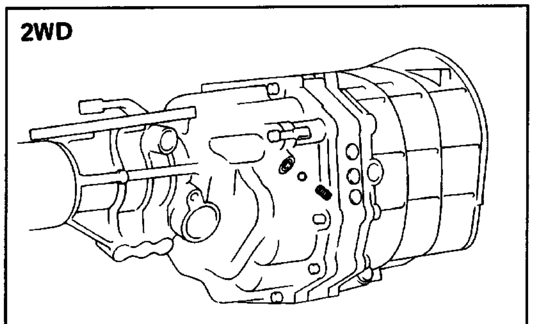

RM0310

(f) Install and torque the bolts.
Torque: 37 N–m (380 kgf–cm, 27 ft–lbf)

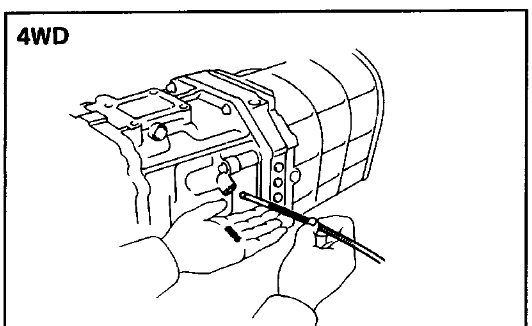

RM0309

(g) Install and torque the shift lever housing bolt.
Torque: 38 N–m (390 kgf–cm, 28 ft–lbf)
(h) Apply liquid sealer to the plug threads.
Sealant: Part No. 08833–00080, THREE BOND 1344,
LOCTITE 242 or equivalent

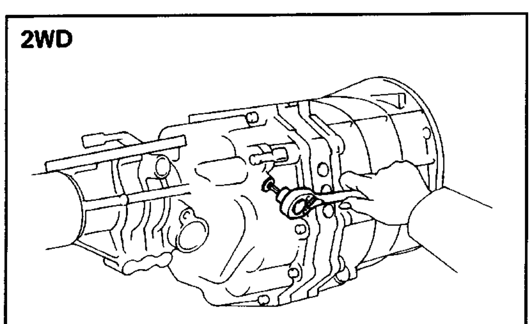
33. INSTALL LOCKING BALL, SPRING AND SCREW PLUG
(a) Apply liquid sealer to the plug threads.
Sealant: Part No. 08833–00080, THREE BOND 1344,
LOCTITE 242 or equivalent
(b) Install the locking ball, spring and plug.



RM0167

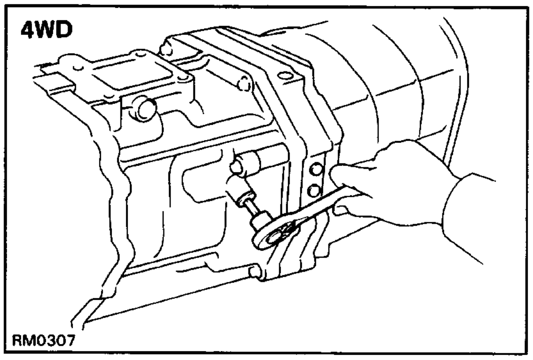


RM0308



RM0166

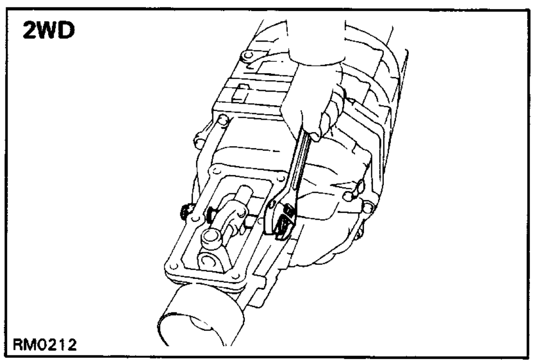
(c) Torque the plug.
(Torx socket wench T40 09042–00020)
Torque: 19 N – m (190 kgf – cm, 14 f t – lbf)

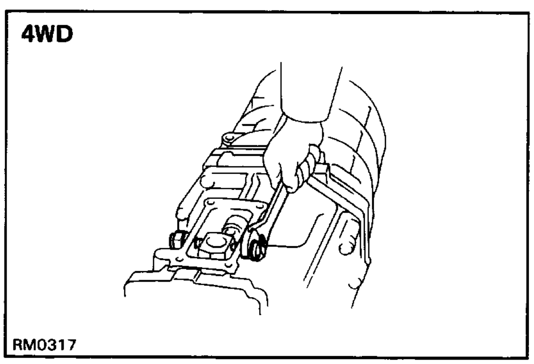


34. AFTER INSTALLING EXTENSION HOUSING OR TRANSFER ADAPTOR CHECK FOLLOWING ITEMS

(a) Check to see that the input and output shafts rotate smoothly.

(b) Check to the that shifting can be made smoothly to all positions.



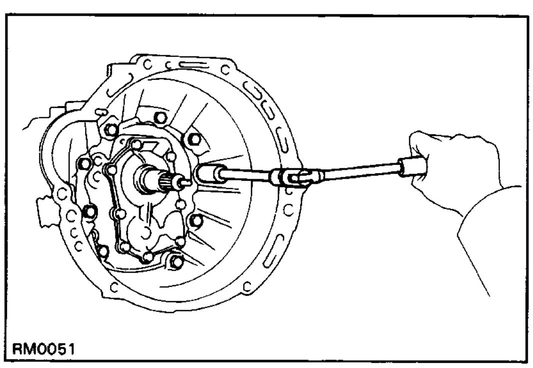


35. INSTALL RESTRICT PINS

(a) Install the black pin on the reverse gear/5th gear side.

(b) Install another pin and torque the pins.

Torque: 37 N–m (380 kgf–cm, 27 ft–lbf)

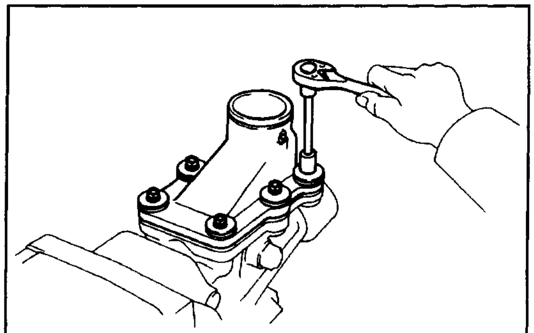


36. INSTALL CLUTCH HOUSING

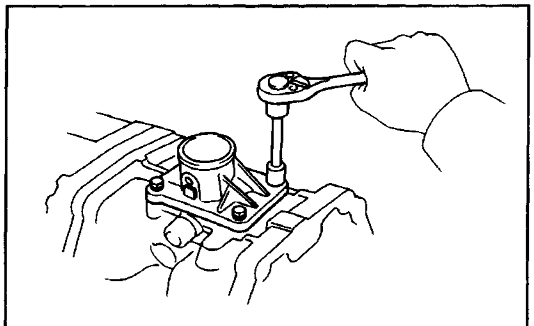
(a) Install the clutch housing.

(b) Install and torque the nine bolts.

Torque: 36 N–m (370 kgf–cm, 27 ft–lbf)


RM0326

37.–1 (2WD)
INSTALL SHIFT LEVER RETAINER
Torque: 16 N–m (160 kgf –cm, 12 ft–lbf)


RM0318

37.–2(4WD)
INSTALL SHIFT LEVER RETAINERS WITH NEW GASKETS

(a) Apply liquid sealer to the bolt threads.
Sealant: Part No, 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent
(b) Install the torque the four bolts.
Torque: 18 N – m (185 kgf – cm, 13 ft – lbf)

38. INSTALL BACK–UP LIGHT SWITCH
Torque: 37 N–m (380 kgf–cm, 27 ft–lbf)

39. (2WD)
INSTALL SPEEDOMETER DRIVEN GEAR

(a) Install speedometer driven gear and lock plate.
(b) Install and torque the bolt.
Torque: 11 N–m (115 kgf–cm, 8 ft–lbf)

40. INSTALL RELEASE FORK AND BEARING
(See page CL–14)

W55 AND W56 MANUAL TRANSMISSION

DESCRIPTION

MX00F–02

PRECAUTIONS

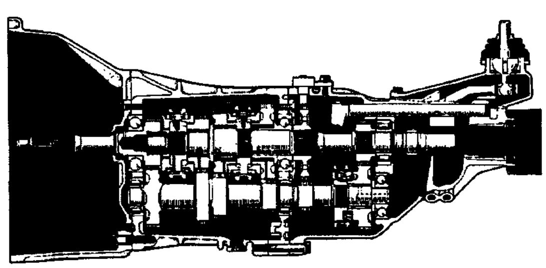
When working with FIPG material, you must be observe the following.

- **Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces.**
- **Thoroughly clean all components to remove all the loose material.**
- **Clean both sealing surfaces with a non–residue solvent.**
- **Apply the seal packing in approx. 1 mm (0.04 in.) bead along the sealing surface.**
- **Parts must be assembly within 10 minutes of application. Otherwise, the packing (FIPG) material must be removed and reapplied.**

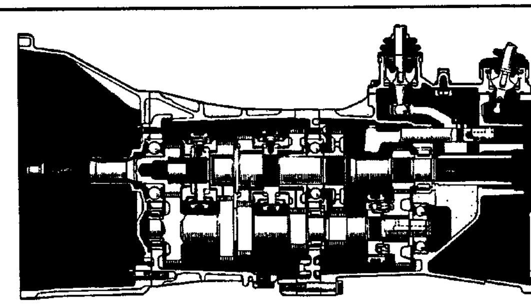
MT002–02

DESCRIPTION

- The W55 and W56 manual transmissions are three–shift type, having an input shaft, output shaft and counter gear. Power is transmitted from the input shaft to the counter gear, and then to the output shaft which is co–axially fitted to the input shaft. The input shaft and the output shaft are engaged directly to each other in the 4th gear position.
- The 1 st through 5th gears are constant mesh gears which use an inertia lock key type synchromesh mechanism. The reverse gear is a sliding mesh gear which is engaged by sliding the idler gear.
- W55 and W56 are manual transmissions use a single–cone synchromesh mechanism foi the reverse gear.



Q03080



Q03081

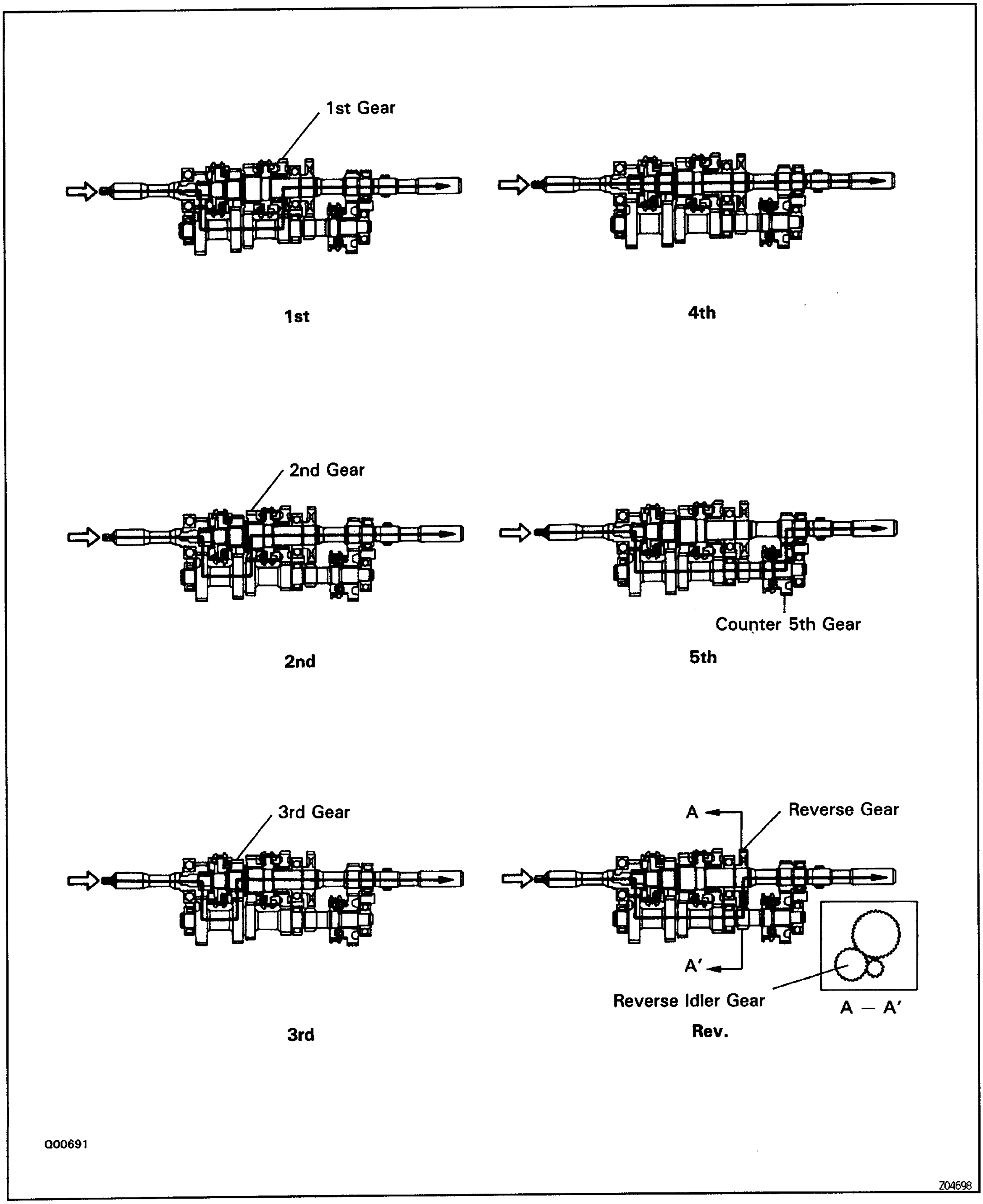
Type of Transmission		W55	W56
Type of Engine		22R–E	
Gear Ratio	1st	3.566	3.954
	2nd	2.056	2.141
	3rd	1.384	←
	4th	1.000	←
	5th	0.850	←
	Reverse	4.091	←
Oil Capacity		2.6 liters (2.7 US.qts, 2.3 Imp.qts)	2.9 liters (3.0 US.qts, 2.6 Imp–qts)
Oil Viscosity		SAE 75W–90 or 80W–90	
Oil Grade		API GL–4	

20469,

OPERATION

MT003–02

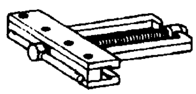
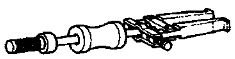
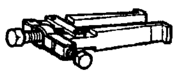
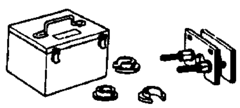
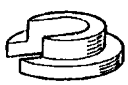
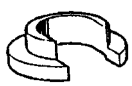
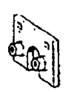
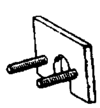
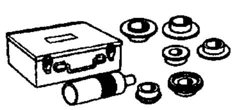
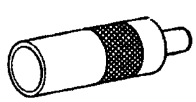
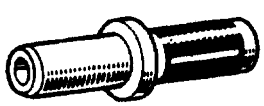
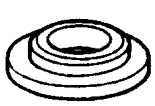
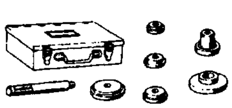
- **The illustrations below show the engagements of transmission gears.**

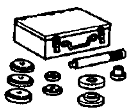
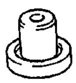
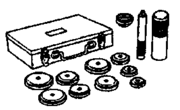
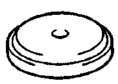
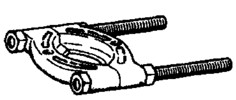
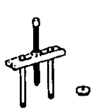
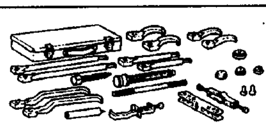


PREPARATION

SST (SPECIAL SERVICE TOOLS)

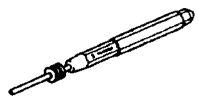
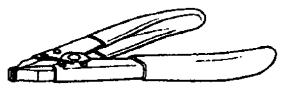
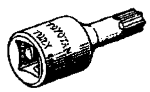
MT004–01

	09213–36020 Timing Gear Remover	
	09308–00010 Oil Seal Puller	
	09308–10010 Oil Seal Puller	
	09312–20011 Transmission Gear Remover & Replacer	
	(09313–00010) Reverse Gear Remover	
	(09313–00030) Rear Bearing Replacer	
	(09313–00040) Plate wAw	
	(09313–00050) Plate wBw	
	09316–60010 Transmission & Transfer Bearing Replacer	
	(09316–00010) Replacer Pipe	
	09325–20010 Transmission Oil Plug	
	09506–35010 Differential Drive Pinion Rear Bearing Replacer	
	09608–12010 Front Hub & Drive Pinion Bearing Replacer Set	

	(09608–00020) Remover & Replacer Handle	
	(09608–00050) Drive Pinion Front Bearing Cup Replacer	
	09608–20012 Front Hub & Drive Pinion Bearing Tool Set	
	(09608–00080) Replacer	
	(09608–03020) Handle	
	09608–35014 Axle Hub & Drive Pinion Bearing Tool Set	
	(09608–06020) Handle	
	(09608–06090) Front Hub Outer & Steering Worm Bearing Replacer	
	(09608–06100) Front Hub Outer Replacer	
	09950–00020 Bearing Remover	
	09950–00030 Bearing Remover Attachment	
	09950–20017 Universal Puller	

MT005–01

RECOMMENDED TOOLS

	09031–00030 Pin Punch	
	09905–00012 Snap Ring No. 1 Expander	
	09042–00020 Torx Socket t40	

MT006–01

EQUIPMENT

Dial indicator or dial indicator with magnetic base	
Torque wrench	

MT007–02

LUBRICANT

Item	Capacity	Classification
Manual transmission	2.6 liters (2.7 US qts, 2.3 Imp.qts)	API GL–4 SAE 75W–90 or 80W–90

MT008–01

SSM (SPECIAL SERVICE MATERIALS)

	08826–00090 Seal Packing 1281, Three bond 1281 or equivalent	Transmission case x Intermediate plate Front bearing retainer x Transmission case
	08833–00080 Adhesive 1344, THREE BOND 1344, LOCTITE 242 or equivalent	Straight screw plug Front bearing retainer bolt

TROUBLESHOOTING

MT009–01

You will find the troubles using the table well shown in this table, each number shows the priority of causes in troubles. Check each part in order. If necessary, replace these parts.

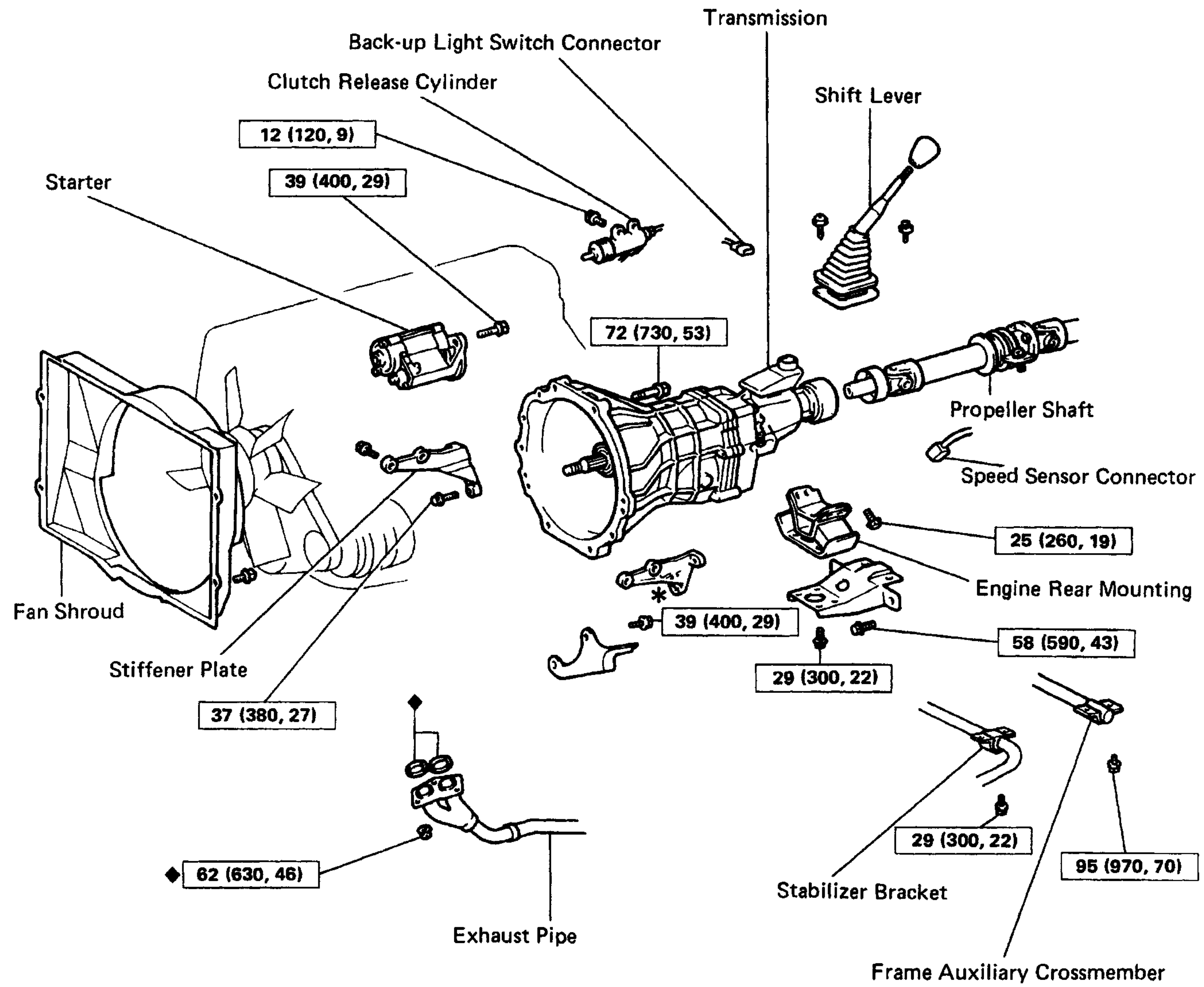
Parts Name	Oil (Level low)	Oil (Wrong)	Oil (Level too high)	Gasket (Damaged)	Oil seal (Worn or damaged)	O–Ring (Worn or damaged)	Locking ball spring (Damaged)	Shift fork (Worn)	Gear (Worn or damaged)	Bearing (Worn or damaged)	Synchronizer ring (Worn or damaged)	Shifting key spring (Damaged)				
See page	–	MT2–2	–	MT2–10	MT2–14	MT2–10	MT2–10,11	MT2–11	MT2–11	MT2–11	MT2–25,33	MT2–25,33				
Trouble																
Noise	1	2							3	3						
Oil leakage			1	2	2	3										
Hard to shift or will not shift											1	2				
Jumps out of gear							1	2	3	3						

V00794

ASSEMBLY REMOVAL AND INSTALLATION

TRANSMISSION REMOVAL AND INSTALLATION

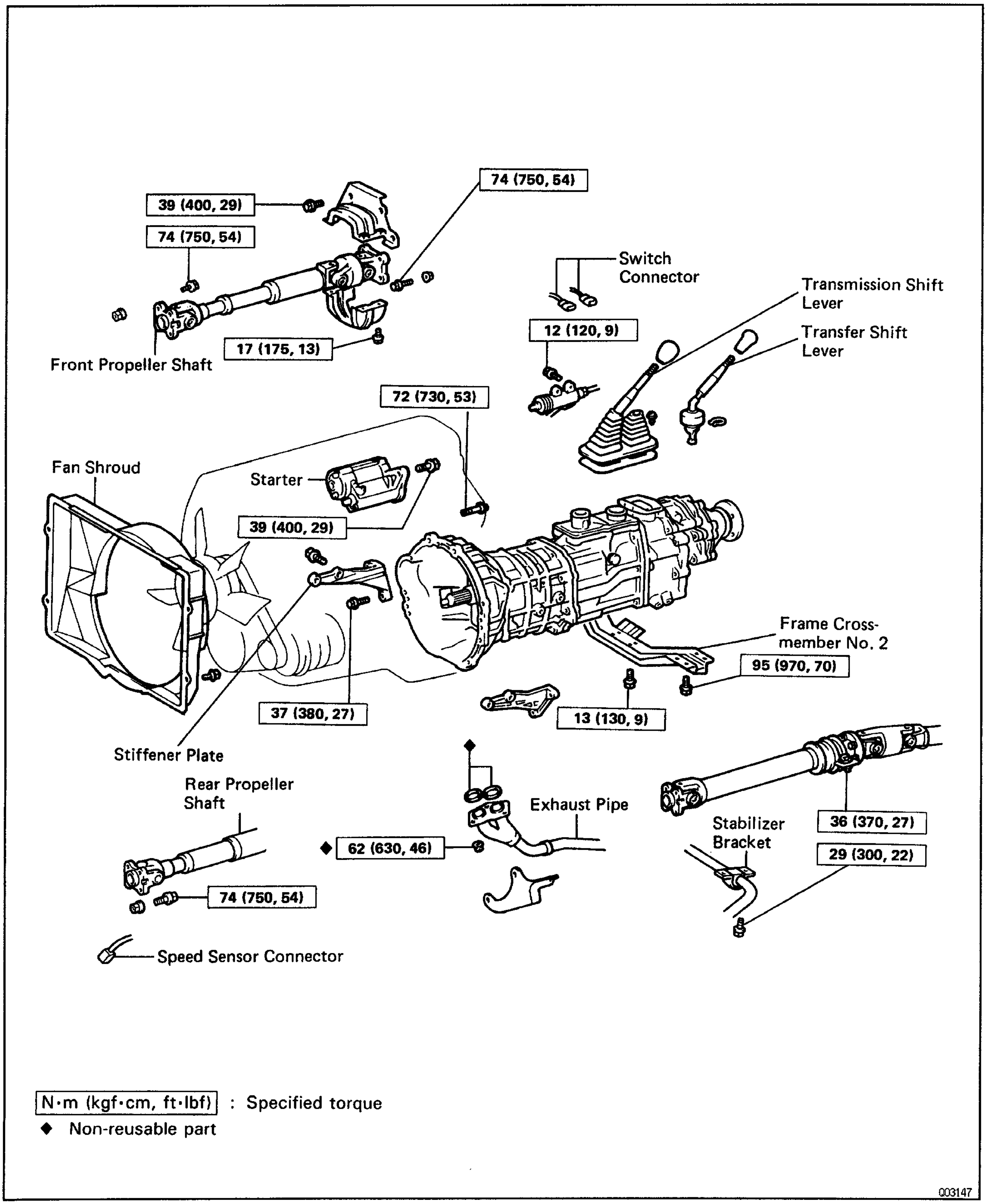
MT0S1–01



N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part

003156

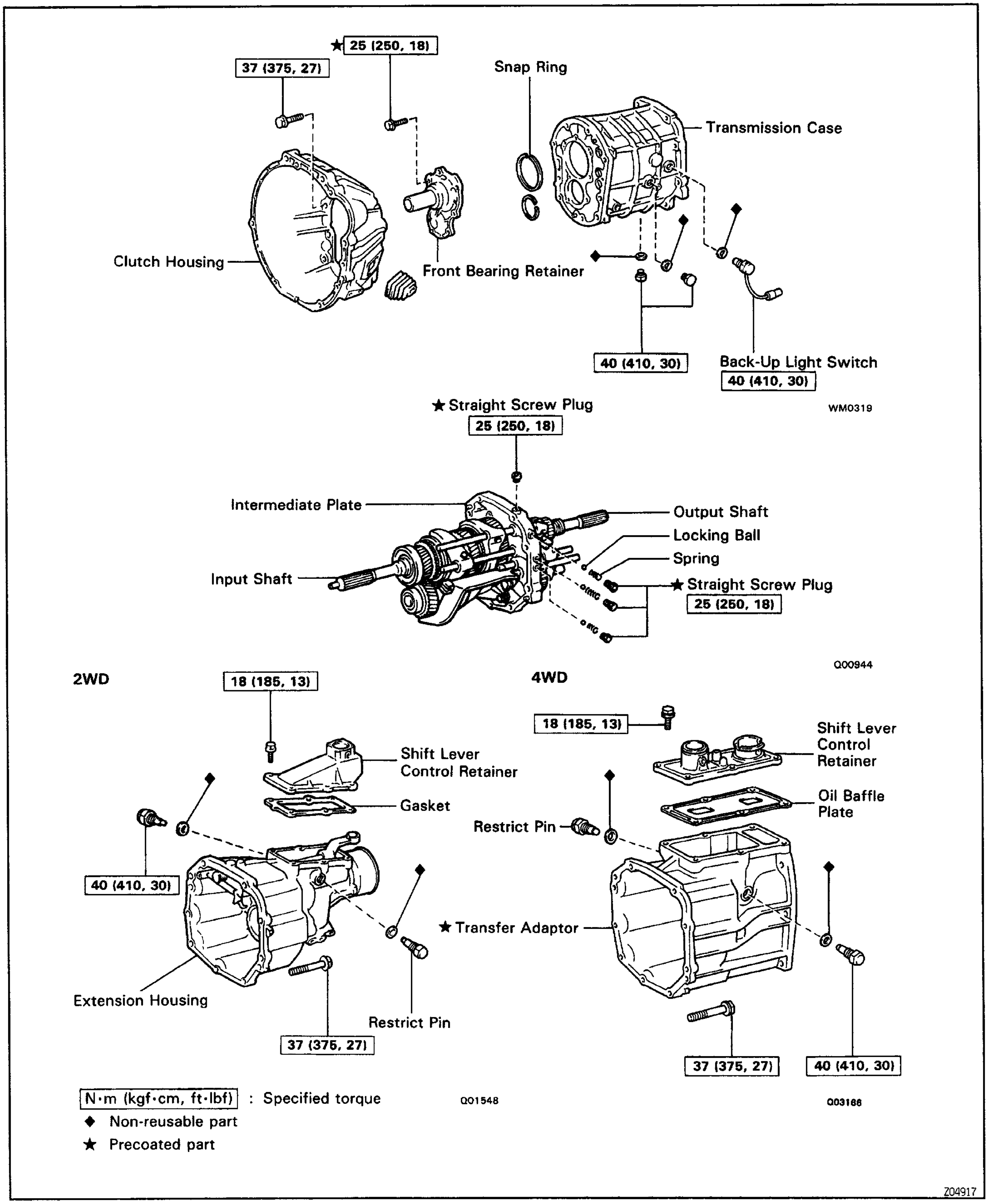
TRANSMISSION WITH TRANSFER REMOVAL AND INSTALLTION

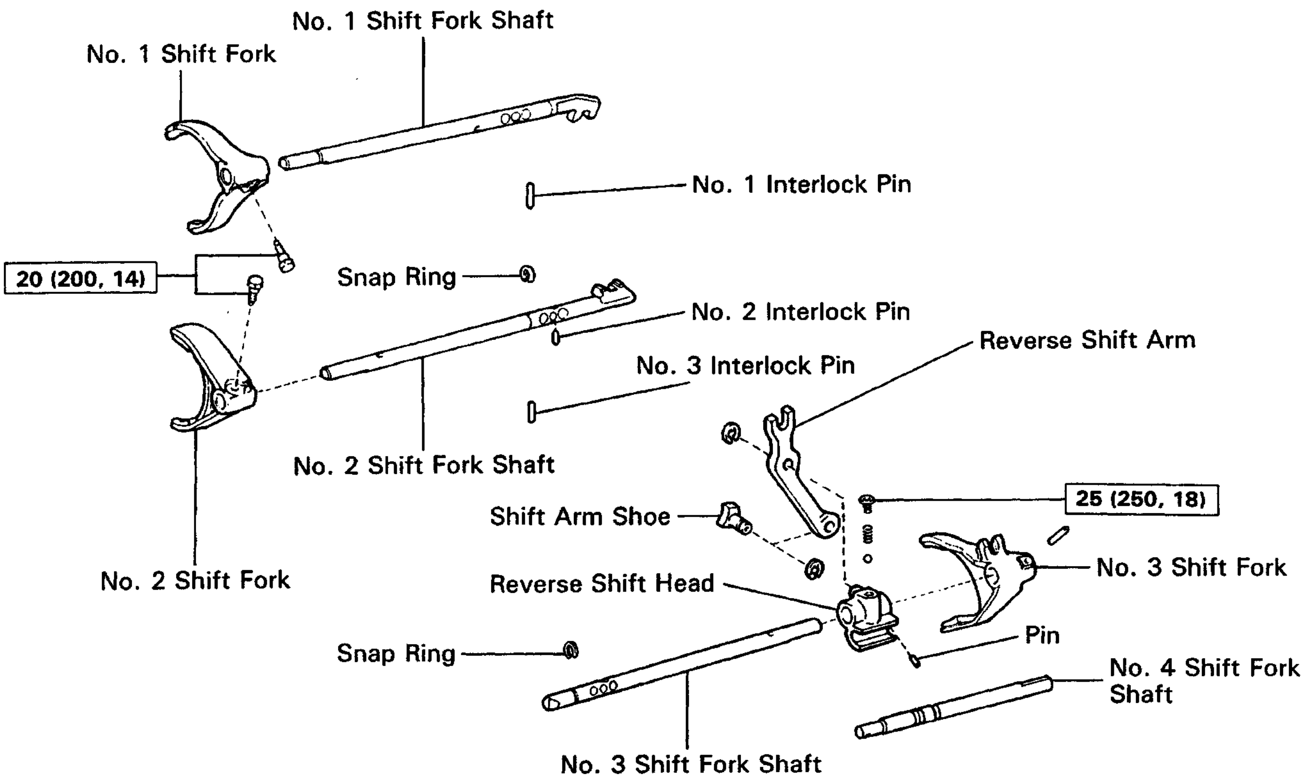


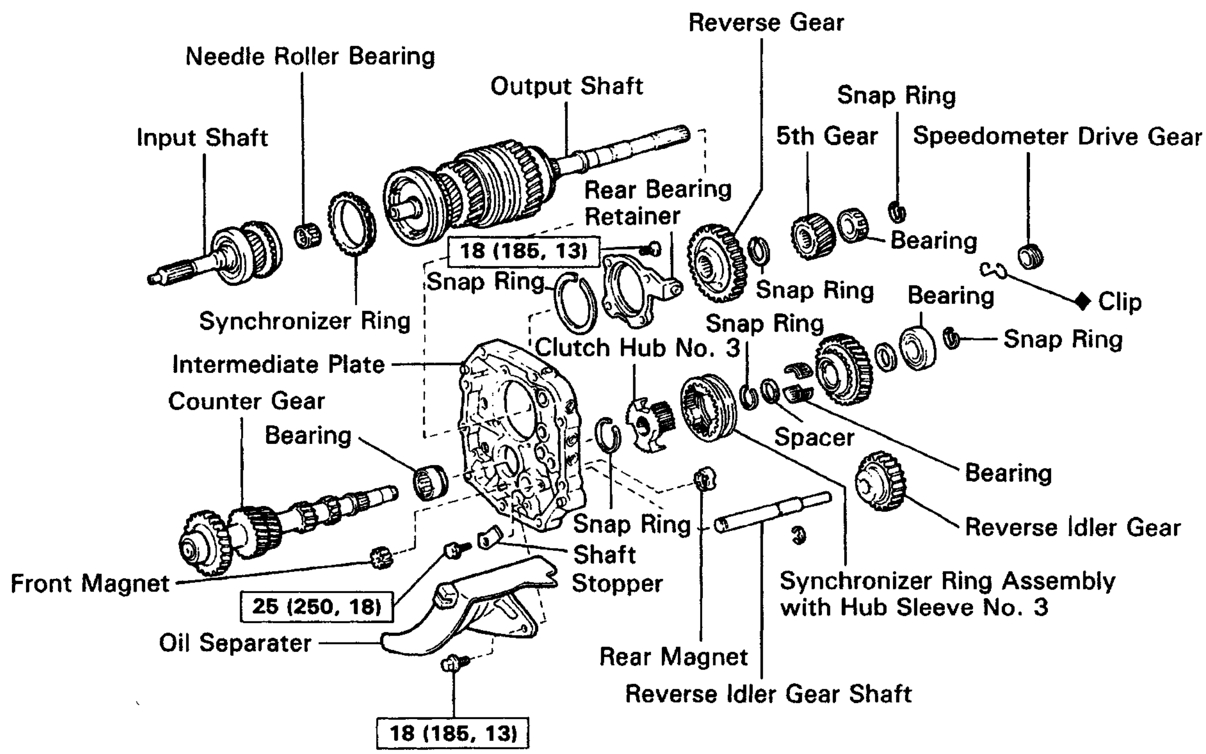
COMPONENT PARTS REMOVAL

MT00D–02

COMPONENTS



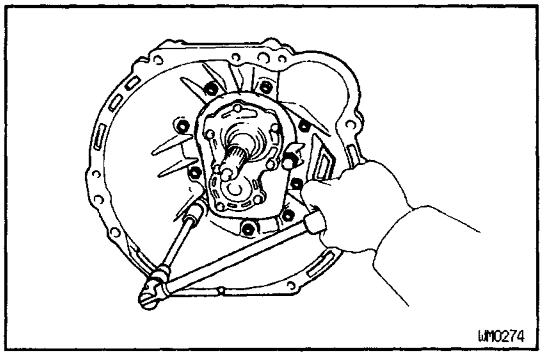




N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

003069



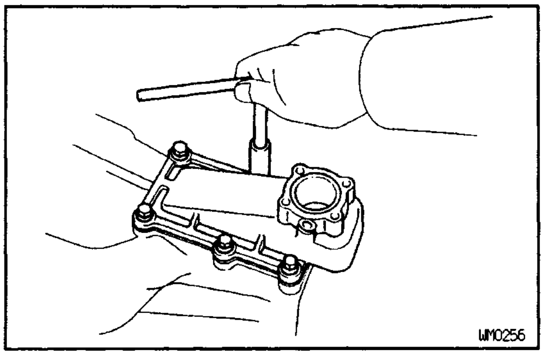
MT00E–02

BASIC SUBASSEMBLY SEPARATION

1. REMOVE BACK – UP LIGHT SWITCH, VEHICLE SPEED SENSOR (2WD) AND ENGINE REAR MOU– NTING

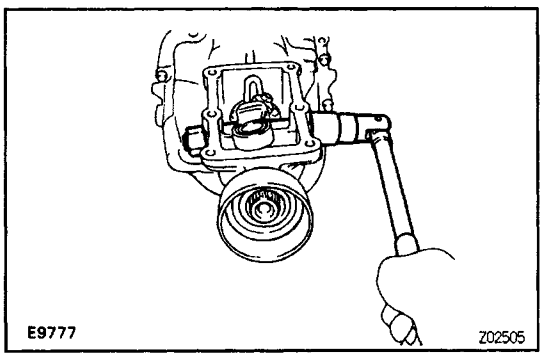
2. REMOVE CLUTCH HOUSING FROM TRANSMIS– SION CASE

Remove the nine bolts and clutch housing from the transmission case.

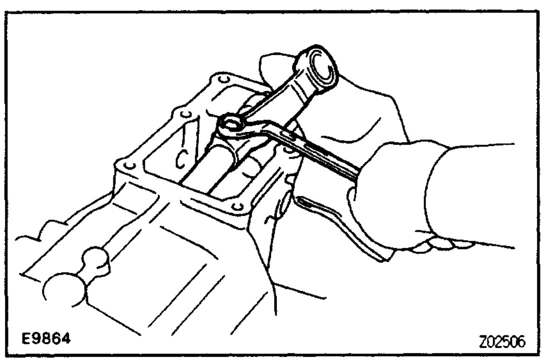


3. (2WD)
REMOVE EXTENSION HOUSING

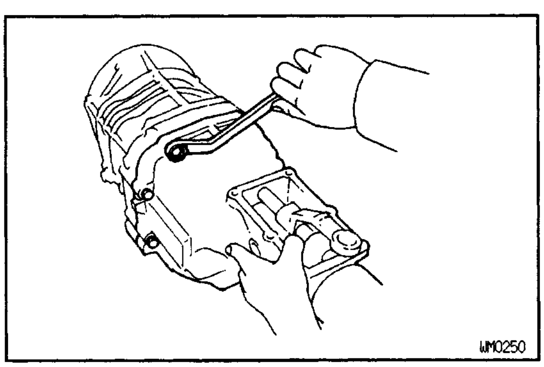
(a) Remove the six bolts.
(b) Remove the shift lever retainer and oil baffle plate.



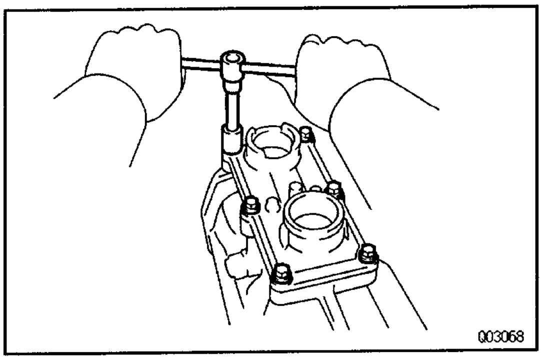
(c) Remove the two restrict pins.



(d) Remove the shift lever housing set bolt.

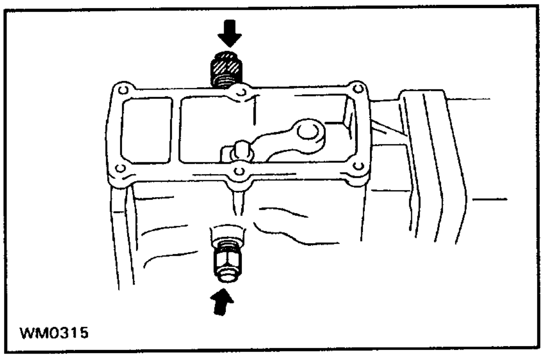


(e) Remove the nine bolts.
(f) Using a plastic hammer, tap the extension housing.
(g) Disengage the shift and select lever from the shift head.
(h) Pull out the extension housing.

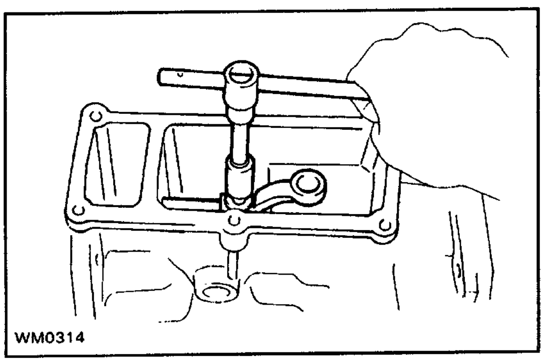


4. (4WD)
REMOVE TRANSFER ADAPTOR

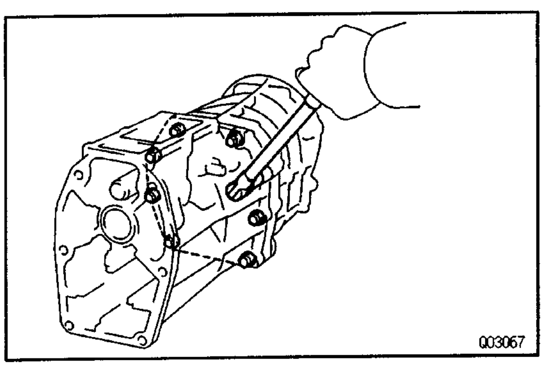
(a) Remove the six bolts, shift lever retainer and gasket.
(b) Remove the select return spring from the shift lever retainer.



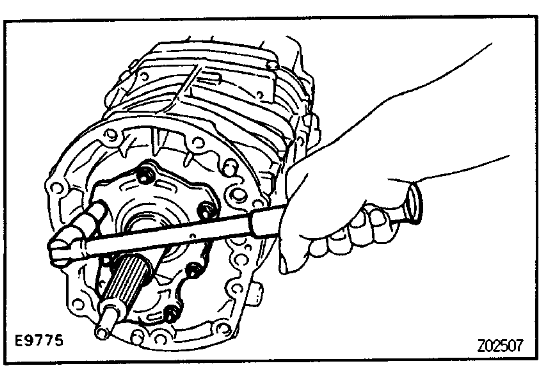
(c) Remove the two restrict pins and gaskets.



(d) Remove the shift lever housing set bolt.

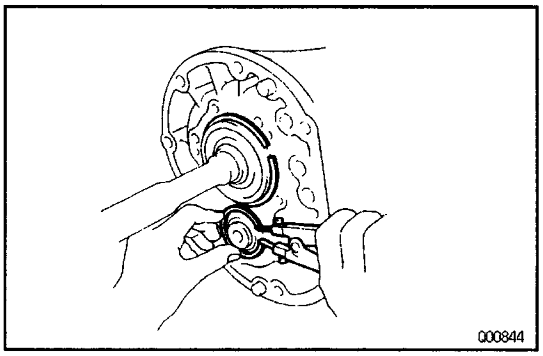


(e) Remove the nine bolts.
(f) Using a plastic hammer, tap the transfer adaptor.
(g) Disengage the shift and select lever from the shift head.
(h) Pull out the transfer adaptor.

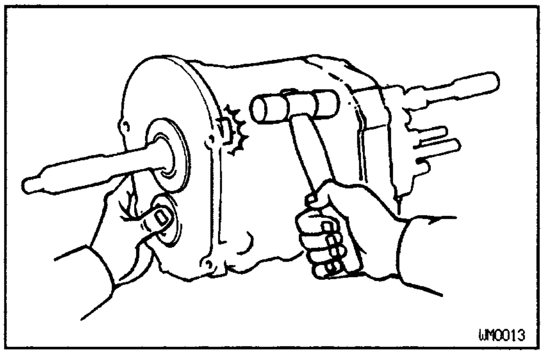


5. REMOVE FRONT BEARING RETAINER AND BEAR–ING SNAP RINGS

(a) Remove the seven bolts and front bearing retainer.



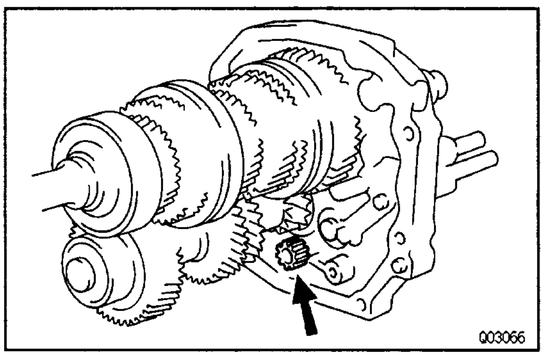
(b) Using a snap ring pliers, remove the two bearing snap rings.



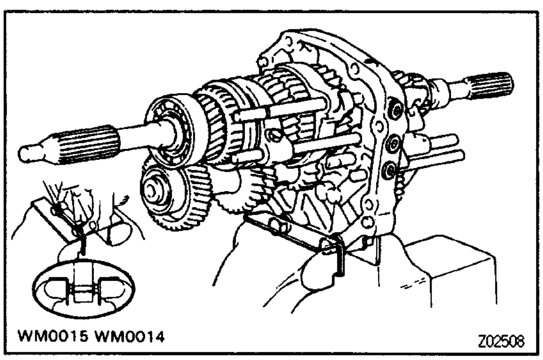
6. SEPARATE INTERMEDIATE PLATE FROM TRANS–MISSION CASE

(a) Using a plastic hammer, carefully tap the transmission case.

(b) Pull the transmission case from the intermediate plate.



7. REMOVE FRONT MAGNET

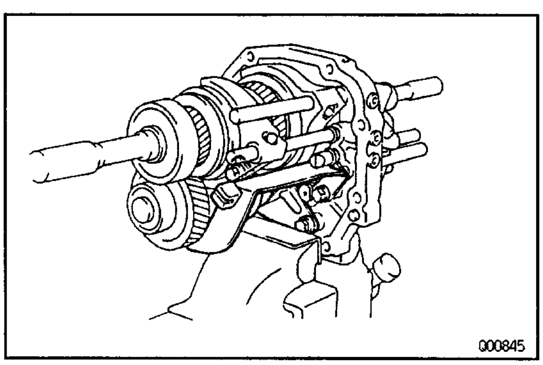


8. MOUNT INTERMEDIATE PLATE IN VISE

(a) Use two long clutch housing bolts, plate washers and suitable nuts as shown.

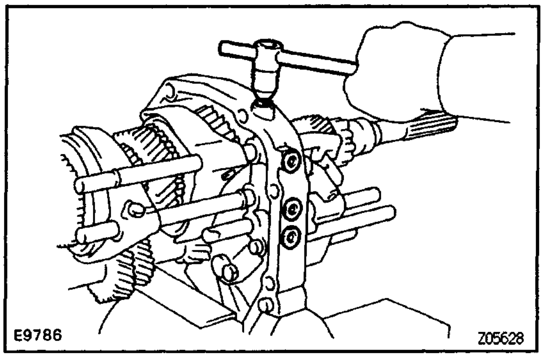
NOTICE: Install the plate washers in reverse of normal. Increase or decrease plate washers so that the bolt tip and the front tip surface of the nut are aligned.

(b) Mount the intermediate plate in a vise.



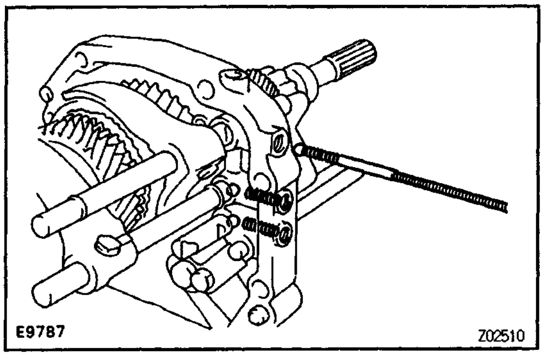
9. REMOVE OIL SEPARATOR

Remove the two bolts and oil receiver.

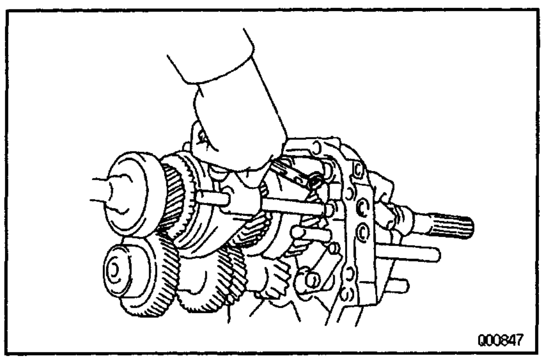


10. REMOVE LOCKING BALL AND SPRING

(a) Using a hexagon wrench, remove the four plugs.

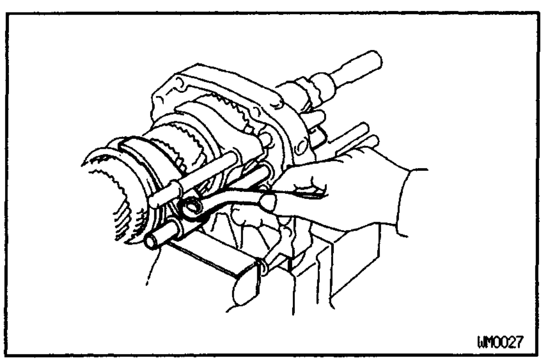


(b) Using a magnetic finger, remove the three springs and balls.

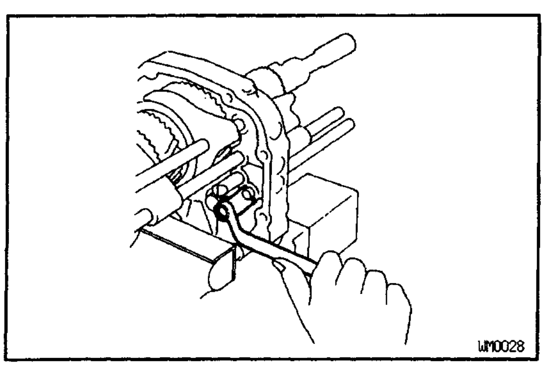


11. REMOVE SHIFT FORKS, SHIFT FORK SHAFTS AND REVERSE IDLER GEAR

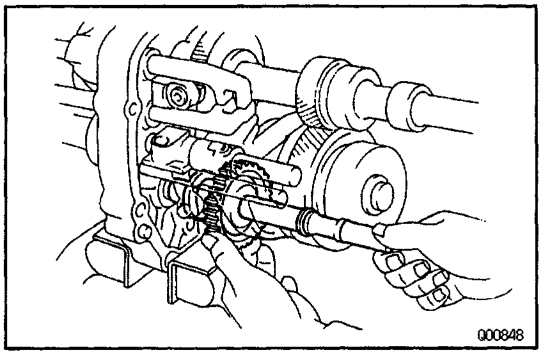
(a) Remove the No. 1 shift fork set bolt.



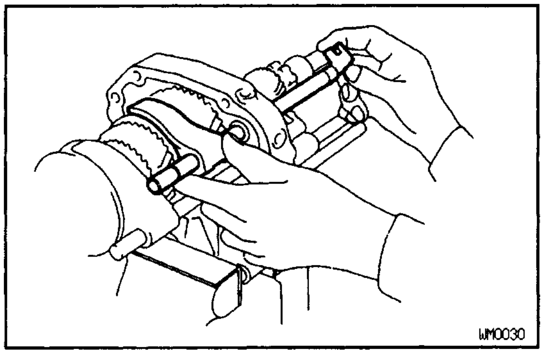
(b) Remove the No.2 shift fork set bolt.



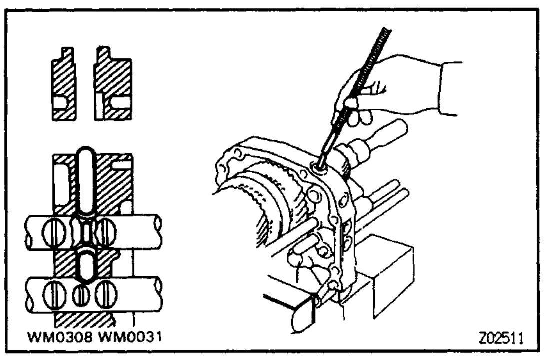
(c) Remove the reverse idler gear shift stopper.



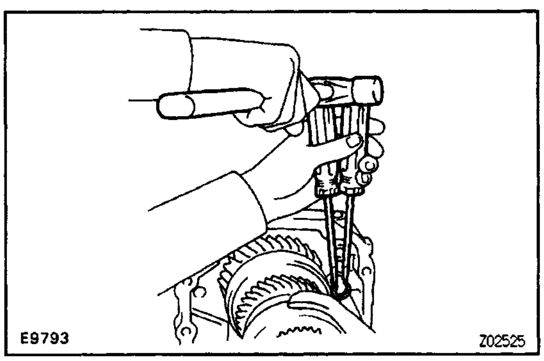
(d) Remove the reverse idler gear and shaft.



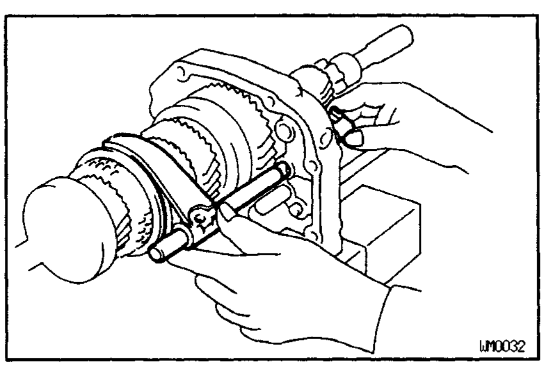
(e) Remove the No.1 shift fork and shaft.



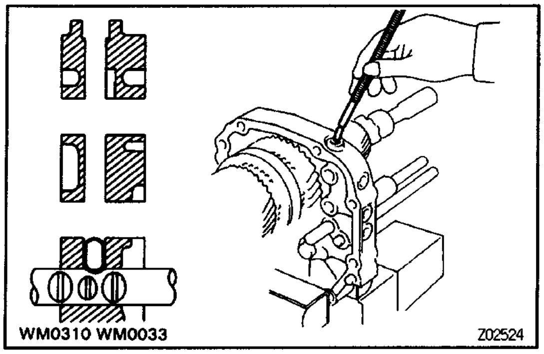
(f) Using a magnetic finger, remove the No–1 and No.2 interlock pins.



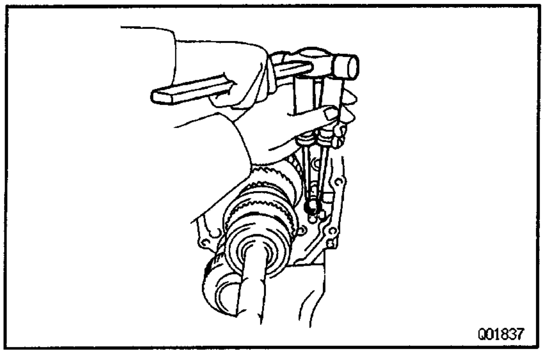
(g) Using two screwdrivers and a hammer, tap out the snap ring from the No.2 fork shaft.



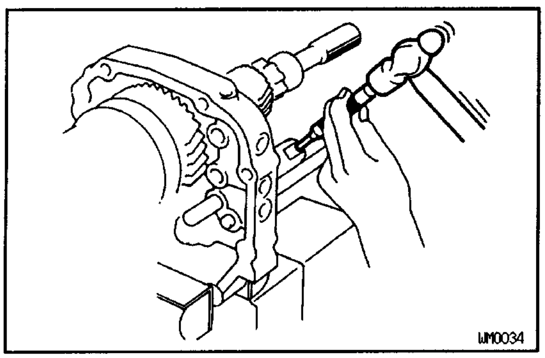
(h) Remove the No.2 shift fork and shaft.



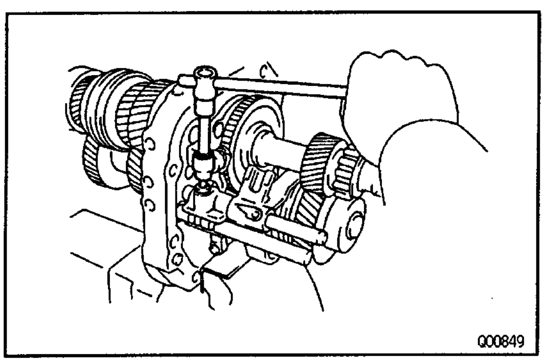
(i) Using a magnetic finger, remove the No.3 interlock pin.



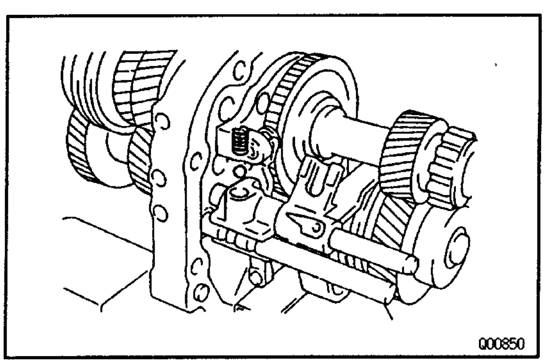
(j) Using two screwdrivers and a hammer, tap out the snap ring from the No.3 fork shaft.



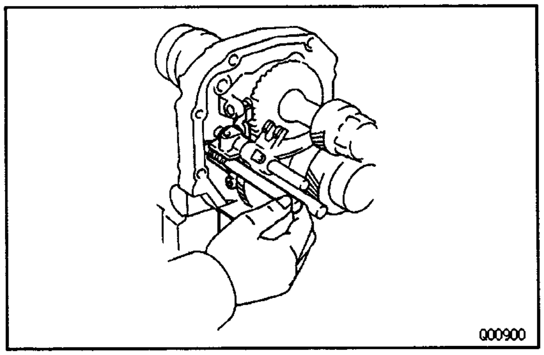
(k) Using a pin punch and hammer, drive out the slotted spring pin from the No.3 shift fork.



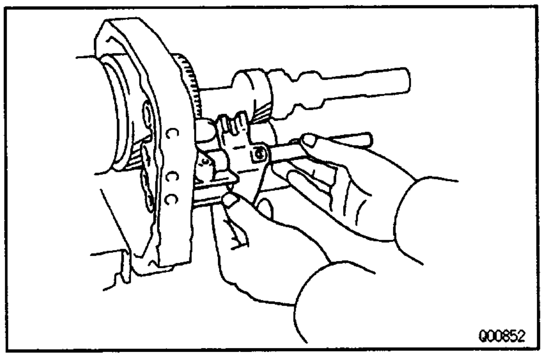
(l) Using a hexagon wrench, remove the plug.



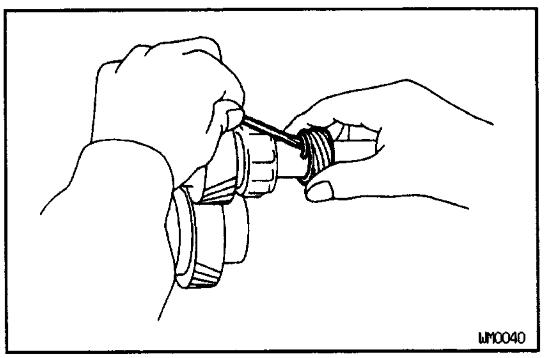
(m) Using a magnetic finger, remove the spring and ball.



(n) Pull out the No.4 shift fork shaft.
(o) Remove the interlock pin.

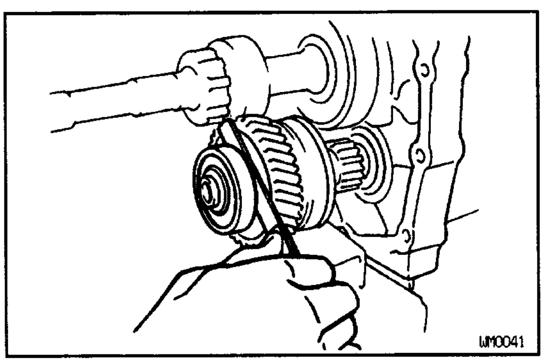


(p) Remove the No.3 shift fork, fork shaft and reverse shift arm with the pin.



12. (2WD)
REMOVE SPEED SENSOR DRIVE GEAR

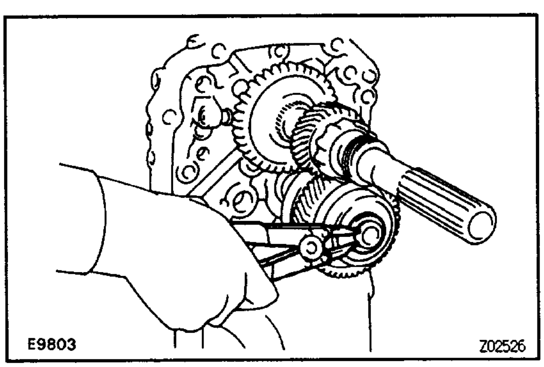
Pry out both ends of the clip and remove the drive gear.



13. INSPECT COUNTER FIFTH GEAR THRUST CLEAR–ANCE

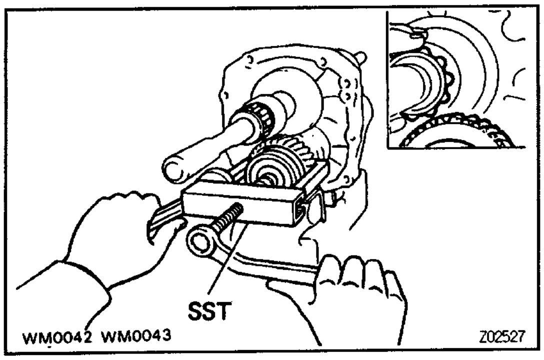
Using feeler gauge, measure the counter 5th gear thrust clearance.

Standard clearance:
0.10–0.41 mm (0.0039–0.0161 in.)
Maximum clearance:
0.46 mm (0.0181 in.)



14. REMOVE COUNTER REAR BEARING, SPACER, COUNTER FIFTH GEAR AND NEEDLE ROLLER BEARING

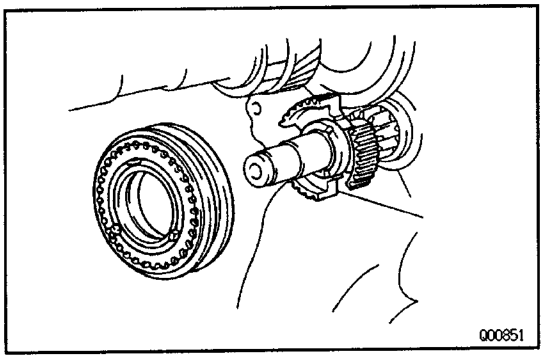
(a) Using a snap ring expander, remove the snap ring.



(b) Using SST, remove the rear bearing, spacer, 5th gear and bearing.
SST 09213–36020

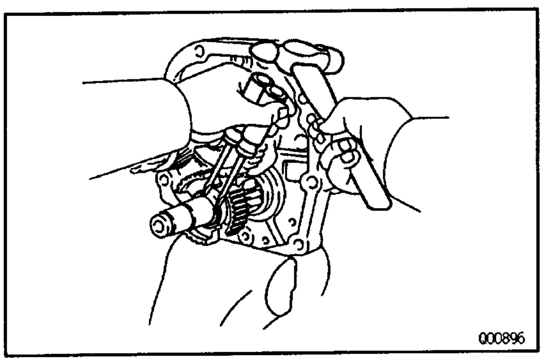
NOTICE: Be careful not to catch the output shaft rear bearing roller on the counter 5th gear.

(c) Remove the spacer.



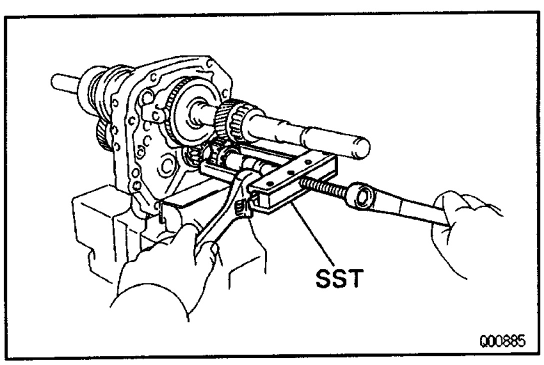
15. REMOVE SYNCHRONIZER RING ASSEMBLY WITH NO.3 HUB SLEEVE AND NO.3 CLUTCH HUB

(a) Remove the synchronizer ring assembly with No.3 hub sleeve from the No.3 clutch hub.

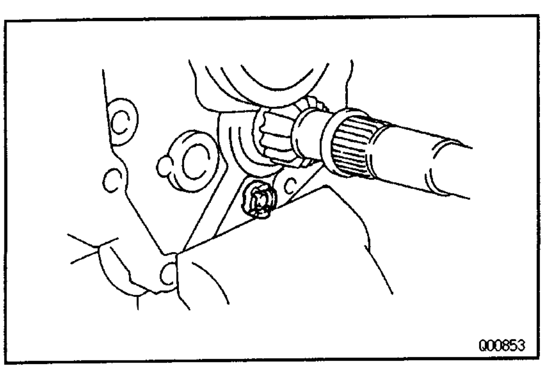


(b) Remove the spacer.

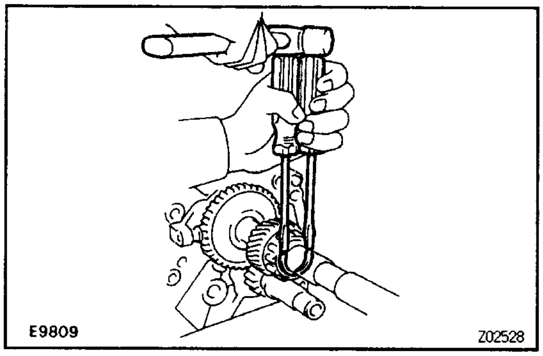
(c) Using two screwdrivers and a hammer, tap out the snap ring.



(d) Using SST, remove the No.3 clutch hub.
SST 09213–36020

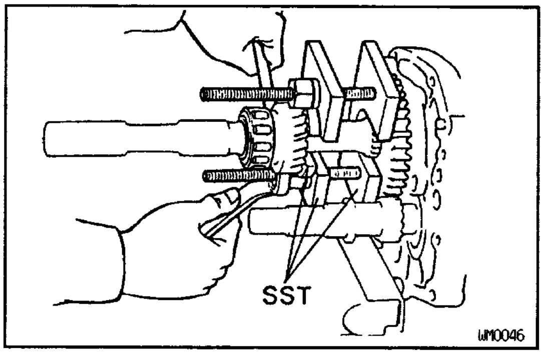


16. REMOVE REAR MAGNET

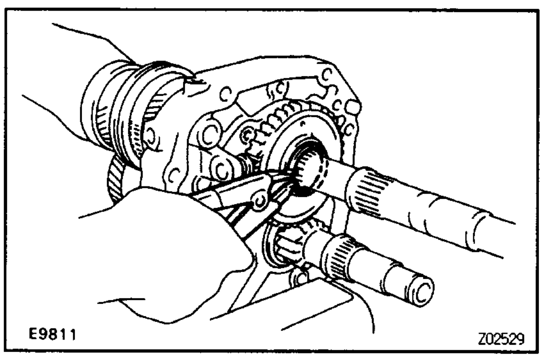


17. REMOVE OUTPUT SHAFT REAR BEARING AND FIFTH GEAR

(a) Using two screwdrivers and a hammer, tap out the snap ring.

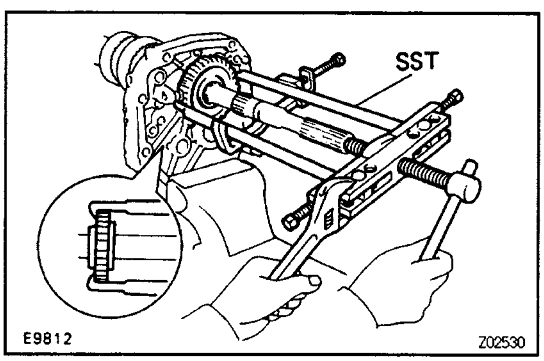


(b) Using SST, remove the rear bearing and 5th gear.
SST 09312–20011 (09313–00030, 09313–00040, 09313–00050)

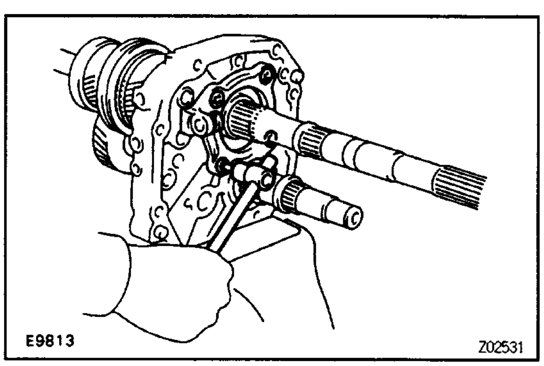


18. REMOVE REVERSE GEAR

(a) Using a snap ring expander, remove the snap ring.

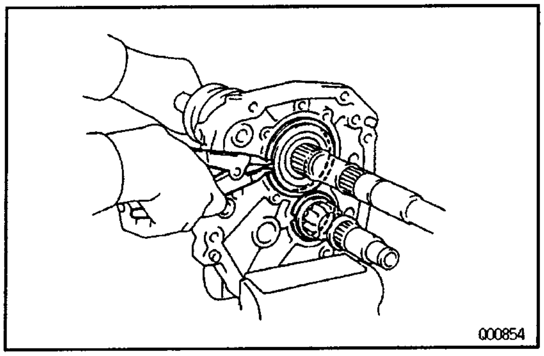


(b) Using SST, remove the reverse gear.
SST 09950–20017

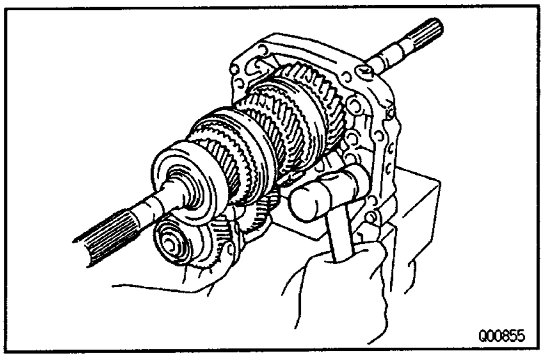


19. REMOVE CENTER BEARING RETAINER

(a) Using a torx socket wrench, unscrew the torx screws and remove the retainer.
Torx wrench T40 09042–00020



(b) Using a snap ring expander, remove the snap rings.



20. REMOVE OUTPUT SHAFT AND COUNTER GEAR AS A UNIT FROM INTERMEDIATE PLATE

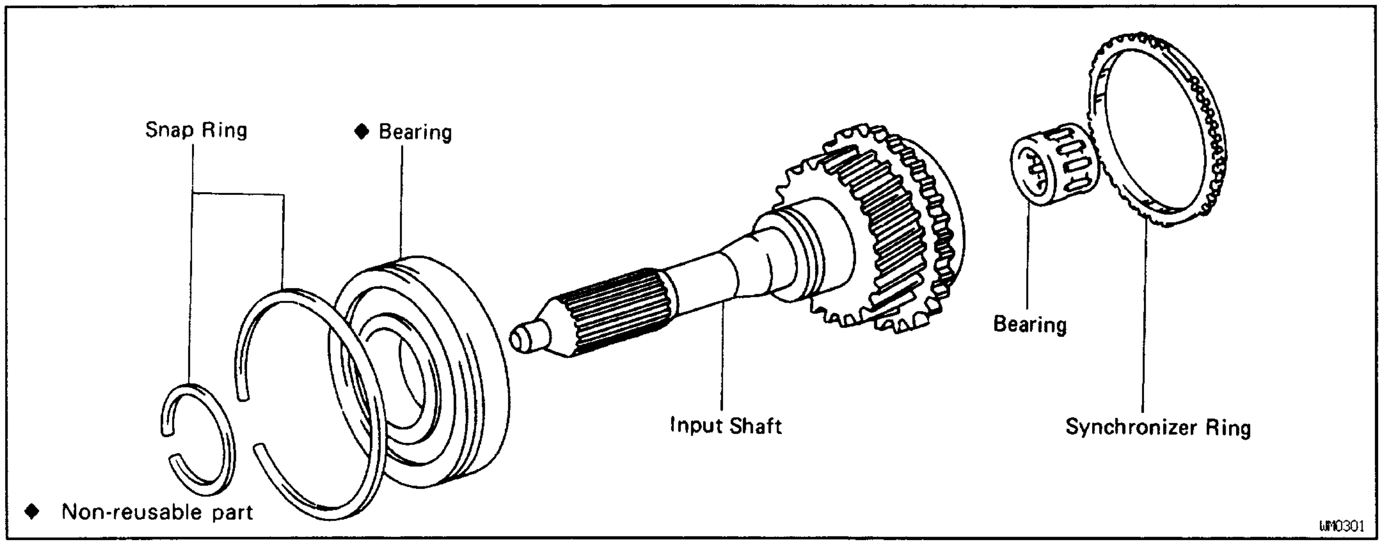
(a) Remove the output shaft, input shaft and counter gear as a unit from the intermediate plate by pulling on the counter gear and tapping on the intermediated plate with a plastic hammer.

(b) Remove the input shaft from the output shaft.

INPUT SHAFT

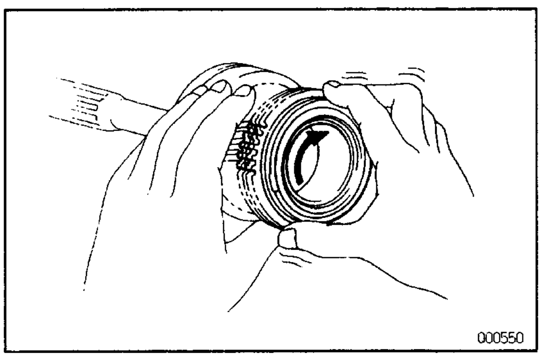
MT00F–02

COMPONENTS



MT00G–02

INPUT SHAFT INSPECTION



INSPECT SYNCHRONIZER RING

(a) Check for wear or damage.

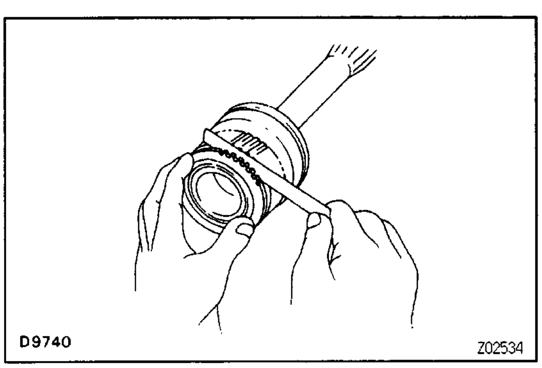
(b) Check the braking effect of the synchronizer ring.

Turn the synchronizer ring in one direction while pushing it to the gear cone and check that the ring is locked.

If the braking effect is insufficient, apply a small amount of fine lapping compound between the synchronizer ring and gear cone.

NOTICE:

- **Wash off completely the fine lapping compound after rubbing.**
- **Check again the braking effect of the synchronizer ring.**



(c) Using a feeler gauge, measure the clearance between the synchronizer ring back and the gear spline end.

Minimum clearance:

0.5 mm (0.020 in:)

HINT:

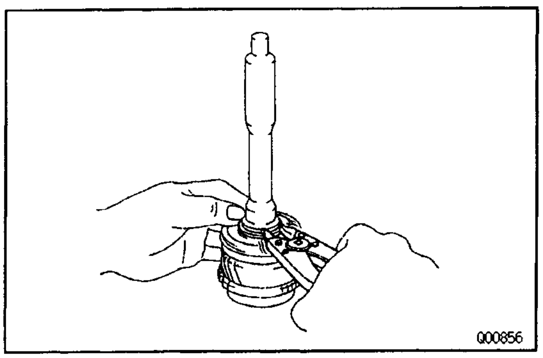
- When replacing either a synchronizer ring or gear, apply a small amount of fine compound between the synchronizer ring and gear cone. Lightly rub the synchronizer ring and gear cone together.
- When replacing both the synchronizer ring and gear, there is no need to apply any compound or to rub them together.

NOTICE: Wash off completely the fine lapping compound after rubbing.

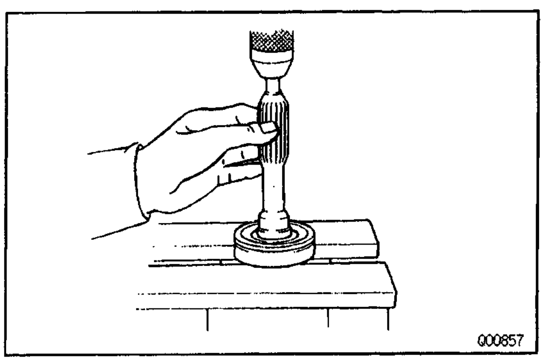
MT00H–01

BEARING REPLACEMENT

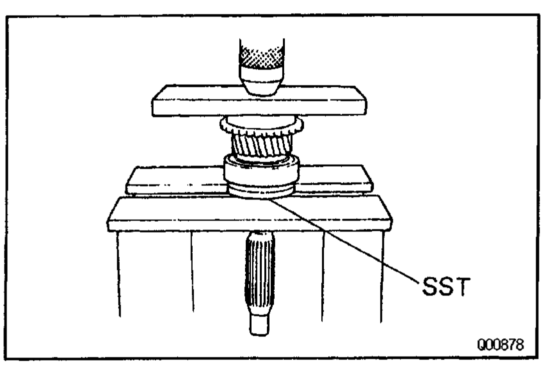
IF NECESSARY, REPLACE INPUT SHAFT BEARING


Q00856

(a) Using a snap ring expander, remove the snap ring.

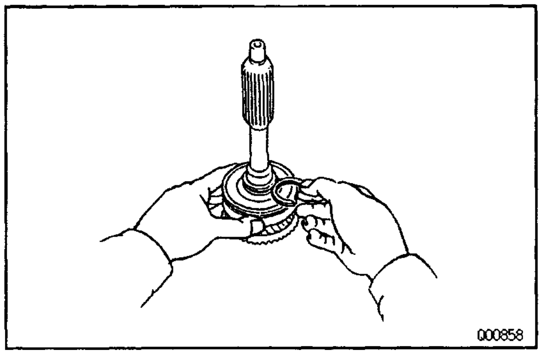

Q00857

(b) Using a press, remove the bearing.



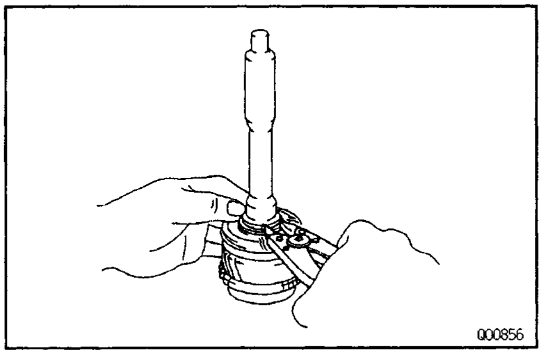
Q00878

(c) Using SST and a press, install a new bearing.
SST 09506–35010



(d) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
1	2.05 – 2.10 (0.0807 – 0.0827)
2	2.10 – 2.15 (0.0827 – 0.0846)
3	2.15 – 2.20 (0.0846 – 0.0866)
4	2.20 – 2.25 (0.0866 – 0.0886)
5	2.25 – 2.30 (0.0886 – 0.0906)
11	2.30 – 2.35 (0.0906 – 0.0925)
12	2.35 – 2.40 (0.0925 – 0.0945)

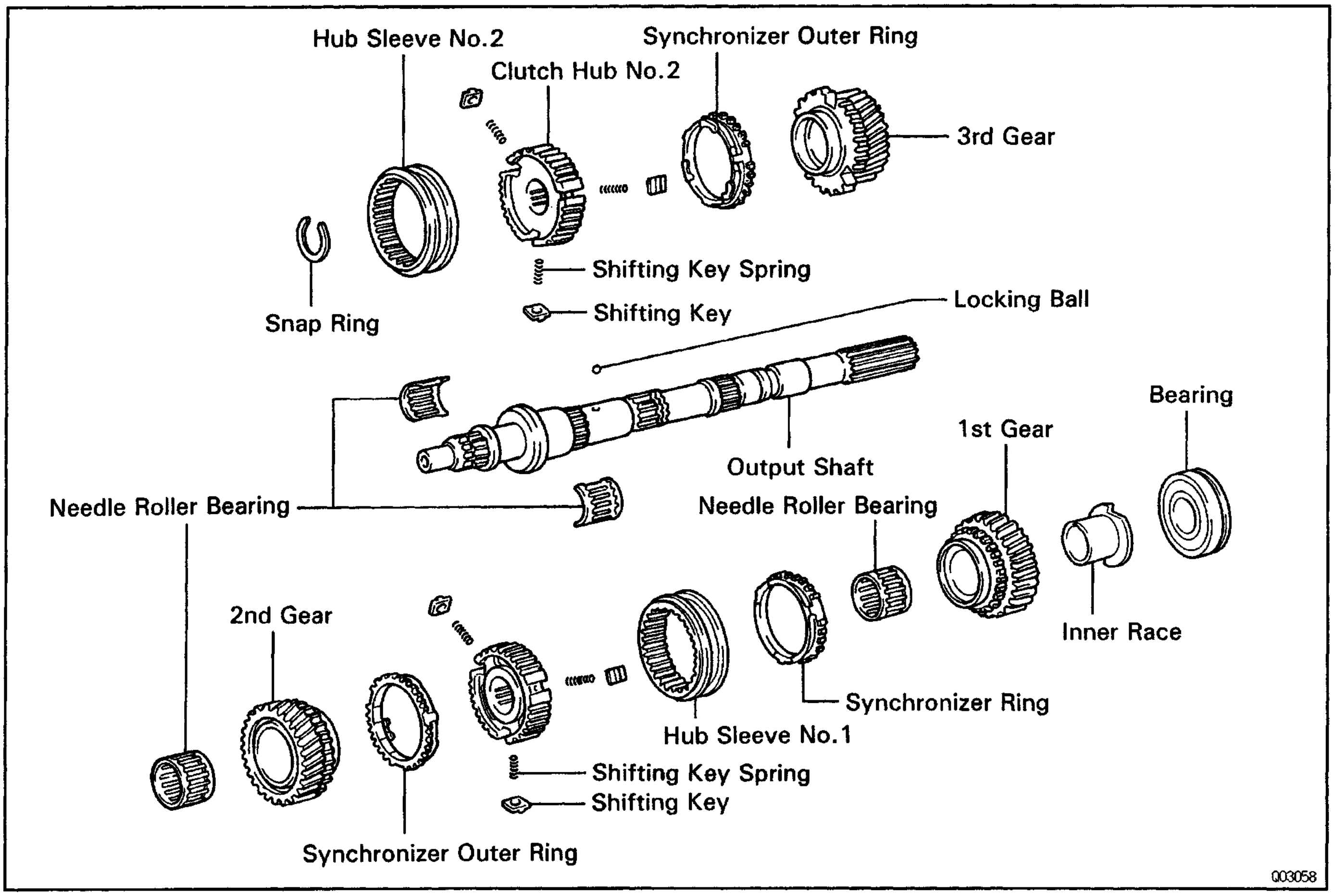


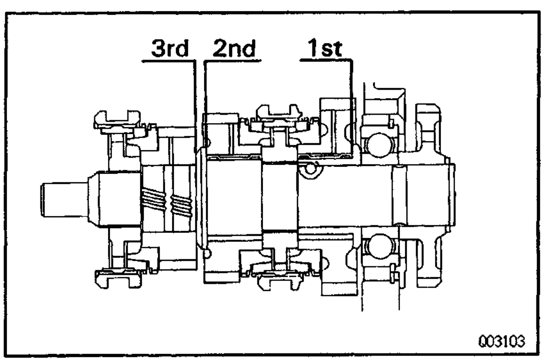
(e) Using a snap ring expander, install the snap ring.

OUTPUT SHAFT

MT00J–02

COMPONENTS





OUTPUT SHAFT DISASSEMBLY

MT00K–02

1. INSPECT EACH GEAR THRUST CLEARANCE

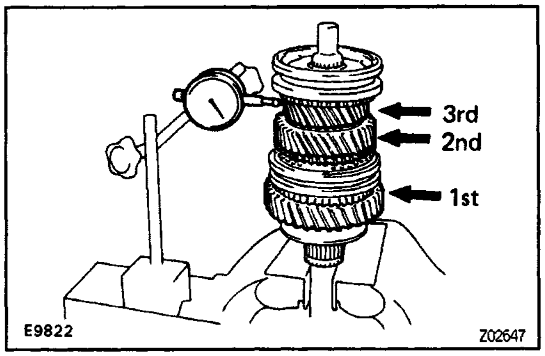
Using a feeler gauge, measure the thrust clearance of each gear.

Standard clearance:

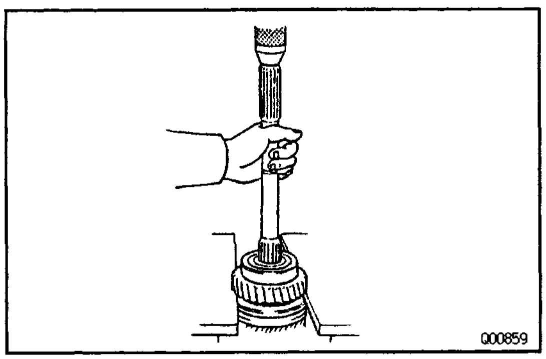
0.10–0.25 mm (0.0039–0.0098 in.)

Maximum clearance:

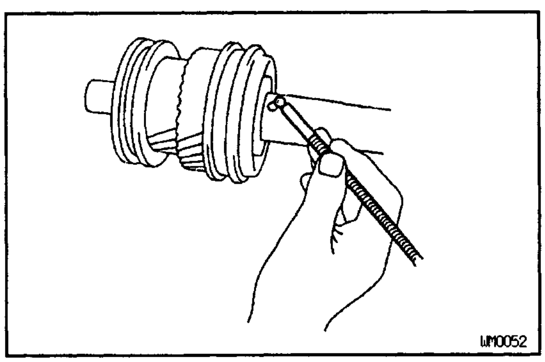
0.30 mm (0.0118 in.)



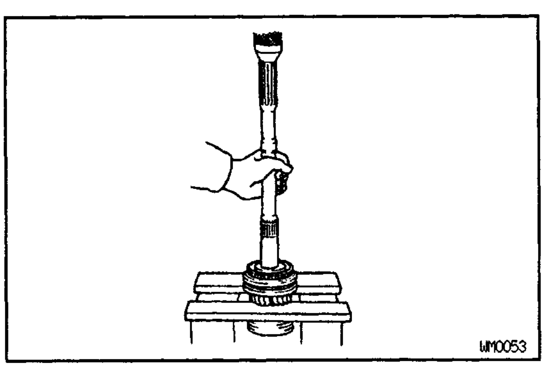
2. INSPECT EACH GEAR OIL CLEARANCE
Using a dial indicator, measure the oil clearance of each gear.
Standard clearance:
1 st and 2nd gear
0.009–0.060 m m (0.0004–0.0024 in.)
3rd gear
0.015–0.066 mm (0.0006–0.0026 in.)
Maximum clearance:
1st and 2nd gear
0.15 mm (0.0059 in.)
3rd gear
0.20 mm (0.0079 in.)
If the clearance exceeds the maximum, replace the gear, shaft or needle roller bearing.



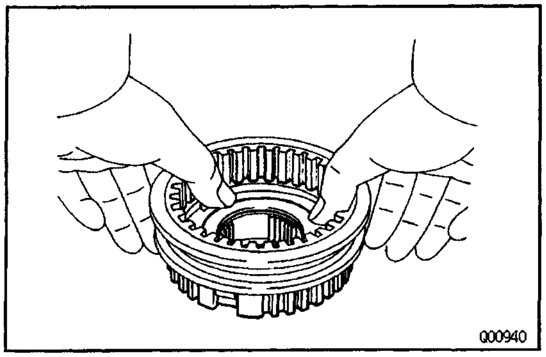
3. REMOVE OUTPUT SHAFT CENTER BEARING AND FIRST GEAR ASSEMBLY
(a) Shift the No. 1 hub sleeve onto the 2nd gear.
(b) Using a press, remove the center bearing, 1st gear, needle roller bearing, inner race and synchronizer ring.



4. REMOVE LOCKING BALL
Using a magnetic finger, remove the locking ball.

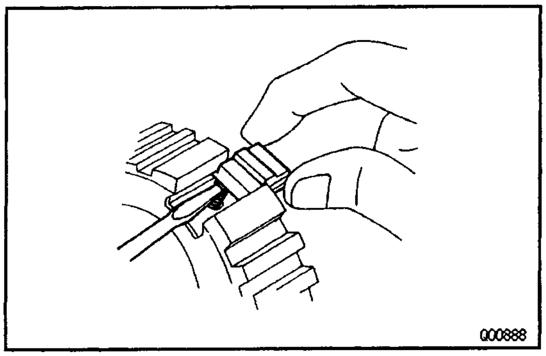


5. REMOVE NO.1 HUB SLEEVE ASSEMBLY, SECOND GEAR AND NEEDLE ROLLER BEARING
Using a press, remove the parts from the shaft as an assembly.

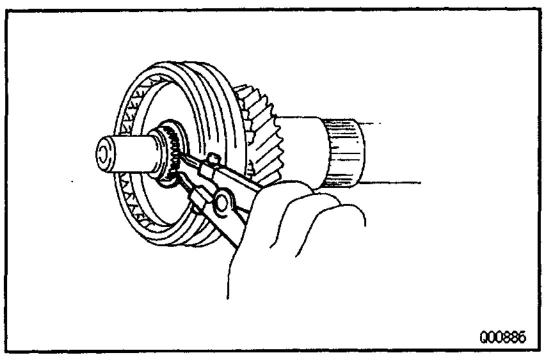


6. REMOVE NO.1 HUB SLEEVE, SHIFTING KEYS AND SPRINGS FROM CLUTCH HUB NO.1

(a) Remove the No. 1 clutch hub from the No. 1 hub sleeve.

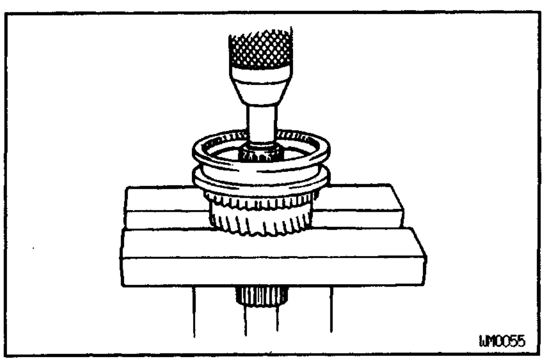


(b) Push the shifting key spring with screwdriver, remove the three shifting keys and key springs.

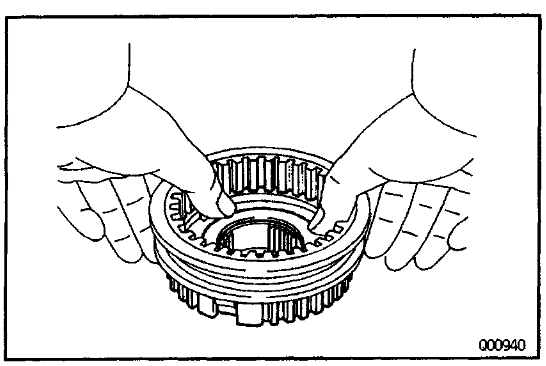


7. REMOVE NO. 2 HUB SLEEVE ASSEMBLY AND THIRD GEAR

(a) Using a snap ring expander, remove the snap ring.

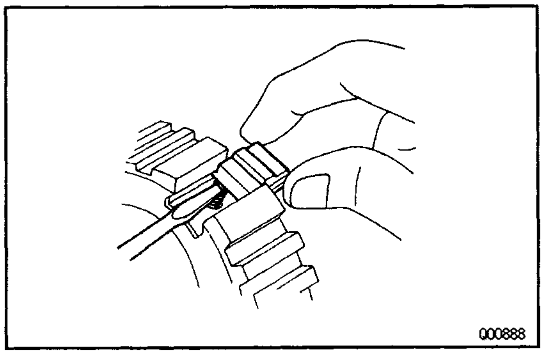


(b) Using a press, remove the No.2 hub sleeve, synchro–nizer ring and 3rd gear.



8. REMOVE NO.2 HUB SLEEVE, SHIFTING KEYS AND SPRINGS FROM NO.2 CLUTCH HUB

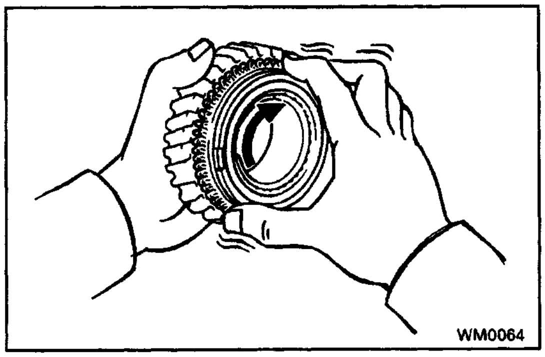
(a) Remove the No. 2 hub sleeve from the No. 2 hub sleeve.

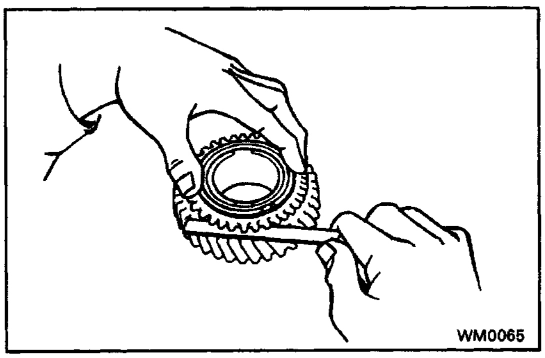


(b) Push the shifting key spring with screwdriver, remove the three shifting keys and key springs.

MT032–01

OUTPUT SHAFT COMPONENT PARTS INSPECTION





1. INSPECT SYNCHRONIZER RINGS

(a) Check for wear or damage.

(b) Check the braking effect of the synchronizer ring.
Turn the synchronizer ring in one direction while pushing it to the gear cone and check that the ring is locked. If the braking effect is insufficient, lightly rub the synchronizer ring and gear cone by applying a small amount of fine lapping compound.

NOTICE:

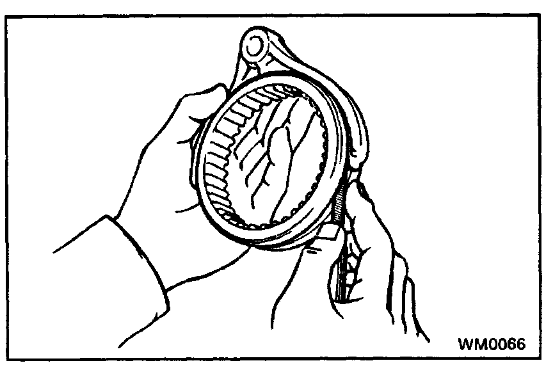
- Wash off completely the fine lapping compound after rubbing.
- Check again the braking effect of the synchronizer ring.

(c) Using a feeler gauge, measure the clearance between the synchronizer ring back and the gear spline end.
Minimum clearance:
0.5 mm (0.020 in.)

HINT:

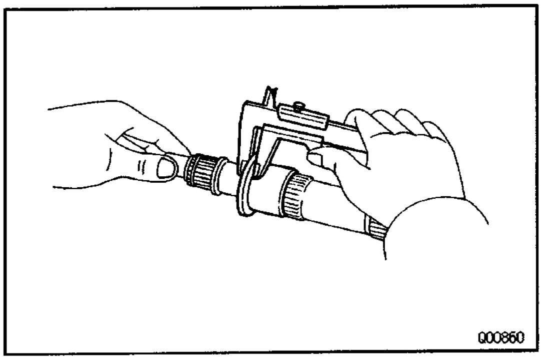
- **When replacing either a synchronizer ring or g apply a small amount of fine lapping compound be–tween the synchronizer ring and gear cone. Lightly rub the synchronizer ring and gear together.**
- **When replacing both the synchronizer ring and gear, there is no need to apply any compound or to rub them together.**

NOTICE: Wash off completely the fine lapping compound after rubbing.



2. INSPECT CLEARANCE OF SHIFT FORKS AND HUB SLEEVES

Using a feeler gauge, measure the clearance between the hub sleeve and shift fork.
Minimum clearance:
1.0 mm (0.039 in.)
If the clearance exceeds the maximum, replace the shift fork or hub sleeve.



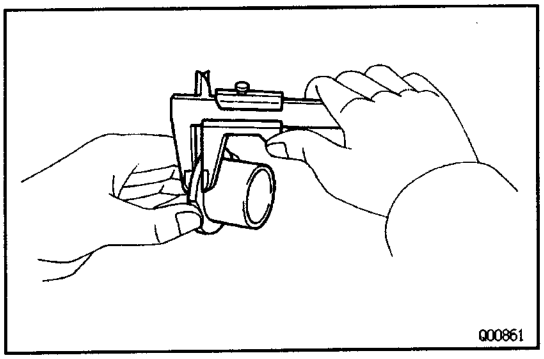
3. INSPECT OUTPUT SHAFT AND INNER RACE

(a) Using vernier calipers, measure the output shaft flange thickness.

Minimum thickness:

5.60 mm (0.2204 in.)

If the thickness exceeds the minimum, replace the output shaft.

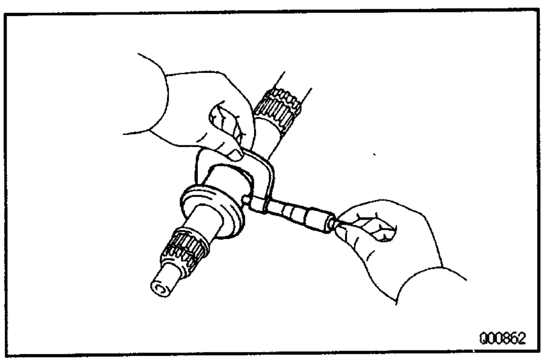


(b) Using vernier calipers, measure the inner race flange thickness.

Minimum thickness:

4.78 mm (0.1882 in.)

If the thickness exceeds the minimum, replace the inner race.



(c) Using a micrometer, measure the outer diameter of the output shaft journal.

Minimum diameter:

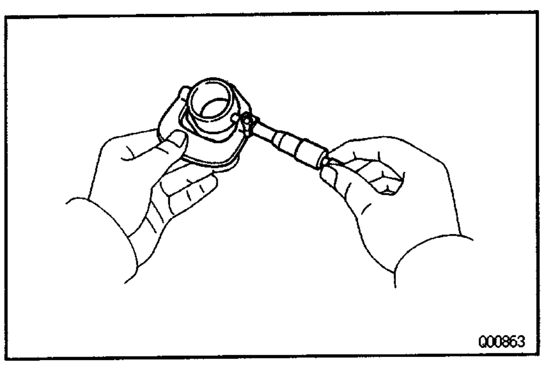
2nd gear

42.975 mm (1.6919 in.)

3rd gear

31.969 mm (1.2586 in.)

If the outer diameter exceeds the minimum, replace the output shaft.

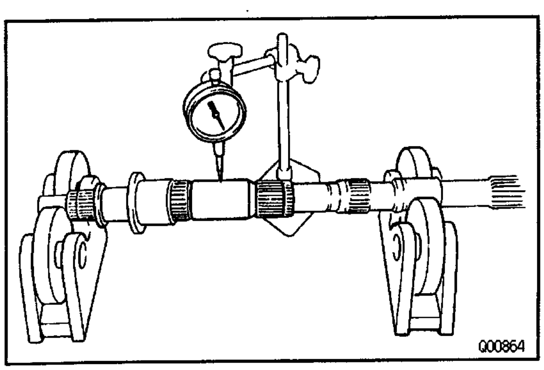


(d) Using a micrometer, measure the outer diameter of the inner race.

Minimum diameter:

42.975 mm (1.6919 in.)

If the outer diameter exceeds the minimum, replace the inner race.

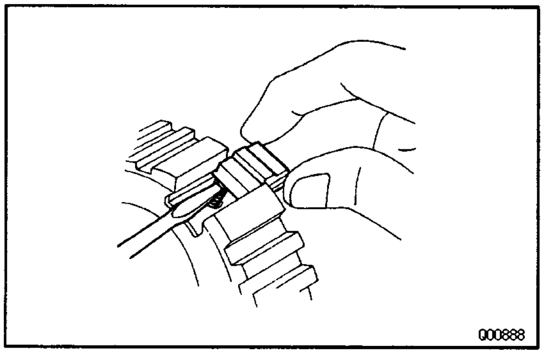


(e) Using a dial indicator, check the shaft runout.

Maximum runout:

0.06 mm (0.0024 in.)

If the runout exceeds the maximum, replace the output shaft.



MT00M–02

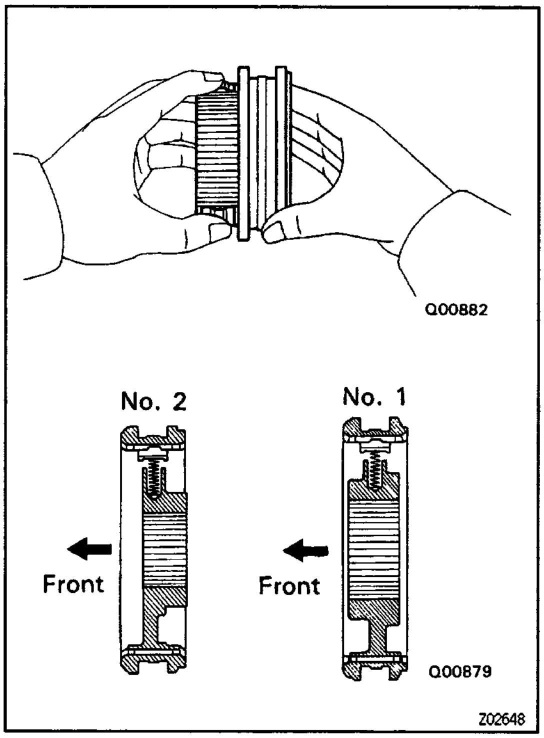
OUTPUT SHAFT ASSEMBLY

HINT: Coat all of the sliding and rotating surface with gear oil before assembly.

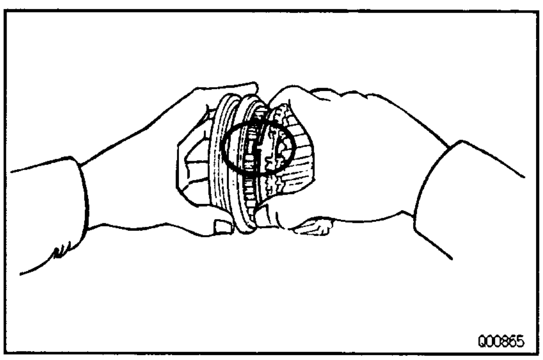
1. INSTALL NO.1 AND NO.2 CLUTCH HUB INTO HUB SLEEVE

(a) Install the three shifting key springs to the clutch hub.

(b) While pushing the shifting key spring with screw–driver, install the three shifting keys.



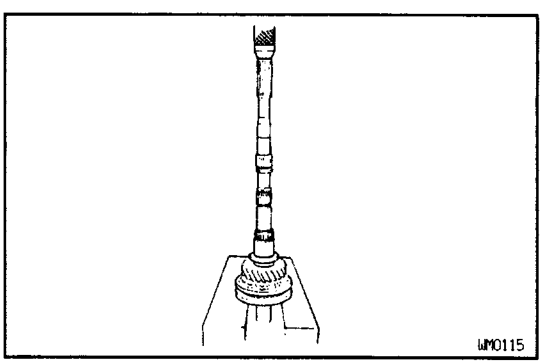
(c) While pushing the three shifting keys, install the clutch hub to the hub sleeve.



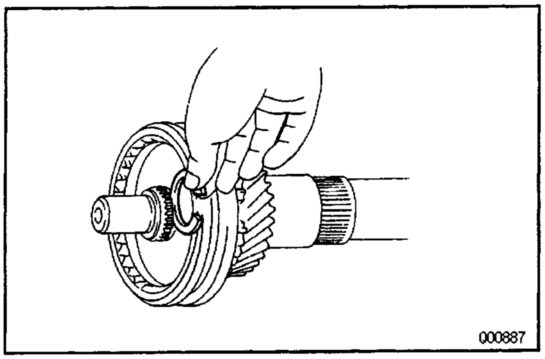
2. INSTALL THIRD GEAR AND NO.2 CLUTCH HUB ON OUTPUT SHAFT

(a) Apply gear oil to the shaft.

(b) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.



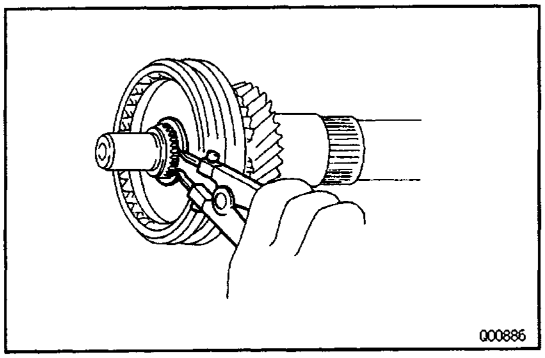
(c) Using a press, install the 3rd gear and No.2 clutch hub.



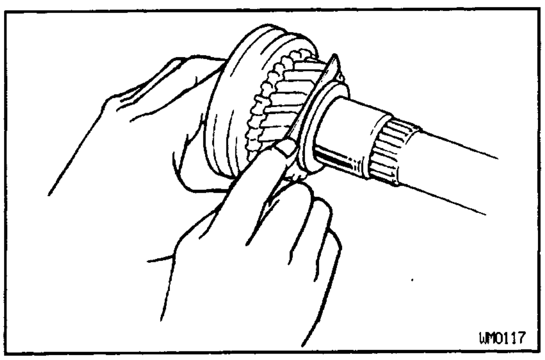
3. INSTALL SNAP RING

(a) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
C–1	1.75–1.80 (0.0689–0.0709)
D	1.80–1.85 (0.0709–0.0728)
11	1.86–1.91 (0.0732–0.0752)
12	1.92–1.97 (0.0756–0.0776)
13	1.98–2.03 (0.0780–0.0799)
14	2.04–2.09 (0.0803–0.0823)
15	2.10–2.15 (0.0827–0.0846)



(b) Using a snap ring expander, install the snap ring.

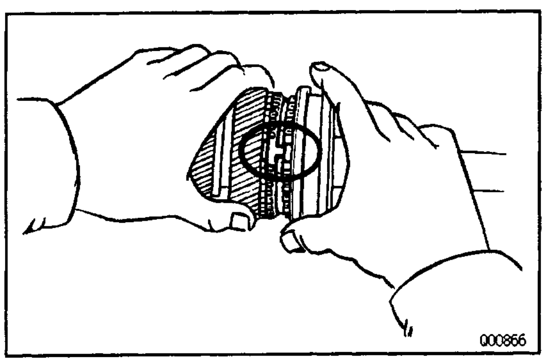


4. INSPECT THIRD GEAR THRUST CLEARANCE

Using a feeler gauge, measure the 3rd gear thrust clearance.

Standard clearance:

0.10–0.25 m m (0.0039–0.0098 in.)

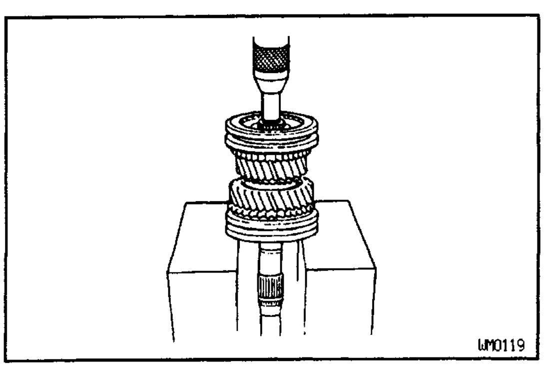


5. INSTALL SECOND GEAR AND NO.1 CLUTCH HUB

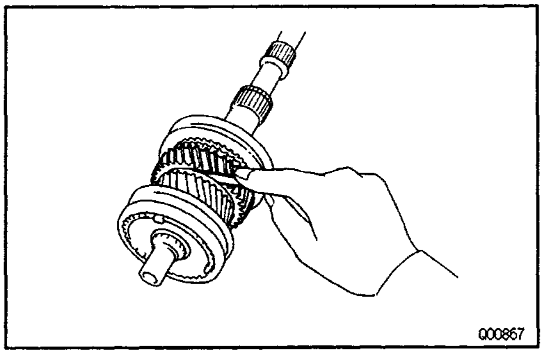
(a) Apply gear oil to the shaft and needle roller bearing.

(b) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.

(c) Install the needle roller bearing in the 2nd gear.



(d) Using a press, install the 2nd gear and No.1 clutch hub.

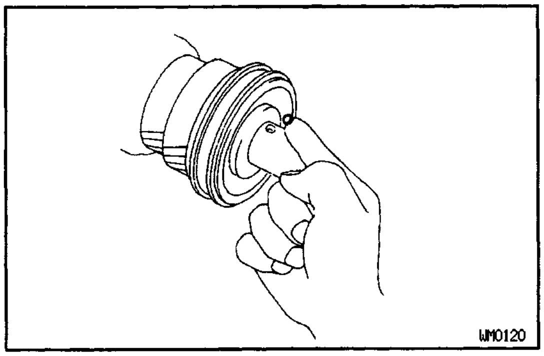


6. INSPECT SECOND GEAR THRUST CLEARANCE

Using a feeler gauge, measure the 2nd gear thrust clearance.

Standard clearance:

0.10–0.25 mm (0.0039–0.0098 in.)

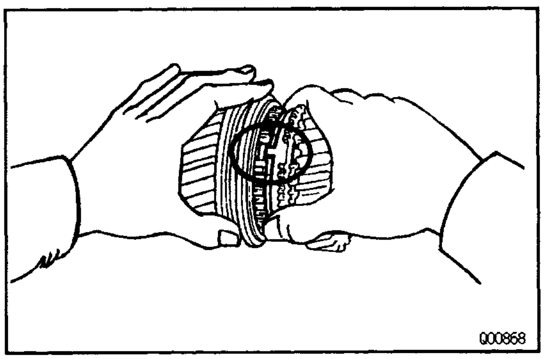


7. INSTALL LOCKING BALL AND FIRST GEAR ASSEMBLY

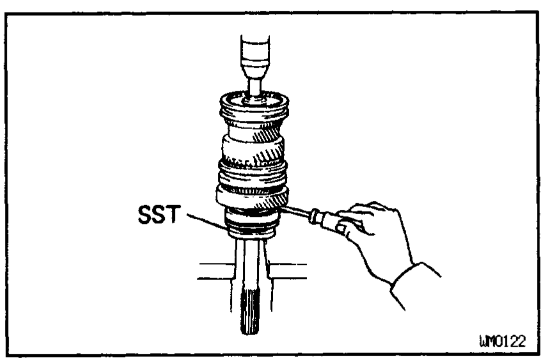
(a) Install the locking ball in the shaft.

(b) Apply gear oil to the bearing.

(c) Assembly the 1 st gear, synchronizer ring, needle roller bearing and bearing inner race.



(d) Install the assembly on the output shaft with the synchronizer ring slots aligned with the shifting keys and turn the inner race to align it with the locking ball.

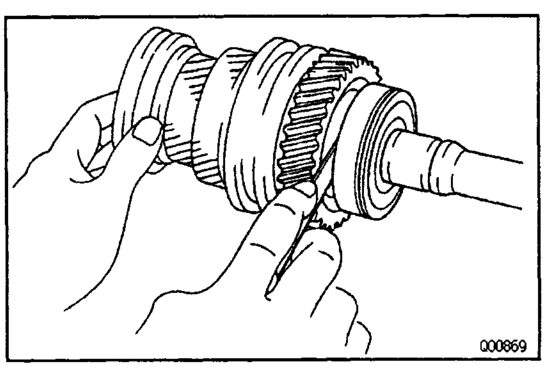


8. INSTALL OUTPUT SHAFT CENTER BEARING

Using SST and a press, install the bearing on the output shaft with the outer race snap ring groove toward the rear.

HINT: Hold the 1 st gear inner race to prevent it frorn falling.

SST 09506 –35010



9. INSPECT FIRST GEAR THRUST CLEARANCE

Using a feeler gauge, measure the 1st gear thrust clearance.

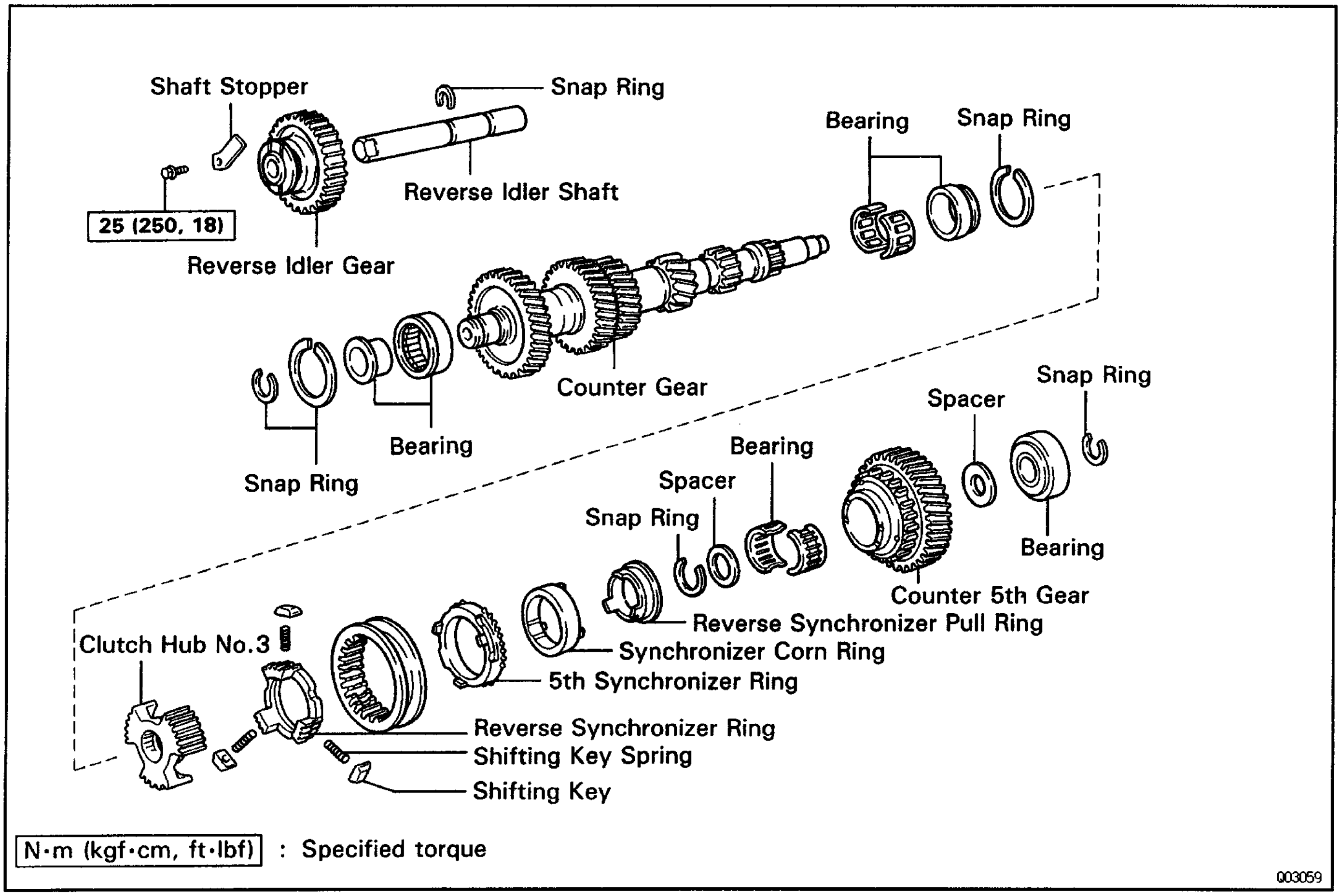
Standard clearance:

0.10–0.25 mm (0.0039–0.0098 in.)

COUNTER GEAR AND REVERSE IDLER GEAR

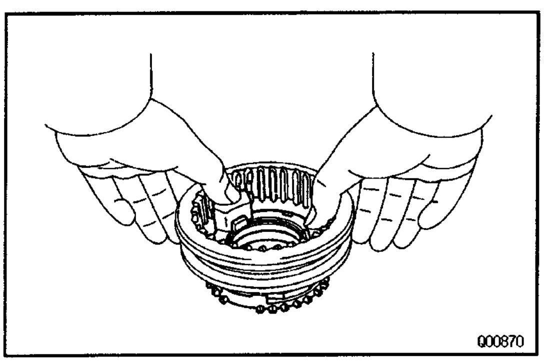
MT00N–02

COMPONENTS



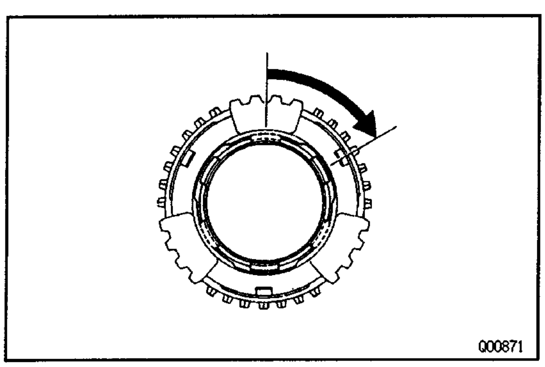
MT00P–02

COUNTER GEAR COMPONENT PARTS DISASSEMBLY

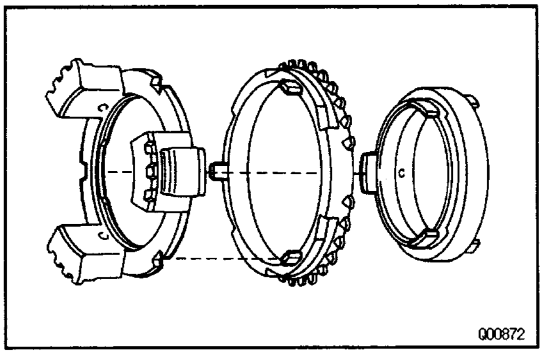


1. REMOVE NO.3 HUB SLEEVE, SHIFTING KEYS AND SPRINGS FROM SYNCHRONIZER RING

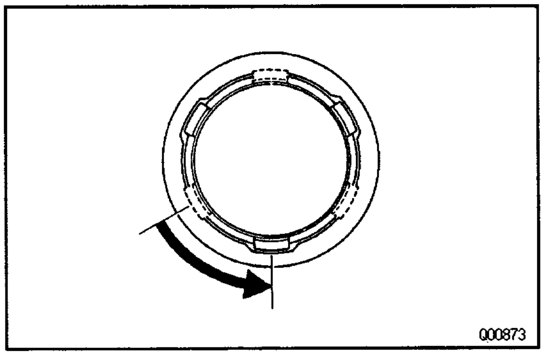
(a) Remove the synchronizer ring assembly from No.3 hub sleeve.



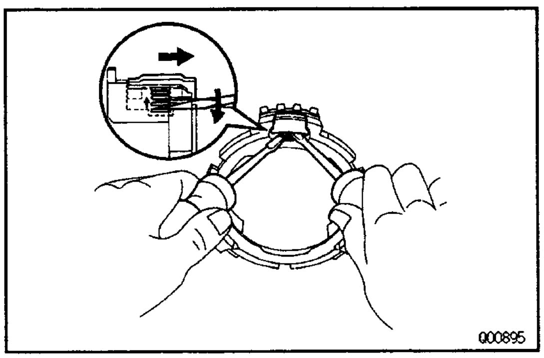
(b) Turn the reverse synchronizer pull ring.



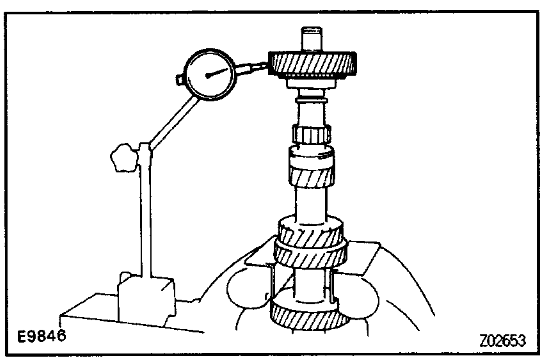
(c) Remove the reverse synchronizer ring and 5th synchronizer ring.



(d) Turn the reverse synchronizer pull ring, separate pull ring and corn ring.



(e) While pushing the shifting key spring to out slide with two screwdrivers, remove the shifting keys and key springs, from remove synchronizer ring.



MT00Q–02

COUNTER GEAR AND REVERSE IDLER GEAR COMPONENT PARTS INSPECTION

1. INSPECT COUNTER 5TH GEAR OIL CLEARANCE

(a) Install the spacer, counter 5th gear and needle roller bearing to counter gear.

(b) Using a dial indicator, measure the counter 5th gear oil clearance.

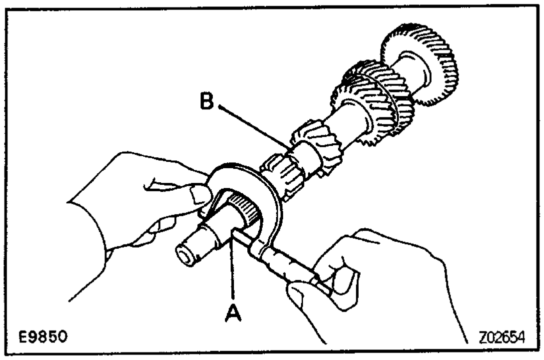
Standard clearance:

0.009–0.06 mm (0.0004–0.0024 in.)

Maximum clearance:

0.15 mm (0.0059 in.)

If the clearance exceeds the maximum, replace the counter gear or needle roller bearing or counter 5th gear.



2. INSPECT COUNTER GEAR

Using a micrometer, measure the outer diameter of the counter shaft journal.

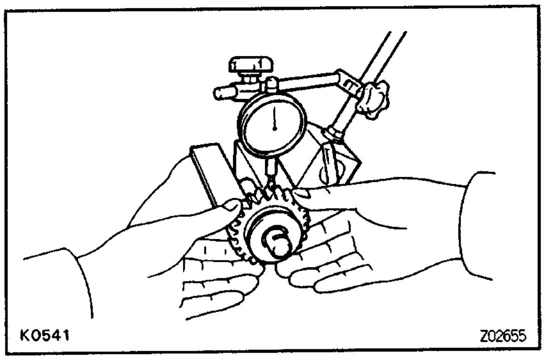
Minimum diameter:

Part A

26.975 mm (1.0620 in.)

Part B

29.95 mm (1.1791 in.)



3. INSPECT REVERSE IDLER GEAR OIL CLEARANCE

Using a dial indicator, measure the reverse idler gear oil clearance.

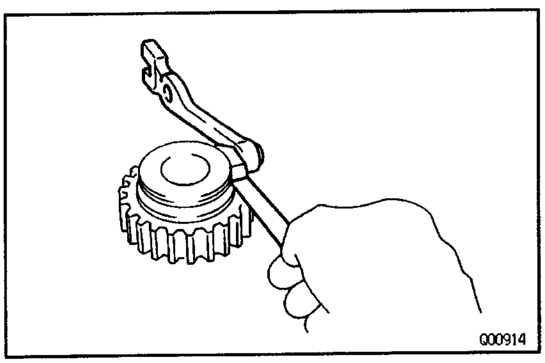
Standard clearance:

0.041–0.074 mm (0.0016–0.0029 in.)

Maximum clearance:

0.194 mm (0.0076 in.)

If the clearance exceeds the maximum, replace the gear or shaft.



4. INSPECT CLEARANCE OF REVERSE IDLER GEAR AND SHIFT ARM SHOE

Using a feeler gauge, measure the clearance between the reverse idler gear and shift arm shoe.

Standard clearance:

0.20–0.41 mm (0.008–0.0161 in.)

Maximum clearance:

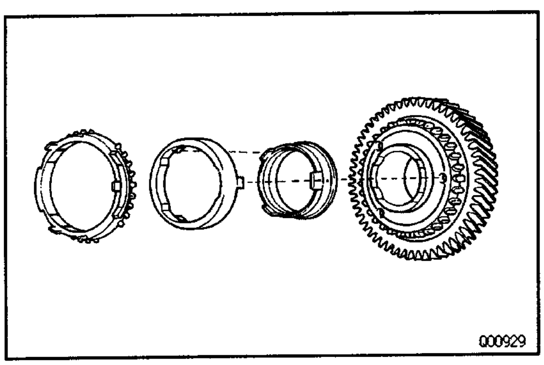
0.9 mm (0.0354 in.)

If the clearance exceeds the maximum, replace the shift arm shoe or reverse idler gear.

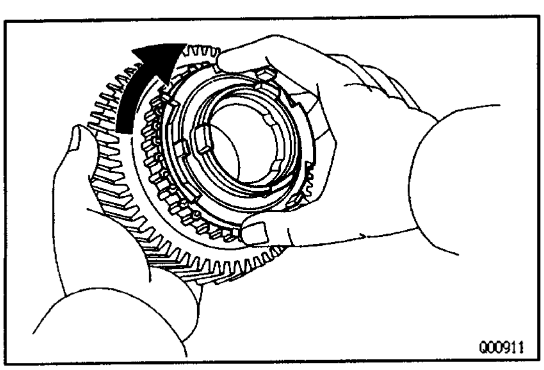
5. INSPECT FIFTH SYNCHRONIZER RING

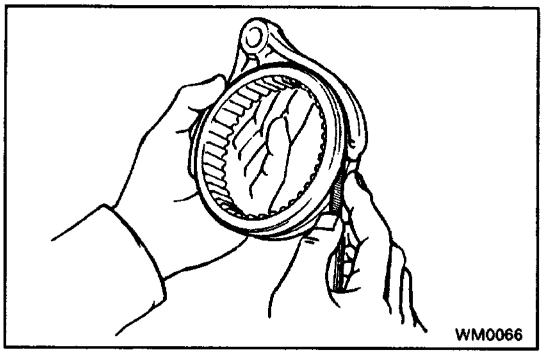
(a) Check for wear or damage.

(b) Install the synchronizer pull ring, corn ring and outer ring to 5th gear.



(c) Check the braking effect of the synchronizer ring.
Turn the synchronizer ring in one direction while pushing it to the gear cone and check that the ring i locked.
If the backing effect is insufficient, replace the syn–chronizer rings.





6. INSPECT CLEARANCE OF SHIFT FORKS AND HUB SLEEVES

Using a feeler gauge, measure the clearance between the hub sleeve and shift fork.

Maximum clearance:

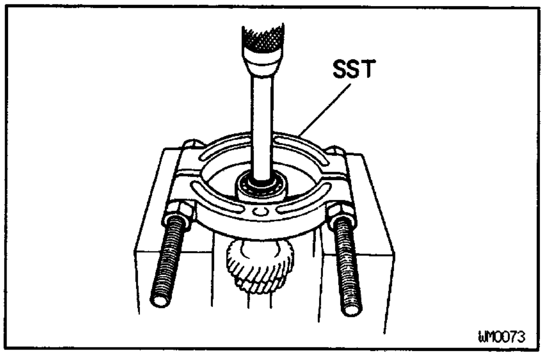
1.0 mm (0.039 in.)

If the clearance exceeds the maximum, replace the shift fork or hub sleeve.

BEARING REPLACEMENT

MT00R–02

1. IF NECESSARY, REPLACE COUNTER GEAR FRONT BEARING AND SIDE RACE

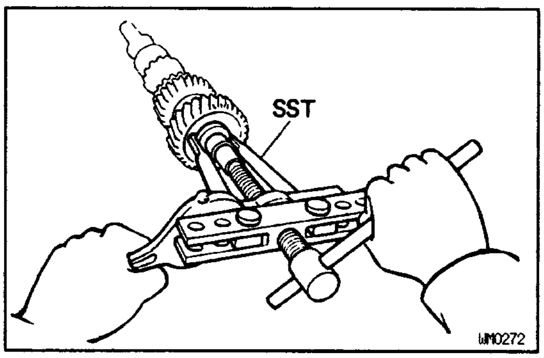


(a) Using snap ring pliers, remove the snap ring.

(b) Using SST, press out the bearing.

SST 09950–00020

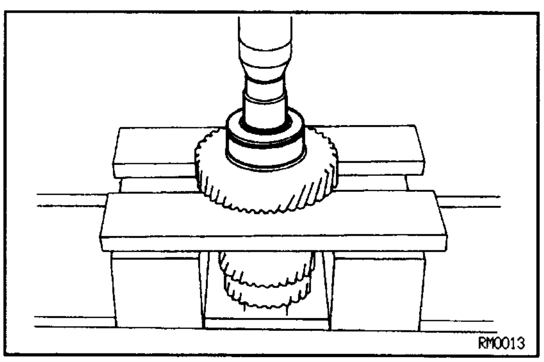
(c) Check the side race for wear or damage.



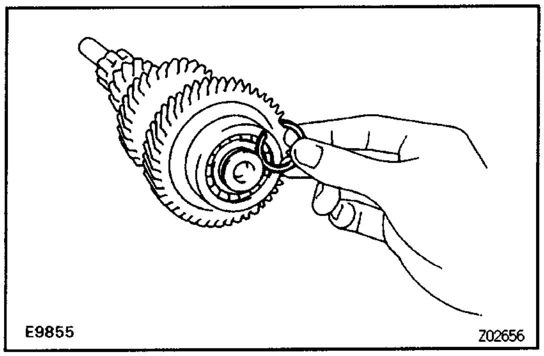
(d) If necessary, remove the side race.

Using SST and socket wrench, remove the side race.

SST 09950–20017

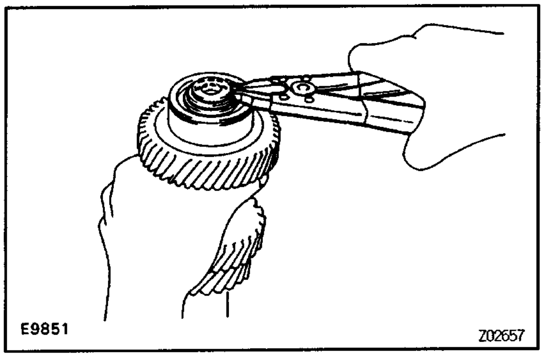


(e) Using a socket wrench, press in a new bearing, side race and inner race.

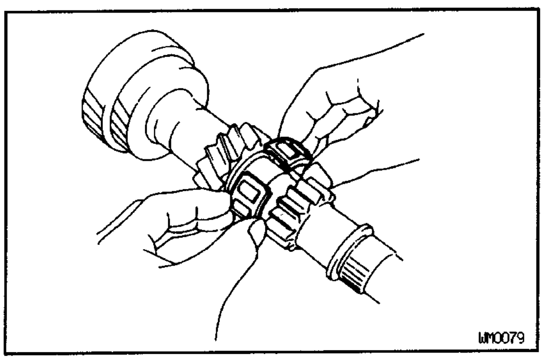


(f) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
A	2.05–2.10 (0.0807–0.0827)
B	2.10–2.15 (0.0827–0.0846)
C	2.15–2.20 (0.0846–0.0866)
D	2.20–2.25 (0.0866–0.0886)
E	2.25–2.30 (0.0886–0.0906)
F	2.30–2.35 (0.0906–0.0925)



(g) Using a snap ring expander, install the snap ring.

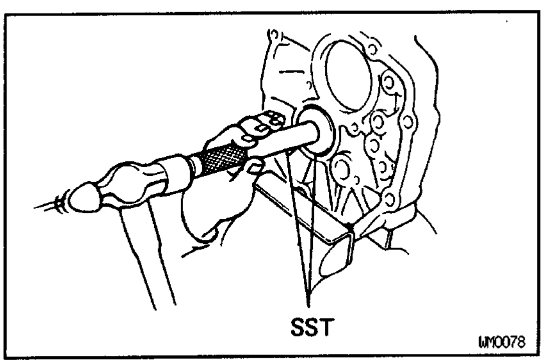


2. IF NECESSARY, REPLACE COUNTER GEAR CENTER BEARING

(a) Remove the bearing from the counter gear.

(b) Install a new bearing on the counter gear.

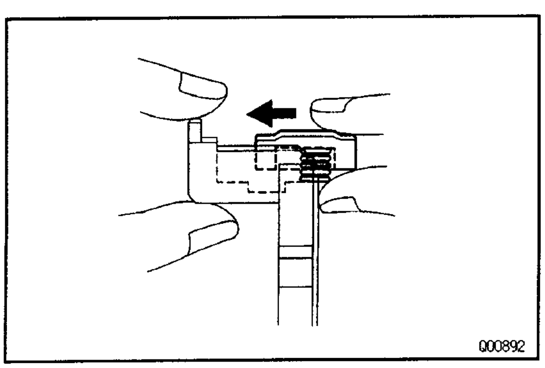
HINT: Engage the roller cages.



(c) Using SST, tap out the bearing outer race.

SST 09608–35014 (09608–06020, 09608–06090)

HINT: The outer race will be installed later, as the transmission is assembled.

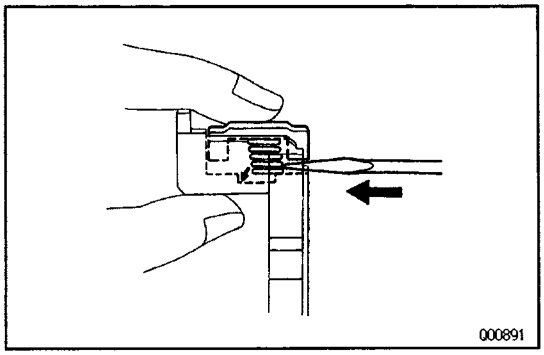


MT008–02

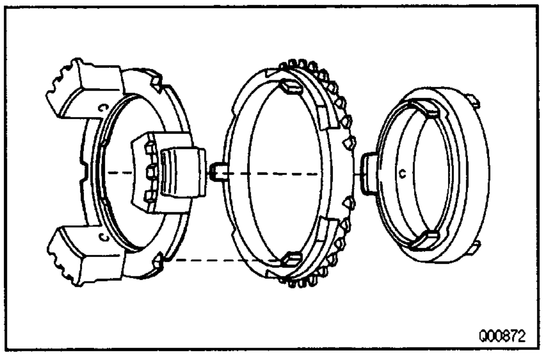
COUNTER GEAR COMPONENT PARTS ASSEMBLY

1. INSTALL SYNCHRONIZER RING ASSEMBLY TO NO.3 HUB SLEEVE

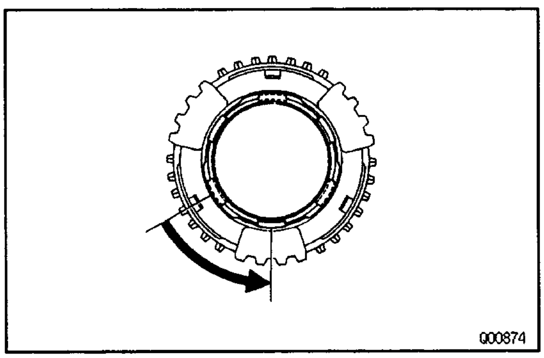
(a) Push the synchronizer spring, install the shifting key and key spring to reverse synchronizer ring.



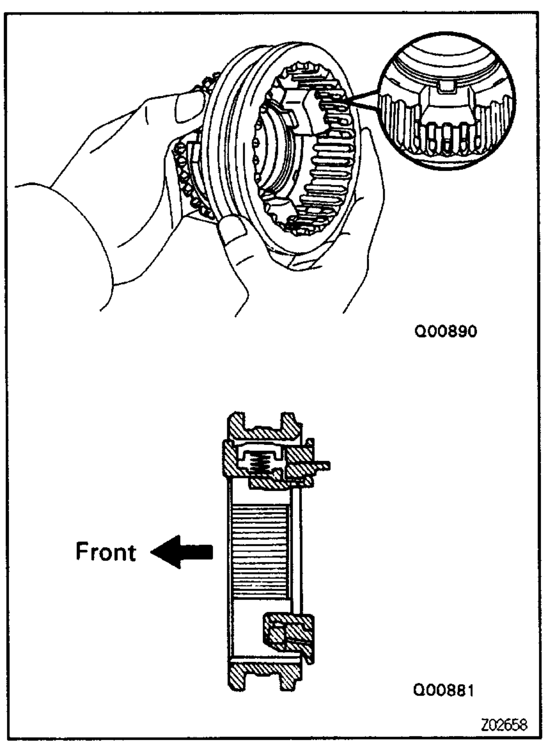
(b) Using a screwdriver, push the three key springs into the synchronizer ring spring gear.



(c) Install the synchronizer corn ring to reverse synchro–nizer pull ring.
(d) Install the 5th synchronizer ring.
(e) Install the reverse synchronizer ring.



(f) Turn the reverse synchronizer pull ring.

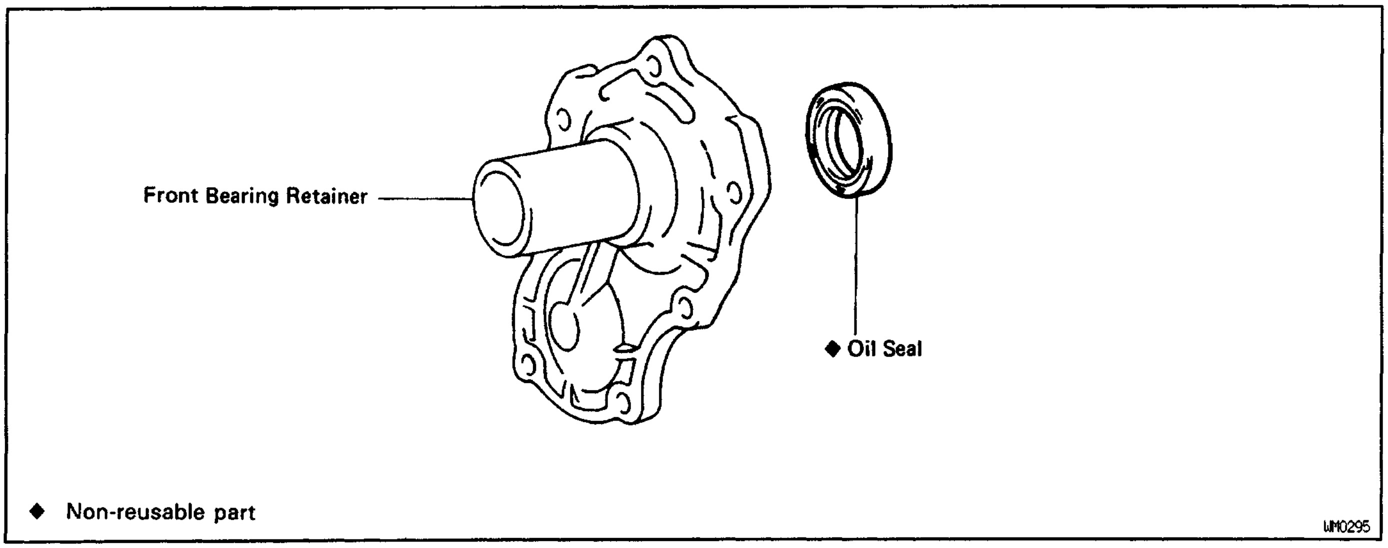


(g) While pushing three shifting keys, install the synch–ronizer ring assembly to No.3 hub sleeve.

FRONT BEARING RETAINER

MT00T–01

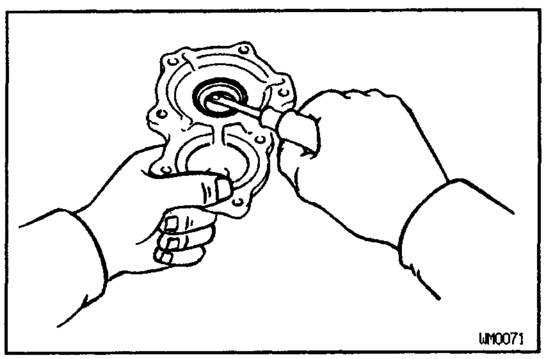
COMPONENT



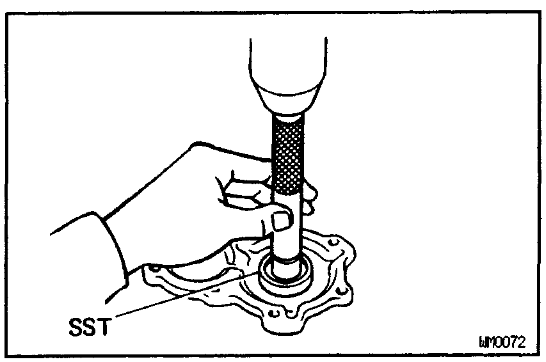
MT00U–02

OIL SEAL REPLACEMENT

IF NECESSARY, REPLACE FRONT BEARING RETAINER OIL SEAL



(a) Using a screwdriver, pry out the oil seal.



(b) Using SST and a press, install a new oil seal.

SST 09608–20012 (09608–03020, 09608–00080)

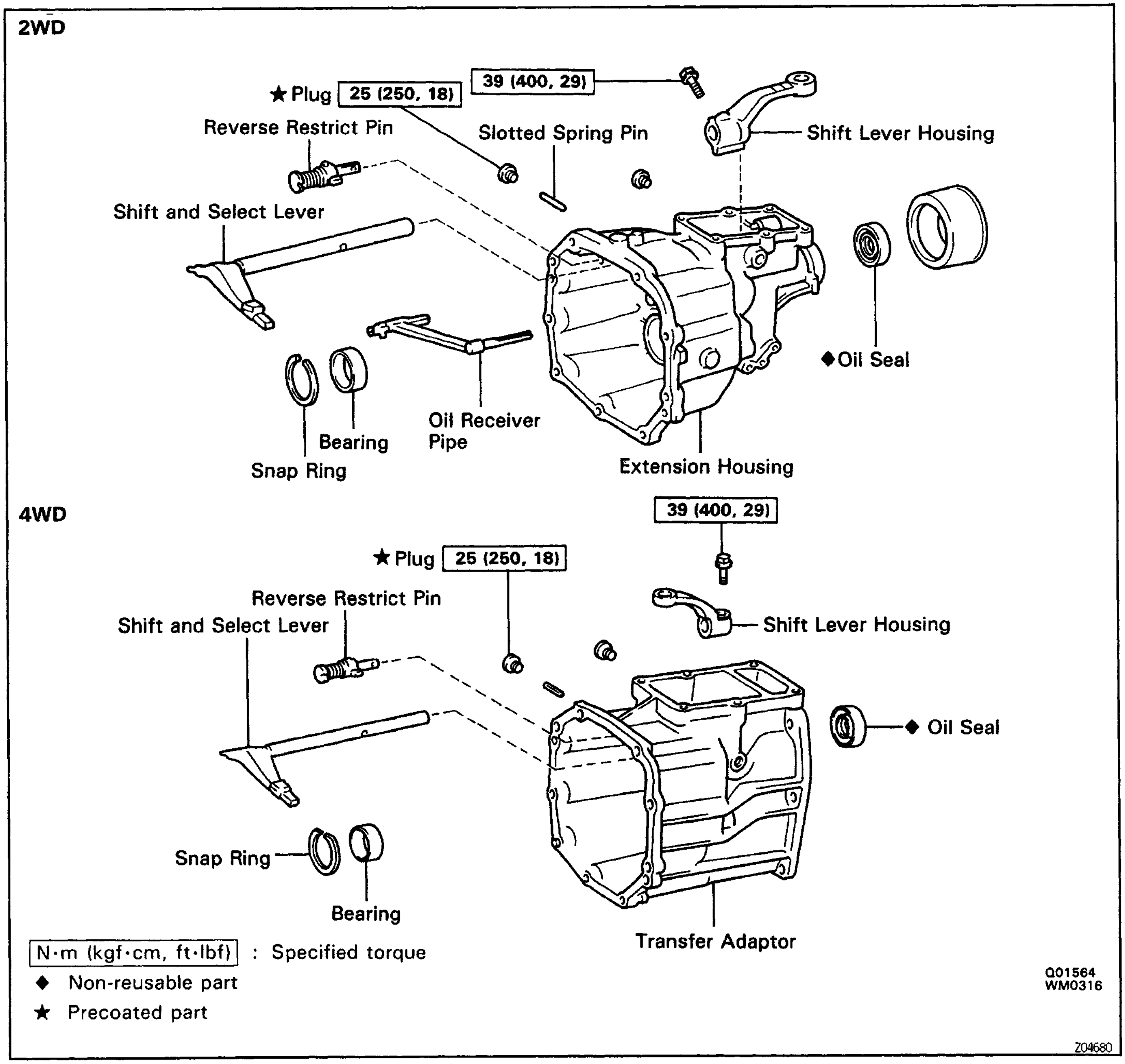
Drive in depth:

11.4–12.0 mm (0.449–0.472 in.) from retainer.

EXTENSION HOUSING AND TRANSFER ADAPTOR

MT00V–02

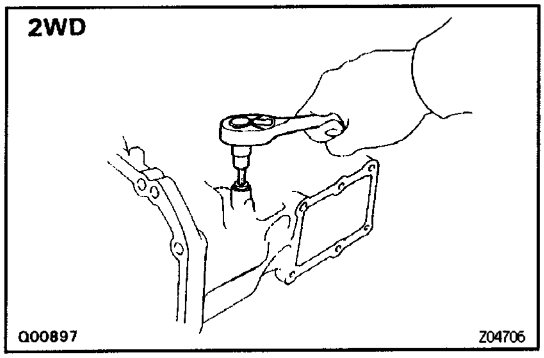
COMPONENT

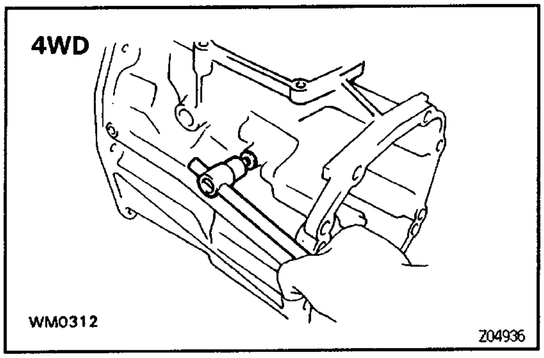


REVERSE RESTRICT PIN REPLACEMENT

1. REMOVE REVERSE RESTRICT PIN

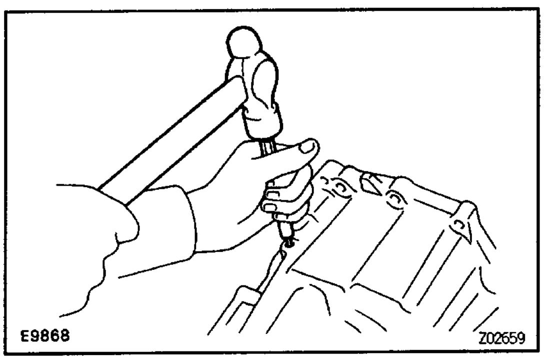
(a) Using a hexagon wrench, remove the screw plug.





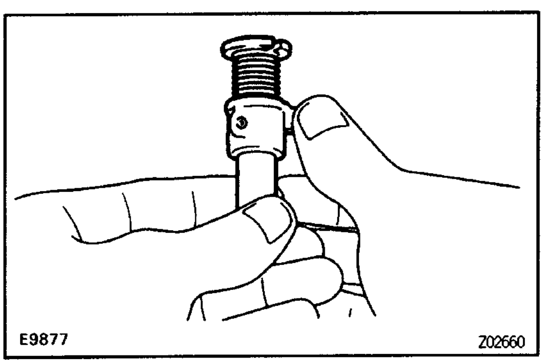
(b) Using a pin punch and hammer, drive out the slotted spring pin.

(c) Pull off the lever housing and slide out the shaft.



2. INSPECT REVERSE RESTRICT PIN

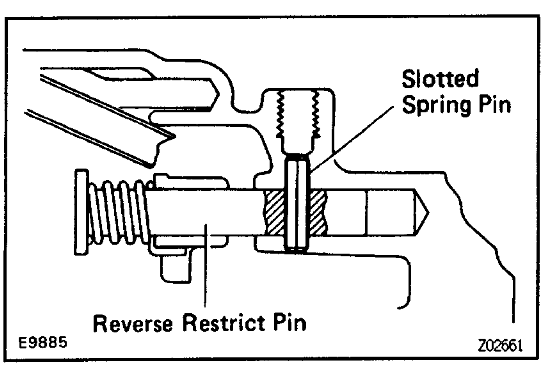
Turn and push the reverse restrict pin by hand while applying direction.

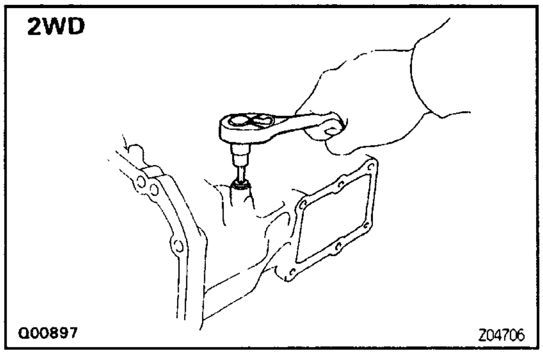


3. INSTALL REVERSE RESTRICT PIN

(a) Install the lever housing.

(b) Using a pin punch and hammer, drive in the slotted spring pin as shown.





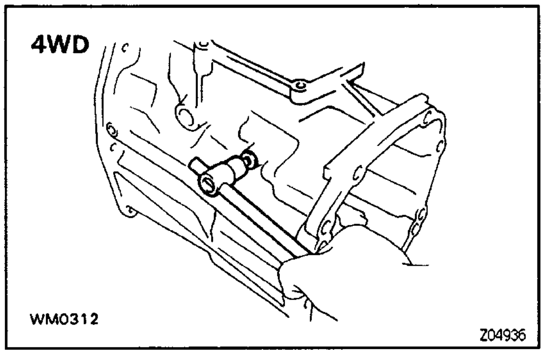
(c) Apply liquid sealer to the plug.

Sealant:

Part No. 08833–00080, THREE BOND 7344, LOC–TITE 242 or equivalent

(d) install and torque the screw plug.

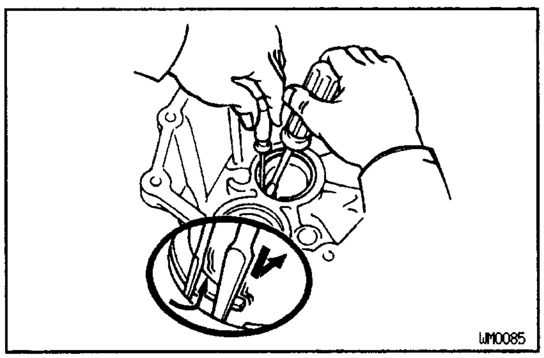
Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)



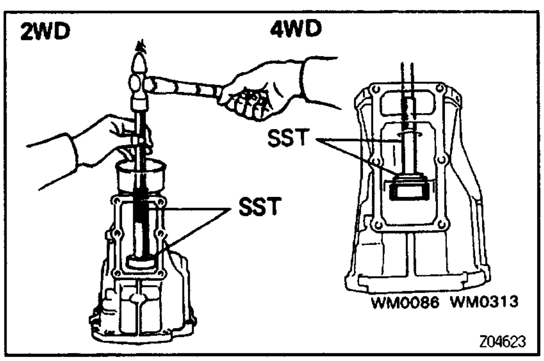
MT00X–02

BEARING REPLACEMENT

IF NECESSARY, REPLACE REAR BEARING OUT REAR RACE

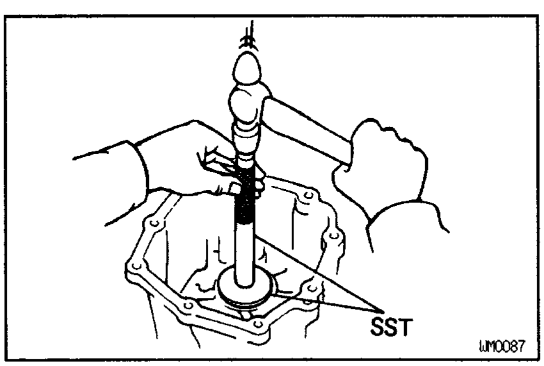


(a) Using two screwdrivers, remove the snap ring.



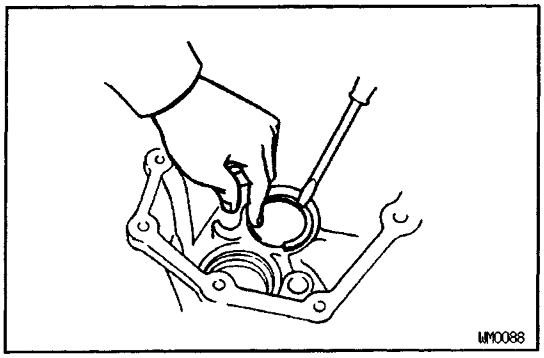
(b) Using SST and a hammer, tap out the outer race.

SST 09608–12010 (09608–00020, 09608–00050)



(c) Using SST, install a new outer race.

SST 09608–35014 (09608–06020, 09608–06100)



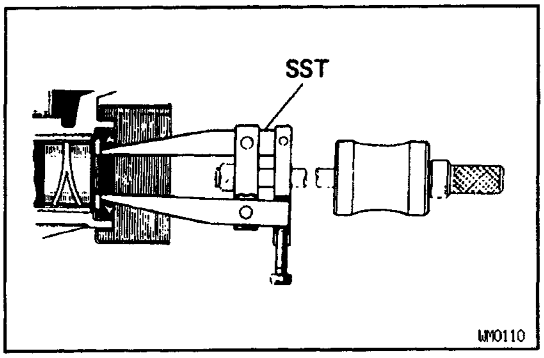
(d) Using a screwdriver, install the snap ring.

MT034–01

OIL SEAL REPLACEMENT

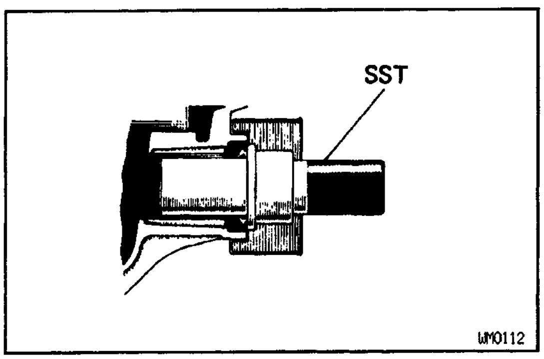
(2WD)

IF NECESSARY, REPLACE EXTENSION HOUSING OIL SEAL



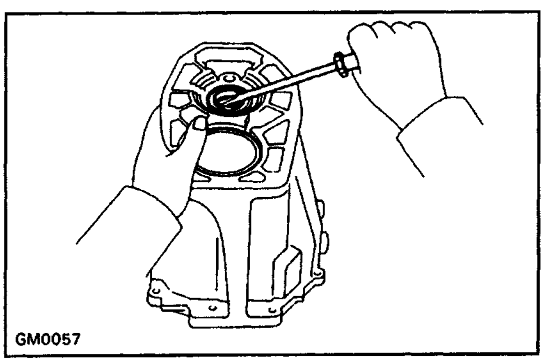
(a) Using SST, remove the oil seal.
SST 09308–00010 or
09308–10010
(w/ output shaft installed)

(b) Using SST, drive in a new oil seal.
SST 09325–20010

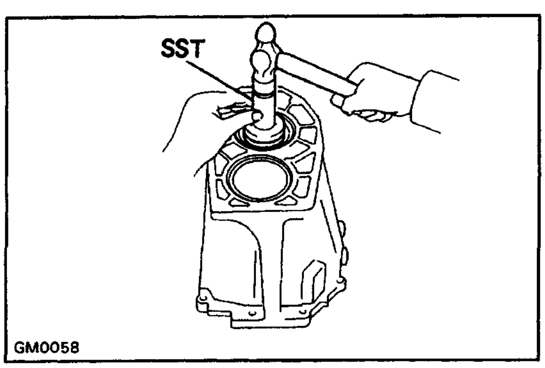


(4WD)

IF NECESSARY, REPLACE TRANSFER ADAPTOR OIL SEAL



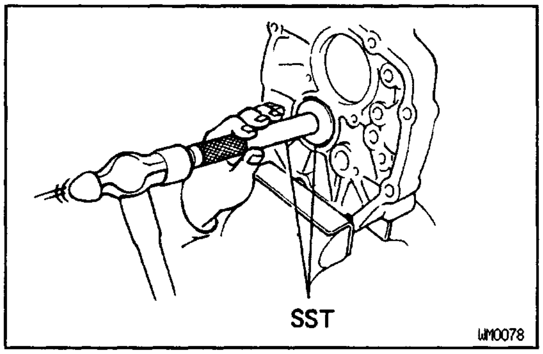
(a) Using a screwdriver, pry out the oil seal.



(b) Using SST and a hammer, drive in a new oil seal.
SST 09325–12010

COMPONENT PARTS INSTALLATION

BASIC SUBASSEMBLY REASSEMBLY

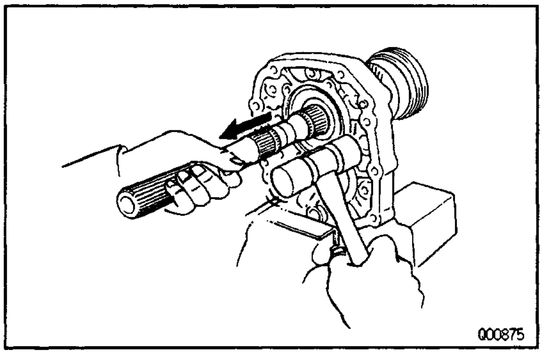


HINT: Coat all of the sliding and rotating surface with gear oil before assembly.

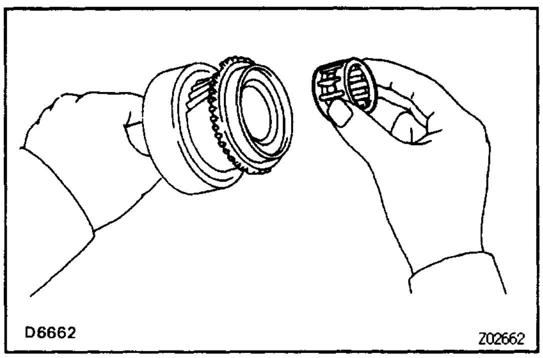
1. INSTALL OUTPUT SHAFT TO INTERMEDIATE PLATE

(a) Before installing the output shaft, use SST to remove the counter gear center bearing outer race.
SST 09608–35014 (09608–06020, 09608–06090)

HINT: Install the outer race after installing the counter gear.



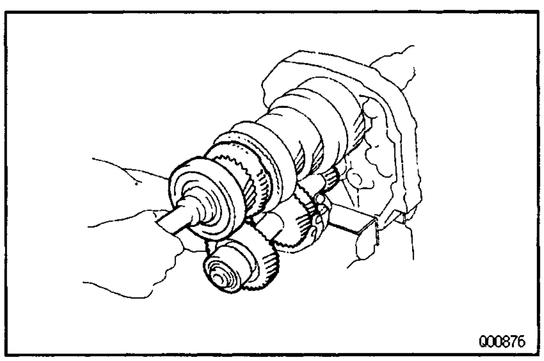
(b) Install the output shaft into the intermediate plate by pulling on the output shaft and tapping on the inter–mediate plate.



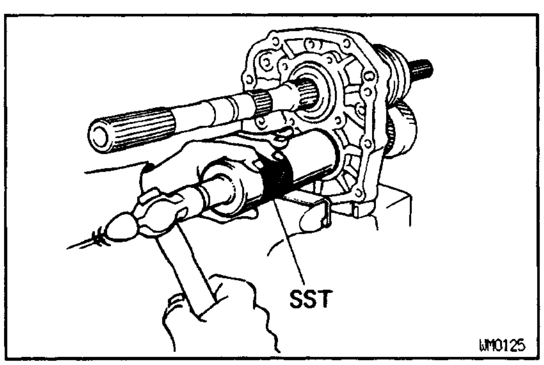
2. INSTALL INPUT SHAFT AND COUNTER GEAR

(a) Apply gear oil to the needle roller bearing.

(b) Install the needle roller bearing to the input shaft.

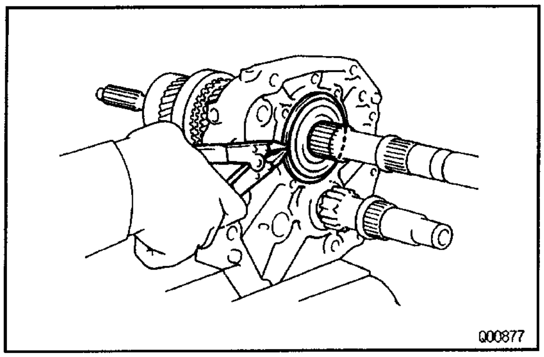


(c) Install the input shaft and counter gear together.



(d) Using SST and a hammer, instal) the counter gear center bearing outer race.
SST 09316–60010 (09316–00010)

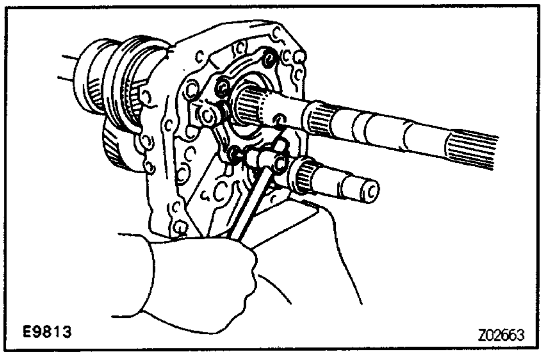
HINT: Be careful not to damage the bearing rollers.



3. INSTALL BEARING RETAINER

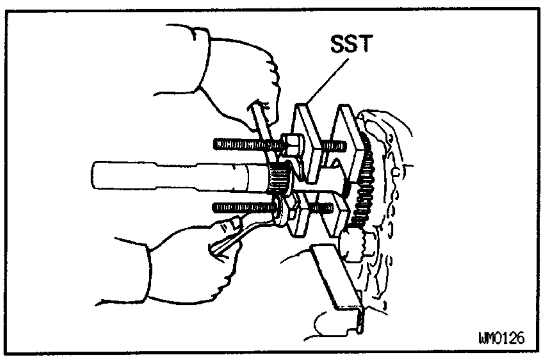
(a) Using a snap ring expander, install the bearing snap ring.

HINT: Be sure the snap ring is flush with the inter–mediate plate surface.



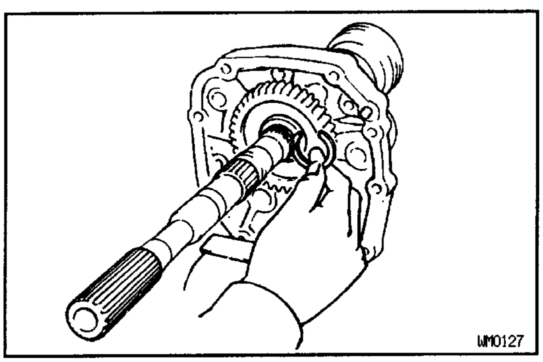
(b) Using a torx socket wrench, install and torque the screws.
Torx wrench T40 09042–00020

Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)



4. INSTALL REVERSE GEAR

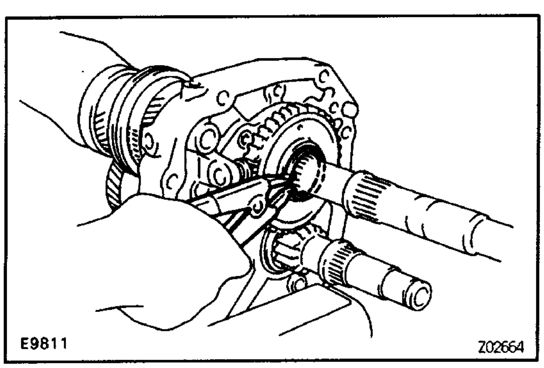
Using SST, install the reverse gear.
SST 09312–20011 (09313–00030, 09313–00040, 09313–00050)



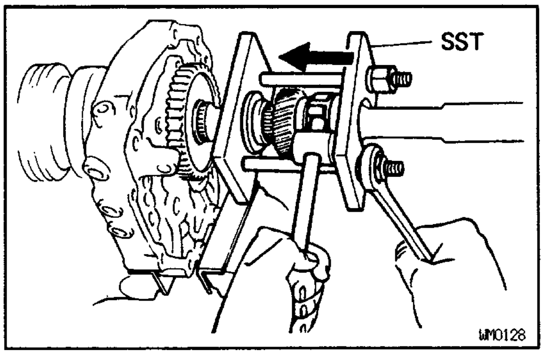
5. INSTALL SNAP RING

(a) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
5	2.25–2.30 (0.0886–0.0906)
11	2.30–2.35 (0.0906–0.0925)
12	2.35–2.40 (0.0925–0.0945)
13	2.40–2.45 (0.0945–0.0965)
14	2.45–2.50 (0.0965–0.0984)
15	2.50–2.55 (0.0984–0.1004)
16	2.55–2.60 (0.1004–0.1024)
17	2.61–2.66 (0.1028–0.1047)
18	2.67–2.72 (0.1051–0.1071)
19	2.73–2.78 (0.1075–0.1094)
20	2.79–2.84 (0.1098–0.1118)
21	2.85–2.90 (0.1122–0.1142)
22	2.91–2.96 (0.1146–0.1165)
23	2.97–3.02 (0.1169–0.1189)



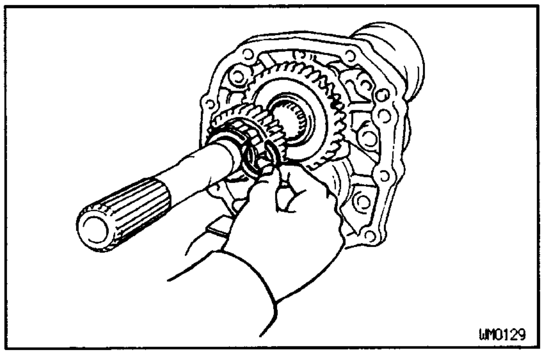
(b) Using a snap ring expander, install the snap ring.



6. INSTALL FIFTH GEAR AND OUTPUT SHAFT REAR BEARING

Using SST, install the 5th gear and rear bearing.
SST 09312–20011 (09313–00010, 09313–00030,

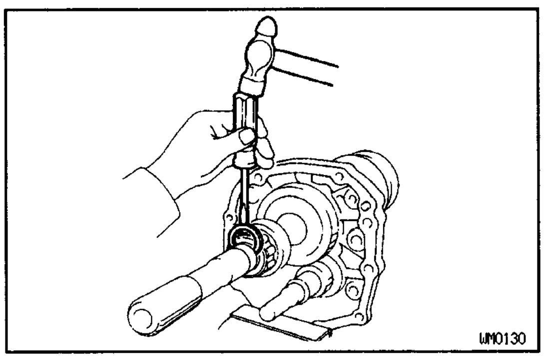
09313–00040, 09313–00050)



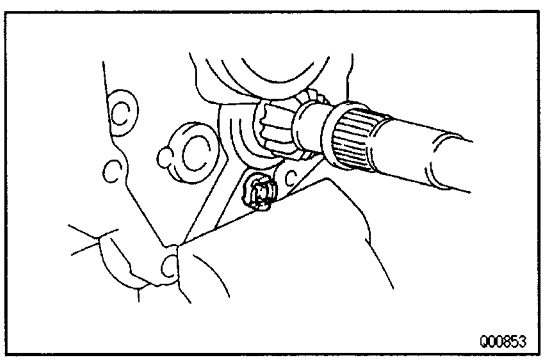
7. INSTALL SNAP RING

(a) Select a snap ring that will allow minimum axial play.

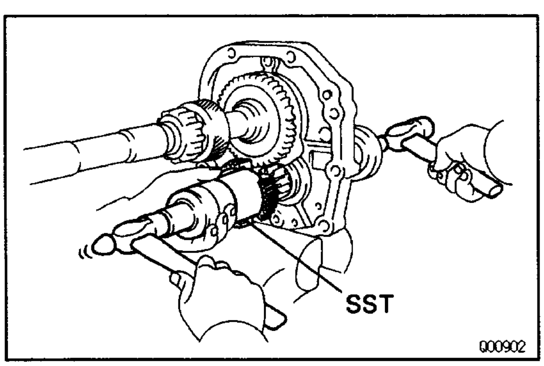
Mark	Thickness mm (in.)
8	2.31 – 2.36 (0.0909 – 0.0929)
9	2.37 – 2.42 (0.0933 – 0.0953)
10	2.43 – 2.48 (0.0957 – 0.0976)
11	2.49 – 2.54 (0.0980 – 0.1000)
12	2.55 – 2.60 (0.1004 – 0.1024)
13	2.61 – 2.66 (0.1028 – 0.1047)
14	2.68 – 2.73 (0.1055 – 0.1098)
15	2.74 – 2.79 (0.1079 – 0.1098)



(b) Using a screwdriver and hammer, tap in the snap ring.



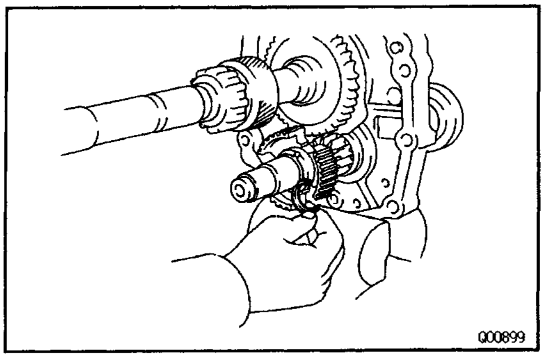
8. INSTALL REAR MAGNET



9. INSTALL NO.3 CLUTCH HUB

Using SST and a hammer, drive in No.3 clutch hub.
SST 09316–60010 (09316–00010, 09316–00070)

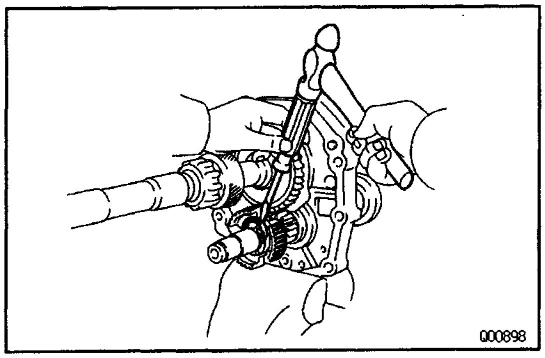
HINT: When installing the clutch hub, support the counter shaft in front with a 3–5 Ib hammer or equivalent.



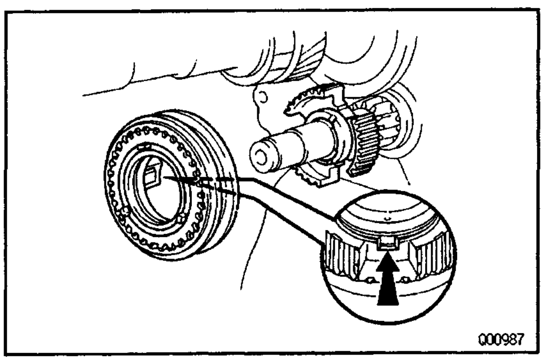
10. INSTALL SNAP RING

(a) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
2	2.06–2.11 (0.0811–0.0831)
3	2.12–2.17 (0.0835–0.0854)
4	2.18–2.23 (0.0858–0.0878)
5	2.24–2.29 (0.0882–0.0902)



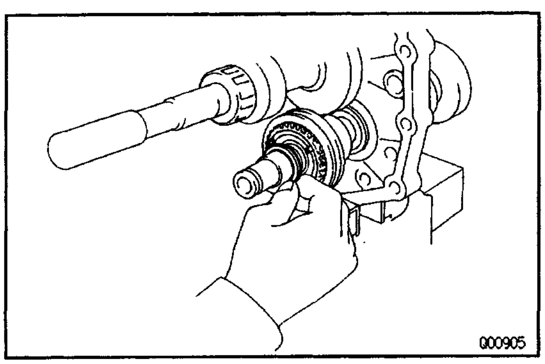
(b) Using a screwdriver and hammer, tap in the snap ring.



11. INSTALL NO.3 HUB SLEEVE ASSEMBLY

(a) Check for reverse synchronizer pull ring position.

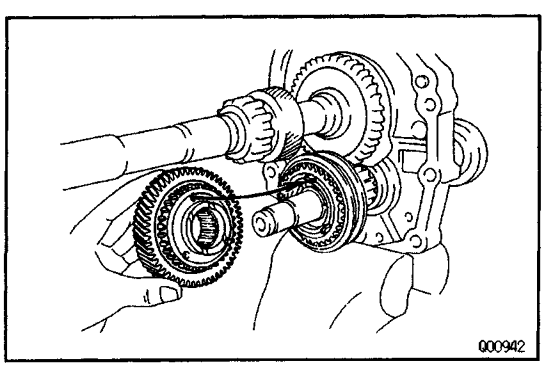
(b) Install the No.3 hub sleeve assembly to the No.3 clutch hub.



12. INSTALL SPACER, NEEDLE ROLLER BEARING AND COUNTER FIFTH GEAR

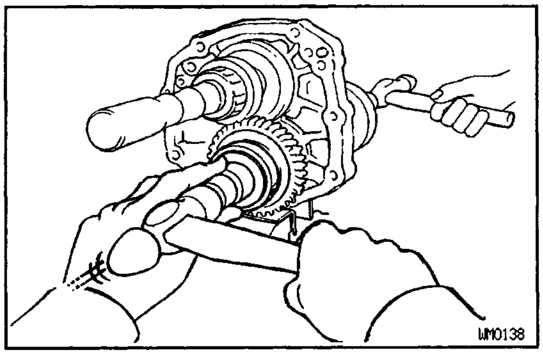
(a) Install the spacer.

(b) Apply gear oil to the needle roller bearing.



(c) Install the needle roller bearing to the counter fifth gear.

(d) Install the counter 5th gear with 5th gear gaps aligned with synchronizer corn ring pin.

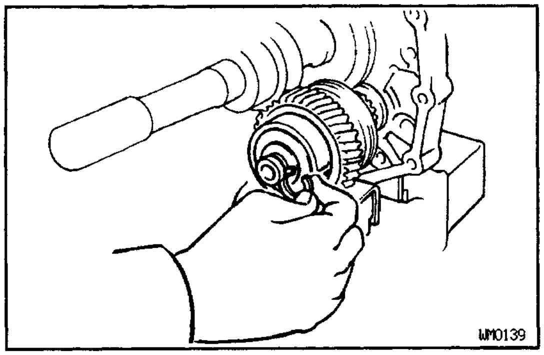


13. INSTALL SPACER AND BEARING

(a) Install the spacer.

(b) Using a socket wrench and hammer, drive in the bearing.

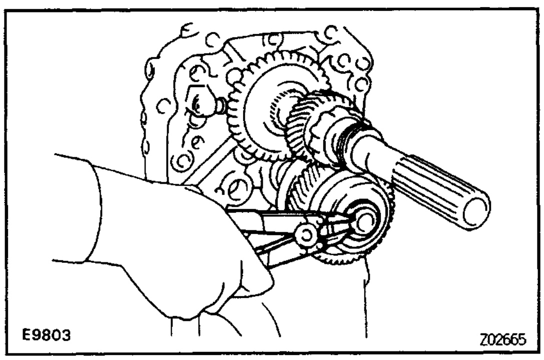
HINT: When driving in the bearing, support the cou–nter shaft in front with a 3–5 Ib hammer or equiva–lent.



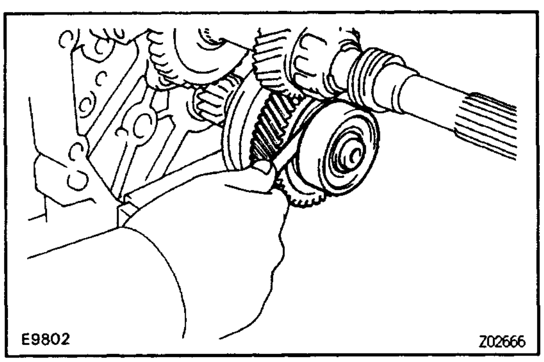
14. INSTALL SNAP RING

(a) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
1	1.90–1.95 (0.0748–0.0768)
2	1.96–2.01 (0.0772–0.0791)
3	2.02–2.07 (0.0795–0.0815)
4	2.08–2.13 (0.0819–0.0839)
5	2.14–2.19 (0.0843–0.0862)
6	2.20–2.25 (0.0866–0.0886)
7	2.26–2.31 (0.0890–0.0909)



(b) Using a snap ring expander, install the snap ring.

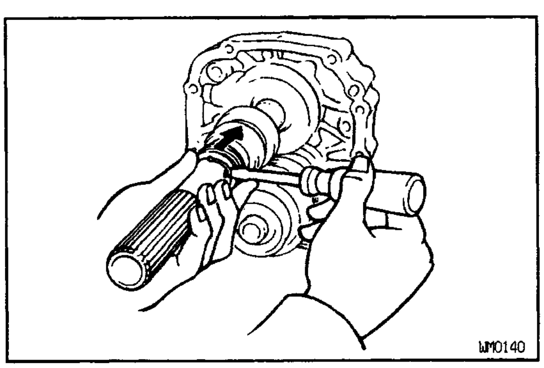


15. INSPECT COUNTER FIFTH GEAR THRUST CLEAR–ANCE

Using a feeler gauge, measure the counter 5th gear thrust clearance.

Standard clearance:

0.10–0.41 mm (0.0039–0.0161 in.)

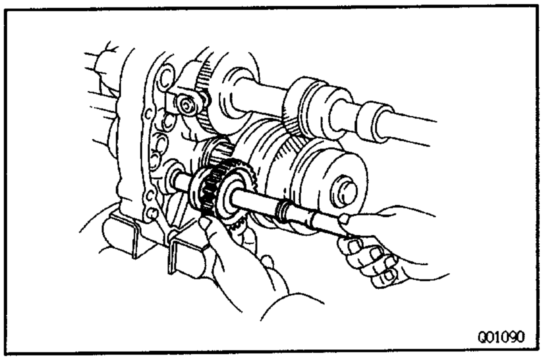


16. INSTALL SPEED SENSOR DRIVE GEAR

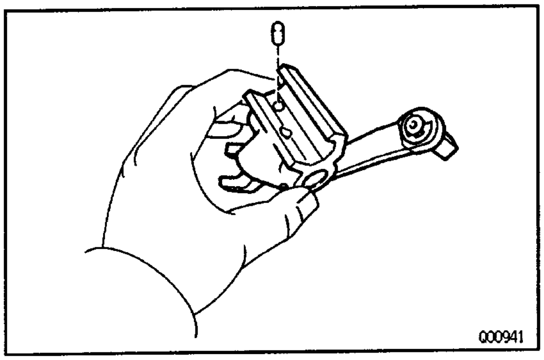
(a) Put a clip on the output shaft and install the drive gear clip into the slot.

(b) Slide the drive gear with clip and fit the clip into the holes.

17. INSTALL SHIFT FORKS, SHIFT FORK SHAFTS AND REVERSE IDLER GEAR

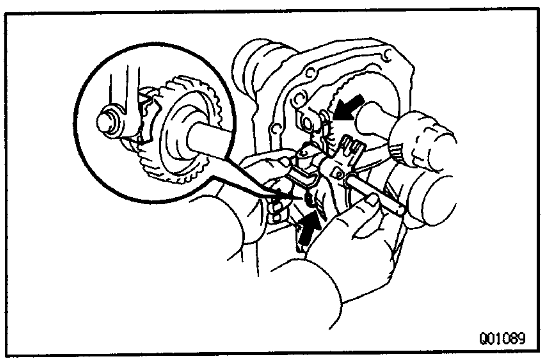


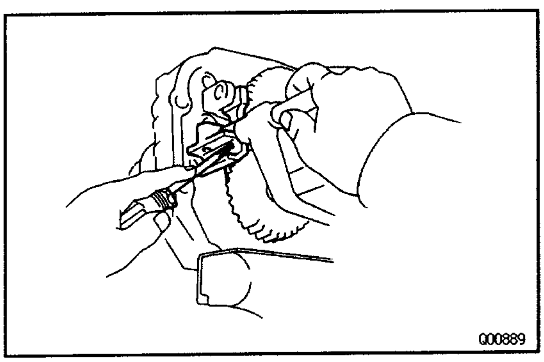
(a) Install the reverse idler gear and shaft.



(b) Install the No.3 shift fork, No.3 fork shaft and reverse shift arm.

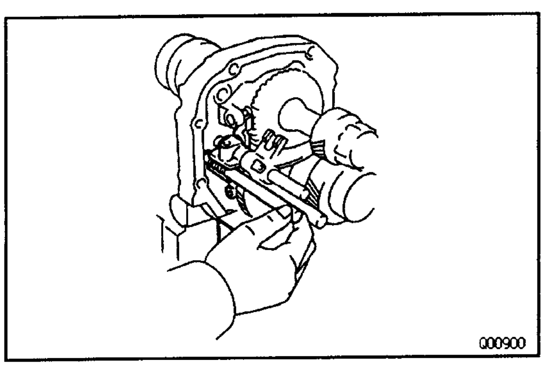
- Coat the pin with MP grease and insert it into the reverse shift head hole.
- Install the No.3 shaft through the No.3 shift fork and reverse shift arm.
- Align the No.3 shift fork with the No.3 hub sleeve groove, put the reverse shift arm into the pivot of bearing retainer and align the reverse shift arm show with the reverse idler gear groove. Install No.3 the shift fork shaft to the intermediate plate.



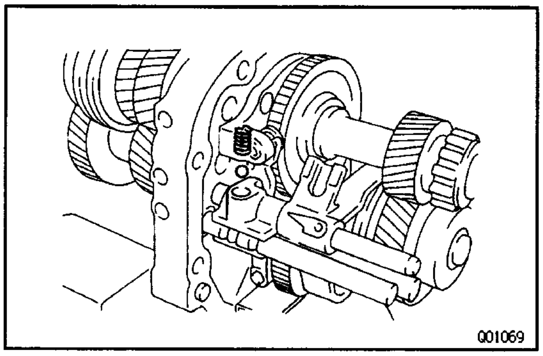


(c) Install the No.4 shift fork shaft.

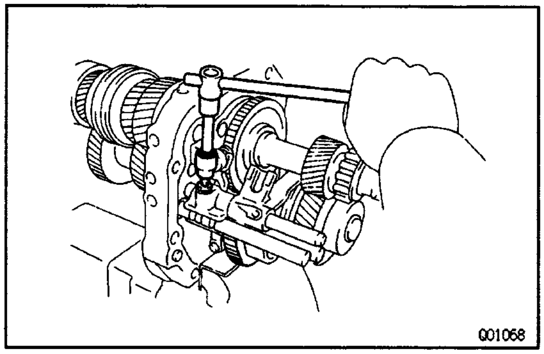
- Push the pin, which was installed into the reverse shift arm hole, into the groove of No.3 shift fork shaft.



- Install the shift fork shaft No.4 to the intermeddle–ate plate.



(d) Install the ball and spring.



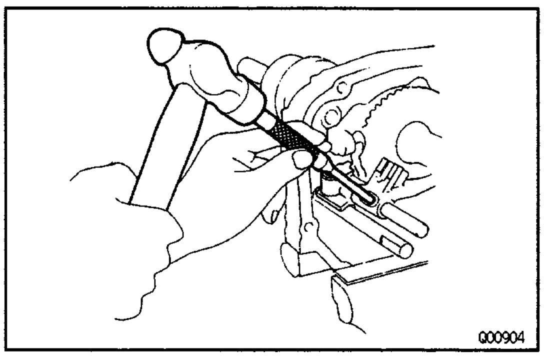
(e) Apply sealant to the plug.

Sealant:

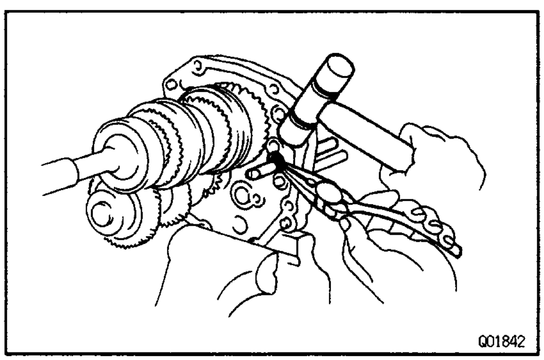
Part No.08833–00080, THREE BOND 1344, LOC–TITE 242 or equivalent

(f) Using a hexagon wrench, install and torque the plug.

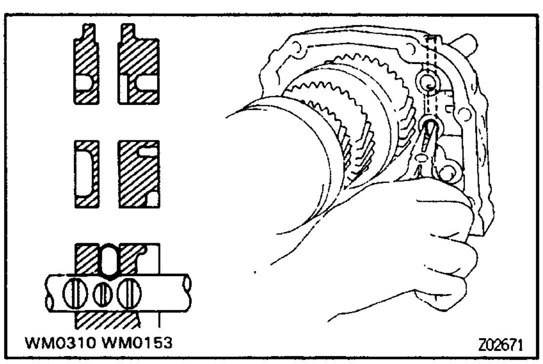
Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)



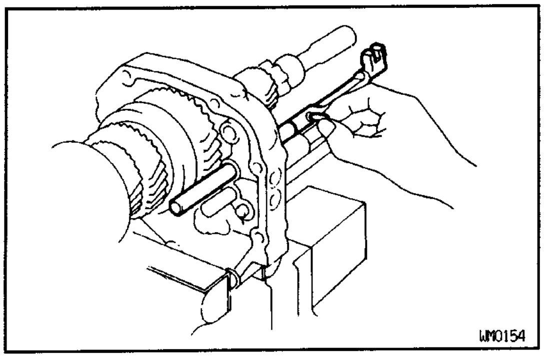
(g) Using a pin punch and hammer, drive in the slotted spring pin until it is flush with the No.3 shift fork.



(h) Install the snap ring to the No.3 fork shaft.

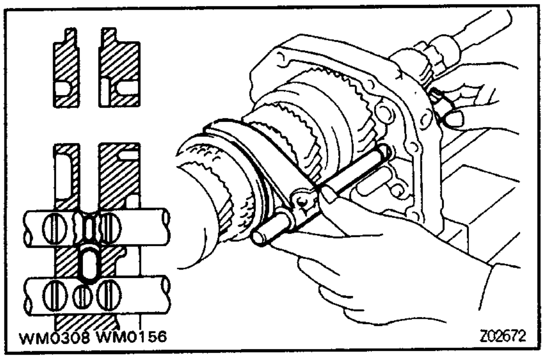


(i) Apply MP grease to the No.3 interlock pin and install the pin into the intermediate plate hole.

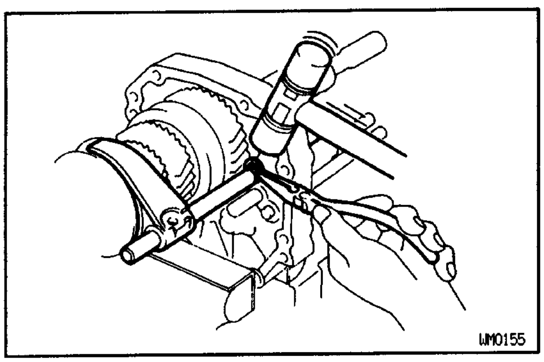


(j) Install the No.2 shift fork and fork shaft.

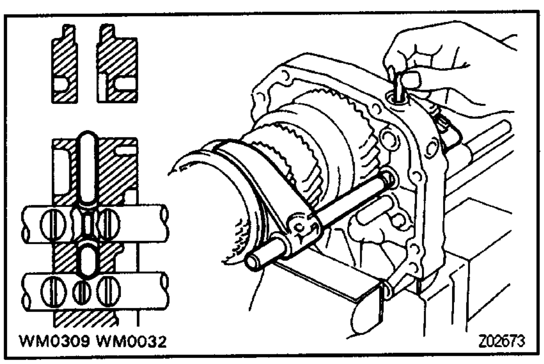
- Apply MP grease to No.2 interlock pin and install the pin into the shaft hole.



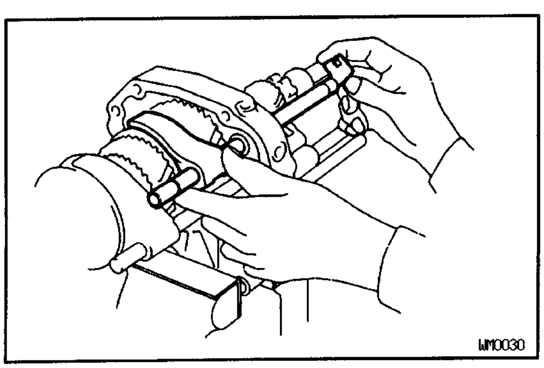
- Place the No.2 shift fork into the groove of No.2 hub sleeve.
- Install the No.2 fork shaft to the shift fork thr–ough the intermediate plate.



(k) Install the snap ring to the No.2 fork shaft.

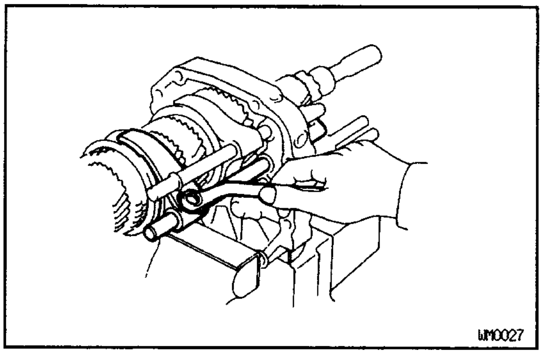


(l) Apply MP grease to the No.2 interlock pin and install the pin into the intermediate plate.



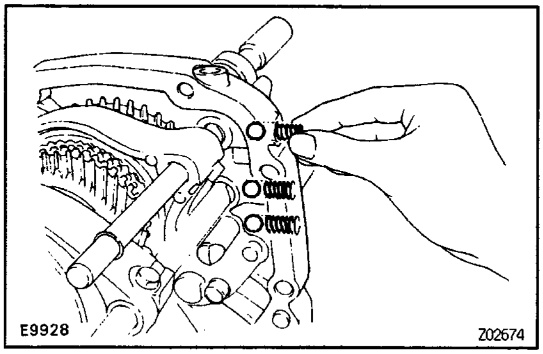
(m) Install the No.1 shift fork and fork shaft.

- Install the No.1 shift fork into the groove of No.1 hub sleeve.
- Install the No.1 fork shaft to the shift fork thr–ough the intermediate plate.



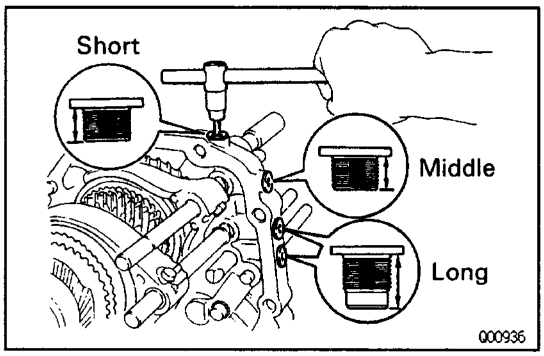
(n) Install and torque the No.1 and No.2 shift fork set bolts.

Torque: 20 N–m (200 kgf.cm, 14 ft–lbf)



18. INSTALL LOCKING BALL AND SPRING

(a) Install the balls and spring into each hole.



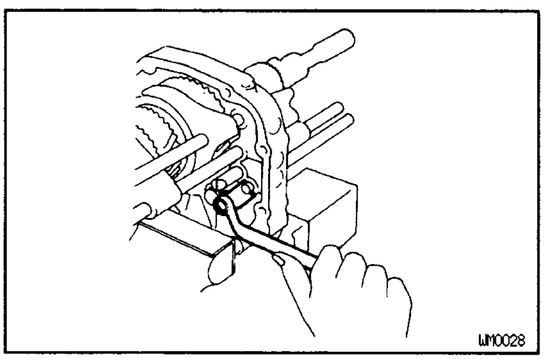
(b) Apply liquid sealer to the plug threads.

Sealant:

Part No.08833–00080, THREE BOND 1344, LOC–TITE 242 or equivalent

(c) Using a hexagon wrench, install the torque the four plugs.

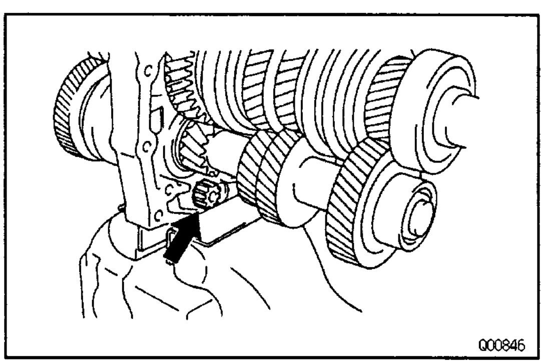
Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)



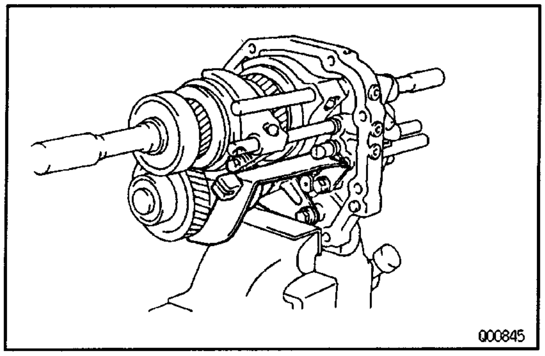
19. INSTALL REVERSE IDLER GEAR SHAFT STOPPER

Install the reverse idler gear shaft stopper and torque the bolt.

Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)



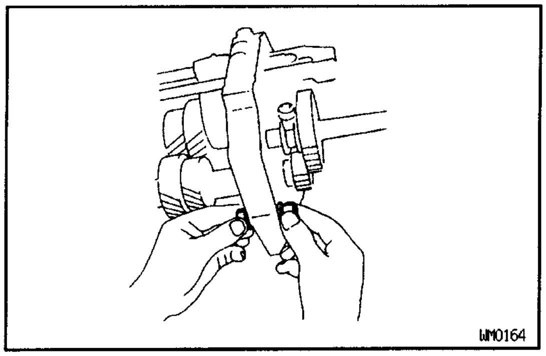
20. INSTALL FRONT MAGNET



21. INSTALL OIL SEPARATOR

Install the oil receiver and torque the two bolts.

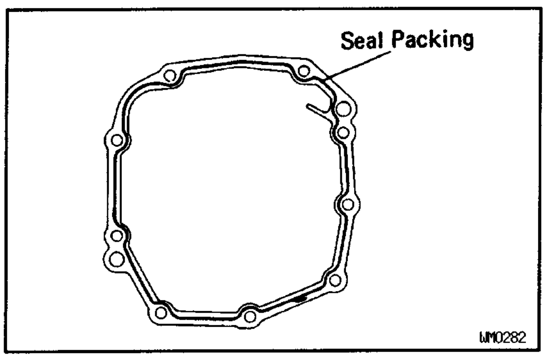
Torque: 18 N–m (185 kgf–cm, 13 ft–tbf)



22. DISMOUNT INTERMEDIATE PLATE FROM VISE

(a) Dismount the intermediate plate from the vise.

(b) Remove the bolts, nuts, plate washers and gasket.



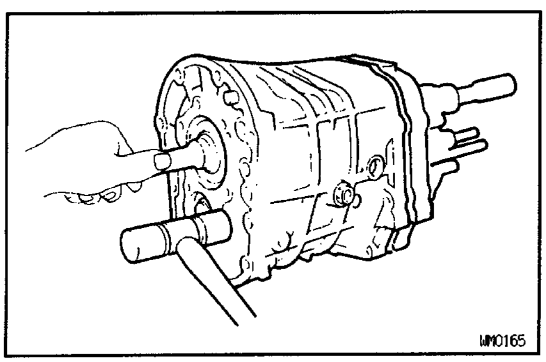
23. INSTALL TRANSMISSION CASE TO INTERMEDIATE PLATE

(a) Remove the any packing material and be careful not to drop oil on the contacting surface of the transmission case or intermediate plate.

(b) Apply seal packing to the transmission case as shown.

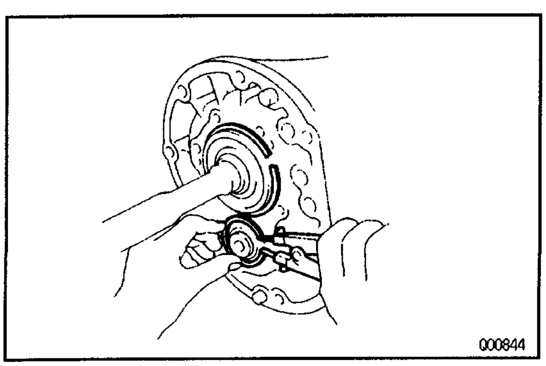
Seal packing:

Part No. 08826 – 00090, THREE BOND 1281 or equivalent



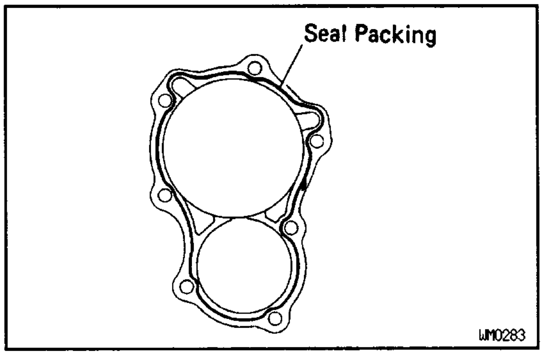
(c) Align the each bearing outer race and each shift fork shaft end with the case holes.

(d) Using a plastic hammer, tap on the case to install it.



24. INSTALL BEARING SNAP RINGS

Using a snap ring expander, install the two snap rings.



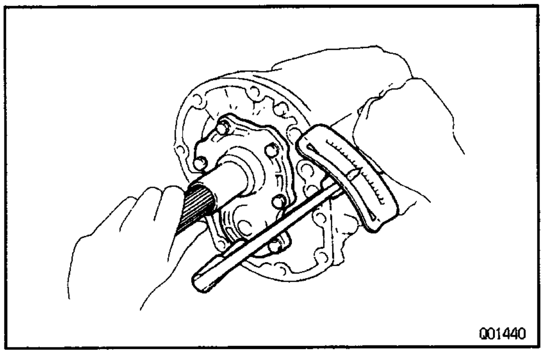
25. INSTALL FRONT BEARING RETAINER

(a) Remove the any packing material and be careful not to drop oil on the contacting surface of the front bearing retainer or transmission case.

(b) Apply seal packing to the retainer as shown, and install it to the transmission case.

Seal packing:

Part No. 08826 – 00090, THREE BOND 1281 or equivalent



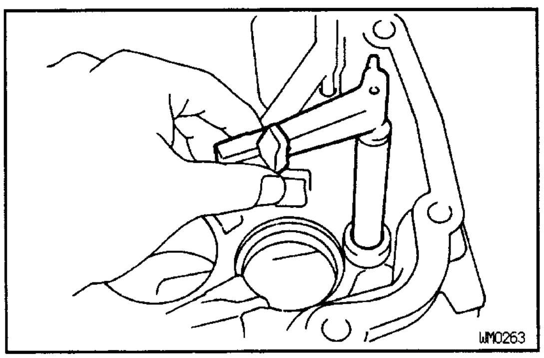
(c) Apply liquid sealer to the bolt threads.

Sealant:

Part No.08833–00080. THREE BOND 1344, LOC–TITE 242 or equivalent

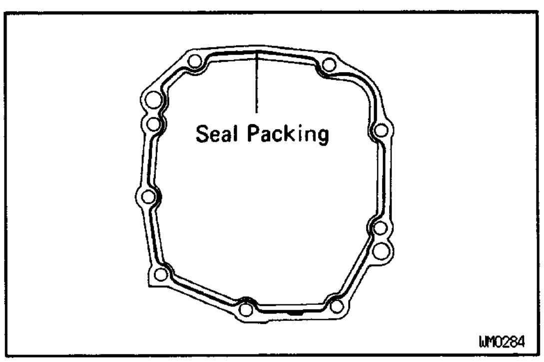
(d) Install and torque the bolts.

Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)



26. (2WD)
INSTALL EXTENSION HOUSING

(a) Install the shift and select lever into the extension housing.

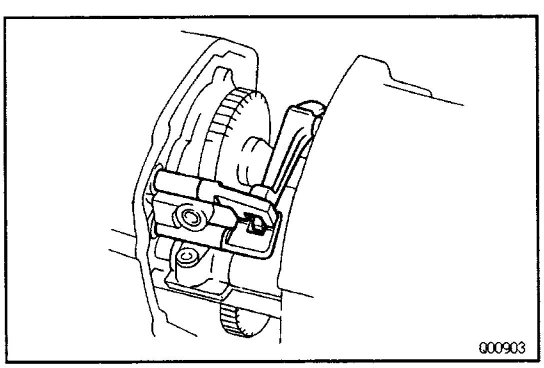


(b) Remove the any packing material and be careful not to drop oil on the contacting surface of the extension housing or intermediate plate.

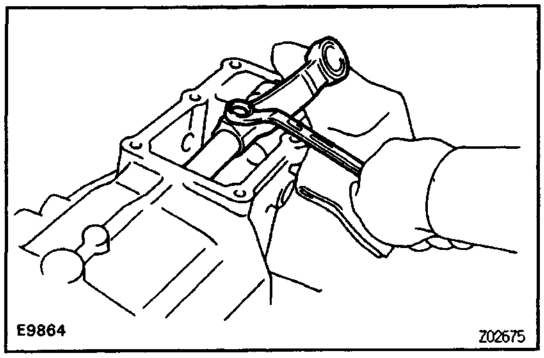
(c) Apply seal packing to the extension housing.

Seal packing:

Part No. 08826 – 00090, THREE BOND 1281 or equivalent

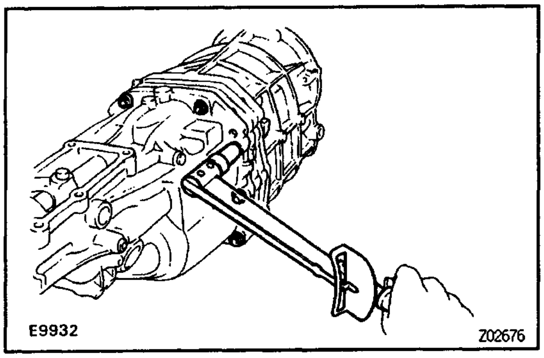


(d) Connect the shift and select lever to the shift fork shaft.



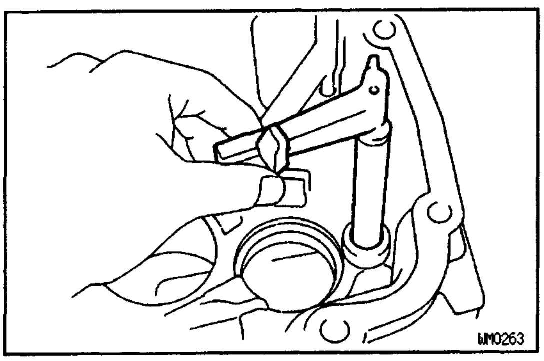
(e) Install the shift lever housing to the shift and select lever shaft, push in the extension housing.
(f) Install and torque the bolt.

Torque: 39 N–m (400 kgf–cm, 29 ft–lbf)

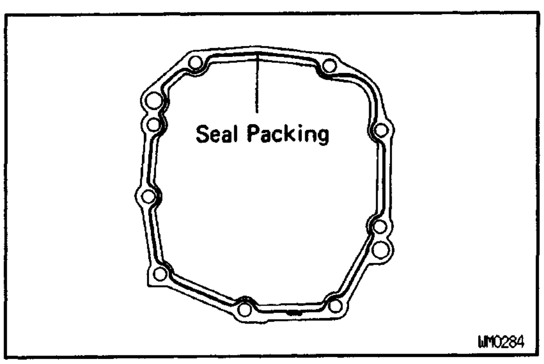


(g) Install the nine bolts to the extension housing.
(h) Torque the bolts.

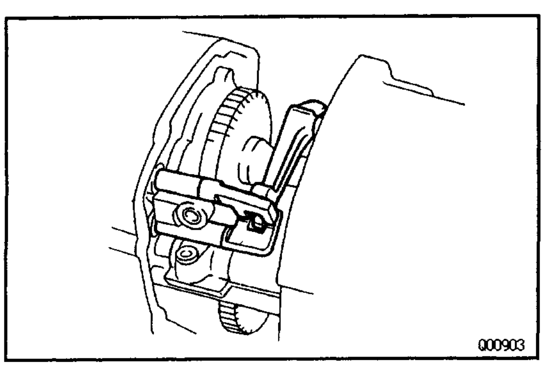
Torque: 37 N–m (375 kgf–cm, 27 ft–lbf)



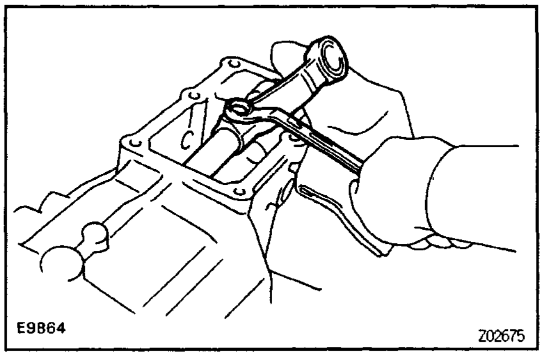
27. (4WD)
INSTALL TRANSFER ADAPTOR
(a) Install the shift and select lever into the transfer adaptor.



(b) Remove the any packing material and be careful not to drop oil on the contacting surface of the transfer adaptor or intermediate plate.
(c) Apply seal packing to the extension housing.
Seal packing:
Part No. 08826 – 00090, THREE BOND 1281 or equivalent

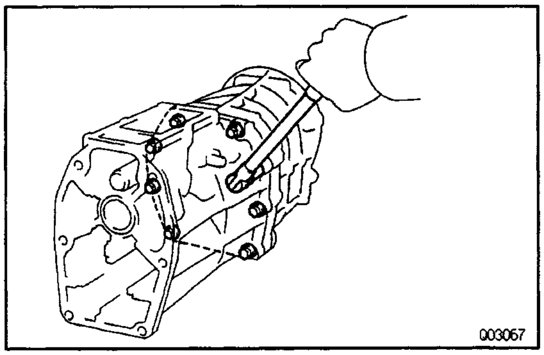


(d) Connect the shift and select lever to the shift fork shaft.



(e) Install the shift lever housing to the shift and select lever shaft, push in the transfer adaptor.
(f) Install and torque the bolt.

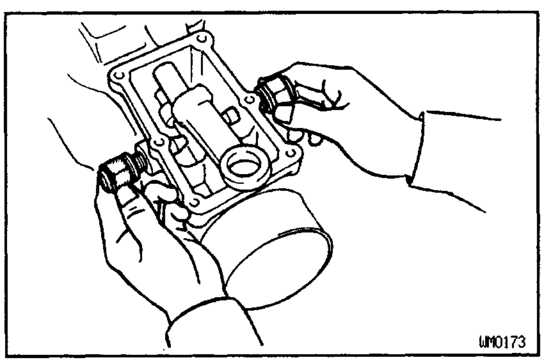
Torque: 39 N–m (400 kgf–cm, 29 ft–lbf)



(g) Install the nine bolts to the transfer adaptor.
(h) Torque the bolts.
Torque: 37 N–m (380 kgf–cm, 27ft¿lbf)

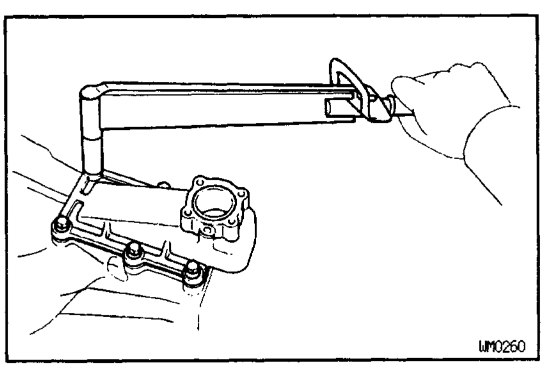
28. AFTER INSTALLING EXTENSION HOUSING, CHECK FOLLOWING ITEMS:

(a) Check to see that the input shaft and output shaft rotate smoothly.
(b) Check to see that shifting can be made smoothly to all positions.



29. INSTALL RESTRICT PINS

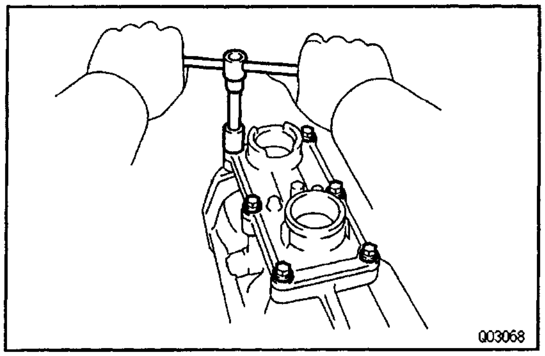
(a) Install the restrict pins together with a gasket.
HINT: Install the black pin on the reverse gear/5th gear side.
(b) Torque the restrict pins.
Torque: 40 N–m (410 kgf–cm, 30 ft–lbf)

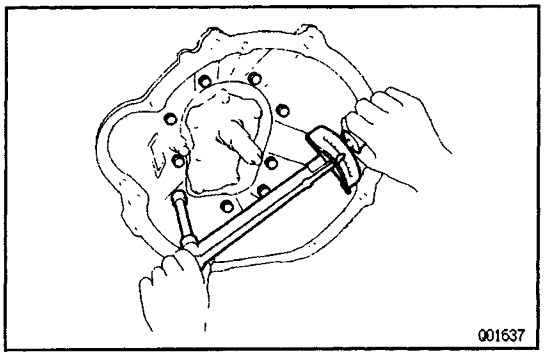


30. (2WD)
INSTALL SHIFT LEVER RETAINER

(a) Install the shift lever retainer with a oil baffle.
(b) Install and torque the six bolts.

Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)





31. INSTALL CLUTCH HOUSING

(a) Install the clutch housing.

(b) Install and torque the nine bolts.

Torque: 37 N–m (375 kgf¿em, 27 ft–lbf)

32. INSTALL VEHICLE SPEED SENSOR

(a) Install the speed sensor.

(b) Install and torque the set bolt.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)

33. INSTALL BACK–UP LIGHT SWITCH

(a) Install and torque the back–up light switch.

Torque: 40 N–m (410 kgf–cm, 30 ft–lbf)

(b) Install the wire clamp.

SERVICE SPECIFICATIONS

MT010–02

SERVICE DATA

Output shaft 2nd gear journal diameter		
Limit	42.975 mm	1.6919 in.
Output shaft 3rd gear journal diameter		
Limit	31.969 mm	1.2586 in.
Output shaft flange thickness		
Limit	5.60 mm	0.2205 in.
Output shaft runout		
Limit	0.06 mm	0.0024 in.
1 st gear inner race flange thickness		
Limit	4.87 mm	0.1882 in.
1 st gear inner race outer diameter		
Limit	42.975 mm	1.6919 in.
Counter gear bearing journal diameter		
Limit	29.950 mm	1.1791 in.
Counter 5th gear journal diameter		
Limit	26.975 mm	1.6919 in.
1st, 2nd and 3rd Gear thrust clearance		
STD	0.10 – 0.25 mm	0.0039 – 0.0098 in.
Limit	0.30 mm	0.0118 in.
Counter 5th gear thrust clearance		
STD	0.10 – 0.41 mm	0.0039 – 0.0161 in.
Limit	0.46 mm	0.0181 in.
1 st, 2nd and counter 5th gear oil clearance		
STD	0.009 – 0.060 mm	0.0004 – 0.0024 in.
Limit	0.15 mm	0.0059 in.
3rd gear oil clearance		
STD	0.015 – 0.066 mm	0.0006 – 0.0026 in.
Limit	0.20 mm	0.0079 in.
Reverse idler gear to shift arm shoe		
STD	0.041 – 0.074 mm	0.0016 – 0.0029 in.
Limit	0.194 mm	0.0076 in.
Shift fork to hub sleeve clearance		
Limit	1.0 mm	0.039 in.
Synchronizer ring to 1 st and 4th gear clearance		
Limit	0.5 mm	0.020 in.
Synchronizer ring to 2nd and 3rd gear clearance		
Limit	0.7 mm	0.028 in.
Input shaft snap ring thickness		
Mark 1	2.05 – 2.10 mm	0.0807 – 0.0827 in.
Mark 2	2.10 – 2.15 mm	0.0827 – 0.0846 in.
Mark 3	2.15 – 2.20 mm	0.0846 – 0.0866 in.
Mark 4	2.20 – 2.25 mm	0.0866 – 0.0886 in.
Mark 5	2.25 – 2.30 mm	0.0886 – 0.0906 in.
Mark 11	2.30 – 2.35 mm	0.0906 – 0.0925 in.
Mark 12	2.35 – 2.40 mm	0.0925 – 0.0945 in.

Output shaft snap ring thickness		
No.2 clutch hub	Mark C−1	1.75 − 1.80 mm 0.0689 − 0.0709 in.
No.2 clutch hub	Mark 11	1.86 − 1.91 mm 0.0732 − 0.0752 in.
No.2 clutch hub	Mark 12	1.92 − 1.97 mm 0.0756 − 0.0776 in.
No.2 clutch hub	Mark 13	1.98 − 2.03 mm 0.0780 − 0.0799 in.
No.2 clutch hub	Mark 14	2.04 − 2.09 mm 0.0803 − 0.0823 in.
No.2 clutch hub	Mark 15	2.10 − 2.15 mm 0.0827 − 0.0846 in.
Rear bearing	Mark 8	2.31 − 2.36 mm 0.0909 − 0.0929 in.
Rear bearing	Mark 9	2.37 − 2.42 mm 0.0933 − 0.0953 in.
Rear bearing	Mark 10	2.43 − 2.48 mm 0.0957 − 0.0976 in.
Rear bearing	Mark 11	2.49 − 2.54 mm 0.0980 − 0.1000 in.
Rear bearing	Mark 12	2.55 − 2.60 mm 0.1004 − 0.1024 in.
Rear bearing	Mark 13	2.61 − 2.66 mm 0.1028 − 0.1047 in.
Rear bearing	Mark 14	2.68 − 2.73 mm 0.1055 − 0.1075 in.
Rear bearing	Mark 15	2.74 − 2.79 mm 0.1079 − 0.1098 in.
Reverse gear	Mark 5	2.25 − 2.30 mm 0.0886 − 0.0906 in.
Reverse gear	Mark 11	2.30 − 2.35 mm 0.0906 − 0.0925 in.
Reverse gear	Mark 12	2.35 − 2.40 mm 0.0925 − 0.0945 in.
Reverse gear	Mark 13	2.40 − 2.45 mm 0.0945 − 0.0965 in.
Reverse gear	Mark 14	2.45 − 2.50 mm 0.0965 − 0.0984 in.
Reverse gear	Mark 15	2.50 − 2.55 mm 0.0984 − 0.1004 in.
Reverse gear	Mark 16	2.55 − 2.60 mm 0.1004 − 0.1024 in.
Reverse gear	Mark 17	2.61 − 2.66 mm 0.1028 − 0.1047 in.
Reverse gear	Mark 18	2.67 − 2.72 mm 0.1051 − 0.1071 in.
Reverse gear	Mark 19	2.73 − 2.78 mm 0.1075 − 0.1094 in.
Reverse gear	Mark 20	2.79 − 2.84 mm 0.1098 − 0.1118 in.
Reverse gear	Mark 21	2.85 − 2.90 mm 0.1122 − 0.1142 in.
Reverse gear	Mark 22	2.91 − 2.96 mm 0.1146 − 0.1165 in.
Reverse gear	Mark 23	2.97 − 3.02 mm 0.1169 − 0.1189 in.
Counter gear snap ring thickness		
Front bearing	Mark A	2.05 − 2.10 mm 0.0807 − 0.0827 in.
Front bearing	Mark B	2.10 − 2.15 mm 0.0827 − 0.0846 in.
Front bearing	Mark C	2.15 − 2.20 mm 0.0846 − 0.0866 in.
Front bearing	Mark D	2.20 − 2.25 mm 0.0866 − 0.0886 in.
Front bearing	Mark E	2.25 − 2.30 mm 0.0886 − 0.0906 in.
Front bearing	Mark F	2.30 − 2.35 mm 0.0906 − 0.0925 in.
Front bearing	Mark G	2.35 − 2.40 mm 0.0925 − 0.0945 in.
No.3 clutch hub	Mark 2	2.06 − 2.11 mm 0.0811 − 0.0831 in.
No.3 clutch hub	Mark 3	2.12 − 2.17 mm 0.0835 − 0.0854 in.
No.3 clutch hub	Mark 4	2.18 − 2.23 mm 0.0858 − 0.0878 in.
No.3 clutch hub	Mark 5	2.24 − 2.29 mm 0.0882 − 0.0902 in.
Rear bearing	Mark 1	1.90 − 1.95 mm 0.0748 − 0.0768 in.
Rear bearing	Mark 2	1.96 − 2.01 mm 0.0772 − 0.0791 in.
Rear bearing	Mark 3	2.02 − 2.07 mm 0.0795 − 0.0815 in.
Rear bearing	Mark 4	2.08 − 2.13 mm 0.0819 − 0.0839 in.
Rear bearing	Mark 5	2.14 − 2.19 mm 0.0843 − 0.0862 in.
Rear bearing	Mark 6	2.20 − 2.25 mm 0.0866 − 0.0886 in.
Rear bearing	Mark 7	2.26 − 2.31 mm 0.0890 − 0.0909 in.

Oil seal drive in depth	
Front bearing retainer (from retainer end)	11.4 – 12.0 mm 0.449 – 0.472 in.

TORQUE SPECIFICATIONS

MT011–02

Part tightened		N·m	kgf·cm	ft·lbf
Transfer x Transfer adaptor		39	400	29
Engine rear mounting x Transmission		25	260	19
Transmission x Engine		72	730	53
Transmission x Stiffener plate		37	380	27
Transmission x Starter		39	400	29
Clutch tube bracket x Transmission		72	730	53
Frame auxiliary crossmember		95	970	70
Engine rear mounting bracket x Support member		58	590	43
Engine rear mounting bracket x Engine rear mounting		29	300	22
No.2 crossmember x Frame		95	970	70
No.2 crossmember x Engine rear mounting		13	130	9
Stabilizer bracket		29	300	22
Exhaust pipe x Exhaust manifold		62	630	46
Exhaust– pipe x bracket x Clutch housing	Upper	19	195	14
	Lower	69	700	51
Exhaust pipe clamp		19	195	14
Clutch release cylinder x Transmission		12	120	9
Front propeller shaft x Front differential		74	750	54
Front propeller shaft x Transfer		74	750	54
Rear propeller shaft x Transfer		74	750	54
Rear propeller shaft center bearing x Frame		37	370	27
Shift fork set bolt		20	200	14
Straight screw plug		25	250	18
Reverse idler gear shaft stopper bolt		25	250	18
Oil separator x Intermediate plate		18	185	13
Front bearing retainer set bolt		25	250	18
Extension housing x Intermediate plate or Transfer adaptor		37	375	27
Restrict pin		40	410	30
Shift lever housing x Shift and select lever shaft		39	400	29
Shift lever retainer x Extension housing or Transfer adaptor		18	185	13
Drain and filler plugs		40	410	30
Back–up light switch		40	410	30
Clutch housing x Transmission case		37	375	27
Rear bearing retainer x Intermediate plate		13	130	9

AUTOMATIC TRANSMISSION

MEMO

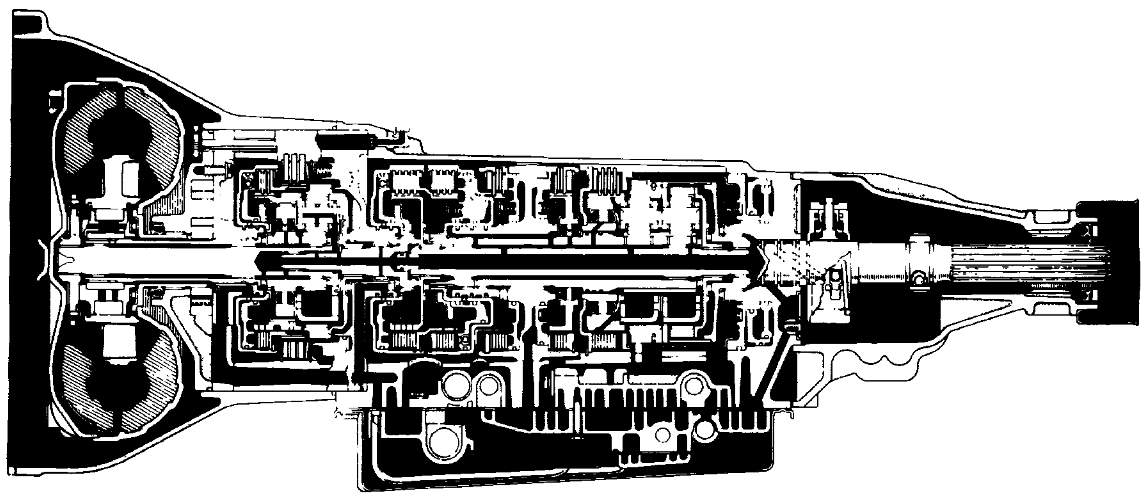
A43D Automatic Transmission

DESCRIPTION

General

The A43D is a 4–speed automatic transmission.
The A43D transmission is mainly composed of the torque converter clutch, the overdrive (hereafter called 0/D) planetary gear unit, 3–speed planetary gear unit, the hydraulic control system and the electronic con–trol system.

Sectional View



AT4220

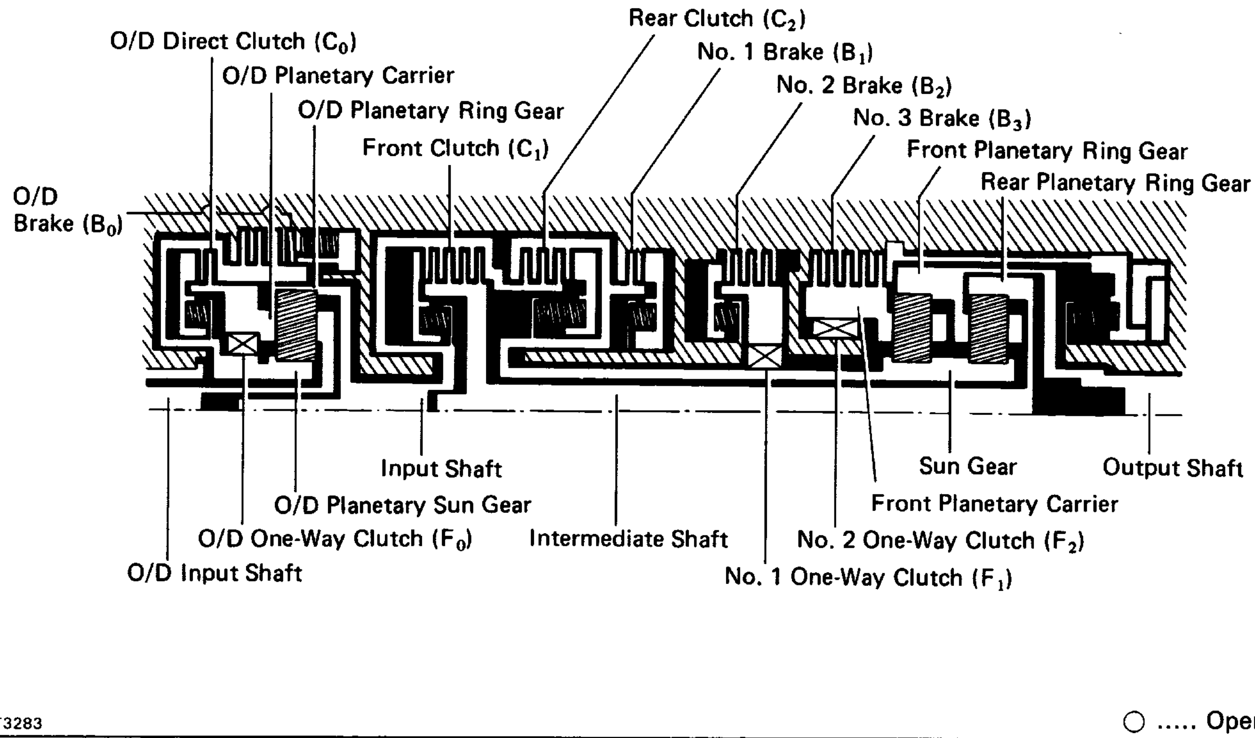
General Specifications

Type of Transmission			A43D
Type of Engine			22R-E
Torque Converter Clutch	Stall Torque Ratio		1.75 : 1
	Lock–Up Mechanism		Equipped
Gear Ratio	1 st Gear		2.452
	2nd Gear		1.452
	3rd Gear		1.000
	O/D Gear		0.688
	Reverse Gear		2.212
Plates (Disc/Plate)	C_0	O/D Direct Clutch	1/0
	C_1	Front Clutch	4/4
	C_2	Rear Clutch	3/3
	B_2	No.2 Brake	3/3
	B_3	No.3 Brake	5/4
	B_0	O/D Brake	3/3
	B_1	No. 1 Brake	1/1
ATF	Type		ATF DEXRON® II
	Capacity liter (US qts, Imp.qts)	Total	6.5 (6.9, 5.7)
		Drain and Ref ill	2.4 (2.5, 2.1)

OPERATION

Mechanical Operation

OPERATING CONDITIONS



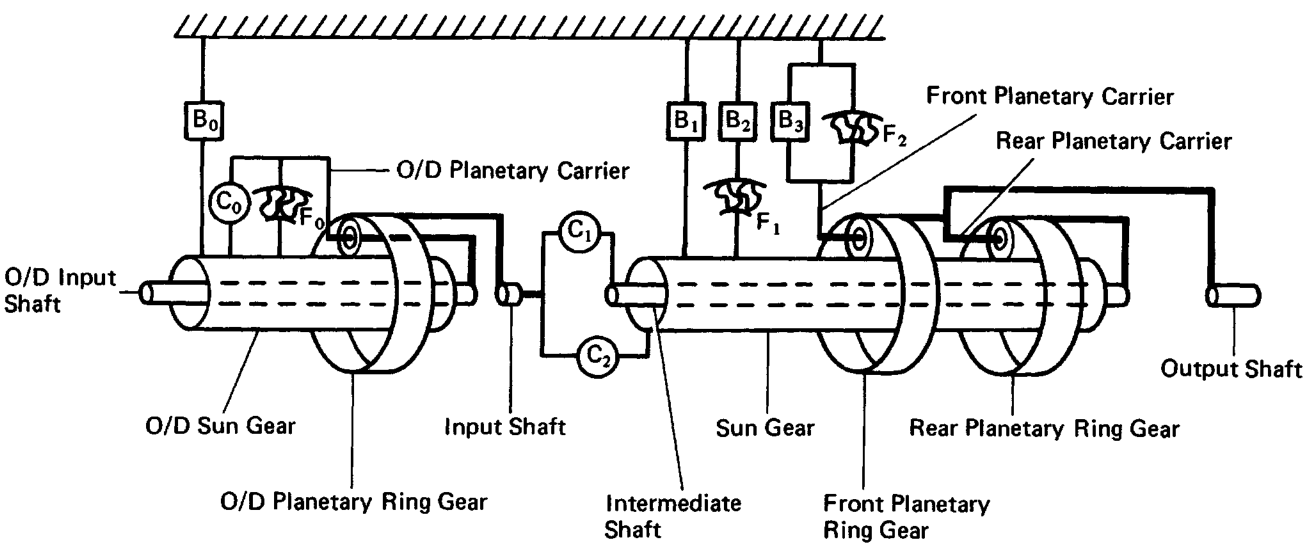
○ ..... Operating

Shift lever position	Gear position	C_0	C_1	C_2		B_0	B_1	B_2	B_3		F_0	F_1	F_2
				I.P.	O.P.				I.P.	O.P.			
P	Parking	○							○	○	○		
R	Reverse	○		○	○				○	○	○		
N	Neutral	○									○		
D	1 st	○	○								○		○
	2nd	○	○					○			○	○	
	3rd	○	○		○			○			○		
	O/D		○		○	○		○					
2	1st	○	○								○		○
	2nd	○	○				○	○			○	○	
L	1 st	○	○						○	○	○		○

I.P. ...... Inner Piston
O.P. ..... Outer Piston

FUNCTION OF COMPONENTS

NOMENCLATURE	OPERATION
O/D Direct Clutch (C_O)	Connects overdrive sun gear and overdrive carrier
O/D Brake (Bo)	Prevents overdrive sun gear from turning either clockwise or counterclockwise
O/D One–Way Clutch (Fo)	When transmission is being driven by engine, connects overdrive sun gear and overdrive carrier
Front Clutch (C_l)	Connects input shaft and intermediate shaft
Rear Clutch (C_2)	Connects input shaft and front & rear planetary sun gear
No. 1 Brake (B_1)	Prevents front & rear planetary sun gear from turning either clockwise or coun–terclockwise
No.2 Brake (B_2)	Prevents outer race of F_1 from turning either clockwise or counterclockwise, thus preventing front & rear planetary sun gear from turning counterclockwise
No.3 Brake (B3)	Prevents front planetary carrier from turning either clockwise or counterclock–wise
No. 1 One–Way Clutch (F_1)	When B_2 is operating, prevents front & rear planetary sun gear from turning counterclockwise
No.2 One–Way Clutch (F_2)	Prevents front planetary carrier from turning counterclockwise

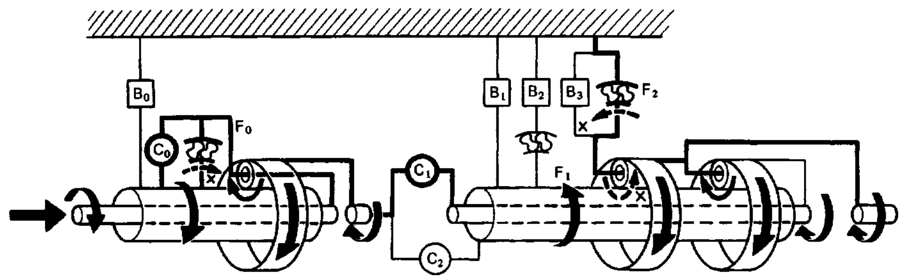


AT3282

FUNCTION OF COMPONENTS (Cont'd)

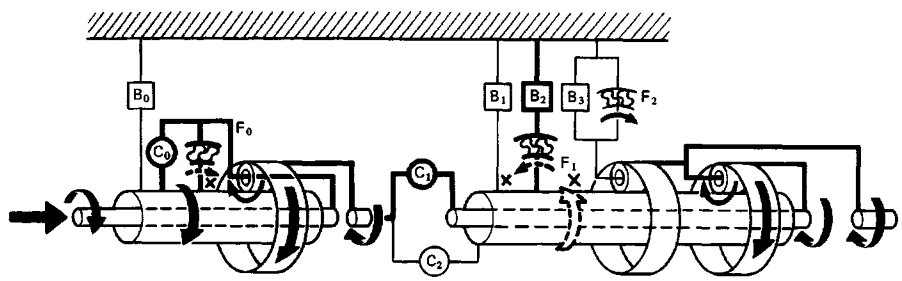
The conditions of operation for each gear position are shown in the following illustrations:

D or 2 Position 1st Gear



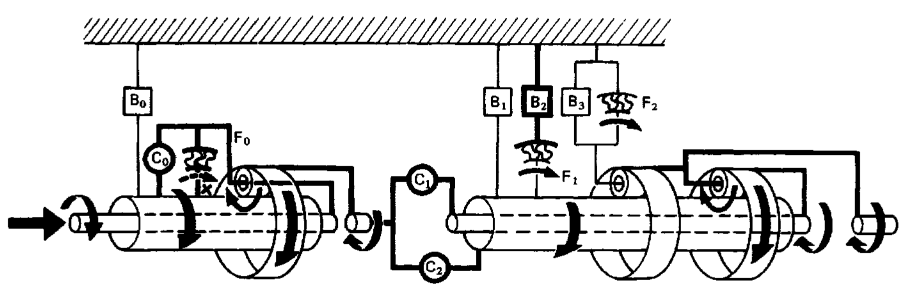
AT7802

D Position 2nd Gear



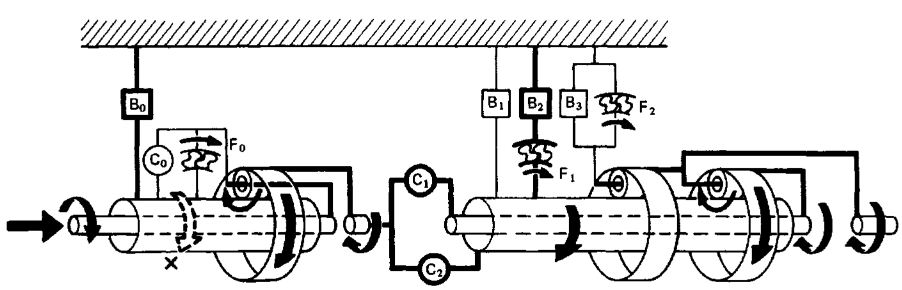
AT7803

D or 2 Position 3rd Gear



AT7804

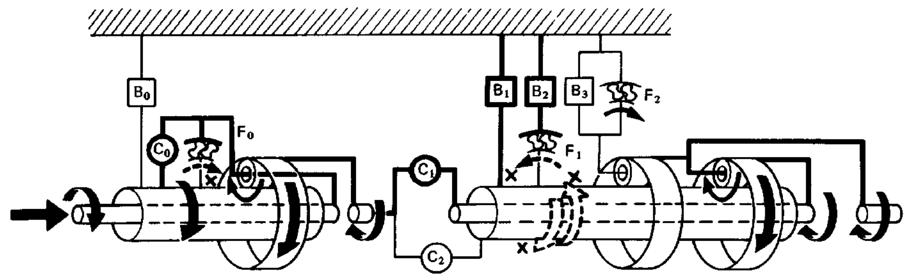
D Position O/D



AT7805

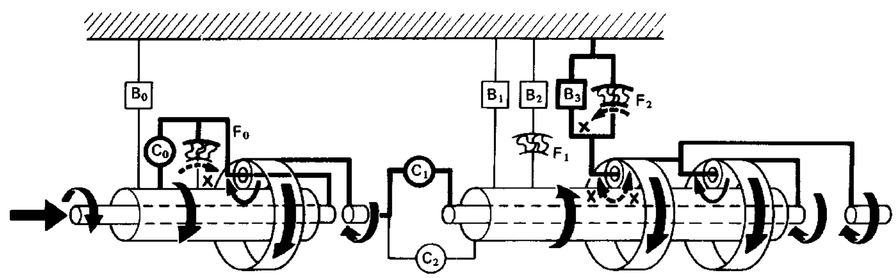
FUNCTION OF COMPONENTS (Cont'd)

2 or L Position 2nd Gear



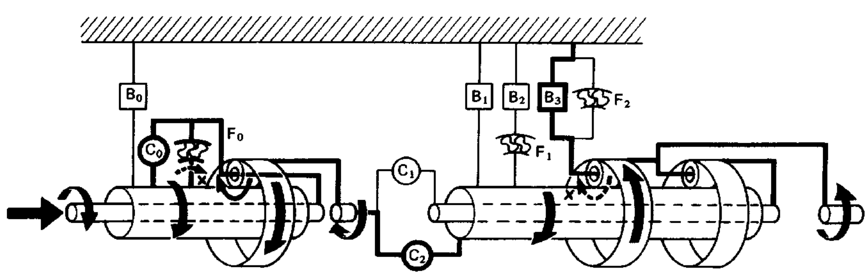
AT7806

L Position 1st Gear



AT7807

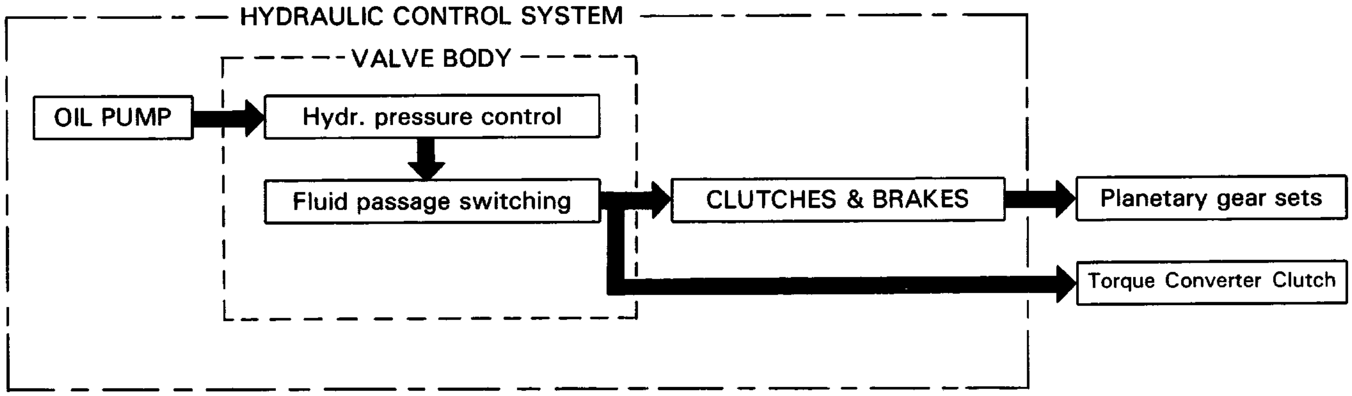
R Position Reverse Gear



AT7808

Hydraulic Control System

The hydraulic control system is composed of the oil pump, the valve body, the governor body, the accumu– lators, the clutches and brakes as well as the fluid passages which connect all of these components. Based in the hydraulic pressure created by the oil pump, the hydraulic control system governs the hydraulic pressure acting on the torque converter clutch, clutches and brakes in accordance with the vehicle driving conditions.



TROUBLESHOOTING

Basic Troubleshooting

1. Troubleshooting occuring with the automatic transmission can be caused by either the engine, electri–cal control or the transmission itself. These three areas should be distinctly isolated before proceeding with troubleshooting.
2. Troubleshooting should begin with the simplest operation, working up in order or difficulty, but first determine whether the trouble lies within the engine, electrical control or transmission.
3. Proceed with the inspection as follows:

PRELIMINARY CHECK (See page AT–14)
(a) Check the tire inflation.
(b) Check the idle speed.
(c) Check the fluid level and fluid condition.
(d) Check the throttle cable mark.
(e) Check the shift linkage.
(f) Check the Park/Neutral Position Switch.

↓

STALL TEST (See page AT–20)
Check the engine and torque converter clutch.

↓

TIME LAG TEST (See page AT–21)
Check the automatic transmission (each clutch, brake and gear) for wear.

↓

HYDRAULIC TEST (See page AT–22)
Measure the line pressure and make basic check of fluid circuit.

↓

ROAD TEST (See page AT–24)
Confirm if trouble lies within automatic transmission. If noisy or vibrating, the possible cause could be with the engine, drive shaft, tires, etc.

(No up–shift to overdrive/No down–shift from overdrive)

OVERDRIVE CONTROL SYSTEM CHECK (See page AT–16)

General Troubleshooting

Problem	Possible cause	Remedy	Page
Fluid discolored or smells burnt	Fluid contaminated Torque converter clutch faulty Transmission faulty	Replace fluid Replace torque converter clutch Disassemble and inspect transmission	AT–14 AT–40
Vehicle does not move in any forward position or reverse	Manual linkage out of adjustment Valve body or primary regulator faulty Parking lock pawl faulty Torque converter clutch faulty Converter drive plate broken Oil pump intake screen blocked Transmission faulty	Adjust linkage Inspect valve body Inspect parking lock pawl Replace torque converter clutch Replace drive plate Clean screen Disassemble and inspect transmission	AT–15 AT–31 AT–40 AT–40
Shift lever position incorrect	Manual linkage out of adjustment Manual valve and lever faulty Transmission faulty	Adjust linkage Inspect valve body Disassemble and inspect transmission	AT–15
Harsh engagement into any drive position	Throttle cable out of adjustment Valve body or primary regulator faulty Accumulator pistons faulty Transmission faulty	Adjust throttle cable Inspect valve body Inspect accumulator pistons Disassemble and inspect transmission	AT–15
Delayed 1–2, 2–3 or 3–0/D up–shift, or down–shift from O/D–3 or 3–2 then shifts back to O/D or 3	Throttle cable out of adjustment Valve body faulty Governor body faulty	Adjust throttle cable Inspect valve body Inspect governor body	AT–15
Slips on 1–2, 2–3 or 3–0/D up–shift, or slips or shudders on acceleration	Manual linkage out of adjustment Throttle cable out of adjustment Valve body faulty Transmission faulty	Adjust linkage Adjust throttle cable Inspect valve body Disassemble and inspect transmission	AT–15 AT–15

Remark *: Refer to A43D Automatic Trans–mission Repair Manual.
(Pub. No. RM 272U)

General Troubleshooting (Cont'd)

Problem	Possible cause	Remedy	Page
Drag, binding or tie–up on 1–2, 2–3 or 3–O/D up–shift	Manual linkage out of adjustment Valve body faulty Transmission faulty	Adjust linkage Inspect valve body Disassemble and inspect transmission	AT–15
Harsh down–shift	Throttle cable out of adjustment Throttle cable and cam faulty Accumulator pistons faulty Valve body faulty Transmission faulty	Adjust throttle cable Inspect throttle cable and cam Inspect accumulator pistons Inspect valve body Disassemble and inspect transmission	AT–15 AT–15
No down–shift when coasting	Valve body faulty Governor body faulty	Inspect valve body Inspect governor body	★
Down–shift occurs too quickly or too late while coasting	Throttle cable faulty Valve body faulty Governor body faulty Transmission faulty	Inspect throttle cable Inspect valve body Inspect governor body Disassemble and inspect transmission	AT–15
No O/D–3, 3–2 or 2–1 kick–down	Throttle cable out of adjustment Governor body faulty Valve body faulty	Adjust throttle cable Inspect governor body Inspect valve body	AT–15
No engine braking in 2 or L position	Valve body faulty Transmission faulty	Inspect valve body Disassemble and inspect transmission	★
Vehicle does not hold in P	Manual linkage out of adjustment Parking lock pawl cam and spring faulty	Adjust linkage Inspect cam and spring	AT–15 AT–15

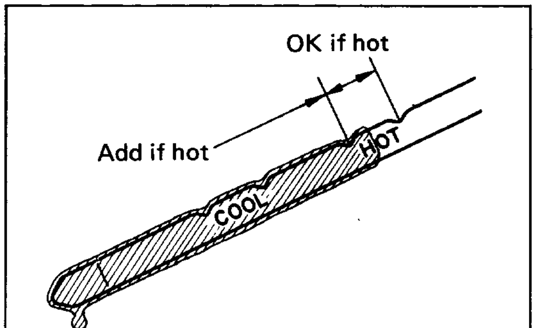
Remark * : Refer to A43D Automatic Trans–mission Repair Manual.
(Pub. No. RM272U)

Preliminary Check

1. CHECK FLUID LEVEL

HINT:

- The vehicle must have been driven so that the engine and transmission are at normal operating temperature. (Fluid temperature: 70–80®C or 158–176®F)
- Only use the COOL range on the dipstick as a rough reference when the fluid is replaced or the engine does not run.



AT3417

(a) Park the vehicle on a level surface, set the parking brake.

(b) With the engine idling, shift the shift lever into all positions from P to L position and return to P posi–tion.

HINT: Depress brake pedal.

(c) Pull out the transmission dipstick and wipe it clean.

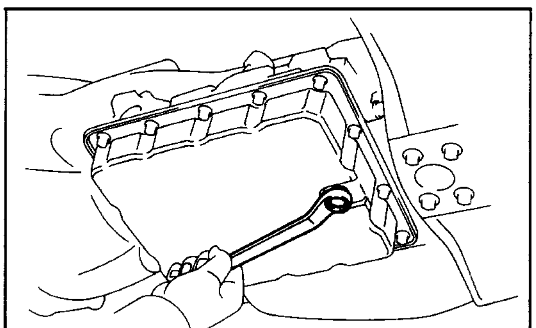
(d) Push it back fully into the tube.

(e) Pull it out and check that the fluid level is in the HOT range.

If the level is at the low side, add fluid.

Fluid type: ATF DEXRON• II

NOTICE: Do not overfill.


AT4239

2. CHECK FLUID CONDITION

If the fluid smells burnt or is black, replace it as following procedures.

(a) Remove the drain plug and drain the fluid.

(b) Reinstall the drain plug securely.

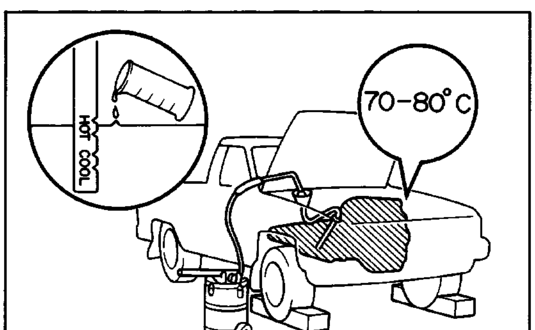
(c) With the engine OFF, add new fluid through the oil filler tube.

Fluid type ATF DEXRON¿ II

Capacity:

Total: 6.5 liters (6.9 US qts, 5.7 Imp qts)

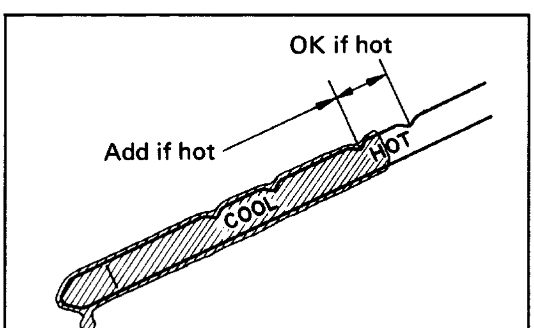
Drain and refill: 2.4 liters (2.5 US qts, 2.1 Imp.qts)



AT6683

(d) Start the engine and shift the shift lever into all po–sitions from P to L position and then shift into P po–sition.

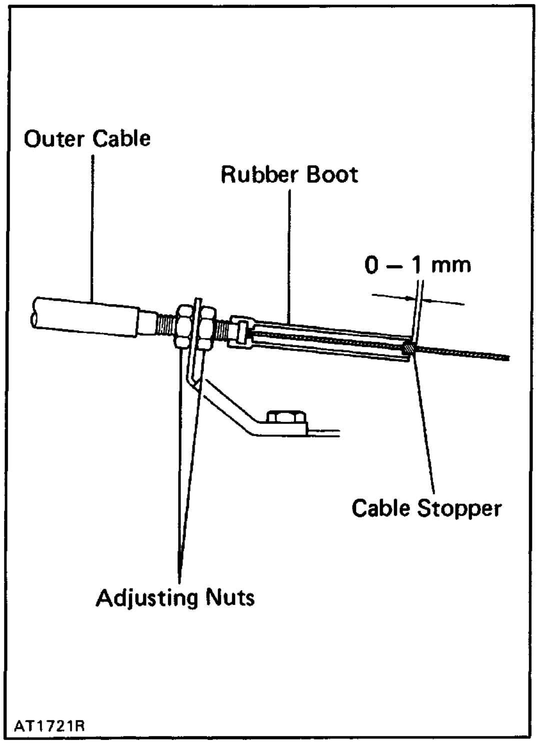
(e) With the engine idling, check the fluid level. Add fluid up to the COOL level on the dipstick.



AT3417

(f) Check the fluid level with the normal operating tem–perature (70–80®C or 158–176 ®F) and add as necessary.

NOTICE: Do not overfill.



3. INSPECT THROTTLE CABLE

(a) Depress the accelerator pedal all the way and check that the throttle valve opens fully.

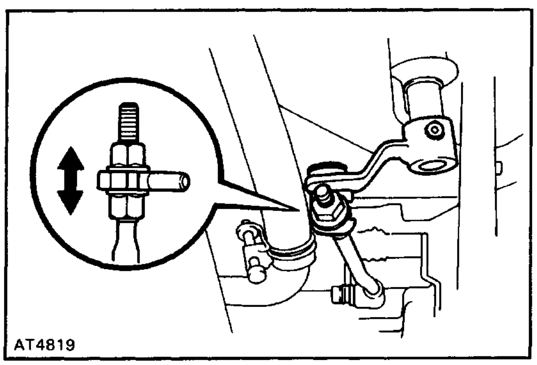
HINT: If the valve does not open fully, adjust the accel–erator cable.

(b) Fully depress the accelerator pedal.

(c) Measure the distance between the end of the boot and stopper on the cable.

Standard distance: 0–1 mm (0–0.04 in.)

If the distance is not standard, adjust the cable by the ad–justing nuts.



4. INSPECT SHIFT LEVER POSITION

When shifting the shift lever from the N position to other positions, check that the lever can be shifted smoothly and accurately to each position and that the position in–dicator correctly indicates the position.

If the indicator is not aligned with the correct position, carry out the following adjustment procedures.

(a) Remove the nut on the cross shaft rod.

(b) Push the cross shaft rod fully downward.

(c) Return the cross shaft rod three notches to N posi–tion.

(d) Set the shift lever to N position.

(e) While holding the shift lever lightly toward the R po–sition side, adjust the cross shaft rod nut.

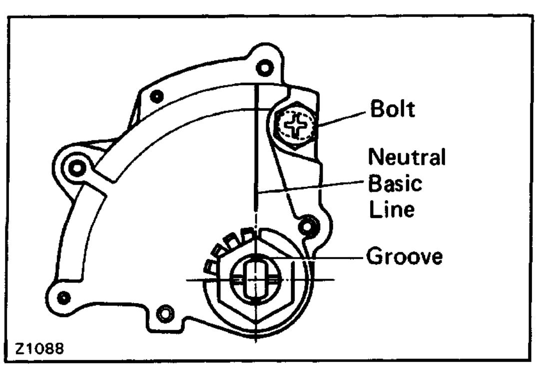
(f) Tighten the cross shaft rod nut.

(g) Start the engine and make sure that the vehicle moves forward when shifting the lever from the N to D position and reverse when shifting it to the R po–sition.

5. INSPECT PARK/ NEUTRAL POSITION SWITCH

Check that the engine can be started with the shift lever only in the N or P position, but not in other positions.

If not as stated above, carry out the following adjustment procedures.



(a) Loosen the park/neutral position switch bolt and set the shift lever to the N position.

(b) Align the groove and neutral basic line.

(c) Hold in position and tighten the bolt.

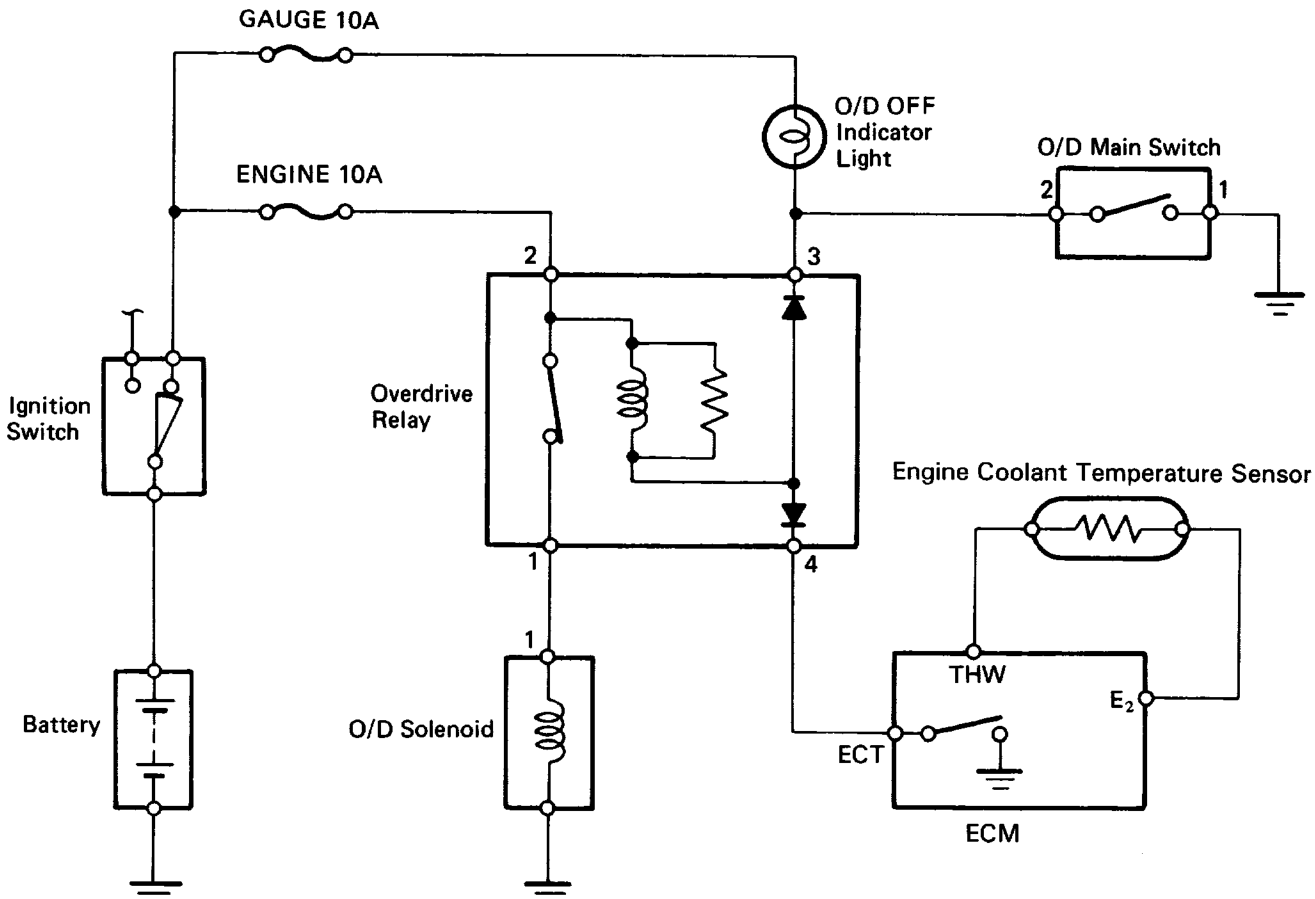
Torque: 5.4 N–m (55 kgf–cm, 48 in.lbf)

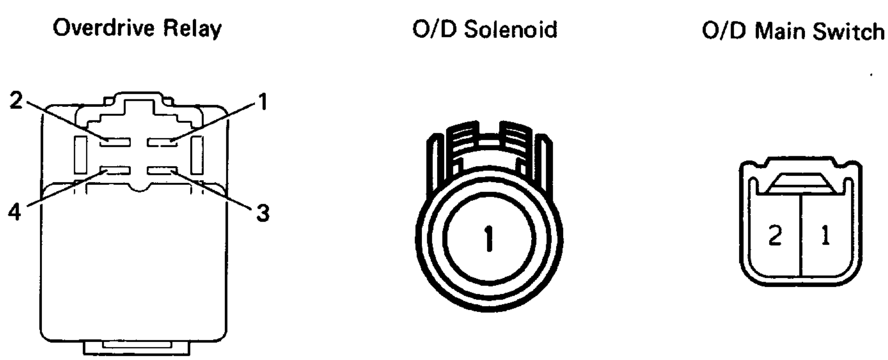
6. INSPECT IDLE SPEED (N POSITION)

Idle speed: 750 RPM

Overdrive Control System

ELECTRIC CONTROL CIRCUIT





AT4834
D9240 Ie-1-2-E H2-2-A

TROUBLESHOOTING FLOW–CHART

Trouble: No overdrive engagement with the main switch ON. (After warm–up)

Check the following:
- Main switch connector
- O/D relay connector
- O/D solenoid connector
- Fuse

↓

With ignition switch ON, is there battery positive voltage to terminal 2 of the O/D relay connector?

No →
- Severance or short in wire harness
- Severance in fuse

↓ Yes

Is voltage between O/D relay terminal 1 and ground as follows?
O/D switch turn ON: 0–12V
O/D switch turn OFF: 0 V

Yes →
- Faulty transmission
- Faulty O/D solenoid
- Faulty O/D solenoid circuit

↓ **No**

Is voltage between O/D relay terminal 3 and ground as follows?
O/D switch turn ON: 0–12V
O/D switch turn OFF: 0 V

No →
- Faulty O/D main switch
- Faulty O/D main switch circuit

↓ Yes

Is there battery positive voltage between O/D relay terminal 4 and ground?

Yes → Try another O/D relay

↓ **No**

Is there battery positive voltage between O/D relay terminal 4 and ground with the ECM connector pulled out?

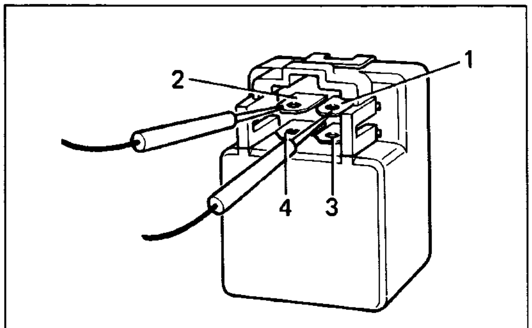
Yes →
- Faulty ECM
- Faulty Engine coolant temperature sensor

↓ **No**

- Faulty O/D relay
- Faulty ECM wire harness

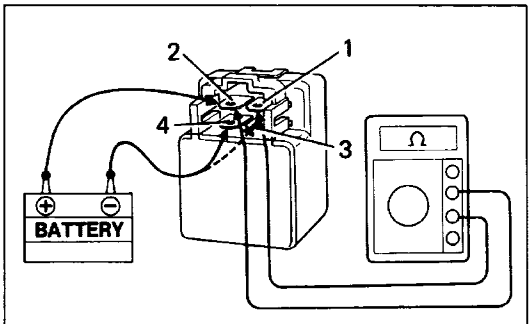
INSPECTION OF OVERDRIVE CONTROL COMPONENTS

1. INSPECT OVERDRIVE RELAY



EL0010

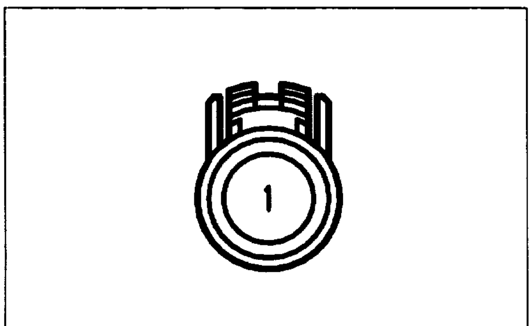
(a) Remove the overdrive relay from the pedal bracket.
(b) Using an ohmmeter, check that there is continuity between terminals 1 and 2.



EL0001

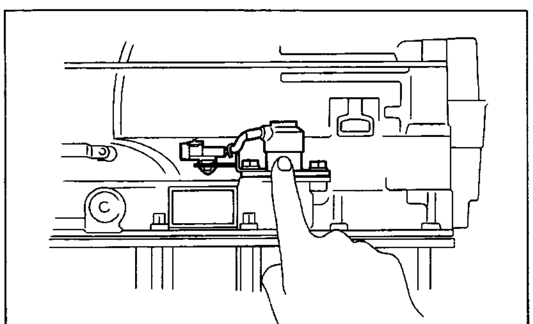
(c) Apply battery positive voltage to the relay terminals 2 and 3. Using an ohmmeter, check that there is no continuity between terminals 1 and 2.
(d) Apply battery positive voltage to the relay terminals 2 and 4. Using an ohmmeter, check that there is no continuity between terminals 1 and 2.
(e) Install the overdrive relay to the pedal bracket.

2. INSPECT OVERDRIVE SOLENOID



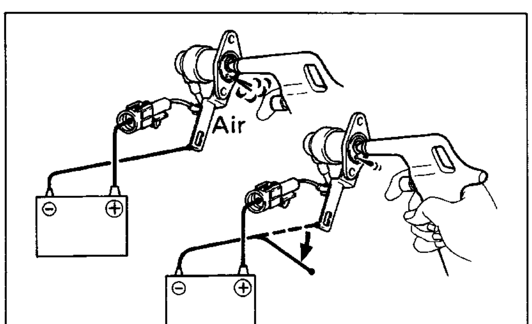
Ie-1-2-E

(a) Using an ohmmeter, measure the resistance be– tween terminal 1 and body.
Resistance: 11–15 9


Q00794

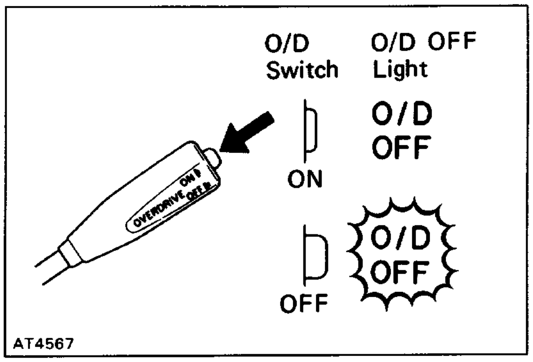
(b) Apply battery positive voltage to the solenoid. Check that the solenoid operation sound is heard.

3. CHECK SOLENOID SEALS



Q00793

If there is foreign material in the solenoid valve, there wil be no fluid control even with solenoid operation
(a) Check that the solenoid valve does not leak when low–pressure compressed air is applied.
(b) When supplying battery positive voltage to the sole– noid, check that the solenoid valve opens.

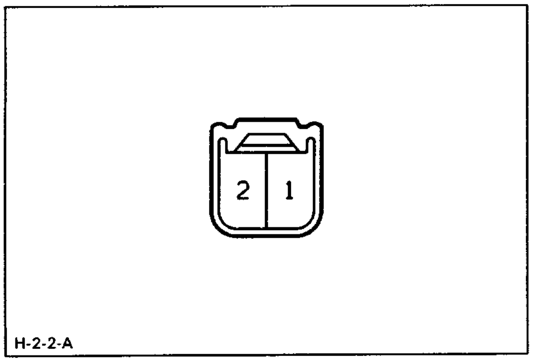


4. INSPECT–O/D OFF” INDICATOR

(a) Turn on the ignition switch.

(b) Check that the–O/D OFF” indicator does not light, when the O/D main switch is turned ON.

(c) Check that the–O/D OFF” indicator lights, when the O/D main switch is turned OFF.



5. INSPECT OVERDRIVE MAIN SWITCH

(a) Remove the steering column cover.

(b) Using an ohmmeter, check the continuity of the ter– minals for each switch position.

Terminal / SW Position	1	2
ON		
OFF	O—	—O

6. INSPECT ENGINE COOLANT TEMPERATURE SENSOR (See page FI–115)

Mechanical System Tests

STALL TEST

The objective of this test is to check the overall performance of the transmission and engine by measuring the maximum engine speeds in the D and R positions.

NOTICE:

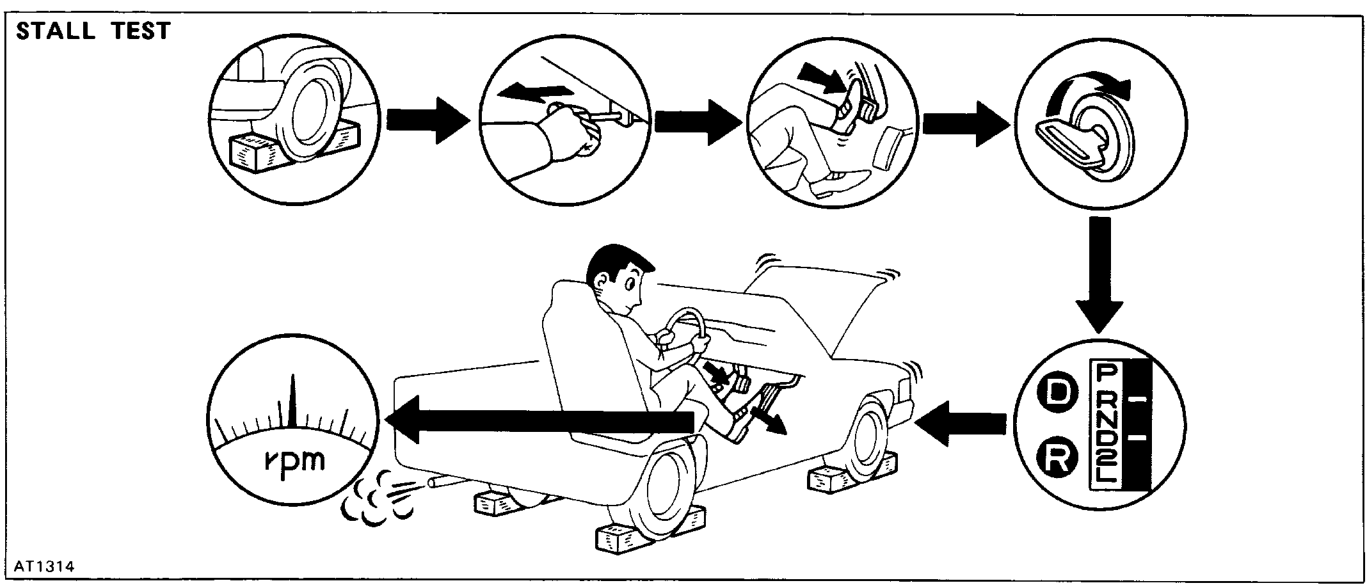
- **Perform the test at normal operating fluid temperature (50–80•C or 122–176•F).**
- **Do not continuously run this test longer than 5 seconds.**
- **To ensure safety, conduct this test in a wide, clear, level area, which provides good traction.**

MEASURE STALL SPEED

(a) Check the four wheels and fully apply the parking brake.
(b) Mount an engine tachometer.
(c) Keep your left foot pressed firmly on the brake pedal, and start the engine.
(d) Shift into the D position. Step all the way down on the accelerator pedal with your right foot.
Quickly read the highest engine RPM at this time.
Stall speed: 1,900 ±150 RPM
(e) Perform the same test in the R position.

EVALUATION

(a) If the engine speed is the same for both positions but lower than specified value:
Engine output may be insufficient
Stator one–way clutch is not operating properly
HINT: If more than 600 RPM below the specified value, the torque converter clutch could be faulty.
(b) If the stall speed at the D position is higher than specified:
Line pressure too low
Front clutch slipping
No.2 one–way clutch not operating properly
O/D one–way clutch not operating properly
(c) If the stall speed at the R position is higher than specified:
Line pressure too low
Rear clutch slipping
No.3 brake slipping
O/D one–way clutch not operating properly
(d) If the stall speed in both R and D positions are higher than specified:
Line pressure too low
Improper fluid level
O/D one–way clutch not operating properly



TIME LAG TEST

When the shift lever is shifted while the engine is idling, there will be a certain time lapse or lag before the shock can be felt. This is used for checking the condition of the O/D direct clutch, front clutch, rear clutch and No.3 brake.

NOTICE:

- **Perform the test at normal operating fluid temperature (50–80• C or 122–176• F).**
- **Be sure to allow one minute interval between tests.**
- **Make three measurements and take the average value.**

MEASURE TIME LAG

(a) Fully apply the parking brake.

(b) Start the engine and check the idle speed.

Idle speed: 750 RPM

(N position)

(c) Shift the shift lever from N to D position. Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.

Time lag: Less than 1.2 seconds

(d) In same manner, measure the time lag for N–R.

Time lag: Less than 1.5 seconds

EVALUATION

(a) If N–) D time lag is longer than specified:

Line pressure too low

Front clutch worn

O/D one–way clutch not operating properly

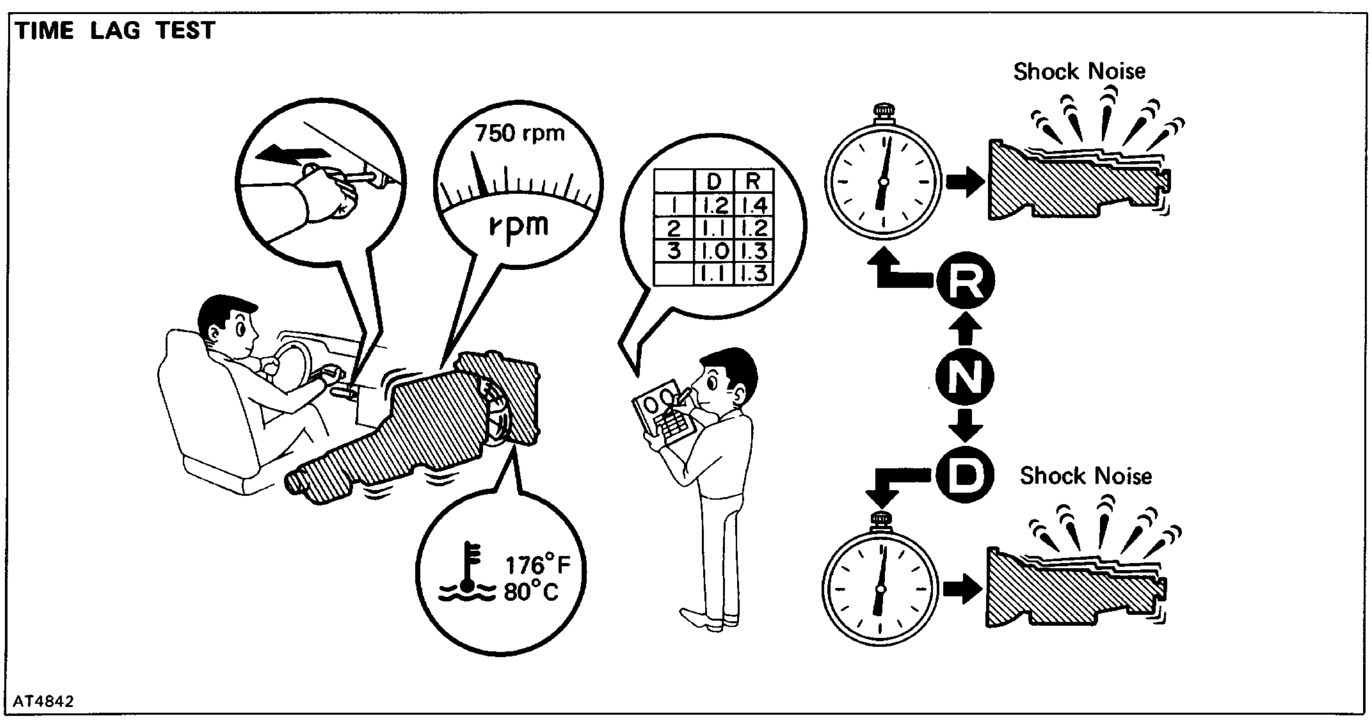
(b) If N–R time lag is longer than specified:

Line pressure too low

Rear clutch worn

No.3 brake worn

O/D one–way clutch not operating properly



HYDRAULIC TEST

1. PREPARATION

(a) Warm up the transmission fluid.

(b) Remove the transmission case test plug and connect the hydraulic pressure gauge.

SST 09992–00094 (Oil pressure gauge)

NOTICE: Perform the test at normal operating fluid temperature (50–80•C or 122–176•F).

2. MEASURE LINE PRESSURE

(a) Fully apply the parking brake and chock the four wheels.

(b) Start the engine and check the idle speed.

(c) Shift into the D position, keep your left foot pressed firmly on the brake pedal and while manipu– lating the accelerator pedal with the right foot, measure the line pressure at the engine speeds specified in the table.

(d) In the same manner, perform the test in the R position.

kPa (kgf/cm2,psi)

D position		R position	
Idling	Stall	Idling	Stall
441 – 500 (4.5 – 5.1, 64 – 73)	990 – 1,167 (10.1 – 11.9, 144 – 169)	667 – 745 (6.8 – 7.6, 97 – 108)	1,471 – 1,863 (15.0 – 19.0, 213 – 270)

If the measured pressures are not up to specified values, recheck the throttle cable adjustment and retest.

EVALUATION

(a) If the measured values at all positions are higher than specified:

Throttle cable out of adjustment
Throttle valve defective
Regulator valve defective

(b) If the measured values at all positions are lower than specified:

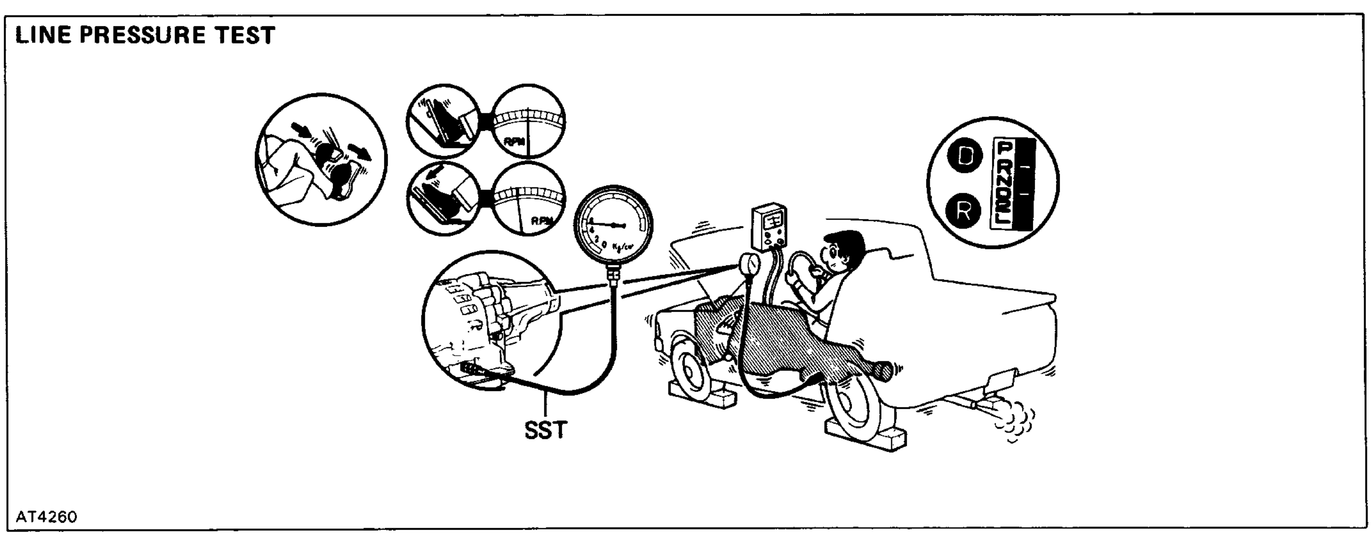
Throttle cable out of adjustment
Throttle valve defective
Regulator valve defective
Oil pump defective
O/D direct clutch defective

(c) If pressure is low in the D position only:

D position circuit fluid leakage
Front clutch defective

(d) If pressure is low in the R position only:

R position circuit fluid leakage
No.3 brake defective
Rear clutch defective



3. MEASURE GOVERNOR PRESSURE

(a) Check the parking brake to see that it is not applied.

(b) Start the engine.

(c) Shift into the D position and measure the governor pressure at the speeds specified in the table.

EVALUATION

If governor pressure is defective:

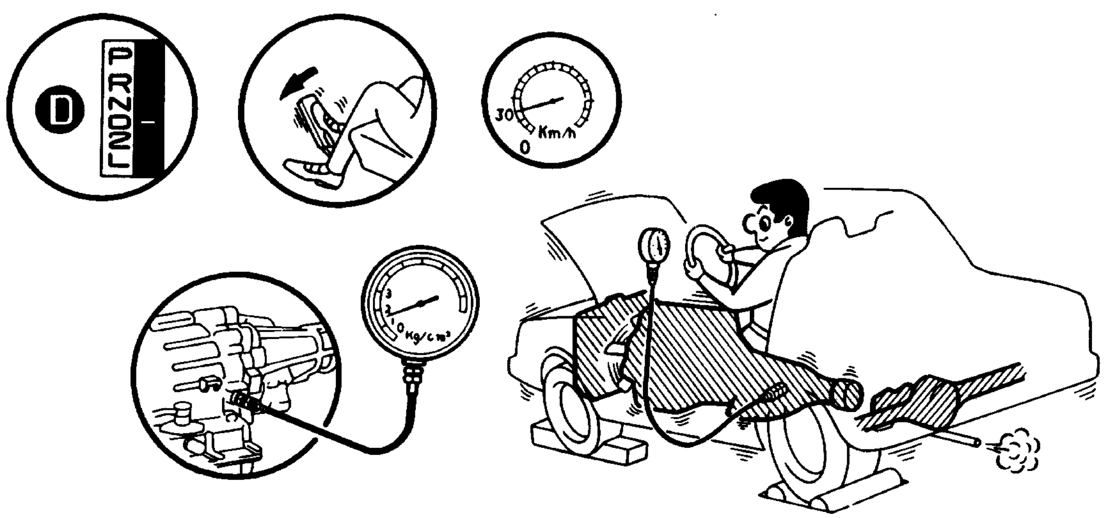
Line pressure defective

Fluid leakage in governor pressure circuit

Governor valve operation defective

Output shaft	Vehicle speed (Reference only)		Governor pressure
	P195175R14	P205/75R 14	
1,000 RPM	32 km/h (20 mph)	32 km/h (20 mph)	88 — 147 kPa (0.9 — 1.5 kgf/cm^2, 13 — 21 psi)
1,800 RPM	57 km/h (35 mph)	58 km/h (36 mph)	157 — 216 kPa (1.6 — 2.2 kgf/cm^2, 23 — 31 psi)
3,500 RPM	111 km/h (69 mph)	113 km/h (70 mph)	402 — 520 kPa (4.1 — 5.3 kgf/cm^2, 58 — 75 psi)

GOVERNOR PRESSURE TEST



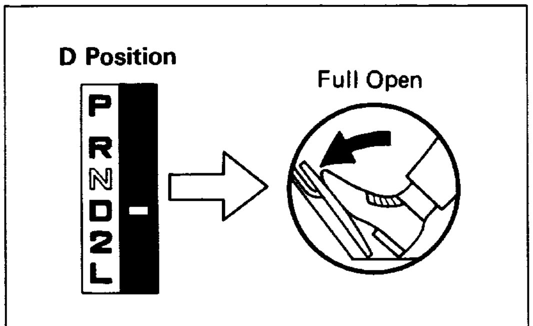
AT4487

ROAD TEST

NOTICE: Perform this test at normal fluid temperature (50–80•C or 122–176•F).

1. D POSITION TEST

Shift into the D position and while driving with the accel–erator pedal held constant at the throttle valve full open and the O/D switch ON, check on the following points:



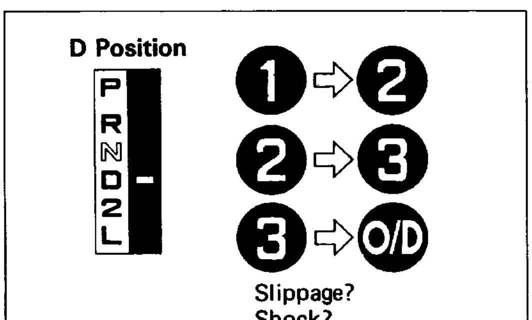
AT2818

(a) Check to see that the 1–2, 2–3 and 3–O/D up–shifts take place and also that the shift points conform to those shown in the automatic shift schedule.

HINT: 3–O/D up–shift does not take place with a throttle valve opening of more than 86% or engine cool–ant temperature below 50•C (122•F).

EVALUATION

(1) If there is no 1–2 up–shift:
  Governor valve is defective
  1–2 shift valve is stuck
(2) If there is no 2–3 up–shift:
  2–3 shift valve is stuck
(3) If there is no 3–O/D up–shift (throttle valve open–ing less than 86%):
  3–4 shift valve is stuck
  Solenoid valve or circuit defective
(4) If the shift point is defective:
  Throttle cable out of adjustment
  Throttle valve, 1–2 shift valve, 2–3 shift valve, 3–4 shift valve etc., are defective

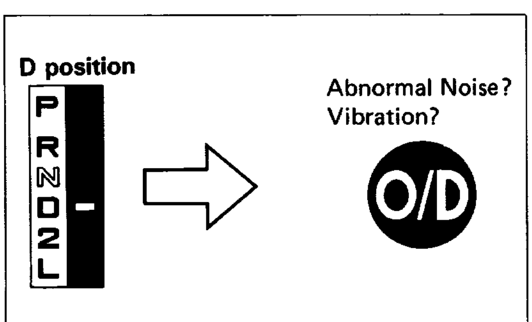


AT3068

(b) In the same manner, check the shock and slip at 1–2, 2–3 and 3–O/D up–shifts.

EVALUATION

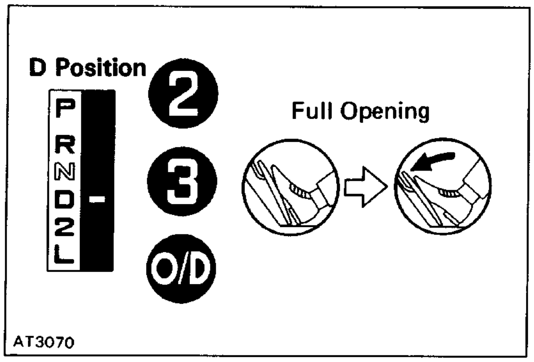
If the shock is excessive:
  Line pressure is too high
  Accumulator is defective



AT4249

(c) Run in the 3rd gear or O/D of D position and check for abnormal noise and vibration.

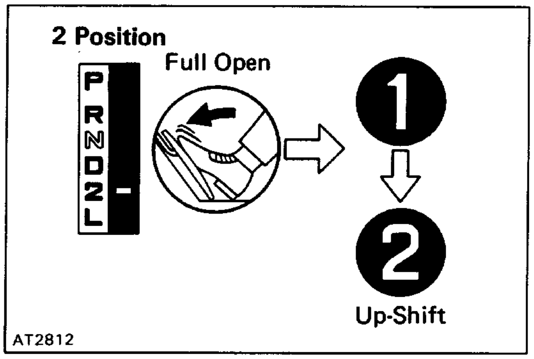
HINT: Check for cause of abnormal noise and vibration must be made with extreme care as they could also be due to unbalance in the propeller shaft, differential, tires, torque converter clutch, etc.



(d) While running in the D position, 2nd, 3rd and O/D gears, check to see that the possible kick–down vehicle speed limits for 2–1, 3–2 and O/D–3 kick–downs conform–to those indicated on the automatic shift schedule.

HINT: O/D–) 3 kick–down is always possible with a throttle valve opening of more than 86%.

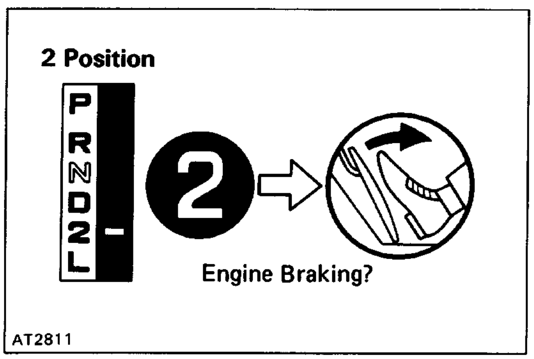
(e) Check for abnormal shock and slip at kick–down.



2. 2 POSITION TEST

Shift into the 2 position and, while driving with the accelerator pedal held constantly at the full throttle valve opening position, check on the following points:

(a) Check to see that the 1–2 up–shift takes place and that the shift point conforms to it shown on the automatic shift schedule.

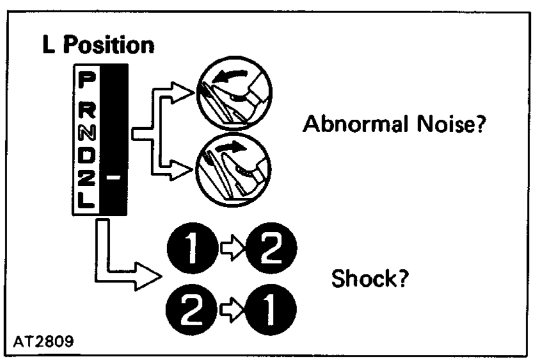


(b) While running in the 2 position and 2nd gear, release the accelerator pedal and check the engine braking effect.

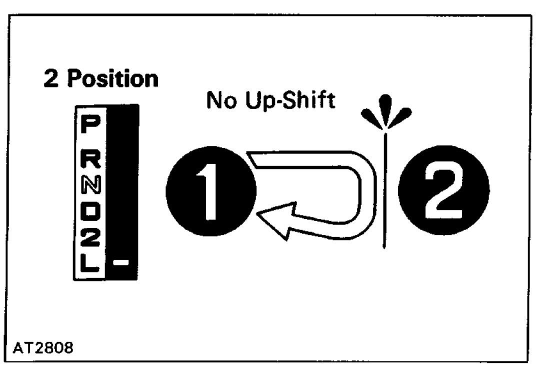
EVALUATION

If there is no engine braking effect:

- No. 1 brake is defective

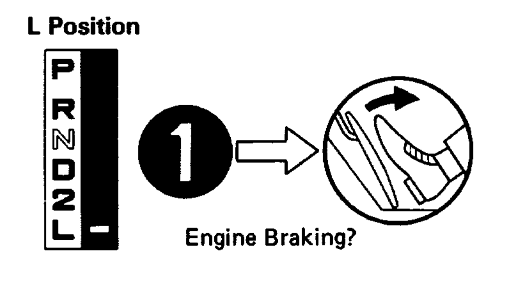


(c) Check for abnormal noise at acceleration and deceleration, and for shock at up–shift and down–shift.



3. L POSITION TEST

(a) While running in the L position, check to see that there is no up–shift to 2nd gear.



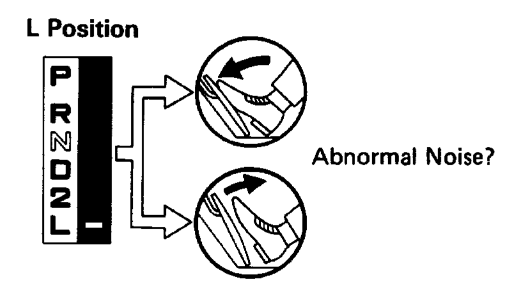
AT2807

(b) While running in the L position, release the accelera– tor pedal and check the engine braking effect.

EVALUATION

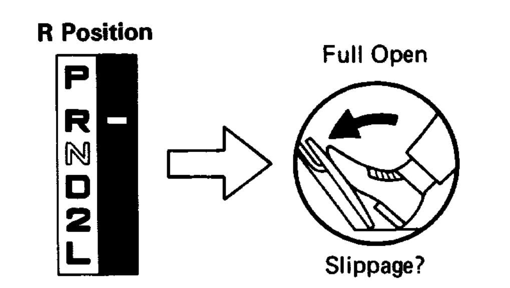
If there is no engine braking effect:

- No–3 brake is defective



AT2806

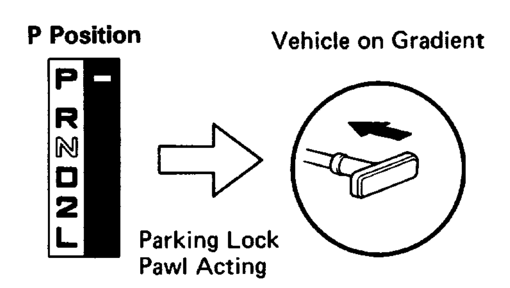
(c) Check for abnormal noise during acceleration and deceleration.



AT2805

4. R POSITION TEST

Shift into the R position and, while starting at wide open throttle, check for slipping.



AT3203

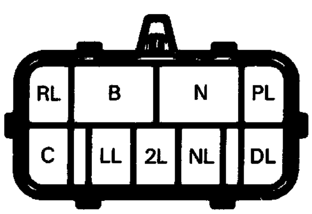
5. P POSITION TEST

Stop the vehicle on a gradient (more than 5•) and after shifting into the P position, release the parking brake. Then check to see that the parking lock pawl holds the vehicle in place.

Automatic Shift Schedule

Throttle valve fully open → Fully closed						km/h (mph)
D position (2 position)						L position
1 → 2	2 → 3	[3 → O/D]	O/D → 3	3 → 2	2 → 1	2 → 1
57 – 73 (35 – 45)	106 – 124 (66 – 77)	38 – 52 (24 – 32)	*	95 – 112 (59 – 70)	36 – 49 (22 – 30)	46 – 62 (29 – 39)

* O/D–¿ 3 down–shift is possible up to maximum speed.



SH-9-2-A

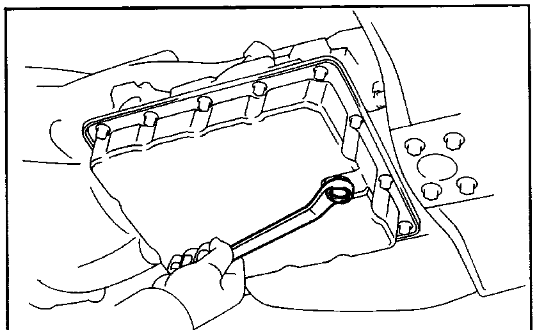
Park Neutral Position Switch

INSPECTION OF PARK/NEUTRAL POSITION SWITCH

Inspect that there is continuity between each terminals.

Shift Position \ Terminal	B	N	PL	RL	NL	DL	2L	LL	C
P	○	○	○	—	—	—	—	—	○
R				○	—	—	—	—	○
N	○	○			○	—	—	—	○
D						○	—	—	○
2							○	—	○
L								○	○

ON–VEHICLE REPAIR
Valve Body
REMOVAL OF VALVE BODY

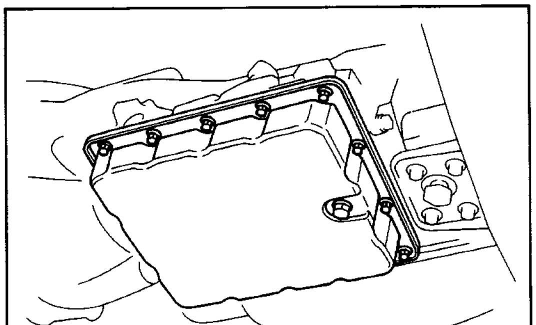

AT4239

1. CLEAN TRANSMISSION EXTERIOR

To prevent contamination, clean the exterior of the trans–mission.

2. DRAIN TRANSMISSION FLUID

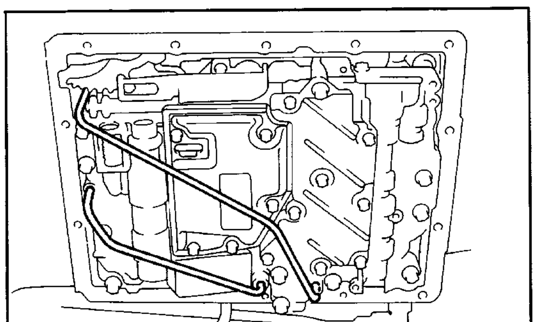
Remove the drain plug and the fluid into a suitable con–tainer.


AT4240

3. REMOVE OIL PAN, FILLER TUBE AND GASKET

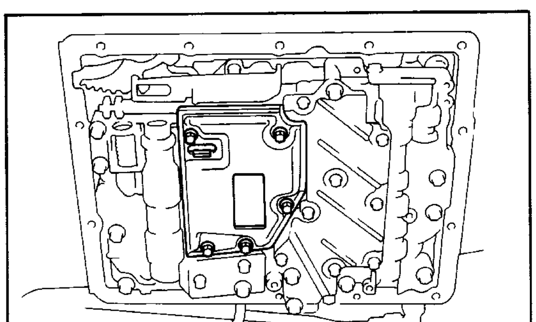
NOTICE: Some fluid will remain in the oil pan. Be careful not to damage the filler tube and O–ring.

Remove all pan bolts, and carefully remove the pan as–sembly. Discard the gasket.


AT4198

4. REMOVE OIL TUBES

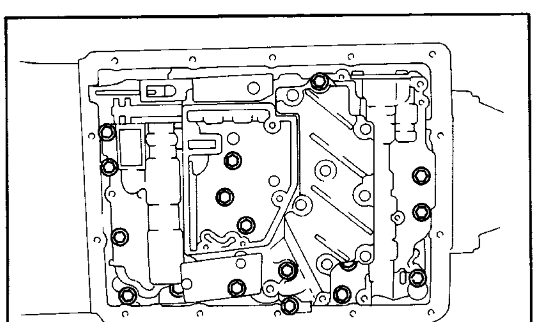
Pry up both tube ends with a large screwdriver and re–move the tubes.


AT4200

5. REMOVE OIL STRAINER

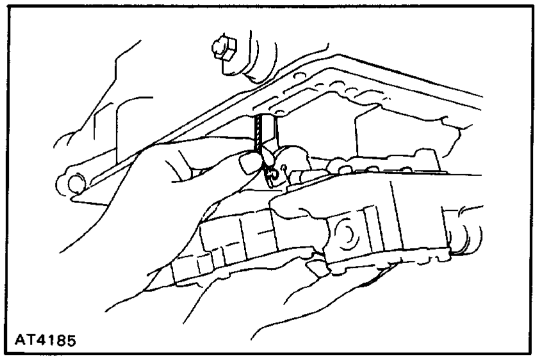
Remove the six bolts, and the oil strainer.

NOTICE: Be careful as some oil will come out with the filter.


AT4202

6. REMOVE VALVE BODY

(a) Remove the seventeen bolts.

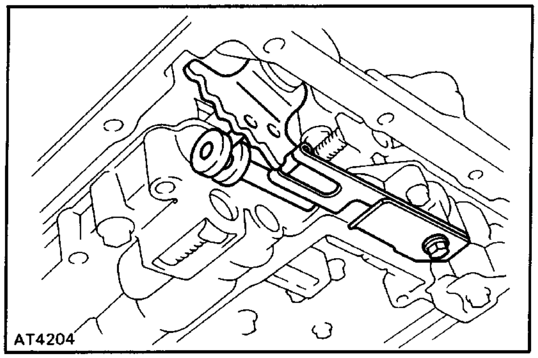


(b) Disconnect the throttle cable from the cam and remove the valve body.

INSTALLATION OF VALVE BODY

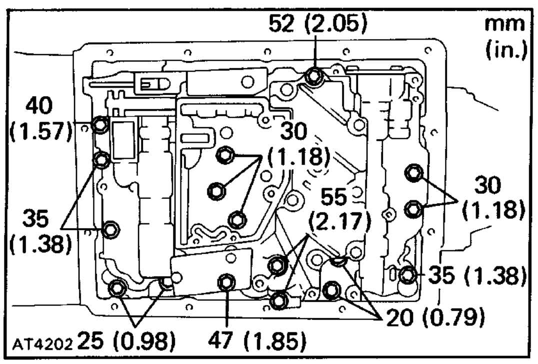
1. CONNECT THROTTLE CABLE TO CAM

Push the cable fitting into the cam.



2. INSTALL VALVE BODY

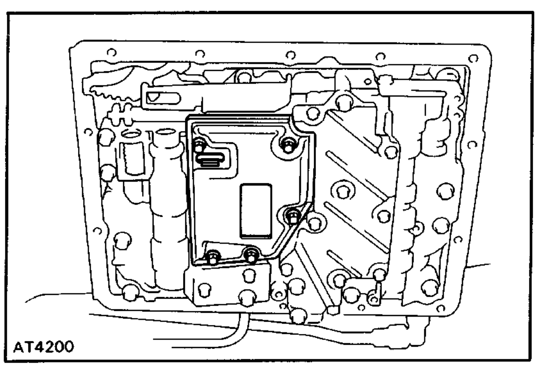
(a) Align the manual valve lever with the manual valve.



(b) Finger tighten the all bolts first. Then tighten the bolts evenly.

HINT: Each bolt length (mm, in.) is indicated in the figure.

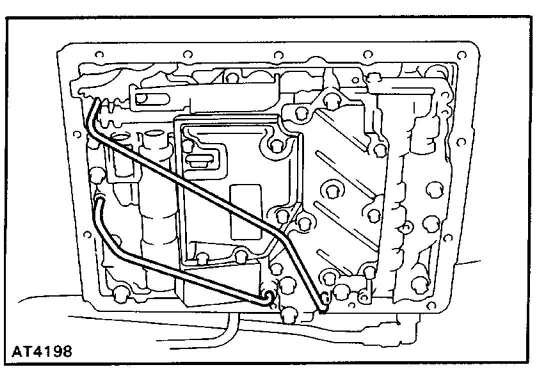
Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)



3. INSTALL OIL STRAINER

Be sure the screen is clean. Torque the bolts.

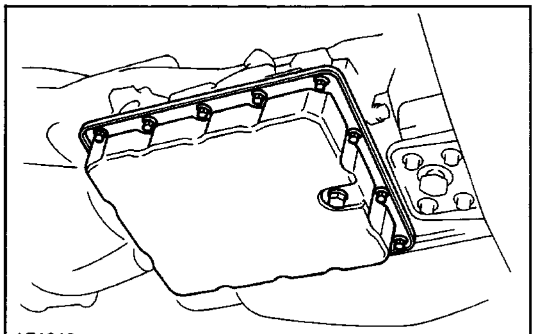
Torque: 5.4 N–m (55 kgf–cm, 48 in.¿lbf)



4. INSTALL OIL TUBES

Tap the tubes with a plastic hammer to install them into the positions in the figure.

NOTICE: Be careful not to bend or damage the tubes.



AT4240

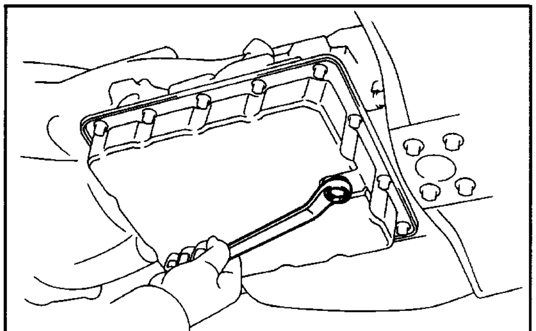
5. INSTALL PAN WITH NEW GASKET

Be sure the pan is clean and the two magnets are in place.

NOTICE: Do not use gasket sealer.

Tighten the bolts evenly.

Torque: 5.4 N–m (55 kgf–cm, 48 in.¿lbf)

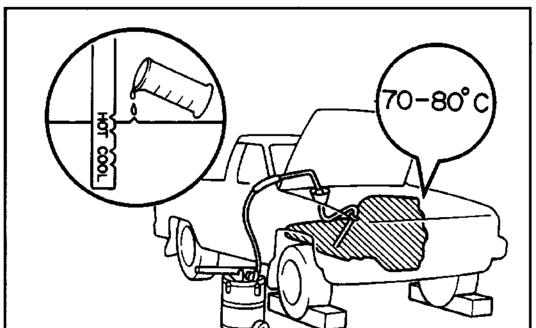


AT4239

6. INSTALL DRAIN PLUG

Torque the drain plug.

Torque: 20 N–m (205 kgf–cm, 15 ft–lbf)



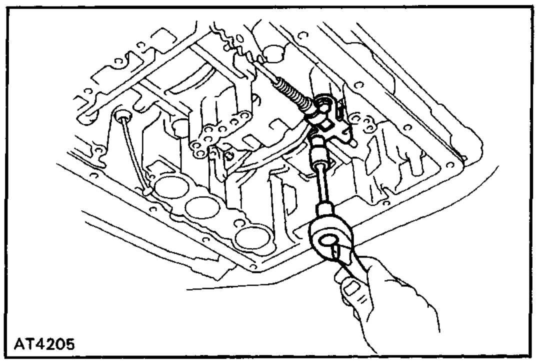
AT6683

7. FILL TRANSMISSION WITH ATF

Add only about two liters of ATF. Start the engine and shift through all the positions. Check the fluid level and add as necessary.

NOTICE: Do not overfill.

Fluid type: ATF DEXRON¿II


AT4205

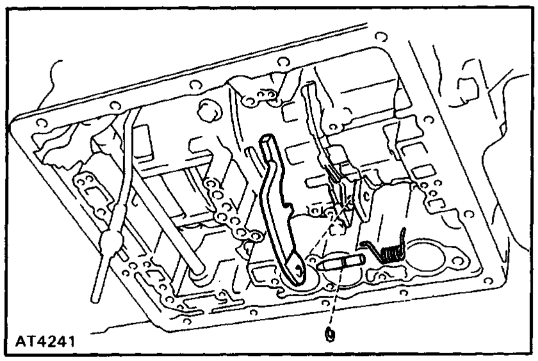
Parking Lock Pawl

REMOVAL OF PARKING LOCK PAWL

1. REMOVE VALVE BODY (See page AT–28)

2. REMOVE PARKING LOCK PAWL BRACKET

Remove the two bolts and the bracket.


AT4241

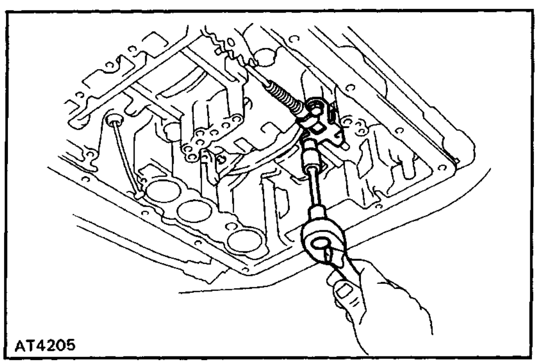
3. REMOVE SPRING FROM PARKING LOCK PAWL PIVOT PIN

4. REMOVE PIVOT PIN AND PARKING LOCK PAWL

INSTALLATION OF PARKING LOCK PAWL

1. INSTALL PARKING LOCK PAWL AND PIVOT PIN

2. INSTALL SPRING


AT4205

3. INSTALL VALVE BODY (See page AT–29)

(a) Push lock rod fully toward.

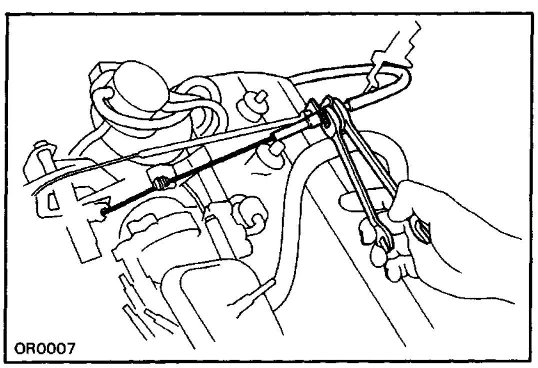
(b) Install the two bolts finger tight

(c) Check that the pawl operates smoothly.

(d) Torque the bolts.

Torque: 7.4 N.m (75 kgf.cm, 65 in.· lbf)

4. INSTALL VALVE BODY (See page AT–29)


OR0007

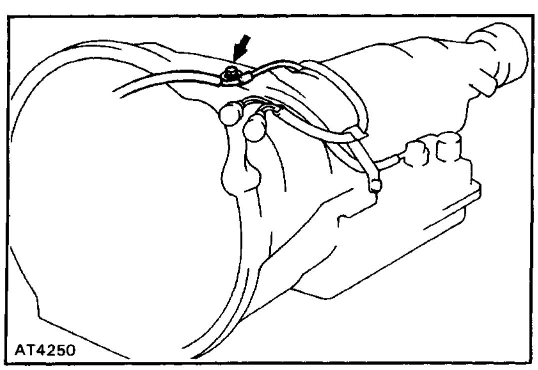
Throttle Cable

REMOVAL OF THROTTLE CABLE

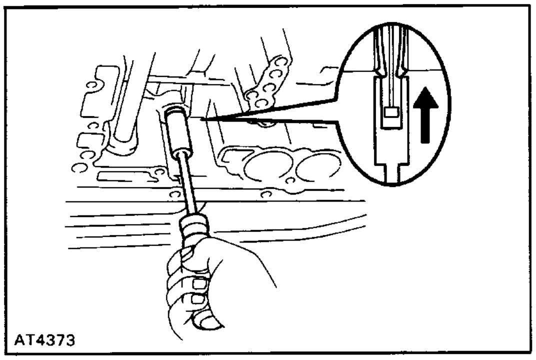
1. DISCONNECT THROTTLE CABLE

(a) Disconnect the cable housing from the bracket.

(b) Disconnect the cable from the throttle linkage.


AT4250

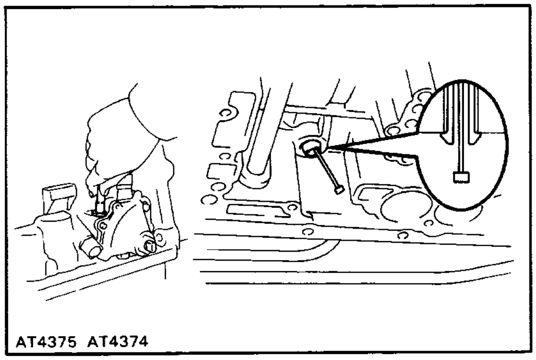
(c) Disconnect the cable from the torque converter clutch housing.



2. REMOVE VALVE BODY (See page AT–28)

3. PUSH THROTTLE CABLE OUT OF TRANSMISSION CASE

Using a 10–mm socket, push the throttle cable out.

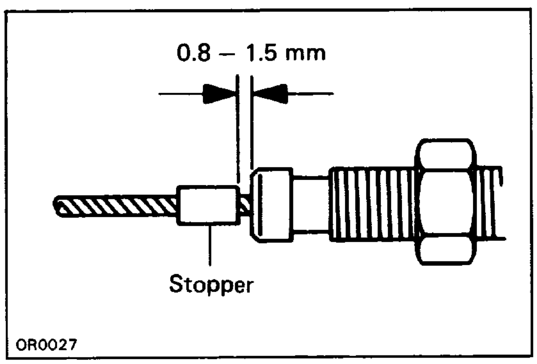


INSTALLATION OF THROTTLE CABLE

1. INSTALL CABLE IN TRANSMISSION CASE

Be sure to push it in all the way.

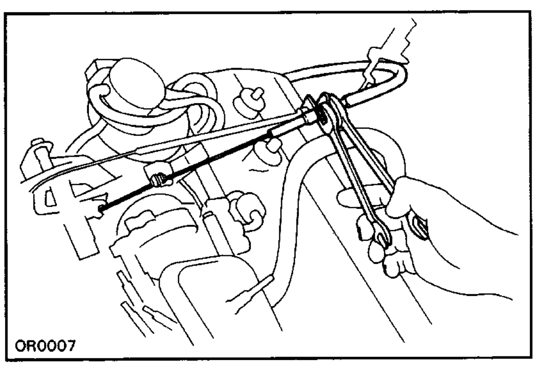
2. INSTALL VALVE BODY (See page AT–29)



3. IF THROTTLE CABLE IS NEW, STAKE STOPPER ON IN–NER CABLE

(a) Pull the inner cable lightly until a slight resistance is felt, and hold it.

(b) Stake the stopper as shown, 0.8–1.5 mm (0.031 –0.059 in.) in width.



4. CONNECT THROTTLE CABLE

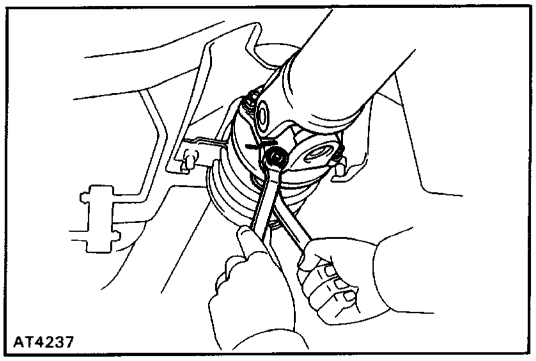
(a) Connect the cable to the throttle linkage.

(b) Connect the cable housing to the bracket.

(c) Connect the cable to the torque converter clutch housing.

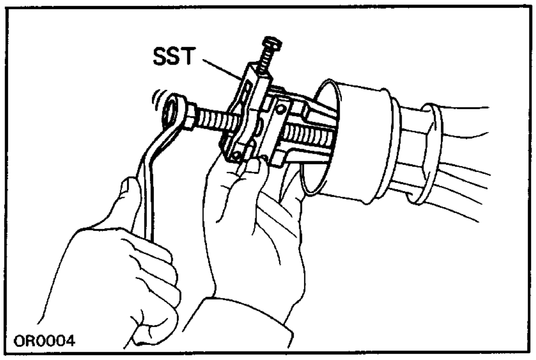
5. ADJUST THROTTLE CABLE (See page AT–15)

6. TEST DRIVE VEHICLE


AT4237

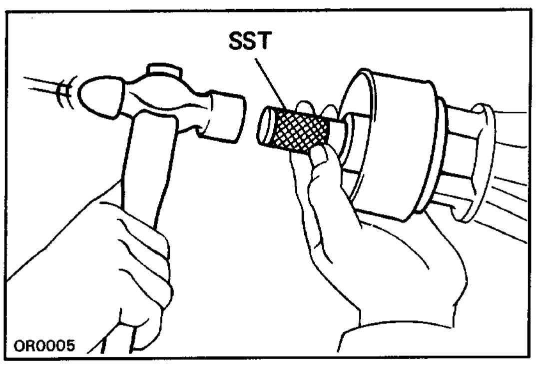
Extension Housing
REPLACEMENT OF OIL SEAL

1. **RAISE VEHICLE, AND POSITION PAN TO CATCH ANY FLUID THAT MAY DRIP**
2. **REMOVE PROPELLER SHAFT**



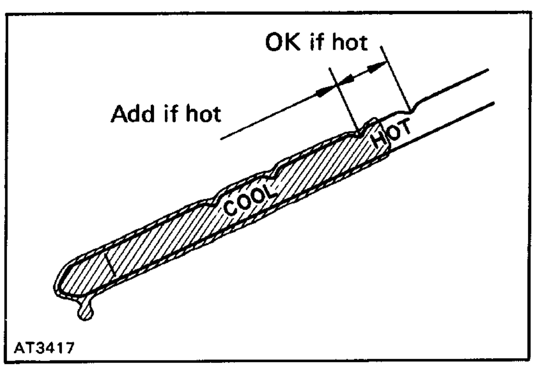
OR0004

3. **REMOVE REAR OIL SEAL**
   NOTICE: Clean the rear extension housing before re–moving the seal.
   Using SST, remove the oil seal.
   SST 09308–10010



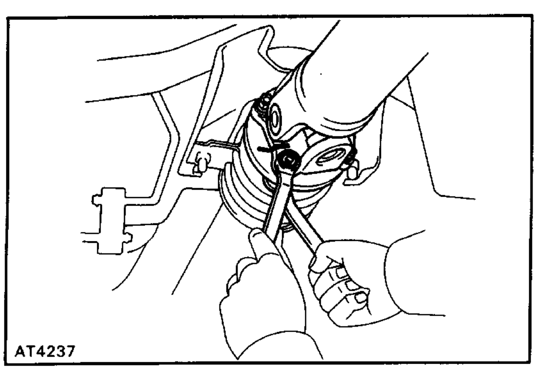
OR0005

4. **INSTALL NEW OIL SEAL**
   Using SST, drive in a new oil seal as far as it will go.
   SST 0932 5–20010



AT3417

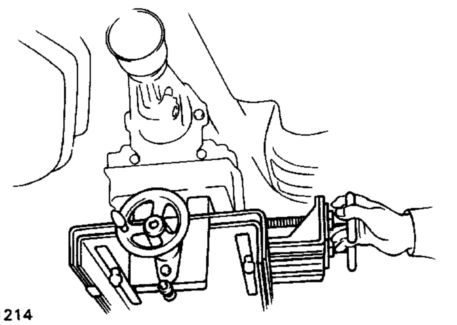
5. **INSTALL PROPELLER SHAFT**
6. **LOWER VEHICLE AND CHECK FLUID LEVEL**
   Start the engine, shift the shift lever into each position and, then check the fluid level with the transmission in P position.
   Add fluid as necessary.
   NOTICE: Do not overfill.
   Fluid type: ATF DEXRON¿II


AT4237

REMOVAL OF EXTENSION HOUSING

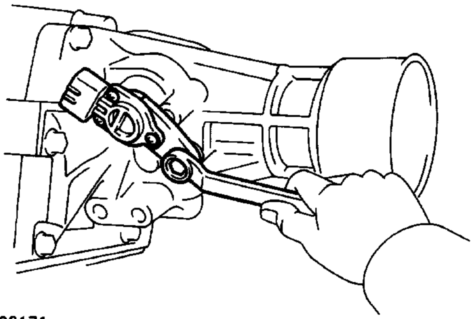
1. **RAISE VEHICLE AND POSITION PAN TO CATCH ANY FLUID THAT MAY DRIP**

2. **REMOVE PROPELLER SHAFT**


AT1214

3. JACK UP TRANSMISSION SLIGHTLY

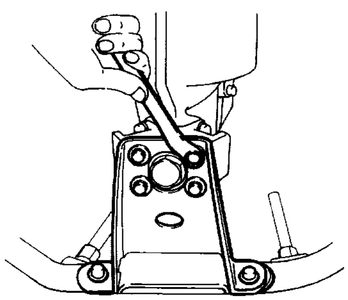
Securely support the transmission on a transmission jack. Lift the transmission slightly to remove weight from the rear support member.


Q03171

4. DISCONNECT CONNECTOR

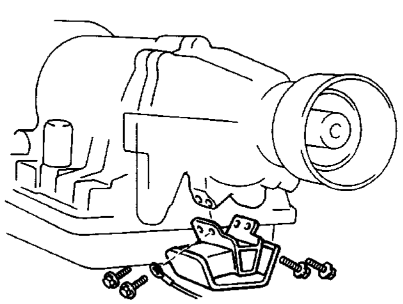
5. REMOVE NO. 1 VEHICLE SPEED SENSOR

(a) Remove the bolt and the vehicle speed sensor.
(b) Remove the 0–ring from the sensor.


MT0015

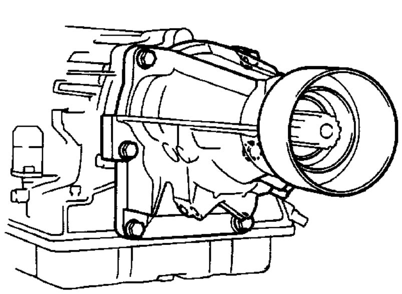
6. DISCONNECT ENGINE REAR MOUNTING FROM BRACKET

Remove four bolts from the bracket.


AT4372

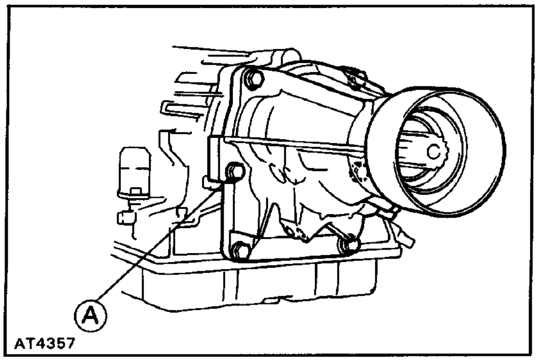
7. REMOVE ENGINE REAR MOUNTING FROM EXTENSION HOUSING

Remove four bolts and the engine rear mounting from the extension housing.


AT4357

8. REMOVE EXTENSION HOUSING AND GASKET

Remove the six bolts. If necessary, tap the extension housing with a plastic hammer or wooden block to loosen it.



INSTALLATION OF EXTENSION HOUSING

1. INSTALL NEW GASKET AND EXTENSION HOUSING ON TRANSMISSION

(a) Clean the threads of the¿¿bolt and bolt hole.

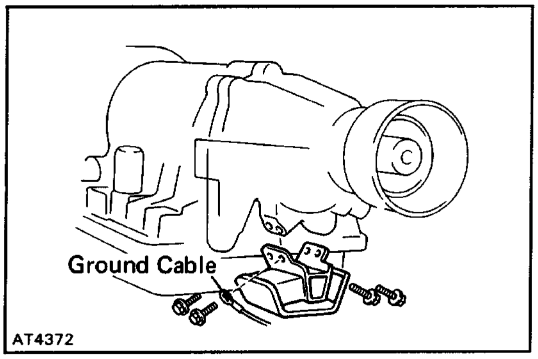
(b) Coat the threads of the¿¿bolt with sealant.

Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(c) Install the extension housing over a new gasket with bolts, and then torque them.

HINT: The two lower bolts are shorter.

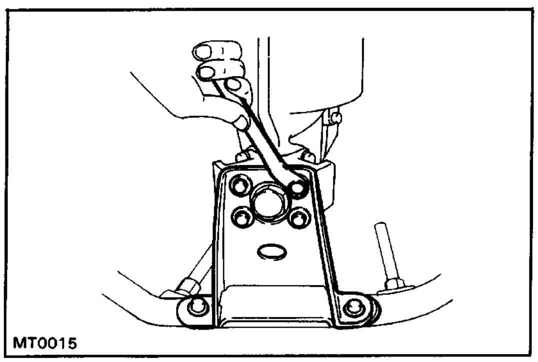
Torque: 34 N–m (345 kgf–cm, 25 ft–lbf)



2. INSTALL ENGINE REAR MOUNTING

(a) Install the engine rear mounting to the extension housing. Tighten the four bolts.

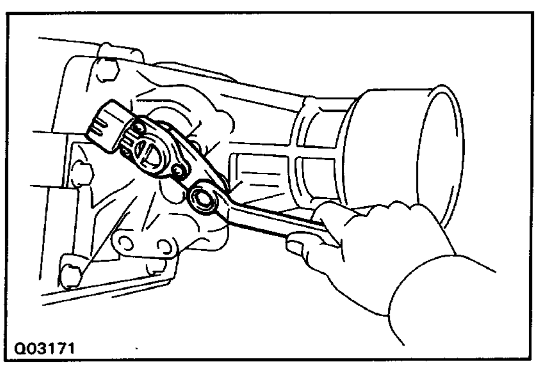
Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)



(b) Lower and rest the transmission on the mounting bracket.

(c) Connect the mounting to the bracket. Tighten the four bolts.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



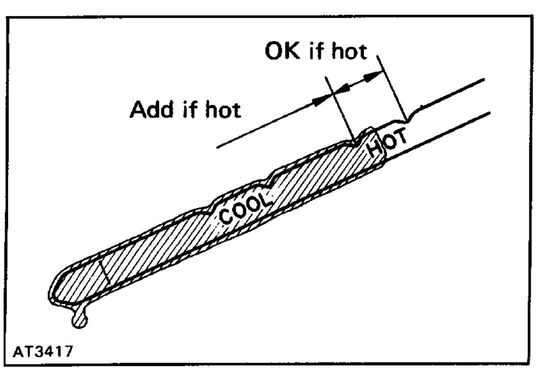
3. INSTALL PROPELLER SHAFT

4. INSTALL NO. 1 VEHICLE SPEED SENSOR

(a) Install a new O–ring on the sensor.

(b) Install the vehicle speed sensor with the bolt.

5. CONNECT CONNECTOR



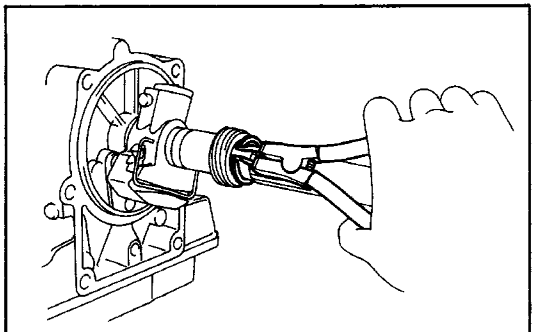
6. LOWER VEHICLE AND CHECK FLUID LEVEL

Start the engine, shift the shift lever into each position, and then check the fluid level with the transmission in P position.

Add fluid as necessary.

NOTICE: Do not overfill.

Fluid type: ATF DEXRON• II


AT4358

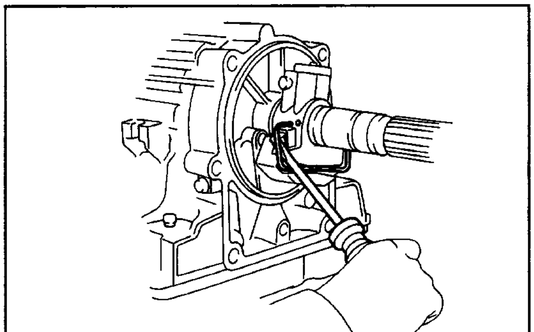
Governor Body

REMOVAL OF GOVERNOR BODY

1. REMOVE EXTENSION HOUSING (See page AT–33)

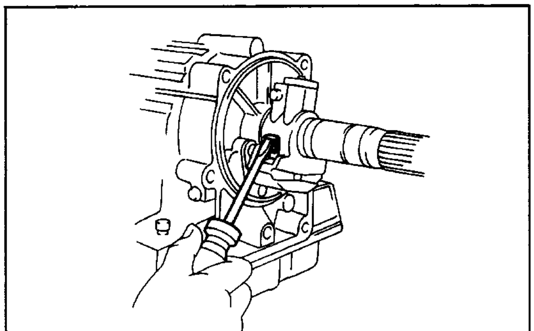
2. REMOVE SPEEDOMETER DRIVE GEAR

(a) Using snap ring pliers, remove the snap ring.
(b) Slide off the speedometer gear.
(e) Remove the lock ball and the outer snap ring.

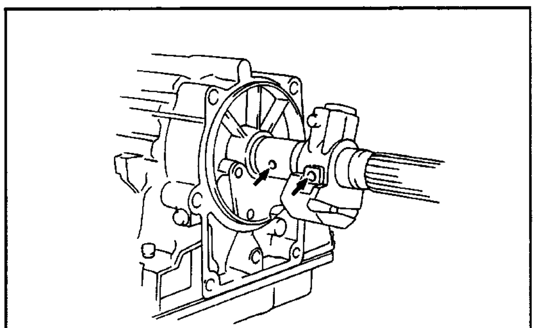

AT4359

3. REMOVE GOVERNOR FROM OUTPUT SHAFT

(a) Using a large screwdriver, remove the retaining clip.


AT4360

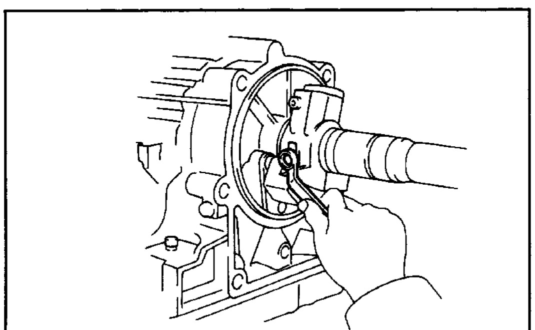
(b) Unstake the lock plate, remove the bolt and lock plate.
(c) Remove the governor body.


AT4363

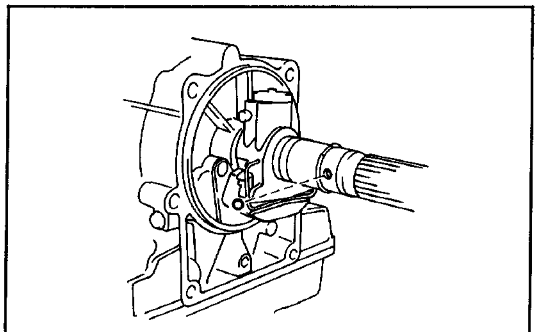
INSTALLATION OF GOVERNOR BODY

1. INSTALL GOVERNOR ON OUTPUT SHAFT

(a) Align the governor body and bolt hole on the output shaft.

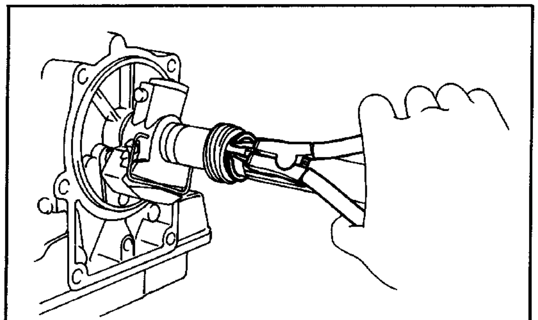

AT4361

(b) Install the bolt and lock plate, stake the lock plate.
(c) Using a large screwdriver, install the retaining clip into the hole in the output shaft.
(d) Check that the governor assembly is secure.


AT4362

2. INSTALL SPEEDOMETER DRIVE GEAR

(a) Install the snap ring and lock ball.


AT4358

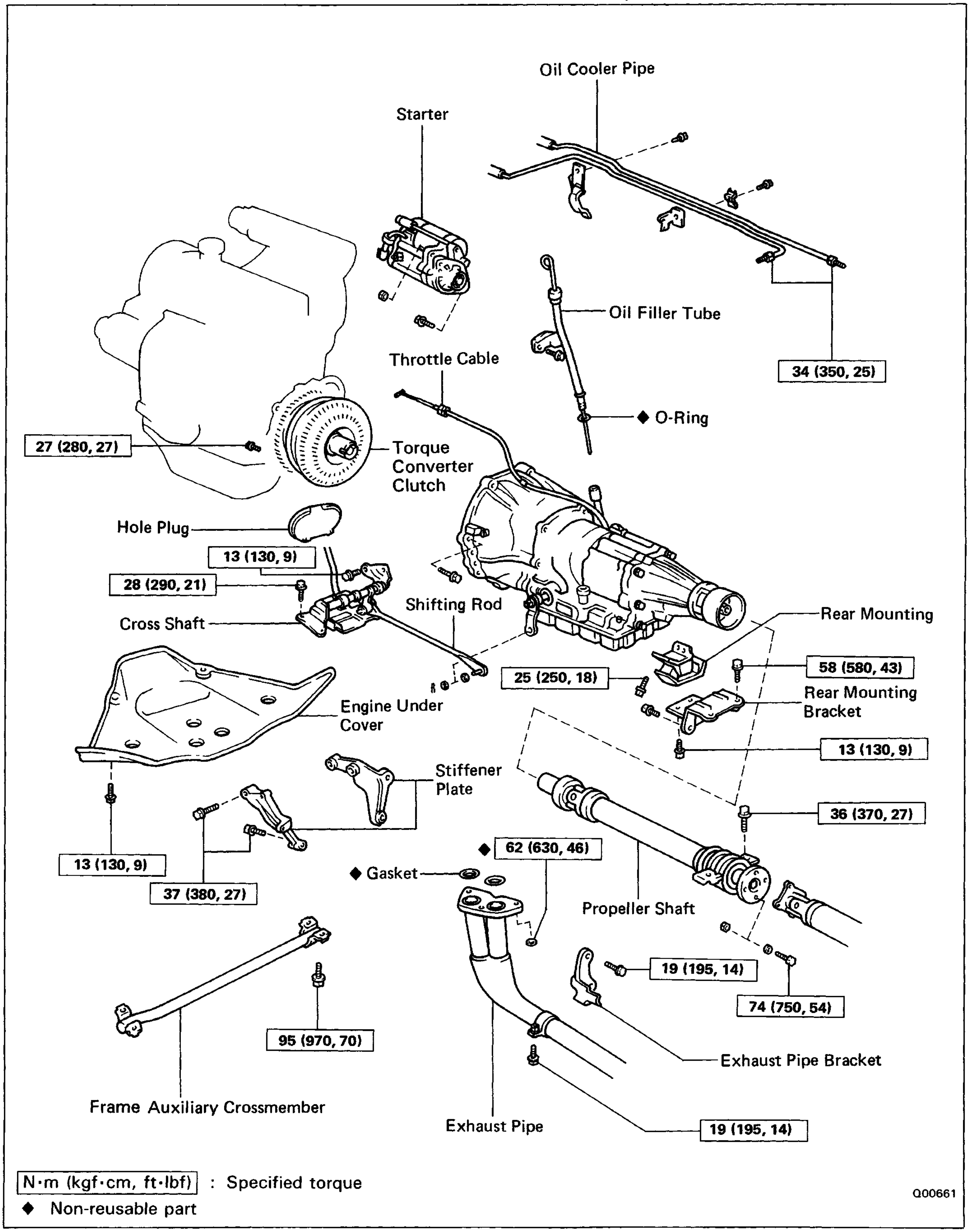
(b) Slide the speedometer drive gear on the shaft.

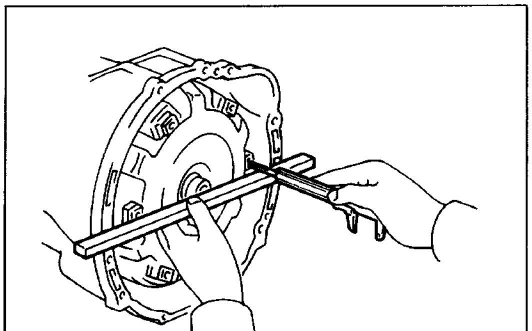
(c) Using snap ring pliers, install the outer snap ring.

3. INSTALL EXTENSION HOUSING (See page AT–34)

REMOVAL AND INSTALLATION OF TRANSMISSION

Remove and install the parts as shown.




D4770

(MAIN POINT OF INSTALLATION)

1. CHECK TORQUE CONVERTER CLUTCH INSTALLATION

Using calipers and a straight edge, measure from the in–stalled surface of the torque converter clutch to the front surface of the transmission housing.

Correct distance: 20.0 mm (0.787 in.)

If the distance is less than the standard, check for an im–proper installation.

2. ADJUST TRANSMISSION THROTTLE CABLE
(See page AT–15)

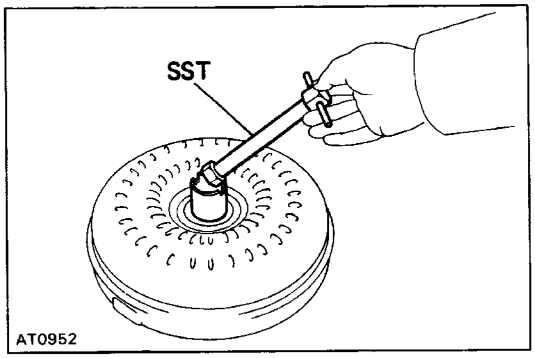
3. FILL TRANSMISSION WITH ATF AND CHECK FLUID LEVEL

Fluid type: ATF DEXRON® II

NOTICE: Do not overfill.

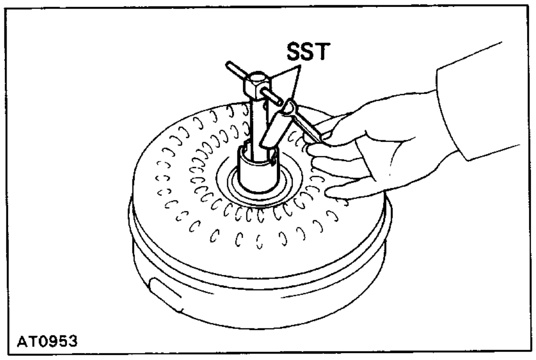
TORQUE CONVERTER CLUTCH AND DRIVE PLATE

INSPECTION OF TORQUE CONVERTER CLUTCH AND DRIVE PLATE

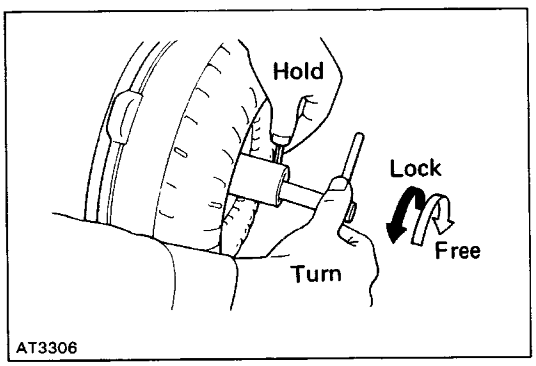


1. INSPECT ONE–WAY CLUTCH

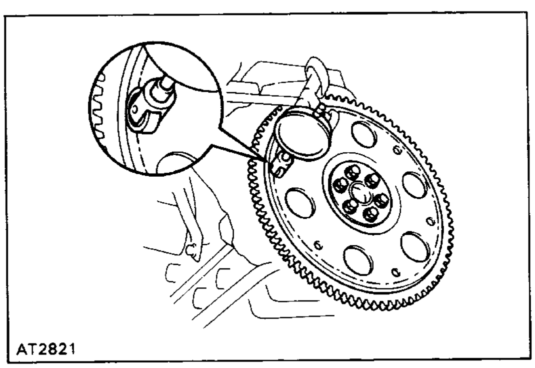
(a) Install SST into the inner race of the one–way clutch.
SST 09350–20015 (09397–22020)



(b) Install SST so that it fits in the notch of the converter hub and outer race of the one–way clutch.
SST 09350–20015 (09397–22020)



(c) With the torque converter clutch standing on its side, the clutch locks when turned counterclockwise, and rotates freely and smoothly clockwise.
If necessary, clean the converter and retest the clutch.
Replace the converter if the clutch still fails the test.

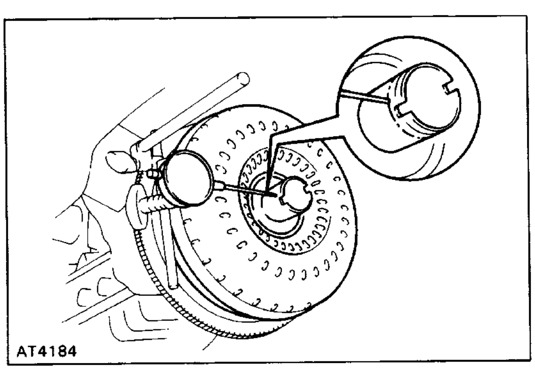


2. MEASURE DRIVE PLATE RUNOUT AND INSPECT RING GEAR

Set up a dial indicator and measure the drive plate runout.

If runout exceeds 0.20 mm (0.0079 in.) or if the ring gear is damaged, replace the drive plate. If installing a new drive plate, note the orientation of spacers and tighten the bolts.

Torque: 83 N–m (850 kgf–cm, 61 ft–lbf)



3. MEASURE TORQUE CONVERTER CLUTCH SLEEVE RUNOUT

(a) Temporarily mount the torque converter clutch to the drive plate. Set up a dial indicator.

If runout exceeds 0.30 mm (0.0118 in.), try to correct by reorienting the installation of the converter. If excessive runout cannot be corrected, replace the torque converter clutch.

HINT: Mark the position of the converter to ensure correct installation.

(b) Remove the torque converter clutch.

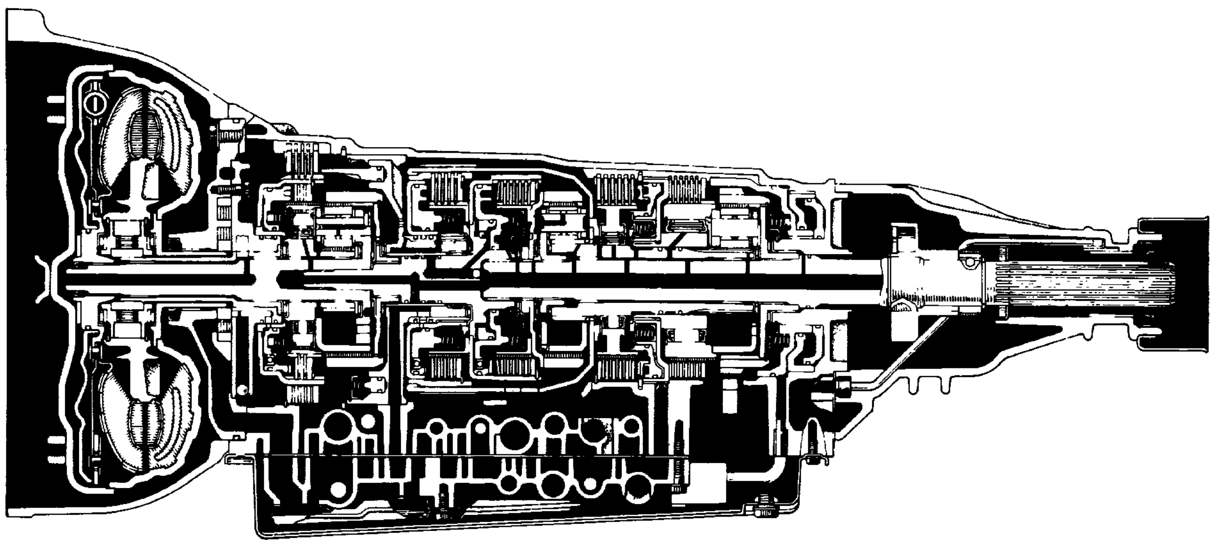
A340E Automatic Transmission

DESCRIPTION

General

The A340E is a 4–speed, Electronic Controlled Transmission developed for use with high–performance en–gine such as the 3VZ–E. A lock–up mechanism is built into the torque converter clutch.
The A340E automatic transmission is mainly composed of the torque converter clutch, the overdrive (here–after called O/D) planetary gear unit, 3–speed planetary gear unit, the hydraulic control system and the elec–tronic control system.

Sectional View



D1328

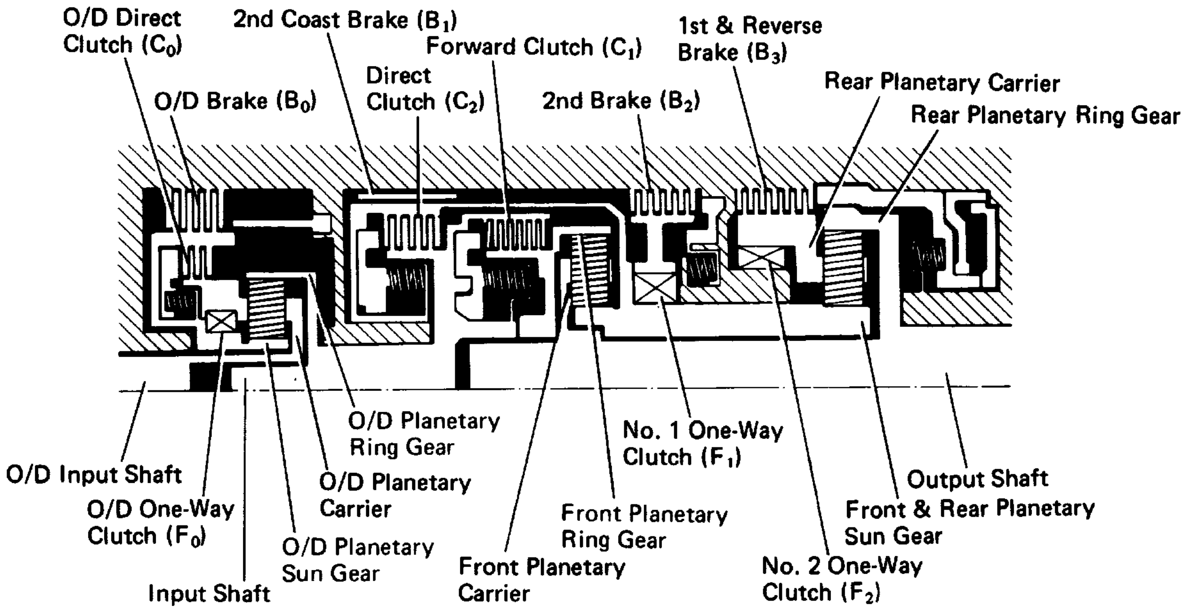
General Specifications

Type of Transmission			A340E
Type of Engine			3VZ-E
Torque Converter Clutch	Stall Torque Ratio		C&C 2.0 : 1 Others 2.1 : 1
	Lock–Up Mechanism		Equipped
Gear Ratio	1 st Gear		2.804
	2nd Gear		1.531
	3rd Gear		1.000
	O/D Gear		0.705
	Reverse Gear		2.393
Plates (Disc/Plate)	C_0	O/D Direct Clutch	2/2
	C_1	Forward Clutch	5/5
	C_2	Direct Clutch	4/4
	B_2	2nd Brake	5/5
	B_3	1 st & Reverse Brake	6/6
	B_0	O/D Brake	4/3
ATF	Type		ATF DEXRON® II
	Capacity liter (US qts, Imp.qts)	Total	7.2 (7.6, 6.3)
		Drain and Refill	1.6 (1.7, 1.4)

OPERATION

Mechanical Operation

OPERATING CONDITIONS



AT2157

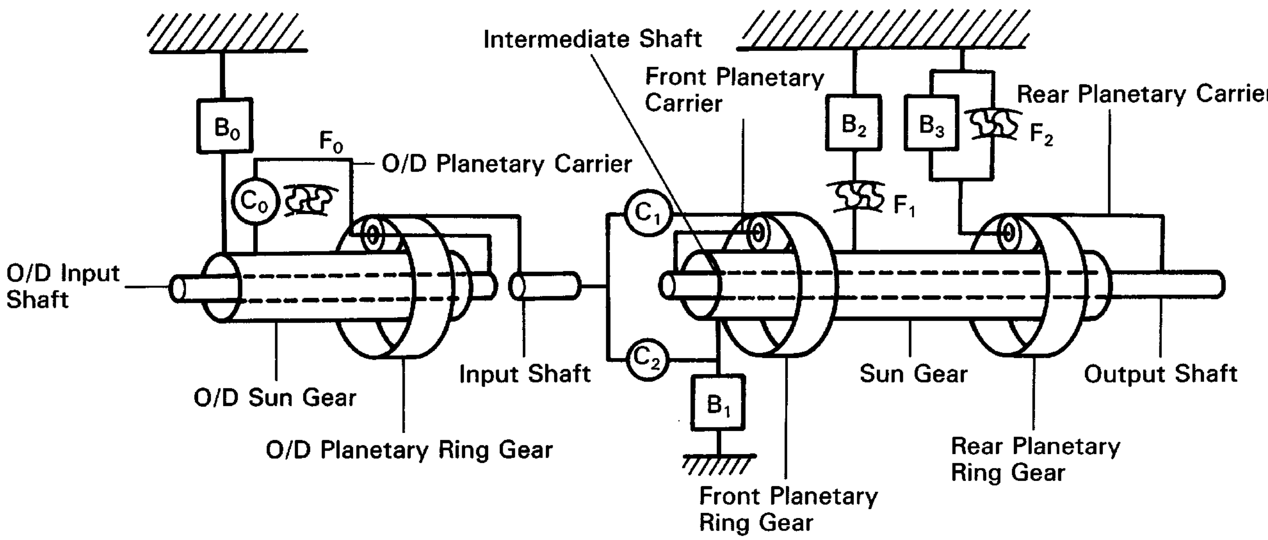
○ ..... Operating

Shift lever position	Gear position	C_0	C_1	C_2	B_0	B_1	B_2	B_3	F_0	F_1	F_2
P	Parking	○									
R	Reverse	○		○				○	○		
N	Neutral	○									
D	1 st	○	○						○		○
	2nd	○	○				○		○	○	
	3rd	○	○	○			○		○		
	O/D		○	○	○		○				
2	1 st	○	○						○		○
	2nd	○	○			○	○		○	○	
	3rd	○	○	○			○		○		
L	1 st	○	○					○	○		○
	* 2nd	○	○			○	○		○	○	

* Down–shift only in the L position and 2nd gear–no up–shift.

FUNCTION OF COMPONENTS

NOMENCLATURE	OPERATION
O/D Direct Clutch (C_0)	Connects overdrive sun gear and overdrive carrier
O/D Brake (BO)	Prevents overdrive sun gear from turning either clockwise or counterclockwise
O/D One–Way Clutch (Fo)	When transmission is being driven by engine, connects overdrive sun gear and overdrive carrier
Forward Clutch (Cl)	Connects input shaft and front planetary ring gear
Direct Clutch (C2)	Connects input shaft and front & rear planetary sun gear
2nd Coast Brake (Bl)	Prevents front & rear planetary sun gear from turning either clockwise or counterclockwise
2nd Brake (BZ)	Prevents outer race of F, from turning either clockwise or counterclockwise, thus preventing front & rear planetary sun gear from turning counterclockwise
1 st & Reverse Brake (B3)	Prevents rear planetary carrier from turning either clockwise or counterclockwise
No. 1 One–Way Clutch (Fl)	When B2 is operating, prevents front & rear planetary sun gear from turning counterclockwise
No.2 One–Way Clutch (F2)	Prevents rear planetary carrier from turning counterclockwise

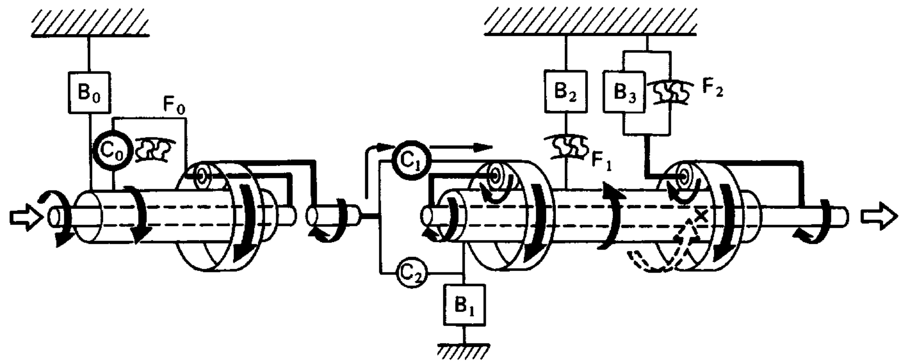


Q02957

FUNCTION OF COMPONENTS (Cont'd)

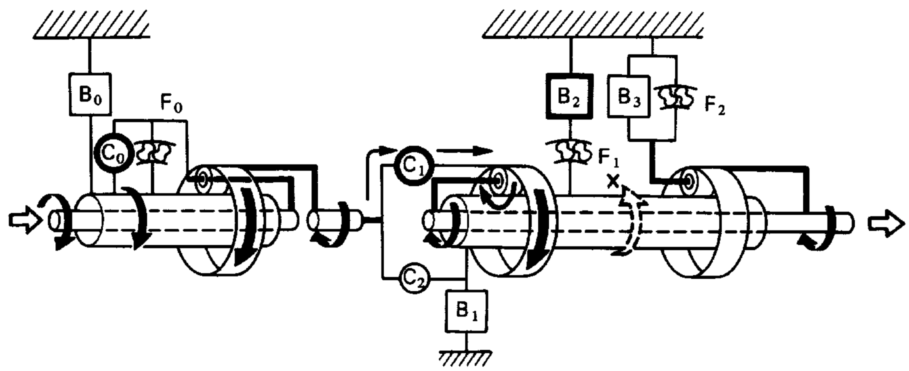
The conditions of operation for each gear position are shown in the following illustrations:

D or 2 Position 1st Gear



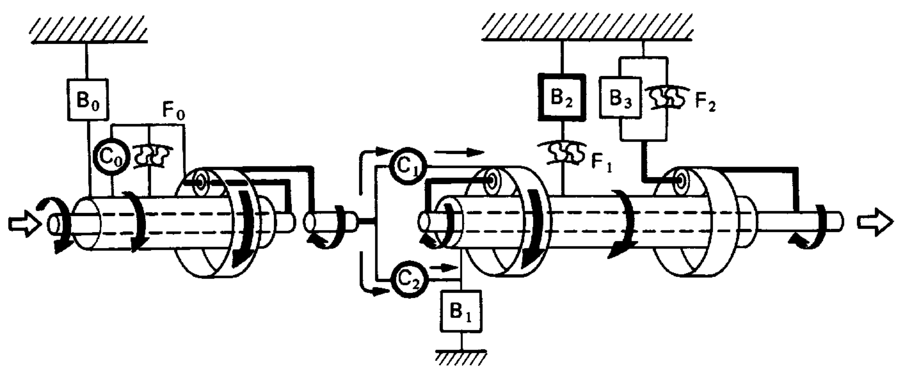
AT6675

D Position 2nd Gear



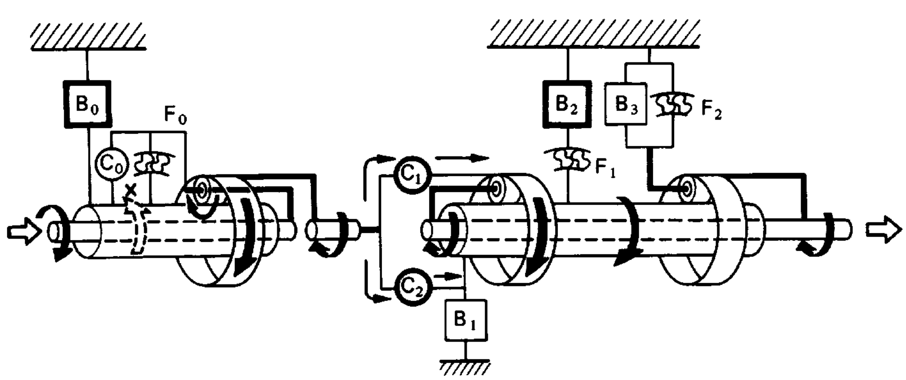
AT6676

D or 2 Position 3rd Gear



AT6677

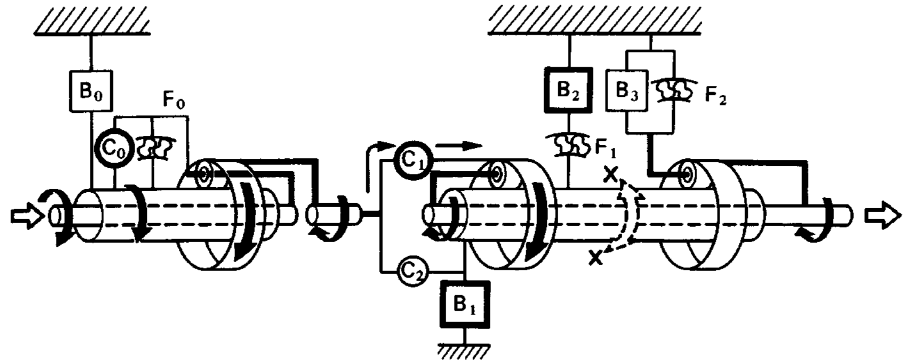
D Position O/D



AT6678

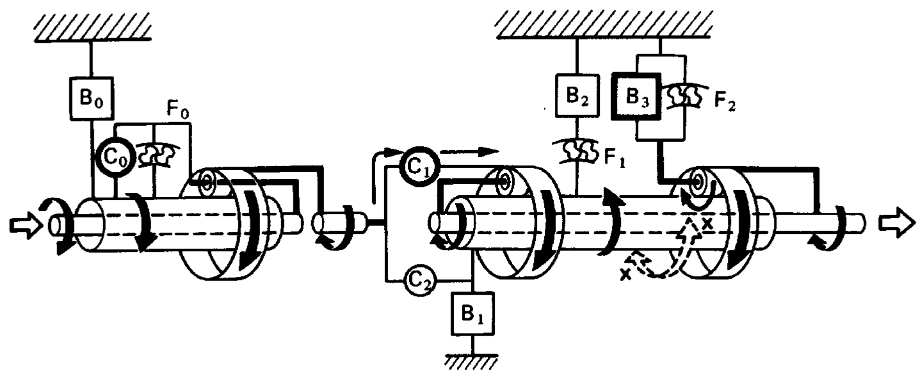
FUNCTION OF COMPONENTS (Cont'd)

2 or L Position 2nd Gear



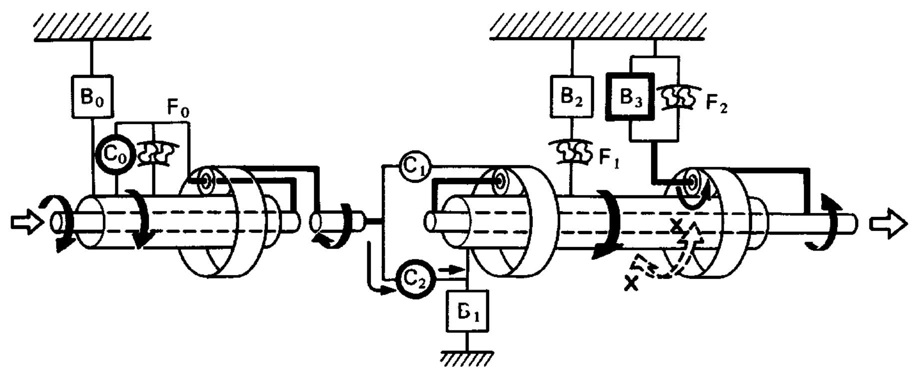
AT6679

L Position 1st Gear



AT6680

R Position Reverse Gear



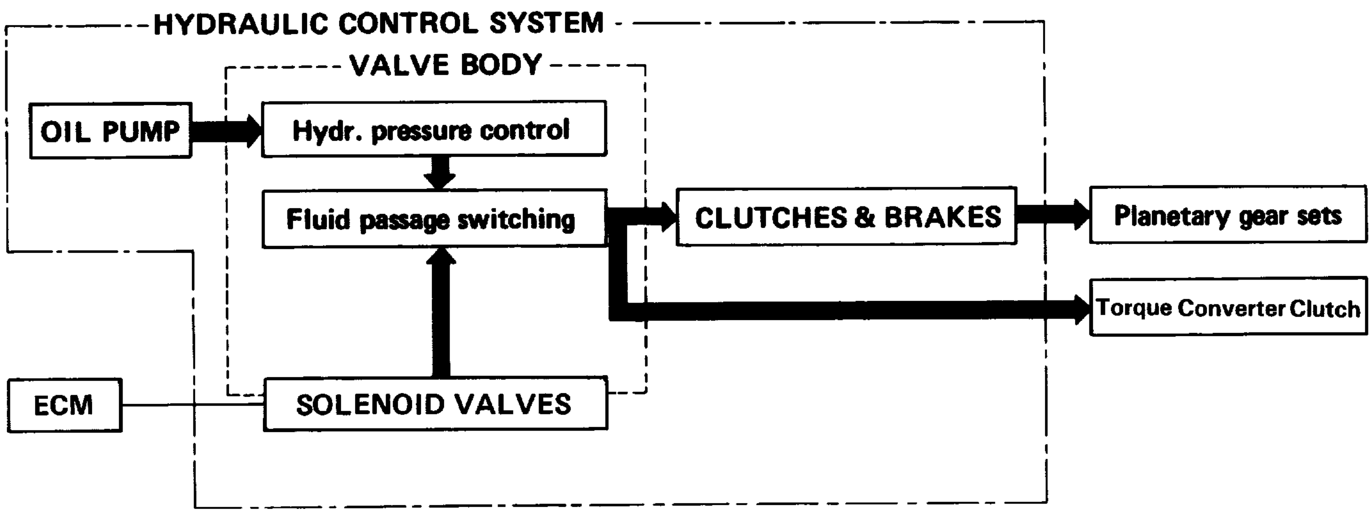
AT6681

HYDRAULIC CONTROL SYSTEM

The hydraulic control system is composed of the oil pump, the valve body, the solenoid valves, and the clutches and brakes, as well as the fluid passages which connect all of these components. Based on the hydraulic pressure created by the oil pump, the hydraulic control system governs the hydraulic pressure acting on the torque converter clutch, clutches and brakes in accordance with the vehicle driving condi– tions.

There are three solenoid valves on the valve body. These solenoid valves are turned on and off by signals from the ECM to operate the shift valves. These shift valves then switch the fluid passages so that fluid goes to the torque converter clutch and planetary gear units.

(Except for the solenoid valves, the hydraulic control system of the electronic controlled transmission is ba– sically the same as that of the fully hydraulic controlled automatic transmission.)



- **LINE PRESSURE**

  Line pressure is the most basic and important pressure used in the automatic transmission, because it is used to operate all of the clutches and brakes in the transmission.

  If the primary regulator valve does not operate correctly, line pressure will be either too high or too low. Line pressure that is too high will lead to shifting shock and consequent engine power loss due to the greater effort required of the oil pump; line pressure that is too low will cause slippage of clutches and brakes, which will, in extreme cases, prevent the vehicle from moving. Therefore, if either of these problems are noted, the line pressure should be measured to see if it is within stan– dard.

- **THROTTLE PRESSURE**

  Throttle pressure is always kept in accordance with the opening angle of the engine throttle valve. This throttle pressure acts on the primary regulator valve and, accordingly, line pressure is regulated in response to the throttle valve opening.

  In the fully hydraulic controlled automatic transmission, throttle pressure is used for regulating line
- Pressure and as signal pressure for up–shift and down–shift of the transmission. In the electronic
- controlled transmission, however, throttle pressure is used only for regulating line pressure. Conse quently, improper adjustment of the transmission throttle cable may result in a line pressure that is too high or too low. This, in turn, will lead to shifting shock or clutch and brake slippage.

ELECTRONIC CONTROL SYSTEM

The electronic control system, which controls the shift points and the operation of the lock–up clutch, is composed of the following three parts:

1. Sensors

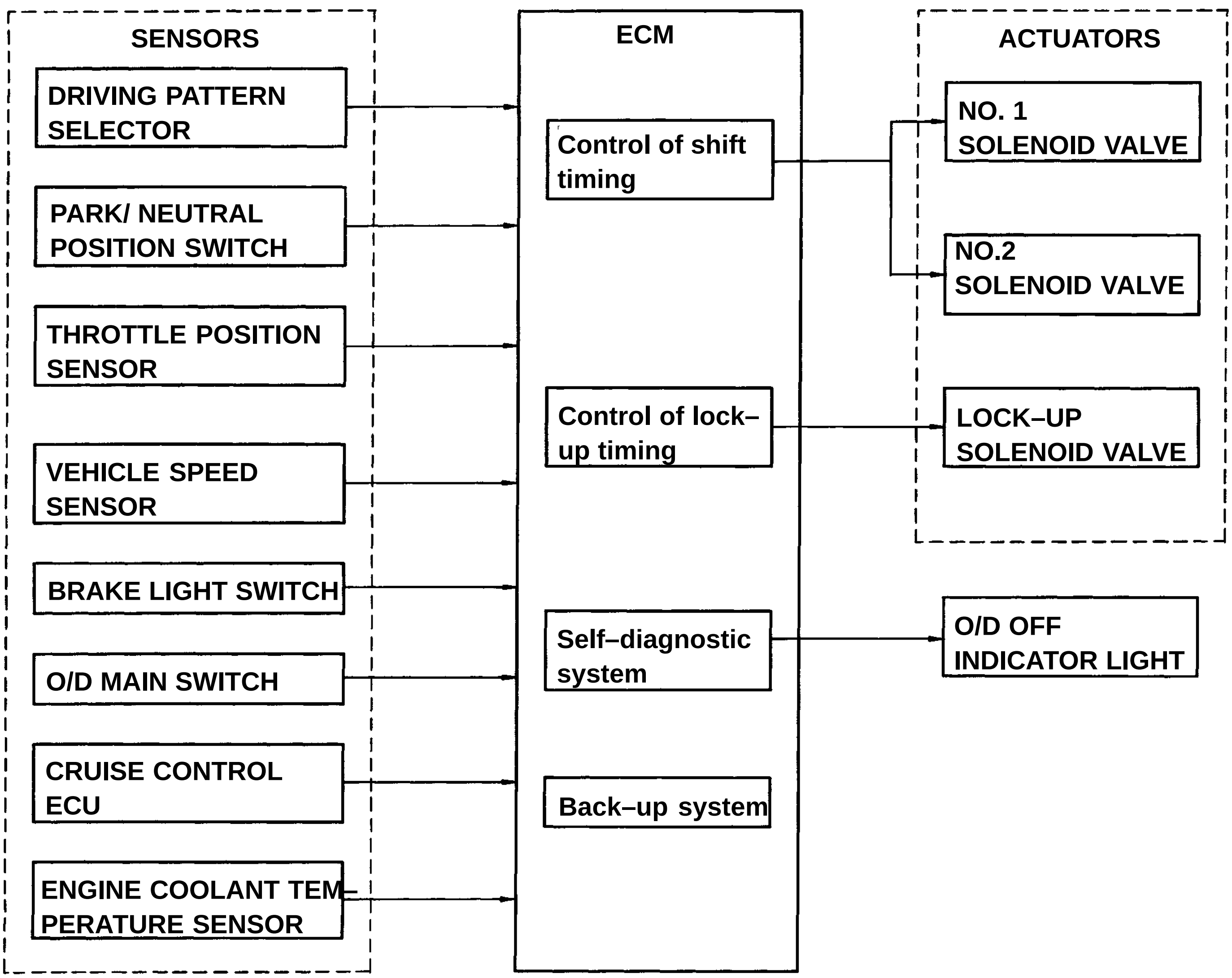
These sensors sense the vehicle speed, throttle opening and other conditions and send these data to the ECM in the form of electrical signals.

2. ECM

The ECM determines the shift and lock–up timing based upon the signals from sensors, and controls the solenoid valves of the hydraulic control unit accordingly.

3. Actuators

These are three solenoid valves that control hydraulic pressure acting on the hydraulic valves to control shifting and lock–up timing.



FUNCTION OF ECM

- **Control of Shift Timing**

The ECM has programmed into its memory the optimum shift pattern for each shift lever position (D, 2, L position) and driving mode (Normal or Power).

Based on the appropriate shift pattern, the ECM turns No. 1 and No.2 solenoid valves on or off in accor–dance with the vehicle speed signal from the vehicle speed sensor and the throttle opening signal from the throttle position sensor. In this manner, the ECM operates each shift valve, opening or closing the fluid passages to the clutches and brakes to permit up–shift or down–shift of the transmission.

HINT: The electronic control system provides shift timing and lock–up control only while the vehicle is traveling forward. In REVERSE, PARK, and NEUTRAL, the transmission is mechanically, not electroni–cally controlled.

- **Control of Overdrive**

Driving in overdrive is possible if the O/D main switch is on and the shift lever is in the D position. How–ever, when the vehicle is being driven using the cruise control system (CCS), if the actual vehicle speed drops to about 4 km/h (2 mph) below the set speed while the vehicle is running in overdrive, the CCS ECU sends a signal to the ECM to release the overdrive and prevent the transmission from shifting back into overdrive until the actual vehicle speed reaches the speed set in the CCS memory.

On this model, if the engine coolant temperature falls below 70•C (158•F), preventing the transmission from up–shifting into overdrive.

- **Control of Lock–Up System**

The ECM has programmed in its memory a lock–up clutch operation pattern for each driving mode (Nor–mal or Power). Based on this lock–up pattern, the ECM turns lock–up solenoid valve on or off in accor–dance with the vehicle speed signals received from the vehicle speed sensor and the throttle opening sig–nals from the throttle position sensor.

Depending on whether lock–up solenoid valve is on or off, the lock–up relay valve performs changeover of the fluid passages for the converter pressure acting on the torque converter clutch to engage or disen–gage the lock–up clutch.

(Mandatory Cancellation of Lock–Up System)

If any of the following conditions exist, the ECM turns off lock–up solenoid valve to disengage the lock–up clutch.

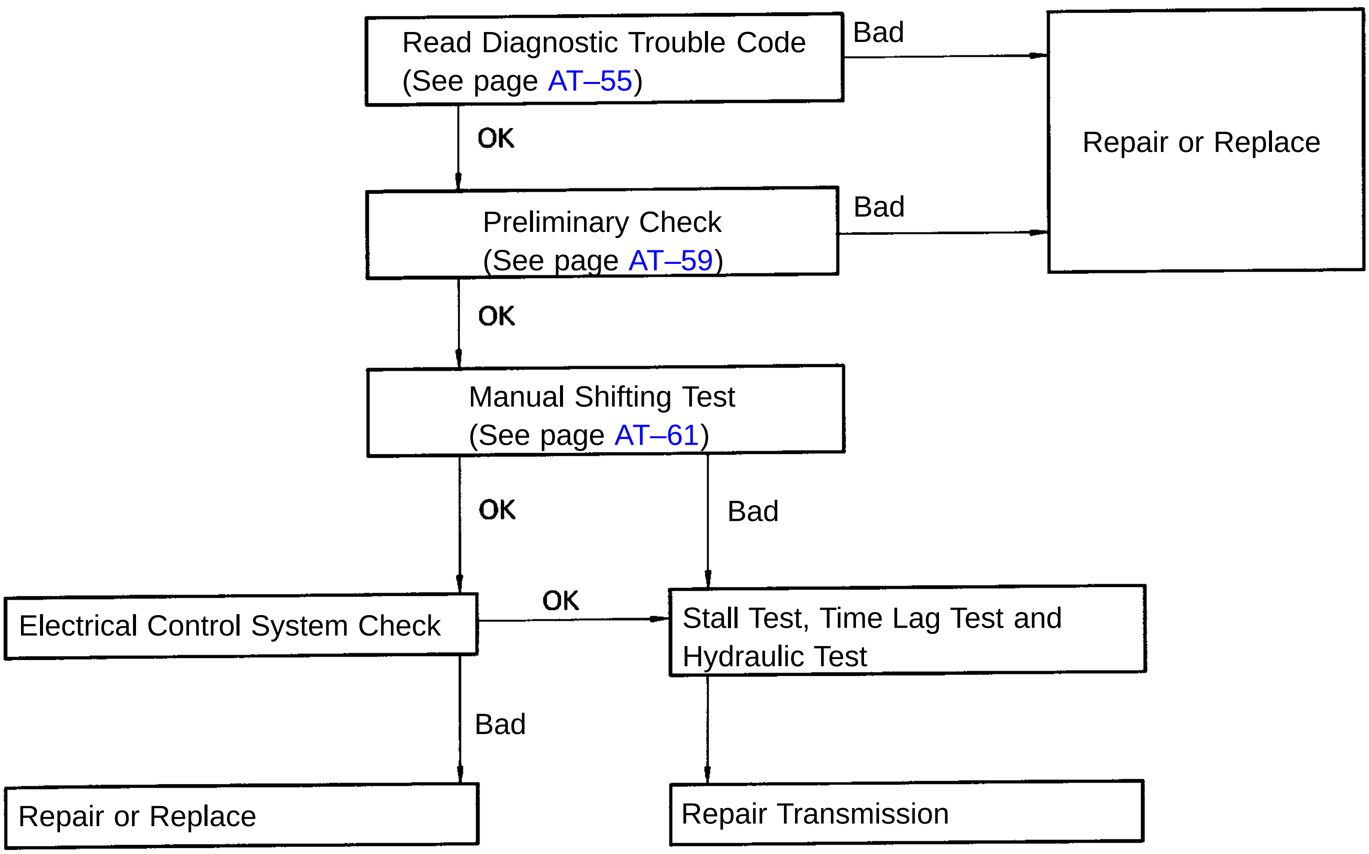
1) The brake light switch comes on (during braking).
2) The IDL points of the throttle position sensor close (throttle valve fully closed).
3) The engine coolant temperature falls below 70•C (158•F).

The purpose of 1) and 2) above is to prevent the engine from stalling if the rear wheels lock up. The pur–pose of 3) is to cause the torque converter clutch to operate to obtain torque multiplication. The purpose of 4) is both to improve general driveability, and to speed up transmission warm–up.

Also, while the lock–up system is in operation, the ECM will temporarily turn it off during up–shift or down–shift in order to decrease shifting shock.

TROUBLESHOOTING
Basic Troubleshooting

Before troubleshooting an electronic controlled transmission, first determine whether the problem is elec–trical or mechanical. To do this, just refer to the basic troubleshooting flow–chart provided below.
If the cause is already known, using the basic troubleshooting chart below along with the general trouble–shooting chart on the following pages should speed the procedure.



General Troubleshooting

Problem	Possible cause	Remedy	Page
Fluid discolored or smells burnt	Fluid contaminated Torque converter clutch faulty Transmission faulty	Replace fluid Replace torque converter clutch Disassemble and inspect transmission	AT–59 AT–96
Vehicle does not move in any forward position or reverse	Manual linkage out of adjustment Valve body or primary regulator faulty Parking lock pawl faulty Torque converter clutch faulty Converter drive plate broken Oil pump intake screen blocked Transmission faulty	Adjust linkage Inspect valve body Inspect parking lock pawl Replace torque converter clutch Replace drive plate Clean screen Disassemble and inspect transmission	AT–60 AT–87 AT–96 AT–96
Shift lever position incorrect	Manual linkage out of adjustment Manual valve and lever faulty Transmission faulty	Adjust linkage Inspect valve body Disassemble and inspect transmission	AT–60
Harsh engagement into any drive position	Throttle cable out of adjustment Valve body or primary regulator faulty Accumulator pistons faulty Transmission faulty	Adjust throttle cable Inspect valve body Inspect accumulator pistons Disassemble and inspect transmission	AT–60
Delayed 1–2, 2–3 or 3–0/13 up–shift, or down–shift from O/D–3 or 3–2 and shifts back to O/D or 3	Electronic control faulty Valve body faulty Solenoid valve faulty	Inspect electronic control Inspect valve body Inspect solenoid valve	AT–63 AT–72
Slips on 1–2, 2–3 or 3–0/D up–shift, or slips or shudders on acceleration	Manual linkage out of adjustment Throttle cable out of adjustment Valve body faulty Solenoid valve faulty Transmission faulty	Adjust linkage Adjust throttle cable Inspect valve body Inspect solenoid valve Disassemble and inspect transmission	AT–60 AT–60 AT–72
Drag, binding or tie–up on 1–2, 2–3 or 3–O/D up–shift	Manual linkage out of adjustment Valve body faulty Transmission faulty	Adjust linkage Inspect valve body Disassemble and inspect transmission	AT–60

Remark ,k : Refer to A340E Automatic Transmission Repair Manual. (Pub. No. RM271U)

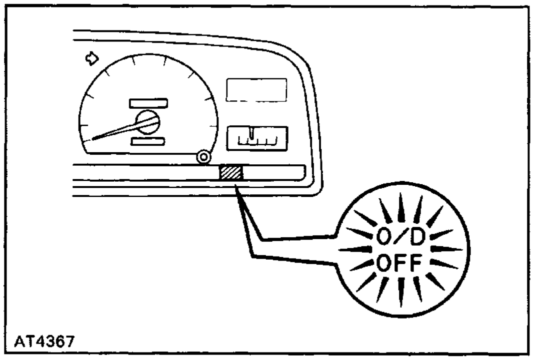
General Troubleshooting (Cont’d)

Problem	Possible cause	Remedy	Page
No lock–up in 2nd, 3rd or 01D	Electronic control faulty Valve body faulty Solenoid valve faulty Transmission faulty	Inspect electronic control Inspect valve body Inspect solenoid valve Disassemble and inspect transmission	AT–63 AT–72
Harsh down–shift	Throttle cable out of adjustment Throttle cable and cam faulty Accumulator pistons faulty Valve body faulty Transmission faulty	Adjust throttle cable Inspect throttle cable and cam Inspect accumulator pistons Inspect valve body Disassemble and inspect transmission	AT–60 AT–60
No down–shift when coasting	Valve body faulty Solenoid valve faulty Electronic control faulty	Inspect valve body Inspect solenoid valve Inspect electronic control	 AT–72 AT–63
Down–shift occurs too quickly or too late while coasting	Throttle cable faulty Valve body faulty Transmission faulty Solenoid valve faulty Electronic control faulty	Inspect throttle cable Inspect valve body Disassemble and inspect transmission Inspect solenoid valve Inspect electronic control	AT–60 AT–72 AT–63
No O/D–3, 3–2 or 2–1 kick–down	Solenoid valve faulty Electronic control faulty Valve body faulty	Inspect solenoid valve Inspect electronic control Inspect valve body	AT–72 AT–63
No engine braking 2 or L position	Solenoid valve faulty Electronic control faulty Valve body faulty Transmission faulty	Inspect solenoid valve Inspect electronic control Inspect valve body Disassemble and inspect transmission	AT–72 AT–63
Vehicle does not hold in P	Manual linkage out of adjustment Parking lock pawl cam and spring faulty	Adjust linkage Inspect cam and spring	AT–60 AT–87

Remark *: Refer to A340E Automatic Transmission Repair Manual.
(Pub. No. RM271U)

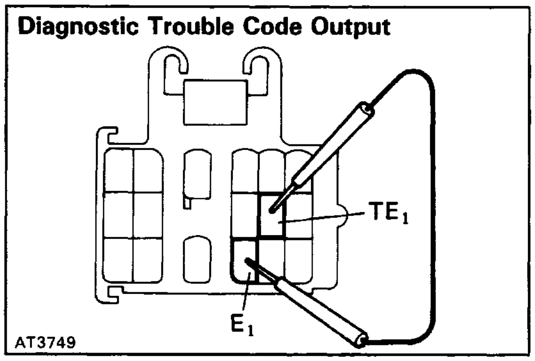
Diagnosis System

DESCRIPTION

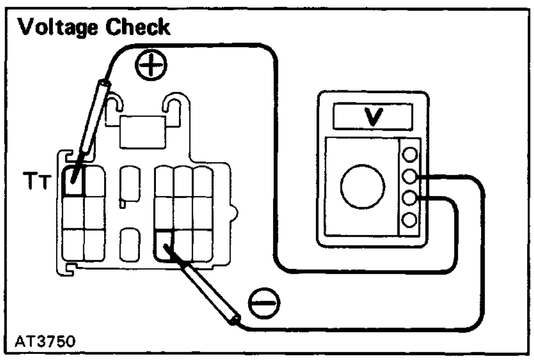


AT4367

1. A self–diagnosis function is built into the electrical control system. Warning is indicated by the overdrive OFF indica–tor light.
   HINT: Warning and diagnostic trouble codes can be read only when the overdrive switch is ON. If OFF, the overdrive OFF light is lit continuously and will not blink.
   (a) If a malfunction occurs within the vehicle speed sen–sors (No. 1 or 2) or solenoids (No. 1 or 2), the over–drive OFF light will blink to warn the driver. However, there will be no warning of a malfunction with lock–up solenoid.
   (b) The diagnostic trouble code can be read by the num–ber of blinks of the overdrive OFF indicator light when terminals TIE, and E I are connected. (See page AT–56)
   (c) The throttle position sensor or brake signal are not indicated, but inspection can be made by checking the voltage at terminal TT of the data link connector 1.
   (d) The signals to each gear can be checked by measur–ing the voltage at terminal TT of the data link con–nectar 1 while driving.

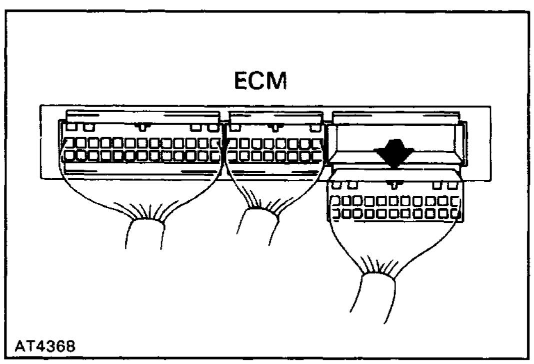


AT3749



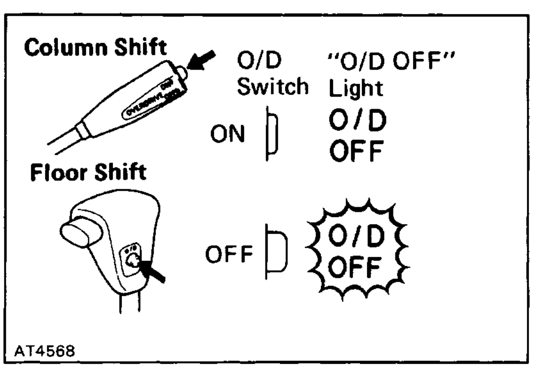
AT3750

2. The diagnostic trouble code is retained in memory by the ECM and due to back–up voltage, is not canceled out when the engine is turned off. Consequently, after repair, it is necessary to turn the ignition switch off and remove the MFI fuse (15A) or disconnect the EC M connector to cancel out the diagnostic trouble code. (See page AT–56)
   HINT:
   Low battery positive voltage will cause faulty opera–tion of the diagnosis system. Therefore, always check the battery first.
   Use a voltmeter and ohmmeter that have an imped–ance of at least 10 kΩ/v.



AT4368

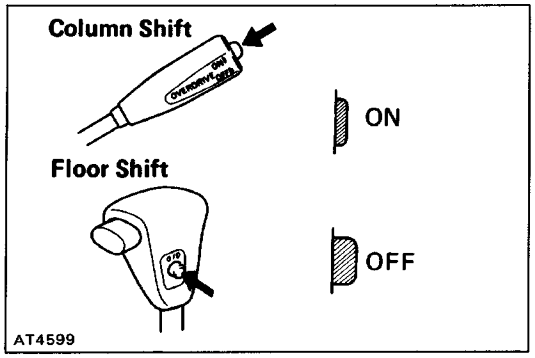
CHECK ”O/D OFF” INDICATOR LIGHT



AT4568

1. Turn the ignition switch ON.
2. The ”O/D OFF” light will come on when the O/D switch is placed at OFF.
3. When the O/D switch is set to ON, the–O/D OFF” light should go out.

If the–O/D OFF” light flashes when the O/D switch is set to ON, the electronic control system is faulty.

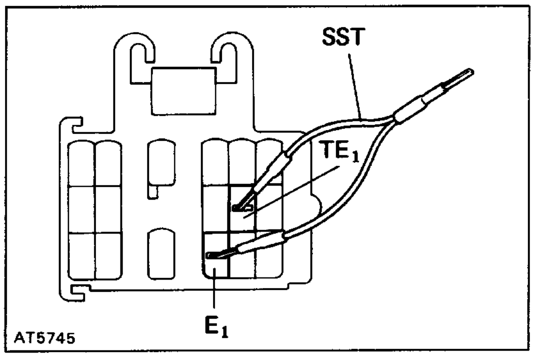


READ DIAGNOSTIC TROUBLE CODE

1. TURN IGNITION SWITCH AND O/D SWITCH TO ON

Do not start the engine.

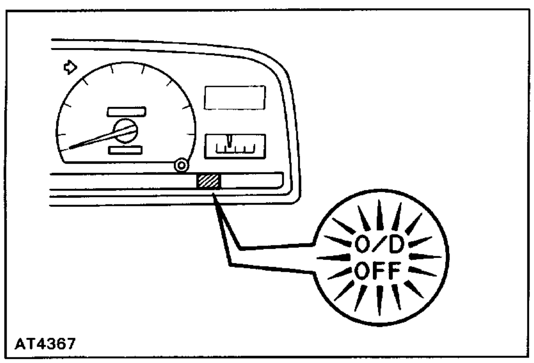
HINT: Warning and diagnostic trouble codes can be read only when the overdrive switch is ON. If OFF, the overdrive OFF light will light continuously and will not blink.



2. CONNECT TE, AND E, TERMINALS OF DATA LINK CONNECTOR 1

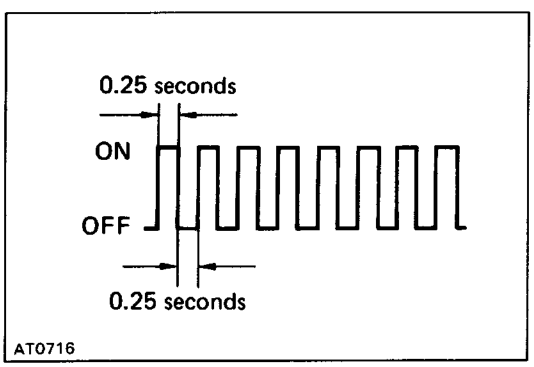
Using a SST, connect terminals TE, and E , of the data link connector 1.

SST 09843–18020



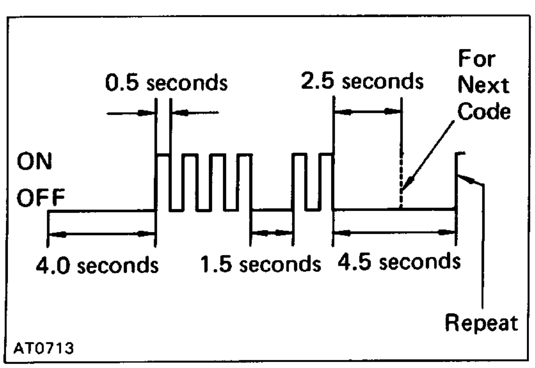
3. READ DIAGNOSTIC TROUBLE CODE

Read the diagnostic trouble code as indicated by the number of times the O/D OFF light flashes.



(Diagnostic Trouble Code Indication)

- If the system is operating normally, the light will flash 2 times per second.



- In the event of a malfunction, the light will flash 1 time per second. The number of blinks will equal the first number and, after 1.5 seconds pause, the second number of the two digit diagnostic trouble code. If there are two or more codes, there will be a 2.5 sec– onds pause between each.

HINT: In the event of several trouble codes occuring si– multaneously, indication will begin from the smaller value and continue to the larger.

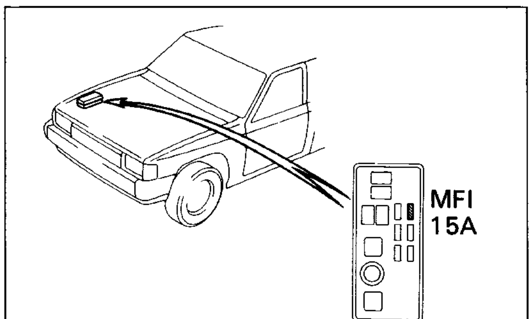
4. REMOVE SST

DIAGNOSTIC TROUBLE CODES

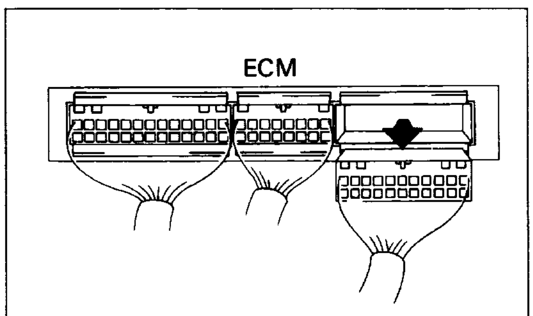
Code No.	Light Pattern	Diagnosis System
–		Normal
42		Defective No. 1 vehicle speed sensor (in ATM)– severed wire harness or short circuit
61		Defective No. 2 vehicle speed sensor (in ATM)– severed wire harness or short circuit
62		Severed No. 1 solenoid or short circuit– severed wire harness or short circuit
63		Severed No.2 solenoid or short circuit– severed wire harness or short circuit
64		Severed lock–up solenoid or short circuit– severed wire harness or short circuit

AT2020

HINT: If codes 62, 63 or 64 appear, there is an electri–cal malfunction in the solenoid.
Causes due to mechanical failure, such as a stuck valve, will not appear.



FI3618



AT4368

CANCEL OUT DIAGNOSTIC TROUBLE CODE

1. After repair of the trouble area, the diagnostic trouble code retained in memory by the ECM must be canceled by removing the MFI fuse (1 5A) for 10 seconds or more, depending on ambient temperature (the lower the tem–perature, the longer the fuse must be left out) with the ig–nition switch OFF.
   HINT:
   Cancellation can be also done by removing the battery negative (–) terminal, but in this case other memory systems will be also canceled out.
   The diagnostic trouble code can be also canceled out by disconnecting the EC M connector.
   If the diagnostic trouble code is not canceled out, it will be retained by the ECM and appear along with a new code in event of future trouble.
2. After cancellation, perform a road test to confirm that a ”normal code” is now read on the O/D OFF light.

TROUBLESHOOTING FLOW–CHART

HINT:

- If diagnostic trouble code Nos. 42, 61, 62 or 63 are output, the overdrive OFF indicator light will begin to blink immediately to warn the driver. However, an impact or shock may cause the blinking to stop; but the code will still be retained in the ECM memory until canceled out.
- There is no warning for diagnostic trouble code No. 64.
- In the event of a simultaneous malfunction of both No. 1 and No. 2 vehicle speed sensors, no diag–nostic trouble code will appear and the fail–safe system will not function. However, when driving in the D position, the transmission will not up–shift from first gear, regardless of the vehicle speed.

Diagnostic trouble code 42 (No. 1 vehicle speed sensor circuitry)

Check continuity between ECM connector SP, terminal and body ground.
(See page AT–71)

OK ↓

Substitute another ECM.

↓

Check No. 1 vehicle speed sensor.
(See page AT–73)

NG → Repair or replace No. 1 vehicle speed sensor.

OK ↓

Check wiring between ECM and combination meter.

Diagnostic trouble code 61 (No.2 vehicle speed sensor circuitry)

Check continuity between ECM connector SP_2 terminal and body ground.
(See page AT–71)

OK ↓

Substitute another ECM.

↓

Check No.2 vehicle speed sensor.
(See page AT–73)

NG → Repair or replace No.2 vehicle speed sensor.

OK ↓

Check wiring between ECM and No.2 vehicle speed sensor.

Diagnostic trouble code 62 (No. 1 solenoid valve circuitry)

Check resistance of No. 1 solenoid valve at ECM connector. (See page AT–72)

OK → Substitute another ECM.

NG ↓

Remove the oil pan and check resistance of No. 1 solenoid valve connector and body ground.
Resistance: 11–15Ω

NG → Replace No. 1 solenoid valve.

OK ↓

Check wiring between No. 1 solenoid valve and ECM.

Diagnostic trouble code 63 (No.2 solenoid valve circuitry)

Check resistance of No–2 solenoid valve at ECM connector. (See page AT–72)

OK → Substitute another ECM.

NG ↓

Remove the oil pan and check resistance of No.2 solenoid valve connector and body ground.
Resistance: 11–15

NG → Replace No.2 solenoid valve.

OK ↓

Check wiring between No.2 solenoid valve and ECM.

Diagnostic trouble code 64 (Lock–up solenoid valve circuitry)

Check resistance of lock–up solenoid valve at ECM connector.
(See page AT–72)

OK → Substitute another ECM.

NG ↓

Remove the oil pan and check resistance of lock–up solenoid valve connector and body ground.
Resistance: 11–15 0

NG → Replace lock–up solenoid valve.

OK ↓

Check wiring between lock–up solenoid valve and ECM.

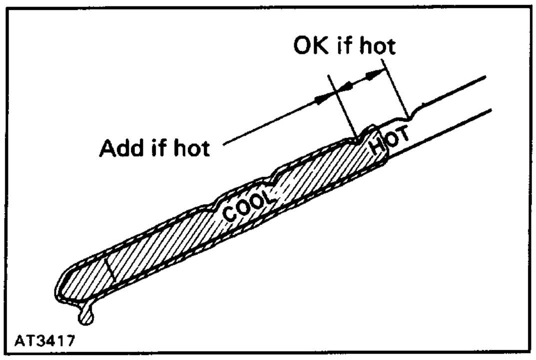
Preliminary Check

1. CHECK FLUID LEVEL

HINT:

The vehicle must have been driven so that the engine and transmission are at normal operating temperature. (Fluid temperature: 70–80 ®C or 158–176 ®F)

Only use the COOL range on the dipstick as a rough reference when the fluid is replaced or the engine does not run.



(a) Park the vehicle on a level surface, set the parking brake.

(b) With the engine idling, shift the shift lever into all positions from P to L position and return to P position.

HINT: Depress brake pedal.

(c) Pull out the transmission dipstick and wipe it clean.

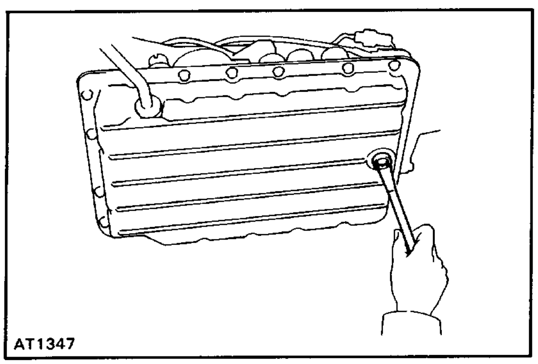
(d) Push it back fully into the tube.

(e) Pull it out and check that the fluid level is in the HOT range.

If the level is at the low side, add fluid.

Fluid type: ATF DEXRON• II

NOTICE: Do not overfill.

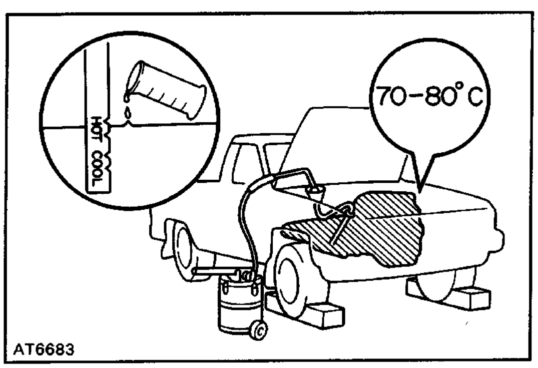


2. CHECK FLUID CONDITION

If the fluid smells burnt or is black, replace it as following procedures.

(a) Remove the drain plug and drain the fluid.

(b) Reinstall the drain plug securely.



(c) With the engine OFF, add new fluid through the oil filler tube.

Fluid type ATF DEXRON• II

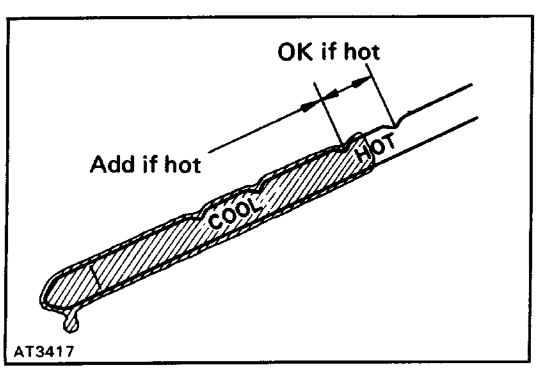
Capacity:

Total: 7.2 liters (7.6 US qts, 6.3 Imp qts)

Drain and refill: 1.6 liters (1.7 US qts, 1.4 Imp.qts)

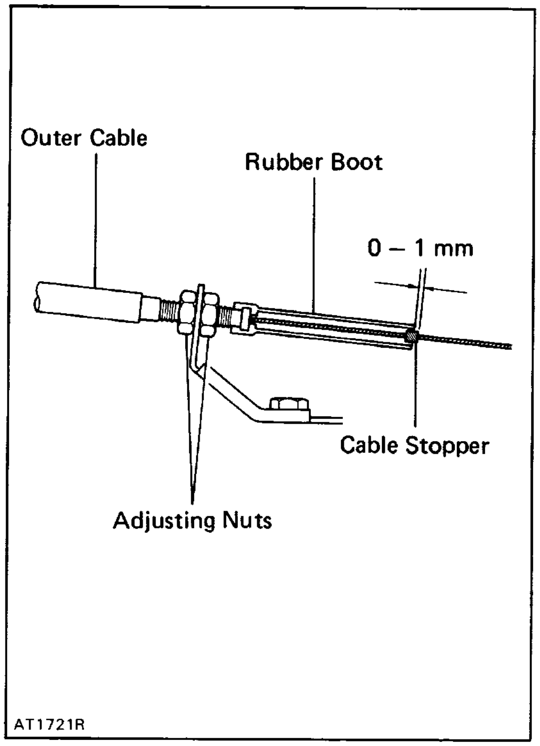
(d) Start the engine and shift the shift lever into all positions from P to L position and then shift into P position.

(e) With the engine idling, check the fluid level. Add fluid up to the COOL level on the dipstick.



(f) Check the fluid level with the normal operating temperature (70–80 ®C or 158–176 ®F) and add as necessary.

NOTICE: Do not overfill.



3. **INSPECT THROTTLE CABLE**

(a) Depress the accelerator pedal all the way and check that the throttle valve opens fully.

HINT: If the valve does not open fully, adjust the accel–erator cable.

(b) Fully depress the accelerator pedal.

(c) Measure the distance between the end of the boot and stopper on the cable.

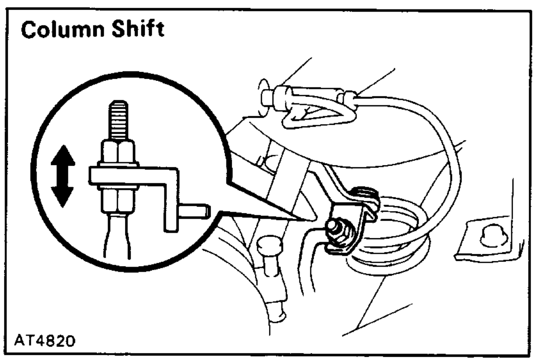
Standard distance: 0–1 mm (0–0.04 in.)

If the distance is not standard, adjust the cable by the ad–justing nuts.

4. **INSPECT SHIFT LEVER POSITION**

When shifting the shift lever from the N position to other positions, check that the lever can be shifted smoothly and accurately to each position and that the position in–dicator correctly indicates the position.

If the indicator is not aligned with the correct position, carry out the following adjustment procedures.



(Column shift)

(a) Remove the nut on the cross shaft rod.

(b) Push the cross shaft rod fully downward.

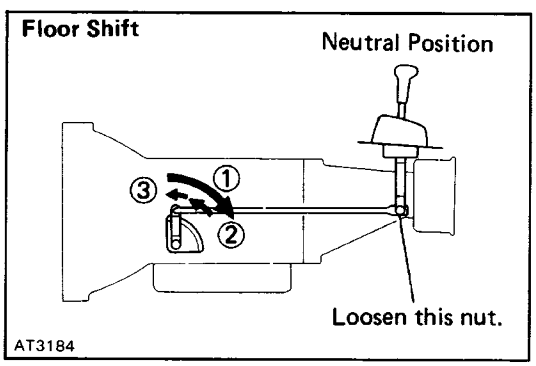
(c) Return the cross shaft rod two notches to N posi–tion.

(d) Set the shift lever to N position.

(e) While holding the shift lever lightly toward the R po–sition side, adjust the cross shaft rod nut.

(f) Tighten the cross shaft rod nut.

(g) Start the engine and make sure that the vehicle moves forward when shifting the lever from the N to D position and reverse when shifting it to the R po–sition.



(Floor shift)

(a) Remove the nut on the cross shaft rod.

(b) Push the cross shaft rod fully downward.

(c) Return the cross shaft rod three notches to N posi–tion.

(d) Set the shift lever to N position.

(e) While holding the shift lever lightly toward the R po–sition side, adjust the cross shaft rod nut.

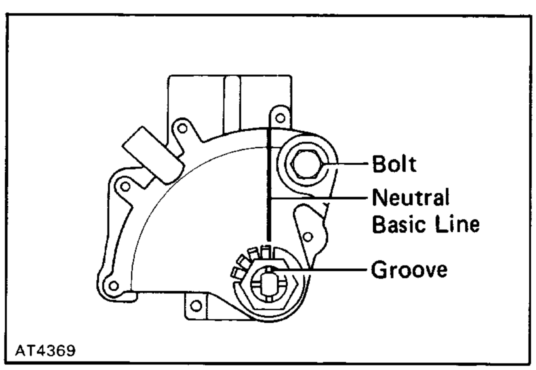
(f) Tighten the cross shaft rod nut.

(g) Start the engine and make sure that the vehicle moves forward when shifting the lever from the N to D position and reverse when shifting it to the R po–sition.

5. **INSPECT PARK/NEUTRAL POSITION SWITCH**

Check that the engine can be started with the shift lever only in the N or P position, but not in other positions.

If not as stated above, carry out the following adjustment procedures.

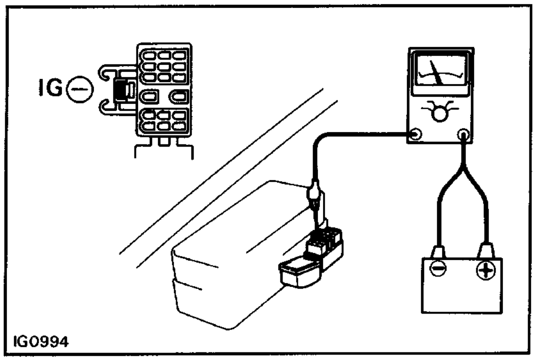


(a) Loosen the park/neutral position switch bolt and set the shift lever to the N position.

(b) Align the groove and neutral basic line.

(c) Hold in position and tighten the bolt.

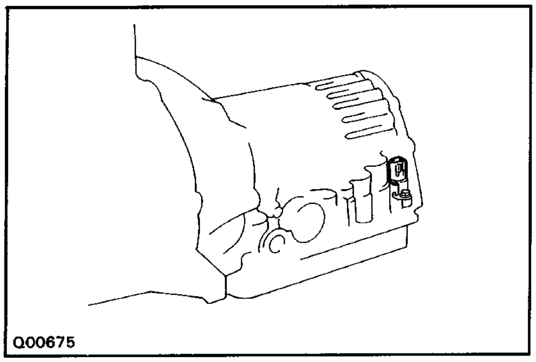
Torque: 13 N–m (130 kgf–cm, 9 in.¿lbf)



6. INSPECT IDLE SPEED (IN POSITION)

Connect a tachometer test probe to the data link connector 1 terminal IG ∞, inspect the idle speed.

Idle speed: 800 RPM



Manual Shifting Test

HINT: With this test, it can be determined whether the trouble lies within the electrical circuit or is a mechanical problem in the transmission.

1. DISCONNECT SOLENOID WIRE

2. INSPECT MANUAL DRIVING OPERATION

Check that the shift and gear position correspond with the table below.

Shift position	D position	2 position	L position	R position	P position
Gear position	O/D	3rd	1st	Reverse	Pawl Lock

HINT: If the L, 2 and D position gear positions are difficult to distinguish, perform the following road test.

- While driving, shift through the L, 2 and D positions. Check that the gear change corresponds to the shift position.
  If any abnormality is found in the above test, the problem lies in transmission itself.

3. CONNECT SOLENOID WIRE

4. CANCEL OUT DIAGNOSTIC TROUBLE CODE
(See page AT–56)

REFERENCE: Possible gear position in accordance with solenoid operating conditions.

Position	NORMAL			NO. 1 SOLENOID MALFUNCTIONING			NO.2 SOLENOID MALFUNCTIONING			BOTH SOLENOIDS MALFUNCTIONING		
	Solenoid Valve No. 1	Solenoid Valve No. 2	Gear Position	Solenoid Valve No. 1	Solenoid Valve No. 2	Gear Position	Solenoid Valve No. 1	Solenoid Valve No. 2	Gear Position	Solenoid Valve No. 1	Solenoid Valve No. 2	Gear Position
D position	ON	OFF	1 st	×	ON (OFF)	3rd (O/D)	ON	×	1 st	×	×	O/D
	ON	ON	2nd	×	ON	3rd	OFF (ON)	×	O/D (1st)	×	×	O/D
	OFF	ON	3rd	×	ON	3rd	OFF	×	O/D	×	×	O/D
	OFF	OFF	O/D	×	OFF	O/D	OFF	×	O/D	×	×	O/D
2 position	ON	OFF	1 st	×	ON (OFF)	3rd (O/D)	ON	×	1 st	×	×	3rd
	ON	ON	2nd	×	ON	3rd	OFF (ON)	×	3rd (1st)	×	×	3rd
	OFF	ON	3rd	×	ON	3rd	OFF	×	3rd	×	×	3rd
L position	ON	OFF	1 st	×	OFF	1st	ON	×	1 st	×	×	1st
	ON	ON	2nd	×	ON	2nd	ON	×	1 st	×	×	1 st

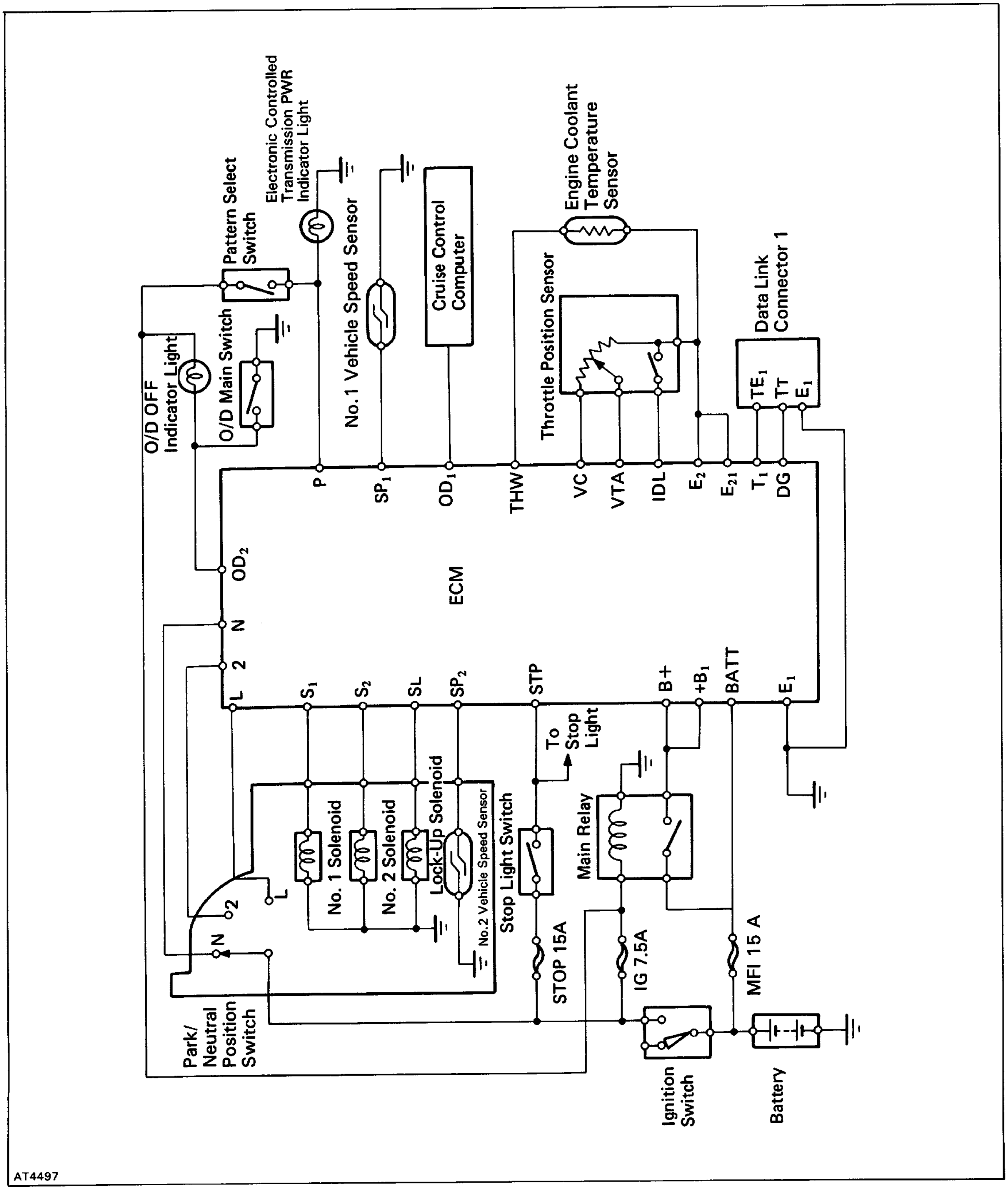
( ): No fail–safe function x : Malfunctions

Electronic Control System

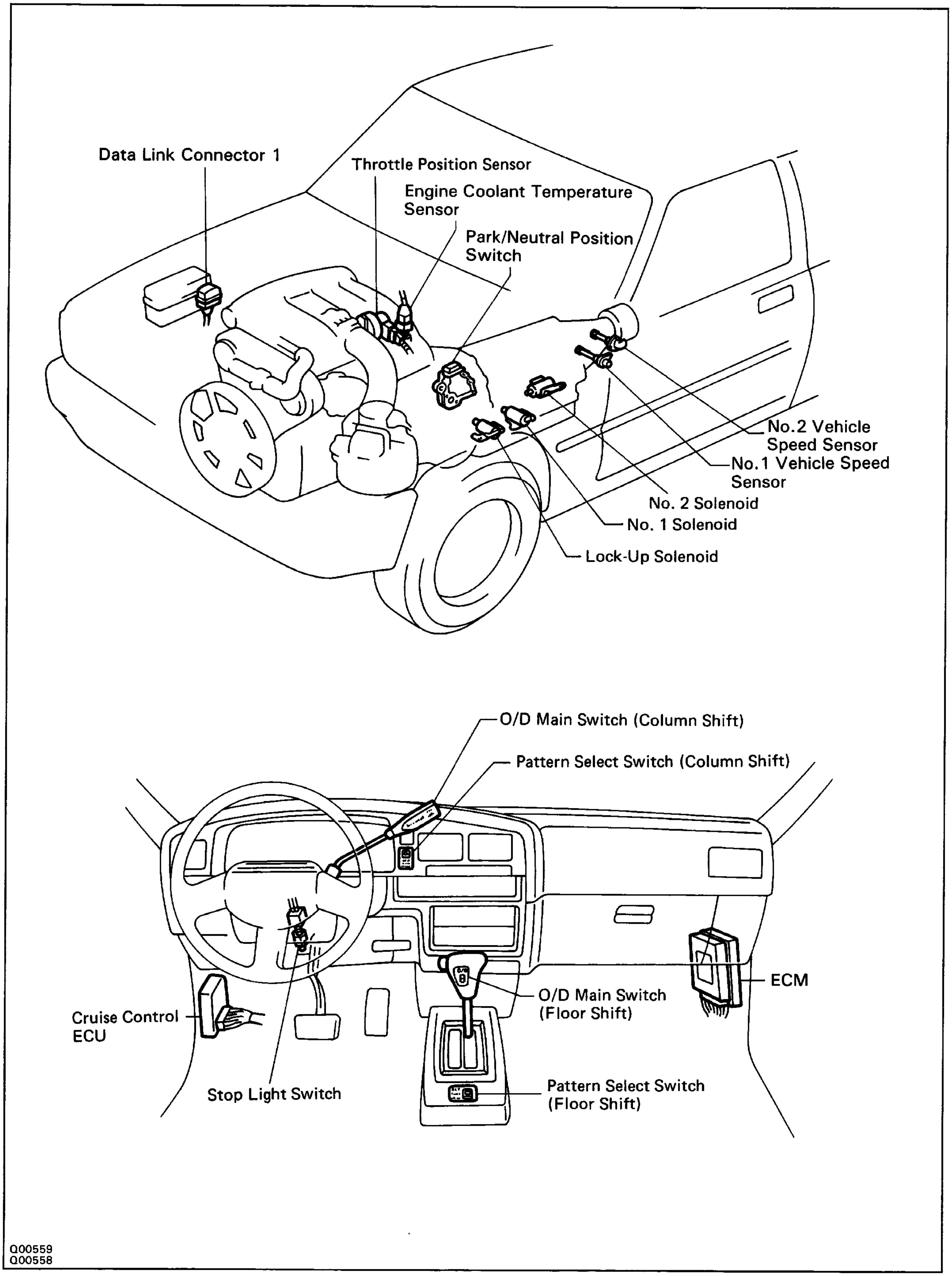
PRECAUTION

Do not open the cover or the case of the ECM and various computer unless absolutely necessary. (If the IC terminals are touched, the IC may be destroyed by static electricity.)

ELECTRONIC CONTROL CIRCUIT



ELECTRONIC CONTROL COMPONENTS



TROUBLESHOOTING FLOW–CHART

Trouble No. 1 No Shifting

Warm up engine
Engine coolant temp.: 80• C (176• F)
ATF temp.: 50–80• C (122–176• F)

↓

Connect a voltmeter to data link connector 1 terminals TT and El. Does TT terminal voltage vary with changes in throttle opening?

Yes ↓ (to solenoid test below)

No ↓

Is voltage between ECM terminals STP and E, as follows?
0 V: Brake pedal released
10–14 V: Brake pedal depressed

No → Brake signal faulty

Yes ↓

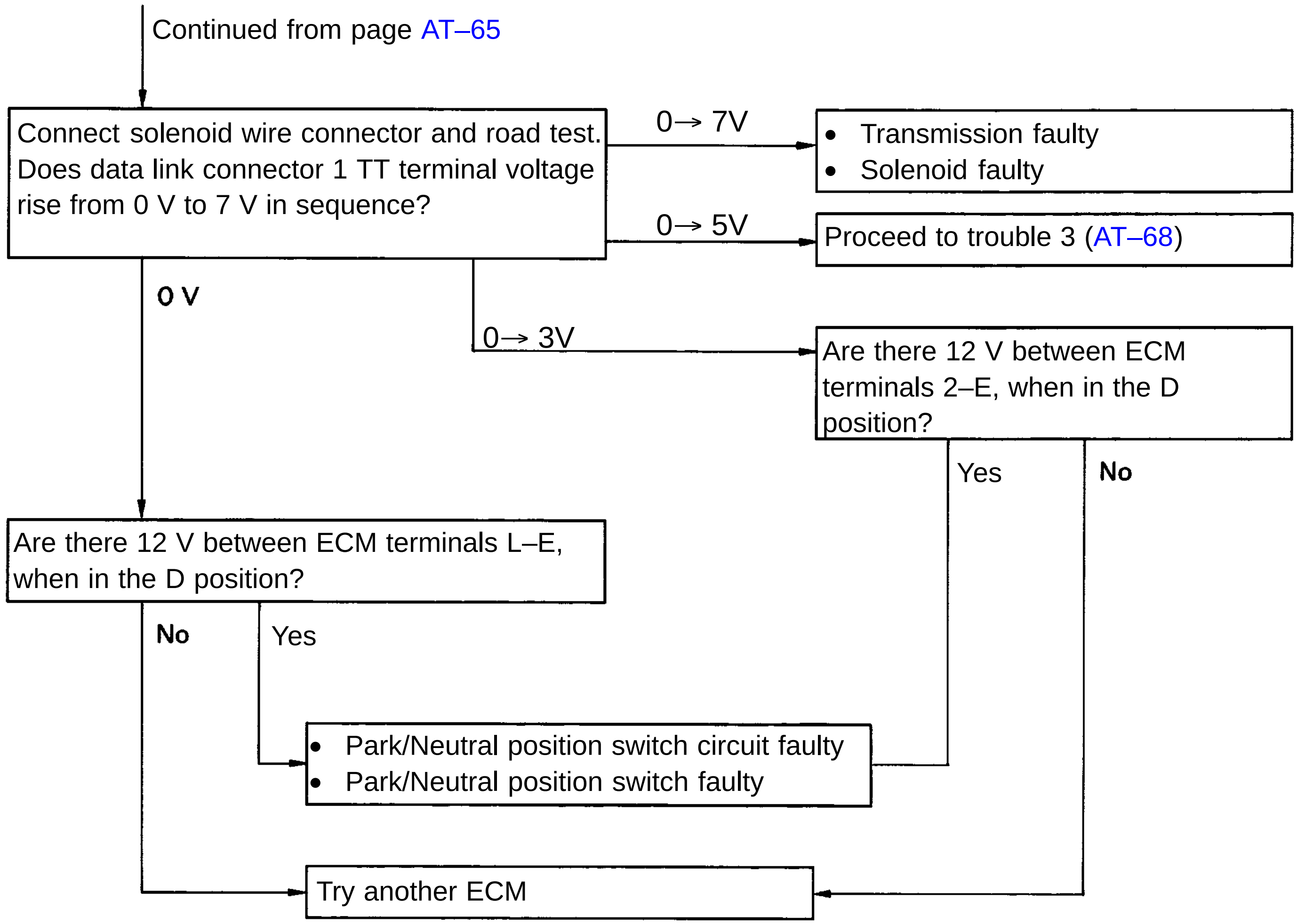
- Throttle position signal faulty
- TT terminal wire open or short

Disconnect solenoid wire connector and road test. Does the transmission operate in the respective gear when in the following positions while driving?
D position ..... Overdrive
2 position ..... 3rd gear
L position ..... 1 st gear

No → Transmission faulty

Yes

Continued on page AT–66


Continued from page AT–65
Connect solenoid wire connector and road test. Does data link connector 1 TT terminal voltage rise from 0 V to 7 V in sequence?
0→ 7V
• Transmission faulty
• Solenoid faulty
0→ 5V
Proceed to trouble 3 (AT–68)
0 V
0→ 3V
Are there 12 V between ECM terminals 2–E, when in the D position?
Yes
No
Are there 12 V between ECM terminals L–E, when in the D position?
No
Yes
• Park/Neutral position switch circuit faulty
• Park/Neutral position switch faulty
Try another ECM

Trouble No.2 Shift point too high or too low

Warm up engine
Engine coolant temp.: 800C (1760F)
ATF temp.: 50–80• C (122–176• F)

Connect a voltmeter to data link connector 1 terminals TT and El. Does TT terminal voltage vary with changes in throttle opening?

No

Is voltage between ECM terminals STP and E, as follows?
0 V: Brake pedal released
10–14 V: Brake pedal depressed

No

Brake signal faulty

Yes

- Throttle position signal faulty
- TT terminal wire open or short

Yes

Check voltage between ECM terminals P and El.
Power pattern: 10–14 V
Normal pattern: 0–2 V

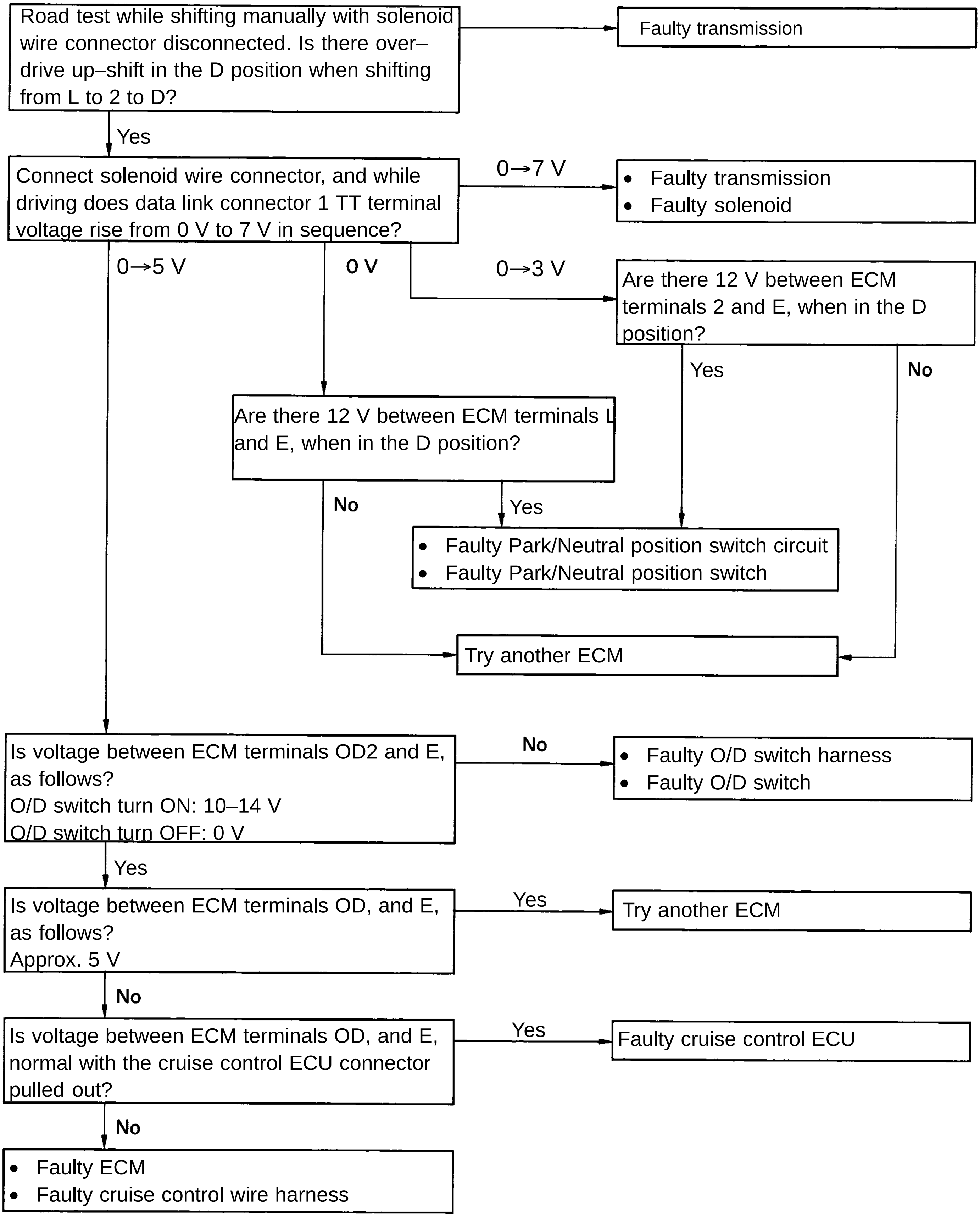
OK

- Faulty ECM
- Faulty transmission

NG

Faulty pattern select switch system

Trouble No.3 No up–shift to overdrive (After warm–up)



Trouble No.4 No lock–up (After warm–up)

Warm up engine
Engine coolant temp.: 80•C (176•F)
ATF temp.: 50–80•C (122–176•F)

↓

Road test
Connect a voltmeter to data link connector 1 ter–minals TT and E1. Is there 7, 5 or 3 V in the lock–up position while driving?

Yes →
- Lock–up solenoid stuck
- Faulty transmission
- Faulty lock–up mechanism

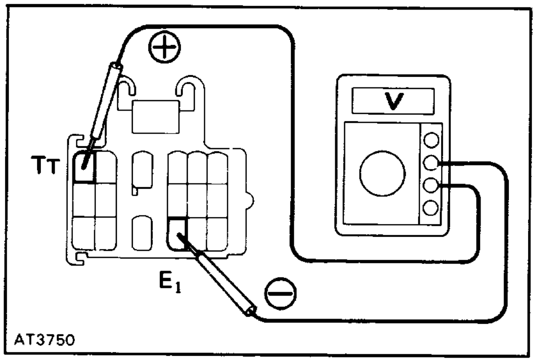
↓ **No**

Is voltage between ECM STP and E, terminals as follows?
Brake pedal depressed: 10–14 V
Brake pedal released: 0 V

No → Faulty brake signal

↓ Yes

Faulty throttle position signal

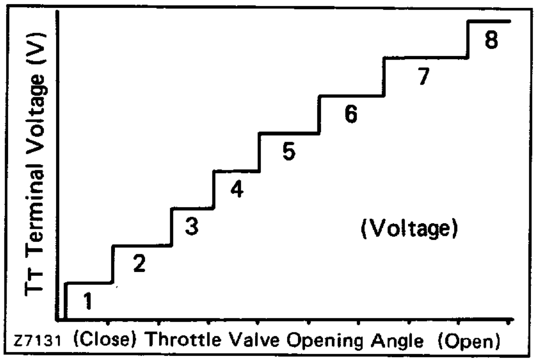


INSPECTION OF TT TERMINAL VOLTAGE

1. INSPECT THROTTLE POSITION SENSOR SIGNAL

(a) Turn the ignition switch to ON. Do not start the en– gine.

(b) Connect a voltmeter to data link connector 1 ter– minals TT and El.



(c) While slowly depressing the accelerator pedal, check that TT terminal voltage rises in sequence.

If the voltage does not change in proportion to the throt– tle opening angle, there is a malfunction in the throttle position sensor or circuit.

2. INSPECT BRAKE SIGNAL

(a) Depress the accelerator pedal until the TT terminal indicates 8V.

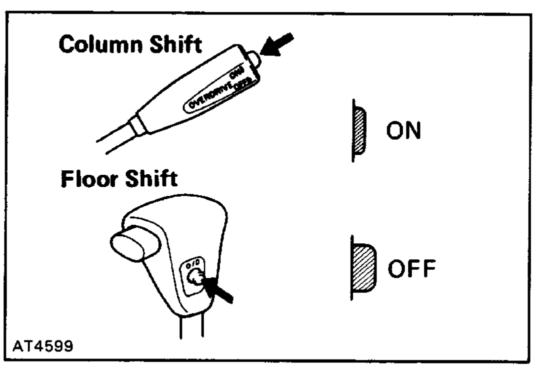
(b) Depress the brake pedal and check the voltage read– ing from the TT terminal.

Brake pedal depressed .... 0 v

Brake pedal released .... 8 V

If not as indicated, there is a malfunction in either the stop light switch or circuit.

3. INSPECT EACH UP–SHIFT POSITION



(a) Warm up the engine.

Engine coolant temperature: 80 • C (176 • F)

(b) Turn the O/D switch to ”ON”.

(c) Place the pattern select switch in ”Normal” and the shift lever into the D position.

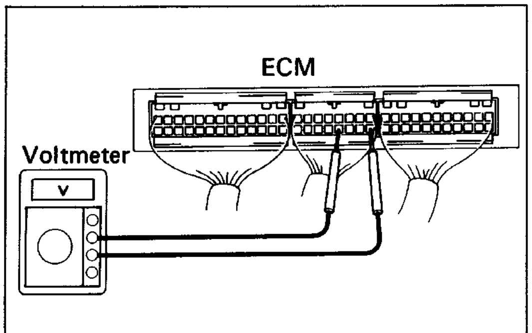
(d) During a road test (above 10 km/h or 6 mph) check that voltage at the TT terminal is as indicated below for each up–shift position.

If the voltage rises from 0 v to 7 v in the sequence shown, the control system is okay.

The chart on the left shows the voltmeter reading and corresponding gears.

T_TTerminal (V)	Gear Position
0	1st
2	2nd
3	2nd Lock-up
4	3rd
5	3rd Lock-up
6	O/D
7	O/D Lock-up

HINT: Determine the gear position by a light shock or change in engine RPM when shifting. The lock–up clutch will turn ON only infrequently during normal 2nd and 3rd gear operation. To trigger this action, press the accelera– tor pedal to 50% or more of its stroke. At less than 50%, the voltage may change in the sequence 2 V–4 v–6 v–7V.

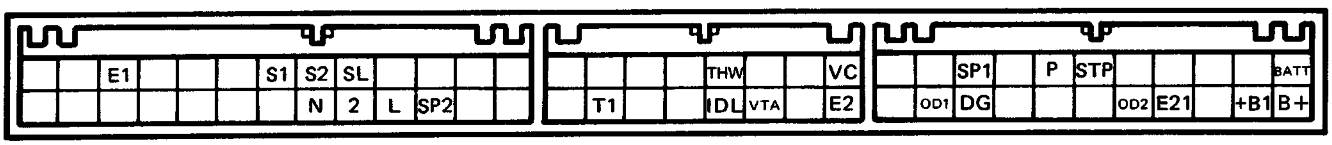


FI2762

INSPECTION OF ELECTRONIC CONTROL COMPONENTS

1. INSPECT VOLTAGE OF ECM CONNECTOR

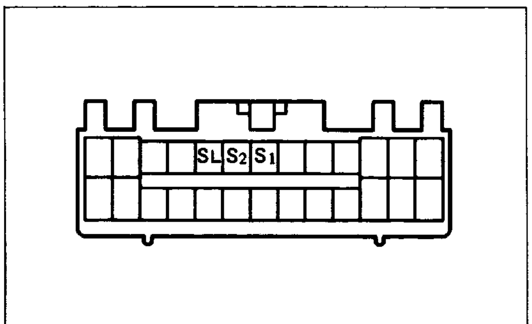
(a) Remove the cowl side trim of passenger side.
(b) Turn on the ignition switch.
(c) Measure the voltage at each terminal.



FI2796

Terminal	Measuring condition		Voltage (V)
S_1 – E_1	–		10 – 14
S_2, S_L – E_1	–		0
P – E_1	PWR pattern		10 – 14
	NORM pattern		0 – 2
STP – E_1	Brake pedal is depressed		10 – 14
	Brake pedal is released		0
THW – E_2 (E_{21})	Engine coolant temp. 80()C (1760F)		0.1 – 1.0
IDL – E_2 (E_{21})	Throttle valve fully closed		0
	Throttle valve open		10 – 14
VTA – E_2 (E_{21})	Throttle valve fully closed		0.1 – 1.0
	Throttle valve fully open		3 – 5
VC – E_2 (E_{21})	–		4 – 6
OD_1 – E_1	–		5
OD_2 – E_1	O/D main switch turned ON		10 – 14
	O/D main switch turned OFF		0
SP_1 – E_1	Cruise control main switch OFF	Standing still	0 or 5
		Vehicle moving	2 – 3
SP_2 – E_1	Standing still		0 or 5
	Vehicle moving		2 – 3

Terminal	Measuring condition	Voltage (V)
N – E_1	N position	10 – 14
	Except N position	0 – 2
2 – E_1	2 position	10 – 14
	Except 2 position	0 – 2
L – E_1	L position	10 – 14
	Except L position	0 – 2
B+ (+B_1) – E_1	–	10 – 14
BATT – E_1	–	10 – 14



VAD-26-1

2. INSPECT SOLENOID

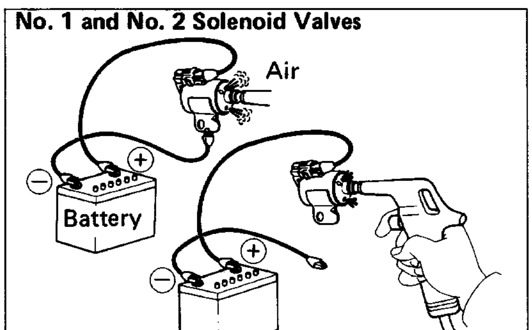
(a) Disconnect the connector from ECM.

(b) Measure the resistance between S, S2, SL and ground.

Resistance: 11–15

(c) Apply battery positive voltage to each terminal.

Check that an operation noise can be heard from the solenoid.



AT3088

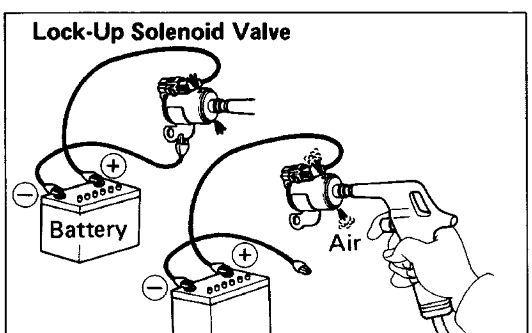
3. CHECK SOLENOID SEALS

If there is foreign material in the solenoid valve, there will be no fluid control even with solenoid operation.

(a) Check No.1 and No.2 solenoid valves.

Check that the solenoid valves do not leak when low–pressure compressed air is applied.

When supply battery positive voltage to the solenoids, check that the solenoid valves open.



AT3087

(b) Check the lock–up solenoid valve.

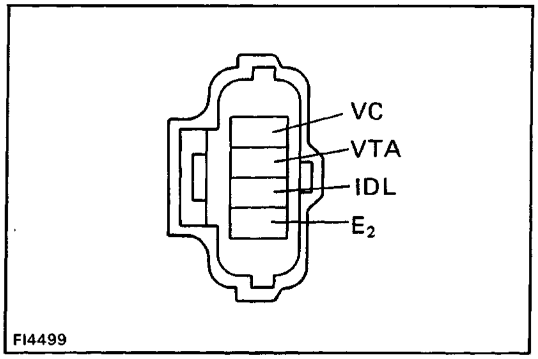
- Applying 490 kPa (5 kgf/cm2, 71 psi) of com– pressed air, check that the solenoid valve opens.
- When supply battery positive voltage to the solenoid, check that the solenoid valve does not leak the air.

If a malfunction is found during voltage inspection (step 1.), inspect the components listed below.

4. INSPECT PARK/NEUTRAL POSITION SWITCH
(See page AT–83)

5. INSPECT THROTTLE POSITION SENSOR

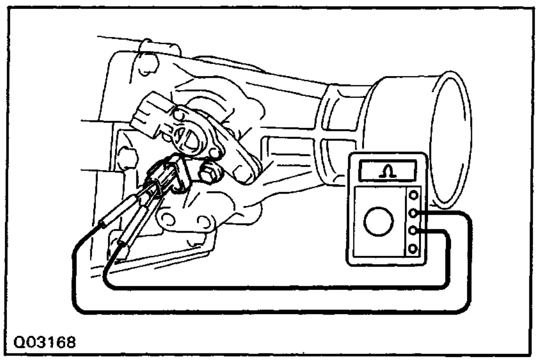
Using an ohmmeter, check the resistance between each terminal.



FI4499

Terminal	Throttle valve condition	Resistance (k/)
IDL – E_2	Fully closed	Less than 2.3
	Open	Infinity
VC – E_2	–	3.9 – 9.0
VTA – E_2	Fully closed	0.47 – 6.1
	Fully open	3.1 – 12.1

6. **INSPECT NO.2 VEHICLE SPEED SENSOR**
   (a) Jack up the rear wheel on one side.
   (b) Connect an ohmmeter between the terminals.
   (c) Spin the wheel and check that the meter needle de– f lects from 0/ to ∞/ .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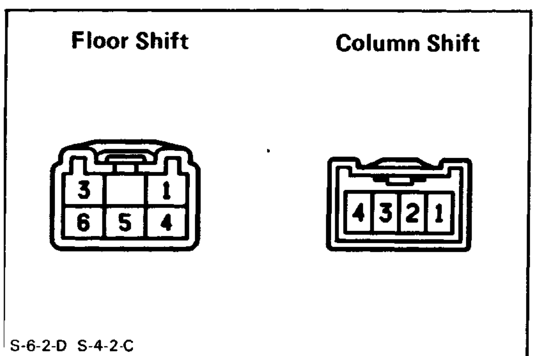
7. **INSPECT NO.1 VEHICLE SPEED SENSOR**
   (See step 6. on page AT–73)

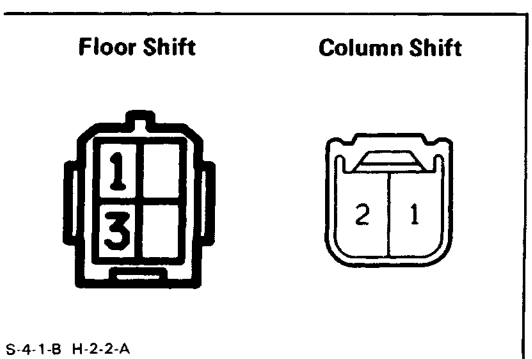
8. **INSPECT PATTERN SELECT SWITCH**
   Using an ohmmeter, check the continuity of terminals for each switch position.
   HINT: As there are diodes inside, be careful of the tester probe polarity.



S-6-2-D S-4-2-C

Terminal / Pattern	Floor shift 4	Floor shift 6	Column shift 2	Column shift 3
PW R	O	O	O	O
NORM				

9. **INSPECT O/D SWITCH ’**
   Using an ohmmeter, check the continuity of the terminals for each switch position.



S-4-1-B H-2-2-A

Terminal / SW position	1	3(2)
ON		
OFF	O	O

10. **INSPECT ENGINE COOLANT TEMPERATURE SENSOR**
    (See page FI–200)

Mechanical System Tests

STALL TEST

The object of this test is to check the overall performance of the transmission and engine by measuring the stall speeds in the D and R positions.

NOTICE:

- **Perform the test at normal operating fluid temperature (50–80•C or 122–176•F).**
- **Do not continuously run this test longer than 5 seconds.**
- **To ensure safety, conduct this test in a wide, clear, level area, which provides good traction.**
- **The stall test should always be carried out in pairs. One should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test.**

MEASURE STALL SPEED

(a) Chock the front and rear wheels.
(b) Connect a tachometer to the engine.
(c) Fully apply the parking brake.
(d) Keep your left foot pressed firmly on the brake pedal.
(e) Start the engine.
(f) Shift into the D position. Step all the way down on the accelerator pedal with your right foot. Quickly read the stall speed at this time.

NOTICE: Release the accelerator pedal and stop test if the rear wheels begin to rotate before the engine speed reaches specified stall speed.

Stall speed: C&C 2,200 ±150 RPM

Except: C&C 2,450 ± 150 RPM

(g) Perform the same test in R position.

EVALUATION

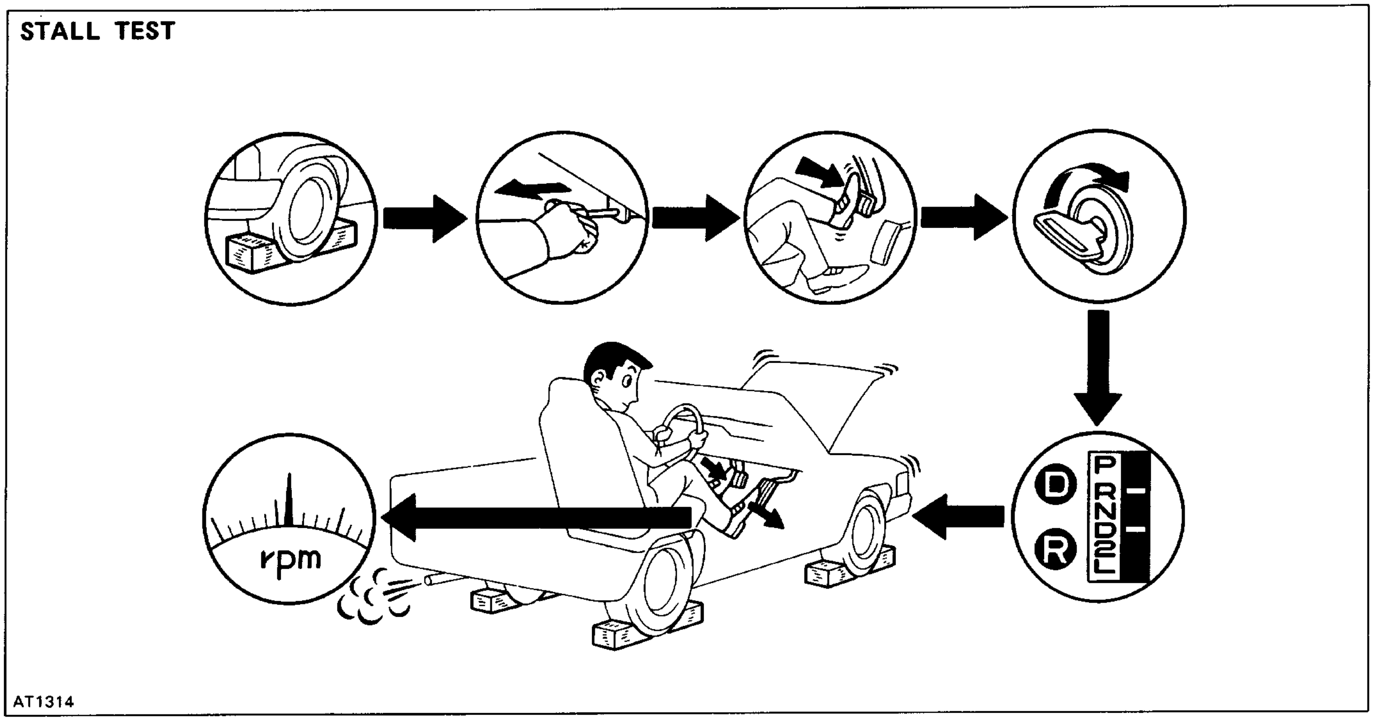
(a) If the stall speed is the same for both positions but lower than specified value:
- Engine output may be insufficient
- Stator one–way clutch is not operating properly

HINT: If more than 600 RPM below the specified value, the torque converter clutch could be faulty.

(b) If the stall speed in D position is higher than specified:
- Line pressure too low
- Forward clutch slipping
- No.2 one–way clutch not operating properly
- O/D one–way clutch not operating properly

(c) If the stall speed in R position is higher than specified:
- Line pressure too low
- Direct clutch slipping
- First and reverse brake slipping
- O/D one–way clutch not operating properly

(d) If the stall speed in both R and D positions are higher than specified:
- Line pressure too low
- Improper fluid level
- O/D one–way clutch not operating properly



TIME LAG TEST

When the shift lever is shifted while the engine is idling, there will be a certain time lapse or lag before the shock can be felt. This is used for checking the condition of the O/D direct clutch, forward clutch, direct clutch and first and reverse brake.

NOTICE:

- **Perform the test at normal operating fluid temperature (50–80• C or 122–176• F).**
- **Be sure to allow one minute interval between tests.**
- **Make three measurements and take the average value.**

MEASURE TIME LAG

(a) Fully apply the parking brake.

(b) Start the engine and check the idle speed.
Idle speed: 800 RPM
(N position)

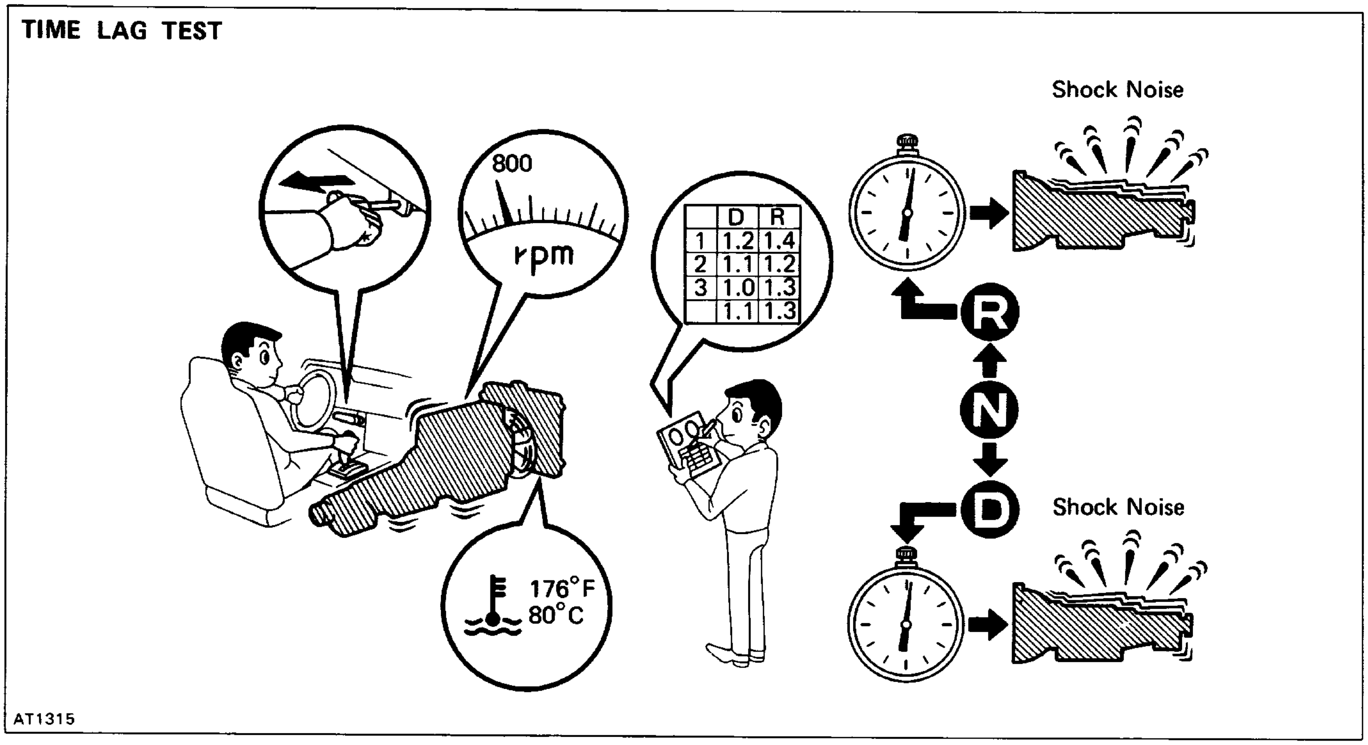
(c) Shift the shift lever from N to D position. Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.
Time lag: Less than 1.2 seconds

(d) In same manner, measure the time lag for N–Y R.
Time lag: Less than 1.5 seconds

EVALUATION

(a) If N–D time lag is longer than specified:
Line pressure too low
Forward clutch worn
O/D one–way clutch not operating properly

(b) If N–R time lag is longer than specified:
Line pressure too low
Direct clutch worn
First and reverse brake worn
O/D one–way clutch not operating properly



HYDRAULIC TEST

PREPARATION

(a) Warm up the transmission fluid.

(b) Remove the transmission case test plug and connect the hydraulic pressure gauge.
SST 09992–00094 (Oil pressure gauge)

NOTICE:

Perform the test at normal operating fluid temperature (50–80•C or 122–176•F).

The line pressure test should always be carried out in pairs. One should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test.

MEASURE LINE PRESSURE

(a) Fully apply the parking brake and chock the four wheels.

(b) Start the engine and check idling rpm.

(c) Keep your left foot pressed firmly on the brake pedal and shift into D position.

(d) Measure the line pressure when the engine is idling.

(e) Press the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.

NOTICE: Release the accelerator pedal and stop test if the rear wheels begin to rotate before the en–

gine speed reaches specified stall speed.

(f) In the same manner, perform the test in R position.

kPa (kgf/cm2,psi)

D position		R position	
Idling	Stall	Idling	Stall
363 – 422 (3.7 – 4.3, 53 – 61)	932 – 1,178 (9.5 – 12.0, 135 – 171)	490 – 588 (5.0 – 6.0, 71 – 85)	1,294 – 1,638 (13.2 – 16.7, 188 – 238)

If the measured pressures are not up to specified values, recheck the throttle cable adjustment and perform a retest.

EVALUATION

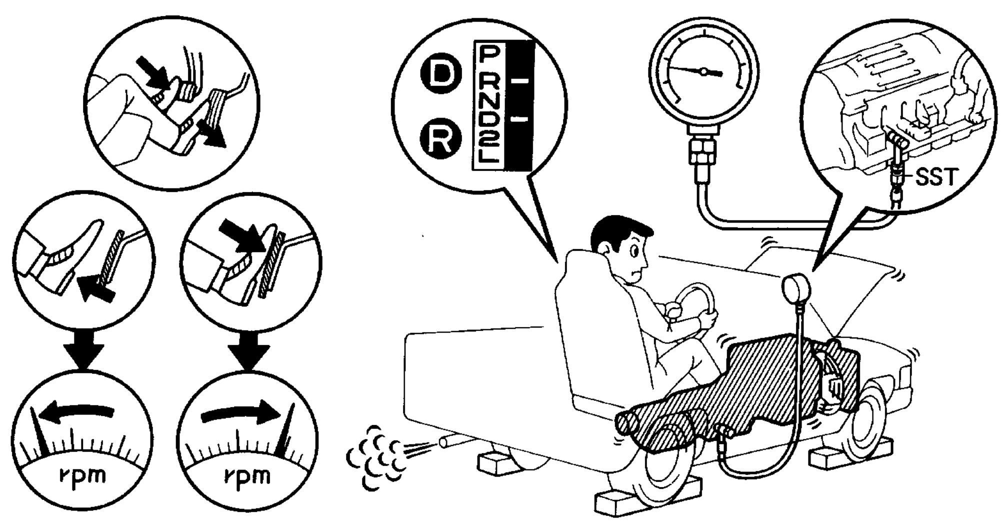
(a) If the measured values at all positions are higher than specified:
- Throttle cable out of adjustment
- Throttle valve defective
- Regulator valve defective

(b) If the measured values at all positions are lower than specified:
- Throttle cable out of adjustment
- Throttle valve defective
- Regulator valve defective
- Oil pump defective
- O/D direct clutch defective

(c) If pressure is low in the D position only:
- D position circuit fluid leakage
- Forward clutch defective

(d) If pressure is low in the R position only:
- R position circuit fluid leakage
- Direct clutch defective
- First and reverse brake defective

HYDRAULIC TEST



AT1316

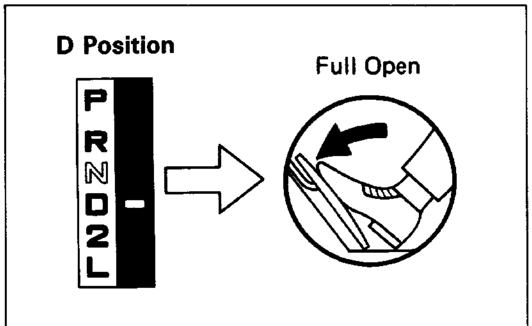
ROAD TEST

NOTICE: Perform the test at normal operating fluid temperature (50–80•C or 122–176•F).

1. D POSITION TEST IN NORM AND PWR PATTERN RANGES

Shift into the D position and hold the accelerator pedal constant at the full throttle valve opening posiiton.

Check the following:



AT2818

(a) 1–2, 2–3 and 3–OlD up–shifts should take place, and shift points should conform to those shown in the automatic shift schedule.
Conduct a test under both Normal and Power patterns.

HINT: There is no O/D up–shift or lock–up when the engine coolant temp. is below 70•C (158•F).

EVALUATION

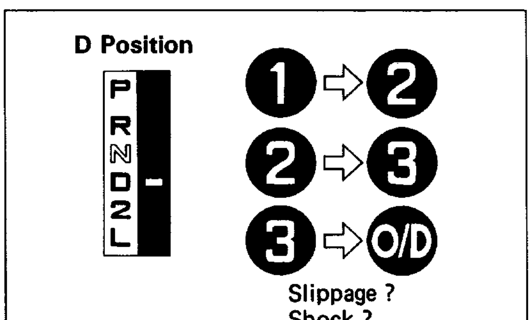
(1) If there is no 1–2 up–shift:
No.2 solenoid is stuck
1–2 shift valve is stuck

(2) If there is no 2–3 up–shift:
No.1 solenoid is stuck
2–3 shift valve is stuck

(3) If there is no 3–O/D up–shift:
3–4 shift valve is stuck

(4) If the shift point is defective:
Throttle valve, 1–2 shift valve, 2–3 shift valve, 3–4 shift valve etc., are defective

(5) If the lock–up is defective:
Lock–up solenoid is stuck
Lock–up relay valve is stuck

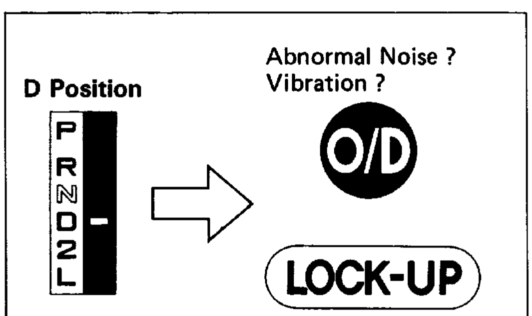


AT3068

(b) In the same manner, check the shock and slip at the 1–2, 2–3, and 3–O/D up–shifts.

EVALUATION

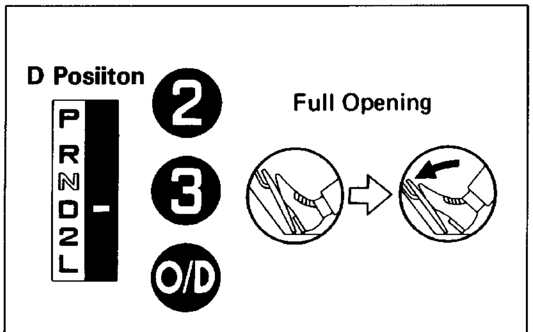
If the shock is excessive:
Line pressure is too high
Accumulator is defective
Check ball is defective



AT3069

(c) Run at the D position lock–up or O/D gear and check for abnormal noise and vibration.

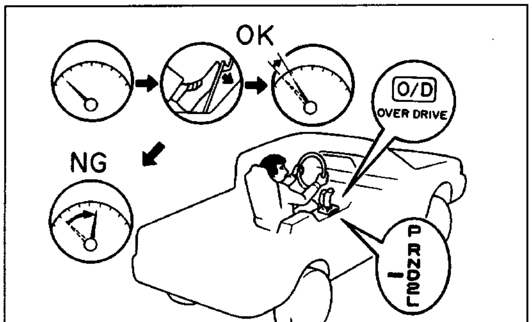
HINT: The check for the cause of abnormal noise and vibration must be made with extreme care as it could also be due to loss of balance in the propeller shaft, differen tial, torque converter clutch, etc.



AT3070

(d) While running in the D position, 2nd, 3rd and O/D gears, check to see the possible kickdown vehicle speed limits for 2 ∞ 1, 3 ∞ 2 and O/D ∞ 3 kickdowns conform to those indicated on the automatic shift schedule.

(e) Check for abnormal shock and slip at kick–down.



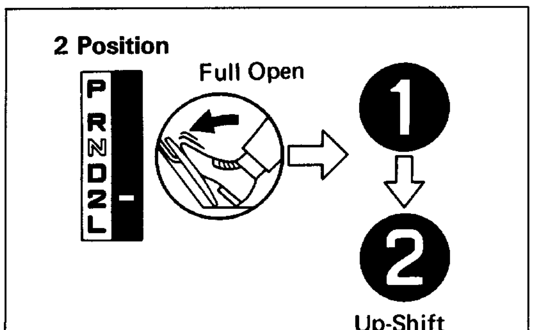
AT6682

(f) Check for the lock–up mechanism.

(1) Drive in D position, O/D gear, at a steady speed (lock–up ON) of about 75 km/h¿47 mph).

(2) Lightly depress the accelerator pedal and check that the engine rpm does not change abruptly.

If there is a big jump in engine rpm, there is no lock–up.



AT2812

2. 2 POSITION TEST

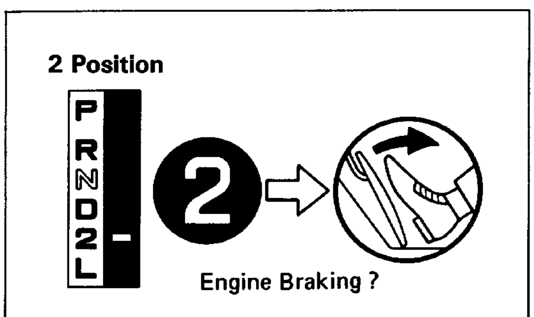
Shift into the 2 position and, while driving with the ac–celerator pedal held constantly at the full throttle valve opening position, push in one of the pattern selectors and check on the following points.

(a) Check to see that the 1–2 up–shift takes place and that the shift point conforms to it shown on the au–tomatic shift schedule.

HINT:

There is no O/D up–shift and lock–up in the 2 position.

To prevent overrun, the transmission up–shifts into 3rd gear at around 100 km/h (62 mph) or more.



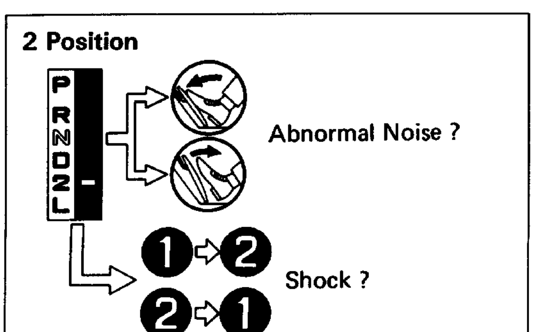
AT2811

(b) While running in the 2 position and 2nd gear, release the accelerator pedal and check the engine braking effect.

EVALUATION

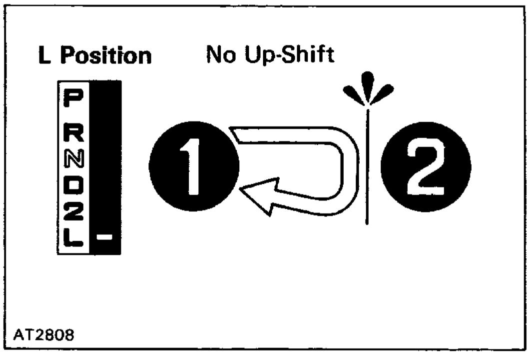
If there is no engine braking effect:

Second coast brake is defective



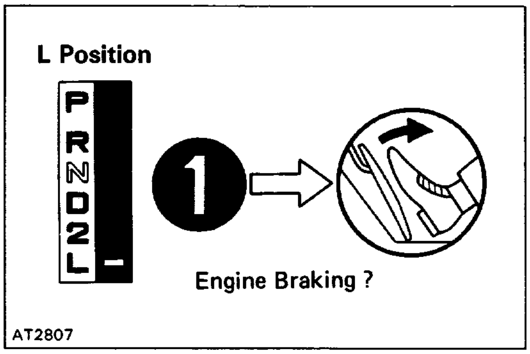
AT2809

(c) Check for abnormal noise at acceleration and decel–eration, and for shock at up–shift and down–shift.



3. L POSITION TEST

(a) While running in the L position , check to see that there is no up–shift to 2nd gear.

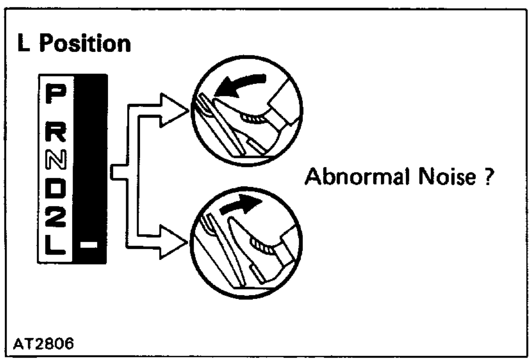


(b) While running in the L position, release the ac–celerator pedal and check the engine braking effect.

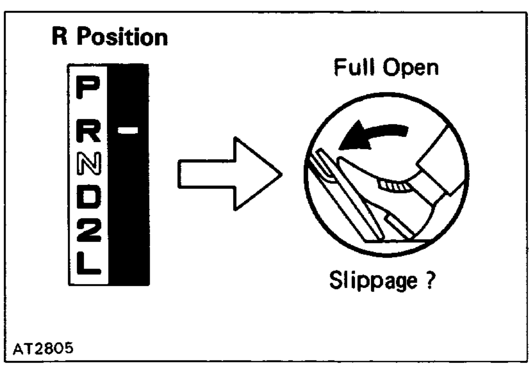
EVALUATION

If there is no engine braking effect:

First and reverse brake is defective

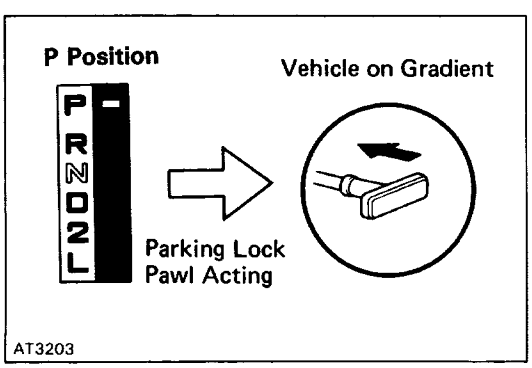


(c) Check for abnormal noise during acceleration and deceleration.



4. R POSITION TEST

Shift into the R position and, while starting at wide open throttle, check for slipping.



5. P POSITION TEST

Stop the vehicle on a gradient (more than 50) and after shifting into the P position, release the parking brake. Then check to see that the parking lock pawl holds the vehicle in place.

Automatic Shift Schedule

CBU: Tire size P205175R14, P215/65R15

(Differential gear ratio: 3.417)

		Throttle valve fully open [ ] Fully closed km/h (mph)							
		1→2	2→3	3→O/D	[3→O/D]	[O/D→3]	O/D→3	3→2	2→1
D position	NORM	61–66 (38–41)	108–117 (67–73)	143–152 (89–94)	43–48 (27–30)	26–30 (16–19)	136–145 (85–90)	100–105 (62–65)	44–49 (27–30)
	PW R	61–66 (38–41)	119–127 (74–79)	147–156 (91–97)	47–52 (29–32)	26–30 (16–19)	140–149 (87–93)	110–119 (68–74)	44–49 (27–30)
2 position	NORM PWR	53–57 (33–35)	126–135 (78–84)	–	–	–	–	119–128 (74–80)	47–52 (29–32)
L position	NORM PW R	–	–	–	–	–	–	101–110 (63–68)	57–62 (35–39)

		Throttle valve opening 5% km/h (mph)					
		Lock–up ON			Lock–up OFF		
		2nd	*3rd	O/D	2nd	*3rd	O/D
D position	NORM	–	79 – 83 (49 – 52)	79 – 83 (49 – 52)	–	71 – 76 (44 – 47)	68 – 73 (42 – 45)
	PW R	–	61 – 66 (38 – 41)	79 – 83 (49 – 52)	–	68 – 73 (42 – 45)	68 – 76 (42 – 47)

* O/D switch OFF

CBU : Tire size 185R14–8

(Differential gear ratio: 3.9001

		Throttle valve fully open [ ] Fully closed km/h (mph)							
		1→2	2→3	3→O/D	[3→O/D]	[O/D→3]	O/D→3	3→2	2→1
D position	NORM	52–56 (32–35)	93–100 (45–62)	135–142 (84–88)	37–41 (23–25)	22–26 (14–16)	130–136 (81–85)	86–90 (53–56)	43–47 (27–29)
	PW R	52–56 (32–35)	102–109 (63–68)	148–154 (92–96)	40–44 (25–27)	22–26 (14–16)	141–148 (88–92)	95–102 (59–63)	43–47 (27–29)
2 position	NORM PW R	45–49 (28–30)	108–115 (67–71)	–	–	–	–	102–109 (63–68)	40–44 (25–27)
L position	NORM PW R	–	–	–	–	–	–	87–94 (54–58)	49–53 (30–33)

		Throttle valve opening 5% km/h (mph)					
		Lock–up ON			Lock–up OFF		
		2nd	*3rd	O/D	2nd	*3rd	O/D
D position	NORM	–	67 – 71 (42 – 44)	68 – 71 (42 – 44)	–	61 – 65 (38 – 40)	58 – 62 (36 – 39)
	PW R	–	58 – 62 (36 – 39)	68 – 71 (42 – 44)	–	52 – 56 (32 – 35)	61 – 65 (38 – 40)

* : O/D switch OFF

C & C: Tire size 185R14–8, 185R14–6 (Double tire) **(Differential gear ratio: 4.100)**

		Throttle valve fully open [ ] Fully closed km/h (mph)							
		1→2	2→3	3→O/D	[3→O/D]	[O/D→3]	O/D→3	3→2	2→1
D position	NORM	43–47 (27–29)	84–91 (52–57)	129–135 (80–84)	73–77 (45–48)	21–25 (13–16)	123–130 (76–81)	77–81 (48–50)	38–42 (24–26)
	PWR	51–55 (32–34)	97–103 (60–64)	132–138 (82–86)	73–77 (45–48)	21–25 (13–16)	126–132 (78–82)	90–97 (56–60)	45–48 (28–30)
2 position	NORM PW R	43–47 (27–29)	103–110 (64–68)	–	–	–	–	97–104 (60–65)	38–42 (24–26)
L position	NORM PW R	–	–	–	–	–	–	83–89 (52–55)	47–51 (29–32)

		Throttle valve opening 5% km/h (mph)					
		Lock–up ON			Lock–up OFF		
		2nd	*3rd	O/D	2nd	*3rd	O/D
D position	NORM	–	73 – 77 (45 – 48)	73 – 77 (45 – 48)	–	61 – 65 (38 – 40)	67 – 71 (42 – 44)
	PW R	–	73 – 77 (45 – 48)	73 – 77 (45 – 48)	–	67 – 71 (42 – 44)	67 – 71 (42 – 44)

* : O/D switch OFF

C & C: Tire size 185R14–6 (Double tire) **(Differential gear ratio: 4.300)**

		Throttle valve fully open [ ] Fully closed km/h (mph)							
		1→2	2→3	3→O/D	[3→O/D]	[O/D→3]	O/D→3	3→2	2→1
D position	NORM	41–45 (25–28)	80–87 (50–54)	123–129 (76–80)	69 – 73 (43 – 45)	20–24 (12–15)	117–124 (73–77)	73–77 (45–48)	37–40 (23–25)
	PW R	49–53 (30–33)	92–99 (57–62)	126–132 (78–82)	69 – 73 (43 – 45)	20–24 (12–15)	120–126 (75–78)	86–92 (53–57)	42–46 (26–29)
2 position	NORM PWR	41–45 (25–28)	98–105 (61–65)	–	–	–	–	93–99 (58–62)	37–40 (23–25)
L position	NORM PW R	–	–	–	–	–	–	79–85 (49–53)	45–48 (28–30)

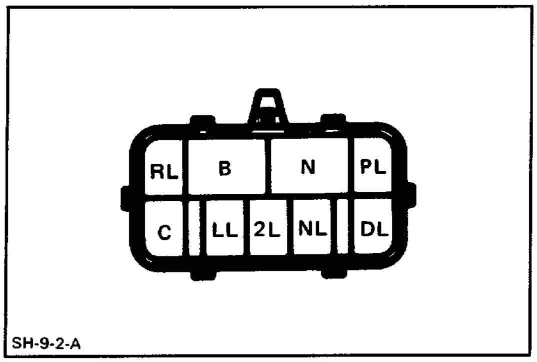
		Throttle valve opening 5% km/h (mph)					
		Lock–up ON			Lock–up OFF		
		2nd	*3rd	O/D	2nd	*3rd	O/D
D position	NORM	–	69 – 73 (43 – 45)	69 – 73 (43 – 45)	–	58 – 62 (36 – 39)	64 – 68 (40 – 42)
	PW R	–	69 – 73 (43 – 45)	69 – 73 (43 – 45)	–	64 – 68 (40 – 42)	64 – 68 (40 – 42)

* : O/D switch OFF

HINT:

(1) Lock–up will not occur in 2nd gear unless the throttle valve opening is greater than 50%.
(2) There is no lock–up in the 2 and L positions.
(3) In the following cases, the lock–up will be released regardless of the lock–up pattern.

- When the throttle is completely closed.
- When the brake light switch is ON.



Park Neutral Position Switch

INSPECTION OF PARK/NEUTRAL POSIITON SWITCH

Inspect that there is continuity between each terminals.

Terminal / Shift Position	B	N	PL	RL	NL	DL	2L	LL	C
P	○	○	○						○
R				○					○
N	○	○			○				○
D						○			○
2							○		○
L								○	○

ON–VEHICLE REPAIR

Valve Body

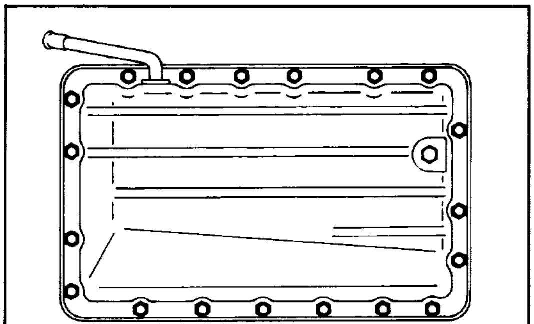
REMOVAL OF VALVE BODY

1. CLEAN TRANSMISSION EXTERIOR

To prevent contamination, clean the exterior of the trans–mission.

2. DRAIN TRANSMISSION FLUID

Remove the drain plug and the fluid into a suitable con–tainer.

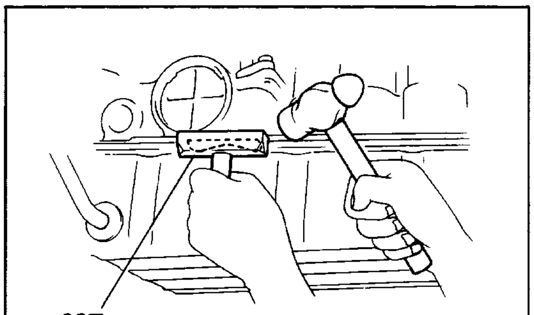


E7058

3. REMOVE OIL PAN

NOTICE: Some fluid will remain in the oil pan. Be careful not to damage the filler tube and O–ring.

(a) Remove the nineteen bolts.

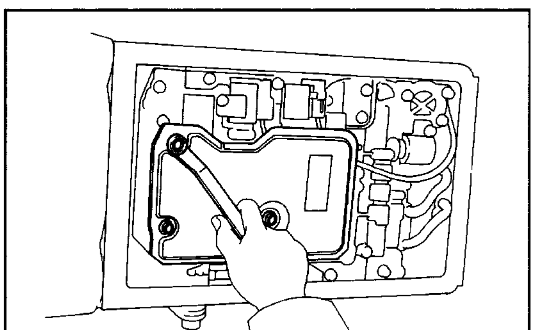


AT3168

(b) Install the blade of SST between the transmission case and oil pan, cut off applied sealer and then re–move the oil pan.

SST 09032–00100

NOTICE: When removing the oil pan, be careful not to damage the oil pan flange.

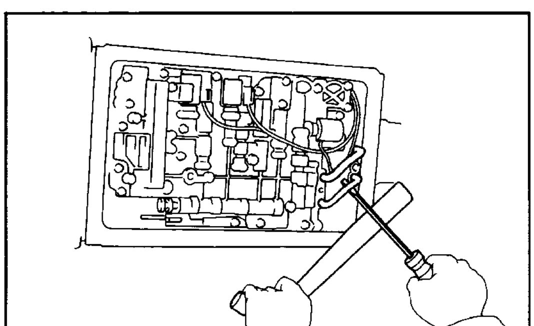


AT1994

4. REMOVE OIL STRAINER

Remove the six bolts, and the oil strainer.

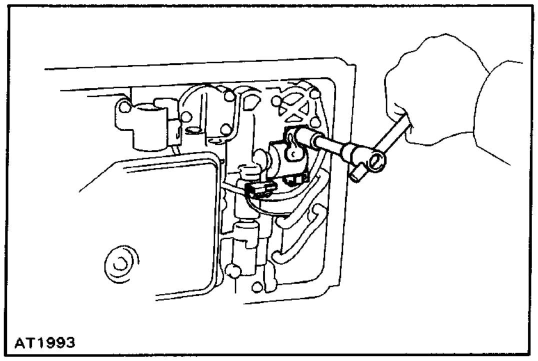
NOTICE: Be careful as some oil will come out with the filter



AT1995

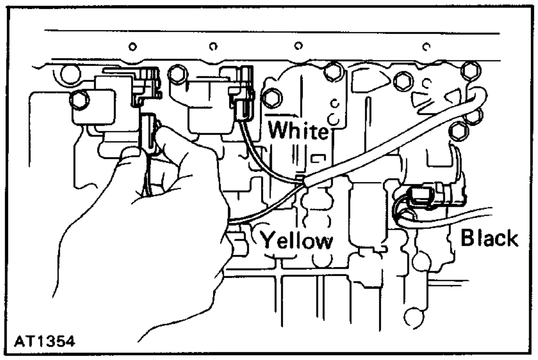
5. REMOVE OIL TUBES

Pry up both tube ends with a large screwdriver and re–move the tubes.



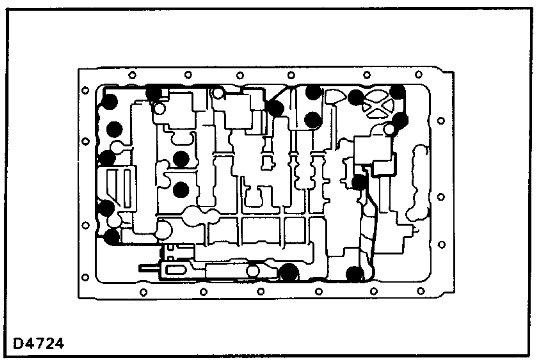
6. WHEN REPLACING SOLENOIDS

(a) Disconnect the connectors from the solenoids.
(b) Remove the solenoid mounting bolts.
(c) Remove the solenoids.



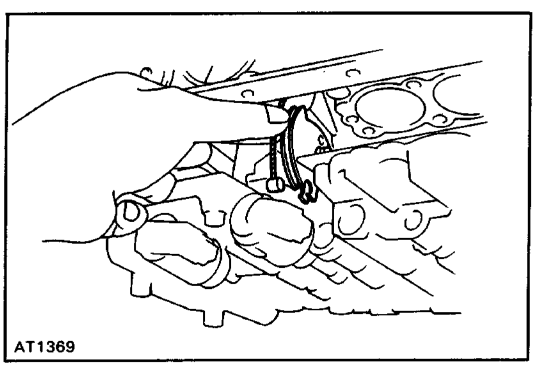
7. DISCONNECT SOLENOID CONNECTORS

Disconnect the three connectors from No.1, No.2 and lock–up solenoids.



8. REMOVE VALVE BODY

(a) Remove the seventeen bolts.

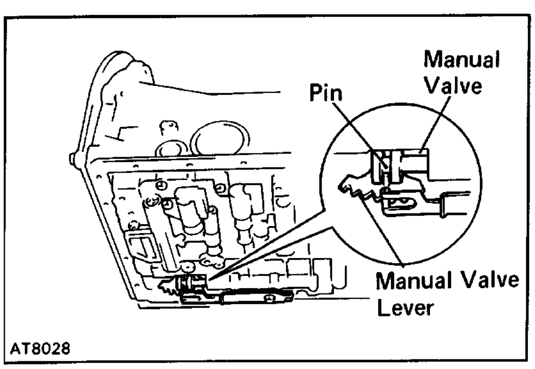


(b) Disconnect the throttle cable from the cam and re–move the valve body.

INSTALLATION OF VALVE BODY

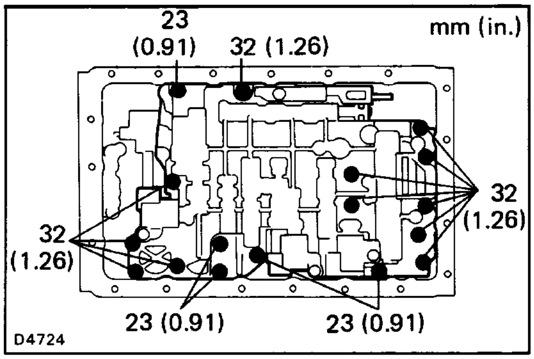
1. CONNECT THROTTLE CABLE TO CAM

Push the cable fitting into the cam.



2. INSTALL VALVE BODY

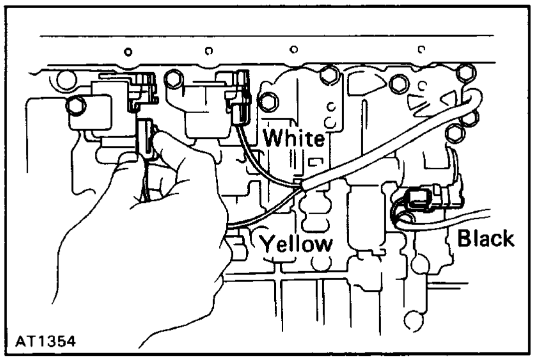
(a) Align the manual valve lever with the manual valve.



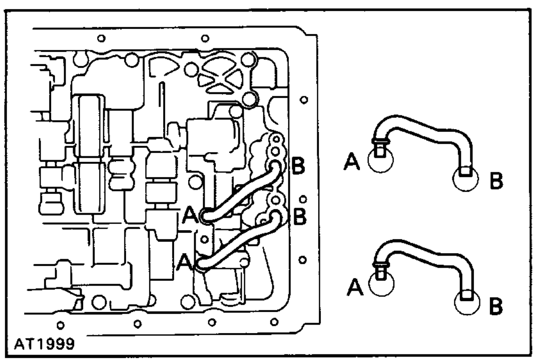
(b) Finger tighten the all bolts first. Then tighten the bolts evenly.

HINT: Each bolt length (mm, in.) is indicated in the fig–ure.

Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)



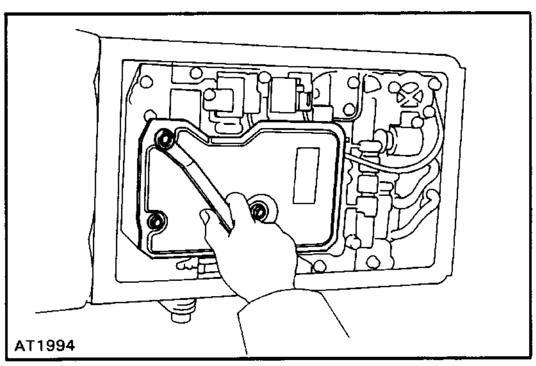
3. CONNECT SOLENOID WIRING



4. INSTALL OIL TUBES

Tap the tubes with a plastic hammer to install them into the positions in the figure.

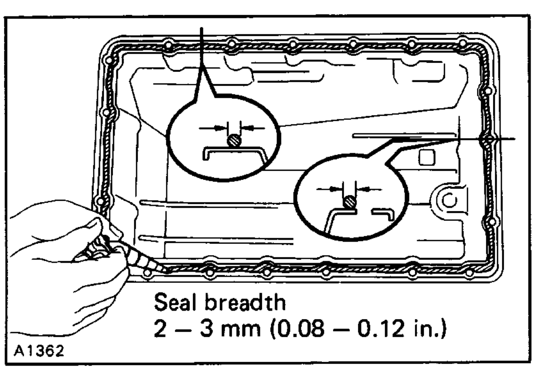
NOTICE: Be careful not to bend or damage the tubes.



5. INSTALL OIL STRAINER

Be sure the screen is clean. Torque the bolts.

Torque: 5.4 N–m (55 kgf–cm, 48 in.¿lbf)

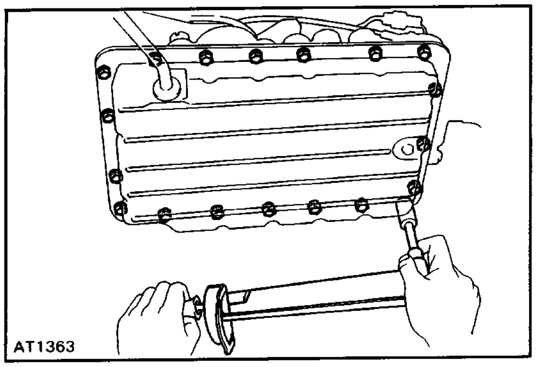


6. INSTALL OIL PAN

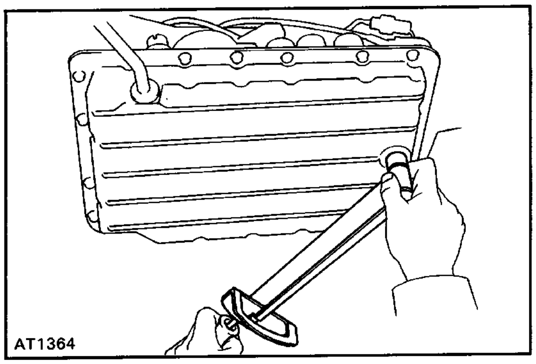
(a) Remove any packing material and be careful not to drop oil on the contacting surfaces of the transrris–sion case and oil pan.

(b) Apply seal packing to the oil pan shown in the fig–ure.

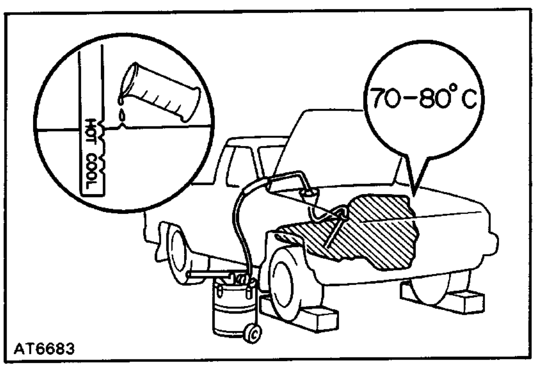
Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent



(c) Install and torque the nineteen bolts.
Torque:. 7.4 N–m (70 kgf–cm, 65 in.–lbf)



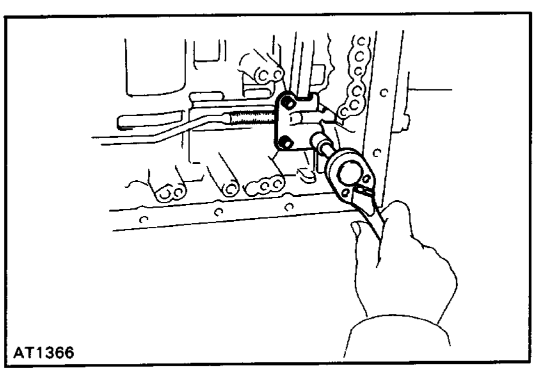
7. **INSTALL DRAIN PLUG**
Torque the drain plug.
Torque: 20 N–m (205 kgf–cm,15 ft–lbf)



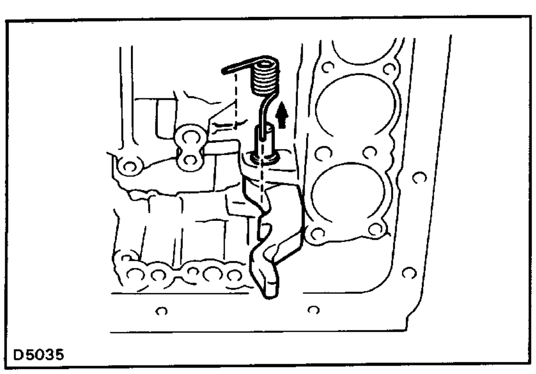
8. **FILL TRANSMISSION WITH ATF**
Add only about two liters of ATF. Start the engine and shift through all the positions. Check the fluid level and add as necessary.
NOTICE: Do not overfill.
Fluid type: ATF DEXRON® II

Parking Lock Pawl

REMOVAL OF PARKING LOCK PAWL



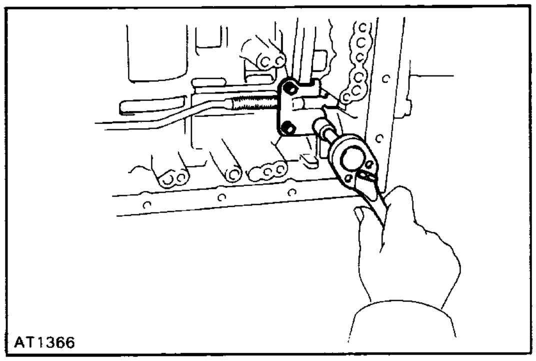
1. **REMOVE VALVE BODY (See page AT–84)**
2. **REMOVE PARKING LOCK PAWL BRACKET**
Remove the three bolts and the bracket.



3. **REMOVE SPRING FROM PARKING LOCK PAWL PIVOT PIN**
4. **REMOVE PIVOT PIN AND PARKING LOCK PAWL**

INSTALLATION OF PARKING LOCK PAWL

1. **INSTALL PARKING LOCK PAWL AND PIVOT PIN**
2. **INSTALL SPRING**

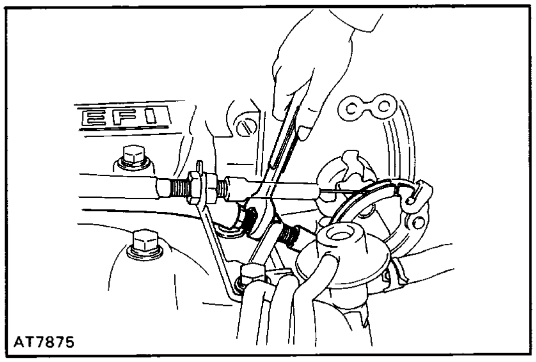


3. INSTALL PARKING LOCK PAWL BRACKET

(a) Push lock rod fully toward.
(b) Install the three bolts finger tight.
(c) Check that the pawl operates smoothly.
(d) Torque the bolts.

Torque: 7.4 N–m (70 kgf–cm,65 in.¿lbf)

4. INSTALL VALVE BODY (See page AT–85)

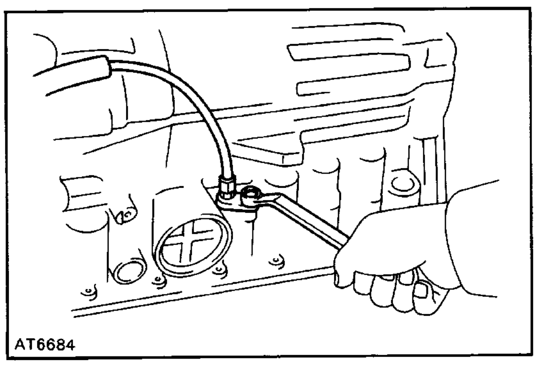


Throttle Cable

REMOVAL OF THROTTLE CABLE

1. DISCONNECT THROTTLE CABLE

(a) Disconnect the cable housing from the bracket.
(b) Disconnect the cable from the throttle linkage.



2. REMOVE VALVE BODY (See page AT–84)

3. PUSH THROTTLE CABLE OUT OF TRANSMISSION CASE

Remove the retaining bolt and pull out the throttle cable.

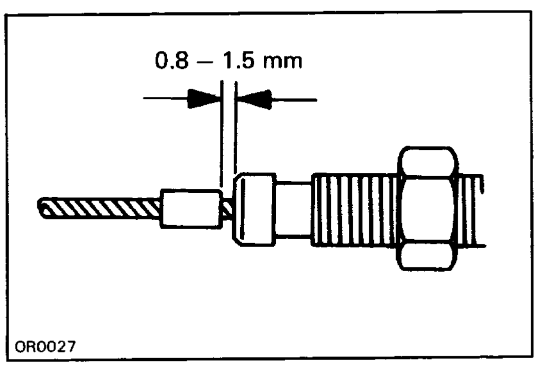
INSTALLATION OF THROTTLE CABLE

1. INSTALL CABLE IN TRANSMISSION CASE

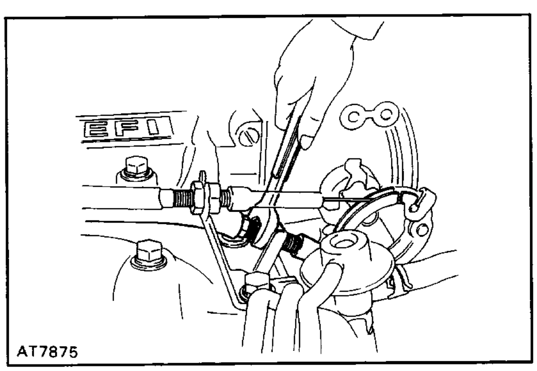
Install the retaining bolt and push in the throttle cable.

2. INSTALL VALVE BODY (See page AT–85)

3. IF THROTTLE CABLE IS NEW, STAKE STOPPER ON INNER CABLE



(a) Pull the inner cable lightly until a slight resistance is felt, and hold it.
(b) Stake the stopper as shown, 0.8–1.5 mm (0.031 –0.059 in.) in width.



4. CONNECT THROTTLE CABLE

(a) Connect the cable to the throttle linkage.
(b) Connect the cable housing to the bracket.

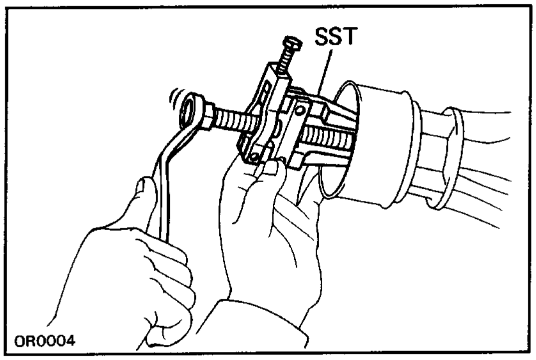
5. ADJUST THROTTLE CABLE (See page AT–60)

6. TEST DRIVE VEHICLE

Extension Housing

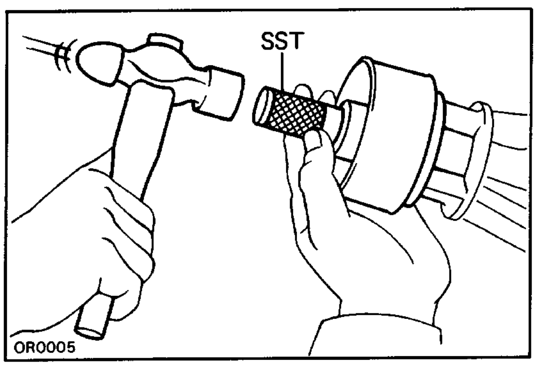
REPLACEMENT OF OIL SEAL

1. **RAISE VEHICLE, AND POSITION PAN TO CATCH ANY FLUID THAT MAY DRIP**
2. **REMOVE PROPELLER SHAFT**
   (See page PR–3)



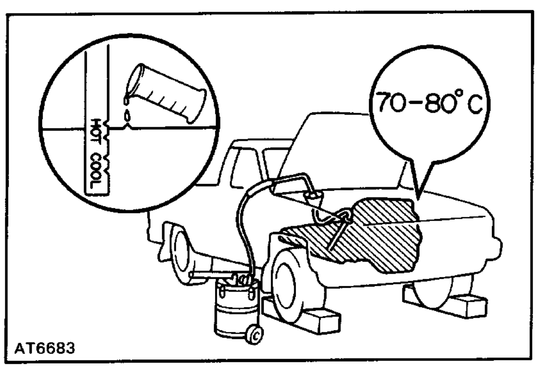
OR0004

3. **REMOVE REAR OIL SEAL**
   NOTICE: Clean the rear extension housing before re–moving the seal.
   Using SST, remove the oil seal.
   SST 09308–10010



OR0005

4. **INSTALL NEW OIL SEAL**
   Using SST, drive in a new oil seal as far as it will go.
   SST 0932 5–20010



AT6683

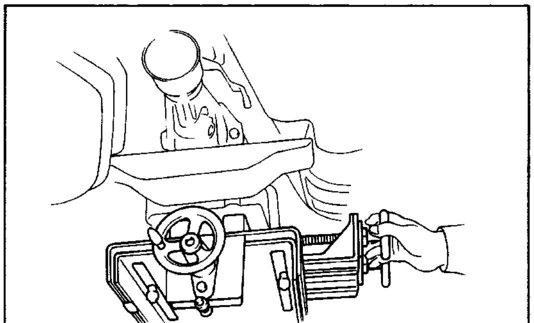
5. **INSTALL PROPELLER SHAFT**
   (See page PR–3)
6. **LOWER VEHICLE AND CHECK FLUID LEVEL**
   Start the engine, shift the shift lever into each position and, then check the fluid level with the transmission in P position.

   Add fluid as necessary.
   NOTICE: Do not overfill.
   Fluid type: ATF DEXRON¿II

REMOVAL OF EXTENSION HOUSING

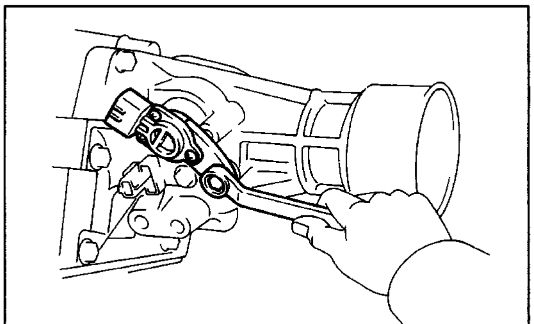
1. RAISE VEHICLE AND POSITION PAN TO CATCH ANY FLUID THAT MAY DRIP

2. REMOVE PROPELLER SHAFT
(See page PR–3)


AT1955

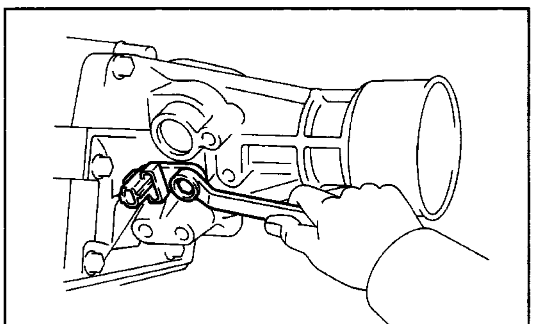
3. JACK UP TRANSMISSION SLIGHTLY

Securely support the transmission on a transmission jack. Lift the transmission slightly to remove weight from the rear support member.

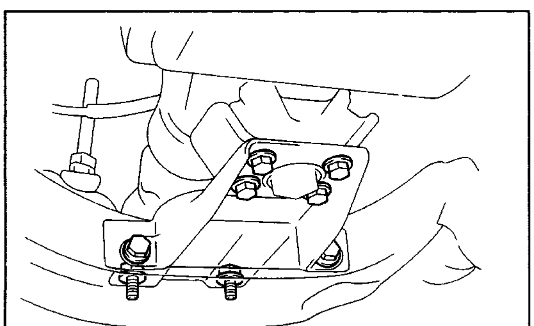

Q03169

4. REMOVE NO. 1 VEHICLE SPEED SENSOR

(a) Disconnect the connector.
(b) Remove the bolt and pry out the No. 1 vehicle speed sensor with a screwdriver.
(c) Remove the 0–ring from the sensor.

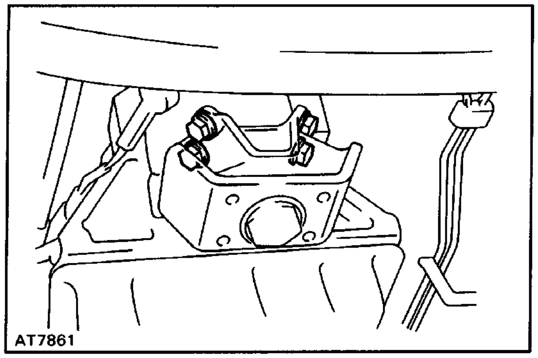

Q03170

5. REMOVE NO.2 VEHICLE SPEED SENSOR


AT7863

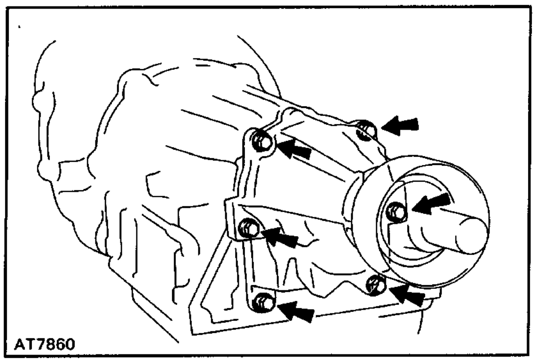
6. REMOVE ENGINE REAR MOUNTING FROM BRACKET

Remove eight bolts from the bracket.



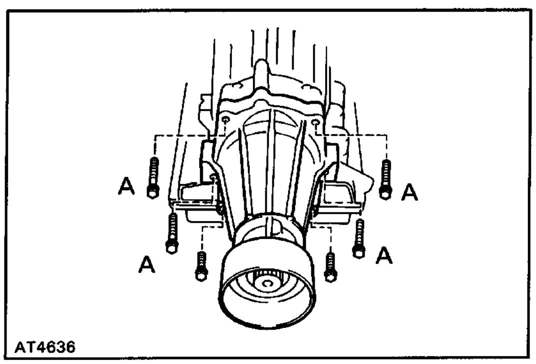
7. REMOVE ENGINE REAR MOUNTING FROM EXTENSION HOUSING

Remove four bolts and the engine rear mounting from the extension housing.



8. REMOVE EXTENSION HOUSING AND GASKET

Remove the six bolts. If necessary, tap the extension housing with a plastic hammer or wooden block to loosen it.



INSTALLATION OF EXTENSION HOUSING

1. INSTALL NEW GASKET AND EXTENSION HOUSING ON TRANSMISSION

(a) Clean the threads of the A bolt and bolt hole.

(b) Coat the threads of the A bolt with sealant.

Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(c) Install the extension housing over a new gasket with bolts, and then torque them.

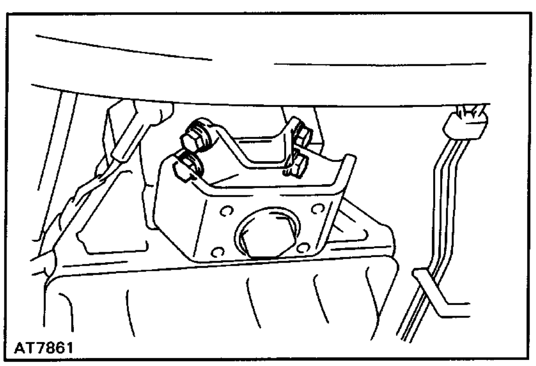
HINT: The two lower bolts are shorter.

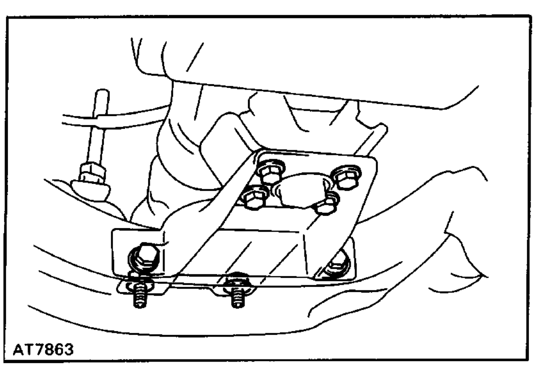
Torque: 34 N–m (345 kgf–cm, 25 ft–lbf)

2. INSTALL ENGINE REAR MOUNTING

(a) Install the engine rear mounting to the extension housing. Tighten the four bolts.

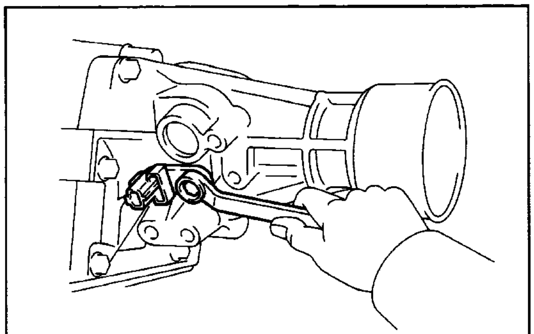
Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)





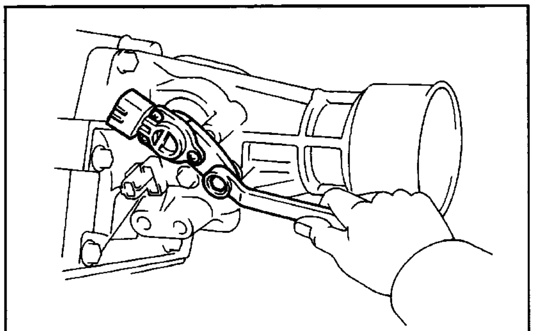
(b) Connect the bracket to the rear mounting and tighten the four bolts.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



Q03170

3. INSTALL NO.2 VEHICLE SPEED SENSOR



Q03169

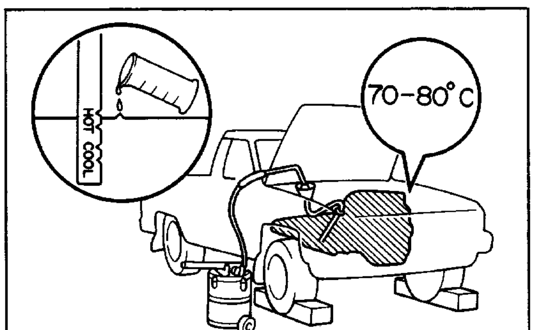
4. INSTALL PROPELLER SHAFT
(See page PR–3)

5. INSTALL NO. 1 VEHICLE SPEED SENSOR

(a) Install a new O–ring on the sensor.

(b) Install the No. 1 vehicle speed sensor.

6. CONNECT CONNECTOR



AT6683

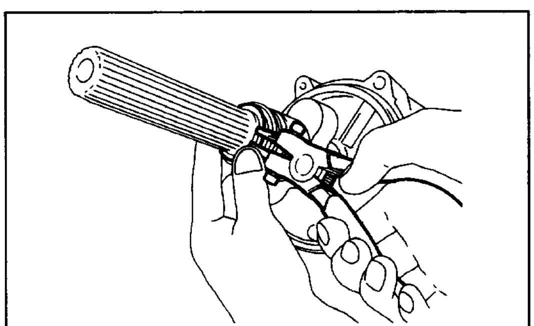
7. LOWER VEHICLE AND CHECK FLUID LEVEL

Start the engine, shift the shift lever into each position, and then check the fluid level with the transmission in P position.

Add fluid as necessary.

NOTICE: Do not overfill.

Fluid type: ATF DEXRON® 11



AT0751

Sensor Rotor

REMOVAL OF SENSOR ROTOR

1. REMOVE EXTENSION HOUSING
(See page AT–90)

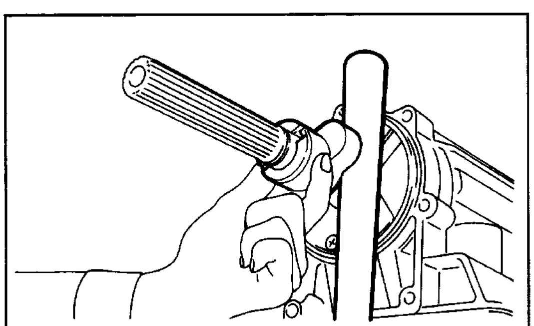
2. REMOVE SPEEDOMETER DRIVE GEAR

(a) Using snap ring pliers, remove the snap ring.

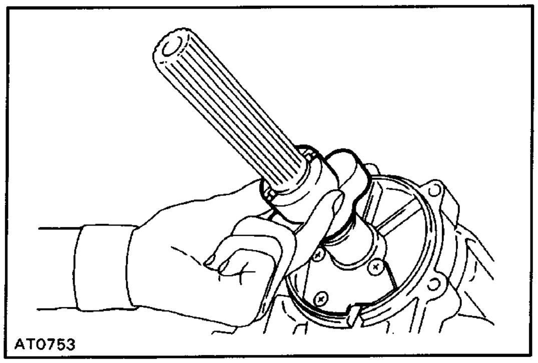
(b) Slide off the speedometer drive gear.

(e) Remove the lock ball.

3. REMOVE SENSOR ROTOR FROM OUTPUT SHAFT



AT0752

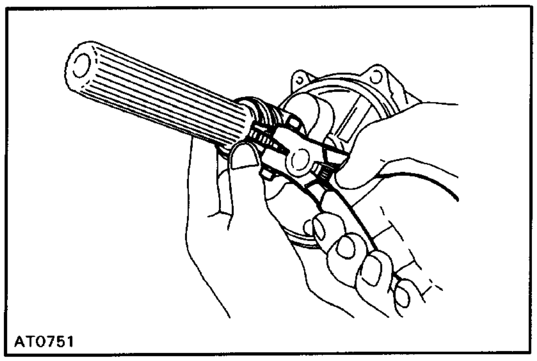


INSTALLATION OF SENSOR ROTOR

1. INSTALL SENSOR ROTOR ON OUTPUT SHAFT

(a) Make sure that the key is installed in the groove.

(b) Install the sensor rotor on the shaft.



2. INSTALL SPEEDOMETER DRIVE GEAR

(a) Slide the lock ball and the speedometer drive gear on the output shaft.

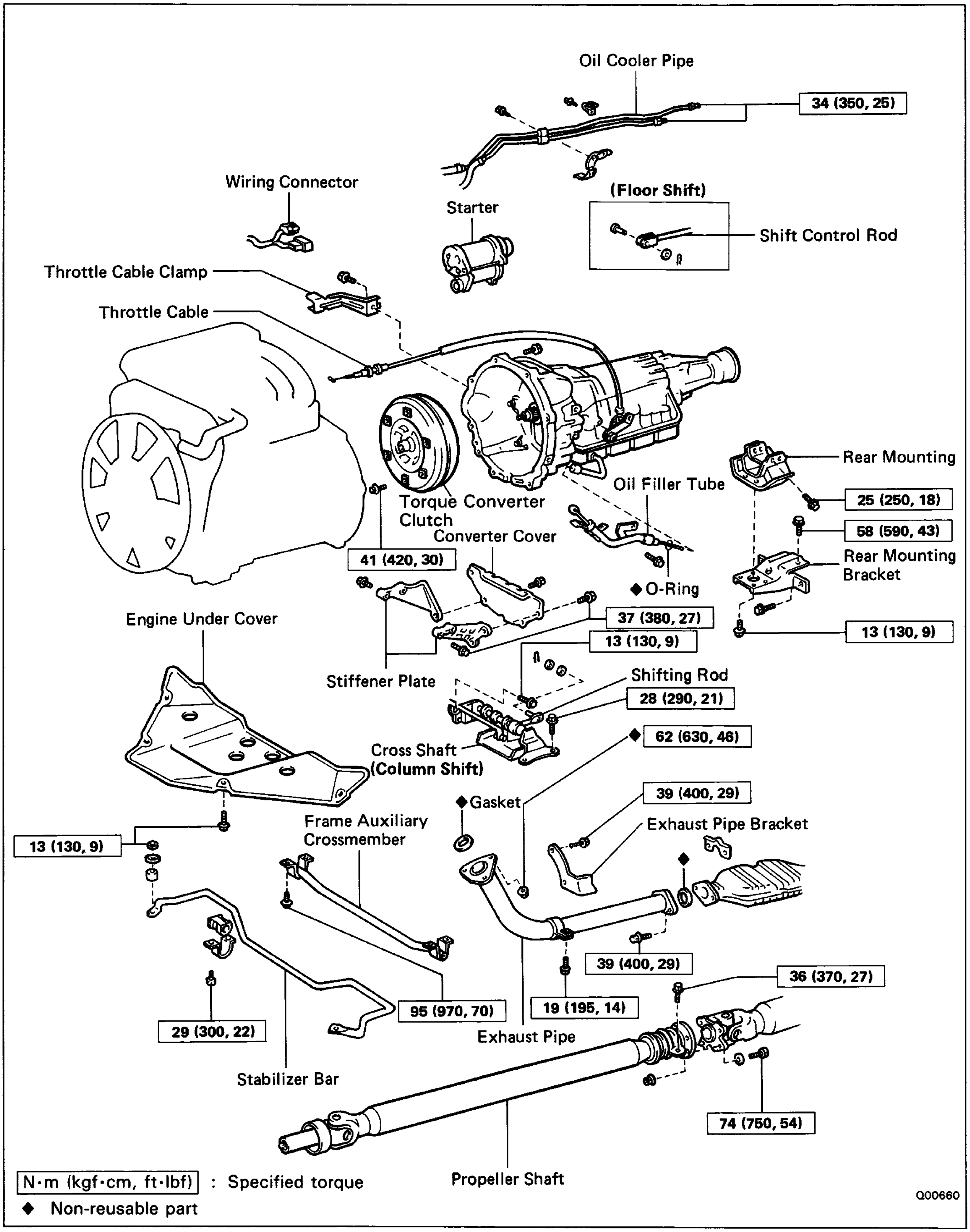
(b) Using snap ring pliers, install the snap ring.

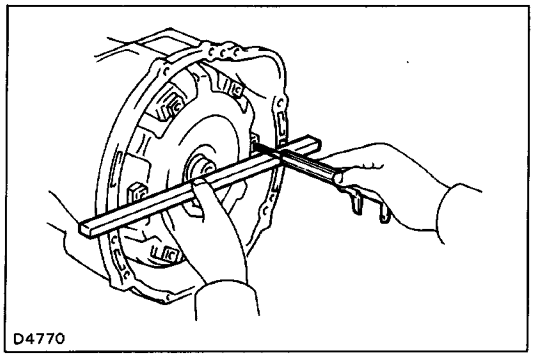
3. INSTALL EXTENSION HOUSING

(See page AT–91)

REMOVAL AND INSTALLATION OF TRANSMISSION

Remove and install the parts as shown.





(MAIN POINT OF INSTALLATION)

1. CHECK TORQUE CONVERTER CLUTCH INSTALLATION

Using calipers and a straight edge, measure from the installed surface of the torque converter clutch to the front surface of the transmission housing.

Correct distance: 18.0 mm (0.709 in.)

If the distance is less than the standard, check for an improper installation.

2. ADJUST TRANSMISSION THROTTLE CABLE

(See page AT–60)

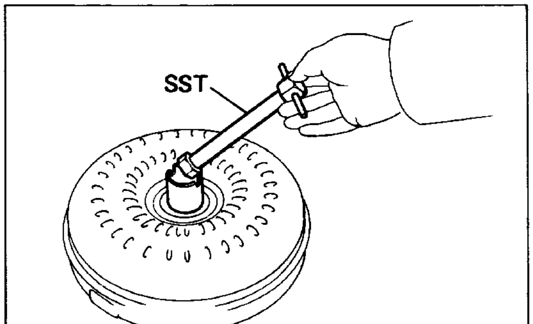
3. FILL TRANSMISSION WITH ATF AND CHECK FLUID LEVEL

Fluid type: ATF DEXRON® II

NOTICE: Do not overfill.

TORQUE CONVERTER CLUTCH AND DRIVE PLATE

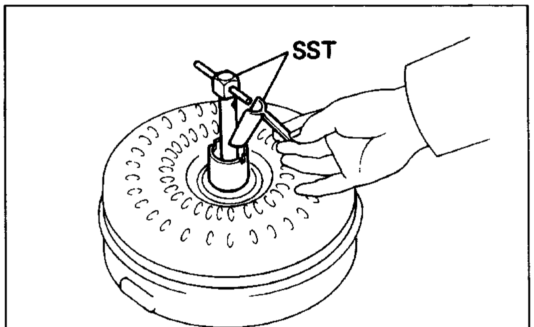
INSPECTION OF TORQUE CONVERTER CLUTCH AND DRIVE PLATE



AT0952

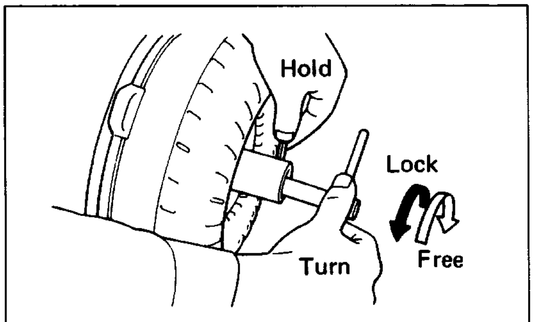
1. INSPECT ONE–WAY CLUTCH

(a) Install SST into the inner race of the one–way clutch.
SST 09350–30020 (09351–32010)



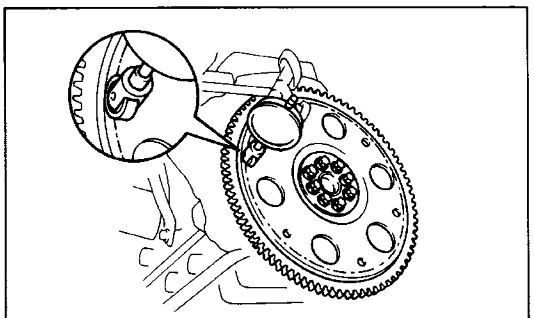
AT0953

(b) Install SST so that it fits in the notch of the con– verter hub and outer race of the one–way clutch.
SST 09350–30020 (09351–32020)



AT3306

(c) With the torque converter clutch standing on its side, the clutch locks when turned counterclockwise, and rotates freely and smoothly clockwise.
If necessary, clean the converter and retest the clutch.
Replace the converter if the clutch still fails the test.

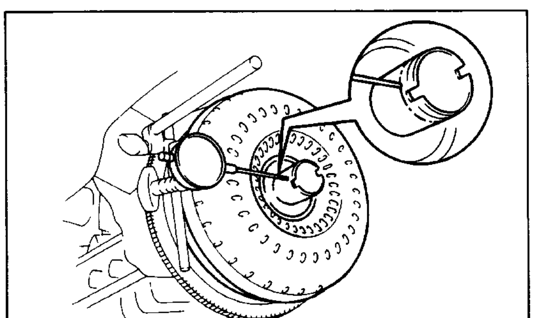

AT4570

2. MEASURE DRIVE PLATE RUNOUT AND INSPECT RING GEAR

Set up a dial indicator and measure the drive plate runout.

If runout exceeds 0.20 mm (0.0079 in.) or if the ring gear is damaged, replace the drive plate. If installing a new drive plate, note the orientation of spacers and tighten the bolts.

Torque: 83 N–m (850 kgf–cm, 61 ft–lbf)


AT4184

3. MEASURE TORQUE CONVERTER CLUTCH SLEEVE RUNOUT

(a) Temporarily mount the torque converter clutch to the drive plate. Set up a dial indicator.

If runout exceeds 0.30 mm (0.0118 in.), try to correct by reorienting the installation of the converter. If excessive runout cannot be corrected, replace the torque converter clutch.

HINT: Mark the position of the converter to ensure cor rect installation.

(b) Remove the torque converter clutch.

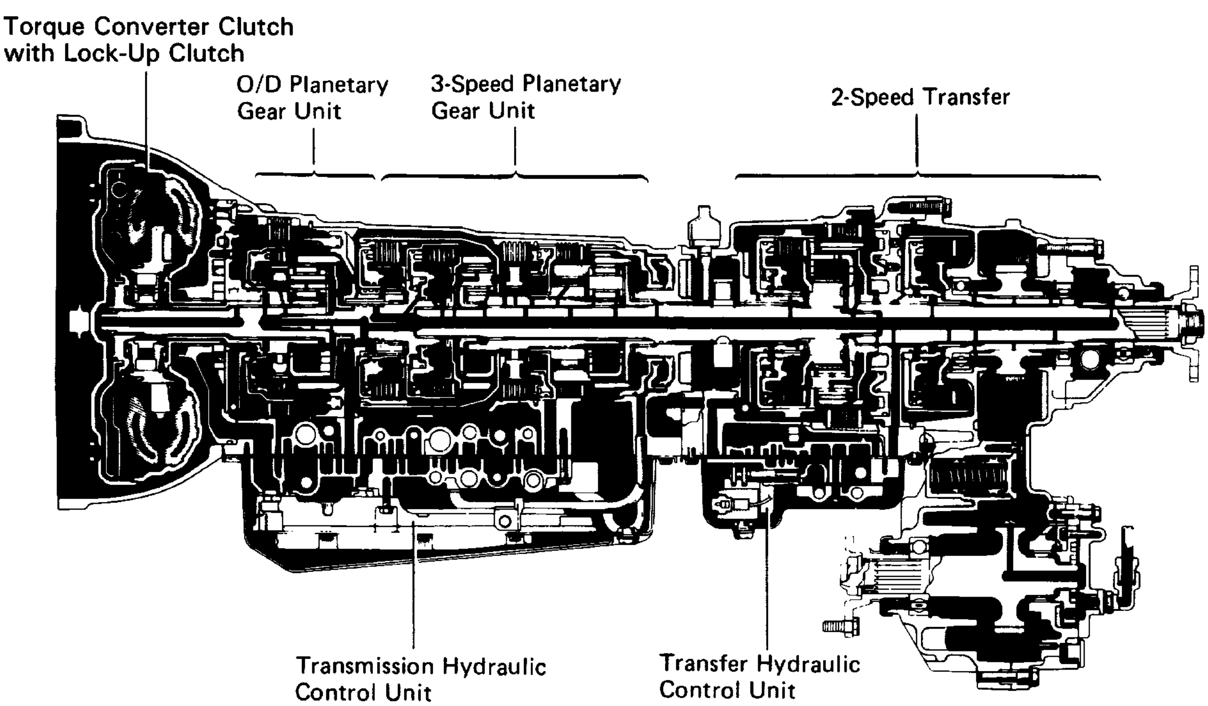
A340H Automatic Transmission

DESCRIPTION

General

The A340H automatic transmission is a four–speed, Electronic Controlled Transmission with electronically controlled 4WD transfer, developed with the aim of producing an easy–driving 4WD vehicle.
The transfer section consists of planetary gears, hydraulic clutches and hydraulic brake. The operation of these is fully controlled by the ECM.
The A340H transmission is mainly composed of the torque converter clutch, the overdrive (hereafter called O/D) planetary gear unit, 3–speed planetary gear unit, 2–speed transfer, the hydraulic control system and the electronic control system.

Sectional View



AT5068

General Specifications

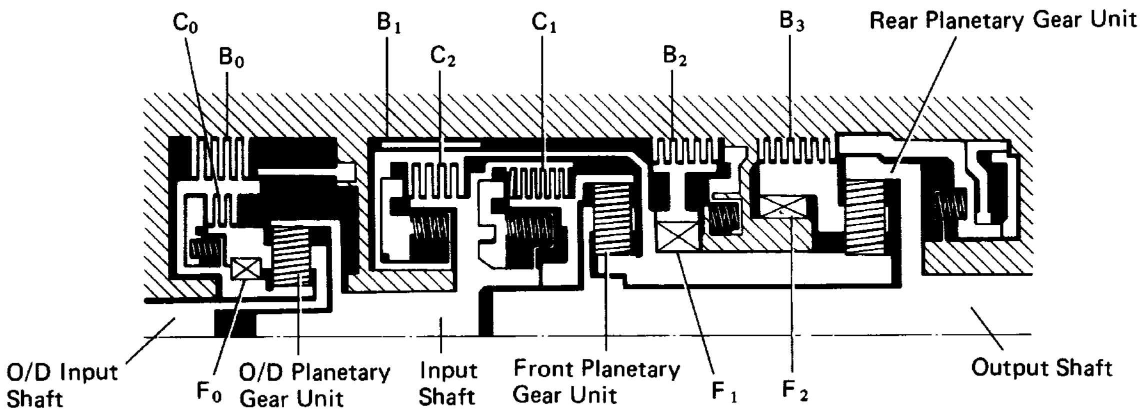
Type of Transmission				A340H
Type of Engine				3VZ-E
Torque Converter Clutch		Stall Torque Ratio		2.1 : 1
		Lock–Up Mechanism		Equipped
Gear Ratio	Transmission	1 st Gear		2.804
		2nd Gear		1.531
		3rd Gear		1.000
		O/D Gear		0.705
		Reverse Gear		2.393
	Transfer	High (H2, H4)		1.000
		Low (L4)		2.659
Number of Discs and Plates (Disc /Plate)	Transmission	C_1	Forward Clutch	5/5
		C_2	Direct Clutch	4/4
		C_0	O/D Direct Clutch	2/2
		B_2	2nd Brake	5/5
		B_3	1 st & Reverse Brake	6/6
		B_0	O/D Brake	4/3
	Transfer	C_3	Transfer Direct Clutch	6/6
		C_4	Front Drive Clutch	6/6
		B_4	Low Speed Brake	7/6
ATF		Type		ATF DEXRON® II
		Capacity liter (US qts, Imp. qts)	Total	Transmission: 10.3 (10.9, 9.1), Transfer: 1.1 (1.2, 1.0)
			Drain & Refill	Transmission: 4.5 (4.8, 4.0), Transfer: 0.8 (0.8, 0.7)

OPERATION

Mechanical Operation

OPERATING CONDITIONS

1. Transmission



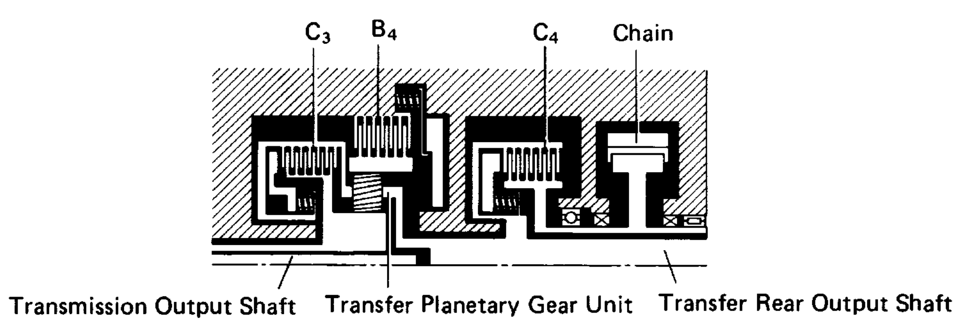
AT2157

Shift Lever Position	Gear	No. 1 Solenoid Valve	No. 2 Solenoid Valve	C_0	C_1	C_2	B_0	B_1	B_2	B_3 I.P.	B_3 O.P.	F_0	F_1	F_2
P	Parking	ON	OFF	●										
R	Reverse	ON	OFF	●		●				●	●	●		
N	Neutral	ON	OFF	●										
D	1st	ON	OFF	●	●							●		●
	2nd	ON	ON	●	●				●			●	●	
	3rd	OFF	ON	●	●	●			●			●		
	O/D	OFF	OFF		●	●	●		●					
2	1st	ON	OFF	●	●							●		●
	2nd	ON	ON	●	●			●	●			●	●	
	3rd	OFF	ON	●	●	●			●			●		
L	1st	ON	OFF	●	●					●	●	●		●
	* 2nd	ON	ON	●	●			●	●			●	●	

* Down–shift only in the L position and 2nd gear–no up–shift.

I.P. ...... Inner Piston
O.P. ..... Outer Piston

2. Transfer



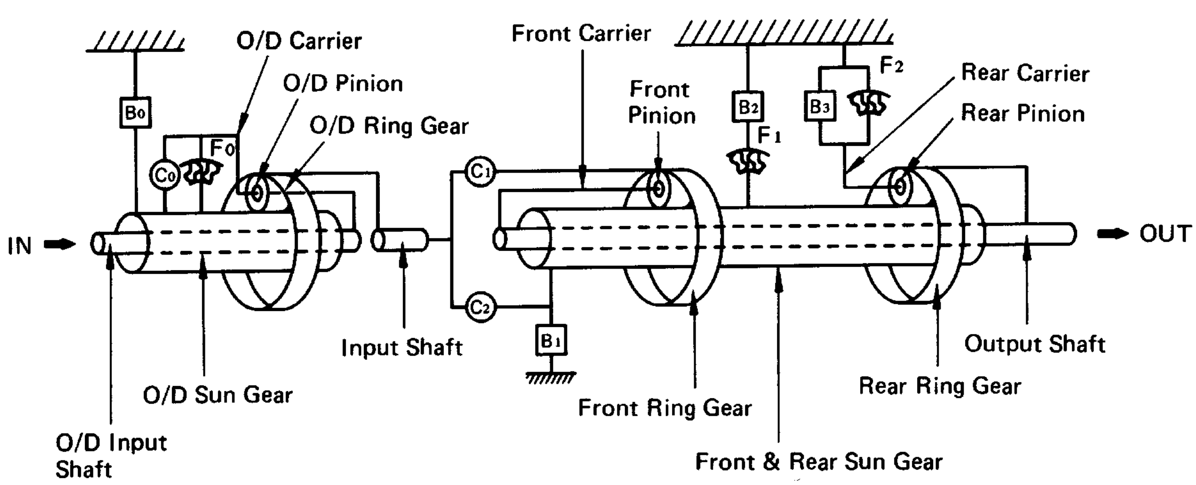
ND0045

Transfer gear position	No.4 solenoid valve	C_3	C_4	B_4
H2	OFF	●		
H4	OFF	●	●	
L4	ON		●	●

FUNCTION OF COMPONENTS

1. Transmission

Component		Function
C_1	Forward Clutch	Connects input shaft and front planetary ring gear.
C_2	Direct Clutch	Connects input shaft and front & rear planetary sun gear.
C_0	O/D Direct Clutch	Connects overdrive sun gear and overdrive planetary carrier.
B_1	2nd Coast Brake	Prevents front & rear planetary sun gear from turning either clockwise or counterclockwise.
B_2	2nd Brake	Prevents outer race of F, from turning either clockwise or counterclockwise thus preventing the front & rear planetary sun gear from turning counterclock–wise.
B_3	1 st & Reverse Brake	Prevents rear planetary carrier from turning either clockwise or counterclock–wise.
B_0	O/D Brake	Prevents overdrive sun gear from turning either clockwise or counterclock–wise.
F_1	No. 1 One–Way Clutch	When B_2 is operating, this clutch prevents the front & rear planetary sun gear from turning counterclockwise.
F_2	No.2 One–Way Clutch	Prevents rear planetary carrier from turning counterclockwise.
F_0	O/D One–Way Clutch	When the transmission is being driven by the engine, this clutch connects the overdrive sun gear and overdrive planetary carrier.
Planetary Gears		These gears change the route through which driving force is transmitted in accordance with the operation of each clutch and brake in order to increase or reduce the input and output speed.

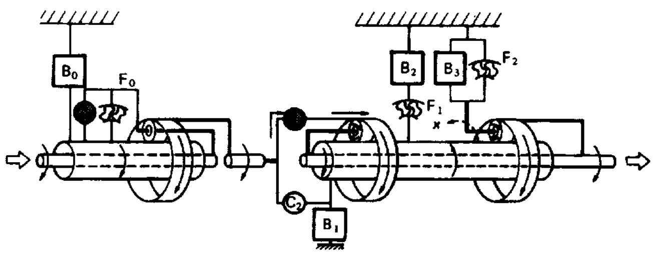


AT5440

FUNCTION OF COMPONENTS (Cont'd)

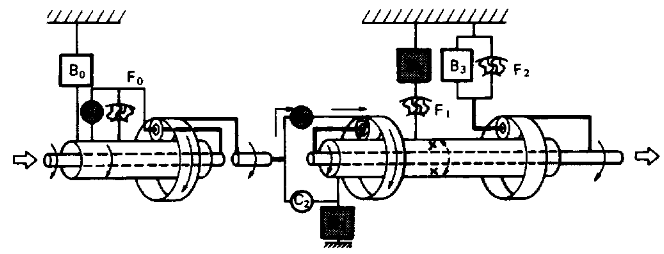
The conditions of operation for each gear position are shown in the following illustrations:

D or 2 Position 1st Gear



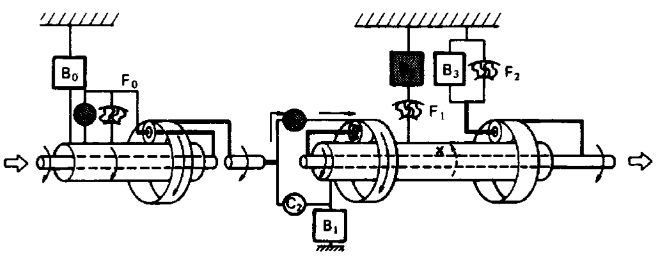
AT5854

2 or L Position 2nd Gear



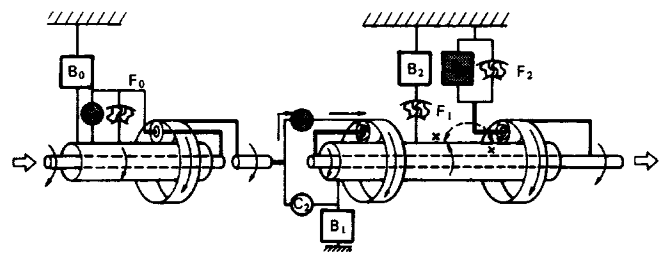
AT5854

D Position 2nd Gear



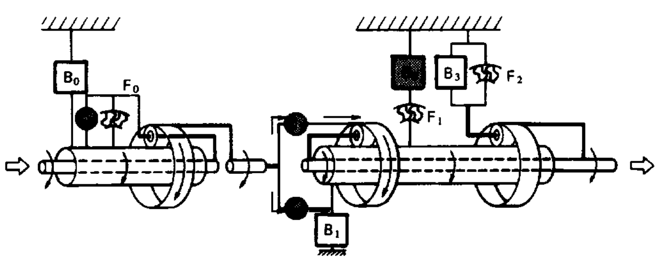
AT5854

L Position 1st Gear



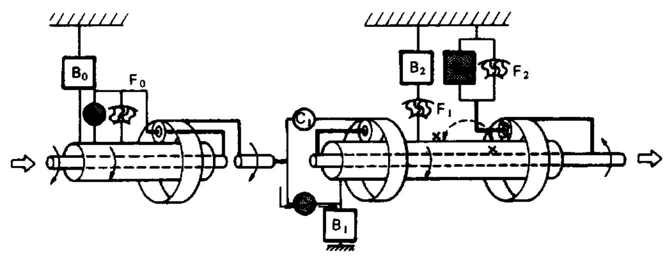
AT5854

D or 2 Position 3rd Gear



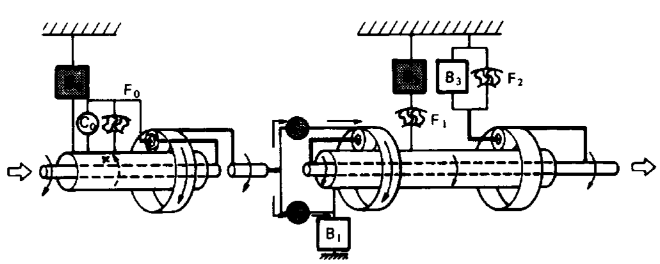
AT5854

R Position Reverse Gear



AT5854

D Position O/D

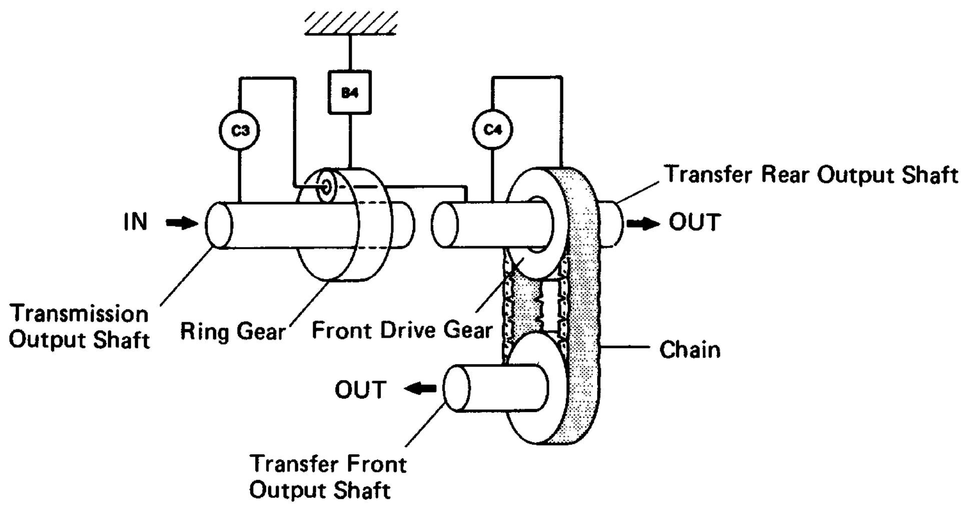


AT5854

FUNCTION OF COMPONENTS (Cont'd)

2. Transfer

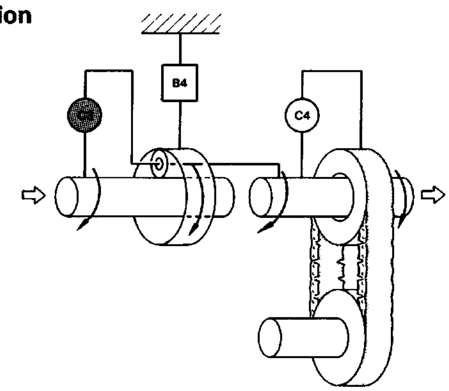
Component		Function
C_3	Forward Clutch	Connects transmission output shaft and transfer pinion gear.
C_4	Direct Clutch	Connects transfer rear output shaft and front drive gear.
B_4	O/D Direct Clutch	Prevents transfer ring gear from turning either clockwise or counterclockwise.



ND0047

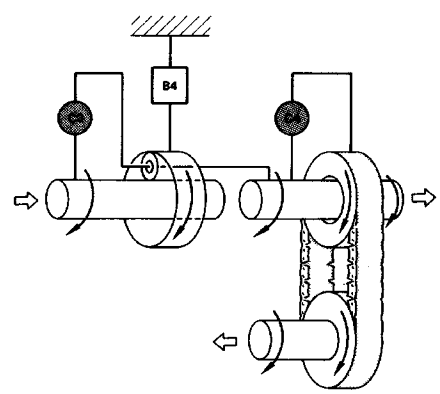
The conditions of operation for each gear position are shown in the following illustrations:

H2 Position



ND0047

H4 Position



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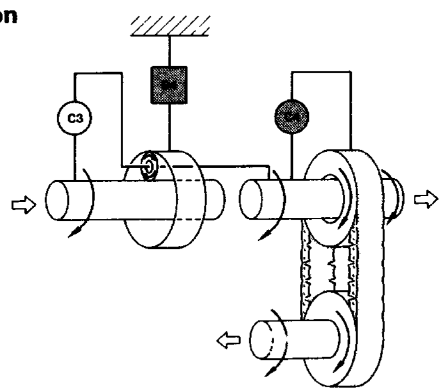
L4 Position

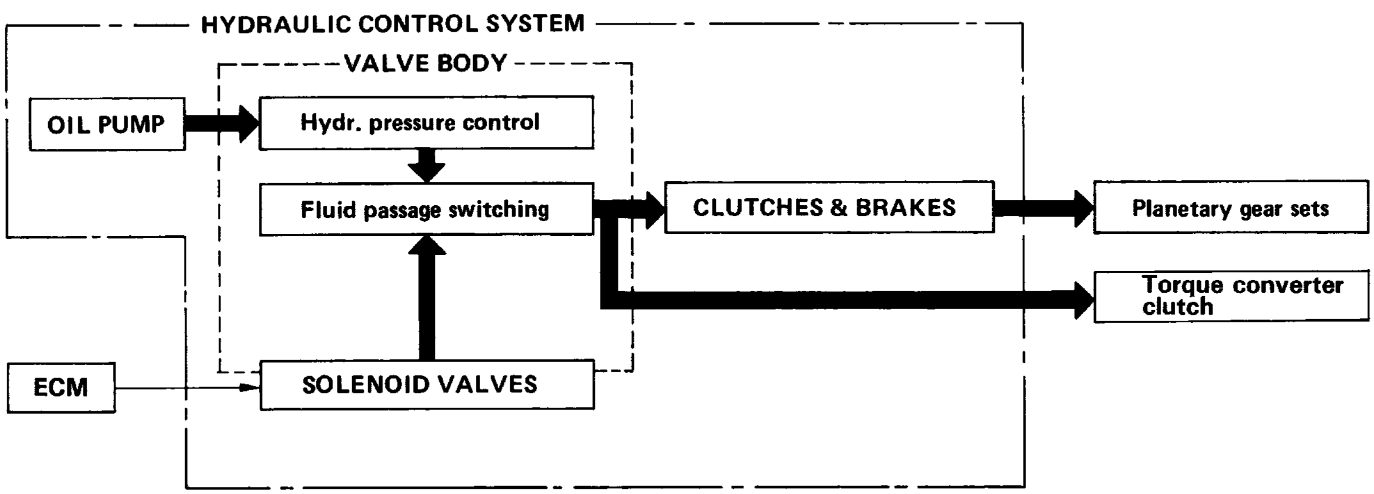


ND00047

Hydraulic Control System

1. Transmission

The hydraulic control system is composed of the oil pump, the valve body, the solenoid valves, and the clutches and brakes, as well as the fluid passages which connect all of these components. Based on the hydraulic pressure created by the oil pump, the hydraulic control system governs the hydraulic pressure acting on the torque converter clutch, clutches and brakes in accordance with the vehicle driving conditions. There are three solenoid valves on the valve body. These solenoid valves are turned on and off by signals from the ECM to operate the shift valves. These shift valves then switch the fluid passages so that fluid goes to the torque converter clutch and planetary gear units.



2 Transfer

The hydraulic control system consists of a valve body, No.4 solenoid valve, a brake (B_4) and two clutches (C3, C4) and passages that connect these elements. It hydraulically controls the planetary gear unit either manually, or automatically by the ECM.

Electronic Control System

The electronic control system, which controls the transmission and transfer shift timing and the operation of the lock–up clutch, is composed of the following three parts:

1. Sensors

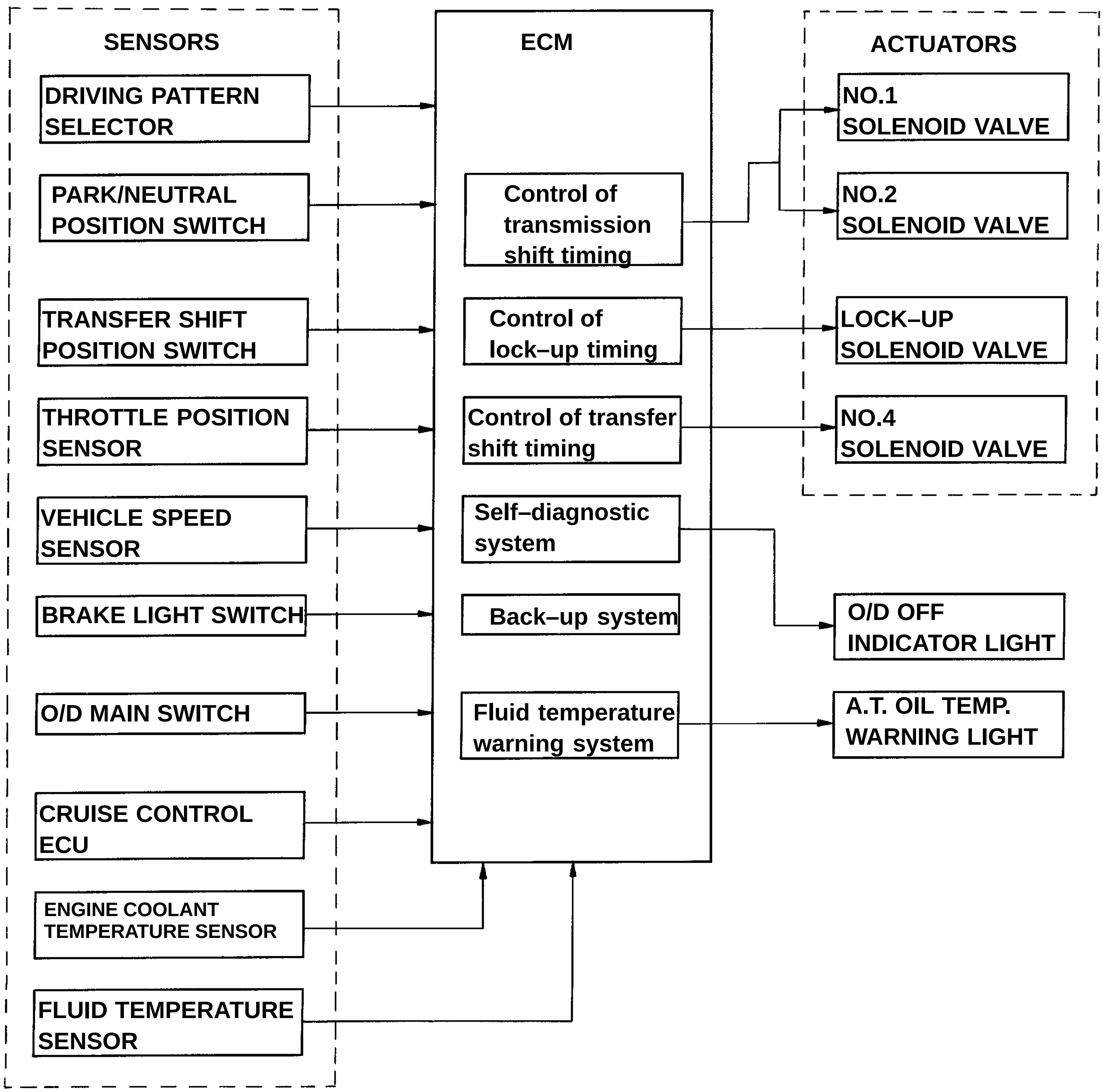
These sensors sense the vehicle speed, throttle opening and other conditions and send these data to the ECM in the form of electrical signals.

2. ECM

The ECM determines the transmission and transfer shift timing and lock–up timing based upon the signals from sensors, and controls the solenoid valves of the hydraulic control unit accordingly.

3. Actuators

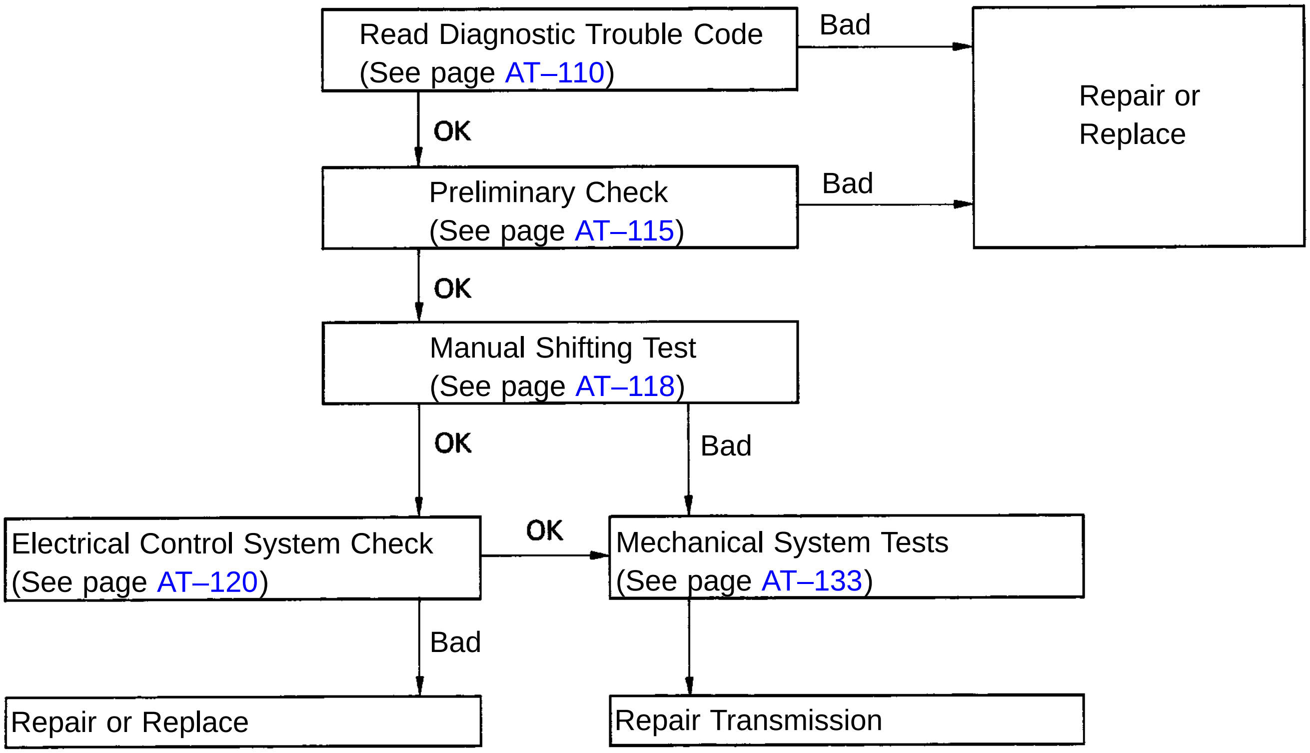
These are four solenoid valves that control hydraulic pressure acting on the hydraulic valves to control shifting and lock–up timing.



TROUBLESHOOTING

Basic Troubleshooting

Before troubleshooting an electronic controlled transmission first determine whether the problem is electri–cal or mechanical. To do this, just refer to the basic troubleshooting flow–chart provide below.
If the cause is already known, using the basic troubleshooting chart below along with the general trouble–shooting chart on the following pages should speed the procedure.



General Troubleshooting

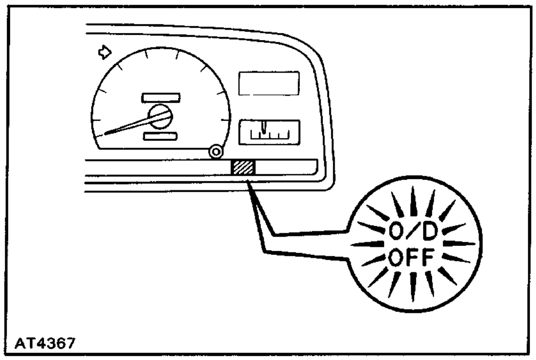
Problem	Possible cause	Remedy	Page
Fluid discolored or smells burnt	Fluid contaminated Torque converter clutch faulty Transmission faulty	Replace fluid Replace torque converter clutch Disassemble and inspect transmission	AT–115 AT–162 *
Vehicle does not move in any forward position or reverse	Manual linkage out of adjustment Valve body or primary regulator faulty Parking lock pawl faulty Torque converter clutch faulty Converter drive plate broken Oil pump intake screen blocked Transmission faulty	Adjust linkage Inspect valve body Inspect parking lock pawl Replace torque converter clutch Replace drive plate Clean screen Disassemble and inspect transmission	AT–116 * AT–158 AT–162 AT–162 * *
Shift lever position incorrect	Manual linkage out of adjustment Manual valve and lever faulty Transmission faulty	Adjust linkage Inspect valve body Disassemble and inspect transmission	AT–116 * *
Harsh engagement into any drive position	Throttle cable out of adjustment Valve body or primary regulator faulty Accumulator pistons faulty Transmission faulty	Adjust throttle cable Inspect valve body Inspect accumulator pistons Disassemble and inspect transmission	AT–116 * * *
Delayed 1–2, 2–3 or 3–0/1) up–shift, or down–shifts from O/D–3 or 3–2 and shifts back to O/D or 3	Electronic control faulty Valve body faulty Solenoid valve faulty	Inspect electronic control Inspect valve body Inspect solenoid valve	AT–120 * *
Slips on 1–2, 2–3 or 3–0/D up–shift, or slips or shudders on acceleration	Manual linkage out of adjustment Throttle cable out of adjustment Valve body faulty Solenoid valve faulty Transmission faulty	Adjust linkage Adjust throttle cable Inspect valve body Inspect solenoid valve Disassemble and inspect transmission	AT–116 AT–116 * * *
Drag, binding or tie–up on 1–2, 2–3 or 3–OlD up–shift	Manual linkage out of adjustment Valve body faulty Transmission faulty	Adjust linkage Inspect valve body Disassemble and inspect transmission	AT–116 * *

Remark *: Refer to A340H Automatic Transmission Repair Manual. (Pub. No. RM271U)

General Troubleshooting (Cont'd)

Problem	Possible cause	Remedy	Page
No lock–up in 2nd, 3rd or O/D	Electronic control faulty Valve body faulty Solenoid valve faulty Transmission faulty	Inspect electronic control Inspect valve body Inspect solenoid valve Disassemble and inspect transmission	AT–120 • • •
Harsh down–shift	Throttle cable out of adjustment Throttle cable and cam faulty Accumulator pistons faulty Valve body faulty Transmission faulty	Adjust throttle cable Inspect throttle cable and cam Inspect accumulator pistons Inspect valve body Disassemble and inspect transmission	AT–116 AT–116 • • •
No down–shift when coasting	Valve body faulty Solenoid valve faulty Electronic control faulty	Inspect valve body Inspect solenoid valve Inspect electronic control	• • AT–120
Down–shift occurs too quickly or too late while coasting	Throttle cable faulty Valve body faulty Transmission faulty Solenoid valve faulty Electronic control faulty	Inspect throttle cable Inspect valve body Disassemble and inspect transmission Inspect solenoid valve Inspect electronic control	AT–116 • • • AT–120
No O/D–3, 3–2 or 2–1 kick–down	Solenoid valve faulty Electronic control faulty Valve body faulty	Inspect solenoid valve Inspect electronic control Inspect valve body	• AT–120 •
No engine braking in 2 or L position	Solenoid valve faulty Electronic control faulty Valve body faulty Transmission faulty	Inspect solenoid valve Inspect electronic control Inspect valve body Disassemble and inspect transmission	• AT–120 • •
Vehicle does not hold in P	Manual linkage out of adjustment Parking lock pawl cam and spring faulty	Adjust linkage Inspect cam and spring	AT–116 AT–158
No H2–H4, H4–L4, L4–H4 or H4–H2 change gear position of transfer	Transfer linkage out of adjustment Electronic control faulty Transfer valve body faulty Transfer faulty	Adjust linkage Inspect electronic control Inspect valve body Disassemble and inspect transfer	AT–116 AT–120 • •

Remark *: Refer to A340H Automatic
Transmission Repair Manual.
(Pub. No. RM271 U)



Diagnosis System

DESCRIPTION

1. A self–diagnosis function is built into the electrical control system. Warning is indicated by the overdrive OFF indicator light.

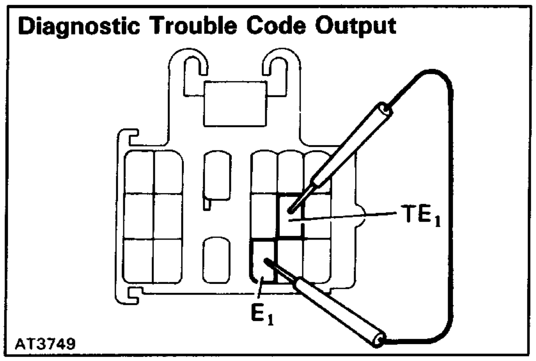
   HINT: Warning and diagnostic trouble codes can be read only when the overdrive switch is ON. If OFF, the overdrive OFF light is lit continuously and will not blink.

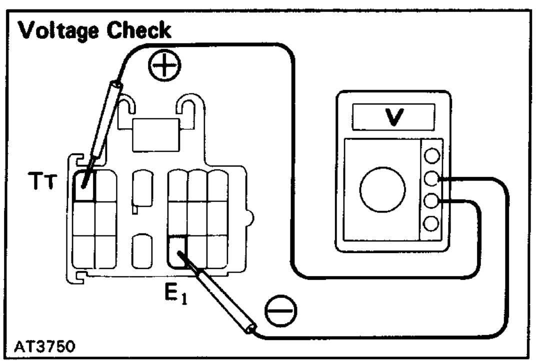
   (a) If a malfunction occurs within the vehicle speed sensors (No. 1 or 2) or solenoids (No. 1, 2, or 4), the overdrive OFF light will blink to warn the driver. However, there will be no warning of a malfunction with lock–up solenoid.

   (b) The diagnostic trouble code can be read by the number of blinks of the overdrive OFF indicator light when terminals TE, and EI are connected. (See page AT–111)

   (c) The throttle position sensor or brake signal are not indicated, but inspection can be made by checking the voltage at terminal TT of the data link connector 1.

   (d) The signals to each gear can be checked by measuring the voltage at terminal TT while driving.



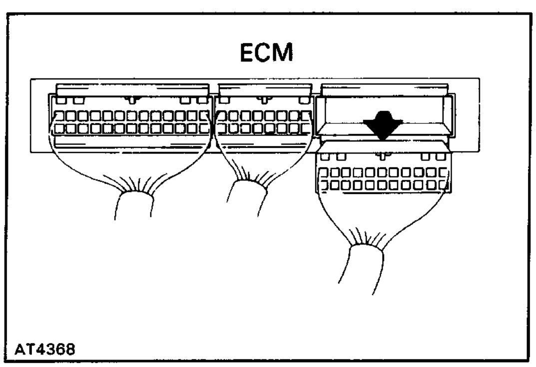


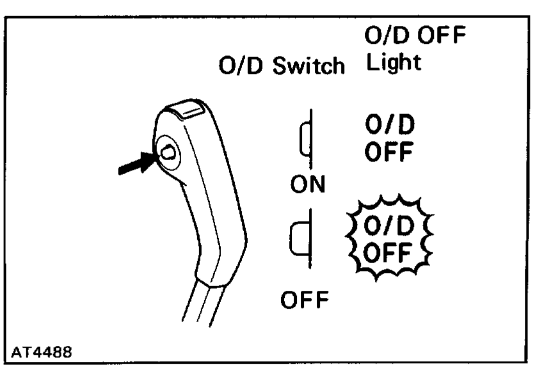
2. The diagnostic trouble code is retained memory by the ECM and due to back–up voltage, is not canceled out when the engine is turned off. Consequently, after repair, it is necessary to turn the ignition switch off and remove the MFI fuse (1 5A) or disconnect the ECM connector to cancel out the diagnostic trouble code. (See page AT–119)

   HINT:

   Low battery positive voltage will cause faulty operation of the diagnosis system. Therefore, always check the battery first.

   Use a voltmeter and ohmmeter that have an impedance of at least 10 kΩ/v.



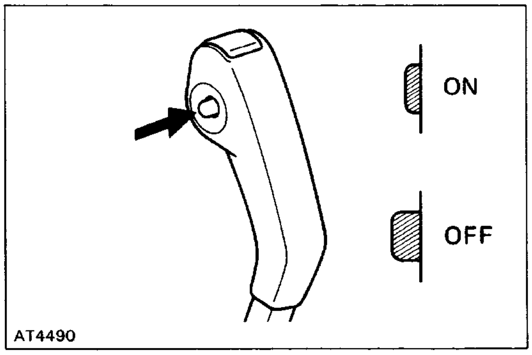


CHECK "O/D OFF" INDICATOR LIGHT

1. Turn the ignition switch ON.
2. The "O/D OFF" light will come on when the O/D switch is placed at OFF.
3. When the O/D switch is set to ON, the–O/D OFF" light should go out.

If the "'O/D OFF" light flashes when the O/D switch is set to ON, the electronic control system is faulty.

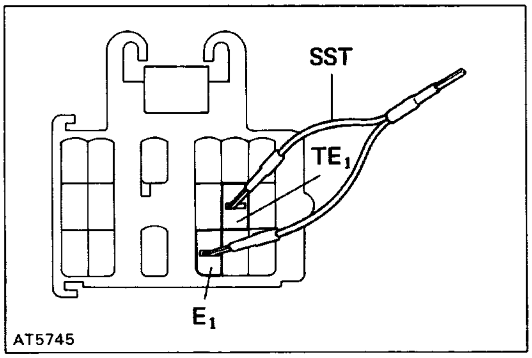
READ DIAGNOSTIC TROUBLE CODE



1. TURN IGNITION SWITCH AND O/D SWITCH TO ON

Do not strat the engine.

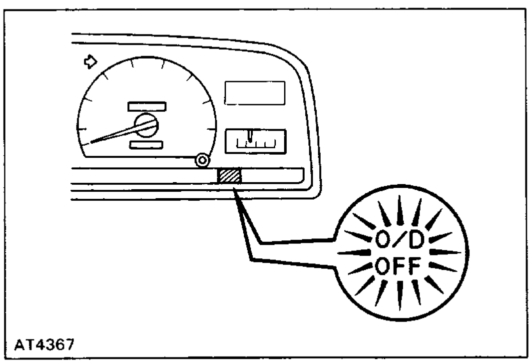
HINT: Warning and diagnostic trouble codes can be read only when the overdrive switch is ON. If OFF, the overdrive OFF light will light continuously and will not blink.



2. CONNECT TE, AND E, TERMINALS OF DATA LINK CONNECTOR 1

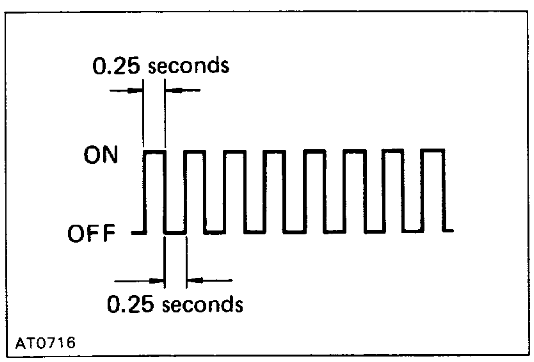
Using SST, connect terminals TE, and.El.

SST 09843–18020



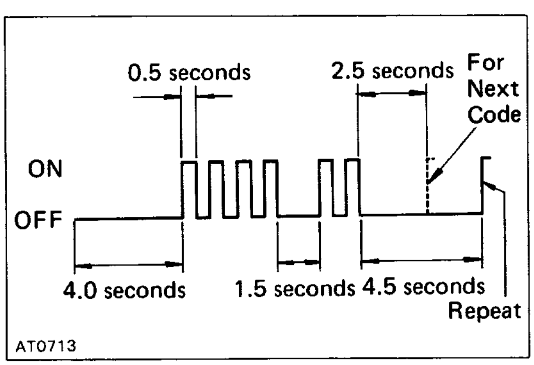
3. READ DIAGNOSTIC TROUBLE CODE

Read the diagnostic trouble code as indicated by the number of times the O/D OFF light flashes.



(Diagnostic Trouble Code Indication)

- If the system is operating normally, the light will flash 2 times per second.



- In the event of a malfunction, the light will flash 1 time per second. The number of blinks will equal the first number and, after 1.5 seconds pause, the second number of the two digit diagnostic trouble code. If there are two or more codes, there will be a 2.5 seconds pause between each.

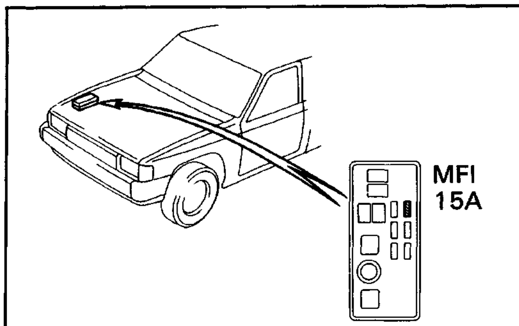
HINT: In the event of several trouble codes occuring si–multaneously, indication will begin from the smaller value and continue to the larger.

4. REMOVE SST

DIAGNOSTIC TROUBLE CODES

Code No.	Light Pattern	Diagnosis System
–		Normal
42		Defective No. 1 vehicle speed sensor (in ATM)– severed wire harness or short circuit
61		Defective No.2 vehicle speed sensor (in ATM)– severed wire harness or short circuit
62		Severed No. 1 solenoid or short circuit– severed wire harness or short circuit
63		Severed No.2 solenoid or short circuit– severed wire harness or short circuit
64		Severed lock–up solenoid or short circuit– severed wire harness or short circuit
65		Severed No.4 solenoid or short circuit– severed wire harness or short circuit

HINT: If codes 62, 63, 64 or 65 appear, there is an electrical malfunction in the solenoid.
Causes due to mechanical failure, such as a stuck valve, will not appear.



FI3618

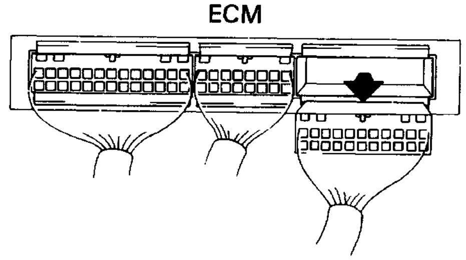
CANCEL OUT DIAGNOSTIC TROUBLE CODE

1. After repair of the trouble area, the diagnostic trouble code retained in memory by the ECM must be canceled by removing the MFI fuse (1 5A) for 10 seconds or more, depending on ambient temperature (the lower the temperature, the longer the fuse must be left out) with the ignition switch OFF.

HINT:

- Cancellation can be also done by removing the battery negative (–) terminal, but in this case other memory systems will be also canceled out.
- The diagnostic trouble code can be also canceled out by disconnecting the ECM connector.
- If the diagnostic trouble code is not canceled out, it will be retained by the ECM and appear along with a new code in event of future trouble.

2. After cancellation, perform a road test to confirm that a ”normal code” is now read on the O/D OFF light.



AT4368

TROUBLESHOOTING FLOW–CHART

HINT:

- If diagnostic trouble code Nos. 42, 61, 62, 63 or 65 are output, the overdrive OFF indicator light will begin to blink immediately to warn the driver. However, an impact or shock may cause the blinking to stop; but the code will still be retained in the ECM memory unit canceled out.
- There is no warning for diagnostic trouble code No. 64.
- In the event of a simultaneous malfunction of both No. 1 and No. 2 vehicle speed sensors, no diagnostic trouble code will appear and the fail–safe system will not function. However, when driving in the D position, the transmission will not up–shift from first gear, regardless of the vehicle speed.

  Diagnostic trouble code 42 (No. 1 vehicle speed sensor circuitry)

Check continuity between ECM connector SP, terminal and body ground.
(See page AT–129)

NG → Check No. 1 vehicle speed sensor.

OK ↓

Substitute another ECM.

Check No. 1 vehicle speed sensor.
(See page AT–131)

NG → Repair or replace No. 1 vehicle speed sensor.

OK ↓

Check wiring between ECM and combination meter.

Diagnostic trouble code 61 (No.2 vehicle speed sensor circuitry)

Check continuity between ECM connector SP2 terminal and body ground.
(See page AT–129)

NG → Check No.2 vehicle speed sensor.

OK ↓

Substitute another ECM.

Check No.2 vehicle speed sensor.
(See page AT–131)

NG → Repair or replace No. 2 vehicle speed sensor.

OK ↓

Check wiring between ECM and No.2 vehicle speed sensor.

Diagnostic trouble code 62 (No. 1 solenoid valve circuitry)

Check resistance of No. 1 solenoid valve at ECM connector.
(See page AT–130)

OK

Substitute another ECM.

Remove the transmission oil pan and check resistance of No. 1 solenoid valve connector and body ground.
Resistance: 11–15Ω

NG → Replace No. 1 solenoid valve.

OK

Check wiring between No. 1 solenoid valve and ECM.

Diagnostic trouble code 63 (No.2 solenoid valve circuitry)

Check resistance of No.2 solenoid valve at ECM connector.
(See page AT–130)

NG

OK

Substitute another ECM.

Remove the transmission oil pan and check resistance of No.2 solenoid valve connector and body ground.
Resistance: 11–15 0

NG → Replace No. 2 solenoid valve.

OK

Check wiring between No.2 solenoid valve and ECM.

Diagnostic trouble code 64 (Lock–up solenoid valve circuitry)

Check resistance of lock–up solenoid valve at ECM connector.
(See page AT–130)

OK

Substitute another ECM.

Remove the transmission oil pan and check resistance of lock–up solenoid valve connector and body ground.
Resistance: 11–15 9

NG → Replace lock–up solenoid valve.

OK

Check wiring between lock–up solenoid valve and ECM.

Diagnostic trouble code 65 (No.4 solenoid valve circuitry)

Check resistance of No.4 solenoid valve at ECM connector.
(See page AT–130)

OK → Substitute another ECM.

NG →

Remove the transfer oil pan and check resistance of No.4 solenoid valve connector and body ground.
Resistance: 11–15Ω

NG → Replace No.4 solenoid valve.

OK → Check wiring between No.4 solenoid valve and ECM.

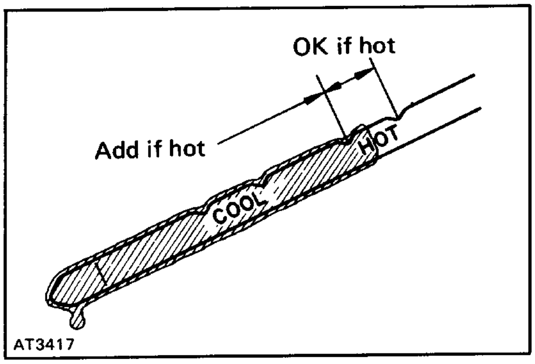
Preliminary Check

1. CHECK FLUID LEVEL

(Transmission and transfer case)

HINT:

- The vehicle must have been driven so that the engine and transmission are at normal operating temperature. (Fluid temperature: 70–80•C or 158–176•F)
- Only use the COOL range on the dipstick as a rough re–ferance when the fluid is replaced or the engine does not run.



(a) Park the vehicle on a level surface, set the parking brake.

(b) With the engine idling, shift the shift lever into all positions from P to L position and return to P posi–tion.

(c) Pull out the transmission dipstick and wipe it clean.

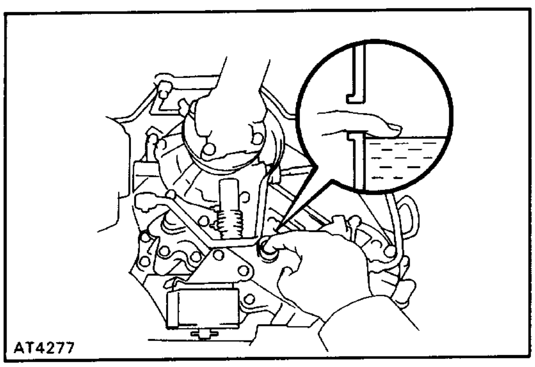
(d) Push it back fully into the tube.

(e) Pull it out and check that the fluid level is in the HOT range.

If the level is at the low side, add fluid.

Fluid type: ATF DEXRON® II

NOTICE: Do not overfill.



(Transfer chain case)

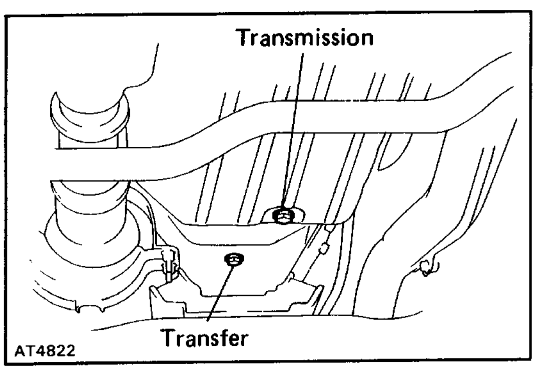
Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 10 mm (0.39 in.) of the bottom edge of the hole.

If the level is low, add fluid until it begins to run out of the filler hole.

Fluid type: ATF DEXRON® II

2. CHECK FLUID CONDITION

If the fluid smells burnt or is black, replace it as following procedures.



(Transmission and transfer case)

(a) Remove the drain plugs and drain the fluid.

(b) Reinstall the drain plugs securely.

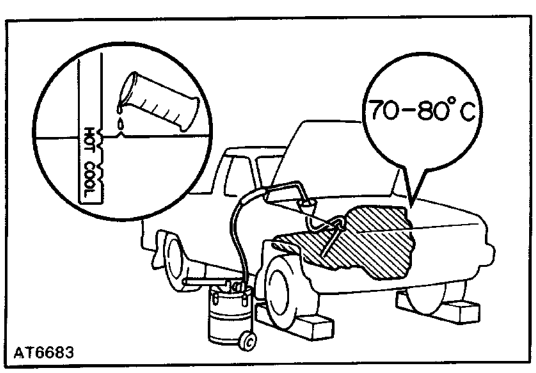
(c) With the engine OFF, add new fluid through the oil filler tube.

Fluid type: ATF DEXRON® II

Capacity: liter (US qts, Imp. qts)

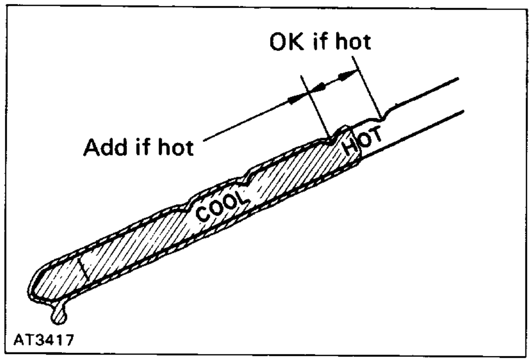
	Transmission	Transfer
Drain and refill	4.5 (4.8, 4.0)	
	* 3.8 (4.0, 3.	*1.2 (1.3, 1.1)
Total	10.3 (10.9, 9.1)	

*: Reference capacity when replacing transmission or transfer valve body.



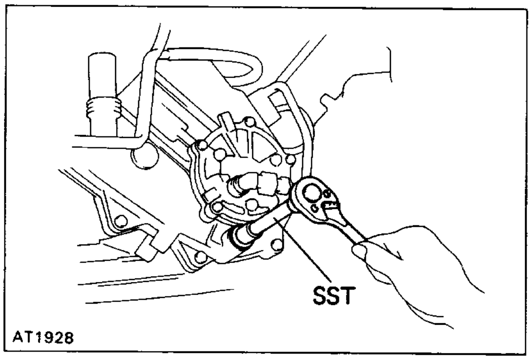
(d) Start the engine and shift the shift lever into all po–sitions from P to L position and then shift into P po–sition.

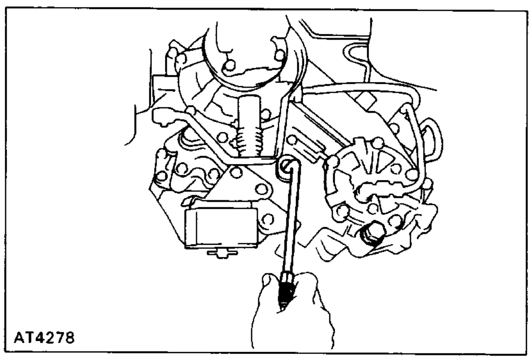
(e) With the engine idling, check the fluid level. Add fluid up to the COOL level on the dipstick.



(f) Check the fluid level with the normal operating temperature (70–80°C or 158–176°F) and add as necessary.

NOTICE: Do not overfill.





(Transfer chain case)

(a) Remove the transfer under cover.

(b) Remove the drain plug with SST and drain the fluid.
SST 09043–38 100

(c) Reinstall the drain plug securely with SST.

(d) With the engine OFF, add new fluid through the filler hole.

Fluid type: ATF DEXRON® II

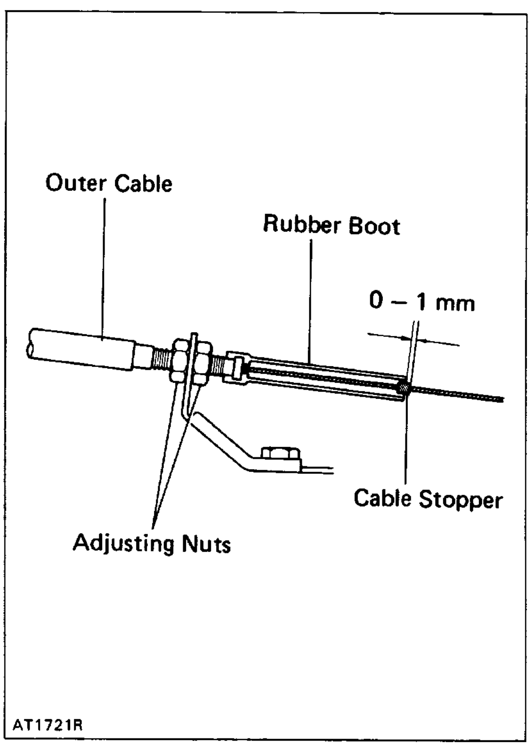
Capacity:

Total 1.1 liters
(1.2 US qts, 1.0 Imp. qts)

Drain and refill 0.8 liters
(0.8 US qts, 0.7 Imp. qts)

(e) Check the fluid level.

(f) Install the transfer under cover.



3. INSPECT THROTTLE CABLE

(a) Depress the accelerator pedal all the way and check that the throttle valve opens fully.

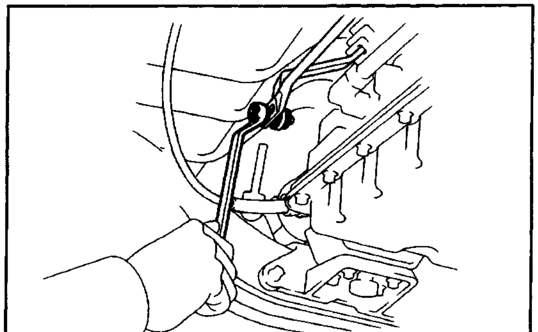
HINT: If the valve does not open fully, adjust the accelerator cable.

(b) Fully depress the accelerator pedal.

(c) Measure the distance between the end of the boot and stopper on the cable.

Standard distance: 0–1 mm (0–0.04 in.)

If the distance is not standard, adjust the cable by the adjusting nuts.

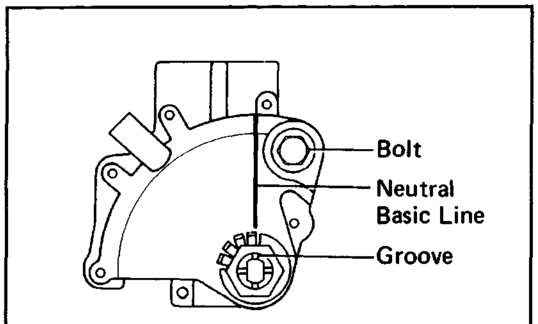

AT5058

4. INSPECT TRANSMISSION SHIFT LEVER POSITION

When shifting the shift lever from the IV position to other positions, check that the lever can be shifted smoothly and accurately to each position and that the position in–dicator correctly indicates the position.

If the indicator is not aligned with the correct position, carry out the following adjustment procedures.

(a) Loosen the nut on the transmission control rod.
(b) Push the control shaft lever fully rearward.
(e) Return the control shaft lever two notches to N po–sition.
(d) Set the shift lever to N position.
(e) While holding the shift lever lightly toward the R po–sition side, tighten the nut.
(f) Start the engine and make sure that the vehicle moves forward when shifting the lever from the N to D position and reverse when shifting it to the R po–sition.



AT4369

5. INSPECT PARK/ NEUTRAL POSITION SWITCH

Check that the engine can be started with the shift lever only in the N or P position, but not in other positions.

If not as stated above, carry out the following adjustment procedures.

(a) Loosen the park/neutral position switch bolt and set the shift lever to the N position.
(b) Align the groove and neutral basic line.
(c) Hold in position and tighten the bolt.

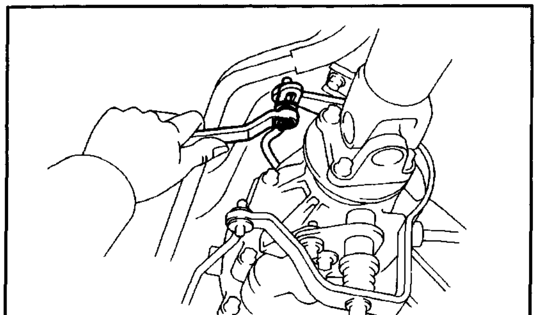
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)

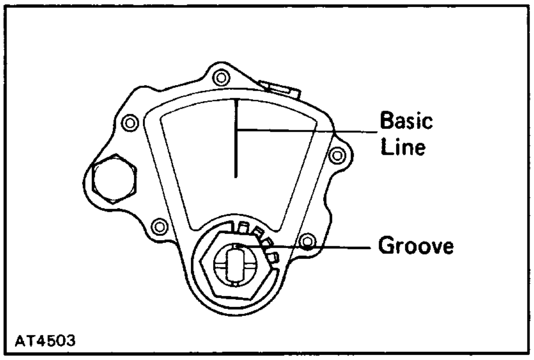
6. INSPECT TRANSFER SHIFT LEVER POSITION

When shifting the shift lever from H2 position to H4 and L4 positions, check that the lever can be shifted smoothly and accurately to each position and that the po–sition indicator correctly indicates the position.

If the indicator is not aligned with the correct position, carry out the following adjustment procedures.

(a) Loosen the nut on the cross shaft.
(b) Push the control shaft lever fully forward.
(c) Return the control shaft lever one notch to H4 po–sition.
(d) Set the shift lever H4 position.
(e) While holding the shift lever lightly toward the L4 position side, tighten the nut.


AT2503



7. INSPECT TRANSFER POSITION SWITCH

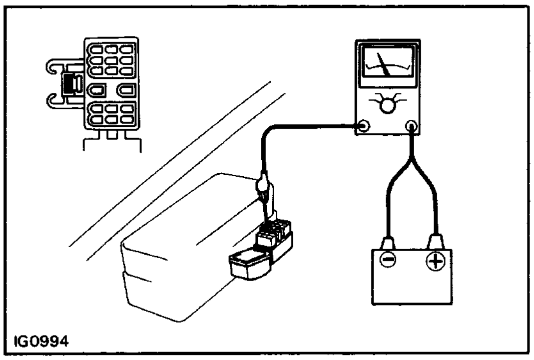
If necessary, carry out the following adjustment procedures.

(a) Loosen the transfer position switch bolt and set the transfer shift lever to the H4 position.

(b) Align the groove and H4 basic line.

(c) Hold in position and tighten the bolt.

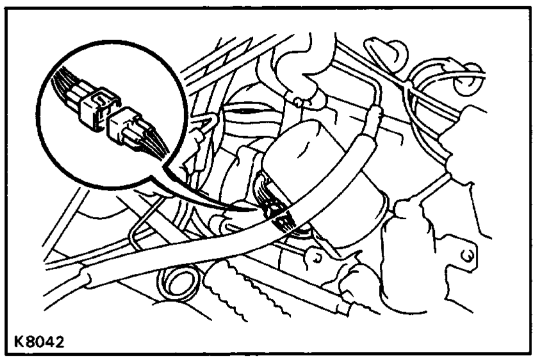
Torque: 13 N. m (130 kgf.cm, 9 ft. lbf)



8. INSPECT IDLE SPEED (N POSITION)

Connect a tachometer test probe to the data link connector 1 terminal IG (3, inspect the idle speed.

Idle speed: 800 RPM



Manual Shifting Test

HINT: With this test, it can be determined whether the trouble lies within the electrical circuit or is a mechanical problem in the transmission.

1. DISCONNECT SOLENOID WIRE

2. INSPECT MANUAL DRIVING OPERATION

Check that the shift and gear positions correspond with the table below.

	Transmission					Transfer (Reference)		
Shift position	D position	2 position	L position	R position	P position	H2 position	H4 position	L4 position
Gear position	O/D	3rd	1 st	Reverse	Pawl Lock	High Gear 2W D	High Gear 4WD	High Gear 4WD

HINT: If the L, 2 and D position gear positions are difficult to distinguish, perform the following road test.

- While driving, shift through the L, 2 and D positions. Check that the gear change corresponds to the shift position.
  If any abnormality is found in the above test, the problem lies in transmission itself.

3. CONNECT SOLENOID WIRE

4. CANCEL OUT DIAGNOSTIC TROUBLE CODE
(See page AT–111)

REFERENCE: Possible gear positions in accordance with solenoid operating conditions.

Position	NORMAL			NO. 1 SOLENOID MALFUNCTIONING			NO.2 SOLENOID MALFUNCTIONING			BOTH SOLENOIDS MALFUNCTIONING		
	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position
	No. 1	No. 2		No. 1	No. 2		No. 1	No. 2		No. 1	No.2	
D position	**ON**	OFF	1 st	**X**	**ON**	3rd	**ON**	**X**	**1st**	**X**	**X**	O/D
	ON	**ON**	2nd	**X**	**ON**	3rd	OFF	**X**	O/D	**X**	**X**	O/D
	OFF	**ON**	3rd	**X**	**ON**	3rd	OFF	**X**	O/D	**X**	**X**	O/D
	OFF	OFF	O/D	**X**	OFF	O/D	OFF	**X**	O/D	**X**	**X**	O/D
2 position	**ON**	OFF	1 st	**X**	**ON**	3rd	**ON**	**X**	**1st**	**X**	**X**	3rd
	ON	**ON**	2nd	**X**	**ON**	3rd	OFF	**X**	3rd	**X**	**X**	3rd
	OFF	**ON**	3rd	**X**	**ON**	3rd	OFF	**X**	3rd	**X**	**X**	3rd
L position	**ON**	OFF	**1st**	**X**	OFF	**1st**	**ON**	**X**	1 st	**X**	**X**	**1st**
	ON	**ON**	2nd	**X**	**ON**	2nd	**ON**	**X**	1 st	**X**	**X**	**1st**

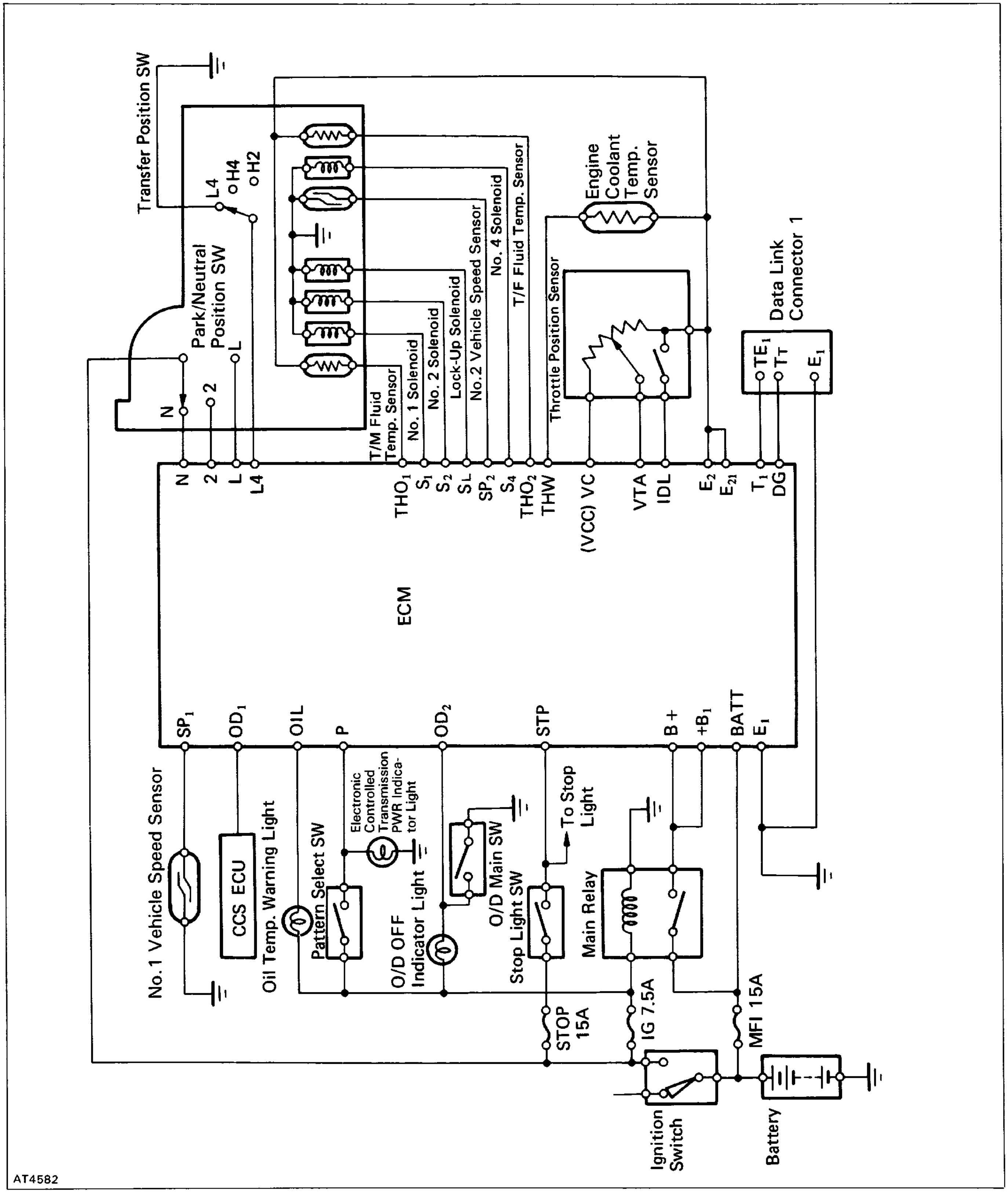
X: Malfunctions

Electronic Control System

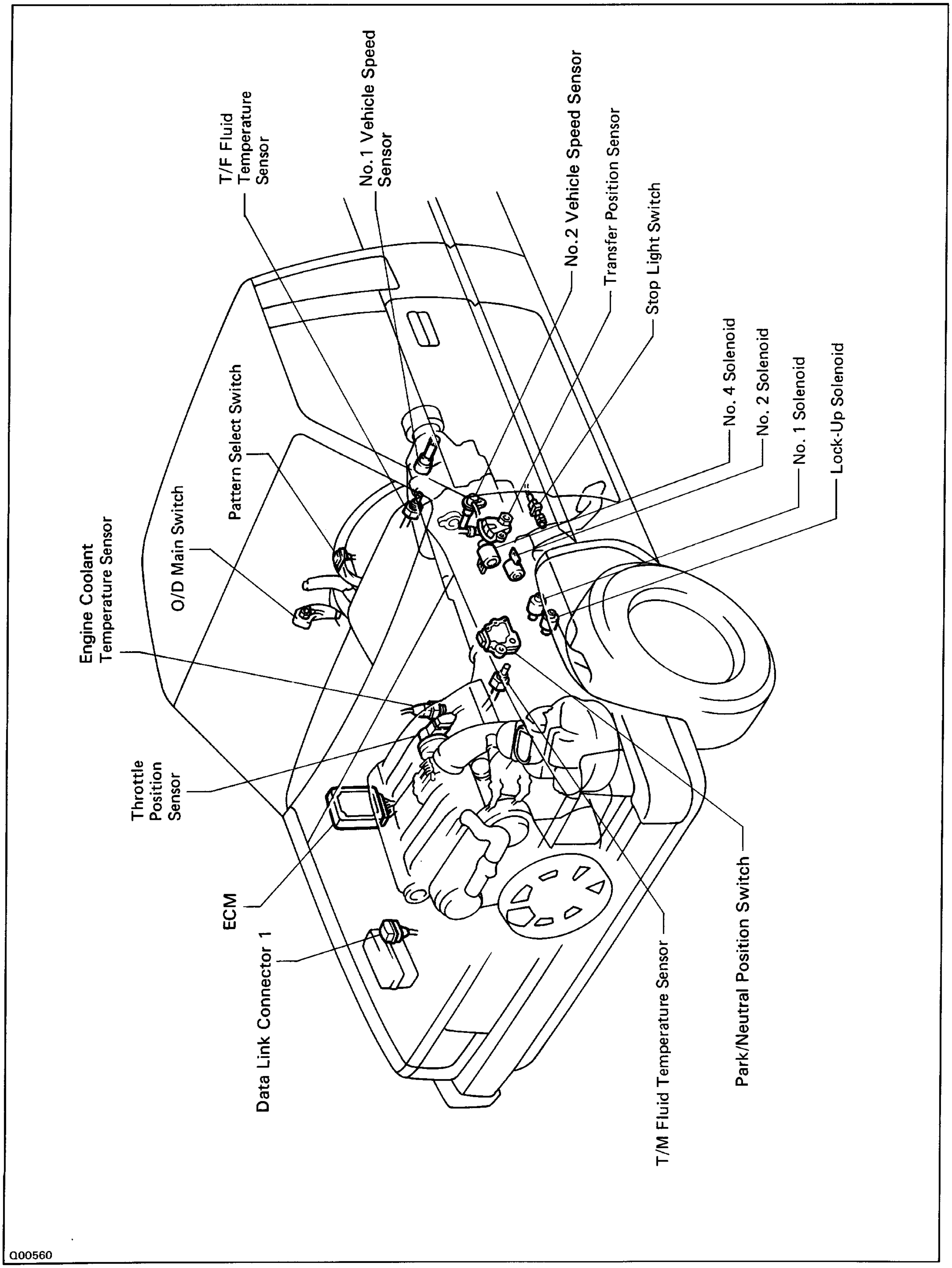
PRECAUTION

Do not open the cover or the case of the ECM and various computer unless absolutely necessary. (If the IC terminals are touched, the IC may be destroyed by static electricity.)

ELECTRONIC CONTROL CIRCUIT



ELECTRONIC CONTROL COMPONENTS



TROUBLESHOOTING FLOW–CHART

Trouble No. 1 No Shifting

Warm up engine
Engine Coolant temp.: 80•C (176•F)
ATF temp.: 50–80•C (122–176•F)

Connect a voltmeter to data link connector
1 terminals TT and E, .
Does Tt terminal voltage vary with changes
in throttle opening?

Yes

No

Is voltage between ECM terminals STP and
E, as follows?
0 V: Brake pedal released
10–14 V : Brake pedal depressed

No

Brake signal faulty

Yes

- Throttle position signal faulty
- TT terminal wire open or short

Disconnect solenoid wire connector and road
test. Does the transmission operate in the
respective gear when in the following posi–
tions while driving?
D position .... Overdrive
2 position .... 3rd gear
L position .... 1 st gear

No

Transmission faulty

Yes

Continued on page AT–123

Continued from page AT–122

Connect solenoid wire connector and road test. Does data link connector 1 TT terminal voltage rise from 0 V to 7 V in sequence?

0→ 7V

- Transmission faulty
- Solenoid faulty

0→ 5 V

Proceed to trouble 3 (AT–126)

0→ 3 V

Are there 12 V between ECM terminals 2–E, when in the D position?

Yes

No

0 V

Are there 12 V between ECM terminals L–E, when in the D position?

No

Yes

- Park/Neutral position switch circuit faulty
- Park/Neutral position switch faulty

Try another ECM

Trouble No.2 Shift point too high or too low

Warm up engine
Engine coolant temp.: 80•C (176•F)
ATF temp.: 50–80•C
(122–176•F)

↓

Connect a voltmeter to data link connector 1 terminals TT and E, .
Does TT terminal voltage vary with changes in throttle opening?

No →

Is voltage between ECM terminals STP and E, as follows?
0 V: Brake pedal released
10–14 V: Brake pedal depressed

No → Brake signal faulty

Yes →

- Throttle position signal faulty
- TT terminal wire open or short

Yes →

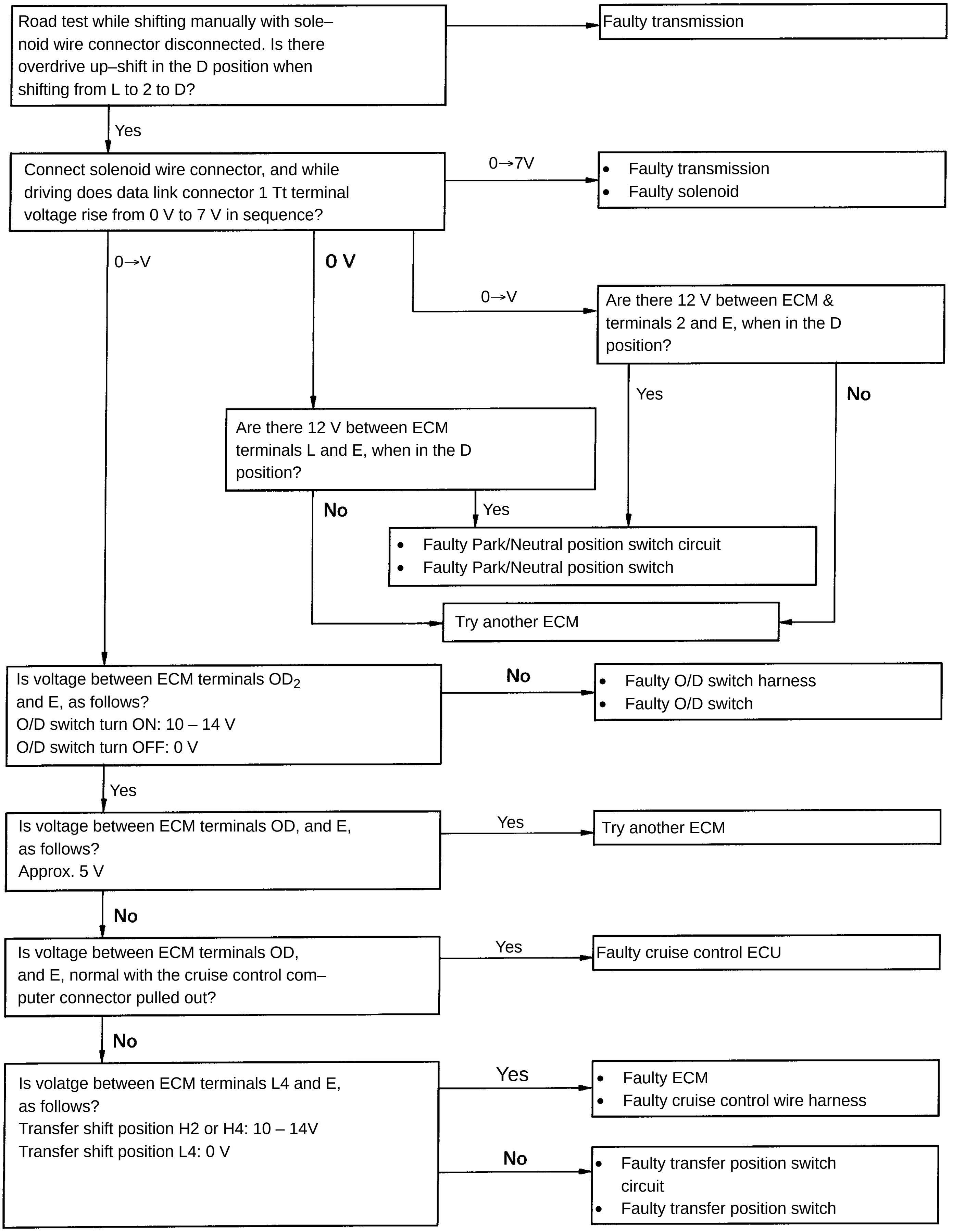
Check voltage between ECM terminals P and El.
Power pattern: 10–14 V
Normal pattern: 0–2 V

OK →

- Faulty ECM
- Faulty transmission

NG → Faulty pattern select switch system

Trouble No.3 No up–shift to overdrive (After warm–up)



Trouble No. 4 No lock–up (After warm–up)

Warm up engine
Engine coolant temp.: 80•C(176•F)
ATF temp.: 50–80•C (1 22–176•F)

↓

Road test
Connect a voltmeter to data link connector 1 terminals TT and E, . Is there 7, 5 or 3 V in the lock–up position while driving?

Yes →
- Lock–up solenoid stuck
- Faulty transmission
- Faulty lock–up mechanism

No ↓

Is voltage between ECM STP and E, termi– nals as follows?
Brake pedal depressed: 10–14 v
Brake pedal released: 0 v

No → Faulty brake signal

No ↓

Is voltage between ECM terminals L4 and E, as follows?
Transfer shift position H2 or H4: 10–14V
Transfer shift position L4: 0 v

Yes → Faulty throttle position signal

No ↓

- Faulty transfer position switch circuit
- Faulty transfer position switch

Trouble No.5 Transfer gear no change L4 from H4

Check transfer position switch
(See page AT–132)

Bad → Faulty transfer position switch

OK ↓

Connect a voltmeter to data link connector 1 terminals TT and E, . Does TT terminal voltage vary with changes in the throttle opening?

No → Faulty throttle position sensor

Yes ↓

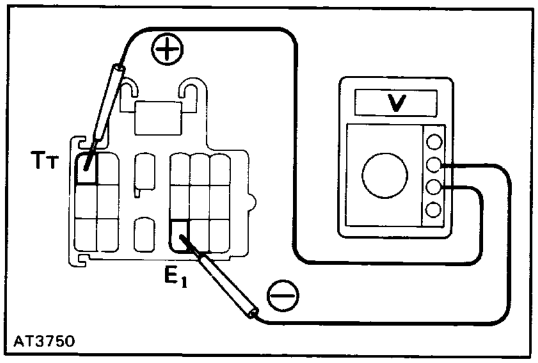
With the engine idling, are there 12 V between ECM terminals S4 and E,, when transfer lever is shifted from H4 to L4?

No → Try another ECM

Yes ↓

- No.4 solenoid stuck
- Faulty transfer

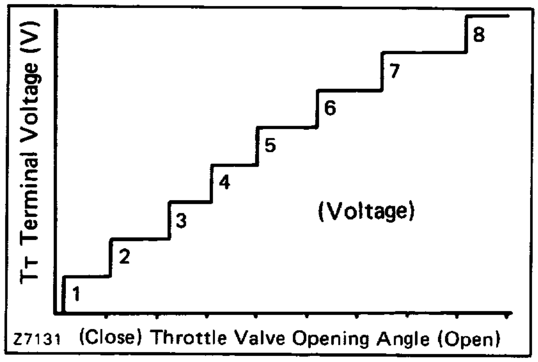
INSPECTION OF TT TERMINAL VOLTAGE



1. INSPECT THROTTLE POSITION SENSOR SIGNAL

(a) Turn the ignition switch to ON. Do not start the en–gine.

(b) Connect a voltmeter to data link connector 1 termi–nals Tt and E,.



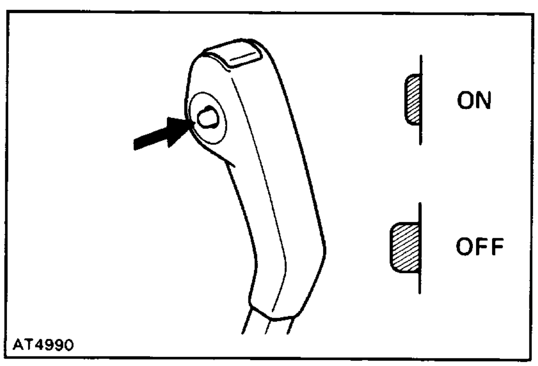
(c) While slowly depressing the accelerator pedal, check that TT terminal voltage rises in sequence.
If the voltage does not change in proportion to the throt–tle opening angle, there is a malfunction in the throttle position sensor or circuit.

2. INSPECT BRAKE SIGNAL

(a) Depress the accelerator pedal until the TT terminal indicates 8 V.

(b) Depress the brake pedal and check the voltage read–ing from the TT terminal.
Brake pedal depressed .... 0 V
Brake pedal released .... 8 V

If not as indicated, there is a malfunction in either the stop light switch or circuit.



T_T Terminal (V)	Gear Position
0	1st
2	2nd
3	2nd Lock-up
4	3rd
5	3rd Lock-up
6	O/D
7	O/D Lock-up

3. INSPECT EACH UP–SHIFT POSITION

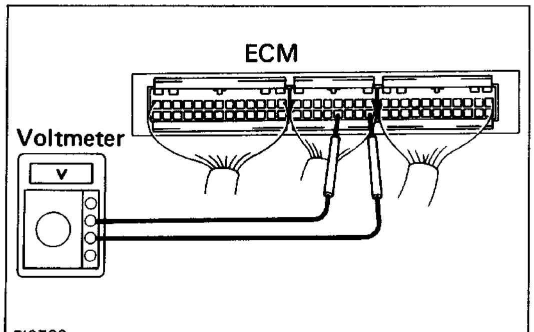
(a) Warm up the engine.
Engine Coolant temperature: 800C (1760F)

(b) Turn the O/D switch to ”ON”.

(c) Place the pattern select switch in ”Normal” and the shift lever into the D position.

(d) During a road test (above 10 km/h or 6 mph)check that voltage at the TT terminal is as indicated below for each up–shift position.

If the voltage rises from 0 V to 7 V in the sequence shown, the control system is okay.
The chart on the left shows the voltmeter reading and corresponding gears.
HINT: Determine the gear position by a light shock or change in engine rpm when shifting. The lock–up clutch will turn ON only infrequently during normal 2nd and 3rd gear operation. To trigger this action, press the accelera–tor pedal to 50% or more of its stroke. At less than 50%, the voltage may change in the sequence 2 V–4 V–6 V–7V.

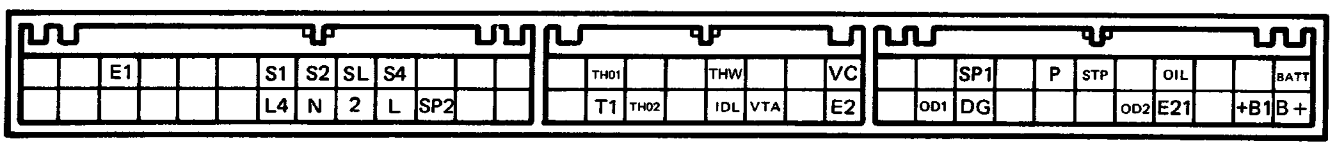


FI2762

INSPECTION OF ELECTRONIC CONTROL COMPONENTS

1. INSPECT VOLTAGE OF ECM CONNECTOR

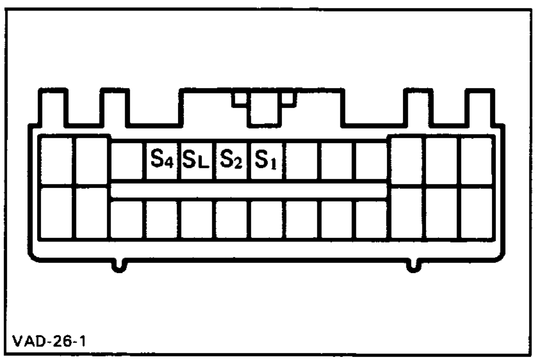
(a) Remove the cowl side trim of passenger side.
(b) Turn on the ignition switch.
(c) Measure the voltage at each terminal.



FI2796

Terminal	Measuring condition		Voltage i V j
S_1 – E_1	–		10 – 14
S_2, S_L – E_1	–		0
S_4 – E_1	Transfer shift position H2 or H4		0
	Transfer shift position L4		10 – 14
P – E_1	PWR pattern		10 – 14
	NORM pattern		0 – 2
STP – E_1	Brake pedal is depressed		10 – 14
	Brake pedal is released		0
THW – E_2 (E_{21})	Engine Coolant temp. 80•C (176•F)		0.1 – 1.0
IDL – E_2 (E_{21})	Throttle valve fully closed		0
	Throttle valve open		10 – 14
VTA – E_2(E_{21})	Throttle valve fully closed		0.1 – 1.0
	Throttle valve fully open		3 – 5
VC (VCC) – E_2 (E_{21})	–		4 – 6
OD_1 – E_1	–		5
OD_2 – E_1	O/D main switch turned ON		10 – 14
	O/D main switch turned OFF		0
SP_1 – E_1	Cruise control main switch OFF	Standing still	0 or 5
		Vehicle moving	2 – 3
SP_2 – E_1	Standing still		0 or 5
	Vehicle moving		2 – 3

Terminal	Measuring condition	Voltage (V)
N – E_1	N position	10 – 14
	Except N position	0 – 2
2 – E_1	2 position	10 – 14
	Except 2 position	0 – 2
L – E_1	L position	10 – 14
	Except L position	0 – 2
L_4 – E_1	Transfer shift position H2 or H4	10 – 14
	Transfer shift position L4	0
OIL – E_1	–	10 – 14
THO_1, THO_2 – E_2 THO (E_{21})	Fluid temp. 20•C (68•F)	4 – 5
B+ (+B_1) – E_1	–	10 – 14
BATT – E_1	–	10 – 14



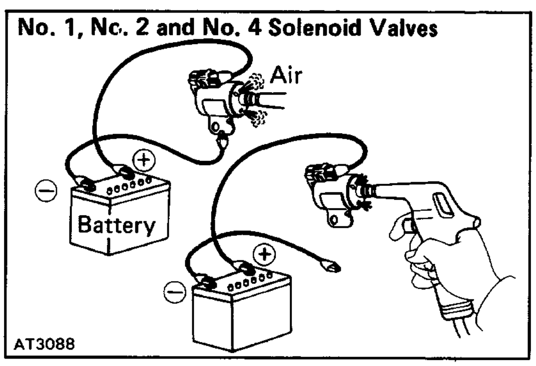
2. INSPECT SOLENOID

(a) Disconnect the connector from ther ECM.

(b) Measure the resistance between S,, S2, SL, S4 and ground.

Resistance: 11–15

(c) Apply battery positive voltage to each terminal. Check that an operation noise can be heard from the solenoid.



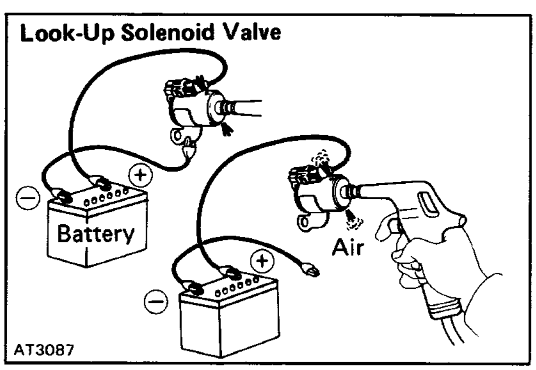
3. CHECK SOLENOID SEALS

If there is foreign material in the solenoid valve, there will be no fluid control even with solenoid operation.

(a) Check No. 1, No.2 and No.4 solenoid valves.

Check that the solenoid valves do not leak when low–pressure compressed air is applied.

When supply battery positive voltage to the solenoids, check that the solenoid valves open.



(b) Check the lock–up solenoid valve.

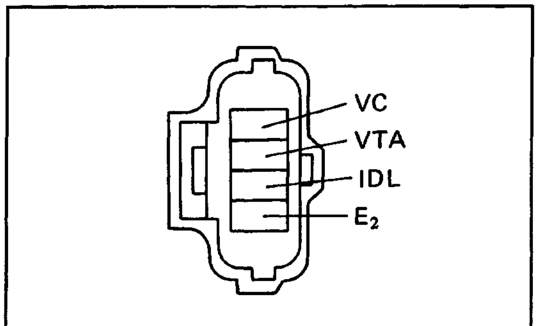
Applying 490 kPa (5 kgf/cm2, 71 psi) of com–pressed air, check that the solenoid valve opens.

When supply battery positive voltage to the solenoid, check that the solenoid valve does not leak the air.

If a malfunction is found during voltage inspection (step 1.), inspect the components listed below.

4. INSPECT PARK/ NEUTRAL POSITION SWITCH

(See page AT–144)

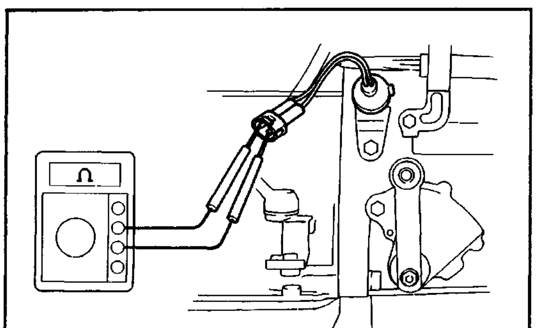


FI1499

5. INSPECT THROTTLE POSITION SENSOR

Using an ohmmeter, check the resistance between each terminal.

Terminal	Throttle valve condition	Resistance (kΩ)
IDL–E2	Fully closed	Less than 2.3
	Open	Infinity
VC–E2	–	3.9–9.0
VTA–E2	Fully closed	0.47–6.1
	Fully open	3.1–12.1


AT4823

6. INSPECT NO.2 VEHICLE SPEED SENSOR

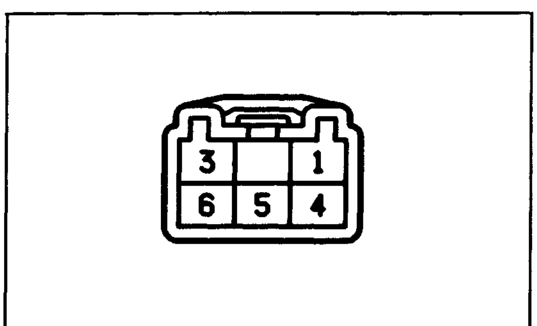
(a) Jack up the rear wheel on one side.

(b) Connect an ohmmeter between the terminals.

(c) Spin the wheel and check that the meter needle de– flects from 0Ω to ∞Ω .

7. INSPECT NO.1 VEHICLE SPEED SENSOR

(See step 6. on page AT–131)



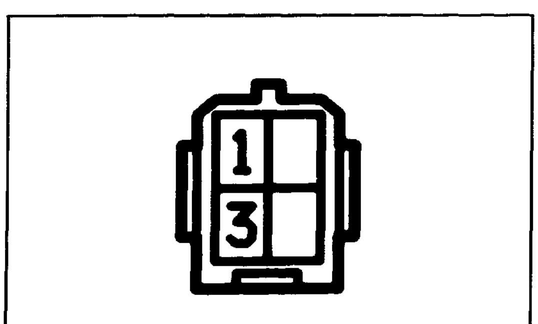
S-6-2-D

8. INSPECT PATTERN SELECT SWITCH

Using an ohmmeter, check the continuity of the terminals for each switch position.

HINT: As there are diodes inside, be careful of the tester probe polarity.

Pattern \ Terminal	4	6
PWR	○—	—○
NORM		



S-4-1-B

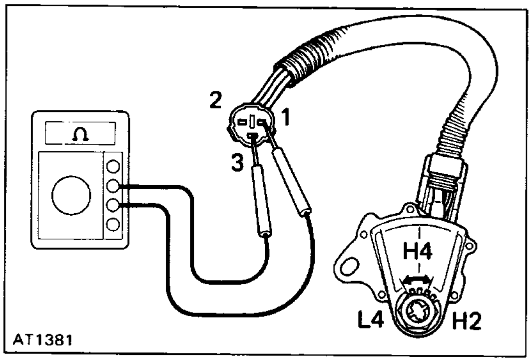
9. INSPECT O/D SWITCH

Using an ohmmeter, check the continuity of the terminals for each switch position.

SW position \ Terminal	1	3
ON		
OFF	○—	—○

10. INSPECT ENGINE COOLANT TEMPERATURE SENSOR

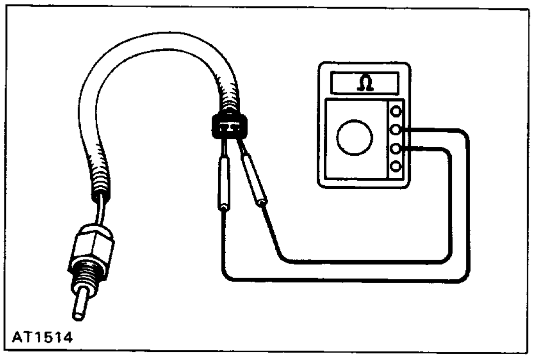
(See page FI–201)



11. INSPECT TRANSFER POSITION SWITCH

Check that there is continuity between each terminal.

Shift position \ Terminal	1	2	3
H4	O		O
L4	O	O	O
H2			



12. INSPECT TRANSMISSION AND TRANSFER FLUID TEMPERATURE SENSOR

Measure the resistance between terminals.

Oil Temperature	Resistance (/)
20°C (68°F)	5k – 20k
120°C (248°F)	540 – 690
150°C (302°F)	300 – 340

Mechanical System Tests

STALL TEST

The object of this test is to check the overall performance of the transmission and engine by measuring the stall speeds in the D and R positions.

NOTICE:

- **Perform the test at normal operating fluid temperature (50–80•C or 122–176•F).**
- **Do not continuously run this test longer than 5 seconds.**
- **To ensure safety, conduct this test in a wide, clear, level area, which provides good traction.**
- **The stall test should always be carried out in pairs. One should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test.**

MEASURE STALL SPEED

(a) Chock the front and rear wheels.
(b) Connect a tachometer to the engine.
(c) Fully apply the parking brake.
(d) Keep your left foot pressed firmly on the brake pedal.
(e) Shift the transfer lever to the H2 position.
(f) Start the engine.
(g) Shift into the D position. Step all the way down on the accelerator pedal with your right foot.
Quickly read the stall speed at this time.

NOTICE: Release the accelerator pedal and stop test if the rear wheels begin to rotate before the en–gine speed reaches specified stall speed.

Stall speed: 2,850 f 150 RPM

(h) Perform the same test in R position.

EVALUATION

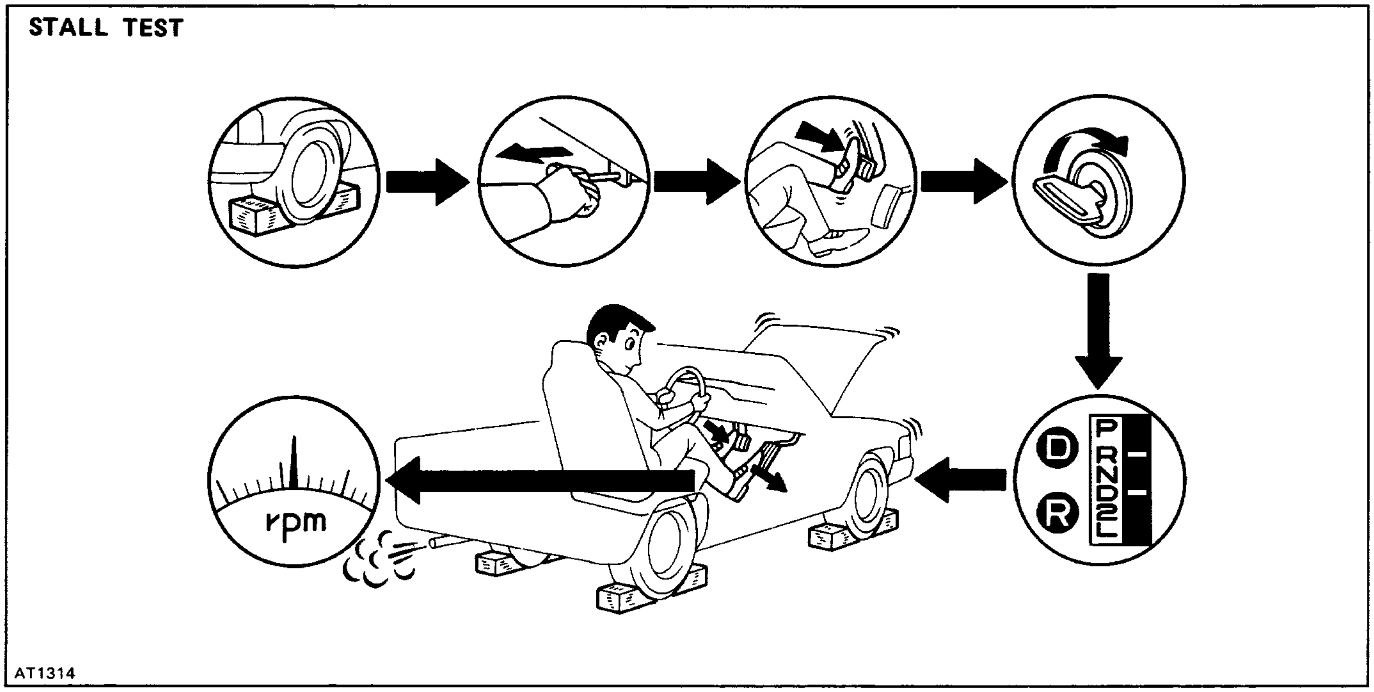
(a) If the stall speed is the same for both positions but lower than specified value:
Engine output may be insufficient
Stator one–way clutch is not operating properly

HINT: If more than 600 RPM below the specified value, the torque converter clutch could be faulty.

(b) If the stall speed in D position is higher than specified:
Line pressure too low
Forward clutch slipping
No.2 one–way clutch not operating properly
O/D one–way clutch not operating properly
Transfer direct clutch slipping

(c) If the stall speed in R position is higher than specified:
Line pressure too low
Direct clutch slipping
First and reverse brake slipping
O/D one–way clutch not operating properly
Transfer direct clutch slipping

(d) If the stall speed in both R and D positions are higher than specified:
Line pressure too low
Improper fluid level
O/D one–way clutch not operating properly
Transfer direct clutch slipping



TIME LAG TEST

When the shift lever is shifted while the engine is idling, there will be a certain time lapse or lag before the shock can be felt. This is used for checking the condition of the O/D direct clutch, forward clutch, direct clutch and first and reverse brake.

NOTICE:

Perform the test at normal operating fluid temperature (50–80•C or 122–176•F).

Be sure to allow one minute interval between tests.

Make three measurements and take the average value.

MEASURE TIME LAG

(a) Fully apply the parking brake.

(b) Shift the transfer shift lever to the H2 position.

(c) Start the engine and check the idle speed.

Idle speed: 850 RPM

(N position)

(d) Shift the shift lever from N to D position. Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.

Time lag: Less than 1.2 seconds

(e) In same manner, measure the time lag for N–R.

Time lag: Less than 1.5 seconds

EVALUATION

(a) If N–D time lag is longer than specified:

Line pressure too low

Forward clutch worn

O/D one–way clutch not operating properly

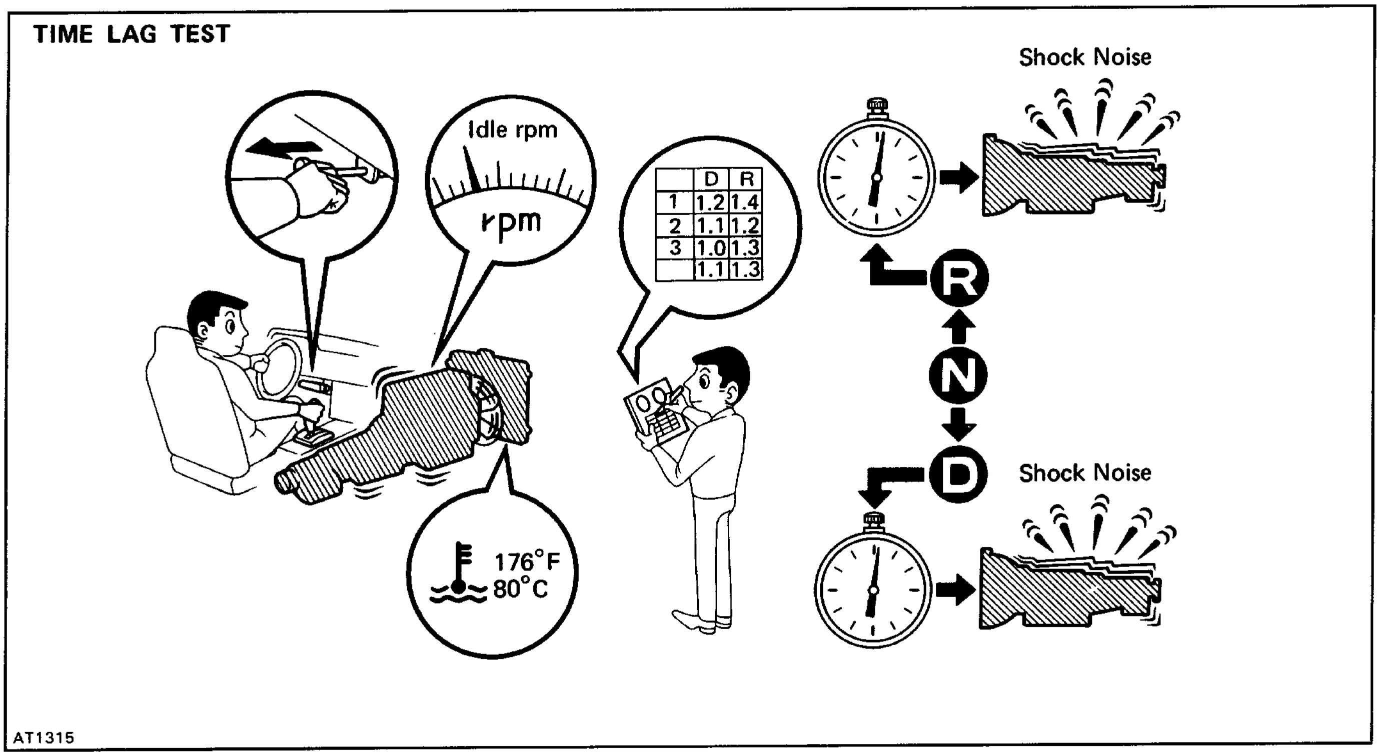
(b) If N–) R time lag is longer than specified:

Line pressure too low

Direct clutch worn

First and reverse brake worn

O/D one–way clutch not operating properly



HYDRAULIC TEST PREPARATION

(a) Warm up the transmission fluid.

(b) Remove the transmission case test plug and connect the hydraulic pressure gauge.
SST 09992–00094 (Oil pressure gauge)

NOTICE:

Perform the test at normal operating fluid temperature (50–80•C or 122–176•F).

The line pressure test should always be carried out in pairs. One should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test.

MEASURE LINE PRESSURE

(a) Fully apply the parking brake and check the four wheels.

(b) Start the engine and check idling RPM.

(c) Keep your left foot pressed firmly on the brake pedal and shift into D position.

(d) Measure the line pressure when the engine is idling.

(e) Press the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.

NOTICE: Release the accelerator pedal and stop test if the rear wheels begin to rotate before the en–
gine speed reaches specified stall speed.

(f) In the same manner, perform the test in R position.

kPa (kgf/cm2,psi)

D position		R position	
Idling	Stall	Idling	Stall
427 – 481 (4.3 – 4.9, 61 – 70)	1,118 – 1,363 (11.4 – 13.9, 162 – 198)	510 – 608 (5.2 – 6.2, 74 – 88)	1,373 – 1,716 (14.0 – 17.5, 199 – 249)

If the measured pressures are not up to specified values, recheck the throttle cable adjustment and perform a retest.

EVALUATION

(a) If the measured values at all positions are higher than specified:

Throttle cable out of adjustment
Throttle valve defective
Regulator valve defective

(b) If the measured values at all positions are lower than specified:

Throttle cable out of adjustment
Throttle valve defective
Regulator valve defective
Oil pump defective
O/D direct clutch defective
Transfer direct clutch defective (H2, H4)
Transfer front drive clutch defective (H4, L4)
Transfer low speed brake defective (L4)

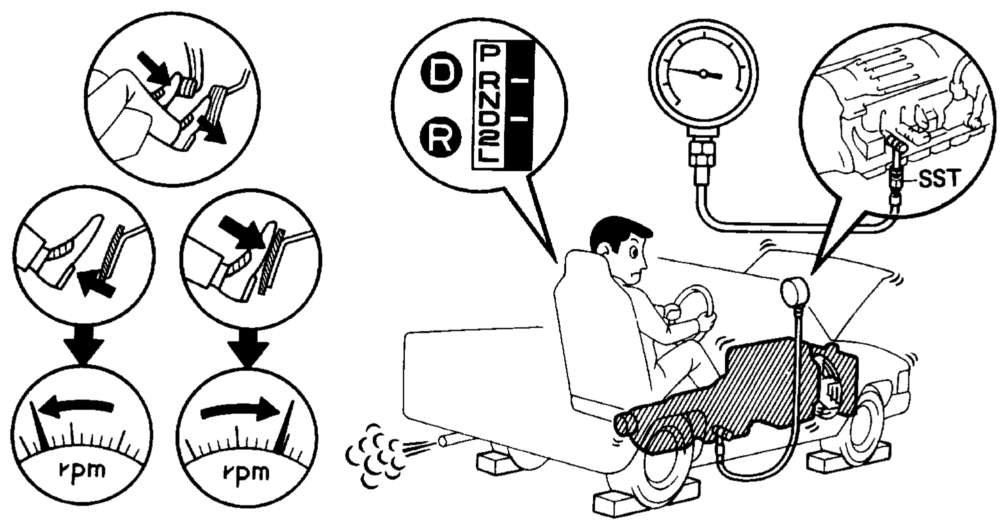
(c) If pressure is low in the D position only:

D position circuit fluid leakage
Forward clutch defective

(d) If pressure is low in the R position only:

R position circuit fluid leakage
Direct clutch defective
First and reverse brake defective

HYDRAULIC TEST



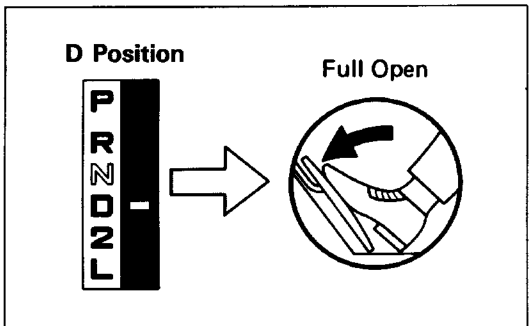
AT1316

ROAD TEST

NOTICE: Perform the test at normal operating fluid temperature (50–80•C or 122–176•F).

HINT: The transmission shift points for the H2, H4 and L4 transfer positions are different. Also, the O/D gear and lock–up are cancelled when L4 is engaged.

1. D POSITION TEST IN NORM AND PWR PATTERN POSITIONS



AT2818

Shift into the D position and hold the accelerator pedal constant at the full throttle valve opening position.

Check the following:

(a) 1–2, 2–3 and 3–O/D up–shifts should take place, and shift points should conform to those shown in the automatic shift schedule.
Conduct a test under both Normal and Power patterns.

HINT: There is no O/D up–shift or lock–up when the engine coolant temp. is below 70•C (158•F).

EVALUATION

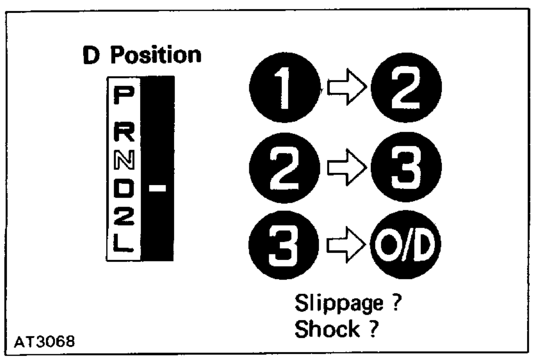
(1) If there is no 1–2 up–shift:
No. 2 solenoid is stuck
1–2 shift valve is stuck

(2) If there is no 2–3 up–shift:
No. 1 solenoid is stuck
2–3 shift valve is stuck

(3) If there is no 3–i O/D up–shift:
3–4 shift valve is stuck

(4) If the shift point is defective:
Throttle valve, 1–2 shift valve, 2–3 shift valve, 3–4 shift valve etc., are defective

(5) If the lock–up is defective:
Lock–up solenoid is stuck
Lock–up relay valve is stuck

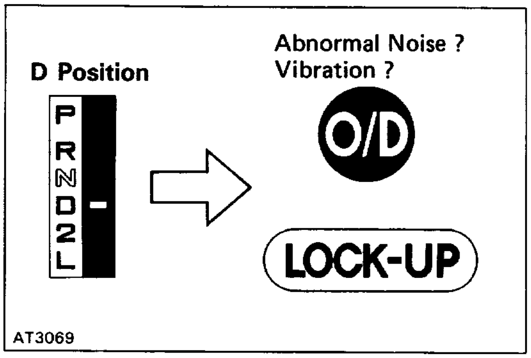


AT3068

(b) In the same manner, check the shock and slip at the 1–) 2, 2–i 3, and 3–O/D up–shifts

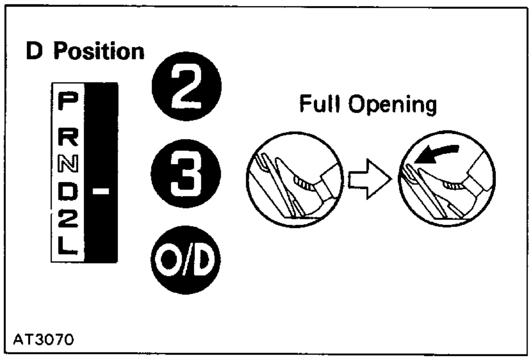
EVALUATION

If the shock is excessive:
Line pressure–is too high
Accumulator is defective
Check ball is defective



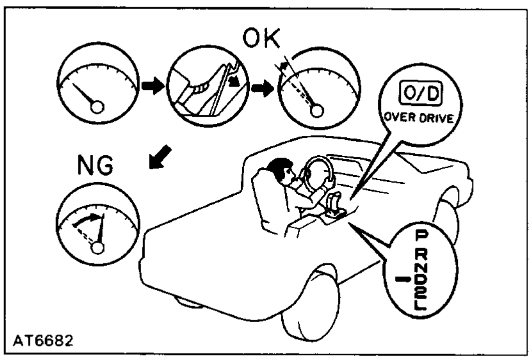
(c) Run at the D position lock–up or O/D gear and check for abnormal noise and vibration.

HINT: The check for the cause of abnormal noise and vibration must be made with extreme care as it could also
be due to loss of balance in the propeller shaft, differ- en–
tial, torque converter clutch, etc.



(d) While running in the D position, 2nd, 3rd and O/D gears, check to see that the possible kick–down ve– hicle speed limits for 2–1, 3–) 2 and O/D–3 kick–downs conform to those indicated on the auto– matic shift schedule.

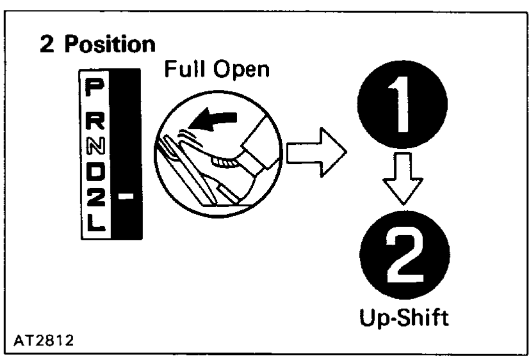
(e) Check for abnormal shock and slip at kick–down.

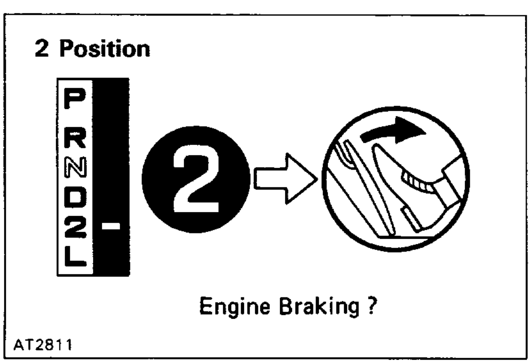


(f) Check for the lock–up mechanism.

(1) Drive in D position, O/D gear, at a steady speed (lock–up ON) of about 75 km/h (47 mph).

(2) Lightly depress the accelerator pedal and check that the engine RPM does not change abruptly. If there is a big jump in engine RPM, there is no lock–up.





2. 2 POSITION TEST

Shift into the 2 position and, while driving with the acceler– ator pedal held constantly at the full throttle valve open– ing position, push in one of the pattern selectors and check on the following points.

(a) Check to see that the 1–2 up–shift takes place and that the shift point conforms to it shown on the au– tomatic shift schedule.

HINT:

There is no O/D up–shift and lock–up in the 2 position.

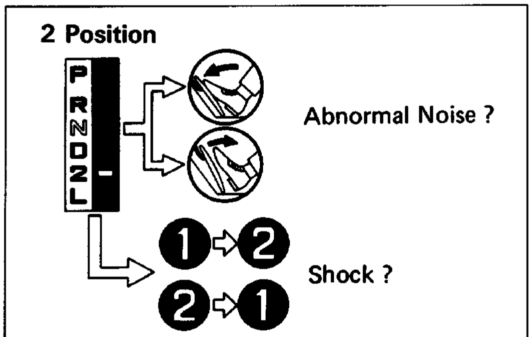
To prevent overrun, the transmission up–shifts into 3rd gear at around 100 km/h (62 mph) or more.

(b) While running in the 2 position and 2nd gear, release the accelerator pedal and check the engine braking effect.

EVALUATION

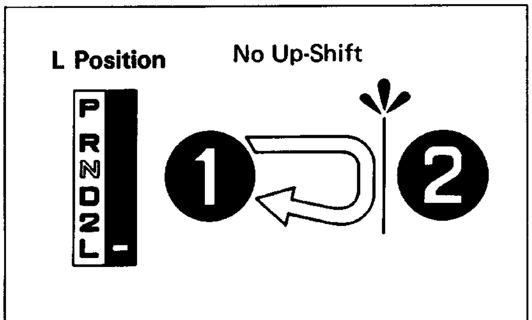
If there is no engine braking effect:

Second coast brake is defective



AT2809

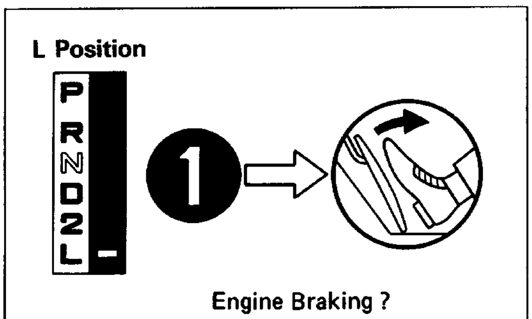
(c) Check for abnormal noise at acceleration and decel– eration, and for shock at up–shift and down–shift.



AT2808

3. L POSITION TEST

(a) While running in the L position, check to see that there is no up–shift to 2nd gear.



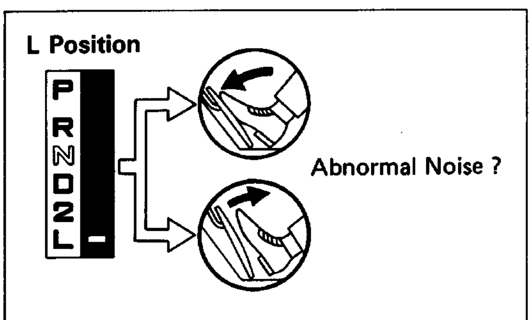
AT2807

(b) While running in the L position, release the accelera– tor pedal and check the engine braking effect.

EVALUATION

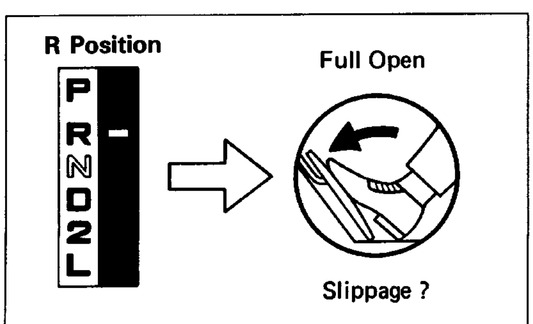
If there is no engine braking effect:

- First and reverse brake is defective



AT2806

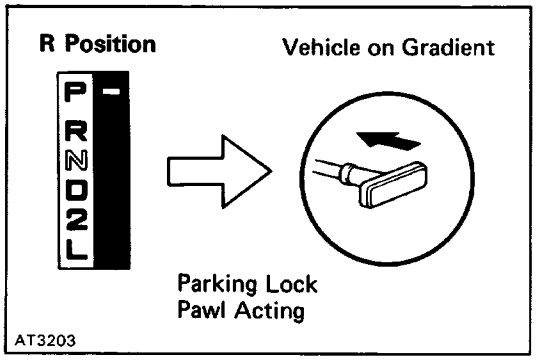
(c) Check for abnormal noise during acceleration and deceleration.



AT2805

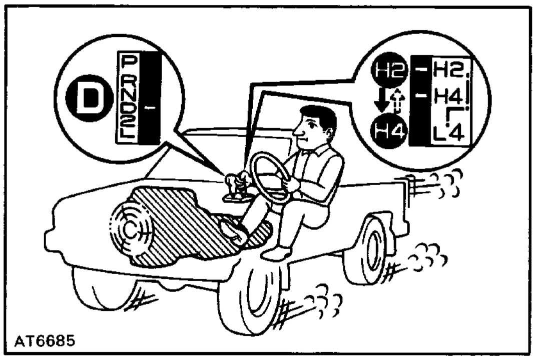
4. R POSITION TEST

Shift into the R position and, while starting at wide open throttle, check for slipping.



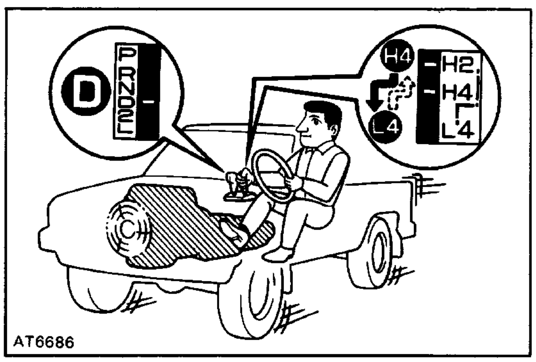
5. P POSITION TEST

Stop the vehicle on a gradient (more than 5•) and after shifting into the P position, release the parking brake. Then check to see that the parking lock pawl holds the vehicle in place.



6. TRANSFER TEST

(a) When the shift lever is shifted from the H2 to H4, confirm that the vehicle changes from 2 to 4 wheel drive. If it does not, the transfer is faulty.



(b) When the transfer lever is shifted from H4 to L4, confirm that the gear changes according to the shifted diagram (See page **AT–141**). If it does not, the No.4 solenoid, ECM or transfer faulty.

Automatic Shift Schedule

Transfer shift position "H2" or.."H4"		Throttle valve fully open ( ) Fully closed							km/h (mph)
		1→2	2→3	3→O/D	[3→O/D]	[O/D→3]	O/D→3	3→2	2→1
D position	NORM	50–53 (31–33)	90–96 (56–60)	131–138 (81–86)	35–39 (22–24)	21–25 (13–16)	125–132 (78–82)	84–91 (52–57)	40–44 (25–27)
	PW R	50–53 (31–33)	90–96 (56–60)	131–138 (81–86)	38–42 (24–26)	21–25 (13–16)	125–132 (78–82)	84–91 (52–57)	40–44 (25–27)
2 position	NORM PWR	43–46 (27–29)	103–109 (64–68)	–	–	–	–	97–103 (60–64)	38–42 (24–42)
L position	NORM PWR	–	–	–	–	–	–	82–89 (51–55)	47–51 (29–32)

Transfer shift position "H2" or "H4"		Throttle valve opening 5%			km/h (mph)		
		Lock–up ON			Lock–up OFF		
		2nd	*3rd	O/D	2nd	*3rd	O/D
D position	NORM	–	52 – 56 (32 – 35)	64 – 68 (40 – 42)	–	50 – 53 (31 – 33)	55 – 59 (34 – 37)
	PW R	–	52 – 56 (32 – 35)	64 – 68 (40 – 42)	–	50 – 53 (31 – 33)	55 – 59 (34 – 37)

* : O/D switch OFF

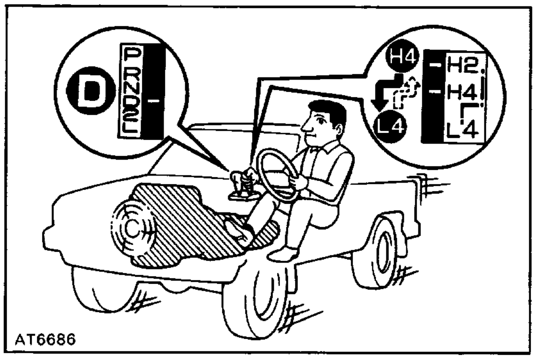
HINT:

(1) Lock–up will not occur–in 2nd gear unless the throttle valve opening is greater than 50%.

(2) There is no lock–up in the 2 and L positions.

(3) In the following cases, the lock–up will be released regardless of the lock–up pattern.

- When the throttle is completely closed.
- When the brake light switch is ON.



AT6686

TRANSFER HIGH–LOW SHIFT RANGE

The A340H transfer differs from previous manual trans– fer in that high–low shifting is possible while the vehicle is in motion, though it is not possible at all vehicle speeds or throttle opening angles. The shifting possibility ranges for high–low shifting have been adopted with the idea of im– proving shifting performance and transfer conditions, and preventing engine overrun.

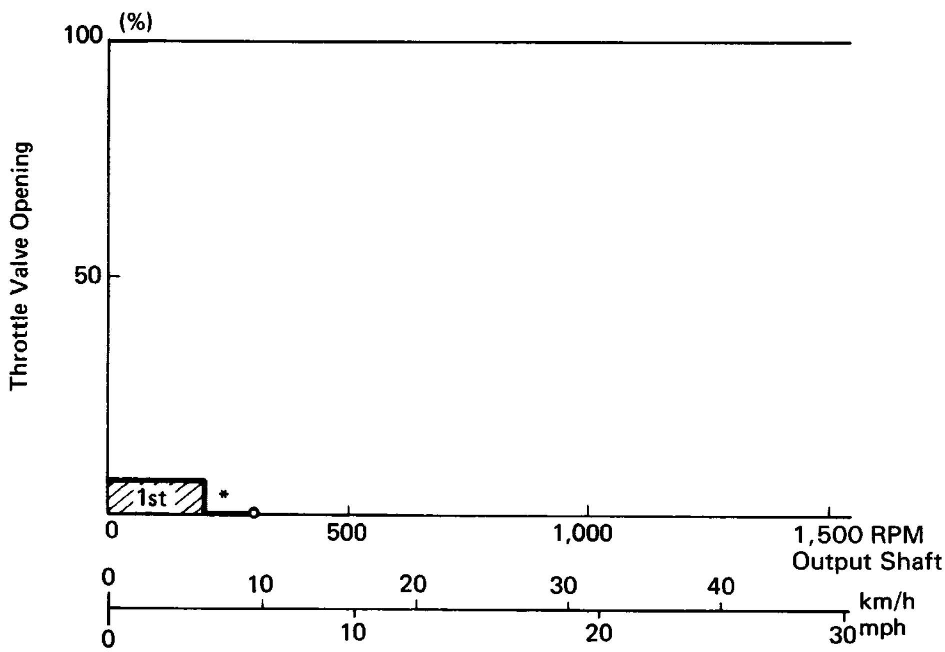
The shifting possibility ranges are controlled by ECM and when a high–low shift change is made within these ranges the ECM operates the No.4 solenoid which carries out the high–low transfer shift. However, if a transfer is attempted outside the shifting possibility range, the high–low shift will not take place until the vehicle speed and throttle opening angle come within the appropriate range. The high–low shifting possibility ranges are shown in the diagrams below.

There are three shifting possibility ranges for when the transmission gear is in first, second or third gear, which combine with the respective transmission shift positions (L, 2, D).

Although the high–) low shift takes place in the 1st gear, 2nd gear and 3rd gear shifting positions with the gears in 1st gear, 2nd gear and 3rd gear respectively, when a high–low shift change is made in 1st gear while in the 2nd gear shifting possibility range only after the transmission has shifted up into second gear does the high–low shift take place. In the 2 position and D position high–low shifting possibility ranges where the 1st and 2nd positions overlap, the high–low shift will take place in first gear if the transmission is in first gear, or in second gear if the transmission is in second gear.

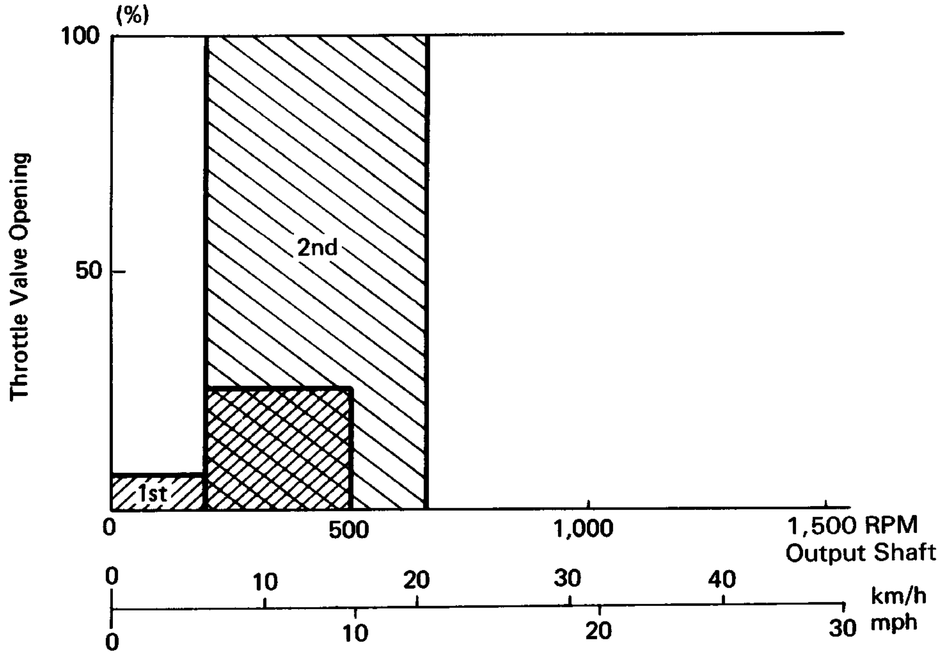
L Position: High–Low Shift Possibility Range

* : This transfer shift is only possible when the I D L contact points of the throttle position sensor are ON.



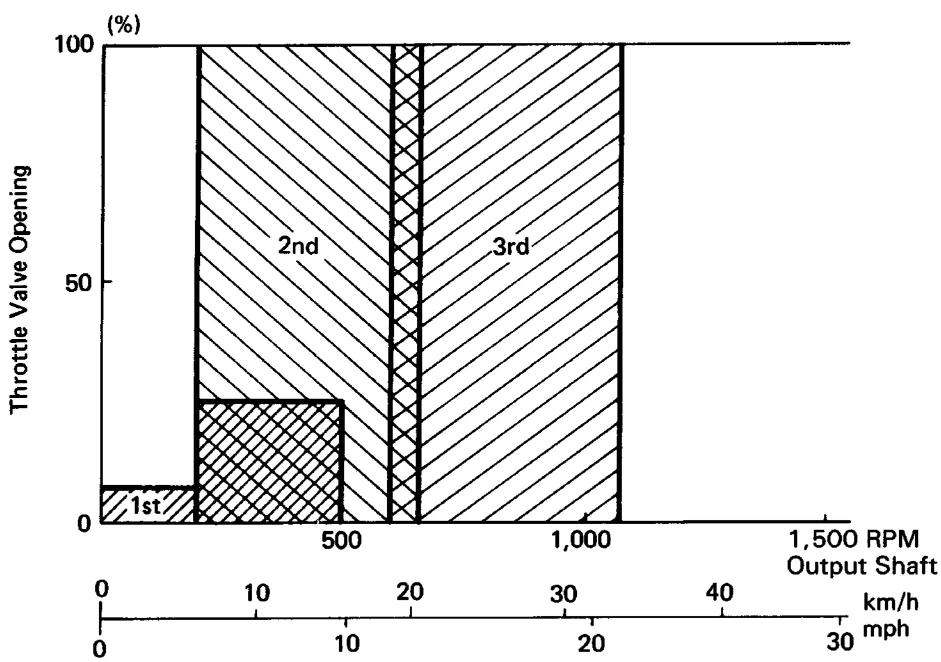
AT4662

2 Position: High–Low Shift Possibility Range



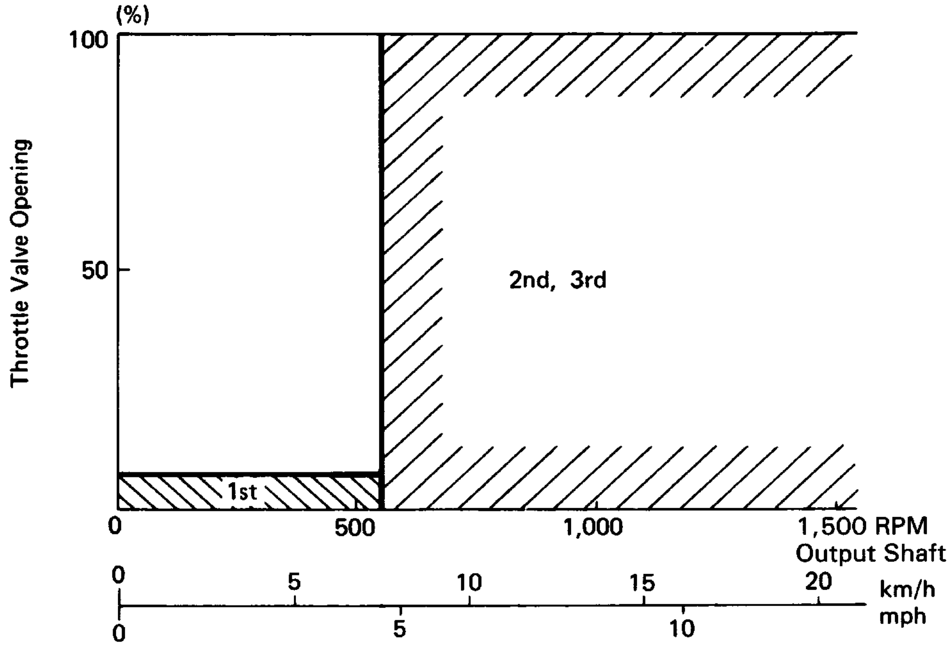
AT4663

D Position: High–Low Shift Possibility Range

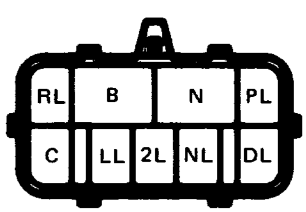


AT4664

Low–High Shift Possibility Range (L, 2, D Position)



AT4665



SH-9-2-A

Park Neutral Position Switch

INSPECTION OF PARK/NEUTRAL POSITION SWITCH

Inspect that there is continuity between each terminals.

Terminal / Shift Position	B	N	PL	RL	NL	DL	2L	LL	C
P	O	O	O						O
R				O					O
N	O	O			O				O
D						O			O
2							O		O
L								O	O

ON–VEHICLE REPAIR

Transmission Valve Body

REMOVAL OF VALVE BODY AND/OR SOLENOID VALVE

1. CLEAN TRANSMISSION EXTERIOR

To prevent contamination, clean the exterior of the trans–mission.

2. DRAIN TRANSMISSION FLUID

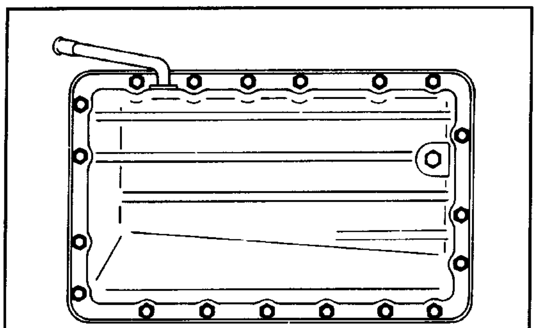
Remove the drain plug and drain the fluid into a suitable container.

3. REMOVE FRONT STABILIZER BAR

(See page SA–123)

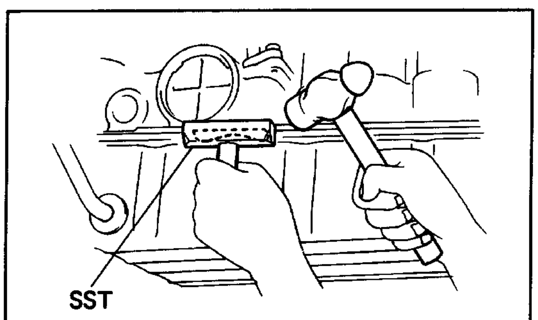
4. REMOVE FRONT PROPELLER SHAFT

(See page PR–4)


E7058

5. REMOVE TRANSMISSION OIL PAN

(a) Remove the nineteen bolts.

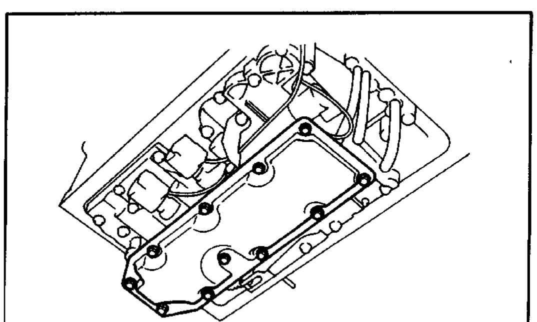


AT3168

(b) Install the blade of SST between the transmission case and oil pan, cut off applied sealer.
SST 09032–00100

NOTICE: Be careful not to damage the oil pan flange.

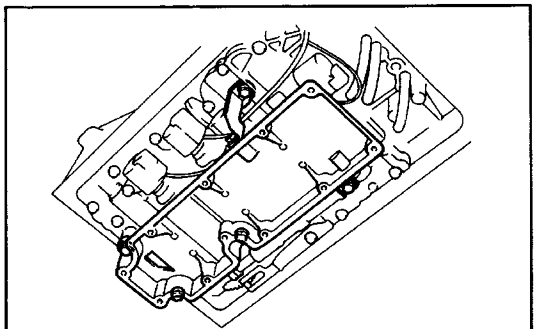
(c) Remove pan by lifting the transmission case.


AT4941

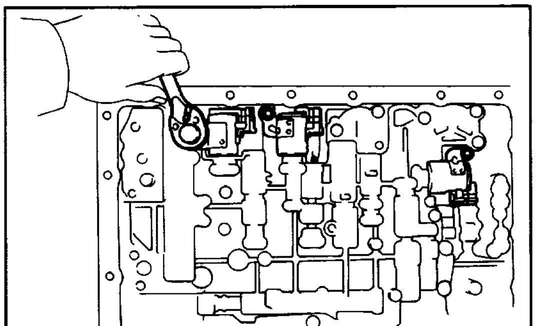
6. REMOVE OIL STRAINER AND GASKETS

(a) Remove the eleven bolts holding the oil strainer to the oil strainer case.

(b) Remove the oil strainer and gasket.

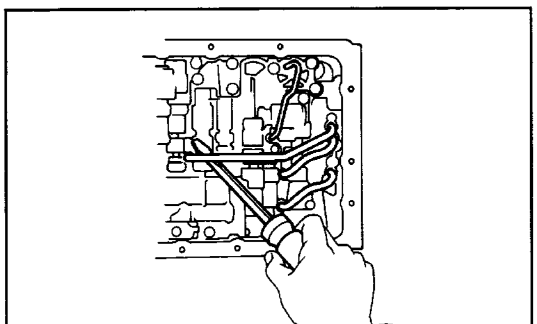

AT4940

(c) Remove the five bolts and oil strainer case.
(d) Remove the two gaskets from the case.


AT1355

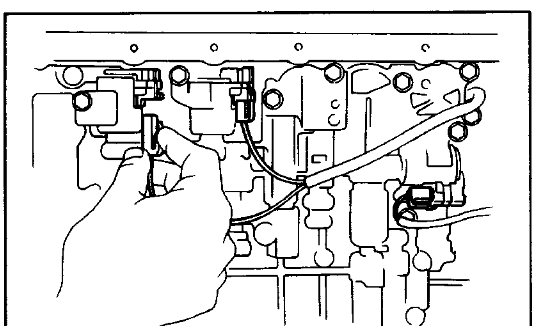
7. WHEN REPLACING SOLENOIDS

(a) Disconnect the connectors from the solenoids.
(b) Remove the solenoid mounting bolts.
(c) Remove the solenoids.


AT1353

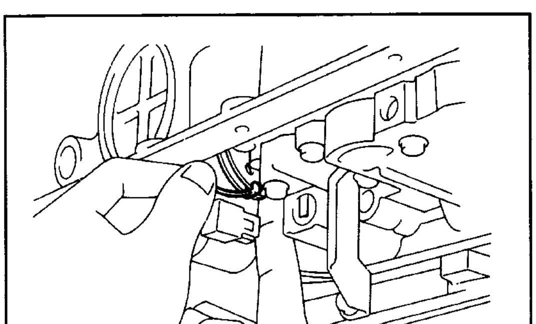
8. REMOVE OIL TUBES

Pry up both tube ends with a large screwdriver and re–move the three tubes.


AT1354

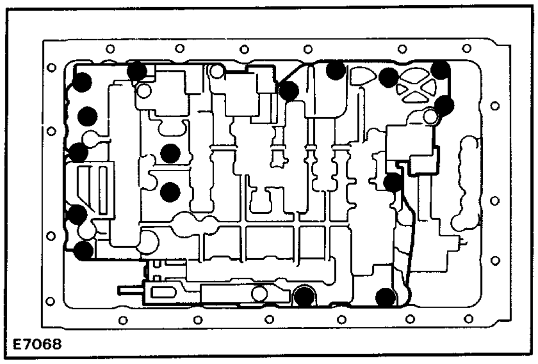
9. DISCONNECT SOLENOID CONNECTORS

Disconnect the three connectors from No.1, No. 2 and lock–up solenoids.

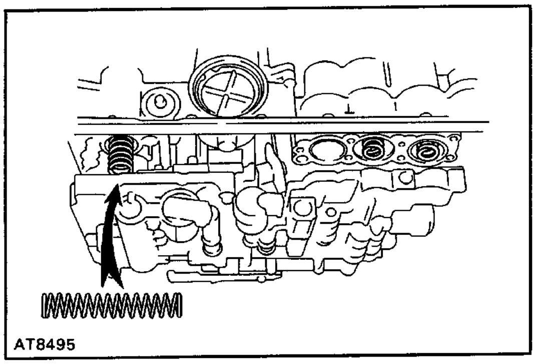

K8051

10. REMOVE VALVE BODY

(a) Disconnect the throttle cable from the cam.

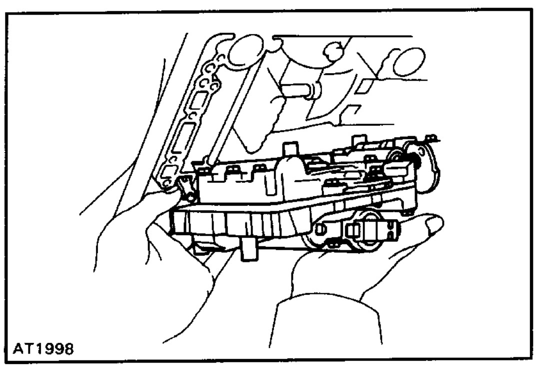


(b) Remove the sixteen bolts.



(c) Remove the two Co accumulator piston springs.
(d) Remove the valve body.

HINT: Be careful not to drop the check ball body and spring.

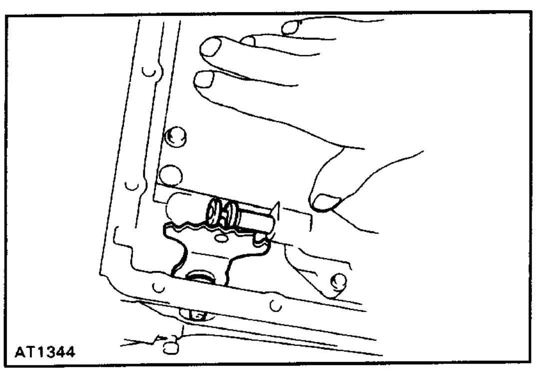


INSTALLATION OF VALVE BODY AND/OR SOLENOID VALVE

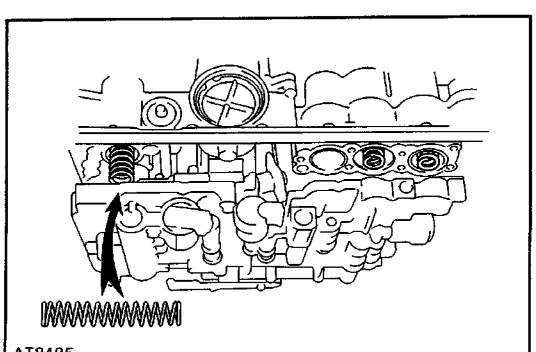
1. INSTALL VALVE BODY

(a) Install the valve body together the check ball body and spring.

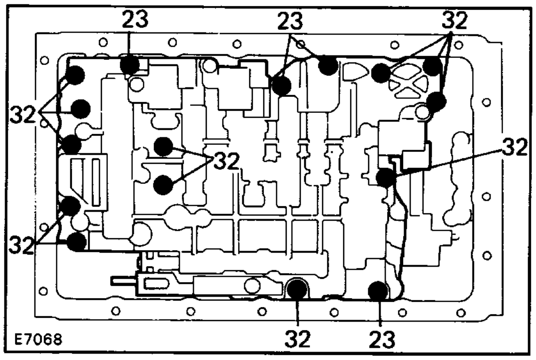
HINT: Align the groove of the manual valve to the pin of the lever.



(b) Align the groove of the manual valve to the pin of the lever.



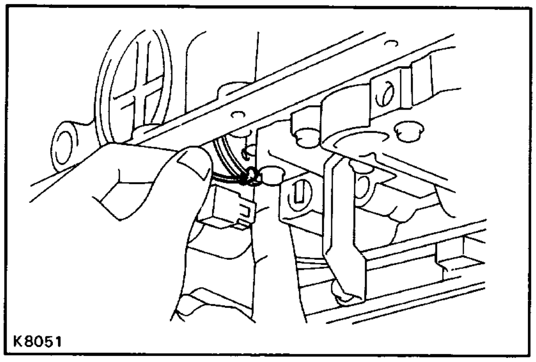
(c) Install the two Co accumulator piston springs.



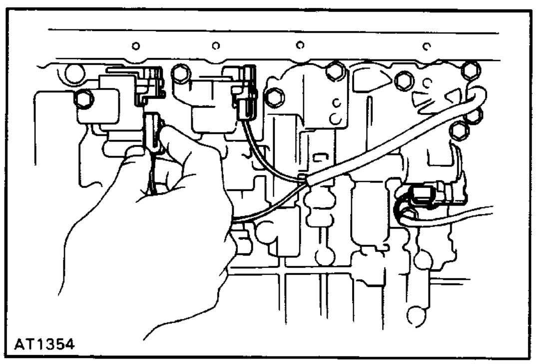
(d) Install the sixteen bolts.

HINT: Each bolt length (mm) is indicated in the figure.

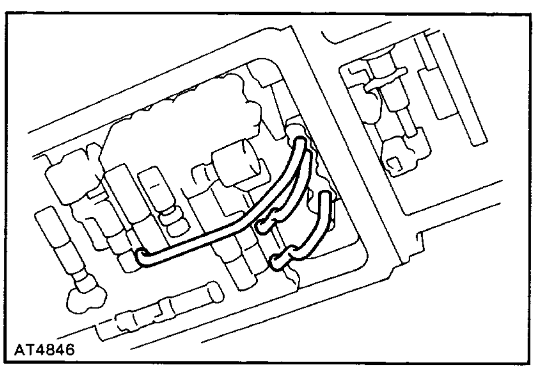
Torque: 10 N–m 0 00 kgf–cm, 7 ft–lbf)



(e) Connect the throttle cable to the cam.



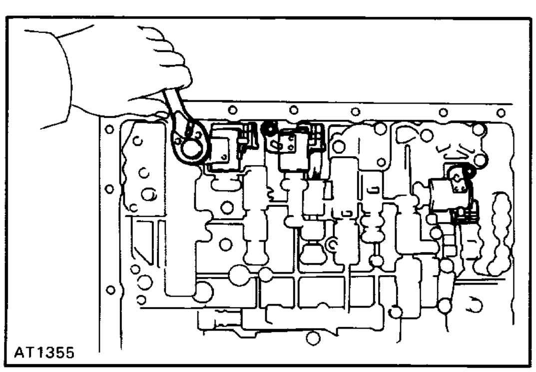
2. CONNECT CONNECTORS TO EACH SOLENOID



3. INSTALL OIL TUBES

Using a plastic hammer, install the three tubes into posi– tion shown in the figure.

NOTICE: Be careful not to bend or damage the tubes.

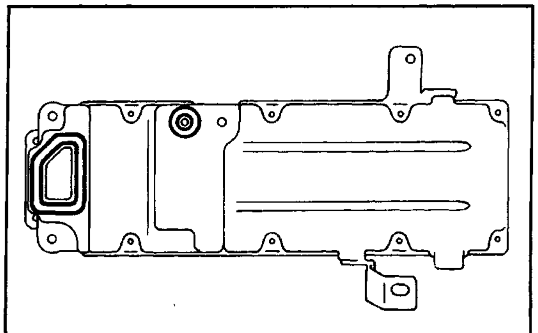


4. WHEN REPLACING SOLENOID

(a) Install a new 0–ring to the solenoid.
(b) Install the solenoid and torque the bolt.

Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)

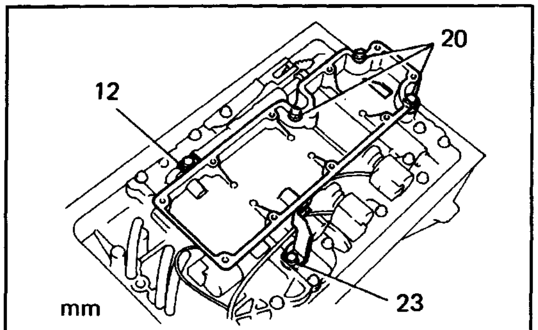
(c) Connect the connector to the solenoid.
(d) Clamp the solenoid wire.



E7258

5. INSTALL OIL STRAINER AND GASKETS

(a) Install two new gaskets to the oil strainer case.

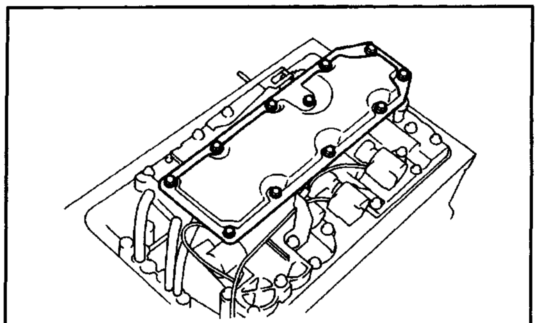


AT4940

(b) Install the oil strainer case and torque the five bolts.

Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)

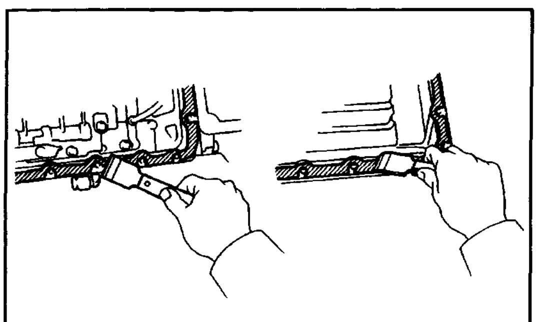
HINT: Each bolt length (mm) is indicated in the figure.



AT4941

(c) Install a new gasket to the oil strainer case.
(d) Install the oil strainer and torque the eleven bolts.

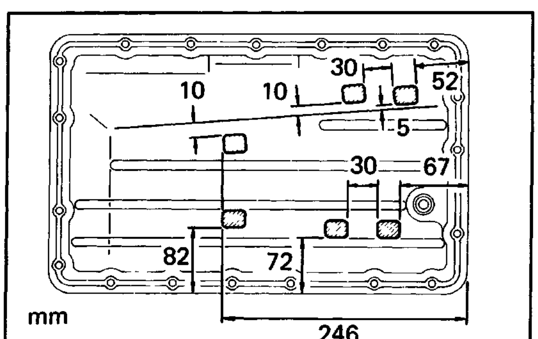
Torque: 6.9 N–m (70 kgf–cm, 61 in.–lbf)



AT1361

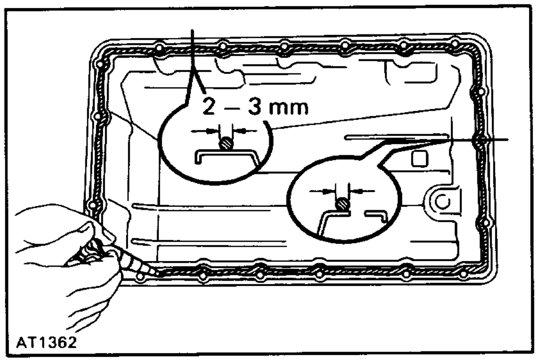
6. INSTALL OIL PAN

(a) Remove any packing material and be careful not to drop the oil on the contacting surfaces of the oil pan and transmission case.
(b) Clean contacting surfaces of any residual packing material using gasoline or alcohol.

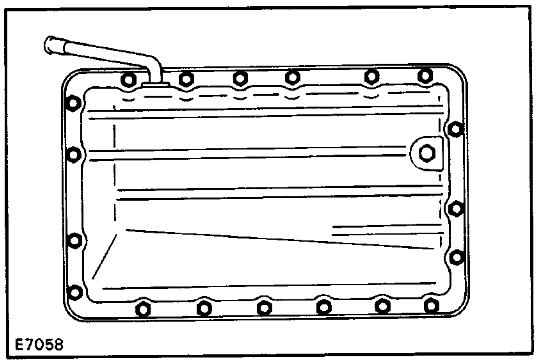


E7008

(c) Install the six magnets as shown in the figure.



(d) Apply seal packing to the oil pan as shown in the fig–ure.
Seal packing: Part No. 08826–00090, THREE BOND
1281 or equivalent



(e) Install and torque the nineteen bolts.

Torque: 7.4 N–m (75 kgf–cm, 61 in.¿lbf)

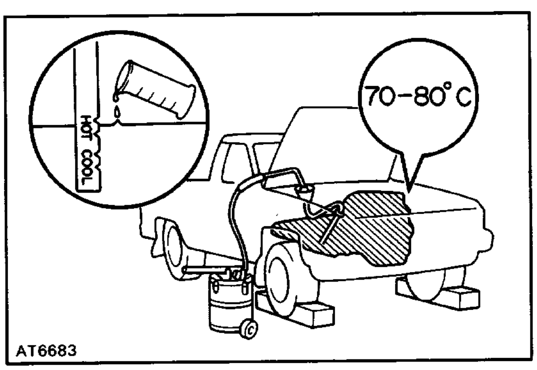
7. INSTALL OIL PAN DRAIN PLUG

Torque the drain plug.

Torque: 20 N–m (205 kgf–cm, 15 ft–lbf)

8. INSTALL FRONT PROPELLER SHAFT
(See page PR–4)

9. INSTALL FRONT STABILIZER BAR
(See page SA–123)



10. FILL TRANSMISSION WITH ATF
(See page AT–1 14)

NOTICE: Do not overfill.

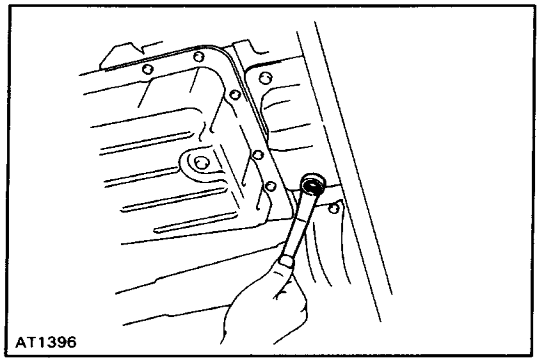
Fluid type: ATF DEXRONO• II

11. CHECK FLUID LEVEL

Transfer Valve Body

REMOVAL OF VALVE BODY AND/OR SOLENOID

VALVE

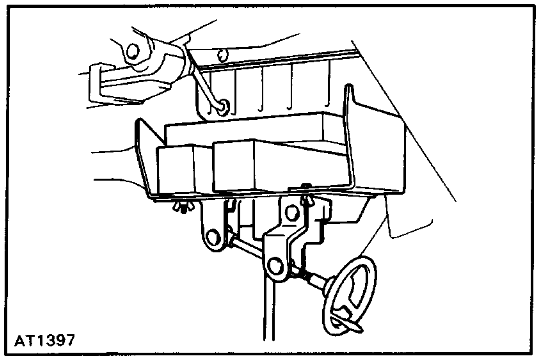

AT1396

1. CLEAN TRANSFER EXTERIOR

To prevent contamination, clean the exterior of the trans–fer.

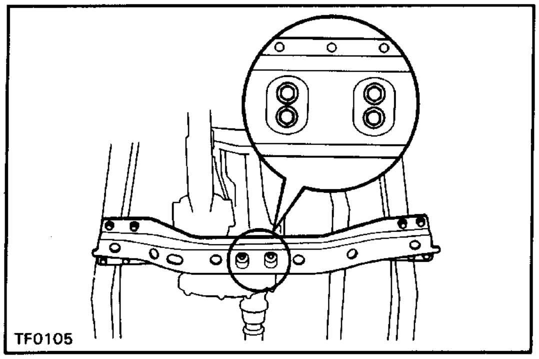
2. DRAIN TRANSFER CASE FLUID

Remove the drain plug and drain fluid into a suitable con–tainer.


AT1397

3. SUPPORT TRANSMISSION

Using a transmission jack, support the transmission.

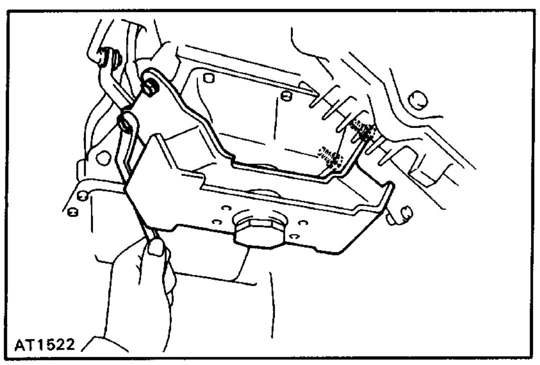

TF0105

4. REMOVE REAR SUPPORT MEMBER FROM SIDE FRAME

(a) Remove the four bolts from the engine rear mount–ing.

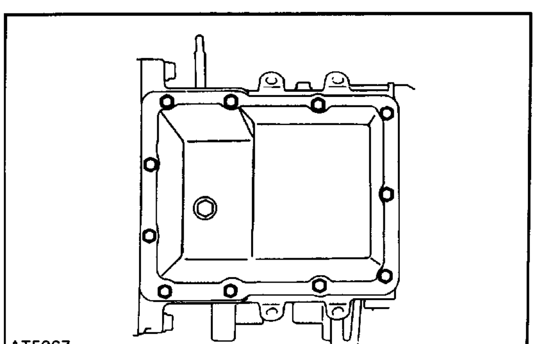
(b) Raise the transmission slightly with a jack.

(c) Remove the eight bolts from the side frame and re–move the rear support member.


AT1522

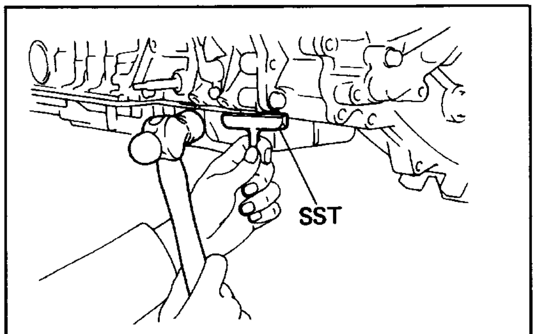
5. REMOVE MEMBER BRACKET FROM TRANSFER

Remove the four bolts and member bracket from the transfer.


AT5067

6. REMOVE TRANSFER OIL PAN

(a) Remove the eleven bolts.

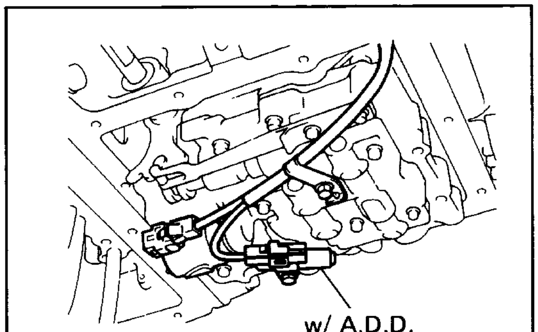


AT4906

(b) Install the blade of SST between the transfer case and oil pan, cut off applied sealer.
SST 09032–00100

NOTICE: Be careful not to damage the oil pan flange.

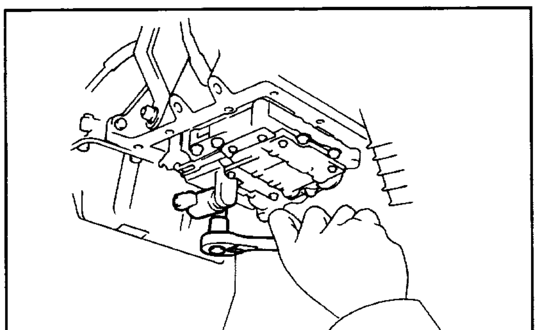
(c) Remove the transfer oil pan.



AT4907

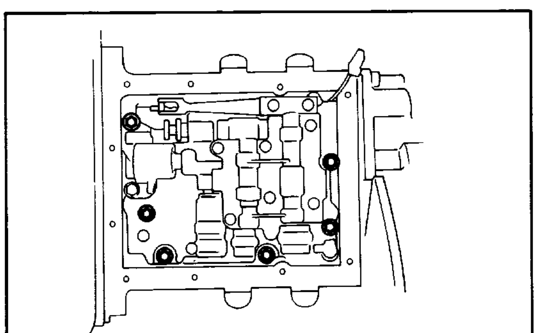
7. DISCONNECT SOLENOID CONNECTOR

Disconnect the connectors from No.4 solenoid and trans–fer pressure switch.


AT1526

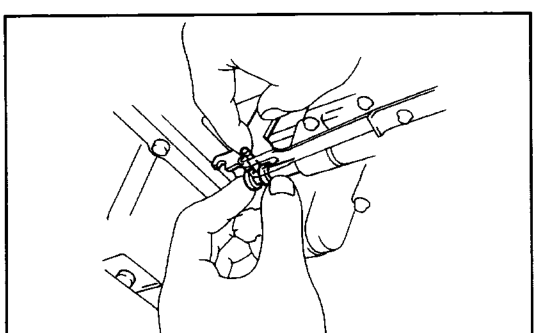
8. WHEN REPLACING SOLENOID

(a) Remove the solenoid mounting bolt.
(b) Remove the solenoid.


AT4280

9. REMOVE VALVE BODY

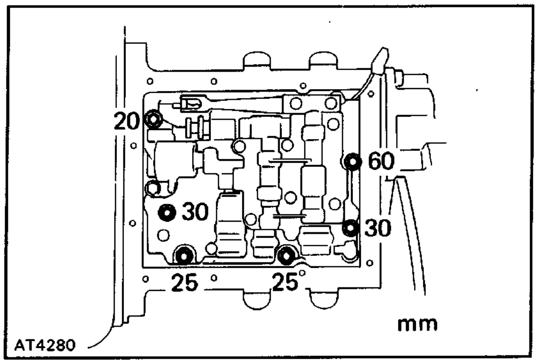
Remove the six bolts and valve body.


AT1527

INSTALLATION OF VALVE BODY AND/OR SOLENOID VALVE

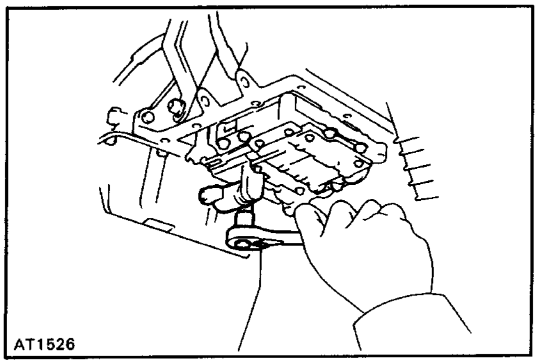
1. INSTALL VALVE BODY

(a) Align the manual valve lever with the manual valve.



(b) Install the bolts as shown. Torque the bolts evenly.

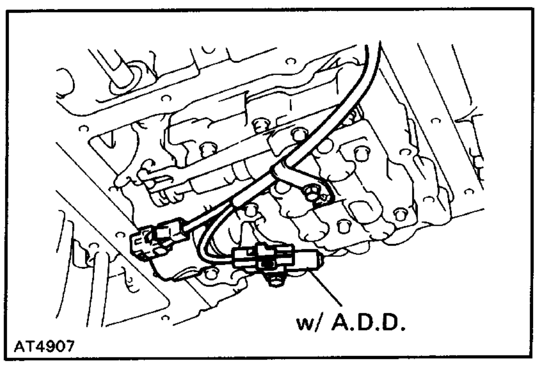
Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)



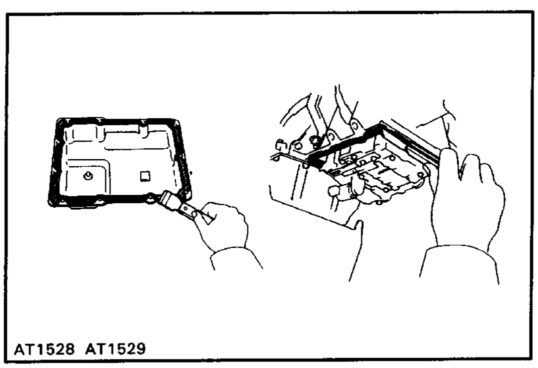
2. WHEN REPLACING SOLENOID

Install the solenoid and torque the bolt.

Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)



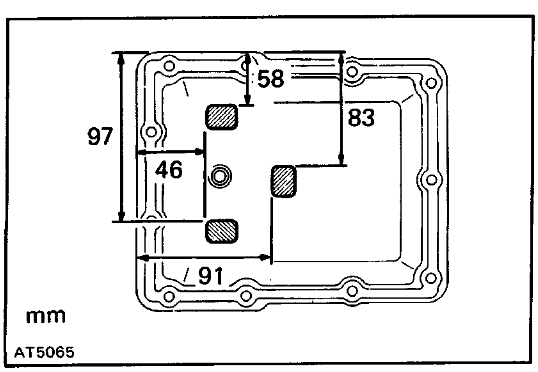
3. CONNECT CONNECTOR TO SOLENOID



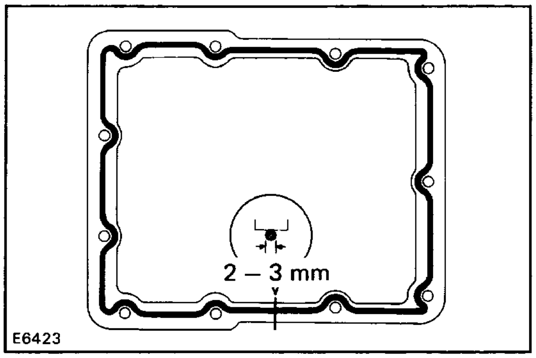
4. INSTALL TRANSFER OIL PAN

(a) Remove any packing material and be careful not to drop the oil on the contacting surfaces of the oil pan and transfer case.

(b) Clean contacting surfaces of any residual packing material, using gasoline or alcohol.

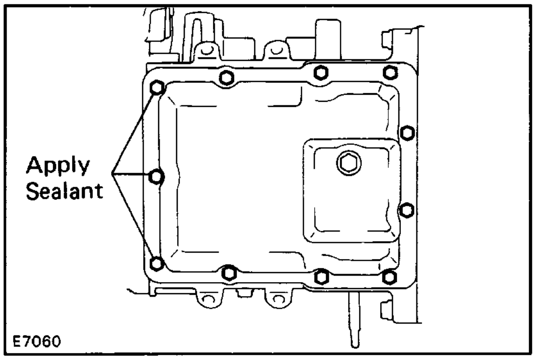


(c) Install the three magnets as shown in the figure.



(d) Apply seal packing to the oil pan as shown in the figure.

Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent



(e) Apply sealant to the threads of the three bolts.

Sealant: Part No. 08833–00070, THREE BOND 1324 or equivalent

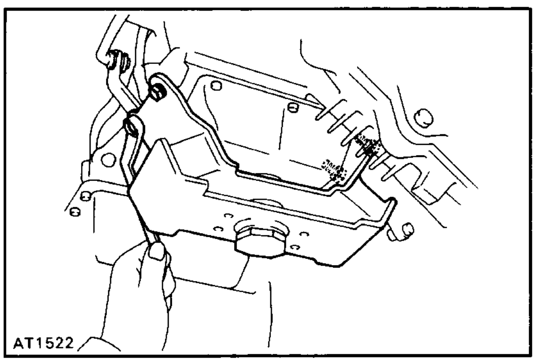
(f) Install the oil pan and torque the eleven bolts.

Torque: 7.4 N–m (75 kgf–cm, 65 in.–lbf)

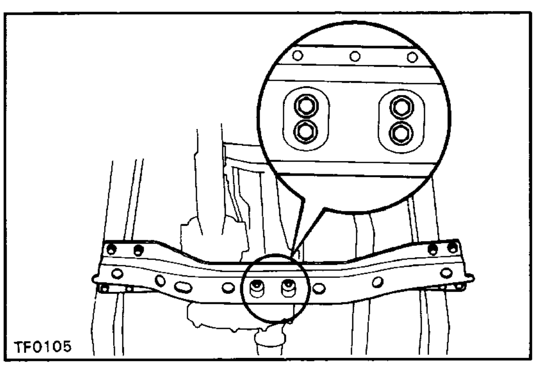
5. INSTALL DRAIN PLUG

Torque the drain plug

Torque: 20 N–m (205 kgf–cm, 15 ft–lbf)



6. INSTALL MEMBER BRACKET TO TRANSFER



7. INSTALL REAR SUPPORT MEMBER

(a) Raise the transmission slightly with a jack.

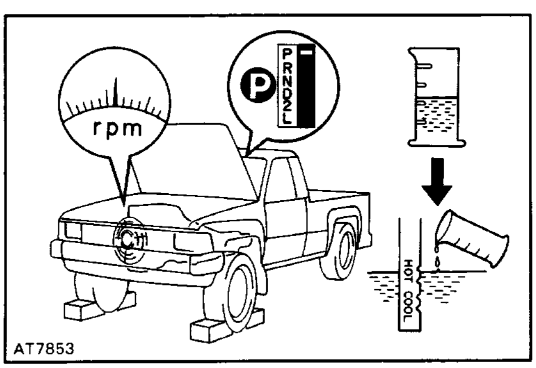
(b) Install the rear support member to the side frame with the bolts. Torque the bolts.

Torque: 95 N–m (970 kgf–cm, 70 ft–lbf)

(c) Lower the transmission and transfer.

(d) Install the four mounting bolts to the engine rear mounting. Torque the bolts.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



8. REMOVE TRANSMISSION JACK

9. FILL TRANSMISSION WITH ATF

(See page AT–115)

NOTICE: Do not overfill.

Fluid type: ATF DEXRON• II

10. CHECK FLUID LEVEL

Throttle Cable

REMOVAL OF THROTTLE CABLE

1. DISCONNECT THROTTLE CABLE FROM THROTTLE LINKAGE

2. DRAIN TRANSMISSION FLUID

Remove the drain plug and drain the fluid into a suitable container.

3. REMOVE FRONT STABILIZER BAR

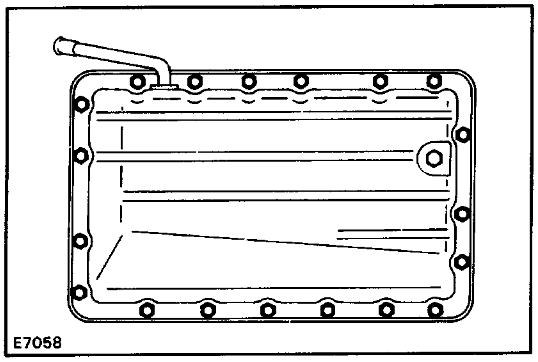
(See page SA–123)

4. REMOVE FRONT PROPELLER SHAFT

(See page PR–4)

5. REMOVE TRANSMISSION OIL PAN

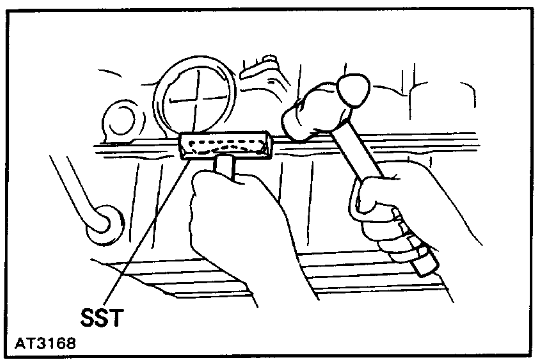
(a) Remove the nineteen bolts.



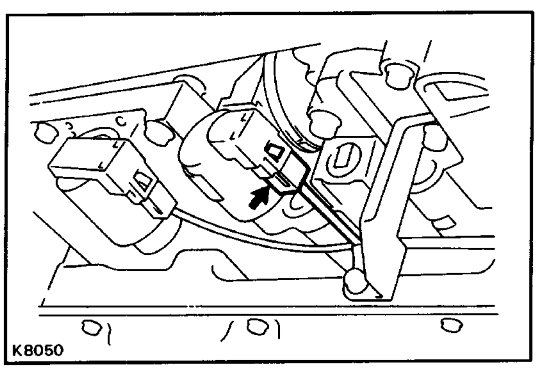
1bf Insert the blade of SST between the transmission case and oil pan, cut off applied sealer.
SST 09032–00100

NOTICE: Be careful not to damage the oil pan flange.

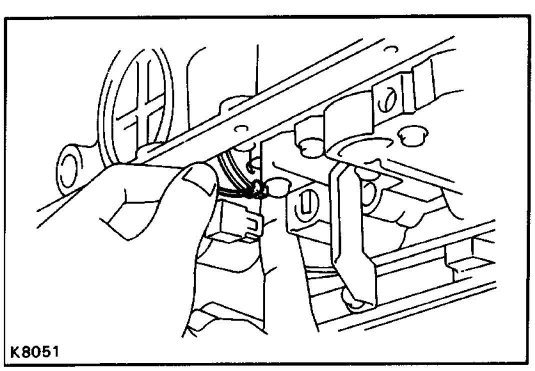
(c) Remove pan by lifting the transmission case.

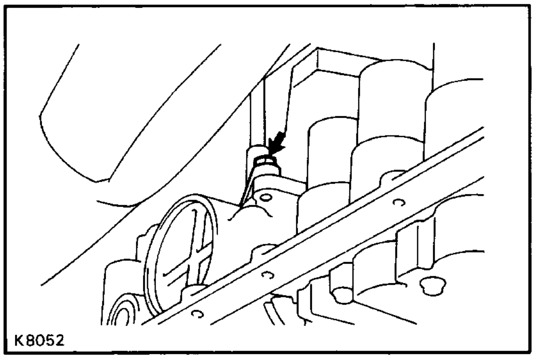


6. DISCONNECT SOLENOID CONNECTOR



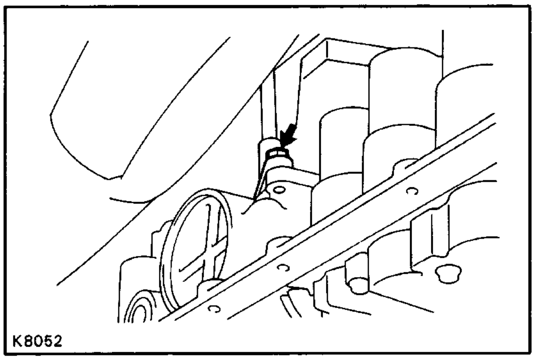
7. DISCONNECT THROTTLE CABLE FROM VALVE BODY





8. REMOVE THROTTLE CABLE

Remove the bolt and pull out the cable from the transmis–sion case.

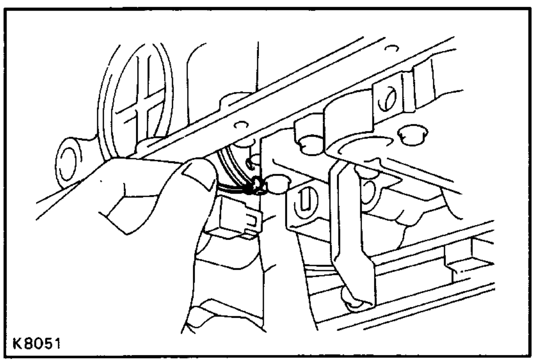


INSTALLATION OF THROTTLE CABLE

1. INSTALL CABLE INTO TRANSMISSION CASE

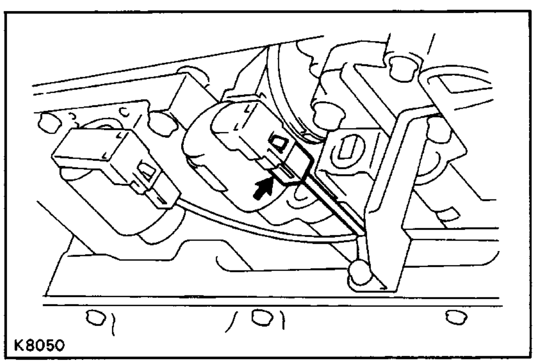
(a) Be sure to push it in all the way.

(b) Install the bolt.



2. CONNECT THROTTLE CABLE TO VALVE BODY

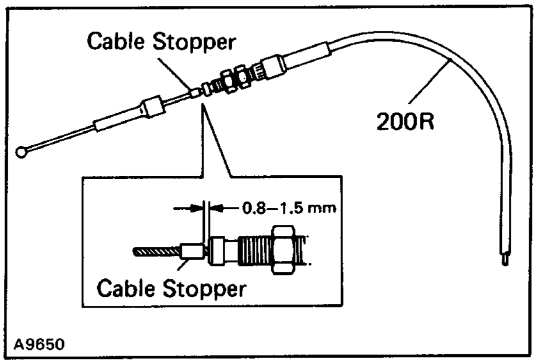
Connect throttle cable to the cam.



3. CONNECT SOLENOID CONNECTOR

4. INSTALL OIL PAN AND OIL PAN DRAIN PLUG

(See pages AT–150 and AT–151)



5. IF THROTTLE CABLE IS NEW, STAKE STOPPER ON INNER CABLE

HINT: New cable do not have a cable stopper staked.

(a) Bend the cable so there is a radius of about 200 mm (7.87 in.).

(b) Pull the inner cable lightly until a slight resistance is felt, and hold it.

(c) Stake the stopper, 0.8–1.5 mm (0.031–0.059 in.) from the end of outer cable.

6. INSTALL FRONT PROPELLER SHAFT
(See page PR–4)

7. INSTALL FRONT STABILIZER BAR
(See page SA–123)

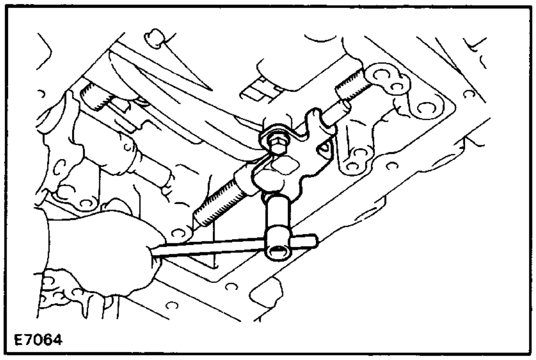
8. CONNECT THROTTLE CABLE TO THROTTLE LINKAGE

9. ADJUST THROTTLE CABLE
(See page AT–116)

10. FILL TRANSMISSION WITH ATF
(See page AT–115)

NOTICE: Do not overfill.
Fluid type: ATF DEXRON• II

11. CHECK FLUID LEVEL

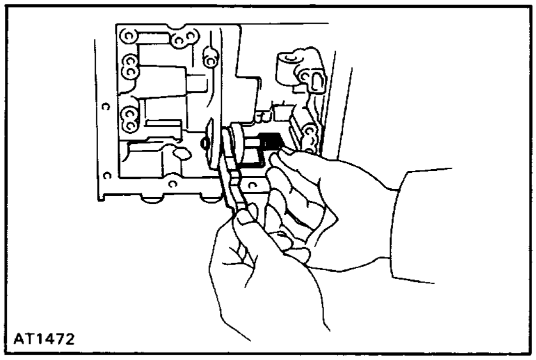

E7064

Parking Lock Pawl

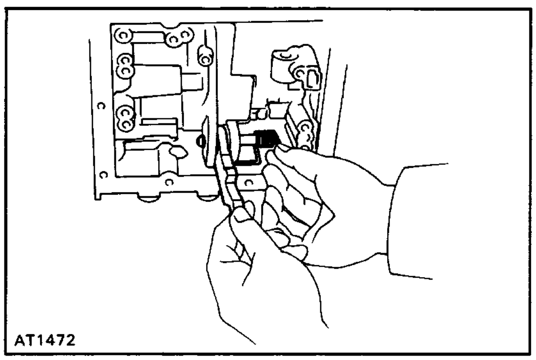
REMOVAL OF PARKING LOCK PAWL

1. REMOVE TRANSFER VALVE BODY
(See page AT–151)

2. REMOVE PARKING LOCK PAWL BRACKET
Remove the two bolts and bracket.

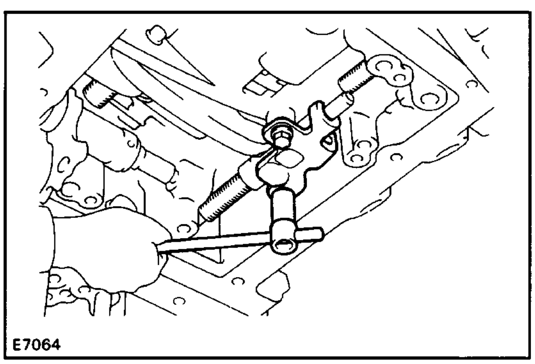

AT1472

3. REMOVE SPRING, SHAFT AND PARKING LOCK PAWL
Remove the spring, shaft and parking lock pawl.


AT1472

INSTALLATION OF PARKING LOCK PAWL

1. INSTALL PARKING LOCK PAWL, SHAFT AND SPRING
Install the parking lock pawl, shaft and spring.


E7064

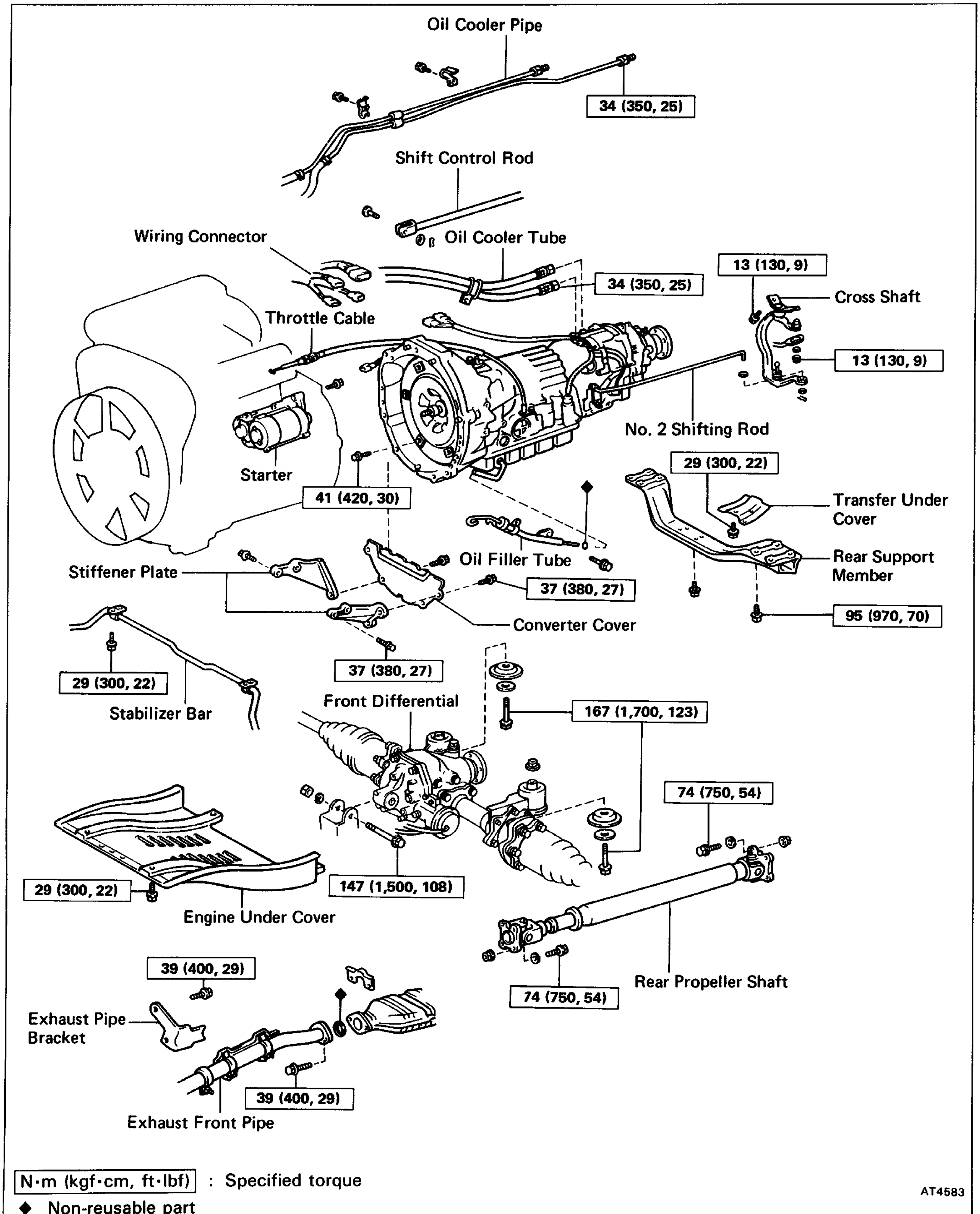
2. INSTALL PARKING LOCK PAWL BRACKET
(a) Install two bolts finger tight.
(b) Check that the parking lock pawl operates smoothly.
(c) Torque the bolts.

Torque: 6.9 N–m (70 kgf–cm, 61 in.¿lbf)

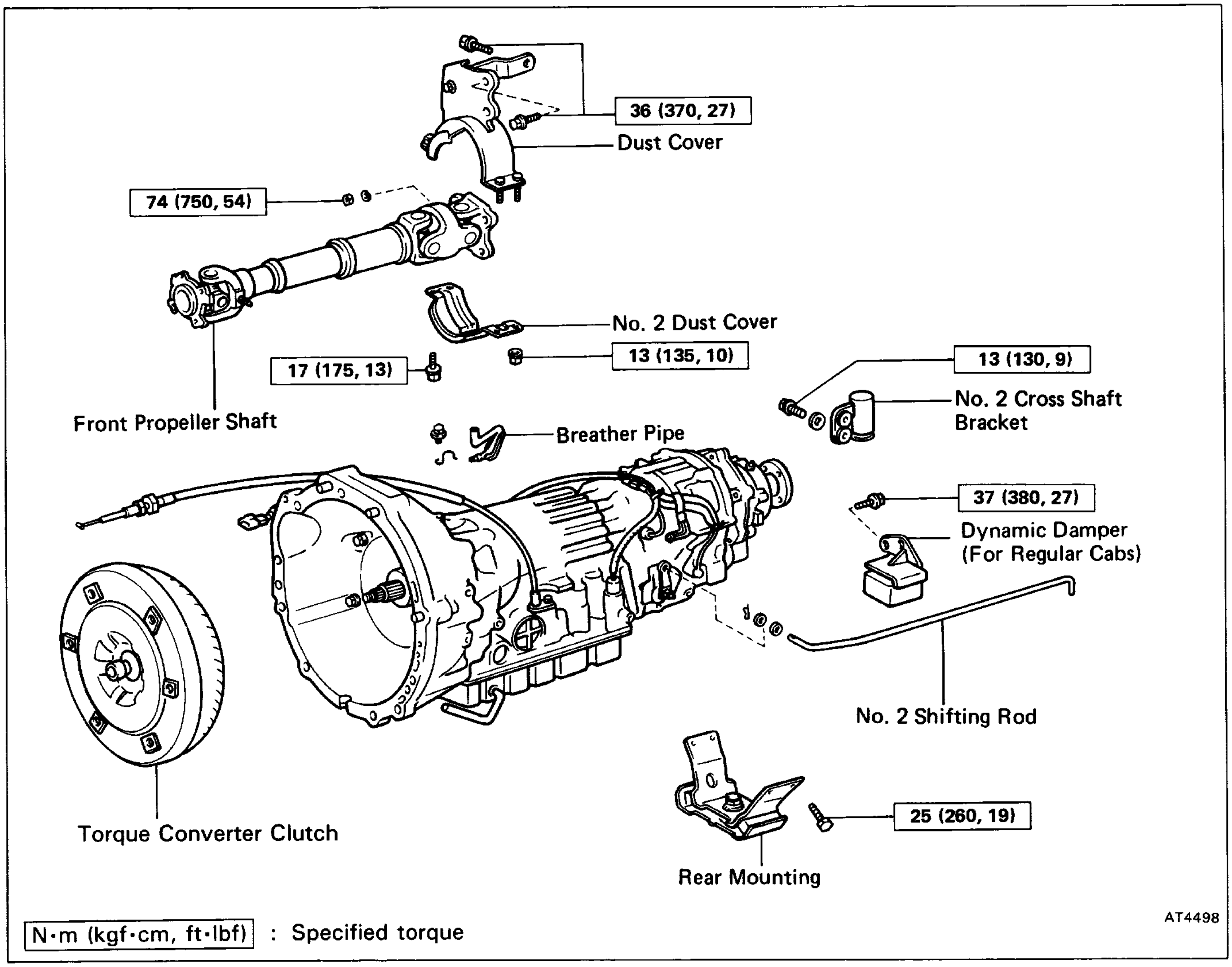
3. INSTALL TRANSFER VALVE BODY
(See page AT–152)

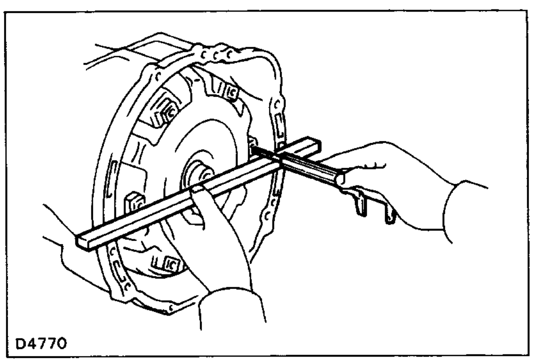
REMOVAL AND INSTALLATION OF TRANSMISSION

Remove and install the parts as shown.



(Cont'd)





(MAIN POINT OF INSTALLATION)

1. CHECK TORQUE CONVERTER CLUTCH INSTALLATION

Using calipers and a straight edge, measure from the in–stalled surface of the torque converter clutch to the front surface of the transmission housing.

Correct distance: 18.0 mm (0.709 in.)

If the distance is less than the standard, check for an im–proper installation.

2. ADJUST TRANSMISSION THROTTLE CABLE
(See page AT–116)

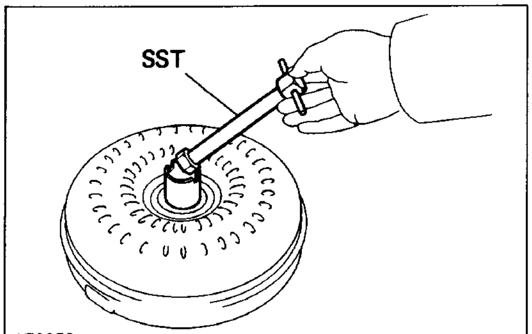
3. FILL TRANSMISSION WITH ATF AND CHECK FLUID LEVEL

Fluid type: ATF DEXRON• II

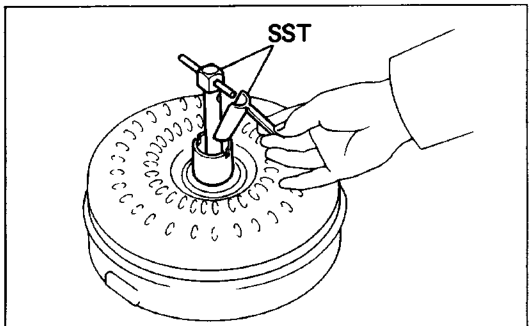
NOTICE: Do not overfill.

TORQUE CONVERTER CLUTCH AND DRIVE PLATE

INSPECTION OF TORQUE CONVERTER CLUTCH AND DRIVE PLATE



AT0952

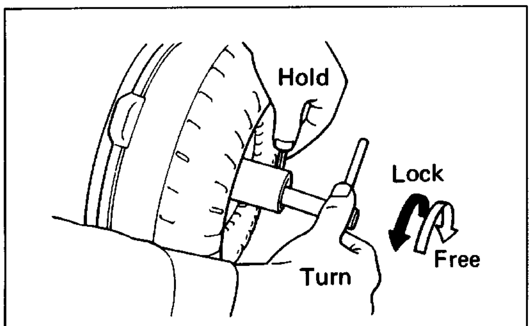


AT0953

1. INSPECT ONE–WAY CLUTCH

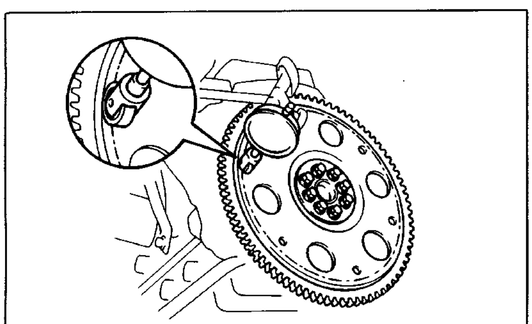
(a) Install SST into the inner race of the one–way clutch.
SST 09350–30020 (09351–32010)

(b) Install SST so that it fits in the notch of the con–verter hub and outer race of the one–way clutch.
SST 09350–30020 (09351–32020)



AT3306

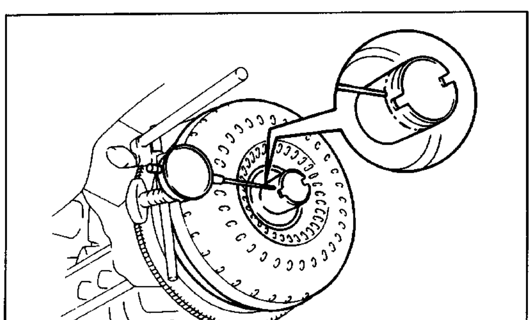
(c) With the torque converter clutch standing on its side, the clutch locks when turned counterclockwise, and rotates freely and smoothly clockwise.
If necessary, clean the converter and retest the clutch.
Replace the converter if the clutch still fails the test.


AT4570

2. MEASURE DRIVE PLATE RUNOUT AND INSPECT RING GEAR

Set up a dial indicator and measure the drive plate runout.
If runout exceeds 0.20 mm (0.0079 in.) or if the ring gear is damaged, replace the drive plate. If installing a new drive plate, note the orientation of spacers and tighten the bolts.

Torque: 83 N–m (850 kgf–cm, 61 ft–lbf)


AT4184

3. MEASURE TORQUE CONVERTER CLUTCH SLEEVE RUNOUT

(a) Temporarily mount the torque converter clutch to the drive plate. Set up a dial indicator.
If runout exceeds 0.30 mm (0.0118 in.), try to correct by reorienting the installation of the converter. If excessive runout cannot be corrected, replace the torque con–verter clutch.

HINT: Mark the position of the converter to ensure cor–rect installation.

(b) Remove the torque converter clutch.

MEMO

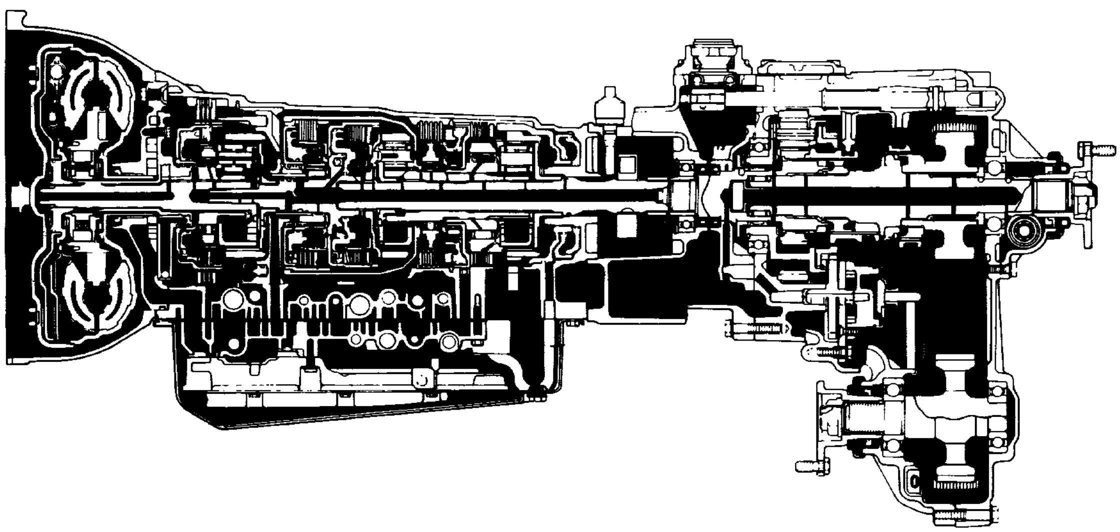
A340F Automatic Transmission

DESCRIPTION

GENERAL

The A340F automatic transmission is a four–speed automatic transmission with mechanically controlled 4WD transfer, developed with the aim of producing an easy–driving 4WD vehicle. The transmission section has fundamentally the same construction as the A340E automatic transmission mounted in the TRUCK 2WD. The operation of these is fully controlled by the ECM.
The A340F transmission is mainly composed of the torque converter clutch, the overdrive (hereafter called O/D) planetary gear unit, 3–speed planetary gear unit, the hydraulic control system and the electronic control system.

Sectional View



AT5774

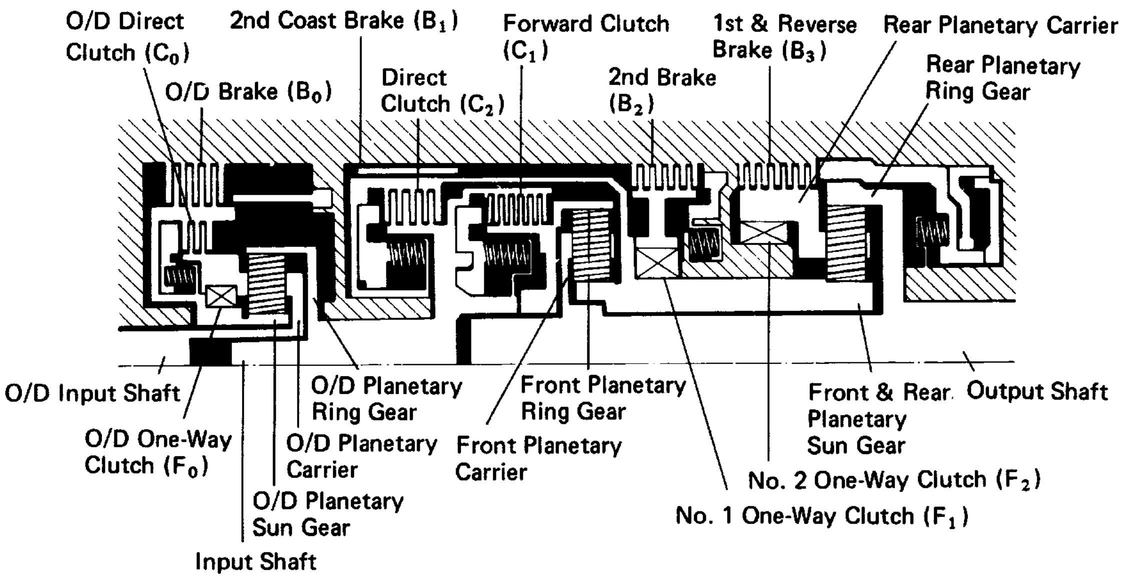
General Specifications

Type of Transmission			A340F
Type of Engine			22R-E
Torque Converter Clutch	Stall Torque Ratio		2.3 : 1
	Lock–Up Mechanism		Equipped
Gear Ratio	1 st Gear		2.804
	2nd Gear		1.531
	3rd Gear		1.000
	O/D Gear		0.705
	Reverse Gear		2.393
Plates (Disc/Plate)	C_0	O/D Direct Clutch	1/1
	C_1	Forward Clutch	4/4
	C_2	Direct Clutch	3/3
	B_2	2nd Brake	4/4
	B_3	1 st & Reverse Brake	5/5
	B_0	O/D Brake	3/2
ATF	Type		ATF DEXRON® II
	Capacity litter (US qts, Imp. qts)	Total	7.6 (8.0, 6.7)
		Drain and Refill	2.0 (2.1, 1.8)

OPERATION

Mechanical Operation

OPERATING CONDITIONS



AT2157

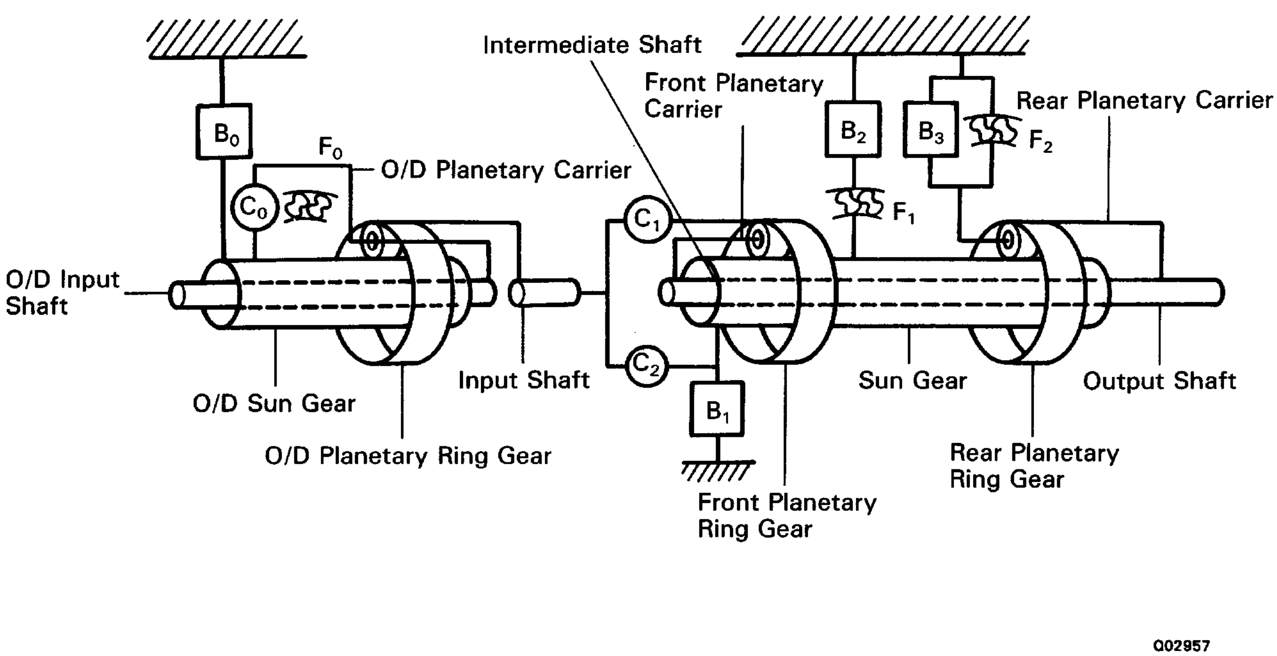
○ ..... Operating

Shift lever position	Gear position	C_0	C_1	C_2	B_0	B_1	B_2	B_3	F_0	F_1	F_2
P	Parking	○									
R	Reverse	○		○				○	○		
N	Neutral	○									
D	1st	○	○						○		○
	2nd	○	○				○		○	○	
	3rd	○	○	○			○		○		
	O/D		○	○	○		○				
2	1st	○	○						○		○
	2nd	○	○			○	○		○	○	
	3rd	○	○	○			○		○		
L	1st	○	○					○	○		○
	* 2nd	○	○			○	○		○	○	

* Down–shift only in the L position and 2nd gear–no up–shift.

FUNCTION OF COMPONENTS

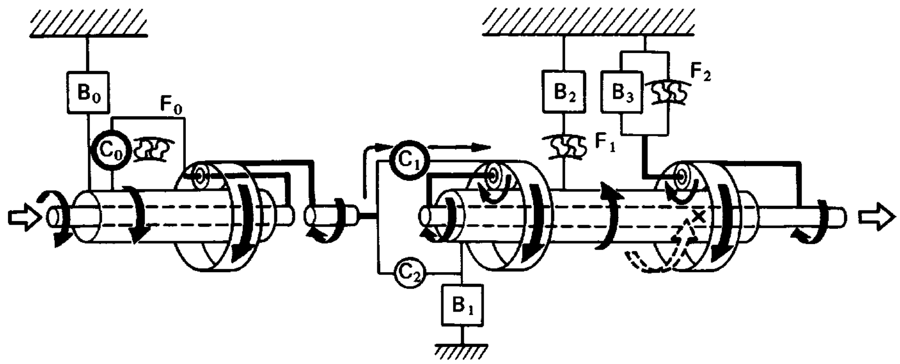
NOMENCLATURE	OPERATION
O/D Direct Clutch (Co)	Connects overdrive sun gear and overdrive carrier
O/D Brake (Bo)	Prevents overdrive sun gear from turning either clockwise or counterclockwise
O/D One–Way Clutch (Fo)	When transmission is being driven by engine, connects overdrive sun gear and overdrive carrier
Forward Clutch (Cl)	Connects input shaft and front planetary ring gear
Direct Clutch (C2)	Connects input shaft and front & rear planetary sun gear
2nd Coast Brake (Bl)	Prevents front & rear planetary sun gear from turning either clockwise or counterclockwise
2nd Brake (B2)	Prevents outer race of F, from turning either clockwise or counterclockwise, thus preventing front & rear planetary sun gear from turning counterclockwise
1 st & Reverse Brake (B3)	Prevents rear planetary carrier from turning either clockwise or counterclockwise
No. 1 One–Way Clutch (Fl)	When B2 is operating, prevents front & rear planetary sun gear from turning counterclockwise
No.2 One–Way Clutch 1F21	Prevents rear planetary carrier from turning counterclockwise



FUNCTION OF COMPONENTS (Cont'd)

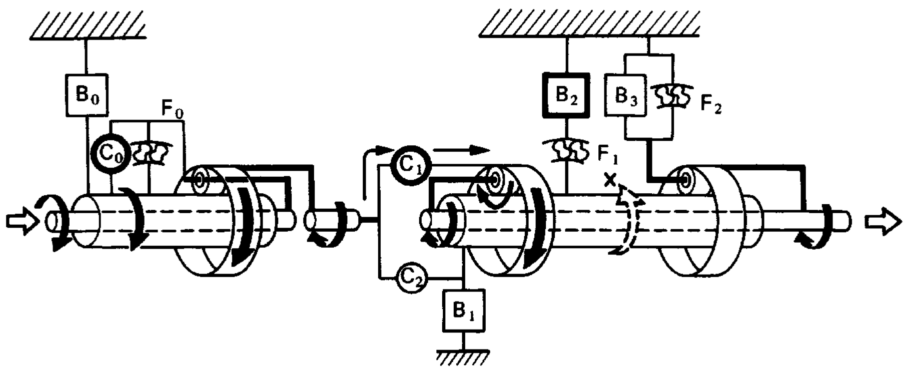
The conditions of operation for each gear position are shown in the following illustrations:

D or 2 Position 1st Gear



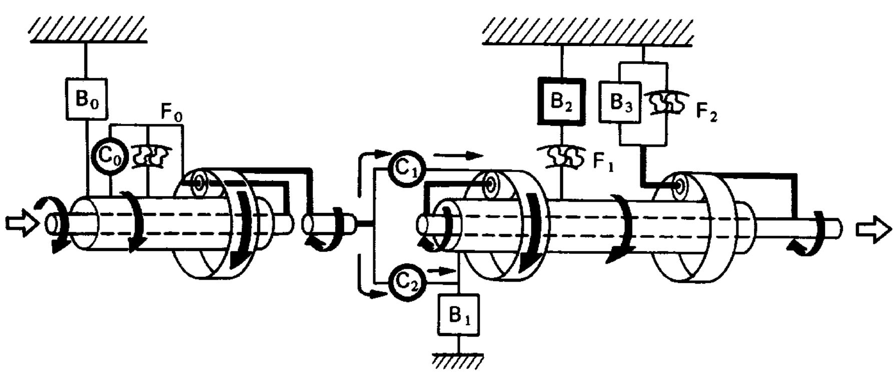
AT6675

D Position 2nd Gear



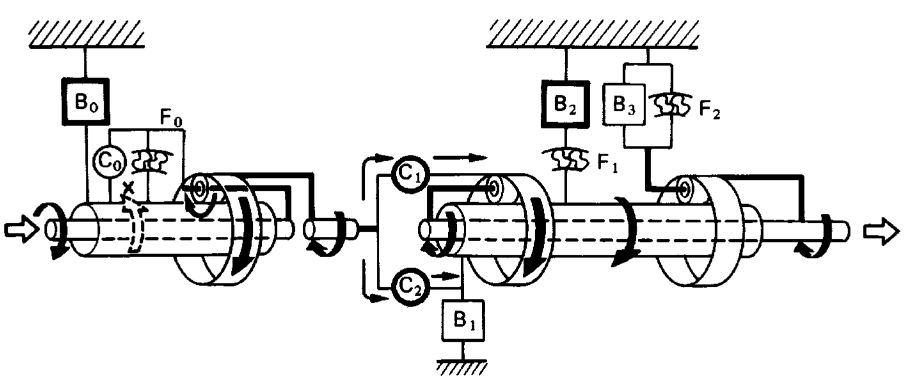
AT6676

D or 2 Position 3rd Gear



AT6677

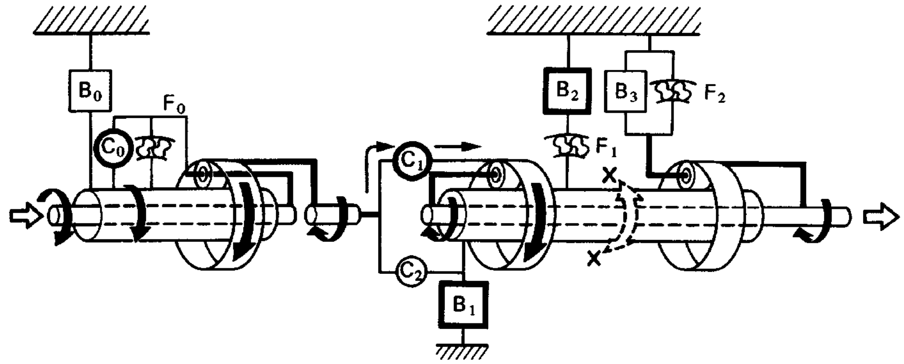
D Position O/D



AT6678

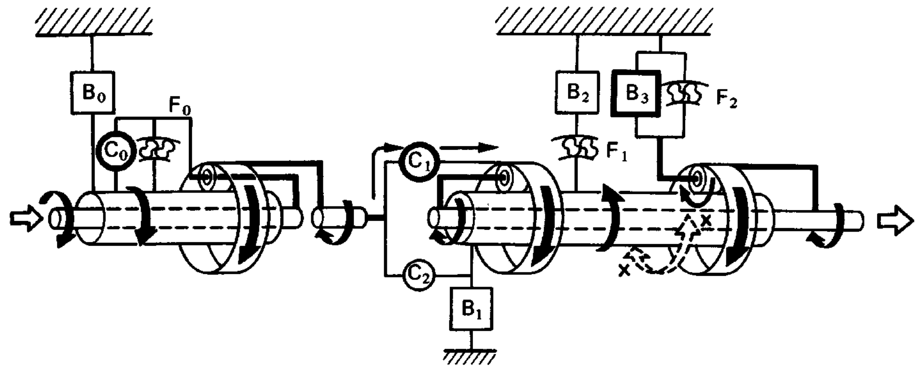
FUNCTION OF COMPONENTS (Cont'd)

2 or L Position Gear



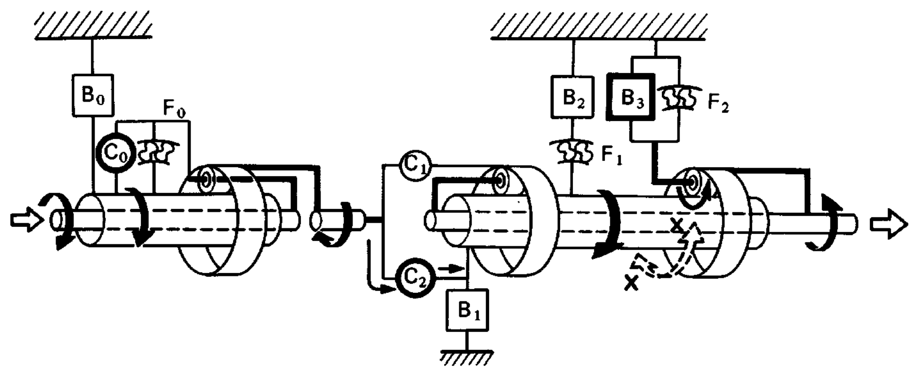
AT6679

L Position 1st Gear



AT6680

R Position Reverse Gear



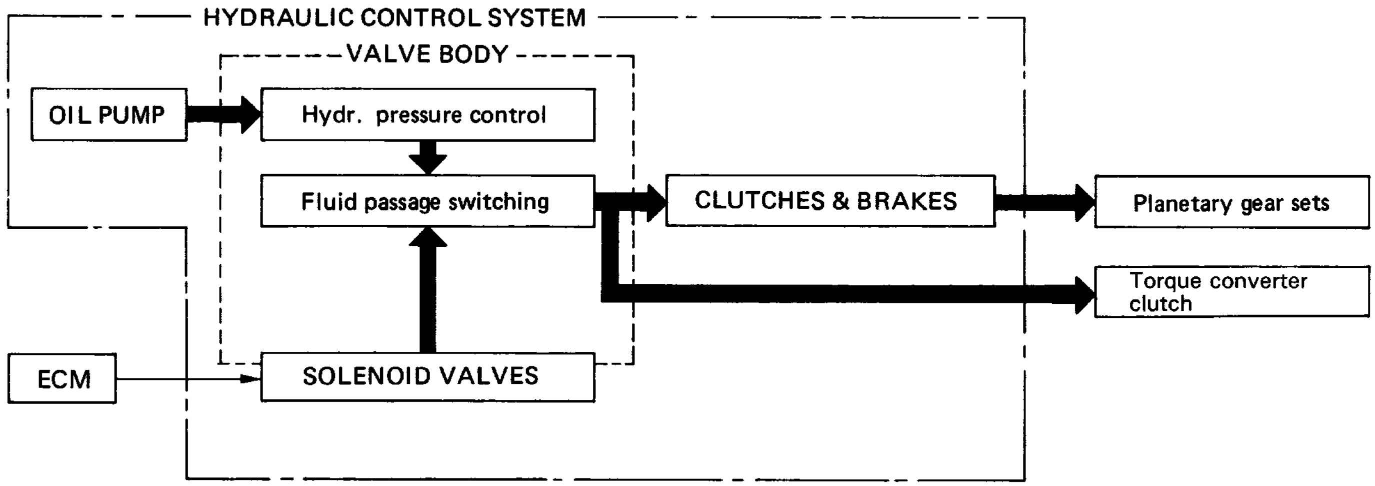
AT6681

HYDRAULIC CONTROL SYSTEM

The hydraulic control system is composed of the oil pump, the valve body, the solenoid valves, and the clutches and brakes, as well as the fluid passages which connect all of these components. Based on the hydraulic pressure created by the oil pump, the hydraulic control system governs the hydraulic pressure acting on the torque converter clutch, clutches and brakes in accordance with the vehicle driving condi–tions.

There are three solenoid valves on the valve body. These solenoid valves are turned on the off by signals from the ECM to operate the shift valves. These shift valves then switch the fluid passages so that fluid goes to the torque converter clutch and planetary gear units.

(Except for the solenoid valves, the hydraulic control system of the electronic controlled transmission is ba–
sically the same as that of the fully hydraulic controlled automatic transmission.)



- **LINE PRESSURE**
  Line pressure is the most basic and important pressure used in the automatic transmission, because it is used to operate all of the clutches and brakes in the transmission.
  If the primary regulator valve does not operate correctly, line pressure will be either too high or too low. Line pressure that is too high will lead to shifting shock and consequent engine power loss due to the greater effort required of the oil pump; line pressure that is too low will cause slippage of clutches and brakes, which will, in extreme cases, prevent the vehicle from moving. Therefore, if either of these problems are noted, the line pressure should be measured to see if it is within stan–dard.
- **THROTTLE PRESSURE**
  Throttle pressure is always kept in accordance with the opening angle of the engine throttle valve. This throttle pressure acts on the primary regulator valve and, accordingly, line pressure is regulated in response to the throttle valve opening.
  In the fully hydraulic controlled automatic transmission, throttle pressure is used for regulating line pressure and as signal pressure for up–shift and down–shift of the transmission. In the electronic controlled transmission, however, throttle pressure is used only for regulating line pressure. Conse–quently, improper adjustment of the transmission throttle cable may result in a line pressure that is too high or too low. This, in turn, will lead to shifting shock or clutch and brake slippage.

ELECTRONIC CONTROL SYSTEM

The electronic control system, which controls the shift points and the operation of the lock–up clutch, is composed of the following three parts:

1. Sensors

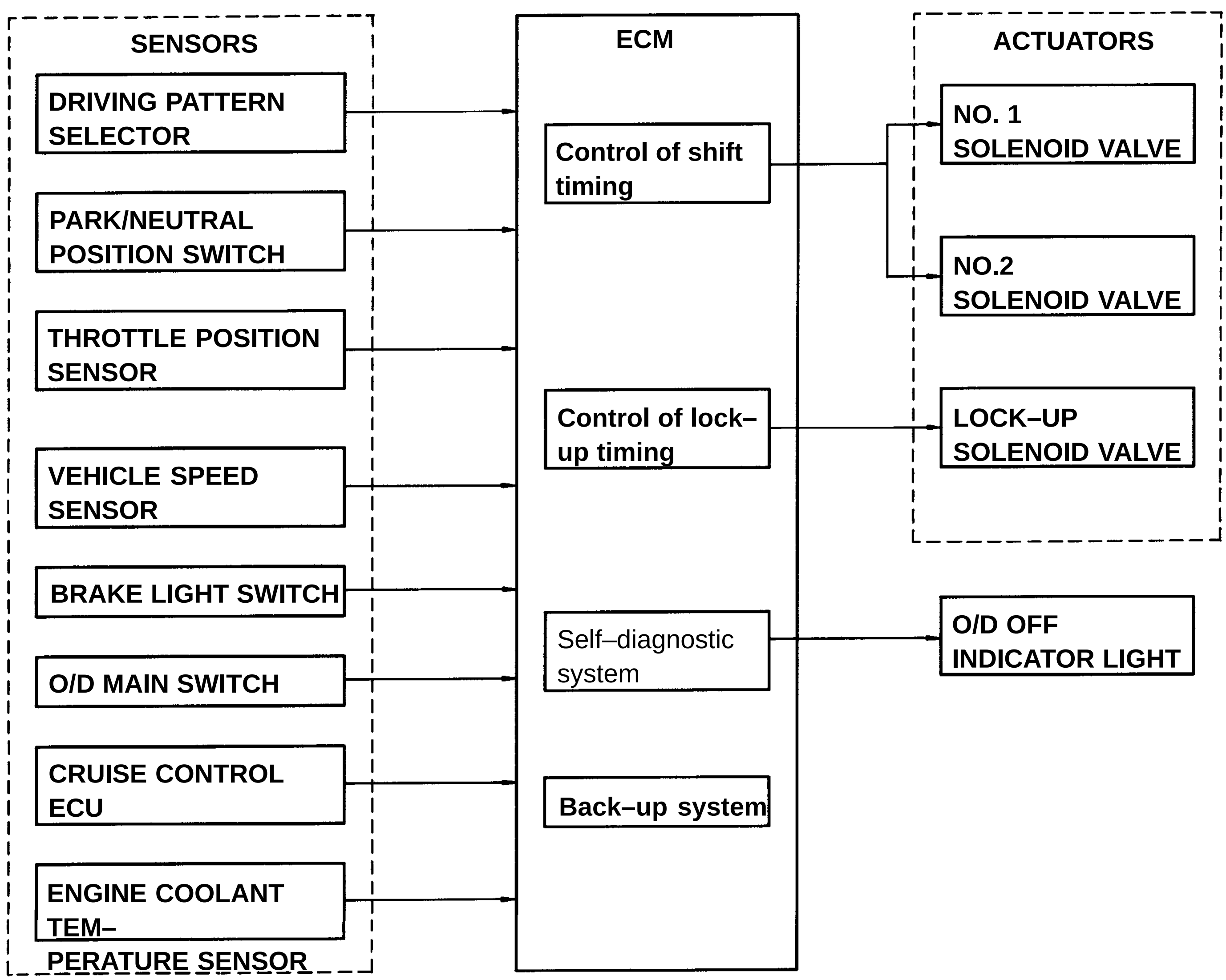
These sensors sense the vehicle speed, throttle opening and other conditions and send these data to the ECM in the form of electrical signals.

2. ECM

The ECM determines the shift and lock–up timing based upon the signals from sensors, and controls the solenoid valves of the hydraulic control unit accordingly.

3. Actuators

These are three solenoid valves that control hydraulic pressure acting on the hydraulic valves to control shifting and lock–up timing.



FUNCTION OF ECM

- **Control of Shift Timing**

  The ECM has programmed into its memory the optimum shift pattern for each shift lever position (D, 2, L position) and driving mode (Normal or Power).

  Based on the appropriate shift pattern, the ECM turns No. 1 and No.2 solenoid valves on or off in accor–dance with the vehicle speed signal from the vehicle speed sensor and the throttle opening signal from the throttle position sensor. In this manner, the ECM operates each shift valve, opening or closing the fluid passages to the clutches and brakes to permit up–shift or down–shift of the transmission.

HINT: The electronic control system provides shift timing and lock–up control only while the vehicle is traveling forward. In REVERSE, PARK, and NEUTRAL, the transmission is mechanically, not electroni–cally controlled.

- **Control of Overdrive**

  Driving in overdrive is possible if the O/D main switch is on and the shift lever is in the D position. How–ever, when the vehicle is being driven using the cruise control system (CCS), if the actual vehicle speed drops to about 4 km/h (2 mph) below the set speed while the vehicle is running in overdrive, the CCS ECU sends a signal to the ECM to release the overdrive and prevent the transmission from shifting back into overdrive until the actual vehicle speed reaches the speed set in the CCS memory.

  On this model, if the engine coolant temperature falls below 70•C (158•F), preventing the transmission from up–shifting into overdrive.

- **Control of Lock–Up System**

  The ECM has programmed in its memory a look–up clutch operation pattern for each driving mode (Nor–mal or Power). Based on this lock–up pattern, the ECM turns lock–up solenoid valve on or off in accor–dance with the vehicle speed signals received from the vehicle speed sensor and the throttle opening sig–nals from the throttle position sensor.

  Depending on whether lock–up solenoid valve is on or off, the lock–up relay valve performs changeover of
  the fluid passages for the converter pressure acting on the torque converter clutch to engage or disen–gage the lock–up clutch.

  (Mandatory Cancellation of Lock–Up System)

  If any of the following conditions exist, the ECM turns off lock–up solenoid valve to disengage the lock–up clutch.

  1) The brake light switch comes on (during braking).
  2) The IDL points of the throttle position sensor close (throttle valve fully closed).
  3) The vehicle speed drops 4 km/h (2 mph) or more below the set speed while the cruise control system is operating.
  4) The engine coolant temperature falls below 70•C (158•F).

  The purpose of 1) and 2) above is to prevent the engine from stalling if the rear wheels lock up. The pur–pose of 3) is to cause the torque converter clutch to operate to obtain torque multiplication. The purpose of 4) is both to improve general driveability, and to speed up transmission warm–up.

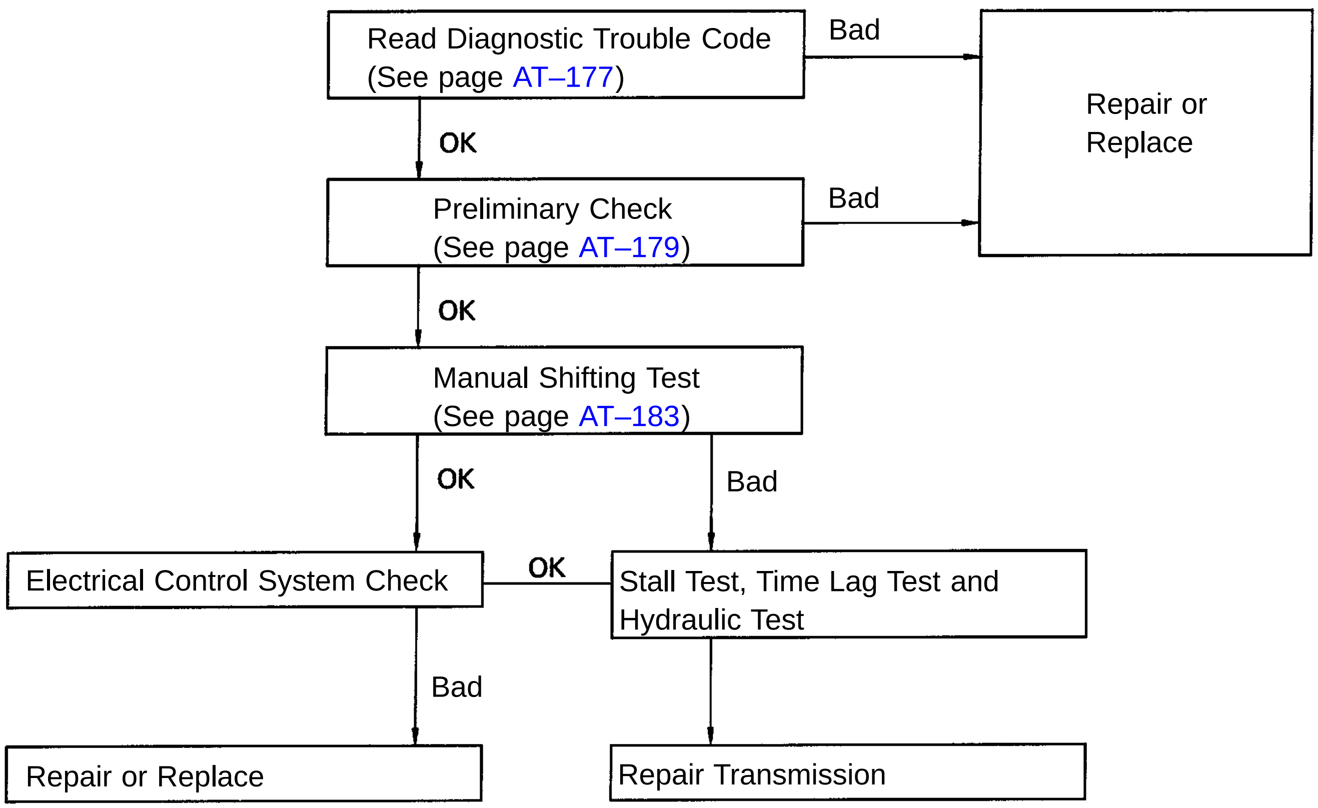
  Also, while the lock–up system is in operation, the ECM will temporarily turn it off during up–shift or down–shift in order to decrease shifting shock.

TROUBLESHOOTING

Basic Troubleshooting

Before troubleshooting an electronic controlled transmission, first determine whether the problem is elec–trical or mechanical. To do this, just refer to the basic troubleshooting flow–chart provided below.

If the cause is already known, using the basic troubleshooting chart below along with the general trouble–shooting chart on the following pages should speed the procedure.



General Troubleshooting

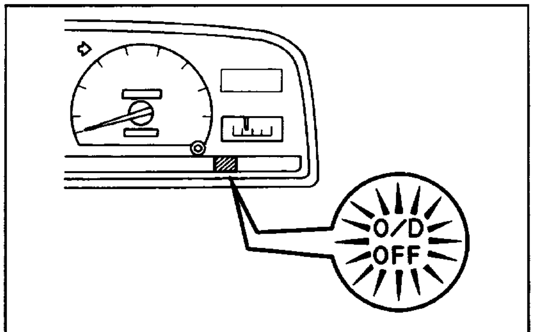
Problem	Possible cause	Remedy	Page
Fluid discolored or smells burnt	Fluid contaminated Torque converter clutch faulty Transmission faulty	Replace fluid Replace torque converter clutch Disassemble and inspect transmission	AT–181 AT–212 ★
Vehicle does not move in any forward position or reverse	Manual linkage out of adjustment Valve body or primary regulator faulty Parking lock pawl faulty Torque converter clutch faulty Converter drive plate broken Oil pump intake screen blocked Transmission faulty	Adjust linkage Inspect valve body Inspect parking lock pawl Replace torque converter clutch Replace drive plate Clean screen Disassemble and inspect transmission	AT–182 AT–208 AT–212 AT–212 ★ ★
Shift lever position incorrect	Manual linkage out of adjustment Manual valve and lever faulty Transmission faulty	Adjust linkage Inspect valve body Disassemble and inspect transmission	AT–182 ★
Harsh engagement into any drive position	Throttle cable out of adjustment Valve body or primary regulator faulty Accumulator pistons faulty Transmission faulty	Adjust throttle cable Inspect valve body Inspect accumulator pistons Disassemble and inspect transmission	AT–182 ★ ★ ★
Delayed 1–2, 2–3 or 3–0/D up–shift, or down–shifts from O/D–3 or 3–2 and shifts back to O/D or 3	Electronic control faulty Valve body faulty Solenoid valve faulty	Inspect electronic control Inspect valve body Inspect solenoid valve	AT–184 AT–193
Slips on 1–2, 2–3 or 3–0/D up–shift, or slips or shudders on acceleration	Manual linkage out of adjustment Throttle cable out of adjustment Valve body faulty Solenoid valve faulty Transmission faulty	Adjust linkage Adjust throttle cable Inspect valve body Inspect solenoid valve Disassemble and inspect transmission	AT–182 AT–182 ★ AT–193 ★
Drag, binding or tie–up on 1–2, 2–3 or 3–OID up–shift	Manual linkage out of adjustment Valve body faulty Transmission faulty	Adjust linkage Inspect valve body Disassemble and inspect transmission	AT–182 ★ ★

Remark ★: Refer to A340F Automatic Transmission Repair Manual.
(Pub. No. RM271U)

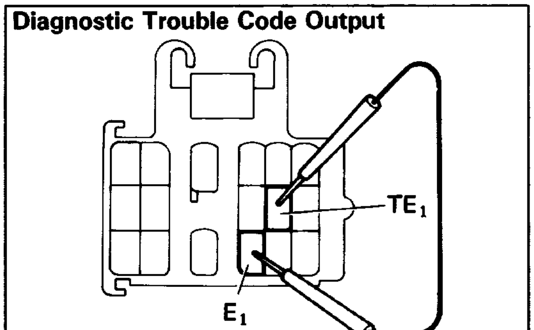
General Troubleshooting (Cont’d)

Problem	Possible cause	Remedy	Page
No lock–up in 2nd, 3rd or O/D	Electronic control faulty Valve body faulty Solenoid valve faulty Transmission faulty	Inspect electronic control Inspect valve body Inspect solenoid valve Disassemble and inspect transmission	AT–184 ★ AT–193 ★
Harsh down–shift	Throttle cable out of adjustment Throttle cable and cam faulty Accumulator pistons faulty Valve body faulty Transmission faulty	Adjust throttle cable Inspect throttle cable and cam Inspect accumulator pistons Inspect valve body Disassemble and inspect transmission	AT–182 AT–182 ★ ★ ★
No down–shift when coasting	Valve body faulty Solenoid valve faulty Electronic control faulty	Inspect valve body Inspect solenoid valve Inspect electronic control	★ AT–193 AT–184
Down–shift occurs too quickly or too late while coasting	Throttle cable faulty Valve body faulty Transmission faulty Solenoid valve faulty Electronic control faulty	Inspect throttle cable Inspect valve body Disassemble and inspect transmission Inspect solenoid valve Inspect electronic control	AT–1 82 ★ ★ AT–193 AT–184
No O/D–3, 3–2 or 2–1 kick–down	Solenoid valve faulty Electronic control faulty Valve body faulty	Inspect solenoid valve Inspect electronic control Inspect valve body	AT–193 AT–184
No engine braking in 2 or L position	Solenoid valve faulty Electronic control faulty Valve body faulty Transmission faulty	Inspect solenoid valve Inspect electronic control Inspect valve body Disassemble and inspect transmission	AT–193 AT–184 ★ ★
Vehicle does not hold in P	Manual linkage out of adjustment Parking lock pawl cam and spring faulty	Adjust linkage Inspect cam and spring	AT–188 AT–208
No H2–H4, H4–L4, L4–H4 or H4–H2 change gear position of transfer	Transfer linkage out of adjustment Transfer faulty	Adjust linkage Disassemble and inspect transfer	AT–182 ★

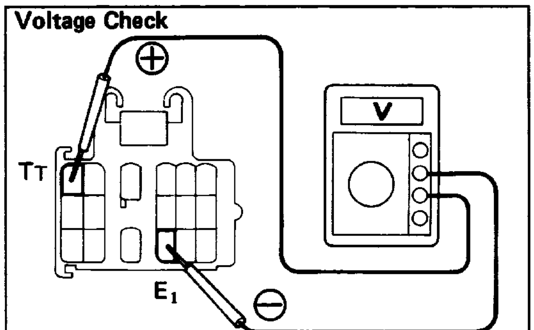
Remark ★: Refer to A340F Automatic Transmission Repair Manual. (Pub. No. RM271 U)



AT4367



AT3749



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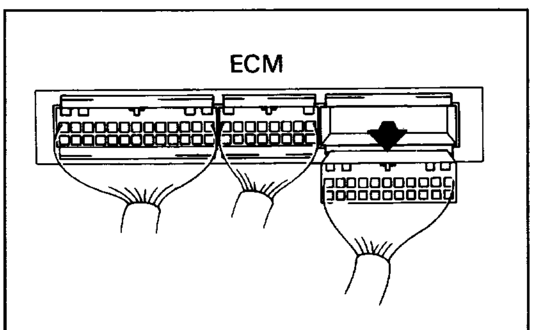
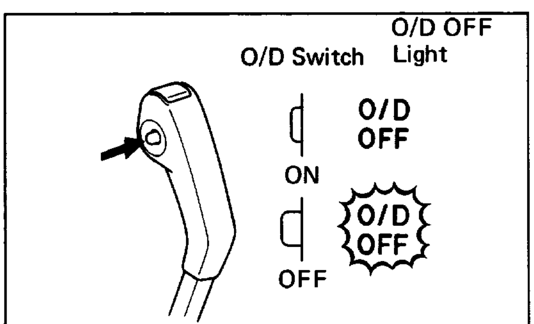


AT4368



AT4488

Diagnosis System

DESCRIPTION

1. A self–diagnosis function is built into the electrical control system. Warning is indicated by the overdrive OFF indica–tor light.

HINT: Warning and diagnostic trouble codes can be read only when the overdrive switch is ON. If OFF, the overdrive OFF light is lit continuously and will not blink.

(a) If a malfunction occurs within the vehicle speed sen–sors (No. 1 or 2) or solenoids (No. 1, 2), the overdrive OFF light will blink to warn the driver.
However, there will be no warning of a malfunction with lock–up solenoid.

(b) The diagnostic trouble code can be read by the num–ber of blinks of the overdrive OFF indicator light when terminals TE, and EI are connected.
(See page AT–1 78)

(c) The throttle position sensor or brake signal are not indicated, but inspection can be made by checking the voltage at terminal TT of the data link connector 1.

(d) The signals to each gear can be checked by measur–ing the voltage at terminal TT while driving.

2. The diagnostic trouble code is retained in memory by the ECM and due to back–up voltage, is not canceled out when the engine is turned off. Consequently, after repair, it is necessary to turn the ignition switch off and remove the MF I fuse
(1 5A) or disconnect the ECM connector to cancel out the diagnostic trouble code. (See page AT–178)

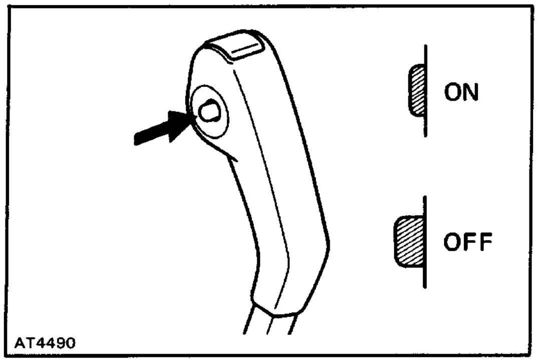
HINT:

Low battery positive voltage will cause faulty opera–tion of the diagnosis system. Therefore, always check the battery first.

Use a voltmeter and ohmmeter that have an imped–ance of at least 10 k0/V.

CHECK ”O/D OFF” INDICATOR LIGHT

1. Turn the ignition switch ON.
2. The–O/D OFF” light will come on when the O/D switch is placed at OFF.
3. When the O/D switch is set to ON, the ”O/D OFF” light should go out.
If the–O/D OFF” light flashes when the O/D switch is set to ON, the electronic control system is faulty.

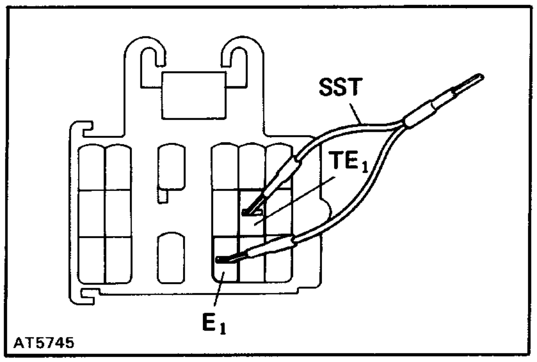


READ DIAGNOSTIC TROUBLE CODE

1. TURN IGNITION SWITCH AND O/D SWITCH TO ON

Do not start the engine.

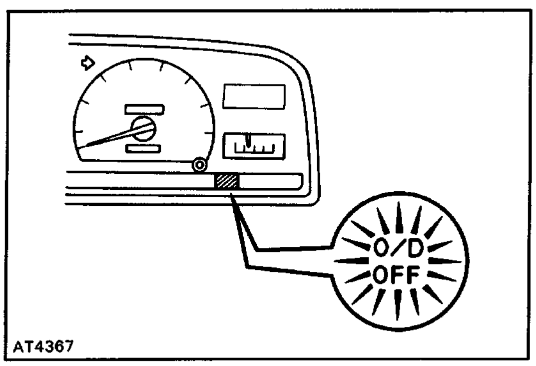
HINT: Warning and diagnostic trouble codes can be read only when the overdrive switch is ON. If OFF, the overdrive OFF light will light continuously and will not blink.



2. CONNECT TE, AND E, TERMINALS OF DATA LINK CONNECTOR 1

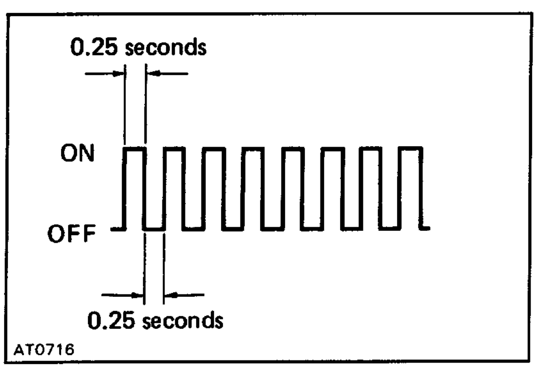
Using SST, connect terminals TE, and El.

SST 09843–18020



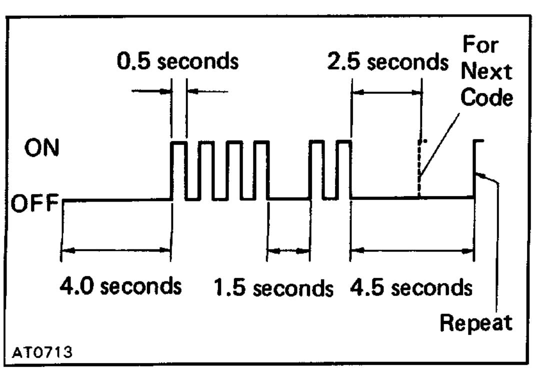
3. READ DIAGNOSTIC TROUBLE CODE

Read the diagnostic trouble code as indicated by the number of times the O/D OFF light flashes.



(Diagnostic Trouble Code Indication)

- If the system is operating normally, the light will flash 2 times per second.



- In the even of a malfunction, the light will flash 1 time per second. The number of blinks will equal the first number and, after 1.5 seconds pause, the second number of the two digit diagnostic trouble code. If there are two or more codes, there will be a 2.5 sec– onds pause between each.

HINT: In the event of several trouble codes occuring si– multaneously, indication will begin from the smaller value and continue to the larger.

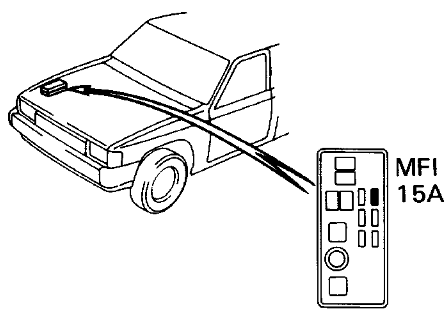
4. REMOVE SST

DIAGNOSTIC TROUBLE CODES

Code No.	Light Pattern	Diagnosis System
–		Normal
42		Defective No. 1 vehicle speed sensor (in combination meter)– severed wire harness or short circuit
61		Defective No.2 vehicle speed sensor (in ATM)– severed wire harness or short circuit
62		Severed No. 1 solenoid or short circuit– severed wire harness or short circuit
63		Severed No.2 solenoid or short circuit– severed wire harness or short circuit
64		Severed lock–up solenoid or short circuit– severed wire harness or short circuit

AT2020

HINT: If codes 62, 63 or 64 appear, there is an electri–cal malfunction in the solenoid.
Causes due to mechanical failure, such as a stuck valve, will not appear.



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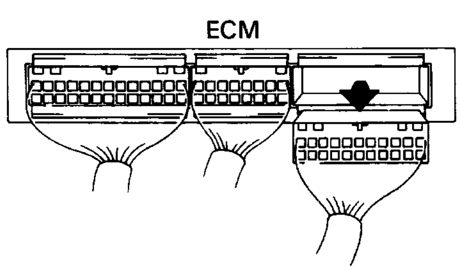


AT4368

CANCEL OUT DIAGNOSTIC TROUBLE CODE

1. After repair of the trouble area, the diagnostic trouble code retained in memory by the ECM must be canceled by removing the MFI fuse (1 5A) for 10 seconds or more, depending on ambient temperature (the lower the tem–perature, the longer the fuse must be left out) with the ig–nition switch OFF.

HINT:
- Cancellation can be also done by removing the battery negative (–) terminal, but in this case other memory systems will be also canceled out.
- The diagnostic trouble code can be also canceled out by disconnecting the ECM connector.
- If the diagnostic trouble code is not canceled out, it will be retained by the ECM and appear along with a new code in event of future trouble.

2. After cancellation, perform a road test to confirm that a ”normal code” is now read on the O/D OFF light.

TROUBLESHOOTING FLOW–CHART

HINT:

- If diagnostic trouble code Nos. 42, 61, 62 or 63 are output, the overdrive OFF indicator light will begin to blink immediately to warn the driver. However, an impact or shock may cause the blinking to stop; but the code will still be retained in the ECM memory until canceled out.
- There is no warning for diagnostic trouble code No.64.
- In the event of a simultaneous malfunction of both No.1 and No.2 vehicle speed sensors, no diag–nostic trouble code will appear and the fail–safe system will not function. However, when driving in the D position, the transmission will not up–shift from first gear, regardless of the vehicle speed.

Diagnostic trouble code 42 (No.1 vehicle speed sensor circuitry)

Check continuity between ECM connector SPj, terminal and body ground.
(See page AT–192)

↓ OK

Substitute another ECM.

Check No. 1 vehicle speed sensor.
(See page BE–34)

NG → Repair or replace No. 1 vehicle speed sensor.

↓ OK

Check wiring between ECM and combination meter.

Diagnostic trouble code 61 (No–2 vehicle speed sensor circuitry)

Check continuity between ECM connector SP2 terminal and body ground.
(See page AT–192)

↓ OK

Substitute another ECM.

Check No.2 vehicle speed sensor.
(See page AT–194)

NG → Repair or replace No.2 vehicle speed sensor.

↓ OK

Check wiring between ECM and No.2 vehi–cle speed sensor.

Diagnostic trouble code 62 (No. 1 solenoid valve circuitry)

Check resistance of No. 1 solenoid valve at EC M connector. (See page AT–193)

OK

Substitute another ECM.

Remove the oil pan and check resistance of No. 1 solenoid valve connector and body ground.
Resistance: 11–15/

NG

Replace No. 1 solenoid valve.

OK

Check wiring between No. 1 solenoid valve and ECM.

Diagnostic trouble code 63 (No.2 solenoid valve circuitry)

Check resistance of No.2 solenoid valve at EC M connector. (See page AT–193)

OK

Substitute another ECM.

Remove the oil pan and check resistance of No. 2 solenoid valve connector and body ground.
Resistance: 11–15/

NG

Replace No. 2 solenoid valve.

OK

Check wiring between No.2 solenoid valve and ECM.

Diagnostic trouble code 64 (Lock–up solenoid valve circuitry)

Check resistance of lock–up solenoid valve at ECM connector. (See page AT–193)

OK

Substitute another ECM.

Remove the oil pan and check resistance of lockup solenoid valve connector and body ground.
Resistance: 11–15

NG

Replace lock–up solenoid valve.

OK

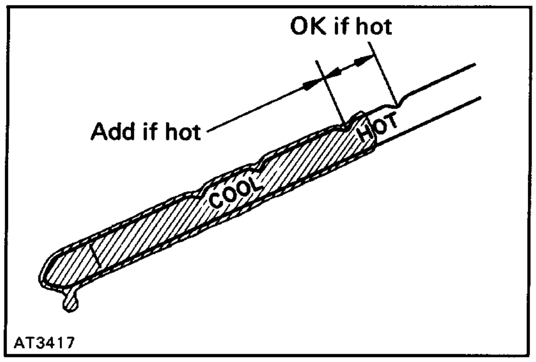
Check wiring between lock–up solenoid valve and ECM.

Preliminary Check

1. CHECK FLUID LEVEL

HINT:

- The vehicle must have been driven so that the engine and transmission are at normal operating temperature. (Fluid temperature: 70–80®C or 158–176®F)
- Only use the COOL range on the dipstick as a rough reference when the fluid is replaced or the engine does not run.



(a) Park the vehicle on a level surface, set the parking brake.

(b) With the engine idling, shift the shift lever into all positions from P to L position and return to P posi– tion.

(c) Pull out the transmission dipstick and wipe it clean.

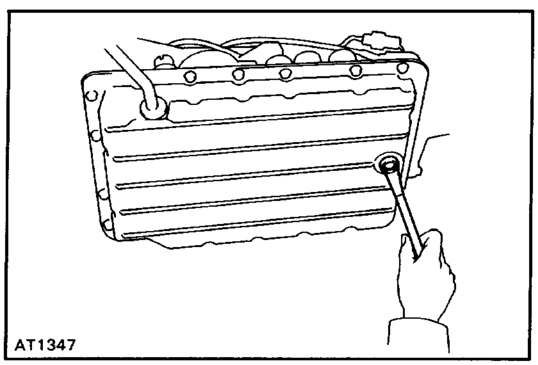
(d) Push it back fully into the tube.

(e) Pull it out and check that the fluid level is in the HOT range.
If the level is at the low side, add fluid.
Fluid type: ATF DEXRON• II

NOTICE: Do not overfill.

2. CHECK FLUID CONDITION

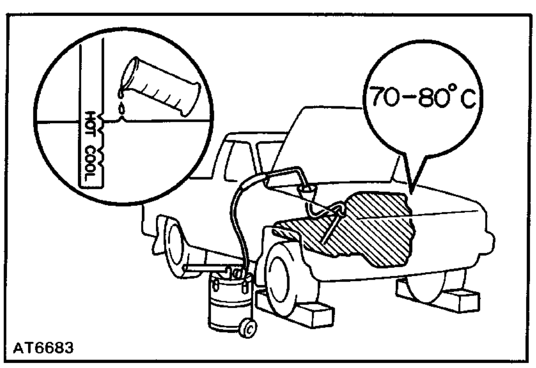
If the fluid smells burnt or is black, replace it as following procedures.



(a) Remove the drain plug and drain the fluid.

(b) Reinstall the drain plug securely.

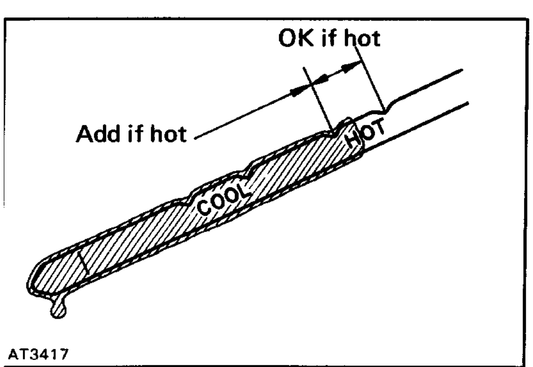
(e) With the engine OFF, add new fluid through the oil filler tube.
Fluid type: ATF DEXRON• II
Capacity:
Total: 7.6 liters (8.0 US qts, 6.7 Imp. qts)
Drain and refill: 1.6 liters (1.7 US qts, 1.4 Imp. qts)



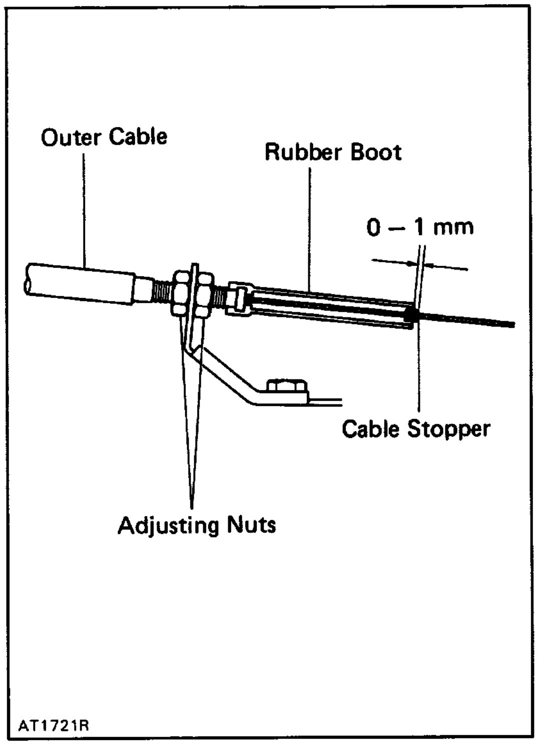
(d) Start the engine and shift the shift lever into all po– sitions from P to L position and then shift into P po– sition.

(e) With the engine idling, check the fluid level. Add fluid up to the COOL level on the dipstick.

(f) Check the fluid level with the normal operating tem– perature (70–80®C or 158–176®F) and add as necessary.



NOTICE: Do not overfill.



3. INSPECT THROTTLE CABLE

(a) Depress the accelerator pedal all the way and check that the throttle valve opens fully.

HINT: If the valve does not open fully, adjust the accel–erator cable.

(b) Fully depress the accelerator pedal.

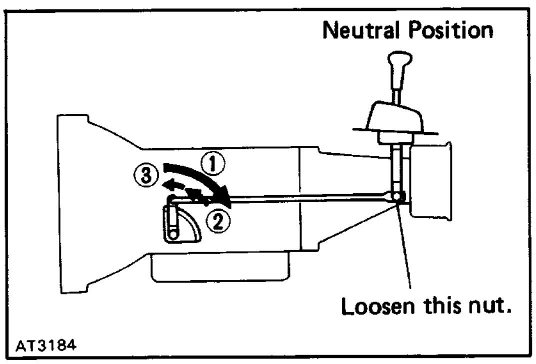
(c) Measure the distance between the end of the boot and stopper on the cable.

Standard distance: 0–1 mm (0–0.04 in.)

If the distance is not standard, adjust the cable by the adjusting nuts.

4. INSPECT TRANSMISSION SHIFT LEVER POSITION

When shifting the shift lever from the N position to other position, check that the lever can be shifted smoothly and accurately indicates the position.
If the indicator is not aligned with the correct position, carry out the following adjustment procedures.



(a) Loosen the nut on the shift lever.

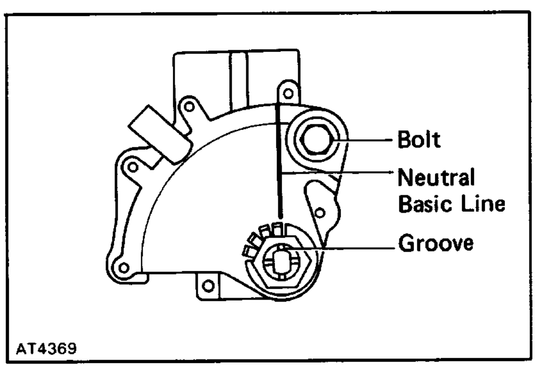
(b) Push the control shaft lever fully rearward.

(c) Return the control shaft lever two notches to N pos–tion.

(d) Set the shift lever to N position.

(e) While holding the shift lever lightly toward the R po–sition side, tighten the shift lever nut.

(f) Start the engine and make sure that the vehicle moves forward when shifting the lever from the N to D position and reverse when shifting it to the R po–sition.



5. INSPECT PARK/NEUTRAL POSITION SWITCH

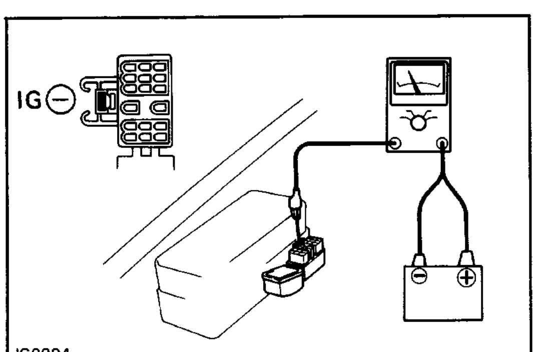
Check that the engine can be started with the shift lever only in the N or P position, but not in other positions.
If not as started above, carry out the following adjust–ment procedures.

(a) Loosen the park/neutral position switch bolt and set the shift lever to the N position.

(b) Align the groove and neutral basic line.

(c) Hold in position and tighten the bolt.

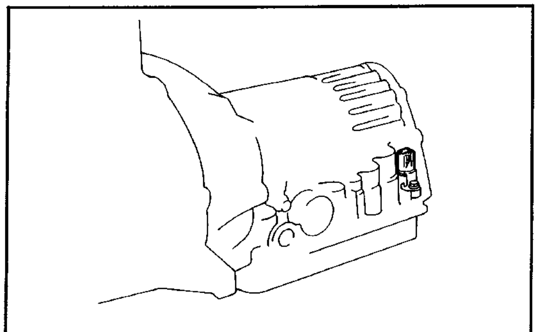
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



6. INSPECT IDLE SPEED (N POSITION)

Connect a tachometer test probe, to the data link con–nectar 1 terminal IG (–), inspect the idle speed.

Idle speed: 850 RPM


Q00675

Manual Shifting Test

HINT: With this test, it can be determined whether the trouble lies within the electrical circuit or is a mechanical problem in the transmission.

1. DISCONNECT SOLENOID WIRE

2. INSPECT MANUAL DRIVING OPERATION

Check that the shift and gear positions correspond with the table below.

Shift Position	D position	2 position	L position	R position	P position
Gear Position	O/D	3rd	1 st	Reverse	Pawl Lock

HINT: If the 1, 2 and D position gear positions are diffi–cult to distinguish, perform the following road test.

- While driving, shift through the L, 2 and D positions. Check that the gear change corresponds to the shift position.
  If any abnormality is found in the above test, the prob-lem lies in transmission itself.

3. CONNECT SOLENOID WIRE

4. CANCEL OUT DIAGNOSTIC TROUBLE CODE
(See page AT–178)

REFERENCE: Possible gear positions in accordance with solenoid operating conditions.

	NORMAL			NO. 1 SOLENOID MALFUNCTIONING			NO.2 SOLENOID MALFUNCTIONING			BOTH SOLENOIDS MALFUNCTIONING		
	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position
Position	No. 1	No.2		No. 1	No. 2		No. 1	No. 2		No. 1	No. 2	
D position	**ON**	OFF	**1st**	×	ON (OFF)	3rd (O/D)	**ON**	×	**1st**	×	×	O/D
	ON	**ON**	2nd	×	**ON**	3rd	OFF (ON)	×	O/D (1 SO	×	×	O/D
	OFF	**ON**	3rd	×	**ON**	3rd	OFF	×	O/D	×	×	O/D
	OFF	OFF	O/D	×	OFF	O/D	OFF	×	O/D	×	×	O/D
2 position	**ON**	OFF	**1st**	×	ON (OFF)	3rd (O/D)	**ON**	×	**1st**	×	×	3rd
	ON	**ON**	2nd	×	**ON**	3rd	OFF (ON)	×	3rd (1st)	×	×	3rd
	OFF	**ON**	3rd	×	**ON**	3rd	OFF	×	3rd	×	×	3rd
L position	**ON**	OFF	**1st**	×	OFF	**1st**	**ON**	×	**1st**	×	×	**1st**
	ON	**ON**	2nd	×	**ON**	2nd	**ON**	×	**1st**	×	×	**1st**

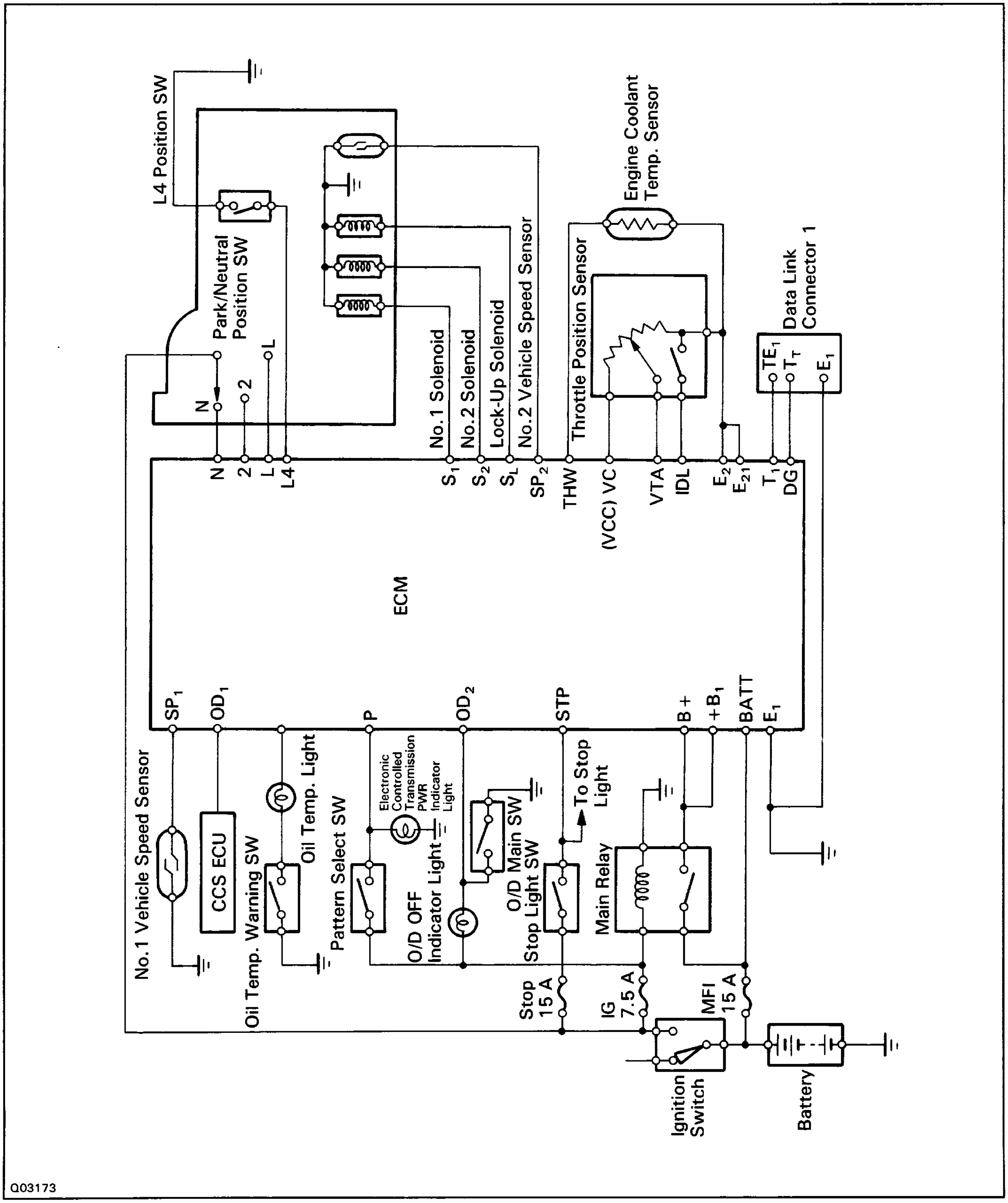
( ) : No fail–safe function   x : Malfunctions

Electronic Control System

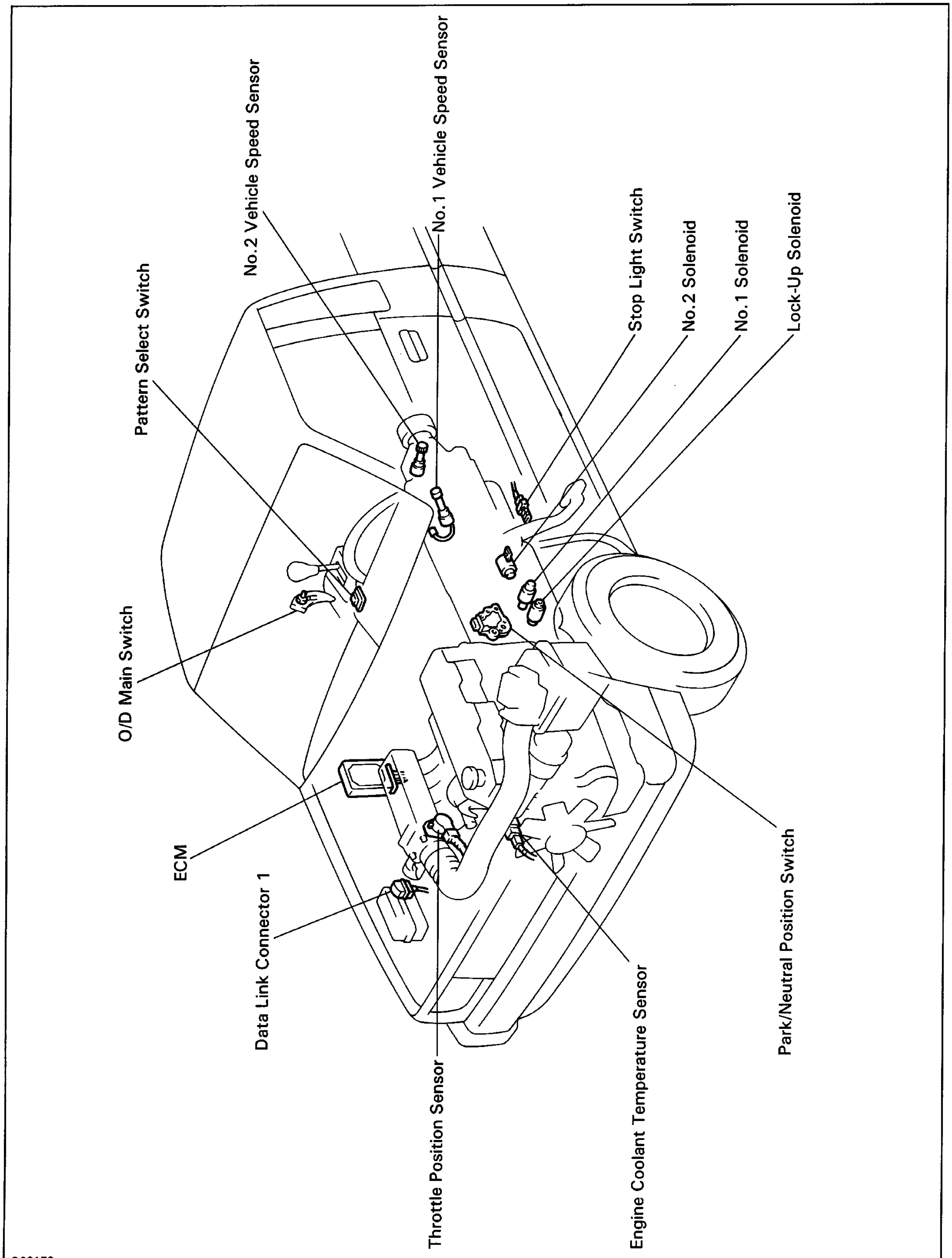
PRECAUTION

Do not open the cover or the case of the ECM and various computer unless absolutely necessary. (If the IC terminals are touched, the IC may be destroyed by static electricity.)

ELECTRONIC CONTROL CIRCUIT



ELECTRONIC CONTROL COMPONENTS



TROUBLESHOOTING FLOW–CHART

Trouble No. 1 No Shifting

Warm up engine
Engine coolant temp.: 80•C (176•F)
ATF temp.: 50–80•C (122–176•F)

Connect a voltmeter to data link connector 1 terminals T_T and El. Does T_T terminal voltage vary with changes in throttle opening?

Yes

No

Is voltage between ECM terminals STP and E , as follows?
0 V: Brake pedal released
10–14 V: Brake pedal depressed

No

Brake signal faulty

Yes

- Throttle position signal faulty
- T_T terminal wire open or short

Disconnect solenoid wire connector and road test. Does the transmission operate in the re–spective gear when in the following positions while driving?

D position .... Overdrive
2 position .... 3rd gear
L position .... 1 st gear

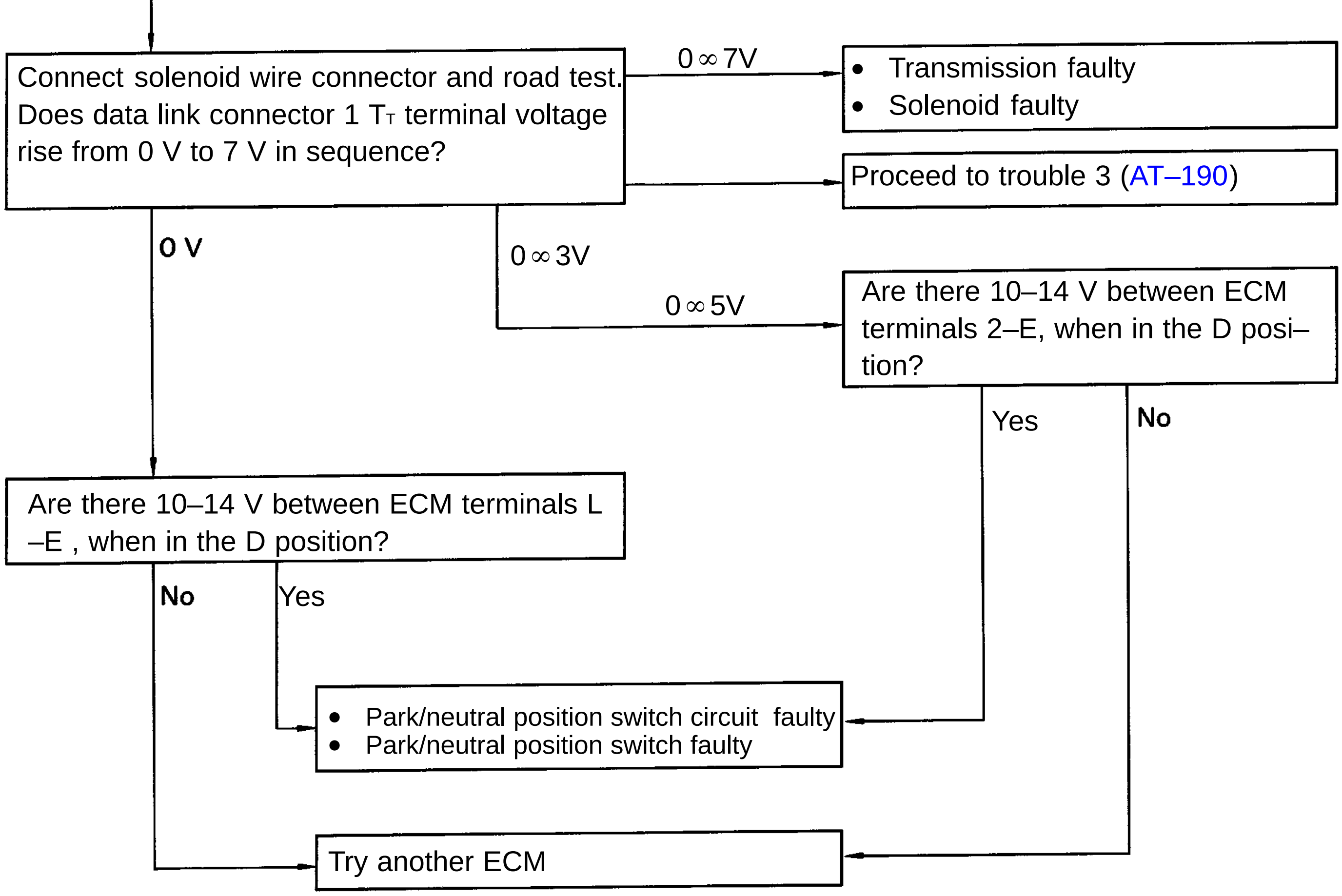
No

Transmission faulty

Yes

Continued on page AT–187

Continued from page AT–186



Trouble No.2 Shift point too high or too low

Warm up engine
Engine coolant temp.: 80•C (176•F)
ATF temp.: 50–80•C (122–176•F)

↓

Connect a voltmeter to data link connector 1 terminals T_T and El. Does T_T terminal voltage vary with changes in throttle opening?

- **Yes** → Check voltage between ECM terminals P and El.
- **No** → Is voltage between ECM terminals STP and E_1 as follows?

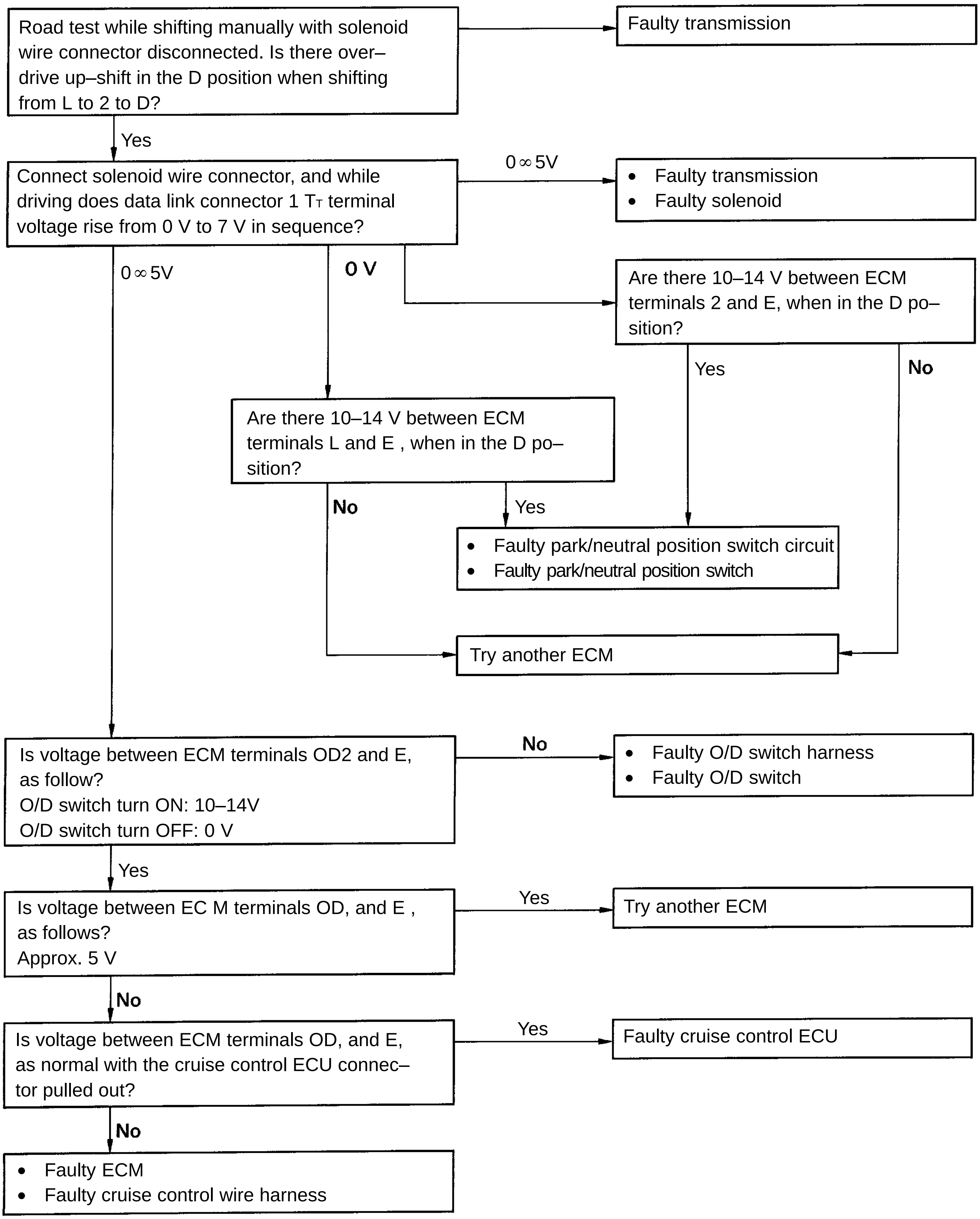
Is voltage between ECM terminals STP and E_1 as follows?
0 V: Brake pedal released
10–14 V: Brake pedal depressed

- **No** → Brake signal faulty
- **Yes** →
  - Throttle position signal faulty
  - T_T terminal wire open or short

Check voltage between ECM terminals P and El.
Power pattern: 10–14 V
Normal pattern: 0–2 V

- **OK** →
  - Faulty ECM
  - Faulty transmission
- **NG** → Faulty pattern select switch system

Trouble No–3 No up–shift to overdrive (After warm–up)



Trouble No.4 No lock–up (After warm–up)

Warm up engine
Engine coolant temp.: 80•C (176•F)
ATF temp.: 50–80•C (122–176•F)

Road test
Connect a voltmeter to data link connector 1 terminals T_T and El. Is there 7, 5 or 3 V in the lock–up position while driving?

Yes →
- Lock–up solenoid stuck
- Faulty transmission
- Faulty lock–up mechanism

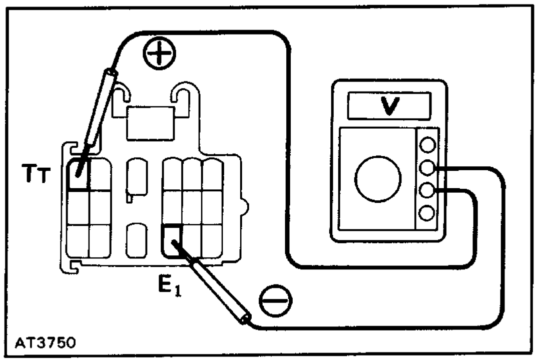
No ↓

Is voltage between ECM STP and E , terminals as follows?
Brake pedal depressed: 10–14 V
Brake pedal released: 0 V

No → Faulty brake signal

Yes ↓

Faulty throttle position signal

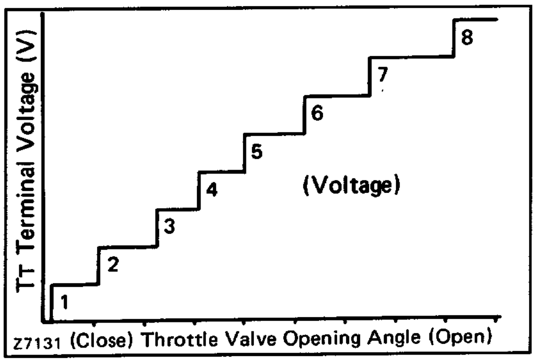


INSPECTION OF T_T TERMINAL VOLTAGE

1. INSPECT THROTTLE POSITION SENSOR SIGNAL

(a) Turn the ignition switch to ON. Do not start the en–gine.

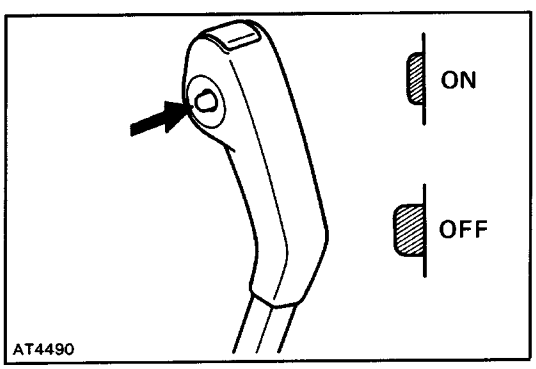
(b) Connect a voltmeter to data link connector 1 termi–nals T_T and El.



(c) While slowly depressing the accelerator pedal, check that T_T terminal voltage rises in sequence.
If the voltage does not change in proportion to the throt–tle opening angle, there is a malfunction in the throttle position sensor or circuit.

2. INSPECT BRAKE SIGNAL

(a) Depress the accelerator pedal until the T_T terminal indicates 8 V.
(b) Depress the brake pedal and check the voltage read–ing from the T_T terminal.
Brake pedal depressed .... 0 V
Brake pedal released .... 8 V
If not as indicated, there is a malfunction in either the stop light switch or circuit.



3. INSPECT EACH UP–SHIFT POSITION

(a) Warm up the engine.
Engine coolant temperature: 80 • C (176 • F)

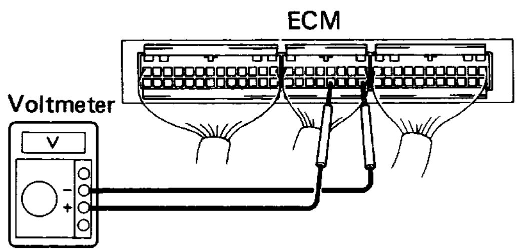
(b) Turn the O/D switch to ”ON”.

(e) Place the pattern select switch in ”Normal” and the shift lever into the D position.

(d) During a road test (above 10 km/h or 6 mph)check that voltage at the T_T terminal is as indicated below for each up–shift position.
If the voltage rises from 0 V to 7 v in the sequence shown, the control system is okay.
The chart on the left shows the voltmeter reading and corresponding gears.

T_T Terminal (V)	Gear Position
0	1st
2	2nd
3	2nd Lock-up
4	3rd
5	3rd Lock-up
6	O/D
7	O/D Lock-up

HINT: Determine the gear position by a light shock or change in engine RPM when shifting. The lock–up clutch will turn ON only infrequently during normal 2nd and 3rd gear operation. To trigger this action, press the accelera–tor pedal to 50% or more of its stroke. At less than 50%, the voltage may change in the sequence 2 V–4 V–6 V–7V.

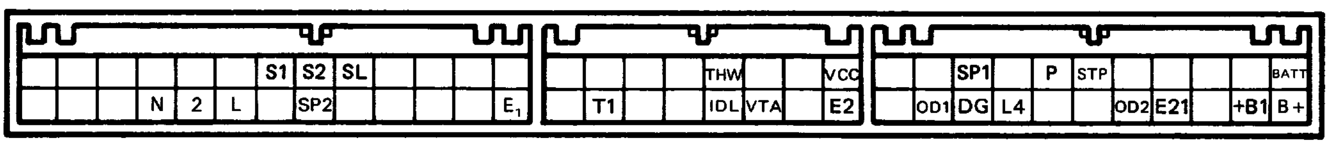


FI2762

INSPECTION OF ELECTRONIC CONTROL COMPONENTS

1. INSPECT VOLTAGE OF ECM CONNECTOR

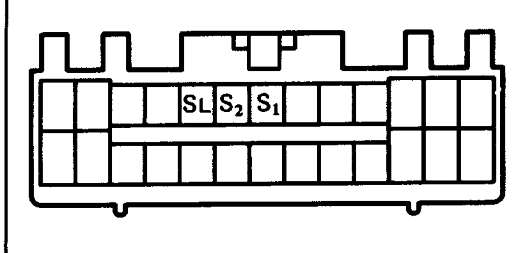
(a) Remove the cowl side trim of passenger side.
(b) Turn on the ignition switch.
(c) Measure the voltage at each terminal.



FI2796

Terminal	Measuring condition		Voltage (V)
S_1 – E_1	–		10 – 14
S_2, S_L – E_1	–		0
P – E_1	PWR pattern		10 – 14
	NORM pattern		0 – 2
STP – E_1	Brake pedal is depressed		10 – 14
	Brake pedal is released		0
THW – E_2 (E_{21})	Engine coolant temp. 80•C (1 760F)		0.1 – 1.0
IDL – E_2 (E_{21})	Throttle valve fully closed		0
	Throttle valve open		10 – 14
VTA – E_2(E_{21})	Throttle valve fully closed		0.1 – 1.0
	Throttle valve fully open		3 – 5
VC (VCC) – E_2 (E_{21})	–		4 – 6
OD_1 – E_1	–		5
OD_2 – E_1	O/D main switch turned ON		10 – 14
	O/D main switch turned OFF		0
SP_1 – E_1	Cruise control main switch OFF	Standing still	0 or 5
		Vehicle moving	2 – 3
SP_2 – E_1	Standing still		0 or 5
	Vehicle moving		2 – 3

Terminal	Measuring condition	Voltage (V)
N – E_1	N position	10 – 14
	Except N position	0 – 2
2 – E_1	2 position	10 – 14
	Except 2 position	0 – 2
L – E_1	L position	10 – 14
	Except L position	0 – 2
L_4 – E_1	Transfer shift position H2 or H4	10 – 14
	Transfer shift position L4	0
B+ (+B_1) – E_1	–	10 – 14
BATT – E_1	–	10 – 14



Vd-26-1

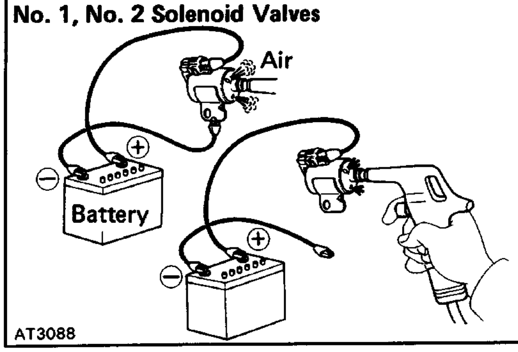
2. INSPECT SOLENOID

(a) Disconnect the connector from the ECM.

(b) Measure the resistance between S,, S2, SL and ground.
Resistance: 11–15/

(c) Apply battery voltage to each terminal. Check that an operation noise can be heard from the solenoid.

No. 1, No. 2 Solenoid Valves



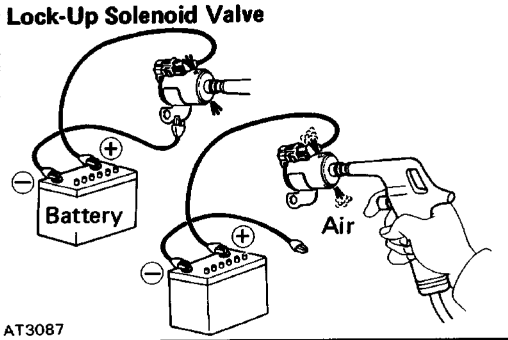
AT3088

3. CHECK SOLENOID SEALS

If there is foreign material in the solenoid valve, there will be no fluid control even with solenoid operation.

(a) Check No. 1, No. 2 solenoid valves.
Check that the solenoid valves do not leak when low–pressure compressed air is applied.
When supply battery positive voltage to the sole–noids, check that the solenoid valves open.

Lock-Up Solenoid Valve

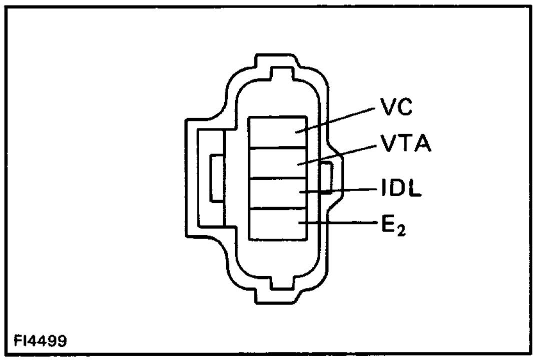


AT3087

(b) Check the lock–up solenoid valve.
Applying 490 kPa (5 kgf/cm^2, 71 psi) of com–pressed air, check that the solenoid valve opens.
When supply battery positive voltage to the sole–noid, check that the solenoid valve does not leak the air.

If a malfunction is found during voltage inspection (step 1.), inspect the components listed below.

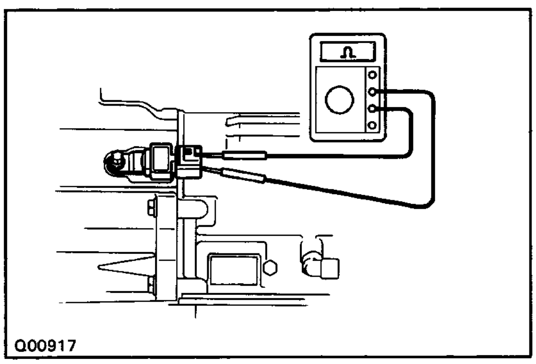
4. INSPECT PARK/NEUTRAL POSITION SWITCH
(See page AT–203)



5. INSPECT THROTTLE POSITION SENSOR

Using an ohmmeter, check the resistance between each terminal.

Terminal	Throttle valve condition	Resistance (kΩ)
IDL–E2	Fully closed	Less than 2.3
	Open	Infinity
VC–E2	–	3.9 – 9.0
VTA–E2	Fully closed	0.47 – 6.1
	Fully open	3.1 – 12.1



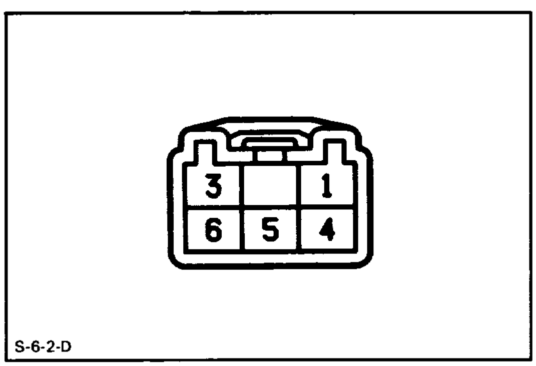
6. INSPECT NO.2 VEHICLE SPEED SENSOR

(a) Jack up the rear wheel on one side.

(b) Connect an ohmmeter between the terminals.

(e) Spin the wheel and check that the meter needle de– flects from O/ to ao/ .

7. INSPECT NO. 1 VEHICLE SPEED SENSOR
(See step 6. on page AT–194)

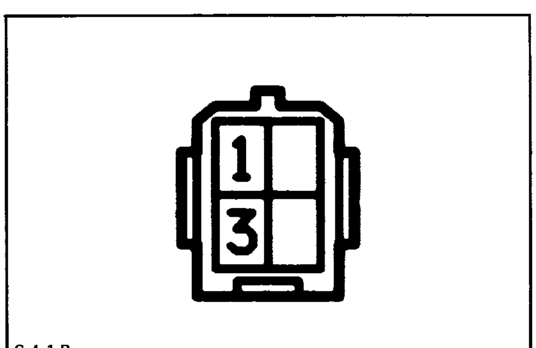


8. INSPECT PATTERN SELECT SWITCH

Using an ohmmeter, check the continuity of the terminals for each switch position.

HINT: As there are diodes inside, be careful of the tester probe polarity.

Terminal / Pattern	4	6
PWR	○	○
NORM		

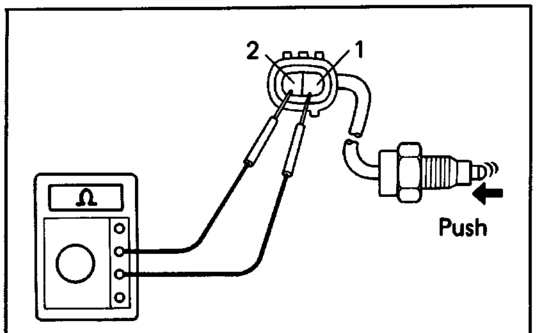


9. INSPECT O/D SWITCH

Using an ohmmeter, check the continuity of the terminals for each switch position.

Terminal / SW position	1	3
ON		
OFF	○	○

10. INSPECT ENGINE COOLANT TEMPERATURE SENSOR
(See page FI–115)



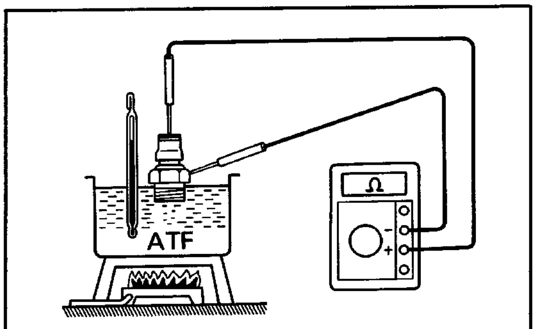
AT5804

11. INSPECT TRANSFER POSITION SWITCH

Check that there is continuity between each terminal as shown.

Switch Position	Specified
Push	Continuity
Free	No continuity

If operation is not as specified, replace the switch.



AT6028

12. INSPECT TRANSMISSION FLUID TEMPERATURE SWITCH

Check that there is continuity at the temperature of 145•C–155•C (325•F–343•F).

If continuity is not as specified, replace the switch.

Mechanical System Tests

STALL TEST

The object of this test is to check the overall performance of the transmission and engine by measuring the stall speeds in the D and R positions.

NOTICE:

- **Perform the test at normal operating fluid temperature (50–80• C or 122–176• F).**
- **Do not continuously run this test longer than 5 seconds.**
- **To ensure safety, conduct this test in a wide, clear, level area, which provides good traction.**
- **The stall test should always be carried out in pairs. One should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test.**

MEASURE STALL SPEED

(a) Check the front and rear wheels.

(b) Connect a tachometer to the engine.

(c) Fully apply the parking brake.

(d) Keep your left foot pressed firmly on the brake pedal.

(e) Start the engine.

(f) Shift into the D position. Step all the way down on the accelerator pedal with your right foot.
Quickly read the stall speed at this time.

NOTICE: Release the accelerator pedal and stop test if the rear wheels begin to rotate before the en–gine speed reaches specified stall speed.

Stall speed: 2,200 f 150 RPM

(g) Perform the same test in R position.

EVALUATION

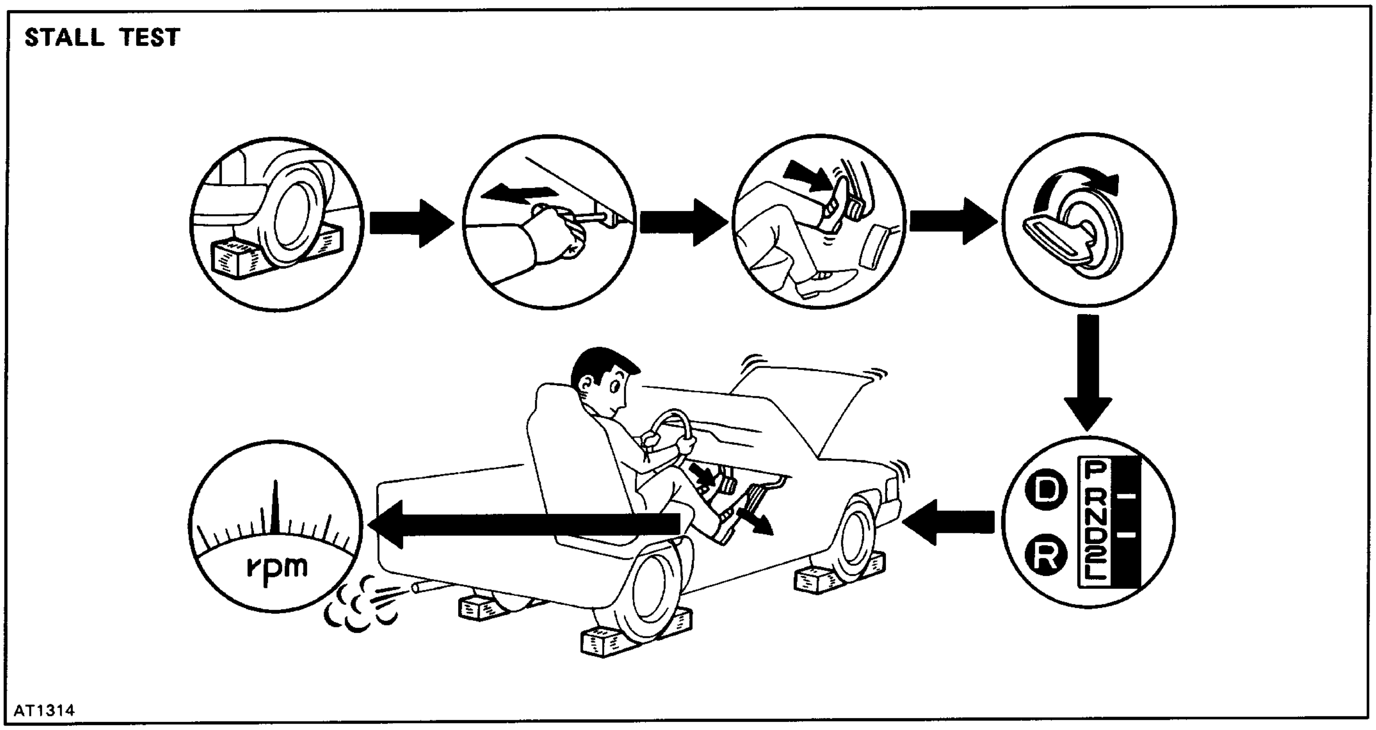
(a) If the stall speed is the same for both positions but lower than specified value:
Engine output may be insufficient
Stator one–way clutch is not operating properly

HINT: If more than 600 RPM below the specified value, the torque converter clutch could be faulty.

(b) If the stall speed in D position is higher than specified:
Line pressure too low
Forward clutch slipping
No.2 one–way clutch not operating properly
O/D one–way clutch not operating properly

(c) If the stall speed in R position is higher than specified:
Line pressure too low
Direct clutch slipping
First and reverse brake slipping
O/D one–way clutch not operating properly

(d) If the stall speed in both R and D positions are higher than specified:
Line pressure too low
Improper fluid level
O/D one–way clutch not operating properly



TIME LAG TEST

When the shift lever is shifted while the engine is idling, there will be a certain time lapse or lag before the shock can be felt. This is used for checking the condition of the 0!D direct clutch, forward clutch, direct clutch and first and reverse brake.

NOTICE:

- **Perform the test at normal operating fluid temperature (50–80• C or 122–176• F).**
- **Be sure to allow one minute interval between tests.**
- **Make three measurements and take the average value.**

MEASURE TIME LAG

(a) Fully apply the parking brake.

(b) Start the engine and check the idle speed.
Idle speed: 850 RPM
(N position)

(c) Shift the shift lever from N to D position. Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.
Time lag: Less than 1.2 seconds

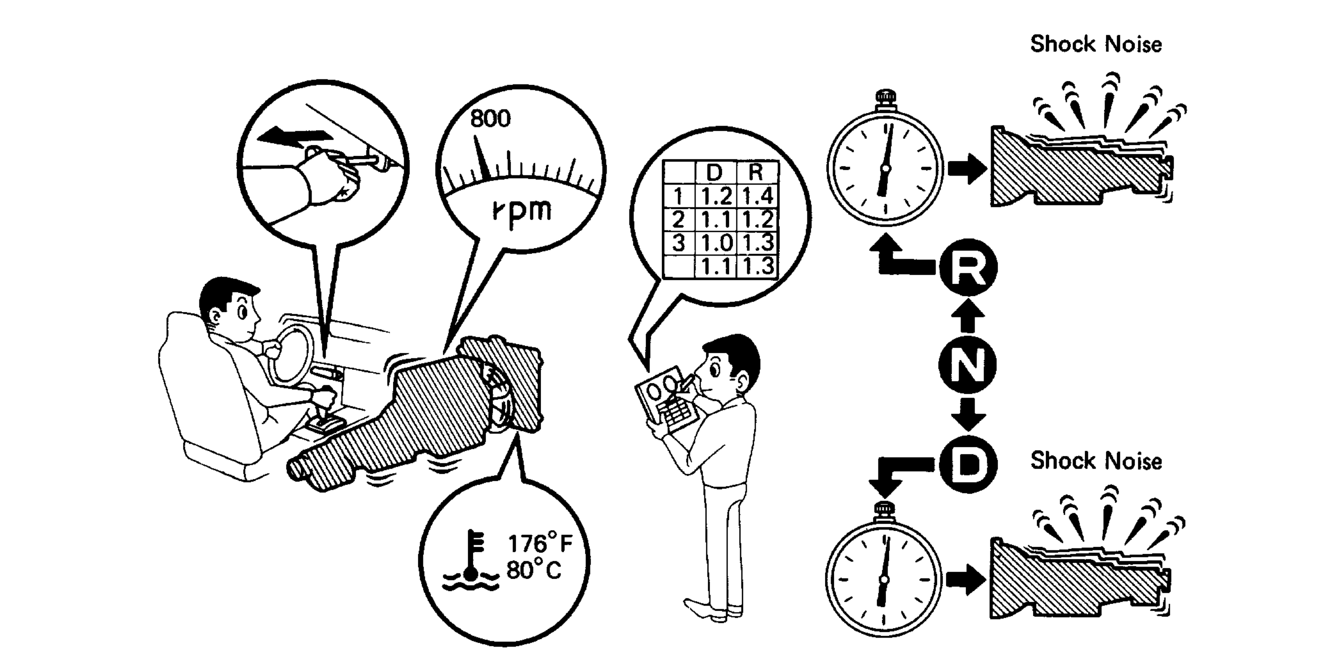
(d) In same manner, measure the time lag for N–R.
Time lag: Less than 1.5 seconds

EVALUATION

(a) If N–i D time lag is longer than specified:
Line pressure too low
Forward clutch worn
O/D one–way clutch not operating properly

(b) If N–R time lag is longer than specified:
Line pressure too low
Direct clutch worn
First and reverse brake worn
O/D one–way clutch not operating properly

TIME LAG TEST



AT1315

HYDRAULIC TEST

PREPARATION

(a) Warm up the transmission fluid.

(b) Remove the transmission case test plug and connect the hydraulic pressure gauge.
SST 09992–00094 (Oil pressure gauge)

NOTICE:

- **Perform the test at normal operating fluid temperature (50–80• C or 122–176• F).**
- **The line pressure test should always be carried out in pairs. One should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test.**

MEASURE LINE PRESSURE

(a) Fully apply the parking brake and check the four wheels.

(b) Start the engine and check idling RPM.

(c) Keep your left foot pressed firmly on the brake pedal and shift into D position.

(d) Measure the line pressure when the engine is idling.

(e) Press the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.

**NOTICE: Release the accelerator pedal and stop test if the rear wheels begin to rotate before the en–
gine speed reaches specified stall speed.**

(f) In the same manner, perform the test in R position. .

kPa (kgf/cm², psi)

D position		R position	
Idling	Stall	Idling	Stall
363 – 422 (3.7 – 4.3, 53 – 61)	932 – 1,177 (9.5 – 12.0, 135 – 171)	490 – 588 (5.0 – 6.0, 71 – 85)	1,294 – 1,638 (13.2 – 16.7, 188 – 238)

If the measured pressures are not up to specified values, recheck the throttle cable adjustment and perform a retest.

EVALUATION

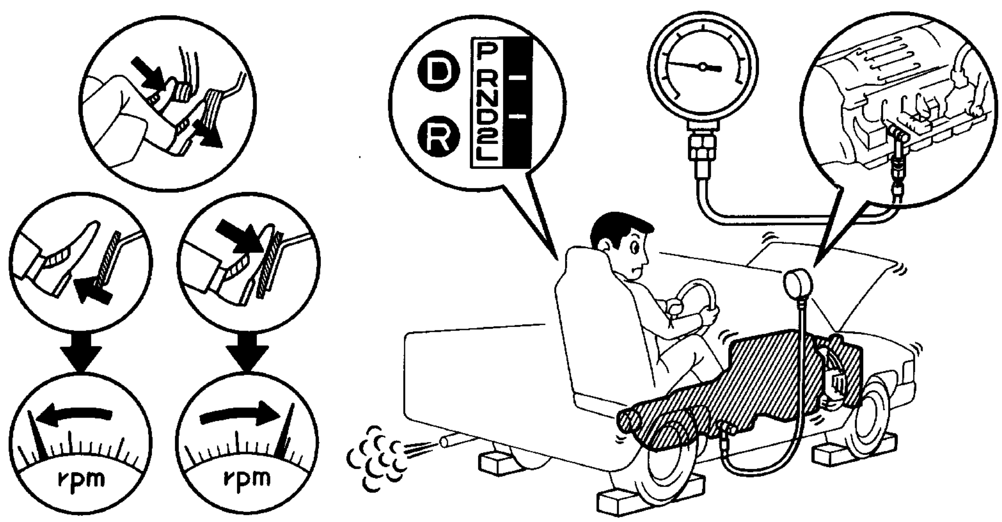
(a) If the measured values at all positions are higher than specified:
- Throttle cable out of adjustment
- Throttle valve defective
- Regulator valve defective

(b) If the measured values at all positions are lower than specified:
- Throttle cable out of adjustment
- Throttle valve defective
- Regulator valve defective
- Oil pump defective
- O/D direct clutch defective

(c) If pressure is low in the D position only:
- D position circuit fluid leakage
- Forward clutch defective

(d) If pressure is low in the R position only:
- R position circuit fluid leakage
- Direct clutch defective
- First and reverse brake defective

HYDRAULIC TEST



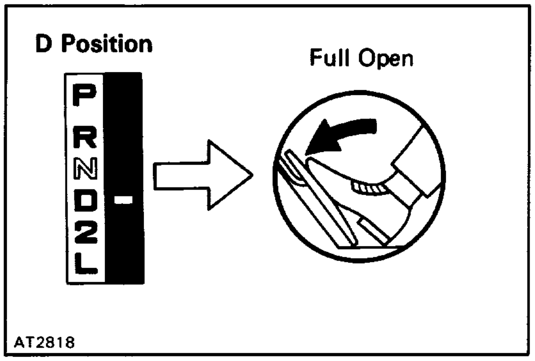
AT1316

ROAD TEST

NOTICE: Perform the test at normal operating fluid temperature (50–800C or 122–1760F).

1. D POSITION TEST IN NORM AND PWR PATTERN POSITIONS

Shift into the D position and hold the accelerator pedal constant at the full throttle valve opening position.



AT2818

(a) 1–2, 2–3 and 3–OID up–shifts should take place, and shift points should conform to those shown in the automatic shift schedule.
Conduct a test under both Normal and Power patterns.

HINT: There is no O/D up–shift or lock–up when the engine coolant temp. is below 70•C (158•F).

EVALUATION

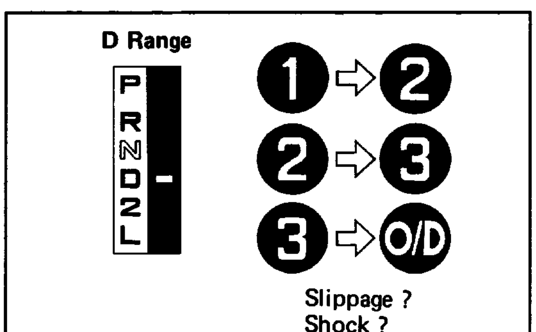
(1) If there is no 1 → 2 up–shift:
No.2 solenoid is stuck
1–2 shift valve is stuck

(2) If there is no 2 → 3 up–shift:
No.1 solenoid is stuck
2–3 shift valve is stuck

(3) If there is no 3 → O/D up–shift:
3–4 shift valve is stuck

(4) If the shift point is defective:
Throttle valve, 1–2 shift valve, 2–3 shift valve, 3–4 shift valve etc., are defective

(5) If the lock–up is defective:
Lock–up solenoid is stuck
Lock–up relay valve is stuck

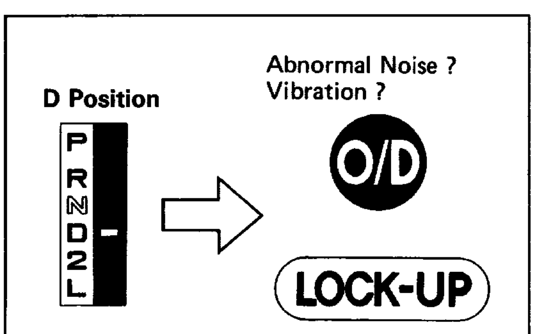


AT3068

(b) In the same manner, check the shock and slip at the 1 → 2, 2 → 3, and 3 → O/D up–shifts.
EVALUATION

If the shock is excessive:

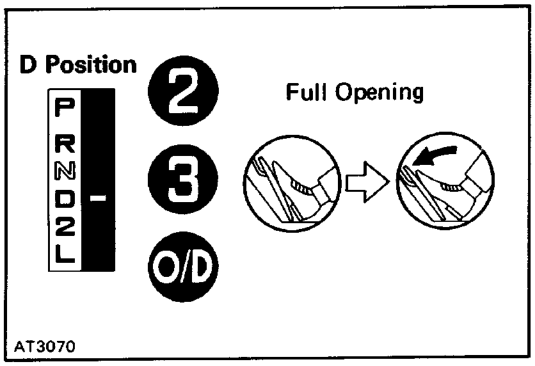
- Line pressure is too high
- Accumulator is defective
- Check ball is defective



AT3069

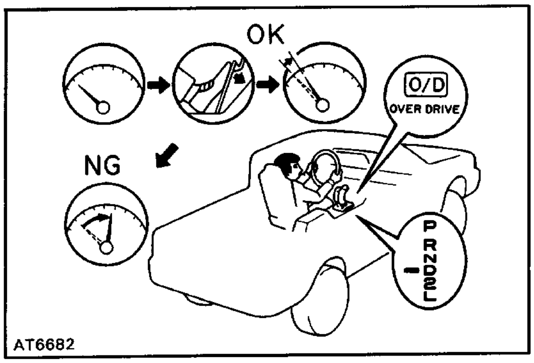
(c) Run at the D position lock–up or O/D gear and check for abnormal noise and vibration.

HINT: The check for the cause of abnormal noise and vibration must be made with extreme care as it could also be due to loss of balance in the propeller shaft, differential, torque converter clutch, etc.



(d) While running in the D position, 2nd, 3rd and O/D gears, check to see that the possible kick–down vehicle speed limits for 2→1, 3→2 and O/D→ 3 kick–downs conform to those indicated on the automatic shift schedule.

(e) Check for abnormal shock and slip at kick–down.

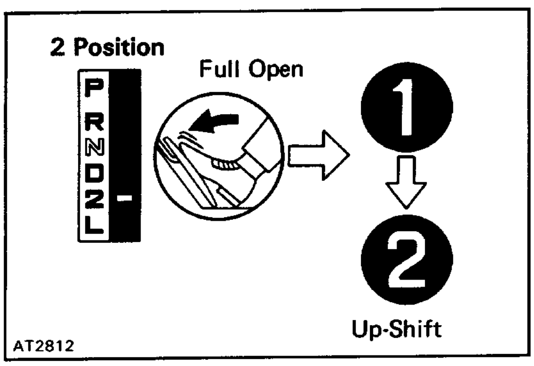


(f) Check for the lock–up mechanism.

(1) Drive in D position, O/D gear, at a steady speed (lock–up ON) of about 75kmlh (47mph).

(2) Lightly depress the accelerator pedal and check that the engine RPM does not change abruptly.

If there is a big jump in engine rpm, there is no lock–up.



2. 2 POSITION TEST

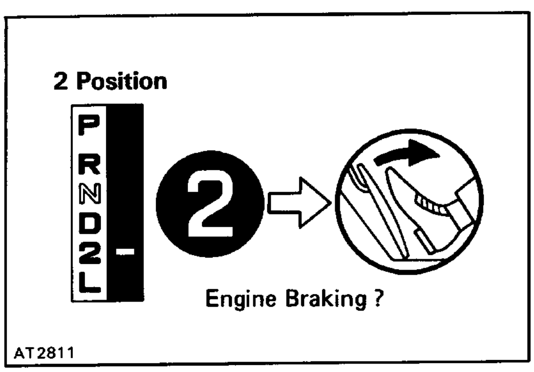
Shift into the 2 position and, while driving with the accel– erator pedal held constantly at the full throttle valve opening position, push in one of the pattern selectors and check on the following points.

(a) Check to see that the 1 → 2 up–shift takes place and that the shift point conforms to it shown on the au– tomatic shift schedule.

HINT:

There is no O/D up–shift and lock–up in the 2 position.

To prevent overrun, the transmission up–shifts into 3rd gear at around 100 km/h (62 mph) or more.

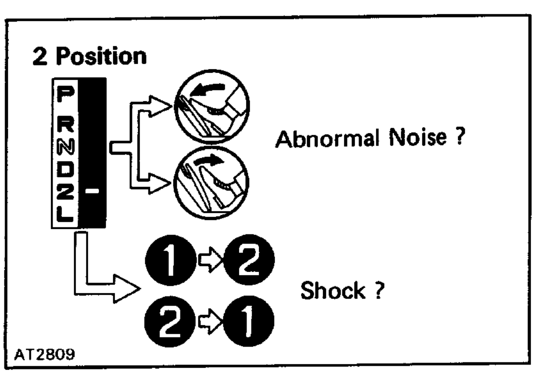


(b) While running in the 2 position and 2nd gear, release the accelerator pedal and check the engine braking effect.

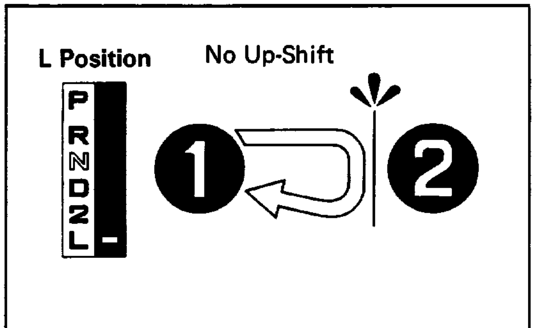
EVALUATION

If there is no engine braking effect:

Second coast brake is defective



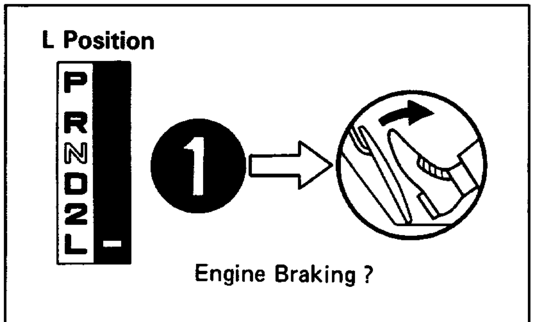
(c) Check for abnormal noise at acceleration and decel- eration, and for shock at up–shift and down–shift.



AT2808

3. L POSITION TEST

(a) While running in the L position, check to see that there is no up–shift to 2nd gear.



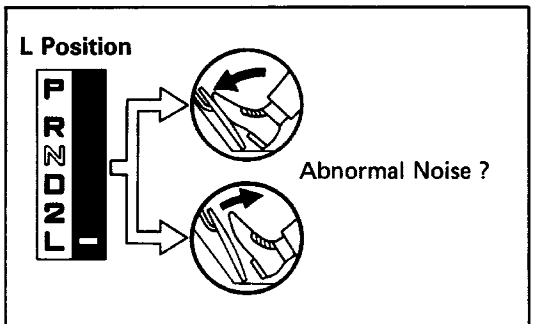
AT2807

(b) While running in the L position, release the accelerator pedal and check the engine braking effect.

EVALUATION

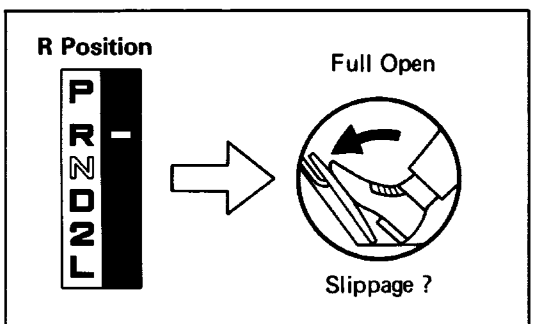
If there is no engine braking effect:

- First and reverse brake is defective



AT2806

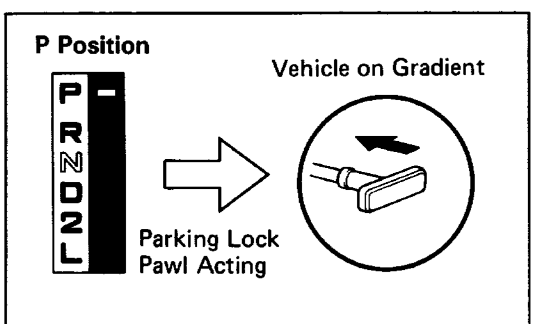
(c) Check for abnormal noise during acceleration and deceleration.



AT2805

4. R POSITION TEST

Shift into the R position and, while starting at wide open throttle, check for slipping.



AT3203

5. P POSITION TEST

Stop the vehicle on a gradient (more than 50) and after shifting into the P position, release the parking brake. Then check to see that the parking lock pawl holds the vehicle in place.

Automatic Shift Schedule

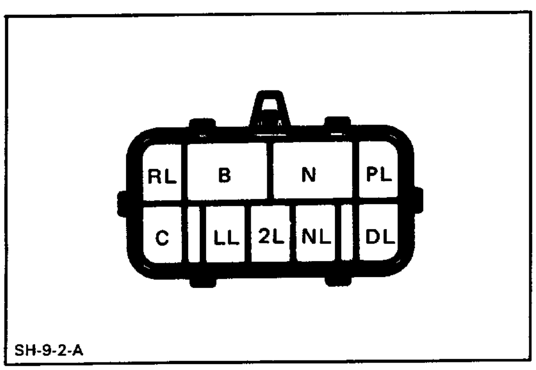
		Throttle valve fully open			[ ] Fully closed			km/h (mph)	
		1→2	2→3	3→O/D	[3→O/D]	[O/D→3]	O/D→3	3→2	2→1
D position	NORM	44–48 (27–30)	93–99 (58–61)	134–141 (83–87)	35–39 (22–24)	21–25 (13–16)	128–135 (79–84)	87–94 (54–58)	40–43 (25–27)
	PW R	47–51 (29–32)	93–99 (58–61)	148–155 (92–96)	50–53 (31–33)	21–25 (13–16)	143–149 (89–92)	87–94 (54–58)	41–45 (25–28)
2 position	NORM PW R	43–46 (27–29)	103–109 (64–68)	–	–	–	–	97–103 (60–64)	38–42 (24–26)
L position	NORM PW R	–	–	–	–	–	–	82–89 (51–55)	47–51 (29–32)

		Throttle valve opening 5%				km/h (mph)	
		Lock–up ON			Lock–up OFF		
		2nd	*3rd	O/D	2nd	*3rd	O/D
D position	NORM	–	41 – 45 (25 – 28)	59 – 63 (37 – 39)	–	38 – 42 (24 – 26)	55 – 59 (34 – 37)
	PWR	–	55 – 59 (34 – 37)	75 – 79 (47 – 49)	–	50 – 53 (31 – 33)	70 – 73 (43 – 45)

* : O/D switch OFF

HINT:

(1) Lock–up will not occur in 2nd gear unless the throttle valve opening is greater than 50%.
(2) There is no lock–up in the 2 and L positions.
(3) In the following cases, the lock–up will be released regardless of the lock–up pattern.
When the throttle is completely closed.
When the brake light switch is ON.



Park/Neutral Position Switch

INSPECTION OF PARK/NEUTRAL POSITION SWITCH

Inspect that there is continuity between each terminals.

Terminal / Shift Position	B	N	PL	RL	NL	DL	2L	LL	C
P	○	○	○						○
R				○					○
N	○	○			○				○
D						○			○
2							○		○
L								○	○

ON–VEHICLE REPAIR
Valve Body
REMOVAL OF VALVE BODY

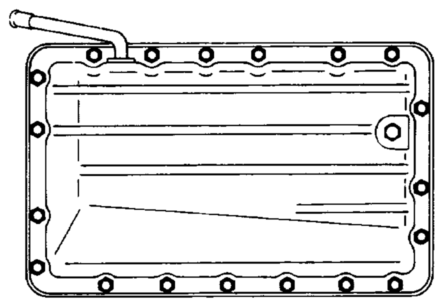
1. CLEAN TRANSMISSION EXTERIOR

To prevent contamination, clean the exterior of the trans–mission.

2. DRAIN TRANSMISSION FLUID

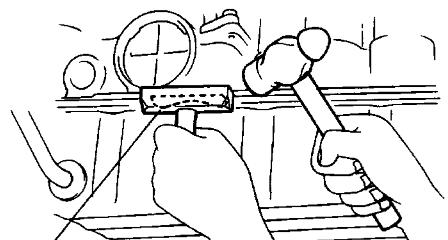
Remove the drain plug and the fluid into a suitable con–tainer.

3. REMOVE OIL PAN


E7058

NOTICE: Some fluid will remain in the oil pan . Be careful not to damage the filler tube and O–ring.

(a) Remove the nineteen bolts.

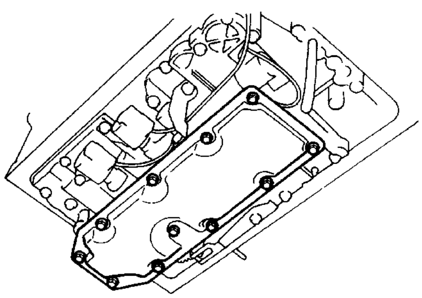


AT3168

(b) Install the blade of SST between the transmission case and oil pan, cut off applied sealer and then re–move the oil pan.

SST 09032–00 100

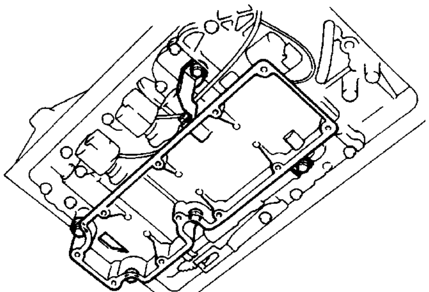
NOTICE: When removing the oil pan, be careful not to damage the oil pan flange.


AT7856

4. REMOVE OIL STRAINER AND GASKETS

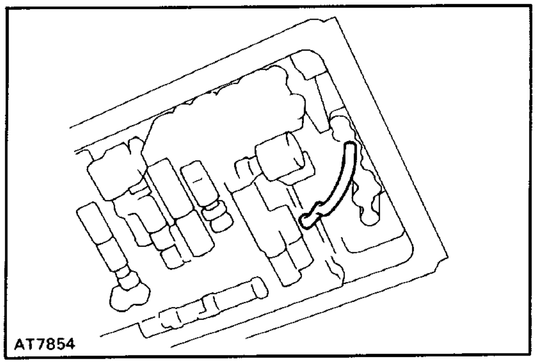
(a) Remove the eleven bolts holding the oil strainer to the oil strainer case.

(b) Remove the oil strainer and gasket.


AT7855

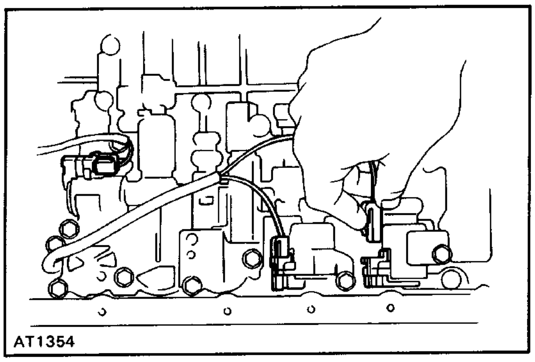
(c) Remove the five bolts and oil strainer case.

(d) Remove the two gaskets from the case.



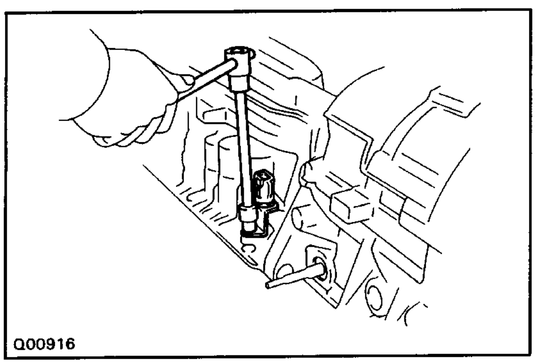
5. REMOVE OIL TUBE

Pry up both tube ends with a large screwdriver and re–move the tube.



6. REMOVE SOLENOID WIRING

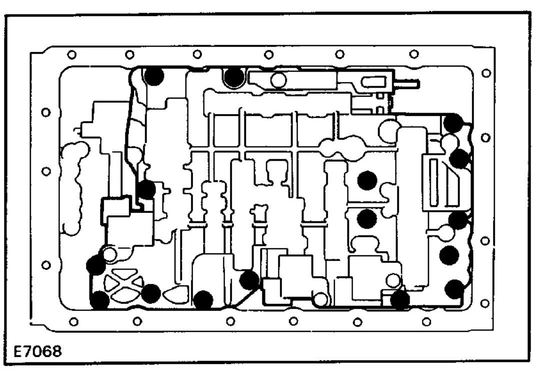
(a) Disconnect the three connectors from No.1, No.2 and lock–up solenoids.



(b) Remove the stopper plate from the case.

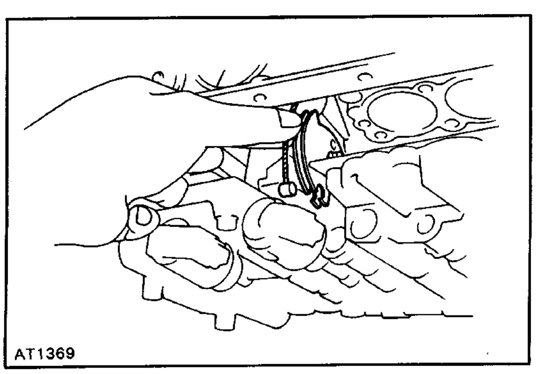
(c) Pull out the solenoid wiring from the transmission case.

(d) Remove the O–ring from the grommet.



7. REMOVE VALVE BODY

(a) Remove the sixteen bolts.

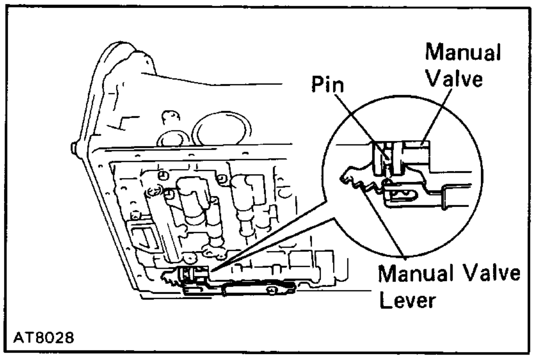


(b) Disconnect the throttle cable from the cam and re–move the valve body.

INSTALLATION OF VALVE BODY

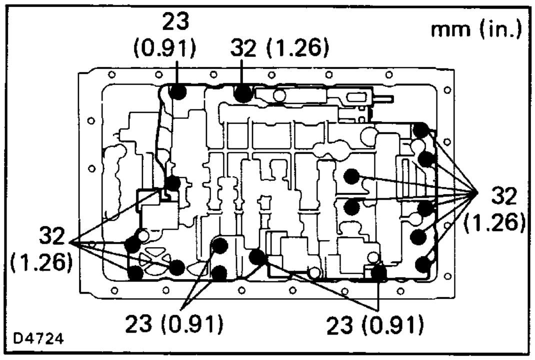
1. CONNECT THROTTLE CABLE TO CAM

Push the cable fitting into the cam.



2. INSTALL VALVE BODY

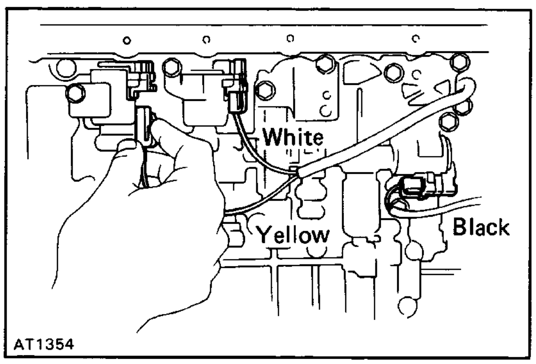
(a) Align the manual valve lever with the manual valve.



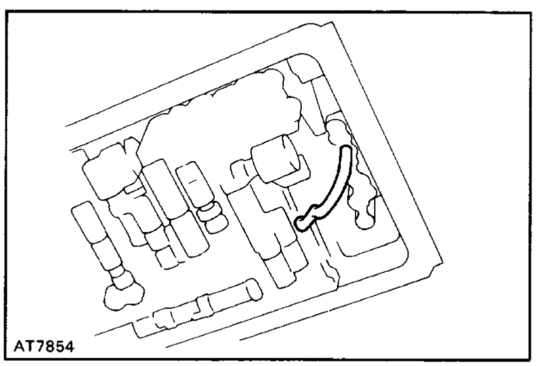
(b) Finger tighten the all bolts first. Then tighten the bolts evenly.

HINT: Each bolt length (mm, in.) is indicated in the fig–ure.

Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)



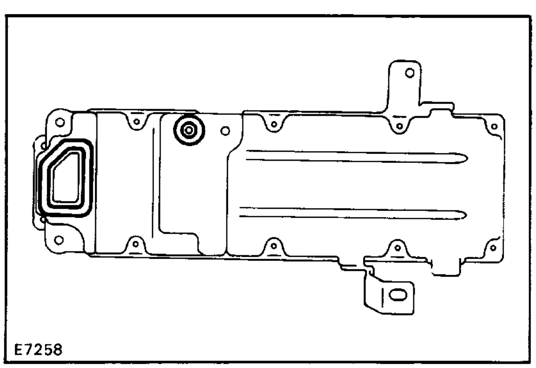
3. CONNECT SOLENOID WIRING



4. INSTALL OIL TUBE

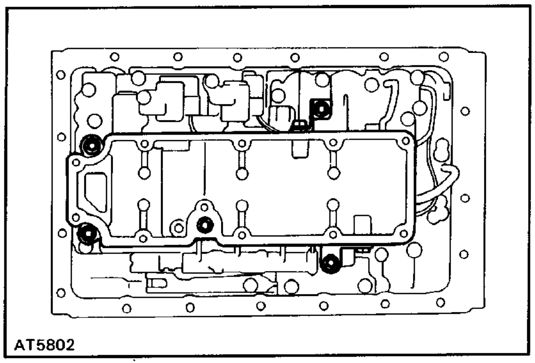
Tap the tubes with a plastic hammer to install the tube into the position shown in the figure.

NOTICE: Be careful not to bend or damage the tube.

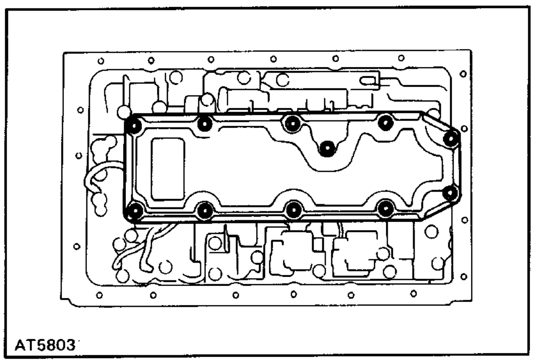


5. INSTALL OIL STRAINER AND GASKETS

(a) Install two new gaskets to the oil strainer case.

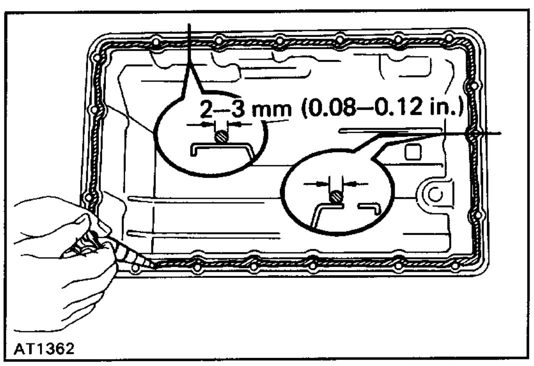

AT5802

(b) Install the oil strainer case and torque the five bolts.
Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)


AT5803

(c) Install a new gasket to the oil strainer case.
(d) Install the oil strainer and torque the eleven bolts.

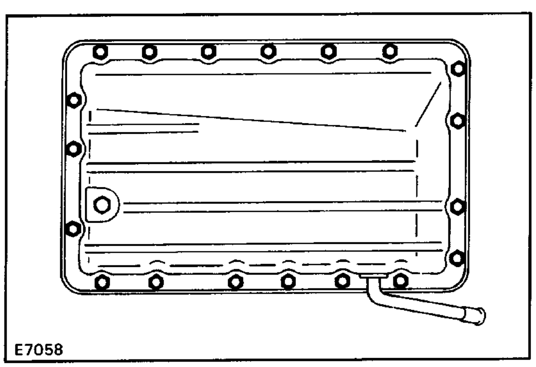
Torque: 6.9 IV –m (70 kgf –cm, 61 in. –lbf)



AT1362

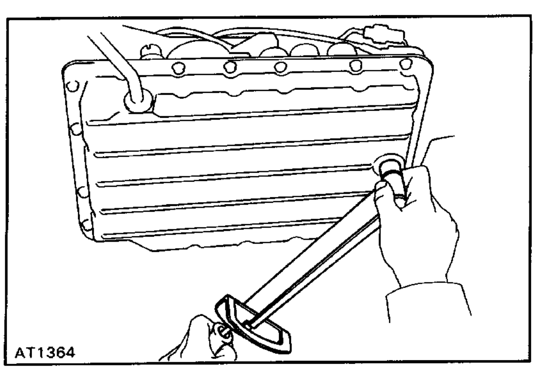
6. INSTALL OIL PAN

(a) Remove any packing material and be careful not to drop oil on the contacting surfaces of the transmis– sion case and oil pan.
(b) Apply seal packing to the oil pan shown in the fig– ure.
Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent


E7058

(c) Install and torque the nineteen bolts.

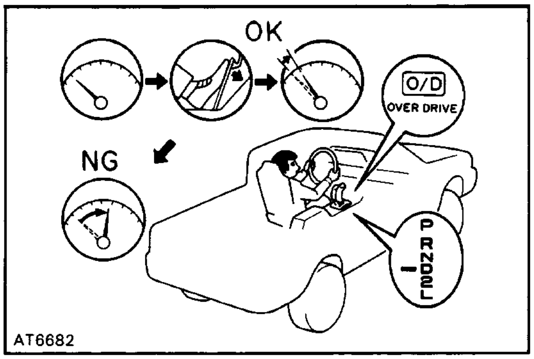
Torque: 7.4 N–m (75 kgf–cm, 65 in.–lbf)


AT1364

7. INSTALL DRAIN PLUG

Torque the drain plug.

Torque: 20 N–m (205 kgf–cm, 15 ft–lbf)



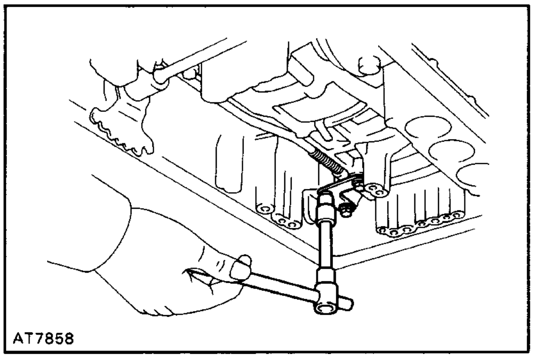
8. FILL TRANSMISSION WITH ATF

Add only about two liters of ATF. Start the engine and shift through all the positions. Check the fluid level and add as necessary.

NOTICE: Do not overfill.

Fluid type: ATF DEXRON• II

Parking Lock Pawl

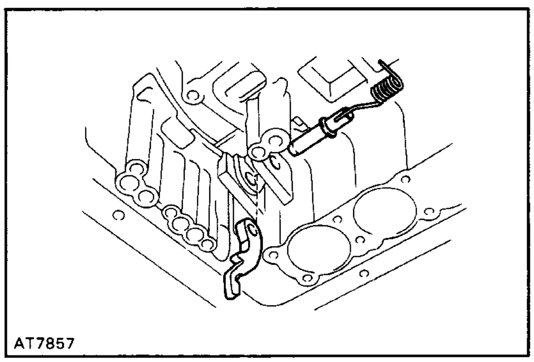


REMOVAL OF PARKING LOCK PAWL

1. REMOVE VALVE BODY (See page AT–204)

2. REMOVE PARKING LOCK PAWL BRACKET

Remove the three bolts and the bracket.



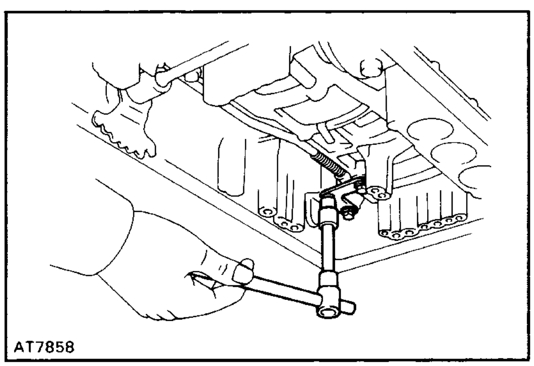
3. REMOVE SPRING FROM PARKING LOCK PAWL PIVOT PIN

4. REMOVE PIVOT PIN AND PARKING LOCK PAWL

INSTALLATION OF PARKING LOCK PAWL

1. INSTALL PARKING LOCK PAWL AND PIVOT PIN

2. INSTALL SPRING



3. INSTALL PARKING LOCK PAWL BRACKET

(a) Push lock rod fully toward.

(b) Install the three bolts finger tight.

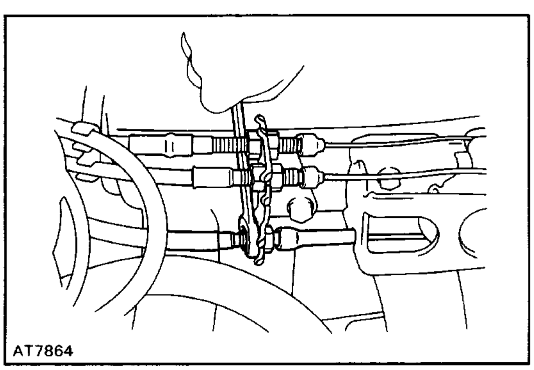
(c) Check that the pawl operates smoothly.

(d) Torque the bolts.

Torque: 7.4 N–m (75 kgf–cm, 65, in.–lbf)

4. INSTALL VALVE BODY (See page AT–204)

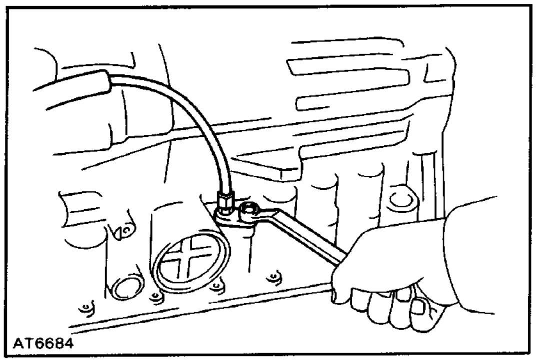
Throttle Cable



REMOVAL OF THROTTLE CABLE

1. DISCONNECT THROTTLE CABLE

Disconnect the cable from the throttle linkage.



2. REMOVE VALVE BODY (See page AT–204)

3. PUSH THROTTLE CABLE OUT OF TRANSMISSION CASE

Remove the retaining bolt and pull out the throttle cable.

INSTALLATION OF THROTTLE CABLE

1. INSTALL CABLE IN TRANSMISSION CASE

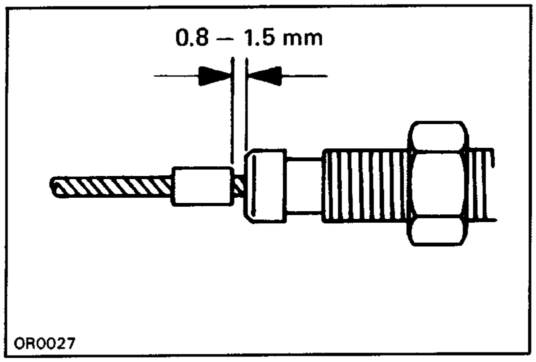
Install the retaining bolt and push in the throttle cable.

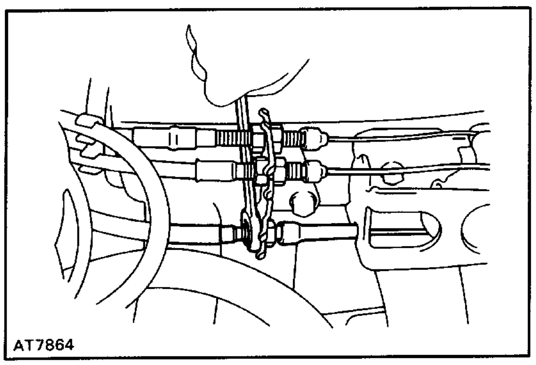
2. INSTALL VALVE BODY (See page AT–205)

3. IF THROTTLE CABLE IS NEW, STAKE STOPPER ON INNER CABLE

(a) Pull the inner cable lightly until a slight resistance is felt, and hold it.

(b) Stake the stopper as shown, 0.8 – 1.5 mm (0.031 – 0.059 in.) in width.





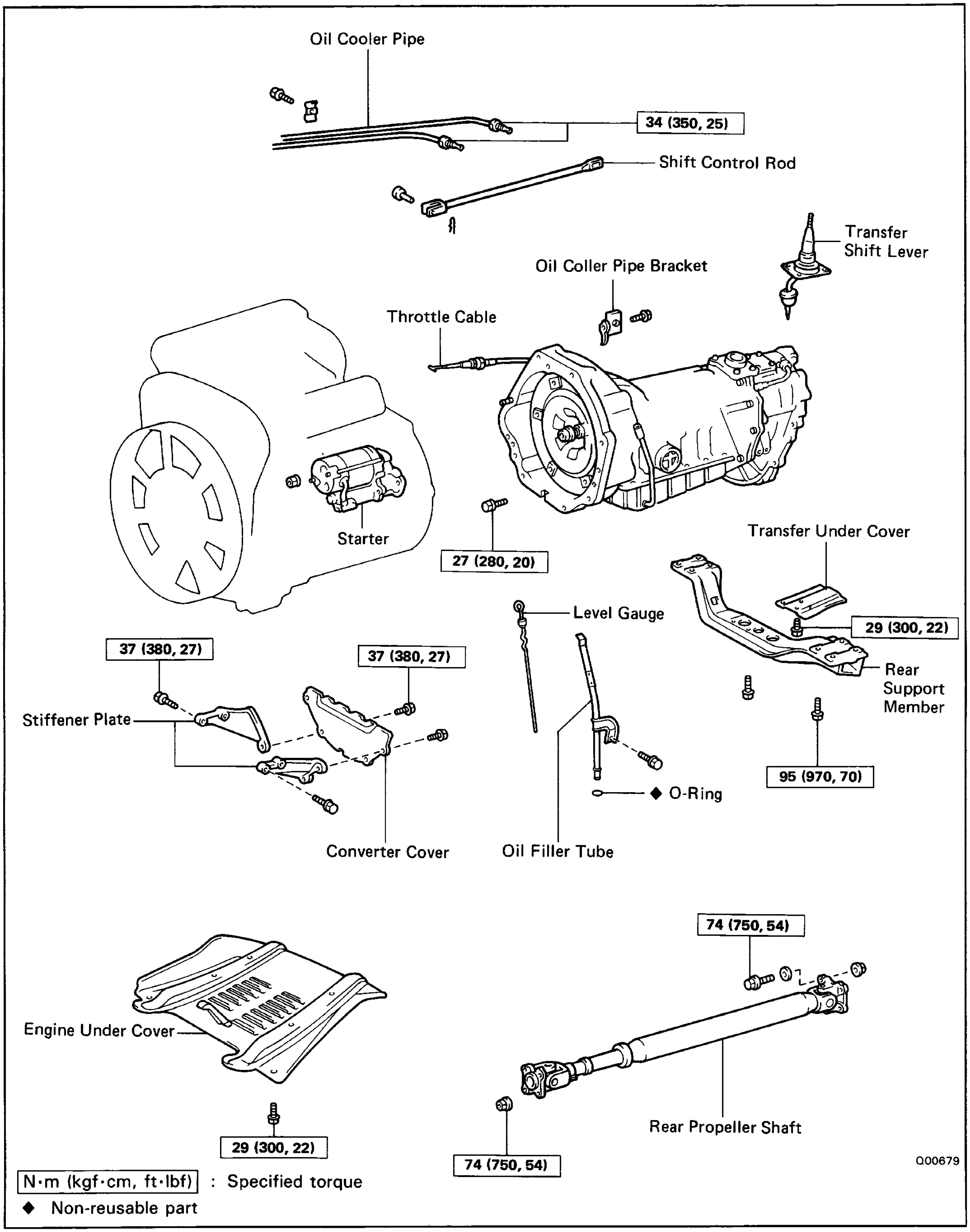
4. CONNECT THROTTLE CABLE

5. ADJUST THROTTLE CABLE (See page AT–182)

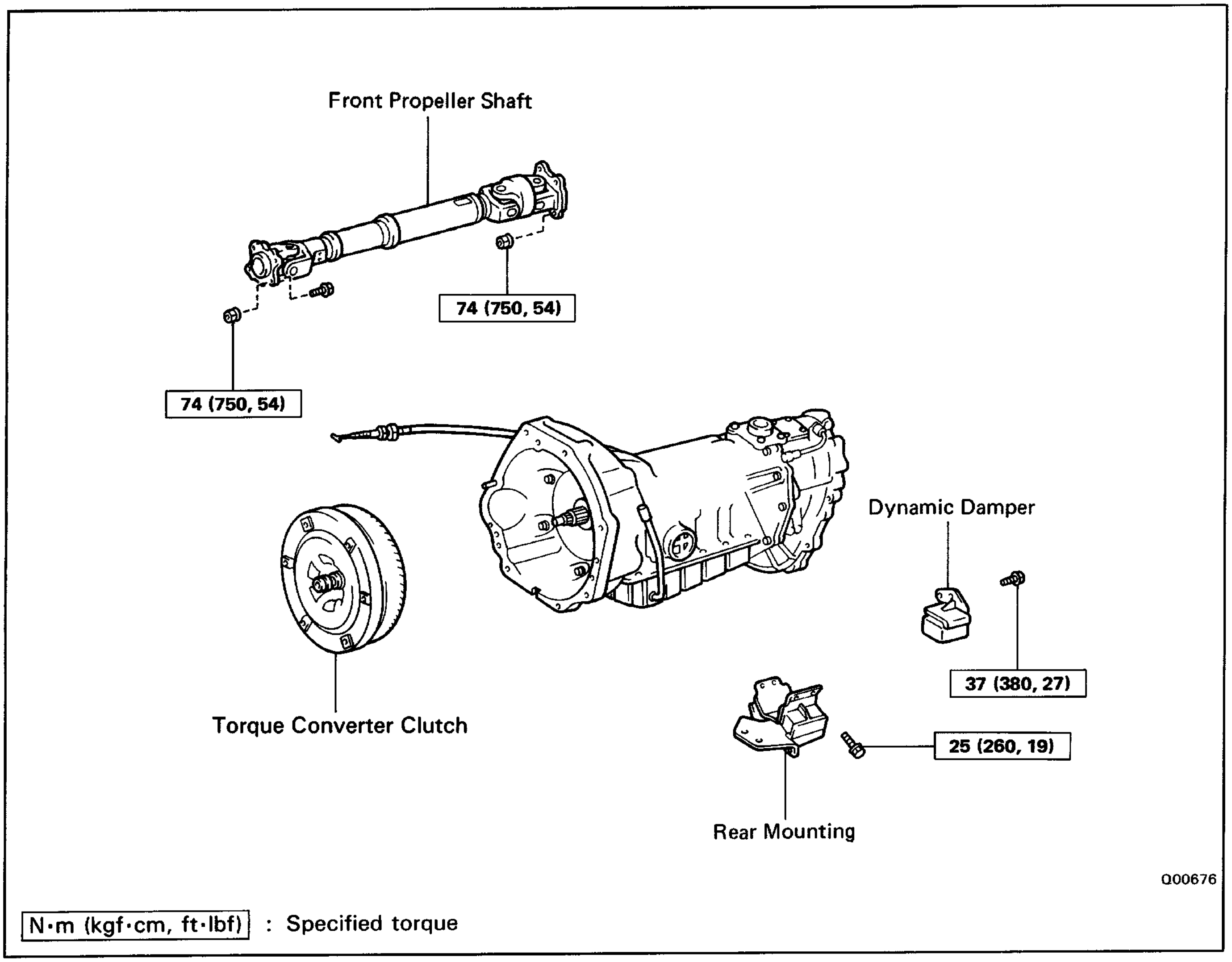
6. TEST DRIVE VEHICLE

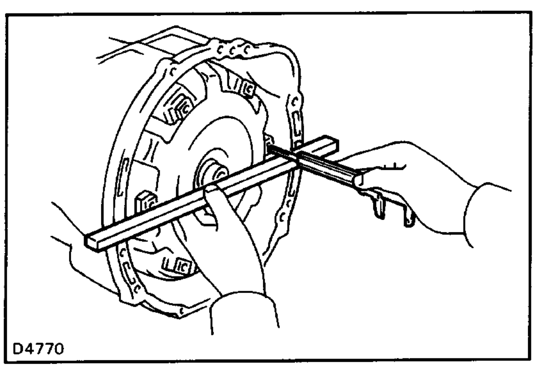
REMOVAL AND INSTALLATION OF TRANSMISSION

Remove and Install the parts as shown.



(Cont'd)





(MAIN POINT OF INSTALLATION)

1. CHECK TORQUE CONVERTER CLUTCH INSTALLATION

Using calipers and a straight edge, measure from the in–stalled surface of the torque converter clutch to the front surface of the transmission housing.

Correct distance: 20.0 mm (0.787 in.)

If the distance is less than the standard, check for an im–proper installation.

2. ADJUST TRANSMISSION THROTTLE CABLE

(See page AT–182)

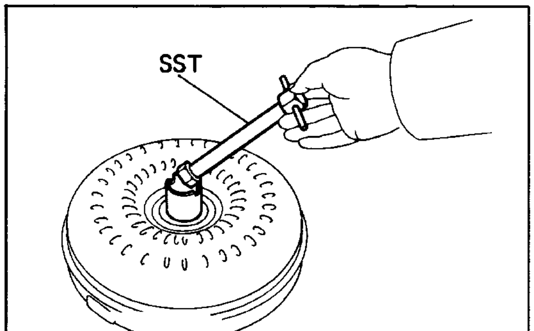
3. FILL TRANSMISSION WITH ATF AND CHECK FLUID LEVEL

Fluid type: ATF DEXRON• II

NOTICE: Do not overfill.

TORQUE CONVERTER CLUTCH AND DRIVE PLATE

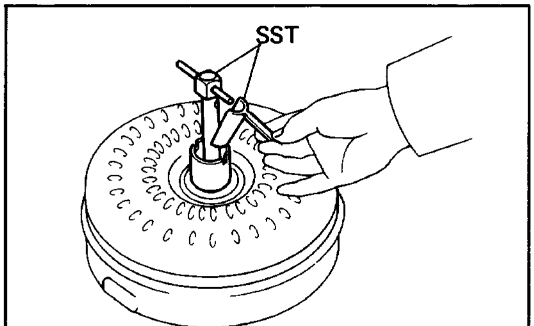
INSPECTION OF TORQUE CONVERTER CLUTCH AND DRIVE PLATE



AT0952

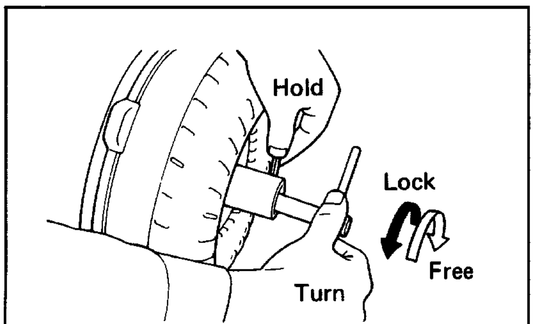
1. INSPECT ONE–WAY CLUTCH

(a) Install SST into the inner race of the one–way clutch.
SST 09350–30020 (09351–32010)



AT0953

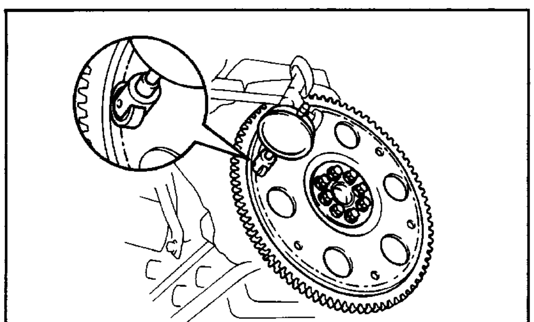
(b) Install SST so that it fits in the notch of the con–verter hub and outer race of the one–way clutch.
SST 09350–30020 (09351–32020)



AT3306

(c) With the torque converter clutch standing on its side, the clutch locks when turned counterclock–wise, and rotates freely and smoothly clockwise.
If necessary, clean the converter and retest the clutch.
Replace the converter if the clutch still fails the test.

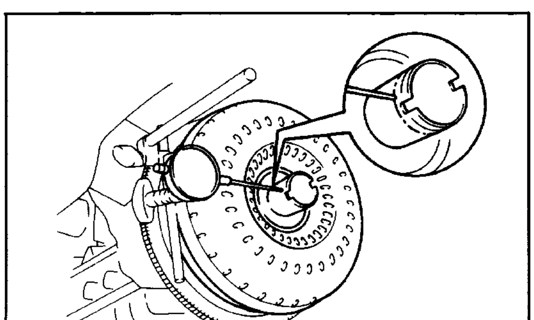
2. MEASURE DRIVE PLATE RUNOUT AND INSPECT RING GEAR


AT4570

Set up a dial indicator and measure the drive plate runout.
If runout exceeds 0.20 mm (0.0079 in.) or if the ring gear is damaged, replace the drive plate. If installing a new drive plate, note the orientation of spacers and tighten the bolts.

Torque: 83 N–m (850 kgf–cm, 61 ft–lbf)

3. MEASURE TORQUE CONVERTER CLUTCH SLEEVE RUNOUT

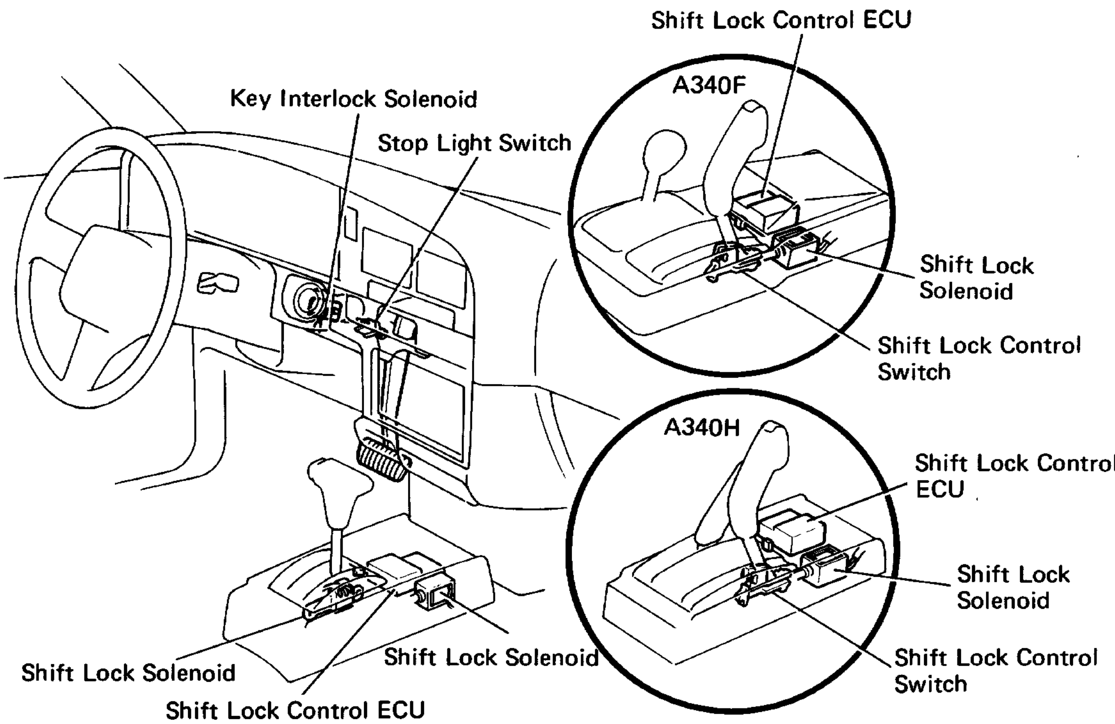

AT4184

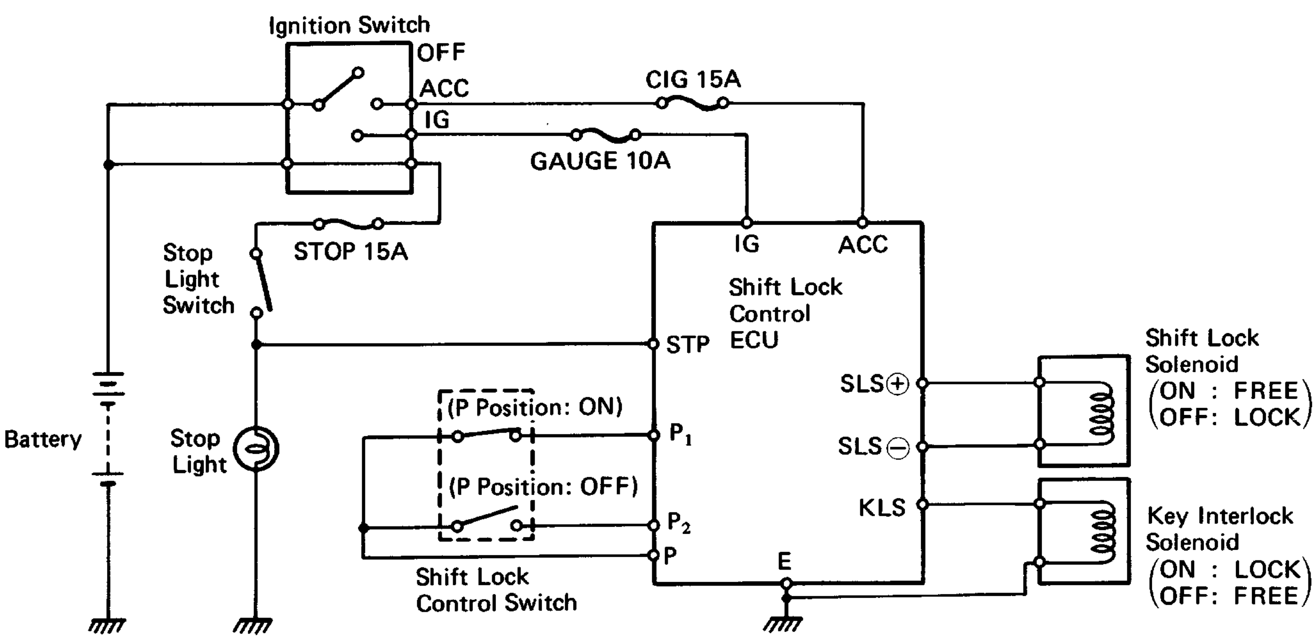
(a) Temporarily mount the torque converter clutch to the drive plate. Set up a dial indicator.
If runout exceeds 0.30 mm (0.0118 in.), try to correct by reorienting the installation of the converter. If excessive runout cannot be corrected, replace the torque con-verter
clutch.

HINT: Mark the position of the converter to ensure cor–rect installation.

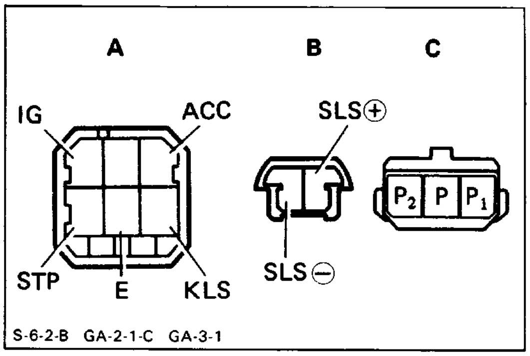
(b) Remove the torque converter clutch.

SHIFT LOCK SYSTEM
(Electrically Controlled Shift Lock System)
COMPONENTS AND CIRCUIT





AT5862
AT4352

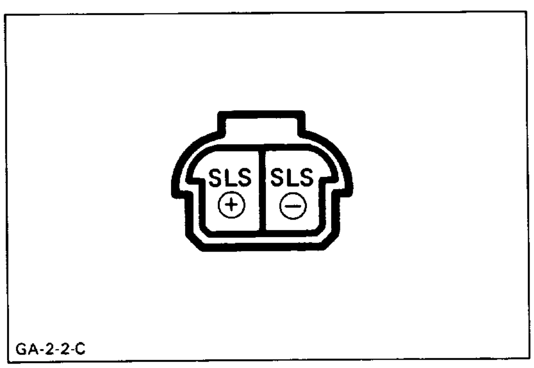


INSPECTION OF ELECTRIC CONTROL COMPONENTS

1. INSPECT SHIFT LOCK CONTROL COMPUTER

Using a voltmeter, measure the voltage at each termi– nals.

Connector	Terminal	Measuring condition		Voltage (V)
A	ACC – E	IG SW ACC position		10 – 14
	IG – E	• G SW ON position		10 – 14
	STP – E	Depress brake pedal		10 – 14
	KLS – E	①	IG SW ACC position and P position	0
		②	P –i R, N, D, 2, L position	10 – 14
		③	↑ (Approx. after one second)	6 – 9
B	SLS ⊕ – SLS ⊖	①	IG SW ON position and P position	0
		②	Depress brake pedal	10 – 14
		③	P¿ R, N, D, 2, L positions or release brake pedal	0
C	P_1 – P	①	IG SW ON, P position and depress brake pedal	0
		②	R, N, D, 2, L positions	10 – 14
	P_2 – P	①	IG SW ACC position and P position	10 – 14
		②	R, N, D, 2, L positions	0



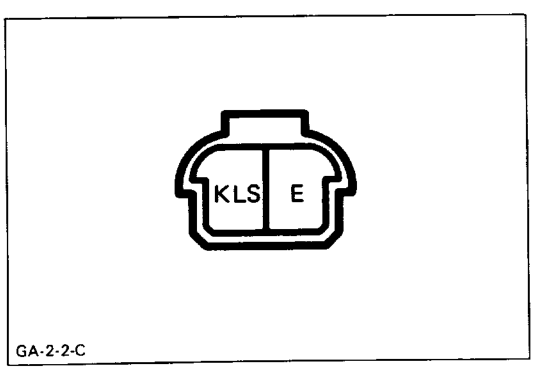
2. INSPECT SHIFT LOCK SOLENOID

(a) Disconnect the solenoid connector.

(b) Using an ohmmeter, measure the resistance be– tween terminals.

Standard resistance: 29 – 36/

(c) Apply the battery positive voltage between termi nals. At this time, confirm that a solenoid operation



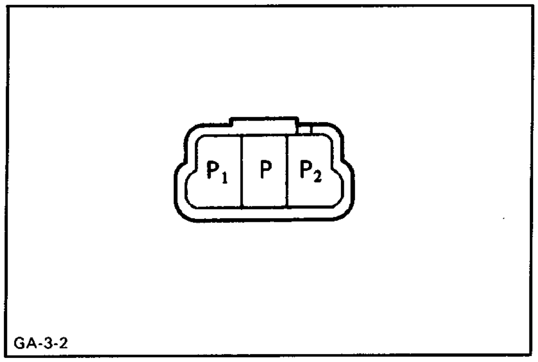
3. INSPECT KEY INTERLOCK SOLENOID

(a) Disconnect the solenoid connector.

(b) Using an ohmmeter, measure the resistance be tween terminals.

Standard resistance: 12 – 17/

(c) Apply the battery positive voltage between termi nals. At this time, confirm that a solenoid operation



4. INSPECT SHIFT LOCK CONTROL SWITCH

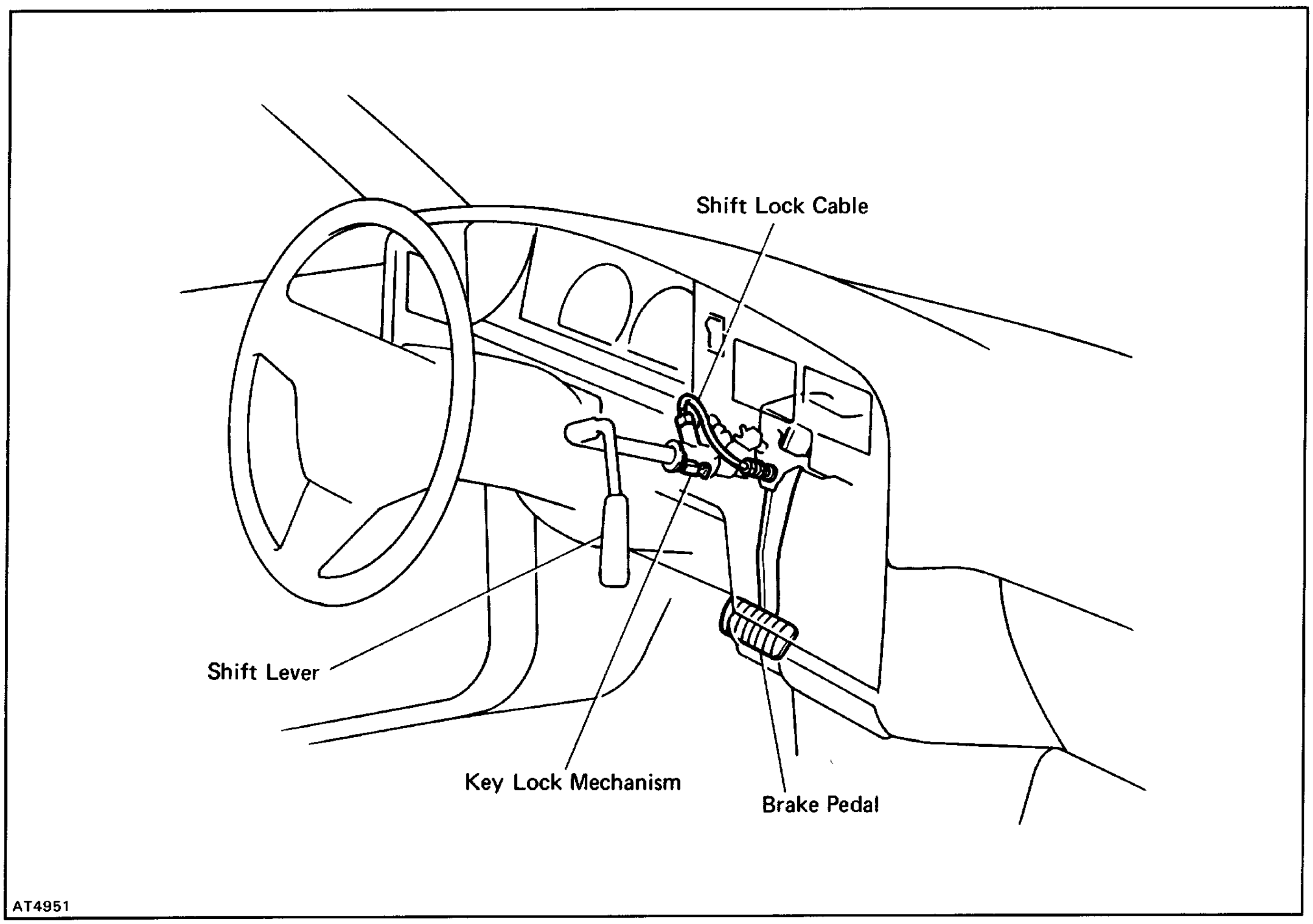
Inspect that there is continuity between each terminals.

: Continuity ○—○

Terminal / Shift Position	P	P_1	P_2
P position (Release button is not pushed)	○—	—○	
R, N, D, 2, L positions	○—	—	—○

(Mechanically Controlled Shift Lock System)

COMPONENTS



HINT: Do the following steps, after replacing the shift–lever, ignition switch, shift lock cable and brake pedal.

(a) Check that the stop lights turn on whlile depressing the brake pedal.

(b) Check that the stop lights turn off when releasing the brake pedal.

If stop light operation is not as specified, adjust the stop light switch position.

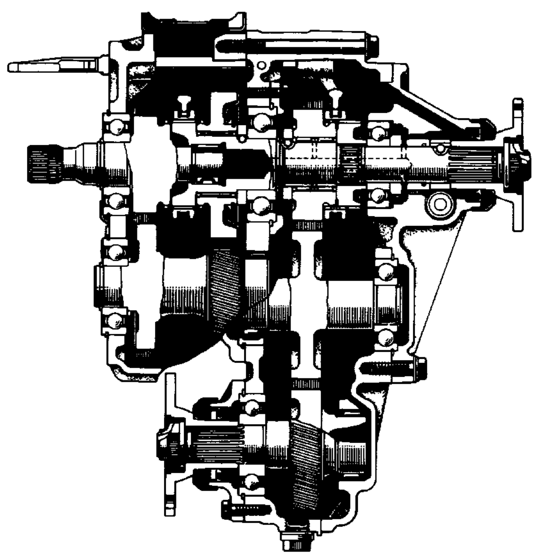
TRANSFER

DESCRIPTION

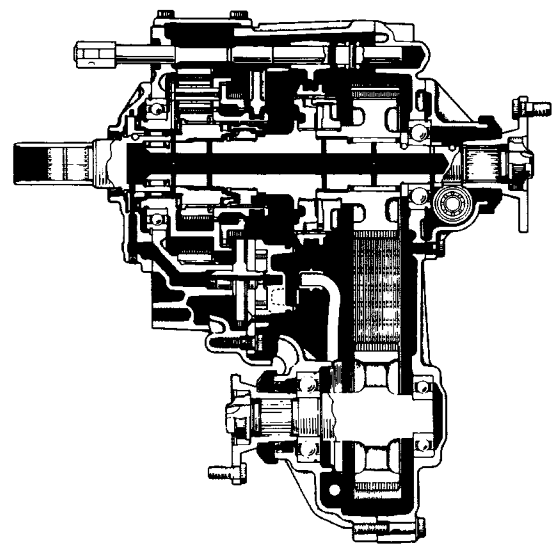
TRANSFER

The Transfer transmits the drive force from the transmission to the front wheels, switching between 2WD, 4WD (High) and 4WD (Low).
In the Truck the types of gear used during deceleration produce 2 types of transfer.
The specifications and cross–section diagrams are as shown.

RF1A Type Transfer



VF1A Type Transfer



E9702 TF0637

Specification

Transfer / Items		RF1A Type Transfer	VF1A Type Transfer	
Type of Engine		22R-E	22R-E	3VZ-E
Type of Transmission		W56	G58, *A340F	R150F
Type of Reduction Gear		Counter Gear	Planetary Gear	
Gear Ratio	H2 and H4	1.000	1.000	
	L4	2.276	2.566	
Oil Capacity liters (US qts., Imp. qts.)		1.6 (1.7, 1.4)	1.1 (1.2, 1.0)	
Oil Grade		API GL-4 or GL-5	API GL-4 or GL-5	
Oil Viscosity		SAE 75W-90	SAE 75W-90	

Automatic Transmission

PRECAUTIONS

When working with FIPG material, you must be observe the following.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket sur–faces.
- Thoroughly clean all components to remove all the loose material.
- Clean both sealing surfaces with a non–residue solvent.
- Apply the seal packing in approx. 1 mm (0.04 in.) bead along the sealing surface.
- Parts must be assembled within 10 minutes of application. Otherwise, the packing (FIPG) material must be removed and reapplied.

TROUBLESHOOTING

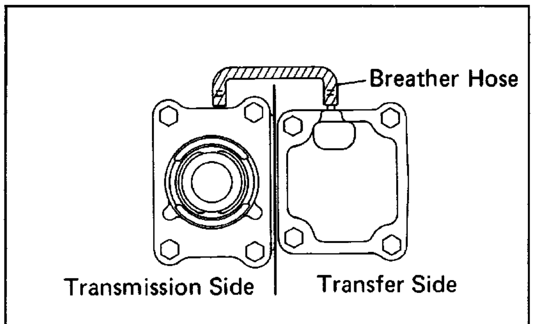
Problem	Possible cause	Remedy	Page
Hard to shift or will not shift	Transfer faulty	Disassemble and inspect transfer	TF–4, 32
Transfer jumps out of gear	Transfer faulty	Disassemble and inspect transfer	TF–4, 32

REMOVAL OF TRANSFER

1. REMOVE TRANSFER WITH TRANSMISSION

MT – See pages MT–14 to 25

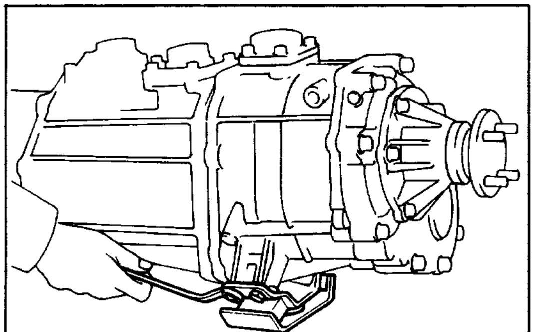
AT – See pages AT–210 and 211



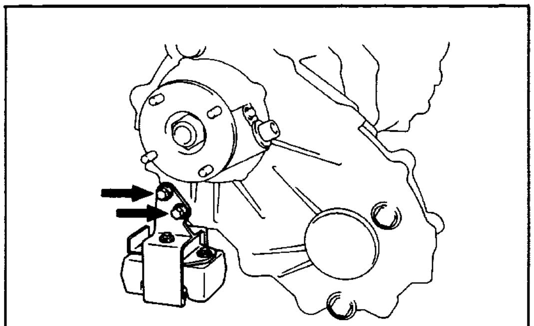
TF0626

2. (22R–E1G58, A340F)
REMOVE BREATHER HOSE

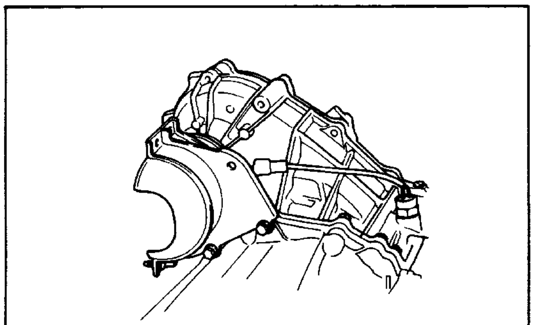
Disconnect the breather hose from transfer upper cover and transmission control retainer.


TF0655

3. REMOVE ENGINE REAR MOUNTING


TF0633

4. (Regular Cab w/ VF1A Type Transfer)
REMOVE DYNAMIC DAMPER


TF0654

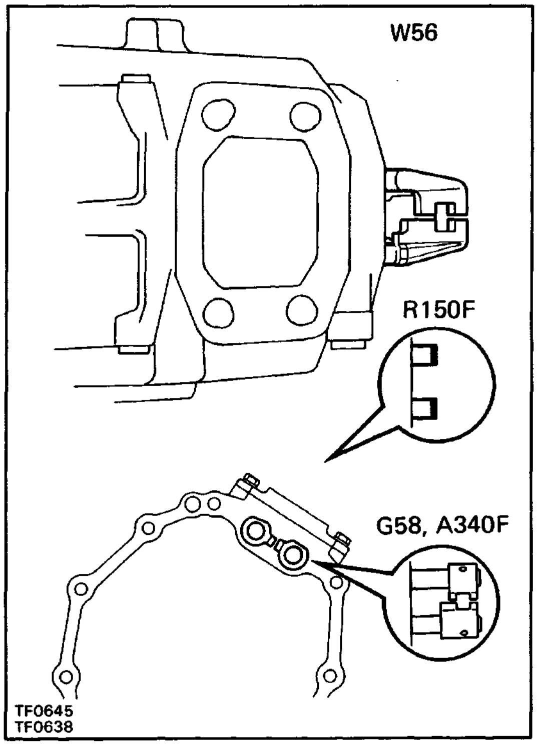
5. REMOVE PROPELLER SHAFT UPPER DUST COVER AND TRANSFER FROM TRANSMISSION

(a) Remove the dust cover bolt from the bracket.

(b) Remove the transfer adaptor rear mounting bolts.

(c) Pull the transfer straight up and remove it from the transmission.

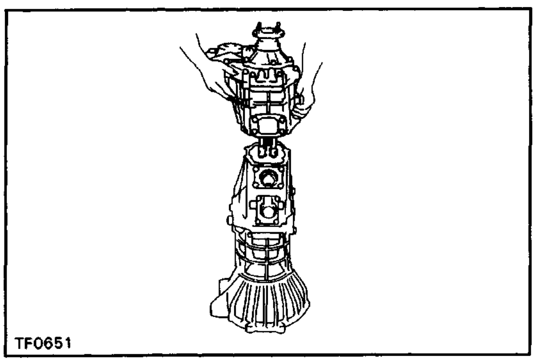
HINT: Take care not to damage the adaptor rear oil seal with the transfer input gear spline.



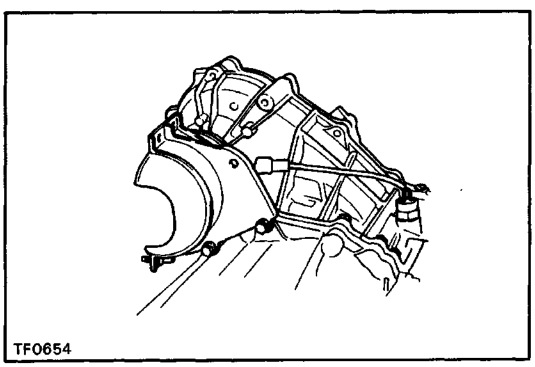
INSTALLATION OF TRANSFER

1. INSTALL TRANSFER AND PROPELLER SHAFT UPPER DUST COVER TO TRANSMISSION WITH NEW GASKET

(a) Shift the two shift fork shafts to the high–four position.

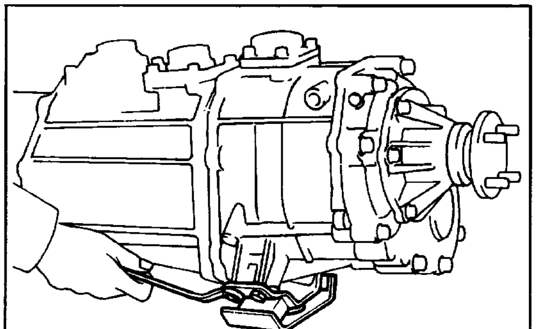


(b) Apply MP grease to the adaptor oil seal.
(c) Place a new gasket to the transfer adaptor.
(d) Install the transfer to the transmission.
HINT: Take care not to damage the oil seal by the input gear spline when installing the transfer.



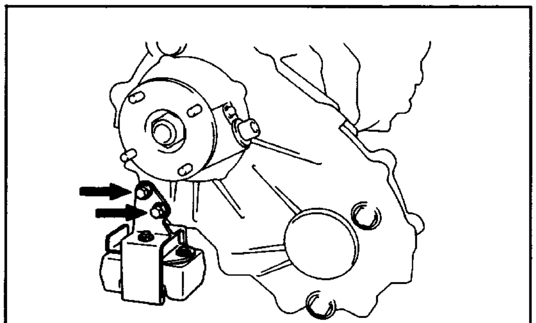
(e) Install and torque the bolts with the propeller shaft upper dust cover.
Torque:
W56 39 N–m (400 kgf–cm, 29 ft–lbf)
R 150F, G58, A340F
37 N–m (380 kgf–cm, 27 ft–lbf)

(f) Install the dust cover bolt to the bracket.
Torque:
R 150F, G58, A340F
23 N–m (230 kgf–cm, 17 ft–lbf)
W56 39 N–m (400 kgf–cm, 29 ft–lbf)



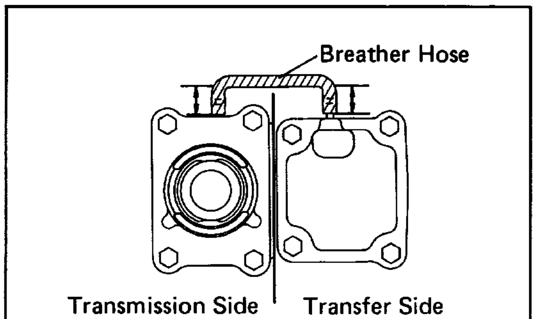
TF0655

2. INSTALL ENGINE REAR MOUNTING
Torque: 25 N–m (260 kgf–cm, 19 ft–lbf)



TF0633

3. (Regular Cab wI VF 1 A Type Transfer)
INSTALL DYNAMIC DAMPER
Torque: 37 N–m (380 kgf–cm, 27 ft–lbf)



TF0626

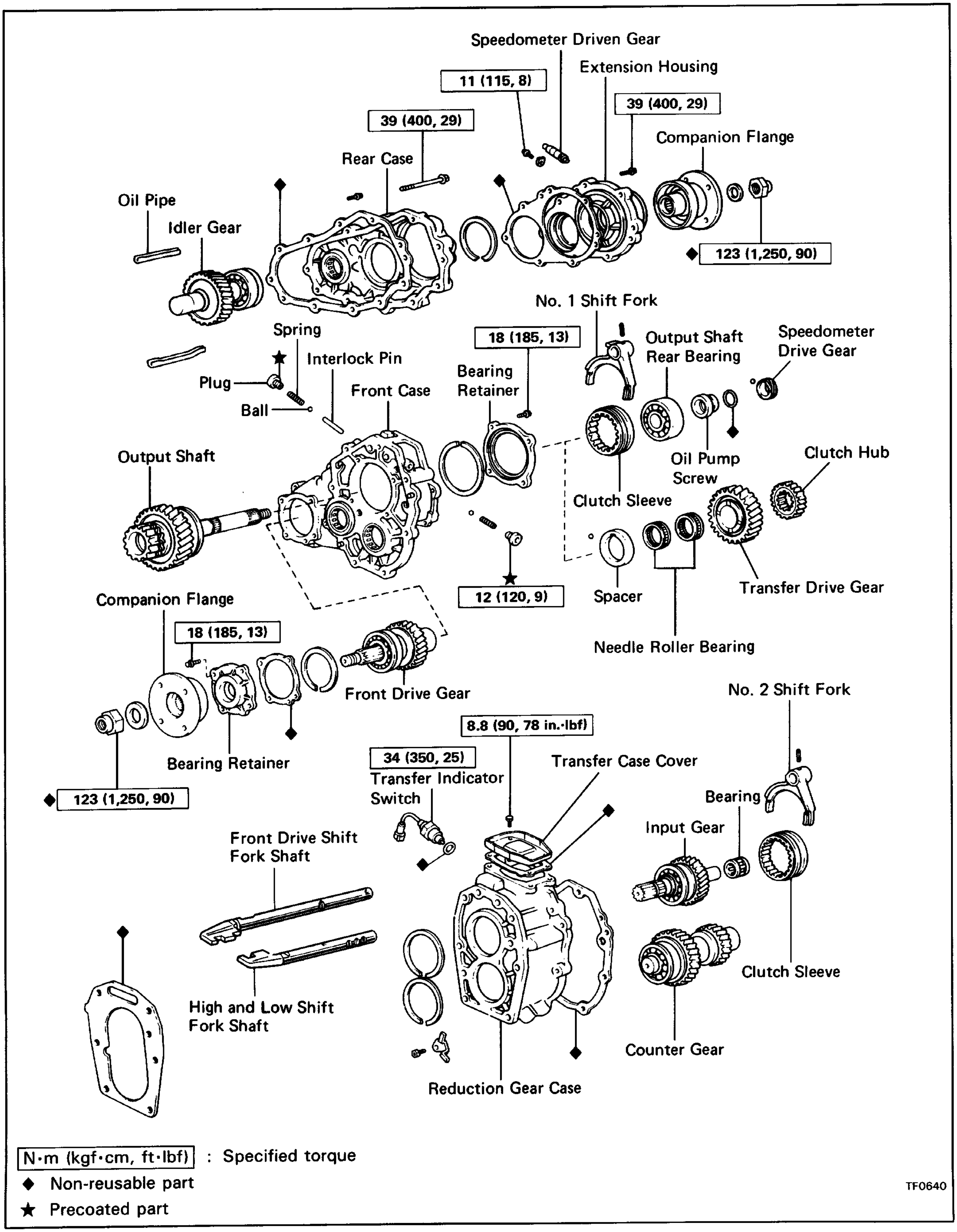
4. (22R–EIG58, A340F)
INSTALL BREATHER HOSE
Connect the breather hose for transfer upper cover and transmission control retainer as shown.
Hose depth: 13 mm (0.51 in.)

5. INSTALL TRANSFER WITH TRANSMISSION
MT – See pages MT–14 to 2 5.
AT – See pages AT–210 and 211.

6. FILL TRANSMISSION AND TRANSFER WITH OIL
MT – See page MT–24.
AT – See page AT–181.

7. PERFORM ROAD TEST
Check for abnormal noise and smooth operation.

(RF1A TYPE TRANSFER) COMPONENTS

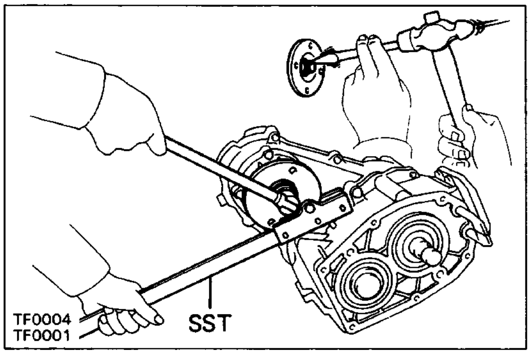


DISASSEMBLY OF TRANSFER

(See page TF–7)

1. REMOVE No. 1 SPEED SENSOR

2. REMOVE TRANSFER INDICATOR SWITCH



TF0004
TF0001

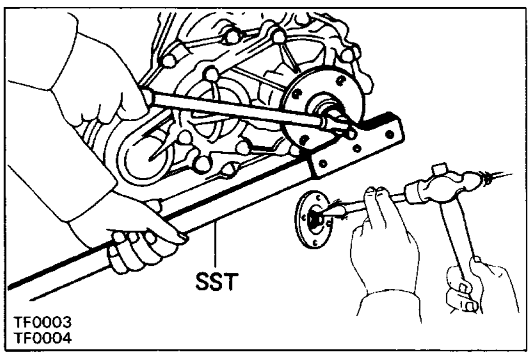
3. REMOVE FRONT COMPANION FLANGE

(a) Using a hammer and chisel, loosen the staked part of the nut.

(b) Using SST to hold the flange, remove the nut and washer.

SST 09330–00021

(c) Remove the companion flange.



TF0003
TF0004

HINT: If the companion flange is difficult to remove, use SST.

4. REMOVE REAR COMPANION FLANGE

(a) Using a hammer and chisel, loosen the staked part of the nut.

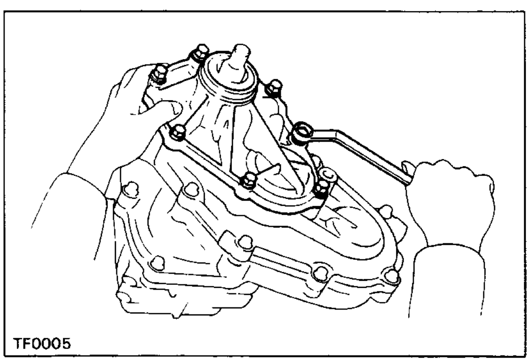
(b) Using SST to hold the flange, remove the nut and washer.

SST 09330–00021

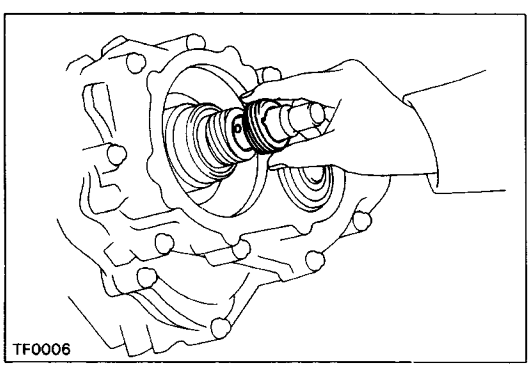
(c) Remove the companion flange.

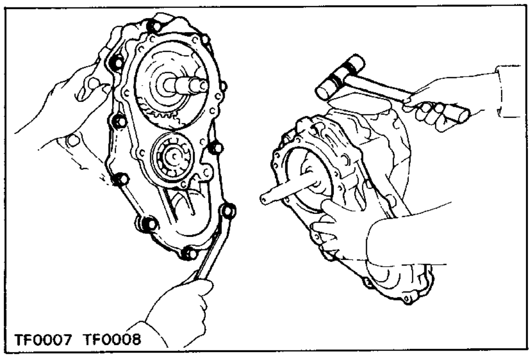
5. REMOVE EXTENSION HOUSING

Remove the seven bolts and remove the extension housing.


TF0005

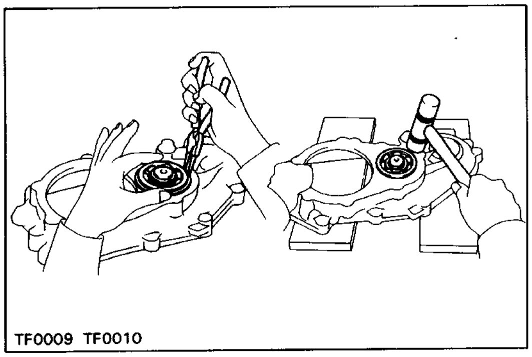
6. REMOVE SPEEDOMETER DRIVE GEAR, STEEL BALL, OIL PUMP SCREW AND BEARING


TF0006



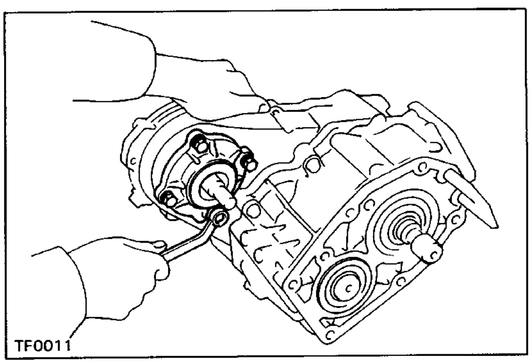
7. REMOVE REAR CASE

(a) Remove the ten bolts.
(b) Using a plastic hammer, remove the rear case with the idler gear.
HINT: Hold the front case so the rear does not descend. If it descends, the clutch hub and steel ball may fall out.



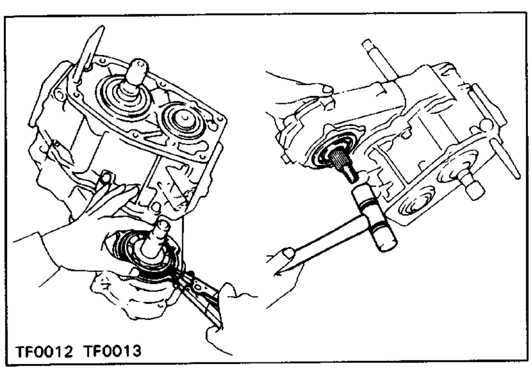
8. REMOVE IDLER GEAR FROM REAR CASE

(a) Using snap ring pliers, remove the snap ring.
(b) Using a plastic hammer, tap out the idler gear from the rear case.
HINT: Place the rear case on something soft such as wooden blocks.



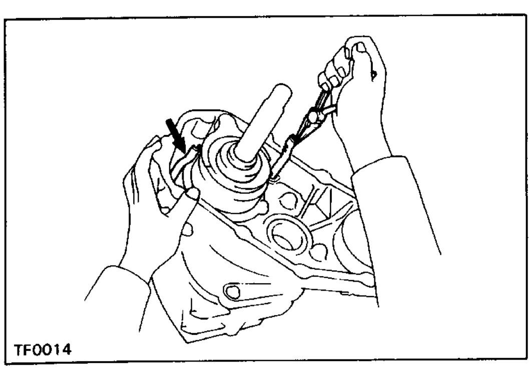
9. REMOVE BEARING RETAINER

Remove the four bolts and remove the bearing retainer.



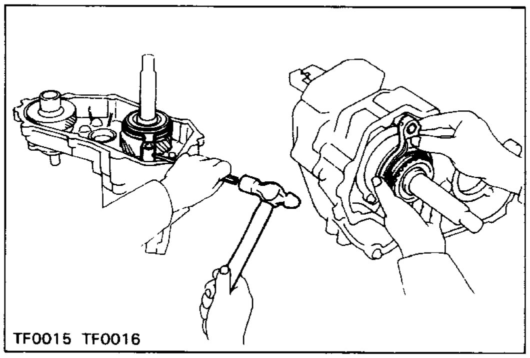
10. REMOVE FRONT DRIVE GEAR

(a) Using snap ring pliers, remove the snap ring.
(b) Using a plastic hammer, tap out the front drive gear from the front case.



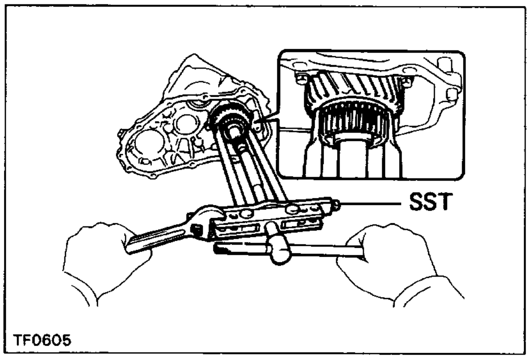
11. REMOVE OIL PIPES

Using pliers, remove the two oil pipes.



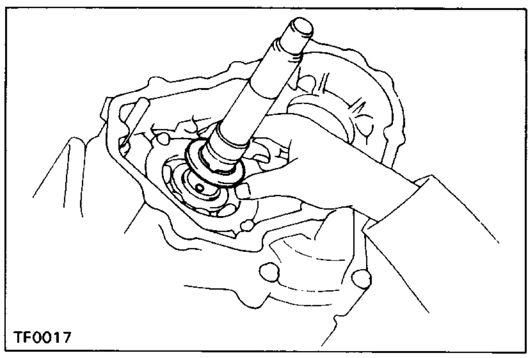
12. REMOVE SHIFT NO. 1 FORK AND CLUTCH SLEEVE

(a) Shift the fork shafts to the high–low position.
(b) Using a pin punch and a hammer, drive out the slot–ted spring pin.
(c) Remove the shift No. 1 fork together with the clutch sleeve.

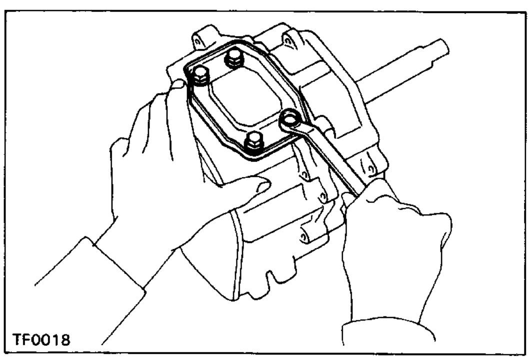


13. REMOVE CLUTCH HUB AND TRANSFER DRIVE GEAR

Using SST, remove clutch hub and transfer drive gear.
SST 09950–20017

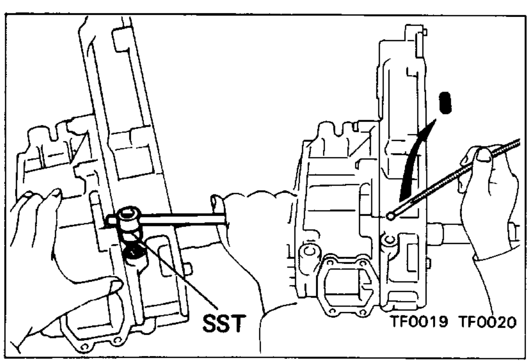


14. REMOVE NEEDLE ROLLER BEARING, NO.2 SPACER AND STEEL BALL



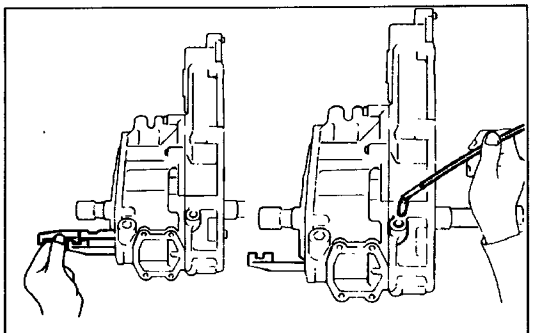
15. REMOVE TRANSFER CASE COVER

Remove the four bolts and remove the transfer case cover and gasket.

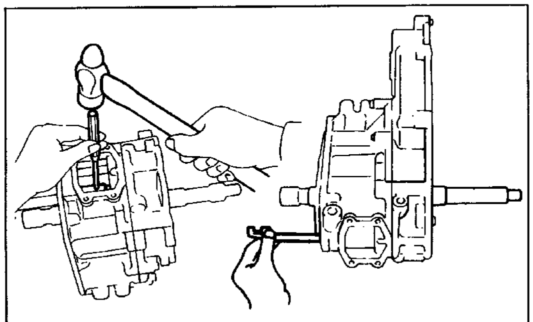


16. REMOVE STRAIGHT SCREW PLUGS, SPRINGS AND LOCKING BALLS

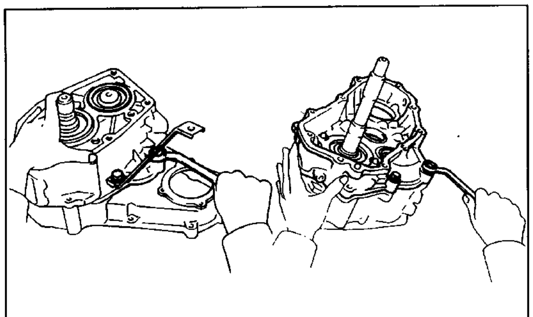
(a) Using SST, remove the plug on the right side.
SST 09313–30021
(b) Using a magnetic finger, remove the spring and ball.
(c) Remove the plug, spring and ball on the left side in the same procedure.


TF0021 TF0022

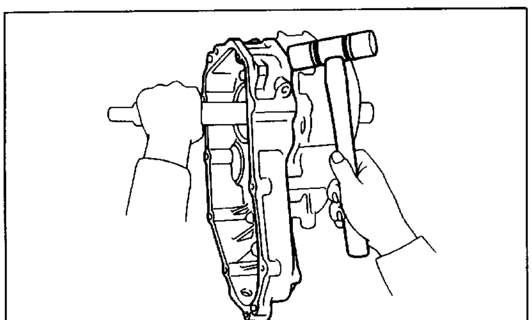
17. REMOVE FRONT DRIVE SHIFT FORK SHAFT
18. REMOVE INTERLOCK PIN
Using a magnetic finger, remove the interlock pin.


TF0023 TF0024

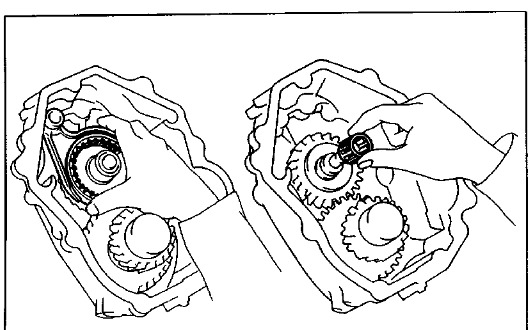
19. REMOVE HIGH AND LOW SHIFT FORK SHAFT
(a) Using a pin punch and a hammer, drive out the slot–ted spring pin.
(b) Remove the shaft.


TF0025 TF0026

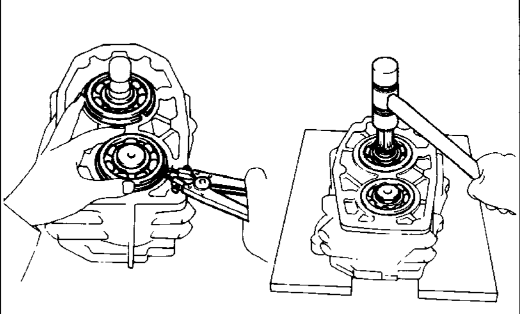
20. REMOVE FRONT CASE
(a) Remove the four bolts.


TF0027

(b) Using a plastic hammer, remove the front case with the output shaft.

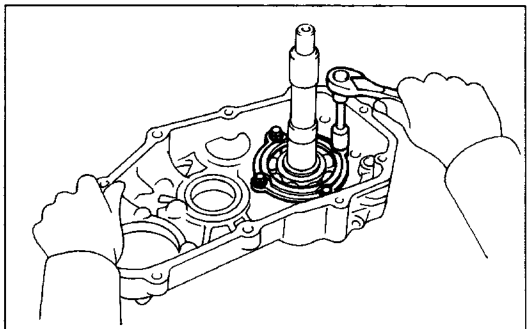

TF0028 TF0029

21. REMOVE NO.2 FORK WITH CLUTCH SLEEVE AND NEEDLE ROLLER BEARING FROM INPUT SHAFT

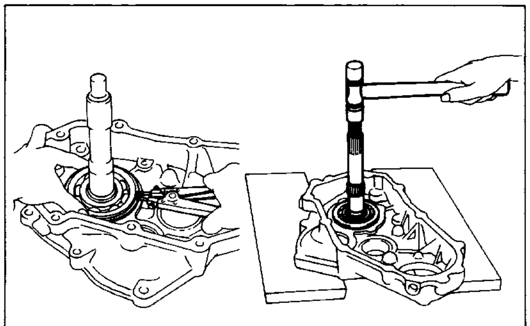

TF0030 TF0031

22. REMOVE INPUT GEAR AND COUNTER GEAR FROM REDUCTION GEAR CASE
(a) Using a snap ring pliers, remove the two snap rings.
(b) Using a plastic hammer, tap out the input gear and counter gear from the reduction gear case.

HINT: Place the reduction gear case on something soft such as wooden blocks.

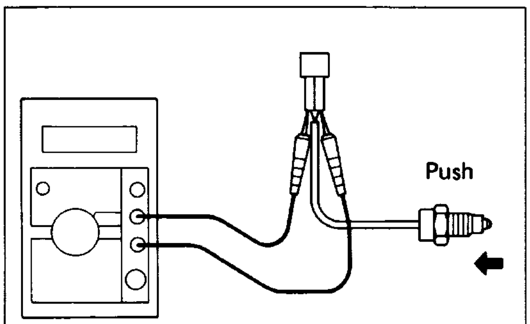

TF0032

23. REMOVE OUTPUT SHAFT FROM FRONT CASE
(a) Remove the four bearing retainer bolts and remove the bearing retainer.


TF0033 TF0034

(b) Using a snap ring pliers, remove the snap ring.
(c) Using a plastic hammer, tap out the output shaft from the front case.

HINT: Place the front case on something soft such as wooden blocks.



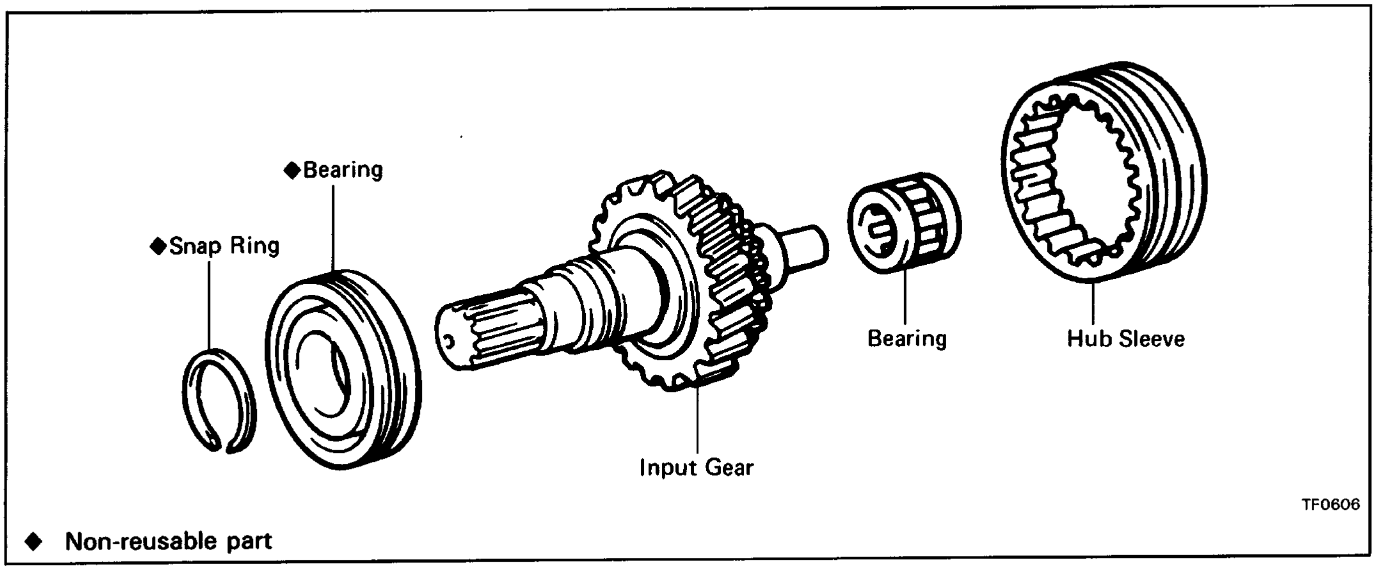
E9755

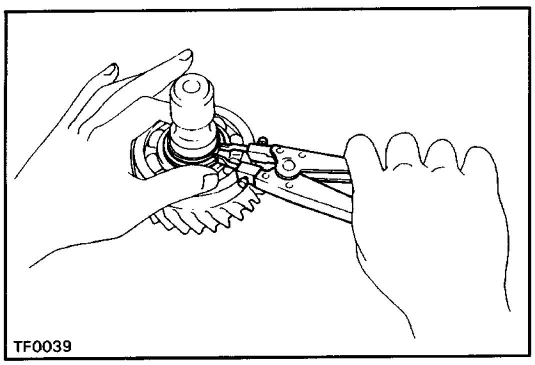
24. INSPECTION OF TRANSFER INDICATOR SWITCH
Check that there is continuity between terminals as shown.

Switch Position	Specified
Push	Continuity
Free	No continuity

If operation is not as specified, replace the switch.

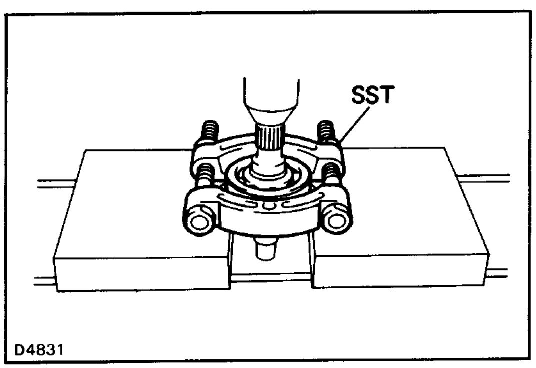
COMPONENT PARTS
Input Gear
COMPONENTS



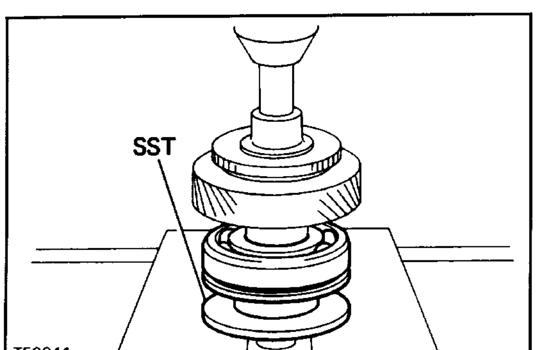


REPLACEMENT OF BEARING
IF NECESSARY, REPLACE INPUT GEAR BEARING

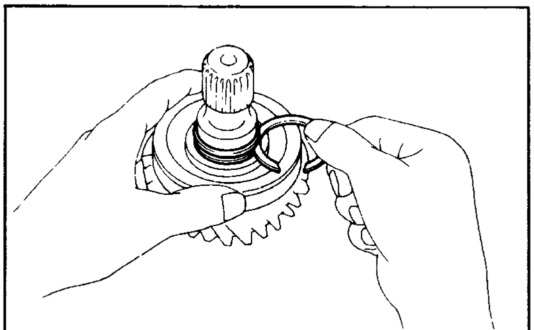
(a) Using snap ring pliers, remove the snap ring.



(b) Using SST and a press, remove the bearing.
SST 09950–00020

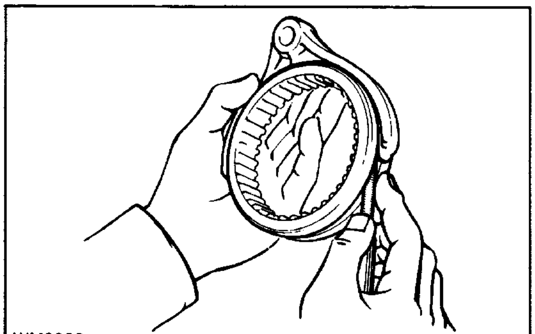


(c) Using SST, press in a new bearing.
SST 09316–60010 (09316–00070)


TF0042

(d) Select a snap ring that will allow minimum axial play and install it on the shaft.
Maximum play: 0.15 mm (0.0059 in.)

Mark	Thickness mm (in.)
1	2.05 – 2.10 (0.0807 – 0.0827)
3	2.15 – 2.20 (0.0846 – 0.0866)
5	2.25 – 2.30 (0.0886 – 0.0906)


WM0066

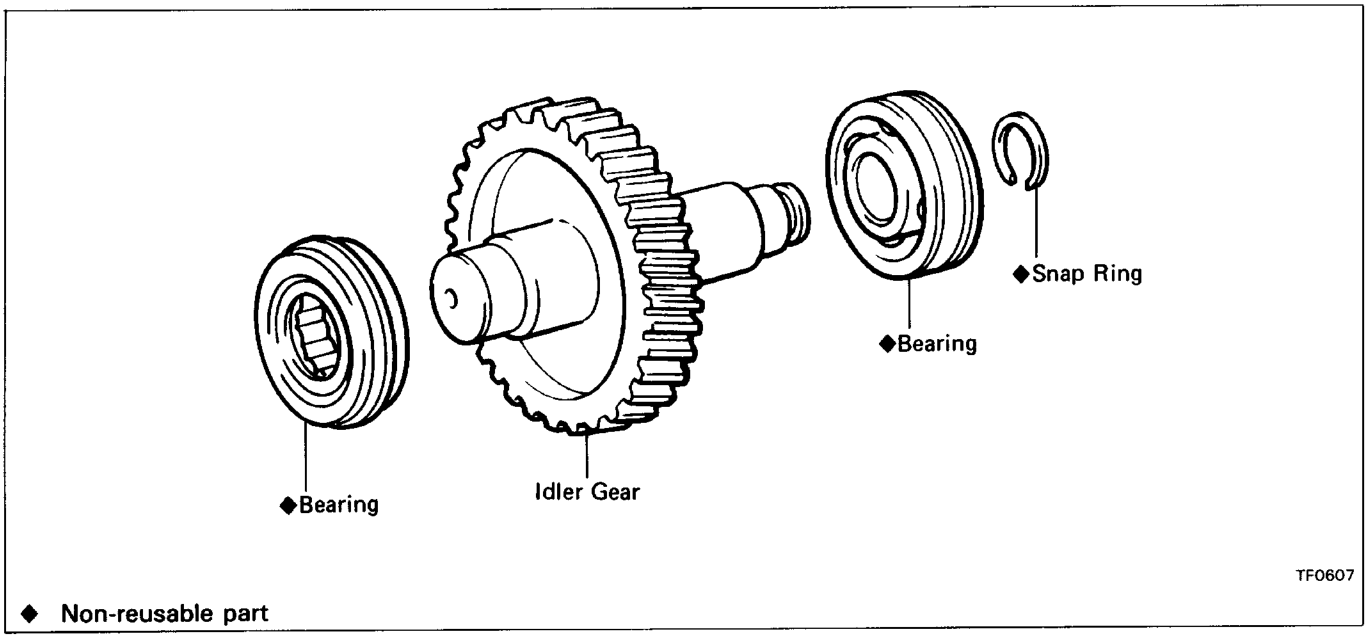
INSPECTION OF HUB SLEEVE AND SHIFT FORK MEASURE

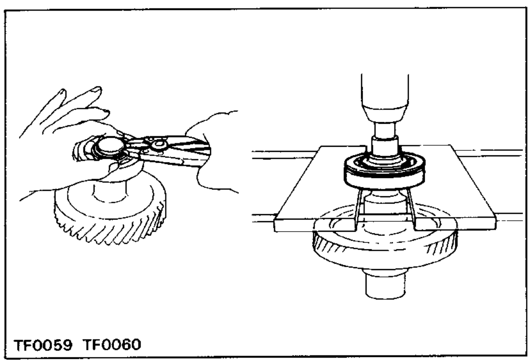
CLEARANCE OF SHIFT FORK AND HUB SLEEVE

Using a feeler gauge, measure the clearance between the hub sleeve and shift fork.
Maximum clearance: 1.0 mm (0.039 in.)
If the clearance exceeds the limit, replace the shift fork or hub sleeve.

Idler Gear

COMPONENTS



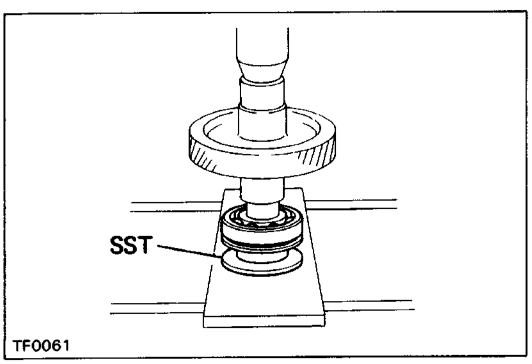


REPLACEMENT OF BEARING

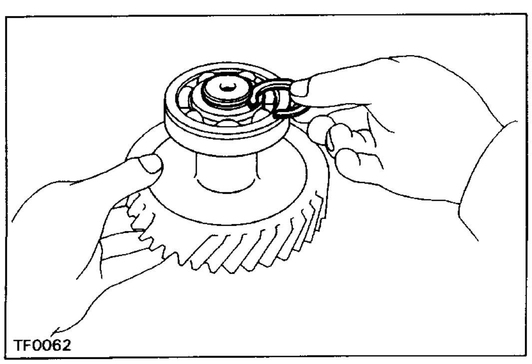
1. IF NECESSARY, REPLACE IDLER GEAR REAR BEARING

(a) Using snap ring pliers, remove the snap ring.

(b) Using a press and 19 mm socket wrench, remove the bearing.



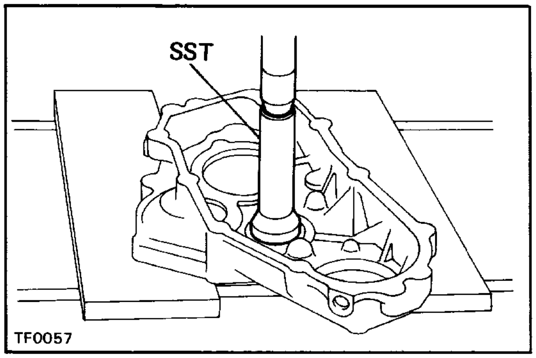
(c) Using SST and a press, press in a new bearing.
SST 09316–60010 (09316–00020)



(d) Select a snap ring that will allow minimum axial play and install it on the shaft.

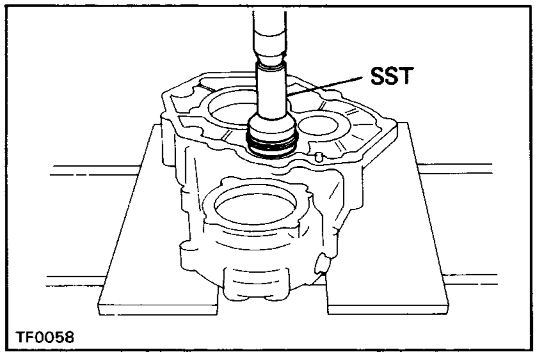
Maximum play: 0.15 mm (0.0059 in.)

Mark	Thickness mm(in.)
A	1.50 – 1.55 (0.0591 – 0.0610)
B	1.60 – 1.65 (0.0630 – 0.0650)



2. IF NECESSARY, REPLACE IDLER GEAR FRONT BEARING

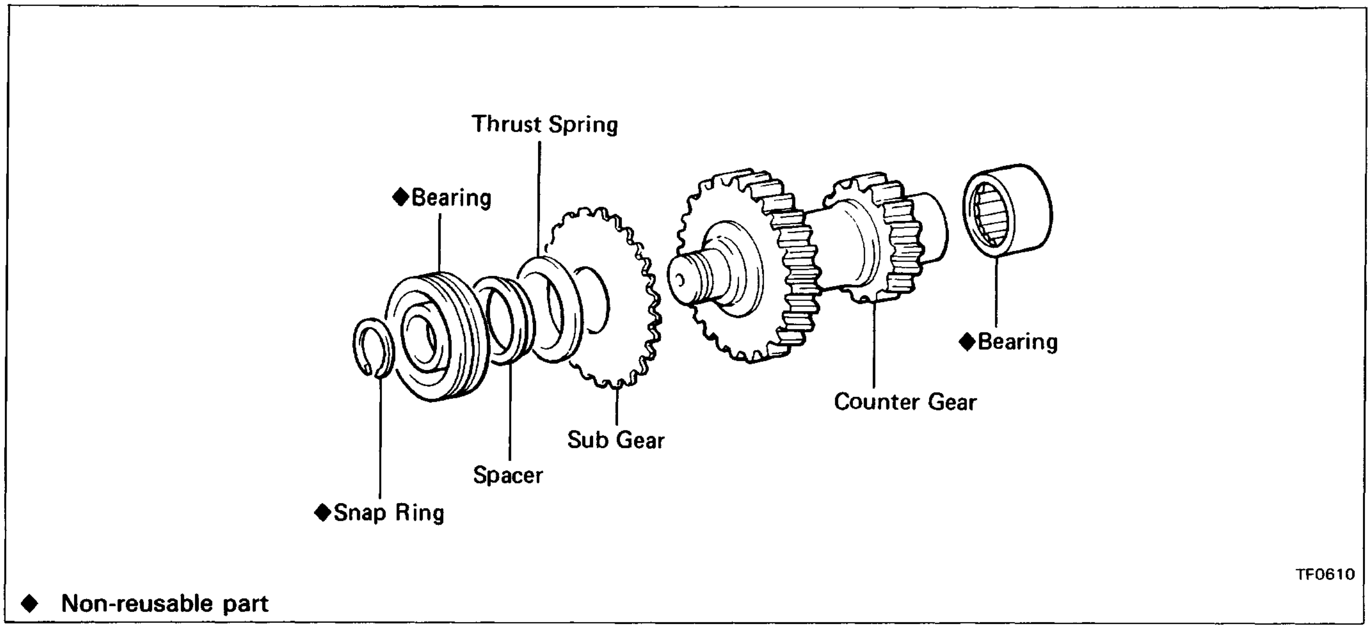
(a) Using SST and a press, press out the bearing.
SST 09310–35010

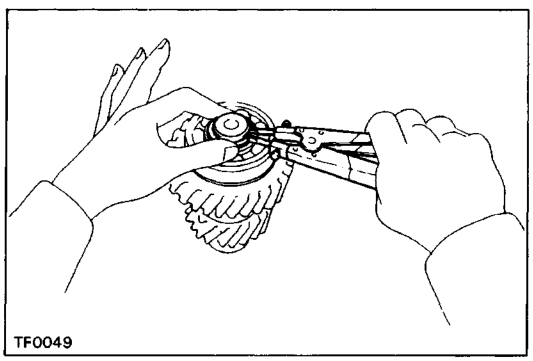


(b) Using SST and a press, press in a new bearing up to the position of the snap ring.
SST 09310–35010

Counter Gear

COMPONENTS

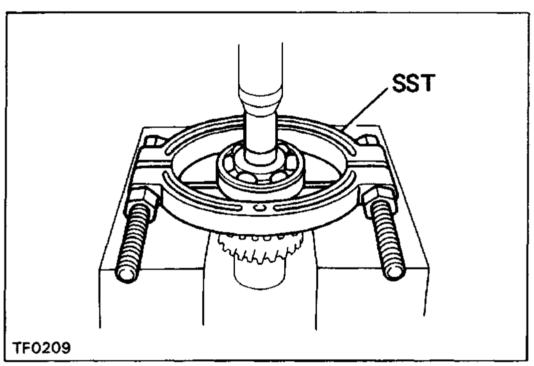




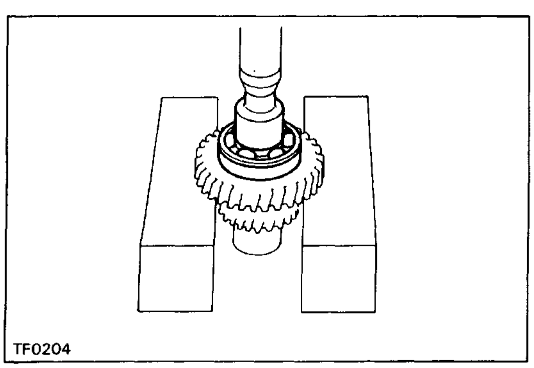
REPLACEMENT OF BEARINGS

1. IF NECESSARY, REPLACE COUNTER GEAR FRONT BEARING AND SUB GEAR

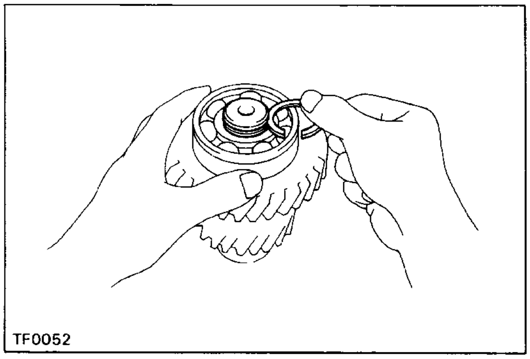
(a) Using snap ring pliers, remove the snap ring.



(b) Using SST and a press, remove the bearing.
SST 09950–00020
(c) Remove the spacer, thrust spring and sub gear.
(d) Install the sub gear, thrust spring and spacer on the counter gear.

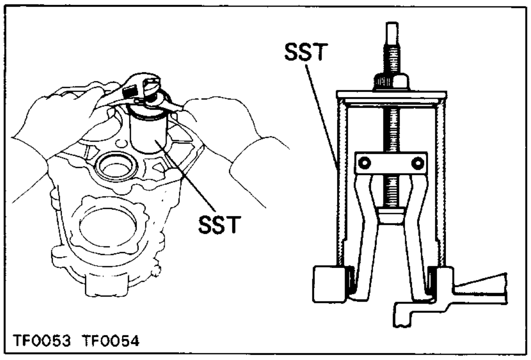


(e) Using a press and 32 mm socket wrench, install a new bearing.



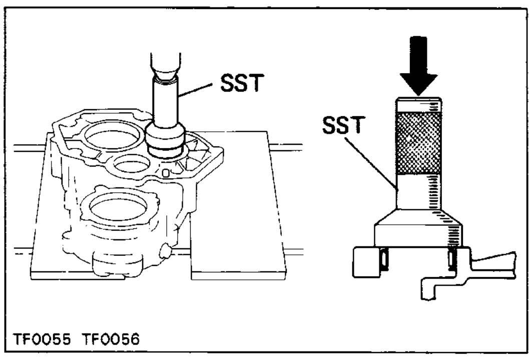
(f) Select a snap ring that will allow minimum axial play and install it on the shaft.
Maximum play: 0.15 mm (0.0059 in.)

Mark	Thickness mm (in.)
1	2.10 – 2.15 (0.0827 – 0.0846)
3	2.20 – 2.25 (0.0866 – 0.0886)



2. IF NECESSARY, REPLACE COUNTER GEAR REAR BEARING

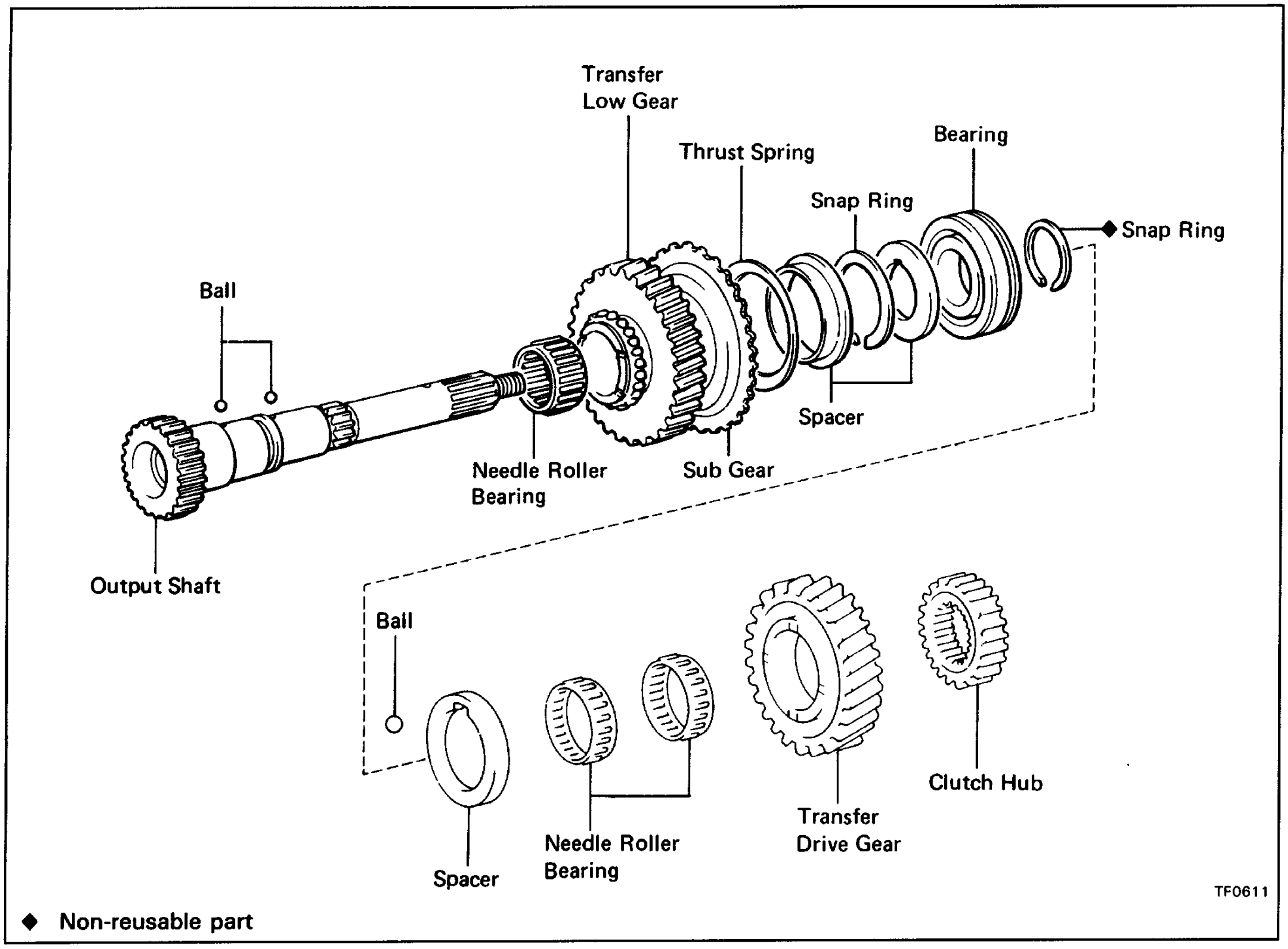
(a) Using SST, remove the bearing.
SST 09612–30012



(b) Using SST and a press, press in a new bearing.
SST 09310–35010

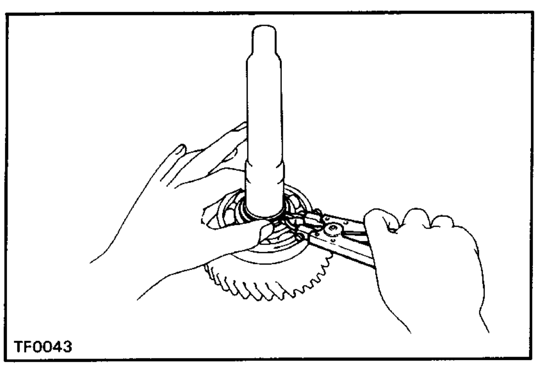
Output Shaft

COMPONENTS

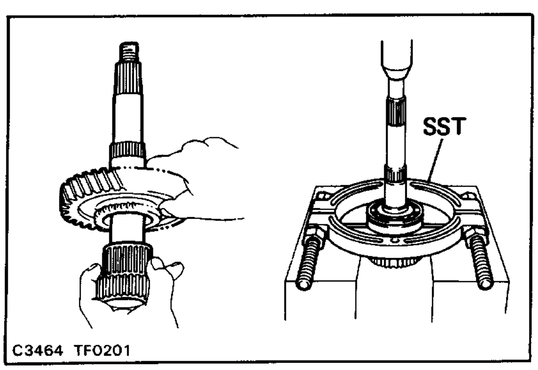


DISASSEMBLY OF OUTPUT SHAFT ASSEMBLY

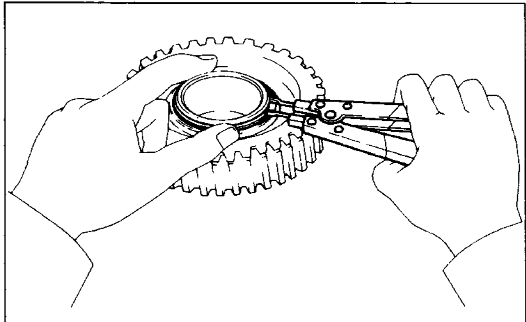
REMOVE OUTPUT SHAFT FRONT BEARING, LOW GEAR AND SUB GEAR



(a) Using snap ring pliers, remove the snap ring.

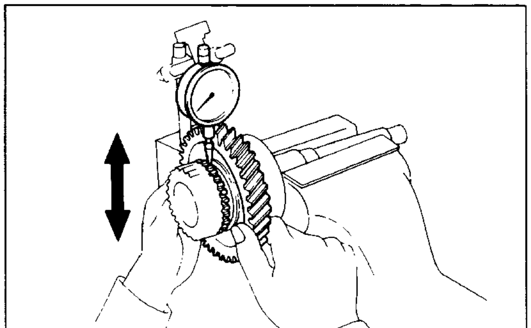


(b) Using SST and a press, remove the bearing, No. 1 spacer and low gear.
SST 09950–00020
(c) Remove the steel ball and needle roller bearing.


TF0203

(d) Using snap ring pliers, remove the snap ring from the low gear.
(e) Remove the spacer, thrust spring and sub gear.

INSPECTION OF OUTPUT SHAFT ASSEMBLY

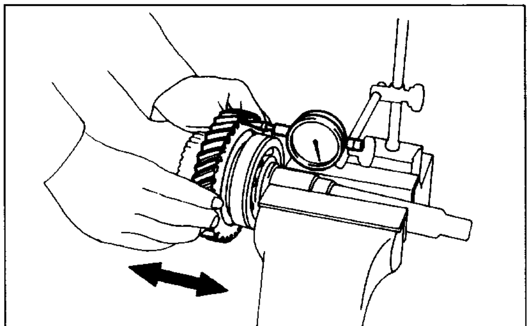

TF0035

1. CHECK OIL CLEARANCE AND THRUST CLEARANCE OF TRANSFER LOW GEAR

(a) Using a dial indicator, measure the oil clearance be– tween the gear and shaft with the needle roller bear– ing installed.

Standard clearance: 0.010 – 0.055 mm
(0.0004 – 0.0022 in.)
Maximum clearance: 0.075 mm (0.0030 in.)

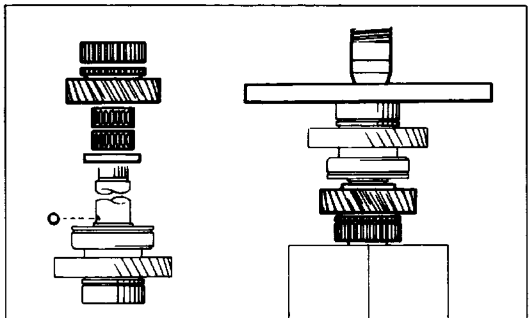
If the clearance exceeds the limit, replace the gear, nee– dle roller bearing or shaft.


TF0200

(b) Using a dial indicator, measure the thrust clearance with the spacer and bearing installed.
HINT: Do not touch the shaft end of the dial indicator to the sub gear.

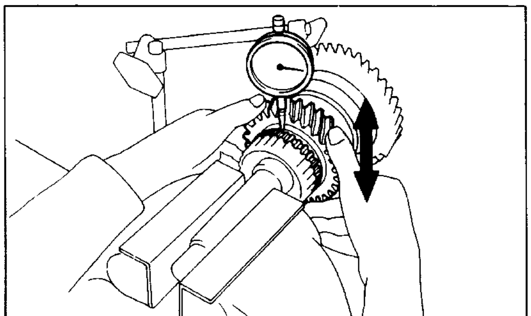
Standard clearance: 0.10 – 0.25 mm
(0.0039 – 0.0098 in.)
Maximum clearance: 0.30 mm (0.0118 in.)

If the clearance exceeds the limit, replace the spacer.


E9757

2. CHECK OIL CLEARANCE AND THRUST CLEARANCE OF TRANSFER DRIVE GEAR

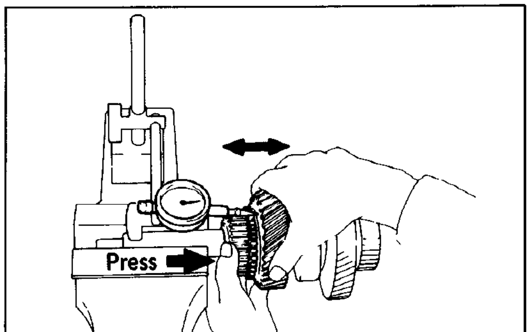
(a) Using a press, install the ball, spacer, two needle roller bearings and transfer drive gear.
HINT: Do not loosen the ball.


TF0037

(b) Using a dial indicator, measure the oil clearance be– tween the gear and shaft with the needle roller bear– ing installed.

Standard clearance: 0.009 – 0.051 mm
(0.0004 – 0.0020 in.)
Maximum clearance: 0.71 mm (0.0028 in.)

If the clearance exceeds the limit, replace the gear, nee– dle roller bearing or shaft.



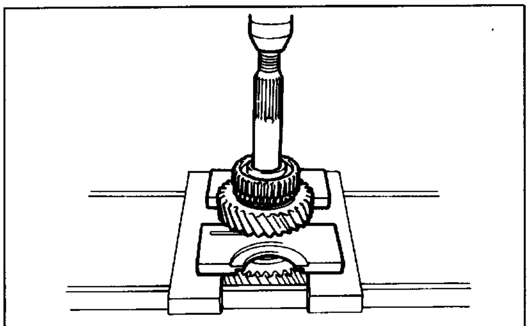
TF0038

(c) Using a dial indicator, measure the thrust clearance with the clutch hub and spacer installed.

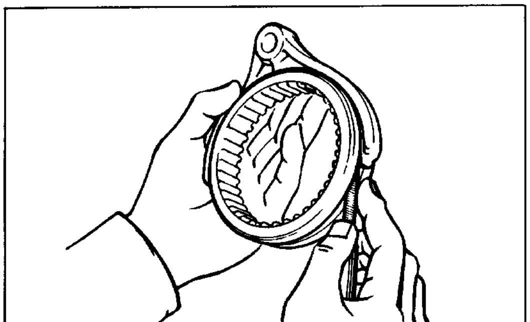
Standard clearance: 0.09 – 0.27 mm
(0.0035 – 0.0106 in.)

Maximum clearance: 0.32 mm (0.0126 in.)

If the clearance exceeds the limit, replace the spacer.


E9758

(d) Using a press, remove the ball, spacer, two needle roller bearings and transfer drive gear.

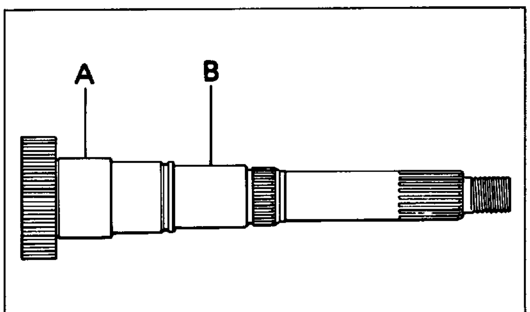

WM0066

3. MEASURE CLEARANCE OF SHIFT FORKS AND HUB SLEEVES

Using a feeler gauge, measure the clearance between the hub sleeve and shift fork.

Maximum clearance: 1.0 mm (0.039 in.)

If the clearance exceeds the limit, replace the shift fork or hub sleeve.

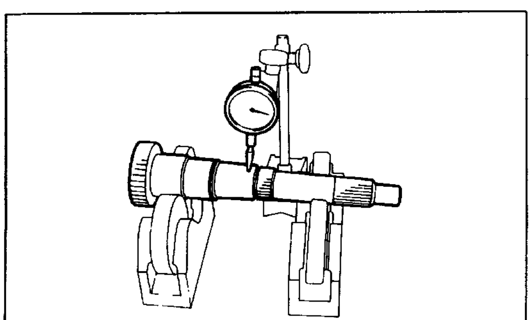


E9759

4. INSPECT OUTPUT SHAFT

(a) Using a micrometer, measure the outer diameter of the output shaft.

Maximum outer diameter:
Part A 44.984 mm (1.7710 in.)
B 34.984 mm (1.3773 in.)

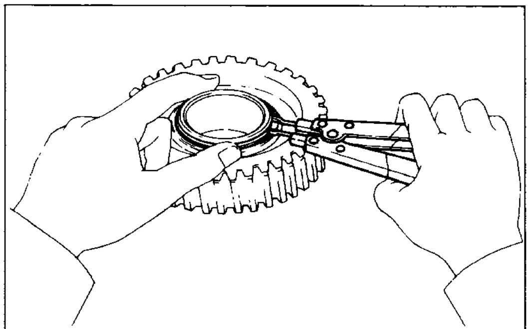

TF0045

(b) Using a dial indicator, measure the shaft runout.

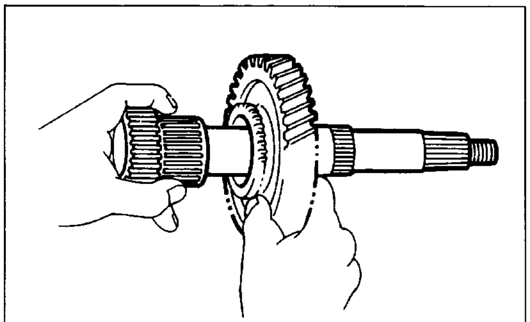
Maximum runout: 0.03 mm (0.0012 in.)

ASSEMBLY OF OUTPUT SHAFT

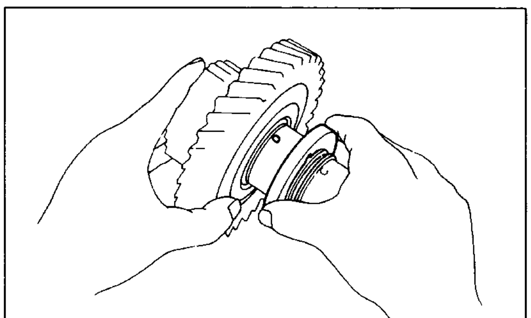
INSTALL OUTPUT SHAFT FRONT BEARING LOW GEAR AND SUB GEAR


TF0203

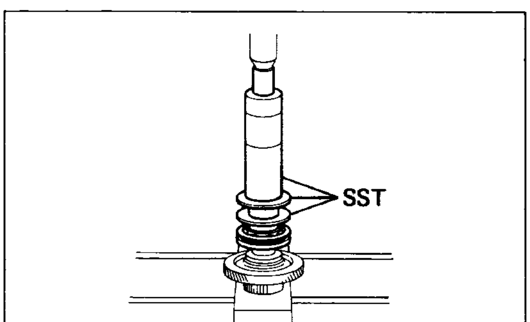
(a) Install the sub gear, thrust spring and spacer.
(b) Using snap ring pliers, install the snap ring.


C3464

(c) Apply MP grease to the needle roller bearing.
(d) Install the low gear with needle roller bearing to the output shaft.

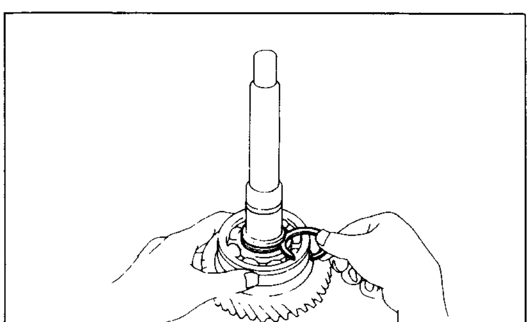

TF0046

(e) Install the steel ball on the output shaft.
(f) Install the No. 1 spacer.



TF0047

(g) Using SST and a press, install a new bearing.
SST 09316–60010 (09316–00010, 09316–00040, 09316–00050)

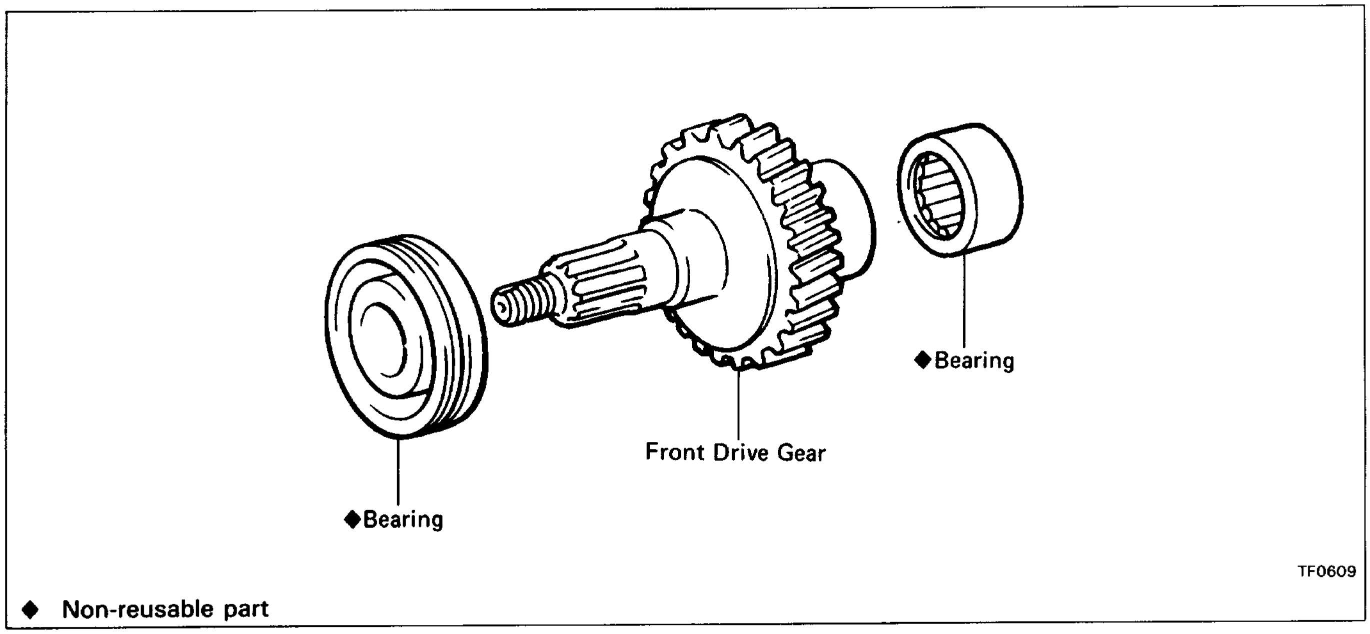

TF0048

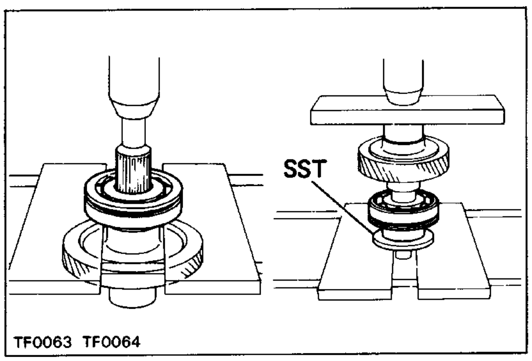
(h) Select a snap ring that will allow minimum axial play and install it on the shaft.
Maximum play: 0.10 mm (0.0039 in.)

Mark	Thickness mm (in.)
0	2.40 – 2.45 (0.0945 – 0.0965)
1	2.45 – 2.50 (0.0965 – 0.0984)
2	2.50 – 2.55 (0.0984 – 0.1004)
3	2.55 – 2.60 (0.1004 – 0.1024)
4	2.60 – 2.65 (0.1024 – 0.1043)
5	2.65 – 2.70 (0.1043 – 0.1063)

Front Drive Gear

COMPONENTS





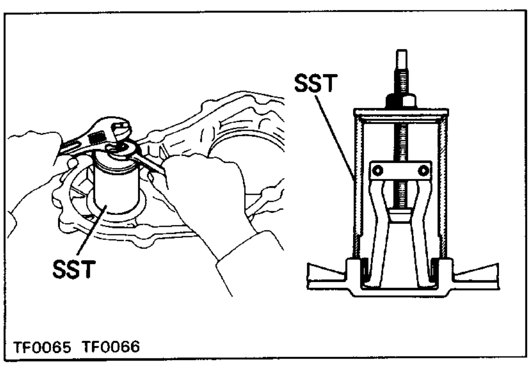
REPLACEMENT OF BEARINGS

1. IF NECESSARY, REPLACE FRONT DRIVE GEAR FRONT BEARING

(a) Press out the bearing.

(b) Using SST and a press, press in a new bearing.

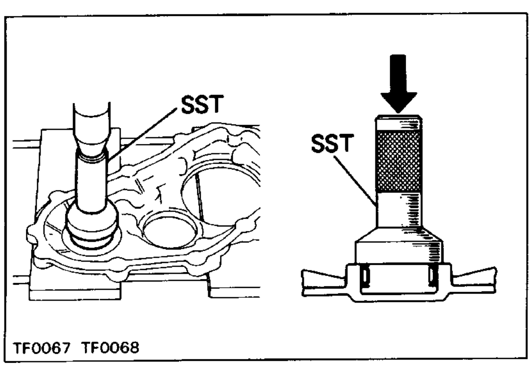
SST 09316–60010 (09316–00020)



2. IF NECESSARY, REPLACE FRONT DRIVE GEAR REAR BEARING

(a) Using SST, remove the bearing.

SST 09612–30012

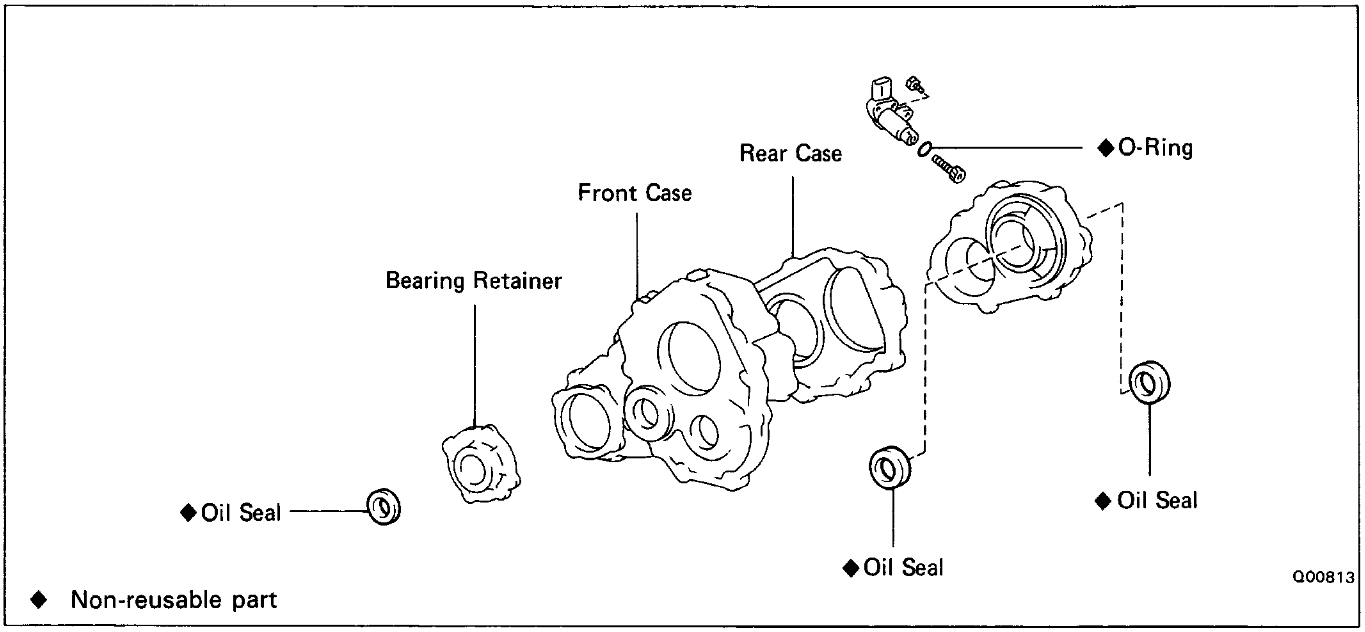


(b) Using SST and a press, press in a new bearing.

SST 09310–3 5010

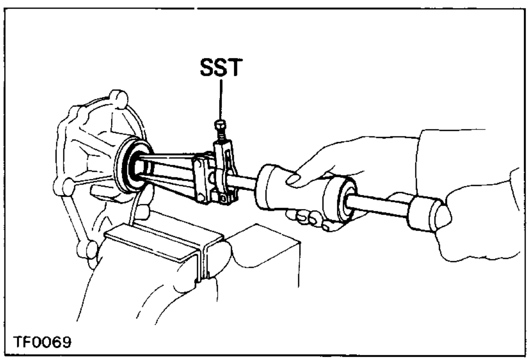
Oil Seals

COMPONENTS

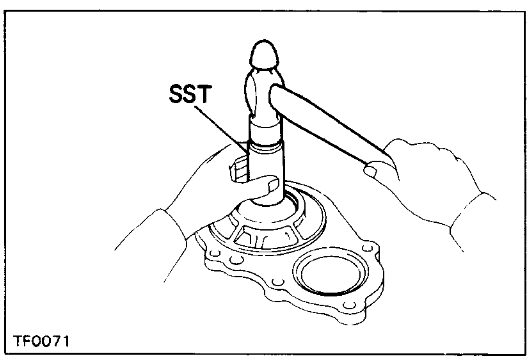


REPLACEMENT OF OIL SEALS

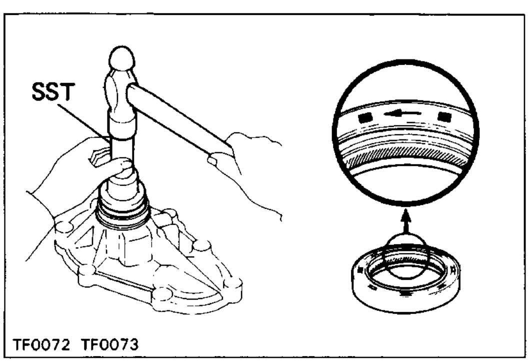
1. IF NECESSARY, REPLACE EXTENSION HOUSING OIL SEAL



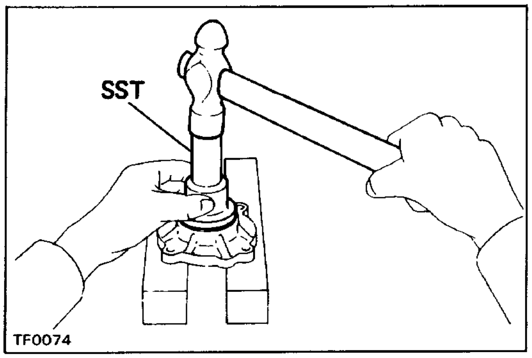
(a) Using SST, remove the two oil seals.
SST 09308–00010



(b) Using SST and a hammer, drive in a new oil seal.
SST 09310–35010
HINT: When assembling a new oil seal for the oil pump screw, position the flat surface upward.

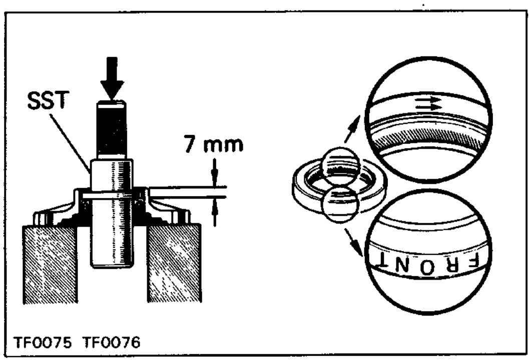


(c) Using SST and a hammer, drive in a new oil seal.
SST 09325–20010
HINT: Take note of the groove direction and be careful not to interchange this seal with the front drive gear oil seal. This oil seal has one arrow mark pointing counter–clockwise to distinguish it from the front drive gear oil seal.

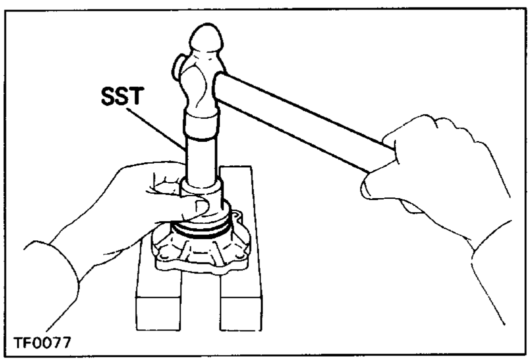


2. IF NECESSARY, REPLACE FRONT DRIVE GEAR OIL SEAL

(a) Using SST and a hammer, drive out the oil seal and dust cover.
SST 09325–20010
HINT: Place the bearing retainer on something soft such as wooden blocks.



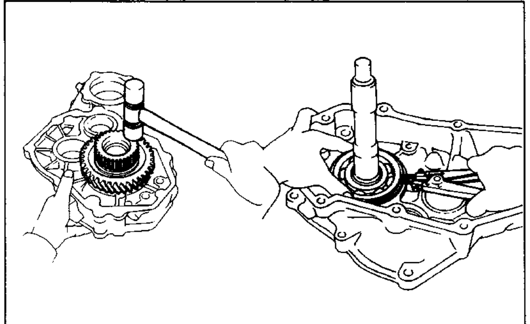
(b) Using SST and a hammer, drive in a .new oil seal to a depth of 7 mm (0.28 in.) from the end.
SST 09325–20010
HINT: Take note of the groove direction and be careful not to interchange this seal with the output shaft oil seal. This oil seal has two arrow marks pointing clockwise and the word FRONT to distinguish it from the output shaft.



(c) Using SST and a hammer, drive in a new dust cover.
SST 09325–20010

ASSEMBLY OF TRANSFER

(See page TF–7)

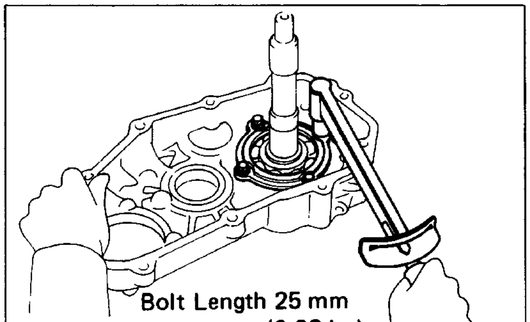

TF0078 TF0033

1. INSTALL OUTPUT SHAFT TO FRONT CASE

(a) Using a plastic hammer, install the output shaft to the front case.

HINT: Place the front case on something soft such as wooden blocks.

(b) Using snap ring pliers, install the snap ring.



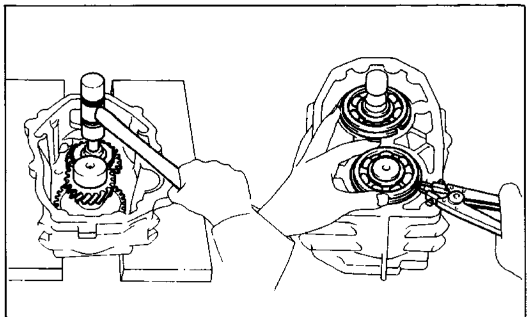
TF0079

2. INSTALL BEARING RETAINER TO FRONT CASE

(a) Install the bearing retainer with four bolts.

(b) Torque the bolts.

Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)

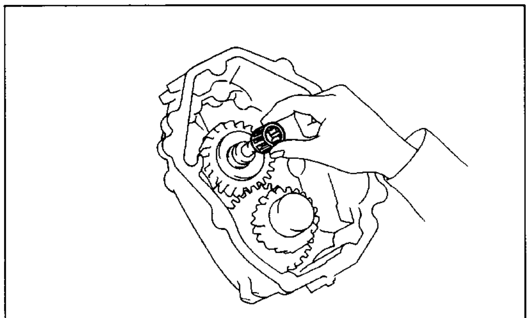

TF0080 TF0030

3. INSTALL INPUT GEAR AND COUNTER GEAR TO REDUCTION GEAR CASE

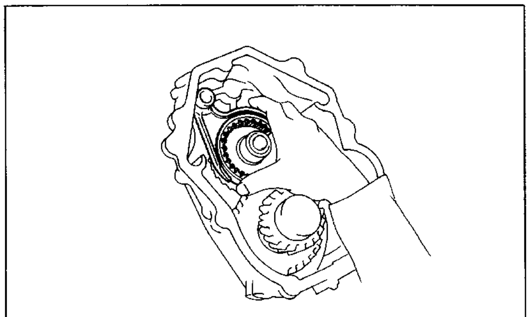
(a) Using a plastic hammer, install the input gear and counter gear to the reduction gear case.

HINT: Place the reduction gear case on something soft such as wooden blocks.

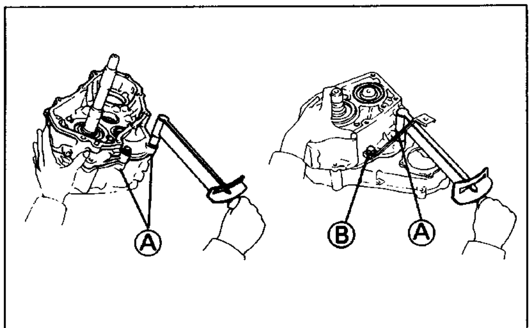
(b) Using snap ring pliers, install the snap rings.


TF0029

4. INSTALL ROLLER BEARING ON INPUT SHAFT


TF0028

5. INSTALL NO.2 HUB SLEEVE AND NO.2 SHIFT FORK ON INPUT SHAFT



TF0081 TF0082

6. INSTALL REDUCTION GEAR CASE WITH NEW GASKET TO FRONT CASE

(a) Place a new gasket on the front case.

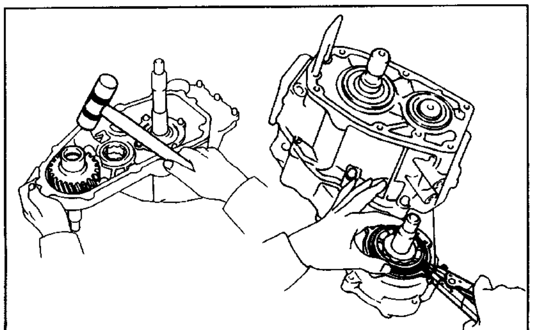
(b) Install the reduction gear case together with the in–put gear and counter gear.

(c) Install and torque the bolts as shown in the figure.

Torque:

(A) Bolt length 47 mm (1.85 in.)
39 N–m (400 kgf–cm, 29 ft–lbf)

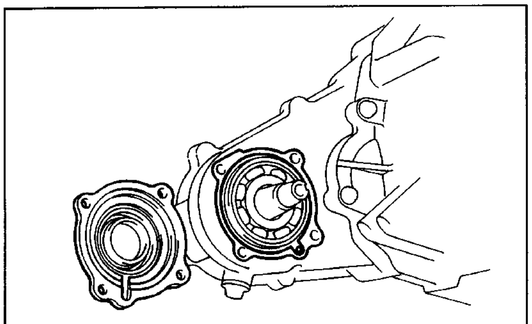
(B) Bolt length 49 mm (1.93 in.)
39 N–m (400 kgf–cm, 29 ft–lbf)


TF0083 TF0012

7. INSTALL FRONT DRIVE GEAR

(a) Using a plastic hammer, install the front drive gear.

(b) Using snap ring pliers, install the snap ring.

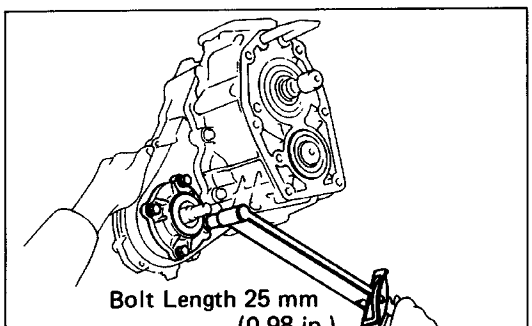

TF0084

8. INSTALL BEARING RETAINER WITH NEW GASKET

(a) Place a new gasket on the front case.

(b) Apply MP grease to the oil seal.

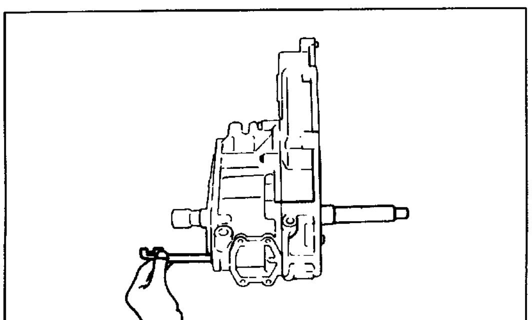
(c) Install the bearing retainer.



TF0085

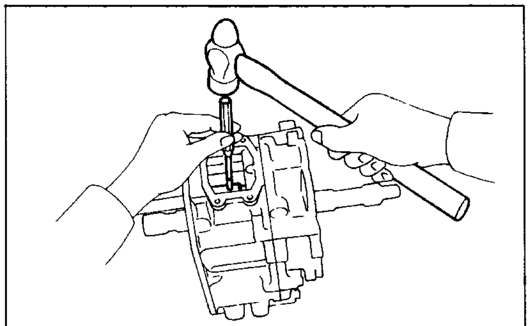
(d) Install and torque the bolts.

Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)

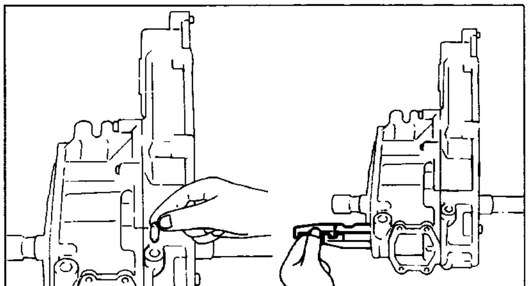

TF0024

9. INSTALL HIGH AND LOW SHIFT FORK SHAFT

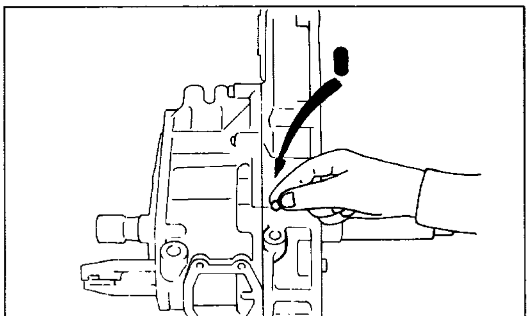
(a) Install the high and low shift fork shaft to the No.2 shift fork.


TF0086

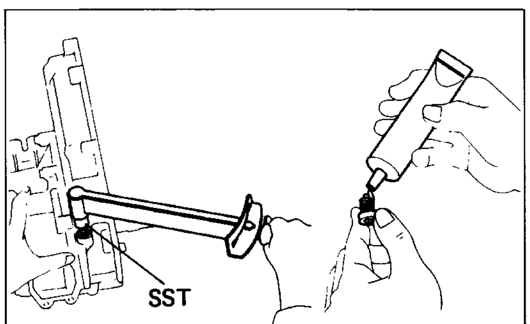
(b) Align the slotted spring hole in the fork with the hole in the shaft.
(c) Using a pin punch and hammer, drive in the slotted spring pin.


TF0087 TF0021

10. INSTALL INTERLOCK PIN AND FRONT DRIVE SHIFT FORK SHAFT
(a) Install the interlock pin.
(b) Install the front drive shift fork shaft with the two grooves facing outward.

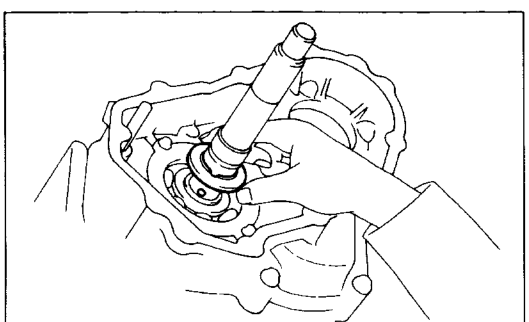

TF0088

11. INSTALL TWO BALLS, SPRINGS AND PLUGS
(a) Install the ball and spring.

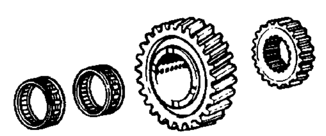


TF0089 WM0236

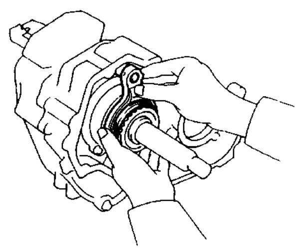
(b) Apply liquid sealer to the plug threads.
Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent
(c) Using SST, install and torque the plug.
SST 09313–30021
Torque: 12 N–m (120 kgf–cm, 9 ft–lbf)
(d) Install the ball, spring and plug to the opposite side.


TF0017

12. INSTALL LOCKING BALL AND NO.2 SPACER

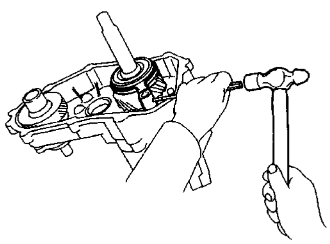

TF0090

13. INSTALL NEEDLE ROLLER BEARINGS, TRANSFER LOWER GEAR AND CLUTCH HUB


TF0016

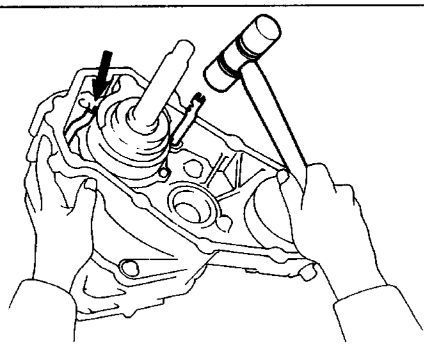
14. INSTALL NO. 1 SHIFT FORK AND HUB SLEEVE

(a) Install the No.1 shift fork together with the hub sleeve to the front drive shift fork shaft.


TF0091

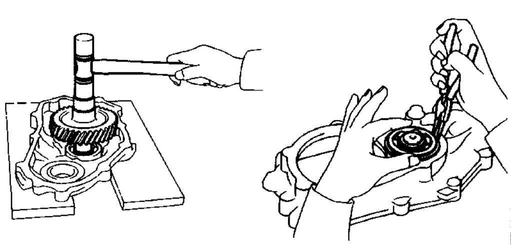
(b) Align the slotted pin hole in the fork with the hole in the shaft.

(c) Using a pin punch and hammer, install the slotted spring pin.


TF0092

15. INSTALL OIL PIPES

Install the two oil pipes with the cutout side positioned upward.

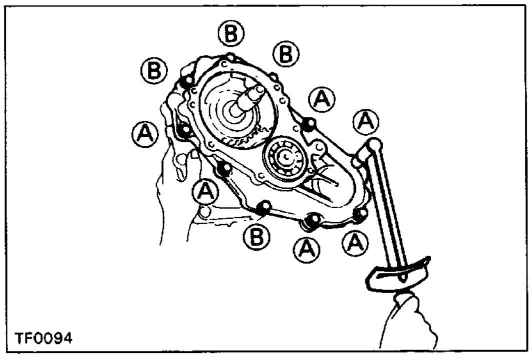

TF0093 TF0009

16. INSTALL IDLER GEAR TO REAR CASE

(a) Using a plastic hammer, install the idler gear to the rear case.

HINT: Place the rear case on something soft such as wooden blocks.

(b) Using snap ring pliers, install the snap ring.

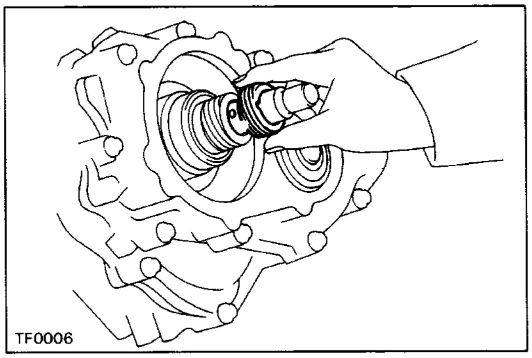


TF0094

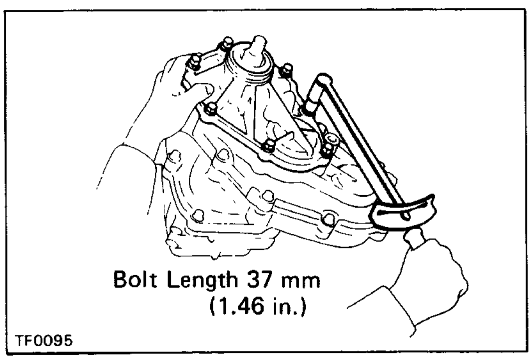
17. INSTALL REAR CASE WITH NEW GASKET

(a) Place a new gasket on the front case.
(b) Install the rear case together with the idler gear.
(c) Install and torque the bolts as shown in the figure.

Torque:
(A) Bolt length 47 mm (1.85 in.)
Ⓑ 39 N–m (400 kgf–cm, 29 ft–lbf)
(B) Bolt length 112 mm (4.41 in.)
39 N–m (400 kgf–cm, 29 ft–lbf)


TF0006

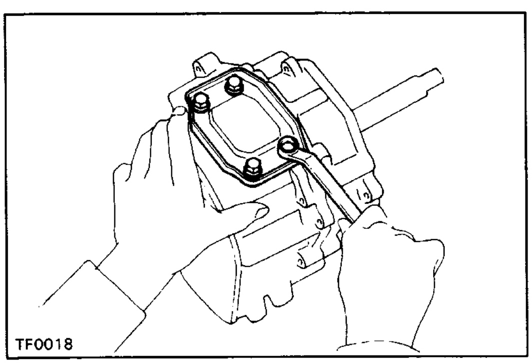
18. INSTALL BEARING, OIL PUMP SCREW, LOCKING BALL AND SPEEDOMETER DRIVE GEAR



TF0095

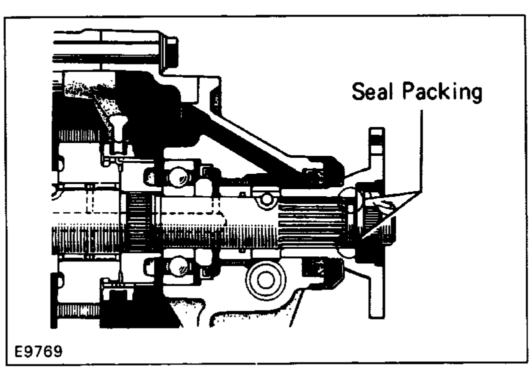
19. INSTALL EXTENSION HOUSING WITH NEW GASKET

(a) Place a new gasket to the rear case.
(b) Apply MP grease to the two oil seals.
(c) Install the extension housing with seven bolts.
Torque the bolts.
Torque: 39 N–m (400 kgf–cm, 29 ft–lbf)


TF0018

20. INSTALL TRANSFER CASE COVER WITH NEW GASKET

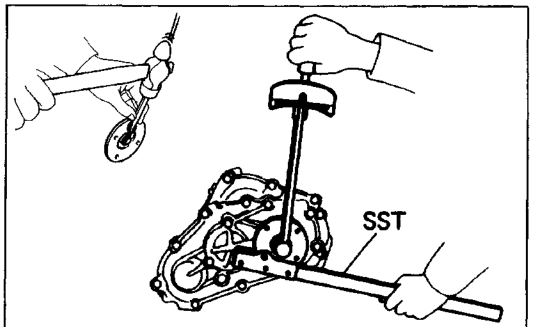
(a) Place a new gasket to the transfer case cover.
(b) Install and torque the four bolts.
Torque: 8.8 N–m (90 kgf–cm, 78 in.lbf)



E9769

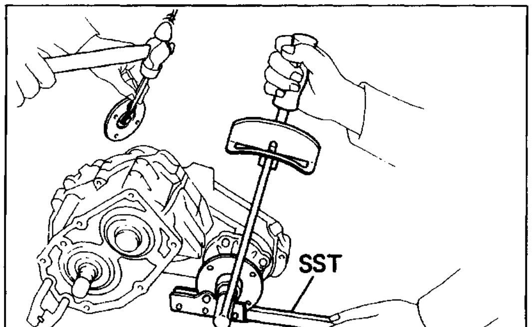
21. INSTALL REAR COMPANION FLANGE

(a) Install the companion flange to the output shaft.
(b) Apply seal packing to the output shaft and companion flange as shown.
Seal packing: Part No. 08826–00090 THREE BOND 1281 or equivalent



TF0096 TF0097

(c) Using SST to hold the flange, install the washer and nut. Torque the nut.
SST 09330–00021
Torque: 123 N–m (1,250 kgf–cm, 90 ft–lbf)
(d) Stake the nut.

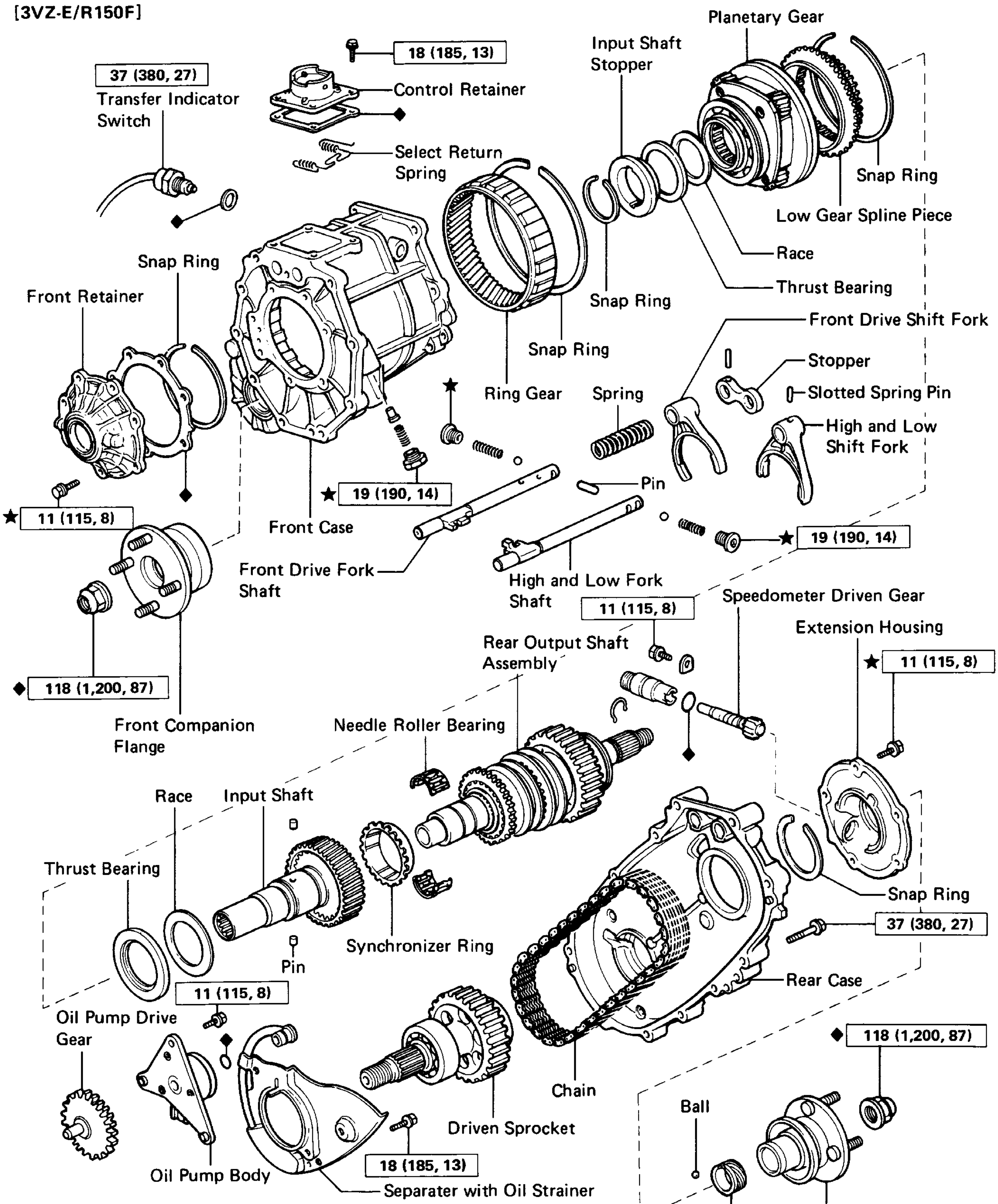


TF0096 TF0099

22. INSTALL FRONT COMPANION FLANGE
(a) Install the companion flange to the front drive gear.
(b) Using SST to hold the flange, install the washer and nut. Torque the nut.
SST 09330–00021
Torque: 123 N–m (1,250 kgf–cm, 90 ft–lbf)
(c) Stake the nut.

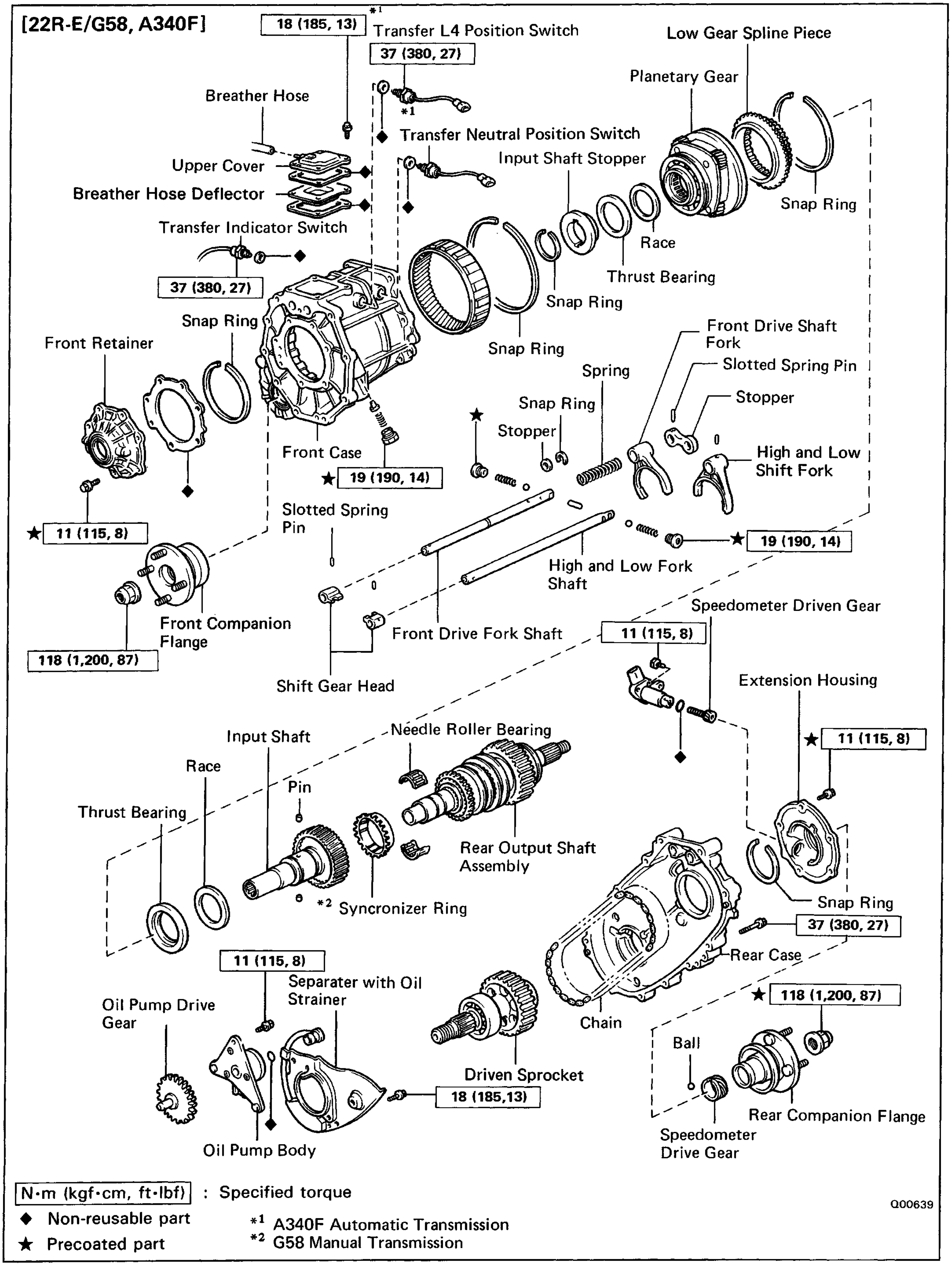
23. INSTALL TRANSFER INDICATOR SWITCH WITH WASHER
Torque: 34 N–m (350 kgf–cm, 25 ft–lbf)
24. INSTALL NO. 1 SPEED SENSOR
(a) Install the No. 1 speed sensor.
(b) Install and torque the bolt.
Torque: 11 N–m (115 kgf–cm, 8 ft–lbf)

(VF1A TYPE TRANSFER) COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
★ Precoated part

COMPONENTS (Cont'd)



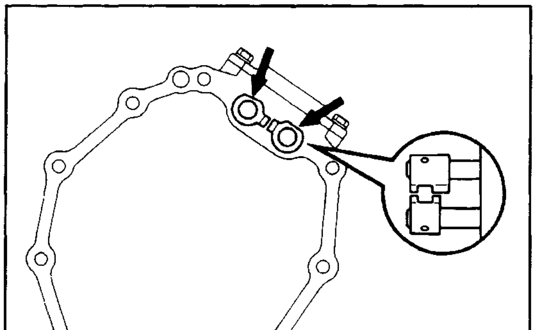
DISASSEMBLY OF TRANSFER

(See pages TF–32 and 33)

1. REMOVE SPEEDOMETER DRIVEN GEAR

2. REMOVE TRANSFER INDICATOR SWITCH

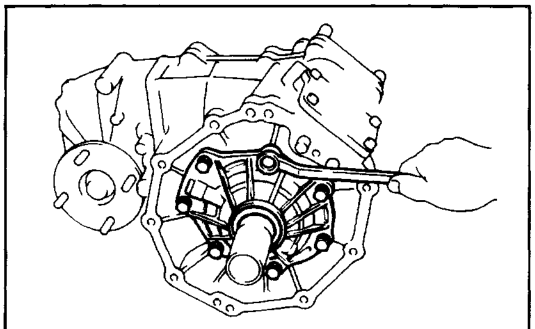
3. (22R–E/A340F)
REMOVE TRANSFER L4 POSITION SWITCH


TF0629

4. (22R–E/G58, A340F)
REMOVE SHIFT GEAR HEAD NO. 1 AND NO.2

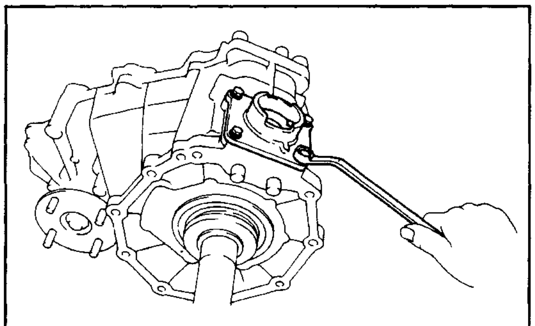
(a) Using a pin punch and hammer, drive out the two slotted spring pins.

(b) Remove two shift gear heads.


TF0447

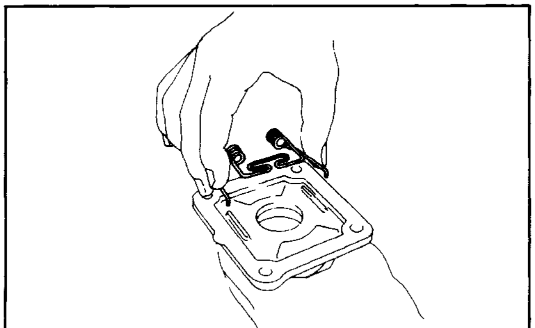
5. REMOVE FRONT RETAINER

Remove the seven bolts and the front retainer.

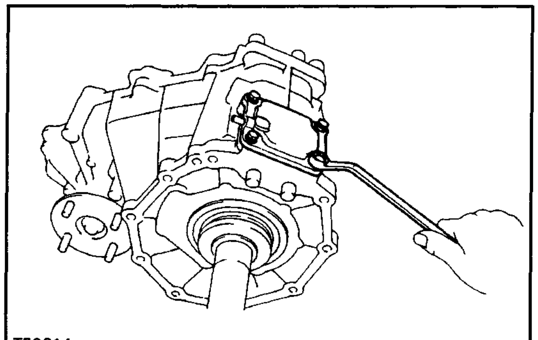

TF0448

6.–1 (3VZ–E/R150F)
REMOVE CONTROL RETAINER

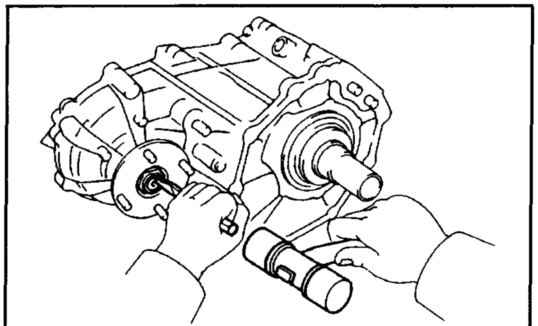
(a) Remove the four bolts and the control retainer.


TF0449

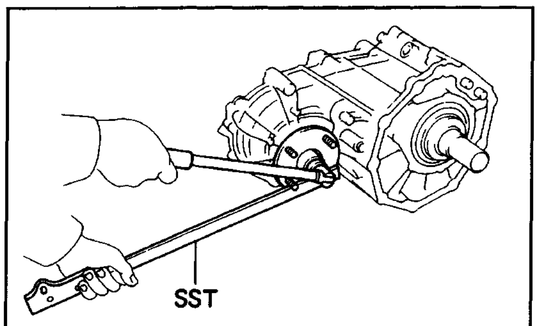
(b) Remove the select return spring from the retainer.


TF0614

6.–2 (22R–E/G58, A340F)
REMOVE UPPER COVER AND OIL DEFLECTOR
Remove the four bolts and the upper cover and oil deflec–tor.

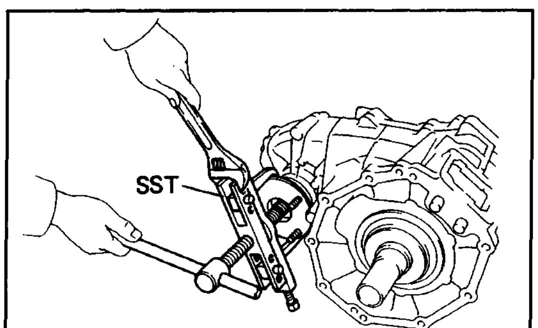

TF0450

7. REMOVE FRONT COMPANION FLANGE
(a) Using a hammer and chisel, loosen the staked part of the nut.



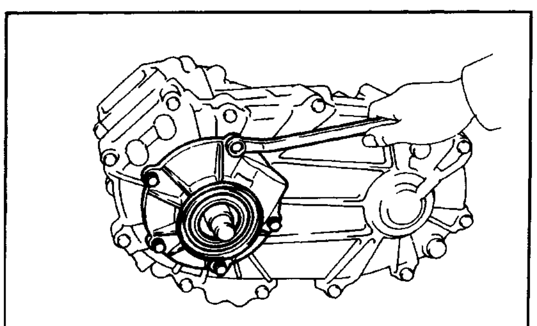
TF0451

(b) Using SST to hold the flange, remove the compan–ion flange lock nut.
SST 09330–00021 –

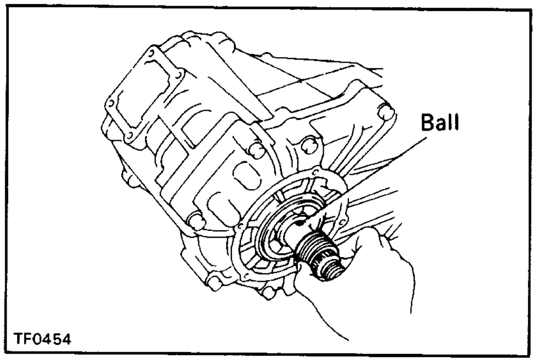


TF0452

(c) Using SST, remove the companion flange.
SST 09950–20017
8. REMOVE REAR COMPANION FLANGE
Remove the rear companion flange in the same way as the front companion flange.


TF0453

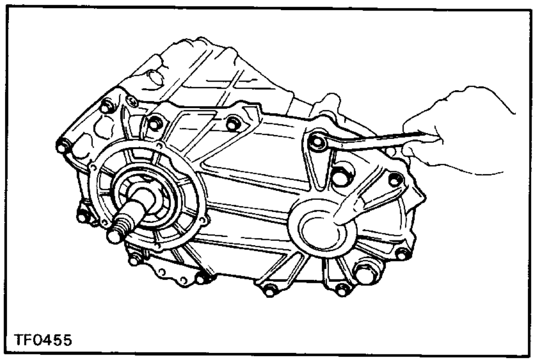
9. REMOVE EXTENSION HOUSING
(a) Remove the five bolts.
(b) Using a plastic hammer, tap the extension housing and remove it.



10. REMOVE SPEEDOMETER DRIVE GEAR

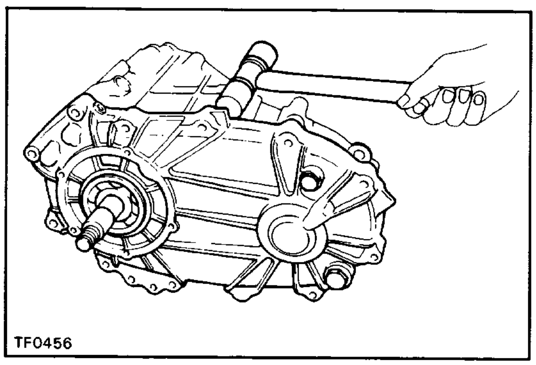
(a) Remove the speedometer drive gear.

(b) Using a magnetic finger, remove the ball from the rear output shaft.

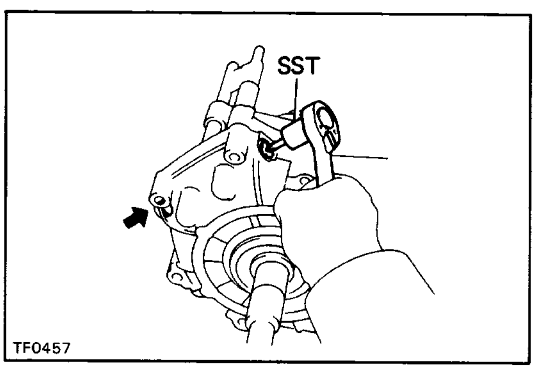


11. SEPARATE FRONT CASE AND REAR CASE

(a) Remove the twelve bolts.



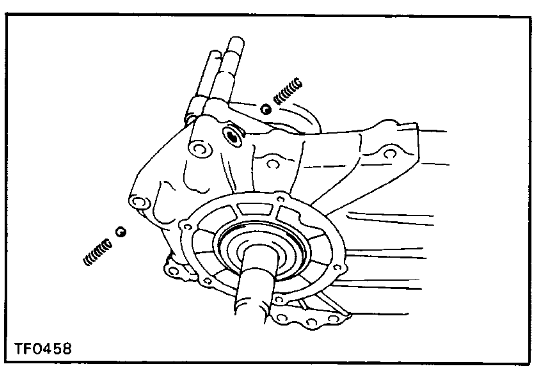
(b) Using a plastic hammer, tap the rear case and sepa– rate the front case and rear case.



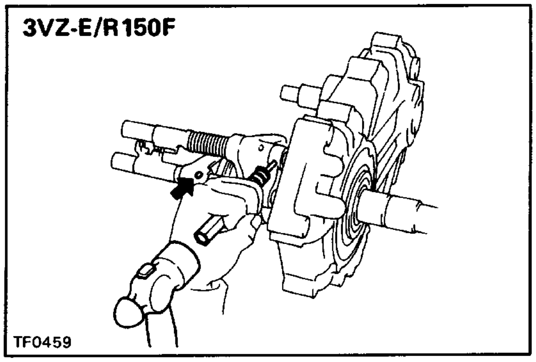
12. REMOVE STRAIGHT SCREW PLUGS, SPRINGS AND LOCKING BALLS

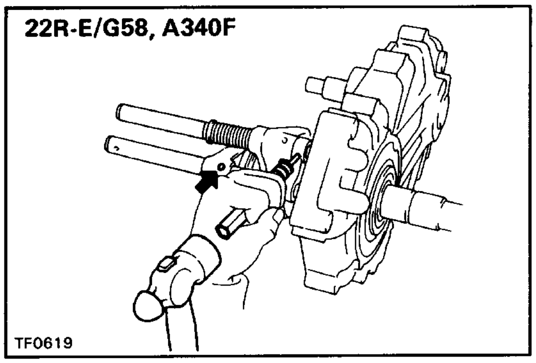
(a) Using SST, remove the two screws.

SST 09313–30021



(b) Using a magnetic finger, remove the spring and ball from the both holes.

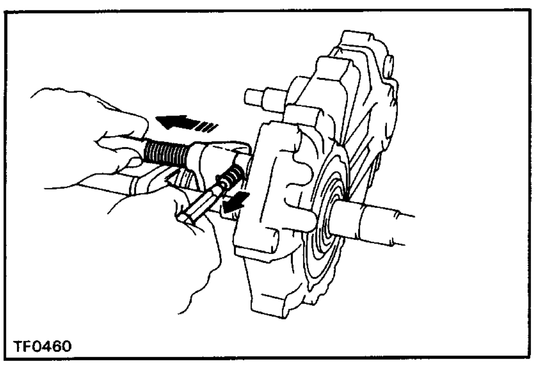




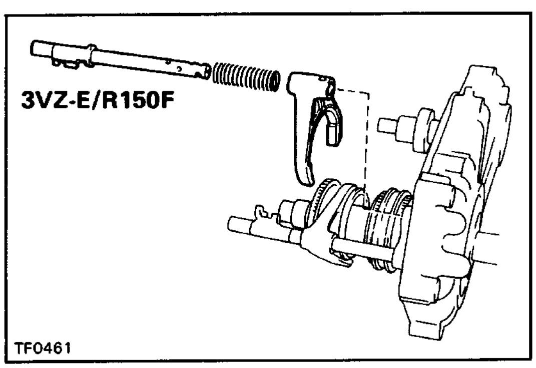
13. REMOVE FRONT DRIVE FORK SHAFT, FORK AND SPRING

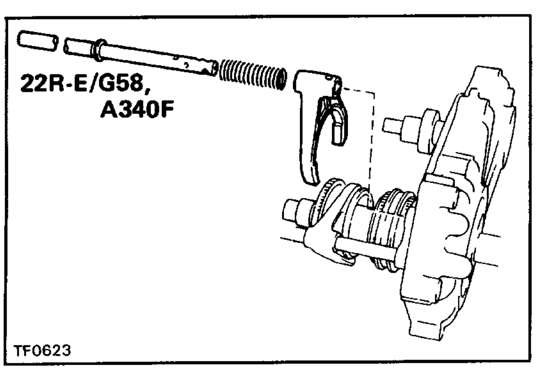
(a) Using a pin punch and hammer, drive out the two slotted spring pins.

HINT: When the pin is removed from the front drive fork shaft, the shaft will spring loose if the pin punch is re–moved, so keep the pin punch inserted in the shaft hole.

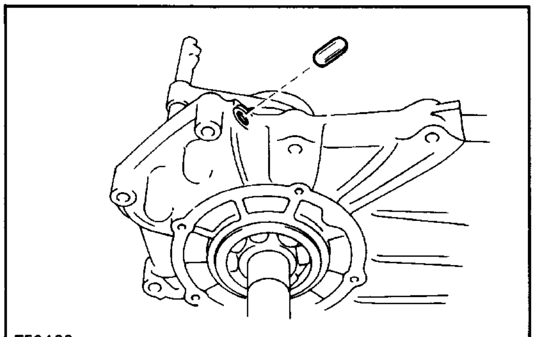


(b) Hold the front drive fork shaft in place by hand, when removing the pin punch.

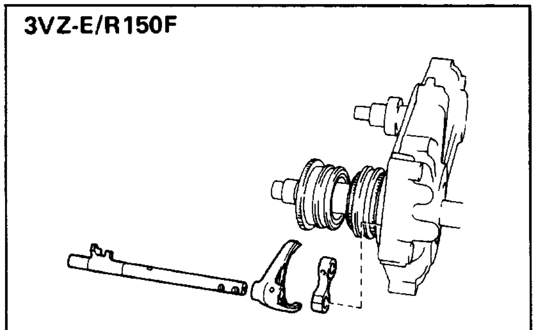




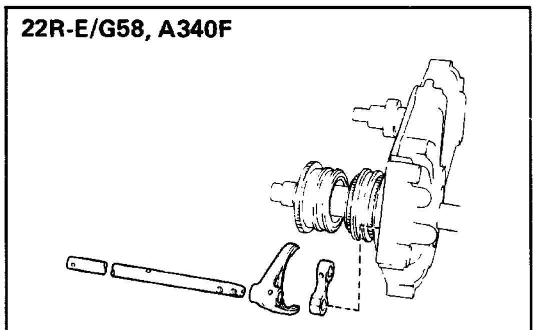
(c) Remove the front drive fork shaft, spring and fork.


TF0462

(d) Using a magnetic finger, remove the straight pin.

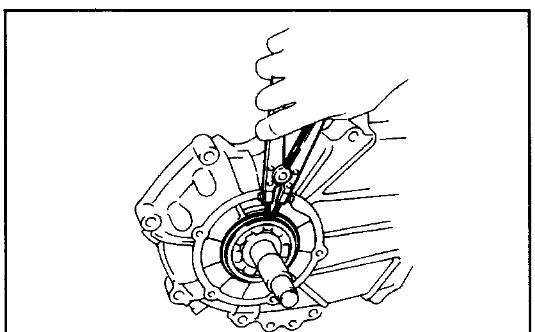


TF0463



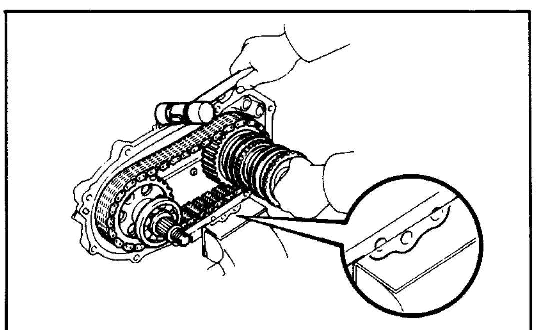
TF0616

14. REMOVE HIGH AND LOW FORK SHAFT, FORK AND STOPPER


TF0464

15. REMOVE REAR OUTPUT SHAFT, DRIVEN SPROCKET AND CHAIN

(a) Using snap ring pliers, remove the snap ring.

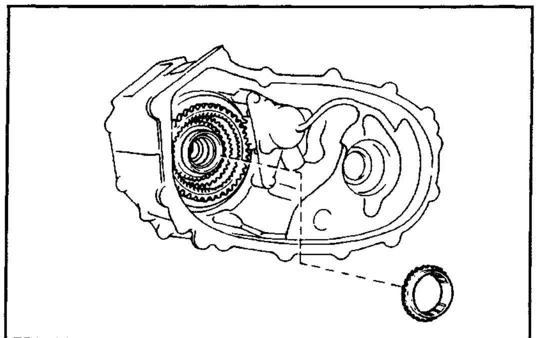

TF0465

(b) Mount the rear case in the vise.

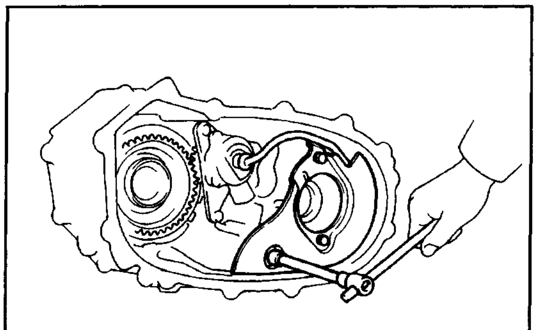
NOTICE: Be careful not to damage the sealing surface.

(c) Using a plastic hammer, tap the rear case with pulling the rear output shaft and driven sprocket.

(d) Remove the chain.


TF0466

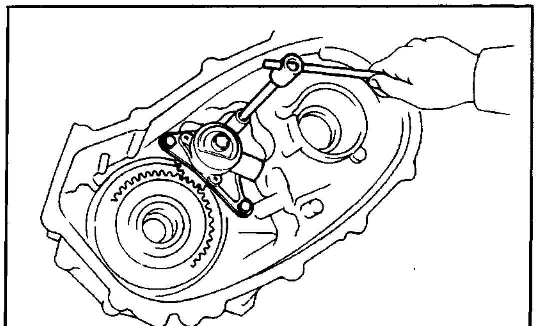
16. (13150F, G58)
REMOVE SYNCHRONIZER RING FROM INPUT SHAFT


TF0467

17. REMOVE SEPARATER WITH OIL STRAINER

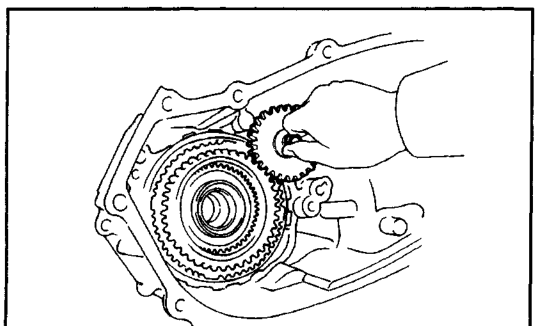
(a) Remove the three bolts and the separater with the oil strainer.

(b) Remove the 0–ring from the oil strainer pipe.

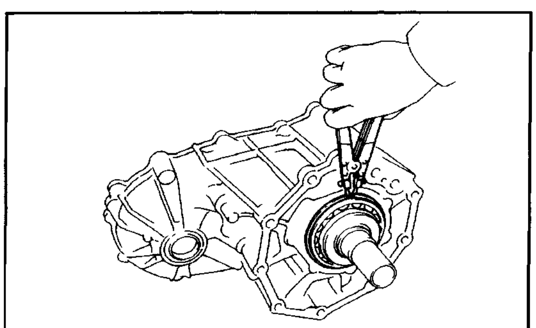

TF0468

18. REMOVE OIL PUMP BODY ASSEMBLY

Remove the three bolts and the oil pump body assembly.

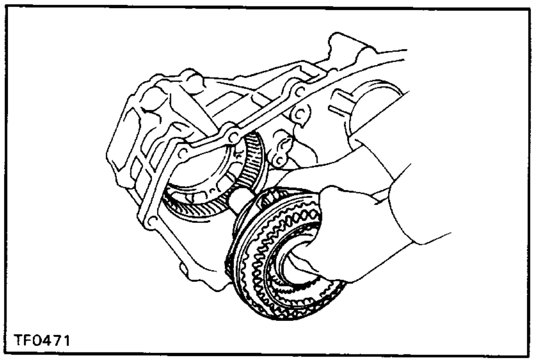

TF0469

19. REMOVE OIL PUMP DRIVE GEAR

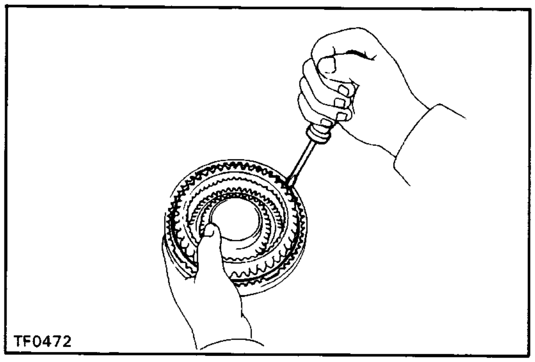

TF0470

20. REMOVE PLANETARY GEAR ASSEMBLY WITH INPUT SHAFT

(a) Using snap ring pliers, remove the snap ring.

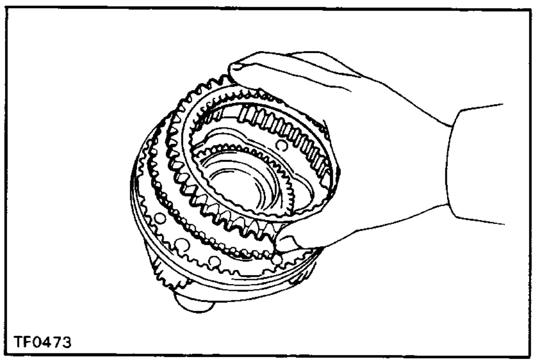

TF0471

(b) Pull out the planetary gear assembly with the input shaft.

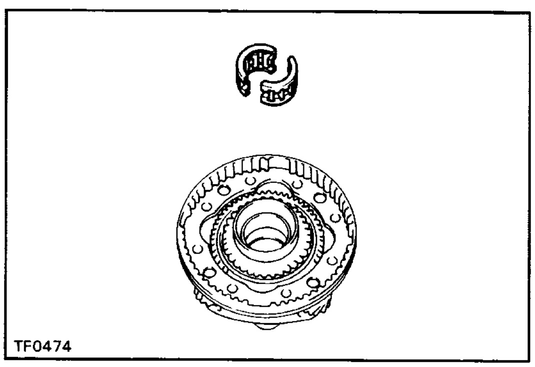

TF0472

21. REMOVE LOW GEAR SPLINE PIECE

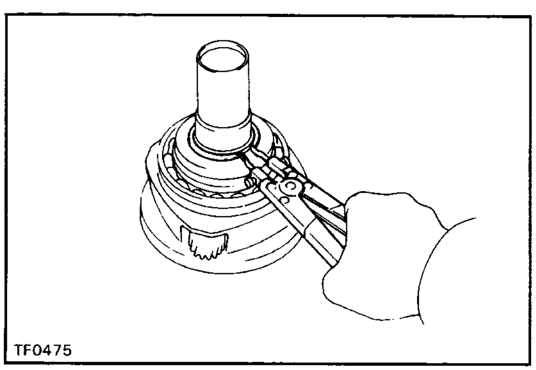
(a) Using a screwdriver, remove the snap ring.


TF0473

(b) Remove the low gear spline piece.

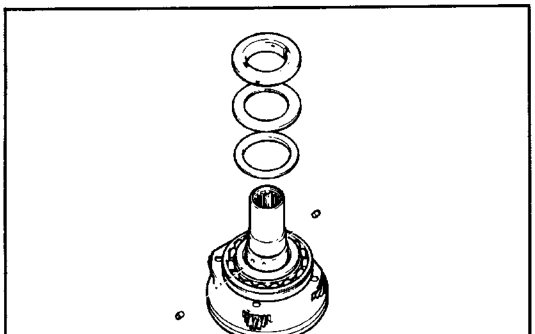

TF0474

22. REMOVE NEEDLE ROLLER BEARING FROM INPUT SHAFT

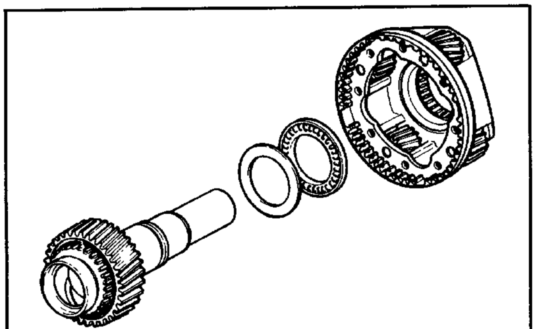

TF0475

23. REMOVE INPUT SHAFT STOPPER AND THRUST BEARING

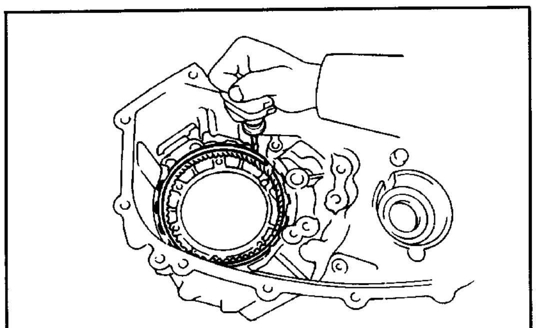
(a) Using snap ring pliers, remove the snap ring.


TF0476

(b) Remove the input shaft stopper, thrust bearing, race and the two pins.

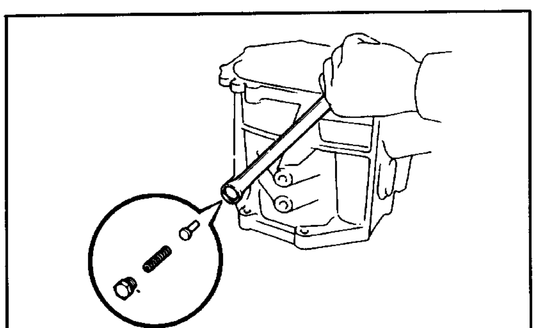

TF0477

24. REMOVE INPUT SHAFT, THRUST BEARING AND RACE

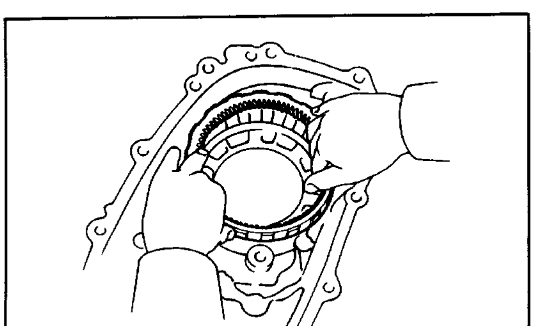

TF0478

25. REMOVE PLANETARY RING GEAR

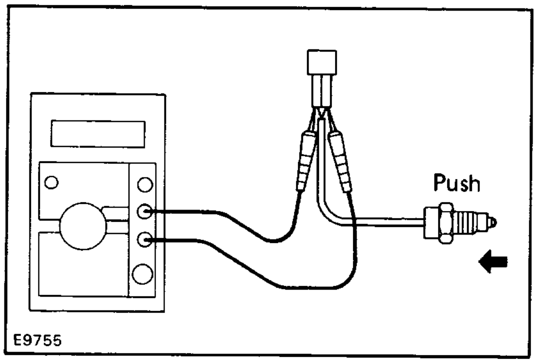
(a) Using a screwdriver, remove the snap ring.


TF0479

(b) Remove the plug, spring and pin.


TF0480

(c) Remove the planetary ring gear.

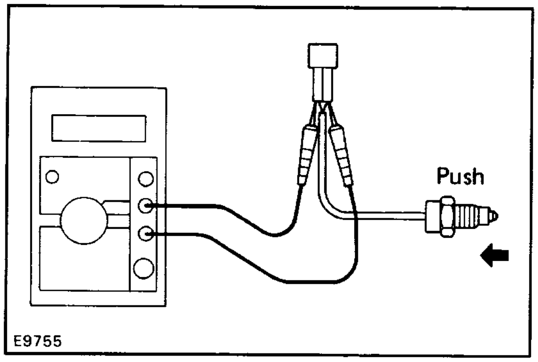


26. INSPECT TRANSFER INDICATOR SWITCH

Check that there is continuity between terminals as shown.

Switch Position	Specified
Push	Continuity
Free	No continuity

If operation is not as specified, replace the switch.



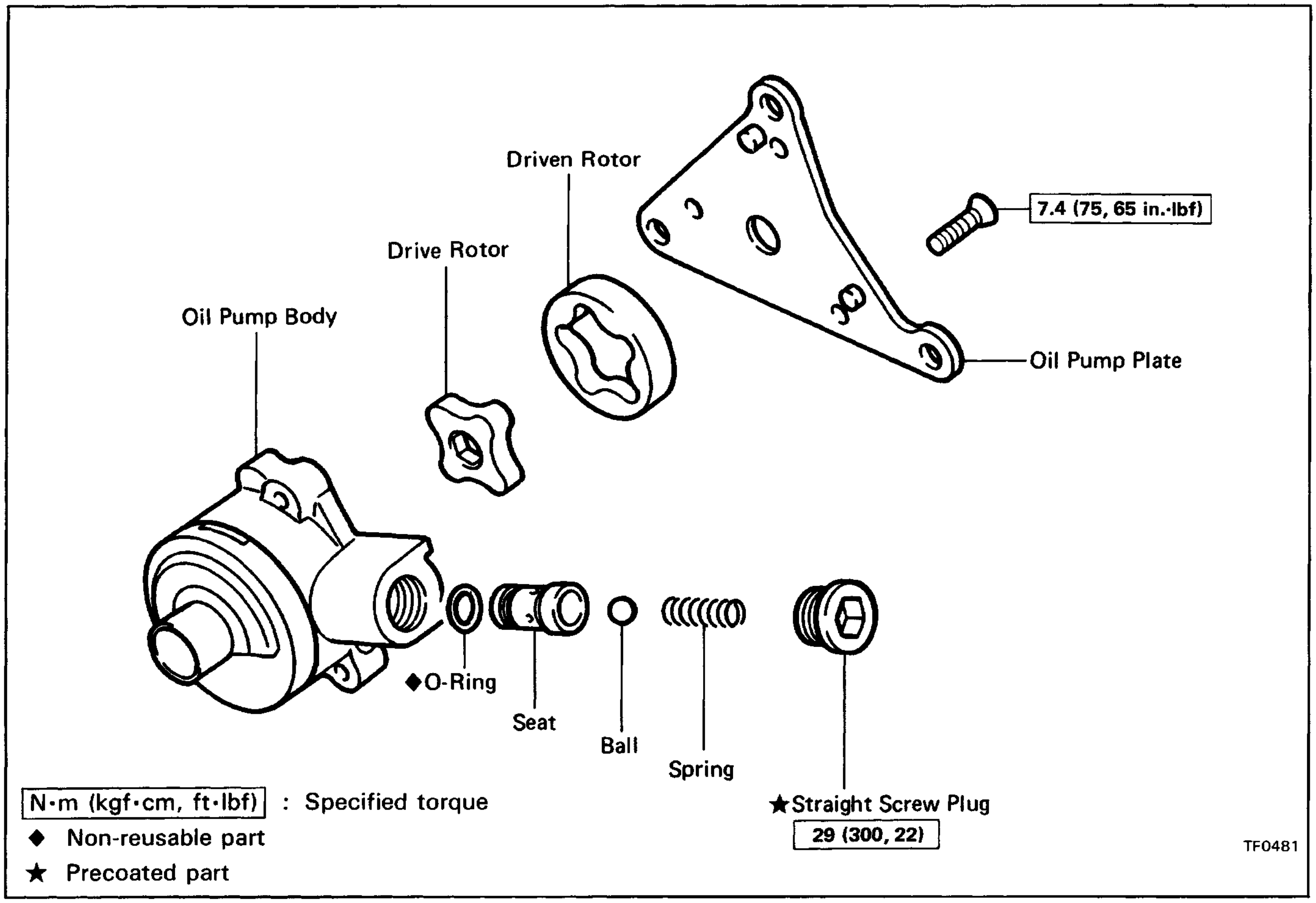
27. (22R–E/A340F) INSPECT TRANSFER L4 AND NEUTRAL POSITION SWITCH

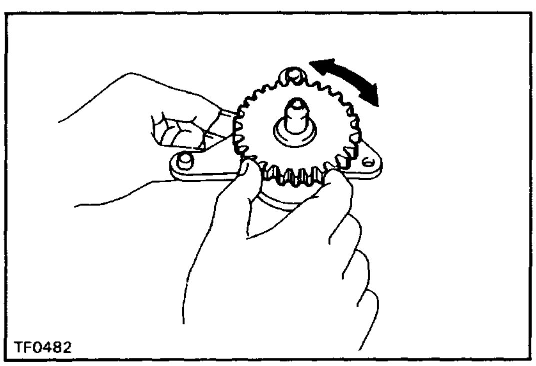
Check that there is continuity between terminals as shown.

Switch Position	Specified
Push	Continuity
Free	No continuity

If operation is not as specified, replace the switch.

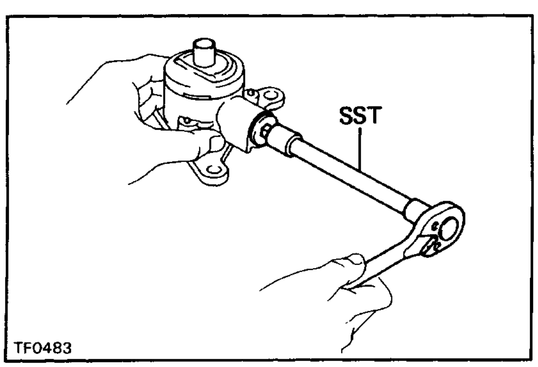
COMPONENT PARTS
Oil Pump Body
COMPONENTS





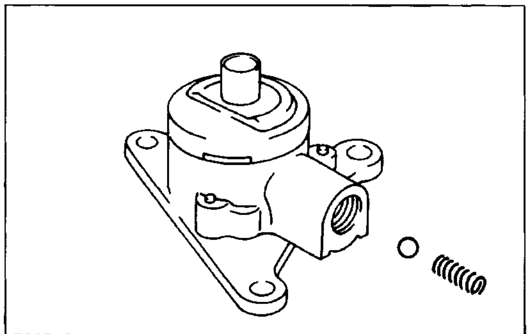
DISASSEMBLY OF OIL PUMP BODY
1. CHECK OPERATION OF OIL PUMP

Install the oil pump drive gear to the drive rotor, check that the drive rotor turns smoothly.

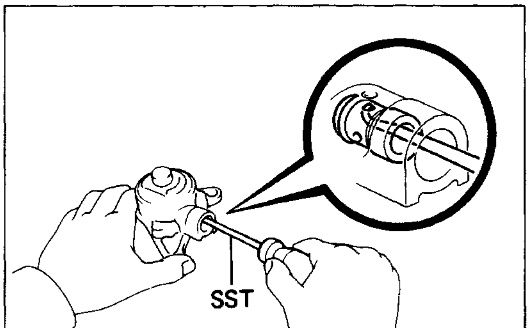


2. REMOVE STRAIGHT SCREW PLUG, SPRING, BALL AND SEAT

(a) Using SST, remove the straight screw plug.
SST 09043–38100

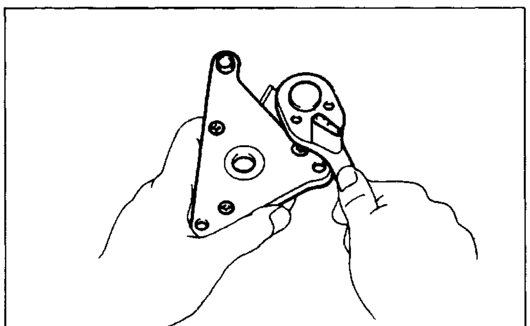

TF0546

(b) Using a magnetic finger, remove the spring and ball.

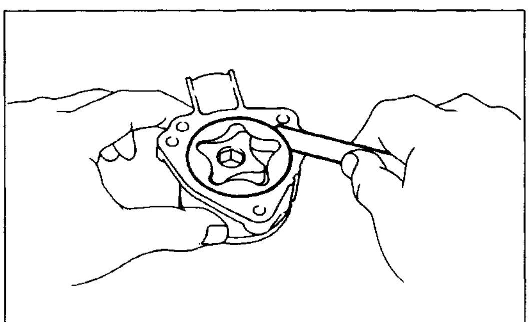


TF0547

(c) Using SST, pull out the seat.
SST 09921–00010
(d) Remove the O–ring from the seat.

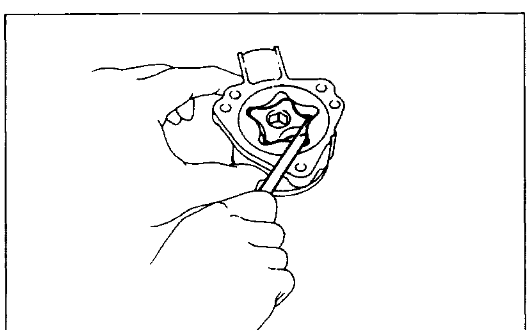

TF0485

3. REMOVE OIL PUMP PLATE
(a) Using a torx socket wrench, unscrew the three torx screws.
(Torx socket wrench T30 09042–00010)
(b) Remove the oil pump plate.
4. REMOVE DRIVE ROTOR AND DRIVEN ROTOR

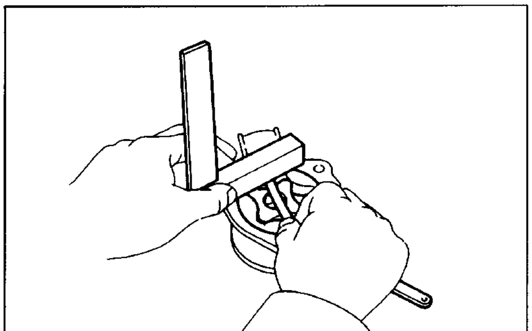

TF0486

INSPECTION OF OIL PUMP BODY

1. CHECK BODY CLEARANCE OF DRIVEN ROTOR
Push the driven rotor to one side of the body.
Using a feeler gauge, measure the clearance.
Standard clearance: 0.10 – 0.16 mm
(0.0039 – 0.0063 in.)
Maximum clearance: 0.16 mm (0.0063 in.)
If the clearance exceeds the limit, replace the drive rotor, driven rotor or pump body.

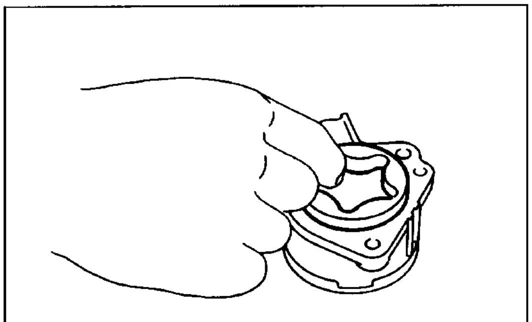

TF0487

2. CHECK TIP CLEARANCE OF BOTH ROTORS
Using a feeler gauge, measure the clearance between both rotor tips.
Standard clearance: 0.08 – 0.16 mm
(0.0031 – 0.0063 in.)
Maximum clearance: 0.16 mm (0.00631n.)
If the clearance exceeds the limit, replace the drive rotor, driven rotor or pump body.


TF0488

3. CHECK SIDE CLEARANCE OF BOTH ROTORS

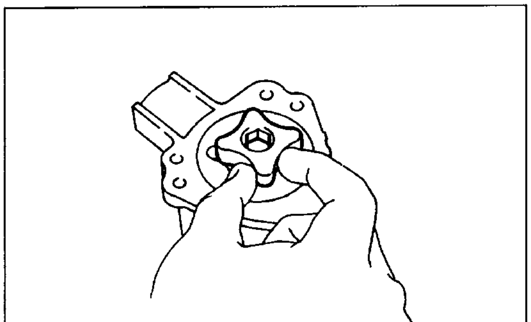
Using a steel straight edge and feeler gauge, measure the clearance between the rotors and straight edge.
Standard clearance: 0.03 – 0.08 mm
(0.0012 – 0.0031 in.)
Maximum clearance: 0.08 mm (0.0031 in.)
If the clearance exceeds the limit, replace the drive rotor, driven rotor or pump body.


TF0489

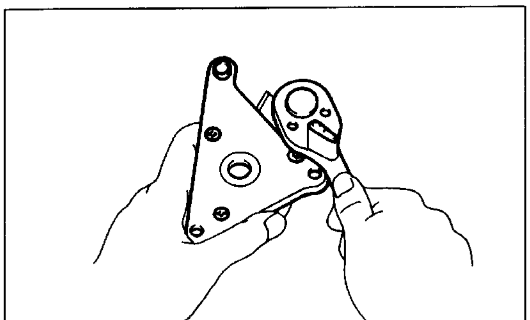
ASSEMBLY OF OIL PUMP BODY

1. INSTALL OIL PUMP DRIVE ROTOR AND DRIVEN ROTOR

(a) Apply gear oil to the both rotors.
(b) Install the driven rotor.

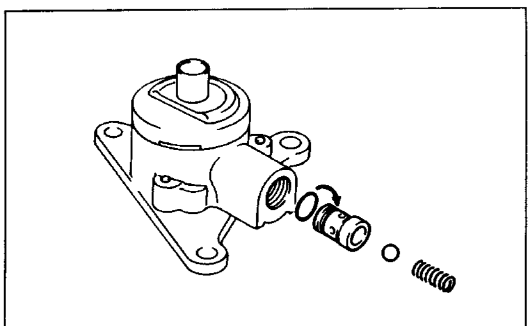

TF0490

(c) Install the drive rotor.


TF0485

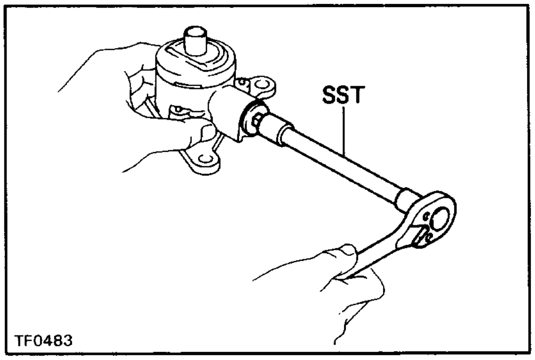
2. INSTALL OIL PUMP PLATE

(a) Install the oil pump plate.
(b) Using a torx socket wrench, tighten the three torx screws.
(Torx socket wrench T30 09042–00010)
Torque: 7.4 N–m (75 kgf–cm, 65 in.–lbf)

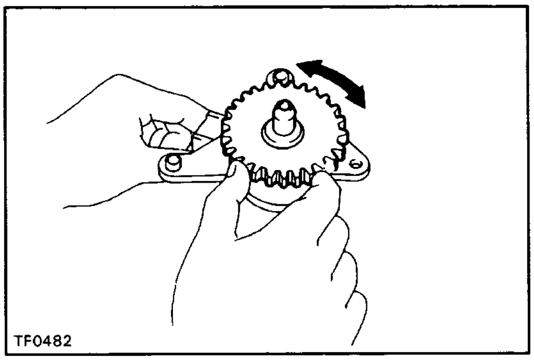

TF0484

3. INSTALL SEAT, BALL, SPRING AND STRAIGHT SCREW PLUG

(a) Install a new O–ring to the seat.
(b) Install the seat, ball and spring.
HINT: When installing the seat, push the seat until it touches the bottom of the hole in the body.



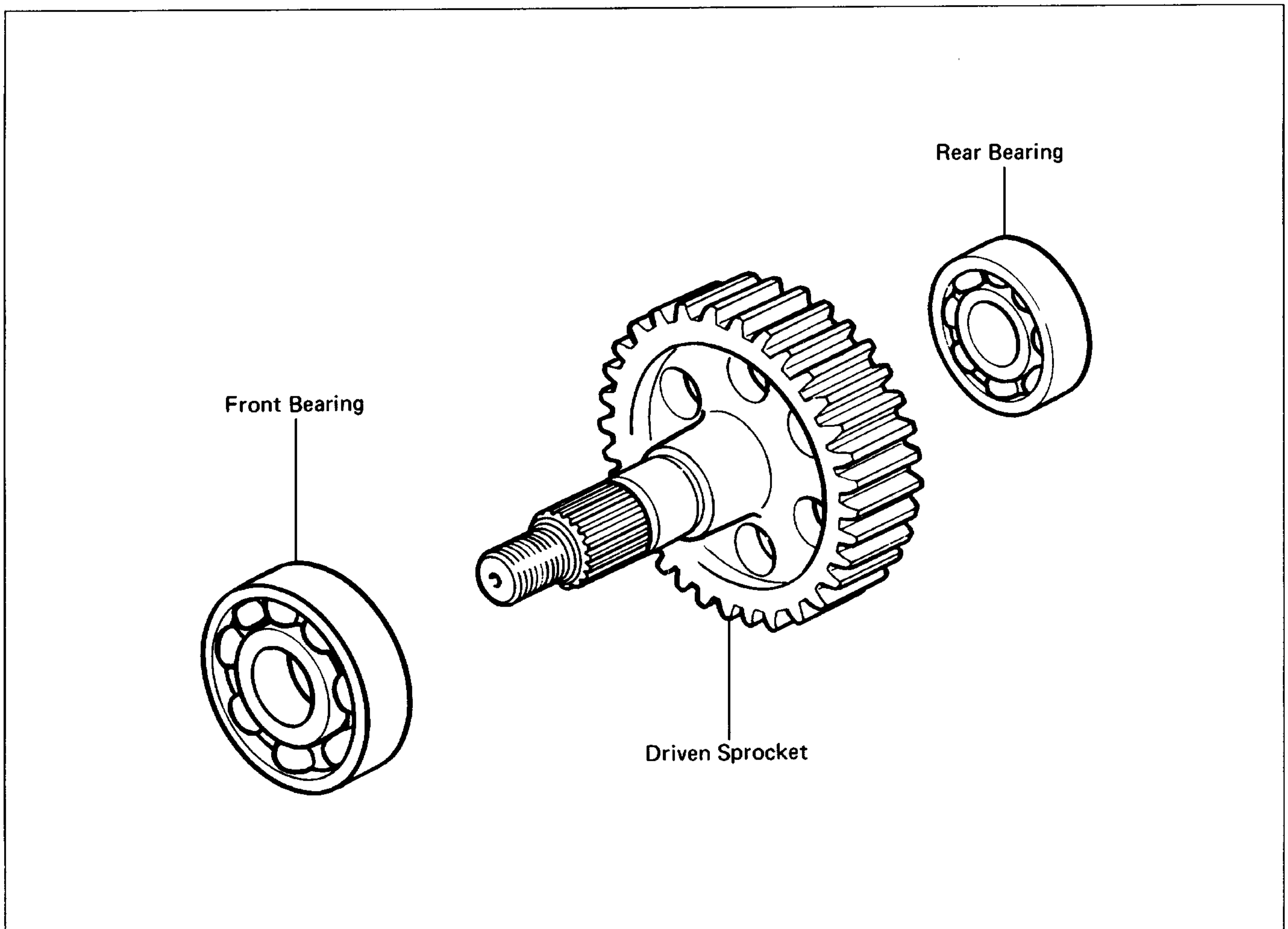
(c) Apply liquid sealer to the plug.
Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent
(d) Using SST, torque the plug.
SST 09043–38100
Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)



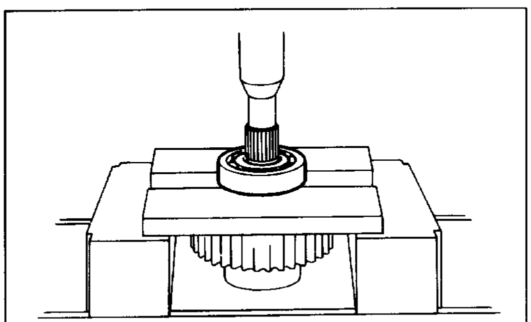
4. CHECK OPERATION OF OIL PUMP
Install the oil pump drive gear to the drive rotor, check that the drive rotor turns smoothly.

Driven Sprocket

COMPONENTS



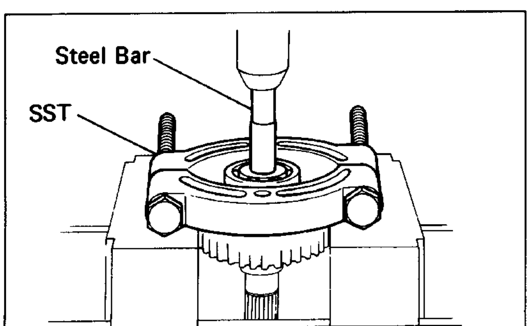
TF0511


TF0512

DISASSEMBLY OF DRIVEN SPROCKET

1. REMOVE FRONT BEARING

Using a press, remove the front bearing.

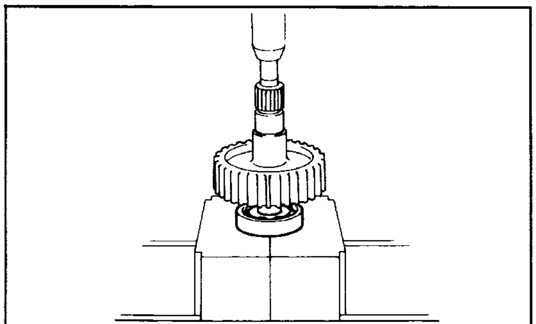


TF0513

2. REMOVE REAR BEARING

Using SST and a press, remove the rear bearing.

SST 09950–00020

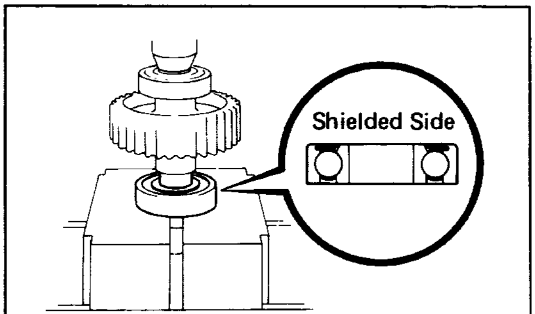


TF0514

ASSEMBLY OF DRIVEN SPROCKET

1. INSTALL REAR BEARING

Using a press, install the rear bearing.



TF0515

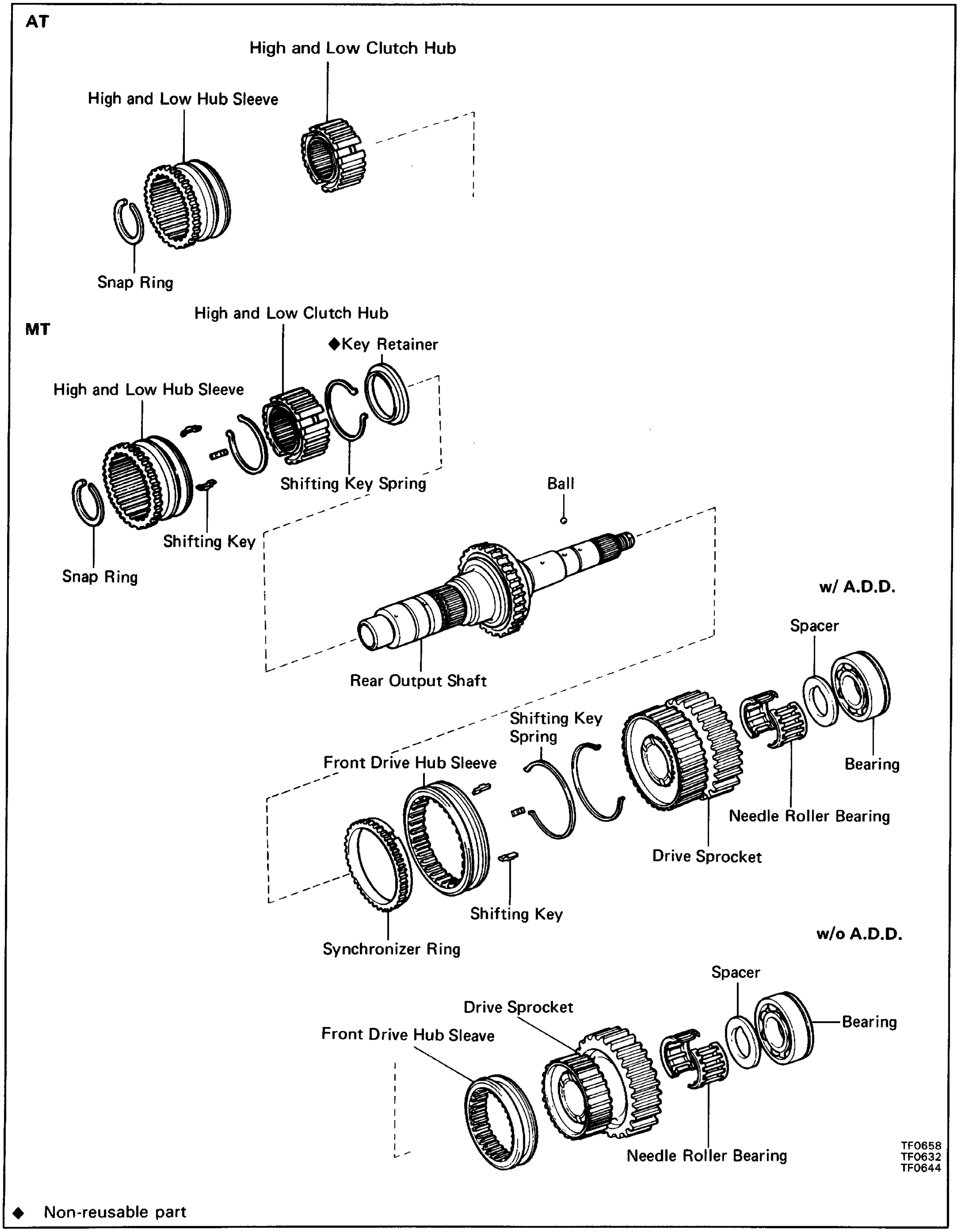
2. INSTALL FRONT BEARING

Using a press, install the front bearing.

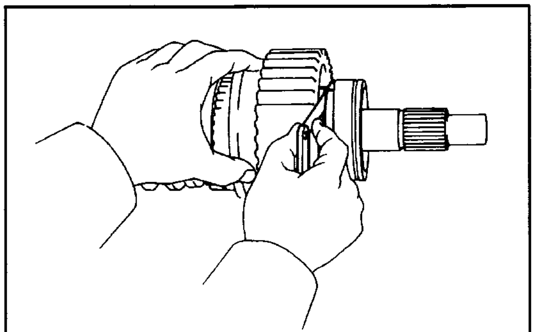
HINT: Make sure to install the bearing in the correct di–rection.

Rear Output Shaft Assembly

COMPONENTS



DISASSEMBLY OF REAR OUTPUT SHAFT ASSEMBLY


TF0516

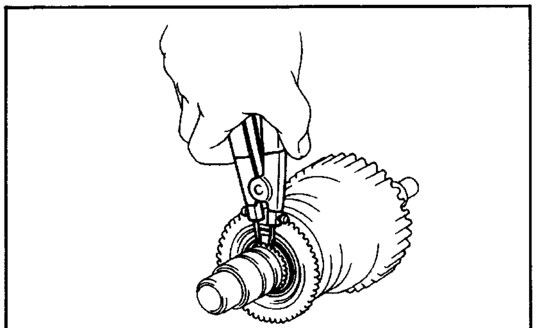
1. MEASURE DRIVE SPROCKET THRUST CLEARANCE

Using a feeler gauge, measure the drive sprocket thrust clearance.

Standard clearance: 0.10 – 0.25 mm (0.0039 – 0.0098 in.)

Maximum clearance: 0.25 mm (0.0098 in.)

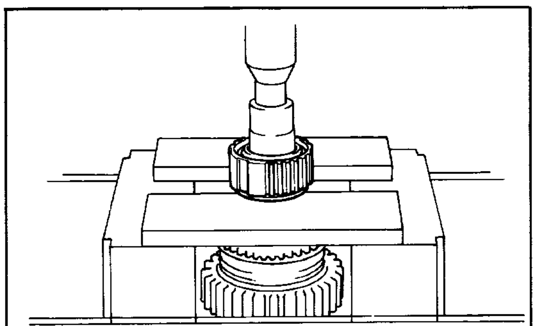
If the clearance exceeds the limit, replace the drive sprocket.


TF0517

2.–1 (MT)

REMOVE HIGH AND LOW HUB SLEEVE ASSEMBLY

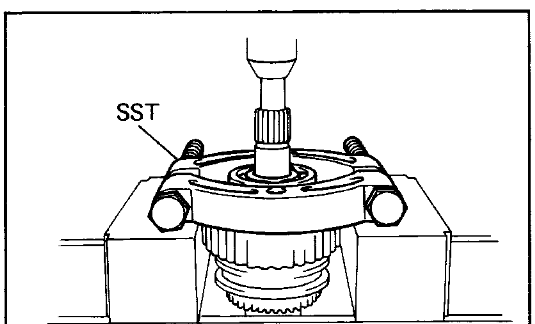
(a) Using snap ring pliers, remove the snap ring.
(b) Remove the hub sleeve and shifting keys.
(c) Using a press, remove the clutch hub, key springs and key retainer.


TF0549

2.–2 (AT)

REMOVE HIGH AND LOW HUB SLEEVE ASSEMBLY

(a) Using snap ring pliers, remove the snap ring.
(b) Remove the hub sleeve.
(c) Using a press, remove the clutch hub.

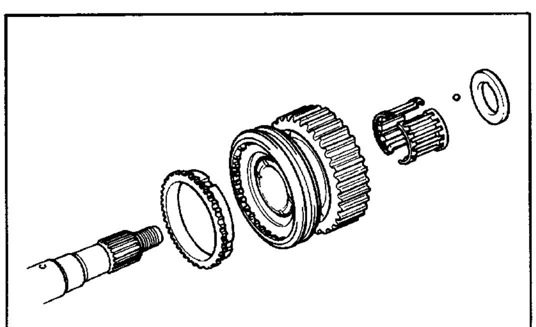


TF0518

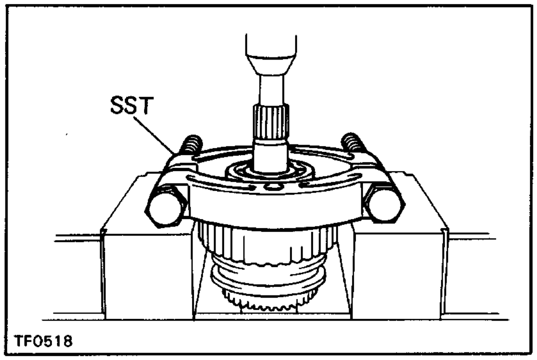
3.–1 (w/ A.D.D.)

REMOVE REAR BEARING, SPACER AND DRIVE SPROCKET WITH FRONT DRIVE HUB SLEEVE ASSEMBLY

(a) Using SST and a press, remove the bearing.
SST 09950–00020

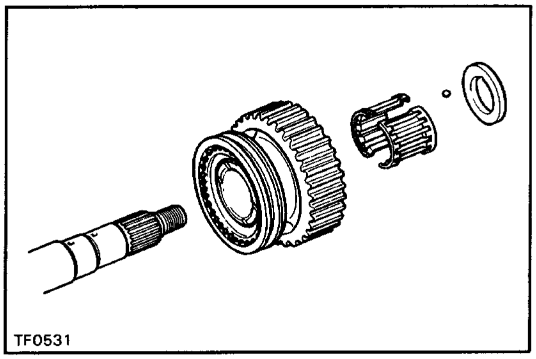

TF0620

(b) Remove the spacer and ball.
(c) Remove the drive sprocket with front drive hub and hub sleeve.
(d) Remove the needle roller bearing.
(e) Remove the synchronizer ring.



3.–2 (w/o A.D.D.)
REMOVE REAR BEARING, SPACER AND DRIVE SPROCKET WITH FRONT DRIVE HUB SLEEVE ASSEMBLY

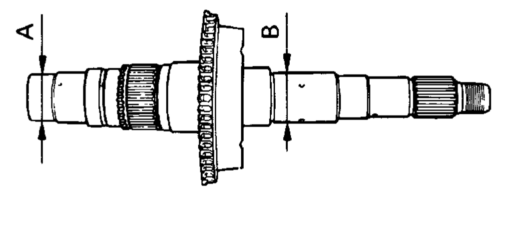
(a) Using SST and a press, remove the bearing.
SST 09950–00020



(b) Remove the spacer and ball.
(c) Remove the drive sprocket with front drive hub and hub sleeve.
(d) Remove the needle roller bearing.

4. (w/ A.D.D.)
REMOVE SHIFTING KEYS AND KEY SPRINGS FROM FRONT DRIVE HUB ASSEMBLY

Using screwdriver, remove the two shifting key springs and three shifting keys.



TF0521

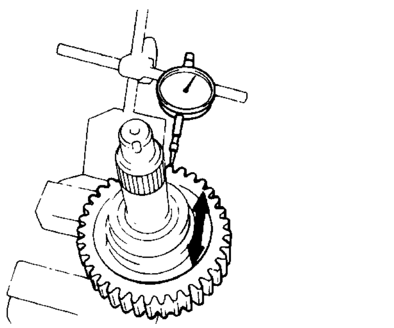
INSPECTION OF REAR OUTPUT SHAFT ASSEMBLY

1. INSPECT REAR OUTPUT SHAFT

Using a micrometer, measure the outer diameter of the rear output shaft journal surface.

Minimum diameter:

Part A 27.98 mm (1.1016 in.)
B 36.98 mm (1.4559 in.)

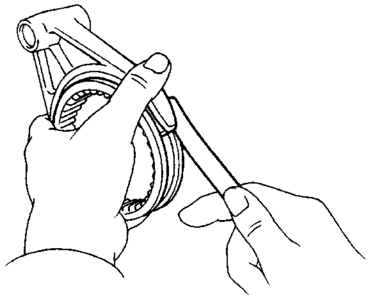

TF0522

2. CHECK OIL CLEARANCE OF DRIVE SPROCKET

Using a dial indicator, measure the oil clearance between the sprocket and shaft with the needle roller bearing in–stalled.

Standard clearance: 0.010 – 0.055 mm
(0.0004 – 0.0022 in.)
Maximum clearance: 0.055 mm (0.022 in.)

If the clearance exceeds the limit, replace the drive sprocket, rear output shaft or needle roller bearing.

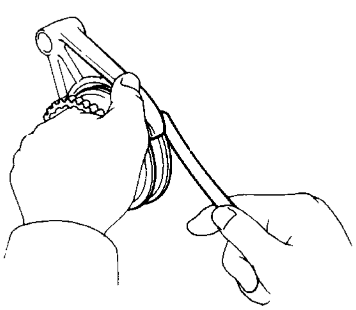

TF0523

3. MEASURE CLEARANCE OF FRONT DRIVE SHIFT FORK AND HUB SLEEVE

Using a feeler gauge, measure the clearance between the front drive shift fork and hub sleeve.

Maximum clearance: 1.0 mm (0.039 in.)

If the clearance exceeds the limit, replace the shift fork or hub sleeve.

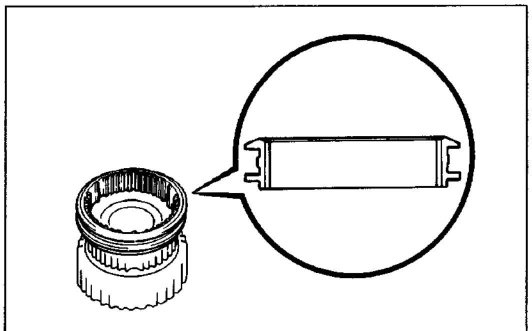

TF0524

4. MEASURE CLEARANCE OF HIGH AND LOW SHIFT FORK AND HUB SLEEVE

Using a feeler gauge, measure the clearance between the high and low shift fork and hub sleeve.

Maximum clearance: 1.0 mm (0.039 in.)

If the clearance exceeds the limit, replace the shift fork or hub sleeve.


TF0621

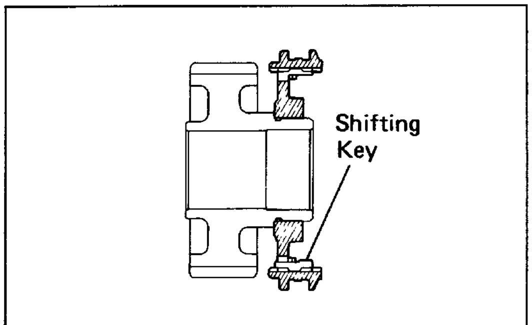
ASSEMBLY OF REAR OUTPUT SHAFT ASSEMBLY

1.–1 (wl A.D.D.)

INSTALL FRONT DRIVE CLUTCH HUB AND HUB SLEEVE

(a) Install the front drive hub sleeve onto the clutch hub.

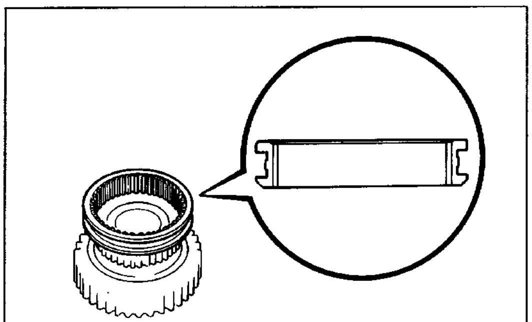
HINT: Make sure to install the hub sleeve in the correct direction.



TF0624

(b) Install the shifting keys and springs.

NOTICE: Install the key springs positioned so that their end gaps are not in line.

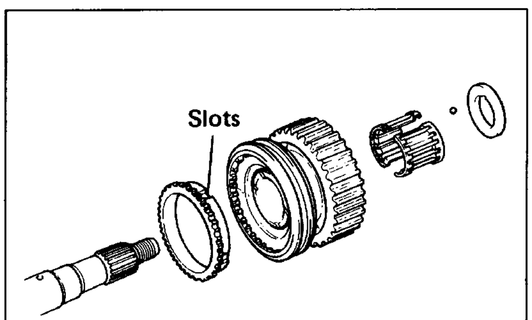

TF0527

1.–2 (w/o A.D.D.)

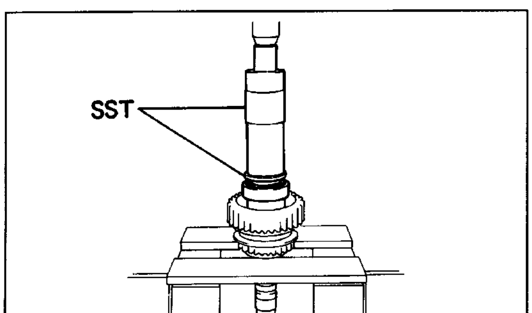
INSTALL FRONT DRIVE CLUTCH HUB AND HUB SLEEVE

Install the front drive hub sleeve onto the clutch hub.

HINT: Make sure to install the hub sleeve in the correct direction.



TF0620



TF0532

2.–1 (w/ A.D.D.)

INSTALL DRIVE SPROCKET WITH FRONT DRIVE HUB SLEEVE ASSEMBLY, SPACER AND REAR BEARING

(a) Apply gear oil to the shaft and needle roller bearing.

(b) Install the synchronizer ring.

(c) Install the needle roller bearing in the drive sprocket.

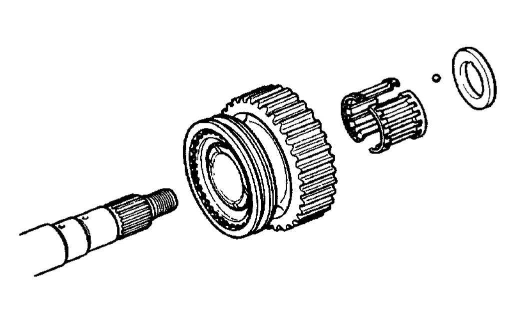
(d) Install the drive sprocket with the front drive hub sleeve.

(e) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.

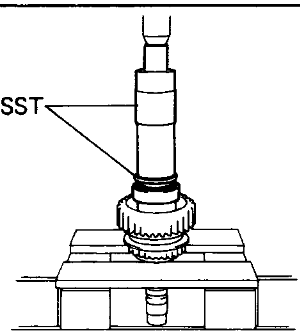
(f) Install the spacer to align it with the ball.

(g) Using SST and a press, install the rear bearing with the outer race snap ring groove toward the rear.

SST 09316–60010 (09316–00010, 09316–00070)

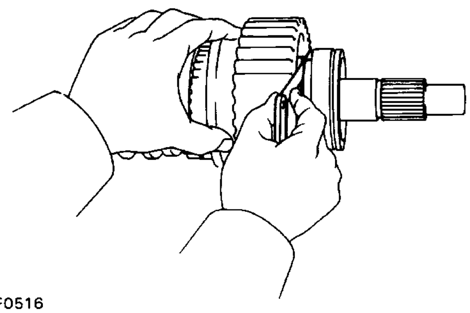

TF0531

2.–2 (w/o A.D.D.)
INSTALL DRIVE SPROCKET WITH FRONT DRIVE HUB SLEEVE ASSEMBLY, SPACER AND REAR BEARING
(a) Apply gear oil to the shaft and needle roller bearing.
(b) Install the needle roller bearing in the drive sprocket.
(c) Install the drive sprocket with the front drive hub sleeve.
(d) Install the spacer to align it with the ball.

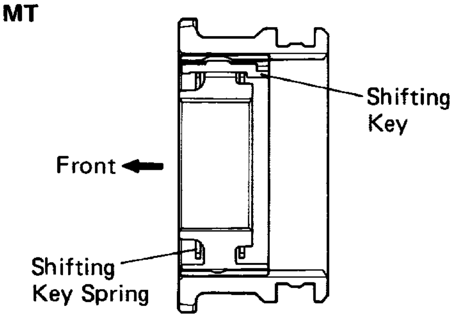


TF0532

(e) Using SST and a press, install the rear bearing with the outer race snap ring groove toward the rear.
SST 09316–60010 (09316–00010, 09316–00070)

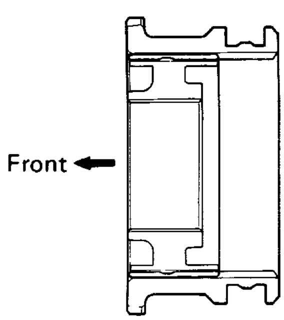

TF0516

3. MEASURE DRIVE SPROCKET THRUST CLEARANCE
Using a feeler gauge, measure the drive sprocket thrust clearance.
Standard clearance: 0.10 – 0.25 mm
(0.0039 – 0.0098 in.)

MT


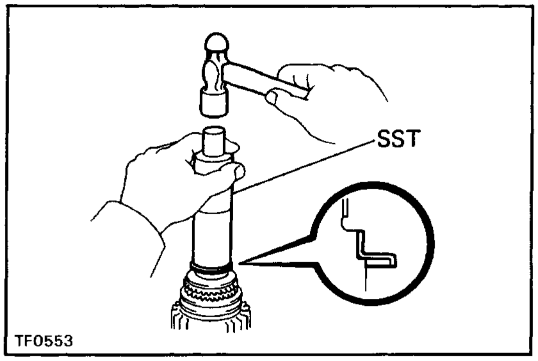
TF0528

4.–1 (MT)
INSERT HIGH AND LOW CLUTCH HUB INTO HUB SLEEVE
(a) Install the clutch hub and shifting keys to the hub sleeve.
(b) Install the shifting key springs under the shifting keys.
NOTICE: Install the key springs positioned so that their end gaps are not in line.

AT


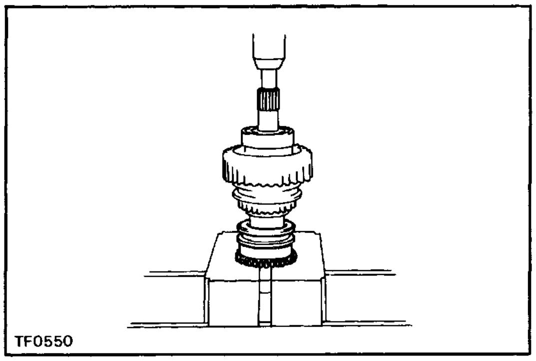
TF0690

4.–2 (AT)
INSERT HIGH AND LOW CLUTCH HUB INTO HUB SLEEVE
Install the clutch hub to the hub sleeve.

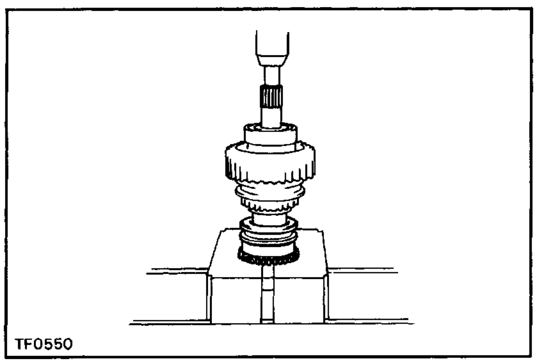


TF0553

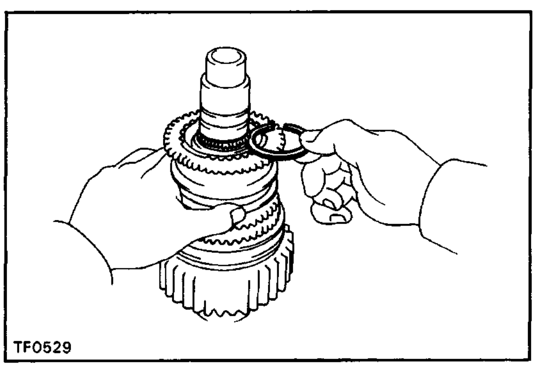
5.–1 (MT)
INSTALL HIGH AND LOW HUB SLEEVE ASSEMBLY
(a) Using SST and a hammer, drive in a new key retainer.
SST 09316–60010 (09316–00010)
NOTICE: Be careful not to deform or damage the key retainer.


TF0550

(b) Using a press, install the high and low hub sleeve assembly.

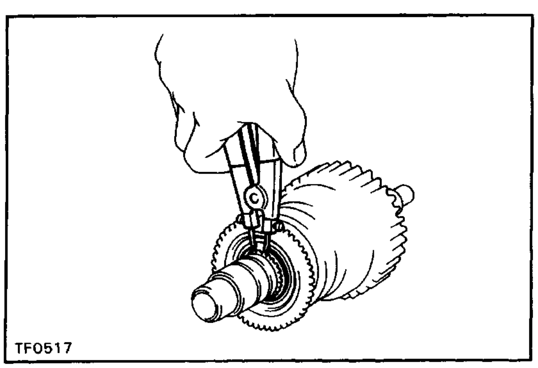

TF0550

5.–2 (AT)
INSTALL HIGH AND LOW HUB SLEEVE ASSEMBLY
Using a press, install the high and low hub sleeve assembly.


TF0529

6. INSTALL SNAP RING
(a) Select a snap ring that will allow minimum axial play.

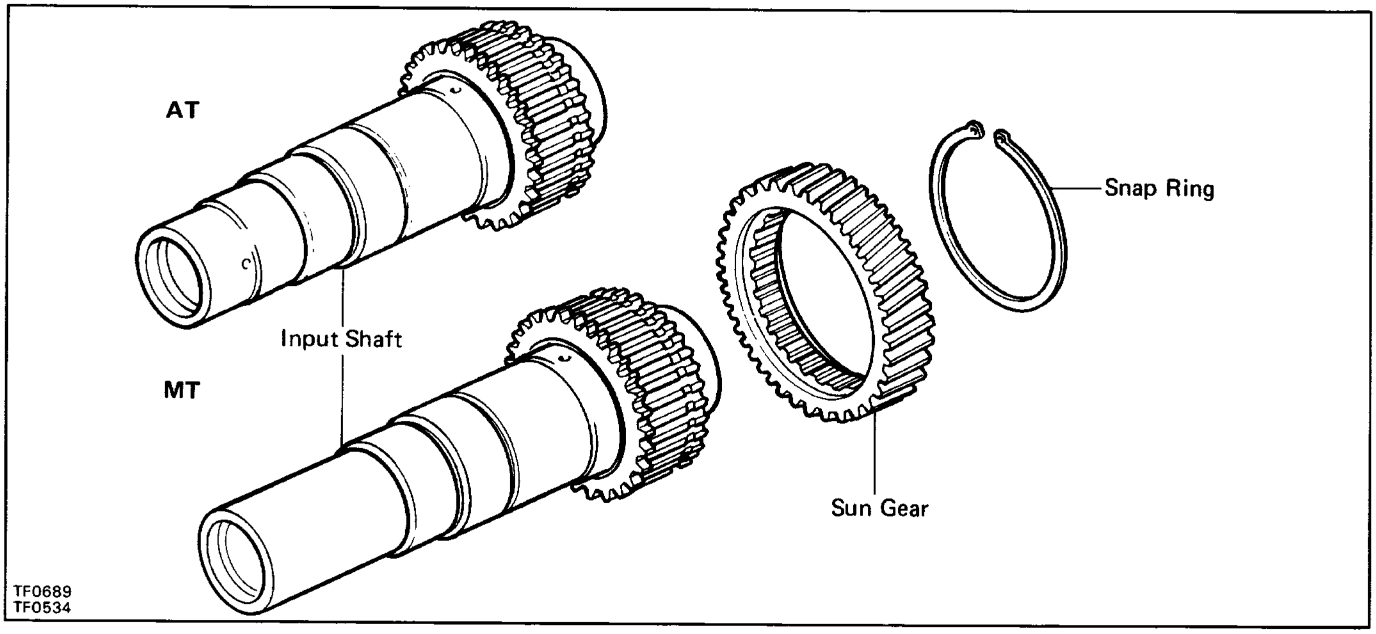
Mark	Thickness mm (in.)
A	2.10 – 2.15 (0.0827 – 0.0846)
B	2.15 – 2.20 (0.0846 – 0.0866)
C	2.20 – 2.25 (0.0866 – 0.0886)
D	2.25 – 2.30 (0.0886 – 0.0906)
E	2.30 – 2.35 (0.0906 – 0.0925)
F	2.35 – 2.40 (0.0925 – 0.0945)
G	2.40 – 2.45 (0.0945 – 0.0965)
H	2.45 – 2.50 (0.0965 – 0.0984)
J	2.50 – 2.55 (0.0984 – 0.1004)
K	2.00 – 2.05 (0.0787 – 0.0807)
L	2.05 – 2.10 (0.0807 – 0.0827)

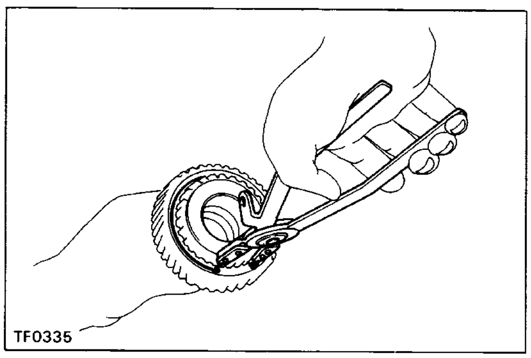

TF0517

(b) Using snap ring pliers, install the snap ring.

Input Shaft

COMPONENTS

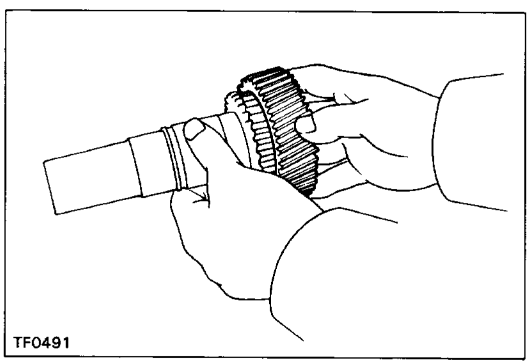




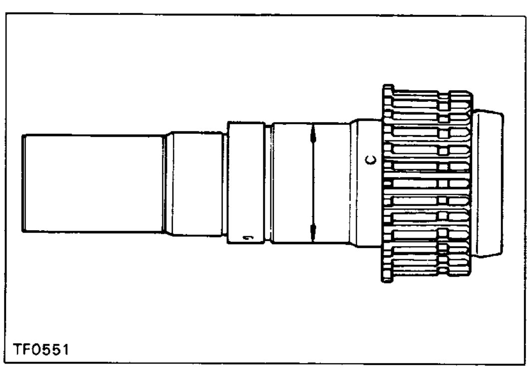
DISASSEMBLY OF INPUT SHAFT

REMOVE SUN GEAR

(a) Using snap ring pliers, remove the snap ring.



(b) Remove the sun gear from the input shaft.

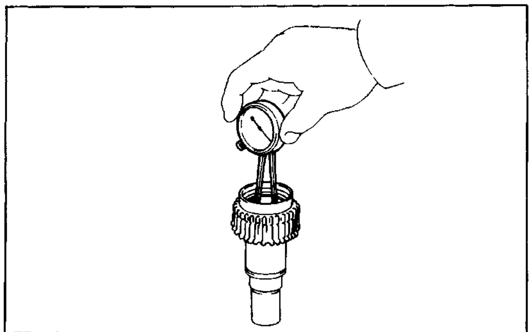


INSPECTION OF INPUT SHAFT

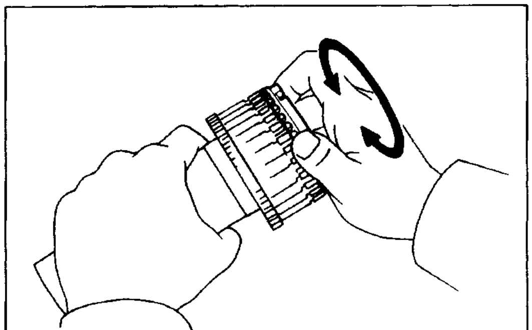
1. INSPECT INPUT SHAFT

(a) Using a micrometer, measure the outer diameter of the input shaft journal surface.

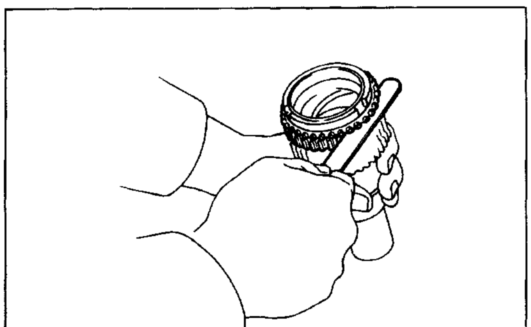
Minimum diameter: 47.59 mm (1.8736 in.)


TF0535

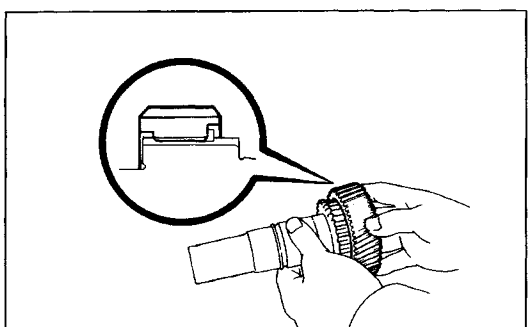
(b) Using a dial indicator, measure the inside diameter of the input shaft bushing.
Maximum inside diameter: 39.14 mm (1.5409 in.)
If the inside diameter exceeds the limit, replace the input shaft.


TF0552

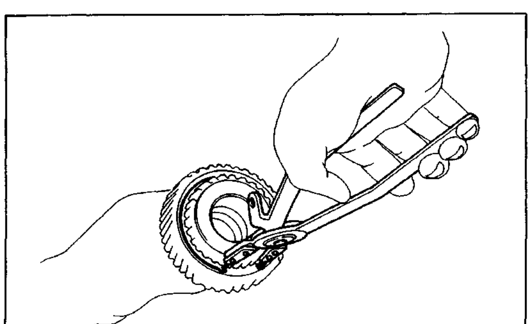
2. INSPECT SYNCHRONIZER RING
(a) Turn the ring and push it in to check the braking ac– tion.


TF0536

(b) Measure the clearance between the synchronizer ring back and the input shaft spline end.
Standard clearance: 1.15 – 1.85 mm
(0.0453 – 0.0728 in.)
Minimum clearance: 0.8 mm (0.031 in.)
If the clearance is less than the limit, replace the synchro– nizer ring.


TF0537

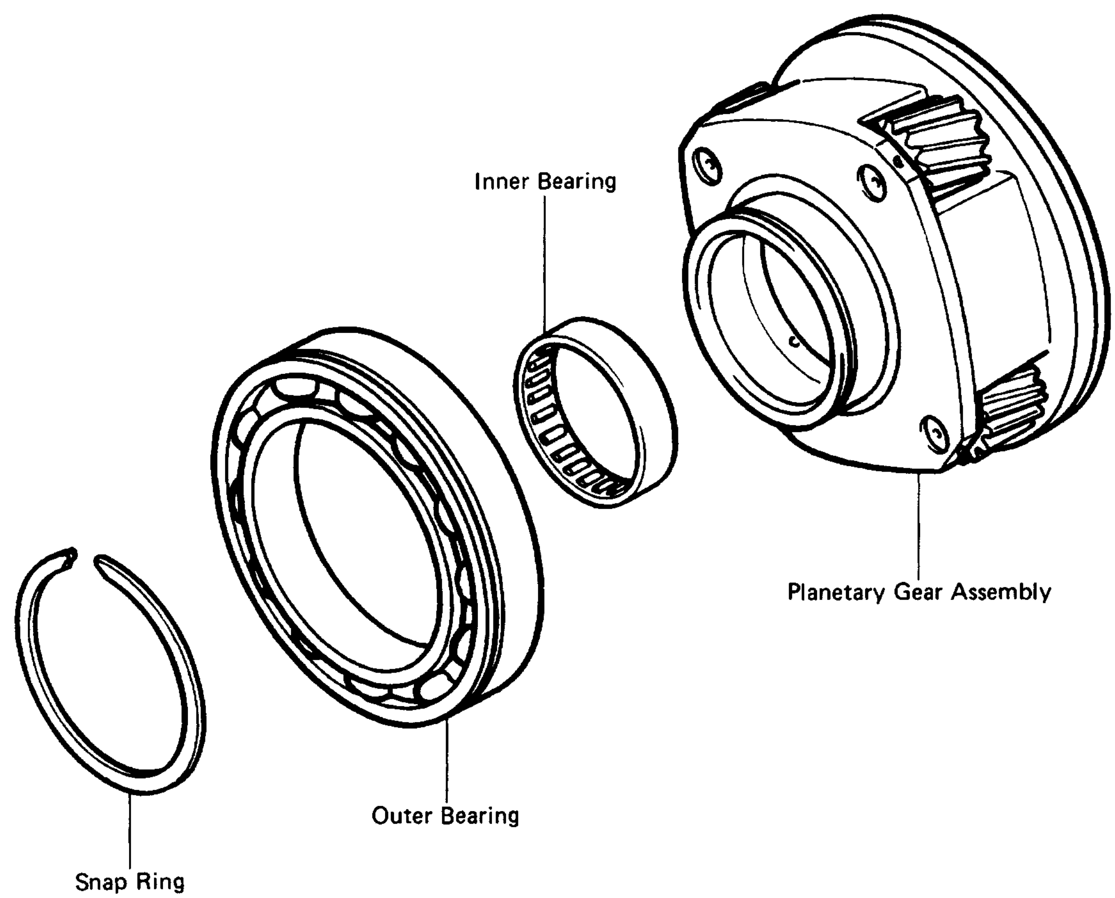
ASSEMBLY OF INPUT SHAFT
INSTALL SUN GEAR
(a) Install the sun gear to the input shaft.
HINT: Make sure to install the sun gear in the correct di– rection.


TF0335

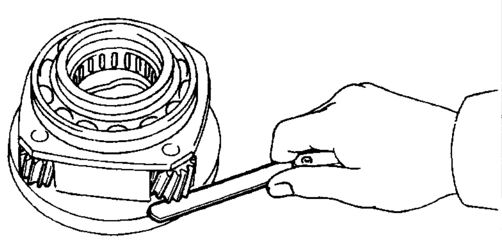
(b) Using snap ring pliers, install the snap ring.

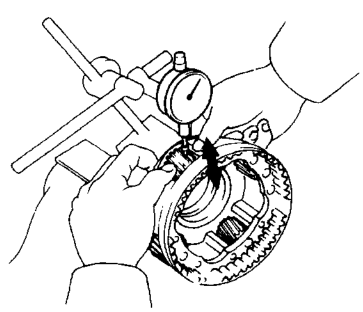
Planetary Gear

COMPONENTS



TF0492


TF0493


TF0494

INSPECTION OF PLANETARY GEAR

1. MEASURE PLANETARY PINION GEAR THRUST CLEARANCE

Using a feeler gauge, measure the planetary pinion gear thrust clearance.

Standard clearance: 0.11 – 0.86 mm (0.0043 – 0.0339 in.)

Maximum clearance: 0.86 mm (0.0339 in.)

If the clearance exceeds the limit, replace the planetary gear assembly.

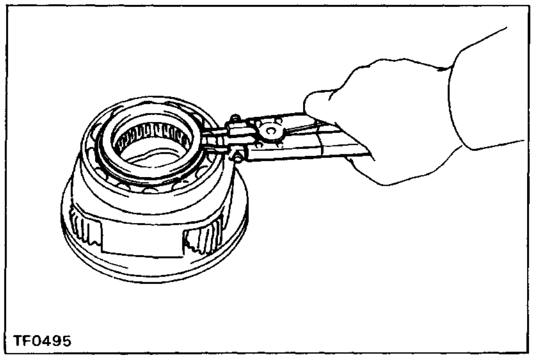
2. CHECK OIL CLEARANCE OF PLANETARY PINION GEAR

Using a dial indicator, measure the oil clearance of the planetary pinion gear.

Standard clearance: 0.009 – 0.038 mm (0.0004 – 0.0015 in.)

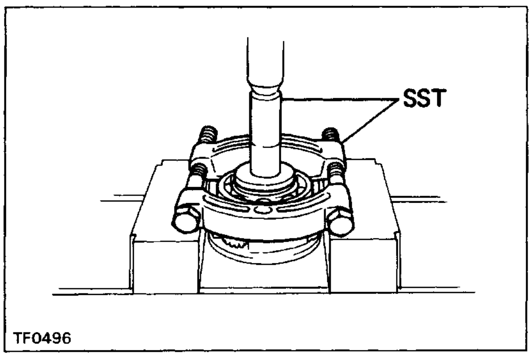
Maximum clearance: 0.038 mm (0.0015 in.)

If the clearance exceeds the limit, replace the planetary gear assembly.

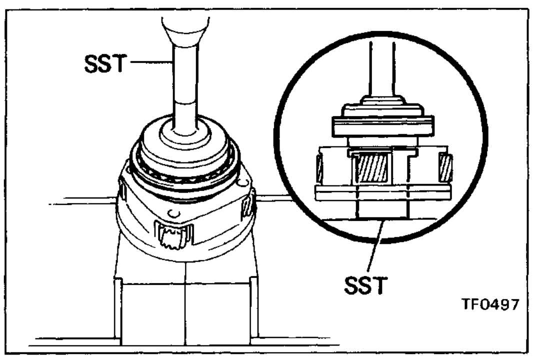


3. IF NECESSARY, REPLACE PLANETARY GEAR OUTER BEARING

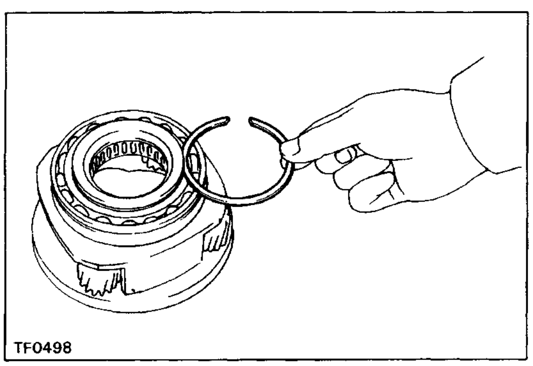
(a) Using snap ring pliers, remove the snap ring.



(b) Using SST and a press, remove the bearing.
SST 09554–30011 and 09555–55010

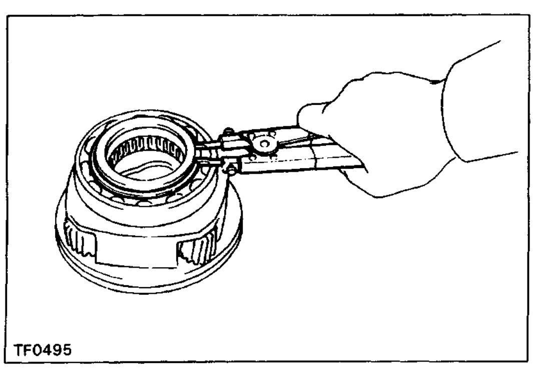


(c) Using SST and a press, install a new bearing with the outer race snap ring groove toward the front.
SST 09223–15010 and 09515–30010

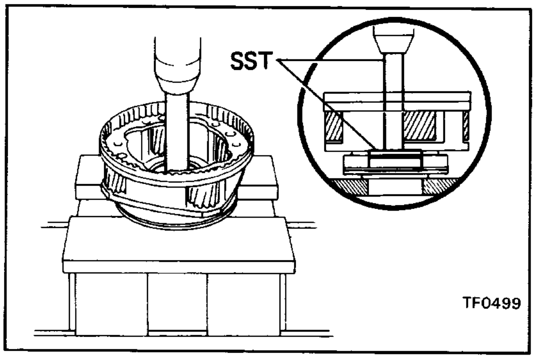


(d) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
1	1.45 – 1.50 (0.0571 – 0.0591)
2	1.50 – 1.55 (0.0591 – 0.0610)
3	1.55 – 1.60 (0.0610 – 0.0630)
4	1.60 – 1.65 (0.0630 – 0.0650)
5	1.65 – 1.70 (0.0650 – 0.0669)

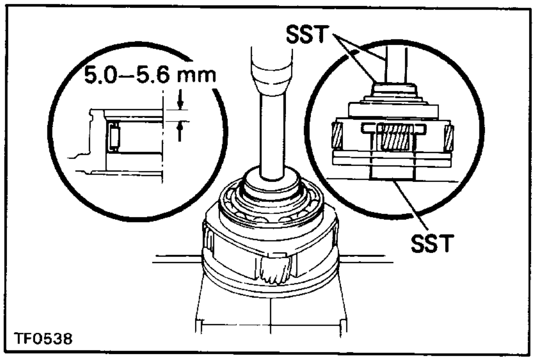


(e) Using snap ring pliers, install the snap ring.



4. IF NECESSARY, REPLACE PLANETARY GEAR INNER BEARING

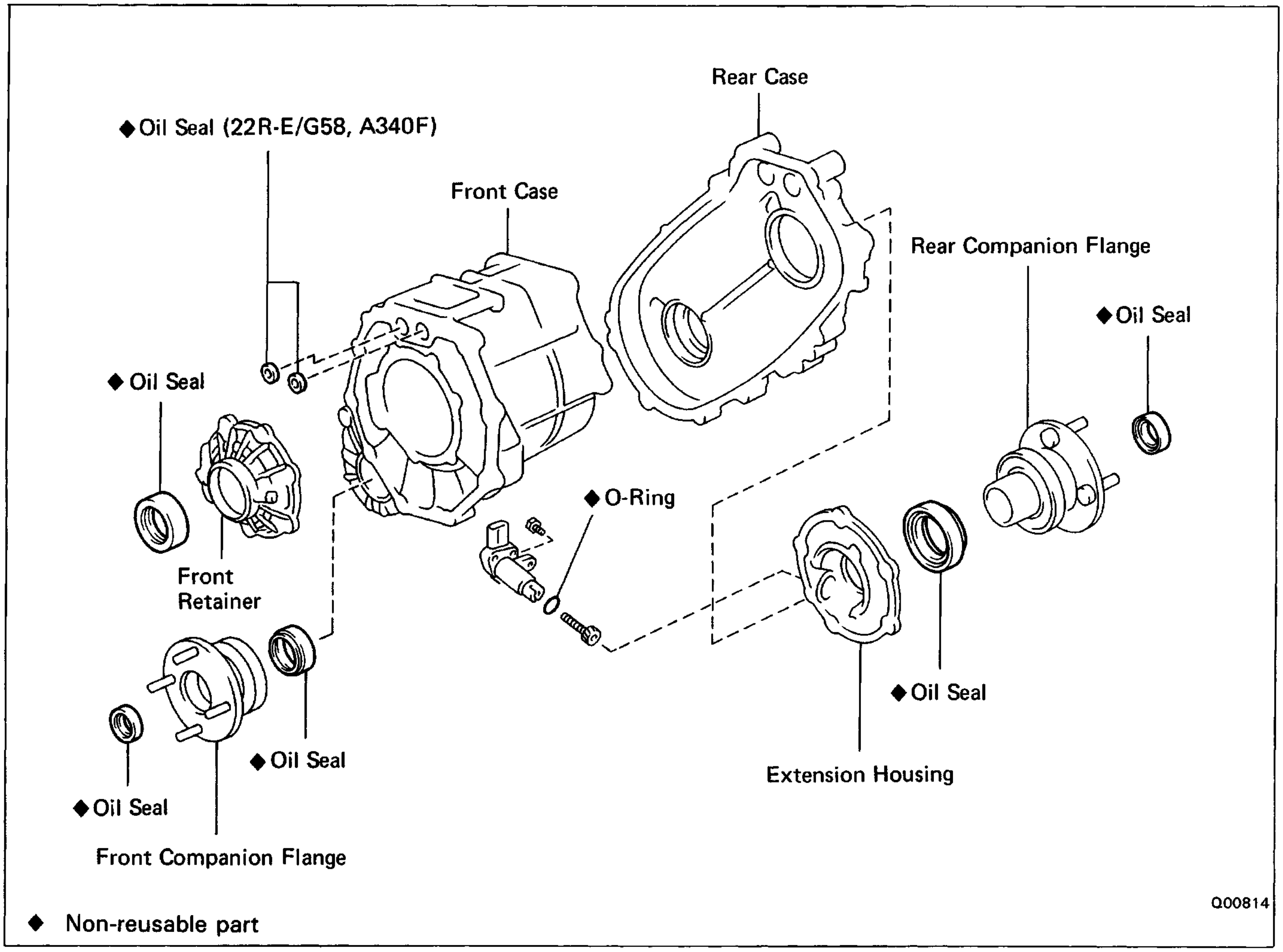
(a) Using SST and a press, remove the bearing.
SST 09550–10012 (09252–10010, 09557–10010)

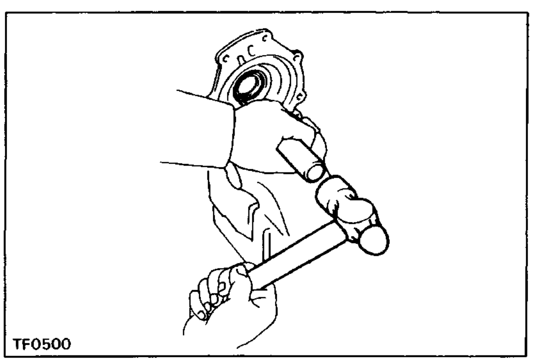


(b) Using SST and a press, install a new bearing.
SST 09550–10012 (09252–10010, 09557–10010) and 09515–30010
Bearing depth: 5.0 – 5.6 mm (0.197 – 0.220 in.)

Oil Seals

COMPONENTS

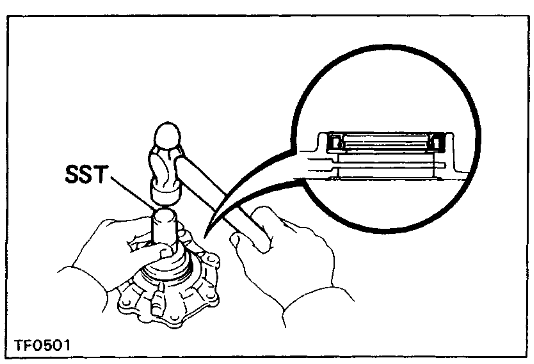




REPLACEMENT OF OIL SEALS

1. IF NECESSARY, REPLACE FRONT RETAINER OIL SEAL

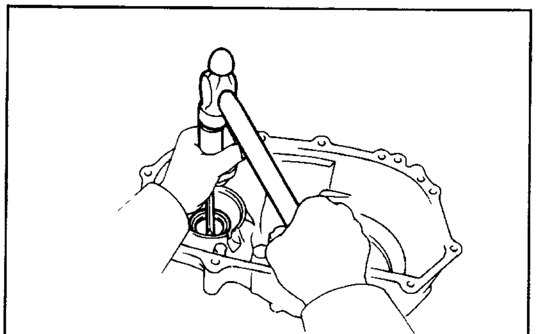
(a) Using a screwdriver and hammer, drive out the oil seal.



(b) Using SST and a hammer, drive in a new oil seal until its surface is flush with the retainer upper surface.

SST 09223–22010

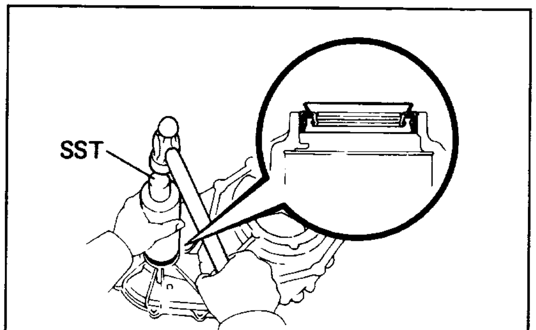
(c) Coat the lip of the oil seal with MP grease.



TF0502

2. IF NECESSARY, REPLACE FRONT CASE OIL SEAL

(a) Using a screwdriver and hammer, drive out the oil seal.

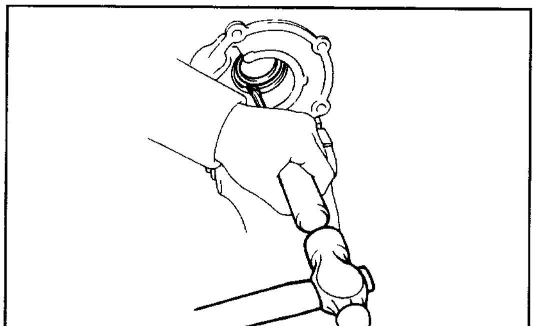


TF0503

(b) Using SST and a hammer, drive in a new oil seal until its surface is flush with the case upper surface.

SST 09316–60010 (09316–00010)

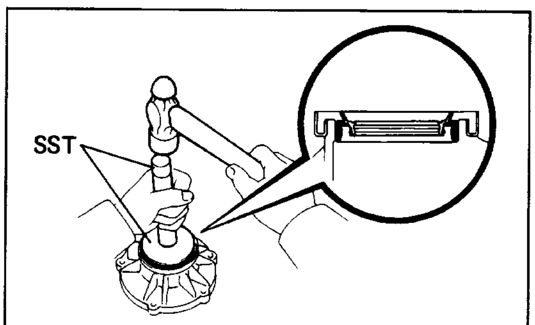
(c) Coat the lip of the oil seal with MP grease.



TF0504

3. IF NECESSARY, REPLACE EXTENSION HOUSING OIL SEAL

(a) Using a screwdriver and hammer, drive out the oil seal.

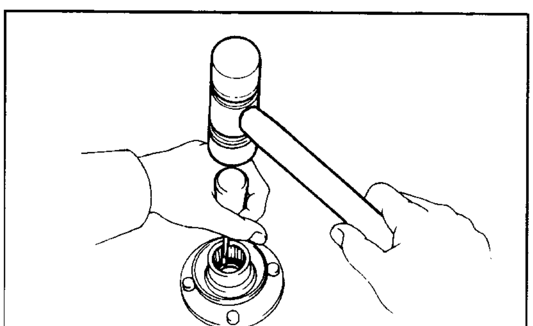


TF0505

(b) Using SST and a hammer, drive in a new oil seal until its surface is flush with the housing upper surface.

SST 09550–22011 (09550–00020, 09550–00031)

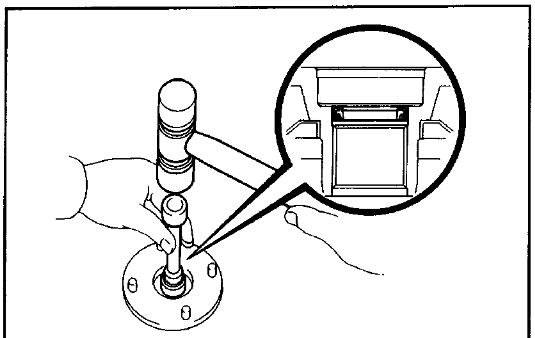
(c) Coat the lip of the oil seal with MP grease.



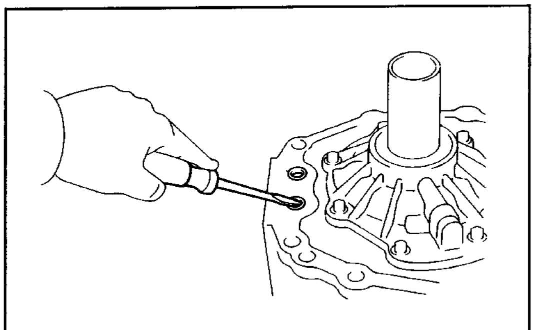
TF0506

4. IF NECESSARY, REPLACE FRONT AND REAR COMPANION FLANGES OIL SEAL

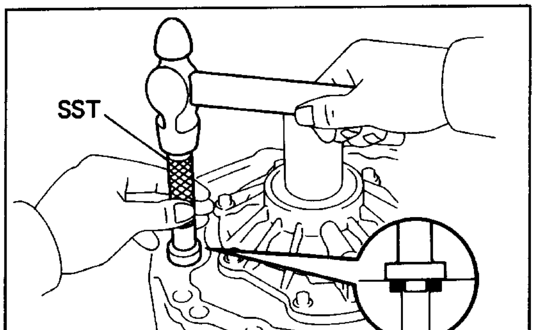
(a) Using a screwdriver and hammer, drive out the oil seal.


TF0530

(b) Using a socket wrench and hammer, drive in a new oil seal.
(c) Coat the lip of the oil seal with MP grease.


TF0631

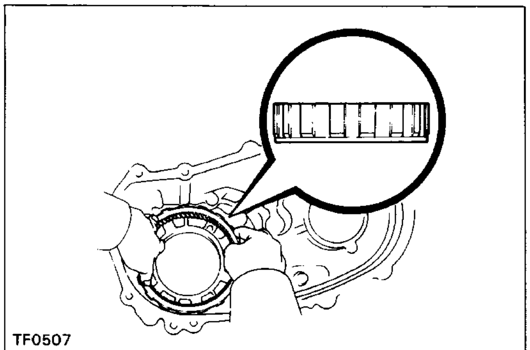
5. (22R–E/G58, A340F)
IF NECESSARY, REPLACE SHIFT FORK SHAFT OIL SEALS
(a) Using a screwdriver, pry out the oil seal.



TF0630

(b) Using SST and a hammer, drive in a new oil seal.
SST 09304–12012
Oil seal depth: –0.5 – 0.5 mm
(–0.0197 – 0.0197 in.)

ASSEMBLY OF TRANSFER

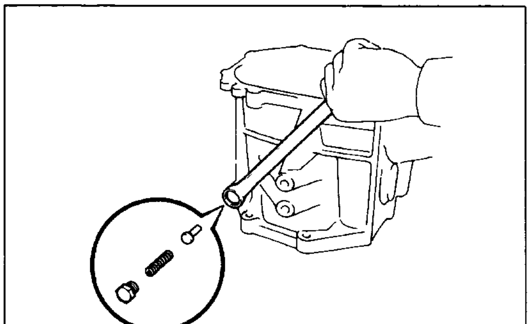

TF0507

(See pages TF–32, 33)

1. INSTALL PLANETARY RING GEAR

(a) Install the planetary ring gear to the front case.

HINT: Make sure to install the ring gear in the correct di– rection.


TF0479

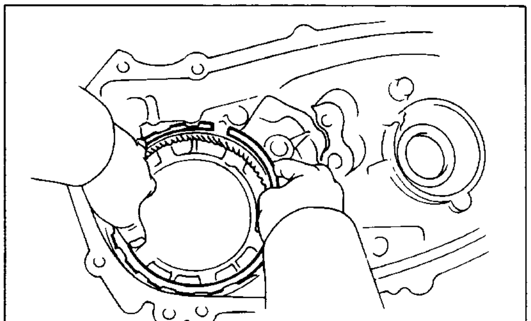
(b) Install the pin and spring.

(c) Apply liquid sealer to the plug.

Sealant: Part No. 08833–00080, THREE BOND 1344,
LOCTITE 242 or equivalent

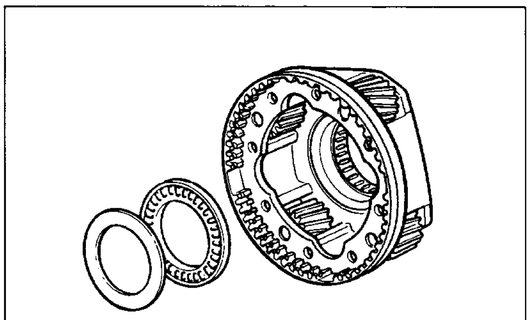
(d) Install and torque the plug.

Torque: 19 N m (190 kgf –cm, 14 ft–lbf)


TF0553

(e) Install the snap ring.

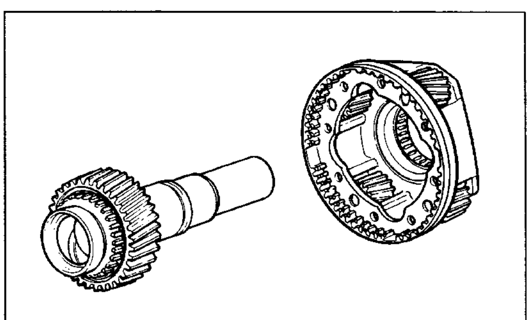
HINT: Be sure the end gap of the snap ring is not aligned with the upper side of the case.


TF0540

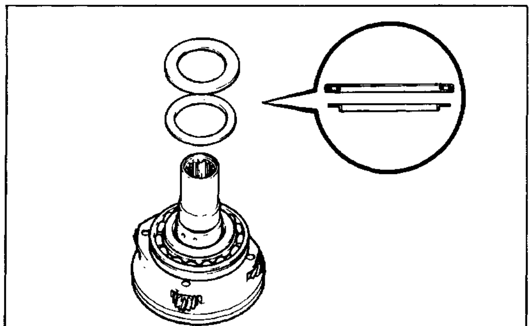
2. INSTALL INPUT SHAFT TO PLANETARY GEAR ASSEM– BLY

(a) Apply gear oil to the thrust bearing and race.

(b) Install the race and thrust bearing.

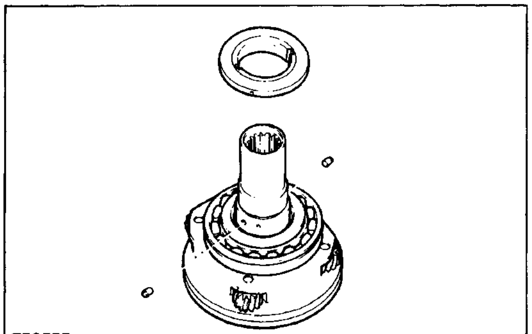

TF0541

(c) Install the input shaft into the planetary gear assem– bly.

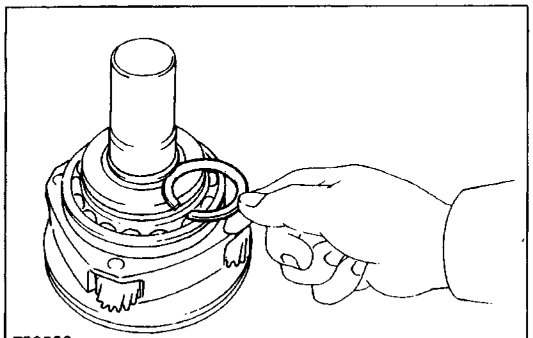

TF0554

3. INSTALL THRUST BEARING AND INPUT SHAFT STOPPER

(a) Apply gear oil to the thrust bearing and race.
(b) Install the race and thrust bearing.


TF0555

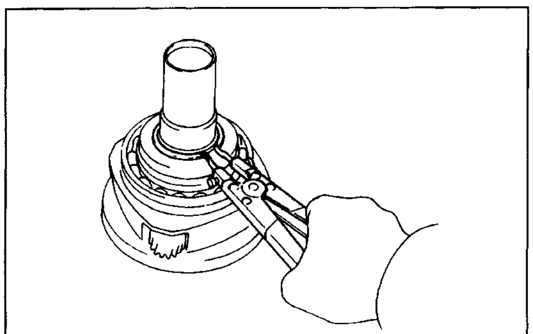
(c) Install the two pins onto the input shaft.
(d) Install the input shaft stopper.


TF0556

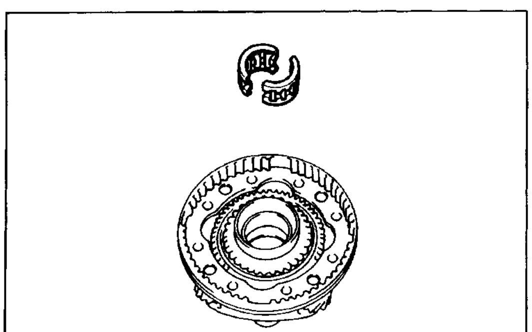
4. INSTALL SNAP RING

(a) Select a snap ring that will allow 0.05 – 0.15 mm (0.0020 – 0.0059 in.) axial play.

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	2.10 – 2.15 (0.0827 – 0.0846)	L	2.60 – 2.65 (0.1024 – 0.1043)
B	2.15 – 2.20 (0.0846 – 0.0866)	M	2.65 – 2.70 (0.1043 – 0.1063)
C	2.20 – 2.25 (0.0866 – 0.0886)	N	2.70 – 2.75 (0.1063 – 0.1083)
D	2.25 – 2.30 (0.0886 – 0.0906)	P	2.75 – 2.80 (0.1083 – 0.1102)
E	2.30 – 2.35 (0.0906 – 0.0925)	Q	2.80 – 2.85 (0.1102 – 0.1122)
F	2.35 – 2.40 (0.0925 – 0.0945)	R	2.85 – 2.90 (0.1122 – 0.1142)
G	2.40 – 2.45 (0.0945 – 0.0965)	S	2.90 – 2.95 (0.1142 – 0.1161)
H	2.45 – 2.50 (0.0965 – 0.0984)	T	2.95 – 3.00 (0.1161 – 0.1181)
J	2.50 – 2.55 (0.0984 – 0.1004)	U	3.00 – 3.05 (0.1181 – 0.1201)
K	2.55 – 2.60 (0.1004 – 0.1024)		

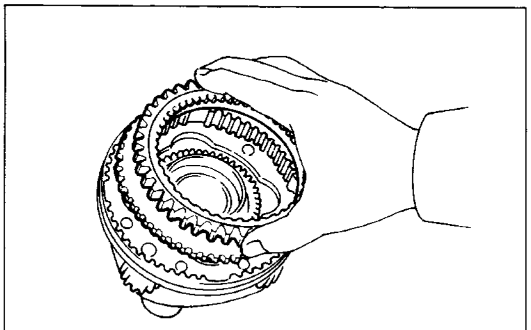

TF0475

(b) Using snap ring pliers, install the snap ring.


TF0474

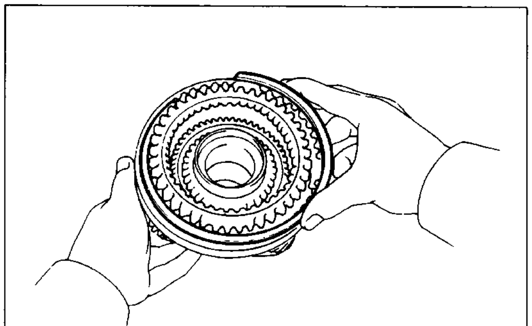
5. INSTALL NEEDLE ROLLER BEARING INTO INPUT SHAFT

(a) Apply gear oil to the needle roller bearing.
(b) Install the needle roller bearing into the input shaft.

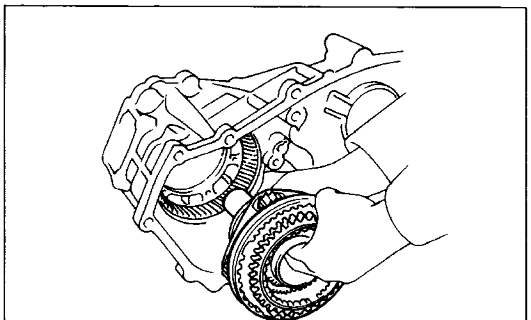

TF0473

6. INSTALL LOW GEAR SPLINE PIECE

(a) Install the low gear spline piece to the planetary car–rier.

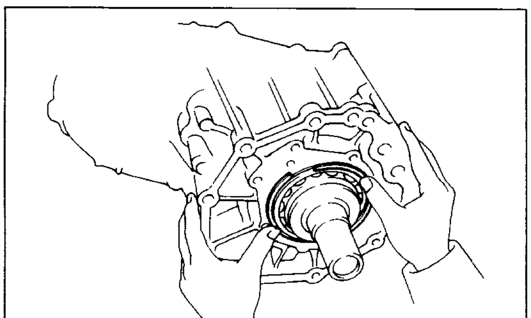

TF0508

(b) Install the snap ring.
HINT: Be sure the end gap of the snap ring is not aligned with cutout portion of the planetary carrier.

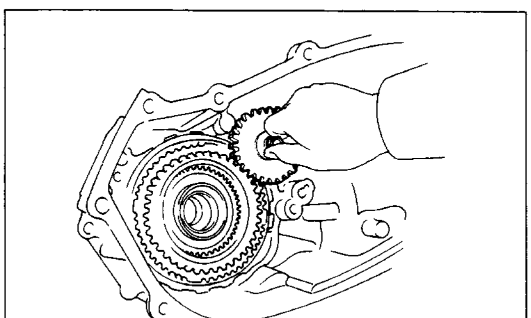

TF0471

7. INSTALL PLANETARY GEAR ASSEMBLY TO FRONT CASE

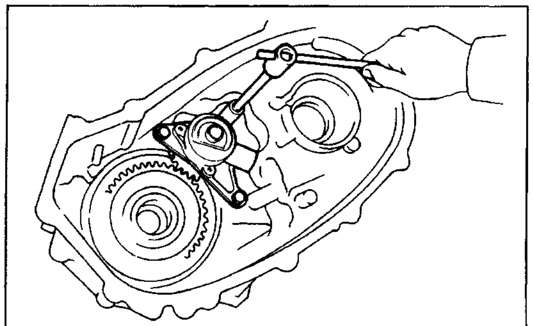
(a) Install the planetary gear assembly with the input shaft.
HINT: If necessary, heat the front case to about 70°C (158°F).


TF0509

(b) Install the snap ring.

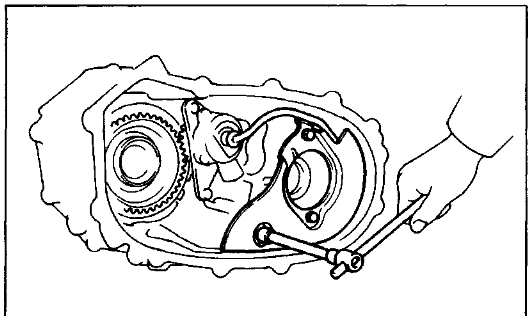

TF0469

8. INSTALL OIL PUMP DRIVE GEAR


TF0468

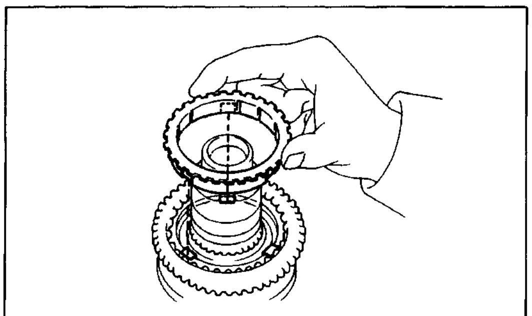
9. INSTALL OIL PUMP BODY ASSEMBLY

(a) Install the oil pump body assembly.
(b) Install and torque the three bolts.
Torque: 11 N–m (115 kgf–cm, 8 ft–lbf)


TF0467

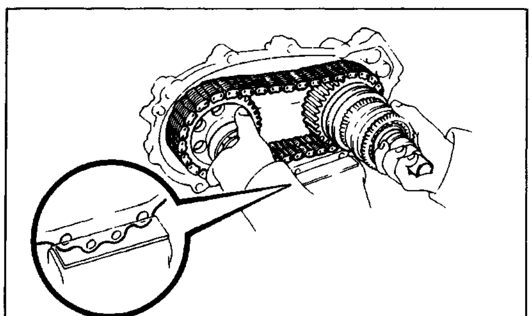
10. INSTALL SEPARATER WITH OIL STRAINER

(a) Coat a new O–ring with gear oil and install it to the oil strainer pipe.
(b) Install the separater with the oil strainer.
(c) Install and torque the three bolts.
Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)

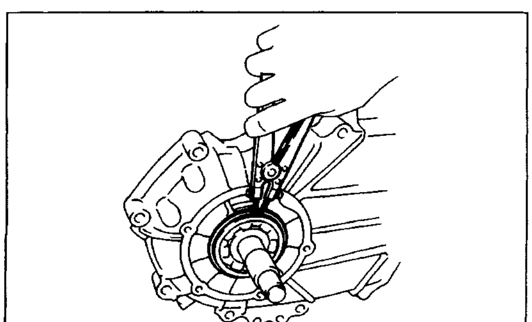

TF0542

11. INSTALL REAR OUTPUT SHAFT, DRIVEN SPROCKET AND CHAIN

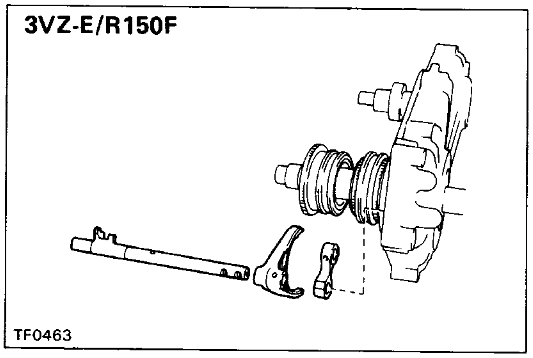
(a) Apply MP grease to the synchronizer ring (R150F, G58).
(b) Align the synchronizer ring slots with the shifting keys, and install it on the high and low clutch hub.

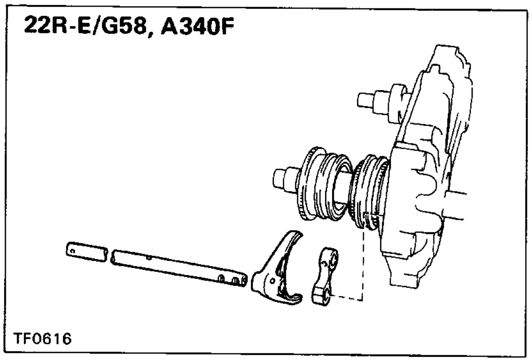

TF0543

(c) Assemble the rear output shaft, driven sprocket and chain.
(d) Mount the rear case in the vise.
NOTICE: Be careful not to damage the sealing surface.
(e) Using a plastic hammer, tap the rear case with push–ing the rear output shaft and driven sprocket.
HINT: If necessary, heat the rear case to about 70•C (158•F).


TF0464

(f) Using snap ring pliers, install the snap ring.



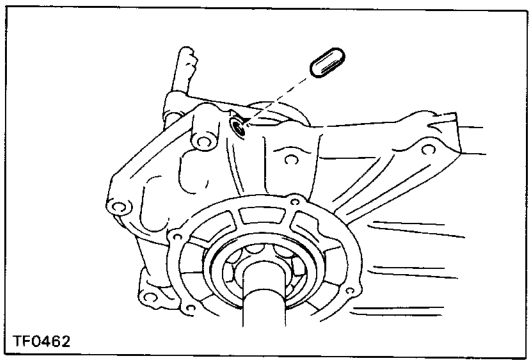


12. INSTALL HIGH AND LOW FORK SHAFT, FORK AND STOPPER

(a) Place the high and low shift fork into the groove of the hub sleeve.

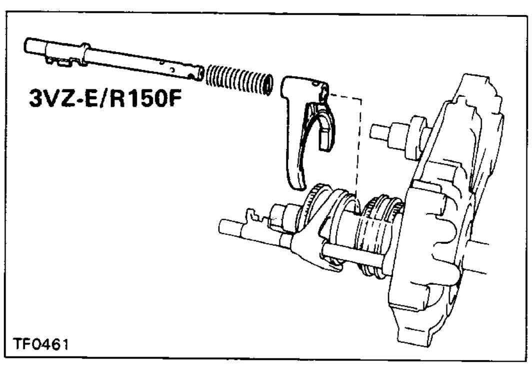
HINT: Make sure to install the shift fork in the correct direction.

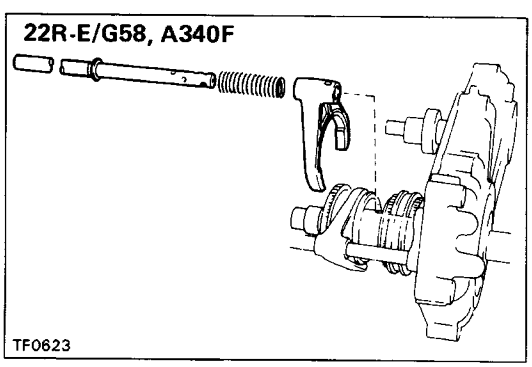
(b) Install the fork shaft to the rear case through the shift fork and stopper.



13. INSTALL FRONT DRIVE FORK SHAFT, FORK AND SPRING

(a) Apply gear oil to the straight pin, and insert it into the case hole.



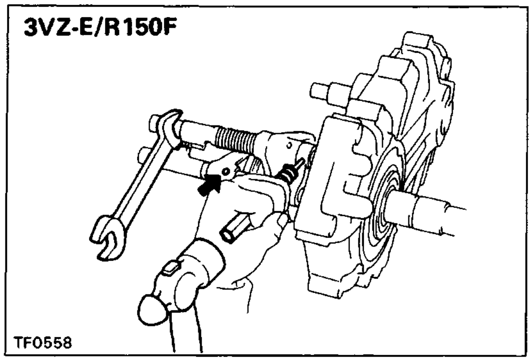


(b) Place the front drive shift fork into the groove of the hub sleeve.

HINT: Make sure to install the shift fork in the correct direction.

(c) Install the spring to the fork shaft.

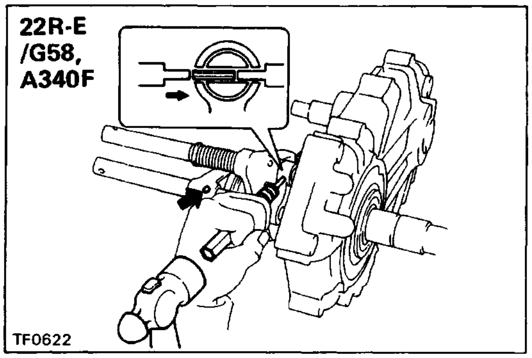
(d) Install the fork shaft to the rear case through the shift fork and stopper.



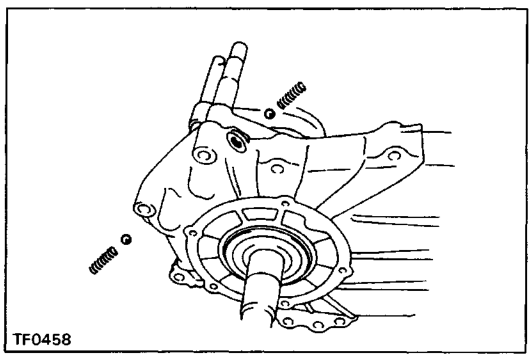
TF0558

(e) Using a pin punch and hammer, drive in the two slotted spring pins.

HINT: When installing the pin in the front drive fork shaft, push the shaft towards the rear case and install the pin while the spring is compressed.

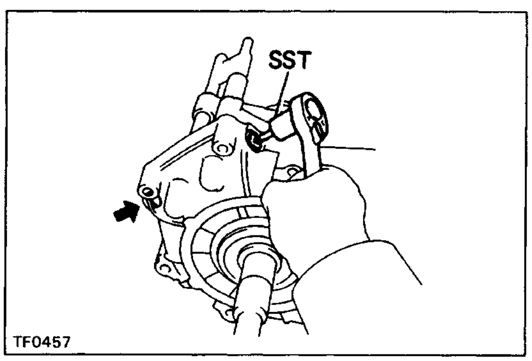


TF0622


TF0458

14. INSTALL STRAIGHT SCREW PLUGS, SPRINGS AND LOCKING BALLS

(a) Install the ball and spring into the both holes.



TF0457

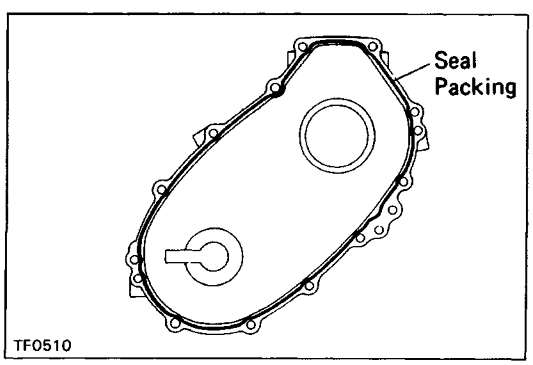
(b) Apply liquid sealer to the plugs.

Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(c) Using SST, install and torque the two screws.

SST 09313–30021

Torque: 19 N–m (190 kgf–cm, 14 ft–lbf)

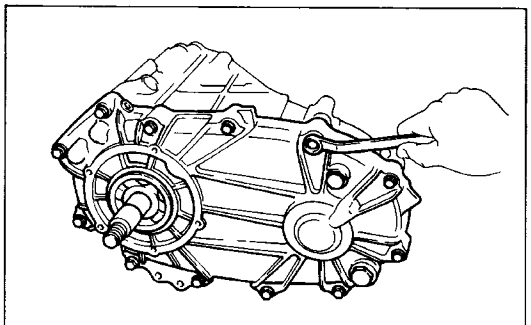


TF0510

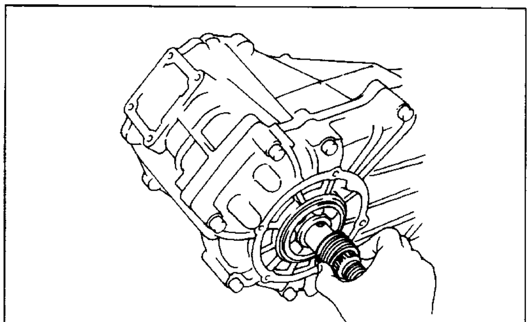
15. ASSEMBLE FRONT CASE AND REAR CASE

(a) Apply seal packing to the rear case as shown in the figure.

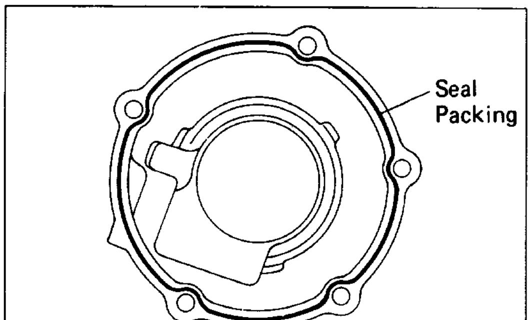
Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent


TF0455

(b) Shift the high and low hub sleeve to low side (rear side).
(c) Assemble the front case and rear case.
(d) Install and torque the twelve bolts.
Torque: 37 N–m (380 kgf–cm, 27 ft–lbf)

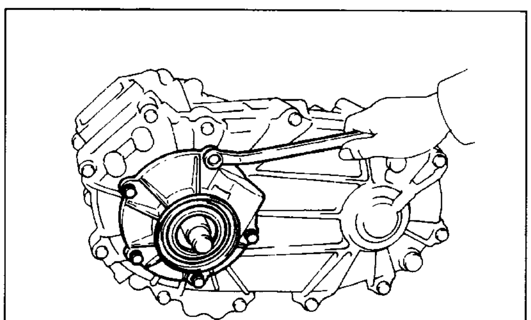

TF0454

16. INSTALL SPEEDOMETER DRIVE GEAR
(a) Install the ball on the rear output shaft.
(b) Install the speedometer drive gear.
HINT: Make sure to install the speedometer drive gear in the correct direction.

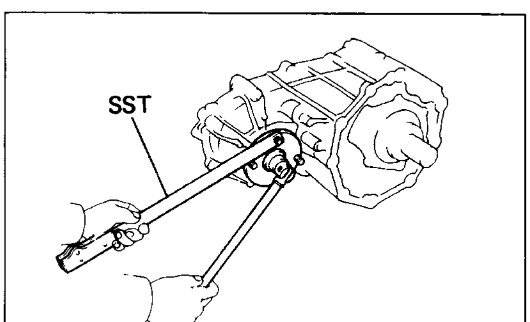


TF0557

17. INSTALL EXTENSION HOUSING
(a) Apply seal packing to the extension housing as shown in the figure.
Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent

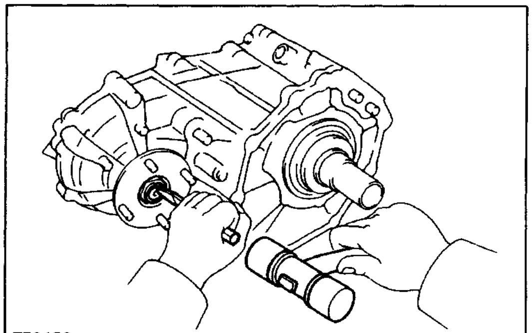

TF0453

(b) Install the extension housing to the rear case.
(c) Apply liquid sealer to the bolts.
Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent
(d) Install and torque the five bolts.
Torque: 11 N–m (115 kgf–cm, 8 ft–lbf)



TF0544

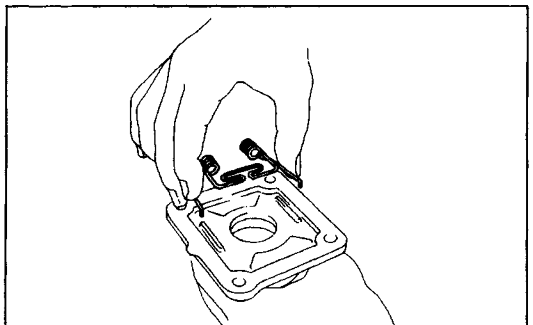
18. INSTALL FRONT COMPANION FLANGE
HINT: Front companion flange bolts are silver.
(a) Apply gear oil to the companion flange inner sur–face.
(b) Install the front companion flange to the driven sprocket shaft.
(c) Using SST to hold the flange, install the companion flange lock nut.
SST 09330–00021
Torque: 118 N–m (1,200 kgf–cm, 87 ft–lbf)
(d) Stake the lock nut.



TF0450

19. INSTALL REAR COMPANION FLANGE

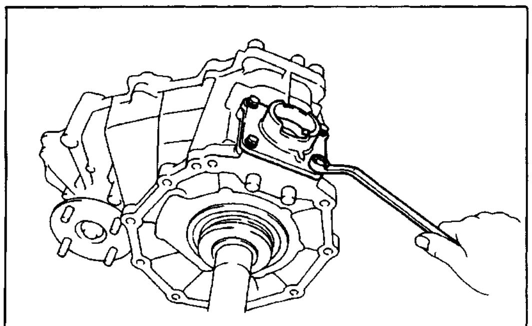
HINT: Rear companion flange bolts are black.
Install the rear companion flange in the same way as the front companion flange.



TF0449

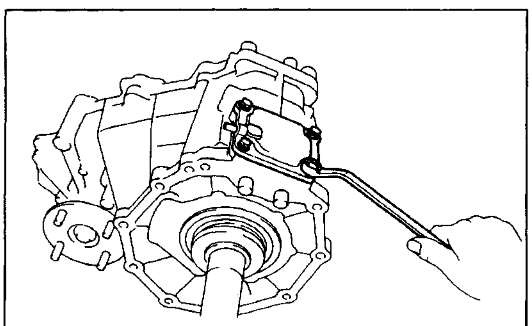
20.–1 (3VZ–E/R 150F) INSTALL CONTROL RETAINER

(a) Install the select return spring to the control re–tainer.



TF0448

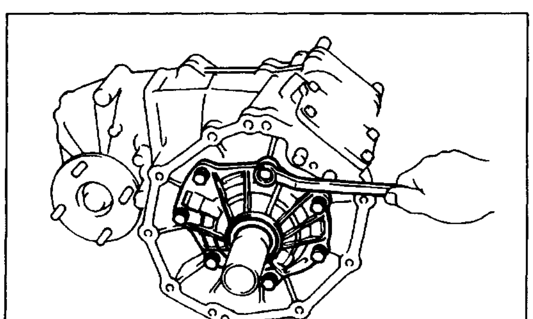
(b) Remove the gasket and install a new one to the con–trol retainer.
(c) Install the control retainer.
(d) Install and torque the four bolts.
Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)



TF0614

20.–2 (22R–E/G58, A340F) INSTALL UPPER COVER AND OIL DEFLECTOR

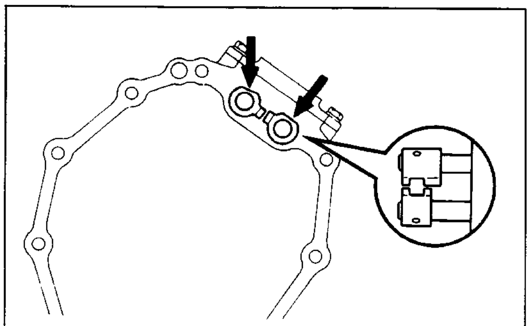
(a) Remove the gasket and install a new one to the case cover.
(b) Install the upper cover and oil deflector.
(c) Install and torque the four bolts.
Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)



TF0447

21. INSTALL FRONT RETAINER

(a) Remove the gasket and install a new one to the front retainer.
(b) Install the front retainer.
(c) Apply liquid sealer to the bolts.
Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent
(d) Install and torque the seven bolts.
Torque: 11 N m (115 kgf –cm, 8 ft–lbf)


TF0629

22. (22R–E1G58, A340F))
INSTALL SHIFT GEAR HEAD NO. 1 AND NO.2
(a) Install two shift gear heads.
(b) Using a pin punch and hammer, drive in the two slotted spring pins.

23. CHECK FOLLOWING ITEMS:
(a) Check to see that the input shaft and output shafts rotate smoothly.
(b) Check to see that shifting can be made smoothly to all positions.

24. INSTALL TRANSFER INDICATOR SWITCH
Torque: 37 N–m (380 kgf–cm, 27 ft–lbf)

25. INSTALL NO. 1 SPEED SENSOR
(a) Install No.1 speed sensor.
(b) Install and torque the bolt.
Torque: 11 N–m (115 kgf–cm, 8 ft–lbf)

26. (22R–E/ 340F)
INSTALL TRANSFER L4 AND NEUTRAL POSITION SWITCH
Torque: 37 N–m (380 kgf–cm, 27 ft–lbf)

PROPELLER SHAFT

PRECAUTIONS

Be careful not to grip the propeller shaft tube too tightly in the vise as this will cause deformation.

TROUBLESHOOTING

You will find the cause of trouble more easily by properly using the table shown below. In this table, the numbers indicate the priority of the probable cause of trouble. Check each part in the order shown. If necessary, repair or replace the part.

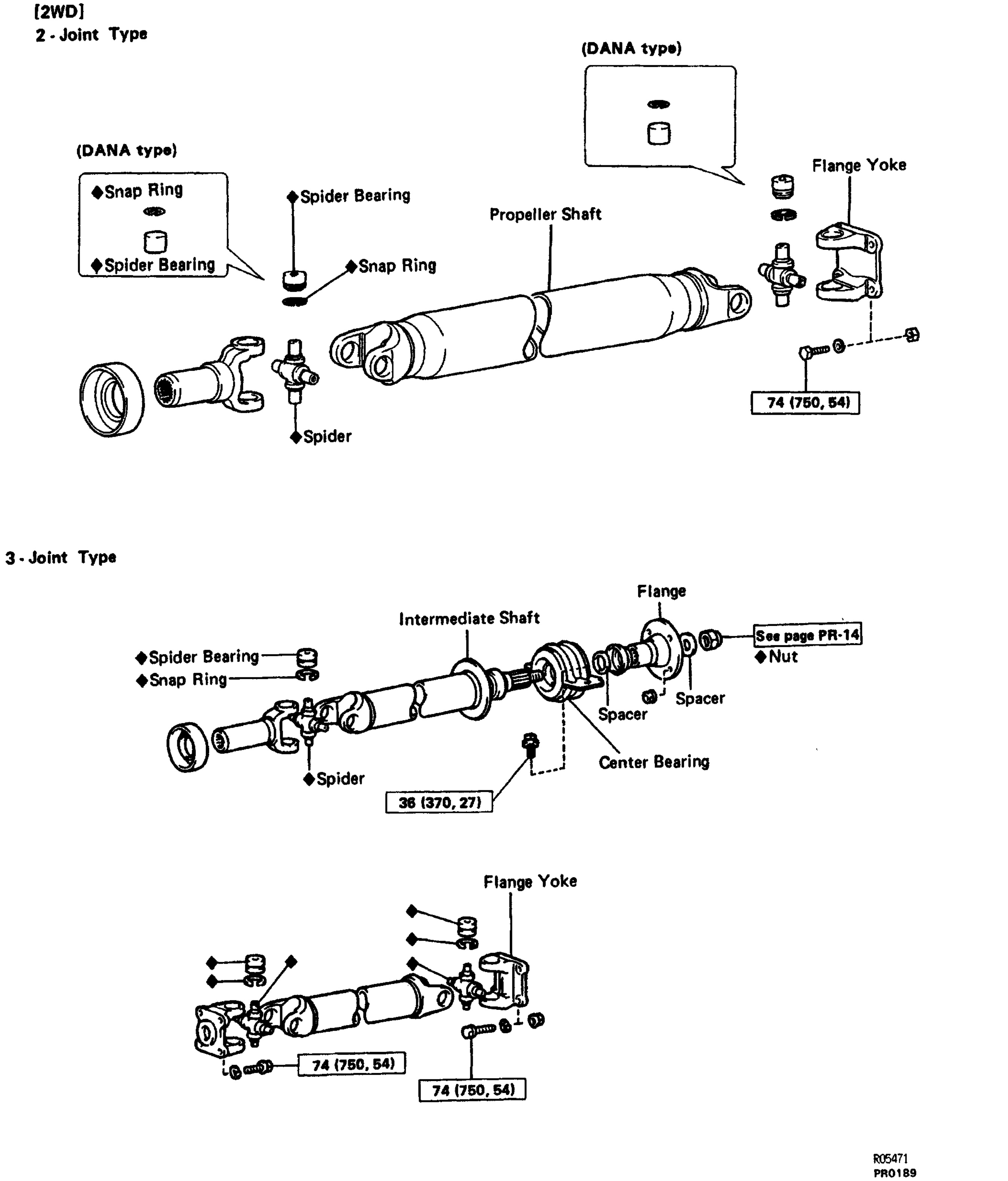
See Page	PR–7 PR–9	PR–8	PR–8	PR–8	PR–7 PR–9	PR–9	(G 58, R 150, R150F) MT–91 (W55, W56) MT–40
Parts Name / Trouble	Sleeve yoke spline worn	Center bearing worn	Propeller shaft runout	Propeller shaft imbalance	Sleeve yoke spline stuck	Spider bearing worn or stuck	Transmission extension housing rear bushing worn
Noise	2	1				3	
Vibration			3	4	2		1

V00647

PROPELLER SHAFT

PR020–01

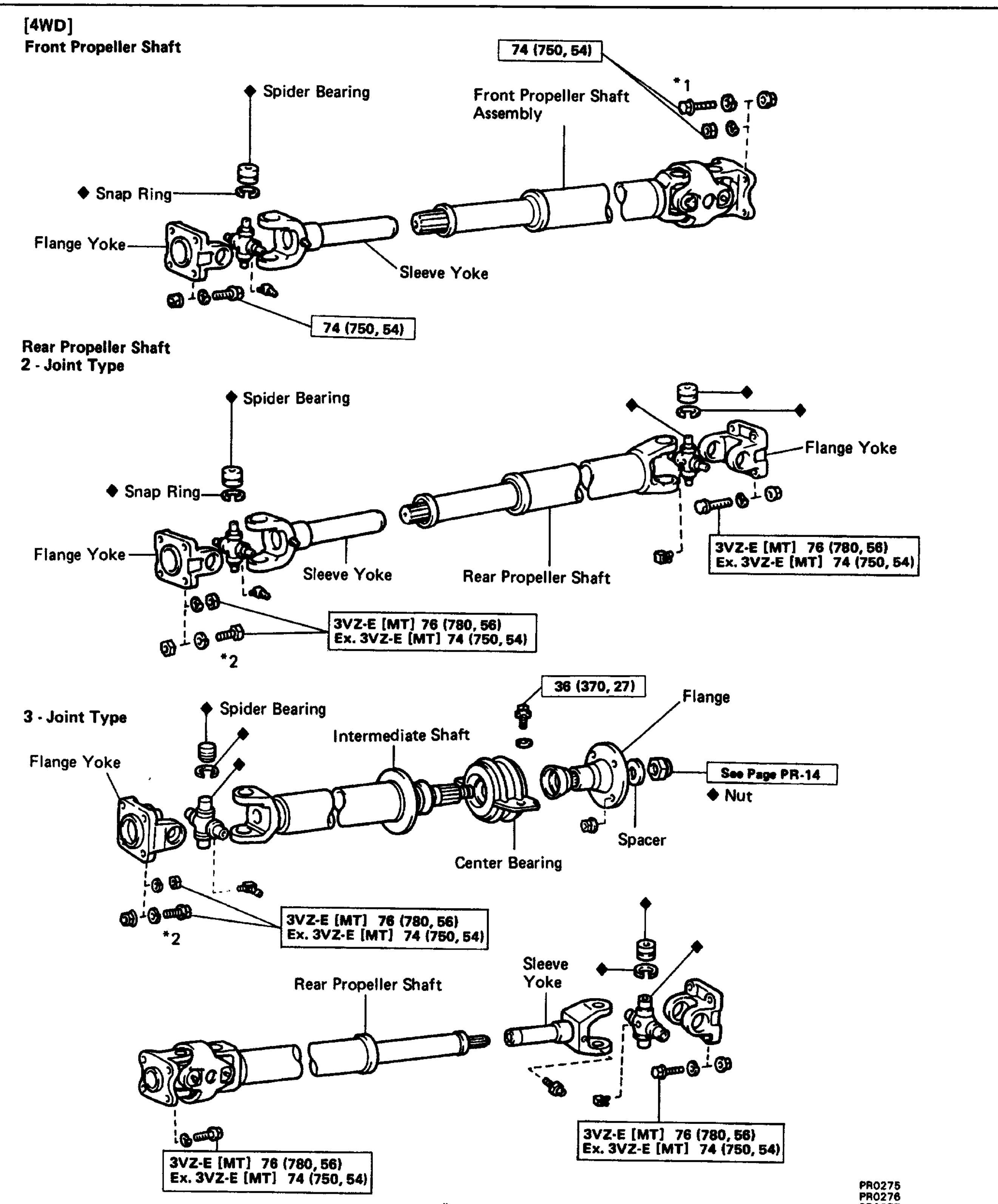
COMPONENTS



$\boxed{\text{N·m (kgf·cm, ft·lbf)}}$: Specified torque

◆ Non-reusable part

Z04237



N·m (kgf·cm, ft·lbf) : Specified torque

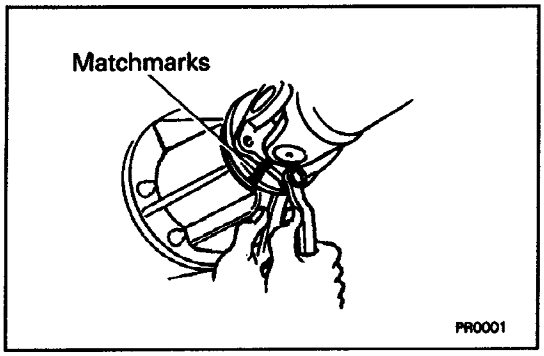
◆ Non-reusable part

*1: w/ RF1A Type Transfer

*2: w/ RF1A Type Transfer and A340H Automatic Transmission

Z04238

PR021–01

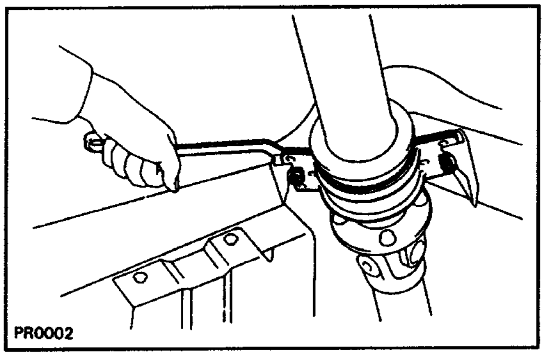


PROPELLER SHAFT REMOVAL (2WD)

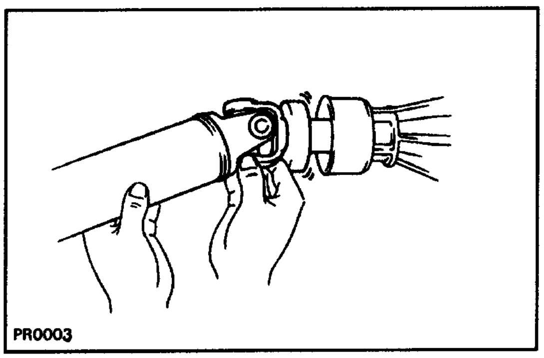
1. DISCONNECT PROPELLER SHAFT FLANGE FROM COMPANION FLANGE ON DIFFERENTIAL

(a) Put matchmarks on the flanges.

(b) Remove the four and nuts.

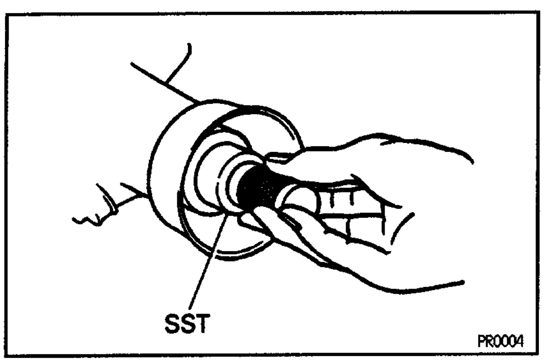


2. REMOVE CENTER SUPPORT BEARING FROM FRAME CROSSMEMBER (3–JOINT TYPE)



3. REMOVE PROPELLER SHAFT FROM TRANSMIS– SION

(a) Pull the yoke from the transmission.

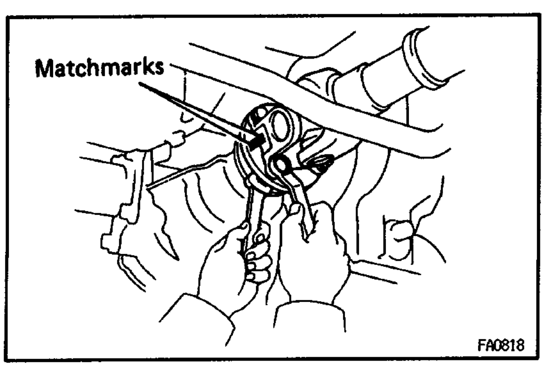


(b) Insert SST in the transmission to prevent oil leakage.

SST 09325–20010 (22R–E engine)

09325–40010 (3VZ–E engine)

PR022–01

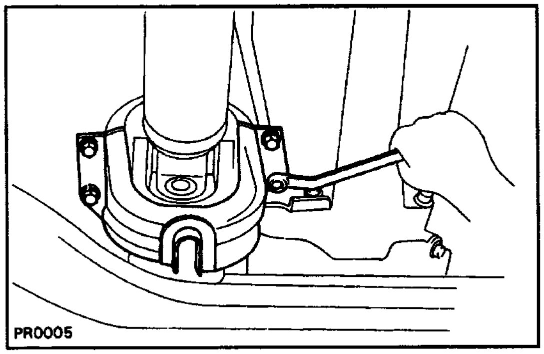


PROPELLER SHAFT REMOVAL (4WD)

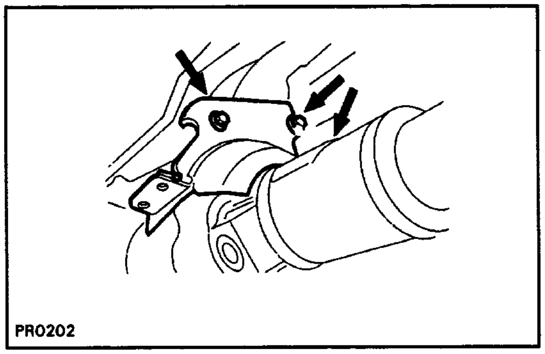
1. DISCONNECT PROPELLER SHAFT FLANGE FROM COMPANION FLANGE ON FRONT DIFFERENTIAL

(a) Put matchmarks on the flanges.

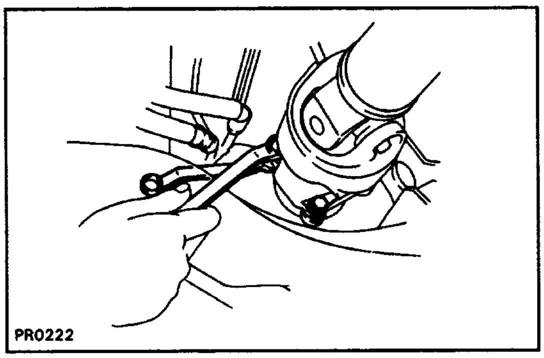
(b) Remove the four bolts and nuts.


PR0005

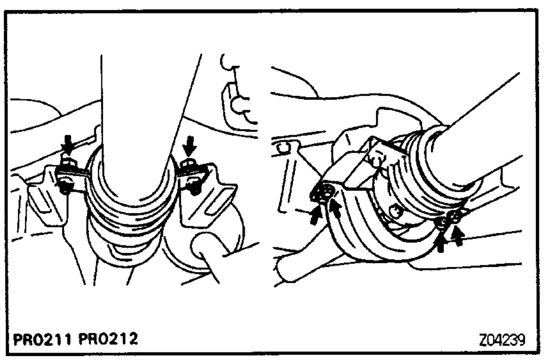
2. REMOVE FRONT PROPELLER SHAFT NO.2 DUST COVER
(W/RF1 A Type Transfer)
Remove the two bolts and two nuts and cover.
(w/VF1 A Type Transfer and A340H)
Remove the four bolts and cover.


PR0202

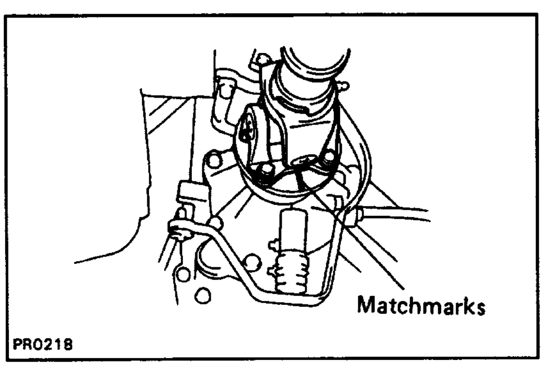
3. REMOVE FRONT PROPELLER SHAFT DUST COVER SUBASSEMBLY
(w/VF1 a Type Transfer and A340H)
Remove the three bolts and cover.


PR0222

4. REMOVE FRONT PROPELLER SHAFT
(a) Suspend the front side of the propeller shaft.
(b) Put matchmarks on the flanges.
(c) Remove the four nuts or four bolts and nuts.
(d) Remove the front propeller shaft.

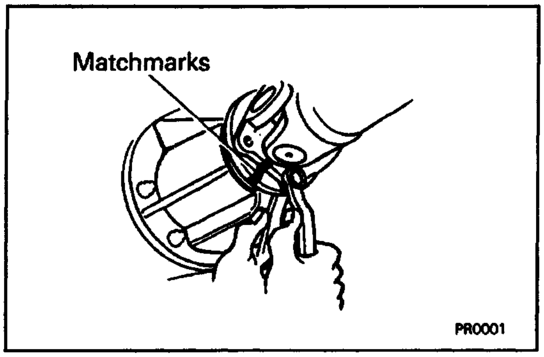

PR0211 PR0212 Z04239

5. REMOVE CENTER SUPPORT BEARING FROM FRAME CROSSMEMBER
(3–JOINT TYPE)
(a) Remove propeller shaft protector set bolts and pro–peller shaft protector.
(b) Remove center support bearing mount bolts.



PR0218

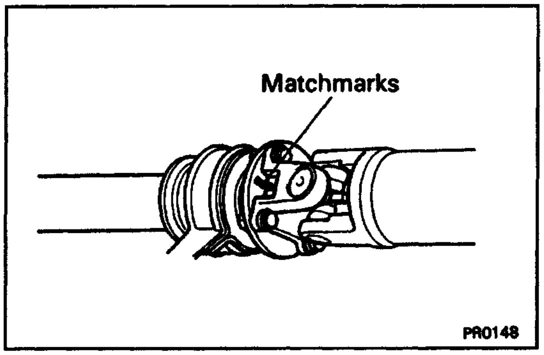
6. DISCONNECT PROPELLER SHAFT FLANGE FROM COMPANION FLANGE ON TRANSFER
(a) Put matchmarks on the flanges.
(b) Remove the four bolts and nuts or four nuts.



7. REMOVE REAR PROPELLER SHAFT

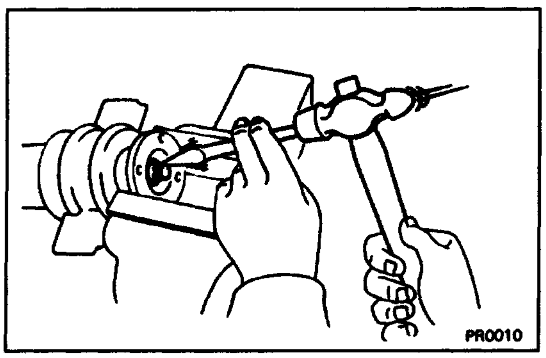
(a) Put matchmarks on the flanges.
(b) Remove the four and nuts.
(c) Remove the rear propeller shaft.

PROPELLER SHAFT DISASSEMBLY



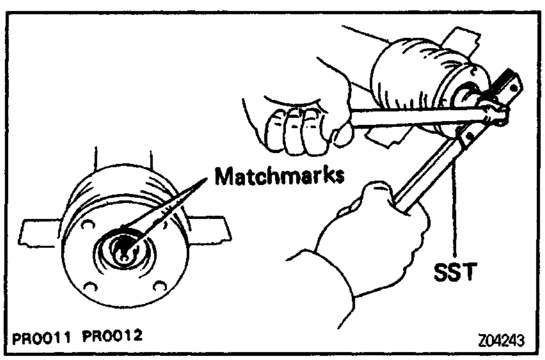
1. SEPARATE PROPELLER SHAFT AND INTERMEDI– ATE SHAFT

(a) Put matchmarks on the flanges.
(b) Remove the four bolts and nuts.

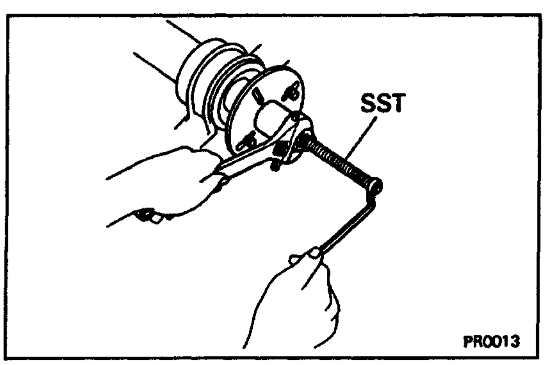


2. REMOVE CENTER SUPPORT BEARING FROM IN– TERMEDIATE SHAFT

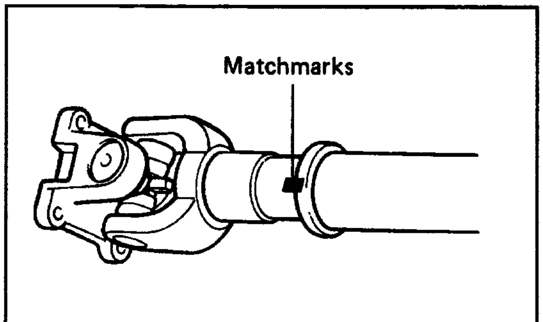
(a) Using a hammer and chisel, loosen the staked part of the nut.



(b) Using SST to hold the flange, remove the nut.
SST 09930–00021
(c) Put matchmarks on the flange and shaft.



(d) Using SST, remove the flange from the intermediate shaft.
SST 09557–22022 (09557–22030)



PR0014

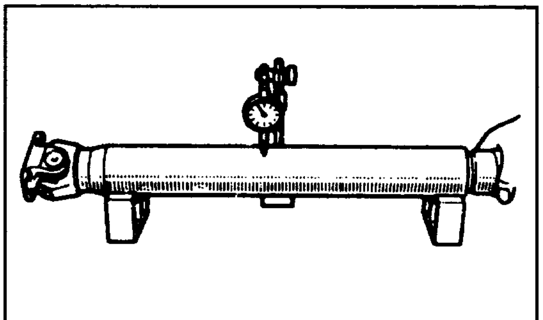
3. REMOVE SLEEVE YOKE FROM PROPELLER SHAFT (4WD)

(a) Place matchmarks on the sleeve yoke and shaft.

(b) Pull out the sleeve yoke from the shaft.

PR024–01

PROPELLER SHAFT INSPECTION COMPONENTS

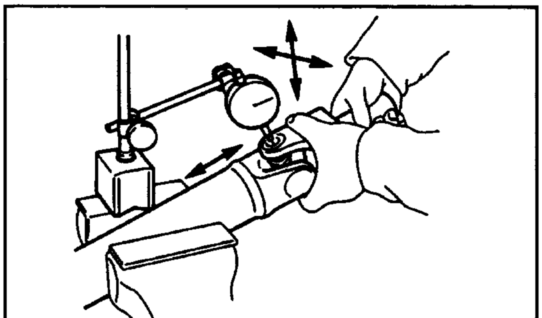

B2776 Z04240

1. INSPECT PROPELLER AND INTERMEDIATE SHAFTS FOR DAMAGE OR RUNOUT

If shaft runout is greater than maximum, replace the shaft.

Maximum runout:

0.8 mm (0.031 in.)


D7674 Z04241

2. INSPECT SPIDER BEARINGS

(a) Inspect the spider bearings for wear or damage.

(b) Check the spider bearing axial play by turning the yoke while holding the shaft tightly.

Bearing axial play:

w/o double cardan joint propeller shaft

Less than 0.05 mm (0.0020 in.)

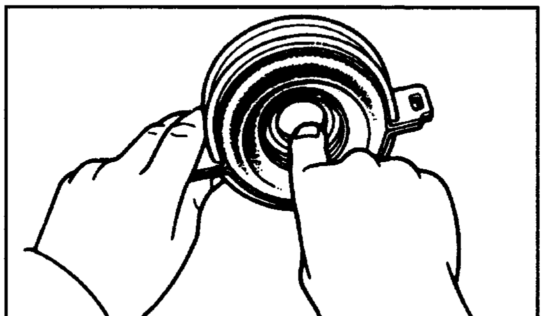
If necessary, replace the spider bearing.

Bearing axial play:

w/ double cardan joint propeller shaft

Less than 0.05 mm (0.0020 in.)

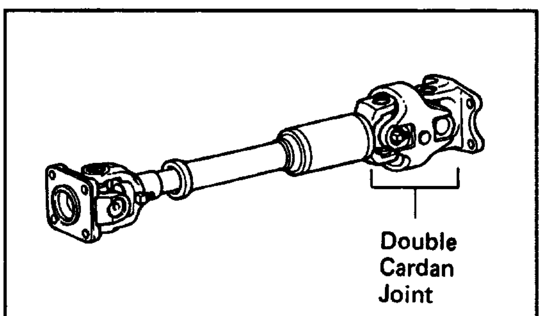
If necessary, replace the propeller shaft.


B2278 Z04242

3. INSPECT CENTER SUPPORT BEARING FOR WEAR OR DAMAGE

Check that the bearing turns freely.

If the bearing is damaged, worn, or does not turn freely, replace it.



PR0149

4. INSPECT WITH DOUBLE CARDAN JOINT PROPEL–LER SHAFT

(a) Inspect the shaft for wear or damage.

(b) Inspect the double cardan joint for wear or damage.

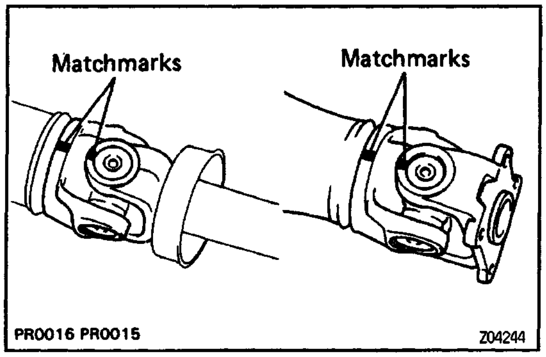
If any problem is found replace the propeller shaft assembly.

HINT: Front propeller shaft and 4WD three joint type rear propeller shafts.

PR02S–01

SPIDER BEARING REPLACEMENT

1. PLACE MATCHMARKS ON SHAFT AND YOKE

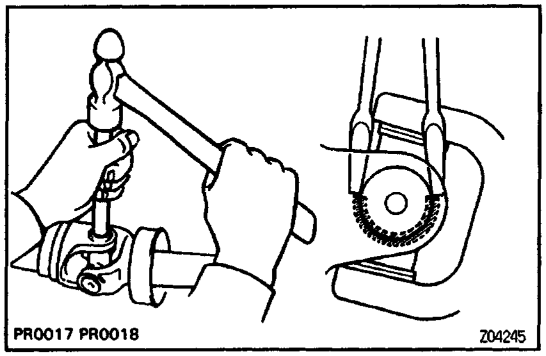


2. REMOVE SNAP RINGS

(TOYOTA type)

(a) Slightly tap in the bearing outer races.

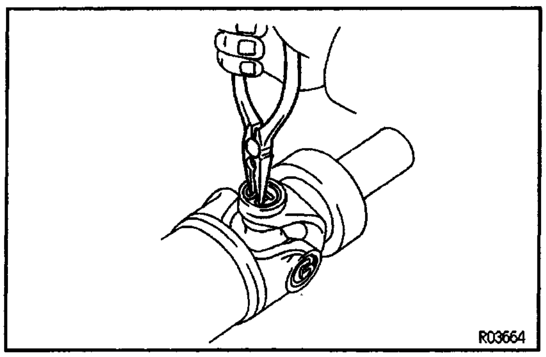
(b) Using two screwdrivers, remove the four snap rings from the grooves.



(DANA type)

(a) Slightly tap in the bearing outer races.

(b) Using snap ring pliers, remove the four snap rings from the grooves.

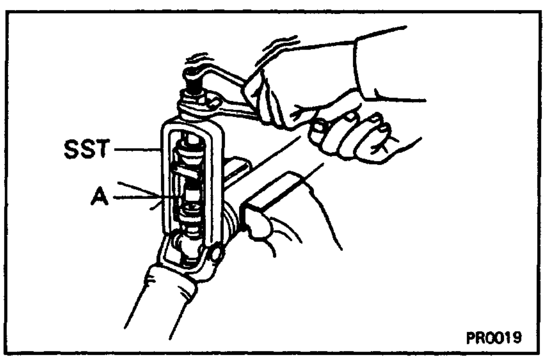


3. REMOVE SPIDER BEARINGS

(a) Using SST, push out the bearing from the propeller shaft.

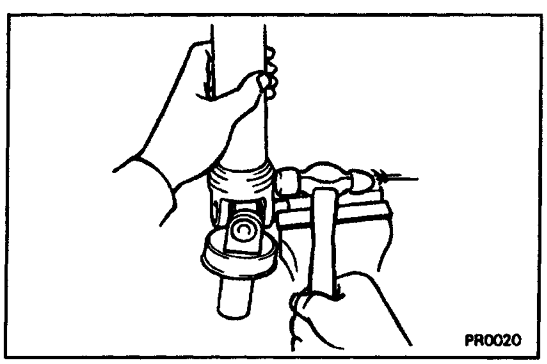
SST 09332–25010

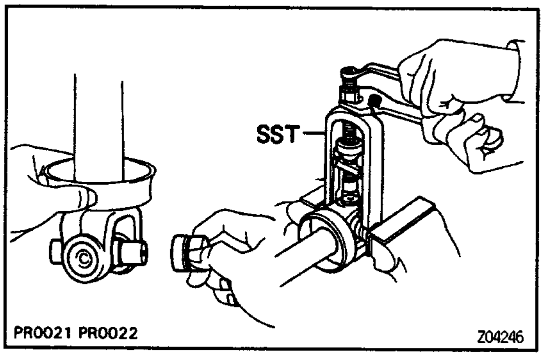
HINT: Sufficiently raise the part indicated by A so that it does not come into contact with the bearing.



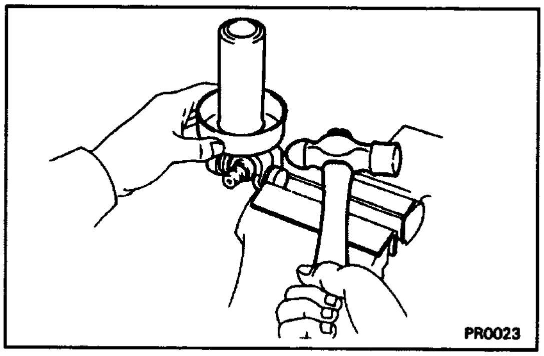
(b) Clamp the bearing outer race in a vise and tap off the propeller shaft with a hammer.

HINT: Remove the bearing on opposite side in the same procedure.

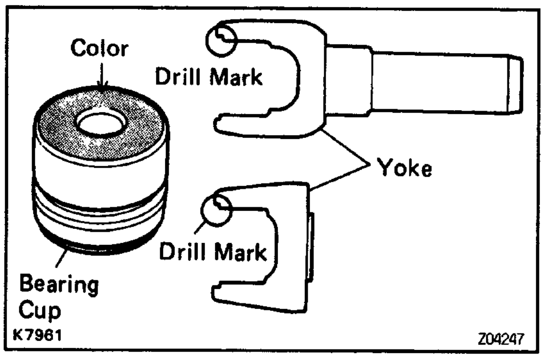




(c) Install the two removed bearing outer races to the spider.
(d) Using SST, push out the bearing from the yoke.
SST 09332 – 25010

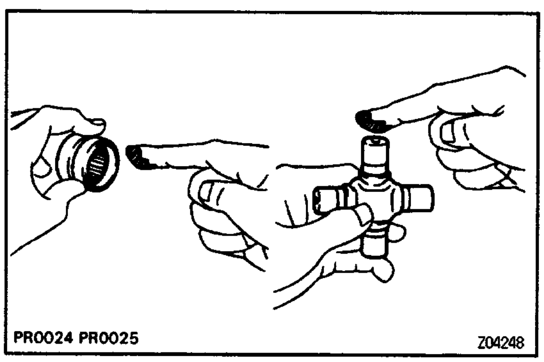


(e) Clamp the outer bearing race in a vise and tap off the yoke with a hammer.
HINT: Remove the bearing on the opposite side in the same procedure.

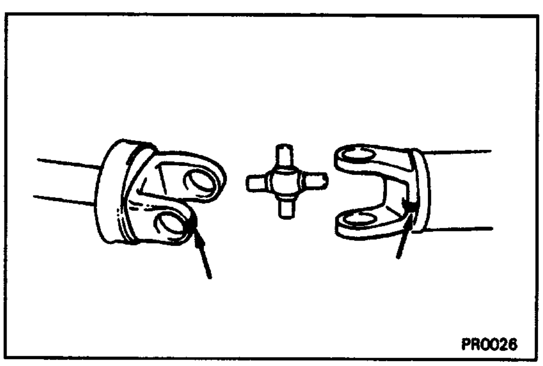


4. SELECT THE SPIDER BEARING
Select the bearing according to whether or not there is a drill mark on the yoke section.

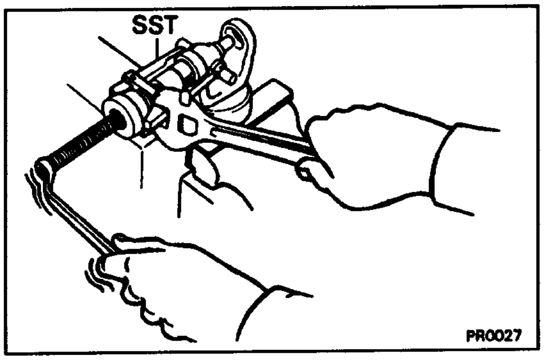
Yoke	Bearing
With drill mark	With color mark (Red)
No drill mark	No color mark



5. INSTALL SPIDER BEARINGS
(a) Apply MP grease to the spider and bearings.
HINT: Be careful not to apply too much grease.

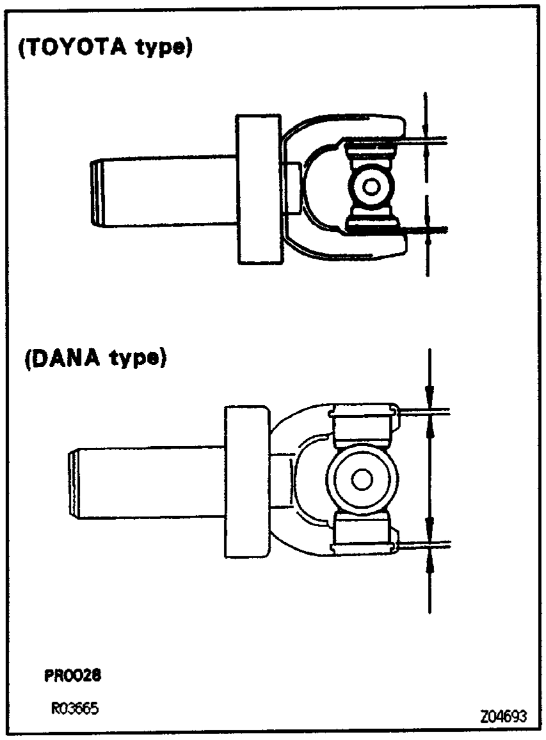


(b) Align the matchmarks on the yoke and shaft.

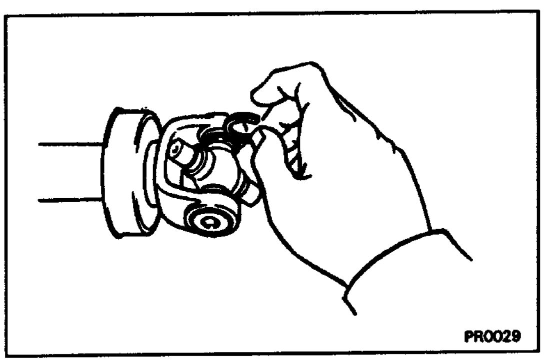


(c) Fit the new spider into the yoke.

(d) Using SST, install the new bearings on the spider.
SST 09332–25010



(e) Using SST, adjust both bearings so that the snap ring grooves are at maximum and equal widths.



6. INSTALL SNAP RINGS

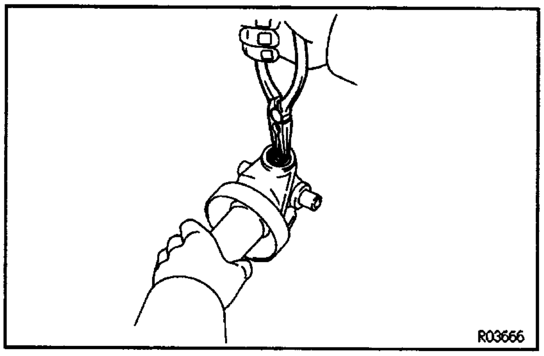
(a) Install two snap rings of equal thickness which will allow 0–0.05 mm (0–0.0020 in.) axial play.

HINT: Do not reuse the snap rings.

(TOYOTA type)

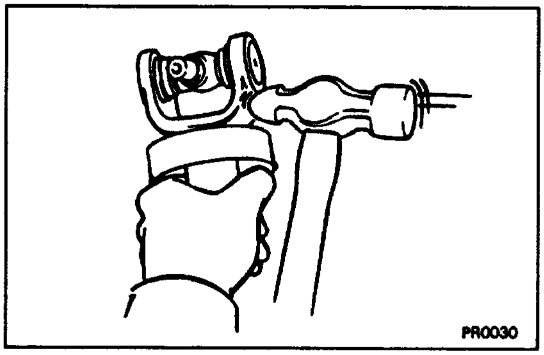
Color	Mark	Thickness mm (in.)
–	1	2.100 – 2.150 (0.0827 – 0.0846)
–	2	2.150 – 2.200 (0.0846 – 0.0866)
–	3	2.200 – 2.250 (0.0866 – 0.0886)
Brown	–	2.250 – 2.300 (0.0886 – 0.0906)
Blue	–	2.300 – 2.350 (0.0906 – 0.0925)
–	6	2.350 – 2.400 (0.0925 – 0.0945)
–	7	2.400 – 2.450 (0.0945 – 0.0965)
–	8	2.450 – 2.500 (0.0965 – 0.0984)

V01997

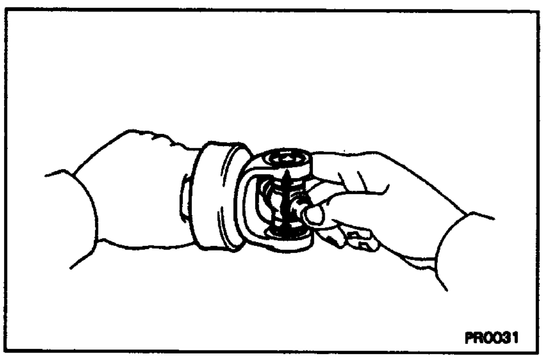


(DANA type)

Color	Thickness mm (in.)
Blue	**1.638 (0.0645)**
Yellow	**1.588 (0.0625)**
Silver	**1.537 (0.0605)**
Copper	**1.511 (0.0595)**
Black	**1.486 (0.0585)**
Red	**1.435 (0.0565)**
Green	**1.384 (0.0545)**



(b) Using a hammer, tap the yoke until there is no clear–ance between the bearing outer race and snap ring.



7. CHECK SPIDER BEARING

(a) Check that the spider bearing moves smoothly.

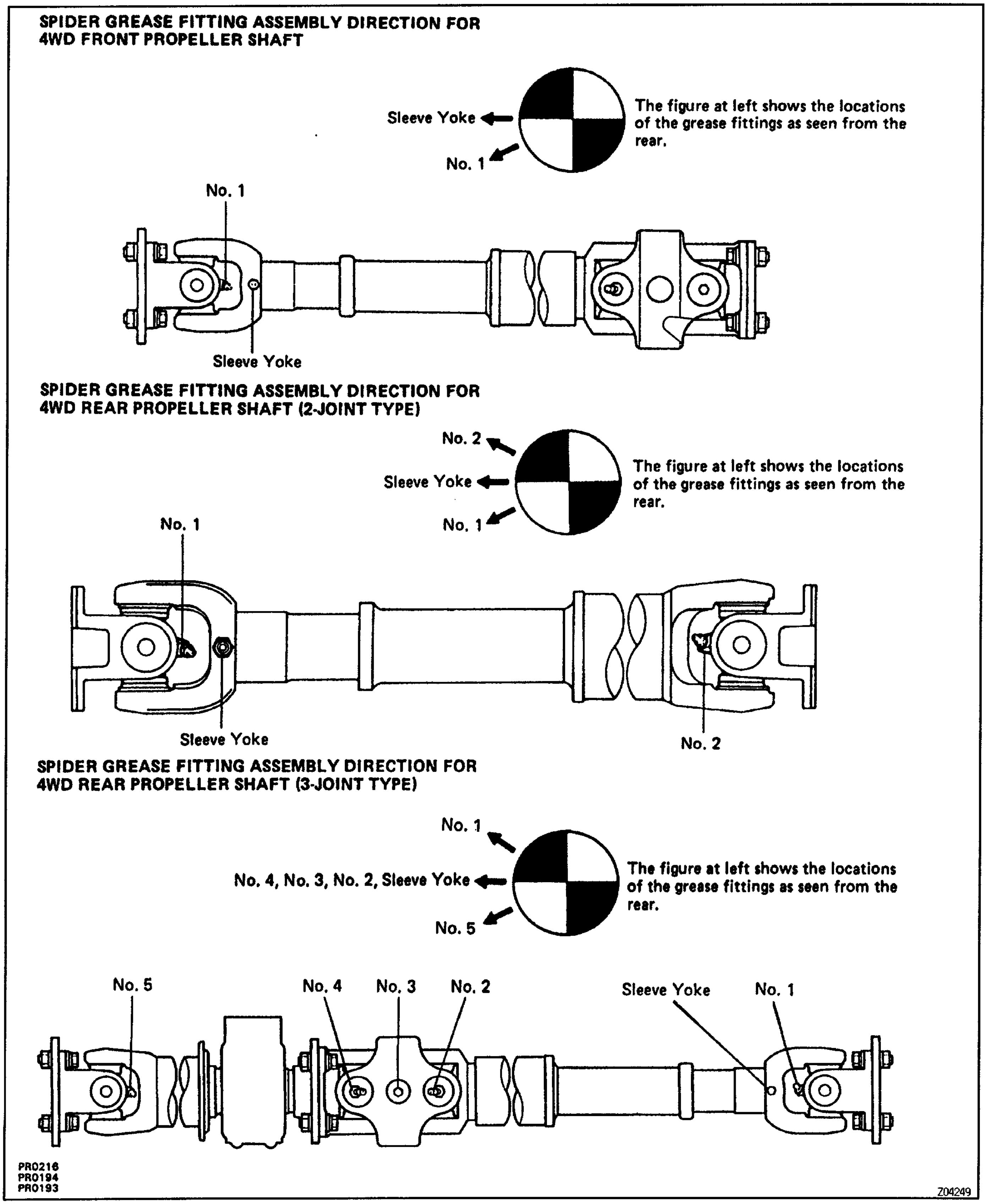
(b) Check the spider bearing axial play.

Bearing axial play:

Less than 0.05 mm (0.020 in.)

HINT: Install new spider bearings on the shaft side in the procedure described above.

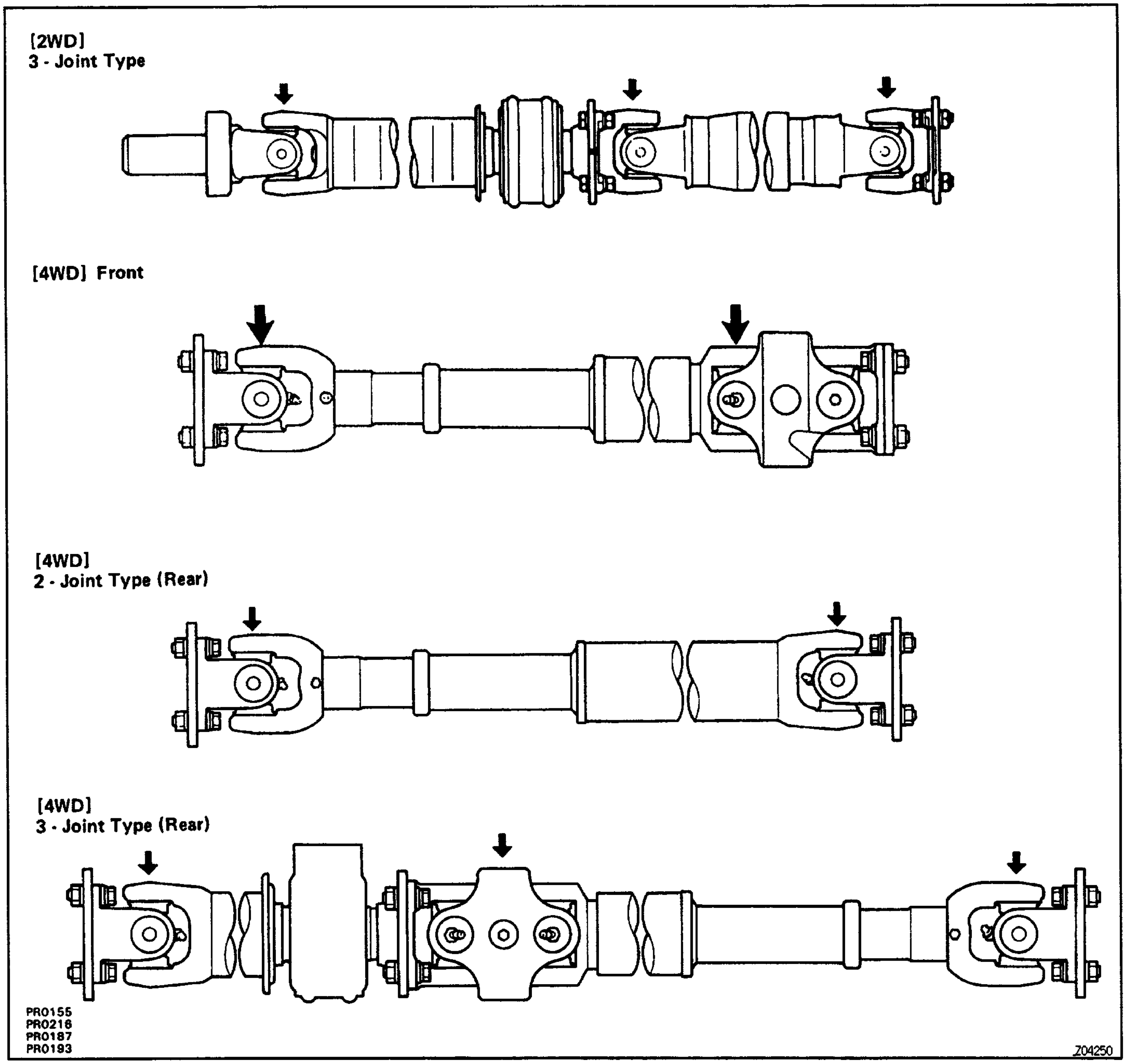
HINT: When replacing the rear propeller shaft spider on 4WD vehicles, be sure that the grease fitting as–sembly hole is facing in the direction shown in the figure.

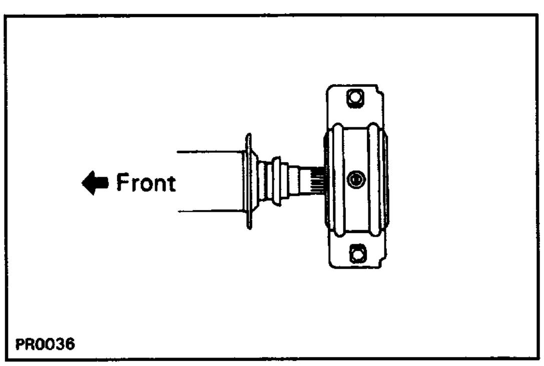


PR026–01

PROPELLER SHAFT ASSEMBLY

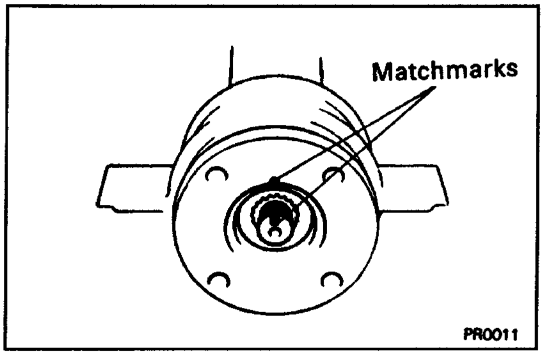
HINT: When replacing the propeller shaft, install the new parts facing as shown in the illustration.

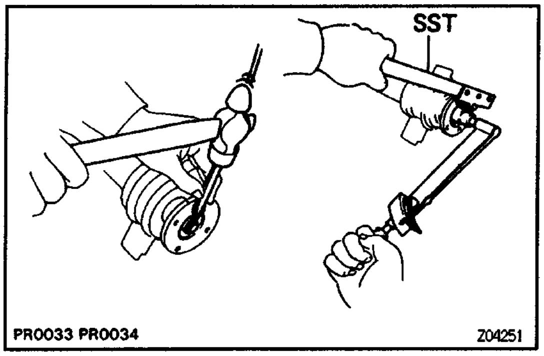




1. INSTALL CENTER SUPPORT BEARING ON INTER–MEDIATE SHAFT

HINT: Install the center support bearing with the cutout toward the rear.





2. INSTALL FLANGE ON INTERMEDIATE SHAFT

(a) Coat the splines of the intermediate shaft with MP grease.

(b) Place the flange on the shaft and align the match–marks.

HINT: If replacing either the center flange or inter–mediate shaft, reassemble them so that the front yoke of the intermediate shaft and the rear yoke of the propeller shaft are facing in the same direction.

(c) Using SST to hold the flange, press the bearing into position by tightening down a new nut.

SST 09930–00021

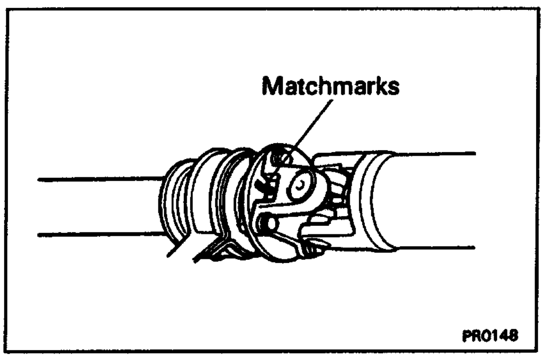
Torque: 181 N–m (1,850 kgf–cm. 134 ft–lbf)

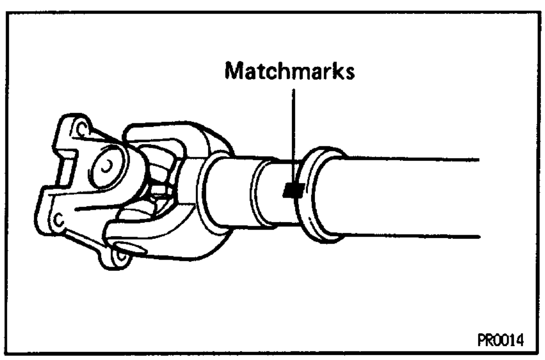
(d) Loosen the nut.

(e) Torque the nut again.

Torque: 69 N–m (700 kgf–cm, 51 ft–lbf)

(f) Using a hammer and punch, stake the nut.





3. INSTALL PROPELLER SHAFT

(a) Align the matchmarks on the flanges and connect the flanges with four bolts and nuts.

HINT: If replacing either the center flange or inter–mediate shaft, reassemble them so that the front yoke of the intermediate shaft and the rear yoke of the propeller shaft are facing in the same direction.

(d) Torque the bolts and nuts.

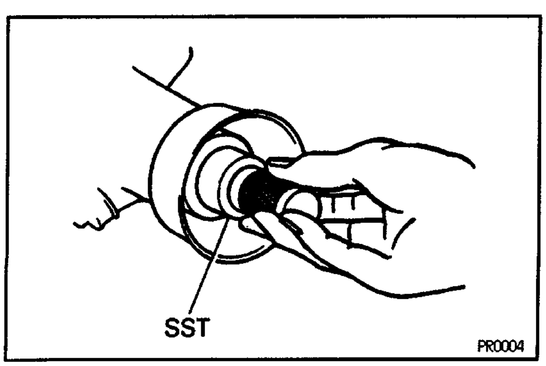
Torque:

4WD 3–joint Type 3VZ–E [MT]
76 N–m (780 kgf–cm, 56 ft–lbf)
Others
74 N–m (750 kgf–cm, 54 ft–lbf)

4. INSERT SLEEVE YOKE INTO PROPELLER SHAFT (4 WD)

(a) Apply Mp grease to the propeller shaft spline and sleeve yoke sliding surface.

(b) Align the matchmarks on the yoke and propeller shaft.



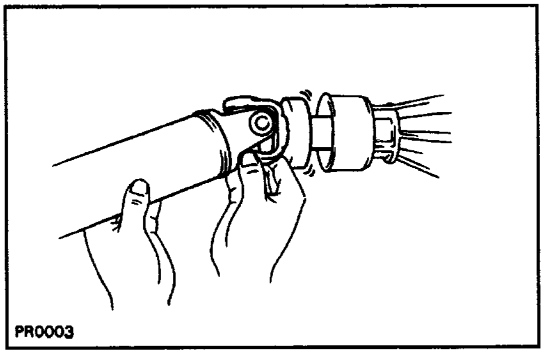
PR027–01

PROPELLER SHAFT INSTALLATION (2WD)

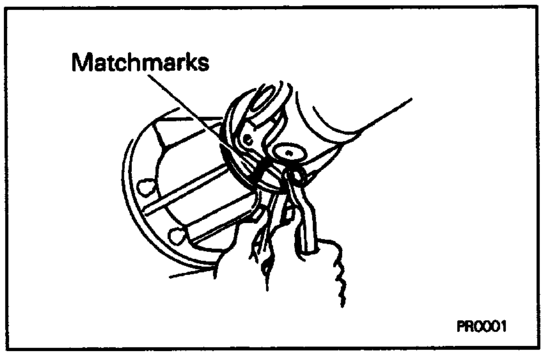
1. INSERT YOKE IN TRANSMISSION

(a) Remove SST.

SST 09325–20010 or 09325–40010



(b) Push the yoke into the transmission.



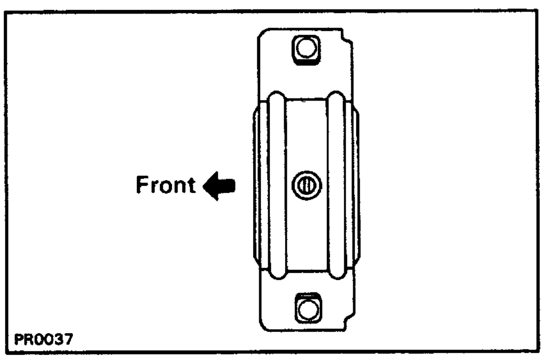
2. CONNECT PROPELLER SHAFT FLANGE TO CON–PANION FLANGE ON DIFFERENTIAL

(a) Align the matchmarks on the flanges with four bolts and nuts.

(b) Torque the bolts and nuts.

Torque:

4WD 3VZ–E [MT]
76 N–m (780 kgf–cm, 56 ft–lbf)
Ex. 4WD 3VZ–E [MT]
74 N–m (750 kgf–cm, 54 ft–lbf)

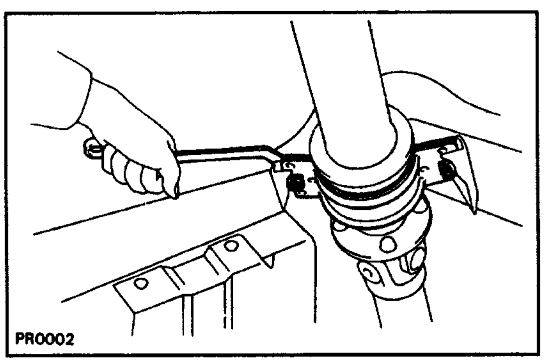


3. INSTALL CENTER SUPPORT BEARING TO FRAME CROSSMEMBER (3–JOINT TYPE)

(a) Install the center support bearing to the frame cro–ssmember with two mount bolts finger tight.

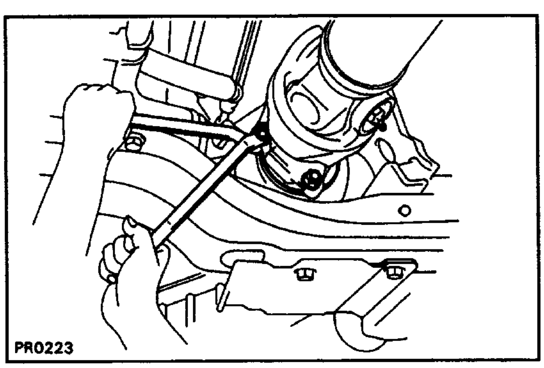
(b) Check that the bearing bracket is at right angle to the propeller shaft. Adjust the bracket if necessary.

(c) Check that the center line of the center bearing is set to the center line of the bracket when the vehicle is in a no–load condition. Adjust the bracket if necessary.



(d) Torque the mount bolts.

Torque: 36 N–m (370 kgf–cm, 27 ft–lbf)



PROPELLER SHAFT INSTALLATION (4WD)

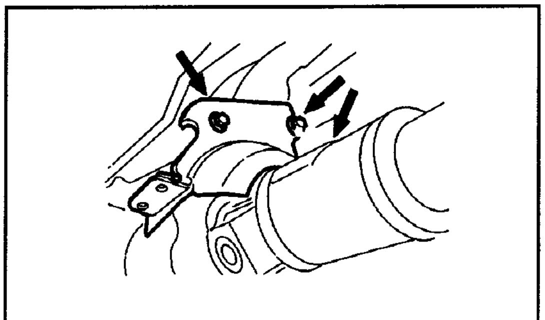
PR028–01

1. CONNECT FRONT PROPELLER SHAFT FLANGE TO COMPANION FLANGE ON TRANSFER

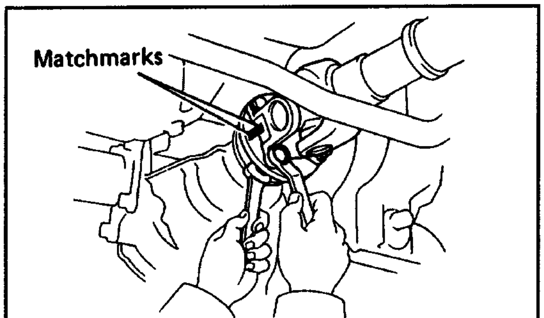
(a) Align the matchmarks on the flanges and connect the flanges with four bolts and nuts.

(b) Torque the bolts and nuts.

Torque: 41 N–m (750 kgf–cm, 54 ft–lbf)

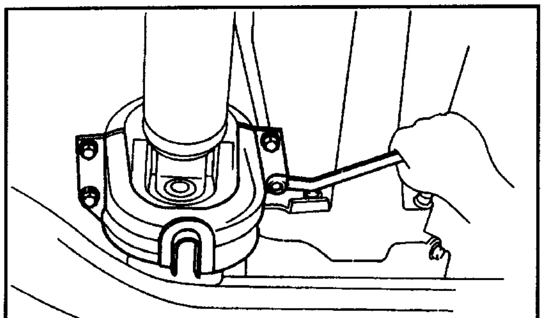

PR0202

2. INSTALL FRONT PROPELLER SHAFT DUST COVER SUBASSEMBLY
(W/VF1 A Type Transfer and A340H)
(a) Install the cover.
(b) Install and torque the three bolts.
Torque:
A bolts 36 N–m (370 kgf–cm, 27 ft–lbf)
B bolts 23 N–m (230 kgf–cm, 17 ft–lbf)

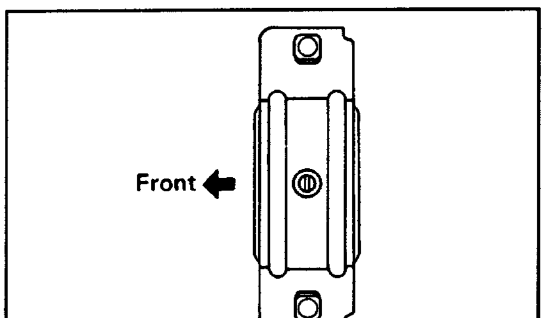


FA0818

3. CONNECT PROPELLER SHAFT FLANGE TO COM–PANION FLANGE ON FRONT DIFFERENTIAL
(a) Align the matchmarks on the flanges and connect the flanges with four bolts and nuts.
(b) Torque the bolts and nuts.
Torque: 74 N–m (750 kgf–cm, 54 ft–lbf)

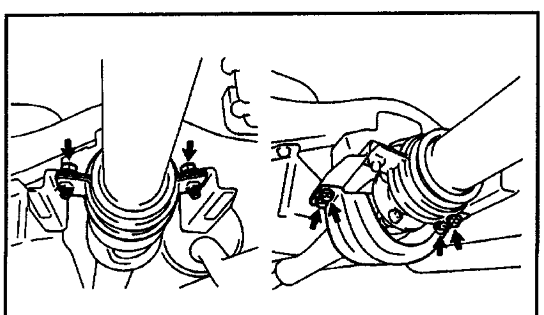

PR0005

4. INSTALL FRONT PROPELLER SHAFT NO. 2 DUST COVER
(a) Install the cover.
(6) Install and torque the bolts and nuts.
Torque:
Bolt 17 N–m (175 kgf–cm, 13 ft–lbf)
Nut 13 N–m (135 kgf–cm, 10 ft–lbf)

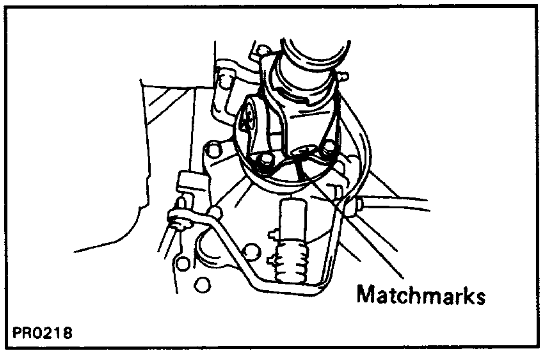


PR0037

5. INSTALL CENTER SUPPORT BEARING TO FRAME CROSSMEMBER (3–JOINT TYPE)
(a) Install the center support bearing to the frame cro–ssmember with two mount bolts finger tight.
(b) Check that the bearing bracket is at right angle to the propeller shaft. Adjust the the bracket if necessary.
(c) Check that the center line of the center bearing is set to the center line of the bracket when the vehicle is in a no–load condition. Adjust the bracket if necessary.


PR0211 PR0212 Z04239

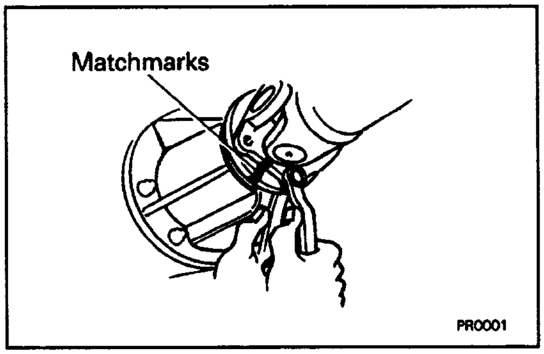
(d) Torque the mount bolts.
Torque: 36 N–m (370 kgf–cm, 27 ft–lbf)
(e) Install propeller shaft protector and four set bolts.
(f) Torque the set bolts.
Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)



6. CONNECT REAR PROPELLER SHAFT FLANGE TO COMPANION FLANGE ON TRANSFER

(a) Align the matchmarks on the flanges and connect the flanges with four bolts and nuts.
(b) Torque the bolts and nuts.

Torque:
3VZ–E [MT]
76 N–m (780 kgf–cm, 56 ft–lbf)
Ex. 3VZ–E [MT]
74 N–m (760 kgf–cm, 54 ft–lbf)



7. CONNECT PROPELLER SHAFT FLANGE TO COMPANION FLANGE ON REAR DIFFERENTIAL

(a) Align the matchmarks on the flanges and connect the flanges with bolts and nuts.
(b) Torque the bolts and nuts.

Torque:
3VZ–E [MT]
76 N–m (780 kgf–cm, 56 ft–lbf)
Ex. 3VZ–E [MT]
74 N–m (760 kgf–cm, 54 ft–lbf)

SERVICE SPECIFICATIONS

PR013–04

SERVICE DATA

Propeller shaft runout			Limit	0.8 mm (0.031 in.)
Spider bearing axial play				0.05 mm (0.0020 in.)
Spider bearing selection			Mark	
Bearing cup outer diameter			None	29.008 – 29.021 mm (1.1420 – 1.1426 in.)
			Red	29.028 – 29.041 mm (1.1428 – 1.1433 in.)
Bearing hole inner diameter			None	29.000 – 29.020 mm (1.1417 – 1.1425 in.)
			Drill	29.021 – 29.042 mm (1.1426 – 1.1434 in.)
Snap ring thickness	TMC – made	mark	color	
		1	–	2.100 – 2.150 mm (0.0827 – 0.0846 in.)
		2	–	2.150 – 2.200 mm (0.0846 – 0.0866 in.)
		3	–	2.200 – 2.250 mm (0.0866 – 0.0886 in.)
		–	Brown	2.250 – 2.300 mm (0.0886 – 0.0906 in.)
		–	Blue	2.300 – 2.350 mm (0.0906 – 0.0925 in.)
		6	–	2.350 – 2.400 mm (0.0925 – 0.0945 in.)
		7	–	2.400 – 2.450 mm (0.0945 – 0.0965 in.)
		8	–	2.450 – 2.500 mm (0.0965 – 0.0984 in.)
	DANA–made		color	
			Blue	1.638 mm (0.0645 in.)
			Yellow	1.588 mm (0.0625 in.)
			Silver	1.537 mm (0.0605 in.)
			Copper	1.511 mm (0.0595 in.)
			Black	1.486 mm (0.0585 in.)
			Red	1.435 mm (0.0565 in.)
			Green	1.384 mm (0.0545 in.)

TORQUE SPECIFICATIONS

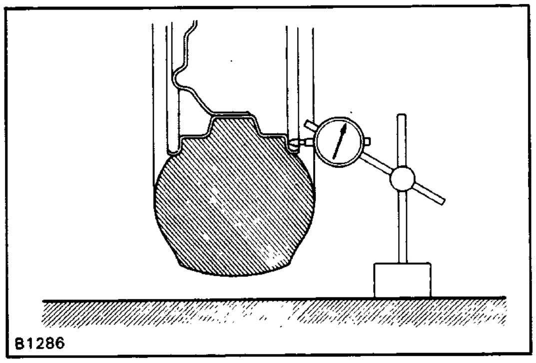
PR014–04

Part tightened		N·m	kgf·cm	ft·lbf
Front differential x Front propeller shaft (4WD)		74	750	54
Front propeller shaft x Transfer (4WD)		74	750	54
Propeller shaft x Rear differential	3VZ–E (M/T)	76	780	56
	Ex. 3VZ–E (M/T)	74	750	54
Propeller shaft x Transfer	3VZ–E (M/T)	76	780	56
	Ex. 3VZ–E (M/T)	74	750	54
Intermediate shaft x Propeller shaft (4WD)				
	3VZ–E (M/T)	76	780	56
	Ex. 3VZ–E (M/T)	74	750	54
Propeller shaft x Differential (2WD)		74	750	54
Intermediate shaft x Propeller shaft (2WD)		74	750	54
Center support bearing x Frame		36	370	27
Intermediate shaft x Center bearing x Joint flange				
	1st	181	1,850	134
	2nd		Loosen nut	
	3rd	69	700	51
Front propeller shaft No.2 dust cover set bolts		17	175	13
Front propeller shaft No.2 dust cover set nut (w/VF1 A type transfer and A340H)		13	135	10
Front propeller shaft dust cover subassembly x Bracket		23	230	17
Front propeller shaft dust cover subassembly x Transfer		37	370	27
Propeller shaft protector x Frame		29	300	22

SUSPENSION AND AXLE

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page 2WD	Page 4WD
Wanders/pulls	Tires worn or improperly inflated Alignment incorrect Wheel bearing adjusted too tight Front or rear suspension parts loose or broken Steering linkage loose or worn Steering gear out of adjustment or broken	Inflate tires to proper pressure or replace tires Check front alignment Adjust wheel bearing Tighten or replace suspension parts Tighten or replace steering linkage Adjust or repair steering gear	SA–3 SA–13 SA–17, 153	SA–6 SA–39 SA–111, 153
Bottoming	Vehicle overloaded Shock absorber worn out Springs weak	Check loading Replace shock absorber Replace spring	SA–22, 153 SA–20, 153	SA–116, 153 SA–114, 153
Sways/pitches	Tires improperly inflated Stabilizer bar bent or broken Shock absorber worn out	Inflate tires to proper pressure Inspect stabilizer bar Replace shock absorber	SA–28, 157 SA–22, 153	SA–122 SA–1 16, 153
Front wheel shimmy	Tires worn or improperly inflated Wheels out of balance Shimmy damper worn out Shock absorber worn out Alignment incorrect Wheel bearings worn or improperly adjusted Ball joints or bushings worn Steering linkage loose or worn Steering gear out of adjustment or broken	Replace tire or inflate tires to proper pressure Balance wheels Replace steering damper Replace shock absorber Check front alignment Replace or adjust wheel bearings Inspect ball joints and bushings Tighten or replace steering linkage Adjust or repair steering gear	SA–22, 153 SA–3 SA–12 SA–18	SA–116, 153 SA–6 SA–36 SA–112
Abnormal tire wear	Tires improperly inflated Shock absorbers worn out Alignment incorrect Suspension parts worn	Inflate tires to proper pressure Replace shock absorber Check toe–in Replace suspension parts	SA–22, 153 SA–5 SA–17, 153	SA–116, 153 SA–9 SA–111, 153
Oil leak from differen–tial	Oil level too high or wrong grade Oil seal worn or damaged Companion flange loose or dam–aged	Drain and replace oil Replace oil seal Tighten or replace flange	SA–136 SA–135 SA–149	SA–57, 136 SA–54, 135 SA–56, 149
Noises in axle	Oil level low or wrong grade Excessive backlash between pinion and ring or side gear Ring, pinion or side gears worn or chipped Pinion shaft bearing worn Axle shaft bearing worn Differential bearing loose or worn	Drain and replace oil Check backlash Inspect gears Replace bearing Replace bearing Tighten or replace bearings	SA–136 SA–137 SA–137 SA–137 SA–124 SA–137	SA–57, 136 SA–68, 85 137 SA–66, 82, 137 SA–66, 82, 137 SA–124 SA–66, 82, 137



WHEEL ALIGNMENT
4WD

1. MAKE FOLLOWING CHECKS AND CORRECT ANY PROBLEMS

(a) Check the tires for wear and proper inflation.

Cold tire inflation pressure: See page A–25

(b) Check the wheel runout.

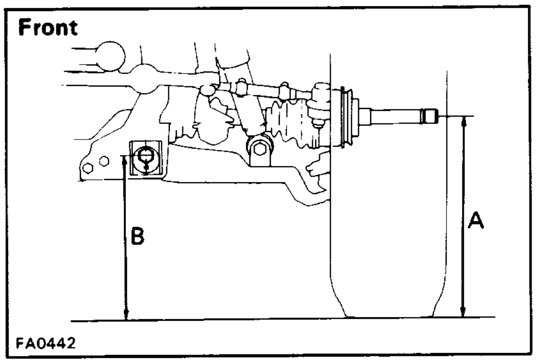
Lateral runout: 1.2 mm (0.047 in.) or less

(c) Check the front wheel bearings for looseness.

(d) Check the front suspension for looseness.

(e) Check the steering linkage for looseness.

(f) Check that the front absorbers work properly by using the standard bounce test.



2. ADJUST VEHICLE HEIGHT

Adjust the vehicle height to the standard vehicle height for wheel alignment inspection.

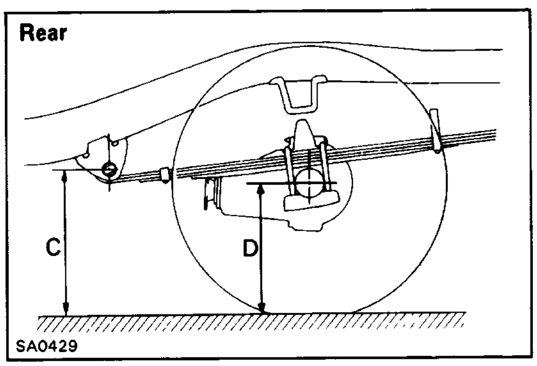
HINT: With non–loaded vehicles, there is a difference in the vehicle height according to the model.

Although the wheel alignment standard value changes according to the vehicle height, by setting the vehicle height to the standard height the standard alignment value becomes the same for all models.

Front: A – B = 58.5 mm (2.303 in.)

A: Height at center of tip of drive shaft

B: Height at center of tip of front side adjusting cam bolt

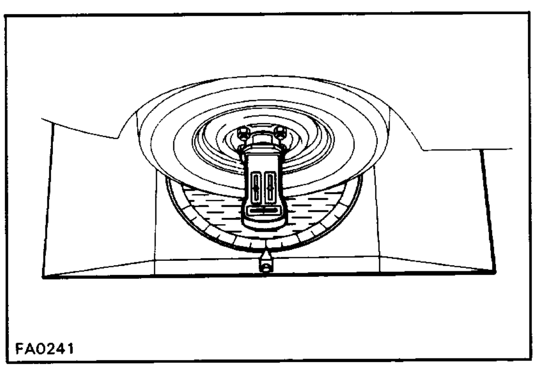


Rear: C – D = 61.0 mm (2.402 in.)

C: Height of center of rear leaf spring front bush 1

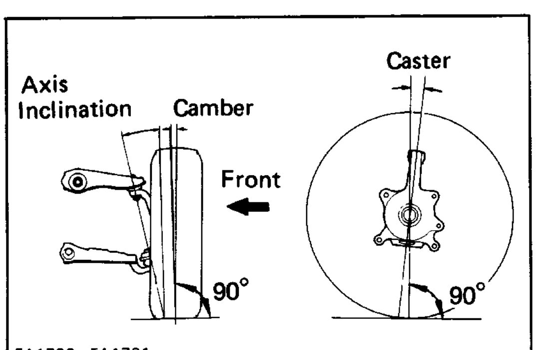
D: Height of center of rear axle shaft

HINT: For the vehicle height of non–loaded vehicles for each model and the alignment standard values, refer to page A–25.



3. INSTALL WHEEL ALIGNMENT EQUIPMENT

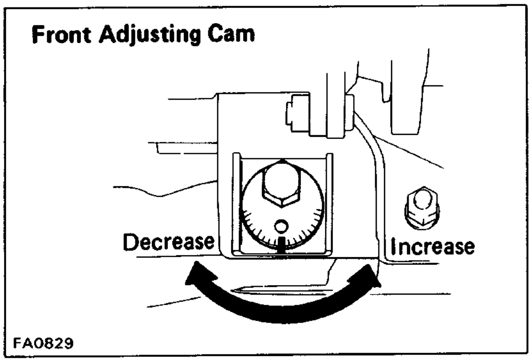
Follow the specific instructions of the equipment manufacturer.



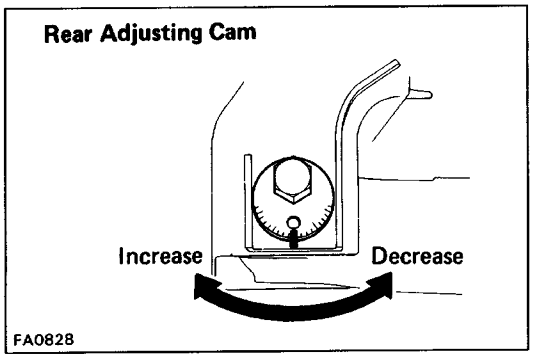
4. ADJUST CAMBER, STEERING AXIS INCLINATION AND CASTER

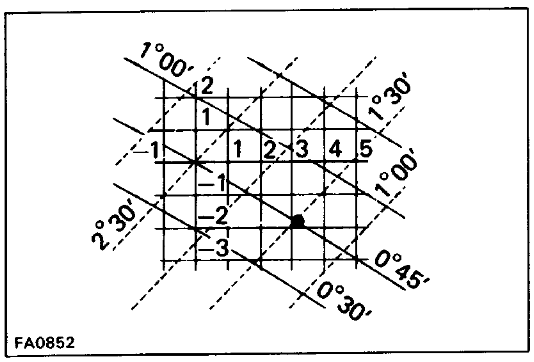
Camber, Steering axis inclination, Caster: See page A–25, 26

If the steering axis inclination is not as specified after camber and caster have been correctly adjusted, recheck the steering knuckle and front wheel for bending or looseness.



If camber and/or caster are not within specification, ad–just by front and/or rear adjusting cams.
(See Adjustment Chart)



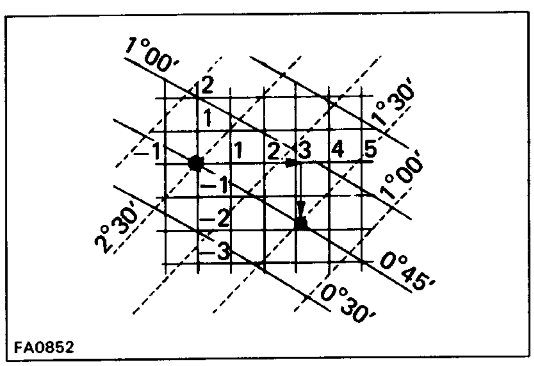


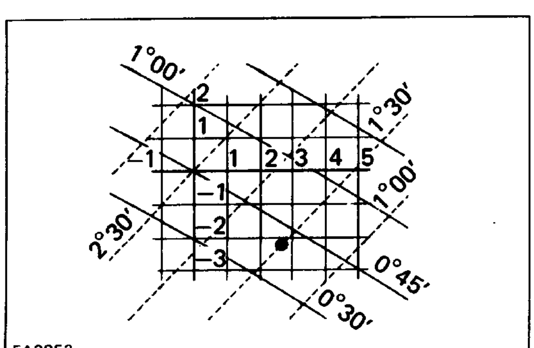
How to Read the Chart
(Alignment measured with vehicle height set to stan- dard
height for wheel alignment inspection)

(a) Mark on the adjustment chart the alignment values measured with the vehicle at standard height.
Example: Camber 0•45'
Caster 1 • 30'

(b) To calculate the amounts by which the front and/or rear cams are to be adjusted, read from the adjust–ment chart the distance from the center of the chart to the mark you have made, as shown in the illustra–tion.
Example: Front cam –1.8
Rear cam + 3.1

(c) Torque the front and/or rear cam nuts.
Torque: 196 N–m (2,000 kgf–cm, 145 ft–lbf)

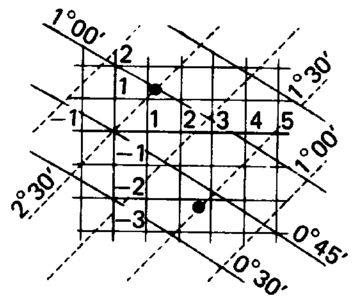




How to Read the Chart
(Wheel alignment measured at vehicle height of non–loaded vehicle)

(a) Find the wheel alignment standard value applicable for the particular model in non–loaded condition.
(See page A–33)

(b) Mark the selected standard value on the adjustment chart.
Example: Camber 0•40'
Caster 1 • 30'

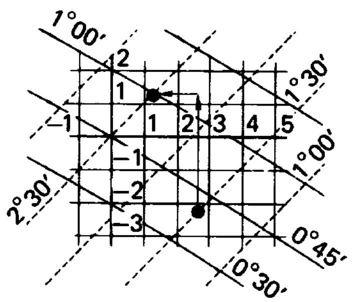


FA0852

(c) Mark on the adjustment chart the alignment values measured at the non–loaded vehicle height.

Example: Camber 1• 00'

Caster 2• 30'



FA0852

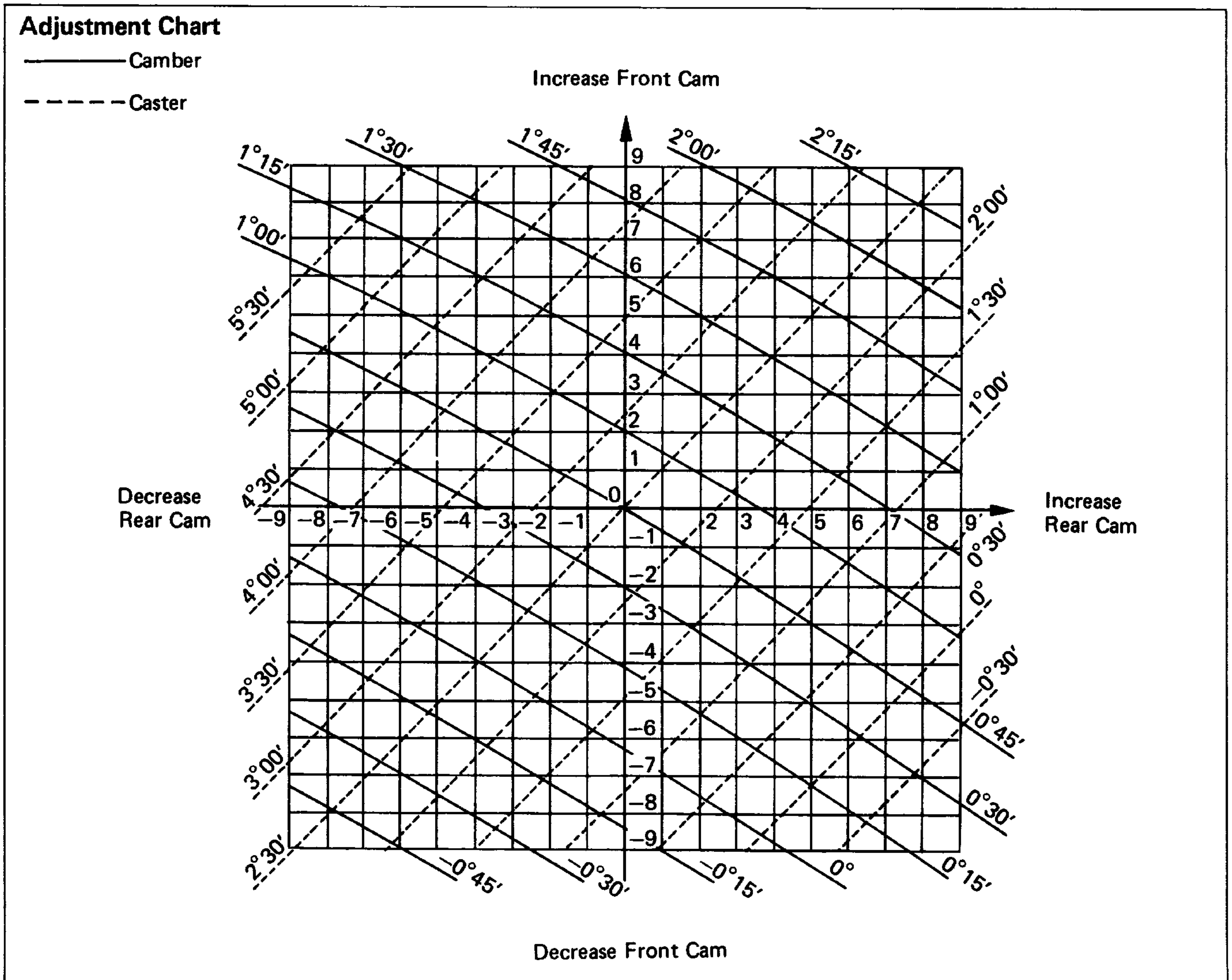
(d) As shown in the illustration, read the distance from the standard value to the measured value, and ad–just the front and/or rear adjusting cams accord–ingly.

Example: Front cam + 3.4

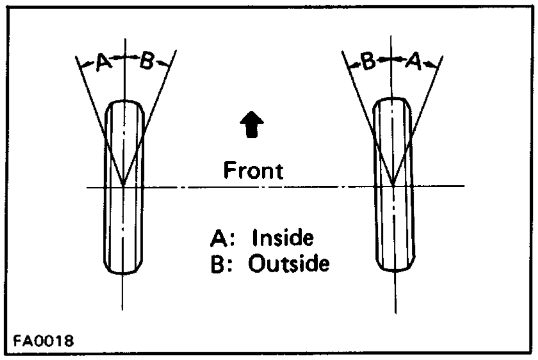
Rear cam –1.6

(e) Torque the front and/or rear cam nuts.

Torque: 196 N–m (2,000 kgf–cm, 145 ft–lbf)



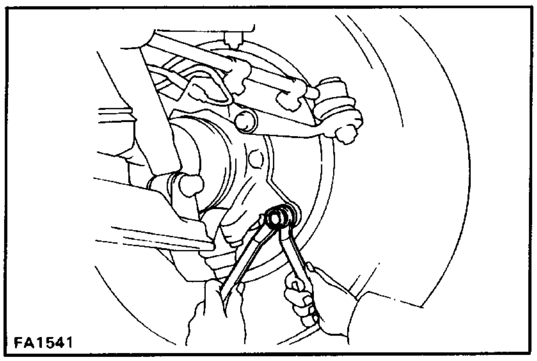
FA0724



5. ADJUST WHEEL ANGLE

Remove the caps of the knuckle stopper bolts and check the steering angles.

Wheel angle		
Max.	Inside wheel	32•00’ +1• –2•
	Outside wheel	31•
at 200 (outside wheel)	Inside wheel	21 • 10’

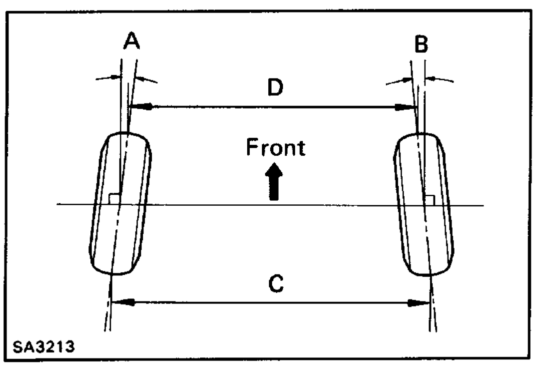


HINT: When the steering wheel is fully turned, make sure that the wheel is not touching the body or brake flexible hose.

If maximum steering angles differ from standard value, adjust the wheel angle with the knuckle stopper bolts.

Torque: 47 N–m (480 kgf–cm, 35 ft–lbf)

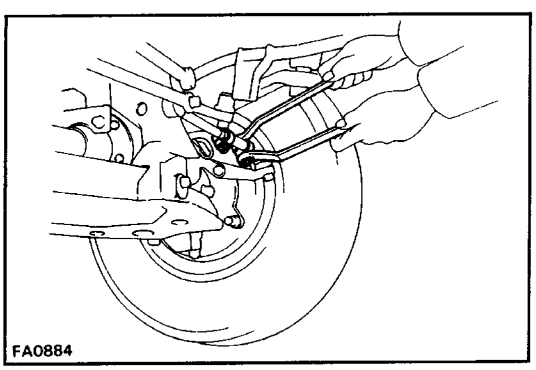
If the wheel angle still cannot be adjusted within limits, inspect and replace damaged or worn steering parts.



6. INSPECT TOE–IN

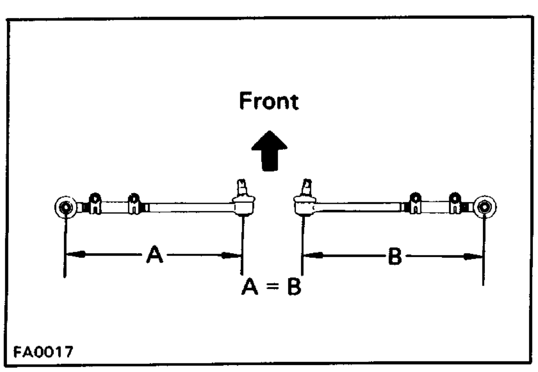
Toe–in: See page A–26

If toe–in is not within specification adjust by the tie rod end.



7. ADJUST TOE–IN

(a) Loosen the clamp bolts and nuts.

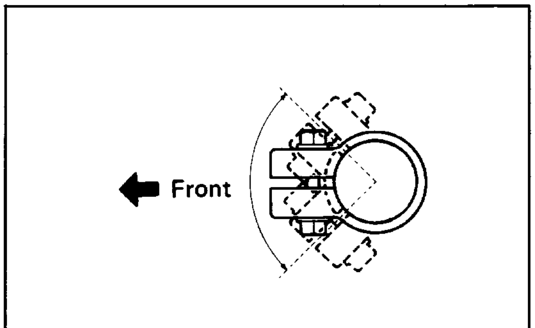


(b) Adjust toe–in by turning the left and right tie rod tubes an equal amount.

Toe–in: See page A–26

(c) Insure that the lengths of the left and right tie rods are equal.

NOTICE: Check that the steering wheel is straightened.

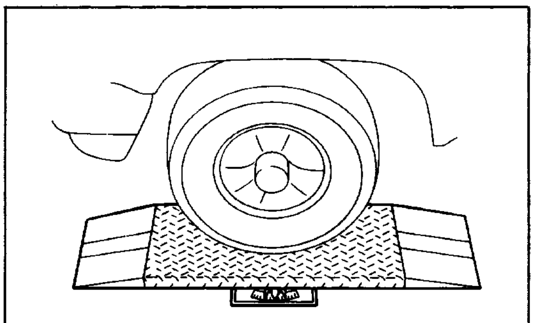


FA0927

(d) Torque the tie rod.

Torque: 22 N–m (225 kgf–cm, 16 ft–lbf)

HINT: Face the clamp bolt toward the front of the vehicle.


FA1272

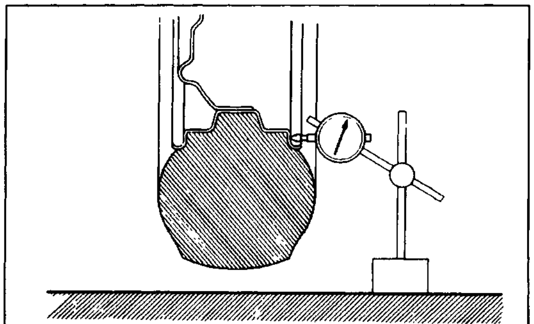
8. INSPECT SIDE SLIP (REFERENCE ONLY)

Side slip: 3.0 mm/m (0.118 in./3.3 ft) or less

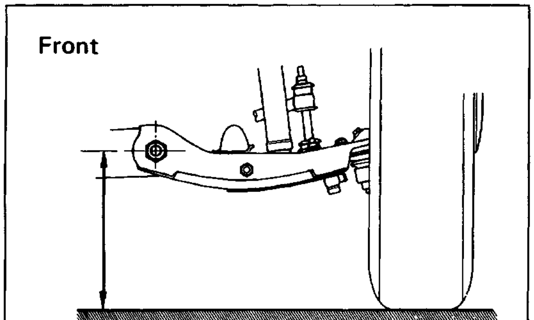
WHEEL ALIGNMENT
2WD

1. MAKE FOLLOWING CHECKS AND CORRECT ANY PROBLEMS

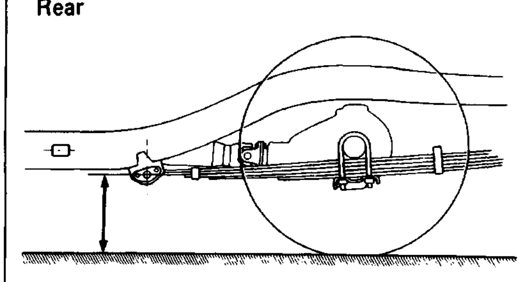
(a) Check the tires for wear and proper inflation.
Cold tire inflation pressure: See page A–23


FA1455

(b) Check the wheel runout.
Lateral runout: 1.2 mm (0.047 in.) or less
(c) Check the front wheel bearings for looseness.
(d) Check the front suspension for looseness.
(e) Check the steering linkage for looseness.
(f) Use the standard bounce test to check that the front absorbers work properly.



FA0009



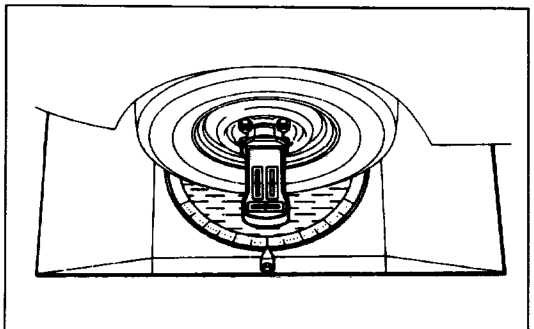
SA0397

2. MEASURE CHASSIS GROUND CLEARANCE

Chassis ground clearance: See page A–23

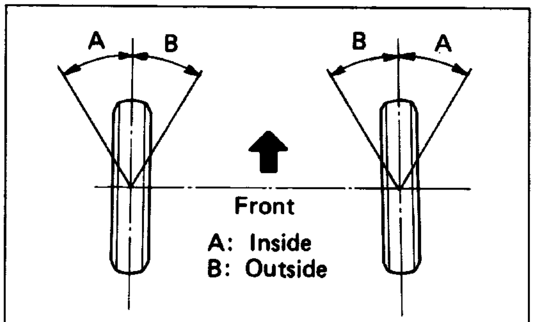
If the clearance of the vehicle is not standard, try to ad–just it by pushing down on the body or by lifting the body. If still not correct, check for bad springs or suspen–sion parts.

HINT: Before inspecting wheel alignment, adjust chas–sis ground clearance to specification.


M9938

3. INSTALL WHEEL ALIGNMENT EQUIPMENT

Follow the specific instructions of the equipment manu–facturer.



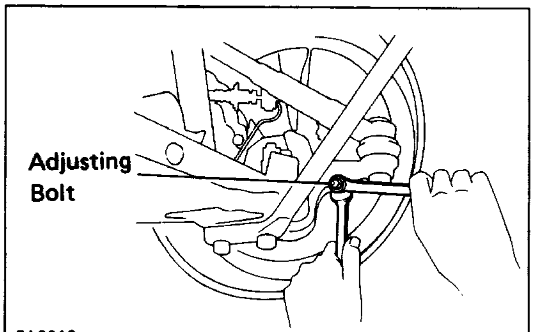
FA0018

4. ADJUST WHEEL ANGLE

Remove the caps of the knuckle stopper bolts and check the steering angles.

Steering angles: See page A–24

HINT: When the steering wheel is fully turned, make sure that the wheel is not touching the body or brake flexible hose.

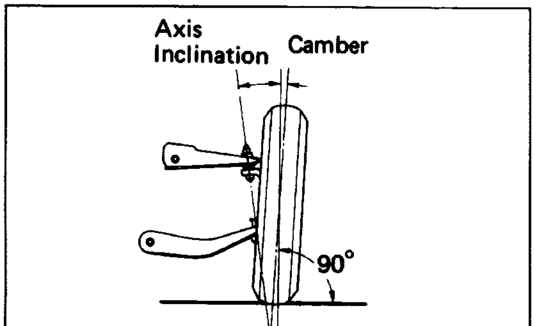


FA0019

If maximum steering angles differ from standard val-ue, adjust the wheel angle with the knuckle stopper bolts.

Torque: 34 N–m (350 kgf–cm, 25 ft–lbf)

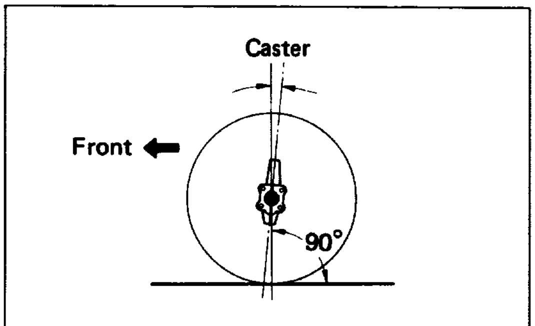
If the wheel angle still cannot be adjusted within limits, inspect and replace damaged or worn steering parts.



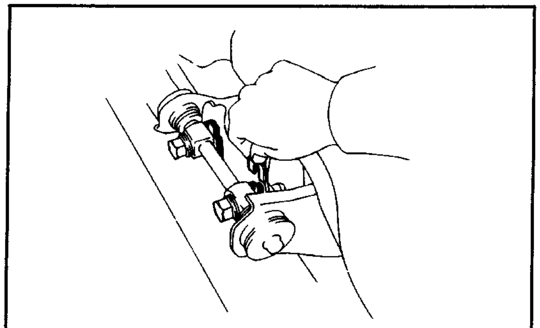
FA0012

5. ADJUST CAMBER, STEERING AXIS INCLINATION AND CASTER

Specifications: See page A–23, 24



FA0013

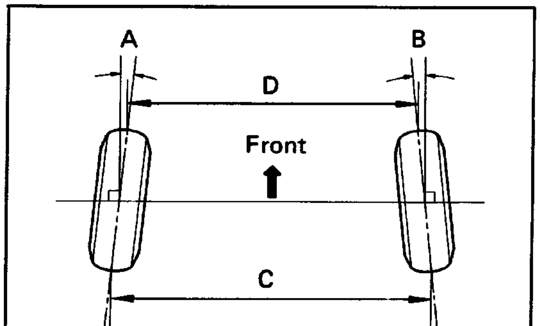


FA0014

If camber caster is not within specification, adjust by adding or removing shims on the upper arm.
Shim thickness mm (in.)

Thickness	
4.0	(0.157)
1.6	(0.063)
1.2	(0.047)

If the steering axis inclination is not as specified after camber and caster have been correctly adjusted, recheck the steering knuckle and front wheel for bending or loose–ness.

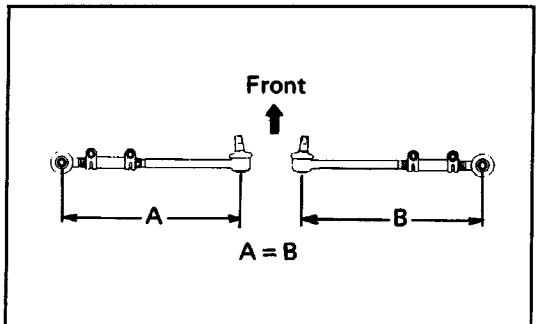


SA3213

6. INSPECT TOE–IN

Toe–in: See page A–23

If toe–in is not within specification adjust by the tie rod end.



FA0017

7. ADJUST TOE–IN

(a) Loosen the clamp bolts.

(b) Adjust toe–in by turning the left and right tie rod tubes an equal amount.

Toe–in: See page A–23

HINT: Make sure that the tie rods are the same length.

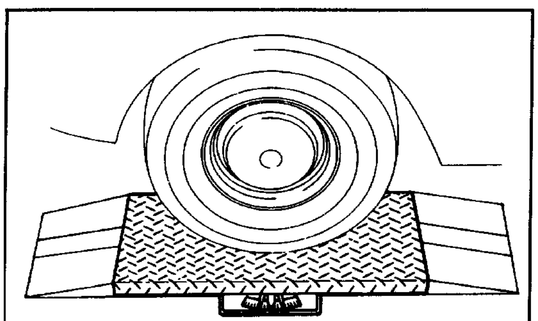
Left–right error: 3.0 mm (0.118 in.) or less

(g) Tighten the clamp bolts and torque them.

Torque: 25 N–m (260 kgf–cm, 19 ft–lbf)

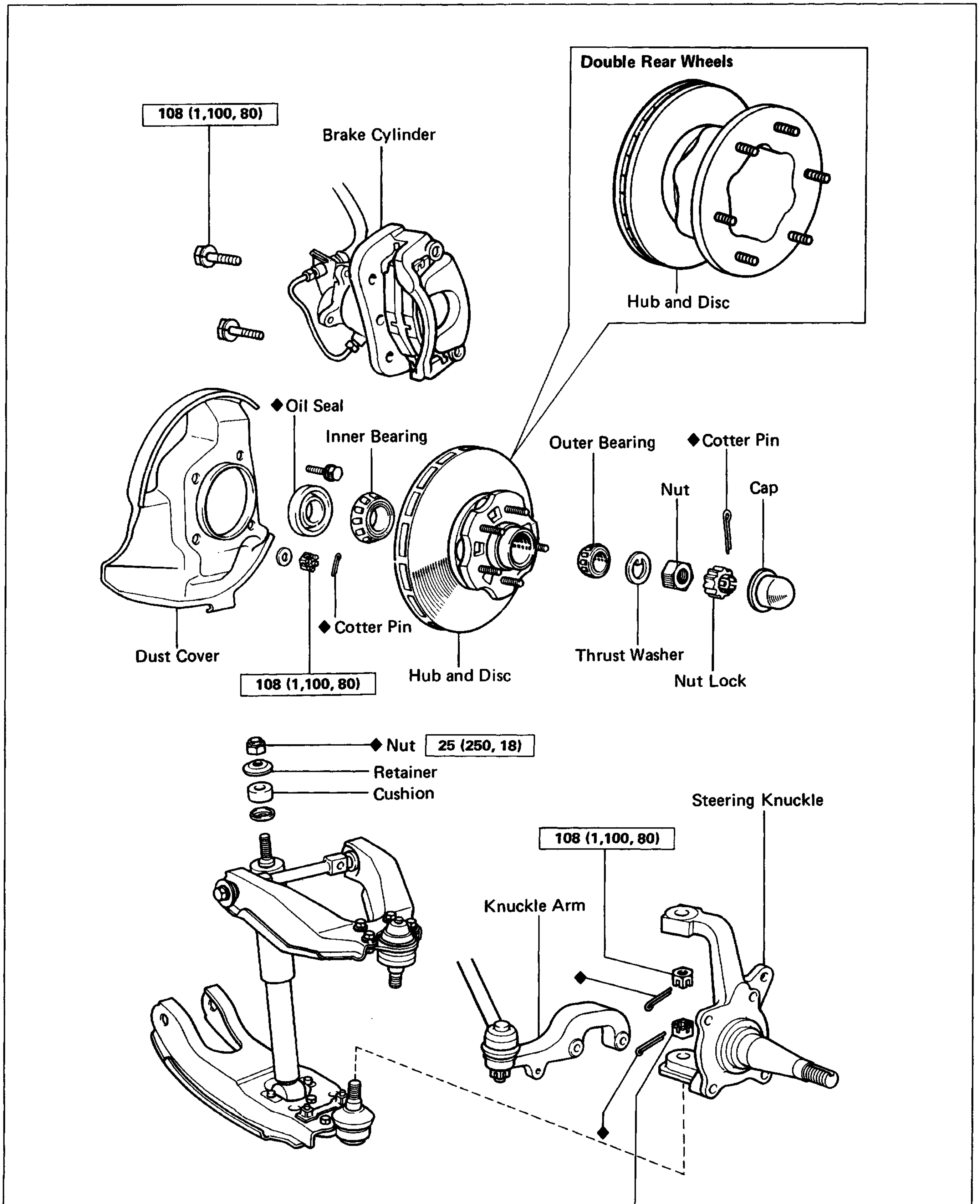
8. INSPECT SIDE SLIP (REFERENCE ONLY)

Side slip: 3.0 mm/m (0.118 in. I3.3 ft) or less



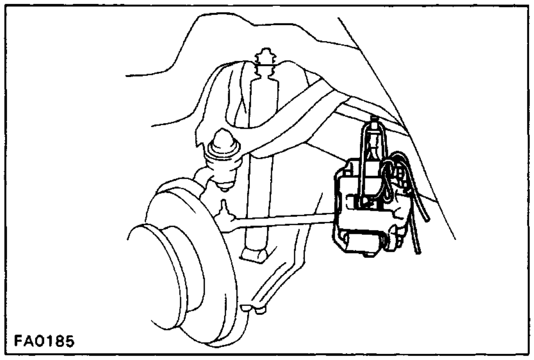
B1292

FRONT AXLE HUB AND STEERING KNUCKLE COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part


FA0185

Front Axle Hub

(See page SA–11)

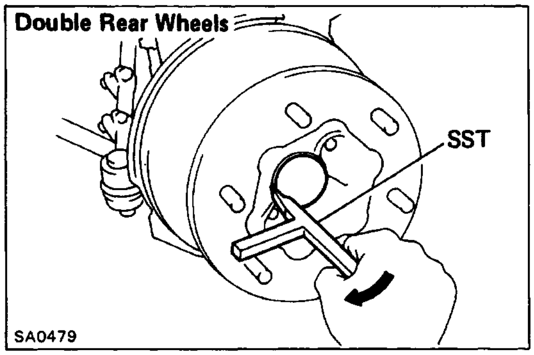
DISASSEMBLY OF FRONT AXLE HUB

1. REMOVE DISC BRAKE CYLINDER AND TORQUE PLATE

(a) Remove the brake cylinder and suspend it with wire.

(b) Remove the torque plate.

HINT: Do not disconnect the brake tube and hose.



SA0479

2. REMOVE AXLE HUB WITH DISC

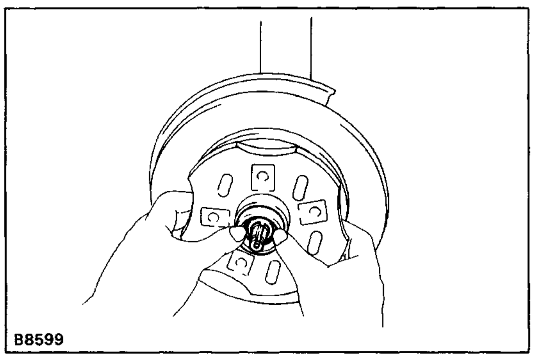
(a) (Single rear wheel)

Remove the cap.

(Double rear wheels)

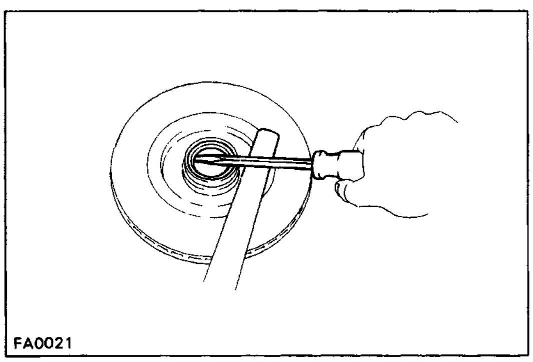
Using SST, pry off the cap.

SST 09504–22011


B8599

(b) Remove the hub and disc together with the outer bearing and thrust washer.

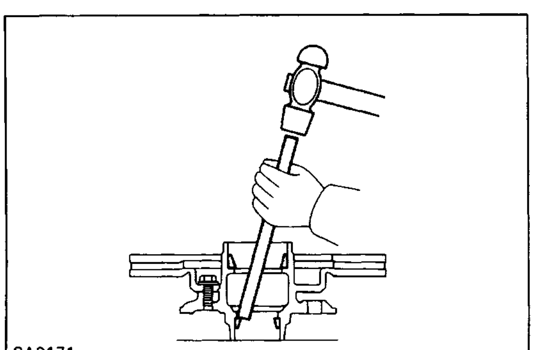
HINT: Be careful not to drop the outer bearing.


FA0021

3. REMOVE INNER BEARING AND OIL SEAL

(a) Using a screwdriver, pry out the oil seal.

(b) Remove the inner bearing from the hub.


SA0171

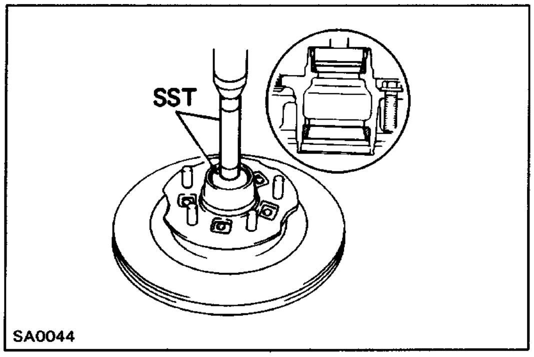
INSPECTION AND REPAIR OF FRONT AXLE HUB

1. INSPECT BEARING

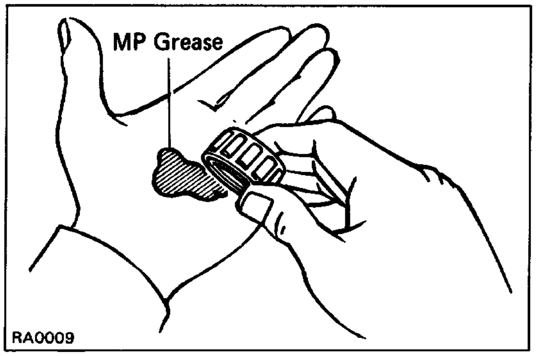
Clean the bearings and outer races and inspect them for wear or damage.

2. REPLACE BEARING OUTER RACE

(a) Using a brass bar and hammer, drive out the bearing outer race.



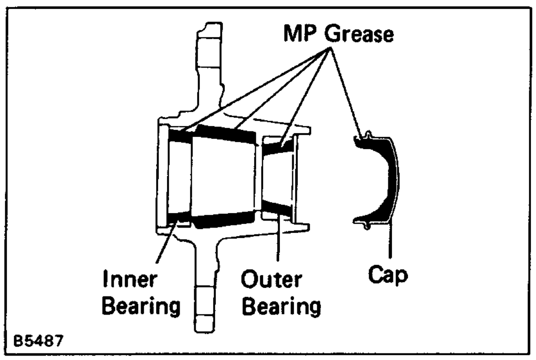
(b) Using SST, carefully drive in a new bearing outer race.
SST 09608–30012
(Inside race 09608–04020, 09608–04100)
(Outside race 09608–04020, 09608–04060)



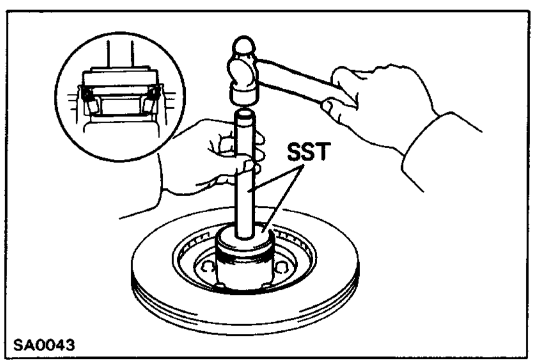
ASSEMBLY OF FRONT AXLE HUB

1. PACK BEARINGS WITH MP GREASE

(a) Place MP grease in the palm of your hand.
(b) Pack grease into the bearing, continuing until the grease oozes out from the other side.
(c) Do the same around the bearing circumference.



2. COAT INSIDE OF HUB AND CAP WITH MP GREASE

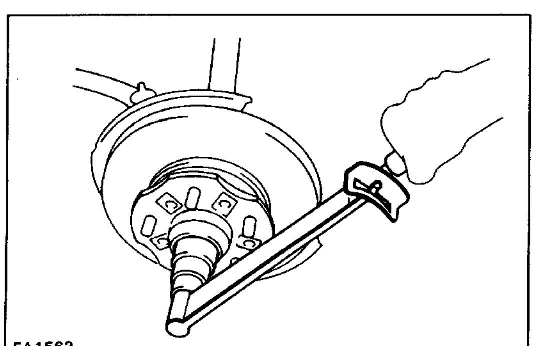


3. INSTALL INNER BEARING AND OIL SEAL

Place inner bearing into the hub. Using SST, drive the oil seal into the hub. Coat the oil seal with MP grease.
SST 09608–30012 (09608–04020, 09608–04100)

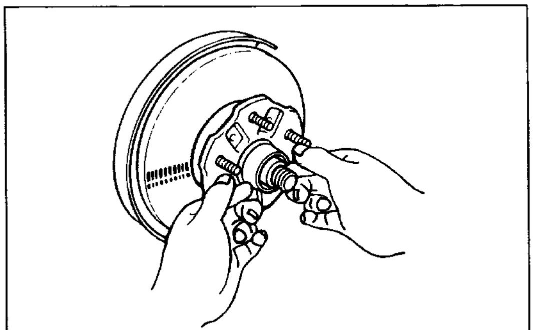
4. INSTALL AXLE HUB ON SPINDLE

(a) Place the axle hub on the spindle.
(b) Install the outer bearing and thrust washer.

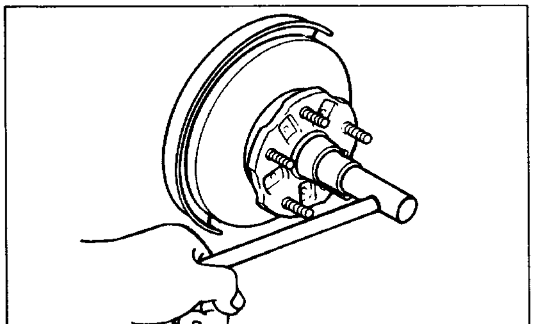


5. ADJUST PRELOAD

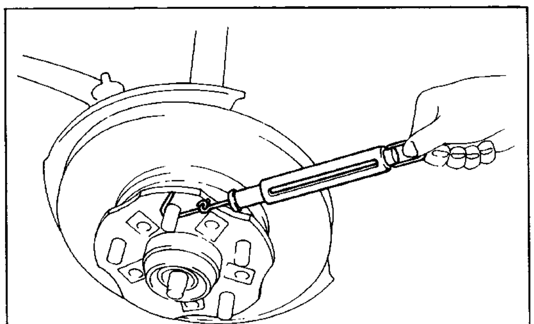
(a) Install and torque the nut.
Torque: 34 N–m (350 kgf–cm, 25 ft–lbf)


FA1565

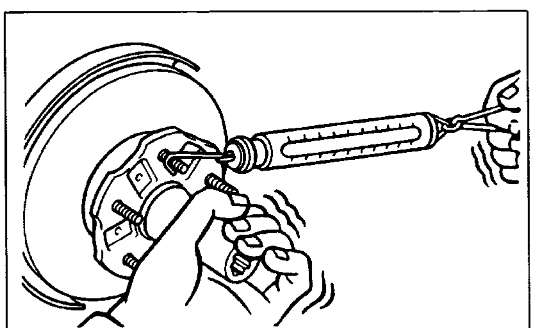
(b) Snug down the bearing by turning the hub several times.


FA1567

(c) Loosen the nut until it can be turned by hand.


FA1566

(d) Using a spring tension gauge, measure and make a note of the frictional force of the oil seal.


FA1564

(e) Tighten the nut until the preload is within specifica– tion.

Preload (starting):

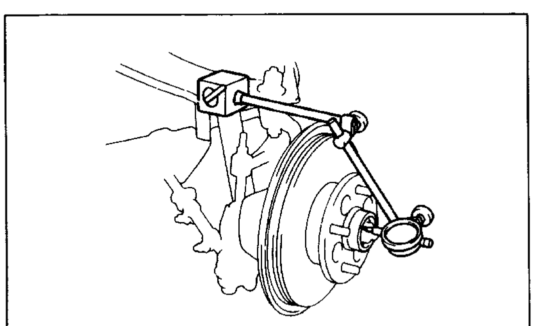
Add oil seal frictional force

Single rear wheel

5.9– 17.7N(0.6– 1.8kgf, 1.3–4.–lbf)

Double rear wheels

3.9–9.8N(0.4– 1.Okgf,0.9–2.21bf)


FA0024

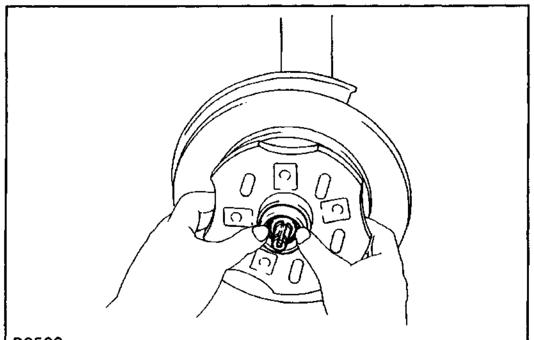
(f) Measure the hub axial play.

Axial play: 0.05 mm (0.0020 in.) or less

6. INSTALL LOCK NUT, COTTER PIN AND GREASE CAP

7. INSTALL BRAKE CYLINDER AND TORQUE PLATE ONTO STEERING KNUCKLE

Torque: 34 N–m (350 kgf–cm, 25 ft–lbf)


B8599

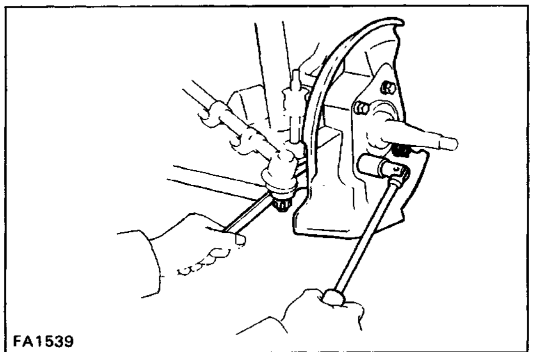
Steering Knuckle

(See page SA–11)

REMOVAL OF STEERING KNUCKLE

1. REMOVE FRONT AXLE HUB AND BRAKE CALIPER

(See page SA–12)

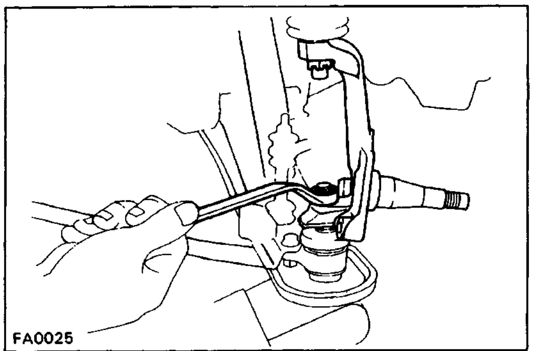

FA1539

2. REMOVE DUST COVER

(a) Remove the two bolts.

(b) Remove the two cotter pins, nuts and bolts and re– move the dust cover.

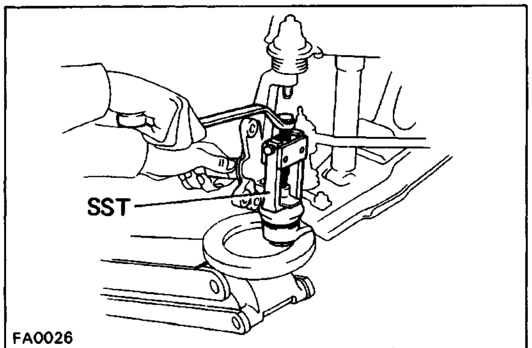
(c) Remove the knuckle arm from the steering knuckle.


FA0025

3. REMOVE STEERING KNUCKLE

(a) Support the lower arm with a jack.

(b) Remove the two cotter pins and two nuts.

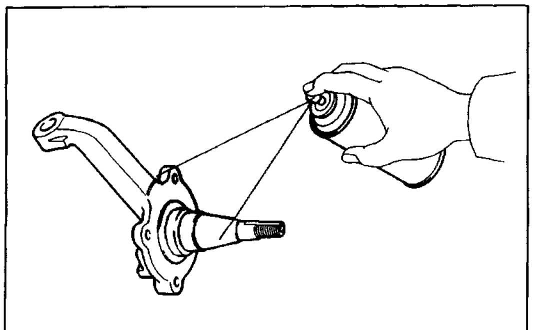


FA0026

(c) Using SST, disconnect the steering knuckle from the lower ball joint.
SST 09628–62011

(d) Using SST, disconnect the steering knuckle from the upper ball joint.
SST 09628–62011

(e) Remove the steering knuckle.

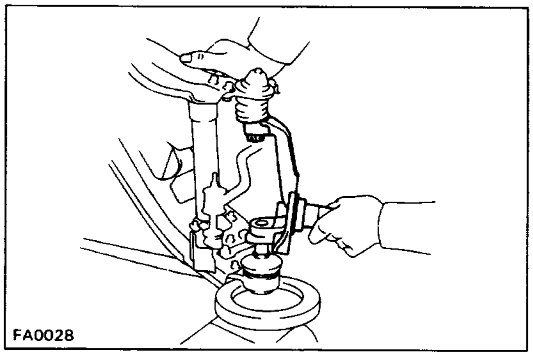

FA0928

INSPECTION OF STEERING KNUCKLE

INSPECT STEERING KNUCKLE

Using a dye penetrant, check the steering knuckle for cracks.

If a crack is found, replace the steering knuckle.



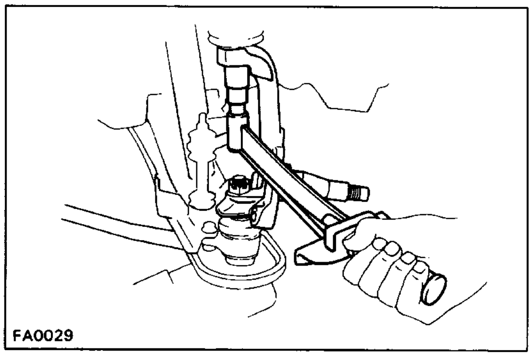
INSTALLATION OF STEERING KNUCKLE

1. INSTALL STEERING KNUCKLE

(a) Support the lower arm with a jack.

(b) Install the steering knuckle to the upper ball joint and install the nut.

(c) Push the upper arm and steering knuckle down and install the steering knuckle to the lower ball joint and install the nut.



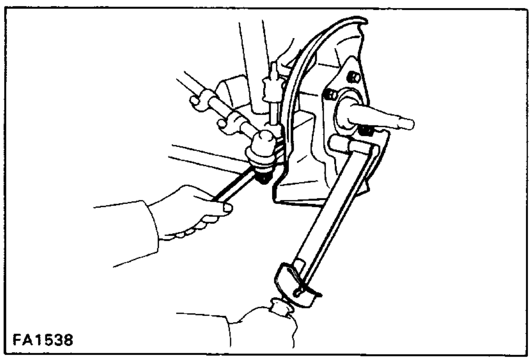
(d) Torque the upper ball joint nut.

Torque: 108 N– m (1,100 kgf–cm, 80 ft–lbf)

(e) Torque the lower ball joint nut.

Torque: 142 N–m (1,450 kgf–cm, 105 ft–lbf)

(f) Install new cotter pins.



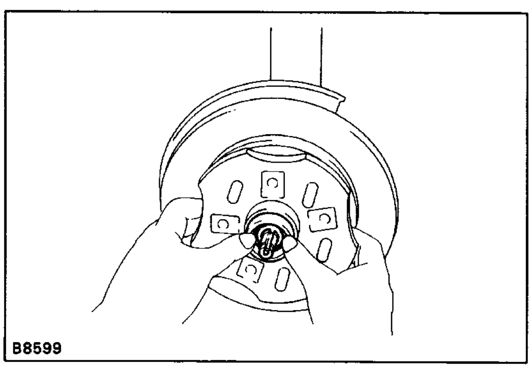
2. INSTALL KNUCKLE ARM AND DUST COVER

(a) Install the knuckle arm and the dust cover.

(b) Torque the bolts and nuts.

Torque: 108 N–m (1,100 kgf–cm, 80 ft–lbf)

(c) Secure the nuts with new cotter pins.



3. INSTALL FRONT AXLE HUB AND BRAKE CALIPER

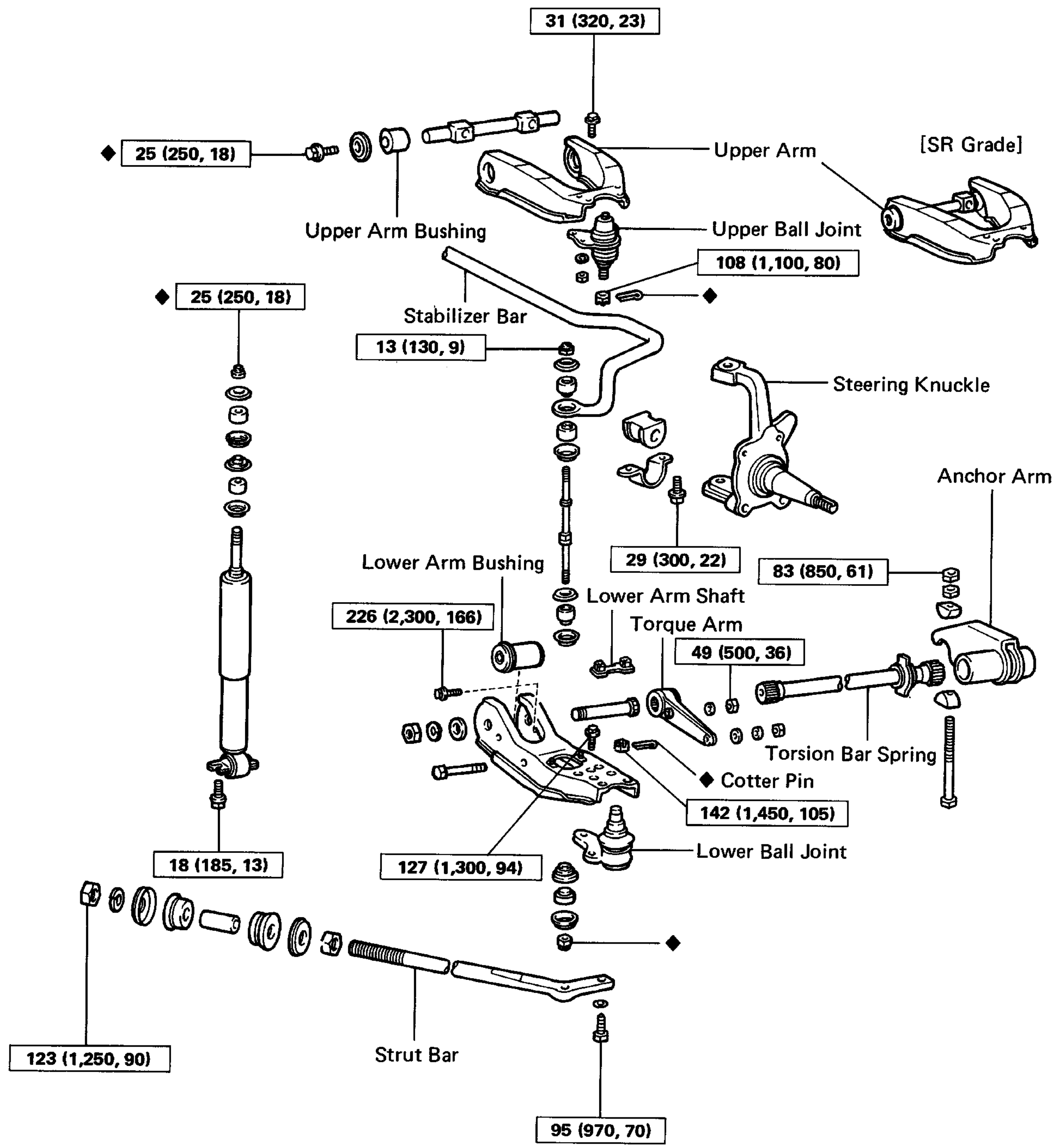
(See page SA–13)

4. CHECK FRONT WHEEL ALIGNMENT

(See page SA–3)

FRONT SUSPENSION

COMPONENTS



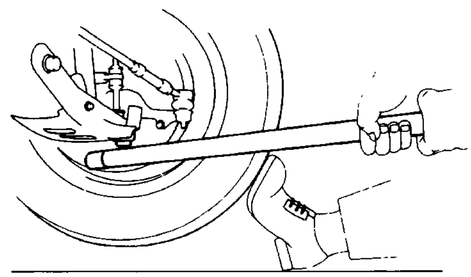
N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

Ball Joint

(See page SA–17)

INSPECTION OF BALL JOINTS


FA0031

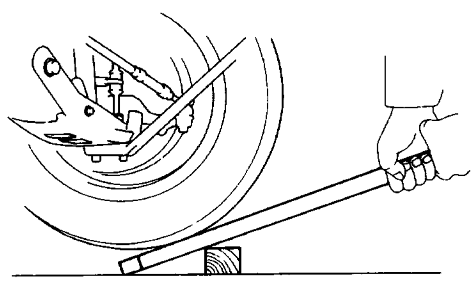
1. INSPECT LOWER BALL JOINT FOR EXCESSIVE LOOSENESS

(a) Jack up the front of the vehicle and support it with stands.

(b) Make sure the front wheels are in a straight forward position, and depress the brake pedal.

(c) Move the lower arm up and down and check that the lower ball joint has no excessive play.

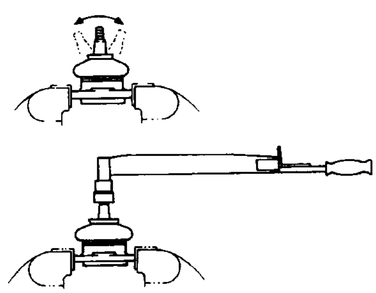
Maximum vertical play: 0 mm (0 in.)


FA0032

2. INSPECT UPPER BALL JOINT FOR EXCESSIVE LOOSENESS

Move the wheel up and down and check that the upper ball joint has no excessive play.

Maximum vertical play: 2.3 mm (0.091 in.)


R01343

3. INSPECT BALL JOINT ROTATION CONDITION

(a) Remove the ball joint.

(b) As shown in the figure, flip the ball joint stud back and forth 5 times before installing the nut.

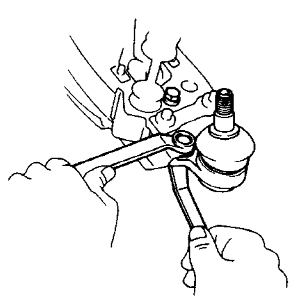
(c) Using a torque gauge, turn the nut continuously one turn every 2–4 seconds and take the torque reading on the 5th turn.

Torque (turning):

Lower ball joint 0.1 – 4.9 N–m
(1– 50 kgf –cm, 1 – 43 in.–lbf)

Upper ball joint 2.0 – 3.9 N–m
(20– 40 kgf –cm, 17 – 35 in.–lbf)

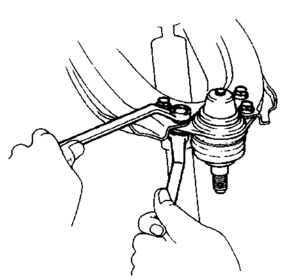
REMOVAL OF BALL JOINTS


FA0033

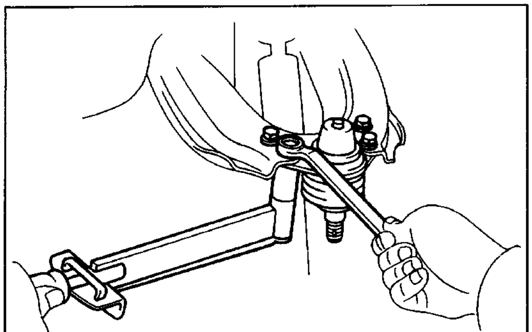
1. REMOVE STEERING KNUCKLE

(See page SA–15)

2. REMOVE LOWER BALL JOINT FROM LOWER ARM


FA0034

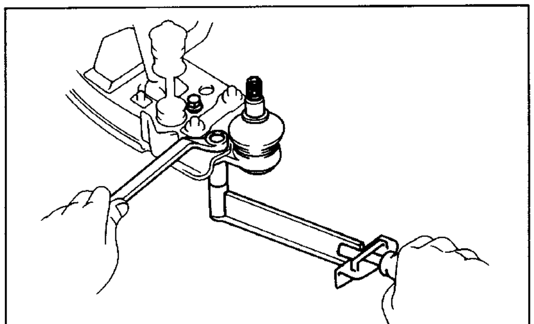
3. REMOVE UPPER BALL JOINT FROM UPPER ARM


FA0035

INSTALLATION OF BALL JOINTS

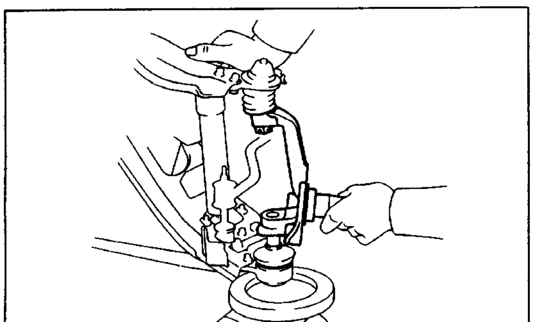
1. INSTALL UPPER BALL JOINT TO UPPER ARM

Torque: 31 N–m (320 kgf–cm, 23 ft–lbf)


FA0036

2. INSTALL LOWER BALL JOINT TO LOWER ARM

Torque: 127 N–m (1,300 kgf–cm, 94 ft–lbf)


FA0028

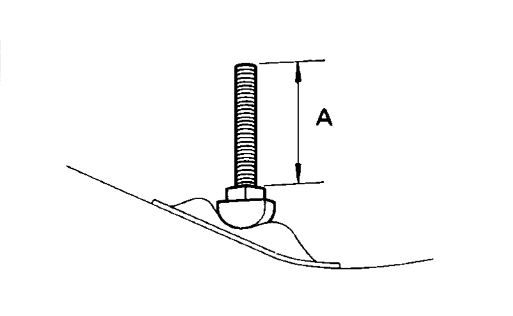
3. INSTALL STEERING KNUCKLE

(See page SA–16)

Torsion Bar Spring

(See page SA–17)

REMOVAL OF TORSION BAR SPRING

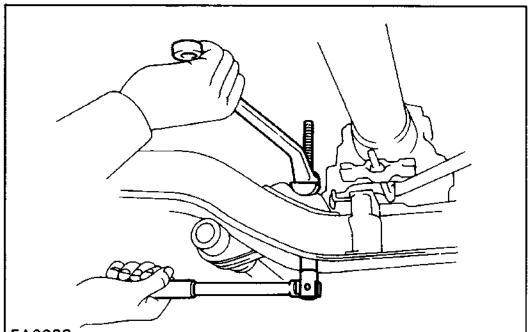


FA0037

1. JACK UP AND SUPPORT FRAME ON STANDS

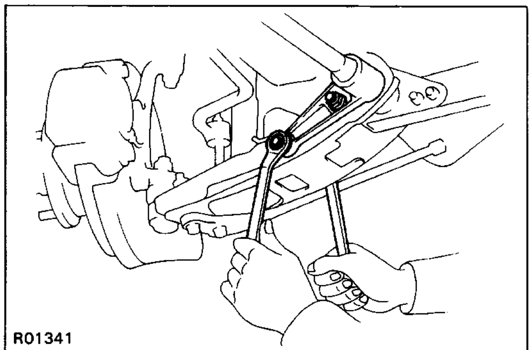
2. REMOVE LOCK NUT AND MEASURE PROTRUDING BOLT END "A", AS SHOWN

HINT: Use this measurement for reference when adjusting the chassis ground clearance.


FA0038

3. REMOVE DUST COVER

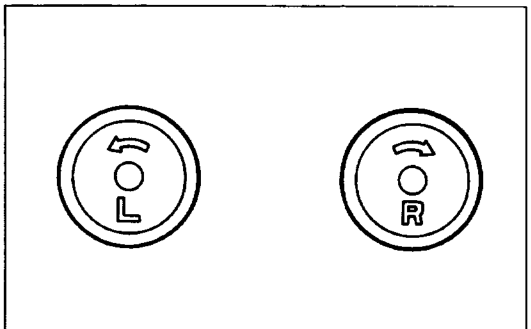
4. LOOSEN ADJUSTING NUT UNTIL NO TENSION ON TORSION BAR


R01341

5. REMOVE TORQUE ARM, TORSION BAR SPRING AND ANCHOR ARM

(a) Remove the torque arm mounting nuts.

(b) Remove the anchor arm from the adjusting bolt and then remove the torsion bar together with the torque arm and anchor arm.



Z7998

INSTALLATION OF TORSION BAR SPRING

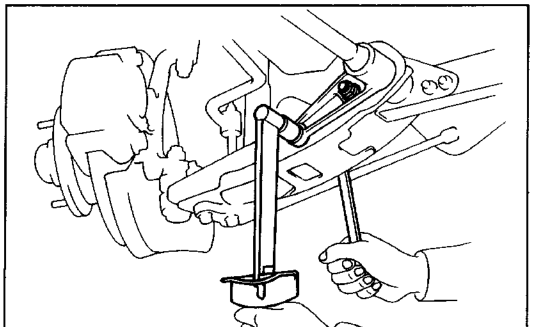
HINT: There are left and right identification marks on the rear end of the torsion bar springs.
Be careful not to interchange the torsion bar springs.

1. INSTALL TORSION BAR SPRING AND ANCHOR ARM AND TORQUE ARM

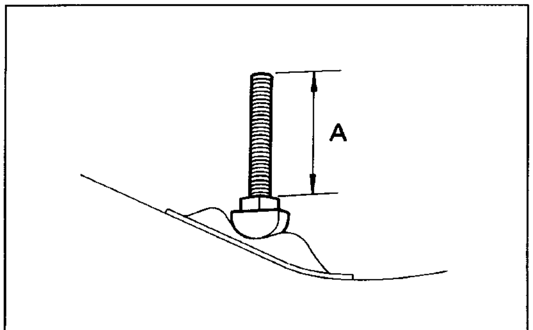
(a) Apply a light coat of MP grease to the spline of the torsion bar spring.

(b) Align the toothless portion and install the anchor arm to the torsion bar spring.

(c) Align the toothless portion and install the torque arm to the torsion bar spring.

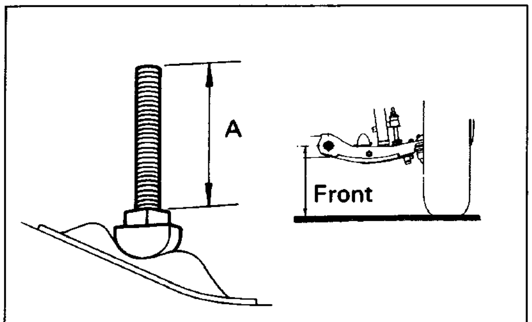

R01342

(d) Install the torsion bar spring torque arm side and install the anchor arm to the adjusting bolt.
(e) Torque the torque arm nuts.
Torque: 49 N–m (500 kgf–cm, 36 ft–lbf)



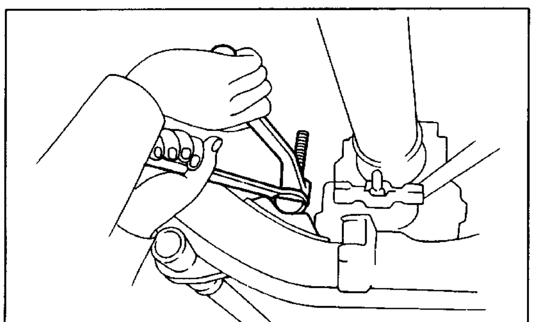
FA0037

(f) Tighten the adjusting nut so that the bolt protrusion is equal to that before removal.



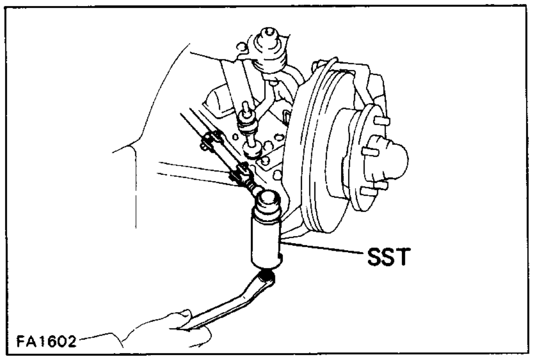
FA0037 FA0009

(g) Install the wheel and remove the stands. Bounce the
vehicle to settle the suspension.
(h) Adjust the chassis ground clearance by turning the adjusting nut.
Chassis ground clearance: See page A–23


FA0041

2. TORQUE LOCK NUT
Torque: 83 N–m (850 kgf–cm, 61 ft–lbf)

3. INSTALL DUST COVER

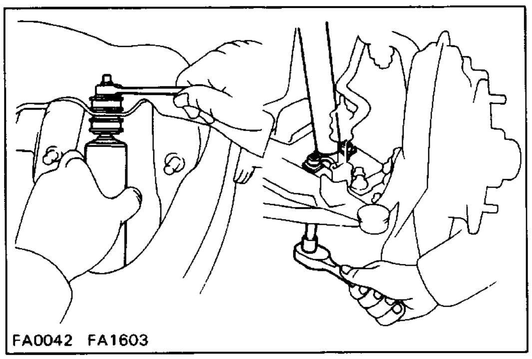


Lower Suspension Arm and Shock Absorber

(See page SA–17)

REMOVAL OF LOWER SUSPENSION ARM AND SHOCK ABSORBER

1. REMOVE TORSION BAR SPRING (See page SA–20)



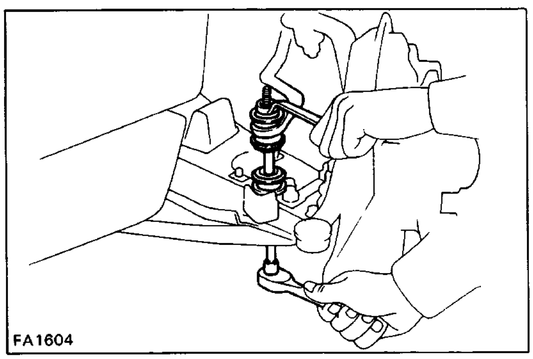
2. DISCONNECT TIE ROD END

(a) Remove the cotter pin and nut.

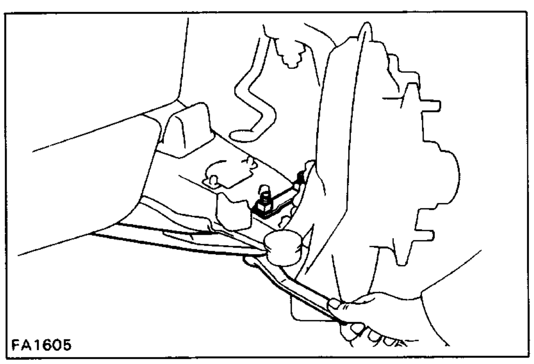
(b) Using SST, disconnect the tie rod end.

SST 09610–20012

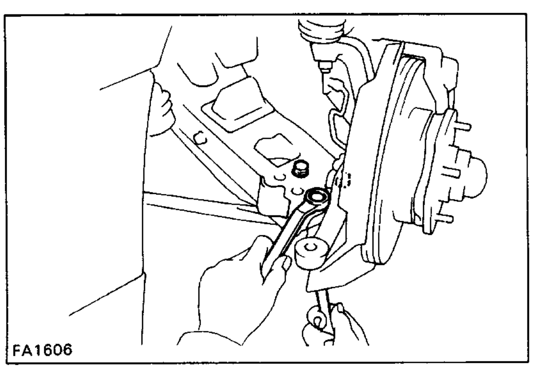
3. REMOVE SHOCK ABSORBER



4. DISCONNECT STABILIZER BAR FROM LOWER ARM

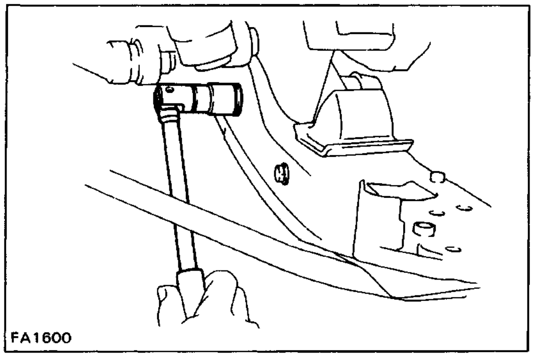


5. DISCONNECT STRUT BAR FROM LOWER ARM



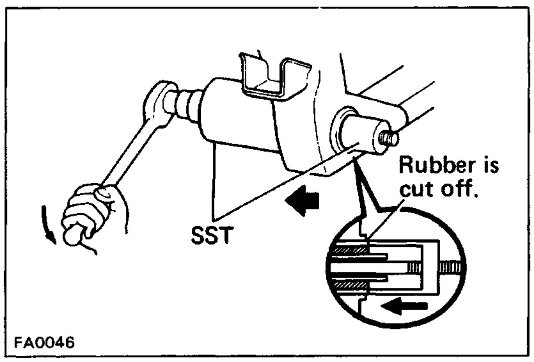
6. DISCONNECT LOWER BALL JOINT

Remove the three bolts and disconnect the lower bal joint.



7. REMOVE LOWER SUSPENSION ARM

Remove the nut and lower suspension arm.

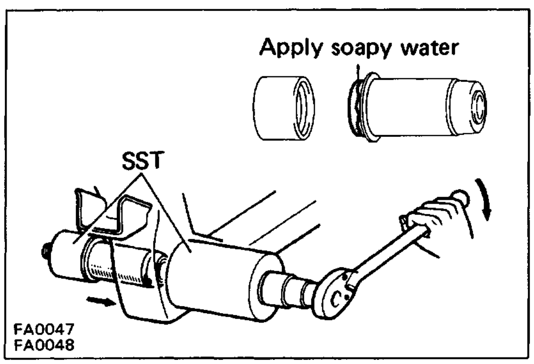


REPLACEMENT OF LOWER ARM BUSHING

1. REMOVE BUSHING

(a) Cut off the bushing rubber as shown in the figure.

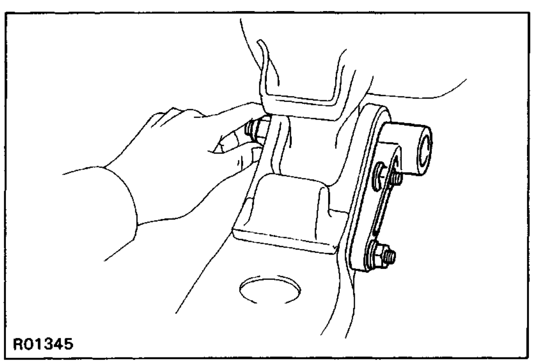
(b) Using SST, remove the bushing.
SST 09726–35010



2. INSTALL BUSHING

(a) Apply soapy water on the front rubber part of the bushing and fit SST on the new bushing.
SST 09726–35010

(b) Using SST, install the new bushing.
SST 09726–35010



INSTALLATION OF LOWER SUSPENSION ARM AND SHOCK ABSORBER

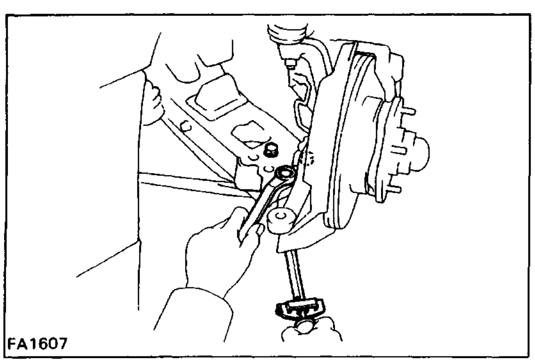
1. INSTALL LOWER SUSPENSION ARM

(a) Install the torque arm mounting bolts to the lower arm.

(b) Place the torque arm on the lower arm shaft.
Set the lower arm in installation position, and install the lower arm shaft and torque arm.

(c) Temporarily install the torque arm.

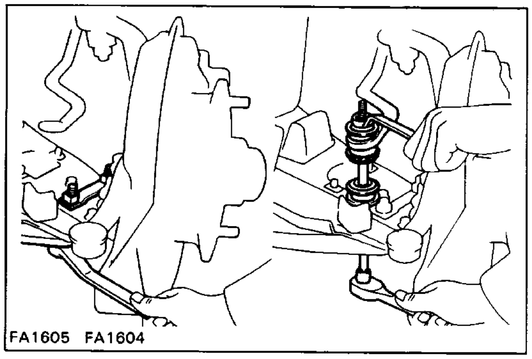
(d) Finger tighten the lower arm, and remove the torque arm.
HINT: Do not torque the nut.



2. CONNECT LOWER BALL JOINT

Connect the lower ball joint to the lower suspension arm with the three bolts.

Torque: 127 N–m (1,300 kgf–cm, 94 ft–lbf)

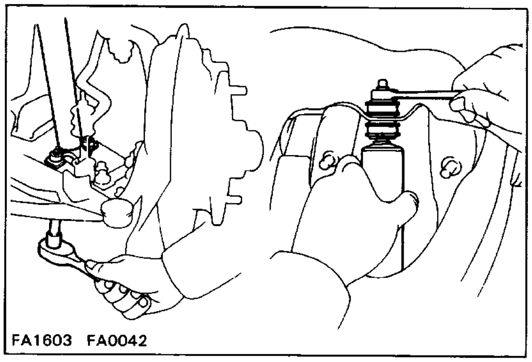


3. CONNECT STRUT BAR TO LOWER ARM

Torque: 95 N–m (970 kgf–cm, 70 ft–lbf)

4. CONNECT STABILIZER BAR TO LOWER SUSPENSION ARM

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



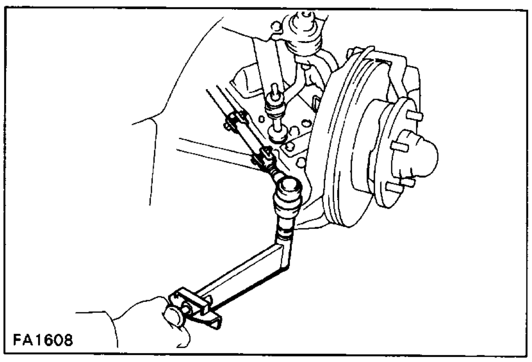
5. INSTALL SHOCK ABSORBER

(a) Install the shock absorber to the lower suspension arm.

Torque: 18 N–m (185 kgf –cm, 13 ft–lbf)

(b) Install the shock absorber to the upper bracket.

Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)



6. CONNECT TIE ROD END

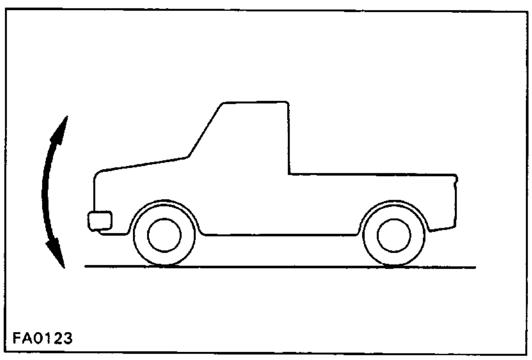
(a) Connect the tie rod end to the steering knuckle arm and install and torque the nut.

Torque: 90 N–m (920 kgf–cm, 67 ft–lbf)

(b) Secure the nut with a new cotter pin.

7. INSTALL TORSION BAR SPRING

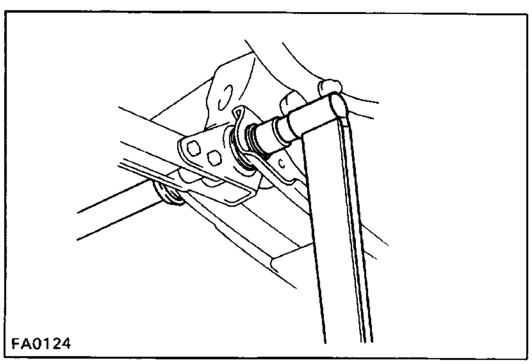
(See page SA–20)



8. TORQUE LOWER SUSPENSION ARM SHAFT NUT

(a) Install the wheel.

(b) Remove the stands and bounce the vehicle up and down to stabilize the suspension.

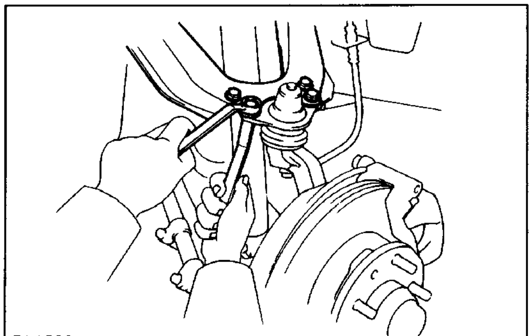


(c) Torque the nut.

Torque: 226 N–m (2,300 kgf–cm, 166 ft–lbf)

9. CHECK FRONT WHEEL ALIGNMENT

(See page SA–3)


FA1598

Upper Suspension Arm

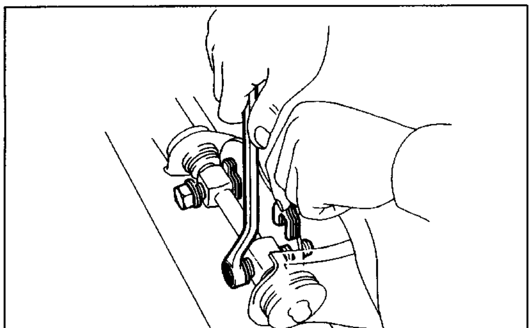
(See page SA–17)

REMOVAL OF UPPER SUSPENSION ARM

1. DISCONNECT UPPER BALL JOINT FROM UPPER ARM

(a) Support the lower arm with a jack.

(b) Remove the four bolts and nuts, and disconnect the upper arm.

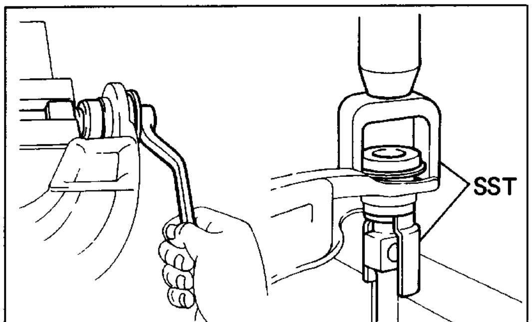

FA0126

2. REMOVE UPPER SUSPENSION ARM

(a) Remove the bolts and camber adjusting shims.

(b) Remove the upper arm.

HINT: Do not loose the camber adjusting shims. Record the position, and the thickness of camber adjusting shims so that these can be reinstalled to their original location.



FA0127 FA0128

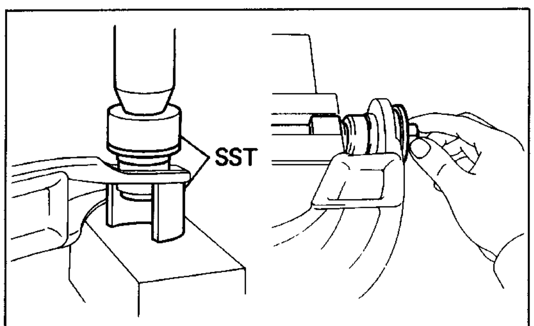
REPLACEMENT OF UPPER ARM BUSHING

1. REMOVE BUSHING

(a) Remove the bolts and washers.

(b) Using SST, push out the bushings.

SST 09710–30020 (09710–03030, 09710–03040)



FA0129 FA0130

2. INSTAL BUSHING

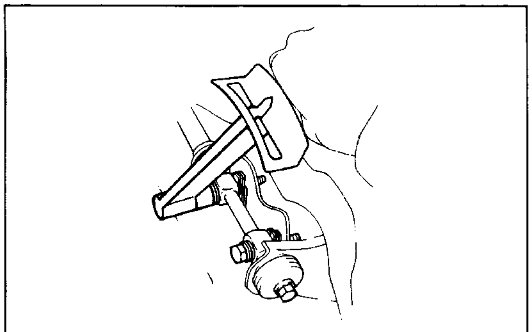
(a) Using SST, push in the bushings.

SST 09710–30020 (09710–03060, 09710–03050)

(b) Install the washers, and finger tighten the bolts.

HINT: Do not torque the bolts.

INSTALLATION OF UPPER SUSPENSION ARM


FA0135

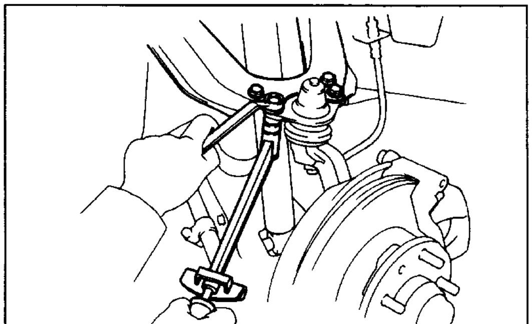
1. INSTALL UPPER ARM

(a) Install the upper arm together with the camber adjusting shims.

(b) Torque the bolts.

Torque: 96 N–m (980 kgf–cm, 71 ft–lbf)

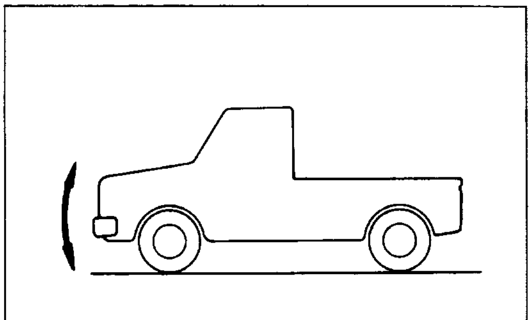
HINT: Install an equal number and thickness of shims in their original position.


FA1599

2. CONNECT UPPER ARM

Connect the upper arm with the four bolts and nuts.

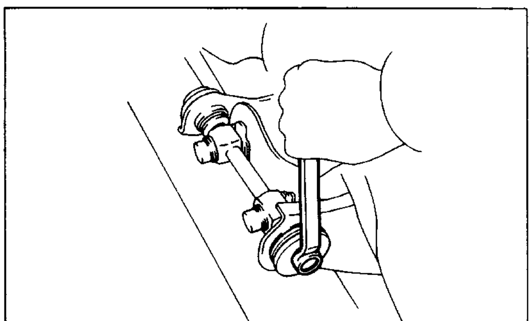
Torque: 31 N–m (320 kgf–cm, 23 ft–lbf)


FA0123

3. TORQUE UPPER ARM SHAFT BOLTS

(a) Install the wheel.

(b) Remove the stands and bounce the vehicle up and down to stabilize the suspension.

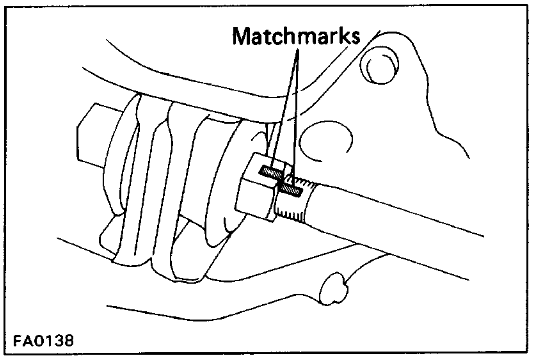

FA0137

(c) Torque the upper arm shaft bolts.

Torque: 126 N–m (1,280 kgf–cm, 93 ft–lbf)

4. CHECK FRONT WHEEL ALIGNMENT

(See page SA–3)

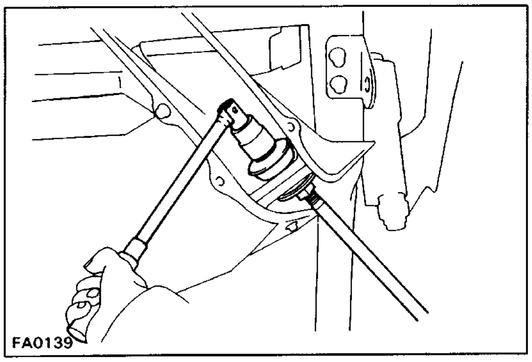


Strut Bar

(See page SA–17)

REMOVAL OF STRUT BAR

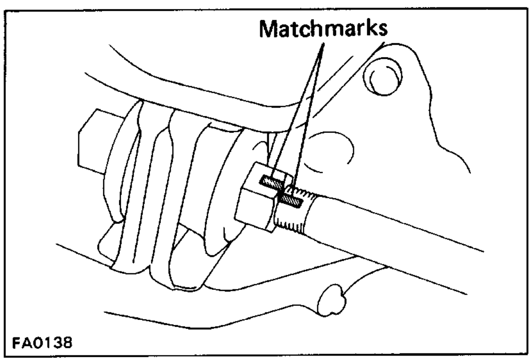
1. PLACE MATCHMARKS ON STRUT BAR



2. REMOVE FRONT NUT FROM STRUT BAR

3. REMOVE STRUT BAR FROM LOWER ARM

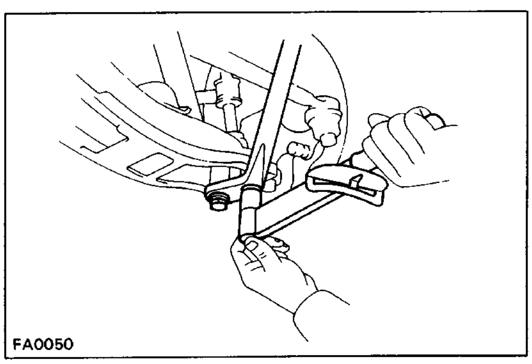
Remove the nuts holding the strut bar to the lower arm, and remove the strut bar.



INSTALLATION OF STRUT BAR

1. INSTALL FRONT NUT

Install the front nut and align the matchmarks on the strut bar.



2. INSTALL STRUT BAR TO BRACKET

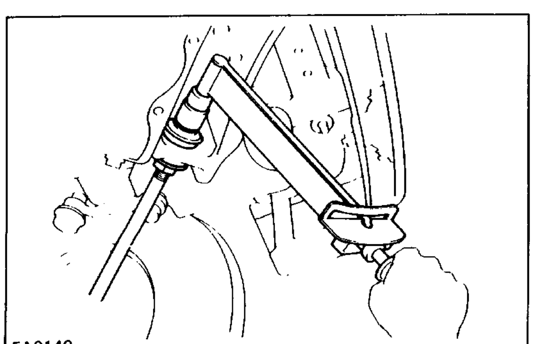
(a) Install the washer and bushing to the strut bar and install it to the bracket.

(b) Install the collar, bushing and washer to the strut bar.

(c) Finger tighten the front nut.

3. CONNECT STRUT BAR TO LOWER ARM

Torque: 95 N–m (970 kgf–cm, 70 ft–lbf)



4. TORQUE FRONT NUT

(a) Remove the stands and the vehicle to stabilize the suspension.

(b) Torque the front nut.

Torque: 123 N–m (1,250 kgf–cm, 90 ft–lbf)

5. CHECK FRONT WHEEL ALIGNMENT

(See page SA–3)

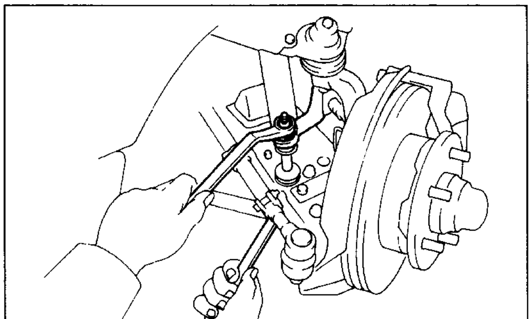
Stabilizer Bar

(See page SA–17)

REMOVAL OF STABILIZER BAR

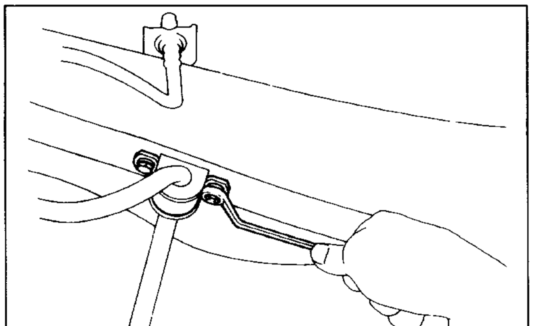
1. REMOVE ONE TORSION BAR SPRING

(See page SA–20)

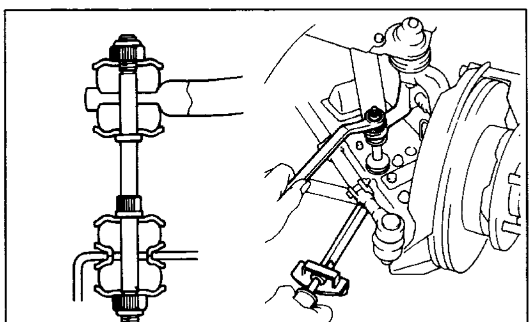

FA1610

2. REMOVE STABILIZER BAR FROM LOWER ARMS

(a) Remove the nuts and cushions holding both sides of the stabilizer bar from the lower arms, and discon–nect the stabilizer bar.


FA0141

(b) Remove both stabilizer bar bushings and brackets, and remove the stabilizer bar.


FA0474 FA1609

INSTALLATION OF STABILIZER BAR

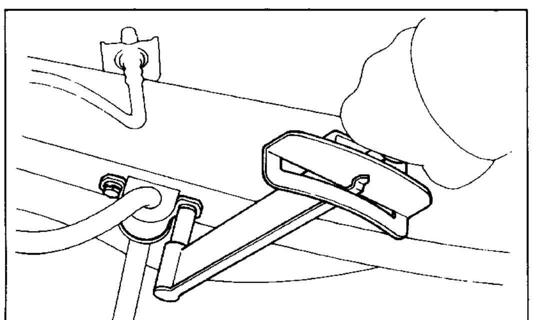
1. PLACE STABILIZER BAR TO FRAME

Place the stabilizer bar in position and install both stabi–lizer bar bushings and brackets to the frame.
Finger tighten the bolts.

2. CONNECT STABILIZER BAR TO LOWER ARMS

Connect the stabilizer bar on both sides to the lower arms with bolts, cushions and new nuts as shown. Torque the nuts.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)


FA0143

3. TORQUE BRACKET SET BOLTS

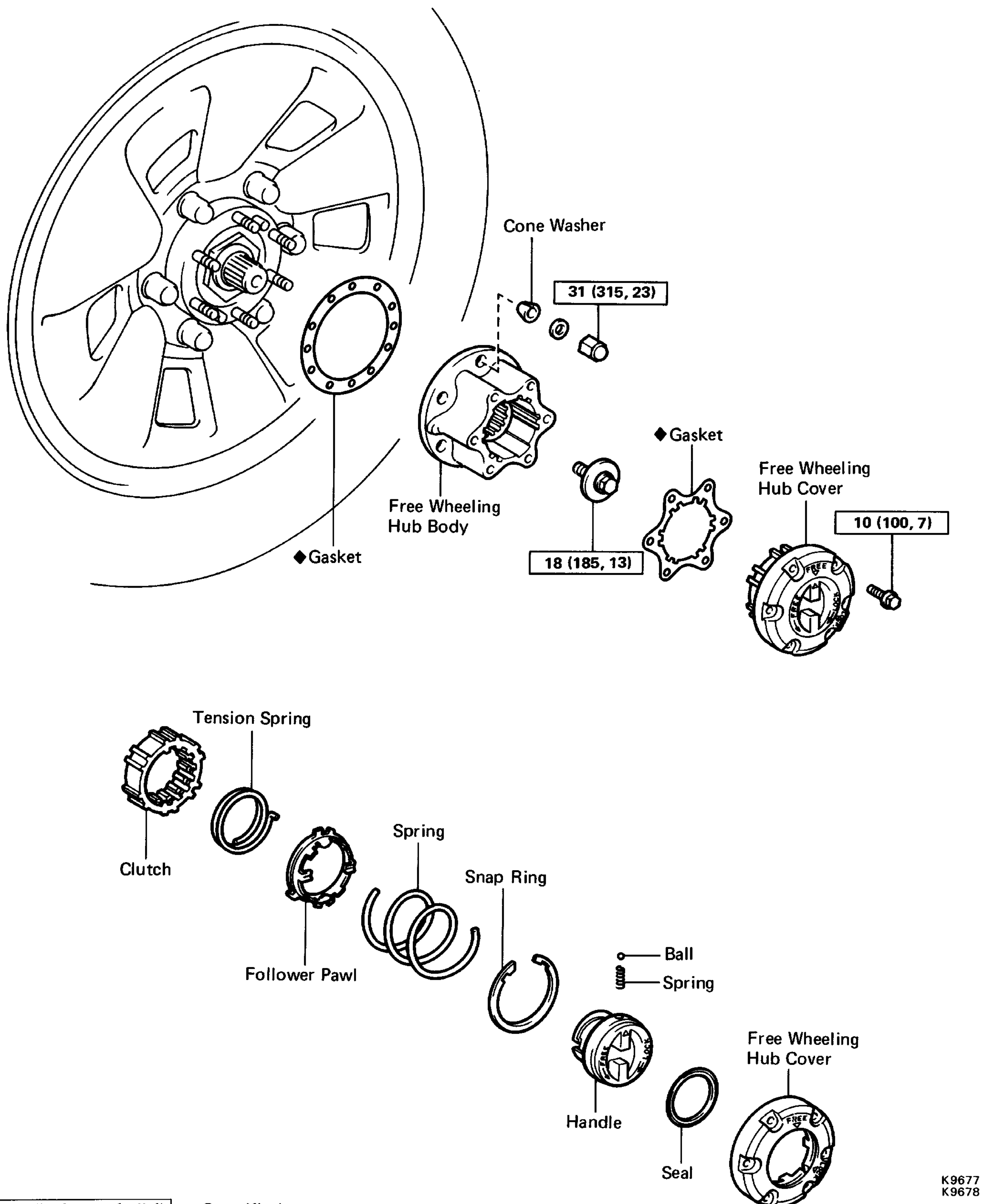
Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)

4. INSTALL TORSION BAR SPRING

(See page SA–20)

FREE WHEELING HUB

COMPONENTS

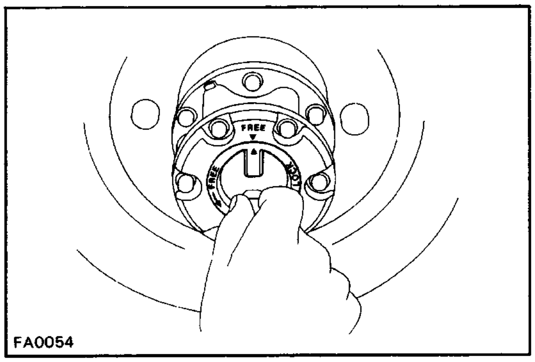


N·m (kgf·cm, ft·lbf) : Specified torque

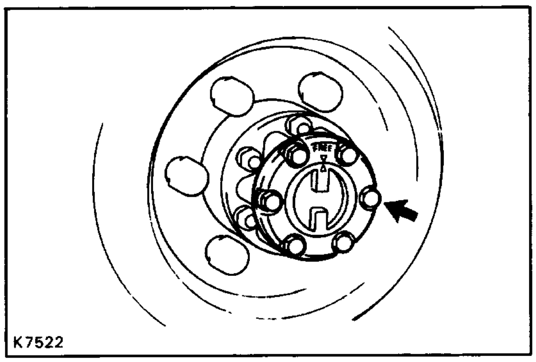
◆ Non-reusable part

REMOVAL OF FREE WHEELING HUB

1. REMOVE FREE WHEELING HUB COVER

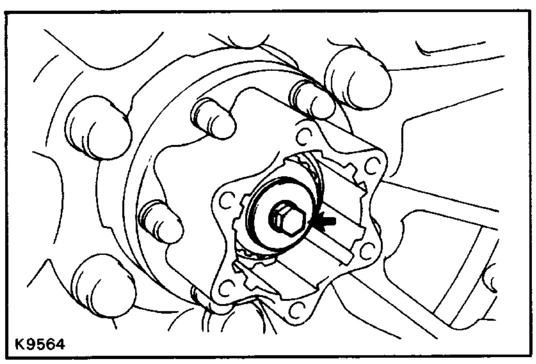

FA0054

(a) Set the control handle to FREE.

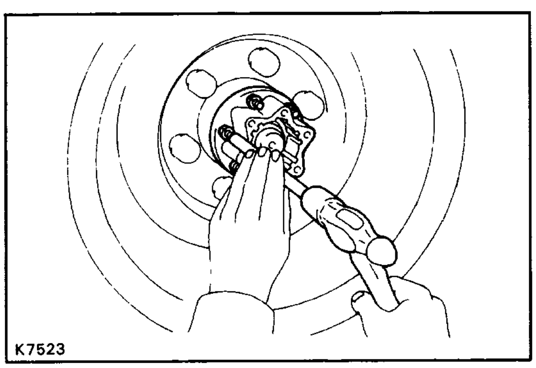

K7522

(b) Remove the cover mounting bolts and pull off the cover.

2. REMOVE BOLT WITH WASHER


K9564

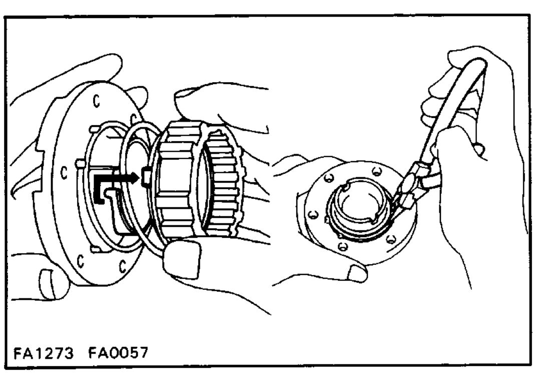
3. REMOVE FREE WHEELING HUB BODY


K7523

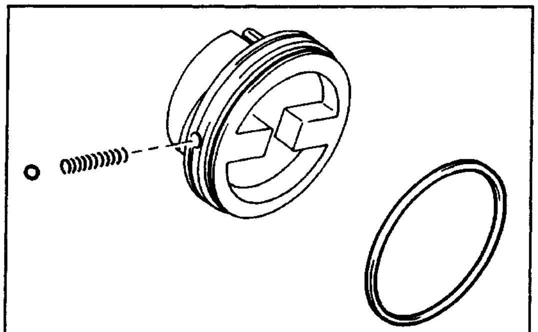
(a) Remove the mounting nuts and washers.
(b) Using a brass bar and hammer, tap on the bolts head and remove the cone washers.
(c) Pull off the free wheeling hub body.

DISASSEMBLY OF FREE WHEELING HUB

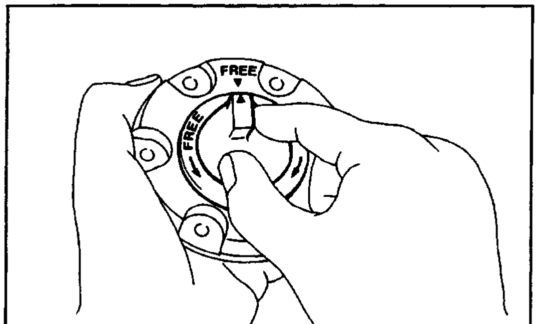
1. REMOVE CONTROL HANDLE FROM FREE WHEELING HUB COVER


FA1273 FA0057

(a) Compressing the spring, remove the pawl tab from the handle cam, and remove the clutch.
(b) Using snap ring pliers, remove the snap ring.
(c) Remove the control handle.


SA0321

(d) Remove the steel ball, spring and seal from the con–trol handle.

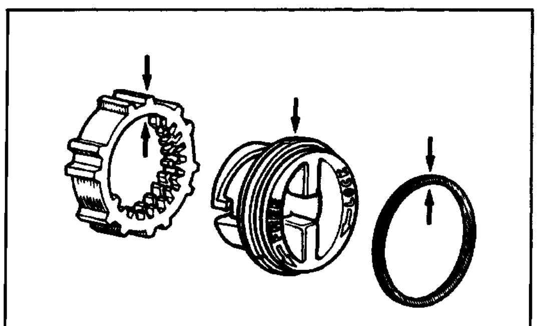


FA0060

INSPECTION OF FREE WHEELING HUB

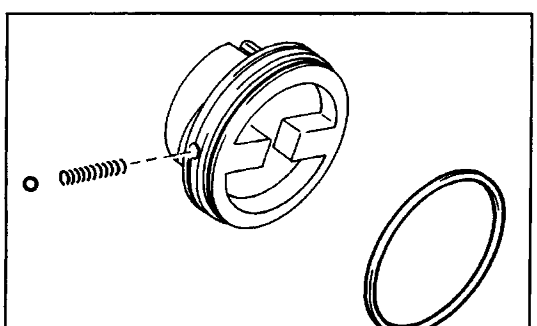
1. INSPECT COVER, HANDLE AND SEAL

Temporarily install the handle in the cover and check that the handle moves smoothly and freely.


SA1378

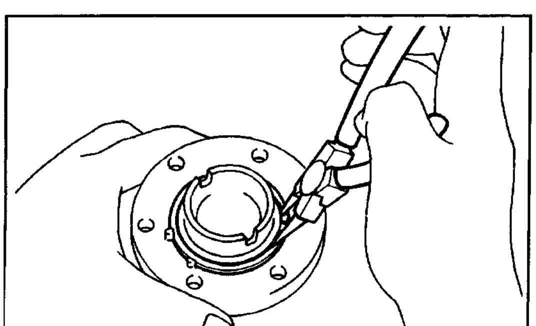
ASSEMBLY OF FREE WHEELING HUB

1. APPLY MP GREASE TO SLIDING SURFACE OF PARTS

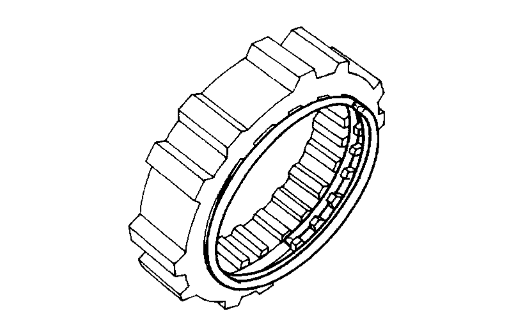

SA0321

2. INSTALL CONTROL HANDLE TO COVER

(a) Install the seal, spring and steel ball to the handle.


FA0057

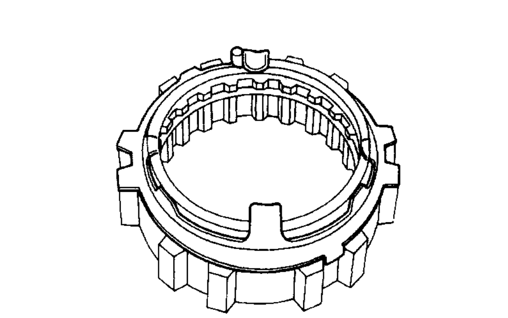
(b) Install the handle in the cover and install the snap ring with snap ring pliers.



FA0063

3. INSTALL TENSION SPRING IN CLUTCH

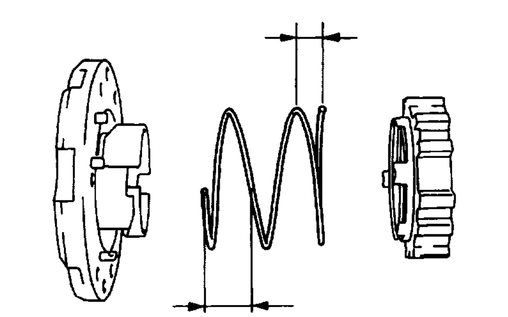
Install the tension spring in the clutch with the spring end aligned with the initial groove.



FA0064

4. INSTALL FOLLOWER PAWL TO CLUTCH

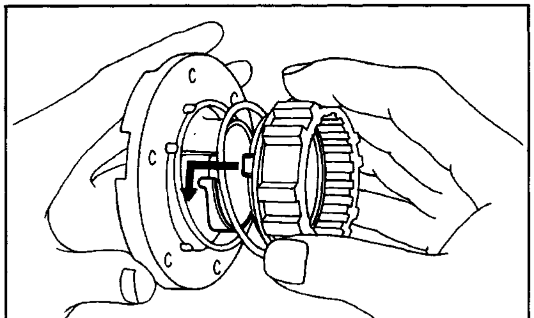
(a) Place the follower pawl on the tension spring with one of the large tabs against the bent spring end.
(b) Place the top ring of the spring on the small tabs.



SA0323

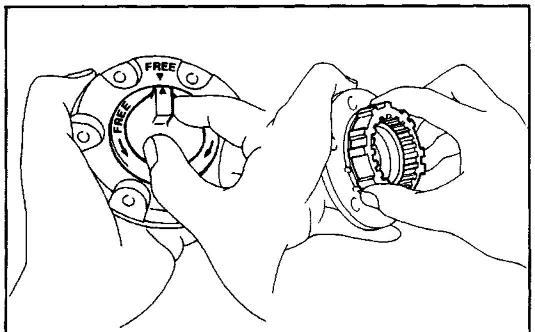
5. INSTALL CLUTCH AND SPRING INTO COVER

(a) Place the spring between the cover and clutch with the large spring end toward the cover.



FA0065

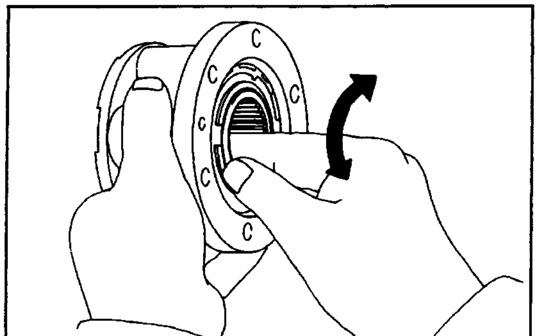
(b) Compress the spring and install the clutch with the pawl tab fit to the handle cam.



FA0060 FA0066

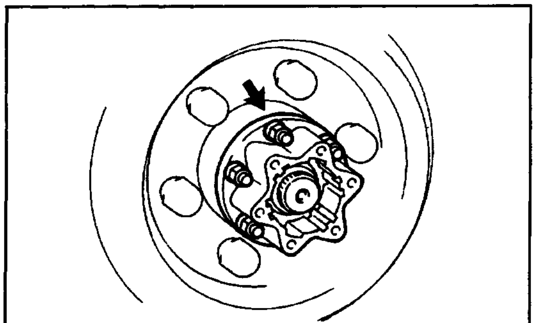
6. TEMPORARILY INSTALL COVER TO BODY AND CHECK FREE WHEELING HUB

(a) Set the control handle and clutch to the FREE posi–tion.



FA0067

(b) Insert the cover in the body and verify that the inner hub turns smoothly.
(c) Remove the cover from the body.

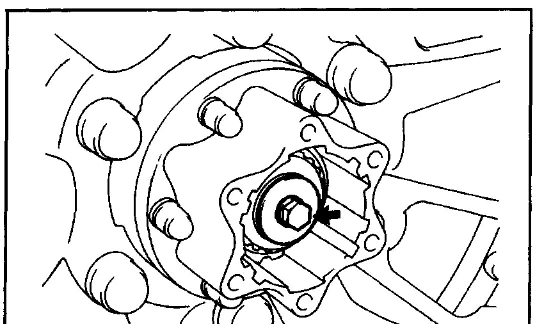


K7526

INSTALLATION OF FREE WHEELING HUB

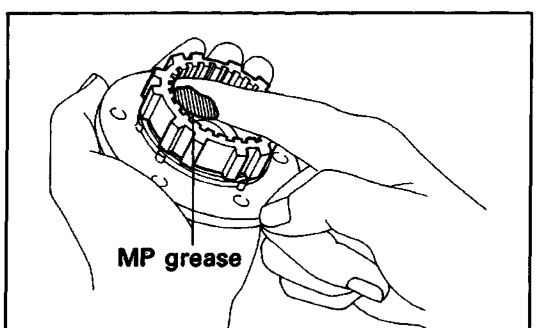
1. INSTALL FREE WHEELING HUB BODY

(a) Place a new gasket in position on the front axle hub.
(b) Install the free wheeling hub body with six cone washers and nuts. Tighten the nuts.
Torque: 31 N–m (315 kgf–cm. 23 ft–lbf)



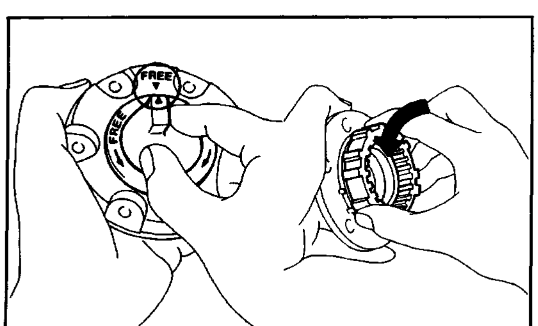
K9564

2. INSTALL BOLT WITH WASHER
Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)



FA0070

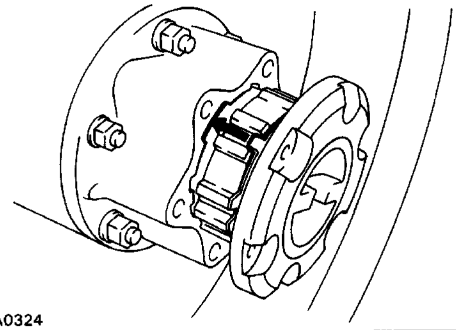
3. APPLY MP GREASE TO INNER HUB SPLINES



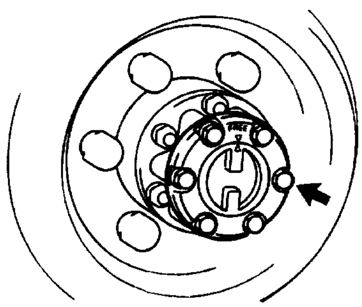
FA0060 FA0066

4. INSTALL FREE WHEELING HUB COVER WITH NEW GASKET

(a) Set the control handle and clutch to the FREE position.
(b) Place a new gasket in position on the cover.


SA0324

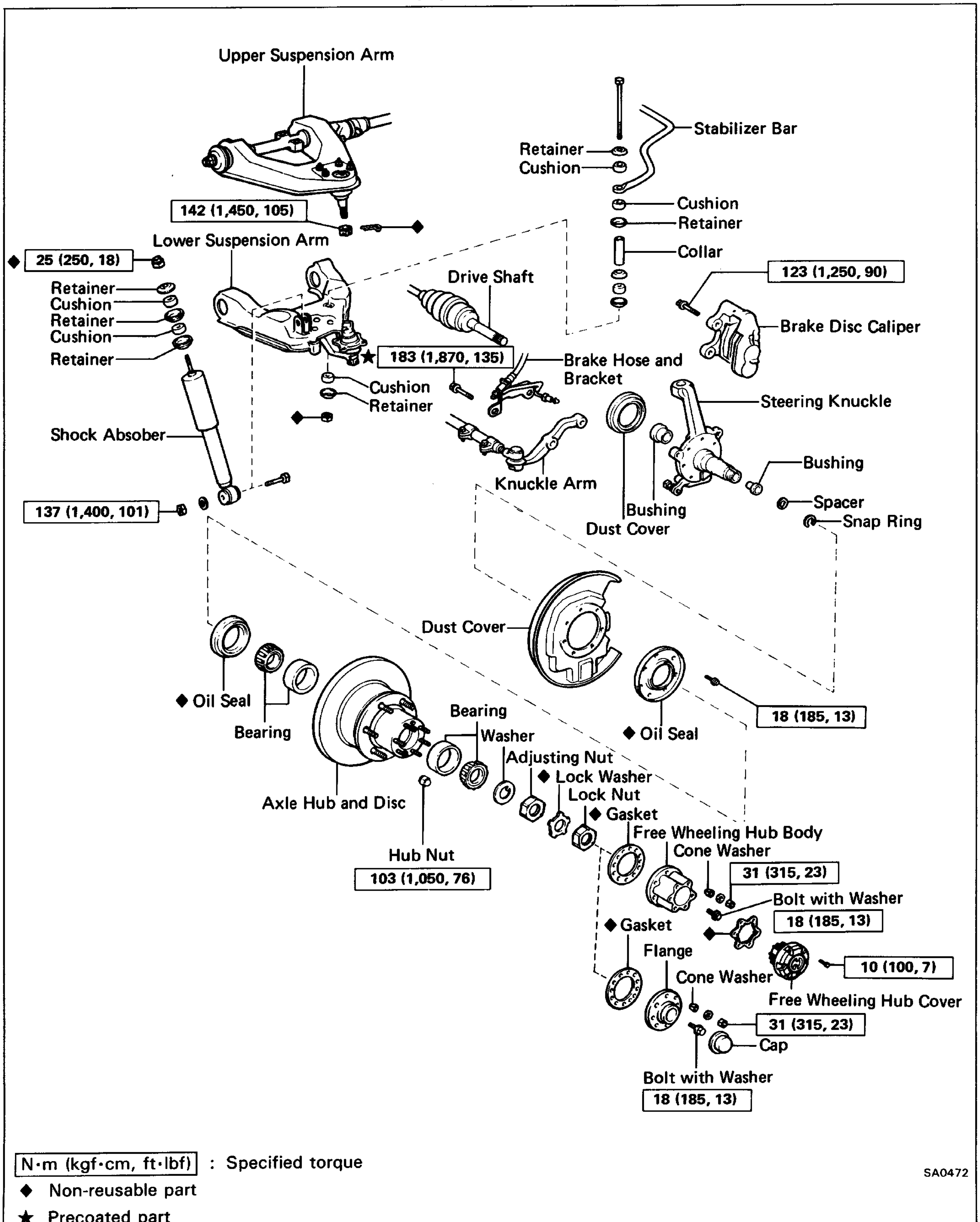
(c) Install the cover to the body with the follower pawl tabs aligned with the non–toothed portions of the body.


K7522

(d) Tighten the cover mounting bolts.
Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)

FRONT AXLE HUB AND STEERING KNUCKLE

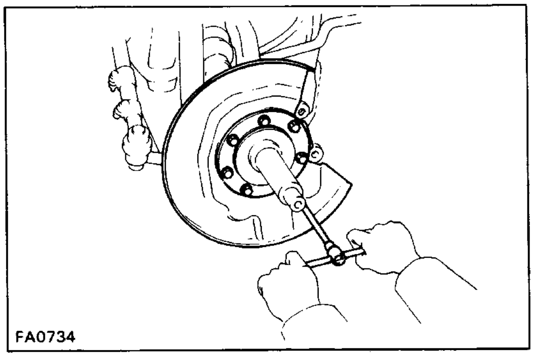
COMPONENTS



Steering Knuckle

(See page SA–35)

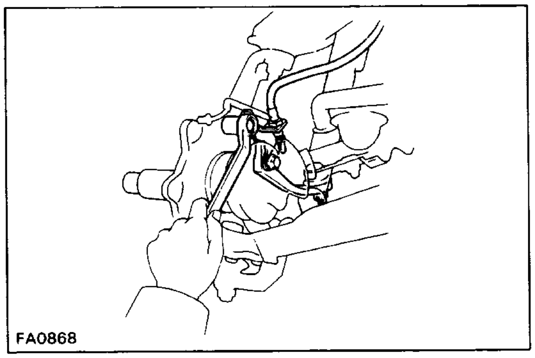
REMOVAL OF STEERING KNUCKLE



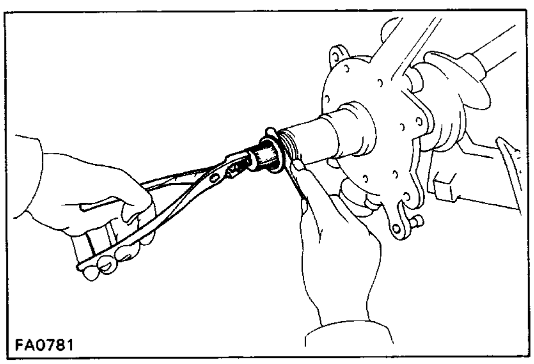
1. REMOVE DISC BRAKE CYLINDER AND FRONT AXLE HUB

(See page SA–36)

2. REMOVE DUST COVER AND OIL SEAL



3. DISCONNECT KNUCKLE ARM FROM STEERING KNUCKLE



4. MEASURE STEERING KNUCKLE BUSHING THRUST CLEARANCE

(a) Install a bolt in the drive shaft.

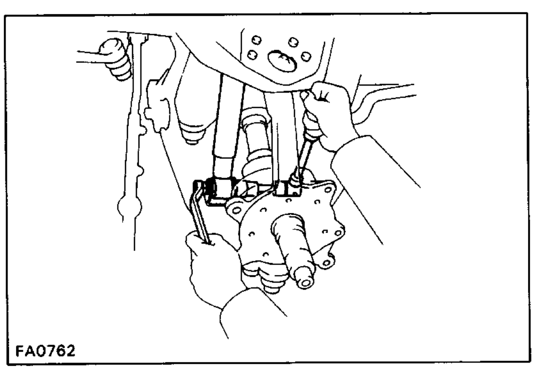
(b) Using a feeler gauge,measure the front drive shaft thrust clearance between the steering knuckle out–side bushing and spacer, by pulling the bolt and ap–plying 98 N (10 kgf, 22.0 lbf) of pressure.

Front drive shaft thrust clearance:

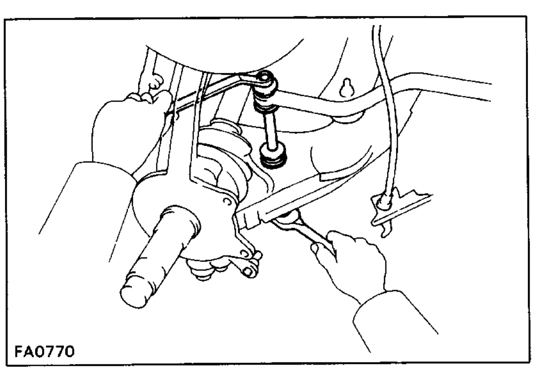
Standard clearance 0.075 – 0.690 mm (0.0030 – 0.0272 in.)

Maximum clearance 1.0 mm (0.039 in.)

If the measurement more than maximum, replace the steering knuckle outside and inside bushings.

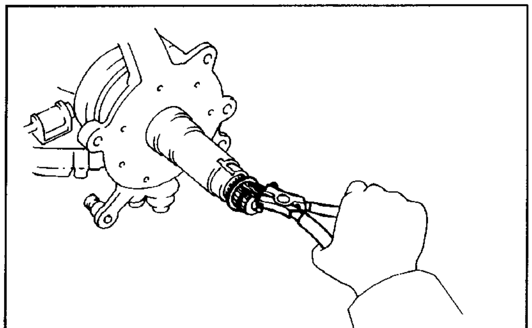


5. DISCONNECT FRONT SHOCK ABSORBER FROM LOW-ER SUSPENSION ARM



6. DISCONNECT STABILIZER BAR FROM LOWER SUSPEN SION ARM

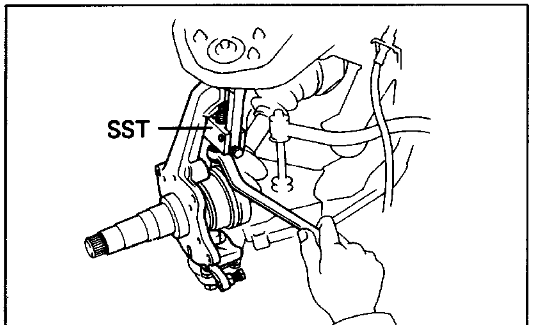
Remove the nut, bolt, retainers, cushions and collar, an(disconnect the stabilizer bar from the lower suspension arm.



FA0783

7. REMOVE SNAP RING AND SPACER

Using snap pliers, remove the snap ring and spacer.

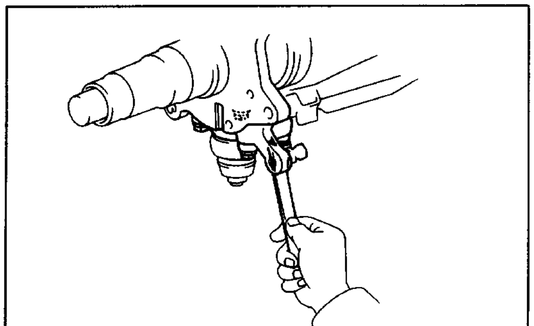


FA0817

8. REMOVE STEERING KNUCKLE

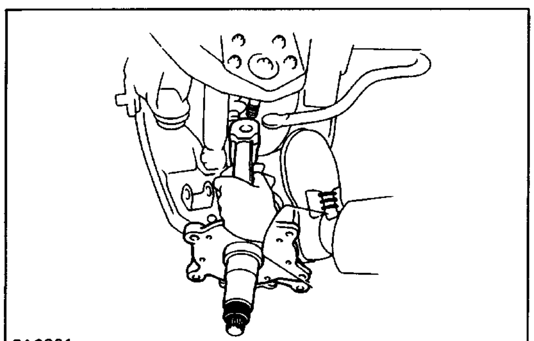
(a) Remove the cotter pin and nut from the upper ball joint.

(b) Using SST, disconnect the steering knuckle from the upper ball joint.
SST 09628–62011



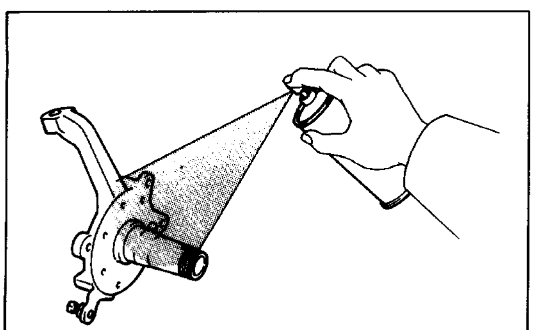
FA0873

(c) Remove the four bolts from the lower ball joint and disconnect the steering knuckle from the lower ball joint.



FA0821

(d) Push the lower suspension arm down and remove the steering knuckle.



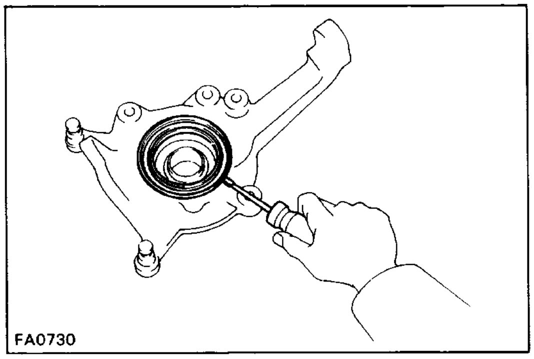
FA0735

INSPECTION AND REPLACEMENT OF STEERING KNUCKLE

1. INSPECT STEERING KNUCKLE

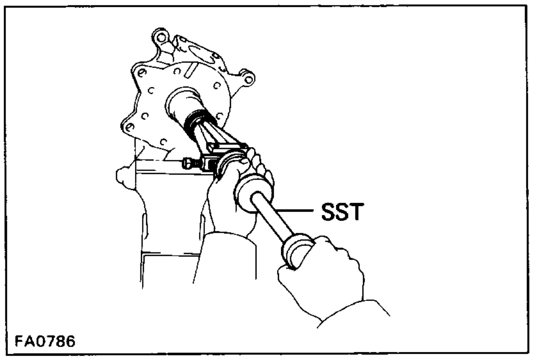
Using a dye penetrant, check the steering knuckle for cracks.

If crack is found, replace the steering knuckle.



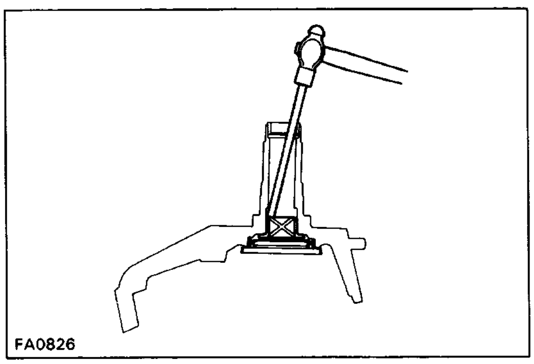
2. REMOVE DUST DEFLECTOR

Using a screwdriver, pry out the dust deflector from the steering knuckle.

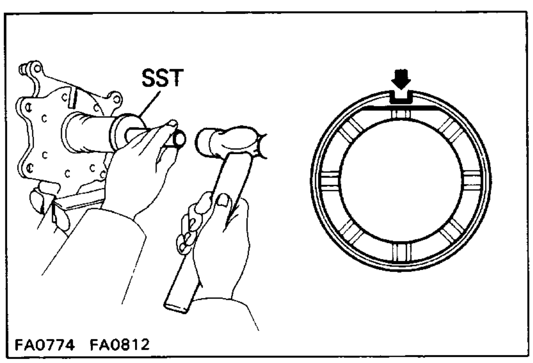


3. REMOVE STEERING KNUCKLE BUSHING

(a) Using SST, pull out the steering knuckle outside bushing.
SST 09308–00010

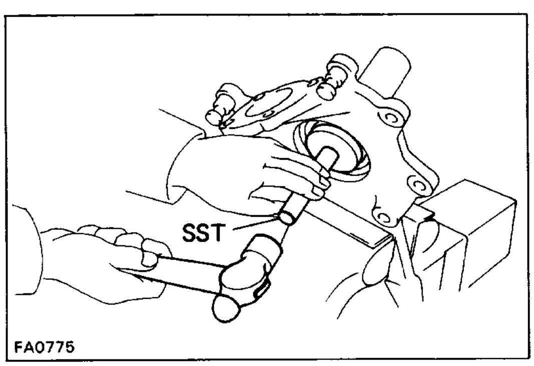


(b) Using a brass bar and hammer, drive out the steer–ing knuckle inside bushing.

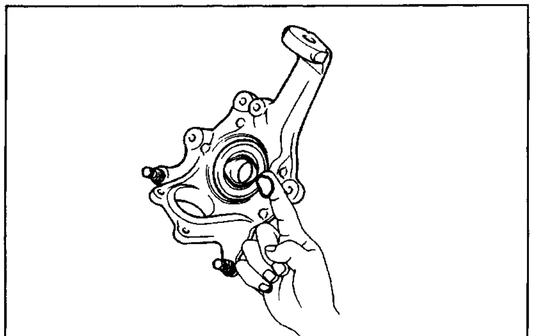


4. INSTALL STEERING KNUCKLE BUSHING

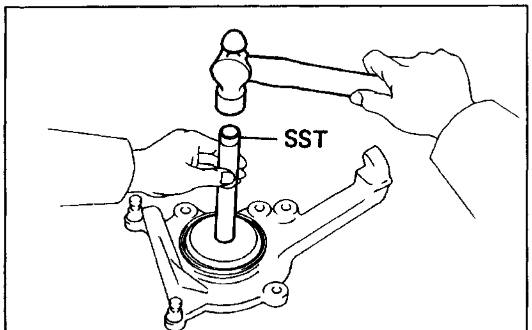
(a) Using SST and a hammer, tap in a new steering knuckle outside bushing.
SST 09550–10012 (09252–10010, 09555–10010)
HINT: When installing the bushing to the spindle, make sure the flat portion of the bushing is aligned with the spindle groove as shown in the figure.



(b) Using SST and a hammer, tap in a new steering knuckle inside bushing.
SST 09550–10012 (09252–10010, 09555–10010)


FA0874

(c) Apply molybdenum disulphide lithium base grease to the steering knuckle bushings.

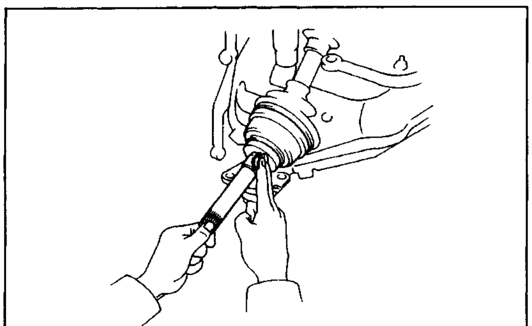


FA0731

5. INSTALL DUST DEFLECTOR TO STEERING KNUCKLE

Using SST and a hammer, tap in a new dust deflector.

SST 09608–35014 (09608–06020, 09608–06180)

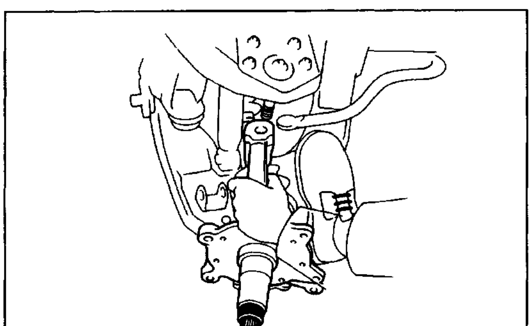

FA0866

INSTALLATION OF STEERING KNUCKLE

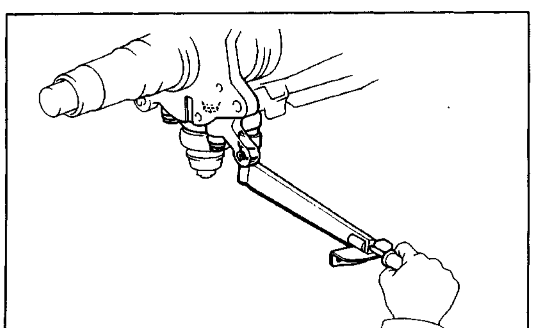
(See page SA–35)

1. INSTALL STEERING KNUCKLE

(a) Apply molybdenum disulphide lithium base grease to the drive shaft.

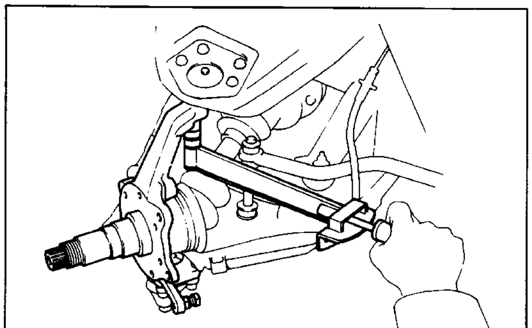

FA0821

(b) Push the lower suspension arm down and install the steering knuckle.

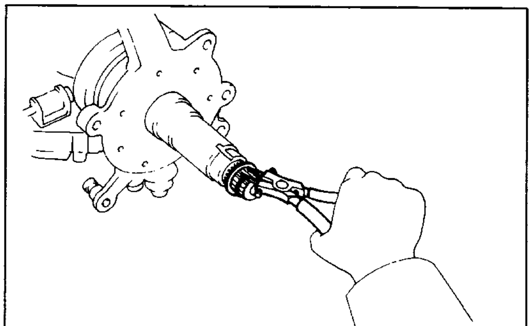

FA0854

(c) Connect the lower ball joint to the steering knuckle and install and torque the four bolts.

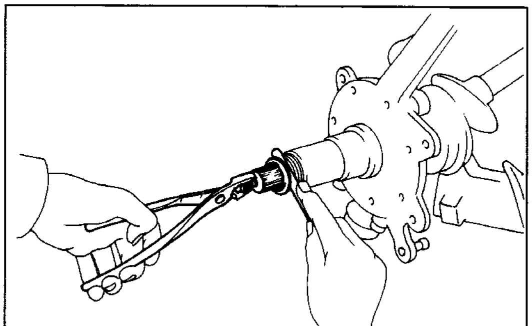
Torque: 58 N–m (590 kgf–cm, 43 ft–lbf)


FA0923

(d) Connect the upper ball joint to the steering knuckle and install and torque the nut.
Torque: 142 N–m (1,450 kgf–cm, 105 ft–lbf)
(e) Install a new cotter pin.


FA0783

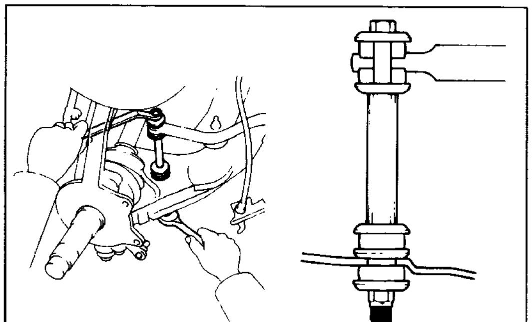
2. INSTALL SPACER AND SNAP RING
Install the spacer to the front drive shaft, and using snap ring pliers, install the snap ring.
If you replace the steering knuckle bushing, recheck the front drive shaft thrust clearance.
(a) Install the bolt in the shaft.


FA0781

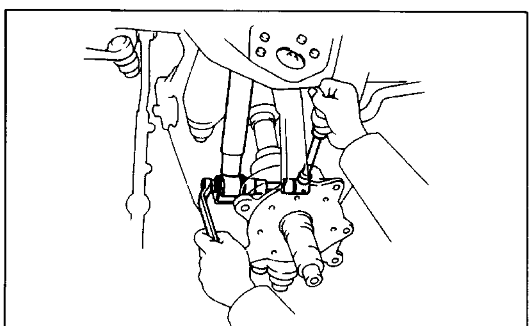
(b) Using a feeler gauge,measure the front drive shaft thrust clearance between the steering knuckle out– side bushing and spacer, by pulling the bolt and ap– plying 98 IV (10 kgf, 22.0 lbf) of pressure.
Front drive shaft thrust clearance:
Standard clearance 0.075 – 0.690 mm (0.0030 – 0.0272 in.)
If the clearance is not within specification, replace the spacer.

Spacer thickness

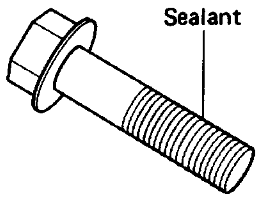
1.80 mm	(0.0709 in.)
2.25 mm	(0.0886 in.)


FA0770 D9679

3. CONNECT STABILIZER BAR TO LOWER SUSPENSION ARM
Jack up the stabilizer bar and install the retainers, cush– ions and collar as shown in the figure, and torque the nut.
Torque: 25 N–m (260 kgf–cm, 19 ft–lbf)


FA0762

4. CONNECT FRONT SHOCK ABSORBER TO LOWER SUS– PENSION ARM
Torque: 137 N–m (1,400 kgf–cm, 101 ft–lbf)



FA0833

5. CONNECT KNUCKLE ARM TO STEERING KNUCKLE

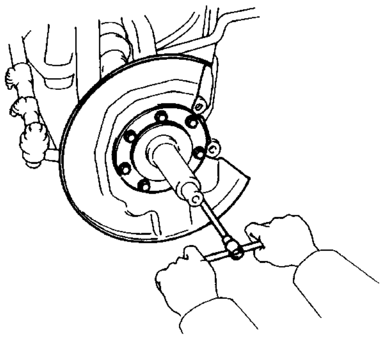
(a) Clean the threads of the bolts and steering knuckle with toluene or trichloroethylene.

(b) Apply sealant to the bolt threads.

Sealant: Part No. 08833–00070, THREE BOND 1324 or equivalent.

(e) Connect the knuckle arm to the steering knuckle with brake hose bracket and torque bolts.

Torque: 183 N–m (1,870 kgf–cm, 135 ft–lbf)



FA0734

6. INSTALL DUST COVER AND NEW OIL SEAL

Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)

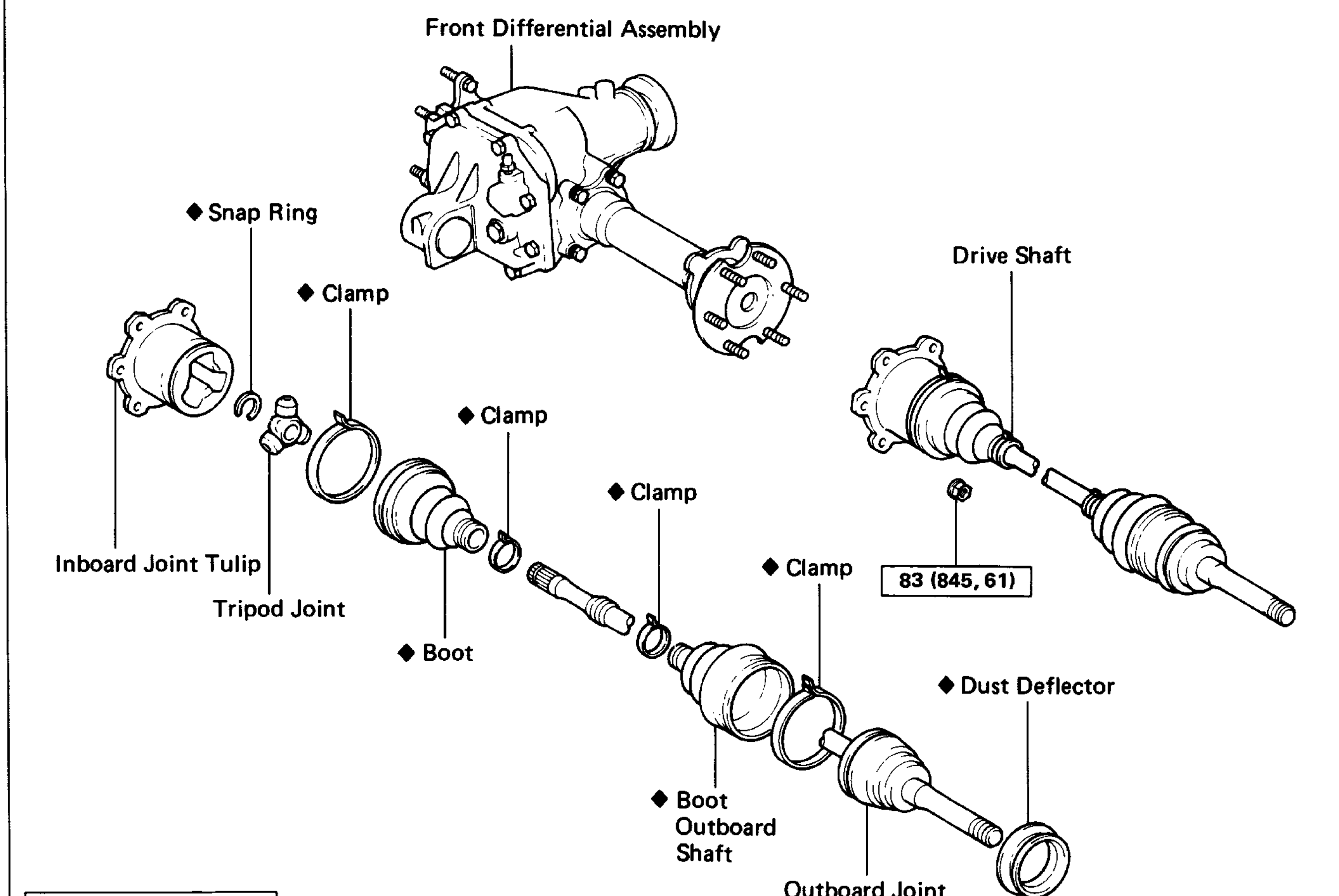
7. INSTALL FRONT AXLE HUB AND DISC BRAKE CYLINDER

(See page SA–37)

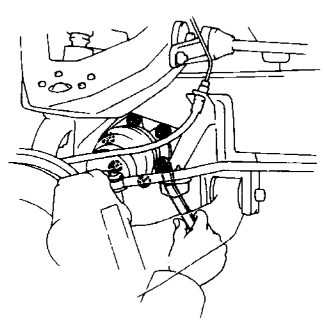
8. BLEED BRAKE SYSTEM

FRONT DRIVE SHAFT

COMPONENTS



FA0926

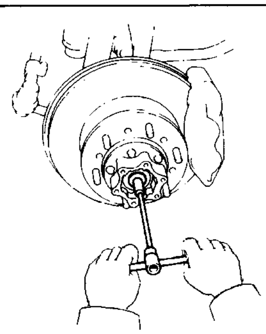


FA0769

REMOVAL OF FRONT DRIVE SHAFT

1. LOOSEN NUTS HOLDING FRONT DRIVE SHAFT

Loosen the six nuts, while depressing the brake pedal.



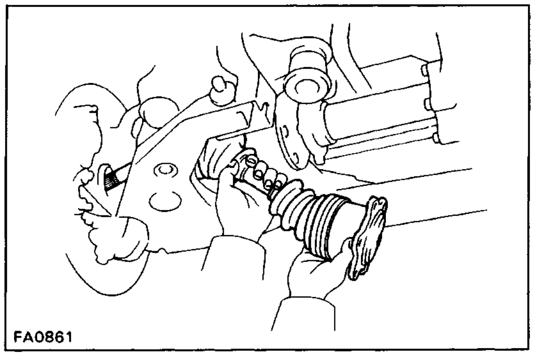
FA1897

2. REMOVE FREE WHEELING HUB OR FLANGE

(Free wheeling hub See page SA–29)
(Flange See page SA–36)

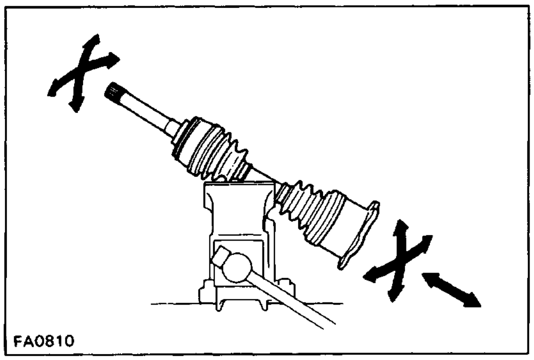
3. REMOVE SNAP RING AND SPACER

Using a snap ring expander, remove the snap ring from the drive shaft.



4. REMOVE FRONT DRIVE SHAFT

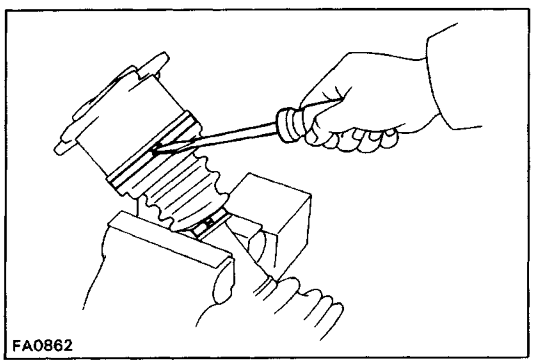
First pull the front drive shaft inboard joint tulip from the side gear shaft, and then pull it out from the steering knuckle.



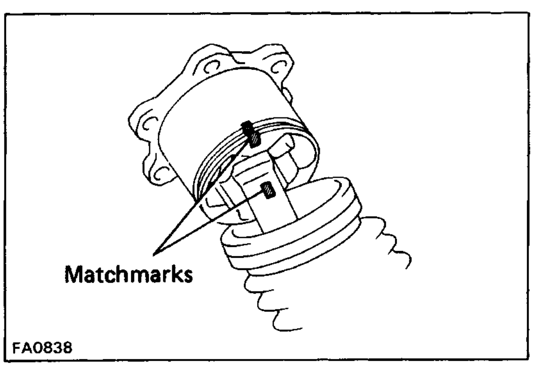
DISASSEMBLY OF FRONT DRIVE SHAFT

1. CHECK DRIVE SHAFT

(a) Check to see there is no play in the inboard and out–board joints.
(b) Check to see that the inboard joint slides smoothly in the thrust direction.
(c) Check to see that there is no noticeable play in the radial direction of the universal joints.
(d) Check for damage to the boots.

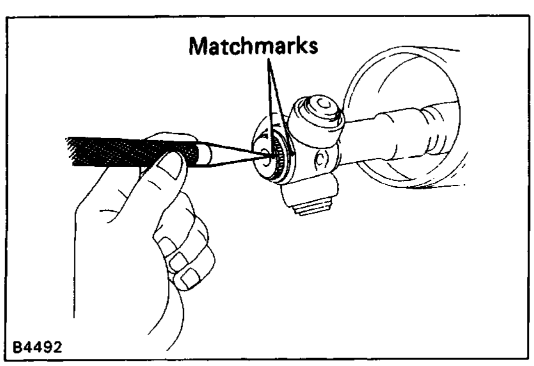


2. REMOVE INBOARD JOINT BOOT CLAMPS



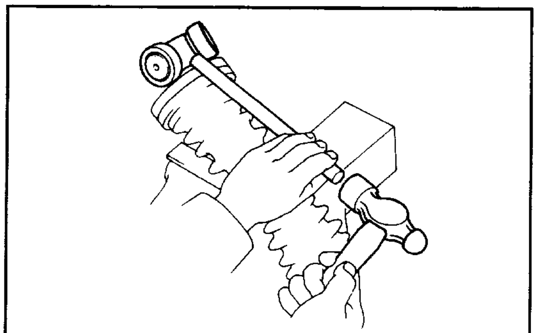
3. DISASSEMBLE INBOARD JOINT TULIP

(a) Place matchmarks on the inboard joint tulip and shaft.
NOTICE: Do not punch the marks.
(b) Remove the inboard joint tulip from the drive shaft.

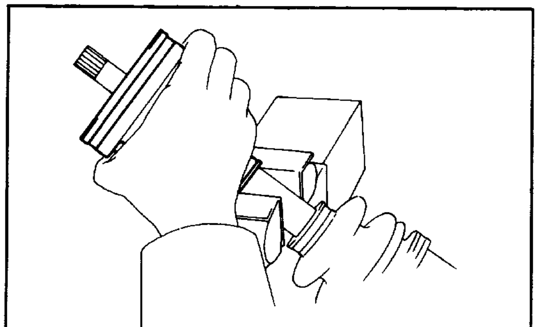


4. DISASSEMBLE TRIPOD JOINT

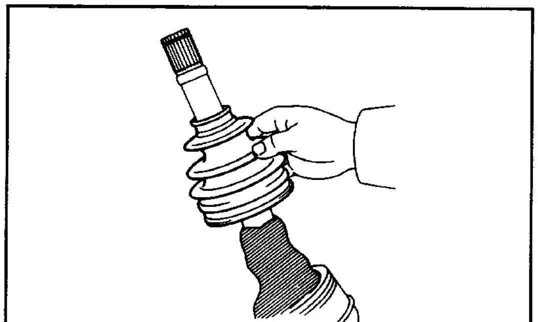
(a) Using a snap ring expander, remove the snap ring.
(b) Using a punch and hammer, place matchmarks on the shaft and tripod.


FA0863

(c) Using a brass bar and hammer, remove the tripod joint from the drive shaft.

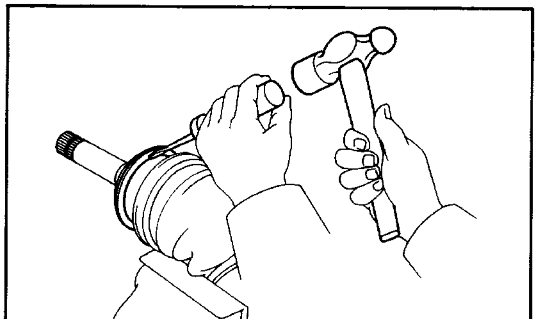

FA0924

5. REMOVE INBOARD JOINT BOOT


FA0840

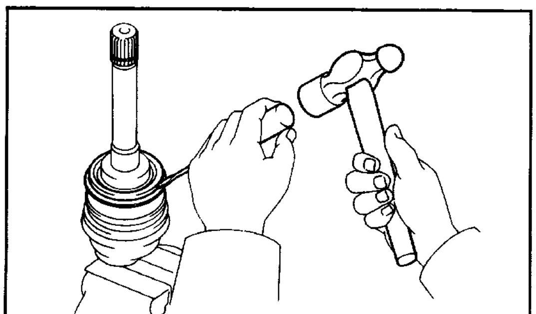
6. REMOVE OUTBOARD JOINT BOOT CLAMPS AND BOOT

NOTICE: Do not disassemble the outboard joint.


FA0841

7. REMOVE DUST DEFLECTOR

Using a screwdriver and hammer, remove the dust de– flector.

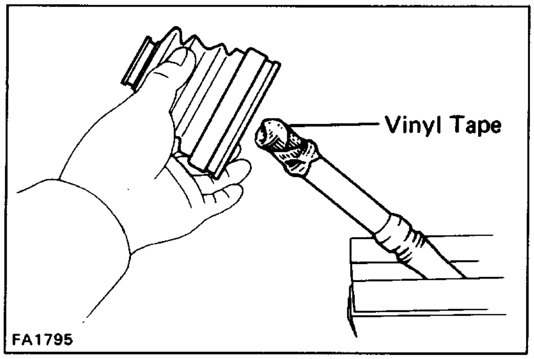

FA0843

ASSEMBLY OF FRONT DRIVE SHAFT

(See page SA–46)

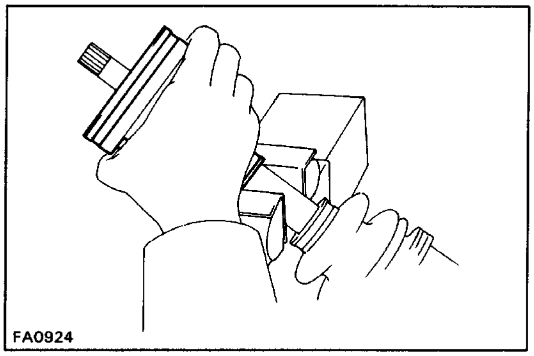
1. INSTALL DUST DEFLECTOR

Using a hammer and screwdriver, install a new dust de– flector.

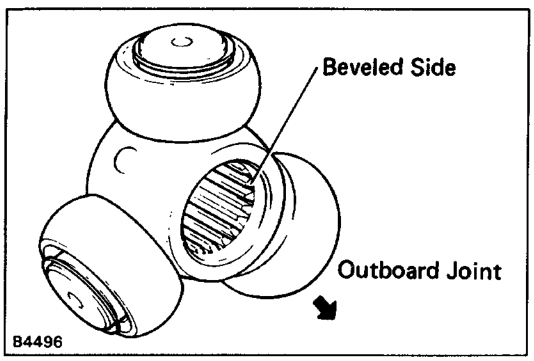


2. TEMPORARILY INSTALL BOOT AND NEW BOOT CLAMPS TO OUTBOARD JOINT

HINT: Before installing the boot, wrap vinyl tape around the spline of the shaft to prevent damaging the boot.

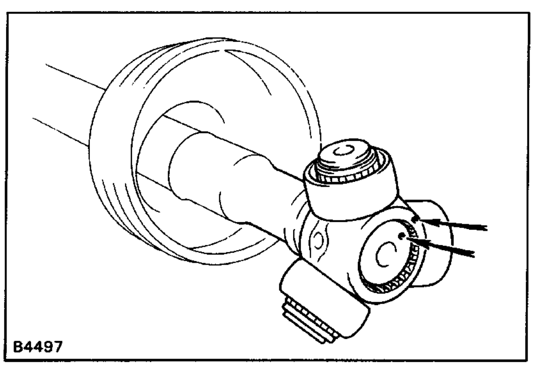


3. TEMPORARILY INSTALL BOOT AND NEW BOOT CLAMPS FOR INBOARD JOINT TO DRIVE SHAFT

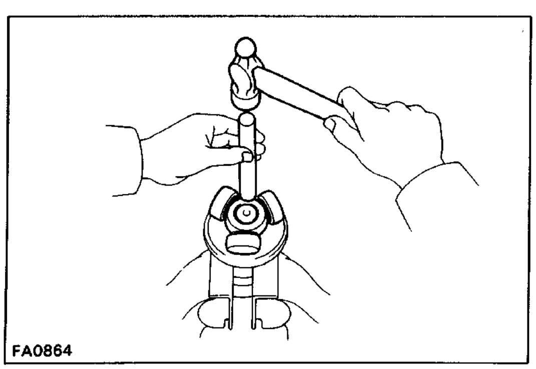


4. ASSEMBLE TRIPOD JOINT

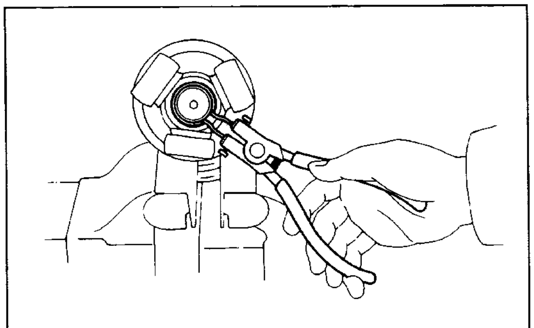
(a) Place the beveled side of the tripod axial spline to–ward the outboard joint.



(b) Align the matchmarks placed before disassembly.

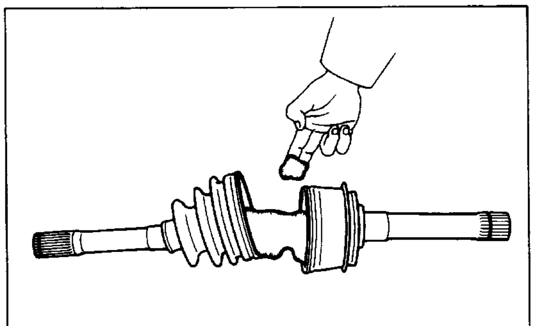


(e) Using a brass bar and hammer, tap in the tripod joint to the drive shaft.



FA0865

(d) Using a snap ring expander, install a new snap ring.



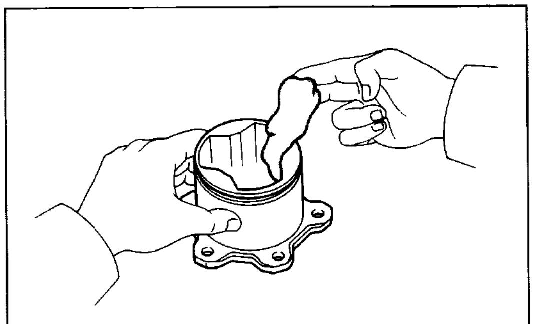
FA0842

5. ASSEMBLE BOOT TO OUTBOARD JOINT

Before assembling the boot, pack in grease.

HINT: Use the grease (black) supplied in the boot kit.

Grease capacity: 195 – 205 g (0.43 – 0.45 lb)



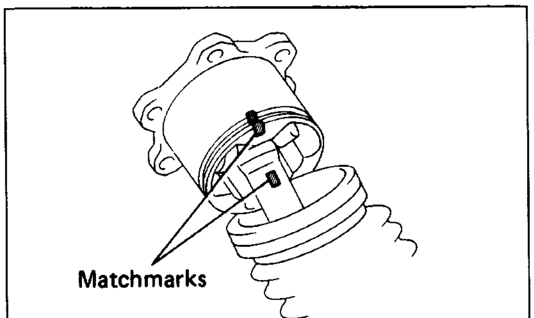
FA0839

6. ASSEMBLE INBOARD JOINT TO INBOARD JOINT TULIP

(a) Pack in grease to the inboard tulip and boot.

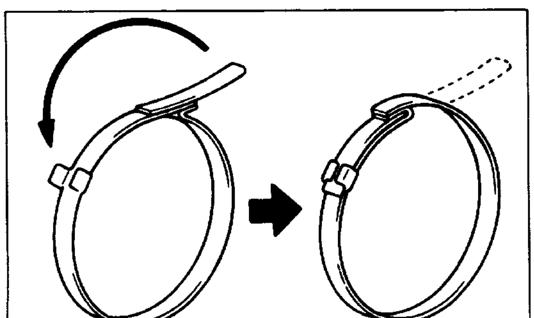
HINT: Use the grease (brown) supplied in the boot kit.

Grease capacity: 270 – 280 g (0.60 – 0.62 lb)



FA0838

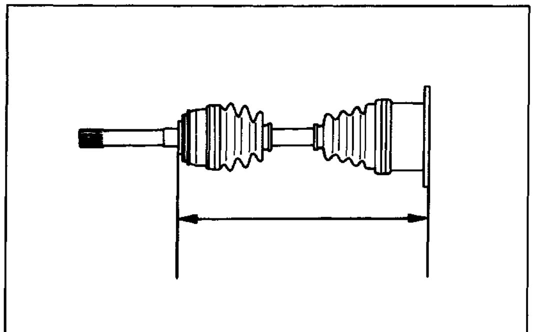
(b) Align the matchmarks placed before disassembly.
(c) Install the inboard tulip to the drive shaft.
(d) Temporarily install the boot to the inboard tulip.



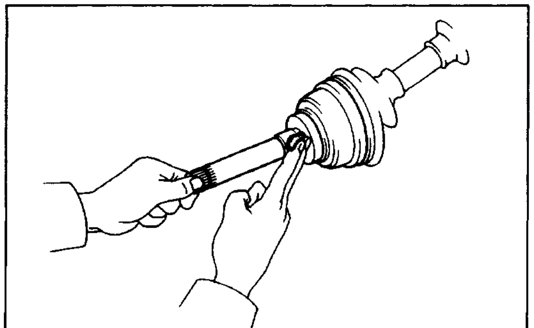
A0480

7. ASSEMBLE NEW BOOT CLAMPS TO BOTH BOOTS

(a) Be sure the boot is on the shaft groove.
(b) Bend the band and lock it as shown in the figure.


FA0811

(c) Insure that the boot is not stretched or contracted when the drive shaft is at standard length.
Standard length:
393.9 – 403.9 mm (15.508 – 15.902 in.)

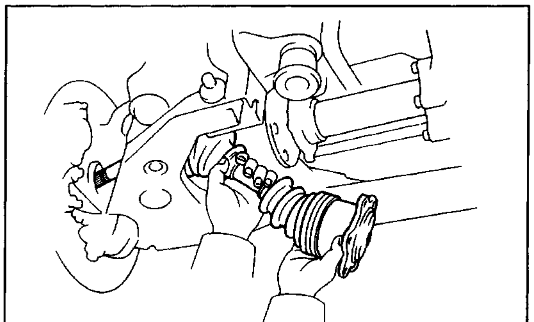

FA0881

INSTALLATION OF FRONT DRIVE SHAFT

(See page SA–46)

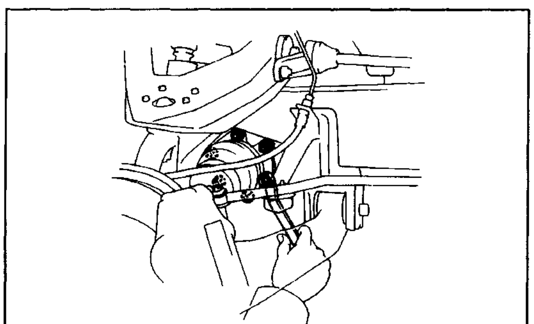
1. APPLY MOLYBDENUM DISULPHIDE LITHIUM BASE GREASE

Apply molibdenum disulphide lithium base grease to the outboard joint shaft.

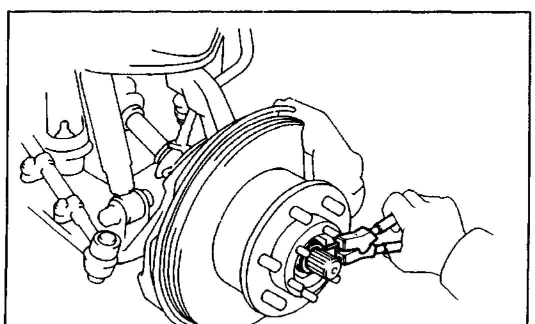

FA0861

2. INSTALL FRONT DRIVE SHAFT

(a) First insert the outboard joint shaft to the steering knuckle, and then install it to the side gear shaft.
HINT: Do not damage the boots.

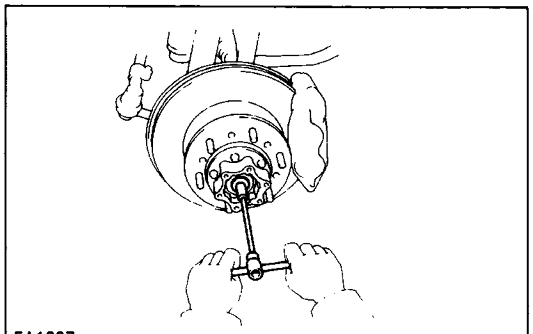

FA0769

(b) Temporarily install the six nuts.


FA1902

3. INSTALL SPACER AND SNAP RING

Install the spacer, and using a snap ring expander, install the snap ring to the outboard joint shaft.

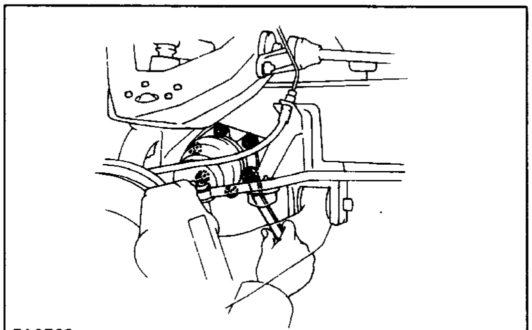


FA1897

4. INSTALL FREE WHEELING HUB OR FLANGE

(Free wheeling hub See page SA–33)

(Flange See page SA–39)



FA0769

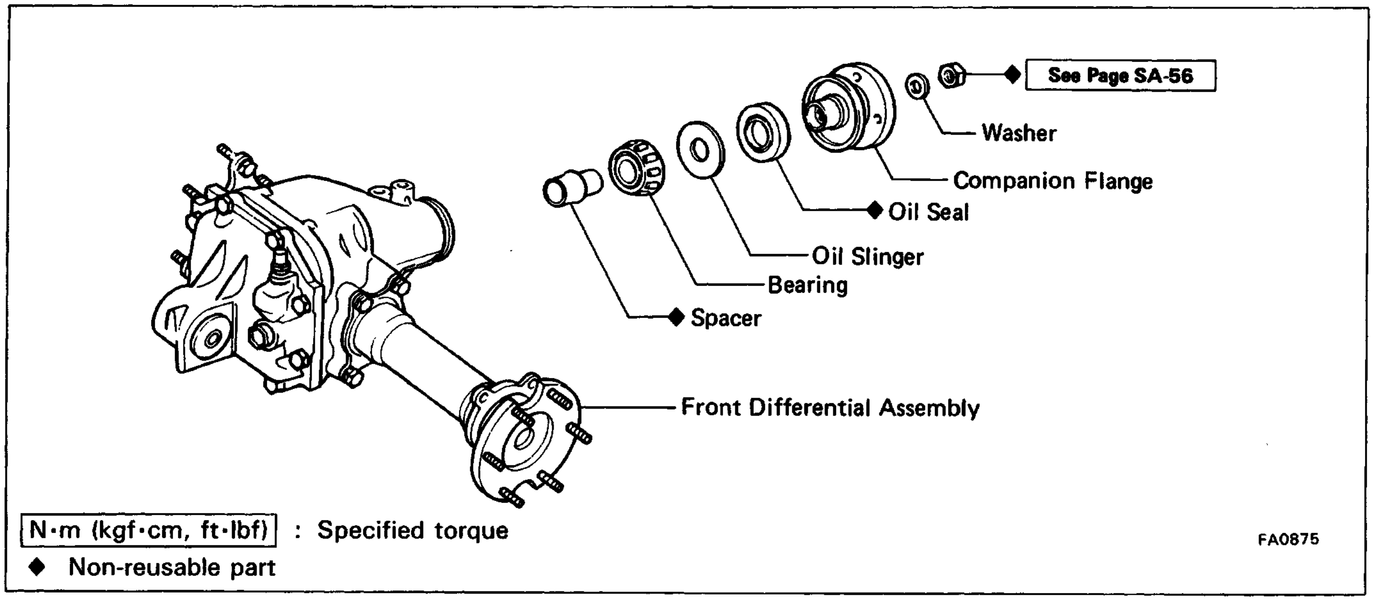
5. TORQUE FRONT DRIVE SHAFT INSTALLATION NUTS

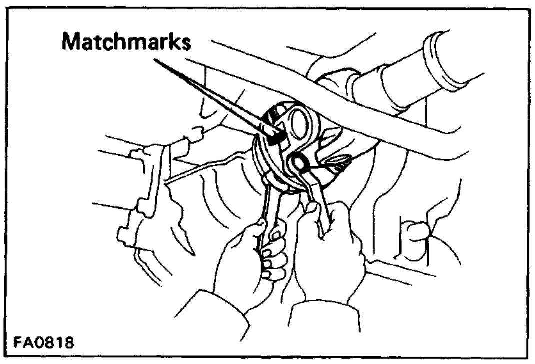
Torque the six nuts, while depressing the brake pedal.

Torque: 83 N–m (845 kgf–cm, 61 ft–lbf)

FRONT DIFFERENTIAL

On–Vehicle Replacement of Rear Oil Seal

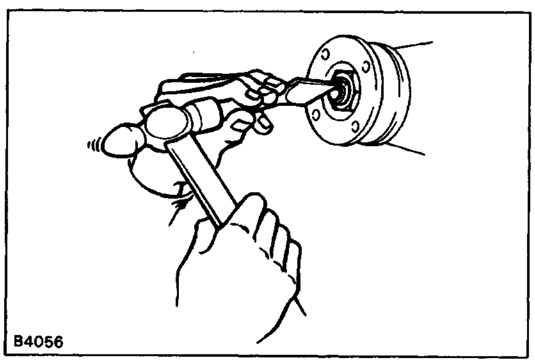




1. DRAIN DIFFERENTIAL OIL

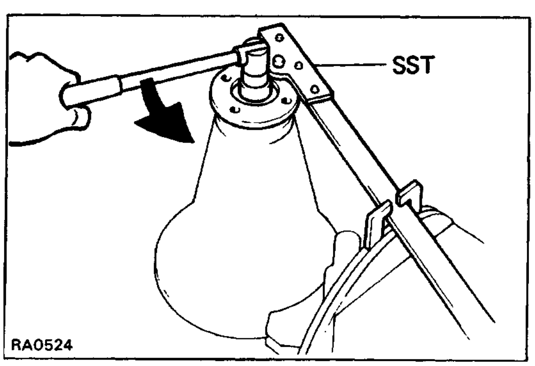
2. DISCONNECT PROPELLER SHAFT

Before disconnecting the propeller shaft from the front differential, place matchmarks on them.

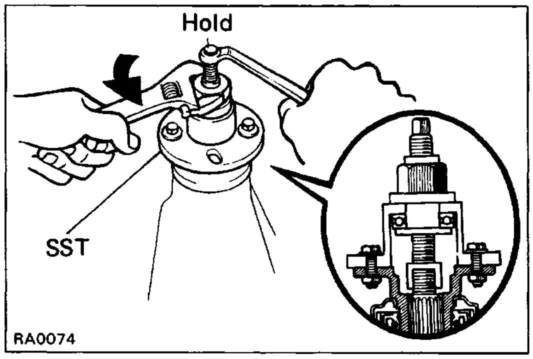


3. REMOVE COMPANION FLANGE

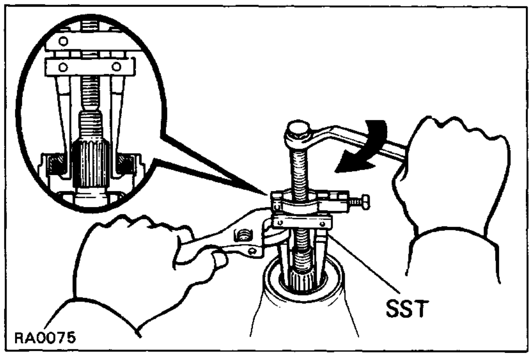
(a) Using a hammer and chisel, loosen the staked part of the nut.



(b) Using SST to hold the flange, remove the nut and washer.
SST 09330–00021



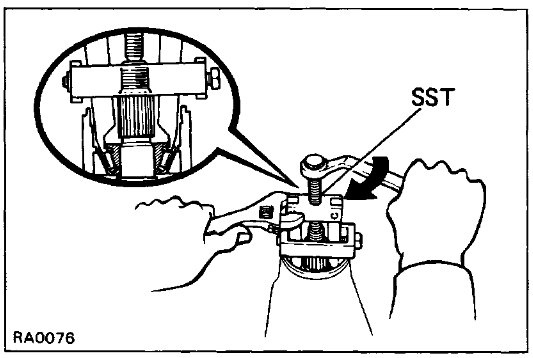
(c) Using SST, remove the companion flange.
SST 09557–22022 (09557–22030)



4. REMOVE OIL SEAL AND OIL SLINGER

(a) Using SST, remove the oil seal.
SST 09308–10010

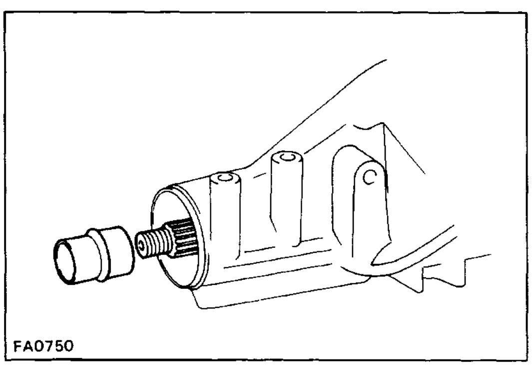
(b) Remove the oil slinger.



5. REMOVE REAR BEARING AND BEARING SPACER

(a) Using SST, remove the rear bearing from the drive pinion.
SST 09556–30010

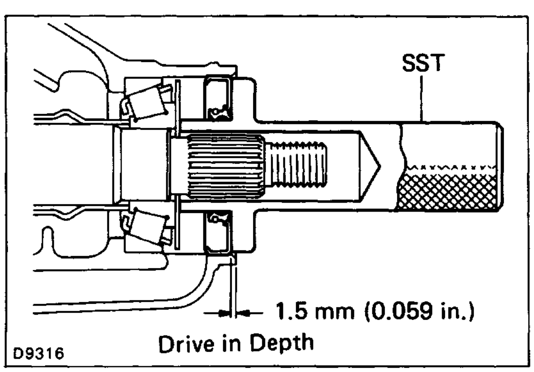
(b) Remove the bearing spacer.



6. INSTALL NEW BEARING SPACER AND REAR BEARING

(a) Install a new bearing spacer on the drive pinion.

(b) Install the rear bearing on the drive pinion.

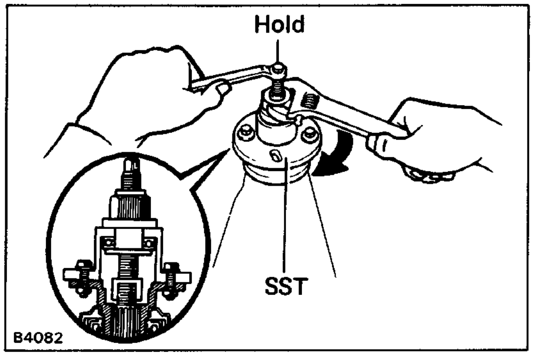


7. INSTALL OIL SLINGER AND NEW OIL SEAL

(a) Install the oil slinger.

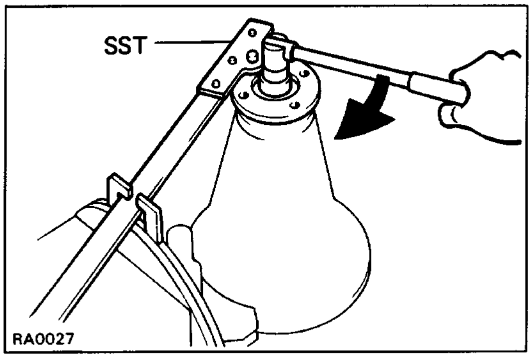
(b) Using SST, drive in a new oil seal.
SST 09554–30011
Oil seal drive in depth: 1.5 mm (0.059 in.)

(c) Apply MP grease to the oil seal lip.

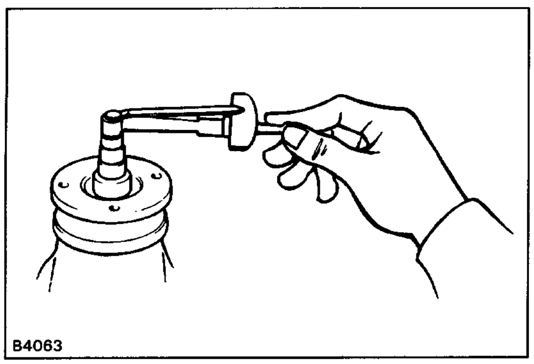


8. INSTALL COMPANION FLANGE

(a) Using SST, install the companion flange on the drive pinion.
SST 09557–22022 (09557–22030)



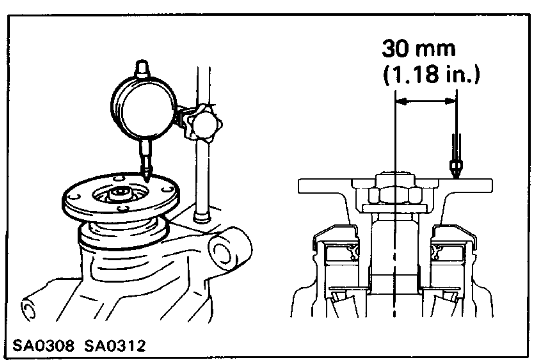
(b) Coat the threads of the new nut with MP grease.
(c) Using SST to hold the flange, torque the nut.
SST 09330–00021
Torque: 120 N–m (1,225 kgf–cm, 89 ft–lbf)



9. ADJUST DRIVE PINION BEARING PRELOAD

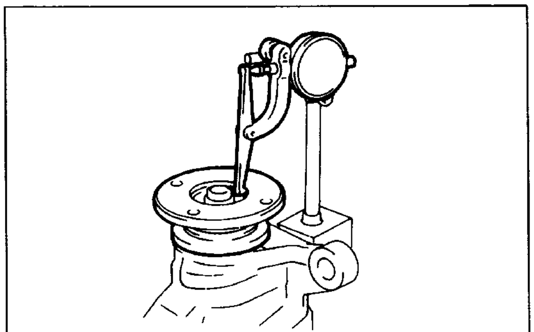
Using a torque meter, measure the preload of the back–lash between the drive pinion and ring gear.
Preload (starting):
New bearing
1.2 – 1.9 N–m
(12 – 19 kgf–cm, 10.4 – 16.5 in.–lbf)
Reused bearing
0.6 – 1.0 N–m
(6 – 10 kgf–cm, 5.2 – 8.7 in.–lbf)

(a) If the preload is greater than specification, replace the bearing spacer.
(b) If the preload is less than specification, retighten the nut 13 N–m (130 kgf–cm, 9 ft–lbf) a little at a time until the specified preload is reached.
Maximum torque: 223 N–m (2,275 kgf–cm, 165 ft–lbf)
If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the preload procedure. Do not back off the pinion nut to reduce the preload.



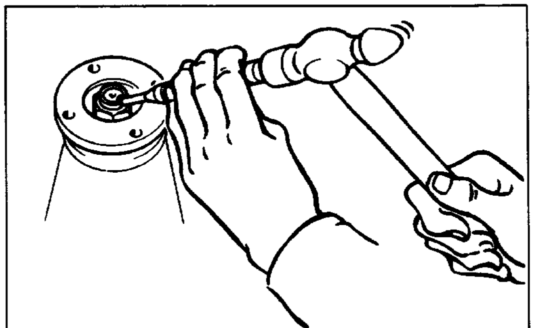
10. CHECK RUNOUT OF COMPANION FLANGE

Using a dial indicator, measure the vertical and lateral runout of the companion flange.
Maximum vertical runout: 0.10 mm (0.0039 in.)


SA0309

Maximum lateral runout: 0.10 mm(0.0039 in.)

If the runout is greater than maximum, inspect the bearings.


RA0032

11. STAKE DRIVE PINION NUT

12. INSTALL DRAIN PLUG AND FILL DIFFERENTIAL WITH GEAR OIL

(w/ A.D.D.)

Oil type: Toyota ”GEAR OIL SUPER” oil (Part No. 08885 – 02106) or hypoid gear oil API GL–5

Recommended oil viscosity: SAE 75W–90

Capacity: 1.86 liters (1.97 US qts, 1.64 Imp. qts)

(w/o A.D.D.)

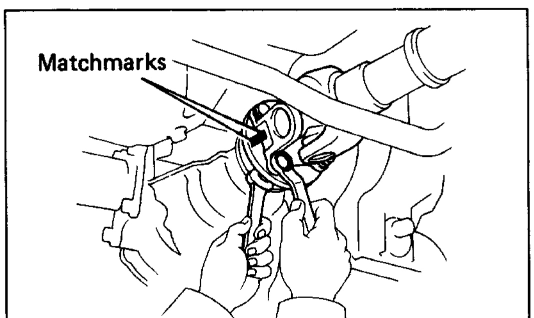
Oil type: Hypoid gear oil API GL–5

Recommended oil viscosity:

Above – 18•C (O•F) SAE 90

Below – 18 • C (0 • F) SAE 80W or 80W–90

Capacity: 1.6 liters (1.7 US qts, 1.4 Imp. qts)



FA0818

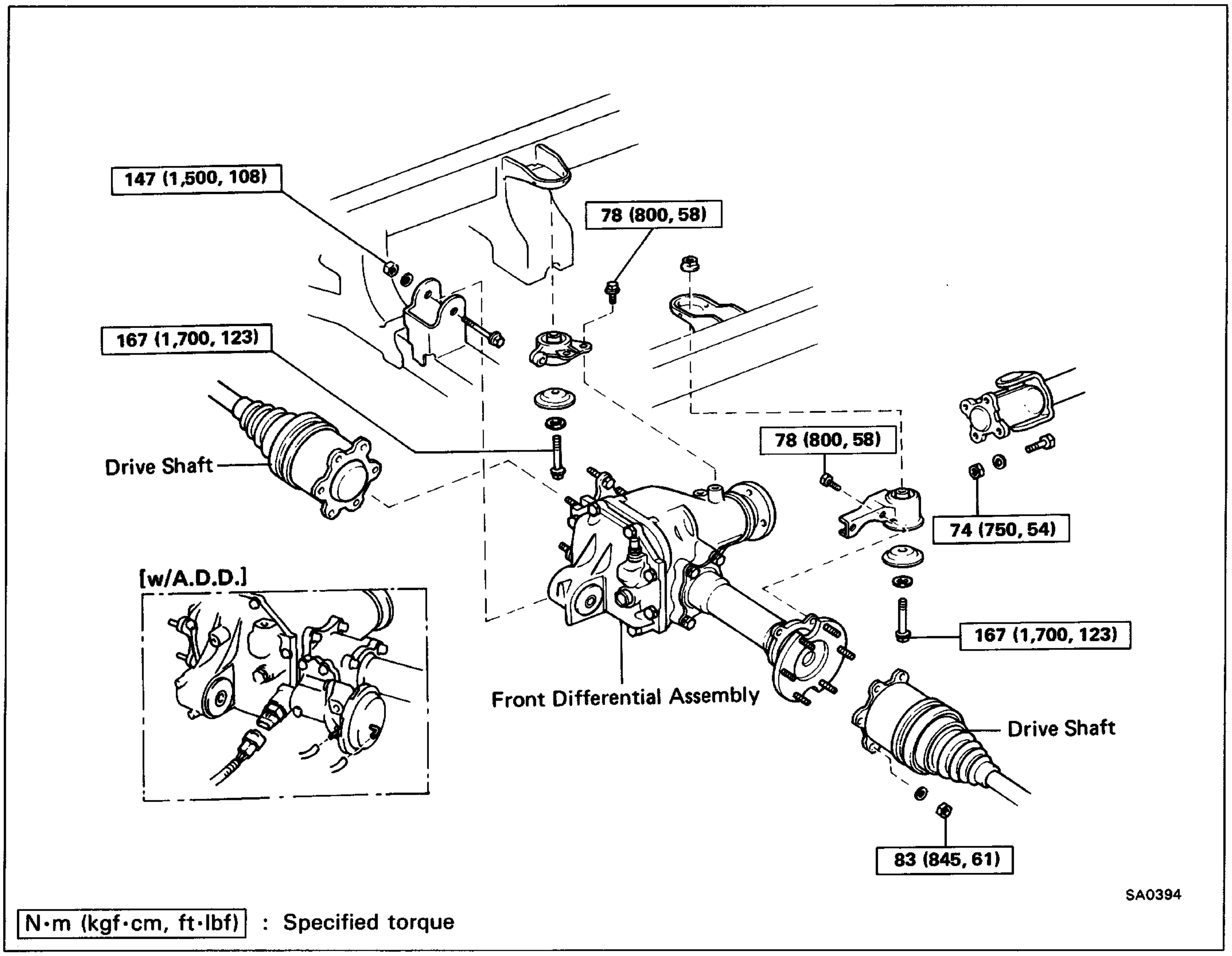
13. CONNECT PROPELLER SHAFT TO COMPANION FLANGE

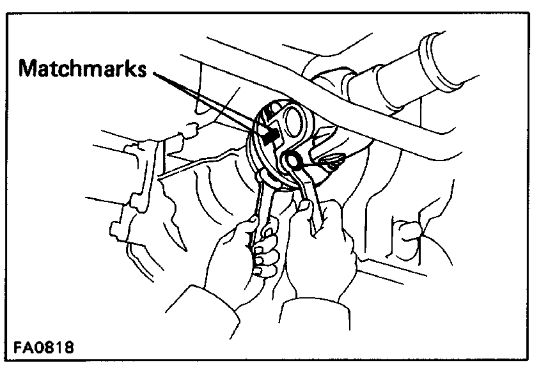
(a) Align the matchmarks and connect the propeller shaft to the companion flange with four bolts anc nuts.

(b) Torque the nuts.

Torque: 74 N–m (750 kgf–cm, 54 ft–lbf)

Removal of Front Differential



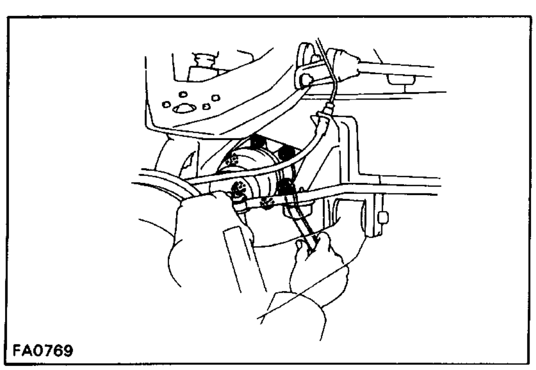


FA0818

1. DRAIN DIFFERENTIAL OIL

2. DISCONNECT PROPELLER SHAFT

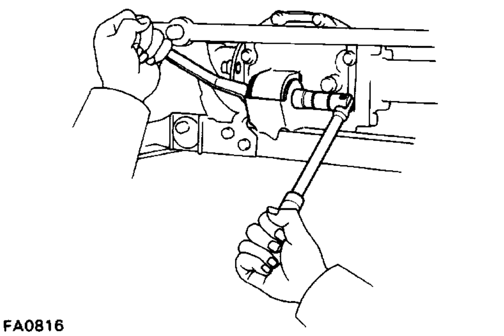
Before disconnecting the propeller shaft, place match–marks.


FA0769

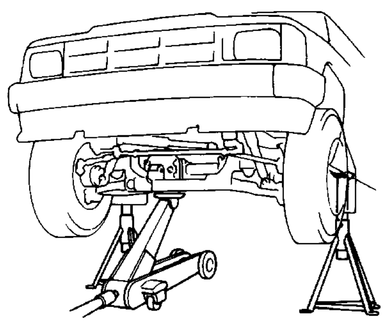
3. DISCONNECT DRIVE SHAFTS FROM SIDE GEAR SHAFT

Loosen the six nuts, while depressing the brake pedal, and disconnect the drive shafts from the side gear shaft.

4. (w/ A.D.D.)
DISCONNECT VACUUM HOSES AND 4WD INDICATOR SWITCH CONNECTOR

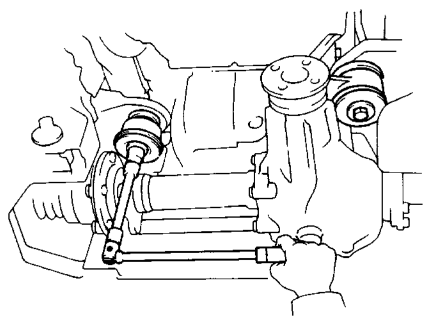

FA0816

5. REMOVE FRONT DIFFERENTIAL FRONT MOUNTING BOLT AND NUT


FA0870

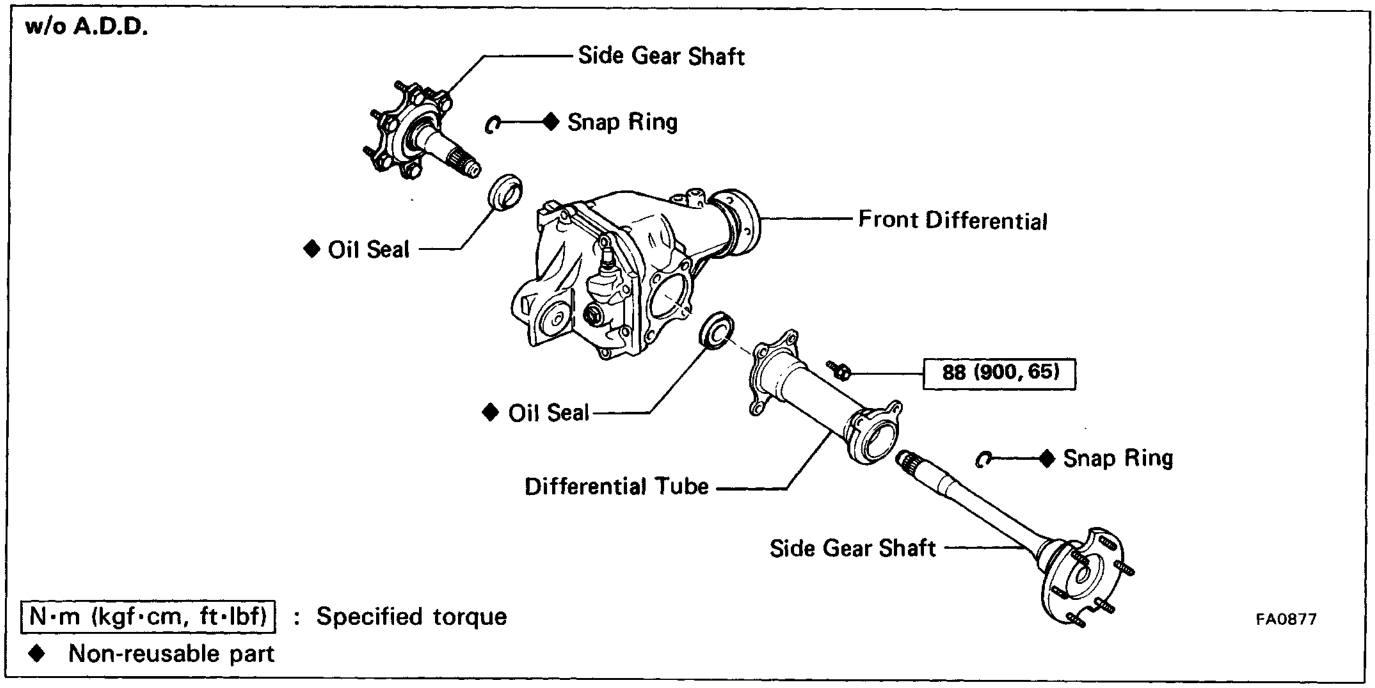
6. REMOVE FRONT DIFFERENTIAL

(a) Hold the front differential with a jack.

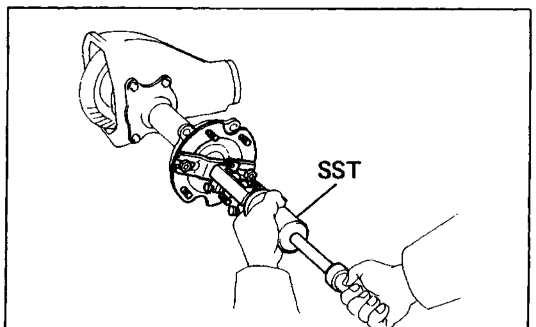

FA0858

(b) Remove the left and right rear mounting bolts, and remove the front differential.

Replacement of Side Oil Seal (without A.D.D.)



FA0877



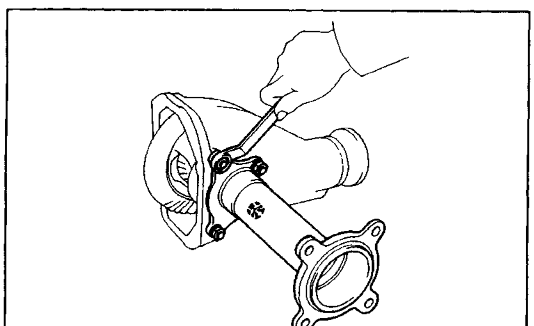
FA0725

1. REMOVE SIDE GEAR SHAFT

Using SST, pull off the side gear shaft from the front dif–ferential.

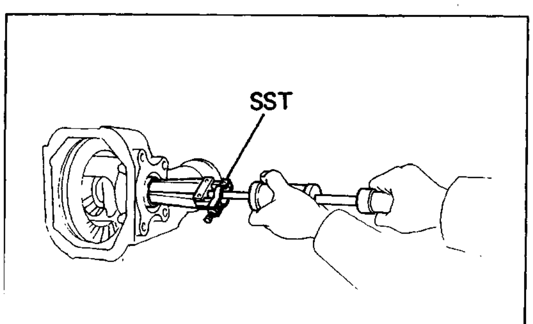
SST 09910–00015

(09911–00011, 09912–00010, 09914–00011)


FA0726

2. REMOVE FRONT DIFFERENTIAL TUBE

Remove the four bolts, and using a plastic–faced ham–mer, remove the differential tube.

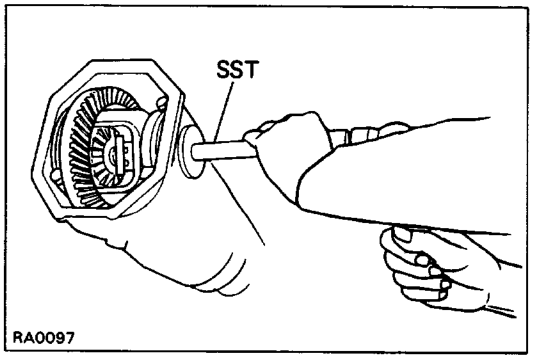


FA0727

3. REMOVE SIDE GEAR SHAFT OIL SEAL

Using SST, remove the side gear shaft oil seal.

SST 09308–00010



RA0097

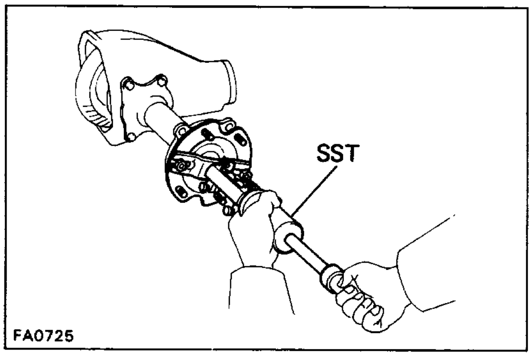
4. INSTALL NEW SIDE GEAR SHAFT OIL SEAL

(a) Using SST, drive in the oil seal until it is flush with the carrier end surface.
SST 09550–22011 (09550–00020, 09550–00031)

(b) Coat the lip of oil seal with MP grease.

5. INSTALL DIFFERENTIAL TUBE

Torque: 88 N–m (900 kgf–cm, 65 ft–lbf)



FA0725

6. INSTALL SIDE GEAR SHAFT

(a) Install a new snap ring to the side gear shaft.

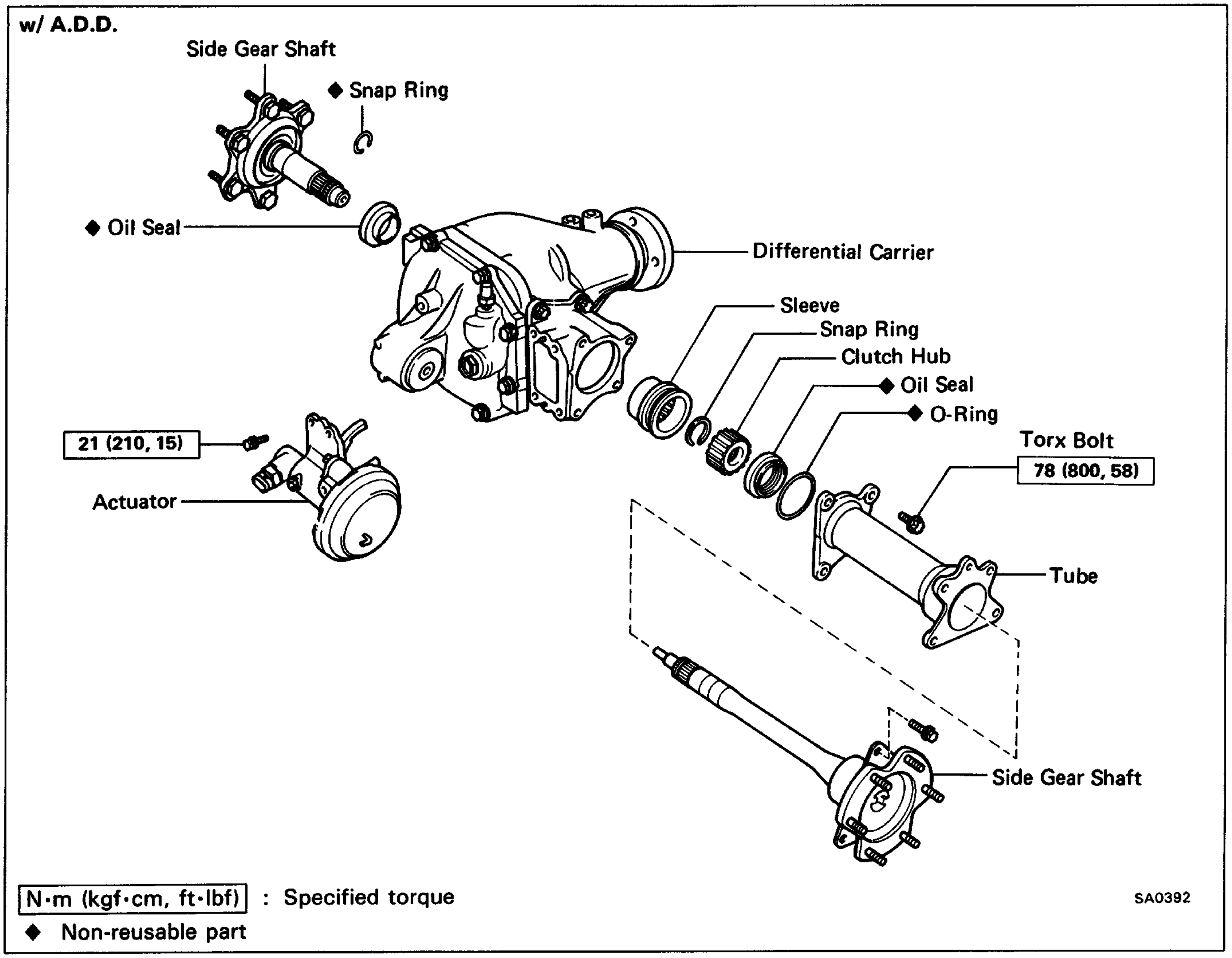
(b) Using SST, install the side gear shaft until it con–tacts the pinion shaft.
SST 09910–00015
(09911–00011, 09912–00010, 09914–00011)

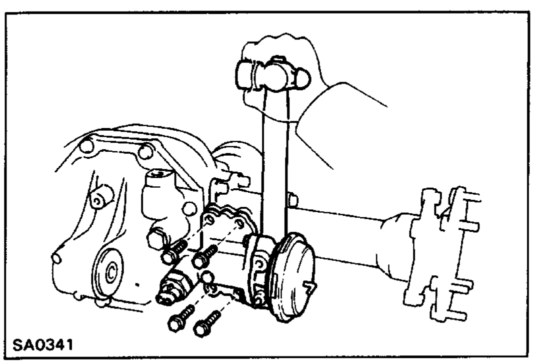
7. CHECK INSTALLATION OF SIDE GEAR SHAFT

(a) Check that there is 2 – 3 mm (0.08 – 0.12 in.) of play in axial direction.

(b) Check that the side gear shaft will not come out by trying to pull it completely out by hand.

Replacement of Side Oil Seal (with A.D.D.)



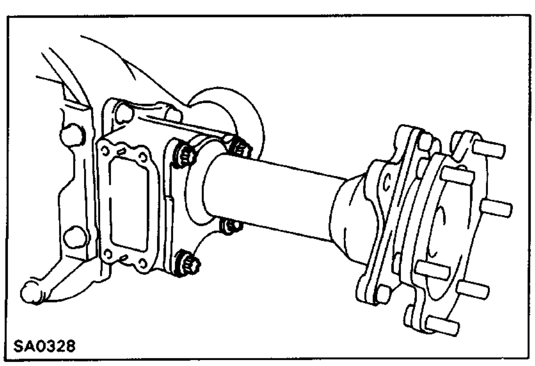


REPLACEMENT OF LH SIDE OIL SEAL

1. REMOVE ACTUATOR

(a) Remove the four bolts.

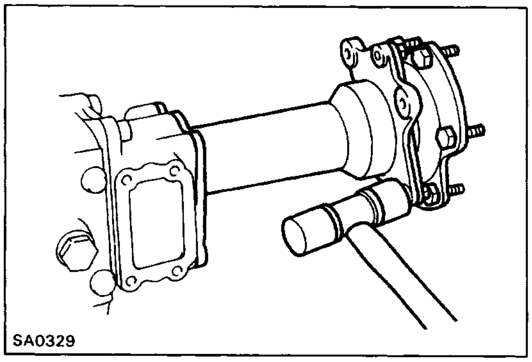
(b) Using a hammer, remove the actuator.



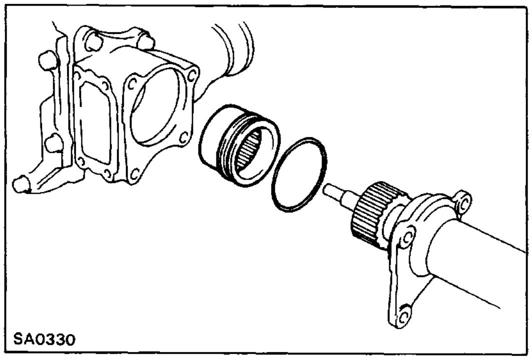
2. REMOVE LH SIDE GEAR SHAFT WITH TUBE

(a) Remove the four torx bolts.

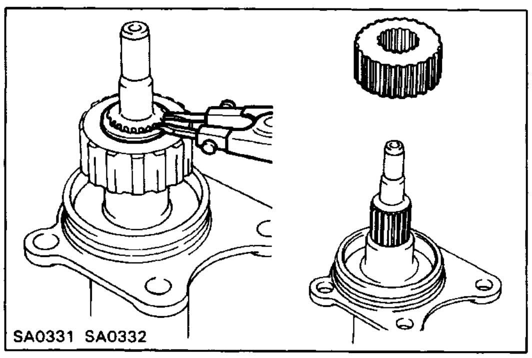
Torx wrench: E 14 (part No. 09044–00010 or locally manufactured tool)


SA0329

(b) Using a plastic–faced hammer, tap on the tube to re–
move it.

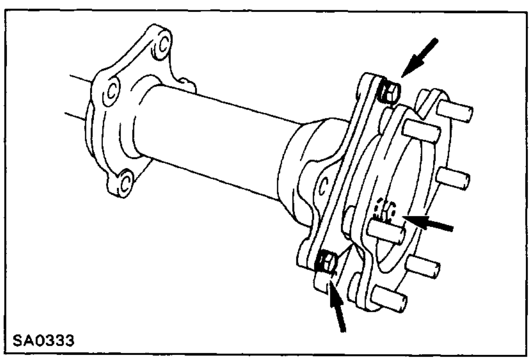

SA0330

(c) Remove the sleeve.
(d) Remove the O–ring from the tube.


SA0331 SA0332

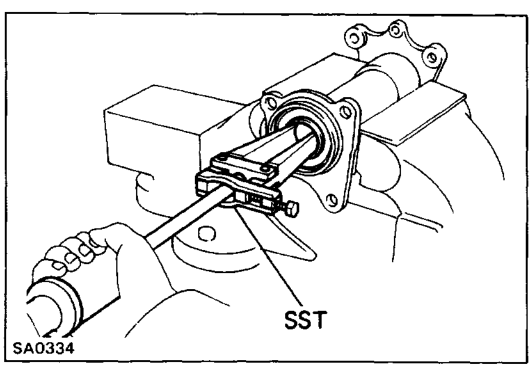
3. REMOVE CLUTCH HUB

(a) Using a snap ring expander, remove the snap ring.
(b) Remove the clutch hub from the side gear shaft.


SA0333

4. REMOVE SIDE GEAR SHAFT FROM TUBE

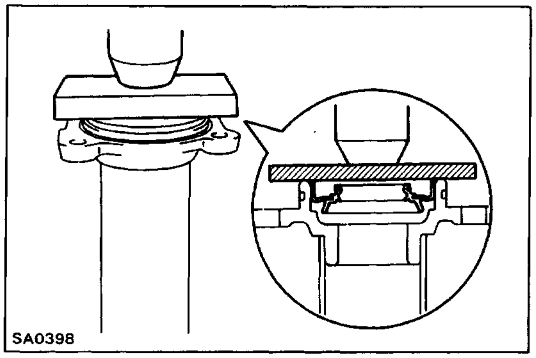
(a) Remove the three bearing retainer bolts.
(b) Remove the side gear shaft from the tube.



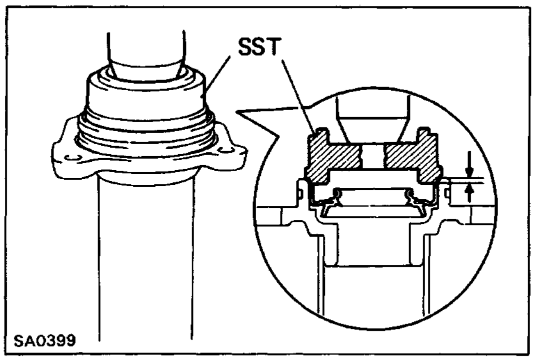
SA0334

5. REPLACE SIDE OIL SEAL

(a) Using SST, remove the side oil seal.
SST 09308–00010

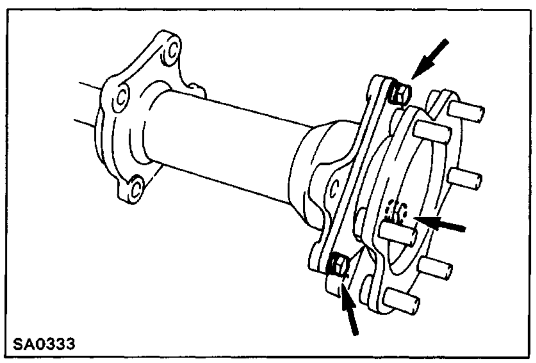


(b) With the oil seal lip facing upward, use press and plate to press in a new side oil seal until its end is flush with the surface of the tube.



(c) Using SST, press in the oil seal.
SST 09554–14010
Press in depth: 2.5 mm (0.098 in.)

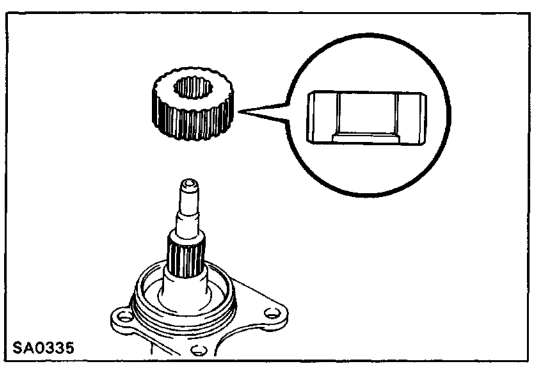
(d) Coat the lip of oil seal with IMP grease.



6. INSTALL SIDE GEAR SHAFT

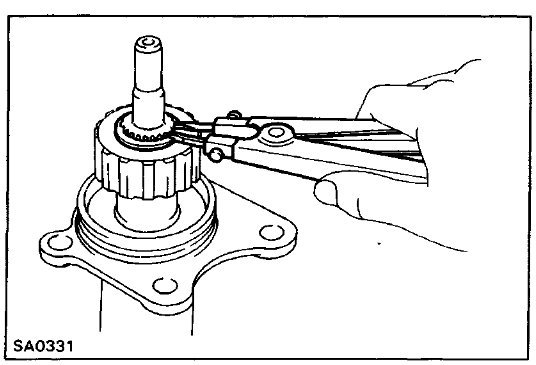
(a) Install the side gear shaft to the tube.

(b) Tighten the three bearing retainer bolts.

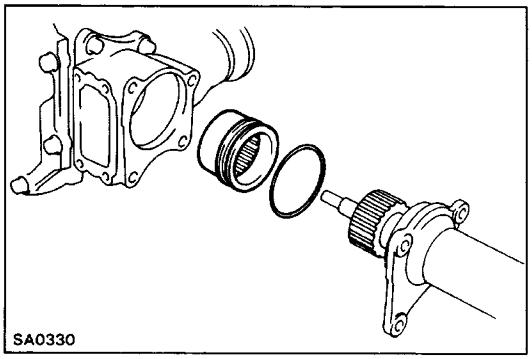


7. INSTALL CLUTCH HUB

(a) Install the clutch hub to the shaft.

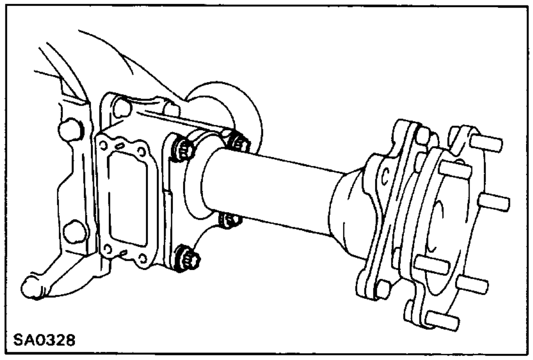


(b) Using a snap ring expander, install the snap ring.



8. INSTALL SIDE GEAR SHAFT WITH TUBE TO DIFFERENTIAL CARRIER

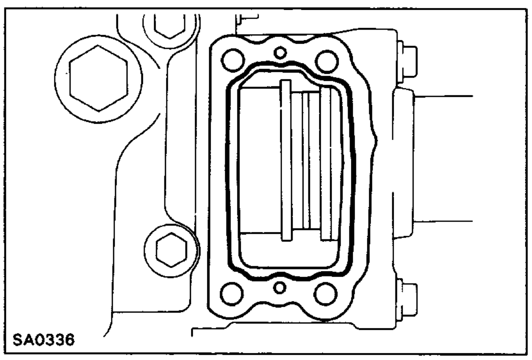
(a) Install a new 4–ring to the tube.
(b) Install the sleeve onto the clutch hub.



(c) Install the side gear shaft with tube.
(d) Tighten the four torx bolts.

Torque: 78 N–m (800 kgf–cm, 58 ft–lbf)

Torx wrench: E14 (Part No. 09044–00010 or locally manufactured tool)

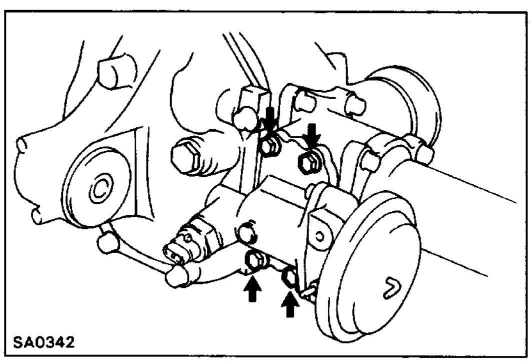


9. INSTALL ACTUATOR

(a) Remove any packing material and be careful not to get oil on the contacting surfaces of the actuator and clutch case.
(b) Apply seal packing to the clutch case as shown.

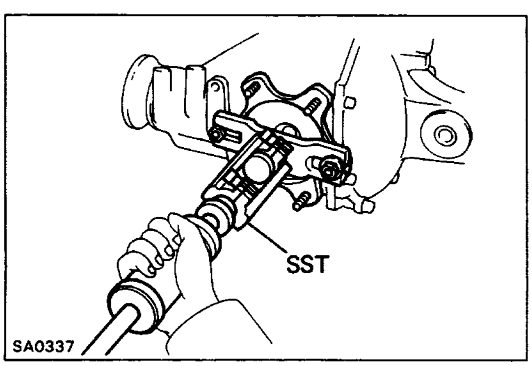
Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent

HINT: Install the actuator within ten minutes after ap–plying seal packing.



(c) Tighten the four bolts.

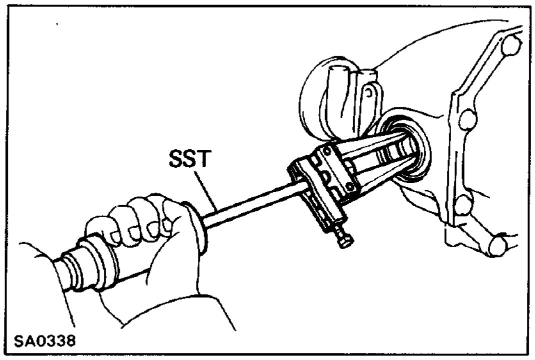
Torque: 21 N–m (210 kgf–cm, 15 ft–lbf)



REPLACEMENT OF RH SIDE OIL SEAL

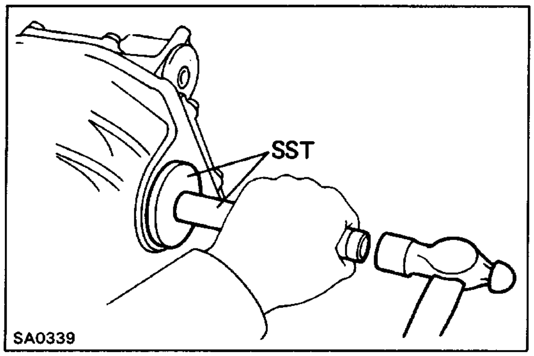
1. REMOVE RH SIDE GEAR SHAFT

Using SST, pull off the RH side gear shaft from differen–tial carrier.
SST 09910–00015
(09911–00011, 09912–00010, 09914–00011)



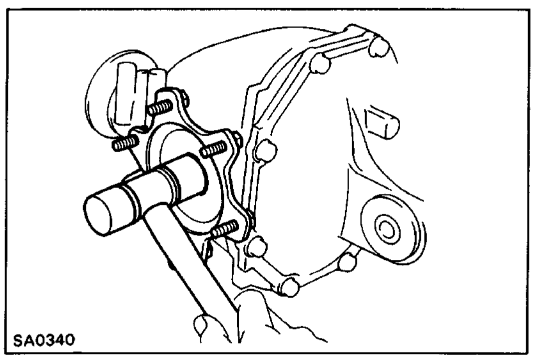
2. REPLACE SIDE OIL SEAL

(a) Using SST, remove the oil seal.
SST 09308–00010



(b) Using SST, install the new oil seal.
SST 09550–22011 (09550–00020, 09550–0003)

(c) Coat the lip of oil seal with MP grease.



3. INSTALL RH SIDE GEAR SHAFT

(a) Install a new snap ring to the side gear shaft.

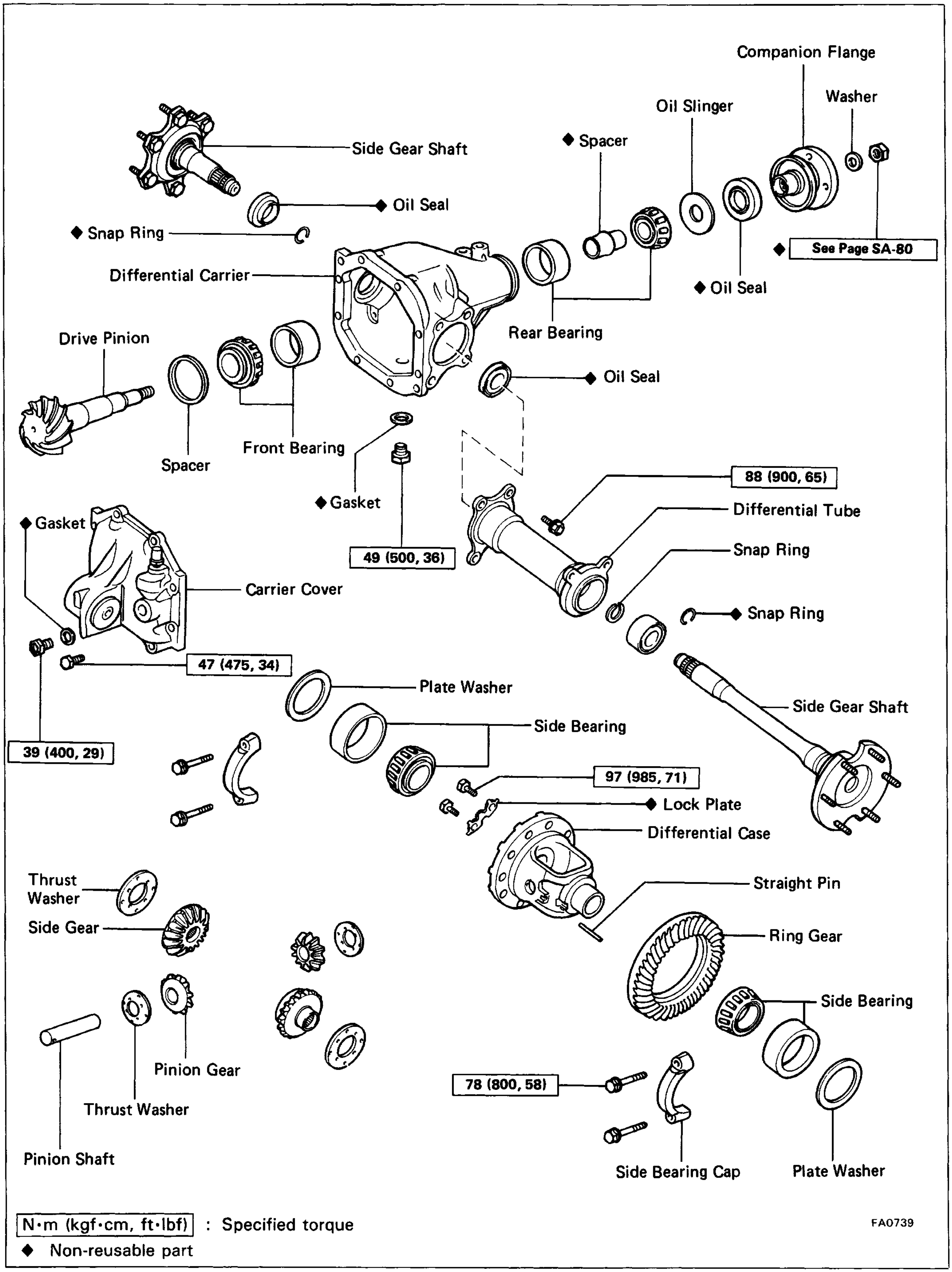
(b) Using a plastic–faced hammer, tap on the side gear shaft to install it.

4. CHECK INSTALLATION OF SIDE GEAR SHAFT

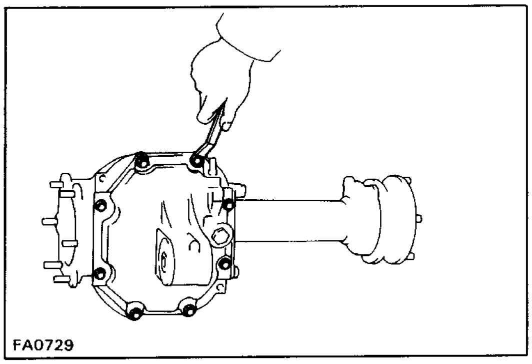
(a) Check that there is 2 – 3 mm (0.08 – 0.12 in.) of play in axial direction.

(b) Check that the side gear shaft will not come out by trying to pull it completely out by hand.

Disassembly and Assembly of Differential (with out A.D.D.)

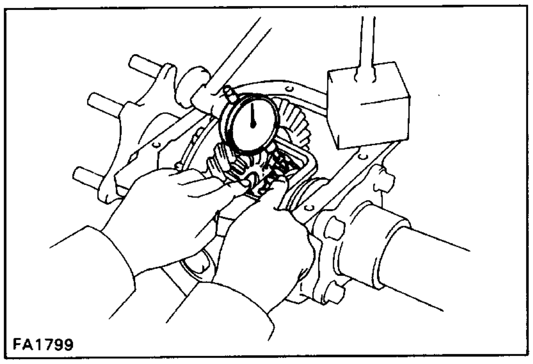


DISASSEMBLY OF DIFFERENTIAL


FA0729

1. REMOVE DIFFERENTIAL COVER

Remove the eight bolts and tap off the cover with a plastic–faced hammer.

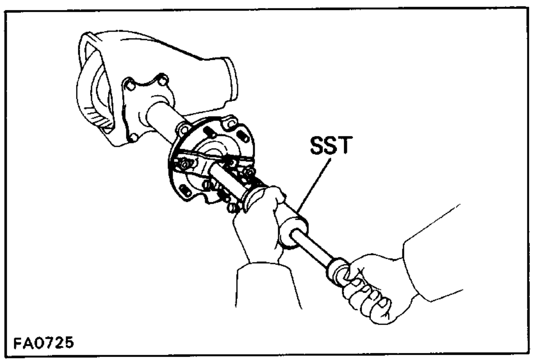

FA1799

2. CHECK SIDE GEAR BACKLASH

Measure the side gear backlash while holding one pinion gear toward the case.

Standard backlash: 0.05 – 0.20 mm
(0.0020 – 0.0079 in.)

If the backlash is out of specification, install the correct thrust washers. (See page SA–71)

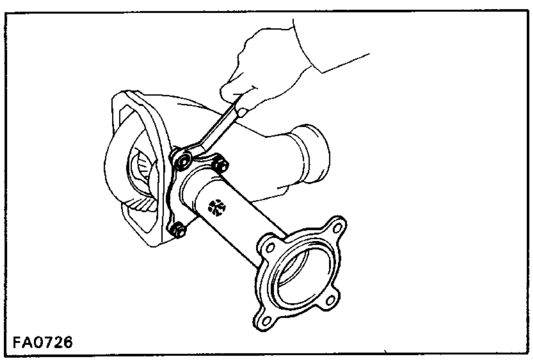


FA0725

3. REMOVE SIDE GEAR SHAFTS

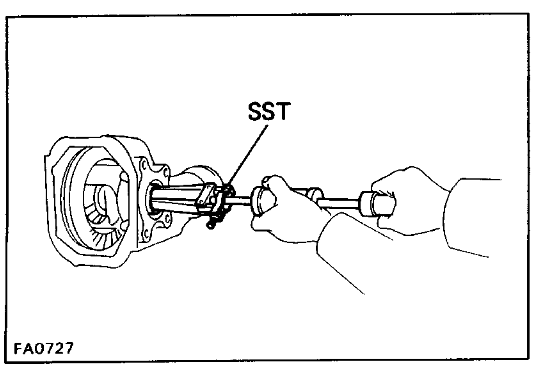
Using SST, remove the side gear shafts from the differ–ential.

SST 09910–00015 .
(09911–00011, 09912–00010, 09914–00011)


FA0726

4. REMOVE DIFFERENTIAL TUBE

Remove the four bolts and tap off the cover with a plastic–faced hammer.

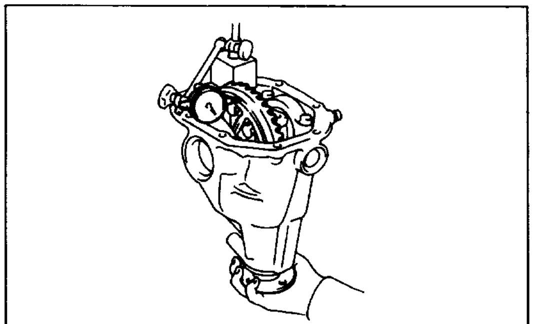


FA0727

5. REMOVE SIDE GEAR SHAFT OIL SEALS

Using SST, remove the oil seals.

SST 09308–00010

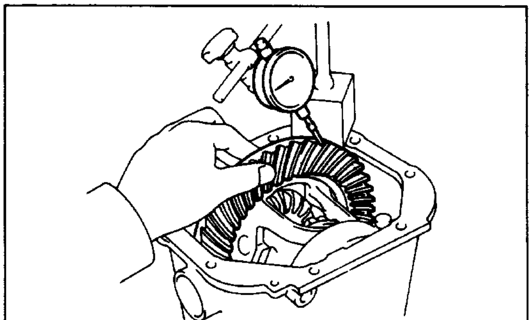

D9325

6. CHECK RING GEAR RUNOUT

Using a dial indicator, measure the ring gear runout.

Maximum runout: 0.07 mm (0.0028 in.)

If the runout is greater than maximum, replace the ring gear and drive pinion as a set.


D9326

7. CHECK RING GEAR BACKLASH

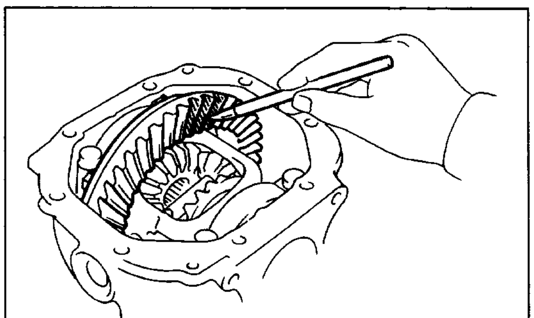
(a) Fix the dial indicator on the tooth surface at a 90• angle.

(b) Holding the drive pinion flange, measure the ring gear backlash.

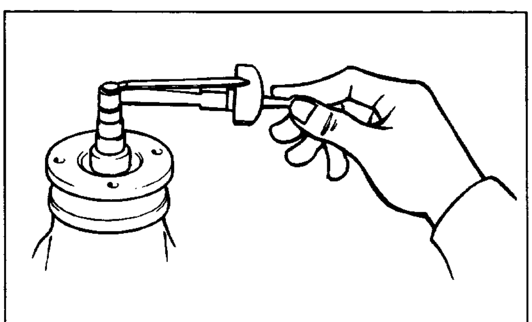
Ring gear backlash: 0.13 – 0.18 mm
(0.0051 – 0.0071 in.)

If the backlash is not within specification, adjust the ring gear backlash.

HINT: Measure from three or more places on the cir– cumference of the ring gear.


D9363

8. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION (SEE STEP 7 ON PAGE SA–78)


B4063

9. MEASURE DRIVE PINION PRELOAD

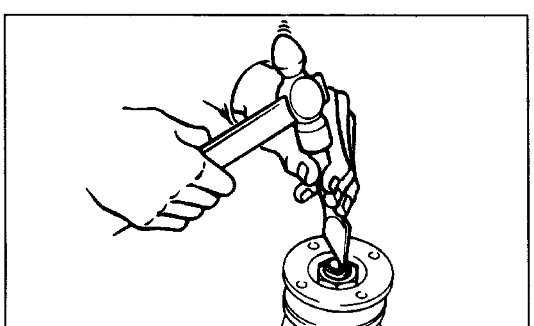
Using a torque gauge, measure the preload of the back– lash between the drive pinion and ring gear.

Preload (starting):
0.6 – 1.0 N–m (6 – 10 kgf–cm, 5.2 – 8.7 in.–lbf)

10. CHECK TOTAL PRELOAD

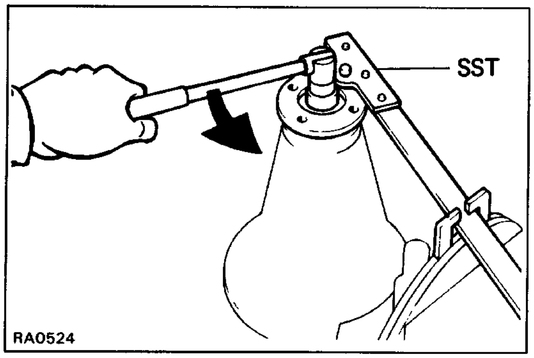
Using a torque gauge, measure the total preload.

Total preload (starting):
Add drive pinion preload
0.4 – 0.6 N–m
(4 – 6 kgf –cm, 3.5 – 5.2 in.–lbf)

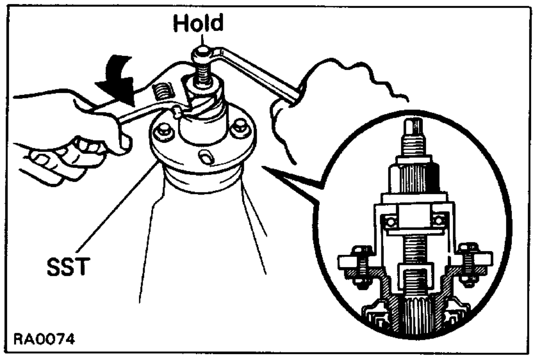

B4056

11. REMOVE COMPANION FLANGE

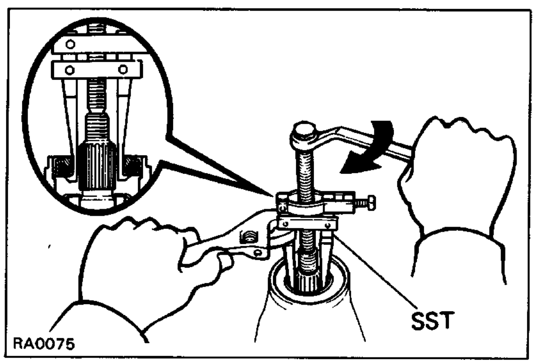
(a) Using a hammer and chisel, loosen the staked part of the nut.



(b) Using SST to hold the flange, remove the nut.
SST 09330–00021



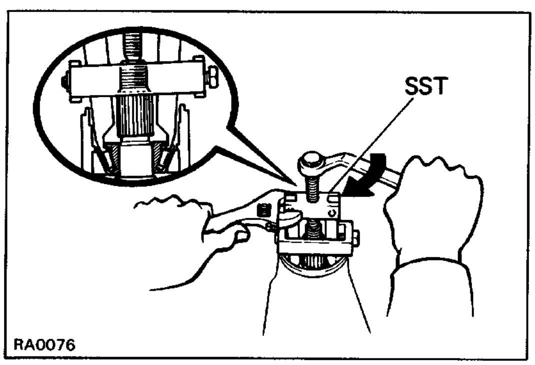
(c) Using SST, remove the companion flange.
SST 09557–22022 (09557–22030)



12. REMOVE OIL SEAL AND OIL SLINGER

(a) Using SST, remove the oil seal from the housing.
SST 09308–10010

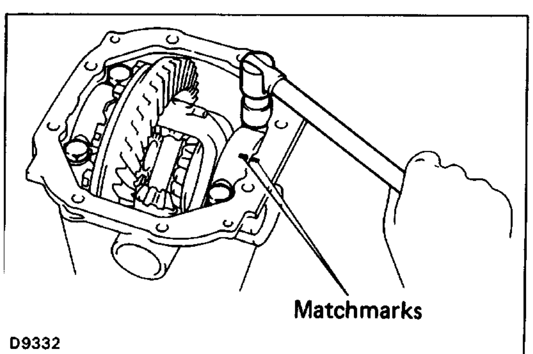
(b) Remove the oil slinger.



13. REMOVE REAR BEARING AND BEARING SPACER

(a) Using SST, remove the rear bearing from drive pinion.
SST 09556–30010

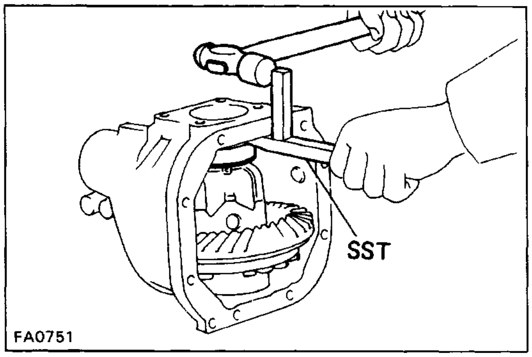
(b) Remove the bearing spacer.
If the rear bearing is damaged or worn, replace the bearing.



14. REMOVE DIFFERENTIAL CASE AND RING GEAR

(a) Place matchmarks on the bearing cap and differential carrier.

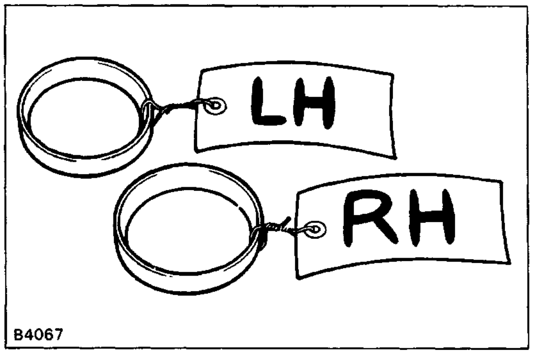
(b) Remove the two bearing caps.



FA0751

(c) Using SST and a hammer, remove the two side bearing preload adjusting plate washers.
SST 09504–22011

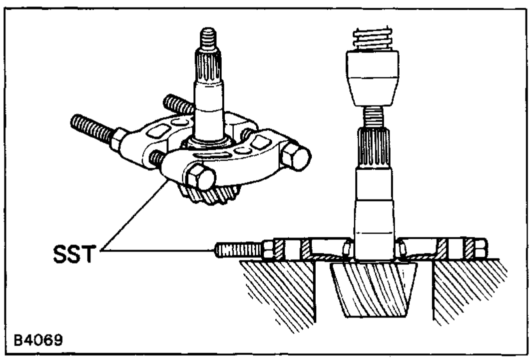
HINT: Measure the adjusting plate washer and note the thickness.



B4067

(d) Remove the differential case with bearing outer race from the carrier.
HINT: Tag the bearing outer races to show the location for reassembly.

15. REMOVE DRIVE PINION FROM DIFFERENTIAL CARRIER

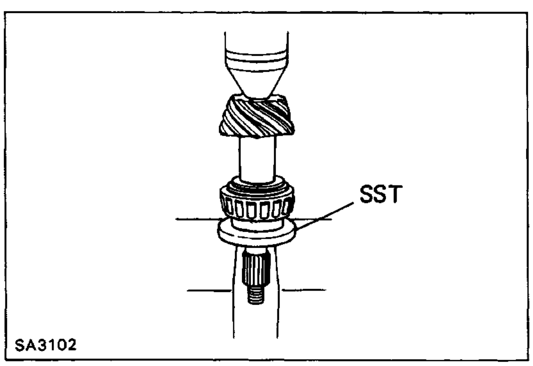


B4069

INSPECTION AND REPLACEMENT OF DIFFERENTIAL

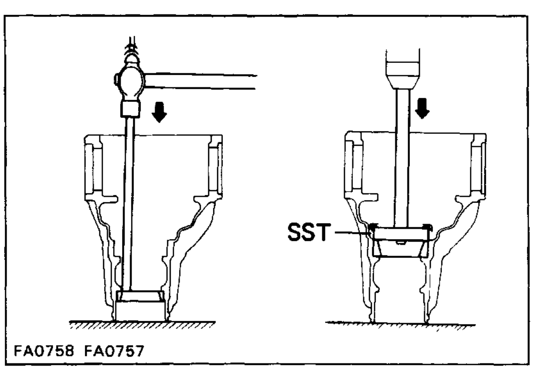
1. REPLACE DRIVE PINION FRONT BEARING

4ay Using SST, press out the front bearing from the drive pinion.
SST 09950–00020
HINT: If the drive pinion or ring gear are damaged, re–place them as a set.



SA3102

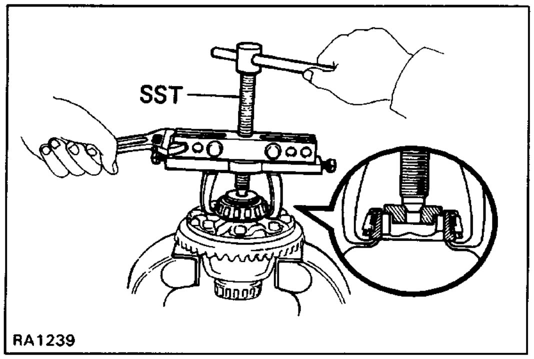
(b) Install the washer on the drive pinion.
(c) Using SST, press in the front bearing onto the drive pinion.
SST 09506–30012



FA0758 FA0757

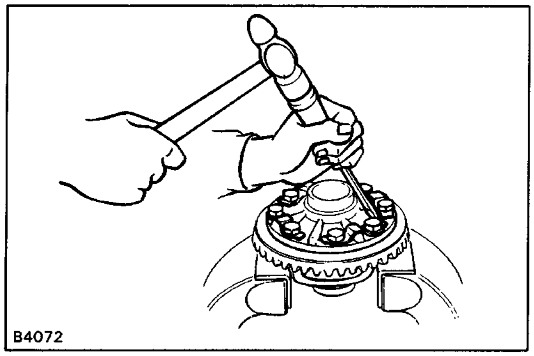
2. REPLACE DRIVE PINION FRONT AND REAR BEARING OUTER RACES

(a) Using a brass bar and hammer, drive out the outer race.
(b) Using SST, drive in a new outer race.
SST 09608–35014
Front outer race (09608–06020, 09608–06120)
Rear outer race (09608–06020, 09608–06110)



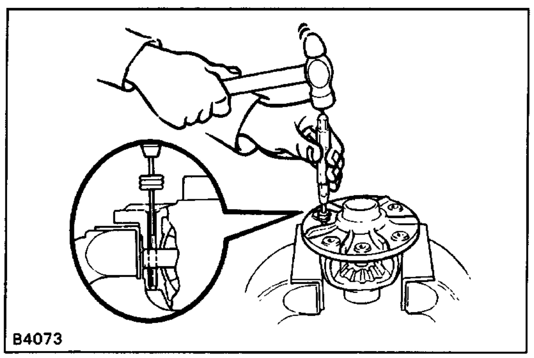
3. REMOVE SIDE BEARING FROM DIFFERENTIAL CASE

Using SST, remove the side bearing from the differential case.
SST 09950–20017
HINT: Fix the claws of SST to the notches in the differ–ential case.



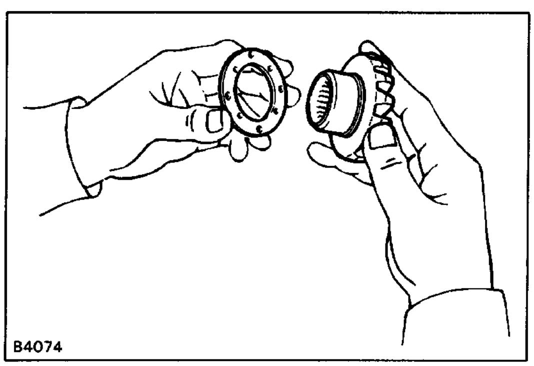
4. REMOVE RING GEAR

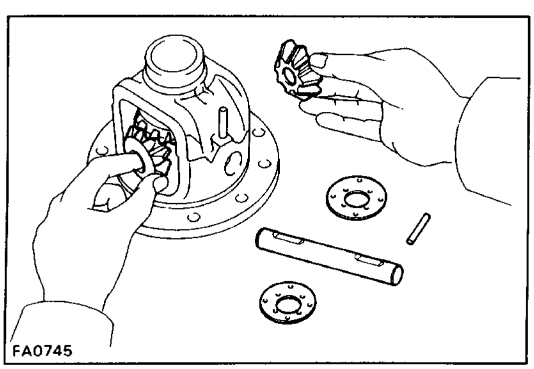
(a) Remove the ring gear set bolts and lock plates.
(b) Place matchmarks on the ring gear and differential case.
(c) Using a plastic–faced hammer, tap on the ring gear to separate it from the differential case.



5. DISASSEMBLE DIFFERENTIAL CASE

Using a hammer and punch, drive out the straight pin. Remove the pinion shaft, two pinion gears, two side gears and four thrust washers.





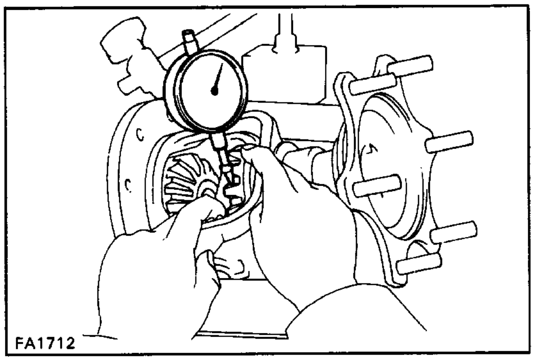
6. ASSEMBLE DIFFERENTIAL CASE

(a) Install the correct thrust washers and side gears.
From the table below select thrust washers that will ensure the backlash is within specification. Try to select washers of the same thickness for both sides.
Standard backlash: 0.05 – 0.20 mm
(0.0020 – 0.0079 in.)

Thrust washer thickness

Thickness mm (in.)
0.96 – 1.04 (0.0378 – 0.0409)
1.06 – 1.14 (0.0417 – 0.0449)
1.16 – 1.24 (0.0457 – 0.0488)
1.26 – 1.34 (0.0496 – 0.0528)

Install the thrust washers and side gears in the differ-ential case.

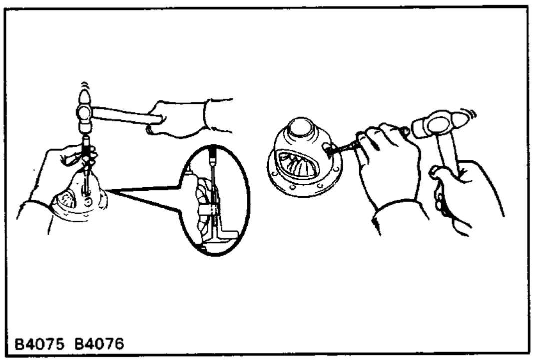


(b) Check the side gear backlash.

- Temporarily install the side gear shaft.
- Measure the side gear backlash while holding one pinion gear toward the case.

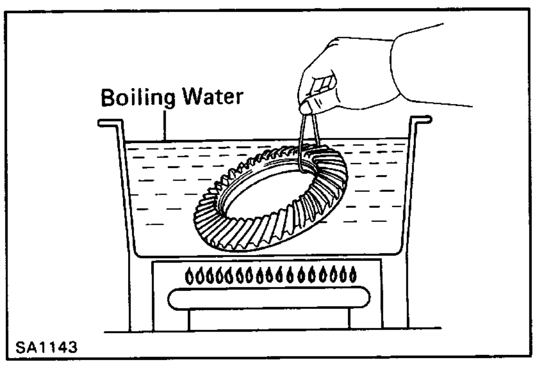
Side gear backlash: 0.05 – 0.20 mm
(0.0020 – 0.0079 in.)

If the backlash is not within specification, replace the thrust washers.



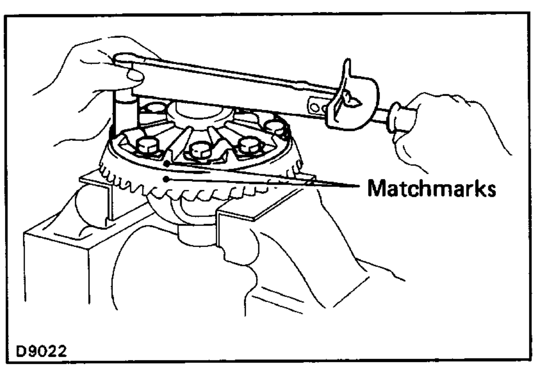
(c) Install straight pin.

- Using a hammer and punch, drive the straight pin through the case and hole in the pinion shaft.
- Stake the pin and differential case.



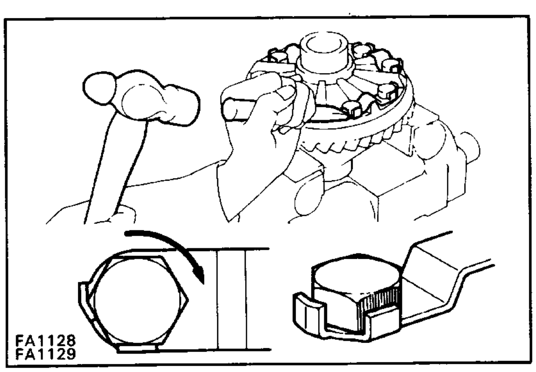
7. INSTALL RING GEAR ON DIFFERENTIAL CASE

(a) Clean the contact surfaces of the differential case and ring gear.
(b) Heat the ring gear in boiling water.
(c) After the moisture on the ring gear has completely evaporated, quickly install the ring gear to the differ–ential case.



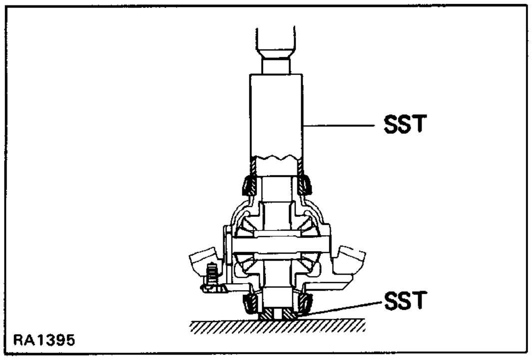
(d) Align the matchmarks on the ring gear and differen–tial case.
(e) Coat the ring gear set bolts with gear oil.
(f) Temporarily install the lock plates and set bolts.
(g) After the ring gear cools down enough, tighten the set bolts uniformly and a little at a time.

Torque: 97 N–m (985 kgf–cm, 71 ft–lbf)



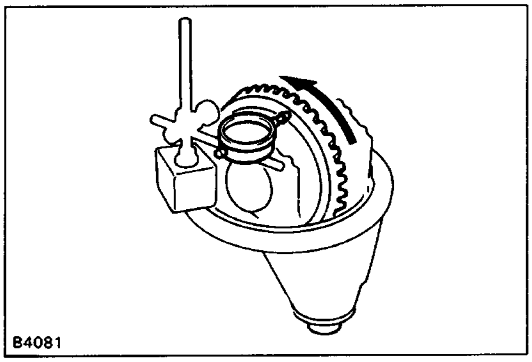
(h) Using a hammer and drift punch, stake the lick plates.

HINT: Stake one claw flush with the flat surface of the nut. For the claw contacting the protruding portion of the nut, stake only the half on the tightening side.



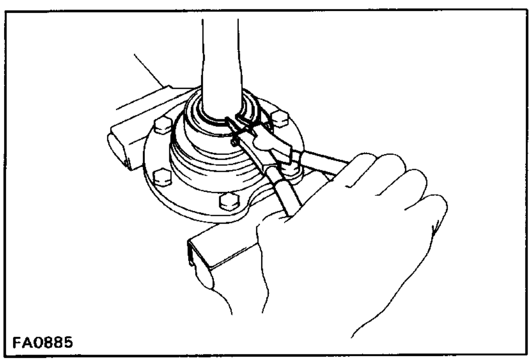
8. INSTALL SIDE BEARINGS

Using a press and SST, drive in the side bearings into the differential case.
SST 09226–10010, 09950–20017



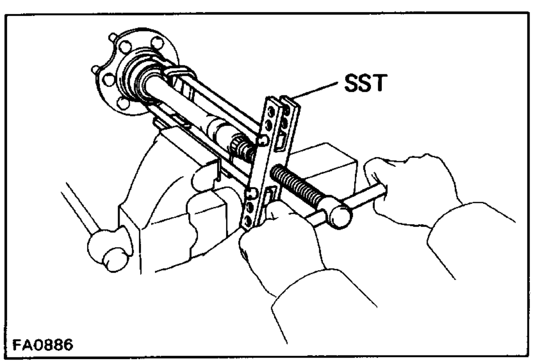
9. CHECK RING GEAR RUNOUT

(a) Install the differential case onto the carrier and in–stall the plate washers to where there is no play in the bearing. (See page SA–75)
(b) Install bearing caps. (See page SA–77)
(e) Using a dial indicator, measure the runout of ring gear.
Maximum runout: 0.07 mm (0.0028 in.)

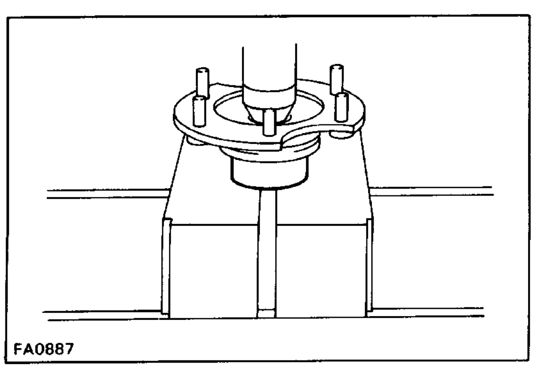


10. REPLACE LH SIDE GEAR SHAFT BEARING

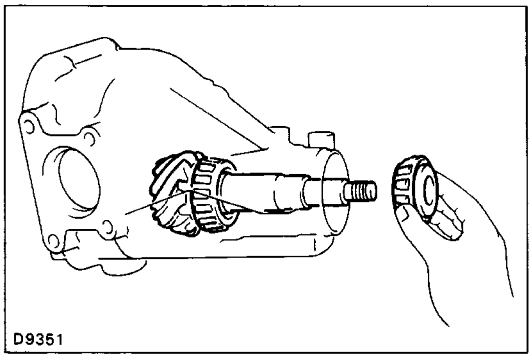
(a) Using a snap ring expander, remove the snap ring.



(b) Using SST, remove the bearing from the LH side gear shaft.
SST 09950–20017



(c) Install a new bearing to the LH side gear shaft.
(d) Using a snap ring expander, install the snap ring.



ASSEMBLY OF DIFFERENTIAL

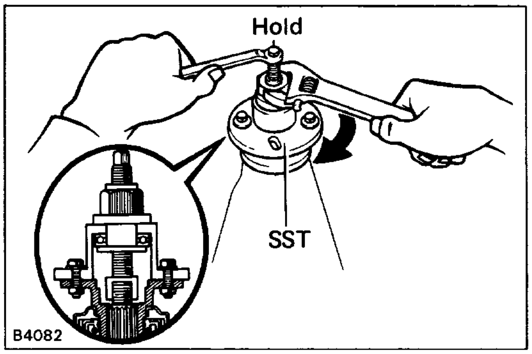
(See page SA–67)

1. TEMPORARILY ADJUST DRIVE PINION PRELOAD

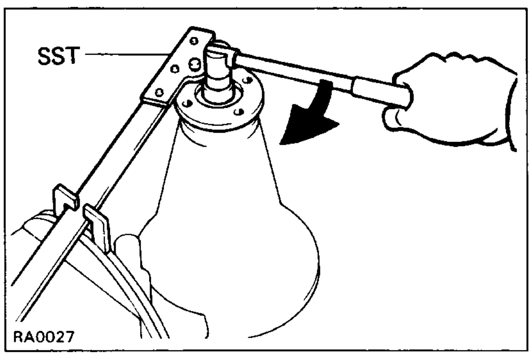
(a) Install the following parts.

- Drive pinion
- Front bearing

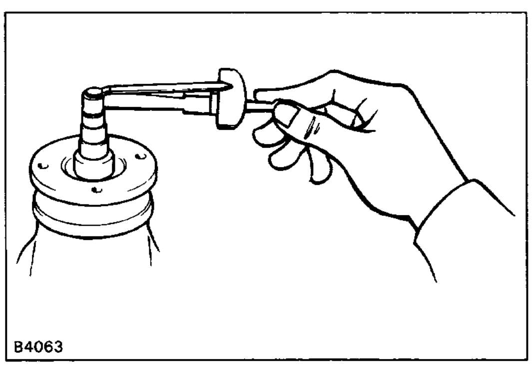
HINT: Assemble the spacer and oil seal after adjusting the gear contact pattern.



(b) Install the companion flange with SST.
Coat the threads of the nut with MP grease.
SST 09557–22022 (09557–22030)



(e) Adjust the drive pinion preload by tightening the companion flange nut.
Using SST to hold the flange, tighten the nut.
SST 09330–00021



(d) Using a torque meter, measure the preload.

Preload (starting):

New bearing

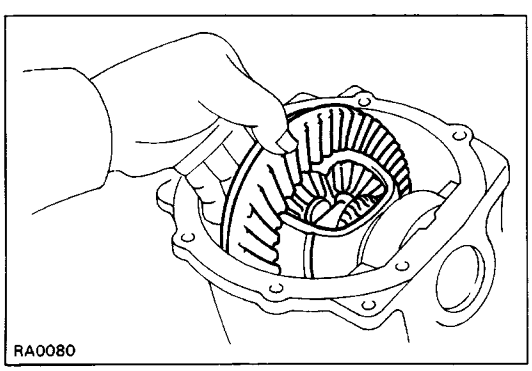
1.2 – 1.9 N–m

(12 – 19 kgf –cm, 10.4 – 16.5 in. –lbf)

Reused bearing

0.6 – 1.0 N–m

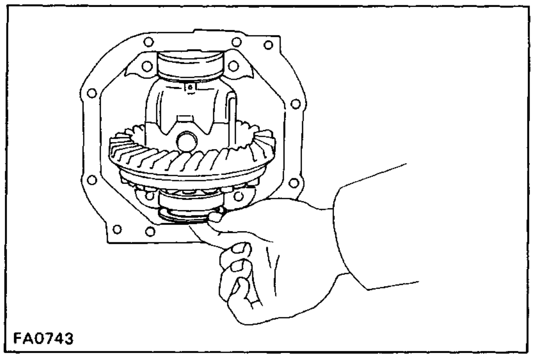
(6 – 10 kgf–cm, 5.2 – 8.7 in. –lbf)



2. INSTALL DIFFERENTIAL CASE IN CARRIER

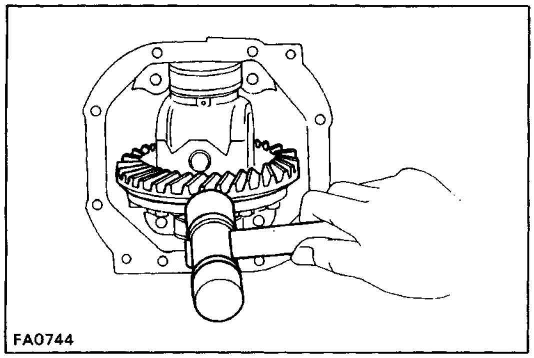
(a) Place the bearing outer races on their respective bearings. Make sure the left and right outer races are not interchanged.

(b) Install the differential case in the carrier.

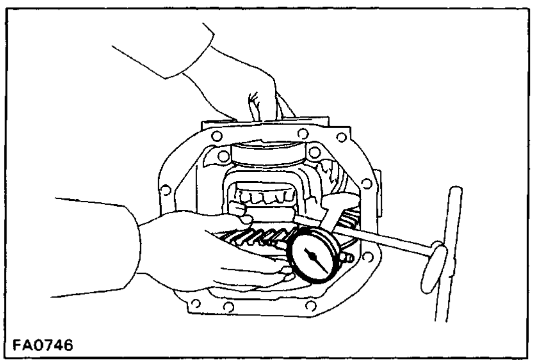

FA0743

3. ADJUST RING GEAR BACKLASH

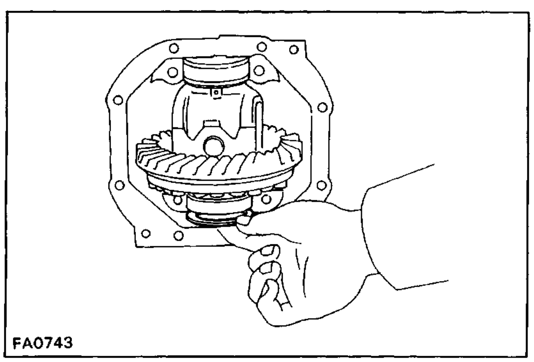
(a) Install only the plate washer on the ring gear back side.
HINT: Insure that the ring gear has backlash.


FA0744

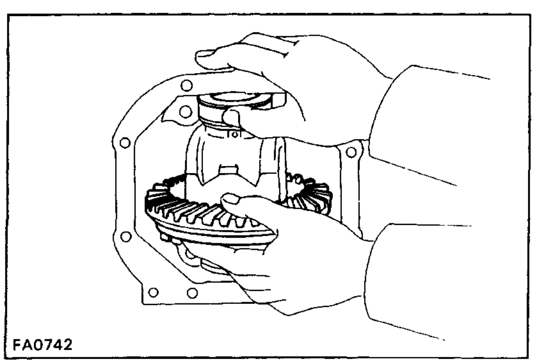
(b) Snug down the washer and bearing by tapping on the ring gear with a plastic–faced hammer.


FA0746

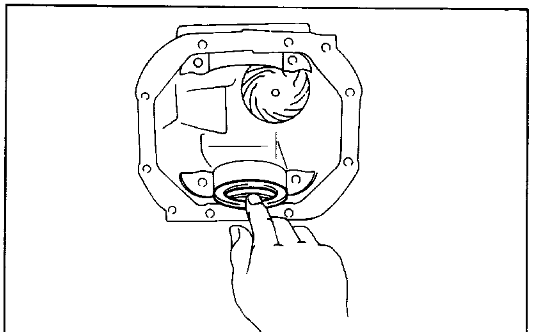
(c) Hold the side bearing boss on the teeth surface of the ring gear and measure the backlash.
Backlash (reference): 0.13 mm (0.0051 in.)


FA0743

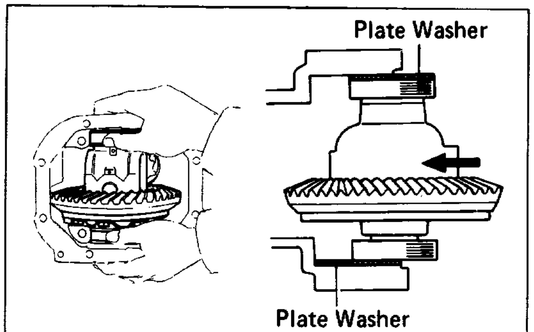
(d) Select a ring gear back plate washer, using the backlash as reference. (See page SA–77)


FA0742

(e) Select a ring gear teeth side washer with a thickness which eliminates any clearance between the outer race and case.

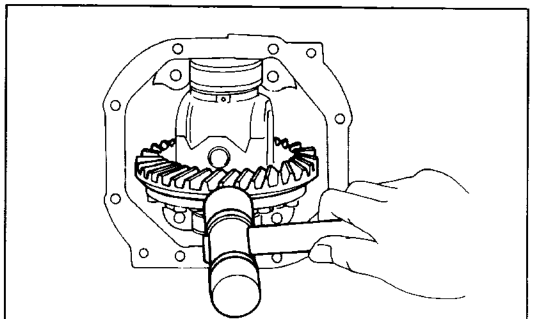

FA0752

(f) Remove the plate washers and differential case.
(g) Install the plate washer into the lower part of the carrier.

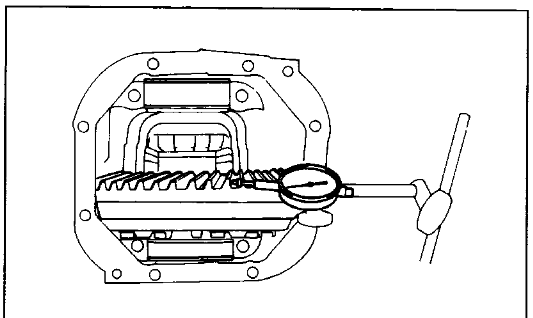


FA0741 RA0087

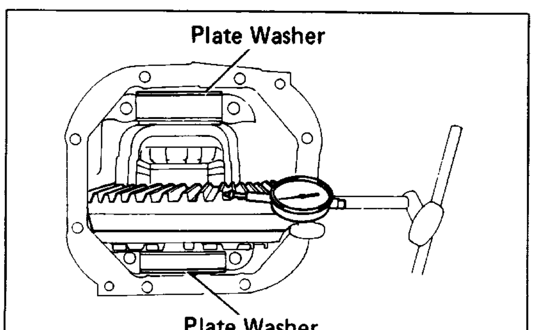
(h) Place the other plate washer onto the differential case together with the outer race, and install the dif–ferential case with the outer race into the carrier.


FA0744

(i) Using a plastic–faced hammer, snug down the washer and bearing by tapping the ring gear.

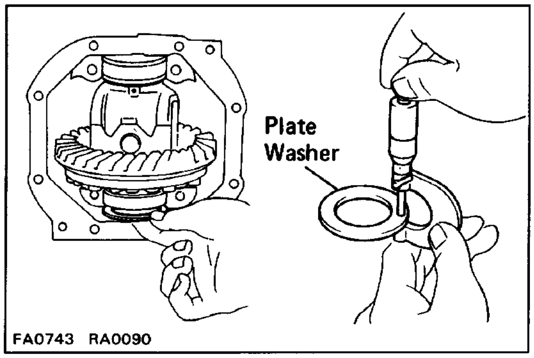

FA0754

(j) Using a dial indicator, measure the ring gear back–lash.
Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)



FA0754

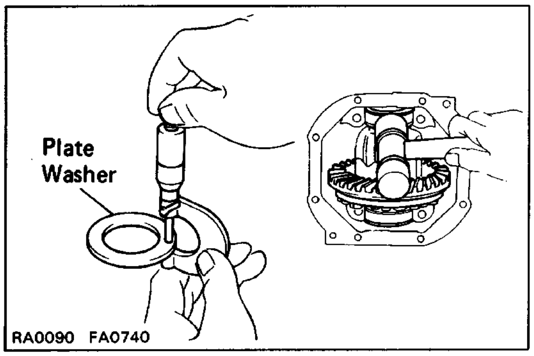
(k) If not within specification, adjust by either increas–ing or decreasing the number of washers on both sides by an equal amount.
HINT: There should be no clearance between the plate washer and case.
Insure that there is ring gear backlash.



FA0743 RA0090

4. ADJUST SIDE BEARING PRELOAD

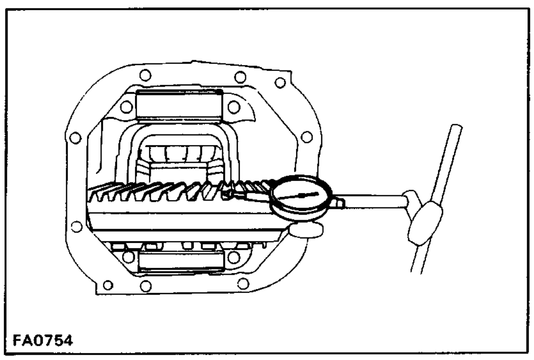
(a) Remove the ring gear teeth plate washer and mea– sure the thickness.



RA0090 FA0740

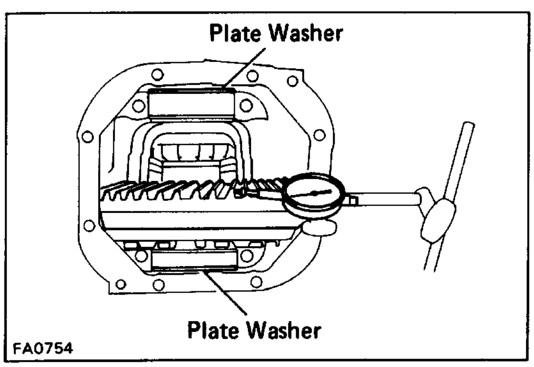
(b) Using the backlash as a reference, install a new washer of 0.06 – 0.09 mm (0.0024 – 0.0035 in.) thicker than the washer removed.
HINT: Select a washer which can be pressed in 2l3 of the way with your finger.

(c) Using a plastic–faced hammer, tap in the side washer.


FA0754

(d) Recheck the ring gear backlash.
Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

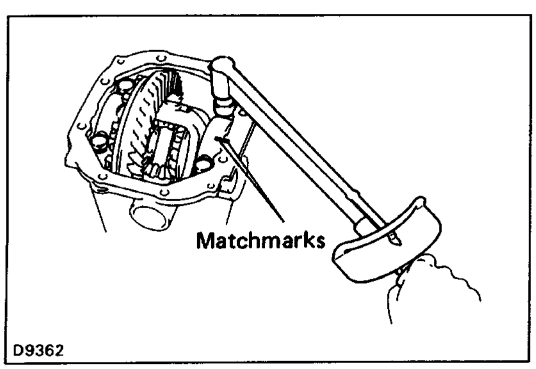
(e) If not within standard, adjust by either increasing or decreasing the washers on both sides by an equal amount.
HINT: The backlash will change about 0.02 mm (0.0008 in.) with 0.03 mm (0.0012 in.) alteration of the side washer.



FA0754

Washer thickness

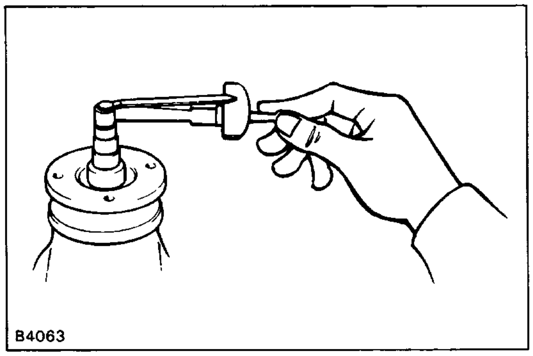
Thickness mm (in.)	
2.57 – 2.59 (0.1012 – 0.1020)	2.93 – 2.95 (0.1154 – 0.1161)
2.60 – 2.62 (0.1024 – 0.1031)	2.96 – 2.98 (0.1165 – 0.1173)
2.63 – 2.65 (0.1035 – 0.1043)	2.99 – 3.01 (0.1177 – 0.1185)
2.66 – 2.68 (0.1047 – 0.1055)	3.02 – 3.04 (0.1189 – 0.1197)
2.69 – 2.71 (0.1059 – 0 .1067)	3.05 – 3.07 (0.1201 – 0.1209)
2.72 – 2.74 (0.1071 – 0.1079)	3.08 – 3.10 (0.1213 – 0.1220)
2.75 – 2.77 (0.1083 – 0.1091)	3.11 – 3.13 (0.1224 – 0.1232)
2.78 – 2.80 (0.1094 – 0.1102)	3.14 – 3.16 (0.1236 – 0.1244)
2.81 – 2.83 (0.1106 – 0.1114)	3.17 – 3.19 (0.1248 – 0.1256)
2.84 – 2.86 (0.1118 – 0.1126)	3.20 – 3.22 (0.1260 – 0.1268)
2.87 – 2.89 (0.1130 – 0.1138)	3.23 – 3.25 (0.1272 – 0.1280)
2.90 – 2.92 (0.1142 – 0.1150)	



D9362

5. INSTALL SIDE BEARING CAPS

Align the matchmarks on the cap and carrier.
Torque: 78 N–m (800 kgf–cm, 58 ft–lbf)



6. MEASURE TOTAL PRELOAD

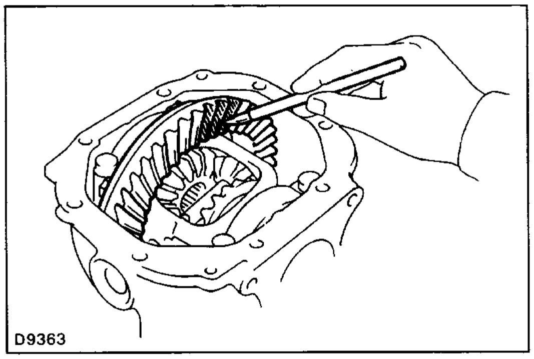
Using a torque wrench, measure the total preload.

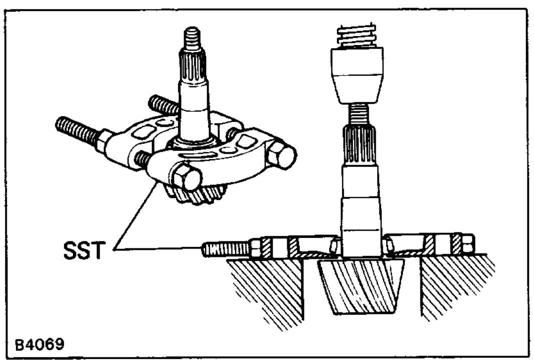
Total preload (starting):

Add drive pinion preload

0.4 – 0.6 N–m

(4 – 6 kgf–cm, 3.5 – 5.2 in.–lbf)





7. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

(a) Coat 3 or 4 teeth at three different positions on the ring gear with red lead .

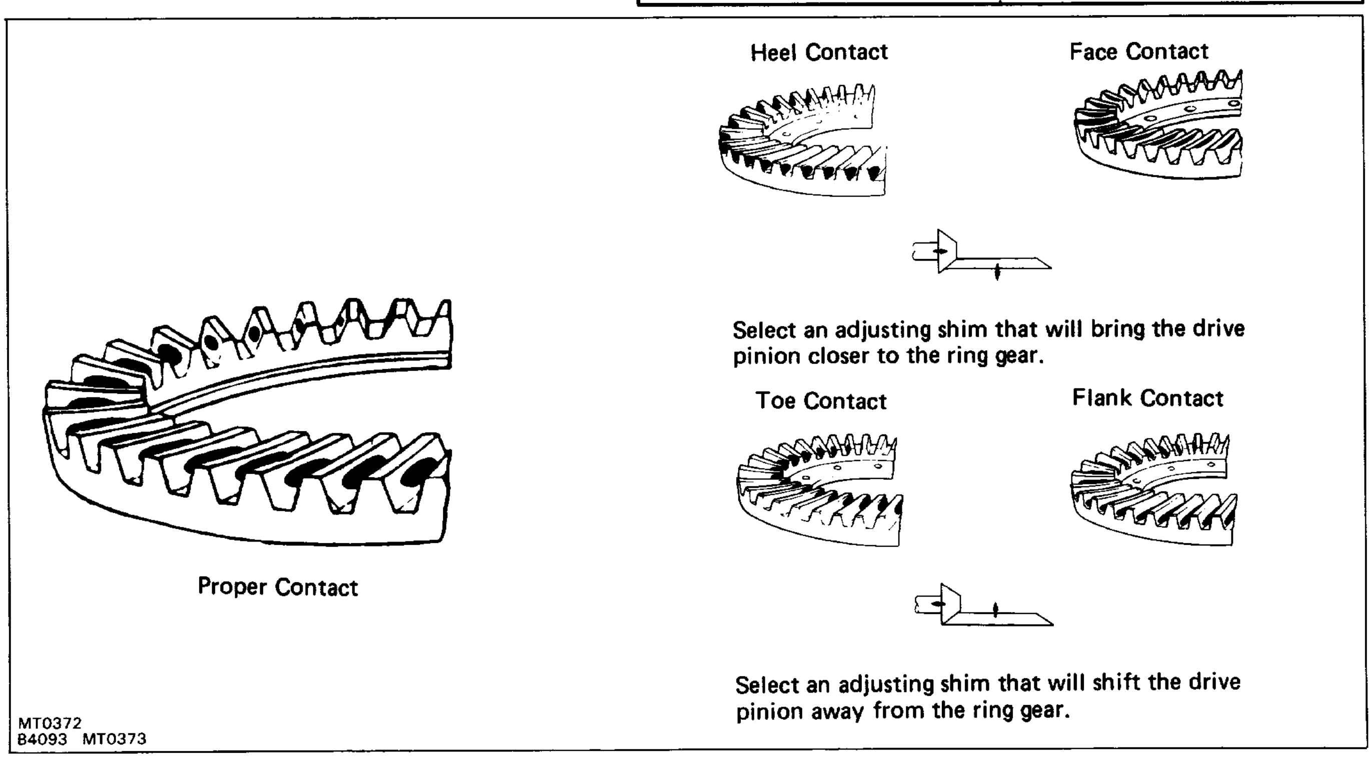
(b) Hold the companion flange firmly and rotate the ring gear in both directions.

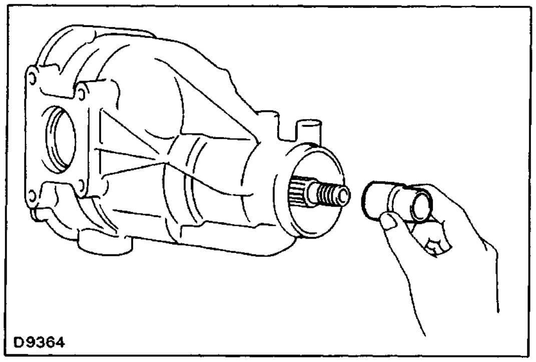
(c) Inspect the tooth pattern.

If the teeth are not contacting properly, use the following chart to select a proper washer for correction.

Washer thickness

Thickness mm (in.)	
2.24 (0.0882)	2.51 (0.0988)
2.27 (0.0894)	2.54 (0.1000)
2.30 (0.0906)	2.57 (0.1012)
2.33 (0.0917)	2.60 (0.1024)
2.36 (0.0929)	2.63 (0.1035)
2.39 (0.0941)	2.66 (0.1047)
2.42 (0.0953)	2.69 (0.1059)
2.45 (0.0965)	2.72 (0.1071)
2.48 (0.0976)	





8. REMOVE COMPANION FLANGE

(See step 11 on page SA–68)

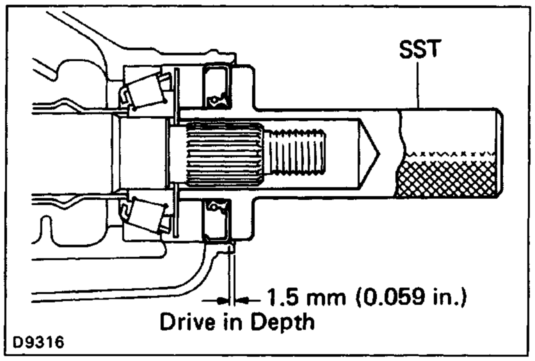
9. REMOVE FRONT BEARING

(See step 12 on page SA–69)

10. INSTALL NEW BEARING SPACER AND FRONT BEARING

(a) Install a new bearing spacer on the drive pinion.

(b) Install the front bearing on the drive pinion.



11. INSTALL OIL SLINGER AND NEW OIL SEAL

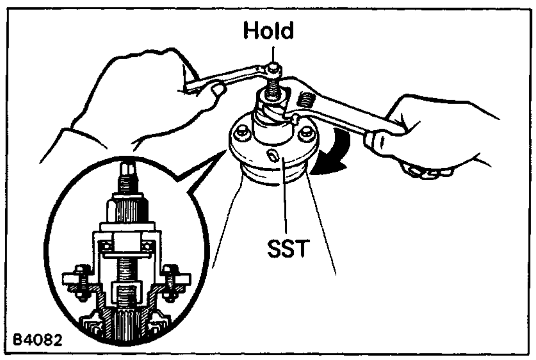
(a) Install the oil slinger.

(b) Using SST, drive in a new oil seal.

SST 09554–3001 1

Oil seal drive in depth: 1.5 mm (0.059 in.)

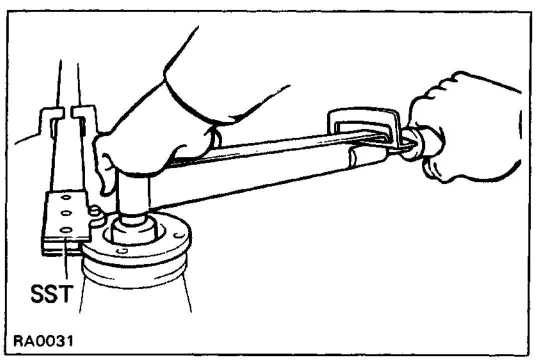
(c) Apply MP grease to the oil seal lip.



12. INSTALL COMPANION FLANGE

(a) Using SST, install the companion flange on the shaft.

SST 09557–22022 (09557–22030)



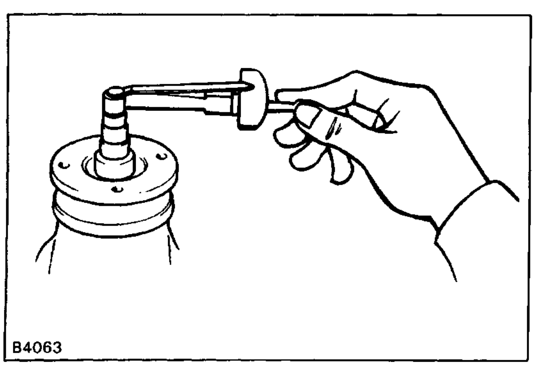
(b) Coat the threads of a new nut with MP grease.

(c) Using SST to hold the flange, tighten the nut.

Torque the nut.

SST 09330–00021

Torque: 120 N–m (1,225 kgf–cm, 89 ft–lbf)



13. CHECK FRONT BEARING PRELOAD

Using a torque meter, measure the preload of the back–lash between the drive pinion and ring gear.

Preload (starting):

New bearing

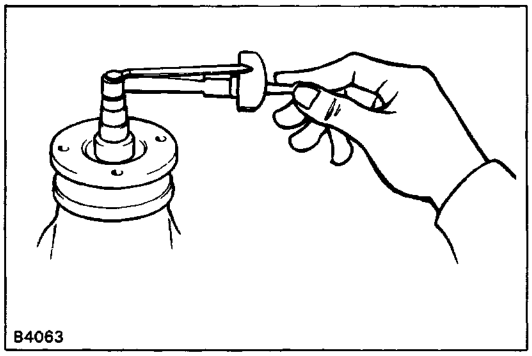
1.2 – 1.9 N–m

(12 – 19 kgf–cm, 10.4 – 16.5 in.–lbf)

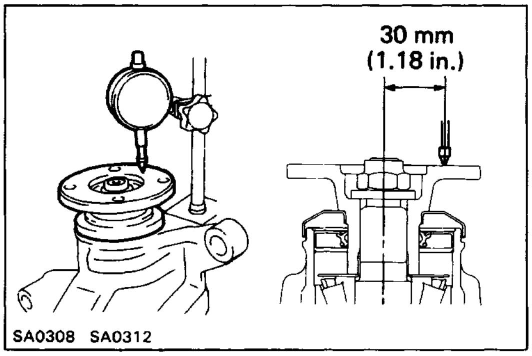
Reused bearing

0.6 – 1.0 N–m

(6 – 10 kgf–cm, 5.2 – 8.7 in.–lbf)

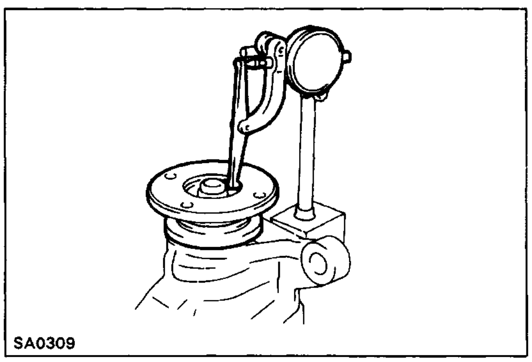

B4063

(a) If the preload is greater than specification, replace the bearing spacer.
(b) If the preload is less than specification, retighten the nut 13 N–m (130 kgf–cm, 9 ft–lbf) a little at a time until the specified preload is reached.
Maximum torque: 223 N–m (2,275 kgf–cm, 165 ft–lbf)
If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the preload procedure. Do not back off the pinion nut to reduce the preload.

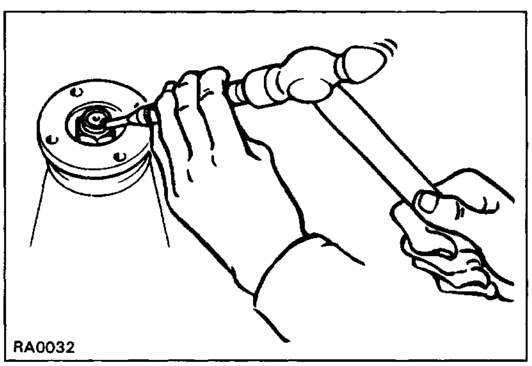


SA0308 SA0312

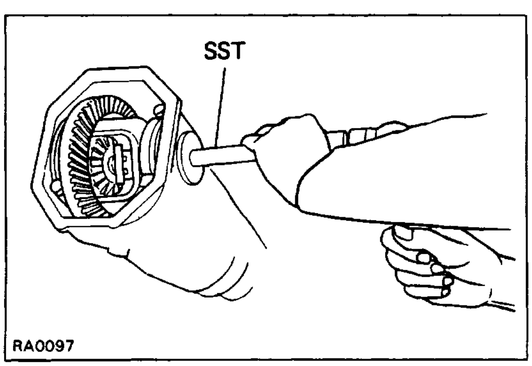
14. CHECK RUNOUT OF COMPANION FLANGE
Using a dial indicator, measure the vertical and lateral runout of the companion flange.
Maximum vertical runout: 0.10 mm 10.0039 in.)


SA0309

Maximum lateral runout: 0.10 mm (0.0039 in.)
If the runout is greater than maximum, inspect the bearings.

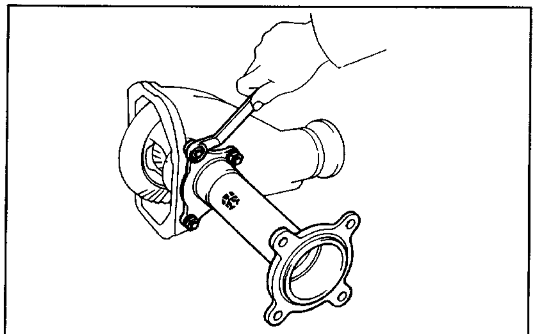

RA0032

15. STAKE DRIVE PINION NUT



RA0097

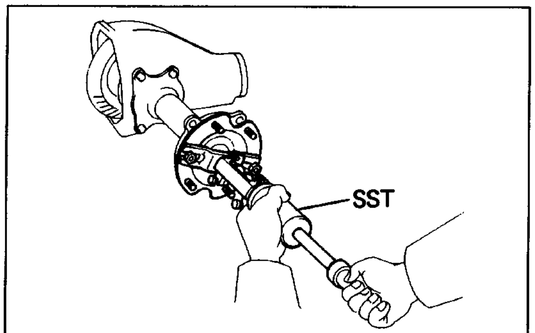
16. INSTALL NEW SIDE GEAR SHAFT OIL SEAL
(a) Coat the oil seal lip with MP grease.
(b) Using SST, drive in the oil seal until it is flush with the carrier end surface.
SST 09550–22011 (09550–00020, 09550–00031)


FA0726

17. INSTALL DIFFERENTIAL TUBE

Install the differential tube to the differential carrier with the four bolts.

Torque: 88 N–m (900 kgf–cm, 65 ft–lbf)



FA0725

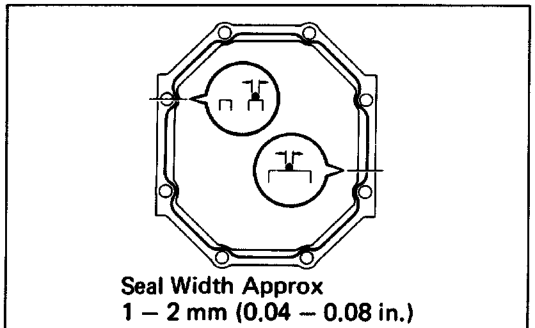
18. INSTALL SIDE GEAR SHAFTS

(a) Before installing the shafts, replace the snap ring.

(b) Using SST, install the side gear shafts to the differential carrier.

SST 09910–00015

(09911–00011, 09912–00010, 09914–00011)



D9367

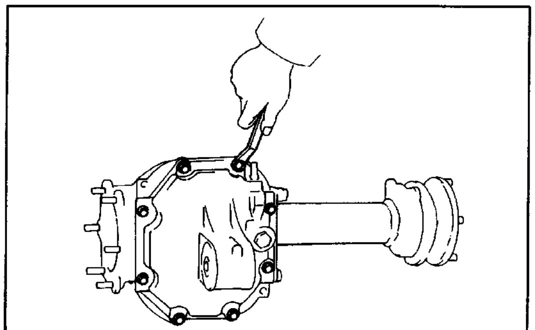
19. INSTALL DIFFERENTIAL CARRIER COVER

(a) Remove any packing material and be careful not to drop oil on the contacting surface of the differential carrier or carrier cover.

(b) Apply seal packing to the carrier cover.

Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent

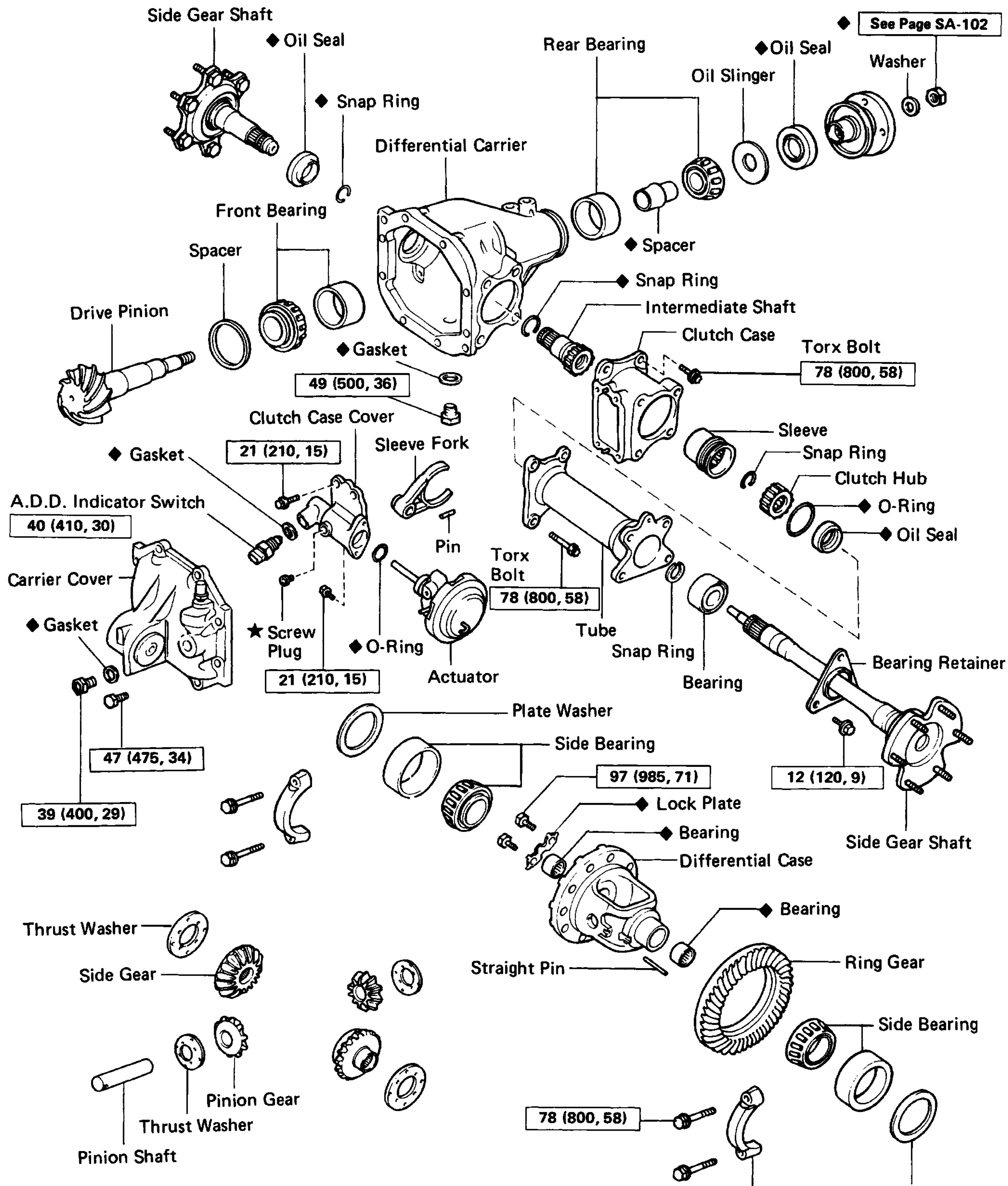
HINT: Install the carrier cover within ten minutes after applying seal packing.


FA0729

(c) Install and torque the bolts.

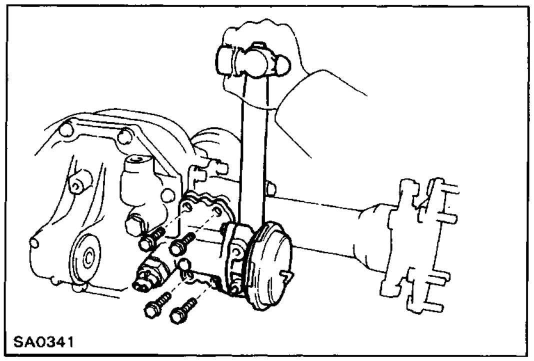
Torque: 47 N–m (475 kgf–cm, 34 ft–lbf)

Disassembly and Assembly of Differential (with A.D.D.)



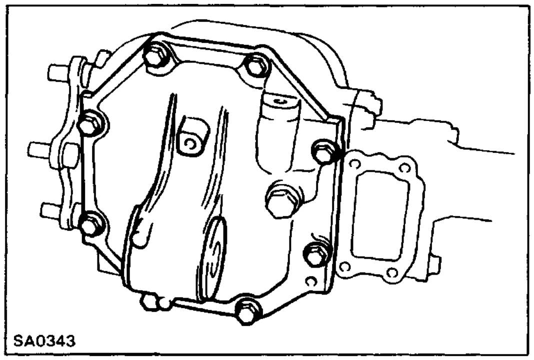
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
★ Precoated part

DISASSEMBLY OF DIFFERENTIAL


SA0341

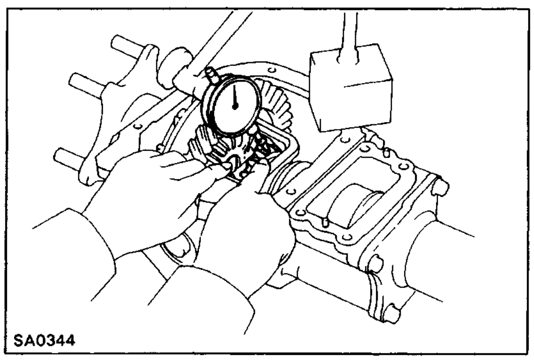
1. REMOVE ACTUATOR

(a) Remove the four bolts.
(b) Using a hammer, remove the actuator.


SA0343

2. REMOVE DIFFERENTIAL CARRIER COVER

Remove the eight bolts and tap off the cover with a plastic–faced hammer.

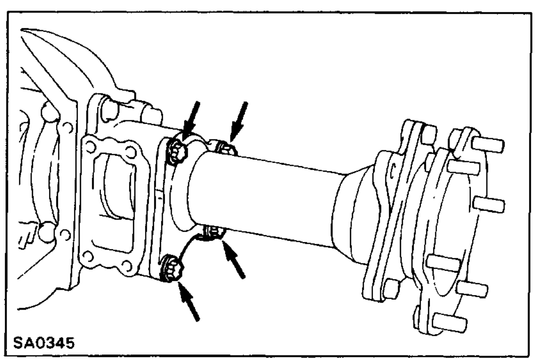

SA0344

3. CHECK SIDE GEAR BACKLASH

Measure the side gear backlash while holding one pinion gear toward the case.

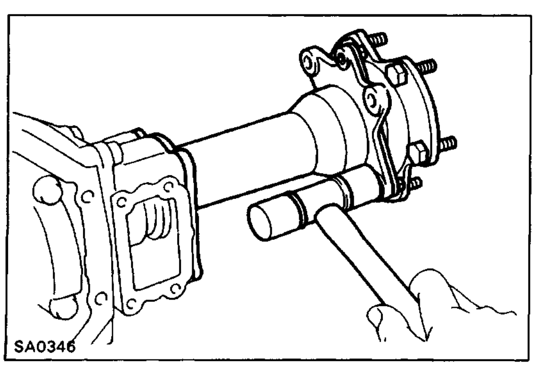
Standard backlash: 0.05 – 0.20 mm
(0.0020 – 0.0079 in.)

If the backlash is out of specification, install the correct thrust washers. (See page SA–90)

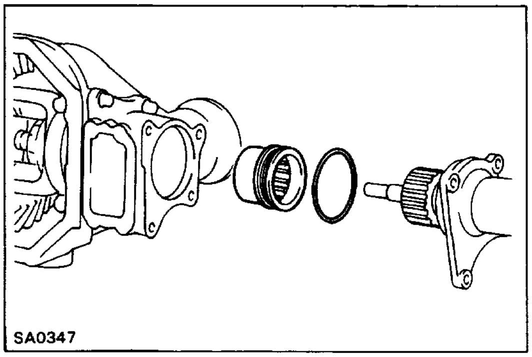

SA0345

4. REMOVE LH SIDE GEAR SHAFT WITH TUBE

(a) Remove the four torx bolts.
Torx wrench: E14 (Part No. 09044–00010 or locally manufactured tool)

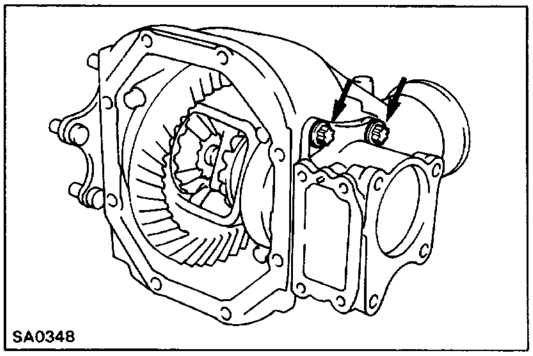

SA0346

(b) Using a plastic–faced hammer, tap on the tube to re–move it.



(c) Remove the sleeve.

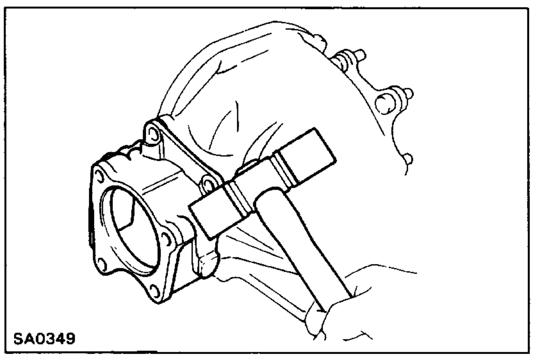
(d) Remove the 0–ring from the tube.



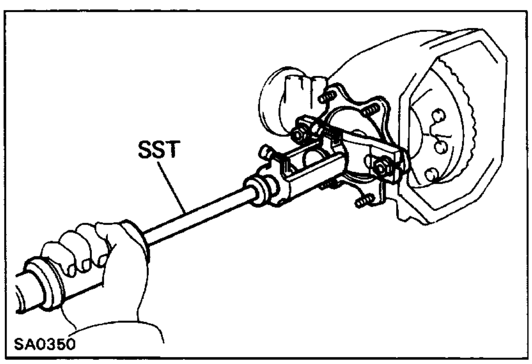
5. REMOVE CLUTCH CASE

(a) Remove the two torx bolts.

Torx wrench: E14 (Part No. 09044–00010 or locally manufactured tool)



(b) Using a plastic–faced hammer, tap on the clutch case to remove it.

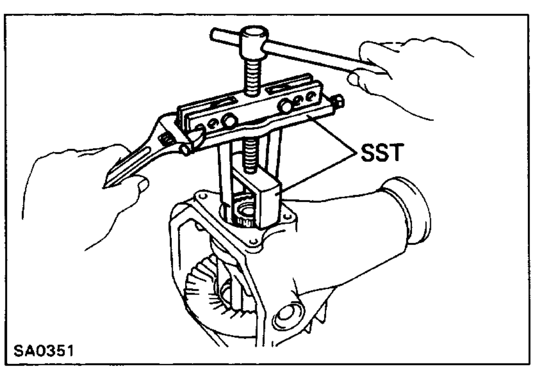


6. REMOVE RH SIDE GEAR SHAFT

Using SST, pull off the RH side gear shaft.

SST 09910–00015

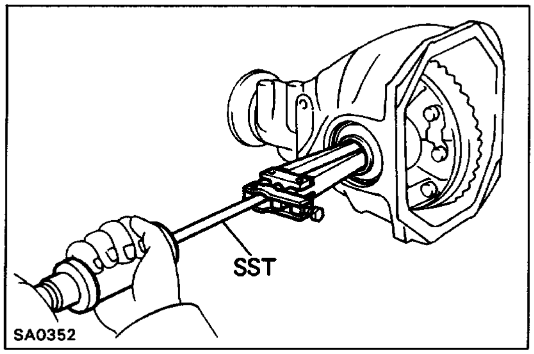
(09911–00011, 09912–00010, 09914–00011)



7. REMOVE INTERMEDIATE SHAFT

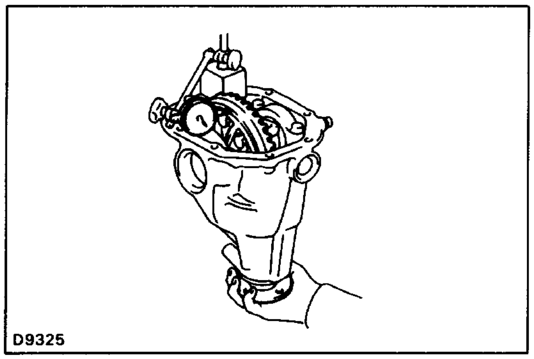
Using SST, pull off the intermediate shaft.

SST 09350–20015 (09369–20040), 09950–20017



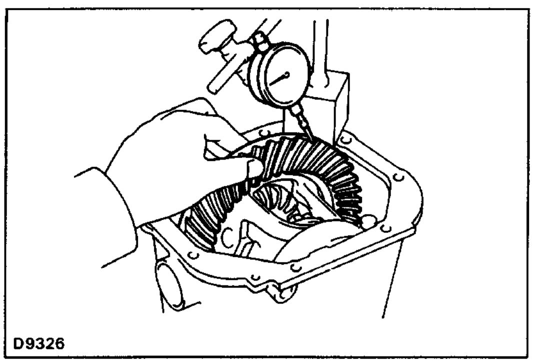
8. REMOVE RH SIDE OIL SEAL

Using SST, remove the oil seal.
SST 09308–00010



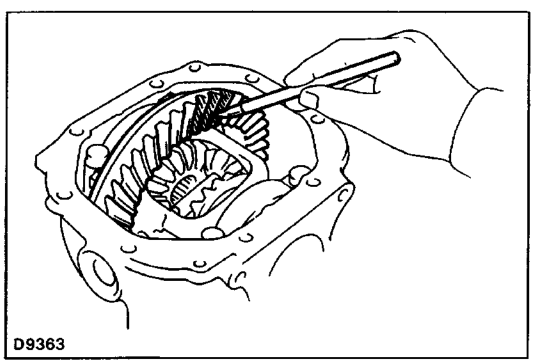
9. CHECK RING GEAR RUNOUT

Using a dial indicator, measure the ring gear runout.
Maximum runout: 0.07 mm (0.0028 in.)
If the runout is greater than maximum, replace the ring gear and drive pinion as a set.



10. CHECK RING GEAR BACKLASH

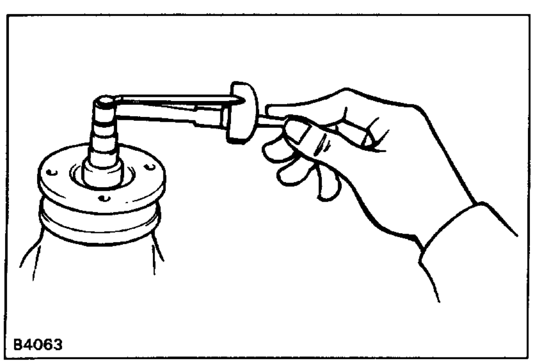
(a) Fix the dial indicator on the tooth surface at a 90• angle.
(b) Holding the drive pinion flange, measure the ring gear backlash.
Ring gear backlash: 0.13 – 0.18 mm
(0.0051 – 0.0071 in.)
If the backlash is not within specification, adjust the ring gear backlash.
HINT: Measure from three or more places on the cir– cumference of the ring gear.



11. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION (SEE STEP 7 ON PAGE SA–100)

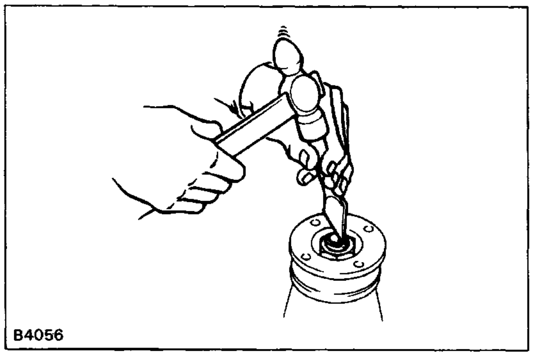
12. MEASURE DRIVE PINION PRELOAD

Using a torque gauge, measure the preload of the back– lash between the drive pinion and ring gear.
Preload (starting):
0.6 – 1.0 N–m (6 – 10 kgf–cm, 5.2 – 8.7 in.–lbf)



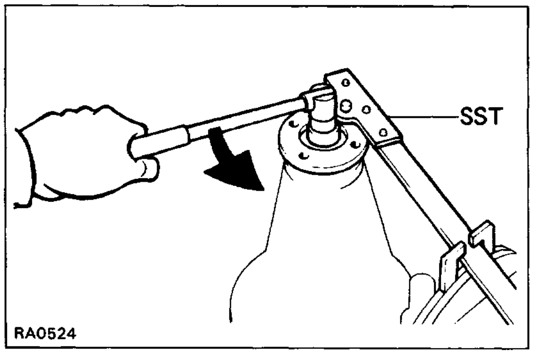
13. CHECK TOTAL PRELOAD

Using a torque gauge, measure the total preload.
Total preload (starting):
Add drive pinion preload
0.4 – 0.6 N–m
(4 – 6 kgf–cm, 3.5 – 5.2 in.–lbf)

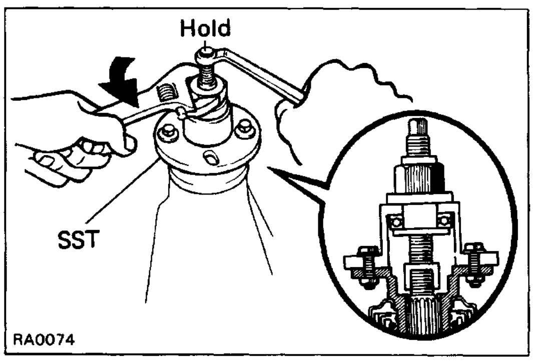


14. REMOVE COMPANION FLANGE

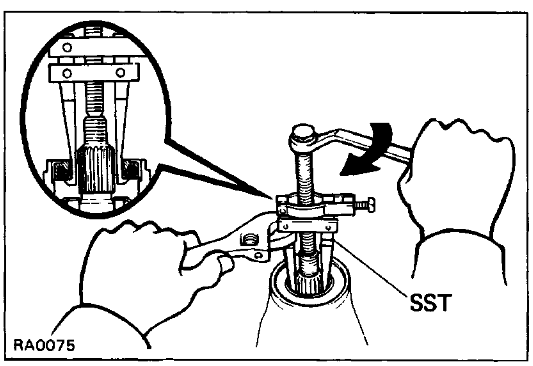
(a) Using a hammer and chisel, loosen the staked part of the nut.



(b) Using SST to hold the flange, remove the nut.
SST 09330–00021



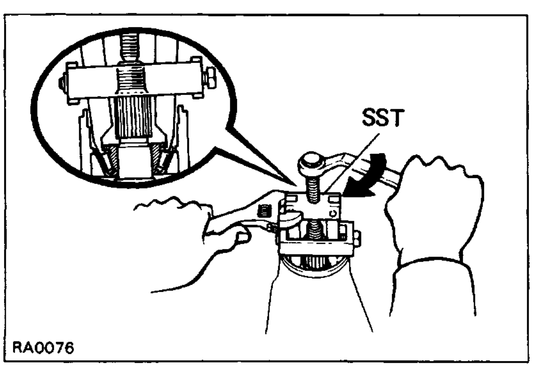
(c) Using SST, remove the companion flange.
SST 09557–22022 (09557–22030)



15. REMOVE OIL SEAL AND OIL SLINGER

(a) Using SST, remove the oil seal from the housing.
SST 09308–10010

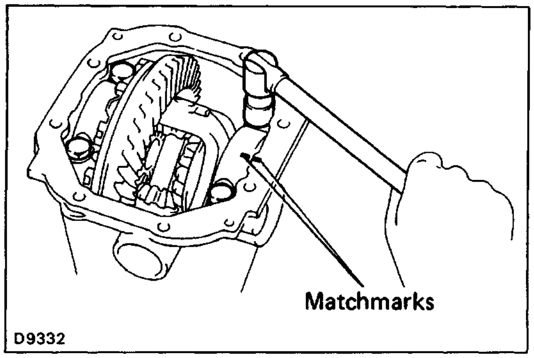
(b) Remove the oil slinger.



16. REMOVE REAR BEARING AND BEARING SPACER

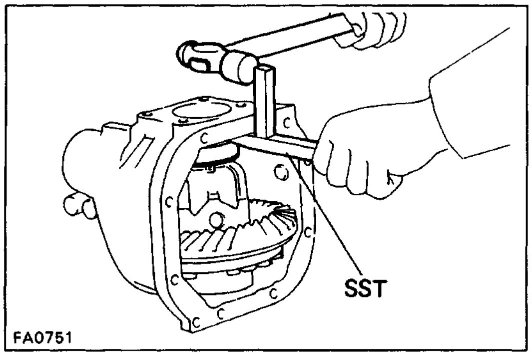
(a) Using SST, remove the rear bearing from drive pin–ion.
SST 09556–30010

(b) Remove the bearing spacer.
If the rear bearing is damaged or worn, replace the bear–ing.

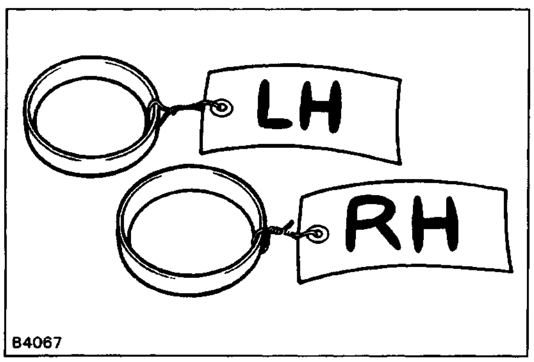


17. REMOVE DIFFERENTIAL CASE AND RING GEAR

(a) Place matchmarks on the bearing cap and differen–tial carrier.
(b) Remove the two bearing caps.



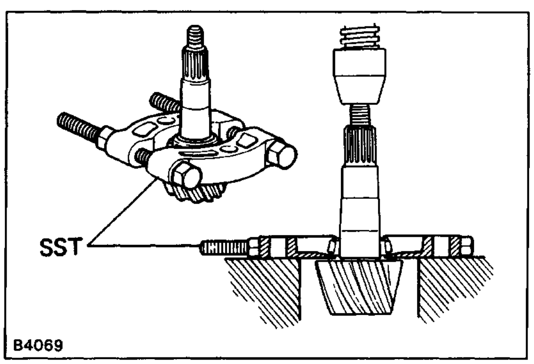
(c) Using SST and a hammer, remove the two side bearing preload adjusting plate washers.
SST 09504–22011
HINT: Measure the adjusting plate washer and note the thickness.



(d) Remove the differential case with bearing outer race from the carrier.
HINT: Tag the bearing outer races to show the location for reassembly.

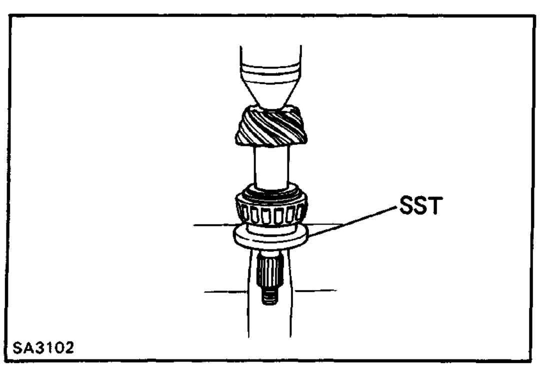
18. REMOVE DRIVE PINION FROM DIFFERENTIAL CARRIER

INSPECTION AND REPLACEMENT OF DIFFERENTIAL

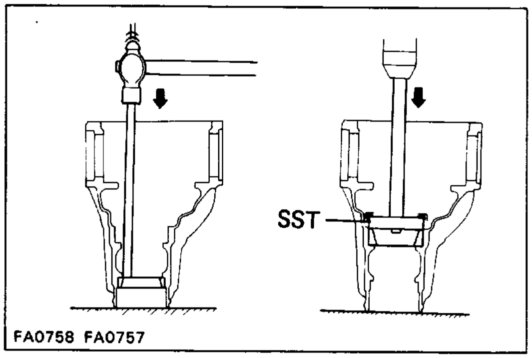


1. REPLACE DRIVE PINION FRONT BEARING

(a) Using SST, press out the front bearing from the drive pinion.
SST 09950–00020
HINT: If the drive pinion or ring gear are damaged, re–place them as a set.



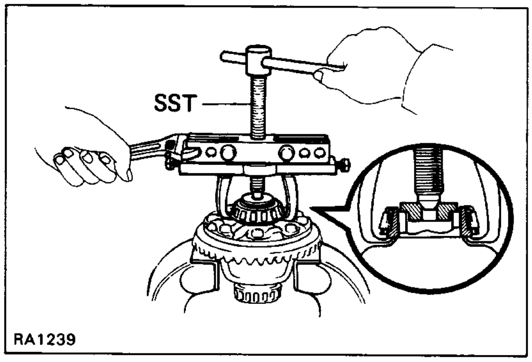
(b) Install the washer on the drive pinion.
(c) Using SST, press in the front bearing onto the drive pinion.
SST 09506–30012



2. REPLACE DRIVE PINION FRONT AND REAR BEARING OUTER RACES

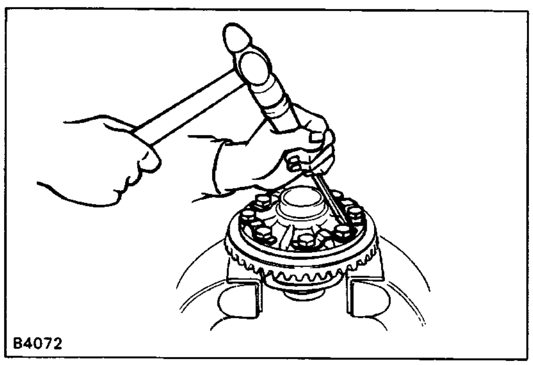
(a) Using a brass bar and hammer, drive out the outer race.

(b) Using SST, drive in a new outer race.
SST 09608–35014
Front outer race (09608–06020, 09608–06120)
Rear outer race (09608–06020, 09608–06110)



3. REMOVE SIDE BEARING FROM DIFFERENTIAL CASE

Using SST, remove the side bearing from the differential case.
SST 09950–20017
HINT: Fix the claws of SST to the notches in the differ– ential case.

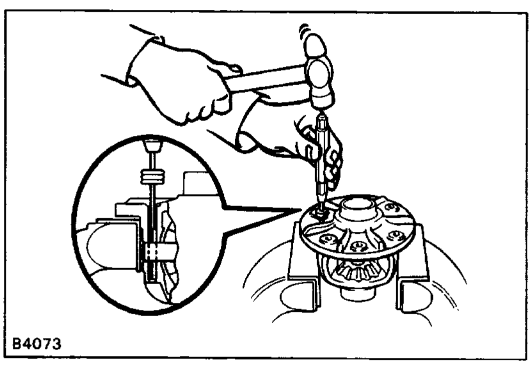


4. REMOVE RING GEAR

(a) Remove the ring gear set bolts and lock plates.

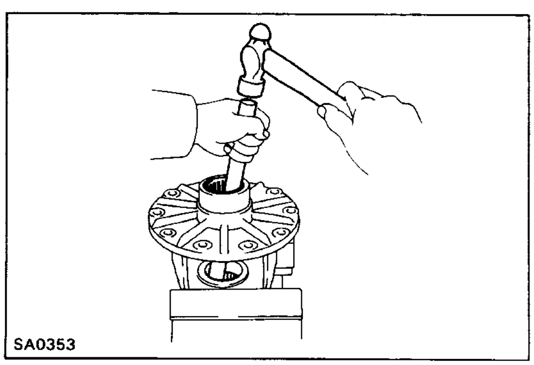
(b) Place matchmarks on the ring gear and differential case.

(c) Using a plastic–faced hammer, tap on the ring gear to separate it from the differential case.



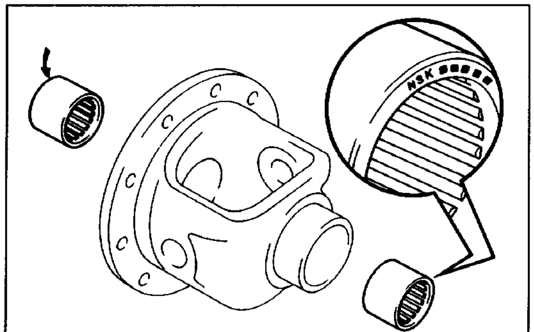
5. DISASSEMBLE DIFFERENTIAL CASE

(a) Using a hammer and punch, drive out the straight pin. Remove the pinion shaft, two pinion gears, two side gears and four thrust washers.



(b) Using a hammer and brass bar, drive out the needle bearings.

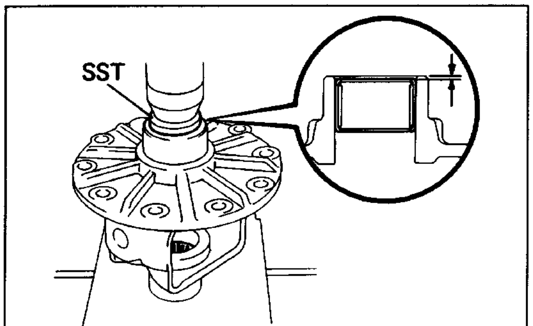
6. ASSEMBLE DIFFERENTIAL CASE



SA0354

(a) Using SST, press the new needle bearing into the differential case.

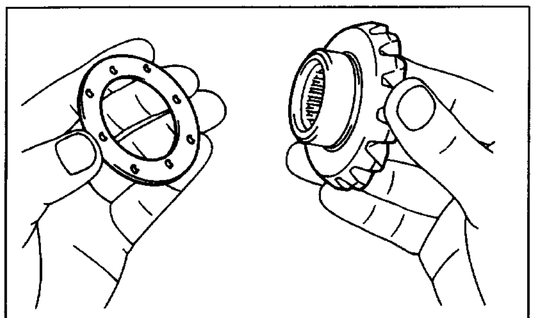
NOTICE: Press in the bearings, with the engraved side of each bearing facing outward from the differential case.



SA0355

Bearing press in depth: 2.0 mm 10.079 in.)

SST 09950–20017



E7910

(b) Install the thrust washers to the side gears.

(c) Install the side gears with thrust washers and pinion gears with thrust washers.

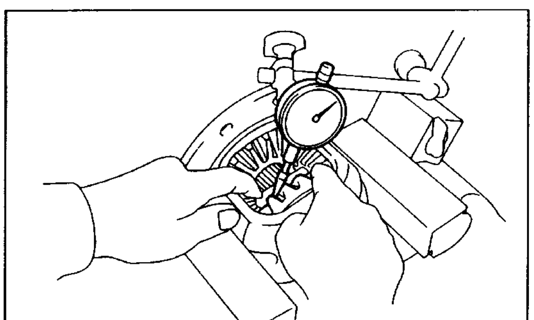
(d) Install the pinion shaft.

(e) Check the side gear backlash.

Measure the side gear backlash while holding one pinion gear toward the case.

Backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)

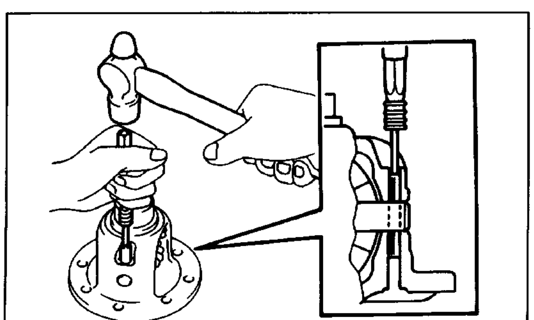
If the backlash is not within specification, install the side gear thrust washers of different thickness.



D7930

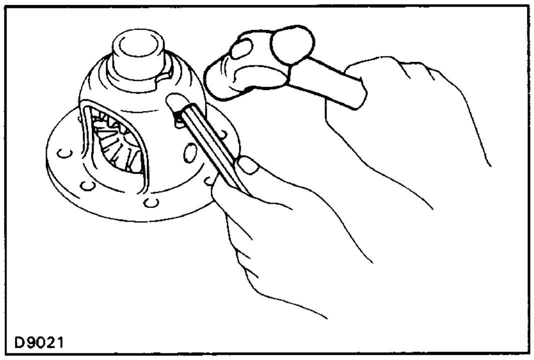
Thickness mm	(in.)
0.96 – 1.04	(0.0378 – 0.0409)
1.06 – 1.14	(0.0417 – 0.0449)
1.16 – 1.24	(0.0457 – 0.0488)
1.26 – 1.34	(0.0496 – 0.0528)

HINT: Use washers of same thickness on both the right and left sides.

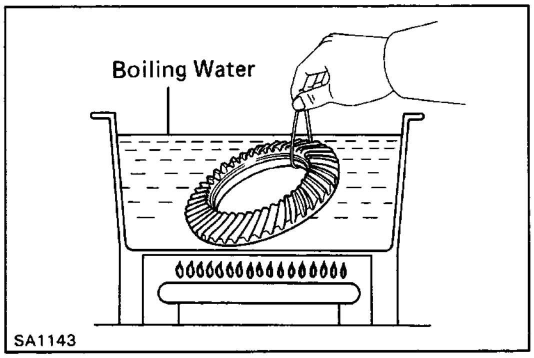


D9020

(f) Using a hammer and punch, drive in the straight pin through the case and hole in the pinion shaft.

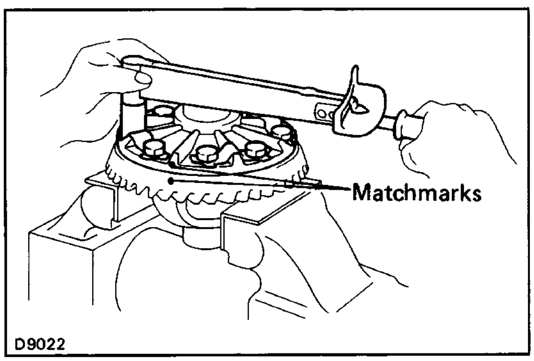


(g) Stake the case.

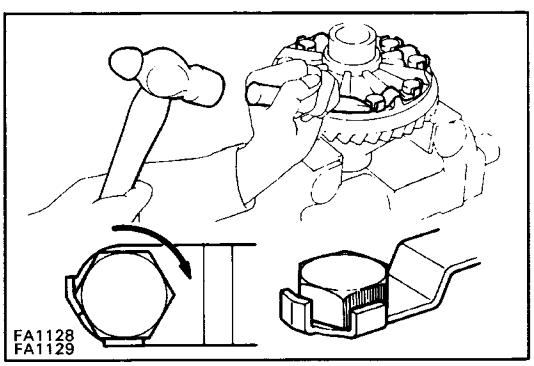


7. INSTALL RING GEAR ON DIFFERENTIAL CASE

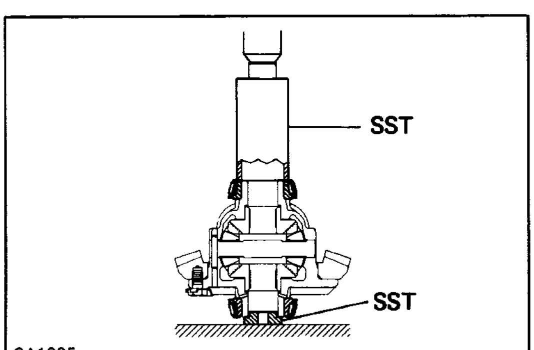
(a) Clean the contact surfaces of the differential case and ring gear.
(b) Heat the ring gear in boiling water.
(c) After the moisture on the ring gear has completely evaporated, quickly install the ring gear to the differ–ential case.



(d) Align the matchmarks on the ring gear and differen–tial case.
(e) Coat the ring gear set bolts with gear oil.
(f) Temporarily install the lock plates and set bolts.
(g) After the ring gear cools down enough, tighten the set bolts uniformly and a little at a time.
Torque: 97 N–m(985 kgf–cm, 71 ft–lbf)

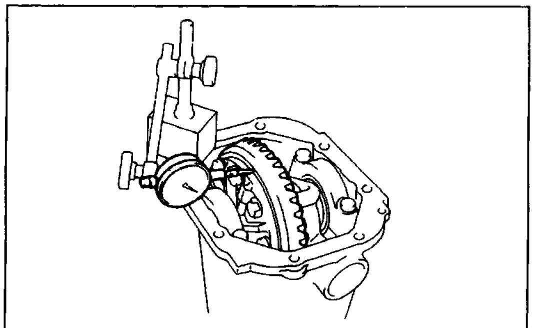


(h) Using a hammer and drift punch, stake the lick plates.
HINT: Stake one claw flush with the flat surface of the nut. For the claw contacting the protruding por-tion of the nut, stake only the half on the tightening side.



8. INSTALL SIDE BEARINGS

Using a press and SST, install the side bearings to the dif ferential case.
SST 09226–10010, 09950–20017


D9348

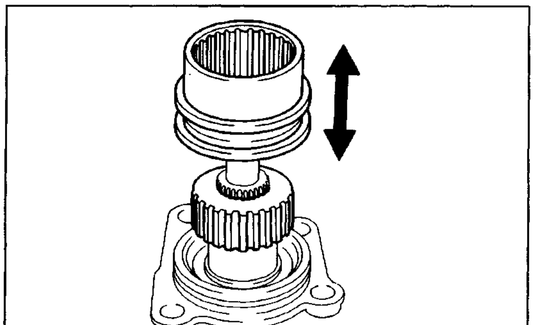
9. CHECK RING GEAR RUNOUT

(a) Install the differential case onto the carrier and install the plate washers to where there is no play in the bearing. (See page SA–97)

(b) Install bearing caps. (See page SA–99)

(c) Using a dial indicator, measure the runout of ring gear.

Maximum runout: 0.07 mm (0.0028 in.)


SA0356

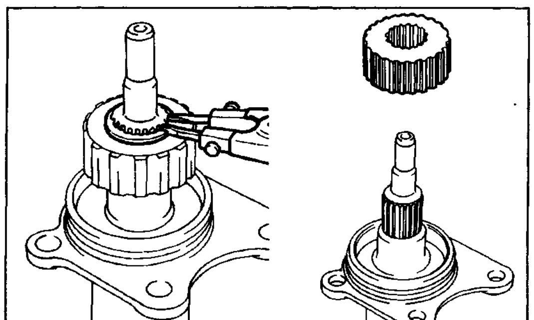
INSPECTION AND REPLACEMENT OF LH SIDE GEAR SHAFT

1. INSPECT CLUTCH HUB AND CLUTCH SLEEVE

(a) Check the wear and damage of the clutch hub and clutch sleeve.

If necessary, replace them.

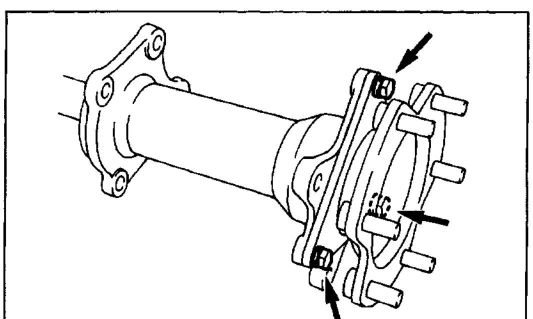
(b) Check that the clutch sleeve slides smoothly on the clutch hub.


SA0331 SA0332

2. REMOVE CLUTCH HUB

(a) Using a snap ring expander, remove the snap ring.

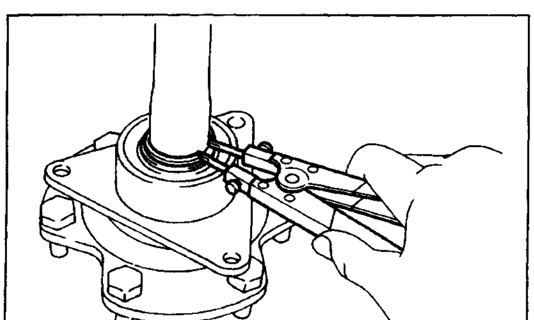
(b) Remove the clutch hub from the side gear shaft.


SA0333

3. REMOVE SIDE GEAR SHAFT FROM TUBE

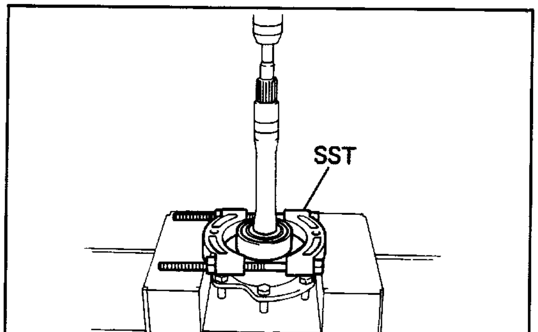
(a) Remove the three bearing retainer bolts.

(b) Remove the side gear shaft from the tube.


SA0357

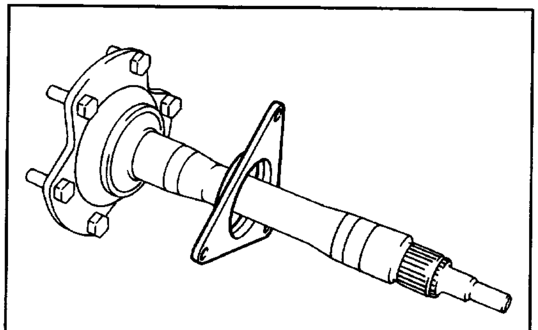
4. REPLACE LH SIDE GEAR SHAFT BEARING

(a) Using a snap ring expander, remove the snap ring.



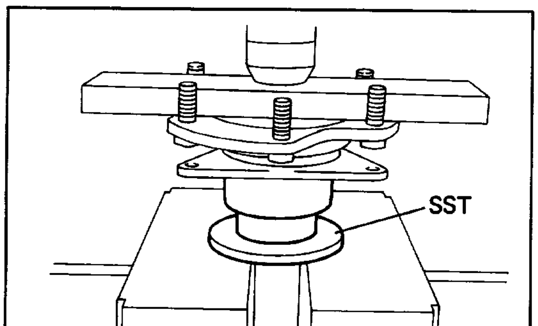
SA0358

(b) Using a press and SST, remove the bearing.
SST 09950–00020



SA0359

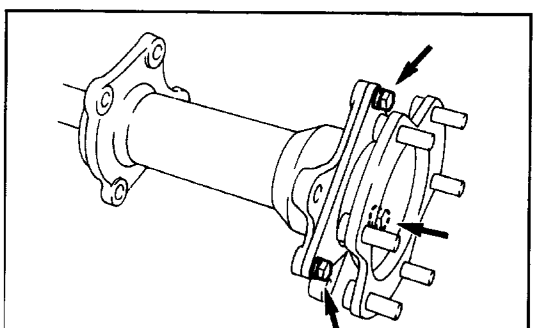
(c) Remove the bearing retainer.
(d) Install the bearing retainer.



SA0360

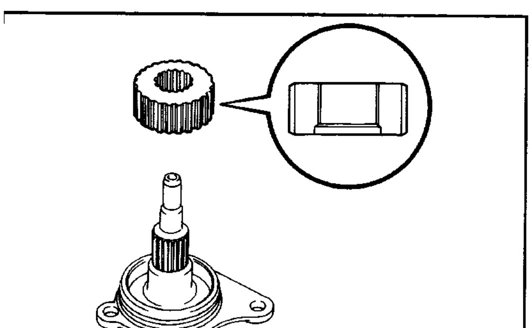
(e) Using a press and SST, install the new bearing.
SST 09316–60010 (09316–00040)
NOTICE: Be careful not to damage the bearing retainer.

5. REPLACE SIDE OIL SEAL
(See page SA–62)



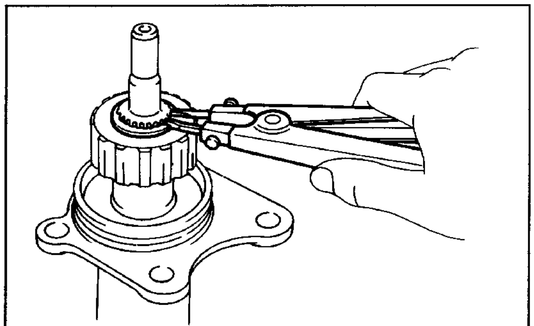
SA0333

6. INSTALL SIDE GEAR SHAFT
(a) Install the side gear shaft into the tube.
(b) Tighten the three bearing retainer bolts.

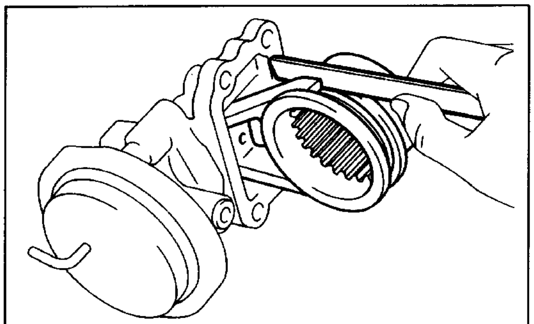


SA0335

7. INSTALL CLUTCH HUB
(a) Install the clutch hub to the shaft.


SA0331

(b) Using a snap ring expander, install the snap ring.


SA0361

INSPECTION AND REPLACEMENT OF ACTUATOR

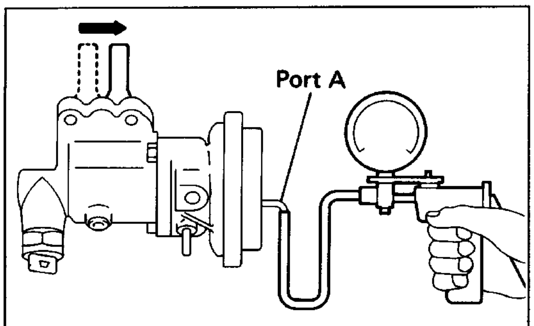
1. MEASURE CLEARANCE OF SLEEVE FORK AND CLUTCH SLEEVE

Using a feeler gauge, measure the clearance between the sleeve fork and clutch sleeve.

Maximum clearance: 0.35 mm (0.0138 in.)

If the clearance exceeds the limit, replace the fork or sleeve.

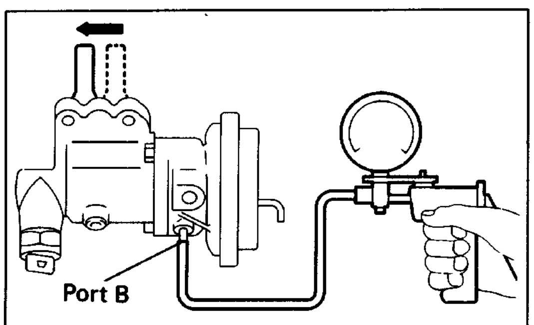
2. INSPECT A.D.D. ACTUATOR



SA0362

(a) Check that the sleeve fork moves to the actuator side when a vacuum of 500 mmHg (19.69 in.Hg, 66.7 kPa) is applied to port A. Also check that the vacuum does not leak.

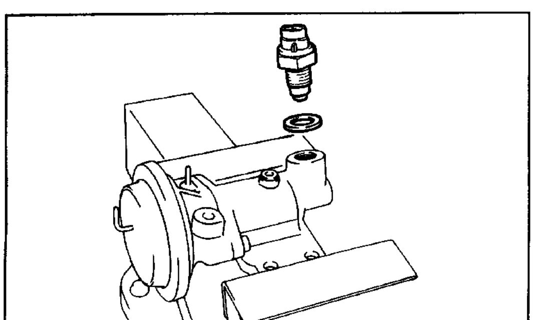
If not, replace the actuator.



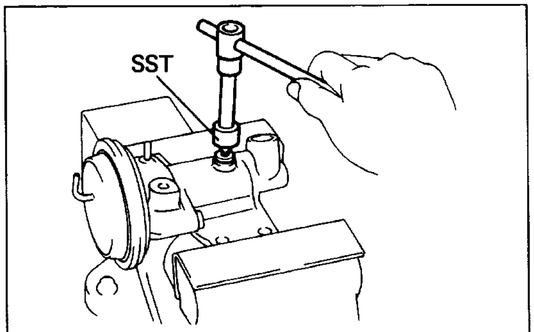
SA0363

(b) Check that the sleeve fork moves away from the ac–tuator when a vacuum of 500 mmHg (19.69 in.Hg, 66.7 kPa) is applied to port B. Also check that the vacuum does not leak.

If not, replace the actuator.


SA0364

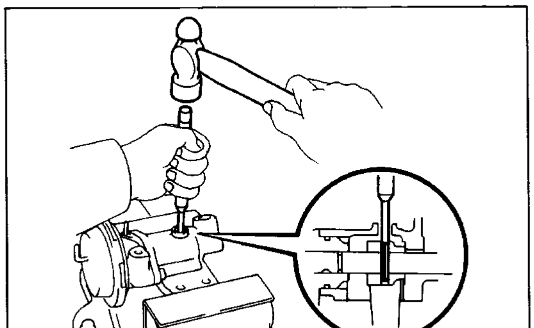
3. REMOVE A.D.D. INDICATOR SWITCH



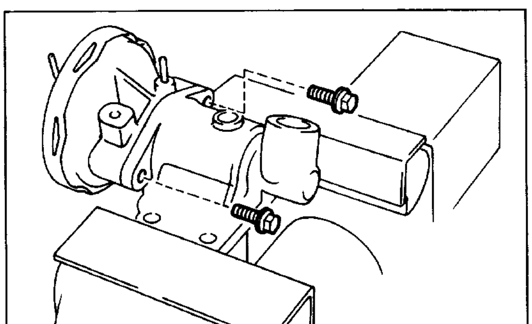
SA0365

4. REMOVE SLEEVE FORK PIN

(a) Using SST, remove the screw plug.
SST 09313–30021

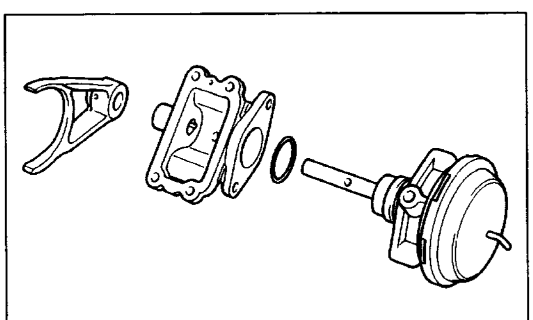

SA0366

(b) Using a hammer and punch, drive out the pin through the hole of clutch case cover.


SA0367

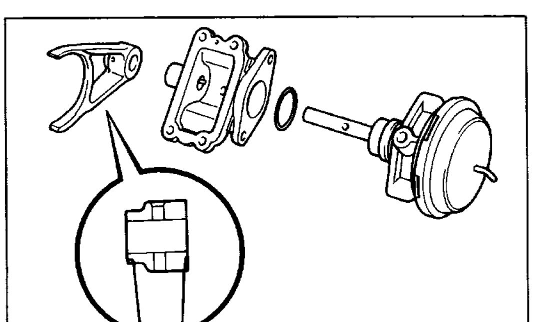
5. SEPARATE ACTUATOR FROM CLUTCH CASE COVER AND REMOVE SLEEVE FORK

(a) Remove the two bolts.


SA0368

(b) Separate the actuator from clutch case cover anc remove the sleeve fork.

(c) Remove the O–ring from actuator.

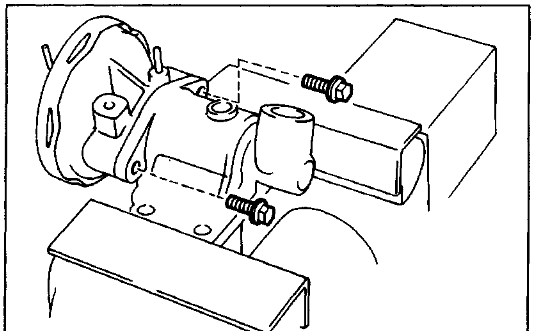

SA0369

6. INSTALL SLEEVE FORK AND ACTUATOR INTO CLUTCH CASE COVER

(a) Install a new 0–ring to the actuator.

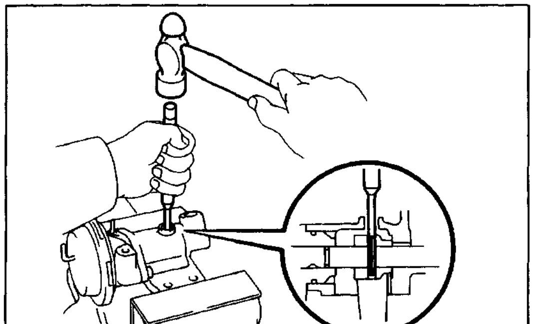
(b) Coat the 0–ring with MP grease.

(c) Place the sleeve fork and install the actuator to the clutch case cover.


SA0367

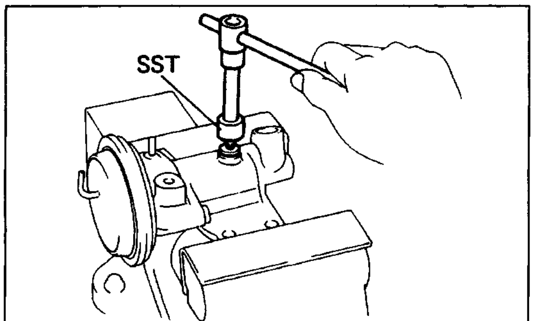
(d) Tighten the two bolts.

Torque: 21 N–m (210 kgf–cm, 15 ft–lbf)


SA0366

7. INSTALL SLEEVE FORK PIN

(a) Using a hammer and punch, drive in the pin through the hole of clutch case cover.



SA0365

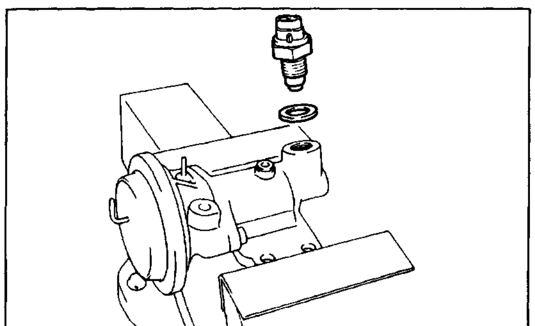
(b) Coat the threads of screw plug with sealer.

Sealer: Part No. 08826–00090, THREE BOND 1281 or equivalent

(c) Using SST, install the screw plug.

Torque: 20 N–m (200 kgf–cm, 14 ft–lbf)

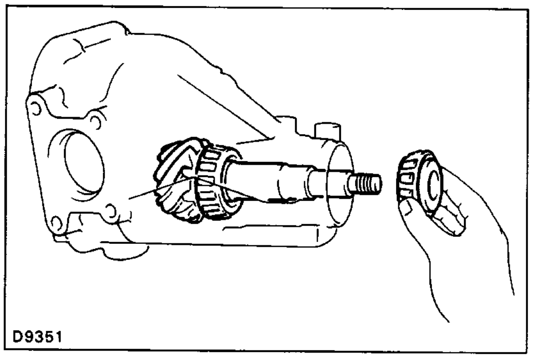
SST 09313–30021


SA0364

8. INSTALL A.D.
D. INDICATOR SWITCH

Install a new gasket and indicator switch.

Torque: 40 N–m (410 kgf–cm, 30 ft–lbf)



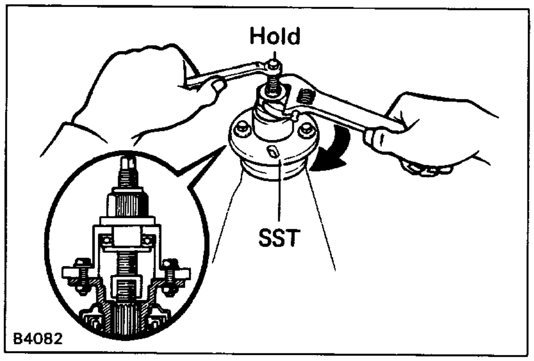
ASSEMBLY OF DIFFERENTIAL
(See page SA–83)

1. TEMPORARILY ADJUST DRIVE PINION PRELOAD

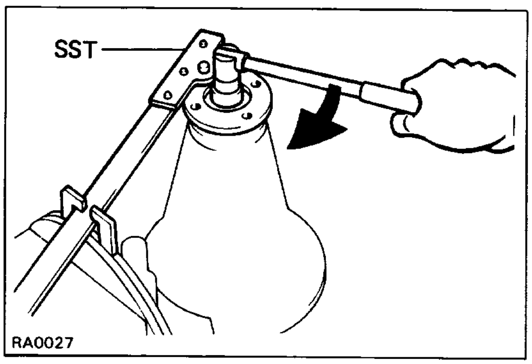
(a) Install the following parts.

- Drive pinion
- Front bearing

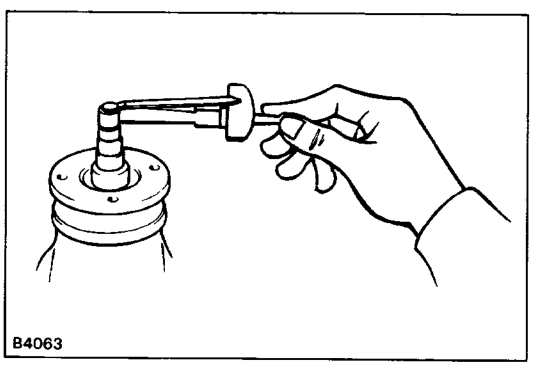
HINT: Assemble the spacer and oil seal after adjusting the gear contact pattern.



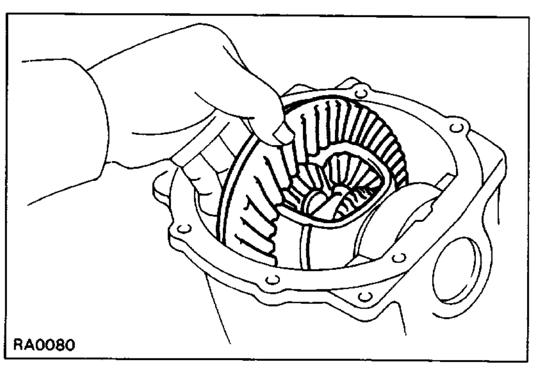
(b) Install the companion flange with SST.
Coat the threads of the nut with MP grease.
SST 09557–22022 (09557–22030)



(c) Adjust the drive pinion preload by tightening the companion flange nut.
Using SST to hold the flange, tighten the nut.
SST 09330–00021

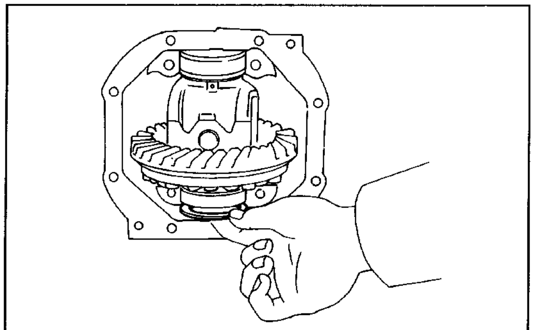


(d) Using a torque meter, measure the preload.
Preload (starting):
New bearing
1.2 – 1.9 N–m
(12 – 19 kgf–cm, 10.4 – 16.5 in.–lbf)
Reused bearing
0.6 – 1.0 N–m
(6 – 10 kgf–cm, 5.2 – 8.7 in.–lbf)



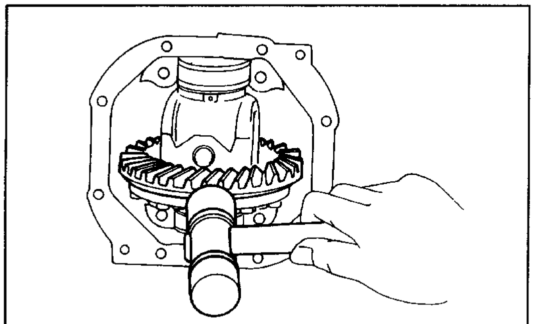
2. INSTALL DIFFERENTIAL CASE IN CARRIER

(a) Place the bearing outer races on their respective bearings. Make sure the left and right outer races are not interchanged.
(b) Install the differential case in the carrier.

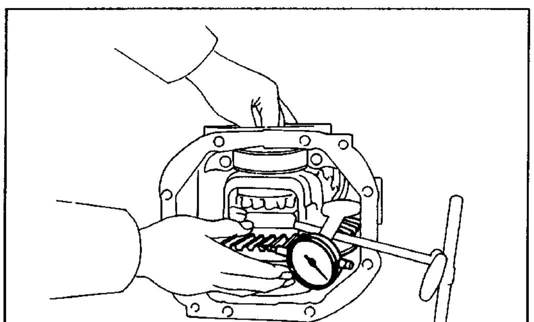

FA0743

3. ADJUST RING GEAR BACKLASH

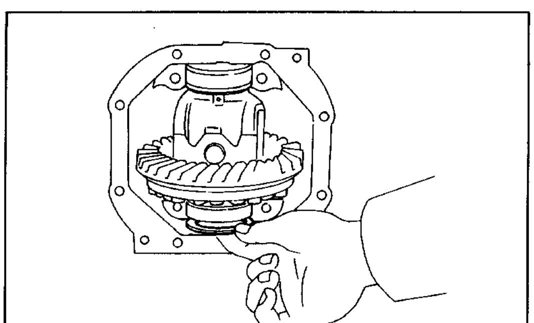
(a) Install only the plate washer on the ring gear back side.
HINT: Insure that the ring gear has backlash.


FA0744

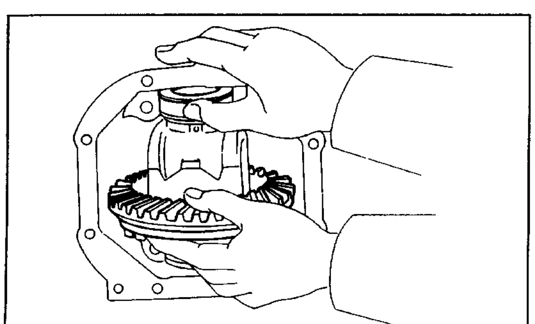
(b) Snug down the washer and bearing by tapping on the ring gear with a plastic–faced hammer.


FA0746

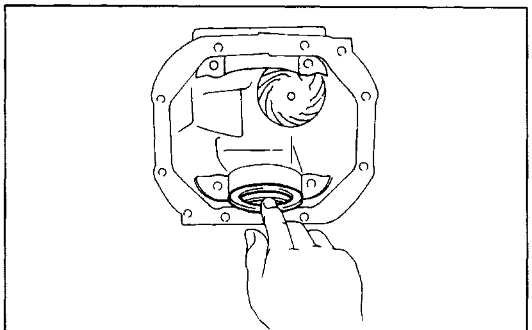
(c) Hold the side bearing boss on the teeth surface of the ring gear and measure the backlash.
Backlash (reference): 0.13 mm (0.0051 in.)


FA0743

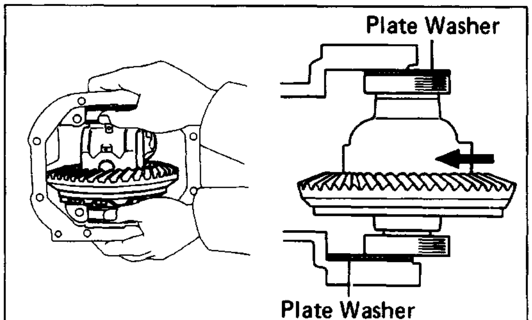
(d) Select a ring gear back plate washer, using the backlash as reference. (See page SA–99)


FA0742

(e) Select a ring gear teeth side washer with a thickness which eliminates any clearance between the outer race and case.

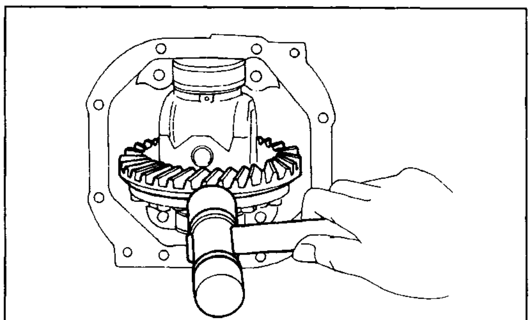

FA0752

(f) Remove the plate washers and differential case.
(g) Install the plate washer into the lower part of the carrier.

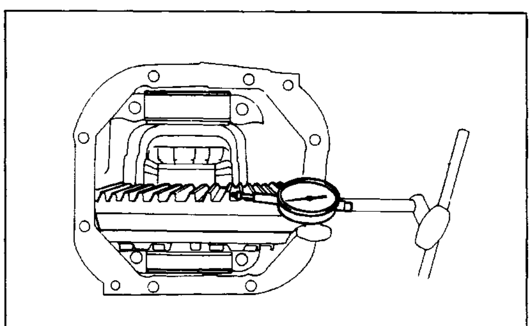


FA0741 RA0087

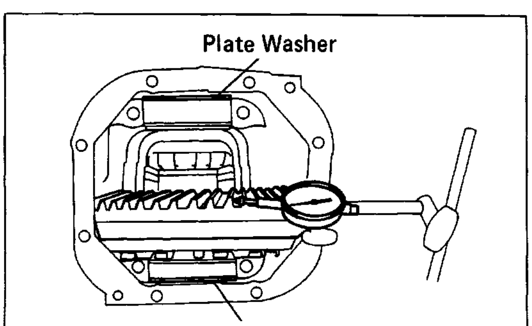
(h) Place the other plate washer onto the differential case together with the outer race, and install the dif–ferential case with the outer race into the carrier.


FA0744

(i) Using a plastic–faced hammer, snug down the washer and bearing by tapping the ring gear.

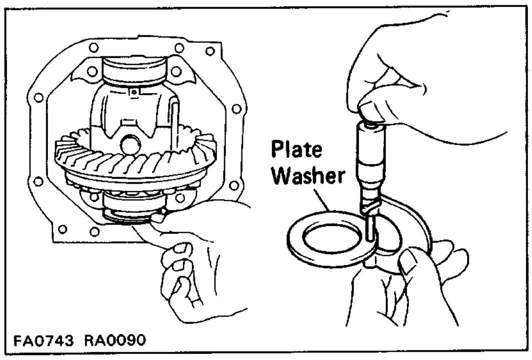

FA0754

(j) Using a dial indicator, measure the ring gear back–lash.
Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)



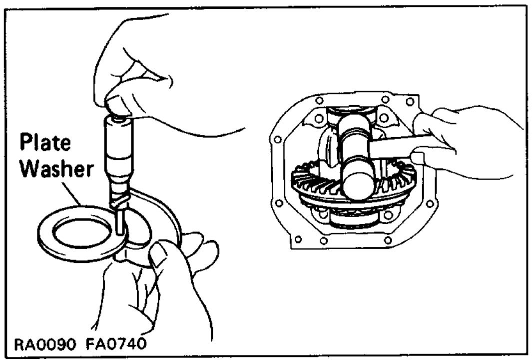
FA0754

(k) If not within specification, adjust by either increas–ing or decreasing the number of washers on both sides by an equal amount.
HINT: There should be no clearance between the plate washer and case.
Insure that there is ring gear backlash.



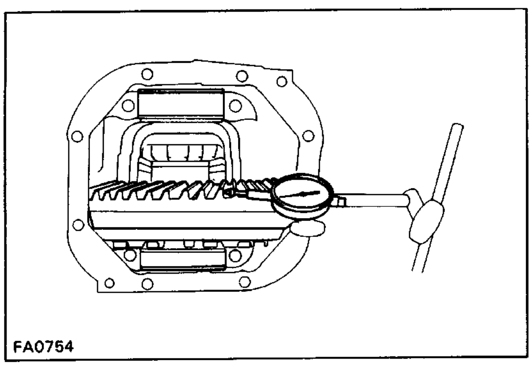
4. ADJUST SIDE BEARING PRELOAD

(a) Remove the ring gear teeth plate washer and measure the thickness.



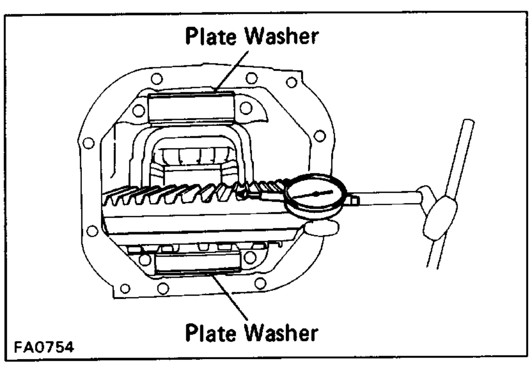
(b) Using the backlash as a reference, install a new washer of 0.06 – 0.09 mm (0.0024 – 0.0035 in.) thicker than the washer removed.
HINT: Select a washer which can be pressed in 2/3 of the way with your finger.

(c) Using a plastic–faced hammer, tap in the side washer.



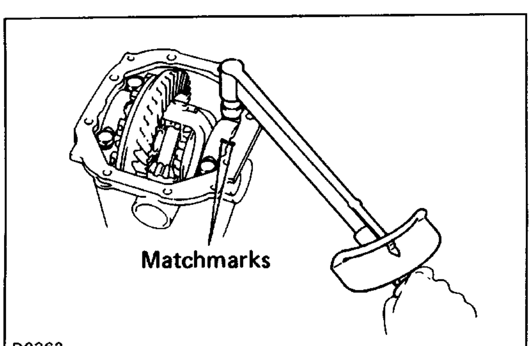
(d) Recheck the ring gear backlash.
Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

(e) If not within standard, adjust by either increasing or decreasing the washers on both sides by an equal amount.
HINT: The backlash will change about 0.02 mm (0.0008 in.) with 0.03 mm (o.0012 in.) alteration of the side washer.



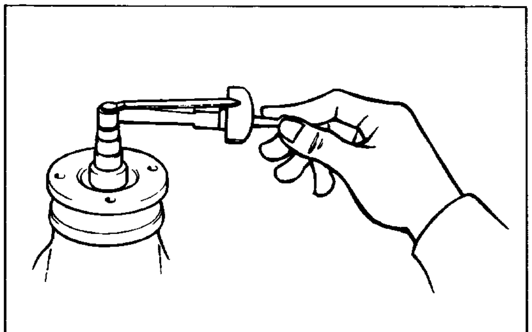
Washer thickness

Thickness mm (in.)	
2.57 – 2.59 (0.1012 – 0.1020)	2.93 – 2.95 (0.1154 – 0.1161)
2.60 – 2.62 (0.1024 – 0.1031)	2.96 – 2.98 (0.1165 – 0.1173)
2.63 – 2.65 (0.1035 – 0.1043)	2.99 – 3.01 (0.1177 – 0.1185)
2.66 – 2.68 (0.1047 – 0.1055)	3.02 – 3.04 (0.1189 – 0.1197)
2.69 – 2.71 (0.1059 – 0.1067)	3.05 – 3.07 (0.1201 – 0.1209)
2.72 – 2.74 (0.1071 – 0.1079)	3.08 – 3.10 (0.1213 – 0.1220)
2.75 – 2.77 (0.1083 – 0.1091)	3.11 – 3.13 (0.1224 – 0.1232)
2.78 – 2.80 (0.1094 – 0.1102)	3.14 – 3.16 (0.1236 – 0.1244)
2.81 – 2.83 (0.1106 – 0.1114)	3.17 – 3.19 (0.1248 – 0.1256)
2.84 – 2.86 (0.1118 – 0.1126)	3.20 – 3.22 (0.1260 – 0.1268)
2.87 – 2.89 (0.1130 – 0.1138)	3.23 – 3.25 (0.1272 – 0.1280)
2.90 – 2.92 (0.1142 – 0.1150)	



5. INSTALL SIDE BEARING CAPS

Align the matchmarks on the cap and carrier.
Torque: 78 N–m (800 kgf–cm, 58 ft–lbf)


B4063

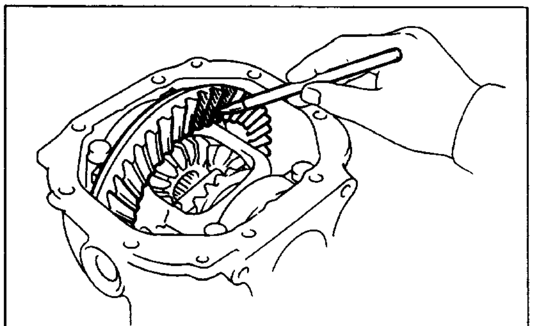
6. MEASURE TOTAL PRELOAD

Using a torque wrench, measure the total preload.

Total preload (starting):

Add drive pinion preload

0.4 – 0.6 N–m (4 – 6 kgf–cm, 3.5 – 5.2 in.–lbf)


D9363

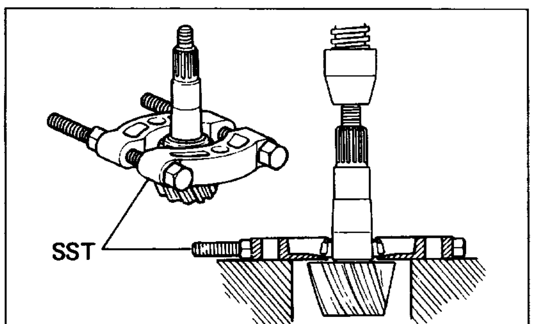
7. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

(a) Coat 3 or 4 teeth at three different positions on the ring gear with red lead.

(b) Hold the companion flange firmly and rotate the ring gear in both directions.

(c) Inspect the tooth pattern.

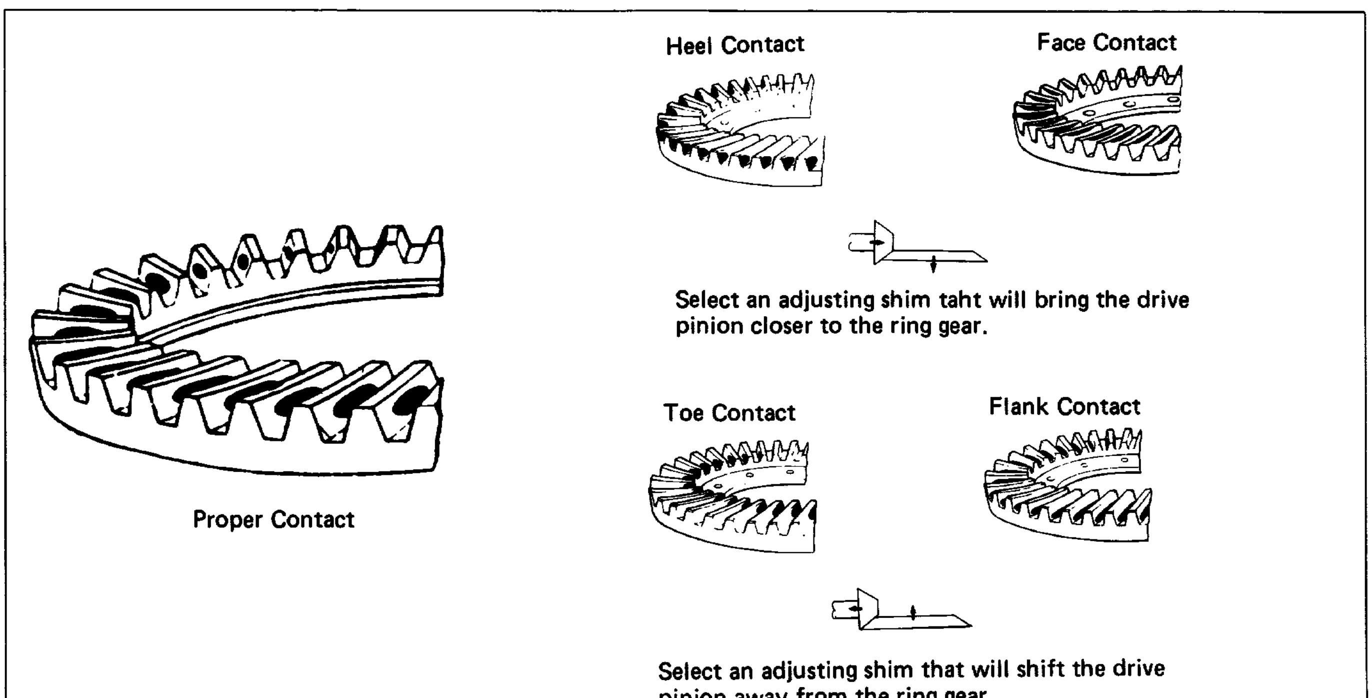
If the teeth are not contacting properly, use the following chart to select a proper washer for correction.



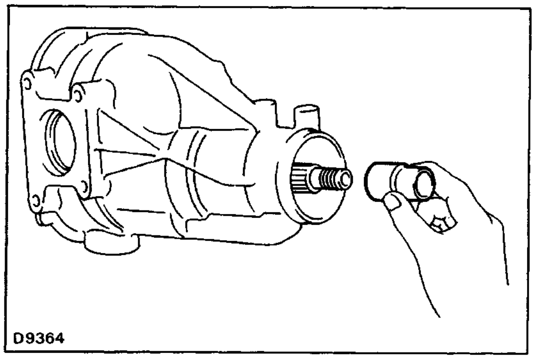
B4069

Washer thickness

Thickness mm (in.)	
2.24 (0.0882)	2.51 (0.0988)
2.27 (0.0894)	2.54 (0.1000)
2.30 (0.0906)	2.57 (0.1012)
2.33 (0.0917)	2.60 (0.1024)
2.36 (0.0929)	2.63 (0.1035)
2.39 (0.0941)	2.66 (0.1047)
2.42 (0.0953)	2.69 (0.1059)
2.45 (0.0965)	2.72 (0.1071)
2.48 (0.0976)	



MT0372
B4093 MT0373



8. REMOVE COMPANION FLANGE

(See step 14 on page SA–86)

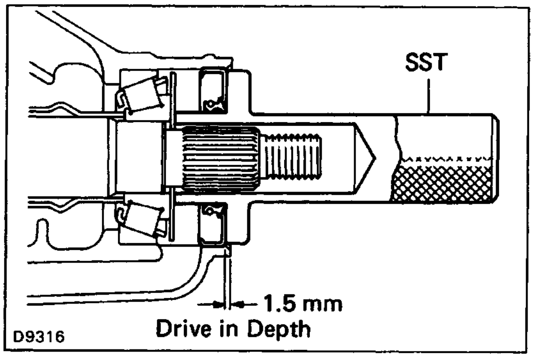
9. REMOVE FRONT BEARING

(See step 16 on page SA–86)

10. INSTALL NEW BEARING SPACER AND FRONT BEARING

(a) Install a new bearing spacer on the drive pinion.

(b) Install the front bearing on the drive pinion.



11. INSTALL OIL SLINGER AND NEW OIL SEAL

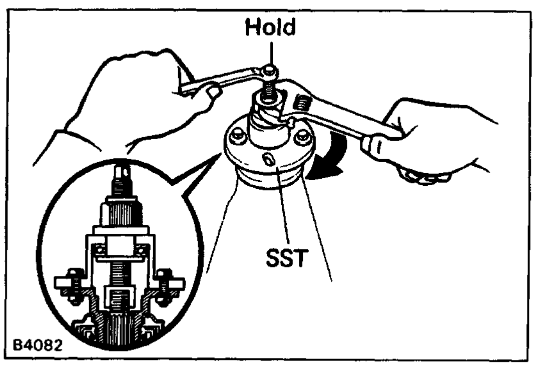
(a) Install the oil slinger.

(b) Using SST, drive in a new oil seal.

SST 09554–30011

Oil seal drive in depth: 1.5 mm (0.059 in.)

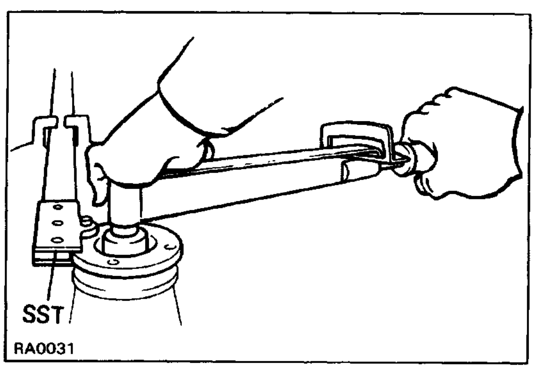
(c) Apply MP grease to the oil seal lip.



12. INSTALL COMPANION FLANGE

(a) Using SST, install the companion flange on the shaft.

SST 09557–22022 (09557–22030)



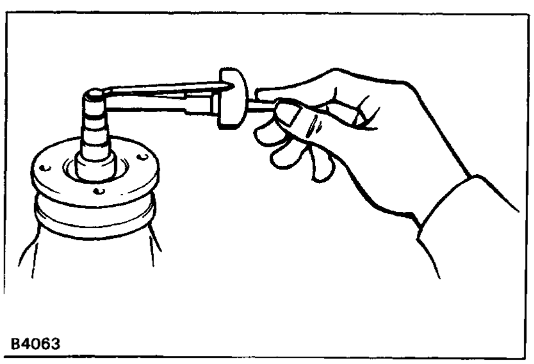
(b) Coat the threads of a new nut with MP grease.

(c) Using SST to hold the flange, tighten the nut.

Torque the nut.

SST 09330–00021

Torque: 120 N–m (1,225 kgf–cm, 89 ft–lbf)



13. CHECK FRONT BEARING PRELOAD

Using a torque meter, measure the preload of the back–lash between the drive pinion and ring gear.

Preload (starting):

New bearing

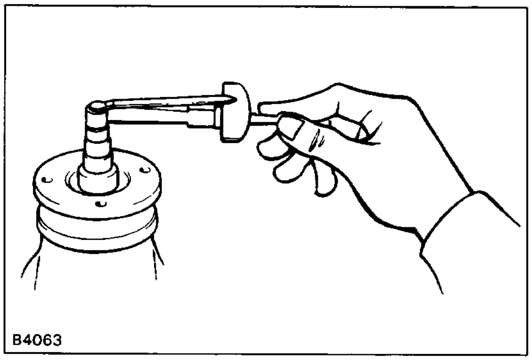
1.2 – 1.9 N–m

(12 – 19 kgf–cm, 10.4 – 16.5 ft–lbf)

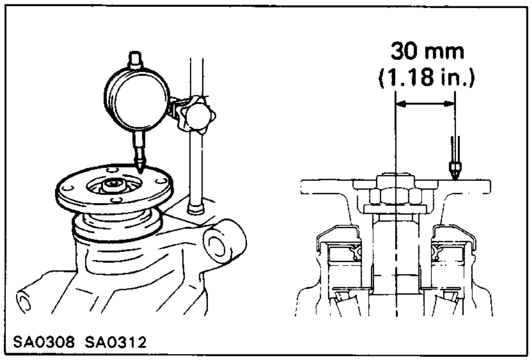
Reused bearing

0.6 – 1.0 N–m

(6 – 10 kgf–cm, 5.2 – 8.7 ft–lbf)

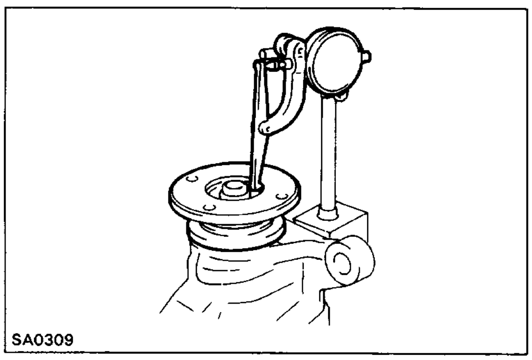

B4063

(a) If the preload is greater than specification, replace the bearing spacer.
(b) If the preload is less than specification, retighten the nut 13 N–m (130 kgf–cm,9 ft–lbf) a little at a time until the specified preload is reached.
Maximum torque: 223 N–m (2,275 kgf–cm, 165 ft–lbf)
If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the preload procedure. Do not back off the pinion nut to reduce the preload.

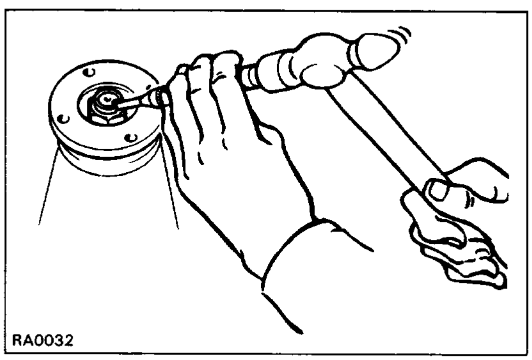


SA0308 SA0312

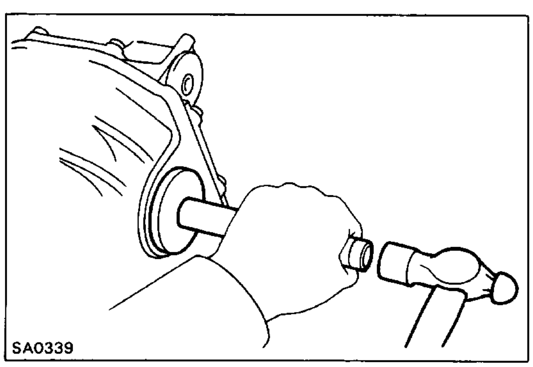
14. CHECK RUNOUT OF COMPANION FLANGE
Using a dial indicator, measure the vertical and lateral runout of the companion flange.
Maximum vertical runout: 0.10 mm (0.0039 in.)


SA0309

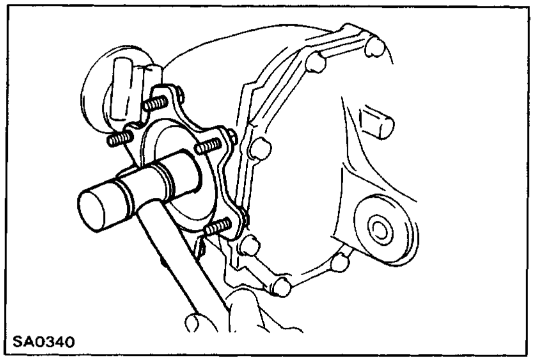
Maximum lateral runout: 0.10 mm (0.0039 in.)
If the runout is greater than maximum, inspect the bearings.


RA0032

15. STAKE DRIVE PINION NUT


SA0339

16. INSTALL NEW RH SIDE GEAR SHAFT OIL SEAL
(a) Coat the oil seal lip with MP grease.
(b) Using SST, drive in the oil seal until it is flush with the carrier end surface.
SST 09550–22011 (09550–00020, 09550–00031)


SA0340

17. INSTALL RH SIDE GEAR SHAFT

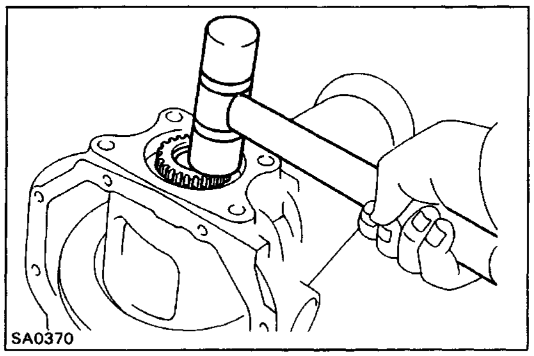
(a) Install a new snap ring to the side gear shaft.

(b) Using a plastic–faced hammer, tap on the side gear shaft to install it.

18. CHECK INSTALLATION OF SIDE GEAR SHAFT

(a) Check that there is 2 – 3 mm (0.08 – 0.12 in.) of play in axial direction.

(b) Check that the side gear shaft will not come out by trying to pull it completely out by hand.


SA0370

19. INSTALL INTERMEDIATE SHAFT

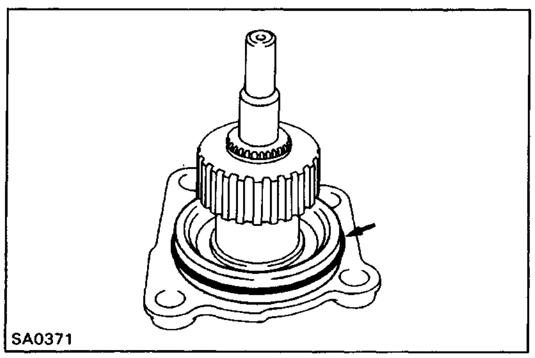
(a) Install a new snap ring to the shaft.

(b) Using a plastic–faced hammer, tap on the shaft to in–stall it.

20. CHECK INSTALLATION OF INTERMEDIATE SHAFT

(a) Check that there is 2 – 3 mm (0.08 – 0.12 in.) of play in axial direction.

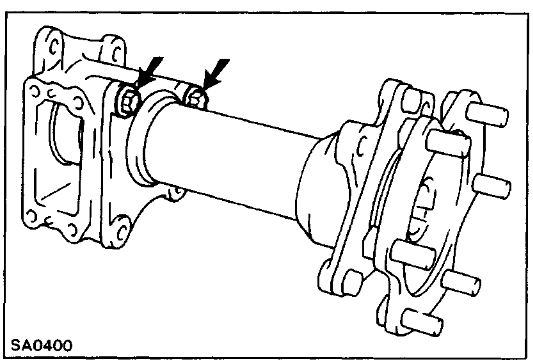
(b) Check that the shaft will not come out by trying to pull it completely out by hand.


SA0371

21. INSTALL CLUTCH CASE TO SIDE GEAR SHAFT TUBE

(a) Install a new O–ring to the tube.

(b) Coat the 0–ring with MP grease.

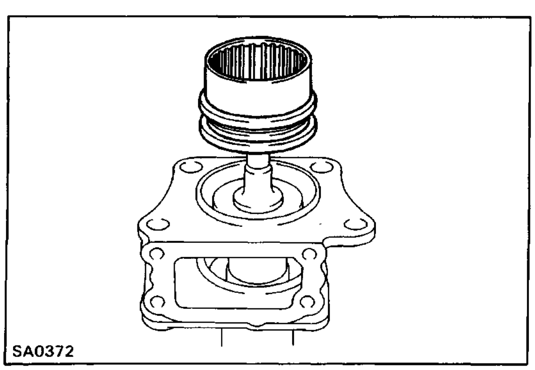

SA0400

(c) Install the clutch case to the tube.

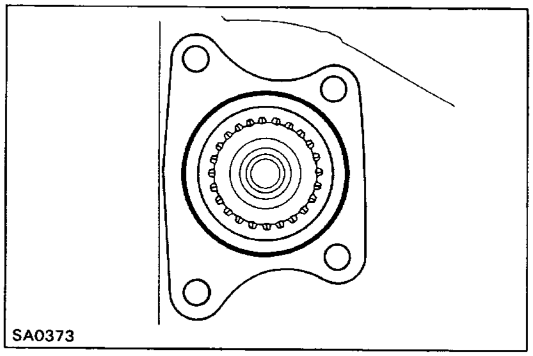
(d) Tighten the two torx bolts.

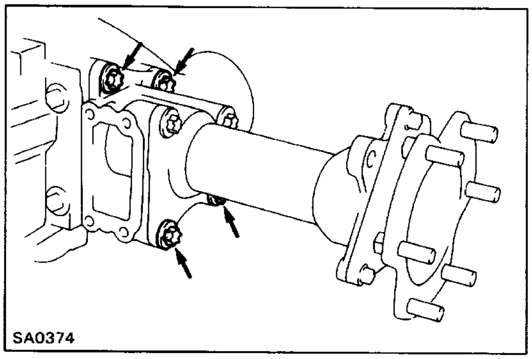
Torque: 78 N¿ m l800 kgf–cm, 58 ft¿ lbf j

Torx wrench: E14 (Part No. 09044–00010 or locally manufactured tool)


SA0372

22. INSTALL CLUTCH SLEEVE





23. INSTAL LH SIDE GEAR SHAFT TO DIFFERENTIAL CARRIER

(a) Remove any packing material and be careful not to get oil on the contacting surfaces of the differential carrier and clutch case.

(b) Apply seal packing to the differential carrier as shown.

Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent

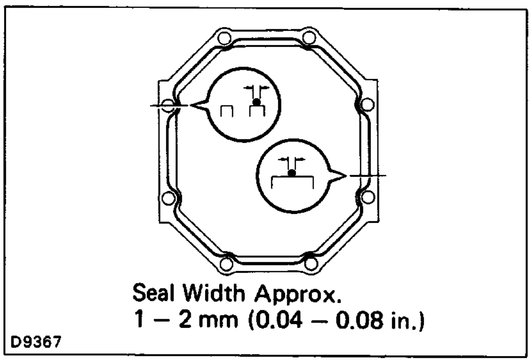
HINT: Install the side gear shaft within ten minutes af–ter applying seal packing.

(c) Install LH side gear shaft to the differential carrier.

W Tighten the four torx bolts.

Torque: 78 N–m (800 kgf–cm, 58 ft–lbf)

Torx wrench: E14 (Part No. 09044–00010 or locally manufactured tool)



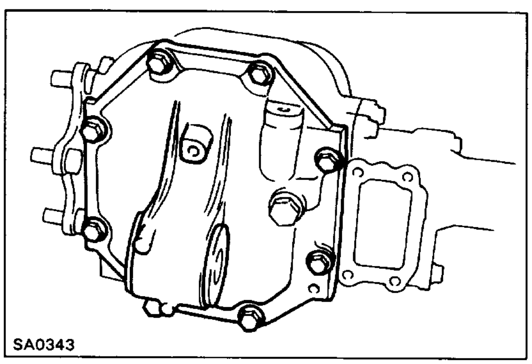
24. INSTALL DIFFERENTIAL CARRIER COVER

(a) Remove any packing material and be careful not to drop oil on the contacting surface of the differential carrier or carrier cover.

(b) Apply seal packing to the carrier cover.

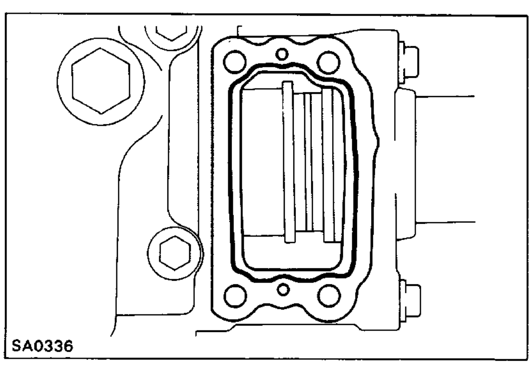
Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent

HINT: Install the carrier cover within ten minutes after applying seal packing.



(c) Install and torque the bolts.

Torque: 47 N–m (475 kgf–cm, 34 ft–lbf)



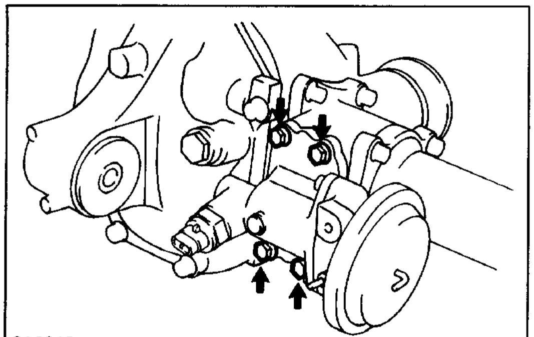
25. INSTALL ACTUATOR

(a) Remove any packing material and be careful not to get oil on the contacting surfaces of the actuator and clutch case.

(b) Apply seal packing to the clutch case as shown.

Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent

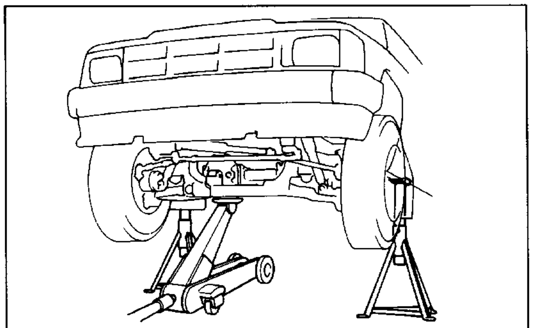
HINT: Install the actuator within ten minutes after ap–plying seal packing.


SA0342

(c) Tighten the four bolts.

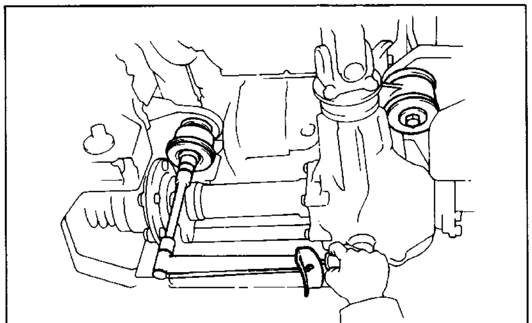
Torque: 21 N–m (210 kgf–cm, 15 ft–lbf)

Installation of Front Differential


FA0870

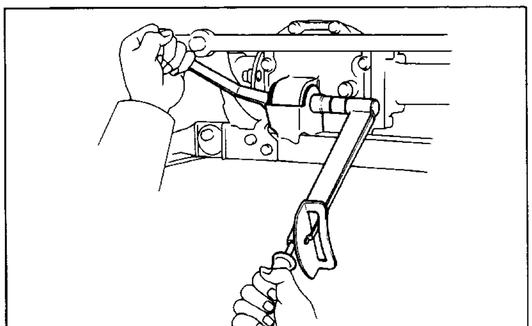
1. INSTALL FRONT DIFFERENTIAL

(a) Install the front differential to the frame, and sup– port it with a jack.


FA0857

(b) Install and torque the left and right rear mounting bolts.

Torque: 167 N–m (1,700 kgf–cm, 123 ft–lbf)

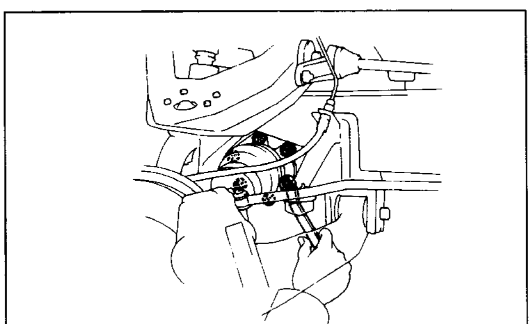

FA0815

3. (wI A.D.D.)
CONNECT VACUUM HOSES AND 4WD INDICATOR SWITCH CONNECTOR

4. CONNECT DRIVE SHAFTS TO SIDE GEAR SHAFT

Connect the drive shafts to the side gear shaft, and in– stall and torque the nuts while depressing the brake pedal.

Torque: 83 N–m (845 kgf –cm, 61 ft–lbf)


FA0769

5. CONNECT PROPELLER SHAFT TO COMPANION FLANGE

(a) Align the matchmarks on the flanges and connect the flanges with four bolts and nuts.

(b) Torque the nuts.

Torque: 74 N–m (750 kgf–cm, 54 ft–lbf)

6. INSTALL DRAIN PLUG AND FILL DIFFERENTIAL WITH GEAR OIL

(wI A.D.D.)

Oil type: Toyota ”GEAR OIL SUPER” oil (Part No. 08885 – 02106) or hypoid gear oil API GL–5

Recommended oil viscosity: SAE 75W–90

Capacity: 1.86 liters (1.97 US qts, 1.64 Imp. qts)

(w/o A.D.D.)

Oil type: Hypoid gear oil API GL–5

Recommended oil viscosity:

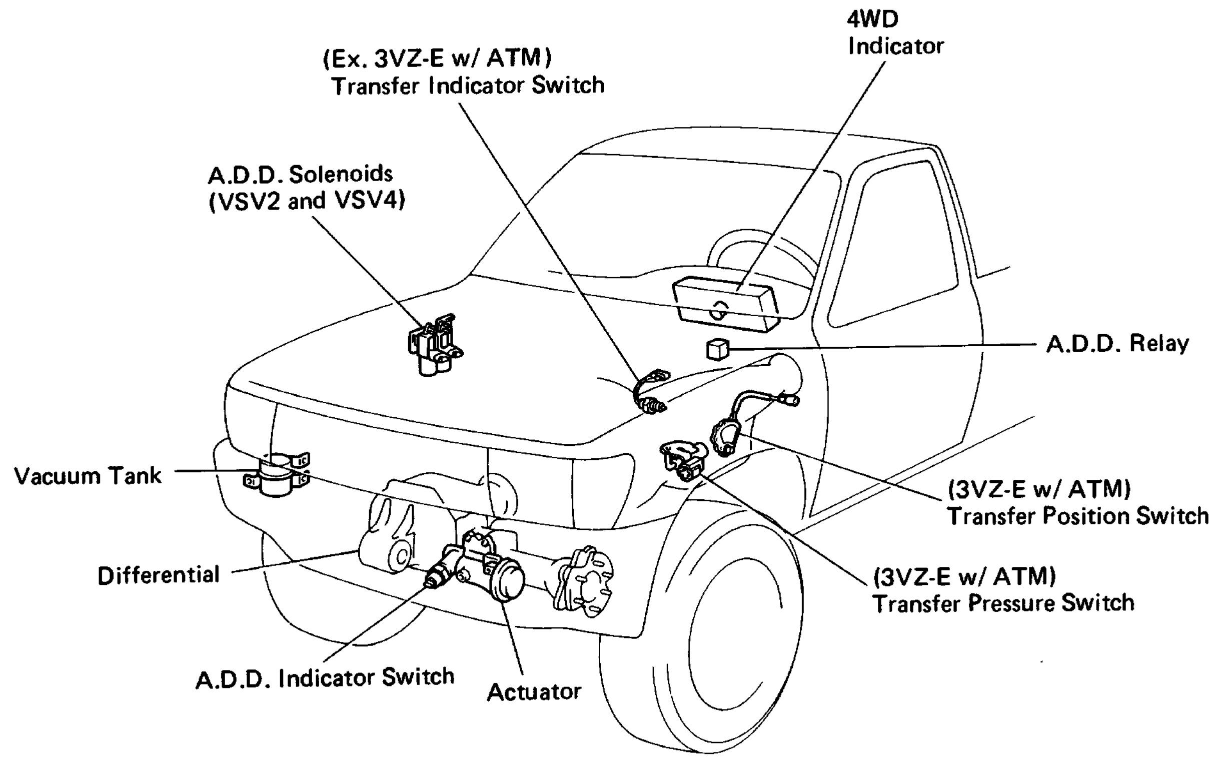
Above – 18• C (0• F) SAE 90

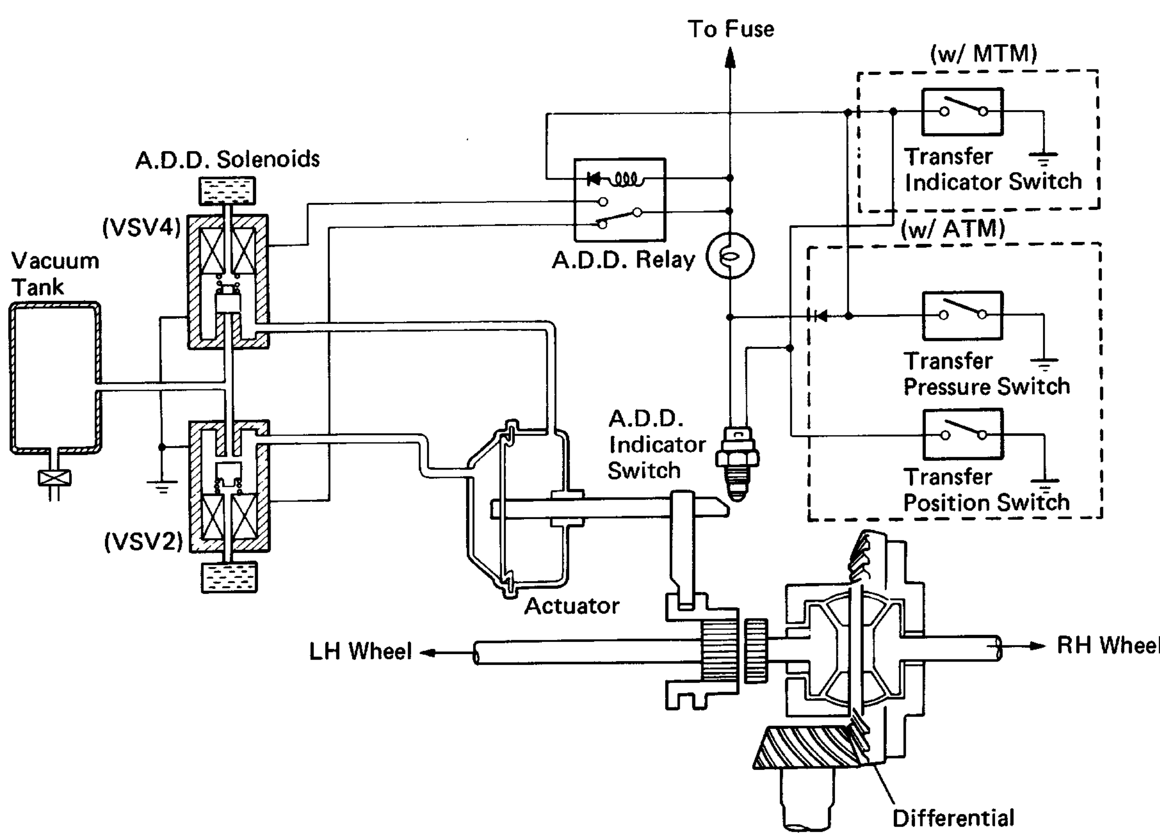
Below – 18• C (0• F) SAE 80W or 80W–90

Capacity: 1.6 liters (1.7 US qts, 1.4 Imp. qts)

A.D.D. Control System

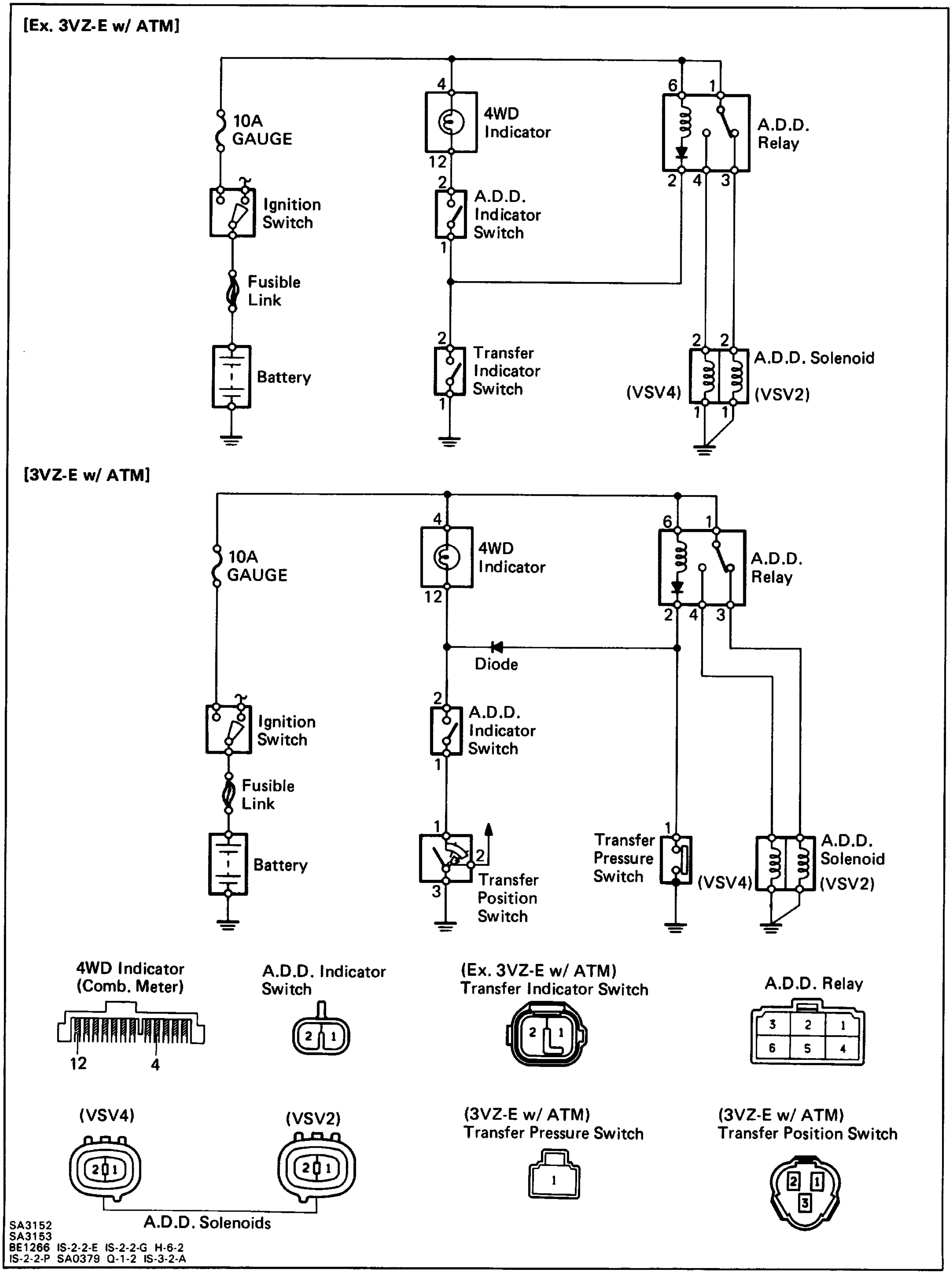
COMPONENTS

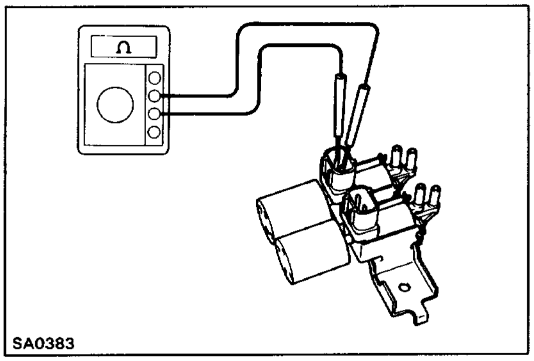




SA0376
SA0585

ELECTRICAL CIRCUIT




SA0383

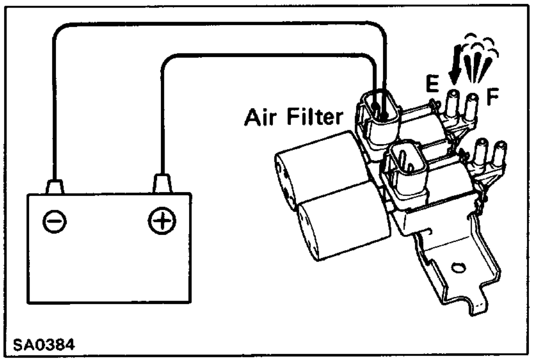
INSPECTION OF COMPONENTS

1. INSPECT A.D.

D. SOLENOIDS

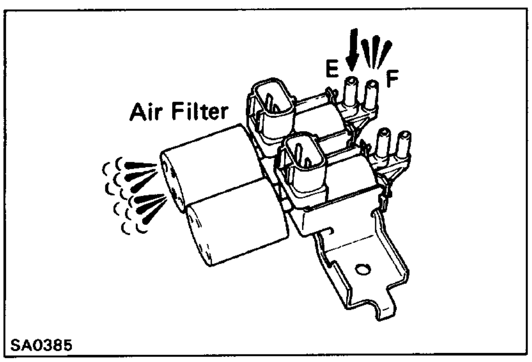
(a) Measure the resistance of the solenoids.

Resistance: 37 – 44/



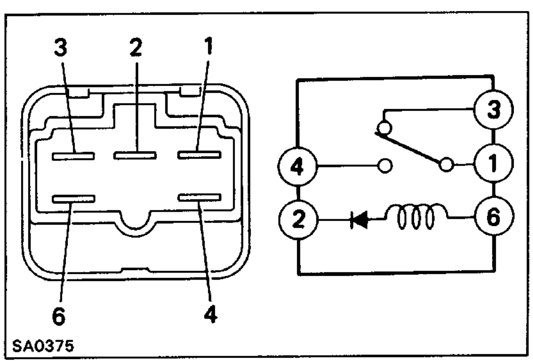
SA0384

(b) Apply the battery voltage to the solenoid.
Check that air flows from port E to port F.
Check that air does not flow from port E to the air fil–ter.



SA0385

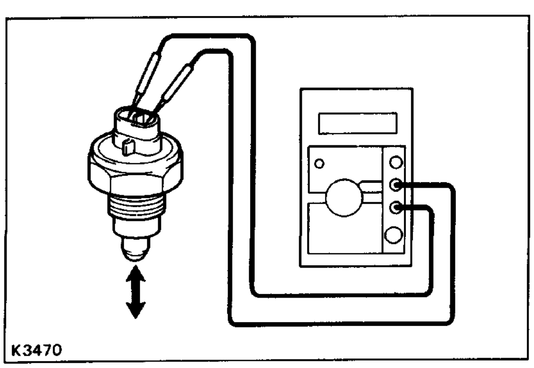
(c) Disconnect the battery voltage from the solenoid.
Check that air flows from port E to the air filter.
Check that air does not flows from port E to port F.



SA0375

2. INSPECT A.D.D. RELAY (Continuity)

Terminal / Condition	1	2	3	4	6
Constant	○	○	○		○
Apply battery voltage to terminals 6 and 2.	○			○	

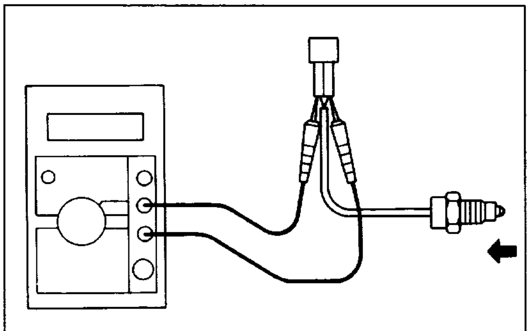

K3470

3. INSPECT A.D.

D. INDICATOR SWITCH

(a) Check that there is continuity between terminals when the switch is pushed (differential connected position).

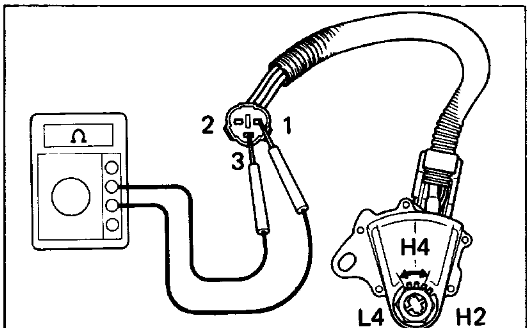
(b) Check that there is no continuity when the switch is free (differential disconnected position).


E9755

4. (Ex. 3VZ–E w/ATM)
INSPECT TRANSFER INDICATOR SWITCH

(a) Check that there is continuity between terminals when the switch is pushed (transfer 4WD position).

(b) Check that there is no continuity between terminals when the switch is free position (transfer H 2 posi–tion).

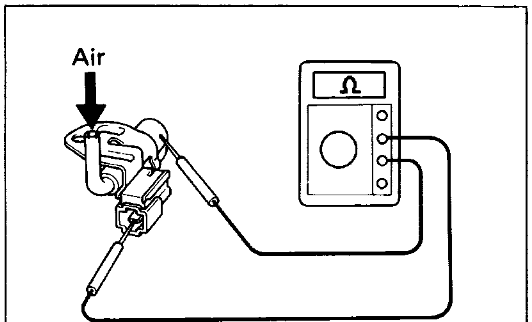


AT1381

5. (3VZ–E w/ATM)
INSPECT TRANSFER POSITION SWITCH

Check that there is continuity between each terminal.

Terminal / Transfer position	1	2	3
H4	O	———	O
L4	O	O	O
H2			



SA0393

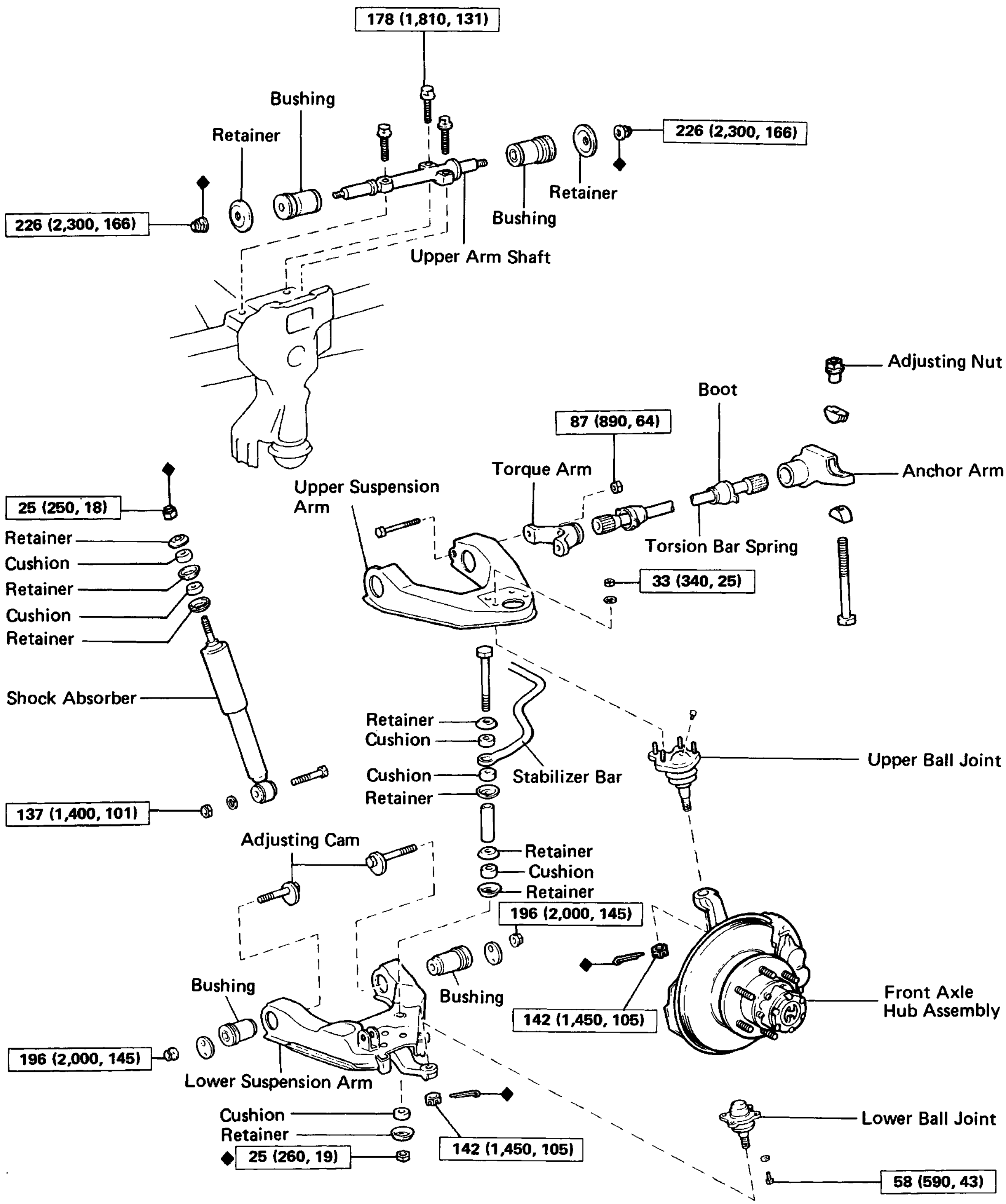
6. (3VZ–E w/ATM)
INSPECT TRANSFER PRESSURE SWITCH

While blowing compressed air (3.0 kg/cm^2, 43 psi or 294 kPa) into the switch, check the continuity between the terminal and switch body.

Resistance: 0 Ω

FRONT SUSPENSION

COMPONENTS



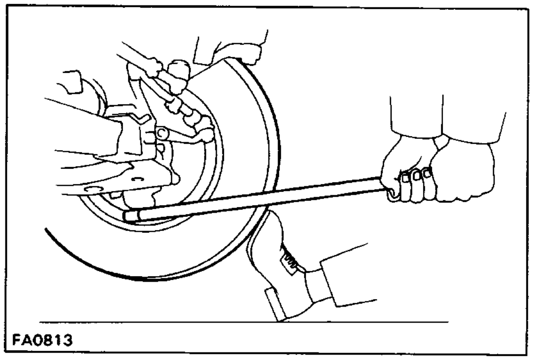
N·m (kgf·cm, ft·lbf) : Specified torque

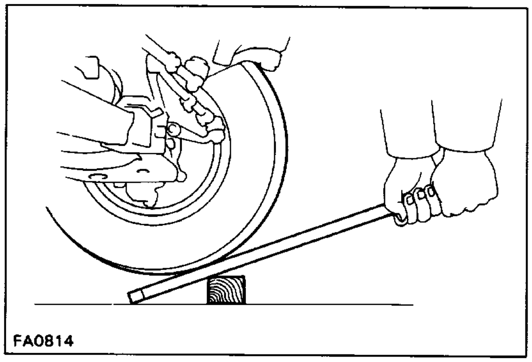
◆ Non-reusable part

Ball Joint

(See page SA–111)

INSPECTION OF BALL JOINTS


FA0813


FA0814

1. INSPECT LOWER BALL JOINT FOR EXCESSIVE LOOSE–NESS

(a) Jack up the front of the vehicle and support it with stands.

(b) Make sure the front wheels are in a straight forward position, and depress the brake pedal.

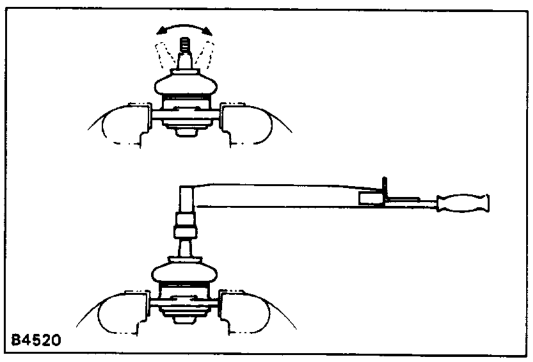
(c) Move the lower suspension arm up and down and check that the lower ball joint has no excessive play.

Maximum vertical play: 2.3 mm (0.091 in.)

2. INSPECT UPPER BALL JOINT FOR EXCESSIVE LOOSENESS

Move the vehicle up and down and check that the upper ball joint has no excessive play.

Maximum vertical play: 0 mm (0 in.)


B4520

3. INSPECT BALL JOINT FOR ROTATION CONDITION

(a) Remove the ball joints.

(b) As shown in the figure, flip the ball joint stud back and forth 5 times before installing the nut.

(c) Using a torque gauge, turn the nut continuously one turn every 2 – 4 seconds and take the torque read–ing on the 5th turn.

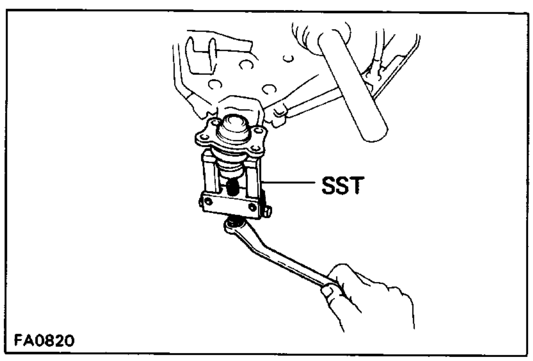
Torque (turning):

Lower ball joint

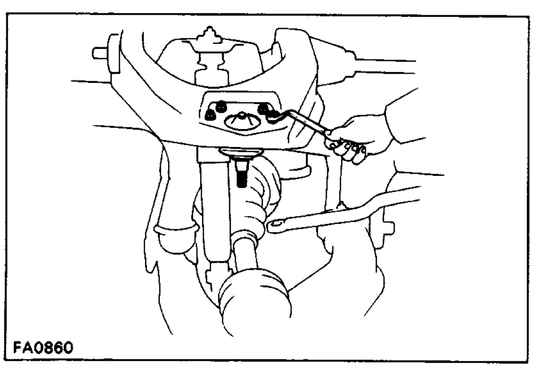
3.0 – 5.9 N–m

(30 – 60 kgf–cm, 26 – 52 in.–lbf)

REMOVAL OF BALL JOINTS



FA0820


FA0860

1. REMOVE STEERING KNUCKLE

(See page SA–41)

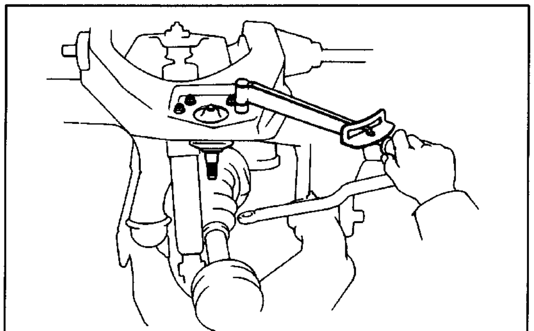
2. REMOVE LOWER BALL JOINT FROM LOWER SUSPENSION ARM

(a) Remove the cotter pin and nut.

(b) Using SST, remove the lower ball joint from the lower suspension arm.

SST 09628–62011

3. REMOVE UPPER BALL JOINT FROM UPPER SUSPENSION ARM

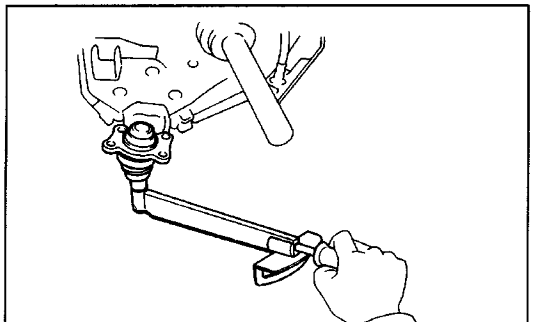


FA0859

INSTALLATION OF BALL JOINTS

1. INSTALL UPPER BALL JOINT TO UPPER SUSPENSION ARM

Torque: 33 N–m (340 kgf–cm, 25 ft–lbf)



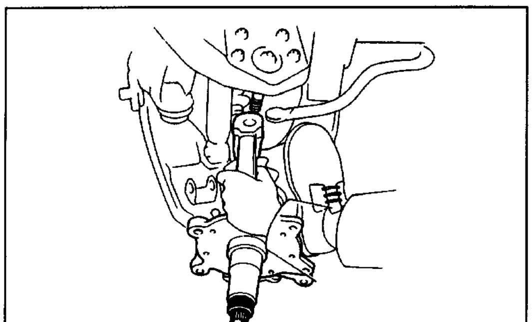
FA0819

2. INSTALL LOWER BALL JOINT TO LOWER SUSPENSION ARM

(a) Install the lower ball joint to the lower suspension arm.

(b) Torque the nut and install a new cotter pin.

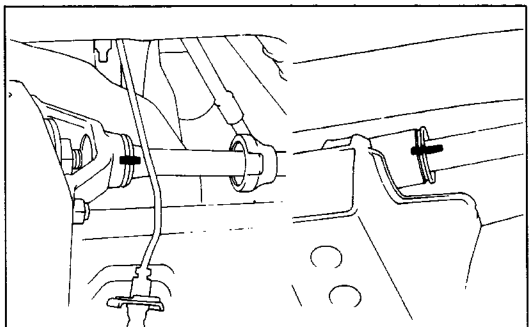
Torque: 142 N–m (1,450 kgf–cm, 105 ft–lbf)



FA0821

3. INSTALL STEERING KNUCKLE

(See page SA–43)


FA0778 FA0856

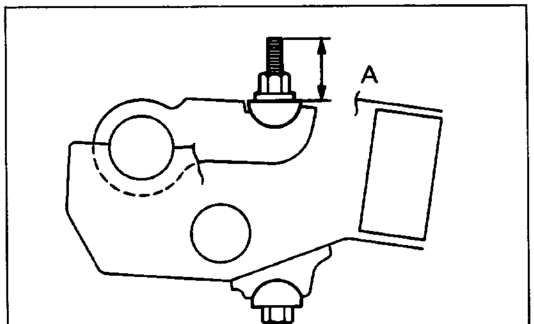
Torsion Bar Spring

(See page SA–111)

REMOVAL OF TORSION BAR SPRING

1. PLACE MATCHMARKS ON TORSION BAR SPRING, ANCHOR ARM AND TORQUE ARM

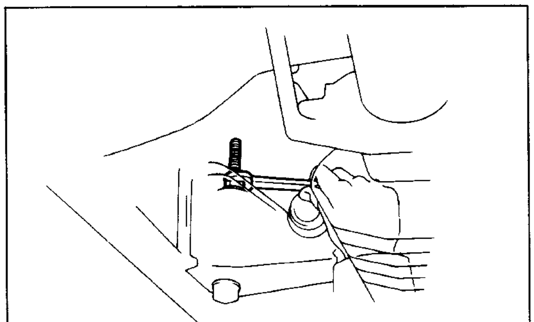
Remove the boots and place matchmarks on the torsion bar spring, anchor arm and torque arm.



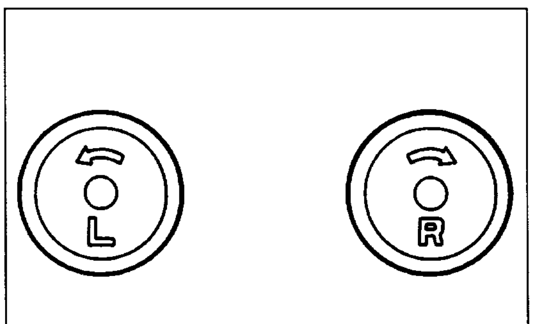
R01450

2. MEASURE PROTRUDING BOLT END ”A”, AS SHOWN

HINT: Use this measurement for reference when adjust–ing the chassis ground clearance.


FA1941

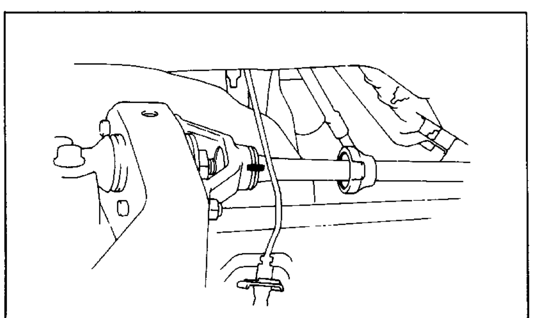
3. LOOSEN ADJUSTING NUT AND REMOVE ANCHOR ARM AND TORSION BAR SPRING



Z7998

INSTALLATION OF TORSION BAR SPRING

HINT: There are left and right indication marks on the rear end of the torsion bar spring. Be careful not to inter–change them.


FA0778

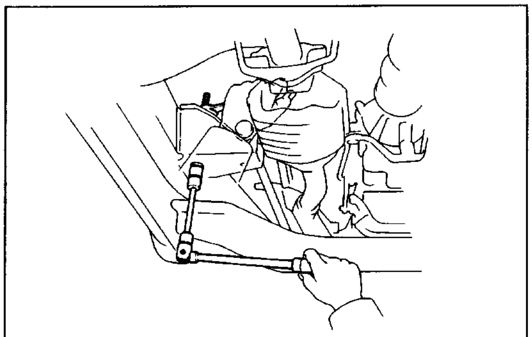
1. INSTALL TORSION BAR SPRING AND ANCHOR ARM

If Reusing Torsion Bar Spring

(a) Apply a light coat of molybdenum disulphide lithium base grease to the spline of the torsion bar spring.

(b) Align the matchmarks and install the torsion bar spring to the torque arm.

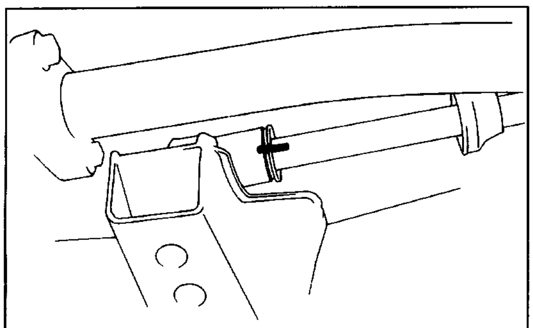
(c) Align the matchmarks and install the anchor arm tc the torsion bar spring.


FA0869

(d) Tighten the adjusting nut so that the bolt protrusion is equal to that before removal.

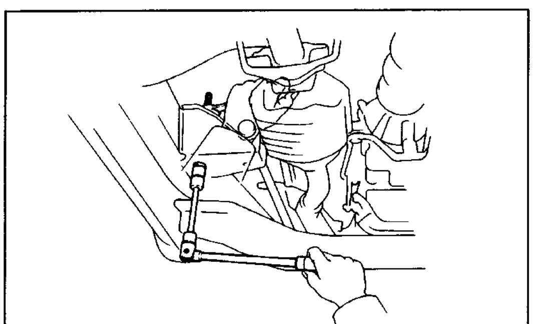
If Using a New Torsion Bar Spring

(a) Remove the wheel.
(b) Install the two boots to the torsion bar spring.
(c) Apply a light coat of the molybdenum disulphide lithium base grease to the spline of the torsion bar spring.
(d) Temporarily install the anchor arm to the small end of the torsion bar spring and place the matchmarks on the torsion bar spring and anchor arm.
HINT:


FA0856

- There is one spline on the torsion bar spring that is larger than the others. Install the torsion bar spring into the anchor arm by slowly turning the anchor arm until you feel the large spline enter the matching point in the anchor arm.
- Place matchmarks on the torsion bar spring and anchor arm on the bottom of each.

(e) Remove the anchor arm from the torsion bar spring.
(f) Install the torsion bar spring into the torque arm.


FA0869

HINT: There is one spline on the torsion bar spring that is larger than the others. Install the torsion bar spring into the torque arm by slowly turning the torsion bar spring until you feel the large spline enter the matching point in the torque arm.

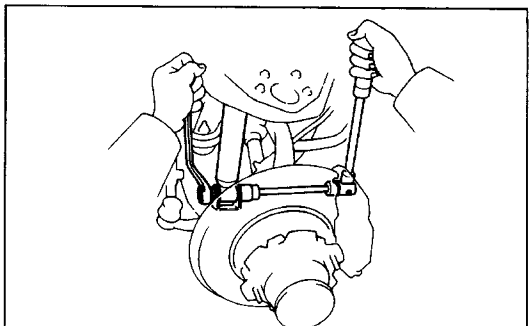
(g) Align the matchmarks and install the anchor arm to the torsion bar spring.
(h) Torque the adjusting nut.
Nut tightening limit: A = 70 mm (2.76 in.)
(i) Temporarily install the lock nut.
(j) Install the wheel and remove the stands, bounce the vehicle to settle the suspension.
(k1 Adjust the chassis ground clearance by turning the adjusting nut.
Chassis ground clearance: See pages A–25, 26

2. ASSEMBLE BOOTS

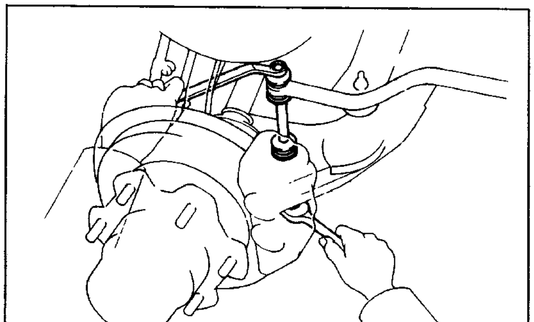
Lower Suspension Arm and Shock Absorber

(See page SA–111)

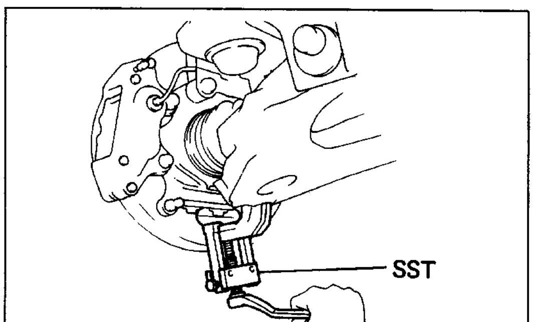
REMOVAL OF LOWER SUSPENSION ARM AND SHOCK ABSORBER


FA0822

1. REMOVE SHOCK ABSORBER


FA1611

2. DISCONNECT STABILIZER BAR FROM LOWER SUSPENSION ARM

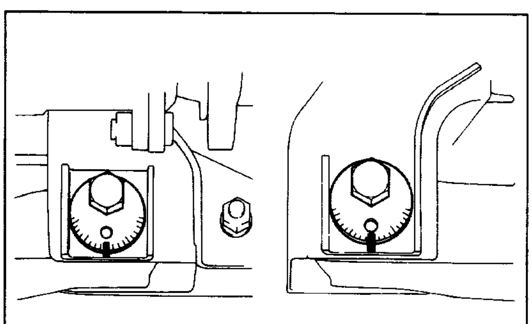


FA1593

3. DISCONNECT LOWER SUSPENSION ARM FROM LOWER BALL JOINT

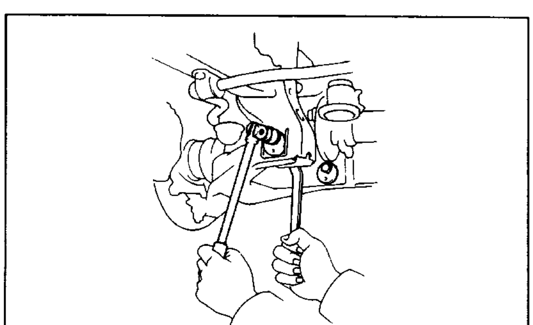
(a) Remove the cotter pin and loosen the nut.

(b) Using SST, disconnect the lower suspension arm from the lower ball joint.
SST 09628–62011

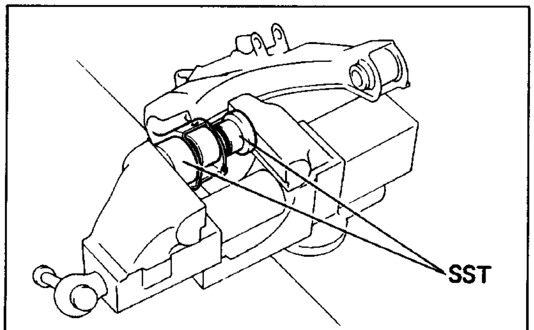

FA0829 FA0828

4. REMOVE LOWER SUSPENSION ARM

(a) Place matchmarks on the front and rear adjusting cams.


FA0871

(b) Remove the nuts and adjusting cams, and remove the lower suspension arm.



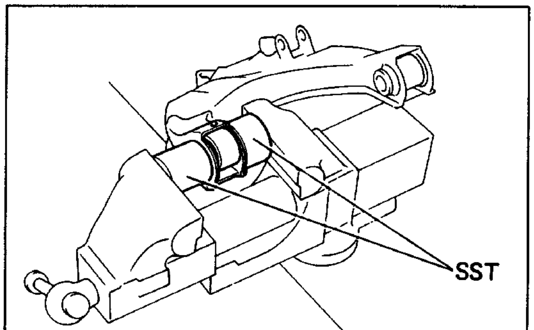
FA0823

PLACEMENT OF LOWER SUSPENSION ARM BUSHING

1. REMOVE FRONT AND REAR BUSHINGS

Using SST, press out the bushings from the lower sus–pension arm.

SST 09726–27011 (09726–02050, 09726–02060)



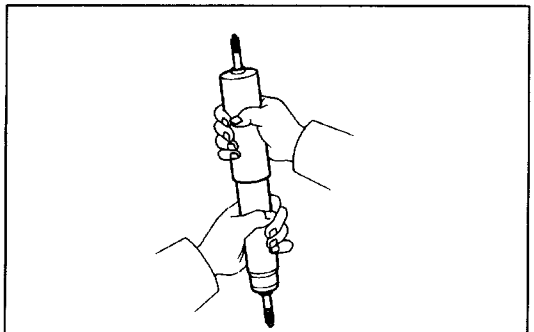
FA0824

2. INSTALL FRONT AND REAR BUSHINGS

Using SST, press in new bushings to the lower suspen–sion arm.

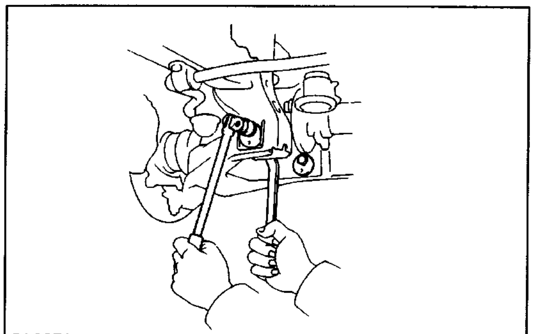
SST 09726–27011 (09726–02040, 09726–02060)

HINT: Do not apply grease or oil to the bushing.


FA0530

INSPECTION OF SHOCK ABSORBER

INSPECT OPERATION OF SHOCK ABSORBER

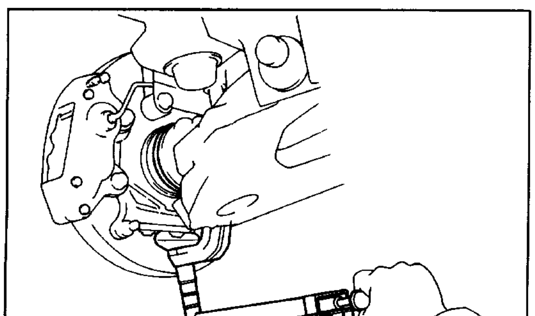

FA0871

INSTALLATION OF LOWER SUSPENSION ARM AND SHOCK ABSORBER

1. INSTALL LOWER SUSPENSION ARM

(a) Install the lower suspension arm to the frame with adjusting cams.

(b) Temporarily install the two nuts to the front and rear adjusting cams.

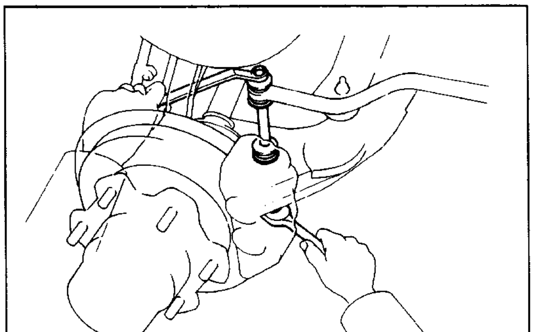

FA1592

2. CONNECT LOWER SUSPENSION ARM TO LOWER BALL JOINT

(a) Connect the lower suspension arm to the lower ball joint and torque the nut.

Torque: 142 N–m (1,450 kgf –cm, 105 ft–lbf)

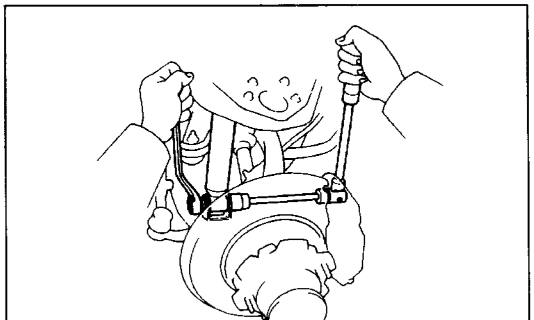
(b) Install a new cotter pin.


FA1611

3. CONNECT STABILIZER BAR TO LOWER SUSPENSION ARM

Jack up the stabilizer bar and install the cushions, retain–ers, collar and bolt, and install and torque the nut.

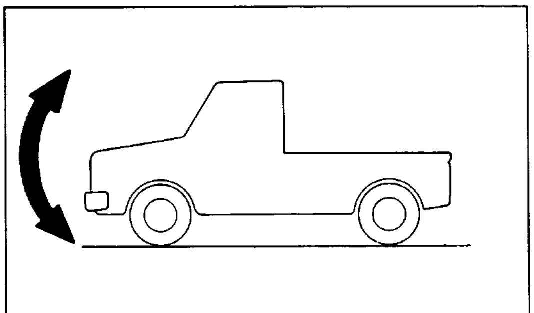
Torque: 25 N–m (250 kgf–cm, 19 ft–lbf)


FA0822

4. INSTALL SHOCK ABSORBER TO LOWER SUSPENSION ARM

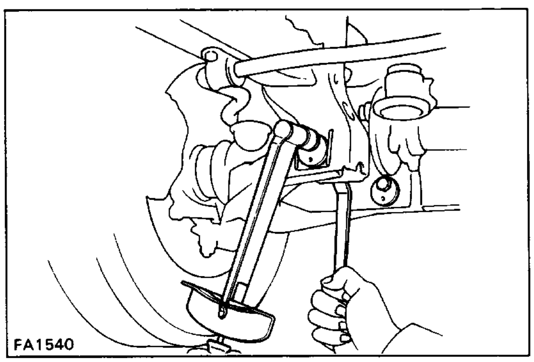
Install the shock absorber to lower suspension arm bracket.

Torque: 137 N–m (1,400 kgf–cm, 101 ft–lbf)


FA0123

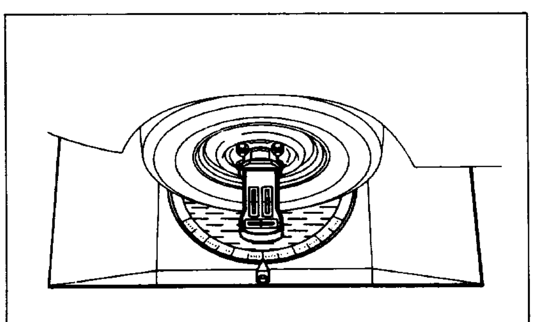
5. TORQUE ADJUSTING CAM NUTS

(a) Install the wheel, and remove the stands and bounce the vehicle up and down to stabilize the sus–pension.


FA1540

(b) Align the matchmarks and torque the nuts.

Torque: 196 N–m (2,000 kgf–cm, 145 ft–lbf)


M9938

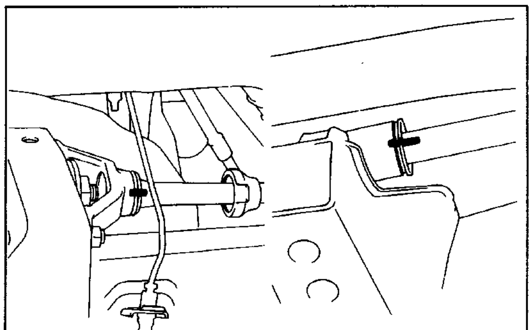
6. CHECK FRONT WHEEL ALIGNMENT

(See page SA–6)

Upper Suspension Arm

(See page SA–111)

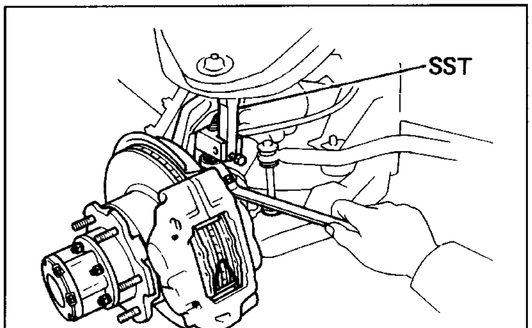
REMOVAL OF UPPER SUSPENSION ARM



FA0778 FA0856

1. REMOVE TORSION BAR SPRING

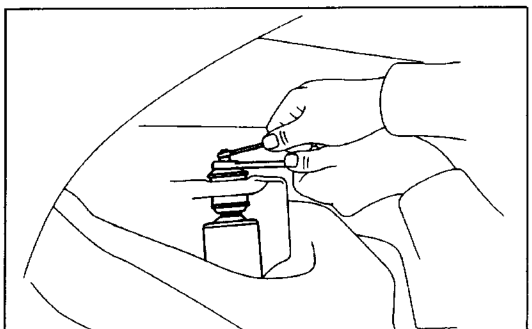
(See page SA–114)



FA1594

2. DISCONNECT UPPER SUSPENSION ARM FROM UPPER BALL JOINT

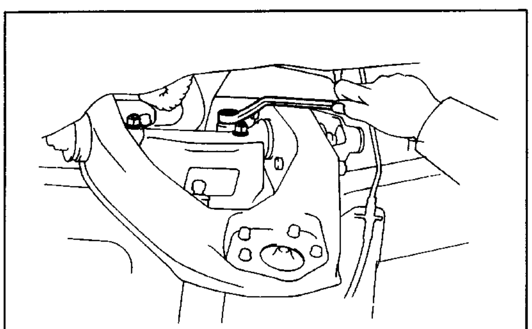
Remove the cotter pin and nut, and using SST disconnect the upper ball joint from the steering knuckle.
SST 09628–62011



SA0831

3. DISCONNECT SHOCK ABSORBER FROM FRAME

Remove the nut, cushion and retainer, and disconnect the shock absorber from the frame.
HINT: Do not disconnect the shock absorber from the lower suspension arm.

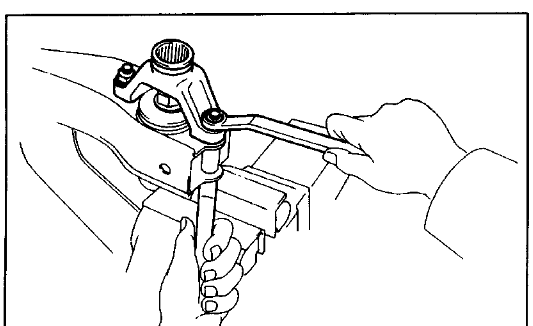


FA0765

4. REMOVE UPPER SUSPENSION ARM

(a) Disconnect the intermediate shaft from the steering gear housing.

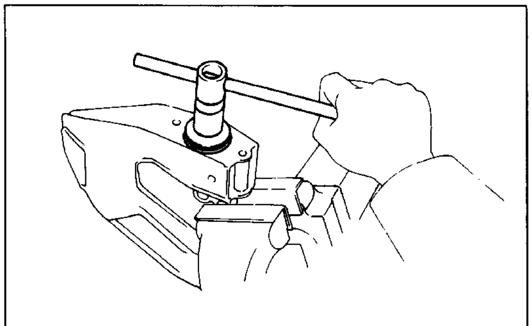
(b) Remove the three bolts, and remove the upper sus–pension arm from the frame.



FA0777

REPLACEMENT OF UPPER ARM BUSHING

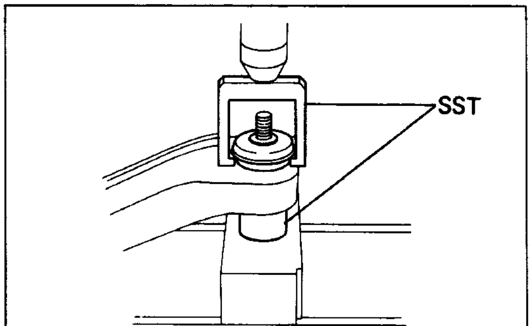
1. REMOVE TORQUE ARM


FA0779

2. REMOVE FRONT BUSHING

(a) Using a chisel and hammer, loosen the staked part of the nut.

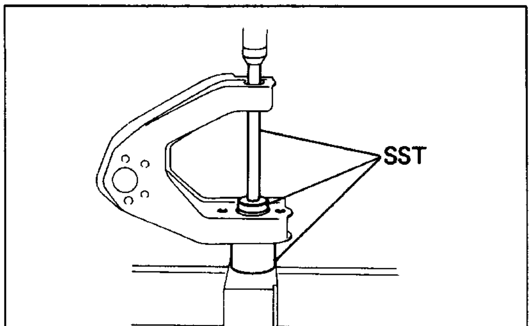
(b) Remove the nut.



FA0785

(c) Using SST, push out the front bushing.
SST 09710–26010 (09710–05040, 09710–05050)

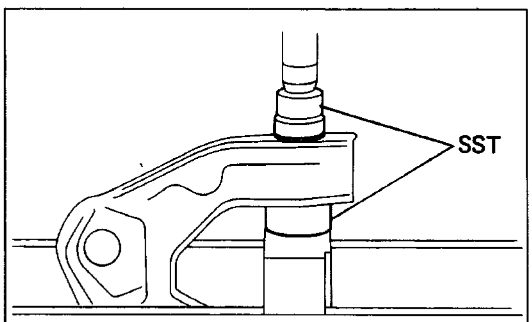
3. REMOVE UPPER ARM SHAFT



FA0784

4. REMOVE REAR BUSHING

Using SST, push out the rear bushing.
SST 09710–26010
(09710–05020, 09710–05030, 09710–05080)

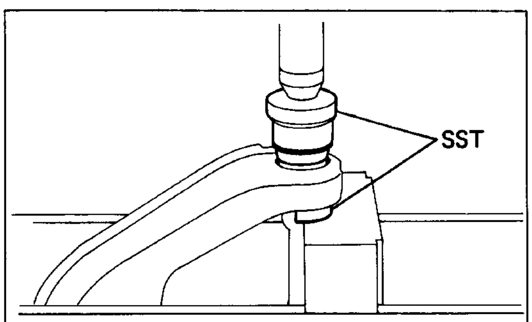


FA0831

5. INSTALL REAR BUSHING

(a) Using SST, push in a new bushing.
SST 09710–26010 (09710–05060, 09710–05080)
HINT: Do not apply grease or oil to the bushing.

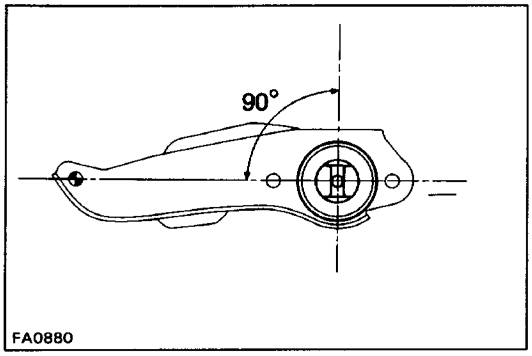
(b) Install the upper arm shaft.



FA0830

6. INSTALL FRONT BUSHING

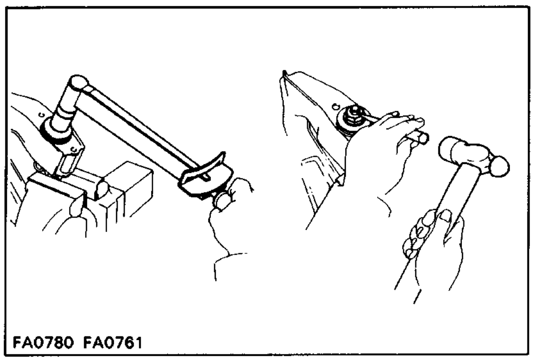
Using SST, push in a new front bushing.
SST 09710–26010 (09710–05060, 09710–05080)



7. TORQUE UPPER ARM SHAFT

(a) Install the retainers and new nuts.

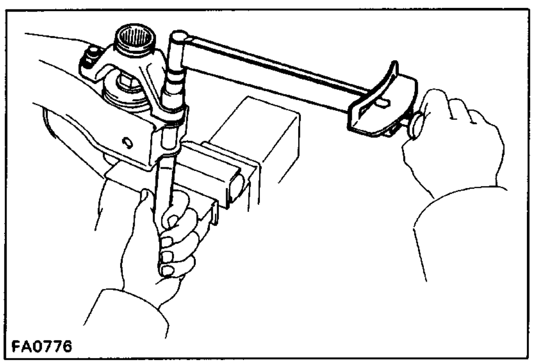
HINT: Position the upper arm shaft so that the frame installation surface is level with the arm.



(b) Torque the shaft nuts.

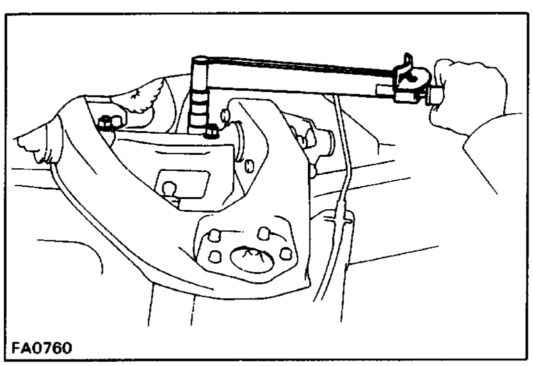
Torque: 226 N–m (2,300 kgf–cm, 166 ft–lbf)

(c) Stake the nuts with a hammer and chisel.



8. INSTALL TORQUE ARM TO UPPER ARM

Torque: 87 N–m (890 kgf–cm, 64 ft–lbf)



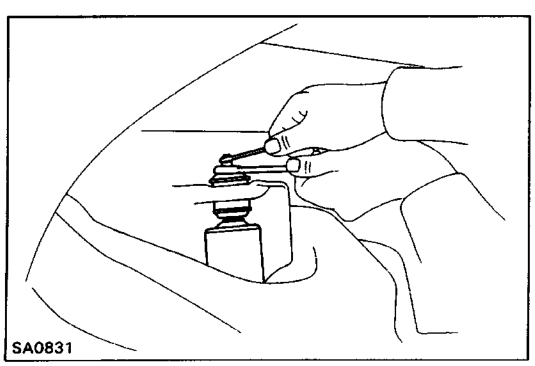
INSTALLATION OF UPPER SUSPENSION ARM

1. INSTALL UPPER SUSPENSION ARM TO FRAME

(a) Install the lower suspension arm to the frame and torque the mounting bolts.

Torque: 178 N–m (1,810 kgf–cm, 131 ft–lbf)

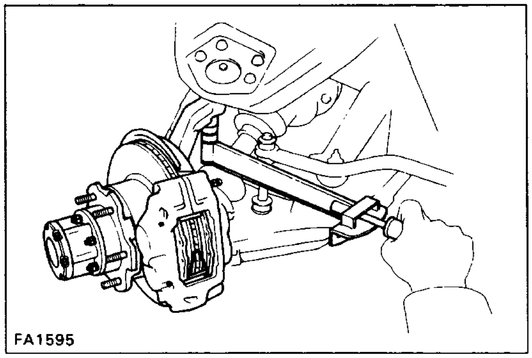
(b) Connect the intermediate shaft to the steering gear housing.



2. CONNECT SHOCK ABSORBER TO FRAME

Connect the shock absorber to frame with cushion and retainer and install and torque a new nut as shown in the figure.

Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)



3. CONNECT UPPER SUSPENSION ARM TO UPPER BALL JOINT

(a) Connect the upper ball joint to the steering knuckle and install and torque the nut.

Torque: 142 N–m (1,450 kgf–cm, 105 ft–lbf)

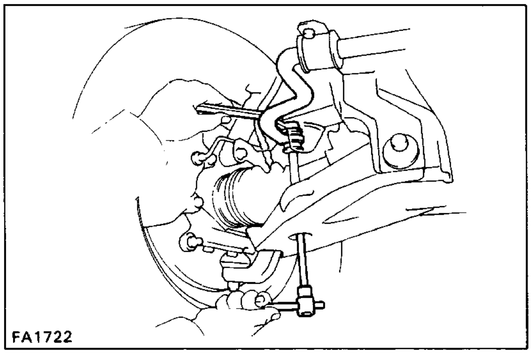
(b) Install a new cotter pin.

4. INSTALL TORSION BAR SPRING

(See page SA–114)

5. CHECK FRONT WHEEL ALIGNMENT

(See page SA–6)



Stabilizer Bar

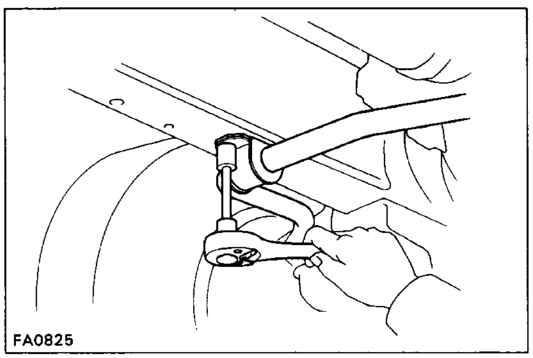
(See page SA–111)

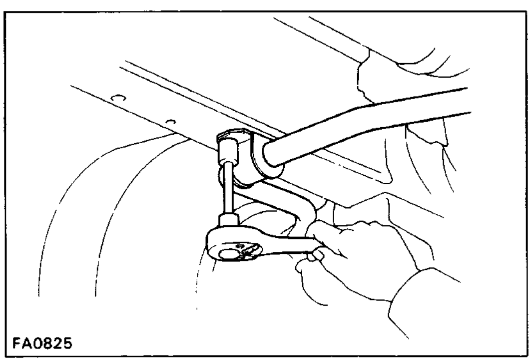
REMOVAL OF STABILIZER BAR

REMOVE STABILIZER BAR

(a) Remove the nut, cushions and retainers holding both sides of the stabilizer bar from the lower sus–pension arms, and disconnect the stabilizer bar.

(b) Remove both stabilizer bar brackets and cushions, and remove the stabilizer bar.





INSTALLATION OF STABILIZER BAR

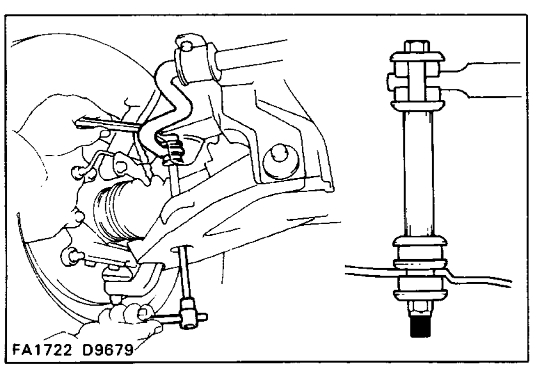
1. PLACE STABILIZER BAR TO FRAME

Place the stabilizer bar in position and install the both sta-bilizer bar cushion and brackets to the frame. Temporarily install the bolts.

2. CONNECT STABILIZER BAR TO LOWER SUSPENSION ARMS

Connect the stabilizer bar on both sides to the lower arms with bolts, cushion, retainers and a new nut as shown. Torque the nut.

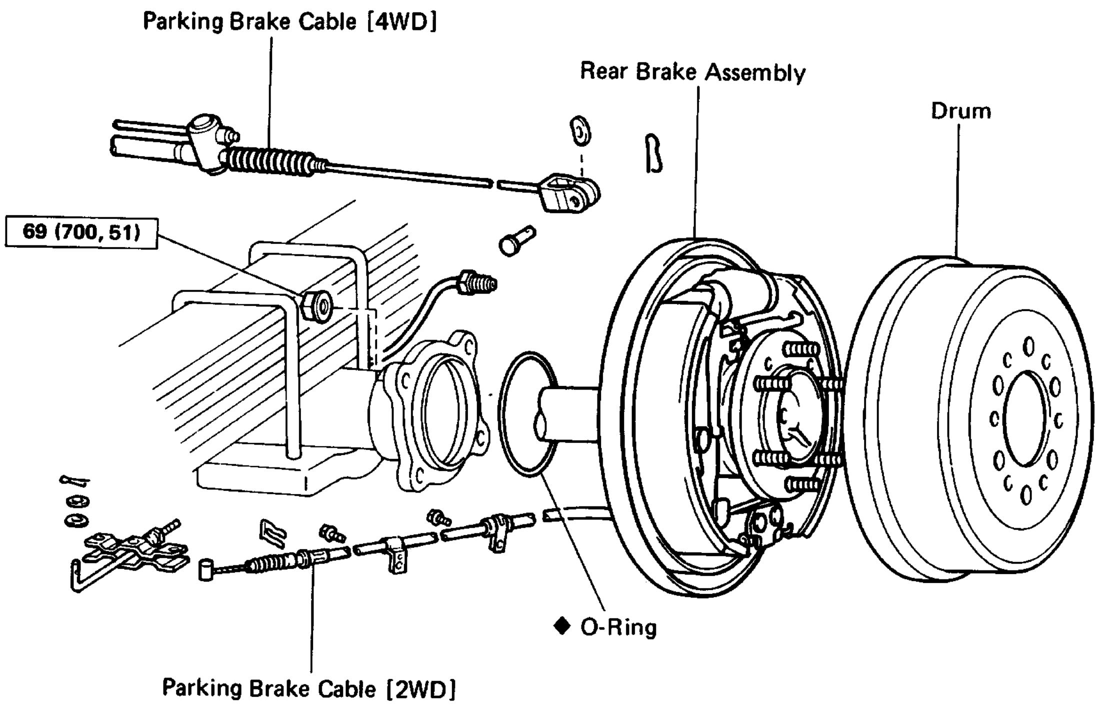
Torque: 25 N–m (260 kgf–cm, 19 ft–lbf)

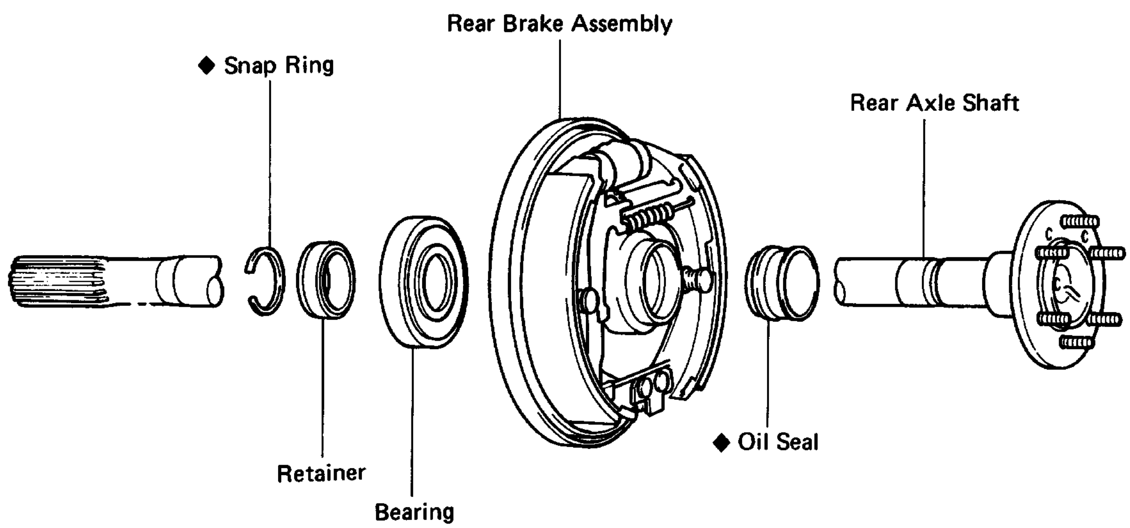


3. TORQUE BRACKET SET BOLTS TO FRAME

Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)

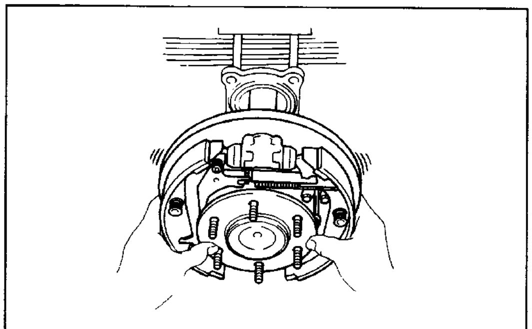
REAR AXLE SHAFT (Single Tire)
COMPONENTS





N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part

SA0387
SA0388



RA1380

REMOVAL OF REAR AXLE SHAFT

1. REMOVE WHEEL AND BRAKE DRUM

2. DISCONNECT BRAKE TUBE AND PARKING BRAKE CABLE

3. REMOVE FOUR BACKING PLATE MOUNTING NUTS

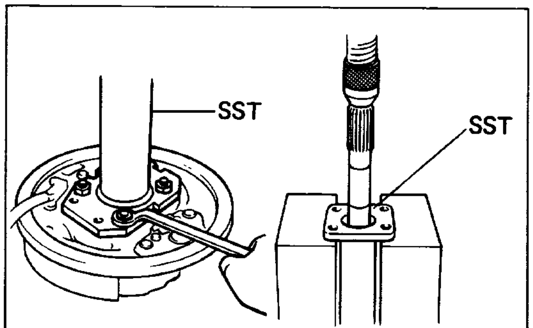
4. REMOVE REAR AXLE SHAFT FROM REAR AXLE HOUSING

5. REMOVE SNAP RING

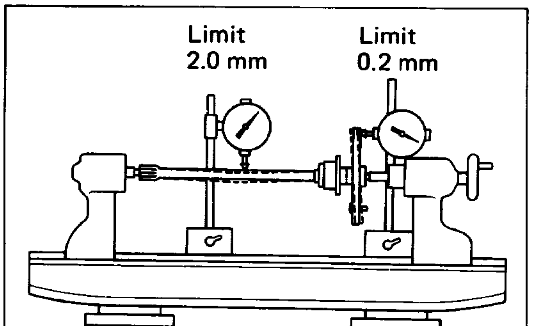
6. REMOVE REAR AXLE SHAFT FROM BACKING PLATE

(a) Attach SST to the backing plate.
SST 09521–25011

(b) Press out the rear axle shaft from the backing plate.
NOTICE: When pulling out the rear axle, be careful not to damage the oil seal.



RA0176 RA0177



RA0005

INSPECTION AND REPAIR OF REAR AXLE SHAFT COMPONENTS

1. INSPECT REAR AXLE SHAFT AND FLANGE FOR WEAR, DAMAGE OR RUNOUT

Maximum shaft runout: 2.0 mm (0.079 in.)
Maximum flange runout: 0.2 mm (0.008 in.)

If the rear axle shaft or flange is damaged or worn, or if runout is greater than maximum, replace the rear axle shaft.

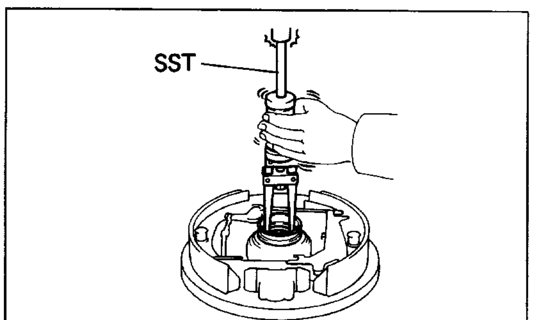
2. INSPECT OUTER OIL SEAL

(a) Check for damage.

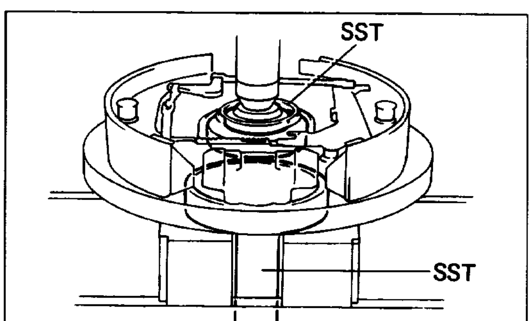
(b) Check the oil seal lip for wear or damage.
If necessary, replace the oil seal.

3. REMOVE OUTER OIL SEAL

Using SST, remove the oil seal.
SST 09308–00010



RA1382



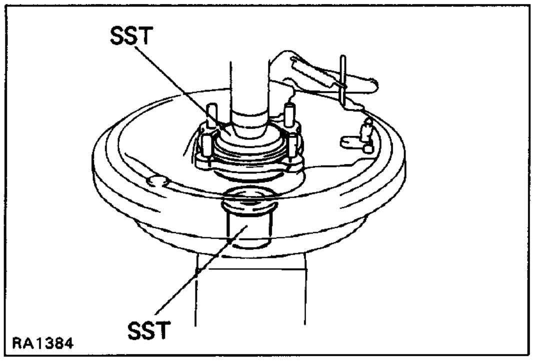
RA1383

4. INSPECT REAR AXLE BEARING

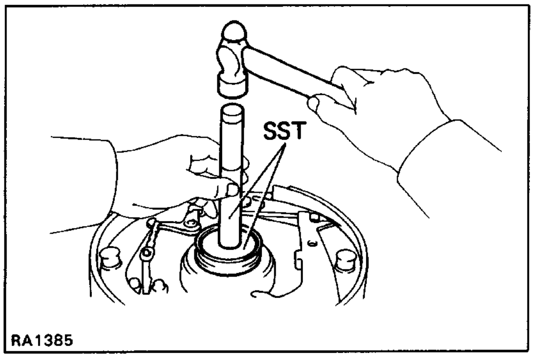
Check for wear or damage.

5. IF NECESSARY, REPLACE REAR AXLE BEARING

(a) Using SST, press out the bearing.
SST 09223–56010 and 09608–35014 (09608–06100)

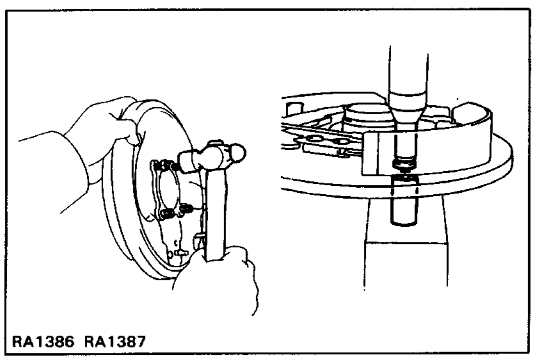


(b) Using SST, press in a new bearing.
SST 09515–30010 and 09608–35014 (09608–06180)



6. INSTALL NEW OUTER OIL SEAL

Using SST, tap in a new oil seal.
SST 09608–30012 (09608–04020, 09608–04070)

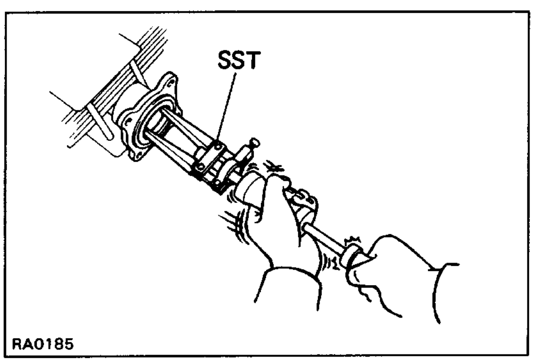


7. INSPECT BEARING CASE

Check for wear or damage.

8. IF NECESSARY, REPLACE BEARING CASE

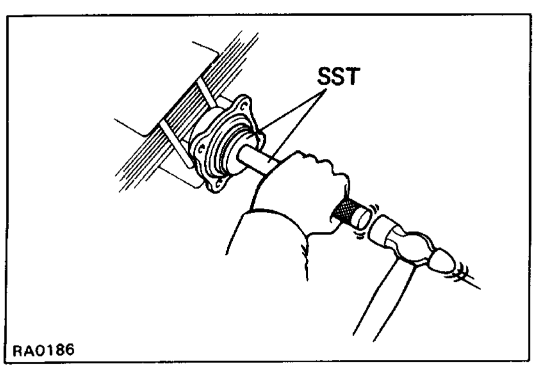
(a) Remove the oil seal and bearing.
(b) Install nuts to the serration bolts.
(c) Using a hammer, tap out the serration bolts and re–move the bearing case.
(d) Position the backing plate on the new bearing case and, using two socket wrenches, press in the serra–tion bolts.
(e) Install a new bearing and oil seal.



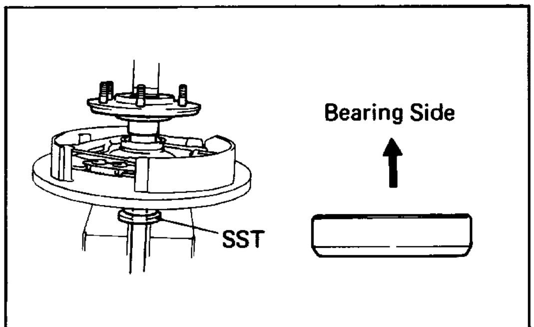
9. INSPECT OIL SEAL FOR WEAR OR DAMAGE

10. IF NECESSARY, REPLACE OIL SEAL

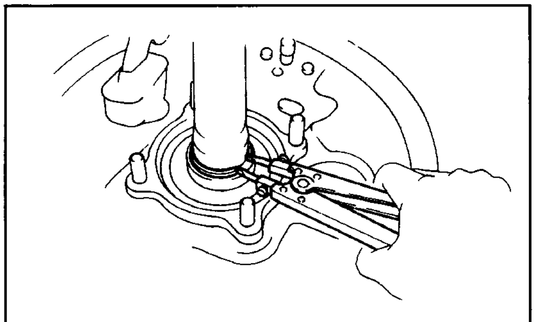
(a) Using SST, remove the oil seal.
SST 09308–00010



(b) Apply MP grease to the oil seal.
(c) Using SST, drive in a new oil seal.
SST 09608–30012 (09608–04020, 09608–04100)



RA1388 RA0210



RA1389

INSTALLATION OF REAR AXLE SHAFT

(See page SA–123)

1. INSTALL REAR AXLE SHAFT IN BACKING PLATE

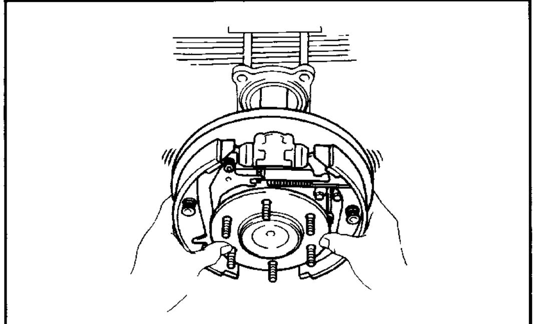
(a) Apply MP grease to the oil seal lip.

(b) Install the backing plate and bearing retainer on the rear axle shaft.

(c) Using SST, press the rear axle shaft into the backing plate.

SST 09515–30010

(d) Using snap ring pliers, install a new snap ring.



RA1380

2. INSTALL REAR AXLE SHAFT INTO HOUSING

Install the rear axle with four nuts.

Torque: 59 N–m (700 kgf–cm, 51 ft–lbf)

HINT:

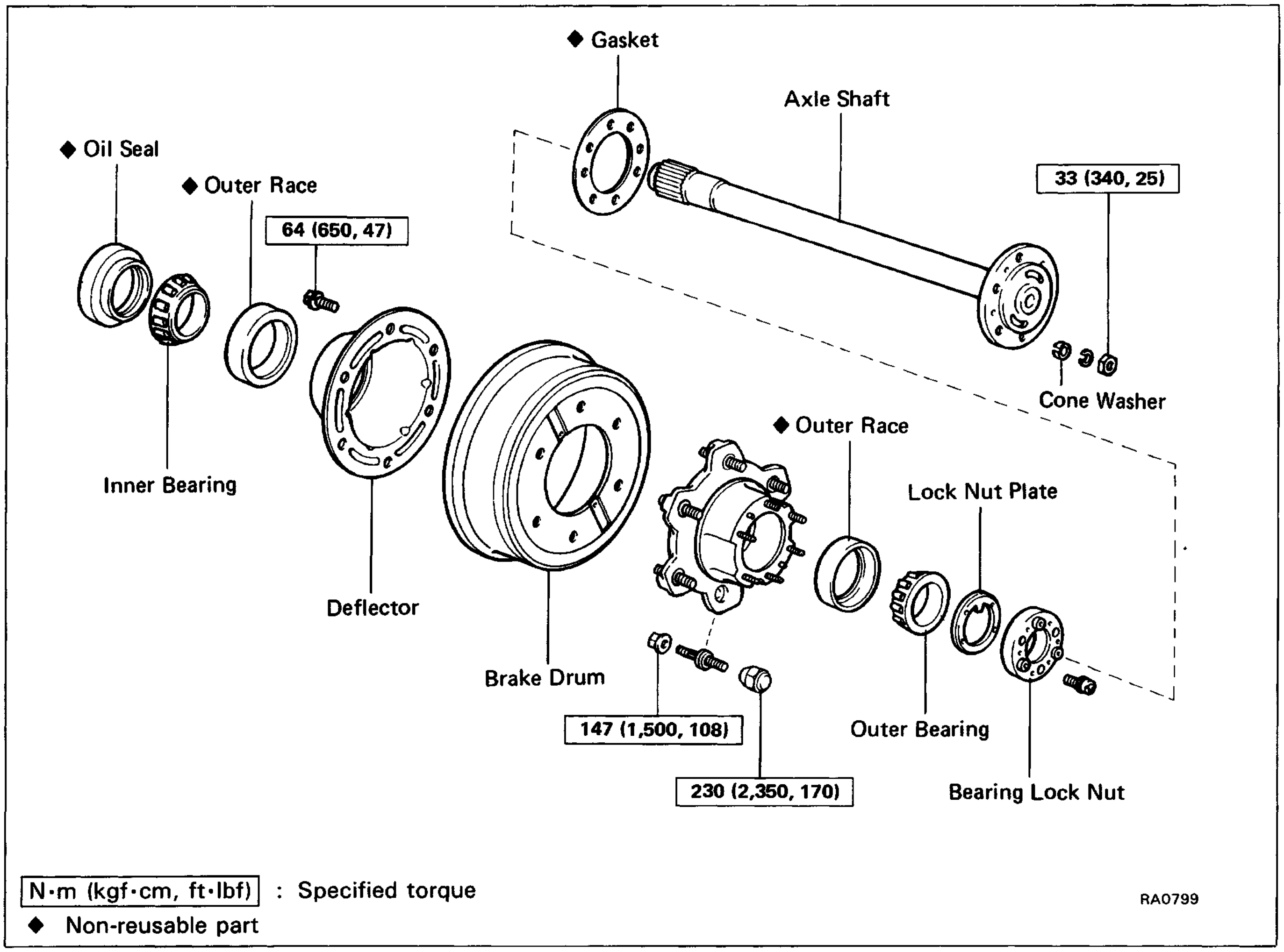
- Be careful not to damage the oil seal.
- When inserting the axle shaft, be careful not to hit or deform the oil deflector inside the axle housing.

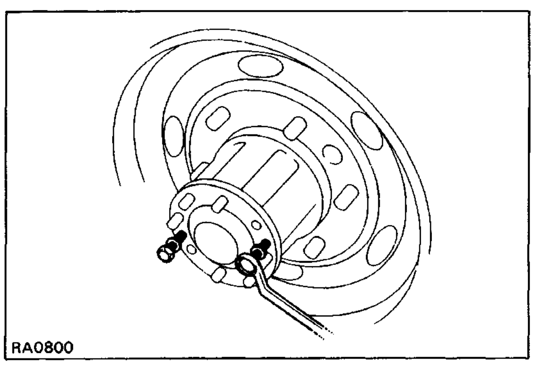
3. CONNECT BRAKE TUBE AND PARKING BRAKE CABLE

4. INSTALL BRAKE DRUM AND WHEEL

5. BLEED BRAKE SYSTEM

REAR AXLE SHAFT AND AXLE HUB (Double Tire)

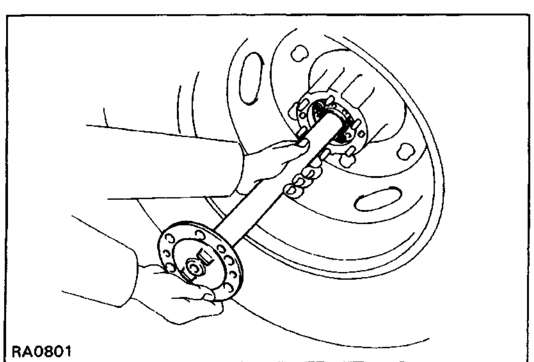




REMOVAL OF REAR AXLE SHAFT

1. REMOVE CONE WASHERS

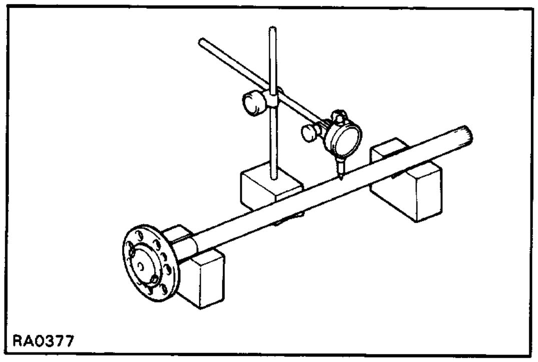
(a) Remove the six nuts and washers.
(b) Install two service bolts and one turn.
(c) Tap on the shaft and remove the six cone washers.



2. REMOVE REAR AXLE SHAFT

(a) Tighten the two service bolts and separate the axle shaft.
(b) Remove the axle shaft with the gasket.
(c) Remove the two service bolts.
HINT: Be careful not to damage the oil seal with the splines.

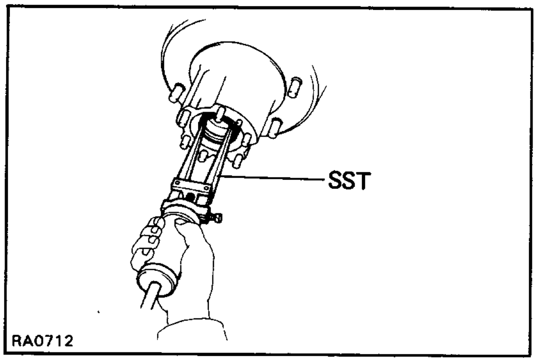
INSPECTION OF REAR AXLE SHAFT COMPONENTS


RA0377

1. INSPECT REAR AXLE SHAFT

Check for wear, damage or runout.

Maximum runout: 2.0 mm (0.079 in.)



RA0712

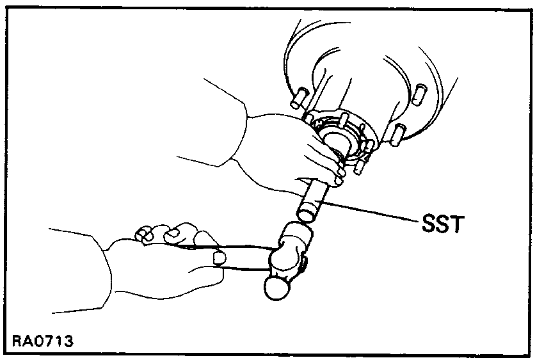
2. INSPECT OIL SEAL FOR WEAR OR DAMAGE

If the oil seal is damaged or worn, replace it.

3. REPLACE OIL SEAL

(a) Using SST, remove the oil seal.

SST 09308–00010



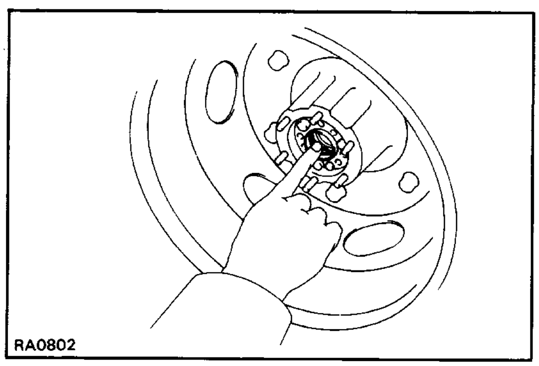
RA0713

(b) Using SST, drive in the oil seal.

SST 09517–12010

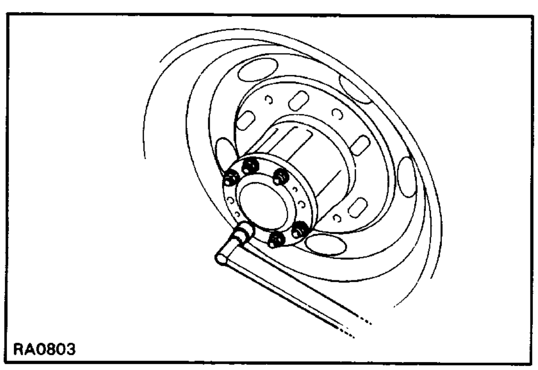
(c) Apply MP grease to the oil seal lip.

INSTALLATION OF REAR AXLE SHAFT


RA0802

(See page SA–127)

1. APPLY MP GREASE TO OIL SEAL LIP

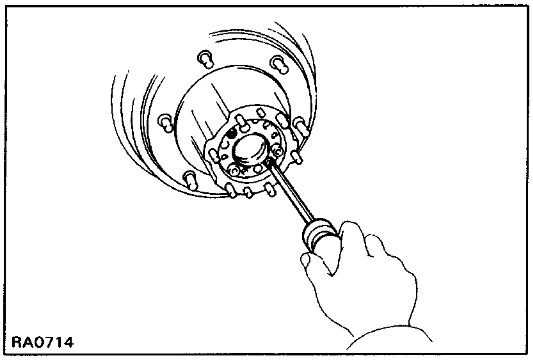

RA0803

2. INSTALL REAR AXLE SHAFT

Install the rear axle shaft, six cone washers and spring washers with nuts.

Torque: 33 N–m (340 kgf–cm, 25 ft–lbf)

HINT: Be careful not to damage the oil seal with the splines.

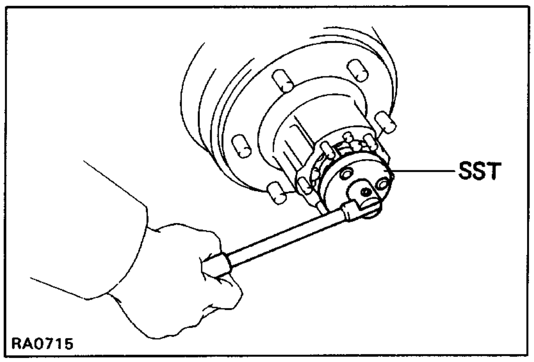


DISASSEMBLY OF REAR AXLE HUB

1. REMOVE REAR WHEEL AND REAR AXLE SHAFT
(See page SA–127)

2. REMOVE BEARING LOCK NUT

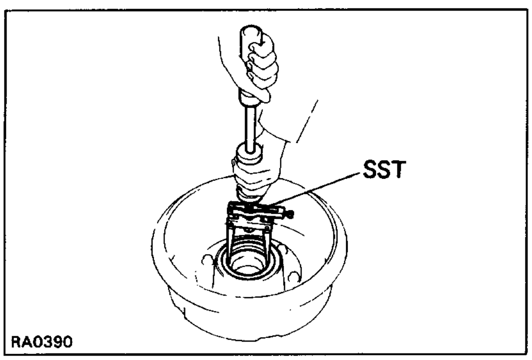
(a) Remove the two bolts from the bearing lock nut.



(b) Using SST, remove the bearing lock nut.
SST 09509–25011

(c) Remove the bearing lock plate.

3. REMOVE AXLE HUB FROM AXLE



4. REMOVE OIL SEAL AND INNER BEARING

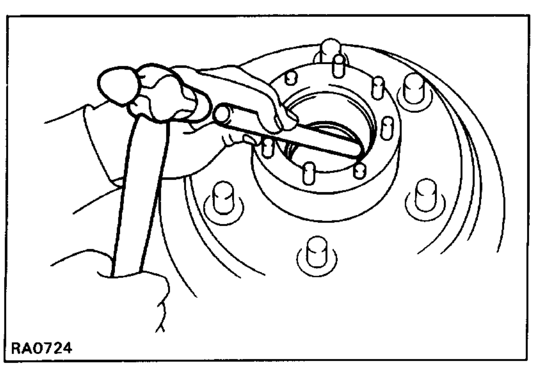
(a) Using SST, remove the oil seal from the axle hub.
SST 09308–00010

(b) Remove the inner bearing from the axle hub.

INSPECTION AND REPAIR OF REAR AXLE HUB

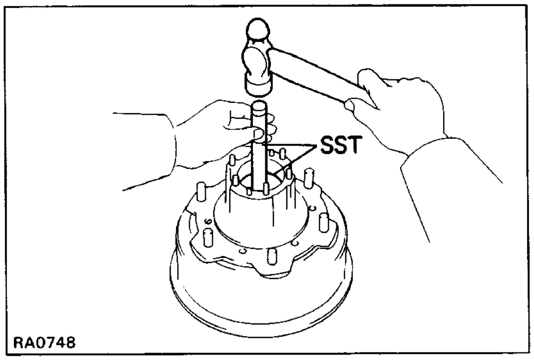
1. INSPECT AXLE HOUSING

Using a magnetic flaw detector or flaw detecting pene– trant, check for damage or cracks.



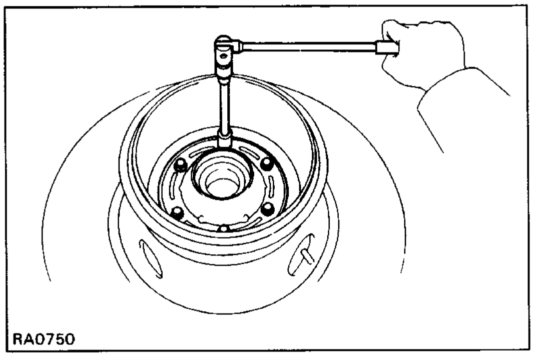
2. REPLACE BEARING OUTER RACE

(a) Using a hammer and brass bar, drive out the outer race.



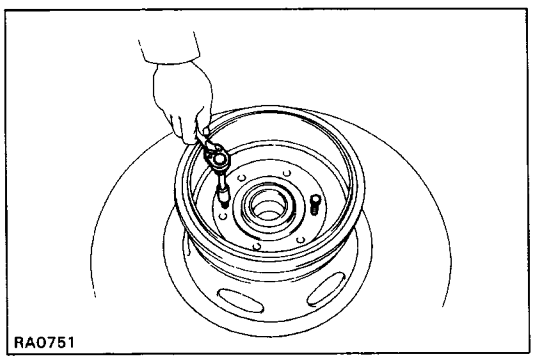
(b) Using SST, carefully tap in a new bearing outer race.

SST Inner side 09608–35014
(09608–06020, 09608–06210)
Outer side 09608–35014
(09608–06020, 09608–06200)

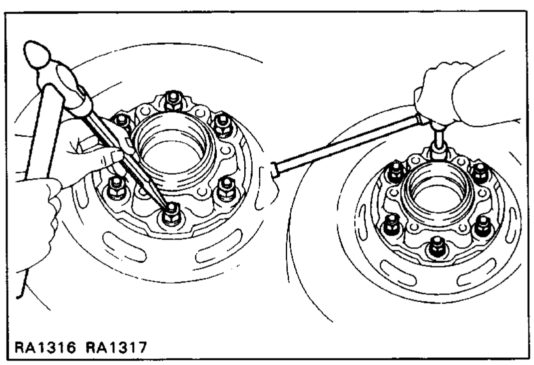


3. REPLACE HUB BOLT

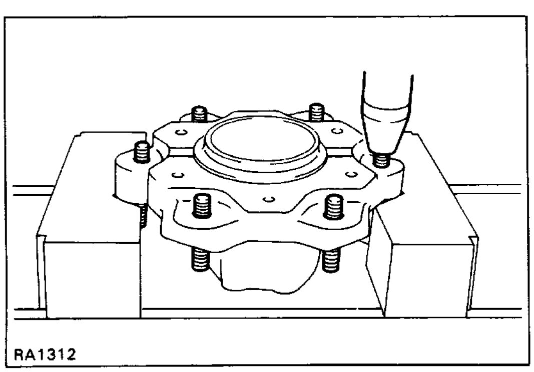
(a) Remove the six bolts and deflector.



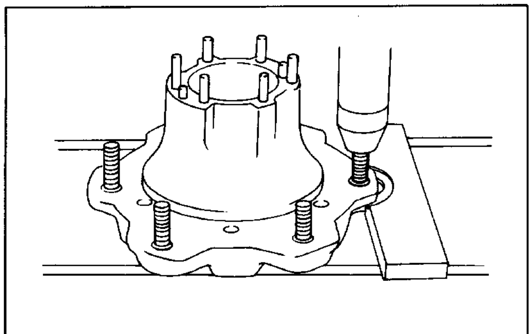
(b) Using the two service bolts, separate the hub and brake drum.



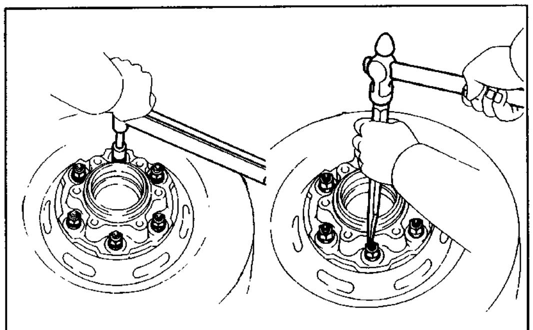
(c) Unstake the bolt and remove the nut.



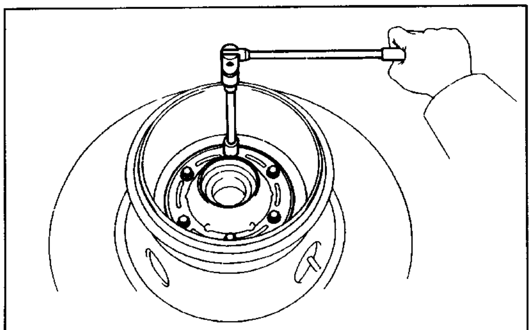
(d) Using a press, press out the hub bolt.


RA1313

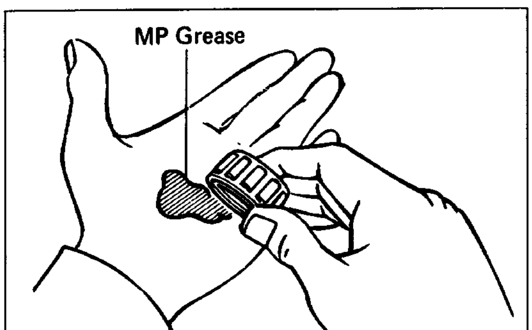
(e) Using a press, press in a new hub bolt.


RA1315 RA1314

(f) Install and tighten the nut and stake the bolt.
Torque: 147 N–m (1,500 kgf–cm, 108 ft–lbf)


RA0750

(g) Install the deflector and torque the six bolts.
Torque: 64 N–m (650 kgf–cm, 47 ft–lbf)

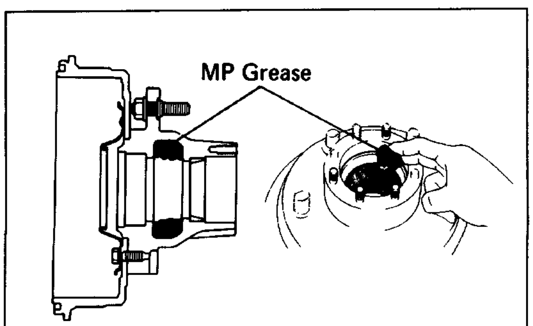


RA0009

ASSEMBLY OF REAR AXLE HUB
(See page SA–127)

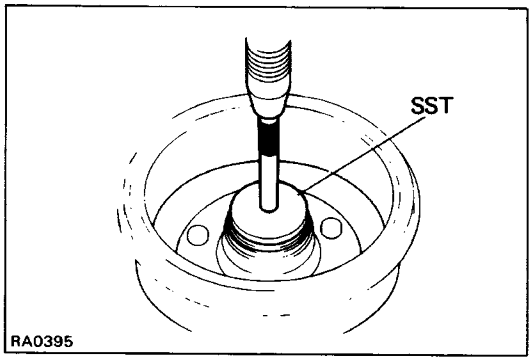
1. PACK BEARING WITH MP GREASE

(a) Place MP grease in the palm of your hand.
(b) Pack grease into the bearing, and continuing until the grease oozes out from the other side.
(c) Do the same around the bearing circumference.



RA1311 RA0413

2. COAT SIDE HUB WITH MP GREASE

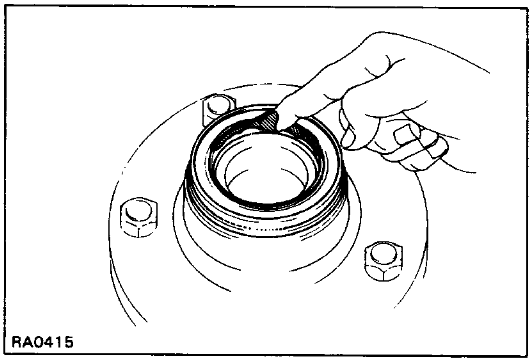


RA0395

3. INSTALL INNER BEARING AND OIL SEAL

(a) Place inner bearing into the hub.

(b) Using SST, press in a new oil seal to the hub.
SST 09608–35014 (09608–06020 and 09608–06180)

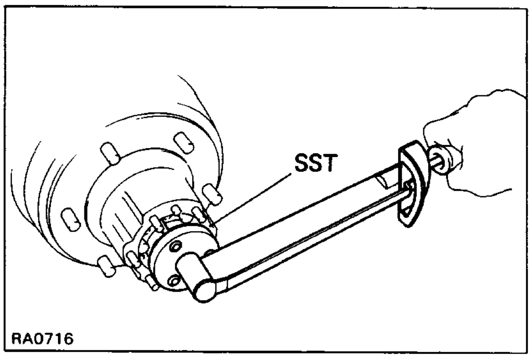

RA0415

(c) Apply MP grease to the oil seal lip.

4. INSTALL AXLE HUB ON AXLE HOUSING

(a) Place the axle hub on the axle housing.

(b) Install the outer bearing into the axle hub.

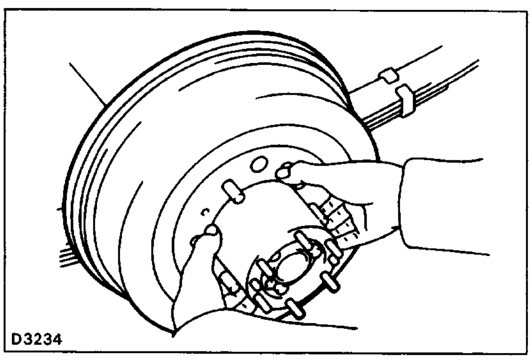


RA0716

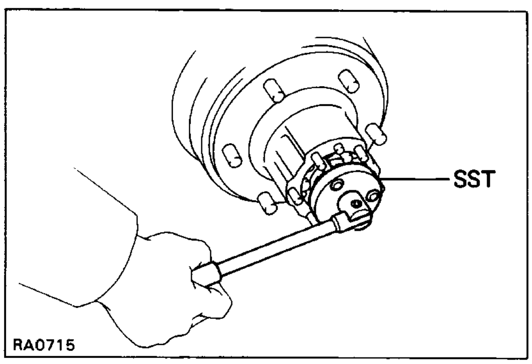
5. ADJUST PRELOAD

(a) Install the lock plate.

(b) Using SST, torque the bearing lock nut.
SST 09509–25011
Torque: 59 N–m (600 kgf–cm, 43 ft–lbf)


D3234

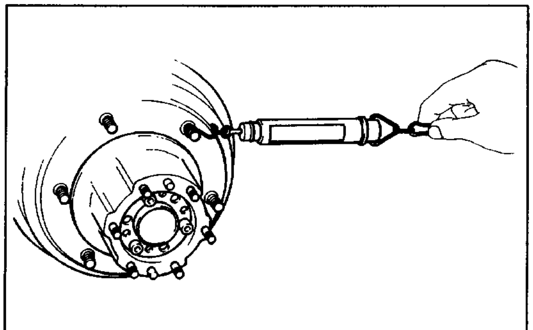
(c) Snug down the bearing by turning the hub several times.



RA0715

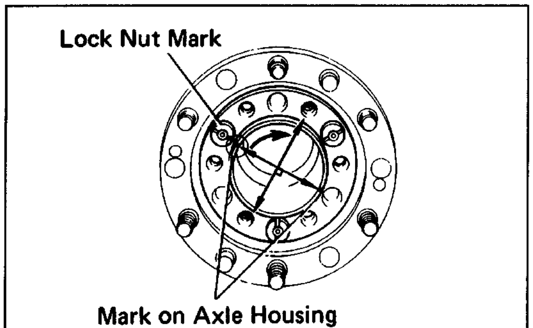
(d) Using SST, retighten the bearing lock nut.
SST 09509–25011
Torque: 59 N–m (600 kgf–cm, 43 ft–lbf)

(e) Using SST, loosen the bearing lock nut until you can rotate it by hand.
SST 09509–25011


RA0717

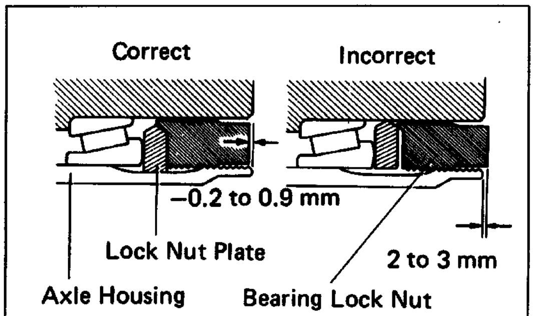
(f) Using a spring tension gauge, measure and note friction force of the oil seal. (starting)

(g) Using SST, tighten the bearing lock nut until the preload is within the specification below.
SST 09 509–2 5011
Preload (starting):
Add oil seal frictional force
1.0 –14.7 N (0.1 –1.5 kgf, 0.2 –3.3 lbf)



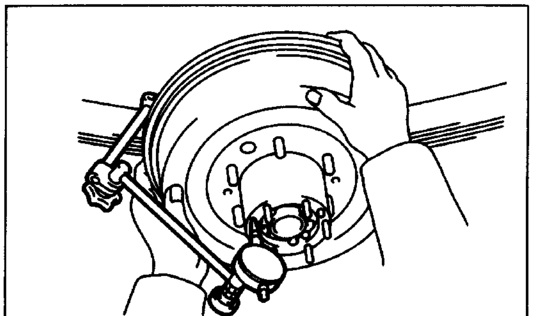
RA0660

(h) Align the lock nut mark with one of the marks on the axle housing, and place lock bolts in the holes at right angles to the lock nut.



RA0784

(i) Measure the distance between the top surface of axle housing and the lock nut.
Standard distance: – 0.2 to 0.9 mm
(– 0.008 to 0.035 in.)
If not within specification, reinstall the axle hub.


D3238

(j) Check the movement of the drum.

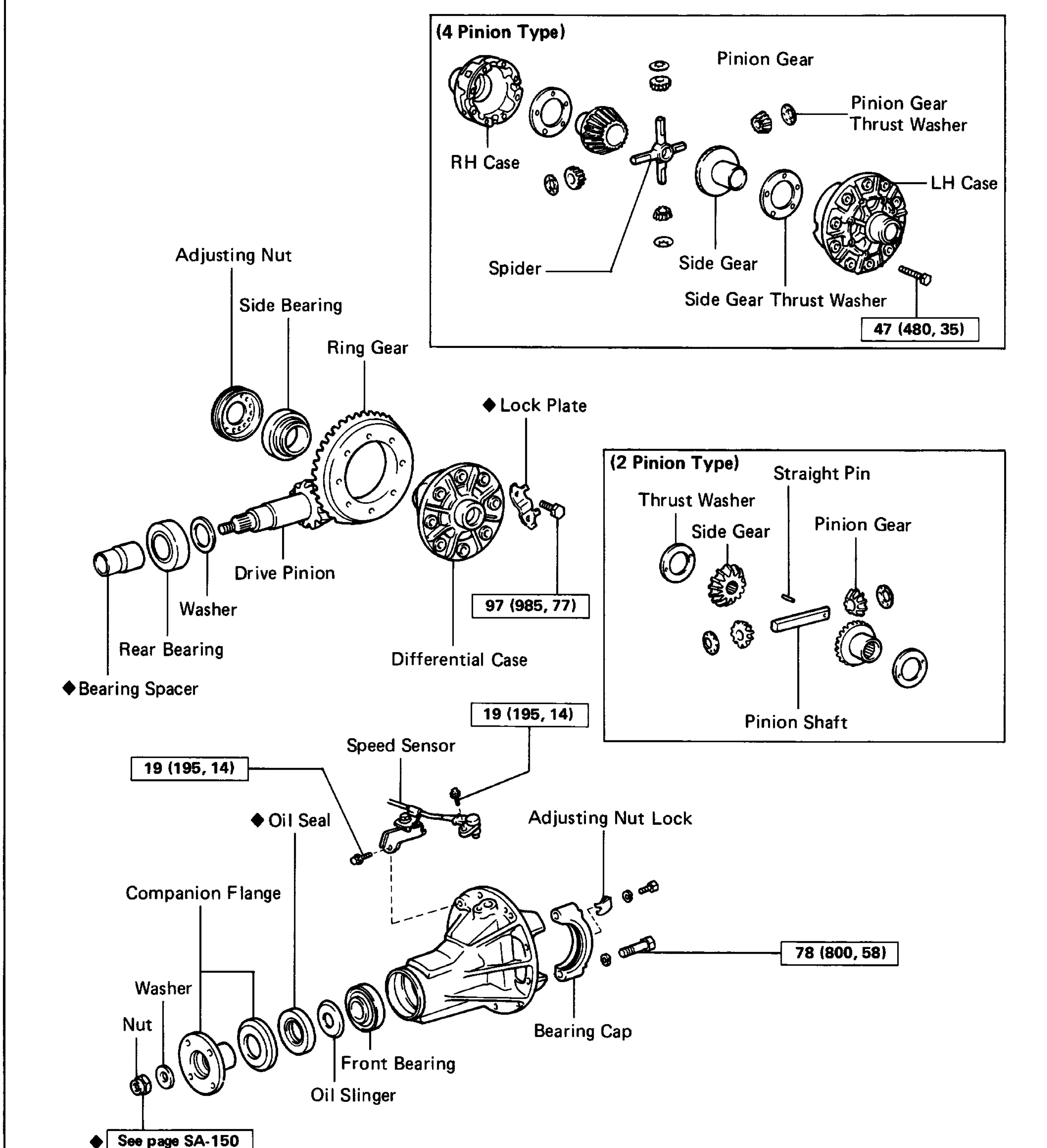
(k) Check that has no axle play.

6. INSTALL REAR AXLE SHAFT
(See page SA–128)

7. INSTALL WHEEL AND LOWER VEHICLE

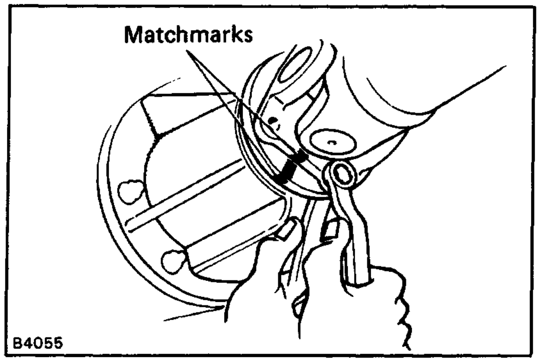
DIFFERENTIAL

COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part

SA3094



ON–VEHICLE REPLACEMENT OF OIL SEAL

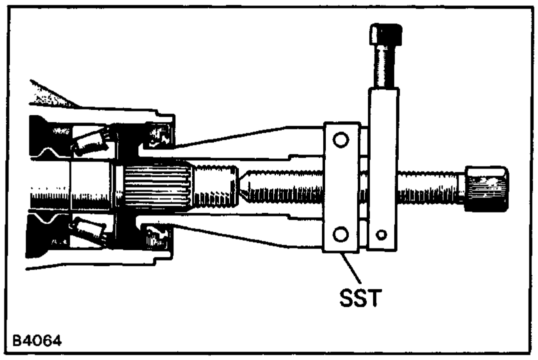
1. DISCONNECT PROPELLER SHAFT FROM DIFFERENTIAL

(a) Place matchmarks on the flanges.

(b) Remove the four bolts and nuts.

2. REMOVE COMPANION FLANGE

(See step 7 on page SA–138)



3. REMOVE OIL SEAL AND OIL SLINGER

(a) Using SST, remove the oil sea! from the housing.

SST 09308–10010

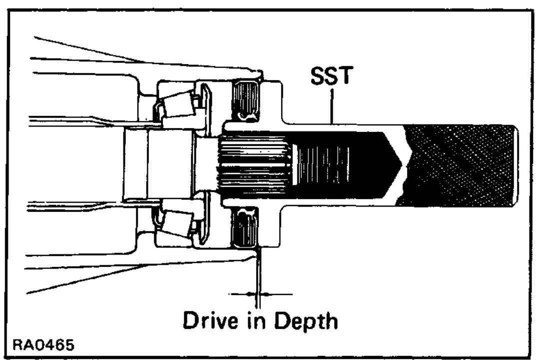
(b) Remove the oil slinger.

4. REMOVE FRONT BEARING AND BEARING SPACER

(See step 9 on page SA–138)

5. INSTALL NEW BEARING SPACER AND FRONT BEARING

(See step 12 on page SA–149)



6. INSTALL OIL SLINGER AND NEW OIL SEAL

(a) Install the oil slinger facing as shown.

(b) Using SST, drive in a new oil seal as shown.

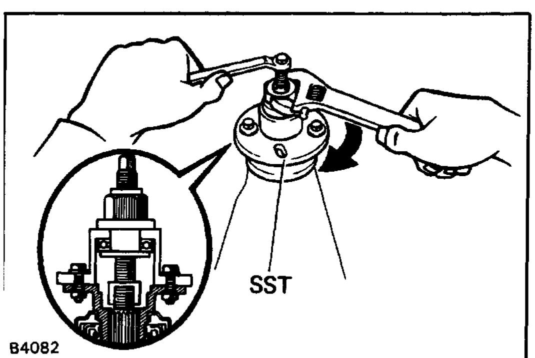
SST 09554–30011

Oil seal drive in depth:

7.5 in. 1.5 mm (0.059 in.)

8 in. 1.0 mm (0.039 in.)

(c) Apply MP grease to the oil seal lip.



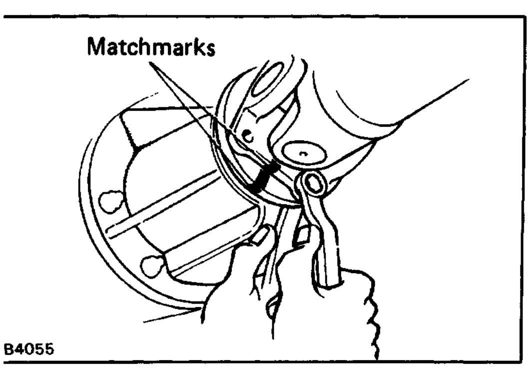
7. INSTALL COMPANION FLANGE

(See step 14 on page SA–149)

8. ADJUST DRIVE PINION BEARING PRELOAD

(See step 15 on page SA–150)

9. STAKE DRIVE PINION NUT



10. CONNECT PROPELLER SHAFT FLANGE TO COMPANION FLANGE

(a) Align the matchmarks on the flanges and connect the flanges with four bolts and nuts.

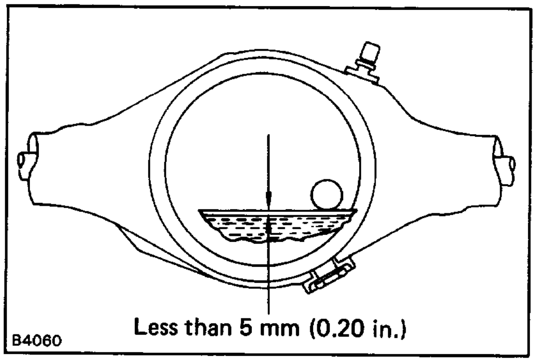
(b) Torque the four bolts and nuts.

Torque: 4WD 3VZ–E [MT]

76 N–m (780 kgf–cm, 56 ft–lbf)

Ex. 4WD 3VZ–E [MT]

74 N–m (750 kgf–cm, 54 ft–lbf)



11. CHECK DIFFERENTIAL OIL LEVEL

Fill with hypoid gear oil if necessary.

Oil type: API GL–5 hypoid gear oil

Viscosity: Above – 180C (0• F) SAE 90

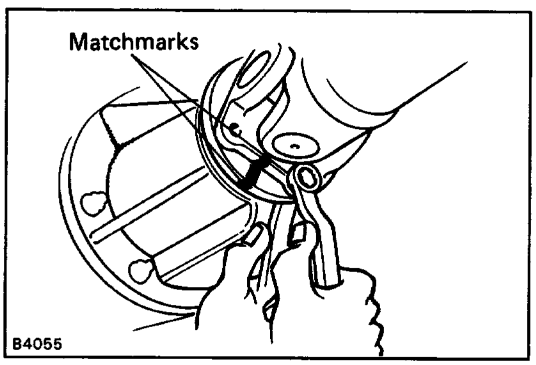
Below – 180C (0• F)

SAE 80V1r or 80w–90

Capacity:

liters (US qts, Imp. qts)

2W D	7.5 in.	2 pinion	1.35 (1.43, 1.19)
	8 in.	2 pinion	1.8 (1.9, 1.6)
		4 pinion	2.2 (2.3, 1.9)
4WD	8 in.	2 pinion	2.2 (2.3, 1.9)
		4 pinion	2.2 (2.3, 1.9)



REMOVAL OF DIFFERENTIAL

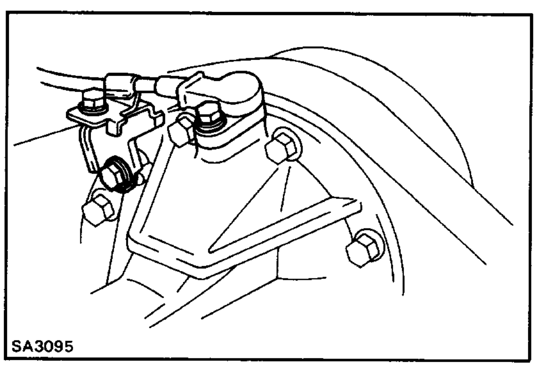
1. REMOVE DRAIN PLUG AND DRAIN DIFFERENTIAL OIL

2. REMOVE REAR AXLE SHAFTS

(See page SA–124 or SA–127)

3. DISCONNECT PROPELLER SHAFT FROM DIFFERENTIAL

(See page SA–135)



4. (wl REAR–WHEEL ANTI–LOCK BRAKE SYSTEM) DISCONNECT SPEED SENSOR

Remove the two bolts and the speed sensor.

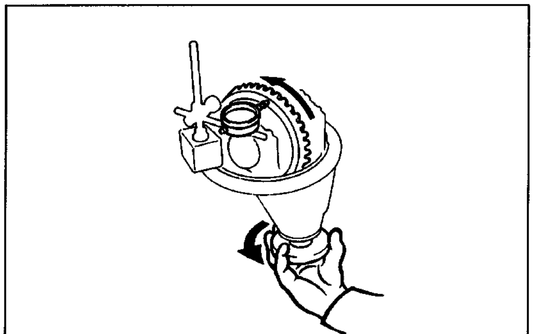
5. REMOVE DIFFERENTIAL CARRIER ASSEMBLY

DISASSEMBLY OF DIFFERENTIAL

(See page SA–134)

HINT: If the differential is noisy, perform the following preinspection before disassembly to determine the cause.

If the differential has severe problems, disassemble and repair it as necessary.



B4061

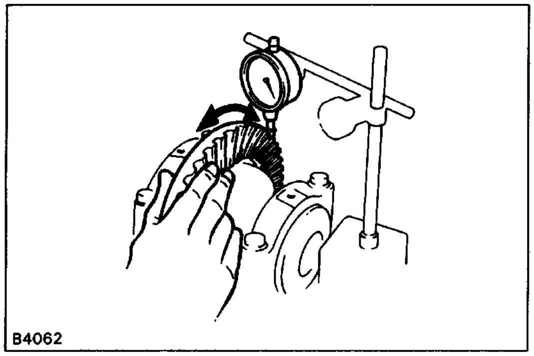
1. CHECK RING GEAR RUNOUT

If the runout is greater than maximum, install a new ring gear.

Maximum runout:

7.5 in. 0.07 mm (0.0028 in.)

8 in. 0.10 mm (0.0039 in.)



B4062

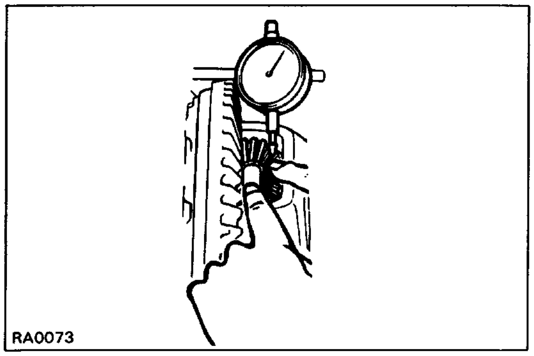
2. CHECK RING GEAR BACKLASH

If the backlash is not within specifications, adjust the side bearing preload or repair as necessary. (See step 8 on page SA–147)

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

3. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION (See step 9 on page SA–149)

Note the tooth contact position.



RA0073

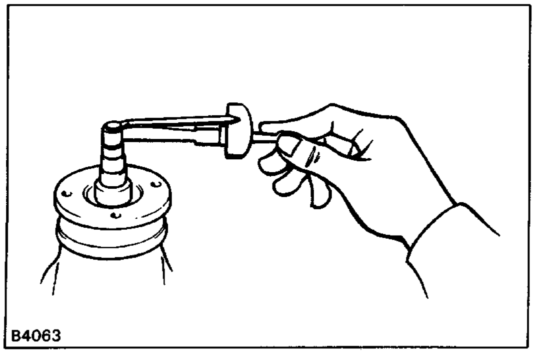
4. (2 PINION TYPE) CHECK SIDE GEAR BACKLASH

Measure the side gear backlash while holding one pinion gear toward the case.

Standard backlash:

0.05 – 0.20 mm (0.0020 – 0.0079 in.)

If the backlash is not within specification, install the proper thrust washers.



B4063

5. MEASURE DRIVE PINION PRELOAD

Using a torque meter, measure the preload of backlash between the drive pinion and ring gear.

Preload (starting):

7.5 in.

0.6 – 1.0 N–m (6 – 10 kgf–cm, 5.2 – 8.7 in.–lbf)

8 in.

(2 pinion type)

0.9 – 1.3 N–m (9 – 13 kgf–cm, 7.8 – 11.3 in.–lbf)

(4 pinion type)

0.5 – 0.8 N–m (5 – 8 kgf–cm, 4.3 – 6.9 in.–lbf)

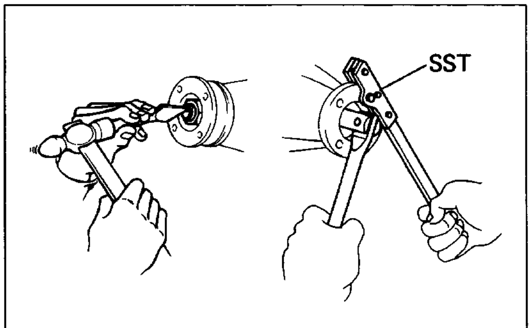
6. CHECK TOTAL PRELOAD

Using a torque meter, measure the total preload.

Total preload (starting):

Add drive pinion preload

0.4 – 0.6 N–m (4 – 6 kgf–cm, 3.5 – 5.2 in.–lbf)



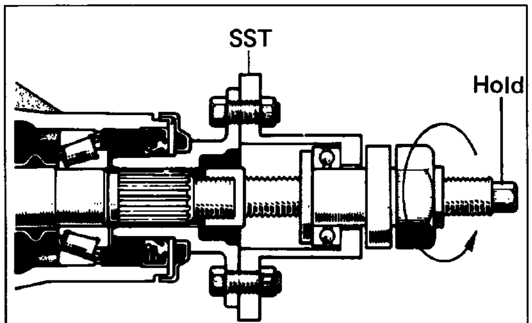
B4056 B4057

7. REMOVE COMPANION FLANGE

(a) Using a hammer and chisel, loosen the staked part of the nut.

(b) Using SST to hold the flange, remove the nut.

SST 09330–0002 1



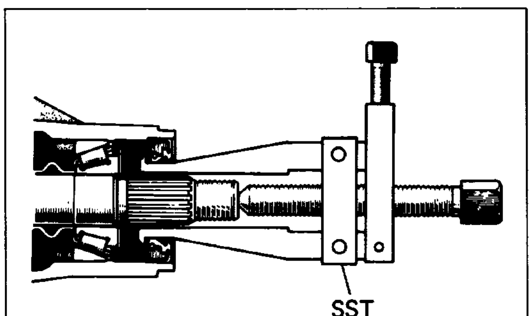
B4058

(c) Using SST, remove the companion flange.

SST 09557–22022

(7.5 in. 09557–22030)

(8 in. 09557–22050)



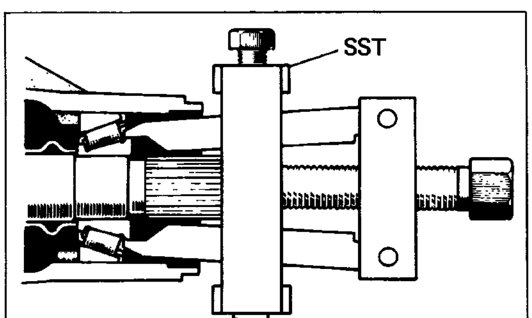
B4064

8. REMOVE OIL SEAL AND OIL SLINGER

(a) Using SST, remove the oil seal from the housing.

SST 09308–10010

(b) Remove the oil slinger.



B4065

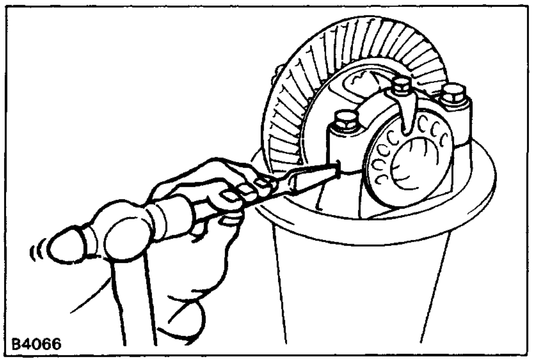
9. REMOVE FRONT BEARING AND BEARING SPACER

(a) Using SST, remove the front bearing from the drive pinion.

SST 09556–30010

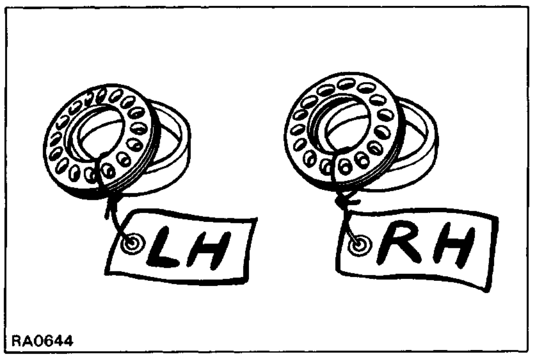
(b) Remove the bearing spacer.

If the front bearing is damaged or worn, replace the bear–ing.

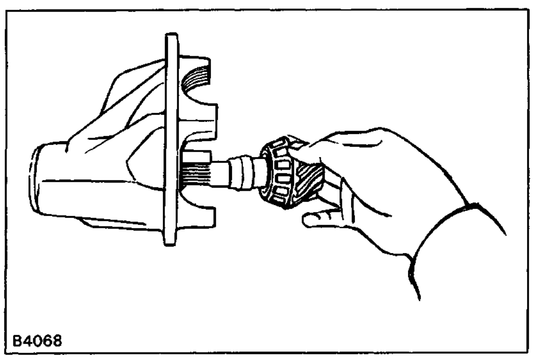


10. REMOVE DIFFERENTIAL CASE AND RING GEAR

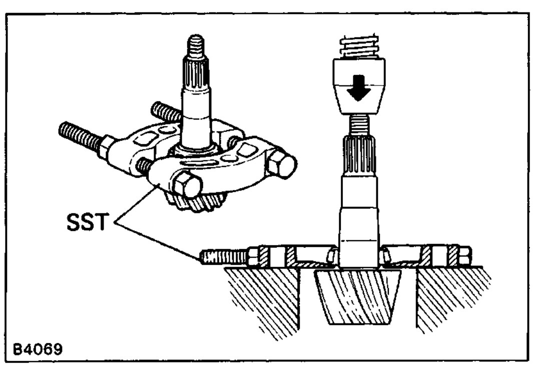
(a) Place matchmarks on the bearing cap and differen–tial carrier.
(b) Remove the two adjusting nut locks.
(c) Remove the two bearing caps and two adjusting nuts.
(d) Remove the bearing outer races.
(e) Remove the differential case from the carrier.



HINT: Tag the disassembled parts to show the location for reassembly.

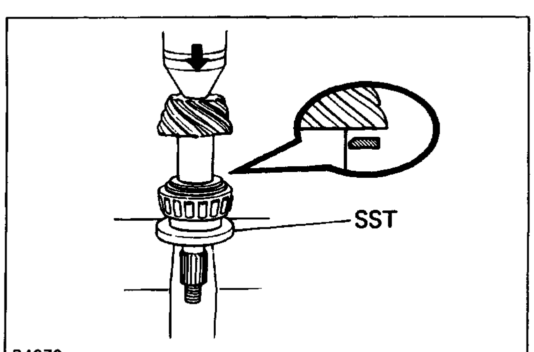


11. REMOVE DRIVE PINION FROM DIFFERENTIAL CARRIER

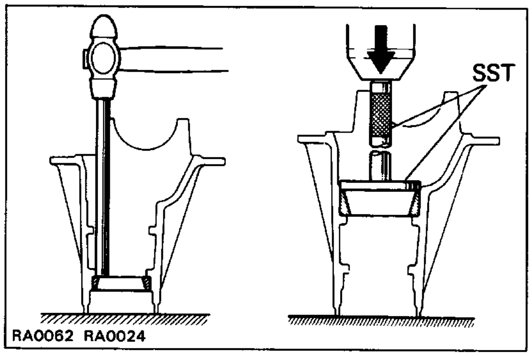


12. REPLACE DRIVE PINION REAR BEARING

(a) Using a press and SST, pull out the rear bearing from the drive pinion.
SST 09950–00020



(b) Install the washer on the drive pinion with the cham–fered end facing the pinion gear.
(c) Using a press and SST, press the reused washer and new rear bearing on the drive pinion.
SST 09506–30012



13. REPLACE DRIVE PINION FRONT AND REAR BEARING OUTER RACES

(a) Using a hammer and brass bar, drive out the outer race.

(b) Using a press and SST, drive in a new outer race.

SST

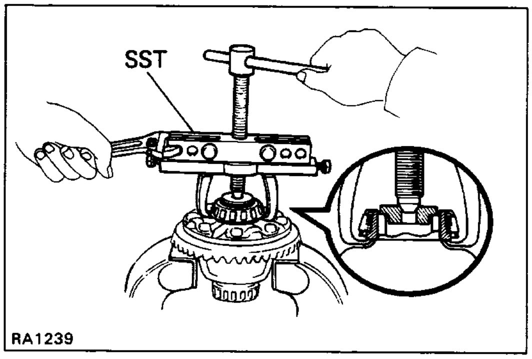
Front side 09608–35014 (09608–06020, 09608–06110)

Rear side

8 in. 4 pinion type

09608–35014 (09608–06020, 09608–06180)

Others 09608–35014 (09608–06020, 09608–06120)

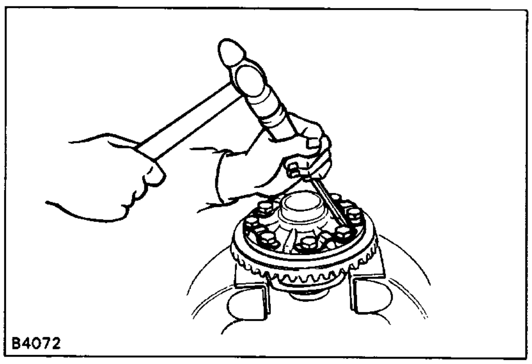


14. REMOVE SIDE BEARINGS FROM DIFFERENTIAL CASE

Using SST, pull the side bearing from the differential case.

SST 09950–20017

HINT: Fix the claws of SST to the notches in the differ–ential case.

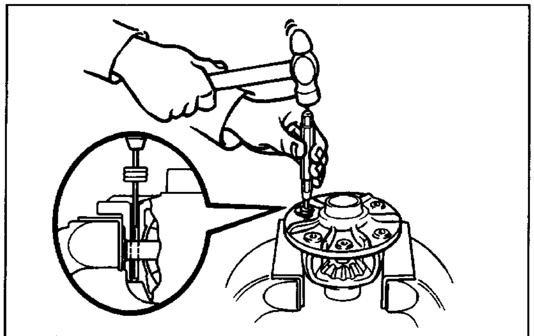


15. REMOVE RING GEAR

(a) Remove the ring gear set bolts and lock plates.

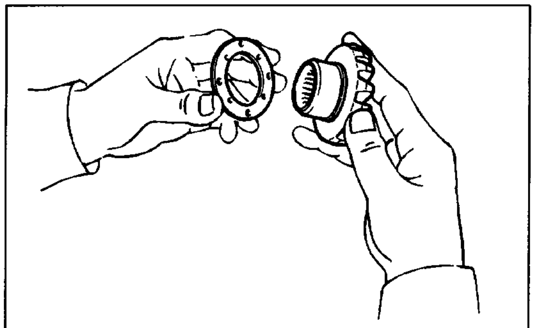
(b) Place alignment marks on the ring gear and differen–tial case.

(c) Using plastic or copper hammer, tap on the ring gear to separate it from the differential case.


B4073

REPLACEMENT OF DIFFERENTIAL CASE COMPONENT PARTS
(2 Pinion Type)
1. DISASSEMBLE DIFFERENTIAL CASE

Using a hammer and punch, drive out the straight pin.
Remove the pinion shaft, two pinion gears, two side gears and two thrust washers.


B4074

2. ASSEMBLE DIFFERENTIAL CASE

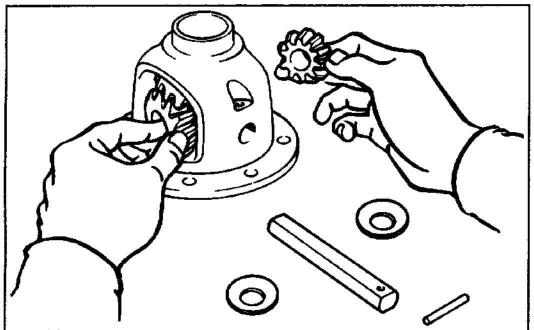
(a) Install the proper thrust washers and side gears.

Using the table below, select thrust washers which will ensure that the backlash is within specification.
Try to select washers of the same size for both sides.
Standard backlash: 0.05 – 0.20 mm
(0.0020 – 0.0079 in.)

Thrust washer thickness

7.5 in.		8 in.	
Thickness	mm (in.)	Thickness	mm (in.)
1.0	(0.039)	1.6	(0.063)
1.1	(0.043)	1.7	(0.067)
1.2	(0.047)	1.8	(0.071)
1.3	(0.051)		

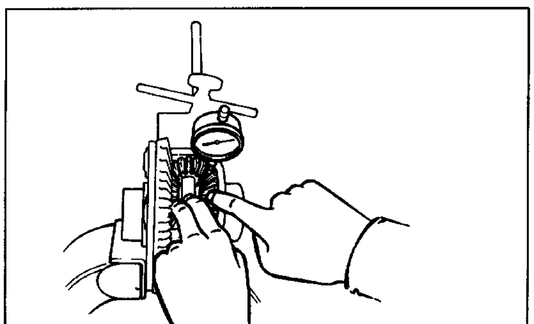
Install thrust washers and side gears in the differential case.


RA0025

(b) Check the side gear backlash.

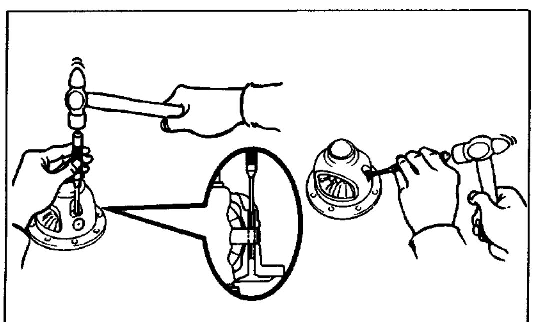
Measure the side gear backlash while holding one pinion gear toward the case.
Standard backlash: 0.05 – 0.20 mm
(0.0020 – 0.0079 in.)

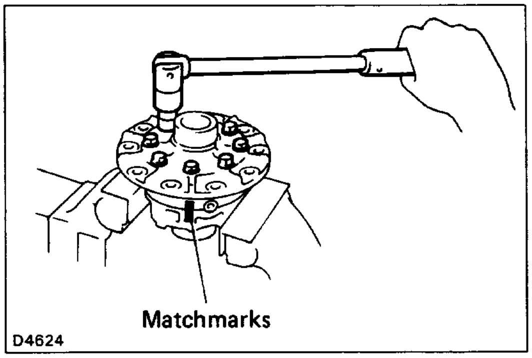
If the backlash is not within specification, install a thrust washer of different thickness.


RA0061

(c) Install the straight pin.

- Using the hammer and punch, drive the straight pin through the case and hole in the pinion shaft.
- Stake the pin and differential case.

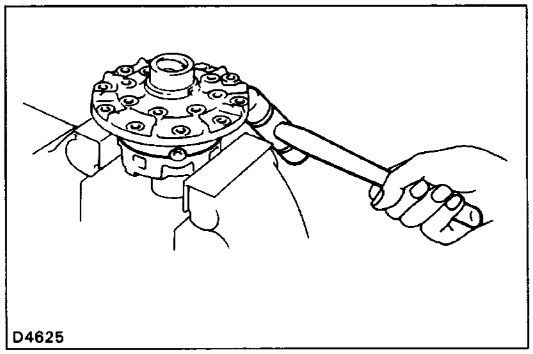

BA4075 BA4076



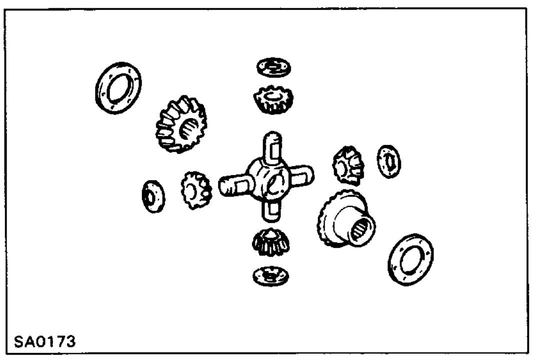
(4 Pinion Type)

1. DISASSEMBLE DIFFERENTIAL CASE

(a) Place the matchmarks on the LH and RH cases.
(b) Remove the eight bolts.

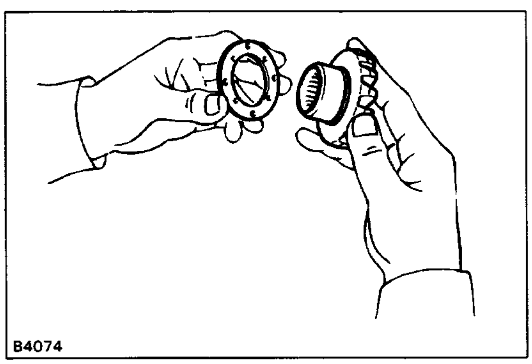


(c) Using a plastic hammer, separate the LH and RH cases.



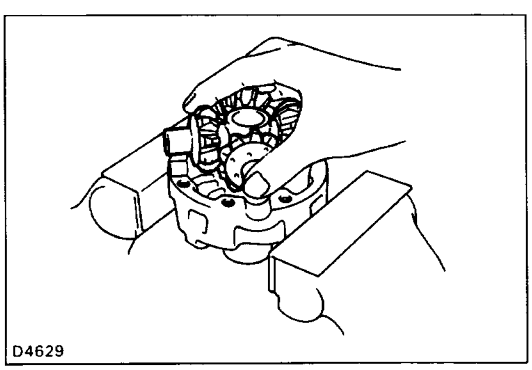
2. REMOVE FOLLOWING PARTS FROM CASE:

- Two side gears
- Two side gears thrust washers
- Spider
- Four pinion gears
- Four pinion gear thrust washers

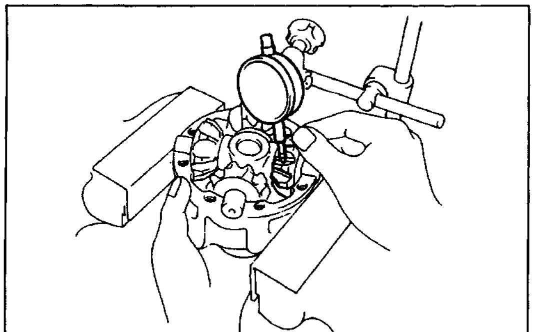


3. MEASURE SIDE GEAR BACKLASH

(a) Install the thrust washer to the side gear.
(b) Install the side gear to the RH case.



(c) Install the four pinion gears and thrust washers tc the spider.
(d) Install the pinion gear and spider to the RH case.

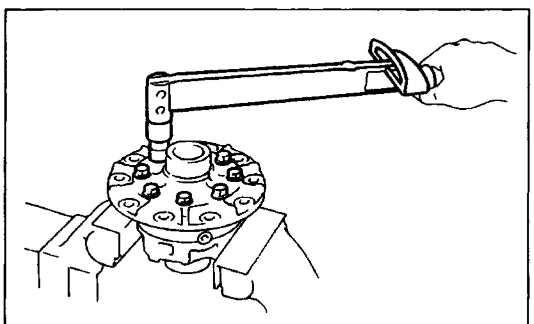

D4630

(e) Hold the side gear, measure the side gear backlash.
Backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)
HINT: Measure the backlash at the RH case at the LH case.

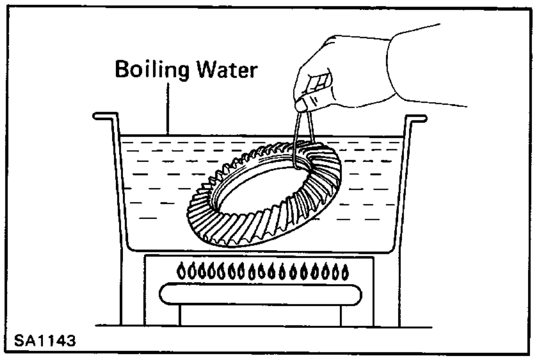
(f) If the backlash is not within specification, install a thrust washer of a different thickness.
HINT: Use washer of the same thickness on both the right and left sides.

Thickness mm (in.)			
0.9	(0.035)	1.2	(0.047)
1.0	(0.039)	1.3	(0.051)
1.1	(0.043)		

4. ASSEMBLE DIFFERENTIAL CASE
(a) Install the side gear and thrust washer to the RH case.
(b) Install the pinion gears and spider to the RH case.
(c) Install the side gear and thrust washer to the LH case.
(d) Apply gear oil to the each parts.


D4632

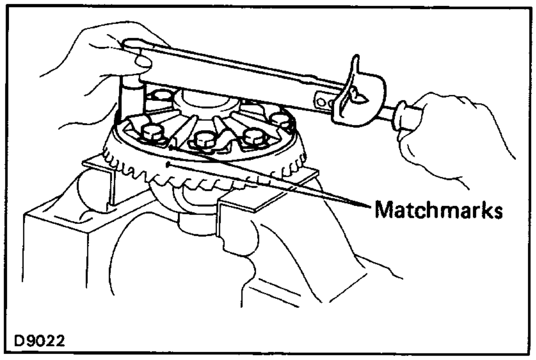
(e) Align the matchmarks on the LH and RH case.
(f) Torque the eight bolts.
Torque: 47 N–m (480 kgf–cm, 35 ft–lbf)



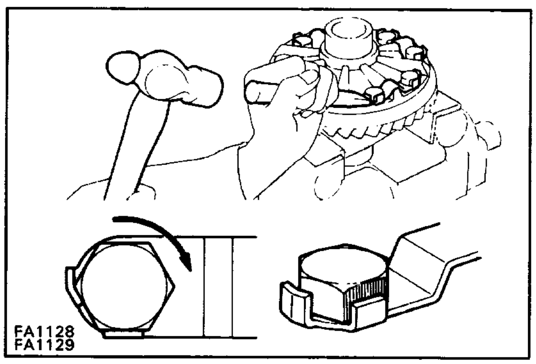
ASSEMBLY OF DIFFERENTIAL

1. INSTALL RING GEAR ON DIFFERENTIAL CASE

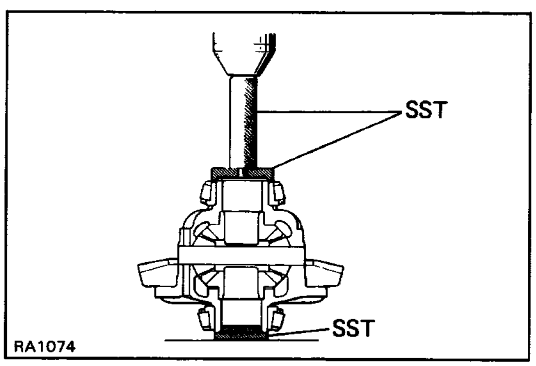
(a) Clean the contact surfaces of the differential case and ring gear.
(b) Heat the ring gear in boiling water.
(c) After the moisture on the ring gear has completely evaporated, quickly install the ring gear to the differential case.



(d) Align the matchmarks on the ring gear and differential case.
(e) Coat the ring gear set bolts with gear oil.
(f) Temporarily install the lock plates and set bolts.
(g) After the ring gear cools down enough, tighten the set bolts uniformly and a little at a time.
Torque: 97 N–m (985 kgf–cm, 71 ft–lbf)

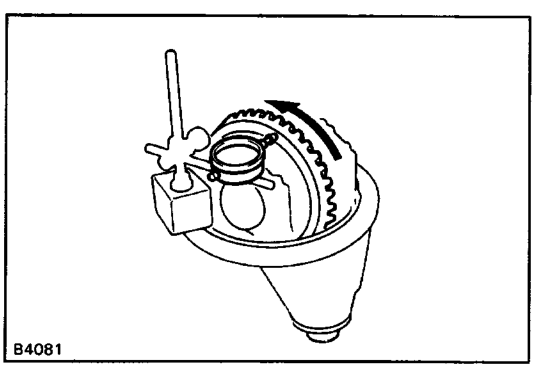


(h) Using a hammer and drift punch, stake the lock plates.
HINT: Stake one claw flush with the flat surface of the bolt. For the claw contacting the protruding portion of the bolt, stake only the half on the tightening side.



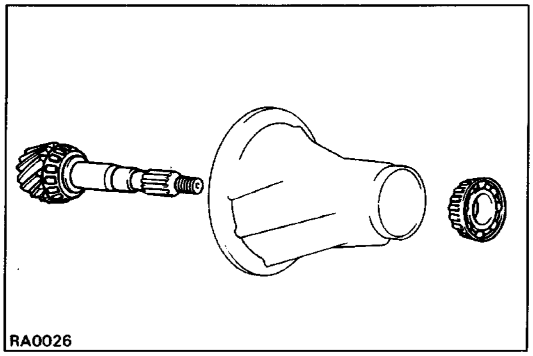
2. INSTALL SIDE BEARINGS

Using a press and SST, press the side bearings on the differential case.
SST 09550–10012
(09252–10010, 09557–10010, 09558–10010)



3. CHECK RING GEAR RUNOUT

(a) Install the differential case onto the carrier and tighten the adjusting nut just to where there is no play in the bearings.
(b) Check the ring gear runout.
Maximum runout:
7.5 in. 0.07 mm (0.0028 in.)
8 in. 0.10 mm (0.0039 in.)

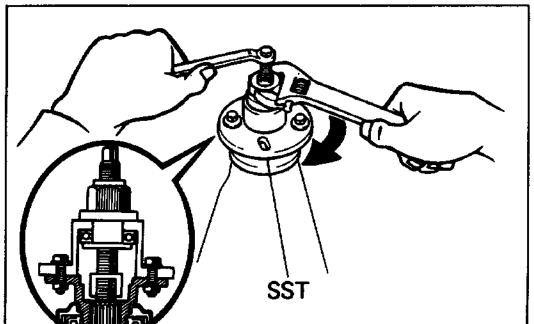

RA0026

4. TEMPORARILY ADJUST DRIVE PINION PRELOAD

(a) Install the following parts.

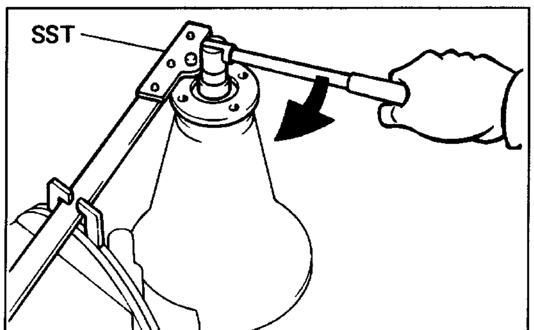
- Drive pinion
- Front bearing

HINT: Assemble the spacer, oil slinger and oil seal after adjusting the gear contact pattern.



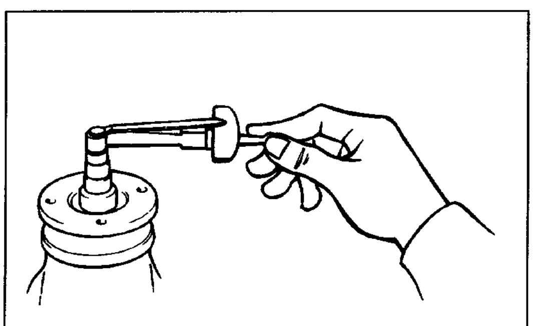
B4082

(b) Install the companion flange with SST.
SST 09557–22022
(7.5 in. 09557–22030)
(8 in. 09557–22050)

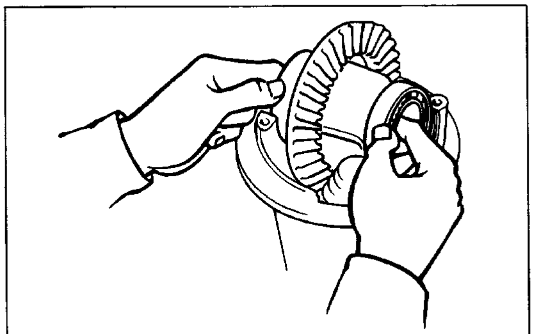


RA0027

(c) Adjust the drive pinion preload by tightening the companion flange nut.
Using SST to hold the flange, tighten the nut.
SST 09330–00021
NOTICE: As there is no spacer, tighten a little at a time, being careful not to overtighten.


B4063

(d) Using a torque meter, measure the preload.
Preload (starting):
New bearing
7.5 in.
1.2 – 1.9 N –m
(12 – 19 kgf–cm, 10.4 – 16.5 in. –lbf)
8 in.
(2 pinion type)
1.9 – 2.5 N–m
(19 – 25 kgf–cm, 16.5 – 22.6 in. –lbf)
(4 pinion type)
1.0 – 1.6 W
(10 – 16 kgf–cm, 8.7 – 13.9in. –lbf)
Reused bearing
7.5 in.
0.6 – 1.0 N–m
(6 – 10 kgf–cm, 5.2 – 8.7 in. –lbf)
8 in.
(2 pinion type)
0.9 – 1.3 N –m
(9 – 13 kgf– cm, 7.8 – 11.3 in.–lbf)
(4 pinion type)
0.5 – 0.8 N–
(5 – 8 kgf –cm, 4.3 – 6.9 in. –lbf)

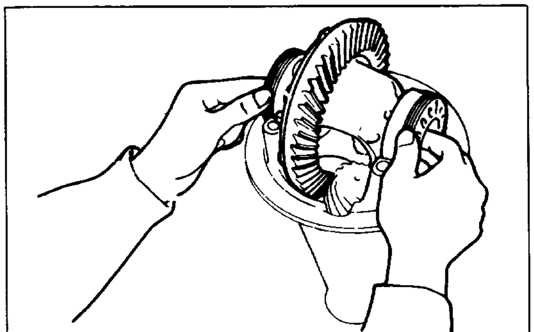

B4084

5. INSTALL DIFFERENTIAL CASE IN CARRIER

(a) Place the bearing outer races on their respective bearings. Make sure the left and right outer races are not interchanged.

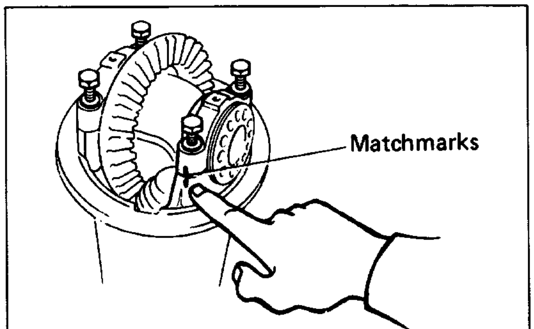
(b) Install the case in the carrier.

HINT: Make sure that there is backlash between the ring gear and drive pinion.


B4085

6. INSTALL ADJUSTING NUTS

Install the adjusting nuts on the carrier, making sure the nuts are threaded properly.

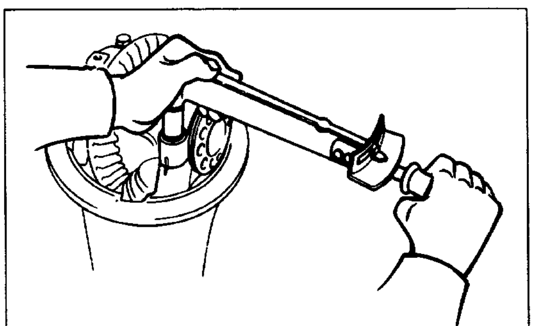


B4086

7. INSTALL BEARING CAPS

Align the matchmarks on the cap and carrier. Screw in the two bearing cap bolts two or three turns and press down the bearing cap by hand.

HINT: If the bearing cap does not fit tightly on the car–rier, the adjusting nuts are not threaded properly. Reinstall the adjusting nuts if necessary.

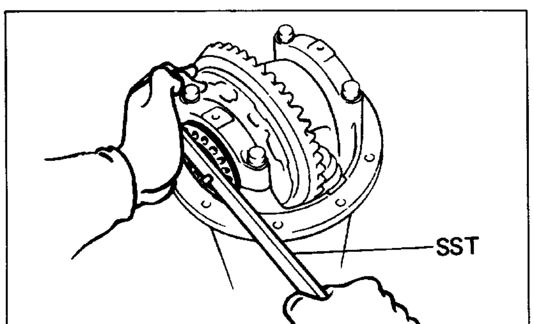

B4090

8. ADJUST SIDE BEARING PRELOAD

(a) Tighten the four bearing cap bolts to the specified torque, then loosen them to the point where they can be turned by hand.

Torque: 78 N–m (800 kgf–cm, 58 ft–lbf)

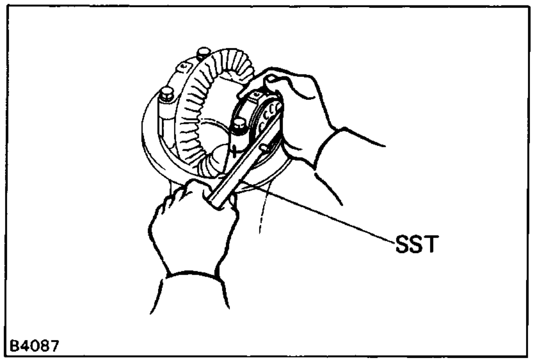
(b) Fully tighten the four bearing cap bolts by hand.



B4088

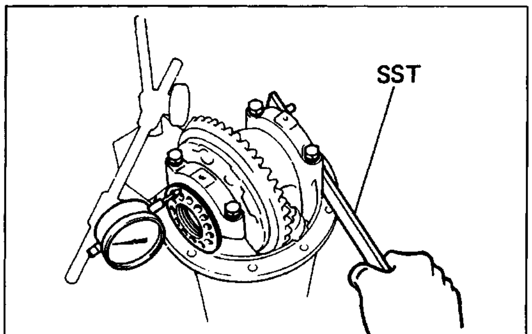
(c) Using SST, tighten the adjusting nut on the ring gear side until the ring gear has a backlash of about 0.2 mm (0.008 in.)

SST 09 504–00011



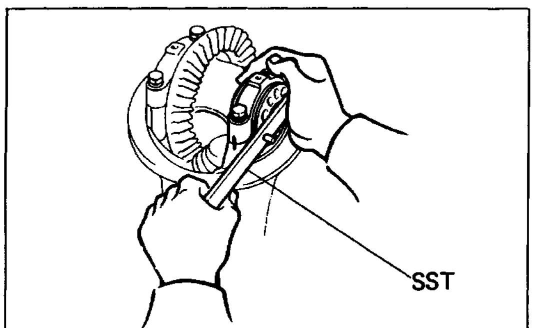
B4087

(d) While turning the ring gear, use SST to fully tighten the adjusting nut on the drive pinion side. After the bearings are settled, loosen the adjusting nut on the drive pinion side.
SST 09504–00011



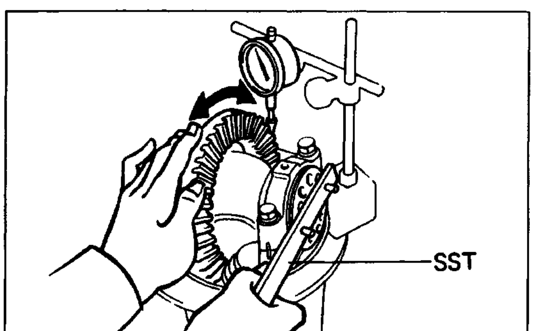
RA0028

(e) Place a dial indicator on the top of the adjusting nut on the ring gear side.
(f) Adjust the side bearing for zero preload by tighten– ing the other adjusting nut until the pointer on the in– dicator begins to move.



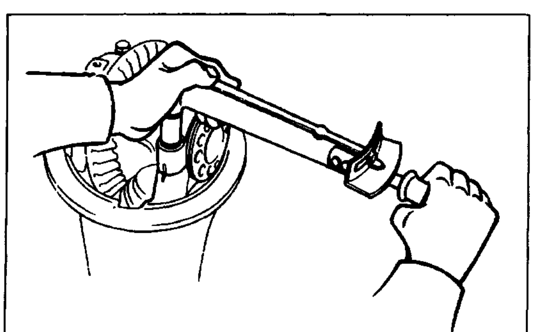
B4087

(g) Tighten the adjusting nut 1 – 1'I2 notches from the zero preload position.

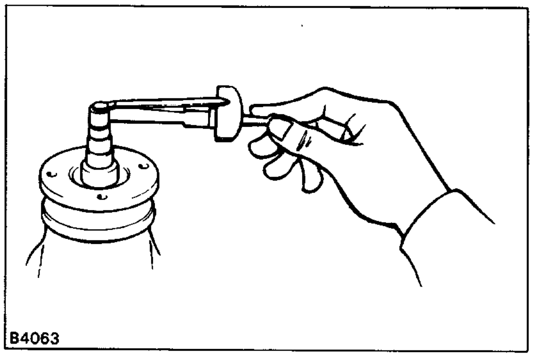


B4089

(h) Using a dial indicator, adjust the ring gear backlash until it is within specification.
Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)
HINT: The backlash is adjusted by turning the left and right adjusting nuts equal amounts. For example, loosen the nut on the left side one notch and tighten the nut on the right side one notch.


B4090

(i) Torque the bearing cap bolts.
Torque: 78 N–m (800 kgf–cm, 58 ft–lbf)
(j) Recheck the ring gear backlash.
Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)


B4063

(k) Using a torque meter, measure the total preload.

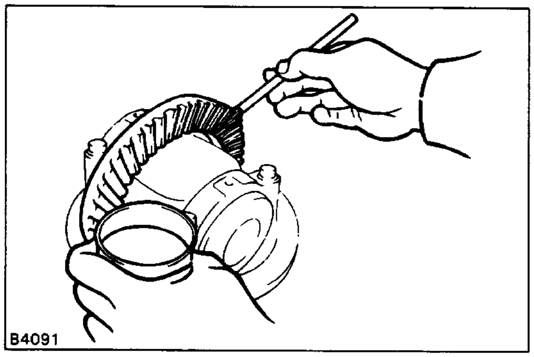
Total preload (starting):

Add drive pinion preload

0.4 – 0.6 N–m

(4 – 6 kgf –cm, 3.5 – 5.2 in.–lbf)

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

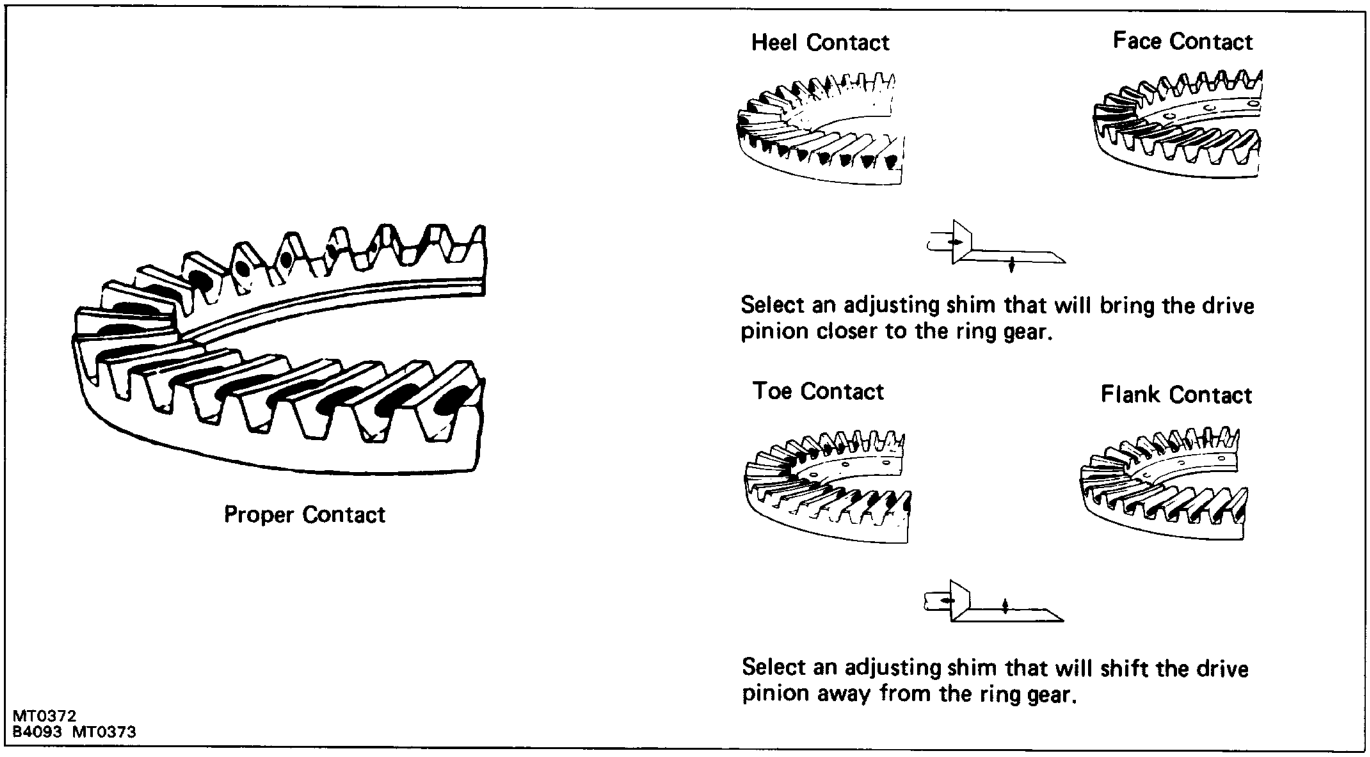

B4091

9. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

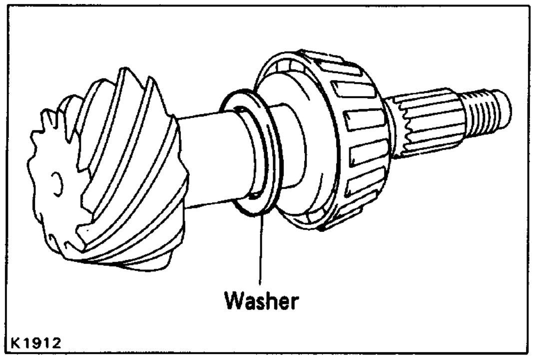
(a) Coat 3 or 4 teeth at three different positions on the ring gear with red lead.

(b) Hold the companion flange firmly and rotate the ring gear in both directions.

(c) Inspect the tooth pattern.



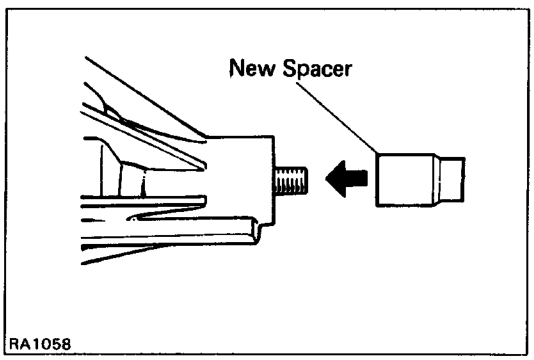
MT0372
B4093 MT0373



If the teeth are not contacting properly, use the following chart to select a proper washer for correction.

Washer thickness

7.5 in.		8 in.	
Thickness	mm (in.)	Thickness	mm (in.)
2.24	(0.0882)	1.70	(0.0669)
2.27	(0.0894)	1.73	(0.0681)
2.30	(0.0906)	1.76	(0.0693)
2.33	(0.0917)	1.79	(0.0705)
2.36	(0.0929)	1.82	(0.0717)
2.39	(0.0941)	1.85	(0.0728)
2.42	(0.0953)	1.88	(0.0740)
2.45	(0.0965)	1.91	(0.0752)
2.48	(0.0976)	1.94	(0.0764)
2.51	(0.0988)	1.97	(0.0776)
2.54	(0.1000)	2.00	(0.0787)
2.57	(0.1012)	2.03	(0.0799)
2.60	(0.1024)	2.06	(0.0811)
2.63	(0.1035)	2.09	(0.0823)
2.66	(0.1047)	2.12	(0.0835)
2.69	(0.1059)	2.15	(0.0846)
2.72	(0.1071)	2.18	(0.0858)
		2.21	(0.0870)
		2.24	(0.0882)
		2.27	(0.0894)
		2.30	(0.0906)
		2.33	(0.0917)



10. REMOVE COMPANION FLANGE

(See step 7 on page SA–138)

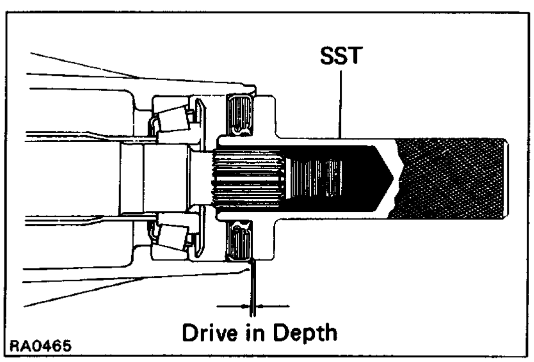
11 REMOVE FRONT BEARING

(See step 9 on page SA–138)

12. INSTALL NEW BEARING SPACER AND FRONT BEARING

(a) Install a new bearing spacer on the shaft.

(b) Install the front bearing on the shaft.



13. INSTALL OIL SLINGER AND NEW OIL SEAL

(a) Install the oil slinger facing as shown.

(b) Using SST, drive in a new oil seal as shown.

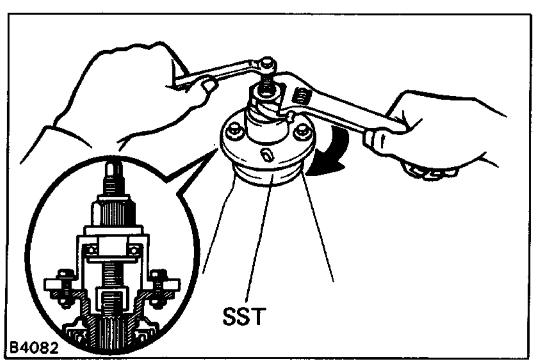
SST 09554–30011

Oil seal drive in depth:

7.5 in. 1.5 mm (0.059 in.)

8 in. 1.0 mm (0.039 in.)

(c) Apply MP grease to the oil seal lip.



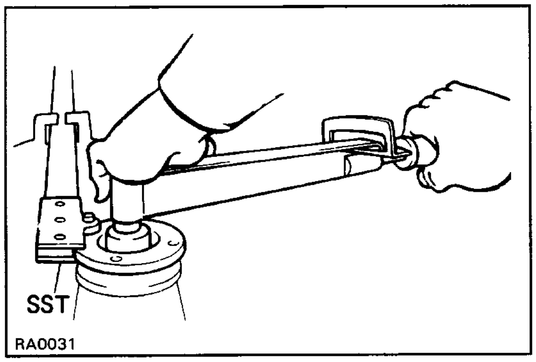
14. INSTALL COMPANION FLANGE

(a) Install the companion flange with SST.

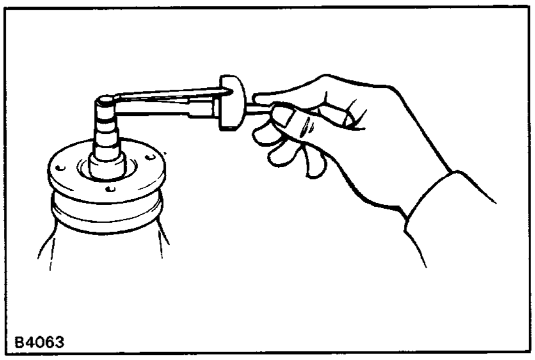
SST 09557–22022

(7.5 in. 09557–22030)

(8 in. 09557–22050)



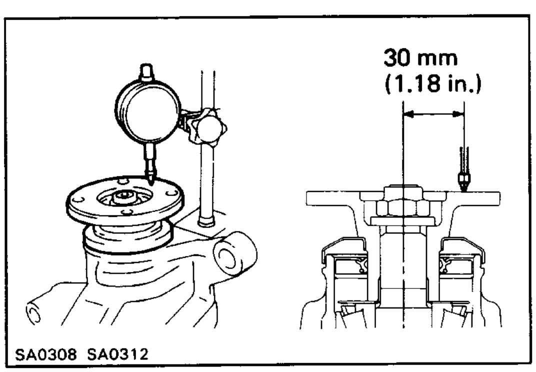
(b) Coat the threads of a new nut with MP grease.
(c) Using SST to hold the flange, tighten the nut.
SST 09330–00021
Torque:
7.5 in.
108 N–m (1,100 kgf–cm, 80 ft–lbf)
8 in.
196 N–m (2,000 kgf–cm, 145 ft–lbf)



15. ADJUST DRIVE PINION PRELOAD

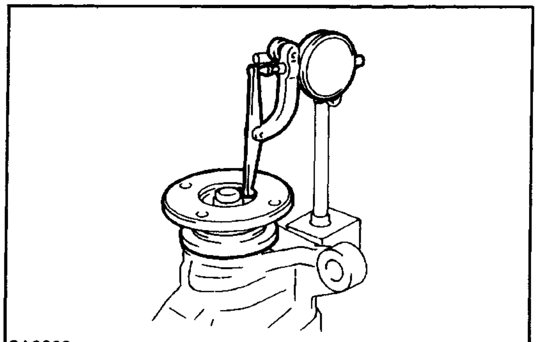
Using a torque meter, measure the preload of the back–lash between the drive pinion and ring gear.
Preload (starting):
New bearing
7.5 in.
1.2 – 1.9 N–m
(12 – 19 kgf–cm, 10.4 – 16.5 in.–lbf)
8 in.
(2 pinion type)
1.9 – 2.5 N–m
(19 – 26 kgf–cm, 16.5 – 22.6–lbf)
(4 pinion type)
1.0 – 1.6 N–m
(10 – 16 kgf–cm, 8.7 – 13.9 in.–lbf)
Reused bearing
7.5 in.
0.6 – 1.0 N–m
(6 – 10 kgf–cm, 5.2 – 8.7 in.–lbf)
8 in.
(2 pinion type)
0.9 – 1.3 N–m
(9 – 13 kgf–cm, 7.8 – 11.3 in.–lbf)
(4 pinion type)
0.5 – 0.8 N–m
(5 – 8 kgf –cm, 4.3 – 6.9 in.–lbf)

(a) If preload is greater than specification, replace the bearing spacer.
(b) If preload is less than specification, retighten the nut 13 N–m (130 kgf–cm, 9 ft–lbf) a little at a time until the specified preload is reached.
Maximum torque:
7.5 in.
235 N–m (2,400 kgf–cm, 174 ft–lbf)
8 in.
343 N–m (3,500 kgf–cm, 253 ft–lbf)
If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the preload procedure. Do not back off the pinion nut to reduce the preload.



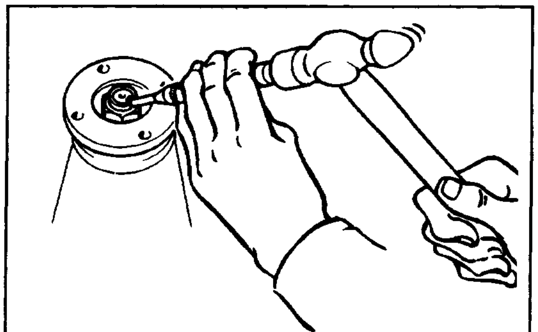
16. CHECK RUNOUT OF COMPANION FLANGE

Maximum vertical runout: 0.10 mm (0.0039 in.)



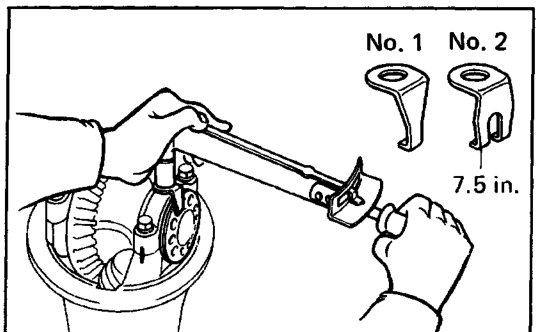
SA0309

Maximum lateral runout: 0.10 mm (0.0039 in.)



RA0032

17. STAKE DRIVE PINION NUT



B4098

18. INSTALL ADJUSTING NUT LOCKS

(a) (7.5 in.)

Select either a lock No. 1 or No. 2, whichever will fit the adjusting nuts.

(b) Install the lock on the bearing caps.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)

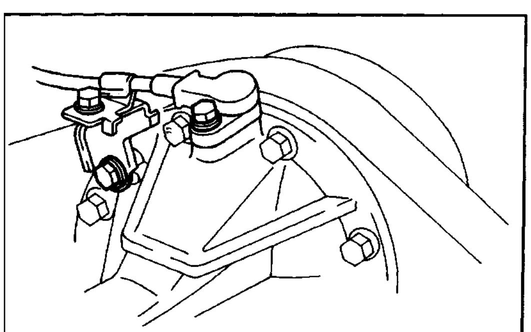
INSTALLATION OF DIFFERENTIAL
(See page SA–134)

1. INSTALL A NEW GASKET

2. INSTALL DIFFERENTIAL CARRIER ASSEMBLY

Install the differential carrier assembly in the axle and in–stall the 10 nuts. Torque the nuts.

Torque: Single tire 25 N–m (250 kgf–cm, 18 ft–lbf)
Double tire 31 N–m (315 kgf–cm, 23 ft–lbf)

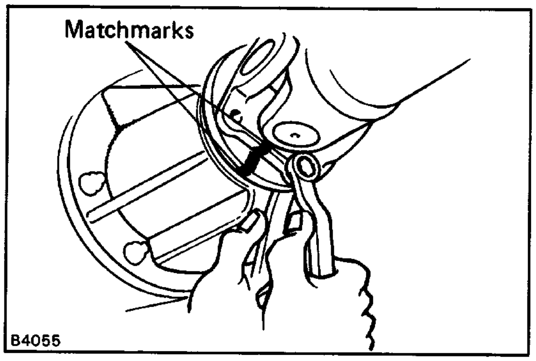


A3095

3. (w/ REAR–WHEEL ANTI–LOCK BRAKE SYSTEM) CONNECT SPEED SENSOR

Connect the speed sensor with the two bolts.

Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)



4. CONNECT PROPELLER SHAFT FLANGE TO COMPANION FLANGE

(a) Align the matchmarks on the flanges and connect the flanges with four bolts and nuts.

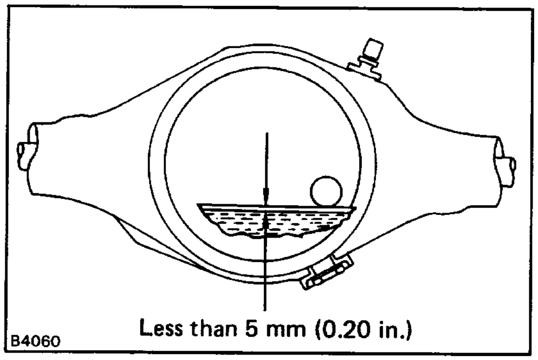
(b) Torque the bolts and nuts.

Torque: 4WD 3VZ–E [MT]

76 N–m (780 kgf–cm, 56 ft–lbf)

Ex. 4WD 3VZ–E [MT]

74 N–m (750 kgf–cm, 54 ft–lbf)



5. INSTALL DRAIN PLUG AND FILL DIFFERENTIAL WITH GEAR OIL

Oil type: APL GL–5 hypoid gear oil

Viscosity: Above – 180C (0• F) SAE 90

Below – 180C (0• F)

SAE 80w or 80W–90

Capacity:

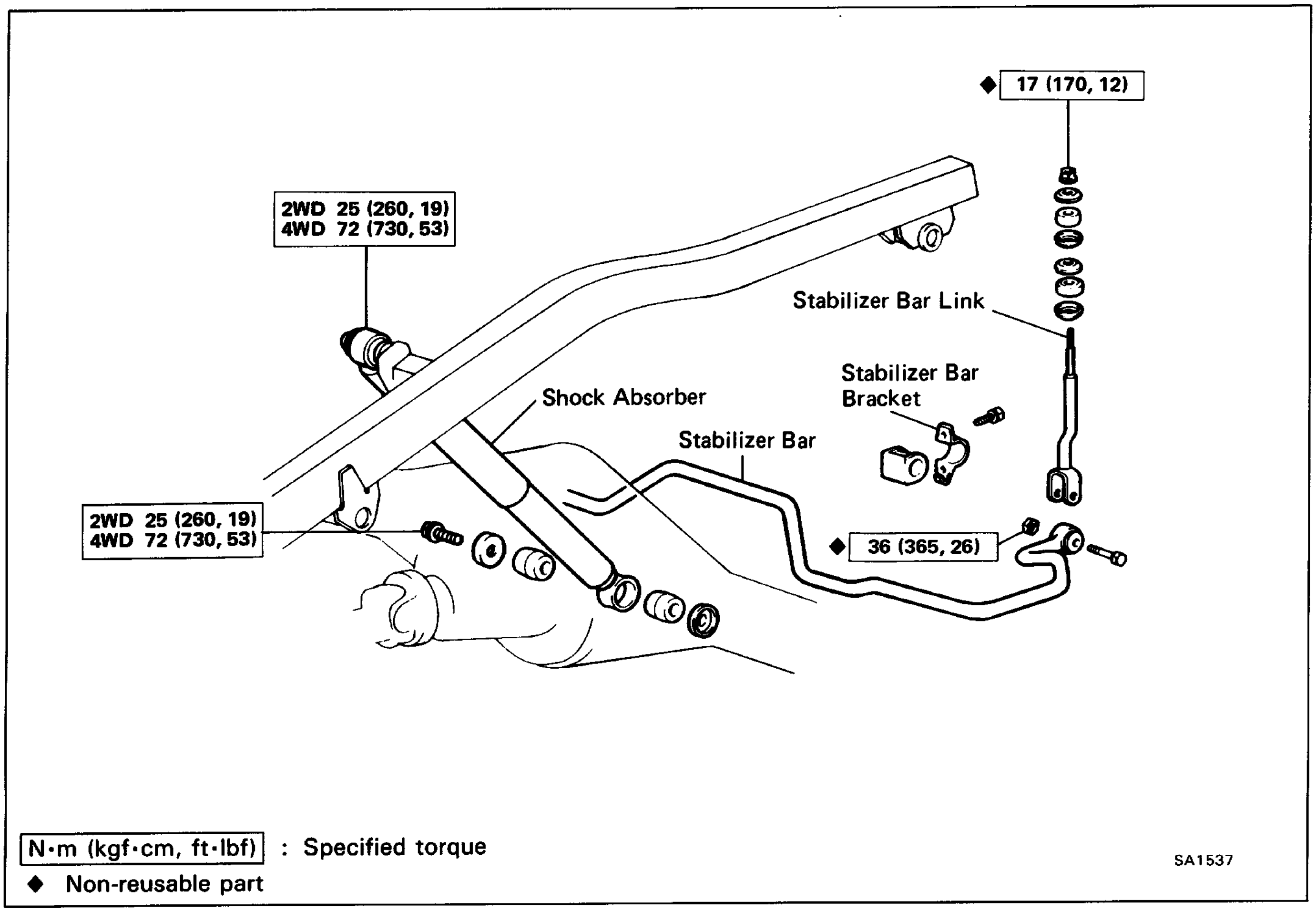
liters (US qts, Imp. qts)

2W D	7.5 in.	2 pinion	1.35 (1.43, 1.19)
	8 in.	2 pinion	1.8 (1.9, 1.6)
		4 pinion	2.2 (2.3, 1.9)
4WD	8 in.	2 pinion	2.2 (2.3, 1.9)
		4 pinion	2.2 (2.3, 1.9)

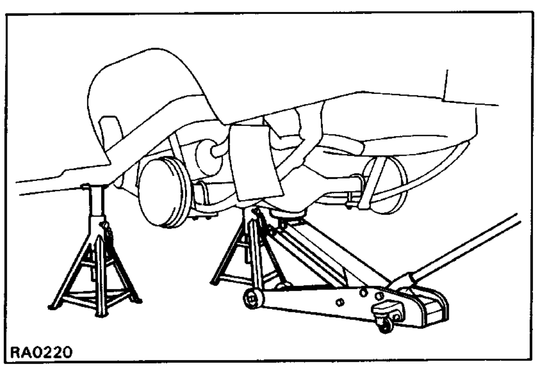
Torque the filler plug.

Torque: 49 N–m (500 kgf–cm, 36 ft–lbf)

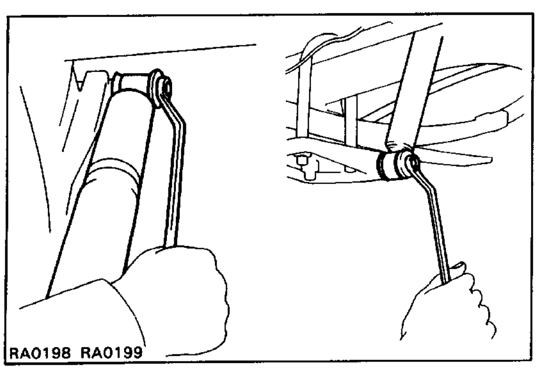
REAR SUSPENSION
Shock Absorber
COMPONENTS



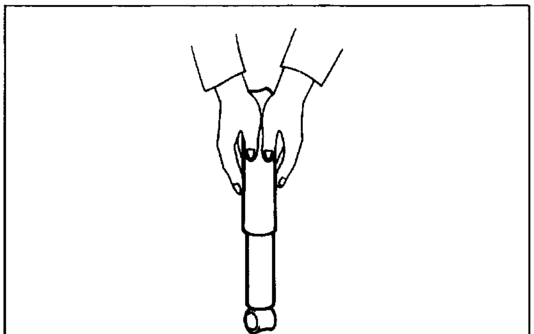
REMOVAL OF SHOCK ABSORBER



1. JACK UP AND SUPPORT BODY
(a) Jack up and support the body on stands.
(b) Lower the axle housing until the leaf spring tension is free, and keep it at this position.



2. REMOVE SHOCK ABSORBER



K7387

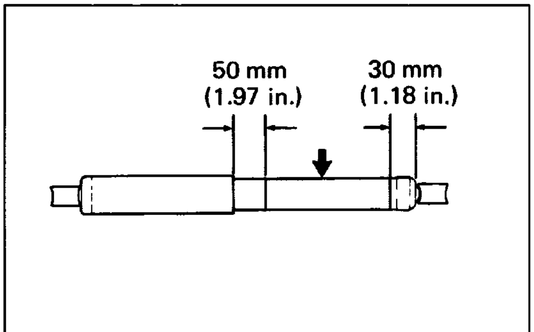
INSPECTION OF SHOCK ABSORBER

1. INSPECT SHOCK ABSORBER

Compress and extend the shock absorber and check that there is no abnormal resistance or unusual operation sounds.

If there is any abnormality, replace the shock absorber with new one.

NOTICE: When discarding the shock absorber, use the following procedure.



SA1538

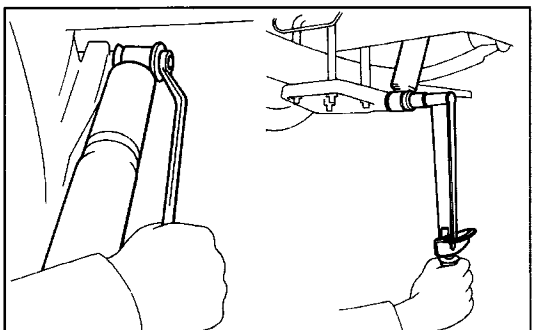
DISPOSAL OF SHOCK ABSORBER

1. FULLY EXTEND SHOCK ABSORBER

2. DRILL HOLE TO REMOVE GAS FROM CYLINDER

Using a drill, make a hole in the cylinder as shown to re–move the gas inside.

CAUTION: The gas coming out is harmless, but be care–ful of chips which may fly up when drilling.



RA0198 RA0207

INSTALLATION OF SHOCK ABSORBER

INSTALL REAR SHOCK ABSORBER

(a) Connect the shock absorber to the frame with the bolt. Tighten the bolt.

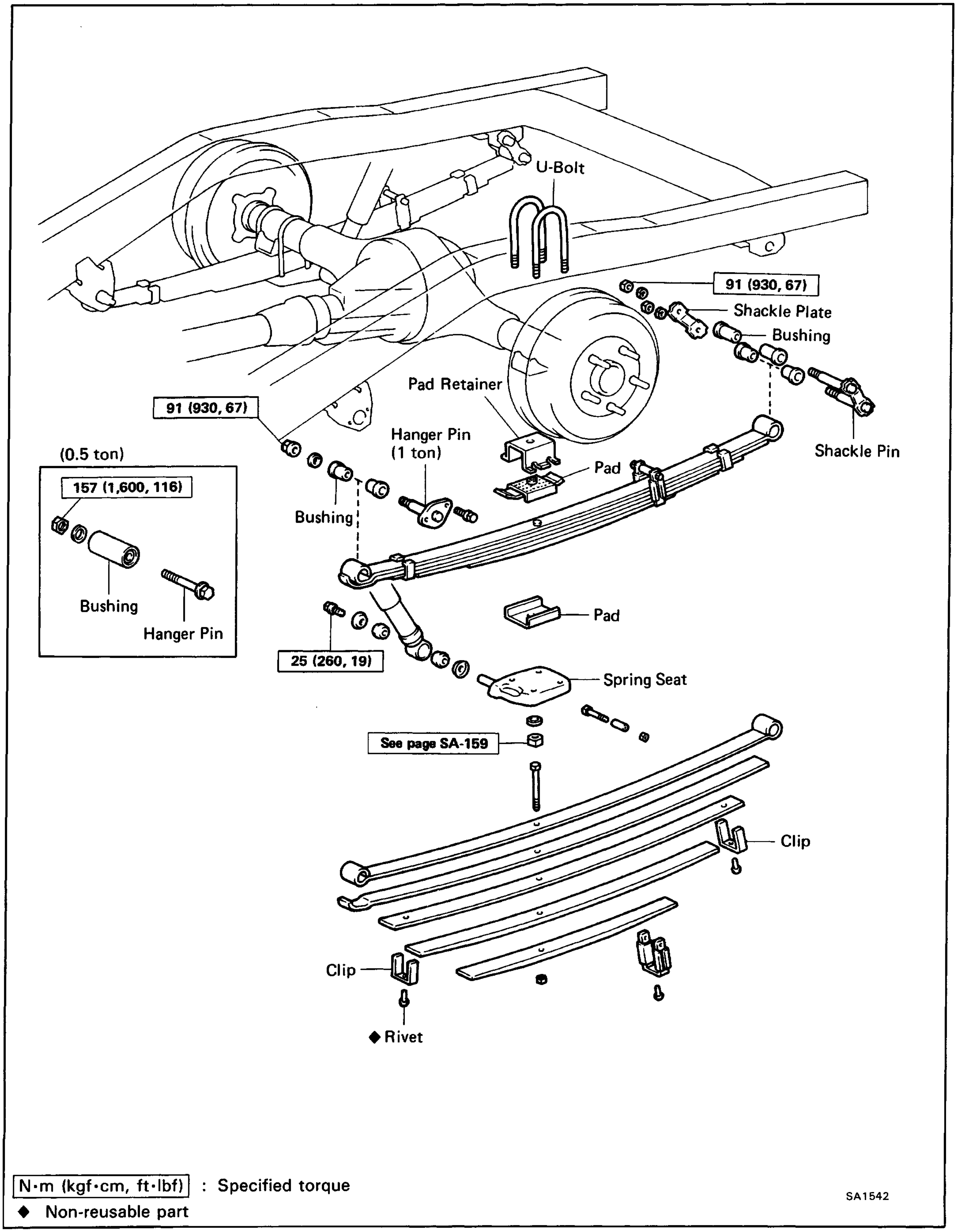
Torque: 2WD 25 N–m (260 kgf–cm, 19 ft–lbf)
4WD 72 N–m (730 kgf–cm, 53 ft–lbf)

(b) Connect the shock absorber to the spring seat with the bolt. Tighten the bolt.

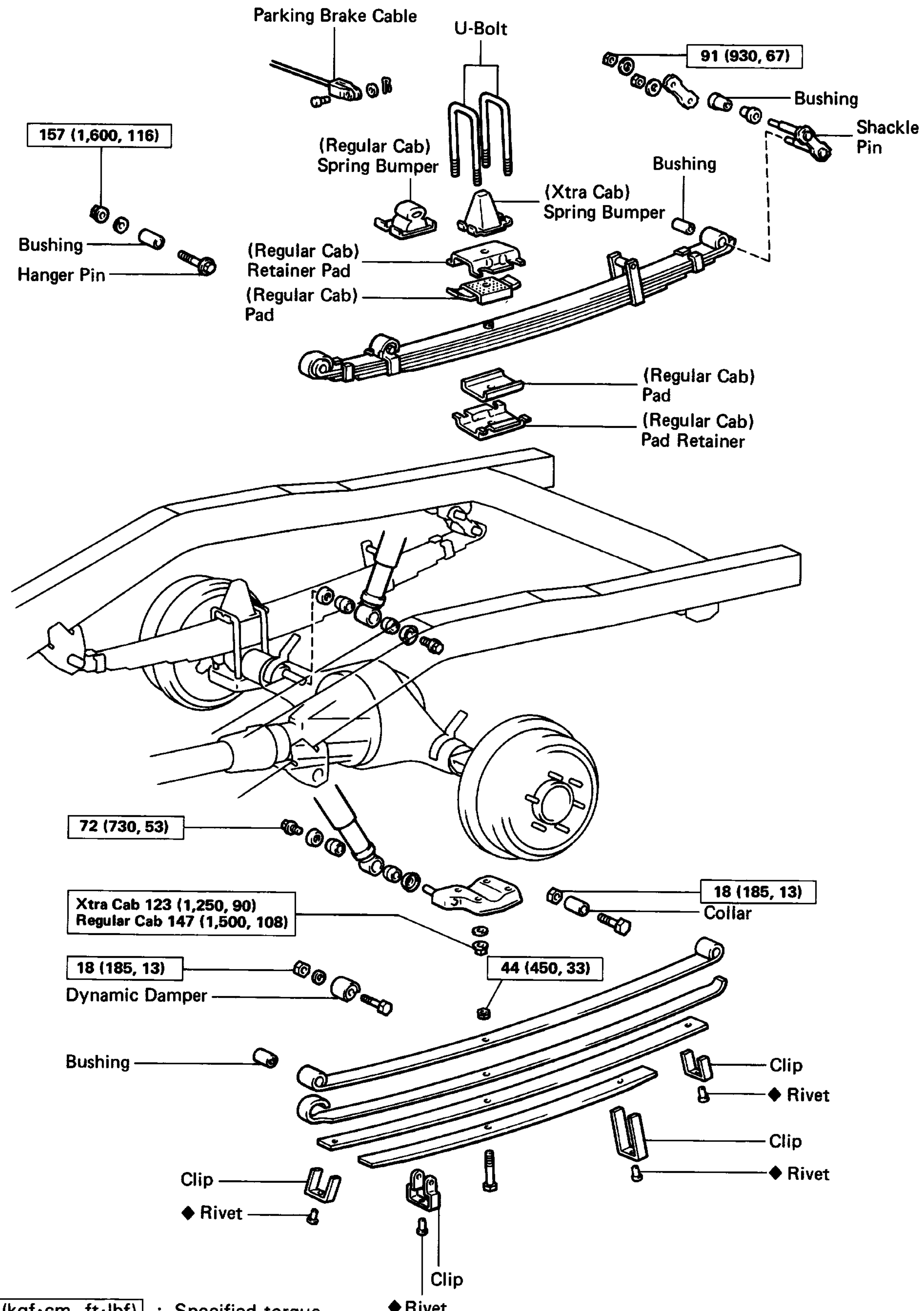
Torque: 2WD 25 N–m (260 kgf–cm. 19 ft–lbf)
4WD 72 N–m (730 kgf–cm. 53 ft–lbf)

Leaf Spring

COMPONENTS



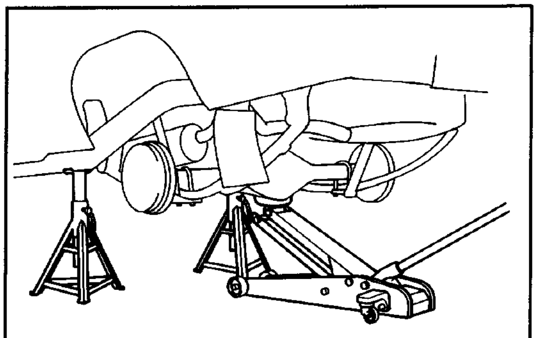
COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

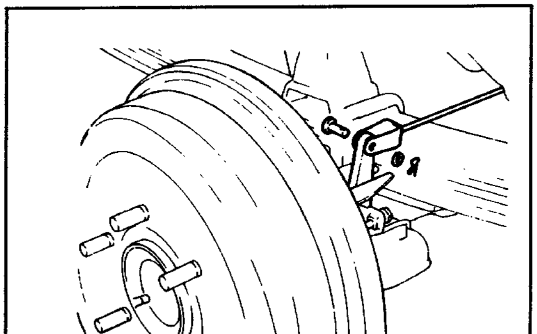
REMOVAL OF LEAF SPRING


RA0220

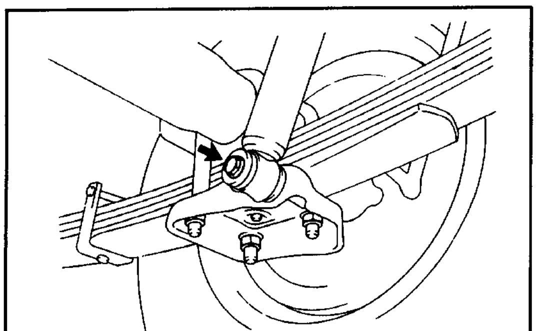
1. JACK UP AND SUPPORT BODY

(a) Jack up and support the body on the stands.

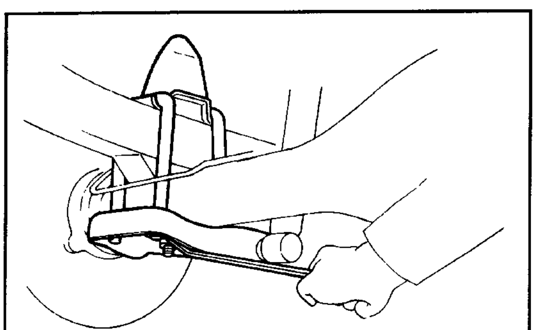
(b) Lower the axle housing until the leaf spring tension is free, and keep it at this position.


K7391

2. (4WD)
DISCONNECT PARKING CABLE


K7392

3. DISCONNECT SHOCK ABSORBER FROM SPRING SEAT


RA0200

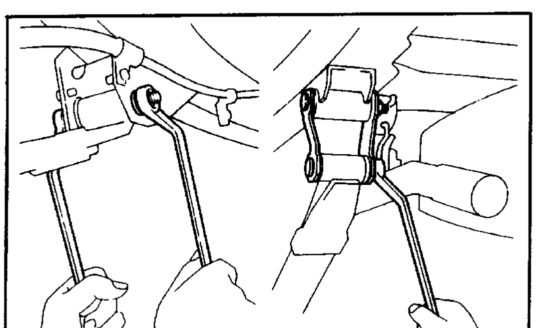
4. REMOVE U–BOLTS

(a) Remove the U–bolt mounting nuts.

(b) Remove the spring seat, pads and pad retainer.

(c) Remove the U–bolts.

(d) (4WD)
Remove the spring bumper.


RA0260 RA0390

5. REMOVE LEAF SPRING

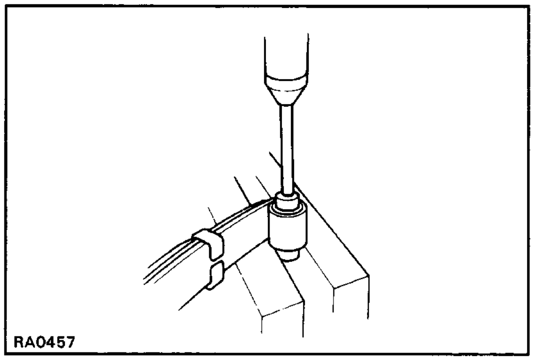
(a) Remove the hanger pin bolt.

(b) (1 ton and C&C)
Remove the hanger pin lock bolt.

(c) Disconnect the leaf from the bracket.

(d) Remove the shackle pin mounting nuts.

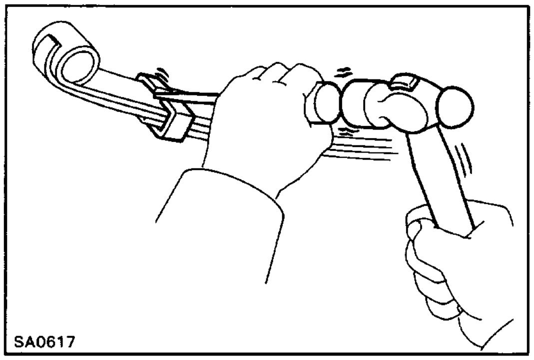
(e) Remove the shackle pin and plate and remove the leaf spring.


RA0457

REPLACEMENT OF BUSHING

REPLACE BUSHINGS WITH PRESS

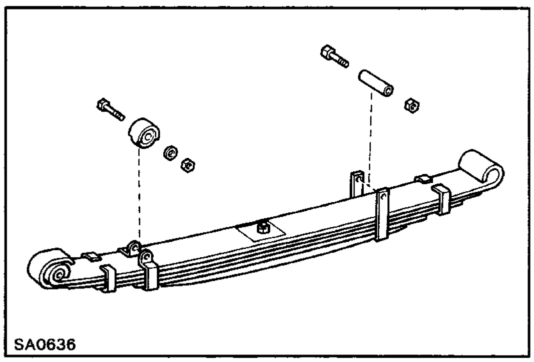
Using a press and socket wrench, replace the eye bush–ings.


SA0617

REPLACEMENT OF LEAF SPRING

1. BEND OPEN SPRING CLIP

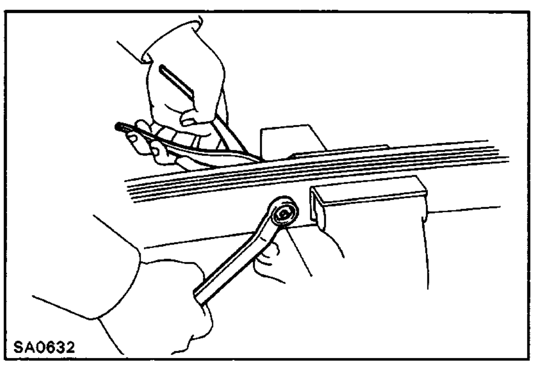
Using a chisel, pry up the spring clip.


SA0636

2. REMOVE CLIP BOLT

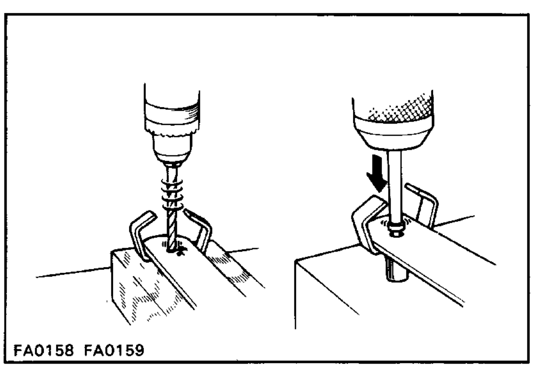
Remove the clip bolt, collar and nut from the clip.

3. REMOVE DYNAMIC DAMPER


SA0632

4. REMOVE CENTER BOLT

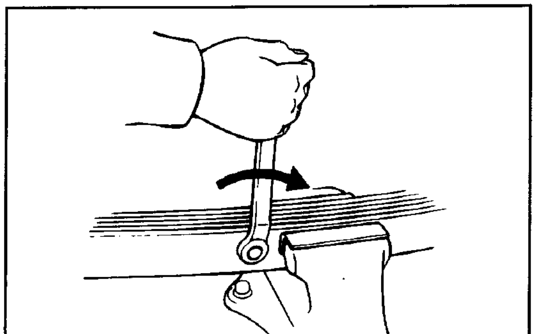
Hold the spring near the center bolt in a vise and remove the center bolt.


FA0158 FA0159

5. IF NECESSARY, REPLACE SPRING CLIP

(a) Drill off the head of the rivet, and drive it out.

(b) Install a new rivet into the holes of the spring leaf and clip. Then rivet with a press.

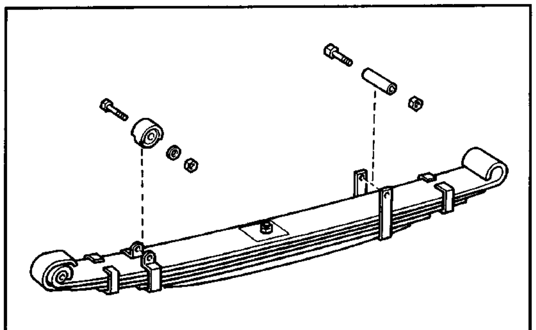

FA0160

6. INSTALL SPRING CENTER BOLT

(a) Align the leaf holes and secure the leaves with a vise.

(b) Install and tighten the spring center bolt.

Torque: 44 N–m (450 kgf–cm, 33 ft–lbf)


SA0636

7. INSTALL CLIP BOLT

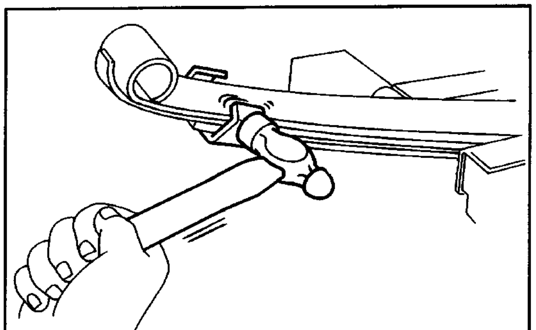
Position the collar and install the clip bolt and nut.

Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)

8. INSTALL DYNAMIC DAMPER

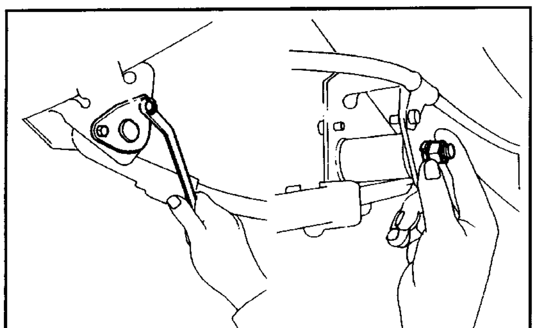
Position the dynamic damper and install the bolt and nut.

Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)


SA0624

9. BEND SPRING CLIP

Using a hammer, bend the spring clip into position.


RA0866 RA0203

INSTALLATION OF LEAF SPRING

1. INSTALL LEAF SPRING

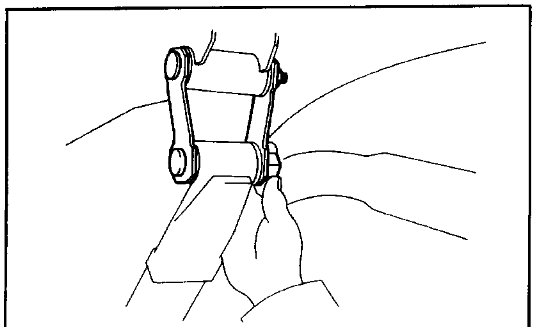
(a) Place the front end of leaf spring in the front bracket and install the hanger pin bolt.

(b) (1 ton and C&C)

Install and tighten the hanger pin lock bolt.

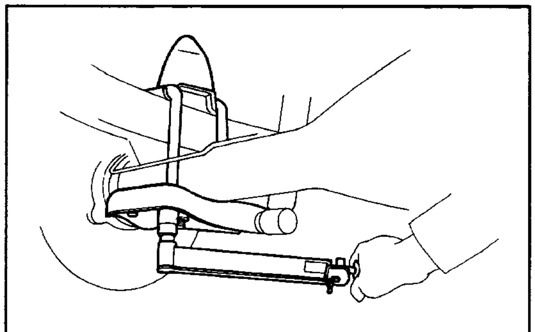
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)

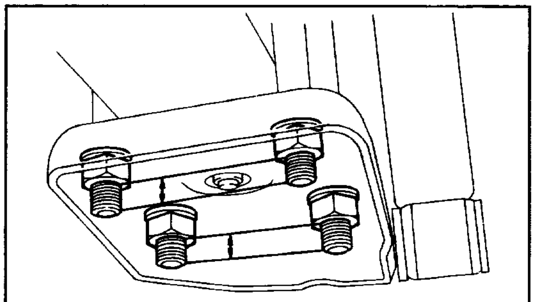
(c) Finger tighten the hanger pin nut.


SA0391

(d) Place the rear end of leaf spring in the rear bracket, and install the shackle pin.

(e) Install the plate and finger tighten the nuts.


RA0205



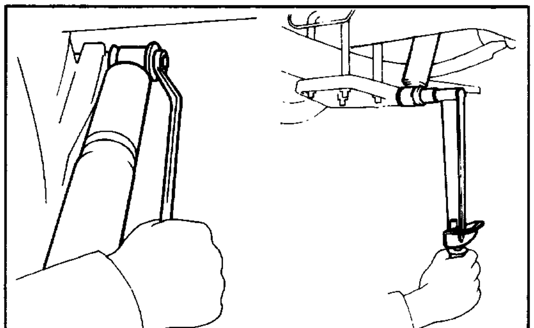
RA0221

2. INSTALL U–BOLTS

(a) Install the pads and pad retainer on the leaf spring.
(b) (4WD)
Install the spring bumper.
M Install the spring seat, U–bolts, washers and nuts.
(d) Tighten the U–bolt mounting nuts.

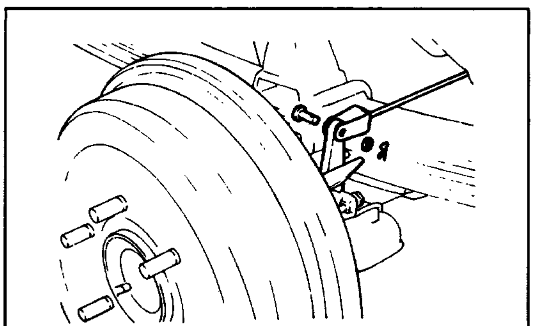
Torque:
2W D 0.5 ton 147 N–m (1,500 kgf–cm, 108 ft–lbf)
1 ton, C&C 123 N–m (1,250 kgf–cm, 90 ft–lbf)
4WD Xtra cab 123 N–m (1,250 kgf–cm, 90 ft–lbf)
Regular Cab 147 N–m (1,500 kgf–cm, 108 ft–lbf)

HINT: Tighten the U–bolts so that the length of all the U–bolts under the spring seat are the same.

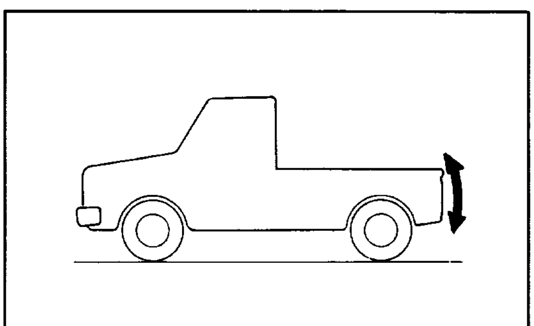

RA0198 RA0207

3. INSTALL REAR SHOCK ABSORBER

(a) Connect the shock absorber to the frame with the bolt. Tighten the bolt.
Torque: 2WD 25 N–m (260 kgf–cm, 19 ft–lbf)
4WD 72 N–m (730 kgf–cm, 53 ft–lbf)
(b) Connect the shock absorber to the spring seat with the bolt. Tighten the bolt.
Torque: 2WD 25 N–m (260 kgf–cm, 19 ft–lbf)
4WD 72 N–m (730 kgf–cm, 53 ft–lbf)

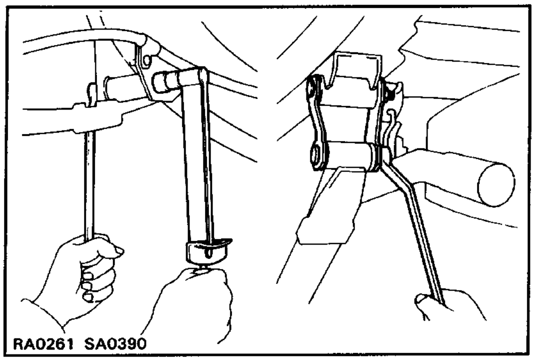

K7391

4. (4WD)
CONNECT PARKING BRAKE CABLE


FA0123

5. STABILIZE SUSPENSION

(a) Install the wheel.
(b) Remove the stands and bounce the vehicle up and down to stabilize the suspension.



6. TIGHTEN HANGER PIN AND SHACKLE PIN

Tighten the hanger pin nut.

Torque: 0.5 ton

157 N–m (1,600 kgf–cm, 116 ft–lbf)

1 ton and C&C

91 N–m (930 kgf –cm, 67 ft–lbf)

Tighten the shackle nuts.

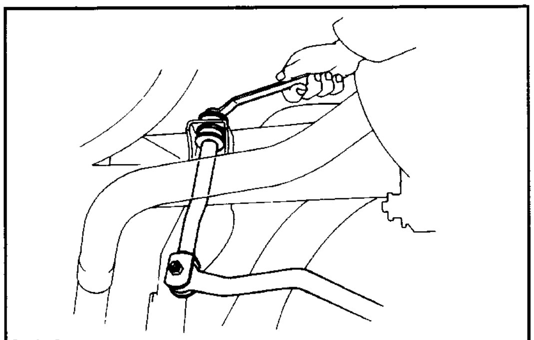
Torque: 91 N–m (930 kgf–cm, 67 ft–lbf)

Stabilizer Bar

(See page SA–153)

REMOVAL OF STABILIZER BAR

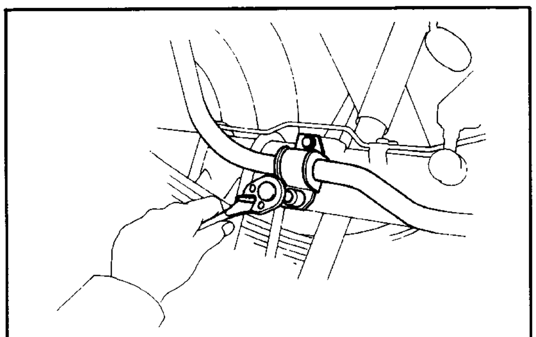
1. JACK UP AND SUPPORT VEHICLE


SA0481

2. DISCONNECT STABILIZER BAR LINK FROM BODY

(a) Disconnect the stabilizer bar link from the body.

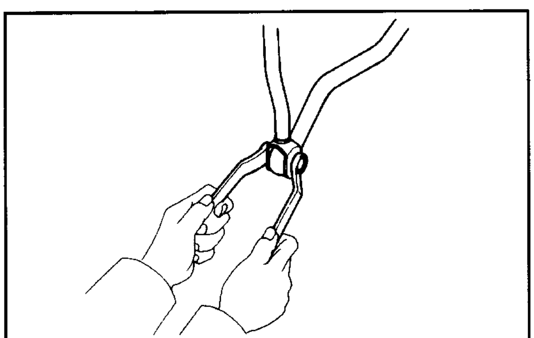
(b) Remove the retainers and cushion from the link.


RA0752

3. REMOVE STABILIZER BAR

(a) Remove the stabilizer bar bracket with cushion from the rear axle housing.

(b) Remove the stabilizer bar.


RA0797

4. REMOVE STABILIZER BAR LINK

(a) Remove the retainers and cushion from the link.

(b) Remove the bolt and nut.

(c) Remove the stabilizer bar link from the stabilizer bar.

INSTALLATION OF STABILIZER BAR

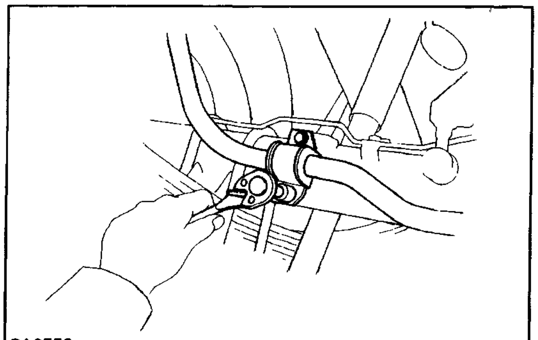
(See page SA–153)

1. INSTALL STABILIZER BAR LINK

(a) Install the retainers and cushion to the link.

(b) Connect the link to the stabilizer bar and torque the bolt and nut.

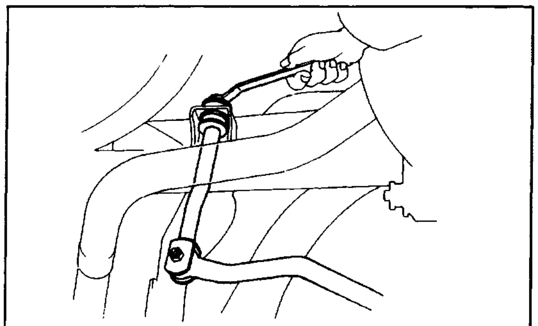
Torque: 36 N–m (365 kgf–cm, 26 ft–lbf)


RA0752

2. INSTALL STABILIZER BAR

(a) Place the stabilizer bar to the rear axle housing.
(b) Install the cushion and bracket.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)


SA0481

3. CONNECT STABILIZER BAR LINK

(a) Position the link to the body.
(b) Install the retainers and cushion to the link.
(e) Install a new nut.

Torque: 17 N–m (170 kgf–cm, 12 ft–lbf)

4. LOWER VEHICLE

BRAKE SYSTEM

PRECAUTIONS

1. **Care must be taken to replace each part properly as it could affect the performance of the brake system and result in a driving hazard. Replace the parts with parts of the same part number or equivalent.**
2. **It is very important to keep parts and the area clean when repairing the brake system.**

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Low or spongy pedal	Linings worn Brake pads worn Leak in brake system Master cylinder faulty Air in brake system Wheel cylinder faulty Brake cylinder faulty Piston seals worn or damaged Rear brake automatic adjuster faulty	Replace brake shoes Replace pads Repair leak Repair or replace master cylinder Bleed brake system Repair wheel cylinder Repair cylinder Repair brake cylinder Repair or replace adjuster	BR–40, 47 55 BR–18, 26 33 BR–10 BR–8 BR–40, 47 55 BR–18, 26 33 BR–18, 26 33 BR–40, 47 55
Brakes drag	Parking brake out of adjustment Binding parking brake wire Booster push rod out of adjustment Tension or return spring faulty Brake line restricted Lining cracked or distorted Pad cracked or distorted Wheel cylinder or caliper piston sticking Adjuster broken Master cylinder faulty	Adjust parking brake Repair as necessary Adjust push rod Replace spring Repair as necessary Replace shoe Replace pad Repair as necessary Replace adjuster Repair or replace master cylinder	BR–9 BR–17 BR–40, 47 55 BR–40, 47 55 BR–18, 26 33 BR–18, 26 33 BR–10
Brakes pull	Tires improperly inflated Oil or grease on shoes or pads Brake shoes distorted, linings worn or glazed Brake pads distorted, worn or glazed Drum or disc out of round Tension or return spring faulty Wheel cylinder faulty Brake cylinder faulty Piston frozen in brake cylinder Brake pad sticking	Inflate tires to proper pressure Check for cause. Replace shoes or pads Replace brake shoes Replace pads Replace drum or disc Replace spring Repair wheel cylinder Repair cylinder Repair cylinder Replace pads	BR–40, 47 55 BR–18, 26 33 BR–18, 26 33,40 47, 55 BR–40, 47 55 BR–18, 26 33 BR–18, 26 33 BR–18, 26 33

TROUBLESHOOTING (Cont'd)

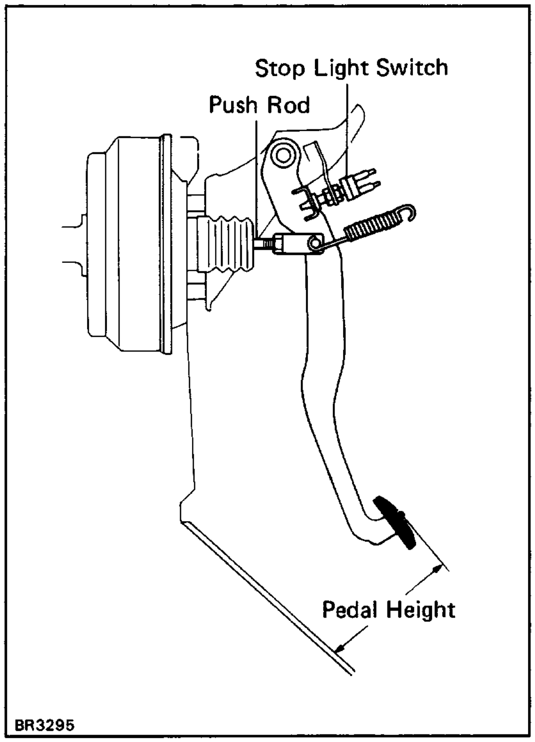
Problem	Possible cause	Remedy	Page
Hard pedal but brakes inefficient	Oil or grease on shoes or pads Brake shoes distorted, linings worn or glazed, drums worn Brake pads distorted, worn or glazed Piston frozen in brake cylinder Brake booster faulty Vacuum leaks Brake line restricted	Check for cause. Replace shoes or pads Replace brake shoes Replace pads Repair cylinder Repair booster Repair as necessary Repair as necessary	BR–40, 47 55 BR–18, 26 33 BR–18, 26 33 BR–16
Snapping or clicking noise when brakes are applied	(Drum brake) Brake shoes binding at backing plate ledges Backing plate ledges worn Loose or missing shoe hold–down spring Loose set bolt at backing plate (Disc brake) Loose or missing pad support plate Loose installation bolt	Lubricate Replace and lubricate ledges Replace shoe hold–down spring Tighten Replace pad support plate Tighten	BR–40, 47 55 BR–40, 47 55 BR–40, 47 55 BR–40, 47 55 BR–18, 26 33 BR–18, 26 33
Scraping or grinding noise when brakes are applied	Worn brake linings or pads Caliper to wheel or rotor interference Dust cover to rotor or backing plate to drum interference Other brake system components faulty Tires rubbing against chassis and/or body	Replace or refinish drums or rotors if heavily scored Replace as required Correct or replace Repair or replace as necessary Repair as necessary	BR–18, 26 33,40 47, 55 BR–18, 26 33 BR–18, 26 33,40 47, 55

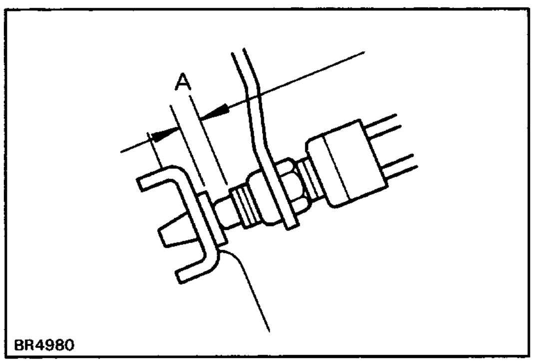
TROUBLESHOOTING (Cont'd)

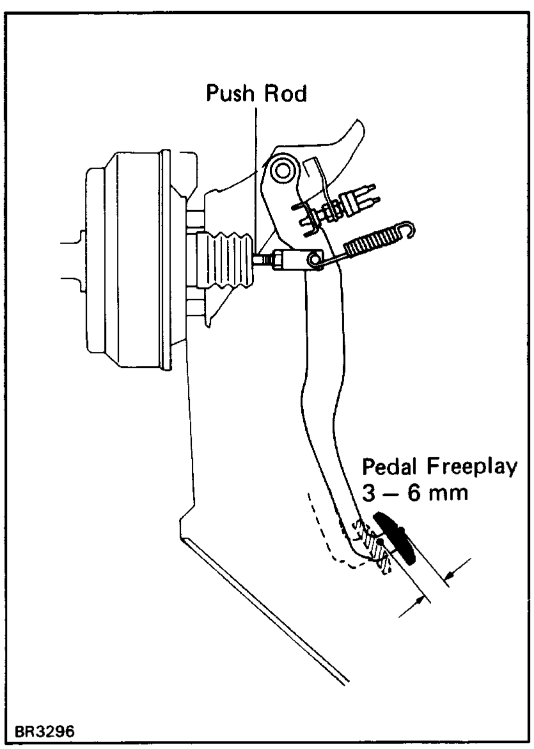
Problem	Possible cause	Remedy	Page
Squeaking, squealing groaning or chattering noise when brakes are applied HINT: Brake friction materials inherently generate noise and heat in order to dissipate energy. As a result, occasional squeal is normal and is aggravated by severe environmental conditions such as cold, heat, wetness, snow, salt, mud, etc. This occasional squeal is not a functional problem and does not indicate any loss of brake effectiveness	Brake drums and linings, rotors and pads worn or scored Dirty, greased, contaminated or glazed linings or pads Improper linings or pads using Maladjustment of brake pedal or booster push rod (Disc brake) Missing or damaged brake pad anti–squeal shim Pad wear and pad wear indicator making contact with the rotor Burred or rusted calipers (Drum brake) Weak damaged or incorrect shoe hold–down springs, loose or damaged shoe hold–down spring pins and springs and grooved backing plate ledges	Inspect, repair or replace Clean or replace Inspect for correct usage or replace Inspect and adjust Replace Replace Clean or deburr Inspect, repair or replace	BR–18, 26 33,40 47, 55 BR–18, 26 33,40 47, 55 BR–6, 17 BR–1 8, 26 33 BR–18, 26 33 BR–18, 26 33 BR–40, 47 55
Squealing and squeaking noise when brakes are not applied	Mal–adjustment of brake pedal or booster push rod Poor return of brake booster or master cylinder or brake cylinder (Disc brake) Rusted or stuck piston Improper positioning of pad in caliper Rotor rubbing against caliper housing Improper installation of disc brake pad support plate Pad wear and pad wear indicator making contact with the rotor (Drum brake) Weak, damaged or incorrect shoe hold–down springs Grooved backing plate ledges Bent or warped backing plate causing interference with drum Improper machining of drum causing interference with backing plate or shoe Other brake system components: Loose or extra parts in brakes Rear drum adjustment too tight causing lining to glaze Worn, damaged or insufficiently lubricated wheel bearings	Inspect and adjust Inspect, repair or replace Inspect and lubricate as necessary Reinstall correctly Inspect and replace Reinstall correctly Replace Replace Repair or replace Repair or replace Replace drum Inspect, repair or replace as necessary	BR–6, 17 BR–10, 16 18,26 33,40 47, 55 BR–18, 26 33 BR–18, 2 33 BR–18, 26 33 BR–40, 47 55 BR–40, 47 55 BR–40, 47 55 BR–40, 47 55 BR–40, 47 55

TROUBLESHOOTING (Cont'd)

Problem	Possible cause	Remedy	Page
Groaning, clicking or rattling noise when brakes are not applied	Stones or foreign material trapped inside wheel covers	Remove foreign material	
	Loose wheel nuts	Tighten to correct torque Replace if stud holes are elongated	
	Mal–adjustment of brake pedal or booster push rod	Inspect and adjust	BR–6, 17
	Worn, damaged or dry wheel bearings	Inspect and lubricate or replace	
	(Disc brake) Loose or missing anti–rattle spring or pad support plate or crimping on outer pad	Inspect, repair or replace	BR–18, 26 33
	Failure of shim	Inspect, replace if necessary	BR–18, 26 33
	Wear on slide bushing	Inspect, replace if necessary	BR–18, 26 33
	Loose installation bolt	Inspect, tighten if necessary	BR–18, 26 33
	Poor return of piston	Inspect, repair or replace	BR–18, 26 33
	(Drum brake) Loose or extra parts	Inspect and repair	BR–40, 47 55







CHECKS AND ADJUSTMENTS

CHECK AND ADJUSTMENT OF BRAKE PEDAL

1. CHECK THAT PEDAL HEIGHT IS CORRECT, AS SHOWN

PEDAL HEIGHT FROM ASPHALT SHEET:
2WD 148 MM (5.83 IN.)
4WD 145 MM (5.71 IN.)

2. IF NECESSARY, ADJUST PEDAL HEIGHT

(a) Disconnect the connector from the stop light switch.

(b) Loosen the stop light switch lock nut and remove the stop light switch.

(c) Loosen the push rod lock nut.

(d) Adjust the pedal height by turning the pedal push rod.

(e) Tighten the push rod lock nut.

Torque: 25 N–m (260 kgf–cm, 19 ft–lbf)

(f) Install the stop light switch and turn it until it lightly contacts the pedal stopper.

(g) Return the stop light switch one turn.

(f) Check the clearance

(A) between stop light switch and pedal.

Clearance: 0.5 – 2.4mm (0.02 – 0.09 in.)

(i) Tighten the stop light switch lock nut.

(j) Check that the stop light come on when the brake pedal is depressed, and go off when the brake pedal is released.

(k) After adjusting the pedal height, check the pedal free play.

HINT: If clearance

(A) between the stop light switch and the pedal stopper has been adjusted correctly, the pedal freeplay will meet the specifications.

3. CHECK THAT PEDAL FREEPLAY IS CORRECT, AS SHOWN

(a) Stop the engine and depress the brake pedal several times until there is no more vacuum left in the booster.

(b) (Single booster)

Push in the pedal until the beginning of resistance is felt. Measure the distance, as shown.

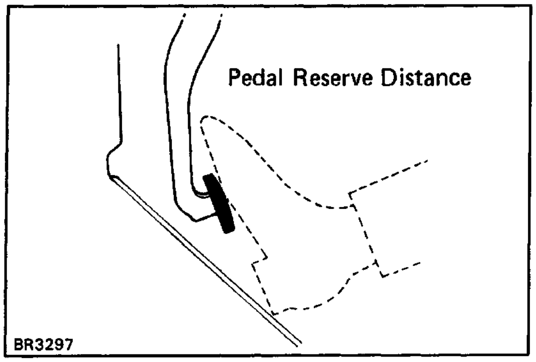
(Tandem booster)

Push in the pedal by hand until the beginning of the second resistance is felt, measure the distance, as shown.

Pedal freeplay: 3 – 6mm (0.12 – 0.24 in.)

(Tandem booster)

HINT: The freeplay to the first resistance is due to the play between the clevis and pin. And it is 1 – 3mm (0.04 – 0.12 in.) on the pedal.



BR3297

4. CHECK THAT PEDAL RESERVE DISTANCE IS CORRECT, AS SHOWN

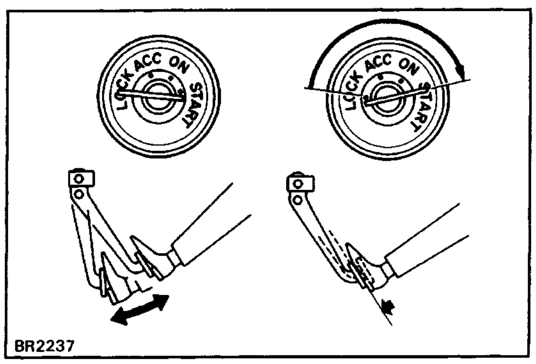
Release the parking brake.

With engine running, depress the pedal and measure the pedal reserve distance, as shown.

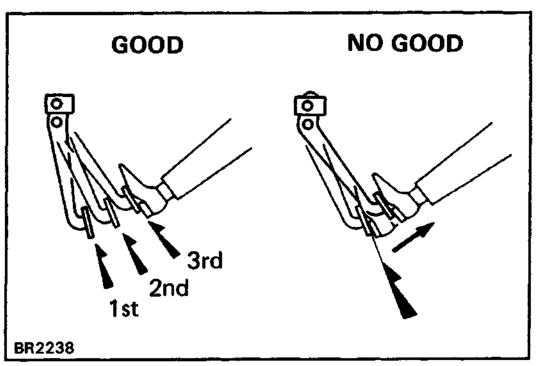
Pedal reserve distance from asphalt sheet at 490 N (50 kgf, 110.2 lbf):

(2WD)		
22R–E Engine		**More than 70 mm (2.76 in.)**
3VZ–E Engine		
	1 ton	**More than 75 mm (2.95 in.)**
	1/2 ton	**More than 65 mm (2.56 in.)**
C&C		
	SRW	**More than 75 mm (2.95 in.)**
	DRW	**More than 55 mm (2.17 in.)**
(4WD)		**More than 65 mm (2.56 in.)**

If incorrect, troubleshoot the brake system.



BR2237



BR2238

OPERATIONAL TEST OF BRAKE BOOSTER

HINT: If available, use a brake booster tester to check the booster operating condition.

1. OPERATING CHECK

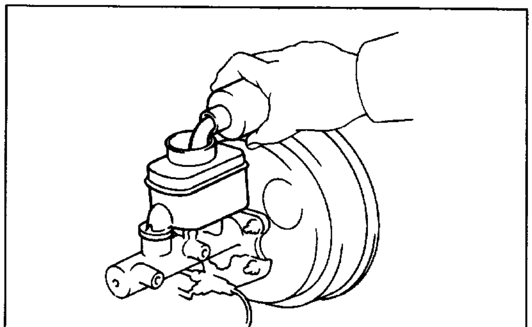
(a) Depress the brake pedal several times with the engine off, and check that there is no change in the pedal reserve distance.

(b) Depress the brake pedal and start engine. If the pedal goes down slightly, operation is normal.

2. AIR TIGHTNESS CHECK

(a) Start the engine and stop it after one or two minutes. Depress the brake pedal several times slowly. If the pedal goes down deepest the first time, but gradually rises after the second or third time, the booster is air tight.

(b) Depress the brake pedal while the engine is running, and stop it with the pedal depressed . If there is no change in pedal reserve travel after holding' the pedal for thirty seconds, the booster is air tight.


BR3172

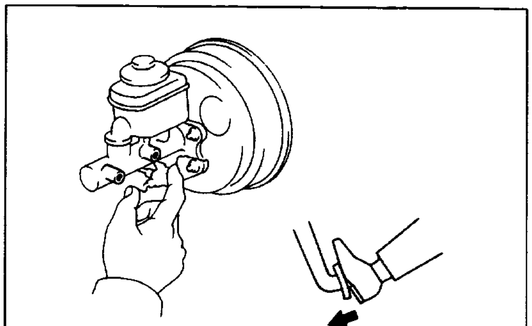
BLEEDING OF BRAKE SYSTEM

HINT: If any work is done on the brake system or if air is suspected in the brake lines, bleed the system of air.

NOTICE: Do not let brake fluid remain on a painted surface. Wash it off immediately.

1. FILL BRAKE RESERVOIR WITH BRAKE FLUID

Check the fluid level in the reservoir after bleeding each wheel. Add fluid, if necessary.

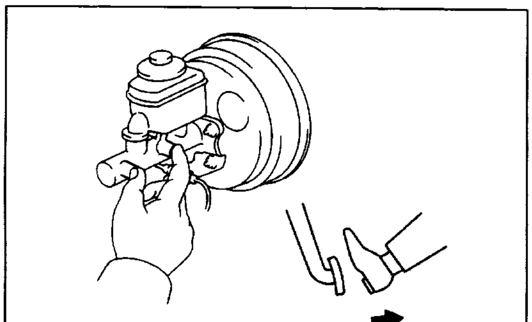

BR3173

2. BLEED MASTER CYLINDER

HINT: If the master cylinder was disassembled or if the reservoir tank becomes empty, bleed the air from the master cylinder.

(a) Disconnect the brake tubes from the master cylinder.

(b) Slowly depress the brake pedal and hold it.

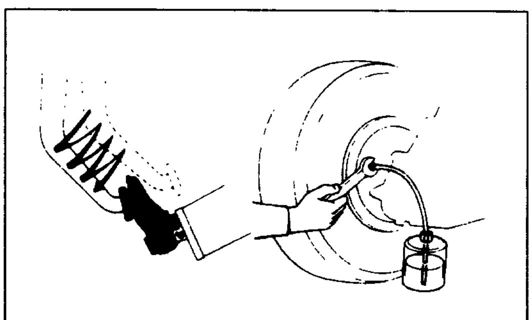

BR3174

(c) Block off the outlet plug with your finger, and release the brake pedal.

(d) Repeat

(b) and

(c) three or four times.


B1528

3. CONNECT VINYL TUBE TO WHEEL CYLINDER BLEEDER PLUG

Insert other end of the tube in a half–full container of brake fluid.

HINT: Begin air bleeding from the wheel cylinder with the longest hydraulic line.

4. BLEED BRAKE LINE

(a) Slowly depress the brake pedal several times.

(b) While an assistant depresses the pedal, loosen the bleeder plug until fluid starts to run out. Then close the bleeder plug.

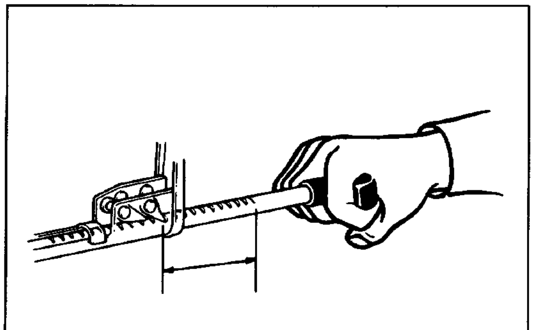
(c) Repeat this procedure until there are no more air bubbles in the fluid.

Bleeder plug tightening torque:

11 N–m (110 kgf–cm, 8 ft–lbf)

5. REPEAT PROCEDURE FOR EACH WHEEL

6. BLEED LSP & BV


BR0080

CHECK AND ADJUSTMENT OF PARKING BRAKE

1. CHECK THAT PARKING BRAKE LEVER TRAVEL IS CORRECT

Pull the parking brake lever all the way up, and count the number of clicks.

Parking brake lever travel at 196 N (20 kgf, 44.1 lbf)

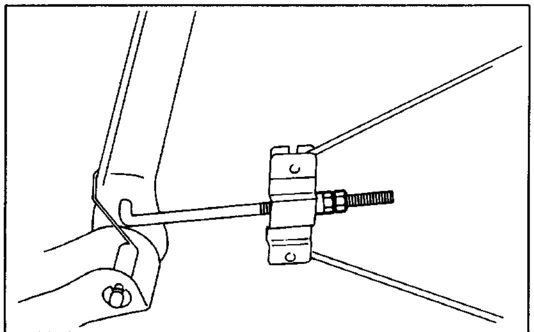
2WD 1/2 ton 12 – 18 clicks

1 ton 11 – 17 clicks

4WD 11 – 17 clicks

2. IF NECESSARY, ADJUST PARKING BRAKE

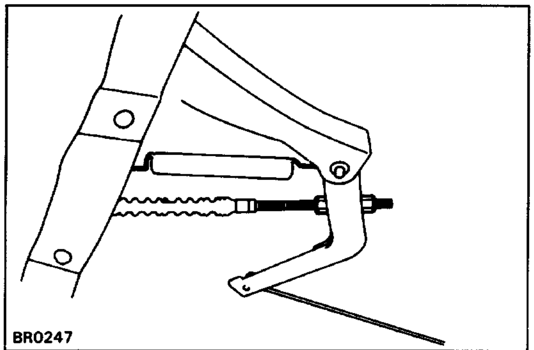
HINT: Before adjusting the parking brake, make sure that the rear brake shoe clearance has been adjusted.


BR0246

(2WD)

(a) Tighten the adjusting nut until the travel is correct. Then tighten the lock nut.

(b) After adjusting the parking brake, confirm that the rear brakes are not dragging.


BR0247

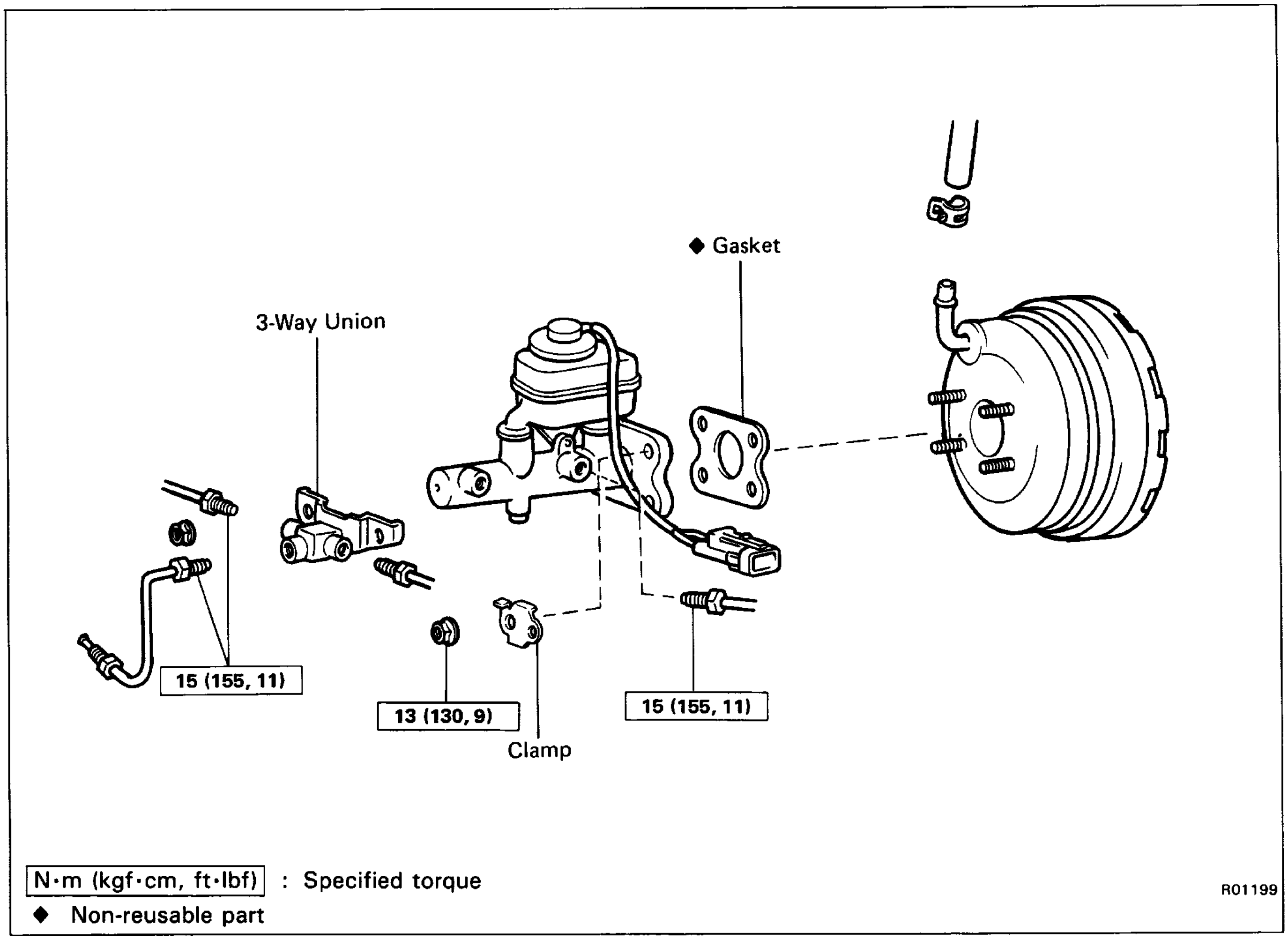
(4WD)

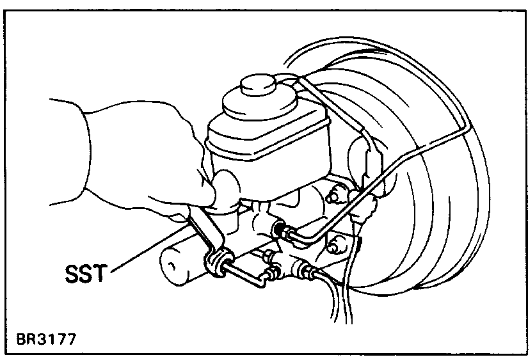
(a) Tighten one of the adjusting nuts of the intermediate lever while loosening the other one until the travel is correct. Tighten the two adjusting nuts.

(b) After adjusting the parking brake, confirm that the bellcrank stopper screw comes in contact with the backing plate.

MASTER CYLINDER

REMOVAL OF MASTER CYLINDER





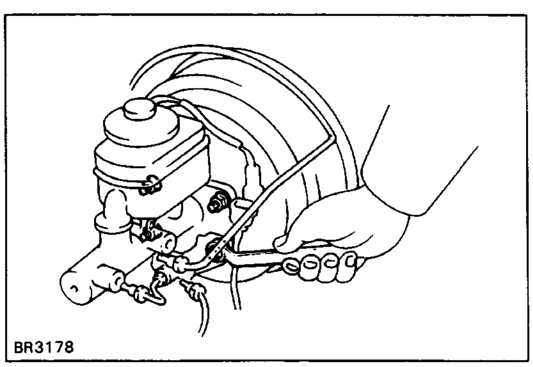
1. DISCONNECT LEVEL WARNING SWITCH CONNECTOR

2. DRAW OUT FLUID WITH SYRINGE

NOTICE: Do not let brake fluid remain on a painted sur–face. Wash it off immediately.

3. DISCONNECT BRAKE TUBES

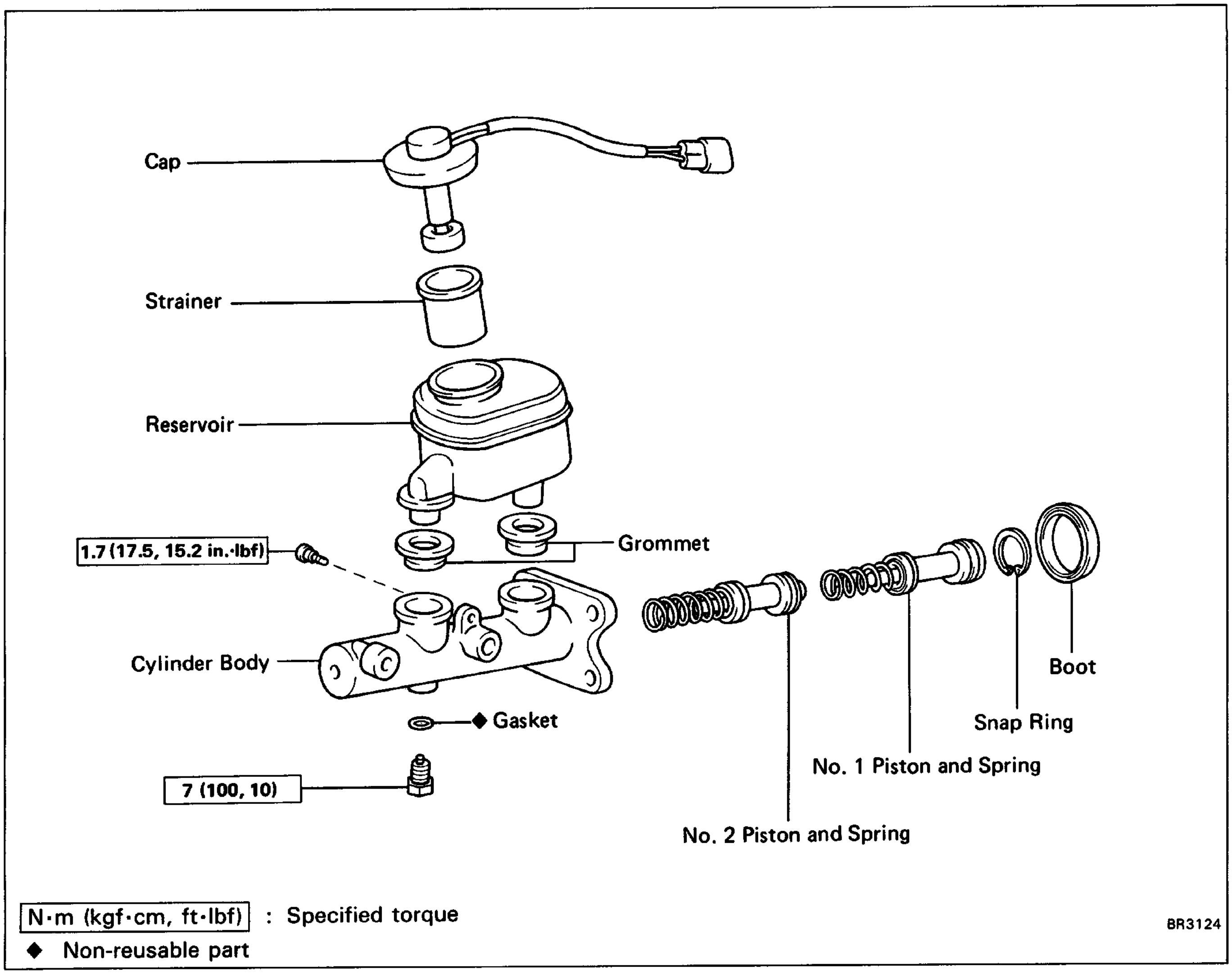
Using SST, disconnect the brake tubes from the master cylinder.
SST 09751–36011

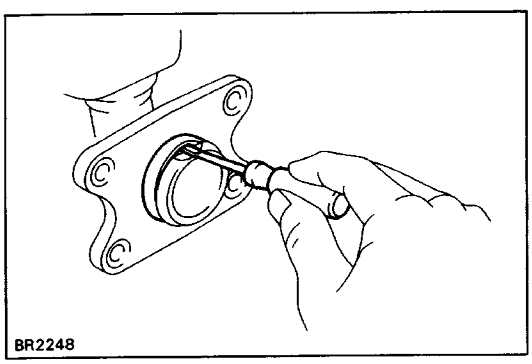


4. REMOVE MASTER CYLINDER

(a) Remove the four nuts and 3–way union.
(b) Remove the clamp.
(c) Remove the master cylinder and gasket from the brake booster.

COMPONENTS

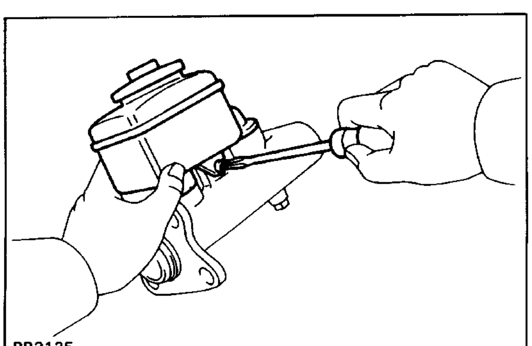




DISASSEMBLY OF MASTER CYLINDER

1. REMOVE MASTER CYLINDER BOOT

Using a screwdriver, remove the master cylinder boot.

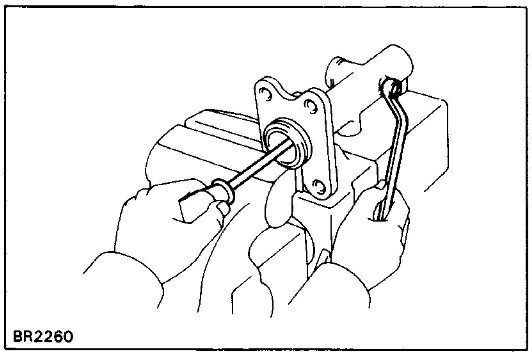


2. REMOVE RESERVOIR

(a) Remove the set screw and pull out the reservoir.
(b) Remove the cap and strainer from the reservoir.

3. REMOVE TWO GROMMETS

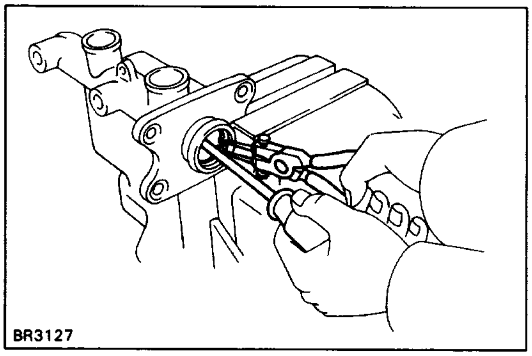
4. PLACE CYLINDER IN VISE



5. REMOVE PISTON STOPPER BOLT

Using a screwdriver, push the pistons in all the way and remove the piston stopper bolt and gasket.

HINT: Tape the screwdriver tip before use.

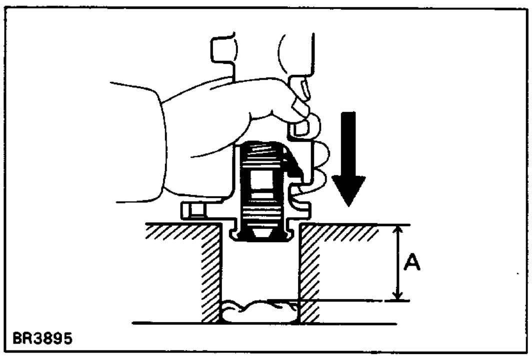


6. REMOVE TWO PISTONS AND SPRINGS

(a) Push in the piston with a screwdriver and remove the snap ring with snap ring pliers.

(b) Remove the No. 1 piston and spring by hand, pulling straight out, not at an angle.

NOTICE: If pulled out at an angle, there is possibility of damaging the cylinder bore.



(c) Place a rag and two wooden blocks on the work table, and lightly tap the cylinder flange against the block edges until the No.2 piston drops out of cylinder.

HINT: Make sure the distance

(A) from the rag to the

top of the blocks is at least 100 mm (3.94 in.).

INSPECTION OF MASTER CYLINDER COMPONENTS

HINT: Clean the disassembled parts with compressed air.

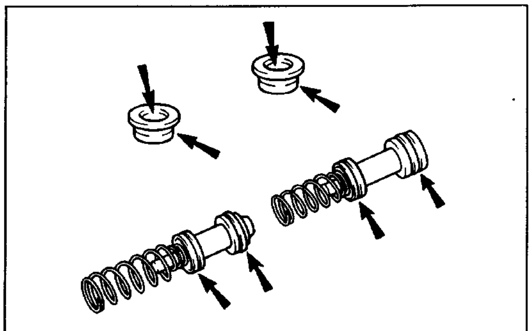
1. INSPECT CYLINDER BORE FOR RUST OR SCORING

2. INSPECT CYLINDER FOR WEAR OR DAMAGE

If necessary, clean or replace the cylinder.

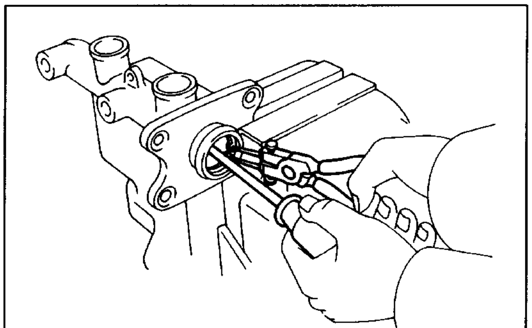
ASSEMBLY OF MASTER CYLINDER

(See page BR–11)



BR2254

1. APPLY LITHIUM SOAP BASE GLYCOL GREASE TO RUBBER PARTS INDICATED BY ARROWS



BR3127

2. INSTALL TWO SPRINGS AND PISTONS

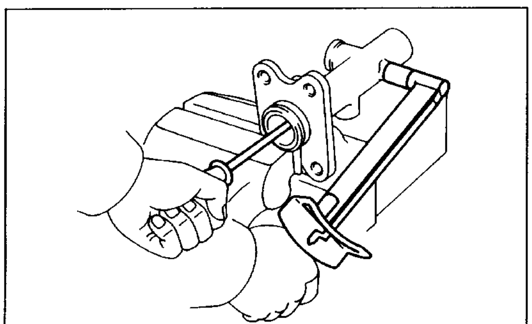
NOTICE: Be careful not to damage the rubber lips on the pistons.

(a) Insert the two springs and pistons straight in, not at an angle.

NOTICE: If inserted at an angle, there is a possibility of damaging the cylinder bore.

(b) Push in the piston with a screwdriver and install the snap ring with snap ring pliers.

HINT: Tape the screwdriver tip before use.

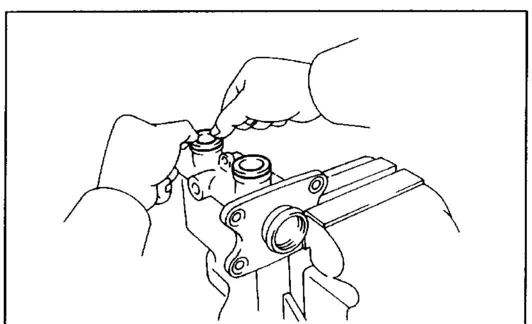


BR2262

3. INSTALL PISTON STOPPER BOLT

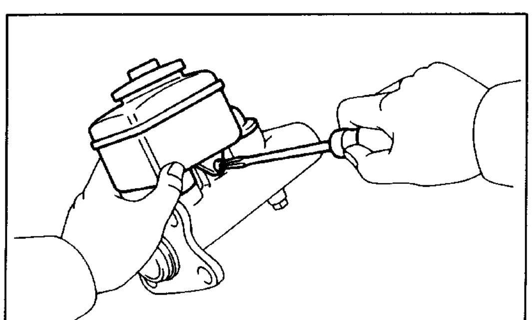
Using a screwdriver, push the piston in all the way and install the piston stopper bolt over the gasket. Torque the bolt.

Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)



BR2263

4. INSTALL TWO GROMMETS



BR3125

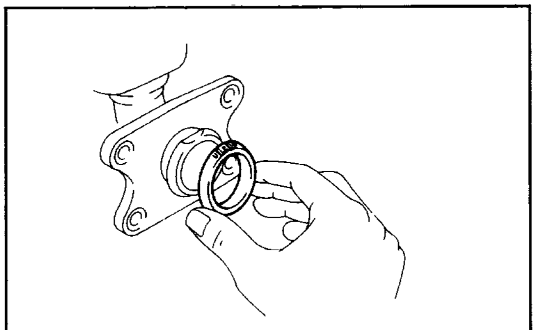
5. INSTALL RESERVOIR

(a) Install the cap and strainer to the reservoir.

(b) Push the reservoir onto the cylinder.

(c) Install the set screw while pushing on the reservoir.

Torque: 1.7 N–m (17.5 kgf–cm, 15.2 in. –lbf)

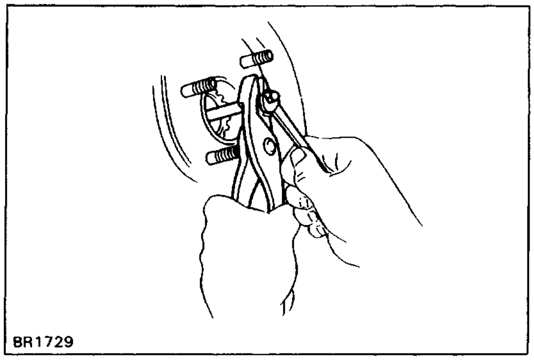

BR2257

6. INSTALL MASTER CYLINDER BOOT

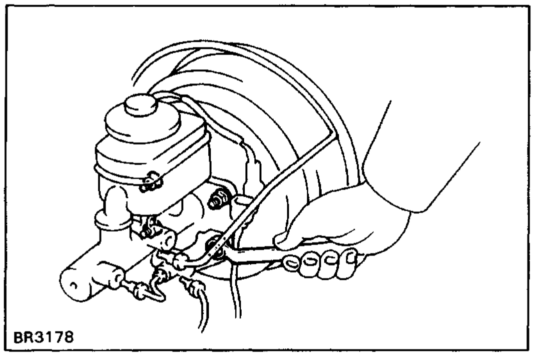
Facing the up mark on the master cylinder boot upwards, install the cylinder boot to the master cylinder.

INSTALLATION OF MASTER CYLINDER

(See page BR–10)


BR1729

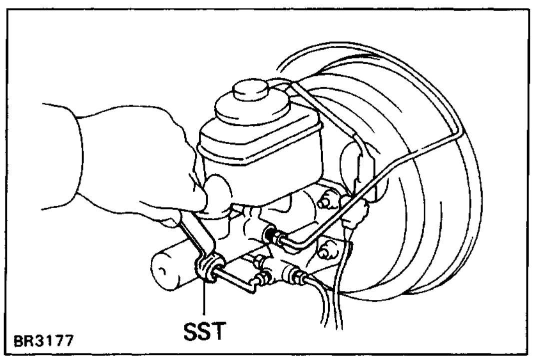
1. ADJUST LENGTH OF BRAKE BOOSTER PUSH ROD BEFORE INSTALLING MASTER CYLINDER
(See page BR–17)


BR3178

2. INSTALL MASTER CYLINDER

Install the master cylinder and gasket on the brake booster with four nuts.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



BR3177

3. CONNECT TWO BRAKE TUBES

Using SST, connect the brake tubes to the master cylin– der. Torque the union nuts.

SST 09751–36011

Torque: 15 N–m (155 kgf–cm, 11 ft–lbf)

4. CONNECT LEVEL WARNING SWITCH CONNECTOR

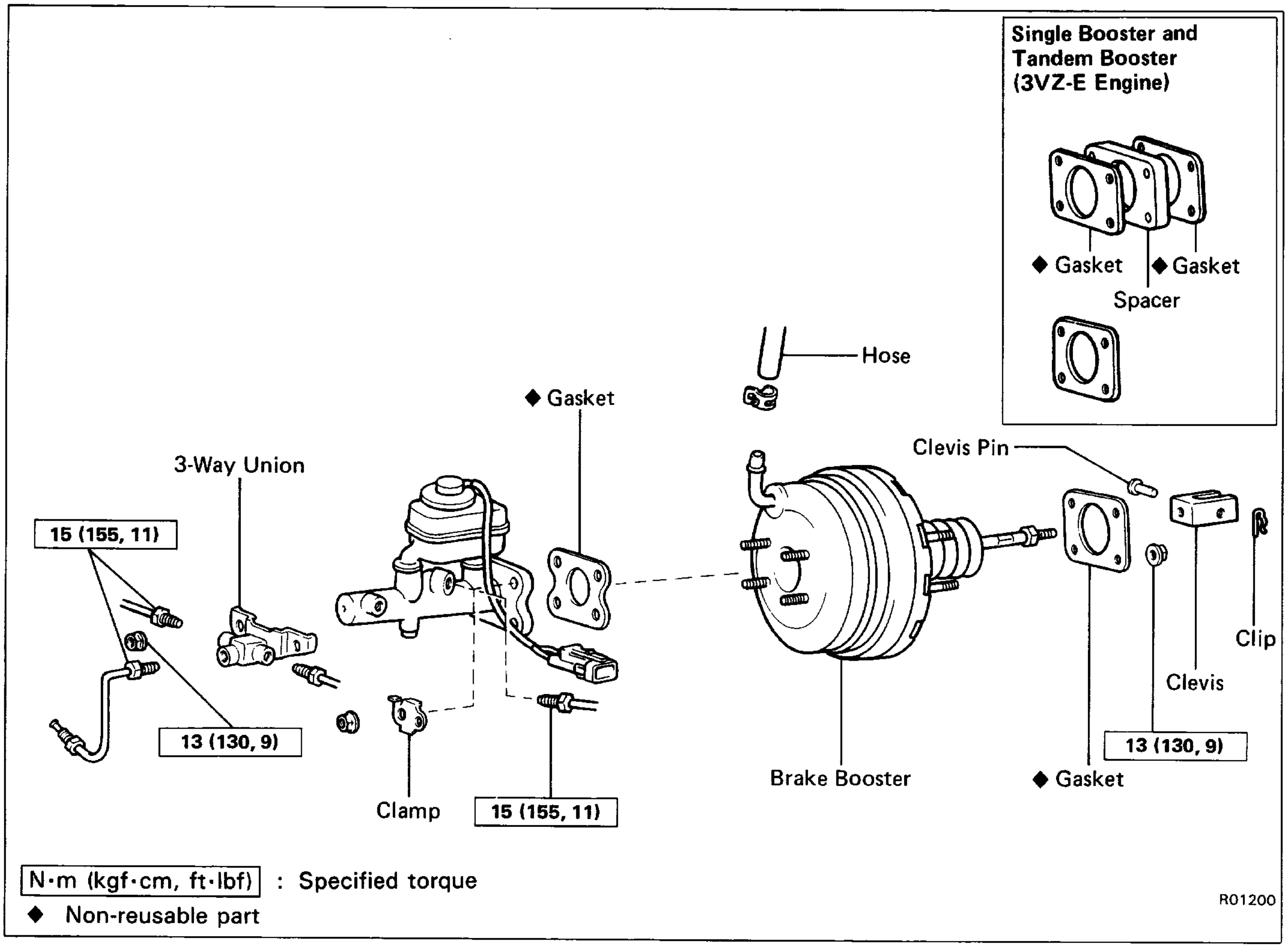
5. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM
(See page BR–8)

6. CHECK FOR FLUID LEAKAGE

7. CHECK AND ADJUST BRAKE PEDAL
(See page BR–6)

BRAKE BOOSTER

REMOVAL OF BRAKE BOOSTER

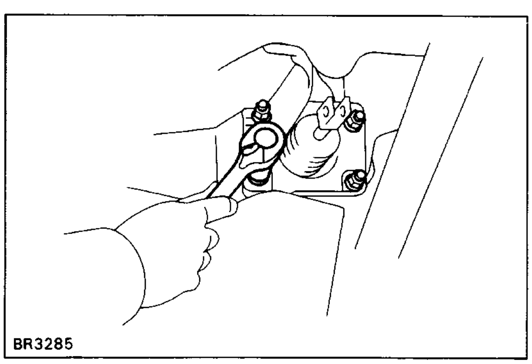


1. REMOVE MASTER CYLINDER
(See page BR–10)

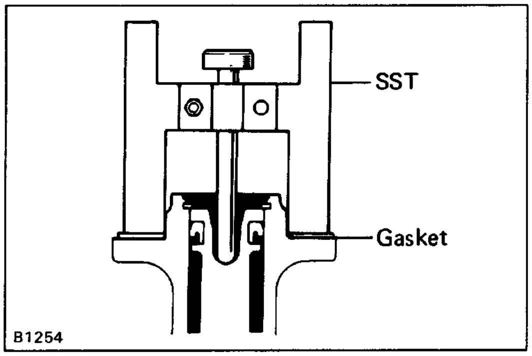
2. DISCONNECT VACUUM HOSE FROM BRAKE BOOSTER

3. REMOVE PEDAL RETURN SPRING

4. REMOVE CLIP AND CLEVIS PIN



5. REMOVE BRAKE BOOSTER, GASKET AND CLEVIS



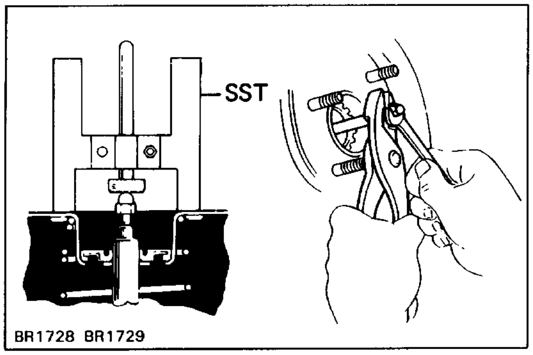
INSTALLATION OF BRAKE BOOSTER

(See page BR–16)

1. ADJUST LENGTH OF BOOSTER PUSH ROD

(a) Install the gasket on the master cylinder.

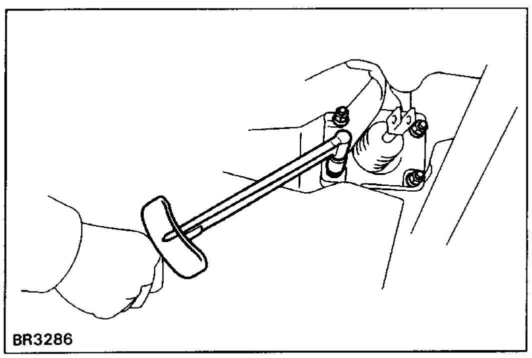
(b) Set the SST on the gasket, and lower the pin until its tip slightly touches the piston.
SST 09737–00010



(c) Turn the SST upside down, and set it on the booster.
SST 09737–00010

(d) Measure the clearance between the booster push rod and pin head (SST).
Clearance: 0 mm (0 in.)

(e) Adjust the booster push rod length until the push rod lightly touches the pin head.



2. INSTALL BRAKE BOOSTER, GASKET AND CLEVIS

(a) Install the booster and gasket.

(b) Install the clevis.

(c) Install and torque the booster mounting nuts.
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)

3. CONNECT CLEVIS TO BRAKE PEDAL

Insert the clevis pin into the clevis and brake pedal and install the clip to the clevis pin.

4. INSTALL PEDAL RETURN SPRING

5. INSTALL MASTER CYLINDER
(See page BR–15)

6. CONNECT HOSE TO BRAKE BOOSTER

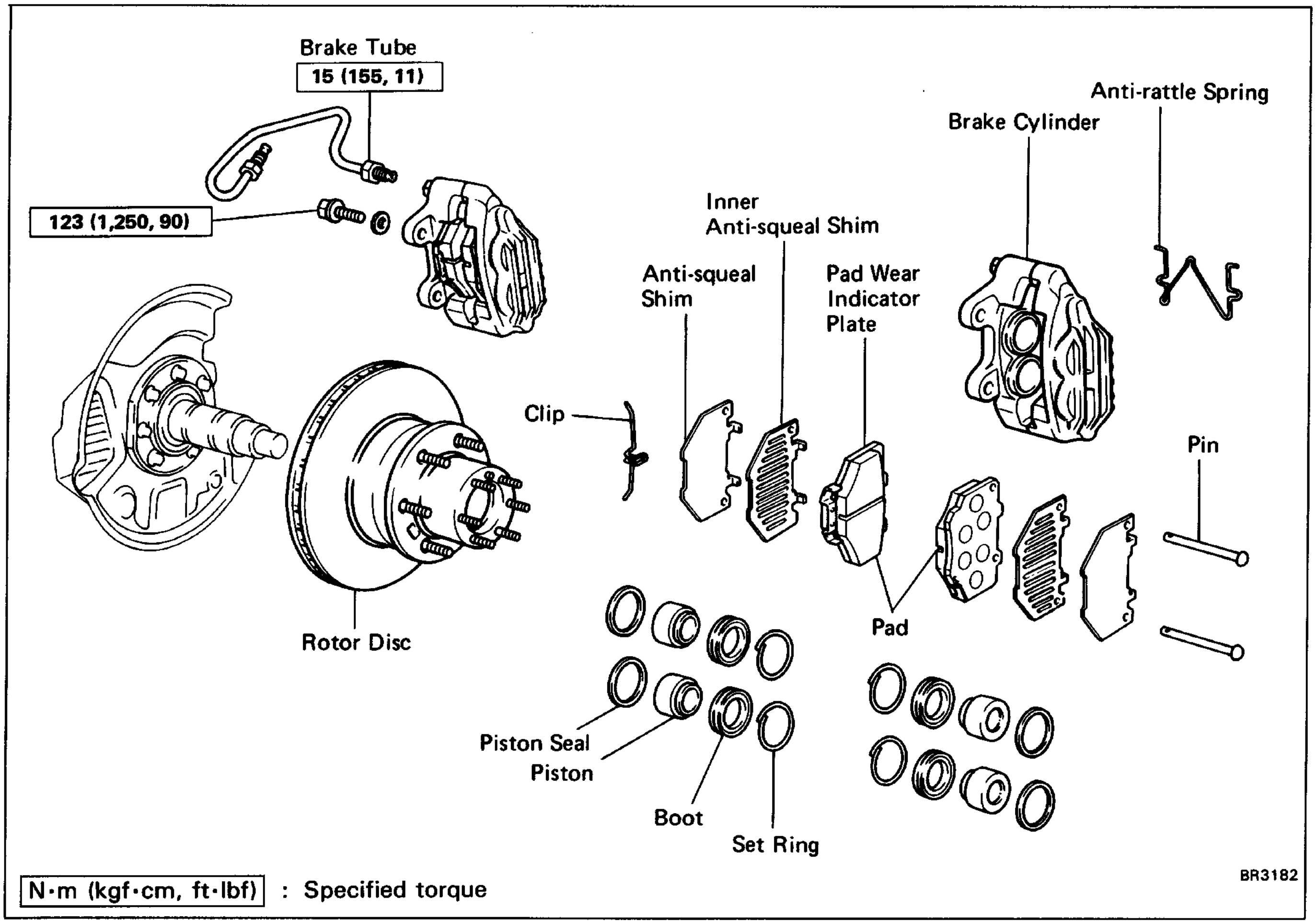
7. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM
(See page BR–8)

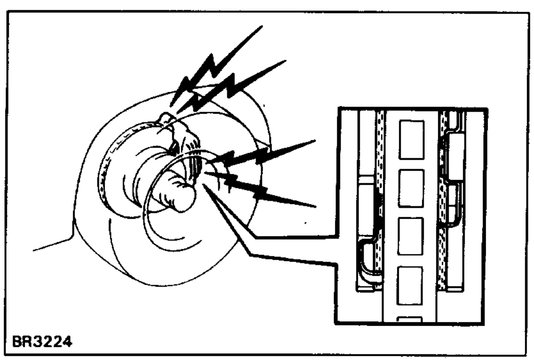
8. CHECK FOR FLUID LEAKAGE

9. CHECK AND ADJUST BRAKE PEDAL
(See page BR–6)

10. PERFORM OPERATIONAL CHECK
(See page BR–7)

FRONT BRAKE
4WD (S12 + 12 Type Disc)
COMPONENTS

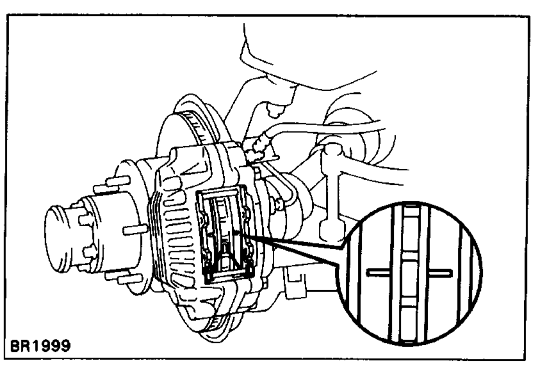




REPLACEMENT OF BRAKE PADS

HINT: If a squealing noise occurs from the brakes while driving, check the pad wear indicator plate. If the pad wear indicator plate contacts the rotor disc, the brake pads should be replaced.

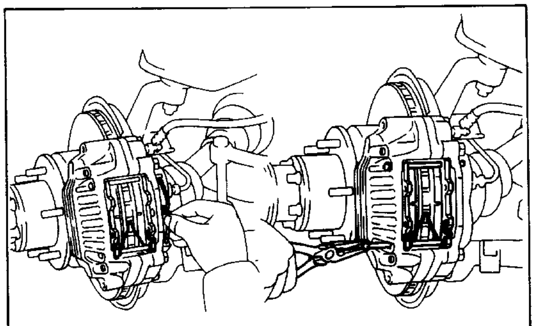
1. REMOVE FRONT WHEEL



2. INSPECT PAD LINING THICKNESS

Check the pad thickness and replace pads if not within specification.

Minimum thickness: 1.0 mm (0.039 in.)

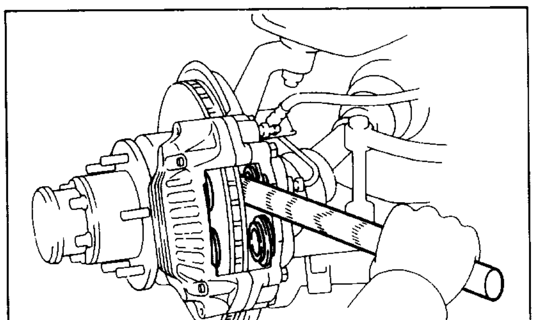

BR2000 BR2001

3. REMOVE FOLLOWING PARTS

(a) Clip
(b) Two pins
(c) Anti–rattle spring
(d) Two pads
(e) Four anti–squeal shims

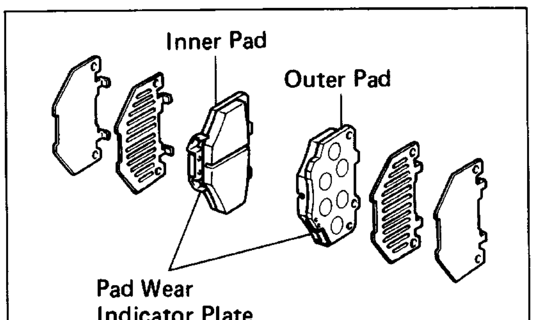
4. CHECK ROTOR DISC THICKNESS
(See step 2 on page BR–37)

5. CHECK ROTOR DISC RUNOUT
(See step 3 on page BR–37)


BR2002

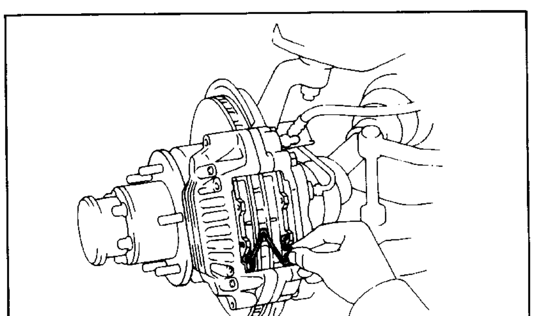
6. INSTALL NEW PADS

(a) Draw out a small amount of brake fluid from the res–ervoir.
(b) Press in the pistons with a hammer handle or ar equivalent.
HINT: Always change the pads on one wheel at a time as there is possibility of the opposite piston flying out.

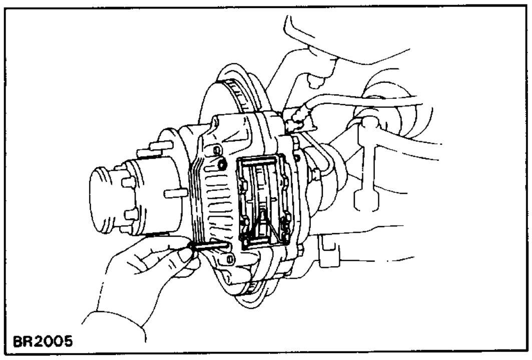


BR3225

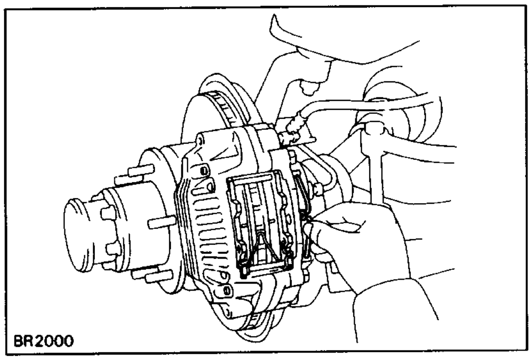
(c) Install the four anti–squeal shims to new pads a: shown.
HINT: Apply disc brake grease to both sides of the inner anti–squeal shims.
(d) Install the two pads as shown in the illustration.
NOTICE: Do not allow oil or grease to get on the rub bing face.


BR2004

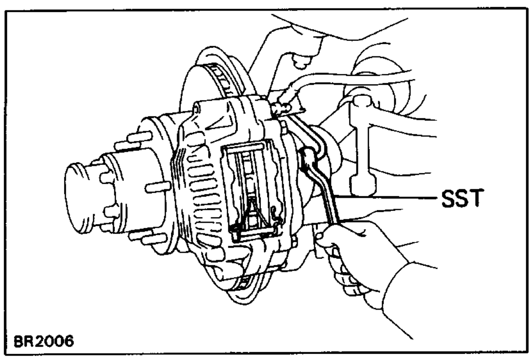
7. INSTALL ANTI–RATTLE SPRING



8. INSTALL TWO PINS



9. INSTALL CLIP



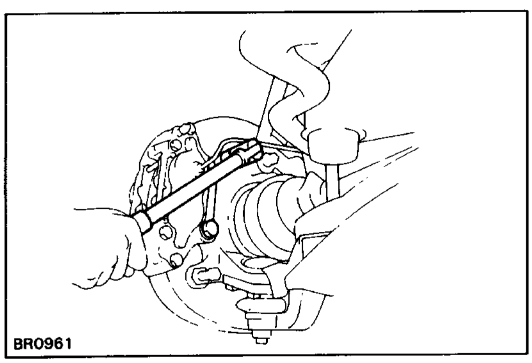
REMOVAL OF CYLINDER

(See page BR–33)

1. REMOVE FRONT WHEEL

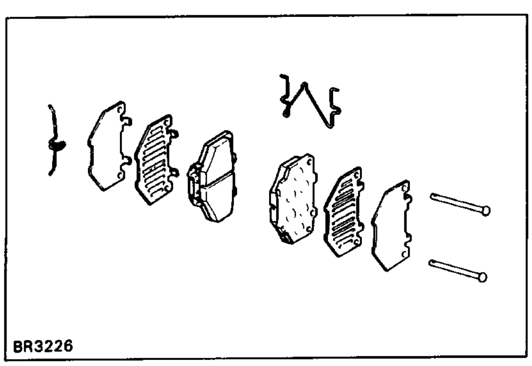
2. DISCONNECT BRAKE TUBE

Using SST, disconnect the brake tube.
Use a container to catch the brake fluid.
SST 09751–36011



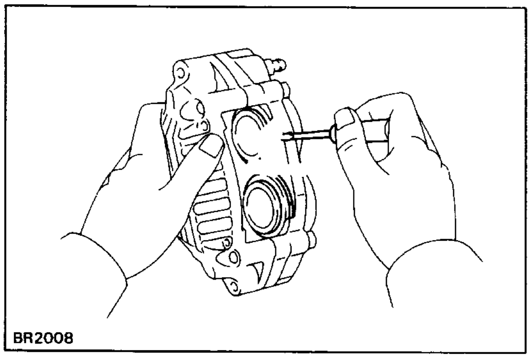
3. REMOVE CYLINDER

Remove the two mounting bolts and remove the cylinder.



4. REMOVE FOLLOWING PARTS:

(a) Clip
(b) Two pins
(c) Anti–rattle spring
(d) Two pads
(e) Four anti–squeal shims

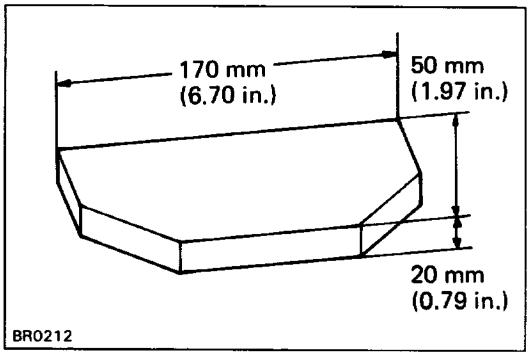


DISASSEMBLY OF CYLINDER

(See page BR–33)

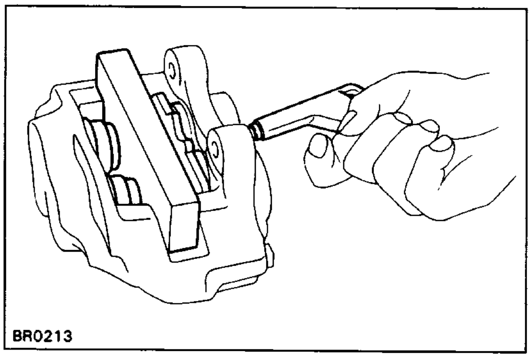
1. REMOVE CYLINDER BOOT SET RINGS AND BOOTS

Using a screwdriver, remove the four cylinder boot set rings and four boots.



2. REMOVE PISTONS FROM CYLINDER

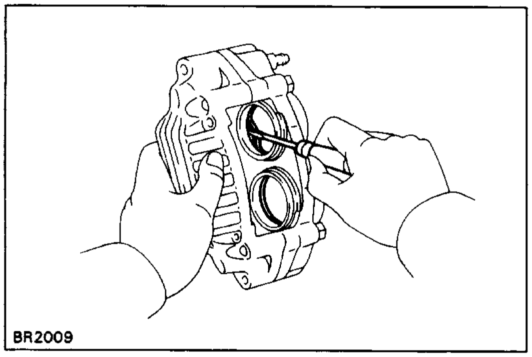
(a) Prepare the wooden plate as shown in the illustra– tion to hold the pistons.



(b) Place the plate between the pistons and insert a pad at one side.

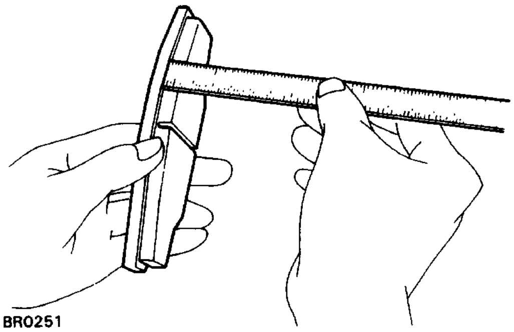
(c) Use compressed air to remove the pistons alter– nately from the cylinder.

NOTICE: Do not place your fingers in front of the pis– tons when using compressed air.



3. REMOVE PISTON SEALS

Using a screwdriver, remove the four seals from the cyl– inder.



BR0251

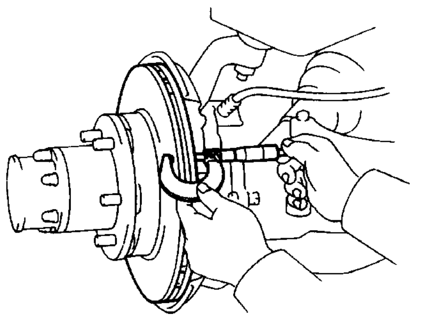
INSPECTION AND REPAIR OF FRONT BRAKE COMPONENTS

1. MEASURE PAD LINING THICKNESS

Standard thickness: 9.5 mm (0. 374 in.)

Minimum thickness: 1.5 mm (0.059 in.)

Replace the pads if the thickness is less than the mini– mum (the 1.5 mm slit is no longer visible) or if it shows sign of uneven wear.



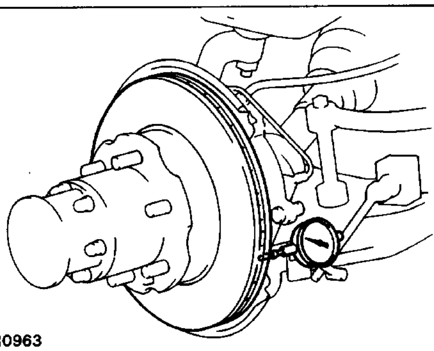
BR3183

2. MEASURE ROTOR DISC THICKNESS

Standard thickness: 20.0 mm (0.787 in.)

Minimum thickness: 18.0 mm (0.709 in.)

If the disc is scored or worn, or if thickness is less than minimum, repair or replace the disc.



BR0963

3. MEASURE ROTOR DISC RUNOUT

Measure the rotor disc runout at 10 mm (0.39 in.) from the outer edge of the rotor disc.

Maximum disc runout: 0.09 mm (0.0035 in.)

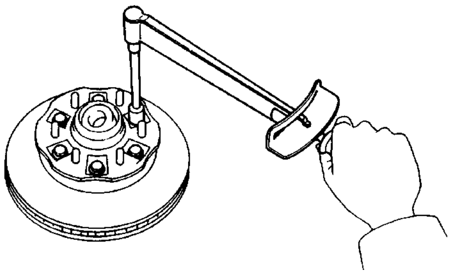
If the runout is greater than maximum, replace the rotor disc.

HINT: Before measuring the runout, confirm that the front bearing play is within specification.

4. IF NECESSARY, REPLACE ROTOR DISC

(a) Remove the front axle hub.

(b) Remove the disc from the axle hub.

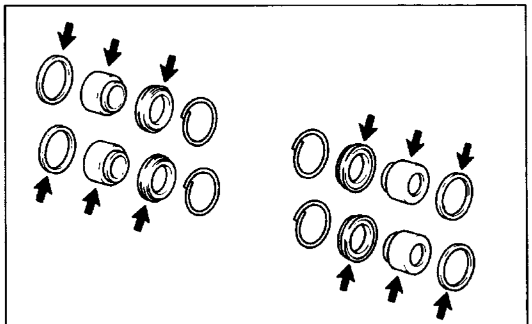


BR1133

(c) Install a new rotor disc and torque the bolts.

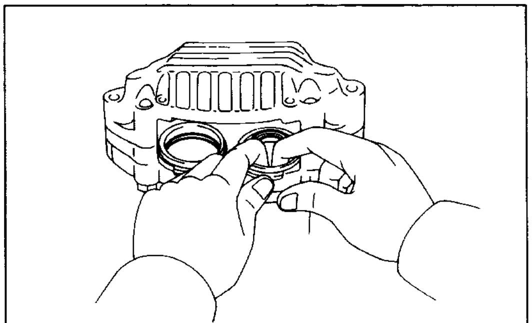
Torque: 64 N–m (650 kgf–cm, 47 ft–lbf)

(d) Install the axle hub and adjust the front bearing pre– load.

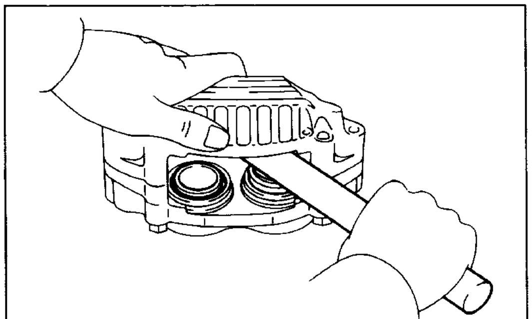

BR2010

ASSEMBLY OF CYLINDER
(See page BR–33)

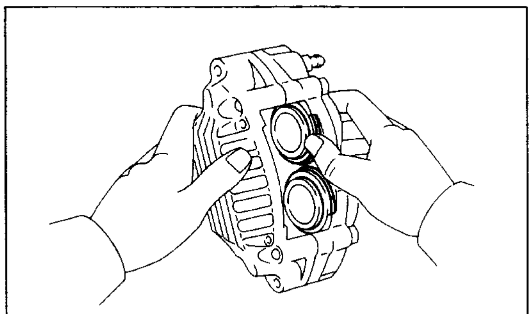
1. APPLY LITHIUM SOAP BASE GLYCOL GREASE TO PARTS INDICATED BY ARROWS


BR2011

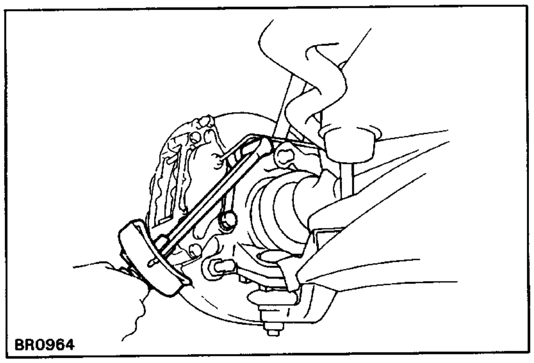
2. INSTALL PISTON SEALS INTO CYLINDER


BR2012

3. INSTALL PISTONS INTO CYLINDER


BR2013

4. INSTALL CYLINDER BOOTS AND SET RINGS INTO CYLINDER

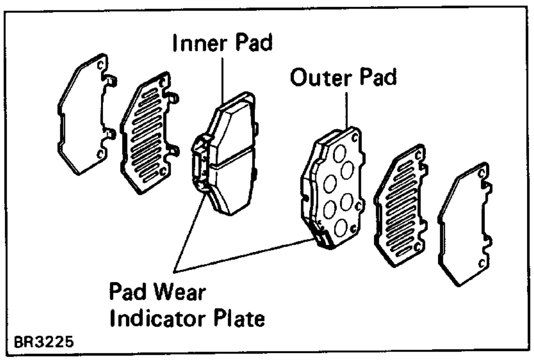


INSTALLATION OF CYLINDER
(See page BR–33)

1. INSTALL CYLINDER

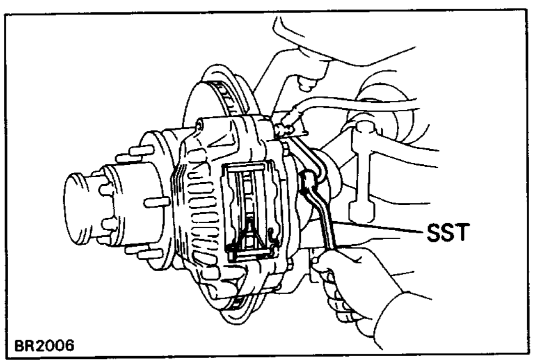
Install the brake cylinder, and torque the two mounting bolts.

Torque: 123 N–m (1,250 kgf–cm, 90 ft–lbf)



2. INSTALL PADS

(See steps 6 to 9 on pages BR–34 and 35)



3. CONNECT BRAKE TUBE

Using SST, connect the brake tube.

SST 09751–36011

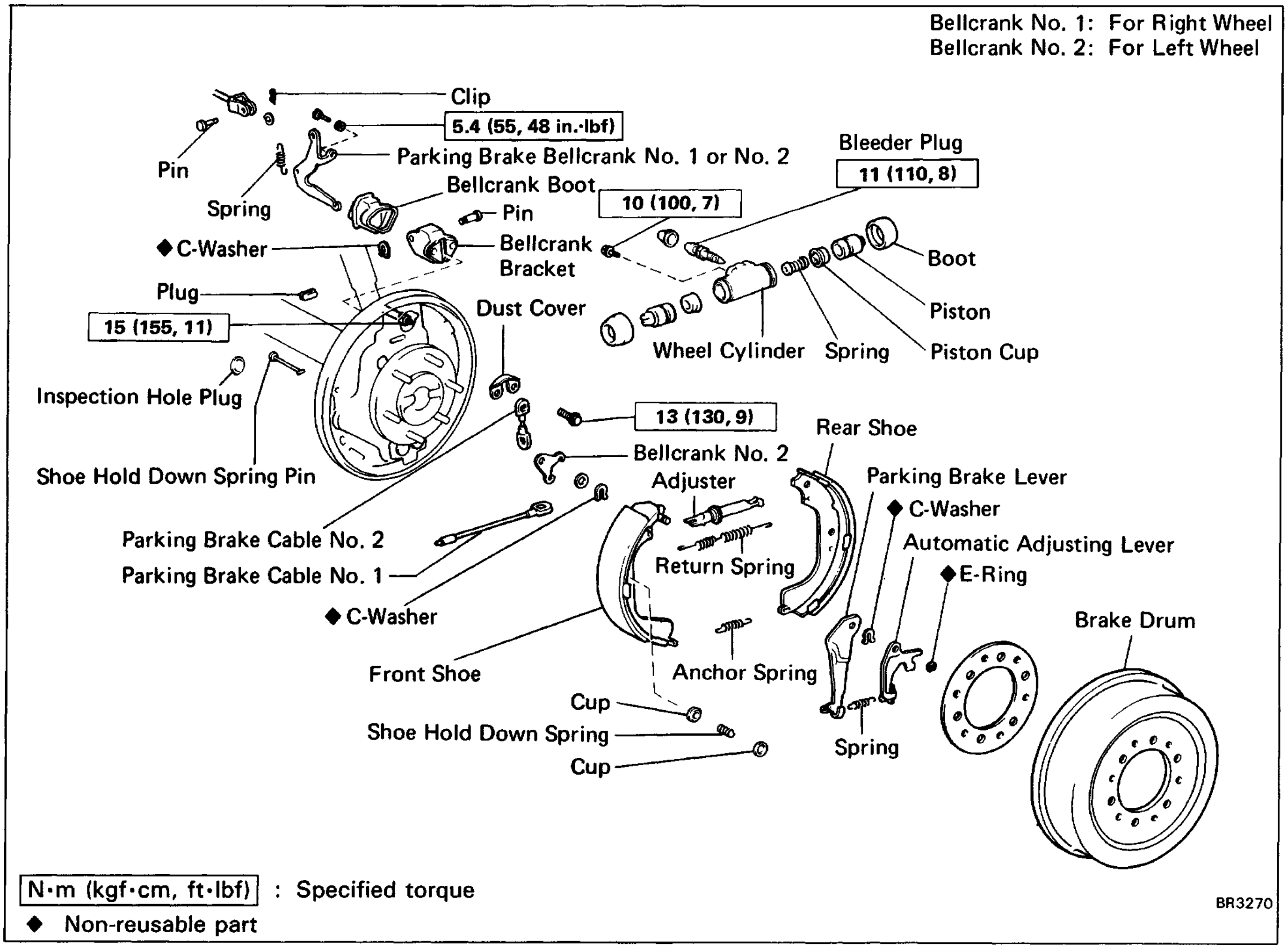
Torque: 15 N–m (155 kgf –cm, 11 ft–lbf)

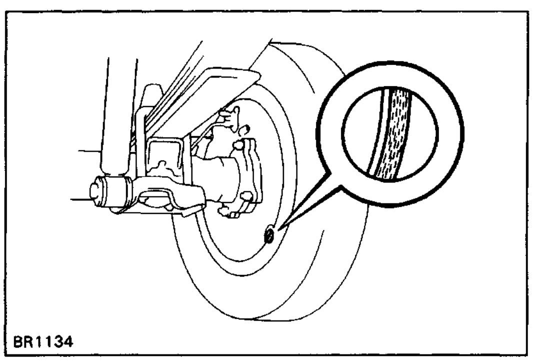
4. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM
(See page BR–8)

5. CHECK FOR FLUID LEAKAGE

6. INSTALL FRONT WHEEL

REAR BRAKE
4WD
COMPONENTS





REMOVAL OF REAR DRUM BRAKE

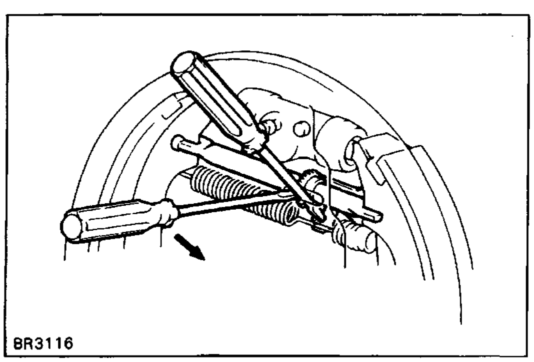
1. INSPECT SHOE LINING THICKNESS

Remove the inspection hole plug, and check the shoe lin–ing thickness through the hole.

If less than minimum, replace the shoes.

Minimum thickness: 1.0 mm (0.039 in.)

2. REMOVE REAR WHEEL

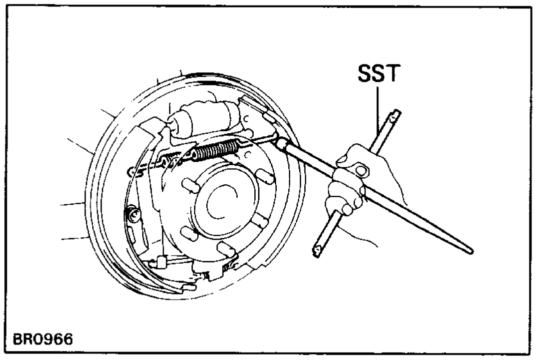


3. REMOVE BRAKE DRUM

HINT: If the brake drum cannot be removed easily, per–form the following.

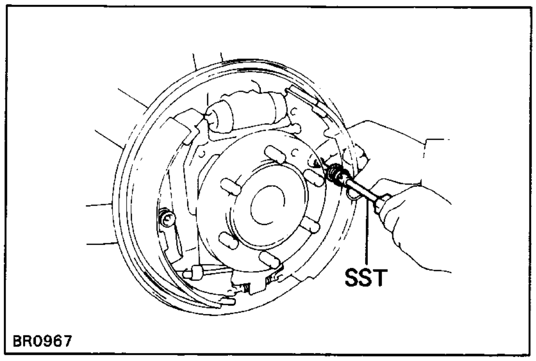
(a) Insert a screwdriver through the hole in the backing plate, and hold the automatic adjusting lever away from the adjusting bolt.

(b) Using another screwdriver, reduce the brake shoe adjustment by turning the adjusting bolt clockwise.

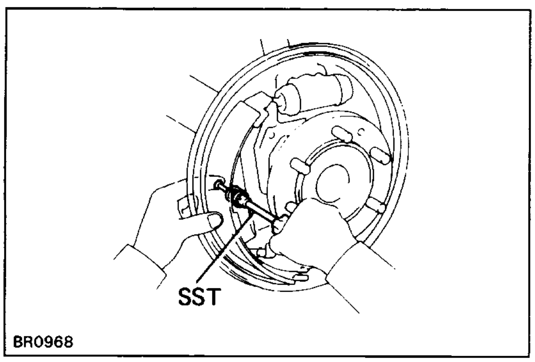


4. REMOVE REAR SHOE

(a) Using SST, disconnect the return spring.
SST 09703–30010

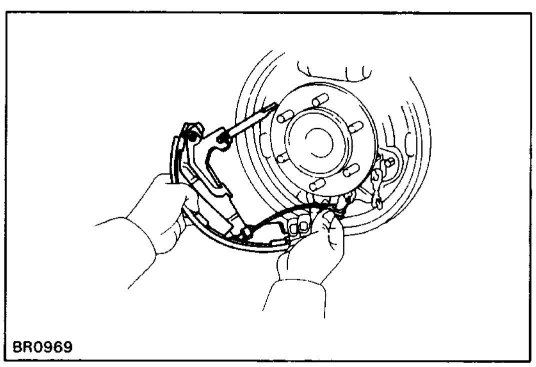


(b) Using SST, remove the shoe hold–down spring, cups and pin.
SST 09718–00010
(c) Disconnect the anchor spring from the rear shoe and remove the rear shoe.
(d) Remove the anchor spring from the. front shoe.

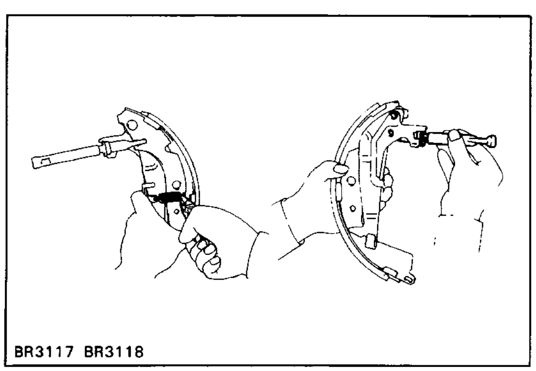


5. REMOVE FRONT SHOE

(a) Using SST, remove the shoe hold–down spring, cups and pin.
SST 09718–00010
(b) Remove the return spring from the front shoe.

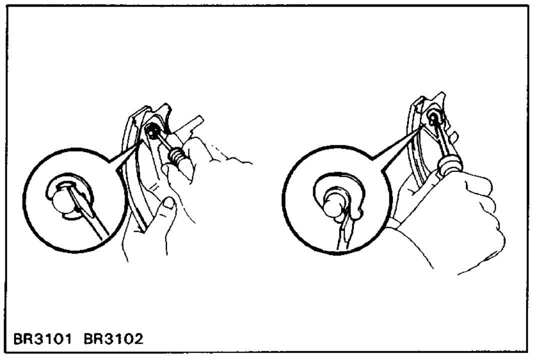


(c) Disconnect the parking brake cable No. 1 from the parking brake bellcrank No.3.
(d) Remove the front shoe with adjuster.
(e) Disconnect the parking brake cable from the front shoe.



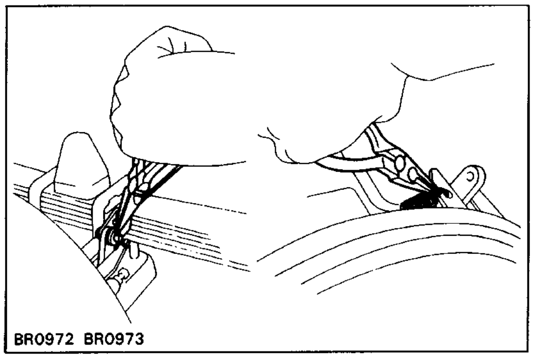
6. REMOVE ADJUSTER FROM FRONT SHOE

(a) Remove the adjusting lever spring.
(b) Remove the adjuster.



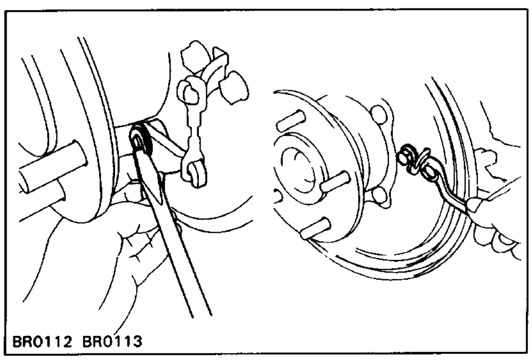
7. REMOVE AUTOMATIC ADJUSTING LEVER AND PARKING BRAKE LEVER

(a) Remove the E–ring.
(b) Remove the automatic adjusting lever.
(c) Remove the C–washer.
(d) Remove the parking brake lever.

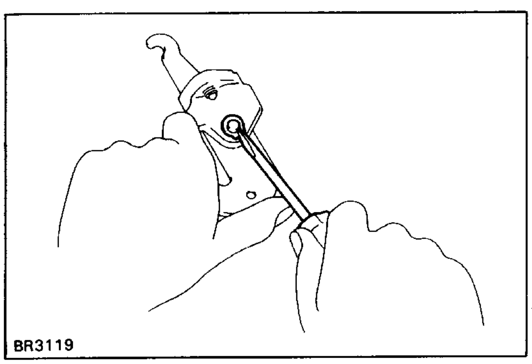


8. REMOVE AND DISASSEMBLE PARKING BRAKE BELLCRANK

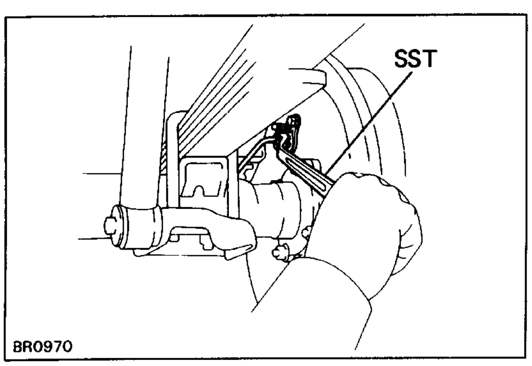
(a) Remove the clip and disconnect the parking brake cable.
(b) Remove the tension spring.



(c) Using a screwdriver, remove the bellcrank No.3 from the backing plate with parking brake cable No. 2.
(d) Remove the parking brake bellcrank No. 1 or No. 2 and dust cover with the two bolts.
(e) Remove the bellcrank boot from the bellcrank bracket.

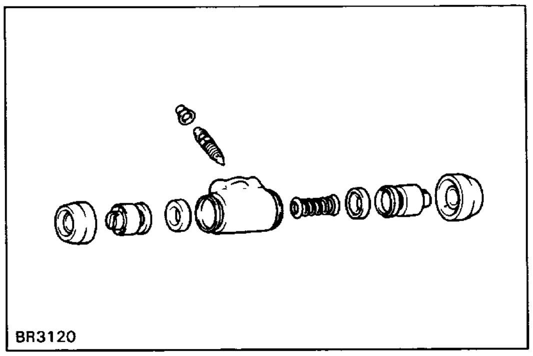


(f) Remove the C–washer and pin.
(g) Remove the par–king brake bellcrank from the bell–crank bracket.



9. REMOVE WHEEL CYLINDER

(a) Using SST, disconnect the brake tube. Use a con–tainer to catch the brake fluid.
SST 09751–36011
(b) Remove the two bolts and the wheel cylinder.



10. DISASSEMBLE WHEEL CYLINDER

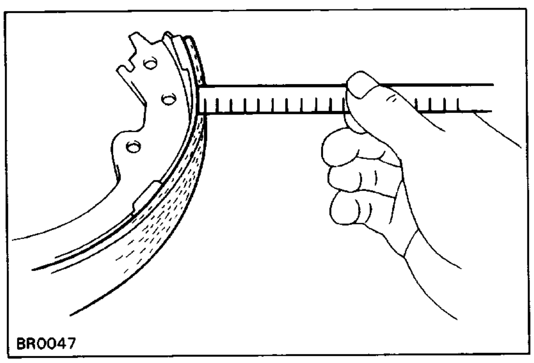
Remove the following parts from the wheel cylinder:

- Two boots
- Two pistons
- Two piston cups
- Spring

INSPECTION AND REPAIR OF REAR BRAKE COMPONENTS

1. INSPECT DISASSEMBLED PARTS

Inspect the disassembled parts for wear, rust or damage.

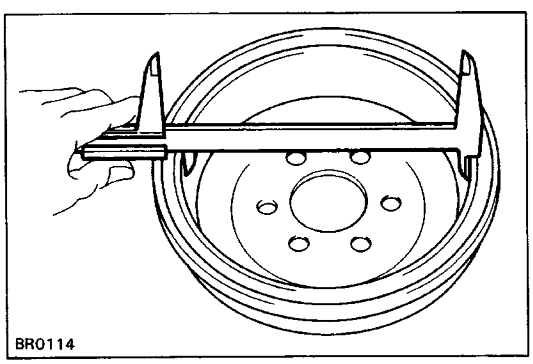


2. MEASURE BRAKE SHOE LINING THICKNESS

Standard thickness: 6.0 mm (0.236 in.)
Minimum thickness: 1.0 mm (0.039 in.)

If the shoe lining is less than minimum or shows signs of uneven wear, replace the brake shoes.

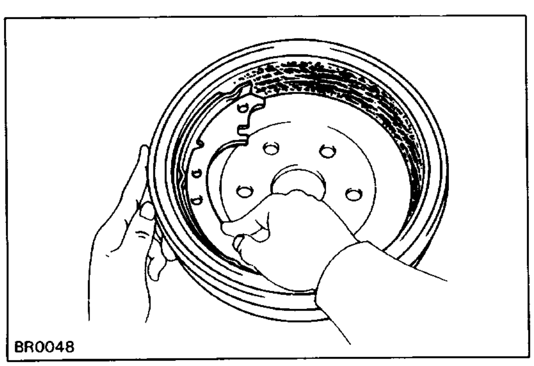
HINT: If any of the brake shoes have to be replaced, re– place all of the rear shoes in order to maintain even brak- ing.



3. MEASURE BRAKE DRUM INSIDE DIAMETER

Standard inside diameter: 295.0 mm (11.61 in.)
Maximum inside diameter: 297.0 mm (11.69 in.)

If the drum is scored or worn, the brake drum may be lathed to the maximum inside diameter.



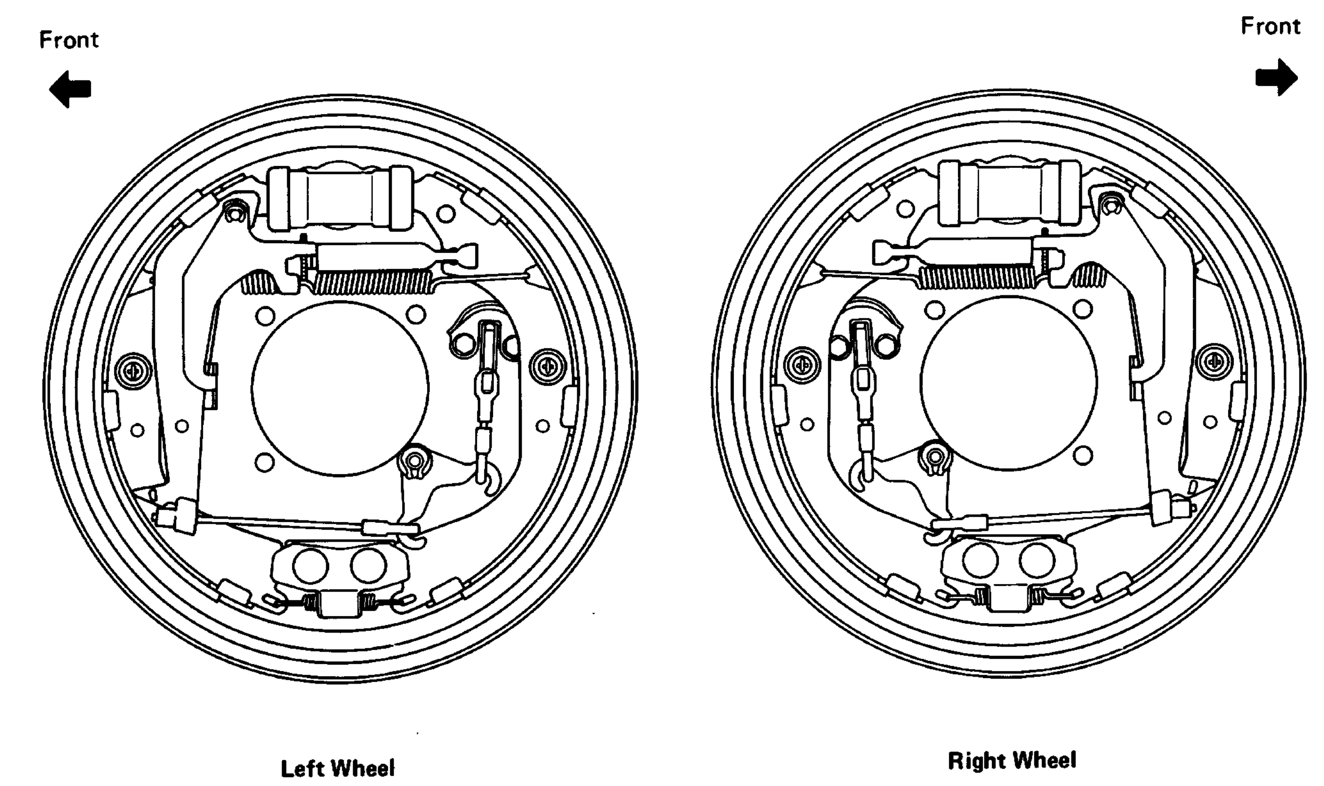
4. INSPECT REAR BRAKE LINING AND DRUM FOR PROP- ER CONTACT

If the contact between the brake lining and drum is im proper, repair the lining with a brake shoe grinder, or re place the brake shoe assembly.

ASSEMBLY OF REAR BRAKES

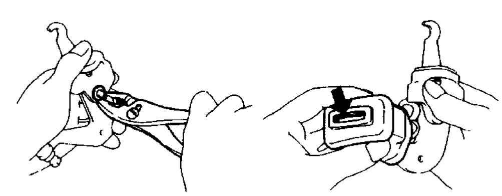
(See page BR–55)

HINT: Assemble the parts in the correct direction as shown.



BR0974

1. ASSEMBLE AND INSTALL PARKING BRAKE BELL-CRANK



BR3121 BR3122

(a) Apply high temperature grease to the rotating parts of the bellcrank.

(b) Apply lithium soap base glycol grease to the bell–crank boot and insert it to the parking brake bell–crank.

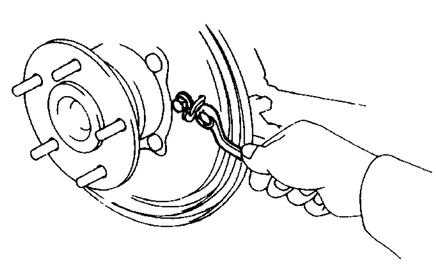
(c) Install the parking brake bellcrank to the bellcrank bracket.

(d) Install the pin with a new C–washer.

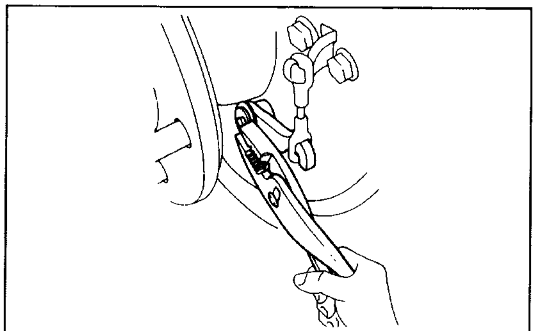
(e) Install the bellcrank boot to the parking brake bell–crank bracket.

(f) Install the parking brake bellcrank and dust cover on the backing plate.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



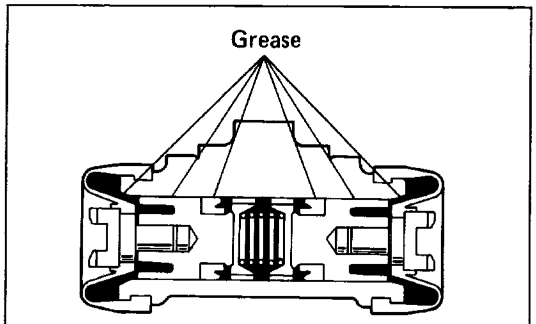
BR0113



BR0116

(g) Install the parking brake cable No.2 to the parking brake bellcrank No. 1 or No. 2.

(h) Hook the bellcrank No. 3 to the cable No. 2, and then install the bellcrank No.3 with a new C–washer.

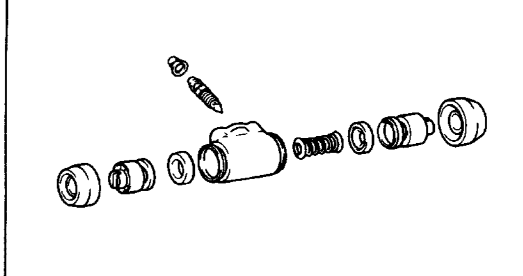


BR3530

2. APPLY LITHIUM SOAP BASE GLYCOL GREASE TO FOLLOWING PARTS:

(a) Two piston cups

(b) Two pistons



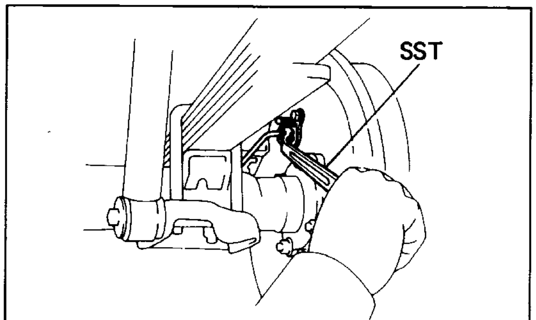
BR3120

3. ASSEMBLE WHEEL CYLINDER

(a) Install the cup to the each piston.

(b) Install the spring and two pistons into the wheel cylinder. Make sure flanges of the cups are pointed inward.

(c) Install the two boots.



BR0970

4. INSTALL WHEEL CYLINDER

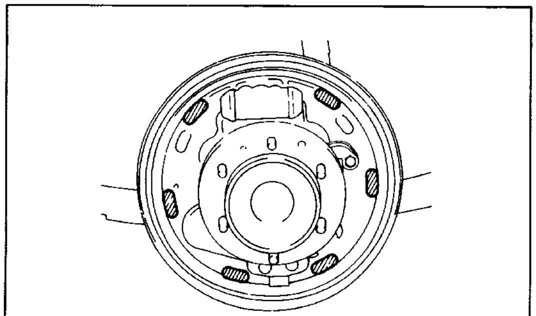
(a) Install the wheel cylinder on the backing plate with two bolts.

Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)

(b) Using SST, connect the brake tube.

SST 09751–36011

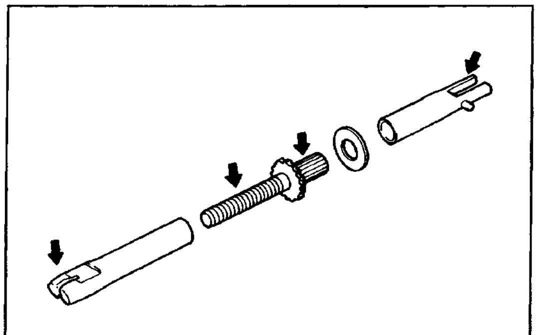
Torque: 15 N–m (155 kgf –cm, 11 ft–lbf)



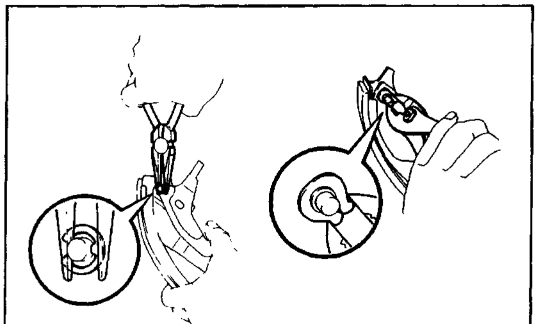
BR0975

5. APPLY HIGH TEMPERATURE GREASE TO BACKING PLATE AND ADJUSTER

(a) Apply high temperature grease to the brake shoe contact surfaces as shown.


BR3123

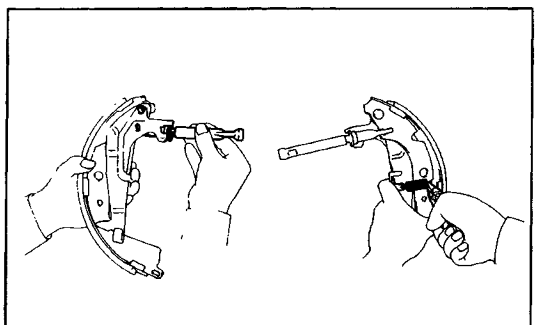
(b) Apply high temperature grease to the adjuster bolt threads and ends.


BR3106 BR3107

6. INSTALL PARKING BRAKE LEVER AND AUTOMATIC ADJUSTING LEVER

(a) Install the parking brake lever with a new C–washer.

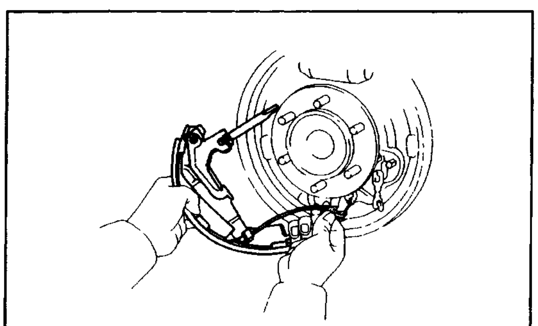
(b) Install the automatic adjusting lever with the E–ring.


BR3118 BR3117

7. INSTALL ADJUSTER TO FRONT SHOE

(a) Install the adjuster to the adjust lever.

(b) Install the adjust lever spring.

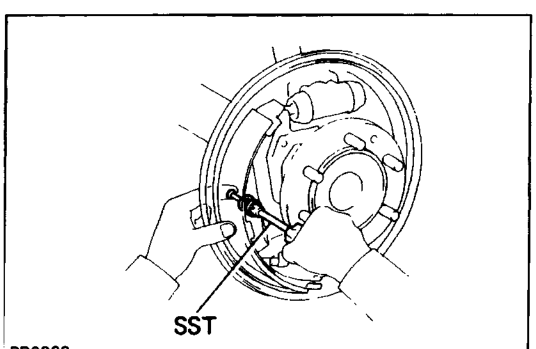

BR0969

8. INSTALL FRONT SHOE

(a) Install the parking brake cable No. 1 to the parking brake shoe lever.

(b) Hook the another side of the cable No. 1 to the bellcrank No.3.

(c) Install the return spring to the front shoe.



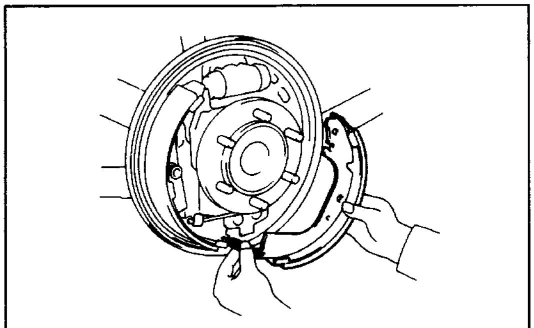
BR0968

(d) Set the front shoe in place with the end of the shoe inserted in the piston.

(e) Using SST, install the shoe hold–down spring, cups and pin.

SST 09718–00010

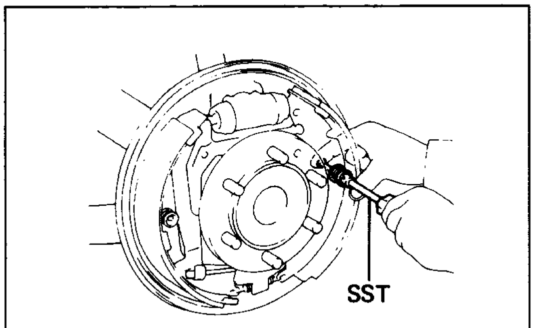
NOTICE: Do not allow oil or grease to get on the rubbing face.


BR0976

9. INSTALL REAR SHOE

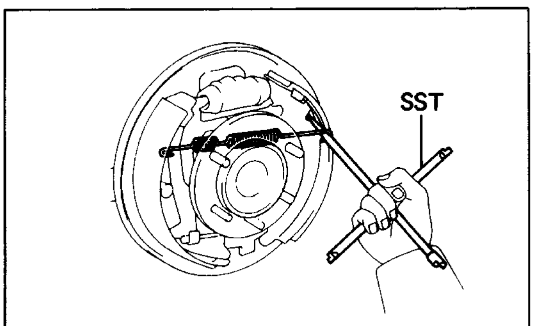
(a) Install the anchor spring between the front and rear shoes.

(b) Set the rear shoe in place with the end of the shoe inserted in the wheel cylinder and the adjuster in place.



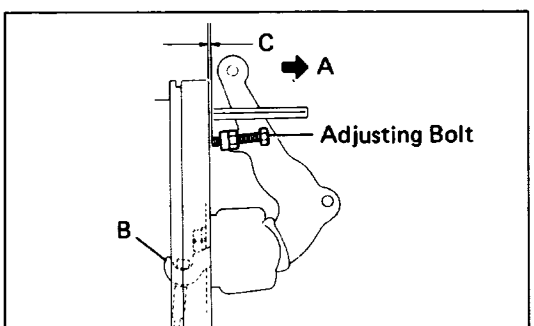
BR0967

(c) Using SST, install the shoe hold down spring, cups and pin.
SST 09718–00010
NOTICE: Do not allow oil or grease to get on the rub–bing face.



BR0977

(d) Using SST, connect the return spring.
SST 09718–00010



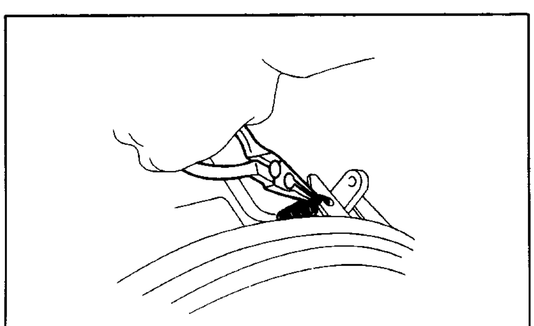
BR0122

10. ADJUST BELLCRANK

(a) Lightly pull the bellcrank in direction A until there is no slack at part B.

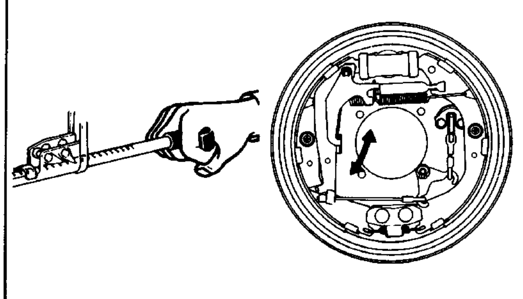
(b) In this condition, turn the adjusting bolt so that di–mension C will be 0.4 – 0.8 mm (0.016 – 0.031 in.).

(c) Lock the adjust bolt with the lock nut.


BR0973

(d) Connect the parking brake cable to the parking brake bellcrank and install the clip.

(e) Install the tension spring.


BR0080 BR0974

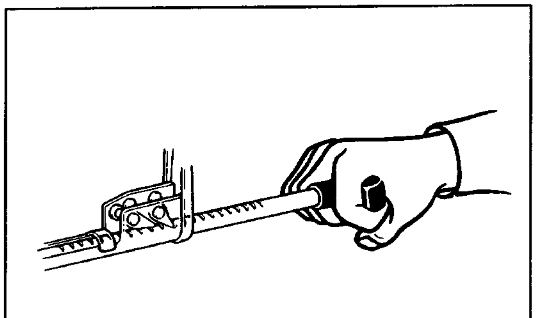
11. CHECK OPERATION OF AUTOMATIC ADJUSTING MECHANISM

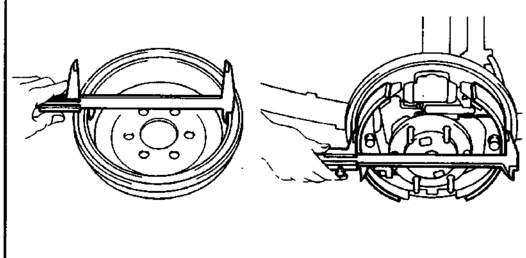
(a) Move the parking brake lever of the front shoe back and forth, as shown. Check that the adjuster turns.
If the adjuster does not turn, check for incorrect instal– lation of the rear brakes.

(b) Adjust the adjuster length to the shortest possible amount.

(c) Install the brake drum.

(d) Pull the parking brake lever all the way up until a clicking sound can no longer be heard.


BR0080


BR0114 BR3273

12. CHECK CLEARANCE BETWEEN BRAKE SHOES AND DRUM

(a) Remove the brake drum.

(b) Measure the brake drum inside diameter and di– ameter of the brake shoes. Check that the differ– ence between the diameters is the correct shoe clearance.
Shoe clearance: 0.6 mm (0.024 in.)
If incorrect, check the parking brake system.

13. INSTALL BRAKE DRUM

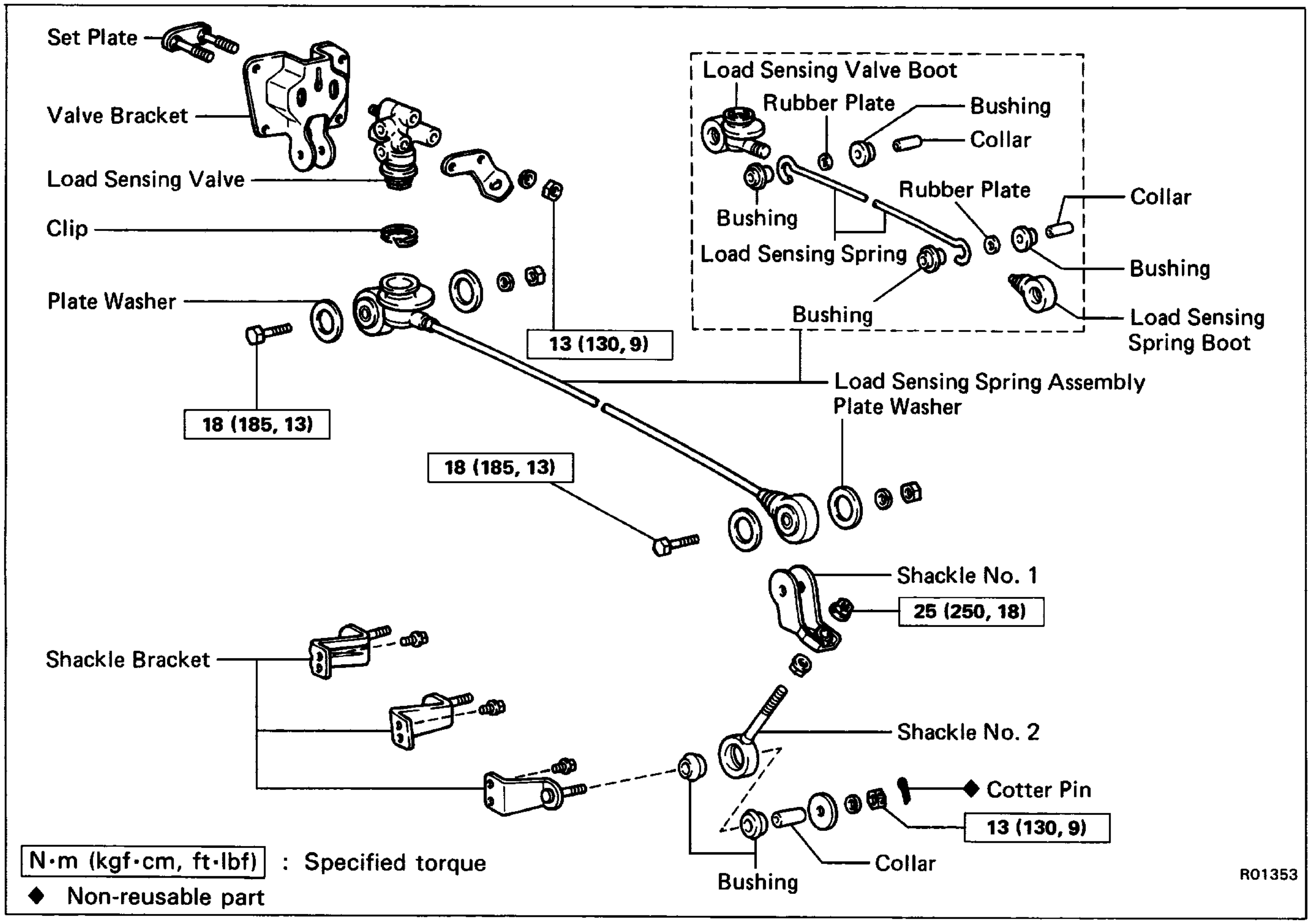
14. INSTALL REAR WHEEL

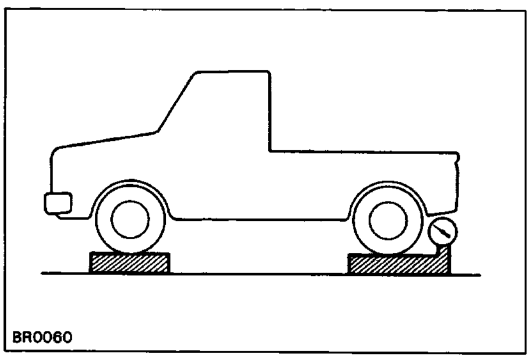
15. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM
(See page BR–8)

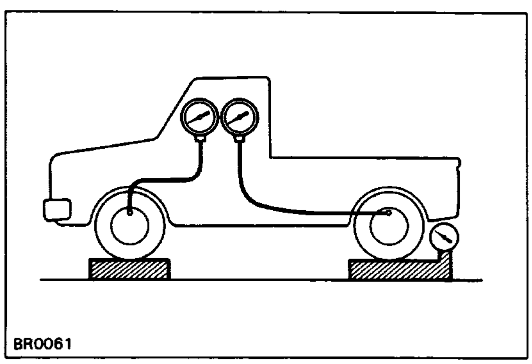
16. CHECK FOR FLUID LEAKAGE

LOAD SENSING PROPORTIONING AND BY–PASS VALVE (LSP & BV)

COMPONENTS







CHECK AND ADJUSTMENT OF FLUID PRESSURE

1. SET REAR AXLE LOAD

Rear axle load (includes vehicle weight):

2WD	**1 ton, C & C (SRW)**	**900 kg (1,984 lb)**
	1/2 ton	**700 kg (1,543 lb)**
	C & C (DRW)	**1,150 kg (2,535 lb)**
4WD		**800 kg (1,764 lb)**

HINT: (For C & C)

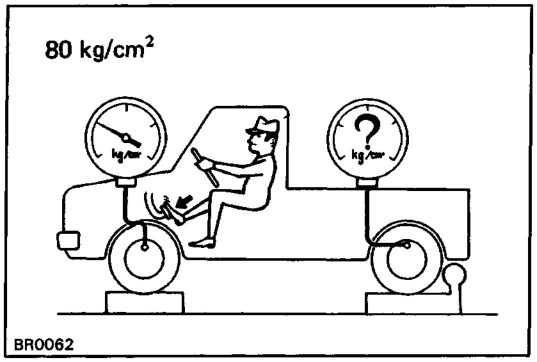
If the vehicle unladen weight exceeds the specification above, set the rear axle load to the specification shown below. (See step 4 on page BR–65)

Rear axle load (includes vehicle weight):

SRW	**1,678 kg (3,699 lb)**
DRW	**1,996 kg (4,400 lb)**

2. INSTALL LSPV GAUGE (SST) AND BLEED AIR

SST 09709–29017

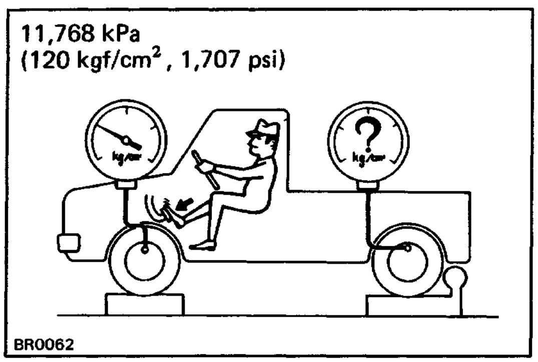


3. RAISE FRONT BRAKE PRESSURE TO 7,845 kPa (80 kgf/cm², 1,138 psi) AND CHECK REAR BRAKE PRES–SURE

Rear brake pressure:

2WD 1 ton, C & C (SRW) 4,413±490 kPa
(45±5kgf/cm², 640±71 psi)
1/2 ton 4,315 t 490 kPa
(44±5 kgf/cm², 626 ± 71 psi)
C & C (DRS) 4,707 ± 490 kPa
(48±5 kgf/cm², 683 ± 71 psi)
4WD Regular cab 3,923±490 kPa
(40±5 kgf/cm², 569±71 psi)
Extra cab 4,315±490 kPa
(43±5 kgf/cm², 626±71 psi)

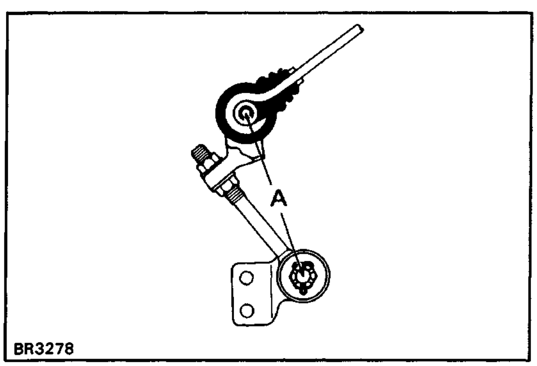
HINT: The brake pedal should not be depressed twice and/or returned while setting to the specified pressure. Read the value of rear brake pressure two seconds after adjusting the specified fluid pressure.
If the brake pressure is incorrect, adjust the fluid pres–sure.



4. (C&C)
RAISE FRONT BRAKE PRESSURE TO 11,768 kPa (120 kgf/cm², 1,707 psi) AND CHECK REAR BRAKE PRES–SURE

Rear brake pressure:

SRW 9,709 ± 588 kPa
(99 ± 6 kgf/cm², 1,408 ± 85 psi)
DRW 8,336 ± 588 kPa
(85 ± 6 kgf/cm², 1,209 ± 85 psi)



5. IF NECESSARY, ADJUST FLUID PRESSURE

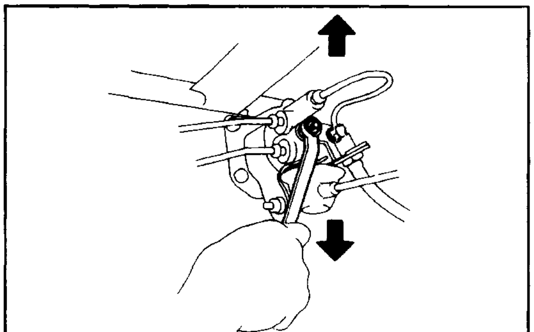
(a) Adjust the length of the No.2 shackle.
Low pressure Lengthen A
High pressure Shorten A

Initial set:
2WD 78 mm (3.07 in.)
4WD 120 mm (4.72 in.)

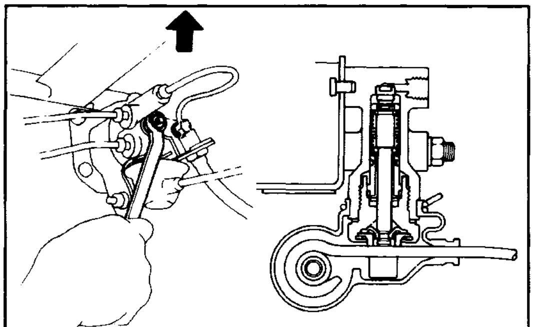
Adjusting range:
2WD 72 – 84 mm (2.83 – 3.31 in.)
4WD 114 – 126 mm (4.49 – 4.96 in.)

HINT: One turn of the nut changes the fluid pressure as shown in the table below.

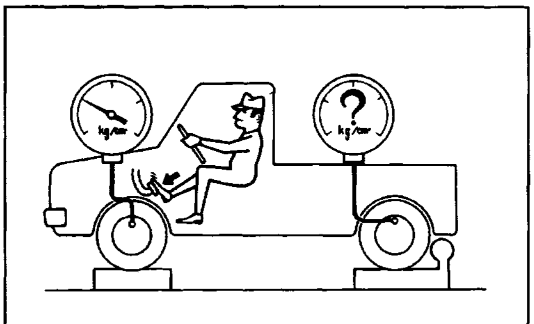
		Rear brake pressure
2WD	1/2 ton, C & C (SRW)	74 kPa (0.75 kgf/cm², 11 psi)
	1 ton, C & C (DRW)	98 kPa (1.0 kgf/cm², 14 psi)
4WD		59 kPa (0.6 kgf/cm², 8.5 psi)


BR0064

(b) In event the pressure cannot be adjusted by the No. 1 shackle, raise or lower the valve body.
Low pressure – Lower
High pressure – Raise
(c) Torque the nuts.
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)
(d) Adjust the length of the No. 1 shackle again.
If it cannot be adjusted, inspect the valve housing.


BR0064 BR0218

6. IF NECESSARY, CHECK VALVE BODY
(a) Assemble the valve body in the uppermost position.
HINT: When the brakes are applied, the piston will move down about 1 mm (0.04 in.). Even at this time, the piston should not make contact with or move the load sensing spring.



BR0062

(b) In this position, check the rear brake pressure.
2WD (SRW) kPa (kgf/cm², psi)

Front brake pressure	Rear brake pressure
490 (5, 71)	490 (5, 71)
2,452 (25, 356)	883 – 1,275 (9 – 13, 128 – 185)
5,884 (60, 853)	1,765 – 2,452 (18 – 25, 256 – 356)

4WD (DRW) kPa (kgf/cm², psi)

Front brake pressure	Rear brake pressure
490 (5, 71)	490 (5, 71)
2,452 (25, 356)	1,020 – 1,412 (10.4 – 14.4, 148 – 205)
5,884 (60, 853)	2,148 – 2,834 (21.9 – 28.9, 311 – 411)

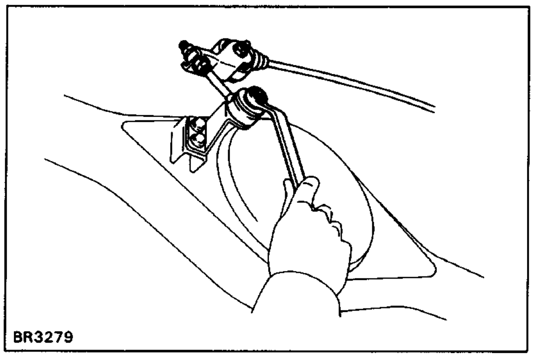
4WD (Regular cab) kPa (kgf/cm², psi)

Front brake pressure	Rear brake pressure
981 (10, 142)	981 (10, 142)
2,452 (25, 356)	1,079 – 1,471 (11 – 15, 156 – 213)
5,884 (60, 853)	1,618 – 2,305 (16.5 – 23.5, 235 – 334)

4WD (Extra cab) kPa (kgf/cm², psi)

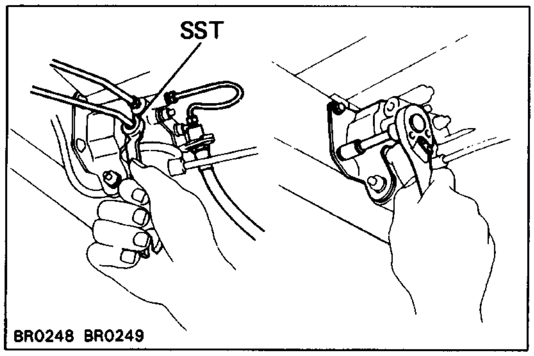
Front brake pressure	Rear brake pressure
981 (10, 142)	981 (10, 142)
2,452 (25,356)	1,157 – 1,549 (11.8 – 15.8, 168 – 225)
5,884 (60, 853)	1,863 – 2,550 (19 – 26, 270 – 370)

If the measured value is not within standard, replace the valve body.



REMOVAL OF LSP & BV OR LSPV
(See page BR–64)

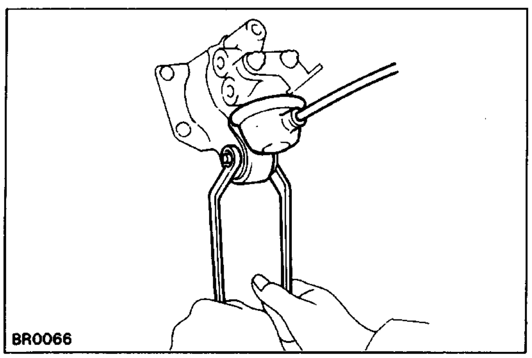
1. DISCONNECT SHACKLE NO.2 FROM BRACKET



2. REMOVE LSP & BV (LSPV) ASSEMBLY

(a) Using SST, disconnect the brake tube from the valve body.
SST 09751–36011

(b) Remove the valve bracket mounting bolts and re– move the LSP & BV (LSPV) assembly.

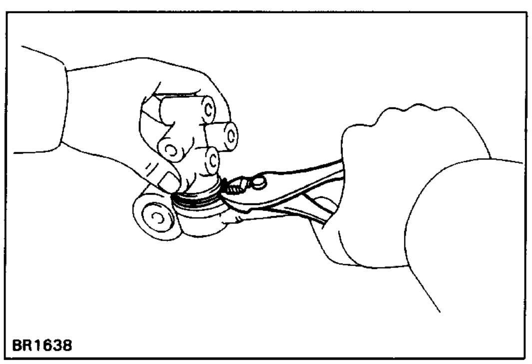


DISASSEMBLY OF LSP & BV OR LSPV ASSEMBLY

1. REMOVE VALVE BRACKET

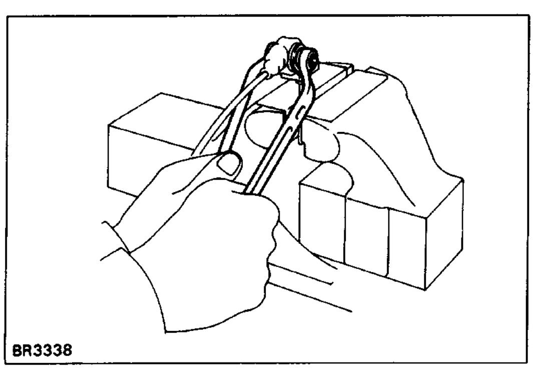
(a) Remove the nut and bolt as shown.

(b) Remove the two nuts, and remove the bracket and set plate from the valve body.



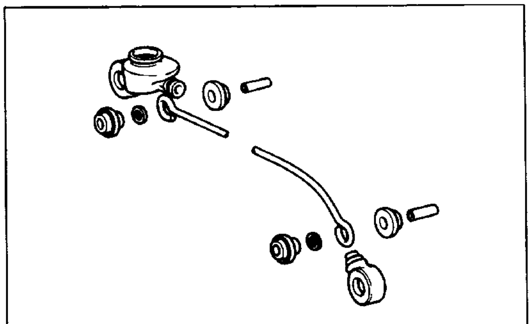
2. DISCONNECT SPRING FROM VALVE

Using pliers, remove the clip, and remove the spring from the valve.



3. REMOVE SHACKLE NO. 1 AND NO.2

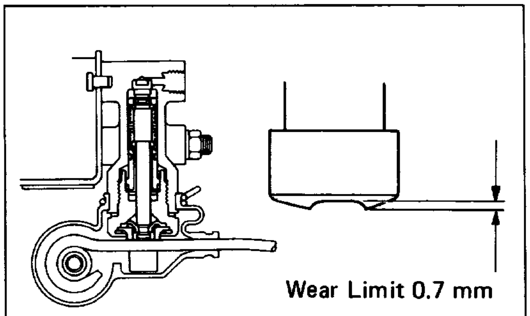
Remove the nut and bolt, and then remove the shackle No.1 and No.2, and two plate washers from the load sensing spring assembly.


BR0589

4. DISASSEMBLE LOAD SENSING SPRING

Disassemble the following parts.

(a) Bushings
(b) Collars
(c) Rubber plates
(d) Load sensing valve boot
(e) Load sensing spring boot

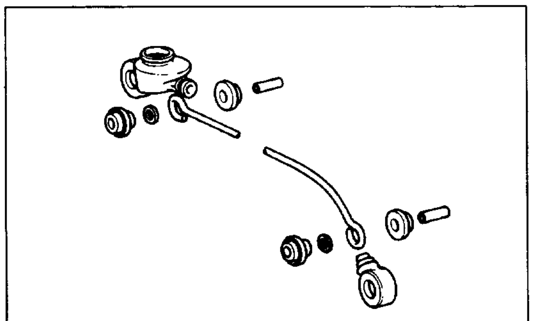


BR0218 BR3610

INSPECTION OF LSP & BV OR LSPV

INSPECT VALVE PISTON PIN AND LOAD SENSING CONTACT SURFACE FOR WEAR

Wear limit: 0.7 mm (0.028 in.)


BR0589

ASSEMBLY OF LSP & BV OR LSPV

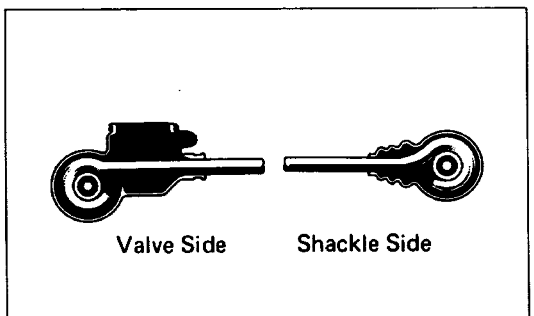
(See page BR–64)

1. ASSEMBLE FOLLOWING PARTS TO LOAD SENSING SPRING:

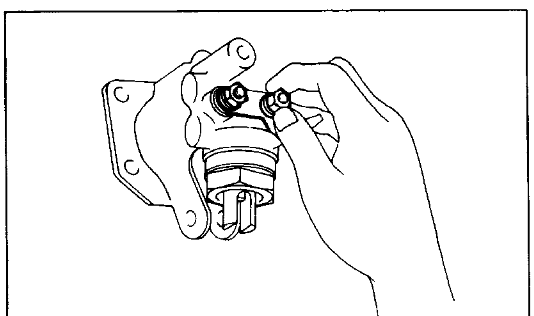
(a) Load sensing valve boot
(b) Load sensing spring boot
(c) Bushings
(d) Rubber plates
(e) Collars

HINT: Apply lithium soap glycol grease to all rubbing areas.

Do not mistake the valve side for the shackle side of the load sensing spring.



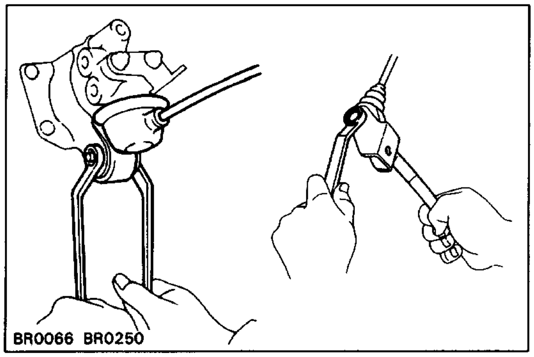
BR0070


BR0065

2. ASSEMBLE VALVE BODY TO BRACKET

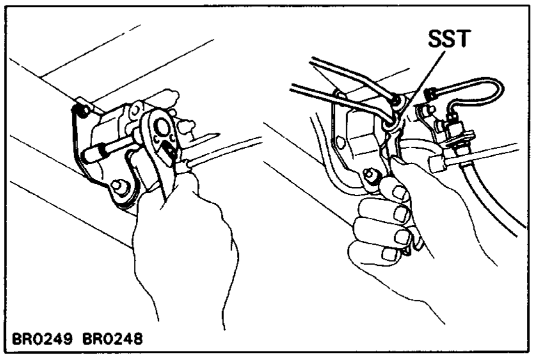
Assemble the valve body to the valve body bracket.

HINT: Finger tighten the valve body mounting nuts.



3. CONNECT VALVE BODY AND NO. 1 SHACKLE TO LOAD SENSING SPRING

CAUTION: When connecting the shackle to the load sensing spring with a bolt and nut, insert the bolt from the front side of vehicle.



INSTALLATION OF LSPV & BV OR LSPV

1. INSTALL LSP & BV (LSPV) ASSEMBLY TO FRAME

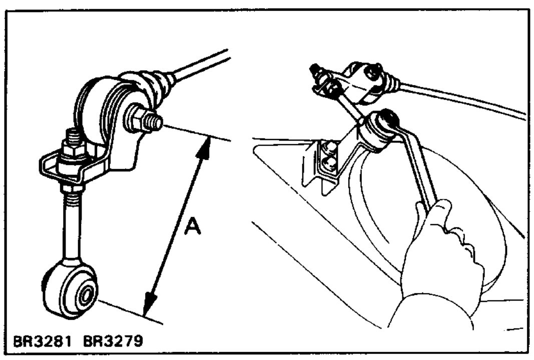
Torque: 19 N–m (195 kgf –cm, 14 ft–lbf)

2. CONNECT BRAKE TUBE

Using SST, connect the brake tubes.

Torque: 15 N–m (155 kgf–cm, 11 ft–lbf)

SST 09751–36011



3. CONNECT SHACKLE NO.2 BRACKET

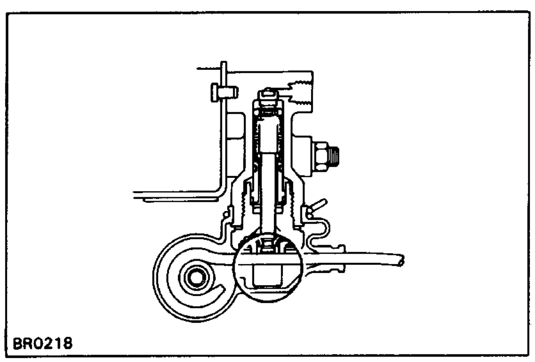
(a) Install the shackle No.2 to the load sensing spring.

(b) Set dimension A.

Initial set: 2WD 78 mm (3.07 in.)

4WD 120 mm (4.72 in.)

(c) Connect the shackle No.2 to the shackle bracket.



4. SET REAR AXLE LOAD (See page BR–64)

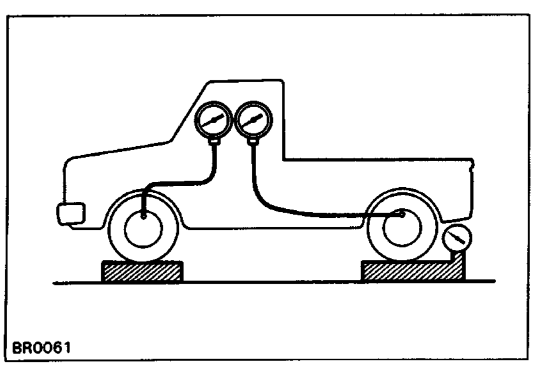
5. SET VALVE BODY

(a) When pulling down the load sensing spring, confirm that. the valve piston moves down smoothly.

(b) Position the valve body so that the valve piston lightly contacts load sensing spring.

(c) Tighten the valve body mounting nuts.

6. BLEED BRAKE LINE (See page BR–8)



7. CHECK AND ADJUST LSP & BV OR (LSPV) FLUID PRESSURE (See page BR–64)

8. APPLY SEALANT TO SHACKLE NO.2

Apply sealant to the top portion of the shackle No.2 bolt threads not to lose the upper lock nut.

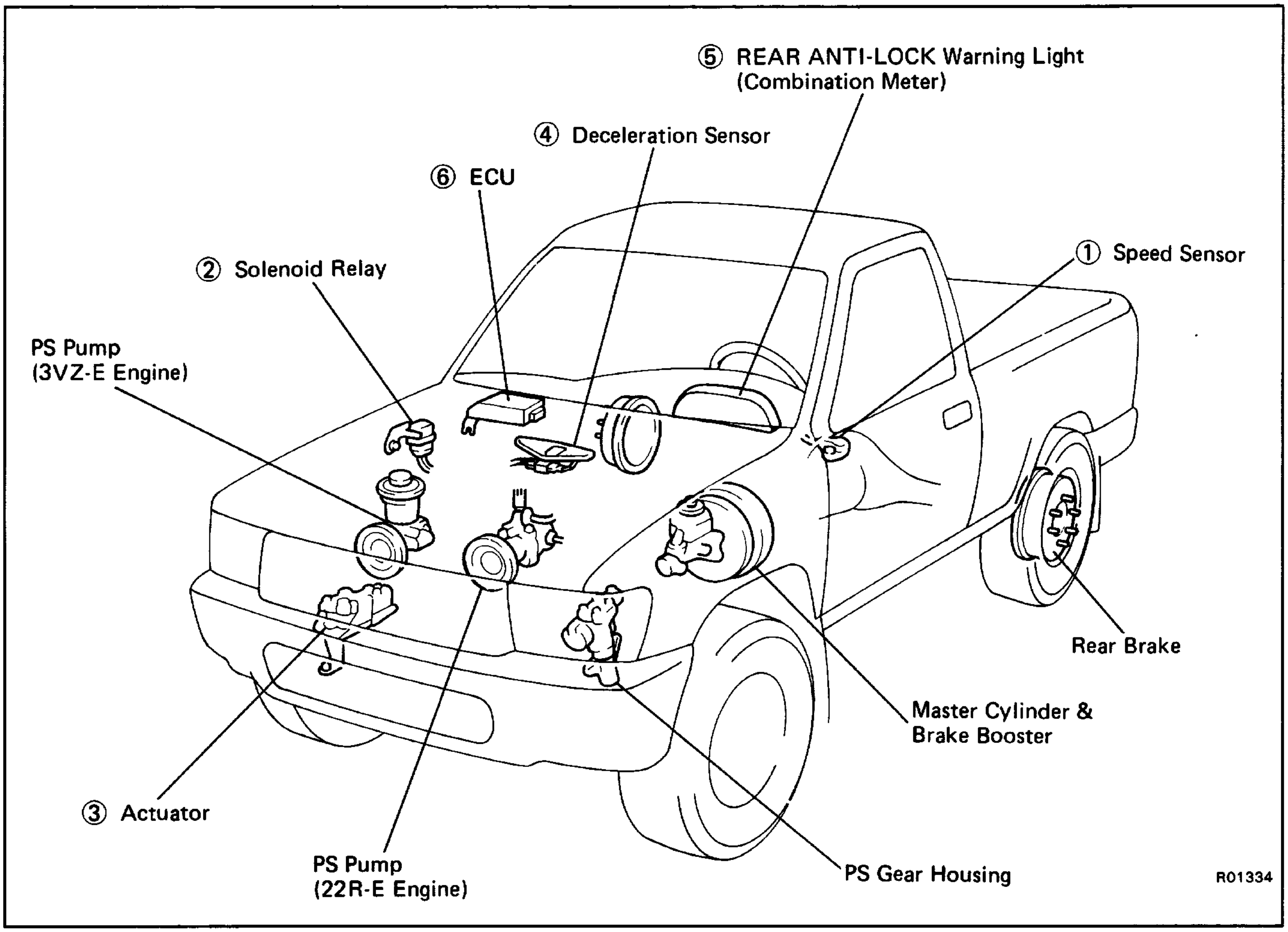
Sealant: Part No. 08833–00070, THREE BOND 1324 or equivalent

REAR–WHEEL ANTI–LOCK BRAKE SYSTEM

General Description

- The Rear–Wheel Anti–Lock Brake System is a brake system which controls the wheel cylinder hydraulic pressure of the rear wheels during sudden braking and braking on slippery road surfaces, preventing the rear wheels from locking.
- In case a malfunction occurs, a diagnosis function and fail–safe system have been adopted for the Rear–Wheel Anti–Lock Brake System to increase serviceability.

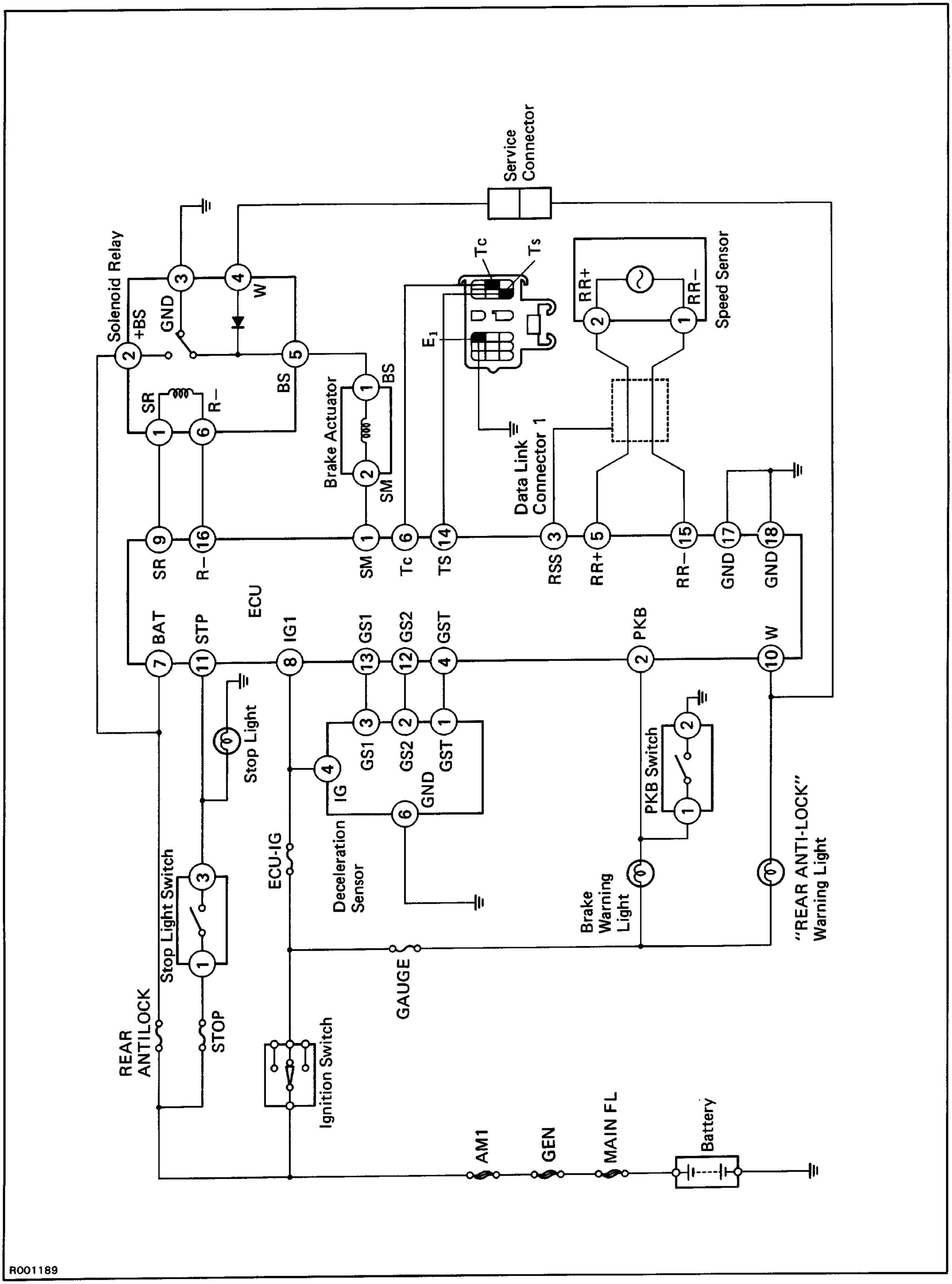
LOCATION OF SYSTEM COMPONENTS



FUNCTION OF COMPONENTS

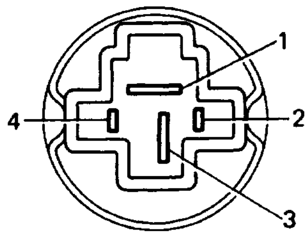
No.	Components	Function
1	Speed Sensor	Detects the wheel speed from the rotation of the rear differential ring gear.
2	Solenoid Relay	Supplies electric current to the solenoid valve of the actuator.
3	Actuator	Controls the brake fluid pressure to rear brake wheel cylinders through signals from the ECU.
4	Deceleration Sensor	Detects the vehicle deceleration rate from the deceleration of the body.
5	REAR ANTI–LOCK Warning Light	Lights up to alert the driver when trouble has occurred in the Rear–wheel Anti–Lock Brake System.
6	ECU	According the wheel speed signals from the speed sensor and vehicle deceleration signals from the deceleration sensor, it calculates acceleration, deceleration and slip values and sends signals to the actuator to control brake fluid pressure.

WIRING DIAGRAM

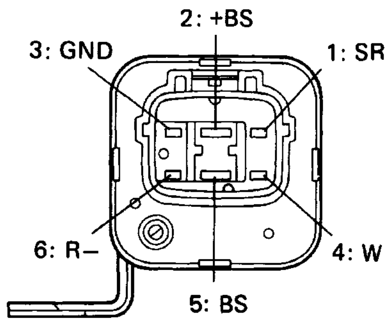


CONNECTORS

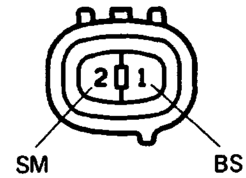
Stop Light Switch



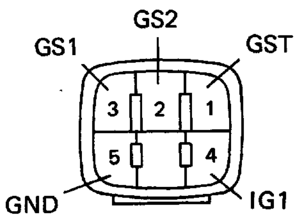
Solenoid Relay



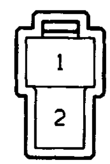
Brake Actuator



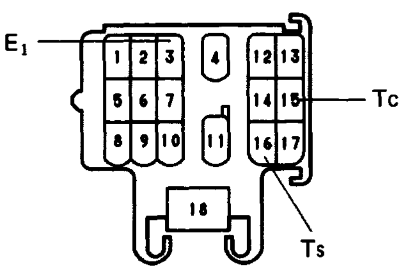
Deceleration Sensor



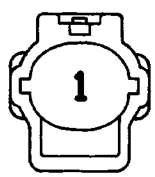
Parking Brake Switch



Data Link Connector 1

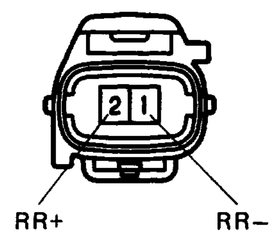


Service Connector

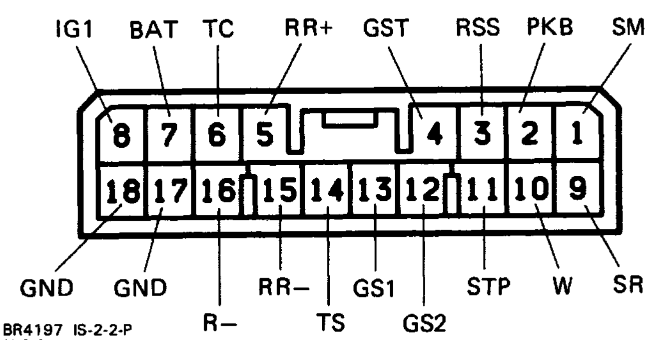


(Solenoid Relay Side)

Speed Sensor

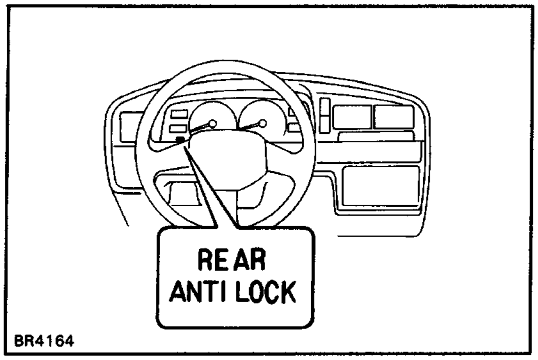


Rear-Wheel Anti-Lock Brake System ECU



BE0336 BR4197 IS-2-2-P
R01331 H-2-2
SH-18-1 R01332 Ie-2-2-F
V-18-2

Diagnosis System



DESCRIPTION

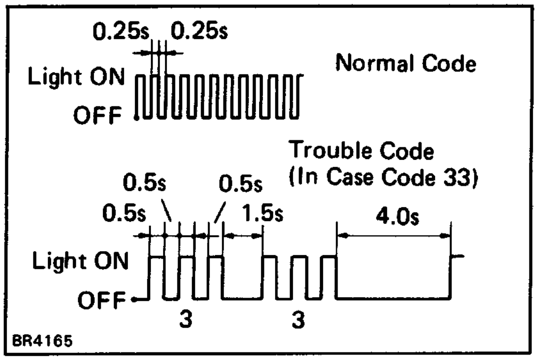
If a functional malfunction occurs, diagnosis system will identify the problem and ECU stores the codes for the trouble items.

At the same time, the system informs the driver of a mal–function via the ”REAR ANTILOCK” warning light in the combination meter.

By turning on the ignition switch and disconnecting the service connector, the trouble can be identified by the number of blinks (diagnosis code) of the warning light.

In event of two codes, that having the smallest number (code) will be identified first.

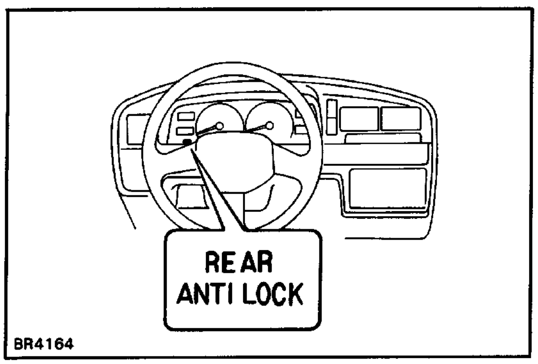
HINT: The warning light do not show the diagnostic trouble codes while the vehicle is running.



INSPECTION OF DIAGNOSIS SYSTEM

1. INSPECT BATTERY POSITIVE VOLTAGE

Inspect that the battery positive voltage is about 12 V.

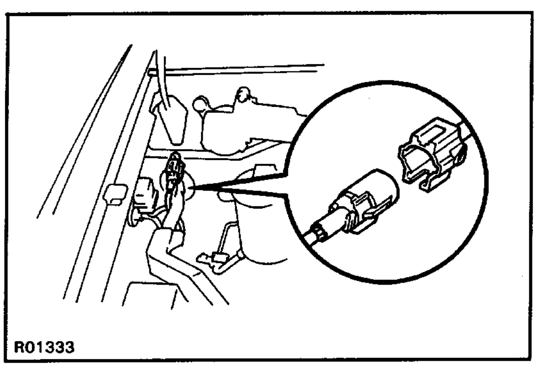


2. CHECK THAT WARNING LIGHT TURNS ON

(a) Turn the ignition switch to ON.

(b) Check that the ”REAR ANTILOCK” warning light turns on for about 3 seconds.

If not, inspect and repair or replace the fuse, bulb and wire harness.

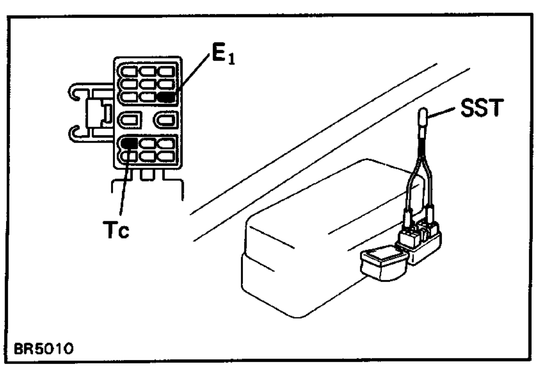


3. READ DIAGNOSTIC TROUBLE CODE

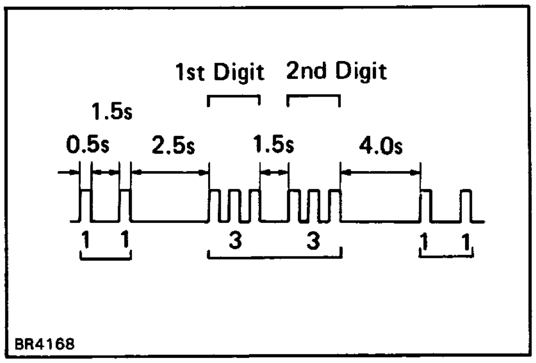
(a) Turn the ignition switch to ON.

(b) Disconnect the service connector.

SST 09843–18020



(c) Using SST, connect the terminal Tc to E, of the data link connector 1.

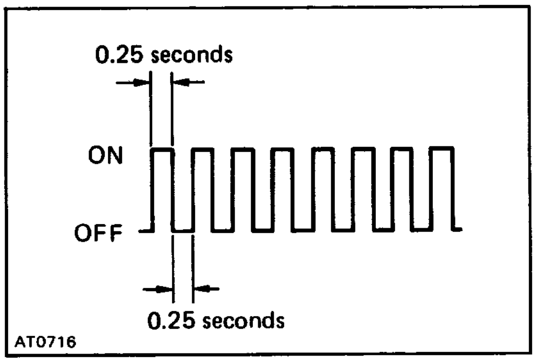


(d) In event of a malfunction, 4 seconds later the warn–ing light will begin to blink. Read the number of blinks.

(See DIAGNOSTIC TROUBLE CODE on page BR–75)

HINT: The first number of blinks will equal the first digit of a two digit diagnostic trouble code. After a 1.5 sec–onds pause, the 2nd number of blinks will equal the 2nd number of a two digit code. If there are two or more codes, there will be a 2.5 seconds pause between each, and indication will begin after 4.0 seconds pause from the smaller value and continue in order to larger.

(e) If the system is operating normally (no malfunction), the warning light will blink 2 times per second.

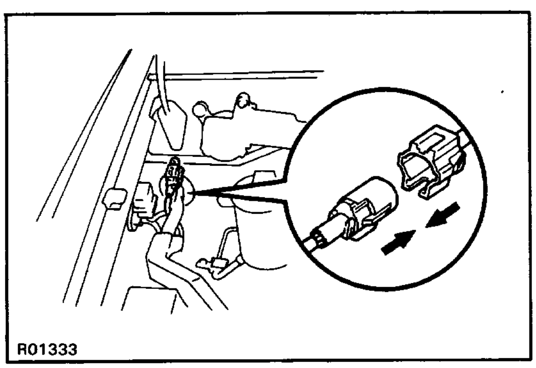


(f) Repair the malfunctioning parts.

(g) After the malfunctioning parts has been repaired, clear the diagnostic trouble codes stored in the ECU . (See page BR–76)

HINT: If you disconnect the battery cable while re-pairing, all diagnostic trouble codes in the ECU will be erased.

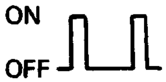
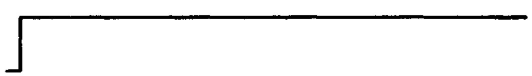
(h) Disconnect the terminal Tc from El of the data link connector 1.



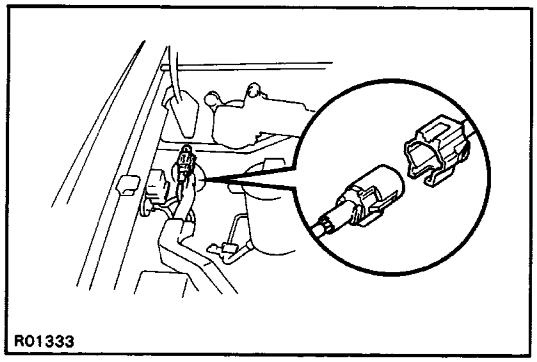
(i) Connect the service connector.

Turn the ignition switch to ON, and check that the ”REAR ANTILOCK” warning light goes off after the warning light goes on for about 2 seconds.

DIAGNOSTIC TROUBLE CODE

Code No.	Light Pattern	Diagnosis	Trouble Part
11		Open circuit in solenoid relay circuit or solenoid circuit	• Solenoid • Solenoid relay • Wire harness and connec–tor of solenoid and/or sole–noid relay circuit
12		Short circuit in solenoid relay circuit	
25		Short circuit in solenoid circuit	
33		Open or short circuit in speed sensor circuit	• Speed sensor • Wire harness and connec–tor of speed sensor circuit
41		Low battery positive voltage (9.5 V or lower	• Battery
42		Abnormally high battery positive voltage 0 7 V or higher)	
43		Mechanical malfunction in deceleration sensor	• Deceleration sensor • Wire harness and connec–tor of deceleration sensor circuit
44		Electrical malfunction in deceleration sensor circuit	
Always ON		Malfunction in ECU	• ECU

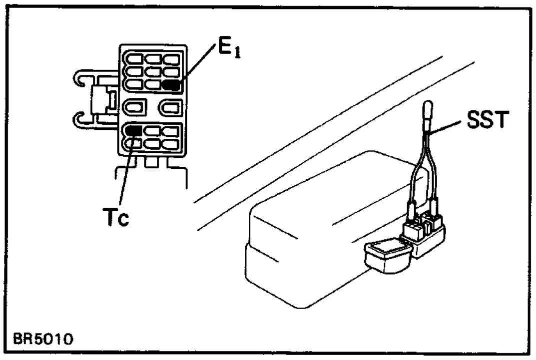
BR4169



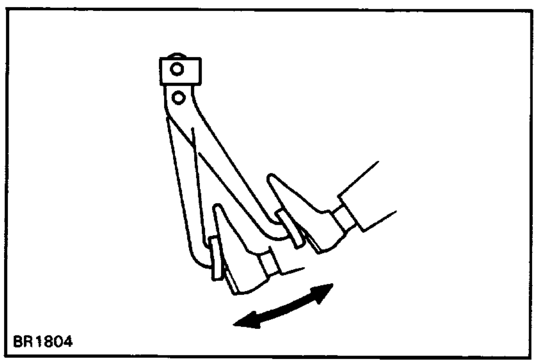
CLEARING OF DIAGNOSTIC TROUBLE CODES

CLEAR DIAGNOSTIC TROUBLE CODES

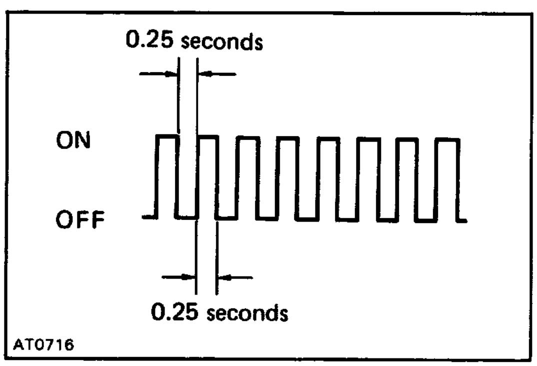
(a) Turn the ignition switch to ON.
(b) Disconnect the service connector.
HINT: Keep the vehicle stopped (vehicle speed 0 km/h (0 mph)).



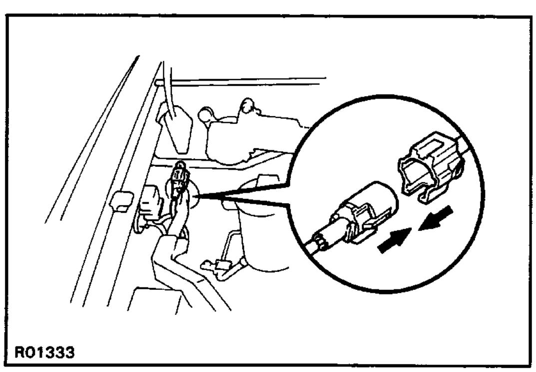
(c) Using SST, connect the terminal Tc to E, of the data link connector 1.
SST 09843–18020



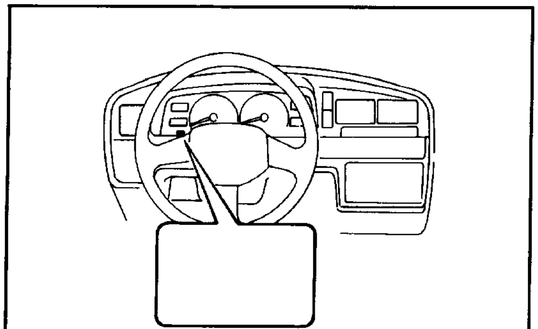
(d) Clear the diagnostic trouble codes stored in ECU by depressing the brake pedal 8 or more times within 3 seconds.



(e) Check that the warning light shows the –normal code.
If the warning light still shows the diagnostic trouble codes, check for cause and repair or replace the trouble
parts, then clear the diagnostic trouble codes again.



(f) Connect the service connector.
(g) Disconnect the terminal Tc from E, of the data link connector 1.


BR4170

(h) Check that the warning light goes off.

Troubleshooting

Problem		No.
”REAR ANTILOCK” warning light	Always comes on after ignition switch is turned to ON.	1
	Does not come on for about 3 seconds after ignition switch on.	2
	Comes on and off.	3
	Comes on while running.	1
Brake working	Brakes pull.	4
	Braking inefficient.	4
	Rear–Wheel Anti–Lock Brake System operates at ordinary braking.	4
	Rear–Wheel Anti–Lock Brake System operates just before stopping at ordinary braking.	4
	Brake pedal pulsates abnormally while Rear–Wheel Anti–Lock Brake System is operating.	4
	Skidding noise occurs while Rear–Wheel Anti–Lock Brake System working. (Rear–Wheel Anti–Lock Brake System works inefficiently)	5

1 ”REAR ANTILOCK” warning light comes on.

Disconnect service connector and con–nect the terminal Tc to E, of the data link connector 1. (See page BR–73)

↓

Does warning light always come on or show the normal code ? (Ignition switch on)

NO → See diagnostic trouble code. (See page BR–75)

YES ↓

Continued on page BR–79

Continued from page BR–78

Is connector of ECU properly connected ? And are all terminals in the connector ?

NO → Faulty connector.

YES

Is there 10 – 14 V between terminal IG on ECU wire harness side connector and body ground ? (Ignition switch on)

NO → Faulty power circuit.

YES

Does warning light come off when both the ECU connector and solenoid relay connector are disconnected ? (Ignition switch on)

NO (Come on) → Short circuit in wire harness between ECU termi– nal W and solenoid relay terminal W.

YES (Come off)

Faulty ECU.

2	**”REAR ANTILOCK” warning light does not come on for about 2 seconds after ignition switch on.**

Disconnect service connector and ground the terminal W of the wire harness side connector. (Ignition switch on)

↓

Does warning light come on ?

- **NO** → Bulb burned out or open circuit in wire harness between warning light and service connector ter–minal W.
- YES ↓

Disconnect connector from ECU and sole–noid relay, and ground terminal W of ECU wire harness side connector.
(ignition switch on)

↓

Does warning light come on ?

- **NO** → Open circuit in wire harness between ECU termi–nal W and warning light.
- YES ↓

With ignition switch off, disconnect sole–noid relay connector, and check continu–ity between terminal W and BS on sole–noid relay side.

↓

Reverse tester leads and check again. Is there one way continuity between termi–nals ?

- **NO** → Short circuit in solenoid relay inside diode.
- YES ↓

Faulty ECU.

HINT: If the diode is short–circuited, a malfunction at ECU terminal W will occur.
When inspecting the terminal, connect the ECU con–nector and disconnect solenoid relay connector. Then turn the ignition switch on, and check that the warn–ing light goes on. If it does, the ECU terminal is OK.

3	**”’REAR ANTILOCK” warning light comes on and off .**

- Short circuit in wire harness between ECU terminal TS and data link connector 1 terminal Ts.
- Short circuit in wire harness between ECU terminal TC and data link connector 1 terminal Tc.

4	• **Braking inefficient.** • **Rear–Wheel Anti–Lock Brake System operates at ordinary braking.** • **Rear–Wheel Anti–Lock Brake System operates just before stopping at ordinary braking.** • **Brake pedal pulsates abnormally while Rear–Wheel Anti–Lock Brake System working.**

Disconnect service connector and con– nect the terminal Tc to E, of the data link connector 1. (See page BR–73)

↓

Does warning light show the diagnostic normal code ? (Ignition switch on) — **NO** → See diagnostic trouble code. (See page BR–75)

YES ↓

Try deceleration sensor operation diagno– sis system. Is sensor OK ?(See page BR–84) — **NO** → Faulty deceleration sensor or sensor installation faulty.

YES ↓

Try speed sensor diagnosis system. Is speed sensor OK ? (See page BR–84) — **NO** → Inspect speed sensor, and replace if necessary.

YES ↓

Is speed sensor installed in place ? And is installation bolt tightened securely ? — **NO** → Speed sensor– installation faulty.

YES ↓

Continued on page BR–82

Continued from page BR–81

Is there foreign material or ferric chips on the speed sensor tip ?

- YES → Clean chips from speed sensor.
- NO ↓

Disconnect connector from ECU and inspect continuity between speed sensor terminals on wire harness side.

↓

Does any abnormal change occur in continuity when the connector or wire harness of speed sensor and intermedi–ate connectors are twisted or bent ?

- YES (Ab–normal change) → Faulty wire harness.
- NO (No change) ↓

Inspect actuator operation.
(See page BR–88)

↓

Is actuator operation OK ?

- NO → Faulty actuator.
- YES ↓

Inspect differential ring gear serrations.
Are serrations OK ?

- NO → Faulty sensor rotor.
(Differential ring gear)
- YES ↓

Faulty ECU.

5 Rear–Wheel Anti–Lock Brake System works inefficiently.

Disconnect service connector and con–nect the terminal Tc to E , of the data link connector

1. (See page BR–73)

↓

Does warning light show the diagnostic normal code ?
(Ignition switch on)

NO → See diagnostic trouble code.
(See page BR–75)

YES ↓

Is there battery positive voltage be–tween ECU terminal STP and body ground when depressing brake pedal ?

NO → Open circuit in stop light switch and/or wire harness.

YES ↓

Inspect actuator.
(See page BR–87)

Deceleration Sensor and Speed Sensor Diagnosis System

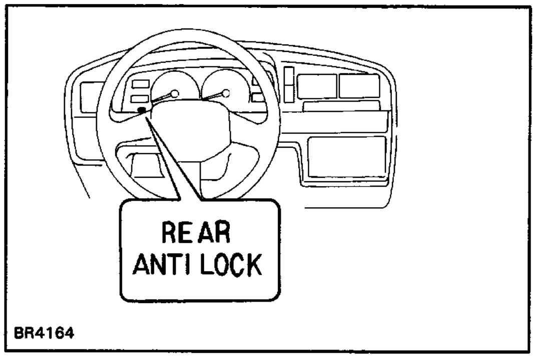
PRECAUTION

- While checking the deceleration sensor and speed sen–sor diagnosis system, the Rear–Wheel Anti–Lock Brake System does not work and brake system works as nor–mal brake system.

INSPECTION OF DIAGNOSIS SYSTEM

1. INSPECT BATTERY POSITIVE VOLTAGE

Inspect that the battery positive voltage is about 12 V.



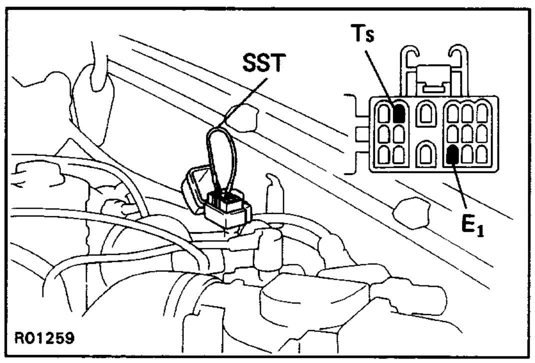
2. CHECK THAT WARNING LIGHT TURNS ON

(a) Turn the ignition switch to ON.

(b) Check that the ”REAR ANTI–LOCK” warning light turns on for about 3 seconds.
If not, inspect and repair or replace the fuse, bulb and wire harness.

(e) Check that the ”REAR ANTI–LOCK” warning light turns off.

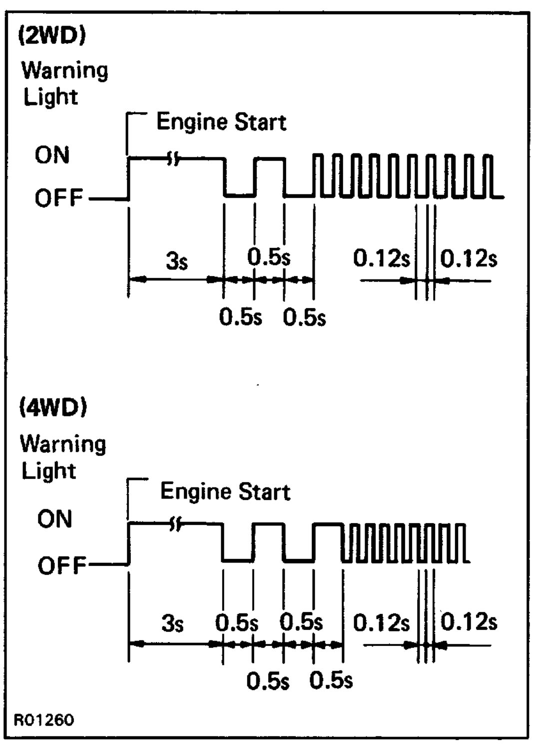
(d) Turn the ignition switch to OFF.



3. PERFORM FOLLOWING STEPS

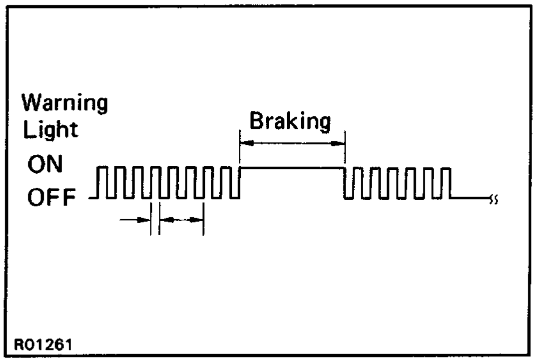
(a) Using SST, connect the terminal Ts to El of the data link connector 1.
SST 09843–18020

(b) Start the engine.



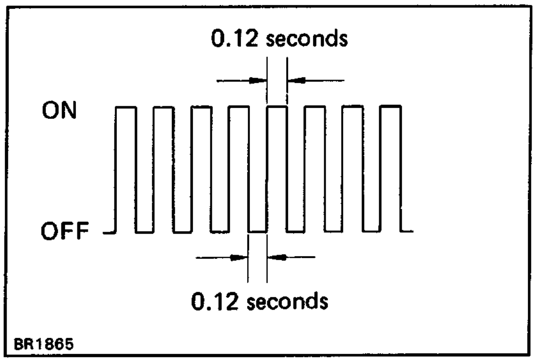
(c) (2 WD model)
Check that the warning light blinks about 4 times every 1 second after blinking 1 time in 1.5 seconds as shown.

(d) (4 WD model)
Check that the warning light blinks about 4 times every 1 second after blinking 2 times in 2.0 seconds as shown.



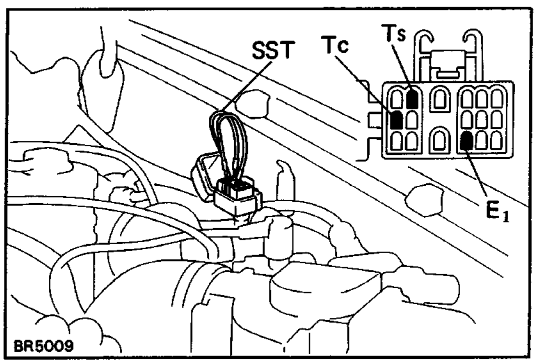
(e) Drive the vehicle straight ahead at about 20 km/h (12.4 mph) or more, depress the brake pedal strongly.

(f) Check that the warning light turns on while braking.

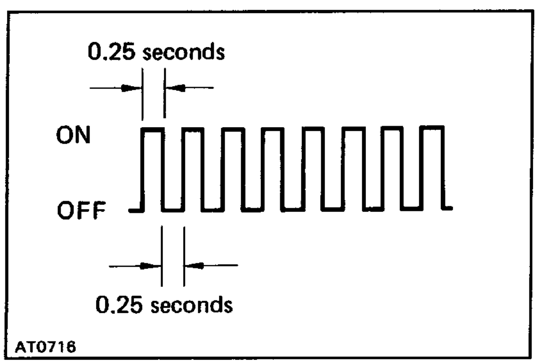


(g) Drive the vehicle straight ahead at about 50 km/h (31 mph) or more, and stop the vehicle.

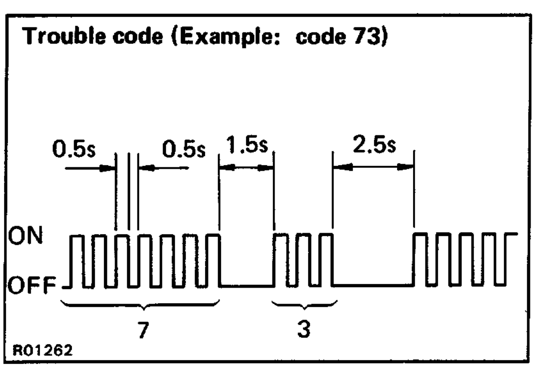
(h) Check that the warning light blinks about 4 times every 1 second as shown.



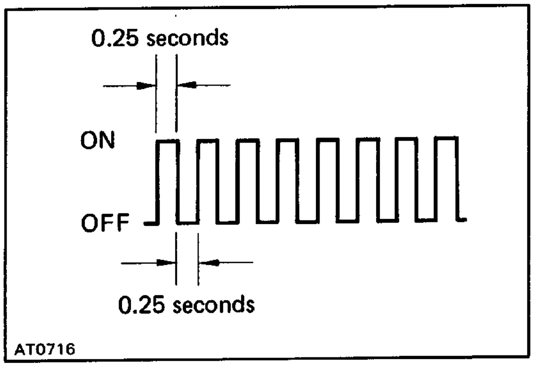
(i) Using SST, connect terminals Tc and E 1 of the data link connector 1.
SST 09843–18020

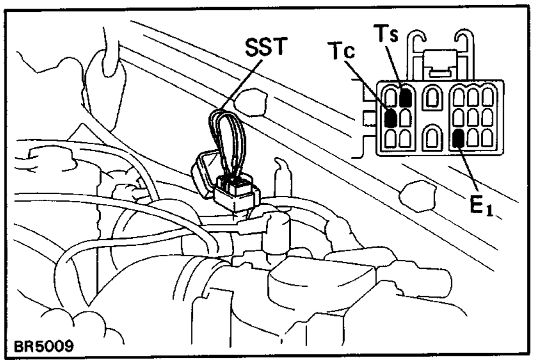


(j) Check that the warning light shows the normal code.



(k) In event of a malfunction, 2.5 seconds later the warning light will begin to blink. Read the number of blinks.
(See DIAGNOSTIC TROUBLE CODE on page BR–86)
HINT: The first number of blinks will equal the first digit of a two digit diagnostic trouble code. After a 1.5 sec–onds pause, the 2nd number of blinks will equal the 2nd number of a two digit code. If there are two or more codes, there will be a 2.5 seconds pause between each,
and indication will begin after 2.5 seconds pause from the smaller value and continue in order to larger.





(l) If the system is operating normally (no malfunction), the warning light will blink once every 0.5 seconds.

(m) Repair the system.

(n) After the malfunctioning components have been re–paired, clear the diagnostic trouble codes stored in the ECU.
(See page BR–76)
HINT: If you disconnect the battery cable while re-pair–
ing, all diagnostic trouble codes in the ECU will be erased.

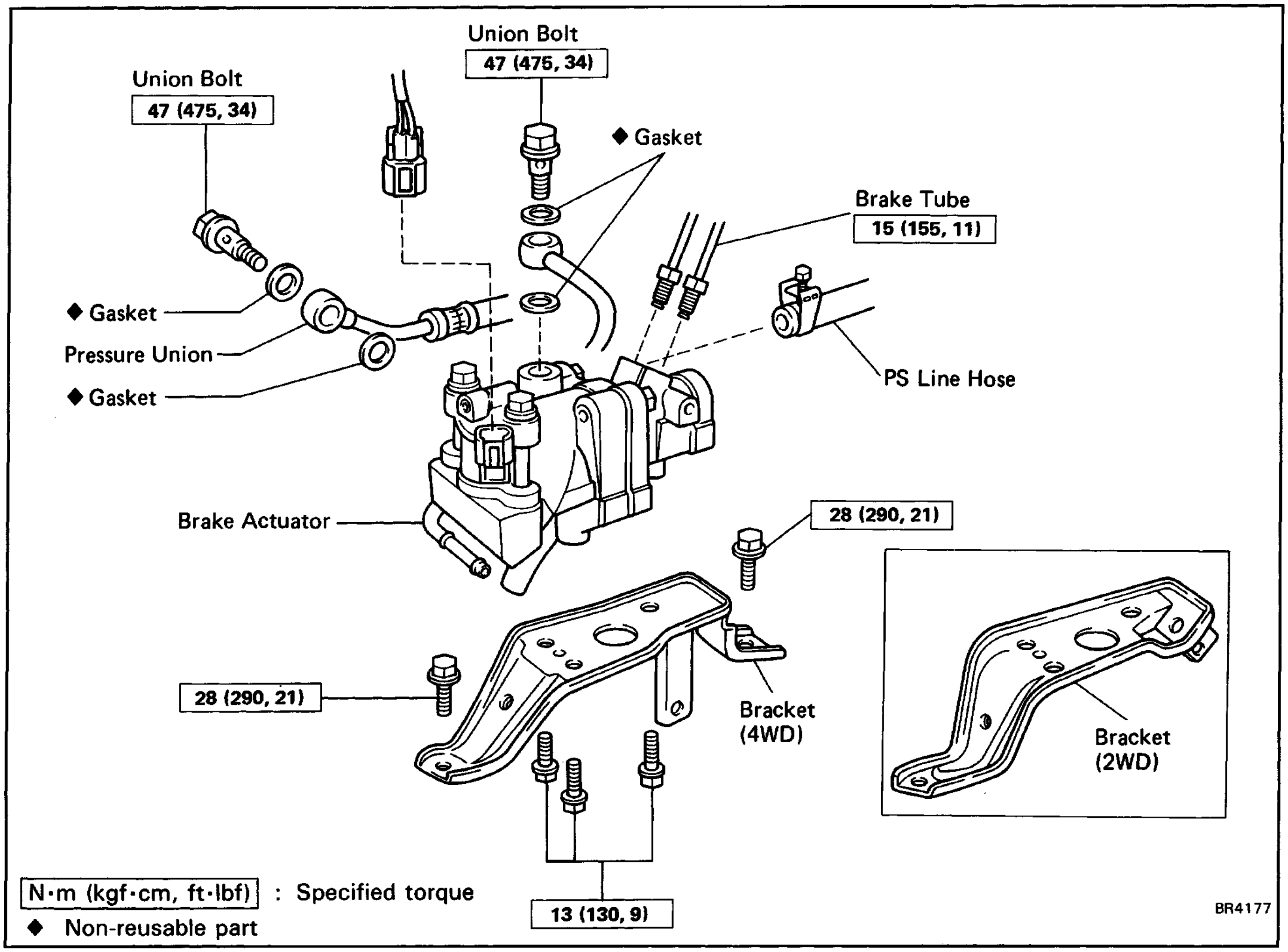
(o) Remove the SST from terminals Ts, Tc and E 1 of the data link connector 1.
SST 09843–18020

DIAGNOSTIC TROUBLE CODE

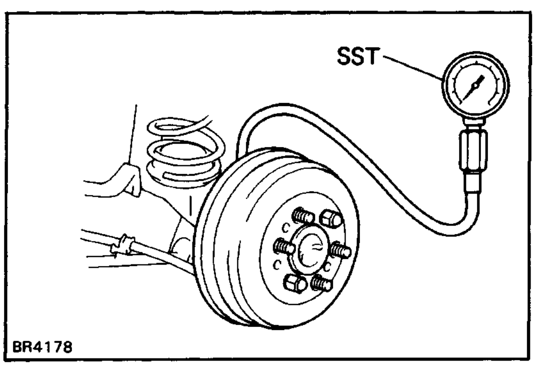
Code No.	Light Pattern	Diagnosis	MAlfunctioning Part
	ON OFF 	Speed sensor and sensor rotor are normal	
73		Low output voltage of speed sensor signal	Speed sensor Sensor rotor Differential ring gear
77		Abnormal change of output voltage of speed sensor signal	Sensor rotor Differential ring gear
79		Sticking of deceleration sensor pendulum	Deceleration sensor

R01263

Brake Actuator
COMPONENTS

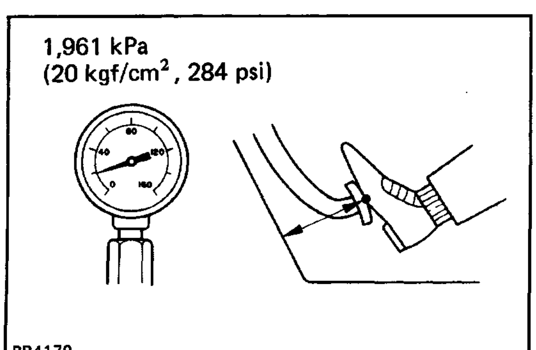


INSPECTION OF BRAKE ACTUATOR
1. CHECK BRAKE FLUID PRESSURE

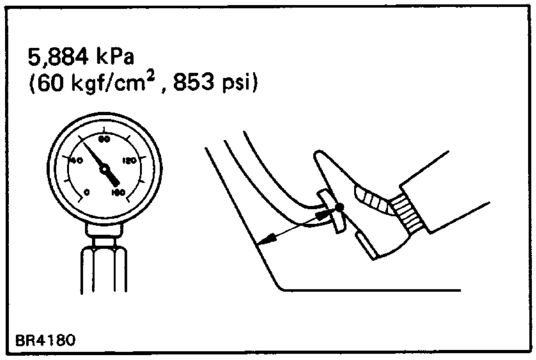


(a) Remove the bleeder plug from the rear wheel cylin–der and connect SST.
SST 09709–29017

(b) Bleed the air from SST.



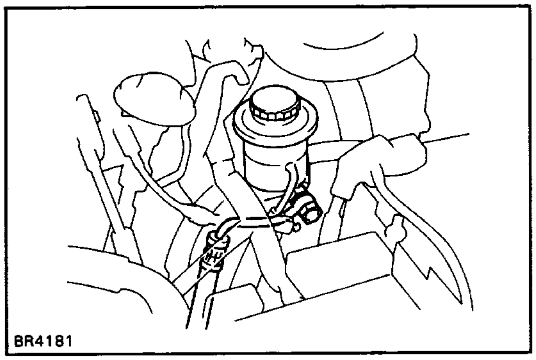
(c) With the engine off, hold the brake pedal depressed for about 10 seconds with the pressure at 1,961 kPa (20 kgf/crn^2, 284 psi), and check that there is no change in the pedal reserve distance.
If there is a change in the brake pedal reserve distance, check the brake line, master cylinder and wheel cylinder for fluid leakage.



BR4180

(d) With the engine running, hold the brake pedal de– pressed for about 1 0 seconds with the pressure at 5,844 kPa (60 kgf/cm^2, 853 psi), and check that there is no change in the pedal reserve distance.

If there is a change in the brake pedal reserve distance, inspect the brake actuator.



BR4181

2. CHECK POWER STEERING FLUID PRESSURE

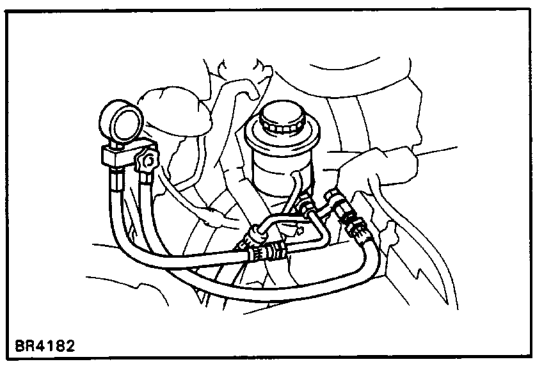
(a) (4WD w/ 22R–E Engine)

Using SST, disconnect the power steering pressure line from the power steering pump.

SST 0963 1–22020

(b) (Except 4WD w/ 22R–E Engine)

Remove the union bolt and disconnect the power steering pressure line from the power steering pump.

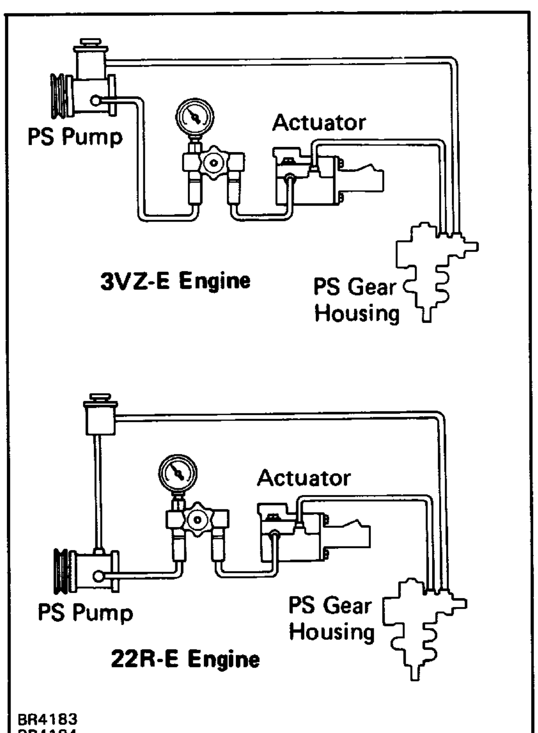


BR4182

(c) Connect the power steering pressure gauge be– tween the power steering pump and hose with the gauge valve on the actuator side.

(d) Bleed the system and check that the fluid level is correct.

(See page BR–94)



BR4183
BR4184

(e) Start the engine and run it at idle.

(f) Close the pressure gauge valve and observe the reading on the gauge.

Minimum pressure: 7,355 kPa (75 kgf/cm^2, 1,067 psi)

HINT:

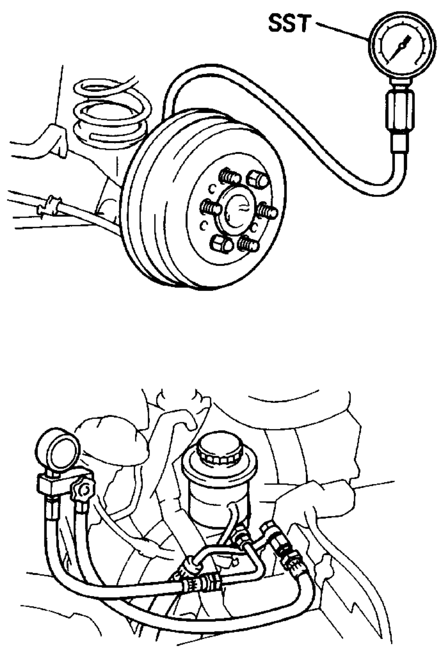
- Do not keep the valve closed for more than 10 sec. onds.
- Check with the fluid temperature at least 80®C (176®F).

If pressure is low, repair or replace the power steering pump.

3. CHECK RELATION BETWEEN BRAKE FLUID AND POWER STEERING FLUID PRESSURE

HINT:

- Be sure the tires in the straight–ahead position.
- Be sure the power steering pressure gauge valve is; fully open.
- Check with the power steering fluid temperature a– least 80®C (176®F).



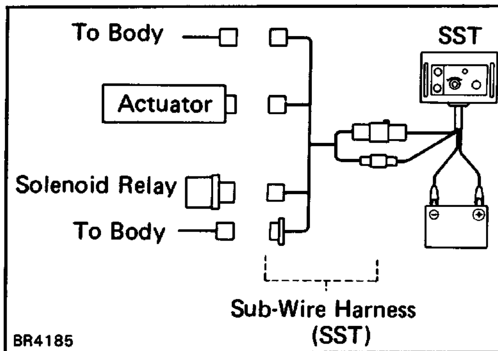
BR4178
BR4182

With the engine running, the brake and power steering fluid pressure should conform to the following table.

kPa (kgf/cm^2, psi)

Brake Fluid Pressure	2,941 (30, 427)	9,807 (100, 1,422)
PS Fluid Pressure	1,569 – 2,550 (16 – 26, 228 – 370)	3,236 – 4,609 (33 – 47, 469 – 668)

If not within specification, check the actuator.



BR4185

4. CHECK ACTUATOR OPERATION

(a) Disconnect the connector from the actuator.

(b) Disconnect the connector from the solenoid relay.

(c) Connect the actuator checker (SST) to the actuator, solenoid relay and body side wire harness through the sub–wire harness (SST) as shown.
SST 09990–00150 and 09990–00205

(d) Connect the red cable of the checker to the battery positive (+) terminal and black to the negative (–) terminal.

(e) Start the engine, and run it at idle.

(f) Turn the selector switch of actuator checker to "REAR" position.

(g) Strongly depress the brake pedal and hold it.

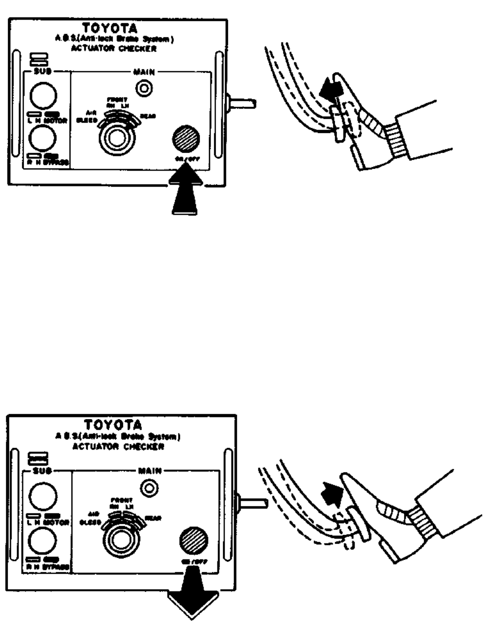
(h) Push the ON/OFF switch, and check that the brake pedal sinks a little and that it returns to the original position when the switch is released.

NOTICE:

- **To avoid damaging the master cylinder piston cup, do not push on SST switch before depressing the brake pedal and do not release your foot from the brake pedal while SST switch is pushing on.**
- **Do not keep the ON/OFF switch pushing more than 10 seconds.**

If operation is not as specified, replace the actuator.

(i) Release the switch, then release the brake pedal.



BR4186
BR4187

5. REMOVE ACTUATOR CHECKER (SST)

Remove SST, then connect the connectors of the actua–tor and solenoid relay.

SST 09990–00150 and 09990–00205

6. REMOVE SST FROM WHEEL CYLINDER

SST 09709–29017

7. REMOVE PRESSURE GAUGE FROM PS PUMP

Remove the pressure gauge from the PS line, then bleed the power steering system.

8. BLEED SYSTEM

(a) Fill brake reservoir with brake fluid.

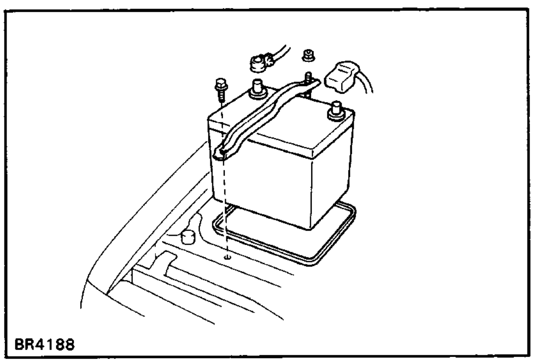
(b) Fill PS reservoir with fluid.

Fluid type: ATF DEXRON• II

(c) Bleed the system.

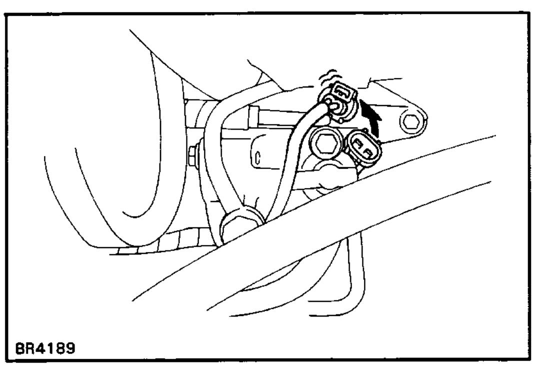
(See page BR–94)

REMOVAL OF BRAKE ACTUATOR



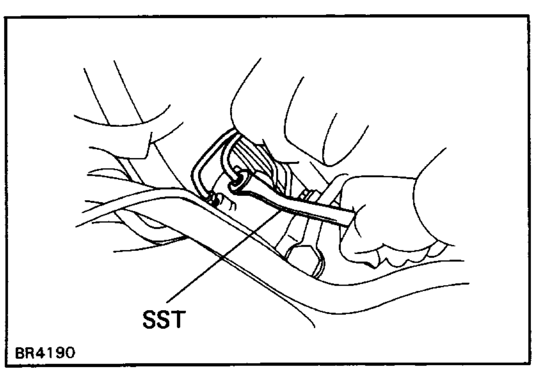
1. REMOVE BATTERY

Disconnect the wire harnesses from the terminals and re–move the battery and tray.



2. DISCONNECT CONNECTOR

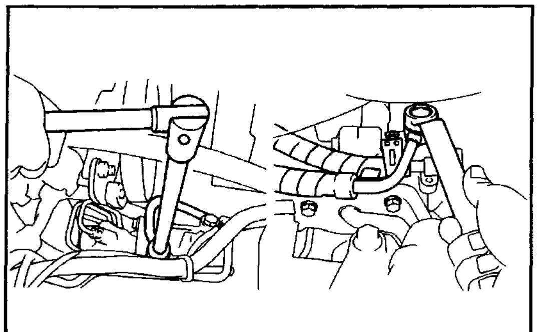
Disconnect the connector from the actuator.



3. DISCONNECT TWO BRAKE TUBES

Using SST, disconnect the two brake tubes.

SST 09751–36011



BR4191 BR4192

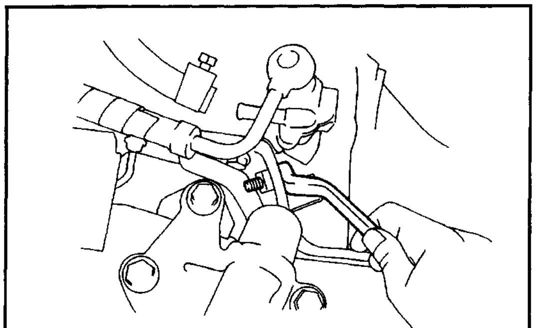
4. DISCONNECT POWER STEERING LINES FROM ACTUATOR

HINT: Turn the steering wheel clockwise until it locks before disconnecting the PS lines. And if you cannot work from the upper side, work from the wheel house.

(a) Remove the two union bolts and disconnect the two power steering pressure tubes.

(b) (22R–E Engine)
Disconnect the power steering line hose.

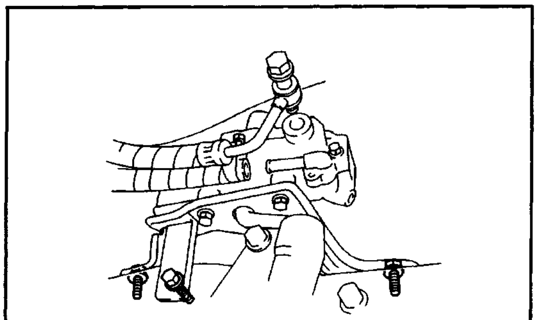
(c) (3VZ–E Engine)
Disconnect the two power steering line hoses.



BR4193

5. REMOVE PS TUBE CLAMP INSTALLATION BOLT

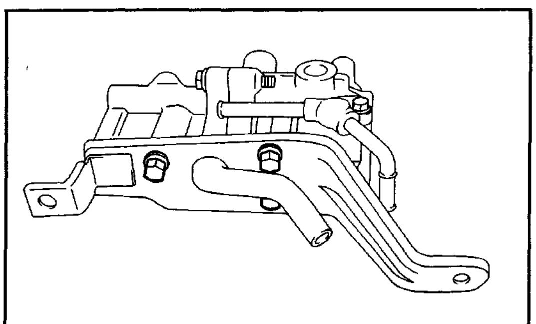
Remove the installation bolt of the power steering tube clamp.



BR4194

6. REMOVE ACTUATOR

Remove the three bolts and remove the actuator from the wheel house.

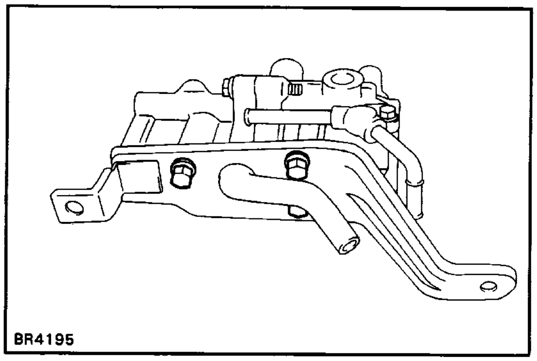


BR4195

7. REMOVE BRACKET FROM ACTUATOR

Remove the three bolts and separate the actuator and bracket.

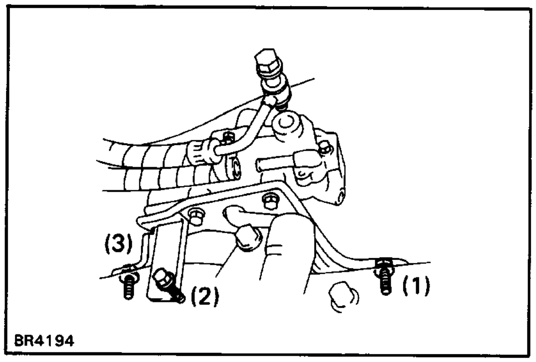
INSTALLATION OF BRAKE ACTUATOR



1. INSTALL BRACKET TO ACTUATOR

Install the bracket to the actuator with the three bolts.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



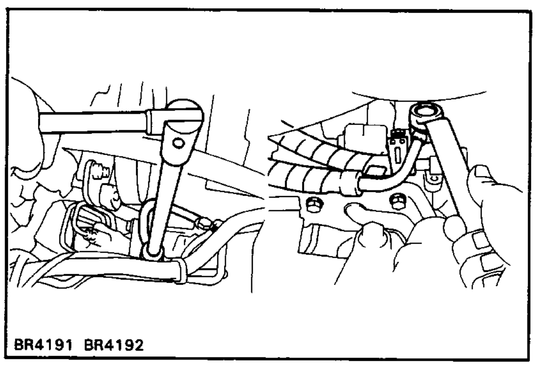
2. INSTALL ACTUATOR

Install the actuator in place and tighten the three bolts.

Torque: 28 N–m (290 kgf–cm, 21 ft–lbf)

HINT: Install the bolts in following order.

(1) Front side bolt
(2) Wheel house side bolt of rear bolts
(3) Upper side bolt on frame of rear bolts

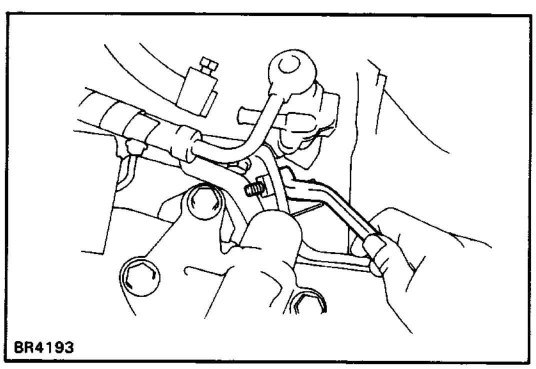


3. CONNECT POWER STEERING LINES

(a) Set the pressure union and new gaskets in place, then install the union bolt.

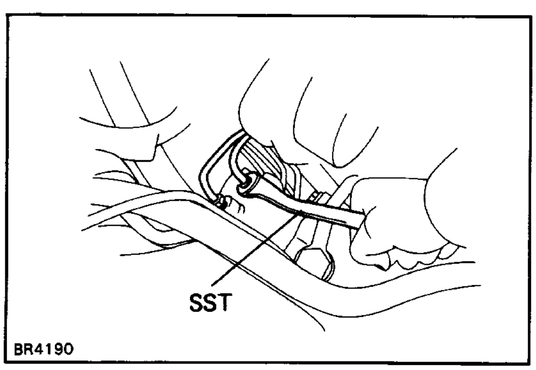
Torque: 47 N–m (475 kgf–cm, 34 ft–lbf)

(b) Similarly connect the other pressure tube.
(c) Connect the PS line hose to the actuator, then fix it with the hose clamp.
(d) (3VZ–E Engine)
Similarly connect the other PS line hose.



4. INSTALL PS TUBE CLAMP

Install the PS pressure tube clamp in place and tighten the bolt.

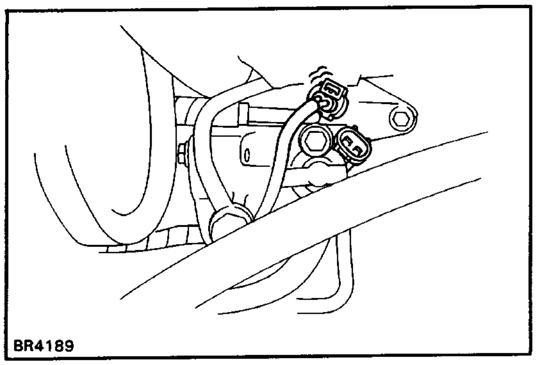


5. CONNECT TWO BRAKE TUBES

Using SST, connect the two brake tubes to the actuator.
SST 09751–36011

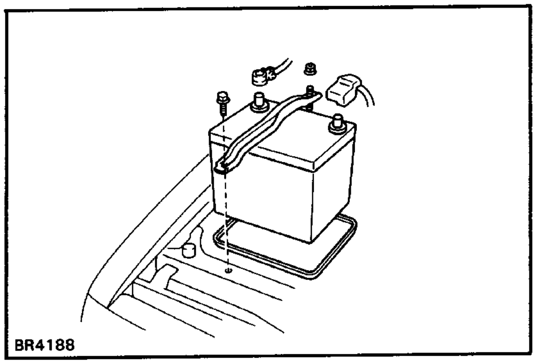
Torque: 15 N–m (155 kgf–cm, 11 ft–lbf)

HINT: First connect the painted brake tube to the painted hole of the actuator, then the other.



6. CONNECT CONNECTOR

Connect the connector to the actuator.



7. INSTALL BATTERY

Install the tray and battery in place, then connect the wire harnesses to the terminals.

8. BLEED SYSTEM

(a) Fill brake reservoir with brake fluid.

(b) Fill PS reservoir with fluid.

Fluid type: ATF DEXRON• II

(c) Bleed the system.

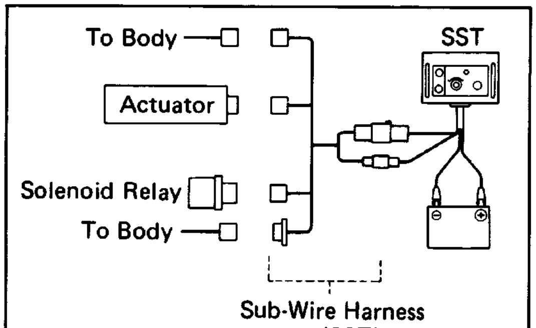
(See page BR–94)

BLEEDING OF REAR–WHEEL ANTI–LOCK BRAKE SYSTEM

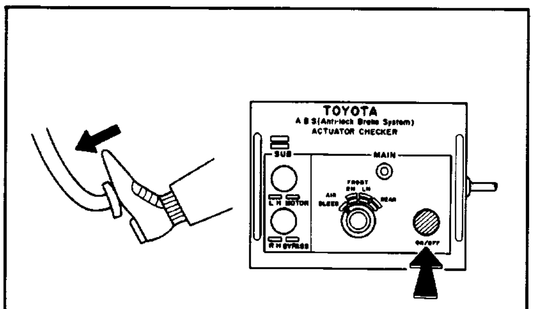
HINT: Whenever PS hoses or PS pressure tube are dis–connected or actuator is removed from the vehicle, the Rear–Wheel Anti–Lock Brake System should be bled in the following procedure.
At the other times, use the conventional procedure.

1. BLEED POWER STEERING SYSTEM
Use the conventional procedure.

2. BLEED BRAKE SYSTEM
(a) Bleed the system with the engine running.
(b) Bleed the system with the engine off.



BR4185

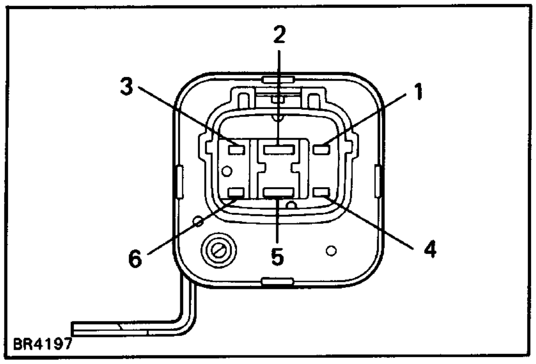


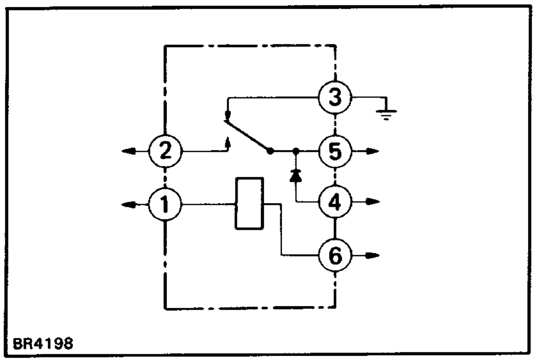
BR4196

3. BLEED POWER STEERING SYSTEM AGAIN
(a) Disconnect the connector from the actuator.
(b) Disconnect the connector from the solenoid relay.
(c) Connect the actuator checker (SST) to the actuator, solenoid relay and body side wire harness through the sub–wire harness (SST) as shown.
SST 09990–00150 and 09990–00205
(d) Connect the red cable of the checker to the battery positive (+) terminal and black to the negative¿ –) terminal.
(e) Start the engine, and run it at idle.
(f) Turn the selector switch of actuator checker to ”AIR BLEED” position.
(g) Strongly depress the brake pedal and hold it.
(h) Push on and release the ON/OFF switch three sec–onds each for five times.

NOTICE:
- **To avoid damaging the master cylinder piston cup, do not push on SST switch before depressing the brake pedal and do not release your foot from the brake pedal while SST switch is pushing on.**
- **Do not keep the ON/OFF switch pushing more than 10 seconds.**

(i) Release the switch, then release the brake pedal.
(j) Check the PS and brake fluid level, and add the fluid if necessary.
(k) Remove SST, then connect the connectors of the actuator and solenoid relay.
SST 09990–00150 and 09990–00205





Control Relay

INSPECTION OF SOLENOID RELAY

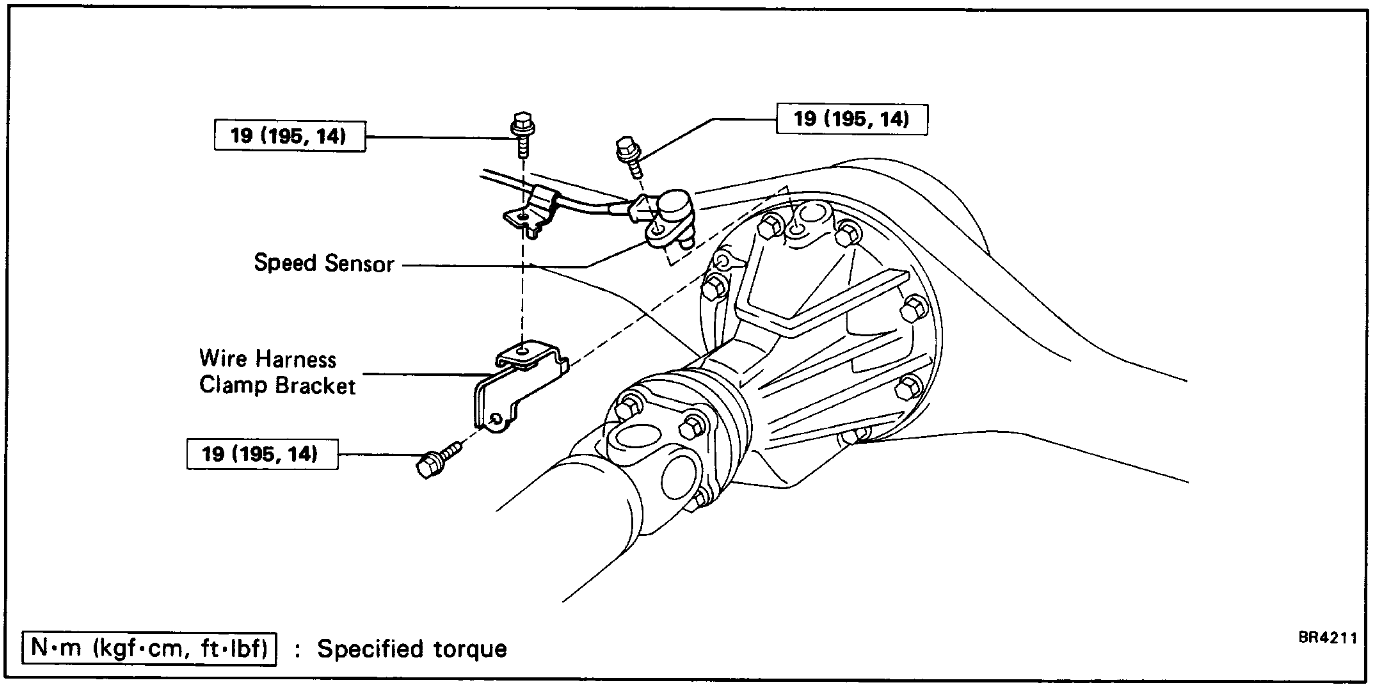
INSPECT SOLENOID RELAY OPERATION

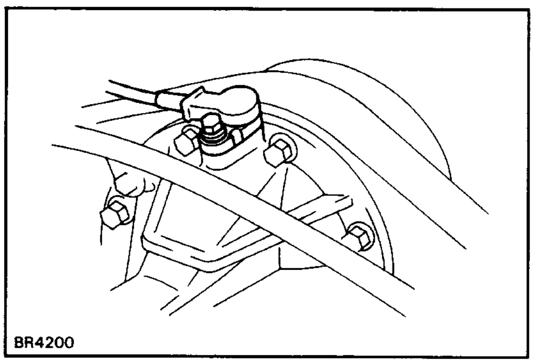
Inspect the relay continuity between terminals.

Terminal / Condition	6	1	2	3	5	4
Constant	○—	—○		○—	—○—▶|—	—○
Apply battery positive voltage between terminals 1 and '6			○—	—	—○—▶|—	—○

If relay operation is not as specified, replace the solenoid relay.

Speed Sensor





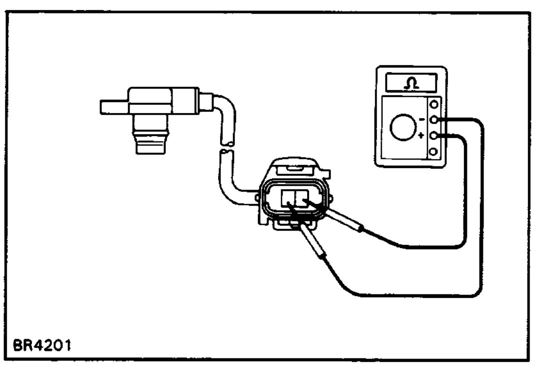
INSPECTION OF SPEED SENSOR

1. INSPECT SENSOR INSTALLATION

Check that the sensor installation bolt is tightened prop–erly.

If not, tighten the bolt.

Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)



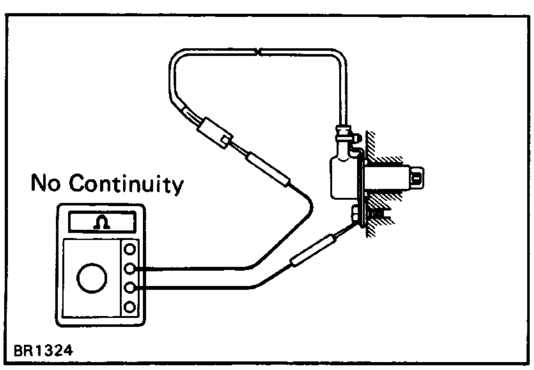
2. INSPECT SPEED SENSOR

(a) Disconnect the speed sensor connector.

(b) Measure the resistance between terminals.

Resistance: 580 – 700

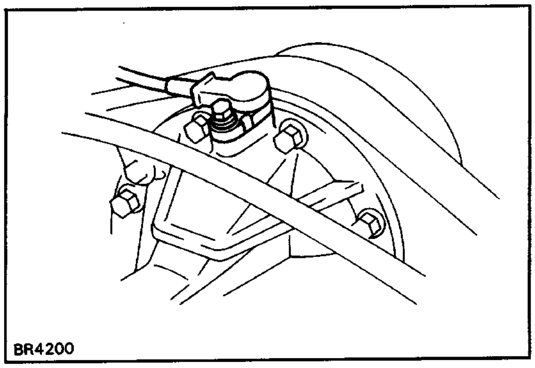
If resistance value is not as specified, replace the sensor.



(c) Check that there is no continuity between each ter–minal and sensor body.

If there is continuity, replace the sensor.

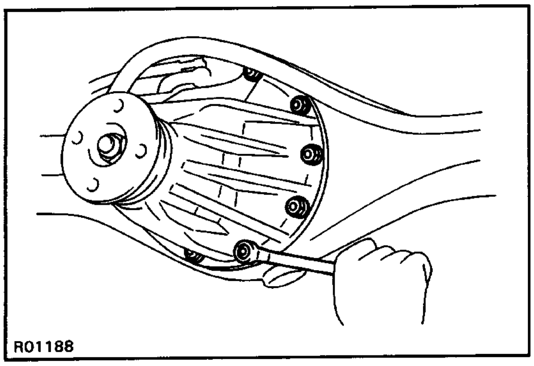
(d) Connect the speed sensor connector.



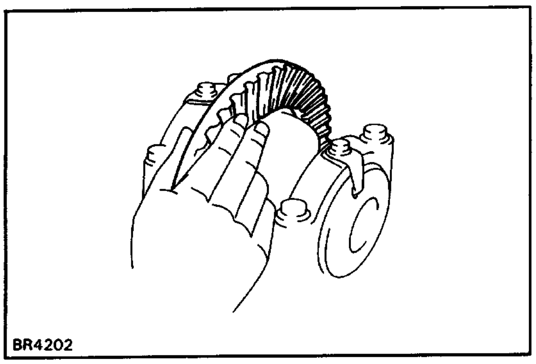
3. VISUALLY INSPECT SENSOR ROTOR SERRATIONS

(a) Disconnect the speed sensor wire harness clamp bolt.

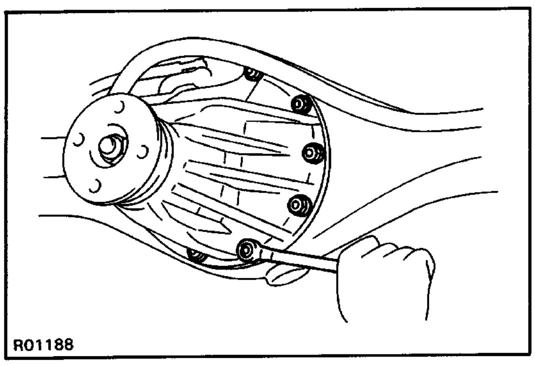
(b) Remove the speed sensor installation bolt and pull out the speed sensor.



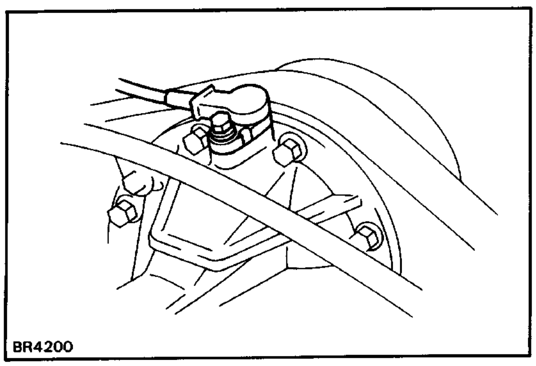
(c) Remove the differential carrier assembly.
(See page SA–136)
NOTICE: To prevent damage to the ring gear serrations, do not strike the ring gear.



(d) Inspect the ring gear (sensor rotor) serrations for scratches, cracks, warping or missing teeth.
If necessary, replace the ring gear.



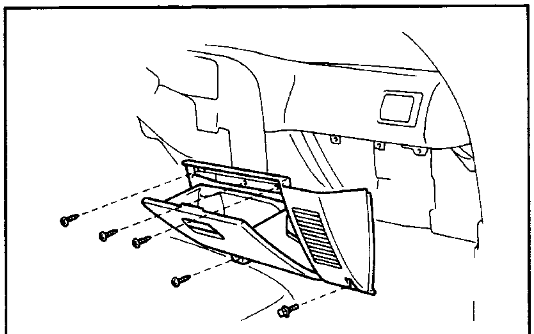
(e) Install the differential carrier assembly.
(See page SA–151)



(f) Install the speed sensor and tighten the installation bolt.
Torque: 19 N–m (195 kgf –cm, 14 ft–lbf)

(g) Set the speed sensor wire harness clamp in place and tighten the clamp bolt.
Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)

INSPECTION OF SPEED SENSOR AND SENSOR ROTOR SERRATIONS (REFERENCE)

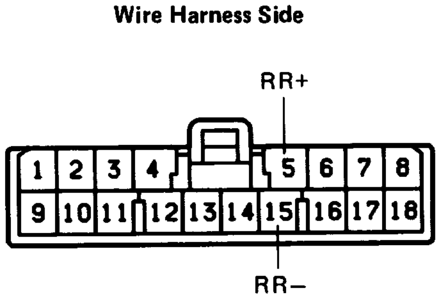


BR4203

INSPECT SPEED SENSOR AND SENSOR ROTOR SERRA–TIONS BY USING AN OSCILLOSCOPE

(a) Remove the glove box assembly and disconnect the radio speaker connector.

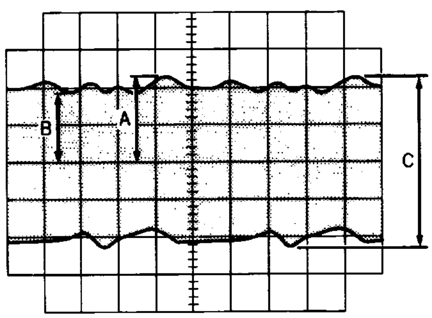
(b) Disconnect the connector from the rear–wheel anti–lock brake system ECU.



V-18-1

(c) Connect an oscilloscope to the terminals RR + and RR – on the wire harness side connector.

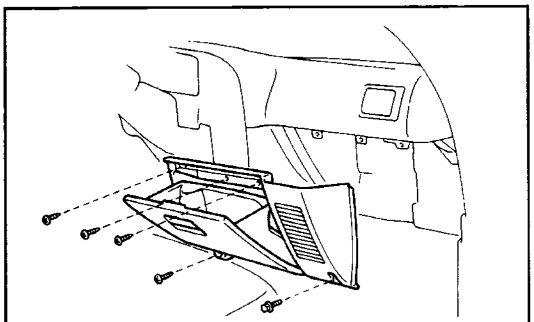
(d) Run the vehicle at 20 km/h 0 2.4 mph), and inspect speed sensor output wave.



E2782

(e) Check that C is 0.4 V or more.
If it is not as specified, replace the speed sensor.
M Check that B is 70% or more of A.
If it is not as specified, replace the sensor rotor.

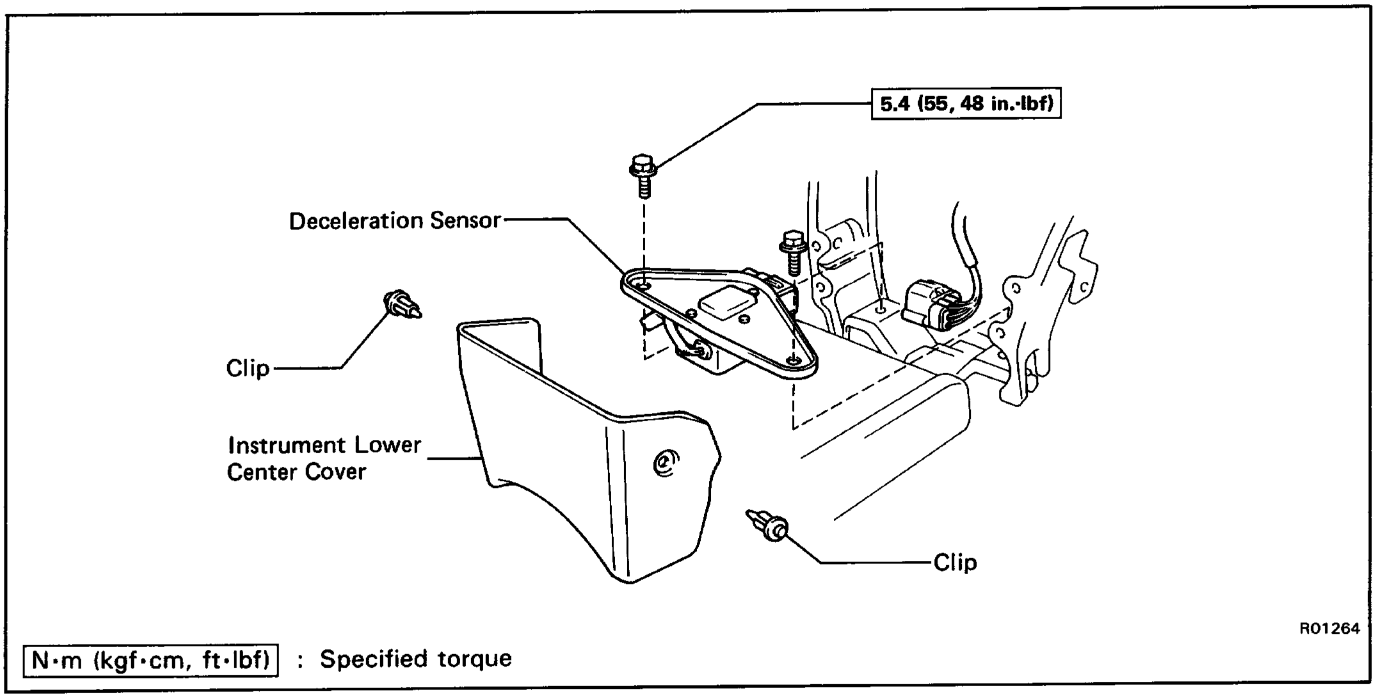
(g) Remove the oscilloscope and connect the connector to the ECU.



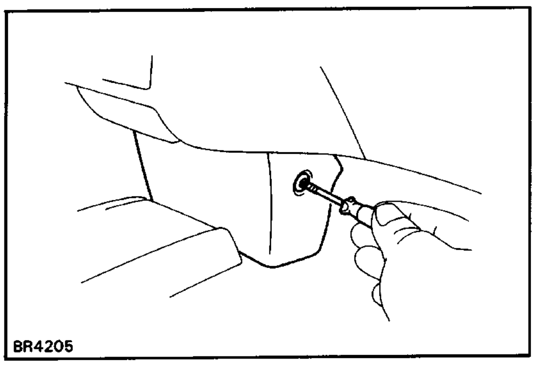
BR4203

(h) Connect the radio speaker connector and install the glove box assembly.

Deceleration Sensor

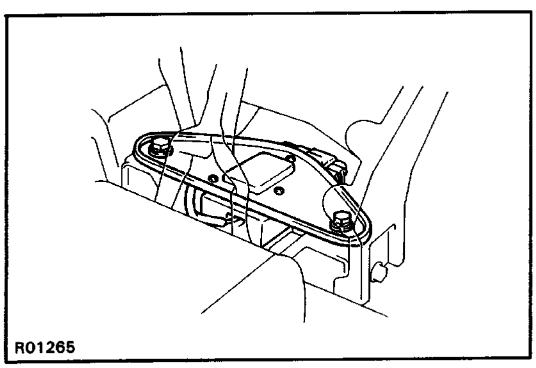


INSPECTION OF DECELERATION SENSOR



INSPECT SENSOR INSTALLATION

(a) Remove the two clips, then remove the instrument lower center cover.

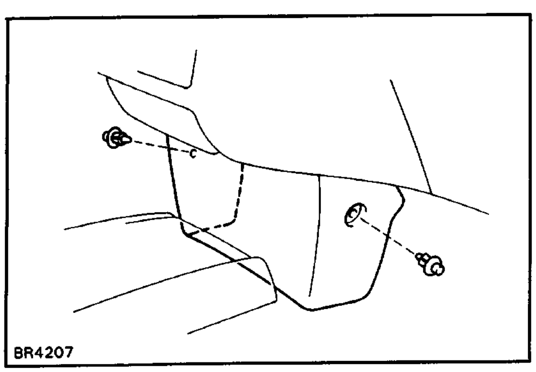


(b) Inspect that the sensor direction is correct.

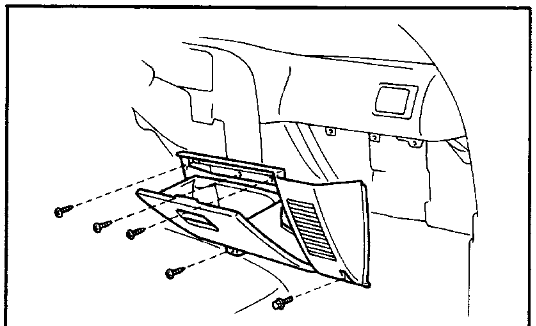
(c) Check that the sensor installation bolts are tight–ened properly.

If not, tighten the bolts.

Torque: 5.4 N–m (55 kgf–cm, 48 in.–lbf)



(d) Install the instrument lower center cover and two clips.


BR4203

Rear–Wheel Anti–Lock Brake System Circuit

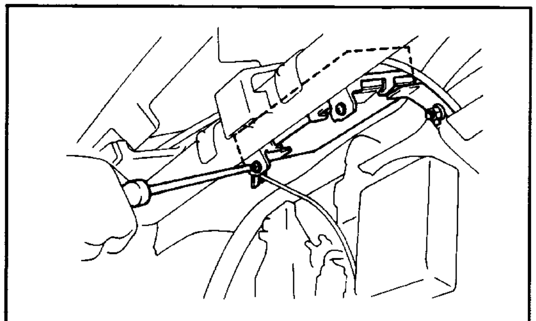
REMOVAL OF REAR–WHEEL ANTI–LOCK BRAKE SYSTEM ECU

1. REMOVE GLOVE BOX ASSEMBLY

Remove the four screws and a bolt, then remove the glove box assembly and disconnect the radio speaker connector.

2. REMOVE ECU

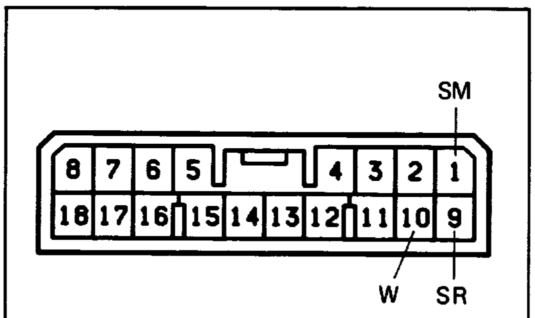
(a) Remove the two screws and a nut.
(b) Pull out the ECU.


BR4208

INSPECTION OF SYSTEM CIRCUIT

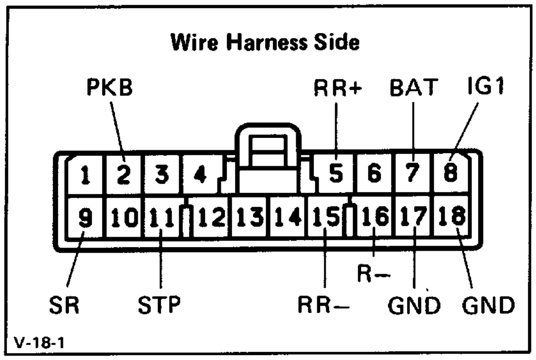
1. INSPECT SYSTEM CIRCUIT WITH CONNECTOR CON–NECTED

Using a voltmeter with high impedance (10 k/ N mini– mum), measure the voltage at each terminal and body ground.



V-18-2

Tester Connection	Condition	Voltage	Trouble Part
SM – Body ground	Ignition switch ON	Battery positive voltage	Solenoid relay, Actuator
	Ignition switch ON and ”REAR ANTILOCK” warning light goes on	About 0 V	
SR – Body ground	Ignition switch ON	Battery positive voltage	
	Ignition switch ON and ”REAR ANTILOCK” warning light goes on	About 0 V	
W – Body ground	Ignition switch ON	Battery positive voltage	Warning light bulb
	Ignition switch ON and ”REAR ANTILOCK” warning light goes on	About 0 V	



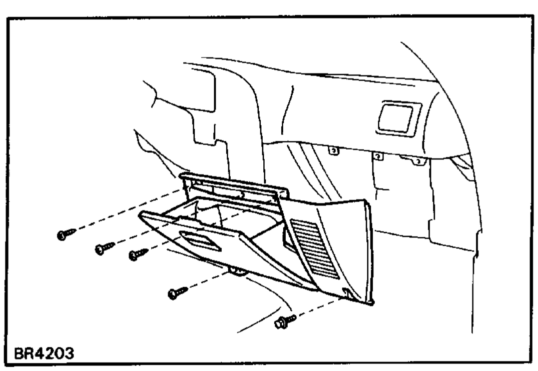
2. INSPECT SYSTEM CIRCUIT WITH CONNECTOR DIS–CONNECTED

(a) Disconnect the connector from the ECU and inspect at the wire harness side connector.

Tester Connection	Check Item	Condition	Voltage or Resistance Value	Trouble Part
PKB – Body ground	Voltage	Ignition SW on and PKB lever pulled	About 0 V	PKB switch, level warning switch
		Ignition SW on and PKB lever returned	Battery positive voltage	
RR+ – RR–	Resistance	–	580 – 700 Ω	Speed sensor
BAT – Body ground	Voltage	–	Battery positive voltage	Wire harness
IG1 – Body ground	Voltage	Ignition SW on	Battery positive voltage	ECU–IG fuse, wire harness
		Ignition SW off	About 0 V	
SR – R–	Resistance	–	80 Ω	Solenoid relay
STP – Body ground	Voltage	Ignition SW off and brake pedal depressed	Battery positive voltage	Stop light switch, stop light
	Continuity	Ignition SW off and brake pedal returned	Continuity	
GND – Body ground	Continuity	–	Continuity	Wire harness

If the circuit is not as specified, check and repair or replace the trouble part shown in the table above.

(b) Connect the connector.



INSTALLATION OF ECU

1. INSTALL ECU

Install the ECU in place with a nut and two screws.

2. INSTALL GLOVE BOX ASSEMBLY

Connect the radio speaker connector and install the glove box assembly in place and install the four screws and a bolt.

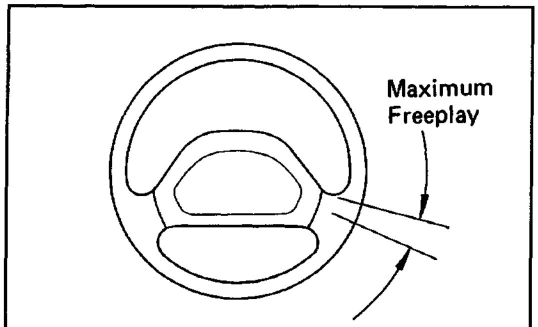
STEERING

PRECAUTION

Care must be taken to replace parts properly because they may affect the performance of the steering system and result in a driving hazard.

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Hard steering	Tires improperly inflated Insufficient lubricant Excessive caster Steering system joints worn Lower arm ball joints worn Steering column binding Steering gear out of adjustment or broken Power steering belt loose Fluid level in reservoir low Power steering unit faulty Solenoid valve faulty Electronic control faulty	Inflate tires to proper pressure Lubricate suspension Check front wheel alignment Replace steering system joints Replace lower arm ball joints Inspect steering column Adjust or repair steering gear Adjust belt Check reservoir Check power steering unit Inspect solenoid valve Inspect electronic control	SA–3, 6 SA–3, 6 SR–93, 97 SA–17, 112 SR–4 SR–19, 26 65,75 SR–40 SR–40 SR–45, 65 75 SR–91 SR–87
Poor return	Tires improperly inflated Insufficient lubricant Wheel alignment incorrect Steering column binding Steering gear out of adjustment or broken	Inflate tires to proper pressure Lubricate suspension Check front wheel alignment Inspect steering column Adjust or repair steering gear	SA–3, 6 SA–3, 6 SR–4 SR–19, 26 65, 75
Excessive play	Front wheel bearing worn Main shaft yoke or intermediate shaft yoke worn Lower arm ball joints worn Steering system joints worn Steering gear out of adjustment or broken	Replace front wheel bearing Replace main shaft or interme–diate shaft Replace lower arm ball joints Replace steering system joints Adjust or repair steering gear	SA–11, 36 SR–4 SA–17, 112 SR–93, 97 SR–19, 26 65, 75
Abnormal noise	Steering linkage loose Steering system joints worn Steering gear out of adjustment or broken	Tighten steering linkage Replace steering system joints Adjust or repair steering gear	SR–93, 97 SR–93, 97 SR–19, 26 65, 75



R01419

ON–VEHICLE INSPECTION

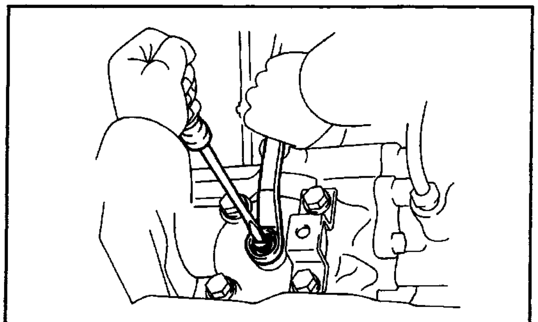
STEERING WHEEL FREEPLAY

1. CHECK THAT STEERING WHEEL FREEPLAY IS CORRECT

With the vehicle stopped and pointed straight ahead, rock the steering wheel gently back and forth with light finger pressure. Freeplay should not exceed the maxi–mum limit.

Maximum play: 30 mm (1.18 in.)

If incorrect, adjust or repair as required.


R01192

2. POINT WHEELS STRAIGHT AHEAD

3. ADJUST STEERING GEAR HOUSING

(a) Loosen the lock nut.

(b) Turn the adjusting screw clockwise to decrease wheel freeplay and counterclockwise to increase it.

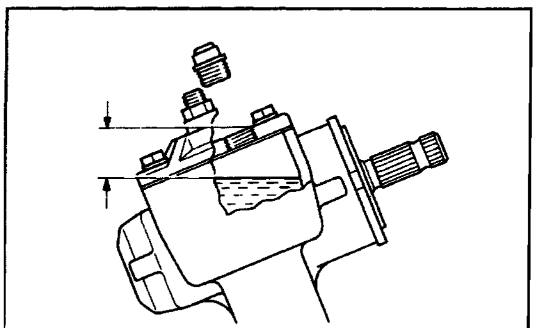
HINT: Turn the adjusting screw in small increments and check the wheel freeplay between each adjustment.

4. CHECK THAT STEERING DOES NOT BIND

Turn the steering wheel half way around in both direc–tions.

Check that the freeplay is correct and steering is smooth and without rough spots.

5. HOLD ADJUSTING SCREW AND TIGHTEN LOCK NUT


SR3105R

OIL LEVEL

CHECK STEERING GEAR HOUSING OIL LEVEL

Oil level:

2WD 18 – 28 mm (0.71 – 1.10 in.)

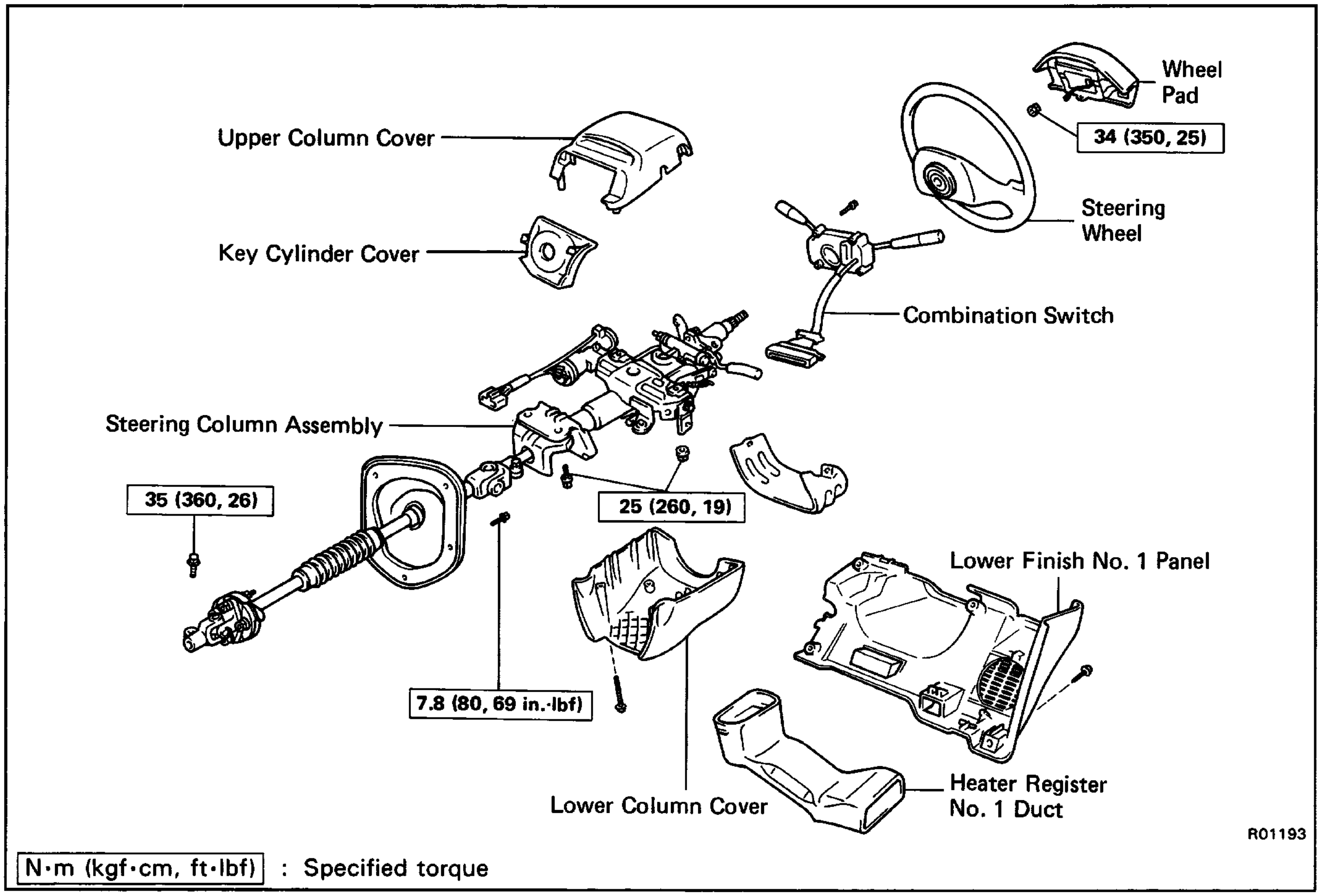
4WD 14 – 17 mm (0.55 – 0.67 in.)

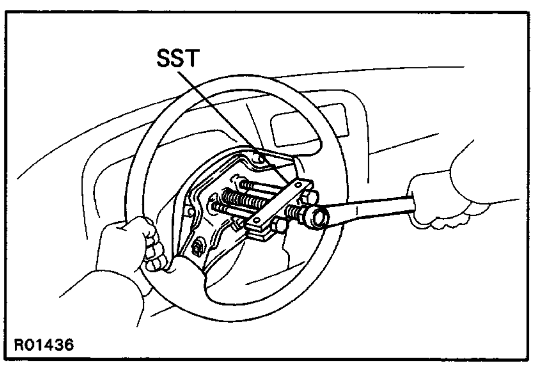
If low, fill with gear oil and check for leaks.

STEERING COLUMN

REMOVAL AND INSTALLATION OF STEERING COLUMN

Remove and install the parts as shown.

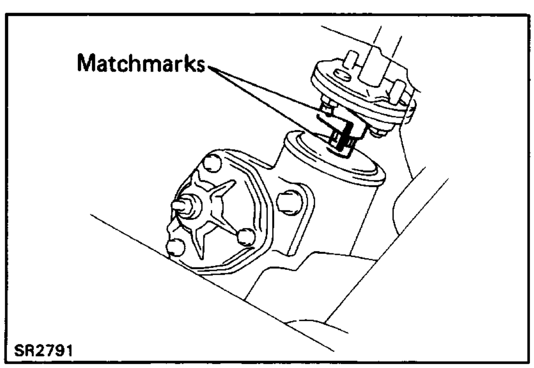




(MAIN POINTS OF REMOVAL)

1. REMOVE STEERING WHEEL

Using SST, remove the steering wheel.
SST 09609–20011

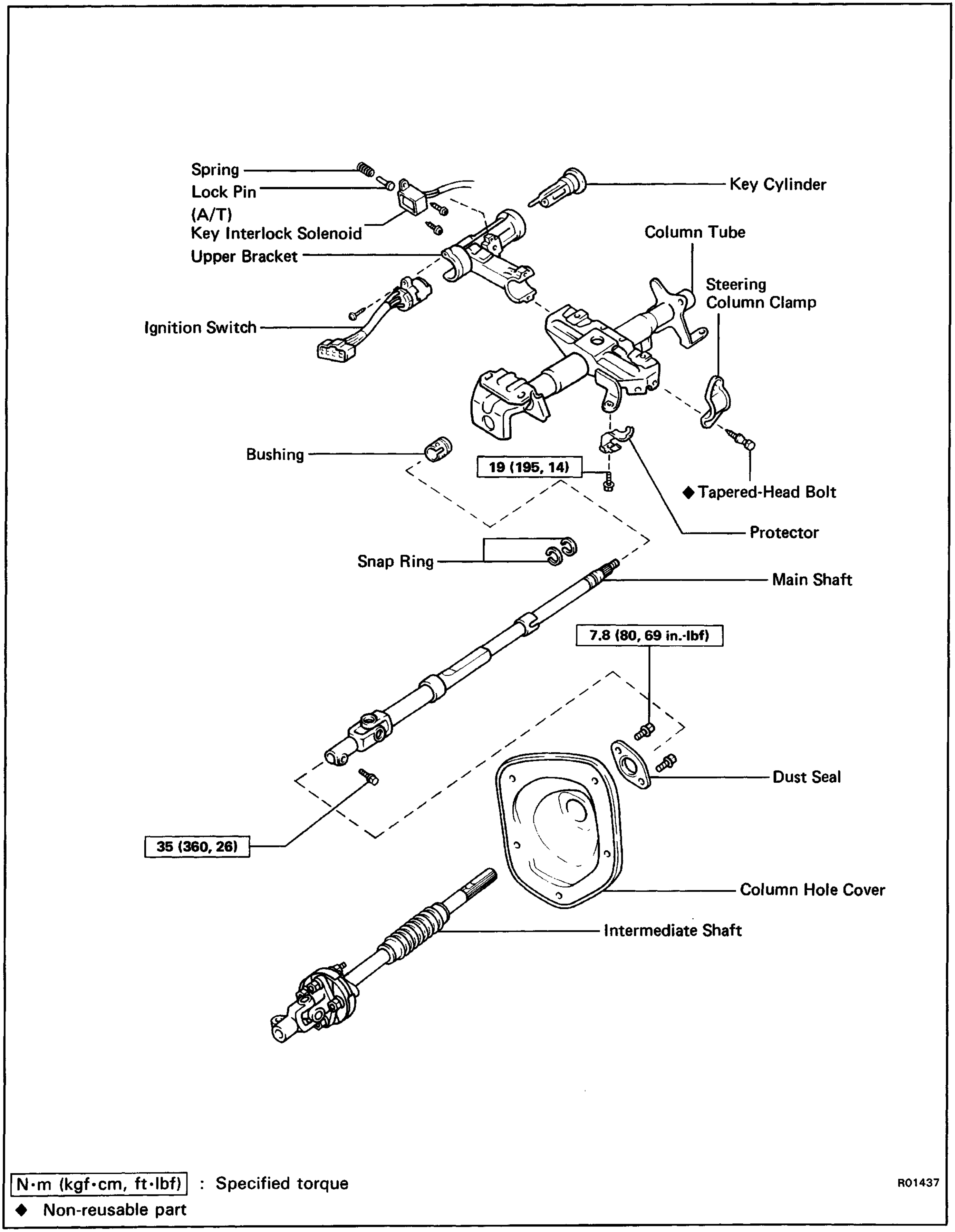


2. DISCONNECT MAIN SHAFT

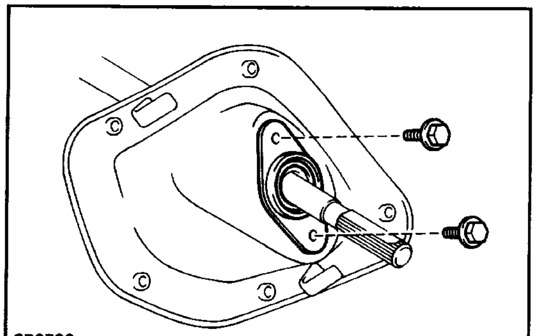
(a) Place matchmarks on the worm shaft and main shaft.

(b) Disconnect the main shaft from the worm shaft.

Non–Tilt Steering Column
COMPONENTS

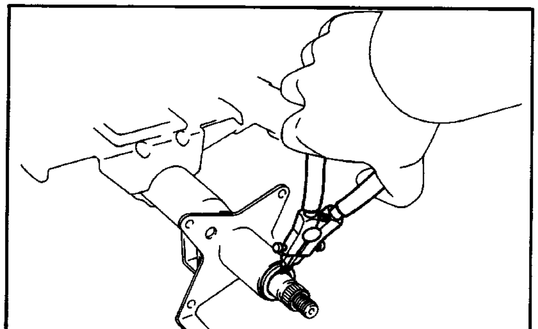


DISASSEMBLY OF STEERING COLUMN


SR2792

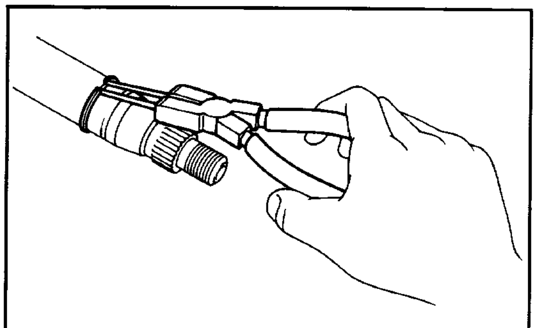
1. REMOVE COLUMN HOLE COVER

(a) Disconnect the intermediate shaft from the main shaft.
(b) Remove two bolts and the dust seal.
(c) Remove the column hole cover.

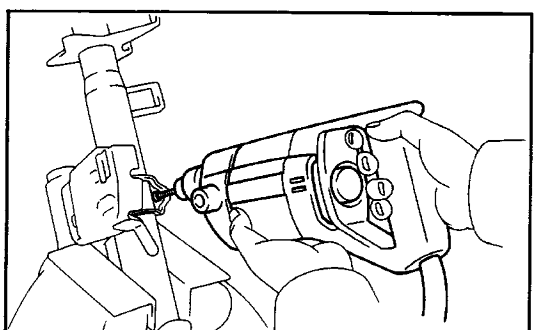

R01429

2. PULL OUT MAIN SHAFT

(a) Using snap ring pliers, remove the snap ring.
(b) Pull out the main shaft from the upper tube.
HINT: Do not place the ignition key at the LOCK position.

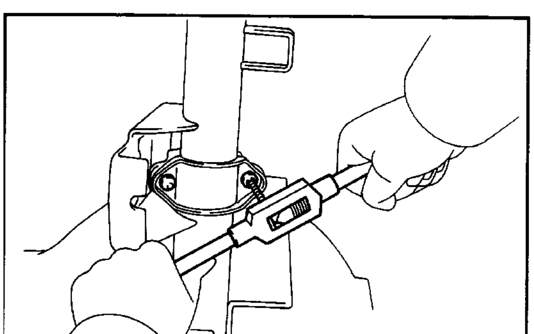

SR2036

(c) Using snap ring pliers, remove the snap ring.

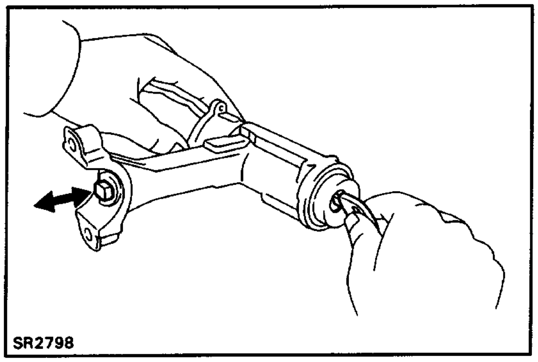

R01422

3. REMOVE UPPER BRACKET

(a) Using a centering punch, mark the center of the tapered–head bolts.
(b) Using a 3 – 4 mm (0.12 – 0.16 in.) drill, drill into the tapered–head bolts.


R01423

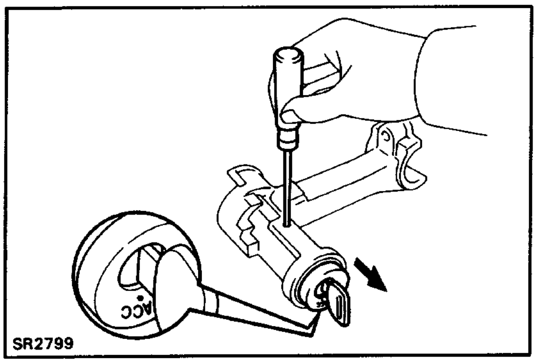
(c) Using a screw extractor, remove the tapered–head bolts.
(d) Remove the two bolts and separate the upper bracket and column tube.



INSPECTION AND REPLACEMENT OF NON–TILT STEERING COLUMN

1. INSPECT UPPER BRACKET

Check that the steering lock mechanism operates properly.

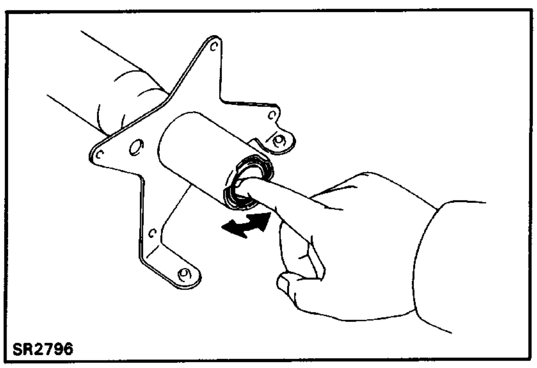


2. IF NECESSARY, REPLACE IGNITION KEY CYLINDER

(a) Place the ignition key at the ACC position.

(b) Push down the stop key with a thin rod, and pull out the key cylinder.

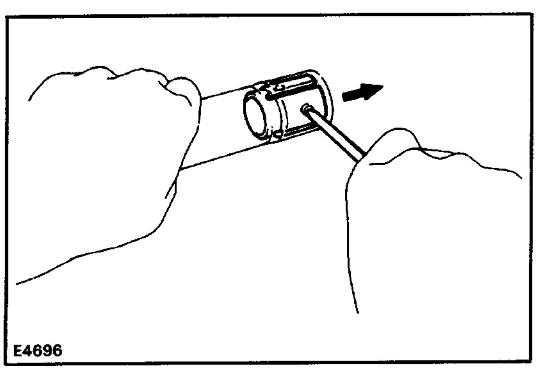
(c) Turn the ignition key plate to the ACC position, and install a new key cylinder into the upper bracket.



3. INSPECT UPPER BEARING

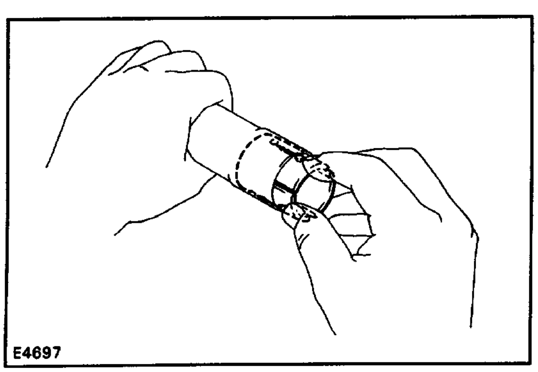
Check the upper bearing rotation condition and check for abnormal noise.

If the bearing is worn or damaged, replace the column tube assembly.



4. IF NECESSARY, REPLACE BUSHING

(a) Using a screwdriver, remove the bushing.



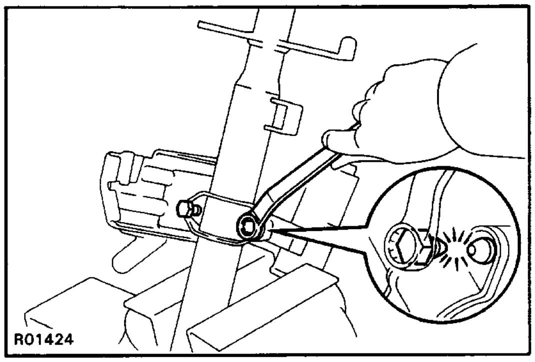
(b) Align the holes of the tube and the projections of a new bushing, and insert the bushing to the column tube.

5. INSPECT KEY INTERLOCK SOLENOID

(See page AT–213)

6. IF NECESSARY, REPLACE KEY INTERLOCK SOLENOID

(See page SR–13)



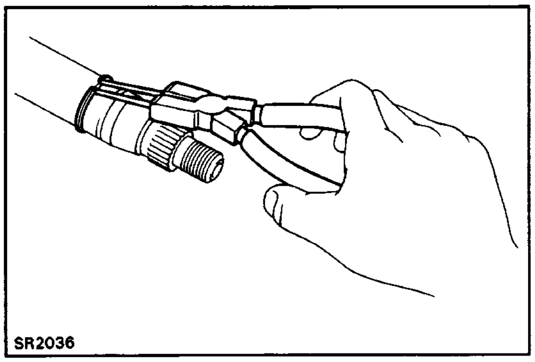
ASSEMBLY OF NON–TILT STEERING COLUMN

(See page SR–5)

1. INSTALL UPPER BRACKET TO COLUMN TUBE

(a) Install the upper bracket with two new tapered–head bolts.

(b) Tighten the tapered–head bolts until the bolt heads break off.

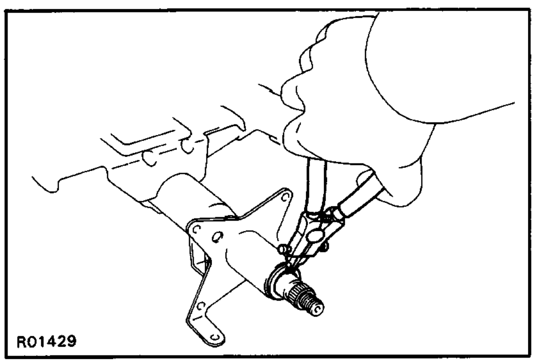


2. INSTALL MAIN SHAFT TO COLUMN TUBE

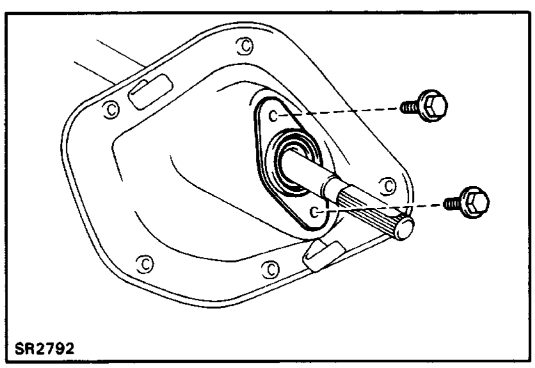
(a) Using snap ring pliers, install the snap ring in the lower groove of the main shaft.

(b) Install the main shaft in the column tube.

HINT: Do not place the ignition key at LOCK position.



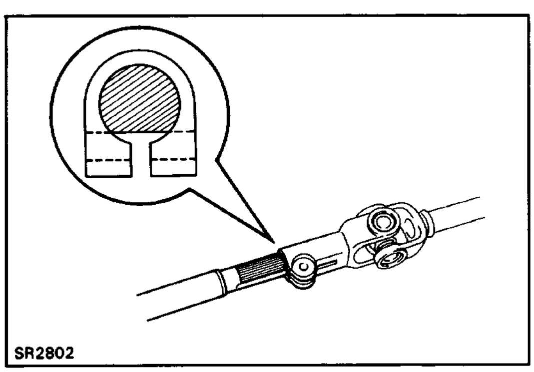
(c) Using snap ring pliers, install the upper snap ring.



3. INSTALL COLUMN HOLE COVER

(a) Install the intermediate shaft to the column hole cover.

(b) Temporarily install the two bolts and dust seal.



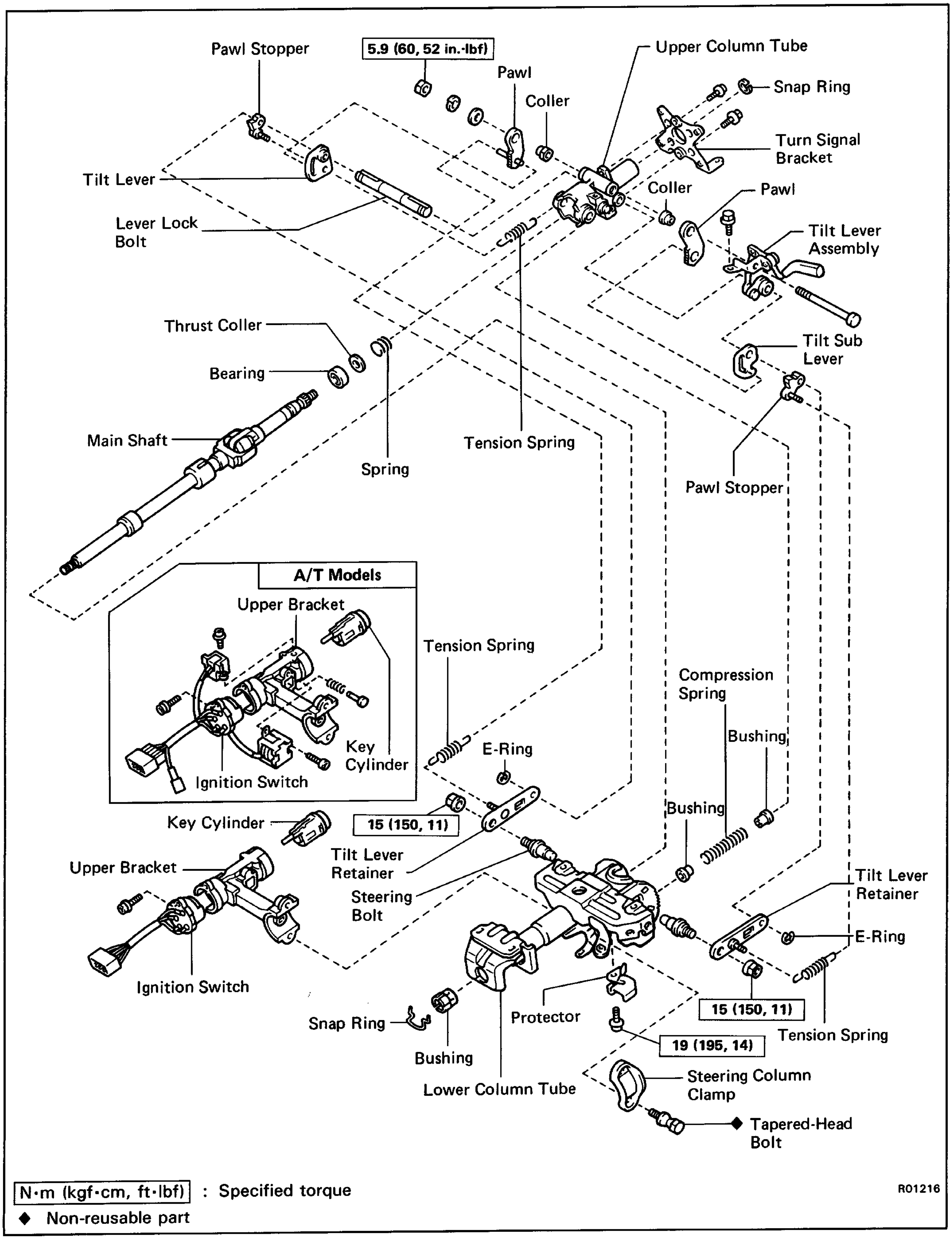
4. CONNECT INTERMEDIATE SHAFT WITH MAIN SHAFT

(a) Place the intermediate shaft in the universal joint as shown.

(b) Temporarily install the bolt.

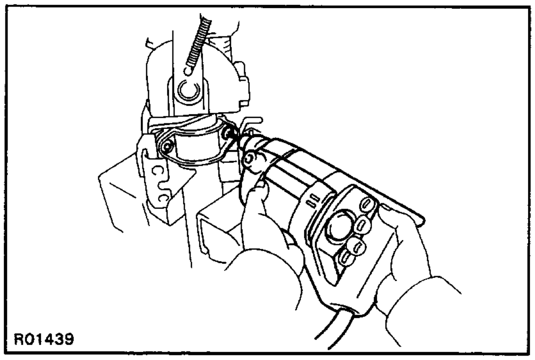
HINT: After install the column to the body, tighten the universal joint set bolt and dust seal bolts.

Tilt Steering Column
COMPONENTS



DISASSEMBLY OF STEERING COLUMN

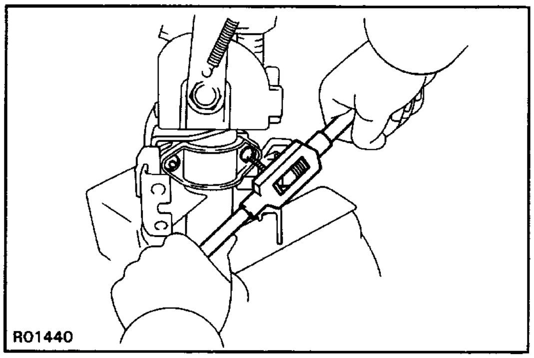
(See page SR–9)



1. REMOVE UPPER BRACKET

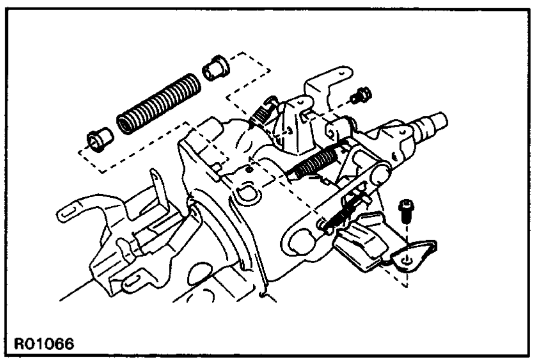
(a) Using a centering punch, mark the center of the tapered–head bolt.

(b) Using a 3 – 4 mm (0. 12 – 0.16 in.) drill, drill into the tapered–head bolt.



(c) Using a screw extractor, remove the tapered–head bolt.

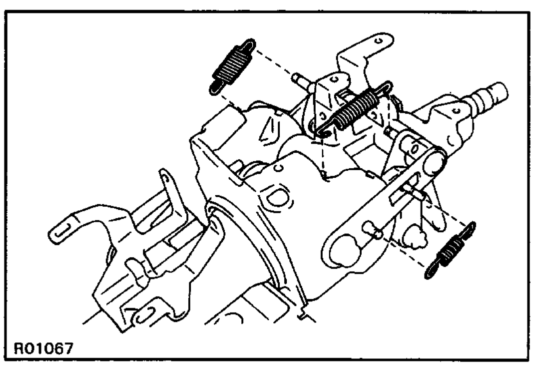
(d) Remove the two bolts, and separate the upper bracket and the column tube.



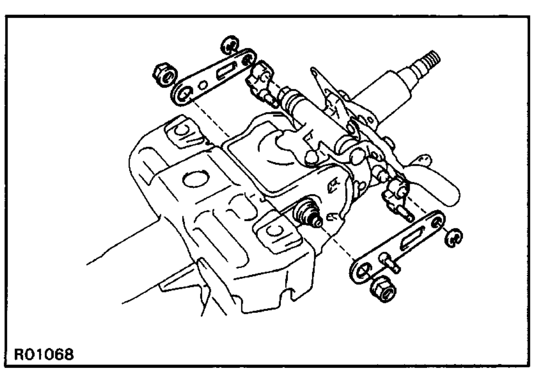
2. REMOVE COMPRESSION SPRING AND TENSION SPRING

(a) Remove the bolt with the compression spring.

(b) Remove the bushings from the spring.



3. REMOVE THREE TENSION SPRINGS

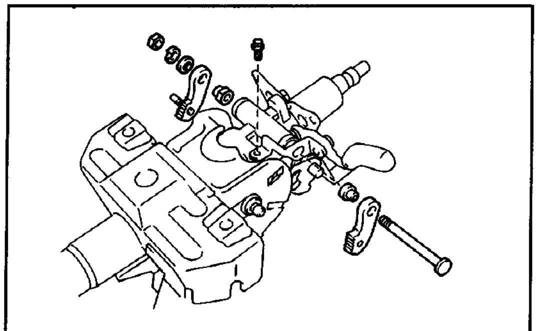


4. REMOVE TWO TILT LEVER RETAINERS

(a) Remove the E–rings from the retainers.

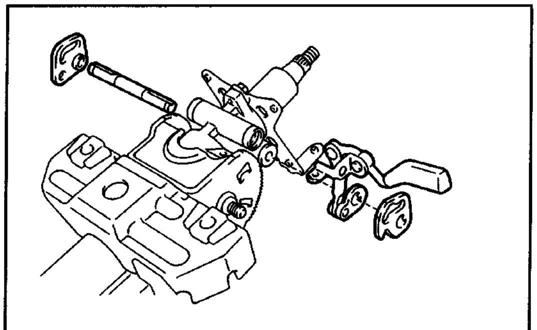
(b) Remove the retainers with the nuts.

5. REMOVE TWO PAWL STOPPERS


R01069

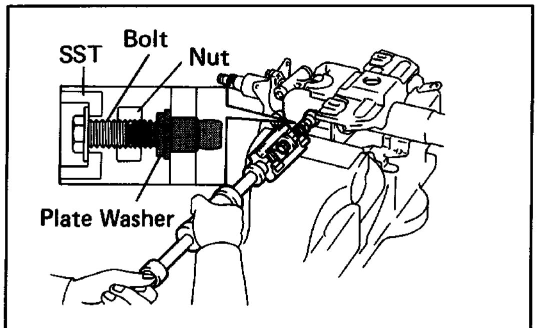
6. REMOVE TWO TILT PAWLS

(a) Remove the nut and bolt.
(b) Remove the two pawls with the collars.


R01070

7. REMOVE TILT LEVER ASSEMBLY, TILT LEVER, TILT SUB LEVER AND LEVER LOCK BOLT

Remove one screw and tilt lever assembly.



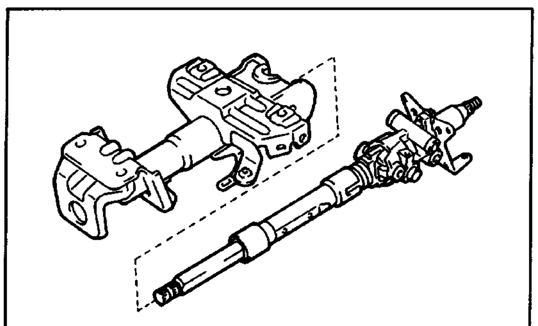
R01254

8. REMOVE UPPER COLUMN TUBE

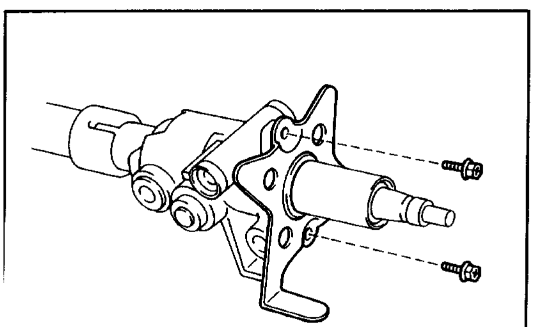
(a) Set SST, the nut (10 mm nominal diameter, 1.25 mm pitch), plate washer (36 mm outer diameter) and bolt (10 mm nominal diameter, 1. 25 mm pitch, 50 mm length) as shown. And then remove the two bolts.
SST 09910–00015 (09911–00011, 09912–00010)

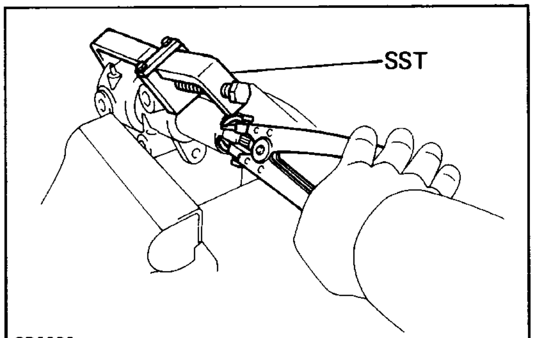
(Reference)	Nut	90170–10004
	Plate washer	90201–10201
	Bolt	91111–51050

(b) Remove the upper column tube from the lower column tube.
(c) Remove the stopper.


R01071

9. REMOVE TURN SIGNAL BRACKET

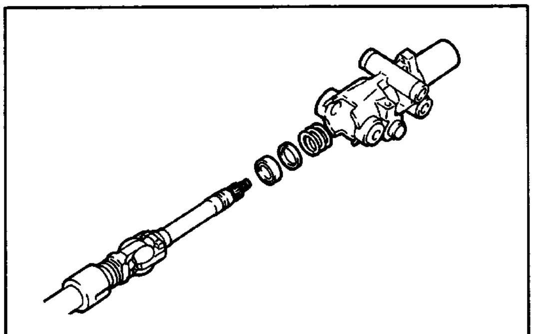

SR2842



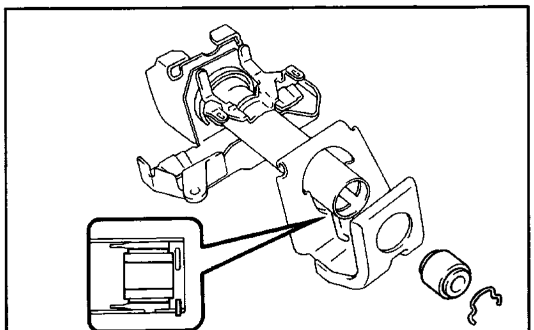
SR2832

10. REMOVE MAIN SHAFT

(a) Using SST to hold the main shaft, remove the snap ring with snap ring pliers.
SST 09950–20017


R01072

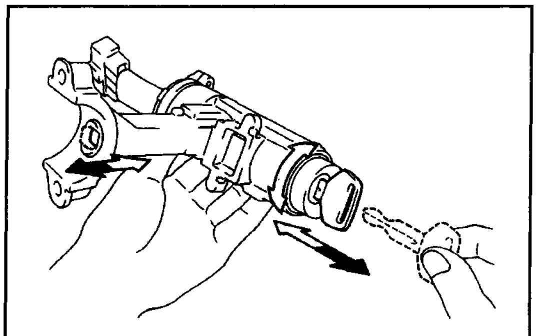
(b) Remove the main shaft from the column tube.
(c) Remove the spring, thrust collar and bearing.


R01441

11. REMOVE MAIN SHAFT COLLAR

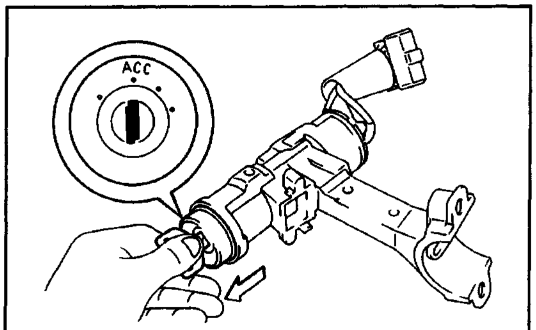
(a) Remove the snap ring from the lower column tube.
(b) Remove the main shaft collar.

INSPECTION AND REPLACEMENT OF STEERING COLUMN


R01073

1. INSPECT KEY CYLINDER

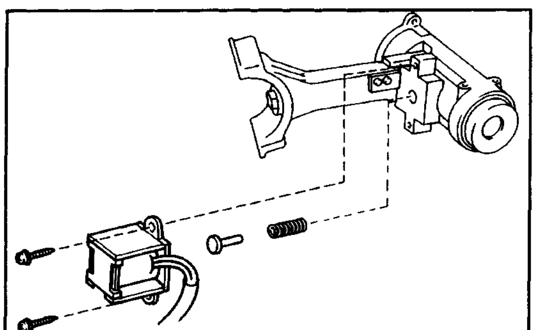
Check that the steering lock mechanism operates prop–erly.



R01074

2. 1F NECESSARY, REPLACE KEY CYLINDER

(a) Place the ignition key at the ACC position.
(b) Push down the stop key with a thin rod, and pull out the key cylinder.
(c) Make sure that the ignition key is at the ACC posi–tion.
(d) Install a new key cylinder.

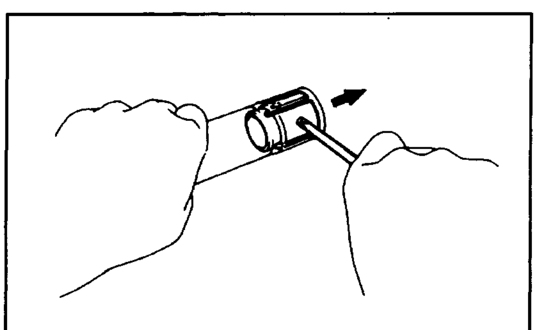

SR2930

3. INSPECT KEY INTERLOCK SOLENOID

(See page AT–214)

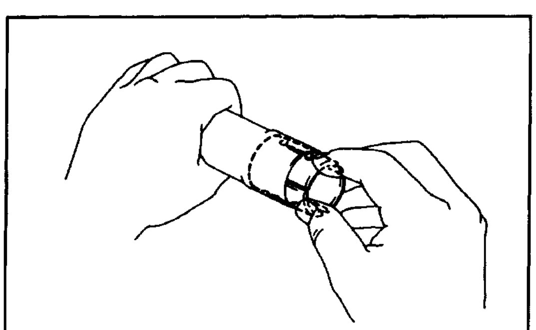
4. IF NECESSARY, REPLACE KEY INTERLOCK SOLENOID

(a) Remove the two screws.
(b) Remove the solenoid, spring and lock pin.
(e) Install a new solenoid with the spring and lock pin, and install the two screws.


E4696

5. IF NECESSARY, REPLACE MAIN SHAFT BUSHING

(a) Using a screwdriver, remove the bushing.

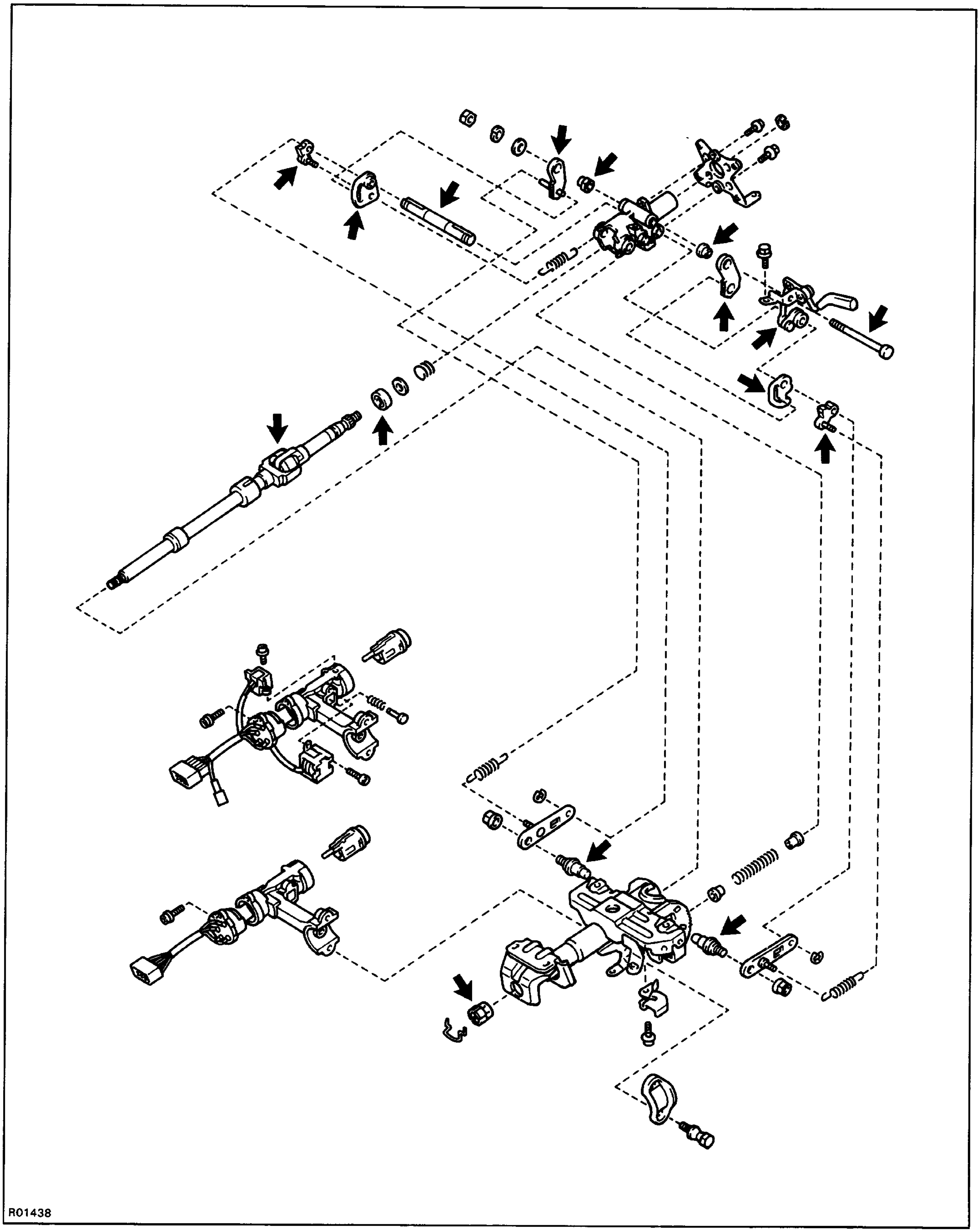

E4697

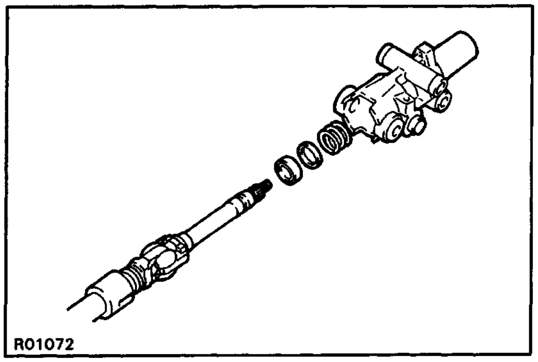
(b) Align the holes of the tube and the projections of a new bushing, and install the bushing in the column tube.

ASSEMBLY OF TILT STEERING COLUMN

(See page SR–9)

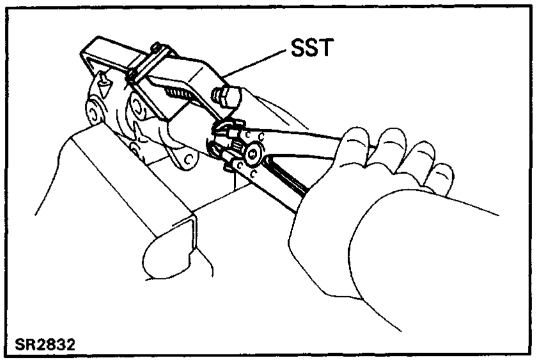
1. COAT MOLYBDENUM DISULPHID LITHIUM BASE GREASE ON FOLLOWING PARTS:



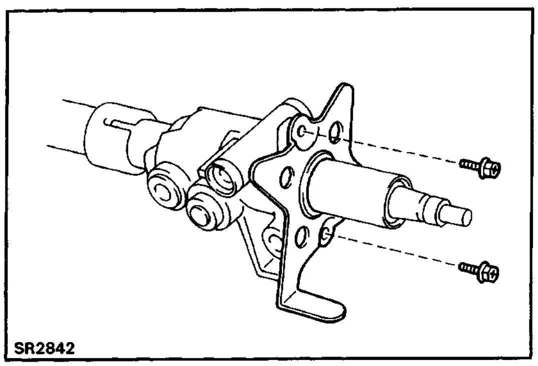


2. INSTALL MAIN SHAFT

(a) Install the main shaft with the bearing, collar and spring.



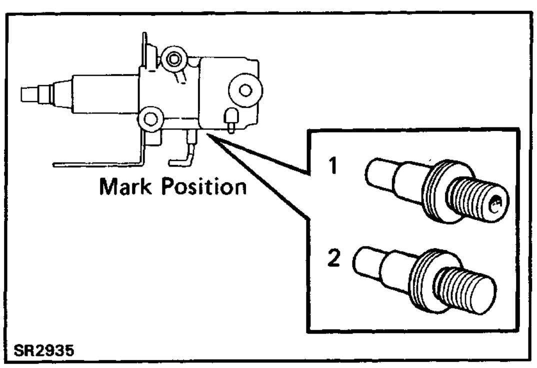
(b) Using SST to hold the main shaft, install the snap ring with snap ring pliers.
SST 09950–20017



3. INSTALL TURN SIGNAL BRACKET

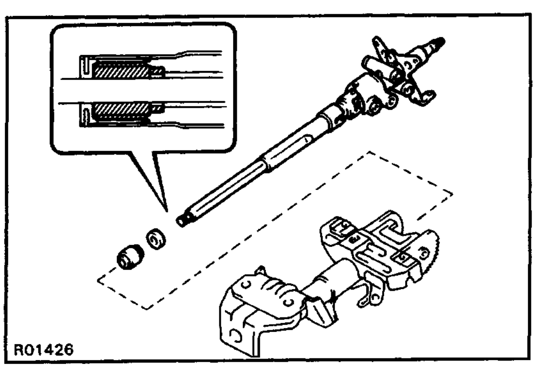
Install the two bolts.

Torque: 7.8 N–m (80 kgf–cm, 69in.–lbf)



4. SELECT STEERING BOLT AND UPPER COLUMN TUBE

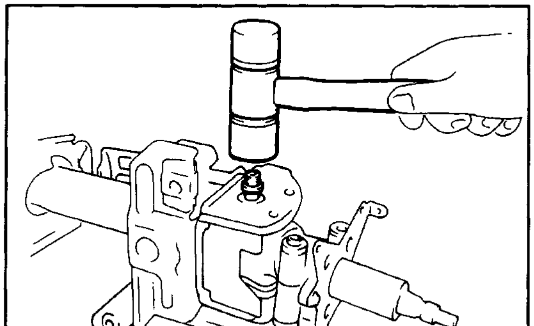
Select the bolt with center hole when the upper column tube mark is 1, and select the bolt without hole when the mark is 2.



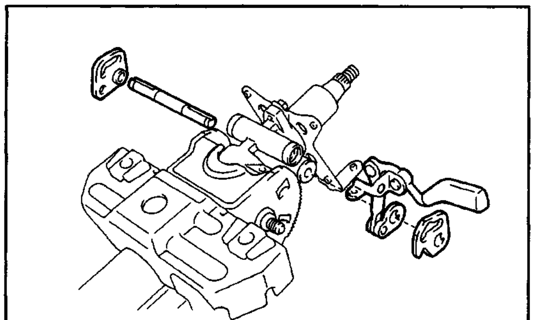
5. INSTALL MAIN SHAFT WITH UPPER COLUMN TUBE

(a) Install the stopper and main shaft collar to the main shaft as shown.

(b) Install the main shaft to the lower column tube.

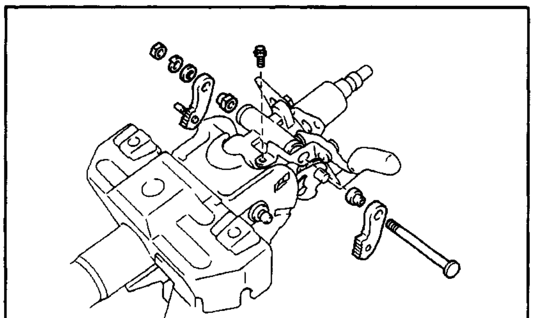

R01425

(c) Using a plastic hammer, drive in the steering bolts.


R01070

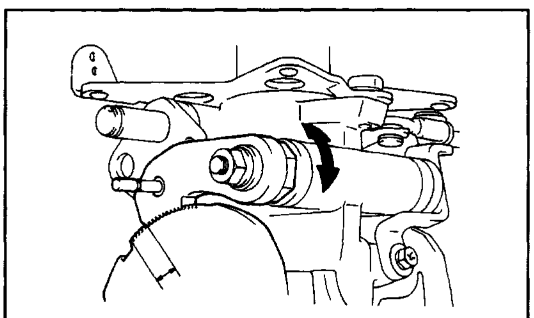
INSTALL TILT LEVER LOCK BOLT, TILT LEVER ASSEMBLY, TILT LEVER AND TILT SUB LEVER

(a) Install the tilt lever lock bolt to the upper column tube.
(b) Install the tilt lever assembly with the screw.
(c) Install the tilt lever and the tilt sub lever.


R01069

INSTALL TWO TILT PAWLS

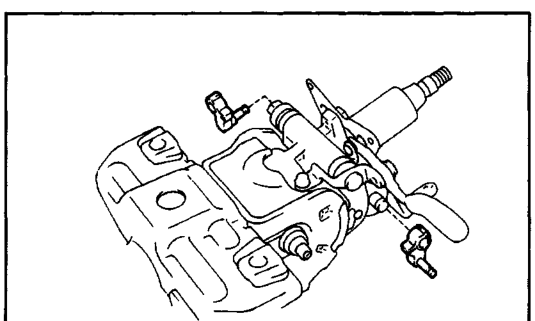
Temporarily install the tilt pawls.


R01276

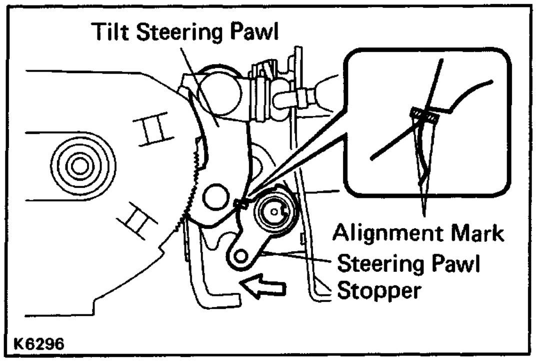
8. ENGAGE AND ADJUST TILT PAWL

(a) Engage the tilt sub lever side pawl to the center of the ratchet.
(b) While turning the tilt lever side collar, engage the tilt lever side pawl to the ratchet completely.
(c) Tighten the nut.

Torque: 5.9 N–m (60 kgf–cm, 52 in.–lbf)


R01075

9. INSTALL TWO TILT PAWL STOPPERS

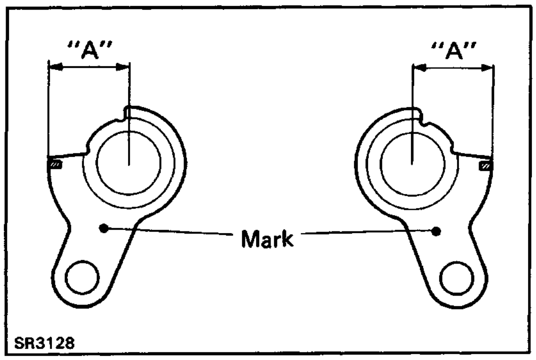


10. SELECT STEERING PAWL STOPPERS FOR BOTH SIDES

(a) With the steering lock pawl and the ratchet engaged, select and install two tilt steering pawl stoppers.

(b) Check that the alignment marks on the stopper and pawl align when the stopper is rotated to the pawl side.

(c) If the alignment marks do not align, select tilt steering pawl stoppers according to the following table.



Tilt lever side	Tilt sub lever side	Dimension "A" mm (in.)
1	A	12.65 – 12.75 (0.4980 – 0.5020)
2	B	12.55 – 12.65 (0.4941 – 0.4980)
3	C	12.45 – 12.55 (0.4902 – 0.4941)
4	D	12.35 – 12.45 (0.4862 – 0.4902)
5	E	12.25 – 12.35 (0.4823 – 0.4862)

(d) After selecting the stoppers, check that on both sides the pawl and ratchet are fully engaged.

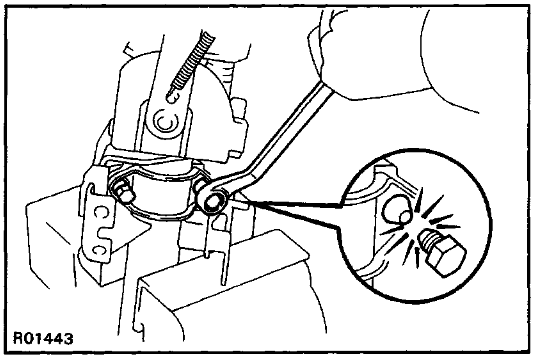
11. INSTALL TWO TILT LEVER RETAINERS

(a) Install the two tilt lever retainers and torque the nuts.

Torque: 15 N–m (1150 kgf –cm, 11 ft–lbf)

(b) Install the E–rings.

[redacted]



14. INSTALL UPPER COLUMN BRACKET

(a) Install the upper column bracket with new two tapered–head bolts.

(b) Tighten the tapered–head bolts until the bolt heads break off.

15. CHECK OPERATION OF TILT STEERING LEVER AND SUPPORT

(a) Check that there is no axial play at the end of the main shaft.

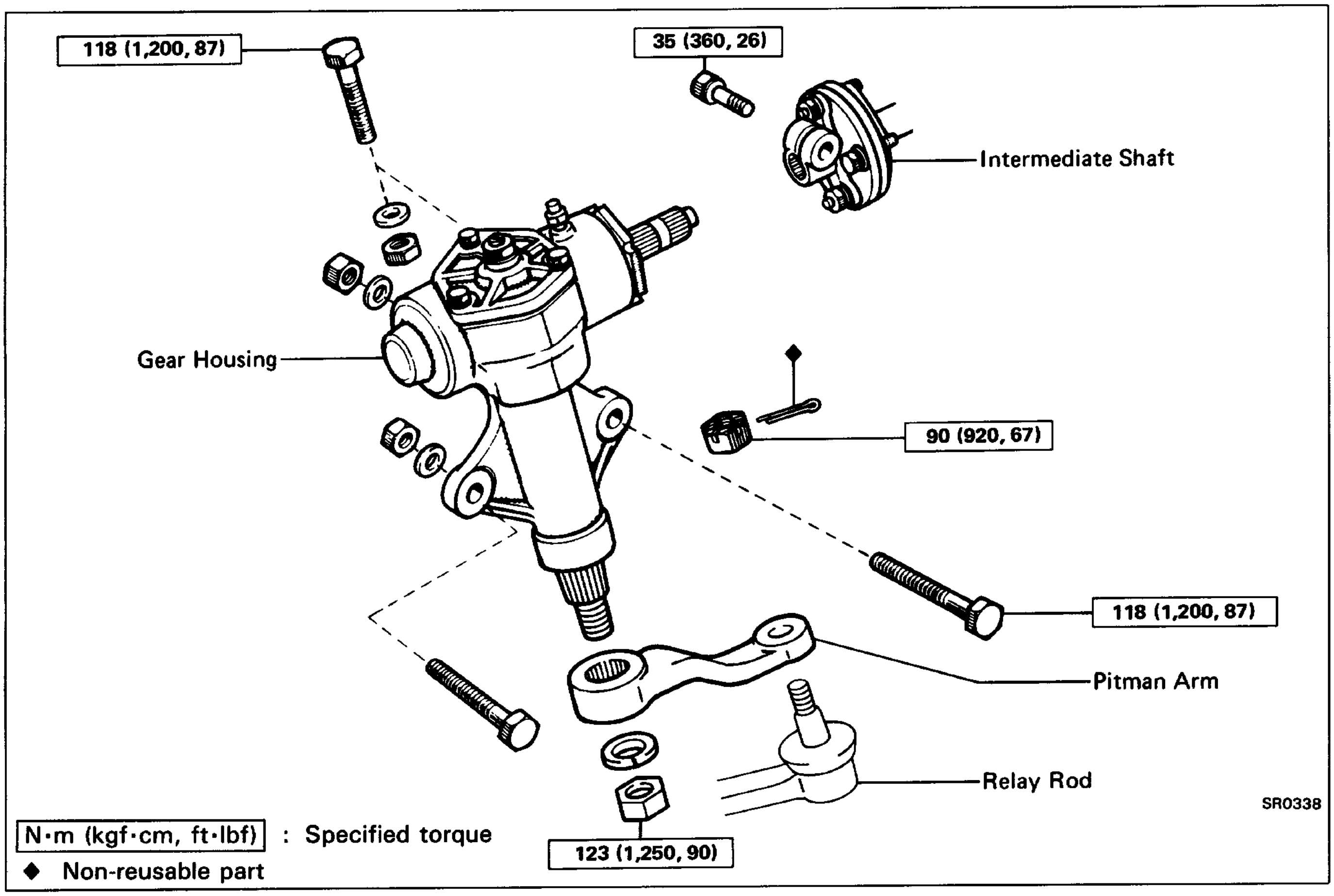
(b) with the main shaft in the neutral position, raise the tilt lever and check that the main shaft rises to the uppermost position.

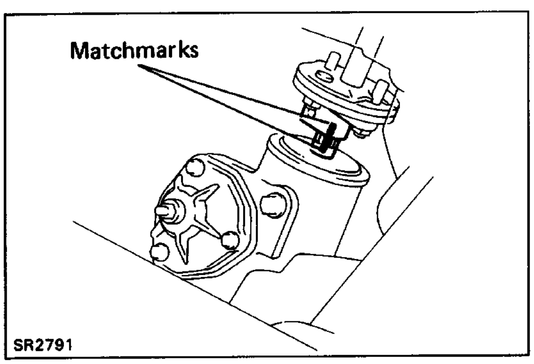
(c) Lower the main shaft, and check that it locks in the lowermost position.

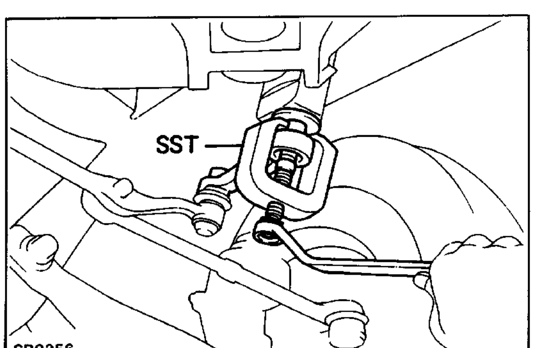
MANUAL GEAR HOUSING (2WD)

REMOVAL AND INSTALLATION OF MANUAL GEAR HOUSING

Remove and install the parts as shown.







(MAIN POINTS OF REMOVAL AND INSTALLATION)

1. DISCONNECT UNIVERSAL JOINT

(a) Loosen the column side set bolt.

(b) Remove the gear side set bolt.

(c) Place matchmarks on the flexible coupling and worm shaft.

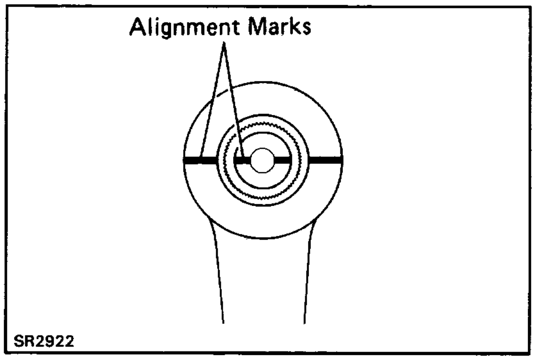
(d) Slide the shaft rearward to disconnect the shaft from the worm shaft.

2. DISCONNECT PITMAN ARM FROM GEAR HOUSING

(a) Loosen the pitman arm nut.

(b) Using SST, disconnect pitman arm from the gear housing.

SST 09610–55012

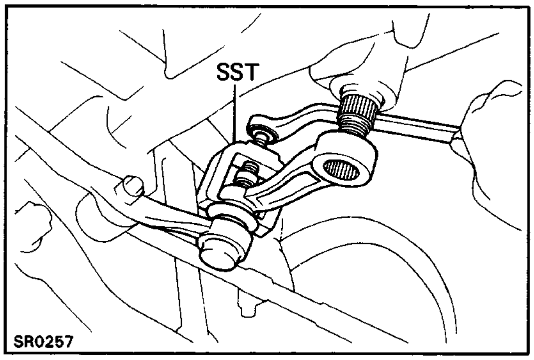


3. CONNECT PITMAN ARM TO GEAR HOUSING

(a) Align the alignment marks on the sector shaft and pitman arm and install the spring washer and arm.

(b) Tighten the pitman arm nut.

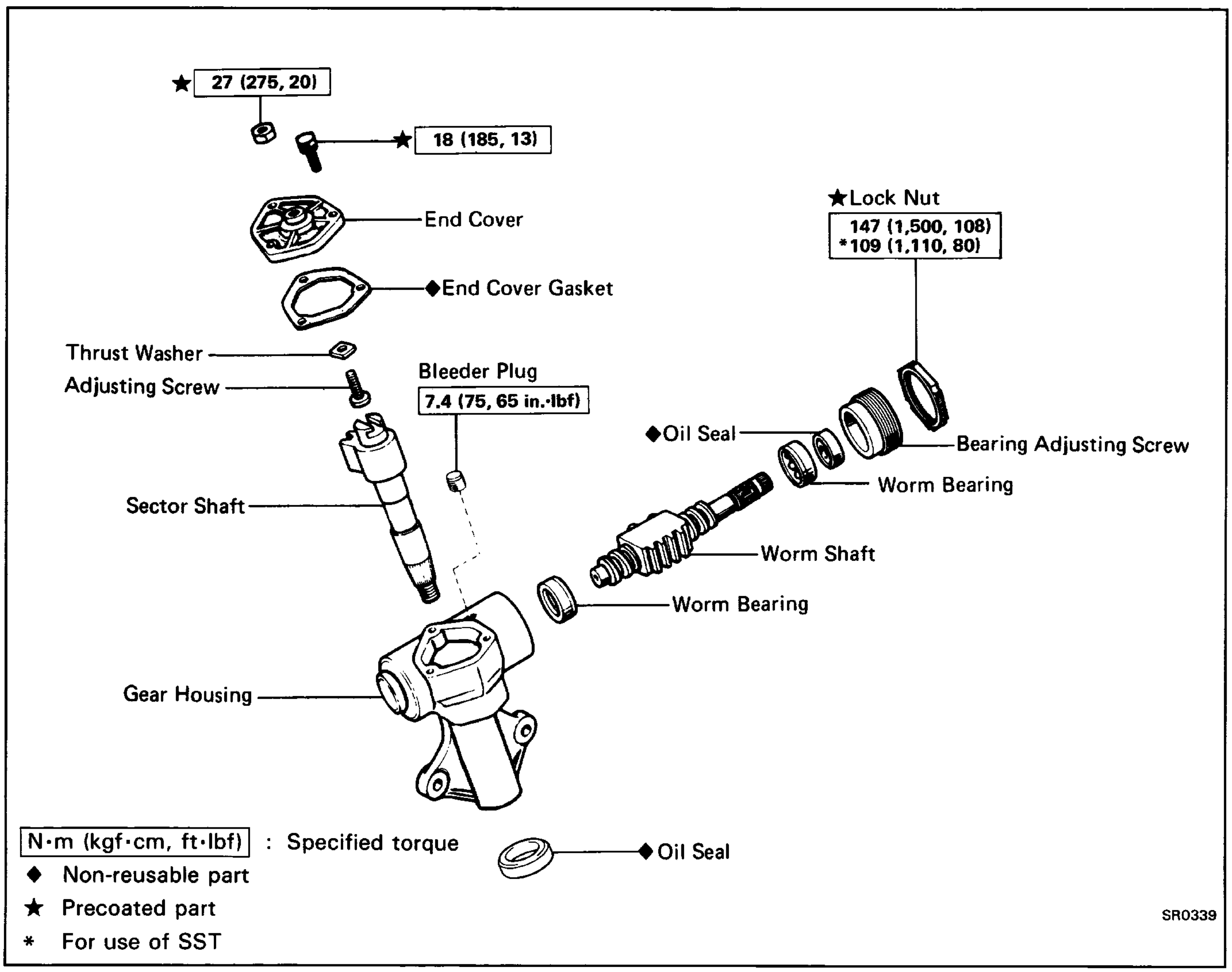
Torque: 123 N–m (1,250 kgf–cm, 90 ft–lbf)

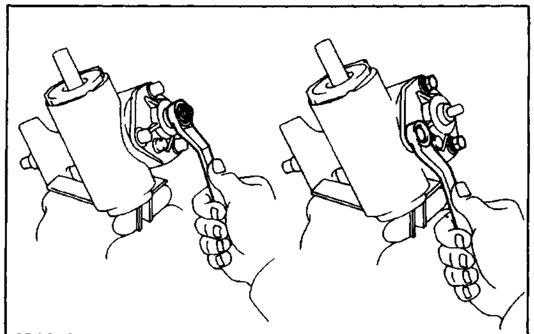


4. DISCONNECT PITMAN ARM FROM RELAY ROD

Using SST, disconnect the pitman arm from the relay rod.
SST 09611–22012

COMPONENTS




SR0378 SR0379

DISASSEMBLY OF MANUAL GEAR HOUSING

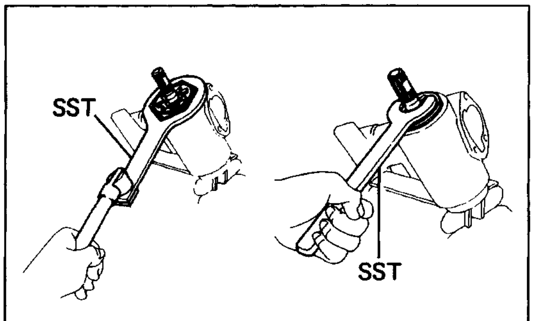
1. REMOVE BLEEDER PLUG AND DRAIN GEAR OIL

2. REMOVE END COVER AND SECTOR SHAFT

(a) Remove the adjusting screw lock nut and three bolts.

(b) Remove the end cover by turning the adjusting screw clockwise with a screwdriver.

(c) Pull out the sector shaft and adjusting screw from the gear housing.



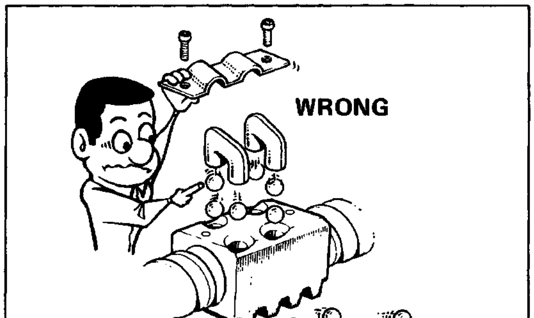
SR0380 SR0381

3. REMOVE LOCK NUT

Using SST, remove the lock nut.
SST 09617–22020

4. REMOVE BEARING ADJUSTING SCREW

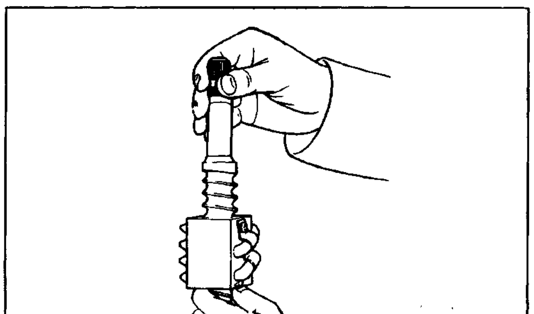
Using SST, remove the adjusting screw.
SST 09616–30011



R01319

5. REMOVE WORM SHAFT

Pull the worm shaft out of the gear housing.
NOTICE: Do not disassemble the ball nut from the worm shaft.

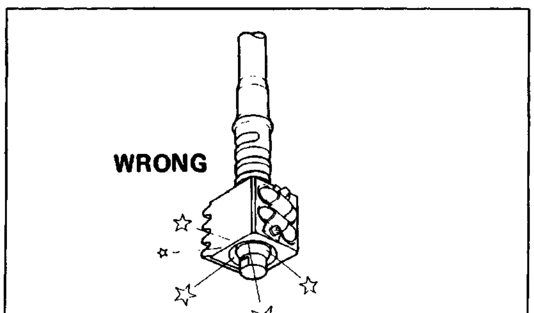

Z6878

INSPECTION AND REPLACEMENT OF MANUAL GEAR HOUSING

1. INSPECT WORM AND BALL NUT

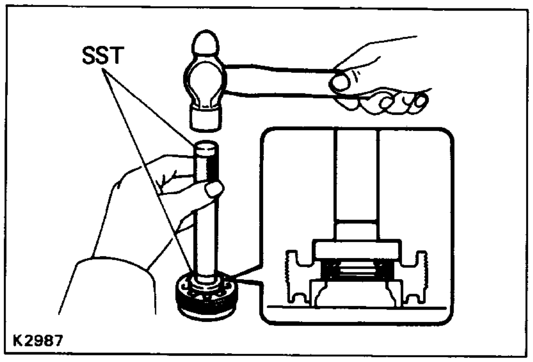
(a) Check the worm and ball nut for wear or damage.

(b) Check that the nut rotates smoothly down the shaft by its own weight.
If a problem is found, repair or replace the worm.



SR0019

NOTICE: Do not allow the ball nut to hit the end of the worm shaft.

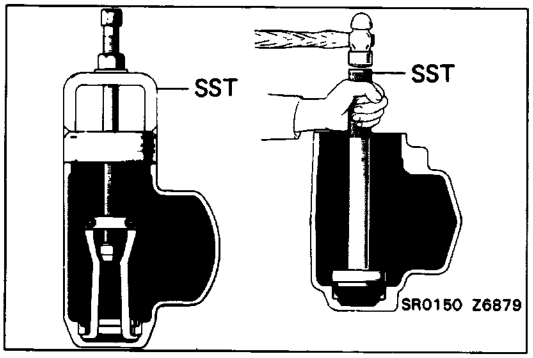


2. INSPECT WORM BEARINGS AND OIL SEAL

Check for wear or damage.
If a problem is found, replace the bearings, bearing races and oil seal.

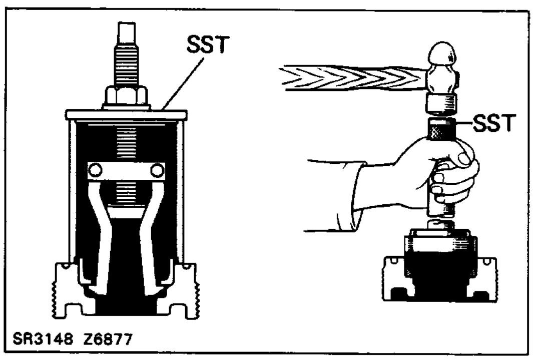
3. IF NECESSARY, REPLACE OIL SEAL

(a) Remove the oil seal with a screwdriver.
(b) Using SST, install a new oil seal.
SST 09620–30010 (09627–30010, 09631–00020)



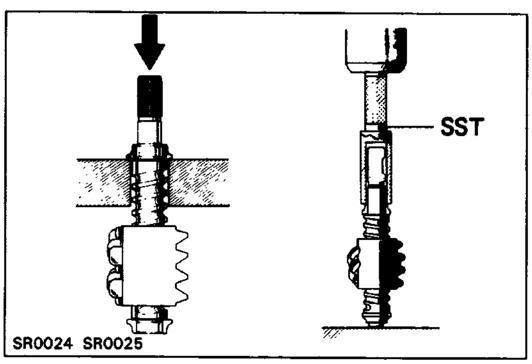
4. IF NECESSARY, REPLACE OUTER RACE IN GEAR HOUS– ING

(a) Using SST, remove the outer race from the housing.
SST 09612–65014 (09612–01030)
(b) Using SST, install a new outer race into the housing.
SST 09620–30010 (09626–30010, 09631–00020)



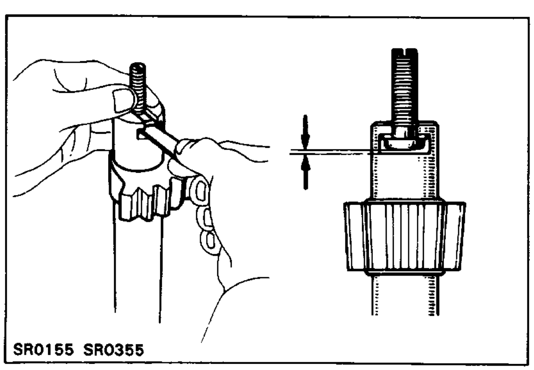
5. IF NECESSARY, REPLACE OUTER RACE 1N ADJUSTING NUT

(a) Remove the oil seal with a screwdriver.
(b) Using SST, remove the outer race from the nut.
SST 09612–30012
(c) Using SST, install a new race into the nut.
SST 09620–30010 (09626–30010, 09631–00020)
(d) Using SST, install a new oil seal into the nut.
SST 09620–30010 (09627–30010, 09631–00020)



6. IF NECESSARY, REPLACE INNER RACE ON WORM SHAFT

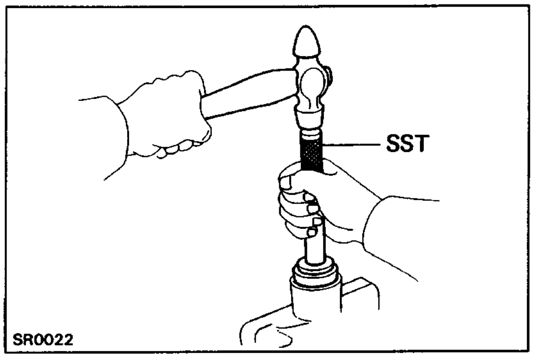
(a) Using a press, remove the inner races from the shaft.
(b) Using SST, press new inner races onto the shaft.
SST 09620–30010 (09623–30010)



7. INSPECT SECTOR SHAFT

Measure shaft thrust clearance with a feeler gauge.
Maximum clearance: 0.05 mm (0.0020 in.) or less
If necessary, install a new thrust washer which will pro– vide the minimum clearance between the sector shaft and the adjusting screw.
Thrust washer thickness

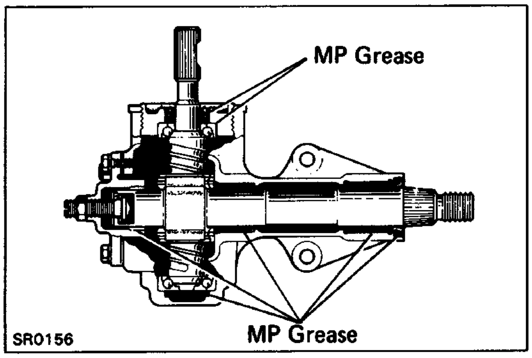
Thickness mm	(in.)	Thickness mm	(in.)
1.95	(0.0768)	2.10	(0.0827)
2.00	(0.0787)	2.15	(0.0847)
2.05	(0.0807)		



8. IF NECESSARY, REPLACE OIL SEAL

(a) Remove the oil seal with a screwdriver from the gear housing.

(b) Using SST and a hammer, install a new oil seal.
SST 09630–00012 (09631–00020, 09631–00090)

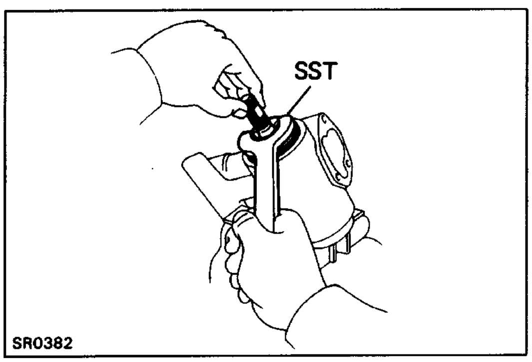


ASSEMBLY OF STEERING GEAR HOUSING
(See page SR–19)

1. APPLY MP GREASE TO BUSHING, NEEDLE ROLLER BEARING AND OIL SEALS

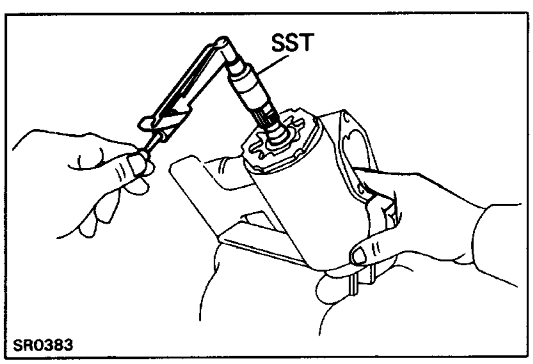
2. INSTALL WORM SHAFT INTO GEAR HOUSING

Place the worm bearings on the shaft and install the shaft into the housing.

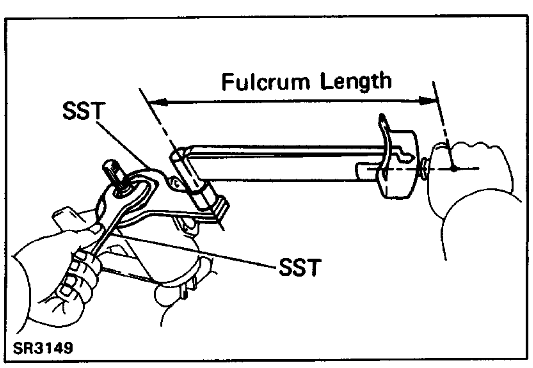


3. INSTALL AND ADJUST BEARING ADJUSTING SCREW

(a) Using SST, gradually tighten the adjusting screw until it is snug.
SST 09616–30020



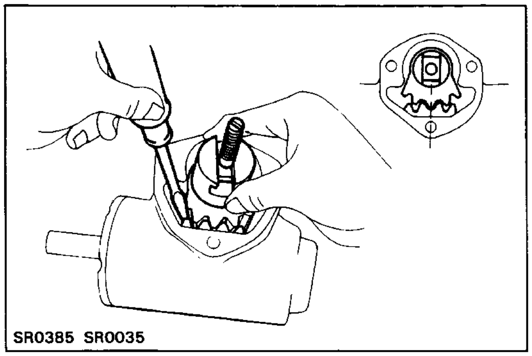
(b) Using a torque meter and SST, measure the bearing preload in both directions. Turn the adjusting screw until the preload is correct.
Preload (Starting): 0.3 – 0.5 N–m
(3 – 5 kgf–cm, 2.6 – 4.3 in.–lbf)
SST 09616–00010



(c) Apply sealant to the lock nut.
Sealant: Part No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(d) Hold the adjusting screw in position with SST and tighten the lock nut with SST.
Torque: 147 N–m (1,500 kgf–cm, 108 ft–lbf)
SST 09616–30011 and 09617–22020
HINT:

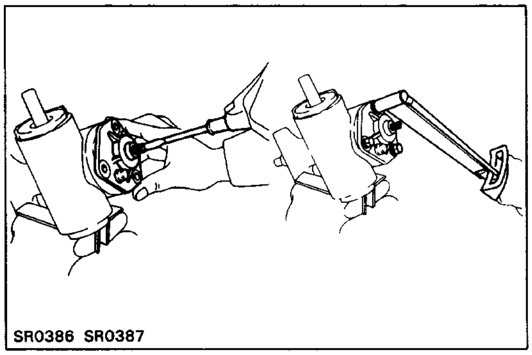
- Check that the bearing preload is still correct.
- Use a torque wrench with a fulcrum length of 425 mm (16.73 in.).



4. INSTALL SECTOR SHAFT

(a) Install the adjusting screw and thrust washer onto the sector shaft.

(b) Set the ball nut at the center of the worm shaft. In–stall the sector shaft into the gear housing so that the center teeth mesh together.



5. INSTALL END COVER

(a) Install the end cover over a new gasket.

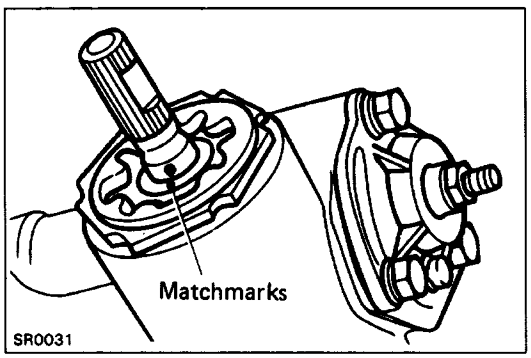
(b) Using a screwdriver, loosen the adjusting screw as far as possible.

(c) Apply sealant to the bleeder plug side cover bolt.

Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(d) Torque the three cover bolts.

Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)

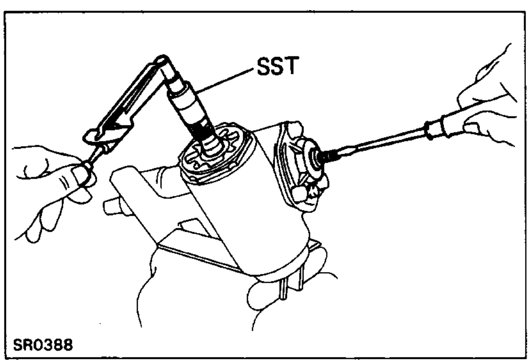


6. PLACE WORM SHAFT IN NEUTRAL POSITION

(a) Count the total shaft rotations and turn the shaft back half of that number.

(b) The worm shaft is now in neutral position.

(c) Place matchmarks on the worm shaft and housing to show neutral position.



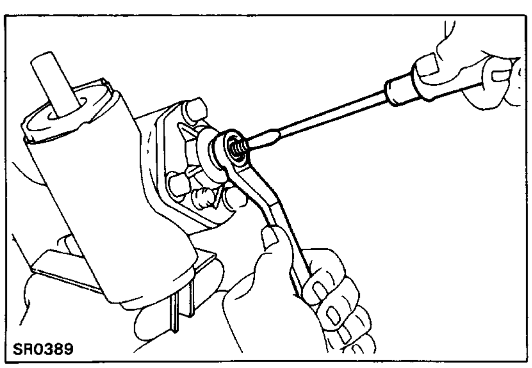
7. ADJUST TOTAL PRELOAD

Using a torque meter and SST, turn the adjusting screw while measuring the preload until it is correct.

HINT: Be sure that the worm shaft is in neutral position.

Preload (Starting): 0.8 – 1.0 N–m
(8 – 10.5 kgf–cm, 6.9 – 9.1 in.–lbf)

SST 09616–00010



8. TIGHTEN ADJUSTING SCREW LOCK NUT

(a) Apply sealant to the lock nut.

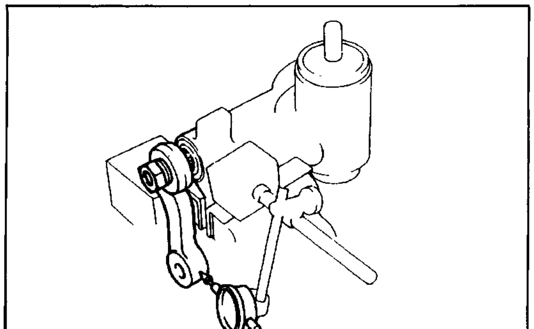
Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(b) Hold the screw with a screwdriver while tightening the lock nut.

(c) Torque the lock nut.

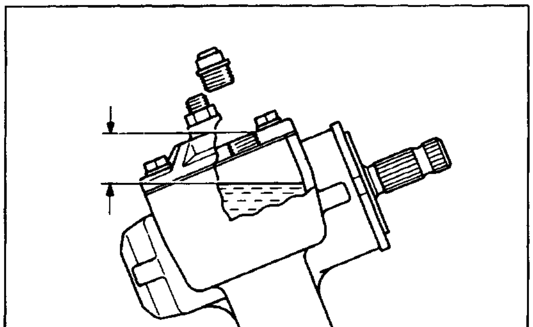
Torque: 27 N–m (275 kgf–cm, 20 ft–lbf)

HINT: Check that the preload is still correct.


SR0340

9. MEASURE SECTOR SHAFT BACKLASH

Install a dial indicator. Check that the sector shaft has no backlash within 100 degrees of the left and right sides from neutral position.


SR3105R

10. REPLENISH WITH GEAR OIL

Oil type: **API GL–4, SAE 90**
Capacity: **380 – 400 cc (23.2 – 24.4 cu in.)**
Oil level: **(at installation)**
18 – 28 mm (0–71 – 1.10 in.) from top

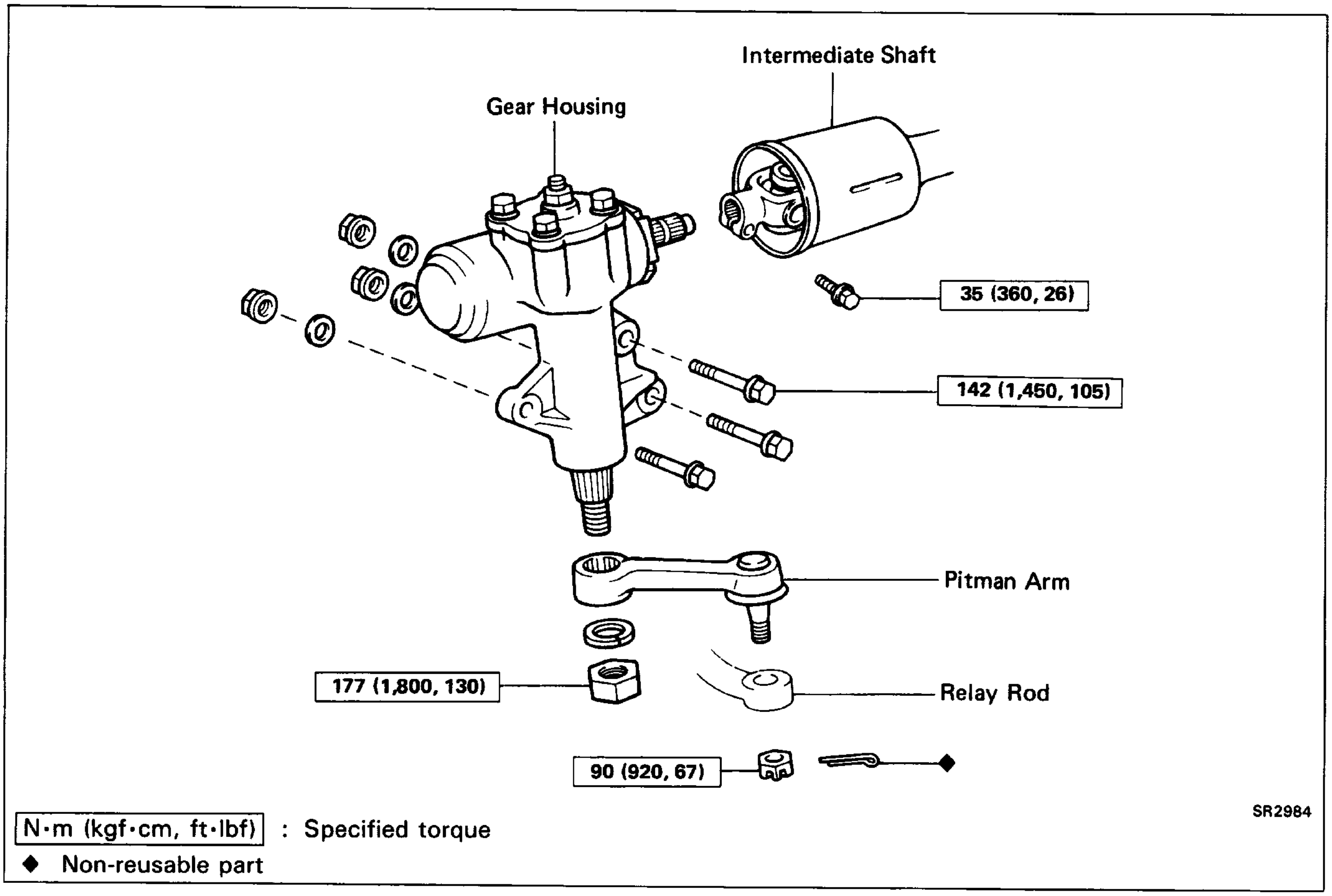
11. INSTALL BLEEDER PLUG

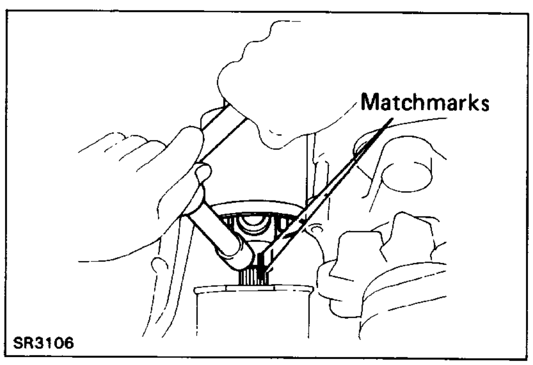
Torque: 7.4 N–m (75 kgf–cm, 65 in.–lbf)

MANUAL GEAR HOUSING (4WD)

REMOVAL AND INSTALLATION OF MANUAL GEAR HOUSING

Remove and install the parts as shown.





(MAIN POINTS OF REMOVAL AND INSTALLATION)

1. DISCONNECT UNIVERSAL JOINT

(a) Loosen the column side set bolt.

(b) Remove the gear side set bolt.

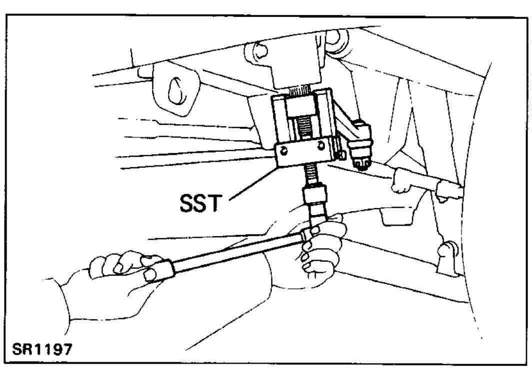
(e) Place matchmarks on the universal joint and worm shaft.

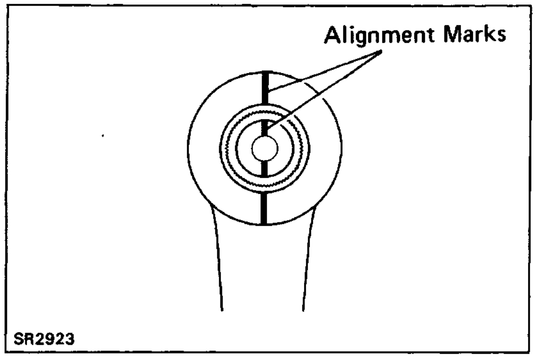
(d) Slide the shaft rearward to disconnect the shaft from the worm shaft.

2. DISCONNECT PITMAN ARM FROM GEAR HOUSING

(a) Loosen the pitman arm set nut.

(b) Using SST, disconnect the pitman arm from the gear housing.
SST 09628–62011

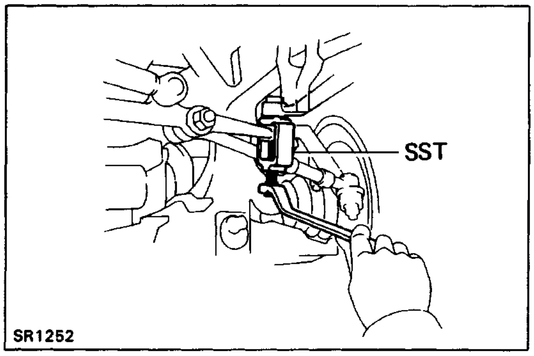




3. CONNECT PITMAN ARM TO GEAR HOUSING

Align alignment marks on the pitman arm and the sector shaft, and install the spring washer and nut.

Torque: 177 N–m (1,800 kgf–cm, 130 ft–lbf)



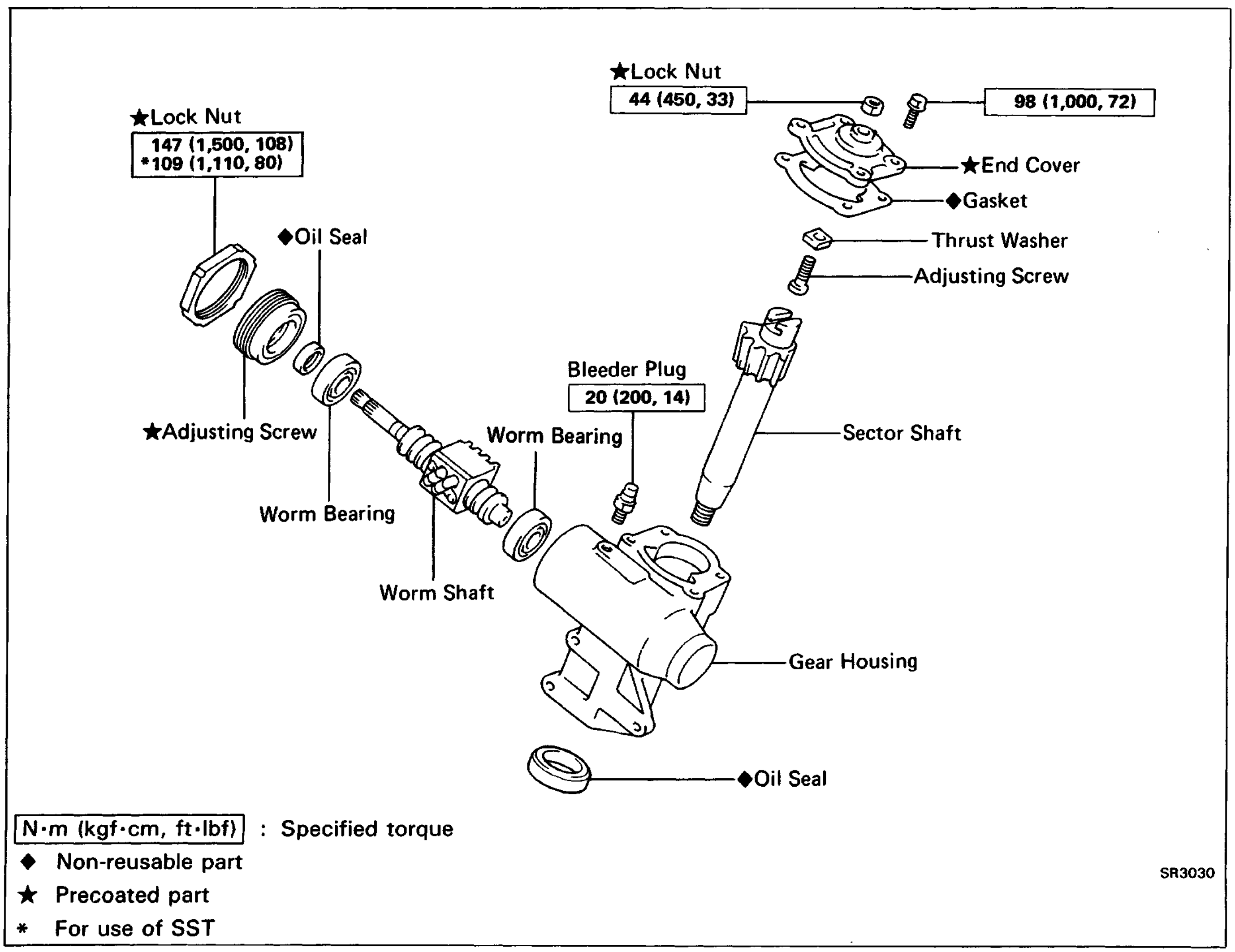
4. DISCONNECT PITMAN ARM FROM RELAY ROD

(a) Remove the cotter pin and set nut.

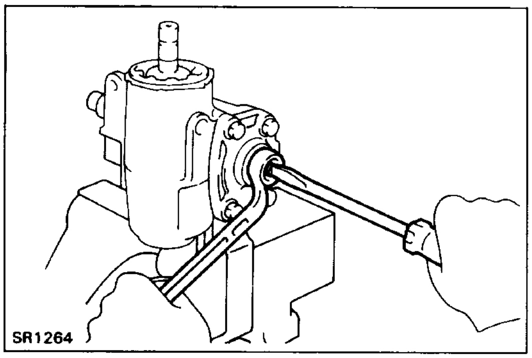
(b) Using SST, disconnect the pitman arm from the re–lay rod.

SST 09611–22012

COMPONENTS



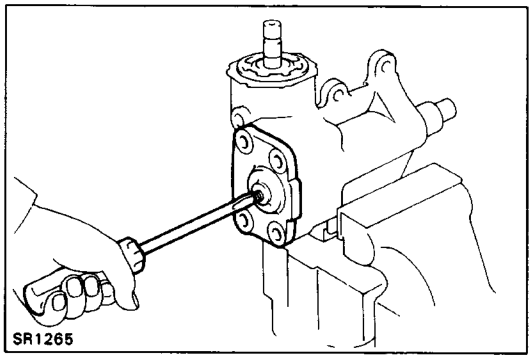
DISASSEMBLY OF MANUAL GEAR HOUSING



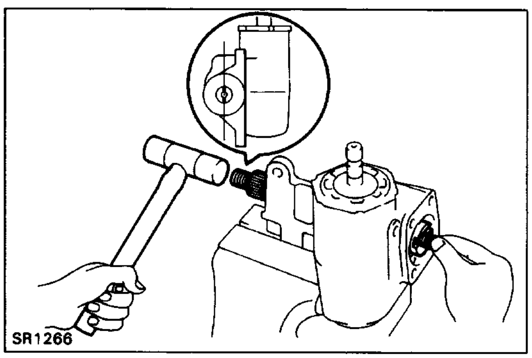
1. REMOVE BLEEDER PLUG AND DRAIN GEAR OIL

2. REMOVE END COVER

(a) Remove the adjusting screw lock nut and four bolts.



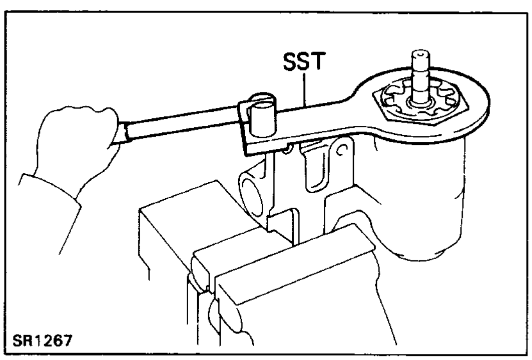
(b) Remove the end cover by turning the adjusting screw clockwise.



3. REMOVE SECTOR SHAFT

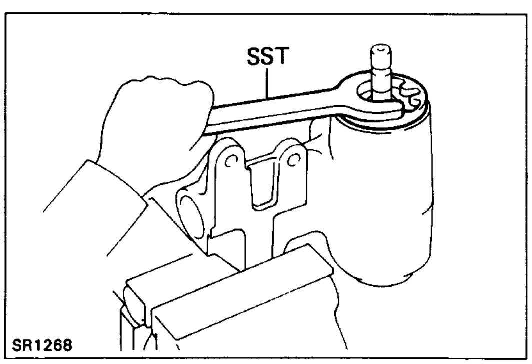
(a) Using a plastic hammer, tap out the sector shaft.

(b) Remove the sector shaft.



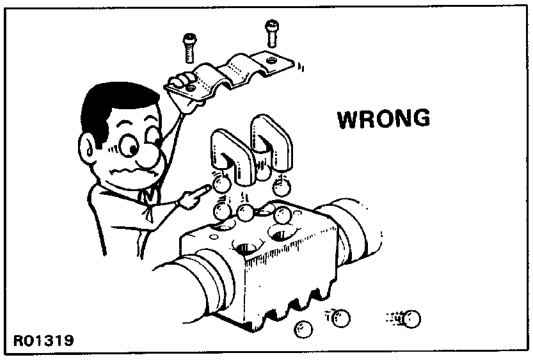
4. REMOVE WORM BEARING ADJUSTING SCREW LOCK NUT

Using SST, remove the lock nut.
SST 09617–60010



5. REMOVE WORM BEARING ADJUSTING SCREW

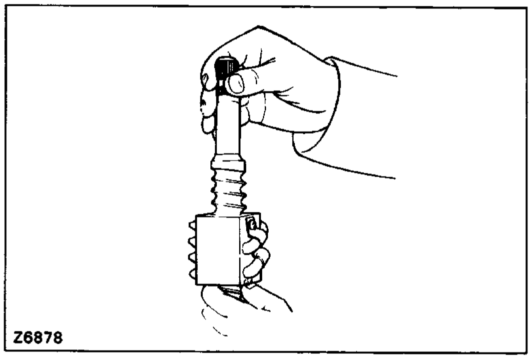
Using SST, remove the adjusting screw.
SST 09616–22010



6. REMOVE WORM SHAFT

Pull the worm shaft out of the gear housing.

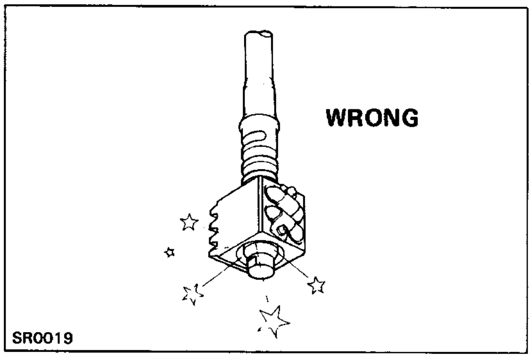
NOTICE: Do not disassemble the ball nut from the worm shaft.



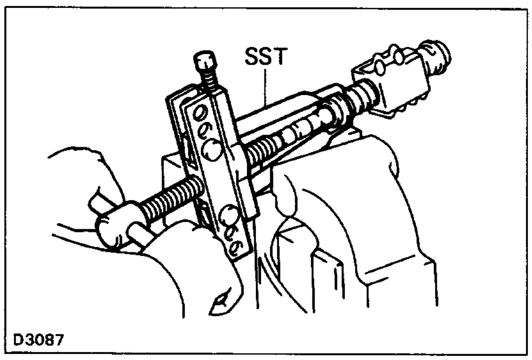
INSPECTION AND REPLACEMENT OF MANUAL GEAR HOUSING

1. INSPECT WORM AND BALL NUT

(a) Check the worm and ball nut for wear or damage.
(b) Check that the nut rotates smoothly down the shaft by its own weight.
If a problem is found, repair or replace the worm.

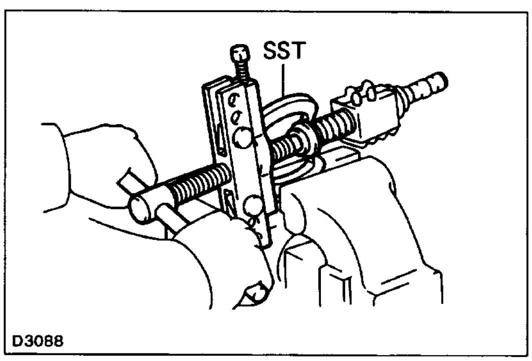


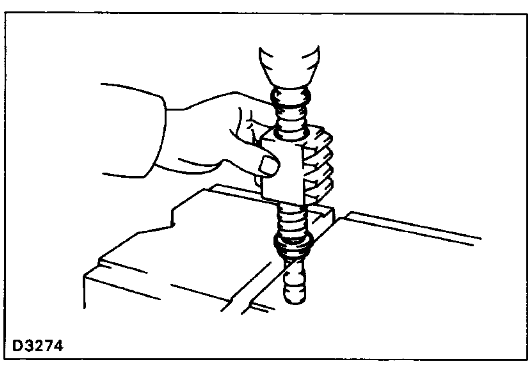
NOTICE: Do not allow the ball nut to hit the end of the worm shaft.



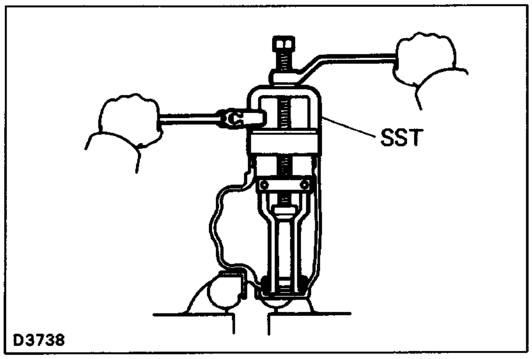
2. IF NECESSARY, REPLACE WORM BEARING INNER RACE

(a) Using SST, remove the both side bearing inner races.
SST 09950–20017

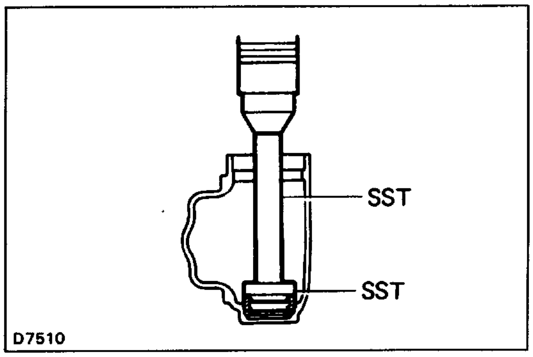




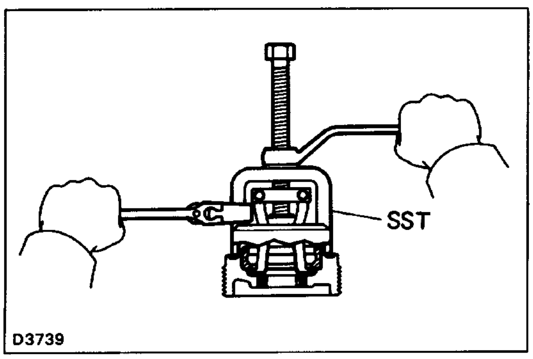
(b) Using a press, install new bearing inner races.
NOTICE: Be careful not to damage the ball nut while holding it with hand.



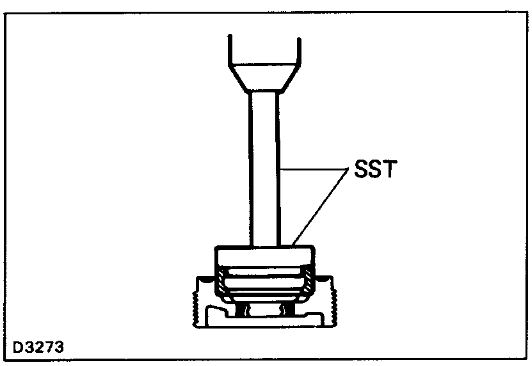
(c) Using SST, remove the outer race from the gear housing.
SST 09612–65014 (09612–01030)



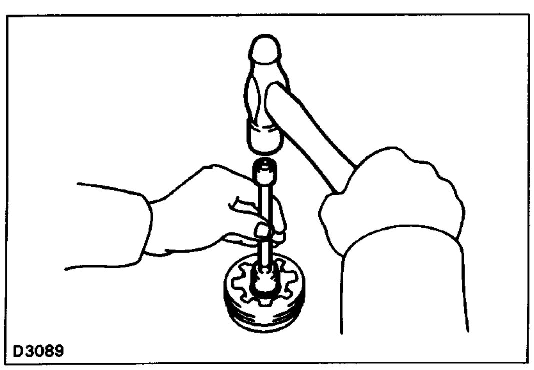
(d) Using SST, press in a new outer race into the gear housing.
SST 09550–10012 (09552–10010, 09559–10010)



(e) Using SST, remove the outer race from the adjusting screw.
SST 09612–65014 (09612–01040)

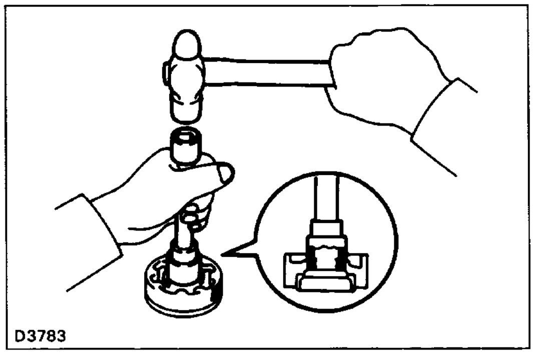


(f) Using SST, press in a new outer race into the adjust–ing screw.
SST 09550–10012 (09552–10010, 09559–10010)

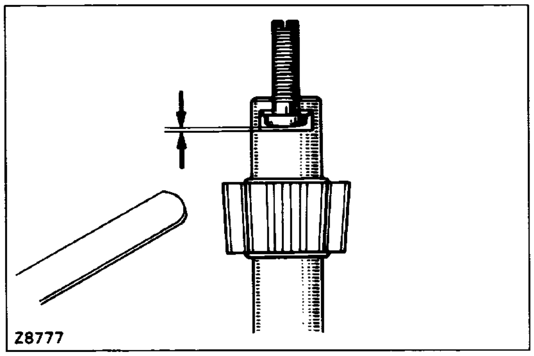


3. IF NECESSARY, REPLACE ADJUSTING SCREW OIL SEAL

(a) Using a socket wrench, drive out the oil seal.



(b) Using a socket wrench, drive in a new oil seal.



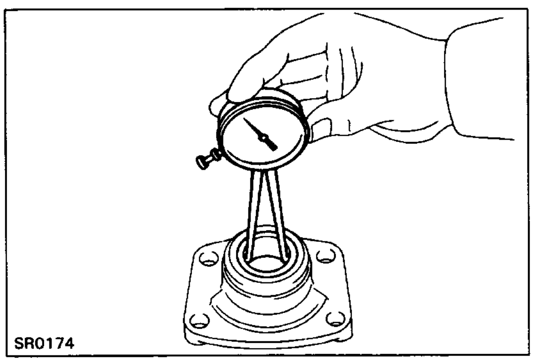
4. MEASURE SECTOR SHAFT THRUST CLEARANCE

Using a feeler gauge, measure the shaft thrust clearance.

Maximum clearance: 0.05 mm (0.0020 in.) or less

If necessary, install a new thrust washer to provide the minimum clearance between the sector shaft and adjust–ing screw.

Thrust washer thickness mm (in.)			
1.95 2.00	(0.0768) (0.0787)	2.05	(0.0807)



5. INSPECT SECTOR SHAFT END COVER

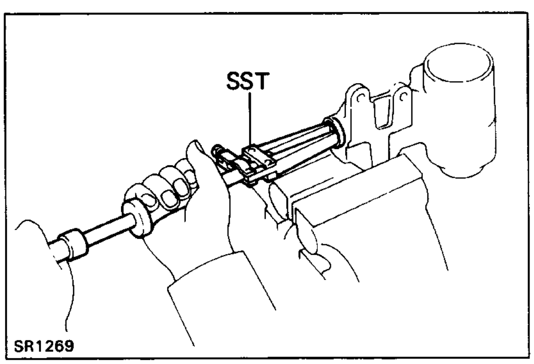
(a) Check for damage.

(b) Check the bushing for wear or damage.

(c) Measure the bushing inside diameter.

Maximum inside diameter: 36.07 mm (1.4201 in.)

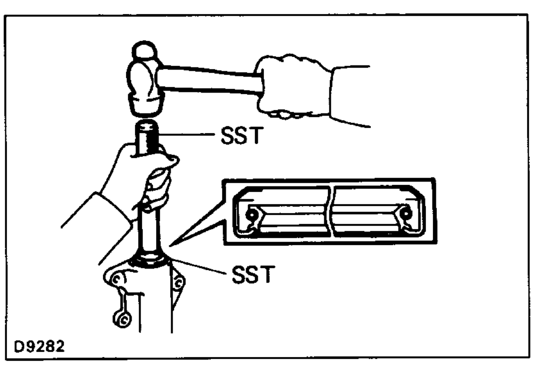
If necessary, replace the end cover.



6. IF NECESSARY, REPLACE GEAR HOUSING OIL SEAL

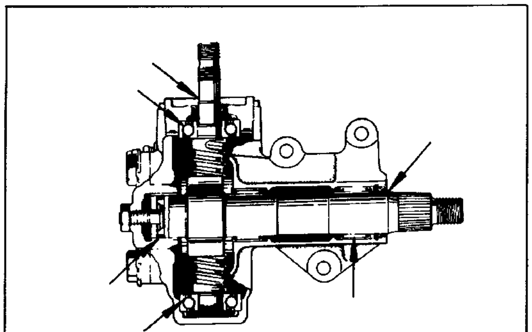
(a) Using SST, remove the oil seal.

SST 09308–00010



(b) Using SST, drive in a new oil seal.

SST 09550–10012 (09552–10010, 09558–10010)


SR1271

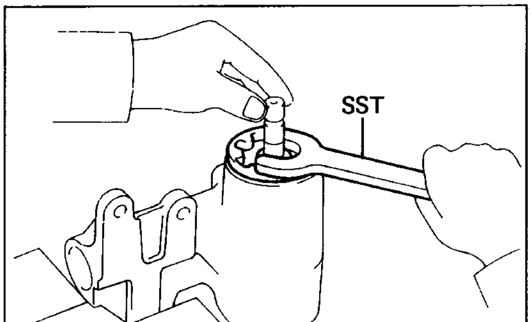
ASSEMBLY OF MANUAL GEAR HOUSING

(See page SR–27)

1. APPLY MP GREASE TO BUSHING, NEEDLE ROLLER BEARING AND OIL SEALS

2. INSTALL WORM SHAFT INTO GEAR HOUSING

Place the worm bearing on the shaft and install the shaft into the housing.



SR1272

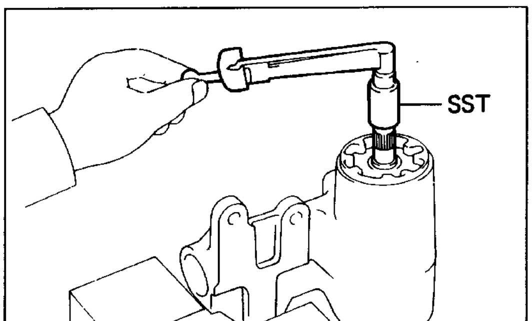
3. INSTALL AND ADJUST BEARING ADJUSTING SCREW

(a) Apply sealant to the adjusting screw.

Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(b) Using SST, gradually tighten the adjusting screw until it is snug.

SST 09616–22010



SR1273

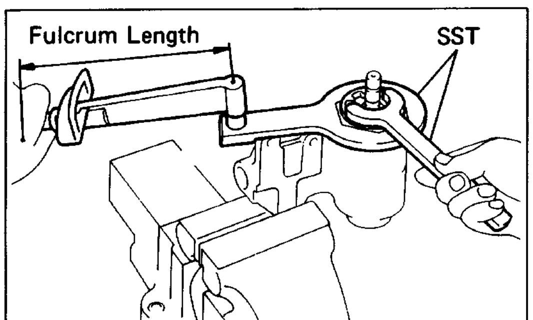
(c) Using a torque meter and SST, measure the bearing preload in both directions. Turn the adjusting screw until the preload is correct.

Preload (Starting):

0.3 – 0.5 N–m

(3.5 – 5.0 kgf–cm, 3.0 – 4.3 in.–lbf)

SST 09616–00010



SR1274

(d) Apply sealant to the lock nut.

Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

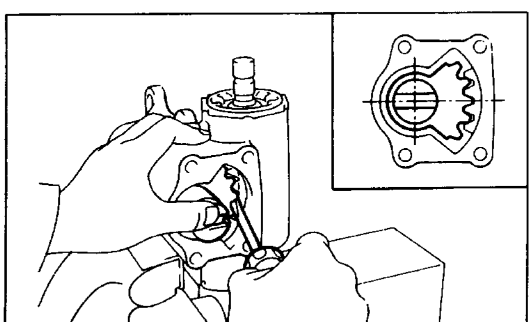
(e) Hold the adjusting screw in position with SST and tighten the lock nut with SST.

Torque: 109 N–m (1,110 kgf–cm, 80 ft–lbf)

SST 09616–22010, 09617–60010

HINT:

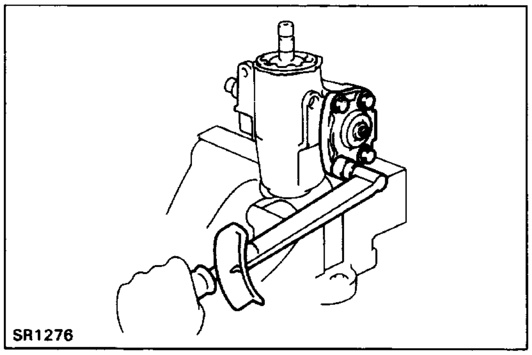
- Check that the bearing preload is still correct.
- Use a torque wrench with a fulcrum length of 425 mm (16.73 in.).


SR1275

4. INSTALL SECTOR SHAFT

(a) Install the adjusting screw and thrust washer onto the sector shaft.

(b) Set the ball nut at the center of the worm shaft. Install the sector shaft into the gear housing so that the center teeth mesh together.



5. INSTALL END COVER

(a) Apply sealant to new gasket and end cover.

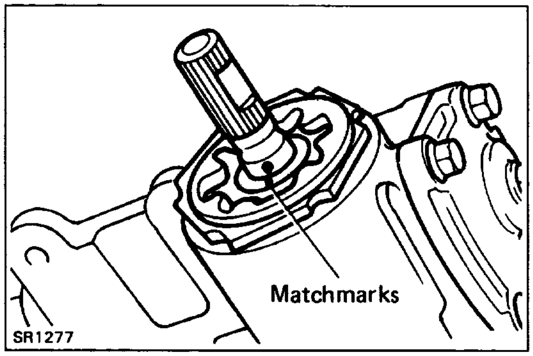
Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(b) Install the end cover over the gasket.

(c) Loosen the adjusting screw as far as possible.

(d) Torque the four cover bolts.

Torque: 98 N–m (1,000 kgf–cm, 72 ft–lbf)

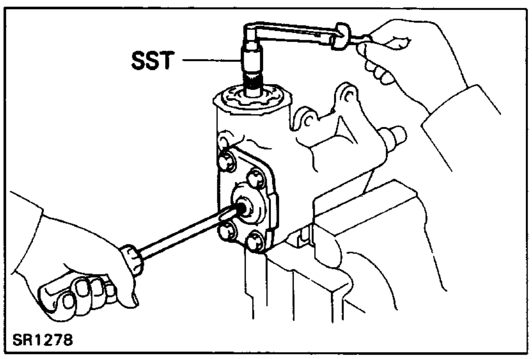


6. PLACE WORM SHAFT IN NEUTRAL POSITION

(a) Count the total shaft rotation and turn the shaft back half of that number.

(b) The worm shaft is now in neutral position.

(c) Place matchmarks on the worm shaft and housing to show neutral position.



7. ADJUST TOTAL PRELOAD

Using a torque meter and SST, turn the adjusting screw while measuring the preload until the preload is correct.

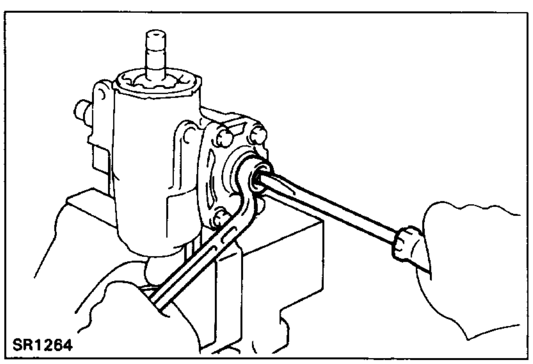
HINT: Be sure that the worm shaft is in neutral position.

Preload (Starting):

0.8 – 1.1 N–m

(8.0 – 11.0 kgf–cm, 6.9 – 9.5 in. AM)

SST 09616–00010



8. TIGHTEN ADJUSTING SCREW LOCK NUT

(a) Apply sealant to the lock nut.

Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(b) Hold the screw with a screwdriver while tightening the lock nut.

(c) Torque the lock nut.

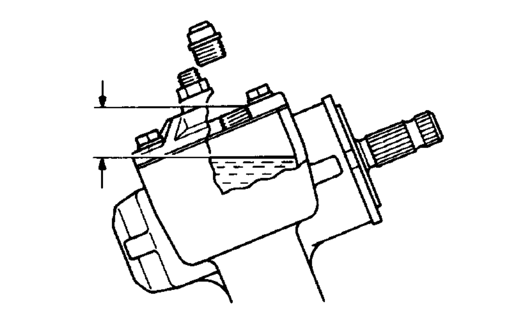
Torque: 44 N–m (450 kgf–cm, 33 ft–lbf)

HINT: Check that the preload is still correct.

9. MEASURE SECTOR SHAFT BACKLASH

(a) Align the alignment marks on the sector shaft with the pitman arm.

(b) Check that the sector shaft has no backlash within 100 degrees of the left and right side from neutral position.


SR3105R

10. REPLENISH WITH GEAR OIL

Oil type: API GL–4, SAE 90
Capacity: 400 cc (24.4 cu in.)
Oil level: (at installation)
14 – 17 mm (0.55 – 0.67 in.) from top

11. INSTALL BLEEDER PLUG

Torque: 20 N–m (200 kgf–cm, 14 ft–lbf)

POWER STEERING

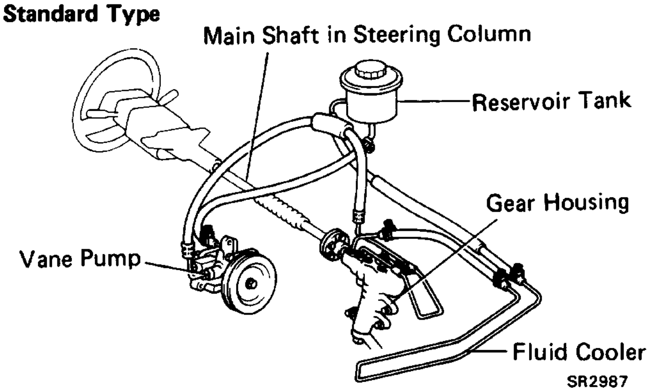
Description

Two types of power steering are the standard type and the PPS (progressive power steering) type. Both these types have a recirculating ball system and rotary type hydraulic control valve.

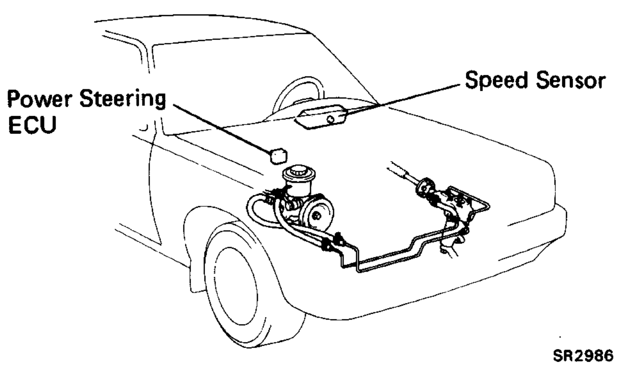
PPS TYPE

Vehicle speed is detected by a speed sensor and fluid pressure acting on the piston is varied accordingly. When the vehicle is stopped or when moving at low speed, fluid pressure is increased to lighten the force required for steering. At high speed, pressure is reduced to lessen the amount of assist and provide appropriate steering wheel response.

Standard Type



PPS (Progressive Power Steering) Type

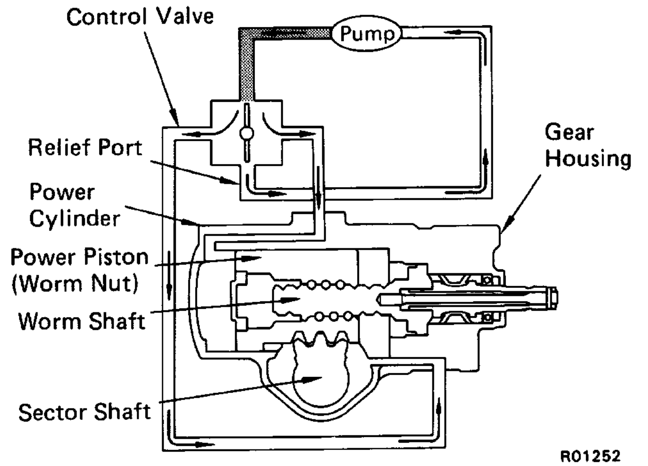


PRINCIPLES OF POWER STEERING

Power steering is one type of hydraulic device for utilizing engine power to reduce steering effort. Consequently, the engine is used to drive a pump to develop fluid pressure, and this pressure acts on a piston within the gear box so that the piston assists the sector shaft effort. The amount of this assistance depends on the extent of pressure act–ing on the piston. Therefore, if more steering force is required, the pressure must be raised. The variation in the fluid pressure is accomplished by a control valve which is linked to the intermediate shaft and the steering main shaft.

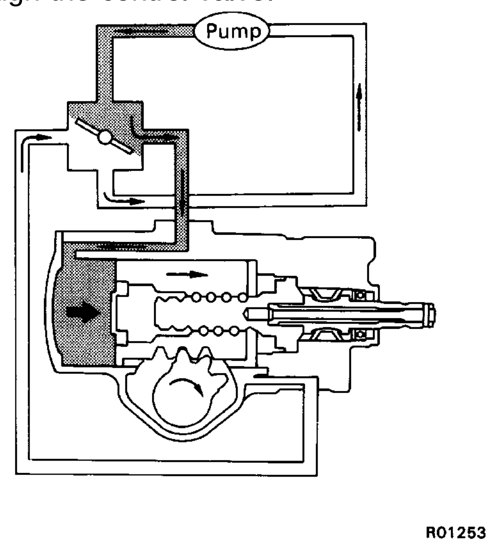
NEUTRAL (STRAIGHT–AHEAD) POSITION

Fluid from the pump is sent to the control valve. If the control valve is in the neutral position, all the fluid will flow through the control valve into the relief port and back to the pump. At this time, hardly any pressure is created and because the pressure on the power piston is equal on both sides, the piston will not move in either direction.



WHEN TURNING

When the steering main shaft is turned in either direction, the control valve also moves, closing one of the fluid passages. The other passage then opens wider, causing a change in fluid flow vol–ume and, at the same time, pressure is created. Consequently, a pressure difference occurs be–tween both sides of the piston and the piston moves in the direction of the lower pressure so that the fluid in the cylinder is forced back to the pump through the control valve.



SERVICE HINT

Troubles with the power steering system are usu–ally concerned with hard steering due to the fact that there is no assist. In such cases, before at–tempting to make repairs, it is necessary to deter–mine whether the trouble lies with the pump or with the gear housing. To do this, an on–vehicle inspection can be made by using a pressure gauge.

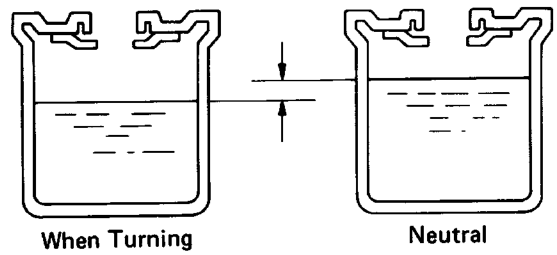
ON–VEHICLE INSPECTION

Power steering is a hydraulic device and problems are normally due to insufficient fluid pressure act–ing on the piston. This could be caused by either the pump not producing the specified fluid pres–sure or the control valve in the gear housing not functioning properly so that the proper fluid pres–sure can not be obtained.

If the fault lies with the pump, the same symp–toms will generally occur whether the steering wheel is turned fully to the right or left. On the other hand, if the fault lies with the control valve, there will generally be a difference between the amount of assist when the steering wheel is turned to the left and right, causing harder steer–ing. However, if the piston seal of the power cyl–inder is worn, there will be a loss of fluid pressure whether the steering wheel is turned to the right or left and the symptoms will be the same for both.

Before performing an on–vehicle inspection, a check must first be made to confirm that the power steering system is completely free of any air. If there is any air in the system, the volume of this air will change when the fluid pressure is raised, causing a fluctuation in the fluid pressure so that the power steering will not function prop–erly. To determine if there is any air in the system, check to see if there is a change of fluid level in the reservoir tank when the steering wheel is turned fully to the right or left.

For example, if there is air in the system, it will be compressed to a smaller volume when the steer–ing wheel is turned, causing a considerable drop in the fluid level. If the system is free of air, there will be very little change in the level even when the fluid pressure is raised. This is because the fluid, being a liquid, does not change volume when compressed. The little change in the fluid level is due to expansion of the hoses between the pump and gear housing when pressure rises.



SR2392 SR2393

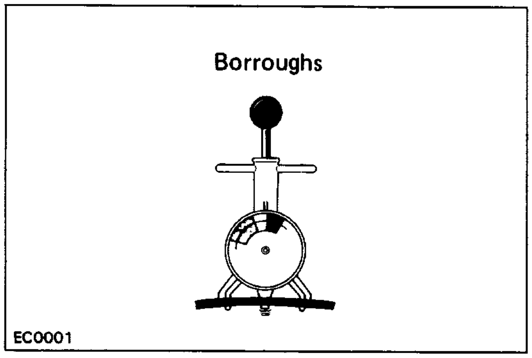
Also, air in the system will sometimes result in an abnormal noise occuring from the pump or gear housing when the steering wheel is fully turned in either direction.

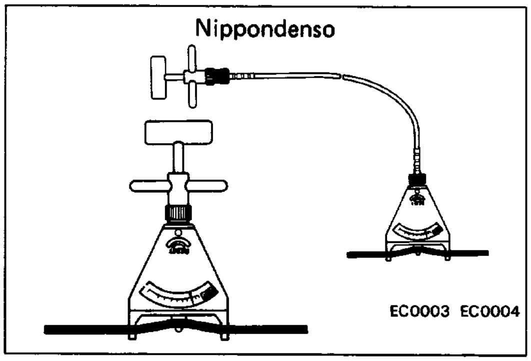
This on–vehicle inspection must be performed ev–ery time to ensure that the power steering system is working properly after overhauling or repairing the pump or gear housing.

VANE PUMP

The main component parts of the vane pump, such as the cam ring, rotor, vanes and flow con–trol valve are high precision parts and must be handled carefully. Also, because this pump pro–duces a very high fluid pressure, O–rings are used for sealing each part. When reassembling the pump, always use new O–rings.

In the flow control valve, there is a relief valve which controls the maximum pressure of the pump. The amount of this maximum pressure is very important; if it is too low, there will be insuf–ficient power steering assist and if too high, it will have an abverse effect on the pressure hoses, oil seals, etc.. If the maximum pressure is either too high or too low due to a faulty relief valve, do not disassemble or adjust the relief valve, but replace the flow control valve as an assembly.





On–Vehicle Inspection

CHECK DRIVE BELT TENSION

Using a belt tension gauge, check the drive belt tension.

Belt tension gauge:

Nippondenso BTG–20 (95506–00020) or

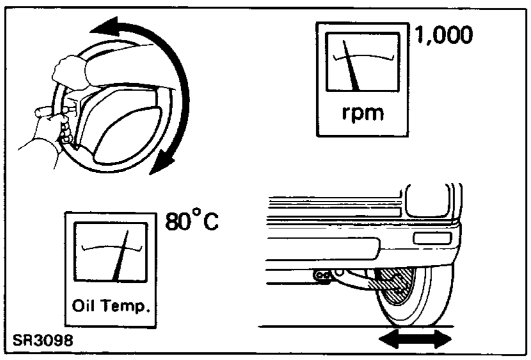
Borroughs No. BT–33–73F

Drive belt tension:

New belt	**441 – 667 N–m**
	(45 – 68 kgf, 100 – 150 lbf)
Used belt	**265 – 441 N–m**
	(27 – 45 kgf, 60 – 100 lbf)

HINT:

- ”New belt” refers to a belt which has been less than 5 minutes on a running engine.
- ”Used belt” refers to a belt which has been used on a running engine for 5 minutes or more.



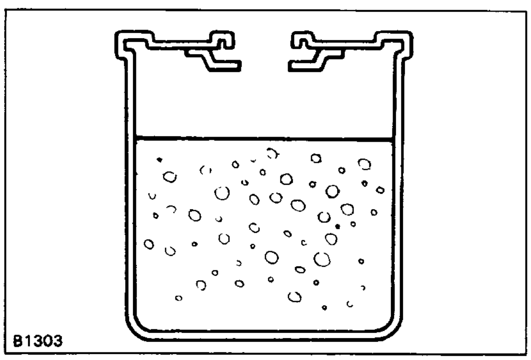
FLUID LEVEL CHECK

1. KEEP VEHICLE LEVEL

2. BOOST FLUID TEMPERATURE

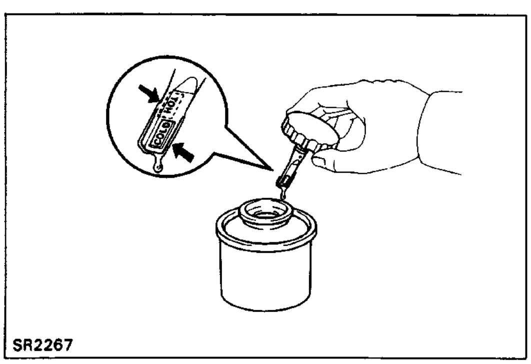
With the engine idling at 1,000 rpm or less, turn the steering wheel from lock to lock several times to boost fluid temperature.

Fluid temperature: 80°C (176°F)



3. CHECK FOR FOAMING OR EMULSIFICATION

HINT: Foaming and emulsification indicate either the existence of air in the system or that the fluid level is too low.

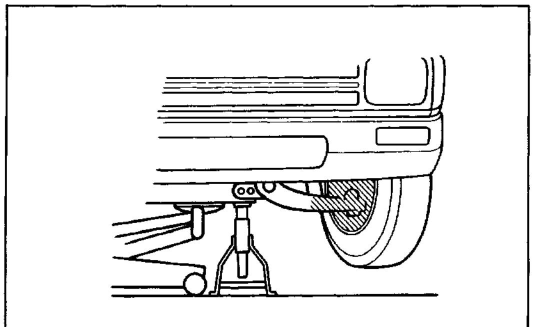


4. CHECK FLUID LEVEL IN RESERVOIR

Check the fluid level and add fluid if necessary.

Fluid: ATF DEXRON• II

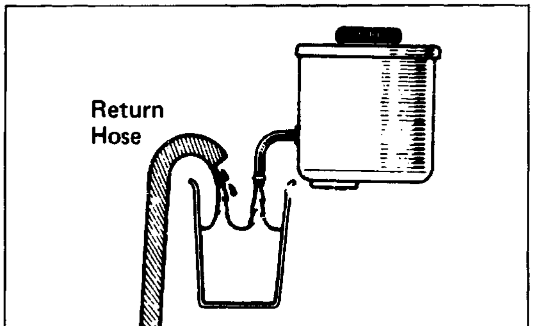
HINT: Check that the fluid level is within the HOT LEVEL of the dipstick. If the fluid is cold, check that it is within the COLD LEVEL of the dipstick.



SR3099

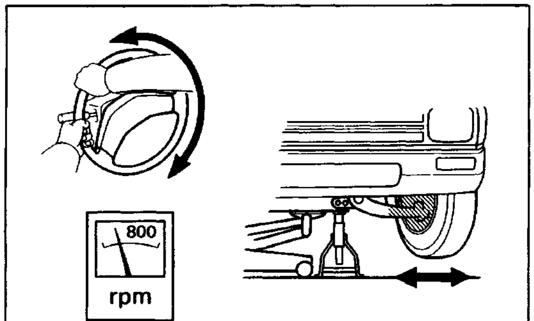
REPLACEMENT OF POWER STEERING FLUID

1. JACK UP FRONT OF VEHICLE AND SUPPORT IT WITH STANDS



B1305

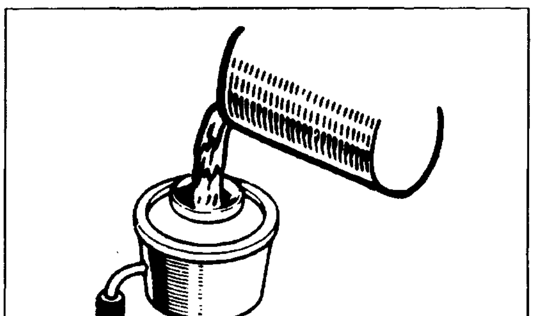
2. REMOVE FLUID RETURN HOSE FROM RESERVOIR TANK AND DRAIN FLUID INTO CONTAINER



SR3100

3. WITH ENGINE IDLING, TURN STEERING WHEEL FROM LOCK TO LOCK WHILE DRAINING FLUID

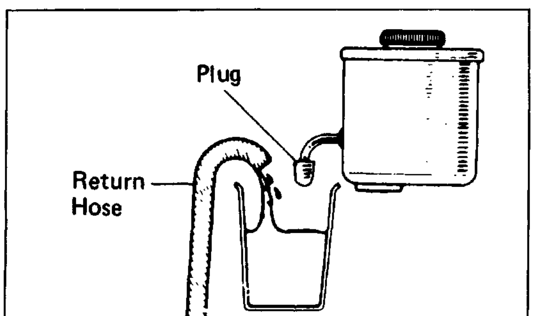
4. STOP ENGINE



B1306

5. FILL RESERVOIR TANK WITH FRESH FLUID

Fluid : ATF DEXRON• II



B1307

6. START ENGINE AND RUN IT AT 1,000 RPM

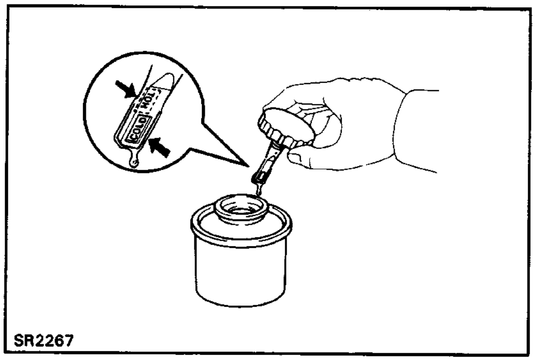
After 1 or 2 seconds, fluid will begin to discharge from the return hose. Stop the engine immediately at this time.

NOTICE: Take care that some fluid remains left in the reservoir tank.

7. REPEAT STEPS 5 AND 6 FOUR OR FIVE TIMES UNTIL THERE IS NO MORE AIR IN FLUID

8. CONNECT RETURN HOSE TO RESERVOIR TANK

9. BLEED POWER STEERING SYSTEM



BLEEDING OF POWER STEERING SYSTEM

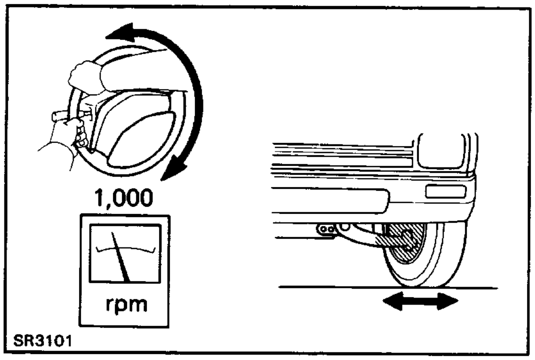
NOTICE: The air bleeding method for vehicles equipped with the rear–wheel anti–lock brake system is different to the former method. For details, see page **BR–95****.**

1. CHECK FLUID LEVEL IN RESERVOIR TANK

Check the fluid level and add fluid if necessary.

Fluid: ATF DEXRON• II

HINT: Check that the fluid level is within the HOT LEVEL of the dipstick. If the fluid is cold, check that it is within the COLD LEVEL of the dipstick.

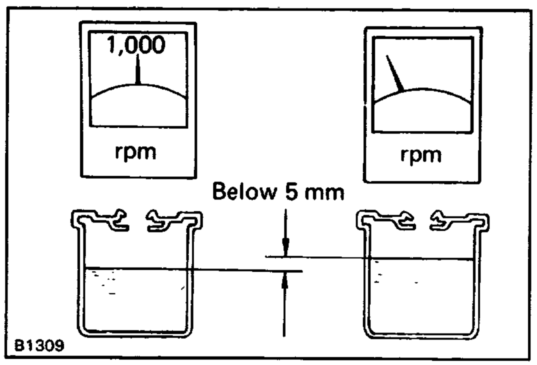


2. START ENGINE AND TURN STEERING WHEEL FROM LOCK TO LOCK THREE OR FOUR TIMES

Run the engine at 1,000 rpm or less.

3. STOP ENGINE AND CONNECT VINYL TUBE TO BLEEDER PLUG

4. START ENGINE AND TURN STEERING WHEEL FROM LOCK TO LOCK TWO OR THREE TIMES



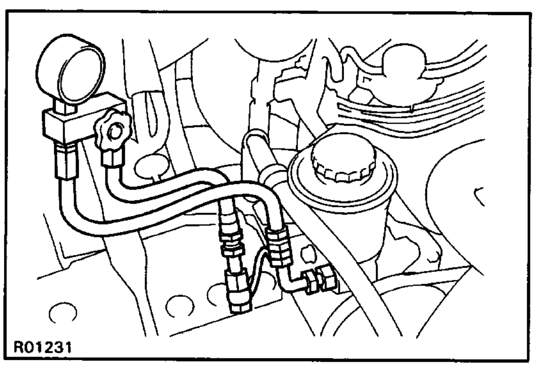
5. CHECK THAT FLUID IN RESERVOIR IS NOT FOAMY OR CLOUDY AND DOES NOT RISE OVER MAXIMUM WHEN ENGINE IS STOPPED

Measure the fluid level with the engine running. Stop the engine and measure the fluid level.

Maximum rise: 5 mm (0.20 in.)

If a problem is found, repeat steps 7 and 8 on page SR–40.

Repair the PS if the problem persists.



OIL PRESSURE CHECK

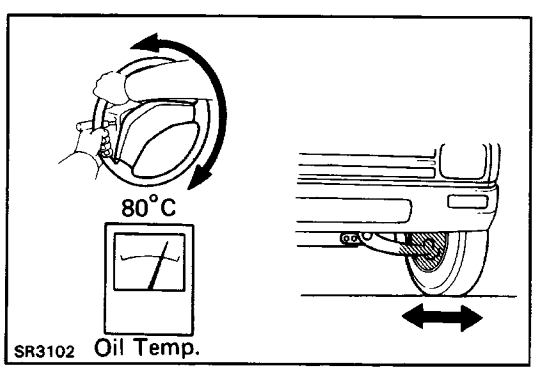
1. CONNECT PRESSURE GAUGE

(a) Disconnect the pressure line from the PS pump.
SST 09631–22020 (RN Series4WD)

(b) Connect the valve side of the pressure gauge to the pressure line, and the gauge side to the PS pump.

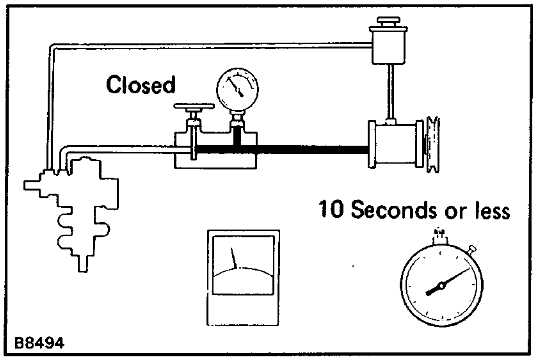
(c) Bleed the system. Start the engine and turn the steering wheel from lock to lock two or three times.

(d) Check that the fluid level is correct.



2. CHECK THAT FLUID TEMPERATURE IS AT LEAST 80®C (176®F)

3. START ENGINE AND RUN IT AT IDLE



4. CHECK FLUID PRESSURE READING WITH VALVE CLOSED

Close the pressure gauge valve and observe the reading on the gauge.

Minimum pressure:

3VZ Engine 7,845 kPa (80 kg f/cm^2, 1,138 psi)

Ex. 3VZ Engine 7,355 kPa (75 kgf/cm^2, 1,067 psi)

NOTICE:

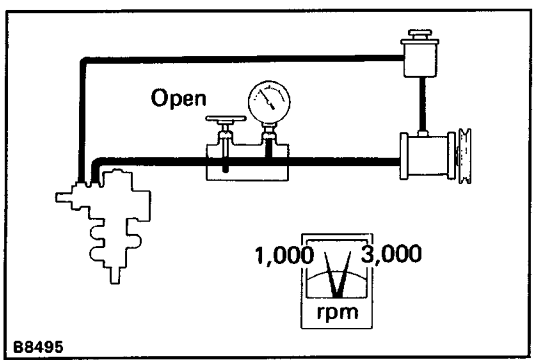
- **Do not keep the valve closed for more than 10 sec– onds.**
- **Do not let the fluid temperature become too high.**

If pressure is low, repair or replace the PS pump.

5. OPEN VALVE FULLY

6. CHECK AND RECORD PRESSURE READING AT 1,000 RPM

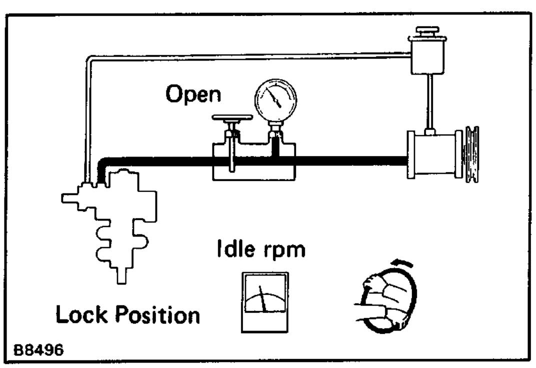
7. CHECK AND RECORD PRESSURE READING AT 3,000 RPM



Check that there is 490 kPa (5 kgf/cm^2, 71 psi) or less difference in pressure between the 1,000 rpm and 3,000 rpm checks.

If the difference is excessive, repair or replace the flow control valve of the PS pump.

8. CHECK PRESSURE READING WITH STEERING WHEEL TURNED TO FULL LOCK



[Standard type power steering]

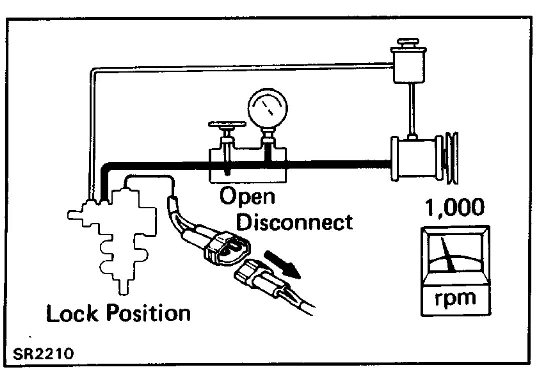
Be sure the pressure gauge valve is fully opened and the engine idling.

Minimum pressure:

3VZ Engine	**7,845 kPa (80 kg f/cm^2, 1,138 psi)**
Ex. 3VZ Engine	**7,355 kPa (75 kgf/cm^2, 1,067 psi)**

If pressure is low, the gear housing has an internal leak and must be repaired or replaced.

[Progressive power steering]



(a) Turn the steering wheel to full lock position.

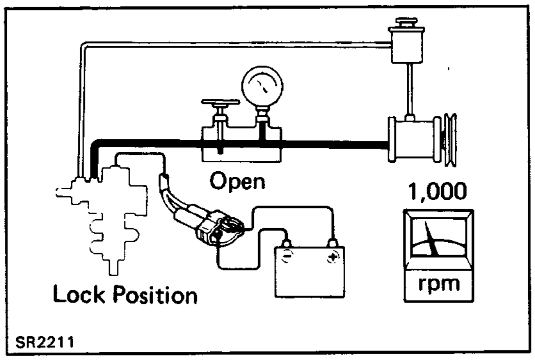
(b) Disconnect the solenoid connector.

(c) Be sure the pressure gauge valve is fully opened and the engine is running at 1,000 rpm.

Minimum pressure:

3VZ Engine	**7,845 kPa (80 kgf/cm^2, 1,138 psi)**
Ex. 3VZ Engine	**7,355 kPa (75 kgf/cm^2, 1,067 psi)**

If pressure is low, the gear housing has an internal leak or the solenoid is faulty.



(d) Apply battery positive voltage to the solenoid.

NOTICE:

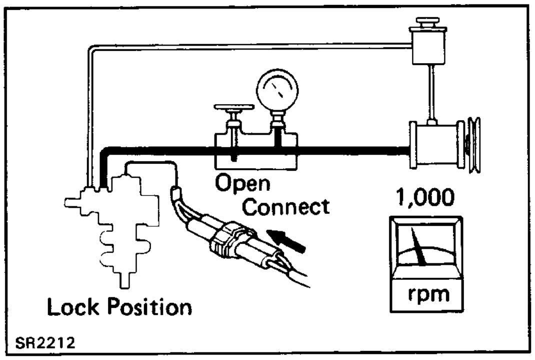
- **Do not apply voltage more than 30 seconds to avoid burning out the solenoid.**
- **If repeating this step, wait until the solenoid cools down enough that it can be touched by hand.**

(e) Check the oil pressure.

(Reference)

Maximum pressure: Approx. 3,923 kPa (40 kgf/cm^2, 569 psi.)

If pressure is high, check the solenoid.



(f) Connect the solenoid connector and check the oil pressure.

Minimum pressure:

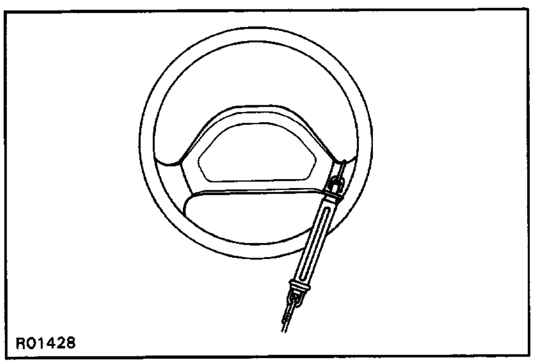
3VZ Engine 7,845 kPa (80 kgf/cm^2, 1,138 psi)

Ex. 3VZ Engine 7,355 kPa (75 kgf/cm^2, 1,067 psi)

If pressure is low, the progressive power steering system is faulty.

9. MEASURE STEERING EFFORT

[Standard type power steering]



(a) Center the steering wheel and run the engine at idle.

(b) Using a spring scale, measure the steering effort in both directions.

Maximum steering effort: 39 N (4 kgf, 8.8 lbf)

If steering effort is excessive, repair the power steering unit.

HINT: Be sure to consider the tire type, pressure and contact surface before making your diagnosis.

[Progressive power steering]

(a) Center the steering wheel and run the engine at idle.

(b) Using a spring scale, measure the steering effort in both directions.

Maximum steering effort: 29 N (3 kgf, 6.6 lbf)

If steering effort is excessive, repair the power steering unit.

(c) Apply battery positive voltage to the solenoid.

NOTICE:

- **Do not apply voltage more than 30 seconds to avoid burning out the solenoid.**
- **If repeating this step, wait until the solenoid cools down enough that it can be touched by hand.**

(d) Check that the steering effort is heavier than it was before battery positive voltage was applied to the solenoid.

(Reference)

Maximum steering effort: 118 N (12 kgf, 26 lbf)

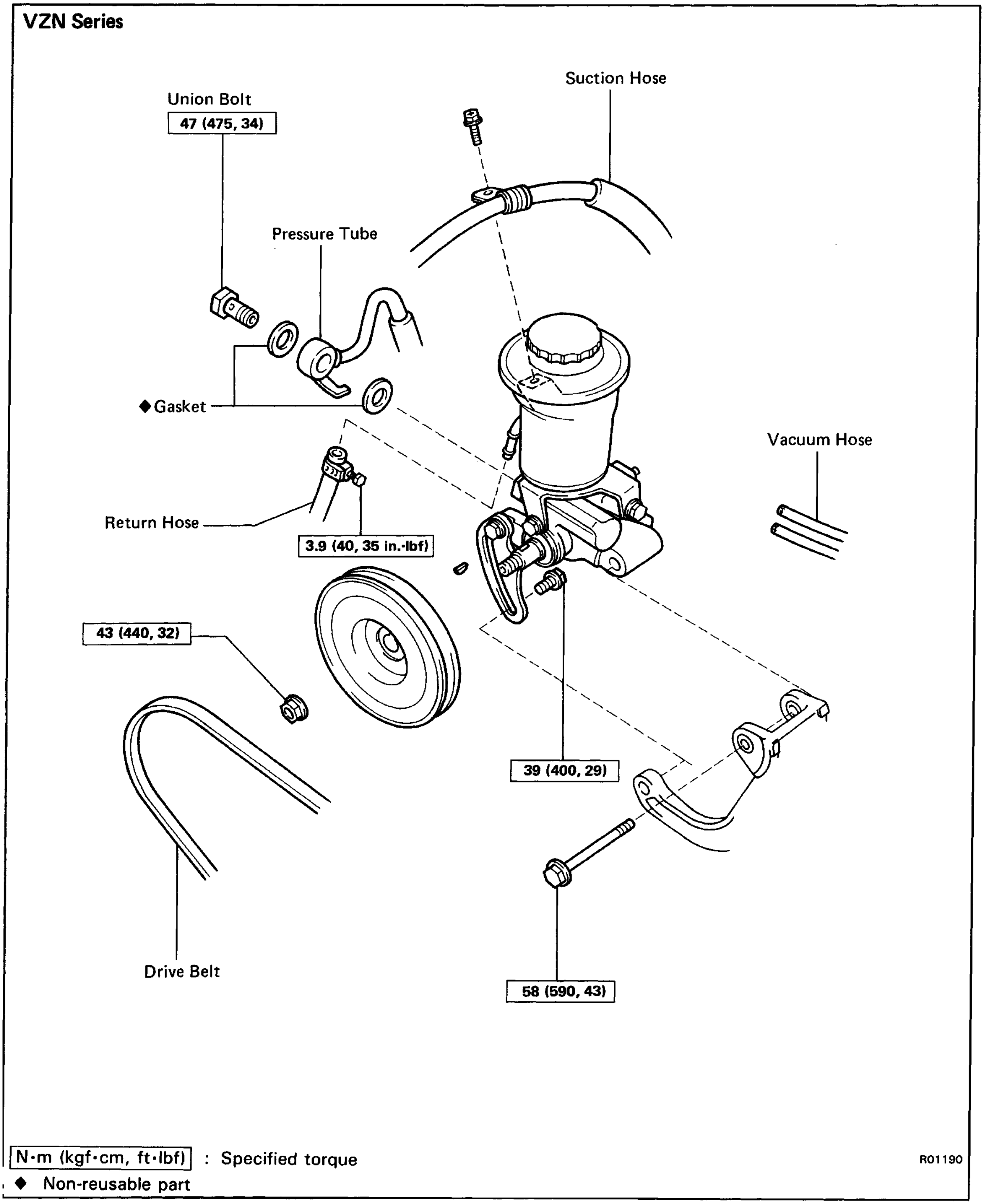
(e) If steering effort is not heavier, check the solenoid.

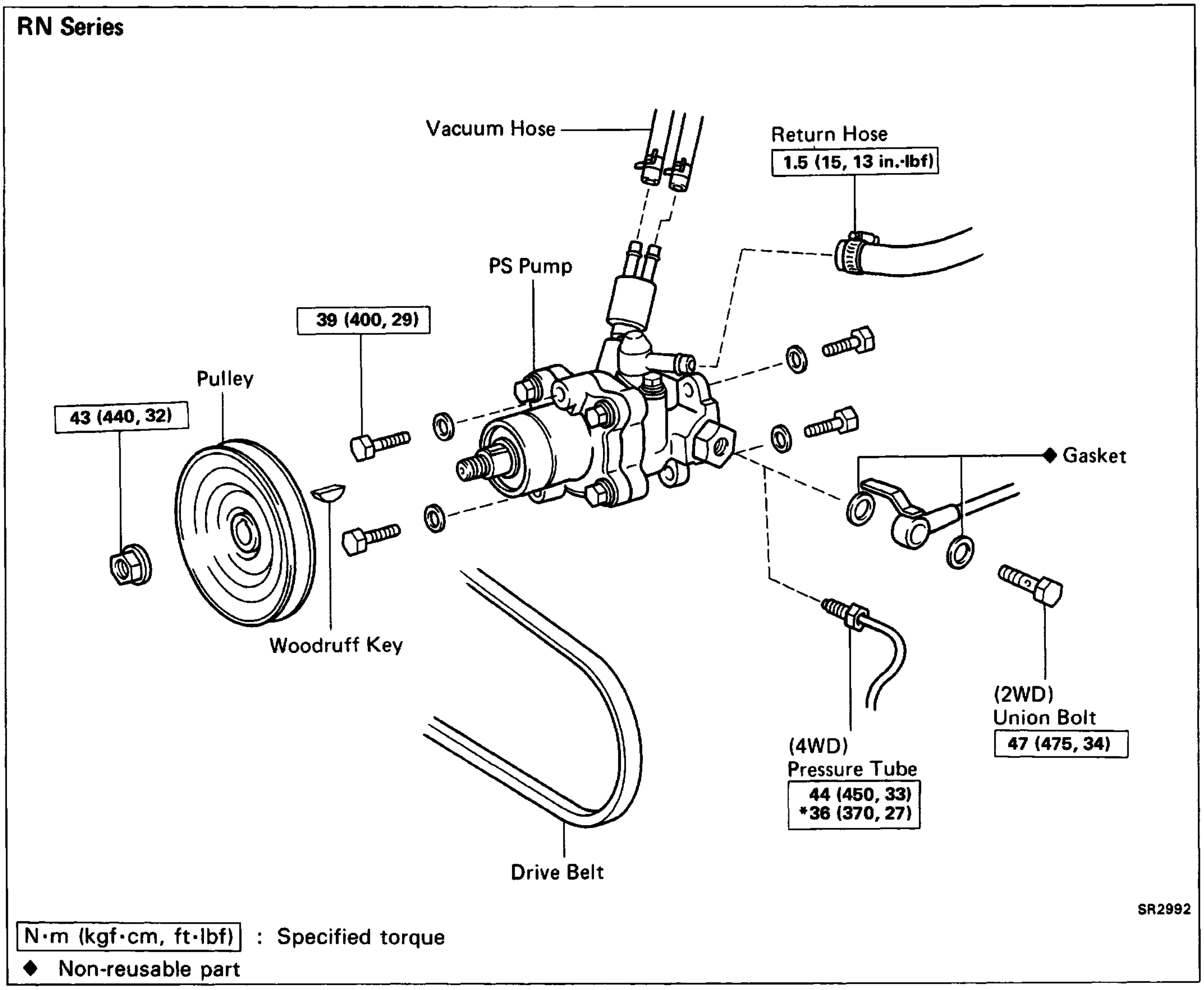
HINT: Be sure to consider tire type, pressure and contact surface before making your diagnosis.

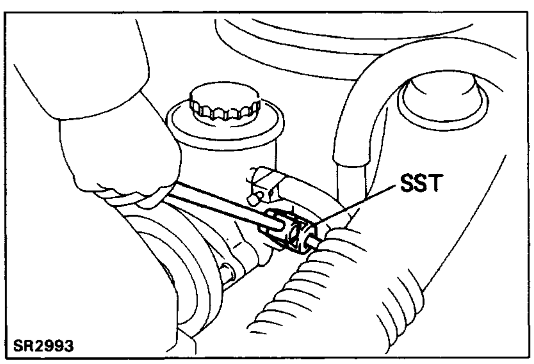
Power Steering Pump

REMOVAL AND INSTALLATION OF POWER STEERING PUMP

Remove and install the parts as shown.







(MAIN POINTS OF REMOVAL AND INSTALLATION)

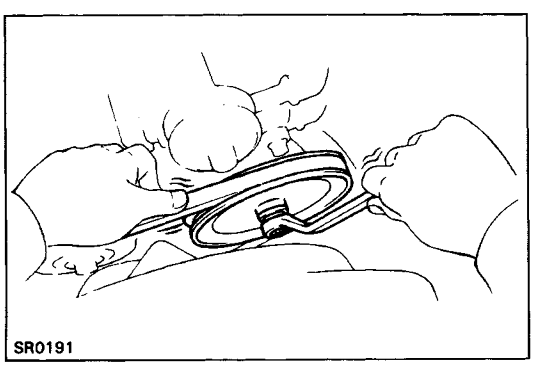
1. (RN Series/4WD) DISCONNECT AND CONNECT PRESSURE TUBE

Using SST, disconnect and connect the pressure tube from/to the PS pump.

SST 09631–22020

Torque: 36 N–m (370 kgf–cm, 27 ft–lbf)

HINT: Use a torque wrench with a fulcrum length of 300 mm (11.81 in.).



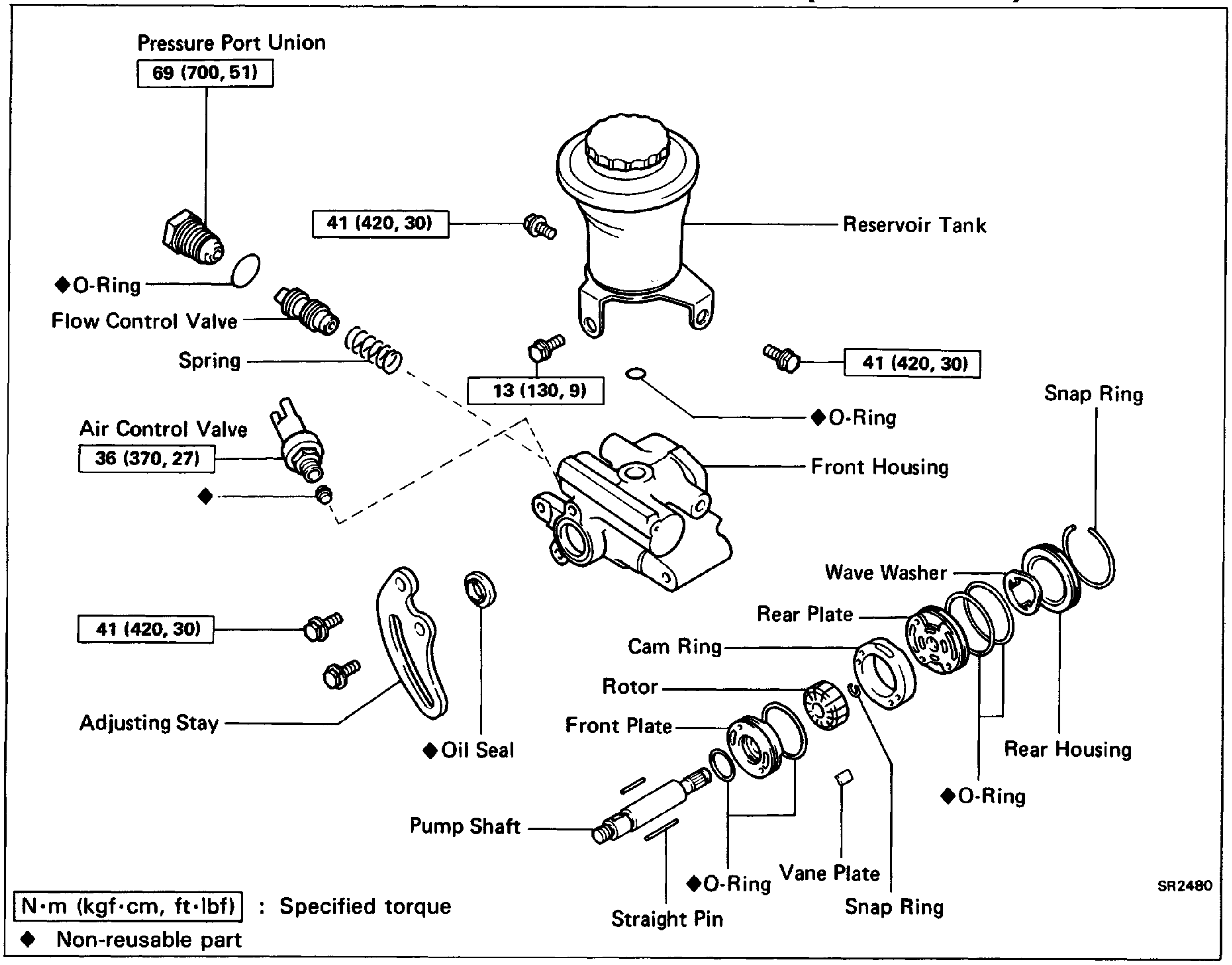
2. LOOSEN PULLEY NUT

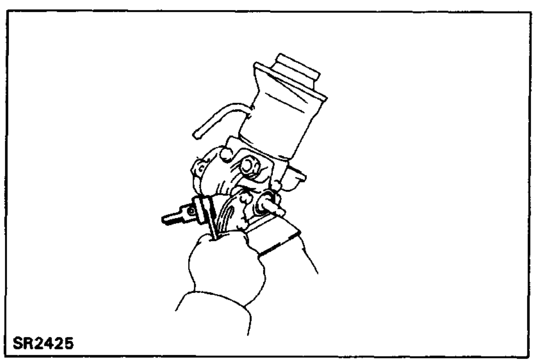
Push on the drive belt with your hand to hold the pulley in place and loosen the pulley nut.

3. ADJUST DRIVE BELT TENSION AFTER INSTALLING PS PUMP

(See page SR–40)

COMPONENTS (VZN series)





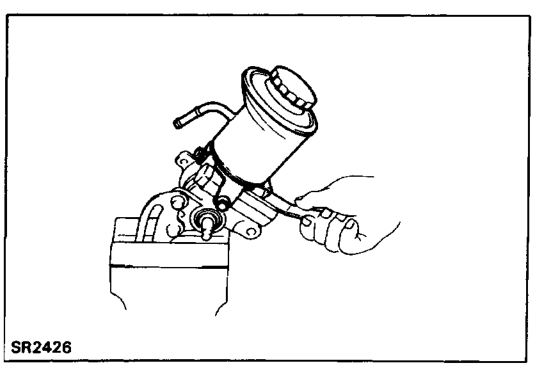
DISASSEMBLY OF POWER STEERING PUMP

1. CLAMP PS PUMP IN VISE

NOTICE: Do not tighten the vise too tight.

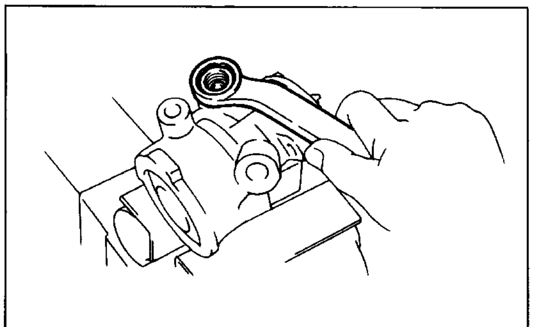
2. REMOVE AIR CONTROL VALVE

(a) Remove the air control valve.
(b) Remove the union seat.



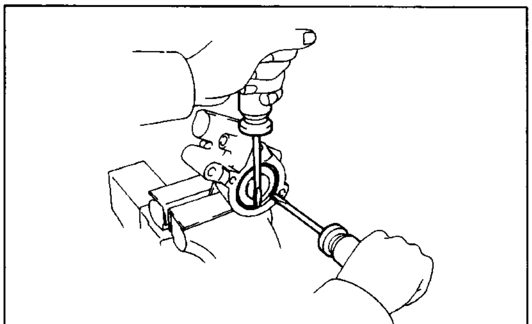
3. REMOVE RESERVOIR TANK

(a) Remove three bolts and the reservoir tank.
(b) Remove the 0–ring from the reservoir tank.


SR2427

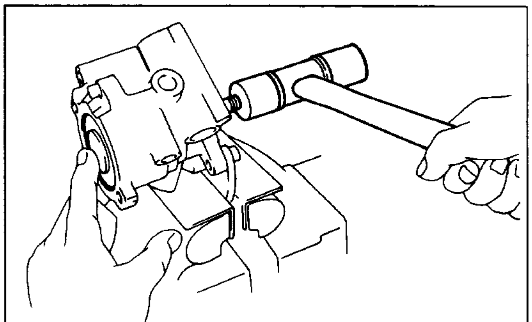
4. REMOVE PRESSURE PORT UNION AND FLOW CONTROL VALVE

(a) Remove the pressure port union.
(b) Remove the O–ring from the pressure port union.
(c) Remove the flow control valve and spring.

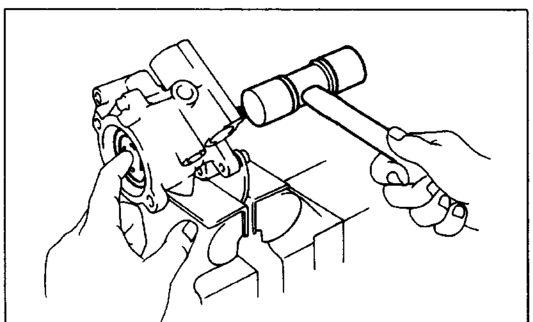

SR2428

5. REMOVE REAR HOUSING

(a) Using two screwdrivers, remove the snap ring.

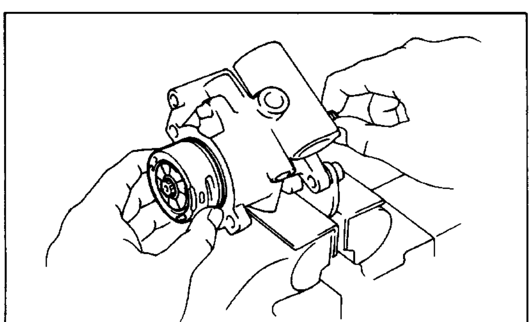

SR2429

(b) Using a plastic hammer, tap out the rear housing and wave washer.
(c) Remove the O–ring from the rear housing.


SR2430

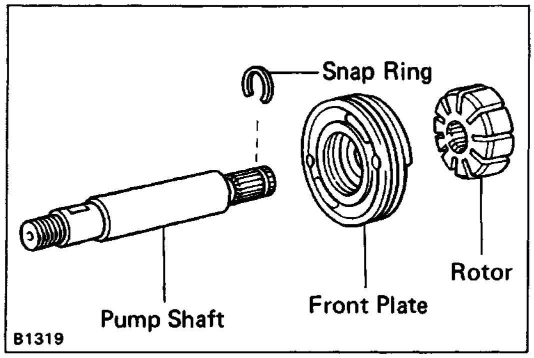
6. REMOVE REAR PLATE

(a) Using a plastic hammer, tap the shaft end and re–move the rear plate.
(b) Remove the 0–ring from the rear plate.


SR2431

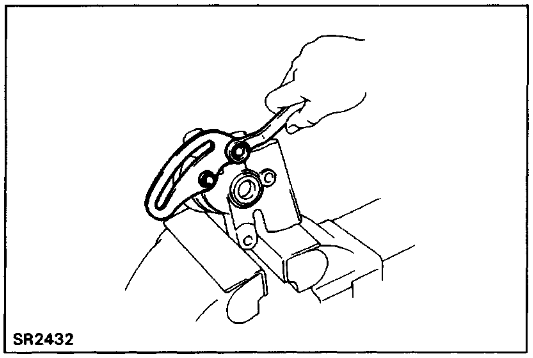
7. REMOVE PUMP SHAFT, CAM RING AND VANE PLATES

(a) Remove the pump shaft with the cam ring and vane plates from the front housing.
(b) Remove the cam ring and ten vane plates from the pump shaft.
(c) Remove the longer straight pin from the front hous–ing.



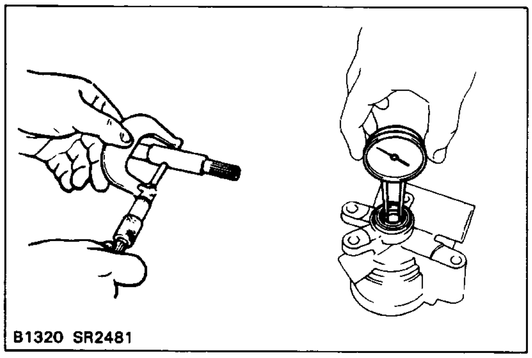
8. REMOVE ROTOR AND FRONT PLATE

(a) Using a screwdriver, remove the snap ring.
(b) Remove the rotor and front plate from the pump shaft.
(c) Remove the two 0–rings from the front plate.
(d) Remove the straight pin from the front plate. .



9. REMOVE ADJUSTING STAY

Remove the two bolts and adjusting stay.



INSPECTION OF POWER STEERING PUMP

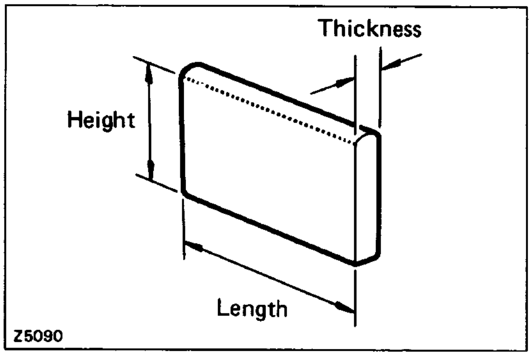
1. CHECK OIL CLEARANCE OF SHAFT AND BUSHING

Using a micrometer and calipers, check the oil clearance.

Standard clearance: 0.01–0.03 mm (0.0004 – 0.0012 in.)

Maximum clearance: 0.07 mm (0.0028 in.)

If more than maximum, replace the entire PS pump.



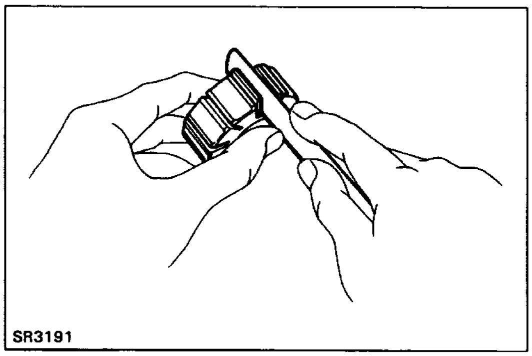
2. INSPECT ROTOR AND VANE PLATES

(a) Using a micrometer, measure the height, thickness and length of the vane plate.

Minimum height: 8.1 mm (0.319 in.)

Minimum thickness: 1.797 mm (0.0707 in.)

Minimum length: 14.988 mm (0.5901 in.)



(b) Using a feeler gauge, measure the clearance be– tween the rotor groove and vane plate.

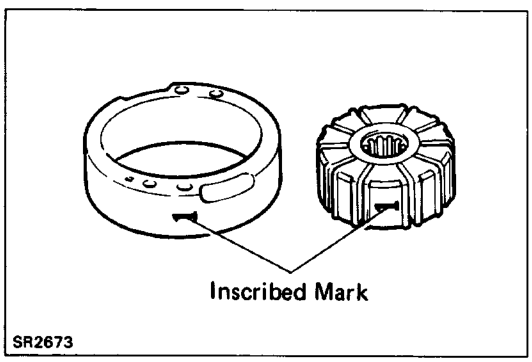
Maximum clearance: 0.03 mm (0.0012 in.)

If more than maximum, replace the vane plate and/or ro– tor with one having the same mark stamped on the cam ring.

Inscribed mark: 1, 2, 3, 4 or None

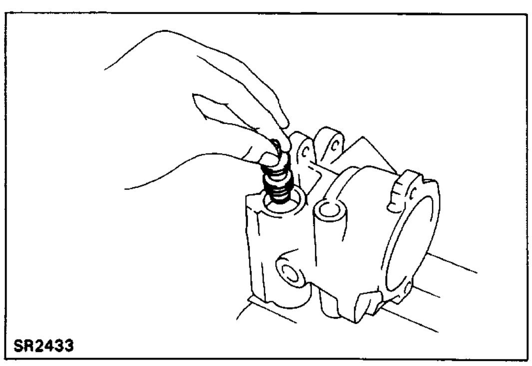
HINT: There are five vane lengths with the following ro– tor and cam ring marks:

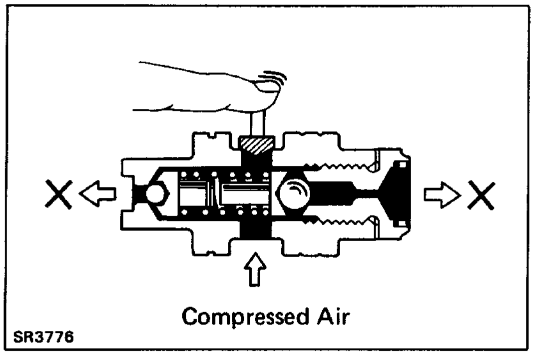
Rotor and cam ring mark	Vane length mm (in.)
None	14.996 – 14.998 (0.59039 – 0.59047)
1	14.994 – 14.996 (0.59032 – 0.59039)
2	14.992 – 14.994 (0.59024 – 0.59032)
3	14.990 – 14.992 (0.59016 – 0.59024)
4	14.988 – 14.990 (0.59008 – 0.59016)



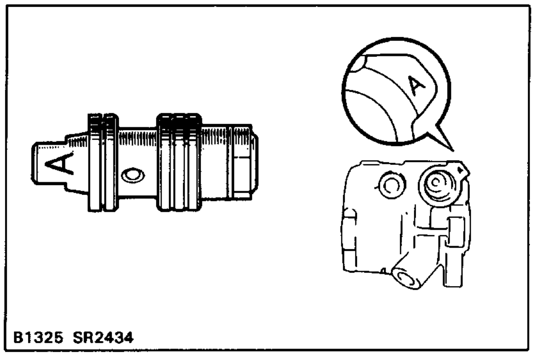
3. INSPECT FLOW CONTROL VALVE

(a) Coat the valve with power steering fluid and check that it falls smoothly into the valve hole by its own weight.

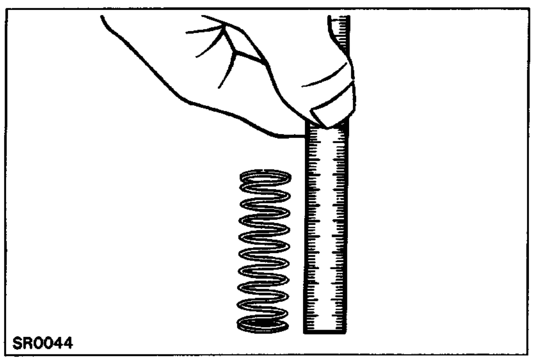




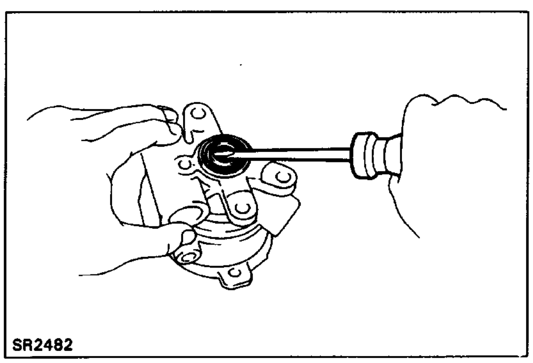
(b) Check the flow control valve for leakage.
Close one of the holes and apply compressed air [392 – 490 kPa (4 – 5 kgf/cm^2, 57 – 71 psi)] into the opposite side, and confirm that air does not come out from the end hole.



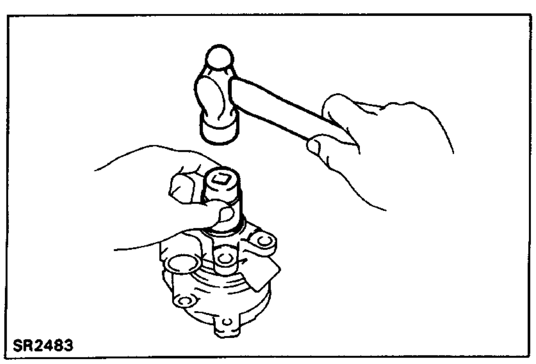
If necessary, replace the valve with one having the same letter as inscribed on the front housing.
Inscribed mark: A, B, C, D, E or F



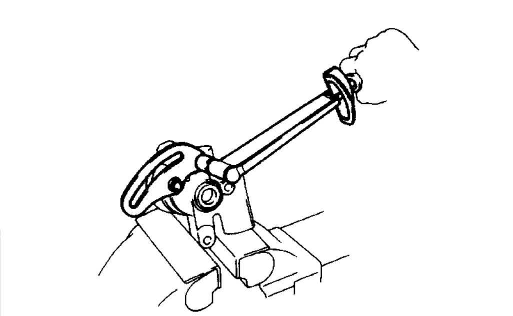
4. INSPECT FLOW CONTROL SPRING
Using a scale, measure the free length of the spring.
Spring length: 35–37 mm (1.38–1.46 in.)
If not within specification, replace the spring.



5. IF NECESSARY, REPLACE OIL SEAL
(a) Using a screwdriver, pry out the oil seal.



(b) Using a socket wrench and hammer, drive in a new oil seal.



SR2435

ASSEMBLY OF POWER STEERING PUMP

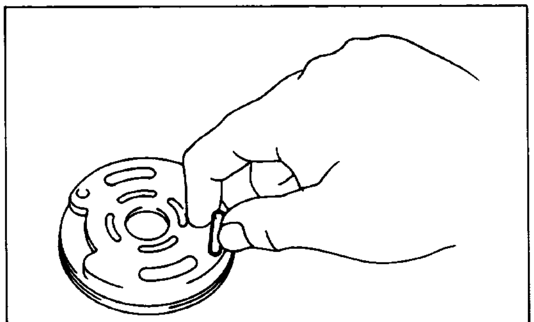
(See page SR–47)

1. COAT ALL SLIDING SURFACES WITH POWER STEERING FLUID BEFORE ASSEMBLY

2. INSTALL ADJUSTING STAY

Install the adjusting stay and torque the two bolts.

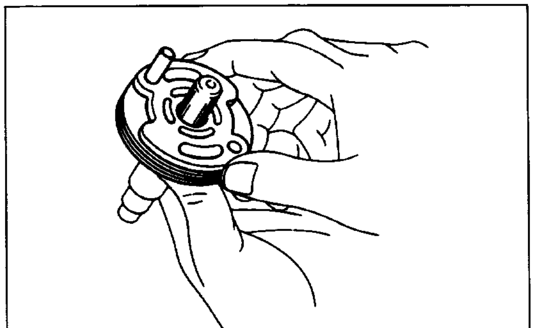
Torque: 41 N–m (420 kgf–cm, 30 ft–lbf)



SR2436

3. INSTALL FRONT PLATE AND ROTOR TO PUMP SHAFT

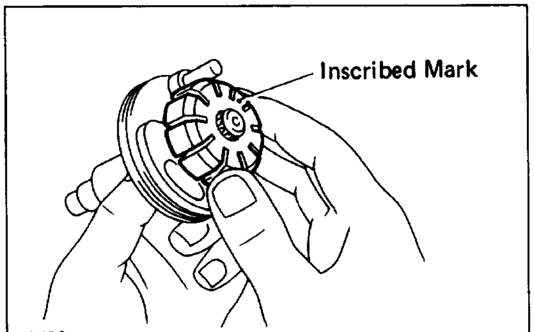
(a) Install the shorter straight pin to the front plate.



D0901

(b) Install two new O–rings to the front plate.

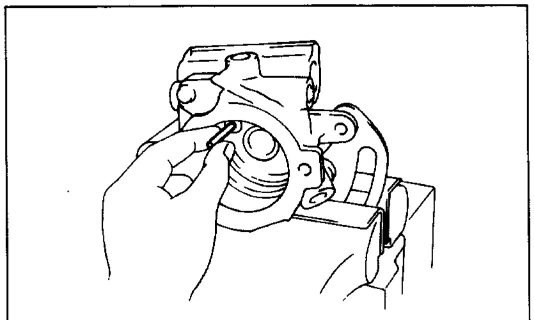
(c) Install the front plate to the pump shaft.



D2786

(d) Install the rotor to the pump shaft with the inscribed mark facing outward.

(e) Install the snap ring.

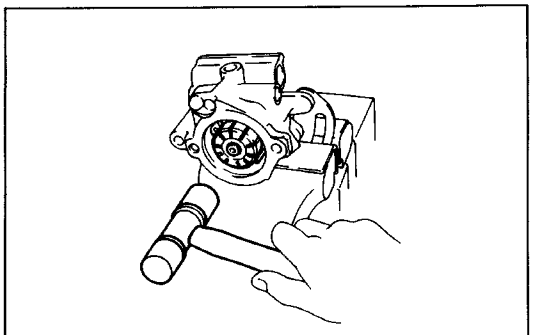


SR2437

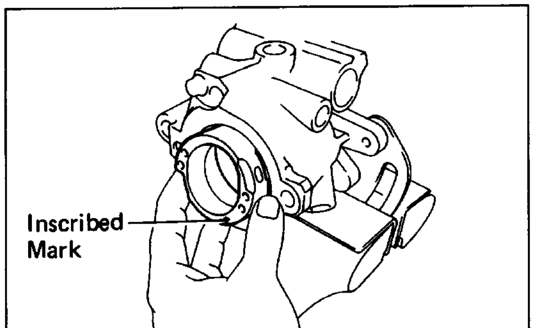
4. INSTALL PUMP SHAFT TO FRONT HOUSING

(a) Coat the oil seal lip with MP grease.

(b) Install the longer straight pin to the front housing.


SR2438

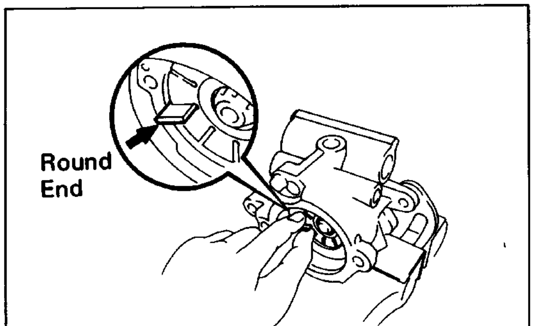
(c) Align the hole of the front plate and straight pin and tap in the pump shaft with a plastic hammer.
NOTICE: Be careful not to damage the oil seal and 0–rings.



SR2439

5. INSTALL CAM RING

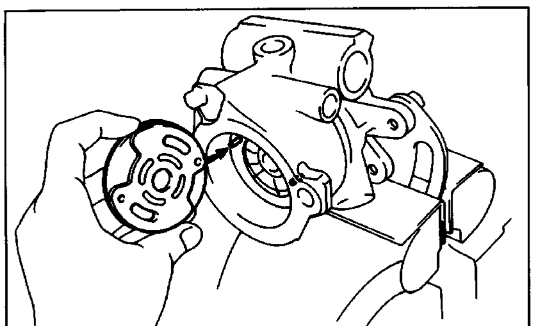
Align the oval hole of the cam ring and longer straight pin, and insert the cam ring with the inscribed mark fac–ing outward.



SR2440

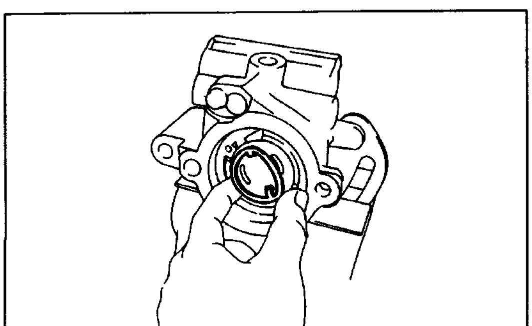
6. INSTALL VANE PLATES

Install the ten vane plates with the round end facing out–ward.


SR2441

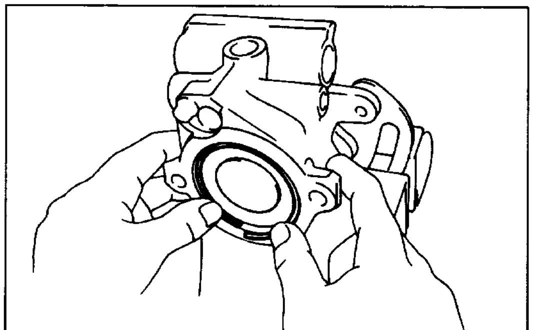
7. INSTALL REAR PLATE

(a) Install a new O–ring to the rear plate.
(b) Align the holes of the rear plate with the pins, and install the plate.

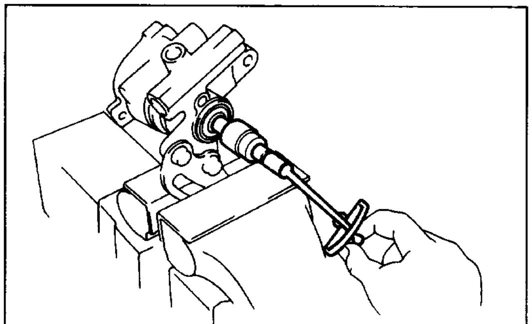

SR2442

8. INSTALL REAR HOUSING

(a) Install the wave washer.
(b) Install a new 0–ring to the rear housing.
(c) Using a plastic hammer, tap in the rear housing.


SR2443

(d) Install the snap ring.


SR2444

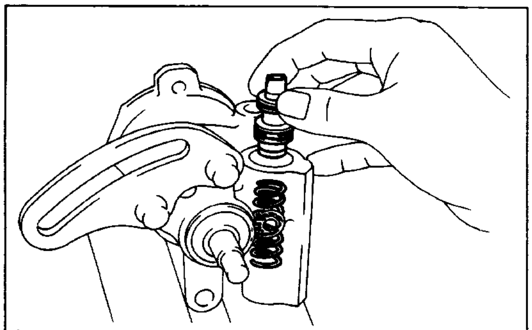
9. CHECK PUMP SHAFT PRELOAD

(a) Check that the shaft rotates smoothly without ab–normal noise.

(b) Temporarily install the pulley nut and check the ro–tating torque.

Rotating torque:

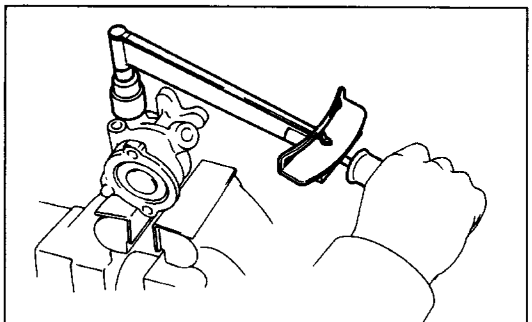
0 .3 N–m (2.8 kgf–cm, 2.4 in.–lbf) or less


SR2445

10. INSTALL SPRING, FLOW CONTROL VALVE AND PRESSURE PORT UNION

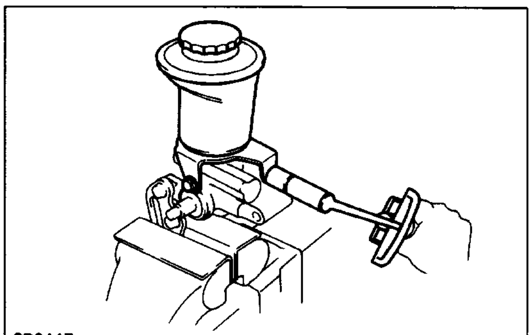
(a) Install the spring and the valve into the housing.

(b) Install a new 0–ring in the groove of the pressure port union.


SR2446

(c) Install and torque the pressure port union.

Torque: 69 N–m (700 kgf–cm, 51 ft–lbf)


SR2447

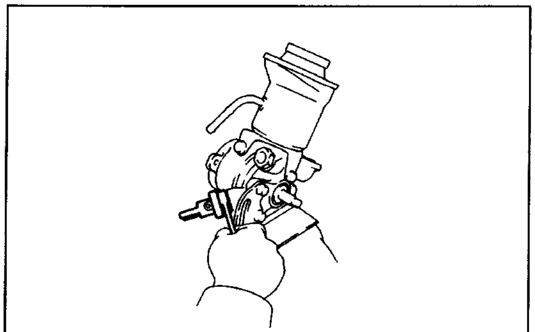
11. INSTALL RESERVOIR TANK

(a) Install a new O–ring to the reservoir tank.

(b) Install the reservoir tank to the housing and torque the three bolts.

Torque: 12 mm bolt 13 N–m (130 kgf–cm, 9 ft–lbf)

14 mm bolt 41 N–m (420 kgf–cm, 30 ft–lbf)


SR2425

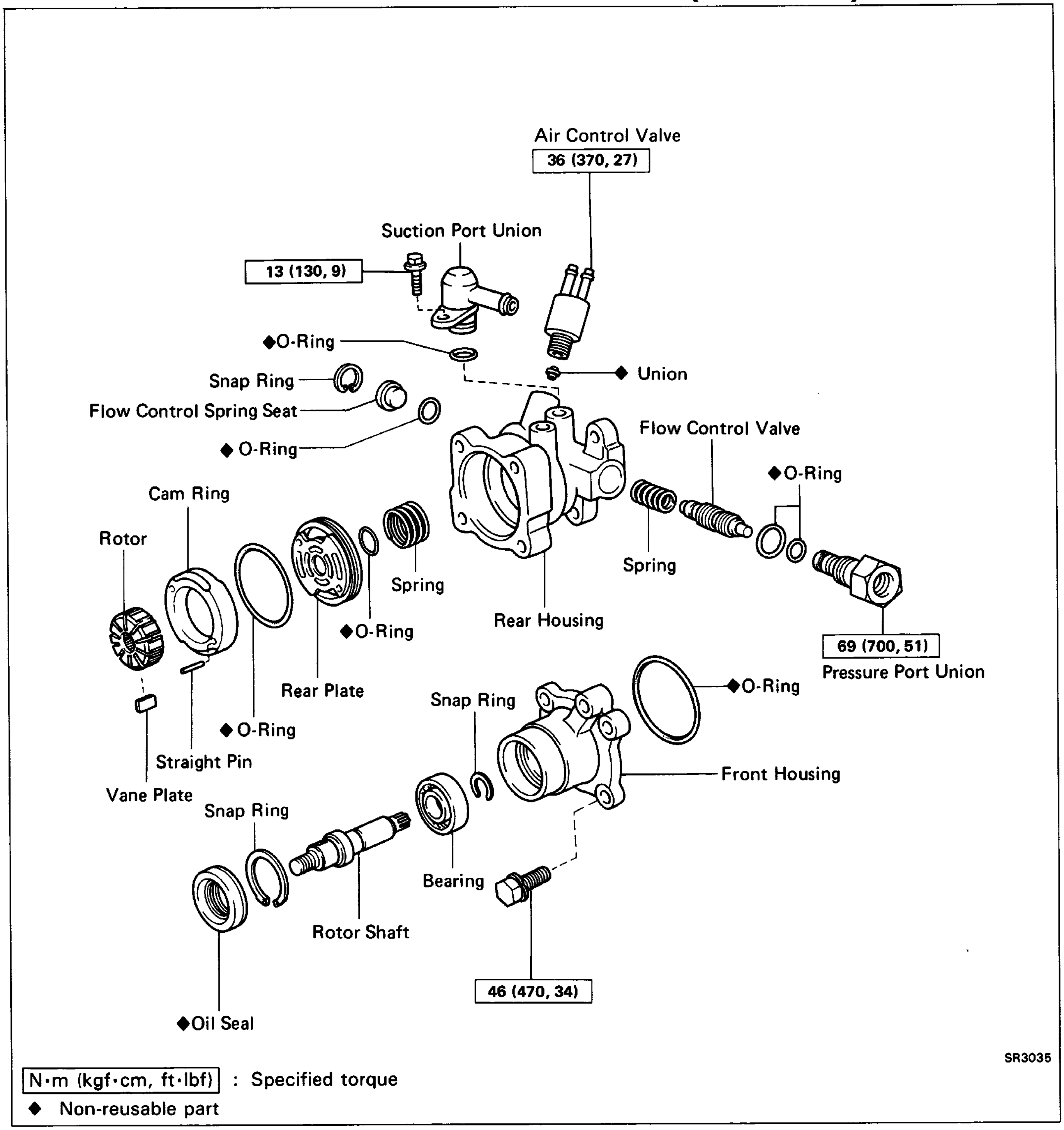
12. INSTALL AIR CONTROL VALVE

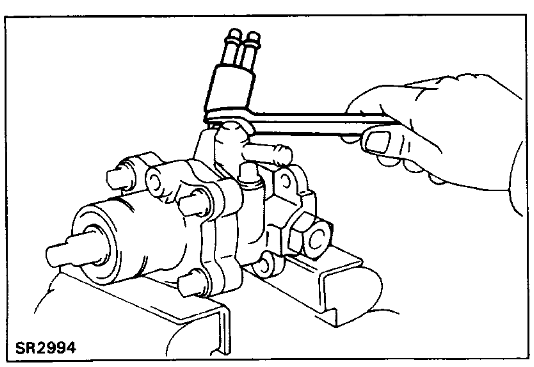
(a) Install a new union seat to the housing.

(b) Install and torque the air control valve.

Torque: 36 N–m (370 kgf–cm, 27 ft–lbf)

COMPONENTS (RN series)





DISASSEMBLY OF POWER STEERING PUMP

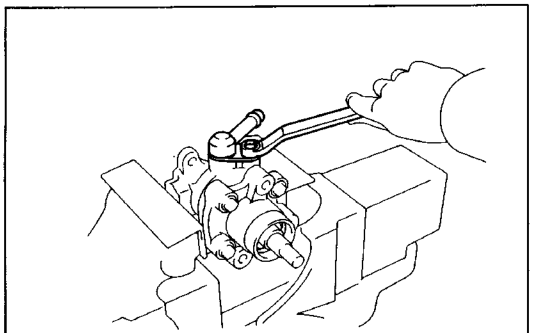
1. CLAMP PS PUMP IN VISE

NOTICE: Do not tighten the vise too tight.

2. REMOVE AIR CONTROL VALVE

(a) Remove the air control valve.

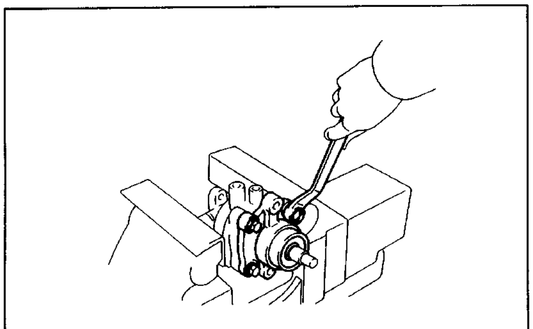
(b) Remove the union seat.


SR3037

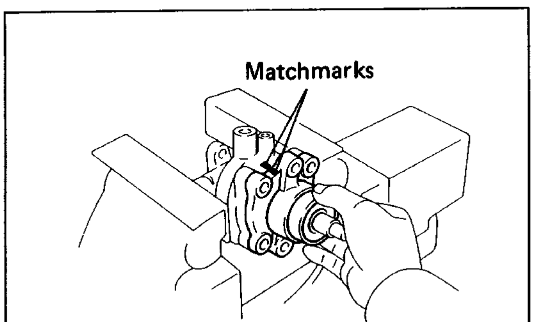
3. REMOVE SUCTION PORT UNION

(a) Remove the bolt and union.

(b) Remove the 0–ring from the union.


SR3036

4. REMOVE FOUR FRONT HOUSING BOLTS



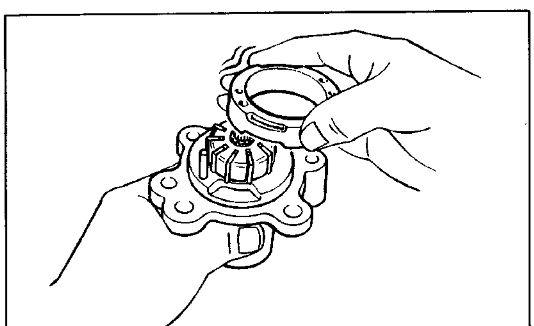
SR3038

5. REMOVE FRONT HOUSING

(a) Place matchmarks on the front and rear housing.

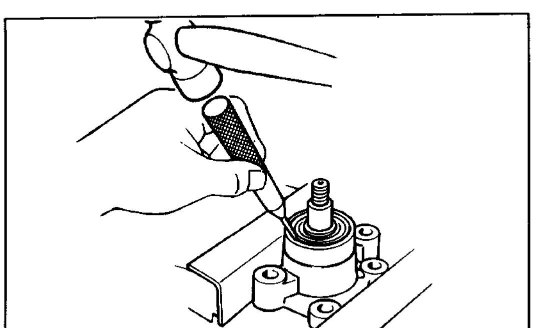
(b) Using a plastic hammer, tap off the front housing.

NOTICE: Be careful that the vane plates, rotor and cam ring do not fall out.


B8509

6. REMOVE CAM RING, ROTOR AND VANE PLATES

NOTICE: Be careful not to scratch the cam ring, rotor or vane plates.


SR0200

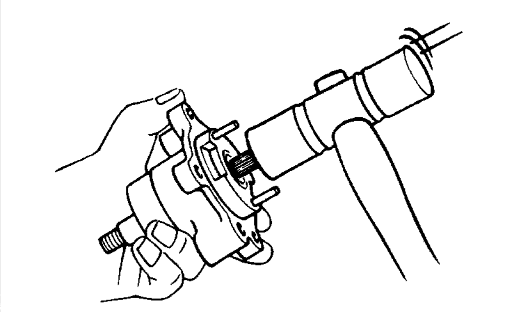
7. REMOVE ROTOR SHAFT

(a) Clamp the front housing in a vise.

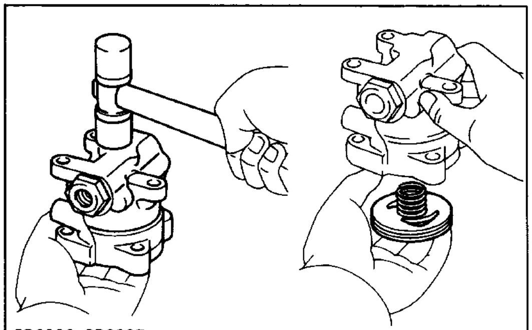
NOTICE: Do not tighten the vise too tight.

(b) Using a chisel and hammer, pry off the oil seal.

(c) Using snap ring pliers, remove the snap ring.

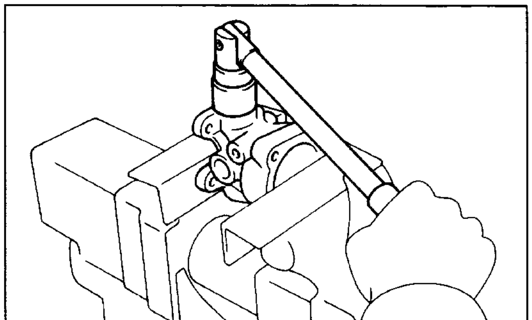

SR0201

(d) Using a plastic hammer, lightly tap the rotor shaft out of the front housing.


SR2996 SR2997

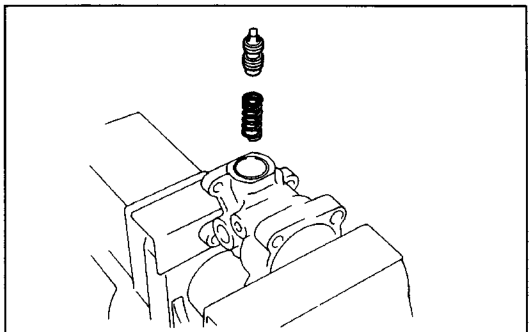
8. REMOVE REAR PLATE AND SPRING

Using a plastic hammer, tap the bottom end of the rear housing, and remove the rear plate and spring.

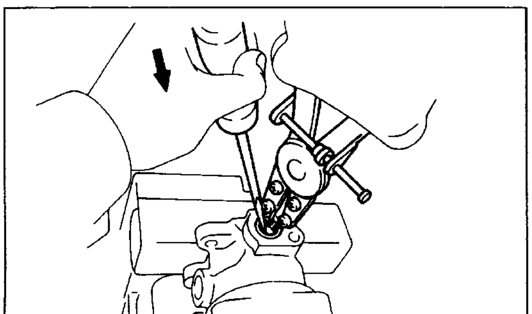

SR2863

9. REMOVE PRESSURE PORT UNION

(a) Remove the pressure port union.
(b) Remove the two 0–rings from the union and hous– ing.

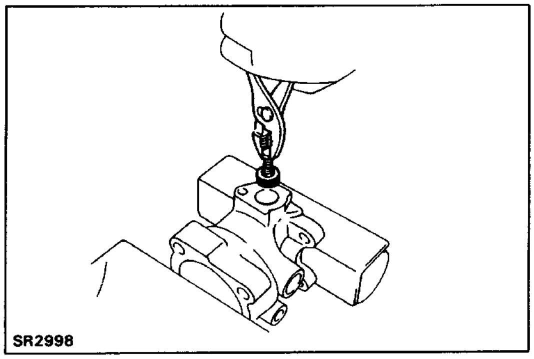

SR2843

(c) Remove the flow control valve and spring.
NOTICE: Use care not to drop, scratch or nick this valve.

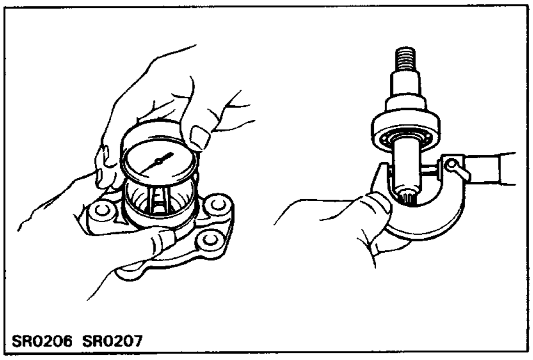

SR2931

10. REMOVE FLOW CONTROL SPRING SEAT

(a) Temporarily install a bolt to the spring seat.
(b) Push the bolt and remove the snap ring with snap ring pliers.



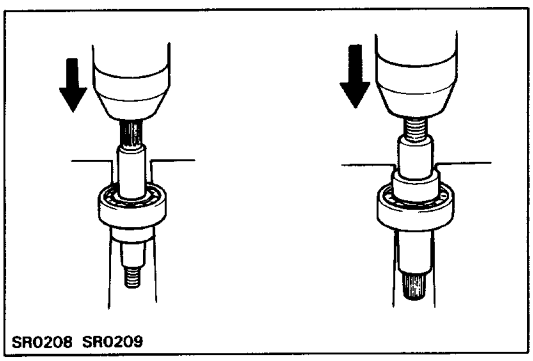
(c) Pull out the bolt and remove the spring seat.
(d) Remove the O–ring from the spring seat.



INSPECTION OF POWER STEERING PUMP

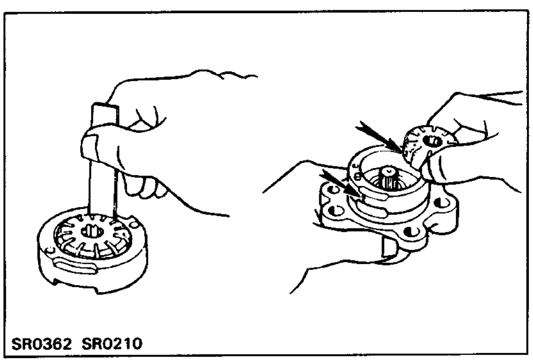
1. INSPECT BUSHING AND MEASURE BUSHING OIL CLEARANCE

(a) Check the bushing for wear or damage. The bushing cannot be replaced separately.
If wear or damage is found, replace entire housing.
(b) Check the oil clearance between the bushing and ro– tor shaft.
Maximum oil clearance: 0.07 mm (0.0028 in.)



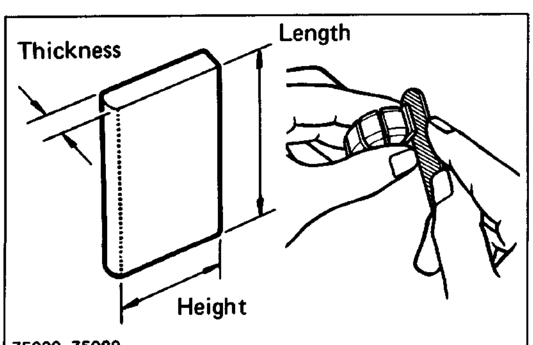
2. IF NECESSARY, REPLACE ROTOR SHAFT BEARING

(a) Using snap ring pliers, remove the snap ring.
(b) Using a press, press out the bearing.
(c) Using a press, press in a new bearing.
(d) Using snap ring pliers, install the snap ring.



3. INSPECT ROTOR AND CAM RING

Measure the cam ring thickness. Check that the differ– ence between the rotor and cam ring measurement is less than maximum.
Maximum difference: 0.06 mm (0.0024 in.)
If the difference is excessive, replace the cam ring with one having the same letter as on the rotor.

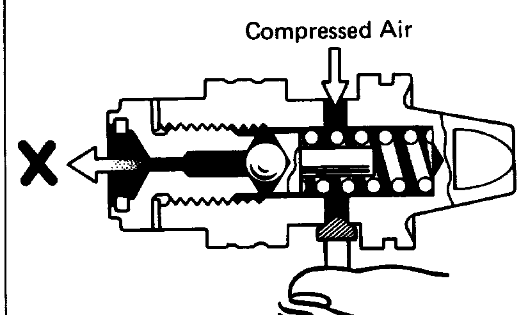


4. INSPECT AND MEASURE VANE PLATES

(a) Check the vane plates for wear or scratches.
(b) Measure the length, height and thickness of the vane plates.
Minimum length: 14.988 mm (0.5901 in.)
Minimum height: 8.1 mm (0.319 in.)
Minimum thickness: 1.797 mm (0.0707 in.)
(c) Measure the clearance between the vane plate and rotor groove.
Maximum clearance: 0.03 mm (0.0012 in.)

HINT: There are five vane lengths with the following rotor and cam ring numbers:

Rotor and cam ring number	Vane length mm (in.)
None	14.996 – 14.998 (0.59039 – 0.59047)
1	14.994 – 14.996 (0.59032 – 0.59039)
2	14.992 – 14.994 (0.59024 – 0.59032)
3	14.990 – 14.992 (0.59016 – 0.59024)
4	14.988 – 14.990 (0.59008 – 0.59016)



B1324

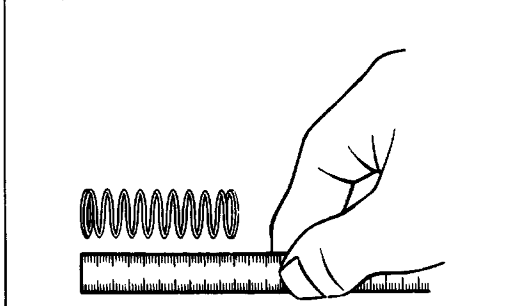
5. INSPECT FLOW CONTROL VALVE

(a) Check the flow control valve for wear or damage.

(b) Apply fluid to the valve and check that it falls smoothly into the valve hole by its own weight.

(c) Check the flow control valve for leakage. Close one of the holes and apply compressed air [392 – 490 kPa (4 – 5 kgf/cm^2, 57 – 71 psi)] into the opposite side, and confirm that air does not come out from the end hole.

If necessary, replace the valve with one having the same letter as inscribed on the rear housing.

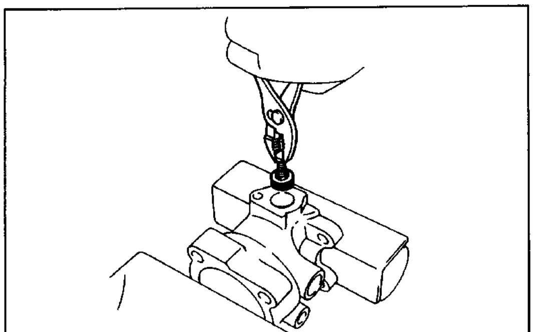

SR0044

6. INSPECT FLOW CONTROL VALVE SPRING

Check that the spring is within specification.

Spring length: 35 – 37 mm (1.38 – 1.46 in.)

If the spring is not within specification, replace it.


SR2998

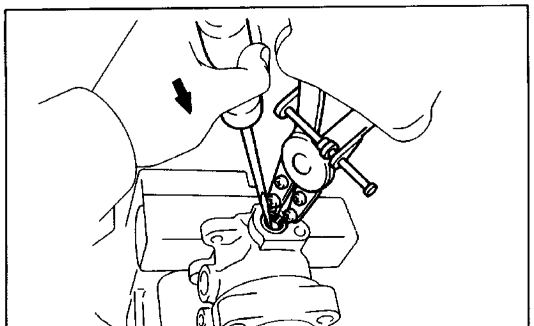
ASSEMBLY OF POWER STEERING PUMP

(See page SR–56)

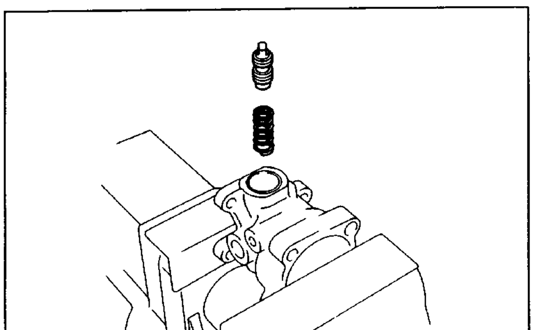
1. INSTALL FLOW CONTROL SPRING SEAT

(a) Install a new O–ring to the spring seat.

(b) Install the spring seat to the housing.


SR2931

(e) Using snap ring pliers, install the snap ring.


SR2843

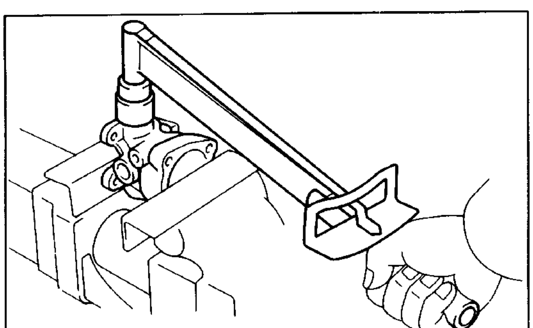
2. INSTALL FLOW CONTROL VALVE AND SPRING

(a) Install new O–ring to the housing.

(b) Install the spring and valve to the housing.

HINT: Be sure the letter inscribed on the flow control valve matches the letter stamped on the rear of the pump body.

Inscribed mark: A, B, C, D, E or F

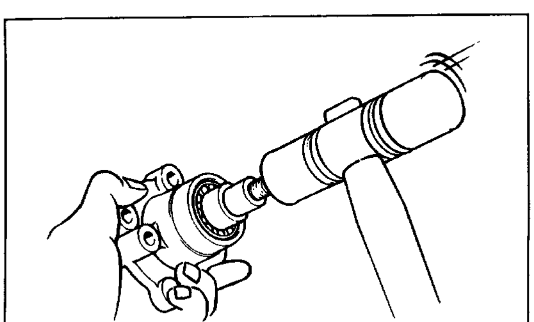

SR2864

3. INSTALL PRESSURE PORT UNION

(a) Install a new O–ring to the pressure port union.

(b) Install and torque the union.

Torque: 69 N–m (700 kgf–cm, 51 ft–lbf)

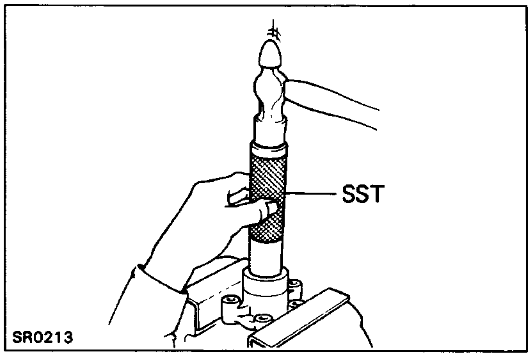

SR0212

4. INSTALL ROTOR SHAFT TO FRONT HOUSING

Install the rotor shaft into the front housing by tapping it in with a plastic hammer.

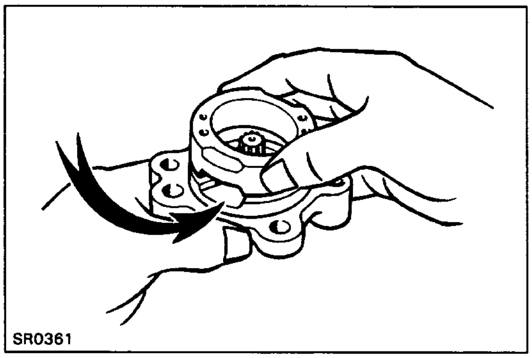
5. INSTALL SNAP RING

Using snap ring pliers, install the snap ring to the front housing.



6. INSTALL OIL SEAL

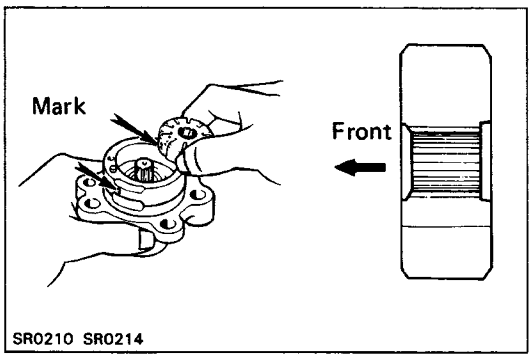
(a) Apply a light coat of MP grease to a new oil seal lip.
(b) Using SST and a hammer, install the oil seal.
SST 09608–30012 (09608–04030)



7. INSTALL NEW O–RING

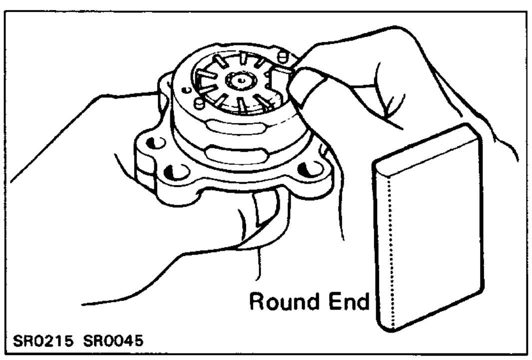
8. INSTALL CAM RING

Align the fluid passages of the cam ring and front hous–ing, and install the cam ring.



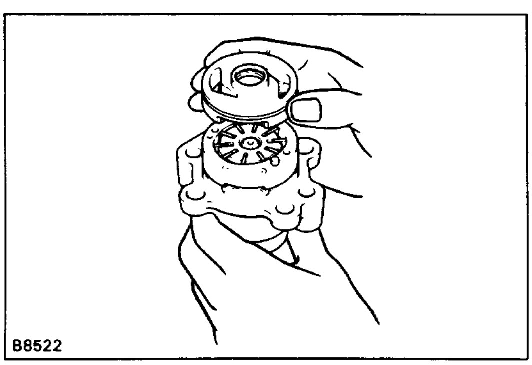
9. INSTALL ROTOR

Install the rotor with the chamfered end facing toward the front.
HINT: Be sure the letters inscribed on the cam ring and rotor match.
Inscribed mark: 1, 2, 3, 4, or None



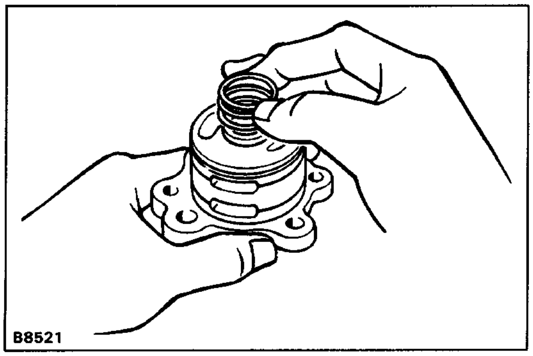
10. INSTALL VANE PLATES

Install the vane plates with the round end facing out–ward.

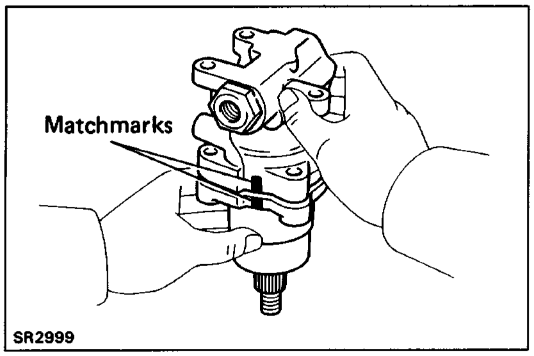


11. INSTALL REAR PLATE AND SPRING

(a) Align the fluid passages of the rear plate and cam ring, and install the rear plate.



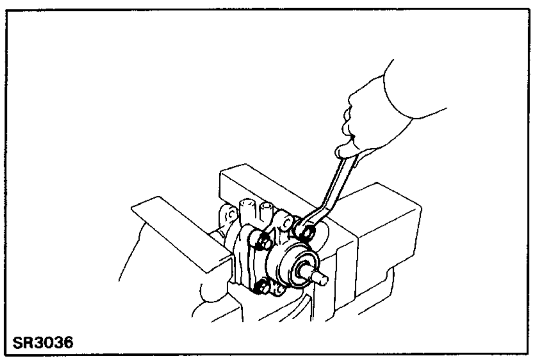
(b) Place the spring on the rear plate.



12. INSTALL REAR HOUSING

(a) Align the matchmarks on the front and rear housing and assemble them.

(b) Tighten the front and rear housing mount bolts by hand.



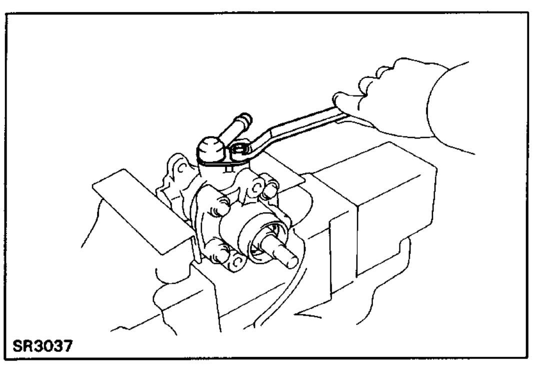
13. TIGHTEN FOUR HOUSING BOLTS

(a) Clamp the rear housing in a vise.

NOTICE: Do not tighten the vise too tight.

(b) Tighten the four housing bolts evenly in 3 or 4 passes.

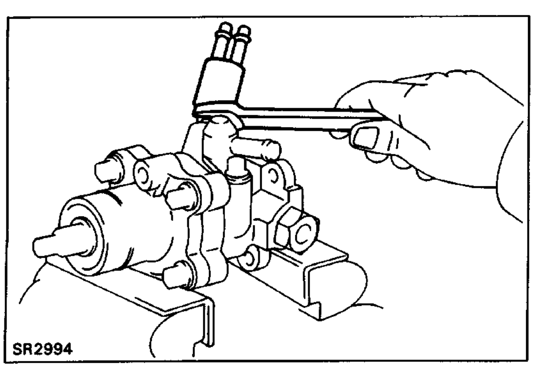
Torque: 46 N–m (470 kgf –cm, 34 ft–lbf)



14. INSTALL SUCTION PORT UNION

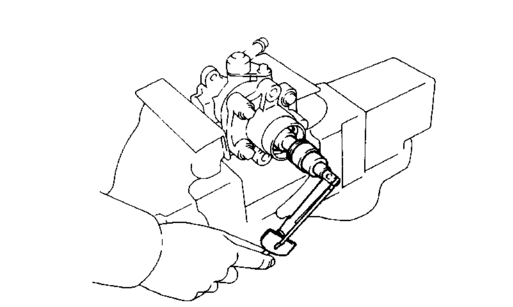
Install and tighten the union with a new O–ring.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



15. INSTALL AIR CONTROL VALVE

Install a *new union seat and the valve.


SR3039

16. CHECK ROTOR SHAFT ROTATION CONDITION

(a) Check that the rotor shaft rotates smoothly without abnormal noise.

(b) Provisionally install the pulley nut and check the rotation torque.

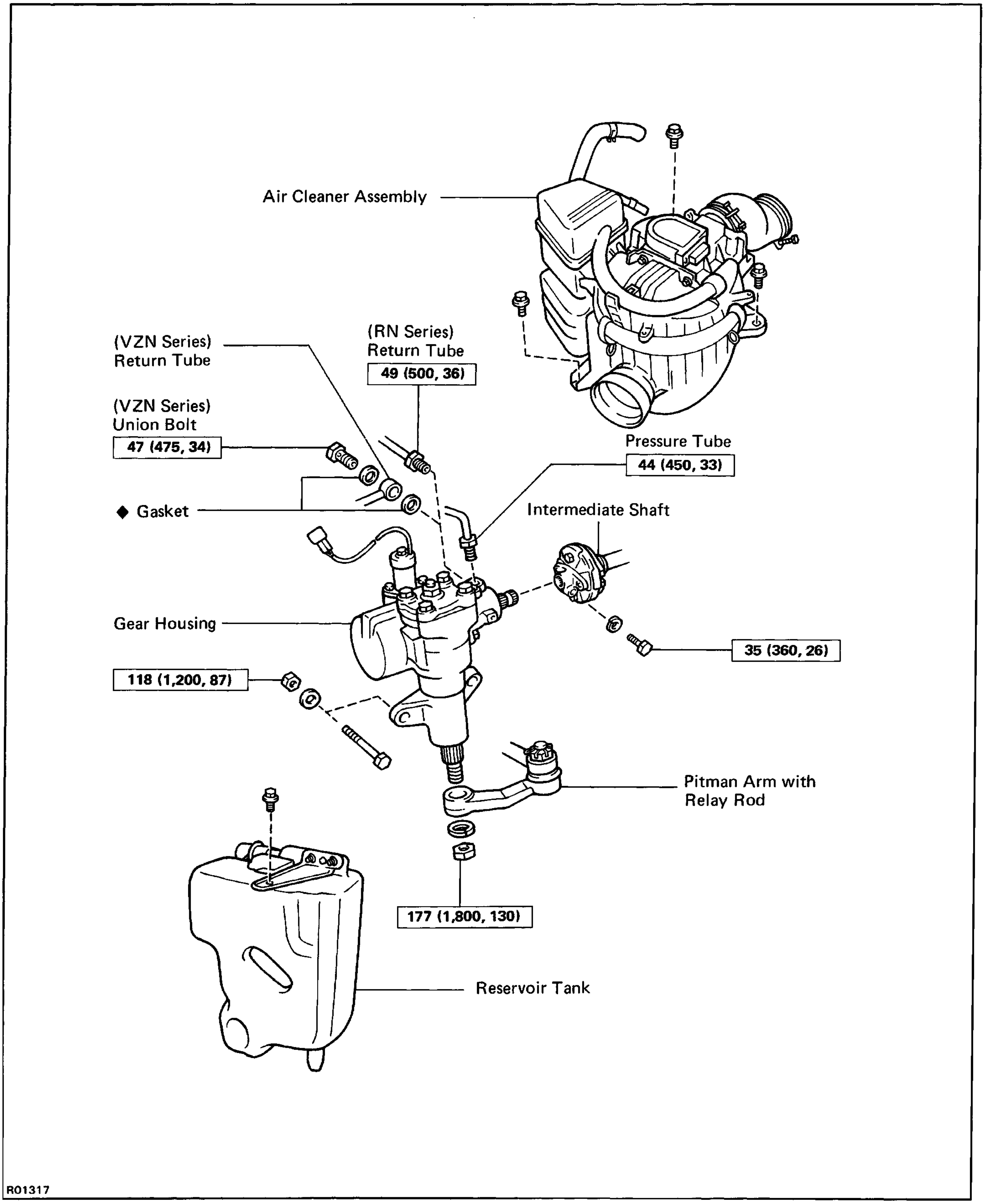
Rotation torque:

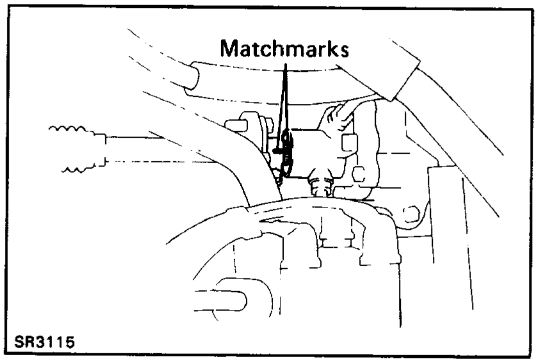
0.3 N–m (2.8 kgf–cm, 2.4 in.–lbf) or less

Gear Housing (2WD)

REMOVAL AND INSTALLATION OF GEAR HOUSING

Remove and install the parts as shown.

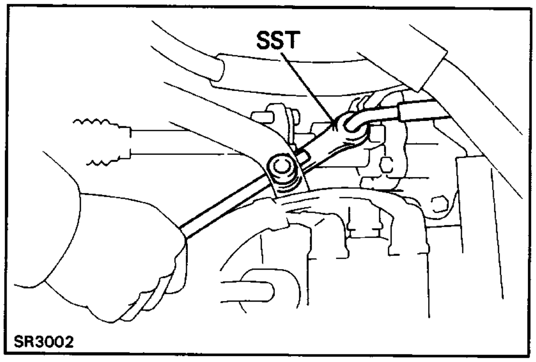




(MAIN POINTS OF REMOVAL AND INSTALLATION)

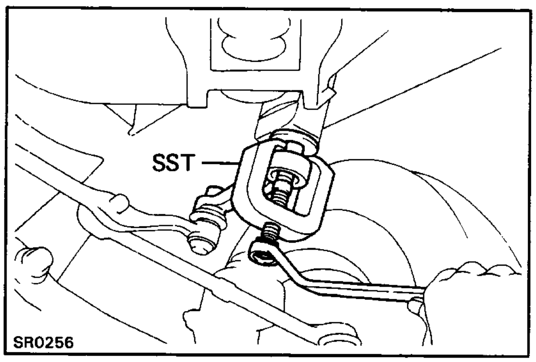
1. DISCONNECT UNIVERSAL JOINT

(a) Loosen the column side set bolt.
(b) Remove the gear side set bolt.
(c) Place matchmarks on the flexible coupling and worm shaft.
(d) Slide the shaft rearward to disconnect the shaft from the worm shaft.



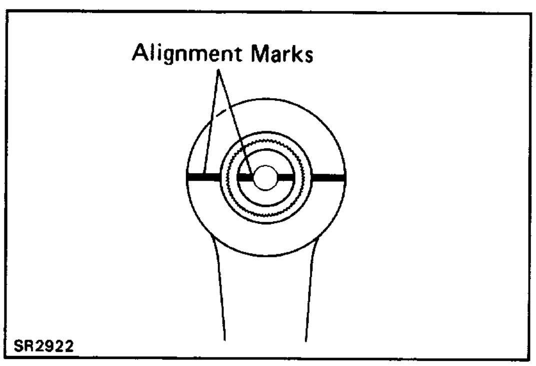
2. DISCONNECT PRESSURE AND RETURN TUBES FROM GEAR HOUSING

Using SST, disconnect the pressure and return tubes from the gear housing.
SST 09631–22020



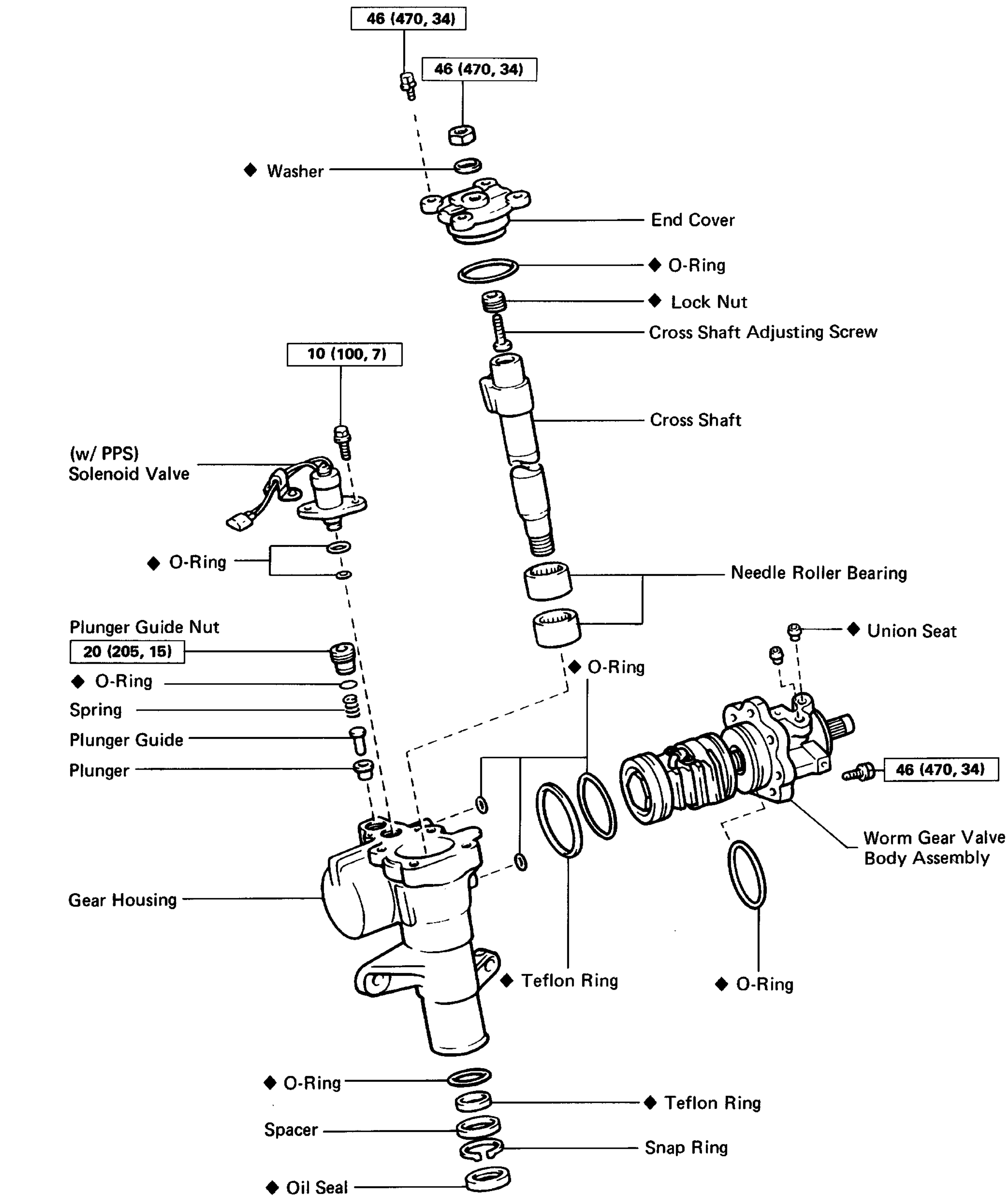
3. DISCONNECT AND CONNECT PITMAN ARM

(a) Using SST, disconnect the pitman arm from the gear housing.
SST 09610–55012



(b) When connecting, align alignment marks on the pit– man arm and the cross shaft, and install the spring washer and nut.
Torque: 177 N–m (1,800 kgf–cm, 130 ft–lbf)

COMPONENTS

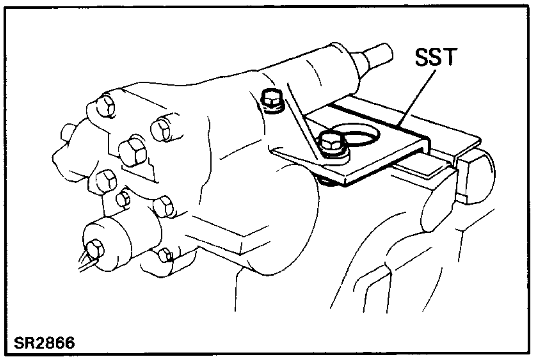


N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part

R01244

DISASSEMBLY OF GEAR HOUSING

(See page SR–67)

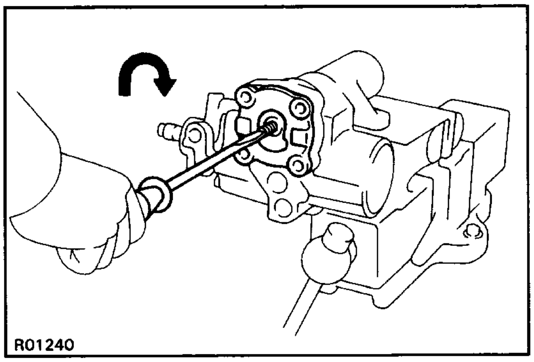


1. MOUNT HOUSING ON STAND

Mount the gear housing on SST and clamp SST in a vise.
SST 09630–00012 (09631–00140)

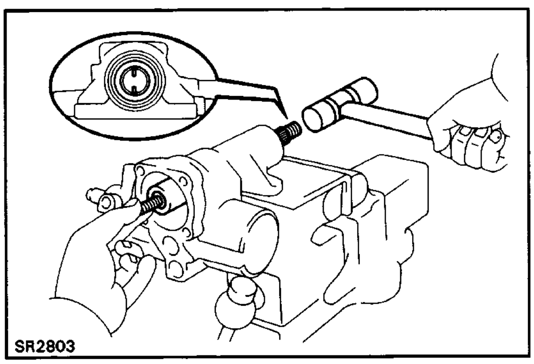
2. (w/PPS)
REMOVE SOLENOID VALVE

(a) Remove the two bolts and solenoid valve.
(b) Remove the 0–rings.



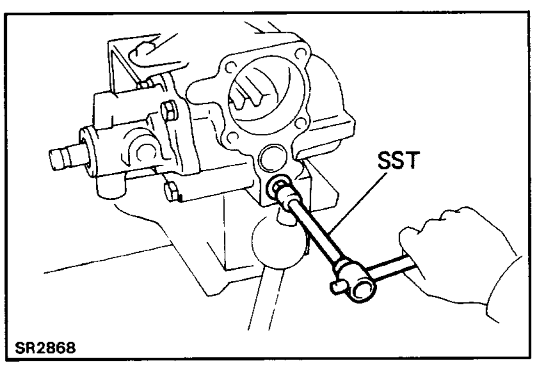
3. REMOVE END COVER

(a) Remove the adjusting screw lock nut.
(b) Remove the four bolts.
(c) Screw in the adjusting screw until the cover comes off.



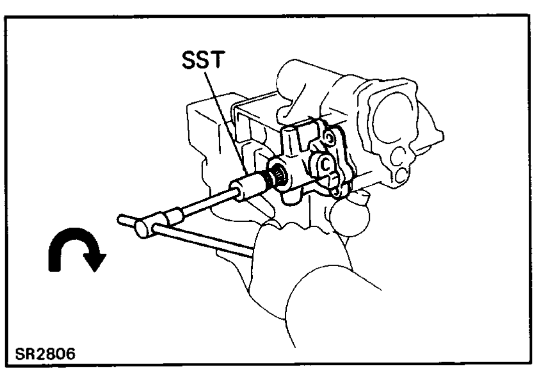
4. REMOVE CROSS SHAFT

Using a plastic hammer, tap on the cross shaft end and pull out the shaft.



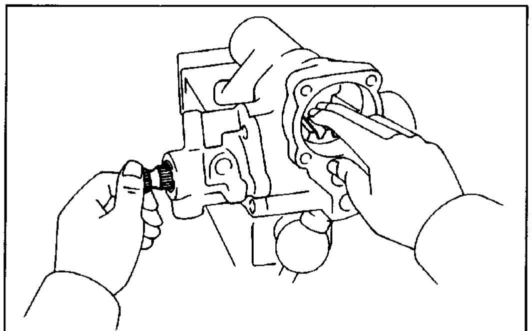
5. REMOVE PLUNGER GUIDE NUT

(a) Using SST, remove the plunger guide nut.
SST 09043–38100
(b) Remove the spring, plunger and plunger guide.
(c) Remove the 0–ring.



6. REMOVE WORM GEAR VALVE BODY ASSEMBLY

(a) Remove the four cap bolts from the housing.
(b) Using SST, turn the worm shaft clockwise with holding the power piston nut by your finger so it cannot move.
SST 09616–00010

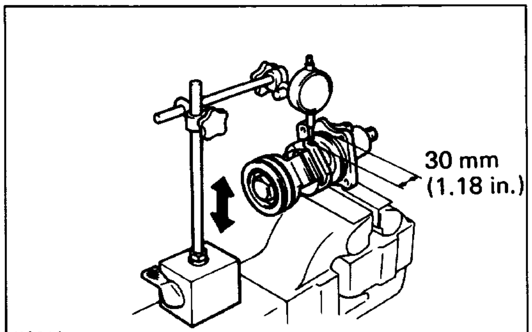

SR2809

(c) Pull out the valve body and power piston assembly.

NOTICE: Ensure that the power piston nut does not come off the worm shaft.

(d) Remove the 0–ring.

INSPECTION AND REPLACEMENT OF GEAR HOUSING

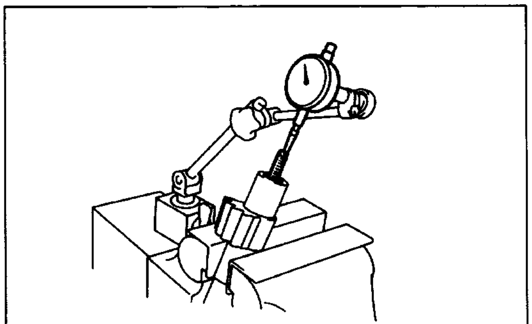


K3013

1. CHECK BALL CLEARANCE

(a) Mount the valve body in a vise.

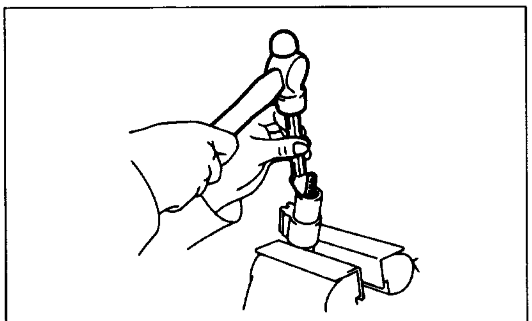
(b) Using a dial indicator, check the ball clearance.
Move the worm gear up and down.
Maximum ball clearance: 0.15 mm (0.0059 in.)
If clearance is excessive, the power control valve assem–bly must be replaced.


D3741

2. INSPECT CROSS SHAFT ADJUSTING SCREW THRUST CLEARANCE

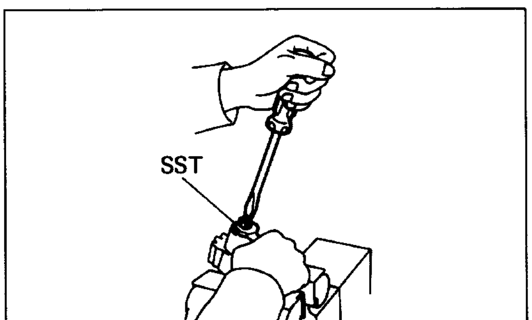
(a) Clamp the cross shaft in a vise.

(b) Using a dial indicator, measure the thrust clearance.
Thrust clearance: 0.03 – 0.05 mm
(0.0012 – 0.0020 in.)
If thrust clearance is not correct, adjust the thrust clear–ance.


D3742

3. IF NECESSARY, ADJUST THRUST CLEARANCE

(a) Using a chisel and hammer, remove the lock nut stake.

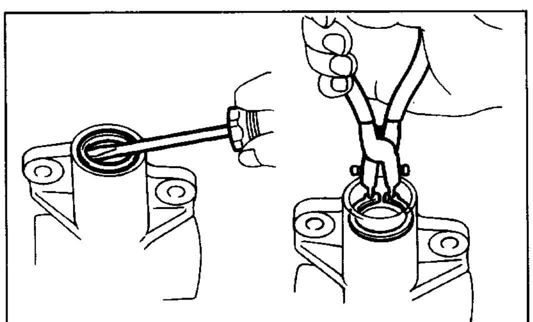


D3742

(b) Using SST, remove the lock nut.
SST 09630–00012 (09631–00050)

(c) Adjust the adjusting screw for correct thrust clear–ance and tighten a new lock nut.

(d) Stake the lock nut.

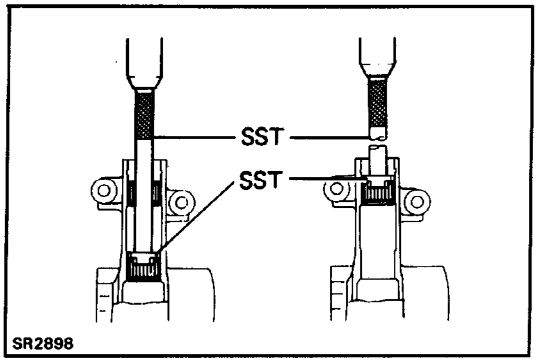

SR2869

4. REPLACE NEEDLE ROLLER BEARINGS

(a) Using a screwdriver, pry out the oil seal.

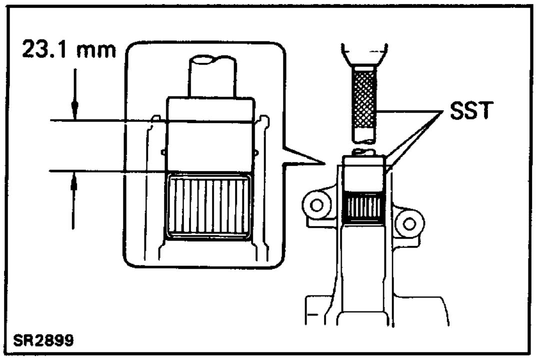
(b) Using snap ring pliers, remove the snap ring.

(c) Remove the metal spacer, teflon ring and 0–ring.



SR2898

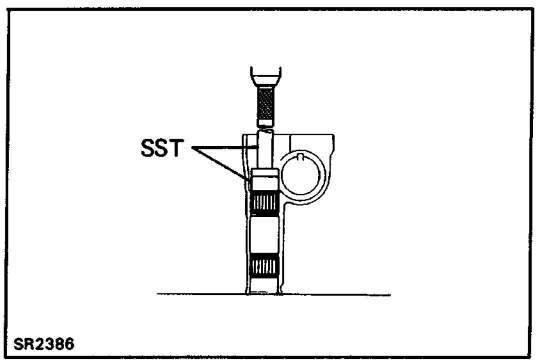
(d) Using SST, press out the bearings.
SST 09630–00012 (09631–00020, 09631–00070)



SR2899

(e) Using SST, press in a new lower bearing.
SST 09630–00012 (09631–00020, 09631–00100, 09631–00170)

HINT: Install the lower bearing so that it is positioned 23.1 mm (0.909 in.) away from the housing inner end surface.

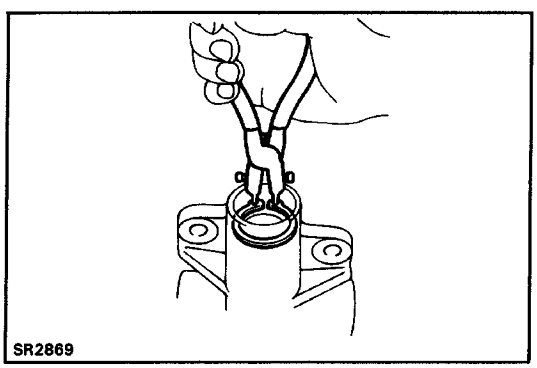


SR2386

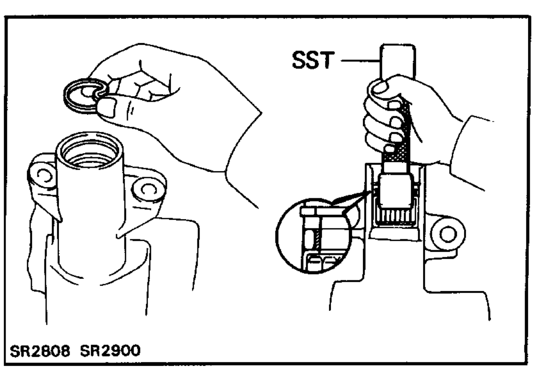
(f) Using SST, press in a new upper bearing.
SST 09630–00012 (09631–00020, 09631–00170)

HINT: The bearing's top end should be installed so that it aligns with the housing end surface.

(g) Install a new O–ring and metal spacer.


SR2869

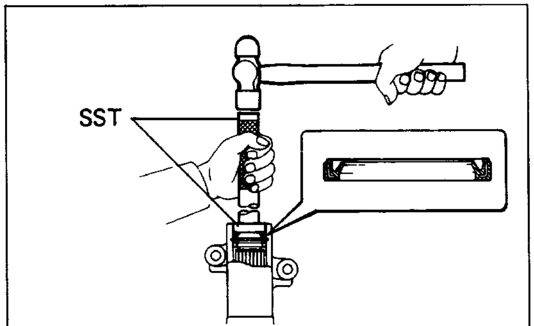
(h) Using snap ring pliers, install the snap ring.



SR2808 SR2900

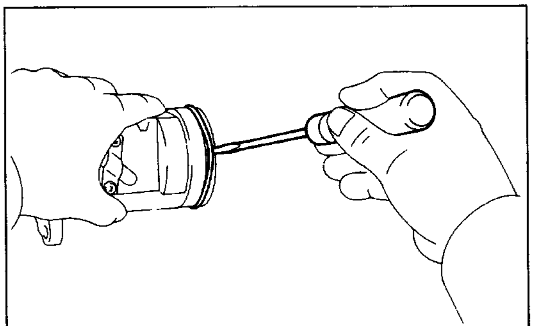
(i) Form a new teflon ring into a heart shape and install it with hand.

(j) Using SST, form the teflon ring.
NOTICE: The teflon ring must be squeezed before in–serting the cross shaft or damage will result.
SST 09630–00012 (09631–00120)



SR2901

(k) Using SST, drive a new oil seal into the gear hous–ing.
SST 09630–00012 (09631–00020, 09631–00170)



SR2812

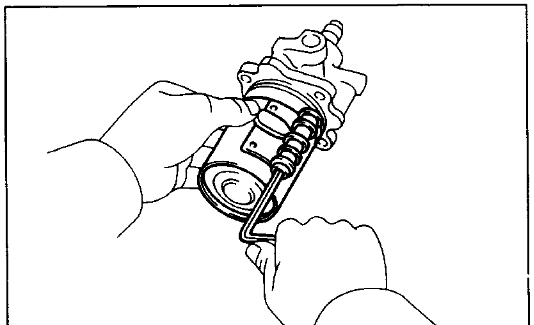
5. IF NECESSARY, REPLACE CONTROL VALVE TEFLON RING AND O–RING

(a) Using a screwdriver, remove the teflon ring and 0–ring.
NOTICE: Be careful not to damage the control valve.

(b) Install a new O–ring.

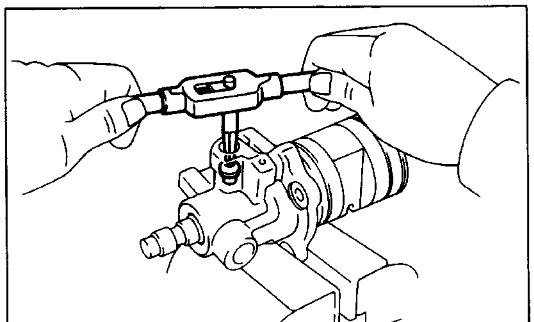
(c) Expand a new teflon ring with your fingers.
NOTICE: Be careful not to over–expand the teflon ring.

(d) Install the teflon ring.



SR2804

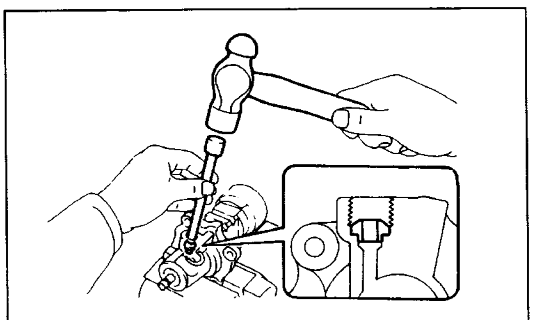
(e) Coat the teflon ring with power steering fluid and snug it down with piston ring compressor for 5 – 7 minutes.



SR2816

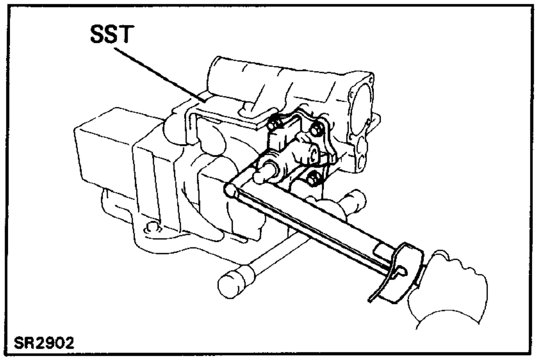
6. IF NECESSARY, REPLACE UNION SEAT

(a) Using a screw extractor, remove the union seat.



SR2811

(b) Using a plastic hammer and extension bar, tap in a new union seat.



SR2902

ASSEMBLY OF GEAR HOUSING

(See page SR–67)

1. INSTALL WORM GEAR VALVE BODY ASSEMBLY

(a) Install the three 0–rings to the gear housing and valve body.

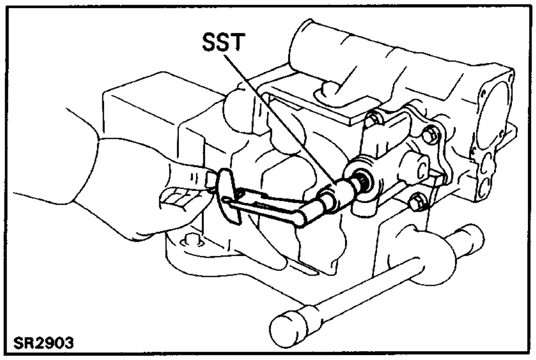
(b) Mount the gear housing on SST and clamp SST in vise.

SST 09630–00012 (09631–00140)

(c) Install and torque the four bolts.

Torque: 46 N–m (470 kgf–cm, 34 ft–lbf)

NOTICE: Be careful not to damage the teflon ring.



SR2903

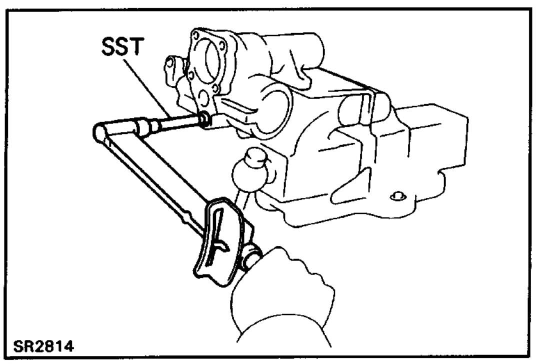
(d) Using SST, check the worm gear preload.

SST 09616–00010

Preload (Starting): 0.3 – 0.5 N–m
(3 – 5.5 kgf–cm, 2.6 – 4.8 in.–lbf)

HINT: Hold the power piston nut to prevent it from turn–ing.

If preload is not correct, replace the worm gear assembly.



SR2814

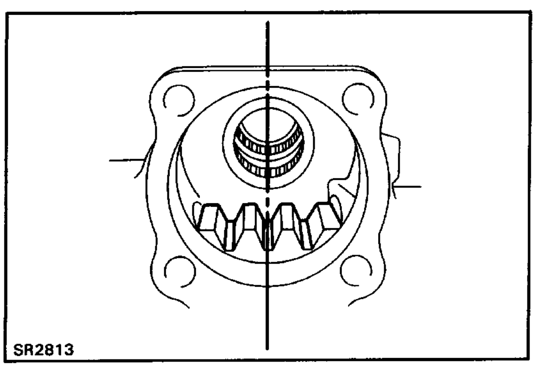
2. INSTALL PLUNGER GUIDE NUT

(a) Install the plunger, plunger guide and spring.

(b) Install a new O–ring to the plunger guide nut and in–stall the plunger guide nut with SST.

SST 09043–38100

Torque: 20 N–m (205 kgf–cm, 15 ft–lbf)


SR2813

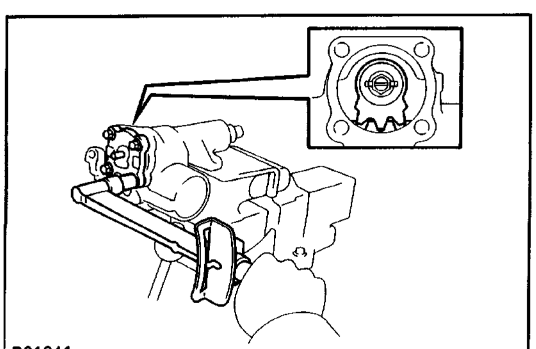
3. INSTALL CROSS SHAFT AND END COVER

(a) Install a new O–ring on the end cover.

(b) Assemble the cross shaft to the end cover.

HINT: Fully loosen the adjusting screw.

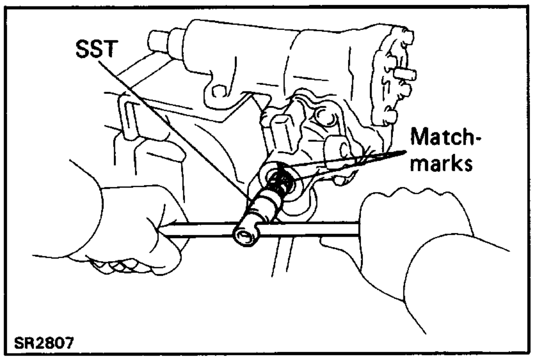
(c) Set the worm gear at the center of the gear housing.


R01241

(d) Install and push the cross shaft into the gear hous–ing so that the center teeth mesh together.

(e) Install the four bolts. Torque the bolts in a diagonal pattern.

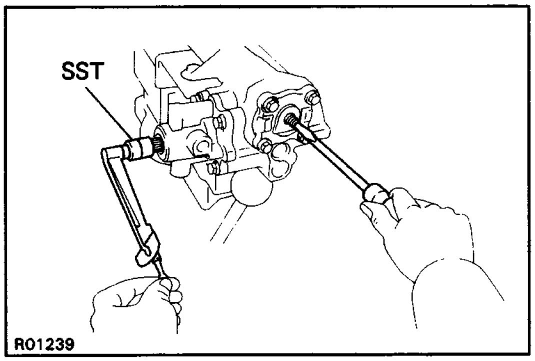
Torque: 46 N–m (470 kgf–cm, 34 ft–lbf)



4. DETERMINE CENTER POSITION OF GEAR HOUSING

(a) Using SST, turn the worm shaft so full lock in both directions and determine the exact center.
SST 09616–00010

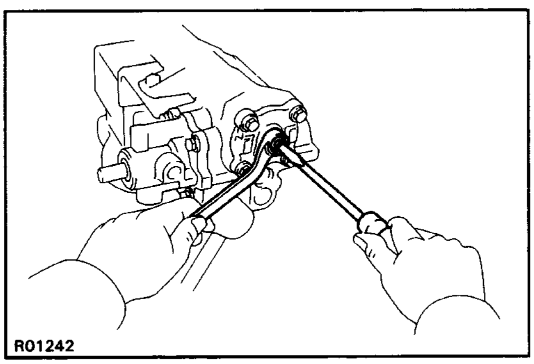
(b) Place matchmarks on the worm shaft and housing to show neutral position.



5. ADJUST CROSS SHAFT ADJUSTING SCREW

(a) Install SST with a torque meter on the worm shaft.
SST 09616–00010

(b) Turn the adjusting screw while measuring the pre–load until it should be increased 0.2 – 0.4 N–m (2 – 4 kgf–cm, 1.7 – 3.5 in.–lbf) more than the preload listed in step 1.



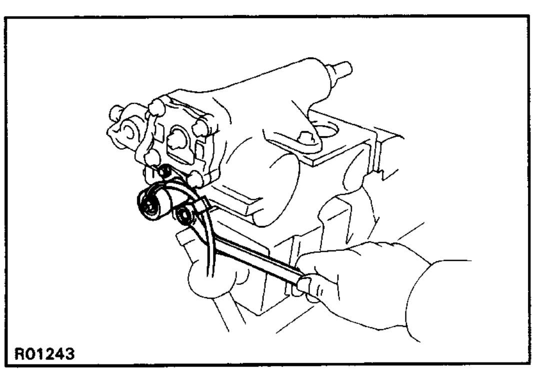
6. INSTALL NEW WASHER

7. INSTALL AND TIGHTEN LOCK NUT

Torque the lock nut while holding the adjusting screw.
Torque: 46 N–m (470 kgf–cm, 34 ft–lbf)

8. CHECK TOTAL PRELOAD

Using SST and a torque meter, check total preload.
SST 09616–00010
Total preload (Starting):
0.5 – 0.9 N–m (5 – 9.5 kgf–cm, 4.3 – 8.3 in.–lbf)



9. INSTALL SOLENOID VALVE (w/ PPS)

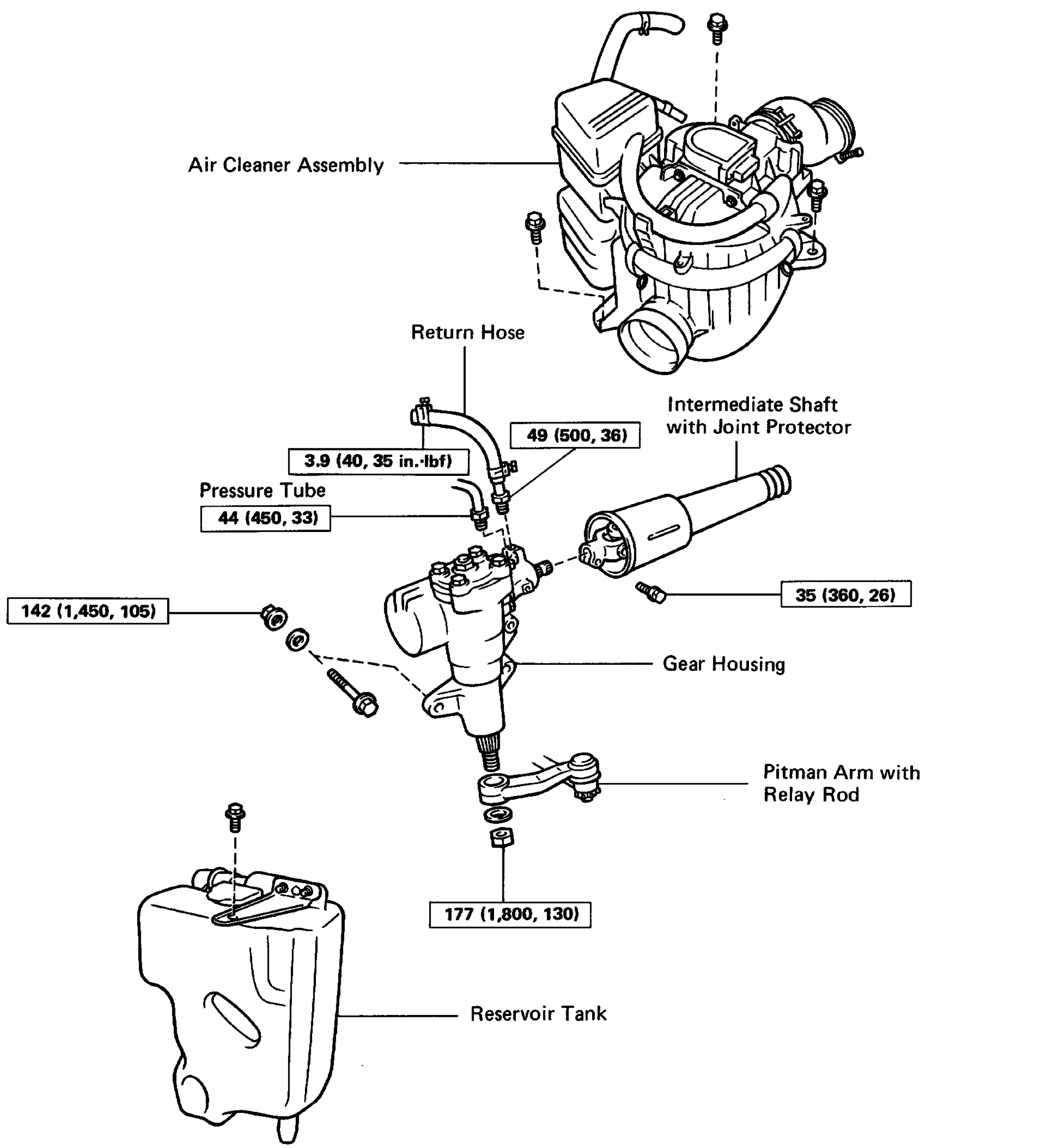
(a) Install new 0–rings to the solenoid valve.

(b) Install the solenoid valve with the two bolts.

Gear Housing (4WD)

REMOVAL AND INSTALLATION OF GEAR HOUSING

Remove and install the parts as shown.

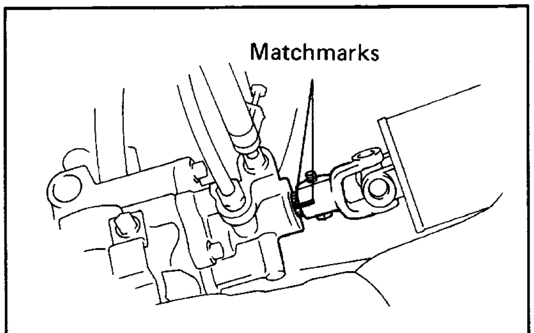


N·m (kgf·cm, ft·lbf) : Specified torque

(MAIN POINT OF REMOVAL AND INSTALLATION)

1. REMOVE RESERVOIR TANK

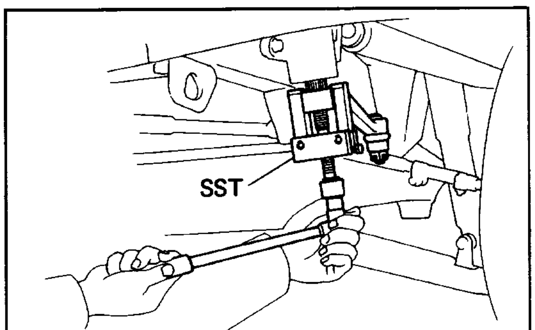
2. REMOVE AIR CLEANER ASSEMBLY



R01278

3. DISCONNECT UNIVERSAL JOINT

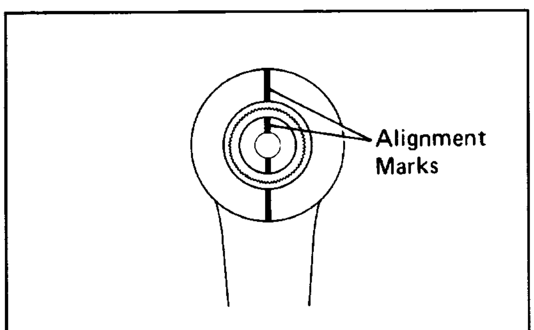
(a) Loosen the column side set bolt.
(b) Remove the gear side set bolt.
(c) Place matchmarks on the universal joint and worm shaft.
(d) Slide the shaft rearward to disconnect the shaft from the worm shaft.



SR1197

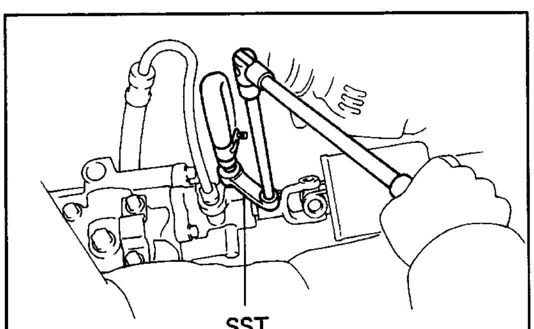
4. DISCONNECT AND CONNECT PITMAN ARM

(a) Remove the pitman arm set nut.
(b) Using SST, disconnect the pitman arm from the gear housing.
SST 09628–62011



SR2923

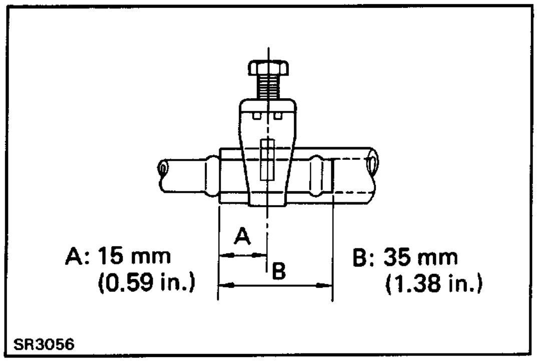
(c) When connecting, align the alignment marks on the sector shaft and pitman arm and install it.



R01318

5. DISCONNECT PRESSURE TUBE FROM GEAR HOUSING

Using SST, disconnect the pressure tube from the gear housing.
SST 09631–22020



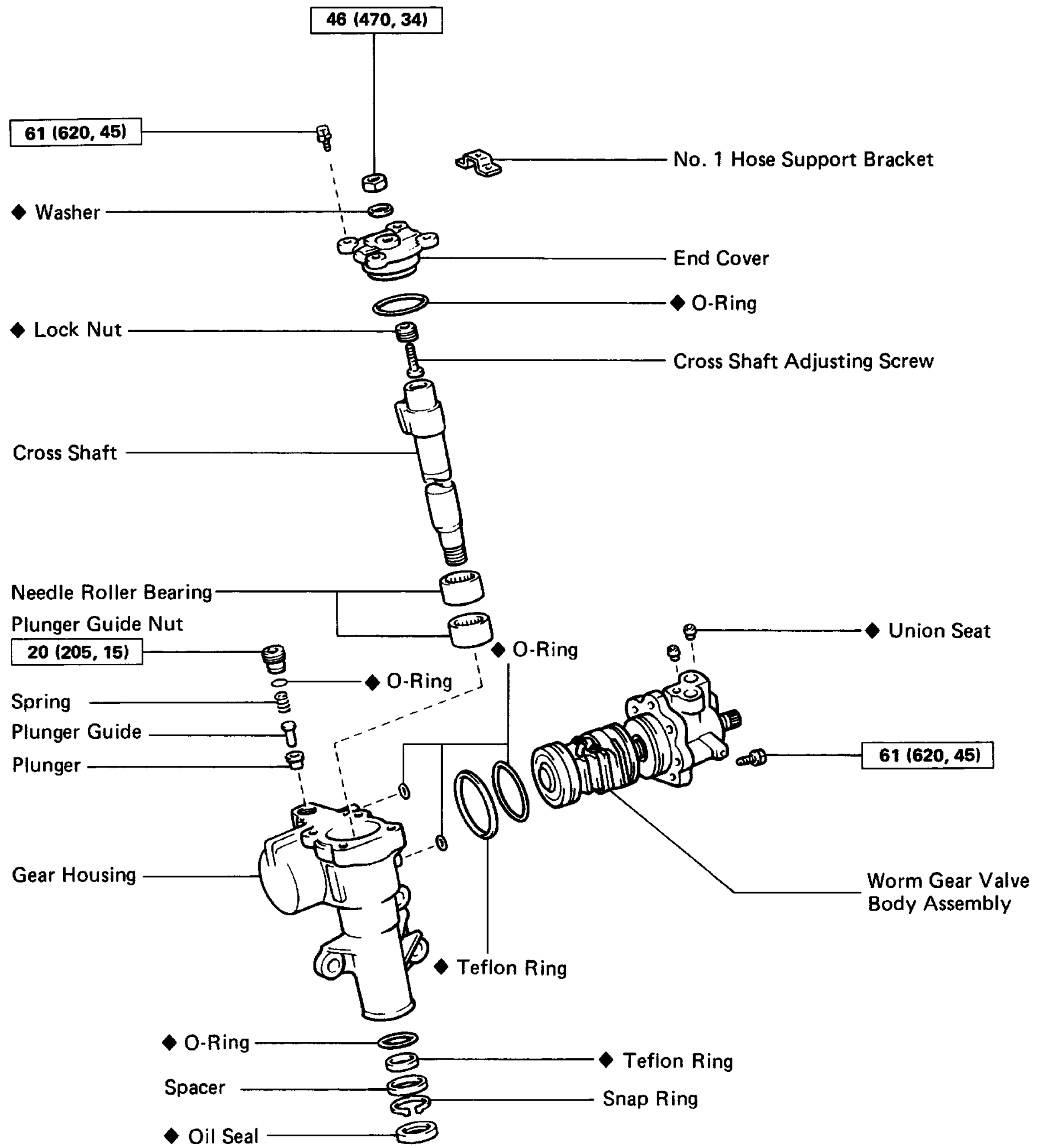
6. DISCONNECT AND CONNECT RETURN HOSE

(a) Using a screwdriver, loosen the clamp and disconnect the return hose.

(b) When connecting, check that hose and tube connections are as shown and tighten the screw.

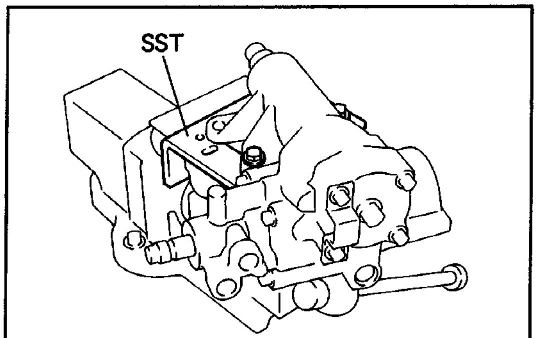
NOTICE: At installation, be sure that the clamp does not touch the other parts.

COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part



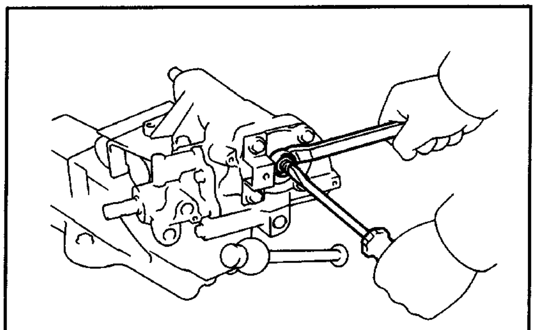
R01279

DISASSEMBLY OF GEAR HOUSING

(See page SR–76)

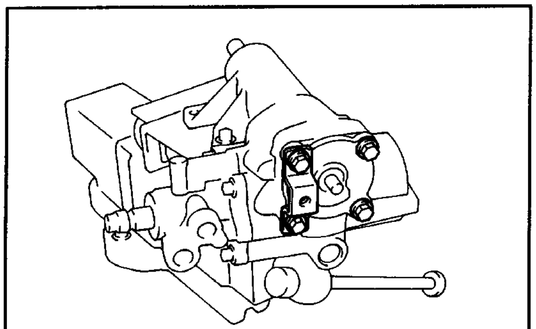
1. MOUNT HOUSING ON STAND

Mount the gear housing on SST and clamp SST in a vise.
SST 09630–00012 (09631–00140)

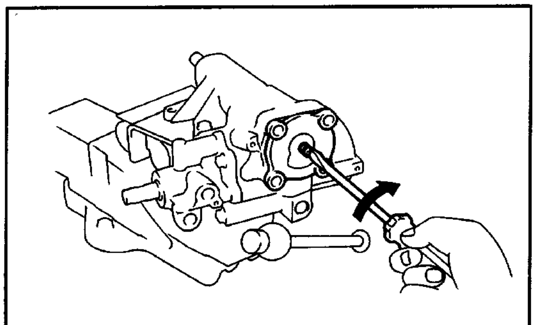

R01290

2. REMOVE END COVER

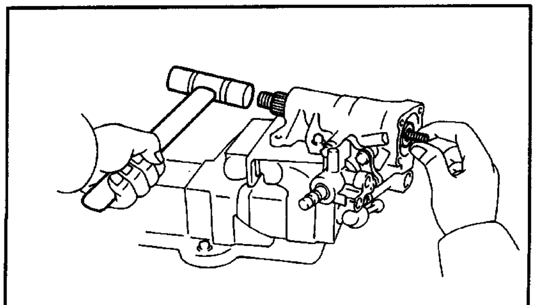
(a) Remove the adjusting screw lock nut.


R01291

(b) Remove the four bolts and No. 1 hose support bracket.

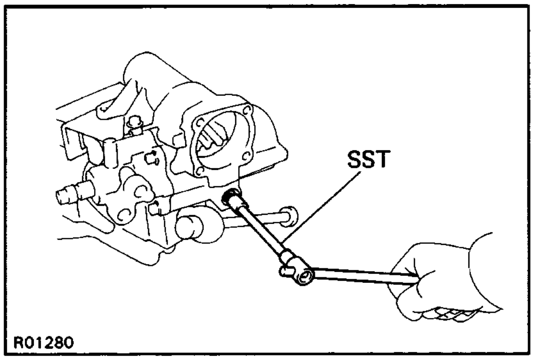

R01292

(c) Screw in the adjusting screw until the cover comes off.


R01293

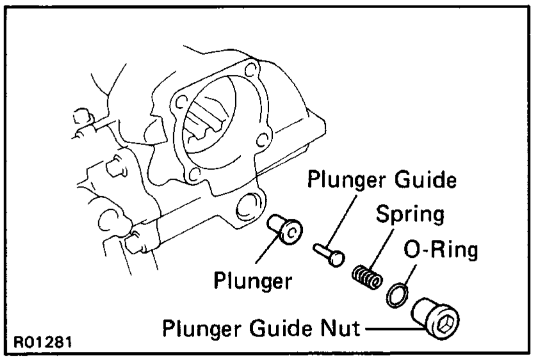
3. REMOVE CROSS SHAFT

Using a plastic hammer, tap on the cross shaft end and pull out the shaft.

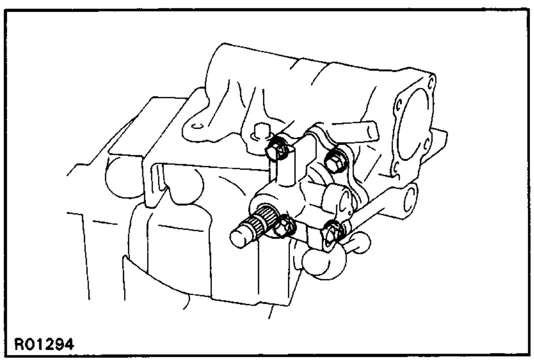


4. REMOVE PLUNGER GUIDE NUT

(a) Using SST, remove the plunger guide nut.
SST 09043–38100

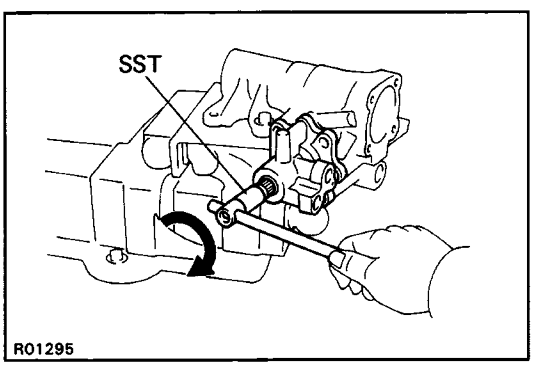


(b) Remove the spring, plunger and plunger guide nut.
(e) Remove the O–ring.

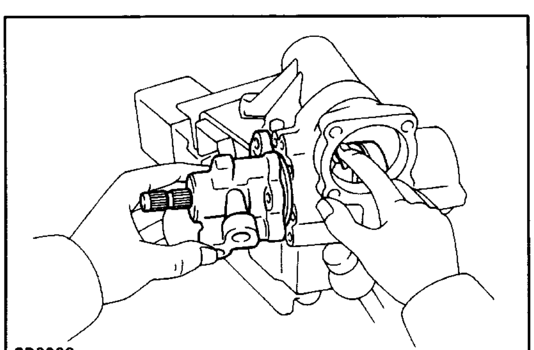


5. REMOVE WORM GEAR VALVE BODY ASSEMBLY

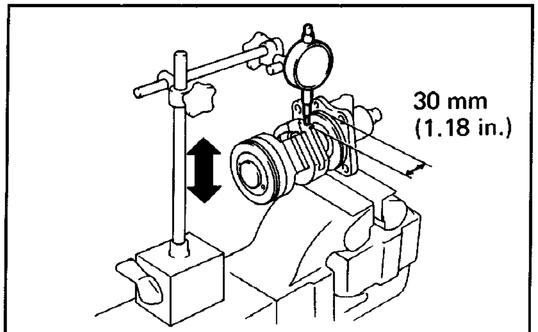
(a) Remove the four cap bolts from the housing.



(b) Using SST, turn the shaft clockwise to disconnect the worm gear valve body assembly from the gear housing.
SST 09616–00010



(c) Hold the power piston nut with your thumb so it cannot move, then withdraw the valve body and power piston assembly.
NOTICE: Ensure that the power piston nut does not come off the worm shaft.
(d) Remove the 0–ring.



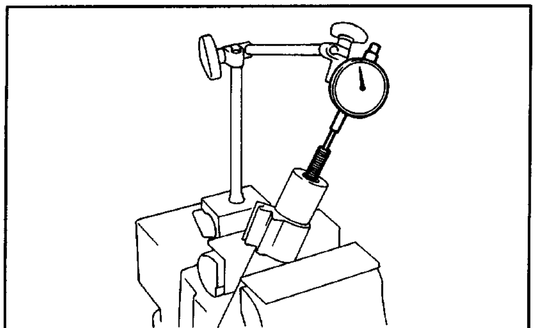
R01282

INSPECTION AND REPLACEMENT OF GEAR HOUSING

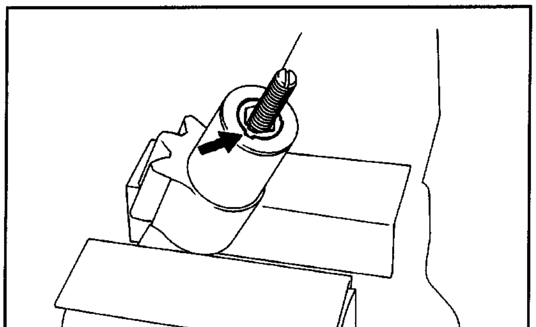
1. CHECK BALL CLEARANCE

(a) Mount the valve body in a vise.
(b) Using a dial indicator, check the ball clearance.
Move the worm gear up and down.
Maximum ball clearance: 0.15 mm (0.0059 in.)
If clearance is excessive, the power control valve assem–bly must be replaced.

2. INSPECT CROSS SHAFT ADJUSTING SCREW THRUST CLEARANCE

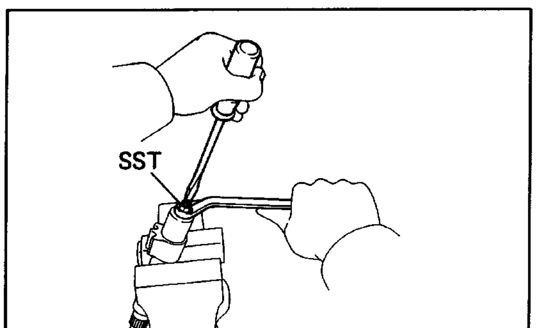

R01296

(a) Clamp the cross shaft in a vise.
(b) Using a dial indicator, measure the thrust clearance.
Thrust clearance: 0.03 – 0.05 mm
(0.0012 – 0.0020 in.)
If thrust clearance is not correct, adjust the thrust clear–ance.


R01297

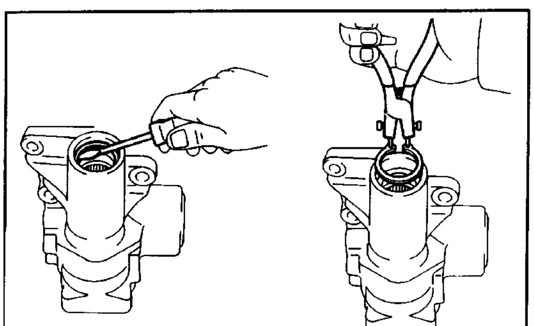
3. IF NECESSARY, ADJUST THRUST CLEARANCE

(a) Using a chisel and hammer, remove the lock nut stake.



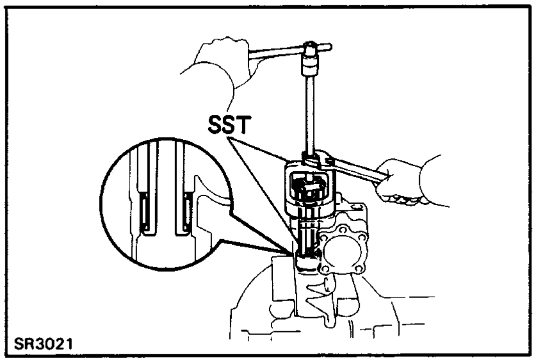
R01283

(b) Using SST, remove the lock nut.
SST 09630–00012 (09631–00050)
(c) Adjust the adjusting screw for correct thrust clear–ance and tighten a new lock nut.
(d) Stake the lock nut.

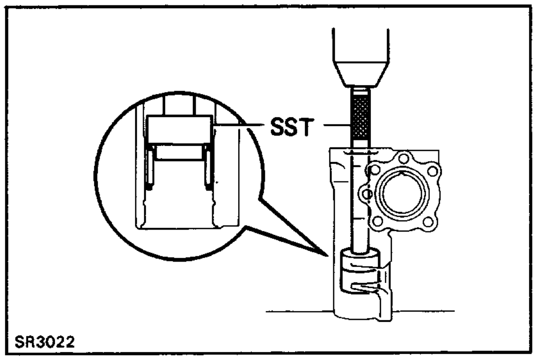

SR3019 SR3020

4. IF NECESSARY, REPLACE NEEDLE ROLLER BEAR-INGS

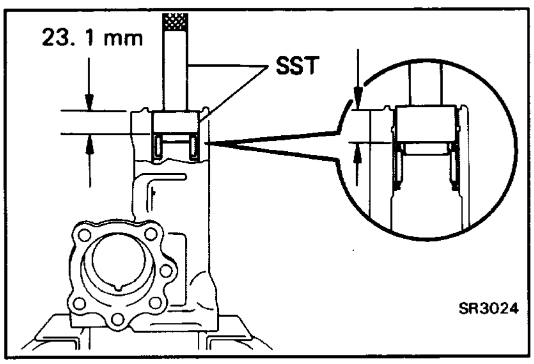
(a) Using a screwdriver, pry out the oil seal.
(b) Using snap ring pliers, remove the snap ring.
(c) Remove the metal spacer, teflon ring and 0–ring.



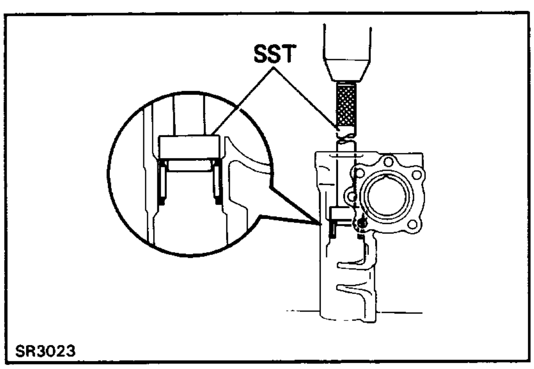
(d) Using SST, remove the upper bearing.
SST 09612–65014 (09612–01030)



(e) Using SST, press out the lower bearing.
SST 09630–00012 (09631–00020, 09631–00090)



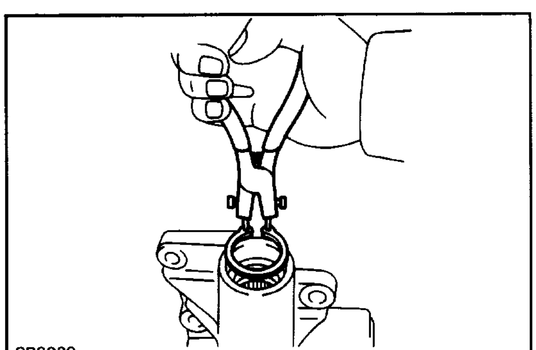
(f) Using SST, press in a new lower bearing.
SST 09630–00012 (09631–00020, 09631–00090)
HINT: Install the lower bearing so that it is positioned 23.1 mm (0.909 in.) away from the housing inner end surface.



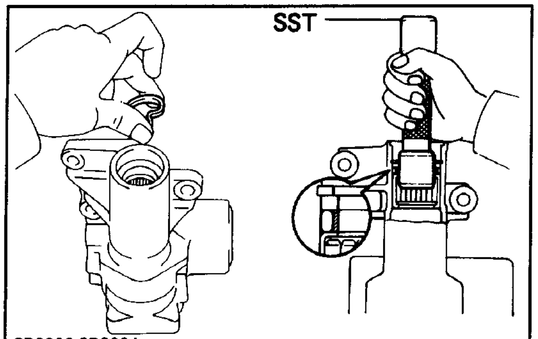
(g) Using SST, press in a new upper bearing.
SST 09630–00012 (09631–00020, 09631–00090)

HINT: The bearing's top end should be installed so that it aligns with the housing end surface.

(h) Install a new O–ring and metal spacer.



(i) Using snap ring pliers, install the snap ring.



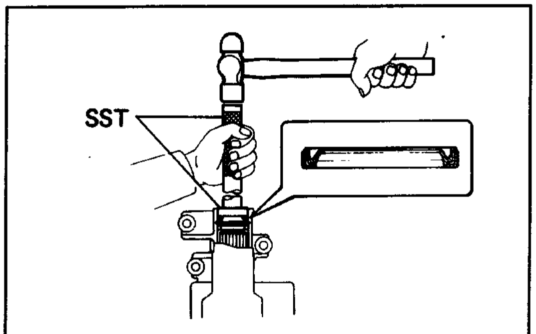
SR3026 SR3004

(j) Form a new teflon ring into a heart shape and install it with hand.

(k) Using SST, form the teflon ring.

NOTICE: The teflon ring must be squeezed before inserting the cross shaft or damage will result.

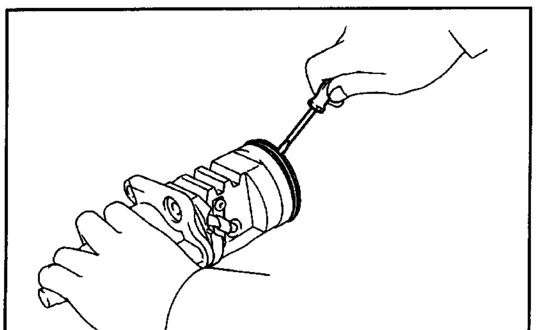
SST 09630–00012 (09631–00120)



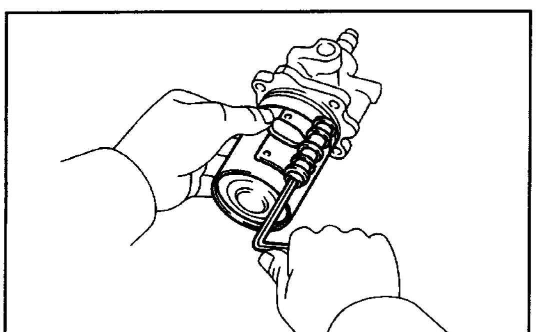
SR3027

(l) Using SST, drive a new oil seal into the gear housing.

SST 09630–00012 (09631–00020, 09631–00090)



R01298



SR2804

5. IF NECESSARY, REPLACE CONTROL VALVE TEFLON RING AND O–RING

(a) Using a screwdriver, remove the teflon ring and 0–ring.

NOTICE: Be careful not to damage the control valve.

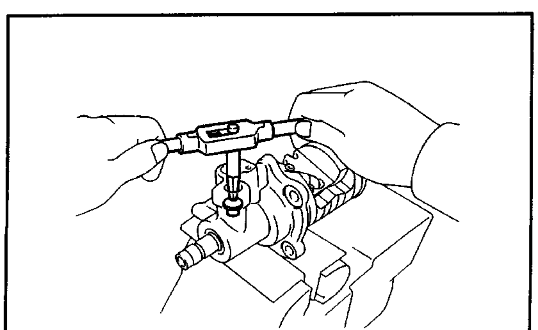
(b) Install a new O–ring.

(c) Expand a new teflon ring with your fingers.

NOTICE: Be careful not to over–expand the teflon ring.

(d) Install the teflon ring.

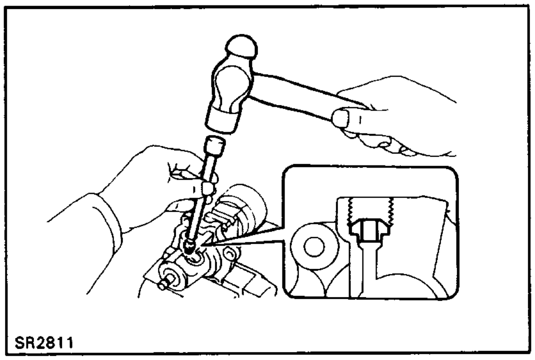
(e) Coat the teflon ring with power steering fluid and snug it down with piston ring compressor for 5 – 7 minutes.



R01299

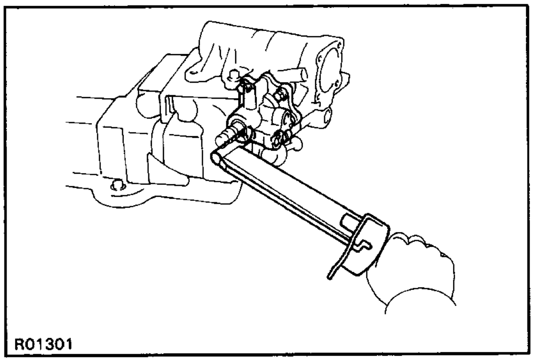
6. IF NECESSARY, REPLACE UNION SEAT

(a) Using a screw extractor, remove the union seat.



(b) Using a plastic hammer and extension bar, tap in a new union seat.

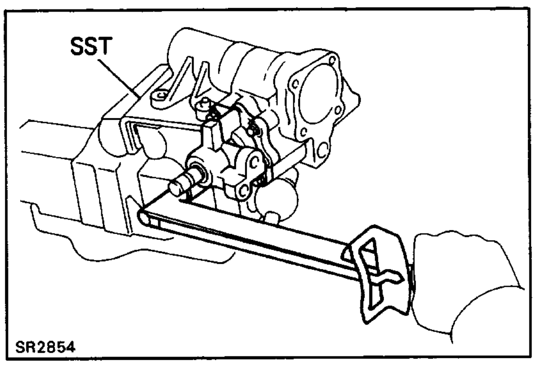
ASSEMBLY OF GEAR HOUSING
(See page SR–76)



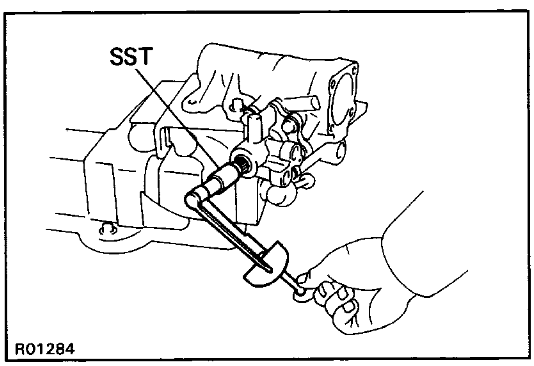
1. INSTALL WORM GEAR VALVE BODY ASSEMBLY

(a) Install the three 0–rings to the gear housing and valve body.

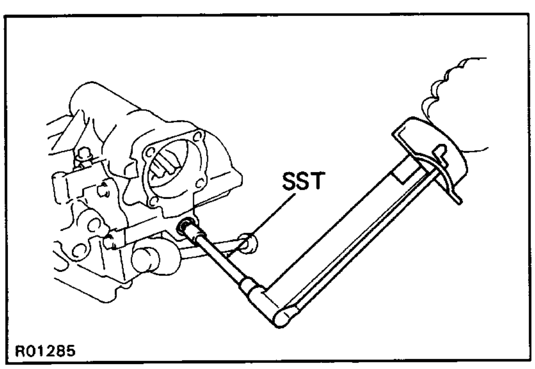
(b) Mount the gear housing on SST and clamp SST in vise.
SST 09630–00012 (09631–00140)



(c) Install and torque the four bolts.
Torque: 61 N–m (620 kgf–cm, 45 ft–lbf)
NOTICE: Be careful not to damage the teflon ring.



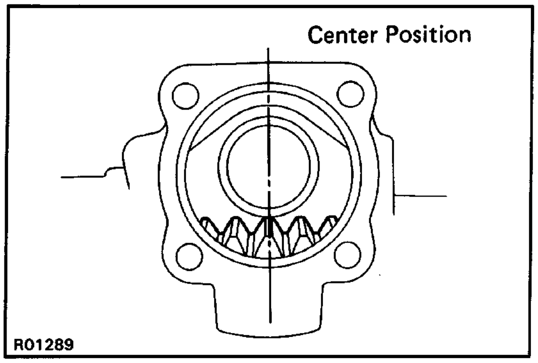
(d) Using SST, check the worm gear preload.
SST 09616–00010
Preload (Starting): 0.3 – 0.5 N–m
(3 – 5.5 kgf –cm, 2.6 – 4.8 in. AM)
HINT: Hold the power piston nut to prevent it from turn–ing.
If preload is not correct, replace the worm gear assembly.



2. INSTALL PLUNGER GUIDE NUT

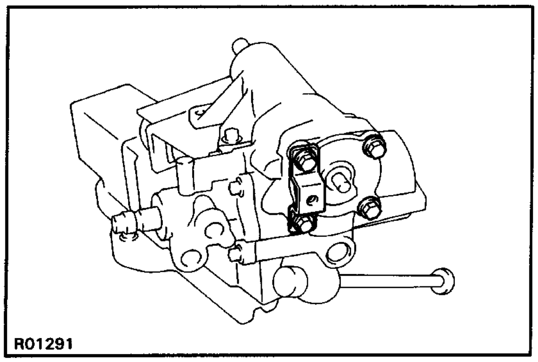
(a) Install the plunger, plunger guide and spring.

(b) Install a new O–ring to the plunger guide nut and in–stall the plunger guide nut with SST.
SST 09043–38100
Torque: 20 N–m (205 kgf–cm, 15 ft–lbf)

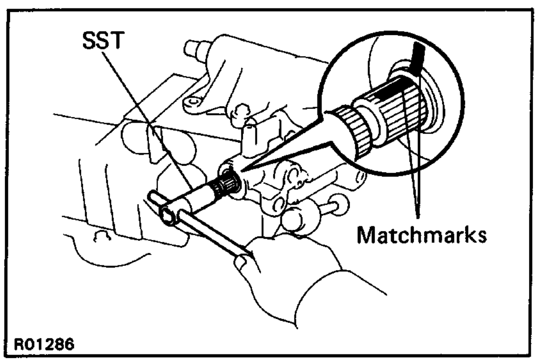


3. INSTALL CROSS SHAFT AND END COVER

(a) Install a new 0–ring on the end cover.
(b) Assemble the cross shaft to the end cover.
HINT: Fully loosen the adjusting screw.
(c) Set the worm gear at the center of the gear housing.

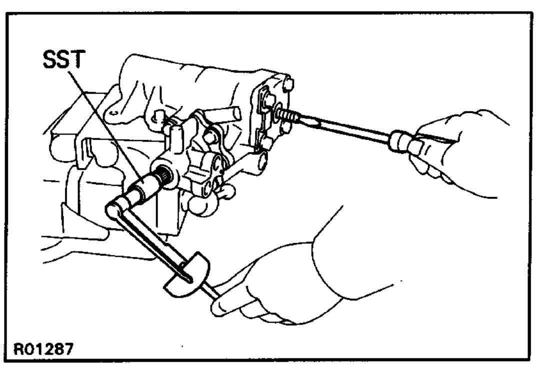


(d) Install and push the cross shaft into the gear housing so that the center teeth mesh together.
(e) Install the four cap bolts. Torque the bolts in a diagonal pattern.
Torque: 61 N–m (620 kgf–cm, 45 ft–lbf)



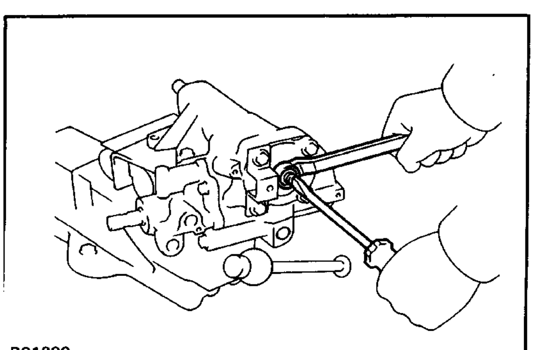
4. DETERMINE CENTER POSITION OF GEAR HOUSING

(a) Using SST, turn the worm shaft so full lock in both directions and determine the exact center.
SST 09616–00010
(b) Place matchmarks on the worm shaft and housing to show neutral position.



5. ADJUST CROSS SHAFT ADJUSTING SCREW

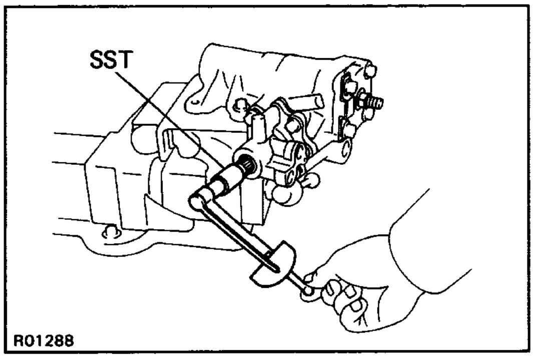
(a) Install SST with a torque meter on the worm shaft.
SST 09616–00010
(b) Turn the adjusting screw while measuring the preload until it should be increased 0.2 – 0.4 N–m (2 – 4 kgf–cm, 1.7 – 3.5 in.–lbf) more than the preload listed in step 1.



6. INSTALL NEW WASHER

7. INSTALL AND TIGHTEN LOCK NUT

Torque the lock nut while holding the adjusting screw.
Torque: 46 N–m (470 kgf–cm, 34 ft–lbf)

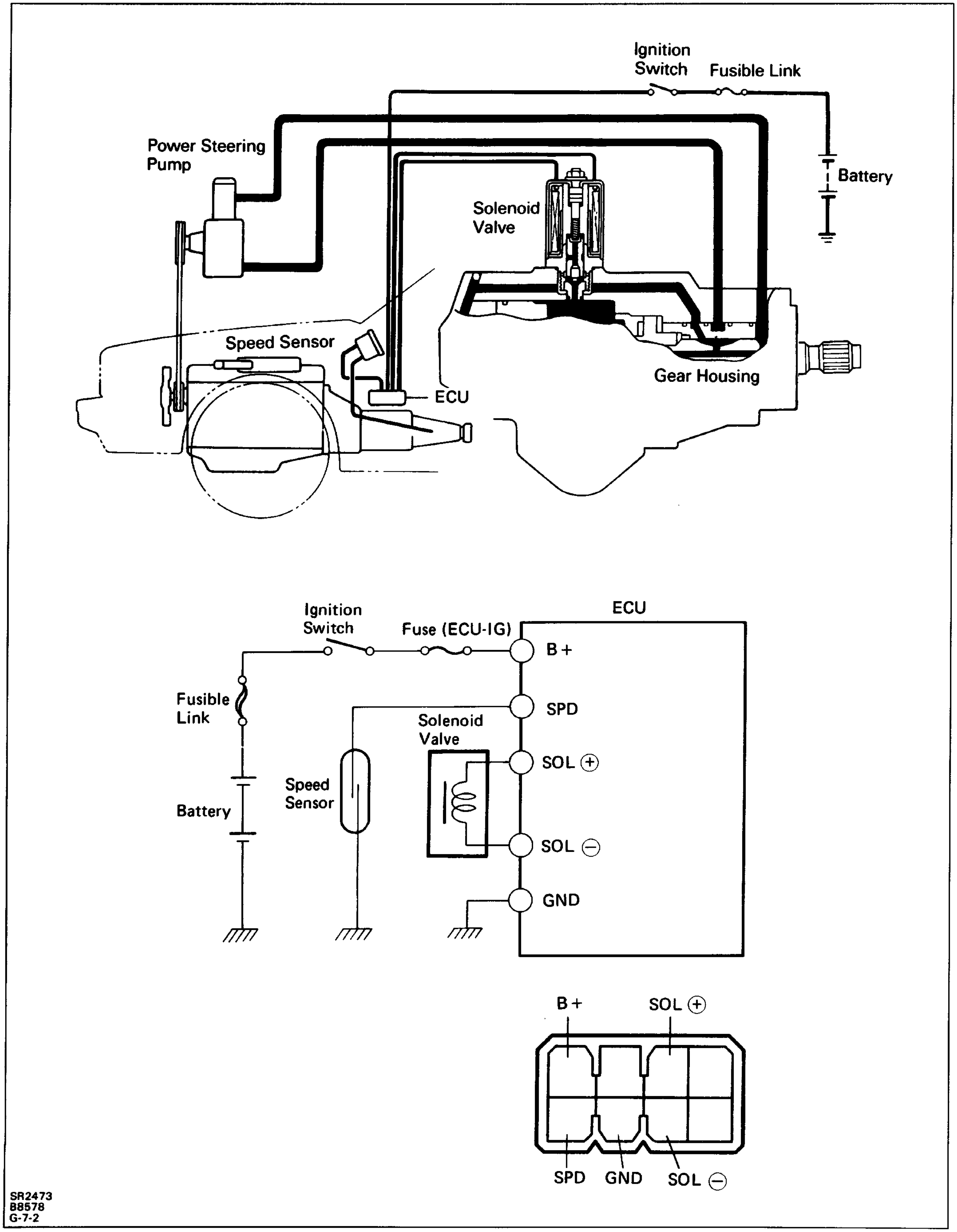


8. CHECK TOTAL PRELOAD

Using SST with a torque meter, check total preload.
SST 09616–00010
Total preload (Starting):
0.5 – 0.9 N–m (5 – 9.5 kgf–cm, 4.3 – 8.3 in.–lbf)

Progressive Power Steering (PPS)

DESCRIPTION AND ELECTRONIC CIRCUIT



TROUBLESHOOTING

Trouble

- Hard steering at idle or low–speed driving.
- Steering too sensitive during high–speed driving.

Preliminary Check

- Check tire pressure.
- Check lubrication of suspension and steering linkage.
- Check front wheel alignment.
- Check steering system joint and suspension arm ball joint.
- Check for bent steering column.
- Check that all connectors are secure.
- Check PS pump fluid pressure. (See page SR–41)

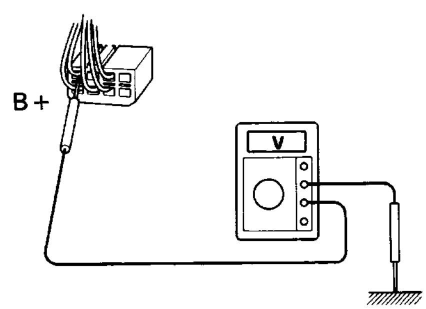
Turn ignition switch on.

Is ECU–IG fuse normal?

No → Replace fuse. Is operation normal?

- No → Short circuit in wire harness between fuse and ECU ter– minal B +.
- Yes → Fuse faulty.

Yes → Disconnect the ECU connector.



SR2196

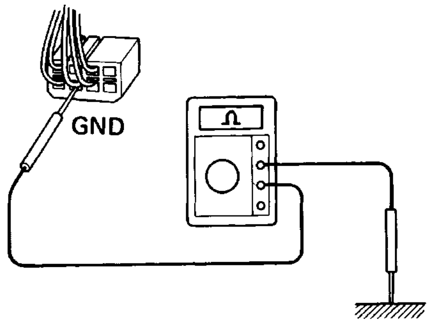
Check 1.
Check that there is the battery positive voltage between the ECU terminal B + and body ground.

No → Open circuit in wire harness between the fuse and ECU terminal B + .

Yes ↓

CONTINUED ON NEXT PAGE

Yes CONTINUED FROM PREVIOUS PAGE



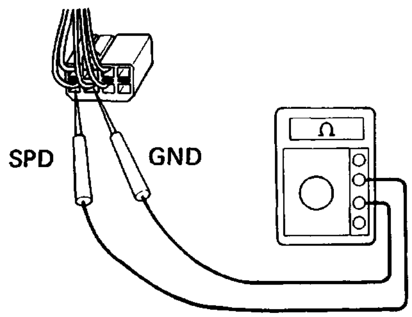
SR2197

Check 2.
Check that there is continuity between the ECU terminal G ND and body ground.

Yes

No

- Open circuit in wire harness between the ECU terminal GND and body ground.
- Body ground faulty.



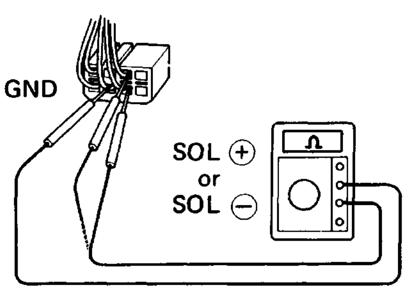
SR0068

Check 3.
(a) Jack up the rear wheel on one side.
(b) Connect an ohmmeter between the ECU connector terminals SPD and GND.
(c) Spin the rear wheel and check that the meter needle deflects from 0 / to ∞/ .

Yes

No

- Open or short circuit in wire harness between the ECU terminal SPD and speed sensor.
- Speed sensor faulty (See page BE–34).



SR2198

Check 4.
Check that there is no continuity between terminals SOL **+** or SOL **–** and GND.

Yes

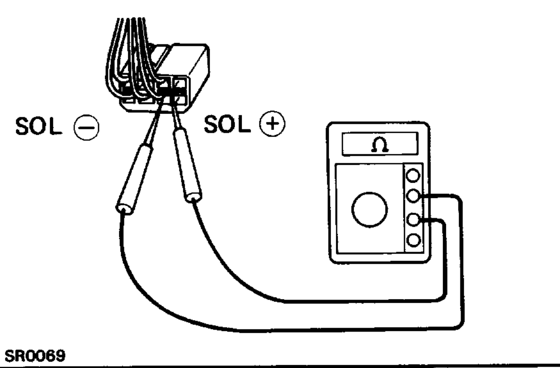
No

- Short circuit in wire harness between the terminals SOL **+** and SOL **–** .
- Solenoid valve faulty.

CONTINUED ON NEXT PAGE

Yes

CONTINUED FROM PREVIOUS PAGE



Check 5.
Measure the resistance between terminals SOL **+** and SOL **–**.
Standard resistance: 6 – 11 Ω

Yes

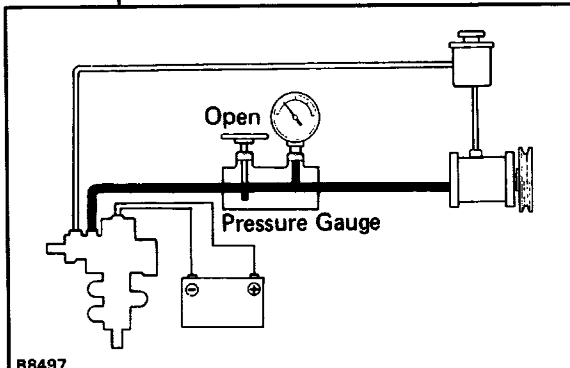
No

- Open circuit in wire harness between the terminals SOL **+** and SOL **–**.
- Solenoid valve faulty.

Check 6.
Inspect ECU.

Bad

Replace ECU .



Check 7.
(a) Turn the steering wheel full lock position.
(b) Apply battery positive voltage between terminals SOL **+** and SOL **–** and turn the solenoid ON and OFF. Is there a change in gear housing fluid pres– sure when the solenoid is ON or OFF?

Yes

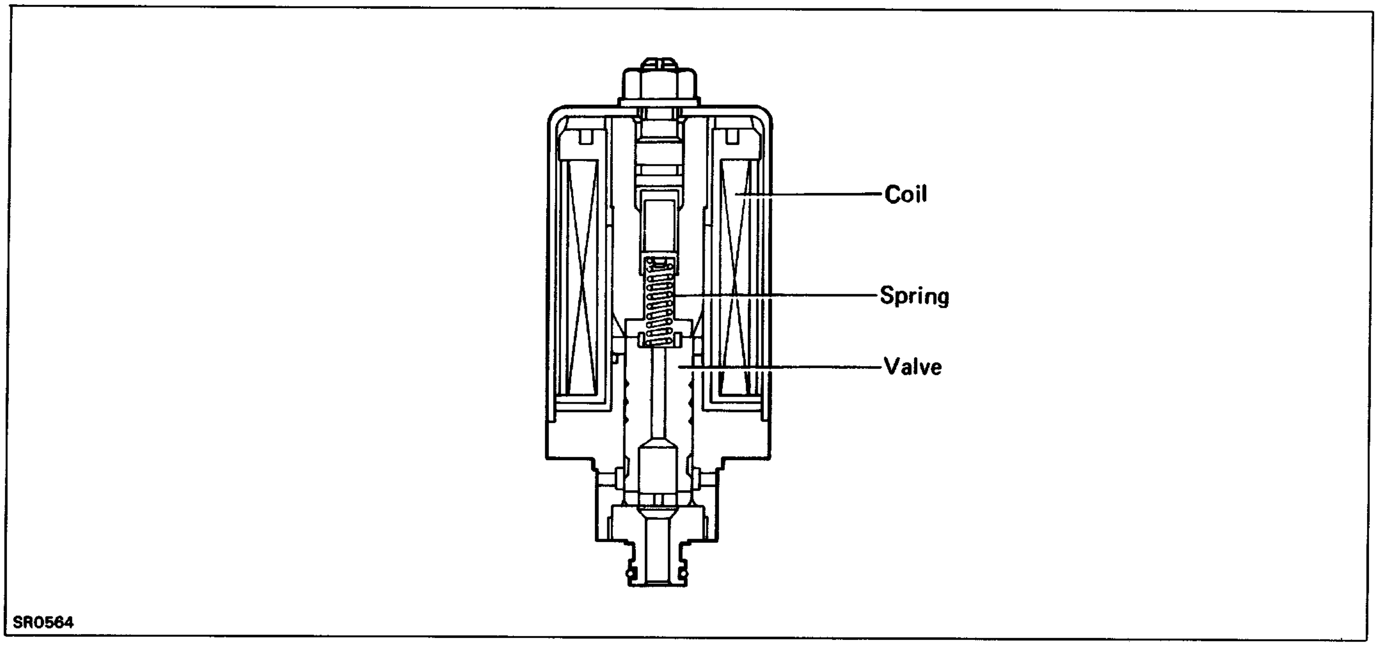
No

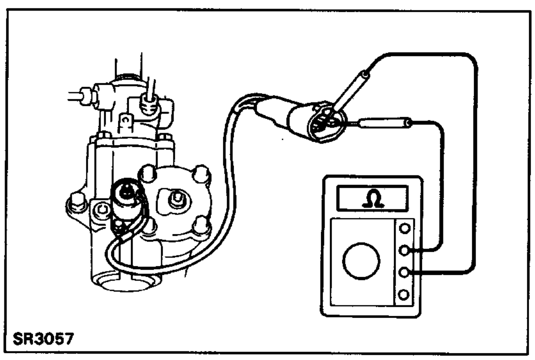
Steering gear housing faulty.

- By–pass or return line clogged.
- Fluid level low.
- Solenoid valve faulty.

ELECTRONIC CONTROL SYSTEM

Solenoid Valve





ON–VEHICLE INSPECTION

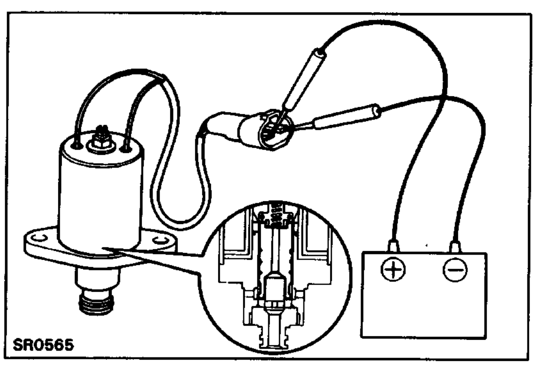
1. DISCONNECT WIRING CONNECTOR

2. MEASURE RESISTANCE

Measure the resistance between SOL **–** and SOL **+**.

Resistance: 6 – 11

3. CONNECT WIRING CONNECTOR



CHECK SOLENOID OPERATION

1. REMOVE SOLENOID VALVE FROM GEAR HOUSING

2. CHECK SOLENOID OPERATION

(a) Connect the battery positive terminal to the solenoid terminal SOL **+**.

(b) Connect the battery negative terminal to the sole–noid terminal SOL **–**.

Confirm that the needle valve has withdrawn about 2 mm (0.79 in.).

If not, replace the solenoid valve.

3. INSTALL SOLENOID VALVE TO GEAR HOUSING

4. BLEEDING OF POWER STEERING LINE

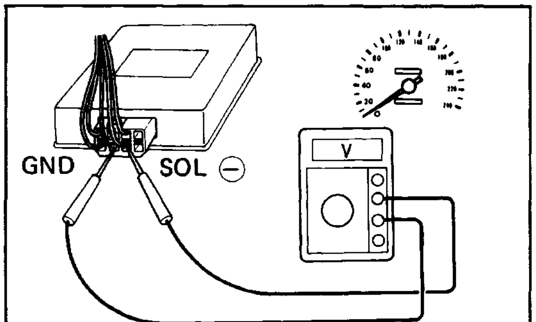
Power Steering ECU

INSPECTION OF ECU

1. JACK UP VEHICLE AND SUPPORT IT ON STANDS

2. REMOVE CENTER CONSOLE

HINT: Do not disconnect the ECU connector.



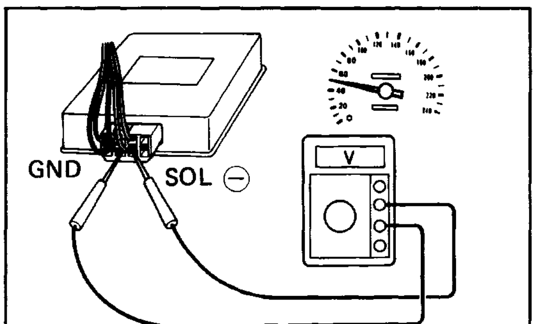
SR3096

3. START ENGINE

4. MEASURE VOLTAGE OF ECU

(a) Using a voltmeter, measure the voltage between ECU terminals GND and SOL E) while the engine is idling.

Standard voltage: 0 – 0.05 V



SR3097

(b) Place the transmission in gear and while running at about 50 km/h (31 mph), measure the voltage be– tween the ECU terminals GND and SOL E).

Standard voltage: Voltage measured in (a) above, plus 0.12 – 0.24 V

If no voltage, try another ECU.

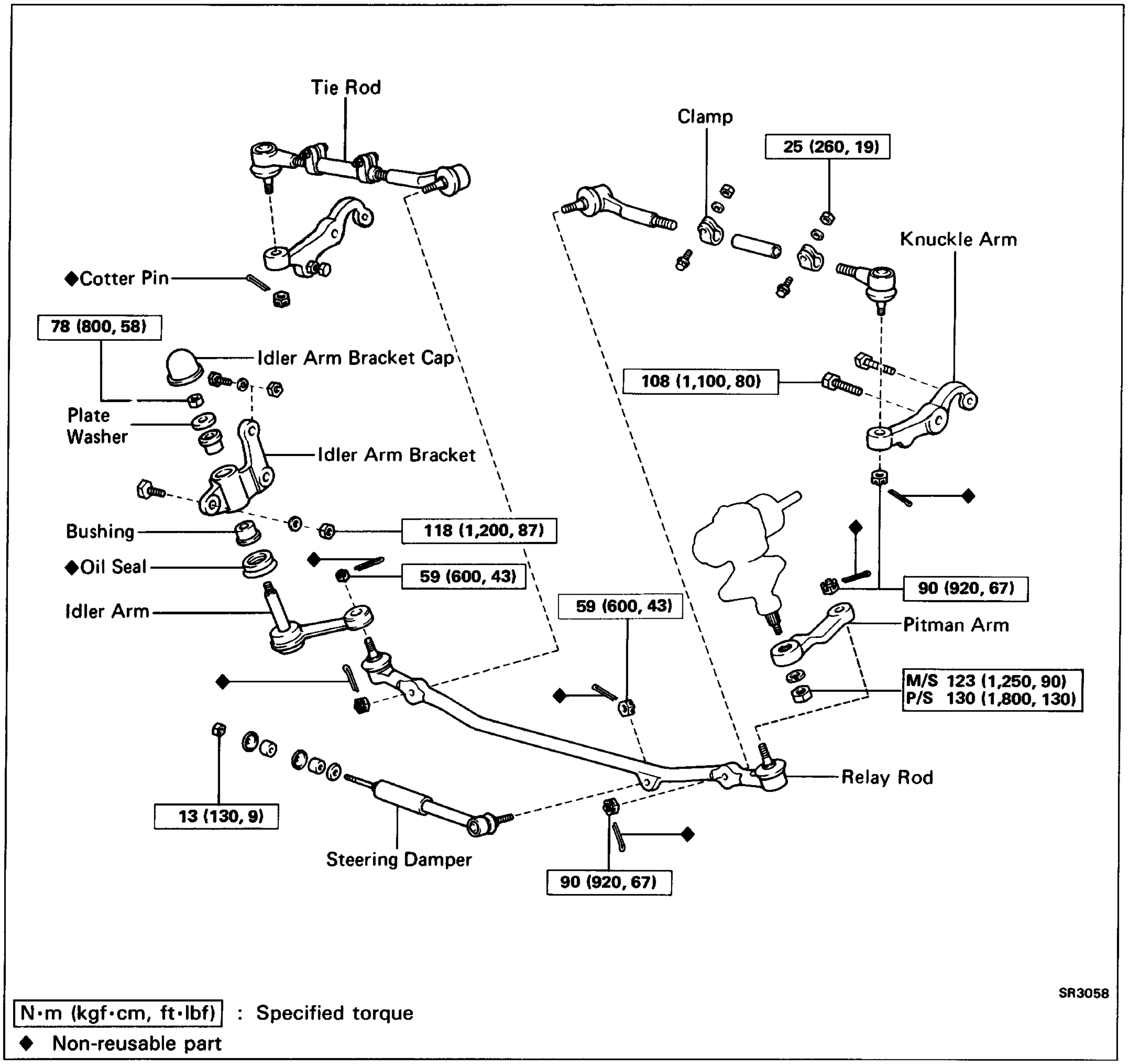
5. INSTALL CENTER CONSOLE

6. LOWER VEHICLE

STEERING LINKAGE (2WD)

REMOVAL AND INSTALLATION OF STEERING LINKAGE

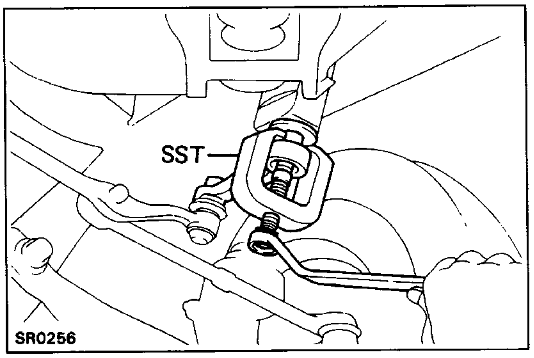
Remove and install the parts as shown.



HINT:

- When connecting the ball stud to the arm or rod, re– move the grease on the joint surfaces.
- After torquing the ball stud nut to specified torque, ad– vance the nut just enough to insert the cotter pin.
- After installing any of the steering linkage compo– nents, check the front wheel alignment.
  (See page SA–3, 6)

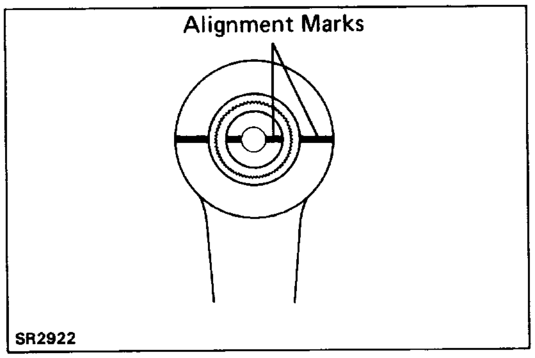
(MAIN POINTS OF REMOVAL AND INSTALLATION)



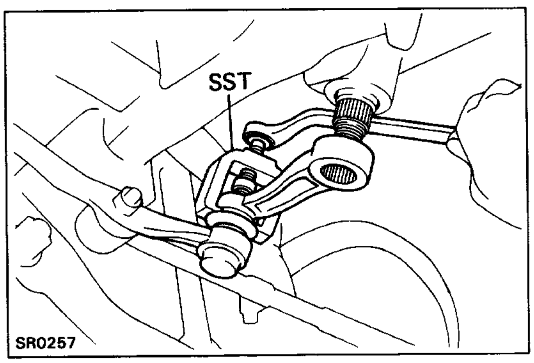
1. DISCONNECT AND CONNECT PITMAN ARM FROM/TO SECTOR SHAFT

(a) Loosen the pitman arm nut.

(b) Using SST, disconnect the pitman arm from the sec–tor shaft.
SST 09610–55012

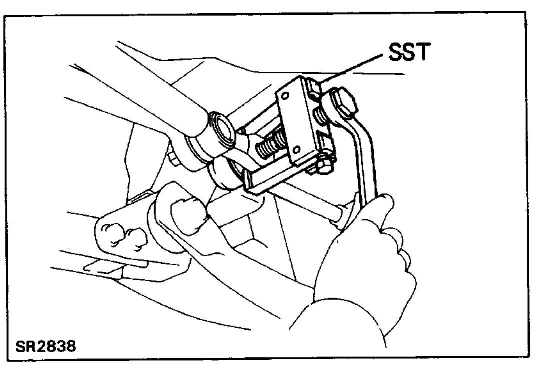


(c) When connecting, align alignment marks on the pit–man arm and the sector shaft, and install the spring washer and nut.



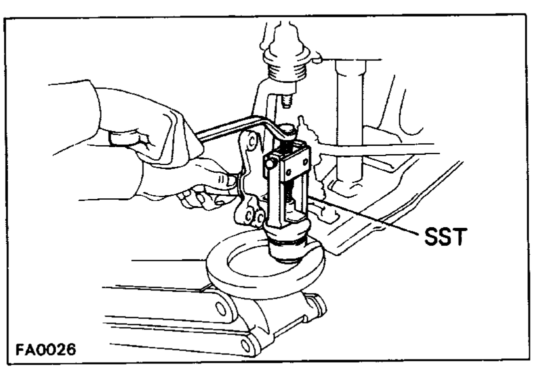
2. DISCONNECT PITMAN ARM FROM RELAY ROD

Using SST, disconnect the pitman arm from the relay rod.
SST 09611–22012



3. DISCONNECT TIE ROD FROM RELAY ROD

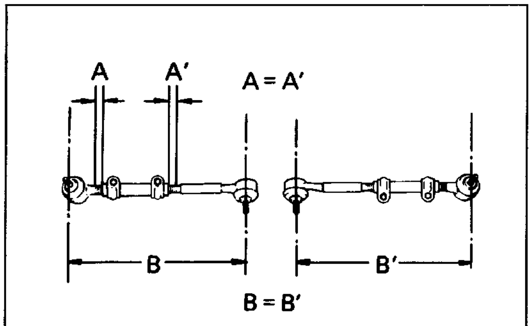
Using SST, disconnect the tie rod from the relay rod.
SST 09628–62011



4. DISCONNECT TIE ROD FROM KNUCKLE ARM

(a) Remove the front axle hub. (See page SA–11

(b) Using SST, disconnect the tie rod from the knuckle arm.
SST 09628–62011

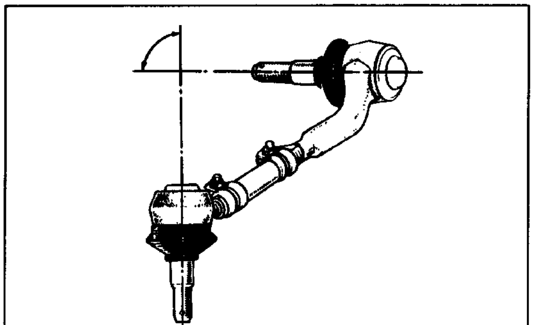


SR0261

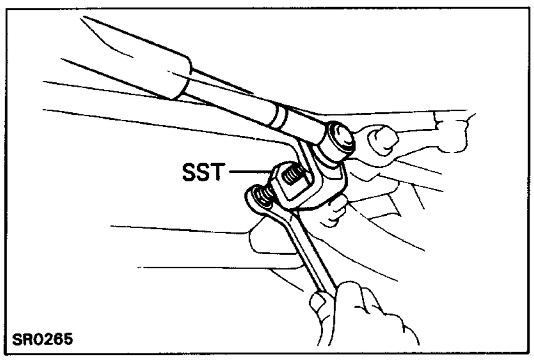
5. CONNECT TIE ROD

(a) Screw the tie rod ends into the tie rod.

HINT: The tie rod length should be approximately 314.5 mm (12.382 in.), and the remaining length of threads on both tie rod ends should be equal.


SR0262

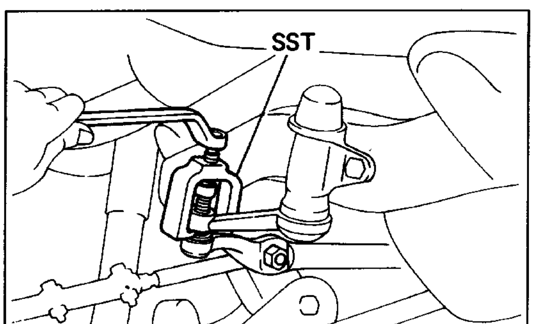
(b) Turn the tie rods so that they cross at about 90 de– grees. And connect it.



SR0265

6. DISCONNECT STEERING DAMPER FROM RELAY ROD

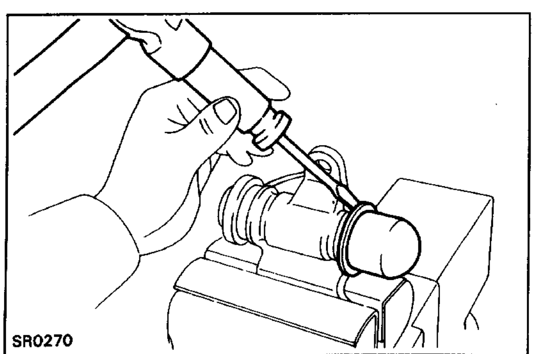
Using SST, disconnect the steering damper from the re– lay rod.
SST 09611–12010



SR2836

7. DISCONNECT IDLER ARM FROM RELAY ROD

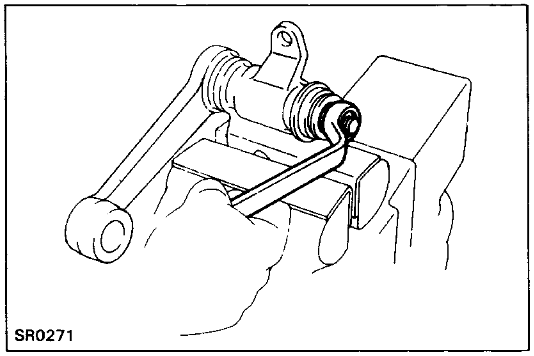
Using SST, disconnect the idler arm from the relay rod.
SST 09611–22012


SR0270

DISASSEMBLY OF IDLER ARM BRACKET

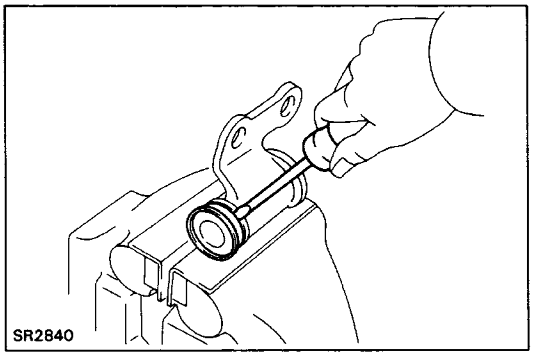
1. REMOVE IDLER ARM BRACKET CAP

Using a screwdriver and hammer, remove the idler arm bracket cap.



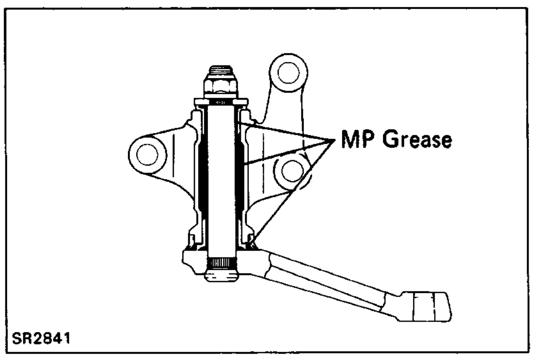
2. REMOVE IDLER ARM WITH SHAFT

Remove the nut and pull the idler arm with the shaft off the idler arm bracket.



3. REMOVE OIL SEAL

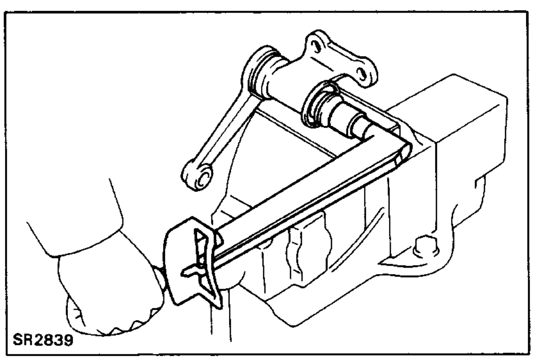
Using a screwdriver, remove the oil seal.



ASSEMBLY OF IDLER ARM BRACKET

1. INSTALL NEW OIL SEAL

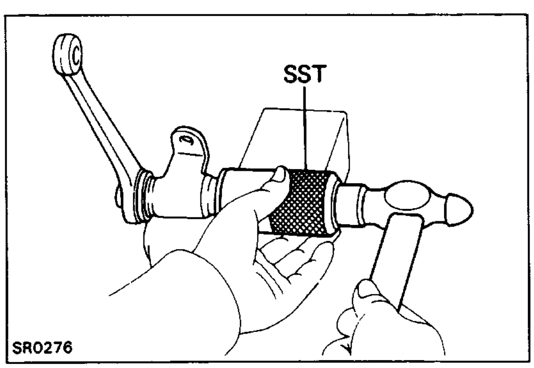
2. APPLY NIP GREASE



3. INSTALL IDLER ARM BRACKET

(a) Insert the idler arm shaft to the bracket.
(b) Install the washer and nut.

Torque: 78 N–m (800 kgf–cm, 58 ft–lbf)



4. INSTALL IDLER ARM BRACKET CAP

(a) Apply sealant to the cap end.

Sealant: Part No. 08826–00090, THREE BOND 1281 or equivalent

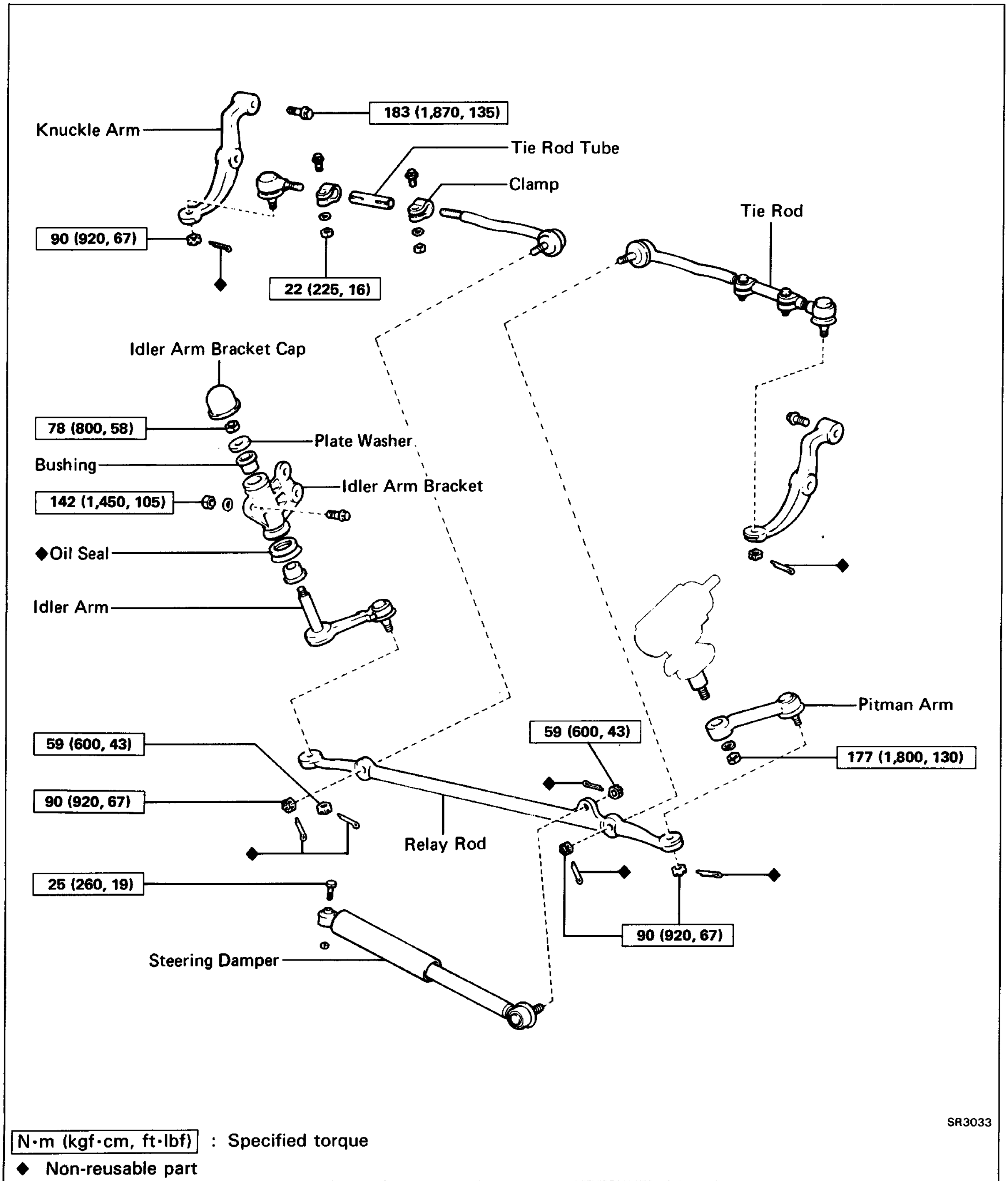
(b) Using SST, install the idler arm bracket cap.

SST 09636–20010

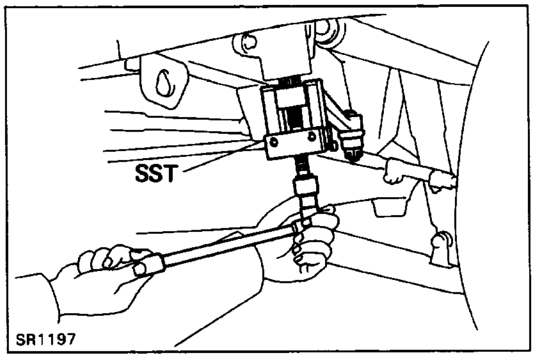
STEERING LINKAGE (4WD)

REMOVAL AND INSTALLATION OF STEERING LINKAGE

Remove and install the parts as shown.



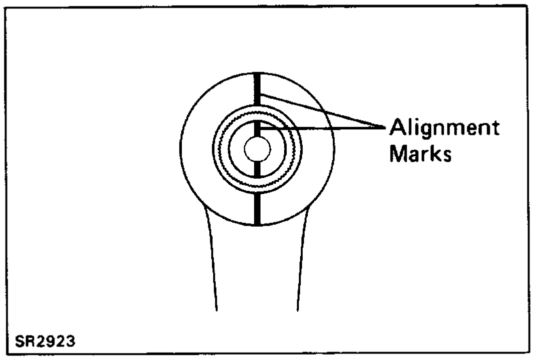
HINT: (See page SR–93)



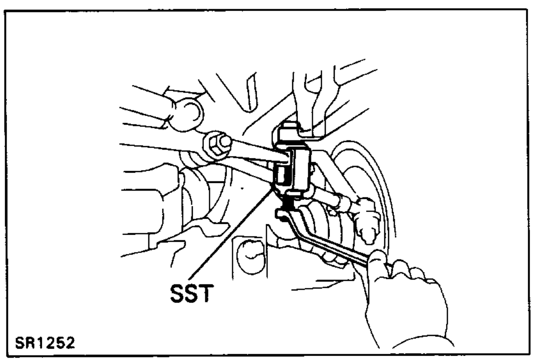
(MAIN POINTS OF REMOVAL AND INSTALLATION)

1. DISCONNECT AND CONNECT PITMAN ARM FROM/TO SECTOR SHAFT

(a) Loosen the pitman arm nut.
(b) Using SST, disconnect the pitman arm from the sec– tor shaft.
SST 09628–62011

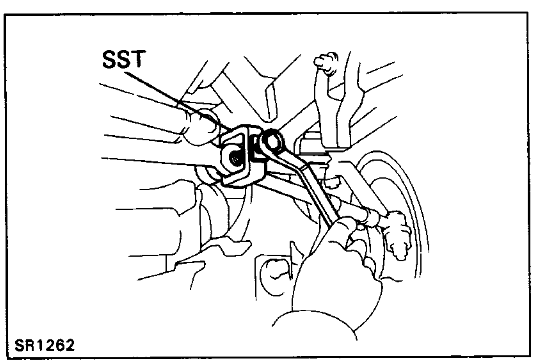


(c) When connecting, align alignment marks on the pit– man arm and the sector shaft, and install the spring washer and nut.



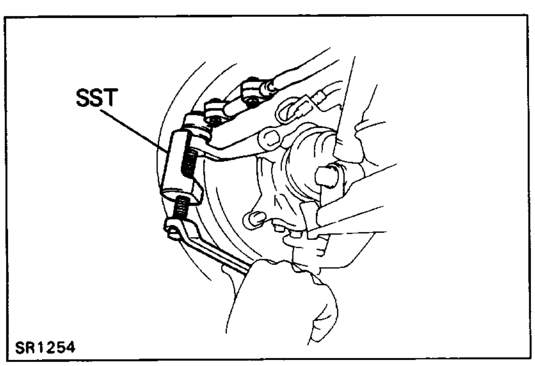
2. DISCONNECT PITMAN ARM FROM RELAY ROD

Using SST, disconnect the pitman arm from the relay rod.
SST 09611–22012



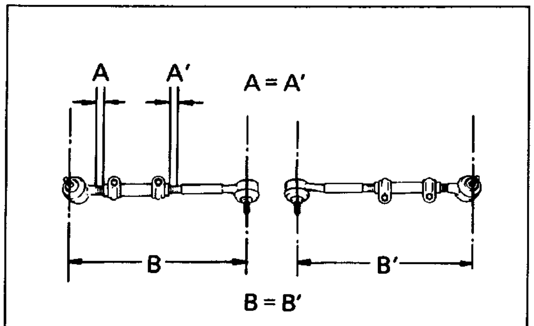
3. DISCONNECT TIE ROD FROM RELAY ROD

Using SST, disconnect the tie rod from the relay rod.
SST 09611–22012



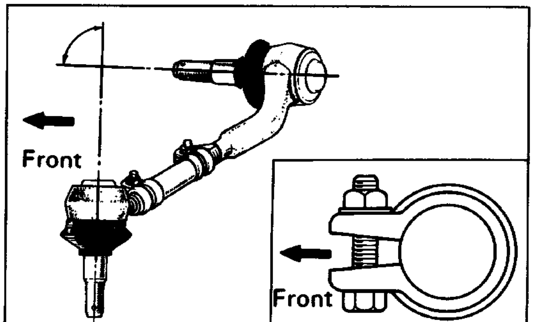
4. DISCONNECT TIE ROD FROM KNUCKLE ARM

Using SST, disconnect the tie rod from the knuckle arm.
SST 09628–62011



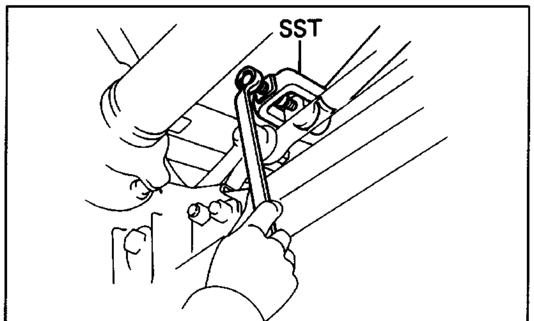
SR0261

5. CONNECT TIE ROD
(a) Screw the tie rod ends into the tie rod.
HINT: The tie rod length should be approximately 328.5 mm (12.933 in.), and the remaining length of threads on both tie rod ends should be equal.



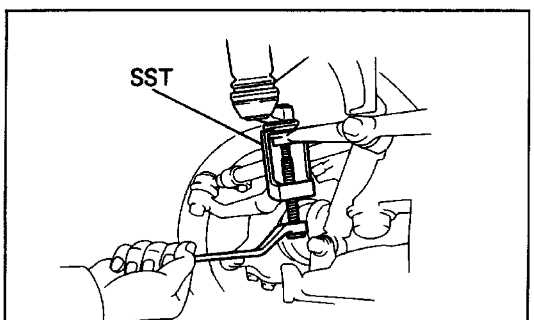
SR0262 SR1454

(b) Turn the tie rods so that they cross at about 90 degrees. And connect it.



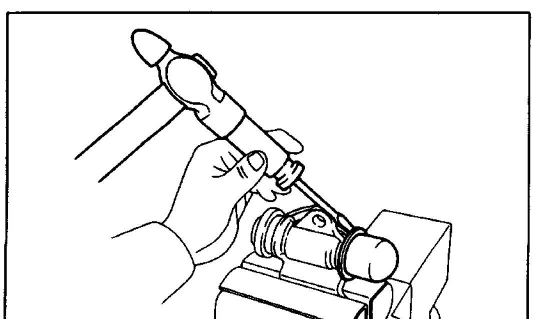
SR1260

6. DISCONNECT STEERING DAMPER FROM RELAY ROD
Using SST, disconnect the steering damper from the relay rod.
SST 09611–22012

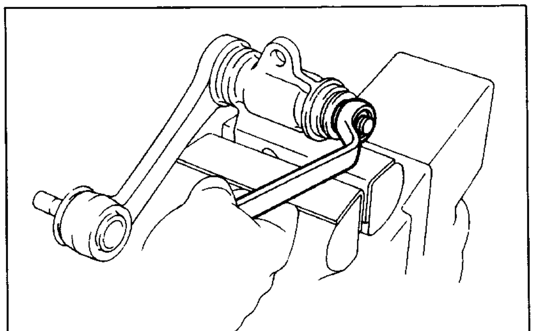


SR1256

7. DISCONNECT IDLER ARM FROM RELAY ROD
Using SST, disconnect the idler arm from the relay rod.
SST 09610–20012


SR1279

DISASSEMBLY OF IDLER ARM BRACKET
1. REMOVE IDLER ARM BRACKET CAP
Using a screwdriver and hammer, remove the idler arm bracket cap.

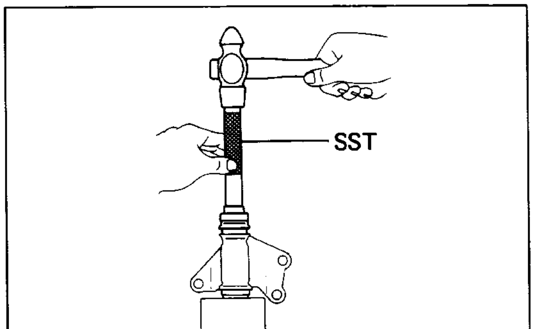

SR1280

2. REMOVE IDLER ARM WITH SHAFT

Remove the nut and pull the idler arm with the shaft off the idler arm bracket.

3. REMOVE OIL SEAL

Using a screwdriver, remove the oil seal.

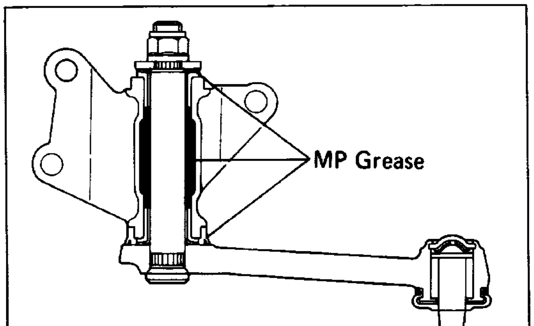


SR1281

ASSEMBLY OF IDLER ARM BRACKET

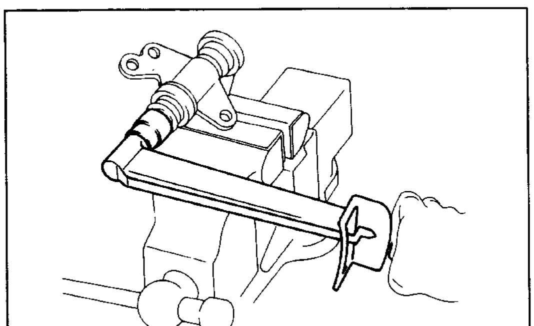
1. INSTALL OIL SEAL

Using SST, tap in a new oil seal.
SST 09620–30010 (09624–30010, 09631–00020)



SR1282

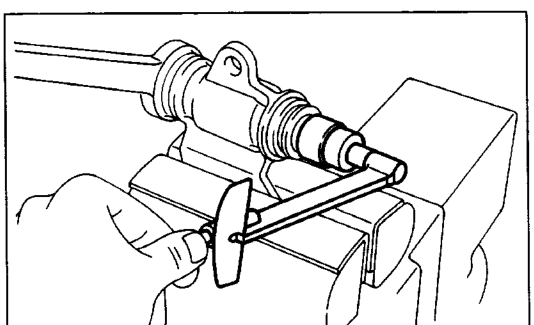
2. APPLY MP GREASE


SR1283

3. INSTALL IDLER ARM WITH SHAFT

(a) Install the idler arm shaft to the bracket.
(b) Install the washer and nut.

Torque: 78 N–m (800 kgf–cm, 58 ft–lbf)

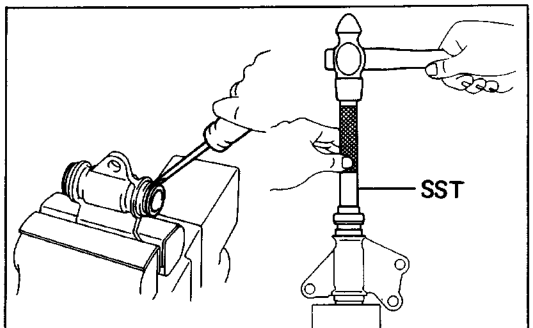

SR1287

4. INSPECT IDLER ARM FOR ROTATION CONDITION

Using a torque meter, turn the nut several times and take the torque reading.

Torque (Turning): 0.5 – 2.9 N¿ m
(5 – 30 kgf–cm, 5 – 26 in.¿lbf)

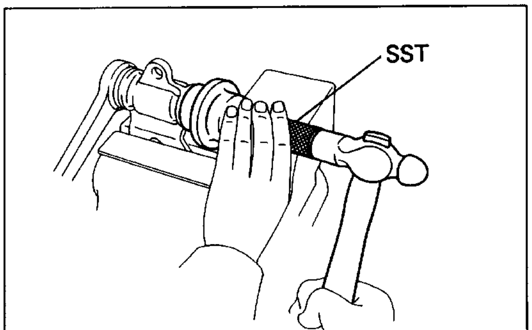
If necessary, replace the bushings.



SR1284 SR1286

5. IF NECESSARY, REPLACE BUSHINGS

(a) Using a screwdriver, remove the bushings.
(b) Using SST, install each bushing to the idler arm bracket.
SST 09620–30010 (09627–30010, 09631–00020)

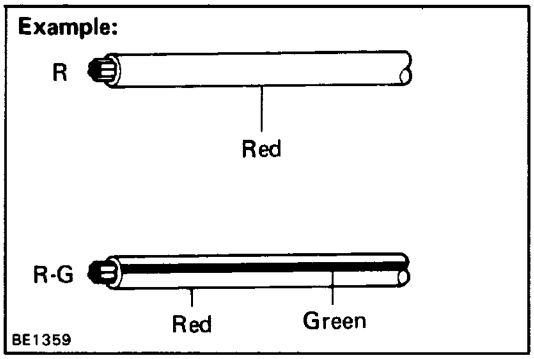


SR1285

6. INSTALL IDLER ARM BRACKET CAP

(a) Apply sealant to the cap end.
Sealant: Part No. 08826–00090, THREE BOND 1281 or equivalent
(b) Using SST, install the idler arm bracket cap.
SST 09223–46011

BODY ELECTRICAL SYSTEM



GENERAL INFORMATION

Wiring color code

Wire colors are indicated by an alphabetical code.

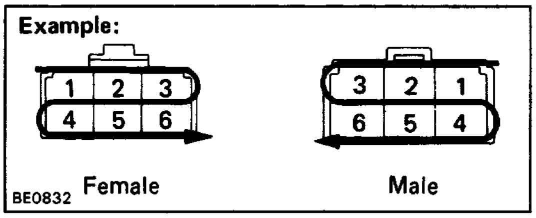
B = Black L = Blue R = Red

BR = Brown LG = Light Green V = Violet

G = Green O = Orange W = White

GR = Gray P = Pink * =Yellow

The first letter indicates the basic wire color and the sec–ond letter indicates the color of the stripe.



Connector

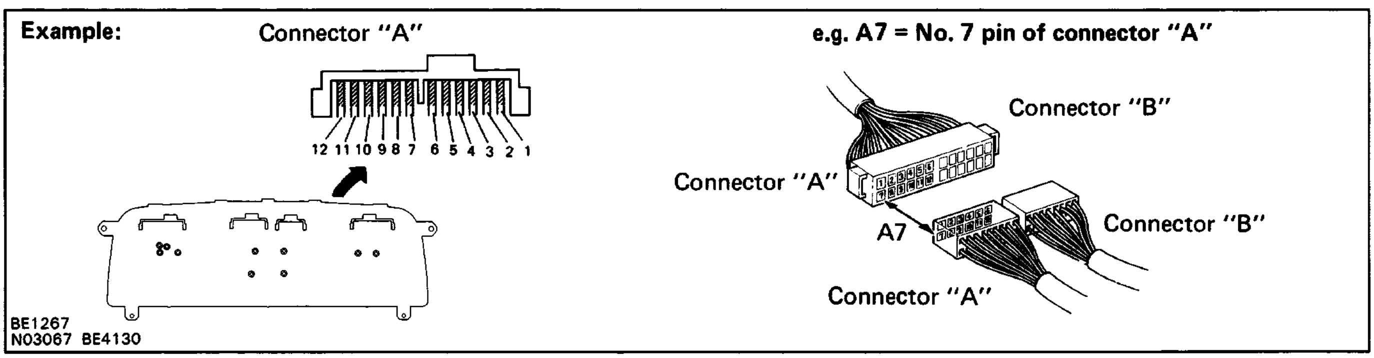
1. PIN NUMBER OF FEMALE CONNECTOR

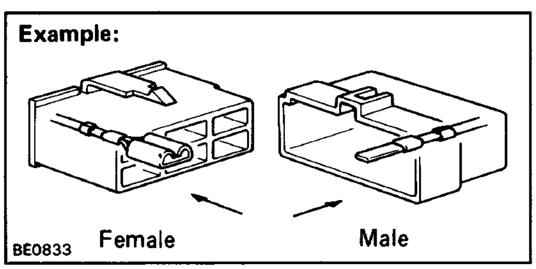
Numbered in order from upper left to lower right.

2. PIN NUMBER OF MALE CONNECTOR

Numbered in order from upper right to lower left.

HINT: When connectors with different or the same number of terminals are used with the same parts, each connector name (letter of the alphabet) and pin number is specified.





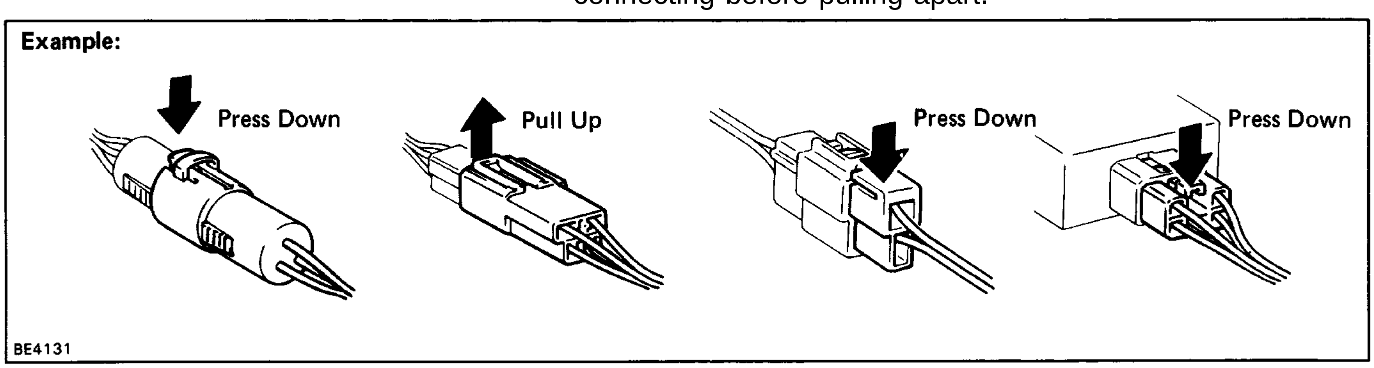
3. DISTINCTION OF MALE AND FEMALE CONNECTORS

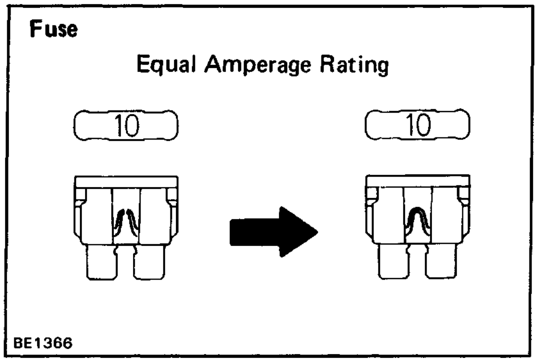
Male and female connectors are distinguished by shape of their internal pins.

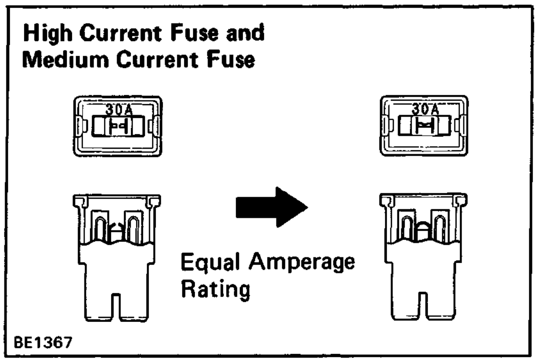
(a) All connectors are shown from the open end, and the lock is on top.

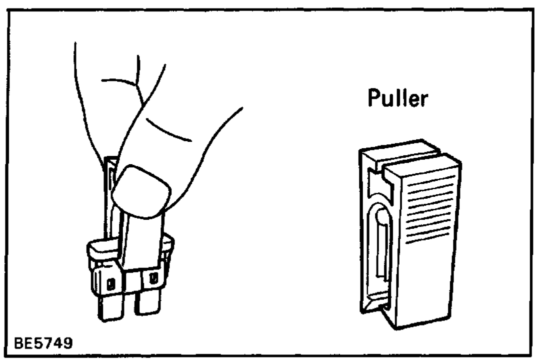
(b) To pull apart the connectors, pull on the connector itself, not the wires.

HINT: Check to see what kind of connector you are dis–connecting before pulling apart.









Replacement of High Current Fuse, Medium Current Fuse and Fuse

HINT: If replacing the fuse be sure to replace it with a fuse of fusible link with and equal amperege rating.

NOTICE:

1. **Turn off all electrical components and the ignition switch before replacing a fuse or fusible link. Do not exceed the fuse or fusible link amperage rating.**
2. **Always use a fuse puller for removing and inserting a fuse. Remove and insert straight in and out with–out twisting. Twisting could force open the termi–nals too much, resulting in a bad connection.**

If a fuse or fusible link continues to blow, a short circuit is indicated. The system must be checked by a qualified technician.

How to Inspect for System Inspection

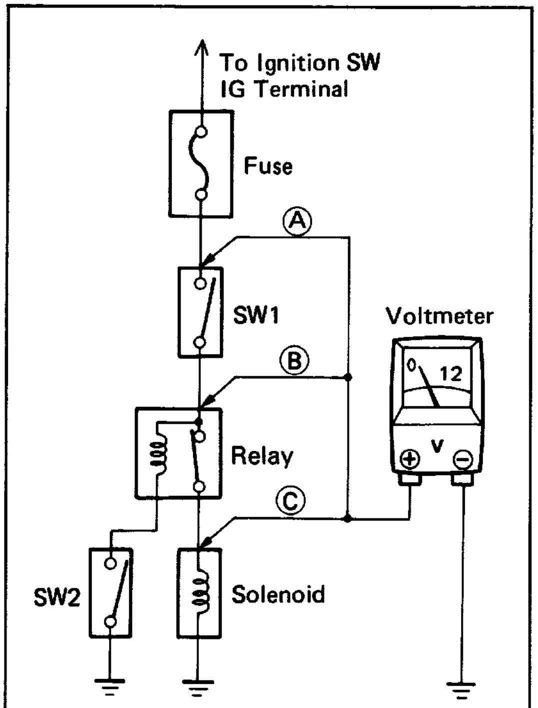
This inspection procedure is a simple troubleshooting which should be carried out on the vehicle during system operation and was prepared on the assumption of system component troubles (except for the wires and connec–tors, etc.).

Always inspect the trouble taking the following items into consideration.

- Ground point fault
- Open or short circuit of the wire harness
- Connector or terminal connection fault
- Fuse or fusible link fault

NOTICE:

1. This is an on–vehicle inspection during system oper–ations. Therefore, inspect the trouble with due re–gard for security.
2. In case of connecting the battery directly, be careful not to short circuit, and select the applicable volt–age.

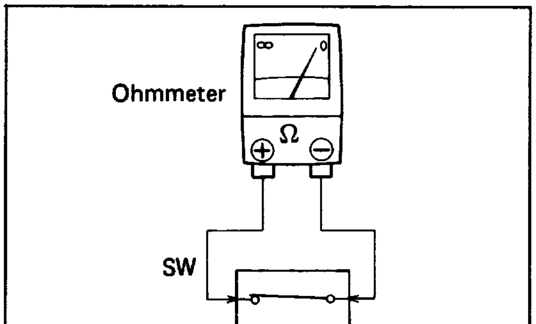


BE0819

Check for Voltage

(a) Establish conditions in which voltage is present at the check point.
Example:
(A) Ignition switch on
(B) Ignition switch and switch 1 (SW 1) on.
(C) Ignition switch, switch 1 (SW 1) and relay on (switch 2 (SW2) off).

(b) Using a voltmeter, connect the negative (–) lead to a good ground point or negative (–) battery terminal and the positive (+) lead to the connector or com–ponent terminal. This check can be done with a test bulb instead of a voltmeter.

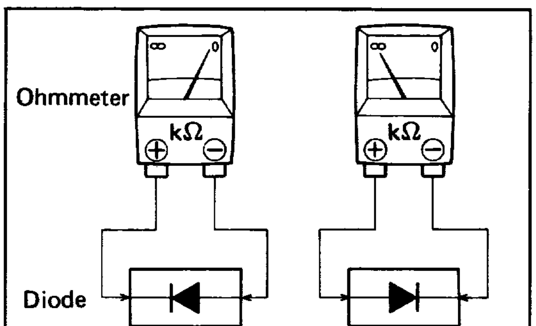


BE0820

Check for Continuity and Resistance

(a) Disconnect the battery terminal or wire so there is no voltage between the check points.

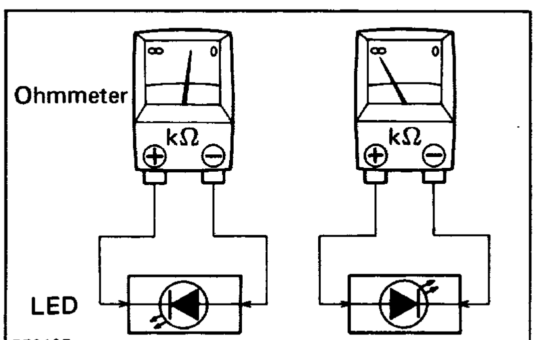
(b) Contact the two leads of an ohmmeter to each of the check points.



BE0821

If the circuit has diodes, reverse the two leads and check again.
When contacting the negative (–) lead to the diode pos–itive (+) side and the positive (+) lead to the negative (–) side, there should be continuity. When contacting the two leads in reverse, there should be no continuity.

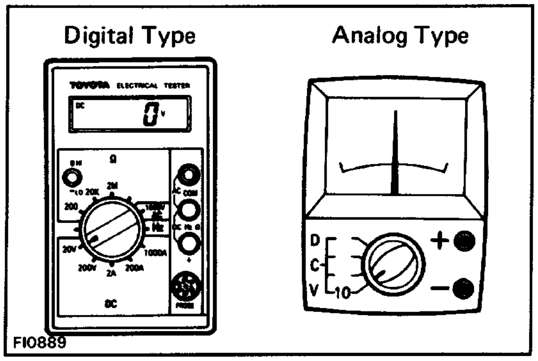
HINT: Specifications may vary depending on the type of tester, so refer to the tester's instruction manual before performing the inspection.



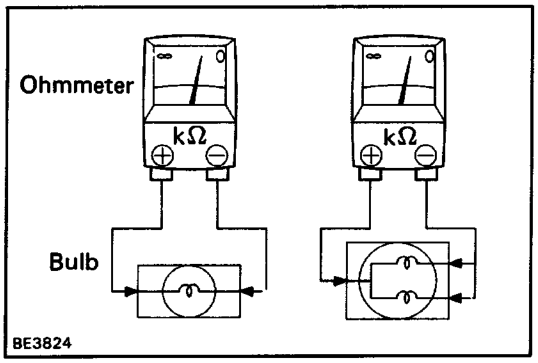
BE2437

Check LED (Light Emitting Diode) in the same manner as that for diodes.

- Use a tester with a power source of 3 V or greater to overcome the circuit resistance.
- If a suitable tester is not available, apply battery posi–tive voltage and check that the LED lights up.

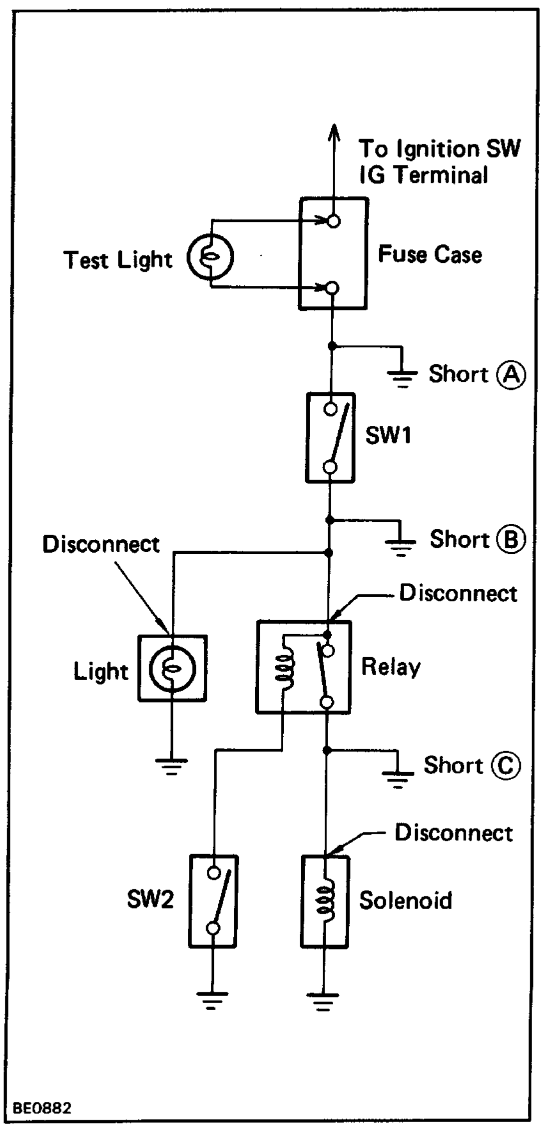


(c) Use a volt/ohmmeter with high impedance (10 k/V minimum) for troubleshooting of the electrical cir– cuit.



Check the Bulb

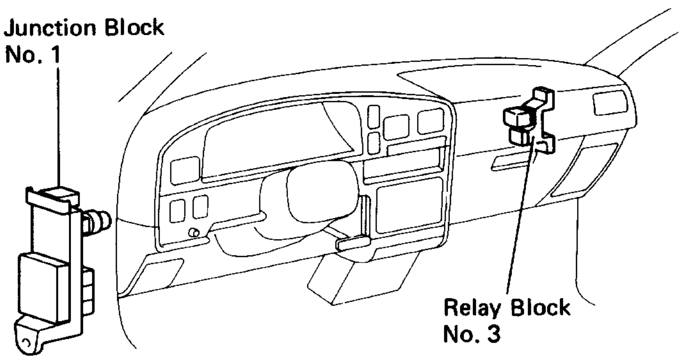
(a) Remove the bulb.
(b) There should be continuity between the respective terminals of the bulb together with a certain amount of resistance.
(c) Apply the two leads of the ohmmeter to each of the terminals.
(d) Apply battery positive voltage and check that the bulb light up.

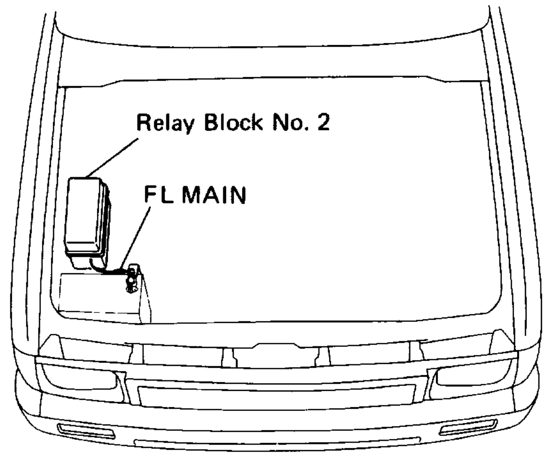


Check for Short Circuit

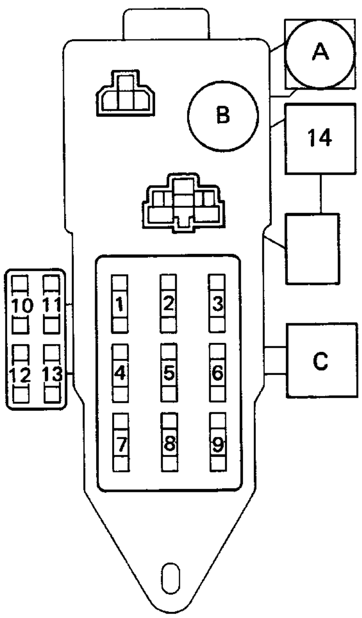
(a) Remove the blown fuse and eliminate all loads from the fuse.
(b) Connect a test bulb in place of the fuse.
(e) Establish conditions in which the test bulb comes on.
Example:
(A) Ignition switch on.
(B) Ignition switch and switch 1 (SW 1) on.
(C) Ignition switch, switch 1 (SW 1) and relay on (connect the relay) and switch 2 (SW2) off (or disconnect switch 2 (SW2)).
(d) Disconnect and reconnect the connectors while watching the test bulb.
The short lies between the connector where the test bulb stays lit and the connector where the bulb goes out.
(e) Find the exact location of the short by lightly shak– ing the problem wire along the body.

POWER SOURCE
Parts Location





Junction Block No. 1

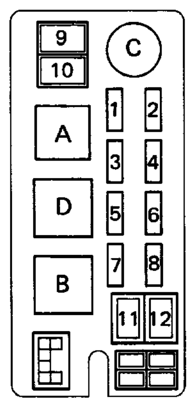


Fuses

1.	ENGINE	10A
2.	IGN	7.5A
3.	TAIL	15A
4.	WIPER	20A
5.	GAUGE	10A
6.	STOP	15A
7.	RADIO	7.5A
8.	CIG	15A
9.	TURN	10A
10.	REAR ANTILOCK	15A
11.	–	–
12.	ECM-IG	20A
13.	–	–
14.	POWER (w/ Power Door Lock and Power Window)	30A

Relays
A. Back Up Relay (USA)
DRL Relay No. 4 (Canada)
B. Taillight Control Relay
C. Horn Relay
14. Back Up Relay
(CANADA with column A/T)

Relay Block No. 2



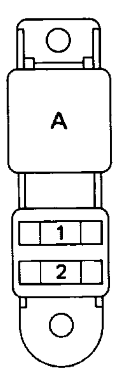
Fuses

1.	CHARGE	7.5A
2.	MFI	15A
3.	HAZ-HORN	15A
4.	DOME	15A
5.	(USA) HEAD (RH)	10A
6.	(USA) HEAD (LH)	10A
7.	–	–
8.	–	–
9.	GEN (H-fuse)	80A
10.	–	–
11.	AM1 (H-fuse)	40A or 60A
12.	AM2 (H-fuse) (CANADA)	30A

1.	DRL	7.5A
5.	HEAD LO (RH)	10A
6.	HEAD LO (LH)	10A
7.	HEAD HI (RH)	10A
8.	HEAD HI (LH)	10A

Relays
A. Headlight Dimmer Relay (CANADA)
B. Headlight Control Relay
C. MFI Relay
D. Starter Relay

Relay Block No. 3



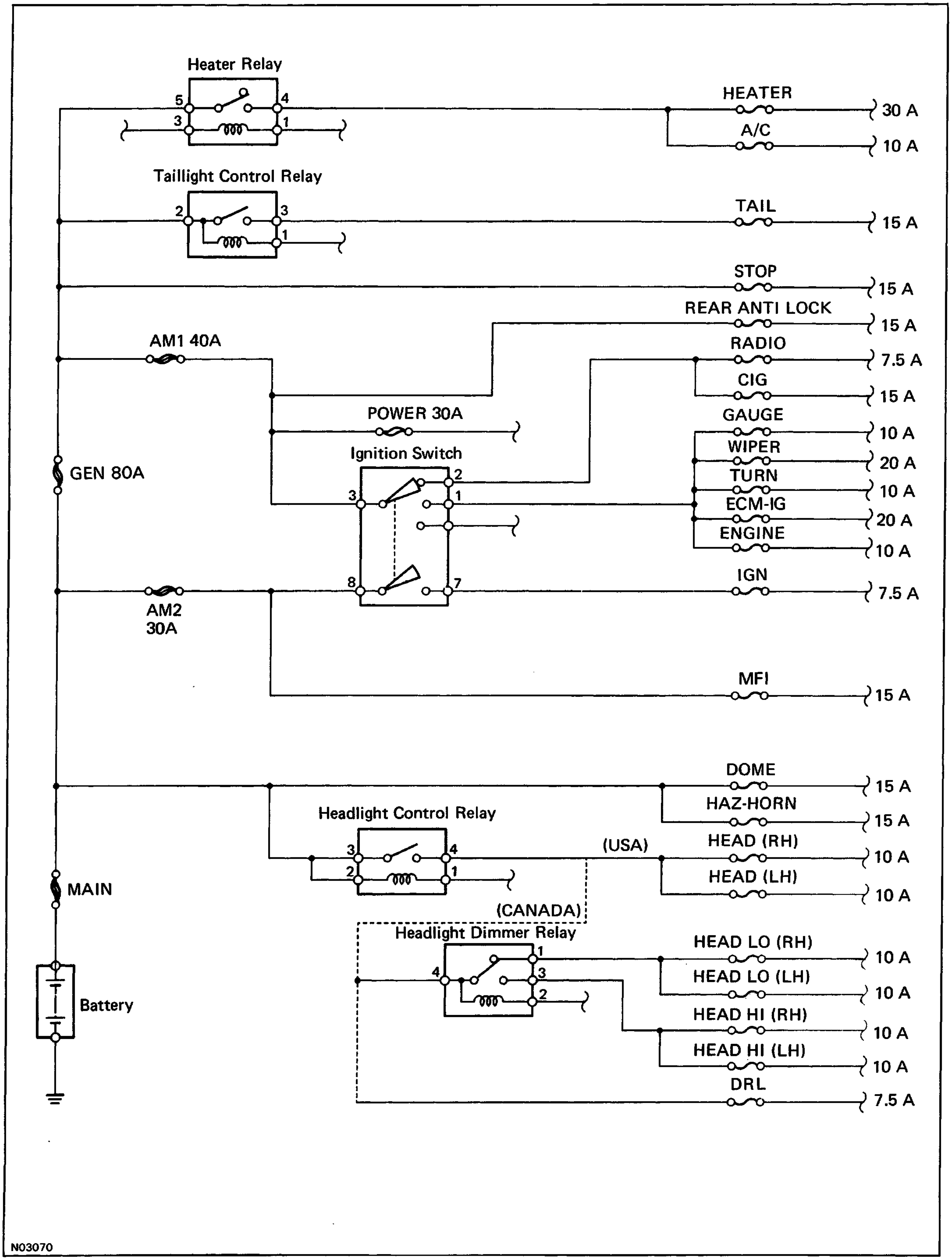
Fuses

1.	A/C	10A
2.	HEATER	30A

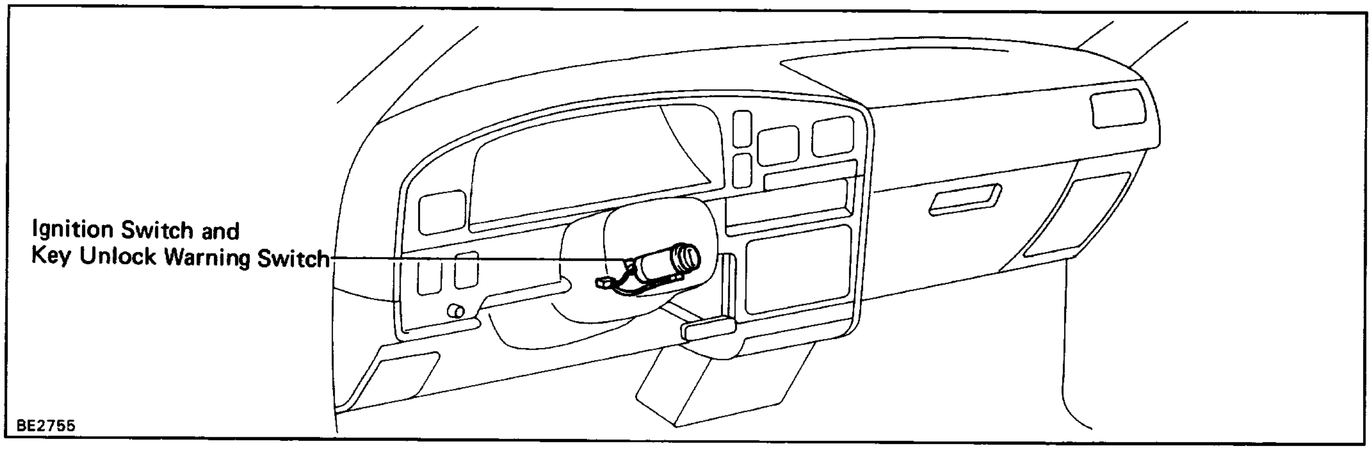
Relay
A. Heater Relay

BE2946 BE2947
N02967 N02966
BE2950

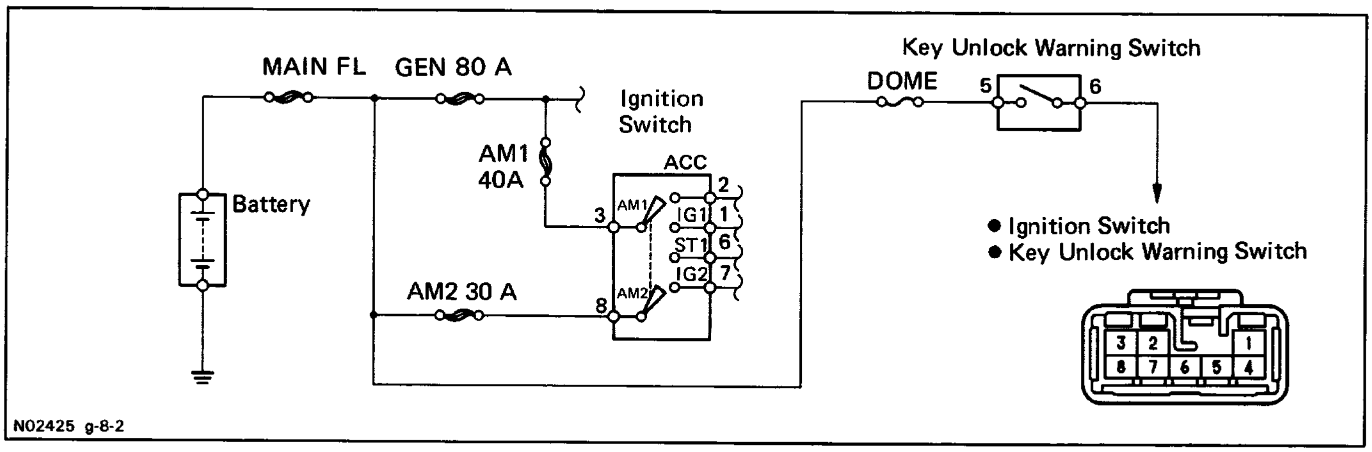
Wiring Diagram



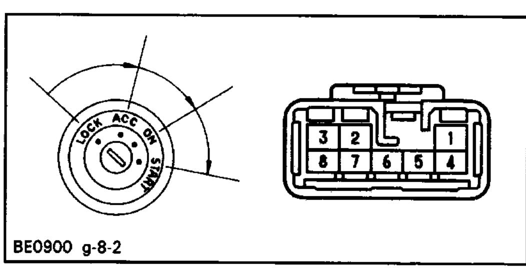
IGNITION SWITCH
Parts Location



Wiring and Connector Diagrams



Parts Inspection
Ignition System
INSPECT SWITCH
(ignition Switch /Continuity)



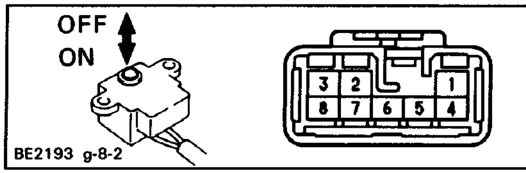
Terminal / Switch position	1	2	3	6	7	8
LOCK						
ACC		○	○			
ON	○	○	○		○	○
START	○		○	○	○	○

If continuity is not as specified, replace the switch.

Key Confine Prevention System

1. INSPECT SWITCH

(Key Unlock Warning Switch/Continuity)



Terminal / Switch position	3	4
OFF (Key removed)		
ON (Key set)	○	○

(Door Courtesy Switch/Continuity)

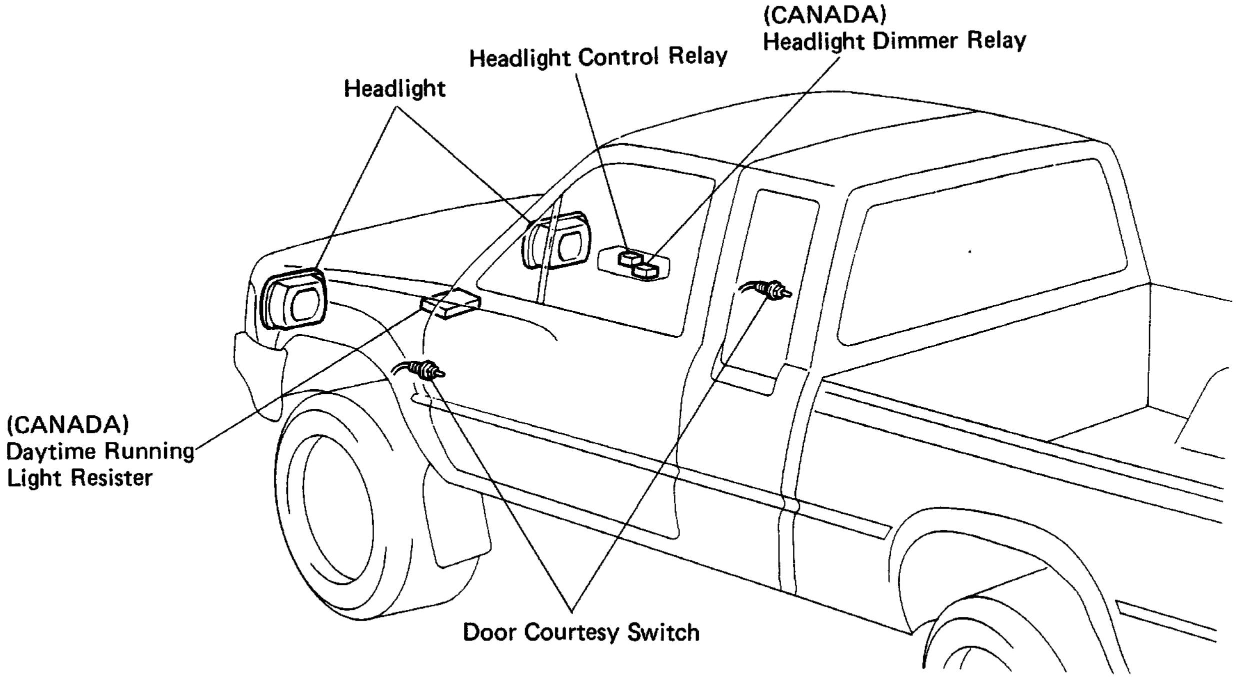
See step 2 on page BE–42.

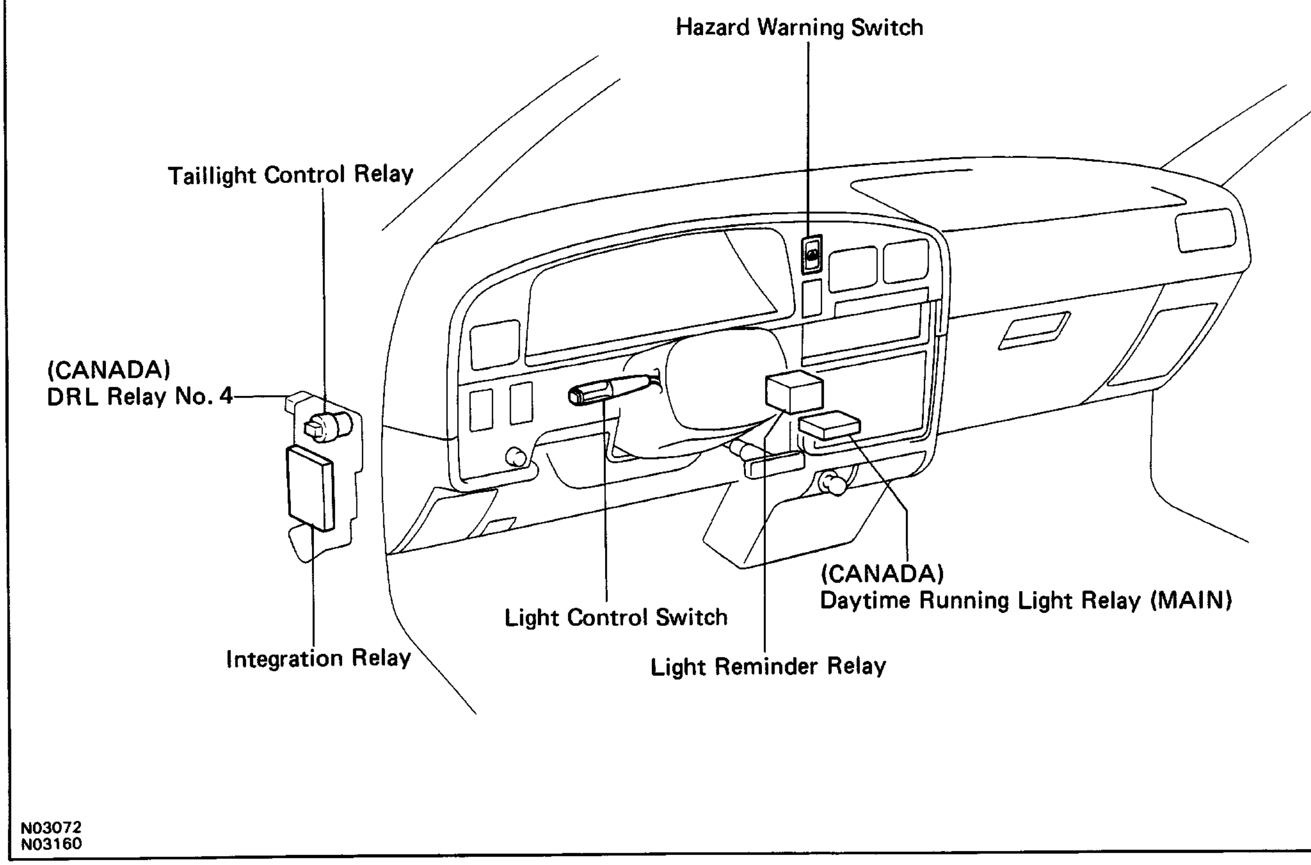
If continuity is not as specified, replace the switch.

2. INSPECT RELAY

See step 3 of Integration Relay on page BE–42.

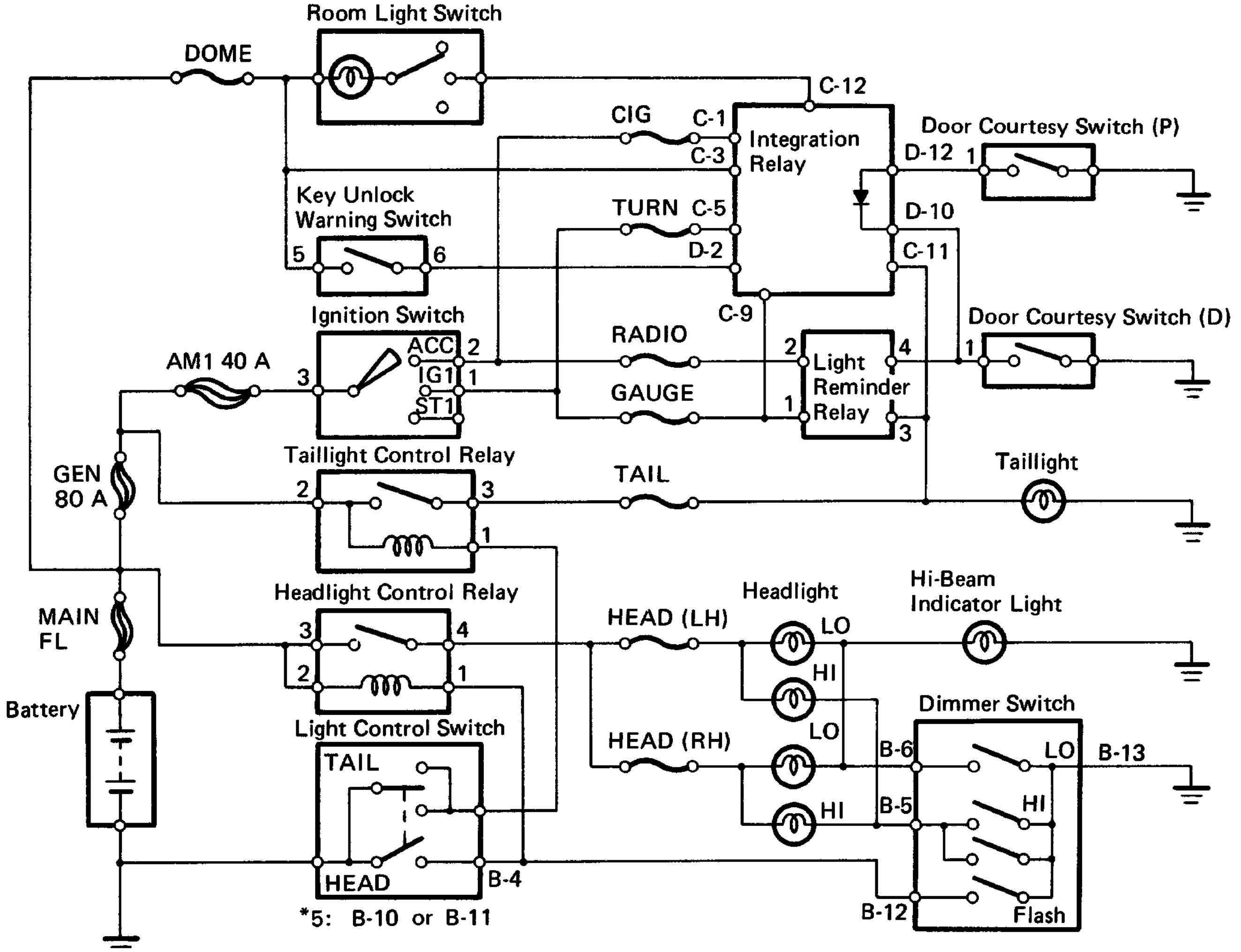
LIGHTING SYSTEM
Parts Location

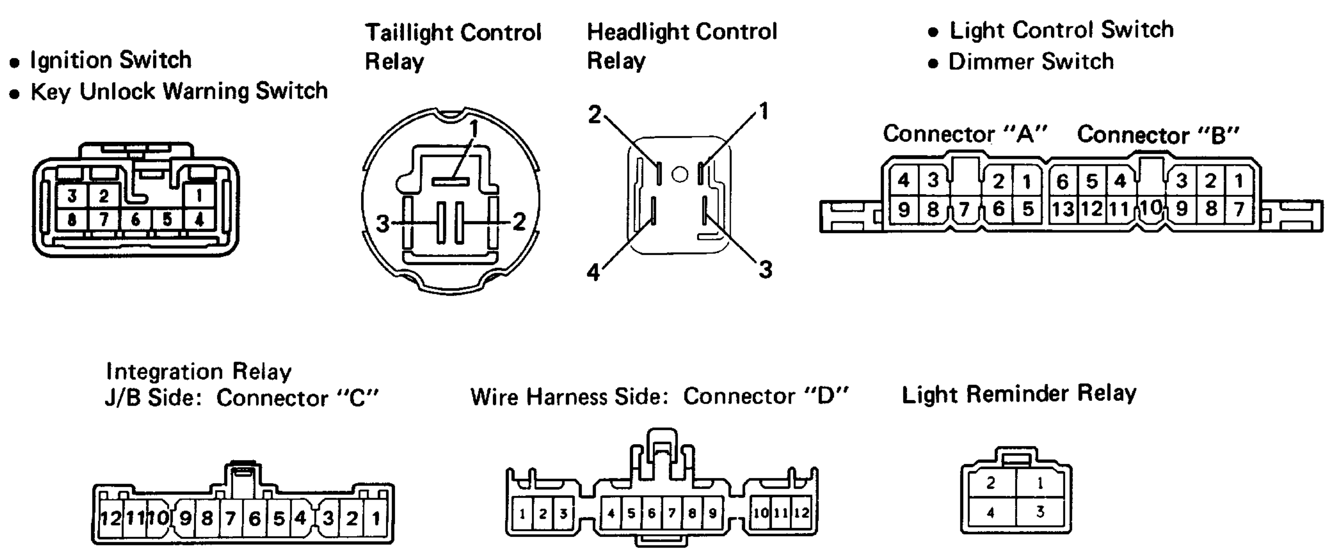




Wiring and Connector Diagrams

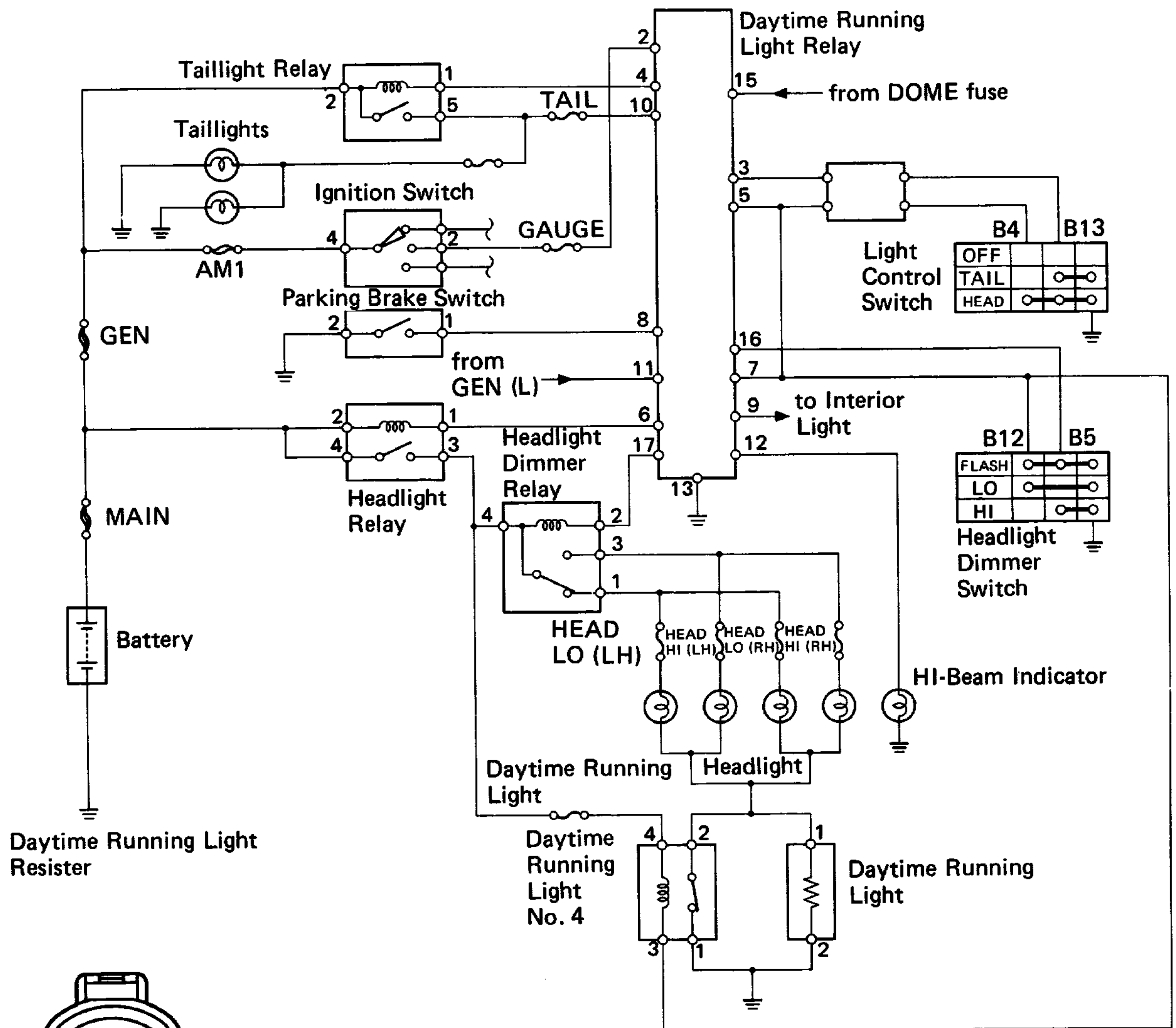
- **Headlight System (USA)**
- **Taillight System (USA)**
- **Lights-On Warning System**
- **Illuminated Entry System**

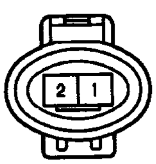




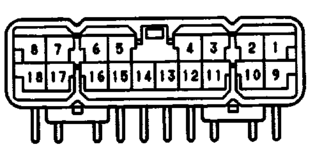
BE5627
g-8-2 BE2763 BE1838 BE0111
BE1851 S-12-1-B H-4-2

- **Daytime Running Light System (CANADA)**



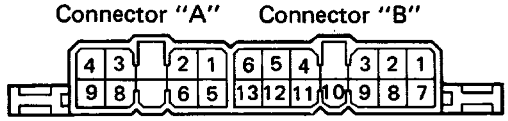


Daytime Running Light Relay

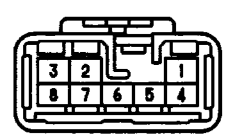


- Light Control Switch
- Headlight Dimmer Switch

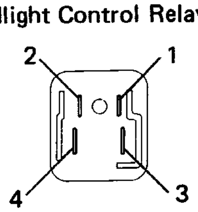
Connector "A" Connector "B"



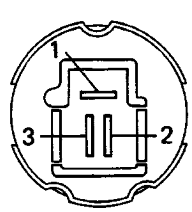
Ignition Switch



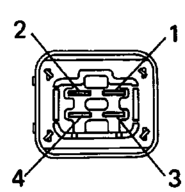
Daytime Running Light Relay and Headlight Control Relay



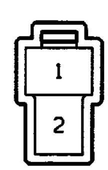
Taillight Control Relay



Headlight Dimmer Relay

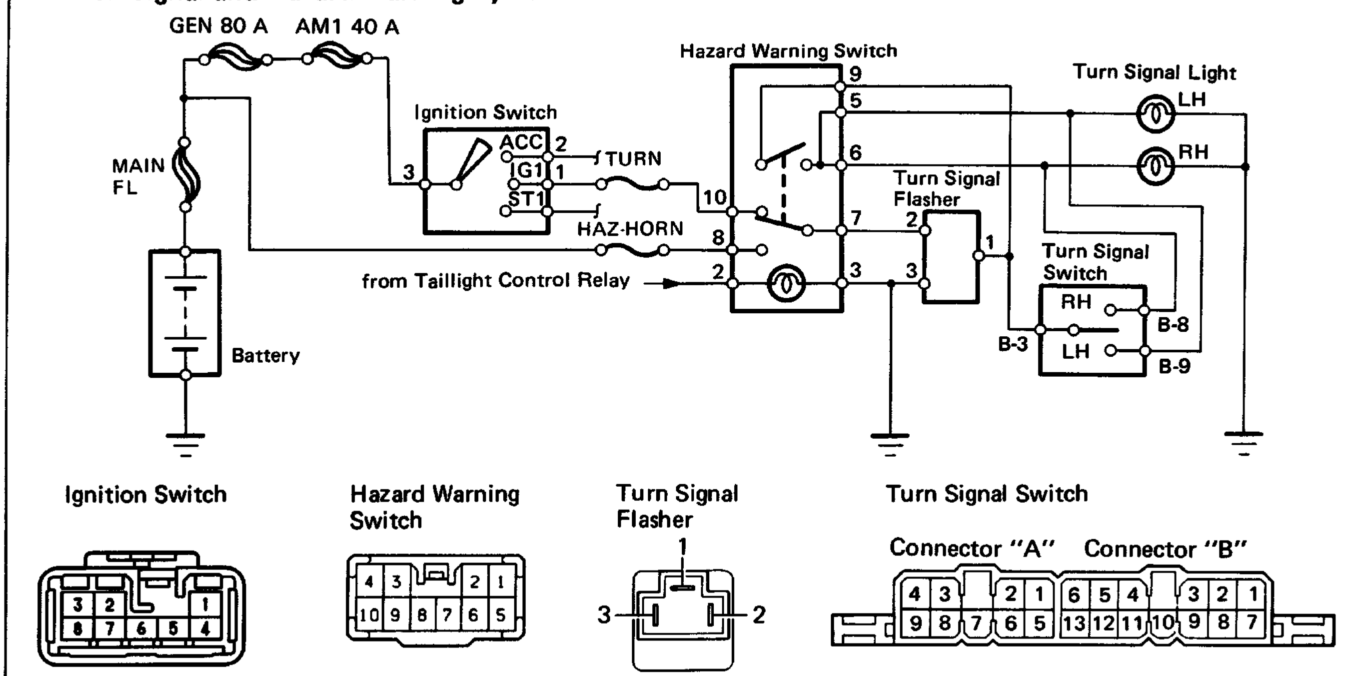


Parking Brake Switch



N02871
lg-2-2
e-18-2-A BE0111 g-8-2
BE1838 BE2763 BE1839 H-2-2

- **Turn Signal and Hazard Warning System**



BE5629
g-8-2 S-10-2 BE2896 BE0111

Troubleshooting

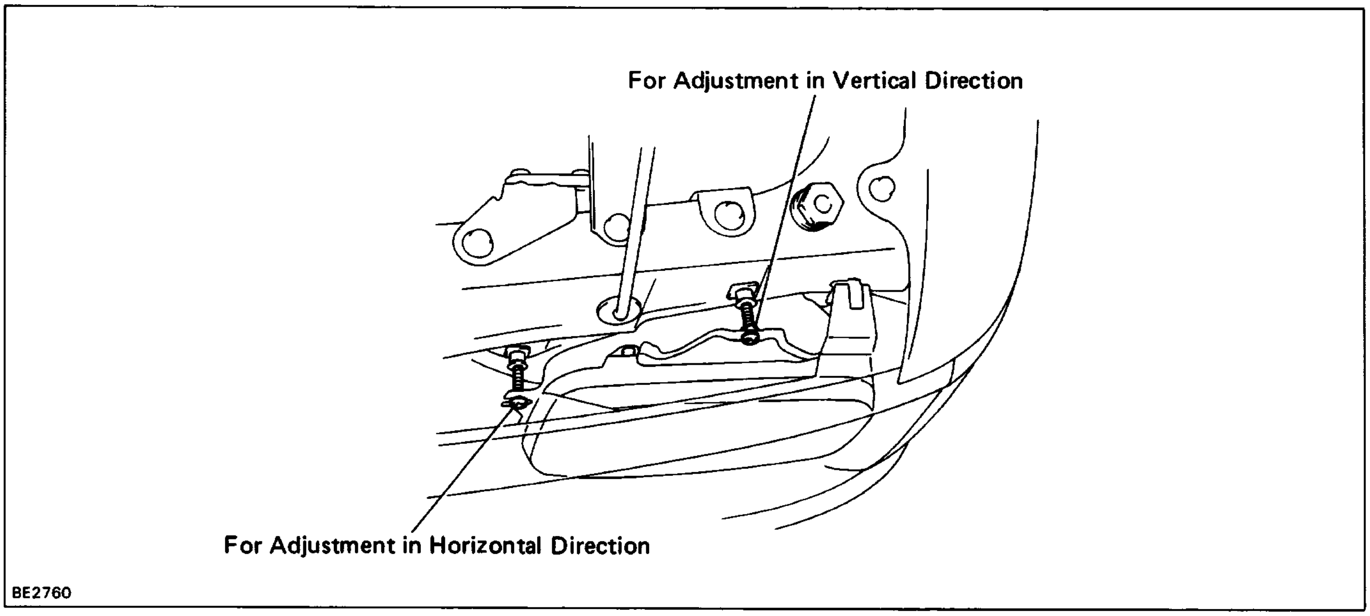
Problem	Possible cause	Remedy	Page
Only one light does not light up	Light bulb burned out Socket, wire or ground faulty	Replace sealed beam headlight Repair as necessary	
Headlights do not light up	Fusible link blown Headlight control relay faulty Light control/dimmer switch faulty Daytime running light relay faulty Wiring and ground faulty	Replace fusible link Check relay Check switch Check relay circuit Repair as necessary	 BE–1 9 BE–1 9 BE–20
High beam headlights or headlight flashers do not operate	Light control/dimmer switch faulty Daytime running light really faulty Wiring or ground faulty	Check switch Check relay Repair as necessary	BE–1 9 BE–20
Tail, parking and license light do not light up	TAIL fuse blown Fusible link blown Taillight control relay faulty Light control relay faulty Daytime running light relay faulty Wiring or ground faulty	Replace fuse and check for short Replace fusible link Check relay Check switch Check relay Repair as necessary	BE–3 BE–19 BE–1 9 BE–20
Stop lights do not light up	STOP fuse blown Stop light switch faulty Wiring or ground faulty	Replace fuse and check for short Adjust or replace switch Repair as necessary	BE–3
Stop lights stay on	Stop light switch faulty	Adjust or replace switch	
Instrument lights do not light up (taillight light up)	Wiring or ground faulty	Repair as necessary	
Turn signal does not flash on one side	Turn signal switch faulty Wiring or ground faulty	Check switch Repair as necessary	BE–1 9

Troubleshooting (Cont'd)

Problem	Possible cause	Remedy	Page
Turn signal do not operate	HAZ–HORN fuse blown Turn signal flasher faulty Turn signal/hazard switch faulty Wiring or ground faulty	Replace fuse and check for short Check flasher Check switch Repair as necessary	BE–3 BE–23 BE–23
Hazard warning lights do not operate	HAZ–HORN fuse blown Turn signal flasher faulty Turn signal/hazard switch faulty Wiring or ground faulty	Replace fuse and check for short Check flasher Check switch Repair as necessary	BE–3 BE–23 BE–23
Daytime running light system does not operate	DOME fuse blown GAUGE fuse blown IG N fuse blown HEAD fuse blown TAIL fuse blown Headlight control relay faulty Taillight control relay faulty Dimmer relay faulty Ignition switch faulty Light control/dimmer switch faulty Wiring or ground faulty	Replace fuse and check for short Check relay Check relay Check relay Check switch Check switch Repair as necessary	BE–3 BE–1 9 BE–19 BE–20 BE–8 BE–1 9

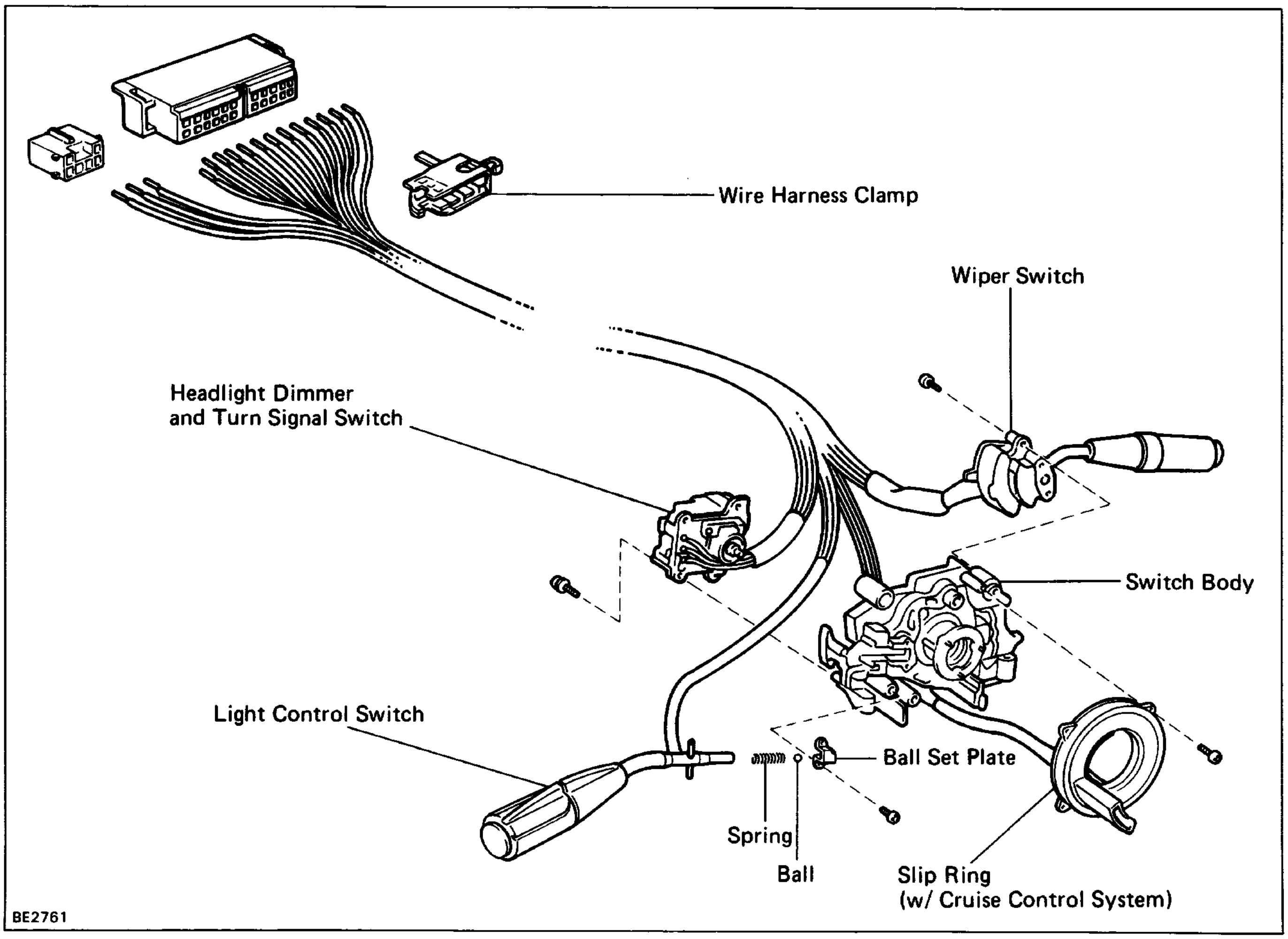
Parts Adjustment

Adjustment of Light Aiming



Parts Replacement

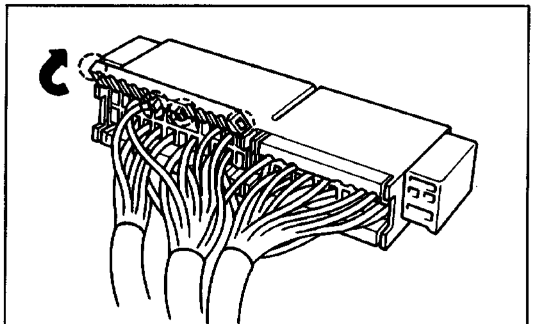
Components



Disassembly of Combination Switch

NOTICE: w/ Cruise Control System
To prevent damage to the slip ring when removing the steering wheel, be careful of the following points.

- **Keep the steering wheel in the ”straight–ahead” steer–ing position.**
- **Do not let the steering wheel strongly interfere with the connector part of the slip ring.**

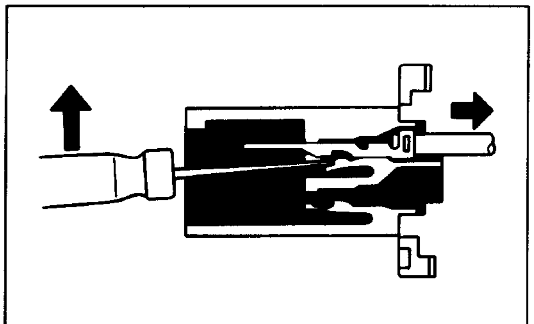

BE1503

1. REMOVE WIRE HARNESS CLAMP FROM WIRE HARNESS

Pry loose– the two locking lugs and remove the clamp from the wire harness.

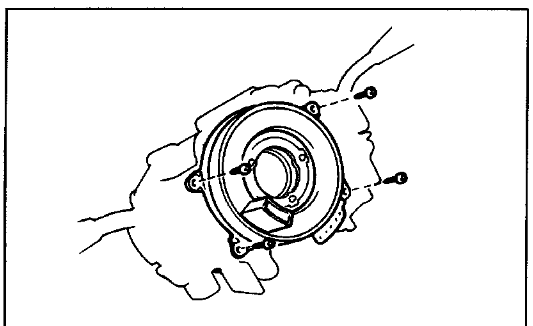
2. REMOVE TERMINALS FROM CONNECTOR

(a) Release four tabs and open the terminal cover.


BE1501

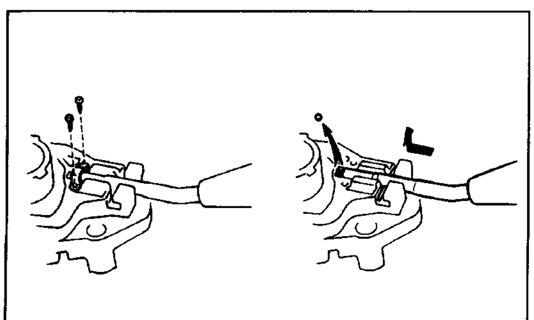
(b) From the open end, insert a miniature screwdriver between the locking lug and terminal.

(c) Pry down the locking lug with the screwdriver and pull the terminal out from the rear.


BE2762

3. (w! Cruise Control System) REMOVE SLIP RING

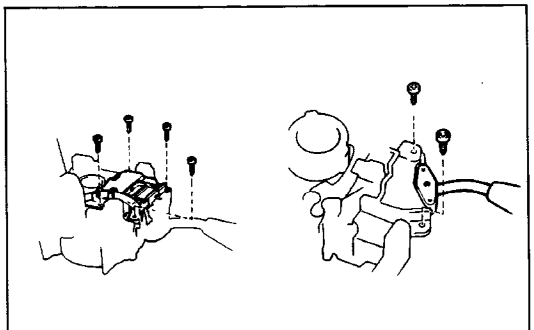
Remove four screws and the slip ring from the switch body.


BE1875 BE1876

4. REMOVE LIGHT CONTROL SWITCH

(a) Remove two screws and the ball set plate from the switch body.

(b) Remove the ball and slide out the switch from the switch body with the spring.

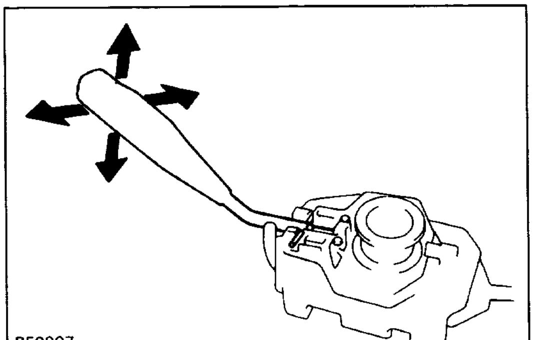

BE1877 BE1878

5. REMOVE HEADLIGHT DIMMER AND TURN SIGNAL SWITCH

Remove four screws and the switch from the switch body.

6. REMOVE WIPER AND WASHER SWITCH

Remove two screws and the switch from the switch body.

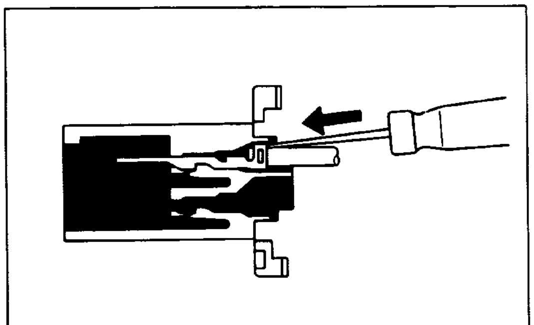

BE0907

Assembly of Combination Switch

INSTALL PARTS OF COMBINATION SWITCH IN REVERSE SEQUENCE OF REMOVAL

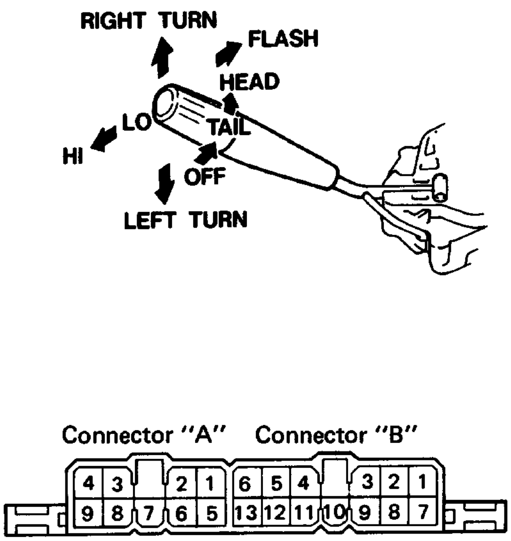
HINT:

- After installing the light control switch to the switch body, insure that the switch operates smoothly.


BE1502

- Push in the terminal until it is securely locked in the connector lug.

Reference:



BE2414
BE0111

Parts Inspection

Headlight, Taillight and Daytime Running Light System

1. INSPECT COMBINATION SWITCH
(Light Control Switch /Continuity)

Terminal (Color) / Switch position	B-10 (W)	B-11 (W)	B-4 (R)
OFF			
TAIL	○	○	
HEAD	○	○	○

(Headlight Dimmer and Turn Signal Switch/Continuity)
Headlight Dimmer Switch

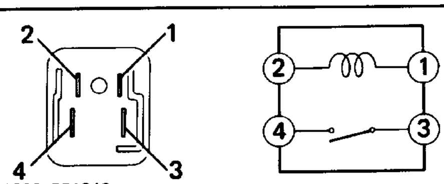
Terminal (Color) / Switch position	B-5 (R-Y)	B-6 (R-G)	B-12 (R-W)	B-13 (W-B)
Flash	○		○	○
Low beam		○		○
High beam	○			○

Turn Signal Switch

Terminal (Color) / Switch position	B-3 (G-W)	B-8 (G-Y)	B-9 (G-B)
Left turn	○		○
Neutral			
Right turn	○	○	

If continuity is not as specified, replace the switch.

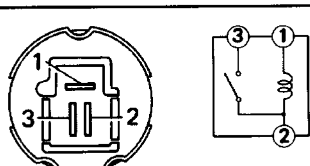
2. INSPECT RELAY
(Headlight Control Relay/Continuity)



BE1838 BE1840

Terminal / Condition	1	2	3	4
Constant	○	○		
Apply battery positive voltage to terminals 1 and 2.			○	○

(Taillight Control Relay/Continuity)

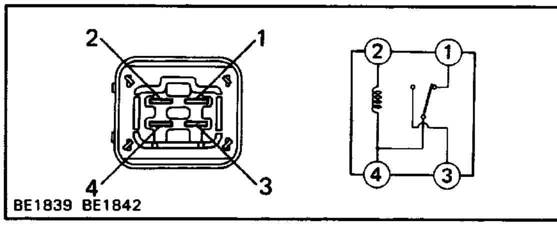


BE2763 BE2505

Terminal / Condition	1	2	3
Constant	○	○	
Apply battery positive voltage to terminals 1 and 2.		○	○

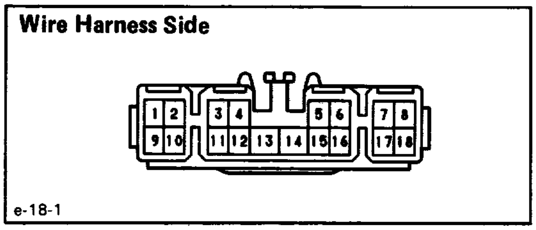
If continuity is not as specified, replace the relay.

(Headlight Dimmer Relay/Continuity)



Terminal / Condition	1	2	3	4
Constant	O	—	—	O
		O	— coil —	O
Apply battery positive voltage to terminals 2 and 4.			O	O

If continuity is not as specified, replace the relay.

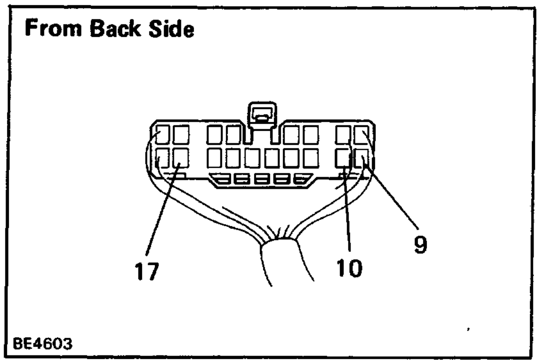


1. INSPECT DAYTIME RUNNING LIGHT RELAY

(Relay Circuit)

Disconnect the connector from the relay and inspect the connector on the wire harness side as shown in the chart.

Check for	Tester connection	Condition		Specified value
Continuity	3 — Ground	Light control switch position	OFF	No continuity
			TAIL or HEAD	Continuity
	5 — Ground	Light control switch position	OFF or TAIL	No continuity
			HEAD	Continuity
	7 — Ground	Headlight dimmer switch position	Low beam or High beam	No continuity
			Flash	Continuity
	8 — Ground	Parking brake switch position	OFF (Parking brake lever released)	No continuity
			ON (Parking brake lever pulled up)	Continuity
	13 — Ground	Constant		Continuity
	16 — Ground	Headlight dimmer switch position	Low beam	No continuity
			High beam or Flash	Continuity
Voltage	2 — Ground 18 — Ground	Ignition switch position	LOCK or ACC	No voltage
			ON or START	Battery positive voltage
	4 — Ground 6 — Ground 15 — Ground	Constant		Battery positive voltage
	11 — Ground	Engine	Stop	No voltage
			Running	Battery positive voltage

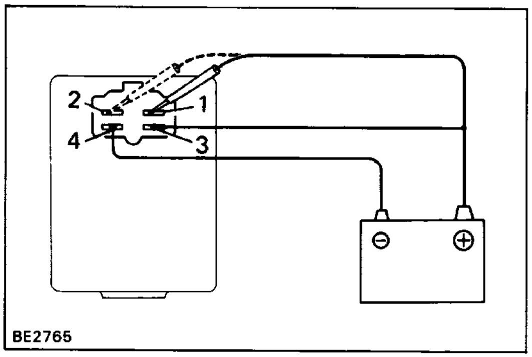


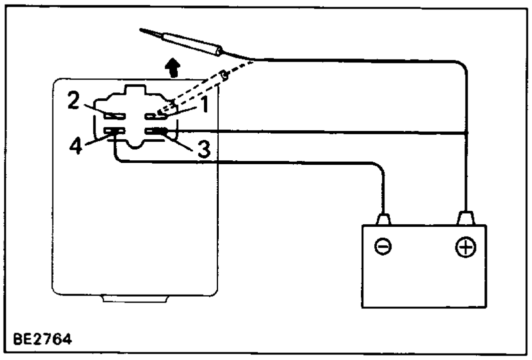
(Relay Circuit/Connector connected)
Connect the wire harness side connector to the relay and inspect wire harness side connector from the back side as shown.

Check for	Tester connection	Condition		Specified value
Voltage	**9 – Ground**	Light control switch position	OFF	No voltage
			TAIL or HEAD	Battery positive voltage
	10 – Ground	Light control switch position	OFF	No voltage
			TAIL or HEAD	Battery positive voltage
	17 – Ground	Headlight dimmer switch position	Low beam or High beam	No voltage
			Flash	Battery positive voltage

If circuit is as specified, replace the relay.

4. INSPECT PARKING BRAKE SWITCH
(See page BE–39)





Lights–On Warning System

1. INSPECT DOOR COURTESY SWITCH

See combination meter on page BE–39.

2. INSPECT LIGHT REMAINDER RELAY

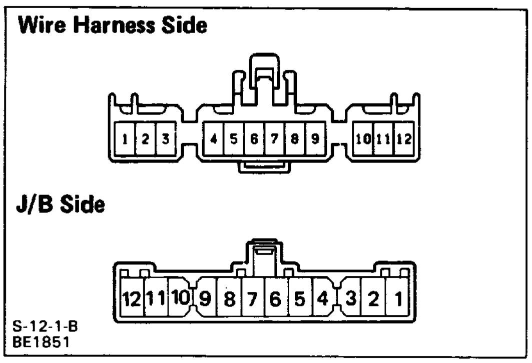
(Relay Circuit/Operation)

(a) Connect the positive (+) lead from the battery to terminal 3 and the negative (–) lead to terminal 4.

(b) Check that the buzzer does not sound when con–nected terminal 1 or 2 to the positive (+) lead.

(c) Check that the buzzer sounds when disconnecting terminal 1 or 2 from the positive (+) lead.

If operation is not as specified, replace the relay.



Illuminated Entry System

1. INSPECT DRIVER'S DOOR COURTESY SWITCH

See combination meter on page BE–40.

2. INSPECT INTEGRATION RELAY

(Relay Circuit)

Disconnect the connectors from the relay and inspect the connectors on the wire harness side and JIB side as shown in the chart.

(Wire Harness Side)

Check for	Tester connection	Condition		Specified value
Continuity	4 – Ground	Constant		Continuity
	7 – Ground	Constant		Continuity
	10 – Ground	Driver's door position	Closed (Courtesy switch OFF)	No continuity
			Opened (Courtesy switch ON)	Continuity

(JIB Side)

Check for	Tester connection	Condition	Specified value
Continuity	7 – Ground	Constant	Continuity
Voltage	3 – Ground	Constant	Battery positive voltage
	12 – Ground	Constant	Battery positive voltage

If the circuit is as specified, replace the relay.

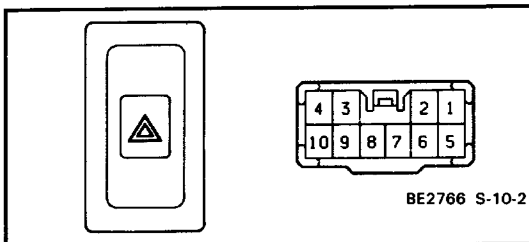
Turn Signal and Hazard Warning System

1. INSPECT SWITCHES

(Turn Signal Switch /Continuity)

See Headlight Dimmer and Turn Signal Switch on page BE–1 9.

(Hazard Warning Switch/Continuity)



Switch position \ Terminal	4	5	6	7	8	9	10	Illumination 2	Illumination 3
OFF				○—	——	——	—○	○—⊗	—○
ON	○—	—○—	—○—	—— ○—	—— —○	—○			

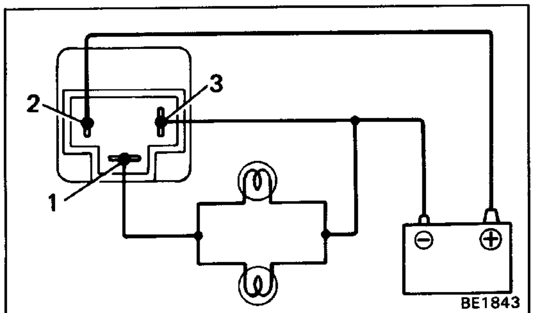
If continuity is not as specified, replace the switch.

2. INSPECT TURN SIGNAL FLASHER

(Operation)

(a) Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 3.

(b) Connect the two turn signal light bulbs parallel to each other to terminals 1 and 3, check that the bulbs flash.



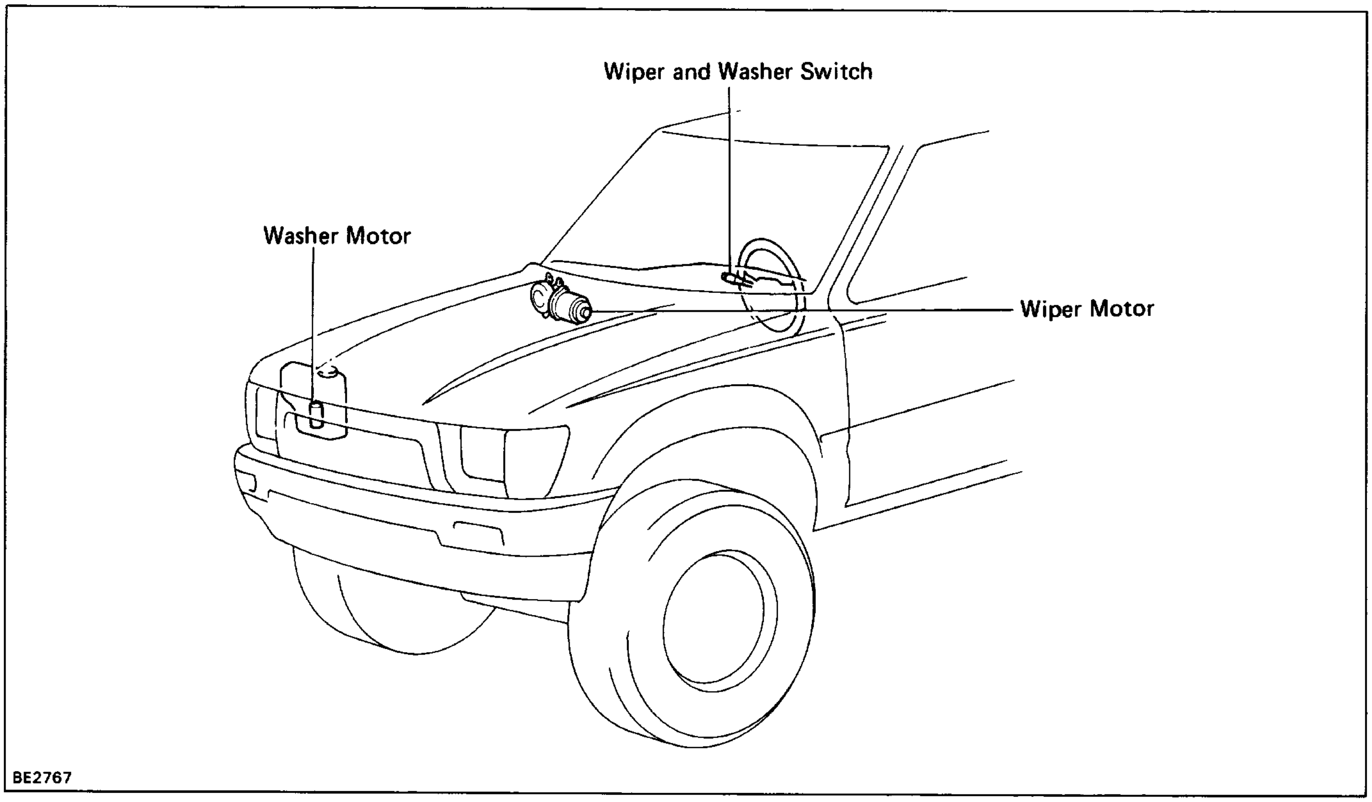
Turn Signal Light Bulbs (21W)

HINT: The turn signal lights should flash 60 to 120 times per minute.

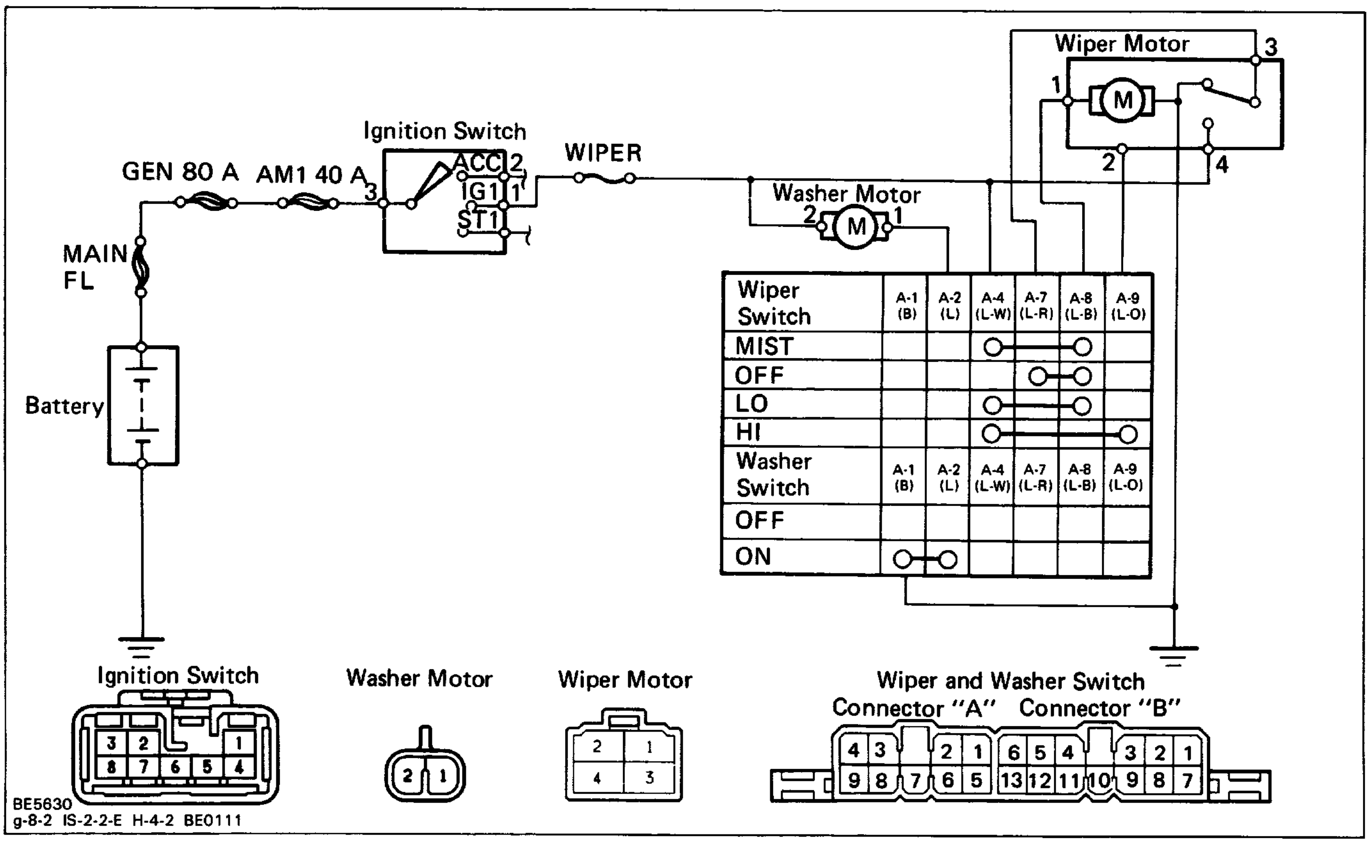
If one of the front or rear turn signal lights has an open circuit, the number of flashers will be more than 140 per minute.

If operation is not as specified, replace the flasher.

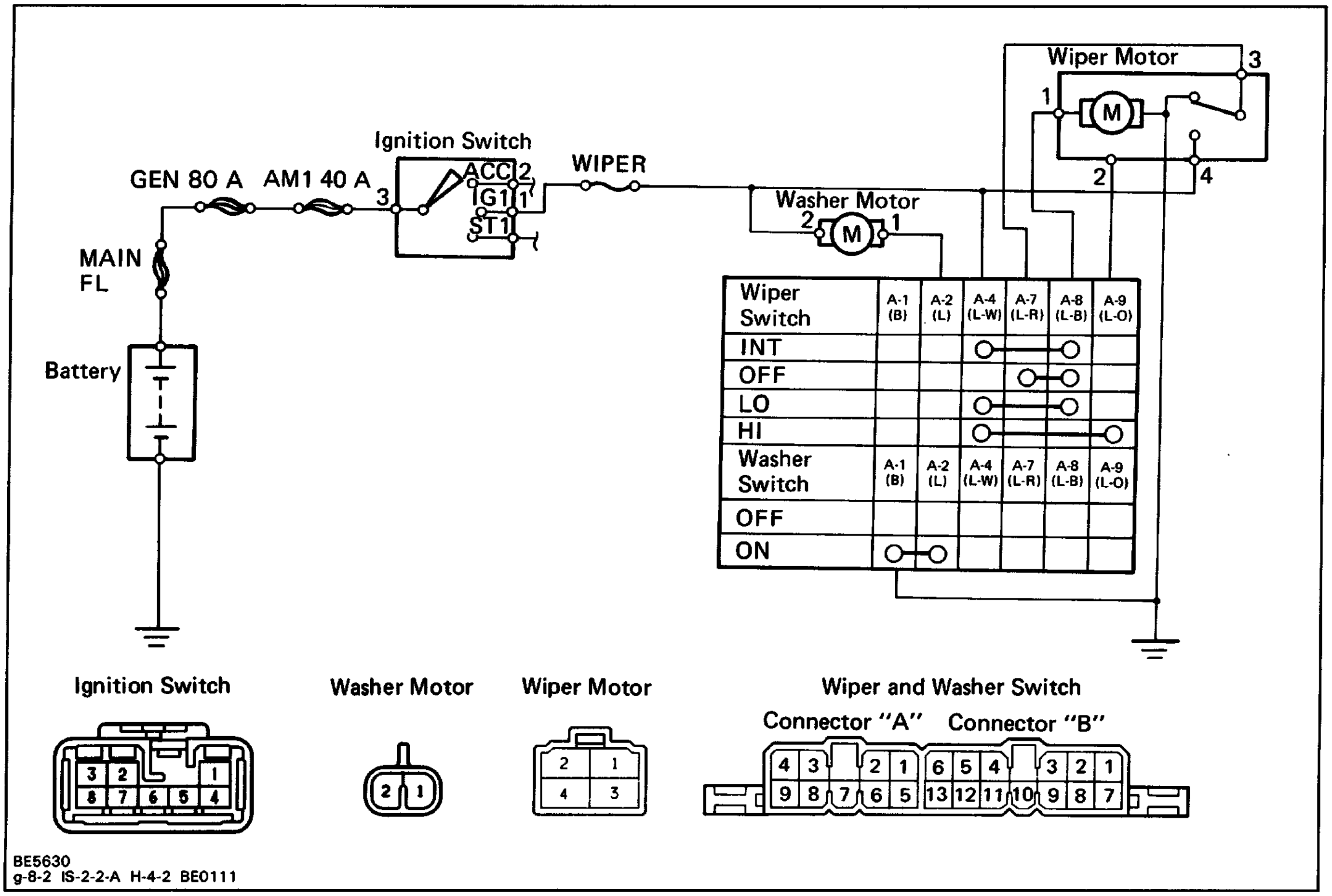
WIPER AND WASHER SYSTEM
Parts Location



Wiring and Connector Diagrams
(w/ MIST Wiper)



(w/ Intermittent Wiper)

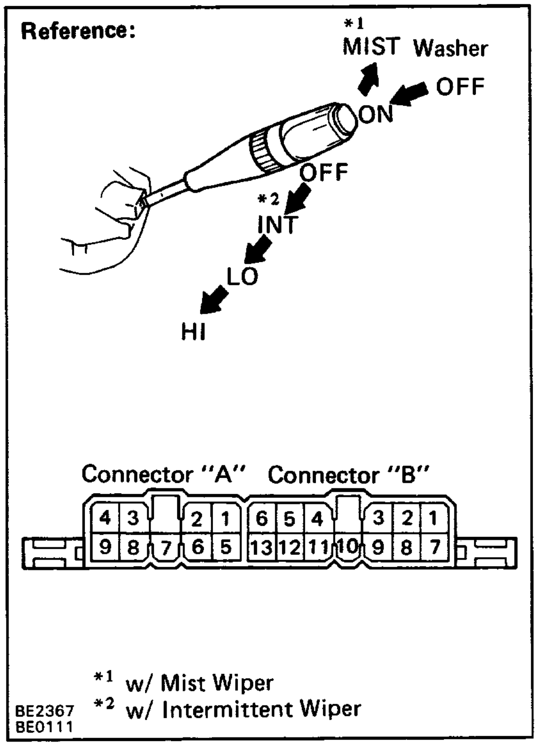


Troubleshooting

Problem	Possible cause	Remedy	Page
Wipers do not operate or return to off position	WIPER fuse blown Wiper motor faulty Wiper switch faulty Wiper or ground faulty	Replace fuse and check for short Check motor Check switch Repair as necessary	BE–3 BE–27 BE–26
Wipers do not operate in INT position	Wiper switch faulty Wiper motor faulty Wiring or ground faulty	Check switch Check motor Repair as necessary	BE–26 BE–27
Washers do not operate	Washer hose or nozzle clogged Washer motor faulty Washer switch faulty Wiring faulty	Repair as necessary Check motor Check switch Repair as necessary	BE–28 BE–28

Parts Replacement

See replacement of combination switch on pages BE–1 6 to 18.



BE2367
BE0111

Parts Inspection

Wiper System

1. INSPECT SWITCHES

(Wiper and Washer Switch/Continuity)

w/ Mist Wiper

Switch position		Terminal (Color) A-1 (B)	A-2 (L)	A-4 (L-W)	A-7 (L-R)	A-8 (L-B)	A-9 (L-O)
Wiper	MIST			O		O	
	OFF				O	O	
	LO			O		O	
	HI			O			O
Washer	OFF						
	ON	O	O				

wl Intermittent Wiper

Switch position		Terminal (Color) A-1 (B)	A-2 (L)	A-4 (L-W)	A-7 (L-R)	A-8 (L-B)	A-9 (L-O)
Wiper	MIST				O	O	
	INT			O		O	
	LO			O		O	
	HI			O			O
Washer	OFF						
	ON	O	O				

If continuity is not as specified, replace the switch.

(Wiper and Washer Switch /intermittent Wiper Operation)

(a) Turn the wiper switch to INT position.

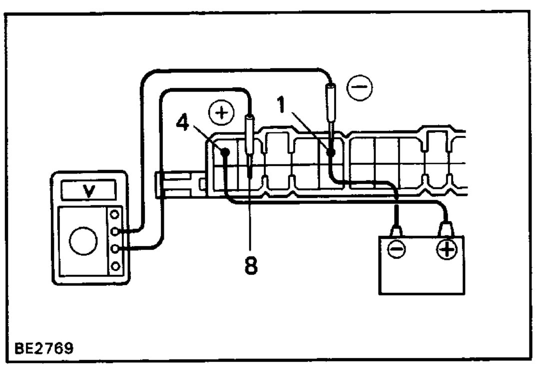
(b) (Variable Type)
Turn the intermittent time control switch to FAST position.

(c) Connect the positive (+) lead from the battery to terminal 4!9 and the negative (–) lead to terminal 1/9.

(d) Connect the positive (+) lead from the voltmeter to terminal 8I9 and the negative (–) lead to terminal 1/9, check that the meter needle indicates battery positive voltage.

(e) After connecting terminal 7I9 to terminal 419, con–nect to terminal 1/9.

Then, check that the voltage rises from 0 volts to battery positive voltage within the times as shown in the table.



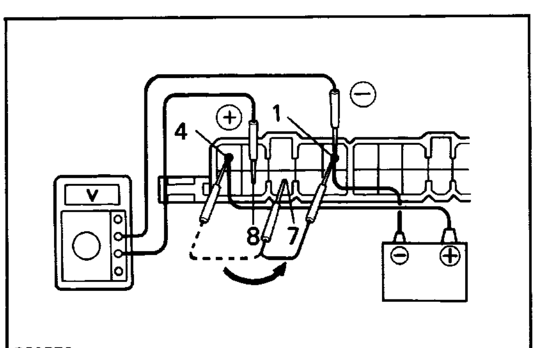
BE2769

Non Variable Type

Switch position	Specified valve
INT	3.3 ± 1 sec. Battery positive voltage 0 volts

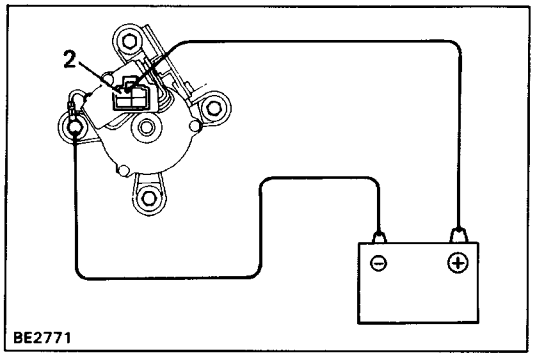
Variable Type

Switch position		Specified valve
INT	FAST	1.6 ± 1 sec. Battery positive voltage 0 volts
	LOW	10.7 ± 5 sec. Battery positive voltage 0 volts



BE2770

If operation is not as specified, replace the switch.

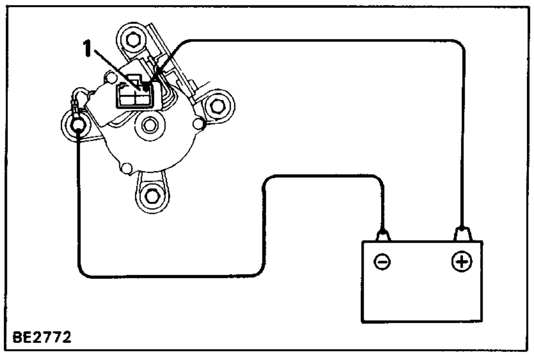


2. INSPECT MOTOR

(Operation at Low Speed)

Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to the motor body, check that the motor operates at low speed.

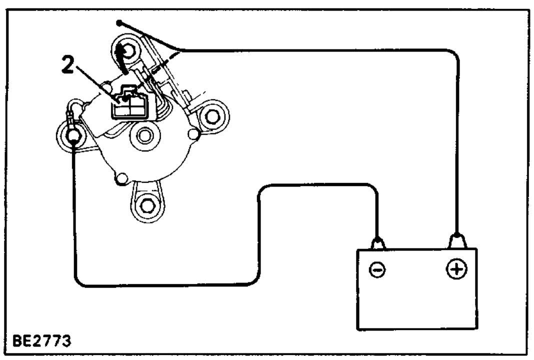
If operation is not as specified, replace the motor.



(Operation at High Speed)

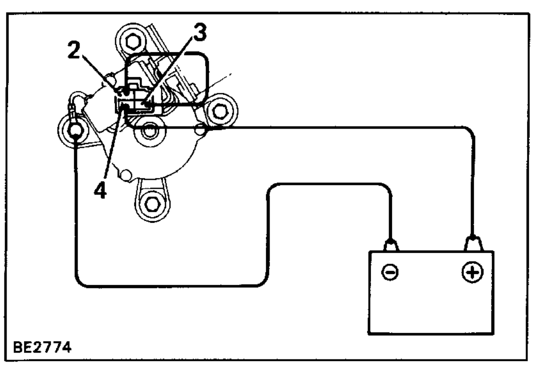
Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to the motor body, check that the motor operates at high speed.

If operation is not as specified, replace the motor.



(Operation, Stopping at Stop Position)

(a) Operate the motor at low speed and stop the motor operation anywhere except at the stop position by disconnecting positive (+) lead from terminal 2.



(b) Connect terminals 2 and 3.

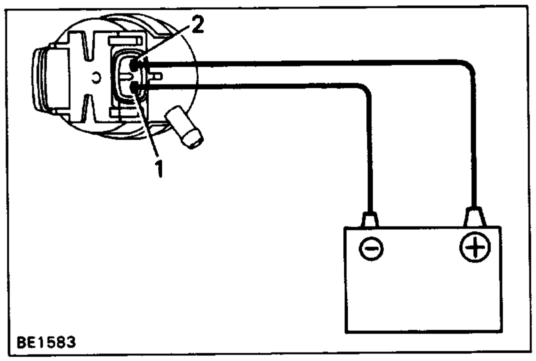
(c) Connect the positive (+) lead from the battery to terminal 4 and the negative (–) lead to the motor body, check that the motor stops running at the stop position after the motor operates again.

If operation is not as specified, replace the motor.

Washer System

1. INSPECT WASHER SWITCH

(Front Windshield Washer Switch)
See Wiper and Washer Switch on page BE–27.



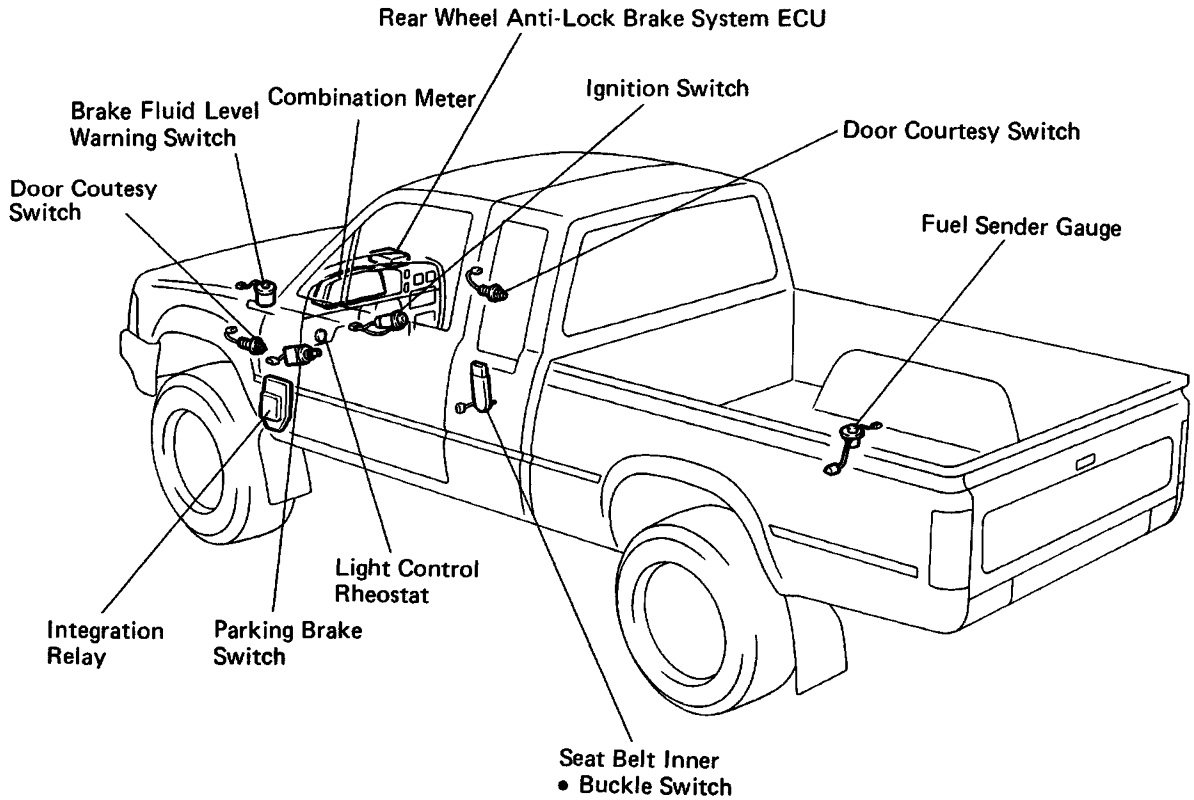
2. INSPECT WASHER MOTOR

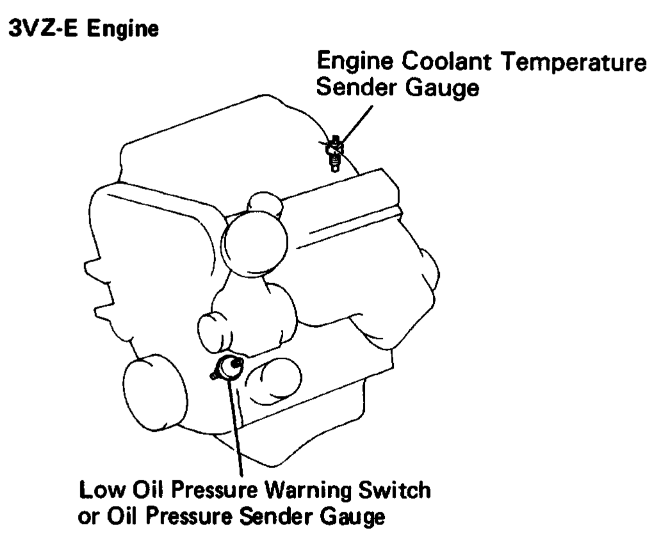
Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 1, check that the motor operates.

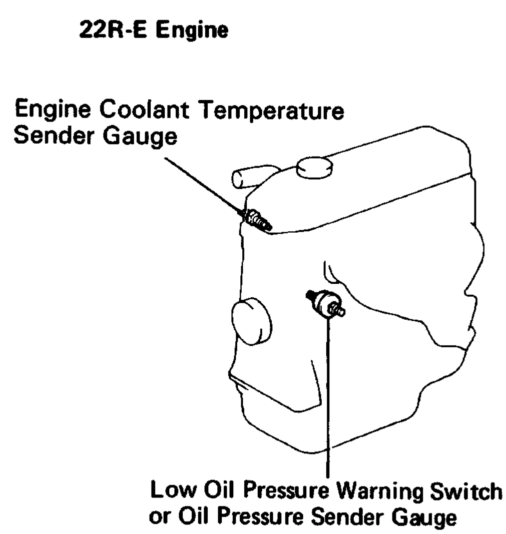
NOTICE: These tests must be performed quickly (Within 20 seconds) to prevent the coil from burning out.

If operation is not as specified, replace the motor.

COMBINATION METER
Parts Location



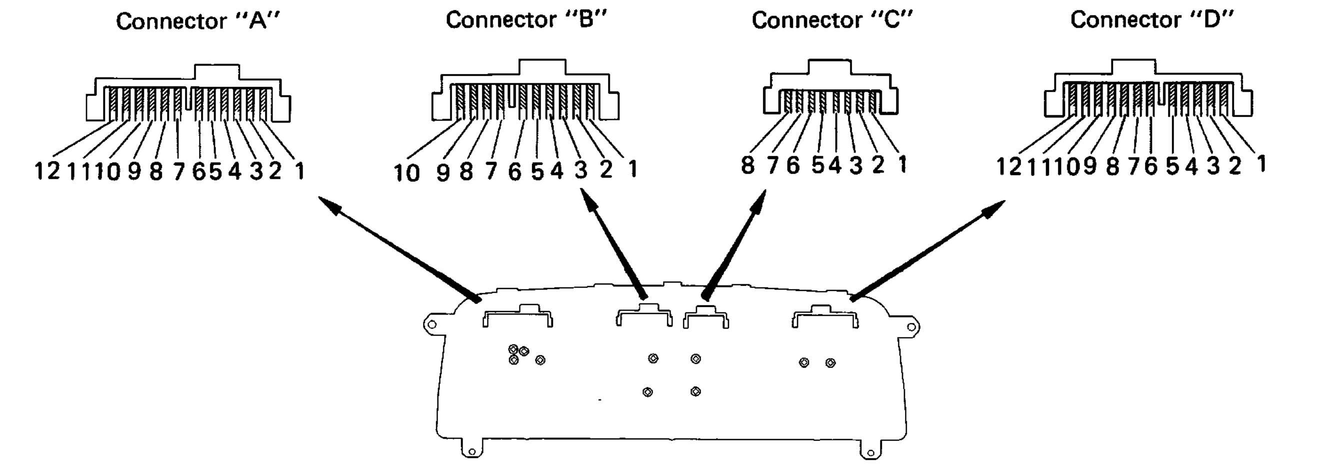


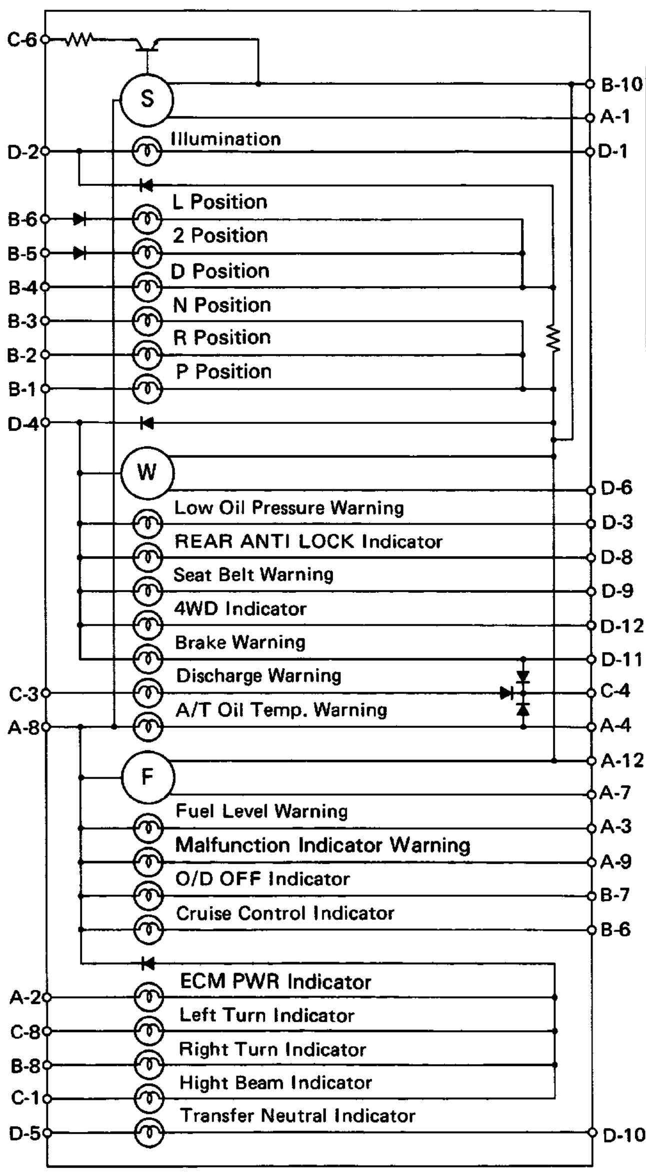


BE5631
BE2865 BE2866

Meter Circuit

(w/o Tachometer)

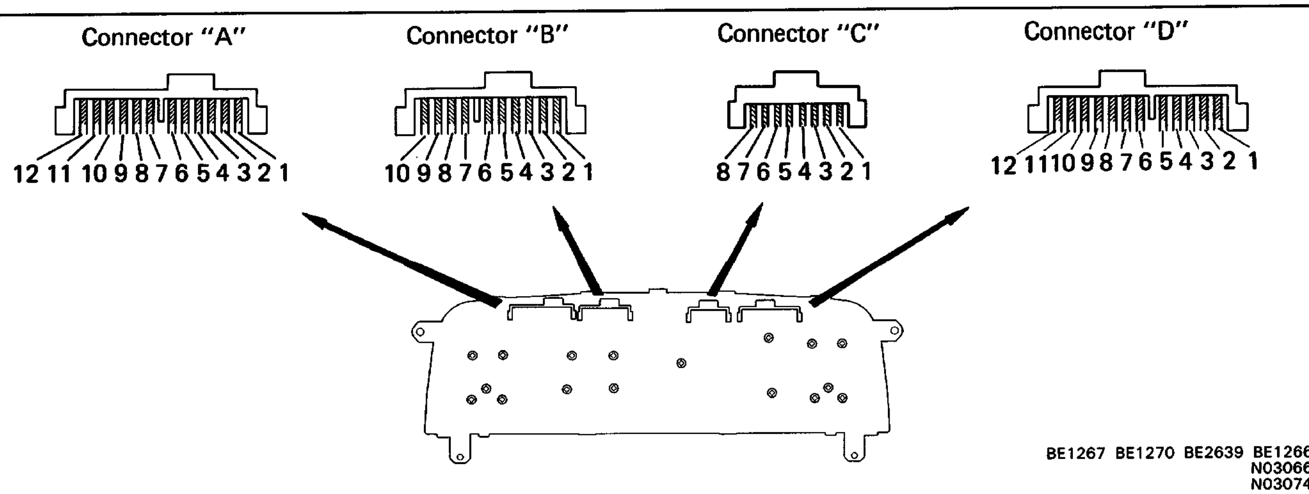


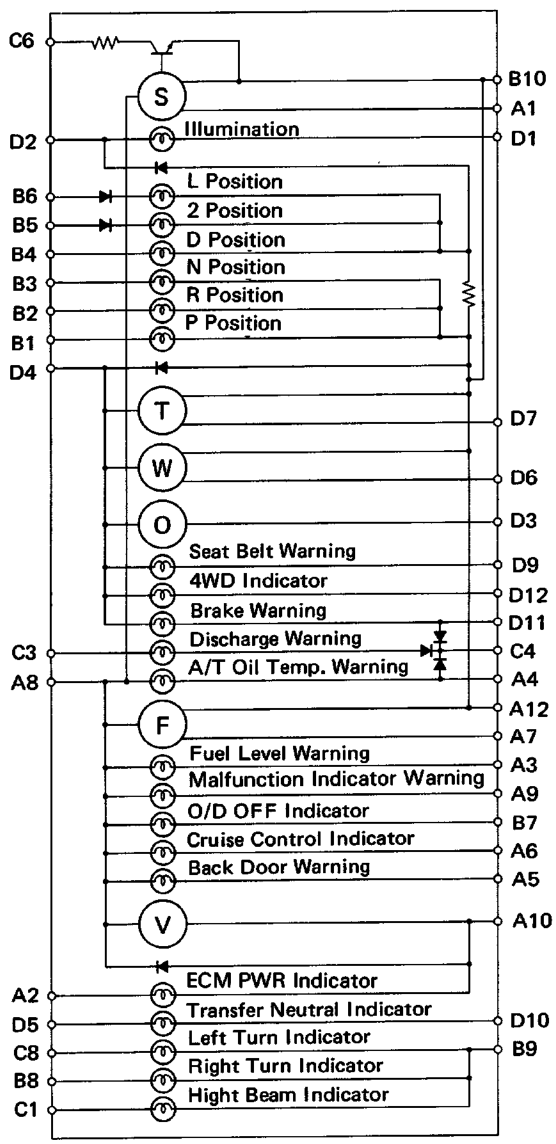


Ⓦ : Engine Coolant Temperature Gauge
Ⓕ : Fuel Gauge
Ⓢ : Speed Meter
Temp.: Temperature

No.		Wiring connector side
A	1	Speed Sensor SIG–VAL
	2	ETC Pattern select switch
	4	A/T Oil Temperature switch
	6	Cruise Control Main Switch
	7	Fuel Sender Gauge–Terminal 2
	8	GAUGE Fuse
	9	ECM
	12	Ground
B	1	Park/Neutral Position Switch
	2	Park/Neutral Position Switch
	3	Park/Neutral Position Switch
	4	Park/Neutral Position Switch
	5	Park/Neutral Position Switch
	6	Park/Neutral Position Switch
	7	O/D Main Switch
	8	Headlight Dimmer and Turn Signal Switch
	9	Ground
	10	Speed Sensor Ground
C	1	Headlight LO (LH)–(USA), HI (RH)–(CANADA)
	3	IG N Fuse
	4	CHARGE Fuse
	6	ECM
	8	Headlight Dimmer and Turn Signal Switch
D	1	(A/T) Light Control Rheostat–terminal 3 (M/T) Light Control Rheostat–terminal 2
	2	TAIL Fuse
	3	Low Oil Pressure Warning Switch
	4	GAUGE Fuse
	6	Engine Coolant Temperature Sender Gauge
	8	Rear Wheel Anti–Lock Brake System ECU
	9	Integration Relay–terminal 8 of mail connector
	11	Brake Fluid Level Warning Switch–terminal 1 and Parking Brake Switch–terminal 1
	12	Transfer Indicator Switch

(w/ Tachometer)





T : Tachometer
W : Engine Coolant Temperature Gauge
O : Oil Pressure Gauge
F : Fuel Gauge
V : Volt Gauge
S : Speed Meter
Temp.: Temperature

No.		Wiring connector side
A	1 2 3 4 6 7 8 9 10 12	Speed Meter SIG–VAL ECM Pattern Select Switch Fuel Sender Gauge–terminal 3 A/T Oil Temperature Switch Cruise Control Main Switch Fuel Sender Gauge–terminal 4 GAUGE Fuse ECM Ground Ground
B	1 2 3 4 5 6 7 8 9 10	Park/Neutral Position Switch Park/Neutral Position Switch Park/Neutral Position Switch Park/Neutral Position Switch Park/Neutral Position Switch Park/Neutral Position Switch O/D Main Switch Headlight Dimmer and Turn Signal Switch Ground Speed Sensor Ground
C	1 3 4 6 8	Headlight LO (LH)–(USA), H I (R H)–(CANADA) IGN Fuse CHARGE Fuse ECM Headlight Dimmer and Turn Signal Switch
D	1 2 3 4 6 7 8 9 11 12	Light Control Rheostat–(DLX Grade) terminal 2, (SR5 and SR5V6 Grades) terminal 3 TAIL Fuse Oil Pressure Sender Gauge GAUGE Fuse Engine Coolant Temperature Sender Gauge Igniter Rear Wheel Anti–Lock Brake System ECU Integration Relay–terminal 8 of mail connector Brake Fluid Level Warning Switch–terminal 1 and Parking Brake Switch–terminal 1 Transfer Indicator Switch

Troubleshooting

Problem	Possible cause	Remedy	Page
Gauges and indicator lights do not operate	GAUGE fuse faulty Wiring or ground faulty	Replace fuse and check for short Repair as necessary	BE–3
Voltmeter does not work	Voltmeter faulty Wiring or ground faulty	Check voltmeter Repair as necessary	BE–33
Tachometer does not operate	Tachometer faulty Wiring or ground faulty	Check tachometer Repair as necessary	BE–33
Fuel gauge does not operate	Receiver gauge faulty Sender gauge faulty Wiring or ground faulty	Check gauge Check gauge Repair as necessary	BE–34 BE–35
Engine Coolant temperature gauge does not operate	Receiver gauge faulty Wiring or ground faulty	Check gauge Repair as necessary	BE–36
Oil pressure gauge does not operate	Receiver gauge faulty Sender gauge faulty Wiring or ground faulty	Check gauge Check gauge Repair as necessary	BE–37 BE–38
Brake warning light does not light up	Bulb burned out Brake fluid level warning switch faulty Parking brake switch faulty Wiring or ground faulty	Replace bulb Check switch Check switch Repair as necessary	BE–38 BE–39
Seat belt warning light does not light up	Bulb burned out Integration relay faulty Wiring or ground faulty	Replace bulb Check relay Repair as necessary	BE–40
Discharge warning light does not light up	IGN fuse blown CHARGE fuse blown Bulb burned out Wiring or ground faulty	Replace fuse and check for short Replace fuse and check for short Replace bulb Repair as necessary	BE–3 BE–3

Standard indication	Allowable range
20	19 – 22
40	39 – 42.5
60	59.5 – 63.5
80	79.5 – 84
100	100 – 105

(km/h)

Standard indication	Allowable range
20	18 – 23
40	40 – 44
60	60 – 64.5
80	80 – 85
100	100 – 105
120	120 – 125.5
140	140 – 146
160	160 – 167

Parts Inspection
Speedometer System

1. INSPECT SPEEDOMETER (ON–VEHICLE)

(a) Using a speedometer tester, inspect the speedometer for allowable indication error and check the operation of the odometer.

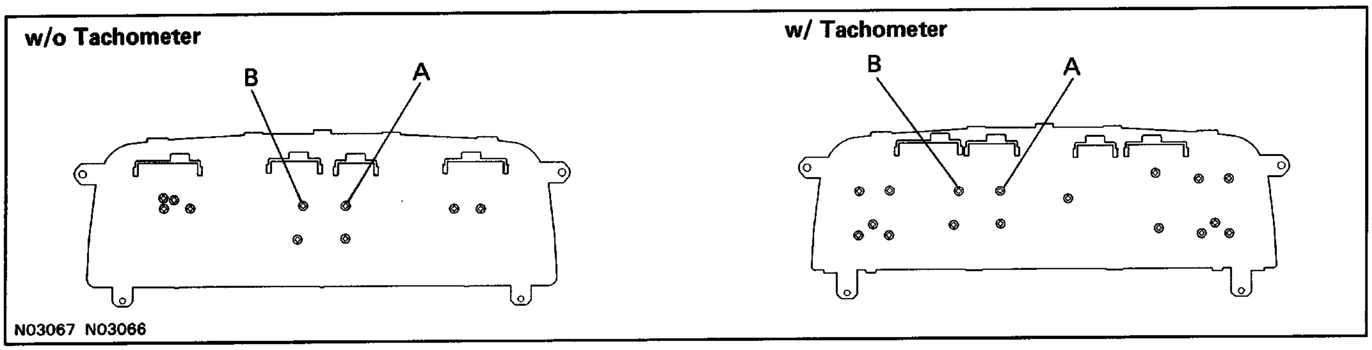
HINT: The wear and tire over or under inflation will increase the indication error.
If error.

(b) Check the speedometer for pointer vibration and abnormal noise.

HINT: Pointer vibration can be caused by a loose speedometer cable.

2. INSPECT SPEED SENSOR

Check that there is continuity between terminals A and B four times par each revolution of the speedometer shaft.
If operation is not as specified, replace the speedometer.



DC 13.5 V 200C (680F)	rpm
Standard indication	Allowable range
700	610 – 750
3,000	2,850 – 3,150
5,000	4,850 – 5,150
7,000	6,790 – 7,210

Tachometer System
INSPECT TACHOMETER (ON–VEHICLE)

(a) Connect a tune–up test tachometer, and start the engine.

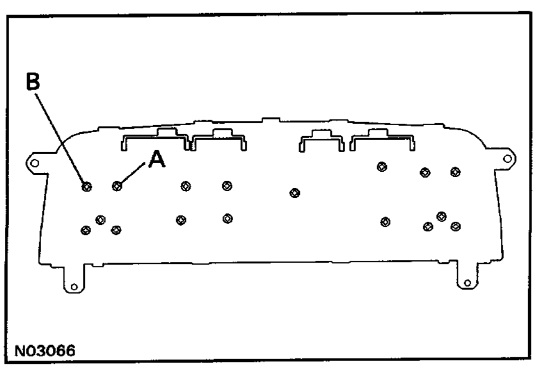
NOTICE:

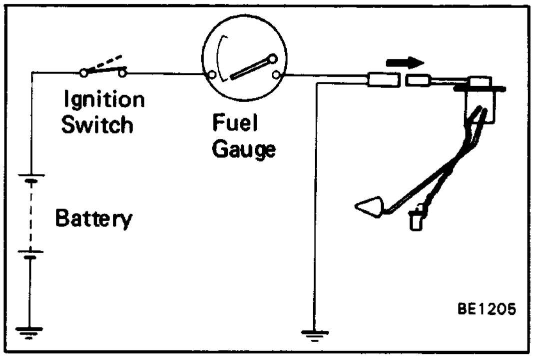
- Reversing the connection of the tachometer will damage the transistors and diodes inside.
- When removing or installing the tachometer, be careful not to drop or subject it to heave shocks.

(b) Compare the tester and tachometer indications.
If error is excessive, replace the tachometer.

Volt Gauge System
INSPECT VOLT GAUGE

Measure the resistance between terminals A and B.
Resistance: Approx. 347
If resistance value is not as specified, replace the gauge.



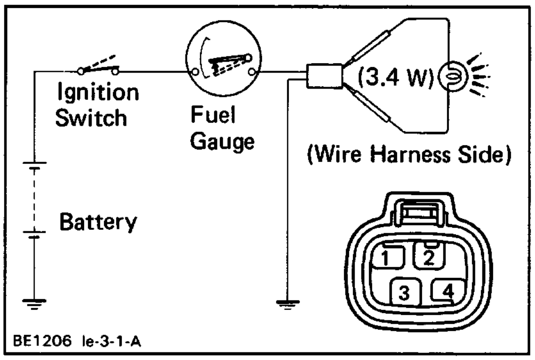


Fuel Gauge System

1. INSPECT RECEIVER GAUGE

(a) Disconnect the connector from the sender gauge.

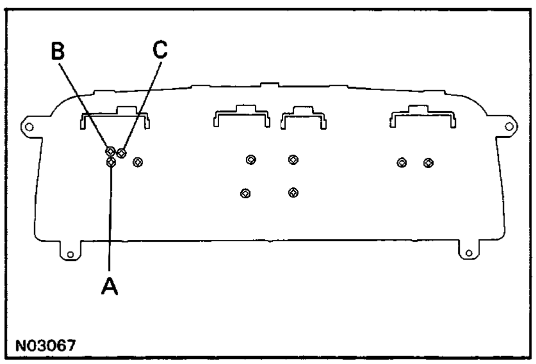
(b) Turn the ignition switch ON, check that the receiver gauge needle indicates EMPTY.



(c) Connect terminals 1 and 2 on the wire harness side connector through a 3.4 W test bulb.

(d) Turn the ignition switch ON, check that the test bulb lights up and the receiver gauge needle moves to–wards the full side.

HINT: (wI Tachometer)
Because of the silicon oil in the gauge, it will take a short time for the needle to stabilize.
If operation is not as specified, inspect the receiver gauge resistance, and the voltage regulator (w/o Tachometer).



(Voltage Regulator: w/o Tachometer)

(a) Connect the positive (+) lead from the battery to terminal A and negative (–) lead to terminal B.

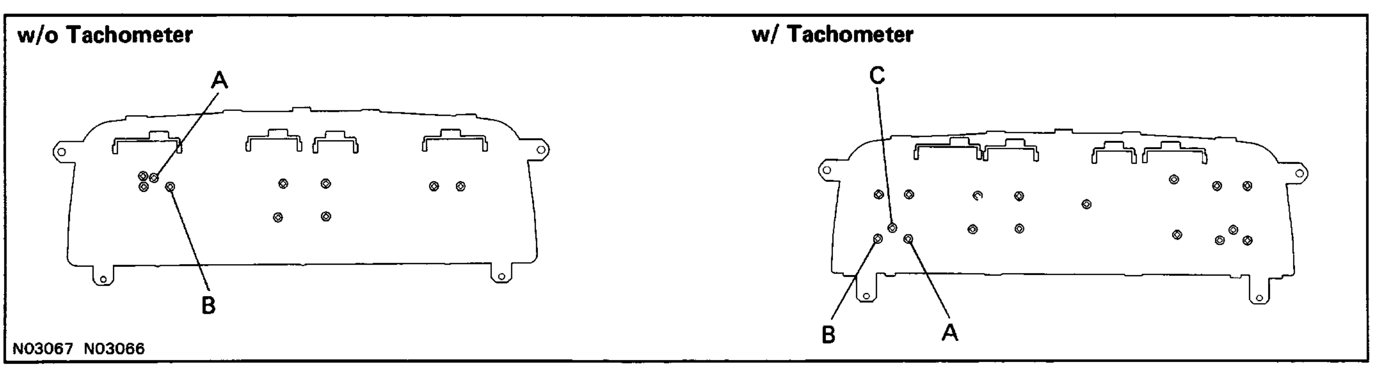
(b) Connect the positive (+) lead from the voltmeter to terminal C and the negative (–) lead to terminal B, check that the voltmeter needle vibrates near the 7 V position.

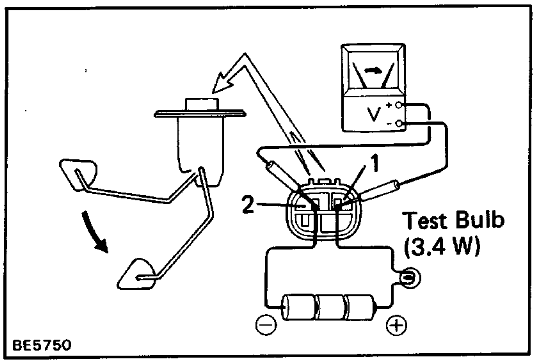
If voltage value is not as specified, replace the receiver gauge.

(Resistance)

Measure the resistance between terminals.
If resistance value is not as specified, replace the receiver gauge.

Between terminals	Resistance (/)	
	w/o Tachometer	wI Tachometer
A – B	Approx. 55	Approx. 123
A – C	–	Approx. 260
B – C	–	Approx. 137





2. INSPECT SENDER GAUGE

(Operation)

(a) Connect a series of three 1.5 v dry cell batteries.

(b) Connect the positive (+) lead from the dry cell bat– teries to terminal 2 through a 3.4 W test bulb and the negative (–) lead to terminal 1.

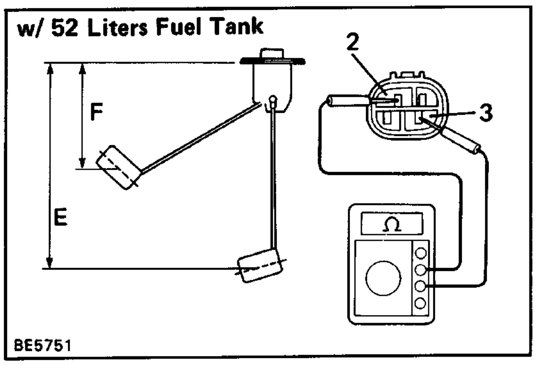
(c) Connect the positive (+) lead from the voltmeter to terminal 2 and negative (–) lead to terminal 1.

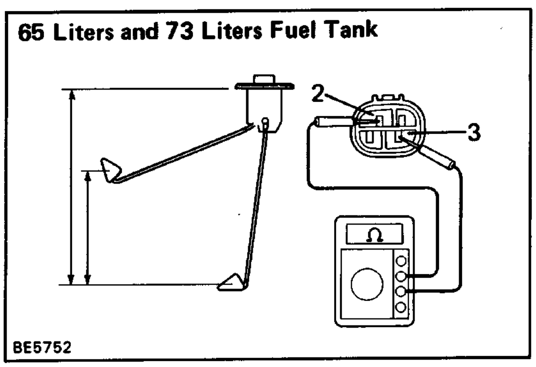
(d) Check that the voltage rises as the float is moved from the top to bottom position.

If operation is not as specified, replace the sender gauge.

(Resistance)

Measure the resistance between terminals 1 and 3.





wl 52 Liters Fuel Tank

Float position mm (in.)		Resistance 1/)
F	Approx. 121 (4.76)	Approx. 3
E	Approx. 263 (10.35)	Approx. 110

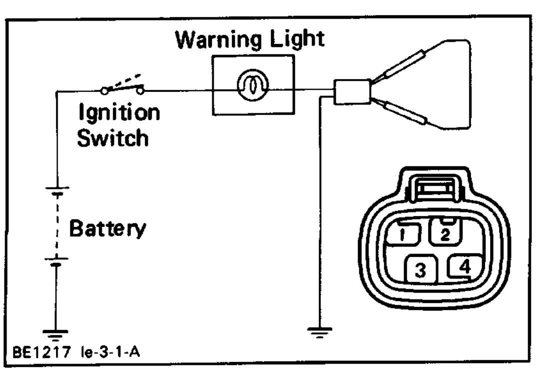
wl 65 Liters Fuel Tank

Models	Float position		Resistance (/)
2WD	F	Approx. 96 (3.78)	Approx. 3
	E	Approx. 281 (11.06)	Approx. 110
4WD	F	Approx. 108 (4.25)	Approx. 3
	E	Approx. 300 (11.81)	Approx. 110

w/ 73 Liters Fuel Tank

Float position		Resistance (/)
F	Approx. 116 (4.57)	Approx. 3
E	Approx. 319 (12.56)	Approx. 110

If resistance value is not as specified, replace the sender gauge.



Fuel Level Warning System

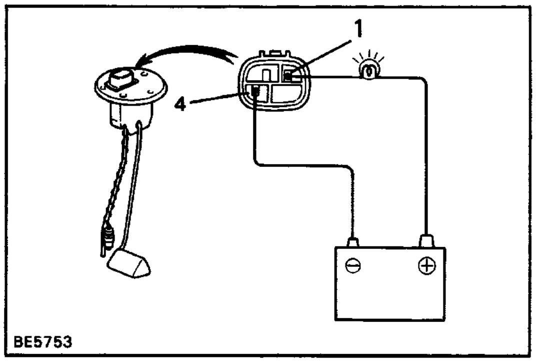
1. INSPECT WARNING LIGHT

(a) Disconnect the connector form the sender gauge.

(b) Connect terminals 1 and 3 on the wire harness side connector.

(c) Turn the ignition switch ON, check that the warning light will come on.

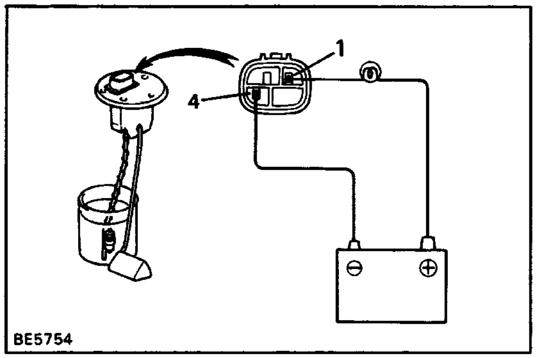
If the warning light does not come on, test the bulb.



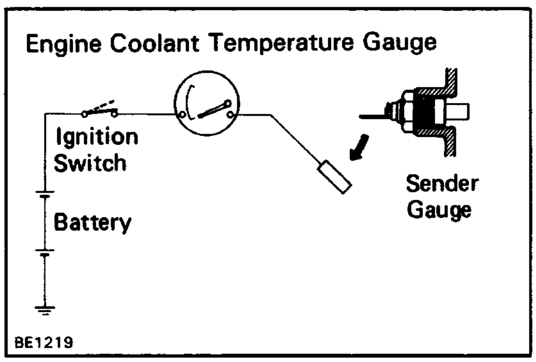
2. INSPECT WARNING SWITCH

(a) Apply battery positive voltage between terminals 1 and 4 through a 3.4 W test bulb, check the bulb lights up.

HINT: It will take a short time for the bulb to light up.



(b) Submerge the switch in fuel, check that the bulb goes out.
If operation is not as specified, replace the sender gauge.

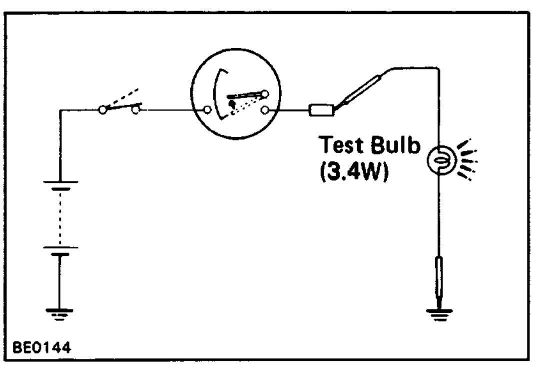


Engine Coolant Temperature Gauge System

INSPECT RECEIVER GAUGE

(Operation)

(a) Disconnect the connector from the sender gauge.
(b) Turn the ignition switch ON, check that the receiver gauge needle indicates cool.

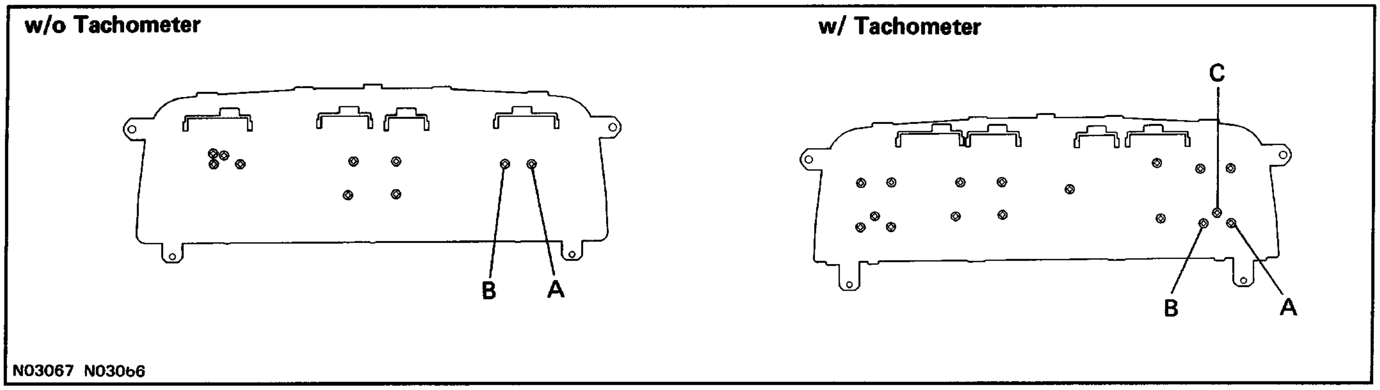


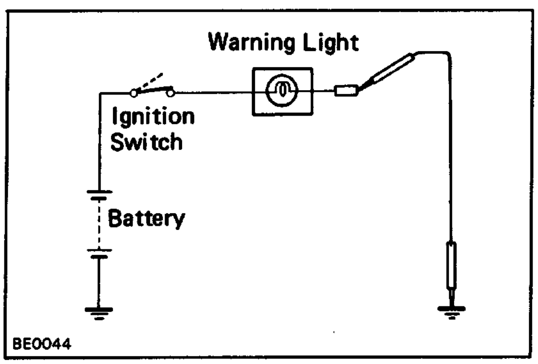
(c) Ground terminal on the wire harness side connector through a 3.4 W test bulb.
(d) Turn the ignition switch ON, check that the bulb lights up and the receiver gauge needle moves to–wards the hot side.

If operation is not as specified, replace the sender gauge. Then, recheck the system.
If operation is not as specified, measure the receiver gauge resistance.

Between terminals	Resistance (/)	
	w/o Tachometer	w/ Tachometer
A → B	Approx. 25	Approx. 57
A → C	–	Approx. 135
B → C	–	Approx. 217

(Resistance)
Measure the resistance between terminals.
HINT: Connect the test leads so that the current form the ohmmeter can flow according to the above order.
If resistance value is not as specified, replace the receiver gauge.

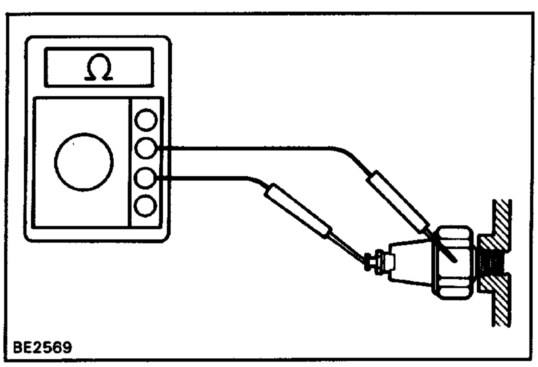




Low Oil Pressure Warning System

1. INSPECT WARNING LIGHT

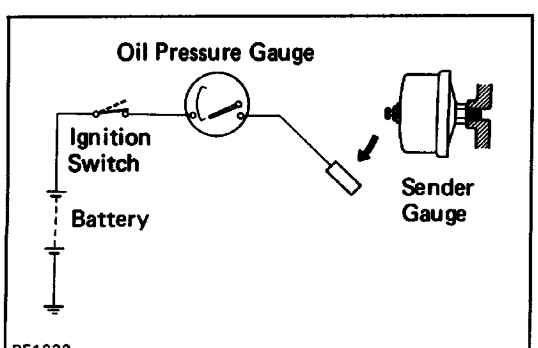
(a) Disconnect the connector from the warning switch and ground terminal on the wire harness side con– nector.
(b) Turn the ignition switch ON, check that the warning light will come on.
If the warning light does not come on, test the bulb.



2. INSPECT WARNING SWITCH

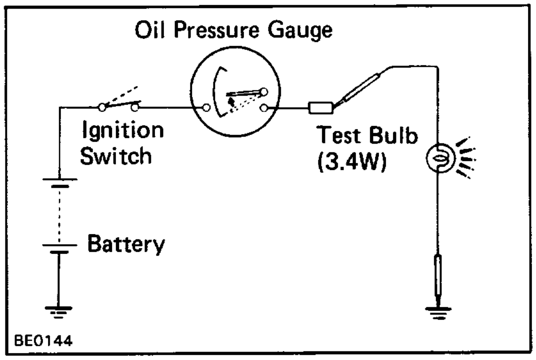
(a) Disconnect the connector from the switch.
(b) Check that there is continuity between terminal and ground with the engine stopped.
(c) Check that there is no continuity between terminal and ground with the engine running.

HINT: Oil pressure should be over 0.3 kg/cm2 (4.3 psi, 29 kPa).
If operation is not as specified, replace the switch.
Oil Pressure Gauge System



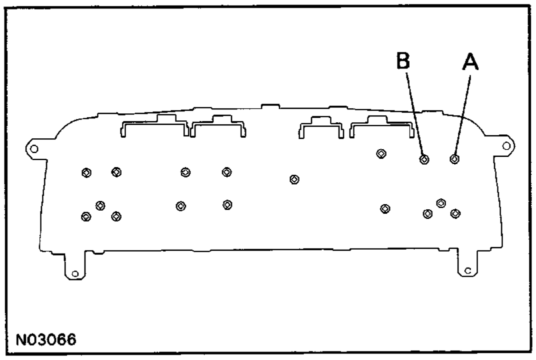
1. INSPECT RECEIVER GAUGE
(Operation)

(a) Disconnect the connector from the sender gauge.
(b) Turn the ignition switch ON, check that the receiver gauge needle indicates LOW.



(e) Ground terminal on the wire harness side connector through a 3.4 W test bulb.

(d) Turn the ignition switch ON, check that the bulb lights up and the receiver gauge needle moves to the
high side.
If operation is not as specified, measure the receiver
gauge resistance.

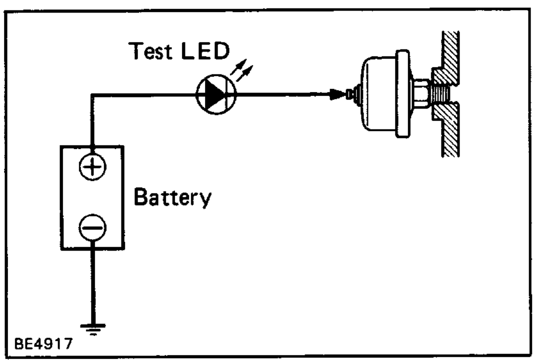


(Resistance)

Measure the resistance between terminals A and B.

Resistance: Approx. 25

If resistance value is not as specified, replace the receiver
gauge.



2. INSPECT SENDER GAUGE

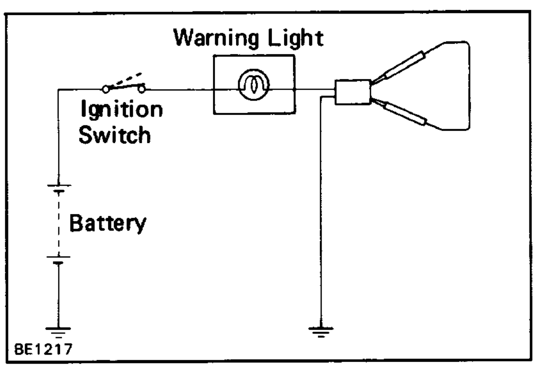
(a) Disconnect the connector from the sender gauge.

(b) Apply battery positive voltage to the sender gauge terminal through a test LED.

(c) Check that the bulb does not light when the engine is stopped.

(d) Check that the LED flashes when the engine is run–ning. The number of flashed should vary with engine speed.
If operation is not as specified, replace the sender gauge.

Brake Warning System

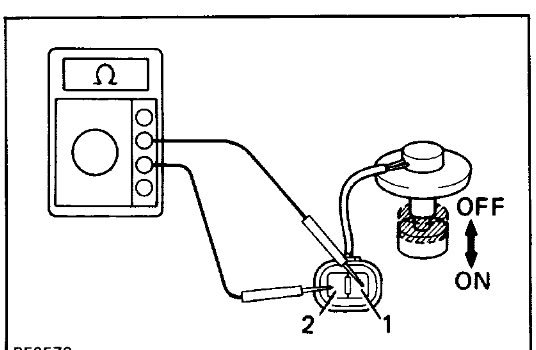


1. INSPECT WARNING LIGHT

(a) Disconnect the connectors from the level warning switch and parking brake switch.

(b) Connect terminals on the wire harness side connec–tor of the level warning switch connector.

(c) Remove the CHARGE fuse and turn the ignition switch ON, check that the warning light will come on.
If the warning light does not come on, test the bulb.

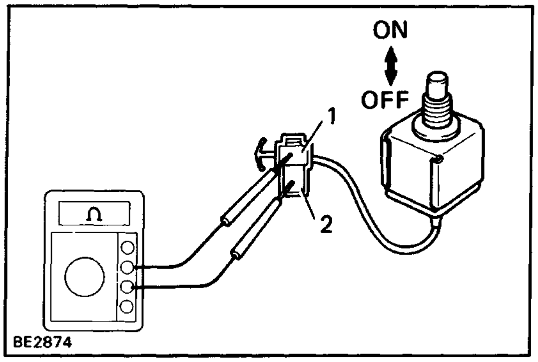


2. INSPECT SWITCHES

(Brake Fluid Level Warning Switch)

(a) Check that there is no continuity between terminals with the switch OFF (float up).

(b) Check that there is continuity between terminals with the switch ON (float down).
If operation is not as specified, replace the switch.



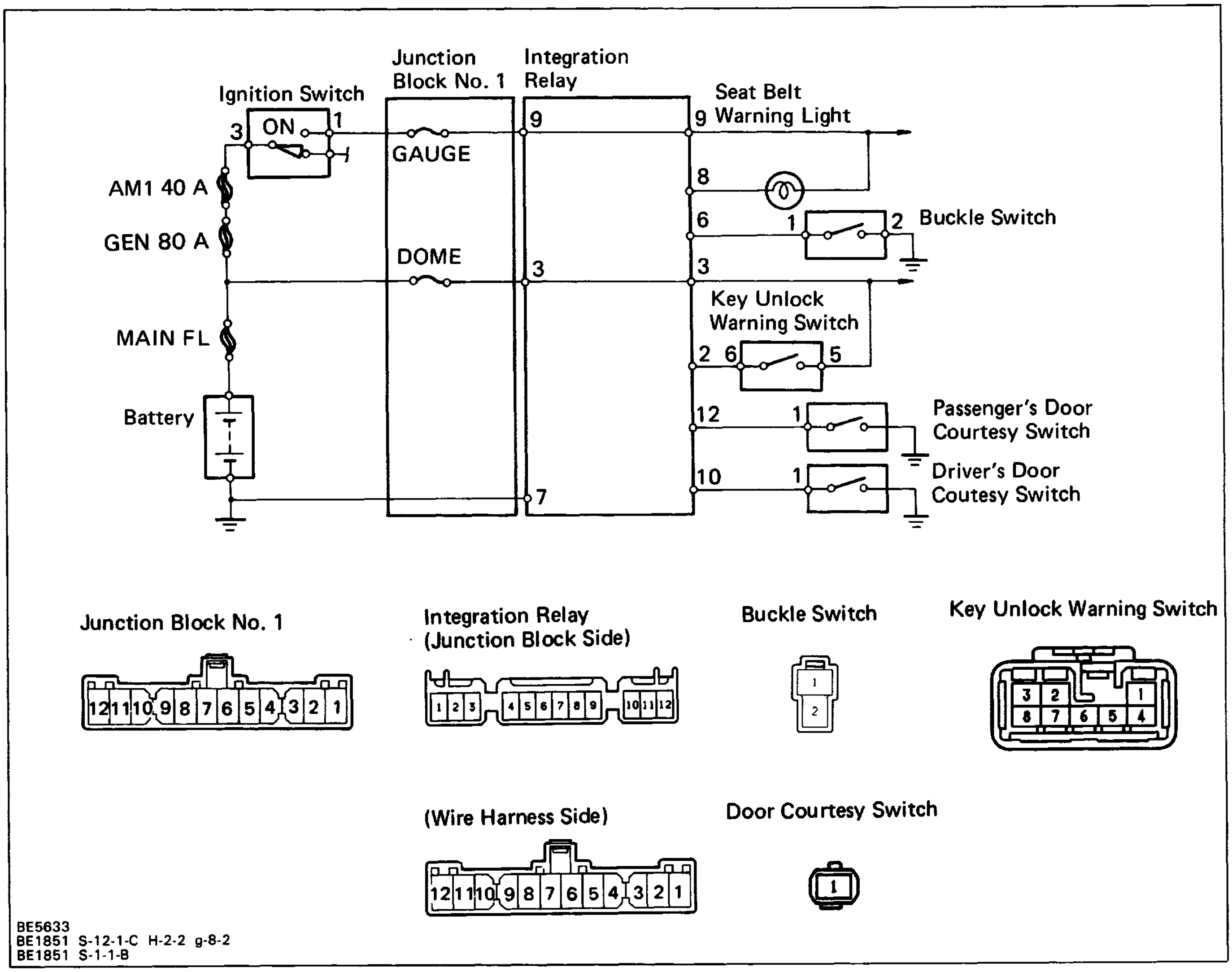
(Parking Brake Switch)

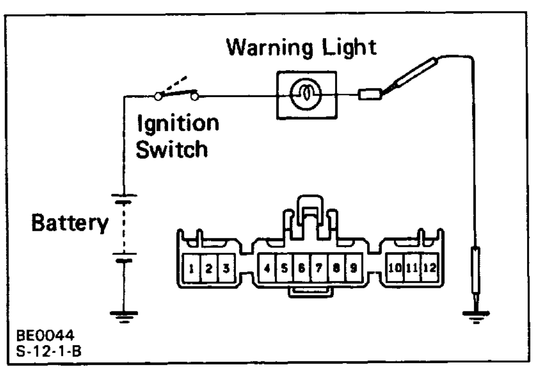
(a) Check that there is continuity between terminals with the switch ON (switch pin released).

(b) Check that there is no continuity between terminals with the switch OFF (switch pin pushed).

If operation is not as specified, replace the switch.

Seat Belt Warning System





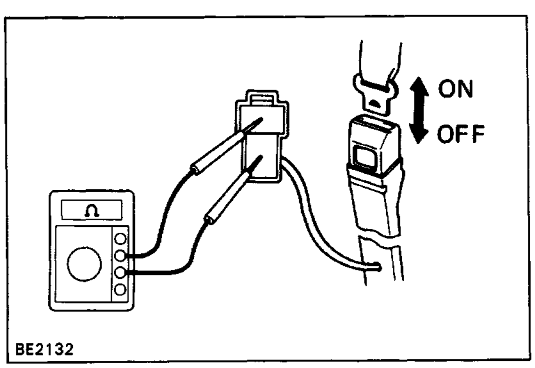
1. INSPECT WARNING SWITCH

(a) Disconnect the wire harness side connector from the integration relay.

(b) Ground terminal 8 on the wire harness side connector.

(c) Turn the ignition switch ON, check that the warninc light lights up.

If the warning light does not light up, test the bulb.

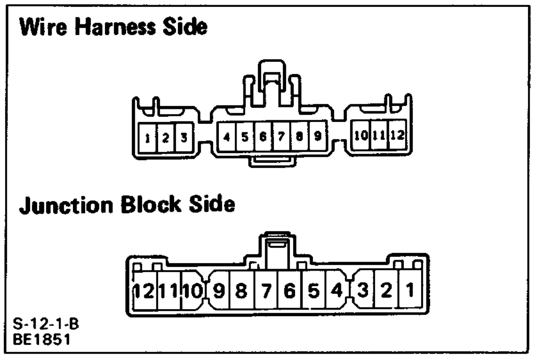


2. INSPECT BUCKLE SWITCH

(a) Check that there is continuity between terminal: with the switch ON (belt unfastened).

(b) Check that there is no continuity between terminal; with the switch OFF (belt fastened).

If operation is not as specified, replace the seat belt inner assembly.



3. INSPECT INTEGRATION RELAY

Remove the integration relay and inspect the connectors on the wire harness side and the junction block side as shown in the chart.

Wire Harness Side

Check for	Tester connection	Condition		Specified value
Continuity	2 – 3	Key unlock warning switch position	OFF (Ignition key removed)	No continuity
			ON (Ignition key set)	Continuity
	6 – Ground	Buckle switch position	OFF (Belt fastened)	No continuity
			ON (Belt unfastened)	Continuity
	8 – 9	Constant		*Continuity
	10 – Ground	Driver's door courtesy switch position	OFF (Door closed)	No continuity
			ON (Door opened)	Continuity
	12 – Ground	Passenger's door cour–tesy switch position	OFF (Door closed)	No continuity
			ON (Door opened)	Continuity

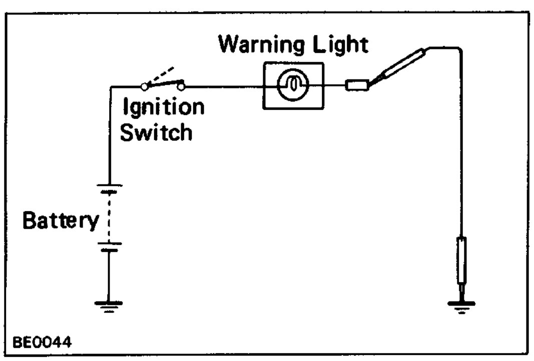
*There is resistance because this circuit is included the bulb.

Junction Block Side

Check for	Tester connection	Condition		Specified value
Continuity	7 – Ground	Constant		Continuity
Voltage	3 – Ground	Constant		Battery positive voltage
	9 – Ground	Ignition switch position	LOCK or ACC	No voltage
			ON	Battery positive voltage

If circuit is as specified, replace the relay.

Open Door Warning System

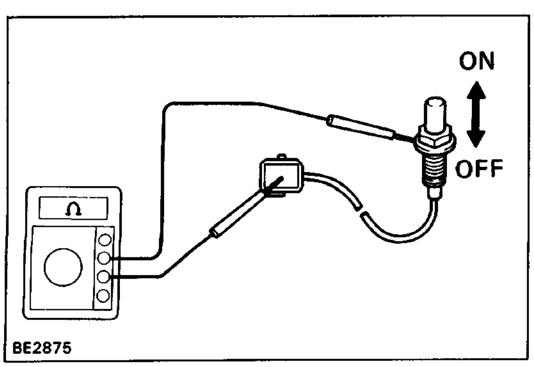


1. INSPECT WARNING LIGHT

(a) Disconnect the connector from the door courtesy switch and ground terminal on the wire harness side.

(b) Turn the ignition switch ON, check that the warning light lights up.

If the warning light does not light up, test the bulb.

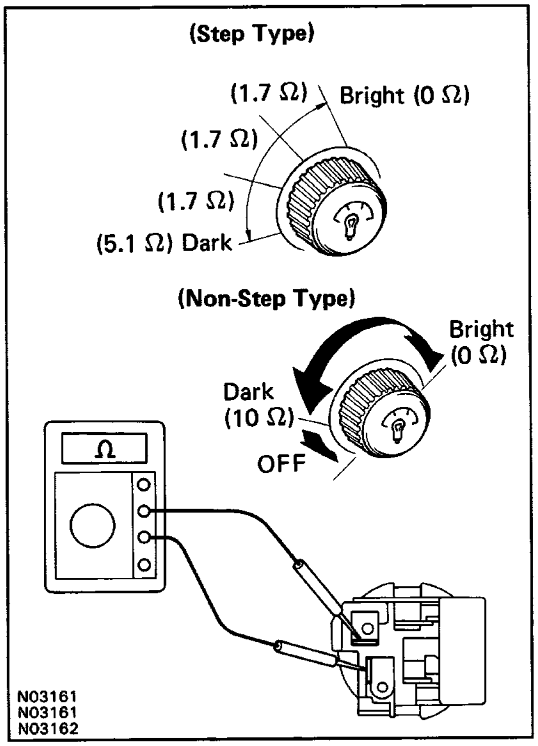


2. INSPECT COURTESY SWITCH

(a) Check that there is continuity between terminal and the switch body with the switch ON (switch pin released).

(b) Check that there is no continuity between terminal and the switch body with the switch OFF (switch pin pushed in).

If operation is not as specified, replace the switch.



Illumination Control System

INSPECT LIGHT CONTROL RHEOSTAT

1. STEP TYPE (w/ o Tachometer)

Gradually turn the rheostat knob from the bright side to dark side, check that the resistance between terminals increases from approximately 0 to 5.1/ .

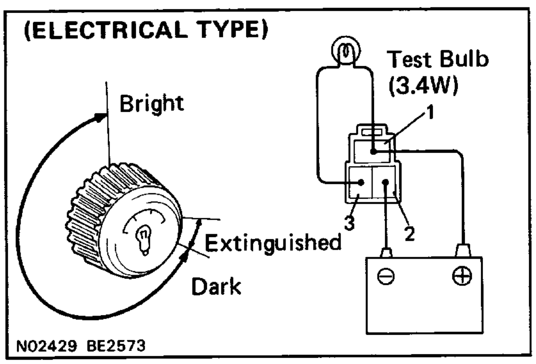
If operation is not as specified, replace the rheostat.

2. NON–STEP TYPE (wI Tachometer)

(a) Turn the rheostat knob OFF, check that there is no continuity between terminals. (Rheostat knob turned to fully counterclockwise)

(b) Gradually, turn the rheostat knob from the dark side to bright side, check that the resistance decreases from 10 to 0 ohm. (Rheostat knob turned to clock–wise)

If operation is not as specified, replace the rheostat.



3. ELECTRICAL TYPE (wI All AIT Vehicle)

(a) Connect terminals 1 and 3 through a 3.4 W test bulb.

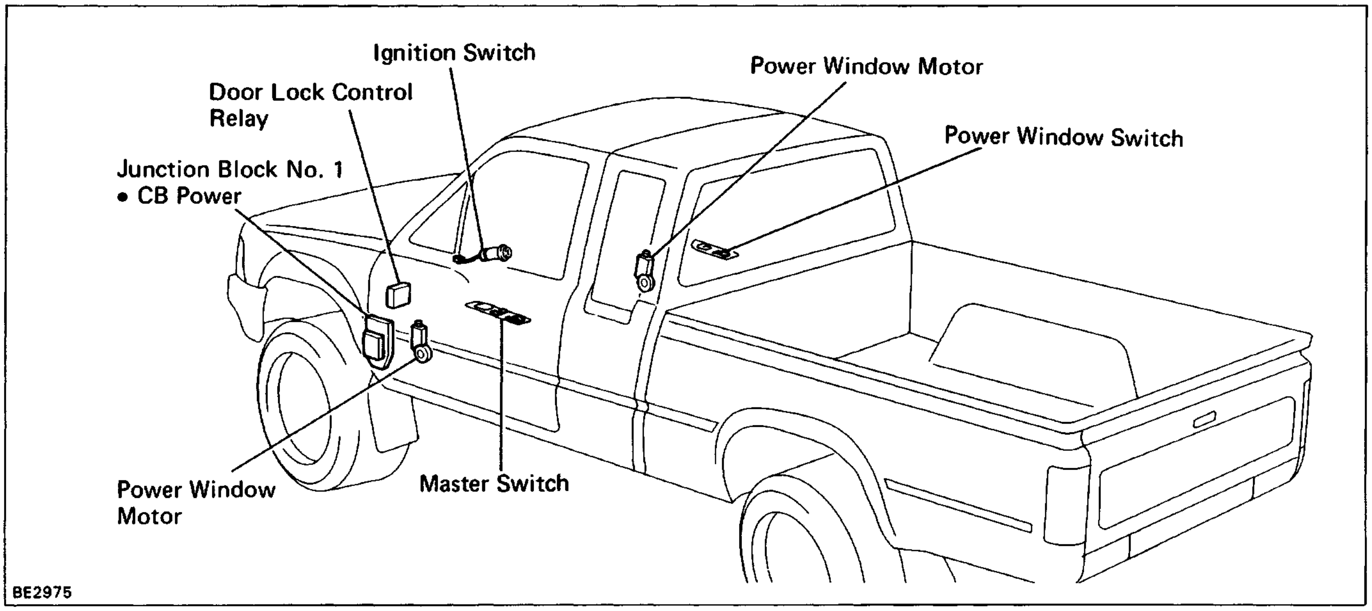
(b) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2.

(c) Turn the rheostat knob to fully counterclockwise check that the test bulb goes out.

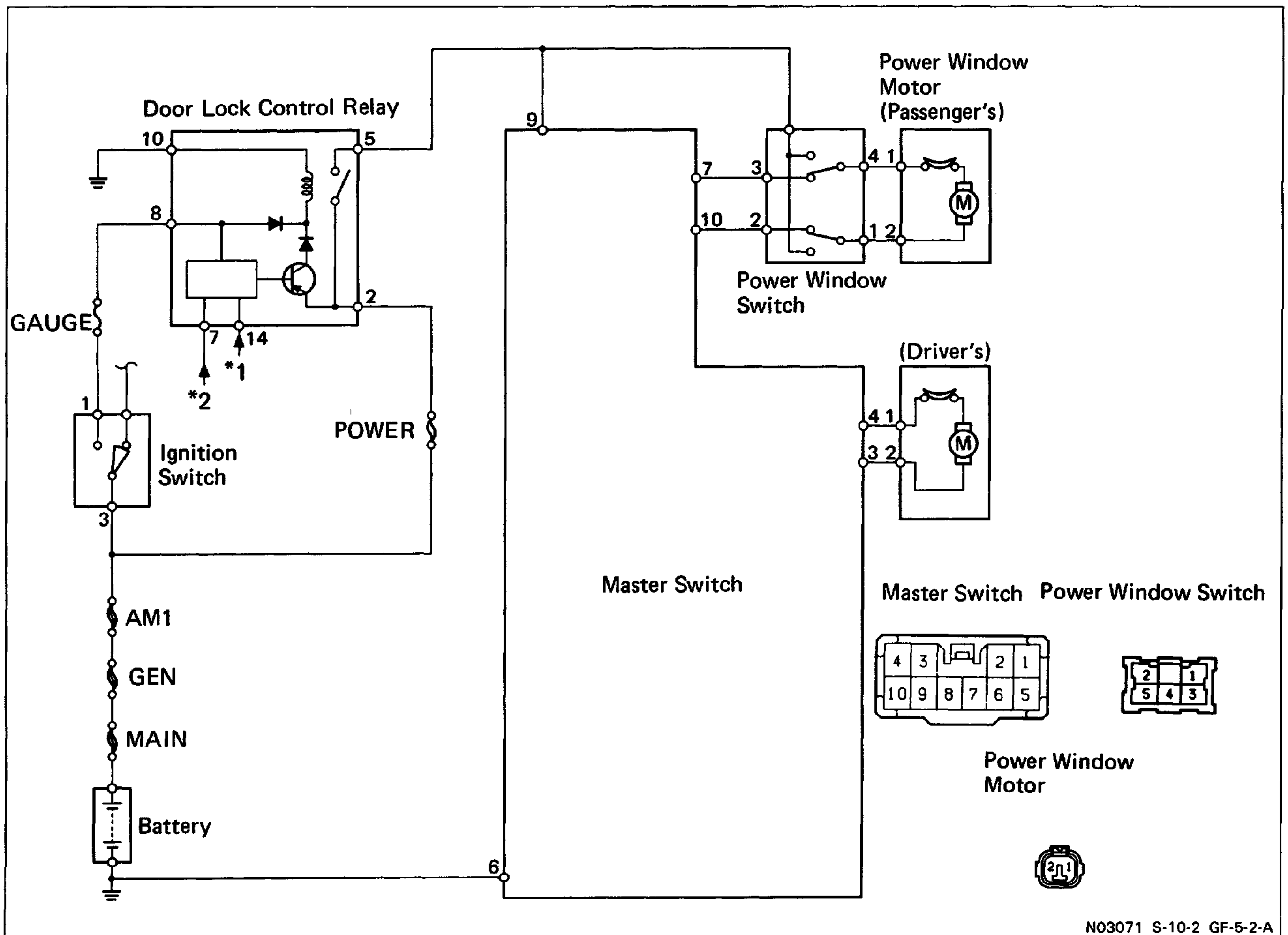
(d) Gradually turn the rheostat knob to clockwise, check that the test bulb brightness changes from dark to bright.

If operation is not as specified, replace the rheostat.

POWER WINDOW CONTROL SYSTEM
Parts Location



Wiring and Connector Diagrams



*1: Driver's Door Courtesy Switch
*2: Passenger's Door Courtesy Switch

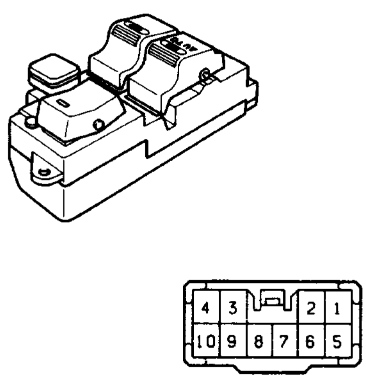
Troubleshooting

Problem	Possible cause	Remedy	Page
Power window does not operate at all	GAUGE fuse blown Door lock control relay faulty Wiring or ground faulty	Replace fuse and check for short Check relay Repair as necessary	BE–3 BE–51
One touch power window does not operate	Power window master switch faulty	Check switch	BE–44
Only one window does not operate	Power window switch faulty Power window motor faulty Wiring or ground faulty	Check switch Check motor Repair as necessary	BE–46 BE–46

Parts Inspection

1. INSPECT SWITCHES

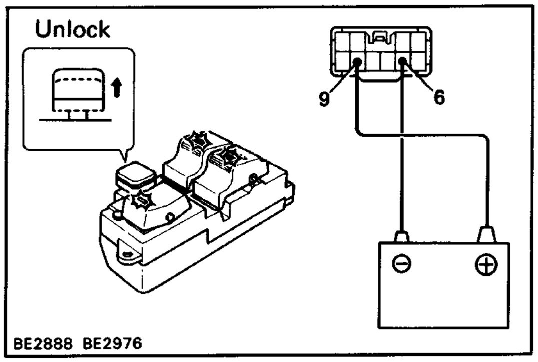
(Master Switch/Continuity)



BE2877
S-10-2

Window operation		Driver's				Passenger's			
Switch position \ Terminal		3	4	6	9	6	7	9	10
Window unlock	UP	O	O	O	O	O	O	O	O
	OFF	O	O	O		O	O		O
	DOWN	O	O	O	O	O	O	O	O
Window lock	UP	O	O	O	O			O	O
	OFF	O	O	O			O		O
	DOWN	O	O	O	O		O	O	

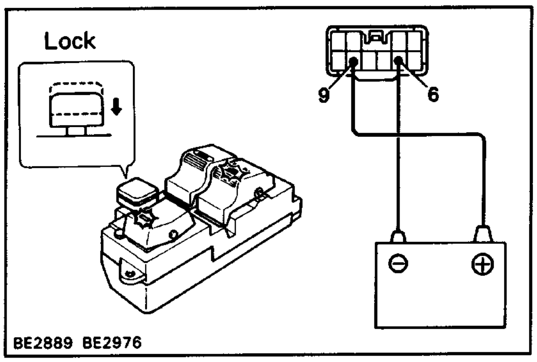
If continuity is not specified, replace the switch.



(Master Switch: Illumination)

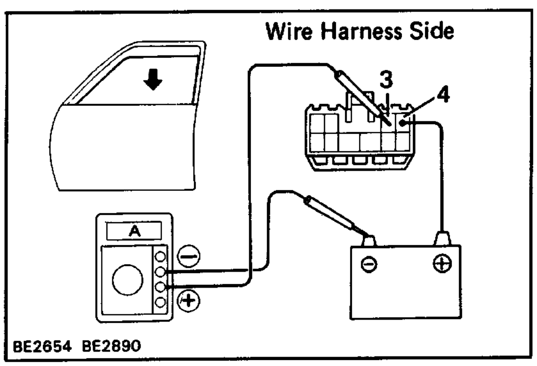
(a) Set the window lock switch to the unlock position.

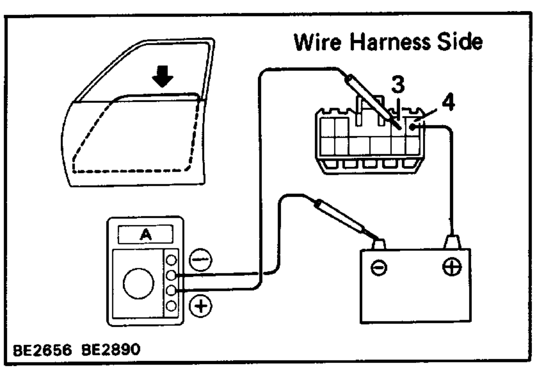
(b) Connect the positive (+) lead from the battery to terminal 9 and negative (–) lead to terminal6, check that all the illuminations light up.

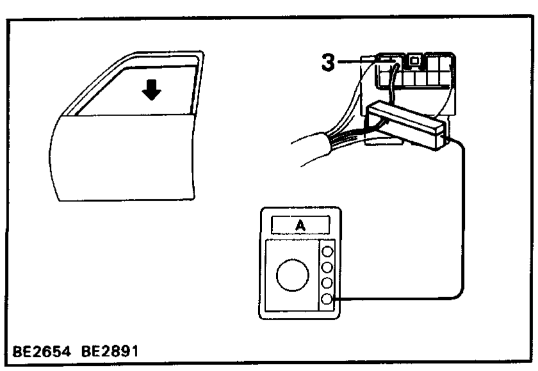


(c) Set the window lock switch to the lock position, check that the passenger's power window switch illumination goes out.

If operation is not as specified, replace the master switch.







(Master Switch: One Touch Power Window System)
Inspection using an ammeter:

(a) Disconnect the connector from the master switch.

(b) Connect the positive (+) lead from the ammeter to terminal 3 on the wire harness side connector and the negative (–) lead to negative terminal of the battery.

(c) Connect the positive (+) lead from the battery to terminal 4 on the wire harness side connector.

(d) As the window goes down, check that the current flows approximately 7 A.

(e) Check that the current increases approximately 14.5 A or more when the window stops going down.

HINT: The circuit breaker opens some 4–40 seconds after the window stops going down, so the check must be made before the circuit breaker operates.
If operation is not as specified, replace the master switch.

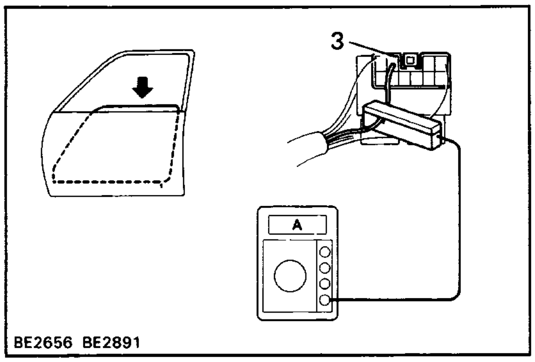
Inspection using an ammeter with a current–measuring probe:

(a) Remove the master switch with connector con–nected.

(b) Attach a current–measuring probe to terminal 3 of the wire harness.

i Turn the ignition switch ON and set the power win–
dow switch in the down position.

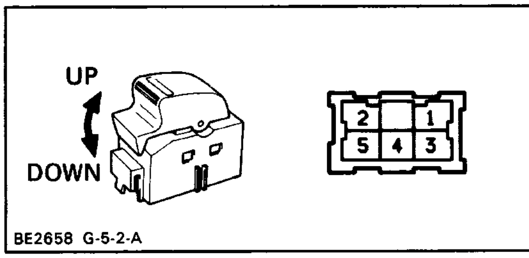
(d) As the window goes down, check that the current flows approximately 7 A.



(e) Check that the current increases approximately 14.5 A or more when the window stops going down.

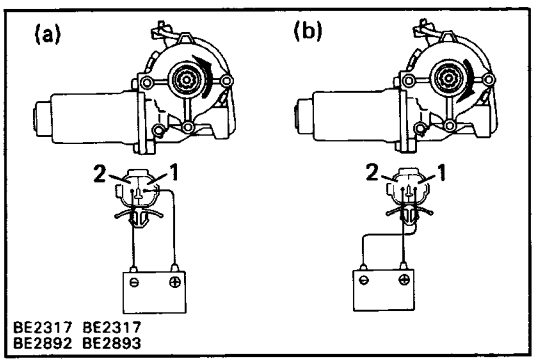
HINT: The circuit breaker opens some 4–40 seconds after the window stops going down, so that check must be made before the circuit breaker operates.
If operation is not as specified, replace the master switch.

(Power Window Switch/ Continuity)



Terminal / Switch position	1	2	3	4	5
UP	○				○
			○	○	
OFF	○	○	○	○	
DOWN	○	○		○	○

If continuity is not as specified, replace the switch.

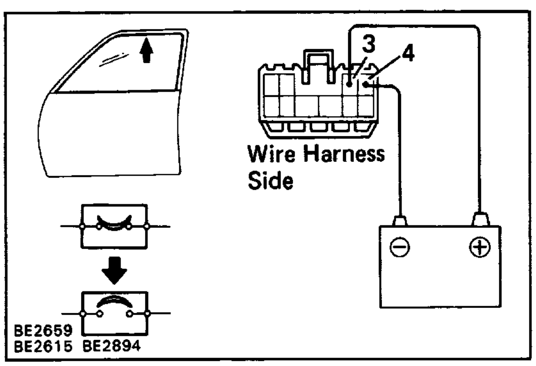


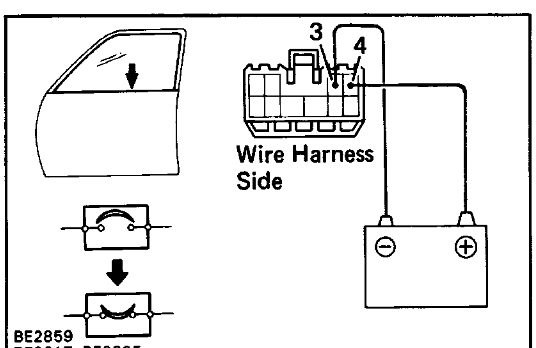
2. INSPECT POWER WINDOW MOTOR

(Left Side Door Motor/ Motor Operation)

(a) Connect the positive (+) lead from the battery to terminal 1 and negative (–) lead to terminal 2, check that the motor turns counterclockwise.

(b) Reverse the polarity, check that the motor turns clockwise.
If operation is not as specified, replace the motor.





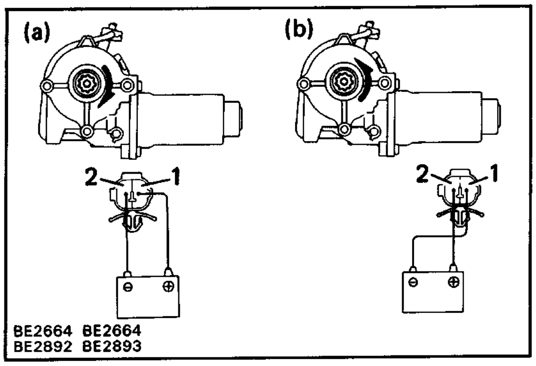
(Left Side Door Motor/ Circuit Breaker Operation)

(a) Disconnect the connector from the master switch.

(b) Connect the positive (+) lead from the battery to terminal 3 and negative (–) lead to terminal 4 on the wire harness side connector, and raise the window to full closed position.

(c) Continue to apply voltage, check that there is a cir–cuit breaker operation noise within approximately 4 to 40 seconds.

(d) Reverse the polarity, check that the window begins to descend within approximately 60 seconds.
If operation is not as specified, replace the motor.

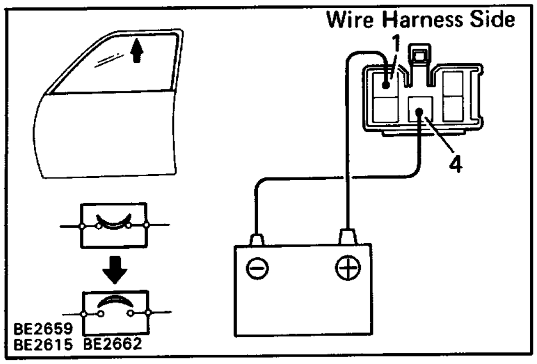


(Right Side Door Motor/ Motor Operation)

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2, check that the motor turns clockwise.

(b) Reverse the polarity, check that the motor turns counterclockwise.

If operation is not as specified, replace the motor.



(Right Side Door Motor/ Circuit Breaker Operation)

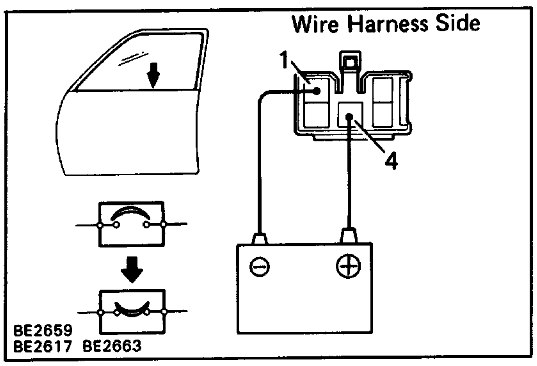
(a) Disconnect the connector from the power window switch.

(b) Connect the positive (+) lead from the battery to terminal 1 and negative (–) lead to terminal 4 on the
wire harness side connector, and raise the window to full closed position.

(c) Continue to apply voltage, check that there is a cir– cuit breaker operation noise within approximately 4 to 40 seconds.

(d) Reverse the polarity, check that the window begins to descend within approximately 60 seconds.

If operation is not as specified, replace the motor.

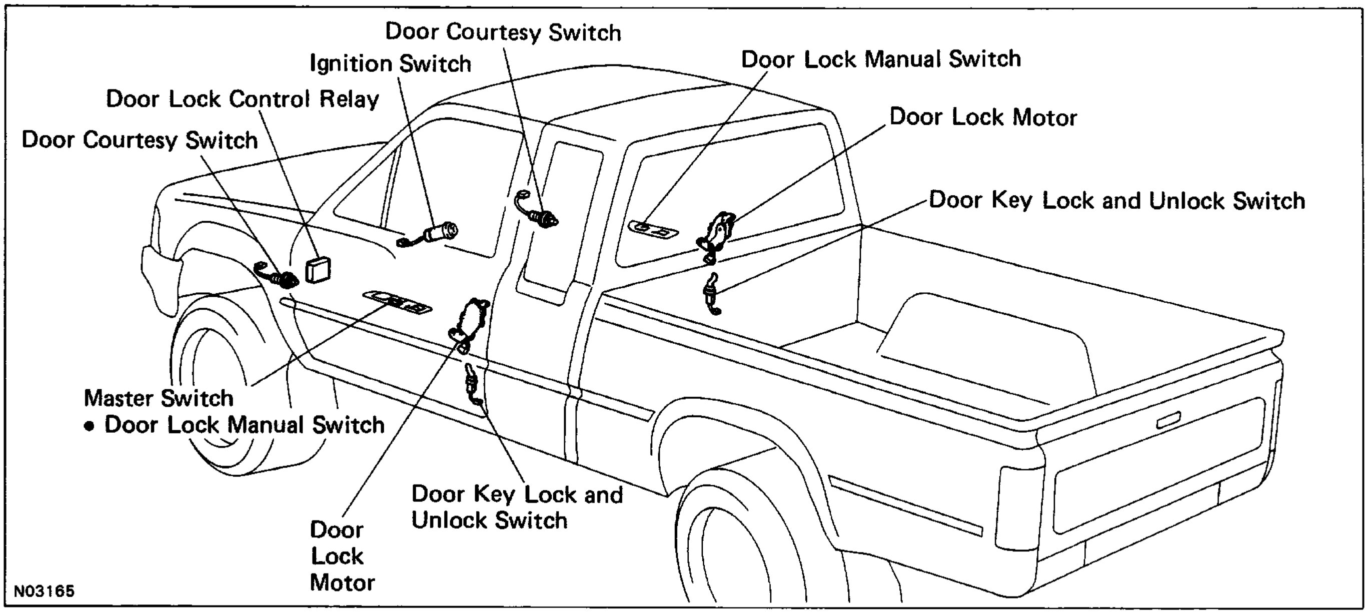


3. INSPECT DOOR LOCK CONTROL RELAY

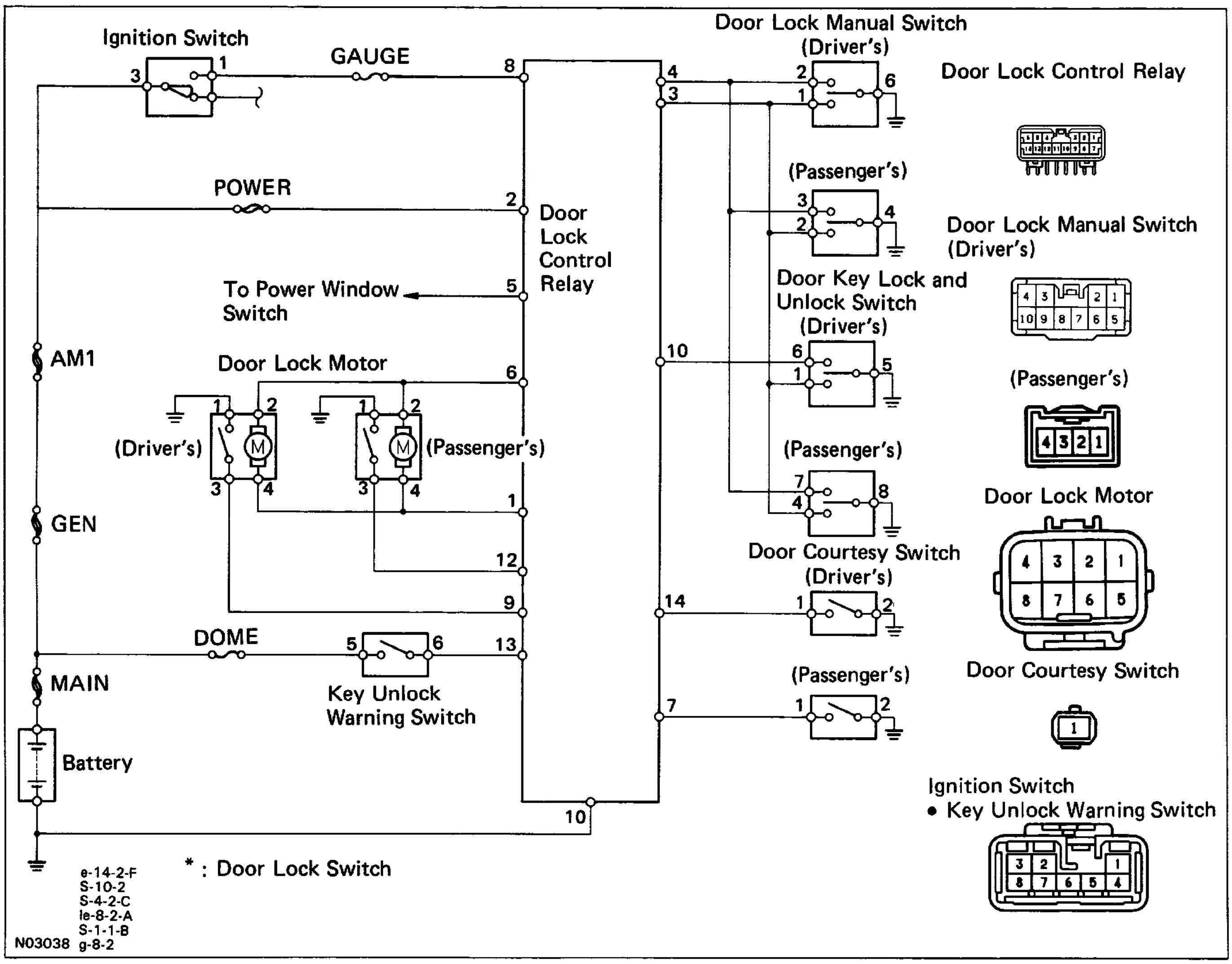
See step 3 of Power Door Lock Control System on page BE–52.

POWER DOOR LOCK CONTROL SYSTEM

Parts Location



Wiring and Connector Diagrams



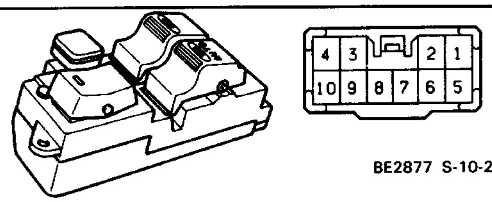
Troubleshooting

Problem	Possible cause	Remedy	Page
Door lock system does not operate at all	GAUGE fuse blown Door lock solenoid faulty Door lock control relay faulty Wiring or ground faulty	Replace fuse and check for short Check solenoid Check relay Repair as necessary	BE–3 BE–50 BE–51
Door lock system does not operate by manual switch	Door lock manual switch faulty Door lock control relay faulty Wiring or ground faulty	Check switch Check relay Repair as necessary	BE–49 BE–51
Door lock system does not operate by door key	Door key lock and unlock switch faulty Door lock control relay faulty Wiring or ground faulty	Check switch Check relay Repair as necessary	BE–49 BE–51

Parts Inspection

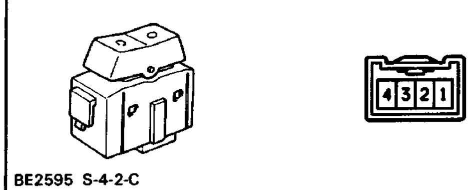
1. INSPECT SWITCHES

(Driver's Door Lock Manual Switch: in Master Switch/ Continuity)



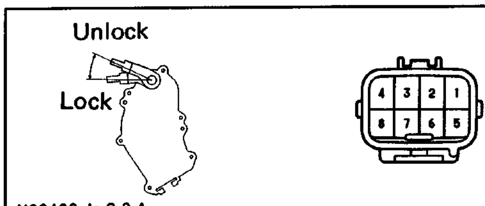
Terminal / Switch position	1	2	6
LOCK		O	O
OFF			
UNLOCK	O		O

(Passenger's Door Lock Manual Switch/ Continuity)



Terminal / Switch position	2	3	4
LOCK		O	O
OFF			
UNLOCK	O		O

(Door Key Lock and Unlock Switch/ Continuity)



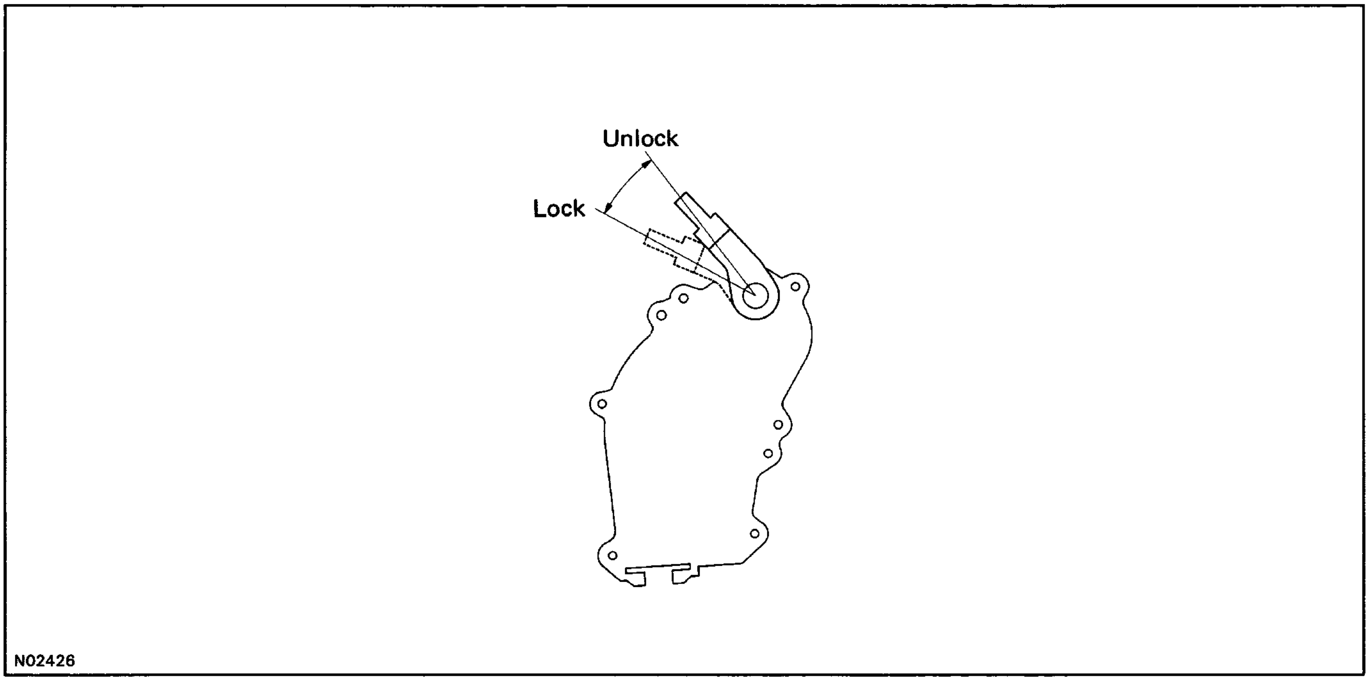
Terminal / Switch position	RH 4 / LH 1	8 / 5	7 / 6
LOCK		O	O
OFF			
UNLOCK	O	O	

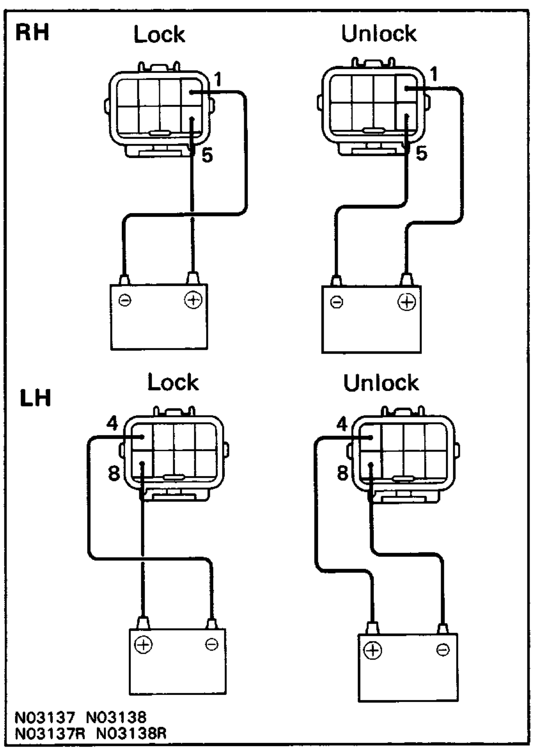
If continuity is not as specified, replace the switch.

(Key Unlock Warning Switch/ Continuity)
See Step I of Key Confine Prevention System on page BE–9.
(Door Courtesy Switch/ Continuity)
See Step of Open Door Warning System on page BE–41.

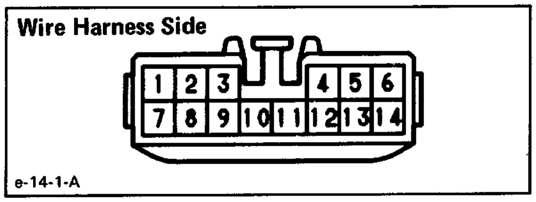
HINT: Door key lock and unlock switch is built into the front door lock assembly.

2. INSPECT DOOR LOCK MOTOR
(Motor Operation)





(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 5, check that the door lock link moves to UNLOCK position.
(b) Remove the polarity, check that the door lock link move to LOCK position.
If operation is not as specified, replace the door lock assembly.
(c) Connect the positive (+) lead from the battery to terminal 4 and the negative (–) lead to terminal 8, check that the door lock link moves to UNLOCK position.
(d) Remove the polarity, check that the door lock link move to lock position.
If operation is not as specified, replace the door lock assembly.



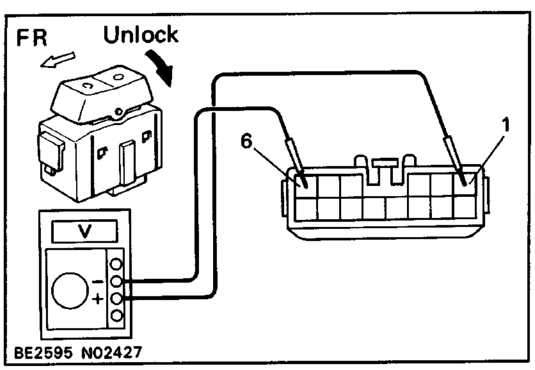
3. INSPECT DOOR LOCK CONTROL RELAY

(Relay Circuit)

Disconnect the connector from the relay and inspect the connector on the wire harness side as shown in the chart.

Check for	Tester connection	Condition		Specified value
Continuity	3 — Ground	Door lock manual switch or door key lock and unlock switch position	OFF or LOCK	No continuity
			Unlock	Continuity
	4 — Ground	Door lock manual switch or door key lock and unlock switch position	OFF or Unlock	No continuity
			Lock	Continuity
	7 — Ground	Passenger's door courtesy switch position	OFF (Door closed)	No continuity
			ON (Door opened)	Continuity
	9 — Ground	Driver's door lock switch position	Unlock	Continuity
			Lock	No continuity
	11 — Ground	Constant		Continuity
	12 — Ground	Passenger's door lock switch po–sition	Unlock	Continuity
			Lock	No continuity
	14 — Ground	Driver's door courtesy switch position	OFF (Door–closed)	No continuity
			ON (Door opened)	Continuity
Voltage	2 — Ground	Constant		Battery positive voltage
	8 — Ground	Ignition switch position	LOCK or ACC	No voltage
			ON	Battery positive voltage
	13 — Ground	Key unlock warning switch posi–tion	OFF (Ignition key removed)	No voltage
			ON (Ignition key set)	Battery positive voltage

If circuit is as specified, inspect the door lock signal and key–off power window signal.



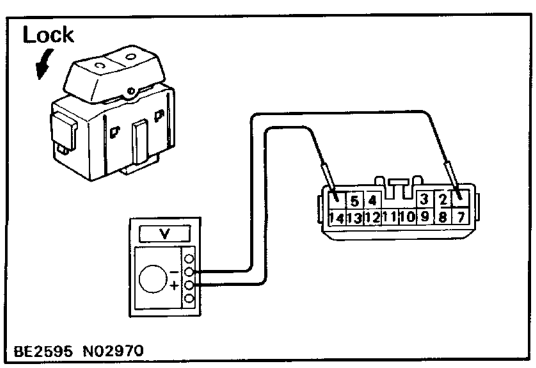
(Door Lock Signal)

HINT: When the relay circuit is as specified, inspect the door lock signal.

(a) Connect the connector to the relay.

(b) Connect the positive (+) lead from the voltmeter to terminal 1 and negative (–) lead to terminal 6.

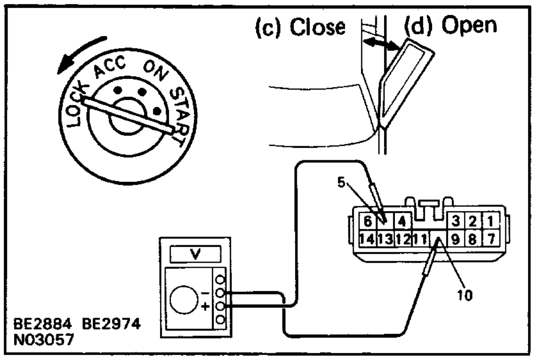
(c) Set the door lock manual switch to UNLOCK, check that the voltage rises from 0 V to battery positive voltage for approximately 0.2 seconds.

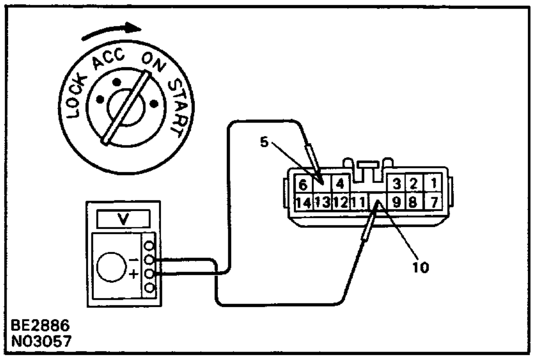


(d) Reverse the polarity of the voltmeter leads.

(e) Set the door–lock manual switch to LOCK, check that the voltage rises from 0 V to battery positive voltage for approximately 0.2 seconds.

If operation is not as specified, replace the relay.



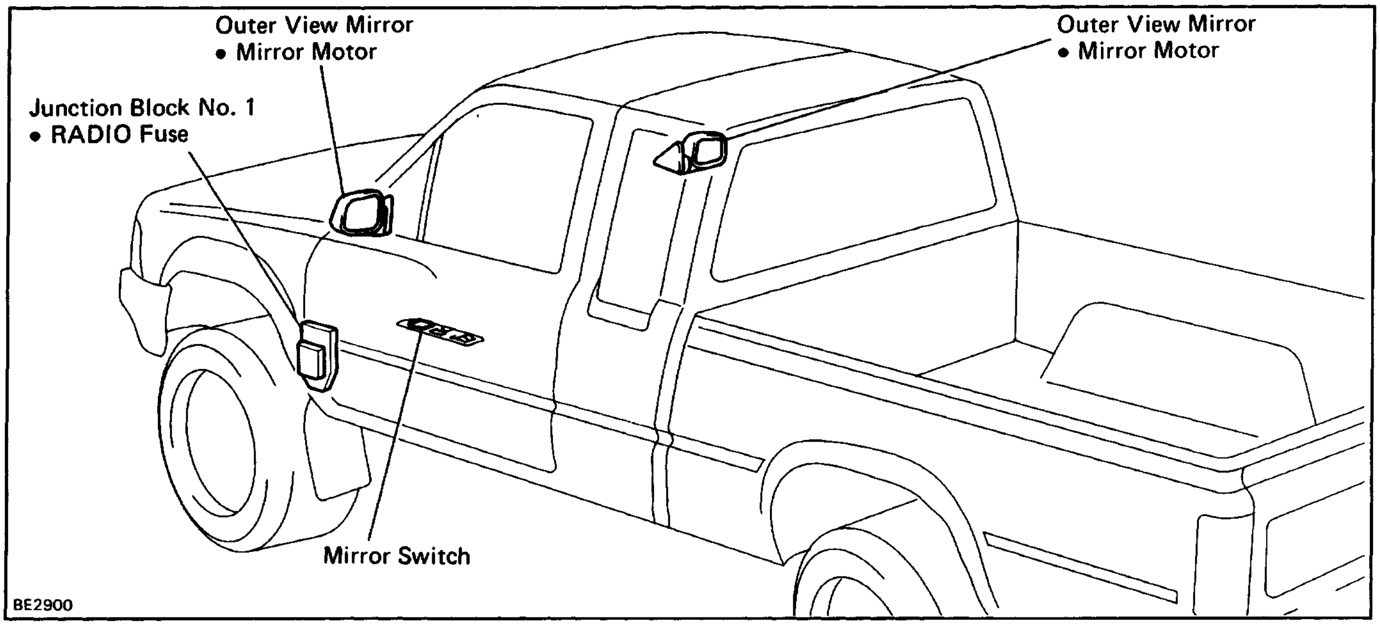


(Key–Off Power Window Signal)

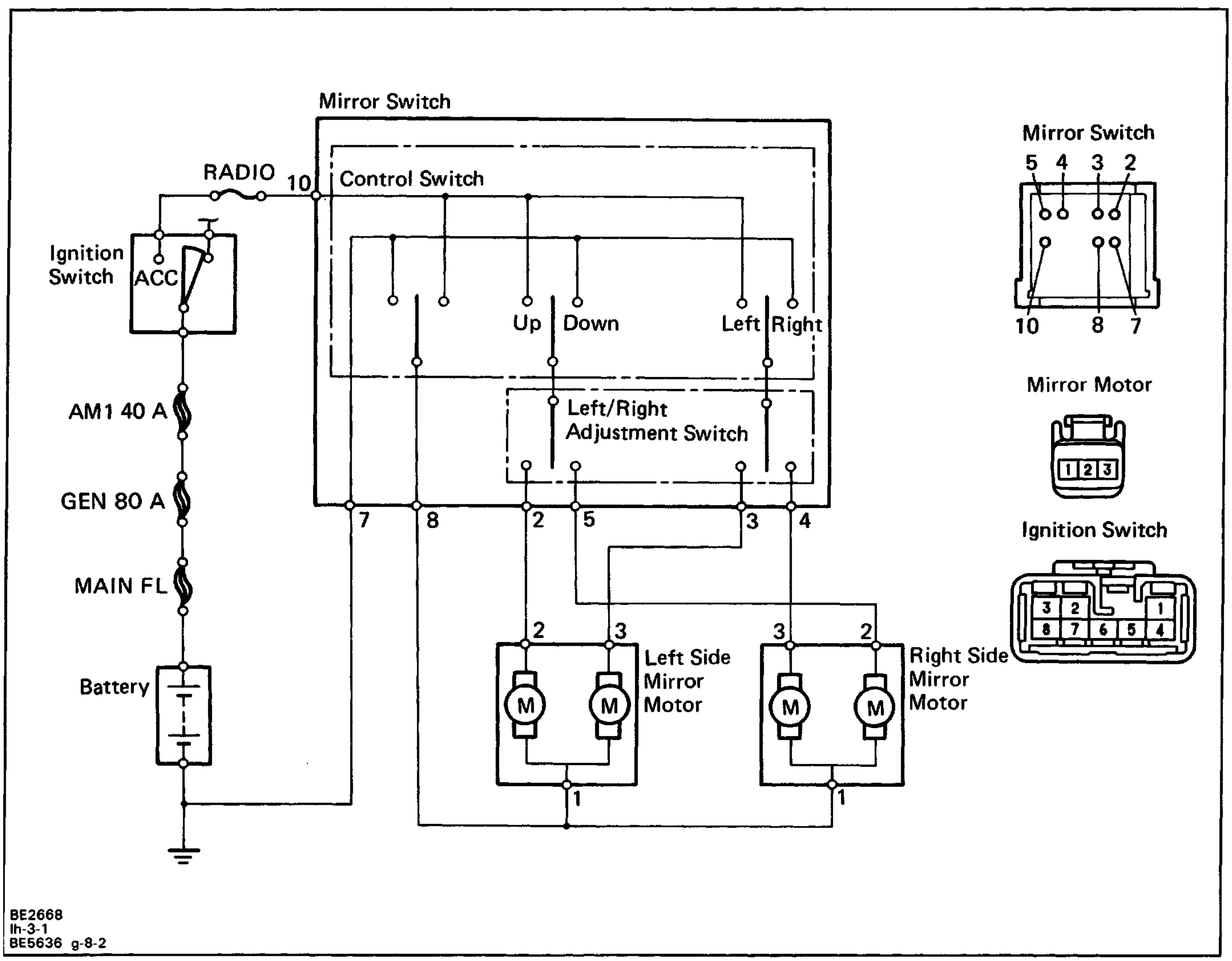
HINT: When the relay circuit is as specified, inspect the key–off power window signal.
(a) Connect the connector to the relay.
(b) Connect the positive (+) lead from the voltmeter to terminal 5 and negative (–) lead to terminal 10.
(c) Close the door with ignition switch turned to LOCK or ACC, check that the meter needle indicates battery positive voltage.
(d) Open the door, check that the meter needle indicates 0 V.
(e) Turn the ignition switch ON, check that the meter needle indicates battery positive voltage again.
If operation is not as specified, replace the relay.

POWER MIRROR CONTROL SYSTEM

Parts Location



Wiring and Connector Diagrams

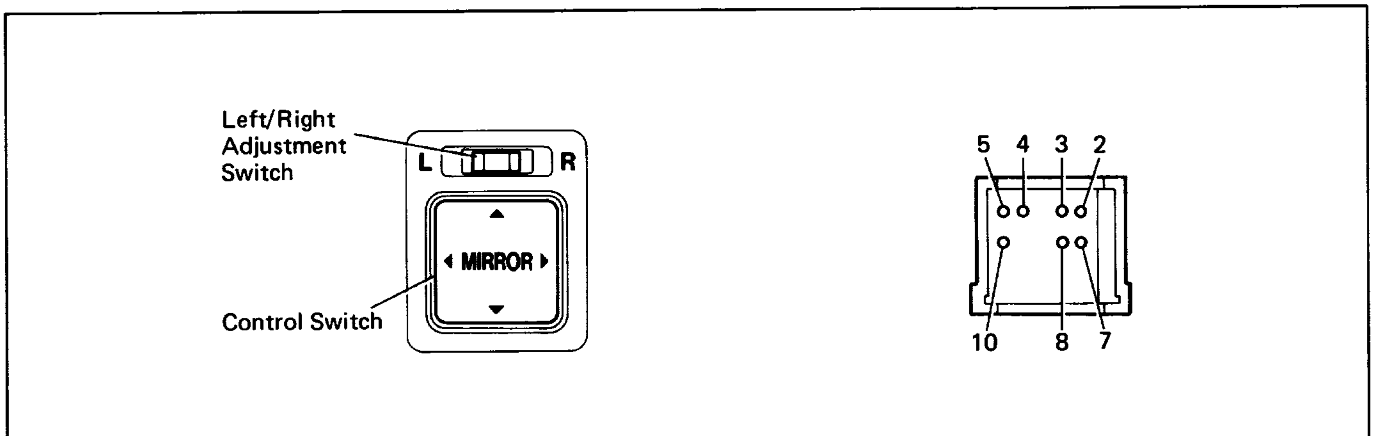


Troubleshooting

Problem	Possible cause	Remedy	Page
Remote control mirror system does not operate	RADIO fuse blown	Replace fuse and check for short	BE–3
	Mirror switch faulty	Check switch	BE–54
	Mirror motor faulty	Check motor	BE–55
	Wiring or ground faulty	Repair as necessary	

Parts Inspection

1. INSPECT MIRROR SWITCH (CONTINUITY)

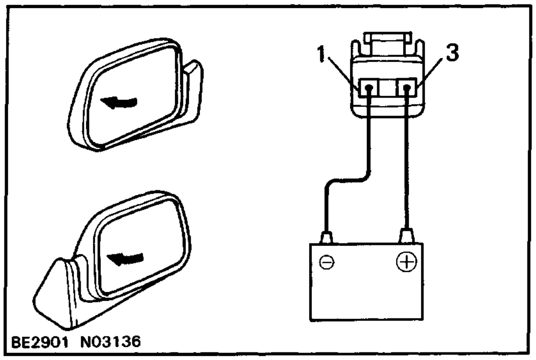


BE2357 BE2989

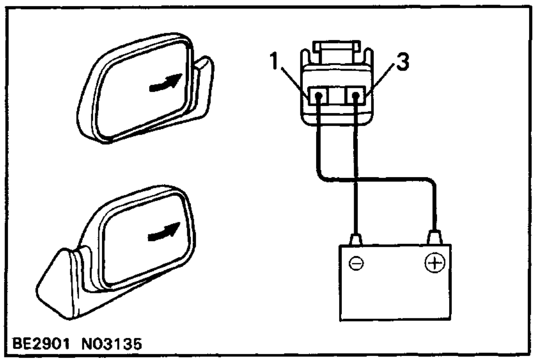
Left/Right adjustment switch position	LEFT SIDE					OFF			RIGHT SIDE				
Terminal / Control switch position	2	3	7	8	10	7	8	10	4	5	7	8	10
OFF													
UP	○				○	○	○			○			○
UP			○	○							○	○	
DOWN	○		○	○	○		○	○		○	○	○	○
LEFT		○			○	○	○		○				○
LEFT			○	○							○	○	
RIGHT		○	○	○	○		○	○	○		○	○	○

If continuity is not as specified, replace the switch.

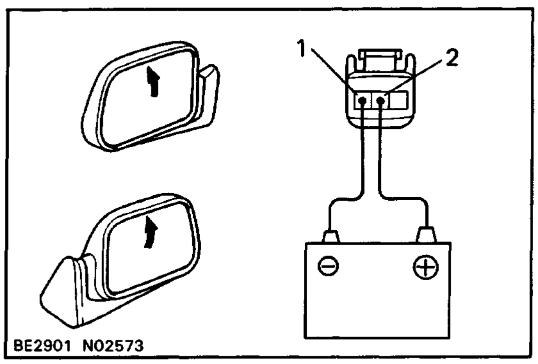
2. INSPECT MIRROR MOTOR



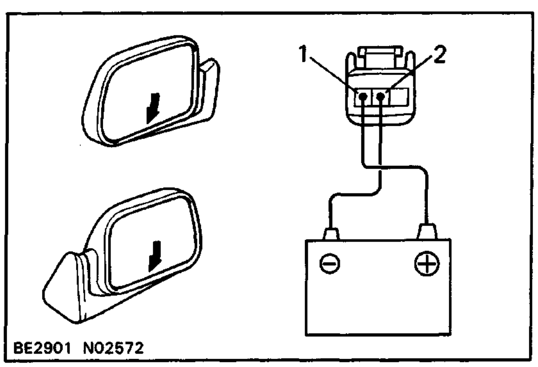
(a) Connect the positive (+) lead from the battery to terminal 3 and negative (–) lead to terminal 1, check that the mirror turns to left side.



(b) Reverse the polarity, check that the mirror turns to right side.



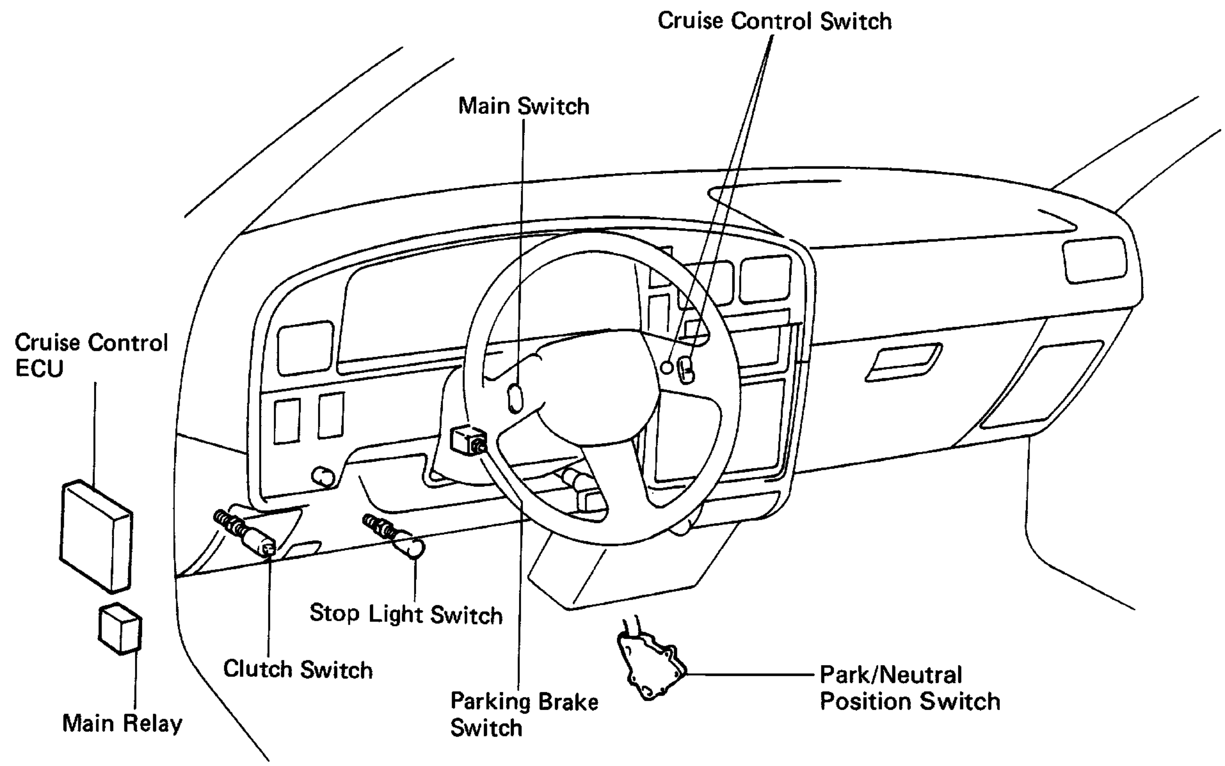
(c) Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 1, check that the mirror turns upward.



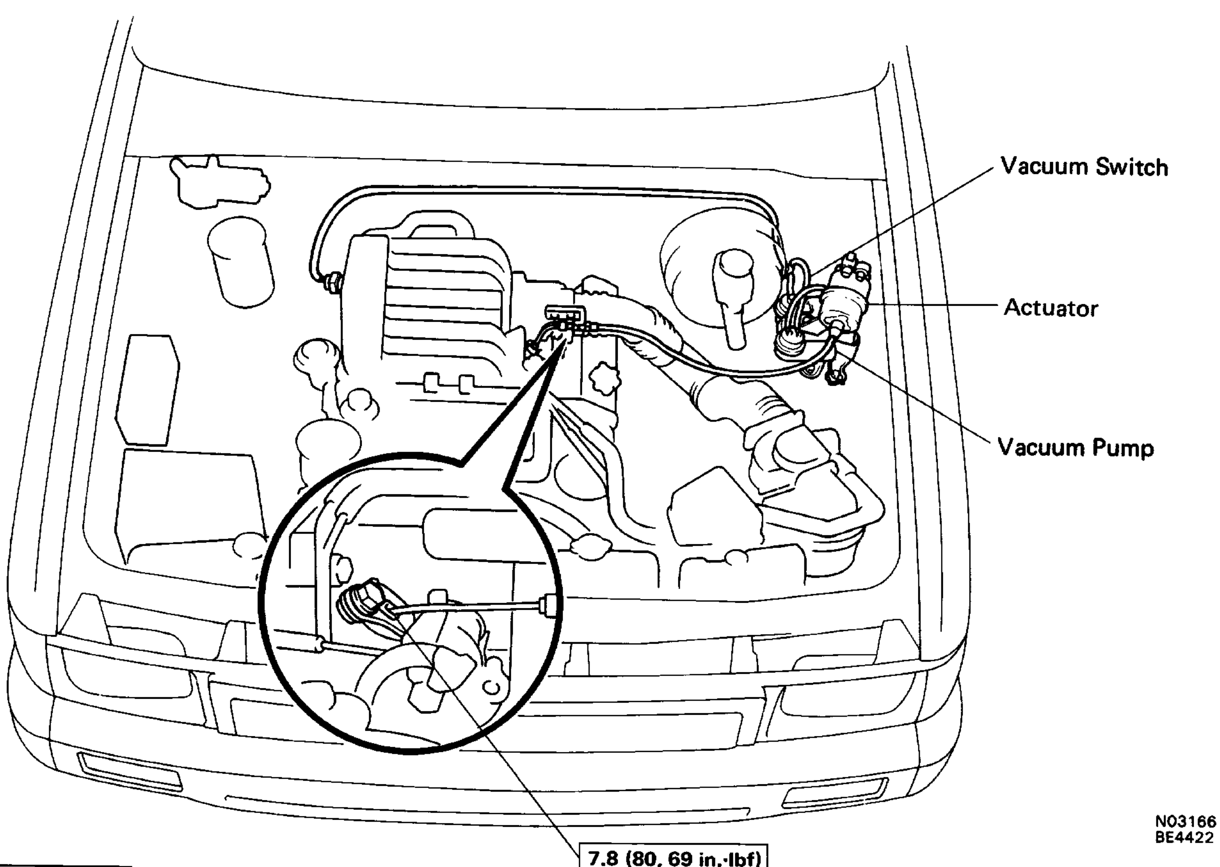
(d) Reverse the polarity, check that the mirror turns downward.

If operation is not as specified, replace the mirror assembly.

CRUISE CONTROL SYSTEM
Parts Location

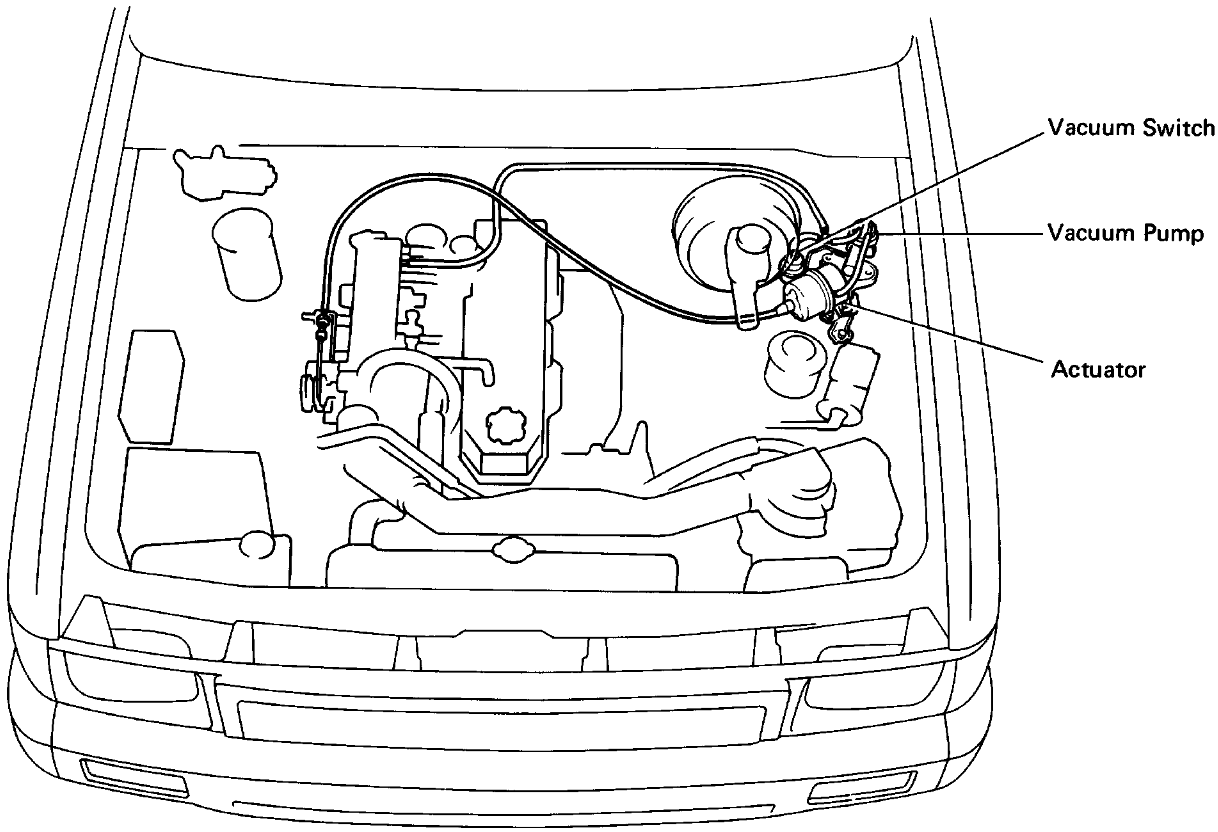


3VZ-E ENGINE



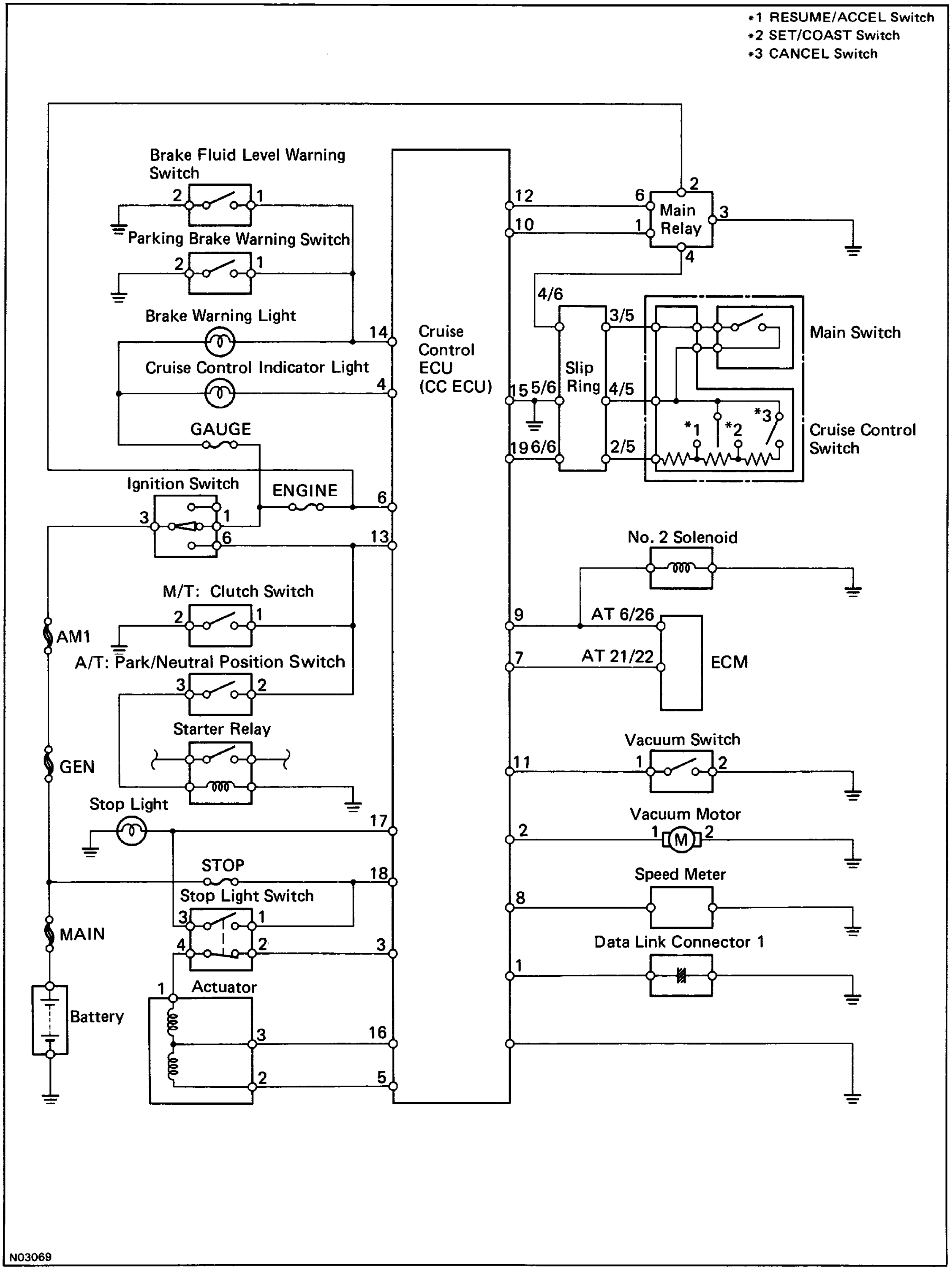
N·m (kgf·cm, ft·lbf) : Specified torque

22R-E ENGINE



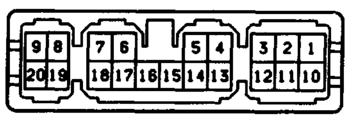
BE3035

Wiring Diagram

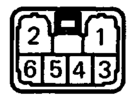


Connector Diagrams

Cruise Control ECU



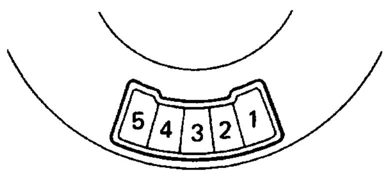
Main Relay



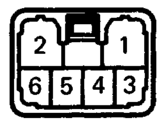
Main Switch

Cruise Control Switch

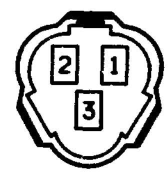
Slip Ring Speed
(Control Switch Side)



(Wire Harness Side)

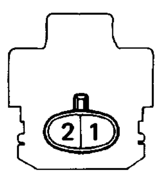


Actuator

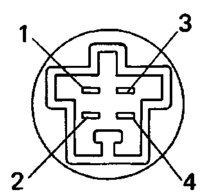


Vacuum Pump

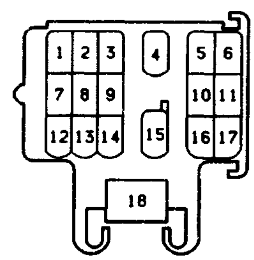
Vacuum Switch



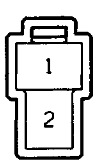
Stop Light Switch



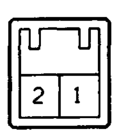
Data Link Connector 1



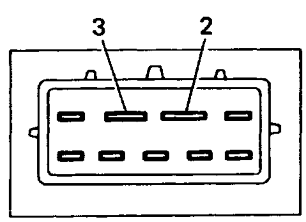
Parking Brake Switch



Clutch Switch



Park/Neutral Position Switch



S-20-2 S-6-2 IS-2-2-C S-5-1-B GA-2-1-C
BE1930 S-6-2 IS-3-2-A
IS-2-2-0 BE5756 SH18-1
H-2-2 G-2-2 BE1485

System Description

Standby Operation

- When the ignition switch is turned ON (IG), current flows from the battery to terminal 6 of the Cruise Control ECU (hereafter called ECU).
- When the ignition switch is turned ON (IG), current flows from the battery to terminal 2 of the Main Relay.

Operation

1. MAIN SWITCH OPERATION

When the main switch is pushed ON, current flows from terminal 2 of the main relay ∞ terminal 4 ∞terminal 4!6 of the slip ring–i terminal 3I5–terminal 3/5 ∞ of the cruise control switch (hereafter called SCS)–i terminal 1/2 ∞ terminal 1 of the main switch–terminal 2 ∞/terminal 2I2 of the SCS ∞ ter–minal 4I5 ∞ terminal 4/5 of the slip ring ∞ terminal 5/6 ∞ ground.
As a result, the main relay turned ON ∞ current flows to terminal 12 of ECU.
After that, current flows through the ”CRUISE” indicator light to terminal 4 of the ECU.
Therefore, the main switch remains on and continues to supply current to terminal 12 of the ECU.

2. SPEED CONTROL SWITCH OPERATION

The cruise control switch controls the SET, COAST, RESUME, ACCEL and CANCEL functions.
When the each speed control switch is pushed ON, sends a signal (each voltage) from terminal 2I5 of the SCS ∞ terminal 2l5 of the slip ring ∞ terminal 6/6 ∞ terminal 19 of the ECU.
Then, the vehicle speed at the moment the switch (SET position) is released is registered in memory.

3. SPEED CONTROL OPERATION

When the vehicle speed is set by the cruise control switch, the ECU send a signal from terminal 3 of the ECU terminal 2 of the stop light switch ∞ terminal 4 ∞ terminal 1 of the actuator (release valve side).
At the same time, the ECU sends a signal from terminal 5 of the ECU ∞ terminal 2 of the actuator (control valve side).
Then, the actuator increases or decreases the throttle valve opening angle in accordance with the sig–nal from the ECU.

4. CANCEL OPERATION

The Cruise Control System is provided with several types of the cancel, such as the cruise control switch (CANCEL), the stop light switch, the parking brake switch and the park/neutral position switch (AM or clutch switch (M/T).

(a) Cruise Control Switch (CANCEL)

When the cruise control switch (CANCEL) is pushed ON, sends a cancellation signal from terminal 2/5 of the SCS ∞ terminal 2I5 of the slip ring ∞ terminal 6/6 ∞ terminal 9 of the ECU.

(b) Parking Brake Switch

When the parking brake lever is pulled, the parking brake switch turned ON ∞ Sends a cancella–tion signal (ground voltage) to terminal 14 of the ECU.

(c) Park/Neutral Position Switch (A/T)

When the shift lever is set to the ”N” or ”P” position, the park/neutral position switch turned ON ∞ sends a cancellation signal (ground voltage) to terminal 14 of the ECU.

(d) Clutch Switch (M/T)

When the clutch pedal is depressed, the clutch switch is turned ON ∞ sends a cancellation signal (ground voltage) to terminal 13 of the ECU.

(e) Stop Light Switch

When the brake pedal is depressed, the SW B of stop light switch is turned OFF ∞ the release valve (in actuator) is opened, and the SW A of stop light switch is turned ON ∞ sends a cancel–lation signal to terminal 17 of the ECU.

Therefore, the operation of the cruise control system is canceled and the actuator is shut off due to the operation of these switches.

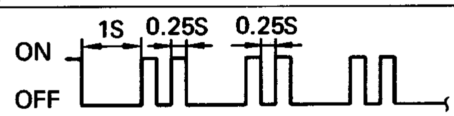
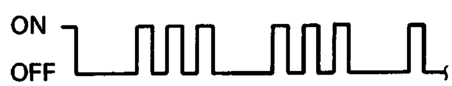
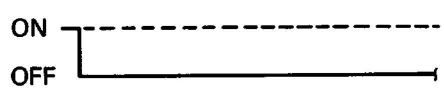
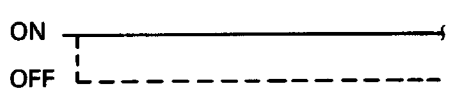
Diagnosis System

Output of Diagnostic Trouble Code

READ DIAGNOSTIC TROUBLE CODE

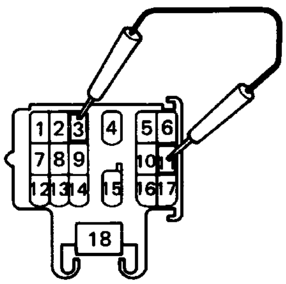
(Type A)

(a) Turn the ignition switch on.
(b) Push the SET/COAST switch on, and keep it on.
(c) Push the main switch on.
(d) Check that the indicator light ”CRUISE” light–on in the combination meter and after 3 seconds check that the indicator light ”CRUISE” blinks.
(e) Turn the SET/COAST switch off.
(f) Meet the conditions listed below.
(g) Read the diagnostic trouble code on the indicator light ”CRUISE”.

No.	Conditions	Indication code	Diagnosis
1	Push the cruise control switch SET/COAST on.	 BE1931	SET/COAST circuit is normal.
2	Push the cruise control switch RESUMEIACCEL on.	 BE1932	RESUMEIACCEL circuit is normal.
3	Vacuum switch is turned ON.	 BE1934	Vacuum switch circuit is normal.
4	Each cancel switch turned ON. • Cruise control switch (to CANCEL) • Stop light switch • Park/Neutral Position switch (to N or P Position) • Clutch switch • Parking brake switch	 BE1935	Each cancel switch is normal.
5	Drive approx. 40 km/h (25 mph) or over.	 BE1937	Speed sensor circuit is normal.
6	Drive approx. 40 km/h (25 mph) or below.	 BE1938	Speed sensor circuit is normal.

HINT:
- Indication codes appear in order from No. 1.
- If there is no indication code, perform diagnosis and in–spection. (See page BE–64)
- Indication is stopped, when the MAIN switch is re–pushed.

Diagnosis Data Link Connector 1

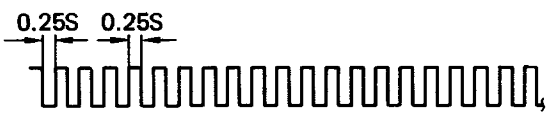
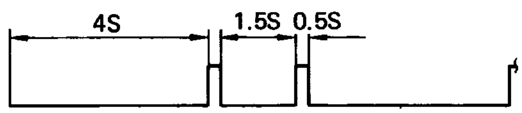
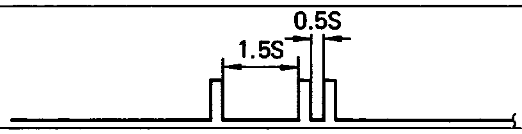
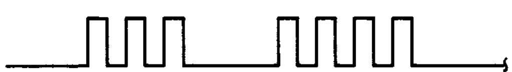


(Type6)

(a) If while driving with the cruise control on, the sys–tem is canceled by a malfunction in either the actuator, speed sensor or cruise control switch circuit, the cruise control indicator light "CRUISE" will blink 5 times.

(b) While stopping, connect terminals 3 and 1 1 of the data link connector 1.
HINT: Should the ignition switch turned off, the diagnostic trouble code will be erased from the computer memory.

(c) Read the diagnostic trouble code on the indicator light "CRUISE".

Indication code		Diagnosis
		Normal.
11		Control valve circuit of actuator is abnormal.
12		Release valve circuit of actuator is abnormal.
21		Speed sensor circuit is abnormal.
23		*Vehicle speed has decreased by 16 km/h (10 mph) or more from the set speed.
32		SET/COAST switch signal and RESUMEIACCEL switch signal stay on simultaneously.
34		Control switch does not turn off before switching.
* If the set speed can be maintained when the speed control switch is again set at SET/COAST, there is no malfunction .		

When 41 code is indicated, replace the cruise control ECU.

41	

HINT:

¿

- Indication codes appear in order from No. 11
- If there is no indication code, perform diagnosis and in–spection. (See page BE–84)

Troubleshooting

You will find the troubles easier using the table well shown below. In this table, each number shows the priority of causes in troubles. Check each part in order.

Chart No.					C	A	B	E	G, H	F	I	I	D		
Inspection Item / Problem	Diagnosis Code Type B	Type A		ECU	Actuator	Main Switch	Control Switch	Stop Light Switch	Clutch Switch or Park/ Neutral Position Switch	Parking Brake Switch	Vacuum Switch	Vacuum Pump	Speed Sensor' or Speedometer Cable	Speedometer Cable Function	Others
• "CRUISE" indicator light blinks 5 time. • Cruise control system does not set. • Cruise control system does not operate.	11			2	1										
	12			3	1			2							
	21			2									1		
	23			6	2						5	4	3	1	*2
	32			2			1								
	Normal	5	OK	8	7	1	2	3	4	5				6	*3
			NG	2									1		
Setting speed deviated on high or low side.		3	OK	6	5						4	3	2	1	
			NG								1				
Vehicle speed fluctuates when speed con–trol switch turned to SET.				4	3								1	2	
Setting speed does not cancel when brake pedal depressed.		4	OK	3	1			2							
			NG	2				1							
Setting speed does not cancel when park–ing brake lever pulled.		4	OK	2	1										
			NG	2						1					
Setting speed does not cancel when shifted to "N" position. (A/T)		4	OK	2	1										
			NG	2					1						
Setting speed does not cancel when clutch pedal depressed. (M/T)		4	OK	2	1										
			NG	2					1						
Vehicle speed does not decrease when cruise control switch turned to COAST.		1	OK	3	1									2	
			NG	2			1								
Vehicle speed does not accelerate when cruise control switch turned to ACCEL.		2	OK	3	1									2	
			NG	2			1								
Vehicle speed does not return to memo–rized speed when control switch turned on RESUME.		2	OK	3	1									2	
			NG	2			1								
Setting speed does not cancel when cruise control switch turned to CANCEL.		4	OK	2	1										
			NG	2			1								
Speed can be set below about 40 km/h (25 mph).		5	OK	2	1										
			NG	2									1		
Cruise control will not disengage even at about 40 km/h (25 mph).		5	OK	2	1										
			NG	3									1	2	
Acceleration response is sluggish when cruise control switch turned to "ACCEL" or "RESUME".		3	OK	4	3							2		1	*2
			NG								1	2			

" : in the Speedometer   Vacuum Hose   *3: Vacuum Hose & Brake Fluid

Inspection Chart

A INSPECTION OF POWER SOURCE CIRCUIT

Turn ignition switch on

Is ENGINE fuse normal?

No → Replace fuse. Is operation nor–mal?

No →
- Short circuit in wire harness between EN–GINE fuse and terminal 2 of main relay.
- Inspect main relay.
(See page BE–82)

Yes → Fuse faulty.

Yes

MAIN RELAY

INSPECT GROUND CONNECTION
Disconnect connector from main relay.
Is there continuity between terminal 3 of main relay and ground?

No →
- Open circuit in wire harness between terminal 3 of main relay and ground.
- Ground faulty.

Yes

INSPECT POWER SOURCE
Is there battery positive voltage between ter–minal 2 of main relay and ground with ignition switch turned on?

No → Open circuit in wire harness between EN–GINE fuse and terminal 2 of main relay.

Yes

INSPECT MAIN RELAY OPERATION
Is main relay operation normal?
(See page BE–81)

No → Main relay faulty.
Replace main relay. Then recheck system.

Yes

Is there continuity between terminal 6 on wire harness side connector and ground?

Yes → Short circuit in wire harness between terminals6 of main relay and 12 of CC ECU.

No

Is there continuity between terminal 1 on wire harness side connector and ground?

Yes → Short circuit in wire harness between terminals 1 of main relay and 10 of CC ECU.

No

CONTINUED ON NEXT PAGE

CONTINUED FROM PREVIOUS PAGE

Disconnect combination switch connector.

Is there continuity between terminal 4 of main relay connector on wire harness side and ground?

Yes → Short circuit in wire harness between terminals 4 of main relay and 4l6 of slip ring.

No

Connect connector to main relay.

SLIP RING

Disconnect connectors from slip ring.

INSPECT POWER SOURCE
Is there battery positive voltage between terminal 4l6 on wire harness side connector and ground with ignition switch turned on?

No → Open circuit in wire harness between terminals 4 of wire harness side connector and 4l6 of slip ring.

Yes

INSPECT GROUND CONNECTION
Is there continuity between terminal 5l6 on wire harness side connector and ground?

No → Open circuit in wire harness side between terminal 5l6 of slip ring and ground.

Yes

INSPECT SLIP RING CONTINUITY
Is slip ring continuity normal?
(See page BE–81)

No → Slip ring faulty.
Replace slip ring. Then recheck system.

Yes

MAIN SWITCH

Disconnect connector from main switch.

Is there continuity between terminals 1l2 and 3l5 of speed control switch?

No → Open circuit in speed control switch between terminals 1/2 and 3l5.

Yes

INSPECT MAIN SWITCH CONTINUITY
Is main switch continuity normal?
(See page BE–80)

No → Main switch faulty.
Replace main switch. Then recheck system.

Yes

CONTINUED ON NEXT PAGE

CONTINUED FROM PREVIEWS PAGE

Is there continuity between terminals 2I2 and 4I5 of speed control switch?

No → Open circuit in cruise control switch be– tween terminals 2I2 and 4I5.

Yes ↓

Connect connectors to slip ring.

↓

INSPECT POWER SOURCE
Is there battery positive voltage between ter– minal 1/2 of cruise control switch and ground with ignition switch turned on?

No → Short circuit in wire harness between ter– minals 1/2 and 3/5 of cruise control switch.

Yes ↓

Connect connector to main switch.

↓

ECU

Disconnect connector from CC ECU and in– spect connector on wire harness side as fol– lows.

↓

INSPECT GROUND CONNECTION
Is there continuity between terminal 15 and ground?

No →
- Open circuit in wire harness between terminal 15 and ground.
- Ground faulty.

Yes ↓

INSPECT POWER SOURCE
Is there battery positive voltage between ter– minal 12 and ground with ignition switch and main switch is turned on?

No → Open circuit in wire harness between ter– minals 12 of CC ECU and 6 of main relay.

Yes ↓

Disconnect connector from main relay.

↓

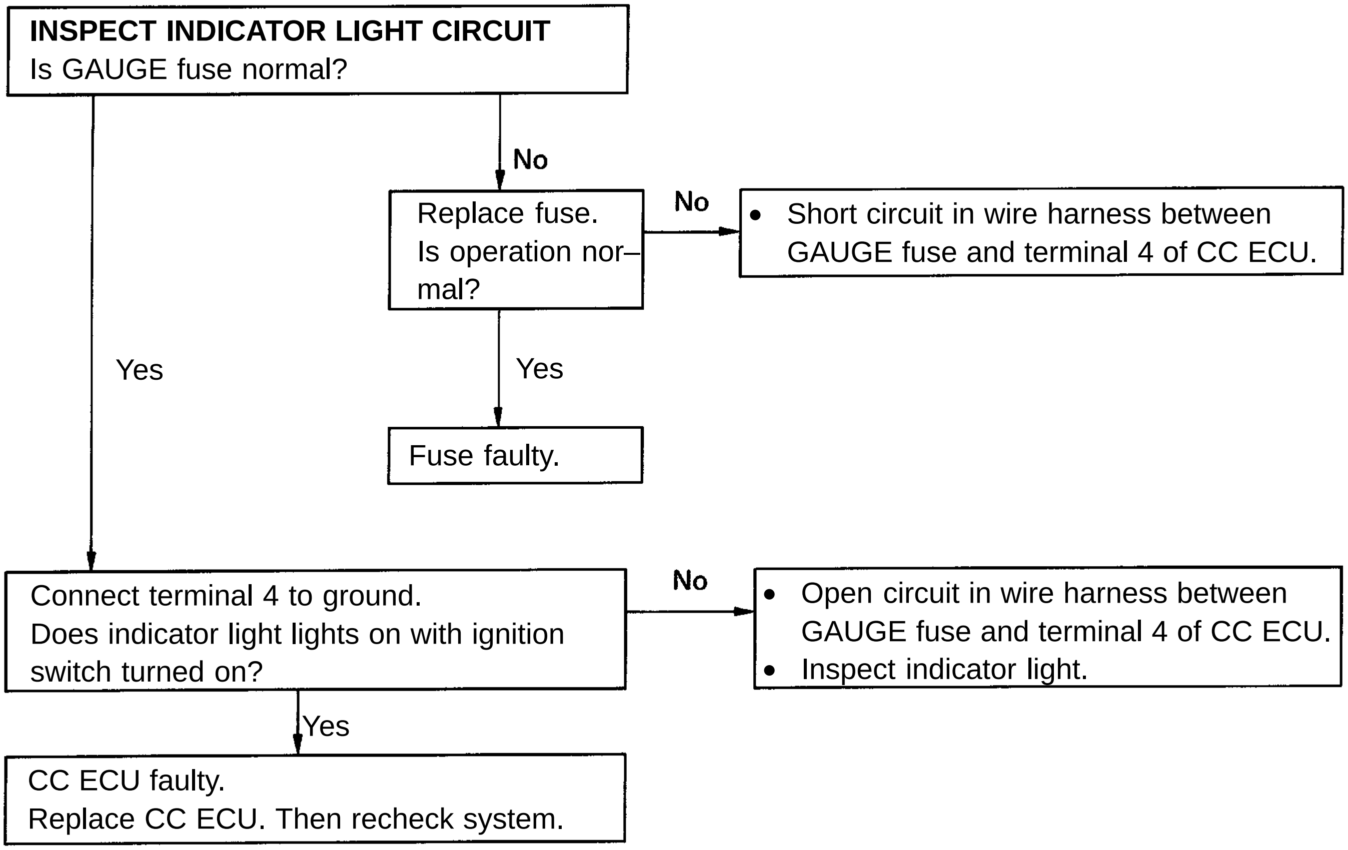
Is there continuity between terminals 10 of CC ECU and 1 of main relay wire harness side connector?

No → Open circuit in wire harness between ter– minals 10 of CC ECU and 1 of main relay.

Yes ↓

CONTINUED ON NEXT PAGE

CONTINUED ON PREVIOUS PAGE



B | INSPECTION OF CRUISE CONTROL SWITCH CIRCUIT

Turn ignition switch off.

CRUISE CONTROL SWITCH

Disconnect connector from control switch.

INSPECT CONTROL SWITCH
Is control switch operation normal?
(See page BE–81)

No → Speed control switch faulty.
Replace cruise control switch. Then re–check system.

Yes ↓

SLIP RING

Disconnect connector from slip ring.

INSPECT GROUND CONNECTION
Is there continuity between terminal 5I6 on wire harness side connector and ground?

No →
- Open circuit in wire harness between terminal 5I6 of slip ring and ground.
- Ground faulty.

Yes ↓

INSPECT SLIP RING CONTINUITY
Is slip ring continuity normal?
(See page BE–82)

No → Slip ring faulty.
Replace slip ring. Then recheck system.

Yes ↓

ECU

Connect connectors to slip ring.
Disconnect connector from CC ECU and in–spect connector on wire harness side as fol–lows.

INSPECT GROUND CONNECTION
Is there continuity between terminal 15 and ground?

No →
- Open circuit in wire harness between terminal 15 of CC ECU and ground.
- Ground faulty.

Yes ↓

INSPECT CRUISE CONTROL SWITCH CIRCUIT
Is there no continuity between terminals 19 and 15 with control switch is off?

No → Short circuit in wire harness between ter–minal 19 of CC ECU and terminal 6I6 of slip ring.

Yes ↓

Is there approx. 68/ between terminals 19 and 15 with control switch RESUME/ACCEL is pushed on?

No → Open circuit in wire harness between ter–minal 19 of CC ECU and terminal 6I6 of slip ring.

Yes ↓

CC ECU faulty.
Replace CC ECU. Then recheck system.

C INSPECTION OF ACTUATOR CIRCUIT

Turn ignition switch off.

VACUUM HOSE

Are there cracks or other damage on the vac–uum hose?

Yes → Vacuum hose faulty. Replace vacuum hose. Then recheck sys–tem.

No ↓

ACTUATOR

INSPECT CABLE FREEPLAY
Is control cable freeplay less than 10 mm (0.39 in.)?

No → Adjust control cable freeplay.

Yes ↓

INSPECT ACTUATOR OPERATION
Disconnect connector from actuator.
Is actuator operation normal?
(See page BE–82)

No → Actuator faulty. Replace actuator. Then recheck system.

Yes ↓

Is there continuity between terminal 3 on wire harness side connector and ground?

No → Open circuit in wire harness between termi–nal 3 of actuator and terminal 16 of ECU.

Yes ↓

STOP LIGHT SWITCH

INSPECT STOP LIGHT SWITCH CIRCUIT
Disconnect connector from stop light switch.
Is there continuity between terminal 4 of wire harness side connector and ground?

Yes → Short circuit in wire harness between ter–minal 1 of actuator and terminal 4 of stop light switch.

No ↓

Connect the connector to actuator.
Is there continuity between terminal 4 of wire harness side connector and ground?

No → Open circuit in wire harness between ter–minal 1 of actuator and terminal 4 of stop light switch. .

Yes (There is resistance approx. 71/) ↓

INSPECT STOP LIGHT SWITCH CONTINUITY
Is stop light switch continuity normal?
(See page BE–80)

→ Replace stop light switch. Then recheck system.

Yes ↓

Connect connector to stop light switch.

CONTINUED ON NEXT PAGE

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ECU

Disconnect connector from CC ECU and in– spect connector–on wire harness side as fol– lows.

INSPECT STOP LIGHT SWITCH CIRCUIT
Is there continuity between terminals 3 and 16 with brake pedal depressed?

Yes → Short circuit in wire harness between ter– minals 3 of ECU and terminal 2 of stop light switch.

No ↓

Is there continuity between terminals 3 and 16 with brake pedal released?

No → Open circuit in wire harness between ter– minals 3 of ECU and terminal 2 of stop light switch.

Yes (There is resistance approx. 71/) ↓

Is there continuity between terminals 3 and 5 with brake pedal depressed?

→ Short circuit in wire harness between termi– nal 2 of actuator and terminal 5 of com– puter.

No ↓

Is there continuity between terminals 3 and 5 with brake pedal released?

No → Open circuit in wire harness between termi– nal 2 of actuator and terminal 5 of com– puter.

Yes (There is resistance approx. 38/) ↓

CC ECU faulty.
Replace CC ECU. Then recheck system.

D INSPECTION OF SPEED SENSOR CIRCUIT

SPEED METER CABLE

INSPECT SPEED METER CABLE
Does not meter fluctuate when driving at a steady speed?

Yes → Meter cable faulty.
Replace meter cable. Then recheck system.

No

Turn ignition switch off.

SPEED SENSOR

Disconnect connector from combination meter.

INSPECT GROUND CONNECTION
Is there continuity between terminal6 of wire harness side connector and ground?

No →
- Open circuit in wire harness between terminal B of combination meter and ground.
- Ground faulty.

Yes

INSPECT SPEED SENSOR OPERATION
Is there sensor operation normal?
(See page BE–33).

No → Speed sensor faulty.
Replace speed sensor. Then recheck system.

Yes

Connect connectors to combination meter.

ECU

Disconnect connector from CC ECU and inspect connector on wire harness side as follows.
Turn ignition switch on.

INSPECT SPEED SENSOR CIRCUIT
Does the voltage between terminal 8 and ground change repeatedly from OV to approx. 5V or more when speedometer shaft is turned?

No → Open or short circuit in wire harness between terminal 8 of CC ECU and terminal A of combination meter.

Yes

CC ECU faulty.
Replace CC ECU. Then recheck system.

E INSPECTION OF STOP LIGHT SWITCH CIRCUIT

Turn ignition switch off.

Is STOP fuse normal?

No → Replace fuse. Is operation nor–mal?

- No → Short circuit in wire harness between termi–nal 18 of CC ECU or terminal 1 of stop light switch and fuse.
- Yes → Fuse faulty.

Yes ↓

STOP LIGHT SWITCH

INSPECT GROUND CONNECTION
Disconnect connector from stop light switch.
Is there continuity between terminal 3 of wire harness side connector and ground?

No →
- Open circuit in wire harness between terminal 3 and ground.
- Bulb burned out.
- Ground faulty.

Yes ↓

INSPECT STOP LIGHT SWITCH CONTINUITY
Is stop light switch continuity normal?
(See page BE–80).

No → Stop light faulty.
Replace stop light switch. Then recheck system.

Yes ↓

Connect connector to stop light switch.

ECU

Disconnect connector from CC ECU and in–spect connector on wire harness side as fol–lows.

INSPECT STOP FUSE CIRCUIT
Is there battery positive voltage between terminal 17 and ground with brake pedal released?

Yes → Short circuit in wire harness between ter–minal 17 of CC ECU and STOP fuse.

No ↓

Is there battery positive voltage between terminal 17 and ground with brake pedal depressed?

No → Open circuit in wire harness between ter–minal 17 of CC ECU and STOP fuse.

Yes ↓

CC ECU faulty.
Replace CC ECU. Then recheck system.

F INSPECTION OF PARKING BRAKE SWITCH CIRCUIT

Turn ignition switch off.

BRAKE FLUID LEVEL WARNING SWITCH

INSPECT GROUND CONNECTION
Disconnect connector from brake fluid level warning switch.
Is there continuity between terminal 2 of wire harness side connector and ground?

No →
- Open circuit in wire harness between terminal 2 of brake fluid level warning switch.
- Ground faulty.

Yes ↓

INSPECT BRAKE WARNING SWITCH
Is brake fluid level warning switch operation normal?
(See page BE–38)

No → Brake warning switch faulty.
Replace brake warning switch.

Yes ↓

Connect the connector to brake warning switch.

PARKING BRAKE SWITCH

INSPECT GROUND CONNECTION
Disconnect connector from parking brake switch.
Is there continuity between terminal 2 of wire harness side connector and ground?

No →
- Open circuit in wire harness between terminal 2 of parking brake switch.
- Ground faulty.

Yes ↓

INSPECT PARKING BRAKE SWITCH OPERATION
Is parking brake switch operation normal?
(See page BE–40)

No → Replace parking brake switch.

Yes ↓

Connect connector to parking brake switch.

ECU

Disconnect connector from CC ECU and inspect connector on wire harness side as follows.

↓

Ignition switch turned on.

↓

Is there no voltage between terminal 14 and ground with parking brake lever pulled up?

No → Open circuit in wire harness between ter– minal 14 of ECU and terminal 1 of parking brake switch or brake warning light.

Yes ↓

Is there battery positive voltage between ter– minal 14 and body ground with parking brake released?

No → Short circuit in wire harness between ter– minal 14 of ECU and terminal 1 of parking brake switch, terminal 1 of brake fluid level warning switch or brake warning light.

Yes ↓

CC ECU faulty.
Replace CC ECU. Then recheck system.

G INSPECTION OF CLUTCH SWITCH CIRCUIT

Turn ignition switch off.

↓

CLUTCH SWITCH

INSPECT GROUND CONNECTION
Disconnect connector from clutch switch.
Is there continuity between terminal 2 of wire harness side connector and ground?

No → Open circuit in wire harness between terminal 2 of the clutch switch and ground.

Yes ↓

INSPECT CLUTCH SWITCH CONTINUITY
Is clutch switch continuity normal?
(See page BE–81)

No → Replace clutch switch.

Yes ↓

Connect connector to clutch switch.

↓

ECU

Disconnect connector from CC ECU and inspect connector on wire harness side as follows.

↓

INSPECT CLUTCH SWITCH CIRCUIT
Is there continuity between terminal 13 and ground when clutch pedal is depressed?

No → Open circuit in wire harness between terminal 13 of ECU and terminal 1 of clutch switch.

Yes ↓

CC ECU faulty.
Replace CC ECU. Then recheck system.

H INSPECTION OF PARK/NEUTRAL POSITION SWITCH CIRCUIT

Turn ignition switch off.

PARK/NEUTRAL POSITION SWITCH

INSPECT GROUND CONNECTION
Disconnect connector from park/neutral posi–tion switch.
Is there continuity between terminal 3 of wire harness side connector and ground?

No → Open circuit in wire harness between ter–minal 3 of park/neutral position switch and ground.

Yes

INSPECT PARK/NEUTRAL POSITION SWITCH OPERATION
Is park/neutral position switch operation normal?
(See page AT–26, 79, 137 or 196)

No → Replace park/neutral position switch.

Yes

Connect connector to park/neutral position switch.

ECU

Disconnect connector from CC ECU and in–spect connector on wire harness side as fol–lows.

INSPECT PARK/NEUTRAL POSITION SWITCH CIRCUIT
Is there continuity between terminal 13 and ground when shifted to "N" and "P" posi–tion?

No → Open circuit in wire harness between ter–minal 13 of ECU and terminal 2 of park /neutral position switch.

Yes

CC ECU faulty.
Replace CC ECU. Then recheck system.

INSPECTION OF VACUUM CIRCUIT

Turn ignition switch off.

VACUUM HOSE

Are there cracks or other damage on the vac–uum hose?

Yes → Replace vacuum hose.

No ↓

VACUUM SWITCH

INSPECT VACUUM SWITCH CIRCUIT
Disconnect connector from vacuum switch.
Is there continuity terminal 2 of vacuum switch and ground?

No →
- Open circuit in wire harness between terminal 2 of vacuum switch and ground.
- Ground faulty.

Yes ↓

INSPECT VACUUM SWITCH OPERATION
Is vacuum switch normal?
(See page BE–82)

No → Replace vacuum switch.

Yes ↓

VACUUM PUMP

INSPECT GROUND CONNECTION
Disconnect connector from vacuum pump.
Is there continuity between terminal 2 of wire harness side connector and ground?

No →
- Open circuit in wire harness between terminal 2 of vacuum pump and ground.
- Ground faulty.

Yes ↓

INSPECT VACUUM PUMP OPERATION
Is vacuum pump operation normal?
(See page BE–82)

No → Replace vacuum pump.

Yes ↓

Connect connector to vacuum switch and pump.

CONTINUED ON NEXT PAGE

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ECU

Disconnect connector from CC ECU and in–spect connector on wire harness side as fol–lows.

INSPECT VACUUM SWITCH CIRCUIT
Is there continuity between terminal 1 1 and ground?

No → Open circuit in wire harness between ter–minal 1 1 of CC ECU and terminal 1 of vac–uum switch.

Yes ↓

Start engine (idling).

Is there continuity between terminal 1 1 and ground?

Yes → Short circuit in wire harness between ter–minal 1 1 of CC ECU and terminal 1 of vac–uum switch.

No ↓

Stop the engine.

INSPECT VACUUM PUMP CIRCUIT
Is there continuity between terminal 2 and ground?

No → Open circuit in wire harness between ter–minal 2 of CC ECU and terminal 1 of vac–uum switch.

Yes ↓

Is there continuity between terminal 2 and ground when disconnect connector from vac–uum pump?

Yes → Short circuit in wire harness between ter–minal 2 of ‘CC ECU and terminal 1 of vac–uum pump.

No ↓

CC ECU faulty.
Replace CC ECU. Then recheck system.

J INSPECTION OF ECM SOLENOID CIRCUIT

Start engine (idling).

ECM

Is there battery positive voltage between terminal 6126 of ECM and ground?

No → Short or open circuit in wire harness be– tween terminal 6/26 of ECM and terminal 9 of CC ECU.

Yes

Is there voltage approx. 5V between terminal 7 of CC ECU and ground?

No → Short or open circuit in wire harness be– tween terminal 7 of CC ECU and terminal of EC M .

Yes

Stop engine.

ECU

Disconnect connector from CC ECU and in– spect connector on wire harness side as fol– lows.

INSPECT ECM SOLENOID CIRCUIT
Is there continuity between terminal 9 and terminal 6126 of ECM?

No → Open circuit in wire harness between ter– minal 9 of CC ECU and terminal 6I26 of ECM.

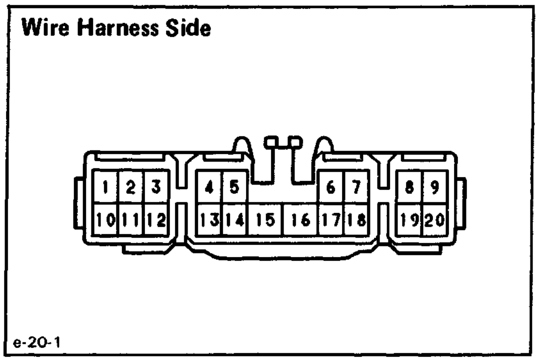
Yes

Is resistance value about 11–15/ between terminal 9 and ground?

No → Open or short circuit in wire harness be– tween terminal 9 of CC ECU and terminal of ECM or No. 2 solenoid.

Yes

CC ECU faulty.
Replace CC ECU. Then recheck system.



Cruise Control ECU Circuit
Inspection of ECU Circuit

Disconnect the connector from the ECU and inspect the connector on the wire harness side as shown below.

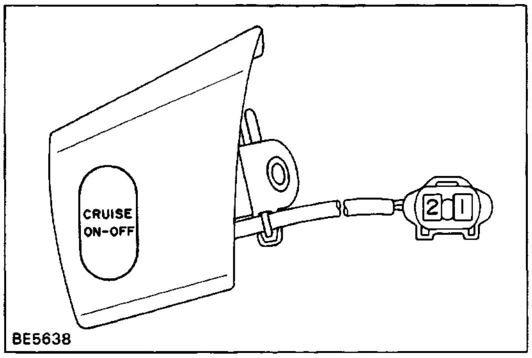
Connection or Measure item	Check for	Tester Connection	Condition		Specified valve
Data Link Connector 2	Continuity	**1 – Ground**	Short terminals between ”Te” and ”El”		Continuity
			Released		No continuity
Vacuum pump		**2 – Ground**	Constant		Continuity *1
Speed sensor (in combination meter)		**8 – Ground**	Vehicle moving slowly		1 pulse each 40 cm approx. (15.75 in.)
Vacuum switch		**11 – Ground**	Vacuum	No vacuum	Continuity
				More than 70 + 30 mmHg 6.69 f 1.18 in. Hg 22.66 + 4.0 kPa	No continuity
Park/Neutral Position switch (A/T)		**13 – Ground**	Shift position	”N” or ”P” position	Continuity
				□, ,.2□, □p□ or ”R” position	No continuity
Clutch switch (M/T)		**13 – Ground**	Clutch pedal position	Depressed	Continuity
				Released	No continuity
Parking brake switch		**14 – Ground**	Parking brake lever position	Pulled	Continuity
				Released	No continuity
Body ground		**15 – Ground**	Constant		Continuity
Stop light switch		**17 – 18**	Brake pedal position	Depressed	Continuity *1
				Released	No continuity
CANCEL switch	Resistance	**19 – Ground**	Cruise control switch position	CANCEL switch is pushed	Approx. 4180
				Released	No continuity
RESUMEIACCEL switch		**19 – Ground**		RESUME/ACCEL switch is pushed	Approx. 68/
				Released	No continuity
SET/COAST switch		**19 – Ground**		SET/COAST switch is pushed	Approx. 1980
				Released	No continuity
Stop light switch and actuator (release valve)		**3 – 16**	Brake pedal position	Depressed	No continuity
				Released	Approx. 71/
Actuator (control valve)		**5 – 16**	Constant		Approx. 380
No. 2 solenoid valve		**9 – Ground**	Constant		less than 1511
GAUGE fuse and in–dicator light	Voltage	**4 – Ground**	Ignition switch posi–tion	**ON**	Battery positive voltage
				LOCK, ACC	No voltage
ENGINE fuse		**6 – Ground**	Ignition switch posi–tion	**ON**	Battery positive voltage
				LOCK, ACC	No voltage
O/D circuit		**7 – Ground**	Ignition SW position	**ON**	Approx. 5V or more
				LOCK or ACC	No voltage
ENGINE fuse, main switch and main relay		**10 – Ground**	Ignition switch ON and MAIN switch po–sition	**ON**	less than 0.3 V
				OFF	No voltage
		12 – Ground	Ignition switch ON –and MAIN switch po–sition	**ON**	Battery positive voltage
				OFF	No voltage

* 1 There is resistance in the circuit.

If circuit is as specified, replace the ECU.

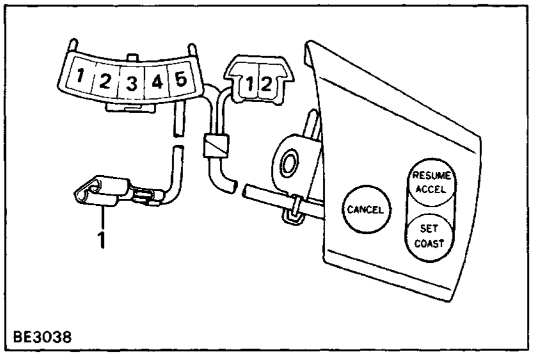
Parts Inspection

1. INSPECT SWITCHES
(Main Switch/Continuity)



Terminal / Switch position	1	2
OFF		
ON	○	○

If continuity is not as specified, replace the switch.
(Cruise Control Switch /Continuity)

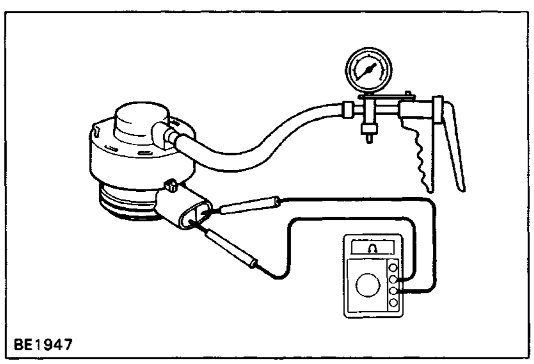


Terminal / Condition	1/2	2/2	3/5	4/5
Constant	○	○	○	○

If continuity is not as specified, replace the switch.
(Cruise Control Switch/Resistance)
Measure the resistance value between terminals 2/5 and 4I5 or 2I2.

Switch position	RESISTANCE (/)
OFF	No continuity
RESUME/ACCEL	Approx. 68
SET/COAST	Approx. 198
CANCEL	Approx. 418

If resistance value is not as specified, replace the switch.

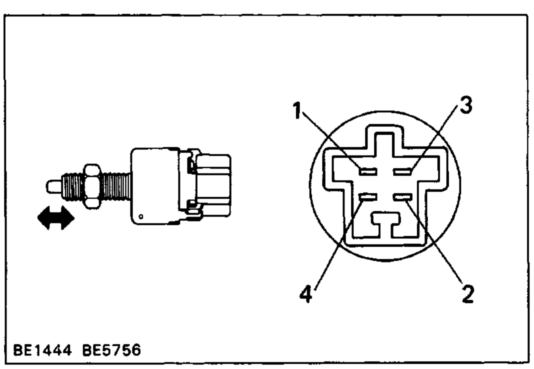


(Vacuum Switch /Operation)

(a) Check that there is continuity between terminals with no vacuum.

(b) Check that there is no continuity between terminals with a vacuum of 170 ± 30mmHg (6.69 ± 1.18 in. Hg, 22.66 ± 4. 00 kPa) or above.

If operation is not as specified, replace the switch.



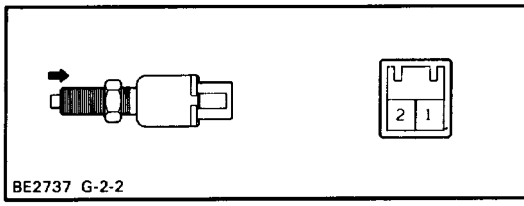
(Stop Light Switch /Continuity)

Inspect the switch continuity between terminals.

Terminals / Switch position	1	2	3	4
Switch pin free (Brake pedal depressed)	○		○	
Switch pin pushed in (Brake pedal released)		○		○

If continuity is not as specified, replace the switch.

(Clutch Switch /Continuity)
Inspect the switch continuity between terminals.



Terminal / Condition	1	2
Switch pin free (Clutch pedal depressed)	O	O
Switch pin pushed in (Clutch pedal released)		

If continuity is not as specified, replace the switch.

(Brake Fluid Level Warning Switch/Operation)

See step 2 on page BE–39.

(Parking Brake Switch/Operation)

See step 2 on page BE–40.

(Park/Neutral Position Switch /Operation)

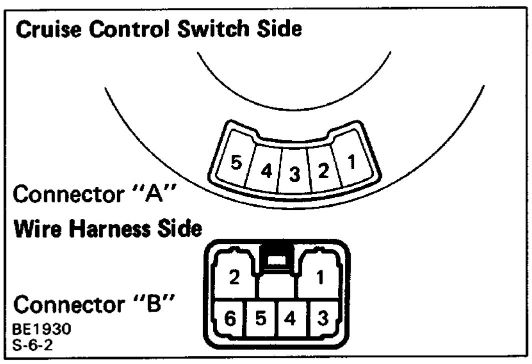
See pages AT–26, 79, 137 or 196.

2. INSPECT SPEED SENSOR

See step 2 on page BE–34.

3. INSPECT SLIP RING

(Continuity)
Inspect the continuity between terminals.



Terminal / Condition	A-2	A-3	A-4	B-4	B-5	B-6
Constant	O	—	—	—	—	O
		O	—	O		
			O	—	O	

If continuity is not as specified, replace the slip ring.

4. INSPECT MAIN RELAY

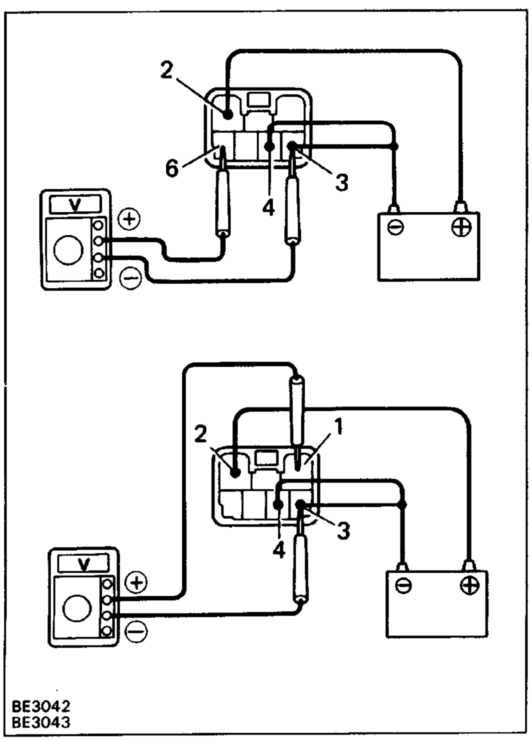
(Operation)

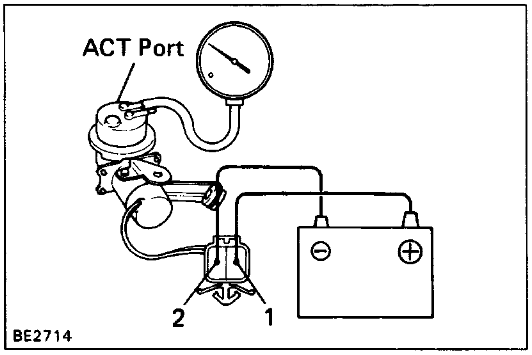
(a) Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminals 3 and 4.

(b) Connect the positive (+) lead from the voltmeter to terminal 6 and the negative (–) lead to terminal 3, check that there is battery positive voltage.

(c) Change the positive (+) lead to terminal 1, check that there is voltage less than 0.3V.

If operation is not as specified, replace the relay.





5. INSPECT VACUUM PUMP

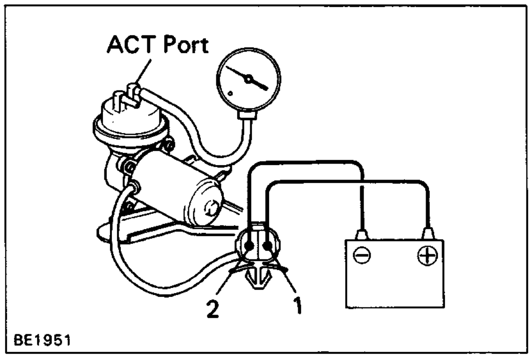
(3VZ–E Engine)

(a) Connect a vacuum gauge to the ACT side of the pump.

(b) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2.

(c) Check that there is a vacuum of 200 mmHg (7.87 in. Hg, 26.7 kPa) or above.

If operation is not as specified, replace the pump.



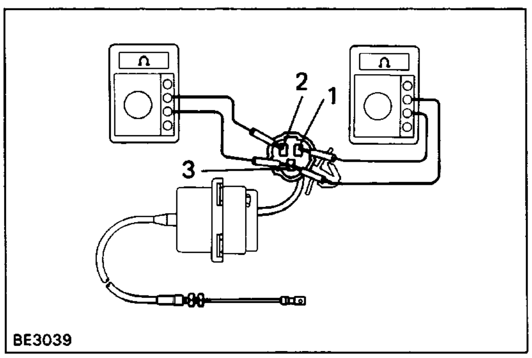
(22R–E Engine)

(a) Connect a vacuum gauge to the ACT side of the pump.

(b) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2.

(c) Check that there is a vacuum of 200 mm Hg (7.87 in.Hg, 26.7 kPa) or above.

If operation is not as specified, replace the pump.



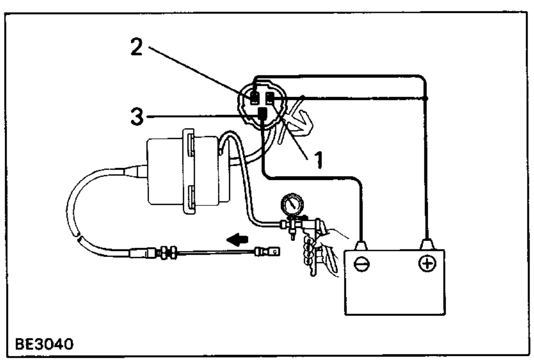
6. INSPECT ACTUATOR

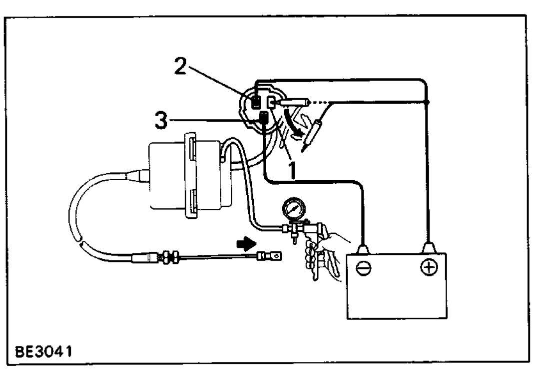
(Resistance)

Measure the resistance value between terminals as fol–lows.

Resistance: 1–3 Approx. 71
2–3 Approx. 38

If the resistance value is not as specified, replace the ac–tuator.





(Operation)

(a) Connect the positive (+) lead from the battery to terminals 1 and 2, and the negative (–) lead to ter–minal 3.

(b) Slowly apply vacuum from 0 to 300 mmHg (0 to 11.81 in.Hg, 0 to 40.0 kPa), check that the control cable can be pulled smoothly.

Cable stroke: Approx. 36 mm (1.42 in.)

(c) With the vacuum stabilized, check that the control cable does not return.

HINT: As you apply and hold the vacuum with the vac–uum pump, the drawn in diaphragm will in some cases return. This does not indicate a malfunction. Actuator leakage is allowable.

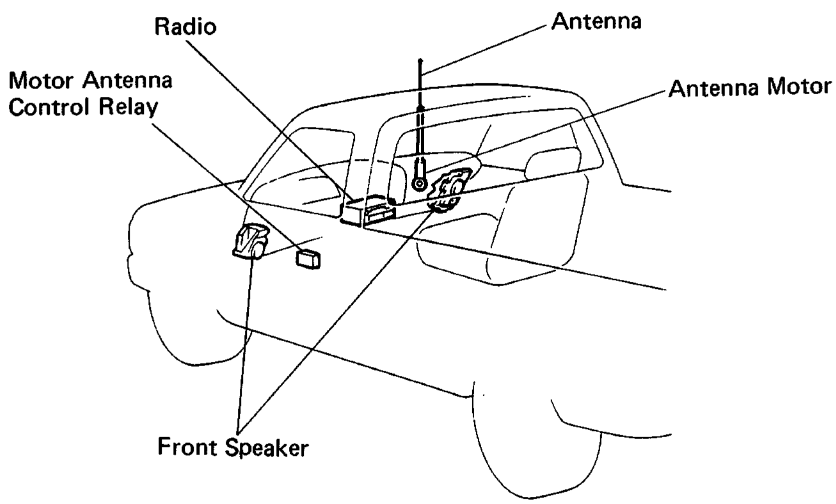
(d) Disconnect terminal 1 or 2 and check that the con–trol cable returns to its original position and the vac–uum returns to 0 mmHg (0 in. Hg, 0 kPa).

If operation is not as specified, replace the actuator.

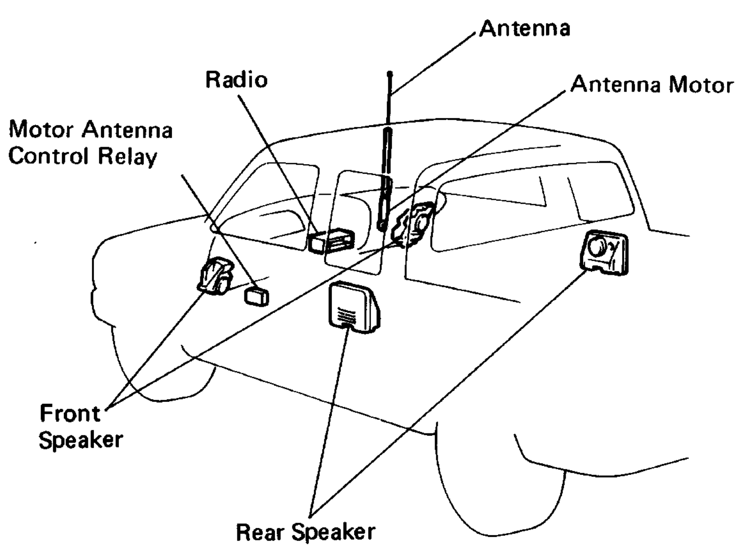
AUDIO SYSTEM

Parts Location

2-Speaker Type



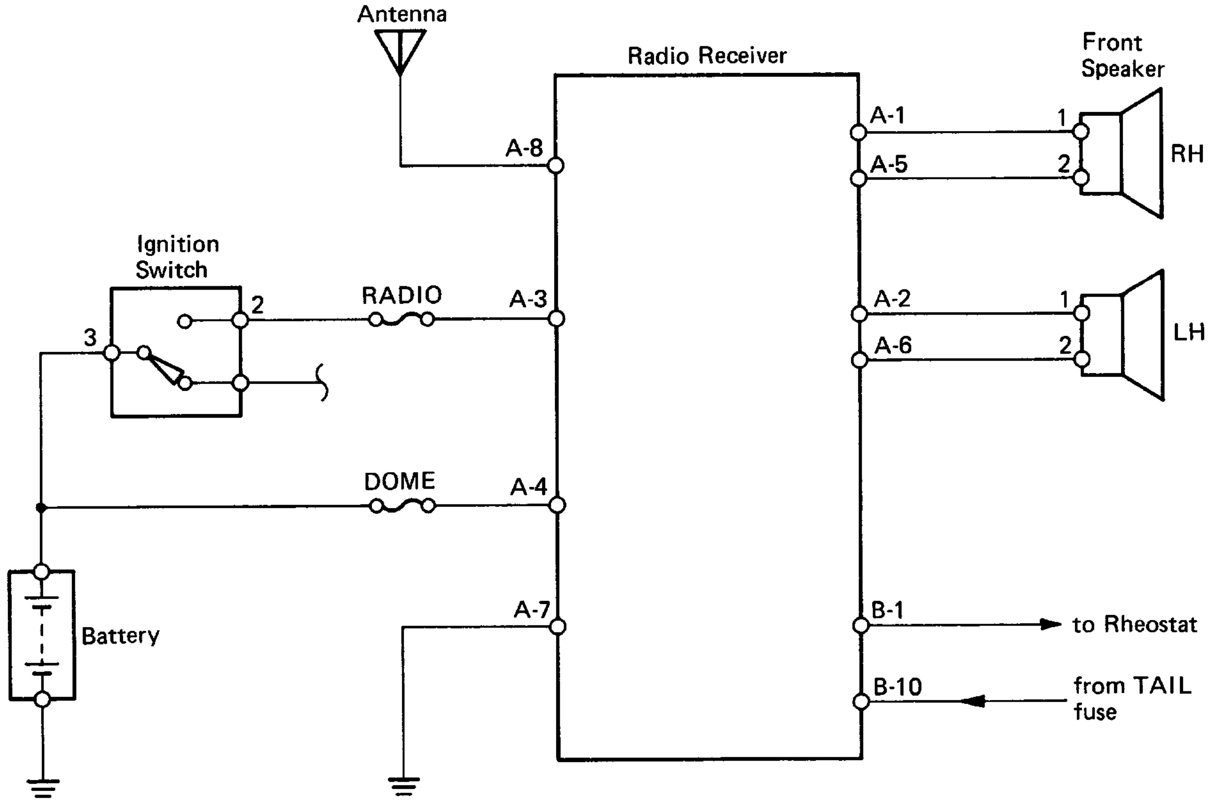
4-Speaker Type



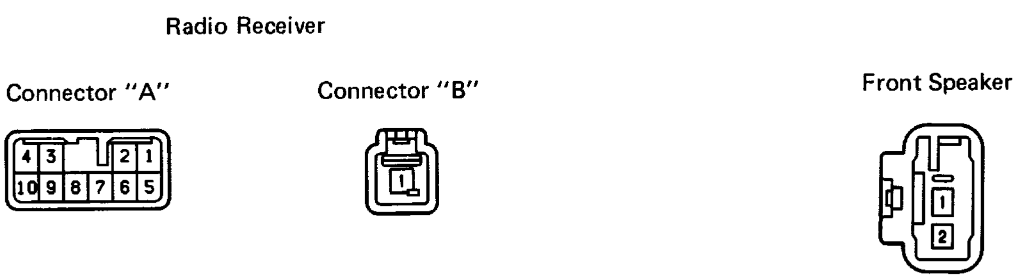
N03063
BE2942

Wiring and Connector Diagrams

Radio: Simbol [R]

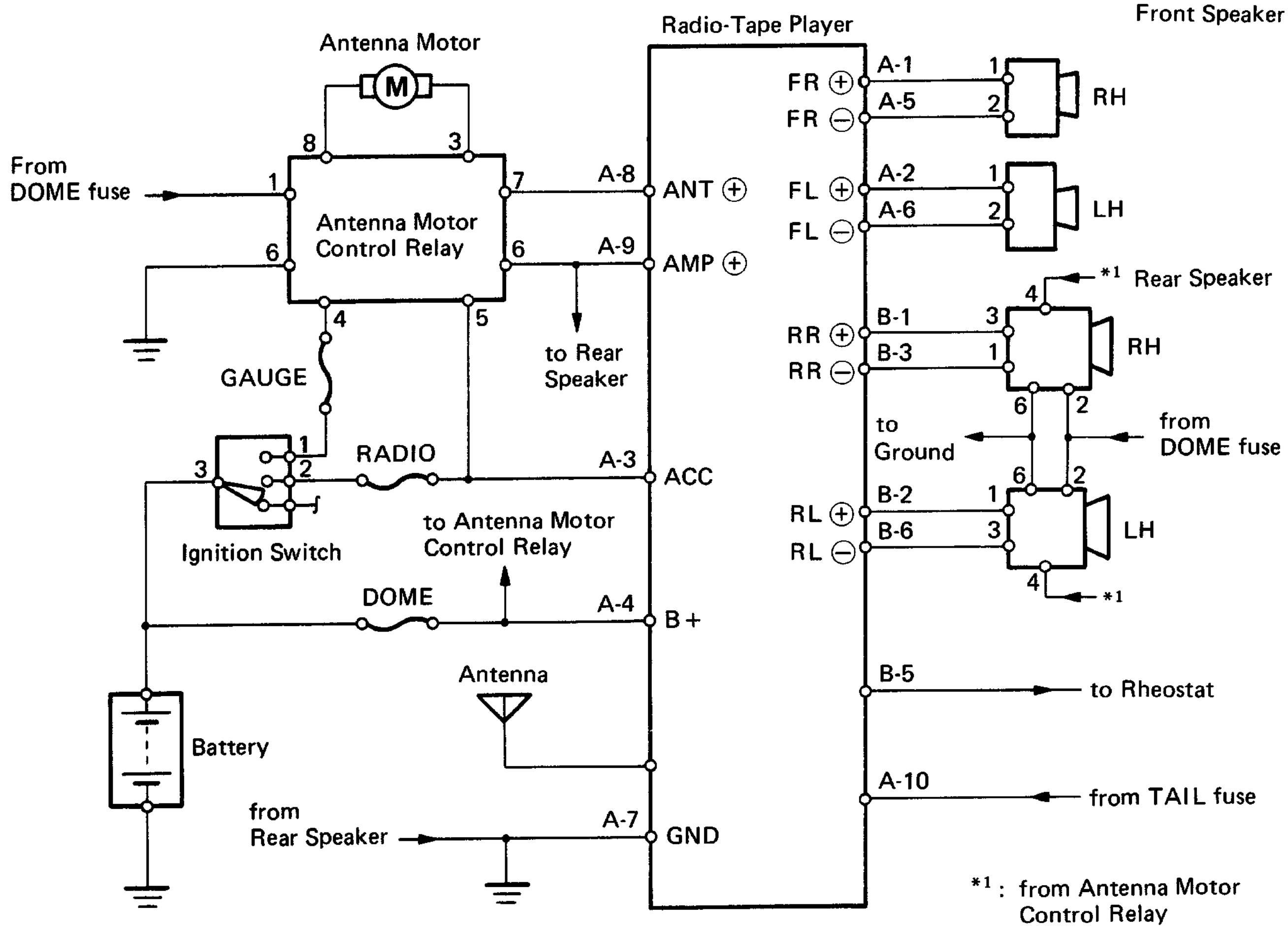


The POWER SOURCE CIRCUIT has been simplified. For full details, see page BE-8.

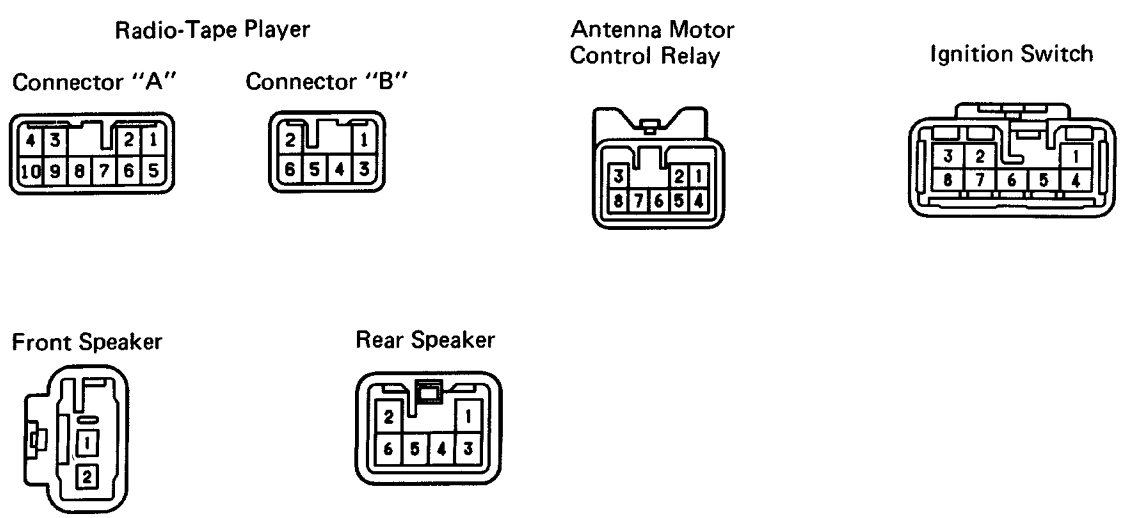


N02964
S-10-2-A e-1-2 e-2-2-E

Radio-Tape Player Unit: Simbol U

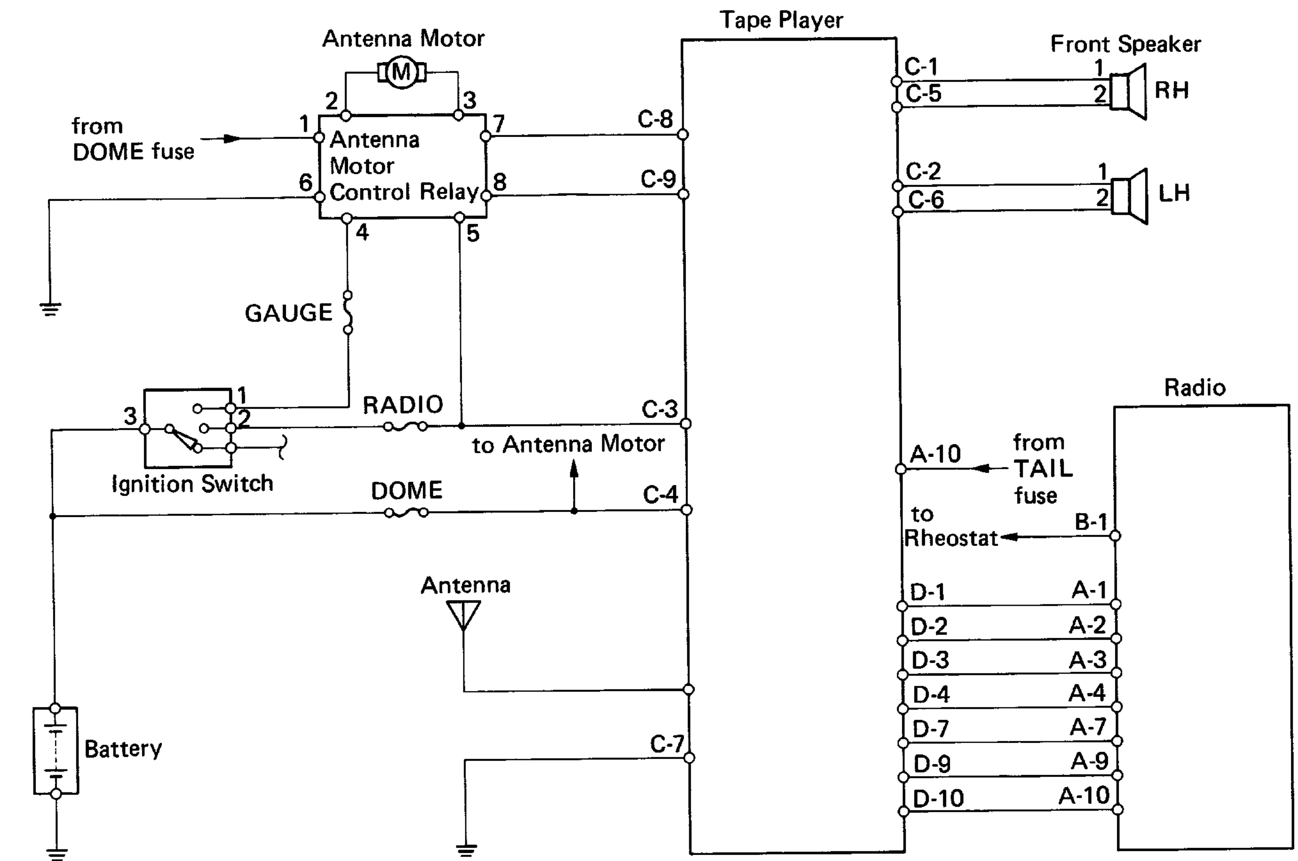


The POWER SOURCE CIRCUIT has been simplified. For full datils, see page BE-8.



BE5640
S-10-2-A S-6-2-E e-8-2 g-8-2
e-2-2-E le-6-2-A

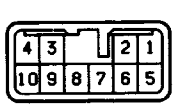
Radio-Tape Player (Separate): Simbol [S]



The POWER SOURCE CIRCUIT has been simplified. For full details, see page BE-8.

Radio

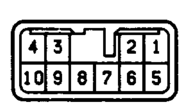
Connector "A"



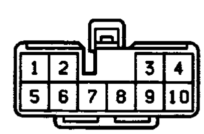
Connector "B"

Tape Player

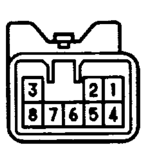
Connector "C"



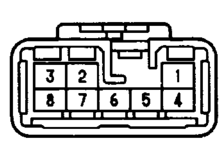
Connector "D"



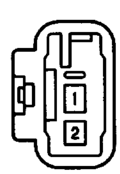
Antenna Motor
Control Relay



Ignition Switch

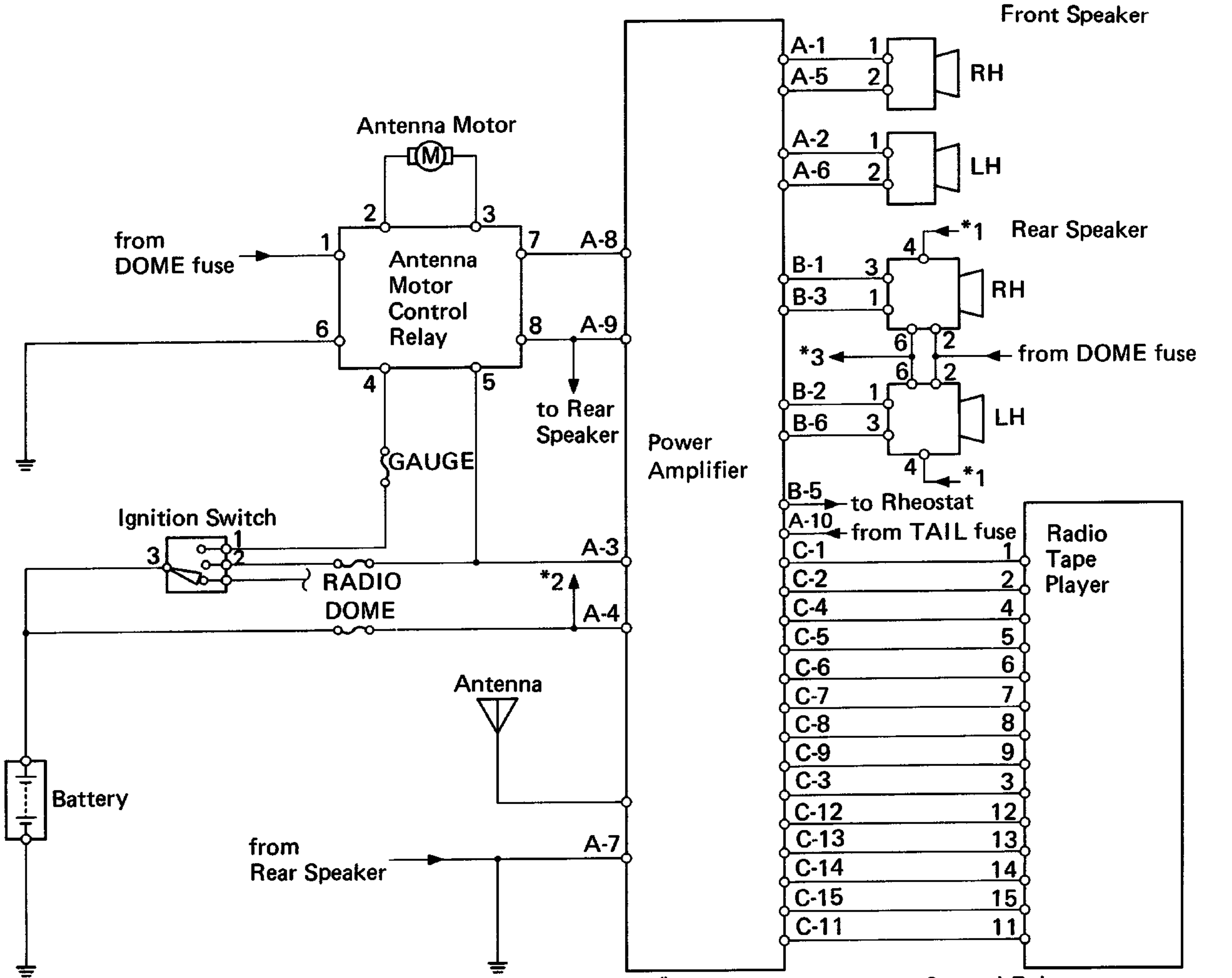


Front Speaker



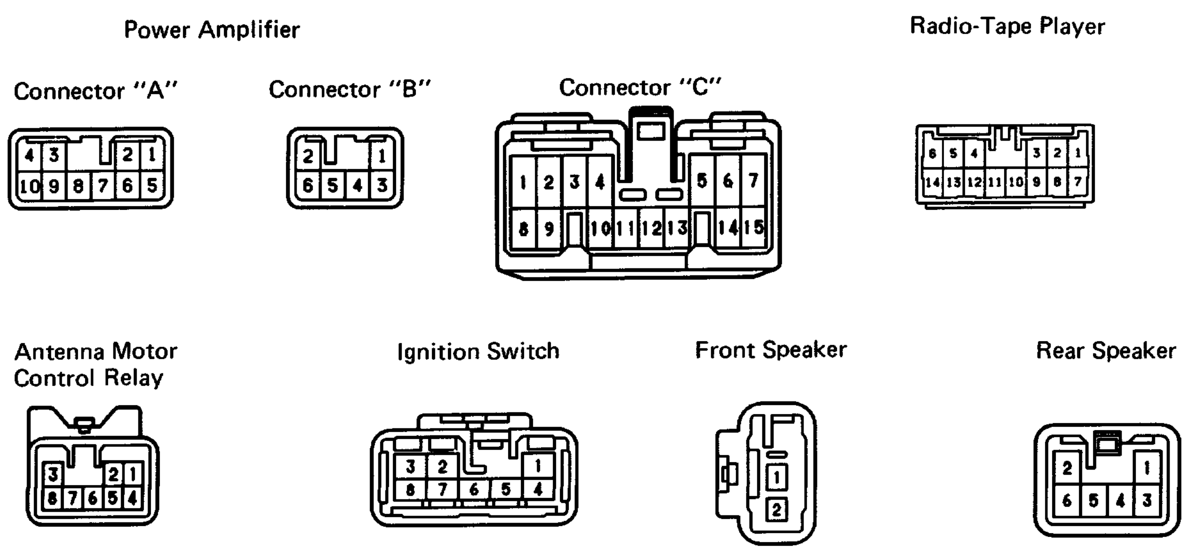
N02968
S-10-2-A e-1-2 S-10-2-A S-10-1-A
G-9-2 e-8-2 g-8-2 e-2-2-E

Radio-Tape Player Unit (Separate Power Amplifier): Simbol [P]



*1 from Antenna Motor Control Relay
*2 to Antenna Motor Control Relay and Rear Speaker
*3 to Ground

The POWER SOURCE CIRCUIT has been simplified. For full details, see page BE-8.



N03036
S-10-2-A S-6-2-E h-15-1-A Y-14-2
e-8-2 g-8-2 e-2-2-E le-6-2-A

System Description

RADIO WAVE BAND

The radio wave bands used in radio broadcasting are as follows:

Frequency	30kHz	300kHz	3MHz	30MHz	300MHz
Designation	LF	MF	HF	VHF	
Radio wave	LM	AM (MW)	SW	FM (UKW)	
Modulation method	Amplitude modulation			Frequency modulation	

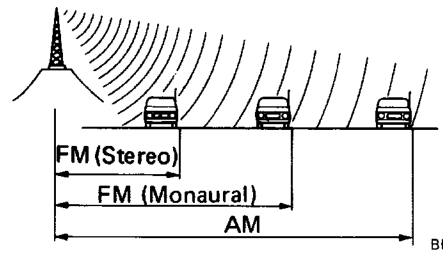
LF: Low Frequency MF: Medium Frequency HF: High Frequency VHF: Very High Frequency

HINT: In this section, the term "'AM" includes LW, MW and SW, and the term "FM" includes UKW.

SERVICE AREA

There is great difference in the size of the service area for AM, FM monaural, and FM stereo broadcasting. Thus it may happen that FM broadcast cannot be received even though AM comes in very clearly.

Not only does FM stereo have the smallest service area, but it also picks up static and other types of interference ("noise") the most easily.



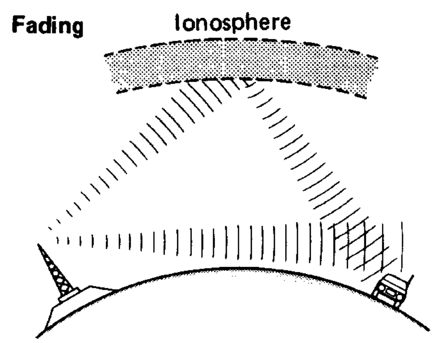
BE2818

RECEPTION PROBLEMS

Besides the problem of static, there are also the problems called "fading", "multipath", and "fade out". These problems are caused not by electrical noise but by the na– ture of the radio waves themselves.

Fading

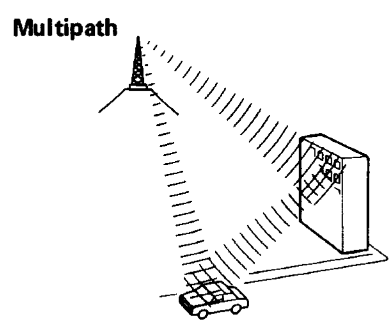
Besides electrical interference, AM broadcasts are also susceptible to other types of interference, especially at night. This is because AM radio waves bounce off the ionosphere at night. These radio waves then interfere with the signals from the same transmitter that reach the vehicle's antenna directly. This type of interference is called "fading".



BE2819

Multipath

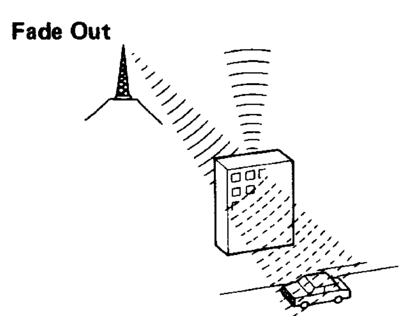
One type of interference caused by the bouncing of radio waves off of obstructions is called "multipath". Mul– tipath occurs when a signal from the broadcast transmit– ter antenna bounces off of buildings and mountains and interferes with the signal that is received directly.



BE2820

Fade Out

Because FM radio waves are of higher frequencies than AM radio waves, they bounce off of buildings, moun– tains, and other obstructions. For this reason, FM signals often seem to gradually disappear or fade away as the vehicle goes behind a building or other obstruction. This is called "fade out".



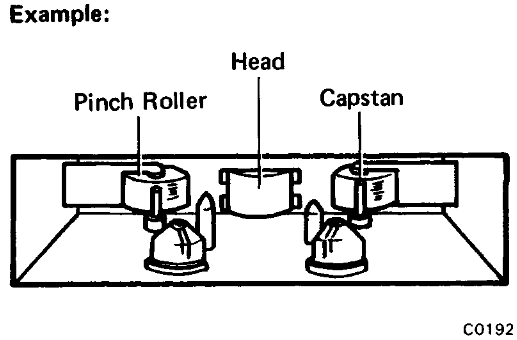
BE2821

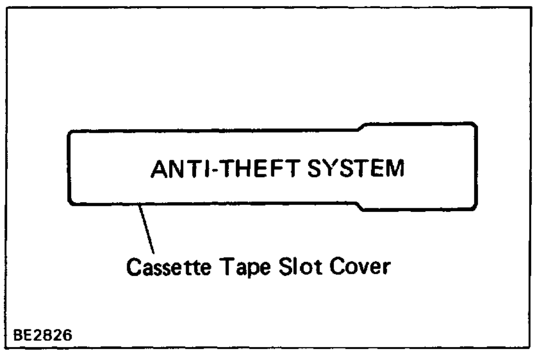
MAINTENANCE OF TAPE PLAYER

Head Cleaning

(a) Raise the cassette door with your finger. Next using a pencil or like object, push in the guide.

(b) Using a cleaning pen or cotton applicator soaked in cleaner, clean the head surface, pinch rollers and capstans.





Anti–Theft System

The anti–theft system is only provided for audio systems equipped with an Acoustic Flavor function.

HINT: The words ”ANTI–THEFT SYSTEM” are dis– played on the cassette tape slot cover.
For operation instructions for the anti–theft system, please consult the audio system section in the Owner’s Manual (hereafter called O/M).

1. SETTING SYSTEM

The system is in operation once the customer has pushed the required buttons and entered the customer–selected 3–digit ID number.
(Refer to the O/M section, ”SETTING THE ANTI–THEFT SYSTEM”).

HINT:

- When the audio system is shipped the ID number has not been input, so the anti–theft system is not in operation.
- If the ID number has not been input, the audio system remains the same as a normal audio system.

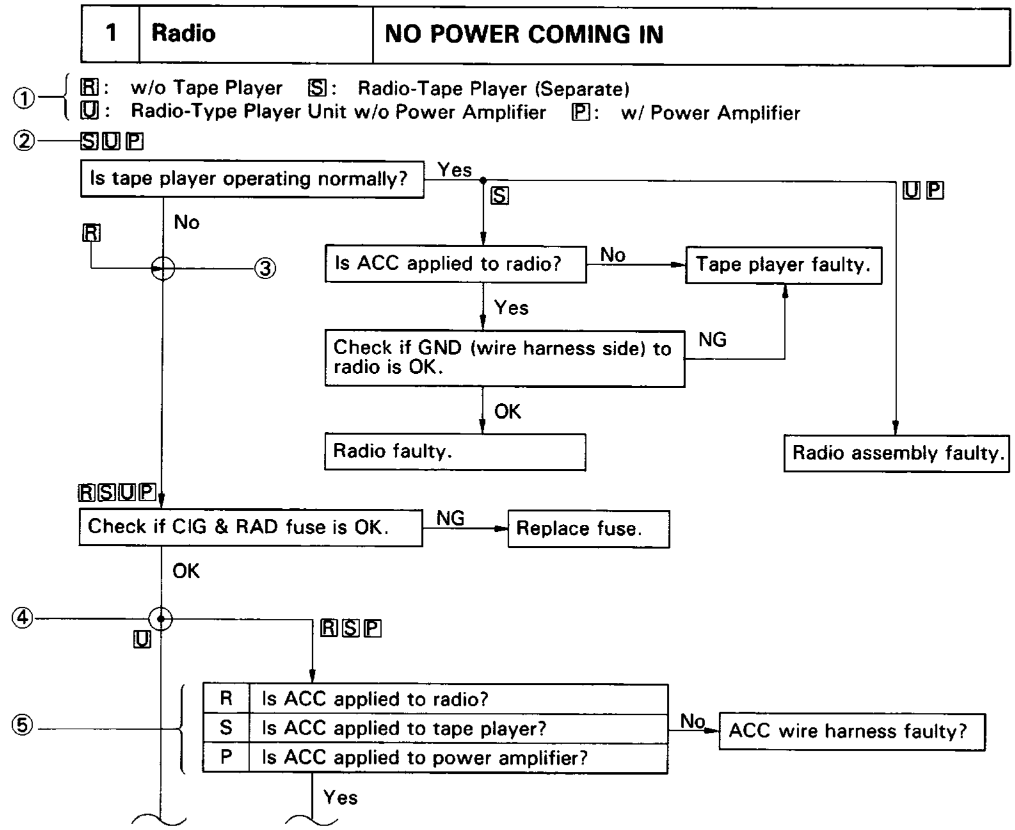
2. ANTI–THEFT SYSTEM OPERATION

If the normal electrical power source (connector or battery terminal) is cut off, the audio system be– comes inoperable, even if the power supply resumes.

3. CANCELLING SYSTEM

The ID number chosen by the customer is input to cancel the anti–theft system.
(Refer to the O/M section, ”IF THE SYSTEM IS ACTIVATED”)
HINT: To change or cancel the ID number, please refer to the O/M section, ”CANCELLING THE SYSTEM”.

HOW TO USE DIAGNOSTIC CHART



① Audio system type and symbol used.
HINT: Confirm the applicable type of audio system.

② Symbol for type of audio system the question applies to.
HINT: If the audio system type is not applicable, proceed to next question below.

③ Junction without black circle.
HINT: Proceed to next question below.

④ Junction with black circle.
HINT: Proceed to question for applicable audio system type.

⑤ HINT: Select question for applicable audio system type.

Troubleshooting

NOTICE: when replacing the internal mechanism (computer part) of the audio system, be careful that no part of your body or clothing comes in contact with the terminals of the leads from the IC, etc. of the replacement part (spare part).

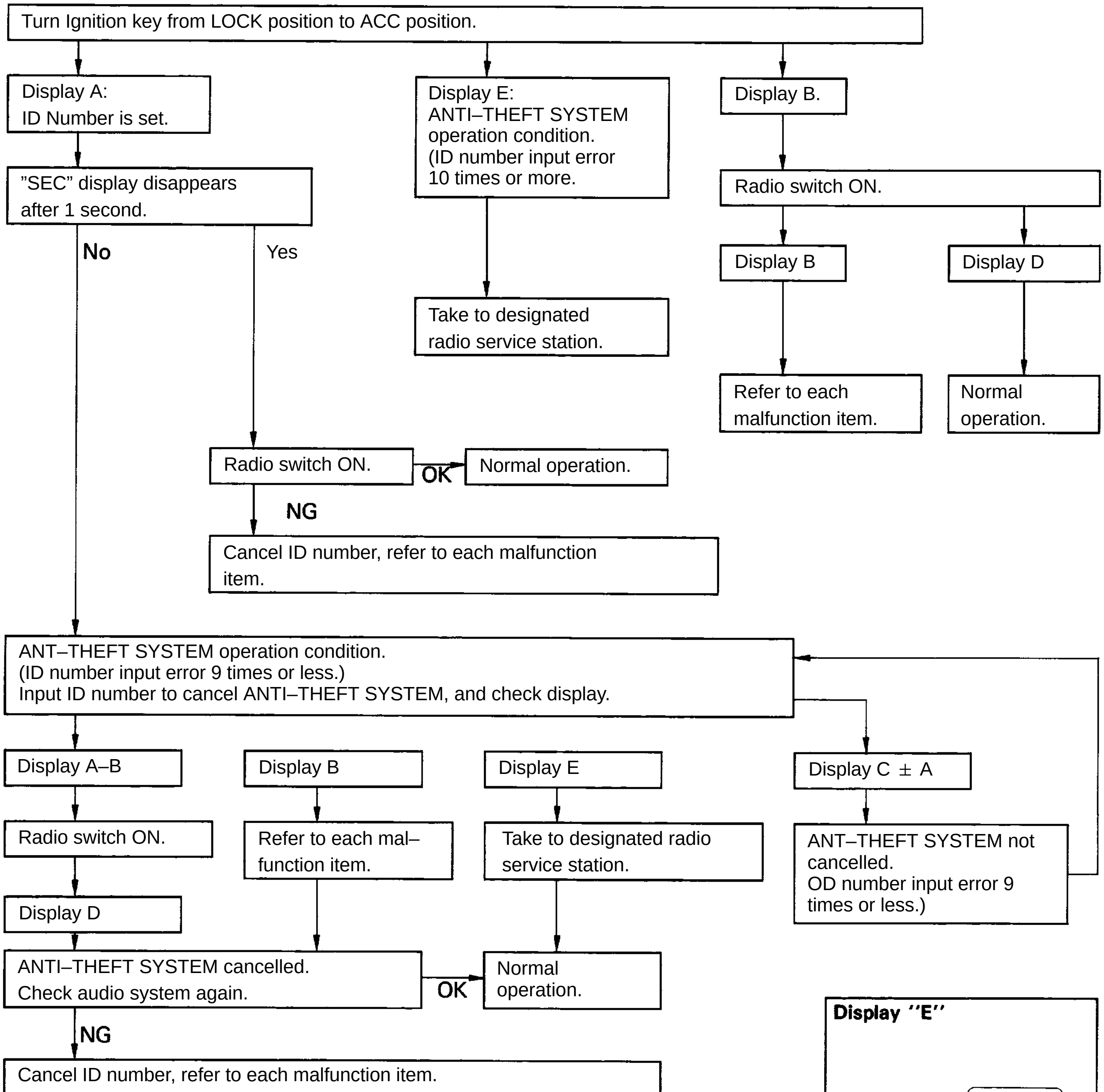
HINT: This inspection procedure is a simple troubleshooting which should be carried out on the vehicle during system operation and was prepared on the assumption of system component troubles (except for the wires and connectors, etc.).

Always inspect the trouble taking the following items into consideration.

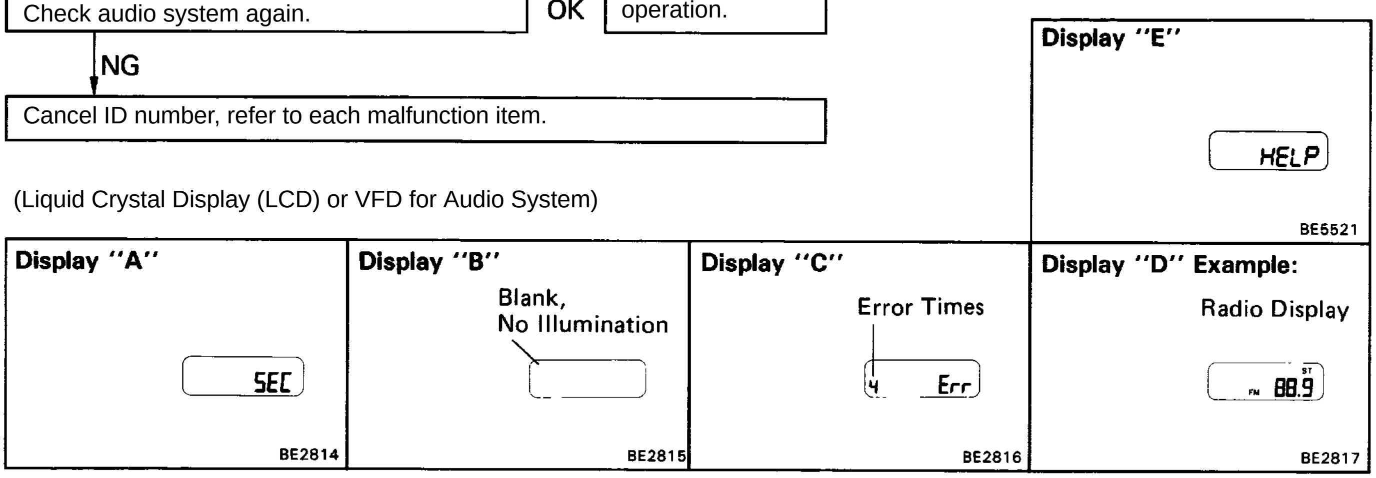
- Open or short circuit of the wire harness
- Connector or terminal connection fault
- For audio systems with anti–theft system, troubleshooting items marked (*) indicate that "Trouble–shooting for ANTI–THEFT SYSTEM" should be carried out first.

Problem		No.
Radio	No power coming in.	*1
	Power coming in, but radio not operating.	*2
	Noise present, but AM–FM not operating.	3
	Either speaker does not work.	4
	Either AM or FM does not work.	5
	Reception poor (Volume faint).	5
	Few preset tuning bands.	5
	Sound quality poor.	6
	Cannot set station select button.	7
	Preset memory disappears.	7
Tape Player	Cassette tape cannot be inserted.	8
	Cassette tape inserts, but no power.	*9
	Power coming in, but tape player not operating.	10
	Either speaker does not work.	11
	Sound quality poor (Volume faint).	12
	Tape jammed, malfunction with tape speed or auto–reverse.	13
	APS, SKIP, RPT buttons not operating.	14
	Cassette tape will not eject.	* 15
Antenna	Antenna–related.	16
Noise	Noise produced by vibration or shock while driving.	17
	Noise produced when engine starts.	18

Troubleshooting for ANTI–THEFT SYSTEM



(Liquid Crystal Display (LCD) or VFD for Audio System)



HINT:

- Refer to Owner's Manual for operation details of ANTI–THEFT SYSTEM.
- When the ID number has been cancelled, reset the same number after completing the operation, or in–form the customer that it has been cancelled.

1	Radio	NO POWER COMING IN

[R] Radio [S]: Radio + Tape Player [U]: Radio–Tape Player (Built–in Power Amplifier)
[P] Radio–Tape Player (Separate Power Amplifier)

[S][U][P]

Is tape player operating normally?

Yes →

S		Radio faulty.
U	P	Radio assembly faulty.

No

R →

NG → Replace fuse.

OK

P

[R][S][U]

Is ACC applied to power amplifier?

No → ACC wire hareness faulty.

Yes

Is ACC for the radio assembly being output from the power am– plifier?

No → Power amplifier faulty.

Yes

Check if GND (wire harness side) to power amplifier is OK.

NG → GND faulty.

OK

[R][S][U][P]

Is ACC applied to radio assembly?

No → ACC wire harness faulty.

Yes

Check if G ND (wire harness side) to radio is OK.

NG →

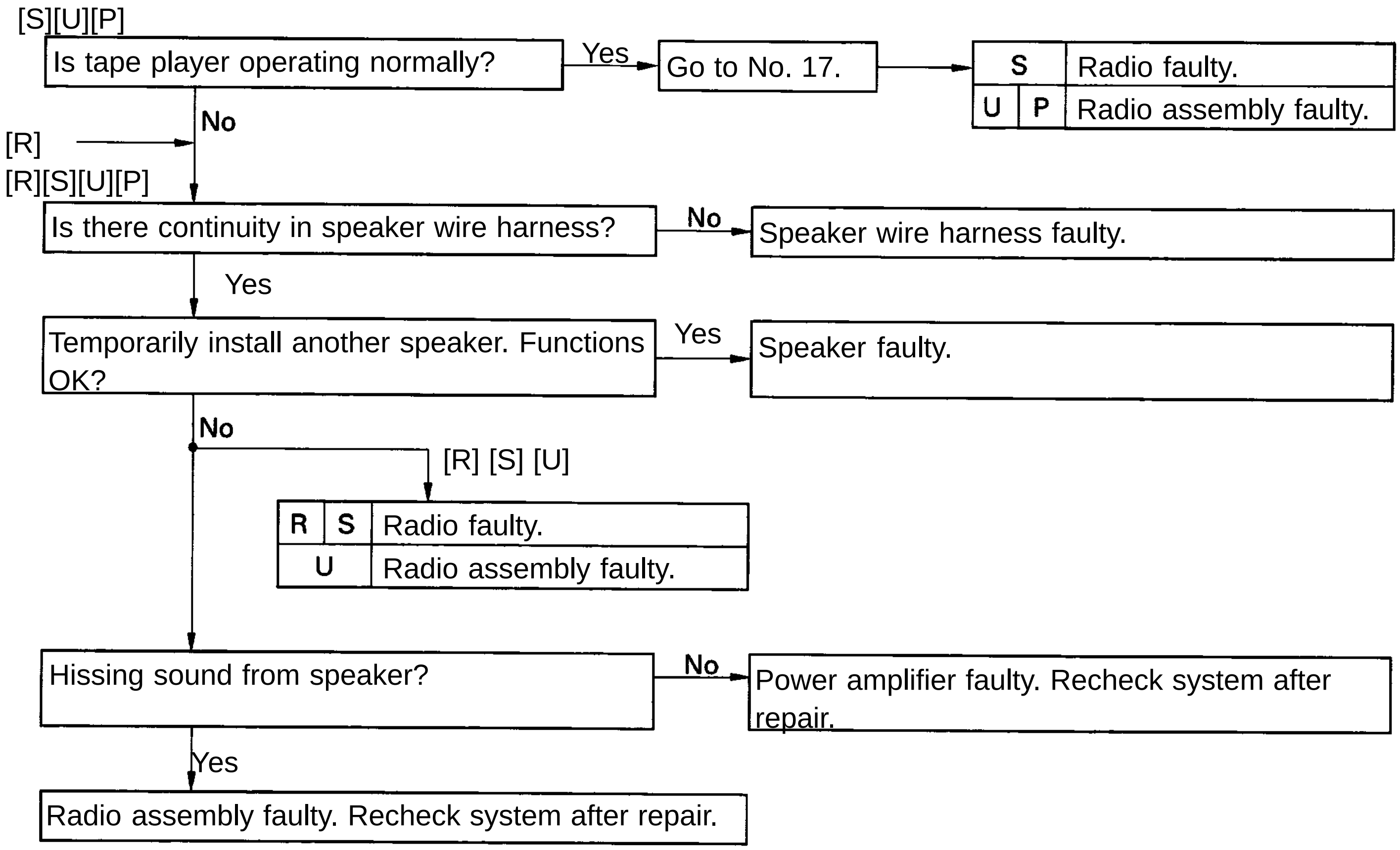
P			Power Amplifier faulty.
R	S	U	G ND wire harness faulty.

OK

R	S	Radio faulty.
U	P	Radio assembly faulty.

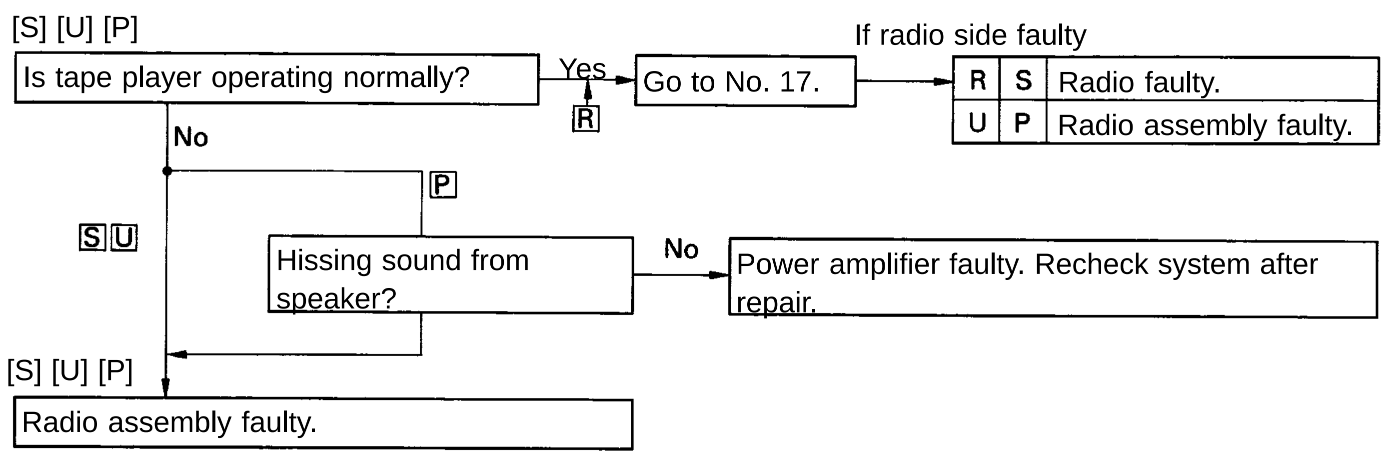
2 Radio — POWER COMING IN, BUT RADIO NOT OPERATING

[R] Radio [S] Radio + Tape Player [U] Radio–Tape Player (Built–in Power Amplifier)
[P] Radio–Tape Player (Separate Power Amplifier)



3 Radio — NOISE PRESENT, BUT AM–FM NOT OPERATING

[R] Radio [S]: Radio + Tape Player [U]: Radio–Tape Player (Built–in Power Amplifier)
[P] Radio–Type Player (Separate Power Amplifier)



4	Radio	EITHER SPEAKER DOES NOT WORK

[R] Radio [S] Radio + Tape Player [U] Radio–Tape Player (Built–in Power Amplifier)
[P] Radio–Tape Player (Separate Power Amplifier)

[S][U][P]

Is tape player operating normally?

Yes →

S	Radio faulty.
U P	Radio assembly faulty.

No

[R] →

[R][S][U][P]

Is hiss produced by non–functioning speaker?

Yes →

R S	Radio faulty.
U	Radio assembly faulty.
P	Radio assembly faulty. Recheck system after repair.

No

Is there continuity in speaker wire harness?

No → Speaker wire harness faulty.

Yes

Temporarily install another speaker. Functions OK?

Yes → Speaker faulty.

No

R S	Radio faulty.
U	Radio assembly faulty.
P	Radio assembly faulty. Recheck sys–tem after repair.

5	**Radio**	**EITHER AM OR FM DOES NOT WORK, RECEPTION POOR (VOLUME FAINT), FEW PRESET TUNING BANDS**

[R] Radio [S] Radio + Tape Player [U] Radio–Tape Player (Built–in Power Amplifier)
[P] Radio–Tape Player (Separate Power Amplifier)

Problem with radio wave signals or location? (See page BE–89)
- Yes → Poor signals, poor location.
- **No** ↓

Are both AM and FM defective?
- **No** → Radio or radio as–sembly faulty.
- Yes ↓

Go to No. 17.
- If radio side faulty. ↓

Is tape player operating normally?
- Yes → Radio assembly faulty.
- **No** ↓

Temporarily install another speaker. Functions OK?
- Yes → Speaker faulty.
- **No** ↓
  - [R] [S] [U] ↓

R	**S**	Radio faulty.
U		Radio assembly faulty.

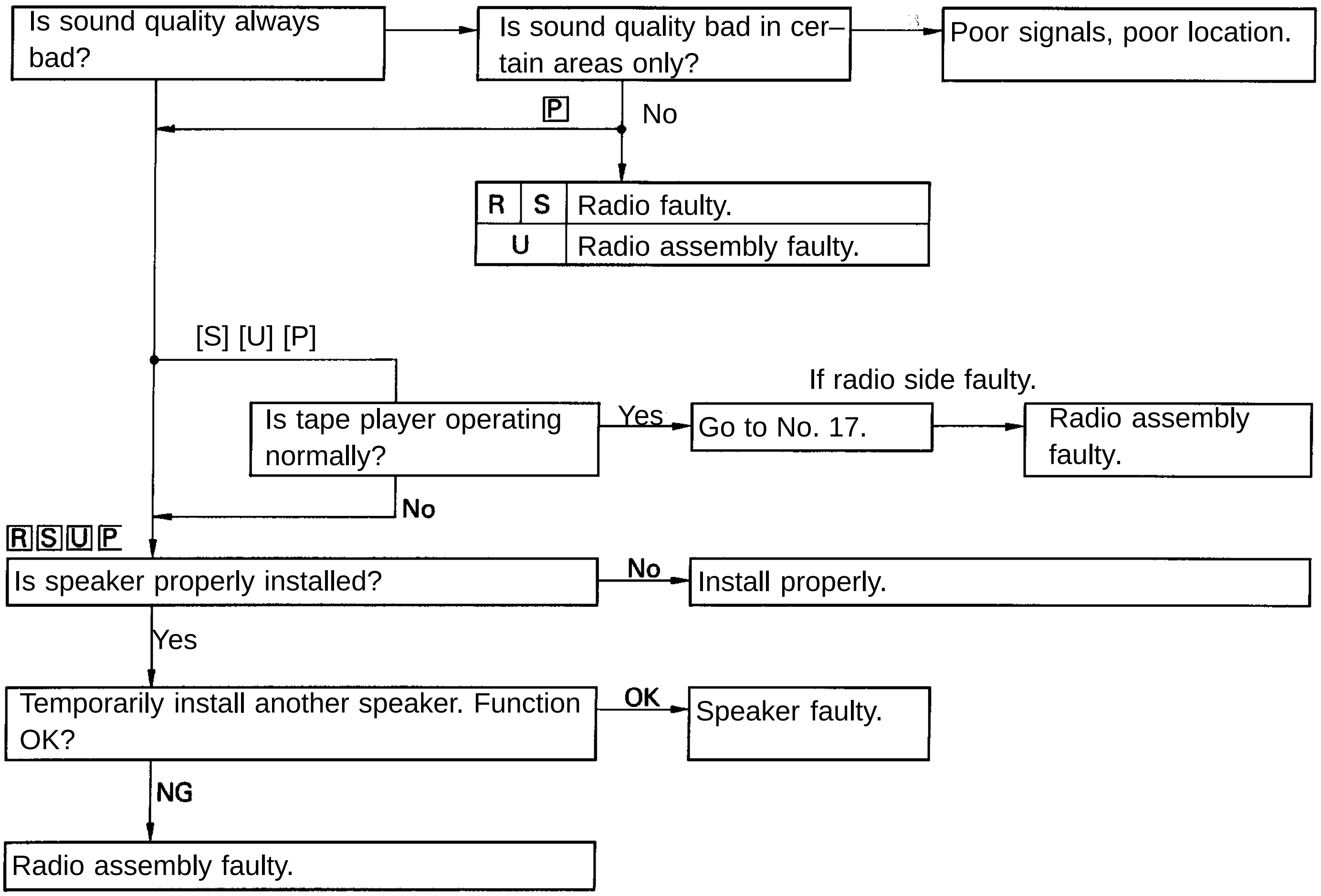
  - [P] ↓

Hissing sound from speaker?
- **No** → Power amplifier faulty. Recheck system after repair.
- Yes ↓

Radio assembly faulty. Recheck system after repair.

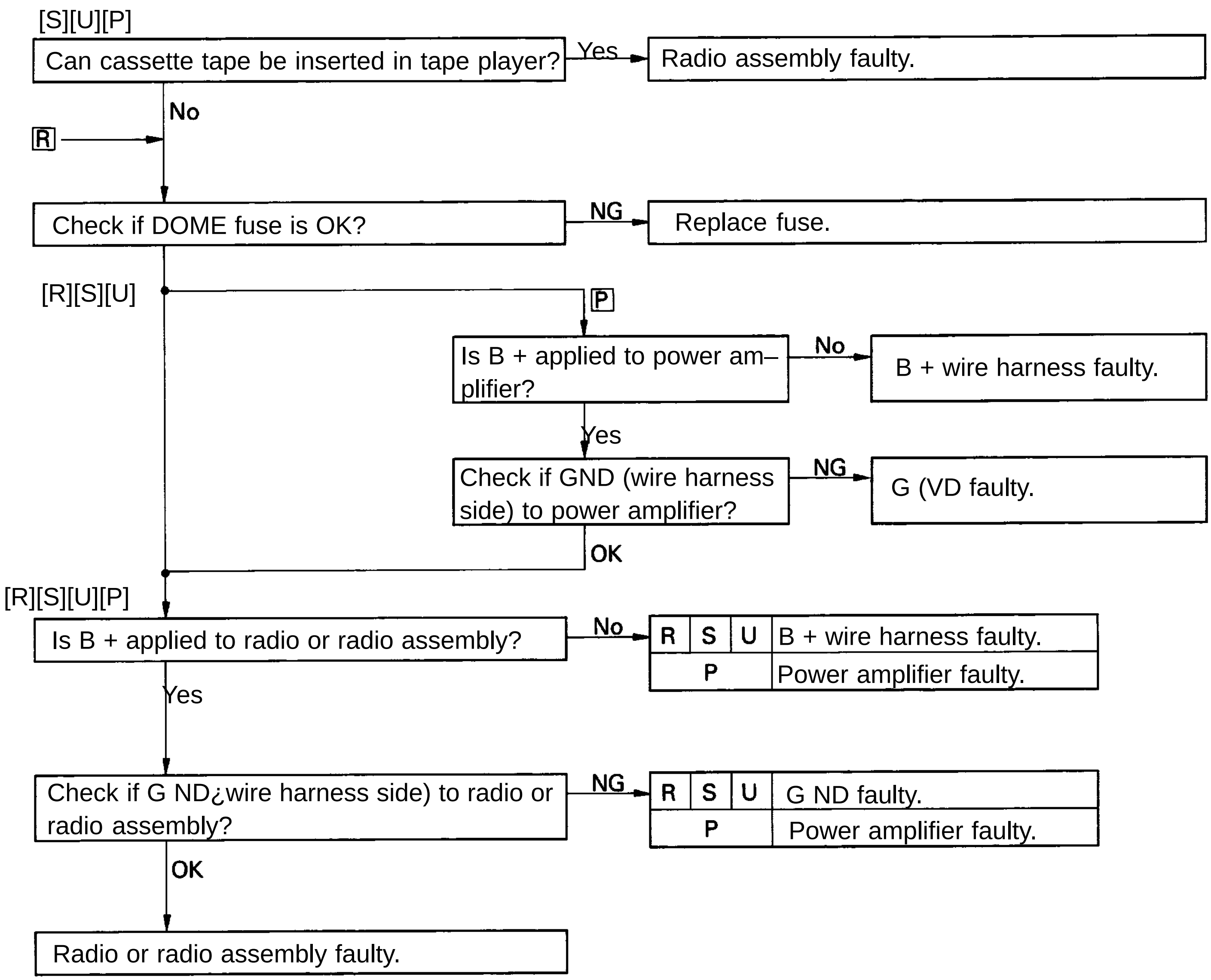
6 Radio — SOUND QUALITY POOR

[E] Radio [S] Radio + Tape Player [U] Radio–Tape Player (Built–in Power Amplifier)
[P] Radio–Tape Player (Separate Power Amplifier)



7	Radio	CANNOT SET STATION SELECT BUTTON, PRESET MEMORY DISAPPEARS

[R] Radio [S] Radio + Tape Player [U] Radio–Tape Player (Built–in Power Amplifier)
[P] Radio–Tape Player (Separate Power Amplifier)



8	Tape Player	CASSETTE TAPE CANNOT BE INSERTED

[S] Radio + Tape Player [U] Radio–Tape Player (Built–in Power Amplifier)
[P] Radio–Tape Player (Separate Power Amplifier)

[S][U][P]

Is there a foreign object inside tape player?
- Yes → Remove foreign object.
- No ↓

Is radio operating normally?
- Yes →

S		Tape player faulty.
U	P	Radio assembly faulty.

- No ↓

Check if DOME fuse is OK?
- NG → Replace fuse.
- OK ↓ (U ↓ / [S][P] →)

S	Is B + applied to tape player?
P	Is B + applied to power amplifier?

- No → B + wire harness faulty.
- Yes ↓

	Check if GND (wire harness side) to tape player is OK?
P	Check if G ND (wire harness side) to power amplifier is OK?

- NG → G ND faulty.
- OK ↓ (P ←)
- S ↓

Tape player faulty.

U

Is B + applied to radio assembly?
- No →

U	B + wire harness faulty.
P	Power amplifier faulty.

- Yes ↓

Check if GND (wire harness side) to radio assembly is OK?
- NG →

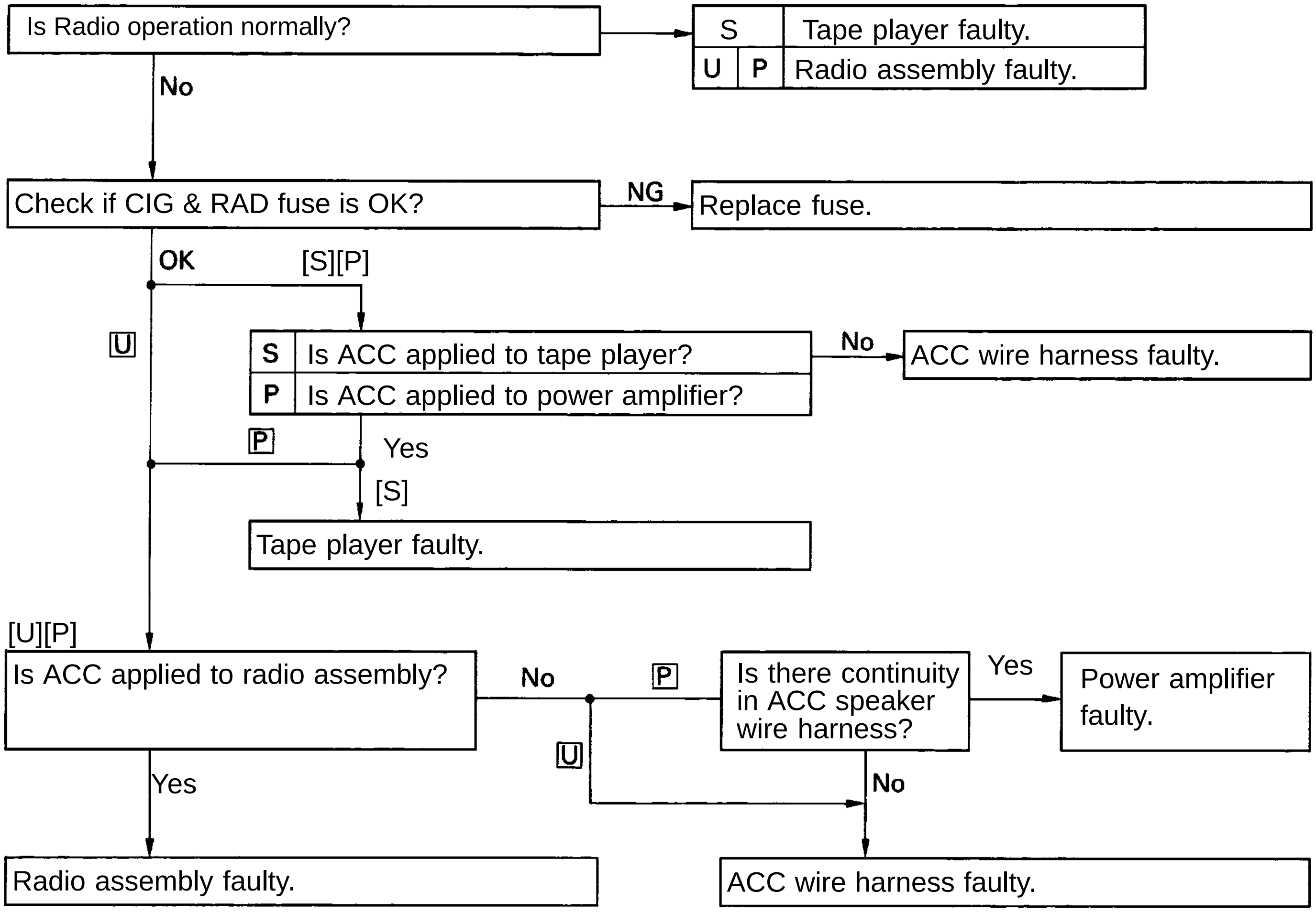
	G ND faulty.
P	Power amplifier faulty.

- OK ↓

Radio assembly faulty.

9	**Tape Player**	**CASSETTE TAPE INSERTS, BUT NO POWER**

[S] Radio + Tape Player [U] Radio–Tape Player (Built–in Power Amplifier)
[P] Radio–Tape Player (Separate Power Amplifier)



10	Tape Player	POWER COMING IN, BUT TAPE PLAYER NOT OPERATING

[S] Radio + Tape Player [U] Radio–Tape Player (Built–in Power Amplifier)
[P] Radio–Tape Player (Separate Power Amplifier)

Functions OK if different cassette tape inserted?
- Yes → Cassette tape faulty.
- No ↓

Is radio operating normally?
- Yes →

S		Tape player faulty.
U	P	Radio assembly faulty.

- No ↓

Is there, continuity in speaker wire harness?
- No → Speaker wire harness faulty.
- Yes ↓

Temporarily install another speaker. Functions OK?
- Yes → Speaker faulty.
- No ↓

[S][U]

S	Tape player faulty.
U	Radio assembly faulty.

P

Hissing sound from speaker?
- No → Power amplifier faulty. Recheck system after repair.
- Yes ↓

Radio assembly faulty. Recheck system after repair.

11	Tape Player	EITHER SPEAKER DOES NOT WORK

[S] Radio + Tape Player [U] Radio–Tape Player (Built–in Power Amplifier)
[P] Radio–Tape Player (Separate Power Amplifier)

Is radio operating normally?

Yes →

S	Tape player faulty.
U P	Radio assembly faulty.

No ↓

Is hiss produced by non–functioning speaker?

Yes →

S	Tape player faulty.
U	Radio assembly faulty.
P	Radio assembly faulty. Recheck system after repair.

No ↓

Is there continuity in speaker wire harness?

No → Speaker wire harness faulty.

Yes ↓

Temporarily install another speaker. Functions OK?

OK → Speaker faulty.

NG ↓

S	Tape player faulty.
U	Radio assembly faulty.
P	Radio assembly faulty. Recheck system after repair.

12	Tape Player	SOUND QUALITY POOR (VOLUME FAINT)

[S] Radio + Tape Player [U] Radio–Tape Player (Built–in Power Amplifier)
[P] Radio–Tape Player (Separate Power Amplifier)

Functions OK if different cassette tape inserted? — Yes → Cassette tape faulty.

↓ No

Operates normally after cleaning the heads? (See page BE–90) — Yes → Head dirty.

↓ No

Is radio operating normally? — Yes → Radio assembly faulty.

↓ No

Is speaker properly installed? — No → Install properly.

↓ Yes

Temporarily install another speaker. Functions OK? — Yes → Speaker faulty.

↓ No

S	Tape player faulty.
U	Radio assembly faulty.
P	Radio assembly faulty. Recheck system after repair.

13	Tape Player	TAPE JAMMED, MALFUNCTION WITH TAPE SPEED OR AUTO–REVERSE

[S] Radio + Tape Player [U] Radio–Tape Player (Built–in Power Amplifier)
[P] Radio–Tape Player (Separate Power Amplifier)

Functions OK if different tape (less than 120 mins.) is inserted? — Yes → Cassette tape faulty.

↓ No

Is there a foreign object inside tape player? — Yes → Remove foreign object.

↓ No

Operates normally after cleaning the heads? (See page BE–90) — Yes → Head dirty.

↓ No

S	Tape player faulty.
U, P	Radio assembly faulty.

14	Tape Player	APS, SKIP, RPT BUTTONS NOT OPERATING

[S] Radio + Tape Player [U] Radio–Tape Player (Built–in Power Amplifier)
[P] Radio–Tape Player (Separate Power Amplifier)

Functions OK if different cassette tape in–serted?
- No → Radio assembly faulty.
- Yes → Cassette tape faulty. (Less than 3 secs. of silence between songs (APS, RPT). Less than 15 secs. of silence (SKIP).)

15	Tape Player	CASSETTE TAPE WILL NOT EJECT

[S] Radio + Tape Player [U] Radio–Tape Player (Built–in Power Amplifier)
[P] Radio–Tape Player (Separate Power Amplifier)

Is tape player operating normally?
- No → Cassette tape jammed.
- Yes ↓

Is radio operating normally?
- Yes →

S		Tape player faulty.
U	P	Radio assembly faulty.

- ↓

Check if DOME fuse is OK?
- NG → Replace fuse.
- OK ↓

Is B + applied to power amplifier?
- No → B + wire harness faulty.
- Yes ↓

S		Is B + applied to tape player?
U	P	Is B + applied to radio assembly?

- No → Is there continuity in B + wire harness be–tween power amplifier and radio assembly?
  - Yes → Power amplifier faulty.
  - No → B + wire harness faulty.
- No → B + wire harness faulty.
- Yes ↓

S		Tape player faulty.
U	P	Radio assembly faulty.

16	Antenna	ANTENNA–RELATED

24–a: Pole Antenna

Is antenna extended?
No → Extend fully.
Yes ↓
Temporarily install another antenna. Functions OK?
Yes → Antenna faulty.
↓
Radio side faulty.

24–b: Motor Antenna

[M] : Motor Antenna (Radio Linked Type) 0 : Motor Antenna (Except Radio–Linked Type)

M	Does antenna extended when radio switched ON?
N	Dose antenna extended when antenna switch pushed in?

→ Temporarily install another antenna. Function OK? → Motor antenna faulty.
No ↓
Radio side faulty.

Yes ↓

Inspect antenna motor. (See page BE–109)
NG → Antenna motor faulty.
OK ↓
[M]
Inspect antenna motor control relay. (See page BE–109)
NG → Relay faulty.
OK ↓
Temporarily install another antenna. Functions OK?
Yes → Motor antenna faulty.
No ↓
Is power related to antenna being input to an–tenna motor control relay?
Yes → Relay faulty.
No ↓

Check continuity between antenna motor control relay and radio.
NG → Wire harness faulty.
OK ↓
Radio side faulty.

17	Noise	NOISE PRODUCED BY VIBRATION OR SHOCK WHILE DRIVING

Is speaker properly installed? — No → Install properly.

Yes ↓

Is each system correctly installed? — No → Install properly.

Yes ↓

With vehicle stopped, lightly tap each system. Is noise produced? — Yes → Each system faulty.

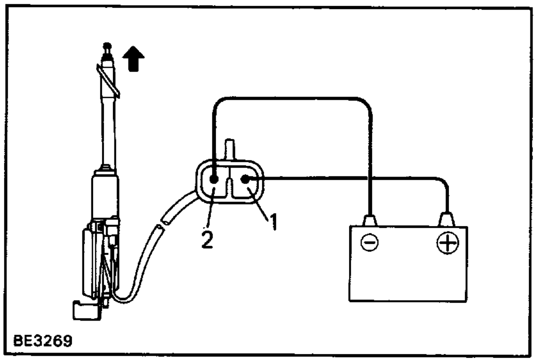
No ↓

Noise produced by static electricity accumu–lating in the vehicle body.

18	Noise	NOISE PRODUCED WHEN ENGINE STARTS

Condition	Yes
Whistling noise which becomes high–pitched when accelerator strongly depressed, disap–pears shortly after engine stops.	Generator noise.
No ↓ Whining noise occurs when A/C is operating.	A/C noise.
No ↓ Scratching noise occurs during sudden accel–eration, driving on rough roads or when igni–tion switch is turned on.	Fuel gauge noise.
No ↓ Clicking sound heard when horn button is pressed, then released. Whirring/grating sound when pushed continuously.	Horn noise.
No ↓ Murmuring sound, stops when engine stops.	Ignition noise.
No ↓ Tick–tock noise, occurs in co–ordination with blinking of flasher.	Turn signal noise.
No ↓ Noise occurs during window washer opera–tion.	Washer noise.
No ↓ Scratching noise occurs while engine is run–ning, continues a while even after engine stops.	Engine coolant temp. gauge noise.
No ↓ Scraping noise in time with wiper beat.	Wiper noise.
No ↓ Other type of noise.	

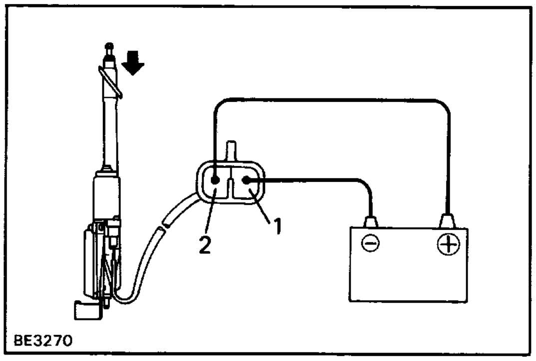
Parts Inspection



1. INSPECT ANTENNA MOTOR

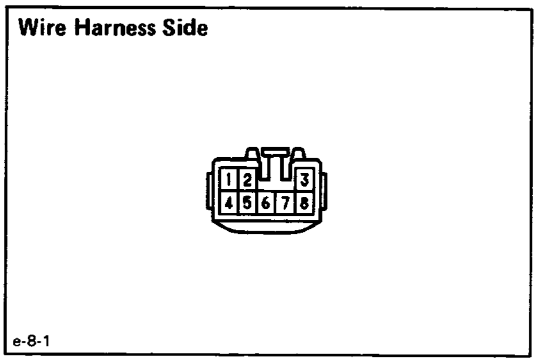
(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2.
(b) Check that the motor turns (moves upward).

NOTICE: These tests must be performed quickly (within 3–5 seconds) to prevent the coil from burning out.



(c) Then, reverse the polarity, check that the motor turns the opposite way (moves downward).

NOTICE: These tests must be performed quickly (within 3–5 seconds) to prevent the coil from burning out.



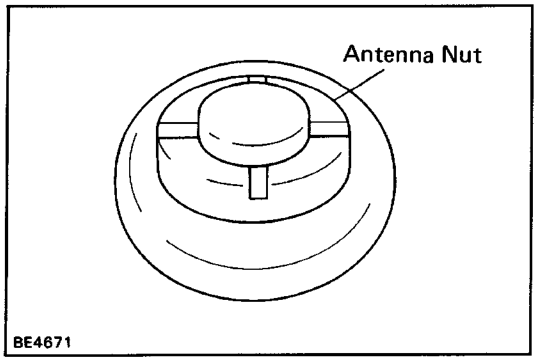
2. INSPECT ANTENNA MOTOR CONTROL RELAY

(Relay Circuit)
Disconnect the connector from the relay and inspect the connector on wire harness side as shown in the chart.

Check for	Tester connection	Condition			Specified value
Continuity	1 – 4	Constant			Continuity
	2 – Ground	Constant			Continuity
Voltage	3 – Ground	Constant			Battery positive voltage
	5 – Ground	Ignition switch position	LOCK		No voltage
			ACC or ON		Battery positive voltage
	6 – Ground	Ignition swtich position	LOCK		No voltage
			ACC or ON	Radio switch and cassette OFF	No voltage
				Radio switch or cassette ON	Battery positive voltage
	8 – Ground	Ignition switch position	LOCK		No voltage
			ACC or ON	Radio switch OFF or cassette ON	No voltage
				Radio switch ON and cassette OFF	Battery positive voltage
	9 – Ground	Ignition switch position	LOCK or ACC		No voltage
			ON		Battery positive voltage

If circuit is as specified, replace the relay.

REMOVAL AND INSTALLATION OF ANTENNA ROD

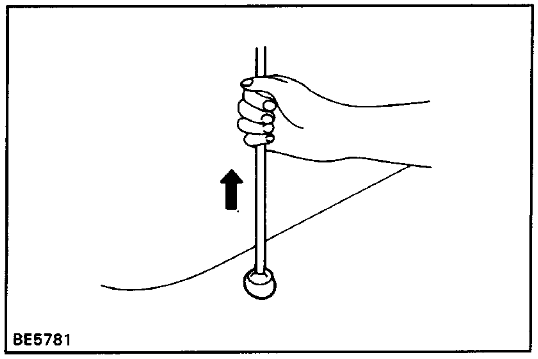


1. REMOVE ANTENNA ROD

HINT: Perform this operation with the battery negative (–) cable connected to the battery terminal.

(a) Turn the ignition switch to ”LOCK” position.

(b) Remove the antenna nut.

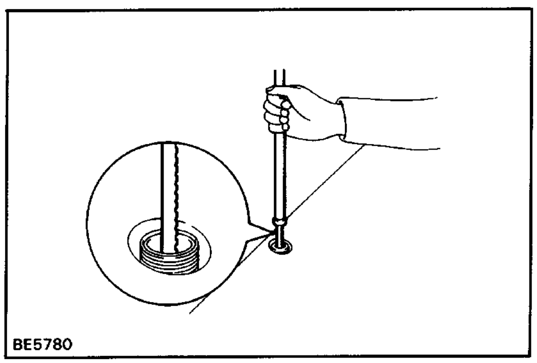


(c) Press the ”AM” button on the radio receiver, and simultaneously turn the ignition switch to ”ACC” position.

HINT:

- The rod will extend fully and be released from the motor antenna.
- After removing the antenna rod, leave the ignition switch at ”ACC”.

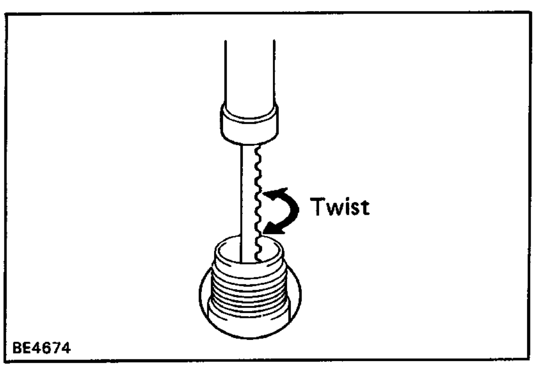
2. INSTALL ANTENNA ROD



(a) Insert the cable of the rod until it reaches the bottom.

HINT:

- When inserting the cable, the teeth on the cable must face toward the rear of the vehicle.
- Insert the antenna approx. 300 mm (11.8 in.)

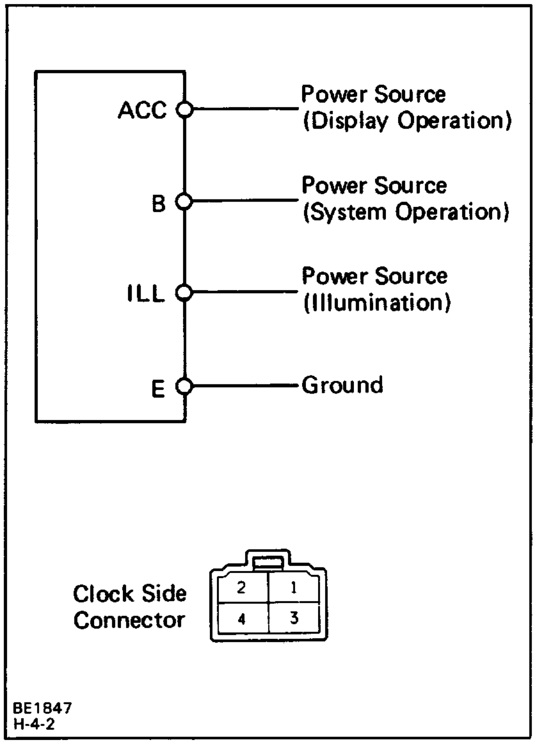


(b) Wind the cable to retract the rod by turning the ignition switch to ”LOCK” position.

HINT:

- If the ignition switch is already in ”LOCK” position, perform step 1
  (c) first, then turn the ignition switch to ”ACC” position.
- In case the cable is not wound, twist it as shown in the illustration.
- Even if the rod has not retracted fully, install the antenna nut and inspect the antenna rod operation. It will finally retract fully.

(c) Inspect the antenna rod operation by pushing the radio wave band select buttons.



CLOCK

Troubleshooting

As shown in the illustration, those are clock circuit and connector diagrams. Inspect each terminal for applicable trouble.

Terminals		Condition	Specified value
1	E	Constant	Continuity
2	ILL	Turn light control switch ON	Battery positive voltage
3	B	Constant	
4	ACC	Turn ignition switch ACC	

Allowable error: ± 1.5 seconds/day

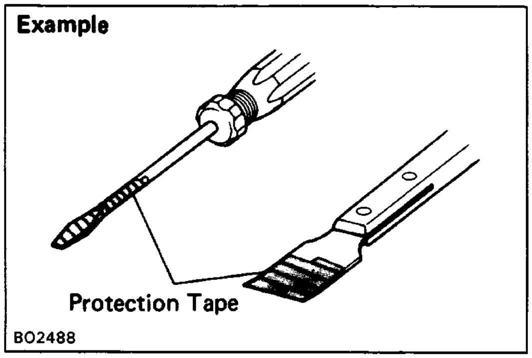
BODY

GENERAL INFORMATION

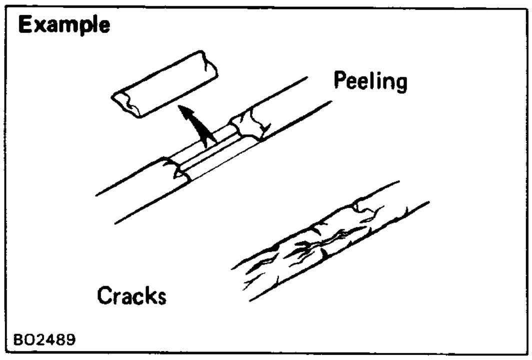
If there is a possibility the body and/or parts may be dam–aged, first remove the danger before performing repair operations.

Example:

1. Apply protection tape to the body adjacent to the body parts when removing and installing.



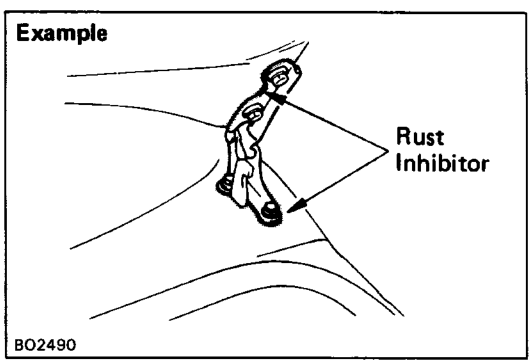
2. When prying off the body parts with a screwdriver or scraper etc., be sure to apply protection tape to the tip or blade to prevent damage to the paint film or body part.



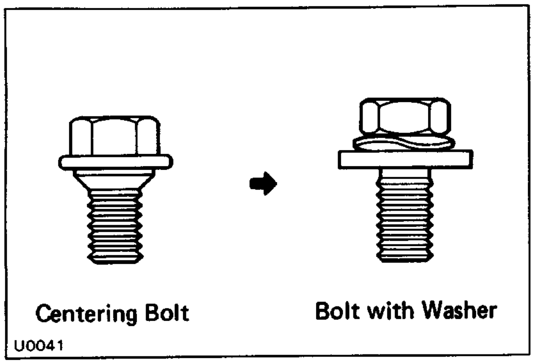
If anti–rust agents are damaged while repairing other parts, be sure to repair the anti–rust agent.

Example:

1. If body sealant, paint film or undercoat are damaged by peeling, cracks, etc., be sure to repair each with an anti–rust agent.



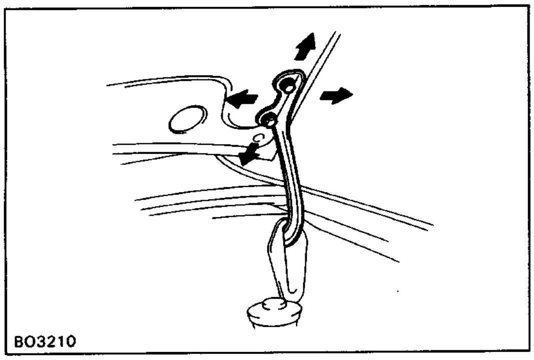
2. If a hinge or exterior body panel is loosened or re–moved, be sure apply rust inhibitor after repairs.



HOOD

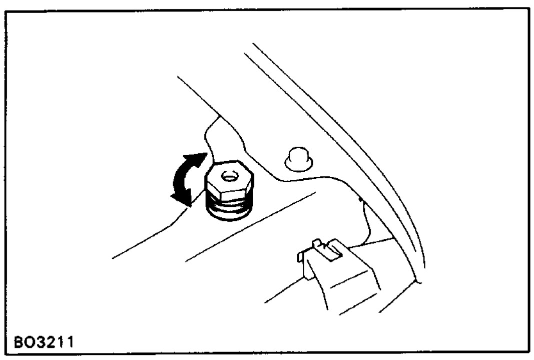
ADJUSTMENT OF HOOD

HINT: Since the centering bolt is used as the hood hinge set bolt, the hood cannot be adjusted with it on. Substi– tute the bolt with the washer for the centering bolt.



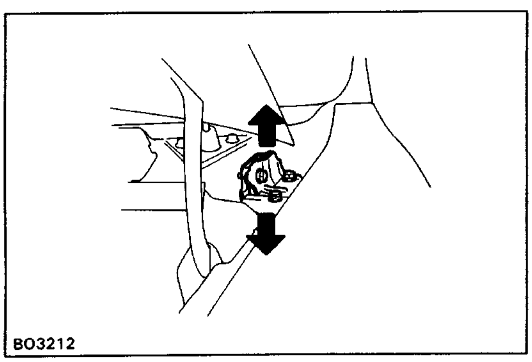
1. ADJUST HOOD IN FORWARD /REARWARD AND LEFT/RIGHT DIRECTIONS

Adjust the hood by loosening the hood side hinge bolts.



2. ADJUST FRONT EDGE OF HOOD IN VERTICAL DIRECTION

Adjust the hood by turning the cushions.



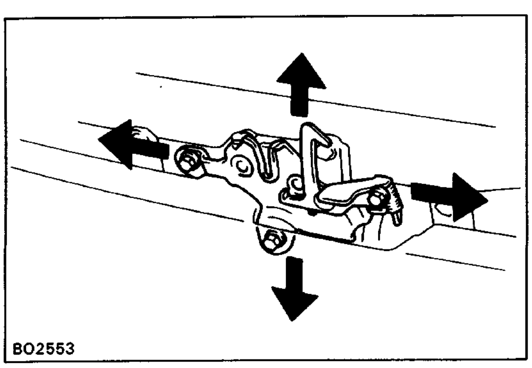
3. REMOVE WIPER ARMS

4. REMOVE COWL PANEL

Remove two clips, three screws and the cowl panel.

5. ADJUST REAR EDGE OF HOOD IN VERTICAL DIRECTION

Adjust the hood by loosening the hood hinge bolts.

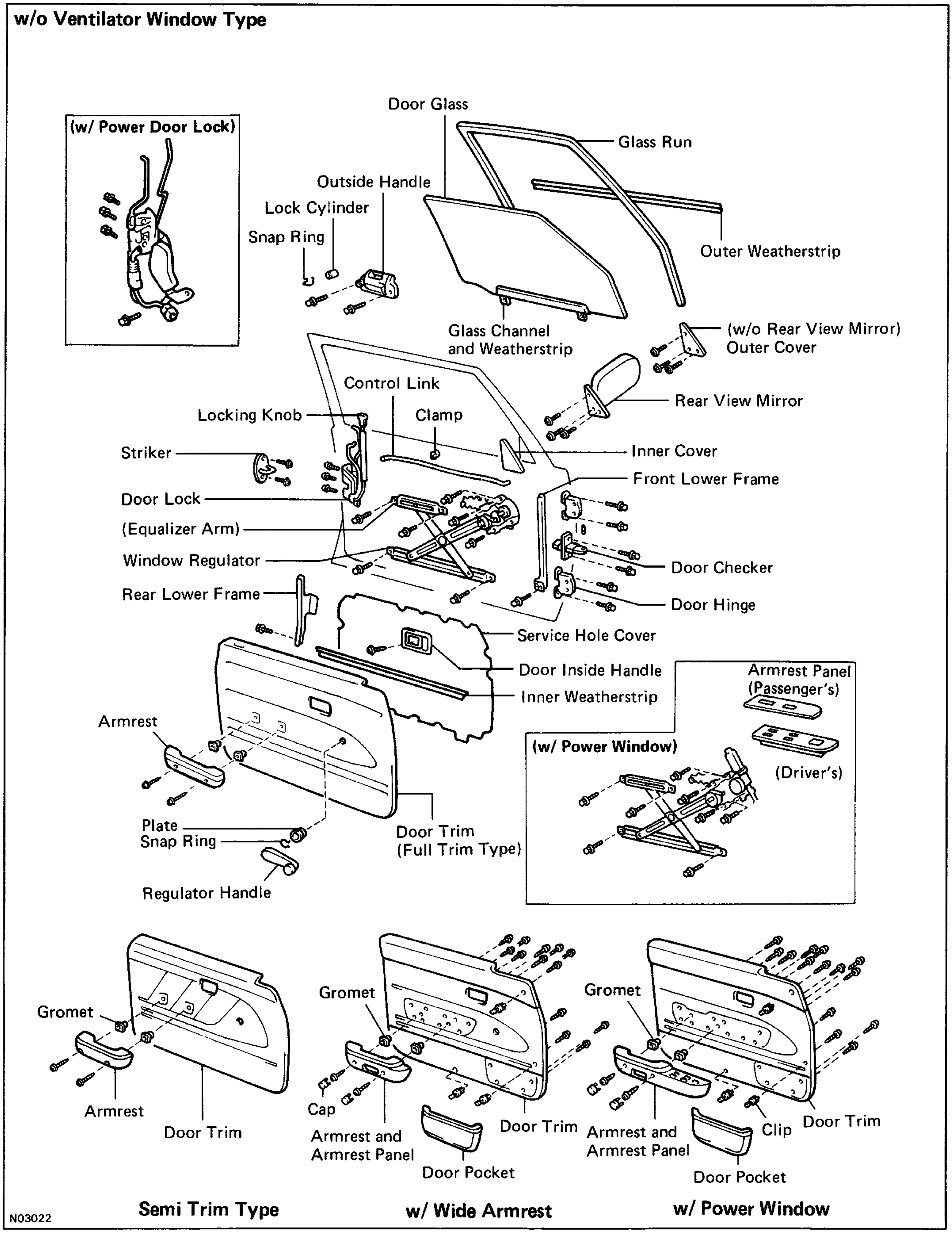


6. ADJUST HOOD LOCK

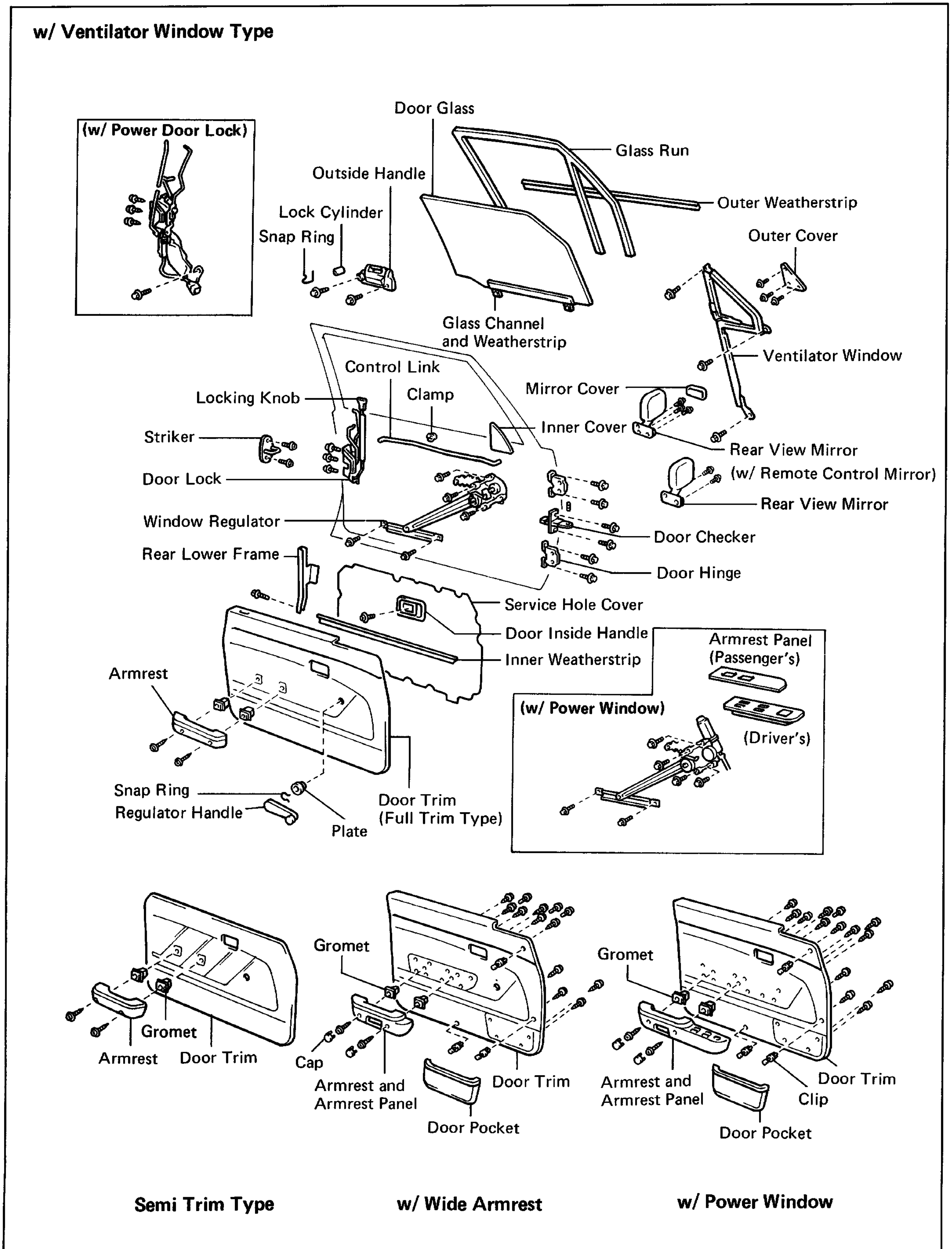
Adjust the lock by loosening the bolts.

FRONT DOOR

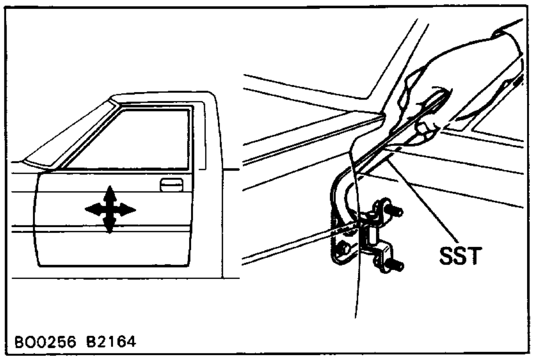
COMPONENTS



COMPONENTS (Cont'd)



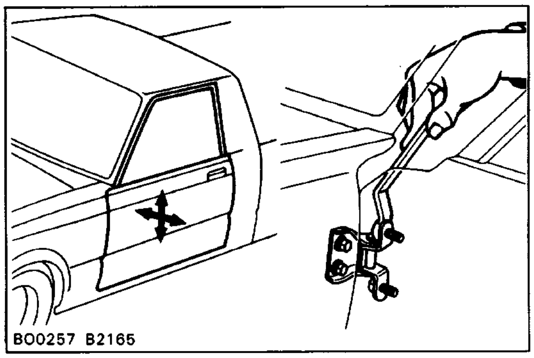
N03023



ADJUSTMENT OF FRONT DOOR

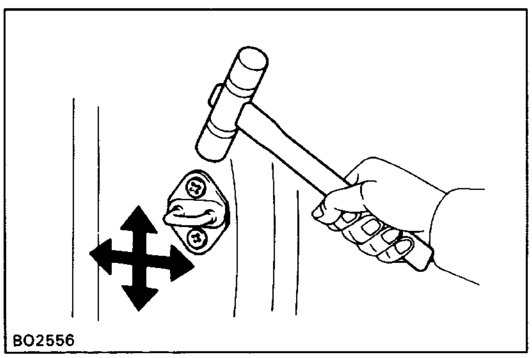
1. ADJUST DOOR IN FORWARD/REARWARD AND VERTICAL DIRECTIONS

Using SST, adjust the door by loosening the body side hinge bolts.
SST 09812–00010



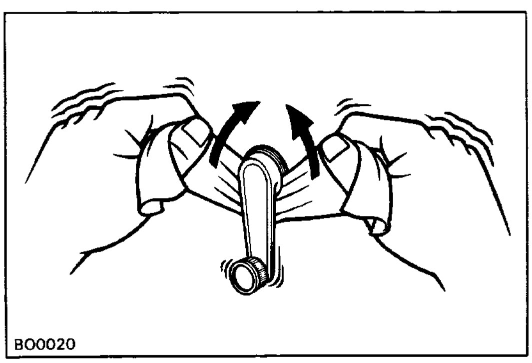
2. ADJUST DOOR IN LEFT/RIGHT AND VERTICAL DIRECTIONS

Loosen the door side hinge bolts to adjust.



3. ADJUST DOOR LOCK STRIKER

(a) Check that the door fit and door lock linkages are adjusted correctly.
(b) Adjust the striker position by slightly loosening the striker mounting screws, and hitting the striker with a hammer.
(c) Tighten the striker mounting screws again.

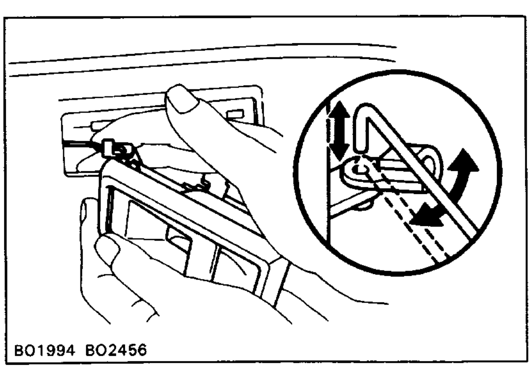


DISASSEMBLY OF FRONT DOOR

(See pages BO–4 and 5)

1. (w/o Power Window) REMOVE REGULATOR HANDLE

Pull off the snap ring with a cloth and remove the regula–tor handle and plate.

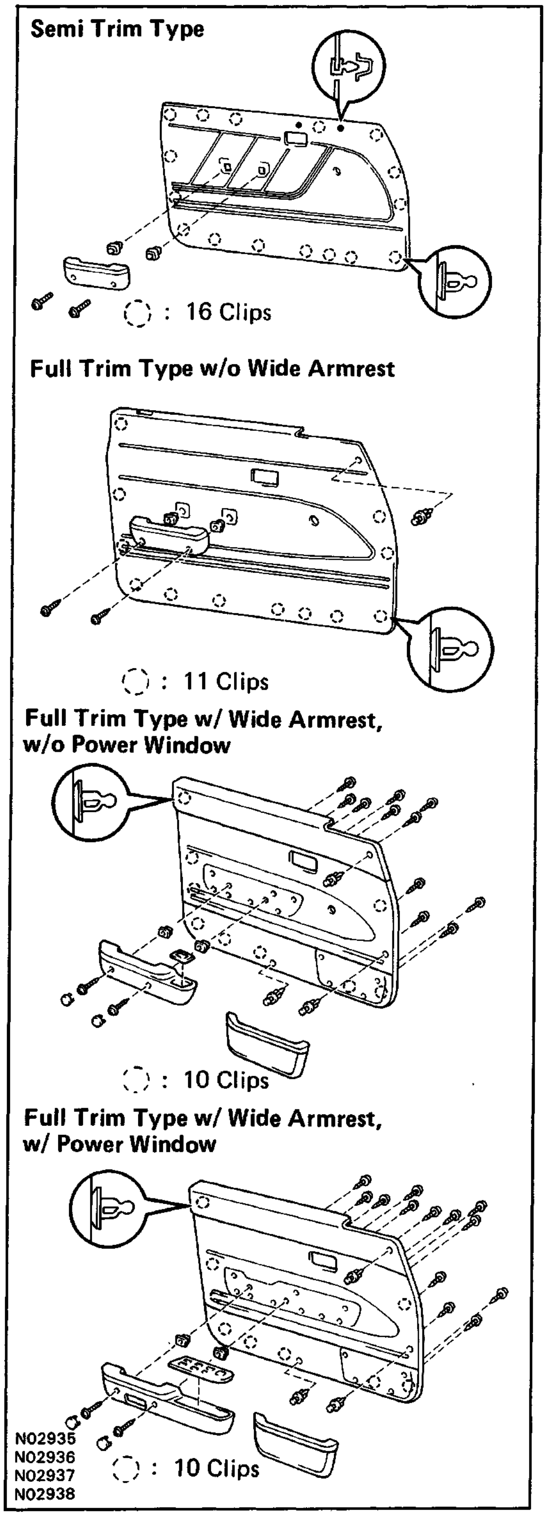


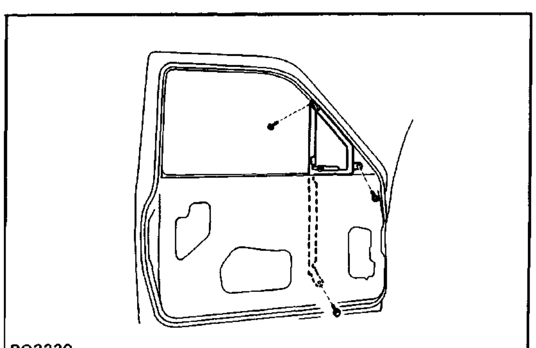
2. REMOVE DOOR INSIDE HANDLE

(a) Remove the screw and slide the handle forward.
(b) Disconnect the handle from the control link and re–move the handle.

3. REMOVE INNER AND OUTER COVERS

(a) Using a screwdriver, pry loose a clip and remove the inner cover.
HINT: Tape the screwdriver tip before use.
(b) (w/ Ventilator Window or w/o Rear View Mirror) Remove three screws and the outer cover.





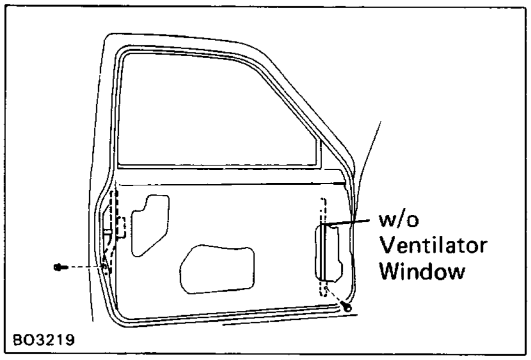
4. REMOVE REAR VIEW MIRROR
(w/o Ventilator Window)
(a) (w/Remote Control Mirror)
Disconnect the connector.
(b) Remove three screws and the mirror.
(wI Ventilator Window)
(a) (w/ Remote Control Mirror)
Disconnect the connector.
(b) (w/o Remote Control Mirror)
Remove the mirror cover, two screws and the mir–ror.
(w/ Remote Control Mirror)
Remove the mirror cover, three screws and the mir–ror.

5. REMOVE DOOR TRIM
(a) (w/ Wide Armrest)
Remove two caps from the armrest.
(b) (w/ Wide Armrest)
Remove two screws from the armrest.
(Semi Trim Type and Full Trim Type, wI Wide Arm–rest)
Remove two screws and the armrest.
(c) (w/ Power Window)
Remove the armrest panel by pulling upward, then disconnect the connectors.
(d) (w/ Wide Armrest)
Remove three clips.
(Full Trim Type, w/o Wide Armrest)
Remove the clip.
(e) Install the screwdriver between the retainers and door trim to pry it loose.

HINT: Tape the screwdriver tip before use.
(f) Remove the door trim.
(g) (w/ Power Window)
Remove nine screws and the armrest.
(wI Wide armrest, w/o Power Window)
Remove seven screws and the armrest.
(h) (w/ Wide Armrest)
Remove four screws and the door pocket.
(i) (Full Trim Type)
Remove the inner weatherstrip from the door trim.

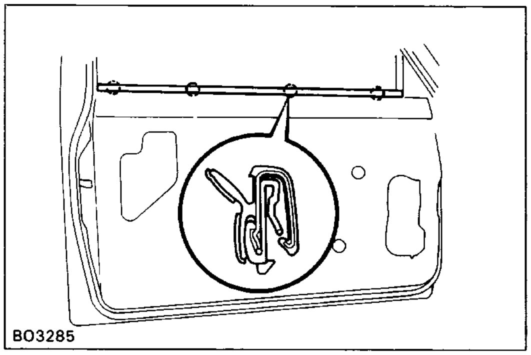
6. REMOVE SERVICE HOLE COVER

7–1. (wI Ventilator Window)
REMOVE VENTILATOR WINDOW
(a) Remove the bolt and two screws.
(b) Remove the ventilator window by pulling it upward.



7–2. (w/o Ventilator Window)
REMOVE FRONT LOWER FRAME
Remove the bolt and the frame.

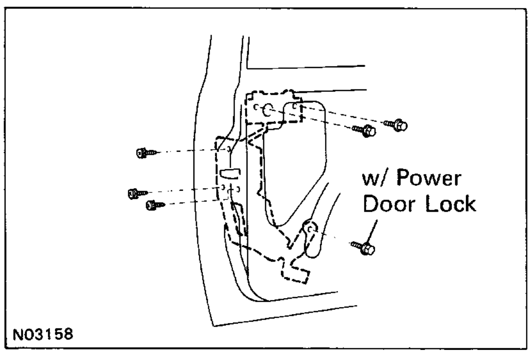
8. REMOVE REAR LOWER FRAME
Remove the bolt and the frame.



9–1. (Semi Trim type)
REMOVE INNER AND OUTER WEATHERSTRIP
Pry loose the clips from the edge of the panel and remove the weatherstrip.

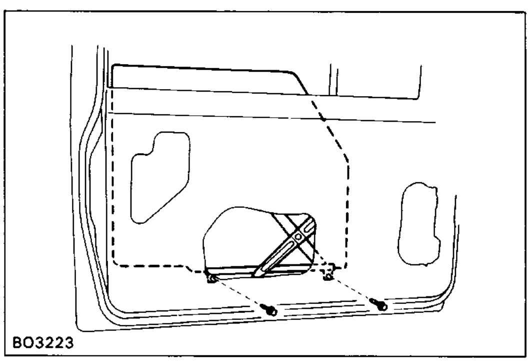
9–2. (Full Trim type)
REMOVE OUTER WEATHERSTRIP
In the same manner, remove the outer weatherstrip.

10. REMOVE GLASS RUN

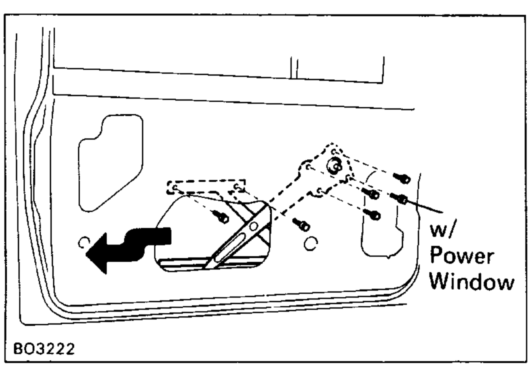


11. REMOVE INSIDE LOCKING KNOB
Disconnect the link and remove the inside locking knob.

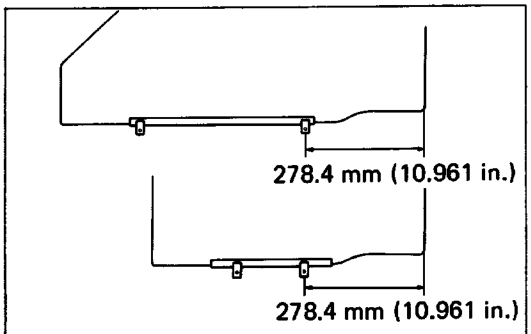
12. REMOVE OUTSIDE HANDLE WITH LOCK CYLINDER AND DOOR LOCK
(a) Disconnect the links from the outside handle with the lock cylinder.
(b) (w/Power Door Lock)
Disconnect the connectors, remove three screws, the bolt and the door lock with the motor.
(w/o Power Door Lock)
Remove three screws and the door lock.
(c) Remove two bolts and the outside handle with lock cylinder.
(d) Remove the snap ring and the lock cylinder.



13. REMOVE DOOR GLASS AND WINDOW REGULATOR
(a) Remove two glass channel mounting bolts.
(b) Place the glass in the door cavity.



(c) (w/o Ventilator Window)
Remove two equalizer arm bracket mounting bolts.
(d) (wI Power Window)
Disconnect the connectors, then remove four regu–lator mounting bolts.
(wIo Power Window)
Remove three regulator mounting bolts.
(e) Remove the regulator through the service hole.
(f) Remove the glass by pulling it upward.



BO3669

REPLACEMENT OF GLASS

1. REMOVE GLASS CHANNEL WITH SCREWDRIVER OR LIKE OBJECT
2. APPLY SOAPY WATER TO INSIDE OF WEATHER–STRIP
3. INSTALL CHANNEL BY TAPPING IT WITH PLASTIC HAMMER

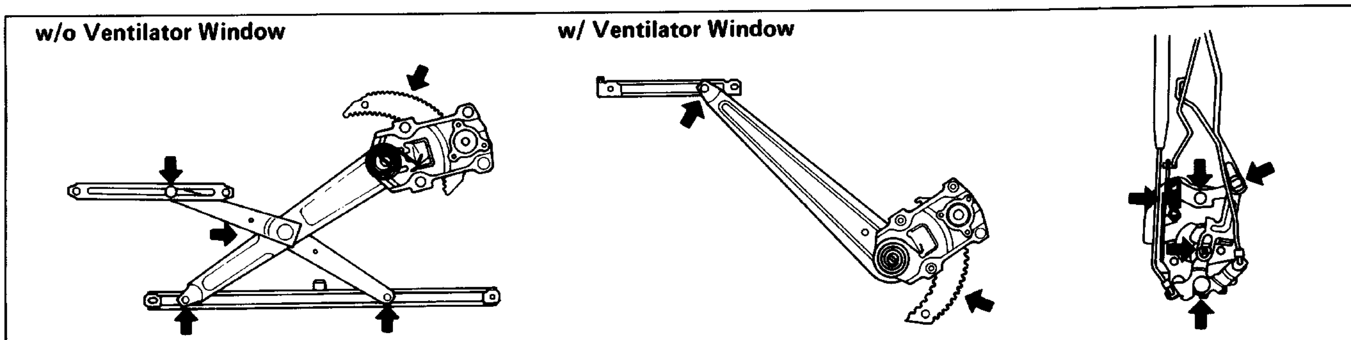
ASSEMBLY OF FRONT DOOR

(See pages BO–4 and 5)

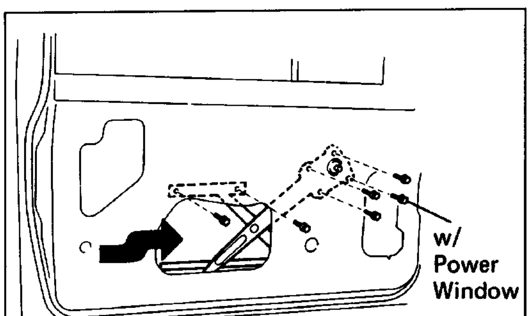
1. BEFORE INSTALLING PARTS, COAT THEM WITH MP GREASE

(a) Apply MP grease to the sliding surface and the gears of the window regulator.
NOTICE: Do not apply MP grease to the spring of the window regulator.

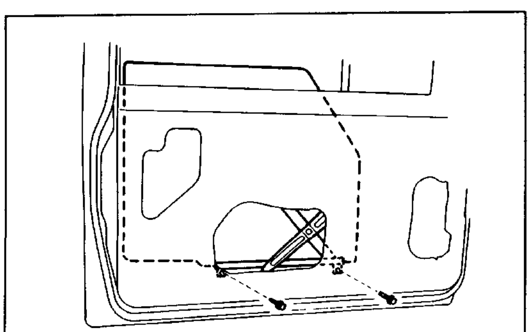
(b) Apply MP grease to the sliding surface of the door lock.



BO2497R BO3226 BO3227



BO3222


BO3223

2. INSTALL WINDOW REGULATOR AND DOOR GLASS

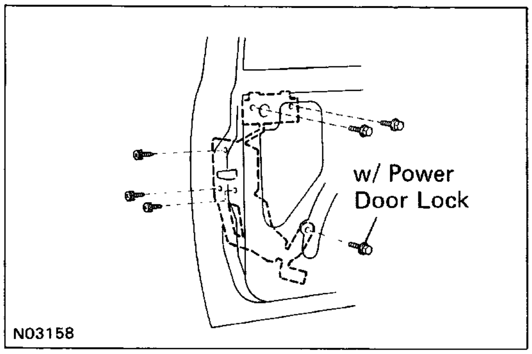
(a) Place the glass in the door cavity.

(b) Place the regulator through the service hole.

(c) (wI Power Window)
Install the four regulator mounting bolts, then con–nect the connector.
(w/o Power Window)
Install the three regulator mounting bolts.

(d) (w/o Ventilator Window)
Install the equalizer arm and temporarily tighten two equalizer arm mounting bolts.

(e) Attach the glass to the window regulator with two bolts.



3. INSTALL OUTSIDE HANDLE WITH LOCK CYLINDER AND DOOR LOCK

(a) Install the lock cylinder with the snap ring to the out–side handle.

(b) Install the outside handle and lock cylinder with two bolts.

(c) (w/Power Door Lock)
Install the door lock and motor with three screws and the bolt, then connect the connector.
(w/o Power Door Lock)
Install the door lock with three screws.

(d) Connect the links to the outside handle.

4. INSTALL INSIDE LOCKING KNOB

Install the locking knob and connect the control links.

5. INSTALL GLASS RUN

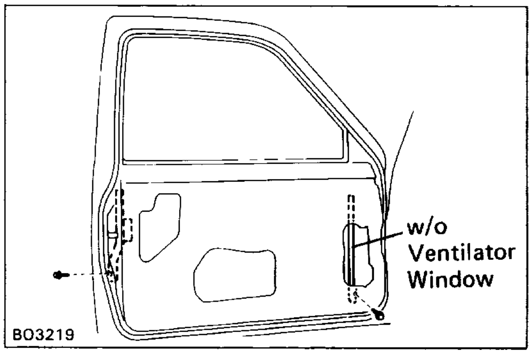
6. INSTALL REAR LOWER FRAME

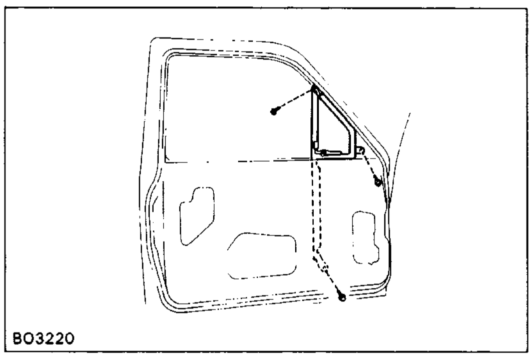
7–1. (w/o Ventilator Window)
INSTALL FRONT LOWER FRAME

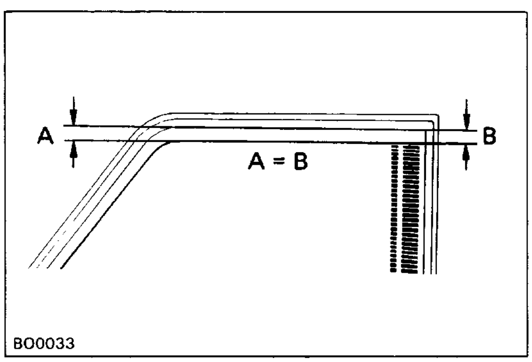
7–2. (w/Ventilator Window)
INSTALL VENTILATOR WINDOW

(a) Install the ventilator window.

(b) Install the bolt and two screws.





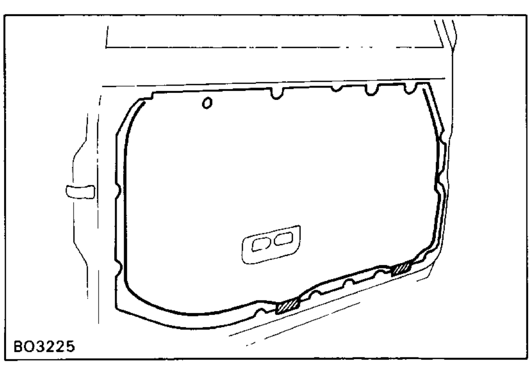


8. (w/o Ventilator Window)
ADJUST DOOR GLASS

Adjust the equalizer arm up or down and tighten if where–dimensions A and B, as shown are equal.

9. INSTALL REAR VIEW MIRROR

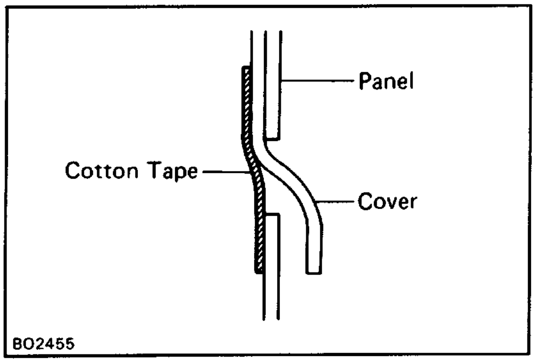
10. INSTALL INNER AND OUTER COVERS

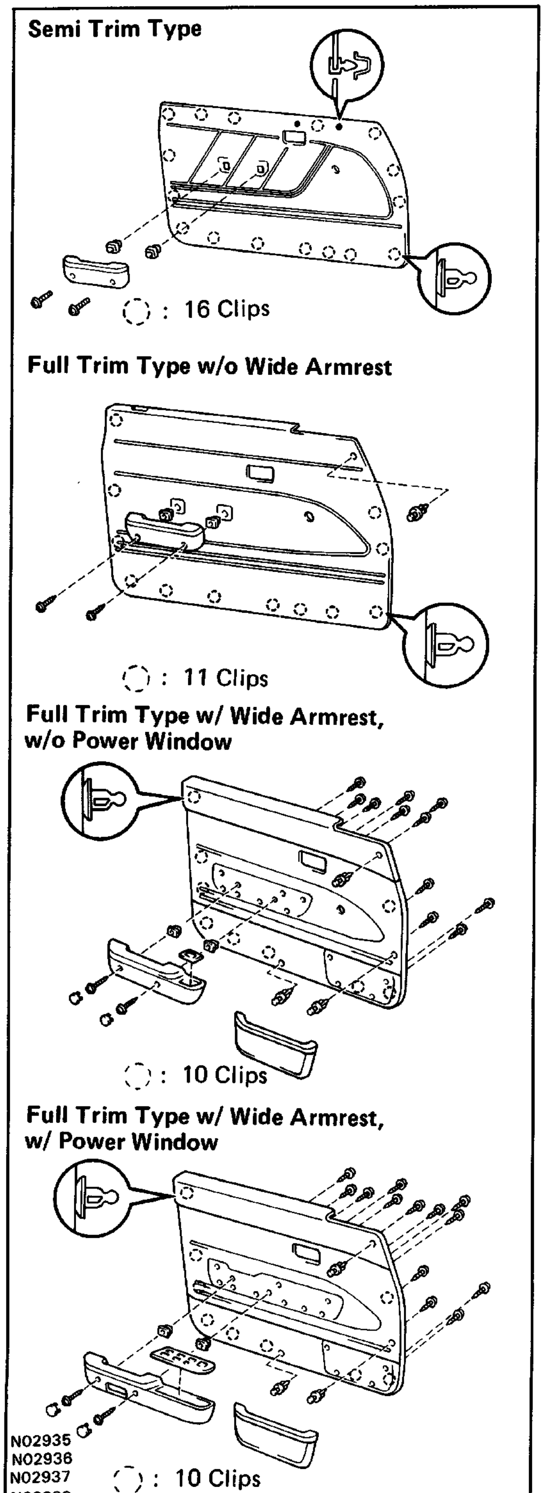


11. INSTALL SERVICE HOLE COVER

(a) Seal the service hole cover with adhesive.

(b) Install the lower edge of the service hole cover into the panel slit.





(c) Seal the panel slit with the cotton tape.

NOTICE: Do not block the trim clip seating with the tape.

12–1.(Semi Trim type)
INSTALL OUTER AND INNER WEATHERSTRIP

Install the claw of the clips into the upper panel slit and push the weatherstrip onto the panel.

12–2.(Full Trim type)
INSTALL OUTER WEATHERSTRIP

In the same manner, install the outer weatherstrip.

13. INSTALL THE DOOR TRIM

(a) (Full Trim Type)
Install the inner weatherstrip to the door trim.

(b) (wI Wide Armrest)
Install the door pocket with four screws to the door trim.

(c) (w/Power Window)
Install the armrest with nine screws to the door trim.
(wI Wide Armrest, w/o Power Window)
Install the armrest with seven screws to the door trim.

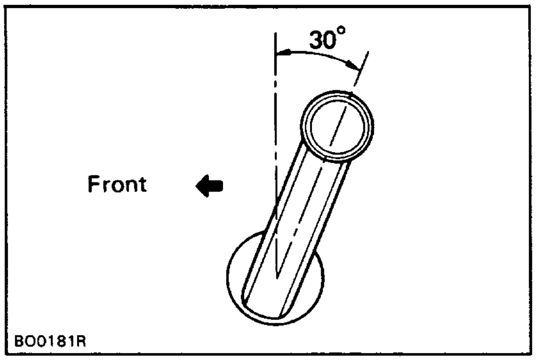
(d) Install the door trim with retainers to the inside panel by tapping.

(e) (wI Power Window)
Connect the connectors and install the armrest panel.

(f) (w/ Wide Armrest)
Install three crips.
(Full Trim Type, w/o Wide Armrest)
Install the clip.

(g) (w/ Wide Armrest)
Install two screws to the armrest.
(Semi Trim Type and Full Trim Type, wI Wide Arm–rest)
Install the armrest with two screws.

(h) (w/ Wide Armrest)
Install two caps to the armrest.



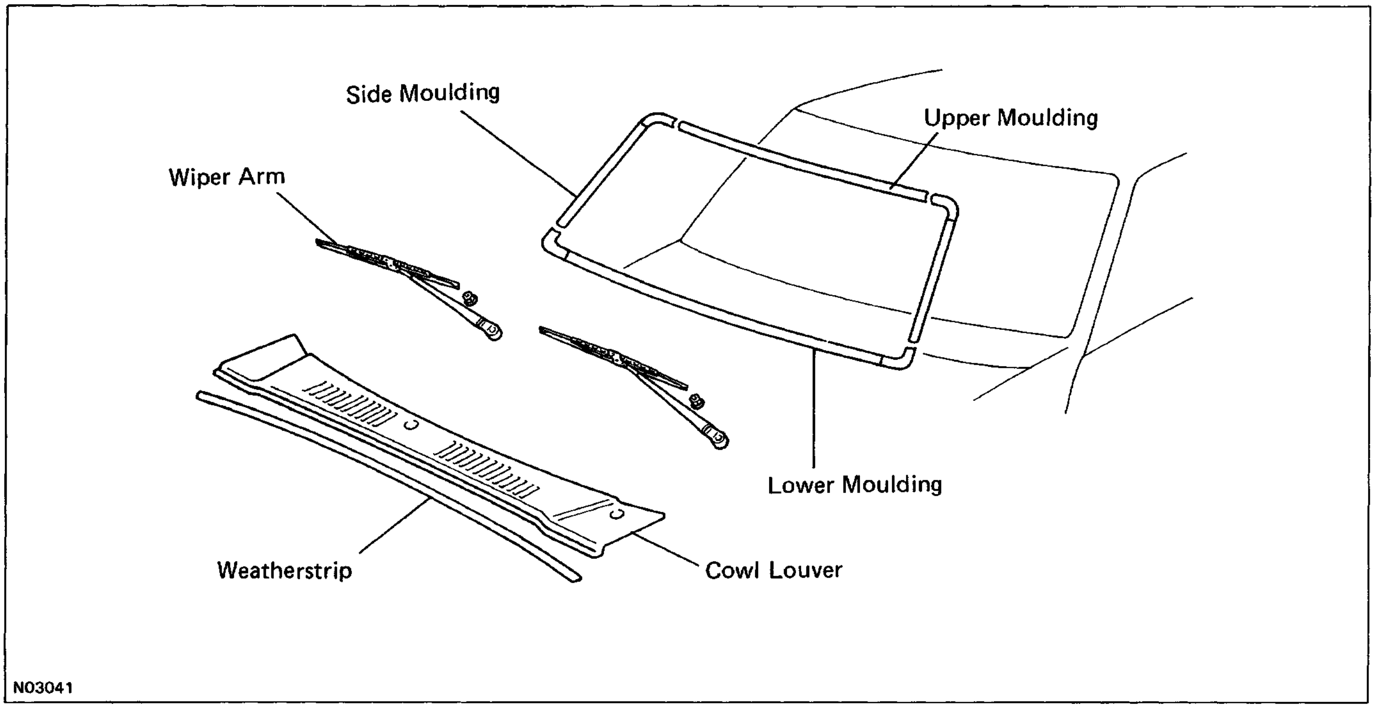
14. INSTALL DOOR INSIDE HANDLE
(See step 2 on page BO–6)

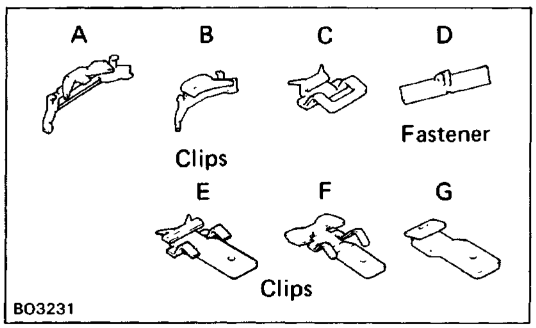
(a) Connect the handle to the control links.
(b) Push the inside handle in the door panel and slide it rearward.
(c) Install the screw.

15. (w/o Power Window)
INSTALL REGULATOR HANDLE

With door window fully closed, install the plate and the regulator handle with the snap ring as shown.

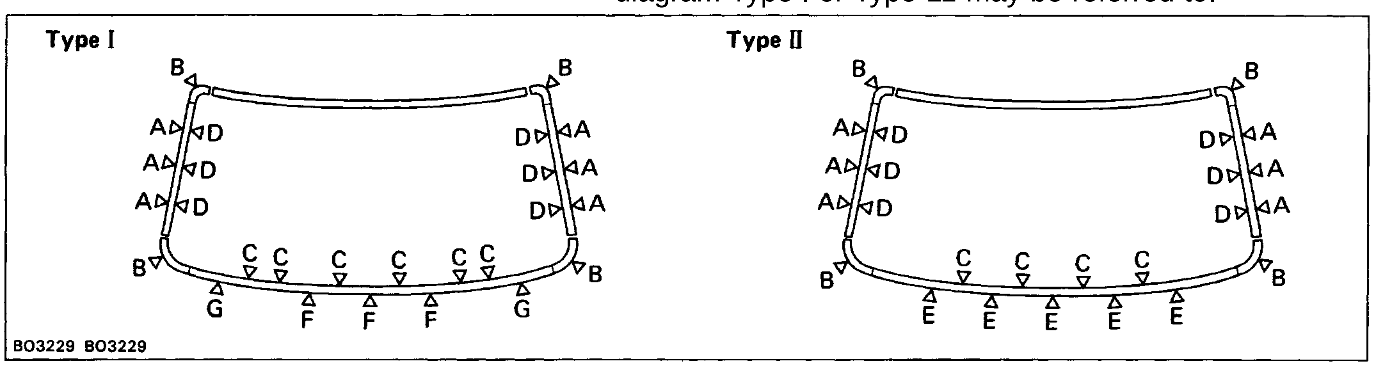
MOULDING
Windshield Moulding
COMPONENTS





REMOVAL OF WINDSHIELD MOULDING
LOCATION OF CLIPS AND FASTENER

- For vehicles in the table below which have black moul–ding, refer to diagram type 1.
- For other vehicles which have black or metallic mould–ing, refer to diagram Type 11.
- However, if all clips and fasteners are replaced, either diagram Type I or Type 11 may be referred to.



Type I Applicable Models

Frame No.	Vehicle Code	Frame No.	Vehicle Code
0000001 ~ 1999999	VZN 100, VZN 105	0000001 ~ 6999999	RN101, RN106
0000001 ~ 4999999	RN80, RN85, RN90 VZN80, VZN85, VZN90, VZN 110	0000001 ~ 9999999	VZN95
		6000000 ~ 9999999	VZN100,VZN105
0000001 ~ 5999999	RN110	–	–

1. REMOVE WIPER ARMS

2. REMOVE COWL LOUVER AND WEATHERSTRIP

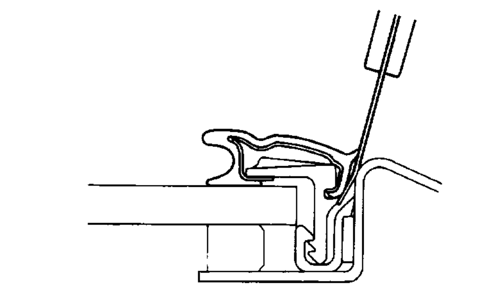
3. REMOVE LOWER MOULDING WITH LOWER JOINT COVERS

(a) Remove five screws from the clips.

(b) Pry up a scraper to loosen the clips from the body.

HINT: Tape the scraper tip before use.

(c) Remove the moulding with lower joint covers and clips.



BO3674

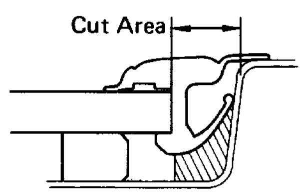
4. REMOVE SIDE MOULDING WITH UPPER JOINT COVERS

(a) Install the tip of a scraper between the body and moulding.

HINT: Tape the scraper tip before use.

(b) Pry up the scraper to loosen the moulding from the claws of the clips and fasteners.

(c) Remove the moulding with upper joint covers.



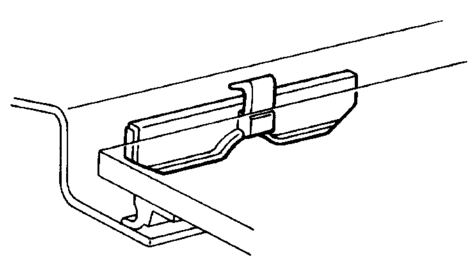
BO3299

5. REMOVE UPPER MOULDING

(a) Using a knife, cut off the upper moulding as shown.

(b) Cut off the old adhesive around the upper moulding installation area.

NOTICE: Do not damage the body and glass.



U0213

REPLACEMENT OF FASTENER

REPLACE FASTENER

(a) Remove the damaged fastener.

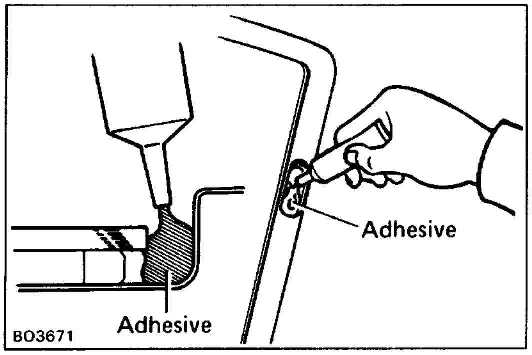
(b) Cut off the old adhesive around the fastener instal–lation area.

NOTICE: Be carefully not to damage the body.

(c) Clean the installation area.

(d) Install new fastener onto the body.

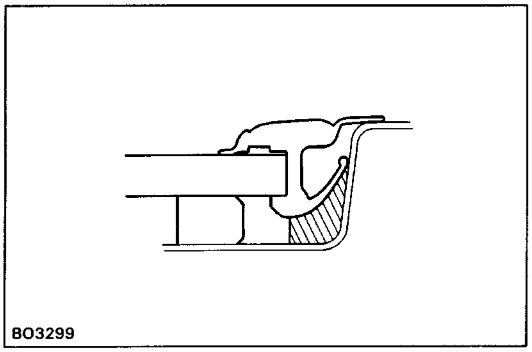
INSTALLATION OF WINDSHIELD MOULDING



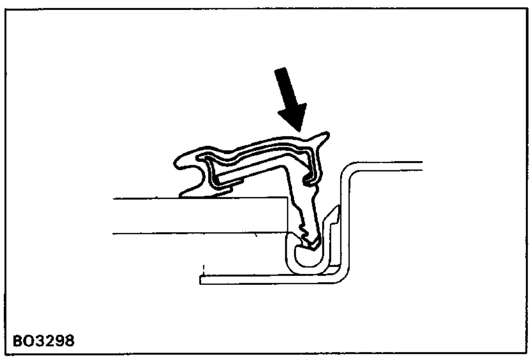
1. INSTALL CLIP INTO MOULDING
(See page BO–13)
Install the clip to the appropriate place on the moulding.

2. APPLY ADHESIVE AT CLIP INSTALLATION AREA
(a) Cut out the old adhesive around the clip installation area.
NOTICE: Do not damage the body and fastener.
(b) Apply adhesive at the clip installation area so water does not collect there.

3. APPLY ADHESIVE AT UPPER MOULDING INSTALLA–TION AREA



4. INSTALL NEW UPPER MOULDING
Place the moulding onto the body and tap it by hand.



5. INSTALL SIDE MOULDING WITH UPPER JOINT COVERS
(a) Place the moulding with upper joint covers onto the body.
(b) Tap the moulding by hand to install it.
(c) Pry up the clips on the body side, and install them to the moulding.

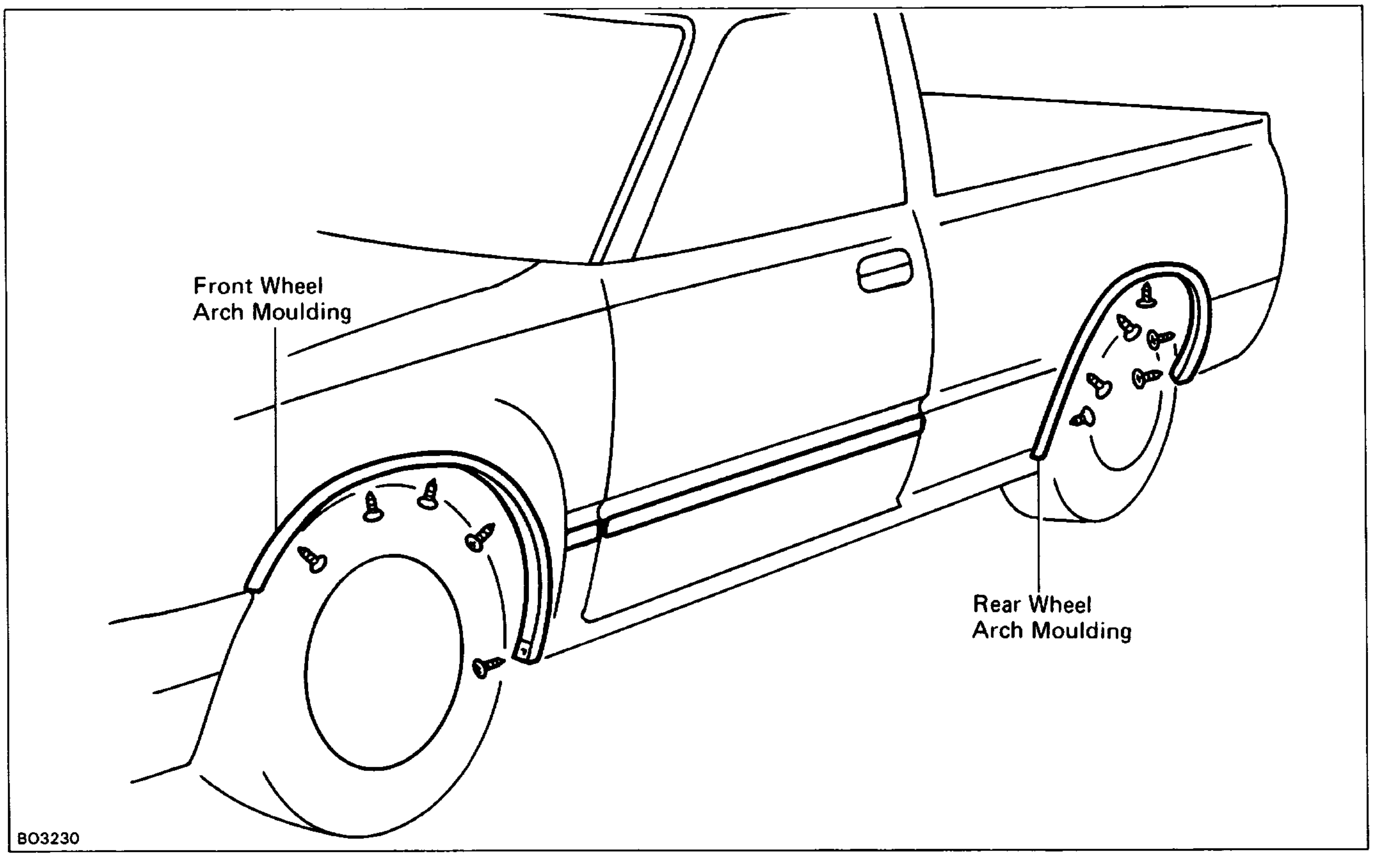
6. INSTALL LOWER MOULDING WITH LOWER JOINT COVERS
(a) Place the moulding with lower joint covers onto the body.
(b) Align the clips of the moulding with the body holes, and push the moulding on the body.

7. INSTALL COWL LOUVER AND WEATHERSTRIP
(See page BO–13)

8. INSTALL WIPER ARMS
(See page BO–13)

Wheel Arch Moulding

COMPONENTS



REPLACEMENT OF FRONT WHEEL ARCH MOULDING

1. REMOVE FRONT WHEEL ARCH MOULDING

(a) Remove five screws.

(b) Using a screwdriver, pry up the wheel arch mould–ing, and remove it.

HINT: Tape the screwdriver tip before use.

2. INSTALL FRONT WHEEL ARCH MOULDING

(a) Tap the wheel arch moulding by hand to install it.

(b) Install five screws.

REPLACEMENT OF REAR WHEEL ARCH MOULDING

1. REMOVE REAR WHEEL ARCH MOULDING

(a) Remove six screws.

(b) Using a screwdriver, pry up the wheel arch mould ing, and remove it.

HINT: Tape the screwdriver tip before use.

2. INSTALL REAR WHEEL ARCH MOULDING

(a) Tap the wheel arch moulding by hand to install it.

(b) Install six screws.

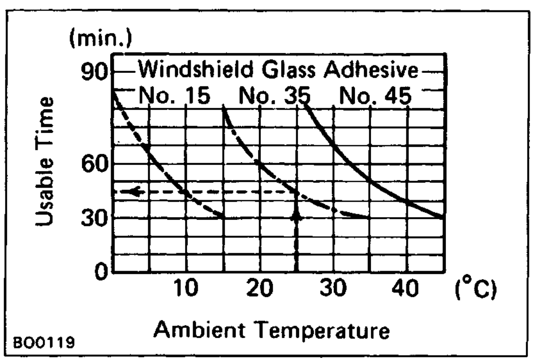
WINDSHIELD
(Adhesive Type)
PREPARE ITEMS LISTED

Part name and No.	Contents of set	Quantity
Adhesive set 08850–00070 (0 – 150C or 32 – 59'F) 08850–00080 (15 – 351C or 59 – 951F) 08850–00090 (35 – 450C or 95 – 1131F)	Main agent 500g (17.64 oz.) hardening agent 75g (2.65 oz.) Primer G (for glass) 20g (0. 71 oz.) Primer M (for body) 20g (0.71 oz.) Sponge (for applying primer) Piano wire 0.6 mm dia. x 1 m (0.024 x 39.37 in.) Cartridge	1 1 1 1 2 1 1
Dam kit 04562–30040	Dam Double–stick tape (for sticking on dam)	
	Sealant gun (for applying adhesive Glass or steel sheet (for mixing adhesive) Putty spatula (for mixing adhesive and correcting adhered parts) Cleaner (for cleaning adhering surface)	

Ambient temperature	Part No.	Part name
0 – 15°C (32 – 59°F)	08850-00070	Windshield glass adhesive set No. 15
15 – 35°C (59 – 95°F)	08850-00080	Windshield glass adhesive set No. 35
35 – 45°C (95 – 113°F)	08850-00090	Windshield glass adhesive set No. 45

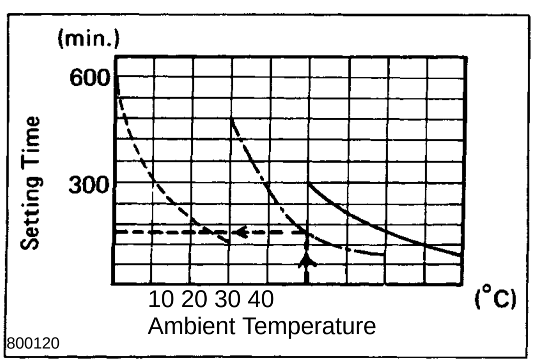
1. CHOOSE SUITABLE ADHESIVE SET

Use an adhesive set suitable for the ambient tempera–ture.



2. CHECK ADHESIVE USABLE TIME

After mixing the main and hardening agents, finish glass installation within the specified time as shown.
Example: For glass installation in ambient temperature of 25•C (77•F), apply adhesive set No.35 within 45 min–utes.

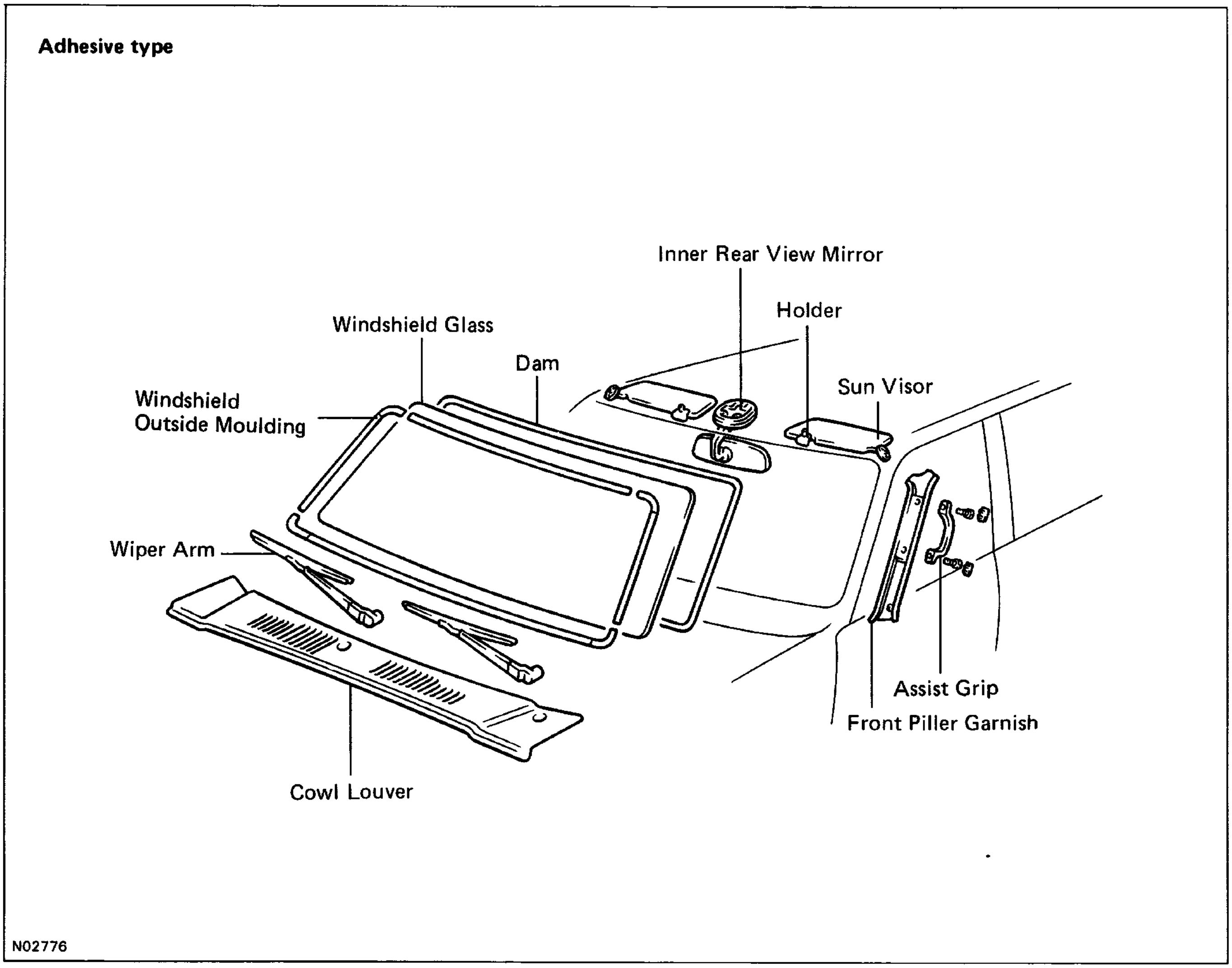


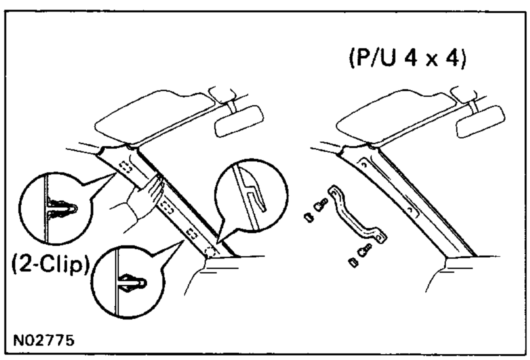
3. CHECK ADHESIVE SETTING TIME

First, mix the main and hardening agents. Then, perform a leak test only after the setting time has elapsed.
Example: The setting time for adhesive set No.35 with an ambient temperature of 25•C (77•F) is 2.5 hours.

NOTICE: Do not drive the vehicle until at least double the setting time has elapsed.

COMPONENTS

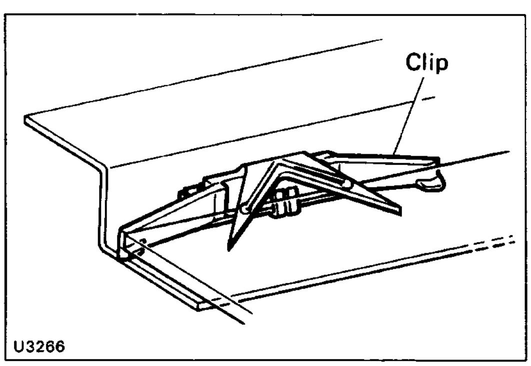




REMOVAL OF WINDSHIELD

1. REMOVE FOLLOWING PARTS:

- Inner rear view mirror
- Sun visors and holders
- Wiper arms
- Cowl louver
- Front pillar garnishes
- Assist grip



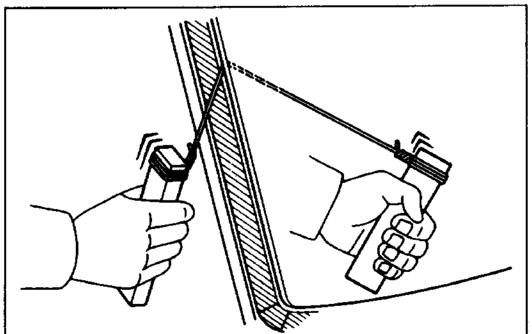
2. REMOVE WINDSHIELD MOULDING

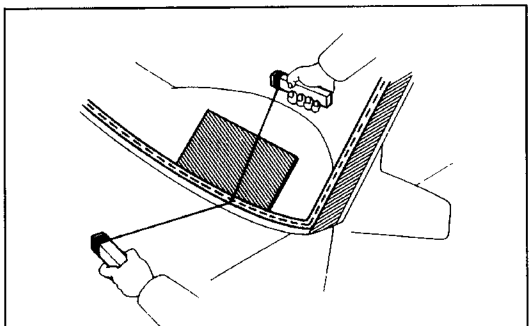
(See page BO–13)

3. REMOVE CLIPS

Be careful not to damage the side moulding clips, when removing them from around the glass.

HINT: It is not necessary to remove the fasteners but any damaged fasteners should be replaced.


B1570


BO1689

4. REMOVE WINDSHIELD GLASS

(a) Push piano wire through from the interior.
(b) Tie both wire ends to the wooden blocks or like ob–jects.

HINT: Apply adhesive tape to the outer surface to keep the surface from being scratched.

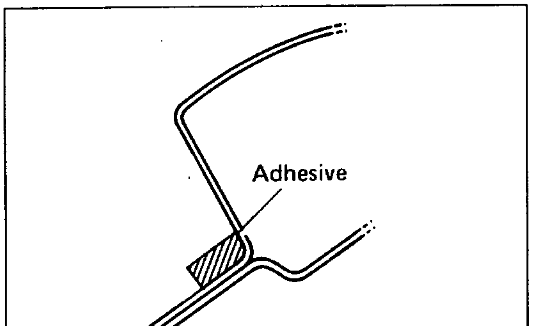
NOTICE: When separating, take care not to damage the paint and interior and exterior ornaments.

To prevent scratching the safety pad when removing the windshield, place a plastic sheet between the piano wire and safety pad.

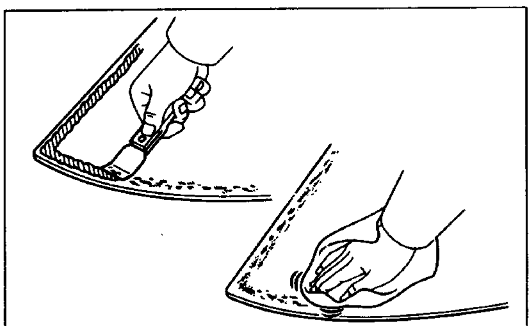
Cut the adhesive by pulling the piano wire around it.

(d) Remove the glass.

NOTICE: Leave as much of the adhesive layer on the body as possible when cutting off the glass.



Z5057


B1572

PREPARATION FOR INSTALLATION

1. CLEAN AND SHAPE CONTACT SURFACE OF BODY

(a) Remove any dam remaining on the body.
(b) Cut away any rough areas with a knife.

HINT: Leave as much of the adhesive layer on the body as possible.

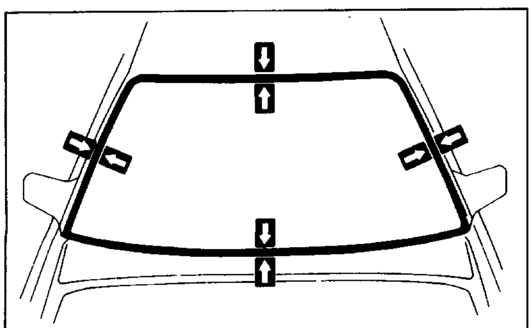
(c) Clean the cutting surface of the adhesive with a piece of cloth saturated in cleaner.

HINT: Even if all the adhesive has been removed, clean the body.

2. IF NECESSARY, REPLACE FASTENERS
(See page BO–14)

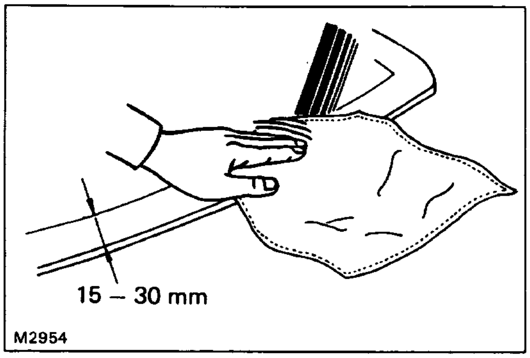
3. CLEAN REMOVED GLASS BEFORE INSTALLATION

(a) Using a scraper, remove the adhesive sticking to the glass.
(b) Using the cleaner, clean the glass.


BO2820

4. POSITION GLASS

(a) Place the glass in correct position.
(b) Check that all contacting parts of the glass rim are perfectly even, and do not make contact with the fasteners.
(c) Mark reference marks between the glass and body.
(d) Remove the glass.

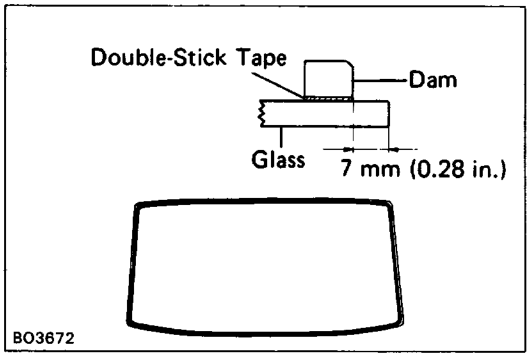


INSTALLATION OF WINDSHIELD

(See pages BO–13 and 18)

1. CLEAN CONTACT SURFACE OF GLASS

Using cleaner, clean the contact surface 15 – 30 mm (0.59 – 1.18) wide around the entire glass rim.



2. INSTALL DAM

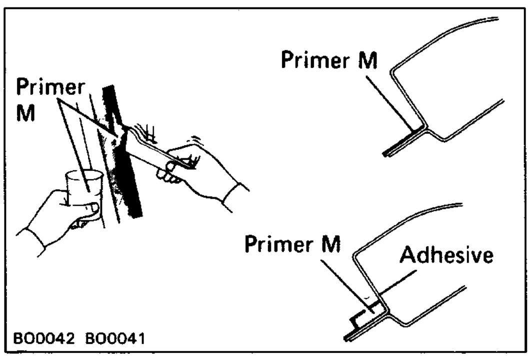
(a) Apply double–stick tape at a point as shown.

(b) Place the dam on the double–stick tape.

NOTICE: Do not touch the glass face after cleaning it.

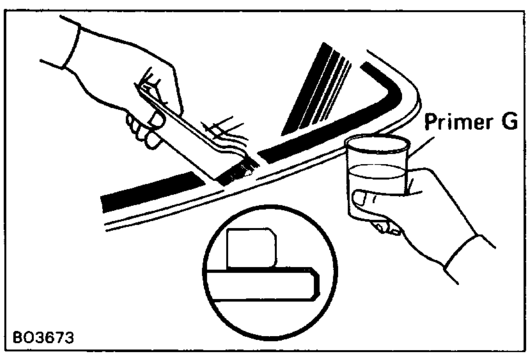
3. COAT CONTACT SURFACE OF BODY WITH PRIMER "M"

Using a brush, coat the contact surface on the body with Primer M.



NOTICE:

- **Let the Primer coating dry for 10 minutes or more. Make sure that the installation of the glass is finished within 2 hours.**
- **Use care not to leave any part of the contact surface uncoated or excessively coated, as Primer M and G serve to boost the adhesive power of the adhesive to the glass or body.**
- **Do not keep any of the opened Primer M and G for later use.**

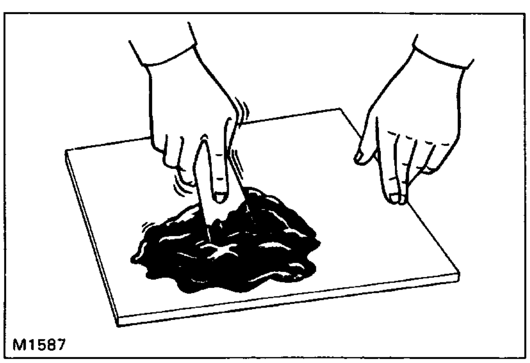


4. COAT CONTACT SURFACE OF GLASS WITH PRIMER "G"

(a) Using a brush or sponge, coat the edge of the glass and the contact surface with Primer G.

(b) Before the Primer dries, wipe it off with a clean cloth to avoid too thick a coat.

NOTICE: Be sure that installation of the glass is finished within 70 minutes.



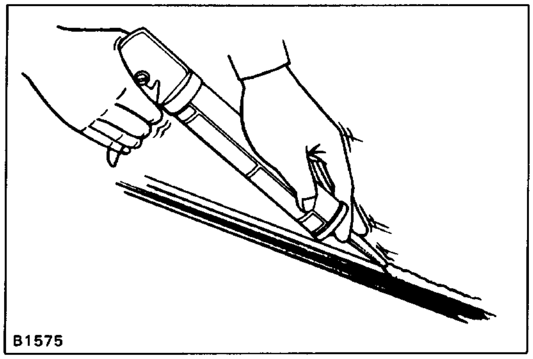
5. MIX ADHESIVE COATING

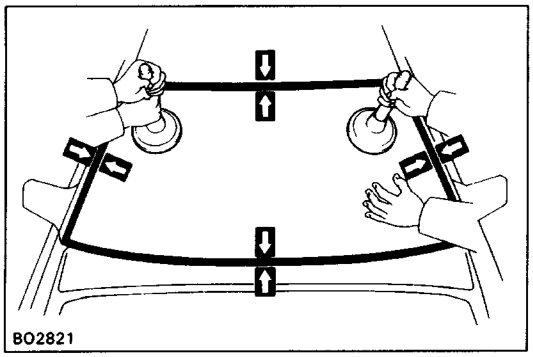
NOTICE:

- **Be sure that installation of the glass is finished within usable time. (See step 2 on page BO–17)**
- **The mixture should be made in 5 minutes or less.**

(a) Thoroughly clean the glass plate and putty spatula with cleaner.

(b) Thoroughly mix 500 g (17.64 oz.) of the main agent and 75 g (2.65 oz.) of the hardening agent on a glass plate or like object with a putty spatula.





6. APPLY ADHESIVE

(a) Cut off the tip of the cartridge nozzle to make a hole 5 mm (0.20 in.) in diameter. Fill the cartridge with adhesive.

(b) Load the cartridge into the sealer gun.

(c) Coat the glass with adhesive on all contact surfaces along the ridge.

Adhesive height:

If adhesive remains on the body
3.5 – 5.0 mm (0.138 – 0.197 in.)
If no adhesive remains on the body
8 – 10 mm (0.31 – 0.39 in.)

7. INSTALL GLASS

(a) Position the glass so that the reference marks are lined up, and press in gently along the rim.

(b) Using a spatula, apply adhesive on the glass rim.

(c) Use a spatula to remove any excess or protruding adhesive.

(d) Fasten glass securely until the adhesive sets.

8. INSPECT FOR LEAKS AND REPAIR

(a) Perform a leak test after the hardening time has elapsed.

(b) Seal any leaks with auto glass sealer.
Part No. 08833–00030 or equivalent

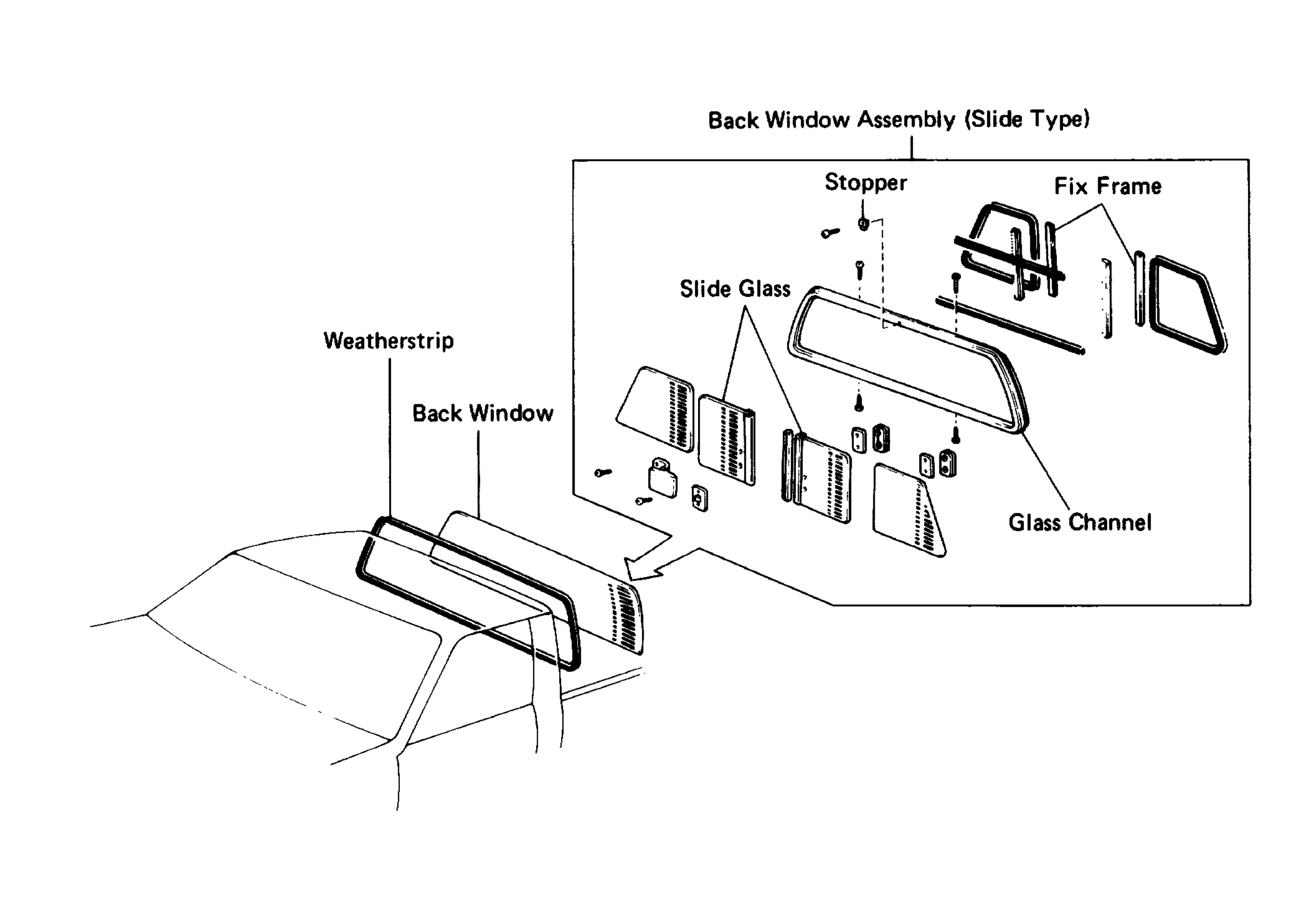
9. INSTALL CLIPS AND WINDSHIELD MOULDING
(See page BO–13)

10. INSTALL FOLLOWING PARTS:
(See page BO–18)

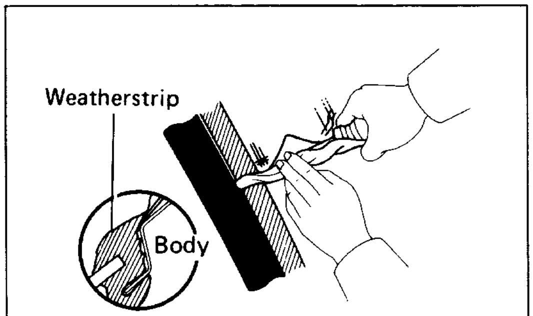
- Inner rear view mirror
- Sun visors and holders
- Front pillar garnishes
- Cowl louver
- Wiper arms

BACK WINDOW

COMPONENTS



BO0023



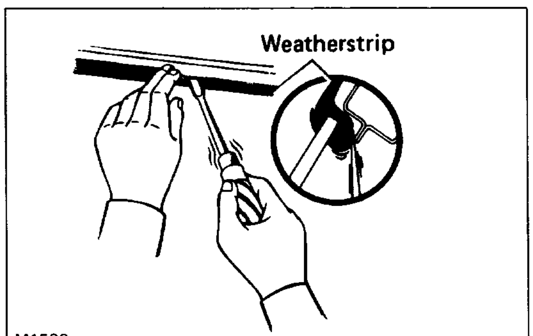
BO3301

REMOVAL OF BACK WINDOW

REMOVE BACK WINDOW

(a) Using a screwdriver, loosen the weatherstrip from the body.

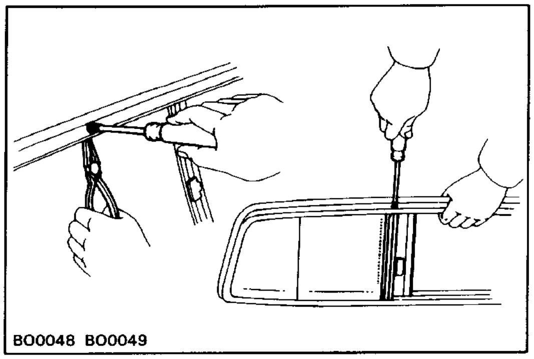
NOTICE: Be careful not to damage the body paint.



M1590

(b) Pry the lip of the weatherstrip outward from the in–terior part of the body flange.

(c) Pull the glass outwards, and remove it with the weatherstrip.

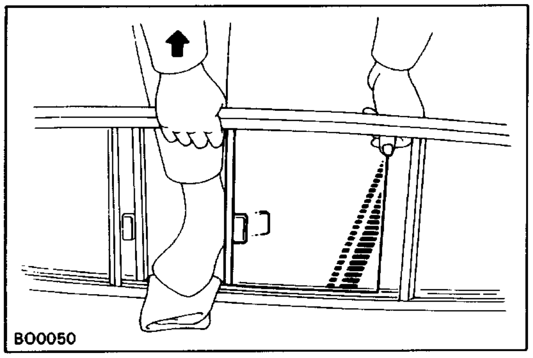


DISASSEMBLY OF BACK WINDOW ASSEMBLY

(Slide Glass type)

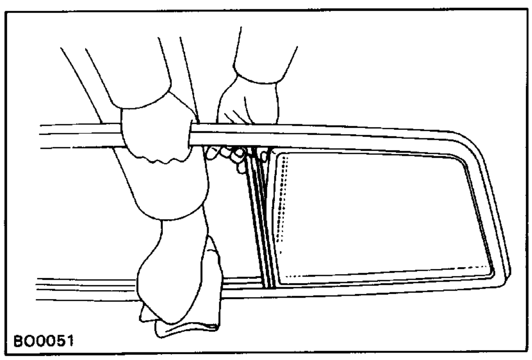
1. REMOVE FOLLOWING PARTS:

- Back window slide glass stoppers
- Four screws holding two fix frames



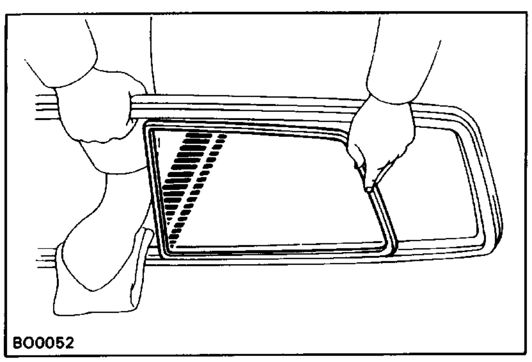
2. REMOVE SLIDE GLASS

Pull apart the channels and remove two slide glass panes at the center area of the glass channel.



3. REMOVE NON–SLIDE GLASS

(a) Pull apart the channels and remove two fix frames as shown.



(b) Pull apart the channels and remove two non–slide glass panes as shown.

ASSEMBLY OF BACK WINDOW ASSEMBLY

1. INSTALL NON–SLIDE GLASS

(a) Apply soapy water to the contact surface of the weatherstrip and glass channel flange.

(b) Install two non–slide glass panes.

(c) Install two fix frames.

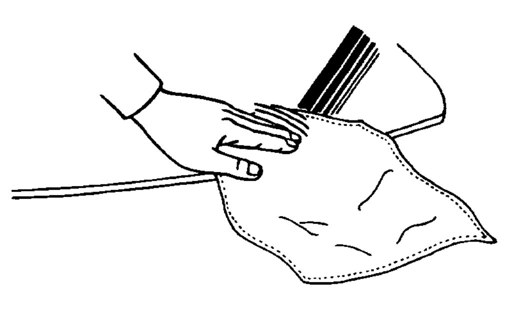
2. INSTALL SLIDE GLASS

Install two slide glass panes at the center area of the glass channel.

3. INSTALL FOLLOWING PARTS:

- Four screws holding two fix frames
- Back window slide glass channel stoppers

INSTALLATION OF BACK WINDOW

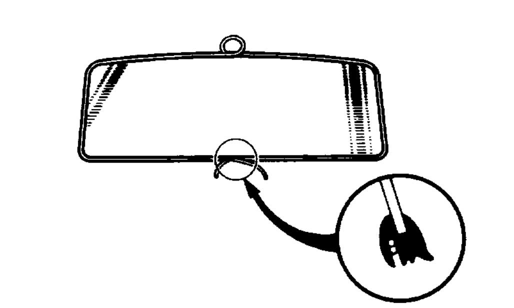

M2954

1. CLEAN BODY AND GLASS

Using cleaner, wipe off the contact surface of the body and the glass.

2. CLEAN WEATHERSTRIP

Using cleaner, clean the weatherstrip surface.

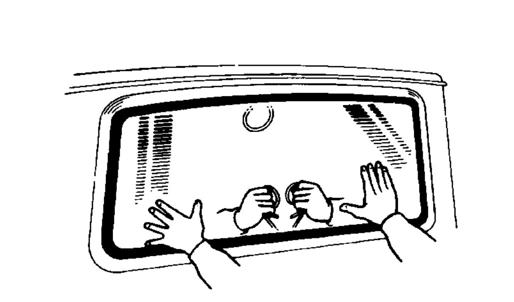

BO0258

3. INSTALL WEATHERSTRIP ON BACK WINDOW

(a) Attach the weatherstrip to the back window.

NOTICE: If the weatherstrip has become hard, it may develop water leaks. Use a new one if possible.

(b) Apply a working cord along the weatherstrip groove as shown.

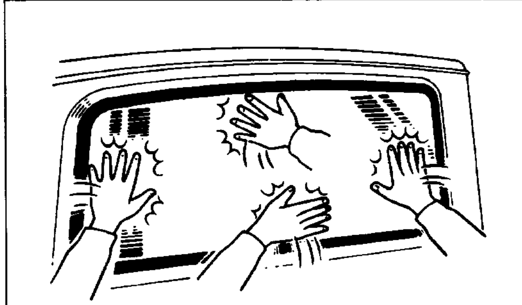

BO0259

4. INSTALL BACK WINDOW

HINT: Begin installation in the middle of the lower part of the glass.

(a) Hold the back window in position on the body.

(b) Install the back window by pulling the cord from the interior, while pushing the outside of the glass with your open hand.


BO0260

(c) To snug the back window in place, tap from the out–side with your open hand.

5. INSPECT FOR LEAKS AND REPAIR

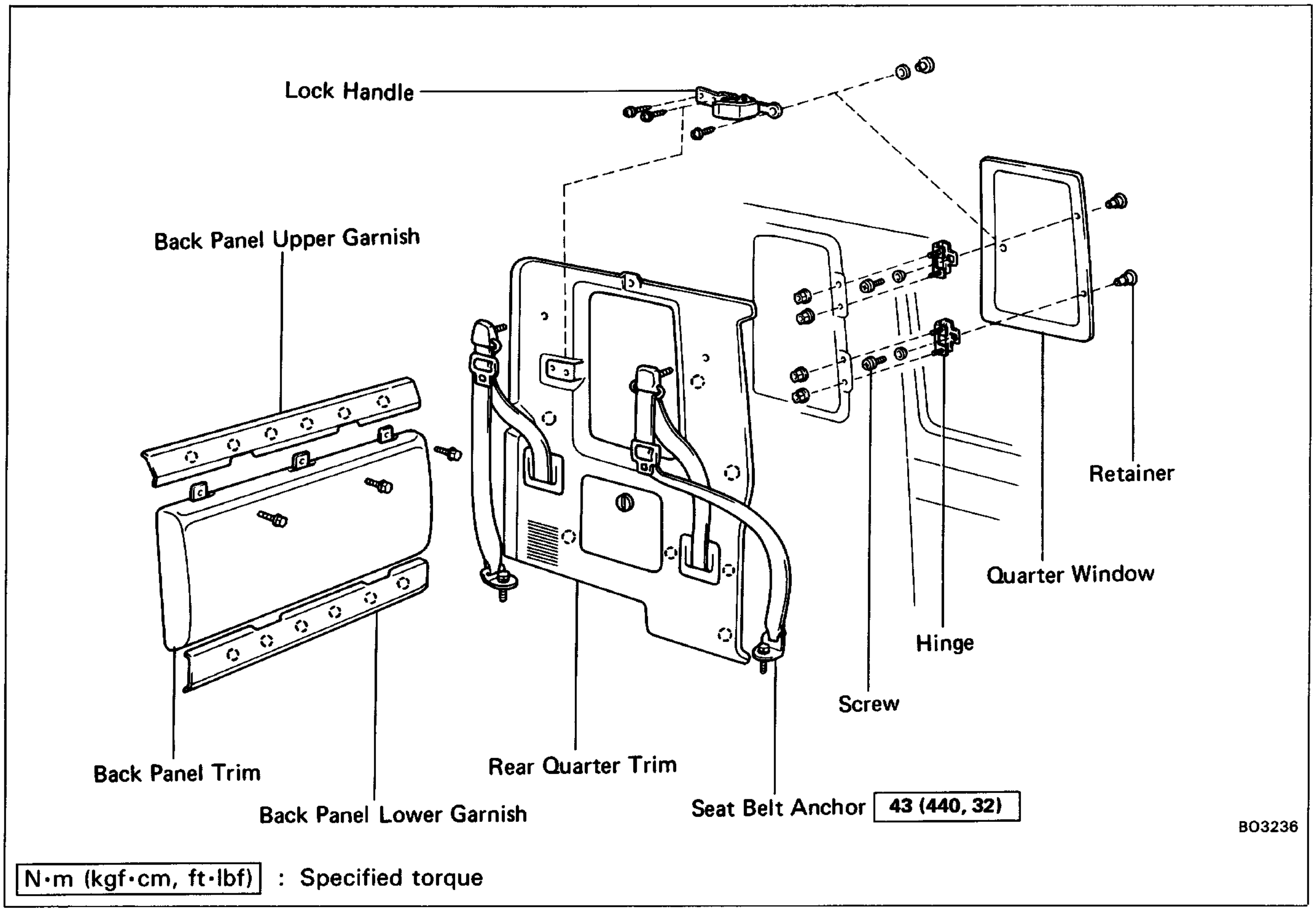
(a) Perform a leak test.

(b) Seal any leak with auto glass sealer.

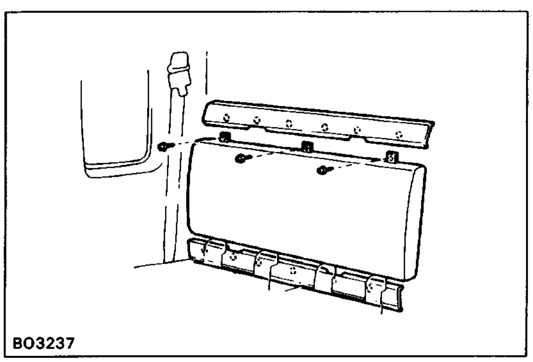
Part No. 08830–00030 or equivalent

QUARTER WINDOW (Xtra Cab)

COMPONENTS

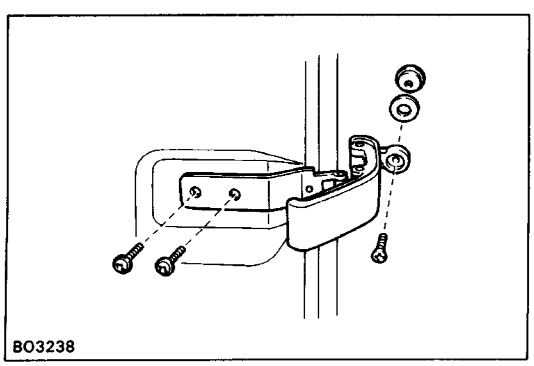


REMOVAL OF QUARTER WINDOW



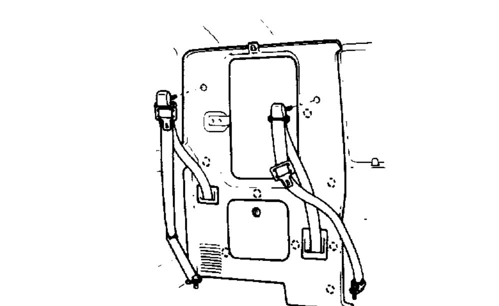
1. REMOVE BACK PANEL GARNISHES AND BACK PANEL TRIM

(a) Remove the back panel lower garnish.
(b) Remove the back panel upper garnish.
(c) Remove three bolts and the back panel trim.

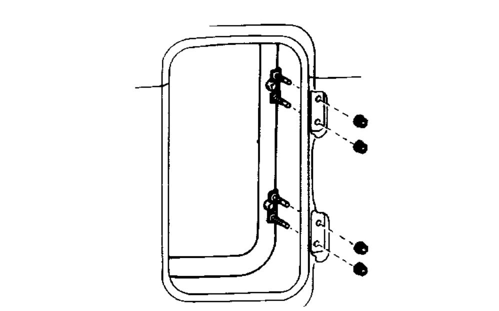


2. REMOVE LOCK HANDLE

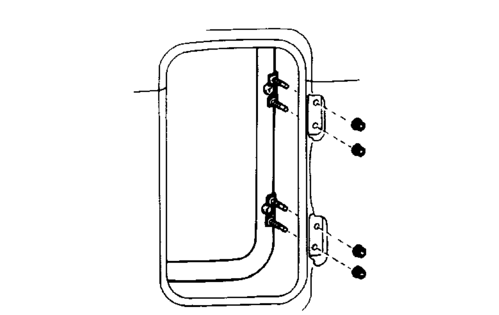
Remove three screws and the lock handle.


B03239

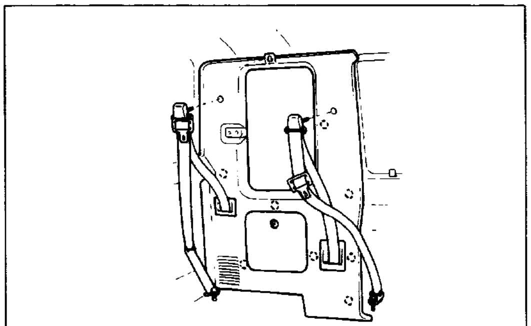
3. REMOVE REAR QUARTER TRIM
(a) Remove four bolts, the seat belt anchors and the belt guide.
(See pages BO–46 and 47)
(b) Remove the screw and the hook.
c) Remove the rear quarter trim.


B03240

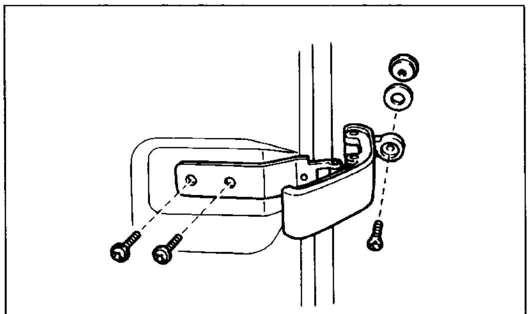
4. REMOVE QUARTER WINDOW
Remove four nuts and the quarter window.
5. REMOVE HINGES FROM WINDOW GLASS
Remove two screws and the hinges.


B03240

INSTALLATION OF QUARTER WINDOW
1. INSTALL HINGES TO WINDOW GLASS
Install the two hinges with the screws.
2. INSTALL QUARTER WINDOW
Install the quarter window with four nuts.


B03239

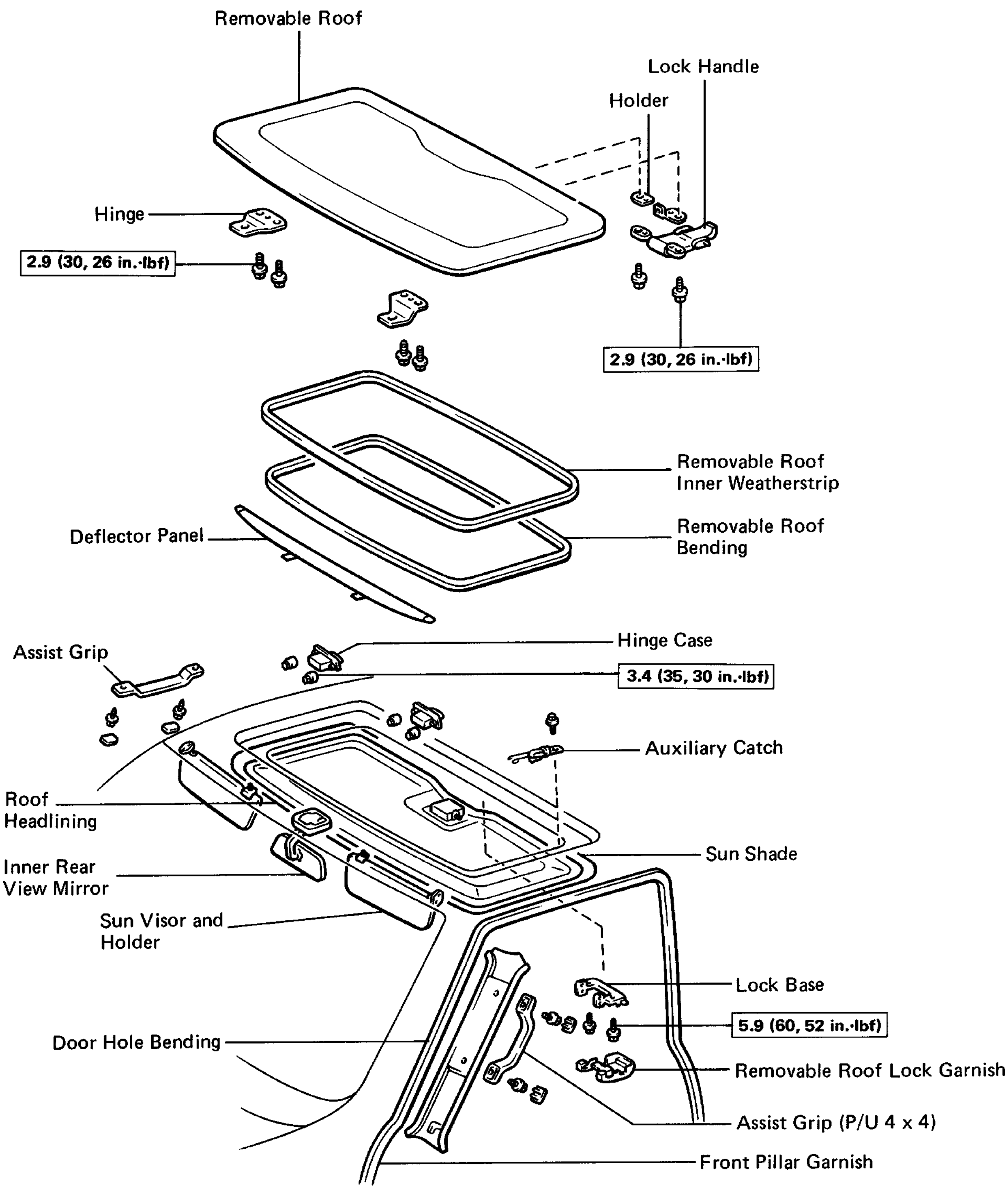
3. INSTALL REAR QUARTER TRIM
(a) Install the rear quarter trim.
(b) Install the hook with the screw.
(c) Install the seat belt anchor with four bolts.
(See pages BO–46 and 47)
Torque: 43 N–m (440 kgf–cm, 32 ft–lbf)


B03238

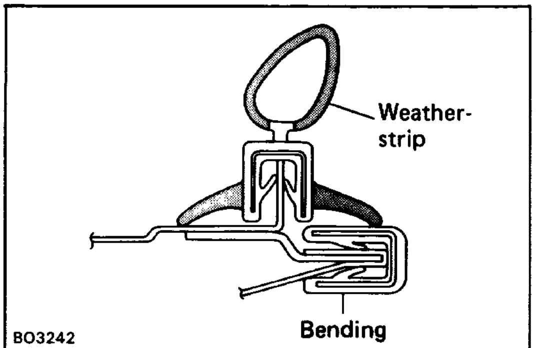
4. INSTALL LOCK HANDLE
Install the lock handle with three screws.
5. INSTALL BACK PANEL TRIM AND BACK PANEL GARNISHES
(a) Install the back panel trim with three bolts.
(b) Install the back panel upper garnish by tapping.
(c) Install the back panel lower garnish.

MOON ROOF

COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque



BO3242

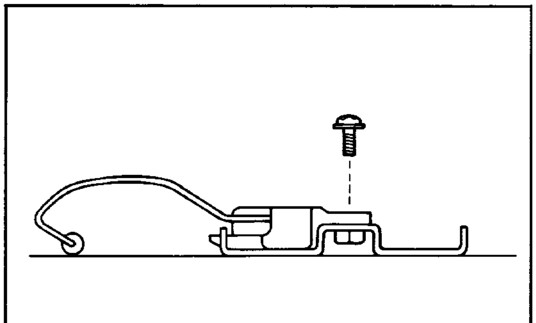
REMOVAL OF MOON ROOF

(See page BO–31)

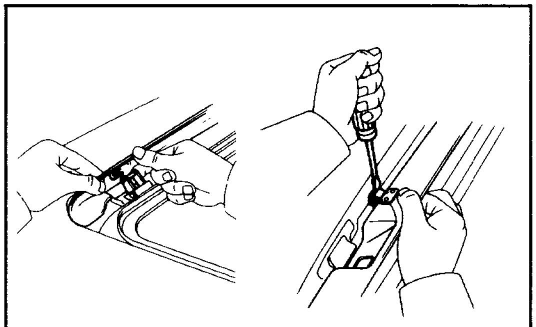
1. REMOVE REMOVABLE ROOF WITH SUN SHADE

2. REMOVE REMOVABLE ROOF INNER WEATHERSTRIP

3. REMOVE REMOVABLE ROOF BENDING


BO3243

4. REMOVE REMOVABLE ROOF AUXILIARY CATCH


BO0894 BO0895

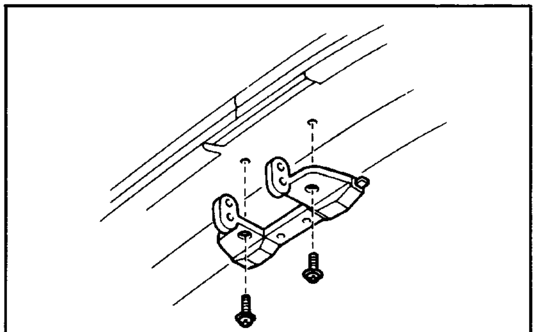
5. REMOVE WIND DEFLECTOR PANEL

(a) Remove two outside deflector clips on the left and right sides.

(b) Remove two inside deflector clips on the left and right sides, while prying it with a screwdriver.

HINT: Tape the screwdriver tip before use.

6. REMOVE REMOVABLE ROOF LOCK GARNISH


BO3245

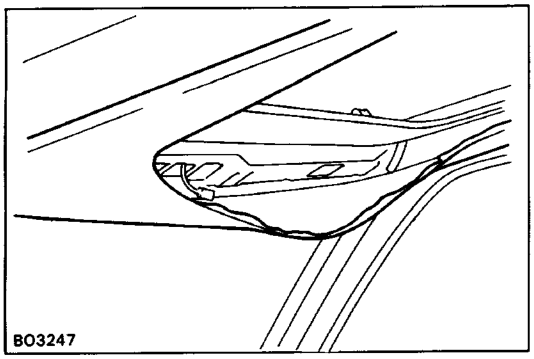
7. REMOVE REMOVABLE ROOF LOCK BASE

Remove two screws and the lock base.

8. REMOVE FOLLOWING PARTS:

(See page BO–31)

- Inner rear view mirror
- Sun visors and holders
- Assist grip
- Front pillar garnishes
- Door hole bendings

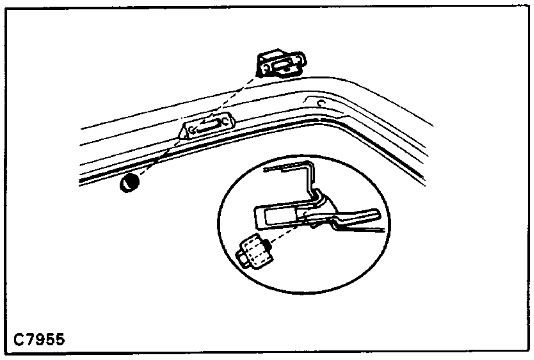


9. REMOVE ROOF HEADLINING

(a) Remove the roof headlining as shown, and leave it hanging.

(b) Remove any double–stick tape remaining on the body.

NOTICE: Do not damage the roof headlining.



10. REMOVE REMOVABLE ROOF HINGE CASE

Remove two bolts and the hinge case.

INSTALLATION OF MOON ROOF

(See page BO–31)

1. INSTALL REMOVABLE ROOF HINGE CASE

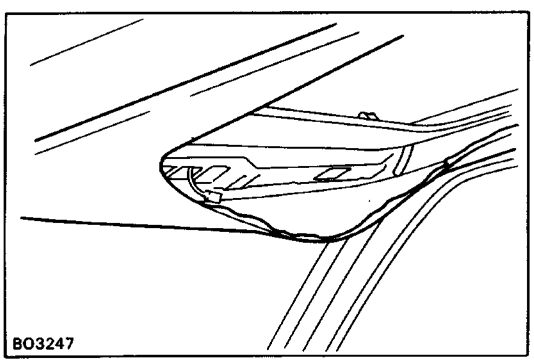
Install the hinge case with the bolts.

Torque: 3.4 N–m (35 kgf–cm, 30 in.–lbf)

HINT:

- Make sure the seal is properly torqued.
- If any part of the seal is damaged, replace the seal and case.

2. INSTALL REMOVABLE ROOF HEADLINING



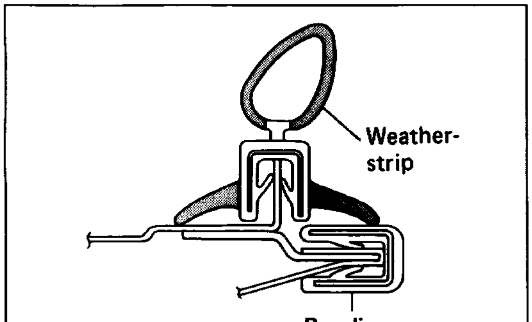
(a) Apply double–stick tape to the edge of the roof panel.

(b) Install the roof headlining to the double–stick tape on the body.

3. INSTALL FOLLOWING PARTS:

(See page BO–31)

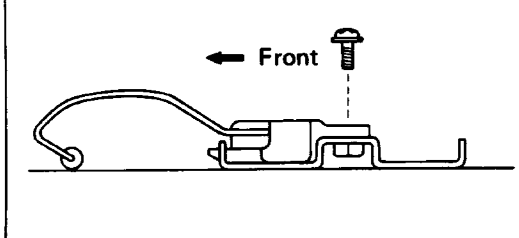
- Door hole bendings
- Front pillar garnishes
- Assist grip
- Sun visors and holders
- Inner rear view mirror



BO3242

4. INSTALL REMOVABLE ROOF BENDING

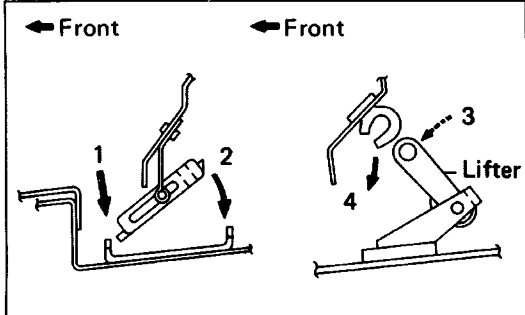
5. INSTALL REMOVABLE ROOF INNER WEATHERSTRIP



BO3243

6. INSTALL REMOVABLE ROOF AUXILIARY CATCH

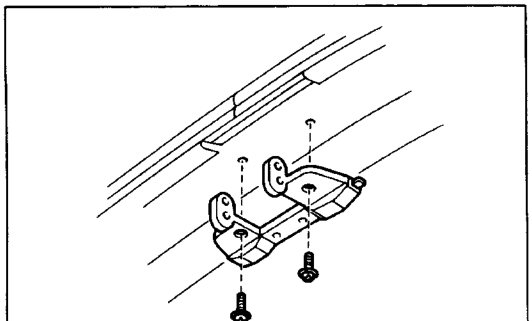
Install the auxiliary catch with the bolt.



BO3246

7. INSTALL WIND DEFLECTOR PANEL

Install the deflector clips as shown in the illustration.


BO3245

8. INSTALL REMOVABLE ROOF LOCK BASE

Install the lock base, and lightly tighten the bolts.

9. INSTALL REMOVABLE ROOF WITH SUN SHADE

10. TORQUE REMOVABLE ROOF LOCK BASE BOLTS

Torque: 5.9 N–m (60 kgf–cm, 52 in.–lbf)

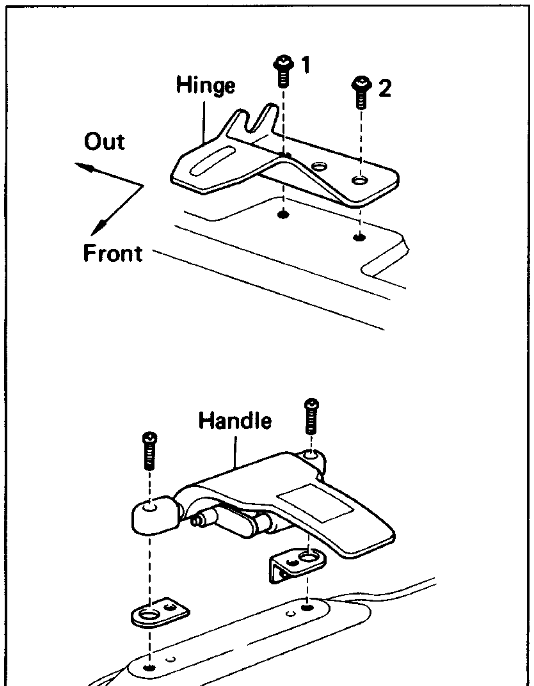
11. INSTALL REMOVABLE ROOF LOCK GARNISH

DISASSEMBLY OF REMOVABLE ROOF

(See page BO–31)

1. REMOVE HANDLE WITH HOLDER

2. REMOVE LEFT/RIGHT HINGE



BO3248
BO3249

ASSEMBLY OF REMOVABLE ROOF

1. INSTALL LEFT/RIGHT HINGE

(a) Install the hinge with two screws.

(b) Torque the outside screw.

Torque: 2.9 N–m (30 kgf–cm, 26 in.–lbf)

(c) Torque the inside screw.

Torque: 2.9 N–m (30 kgf–cm, 26 in.–lbf)

2. INSTALL HOLDER AND HANDLE

(a) Install the holder and handle with two bolts.

(b) Torque the bolts.

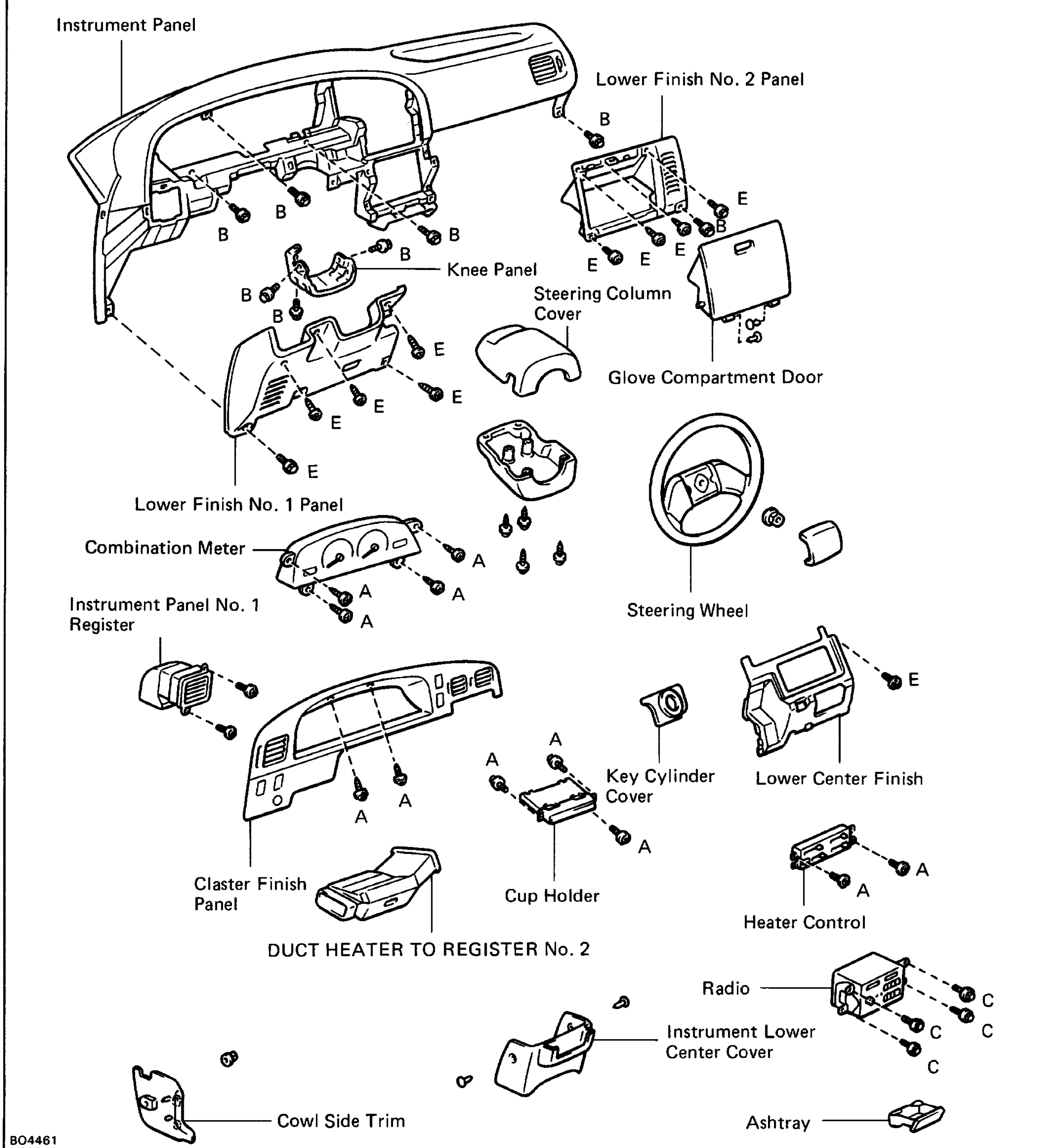
Torque: 2.9 N–m (30 kgf–cm, 26 in.–lbf)

INSTRUMENT PANEL

COMPONENTS

Models Ex. 4-Speed M/T

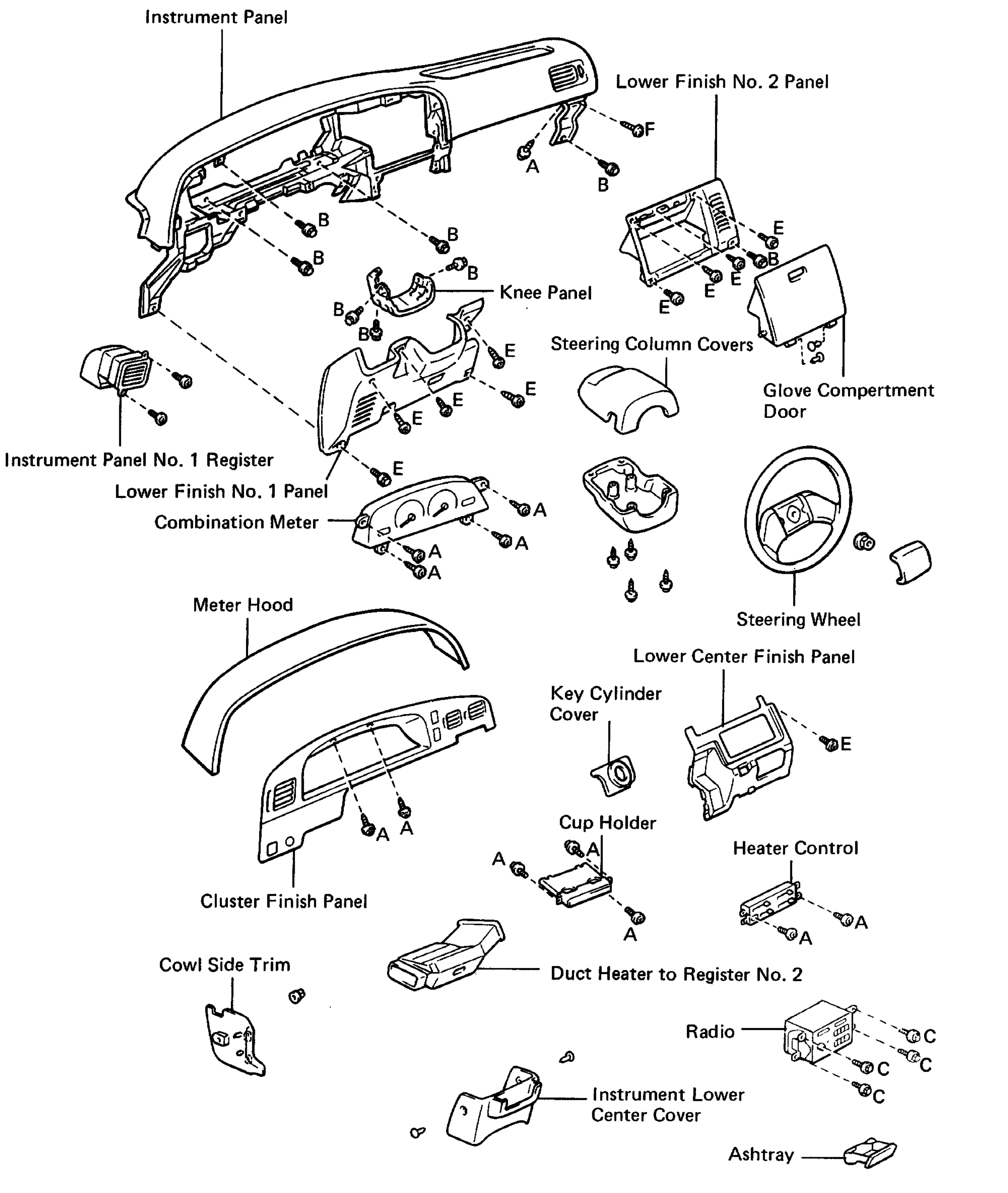
Code	Shape	Size	Code	Shape	Size	Code	Shape	Size
A		φ = 5 (0.20) L = 14 (0.55)	B		φ = 6 (0.24) L = 22 (0.87)	C		φ = 5 (0.20) L = 18 (0.71)
D		φ = 5 (0.20) L = 16 (0.63)	E		φ = 5 (0.20) L = 16 (0.63)			



COMPONENTS (Cont'd)

4-Speed M/T Models

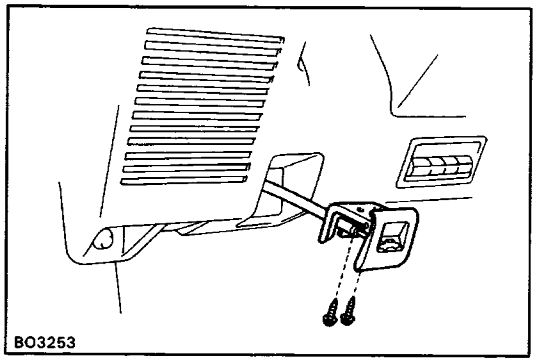
Code	Shape	Size	Code	Shape	Size	Code	Shape	Size
A		$\phi = 5$ (0.20) L = 14 (0.55)	B		$\phi = 6$ (0.24) L = 22 (0.87)	C		$\phi = 5$ (0.20) L = 18 (0.71)
D		$\phi = 5$ (0.20) L = 16 (0.63)	E		$\phi = 5$ (0.20) L = 16 (0.63)	F		$\phi = 5$ (0.20) L = 14 (0.55)



N03040
N02849

REMOVAL OF INSTRUMENT PANEL

(See pages BO–36 and 37)



1. DISCONNECT BATTERY CABLE FROM NEGATIVE TERMINAL

2. REMOVE STEERING WHEEL

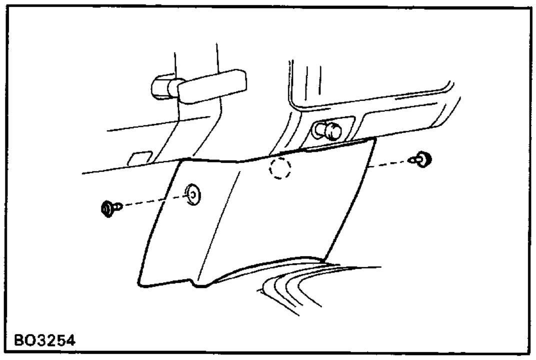
(See page SR–4)

3. REMOVE STEERING COLUMN COVERS

(See page SR–4)

4. REMOVE ENGINE HOOD RELEASE LEVER

Remove two screws and the engine hood release lever.



5. REMOVE COWL SIDE TRIM

Remove the nut and the cowl side trim.

6. REMOVE INSTRUMENT LOWER CENTER COVER

Remove two clips and the cover.

7. REMOVE KEY CYLINDER COVER

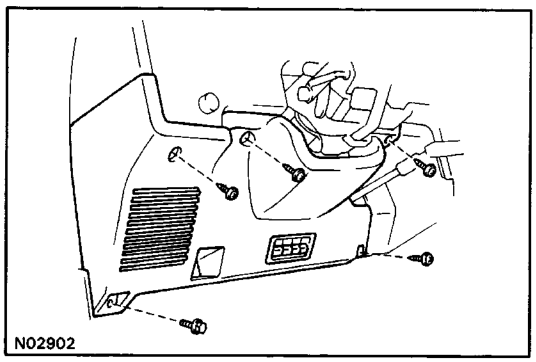
Pry out the key cylinder cover.

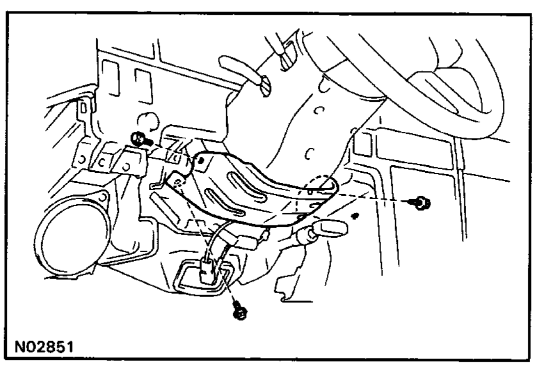
8. REMOVE LOWER FINISH NO.1 PANEL

(a) Remove four screws, one bolt and the panel.

(b) Disconnect the connector.

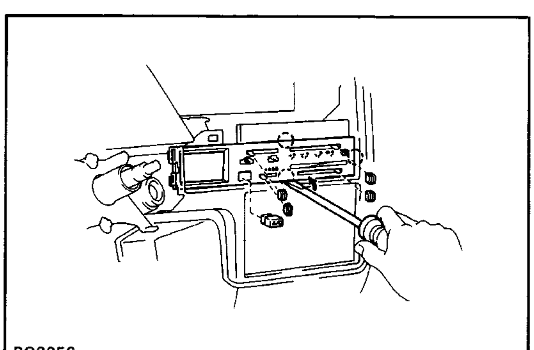
9. REMOVE DUCT HEATER TO REGISTER NO.2





10. REMOVE KNEEPANEL

Remove the three bolts and knee panel.



11. REMOVE HEATER CONTROL PLATE

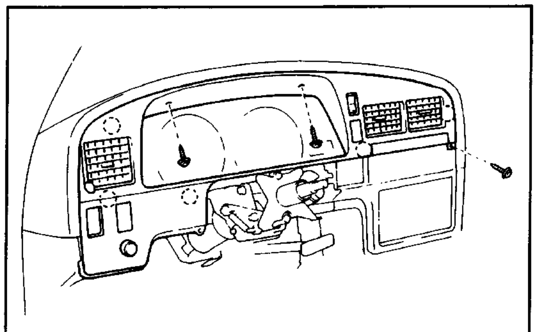
(a) Pull off the heater control knobs.

(b) (w/ A/C)

Pry off the A/C switch.

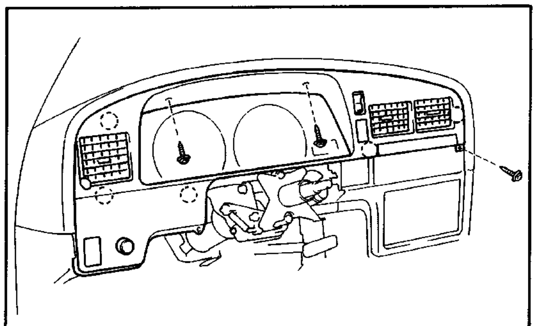
(c) Using a screwdriver, pry out the heater control plate as shown in the illustration, and remove it.

HINT: Tape the screwdriver tip before use.


BO3257

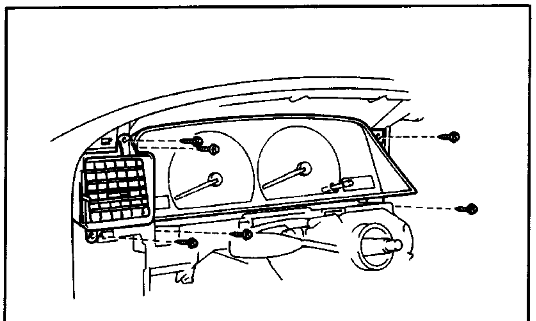
12–1.(Models Ex. 4–Speed M/T)
REMOVE CLUSTER FINISH PANEL

(a) Remove three screws and pull out the cluster finish panel.
(b) Disconnect the connectors.
(c) Remove two screws and the cup holder from the cluster finish panel.


N03157

12–2.(4–Speed M/T Models)
REMOVE CLUSTER FINISH PANEL WITH METER HOOD

(a) Remove two screws and pull out the cluster finish panel with meter hood.
(b) Disconnect the connectors.
(c) Pull off the meter hood.
(d) Remove two screws and the cup holder from the cluster finish panel.

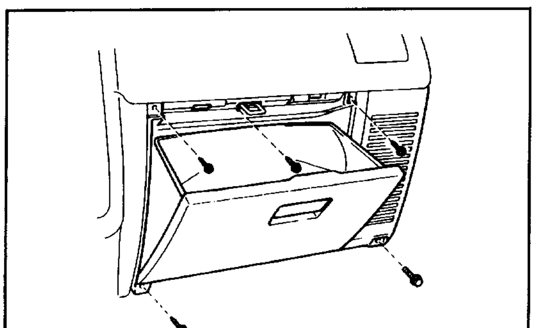

BO3259

13. REMOVE INSTRUMENT PANEL NO. 1 REGISTER

Remove two screws and the register.

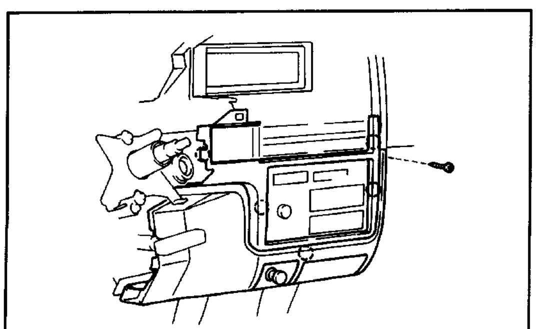
14. REMOVE COMBINATION METER

(a) Remove four screws.
(b) Disconnect the connectors.
(c) Remove the combination meter.


BO3260

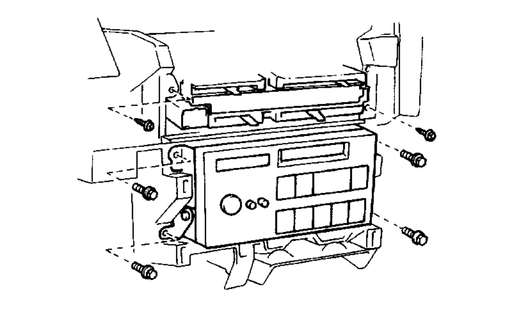
15. REMOVE LOWER FINISH NO.2 PANEL WITH GLOVE COMPARTMENT DOOR

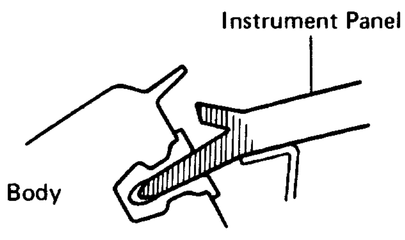
(a) Remove four screws, one bolt and the lower finish No.2 panel with glove compartment door.
(b) Disconnect the connector.


BO3262

16. REMOVE LOWER CENTER FINISH PANEL

(a) Remove a screw and pull out the panel.
(b) Disconnect the connectors.


N03043



BO3649

17. REMOVE HEATER CONTROL

Remove two screws and hang the heater control.

18. REMOVE RADIO

(a) Remove four bolts

(b) Disconnect the antenna cable and connectors.

(c) Remove the radio with bracket.

19. REMOVE INSTRUMENT PANEL

(a) Remove four bolts and the instrument panel.

(b) Disconnect the connectors.

HINT: The instrument panel has a boss onto the clip on the body side. Therefore when removing, pull upward at an angle.

20. REMOVE FOLLOWING PARTS FROM INSTRUMENT PANEL

(Models Ex. 4–Speed M/T)

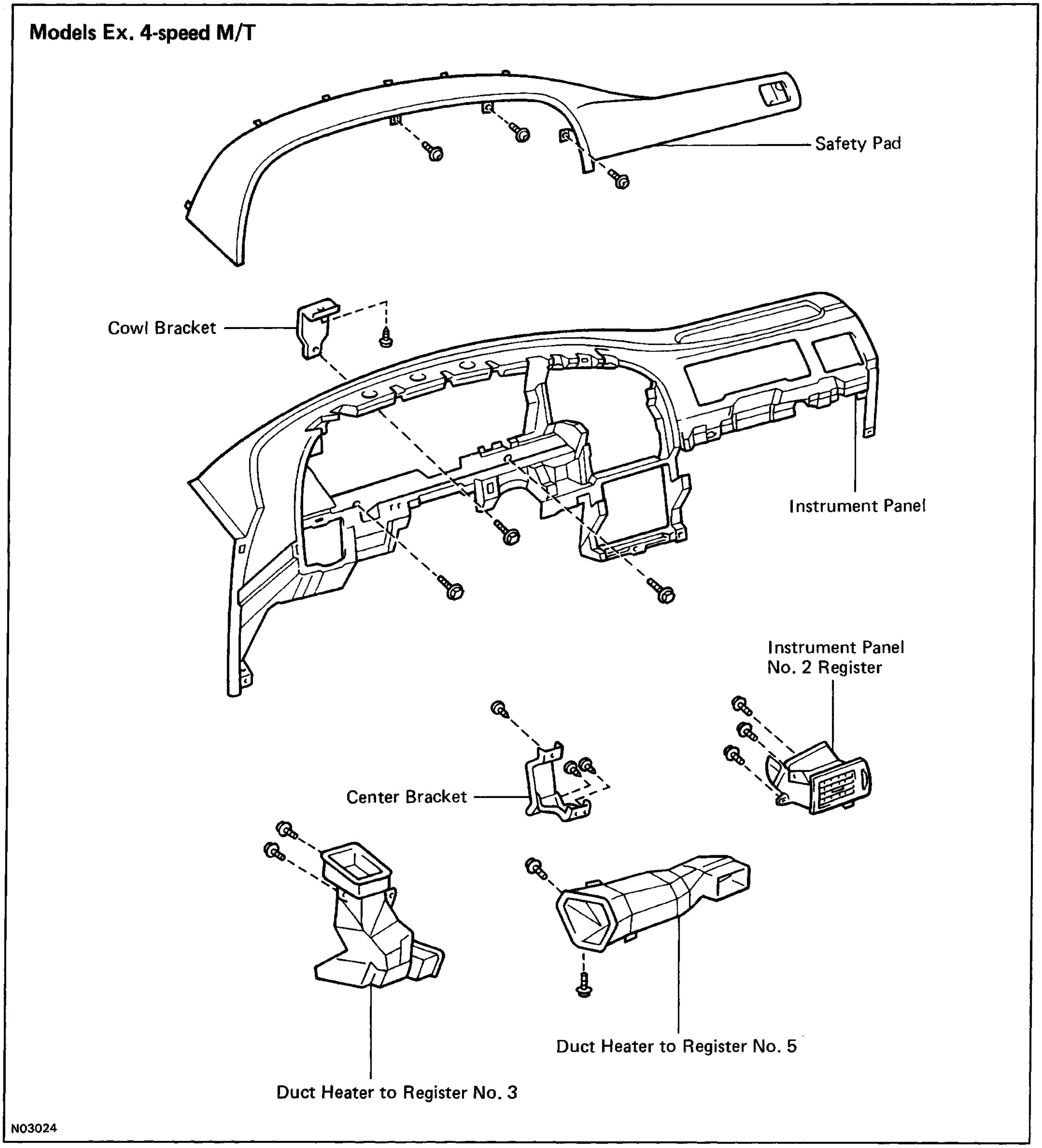
(a) Safety pad

(b) No. 3, No. 5 heater to register ducts

(c) Instrument panel No.2 register

(d) Center bracket

(e) Cowl bracket



(4–Speed M/T Models)

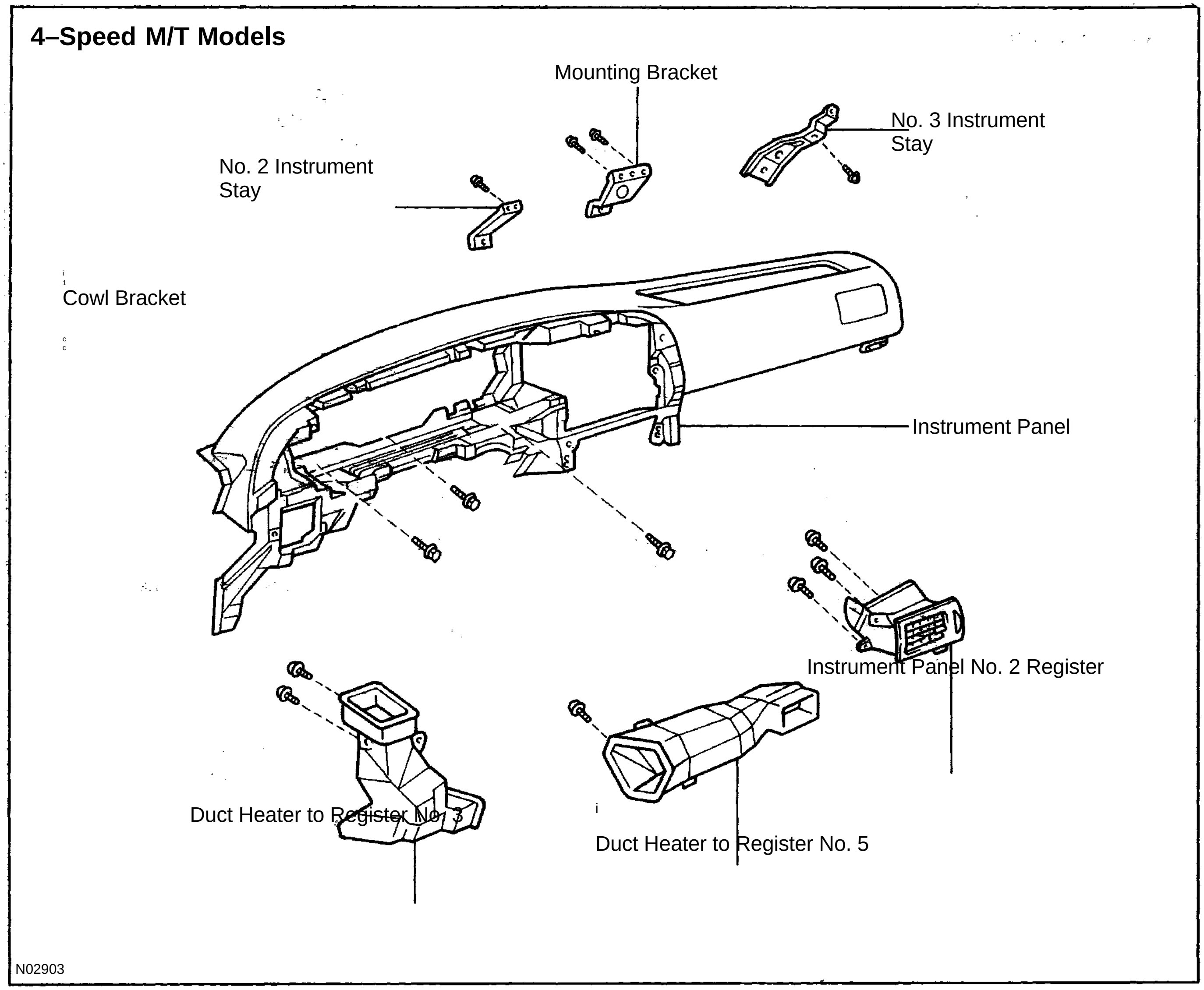
(a) No.3, No.5 heater to register duct

(b) Instrument panel No.2 register

(c) No.2, No.3 Instrument stay

(d) Mounting bracket

(e) Cowl bracket



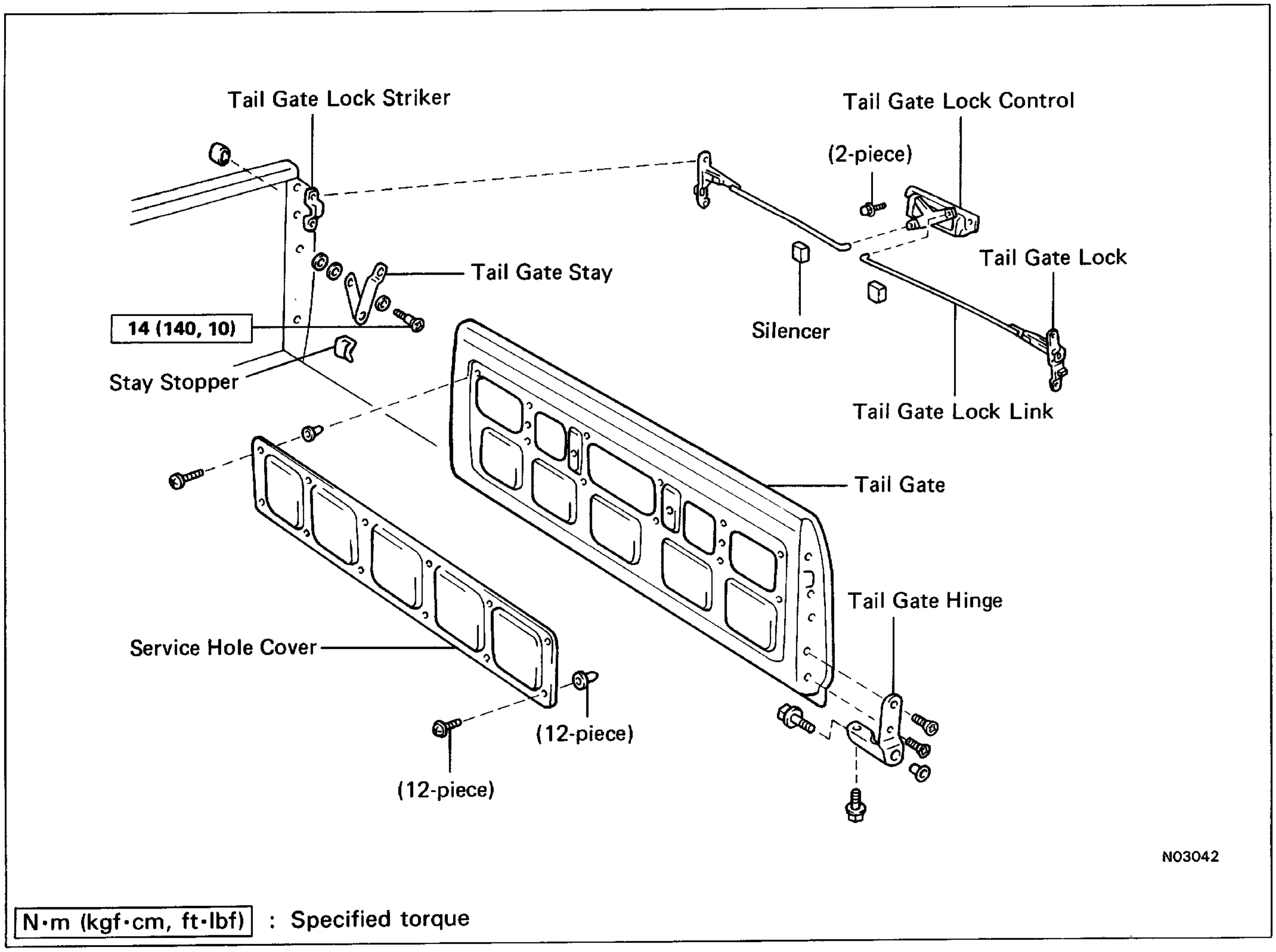
INSTALLATION OF INSTRUMENT PANEL

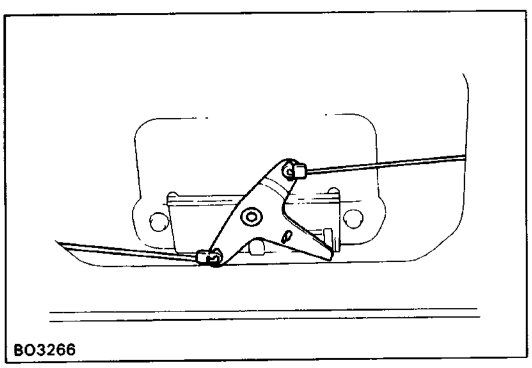
(See pages BO–36 and 37)

INSTALL INSTRUMENT PANEL PARTS FOLLOWING REMOVAL SEQUENCE IN REVERSE

ONE–TOUCH TAIL GATE

COMPONENTS



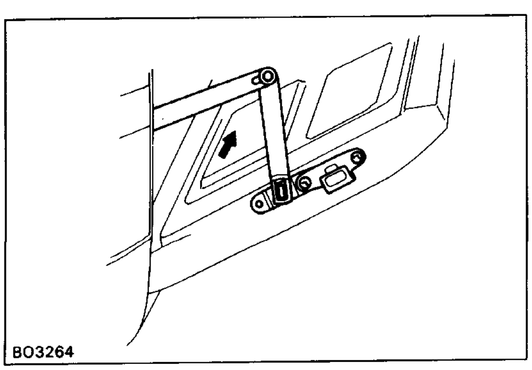


REMOVAL OF TAIL GATE LOCK

1. REMOVE SERVICE HOLE COVER

Remove twelve screws and the service hole cover.

2. DISCONNECT TAIL GATE LOCK LINK FROM TAIL GATE LOCK CONTROL



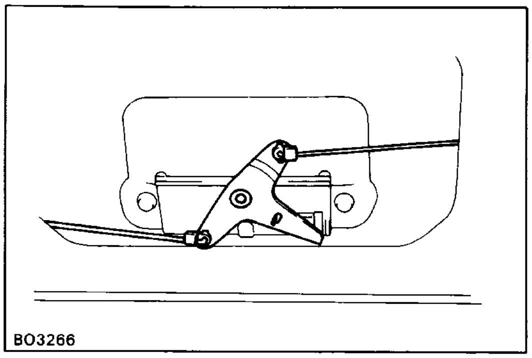
3. REMOVE TAIL GATE STAY

(a) Disconnect the tail gate stay from the tail gate.

(b) Remove the bolt and the tail gate stay from the body.

4. REMOVE TAIL GATE LOCK FROM TAIL GATE

Remove two screws and the tail gate lock.



INSTALLATION OF TAIL GATE LOCK

1. INSTALL TAIL GATE LOCK TO TAIL GATE

Install the tail gate lock with the two screws.

2. INSTALL TAIL GATE STAY

(a) Install the tail gate stay and the bolt.

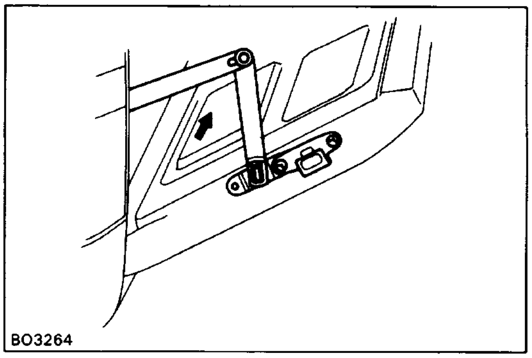
Torque: 14 N–m (140 kgf–cm, 10 ft–lbf)

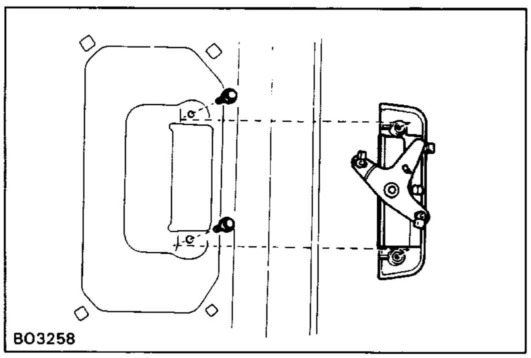
(b) Connect the tail gate stay to the tail gate.

3. CONNECT TAIL GATE STAY TO TAIL GATE

4. INSTALL SERVICE HOLE COVER

Install service hole cover with twelve screws.





REMOVAL OF TAIL GATE LOCK CONTROL

1. REMOVE SERVICE HOLE COVER

2. DISCONNECT TWO TAIL GATE LOCK LINKS

3. REMOVE TAIL GATE LOCK CONTROL

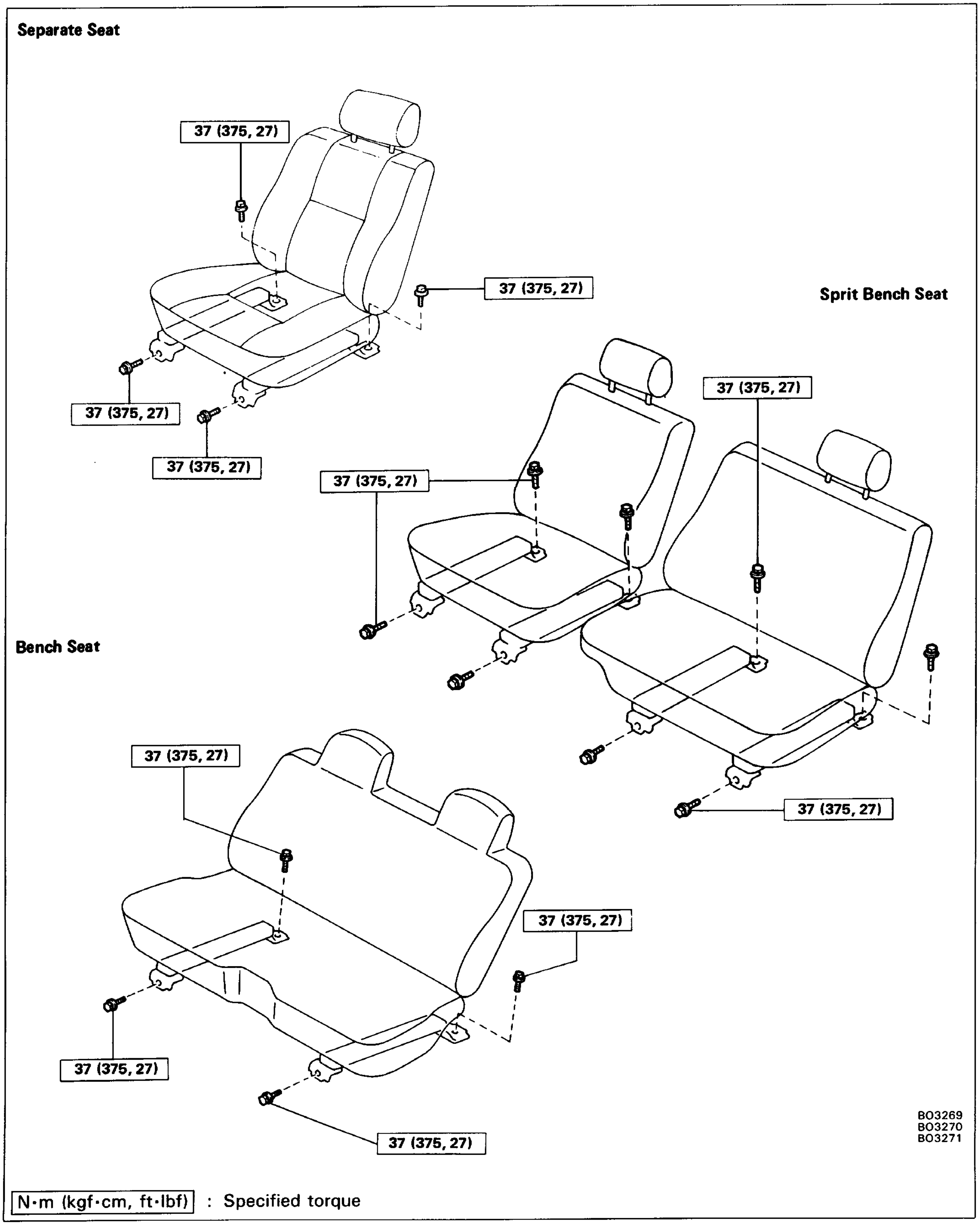
INSTALLATION OF TAIL GATE LOCK CONTROL

INSTALL TAIL GATE LOCK CONTROL IN REVERSE ORDER OF REMOVAL

SEAT

Front Seat

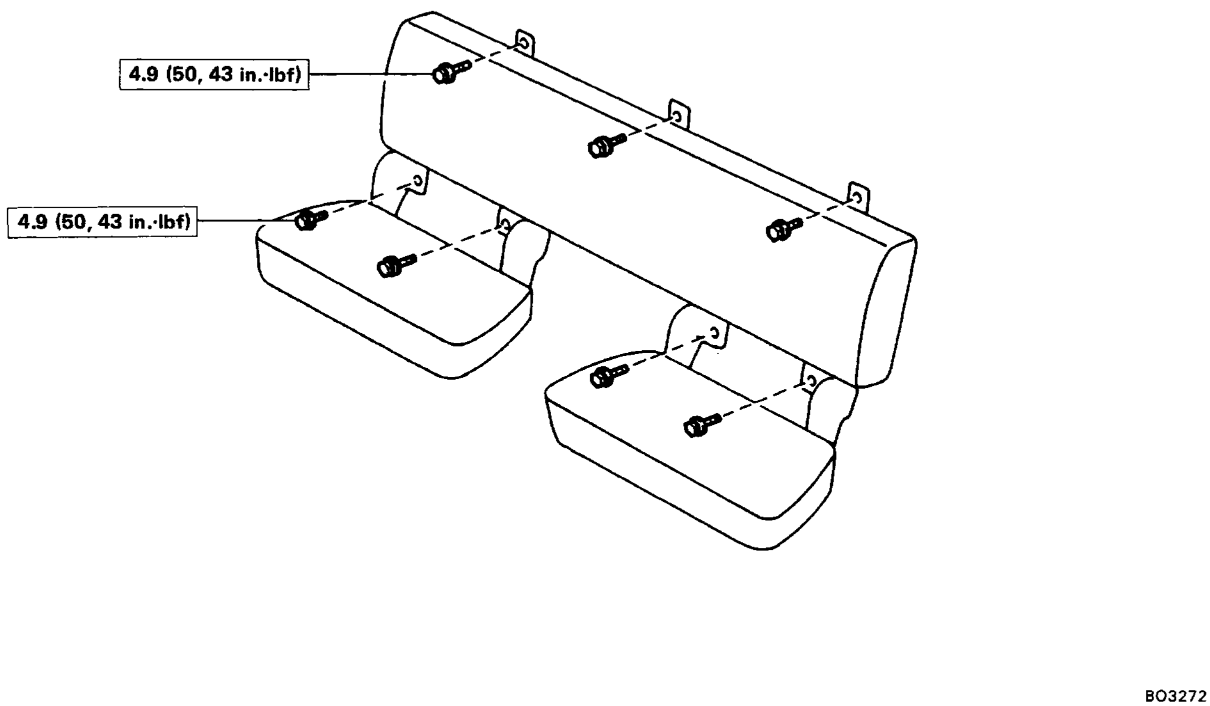
COMPONENTS



Rear Jump Seat

COMPONENTS (Cont'd)

Xtra Cab



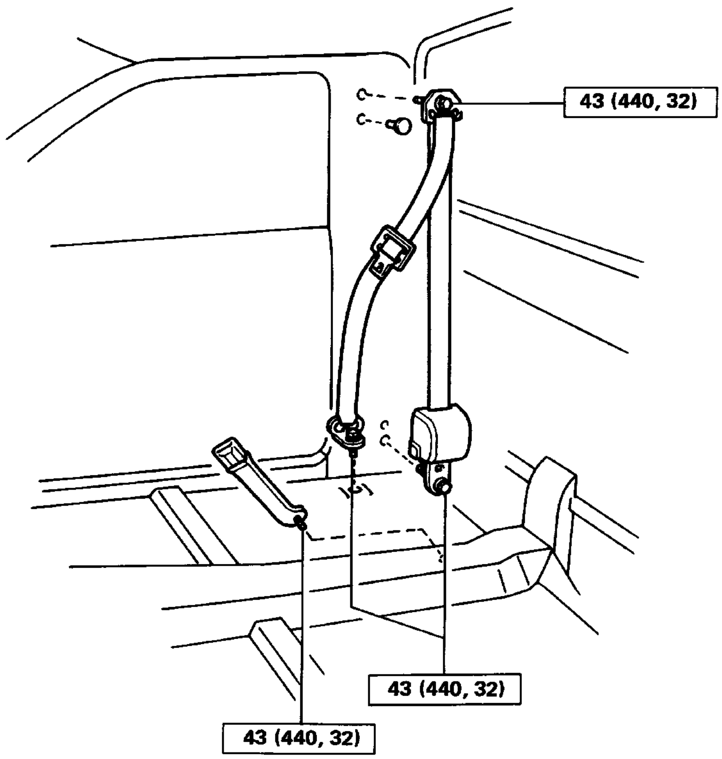
N·m (kgf·cm, ft·lbf) : Specified torque

SEAT BELT

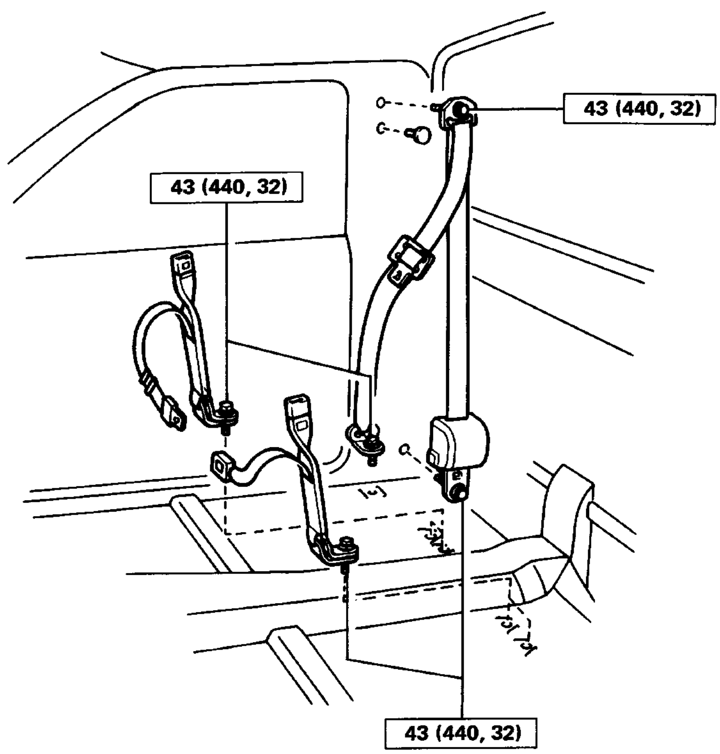
Front Seat Belt

COMPONENTS

Separate Seat



Sprit Bench Seat and Bench Seat



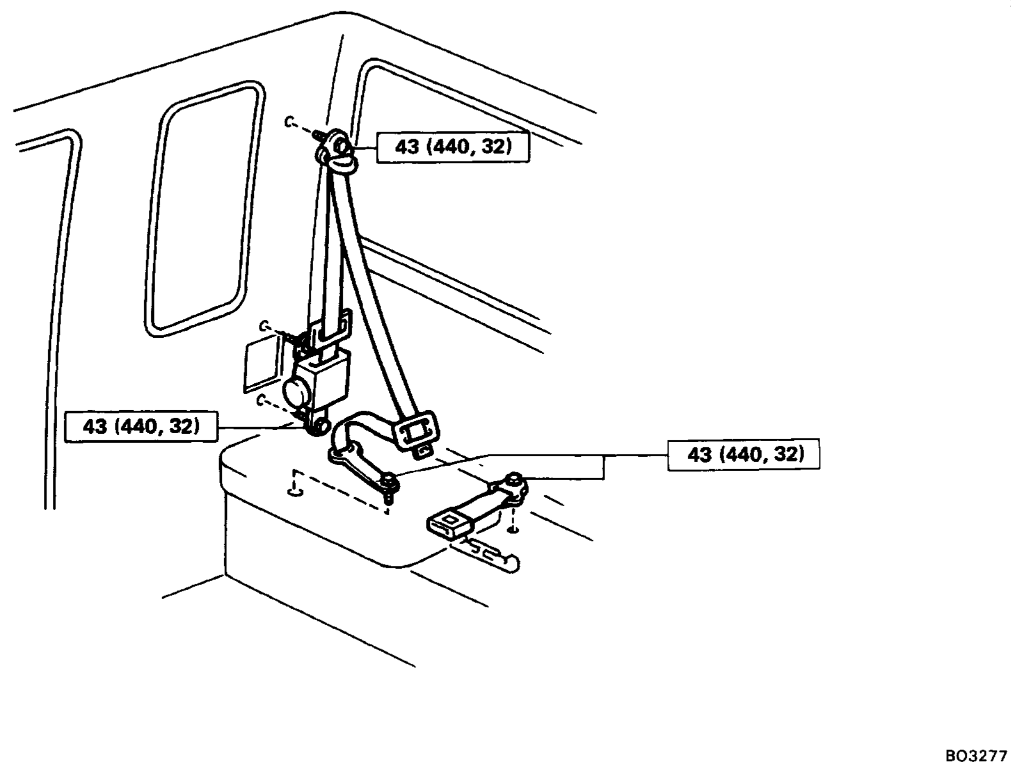
BO3275
BO3274

N·m (kgf·cm, ft·lbf) : Specified torque

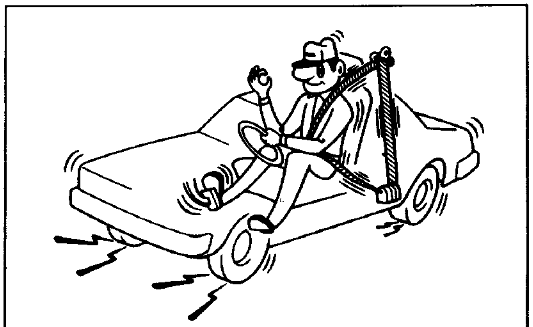
Rear Jump Seat Belt

COMPONENTS (Cont'd)

Xtra Cab



N·m (kgf·cm, ft·lbf) : Specified torque


BO0632

SEAT BELT

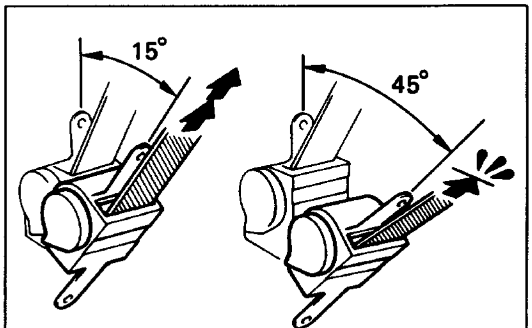
[Emergency Locking Retractor (ELR) Type]

1. RUNNING TEST (IN SAFETY AREA)

(a) Fasten the seat belt.

(b) Drive the car at 10 mph116 km/h) and make a very hard stop.

(c) Check that the seat belt is locked and cannot be ex– tended at this time.



BO0633

HINT: Conduct this test in safe area. If the belt does not lock, remove the belt mechanism assembly and conduct the following static check. Also, whenever installing a new belt assembly, verify the proper operation before in– stallation.

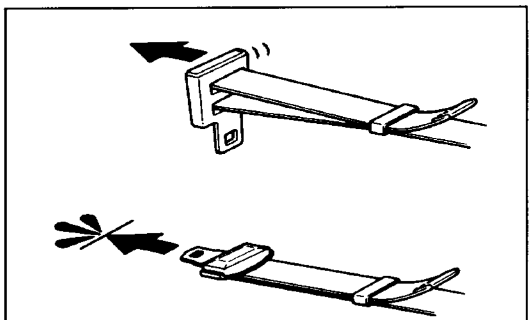
2. STATIC TEST

(a) Remove the locking retractor assembly.

(b) Tilt the retractor slowly.

(e) Verify that the belt can be pulled out at a tilt of 15 degrees or less, and cannot be pulled out at over 45 degrees of tilt.

If a problem is found, replace the assembly.


BO0635

CENTER SEAT BELT

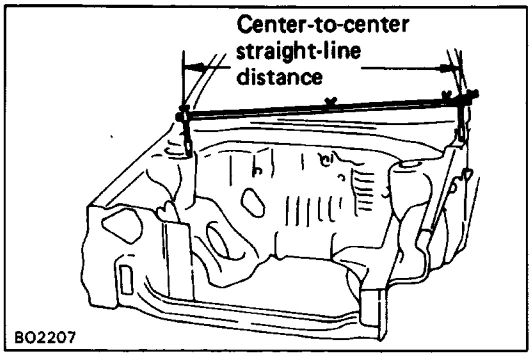
(Manual Type)

TESTING

(a) Adjust the belt to the proper length.

(b) Apply a firm load to the belt.

(c) Verify that the belt does not extend.



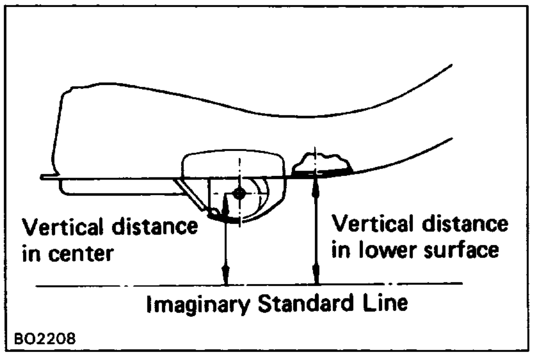
BODY DIMENSIONS

General Information

1. BASIC DIMENSIONS

(a) There are two types of dimensions in the diagram.
(Three–dimensional distance)

- Straight–line distance between the centers of two measuring points.

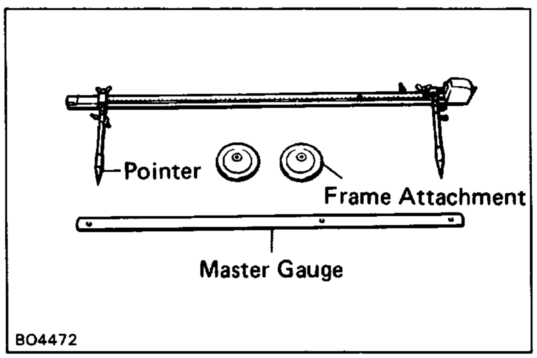


(Two–dimensional distance)

- Horizontal distance in forward/rearward between the centers of two measuring points.
- The height from an imaginary standard line.

(b) Incases in which only one dimension is given, left and right are symmetrical.

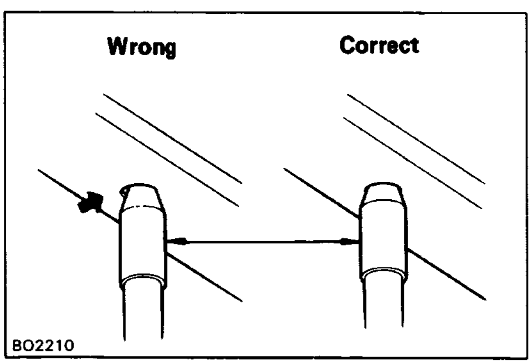
(c) The dimensions in the following drawing indicate ac–tual distance. Therefore, please use the dimensions as a reference.



2. MEASURING

(a) Basically, all measurements are to be done tracking gauge. For portions where it is not possible to use a tracking gauge, a tape measure should be used.

(b) Use only tracking gauge that has no looseness in the body, measuring plate, or pointers.



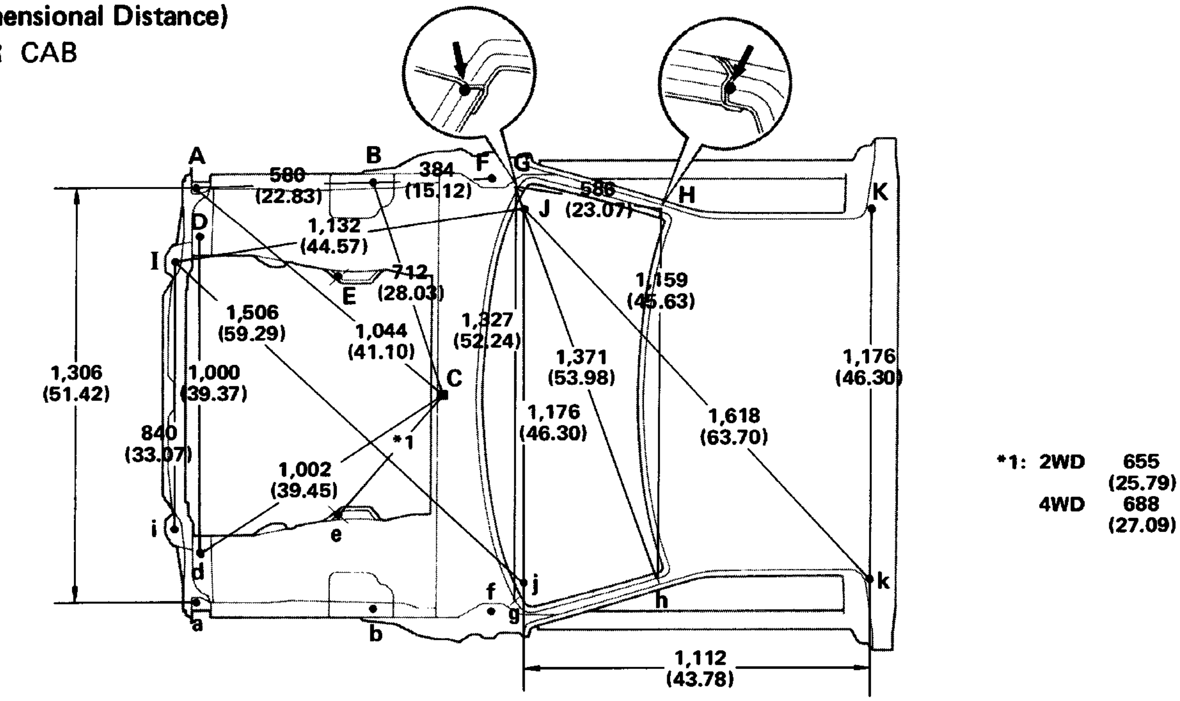
HINT:
1. The height of the left and right pointers must be equal.
2. Always calibrate the tracking gauge before measur–ing or after adjusting the pointer height.
3. Take care not to drop the tracking gauge or other–wise shock it.
4. Confirm that the pointers are securely in the holes.

(c) When using a tape measure, avoid twists and bends in the tape.

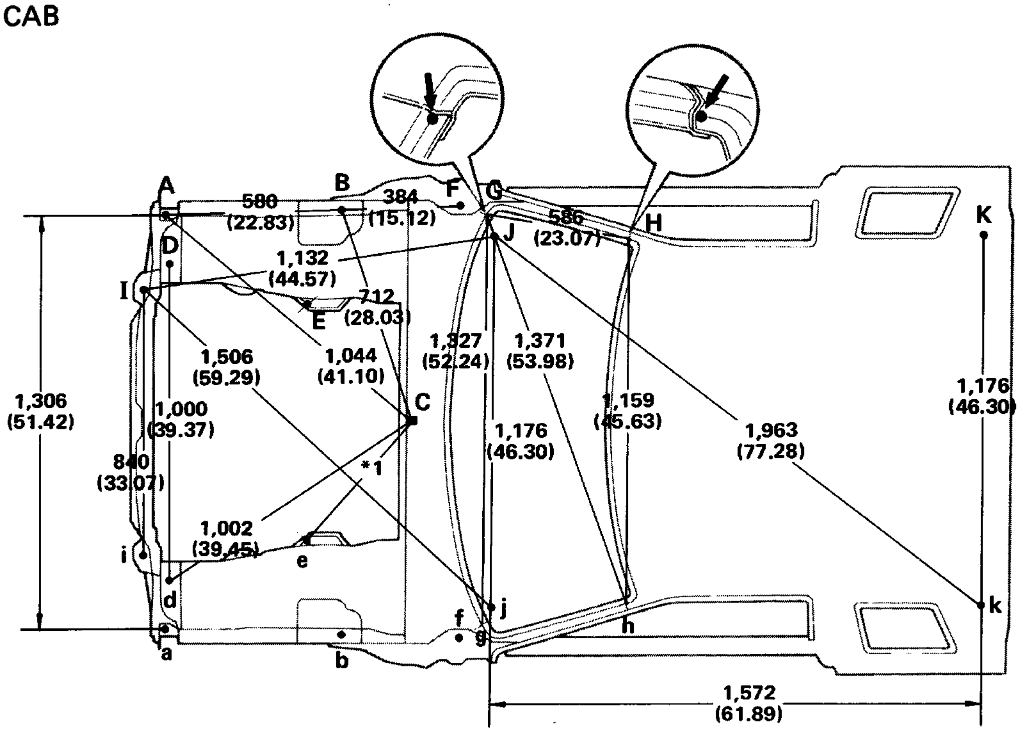
Body Dimensions

OVERHEAD VIEW
(Three-Dimensional Distance)

REGULAR CAB



XTRA CAB



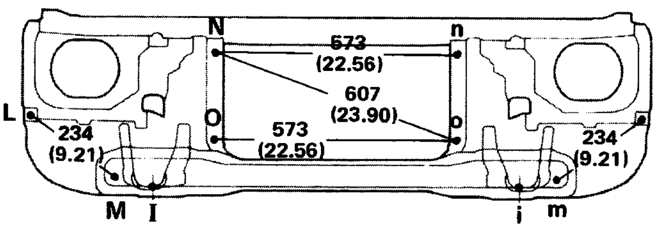
B03601
B03602

mm (in.)

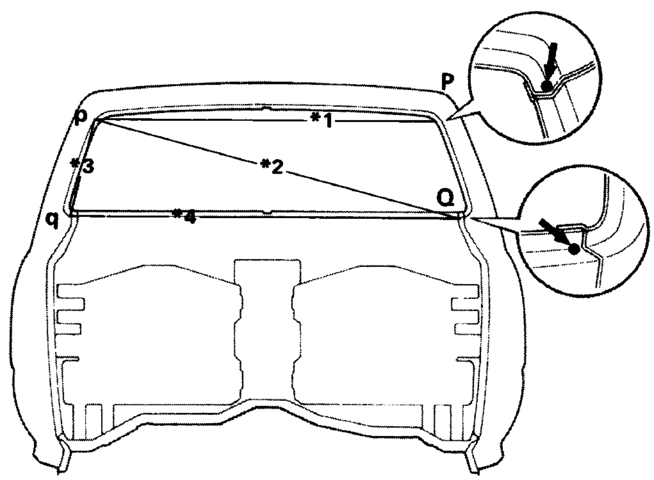
Symbol	Name	Hole dia.
A,a	Front fender installation nut	8 (0.31)
B,b	Front fender installation nut	8 (0.31)
C	Cowl ventilation louver installation nut	7.5 x 7.5 (0.295 x 0.295)
D,d	Fender apron standard hole	25 (0.98)
E,e	Fender apron seal installation hole	8 (0.31)
F,f	Cowl top panel standard hole	10 (0.39)
—	—	—

Symbol	Name	Hole dia.
G,g	Front body pillar/Cowl panel adjoining portion	—
H,h	Roof panel/Front body pillar adjoining portion	—
I,i	Cab mounting hole	RH 11 (0.43) LH 15 x 12 (0.59 x 0.47)
J,j	Cab mounting hole	22 (0.87)
K,k	Cab mounting hole	RH 22 (0.87) LH 23 x 12 (0.91 x 0.47)

FRONT VIEW
(Three-Dimensional Distance)
ALL MODELS



REAR VIEW
(Three-Dimensional Distance)
ALL MODELS



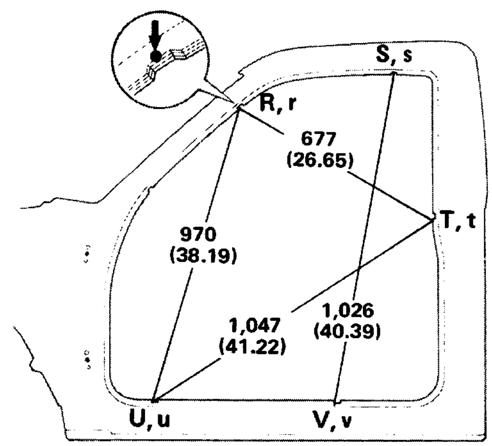
*1: Regular Cab 1,110 (43.70)
Xtra Cab 1,104 (43.46)

*2: Regular Cab 1,216 (47.87)
Xtra Cab 1,231 (48.46)

*3: Regular Cab 305 (12.01)
Xtra Cab 346 (13.62)

*4: Regular Cab 1,248 (49.13)
Xtra Cab 1,264 (49.76)

SIDE VIEW
(Three-Dimensional Distance)
ALL MODELS



NOTE: For symbol, capital letters indicate right side of vehicle, small letters indicate left side of vehicle.

BO3603
BO3604 BO3605

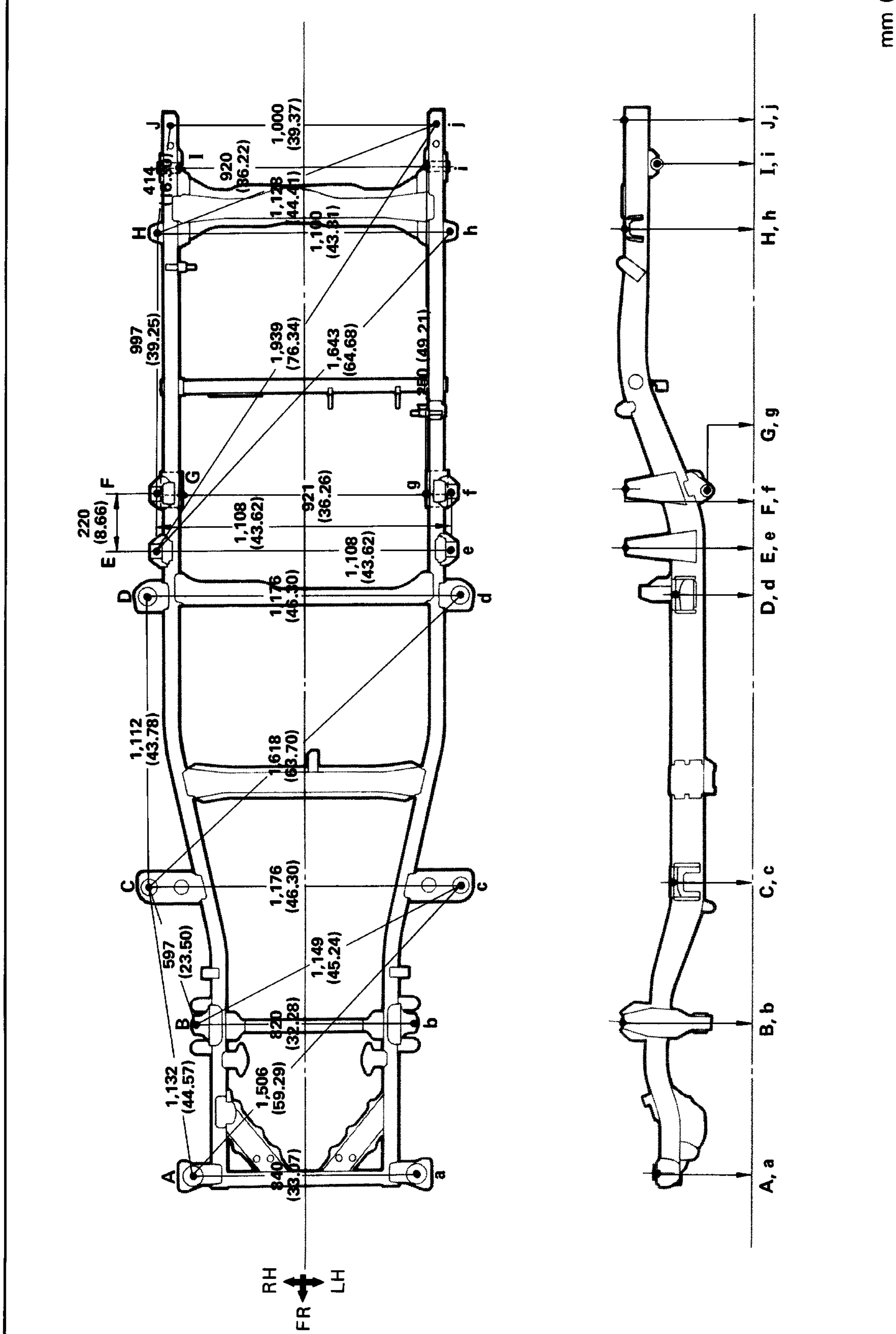
mm (in.)

Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
I,i	Cab mounting hole	RH 11 (0.43) LH 15 x 12 (0.59 x 0.47)	Q,q	Back panel/Quarter panel adjoining portion	—
L,l	Front fender installation nut	7 (0.28)	R,r	Front body pillar assembly mark	—
M,m	Front crossmember standard hole	13 (0.51)	S,s	Roof side rail assenbly mark	—
N,n	Radiator installation nut	9 (0.35)	T,t	Quarter panel assembly mark	—
O,o	Radiator installation nut	9 (0.35)	U,u	Rocker panel assembly mark	—
P,p	Roof panel/Quarter panel adjoining portion	—	V,v	Rocker panel assembly mark	—
			—	—	—

Frame Dimensions

2WD Regular Cab: Short Wheel Base Models

(Three-Dimensional Distance)



BO3586

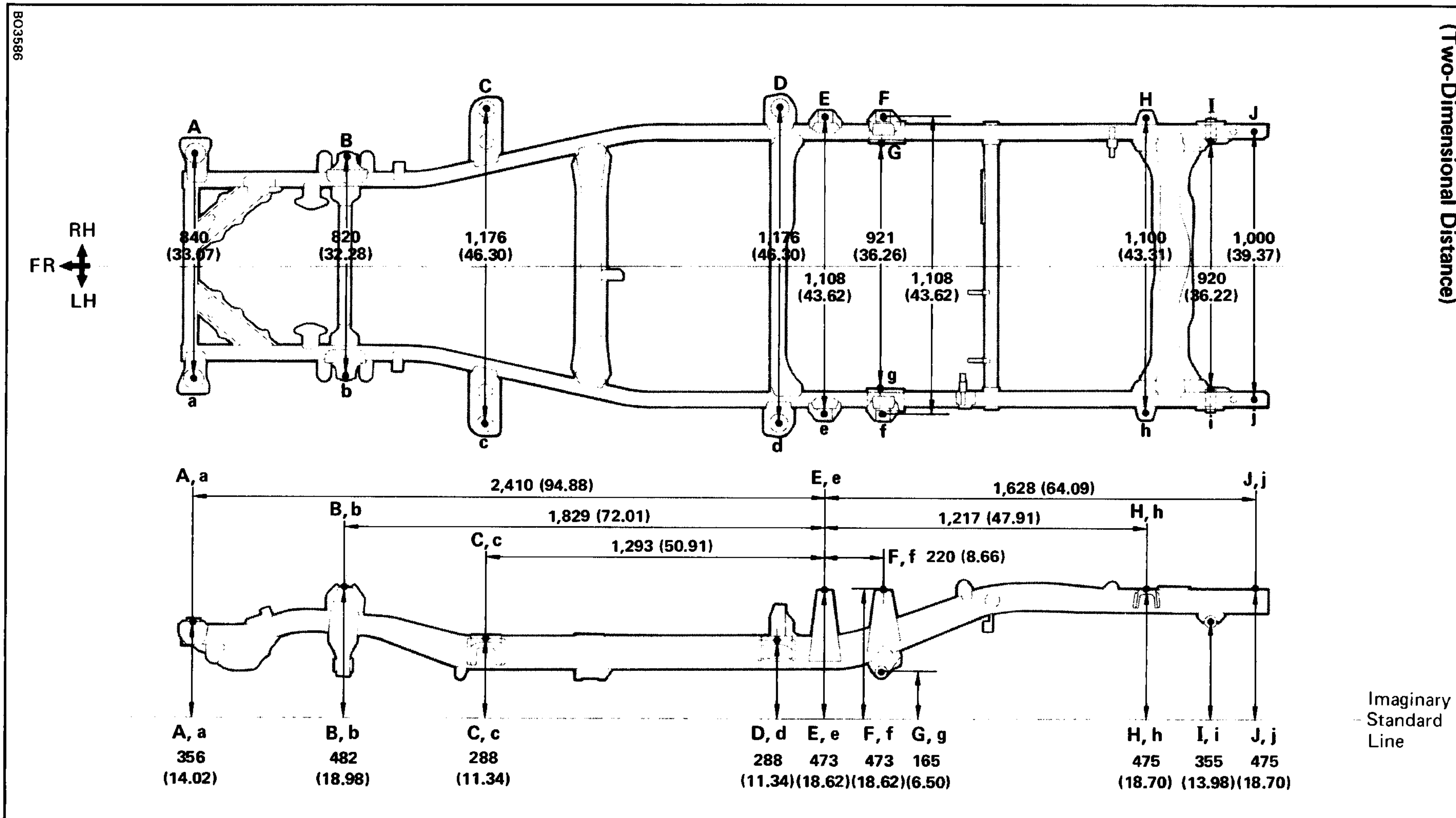
mm (in.)

Symbol	Name	Hole dia.
A,a	Cab mounting hole	24 (0.94)
B,b	Shock absorber installation hole	16 (0.63)
C,c	Cab mounting hole	60 (2.36)
D,d	Cab mounting hole	70 (2.76)
E,e	Rear body mounting hole	17 (0.67)

Symbol	Name	Hole dia.
F,f	Rear body mounting hole	17 (0.67)
G,g	Rear spring front hanger hole — inner	14.5 (0.571)
H,h	Rear body mounting hole	17 (0.67)
I,i	Rear spring rear hanger hole — inner	30.35 (1.1949)
J,j	Rear body mounting hole	18 x 21 (0.71 x 0.83)

2WD Regular Cab: Short Wheel Base Models

(Two-Dimensional Distance)



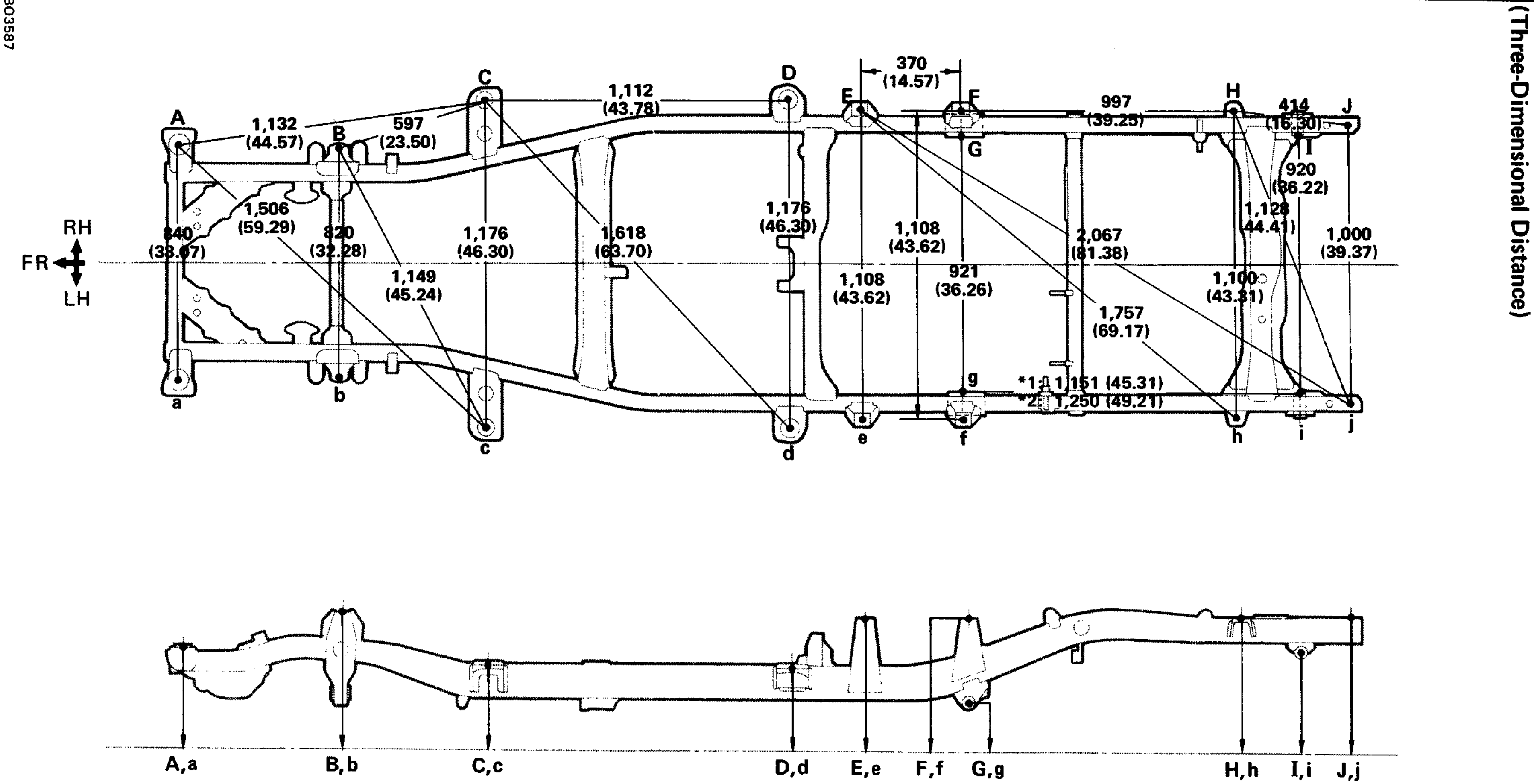
Wheel base: 2,615 (102.95)

mm (in.)

Symbol	Name	Hole dia.
A,a	Cab mounting hole	24 (0.94)
B,b	Shock absorber installation hole	16 (0.63)
C,c	Cab mounting hole	60 (2.36)
D,d	Cab mounting hole	70 (2.76)
E,e	Rear body mounting hole	17 (0.67)
F,f	Rear body mounting hole	17 (0.67)
G,g	Rear spring front hanger hole — inner	14.5 (0.571)
H,h	Rear body mounting hole	17 (0.67)
I,i	Rear spring rear hanger hole — inner	30.35 (1.1949)
J,j	Rear body mounting hole	18 x 21 (0.71 x 0.83)

2WD Regular Cab: Long Wheel Base Models

(Three-Dimensional Distance)



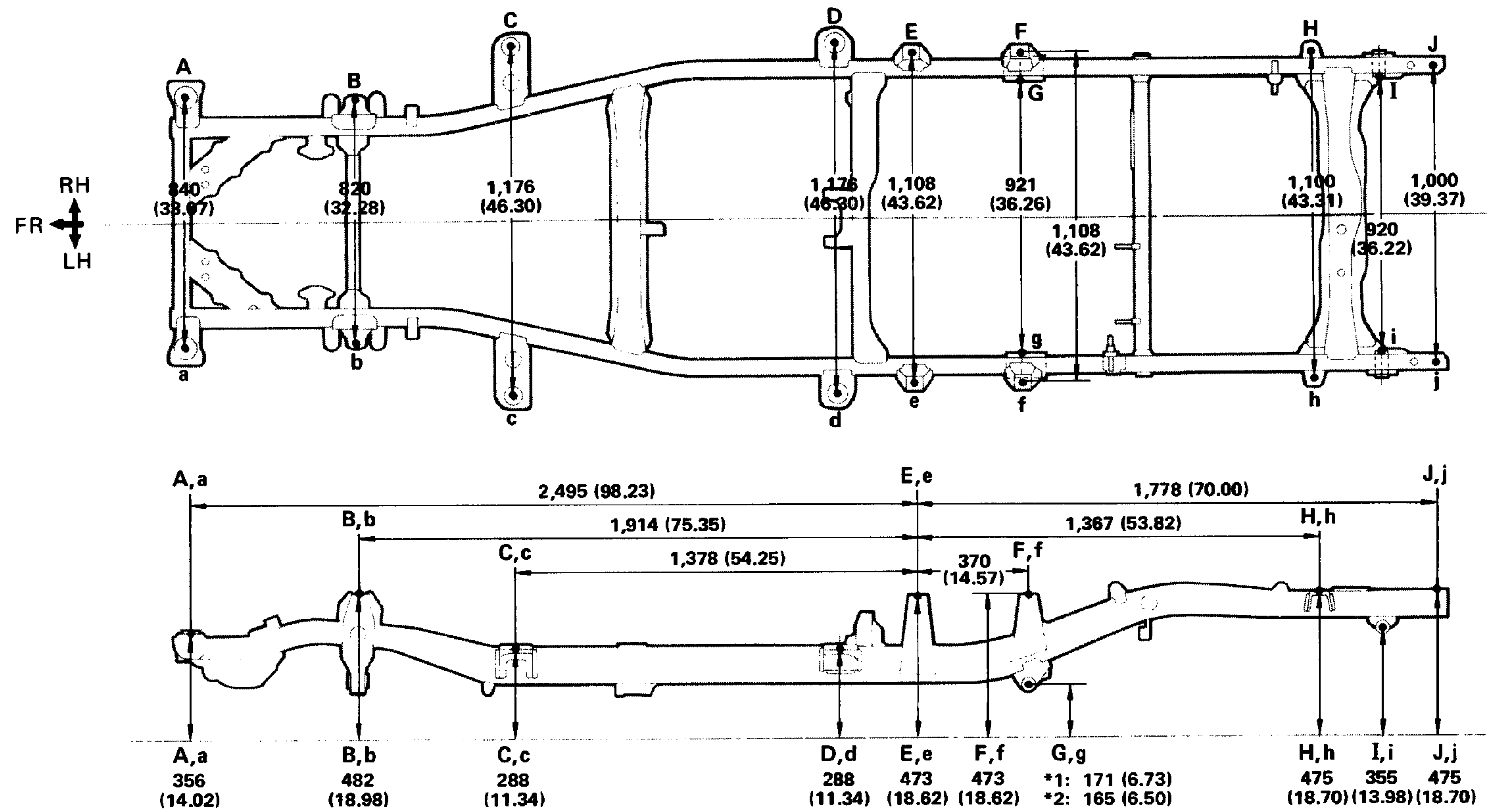
*1: Loading Capacity 1.0 ton, and Cab and Chassis Models
*2: Loading Capacity 0.5 ton Models

mm (in.)

Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A,a	Cab mounting hole	24 (0.94)	G,g	Rear spring front hanger hole — inner	14.5 (0.571)
B,b	Shock absorber installation hole	16 (0.63)	H,h	Rear body mounting hole	17 (0.67)
C,c	Cab mounting hole	60 (2.36)	I,i	Rear spring rear hanger hole — inner	30.35 (1.1949)
D,d	Cab mounting hole	70 (2.76)	J,j	Rear body mounting hole	18 x 21 (0.71 x 0.83)
E,e	Rear body mounting hole	17 (0.67)			
F,f	Rear body mounting hole	17 (0.67)	—	—	—

2WD Regular Cab: Long Wheel Base Models

(Two-Dimensional Distance)



*1: Loading Capacity: 1.0 ton, and Cab and Chassis Models
*2: Loading Capacity: 0.5 ton Models

Wheel Base: 2,850 (112.20)

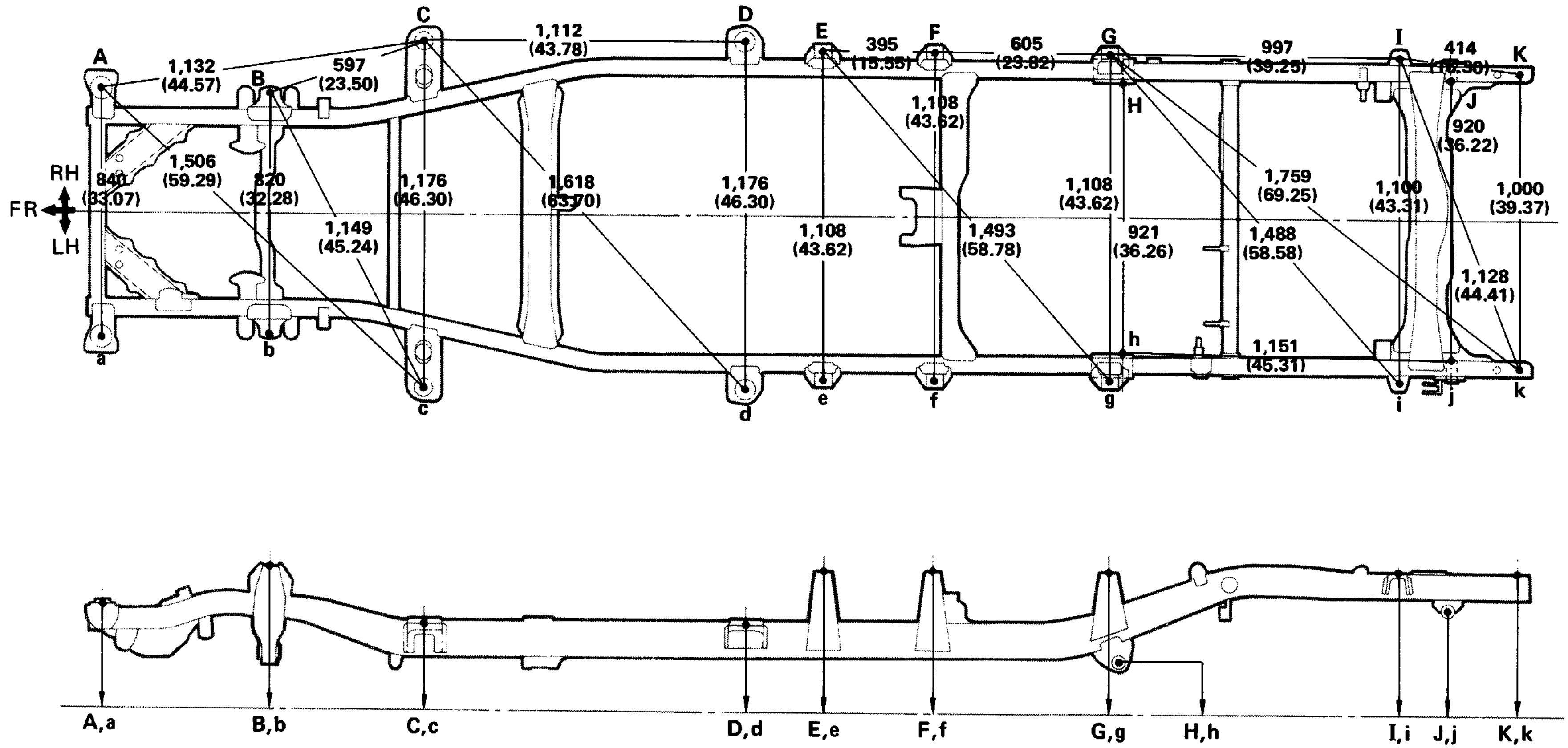
mm (in.)

Symbol	Name	Hole dia.
A,a	Cab mounting hole	24 (0.94)
B,b	Shock absorber installation hole	16 (0.63)
C,c	Cab mounting hole	60 (2.36)
D,d	Cab mounting hole	70 (2.76)
E,e	Rear body mounting hole	17 (0.67)
F,f	Rear body mounting hole	17 (0.67)

Symbol	Name	Hole dia.
G,g	Rear spring front hanger hole — inner	*1 14.6 (0.575) *2 14.5 (0.571)
H,h	Rear body mounting hole	17 (0.67)
I,i	Rear spring rear hanger hole — inner	30.35 (1.1949)
J,j	Rear body mounting hole	18 x 21 (0.71 x 0.83)

2WD Regular Cab: Super Long Wheel Base Models

(Three-Dimensional Distance)

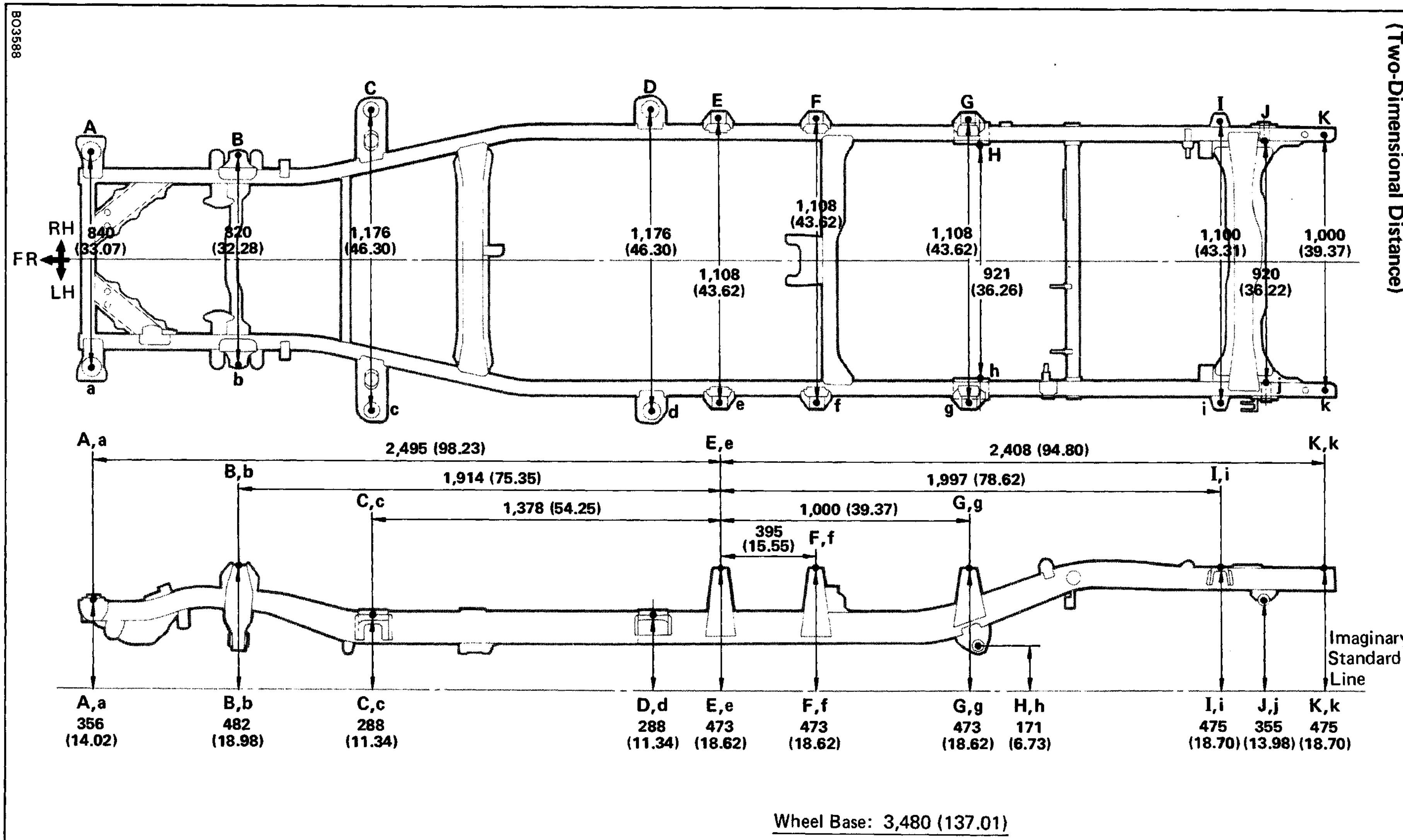


mm (in.)

Symbol	Name	Hole dia.
A,a	Cab mounting hole	24 (0.94)
B,b	Shock absorber installation hole	16 (0.63)
C,c	Cab mounting hole	60 (2.36)
D,d	Cab mounting hole	70 (2.76)
E,e	Rear body mounting hole	17 (0.67)
F,f	Rear body mounting hole	17 (0.67)
G,g	Rear body mounting hole	17 (0.67)
H,h	Rear spring front hanger hole — inner	14.6 (0.575)
I,i	Rear body mounting hole	17 (0.67)
J,j	Rear spring rear hanger hole — inner	30.35 (1.1949)
K,k	Rear body mounting hole	18 x 21 (0.71 x 0.83)

2WD Regular Cab: Super Long Wheel Base Models

(Two-Dimensional Distance)

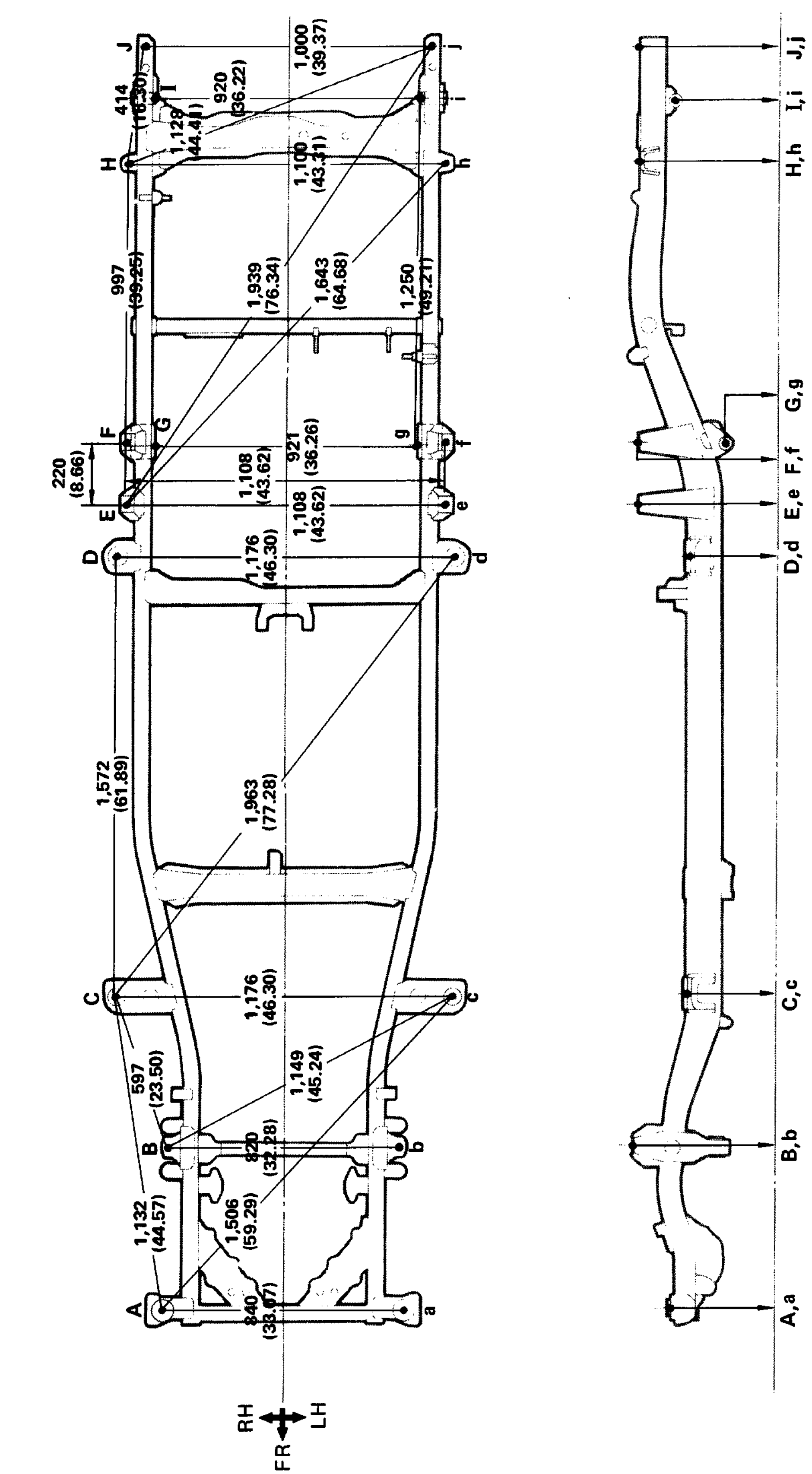


mm (in.)

Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A,a	Cab mounting hole	24 (0.94)	G,g	Rear body mounting hole	17 (0.67)
B,b	Shock absorber installation hole	16 (0.63)	H,h	Rear spring front hanger hole — inner	14.6 (0.575)
C,c	Cab mounting hole	60 (2.36)	I,i	Rear body mounting hole	17 (0.67)
D,d	Cab mounting hole	70 (2.76)	J,j	Rear spring rear hanger hole — inner	30.35 (1.1949)
E,e	Rear body mounting hole	17 (0.67)	K,k	Rear body mounting hole	18 x 21 (0.71 x 0.83)
F,f	Rear body mounting hole	17 (0.67)			

2WD Xtra Cab Models

(Three-Dimensional Distance)



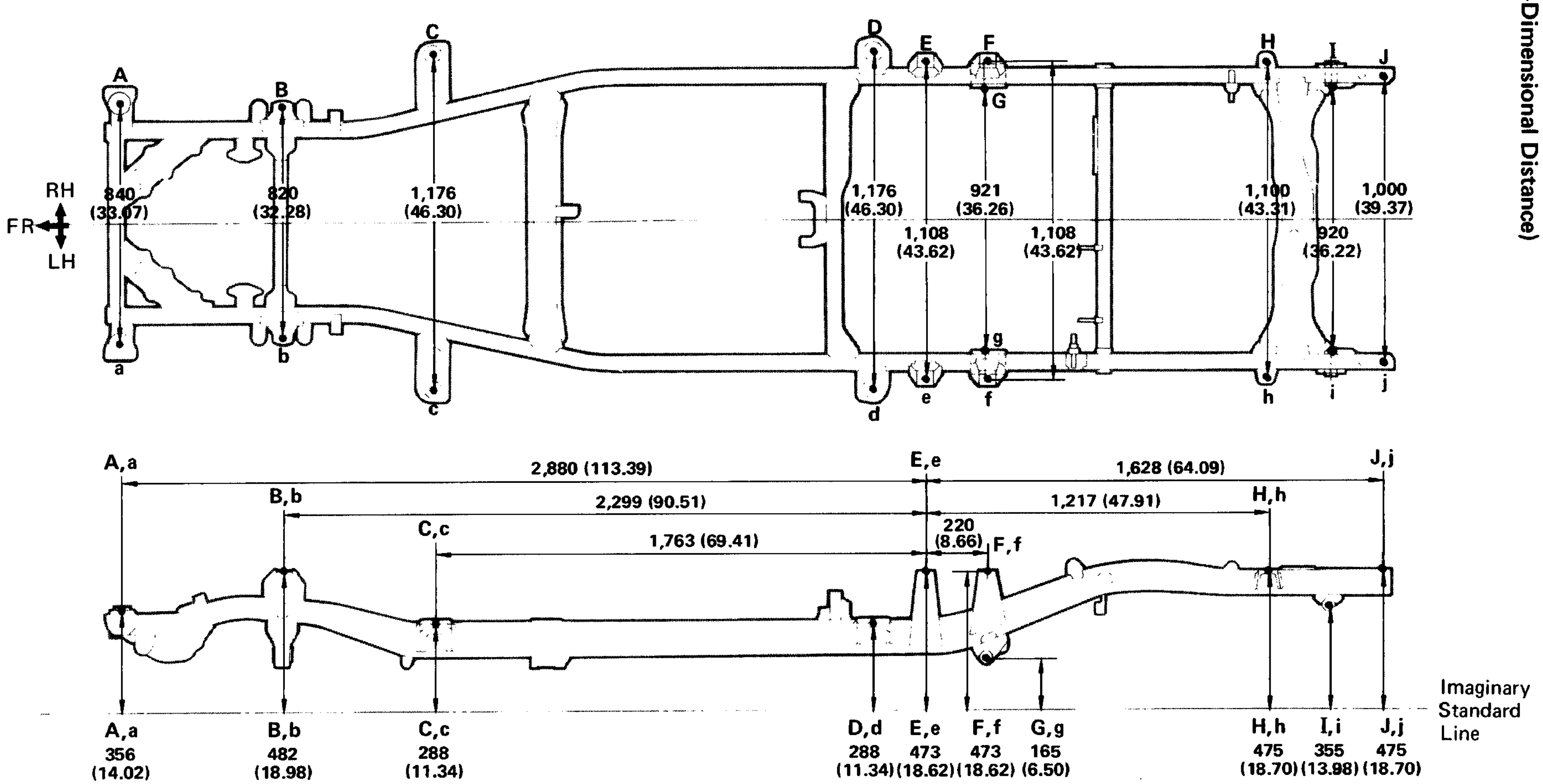
BO3589

mm (in.)

Symbol	Name	Hole dia.
A,a	Cab mounting hole	24 (0.94)
B,b	Shock absorber installation hole	16 (0.63)
C,c	Cab mounting hole	60 (2.36)
D,d	Cab mounting hole	70 (2.76)
E,e	Rear body mounting hole	17 (0.67)
F,f	Rear body mounting hole	17 (0.67)
G,g	Rear spring front hanger hole — inner	14.5 (0.571)
H,h	Rear body mounting hole	17 (0.67)
I,i	Rear spring rear hanger hole — inner	30.35 (1.1949)
J,j	Rear body mounting hole	18 x 21 (0.71 x 0.83)
—	—	—

2WD Xtra Cab Models

(Two-Dimensional Distance)



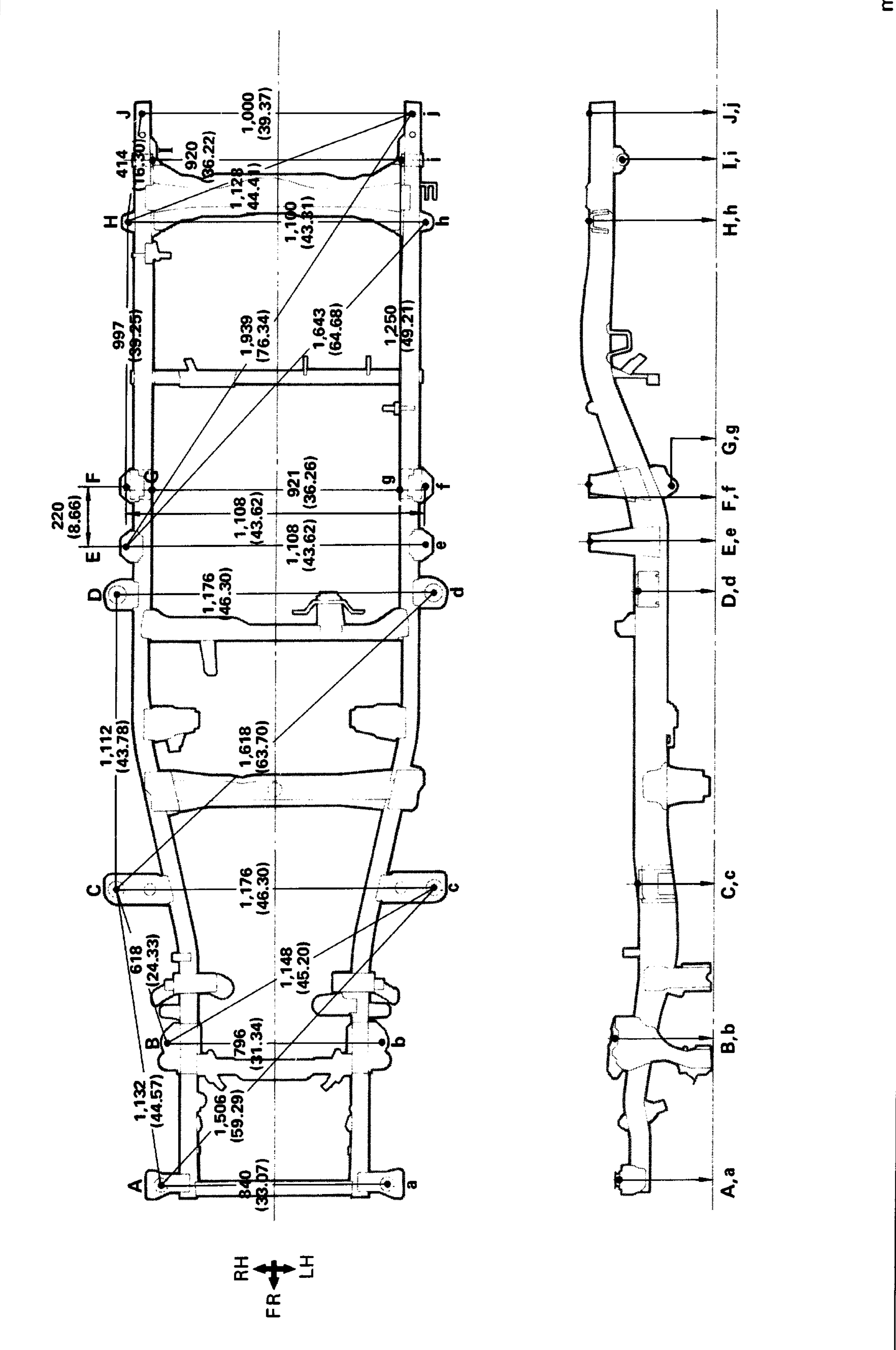
Wheel Base: 3,085 (121.46)

mm (in.)

Symbol	Name	Hole dia.
A,a	Cab mounting hole	24 (0.94)
B,b	Shock absorber installation hole	16 (0.63)
C,c	Cab mounting hole	60 (2.36)
D,d	Cab mounting hole	70 (2.76)
E,e	Rear body mounting hole	17 (0.67)
F,f	Rear body mounting hole	17 (0.67)
G,g	Rear spring front hanger hole – inner	14.5 (0.571)
H,h	Rear body mounting hole	17 (0.67)
I,i	Rear spring rear hanger hole – inner	30.35 (1.1949)
J,j	Rear body mounting hole	18 x 21 (0.71 x 0.83)
–	–	–

4WD Regular Cab: Short Wheel Base Models

(Three-Dimensional Distance)

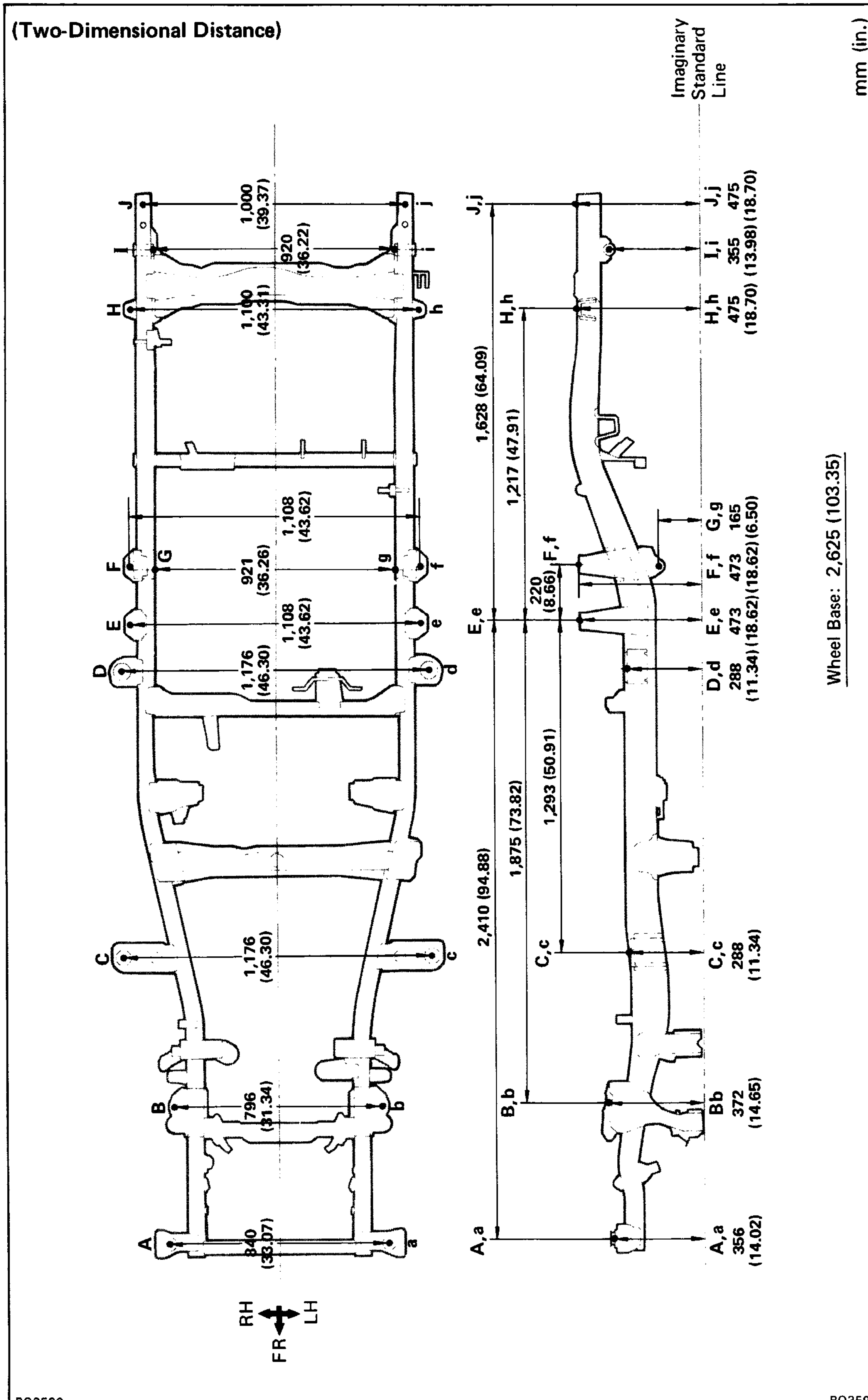


mm (in.)

Symbol	Name	Hole dia.
A,a	Cab mounting hole	24 (0.94)
B,b	Shock absorber installation hole	16 (0.63)
C,c	Cab mounting hole	60 (2.36)
D,d	Cab mounting hole	70 (2.76)
E,e	Rear body mounting hole	17 (0.67)
F,f	Rear body mounting hole	17 (0.67)

Symbol	Name	Hole dia.
G,g	Rear spring front hanger hole — inner	14.5 (0.571)
H,h	Rear body mounting hole	17 (0.67)
I,i	Rear spring rear hanger hole — inner	30.35 (1.1949)
J,j	Rear body mounting hole	18 x 21 (0.71 x 0.83)
—	—	—

4WD Regular Cab: Short Wheel Base Models

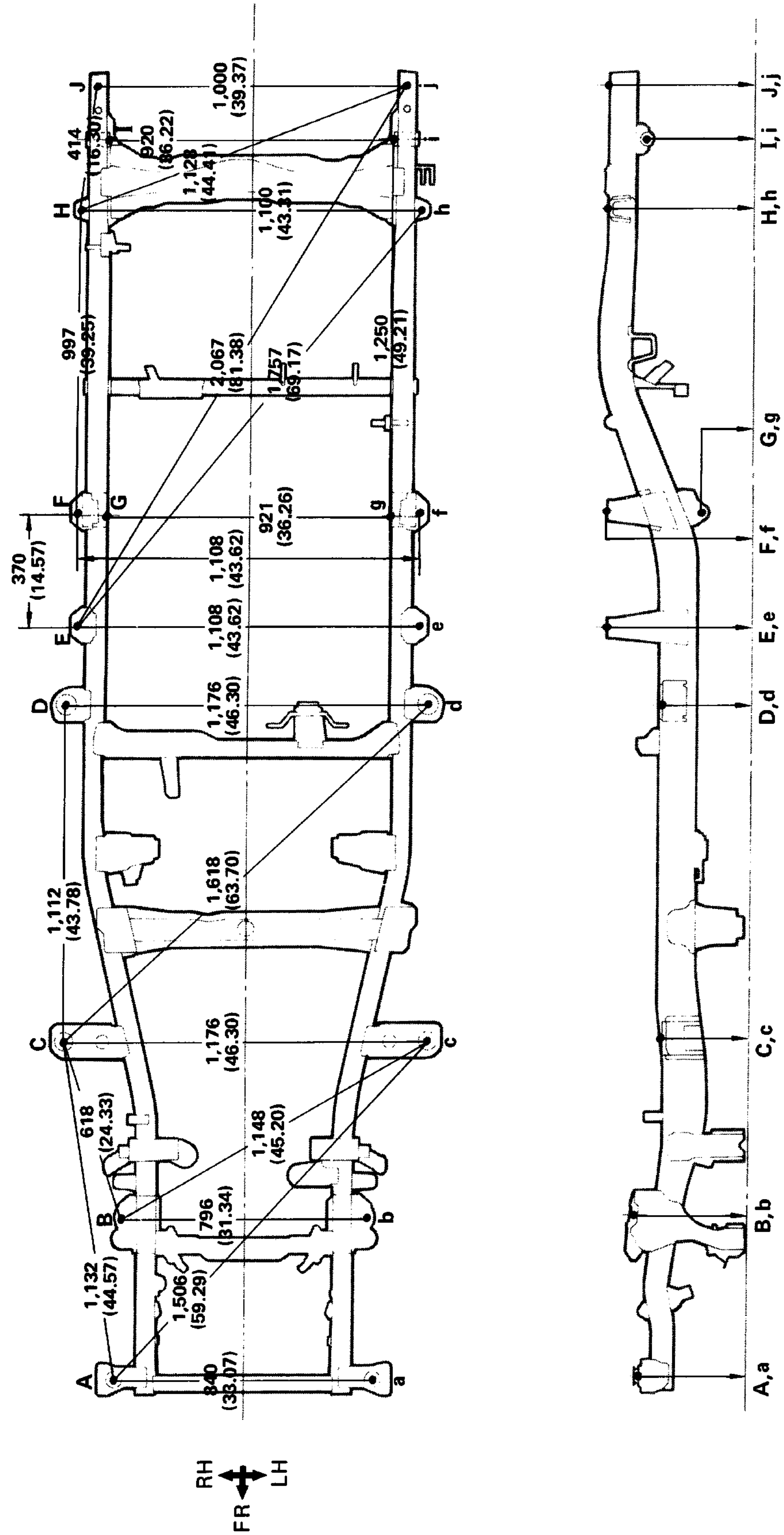


Symbol	Name	Hole dia.
A,a	Cab mounting hole	24 (0.94)
B,b	Shock absorber installation hole	16 (0.63)
C,c	Cab mounting hole	60 (2.36)
D,d	Cab mounting hole	70 (2.76)
E,e	Rear body mounting hole	17 (0.67)
F,f	Rear body mounting hole	17 (0.67)
G,g	Rear spring front hanger hole — inner	14.5 (0.571)
H,h	Rear body mounting hole	17 (0.67)
I,i	Rear spring rear hanger hole — inner	30.35 (1.1949)
J,j	Rear body mounting hole	18 x 21 (0.71 x 0.83)
—	—	—

BO3590

4WD Regular Cab: Long Wheel Base Models

(Three-Dimensional Distance)



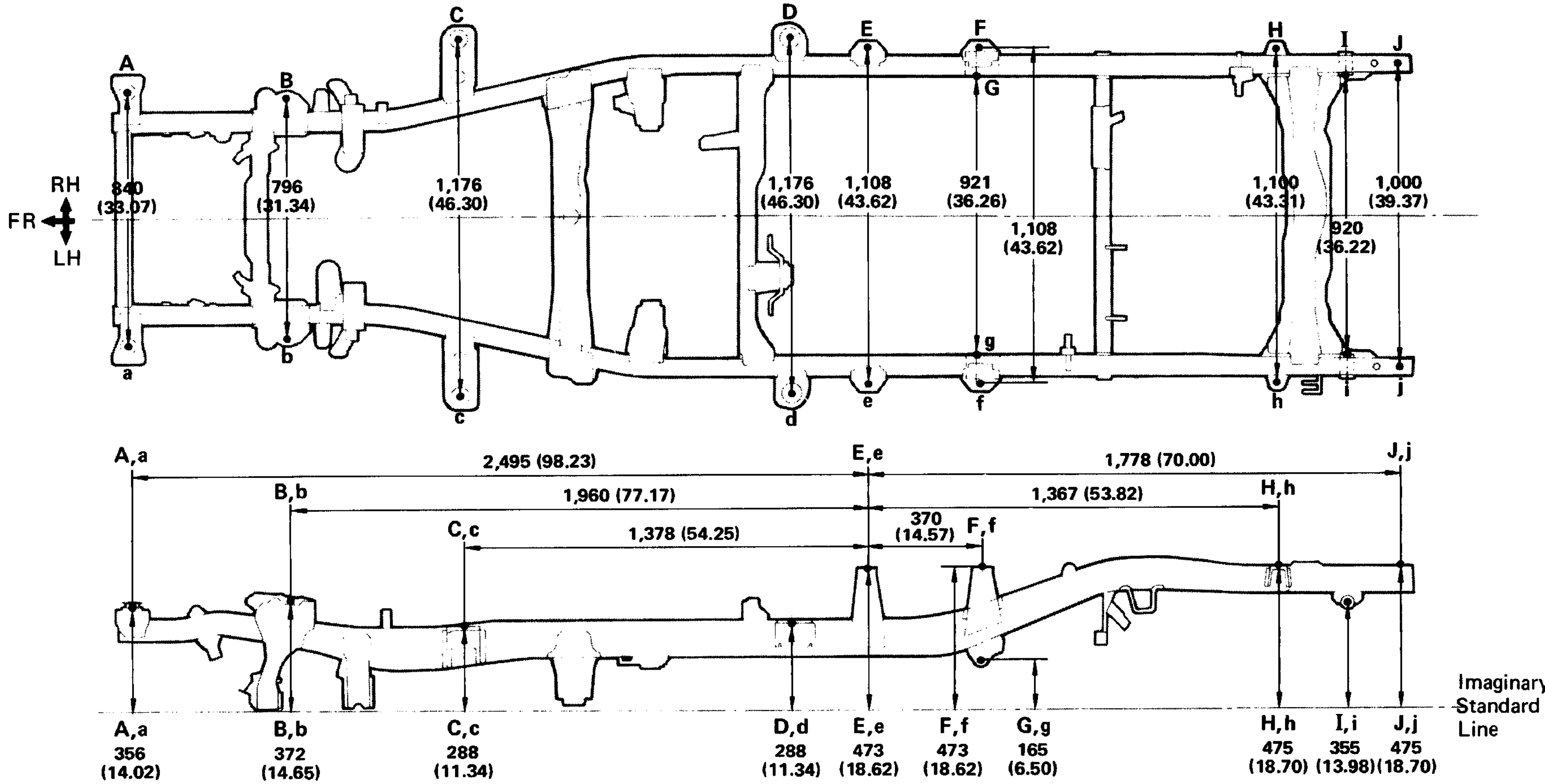
BO3591

mm (in.)

Symbol	Name	Hole dia.
A,a	Cab mounting hole	24 (0.94)
B,b	Shock absorber installation hole	16 (0.63)
C,c	Cab mounting hole	60 (2.36)
D,d	Cab mounting hole	70 (2.76)
E,e	Rear body mounting hole	17 (0.67)
F,f	Rear body mounting hole	17 (0.67)
G,g	Rear spring front hanger hole — inner	14.5 (0.571)
H,h	Rear body mounting hole	17 (0.67)
I,i	Rear spring rear hanger hole — inner	30.35 (1.1949)
J,j	Rear body mounting hole	18 x 21 (0.71 x 0.83)
—	—	—

4WD Regular Cab: Long Wheel Base Models

(Two-Dimensional Distance)



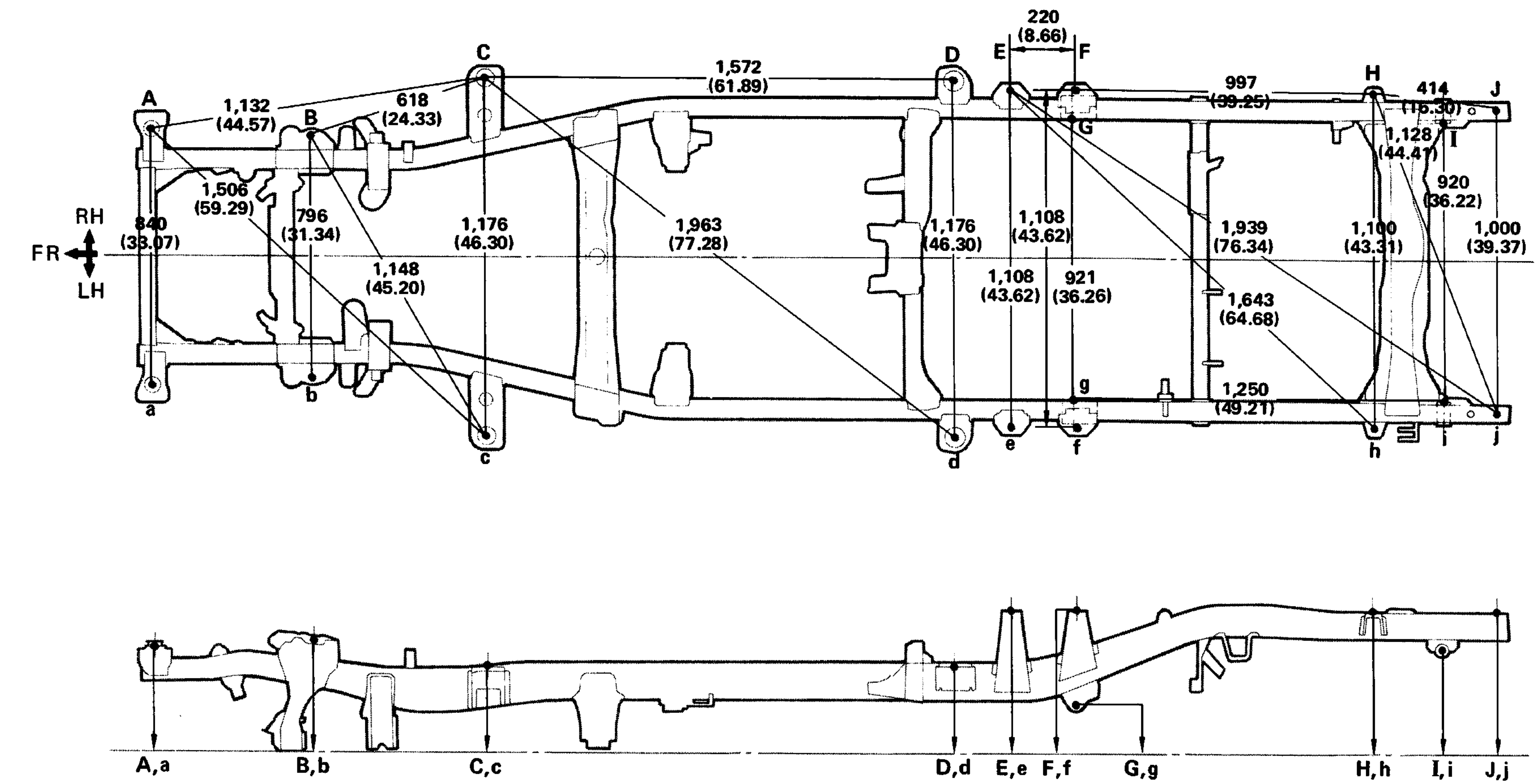
BO3591

mm (in.)

Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A,a	Cab mounting hole	24 (0.94)	G,g	Rear spring front hanger hole — inner	14.5 (0.571)
B,b	Shock absorber installation hole	16 (0.63)	H,h	Rear body mounting hole	17 (0.67)
C,c	Cab mounting hole	60 (2.36)	I,i	Rear spring rear hanger hole — inner	30.35 (1.1949)
D,d	Cab mounting hole	70 (2.76)	J,j	Rear body mounting hole	18 x 21 (0.71 x 0.83)
E,e	Rear body mounting hole	17 (0.67)			
F,f	Rear body mounting hole	17 (0.67)	—	—	—

4WD Xtra Cab Models

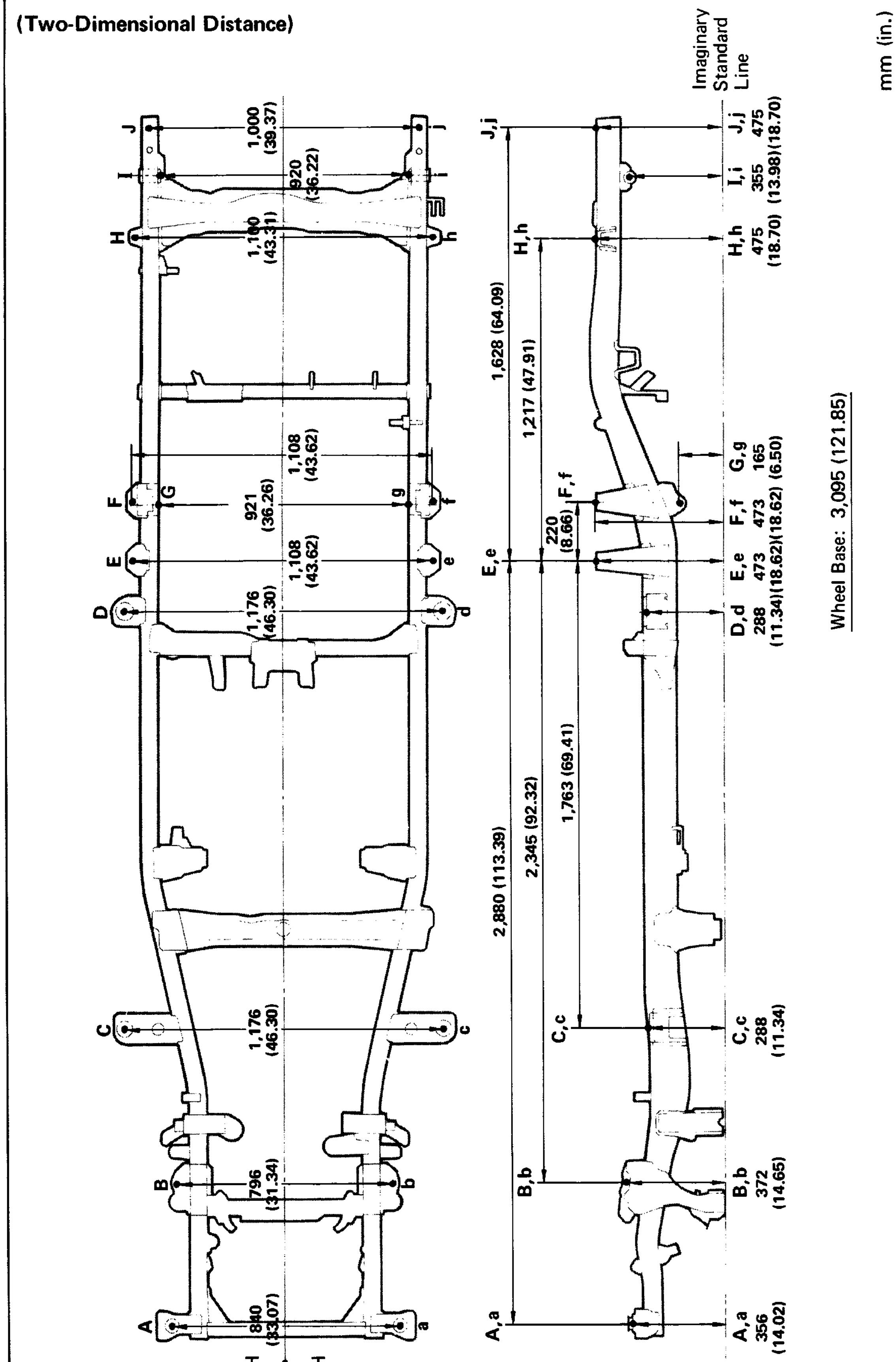
(Three-Dimensional Distance)



mm (in.)

Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A,a	Cab mounting hole	24 (0.94)	G,g	Rear spring front hanger hole — inner	14.5 (0.571)
B,b	Shock absorber installation hole	16 (0.63)	H,h	Rear body mounting hole	17 (0.67)
C,c	Cab mounting hole	60 (2.36)	I,i	Rear spring rear hanger hole — inner	30.35 (1.1949)
D,d	Cab mounting hole	70 (2.76)	J,j	Rear body mounting hole	18 x 21 (0.71 x 0.83)
E,e	Rear body mounting hole	17 (0.67)			
F,f	Rear body mounting hole	17 (0.67)	—	—	—

4WD Xtra Cab Models

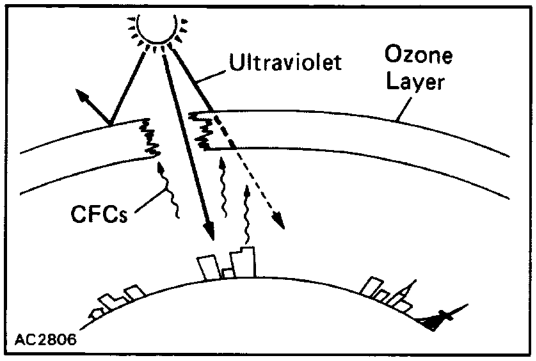


Symbol	Name	Hole dia.
A,a	Cab mounting hole	24 (0.94)
B,b	Shock absorber installation hole	16 (0.63)
C,c	Cab mounting hole	60 (2.36)
D,d	Cab mounting hole	70 (2.76)
E,e	Rear body mounting hole	17 (0.67)
F,f	Rear body mounting hole	17 (0.67)
G,g	Rear spring front hanger hole — inner	14.5 (0.571)
H,h	Rear body mounting hole	17 (0.67)
I,i	Rear spring rear hanger hole — inner	30.35 (1.1949)
J,j	Rear body mounting hole	18 x 21 (0.71 x 0.83)
–	–	–

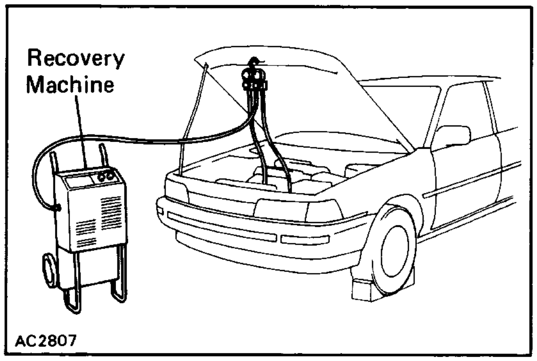
AIR CONDITIONING SYSTEM

GENERAL INFORMATION

REFRIGERATION SYSTEM



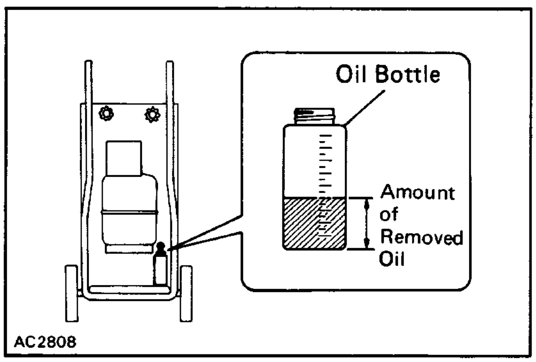
Prevention of Refrigerant Release and Excessive quantities Refrigerant (CFCs) for automobile air conditionings is believed to cause harm by depleting the ozone layer which helps to protect us from the ultraviolet rays of the sun. Therefore, it is necessary to prevent release of refrigerant to the atmosphere and to use the minimum amount when servicing the air conditioning.



1. USE RECOVERY MACHINE TO RECOVER REFRIGERANT

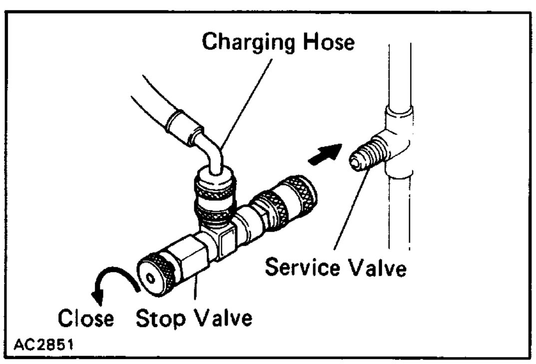
When discharging refrigerant from the system as follows, use a recovery machine to recover the refrigerant.

- Before replacing parts on the refrigerant line.
- When moisture or air gets in the refrigerant line.
- When excess refrigerant is charged.



NOTICE:

- **When handling the recovery machine, always follow the directions given in the instruction manual.**
- **After recovery, the amount of compressor oil removed must be measured and the same amount added to the system.**



2. USE CHARGING HOSES WITH STOP VALVE WHEN INSTALLING MANIFOLD GAUGE SET

To prevent release of refrigerant, using charging hoses with a stop valve when installing the manifold gauge set to the service valves on the refrigerant line.

3. TIGHTEN CONNECTING PARTS SECURELY

Follow the notices about tightening connecting parts in step 6 on page AC–4.

4. PROPERLY EVACUATE AIR FROM REFRIGERANT SYSTEM

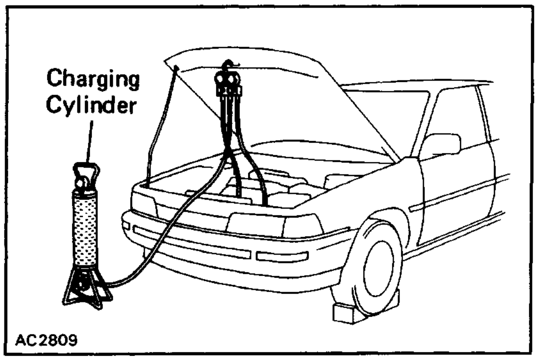
To prevent release and wasteful use of refrigerant, evacuate air with care from refrigeration system as follows;

- Do not evacuate before recovering refrigerant in system.

- Do not perform repeat evacuation of system.

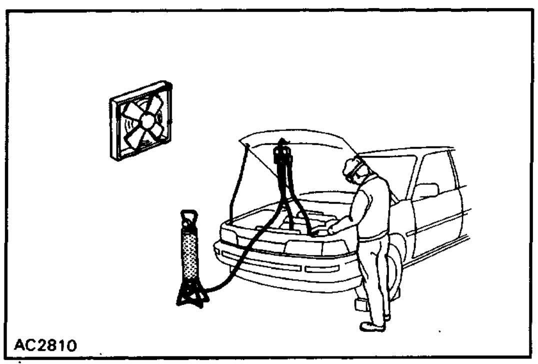
Evacuation Process

Evacuation	Airtight Check	→	Top–Up Charging of Refrigerant	→	Refrigerant Leak Check	→	Charging Refrigerant
10 minutes or more	Leave for 5 minutes						



6. USE CHARGING CYLINDER TO CHARGE PROPER AMOUNT OF REFRIGERANT

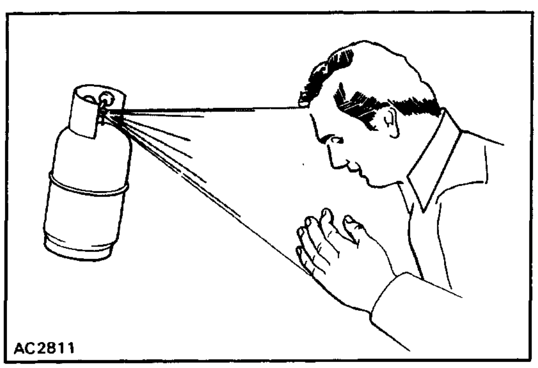
To prevent excessive use of refrigerant due to overcharg– ing, use a charging cylinder to charge the proper amount of refrigerant.



Handling Precautions for Refrigerant

1. DO NOT HANDLE REFRIGERANT IN AN ENCLOSED AREA OR NEAR AN OPEN FLAME

2. ALWAYS WEAR EYE PROTECTION



3. BE CAREFUL THAT LIQUID REFRIGERANT DOES NOT GET IN YOUR EYES OR ON YOUR SKIN

If liquid refrigerant gets in your eyes or on your skin;

(a) Wash the area with lots of cool water.

CAUTION: Do not rub your eyes or skin.

(b) Apply clean petroleum jelly to the skin.

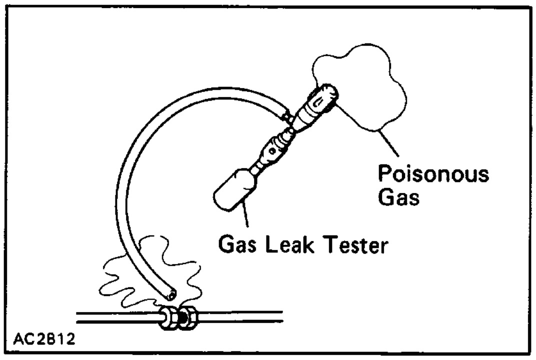
(c) Go immediately to a physician or hospital for profes– sional treatment.

CAUTION: Do not attempt to treat yourself.

Handling Precautions for Refrigerant Container

1. NEVER HEAT CONTAINER OR EXPOSE IT TO NAKED FLAME

2. BE CAREFUL NOT TO DROP CONTAINER AND NOT TO APPLY PHYSICAL SHOCKS TO IT

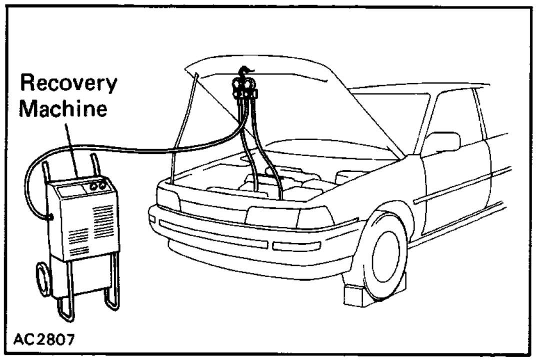


Handling Precautions for Gas–Cylinder Type Gas Leak Tester

1. BEFORE USING TESTER MAKE SURE THAT THERE ARE NO FLAMMABLE SUBSTANCES NEARBY

2. BE CAREFUL NOT TO INHALE POISONOUS GAS

If refrigerant gas comes in contact with flame, a poison–ous gas is produced. During leak tests, do not inhale any gas.

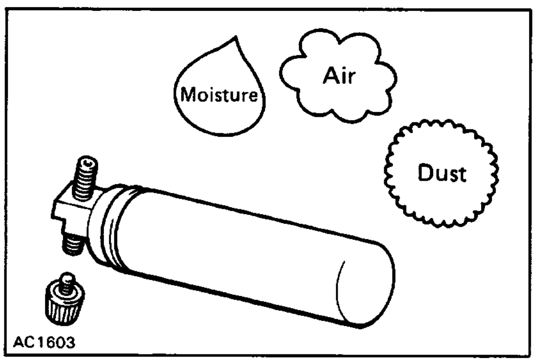


Precautions When Replacing Parts in Refrigerant line

1. RECOVER REFRIGERANT IN SYSTEM BEFORE REMOV–ING PARTS

Using a recovery machine, recover refrigerant in system before removing the parts.

NOTICE: Do not release refrigerant to atmosphere.



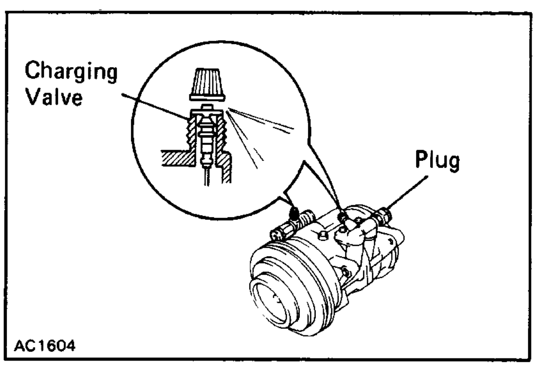
2. INSERT PLUG IMMEDIATELY IN DISCONNECTED PARTS

Insert a plug immediately in the disconnected parts to prevent the entry of moisture and dust.

3. DO NOT REMOVE PLUG FROM NEW PARTS UNTIL IM–MEDIATELY BEFORE INSTALLATION

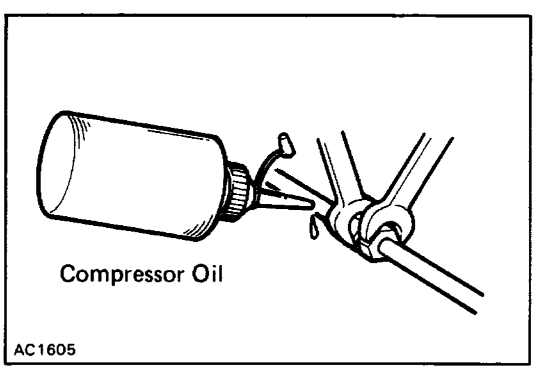
4. DO NOT USE BURNER FOR BENDING OR LENGTHENING OPERATIONS ON TUBE

If the tubes are heated with a burner, a layer of oxidation forms inside the tube, causing the same kind of trouble as an accumulation of dust.



5. DISCHARGE GAS IN NEW COMPRESSOR FROM CHARGING VALVE BEFORE INSTALLING IT

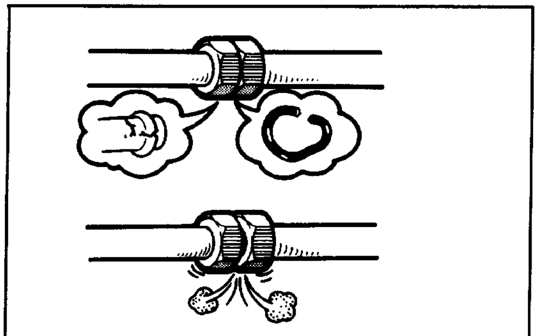
If the gas in new compressor is not discharged first, com–pressor oil will spray out with gas when the plug is re–moved.



6. TIGHTEN CONNECTING PARTS SECURELY

Securely tighten the connecting parts to prevent leaking of refrigerant gas.

- Apply a few drops of compressor oil to 0–ring fittings for easy tightening and to prevent leaking of refriger–ant gas.
- Tighten the nuts using two wrenches to avoid twisting the tube.



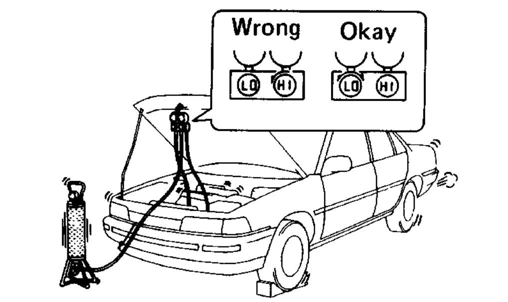
AC1606

- Tighten the O–ring fittings or the bolted type fittings to the specified torque.

Precautions When Charging Refrigerant

1. DO NOT OPERATE COMPRESSOR WITHOUT ENOUGH REFRIGERANT IN REFRIGERANT CYCLE

If there is not enough refrigerant in the refrigerant cycle, oil lubrication will be insufficient and compressor burnout may occur, so take care to avoid this.



AC2813

2. DO NOT OPEN HIGH PRESSURE VALVE OF MANIFOLD GAUGE WITH COMPRESSOR OPERATING

If the high pressure valve is opened, refrigerant flows in the reverse direction and could cause the charging cylin–der to rupture, so open and close the low pressure valve only.

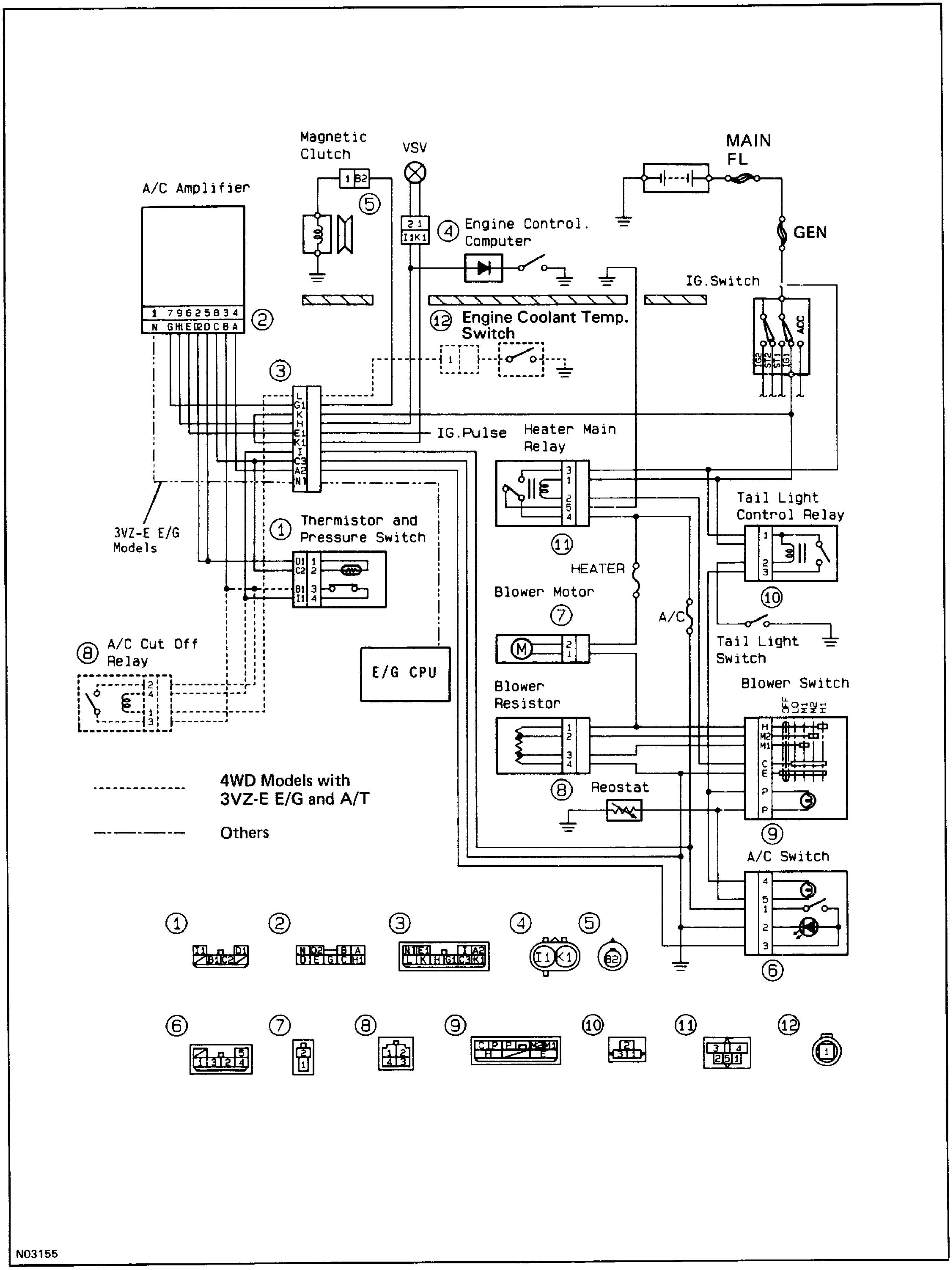
3. BE CAREFUL NOT TO OVERCHARGE WITH REFRIGER–ANT IN SYSTEM

If refrigerant is overcharged, it causes trouble such as in–sufficient cooling, poor fuel economy, engine overheating etc.

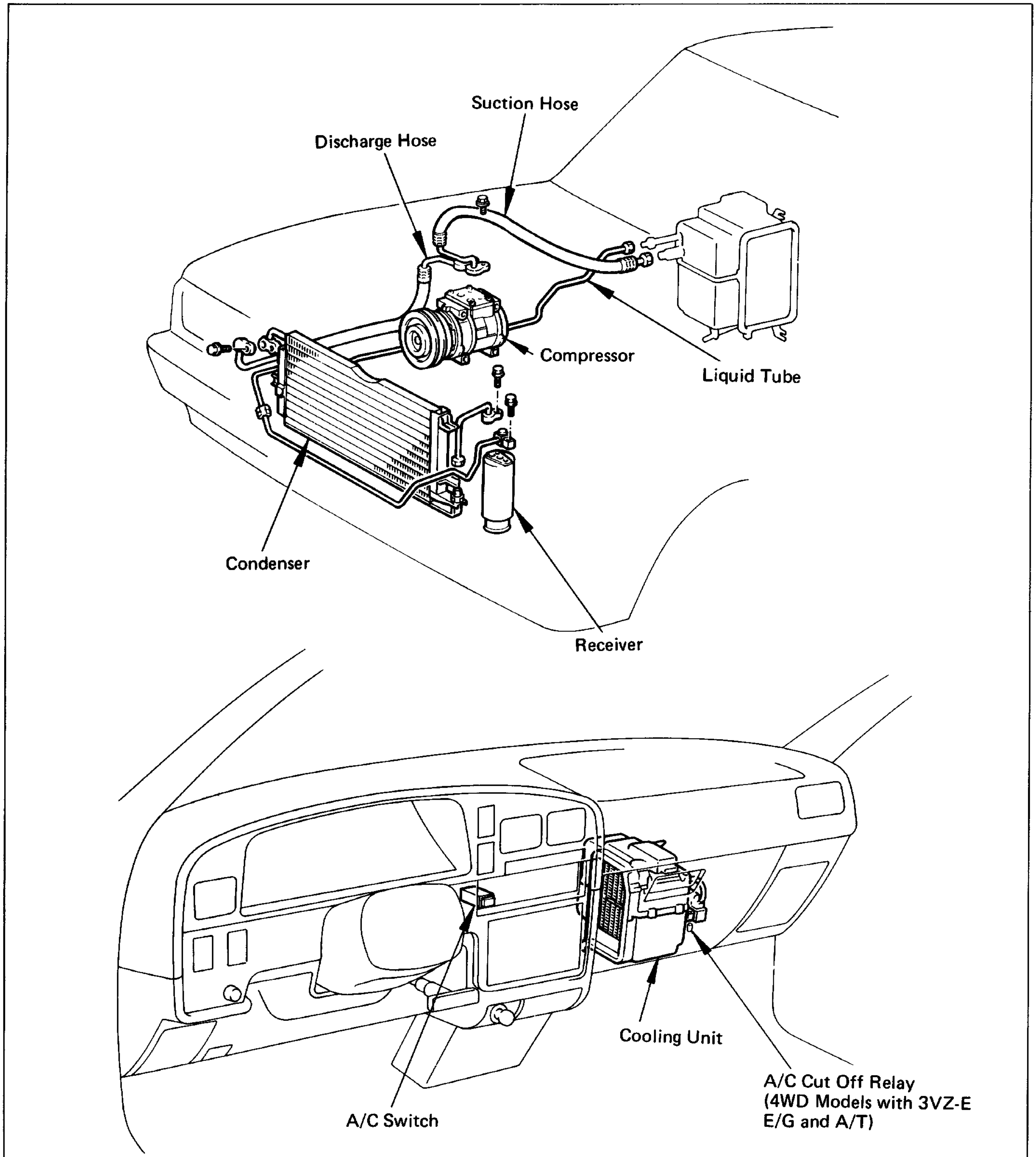
ELECTRICAL PARTS

Before removing and inspecting the electrical parts, set the ignition switch to the LOCK position and disconnect the negative (–) terminal cable from the battery..

AIR CONDITIONING SYSTEM CIRCUIT



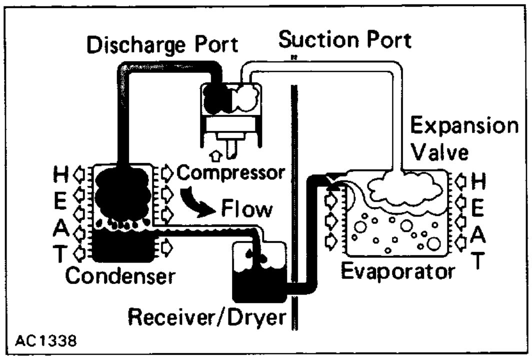
SYSTEM COMPONENTS



Specified Torque N·m (kgf·cm, ft·lbf)

0.31 in. Tube		**14 (140, 10)**
0.50 in. Tube		**23 (230, 17)**
0.62 in. Tube		**32 (330, 24)**
Bolted Type	For Compressor	**25 (250, 18)**
	For Condenser	**13 (130, 9)**
	For Receiver	**5 (55, 48 in.·lbf)**

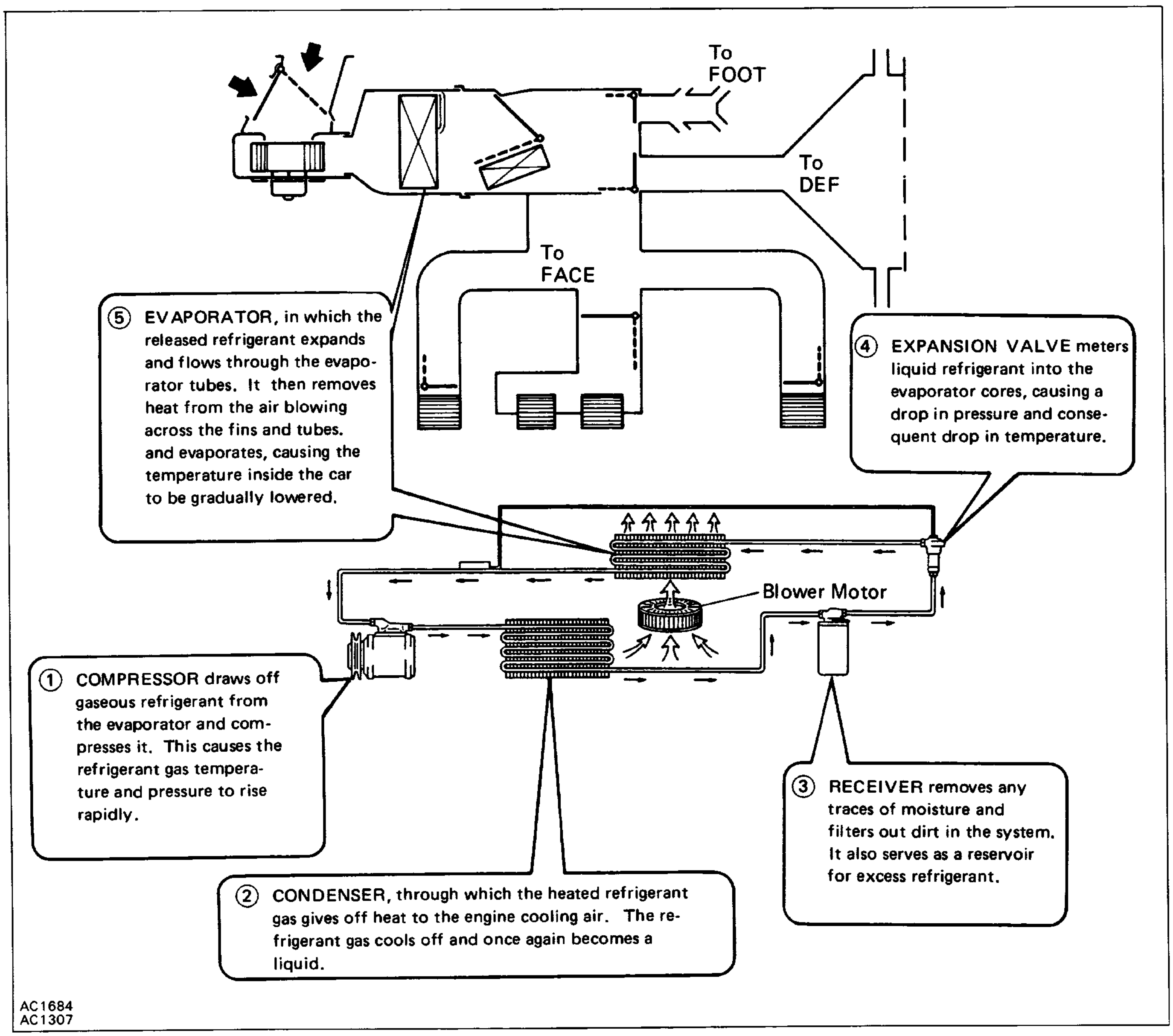
AC1852
AC2240



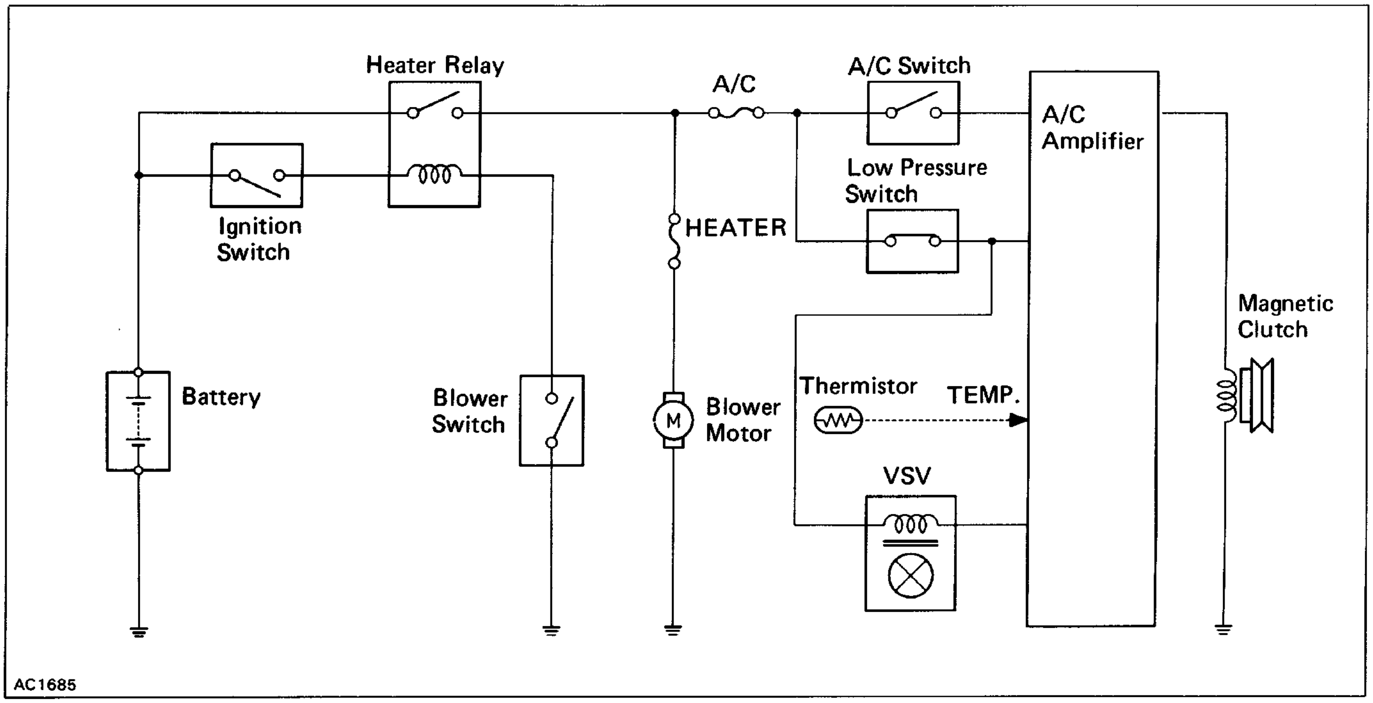
GENERAL DESCRIPTION

REFRIGERATION CYCLE

1. The compressor discharges high temperature and high pressure refrigerant containing the heat absorbed from the evaporator plus the heat created by the compressor in a discharge stroke.
2. This gaseous refrigerant flows into the condenser. In the condenser, the gaseous refrigerant condenses into liquid refrigerant.
3. This liquid refrigerant flows into the receiver which stores and filters the liquid refrigerant till the evaporator requires the refrigerant.
4. The liquid refrigerant is changed by the expansion valve into a low temperature, low pressure liquid and gaseous mixture.
5. This cold and foggy refrigerant flows to the evaporator. Vaporizing the liquid in the evaporator, the heat from the warm air stream passing through the evaporator core is transferred to the refrigerant. All the liquid is changed into the gaseous refrigerant in the evaporator and only heat–laden gaseous refrigerant is drawn into the compressor. Then the process is repeated again.



1. PRINCIPLE OF A/C ELECTRICAL CIRCUIT



2. HOW IS MAGNETIC CLUTCH ENERGIZED?

The general process until the magnetic clutch is energized as shown below.

① Ignition Switch "ON"

② Blower Switch "ON" → Heater Relay "ON" (Blower Motor "RUN")

③ A/C Switch "ON" → A/C Amplifier "ON" (A/C Amp. Main Power Supply)

④ Low Pressure Switch "ON":
Refrigerant Condition is more than 206 kPa (2.1 kgf/cm^2, 30 psi)

⑤ Thermistor supplies temperature signal of evaporator to A/C amplifier.

⑥ VSV "ON" → E/G Idle-up

⑦ Magnetic Clutch "ON"

SPECIAL TOOLS AND EQUIPMENT

Tool	SST No.	Use
Ohmmeter		To diagnosis electrical system
Voltage meter		To diagnosis electrical system
Air conditioning service tool set	07110–58011	To evacuate and charge system
Magnetic clutch remover	07112–66040	To remove pressure plate
Magnetic clutch stopper	07112–76060	To remove and install pressure plate
Snap ring pliers	07114–84020	To remove pressure plate

SSM (SPECIAL SERVICE MATERIALS)

Part Name	Part No.	Use etc.
ND OIL6, SUNISO No.5GS or equivalent	07117–68040	Compressor

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
No cooling or warm air	Magnetic clutch does not engage		
	(a) A/C fuse blown	Replace fuse and check for short	AC–6
	(b) Magnetic clutch faulty	Check magnetic clutch	AC–17
	(c) A/C switch faulty	Check switch	AC–29
	(d) A/C amplifier faulty	Check amplifier	AC–31
	(e) Wiring or ground faulty	Repair as necessary	AC–6
	(f) Refrigerant empty	Check refrigerant volume	AC–16
	(g) Heater relay faulty	Check heater relay	AC–37
	(h) Pressure switch faulty	Check pressure switch	AC–29
	Compressor does not rotate properly		
	(a) Drive belt loose or broken	Adjust or replace drive belt	AC–15
	(b) Compressor faulty	Check compressor	AC–17
	Expansion valve faulty	Check expansion valve	AC–25
	Leak in system	Test system for leaks	
	Fusible plug on receiver blown or clogged screen	Check receiver	AC–23
	Blower does not operate		
	(a) HEATER fuse blown	Replace fuse and check for short	AC–6
	(b) A/C switch faulty	Check switch	AC–29
	(c) Heater relay faulty	Check heater relay	AC–37
	(d) Blower motor faulty	Check blower motor	AC–37
	(e) Wiring or ground faulty	Repair as necessary	AC–6
Cool air comes out intermittently	Magnetic clutch slipping	Check magnetic clutch	AC–17
	Expansion valve faulty	Check expansion valve	AC–25
	Wiring connection faulty	Repair as necessary	AC–6
	Excessive moisture in system	Evacuate and charge system	
	A/C amplifier faulty	Check amplifier	AC–31

TROUBLESHOOTING (Cont’d)

Problem	Possible cause	Remedy	Page
Cool air comes out only at high speed	Condenser clogged	Check condenser	AC–24
	Drive belt slipping	Check or replace drive belt	AC–15
	Compressor faulty	Check compressor	AC–17
	Insufficient or too much refrigerant	Check refrigerant volume	AC–16
	Air in system	Evacuate and charge system	
Insufficient cooling	Condenser clogged	Check condenser	AC–24
	Drive belt slipping	Check or replace drive belt	AC–15
	Magnetic clutch faulty	Check magnetic clutch	AC–17
	Compressor faulty	Check compressor	AC–17
	Expansion valve faulty	Check expansion valve	AC–25
	Insufficient *or too much refrigerant	Check refrigerant volume	AC–16
	Air or excessive compressor oil in system	Evacuate and charge system	
	Receiver clogged	Check receiver	AC–23
	Water valve cable faulty	Reset water valve cable	AC–36
	A/C amplifier faulty	Check amplifier	AC–31
Insufficient velocity of cool air	Evaporator clogged or frosted	Clean evaporator fins or filters	AC–27
	Air leakage from cooling unit or air duct	Repair as necessary	
	Air inlet blocked	Repair as necessary	
	Blower motor faulty	Check blower motor	AC–37
	A/C amplifier faulty	Check amplifier	AC–31

Inspection of Refrigeration System with Manifold Gauge Set

This is a method in which the trouble is located by using a manifold gauge set. (See ”Installation of Mani– fold Gauge Set” on page AC–16.) Read the manifold gauge pressure when the following conditions are established:

(b) Engine running at 2,000 rpm

(a) Temperature at the air inlet with the switch set at RECIRC is 30 – 35•C (86 – 95•F)

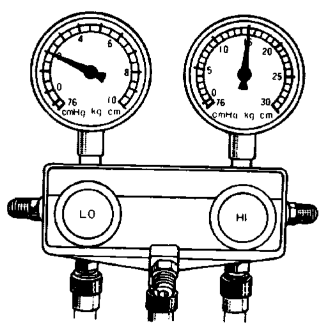
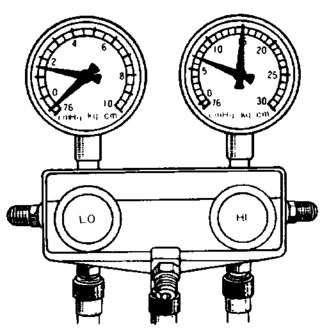
(c) Blower fan speed control switch set at high speed

(d) Temperature control switch set at max. cool side

HINT: It should be noted that the gauge indications may vary slightly due to ambient temperature condi– tions.

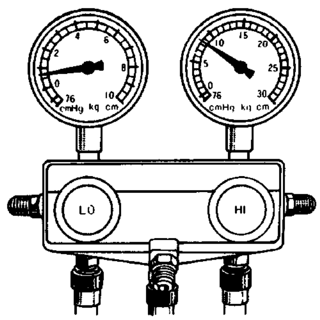
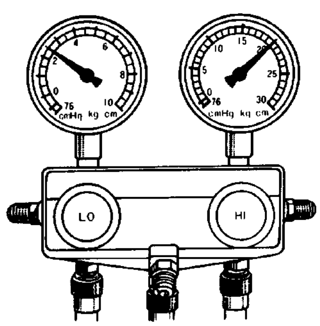
NOTICE:

- **Always recover refrigerant before removing the parts in the refrigerant line and evacuating air.**
- **Evacuate air and charge proper amount of purified refrigerant after installing the parts in the refriger- ant line.**

No.	Gauge reading kPa (kgf/cm^2, psi)	Condition	Probable cause	Remedy
1	LO: 147 – 196 (1.5 – 2.0, 21 – 28) HI: 1,422 – 1,471 (14.5 – 15.0, 206 – 213)  AC0067	Normal cooling	Normally functioning system	
2	During operation, pressure at low pressure side sometimes becomes a vacuum and sometimes normal  AC0068	Periodically cools and then fails to cool	Moisture present in refrigeration system	(1) Replace receiver (2) Remove moisture in system through repeatedly evacu– ating air

NOTICE:

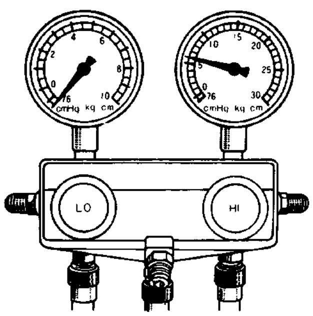
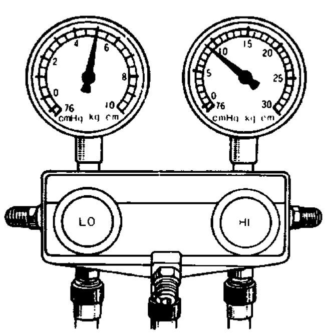
- **Always recover refrigerant before removing the parts in the refrigerant line and evacuating air.**
- **Evacuate air and charge proper amount of purified refrigerant after installing the parts in the refrigerant line.**

No.	Gauge reading kPa (kgf/cm^2, psi)	Condition	Probable cause	Remedy
3	**Pressure low at both low and high pressure sides**  AC0069	• Insufficient cooling • Bubbles seen in sight glass	Insufficient refrigerant	(1) Check for gas leakage with gas leak tester and repair if necessary (2) Add refrigerant until bubbles dis–appear
		• Insufficient cooling • Frost on tubes from receiver to unit	Refrigerant flow ob–structed by dirt in re ceiver	Replace receiver
4	**Pressure too high at both low and high pressure sides**  AC0070	Insufficient cooling	Insufficient cooling of condenser	(1) Clean condenser (2) Check fan motor operation
5			Refrigerant over–charged	(1) Check amount of refrigerant If refrigerant is over–charged (2) Recover refriger–ant (3) Evacuate air and charge proper amount of purified refrigerant
6			Air present in system	(1) Replace receiver (2) Check compressor oil to see if dirty (3) Remove air in sys–tem through re–peatedly evacuat–ing air
7		• Insufficient cooling • Frost or Large amount of dew on piping at low pres–sure side	Expansion valve im–properly mounted,heat sensing tube defective (Opens too wide)	(1) Check heat sens–ing tube installa–tion condition If (1) is normal (2) Check expansion valve and replace if defective

Hint at 6:
These gauge indications are for when the refrigeration system has been opened and the refrigerant charged without evacuating air.

NOTICE:

- **Always recover refrigerant before removing the parts in the refrigerant line and evacuating air.**
- **Evacuate air and charge proper amount of purified refrigerant after installing the parts in the refrigerant line.**

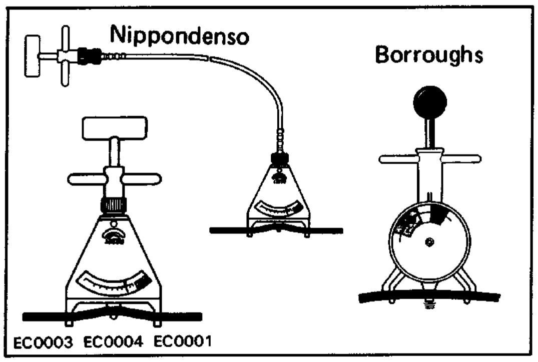
No.	Gauge reading kPa (kgf/cm^2, psi)	Condition	Probable cause	Remedy
8	Vacuum indicated at low pressure side, very low pressure indicated at high pressure  AC0156	• Does not cool (Cools from time to time in some cases) • Frost or dew seen on piping before and after receiver or expansion valve	Refrigerant does not circulate	(1) Check heat sensing tube for gas leakage and replace expansion valve if defective If (1) is normal (2) Clean out dirt in expansion valve by blowing with air If not able to remove dirt, replace expansion valve (3) Replace receiver
9	Pressure too high at low pressure side, pressure too low at high pressure side  AC0157	Does not cool	Insufficient compression	Repair or replace compressor

ON–VEHICLE INSPECTION

7. CHECK CONDENSER FINS FOR BLOCKAGE OR DAMAGE

If the fins are clogged, clean them with pressurized wa–ter.

NOTICE: Be careful not to damage the fins.



2. CHECK DRIVE BELT TENSION

Using a belt tension gauge, check the drive belt tension.

Belt tension gauge:

Nippondenso BTG–20 (95506–00020) or

Borroughs No. BT–33–73F

Drive belt tension:

	New belt (lbs)	Used belt (lbs)
3VZ	125 ± 25	80 ± 20
22R–E	125 ± 25	80 ± 20

HINT:

- ”New belt” refers to a belt which has been used less than 5 minutes on a running engine.
- ”Used belt” refers to a belt which has been used on a running engine for 5 minutes or more.

3. START ENGINE

4. TURN ON A/C SWITCH

Check that the A/C operates at each position of the blower switch.

If blower does not operate, check heater fuse.

5. CHECK MAGNETIC CLUTCH OPERATION

6. CHECK THAT IDLE INCREASES

When the magnetic clutch engages, engine revolution should increase.

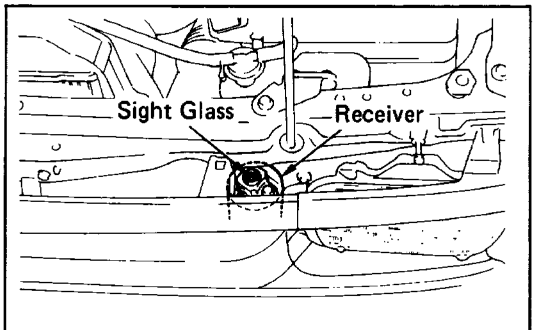
Standard idle–up rpm: 900 – 1,000 rpm

7. CHECK AMOUNT OF REFRIGERANT

If you can see bubbles in the sight glass, additional refrig–erant is needed. (See page AC–16)

8. IF NO COOLING OR IT IS INSUFFICIENT, INSPECT FOR LEAKAGE

Using a gas leak tester, inspect each component of the refrigeration system.



AC1689

REFRIGERATION SYSTEM
Checking of Refrigerant Volume

1. RUN ENGINE AT APPROX. 1,500 RPM

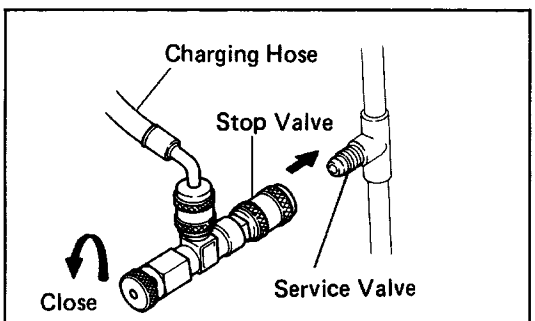
2. OPERATE AIR CONDITIONING AT MAXIMUM COOLING FOR A FEW MINUTES

3. CHECK AMOUNT OF REFRIGERANT

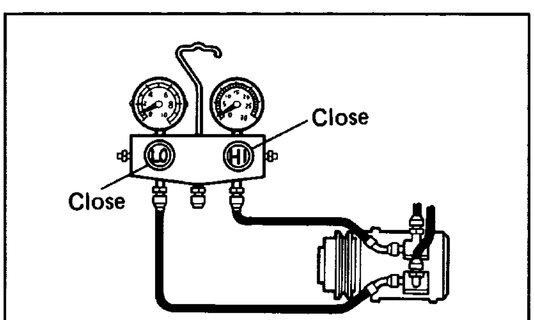
Observe the sight glass on the receiver.

Item	Symptom	Amount of refrigerant	Remedy
1	Bubbles present in sight glass	Insufficient *	(1) Check for gas leakage with gas leak tester and repair if necessary (2) Add refrigerant until bubbles disappear
2	No bubbles present in sight glass	None, sufficient or too much	Refer to items 3 and 4
3	No temperature difference be–tween compressor inlet and out–let	Empty or nearly empty	(1) Check for gas leakage with gas leak tester and repair if necessary (2) Add refrigerant until bubbles disappear
4	Temperature between compres–sor inlet and outlet is noticeably different	Proper or too much	Refer to items 5 and 6
5	Immediately after air condition–ing is turned off, refrigerant in sight glass stays clear	Too much	(1) Recover refrigerant (2) Evacuate air and charge proper amount of purified refrigerant
6	When air conditioning is turned off, refrigerant foams and then stay clear	Proper	–

*: Bubbles in the sight glass with ambient temperatures higher can be considered normal if cooling is sufficient



AC2851



AC0165

Installation of Manifold Gauge Set

HINT: To prevent releasing refrigerant, use charging hoses with a stop valve when installing the manifold gauge set to service valves on the refrigerant line.
Part No. of charging hoses with a stop valve

1. CONNECT CHARGING HOSES WITH A STOP VALVE TO MANIFOLD GAUGE SET

Tighten the nuts by hand.

CAUTION:

- **Do not connect the wrong hoses to the high pressure and the low pressure sides.**
- **To prevent loosening the nuts, do not apply compres–sor oil to seat of the connection.**

2. CLOSE HAND VALVES OF BOTH STOP VALVES

3. CLOSE BOTH HAND VALVES OF GAUGE SET

4. REMOVE CAPS FROM SERVICE VALVES ON REFRIGER–ANT LINE

5. CONNECT STOP VALVES TO SERVICE VALVES

Tighten the nuts by hand.

CAUTION:

- **Do not connect the wrong valves to the high pressure and the low pressure sides.**
- **To prevent loosening the nuts, do not apply compres– sor oil to seat of the connection.**

6. OPEN HAND VALVES OF BOTH STOP VALVES

REMOVAL OF MANIFOLD GAUGE SET

1. CLOSE BOTH HAND VALVES OF MANIFOLD GAUGE SET

2. CLOSE HAND VALVES OF BOTH STOP VALVES

3. DISCONNECT STOP VALVES FROM SERVICE VALVES ON REFRIGERANT LINE

4. INSTALL CAPS TO SERVICE VALVES

COMPRESSOR

ON–VEHICLE INSPECTION

1. INSTALL MANIFOLD GAUGE SET

(See page AC–16)

2. RUN ENGINE AT APPROX. 1,500 RPM

3. CHECK COMPRESSOR FOR FOLLOWING:

(a) High pressure gauge reading is not low and low pressure gauge reading is not higher than normal.

(b) Metallic sound

(e) Leakage from shaft seal

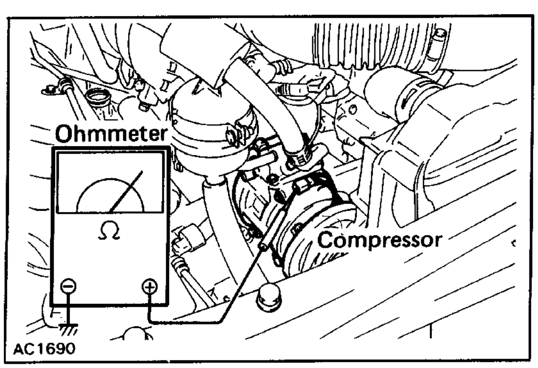
If defects are found, repair the compressor.

4. CHECK MAGNETIC CLUTCH

(a) Inspect the pressure plate and the rotor for signs of oil.

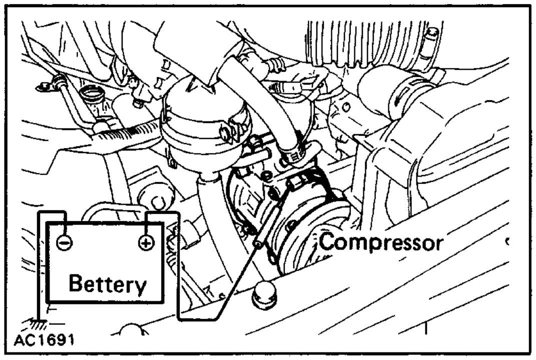
(b) Check the clutch bearings for noise and grease leakage.

(c) Using an ohmmeter, measure the resistance of the stator coil between the clutch lead wire and ground.



Standard resistance: 3.6 ± 0.2 Ω at 200C (680F)

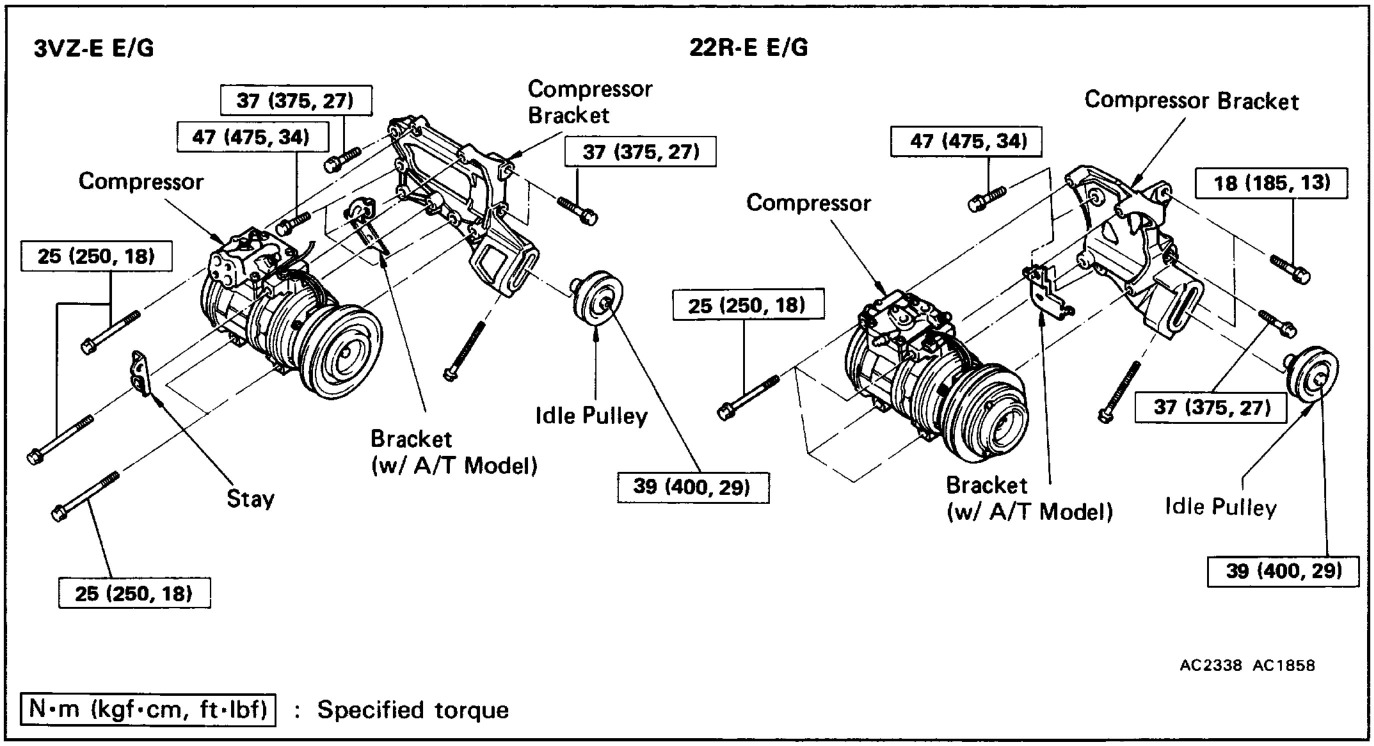
If resistance value is not as specified, replace the coil.



(d) Connect the positive (+) lead from the battery to terminal and the negative (–) lead to ground, check that the magnetic clutch is energized.

If magnetic clutch is not energized, replace the coil.

NOTICE: Do not short the positive (+) lead wire on the vehicle by applying battery positive voltage.



REMOVAL OF COMPRESSOR

1. RUN ENGINE AT IDLE SPEED FOR 10 MINUTES WITH AIR CONDITIONING ON

2. STOP ENGINE

3. DISCONNECT NEGATIVE CABLE FROM BATTERY

4. REMOVE POWER STEERING PUMP (3VZ EG ONLY)

5. DISCONNECT CLUTCH LEAD WIRE FROM WIRING HARNESS

6. RECOVER REFRIGERANT FROM REFRIGERATION SYS–TEM

7. DISCONNECT TWO HOSES FROM COMPRESSOR SERVICE VALVES

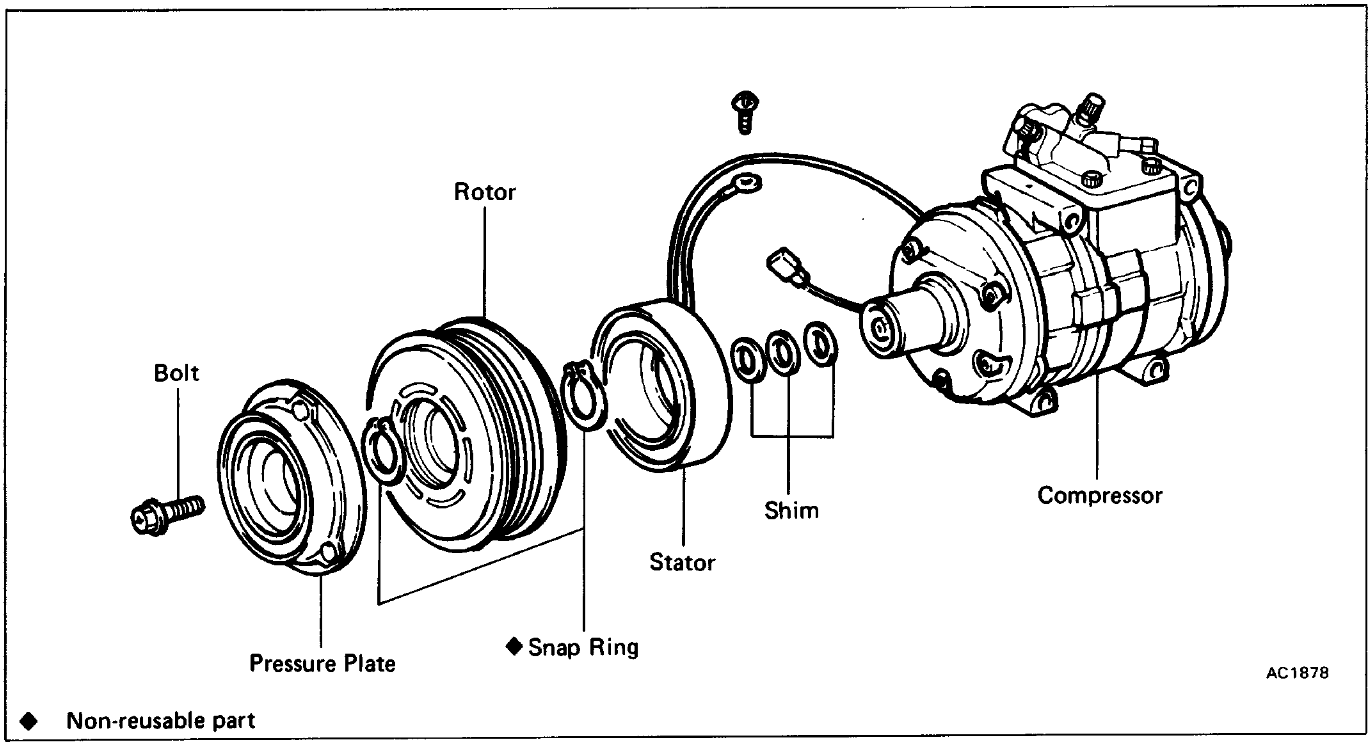
Cap the open fitting immediately to keep moisture out of the system.

8. REMOVE COMPRESSOR

(a) Remove the fan shroud.

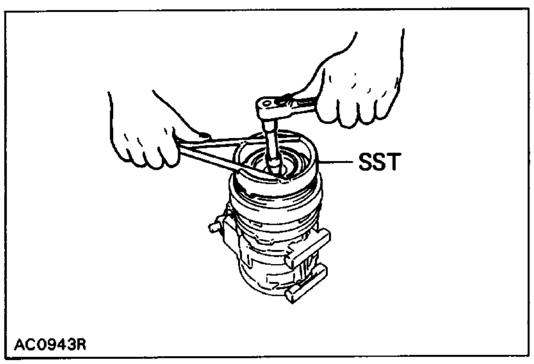
(b) Loosen the drive belt.

(c) Remove the compressor mounting bolts and the compressor.

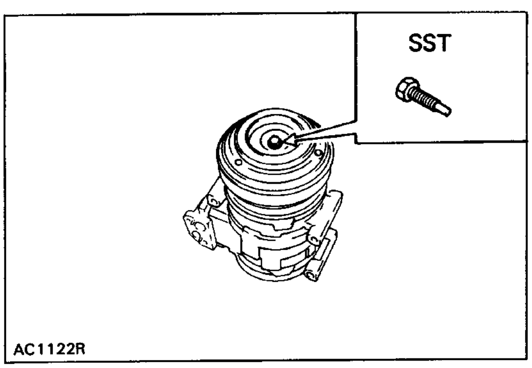


DISASSEMBLY OF MAGNETIC CLUTCH

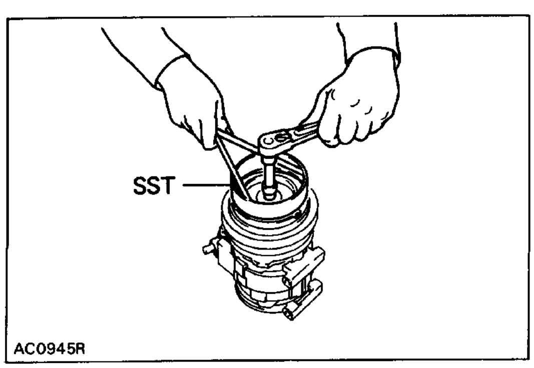
1. REMOVE PRESSURE PLATE



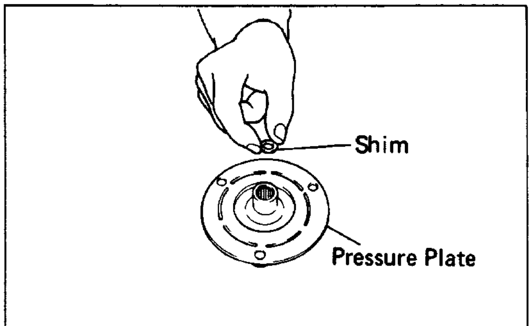
(a) Using SST and a socket, remove the shaft bolt.
SST 07112–76060



(b) Install SST to the pressure plate.
SST 07112–66040

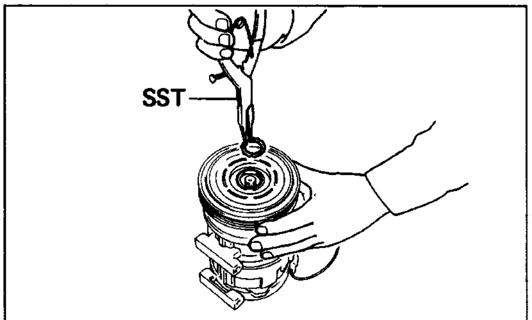


(c) Using SST and a socket, remove the pressure plate. SST 07112–76060



AC0946

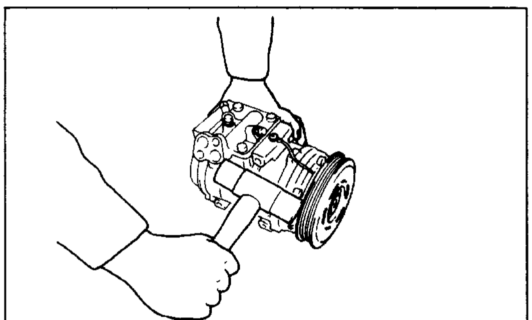
(d) Remove the shims from the pressure plate.



AC0947

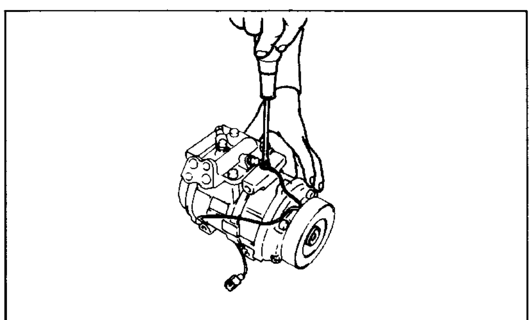
2. REMOVE ROTOR

(a) Using SST, remove the snap ring.
SST 07114–84020


AC1874

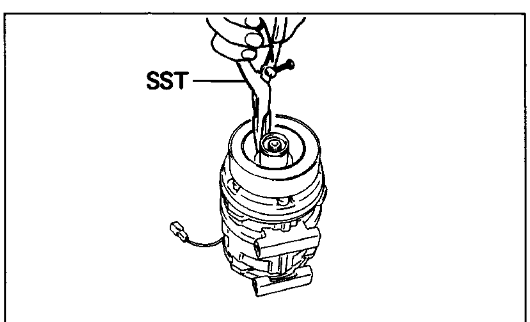
(b) Using a plastic hammer, tap the rotor off the shaft.

NOTICE: Be careful not to damage the pulley when tapping on the rotor.


AC1875

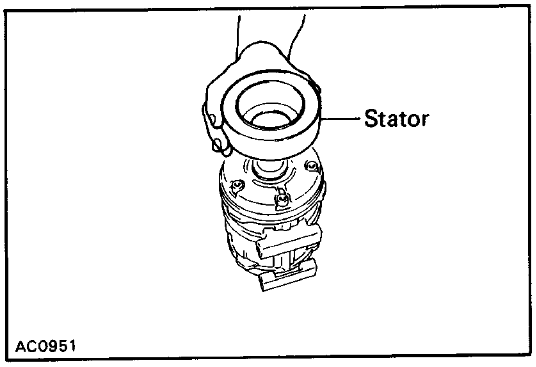
3. REMOVE STATOR

(a) Disconnect the stator lead wire from the compressor housing.



AC0950

(b) Using SST, remove the snap ring.
SST 07114–84020

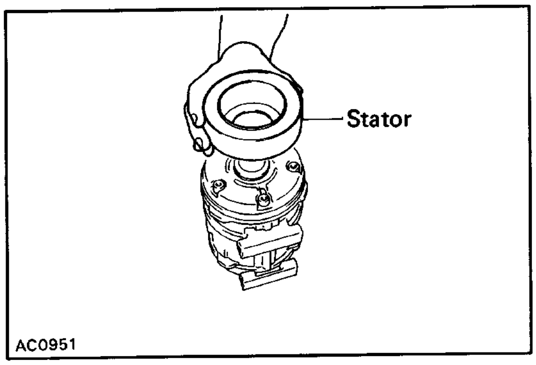


(c) Remove the stator.

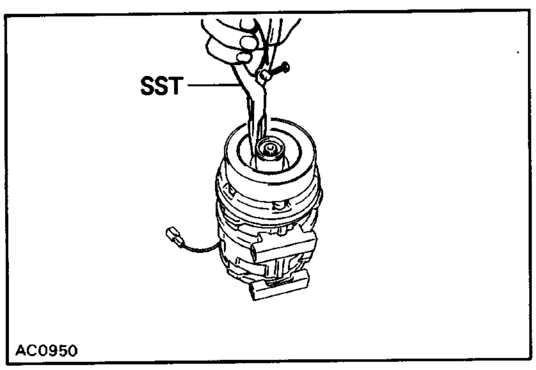
ASSEMBLY OF MAGNETIC CLUTCH

1. INSTALL STATOR

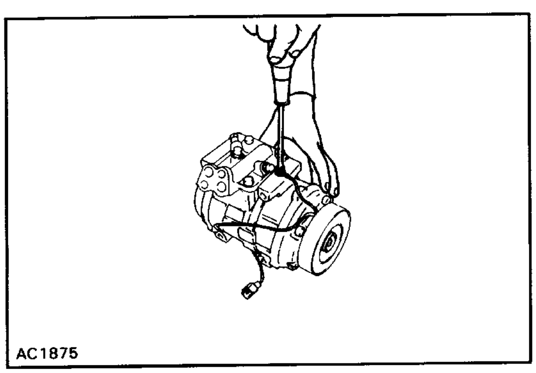
(a) Install the stator on the compressor.



(b) Using SST, install the new snap ring.
SST 07114–84020



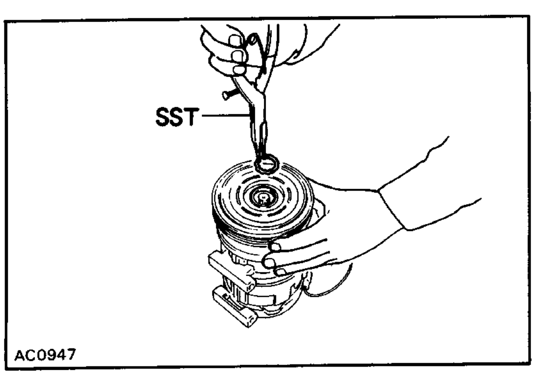
(c) Connect the stator lead wires to the compressor housing.

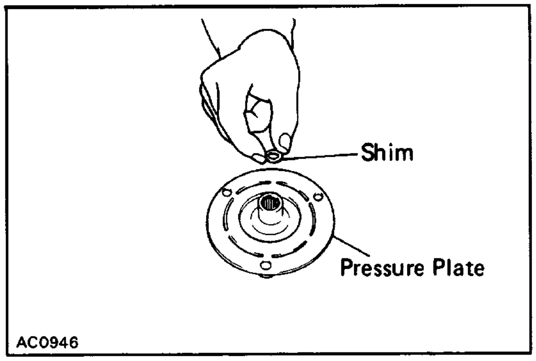


2. INSTALL ROTOR

(a) Install the rotor on the compressor shaft.

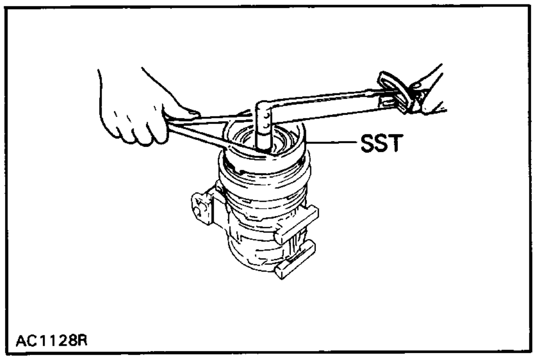
(b) Using SST, install the snap ring.
SST 07114–84020





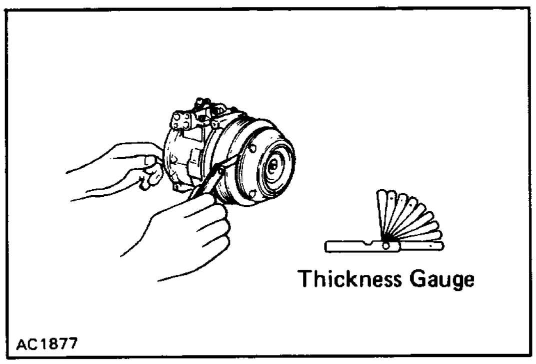
3. INSTALL PRESSURE PLATE

(a) Put the shims to the pressure plate.



(b) Using SST and torque wrench, install the shaft bolt. SST 07112–76060

Torque: 14 N–m (140 kgf·crm, 10 ft–lbf)



4. CHECK CLEARANCE OF MAGNETIC CLUTCH

Check the clearance between the pressure plate and rotor using thickness gauge.

Standard clearance:

0.5 ± 0.15 mm (0.020 i 0.0059 in.)

If the clearance is not within tolerance, change the number of shims to obtain the standard clearance.

INSTALLATION OF COMPRESSOR
(See page AC–17)

1. INSTALL COMPRESSOR WITH THREE MOUNTING
BOLTS

Torque: 27 N·m (280 kgf·cm, 20 ft·lbf)

2. INSTALL DRIVE BELT
(See step 2 and 3 and on page AC–14)

3. CONNECT TWO HOSES TO COMPRESSOR SERVICE
VALVES

Torque: Discharge line 25 N·m (250 kgf·cm, 18 ft·lbf)
Suction line 25 N·m (250 kgf·cm, 18 ft·lbf)

4. CONNECT CLUTCH LEAD WIRE TO WIRING HARNESS

5. CONNECT NEGATIVE CABLE TO BATTERY

6. EVACUATE AIR FROM AIR CONDITIONING SYSTEM

7. CHARGE AIR CONDITIONING SYSTEM WITH REFRIGERANT AND CHECK FOR GAS LEAKAGE

Specified amount: 700 – 800 g (1.5 – 1.8 lb)

RECEIVER

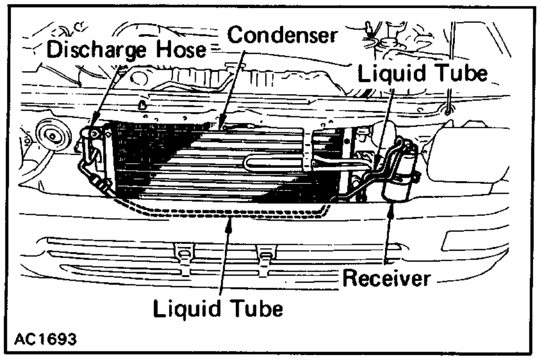
(See page AC–7)

ON–VEHICLE INSPECTION

CHECK SIGHT GLASS, FUSIBLE PLUG AND FITTINGS FOR LEAKAGE

Use a gas leak tester. Repair as necessary.

REMOVAL OF RECEIVER



1. RECOVER REFRIGERANT FROM REFRIGERATION SYS–TEM

2. DISCONNECT TWO LIQUID TUBES FROM RECEIVER

HINT: Cap the open fittings immediately to keep mois–ture out of the system.

3. REMOVE RECEIVER FROM RECEIVER HOLDER

INSTALLATION OF RECEIVER

1. INSTALL RECEIVER IN RECEIVER HOLDER

HINT: Do not remove the caps until ready for connec–tion.

2. CONNECT TWO LIQUID TUBES TO RECEIVER

Torque: 5.4 N·m (55 kgf·cm, 43 in.·lbf)

3. IF RECEIVER WAS REPLACED, ADD COMPRESSOR OIL TO COMPRESSOR

Add 20 cc (0.7 fl. oz.)

Compressor oil: ND OIL6,
SUNISO No.5GS or equivalent

4. EVACUATE AIR FROM AIR CONDITIONING SYSTEM

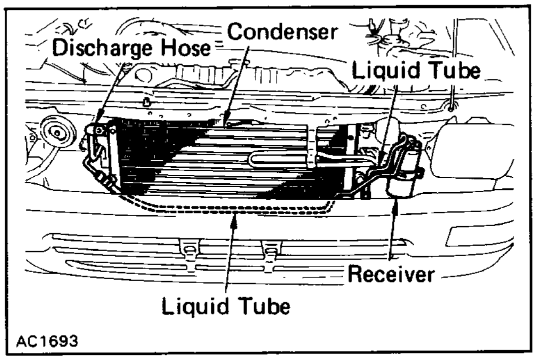
5. CHARGE AIR CONDITIONING SYSTEM WITH REFRIGERANT AND CHECK FOR GAS LEAKAGE

Specified amount: 700 – 800 g (1.5 – 1.8 lb)

CONDENSER

ON–VEHICLE INSPECTION

1. **CHECK CONDENSER FINS FOR BLOCKAGE OR DAMAGE**
   If the fins are clogged, wash them with water and dry with compressed air.
   NOTICE: Be careful not to damage the fins.
   If the fins are bent, straighten them with a screwdriver or pliers.



2. **CHECK CONDENSER FITTINGS FOR LEAKAGE**
   Repair as necessary.

REMOVAL OF CONDENSER

(SEE PAGE AC–7)

1. **RECOVER REFRIGERANT FROM REFRIGERATION SYS– TEM**
2. **REMOVE FRONT GRILLE AND HOOD LOCK BRACE**
3. **DISCONNECT DISCHARGE HOSE FROM CONDENSER INLET FITTING**
4. **DISCONNECT LIQUID TUBE FROM RECEIVER OUTLET FITTING**
   HINT: Cap the open fittings immediately to keep mois– ture out of the system.
5. **REMOVE CONDENSER**
   Remove the four bolts.

INSTALLATION OF CONDENSER

(SEE PAGE AC–7)

1. **INSTALL CONDENSER**
   Install the four bolts making sure the rubber cushions fit on the mounting flanges correctly.
2. **CONNECT LIQUID TUBE TO RECEIVER AND DISCHARGE HOSE TO CONDENSER**
   Torque:
   Liquid tube 5.4 N·m (55 kgf·cm, 48 in.·lbf)
   Discharge hose 18.5 N·m (185 kgf·cm, 14 ft·lbf)
3. **INSTALL FRONT GRILLE AND HOOD LOCK BRACE**
4. **IF CONDENSER IS REPLACED, ADD COMPRESSOR OIL TO COMPRESSOR**
   Add 40 – 50 cc (1.4 – 1.7 fl.oz.)
   Compressor oil: ND OIL6,
   SUNISO No.5GS or equivalent
5. **EVACUATE AIR FROM AIR CONDITIONING SYSTEM**
6. **CHARGE AIR CONDITIONING SYSTEM WITH REFRIGERANT AND CHECK FOR GAS LEAKAGE**
   Specified amount: 700 – 800 g (1.5 – 1.8 lb)

COOLING UNIT

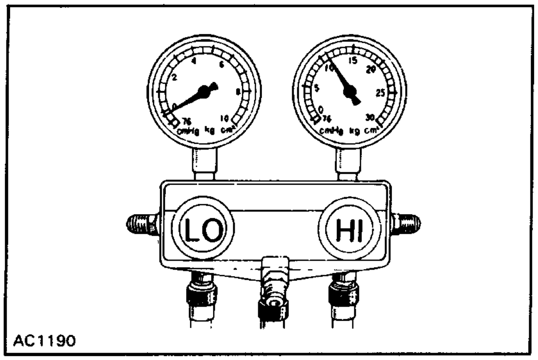
(SEE PAGE AC–7)

ON–VEHICLE INSPECTION OF EXPANSION VALVE

1. CHECK QUANTITY OF REFRIGERANT GAS DURING REFRIGERATION CYCLE

2. INSTALL MANIFOLD GAUGE SET

(See page AC–16)



AC1190

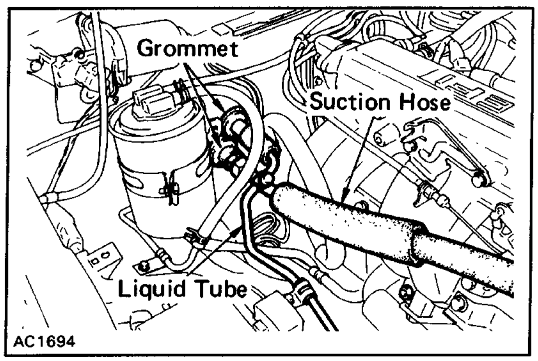
3. RUN ENGINE

Run the engine at 2,000 rpm for at least 5 minutes.

4. CHECK EXPANSION VALVE

If the expansion valve is clogged, the low pressure read–ing will drop to 0 kPa (0 kgf/cm2, 0 psi) otherwise it is OK.

REMOVAL OF COOLING UNIT



AC1694

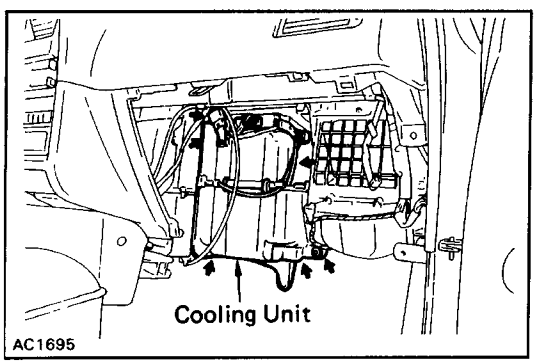
1. DISCONNECT NEGATIVE CABLE FROM BATTERY

2. RECOVER REFRIGERANT FROM REFRIGERATION SYS–TEM

3. DISCONNECT SUCTION TUBE FROM COOLING UNIT OUTLET FITTING

4. DISCONNECT LIQUID TUBE FROM COOLING UNIT INLET FITTING

HINT: Cap the open fittings immediately to keep mois–ture out of the system.



AC1695

5. REMOVE GROMMETS FROM INLET AND OUTLET FITTINGS

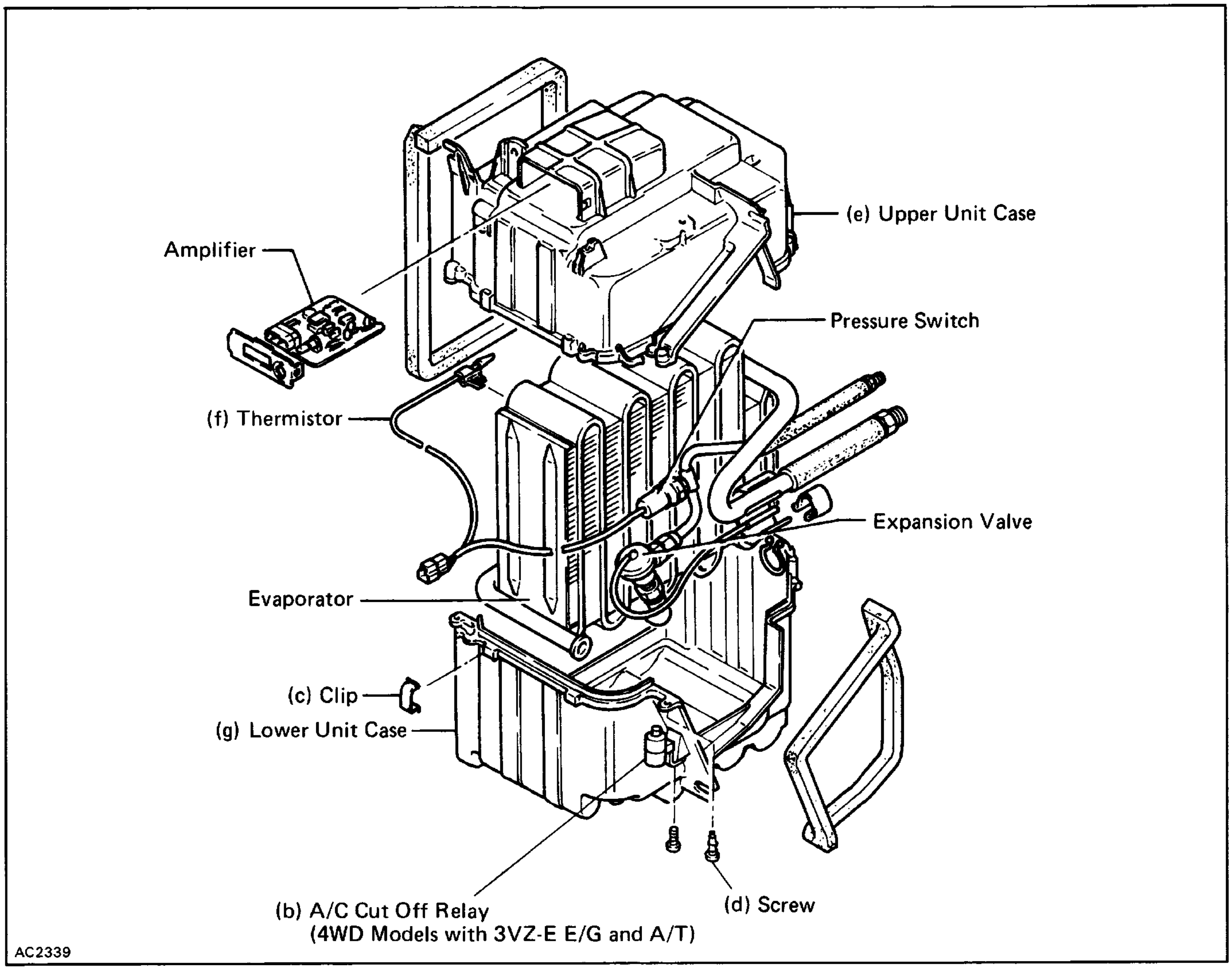
6. REMOVE GLOVE BOX

7. DISCONNECT CONNECTOR

8. REMOVE COOLING UNIT

Remove the five screws and a nut.

DISASSEMBLY OF COOLING UNIT



1. REMOVE LOWER AND UPPER UNIT CASES

(a) Disconnect connector.

(b) Remove A/C cut off relay (4WD with 3VZ–E E/G and A/T

(c) Remove four clips.

(d) Remove four screws.

(e) Remove upper unit case.

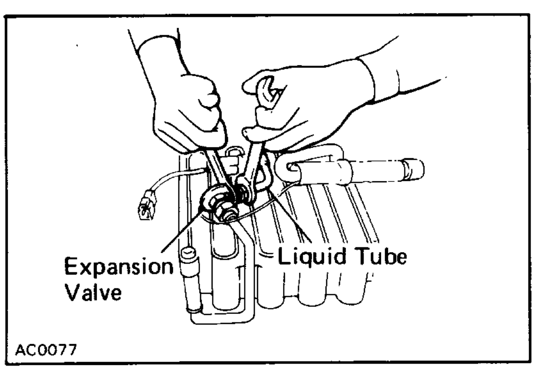
(f) Remove thermistor with thermistor holder.

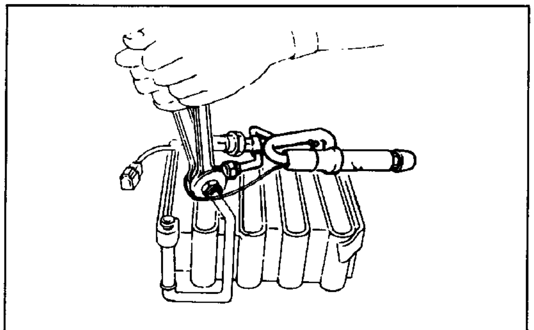
(g) Remove lower unit case.

2. REMOVE EXPANSION VALVE

(a) Disconnect the liquid tube from the inlet fitting of the expansion valve.

(b) Remove the packing and heat sensing tube from suction tube of evaporator.




AC0078

(c) Remove expansion valve.

Evaporator

INSPECTION OF EVAPORATOR

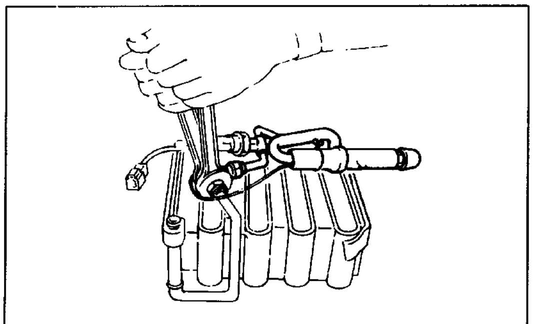
1. CHECK EVAPORATOR FINS FOR BLOCKAGE

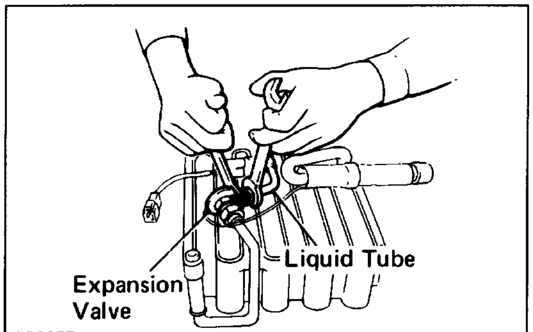
If the fins are clogged, clean them with compressed air.

NOTICE: Never use water to clean the evaporator.

2. CHECK FITTINGS FOR CRACKS OR SCRATCHES

Repair as necessary.


AC0078



AC0077

ASSEMBLY OF COOLING UNIT

INSTALL COMPONENTS ON EVAPORATOR

(a) Connect the expansion valve to the inlet fitting of the evaporator. Torque the nut.

Torque: 23 N±m (235 kgf±cm, 17 ft±lbf)

HINT: Be sure that the 0–rings are positioned on the tube fitting.

(b) Install the holder to the suction tube with heat sen–sitizing tube.

(c) Connect the liquid tube to the inlet fitting of the ex–pansion valve. Torque the nut.

Torque: 13 N±m (135 kgf±cm, 10 ft±lbf)

(d) Install lower unit case to the evaporator.

(e) Install thermistor to the evaporator.

(f) Install upper unit case

(g) Install four screws.

(h) Install four clips.

(i) Install A/C cut off relay.

(j) Connect connectors.

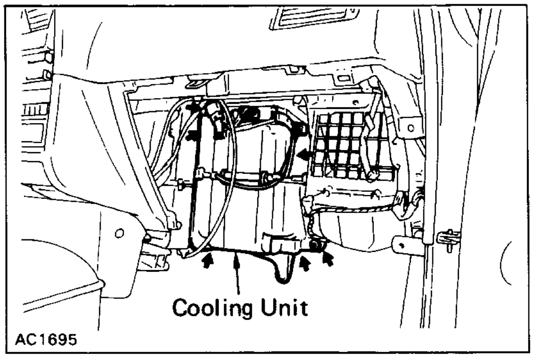
INSTALLATION OF COOLING UNIT

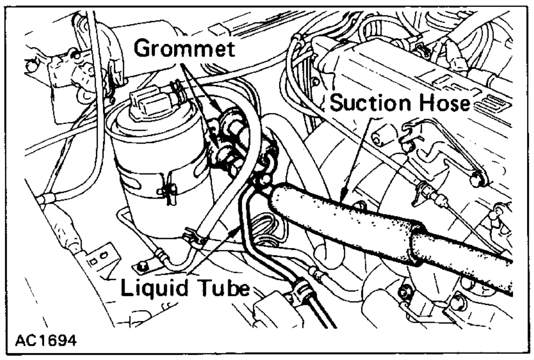
1. INSTALL COOLING UNIT

Install the cooling unit with four screws and a bolt.

2. CONNECT CONNECTOR

3. INSTALL GLOVE BOX AND REINFORCEMENT





4. INSTALL GROMMETS ON INLET AND OUTLET FITTINGS

5. CONNECT LIQUID TUBE TO COOLING UNIT INLET FITTING

Torque: 13 N·m (135 kgf·cm, 10 ft·lbf)

6. CONNECT SUCTION TUBE TO COOLING UNIT OUTLET FITTING

Torque: 32 N·m (325 kgf·cm, 24 ft·lbf)

7. IF EVAPORATOR WAS REPLACED, ADD COMPRESSOR OIL TO COMPRESSOR

Add 40 – 50 cc (1.4 – 1.7 fl.oz.)

Compressor oil: ND OIL6,
SUNISO No.5GS or equivalent

8. CONNECT NEGATIVE CABLE TO BATTERY

9. EVACUATE AIR FROM AIR CONDITIONING SYSTEM

10. CHARGE AIR CONDITIONING SYSTEM WITH REFRIGER– ANT AND CHECK FOR GAS LEAKAGE

Specified amount: 700 – 800 g (1.5 – 1.8 lb)

REFRIGERANT LINES

ON–VEHICLE INSPECTION

1. INSPECT HOSES AND TUBES FOR LEAKAGE

Use a gas leak tester. Replace, if necessary.

2. CHECK THAT HOSE AND TUBE CLAMPS ARE NOT LOOSE

Tighten or replace, as necessary.

REPLACEMENT OF REFRIGERANT LINES

(SEE PAGE AC–7)

1. RECOVER REFRIGERANT FROM REFRIGERATION SYSTEM

2. REPLACE FAULTY TUBE OR HOSE

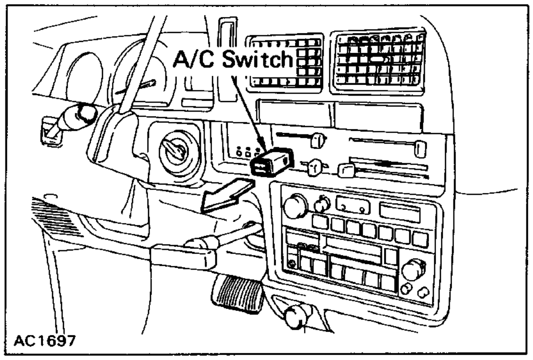
HINT: Cap the open fittings immediately to keep mois ture out of the system.

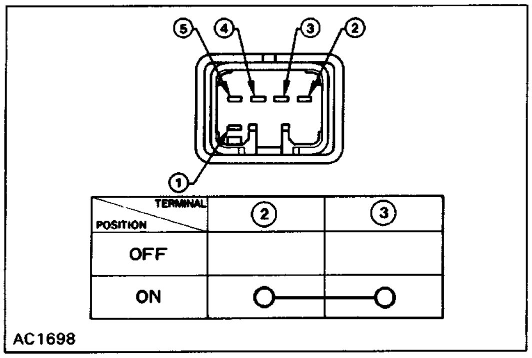
3. TIGHTENING TORQUE FOR O–RING FITTINGS AND BOLTED TYPE FITTINGS (See page AC–7)

4. EVACUATE AIR FROM AIR CONDITIONING SYSTEM

5. CHARGE AIR CONDITIONING SYSTEM WITH REFRIGERANT AND CHECK FOR GAS LEAKAGE

Specified amount: 700 – 800 g (1.5 – 1.8 lb)





AC SWITCH

ON–VEHICLE INSPECTION

1. DISCONNECT NEGATIVE CABLE FROM BATTERY

2. REMOVE GLOVE BOX

3. REMOVE A/C SWITCH

4. CHECK A/C SWITCH FOR CONTINUITY

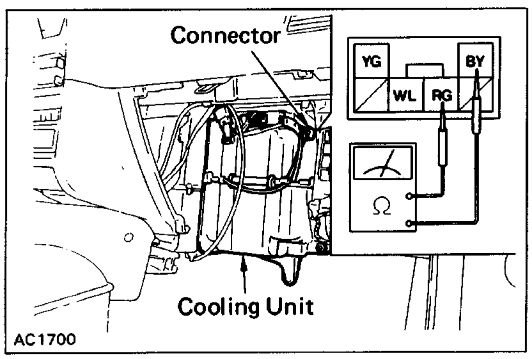
Using an ohmmeter, check for continuity between the terminals for each switch position shown in the table.

If there is no continuity, replace the A/C switch.

5. INSTALL A/C SWITCH

6. INSTALL GLOVE BOX

7. CONNECT NEGATIVE CABLE TO BATTERY



PRESSURE SWITCH

INSPECTION OF DUAL PRESSURE SWITCH

ON–VEHICLE INSPECTION

1. DISCONNECT NEGATIVE CABLE FROM BATTERY

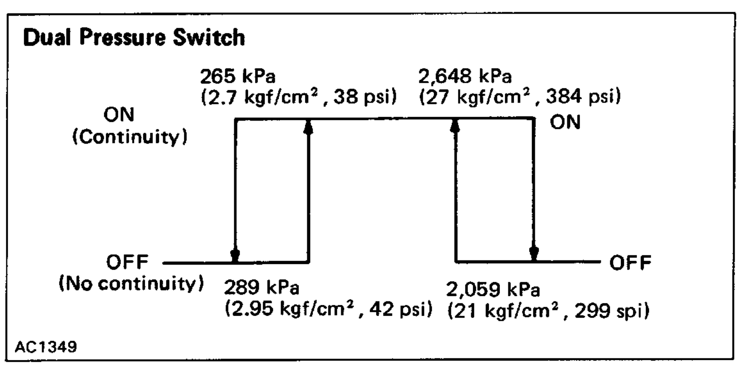
2. REMOVE GLOVE BOX

3. INSPECT PRESSURE SWITCH

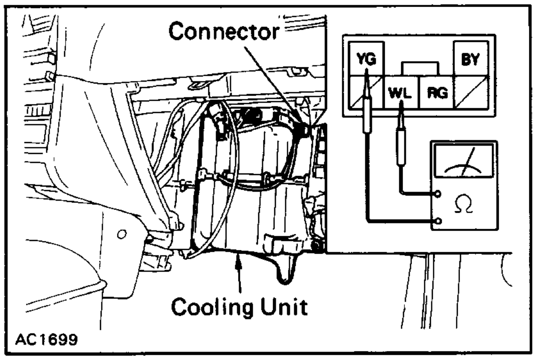
(a) Install the manifold gauge set.

(b) Observe the gauge reading.

(c) Check the continuity between the two terminals of the pressure switch shown in the below.



If defective, replace the pressure switch.



THERMISTOR

ON–VEHICLE INSPECTION

1. DISCONNECT NEGATIVE BATTERY CABLE

2. REMOVE GLOVE BOX

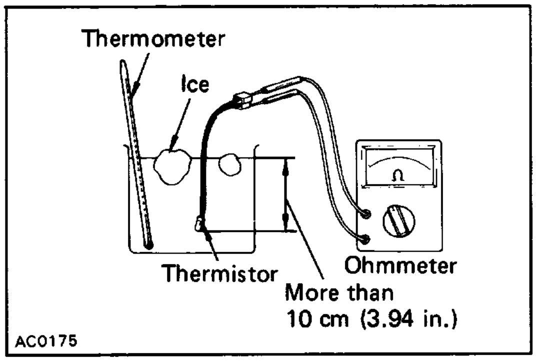
3. DISCONNECT CONNECTOR OF THERMISTOR

4. CHECK RESISTANCE OF THERMISTOR

Measure the resistance between terminals.

Standard resistance: 1,500 at 25•C (77•F)

If resistance is not as specified, replace the thermistor.



REMOVAL AND INSPECTION OF THERMISTOR

1. REMOVE AND DISASSEMBLE COOLING UNIT (SEE PAGE AC–25)

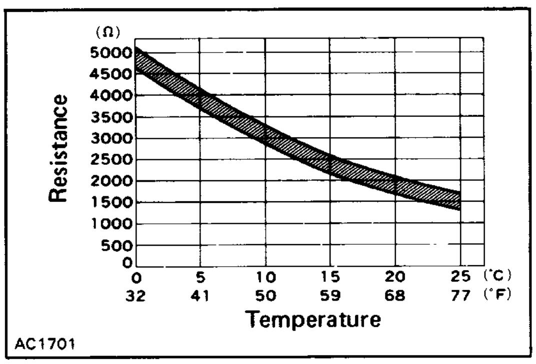
2. REMOVE THERMISTOR FROM EVAPORATOR

3. CHECK THERMISTOR OPERATION

(a) Place the thermistor in cold water. While varying the temperature of the water, measure the resistance at the connector and at the same time; measure the temperature of the water with a thermometer.

(b) Compare the two readings on the chart.

If the intersection is not between the two lines, replace the thermistor.



INSTALLATION OF THERMISTOR

1. INSTALL THERMISTOR TO EVAPORATOR

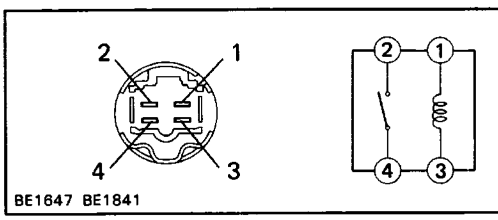
2. ASSEMBLE AND INSTALL COOLING UNIT

RELAY

INSPECTION OF A/C CUT OFF RELAY

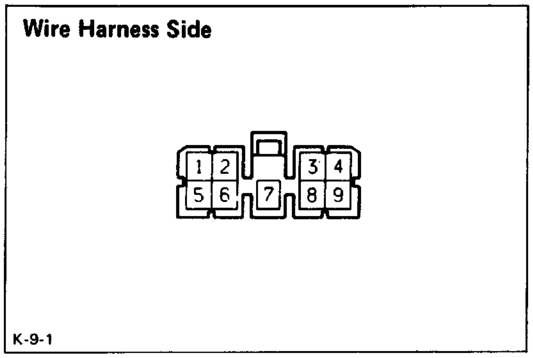
4WD Models with 3VZ–E E/G and AM

INSPECT A/C CUT OF RELAY CONTINUITY



Terminal / Condition	1	2	3	4
Constant	O—	—0000—	—O	
Apply battery positive voltage to terminals 1 and 3.		O—	—	—O

If continuity is not as specified, replace the relay.



AIR CONDITIONING AMPLIFIER

INSPECTION OF AMPLIFIER

INSPECT AMPLIFIER CIRCUIT

Disconnect the amplifier and inspect the connector on the wire harness side as shown in the chart below.

Test conditions:

(1) Ignition switch: ON

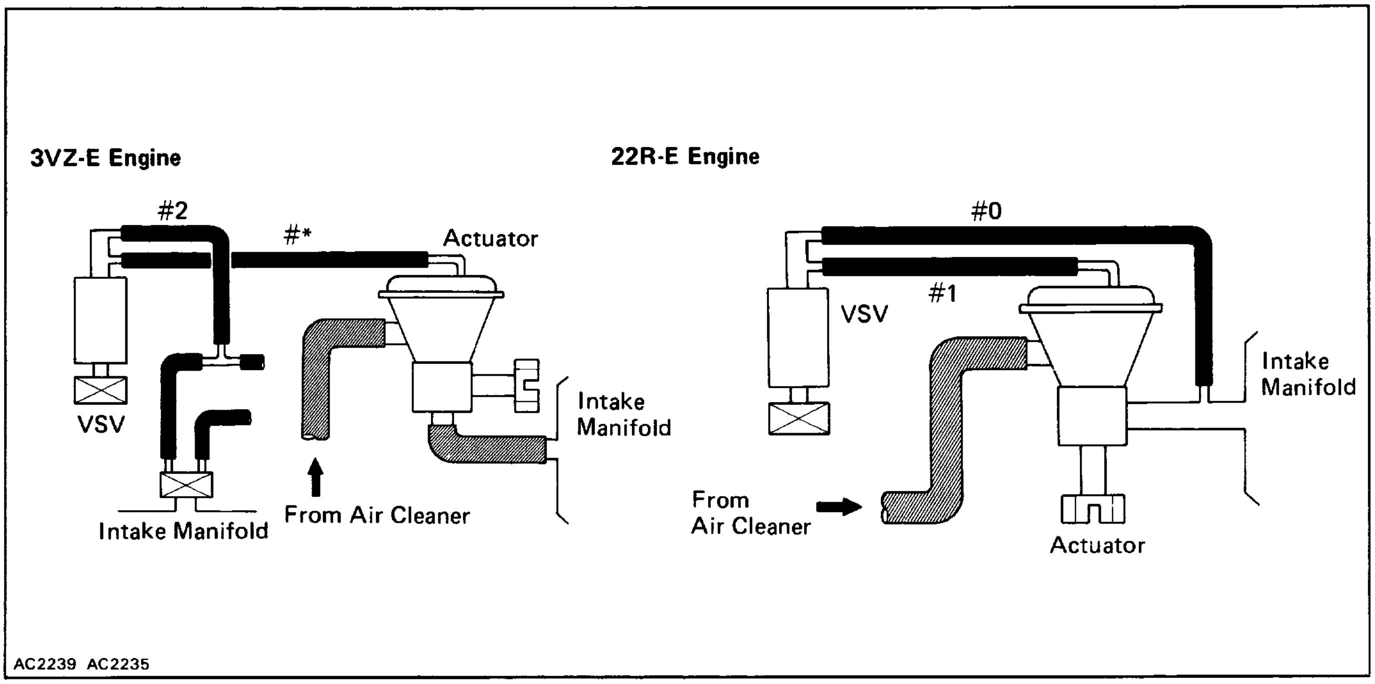
(2) Temperature control lever: MAX COOL

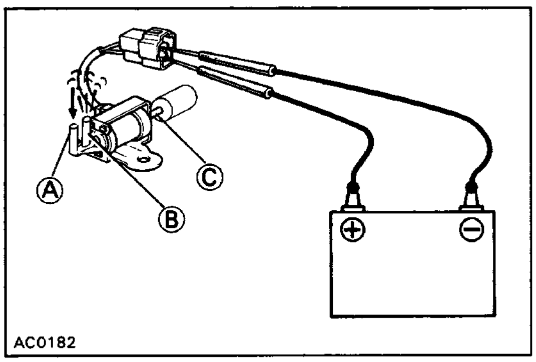
(3) Blower switch: HI

Check for	Tester connection	Condition	Specified value
Continuity	7 – 8	Constant	Continuity
	8 – Ground	Constant	Continuity
Voltage	3 – 8	Turn A/C switch on.	Battery positive voltage
		Turn A/C switch off.	Battery positive voltage
	4 – 8	Turn A/C switch on.	Battery positive voltage
		Turn A/C switch off.	No voltage
	6 – 8	Start the engine.	Approx. 10 to 14 V
		Stop the engine.	No voltage
	8 – 9	Turn A/C switch on.	Battery positive voltage
		Turn A/C switch off.	Battery positive voltage
Resistance	5 – 8	Constant	Approx. 1.5 kΩ at 25•C (77•F)
	2 – 5	MAX COOL	Approx. 0 0
		MIN COOL	Approx. 3 kΩ

If circuit is correct, replace the amplifier.

VACUUM HOSE CIRCUIT





VACUUM SWITCHING VALVE (VSV)

INSPECTION OF VSV

1. DISCONNECT VACUUM HOSES AND CONNECTOR FROM VSV

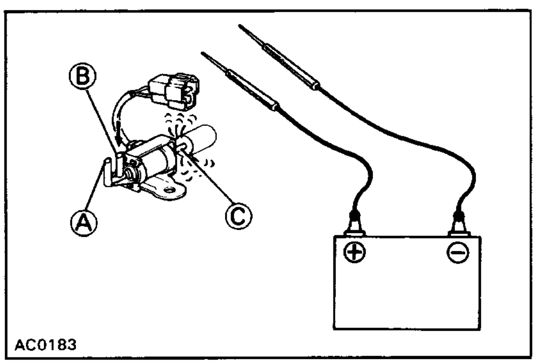
2. CHECK VACUUM CIRCUIT CONTINUITY IN VSV BY BLOWING AIR INTO PIPE

(a) Connect the VSV terminals to the battery terminals as shown.

(b) Blow into pipe (A) , and check that air comes out of pipe (B), but does not come out of filter (C).

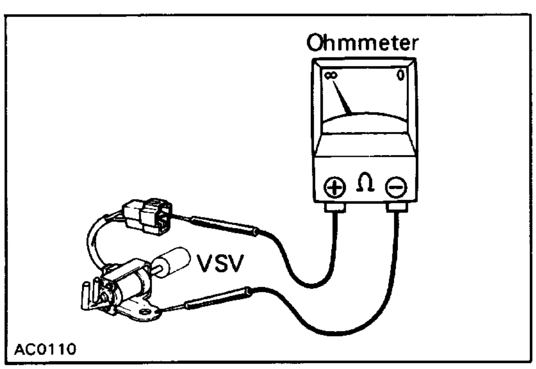
(c) Disconnect the battery.

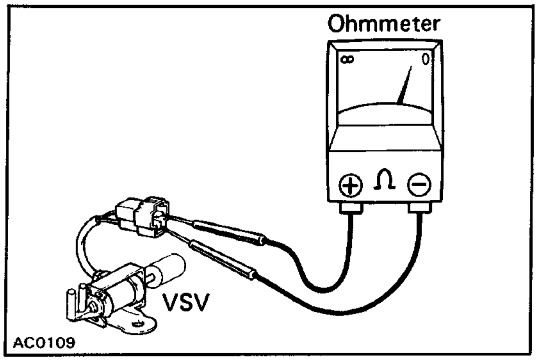
(d) Blow into pipe (B) and check that air comes out of filter (C), but does not come out of pipe (A) .
If a problem is found, replace the VSV.



3. CHECK FOR SHORT CIRCUIT

Using an ohmmeter, check that there is no continuity be– tween each terminal and the VSV body.
If a short circuit is found, repair or replace the VSV.





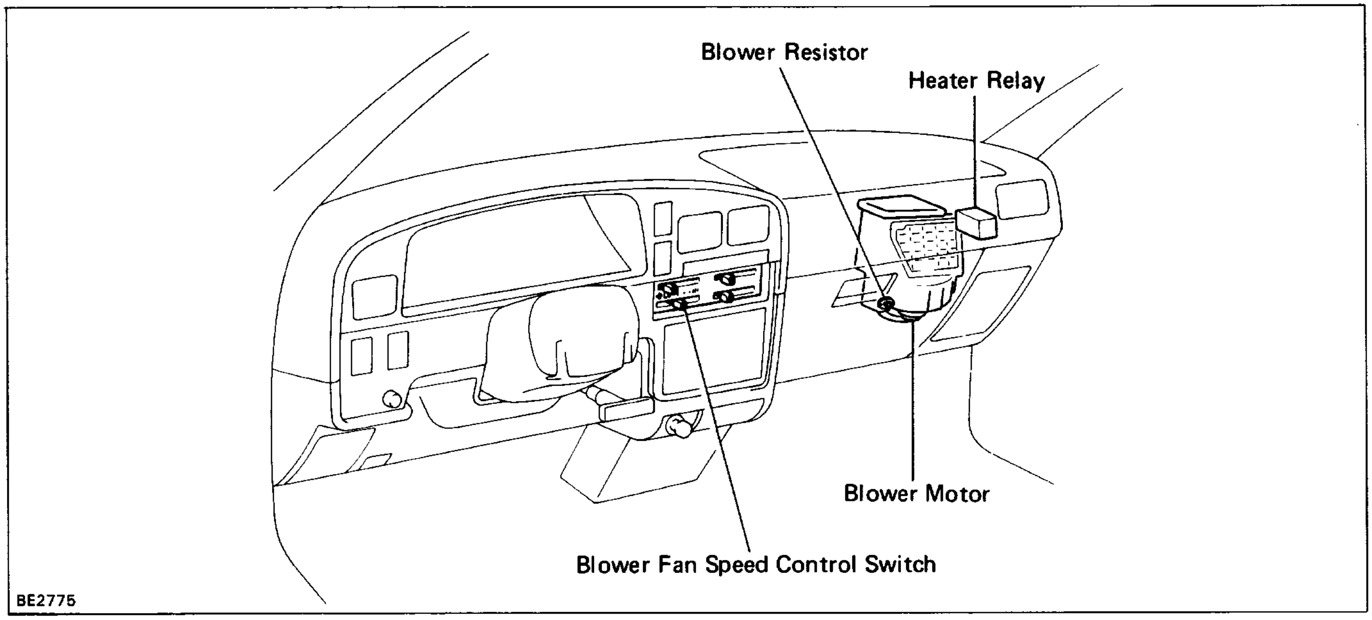
4. CHECK FOR OPEN CIRCUIT

Using an ohmmeter, measure the resistance between two terminals of the VSV.

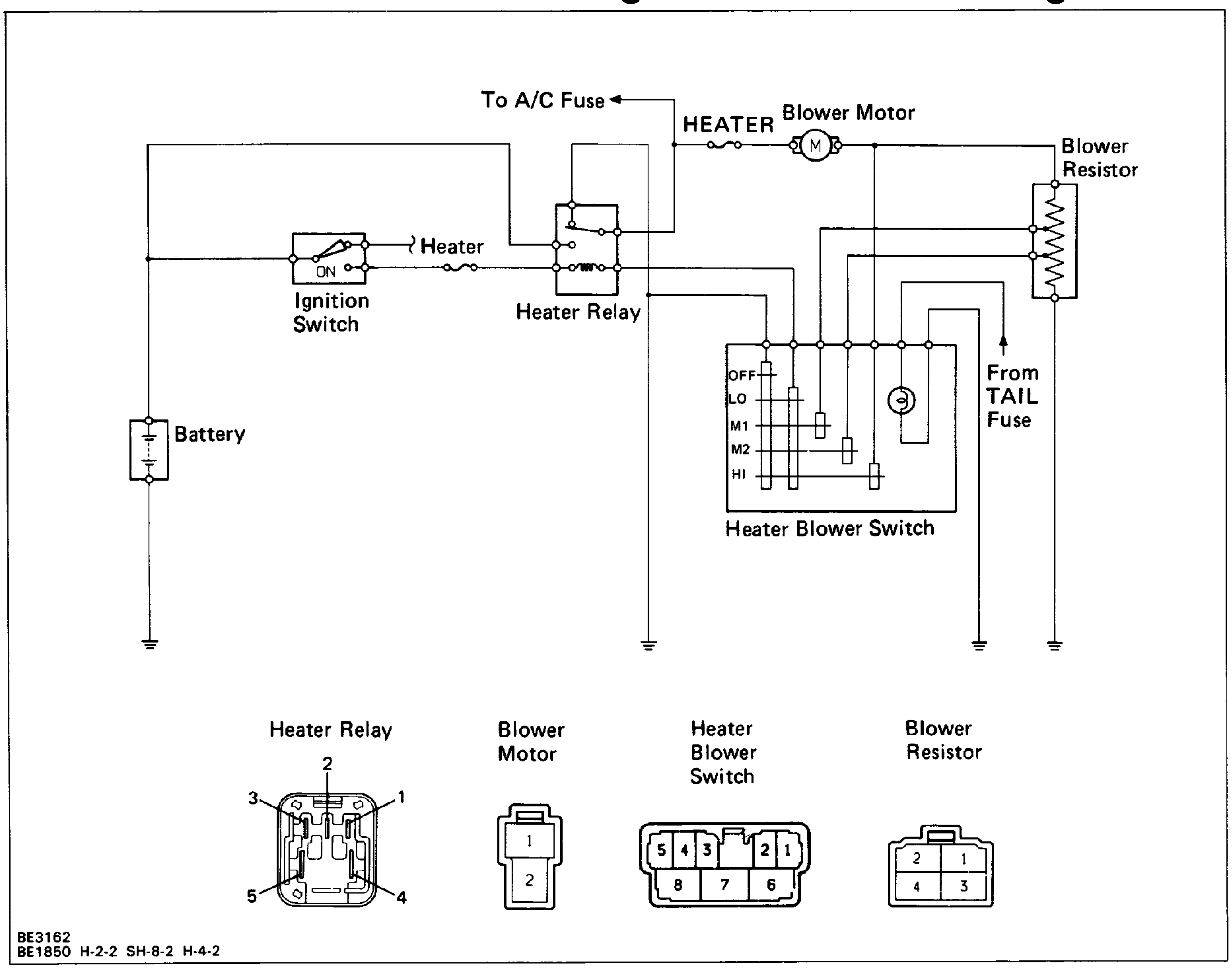
Specified resistance: 37 – 42 Ω at 200C (680F)

If resistance value is not as specified, replace the VSV.

HEATER
Parts Location



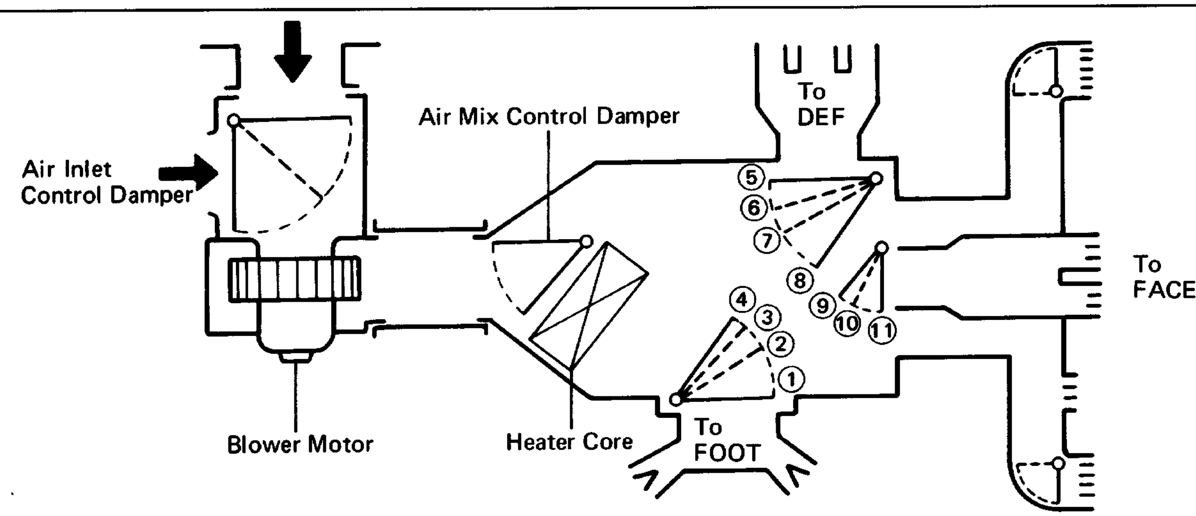
Wiring and Connector Diagrams



Troubleshooting

Problem	Possible cause	Remedy	Page
Blower does not work when fan switch is on	HEATER fuse blown	Replace fuse and check for short	
	Heater relay faulty	Check relay	AC–37
	Heater blower switch faulty	Check switch	AC–37
	Heater blower resistor faulty	Check resistor	AC–37
	Heater blower motor faulty	Check motor	AC–37
	Wiring or ground faulty	Repair as necessary	
Incorrect temperature output	Control cables broken or adjustment faulty	Check cables	AC–36
	Heater hoses leaking or clogged	Replace hose	
	Water valve faulty	Replace valve	
	Air dampers broken	Repair dampers	

Damper Positions

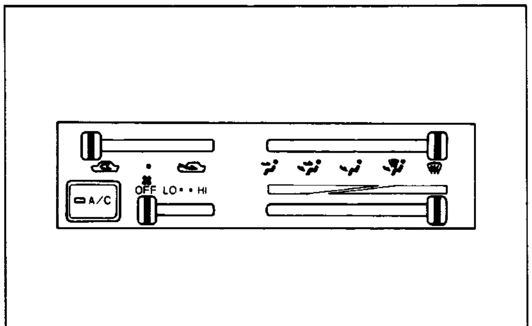


Mode	Air Flow Mode Control Damper Positions			Air Flow Vents				
				Center	Side	Foot	Def.	Center of Driver's Seat
Face	1	5	9	○	○			○
Bi-Level	2	5	10	○	○	○		○
Foot	4	6	11		○	○	○	○
Foot/Def.	3	7	11		○	○	○	○
Def.	1	8	11		○		○	○

BE2777
0001BE

The size of circle (○) indicates the proportion of the air flow volume.

Inspection and Adjustment

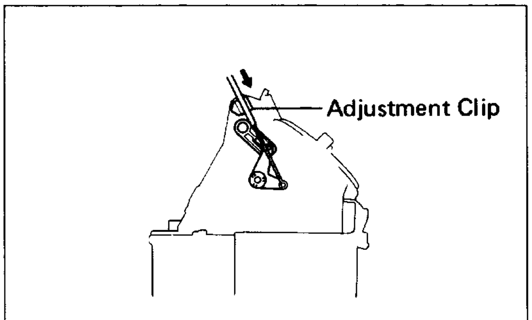


BE2778

1. INSPECT HEATER CONTROL PANEL

(Heater Control Cable Position)

Move the control levers left and right and check for stiff–ness and binding through the full range of the levers.

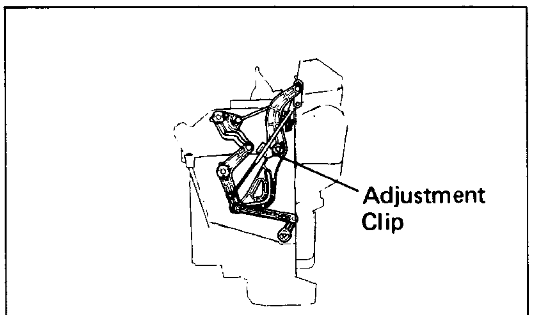


BE2779R

2. ADJUST CONTROL DAMPER

(Air Inlet Control Damper)

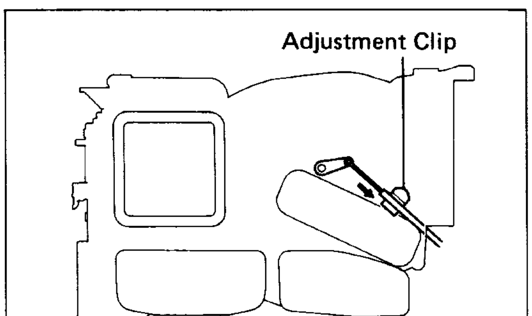
Set the air inlet control damper and lever to ”FRESH”.



BE2780

(Air Flow Control Damper)

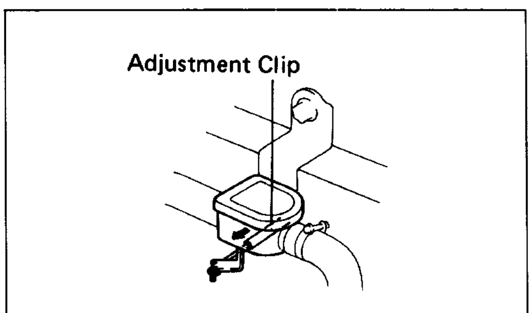
Set the air flow control damper and lever to ”DEF”.



BE2781

(Air Mix Control Damper)

Set the air mix control damper and lever to ”COOL”.



BE2782

3. ADJUST WATER VALVE

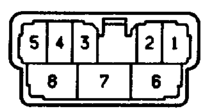
(Water Valve)

Set the water valve and control lever to ”COOL”.

HINT: Place the water valve lever on ”COOL” and while pushing the outer cable in the ”COOL” direction, clamp the outer cable to the water valve bracket.

Part Inspection

1. INSPECT HEATER BLOWER SWITCH (Continuity)

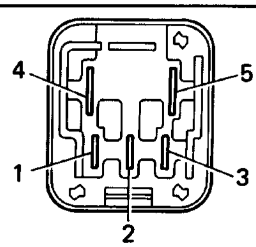


SH-8-2

Terminal / Switch position	1	2	5	6	8	Illumination 3	Illumination 4
OFF						○	○
LO			○	○		○	○
o (M 1)	○		○	○		○	○
O (M 2)		○	○	○		○	○
HI			○	○	○	○	○

If continuity is not as specified, replace the switch.

2. INSPECT HEATER RELAY (Continuity)

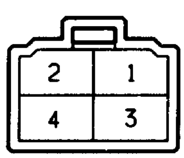


BE1013

Terminal / Condition	1	2	3	4	5
Constant	○ (coil to 3)	○ (to 4)	○ (coil to 1)	○ (to 2)	
Apply battery positive voltage to terminals 1 and 3.				○	○

If continuity is not as specified, replace the relay.

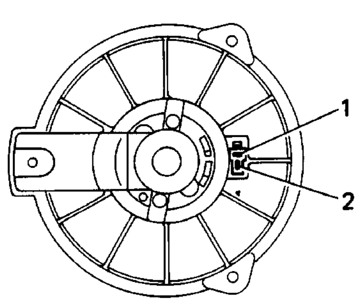
3. INSPECT HEATER BLOWER RESISTOR (Continuity)



H-4-2

Terminal / Condition	2	1	3	4
Constant	Hi ○	○	○	Lo ○

If continuity is not as specified, replace the resistor.



BE1735

4. INSPECT HEATER BLOWER MOTOR (Operation)

Connect the positive (+) lead from the battery to termi– nal 1 and the negative (–) lead to terminal 2, check that the motor operation is smooth.

If operation is not as specified, replace the motor.

SERVICE SPECIFICATIONS

MAINTENANCE

Engine

Drive belt tension		New belt	125 ± 25 lb			
		Used belt	80 ± 20 lb			
Coolant capacity w/heater or air conditioner			8.4 liters	8.9 US qts		7.4 Imp. qts
Engine oil capacity drain and refill with oil filter change			4.6 liters	4.9 US qts		4.0 Imp. qts
Spark plug	Type	ND	W16EXR-U			
		NGK	BPR5EY			
	Gap		0.8 mm		0.031 in.	
Firing order			1–3–4–2			
Valve clearance (hot)		Intake	0.20 mm		0.008 in.	
		Exhaust	0.30 mm		0.012 in.	
Idle speed		22R	700 rpm M/T		750 rpm A/T	
		22R-E	750 rpm			
Fast idle speed		22R	2600 rpm (EGR system OFF and choke opener OFF)			

Chassis

Front brake							
Pad thickness			Limit	1.0 mm		0.039 in.	
Disc thickness	Limit	2WD	1/2 ton	21.0 mm		0.827 in.	
		4WD	1 ton, C&C	24.0 mm		0.945 in.	
			Limit	11.5 mm		0.453 in.	
Disc runout			Limit	0.15 mm		0.0059 in.	
Rear brake							
Lining thickness			Limit	1.0 mm		0.039 in.	
Drum inner diameter			Limit	256.0 mm		10.079 in.	
Front axle and suspension							
Ball joint vertical play			Limit	2.3 mm		0.091 in.	
Wheel bearing friction preload (at starting)			2WD	0.6 – 1.8 kg	1.3 – 4.0 lb		5.9 – 17.7 N
			4WD	2.8 – 5.6 kg	6.2 – 12.3 lb		27 – 55 N
Steering wheel freeplay			Less than	30 mm		1.18 in.	
Tightening torque							
Seat mounting bolts				375 kg-cm	27 ft-lb		37 N·m
Leaf spring U-bolt			2WD	1,000 kg-cm	72 ft-lb		98 N·m
			4WD	1,250 kg-cm	90 ft-lb		123 N·m
Strat bar bracket x frame				530 kg-cm	38 ft-lb		52 N·m

ENGINE MECHANICAL

Specifications

Compression pressure		STD		More than 12.0 kg/cm²	171 psi	1,177 kPa
		Limit		10.0 kg/cm²	142 psi	981 kPa
	Differential of pressure between each cylinder			Less than 1.0 kg/cm²	14 psi	98 kPa
Cylinder head	Head surface warpage	Limit		0.15 mm	0.0059 in.	
	Valve seat Refacing angle		IN	30°, 45°, 60°		
			EX	30°, 45°, 65°		
	Contacting angle			45°		
	Contacting width			1.2 – 1.6 mm	0.047 – 0.063 in.	
Valve guide bushing	Inner diameter	Intake		8.01 – 8.03 mm	0.3154 – 0.3161 in.	
		Exhaust		8.01 – 8.03 mm	0.3154 – 0.3161 in.	
	Outer diameter	STD		13.040 – 13.051 mm	0.5134 – 0.5138 in.	
		O/S type 0.05		13.090 – 13.101 mm	0.5154 – 0.5158 in.	
	Protrusion from cylinder head			19 mm	0.75 in.	
	Replacing temperature (cylinder head side)			Normal temperature		
Valve	Valve overall length	STD	Intake	113.5 mm	4.468 in.	
			Exhaust	112.4 mm	4.425 in.	
	Valve face angle		IN & EX	44.5°		
	Stem diameter	STD	Intake	7.970 – 7.985 mm	0.3138 – 0.3144 in.	
			Exhaust	7.965 – 7.980 mm	0.3136 – 0.3142 in.	
	Stem end refacing	Limit	IN & EX	0.5 mm	0.020 in.	
	Stem oil clearance	STD	Intake	0.02 – 0.06 mm	0.0008 – 0.0024 in.	
			Exhaust	0.03 – 0.07 mm	0.0012 – 0.0028 in.	
		Limit	Intake	0.08 mm	0.0031 in.	
			Exhaust	0.10 mm	0.0039 in.	
	Valve head edge thickness	Limit		0.6 mm	0.024 in.	
Valve spring	Free length			45.8 mm	1.803 in.	
	Installed length			40.5 mm	1.594 in.	
	Installed load	STD		25.0 kg	55.1 lb	245 N
		Limit		22.5 kg	49.6 lb	221 N
	Squareness	Limit		1.6 mm	0.063 in.	
Rocker arm and shaft	Rocker shaft diameter			15.97 – 15.99 mm	0.6287 – 0.6295 in.	
	Shaft to arm oil clearance	STD		0.01 – 0.05 mm	0.0004 – 0.0020 in.	
		Limit		0.08 mm	0.0031 in.	
Intake and exhaust manifold	Manifold surface warpage	Limit	Intake	0.20 mm	0.0079 in.	
			Exhaust	0.70 mm	0.0276 in.	
Chain and sprocket	Crankshaft sprocket wear	Limit		59.4 mm	2.339 in.	
	Camshaft sprocket wear	Limit		113.8 mm	4.480 in.	
Tension and damper	Tensioner head thickness	Limit		11.0 mm	0.433 in.	
	Damper No. 1 wear	Limit		0.5 mm	0.020 in.	
	Damper No. 2 wear	Limit		0.5 mm	0.020 in.	

Specifications (Cont'd)

Camshaft	Thrust clearance	STD		0.08 – 0.18 mm	0.0031 – 0.0071 in.
		Limit		0.25 mm	0.0098 in.
	Journal oil clearance	STD		0.01 – 0.05 mm	0.0004 – 0.0020 in.
		Limit		0.1 mm	0.004 in.
	Journal diameter	STD		32.98 – 33.00 mm	1.2984 – 1.2992 in.
	Circle runout	Limit		0.2 mm	0.008 in.
	Cam height	Intake		42.63 – 42.72 mm	1.6783 – 1.6891 in.
		Exhaust		42.69 – 42.78 mm	1.6807 – 1.6842 in.
Cylinder block	Warpage	Limit		0.05 mm	0.0020 in.
	Cylinder bore	STD		92.00 – 92.03 mm	3.6220 – 3.6232 in.
	Cylinder bore wear	Limit		0.2 mm	0.008 in.
	Difference of bore limit between cylinder			Less than 0.03 mm (0.0012 in.)	
	Taper and out-of-round	Limit		0.02 mm	0.0008 in.
Piston and piston ring	Piston diameter	STD		91.938 – 91.968 mm	3.6196 – 3.6208 in.
		O/S type 0.50		92.438 – 92.468 mm	3.6393 – 3.6405 in.
		O/S type 1.00		92.938 – 92.968 mm	3.6590 – 3.6602 in.
	Piston to cylinder clearance			0.03 – 0.05 mm	0.0012 – 0.0020 in.
	Piston ring end gap	Standard	No. 1	0.24 – 0.39 mm	0.009 – 0.015 in.
			No. 2	0.18 – 0.42 mm	0.007 – 0.017 in.
			Oil	0.20 – 0.82 mm	0.008 – 0.032 in.
		Maximum	No. 1	0.99 mm	0.039 in.
			No. 2	1.02 mm	0.040 in.
			Oil	1.42 mm	0.056 in.
	Ring to ring groove clearance	Limit No. 1, No. 2		0.2 mm	0.008 in.
	Piston pin installing temperature			80°C	176°F
Connecting rod and bearing	Thrust clearance	STD		0.16 – 0.26 mm	0.0063 – 0.0102 in.
		Limit		0.30 mm	0.0118 in.
	Bearing oil clearance	STD		0.025 – 0.055 mm	0.0010 – 0.0022 in.
		Limit		0.10 mm	0.0039 in.
	Pin to bushing oil clearance	STD		0.005 – 0.011 mm	0.0002 – 0.0004 in.
		Limit		0.015 mm	0.0006 in.
	Rod bend	Limit		0.05 mm	0.0020 in.
	Rod twist	Limit		0.15 mm	0.0059 in.
Crankshaft	Thrust clearance	STD		0.02 – 0.22 mm	0.0008 – 0.0087 in.
		Limit		0.30 mm	0.0118 in.
	Thrust washer thickness	STD		2.00 mm	0.0787 in.
		O/S type 0.125		2.06 mm	0.0811 in.
		O/S type 0.25		2.13 mm	0.0839 in.
	Main journal oil clearance	STD		0.025 – 0.055 mm	0.0010 – 0.0022 in.
		Limit		0.08 mm	0.0031 in.
	Main journal diameter	STD		59.984 – 60.000 mm	2.3616 – 2.3622 in.
		Bearing U/S type 0.25		59.70 – 59.71 mm	2.3504 – 2.3508 in.
		Bearing U/S type		0.25 mm	0.0098 in.
	Crank pin oil clearance	STD		0.025 – 0.055 mm	0.0010 – 0.0022 in.
		Limit		0.08 mm	0.031 in.
	Crank pin diameter	STD		52.988 – 53.000 mm	2.0861 – 2.0866 in.
		Bearing U/S type 0.25		52.70 – 52. 71 mm	2.0748 – 2.0752 in.
		Bearing U/S type		0.25 mm	0.0098 in.
	Circle runout	Limit		0.1 mm	0.004 in.
	Main journal taper and out-of-round	Limit		0.01 mm	0.0004 in.
	Crank pin journal taper and out-of-round	Limit		0.01 mm	0.0004 in.

Tightening Torque

Tightening part		kg-cm	ft-lb	N-m
Cylinder head x Cylinder block		800	58	78
Manifold x Cylinder head	Intake	195	14	19
	Exhaust	450	33	44
Crankshaft bearing cap x Cylinder block		1,050	76	103
Connecting rod cap x Connecting rod		630	46	62
Crankshaft pulley x Crankshaft		1,600	116	157
Flywheel x Crankshaft		1,100	80	108
Camshaft bearing cap x Cylinder head		200	14	20
Camshaft timing sprocket x Camshaft		800	58	78
Oil pan x Cylinder block		60	52 in.-lb	5.9

EFI SYSTEM

Pressure regulator	Fuel pressure	at No vacuum	2.3 – 2.7 kg/cm^2 33 – 38 psi 226 – 265 kPa
Cold start injector	Resistance		2 – 4 Ω
	Leakage		Less than one drop of fuel per minute
Injector	Resistance		1.5 – 3.0 Ω
	Injection volume		40 – 50 cc/15 sec (2.4 – 3.1 cu in.)
	Difference between each injector		Less than 6 cc (0.37 cu in.)
	Leakage		Less than one drop of fuel per minute
Air flow meter	Resistance	E_2 – Vs	20 – 400 Ω (Measuring plate fully closed) 20 – 1,000 Ω (Measuring plate fully open)
		E_2 – Vc	100 – 300 Ω
		E_2 – V_B	200 – 400 Ω
		E_1 – Fc	∞ (Measuring plate fully closed) 0 (Measuring plate open)
		E_2 – THA	10 – 20 kΩ (–20°C, –4°F) 4 – 7 kΩ (0°C, 32°F) 2 – 3 kΩ (20°C, 68°F) 0.9 – 1.3 kΩ (40°C, 104°F) 0.4 – 0.7 kΩ (60°C, 140°F)
Auxiliary air valve	Resistance		39 – 59 Ω
	Temperature	w/ valve closed	About 120°C (248°F)
Throttle body	Throttle valve fully closed angle		6°

Throttle position sensor	Clearance between lever and stop screw	Between terminals	Resistance
	0 mm 0 in.	VTA – E_2	0.2 – 0.8 kΩ
	0.57 mm 0.0224 in.	IDL – E_2	0 – 100 Ω
	0.85 mm 0.0335 in.	IDL – E_2	Infinity
	Throttle valve fully opened position	VTA – E_2	3.3 – 10 kΩ
	–	Vcc – E_2	3 – 7 kΩ

EFI SYSTEM (Cont'd)

Main relay	Resistance	1 – 2 3 – 4	60 – 80 Ω ∞
Circuit opening relay	Resistance	STA – E_1 +B – Fc +B – Fp	17 – 25 Ω 88 – 132 Ω ∞
Resistor	Resistance		2 – 3 Ω each
Start injector time switch	Resistance	STA – STJ STA – Ground	20 – 40 Ω (below 30°C, 86°F) 40 – 60 Ω (above 40°C, 104°F) 20 – 80 Ω
Temperature sensor	Resistance		10 – 20 kΩ (–20°C, –4°F) 4 – 7 kΩ (0°C, 32°F) 2 – 3 kΩ (20°C, 68°F) 0.9 – 1.3 kΩ (40°C, 104°F) 0.4 – 0.7 kΩ (60°C, 140°F) 0.2 – 0.4 kΩ (80°C, 176°F)

ECU

NOTE: 1. Perform all voltage and resistance measurements with the ECU connected.
2. Verify that the battery voltage is 11V or above when the ignition switch is ON.
3. The testing probes must not make contact with the computer Ox and VF terminals.

+B – E_1	10 – 14	Ignition switch ON	
BATT – E_1	10 – 14	–	
IDL – E_2	4 – 10	Throttle valve open	
VTA – E_2	0.1 – 1.0	Ignition switch ON	Throttle valve fully closed
	4 – 5	Ignition switch ON	Throttle valve fully open
Vcc – E_2	4 – 6	Ignition switch ON	–
IGt – E_1	0.7 – 1.0	Idling	
STA – E_1	6 – 12	Ignition switch ST position	
No. 10 – E_1 No. 20 – E_1	9 – 14	Ignition switch ON	
W – E_1	8 – 14	No trouble (CHECK ENGINE light go off) and engine running	
Vc – E_2	4 – 9	Ignition switch ON	–
Vs – E_2	0.5 – 2.5	Ignition switch ON	Measuring plate fully closed
	5 – 8	Ignition switch ON	Measuring plate fully open
	2.5 – 5.5	Idling	
THA – E_2	2 – 6	Ignition switch ON	Intake air temperature 20°C or 68°F
THW – E_2	0.5 – 2.5	Ignition switch ON	Coolant temperature 80°C or 176°F
B/K – E_2	8 – 14	Stop light switch ON	

Resistance	E_1 – E_2 E_1 – BODY E_1 – E_{01} E_1 – E_{02}	0 Ω 0 Ω 0 Ω 0 Ω
Fuel cut rpm	Cut M/T A/T Hysteresis	2,130 rpm (Brake switch OFF) 2,200 rpm 300 – 500 rpm (Brake switch ON) 230 – 430 rpm (Brake switch OFF)

FUEL SYSTEM

Carburetor	Float level Raised position (float top to air horn)		9.8 mm	0.386 in.
	Lowered position (float bottom to air horn)		48 mm	1.89 in.
	Float lip clearance (at float lowered)		1 mm	0.04 in.
	Throttle valve closed angle	Primary	9° from horizontal plane	
		Secondary	20° from horizontal plane	
	Throttle valve full open angle	Primary	90° from horizontal plane	
		Secondary	90° from horizontal plane	
	Secondary touch angle		59° from horizontal plane	
	Fast idle angle		23° from horizontal plane	
	Fast idle speed		2,600 rpm	
	Unloader angle		45° from horizontal plane	
	Choke breaker opening angle		42° from horizontal plane	
	Choke heater	Resistance	20 – 22 Ω at 20°C (68°F)	
	Idle-up angle		16.5° from horizontal plane	
	Dash pot touch angle		24.5° from horizontal plane	
	Dash pot setting speed		3,000 rpm	
	Idle speed	M/T	700 rpm	
		A/T	750 rpm	
	Idle mixture adjusting screw presetting		Screw out 3-1/2 turns	
	Idle mixture speed	M/T	740 rpm	
		A/T	790 rpm	

COOLING SYSTEM

Radiator	Relief valve opening pressure	STD	0.75–1.05 kg/cm^2	10.7–14.9 psi	74–103 kPa
		Limit	0.6 kg/cm^2	8.5 psi	59 kPa
Thermostat	Valve opening temperature				
	Starts to open at		88°C	190°F	
	Fully opens at		100°C	212°F	
	Valve opening travel		8 mm	0.31 in.	

LUBRICATION SYSTEM

Oil pressure (normal operating temperature)					
	at idle speed		More than 0.3 kg/cm^2 (4.3 psi, 29 kPa)		
	at 3,000 rpm		2.5–5.0 kg/cm^2 (36–71 psi, 245–490 kPa)		
Oil pump	Body clearance	STD	0.09 – 0.15 mm	0.0035 – 0.0059 in.	
		Limit	0.2 mm	0.008 in.	
	Tip clearance				
	Drive gear to crescent	STD	0.15 – 0.21 mm	0.0059 – 0.0083 in.	
		Limit	0.3 mm	0.012 in.	
	Drive gear to crescent	STD	0.22 – 0.25 mm	0.0087 – 0.0098 in.	
		Limit	0.3 mm	0.012 in.	
	Side clearance	STD	0.03 – 0.09 mm	0.0012 – 0.0035 in.	
		Limit	0.15 mm	0.0059 in.	
	Relief valve operating pressure		4.5 kg/cm^2	64 psi	441 kPa

IGNITION SYSTEM

Spark plug	Type	ND	W16EXR-U	
		NGK	BPR5EY	
	Gap		0.8 mm	0.031 in.
Distributor (22R Engine)	Air gap		0.2 – 0.4 mm	0.008 – 0.016 in.

Distributor advance angle	Governor	Distributor rpm	Advance angle	
		600	Advance begins	
		873	1.8°	
		1,200	4.5°	
		2,400	13.0°	
		3,000	12.4°	

Vacuum		Ex. Calif. mmHg (in.Hg, kPa)	Ex. Calif. Advance angle	For Calif. mmHg (in.Hg, kPa)	For Calif. Advance angle
	Main	80 (3.15, 10.7)	Advance begins	80 (3.15, 10.7)	Advance begins
		132 (5.20, 17.6)	5.9°	212 (8.35, 28.3)	7.2°
		190 (7.48, 25.3)	10.0°	330 (13.00, 44.0)	12.5°
	Sub	200 (7.87, 26.7)	Advance begins	200 (7.87, 26.7)	Advance begins
		246 (9.69, 32.8)	3.2°	300 (11.81, 40.0)	6.0°
		300 (11.81, 40.0)	6.0°		

High tension wire	Resistance Limit	Less than 25 kΩ per cord	
Ignition coil		22R-E	22R
	Primary coil resistance	0.8 – 1.1 Ω	0.4 – 0.5 Ω
	Secondary coil resistance	10.7 – 14.5 kΩ	8.5 – 11.5 kΩ
	Insulation resistance w/500V megohm meter	10 MΩ or more	

STARTING SYSTEM

Reduction type starter	Rated voltage and output power			12V, 1.0 kW	12V, 1.4 kW
	No-load characteristic		Ampere	Less than 90A	Less than 90A
			rpm	More than 3,000 rpm at 11.5V	More than 3,500 rpm at 11.5V
	Brush	Length	STD	13.0 mm 0.512 in.	15.0 mm 0.591 in.
			Limit	8.5 mm 0.335 in.	10.0 mm 0.394 in.
	Commutator	Outer diameter	STD	30 mm 1.18 in.	←
			Limit	29 mm 1.14 in.	←
		Mica depth	STD	0.5 – 0.8 mm 0.020 – 0.031 in.	←
			Limit	0.2 mm 0.008 in.	←
		Runout	Limit	0.05 mm 0.0020 in.	←
	Spring installed load		STD	1,785 – 2,415 g 3.9 – 5.3 lb 18 – 24 N	←
	A04978		Limit	1,200 g 2.6 lb 12 N	←

SERVICE SPECIFICATIONS

CLUTCH

Specifications

Pedal height (from asphalt sheet)	2WD	154.5 mm	6.083 in.
	4WD	151.5 mm	5.965 in.
(from floor panel)		157.5 mm	6.201 in.
Push rod play at pedal top		1.0 – 5.0 mm	0.039 – 0.197 in.
Pedal freeplay		5 – 15 mm	0.20 – 0.59 in.
Clutch release point (from pedal full stroke end position)		25 mm (0.98 in.) or more	
Disc rivet head depth	Limit	0.3 mm	0.012 in
Disc runout	Limit	0.8 mm	0.031 in.
Diaphragm spring tip alignment	Limit	0.5 mm	0.020 in
Diaphragm spring finger wear Depth	Limit	0.6 mm	0.024 in.
Width	Limit	5.0 mm	0.197 in.
Flywheel runout	Limit	0.1 mm	0.004 in.
Master cylinder reservoir set pin protrusion		1.5 – 3.5 mm	0.059 – 0.138 in.

Torque Specifications

Part tightened		N·m	kgf·cm	ft·lbf
Master cylinder mounting nut		13	130	9
Release cylinder mounting bolt		12	120	9
Bleeder plug		11	110	8
Clutch cover x Flywheel		19	195	14
Clutch line union		15	155	11
Release fork support	22R–E	39	400	29
	3VZ–E	47	480	35

MANUAL TRANSMISSION (G57, G58)

Specifications (2WD and 4WD)

Output shaft			
2nd gear journal diameter	Limit	37.984 mm	1.4954 in.
3rd gear journal diameter	Limit	34.984 mm	1.3773 in.
Flange thickness	Limit	4.80 mm	0.1890 in.
Runout	Limit	0.05 mm	0.0020 in.
Inner race flange thickness	Limit	3.99 mm	0.1571 in.
Inner race outer diameter	Limit	38.985 mm	1.5348 in.
Gear thrust clearance			
1st, 2nd & 3rd	STD	0.10 – 0.25 mm	0.0039 – 0.0098 in.
	Limit	0.25 mm	0.0098 in.
Counter 5th	STD	0.10 – 0.30 mm	0.0039 – 0.0118 in.
	Limit	0.30 mm	0.0118 in.

CLUTCH

Specifications

Pedal height (from asphalt sheet)	2WD	154.5 mm	6.083 in.
	4WD	151.5 mm	5.965 in.
(from floor panel)		157.5 mm	6.201 in.
Push rod play at pedal top		1.0 – 5.0 mm	0.039 – 0.197 in.
Pedal freeplay		5 – 15 mm	0.20 – 0.59 in.
Clutch release point (from pedal full stroke end position)		25 mm (0.98 in.) or more	
Disc rivet head depth	Limit	0.3 mm	0.012 in
Disc runout	Limit	0.8 mm	0.031 in.
Diaphragm spring tip alignment	Limit	0.5 mm	0.020 in
Diaphragm spring finger wear Depth	Limit	0.6 mm	0.024 in.
Width	Limit	5.0 mm	0.197 in.
Flywheel runout	Limit	0.1 mm	0.004 in.
Master cylinder reservoir set pin protrusion		1.5 – 3.5 mm	0.059 – 0.138 in.

Torque Specifications

Part tightened		N·m	kgf·cm	ft·lbf
Master cylinder mounting nut		13	130	9
Release cylinder mounting bolt		12	120	9
Bleeder plug		11	110	8
Clutch cover x Flywheel		19	195	14
Clutch line union		15	155	11
Release fork support	22R–E	39	400	29
	3VZ–E	47	480	35

MANUAL TRANSMISSION (G57 G58)

Specifications (2WD and 4WD)

Output shaft			
2nd gear journal diameter	Limit	37.984 mm	1.4954 in.
3rd gear journal diameter	Limit	34.984 mm	1.3773 in.
Flange thickness	Limit	4.80 mm	0.1890 in.
Runout	Limit	0.05 mm	0.0020 in.
Inner race flange thickness	Limit	3.99 mm	0.1571 in.
Inner race outer diameter	Limit	38.985 mm	1.5348 in.
Gear thrust clearance			
1st, 2nd & 3rd	STD	0.10 – 0.25 mm	0.0039 – 0.0098 in.
	Limit	0.25 mm	0.0098 in.
Counter 5th	STD	0.10 – 0.30 mm	0.0039 – 0.0118 in.
	Limit	0.30 mm	0.0118 in.

Specifications (2WD and 4WD) (Cont'd)

Gear oil clearance			
1 st, 2nd & 3rd	STD	0.009 – 0.032 mm	0.0004 – 0.0013 in.
	Limit	0.032 mm	0.0013 in.
5th	STD	0.009 – 0.032 mm	0.0004 – 0.0013 in.
	Limit	0.032 mm	0.0013 in.
Reverse	STD	0.04 – 0.08 mm	0.0016 – 0.0031 in.
	Limit	0.13 mm	0.0051 in.
Shift fork to hub sleeve clearance	Limit	1.0 mm	0.039 in.
Synchronizer ring to gear clearance	STD	1.0 – 2.0 mm	0.039 – 0 .079 in.
	Limit	0.8 mm	0.031 in.
Front bearing retainer oil seal			
Drive in depth		12.2 – 13.2 mm	0.480 – 0.520 in.
Speedometer driven gear oil seal			
Oil seal depth		20 mm	0.79 in.
Input shaft synchronizer ring to gear clearance	STD	1.0 – 2.0 mm	0.039 – 0.079 in.
	Limit	0.8 mm	0.031 in.
Counter gear outer diameter of needle roller bearing race	STD	25.98 – 26.00 mm	1.0228 – 1.0236 in.
	Limit	25.86 mm	1.0181 in.
Reverse idler gear to shift arm shoe clearance	STD	0.05 – 0.27 mm	0.0020 – 0.0106 in.
	Limit	0.5 mm	0.197 in.
Input shaft snap ring thickness	Mark		
	0	2.05 – 2.10 mm	0.0807 – 0.0827 in.
	1	2.10 – 2.15 mm	0.0827 – 0.0846 in.
	2	2.15 – 2.20 mm	0.0846 – 0.0866 in.
	3	2.20 – 2.25 mm	0.0866 – 0.0886 in.
	4	2.25 – 2.30 mm	0.0886 – 0.0906 in.
	5	2.30 – 2.35 mm	0.0906 – 0.0925 in.
Output shaft snap ring thickness			
Front	Mark		
	C-1	1.75 – 1.80 mm	0.0689 – 0.0709 in.
	D	1.80 – 1.85 mm	0.0709 – 0.0728 in.
	D-1	1.85 – 1.90 mm	0.0728 – 0.0748 in.
	E	1.90 – 1.95 mm	0.0748 – 0.0768 in.
	E-1	1.95 – 2.00 mm	0.0768 – 0.0787 in.
	F	2.00 – 2.05 mm	0.0787 – 0.0807 in.
	F-1	2.05 – 2.10 mm	0.0807 – 0.0827 in.
Rear	Mark		
	A	2.67 – 2.72 mm	0.1051 – 0.1071 in.
	B	2.73 – 2.78 mm	0.1075 – 0.1094 in.
	C	2.79 – 2.84 mm	0.1098 – 0.1118 in.
	D	2.85 – 2.90 mm	0.1122 – 0.1142 in.
	E	2.91 – 2.96 mm	0.1146 – 0.1165 in.
	F	2.97 – 3.02 mm	0.1169 – 0.1189 in.

Specifications (2WD and 4WD) (Cont'd)

Output shaft snap ring thickness (cont'd)			
Rear	Mark		
	G	3.03 – 3.08 mm	0.1193 – 0.1213 in.
	H	3.09 – 3.14 mm	0.1217 – 0.1236 in.
	J	3.15 – 3.20 mm	0.1240 – 0.1260 in.
	K	3.21 – 3.26 mm	0.1264 – 0.1283 in.
	L	3.27 – 3.32 mm	0.1287 – 0.1307 in.
Counter gear snap ring			
Front bearing	Mark		
	1	2.05 – 2.10 mm	0.0807 – 0.0827 in.
	2	2.10 – 2.15 mm	0.0827 – 0.0846 in.
	3	2.15 – 2.20 mm	0.0846 – 0.0866 in.
	4	2.20 – 2.25 mm	0.0866 – 0.0886 in.
	5	2.25 – 2.30 mm	0.0886 – 0.0906 in.
	6	2.30 – 2.35 mm	0.0906 – 0.0925 in.
Gear spline piece No. 5 (5–speed) or oil separator (4–speed)			
	Mark		
	A	2.80 – 2.85 mm	0.1102 – 0.1122 in.
	B	2.85 – 2.90 mm	0.1122 – 0.1142 in.
	C	2.90 – 2.95 mm	0.1142 – 0.1161 in.
	D	2.95 – 3.00 mm	0.1161 – 0.1181 in.
	E	3.00 – 3.05 mm	0.1181 – 0.1201 in.
	F	3.05 – 3.10 mm	0.1201 – 0.1220 in.
	G	3.10 – 3.15 mm	0.1220 – 0.1240 in.

Torque Specifications (2WD and 4WD)

Part tightened	N·m	kgf·cm	ft·lbf
Straight screw plug	19	190	14
Extension housing or transfer adaptor x Transmission case	37	380	27
Restrict pin	27	280	20
Shift lever retainer x Extension housing	18	185	13
Back–up light switch	37	380	27
Front bearing retainer x Transmission case	17	170	12
Rear bearing retainer x Intermediate plate	18	185	13
Reverse shift arm bracket	18	185	13
Reverse idler gear shaft stopper bolt	17	175	13
Clutch housing x Transmission case	37	380	27
Shift lever housing bolt	38	390	28
Shift fork x Fork shaft	20	200	14
Speedometer driven gear lock plate (2WD)	11	115	8
Oil receiver x Extension housing (2WD)	11	115	8
Oil receiver x Transfer adaptor (4WD)	13	130	9

MANUAL TRANSMISSION (R150 R150F)

Specifications (2WD and 4WD)

Output shaft			
1 st gear journal diameter	Limit	38.860 mm	1.5299 in.
2nd gear journal diameter	Limit	46.860 mm	1.8449 in.
3rd gear journal diameter	Limit	37.860 mm	1.4905 in.
Flange thickness	Limit	4.70 mm	0.1850 in.
Runout	Limit	0.06 mm	0.0024 in.
Counter gear			
Roller bearing journal diameter	Limit	27.860 mm	1.0968 in.
Gear thrust clearance			
1 st	STD	0.10 – 0.45 mm	0.0039 – 0.0177 in.
	Limit	0.50 mm	0.0197 in.
2nd & 3rd	STD	0.10 – 0.25 mm	0.0039 – 0.0098 in.
	Limit	0.30 mm	0.0118 in.
Counter 5th	STD	0.10 – 0.35 mm	0.0039 – 0.0138 in.
	Limit	0.40 mm	0.0157 in.
Gear oil clearance			
1 st	STD	0.020 – 0.073 mm	0.0008 – 0.0029 in.
	Limit	0.16 mm	0.0063 in.
2nd, 3rd & Counter 5th	STD	0.015 – 0.068 mm	0.0006 – 0.0027 in.
	Limit	0.16 mm	0.0063 in.
Reverse	STD	0.040 – 0.082 mm	0.0016 – 0.0032 in.
	Limit	0.13 mm	0.0051 in.
Shift fork to hub sleeve clearance	Limit	1.0 mm	0.039 in.
Synchronizer ring to gear clearance	STD	0.8 – 1.6 mm	0.031 – 0.063 in.
	Limit	0.6 mm	0.024 in.
Oil seal drive in depth			
Front bearing retainer		10.5 – 11.5 mm	0.413 – 0.453 in.
Speedometer driven gear		25 mm	0.98 in.
Input shaft to synchronizer ring	STD	0.8 – 1.6 mm	0.031 – 0.063 in.
	Limit	0.6 mm	0.024 in.
Reverse idler gear to shift arm shoe	STD	0.05 – 0.25 mm	0.0020 – 0.098 in.
	Limit	0.5 mm	0.020 in.
Input shaft snap ring thickness	Mark		
	A	2.10 – 2.15 mm	0.0827 – 0.0846 in.
	B	2.15 – 2.20 mm	0.0846 – 0.0866 in.
	C	2.20 – 2.25 mm	0.0866 – 0.0886 in.
	D	2.25 – 2.30 mm	0.0886 – 0.0906 in.
	E	2.30 – 2.35 mm	0.0906 – 0.0925 in.
	F	2.35 – 2.40 mm	0.0925 – 0.0945 in.
	G	2.40 – 2.45 mm	0.0945 – 0.0965 in.

Specifications (2WD and 4WD) (Cont'd)

Counter gear snap ring (Front bearing)	Mark		
	A	2.00 – 2.05 mm	0.0787 – 0.0807 in.
	B	2.05 – 2.10 mm	0.0807 – 0.0827 in.
	C	2.10 – 2.15 mm	0.0827 – 0.0846 in.
	D	2.15 – 2.20 mm	0.0846 – 0.0866 in.
	E	2.20 – 2.25 mm	0.0866 – 0.0886 in.
Output shaft snap ring thickness			
Clutch hub No.2	Mark		
	A	1.80 – 1.85 mm	0.0709 – 0.0728 in.
	B	1.85 – 1.90 mm	0.0728 – 0.0748 in.
	C	1.90 – 1.95 mm	0.0748 – 0.0768 in.
	D	1.95 – 2.00 mm	0.0768 – 0.0787 in.
	E	2.00 – 2.05 mm	0.0787 – 0.0807 in.
	F	2.05 – 2.10 mm	0.0807 – 0.0827 in.
	G	2.10 – 2.15 mm	0.0827 – 0.0846 in.
Clutch hub No. 1	Mark		
	A	2.30 – 2.35 mm	0.0906 – 0.0925 in.
	B	2.35 – 2.40 mm	0.0925 – 0.0945 in.
	C	2.40 – 2.45 mm	0.0945 – 0.0965 in.
	D	2.45 – 2.50 mm	0.0965 – 0.0984 in.
	E	2.50 – 2.55 mm	0.0984 – 0.1004 in.
	F	2.55 – 2.60 mm	0.1004 – 0.1024 in.
	G	2.60 – 2.65 mm	0.1024 – 0.1043 in.
Rear	Mark		
	A	2.65 – 2.70 mm	0.1043 – 0.1063 in.
	B	2.70 – 2.75 mm	0.1063 – 0.1083 in.
	C	2.75 – 2.80 mm	0.1083 – 0.1102 in.
	D	2.80 – 2.85 mm	0.1102 – 0.1122 in.
	E	2.85 – 2.90 mm	0.1122 – 0.1142 in.
	F	2.90 – 2.95 mm	0.1142 – 0.1161 in.
	G	2.95 – 3.00 mm	0.1161 – 0.1181 in.
	H	3.00 – 3.05 mm	0.1181 – 0.1201 in.
	J	3.05 – 3.10 mm	0.1201 – 0.1220 in.
	K	3.10 – 3.15 mm	0.1220 – 0.1240 in.
	L	3.15 – 3.20 mm	0.1240 – 0.1260 in.
	M	3.20 – 3.25 mm	0.1260 – 0.1280 in.
	N	3.25 – 3.30 mm	0.1280 – 0.1299 in.
	P	3.30 – 3.35 mm	0.1299 – 0.1319 in.
	Q	3.35 – 3.40 mm	0.1319 – 0.1339 in.
	R	3.40 – 3.45 mm	0.1339 – 0.1358 in.
	S	3.45 – 3.50 mm	0.1358 – 0.1378 in.

Torque Specifications (2WD and 4WD)

Part tightened	N·m	kgf·cm	ft·lbf
Reverse shift arm bracket	18	185	13
Rear bearing retainer x Intermediate plate	18	185	13
Counter gear rear lock nut	127	1,300	94
Shift fork x Shift fork shaft	20	200	14
Straight screw plug	19	190	14
Front bearing retainer x Transmission case	17	170	12
Transmission case x Extension housing	37	380	27
Shift lever housing bolt	38	390	28
Clutch housing x Transmission case	36	370	27
Oil receiver x Extension housing	11	115	8
Back–up light switch	44	450	33
Restrict pin	37	380	27
Shift lever retainer x Extension housing or transfer adaptor	18	185	13

MANUAL TRANSMISSION (installation of Transmission)

Torque Specifications (2WD)

Part tightened	N·m	kgf·cm	ft·lbf
Transmission x Engine	72	730	53
Stiffener plate x Transmission	37	380	27
Starter	39	400	29
Engine rear mounting x Transmission	25	260	19
Clutch tube bracket x Transmission (22R–E)	72	730	53
Clutch release cylinder	12	120	9
Stabilizer bracket	29	300	22
Frame auxiliary crossmember	95	970	70
Engine rear mounting bracket x Support member	58	590	43
Engine rear mounting bracket x Engine rear mounting	29	300	22
Exhaust pipe x Exhaust manifold	62	630	46
Exhaust pipe bracket x Clutch housing			
(22R–E)			
Upper	19	195	14
Lower	69	700	51
(3VZ–E)	39	400	29
Exhaust pipe x Catalytic converter front side (3VZ–E)	39	400	29
Exhaust pipe clamp	19	195	14

Torque Specifications (4WD)

Part tightened		N·m	kgf·cm	ft·lbf
Transfer x Transfer adaptor	W56	39	400	29
	G58, R 150F	37	380	27
Engine rear mounting		25	260	19
Transfer x Dynamic damper (Regular cab w/ Planetary gear type transfer)		37	380	27
Transmission x Engine		72	730	53
Transmission x Stiffener plate		37	380	27
Starter		39	400	29
No. 2 crossmember x Frame		95	970	70
No. 2 crossmember x Engine rear mounting		13	130	9
Stabilizer bracket		29	300	22
Front differential carrier cover x Frame (3VZ–E)		147	1,500	168
Front differential carrier x Frame (3VZ–E)		167	1,700	123
Exhaust pipe x Exhaust manifold		62	630	46
Exhaust pipe bracket x Clutch housing				
Exhaust pipe bracket x Clutch housing	(22R–E)			
	Upper	19	195	14
	Lower	69	700	51
	(3VZ–E)	39	400	29
Exhaust pipe x Catalytic converter front side (3VZ–E)		39	400	29
Exhaust pipe clamp		19	195	14
Clutch release cylinder x Transmission		12	120	9
Propeller shaft dust cover subassembly (G 58, R 150F)				
	A–bolt	37	370	27
	B–bolt	23	230	17
Front propeller shaft x Front differential		74	750	54
Front propeller shaft x Transfer		74	750	54
Rear propeller shaft x Rear differential	3VZ–E	76	780	56
	22R–E	74	750	54
Rear propeller shaft x Transfer	3VZ–E	76	780	56
	22R–E	74	750	54
Rear propeller shaft center bearing x Frame		37	370	27

AUTOMATIC TRANSMISSION (A43D)

Specifications

Line pressure					
Engine idling		D range	427 — 481 kPa	4.3 — 4.9 kgf/cm^2	61 — 70 psi
		R range	510 — 608 kPa	5.2 — 6.2 kgf/cm^2	74 — 88 psi
At stall		D range	1,118 — 1,363 kPa	11.4 — 13.9 kgf/cm^2	162 — 198 psi
(Throttle valve fully opened)		R range	1,373 — 1,716 kPa	14.0 — 17.5 kgf/cm^2	199 — 249 psi
Engine stall revolution			1,900 ± 150 rpm		
Time lag	N range →	D range	Less than 1.2 seconds		
	N range →	R range	Less than 1.5 seconds		
Engine idle speed (A/C OFF)		N range	750 rpm		
Governor pressure (Vehicle speed reference)					
Output shaft rpm	Tire size				
	(P195/75R14)	(P205/75R14)			
1,000	32 km/h (20 mph)	32 km/h (20 mph)	88 — 147 kPa	0.9 — 1.5 kgf/cm^2	13 — 21 psi
1,800	57 km/h (35 mph)	58 km/h (36 mph)	157 — 216 kPa	1.6 — 2.2 kgf/cm^2	23 — 31 psi
3,500	111 km/h (69 mph)	113 km/h (70 mph)	402 — 520 kPa	4.1 — 5.3 kgf/cm^2	58 — 75 psi
Throttle cable adjustment					
Throttle valve fully opened			Between boot end face and inner cable stopper		
			0 — 1 mm	0 — 0.04 in.	
Torque converter sleeve runout		Limit	0.30 mm	0.0118 in.	
Torque converter installation distance			20.0 mm	0.787 in.	
Drive plate runout		Limit	0.20 mm	0.0079 in.	

Shift point km/h (mph)	Throttle valve fully open [ ] Fully closed						
	D range (2 range)						L range
	1 → 2	2 → 3	[3 → O/D]	O/D → 3	3 → 2	2 → 1	2 → 1
	57 — 73 (35 — 45)	106 — 124 (66 — 77)	38 — 52 (24 — 32)	*	95 — 112 (59 — 70)	36 — 49 (22 — 30)	46 — 62 (29 — 39)
	* O/D → 3 down-shift is possible up to maximum speed.						

Torque Specifications

Part tightened		N·m	kgf·cm	ft·lbf
Oil cooler pipe union nut		34	350	25
Torque converter x Drive plate		27	280	20
Drive plate x Crankshaft		83	850	61
Extension housing x Transmission case		34	345	25
Center support x Transmission case		25	260	19
Parking lock pawl bracket		7.4	75	65 in.·lbf
Valve body x Transmission case		10	100	7
Throttle cam		7.4	75	65 in.·lbf
Oil strainer		5.4	55	48 in.·lbf
Oil pan		4.4	45	39 in.·lbf
Governor body		3.9	40	35 in.·lbf
Overdrive solenoid		13	130	9
Control shaft lever		6.9	70	61 in.·lbf
Cooler union		34	350	25
Neutral start switch	Bolt	5.4	55	48 in.·lbf
	Nut	3.9	40	35 in.·lbf

AUTOMATIC TRANSMISSION (A340E)

Specifications

Line pressure				
Engine idling	D range	363 – 422 kPa	3.7 – 4.3 kgf/cm²	53 – 61 psi
	R range	490 – 588 kPa	5.0 – 6.0 kgf/cm²	71 – 85 psi
At stall	D range	932 – 1,178 kPa	9.5 – 12.0 kgf/cm²	135 – 171 psi
(Throttle valve fully opened)	R range	1,294 – 1,638 kPa	13.2 – 16.7 kgf/cm²	188 – 238 psi
Engine stall revolution	C&C	2,200 ± 150 rpm		
	Except C&C	2,450 ± 150 rpm		
Time lag	N range → D range	Less than 1.2 seconds		
	N range → R range	Less than 1.5 seconds		
Engine idling speed (A/C OFF)	N range	800 rpm		
Throttle cable adjustment				
Throttle valve fully opened		Between boot end face and inner cable stopper		
		0 – 1 mm	0 – 0.04 in.	
Torque converter sleeve runout	Limit	0.30 mm	0.0118 in.	
Torque converter installation distance		18.0 mm	0.709 in.	
Drive plate runout	Limit	0.20 mm	0.0079 in.	

Shift point CBU Tire size: P205/75R14 P215/65R15 km/h (mph)			Throttle valve fully open [ ] Fully closed							
			1 → 2	2 → 3	3→ O/D	[3→ O/D]	[O/D→ 3]	O/D→ 3	3 → 2	2 → 1
	D range	NORM	61–66 (38–41)	108–117 (67–73)	143–152 (89–94)	43–48 (27–30)	26–30 (16–19)	136–145 (85–90)	100–105 (62–65)	44–49 (27–30)
		PWR	61–66 (38–41)	119–127 (74–79)	147–156 (91–97)	47–52 (29–32)	26–30 (16–19)	140–149 (87–93)	110–119 (68–74)	44–49 (27–30)
	2 range	NORM PWR	53–57 (33–35)	126–135 (78–84)	–	–	–	–	119–128 (74–80)	47–52 (29–32)
	L range	NORM PWR	–	–	–	–	–	–	101–110 (63–68)	57–62 (35–39)

Lock-up point CBU Tire size: P205/75R14 P215/65R15 km/h (mph)			Throttle valve opening 5%					
			Lock-up ON			Lock-up OFF		
			2nd	*3rd	O/D	2nd	*3rd	O/D
	D range	NORM	–	79–83 (49–52)	79–83 (49–52)	–	71–76 (44–47)	68–73 (42–45)
		PWR	–	61–66 (38–41)	79–83 (49–52)	–	68–73 (42–45)	68–76 (42–47)
	* O/D switch OFF							

Shift point CBU Tire size: 185R14-8 km/h (mph)			Throttle valve fully open [ ] Fully closed							
			1 → 2	2 → 3	3 → O/D	[3 → O/D]	[O/D → 3]	O/D → 3	3 → 2	2 → 1
	D range	NORM	52–56 (32–35)	73–100 (45–62)	135–142 (84–88)	37–41 (23–25)	22–26 (14–16)	130–136 (81–85)	86–90 (53–56)	43–47 (27–29)
		PWR	52–56 (32–35)	102–109 (63–68)	148–154 (92–96)	40–44 (25–27)	22–26 (14–16)	141–148 (88–92)	95–102 (59–63)	43–47 (27–29)
	2 range	NORM PWR	45–49 (28–30)	108–115 (67–71)	–	–	–	–	102–109 (63–68)	40–44 (25–27)
	L range	NORM PWR	–	–	–	–	–	–	87–94 (54–58)	49–53 (30–33)

Lock-up point CBU Tire size: 185R14-8 km/h (mph)			Throttle valve opening 5%					
			Lock-up ON			Lock-up OFF		
			2nd	*3rd	O/D	2nd	*3rd	O/D
	D range	NORM	–	67–71 (42–44)	68–71 (42–44)	–	61–65 (38–40)	58–62 (36–39)
		PWR	–	58–62 (36–39)	68–71 (42–44)	–	52–56 (32–35)	61–65 (38–40)
	* O/D switch OFF							

Specifications (Cont'd)

Shift point C & C Tire size: 185R14-8 185R14-6 (Double tire) km/h (mph)			Throttle valve fully open [ ] Fully closed							
			1 → 2	2 → 3	3 → O/D	[3 → O/D]	[O/D → 3]	O/D → 3	3 → 2	2 → 1
	D range	NORM	43–47 (27–29)	84–91 (52–57)	129–135 (80–84)	73–77 (45–48)	21–25 (13–16)	123–130 (76–81)	77–81 (48–50)	38–42 (24–26)
		PWR	51–55 (32–34)	97–103 (60–64)	132–138 (82–86)	73–77 (45–48)	21–25 (13–16)	126–132 (78–82)	90–97 (56–60)	45–48 (28–30)
	2 range	NORM PWR	43–47 (27–29)	103–110 (64–68)	–	–	–	–	97–104 (60–65)	38–42 (24–26)
	L range	NORM PWR	–	–	–	–	–	–	83–89 (52–55)	47–51 (29–32)

Lock-up point C & C Tire size: 185R14-8 185R14-6 (Double tire) km/h (mph)			Throttle valve opening 5%					
			Lock-up ON			Lock-up OFF		
			2nd	*3rd	O/D	2nd	*3rd	O/D
	D range	NORM	–	73–77 (45–48)	73–77 (45–48)	–	61–65 (38–40)	67–71 (42–44)
		PWR	–	73–77 (45–48)	73–77 (45–48)	–	67–71 (42–44)	67–71 (42–44)
	* O/D switch OFF							

Shift point C & C Tire size: 185R14-6 (Double tire) km/h (mph) (Differential gear ratio 4.300)			Throttle valve fully open [ ] Fully closed							
			1 → 2	2 → 3	3 → O/D	[3 → O/D]	[O/D → 3]	O/D → 3	3 → 2	2 → 1
	D range	NORM	41–45 (25–28)	80–87 (50–54)	123–129 (76–80)	69–73 (43–45)	20–24 (12–15)	117–124 (73–77)	73–77 (45–48)	37–40 (23–25)
		PWR	49–53 (30–33)	92–99 (57–62)	126–132 (78–82)	69–73 (43–45)	20–24 (12–15)	120–126 (75–78)	86–92 (53–57)	42–46 (26–29)
	2 range	NORM PWR	41–45 (25–28)	98–105 (61–65)	–	–	–	–	93–99 (58–62)	37–40 (23–25)
	L range	NORM PWR	–	–	–	–	–	–	79–85 (49–53)	45–48 (28–30)

Lock-up point C & C Tire size: 185R14-6 (Double tire) km/h (mph) (Differential gear ratio 4.300)			Throttle valve opening 5%					
			Lock-up ON			Lock-up OFF		
			2nd	*3rd	O/D	2nd	*3rd	O/D
	D range	NORM	–	69–73 (43–45)	69–73 (43–45)	–	58–62 (36–39)	64–68 (40–42)
		PWR	–	69–73 (43–45)	69–73 (43–45)	–	64–68 (40–42)	64–68 (40–42)
	* O/D switch OFF							

Torque Specifications

Part tightened	N·m	kgf·cm	ft·lbf
Oil cooler pipe union nut	34	350	25
Torque converter x Drive plate	41	420	30
Drive plate x Crankshaft	83	850	61
Extension housing x Transmission case	36	370	27
Parking lock pawl bracket	7.4	75	65 in.·lbf
Valve body x Transmission case	10	100	7
Detent spring x Valve body	10	100	7
Solenoid x Valve body	10	100	7
Oil strainer	10	100	7
Oil pan	7.4	75	65 in.·lbf
Speed sensor	16	160	12
Speedometer driven gear lock plate	16	160	12

Torque Specifications (Cont'd)

Part tightened		N·m	kgf·cm	ft·lbf
Cooler union		29	300	22
Neutral start switch	Bolt	13	130	9
	Nut	6.9	70	61 in.·lbf
Control shaft lever		16	160	12

AUTOMATIC TRANSMISSION (A340H)

Specifications

Line pressure				
Engine idling	D range	422 – 481 kPa	4.3 – 4.9 kgf/cm^2	61 – 70 psi
	R range	520 – 618 kPa	5.3 – 6.3 kgf/cm^2	75 – 90 psi
At stall	D range	1,118 – 1,363 kPa	11.4 – 13.9 kgf/cm^2	162 – 198 psi
(Throttle valve fully opened)	R range	1,373 – 1,716 kPa	14.0 – 17.5 kgf/cm^2	199 – 249 psi
Engine stall revolution		2,850 ± 150 rpm		
Time lag	N range → D range	Less than 1.2 seconds		
	N range → R range	Less than 1.5 seconds		
Engine idling speed (A/C OFF)	N range	850 rpm		
Throttle cable adjustment				
Throttle valve fully opened		Between boot end face and inner cable stopper		
		0 – 1 mm	0 – 0.04 in.	
Torque converter sleeve runout	Limit	0.30 mm	0.0118 in.	
Torque converter installation distance		18.0 mm	0.709 in.	
Drive plate runout	Limit	0.20 mm	0.0079 in.	

Shift point km/h (mph)	Transfer shift position "H2" or "H4"		Throttle valve fully open [ ] Fully closed							
			1 → 2	2 → 3	3 → O/D	[3 → O/D]	[O/D → 3]	O/D → 3	3 → 2	2 → 1
	D range	NORM	50–53 (31–33)	90–96 (56–60)	131–138 (81–86)	35–39 (22–24)	21–25 (13–16)	125–132 (78–82)	84–91 (52–57)	40–44 (25–27)
		PWR	50–53 (31–33)	90–96 (56–60)	131–138 (81–86)	38–42 (24–26)	21–25 (13–16)	125–132 (78–82)	84–91 (52–57)	40–44 (25–27)
	2 range	NORM PWR	43–46 (27–29)	103–109 (64–68)	–	–	–	–	97–103 (60–64)	38–42 (24–42)
	L range	NORM PWR	–	–	–	–	–	–	82–89 (51–55)	47–51 (29–32)

Lock-up point km/h (mph)	Transfer shift position "H2" or "H4"		Throttle valve opening 5 %					
			Lock-up ON			Lock-up OFF		
			2nd	*3rd	O/D	2nd	*3rd	O/D
	D range	NORM	–	52–56 (32–35)	64–68 (40–42)	–	50–53 (31–33)	55–59 (34–37)
		PWR	–	52–56 (32–35)	64–68 (40–42)	–	50–53 (31–33)	55–59 (34–37)

* O/D switch OFF

Torque Specifications
(Refer to the A340E automatic transmission)

AUTOMATIC TRANSMISSION (A340F)
Specifications

Line pressure				
Engine idling	D range	363 – 422 kPa	3.7 – 4.3 kgf/cm²	53 – 61 psi
	R range	490 – 588 kPa	5.0 – 6.0 kgf/cm²	71 – 85 psi
At stall	D range	932 – 1,177 kPa	9.5 – 12.0 kgf/cm²	135 – 171 psi
	R range	1,294 – 1,638 kPa	13.2 – 16.7 kgf/cm²	188 – 238 psi
Engine stall revolution		2,200 ± 150 rpm		
Time lag	N range → D range	Less than 1.2 seconds		
	N range → R range	Less than 1.5 seconds		
Engine idling speed (A/C OFF)	N range	800 rpm		
Throttle cable adjustment				
Throttle valve fully opened		Between boot end face and inner cable stopper		
		0 – 1 mm	0 – 0.04 in.	
Torque converter sleeve runout	Limit	0.30 mm	0.0118 in.	
Torque converter installation distance		20.0 mm	0.787 in.	
Drive plate runout		0.20 mm	0.0079 in.	

Shift point km/h (mph)			Throttle valve fully open [ ] Fully closed							
			1 → 2	2 → 3	3 → O/D	[3→ O/D]	[O/D→ 3]	O/D → 3	3 → 2	2 → 1
	D range	NORM	44–48 (27–30)	93–99 (58–61)	134–141 (83–87)	35–39 (22–24)	21–25 (13–16)	128–135 (79–84)	87–94 (54–58)	40–43 (25–27)
		PWR	47–51 (29–32)	93–99 (58–61)	148–155 (92–96)	50–53 (31–33)	21–25 (13–16)	143–149 (89–92)	87–94 (54–58)	41–45 (25–28)
	2 range	NORM PWR	43–46 (27–29)	103–109 (64–68)	–	–	–	–	97–103 (60–64)	38–42 (24–26)
	L range	NORM PWR	–	–	–	–	–	–	82–89 (51–55)	47–51 (29–32)

Lock-up point km/h (mph)			Throttle valve opening 5%					
			Lock-up ON			Lock-up OFF		
			2nd	*3rd	O/D	2nd	*3rd	O/D
	D range	NORM	–	41–45 (25–28)	59–63 (37–39)	–	38–42 (24–26)	55–59 (34–37)
		PWR	–	55–59 (34–37)	75–79 (47–49)	–	50–53 (31–33)	70–73 (43–45)
	* O/D switch OFF							

Torque Specifications
(Refer to the A340E automatic transmission)

TRANSFER (RF1A Type Transfer W56)
Specifications

Output shaft bearing thrust clearance			Less than 0.10 mm (0.0039 in.)	
Output shaft snap ring thickness		Mark		
		0	2.40 – 2.45 mm	0.0945 – 0.0965 in.
		1	2.45 – 2.50 mm	0.0965 – 0.0984 in.
		2	2.50 – 2.55 mm	0.0984 – 0.1004 in.
		3	2.55 – 2.60 mm	0.1004 – 0.1024 in.
		4	2.60 – 2.65 mm	0.1024 – 0.1043 in.
		5	2.65 – 2.70 mm	0.1043 – 0.1063 in.
Output shaft runout		Limit	0.03 mm	0.0012 in.
Output shaft outer diameter	Limit	Part A	44.984 mm	1.7710 in.
		Part B	34.984 mm	1.3773 in.
Low gear to output shaft oil clearance		STD	0.010 – 0.055 mm	0.0004 – 0.0022 in.
		Limit	0.075 mm	0.0030 in.
Low gear thrust clearance		STD	0.10 – 0.25 mm	0.0039 – 0.0098 in.
		Limit	0.30 mm	0.0118 in.
Transfer drive gear to output shaft oil clearance		STD	0.009 – 0.051 mm	0.0004 – 0.0020 in.
		Limit	0.071 mm	0.0028 in.
Transfer drive gear thrust clearance		STD	0.09 – 0.27 mm	0.0035 – 0.0106 in.
		Limit	0.32 mm	0.0126 in.
Input shaft bearing thrust clearance			Less than 0.15 mm (0.0059 in.)	
Input shaft snap ring thickness		Mark		
		1	2.05 – 2.10 mm	0.0807 – 0.0827 in.
		3	2.15 – 2.20 mm	0.0846 – 0.0866 in.
		5	2.25 – 2.30 mm	0.0886 – 0.0906 in.
Counter shaft bearing thrust clearance			Less than 0.15 mm (0.0059 in.)	
Counter shaft snap ring thickness		Mark		
		1	2.10 – 2.15 mm	0.0827 – 0.0846 in.
		3	2.20 – 2.25 mm	0.0866 – 0.0886 in.
Idler gear shaft bearing thrust clearance			Less than 0.15 mm (0.0059 in.)	
Idler gear shaft snap ring thickness		Mark		
		A	1.50 – 1.55 mm	0.0591 – 0.0610 in.
		B	1.60 – 1.65 mm	0.0630 – 0.0650 in.
Shift fork to hub sleeve clearance		Limit	1.0 mm	0.039 in.
Speedometer driven gear oil seal depth			20 mm	0.79 in.
Front drive gear oil seal depth			7 mm	0 28 in

Torque Specifications

Part tightened	N·m	kgf·cm	ft·lbf
Adaptor x Reduction gear case	39	400	29
Reduction gear case x Front case x Rear case	39	400	29
Rear case x Extension housing	39	400	29
Front case x Rear case	39	400	29
Reduction case x Front case	39	400	29
Reduction case x Transfer case cover	8.8	90	78 in.·lbf
Output shaft x Companion flange	123	1,250	90
Front drive gear bearing retainer x Front case	18	185	13
Front case x Bearing retainer	18	185	13
Straight screw plug	12	120	9
Transfer indicator switch	34	350	25
Speedometer driven gear lock plate	11	115	8

TRANSFER (VF1A Type Tansfer G58 R150F A340F)

Specifications

Oil pump body	Body clearance	STD	0.10 – 0.16 mm	0.0039 – 0.0063 in.
		Limit	0.16 mm	0.0063 in.
	Tip clearance	STD	0.08 – 0.16 mm	0.0031 – 0.0063 in.
		Limit	0.16 mm	0.0063 in.
	Side clearance	STD	0.03 – 0.08 mm	0.0012 – 0.0031 in.
		Limit	0.08 mm	0.0031 in.
Rear output shaft assem–bly	Drive sprocket thrust clearance	STD	0.10 – 0.25 mm	0.0039 – 0.0098 in.
		Limit	0.25 mm	0.0098 in.
	Driven sprocket oil clearance	STD	0.010 – 0.055 mm	0.0004 – 0.0022 in.
		Limit	0.055 mm	0.0022 in.
	Rear output shaft journal diameter			
	Part A	Limit	27.98 mm	1.1016 in.
	Part B	Limit	36.98 mm	1.4559 in.
	Front drive shift fork to hub sleeve clearance	Limit	1.0 mm	0.039 in.
	High and low shift fork to hub sleeve clearance	Limit	1.0 mm	0.039 in.
	Rear output shaft snap ring thickness	Mark		
		A	2.10 – 2.15 mm	0.0827 – 0.0846 in.
		B	2.15 – 2.20 mm	0.0846 – 0.0866 in.
		C	2.20 – 2.25 mm	0.0866 – 0.0886 in.
		D	2.25 – 2.30 mm	0.0886 – 0.0906 in.
		E	2.30 – 2.35 mm	0.0906 – 0.0925 in.
		F	2.35 – 2.40 mm	0.0925 – 0.0945 in.
		G	2.40 – 2.45 mm	0.0945 – 0.0965 in.
		H	2.45 – 2.50 mm	0.0965 – 0.0984 in.
		J	2.50 – 2.55 mm	0.0984 – 0.1004 in.
		K	2.00 – 2.05 mm	0.0787 – 0.0807 in.
		L	2.05 – 2.10 mm	0.0807 – 0.0827 in.

Specifications (Cont'd)

Input shaft	Input shaft journal outer diameter	Limit	47.59 mm	1.8736 in.
	Input shaft bushing diameter	Limit	39.14 mm	1.5409 in.
	Synchronizer ring to sprocket clearance	STD	1.15 – 1.8 5 mm	0.0453 – 0.0728 in.
		Limit	0.8 mm	0.0031 in.
	Input shaft snap ring thickness	Mark		
		A	2.10 – 2.15 mm	0.0827 – 0.0846 in.
		B	2.15 – 2.20 mm	0.0846 – 0.0866 in.
		C	2.20 – 2.25 mm	0.0866 – 0.0886 in.
		D	2.25 – 2.30 mm	0.0886 – 0.0906 in.
		E	2.30 – 2.35 mm	0.0906 – 0.0925 in.
		F	2.35 – 2.40 mm	0.0925 – 0.0945 in.
		G	2.40 – 2.45 mm	0.0945 – 0.0965 in.
		H	2.45 – 2.50 mm	0.0965 – 0.0984 in.
		J	2.50 – 2.55 mm	0.0984 – 0.1004 in.
		K	2.55 – 2.60 mm	0.1004 – 0.1024 in.
		L	2.60 – 2.65 mm	0.1024 – 0.1043 in.
		M	2.65 – 2.70 mm	0.1043 – 0.1063 in.
		N	2.70 – 2.75 mm	0.1063 – 0.1083 in.
		P	2.75 – 2.80 mm	0.1083 – 0.1102 in.
		Q	2.80 – 2.85 mm	0.1102 – 0.1122 in.
		R	2.85 – 2.90 mm	0.1122 – 0.1142 in.
		S	2.90 – 2.95 mm	0.1142 – 0.1161 in.
		T	2.95 – 3.00 mm	0.1161 – 0.1181 in.
		U	3.00 – 3.05 mm	0.1181 – 0.1201 in.
Planetary gear	Pinion gear thrust clearance	STD	0.11 – 0.86 mm	0.0043 – 0.0339 in.
		Limit	0.86 mm	0.0339 in.
	Pinion gear oil clearance	STD	0.009 – 0.038 mm	0.0004 – 0.0015 in.
		Limit	0.038 mm	0.0015 in.
	Outer bearing snap ring thickness	Mark		
		1	1.45 – 1.50 mm	0.0571 – 0.0591 in.
		2	1.50 – 1.55 mm	0.0591 – 0.0610 in.
		3	1.55 – 1.60 mm	0.0610 – 0.0630 in.
		4	1.60 – 1.65 mm	0.0630 – 0.0650 in.
		5	1.65 – 1.70 mm	0.0650 – 0.0669 in.
	Inner bearing depth		5.0 – 5.6 mm	0.197 – 0.220 in.
Oil seal	Speedometer driven gear oil seal depth		25 mm	0.98 in.
	Shift fork shaft oil seal depth		–0.5 – 0.5 mm	–0.020 – 0.020 in.

Torque Specifications

Part tightened	N·m	kgf·cm	ft·lbf
Oil pump plate	7.4	75	65 in.·lbf
Straight screw plug for oil pump body	29	300	22
Straight screw plug for ring gear	19	190	14
Oil pump body x Front case	11	115	8
Separator with oil strainer	18	185	13
Straight screw plug for shift fork shaft	19	190	14
Front case x Rear case	37	380	27
Extension housing	11	115	8
Companion flange lock nut	118	1,200	87
Control retainer or upper cover	18	185	13
Front retainer	11	115	8
Transfer indicator switch	37	380	27
Transfer assembly x Transmission	37	380	27
Transfer L4 position switch	37	380	27

TRANSFER (Installation of Transfer)

Torque Specifications

Part tightened		N·m	kgf·cm	ft·lbf
Transfer x Transfer adaptor	W56	39	400	29
	G 58, R 150F, A340F	37	380	27
Engine rear mounting		25	260	19
Transfer x Dynamic damper (Regular cab wl Planetary gear type transfer)		37	380	27

PROPELLER SHAFT

Specifications

Spider axial play			Less than 0.05 mm (0.0020 in.)	
Spider bearing selection		Mark		
Bearing cup outer diameter		None	29.008 – 29.021 mm	1.1420 – 1.1426 in.
		Red	29.028 – 29.041 mm	1.1428 – 1.1433 in.
Bearing hole inner diameter		None	29.000 – 29.020 mm	1.1417 – 1.1425 in.
		Drill	29.021 – 29.042 mm	1.1426 – 1.1434 in.
Snap ring thickness	Color	Mark		
	None	1	2.100 – 2.150 mm	0.0827 – 0.0846 in.
	None	2	2.150 – 2.200 mm	0.0846 – 0.0866 in.
	None	3	2.200 – 2.250 mm	0.0866 – 0.0886 in.
	Brown	None	2.250 – 2.300 mm	0.0886 – 0.0906 in.
	Blue	None	2.300 – 2.350 mm	0.0906 – 0.0925 in.
	None	6	2.350 – 2.400 mm	0.0925 – 0.0945 in.
	None	7	2.400 – 2.450 mm	0.0945 – 0.0965 in.
	None	8	2.450 – 2.500 mm	0.0965 – 0.0984 in.
Runout		Limit	0.8 mm	0.031 in.

Torque Specifications

Part tightened		N·m	kgf·cm	ft·lbf
Front differential x Front propeller shaft (4WD)		74	750	54
Front propeller shaft x Transfer (4WD)		74	750	54
Propeller shaft x Rear differential	3VZ–E (M/T)	76	780	56
	Ex. 3VZ–E (M/T)	74	750	54
Propeller shaft x Transfer 3VZ–E (M/T)		76	780	56
	Ex. 3VZ–E (M/T)	74	750	54
Intermediate shaft x Propeller shaft (4WD)				
	3VZ–E (M/T)	76	780	56
	Ex. 3VZ–E (M/T)	74	750	54
Propeller shaft x Differential (2WD)		74	750	54
Intermediate shaft x Propeller shaft (2WD)		74	750	54
Center support bearing x Frame		36	370	27
Intermediate shaft x Center bearing x Joint flange				
	1 st	181	1,850	134
	2nd	Loosen nut		
	3rd	69	700	51
Front propeller shaft No. 2 dust cover set bolts		17	175	13
Front propeller shaft No. 2 dust cover set nut		13	135	10
(wl VF 1 A type transfer and A340H)				
Front propeller shaft dust cover subassembly x Bracket		23	230	17
Front propeller shaft dust cover subassembly x Transfer		37	370	27
Propeller shaft protector x Frame		29	300	22

SUSPENSION AND AXLE
Specifications (Front/2WD)

	Tire size	Pressure kPa (kgf/cm2, psi)	
		Front	Rear
Cold tire inflation pressure	P195/75R14 P205/75R14 P215/65R15	200 (2.0, 29)	240 (2.4, 35)
	185R14LT-6PR	220 (2.2, 32)	220 (2.2, 32)
	185R14LT-8PR	200 (2.0, 29)	450 (4.5, 65)

	Model	Tire size	Clearance mm (in.)	
			Front	Rear
Chassis ground clearance	RN80L – TRMDEA RN80L – TRMDEK	P195/75R14	257 (10.12)	263 (10.35)
	RN80L – TRSDEA RN80L – TRSDEK	P195/75R14	257 (10.12)	263 (10.35)
	RN80L – TRMREA RN80L – TRMREK	P195/75R14	260 (10.23)	268 (10.55)
	RN85L – TRMDEA RN85L – TRMDEK	P195/75R14	263 (10.35)	261 (10.28)
	RN85L – TRSDEA RN85L – TRSDEK	P195/75R14	262 (10.31)	261 (10.28)
	RN90L – CRMDEA RN90L – CRMDEK	P205/75R14	278 (10.94)	264 (10.39)
	RN90L – CRSDEA RN90L – CRSDEK	P205/75R14	278 (10.94)	264 (10.39)
	VZN85L – THMDEA	185R14LT – 8PR	260 (10.24)	284 (11.18)
	VZN85L – THSDEA	185R14LT – 8PR	258 (10.16)	283 (11.14)
	VZN85L – TWMREA6	185R14LT – 6PR	259 (10.20)	234 (9.21)
	VZN85L – TINSREA6	185R14LT – 6PR	259 (10.24)	235 (9.25)
	VZN90L – CRMDEA VZN90L – CRMDEK	P205/75R14	277 (10.91)	266 (10.47)
	VZN90L – CRSDEA VZN90L – CRSDEK	P205/75R14	277 (10.91)	265 (10.43)
	VZN90L – CRMGEA	P205/75R14	273 (10.75)	262 (10.31)
	VZN90L – CRPGEA	P205/75R14	273 (10.75)	262 (10.31)
		P215/75R15	274 (10.79)	263 (10.35)
	VZN95L – TWMREA6	185R14LT – 6PR	259 (10.20)	232 (9.13)
	VZN95L – TWSREA6 VZN95L – TWSREK6	185R14LT – 6PR	259 (10.20)	232 (9.13)

	Model	Camber	Caster	Steering axis inclination	Toe–in mm (in.)
Front wheel alignment	RN80L – TRSDEA RN80L – TRSDEK	0°30′ ± 45′	0°43′ ± 45′	10°00′ ± 45′	1.32±2 (0.0520±0.08)
	RN80L – TRMDEA RN80L – TRMDEK	0°30′ ± 45′	0°44′ ± 45′	10°00′ ± 45′	1.32±2 (0.0520±0.08)
	RN80L – TRMREA RN80L – TRMREK	0°28′ ± 45′	0°40′ ± 45′	10°01′ ± 45′	1.74±2 (0.0685±0.08)

Specifications (Front/2WD) (Cont'd)

	Model	Camber	Caster	Steering axis inclination	Toe–in mm (in.)
Front wheel alignment (cont'd)	RN85L – TRMDEA RN85L – TRMDEK	0°27′ ± 45′	0°59′ ± 45′	10°02′ ± 45′	2.09±2 (0.0822±0.08)
	RN85L – TRSDEA RN85L – TRSDEK	0°27′ ± 45′	0°58′ ± 45′	10°02′ ± 45′	2.09±2 (0.0822±0.08)
	RN90L – CRSDEA RN90L – CRSDEK	0°23′ ± 45′	1°15′ ± 45′	10°06′ ± 45′	3.27±2 (0.1287±0.08)
	RN90L – CRMDEA RN90L – CRMDEK	0°23′ ± 45′	1°15′ ± 45′	10°06′ ± 45′	3.27±2 (0.1287±0.08)
	VZN85L – THMDEA	0°29′ ± 45′	0°34′ ± 45′	10°00′ ± 45′	5.61±2 (0.2209±0.08)
	VZN85L – THSDEA	0°30′ ± 45′	0°33′ ± 45′	10°00′ ± 45′	4.85±2 (0.1909±0.08)
	VZN85L – TWMREA6	0°29′ ± 45′	1°46′ ± 45′	10°00′ ± 45′	5.73±2 (0.2256±0.08)
	VZN85L – TWSREA6	0°29′ ± 45′	1°45′ ± 45′	10°00′ ± 45′	5.73±2 (0.2256±0.08)
	VZN90L – CRMDEA VZN90L – CRMDEK	0°23′ ± 45′	1°11′ ± 45′	10°06′ ± 45′	3.27±2 (0.1287±0.08)
	VZN90L – CRSDEA VZN90L – CRSDEK	0°23′ ± 45′	1°12′ ± 45′	10°06′ ± 45′	3.27±2 (0.1287±0.08)
	VZN90L – CRMGEA	0°25′ ± 45′	1°13′ ± 45′	10°04′ ± 45′	2.82±2 (0.1110±0.08)
	VZN90L – CRPGEA	0°25′ ± 45′	1°12′ ± 45′	10°04′ ± 45′	2.82±2 (0.1110±0.08)
	VZN95L – T1IVMREA6	0°29′ ± 45′	1°47′ ± 45′	10°00′ ± 45′	5.73±2 (0.2256±0.08)
	VZN95L – TWSREA6 VZN95L – TWSREK6	0°29′ ± 45′	1°46′ ± 45′	10°00′ ± 45′	5.73±2 (0.2256±0.08)

Wheel angle	Max.	Inside wheel	$34^{\circ}\,{}^{+1^{\circ}}_{-2^{\circ}}$
		Outside wheel	30°
	At 20° (outside wheel)		22°15′ (Inside wheel)

Disc wheel lateral runout	Limit	1.2 mm	0.047 in.	
Wheel bearing preload (starting) (rotating load at hub bolt)		5.9 – 17.7 N	0.6 – 1.8 kgf	1.3 – 4.0 lbf
		Add oil seal frictional force		
Hub axial play	Limit	0.05 mm	0.0020 in.	
Lower ball joint vertical play		0 mm	0 in.	
Upper ball joint vertical play	Limit	2.3 mm	0.091 in.	
Ball joint rotation condition	Lower ball joint	0.1–4.9 N·m	1–50 kgf·cm	1–43 in.·lbf
	Upper ball joint	2.0–3.9 N·m	20–40 kgf·cm	17–35 in.·lbf

Specifications (Front/4WD)

Cold tire inflation pressure	Tire size	Pressure kPa (kgf/cm^2, psi) Front	Rear
	P225/75R15	180 (1.8, 26)	200 (2.0, 29)
	31X10.5 R15LT	180 (1.8, 26)	200 (2.0, 29)

Front wheel alignment (Specifications with vehicle height set to standard height)			
Standard vehicle height for alignment inspection	Front	Difference between the height at center of tip of drive shaft and the height at center of tip of front side adjusting cam bolt	58.5 mm (2.303 in.)
	Rear	Difference between the height of center of rear leaf spring front bushing and the height of center of rear axle shaft	61.0 mm (2.402 in.)
Camber			0°45′ ± 45′
	Left–right error		30′ or less
Caster			2°30′ ± 45′
	Left–right error		30′ or less
Steering axis inclination			11°50′ ± 45′
	Left–right error		30′ or less
Toe–in			1 ± 2 mm (0.04 ± 0.08 in.)
Wheel angle	Max. Inside wheel		$32°00'^{+1°}_{-2°}$
	Outside wheel		31°
	At 20° (outside wheel)		21°10′ (inside wheel)

Front wheel alignment (Specifications at vehicle height of non–loaded vehicle)	Model	Tire size	Height mm (in.) Front: Height at center of tip of front side adjusting cam bolt	Rear: Height of center of rear leaf spring front bushing
Vehicle height of non–loaded vehicle	RN101 L – TRLDEA RN101 L – TRLDEK	P225/75R15	281.6 (11.087)	426.9 (16.807)
	RN101 L – TRMDEA	P225/75R15	281.8 (11.095)	426.9 (16.807)
	RN101 L – TRPDEA	P225/75R15	281.4 (11.079)	424.9 (16.728)
	RN106L – TRMDEA	P225/75R15	285.9 (11.256)	427.5 (16.831)
	RN106L – TRMDEA RN106L – TRLDEK	P225/75R15	285.6 (11.244)	427.5 (16.831)
	RN110L – CRMDEA	P225/75R15	292.0 (11.496)	423.2 (16.661)
	RN110L – CRPDEA	P225/75R15	291.4 (11.472)	420.2 (16.543)
	RN110L – CRLDEA	P225/75R15	291.3 (11.468)	423.1 (16.657)
	RN110L – CRLDEK	P225/75R15	291.1 (11.461)	426.4 (16.787)
	VZN100L – TRMDEA VZN100L – TRMDEK	P225/75R15	279.5 (11.003)	422.5 (16.634)
		31X10.5R15LT	311.0 (12.244)	454.1 (17.878)
	VZN105L – TRMDEA VZN105L – TRMDEK	P225/75R15	283.6 (11.165)	422.6 (16.638)
		31X10.5R15LT	315.1 (12.405)	454.3 (17.886)
	VZN110L – CRMDEA	P225/75R15	289.8 (11.409)	418.8 (16.448)
		31X10.5R15LT	321.3 (12.650)	450.4 (17.732)
	VZN110L – CRMDEK	P225/75R15	289.8 (11.409)	422.1 (16.618)
		31X10.5R15LT	321.3 (12.650)	453.4 (17.850)
	VZN110L – CRPDEA	P225/75R15	289.4 (11.394)	417.4 (16.433)
		31X10.5R15LT	321.0 (12.638)	449.0 (17.677)

Specifications (Front/4WD) (Cont'd)

mm (in.)

Front wheel alignment	Vehicle height of non–loaded vehicle	Model	Tire size	Height: Front (Height at center of tip of front side adjusting cam bolt)	Height: Rear (Height of center of rear leaf spring front bushing)
Specifications at vehicle height of non–loaded vehicle		VZN110L – CRPDEK	P225/75R15	289.2 (11.386)	420.6 (16.559)
			31X10.5R15LT	320.7 (12.626)	452.3 (17.807)
		VZN110L – CRMGEA	P225/75R15	283.1 (11.146)	415.6 (16.362)
			10.5R15LT	314.7 (12.390)	447.3 (17.610)
		VZN110L – CRMGEK	P225/75R15	282.9 (11.138)	418.8 (16.488)
			31X10.5R15LT	314.4 (12.378)	450.5 (17.736)
		VZN110L – CRPGEA VZN110L – CRPGEK	P225/75R15	282.7 (11.130)	413.9 (16.296)
			31X10.5R15LT	314.3 (12.374)	445.6 (17.543)

	Alignment	Model	Camber	Caster	Steering axis inclination	Toe–in mm (in.)
		RN106L series	0°42′ ± 45′	1°41′ ± 45′	11°53′ ± 45′	2.22±2 (0.0874±0.08)
		VZN100L series	0°43′ ± 45′	1°41′ ± 45′	11°52′ ± 45′	1.91±2 (0.0751±0.08)
		VZN105L series	0°42′ ± 45′	1°45′ ± 45′	11°53′ ± 45′	2.22±2 (0.0874±0.08)
		RN101L – TRMDEA	0°43′ ± 45′	1°38′ ± 45′	11°52′ ± 45′	1.92±2 (0.0756±0.08)
		RN101L – TRLDEA	0°43′ ± 45′	1°38′ ± 45′	11°52′ ± 45′	1.92±2 (0.0756±0.08)
		RN101L – TRLDEK	0°43′ ± 45′	1°37′ ± 45′	11°52′ ± 45′	1.92±2 (0.0756±0.08)
		RN101L – TRPDEA	0°43′ ± 45′	1°41′ ± 45′	11°52′ ± 45′	1.91±2 (0.0752±0.08)
		RN110L – CRMDEA	0°40′ ± 45′	1°49′ ± 45′	11°55′ ± 45′	2.69±2 (0.1059±0.08)
		RN110L – CRPDEA	0°40′ ± 45′	1°52′ ± 45′	11°55′ ± 45′	2.69±2 (0.1059±0.08)
		RN110L – CRLDEA	0°40′ ± 45′	1°49′ ± 45′	11°55′ ± 45′	2.68±2 (0.1055±0.08)
		RN110L – CRLDEK	0°40′ ± 45′	1°44′ ± 45′	11°55′ ± 45′	2.68±2 (0.1055±0.08)
		VZN110L – CRMDEA	0°40′ ± 45′	1°52′ ± 45′	11°55′ ± 45′	2.69±2 (0.1059±0.08)
		VZN110L – CRMDEK	0°40′ ± 45′	1°48′ ± 45′	11°55′ ± 45′	2.69±2 (0.1059±0.08)
		VZN110L – CRPDEA	0°40′ ± 45′	1°53′ ± 45′	11°55′ ± 45′	2.69±2 (0.1059±0.08)
		VZN110L – CRPDEK	0°40′ ± 45′	1°49′ ± 45′	11°55′ ± 45′	2.69±2 (0.1059±0.08)
		VZN110L – CRMGEA	0°42′ ± 45′	1°55′ ± 45′	11°53′ ± 45′	2.25±2 (0.0886±0.08)
		VZN110L – CRMGEK	0°42′ ± 45′	1°50′ ± 45′	11°53′ ± 45′	2.25±2 (0.0886±0.08)
		VZN110L – CRPGEA	0°42′ ± 45′	1°56′ ± 45′	11°53′ ± 45′	2.25±2 (0.0886±0.08)
		Camber left–right error			30′ or less	
		Caster left–right error			30′ or less	
		Steering axis inclination left–right error			30′ or less	
		Wheel angle Max. Inside wheel			$32°00'^{+1°}_{-2°}$	
		Outside wheel			31°	
		At 200 (outside wheel)			21°10′ (inside wheel)	

Disc wheel lateral runout Limit	1.2 mm		0.047 in.
Wheel bearing preload (starting) (rotating load at hub bolt)	28 – 56 N	2.9 – 5.7 kgf	6.4 – 12.6 lbf
Free wheeling hub ring oil clearance	0.3 mm		0.012 in.
Automatic locking hub brake shoe thickness Minimum	1.5 mm		0.059 in.
Front drive shaft thrust clearance	0.075 – 0.690 mm		0.0030 – 0.0272 in.
Maximum	1.0 mm		0.039 in.

Specifications (Front/4WD) (Cont'd)

Front drive shaft thrust clearance adjusting shim thickness		1.80 mm 2.25 mm		0.0709 in. 0.0886 in.
Front drive shaft grease capacity				
	Outboard joint (black)	195 – 205 g		0.43 – 0.45 lb
	Inboard joint (brown)	270 – 280 g		0.60 – 0.62 lb
Front differential drive pinion bearing preload				
(starting)	New bearing	1.2 – 1.9 N·m	12 – 19 kgf·cm	10.4 – 16.5 in.·lbf
	Reused bearing	0.6 – 1.0 N·m	6 – 10 kgf·cm	5.2 – 8.7 in.·lbf
Front differential companion flange deviation				
	Maximum vertical runout	0.10 mm		0.0039 in.
	Maximum lateral runout	0.10 mm		0.0039 in.
Front differential ring gear runout		0.07 mm		0.0028 in.
Front differential ring gear backlash		0.13 – 0.18 mm		0.0051 – 0.0071 in.
Front differential preload (starting).	Total preload	Add drive pinion preload		
		0.4 – 0.6 N·m	4 – 6 kgf·cm	3.5 – 5.2 in.·lbf
Front differential side gear backlash		0.05 – 0.20 mm		0.0020 – 0.0079 in.
Front differential rear oil seal drive in depth		1.5 mm		0.059 in.
Clutch sleeve clearance (A.D.D.)	Limit	0.35 mm		0.0138 in.
Nut tightening limit		70 mm		3.43 in.
Lower ball joint vertical play		2.3 mm		0.091 in.
Upper ball joint vertical play	Limit	0 mm		0 in.
Lower ball joint turning torque		0.1 – 4.9 N·m	1 – 50 kgf·cm	1 – 43 in.·lbf
Upper ball joint turning torque		2.0 – 3.9 N·m	20 – 40 kgf·cm	17 – 35 in.·lbf

Specifications (Rear)

Rear axle shaft (Single tire)	Maximum shaft runout		2.0 mm		0.079 in.
	Maximum flange runout		0.2 mm		0.008 in.
Rear axle shaft and hub (Double tire)	Maximum shaft runout		2.0 mm		0.079 in.
	Preload (starting)		Add oil seal frictional force		
			1.0 – 14.7 N	0.1 – 1.5 kgf	0.2 – 3.3 lbf
7.5 in. differential	Drive pinion bearing preload (starting)				
		New bearing	1.2 – 1.9 N·m	12 – 19 kgf·cm	10.4 – 16.5 in.·lbf
		Reused bearing	0.6 – 1.0 N·m	6 – 10 kgf·cm	5.2 – 8.7 in.·lbf
	Total preload (starting)		Add drive pinion bearing preload		
		New and reused bearing	0.4 – 0.6 N·m	4 – 6 kgf·cm	3.5 – 5.2 in.·lbf
	Drive pinion to ring gear backlash		0.13 – 0.18 mm		0.0051 – 0.0071 in.
	Pinion gear to side gear backlash		0.05 – 0.20 mm		0.0020 – 0.0079 in.
	Ring gear runout	Limit	0.07 mm		0.0028 in.
	Companion flange deviation				
		Maximum vertical runout	0.10 mm		0.0039 in.
		Maximum lateral runout	0.10 mm		0.0039 in.
8.0 in. differential	Drive pinion bearing preload (starting)				
	2 pinion type	New bearing	1.9 – 2.5 N·m	19 – 26 kgf·cm	16.5 – 22.6 in.·lbf
		Reused bearing	0.9 – 1.3 N·m	9 – 13 kgf·cm	7.8 – 11.3 in.·lbf
	4 pinion type	New bearing	1.0 – 1.6 N·m	10 – 16 kgf·cm	8.7 – 13.9 in.·lbf
		Reused bearing	0.5 – 0.8 N·m	5 – 8 kgf·cm	4.3 – 6.9 in.·lbf

Specifications (Rear) (Cont'd)

8.0 in. differential (cont'd)	Total preload (starting)	Add drive pinion bearing preload 0.4 – 0.6 N·m 4 – 6 kgf·cm	3.5 – 5.2 in.·lbf
	Drive pinion to ring gear backlash	0.13 – 0.18 mm	0.0051 – 0.0071 in.
	Pinion gear to side gear– backlash	0.05 – 0.20 mm	0.0020 – 0.0079 in.
	Ring gear runout Limit	0.10 mm	0.0039 in.
	Companion flange deviation		
	Maximum vertical runout	0.10 mm	0.0039 in.
	Maximum lateral runout	0.10 mm	0.0039 in.

Torque Specifications (Front/2WD)

Part tightened	N·m	kgf·cm	ft·lbf
Knuckle stopper bolt lock nut	34	350	25
Tie rod clump bolt	22	225	16
Steering knuckle x Upper ball joint	108	1,100	80
Steering knuckle x Lower ball joint	142	1,450	105
Steering knuckle x Tie rod	90	920	67
Upper suspension arm x Upper ball joint	31	320	23
Lower suspension arm x Lower ball joint	127	1,300	94
Torsion bar spring lock nut	83	850	61
Lower suspension arm x Strut bar	95	970	70
Lower suspension arm x Stabilizer bar	13	130	9
Lower suspension arm x Shock absorber	18	185	13
Shock absorber x Frame	25	250	18
Lower arm shaft nut	226	2,300	166
Upper arm shaft x Frame	96	980	71
Upper suspension arm set bolt	126	1,280	93
Strut bar x Frame	123	1,250	90
Stabilizer bar bracket x Frame	29	300	22
Hub nut	103	1,050	76

Torque Specifications (Front/4WD)

Part tightened	N·m	kgf·cm	ft·lbf
Knuckle stopper bolt lock nut	47	480	35
Free wheeling hub body x Axle hub	31	315	23
Free wheeling hub body x Front drive shaft	18	185	13
Free wheeling hub body x Cover	10	100	7
Axle hub bearing lock nut	47	480	35
Upper suspension arm x Upper ball joint	33	340	25
Upper ball joint x Steering knuckle	142	1,450	105
Steering knuckle arm x Steering knuckle	183	1,870	135
Lower suspension arm x Shock absorber	137	1,400	101
Lower suspension arm x Stabilizer bar	25	260	19
Lower suspension arm x Lower ball joint	142	1,450	105
Front drive shaft x Side gear shaft	83	845	61
Front differential front mounting bolt	147	1,500	108
Front differential rear left mounting bolt	167	1,700	123

Torque Specifications (Front/4WD) (Cont'd)

Part tightened	N·m	kgf·cm	ft·lbf
Front differential rear right mounting bolt	167	1,700	123
Differential tube x Bracket	127	1,300	94
Front differential x Bracket	78	800	58
Ring gear x Differential case	97	985	71
Differential carrier x Differential tube (wlo A.D.D.¿Differential	85	900	65
carrier x Side bearing cap	78	800	58
Differential carrier x Carrier cover	47	475	34
Lower suspension arm x Frame	196	2,000	145
Upper suspension arm shaft x Frame	178	1,810	131
A.D.D. clutch case x Differential carrier	78	800	58
A.D.D. clutch case x Differential to be	78	800	58
A.D.D. clutch case cover x A.D.D. clutch case	21	210	15
Upper suspension arm shaft lock nut	226	2,300	166
Upper suspension arm x Torque arm	87	890	64
Shock absorber x Frame	25	250	18
Stabilizer bar bracket x Frame	29	300	22
Hub nut	103	1,050	76

Torque Specifications (Rear)

Part tightened	N·m	kgf·cm	ft·lbf
Ring gear x Differential case	97	985	71
Bearing cap x Differential carrier	78	800	58
Differential carrier x Axle housing — Single tire	25	250	18
Double tire	31	315	23
Rear axle housing x Bearing retainer	69	700	51
Spring center bolt	44	450	33
Front spring bracket x Hanger pin			
Rubber bushing type	91	930	67
Press–installed bushing type	157	1,600	116
Rear spring shackle x Leaf spring	91	930	67
Rear shock absorber x U–bolt seat — 2WD	25	260	19
4WD	72	730	53
Rear shock absorber x Body — 2W D	25	260	19
4WD	72	730	53
U–bolt x U–bolt seat			
2WD — 0.5 ton	147	1,500	108
1 ton, C &C	123	1,250	90
4WD — Xtra cab	123	1,250	90
Regular cab	147	1,500	108
Stabilizer bar x Stabilizer bar link	36	365	26
Stabilizer bar bracket x Axle housing	13	130	9
Hub nut	103	1,050	76

BRAKE SYSTEM

Specifications

Brake pedal	Pedal height (from asphalt sheet)		
	2WD	148 – 153 mm	5.83 – 6.02 in.
	4WD	145 – 150 mm	5.71 – 5.91 in.
	Stop light switch to pedal clearance	0.5 – 2.4 mm	0.02 – 0.09 in.
	Pedal freeplay	3 – 6 mm	0.12 – 0.24 in.
	Pedal reserve distance at 490 N (50 kgf, 110.2 lbf)		
	2WD 22R-E engine	More than 70 mm (2.76 in.)	
	3VZ-E engine		
	1 ton	More than 75 mm (2.95 in.)	
	1/2 ton	More than 65 mm (2.56 in.)	
	C & C		
	SRW	More than 75 mm (2.95 in.)	
	DRW	More than 55 mm (2.17 in.)	
	4WD	More than 65 mm (2.56 in.)	
Brake booster	Booster push rod piston clearance		
	w/ SST	0 mm	0 in.
Front disc brake	**PD 60, 66 type**		
	Disc thickness		
	PD 60 type STD	25.0 mm	0.984 in.
	Limit	23.0 mm	0.906 in.
	PD 66 type STD	30.0 mm	1.181 in.
	Limit	28.0 mm	1.102 in.
	Disc runout		
	PD 60 type Limit	0.09 mm	0.0035 in.
	PD 66 type Limit	0.12 mm	0.0047 in.
	Pad thickness		
	PD 60 type STD	9.5 mm	0.374 in.
	Limit	1.0 mm	0.039 in.
	PD 66 type STD	9.7 mm	0.382 in.
	Limit	1.0 mm	0.039 in.
	FS 17, 18 type		
	Disc thickness STD	22.0 mm	0.866 in.
	Limit	20.0 mm	0.787 in.
	Disc runout Limit	0.09 mm	0.0035 in.
	Pad thickness		
	FS 17 type STD	9.5 mm	0.374 in.
	Limit	1.0 mm	0.039 in.
	FS 18 type STD	10.0 mm	0.394 in.
	Limit	1.0 mm	0.039 in.
	S12 + 12 type		
	Disc thickness STD	20.0 mm	0.787 in.
	Limit	18.0 mm	0.709 in.
	Disc runout Limit	0.09 mm	0.0035 in.
	Pad thickness STD	9.5 mm	0.374 in.
	Limit	1.5 mm	0.059 in.

Specifications (Cont'd)

Rear brake	2WD Drum inner diameter	STD	254.0 mm	10.000 in.
		Limit	256.0 mm	10.079 in.
	Lining thickness	STD	5.0 mm	0.197 in.
		Limit	1.0 mm	0.039 in.
	4WD Drum inner diameter	STD	295.0 mm	11.614 in.
		Limit	297.0 mm	11.693 in.
	Lining thickness	STD	6.0 mm	0.236 in.
		Limit	1.0 mm	0.039 in.
Parking brake	2W D	1/2 ton	12 – 18 clicks	
		1 ton	11 – 17 clicks	
	4WD		11 – 17 clicks	

Torque Specifications

Part tightened		N·m	kgf·cm	ft·lbf
Master cylinder x Piston stopper bolt		10	100	7
Master cylinder x Reservoir		1.7	17.5	15.2 in.·lbf
Master cylinder x Brake booster		13	130	9
Brake tube union nut		15	155	11
Brake booster clevis lock nut		25	260	19
Brake booster x Pedal bracket		13	130	9
Front brake wheel cylinder x Backing plate		18	185	13
Front brake cylinder installation bolt (PD 60, 66 type disc)		39	400	29
Front brake cylinder sliding pin (FS 17, 18 type disc)		88	900	65
Torque plate x Steering knuckle	2WD	108	1,100	80
	4WD	123	1,250	90
Rear brake wheel cylinder x Backing plate	Leading–trailing type	10	100	7
	Duo–servo type	14	145	10
Bleeder plug		11	110	8
LSP & BV (LSPV) bracket x Frame		19	195	14
LSP & BV (LSPV) x LSP & BV (LSPV) bracket		13	130	9
LSP & BV (LSPV) spring x LSP & BV (LSPV) bracket		18	185	13
LSP & BV (LSPV) spring x Shackle		18	185	13
LSP & BV (LSPV) shackle lock nut		25	250	18
LSP & BV (LSPV) shackle x Shackle bracket		13	130	9
LSP & BV (LSPV) shackle bracket x Rear axle housing		19	195	14
Brake actuator x PS pressure line		47	475	34
Brake actuator x Actuator bracket		13	130	9
Actuator bracket x Frame		28	290	21
Speed sensor x Rear differential		19	195	14
Speed sensor wire harness x Clamp bracket		19	195	14
Clamp bracket x Rear differential		19	195	14
Deceleration sensor x Body		5.4	55	48 in.·lbf

STEERING

Specifications

Steering column	Steering wheel freeplay	Maximum	30 mm		1.18 in.
	Pawl stopper	Mark			
		1 or A	12.65 – 12.75 mm		0.4980 – 0.5020 in.
		2 or B	12.55 – 12.65 mm		0.4941 – 0.4980 in.
		3 or C	12.45 – 12.55 mm		0.4902 – 0.4941 in.
		4 or D	12.35 – 12.45 mm		0.4862 – 0.4902 in.
		5 or E	12.25 – 12.35 mm		0.4823 – 0.4862 in.
Manual gear housing	Sector shaft thrust clearance		0.05 mm		0.0020 in.
	Thrust washer thickness (2WD)		1.95 mm		0.0768 in.
			2.00 mm		0.0787 in.
			2.05 mm		0.0807 in.
			2.10 mm		0.0827 in.
			2.15 mm		0.0847 in.
	Thrust washer thickness (4WD)		1.95 mm		0.0768 in.
			2.00 mm		0.0787 in.
			2.05 mm		0.0807 in.
	Worm bearing preload	(2WD) at Starting	0.3 – 0.5 N·m	3 – 5 kgf·cm	2.6 – 4.3 in.·lbf
		(4WD) at Starting	0.3 – 0.5 N·m	3.5 – 5 kgf·cm	3.0 – 4.3 in.·lbf
	Total preload	(2WD) at Starting	0.8 – 1.0 N·m	8 – 10.5 kgf·cm	6.9 – 9.1 in.·lbf
		(4WD) at Starting	0.8 – 1.1 N·m	8 – 11.0 kgf·cm	6.9 – 9.5 in.·lbf
	Sector shaft end cover bushing inside diameter (4WD)	Maximum	36.07 mm		1.4201 in.
Power steering	Drive belt tension	New belt	441 – 667 N·m	45 – 68 kgf	100 – 150 lbf
		Used belt	265 – 441 N·m	27 – 45 kgf	60 – 100 lbf
	Maximum rise of oil level		5 mm		0.20 in.
	Oil pressure at idle speed	Minimum	7,335 kPa	75 kgf/cm^2	1,067 psi
	Steering effort (w/o PPS)	Maximum	39 N	4 kgf	8.8 lbf
	Steering effort (w/ PPS)	Maximum	29 N	3 kgf	6.6 lbf
	Rotor shaft bushing oil clearance	STD	0.01 – 0.03 mm		0.0004 – 0.0012 in.
		Maximum	0.07 mm		0.0028 in.
	Rotor to cam ring oil clearance (RN series)	Maximum	0.06 mm		0.0024 in.
	Vane plate to rotor groove clearance	Maximum	0.03 mm		0.0012 in.
	Vane plate	Minimum length	14.988 mm		0.5901 in.
		Minimum height	8.1 mm		0.319 in.
		Minimum thickness	1.797 mm		0.0707 in.
	Vane plate length	Rotor and cam ring mark			
		None	14.996 – 14.998 mm		0.59039 – 0.59047 in.
		1	14.994 – 14.996 mm		0.59032 – 0.59039 in.
		2	14.992 – 14.994 mm		0.59024 – 0.59032 in.
		3	14.990 – 14.992 mm		0.59016 – 0.59024 in.
		4	14.988 – 14.990 mm		0.59008 – 0.59016 in.

Specifications (Cont'd)

Power steering (cont'd)	Flow control valve spring length STD	37 mm	1.46 in.
	Minimum	35 mm	1.38 in.
	Pump rotating torque Maximum	0.3 N·m 2.8 kgf·cm	2.4 in.·lbf
	Worm gear valve body ball clearance	0.15 mm	0.0059 in.
	Cross shaft adjusting screw thrust clearance	0.03 – 0.05 mm	0.0012 – 0.0020 in.
	Worm gear preload at Starting	0.3 – 0.5 N·m 3 – 5.5 kgf·cm	2.6 – 4.8 in.·lbf
	Total preload at Starting	0.5 – 0.9 N·m 5 – 9.5 kgf·cm	4.3 – 8.3 in.·lbf

Torque Specifications

	Part tightened	N·m	kgf·cm	ft·lbf
Steering column	Steering wheel set nut	34	350	25
	Column tube x Body	25	260	19
	Breakaway bracket x Body	25	260	19
	Column hole cover x Body	7.8	80	69 in.·lbf
	Main shaft x Intermediate shaft	35	360	26
	Intermediate shaft x Worm shaft	35	360	26
	Turn signal bracket x Upper column tube	7.8	80	69 in.·lbf
	Tilt pawl set nut	5.9	60	52 in.·lbf
	Compression spring set bolt	7.8	80	69 in.·lbf
	Tilt lever retainer set nut	15	150	11
	Protector x Breakaway bracket	19	195	14
	Tilt lever assembly installation bolt	2.0	20	17 in.·lbf
Manual gear housing	**[2WD]**			
	Gear housing x Body	118	1,200	87
	Intermediate shaft x Worm shaft	35	360	26
	Relay rod x Pitman arm	90	920	67
	Pitman arm x Sector shaft	123	1,250	90
	Worm bearing adjusting screw lock nut	109	1,110	80
	End cover set bolt	18	185	13
	Sector shaft adjusting screw lock nut	27	275	20
	Bleeder plug	7.4	75	65 in.·lbf
	[4WD]			
	Gear housing x Body	142	1,450	105
	Intermediate shaft x Worm shaft	35	360	26
	Pitman arm x Sector shaft	177	1,800	130
	Relay rod x Pitman arm	90	920	67
	Worm bearing adjusting screw lock nut	109	1,110	80
	End cover set bolt	93	1,000	72
	Sector shaft adjusting screw lock nut	44	450	33
	Bleeder plug	20	200	14

Torque Specifications (Cont'd)

	Part tightened		N·m	kgf·cm	ft·lbf
Power steering (PS pump)	Pressure tube x PS pump (RN series/4WD)		36	370	27
	Return hose clamp	(RN series)	1.5	15	13 in.·lbf
		(VZN series)	3.9	40	35 in.·lbf
	Pressure tube union bolt		47	475	34
	Pulley set nut		43	440	32
	PS pump x Bracket				
	(RN series)		39	400	29
	(VZN series)	Through bolt	58	590	43
		Adjusting bolt	39	400	29
	PS pump x Adjusting stay (VZN series)		41	420	30
	Reservoir tank x PS pump (VZN series)				
		12 mm bolt	13	130	9
		14 mm bolt	41	420	30
	Suction port union (RN series)		13	130	9
	Air control valve		36	370	27
	Pressure port union		69	700	51
	Front housing x Rear housing (RN series)		46	470	34
Power steering (Gear housing)	Pressure tube		44	450	33
	Return tube	Union bolt	47	475	34
		Others	49	500	36
	Return hose clamp	4WD	3.9	40	35 in.·lbf
	Intermediate shaft x Worm shaft		35	360	26
	Gear housing x Body	2WD	118	1,200	87
		4WD	142	1,450	105
	Pitman arm x Cross shaft		177	1,800	130
	Cross shaft adjusting screw set nut		46	470	34
	Cross shaft end cover set bolt		46	470	34
	Bleeder plug		7.8	80	69 in.·lbf
	Plunger guide nut		20	205	15
	Worm gear valve body set bolt		46	470	34
	Solenoid valve set bolt (wl PPS)		10	100	7
Steering linkage (2WD)	Pitman arm x Sector shaft	MS	123	1,250	90
		PS	177	1,800	130
	Pitman arm x Relay rod		90	920	67
	Tie rod tube clamp bolt		25	260	19
	Tie rod x Relay rod		90	920	67
	Tie rod x Knuckle arm		90	920	67
	Relay rod x Idler arm		59	600	43
	Knuckle arm x Steering knuckle		108	1,100	80
	Steering damper x Frame		13	130	9
	Steering damper x Relay rod		59	600	43
	Idler arm x Idler arm bracket		78	800	58
	Idler arm bracket x Frame		118	1,200	87

Torque Specifications (Cont'd)

	Part tightened	N·m	kgf·cm	ft·lbf
Steering linkage (4WD)	Pitman arm x Sector shaft	177	1,800	130
	Pitman arm x Relay rod	90	920	67
	Tie rod tube clamp bolt	25	260	19
	Tie rod x Relay rod	90	920	67
	Tie rod x Knuckle arm	90	920	67
	Relay rod x Idler arm	59	600	43
	Relay rod x Steering damper	59	600	43
	Knuckle arm x Steering knuckle	183	1,870	135
	Idler arm x Idler arm bracket	78	800	58
	Idler arm bracket x Frame	142	1,450	105

BODY

Torque Specifications

Part tightened	N·m	kgf·cm	ft·lbf
MOON ROOF			
Removable roof hinge case x Body	3.4	35	30 in.·lbf
Removable roof lock base x Body	5.9	60	52 in.·lbf
Removable roof hinge x Removable roof	2.9	30	26 in.·lbf
Removable roof handle x Removable roof	2.9	30	26 in.·lbf
ONE–TOUCH TAIL GATE			
Tail gate stay x Tail gate	14	140	10
SEAT			
Front Seat			
Seat adjuster x Body	37	375	27
Rear Jump Seat (Extra Cab)			
Back panel trim x Body	4.9	50	43 in.·lbf
Seat cushion x Body	4.9	50	43 in.·lbf
SEAT BELT			
Seat belt anchor x Body	43	440	32
Seat belt guide x Body	43	440	32
Buckle x Body	43	440	32

LUBRICANT

Item			Capacity			Classification
			Liters	U S qts	Imp. qts	
Manual transmission oil						
2W D	G57		2.2	2.3	1.9	API GL–4 or GL–5 SAE 75W–90
	R 150		3.0	3.2	2.6	API GL–4 or GL–5 SAE 75W–90
4WD	G58		3.9	4.1	3.4	API GL–4 or GL–5 SAE 75W–90
	R 150F		3.0	3.2	2.6	
Automatic transmission fluid						ATF DEXRON 11
A43D	Dry fill		6.5	6.9	5.7	
	Drain and refill		2.4	2.5	2.1	
A340E	Dry fill		7.2	7.6	6.3	
	Drain and refill		1.6	1.7	1.4	
A340H						
(Transmission)	Dry fill		10.3	10.9	9.1	
	Drain and refill		4.5	4.8	4.0	
(Transfer)	Dry fill		1.1	1.2	1.0	
	Drain and refill		0.8	0.8	0.7	
A340F	Dry fill		7.6	8.0	6.7	
	Drain and refill		1.6	1.7	1.4	
Transfer oil	W56 (RF 1 A)		1.6	1.7	1.4	API GL–4 or GL–5
	G 58, R 150F, A340F (VF 1 A)		1.1	1.2	1.0	SAE 75W–90
Differential oil						Standard differential API GL–5 hypoid gear oil Above –18°C (0°F) SAE 90 Below –18°C (0°F) SAE 80W–90 or 80W A.D. D. (4WD Front only) TOYOTA ”GEAR OIL SUPER” oil or hypoid gear oil API GL–5 SAE 75W–90
2WD	7.5 in.		1.35	1.4	1.2	
	8.0 in.	2 pinion	1.8	1.9	1.6	
		4 pinion	2.2	2.3	1.9	
4WD	Front	Standard differential	1.6	1.7	1.4	
		A.D.D.	1.86	2.0	1.6	
	Rear		2.2	2.3	1.9	
Steering gear box oil						API GL–4, SAE 90
	2W D		380 – 400 cc	23.2 – 24.4 cu in.		
	4WD		400 cc	24.4 cu in.		