SUZUKI

VZ800

SERVICE MANUAL

99500-38050-01E

FOREWORD

This manual contains an introductory description on the SUZUKI VZ800 and procedures for its inspection/service and overhaul of its main components. Other information considered as generally known is not included.

Read the GENERAL INFORMATION section to familiarize yourself with the motorcycle and its maintenance. Use this section as well as other sections to use as a guide for proper inspection and service. This manual will help you know the motorcycle better so that you can assure your customers of fast and reliable service.

- ** This manual has been prepared on the basis of the latest specifications at the time of publication. If modifications have been made since then, differences may exist between the content of this manual and the actual motorcycle.*
- ** Illustrations in this manual are used to show the basic principles of operation and work procedures. They may not represent the actual motorcycle exactly in detail.*
- ** This manual is written for persons who have enough knowledge, skills and tools, including special tools, for servicing SUZUKI motorcycles. If you do not have the proper knowledge and tools, ask your authorized SUZUKI motorcycle dealer to help you.*

⚠ WARNING

Inexperienced mechanics or mechanics without the proper tools and equipment may not be able to properly perform the services described in this manual.
Improper repair may result in injury to the mechanic and may render the motorcycle unsafe for the rider and passenger.

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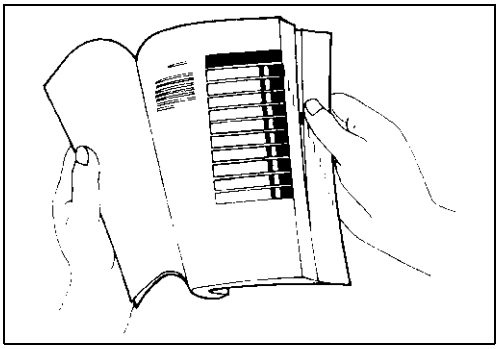
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HOW TO USE THIS MANUAL

TO LOCATE WHAT YOU ARE LOOKING FOR:

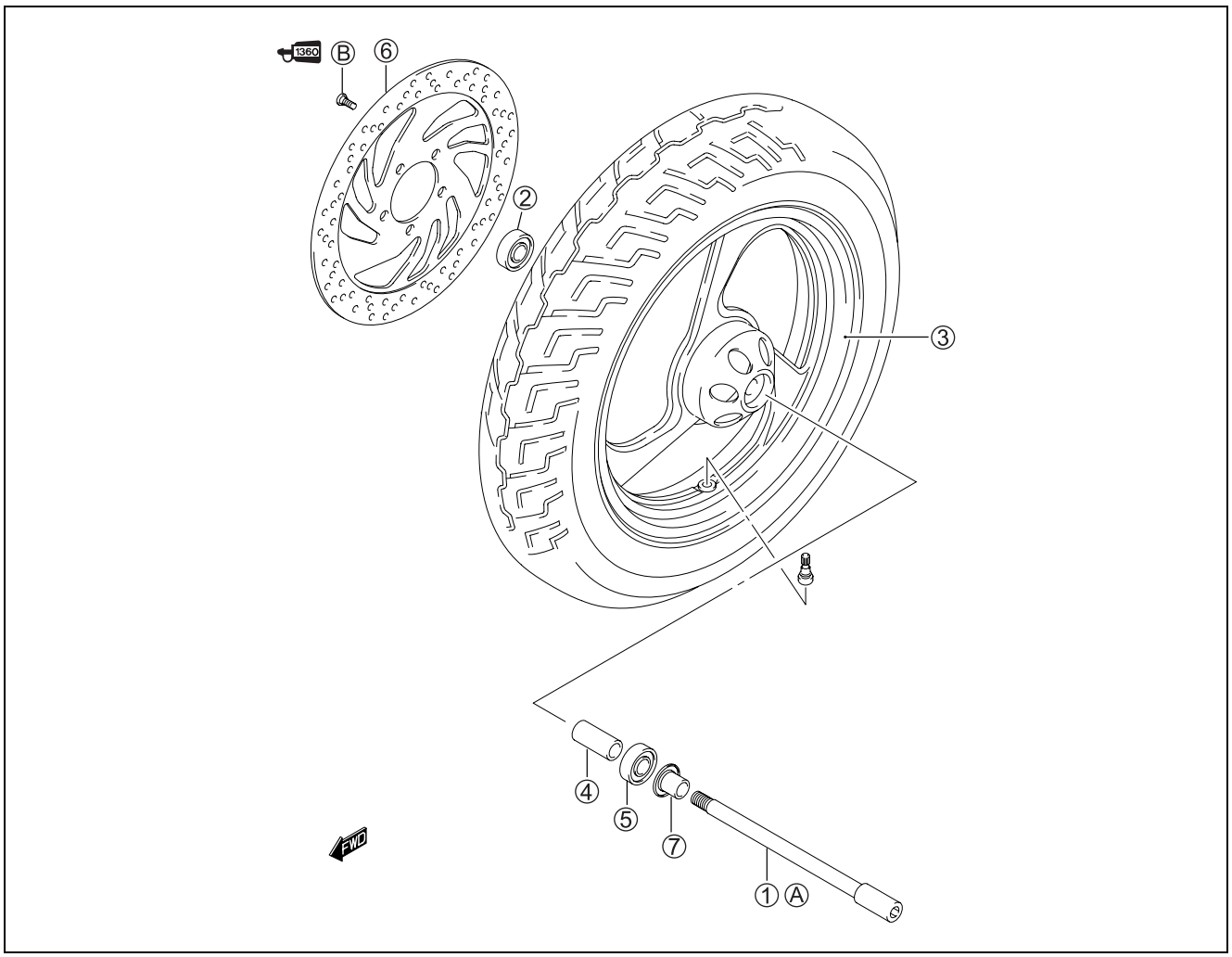
1. The text of this manual is divided into sections.
2. The section titles are listed in the GROUP INDEX.
3. Holding the manual as shown at the right will allow you to find the first page of the section easily.
4. The contents are listed on the first page of each section to help you find the item and page you need.



COMPONENT PARTS AND WORK TO BE DONE

Under the name of each system or unit, is its exploded view. Work instructions and other service information such as the tightening torque, lubricating points and locking agent points, are provided.

Example: Front wheel

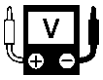
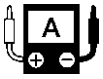
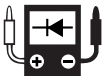


①	Front axle	⑥	Brake disc
②	Bearing (R)	⑦	Spacer
③	Front wheel		
④	Spacer	Ⓐ	Front axle
⑤	Bearing (L)	Ⓑ	Brake disc mounting bolt

ITEM	N·m	kgf-m	lb-ft
Ⓐ	65	6.5	47.0
Ⓑ	23	2.3	16.5

SYMBOL

Listed in the table below are the symbols indicating instructions and other information necessary for servicing. The meaning of each symbol is also included in the table.

SYMBOL	DEFINITION	SYMBOL	DEFINITION
	Torque control required. Data beside it indicates specified torque.		Apply THREAD LOCK SUPER “1360”. 99000-32130
	Apply oil. Use engine oil unless otherwise specified.		Use engine coolant. 99000-99032-11X
	Apply molybdenum oil solution. (Mixture of engine oil and SUZUKI MOLY PASTE in a ratio of 1 : 1)		Use fork oil. 99000-99044-L01
	Apply SUZUKI SUPER GREASE “A”. 99000-25030 (USA) 99000-25010 (Others)		Apply or use brake fluid.
	Apply SUZUKI MOLY PASTE. 99000-25140		Measure in voltage range.
	Apply SUZUKI SILICONE GREASE. 99000-25100		Measure in resistance range.
	Apply SUZUKI BOND “1207B”. 99000-31140		Measure in current range.
	Apply SUZUKI BOND “1216B”. 99000-31230		Measure in diode test range.
	Apply THREAD LOCK SUPER “1303”. 99000-32030		Measure in continuity test range.
	Apply THREAD LOCK SUPER “1322”. 99000-32110 (Except USA)		Use special tool.
	Apply THREAD LOCK “1342”. 99000-32050		Indication of service data.

ABBREVIATIONS USED IN THIS MANUAL

A

ABDC	: After Bottom Dead Center
AC	: Alternating Current
ACL	: Air Cleaner, Air Cleaner Box
API	: American Petroleum Institute
ATDC	: After Top Dead Center
ATM Pressure	: Atmospheric Pressure Atmospheric Pressure Sensor (APS)
A/F	: Air Fuel Mixture

B

BBDC	: Before Bottom Dead Center
BTDC	: Before Top Dead Center
B+	: Battery Positive Voltage

C

CKP Sensor	: Crankshaft Position Sensor (CKPS)
CKT	: Circuit
CLP Switch	: Clutch Lever Position Switch (Clutch Switch)
CO	: Carbon Monoxide
CPU	: Central Processing Unit

D

DC	: Direct Current
DMC	: Dealer Mode Coupler
DOHC	: Double Over Head Camshaft
DRL	: Daytime Running Light

E

ECM	: Engine Control Module Engine Control Unit (ECU) (FI Control Unit)
EOT Sensor	: Engine Oil Temperature Sensor (EOTS), Oil Temp. Sensor
EVAP	: Evaporative Emission
EVAP Canister	: Evaporative Emission Canister (Canister)

F

FI	: Fuel Injection, Fuel Injector
FP	: Fuel Pump
FPR	: Fuel Pressure Regulator
FP Relay	: Fuel Pump Relay

G

GEN	: Generator
GND	: Ground
GP Switch	: Gear Position Switch

H

HC	: Hydrocarbons
HO2 Sensor	: Heated Oxygen Sensor (HO2S)

I

IAP Sensor	: Intake Air Pressure Sensor (IAPS)
IAT Sensor	: Intake Air Temperature Sensor (IATS)
IG	: Ignition

L

LCD	: Liquid Crystal Display
LED	: Light Emitting Diode (Malfunction Indicator Lamp)
LH	: Left Hand

M

MAL-Code	: Malfunction Code (Diagnostic Code)
Max	: Maximum
MIL	: Malfunction Indicator Lamp (LED)
Min	: Minimum

N

NOx	: Nitrogen Oxides

O

OHC	: Over Head Camshaft
OPS	: Oil Pressure Switch

P

PCV	: Positive Crankcase Ventilation (Crankcase Breather)

R

RH	: Right Hand
ROM	: Read Only Memory

S

SAE	: Society of Automotive Engineers
SDS	: Suzuki Diagnosis System
STC System	: Secondary Throttle Control System (STCS)
STP Sensor	: Secondary Throttle Position Sensor (STPS)
ST Valve	: Secondary Throttle Valve (STV)
STV Actuator	: Secondary Throttle Valve Actuator (STVA)

T

TO Sensor	: Tip Over Sensor (TOS)
TP Sensor	: Throttle Position Sensor (TPS)

WIRE COLOR

B	: Black	Gr	: Gray	R	: Red
Bl	: Blue	Lbl	: Light blue	W	: White
Br	: Brown	Lg	: Light green	Y	: Yellow
Dg	: Dark green	O	: Orange		
G	: Green	P	: Pink		

B/Bl	: Black with Blue tracer	B/Br	: Black with Brown tracer
B/G	: Black with Green tracer	B/Lg	: Black with Light green tracer
B/R	: Black with Red tracer	B/W	: Black with White tracer
B/Y	: Black with Yellow tracer	Bl/B	: Blue with Black tracer
Bl/G	: Blue with Green tracer	Bl/R	: Blue with Red tracer
Bl/W	: Blue with White tracer	Bl/Y	: Blue with Yellow tracer
Br/B	: Brown with Black tracer	Br/W	: Brown with White tracer
G/B	: Green with Black tracer	G/W	: Green with White tracer
G/Y	: Green with Yellow tracer	Gr/B	: Gray with Black tracer
Gr/R	: Gray with Red tracer	Gr/W	: Gray with White tracer
Lg/G	: Light green with Green tracer	O/B	: Orange with Black tracer
O/Bl	: Orange with Blue tracer	O/G	: Orange with Green tracer
O/R	: Orange with Red tracer	O/W	: Orange with White tracer
O/Y	: Orange with Yellow tracer	P/W	: Pink with White tracer
R/B	: Red with Black tracer	R/Bl	: Red with Blue tracer
W/B	: White with Black tracer	W/Bl	: White with Blue tracer
W/R	: White with Red tracer	Y/B	: Yellow with Black tracer
Y/Bl	: Yellow with Blue tracer	Y/G	: Yellow with Green tracer
Y/R	: Yellow with Red tracer	Y/W	: Yellow with White tracer

GENERAL INFORMATION

1

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COUNTRY AND AREA CODES

The following codes stand for the applicable country(-ies) and area(-s).

CODE	COUNTRY or AREA	EFFECTIVE FRAME NO.
E-02	U.K.	JS1B4111200100001 –
E-03	U.S.A. (Except for California)	JS1VS56A 52100001 –
E-19 (VZ800)	E.U.	JS1B4111100100001 –
E-19 (VZ800U)	E.U.	JS1B4211100100001 –
E-24	Australia	JS1B4111300100001 –
E-28	Canada	JS1VS56A 52100001 –
E-33	California (U.S.A.)	JS1VS56A 52100001 –

WARNING/CAUTION/NOTE

Please read this manual and follow its instructions carefully. To emphasize special information, the symbol and the words WARNING, CAUTION and NOTE have special meanings. Pay special attention to the messages highlighted by these signal words.

⚠ WARNING

Indicates a potential hazard that could result in death or injury.

CAUTION

Indicates a potential hazard that could result in motorcycle damage.

NOTE:
Indicates special information to make maintenance easier or instructions clearer.

Please note, however, that the warnings and cautions contained in this manual cannot possibly cover all potential hazards relating to the servicing, or lack of servicing, of the motorcycle. In addition to the WARNINGS and CAUTIONS stated, you must use good judgement and basic mechanical safety principles. If you are unsure about how to perform a particular service operation, ask a more experienced mechanic for advice.

GENERAL PRECAUTIONS

⚠ WARNING

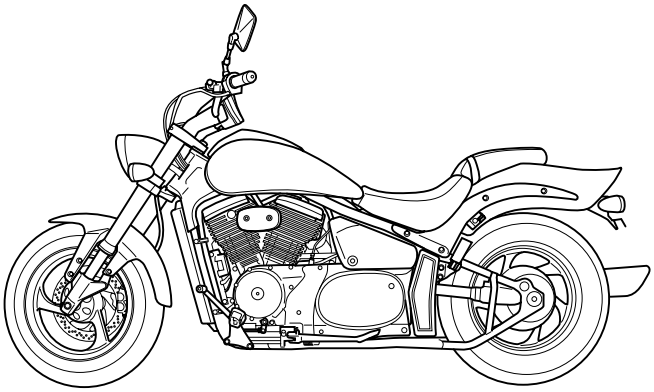
- **Proper service and repair procedures are important for the safety of the service mechanic and the safety and reliability of the motorcycle.**
- **When 2 or more persons work together, pay attention to the safety of each other.**
- **When it is necessary to run the engine indoors, make sure that exhaust gas is forced outdoors.**
- **When working with toxic or flammable materials, make sure that the area you work in is well-ventilated and that you follow all of the material manufacturer's instructions.**
- **Never use gasoline as a cleaning solvent.**
- **To avoid getting burned, do not touch the engine, engine oil, radiator and exhaust system until they have cooled.**
- **After servicing the fuel, oil, water, exhaust or brake systems, check all lines and fittings related to the system for leaks.**

CAUTION

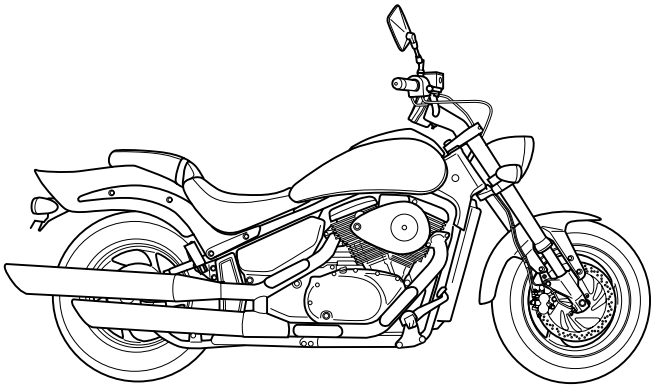
*** If parts replacement is necessary, replace the parts with Suzuki Genuine Parts or their equivalent.**
*** When removing parts that are to be reused, keep them arranged in an orderly manner so that they may be reinstalled in the proper order and orientation.**
*** Be sure to use special tools when instructed.**
*** Make sure that all parts used in reassembly are clean. Lubricate them when specified.**
*** Use the specified lubricant, bond or sealant.**
*** When removing the battery, disconnect the negative cable first and then the positive cable.**
*** When reconnecting the battery, connect the positive cable first and then the negative cable, and replace the terminal cover on the positive terminal.**
*** When performing service to electrical parts, if the service procedures do not require use of battery power, disconnect the negative cable from the battery.**
*** When tightening the cylinder head and case bolts or nuts, tighten the larger sizes first. Always tighten the bolts and nuts diagonally from the inside toward outside and to the specified tightening torque.**
*** Whenever you remove oil seals, gaskets, packing, O-rings, locking washers, self-locking nuts, cotter pins, circlips and certain other parts as specified, be sure to replace them with new ones. Also, before installing these new parts, be sure to remove any left over material from the mating surfaces.**
*** Never reuse a circlip. When installing a new circlip, take care not to expand the end gap larger than required to slip the circlip over the shaft. After installing a circlip, always ensure that it is completely seated in its groove and securely fitted.**
*** Use a torque wrench to tighten fasteners to the specified torque. Wipe off grease and oil if a thread is smeared with them.**
*** After reassembling, check parts for tightness and proper operation.**

*** To protect the environment, do not unlawfully dispose of used motor oil, engine coolant and other fluids: batteries and tires.**
*** To protect Earth's natural resources, properly dispose of used motorcycle and parts.**

SUZUKI VZ800K5 ('05-MODEL)



RIGHT SIDE



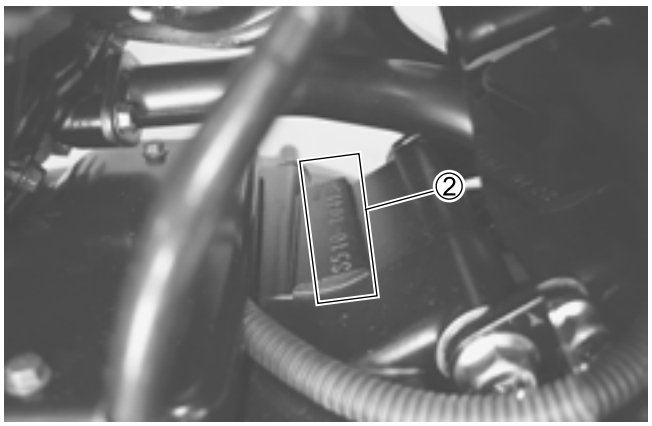
LEFT SIDE

* Difference between illustration and actual motorcycle may exist depending on the markets.

SERIAL NUMBER LOCATION

The frame serial number or V.I.N. (Vehicle Identification Number) ① is stamped on the right side of the steering head pipe. The engine serial number ② is located on the right side of the crankcase. These numbers are required especially for registering the machine and ordering spare parts.





FUEL, OIL AND ENGINE COOLANT RECOMMENDATION

FUEL (FOR USA AND CANADA)

Use only unleaded gasoline of at least 87 pump octane (R/2 + M/2) or 91 octane or higher rated by the research method.

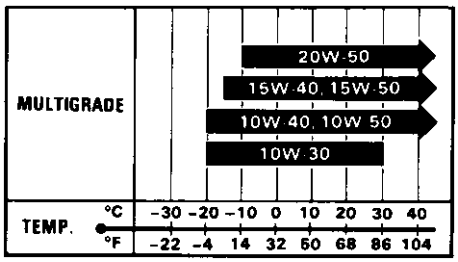
Gasoline containing MTBE (Methyl Tertiary Butyl Ether), less than 10% ethanol, or less than 5% methanol with appropriate cosolvents and corrosion inhibitor is permissible.

FUEL (FOR OTHER COUNTRIES)

Gasoline used should be graded 91 octane (Research Method) or higher. Unleaded gasoline is recommended.

ENGINE OIL

Oil quality is a major contributor to your engine's performance and life. Always select good quality engine oil. Use of API SF/SG or SH/SJ with JASO MA.
Suzuki recommends the use of SAE 10W-40 engine oil. If SAE 10W-40 engine oil is not available, select an alternative according to the right chart.



BRAKE FLUID

Specification and classification: DOT 4

⚠ WARNING

Since the brake system of this motorcycle is filled with a glycol-based brake fluid by the manufacturer, do not use or mix different types of fluid such as silicone-based and petroleum-based fluid for refilling the system, otherwise serious damage will result.
Do not use any brake fluid taken from old or used or unsealed containers.
Never re-use brake fluid left over from a previous servicing, which has been stored for a long period.

FRONT FORK OIL

Use fork oil L01 or an equivalent fork oil.

ENGINE COOLANT

Use an anti-freeze/engine coolant compatible with an aluminum radiator, mixed with distilled water only.

WATER FOR MIXING

Use distilled water only. Water other than distilled water can corrode and clog the aluminum radiator.

ANTI-FREEZE/ENGINE COOLANT

The engine coolant performs as a corrosion and rust inhibitor as well as anti-freeze. Therefore, the engine coolant should be used at all times even though the atmospheric temperature in your area does not go down to freezing point.

Suzuki recommends the use of SUZUKI COOLANT anti-freeze/engine coolant. If this is not available, use an equivalent which is compatible with an aluminum radiator.

LIQUID AMOUNT OF WATER/ENGINE COOLANT

Solution capacity (total): 1 750 ml (1.85/1.54 US/Imp qt)

For engine coolant mixture information, refer to cooling system section in page 5-3.

CAUTION

Mixing of anti-freeze/engine coolant should be limited to 60%. Mixing beyond it would reduce its efficiency. If the anti-freeze/engine coolant mixing ratio is below 50%, rust inhabiting performance is greatly reduced. Be sure to mix it above 50% even though the atmospheric temperature does not go down to the freezing point.

BREAK-IN PROCEDURES

During manufacturing only the best possible materials are used and all machined parts are finished to a very high standard. It is still necessary to allow the moving parts to “BREAK-IN” before subjecting the engine to maximum stresses. The future performance and reliability of the engine depends on the care and restraint exercised during its early life. Refer to the following break-in engine speed recommendations.

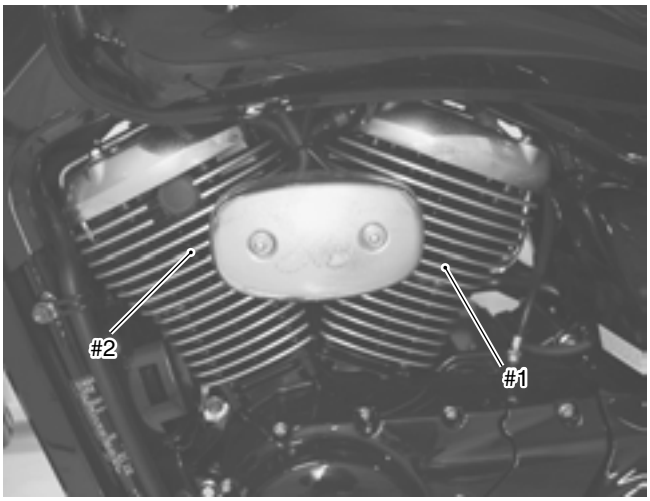
- Keep to these break-in throttle positions during the break-in period.

Break-in throttle operation
Initial 800 km (500 miles): Less than 1/2 throttle
Up to 1 600 km (1 000 miles): Less than 3/4 throttle

- Upon reaching an odometer reading of 1 600 km (1 000 miles) you can subject the motorcycle to full throttle operation.

CYLINDER IDENTIFICATION

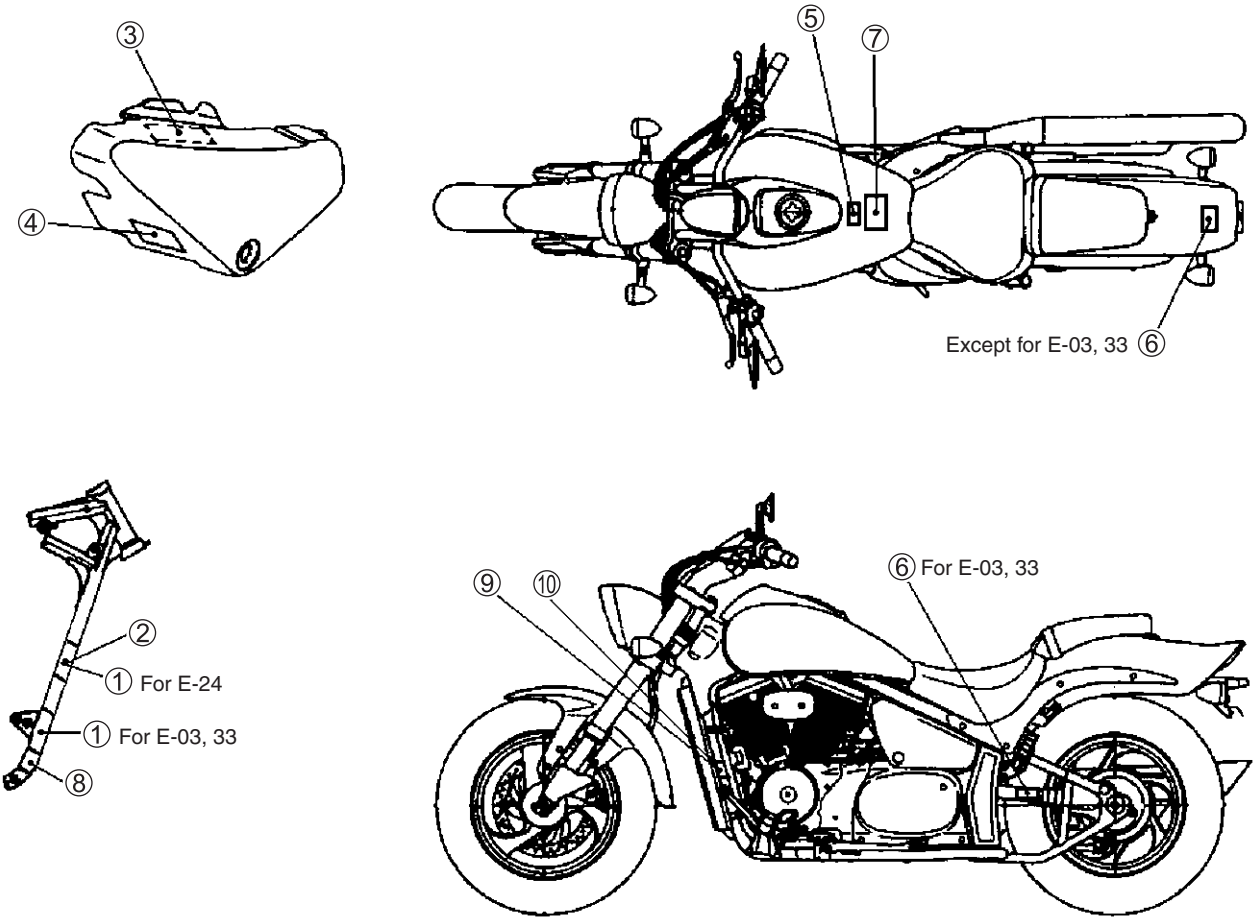
The two cylinders of this engine are identified as No. 1 and No. 2 cylinder, as counted from front to rear (as viewed by the rider on the seat).



INFORMATION LABELS

	VZ800
① Noise label	A For E-03, 24, 33
② Information label	A For E-03, 28, 33
③ Vacuum hose routing label	A For E-33
④ Manual notice label	A For E-03, 33
⑤ Fuel caution label	A For E-02, 24
⑥ Tire information label	A
⑦ General warning label	A
⑧ ICES Canada label	A For E-28
⑨ I.D. plate	A Except for E-03, 28, 33
⑩ Safety plate	A For E-03, 28, 33

A: Attached



SPECIFICATIONS

DIMENSIONS AND DRY MASS

Overall length	2 370 mm (93.3 in)
Overall width	920 mm (36.2 in)
Overall height	1 125 mm (44.3 in)
Wheelbase	1 655 mm (65.2 in)
Ground clearance	140 mm (5.5 in)
Seat height	700 mm (27.6 in)
Dry mass	247 kg (545 lbs)

ENGINE

Type	4-stroke, liquid-cooled, OHC, 45° degree V-twin
Number of cylinders	2
Bore	83.0 mm (3.268 in)
Stroke	74.4 mm (2.929 in)
Displacement	805 cm³ (49.1 cu. in)
Compression ratio	9.4 : 1
Fuel system	Fuel injection
Air cleaner	Non-woven fabric element
Starter system	Electric
Lubrication system	Wet sump
Idle speed	1 100 ± 100 r/min

DRIVE TRAIN

Clutch	Wet multi-plate type
Transmission	5-speed constant mesh
Gearshift pattern	1-down, 4-up
Primary reduction ratio	1.690 (71/42)
Gear ratios, Low	2.461 (32/13)
2nd	1.631 (31/19)
3rd	1.227 (27/22)
4th	1.000 (25/25)
Top	0.814 (22/27)
Final reduction ratio	3.503 (17/15 × 34/11)
Drive system	Shaft drive

CHASSIS

Front suspension	Inverted telescopic, coil spring, oil damped
Rear suspension	Swingarm type, coil spring, oil damped
Front suspension stroke	140 mm (5.5 in)
Rear wheel travel	105 mm (4.1 in)
Caster	33° 15’
Trail	141 mm (5.6 in)
Steering angle	38° (right & left)
Turning radius	3.0 m (9.8 ft)
Front brake	Disc brake, twin
Rear brake	Drum brake
Front tire size	130/90-16M/C (67H), tubeless
Rear tire size	170/80-15M/C (77H), tubeless

ELECTRICAL

Ignition type	Electronic ignition (Transistorized)	
Ignition timing	5° B.T.D.C at 1 100 r/min	
Spark plug	NGK: DPR7EA-9 or DENSO: X22EPR-U9	
Battery	12 V 36.0 kC (10 Ah)/10 HR	
Generator	Three-phase A.C. Generator	
Main fuse	30 A	
Fuse	10/10/10/10/10/15 A	
Headlight	12 V 60/55 W (H4)	
Parking or city light	12 V 5 W	For E-02, 19
Front turn signal light	12 V 21/5 W	For E-03, 28, 33
	12 V 21 W	For the others
Rear turn signal light	12 V 21 W	
Brake light/Taillight	LED	
Speedometer light	LED	
Fuel level indicator light	LED	
Turn signal indicator light	LED	
Neutral indicator light	LED	
High beam indicator light	LED	
Oil pressure/Coolant temperature/Fuel injection warning light	LED	

CAPACITIES

Fuel tank, including reserve	15.0 L (4.0/3.3 US/Imp gal)	For E-33
	15.5 L (4.1/3.4 US/Imp gal)	For the others
reserve	3.0 L (0.8/0.7 US/Imp gal)	
Engine oil, oil change	3 000 ml (3.2/2.6 US/Imp qt)	
with filter change	3 400 ml (3.6/3.0 US/Imp qt)	
overhaul	3 700 ml (3.9/3.3 US/Imp qt)	
Front fork oil (each leg)	493 ml (16.7/17.4 US/Imp oz)	
Coolant	1.5 L (1.59/1.32 US/Imp qt)	

These specifications are subject to change without notice.

PERIODIC MAINTENANCE

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PERIODIC MAINTENANCE SCHEDULE

The chart below lists the recommended intervals for all the required periodic service work necessary to keep the motorcycle operating at peak performance and economy. Mileages are expressed in terms of kilometers, miles and time for your convenience.

NOTE:
More frequent servicing may be performed on motorcycles that are used under severe conditions.

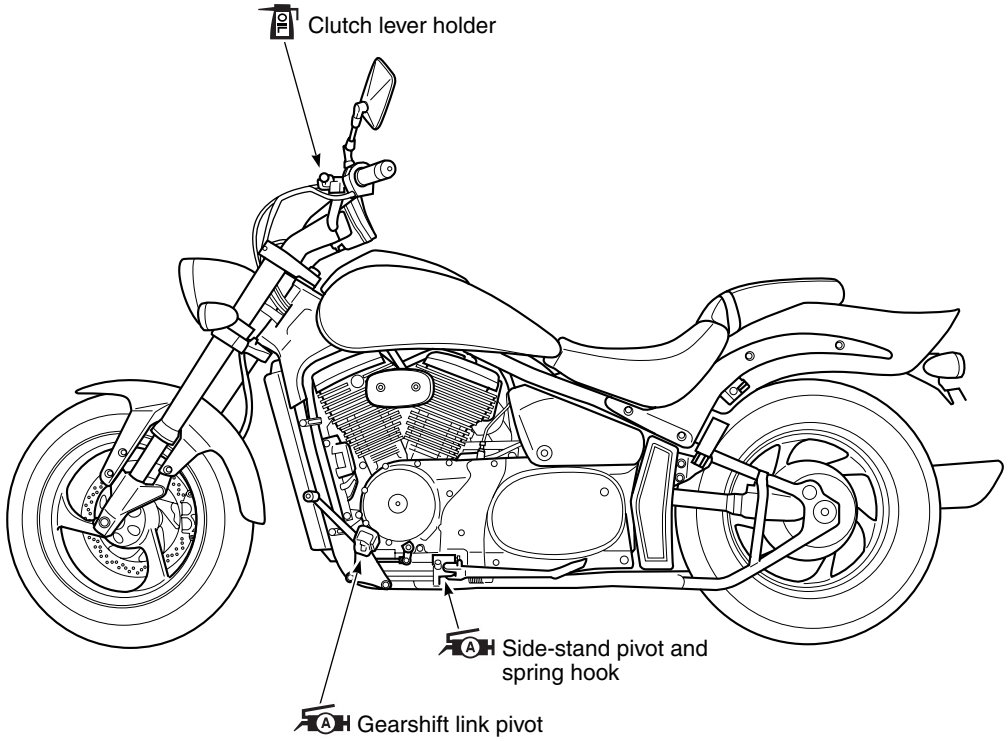
PERIODIC MAINTENANCE CHART

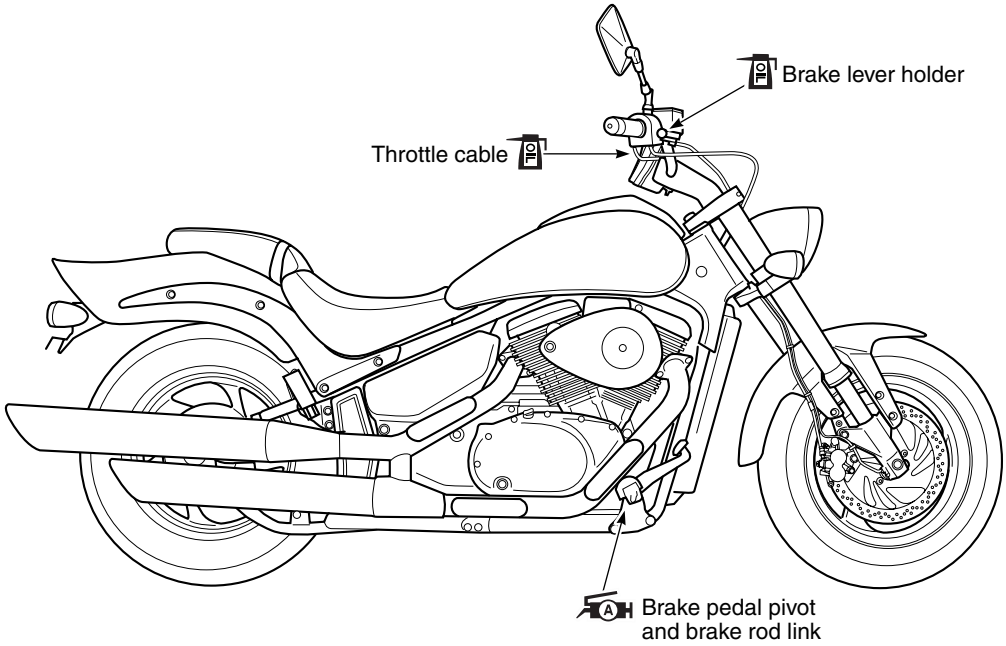
Item \ Interval	km	1 000	6 000	12 000	18 000	24 000
	miles	600	4 000	7 500	11 000	14 500
	months	2	12	24	36	48
Air cleaner element		—	I	I	R	I
Exhaust pipe bolts and muffler bolts		T	—	T	—	T
Valve clearance		I	—	I	—	I
Spark plugs		—	I	R	I	R
Fuel hose		—	I	I	I	I
Engine oil		R	R	R	R	R
Engine oil filter		R	—	—	R	—
Idle speed		I	I	I	I	I
Throttle cable play		I	I	I	I	I
Throttle valve synchronization		I (CA. only)	—	I	—	I
Evaporative emission control system (California model only)		—	—	I	—	I
		Replace vapor hose every 4 years.				
PAIR (air supply) system		—	—	I	—	I
Engine coolant		Replace every 2 years.				
Radiator hose		—	I	I	I	I
Clutch		—	I	I	I	I
Final gear oil		R	—	I	—	I
Brakes		I	I	I	I	I
Brake hose		—	I	I	I	I
		Replace every 4 years.				
Brake fluid		—	I	I	I	I
		Replace every 2 years.				
Tires		—	I	I	I	I
Steering		I	—	I	—	I
Front fork		—	—	I	—	I
Rear suspension		—	—	I	—	I
Chassis bolts and nuts		T	T	T	T	T

NOTE:
I = Inspect and clean, adjust, replace or lubricate as necessary
R = Replace
T = Tighten

LUBRICATION POINTS

Proper lubrication is important for smooth operation and long life of each working part of the motorcycle. Major lubrication points are indicated below.





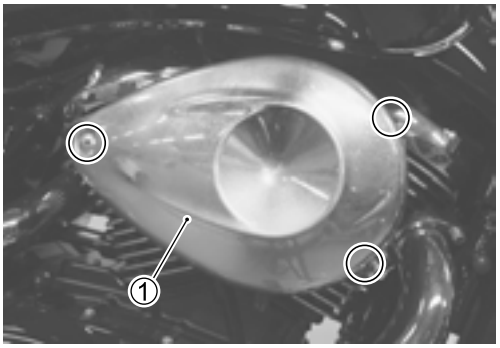
NOTE:

** Before lubricating each part, clean off any rusty spots and wipe off any grease, oil, dirt or grime.*

** Lubricate exposed parts which are subject to rust, with a rust preventative spray whenever the motorcycle has been operated under wet or rainy conditions.*

MAINTENANCE AND TUNE-UP PROCEDURES

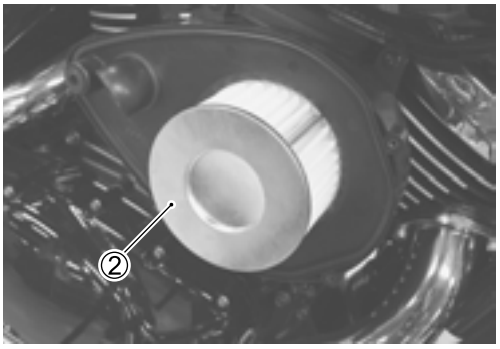
This section describes the servicing procedures for each item of the Periodic Maintenance requirements.



AIR CLEANER

Inspect every 6 000 km (4 000 miles, 12 months) and replace every 18 000 km (11 000 miles, 36 months).

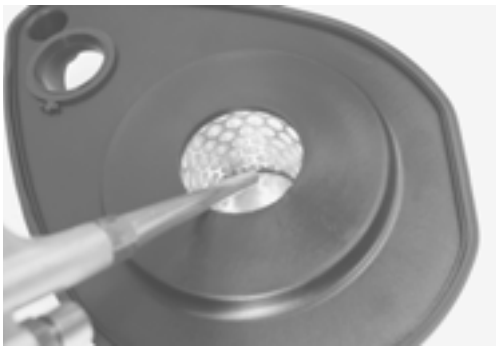
- Remove the air cleaner cover ①.
- Remove the air cleaner element ②.



- Carefully use air hose to blow the dust from the cleaner element.

CAUTION

Always use air pressure on the engine side of the air cleaner element. If air pressure is used on the other side, dirt will be forced into the pores of the air cleaner element thus restricting air flow through the air cleaner element.

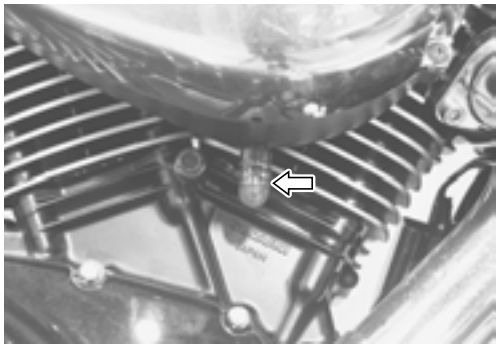


- Reinstall the cleaned or new air cleaner element in the reverse order of removal.

CAUTION

If driving under dusty condition, clean the air cleaner element more frequently. The surest way to accelerate engine wear is to use the engine without the element or to use a ruptured element. Make sure that the air cleaner is in good condition at all times. Life of the engine depends largely on this component!

NOTE:
When cleaning the air cleaner element, drain water from the air cleaner by removing the drain plug.



SPARK PLUG

Inspect every 6 000 km (4 000 miles, 12 months) and replace every 12 000 km (7 500 miles, 24 months).

No. 1 (FRONT) SPARK PLUG REMOVAL

- Remove the rear and front seats. (☞8-3)
- Remove the fuel tank. (☞6-3)
- Remove the right frame cover ①.



☆: Hooked part

- Remove the spark plug cap.

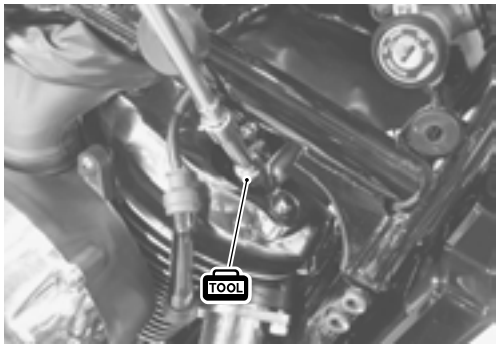
⚠ WARNING

The hot radiator and the hot engine can burn you. Wait until the radiator and the engine are cool enough to touch.



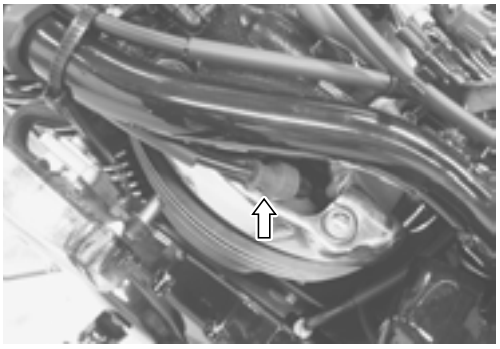
- Remove the spark plug with a spark plug wrench.

TOOL 09930-14530: Universal joint



No. 2 (REAR) SPARK PLUG REMOVAL

- Remove the rear and front seats. (☞8-3)
- Remove the fuel tank. (☞6-3)
- Remove the spark plug cap.
- Remove the spark plug with a spark plug wrench.



HEAT RANGE

- Check to see the heat range of the plug.

	Standard	Cold type
NGK	DPR7EA-9	DPR8EA-9
DENSO	X22EPR-U9	X24EPR-U9



CARBON DEPOSIT

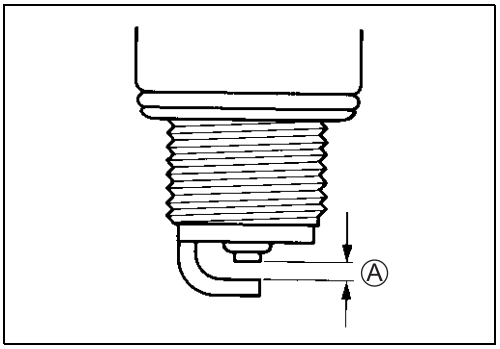
- Check to see if there are carbon deposits on the plugs. If carbon is deposited, remove it with a spark plug cleaner machine or carefully using a tool with a pointed end.

SPARK PLUG GAP

- Measure the plug gap with a thickness gauge. If out of specification, adjust it to the following gap.

TOOL 09900-20803: Thickness gauge

DATA Spark plug gap Ⓐ
Standard: 0.8 – 0.9 mm (0.031 – 0.035 in)

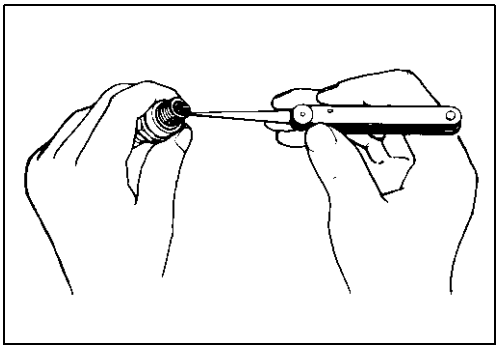


ELECTRODES CONDITION

- Check to see the worn or burnt condition of the electrodes. If it is extremely worn or burnt, replace the plug. And also replace the plug if it has a broken insulator, damaged thread.

CAUTION

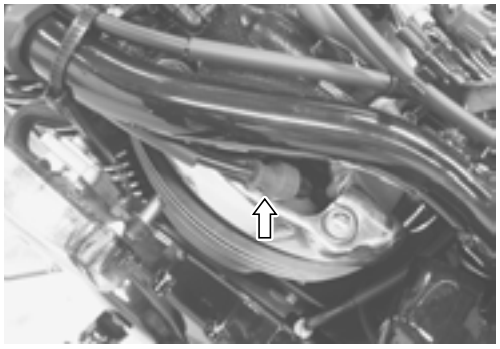
Confirm the thread size and reach when replacing the plug. If the reach is too short, carbon will be deposited on the screw portion of the plug hole and engine damage may result.



SPARK PLUG AND PLUG CAP INSTALLATION

- Install the spark plugs to the cylinder heads by finger tight, and then tighten them to the specified torque.

Spark plug: 11 N·m (1.1 kgf-m, 8.0 lb-ft)



CAUTION

When installing a spark plug, carefully turn the spark plug wrench by finger into the threads of the cylinder head to prevent damage the aluminum threads.

- Install the spark plug caps.

VALVE CLEARANCE

Inspect initially at 1 000 km (600 miles, 2 months) and every 12 000 km (7 500 miles, 24 months) thereafter.

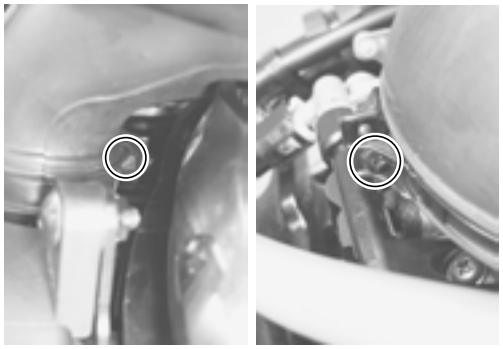
Valve clearance must be checked and adjusted when:
(1) the valve mechanism is service, and
(2) the camshafts are serviced.
Check and adjust the clearance to the specification.

DATA Valve clearance (when cold):
IN. 0.08 – 0.13 mm (0.003 – 0.005 in)
EX. 0.17 – 0.22 mm (0.007 – 0.009 in)

NOTE:

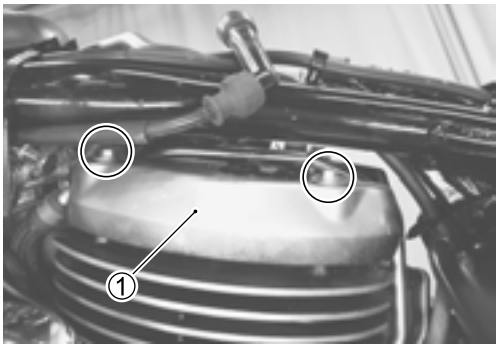
** The clearance specification is for COLD state.*

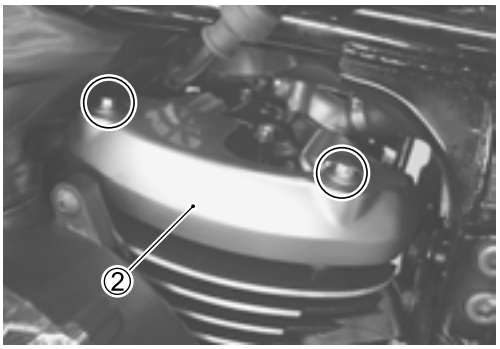
** Both intake and exhaust valves must be checked and adjusted when the piston is at Top Dead Center (TDC) of the compression stroke.*



- Remove the rear and front seats. (☞8-3)
- Remove the fuel tank. (☞6-3)
- Remove the right frame cover. (☞8-4)
- Remove the spark plug caps.
- Loosen the inlet pipe screws.

• Remove the cylinder head cover caps (①, ②).





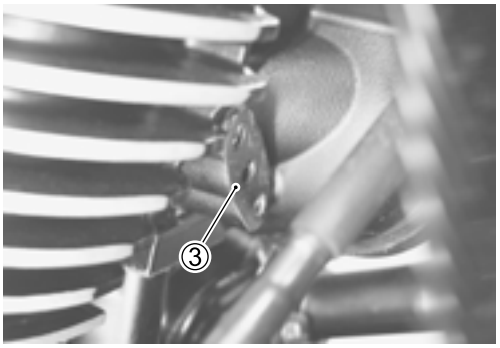
• Remove the PAIR pipe.



• Remove the gasket ③.

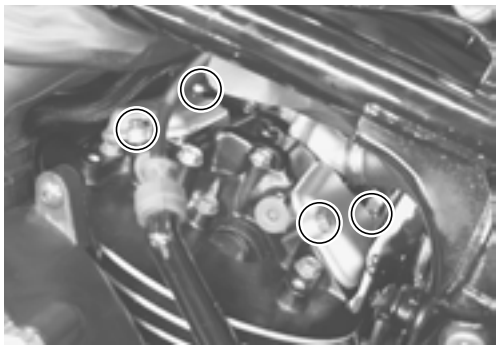
CAUTION

Do not reuse the removed gasket.

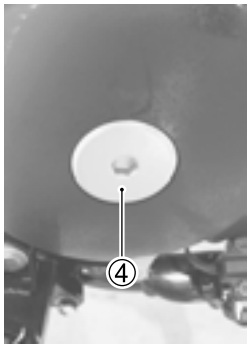


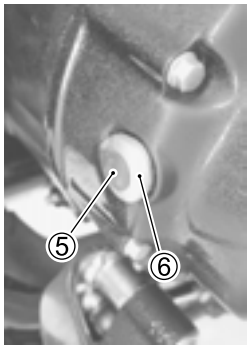
- Remove all the inspection caps.
- Remove all the spark plugs.



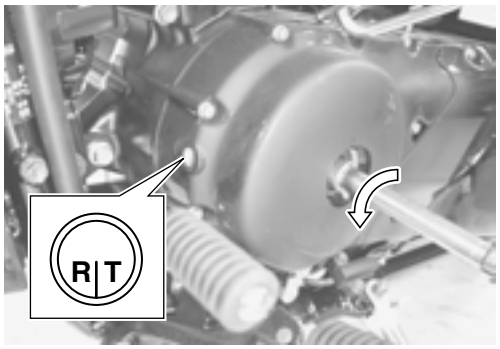


- Remove the generator cover plug ④.
- Remove the cap ⑤ and the timing inspection plug ⑥.





- Rotate the generator rotor to set the No. 1 engine's piston at TDC of the compression stroke. (Rotate the rotor until the "R I T" line on the rotor is aligned with the center of hole on the generator cover.)

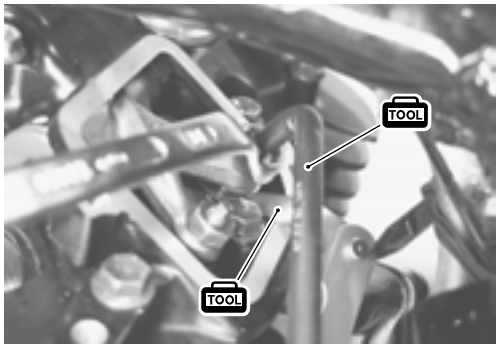


- To inspect the No. 1 engine's valve clearance, insert the thickness gauge to the clearance between the valve stem end and the adjusting screw on the rocker arms.

TOOL 09900-20806: Thickness gauge

- If the clearance is out of the specification, bring it into the specified range by using the special tool.

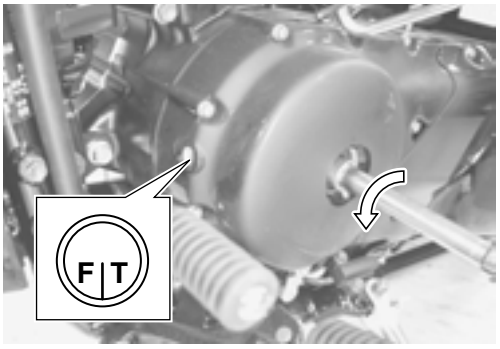
TOOL 09917-10410: Valve adjust driver



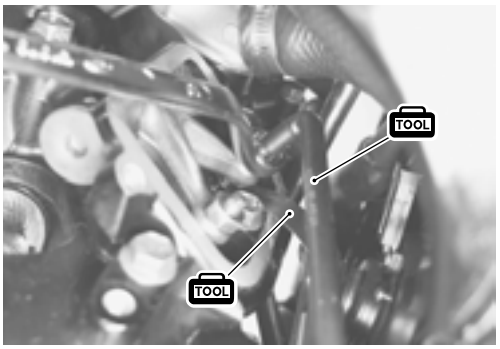
CAUTION

Both right and left valve clearances should be as closely set as possible.

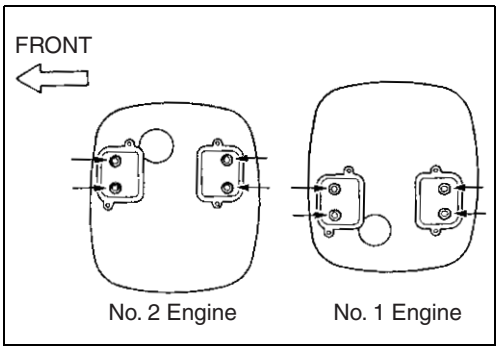
- Rotate the generator rotor 450 degrees (1 and 1/4 turns) and align the “F I T” line on the rotor with the center of hole on the generator cover.



Inspect the No. 2 engine’s valve clearance as the same manner above.



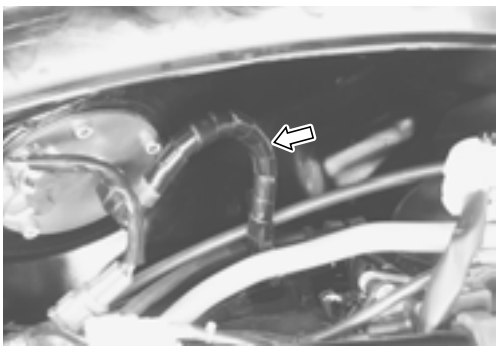
NOTE:
Use the thickness gauge from the arrow marks as shown in the illustration.



FUEL HOSE

Inspect every 6 000 km (4 000 miles, 12 months).

Inspect the fuel feed hose for damage and fuel leakage. If any defects are found, the fuel hoses must be replaced.



ENGINE OIL AND OIL FILTER

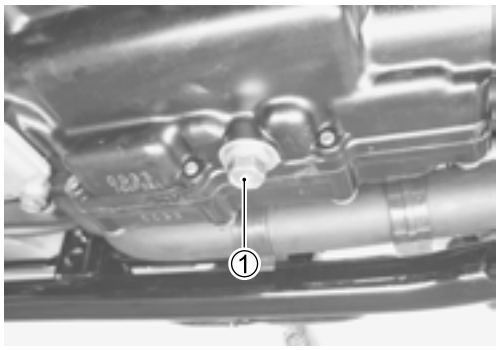
(ENGINE OIL)
Replace initially at 1 000 km (600 miles, 2 months) and every 6 000 km (4 000 miles, 12 months) thereafter.

(OIL FILTER)
Replace initially at 1 000 km (600 miles, 2 months) and every 18 000 km (11 000 miles, 36 months) thereafter.

Oil should be changed while the engine is warm. Oil filter replacement at the above intervals, should be done together with the engine oil change.

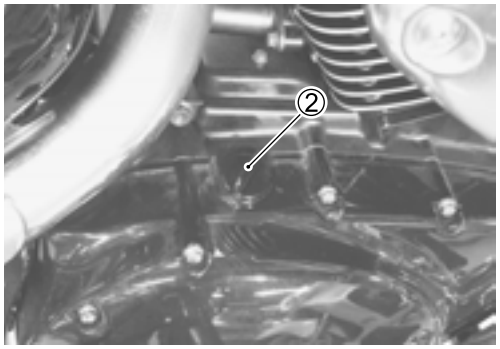
ENGINE OIL REPLACEMENT

- Keep the motorcycle upright.
- Place an oil pan below the engine, and drain oil by removing the drain plug ① and filler cap ②.

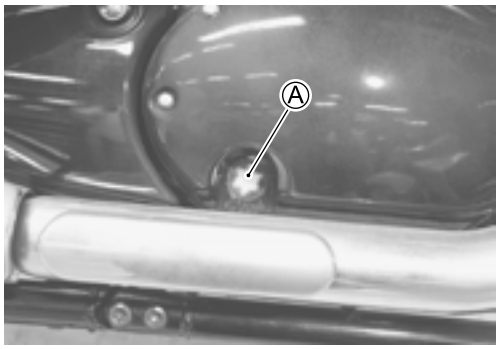


- Tighten the drain plug ① to the specified torque, and pour fresh oil through the oil filler. The engine will hold about 3.0 L (3.2/2.6 US/Imp qt) of oil. Use of API SF/SG or SH/SJ with JASO MA.

Oil drain plug: 21 N·m (2.1 kgf-m, 15.0 lb-ft)

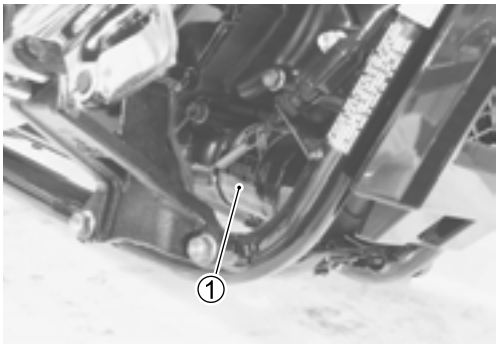


- Start up the engine and allow it to run for several minutes at idling speed.
- Turn off the engine and wait about three minutes, then check the oil level through the inspection window Ⓐ. If the level is below mark “L”, add oil to “F” level. If the level is above mark “F”, drain oil to “F” level.



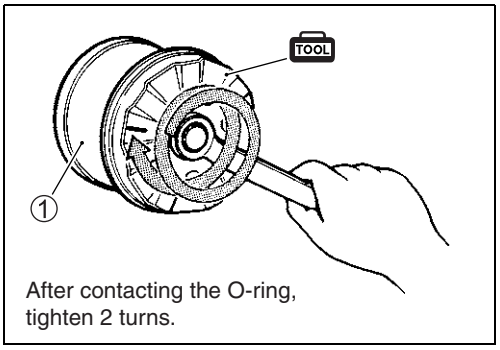
OIL FILTER REPLACEMENT

- Drain engine oil in the same manner of engine oil replacement procedure.
- Remove the oil filter ① by using the oil filter wrench. (Special tool)
- Apply engine oil lightly to the O-ring of the new filter before installation.
- Install the new filter turning it by hand until you feel that the filter O-ring contacts the mounting surface. Then tighten it 2 turns using the oil filter wrench. (20 N·m, 2.0 kgf-m, 14.5 lb-ft)



TOOL 09915-40610: Oil filter wrench

NOTE:
To properly tighten the filter, use the special tool. Never tighten the filter by hand.



After contacting the O-ring, tighten 2 turns.

- Pour fresh engine oil and check the oil level in the same manner of engine oil replacement procedure.

DATA Engine oil capacity

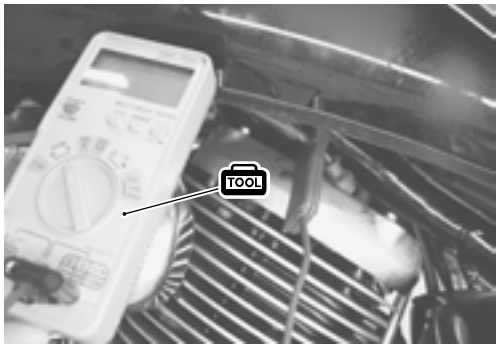
Oil change:	**3.0 L (3.2/2.6 US/Imp qt)**
Filter change:	**3.4 L (3.6/3.0 US/Imp qt)**
Overhaul engine:	**3.7 L (3.9/3.3 US/Imp qt)**

CAUTION

ONLY USE A GENUINE SUZUKI MOTORCYCLE OIL FILTER. Other manufacturer's oil filters may differ in thread specifications (thread diameter and pitch), filtering performance and durability which may lead to engine damage or oil leaks. Also, do not use a genuine Suzuki automobile oil filter on this motorcycle.

ENGINE IDLE SPEED

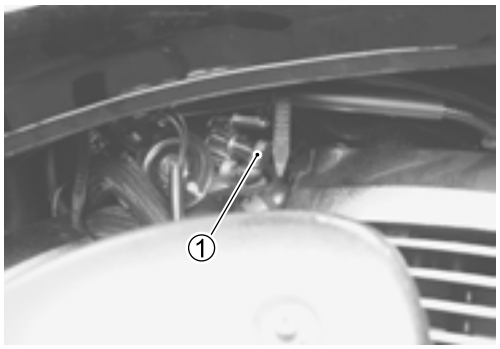
Inspect initially at 1 000 km (600 miles, 2 months) and every 6 000 km (4 000 miles, 12 months) thereafter.



NOTE:
Warm up the engine before adjusting the engine idle speed.

- Connect the multi-circuit tester to the high-tension cord.

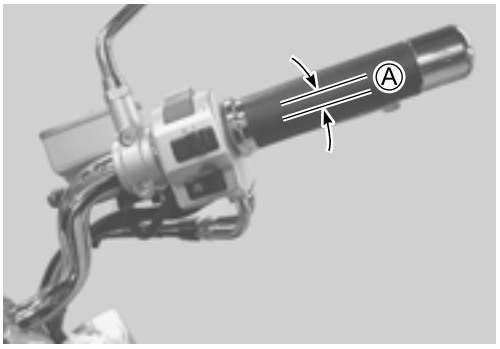
- Start up the engine and set its idle speed to the specified range by turning the throttle stop screw ①.



DATA Engine idle speed: 1 100 ± 100 r/min

TOOL 09900-25008: Multi-circuit tester set

THROTTLE CABLE PLAY



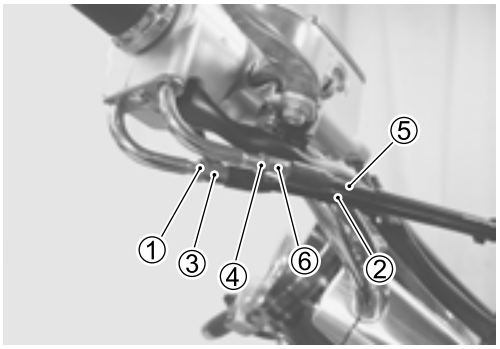
Inspect initially at 1 000 km (600 miles, 2 months) and every 6 000 km (4 000 miles, 12 months) thereafter.

Adjust the throttle cable play Ⓐ with the following three steps.

MINOR ADJUSTMENT

First step:

- Loosen the lock nut ① of the throttle returning cable ② and turn in the adjuster ③ fully into the threads.



Second step:

- Loosen the lock nut ④ of the throttle pulling cable ⑤.
- Turn the adjuster ⑥ in or out until the throttle cable play Ⓐ should be 2.0 – 4.0 mm (0.08 – 0.16 in) at the throttle grip.
- Tighten the lock nut ④ while holding the adjuster ⑥.

Third step:

- While holding the throttle grip at the fully closed position, slowly turn out the adjuster ③ of the throttle returning cable ② to feel resistance.
- Tighten the lock nut ① while holding the adjuster ③.

DATA Throttle cable play Ⓐ: 2.0 – 4.0 mm (0.08 – 0.16 in)

⚠ WARNING

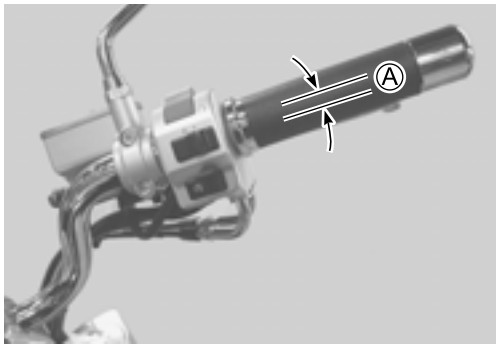
After the adjustment is completed, check that handlebar movement does not raise the engine idle speed and that the throttle grip returns smoothly and automatically.

NOTE:

Major adjustment can be made by the throttle body side adjuster.

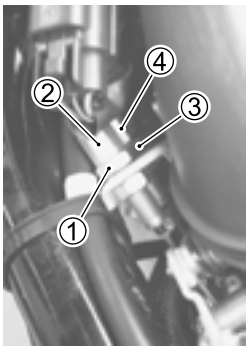
MAJOR ADJUSTMENT

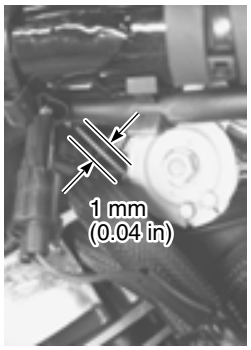
- Remove the rear and front seats. (☞8-3)
- Remove the fuel tank. (☞6-3)
- Loosen the lock nut ① of the throttle returning cable.
- Turn the returning cable adjuster ② to obtain proper cable play.
- Loosen the lock nut ③ of the throttle pulling cable.
- Turn the pulling cable adjuster ④ in or out until the throttle cable play Ⓐ should be 2.0 – 4.0 mm (0.08 – 0.16 in) at the throttle grip.
- Tighten the lock nut ③ securely while holding the adjuster ④.



DATA Throttle cable play Ⓐ: 2.0 – 4.0 mm (0.08 – 0.16 in)

- While holding the throttle grip at the fully closed position, slowly turn the returning cable adjuster ② to obtain a slack of 1.0 mm (0.04 in).
- Tighten the lock nut ① securely.





⚠ WARNING

After the adjustment is completed, check that handlebar movement does not raise the engine idle speed and that the throttle grip returns smoothly and automatically.

THROTTLE VALVE SYNCHRONIZATION

Inspect initially at 1 000 km (600 miles, 2 months) (For E-33 only) and every 12 000 km (7 500 miles, 24 months).

Inspect the throttle valve synchronization periodically.
(☞6-24)

EVAPORATIVE EMISSON CONTROL SYSTEM (FOR E-33 ONLY)

Inspect every 12 000 km (7 500 miles, 24 months).
Replace vapor hose every 4 years.

(☞11-9)

PAIR (AIR SUPPLY) SYSTEM

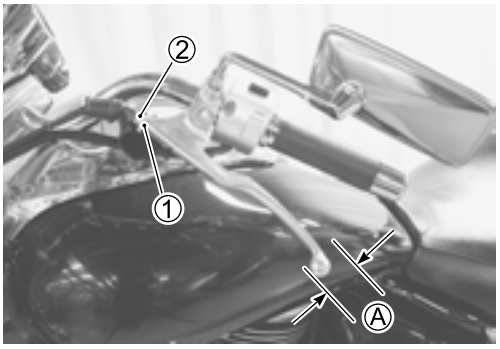
Inspect every 12 000 km (7 500 miles, 24 months).

Inspect the PAIR (air supply) system periodically.
(☞11-5)

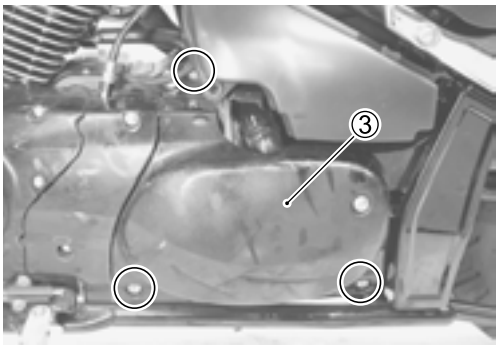
CLUTCH

Inspect every 6 000 km (4 000 miles, 12 months).

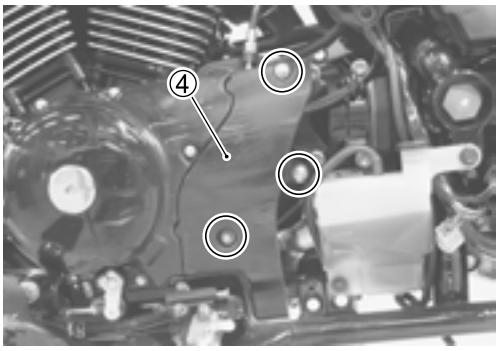
- Loosen the lock nut ①.
- Turn in the adjuster ② all the way into the clutch lever assembly.



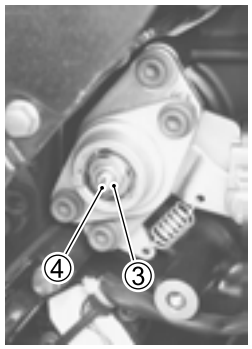
- Remove the left frame cover. (☞8-3)
- Remove the secondary gear case cover ③.

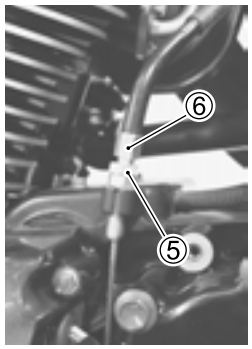


- Remove the clutch release cover ④.



- Loosen the lock nut ③ and turn out the adjusting screw ④ two or three rotations.
- From that position, slowly turn in the adjusting screw ④ to feel resistance.
- From this position, turn out the adjusting screw ④ 1/4 rotations, and tighten the lock nut ③.
- Loosen the lock nut ⑤, and turn the cable adjuster ⑥ to obtain 10 – 15 mm (0.4 – 0.6 in) of free play Ⓐ at the clutch lever end.
- Tighten the lock nut ⑤.
- Tighten the lock nut ①.

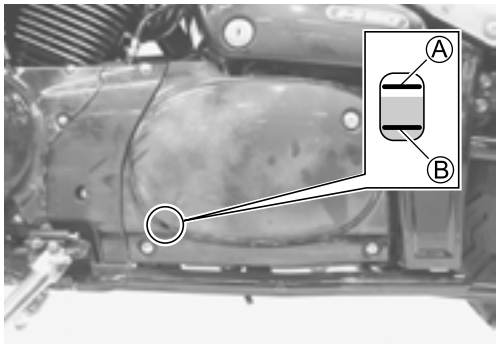




DATA **Clutch lever play Ⓐ: 10 – 15 mm (0.4 – 0.6 in)**
Clutch release screw: 1/4 turn out

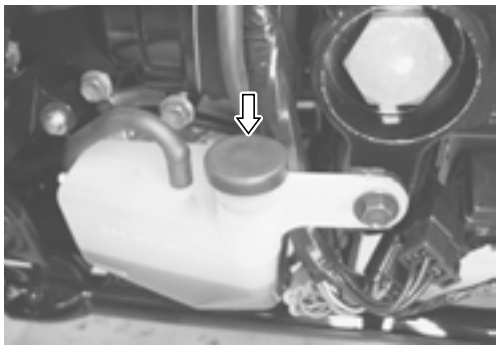
COOLING SYSTEM

RADIATOR HOSE
Inspect every 6 000 km (4 000 miles, 12 months).
ENGINE COOLANT
Replace engine coolant every 2 years.



ENGINE COOLANT LEVEL CHECK

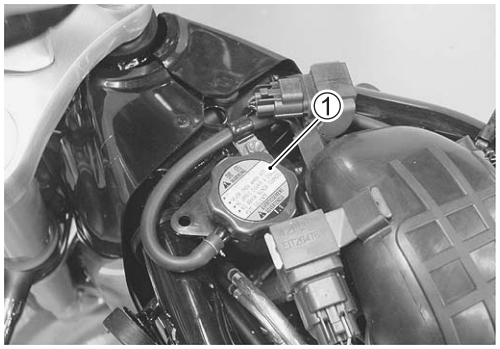
- Keep the motorcycle upright.
- Check the engine coolant level by observing the full and lower lines on the engine coolant reserve tank.
  Ⓐ Full line Ⓑ Lower line
- If the level is below the lower line, add engine coolant to the full line from the engine coolant reserve tank filler.



NOTE:
To remove the filler cap, remove the tool box cover and secondary gear case cover. (☞2-16)

ENGINE COOLANT CHANGE

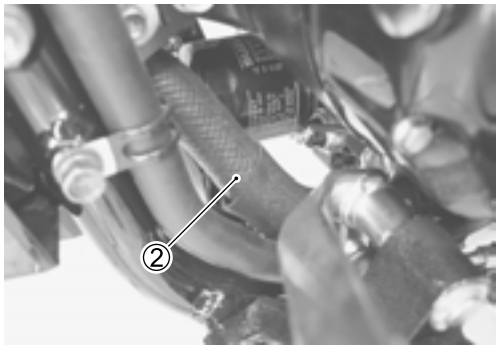
- Remove the rear and front seat. (☞8-3)
- Remove the fuel tank. (☞6-3)
- Remove the radiator cap ①.
- Drain engine coolant by disconnecting the radiator hose ② from the pump.



⚠ WARNING

*** Do not open the radiator cap when the engine is hot, as you may be injured by escaping hot liquid or vapor.**
*** Engine coolant may be harmful if swallowed or if it comes in contact with skin or eyes. If engine coolant gets into the eyes or in contact with the skin, flush thoroughly with plenty of water. If swallowed, induce vomiting and call physician immediately!**

- Flush the radiator with fresh water if necessary.
- Connect the radiator hose ② securely.
- Pour the specified engine coolant up to the radiator inlet.
- Bleed the air from the engine coolant circuit as following procedure.



NOTE:
For engine coolant information, refer to page 7-2.

AIR BLEEDING THE COOLING CIRCUIT



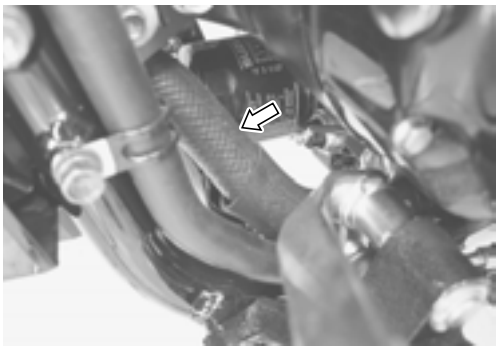
- Add engine coolant up to the radiator inlet.
- Support the motorcycle upright.
- Slowly swing the motorcycle, right and left, to bleed the air trapped in the cooling circuit.
- Add engine coolant up to the radiator inlet.
- Start up the engine and bleed air from the radiator inlet completely.
- Add engine coolant up to the radiator inlet.
- Repeat the above procedure until bleed no air from the radiator inlet.
- Close the radiator cap securely.
- After warming up and cooling down the engine several times, add the engine coolant up to the full level of the reservoir.

CAUTION

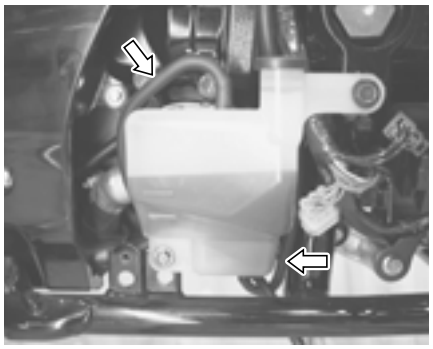
Repeat the above procedure several times and make sure that the radiator is filled with engine coolant up to the reserve tank full level.

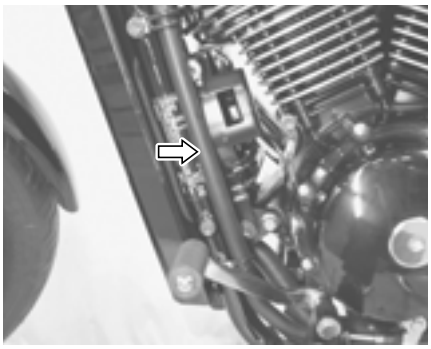
LLC **Engine coolant capacity**
Reverse tank side: 250 ml (0.26/0.22 US/Imp qt)
Engine side: 1 500 ml (1.59/1.32 US/Imp qt)

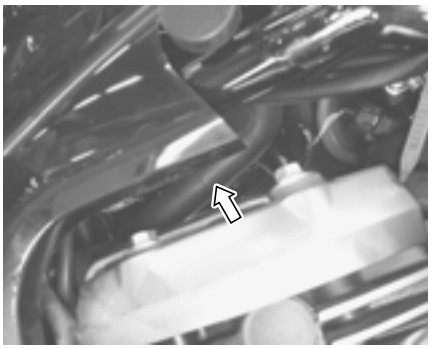
RADIATOR HOSES



- Check to see the radiator hoses for crack, damage or engine coolant leakage.
- If any defects are found, replace the radiator hoses with new ones.

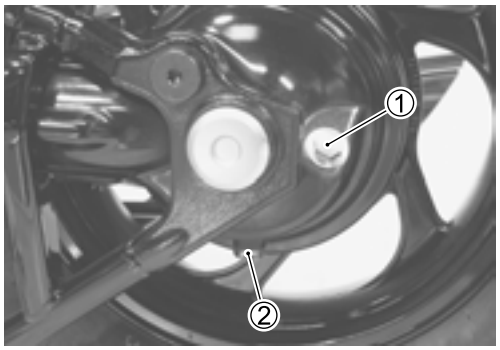






FINAL GEAR OIL

Replace initially at 1 000 km (600 miles, 2 months) and inspect every 12 000 km (7 500 miles, 24 months) thereafter.



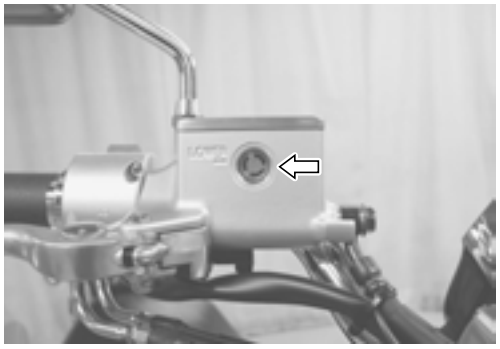
- Keep the motorcycle upright.
- Place an oil pan under the final gear case.
- Remove the filler cap ① and drain plug ② to drain oil.
- Refit the drain plug ②. Pour the specified oil (SAE 90 hypoid gear oil with GL-5 under API classification) through the filler hole until the oil level reaches the filler hole.
- Refit the filler cap ①.

DATA **Final gear oil: 200 – 220 ml (6.8/7.0 – 7.4/7.7 US/Imp oz)**

BRAKE

(BRAKE)
Inspect initially at 1 000 km (600 miles, 2 months) and every 6 000 km (4 000 miles, 12 months) thereafter.

(BRAKE HOSE AND BRAKE FLUID)
Inspect every 6 000 km (4 000 miles, 12 months). Replace hoses every 4 years. Replace fluid every 2 years.



FRONT BRAKE FLUID LEVEL CHECK

- Keep the motorcycle upright and place the handlebars straight.
- Check the brake fluid level by observing the lower limit line on the front brake fluid reservoir.
- When the level is below the lower limit line, replenish with brake fluid that meets the following specification.

BF **Specification and classification: DOT 4**

⚠ WARNING

*** The brake system of this motorcycle is filled with a glycol-based brake fluid. Do not use or mix different types of fluid such as silicone-based or petroleum-based. Do not use any brake fluid taken from old, used or unsealed containers. Never re-use brake fluid left over from the last servicing or stored for a long period.**
*** Brake fluid, if it leaks, will interfere with safe running and immediately discolor painted surfaces. Check the brake hoses and hose joints for cracks and oil leakage before riding.**

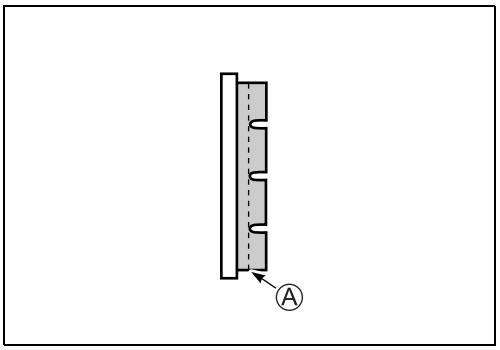
FRONT BRAKE PADS

The extent of brake pad wear can be checked by observing the grooved limit Ⓐ on the pad. When the wear exceeds the grooved limit, replace the pads with new ones.
(☞8-52)



CAUTION

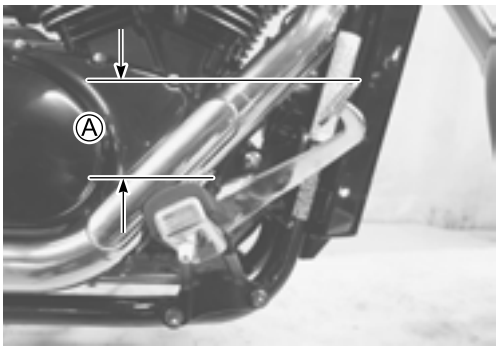
Replace the brake pads as a set, otherwise braking performance will be adversely affected.



REAR BRAKE PEDAL HEIGHT

- Loosen the lock nut ①.
- Adjust the brake pedal height Ⓐ by turning the adjuster ②.

DATA Rear brake pedal height : 75 – 85 mm (3.0 – 3.3 in)

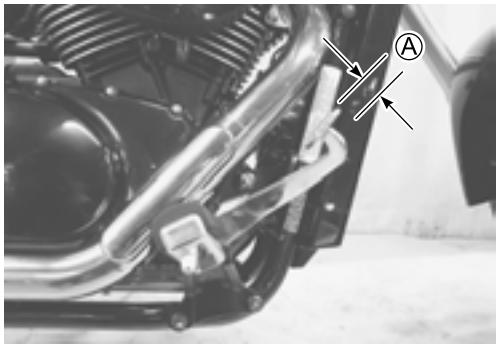


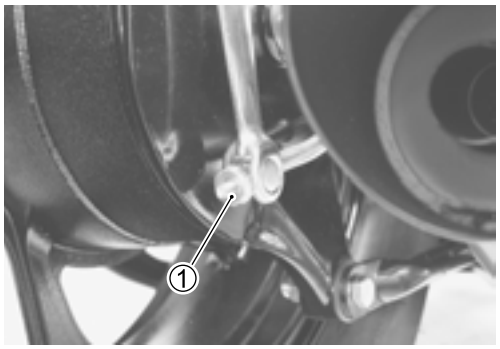


REAR BRAKE ADJUSTING

- Adjust the free travel Ⓐ to 20 – 30 mm by turning the adjusting nut ①.

DATA Rear brake pedal free travel Ⓐ:
20 – 30 mm (0.8 – 1.2 in)

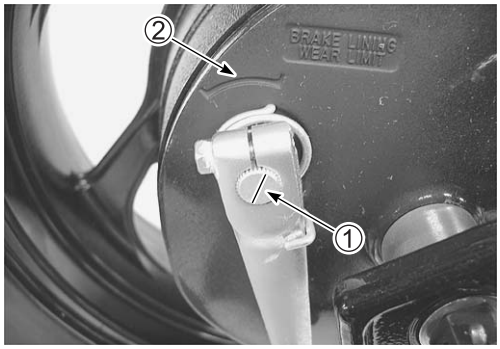




REAR BRAKE SHOE WEAR

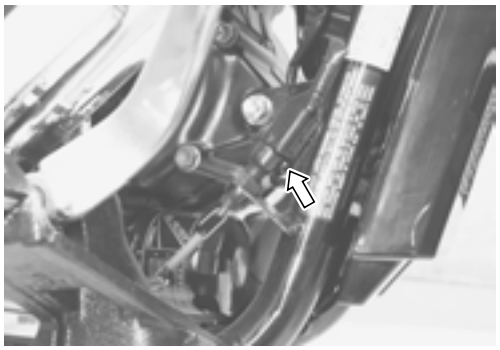
This motorcycle is equipped with brake lining wear limit indicator on the rear brake.
To check brake lining wear, perform the following steps.

- Make sure that the rear brake is properly adjusted.
- Depress the rear brake pedal. Make sure that the index mark ① is within the range ② embossed on the brake panel.
- If the index mark goes beyond the range, the brake shoe assembly should be replaced with a new set of shoes. (☞8-62)



BRAKE LIGHT SWITCH

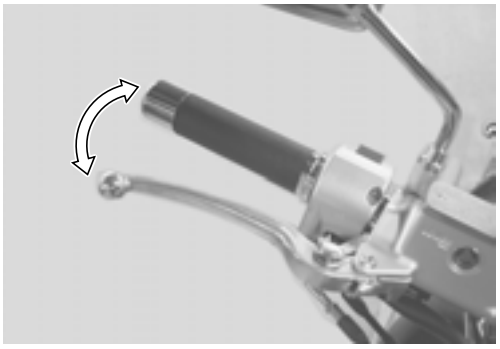
Adjust the rear brake light switch so that the brake light will come on just before pressure is felt when the brake pedal is depressed.



AIR BLEEDING FROM THE BRAKE FLUID CIRCUIT

Air trapped in the fluid circuit acts like a cushion to absorb a large proportion of the pressure developed by the master cylinder and thus interferes with the full braking performance of the brake caliper. The presence of air is indicated by “sponginess” of the brake lever and also by lack of braking force. Considering the danger to which such trapped air exposes the machine and rider, it is essential that, after remounting the brake and restoring the brake system to the normal condition, the brake fluid circuit be purged of air in the following manner:





- Fill up the master cylinder reservoir to the top of the inspection window. Place the reservoir cap to prevent entry of dirt.
- Attach a pipe to the air bleeder valve, and insert the free end of the pipe into a receptacle.
- Squeeze and release the brake lever several times in rapid succession and squeeze the lever fully without releasing it. Loosen the bleeder valve by turning it a quarter of a turn so that the brake fluid runs into the receptacle; this will remove the tension of the brake lever causing it to touch the handlebar grip. Then, close the valve, pump and squeeze the lever, and open the valve. Repeat this process until the fluid flowing into the receptacle no longer contains air bubbles.

NOTE:
Replenish the brake fluid in the reservoir as necessary while bleeding the brake system. Make sure that there is always some fluid visible in the reservoir.

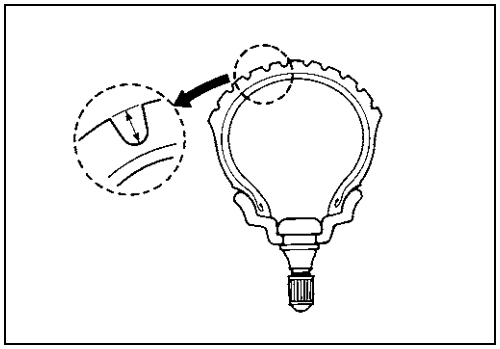
- Close the bleeder valve, and disconnect the pipe. Fill the reservoir with brake fluid to the top of the inspection window.

Air bleeder valve: 7.5 N·m (0.75 kgf-m, 5.5 lb-ft)

CAUTION

Handle brake fluid with care: the fluid reacts chemically with paint, plastics, rubber materials and so on.

TIRE



Inspect every 6 000 km (4 000 miles, 12 months).

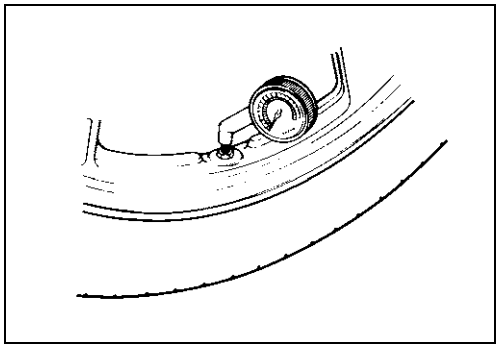
TIRE TREAD CONDITION

Operating the motorcycle with excessively worn tires will decrease riding stability and consequently invite a dangerous situation. It is highly recommended to replace a tire when the remaining depth of tire tread reaches the following specification.

TOOL 09900-20805: Tire depth gauge

DATA Tire tread depth

Service Limit (FRONT) : 1.6 mm (0.06 in)
(REAR) : 2.0 mm (0.08 in)



TIRE PRESSURE

If the tire pressure is too high or too low, steering will be adversely affected and tire wear increased. Therefore, maintain the correct tire pressure for good roadability or shorter tire life will result. Cold inflation tire pressure is as follows.

COLD INFLATION TIRE PRESSURE	SOLO RIDING			DUAL RIDING		
	kPa	kgf/cm²	psi	kPa	kgf/cm²	psi
FRONT	200	2.0	29	200	2.0	29
REAR	250	2.5	36	250	2.5	36

CAUTION

The standard tire fitted on this motorcycle is 130/90-16M/C (67H) for front and 170/80-15M/C (77H) for rear. The use of tires other than those specified may cause instability. It is highly recommended to use a SUZUKI Genuine Tire.

TIRE TYPE

IRC (FRONT) : GS-23F A
IRC (REAR) : GS-23R A

STEERING

Inspect initially at 1 000 km (600 miles, 2 months) and every 12 000 km (7 500 miles, 24 months) thereafter.

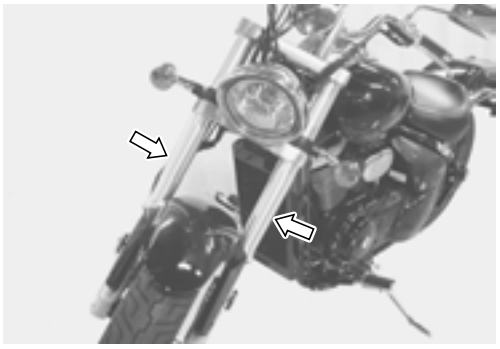


Steering should be adjusted properly for smooth turning of handlebars and safe running. Overtighten steering prevents smooth turning of the handlebars and too loose steering will cause poor stability. Check that there is no play in the steering stem while grasping the lower fork tubes by supporting the machine so that the front wheel is off the ground, with the wheel straight ahead, and pull forward. If play is found, perform steering bearing adjustment as described in page 8-24 of this manual.

FRONT FORK

Inspect every 12 000 km (7 500 miles, 24 months).

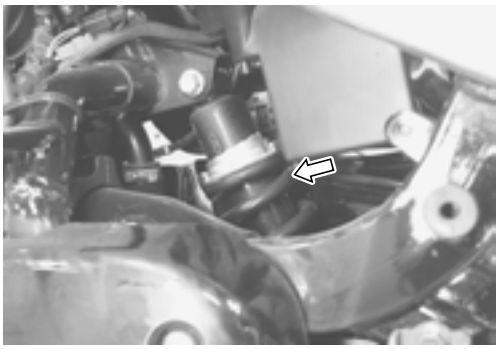
Inspect the front forks for oil leakage, scoring or scratches on the outer surface of the inner tubes. Replace any defective parts, if necessary. (☞8-13)



REAR SUSPENSION

Inspect every 12 000 km (7 500 miles, 24 months).

Inspect the damper for oil leakage and the spring unit for damage. Check that there is no play in the swingarm assembly. Replace any defective parts, if necessary. (☞8-40)



EXHAUST PIPE BOLT

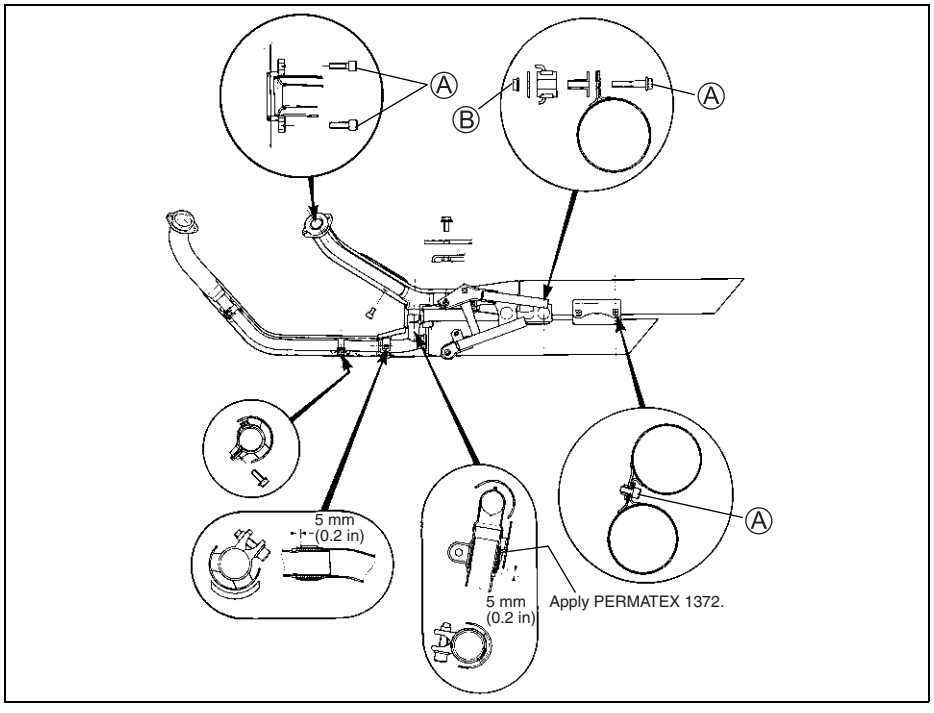
Tighten initially at 1 000 km (600 miles, 2 months) and every 12 000 km (7 500 miles, 24 months) thereafter.

- Tighten the exhaust pipe bolts and muffler mounting bolts to the specified torque.

Muffler mounting bolt and exhaust pipe bolt Ⓐ: 23 N·m (2.3 kgf-m, 16.5 lb-ft)
Muffler mounting nut Ⓑ: 23 N·m (2.3 kgf-m, 16.5 lb-ft)

1342 99000-32050: THREAD LOCK "1342"

EXHAUST GAS SEALER: PERMATEX 1372



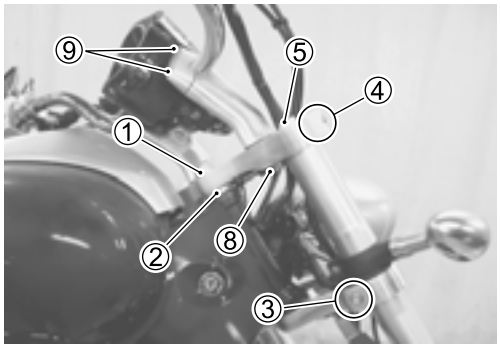
ITEM	N·m	kgf-m	lb-ft
Ⓐ	23	2.3	16.5
Ⓑ	23	2.3	16.5

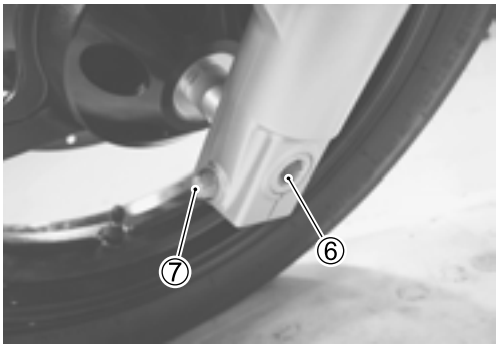
CHASSIS BOLT AND NUT

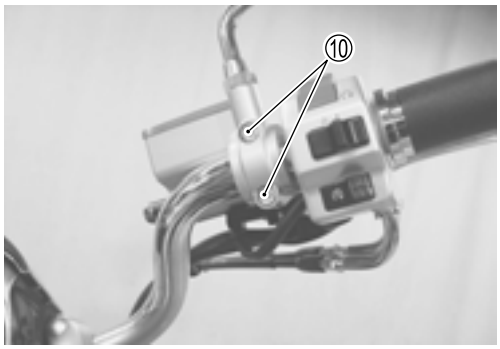
Tighten initially at 1 000 km (600 miles, 2 months) and every 6 000 km (4 000 miles, 12 months) thereafter.

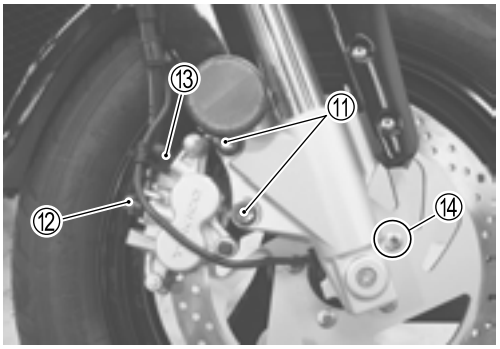
Check that all chassis bolts and nuts are tightened to their specified torque. (Refer to page 2-26 for the locations of the following nuts and bolts on the motorcycle.)

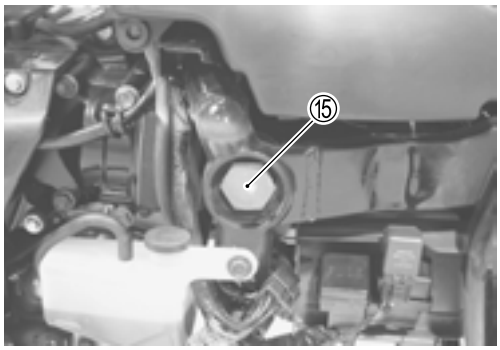
ITEM	N·m	kgf-m	lb-ft
① Steering stem head nut	90	9.0	65.0
② Steering stem nut	45	4.5	32.5
③ Front fork lower clamp bolt	30	3.0	21.5
④ Front fork upper clamp bolt	23	2.3	16.5
⑤ Front fork cap bolt	23	2.3	16.5
⑥ Front axle	65	6.5	47.0
⑦ Front axle pinch bolt	23	2.3	16.5
⑧ Handlebar holder set nut	45	4.5	32.5
⑨ Handlebar clamp bolt	23	2.3	16.5
⑩ Front brake master cylinder mounting bolt	10	1.0	7.0
⑪ Front brake caliper mounting bolt	39	3.9	28.0
⑫ Brake hose union bolt	23	2.3	16.5
⑬ Caliper air bleeder valve	7.5	0.75	5.5
⑭ Brake disc bolt	23	2.3	16.5
⑮ Swingarm pivot bolt lock nut	100	10.0	72.5
⑯ Torque link bolt and nut (Front)	35	3.5	25.5
⑰ Torque link bolt and nut (Rear)	25	2.5	18.0
⑱ Rear shock absorber mounting bolt/nut (Upper & Lower)	50	5.0	36.0
⑲ Rear cushion lever/rod mounting nut	78	7.8	57.5
⑳ Rear axle nut	65	6.5	47.0
㉑ Brake cam lever bolt	10	1.0	7.0
㉒ Front footrest bracket mounting bolt	55	5.5	40.0

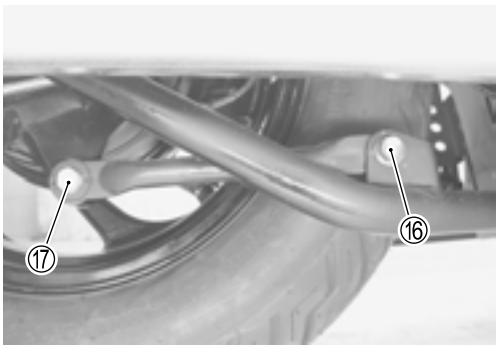

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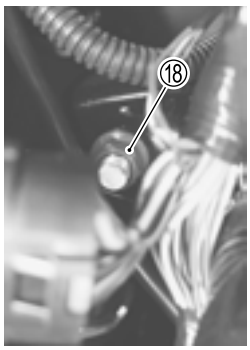

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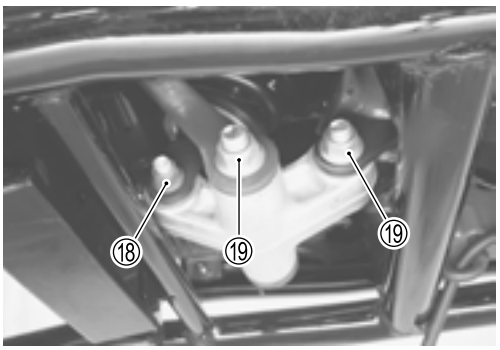

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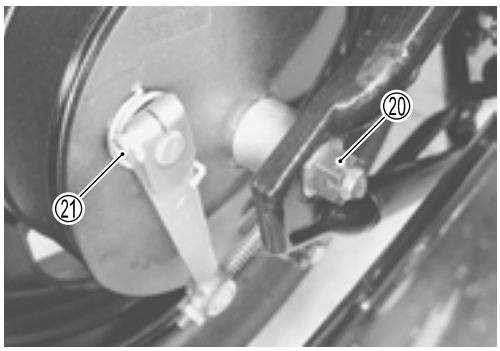

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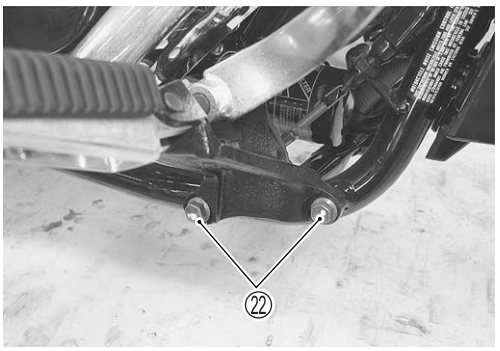

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COMPRESSION PRESSURE CHECK

The compression of a cylinder is a good indicator of its internal condition.
The decision to overhaul the cylinder is often based on the results of a compression test. Periodic maintenance records kept at your dealership should include compression readings for each maintenance service.

COMPRESSION PRESSURE SPECIFICATION (Automatic de-comp. actuated)

Standard	Limit	Difference
1 300 – 1 700 kPa (13 – 17 kgf/cm², 185 – 242 psi)	1 100 kPa (11 kgf/cm², 156 psi)	200 kPa (2 kgf/cm², 28 psi)

Low compression pressure can indicate any of the following conditions:

* Worn-down piston or piston rings
* Piston rings stuck in grooves
* Poor seating of valves
* Ruptured or otherwise defective cylinder head gasket

Overhaul the engine in the following cases:

* Compression pressure in one of the cylinders is less than 1 100 kPa (11 kgf/cm², 156 psi).
* Difference in compression pressure between two cylinders is more than 200 kPa (2 kgf/cm², 28 psi).
* All compression pressure are below 1 100 kPa (11 kgf/cm², 156 psi) even when they measure more than 1 300 kPa (13 kgf/cm², 185 psi).

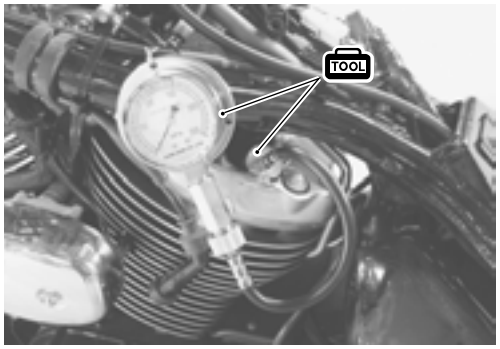
COMPRESSION TEST PROCEDURE

NOTE:

* *Before testing the engine for compression pressure, make sure that the cylinder head bolts are tightened to the specified torque values and valves are properly adjusted.*
* *Have the engine warmed up by idling before testing.*
* *Be sure that the battery used is in fully-charged condition.*

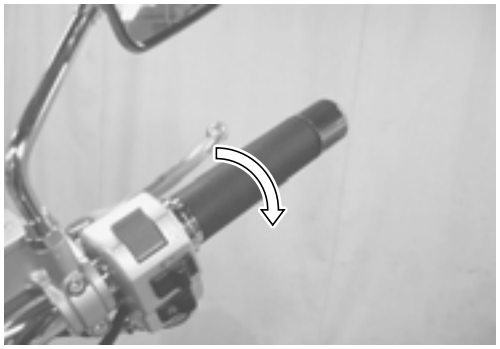
Remove the parts concerned and test the compression pressure in the following manner.

- Remove all the spark plugs. (☞2-5 and -6)
- Fit the compression gauge in one of the plug holes, while taking care of the tight connection.



- Keep the throttle grip in full-open position.
- While cranking the engine a few seconds with the starter, and record the maximum gauge reading as the compression of that cylinder.
- Repeat this procedure with an other cylinder.

TOOL 09915-64512: Compression gauge
09915-63210: Compression gauge adaptor



OIL PRESSURE CHECK

Check periodically the oil pressure in the engine to judge roughly the condition of the moving parts.

OIL PRESSURE SPECIFICATION

Above 350 kPa (3.5 kgf/cm², 50 psi) **Below 650 kPa (6.5 kgf/cm², 92 psi)**	**at 3 000 r/min, Oil temp. at 60°C (140°F)**

If the oil pressure is lower or higher than the specification, the following causes may be considered.

LOW OIL PRESSURE

* Clogged oil filter
* Oil leakage from the oil passage way
* Damaged O-ring
* Defective oil pump
* Combination of the above items

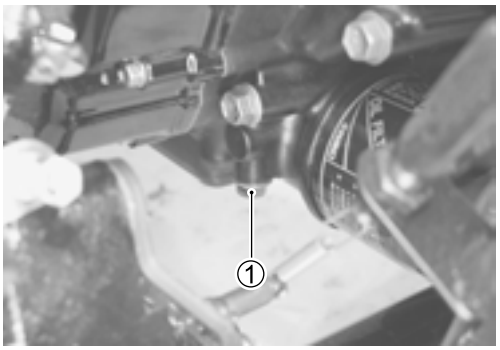
HIGH OIL PRESSURE

* Used of high viscosity engine oil
* Clogged oil passage way
* Combination of the above items

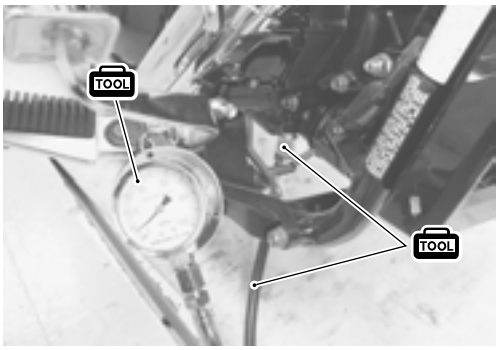
OIL PRESSURE TEST PROCEDURE

Start the engine and check if the oil pressure indicator light is turned on. If it keeps on lighting, check the oil pressure indicator light circuit. If it is in good condition, check the oil pressure in the following manner.

- Remove the main oil gallery plug ①.



- Install the oil pressure gauge with attachment in the position shown in the photo.
- Warm up the engine as follows:
  Summer 10 min at 2 000 r/min
  Winter 20 min at 2 000 r/min
- After warming up, increase the engine speed to 3 000 r/min (with the multi circuit tester ☞2-13), and read the oil pressure gauge.



TOOL **09915-74511: Oil pressure gauge hose**
09915-74532: Oil pressure gauge attachment
09915-77331: Meter (for high pressure)

Oil gallery plug: 18 N·m (1.8 kgf-m, 13.0 lb-ft)

SDS CHECK

Using SDS, take the sample of data from the new motorcycle and at the time of periodic maintenance at your dealership.

Save the data in the computer or by printing and filing the hard copies. The saved or filed data are useful for troubleshooting as they can be compared periodically with changes over time or failure conditions of the motorcycle.

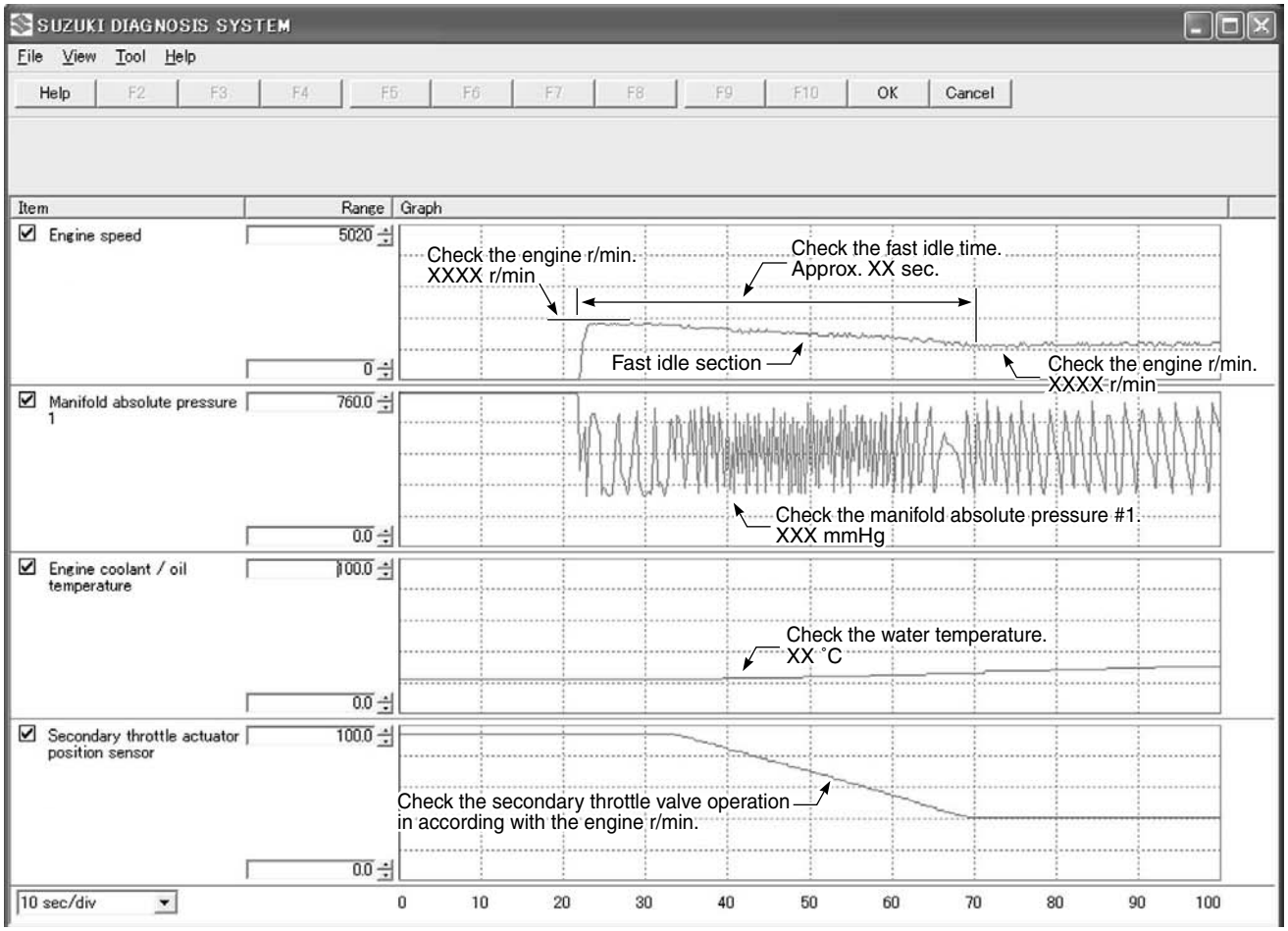
For example, when a motorcycle is brought in for service but the troubleshooting is difficult, comparison with the normal data that have been saved or filed can allow the specific engine failure to be determined.

- Remove the right frame cover. (☞8-3)
- Set up the SDS tool. (☞5-24)

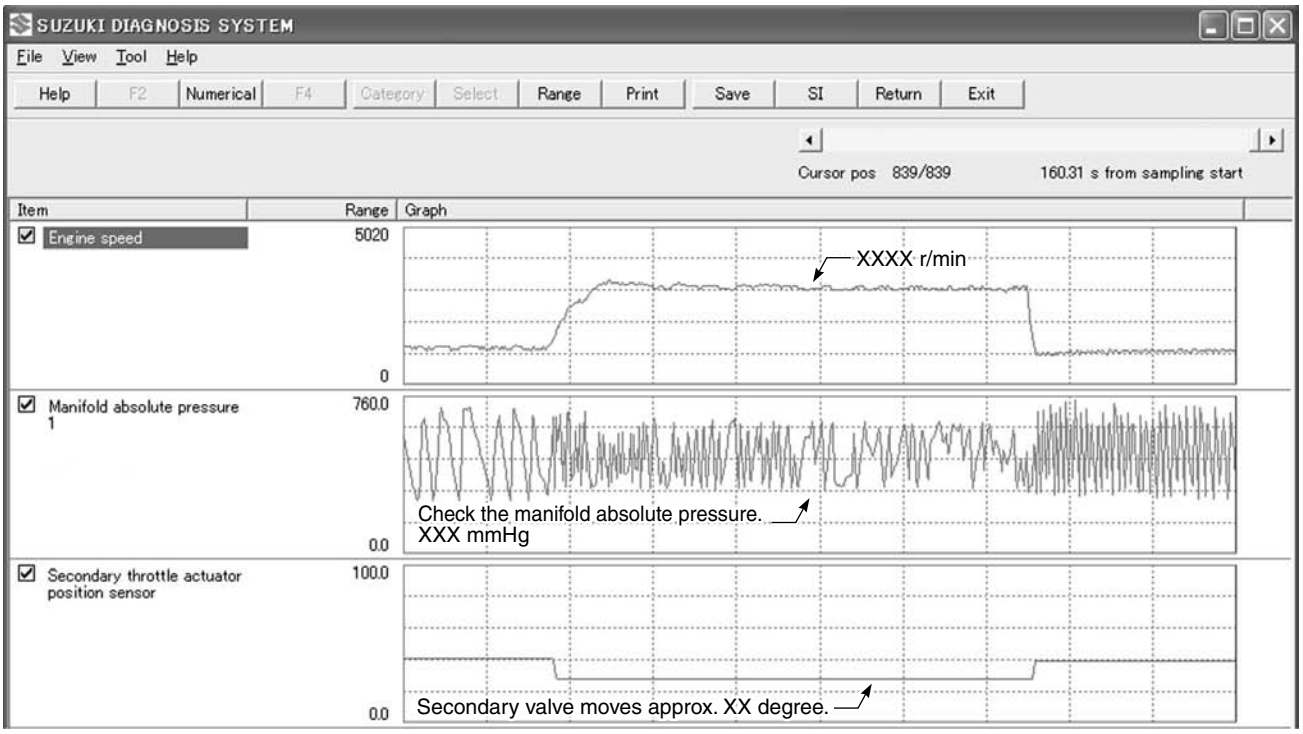
TOOL 09904-41010: SDS set tool
99565-01010: CD-ROM Ver. 5

A number of different data under a fixed condition as shown below should be saved or filed as sample.

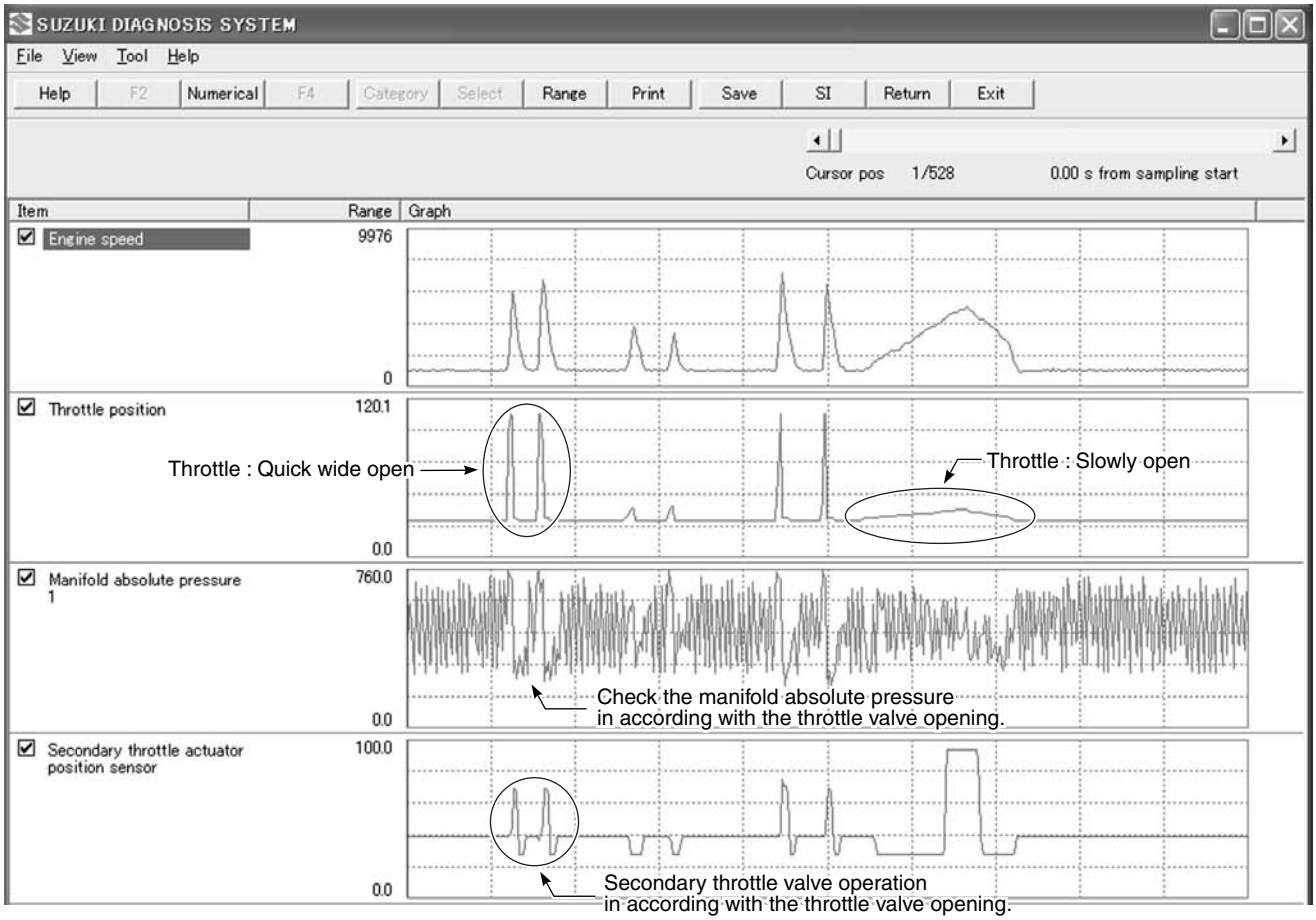
SAMPLE:
Data sampled from cold starting through warm-up



Data at 3 000 r/min under no load



Data at the time of racing



ENGINE

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ENGINE COMPONENTS REMOVABLE WITH ENGINE IN PLACE

The parts listed below can be removed and reinstalled without removing the engine from the frame. Refer to the page listed in this section for removal and reinstallation instructions.

ENGINE CENTER

PARTS	REMOVAL	INSTALLATION
Inspection cap	3-12	3-85
PAIR pipe	3-11	3-86
Starter motor	9-14	9-14
Oil filter	3-21	3-72

ENGINE LEFT SIDE

PARTS	REMOVAL	INSTALLATION
Neutral switch	3-22	3-72
Generator	3-23	3-71
Water pump	3-24	3-69
Secondary driven bevel gear	3-24	3-68

ENGINE RIGHT SIDE

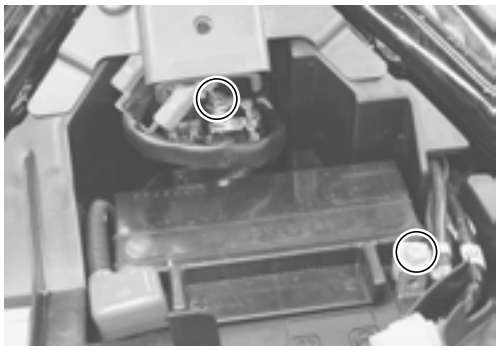
PARTS	REMOVAL	INSTALLATION
Clutch	3-18	3-76
Oil pump	3-20	3-74
Gearshift	3-20	3-74
Primary drive gear	3-21	3-73
Driveshaft bolt/Secondary driven gearshaft nut	3-21	3-69

ENGINE REMOVAL AND INSTALLATION

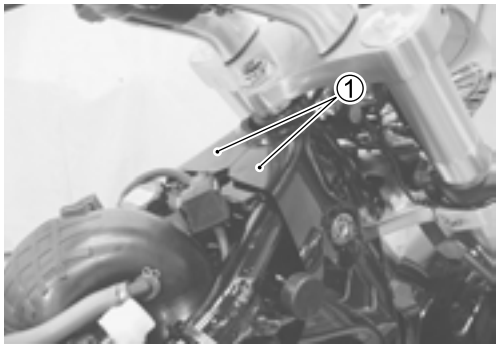
ENGINE REMOVAL

Before taking the engine out of the frame, wash the engine using a steam cleaner. Engine removal is sequentially explained in the following steps. Reinstall the engine by reversing the removal procedure.

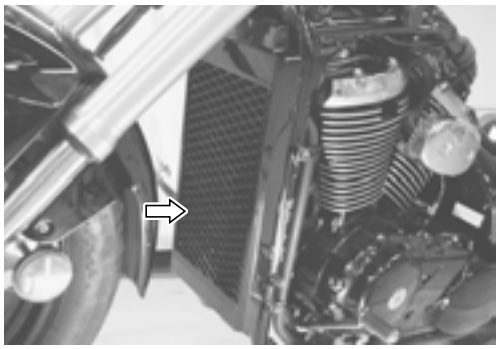
- Drain engine oil. (☞2-11)
- Drain engine coolant. (☞2-17)
- Remove the seats. (☞8-3)
- Remove the fuel tank. (☞ 6-3)
- Disconnect the battery ⊖ lead wire and starter motor lead wire.



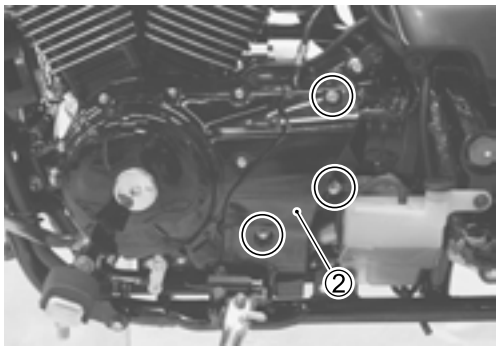
- Remove the frame head covers ①.



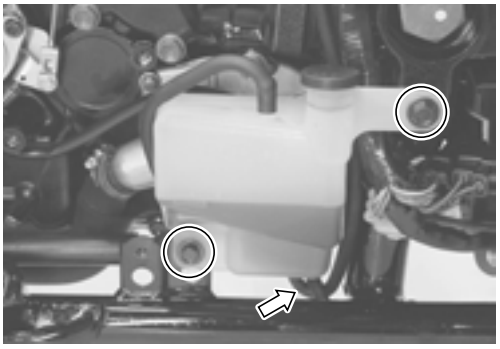
- Remove the radiator. (☞7-4)



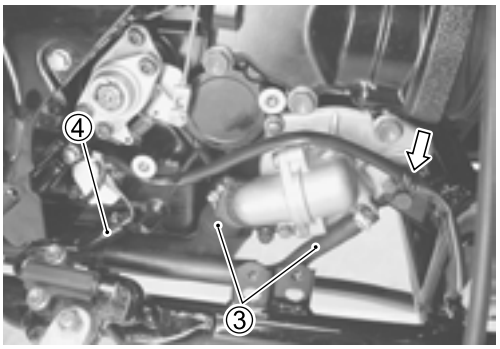
- Remove the left frame cover. (☞8-3)
- Remove the tool box and secondary gear case cover. (☞2-16)
- Remove the secondary drive unit cover ②.



- Remove the engine coolant reservoir tank.

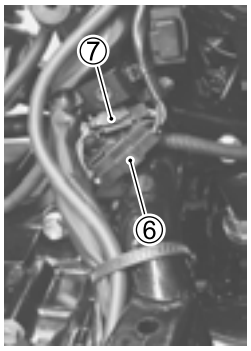


- Disconnect the water hoses ③.
- Disconnect the side-stand switch lead wire coupler ④.

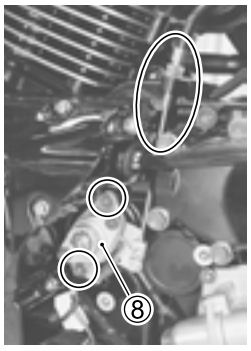


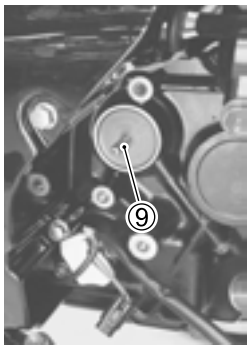
- Disconnect the neutral switch lead wire coupler ⑤.
- Disconnect the generator lead wire coupler ⑥ and the signal generator lead wire coupler ⑦.



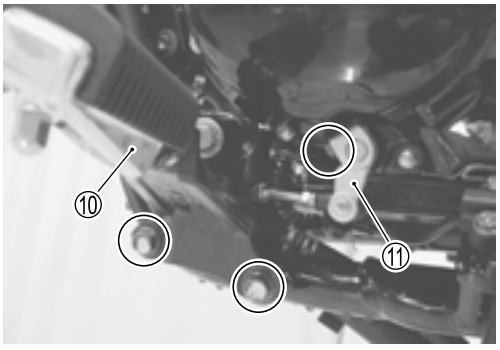


- Remove the clutch release mechanism ⑧.
- Remove the push rod ⑨.





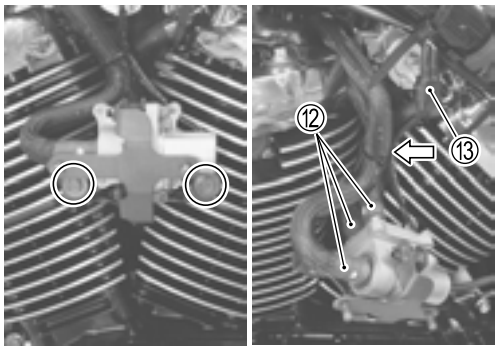
- Remove the left footrest ⑩ and the gearshift lever ⑪.



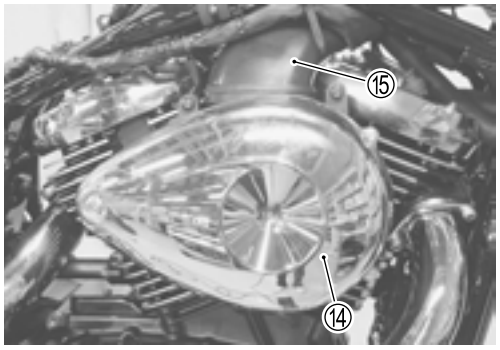
- Remove the PAIR (AIR SUPPLY) cover.



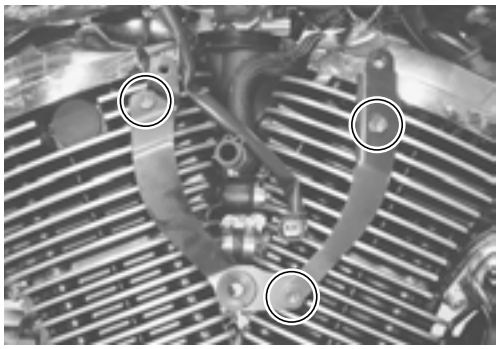
- Remove the PAIR mounting bolts.
- Disconnect the PAIR hoses ⑫ and lead wire coupler ⑬.



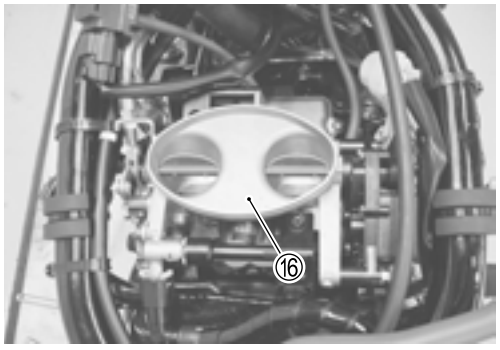
- Remove the air cleaner box ⑭ and air intake pipe ⑮. (☞5-47)



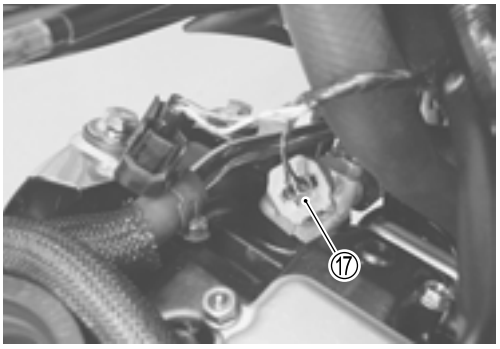
- Remove the air cleaner box bracket.



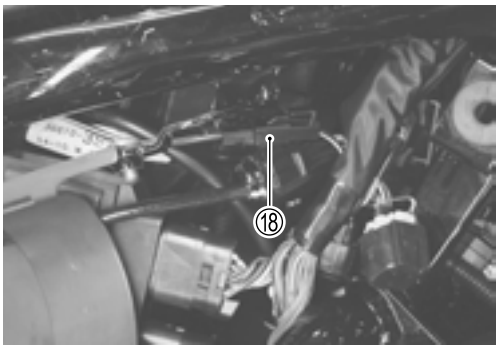
- Remove the throttle body ⑯. (☞6-14)



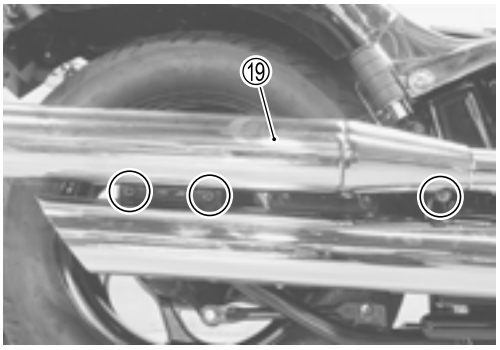
- Disconnect the ECT sensor lead wire coupler ⑰.
- Disconnect the spark plug caps.



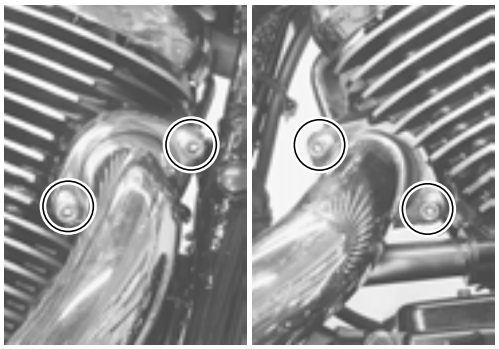
- Remove the right frame cover. (☞8-4)
- Disconnect the HO2 sensor lead wire coupler ⑱. (For E-02, 19, 24)

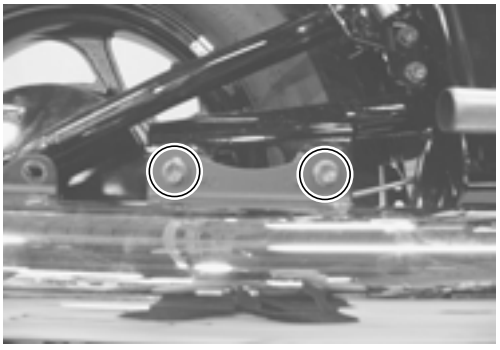


- Remove the No. 1 muffler ⑲.

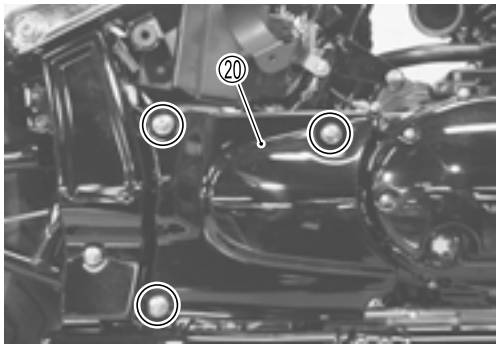


- Remove the exhaust pipes and the No. 2 muffler.

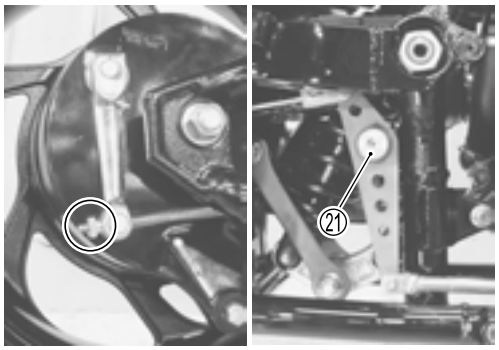




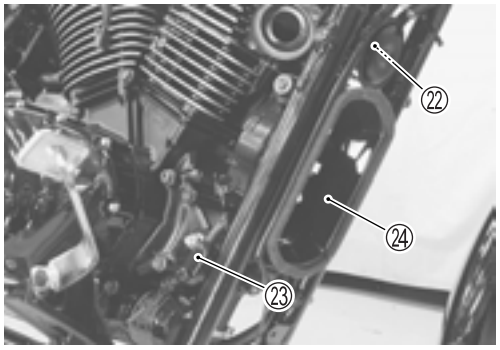
- Remove the rear clutch cover ⑳.



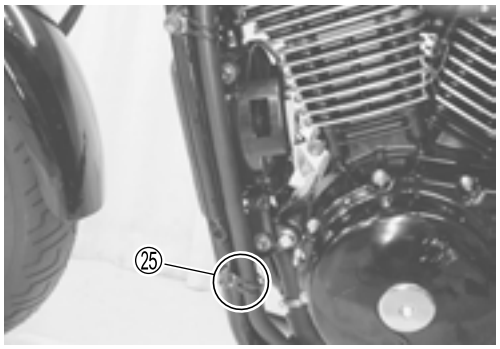
- Remove the rear brake link ㉑.



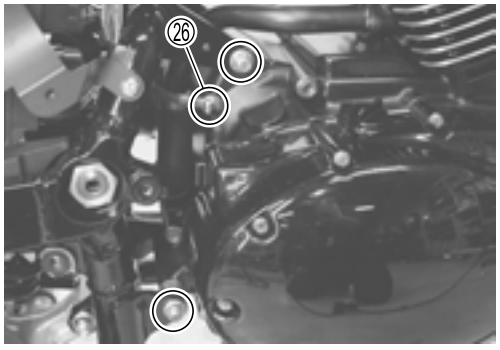
- Disconnect the horn lead wire coupler ㉒ and rear brake switch lead wire coupler ㉓.
- Remove the cooling fan ㉔. (☞7-8)



- Remove the engine frame mounting bolt ㉕.



- Remove the ground lead wire ㉖.
- Support the engine with an engine jack.
- Remove the engine mounting bolts and nuts.
- Gradually lower the engine.

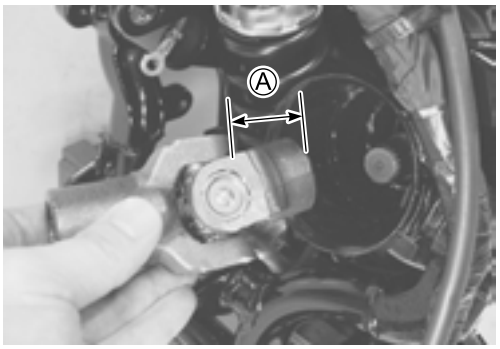


ENGINE INSTALLATION

Install the engine in the reverse order of engine removal.
Pay attention to the following points:

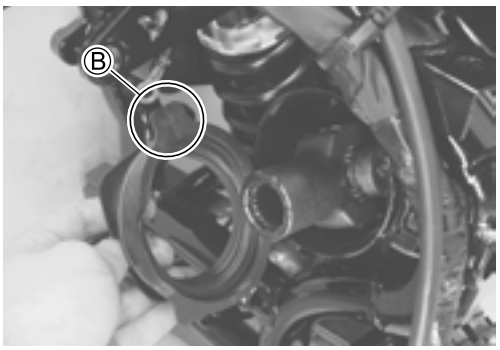
- Install the universal joint.

NOTE:
Be sure to face the short portion Ⓐ backward when installing it.



- Install the boot.

NOTE:
Make sure that the "UP" mark Ⓑ faces up.



- Gradually raise the engine, and then engage the secondary driven gear shaft to the universal joint.
- Properly fit the boot onto the engine and the swingarm.



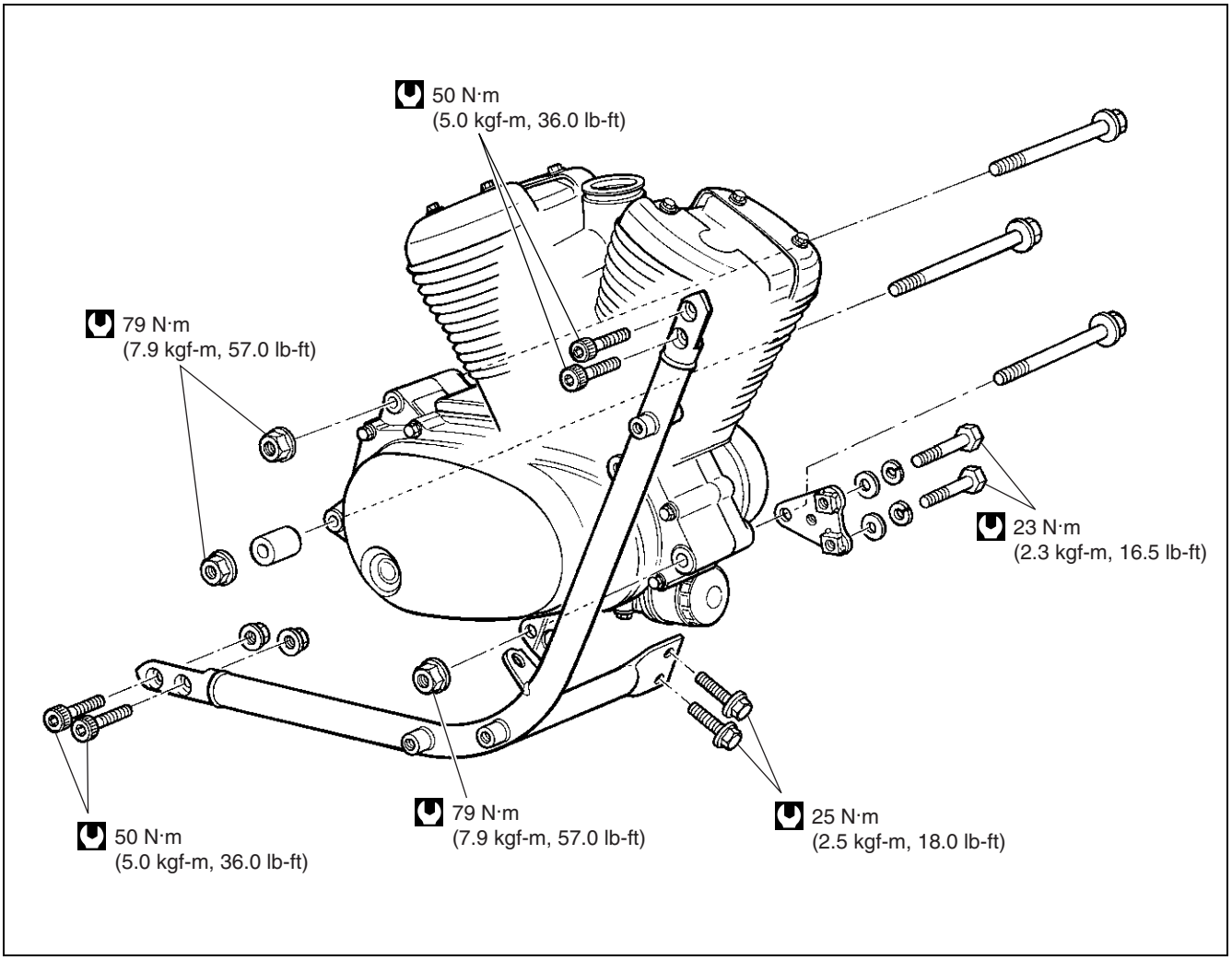
- Install the engine mounting bolts and nuts and tighten them.



NOTE:

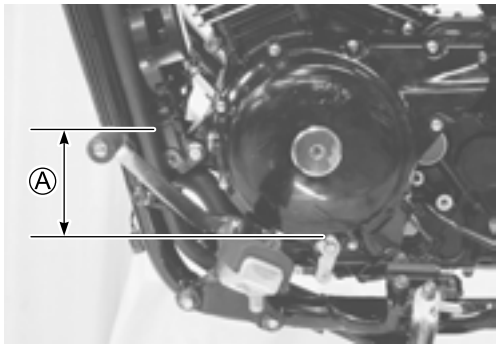
** The engine mounting nuts are self-locking. Once the nut has been removed, they are no longer of any use.*

** Be sure to use new nuts and tighten them to the specified torque.*



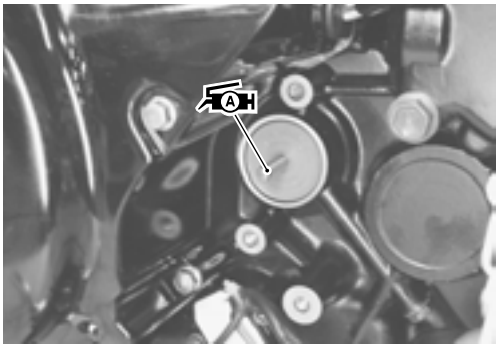
- Install the gearshift lever and the footrest in the correct position.

DATA Gearshift lever height Ⓐ
Standard: 85 – 95 mm (3.3 – 3.7 in)



• Apply grease to the push rod and install it.

99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

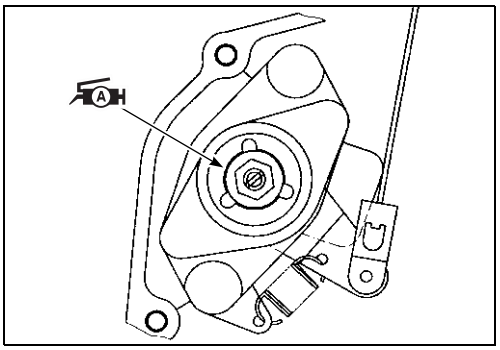


• Apply grease to the clutch release mechanism and install it.

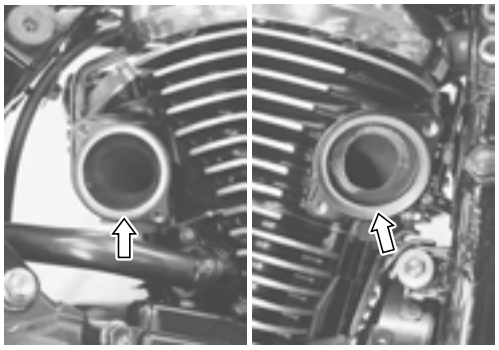
99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

DATA Clutch release screw
Standard: 1/4 turn back

CLUTCH CABLE ADJUSTMENT☞2-16

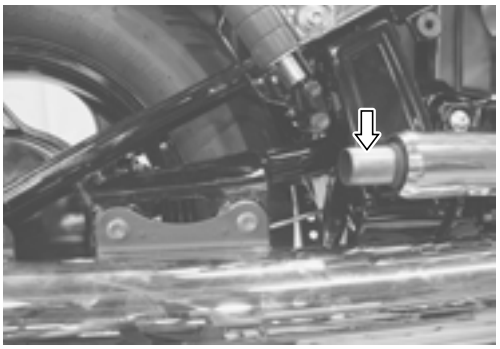


• Install the new gaskets.
• Install the exhaust pipes and mufflers.



• Apply gas sealer to the exhaust pipe connectors.

EXHAUST GAS SEALER: PERMATEX 1372

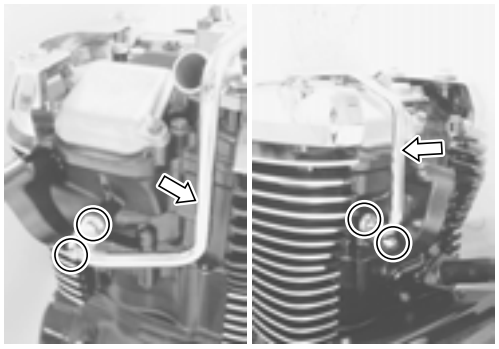


• Adjust the following items.
* Engine oil ☞2-11
* Engine coolant ☞2-17 and -18
* Idling adjustment ☞2-13
* Throttle cable play ☞2-14 and -15
* Rear brake adjusting ☞2-21

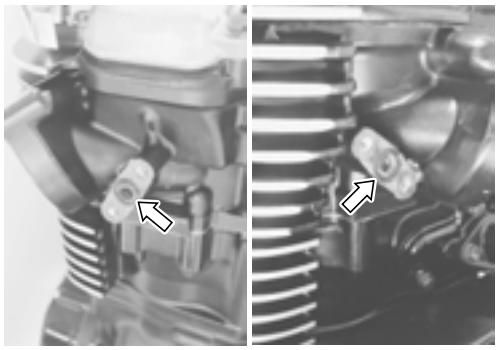
ENGINE DISASSEMBLY

- Remove the PAIR pipes.
- Remove the spark plugs.

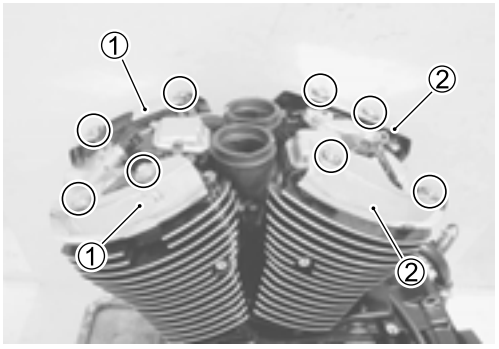
TOOL 09930-10121: Spark plug wrench set



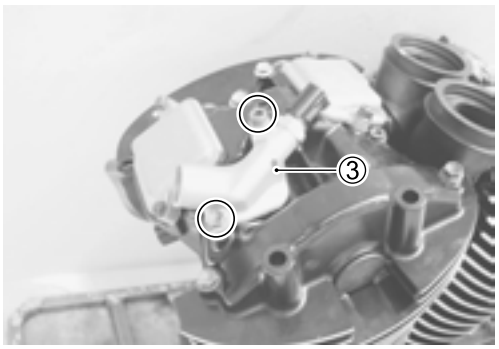
- Remove the gaskets.



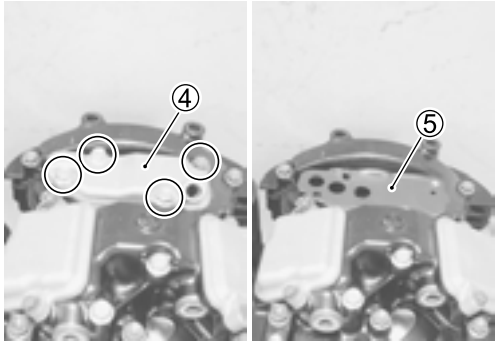
- Remove the cylinder head cover caps (①, ②).



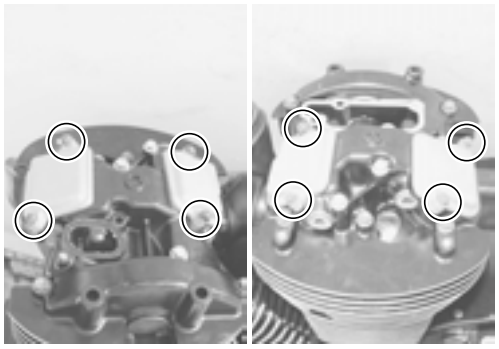
- Remove the water outlet union ③.



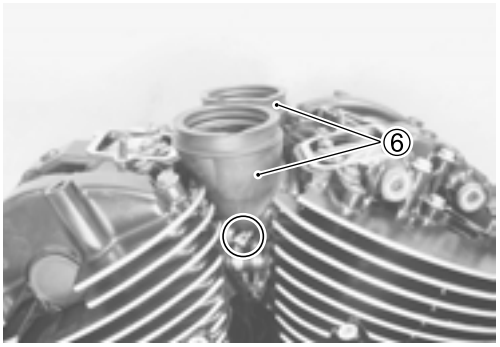
- Remove the breather cover ④ and gasket ⑤.



- Remove the valve inspection caps. (F & R)

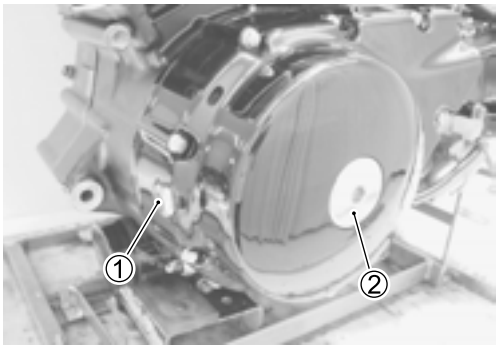


- Remove the intake pipes ⑥. (F & R)

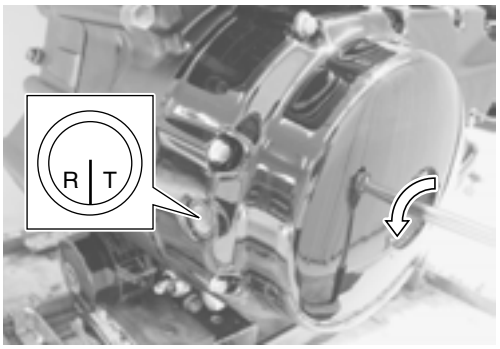


CYLINDER HEAD COVER

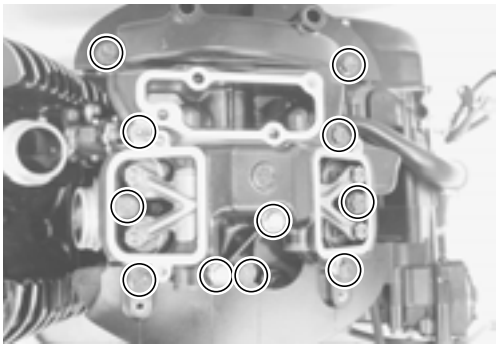
- Remove the valve timing inspection plug ① and the generator cover cap ②.



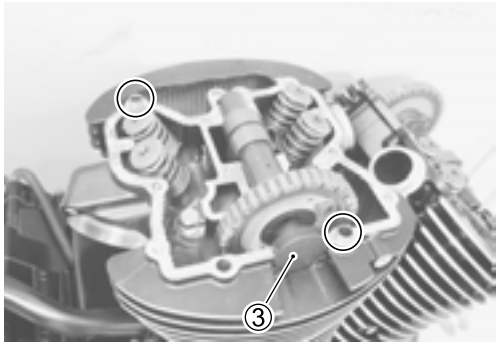
- Position “R I T” line on the generator with the center of the valve timing inspection hole.



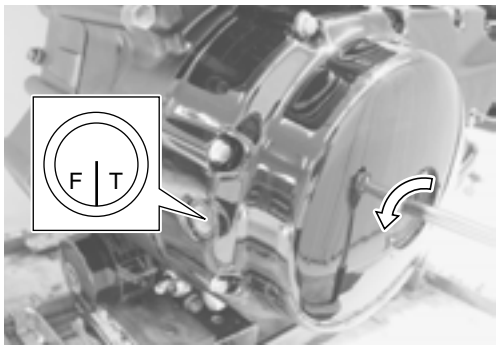
- Remove the cylinder head cover. (Rear)



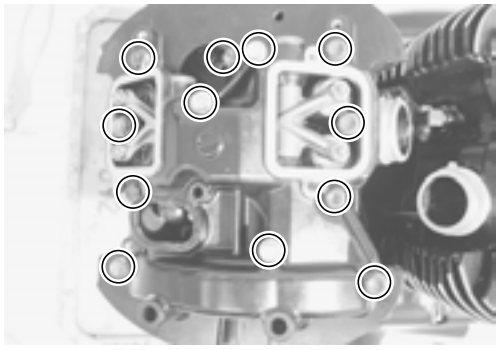
- Remove the dowel pins and camshaft end cap ③.



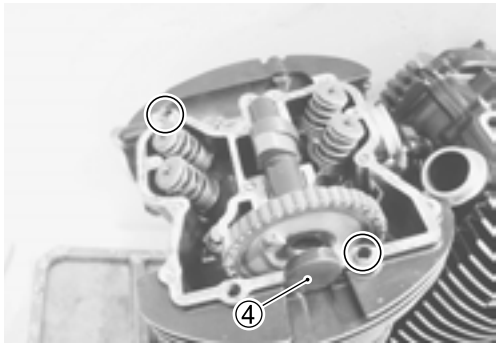
- Rotate the generator rotor 450 degrees (1 and 1/4 turns) and align the “F I T” line on the generator with the center of the valve timing inspection hole.



- Remove the cylinder head cover. (Front)

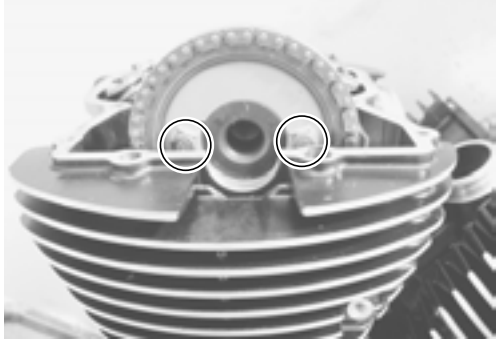


- Remove the dowel pins and camshaft end cap ④.



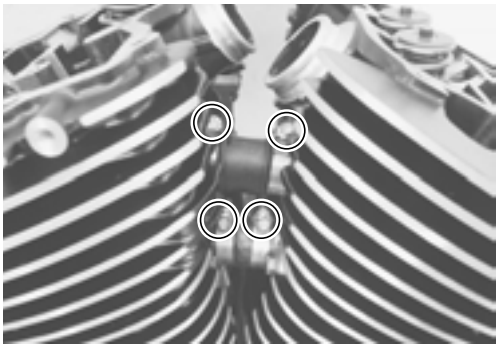
CAMSHAFT

- Flatten the lock washer.
- Remove the cam sprocket and camshaft. (Front and rear cylinders)

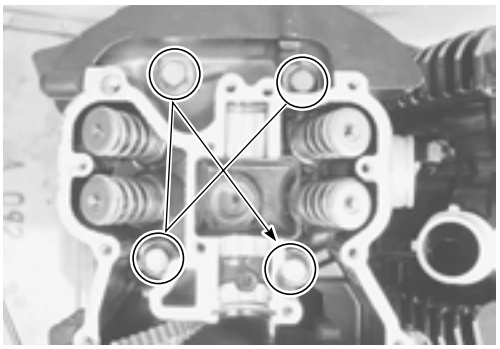


CYLINDER HEAD/CYLINDER

- Loosen the water hose clamp screws.

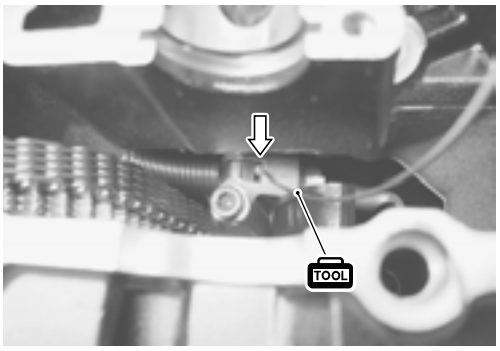


- Remove the cylinder head bolts. (Front cylinder)

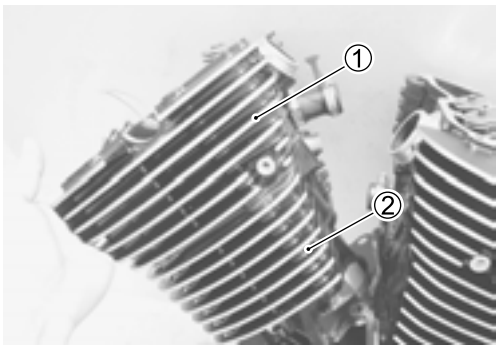


- After unlocking the ratchet, push the cam chain tension adjuster rod fully.
- Insert the special tool between the ratchet and the adjuster body.

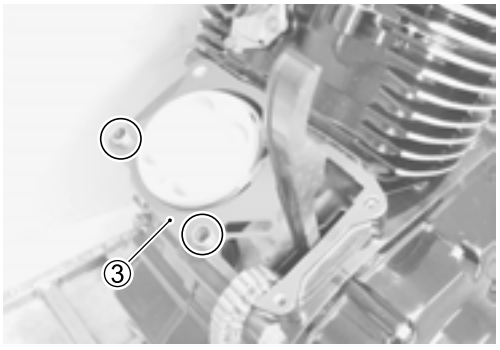
09918-53810: Chain tensioner lock tool



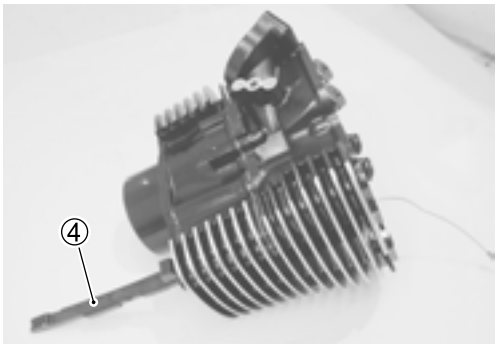
- Remove the cylinder head ① and cylinder ②. (Front cylinder)



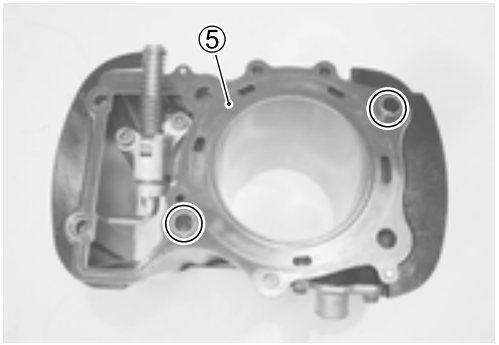
- Remove the dowel pins and gasket ③.



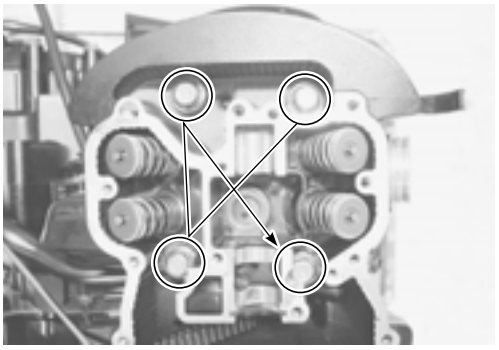
- Separate the cylinder head/cylinder assembly. (Front cylinder)
- Remove the cam chain guide ④.



- Remove the dowel pins and gasket ⑤.

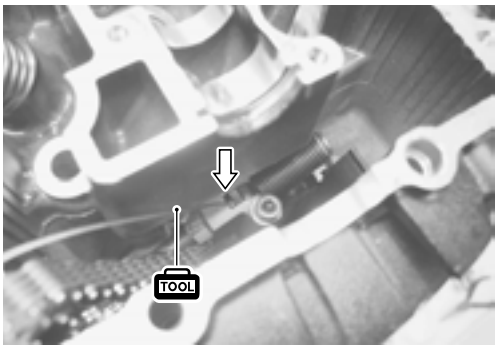


- Remove the cylinder head bolts. (Rear cylinder)

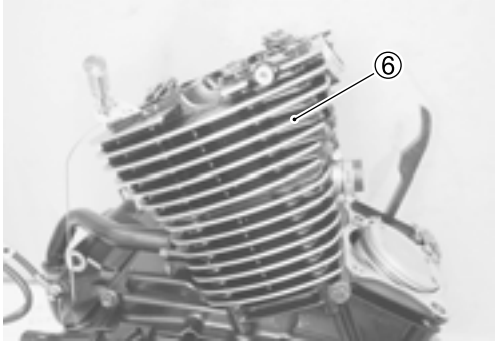


- Push the cam chain tension adjuster rod and insert the special tool.

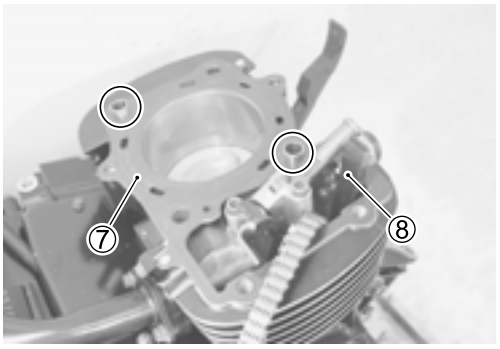
TOOL 09918-53810: Chain tensioner lock tool



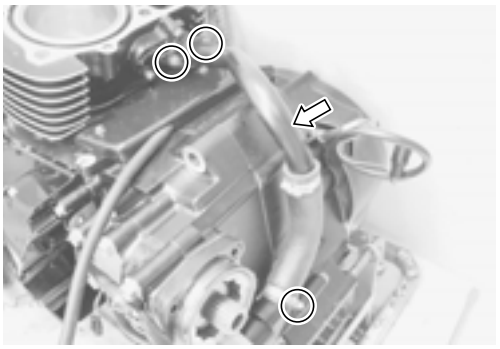
- Remove the cylinder head ⑥. (Rear cylinder)



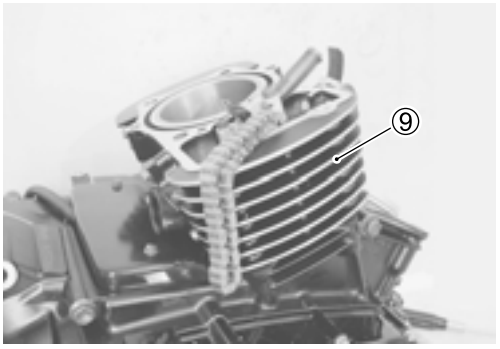
- Remove the dowel pins and gasket ⑦.
- Remove the cam chain guide ⑧.



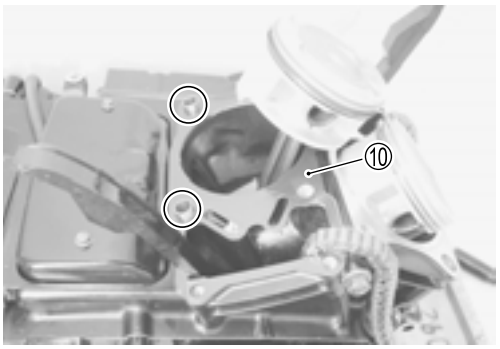
- Remove the water hose and pipe.



- Remove the cylinder ⑨. (Rear cylinder)



- Remove the dowel pins and gasket ⑩.



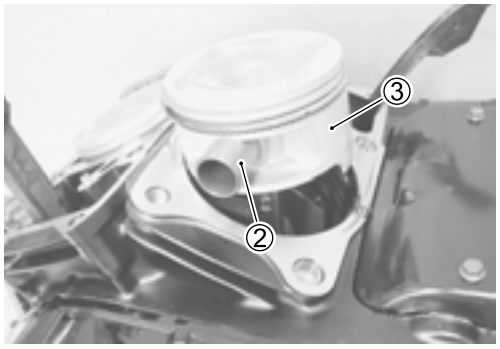
PISTON

- Place a clean rag under the piston to prevent any parts from falling into the crankcase.
- Remove the piston pin circlip ① using long-nose pliers.



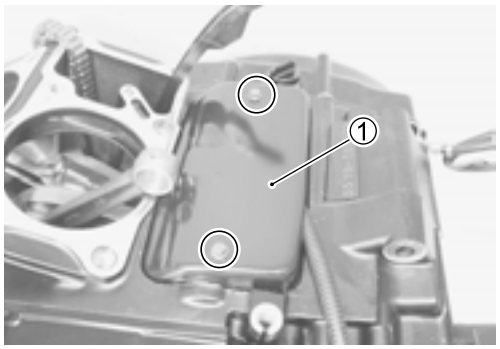
• Draw out each piston pin ② and remove the pistons ③. (F & R)

NOTE:
Scribe the cylinder position on the head.

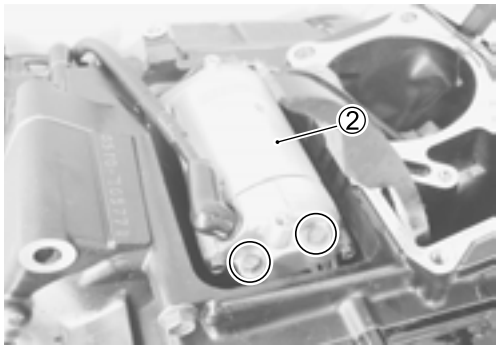


STARTER MOTOR

• Remove the starter motor cover ①.

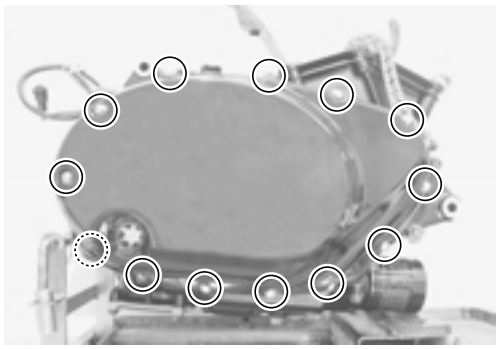


• Remove the starter motor ②.

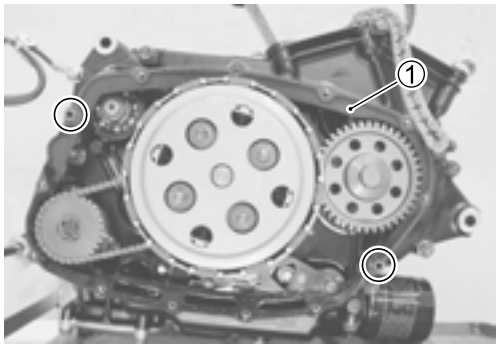


CLUTCH

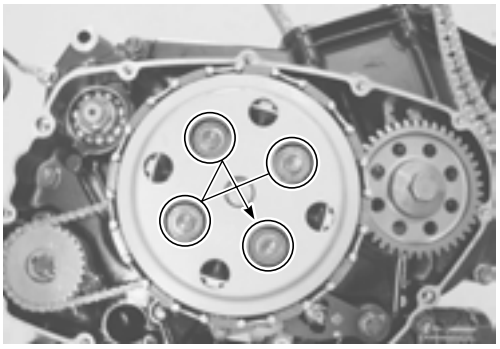
• Remove the clutch cover.



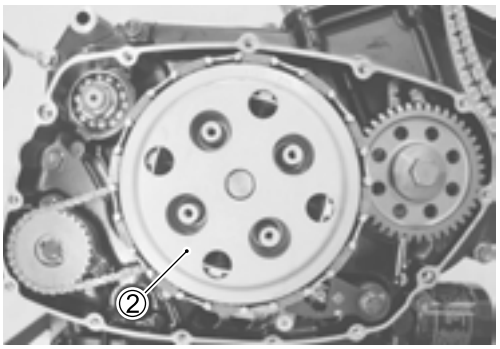
• Remove the dowel pins and gasket ①.



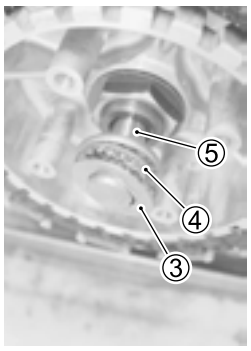
- Remove the clutch spring mounting bolts and springs diagonally.

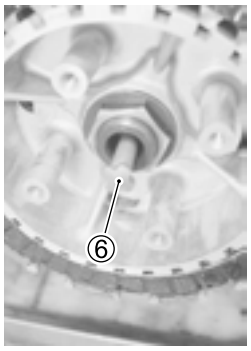


- Remove the pressure plate ②.

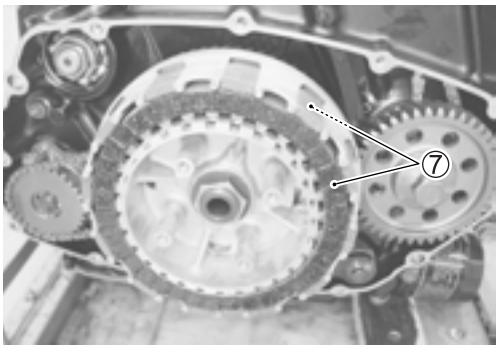


- Remove the thrust washer ③, bearing ④, push piece ⑤ and push rod ⑥.

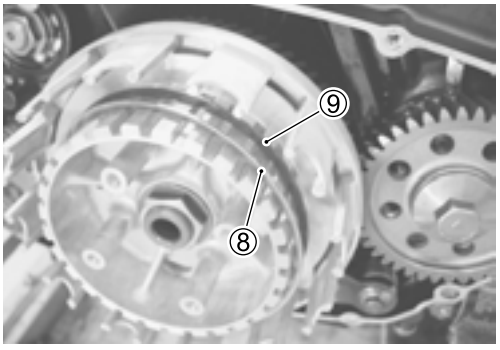




- Remove the clutch drive and driven plates ⑦.

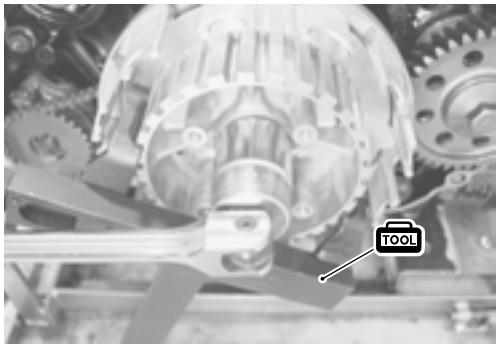


- Remove the spring washer ⑧ and spring washer seat ⑨.

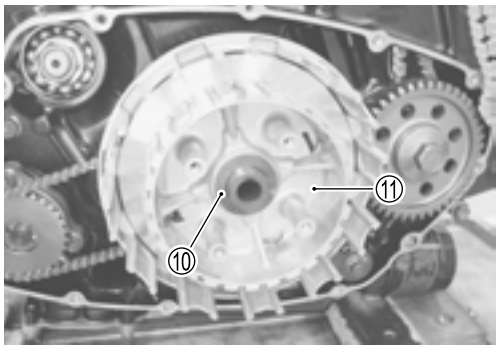


- Remove the clutch sleeve hub nut with the special tool.

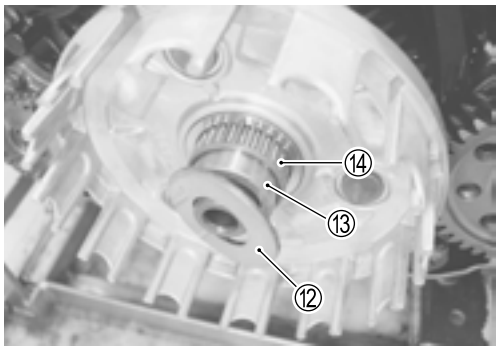
TOOL 09920-53740: Clutch sleeve hub holder



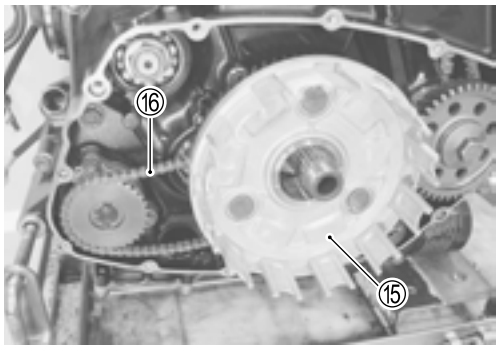
- Remove the washer ⑩ and the clutch sleeve hub ⑪.



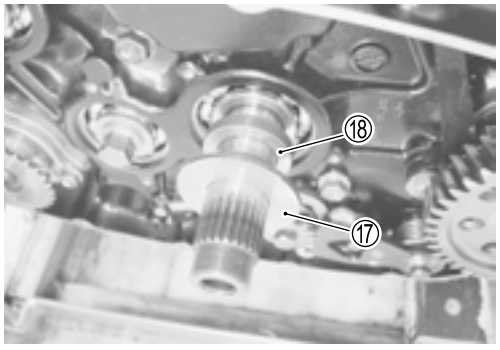
- Remove the thrust washer ⑫, spacer ⑬, and needle roller bearing ⑭.



- Remove the primary driven gear assembly ⑮ and the oil pump drive chain ⑯.



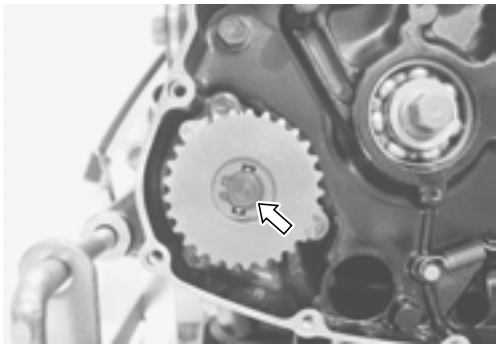
- Remove the thrust washer ⑰ and spacer ⑱.



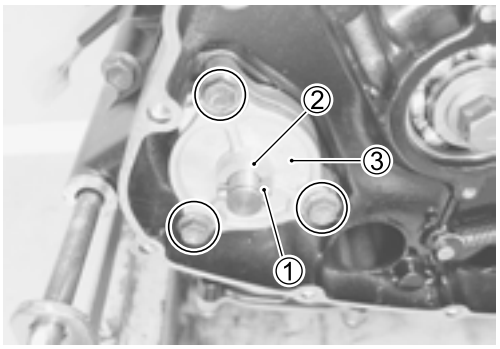
OIL PUMP

- Remove the oil pump by removing the snap ring.

09900-06107: Snap ring pliers

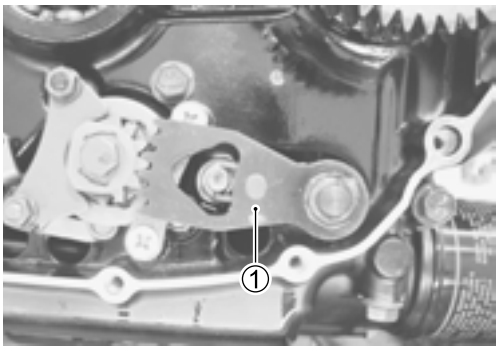


- Remove the pin ① and washer ②.
- Remove the oil pump ③.

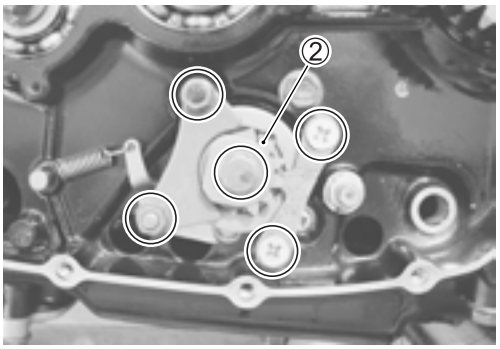


GEARSHIFT

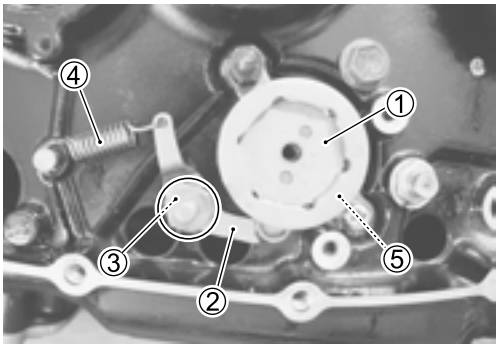
- Draw out the gearshift shaft ①.



- Remove the cam guide and the pawl lifter.
- Remove the cam driven gear assembly ② by removing the gearshift cam stopper bolt.



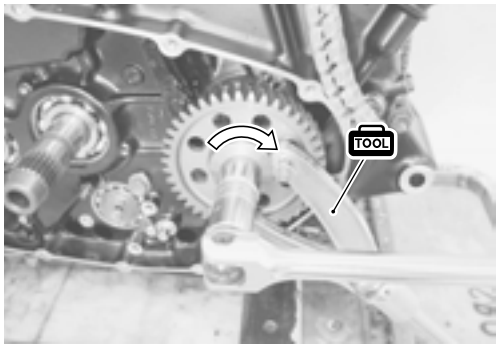
- Remove the gearshift cam plate ①.
- Remove the gearshift cam stopper ②, washer ③, spring ④.
- Remove the washer ⑤.



PRIMARY DRIVE GEAR

- Remove the primary drive gear by removing the primary drive gear bolt with the special tool.

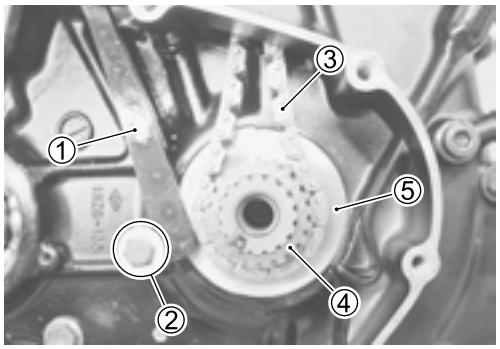
TOOL 09930-40113: Rotor holder



CAUTION

This bolt has left-hand thread.
Turning it counter-clockwise may cause damage.

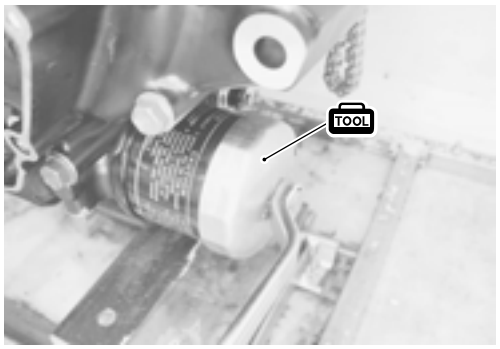
- Remove the cam chain tensioner ①, washers, spacer ② and the chain ③.
- Remove the cam chain drive sprocket ④ and the thrust washer ⑤.



OIL FILTER

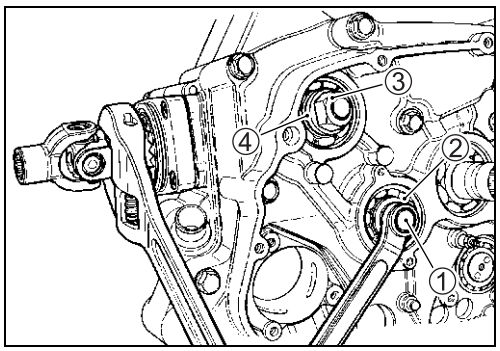
- Remove the oil filter with the special tool.

TOOL 09915-40610: Oil filter wrench



DRIVESHAFT BOLT/SECONDARY DRIVEN GEAR SHAFT NUT

- Install the universal joint on the secondary driven gear shaft.
- While holding the universal joint with an adjustable wrench, remove the driveshaft bolt ①, thrust washer ②, secondary drive gear shaft nut ③ and the thrust washer ④.

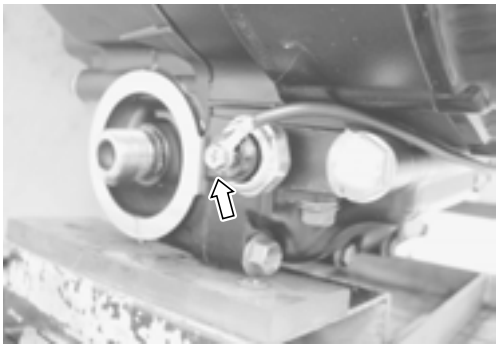


CAUTION

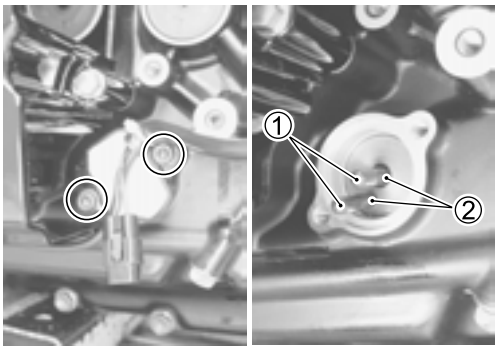
The driveshaft bolt ① has left-hand thread.
Turning it counter-clockwise may cause damage.

NEUTRAL SWITCH

- Remove the oil pressure switch lead wire.



- Remove the neutral switch assembly.
- Remove the neutral switch contacts ① and spring ②.

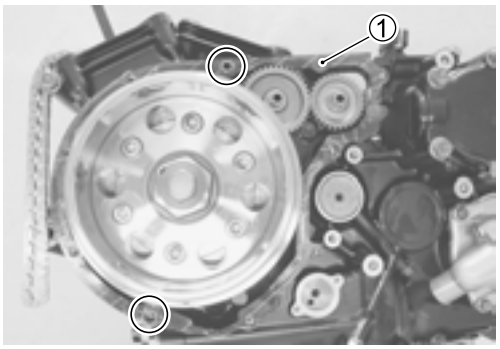


GENERATOR

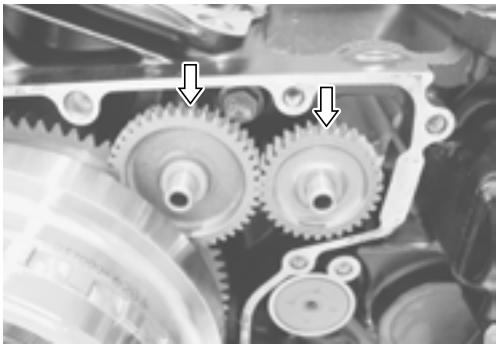
- Remove the generator cover.



- Remove the dowel pins and gasket ①.

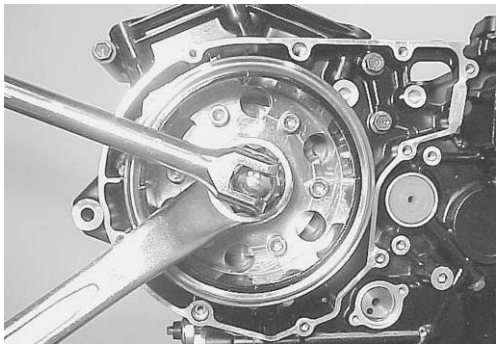


- Remove the starter motor driven gear and the idle gear.



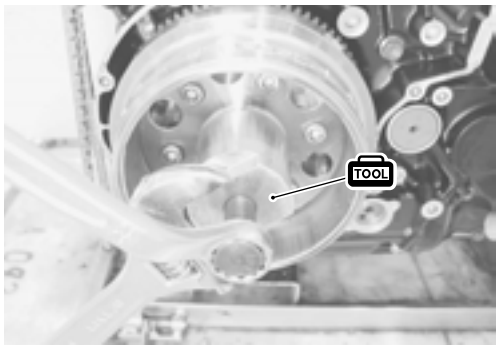
• Loosen the generator rotor bolt.

NOTE:
When loosen the rotor bolt, do not remove it. The rotor bolt is used in conjunction with the rotor remover when removing the rotor.

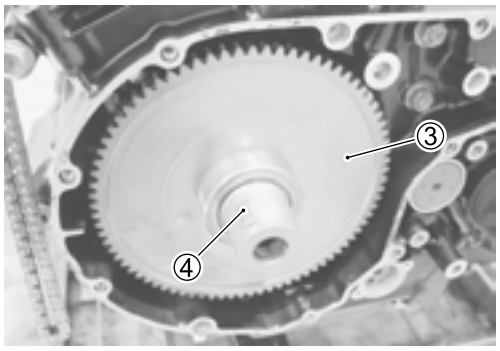


• Remove the generator rotor assembly with the special tool.

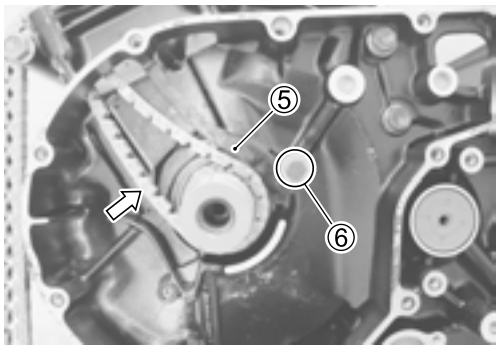
TOOL 09930-33730: Rotor remover



• Remove the starter gear ③ and key ④.

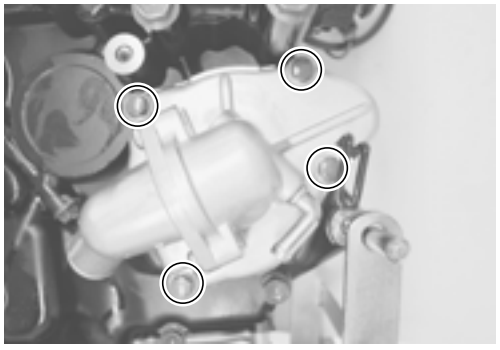


• Remove the cam chain tensioner ⑤, washers, spacer ⑥ and the chain.



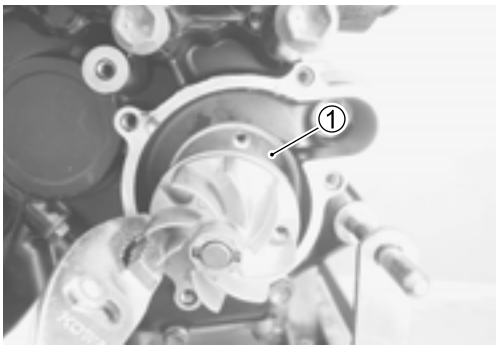
WATER PUMP

• Remove the water pump cover.



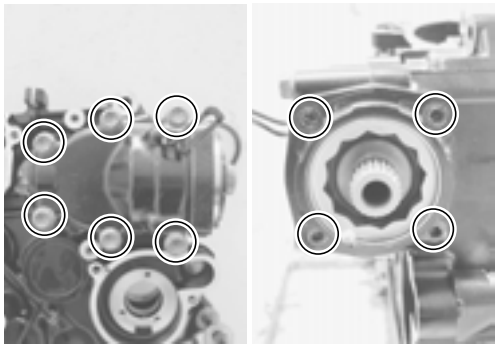
- Remove the water pump assembly and gasket ①.



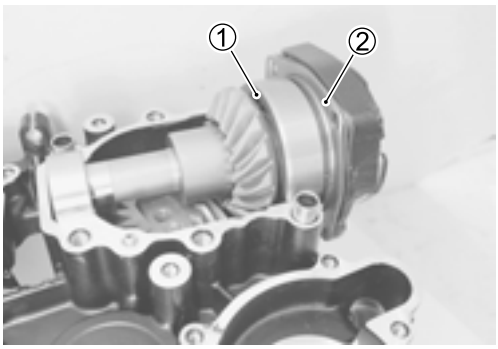


SECONDARY DRIVEN GEAR

- Remove the secondary driven gear housing bolts.
- Remove the secondary driven gear case.



- Remove the secondary driven gear assembly ① and shims ②.

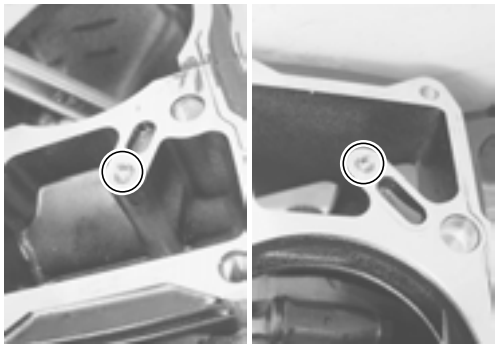


- Remove the bearing ③, pin ④, oil jet ⑤, and dowel pins.



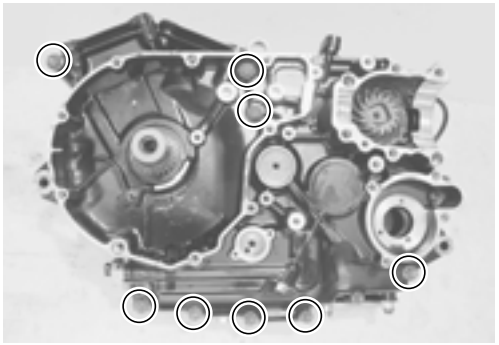
OIL JET

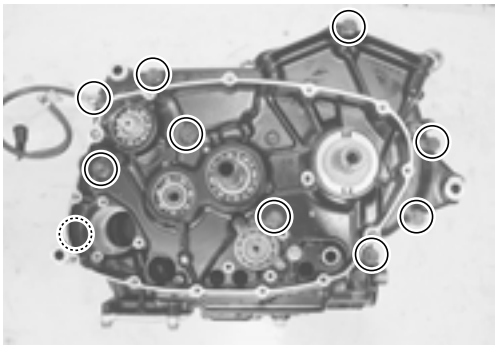
- Remove the oil jets.



CRANKCASE

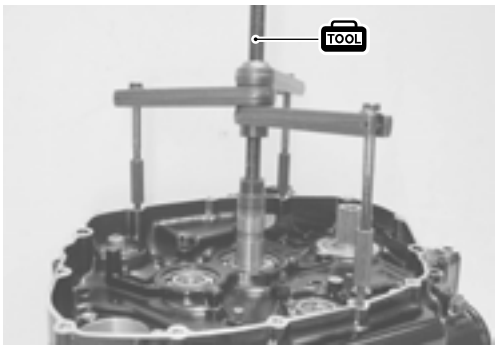
- Remove the crankcase bolts.



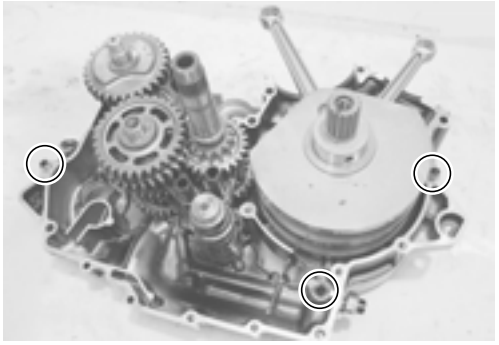


- Separate the crankcase into two parts with the special tool.

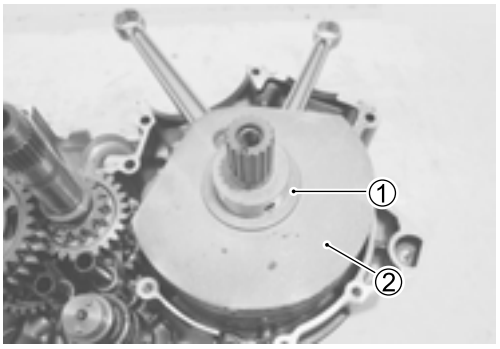
TOOL **09920-13120: Crankcase separator**



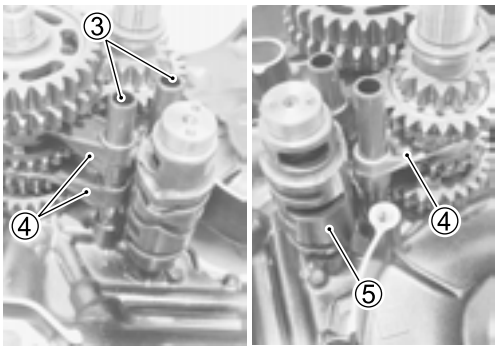
- Remove the dowel pins and O-ring.



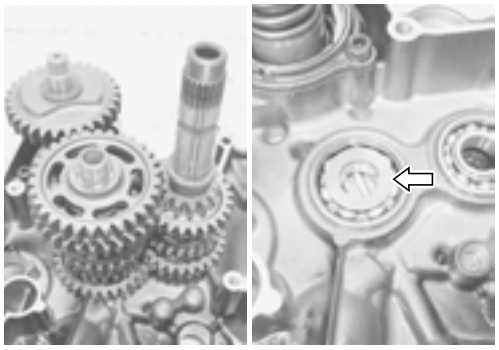
- Remove the thrust shim ① and crankshaft ②.



- Remove the gearshift fork shafts ③ gearshift forks ④ and gearshift cam ⑤.

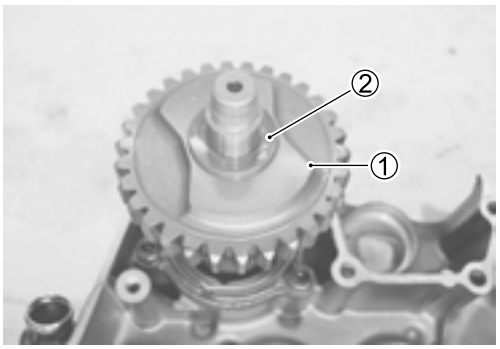


- Remove the transmission.
- Remove the washer.

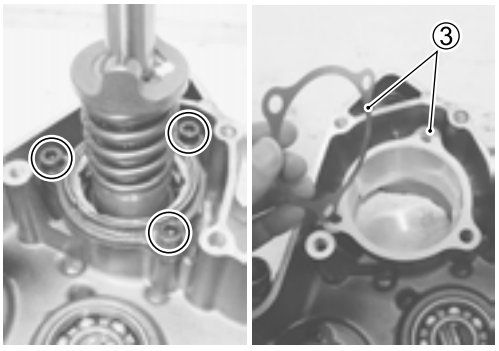


SECONDARY DRIVE BEVEL GEAR

- Remove the over driving gear ① and bush ②.



- Remove the secondary drive bevel gear assembly.
- Remove the shims ③.



ENGINE COMPONENTS INSPECTION AND SERVICING

CYLINDER HEAD COVER

DISASSEMBLY

CAUTION

Be sure to identify each removed part as to its location, and lay the parts out in groups designated as "No. 1 cylinder", "No. 2 cylinder", "Exhaust", "Intake", so that each will be restored to the original location during assembly.



- Loosen the rocker arm shafts and pull out the rocker arm shafts.

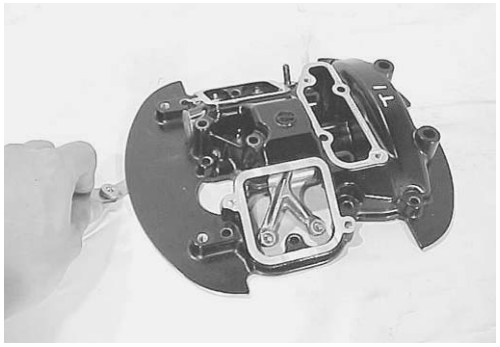
CYLINDER HEAD COVER DISTORTION

After removing sealant from the fitting surface of the cylinder head cover, place the cylinder head cover on a surface plate and check for distortion with a thickness gauge.

DATA Cylinder head cover distortion
Service Limit: 0.05 mm (0.002 in)

TOOL 09900-20803: Thickness gauge

If the distortion exceeds the limit, replace the cylinder head cover.

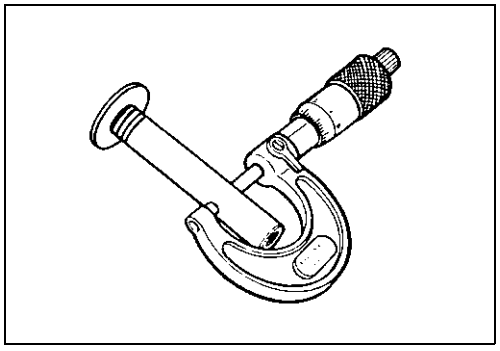


ROCKER ARM SHAFT O.D.

Measure diameter of rocker arm shaft.

DATA Rocker arm shaft O.D. (IN. & EX.)
Standard: 11.977 – 11.995 mm (0.4715 – 0.4722 in)

TOOL 09900-20205: Micrometer (0 – 25 mm)

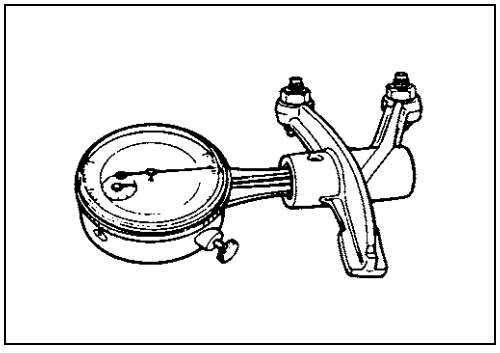


ROCKER ARM I.D.

When checking the valve rocker arm, the inside diameter of the valve rocker arm and wear of the camshaft contacting surface should be checked.

DATA Rocker arm I.D.
Standard: 12.000 – 12.018 mm (0.4724 – 0.4731 in)

TOOL 09900-20605: Dial calipers

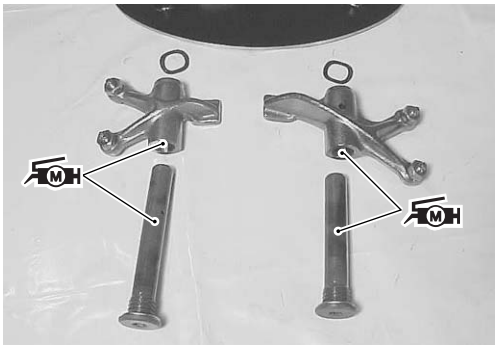


REASSEMBLY

- Apply SUZUKI MOLY PASTE to the rocker arms and their shafts.

99000-25140: SUZUKI MOLY PASTE

Rocker arm shaft: 27 N·m (2.7 kgf-m, 19.5 lb-ft)



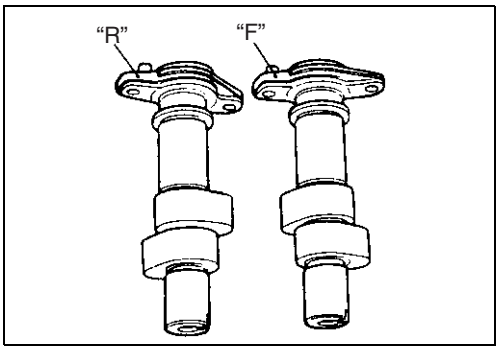
CAMSHAFT

The camshafts should be checked for wear and also for runout of cams and journals if the engine has been noted to produce abnormal noise or vibration or to lack output power. Any of these malconditions could be caused by a worn camshafts.

The camshaft can be distinguished by the embossed-letters, “F” and “R”, on the camshaft.

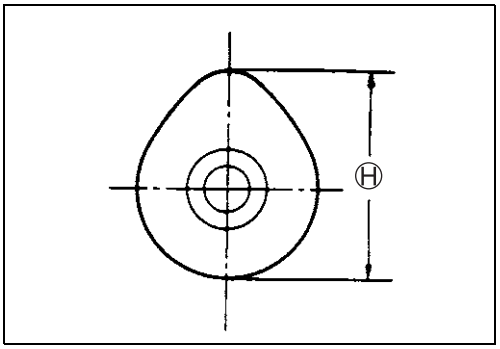
“F” : Front (No. 2) camshaft

“R” : Rear (No. 1) camshaft



CAMSHAFT CAM WEAR

Worn-down cams are often the cause of mistimed valve operation resulting in reduced output power. The limit of cam wear is specified for both intake and exhaust cams in terms of cam height Ⓗ, which is to be measured with a micrometer. Replace camshafts if found worn down to the limit.



Cam height Ⓗ

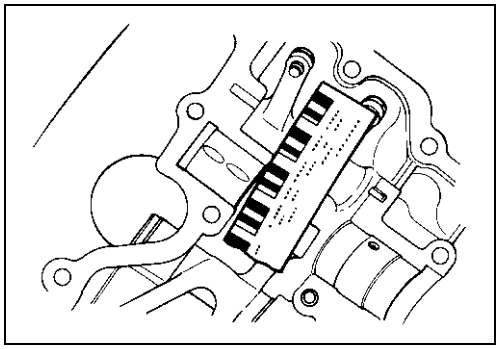
Service Limit: (IN.) : 35.20 mm (1.386 in)

(EX.): 36.28 mm (1.428 in)

09900-20202: Micrometer (25 – 50 mm)

CAMSHAFT JOURNAL WEAR

Determine whether each journal is worn down to the limit or not by measuring camshaft journal oil clearance with the camshaft installed. Use plastigauge to read the clearance, which is specified as follows:



DATA Camshaft journal oil clearance
Service Limit: 0.150 mm (0.0059 in)

TOOL 09900-22302: Plastigauge

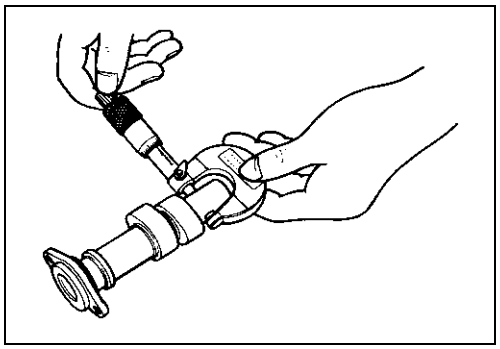
NOTE:
To properly measure the oil clearance with plastigauge, all gasket material must be removed from fitting surfaces of cylinder head and cover. Do not apply SUZUKI BOND "1216B" until after the oil clearance has been determined.

- Tighten the cylinder head cover bolts evenly and diagonally to the specified torque.

Cylinder head cover bolts
(M6): 10 N·m (1.0 kgf-m, 7.0 lb-ft)
(M8): 24.5 N·m (2.45 kgf-m, 18.0 lb-ft)

NOTE:
Do not rotate the camshafts with the plastigauge in place.

Remove the cylinder head cover, and read the width of the compressed plastigauge with envelop scale. This measurement should be taken at the widest part.



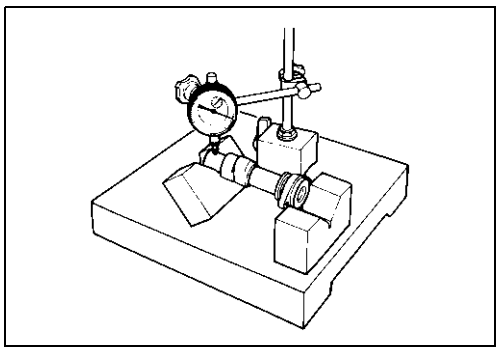
If the camshaft journal oil clearance measured exceeds the limit, measure the outside diameter of camshaft.
Replace either the cylinder head set or the camshaft if the clearance is incorrect.

DATA Camshaft journal O.D.
(Sprocket side): 24.959 – 24.980 mm (0.9826 – 0.9835 in)
(Other side) : 19.959 – 19.980 mm (0.7858 – 0.7866 in)

TOOL 09900-20205: Micrometer (0 – 25 mm)

CAMSHAFT RUNOUT

Measure the runout with a dial gauge. Replace the camshaft if the runout exceeds the limit.



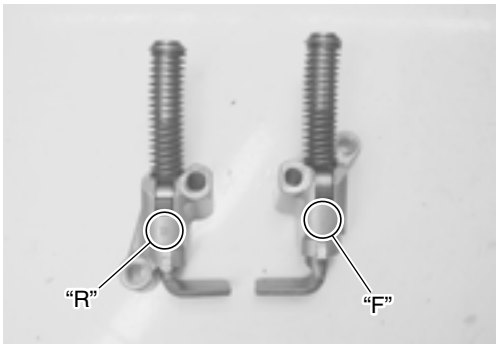
DATA Camshaft runout (IN. & EX.)
Service Limit: 0.10 mm (0.004 in)

TOOL 09900-20607: Dial gauge (1/100, 10 mm)
09900-20701: Magnetic stand
09900-21304: V-block (100 mm)

CAM CHAIN TENSIONER AND GUIDE

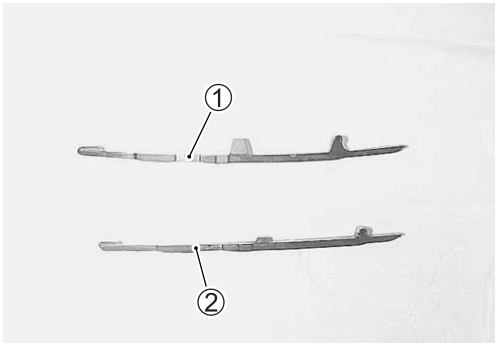
CAM CHAIN TENSIONER

For driving the camshafts, two cam chain tensioners are used on the respective cam drive chains. Unlock the ratchet mechanism, and move the push rod in place to see if it slides smoothly. If any stickiness is noted or ratchet mechanism is faulty, replace the cam chain tensioner assembly with a new one.
The cam chain tensioner can be distinguished by the embossed letters, “F” and “R”, on the cam chain tensioners.
“F”: Front (No. 2) cam chain tensioner
“R”: Rear (No. 1) cam chain tensioner



CAM CHAIN GUIDE

Check the contacting surface of the cam chain guide for wear and damage. If it is found to be damaged, replace it with a new one.
Two kinds of cam chain guide are used on the respective cam drive chains.
①: For front cylinder
②: For rear cylinder

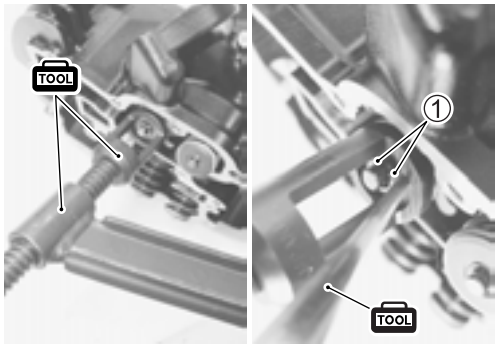


CYLINDER HEAD

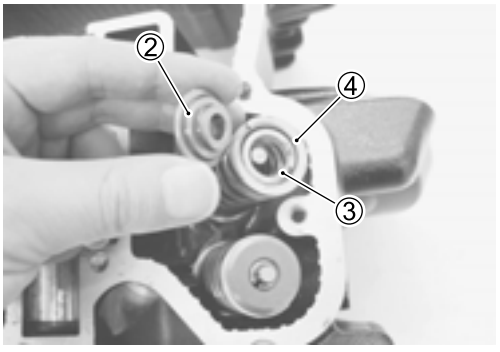
VALVE AND VALVE SPRING DISASSEMBLY

- Using special tools, compress the valve springs and remove the two cotter halves ① from valve stem.

TOOL 09916-14510: Valve spring compressor
09916-14910: Valve spring compressor attachment
09916-84511: Tweezers

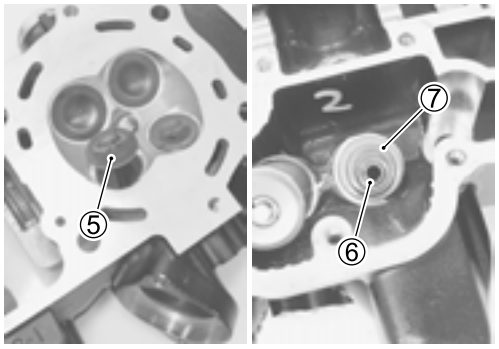


- Remove the valve spring retainer ②, inner spring ③ and outer spring ④.



- Pull out the valve ⑤ from the other side.
- Remove the valve stem seal ⑥ and valve spring seat ⑦.

NOTE:
Removal of valves completes ordinary disassembling work. If valve guides have to be removed for replacement after inspecting related parts, carry out the steps shown in valve guide servicing. (☞3-32)



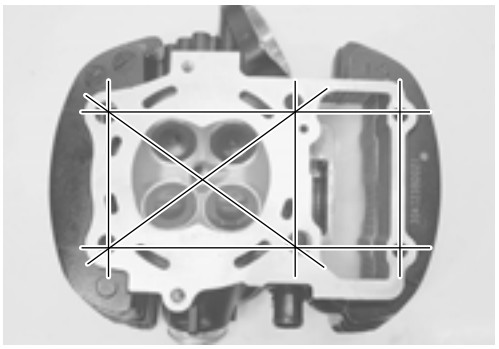
CYLINDER HEAD DISTORTION

- Decarbonize the combustion chambers.

Check the gasketed surface of the cylinder head for distortion with a straightedge and thickness gauge, taking a clearance reading at several places indicated. If the largest reading at any position of the straightedge exceeds the limit, replace the cylinder head.

DATA Cylinder head distortion
Service Limit: 0.05 mm (0.002 in)

TOOL 09900-20803: Thickness gauge

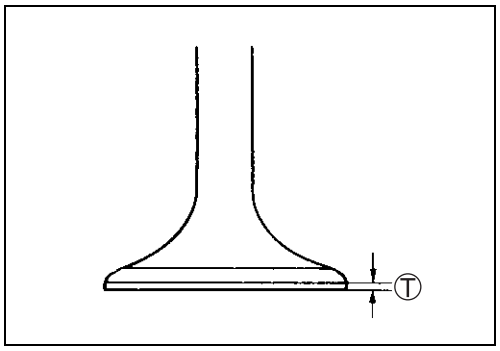


VALVE FACE WEAR

Visually inspect each valve for wear of its seating face. Replace any valve with an abnormally worn face.
The thickness Ⓣ decreases as the wear of the face advances.
Measure the thickness and, if the thickness is found to have been reduced to the limit, replace it.

DATA Valve head thickness
Service Limit Ⓣ: 0.5 mm (0.02 in)

TOOL 09900-20102: Vernier calipers

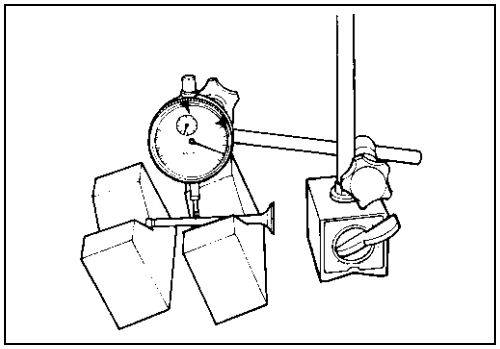


VALVE STEM RUNOUT

Support the valve with "V" blocks, as shown, and check its runout with a dial gauge.
The valve must be replaced if the runout exceeds the limit.

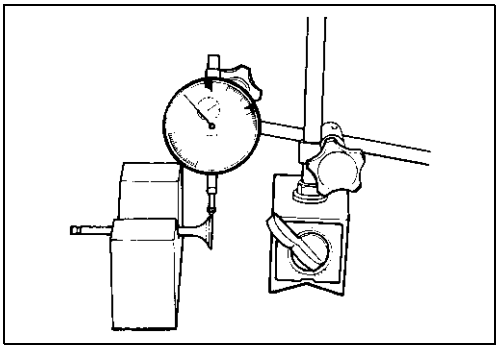
DATA Valve stem runout
Service Limit: 0.05 mm (0.002 in)

TOOL 09900-20701: Magnetic stand
09900-20607: Dial gauge (1/100 mm)
09900-21304: V-block



VALVE HEAD RADIAL RUNOUT

Place the dial gauge at right angles to the valve head face, and measure the valve head radial runout.
If it measures more than limit, replace the valve.

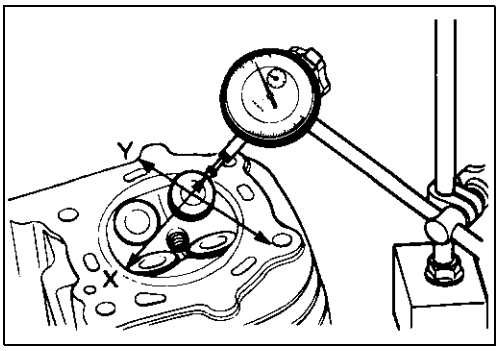


DATA Valve head radial runout
Service Limit: 0.03 mm (0.001 in)

TOOL 09900-20701: Magnetic stand
09900-20607: Dial gauge (1/100 mm)
09900-21304: V-block

VALVE STEM DEFLECTION

Lift the valve about 10 mm (0.39 in) from the valve seat. Measure the valve stem deflection in two directions, "X" and "Y", perpendicular to each other, by positioning the dial gauge as shown. If the deflection measured exceeds the limit, (see below) then determine whether the valve or the guide should be replaced with a new one.

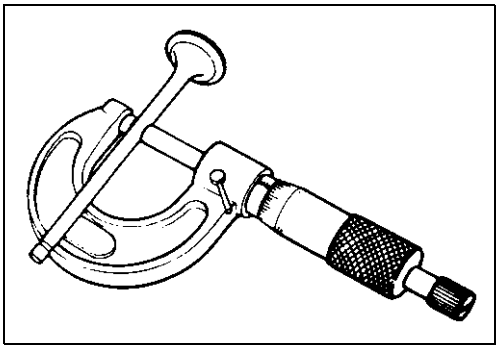


DATA Valve stem deflection (IN. & EX.)
Service Limit: 0.35 mm (0.14 in)

TOOL 09900-20607: Dial gauge (1/100 mm)
09900-20701: Magnetic stand

VALVE STEM WEAR

If the valve stem is worn down to the limit, as measured with a micrometer, where the clearance is found to be in excess of the limit indicated replace the valve, if the stem is within the limit, then replace the guide. After replacing valve or guide, be sure to re-check the clearance.

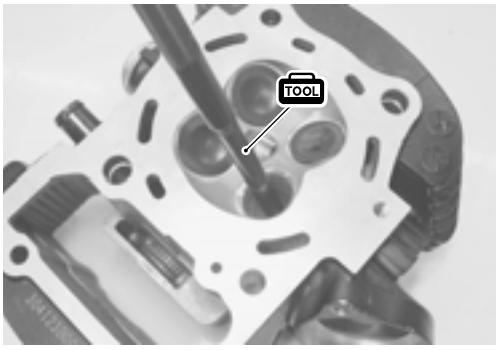


DATA Valve stem O.D.
Standard (IN.) : 5.475 – 5.490 mm (0.2156 – 0.2161 in)
(EX.) : 5.455 – 5.470 mm (0.2148 – 0.2154 in)

TOOL 09900-20205: Micrometer (0 – 25 mm)

VALVE GUIDE SERVICING

- Using the valve guide remover, drive the valve guide out toward the intake or exhaust rocker arm side.

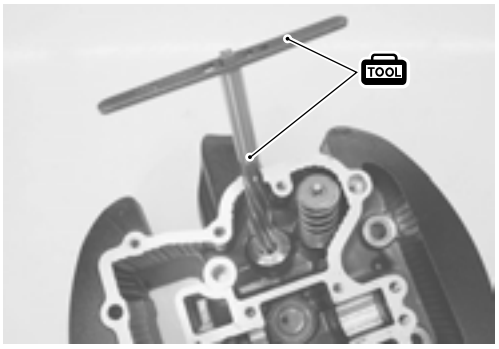


TOOL 09916-44910: Valve guide remover/installer

NOTE:
** Discard the removed valve guide subassemblies.*
** Only oversized valve guides are available as replacement parts. (Part No. 11115-38A71)*

- Re-finish the valve guide holes in cylinder head with a 10.8 mm reamer and handle.

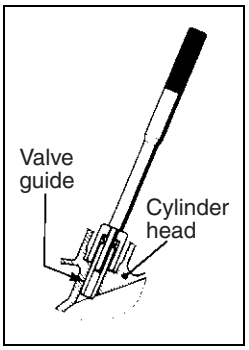
TOOL 09916-34580: Valve guide hole reamer
09916-34542: Reamer handle

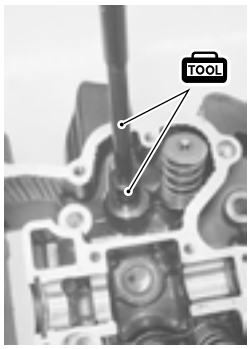


- Cool down the new valve guides in a freezer for about one hour and heat the cylinder head to 100 – 150 °C (212 – 302 °F) with a hot plate.

CAUTION

Do not use a burner to heat the valve guide hole to prevent cylinder head distortion.





- Oil the stem hole, too, of each valve guide and drive the guide into the guide hole with the valve guide installer and attachment.

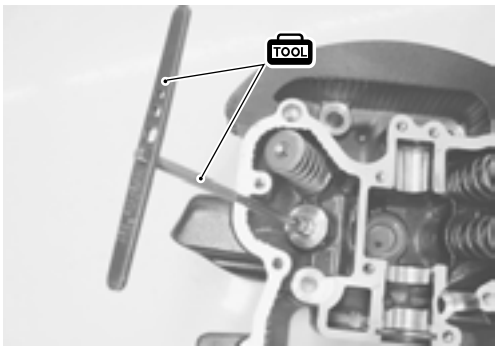
TOOL 09916-44910: Valve guide remover/installer
09916-44920: Valve guide installer attachment

CAUTION

Failure to oil the valve guide hole before driving the new guide into place may result in a damage guide or head.

- After fitting all valve guides, re-finish their guiding bores with a 5.5 mm reamer. Be sure to clean and oil the guide after reaming.

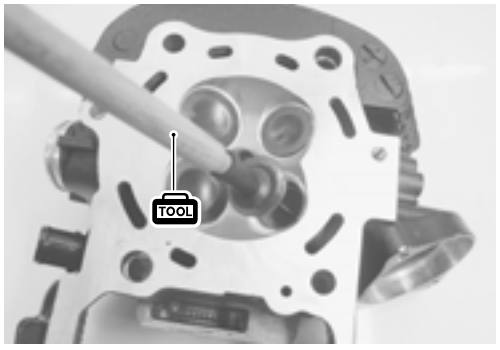
TOOL 09916-34550: Valve guide reamer
09916-34542: Reamer handle



NOTE:
** Be sure to cool down the cylinder head to ambient air temperature.*
** Insert the reamer from the combustion chamber and always turn the reamer handle clockwise.*

VALVE SEAT WIDTH

- Coat the valve seat with prussian blue uniformly. Fit the valve and tap the coated seat with the valve face in a rotating manner, in order to obtain a clear impression of the seating contact.
  In this operation, use the valve lapper to hold the valve head.

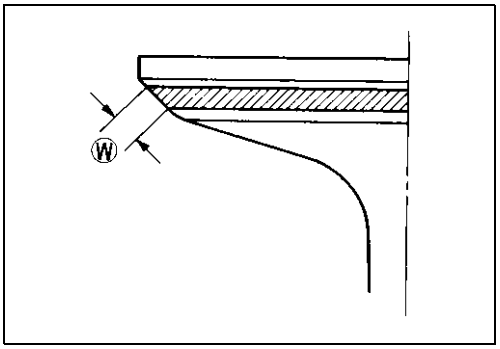


- The ring-like dye impression left on the valve face must be continuous – without any break. In addition, the width of the dye ring, which is the visualized seat "width", must be within the following specification:

DATA Valve seat width Ⓦ
Standard: 0.9 – 1.1 mm (0.035 – 0.043 in)

TOOL 09916-10911: Valve lapper set

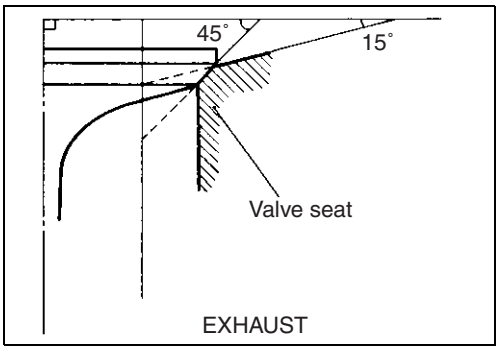
If either requirement is not met, correct the seat by servicing it as follows:



VALVE SEAT SERVICING

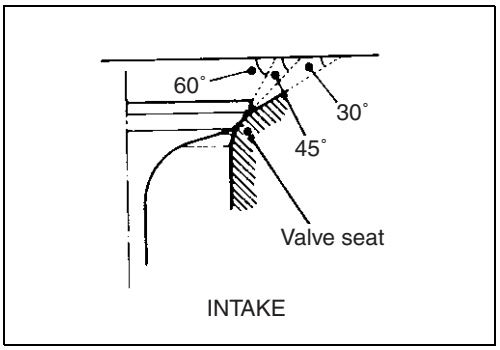
The valve seats for intake and exhaust valves are machined to four different angles. The seat contact surface is cut at 45°.

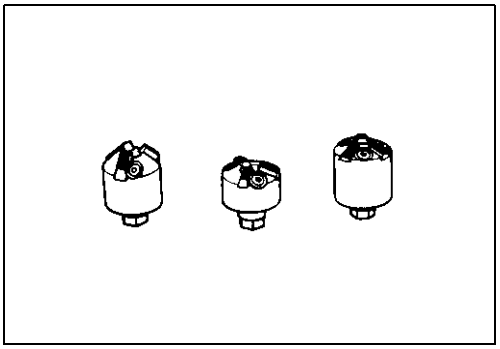
	INTAKE	EXHAUST
15°		N-121
30°	N-128	
45°	N-128	N-122
60°	N-111	



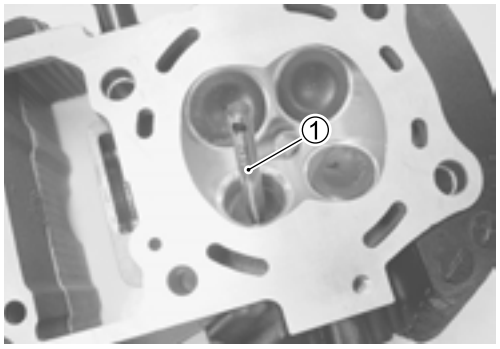
NOTE:
The valve seat contact area must be inspected after each cut.

TOOL 09916-21111: Valve seat cutter set
09916-22430: Valve seat cutter (N-128)



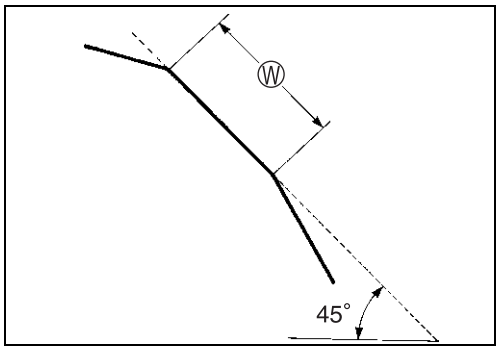


- Insert the solid pilot ① (09916-24450: N-100-5.52) with a slight rotation. Seat the pilot snugly. Install the 45° cutter, attachment and T-handle.



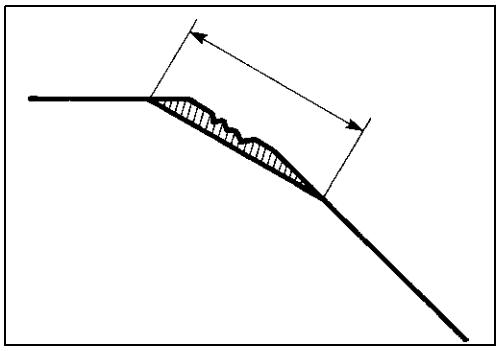
INITIAL SEAT CUT

- Using the 45° cutter, descale and clean up the seat. Rotate the cutter one or two turns.
- Measure the valve seat width Ⓦ after every cut.



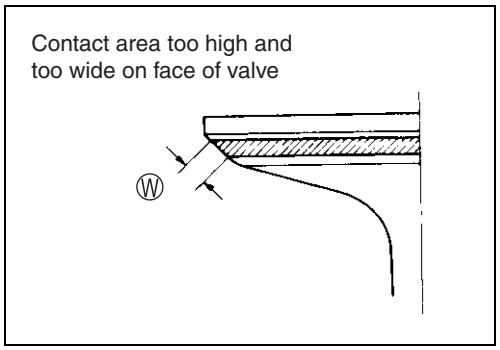
- If the valve seat is pitted or burned, use the 45° cutter to condition the seat some more.

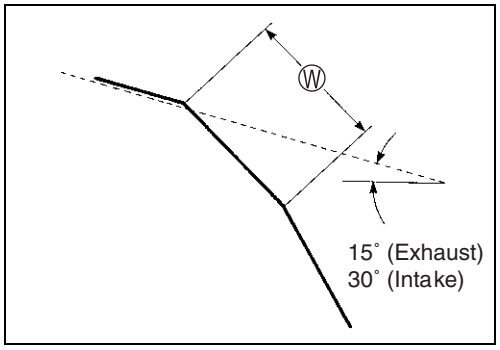
NOTE:
Cut only the minimum amount necessary from the seat to prevent the possibility of the valve stem becoming too close to the camshaft.



TOP NARROWING CUT

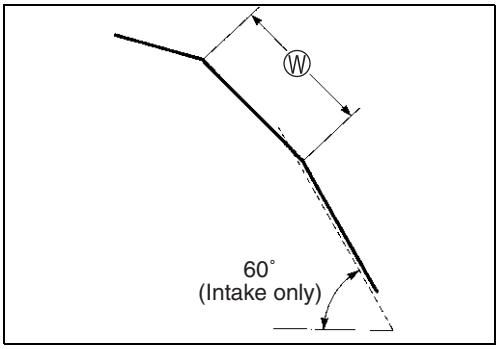
- If the contact area Ⓦ is too high on the valve, or if it is too wide, use the 15° (for the exhaust side) and the 30° (for the intake side) to lower and narrow the contact area.





BOTTOM NARROWING CUT

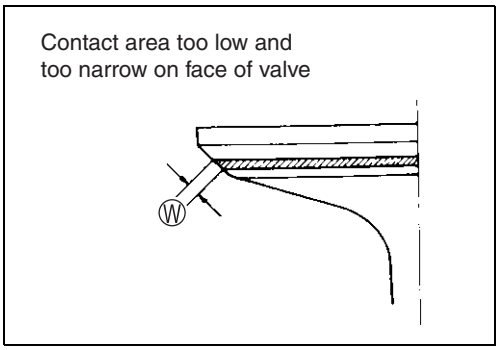
- If the contact area Ⓦ is too wide or too low, use the 60° (intake side only) to narrow and raise the contact area.

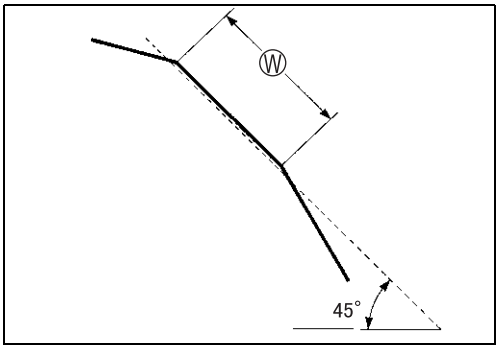


FINAL SEAT CUT

- If the contact area Ⓦ is too low or too narrow, use the 45° cutter to raise and widen the contact area.

NOTE:
After cutting the 15°, 30° and 60° angles, it is possible that the valve seat (45°) is too narrow. If so, re-cut the valve seat to the correct width.





- After the desired seat position and width is achieved, use the 45° cutter very lightly to clean up any burrs caused by the previous cutting operations.



CAUTION

Do not use lapping compound after the final cut is made. The finished valve seat should have a velvety smooth finish but not a highly polished or shiny finish. This will provide a soft surface for the final seating of the valve which will occur during the first few seconds of engine operation.

NOTE:
After servicing the valve seats, be sure to check the valve clearance after the cylinder head has been reinstalled. (☞2-7)

- Clean and assemble the head and valve components. Fill the intake and exhaust ports with gasoline to check for leaks.
- If any leaks occur, inspect the valve seat and face for burrs or other things that could prevent the valve from sealing.

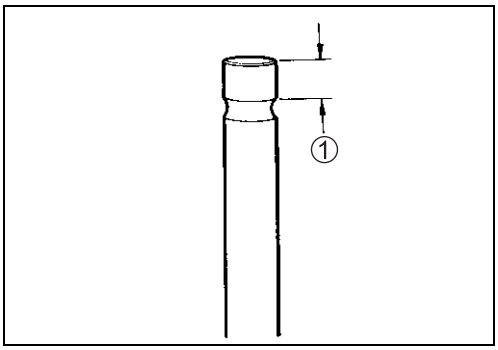


⚠ WARNING

Always use extreme caution when handling gasoline.

VALVE STEM END CONDITION

Inspect the valve stem end face for pitting and wear. If pitting or wear of the stem end face are present, the valve stem end may be resurfaced, providing that the length ① will not be reduced to less than the service limit. If this length becomes less than the service limit, the valve must be replaced.

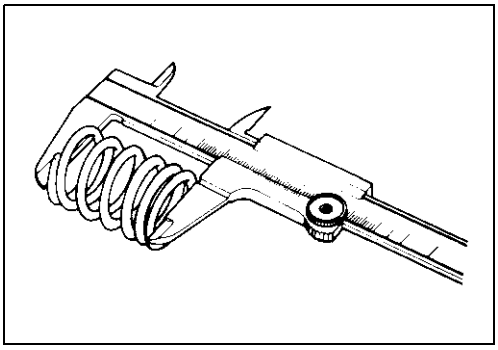


DATA Valve stem end length
Service Limit: 3.1 mm (0.12 in)

VALVE SPRING

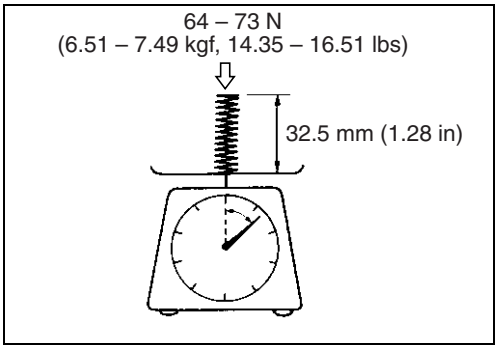
The force of the coil spring keeps the valve seat tight. Weakened spring result in reduced engine power output, and often account for the chattering noise coming from the valve mechanism.

Check the valve springs for proper strength by measuring their free length and also by the force required to compress them. If the spring length is less than the service limit, or if the force required to compress the spring does not fall within the range specified, replace both the inner and outer springs as a set.



TOOL 09900-20102: Vernier calipers

DATA Valve spring free length (IN. & EX.)
Service Limit INNER : 38.3 mm (1.51 in)
OUTER: 40.1 mm (1.58 in)

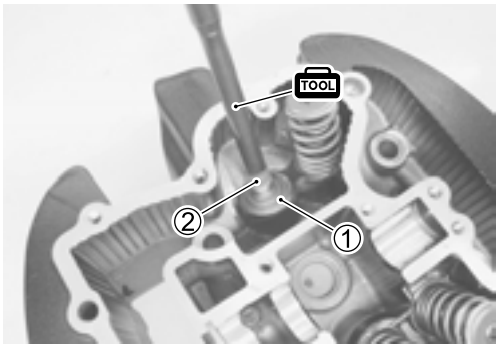


DATA Valve spring tension (IN. & EX.)
Standard
INNER:
64 – 73 N/32.5 mm
(6.51 – 7.49 kgf/32.5 mm, 14.35 – 16.51 lbs/1.28 in)
OUTER:
119 – 136 N/36.0 mm
(12.09 – 13.91 kgf/36.0 mm, 26.65 – 30.67 lbs/1.42 in)

VALVE AND VALVE SPRING REASSEMBLY

- Fit the valve spring lower seats ①.
- Oil each oil seal, and press-fit the oil seal ② into position with the valve guide installer.

09916-44910: Valve guide remover/installer

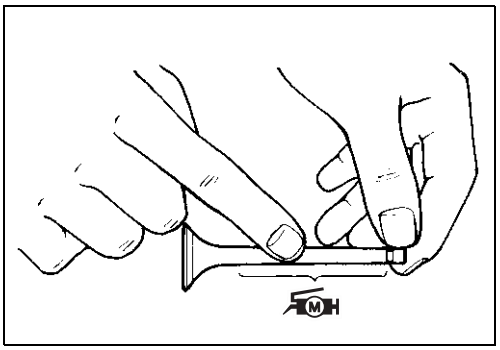


CAUTION

Do not reuse the oil seal.

- Insert the valves, with their stems coated with high quality molybdenum disfluid lubricant (SUZUKI MOLY PASTE) all around and along the full stem length without any break.

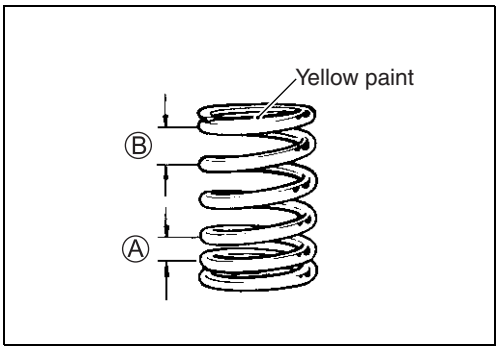
99000-25140: SUZUKI MOLY PASTE



CAUTION

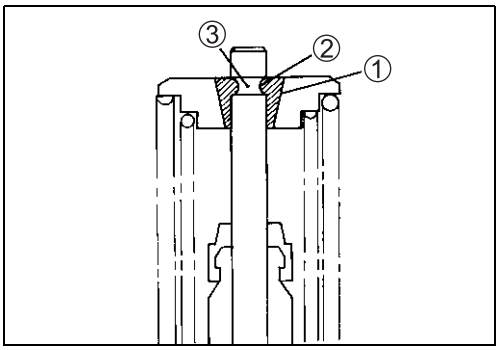
When inserting each valve, take care not to damage the lip of the stem seal.

- Install the valve springs with the small-pitch portion Ⓐ facing cylinder head.
  Ⓑ: Large-pitch portion



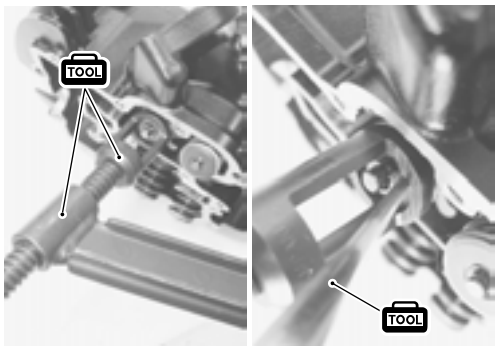
- Put on the valve spring retainer using the valve spring compressor, press down the springs, fit the two cotter halves to the stem end, and release the compressor to allow the cotter ① to wedge in between seat and stem. Be sure that the rounded lip ② of the cotter fits snugly into the groove ③ in the stem end.

09916-14510: Valve spring compressor
09916-14910: Valve spring compressor attachment
09916-84511: Tweezers



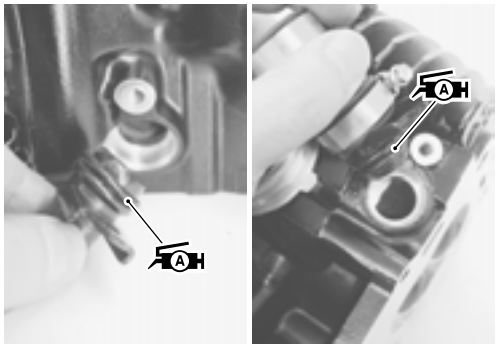
CAUTION

Be sure to restore each spring, valve and spring retainer to their original positions.



NOTE:
When installing the water union to the cylinder head, apply grease to the new O-rings.

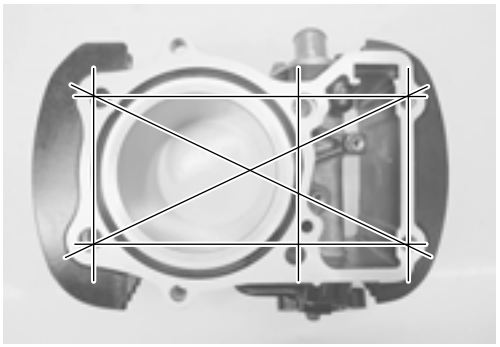
99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)



CYLINDER

CYLINDER DISTORTION

Check the gasketed surface of the cylinder for distortion with a straightedge and thickness gauge, taking a clearance reading at several places as indicated. If the largest reading at any position of the straightedge exceeds the limit, replace the cylinder.

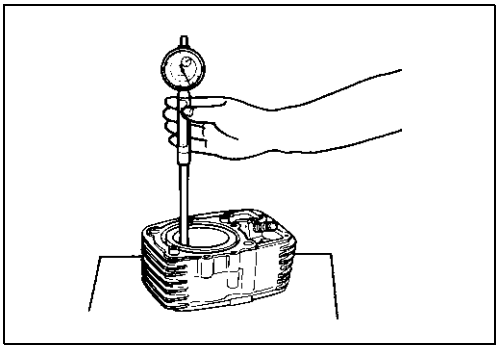


DATA Cylinder distortion
Service Limit: 0.05 mm (0.002 in)

TOOL 09900-20803: Thickness gauge

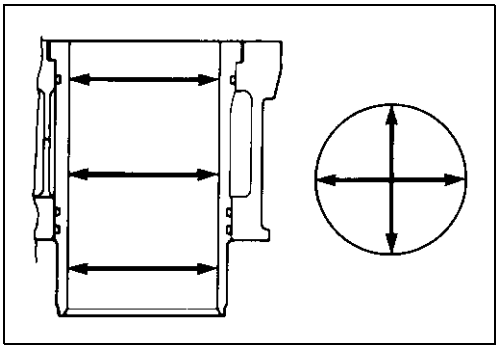
CYLINDER BORE

Measure the cylinder bore diameter at six places. If any one of the measurements exceeds the limit, overhaul the cylinder and replace the piston with an oversize, or replace the cylinder. Once the reboring is done on any one cylinder which measurements is beyond the limit, the remaining cylinders must be also rebored accordingly. Otherwise the imbalance might cause excess vibration.



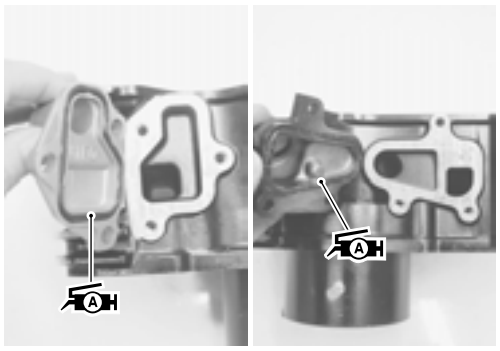
DATA Cylinder bore
Service Limit: 83.085 mm (3.2711 in)

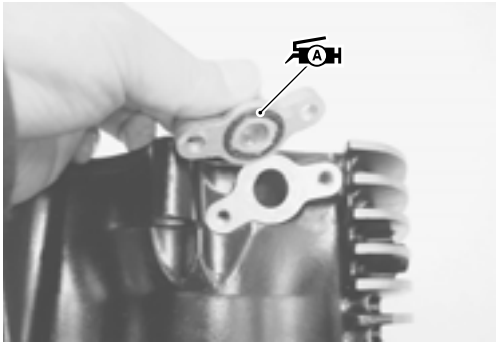
TOOL 09900-20508: Cylinder gauge set



NOTE:
When installing the water union to the cylinder, apply grease to the new O-rings.

A 99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)





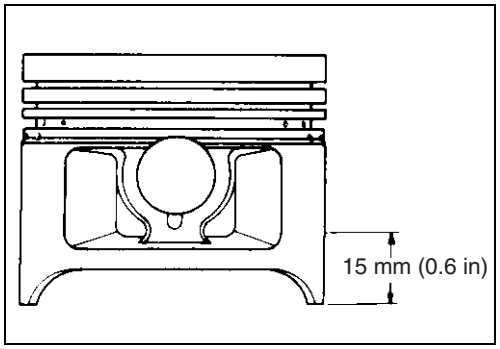
PISTON

PISTON DIAMETER

Using a micrometer, measure the piston outside diameter at the place shown in Fig. If the measurement is less than the limit, replace the piston.

DATA Piston diameter
Service Limit: 82.880 mm (3.2630 in)

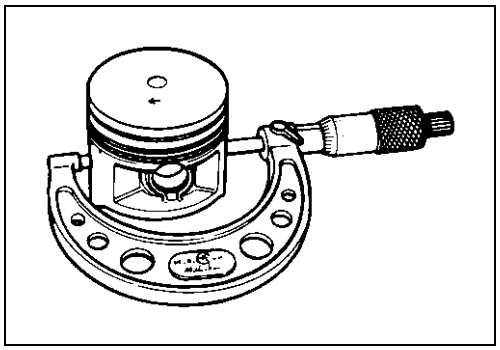
TOOL 09900-20204: Micrometer (75 – 100 mm)



PISTON-TO-CYLINDER CLEARANCE

As a result of the aforesaid measurement, if the piston to cylinder clearance exceeds the following limit, overhaul the cylinder and use an oversize piston, or replace both cylinder and piston.

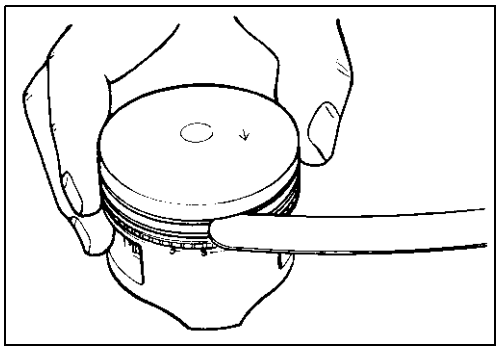
DATA Piston to cylinder clearance
Service Limit: 0.120 mm (0.0047 in)
Piston oversize: 0.5, 1.0 mm



PISTON RING TO GROOVE CLEARANCE

Using a thickness gauge, measure the side clearances of the 1st and 2nd rings. If any of the clearances exceeds the limit, replace both piston and piston rings.

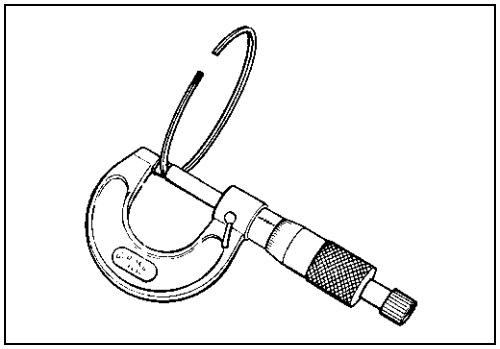
DATA Piston ring-groove clearance
Service Limit (1st) : 0.180 mm (0.007 in)
(2nd): 0.150 mm (0.006 in)



DATA Piston ring groove width
Standard (1st) : 1.01 – 1.03 mm (0.0398 – 0.0406 in)
(2nd): 1.21 – 1.23 mm (0.0476 – 0.0484 in)
(Oil) : 2.51 – 2.53 mm (0.0988 – 0.0996 in)

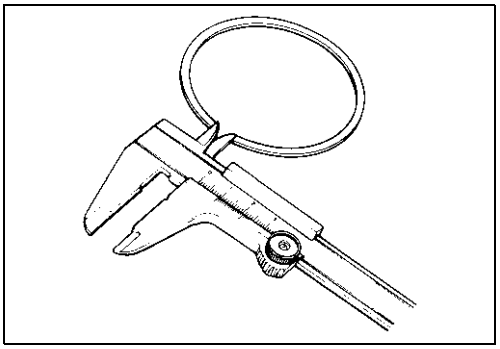
DATA Piston ring thickness
Standard (1st) : 0.970 – 0.990 mm (0.0382 – 0.0390 in)
(2nd): 1.170 – 1.190 mm (0.0461 – 0.0469 in)

TOOL 09900-20803: Thickness gauge
09900-20205: Micrometer (0 – 25 mm)



PISTON RING FREE END GAP AND END GAP

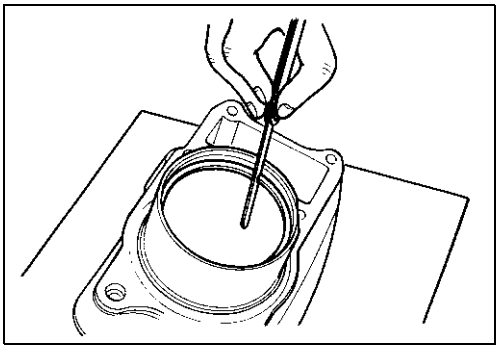
Before installing piston rings, measure the free end gap of each ring using vernier calipers. Next, fit the ring in the cylinder, and measure each ring end gap using a thickness gauge.
If any ring has an excess end gap, replace the ring.



DATA Piston ring free end gap
Service Limit (1st) : 7.7 mm (0.30 in)
(2nd): 9.4 mm (0.37 in)

DATA Piston ring end gap
Service Limit (1st) : 0.70 mm (0.028 in)
(2nd): 0.70 mm (0.028 in)

TOOL 09900-20102: Vernier calipers
09900-20803: Thickness gauge



Oversize piston ring

The following two types of oversize piston rings are used. They bear the following identification numbers.

SIZE	1st	2nd
0.5 mm O.S.	50	50
1.0 mm O.S.	100	100

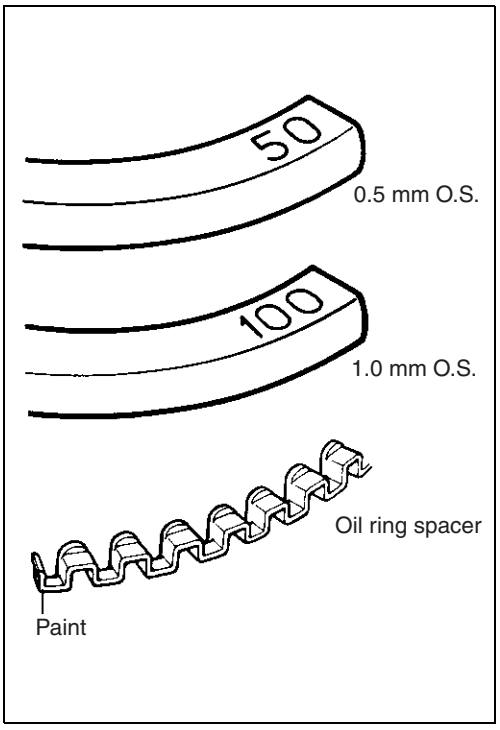
Oversize oil ring

The following two types of oversize oil rings are available as optional parts. They bear the following identification marks.

SIZE	COLOR
STD	NIL
0.5 mm O.S.	Painted Red
1.0 mm O.S.	Painted Yellow

Oversize side rail

Just measure outside diameter to identify the side rail as there is no mark or numbers on it.

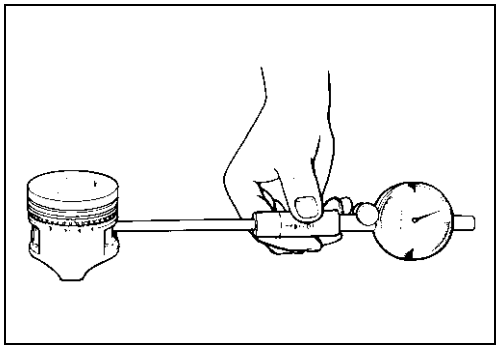


PISTON PIN AND PIN BORE

Using a small bore gauge, measure the piston pin bore inside diameter, and using a micrometer, measure the piston pin outside diameter. If the reading exceeds following limit, replace both piston and piston pin.

DATA Piston pin bore I.D.
Service Limit: 20.030 mm (0.7886 in)

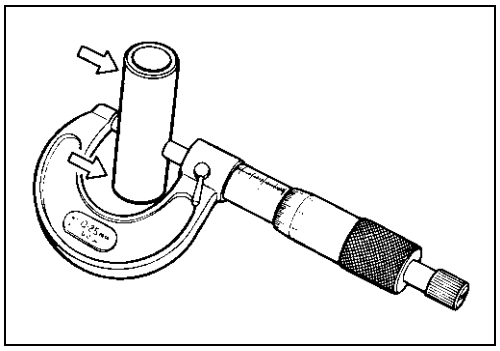
TOOL 09900-20602: Dial gauge (1/1 000 mm, 1 mm)
09900-22403: Small bore gauge (18 – 35 mm)



Using a micrometer, measure the piston pin outside diameter at three positions.

DATA Piston pin O.D.
Service Limit: 19.980 mm (0.7866 in)

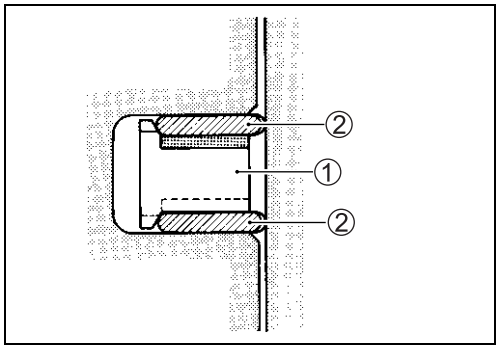
TOOL 09900-20205: Micrometer (0 – 25 mm)



PISTON RING REASSEMBLY

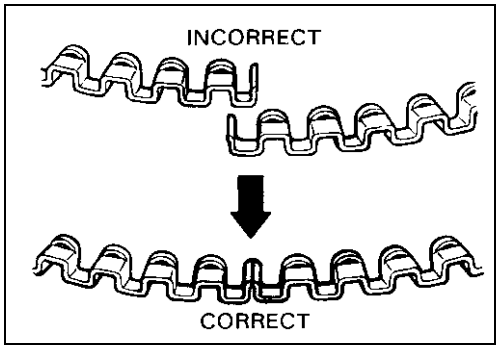
- Install the piston rings in the order of oil ring, 2nd ring and 1st ring.
- The first member to go into the oil ring groove is a spacer ①. After placing the spacer, fit the two side rails ②.

NOTE:
Side designations, top and bottom, are not applied to the spacer and side rails: you can position each either way.



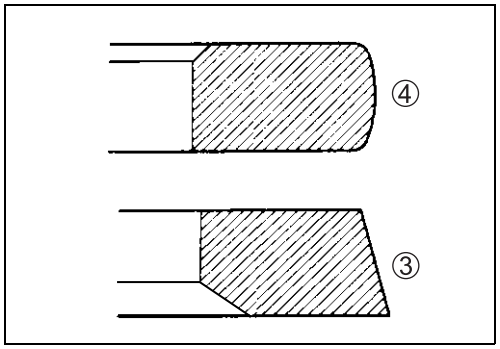
CAUTION

When installing the spacer, be careful not to allow its two ends to overlap in the groove.

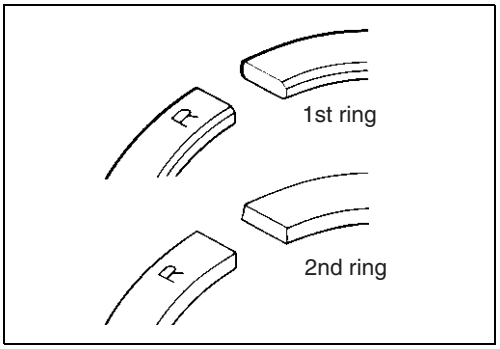


- Install the 2nd ring ③ and the 1st ring ④.

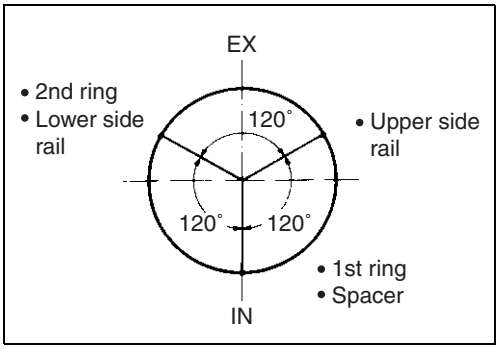
NOTE:
1st ring and 2nd ring differ in shape.



- 1st ring and 2nd ring have letter “R” marked on the side. Be sure to bring the marked side to the top when fitting them to the piston.



- Position the gaps of the three rings as shown. Before inserting each piston into the cylinder, check that the gaps are so located.



CONROD/CRANKSHAFT

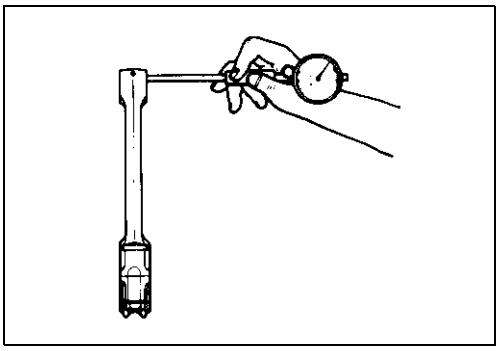
CONROD SMALL END I.D.

Using a small bore gauge, measure the conrod small end inside diameter.

DATA Conrod small end I.D.
Service Limit: 20.040 mm (0.7890 in)

TOOL 09900-20602: Dial gauge (1/1 000 mm, 1 mm)
09900-22403: Small bore gauge (18 – 35 mm)

If the conrod small end inside diameter exceeds the above mentioned limit, replace the conrod.

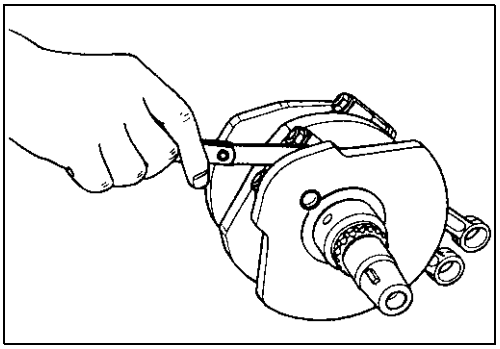


CONROD BIG END SIDE CLEARANCE

Check the conrod thrust clearance by using a thickness gauge. If the clearance exceeds the limit, replace conrod or crankshaft.

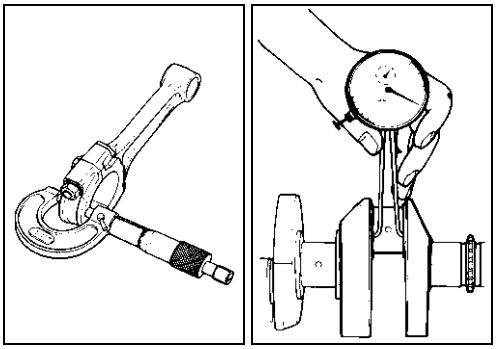
DATA Conrod big end side clearance
Service Limit: 0.30 mm (0.012 in)

TOOL 09900-20803: Thickness gauge



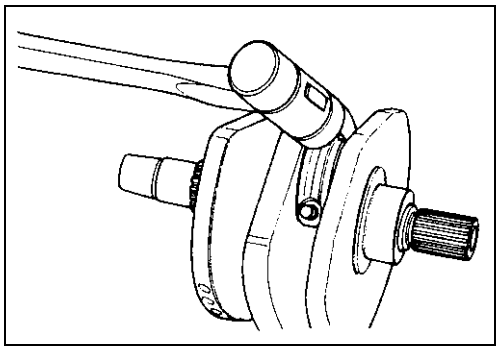
DATA Conrod big end width
Standard: 21.95 – 22.00 mm (0.864 – 0.866 in)
Crank pin width
Standard: 22.10 – 22.15 mm (0.870 – 0.872 in)

TOOL 09900-20205: Micrometer (0 – 25 mm)
09900-20605: Dial calipers (10 – 34 mm)



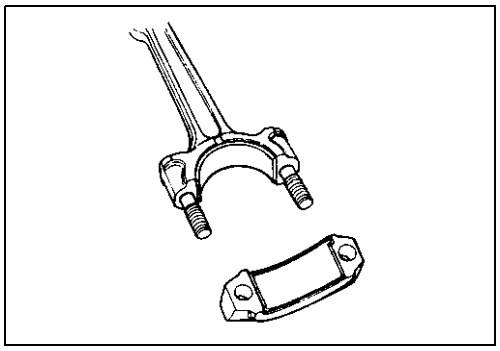
CONROD-CRANK PIN BEARING SELECTION

- Loosen the bearing cap nuts and tap the bolt end lightly with plastic hammer to remove the bearing cap.



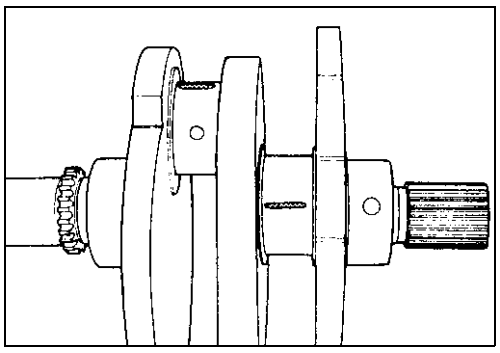
- Remove the rods and mark them to identify the cylinder position.
- Inspect the bearing surfaces for any sign of fusion, pitting, burn, or flaws. If any, replace them with a specified set of bearings.

NOTE:
Never try to remove or loosen the conrod cap bolts due to their possible loosening in the rod. Once displaced, the bearing cap will not be fitted properly.



- Place plastigauge axially on the crank pin avoiding the oil hole, at TDC or BDC side as shown.
- Tighten the bearing cap with two-step torque values.

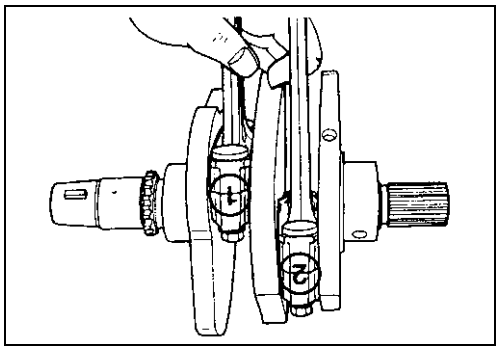
NOTE:
When fitting the bearing cap to crank pin, be sure to discriminate between its two ends, I.D. code side and the other.
I.D. code always faces intake valve side.



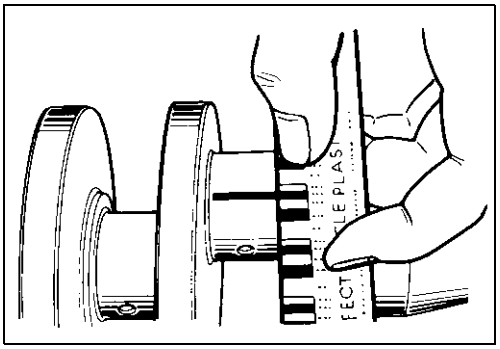
Conrod nut
Initial tightening torque: 25 N·m (2.5 kgf-m, 18.0 lb-ft)
Final tightening torque: 51 N·m (5.1 kgf-m, 37.0 lb-ft)

TOOL 09900-22301: Plastigauge

NOTE:
Never rotate the crankshaft or conrod when a piece of plastigauge is in the clearance.

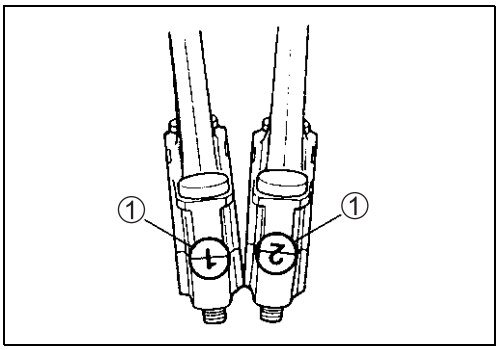


- Remove the caps and measure the width of compressed plastigauge with envelope scale. This measurement should be taken at the widest part.



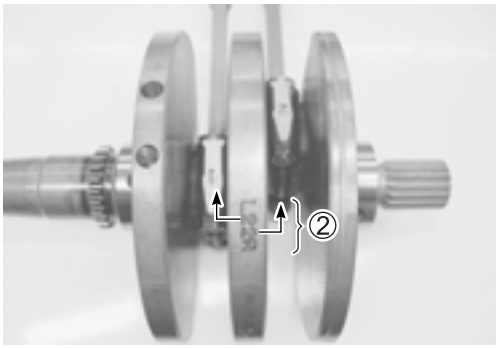
DATA Conrod big end oil clearance
Standard: 0.024 – 0.042 mm (0.0009 – 0.0017 in)
Service Limit: 0.080 mm (0.0031 in)

- If oil clearance exceeds the service limit, select the specified bearings from the following table.
- Check the corresponding conrod I.D. code number ①, "1", "2" or "3".
- Check the corresponding crank pin O.D. code number ②, "1", "2" or "3".
- The crank pin O.D. code number ②, "1", "2" or "3" which are stamped on the left crank web.



Bearing selection table

		Crank pin O.D. ②		
	Code	1	2	3
Conrod I.D. code ②	1	Green	Black	Brown
	2	Black	Brown	Yellow
	3	Brown	Yellow	Blue



Conrod I.D. specification

Code ①	I.D. specification
1	44.000 – 44.006 mm (1.7323 – 1.7325 in)
2	44.006 – 44.012 mm (1.7325 – 1.7328 in)
3	44.012 – 44.018 mm (1.7328 – 1.7330 in)

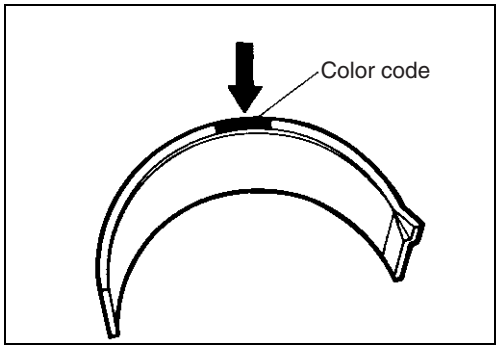
Crank pin O.D. specification

Code ②	O.D. specification
1	40.994 – 41.000 mm (1.6139 – 1.6142 in)
2	40.988 – 40.994 mm (1.6137 – 1.6139 in)
3	40.982 – 40.988 mm (1.6135 – 1.6137 in)

TOOL 09900-20202: Micrometer (25 – 50 mm)

Bearing thickness specification

Color (Part No.)	Thickness
Green (12164-38E00-0A0)	1.485 – 1.488 mm (0.0585 – 0.0586 in)
Black (12164-38E00-0B0)	1.488 – 1.491 mm (0.0586 – 0.0587 in)
Brown (12164-38E00-0C0)	1.491 – 1.494 mm (0.0587 – 0.0588 in)
Yellow (12164-38E00-0D0)	1.494 – 1.497 mm (0.0588 – 0.0589 in)
Blue (12164-38E00-0E0)	1.497 – 1.500 mm (0.0589 – 0.0591 in)

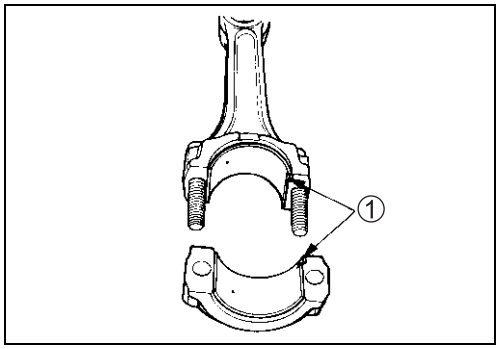


CAUTION

The bearings should be replaced as a set.

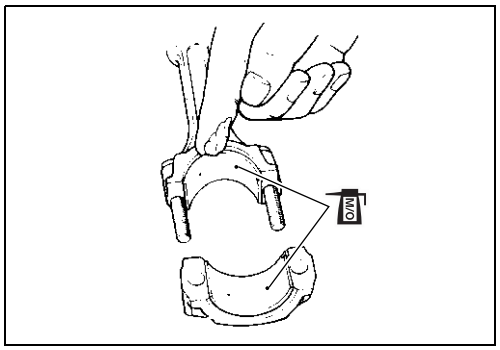
CONROD/CRANK PIN BEARING ASSEMBLY

- When fitting the bearing to the bearing cap and conrod, be sure to fix the stopper part ① first and press in the other end.



- Apply molybdenum oil solution to the crank pin and bearing surface.

MOLYBDENUM OIL SOLUTION

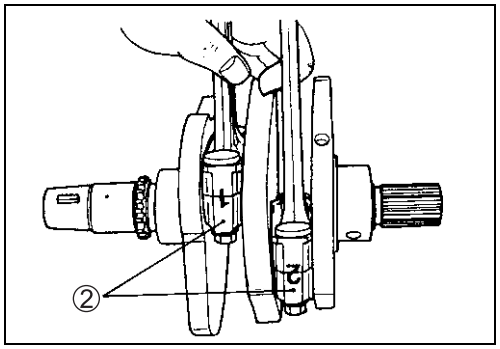


- When mounting the conrod on the crankshaft, make sure that I.D. code ② of the conrod faces rearward.
- Tighten the conrod fitting nuts with specified torque after applying engine oil to the nut thread.

Conrod nut

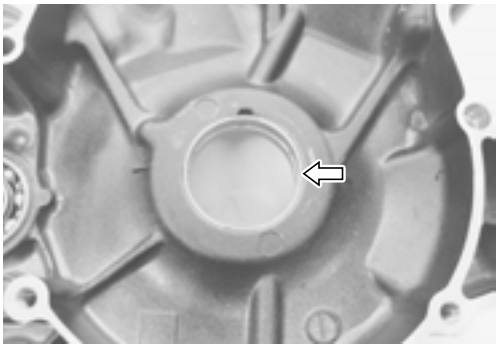
Initial tightening torque: 25 N·m (2.5 kgf-m, 18.0 lb-ft)
Final tightening torque: 51 N·m (5.1 kgf-m, 37.0 lb-ft)

- Check the conrod movement for smooth turning.



CRANKCASE/CRANKSHAFT BEARING INSPECTION

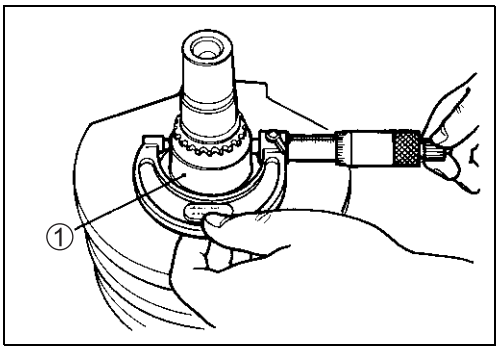
- Inspect the crankshaft and crankshaft journal bearings for any damage. If any, replace them with a specified set of bearings.



- Measure the crankshaft journal O.D. ① by using the special tool.

DATA Crankshaft journal O.D. ①
Standard: 47.965 – 47.980 mm (1.8884 – 1.8890 in)

TOOL 09900-20202: Micrometer (25 – 50 mm)

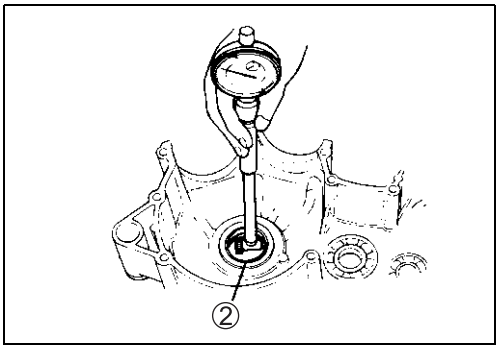


- Measure the crankshaft journal bearing I.D. ② by using the special tool.

DATA Crankshaft journal bearing I.D. ②
Standard: 48.000 – 48.015 mm (1.8898 – 1.8904 in)

TOOL 09900-20508: Cylinder gauge set

- If each crankshaft journal bearing I.D. is not within the standard range, replace them with new ones.

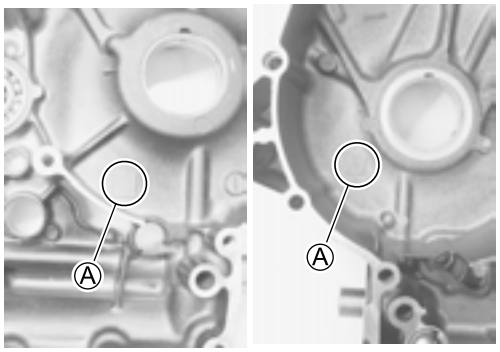


CRANKCASE-CRANKSHAFT BEARING SELECTION

Select the specified bearings from the crankcase bore I.D. code. The crankcase bore I.D. code Ⓐ "A", "B" or "C", is stamped on the inside of each crankcase half.

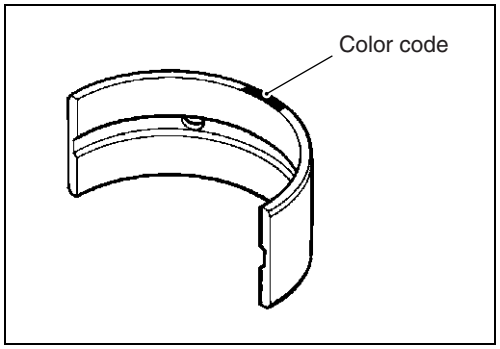
Bearing selection table

I.D. code Ⓐ	I.D. specification	Bearing
A	52.000 – 52.006 mm (2.0472 – 2.0475 in)	Green
B	52.006 – 52.012 mm (2.0475 – 2.0477 in)	Black
C	52.012 – 52.018 mm (2.0477 – 2.0479 in)	Brown



Bearing thickness

Color (Part No.)	Thickness
Green (12229-39G00-0A0)	2.006 – 2.009 mm (0.0789 – 0.0790 in)
Black (12229-39G00-0B0)	2.009 – 2.012 mm (0.0790 – 0.0792 in)
Brown (12229-39G00-0C0)	2.012 – 2.015 mm (0.0792 – 0.0793 in)



CAUTION

Bearing must be replaced as a set.

CRANKSHAFT JOURNAL BEARING REPLACEMENT

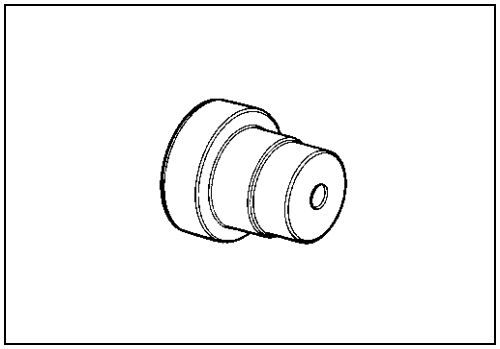
Use the special tool to replace the crankshaft journal bearings. The replacement procedure is as follows:

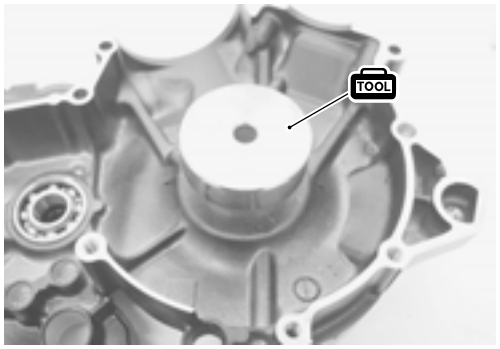
TOOL 09913-60230: Journal bearing remover/installer

- Set the special tool as shown to remove the crankshaft journal bearings.

NOTE:

Remove the crankshaft journal bearings in only one direction, from inside to outside of each crankcase half.

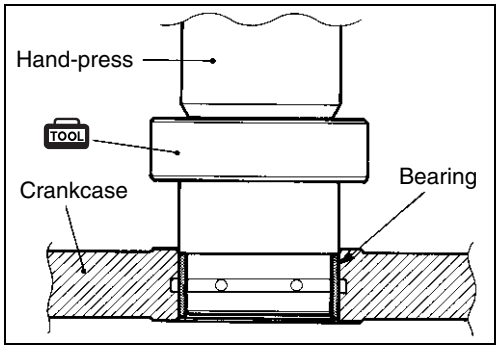




- Gradually press out the bearing with the special tool by using the hand-press.

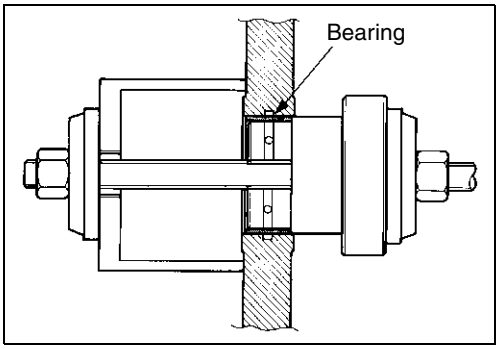
CAUTION

The removed bearings must be replaced with new ones.



NOTE:
Using the hand-press is recommended to remove the crankshaft journal bearings. However, the crankshaft journal bearings can be removed by using with the following special tools.

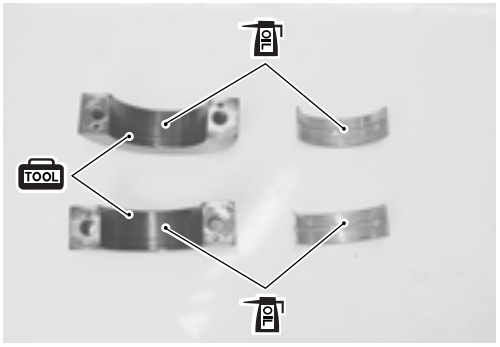
TOOL 09924-84510: Bearing installer set
09924-74570: Final drive gear bearing remover/installer



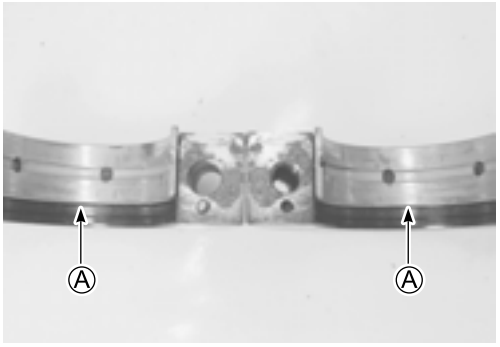
- Set the specified crankshaft journal bearings to the special tool.

CAUTION

*** Before setting the bearing, apply enough engine oil to the special tool and bearings.**
*** When setting the bearing, align the bearing side with the engraved line Ⓐ and also the bearing edge with the mating surface of the special tool.**



TOOL 09913-60241: Journal bearing remover/installer



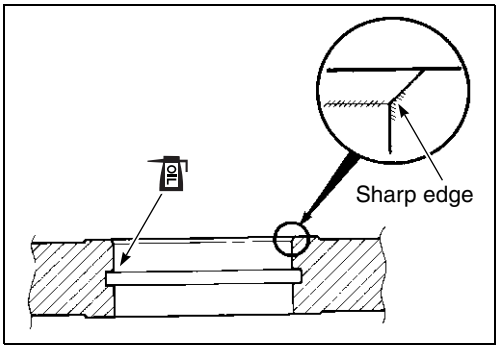
- Tighten the special tool bolt to the specified torque.

Special tool bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)

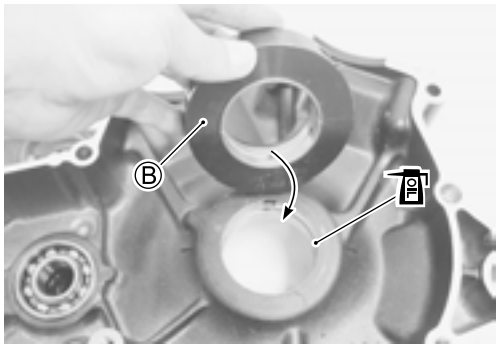


CAUTION

Before installing the bearings, lightly shave off the sharp edge part of the crankcase chamfer by using an oilstone and wash the crankcase bore with enough engine oil.



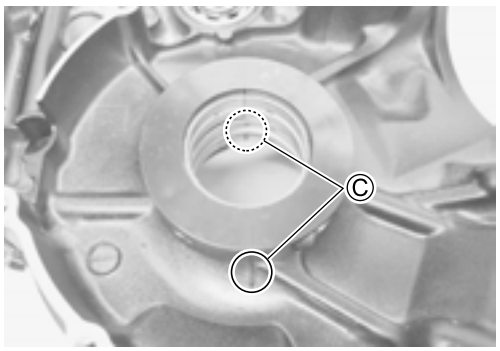
• Set the bearings installed in the special tool to the crankcase half as shown.



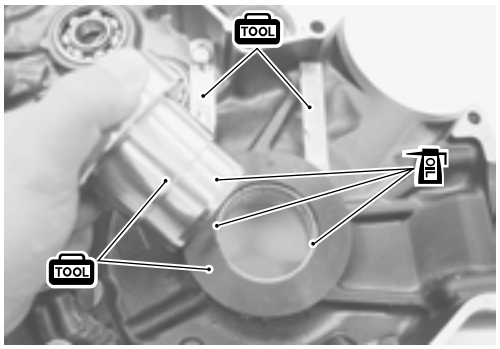
CAUTION

*** Be sure the bearing protruded side Ⓑ faces the crankcase bore.**
*** Align the special tool mating surface with the line mark Ⓒ on the crankcase.**

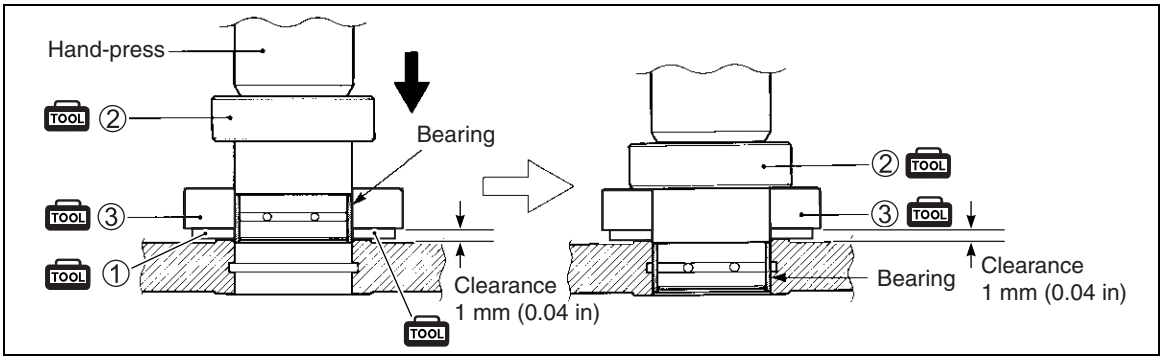
NOTE:
The upper and lower bearings are same.



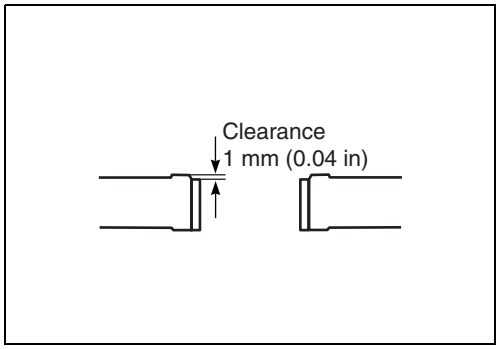
• Insert the thickness gauge ① between the crankcase and special tool ③ for 1 mm (0.04 in) clearance.
• Apply enough engine oil to the special tool and the bearings and then set the special tool carefully.
• Gradually press in the bearing into the main journal bore by using the hand-press until the special tool ② stops the special tool ③.



TOOL 09913-60230: Journal bearing remover/installer
09900-20803: Thickness gauge

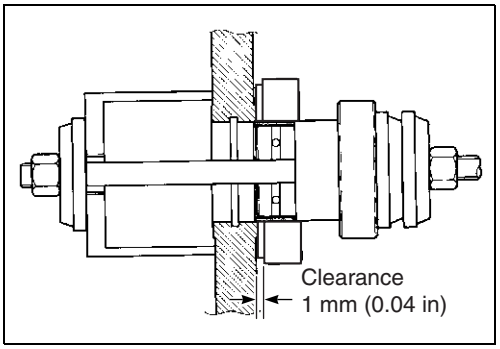


• Measure the clearance from case surface to bearing.

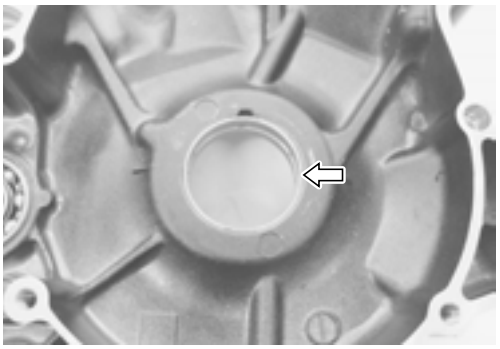


NOTE:
Using the hand-press is recommended to install the crankshaft journal bearings. However, the crankshaft journal bearings can be installed by using the following special tools.

09924-84510: Bearing installer set
09924-74570: Final drive gear bearing remover/installer

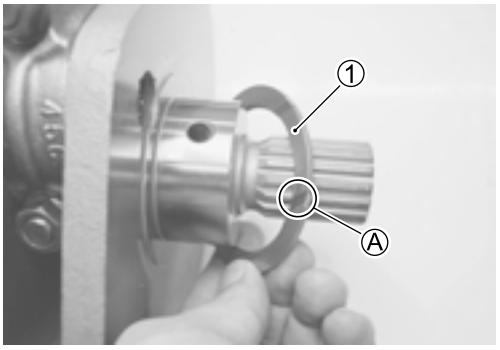


- After installing the bearings, check the bearing surface for any scratch or damage.



CRANKSHAFT THRUST CLEARANCE
Install the crankshaft in the right crankcase half after installing the thrust shim on the crankshaft.

NOTE:
The oil grooved face Ⓐ of thrust shim ① is faced to crankshaft web side.



- Place the thrust washer, camshaft drive sprocket and primary drive gear on the right end of the crankshaft and tighten primary drive gear bolt to the specified torque. (☞3-73)

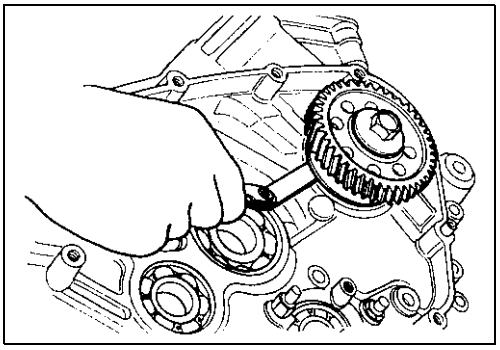
09930-40113: Rotor holder

Primary drive gear bolt: 95 N·m (9.5 kgf-m, 68.5 lb-ft)

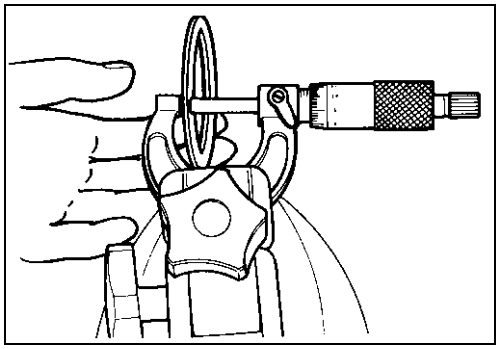
- Use a thickness gauge to measure the thrust clearance between right crankcase and thrust washer.

Crankshaft thrust clearance
Standard: 0.05 – 0.10 mm (0.002 – 0.004 in)

09900-20803: Thickness gauge



- If the thrust clearance exceeds the standard range, adjust the thrust clearance by the following procedures:
- Remove the thrust shim, and measure its thickness with a micrometer.
- Change the thrust shim with the other shim if the thrust clearance is incorrect.
- Perform the thrust clearance measurement described above once again.



TOOL 09900-20205: Micrometer (0 – 25 mm)

Checking to make sure it is within standard

Unit: mm (in)

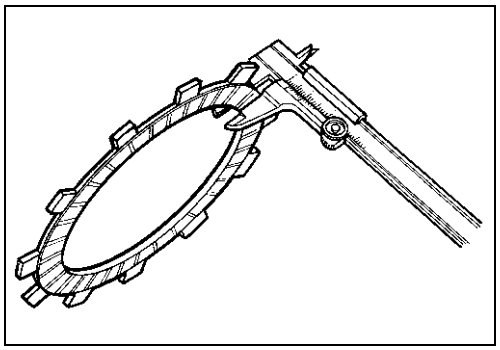
Part number	Thrust shim thickness
09160-48001	1.925 – 1.950 (0.0758 – 0.0768)
09160-48002	1.950 – 1.975 (0.0768 – 0.0778)
09160-48003	1.975 – 2.000 (0.0778 – 0.0787)
09160-48004	2.000 – 2.025 (0.0787 – 0.0797)
09160-48005	2.025 – 2.050 (0.0797 – 0.0807)
09160-48006	2.050 – 2.075 (0.0807 – 0.0817)
09160-48007	2.075 – 2.100 (0.0817 – 0.0827)
09160-48008	2.100 – 2.125 (0.0827 – 0.0837)
09160-48009	2.125 – 2.150 (0.0837 – 0.0846)
09160-48010	2.150 – 2.175 (0.0846 – 0.0856)

CLUTCH

CLUTCH DRIVE AND DRIVEN PLATES

NOTE:
Wipe off the engine oil from the drive and driven plates with a clean rag.

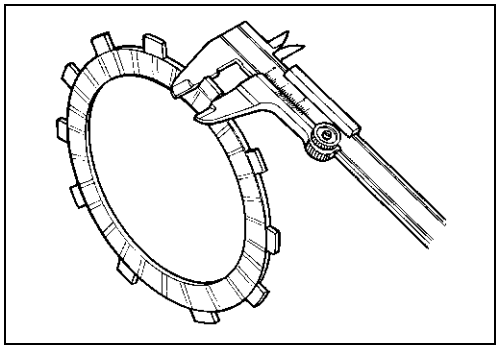
Measure the thickness of drive plates with a vernier calipers. If each drive plate is not within the standard range, replace it with a new one.



DATA Clutch drive plate thickness
Standard (No. 1): 2.92 – 3.08 mm (0.115 – 0.121 in)
(No. 2): 3.42 – 3.58 mm (0.135 – 0.141 in)

TOOL 09900-20102: Vernier calipers

Measure the claw width of drive plates with a vernier calipers. Replace the drive plates found to have worn down to the limit.



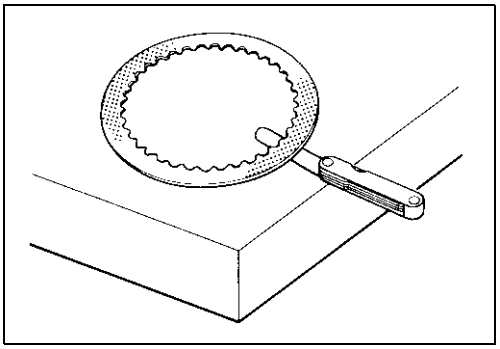
DATA Clutch drive plate claw width (No. 1 & No. 2)
Service Limit: 15.1 mm (0.594 in)

TOOL 09900-20102: Vernier calipers

Measure each driven plate for distortion with a thickness gauge and surface plate.
Replace driven plates which exceed the limit.

DATA Clutch driven plate distortion
Service Limit: 0.10 mm (0.004 in)

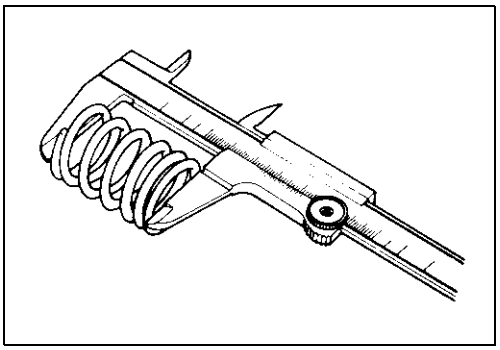
TOOL 09900-20803: Thickness gauge



CLUTCH SPRING FREE LENGTH
Measure the free length of each coil spring with a vernier calipers, and compare the elastic strength of each with the specified limit. Replace all the springs if any spring is not within the limit.

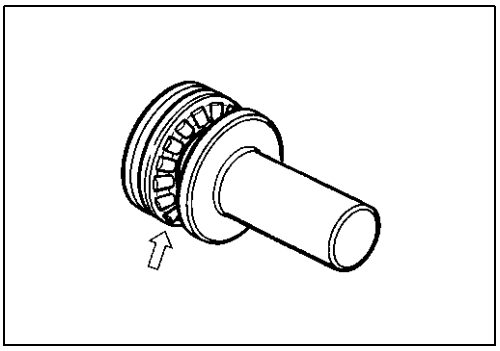
DATA Clutch spring free length
Service Limit: 46.8 mm (1.84 in)

TOOL 09900-20102: Vernier calipers



CLUTCH BEARING
Inspect the clutch release bearing for any abnormality, particularly cracks, upon removal from the clutch, to decide whether it can be reused or should be replaced.
Smooth engagement and disengagement of the clutch depends much on the condition of this bearing.

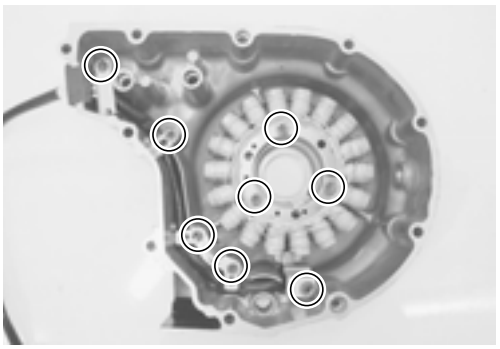
NOTE:
Thrust washer is located between the pressure plate and thrust bearing.



GENERATOR/SIGNAL GENERATOR/ STARTER CLUTCH

GENERATOR STATOR AND SIGNAL GENERATOR STATOR INSPECTION ☞9-10, -23 and -24

GENERATOR STATOR AND SIGNAL GENERATOR STATOR SERVICING
When replacing the generator stator or signal generator stator, route the wire properly.



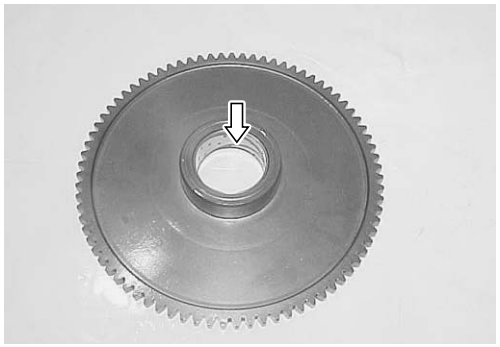
STARTER CLUTCH INSPECTION

Install the starter driven gear onto the starter clutch and turn the starter driven gear by hand to inspect the starter clutch for a smooth movement. The gear turns one direction only. If a large resistance is felt to rotation, inspect the starter clutch for damage or inspect the starter clutch contacting surface of the starter driven gear for wear or damage.
If they are found to be damaged, replace them with new ones.



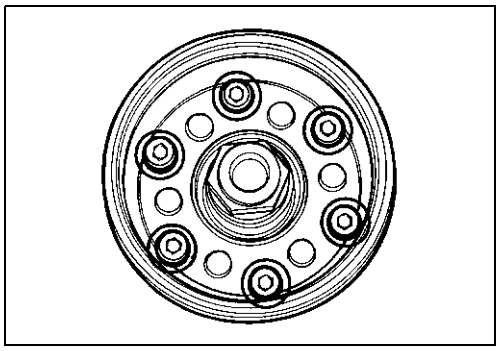
STARTER DRIVEN GEAR BEARING INSPECTION

Inspect the starter driven gear bearing for any damages.

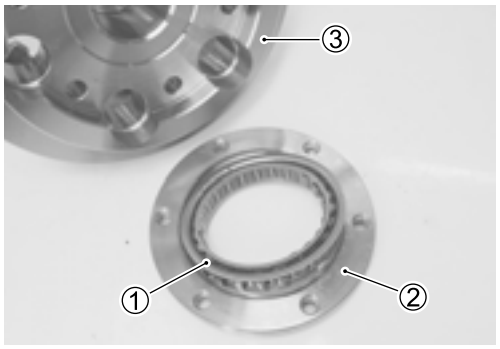


STARTER CLUTCH SERVICING

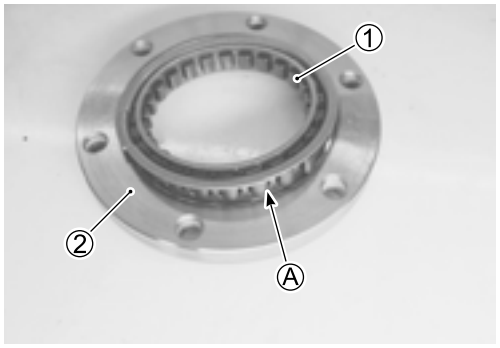
- Hold the rotor with off-set wrench and remove the starter clutch securing bolts.



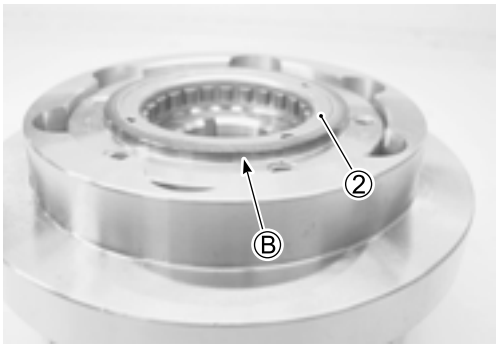
- Remove the one way clutch ① and guide ② from the rotor ③.



- When fitting the one way clutch ① to the guide ②, position flange side Ⓐ of one way clutch to the rotor side.



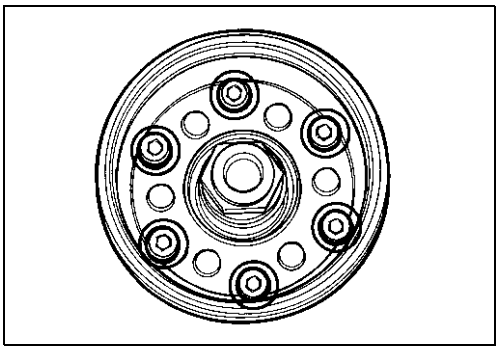
- When installing the starter clutch guide ②, make sure that the flange Ⓑ side faces out.



- Apply THREAD LOCK SUPER “1303” to the securing bolts and tighten them to the specified torque while holding the rotor with off-set wrench.

1303 99000-32030: THREAD LOCK SUPER “1303”

Starter clutch securing bolt: 26 N·m (2.6 kgf-m, 19.0 lb-ft)

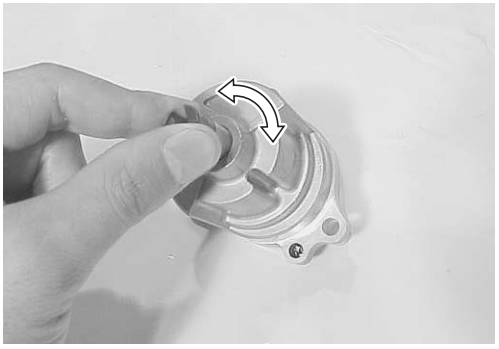


OIL PUMP

- Rotate the oil pump by hand and check that it moves smoothly.
- If it does not move smoothly, replace the oil pump assembly.

CAUTION

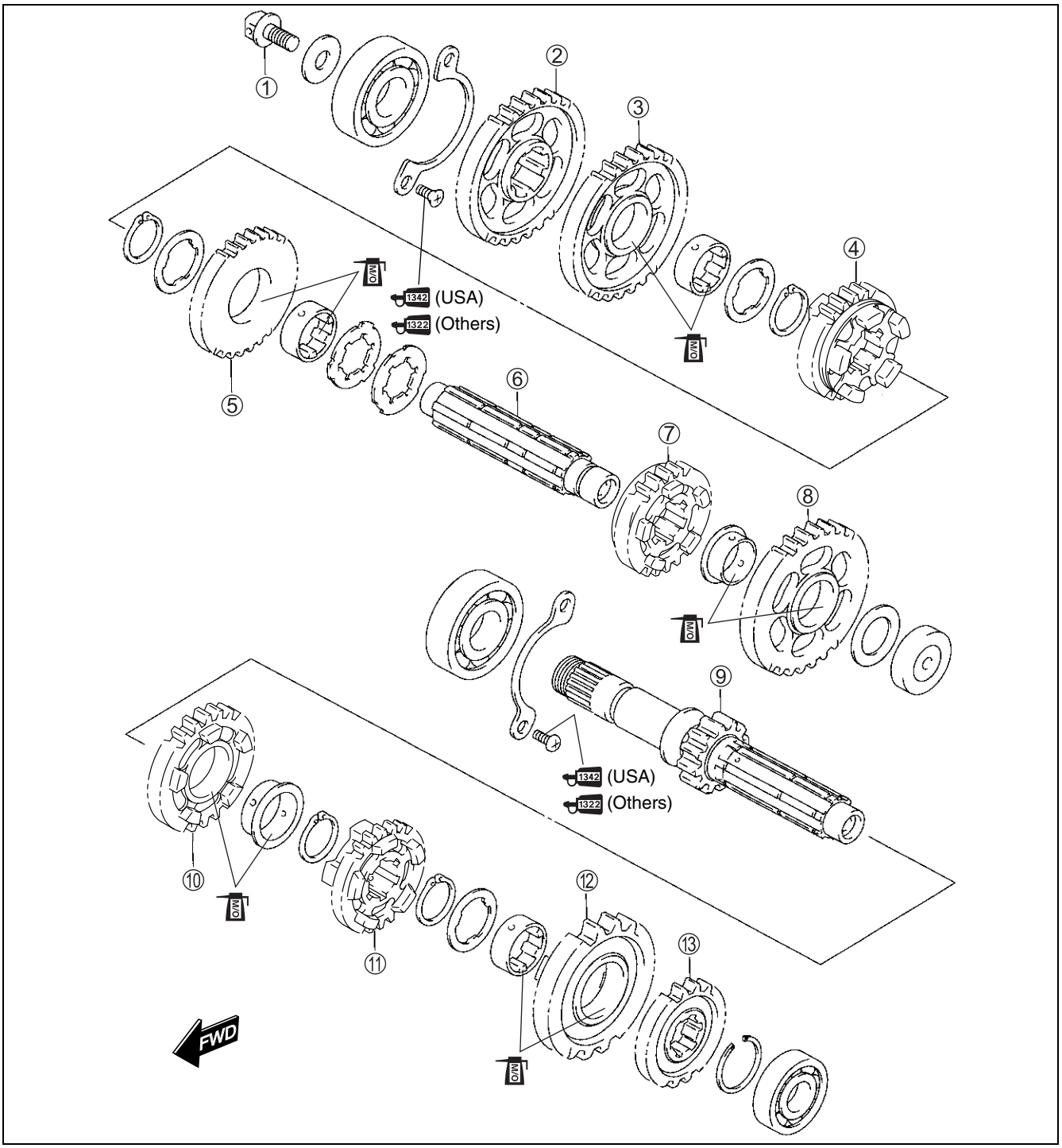
Do not attempt to disassemble the oil pump assembly. The oil pump is available only as an assembly.



TRANSMISSION

DISASSEMBLY

• Disassemble the transmission gears as shown in the illustration.



①	Driveshaft bolt	⑧	2nd driven gear
②	Over driving gear	⑨	Countershaft/1st drive gear
③	1st driven gear	⑩	4th drive gear
④	4th driven gear	⑪	3rd drive gear
⑤	3rd driven gear	⑫	5th drive gear
⑥	Driveshaft	⑬	2nd drive gear
⑦	5th driven gear		

ITEM	N·m	kgf-m	lb-ft
①	65	6.5	47.0

REASSEMBLY

Assemble the countershaft and driveshaft in the reverse order of disassembly. Pay attention to following points:

NOTE:
Always use new circlips.

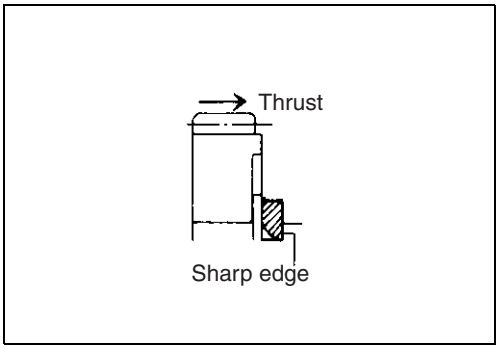
NOTE:
Before installing the gears, coat lightly moly paste or engine oil to the driveshaft and countershaft.

99000-25140: SUZUKI MOLY PASTE

CAUTION

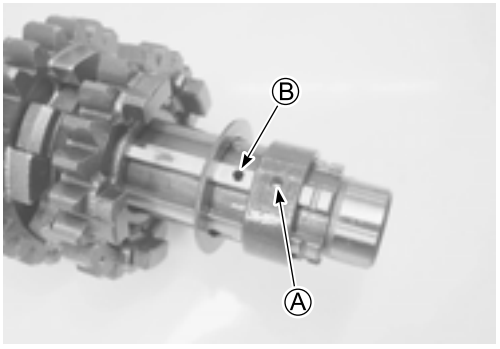
*** Never reuse a circlip. After a circlip has been removed from a shaft, it should be discarded and a new snap ring must be installed.**
*** When installing a new snap ring, care must be taken not to expand the end gap larger than required to slip the snap ring over the shaft.**
*** After installing a snap ring, always ensure that it is completely seated in its groove and securely fitted.**

- When installing a new snap ring, pay attention to the direction of the snap ring. Fit it to the side where the thrust is as shown in figure.

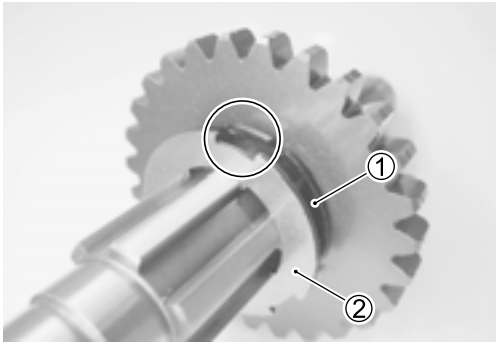


CAUTION

When installing the top drive gear bushing, align the bushing oil hole Ⓐ with the countershaft hole Ⓑ.

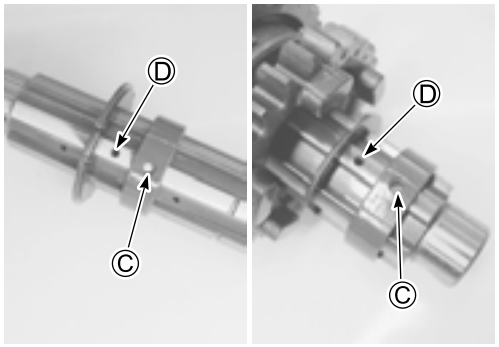


When installing the 3rd driven gear onto the driveshaft, install the lock washer No. 2 ① onto the driveshaft, and turn and fit it into the groove.
Then, fit the lock washer No. 1 ② in the lock washer No. 2 ①.

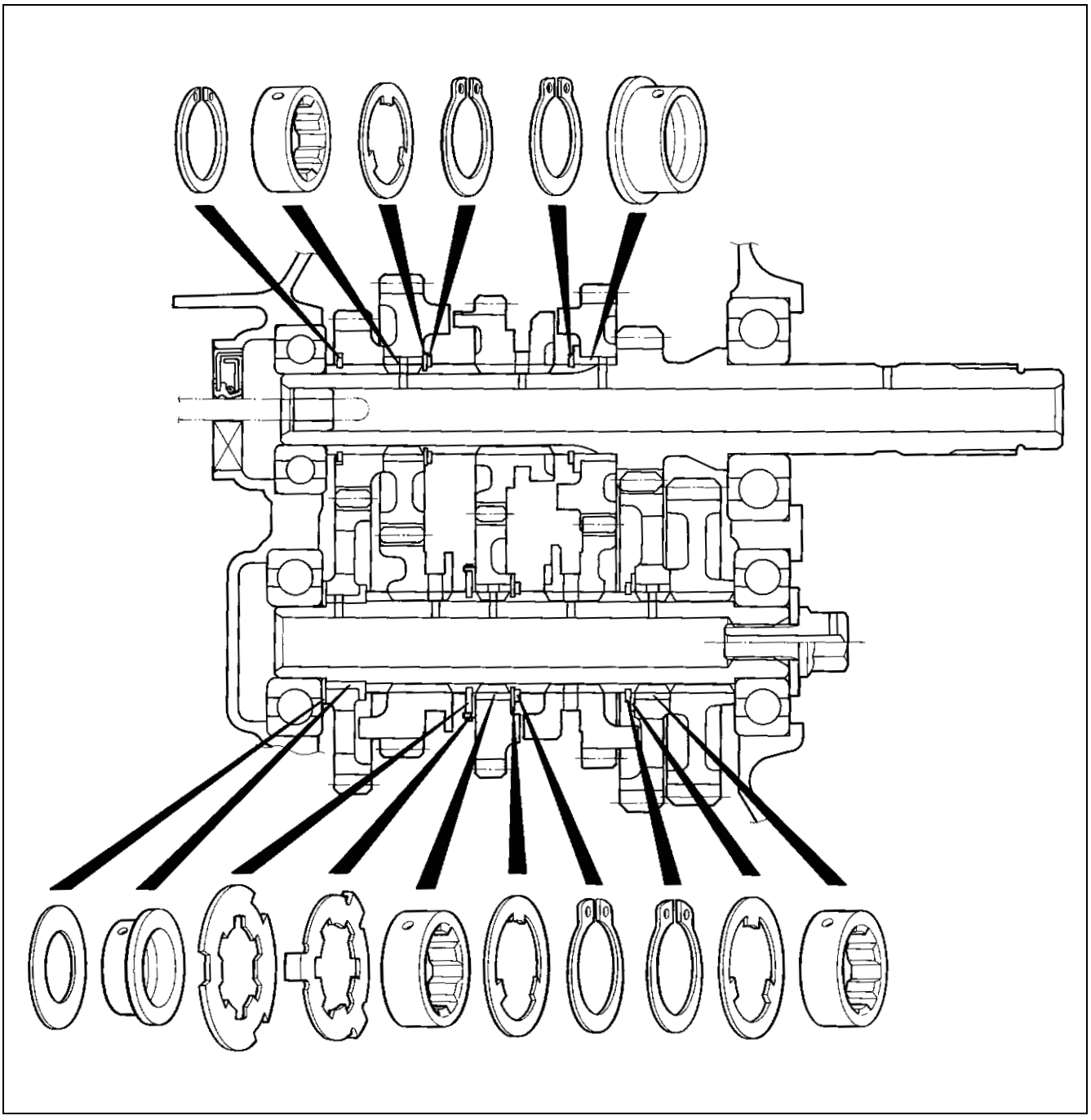


CAUTION

When installing the 1st and 3rd driven gear bushings, align the bushing oil hole Ⓒ with the driveshaft oil hole Ⓓ.



TRANSMISSION GEARS AND RELATED PARTS



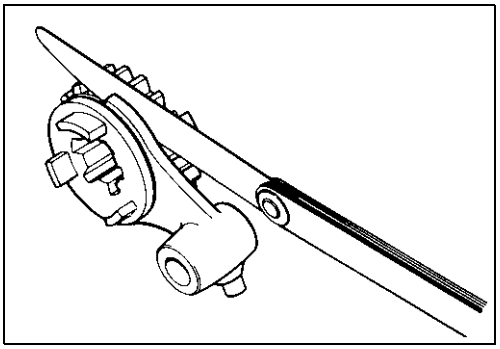
GEARSHIFT FORK

GEARSHIFT FORK TO GROOVE CLEARANCE

Using a thickness gauge, check the shifting fork clearance in the groove of its gear.

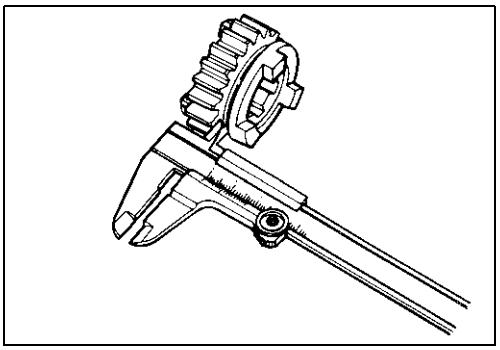
The clearance for each of the three shifting forks plays an important role in the smoothness and positiveness of shifting action.

If the clearance checked is noted to exceed the limit specified, replace the fork or its gear, or both.

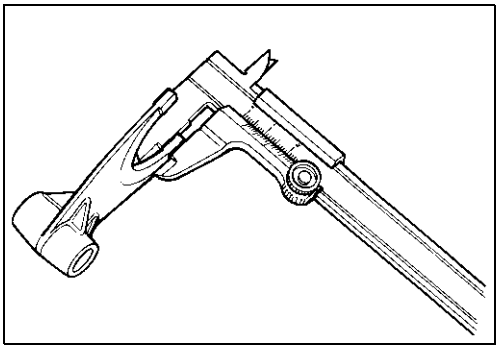


DATA Gearshift fork to groove clearance
Standard: 0.10 – 0.30 mm (0.004 – 0.012 in)
Service Limit: 0.50 mm (0.020 in)

TOOL 09900-20803: Thickness gauge
09900-20102: Vernier calipers



DATA Shift fork groove width
Standard (No. 1): 5.50 – 5.60 mm (0.217 – 0.220 in)
(No. 2): 4.50 – 4.60 mm (0.177 – 0.181 in)



DATA Shift fork thickness
Standard (No. 1): 5.30 – 5.40 mm (0.209 – 0.213 in)
(No. 2): 4.30 – 4.40 mm (0.169 – 0.173 in)

OIL JET

Check the all oil jets for clogging. If it is clogged, clean its oil passage with a compressed air.

CAUTION

Use new O-rings to prevent the oil pressure down.

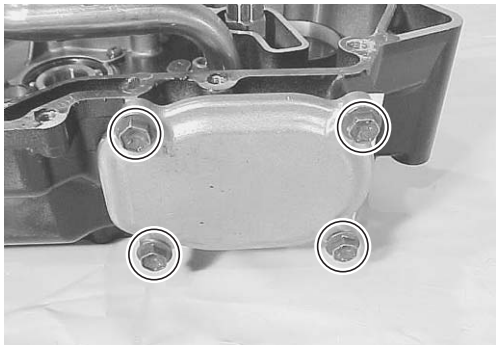
NOTE:
When installing the oil jets apply oil to the O-rings.



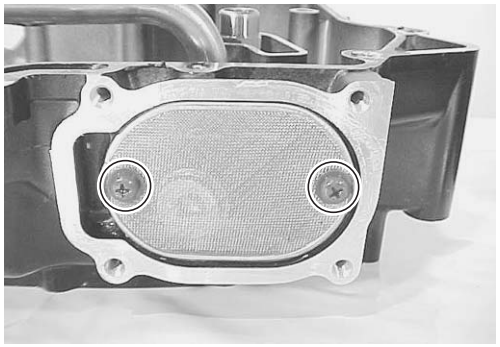
CRANKCASE

OIL SUMP FILTER

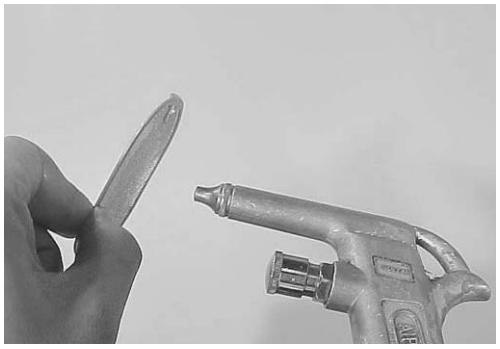
- Remove the oil sump filter cover.



- Remove the oil sump filter.

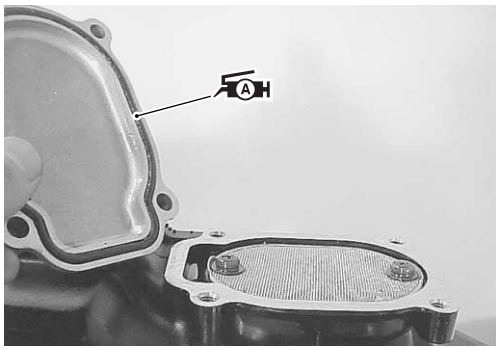


- Clean the oil sump filter using compressed air.



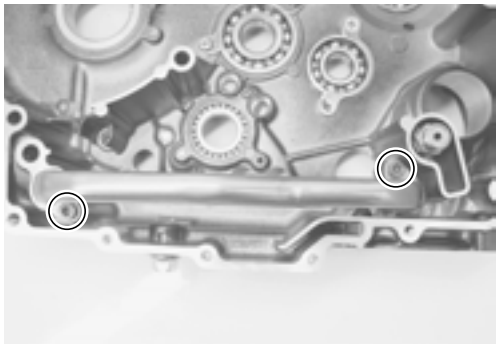
- When installing the new O-ring, apply grease to it.

99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)



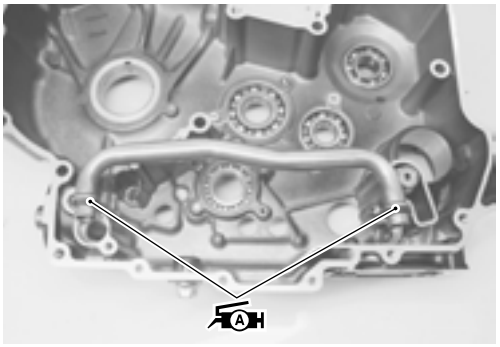
OIL PIPE

- Remove the oil pipe.



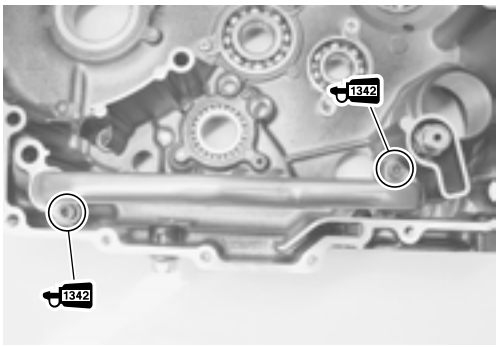
- When installing the oil pipe, use the new O-rings.
- Apply grease to the O-rings.

99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)



- Apply a small quantity of the THREAD LOCK "1342" to the oil pipe retainer bolts and tighten them securely.

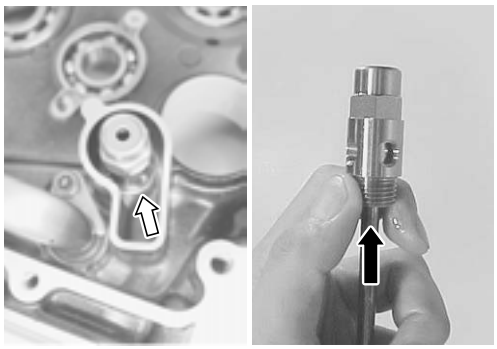
99000-32050: THREAD LOCK "1342"



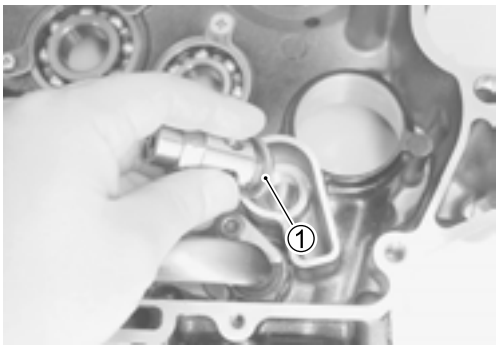
OIL PRESSURE REGULATOR

- Remove the oil pressure regulator.

Check the operation of the oil pressure regulator by pushing on the piston with an appropriately shaped tool. If the piston does not operate, replace the oil pressure regulator with a new one.

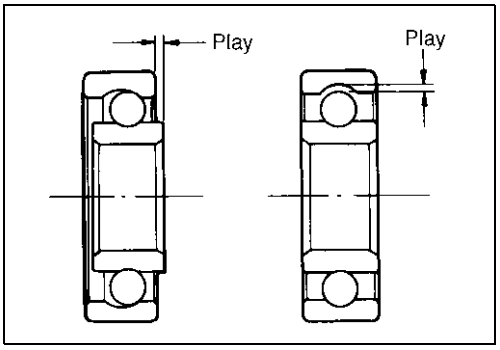


- When installing the oil pressure regulator, install the new washer ①.



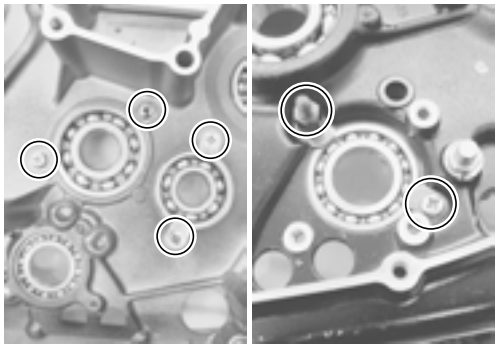
BEARING INSPECTION

Rotate the bearing inner race by finger to inspect for abnormal play, noise and smooth rotation while the bearings are in the crankcase.
Replace the bearing in the following procedure if there is anything unusual.



BEARING DISASSEMBLY

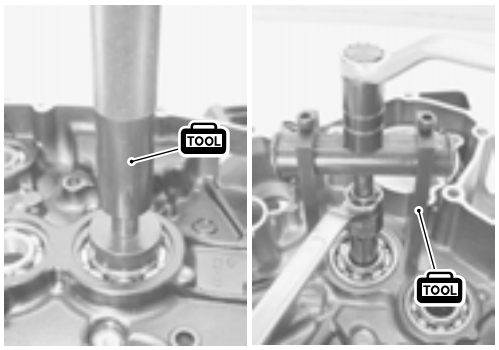
- Remove the bearing retainers.



- Remove the bearing with the special tools.

TOOL 09913-70210: Bearing installer set
09921-20240: Bearing remover set

NOTE:
If abnormal noise does not occur, it is not necessary to remove the bearing.

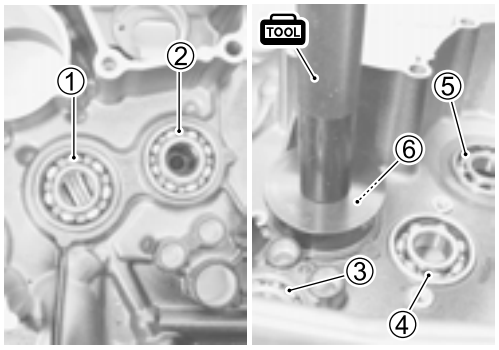


BEARING REASSEMBLY

- Install the bearing into the crankcase with the special tool.

NOTE:
** The stamped mark side of the bearing faces (①, ②, ④) outside.*
** The stamped mark side of the bearing faces (③, ⑤, ⑥) inside.*

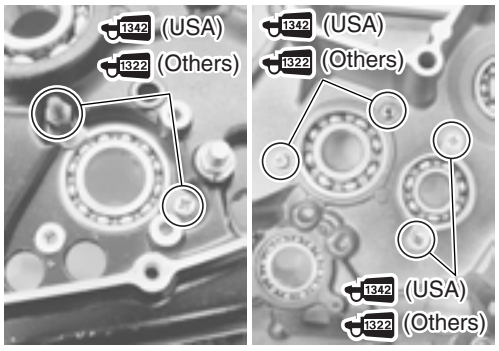
TOOL 09913-70210: Bearing installer set



- Apply a small quantity of the THREAD LOCK “1342” to the bearing retainer screws. (USA)
- Apply a small quantity of the THREAD LOCK SUPER “1322” to the bearing retainer screws. (Others)

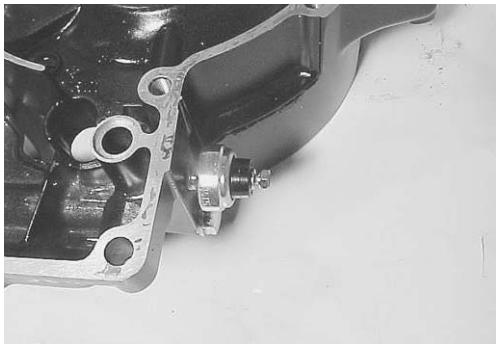
1342 99000-32050: THREAD LOCK “1342” (USA)

1322 99000-32110: THREAD LOCK SUPER “1322” (Others)



OIL PRESSURE SWITCH

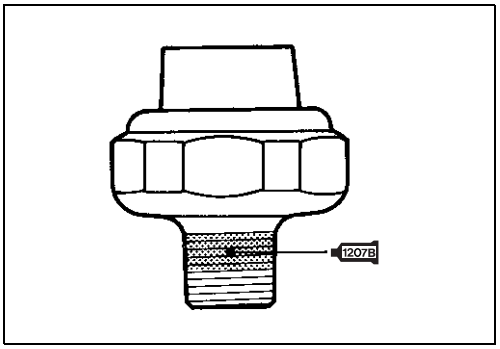
- Remove the oil pressure switch.



• When installing the switch, apply SUZUKI BOND “1207B”.

Oil pressure switch: 14 N·m (1.4 kgf-m, 10.0 lb-ft)

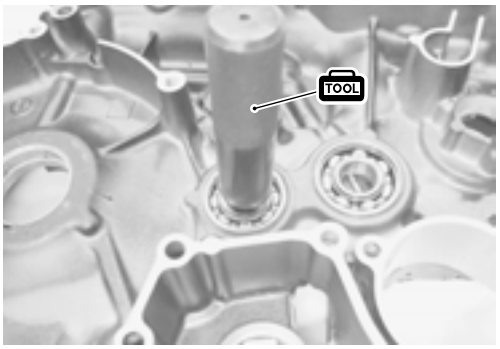
1207B 99000-31140: SUZUKI BOND “1207B”



OIL SEAL

• Remove the oil seal with the special tool.

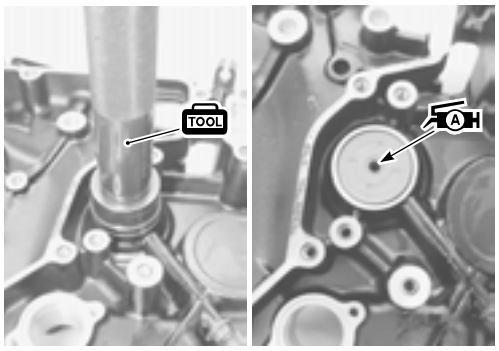
TOOL 09913-70210: Bearing installer set



• Install the oil seal with the special tool.
• Apply grease to the oil seal lip.

A 99000-25030: SUZUKI SUPER GREASE “A” (USA)
99000-25010: SUZUKI SUPER GREASE “A” (Others)

TOOL 09913-70210: Bearing installer set



ENGINE REASSEMBLY

Reassemble the engine in the reverse order of disassembly. The following steps require special attention or precautionary measures should be taken.

NOTE:
Apply engine oil to each running and sliding part before reassembling.

SECONDARY DRIVE BEVEL GEAR

- Install the secondary drive bevel gear shim(s).
  SHIM SELECTION ☞4-7

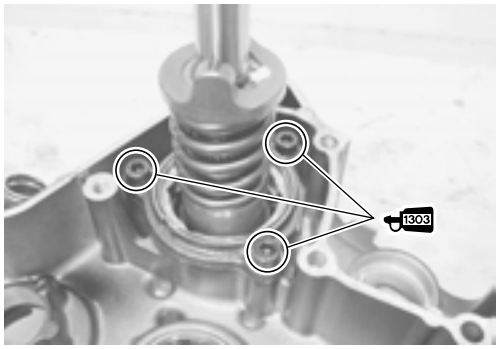


- Install the secondary drive bevel gear assembly and tighten the retainer bolts to the specified torque.

NOTE:
Apply THREAD LOCK SUPER "1303" to the thread of the bolts.

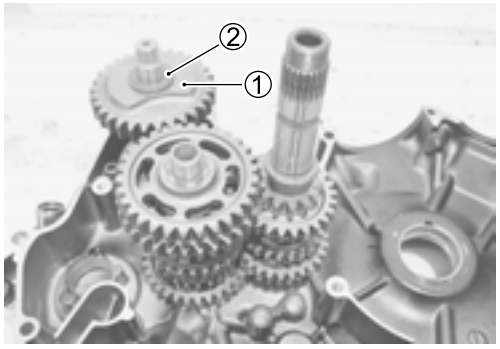
1303 99000-32030: THREAD LOCK SUPER "1303"

Secondary drive gear bearing retainer bolt:
23 N·m (2.3 kgf-m, 16.5 lb-ft)

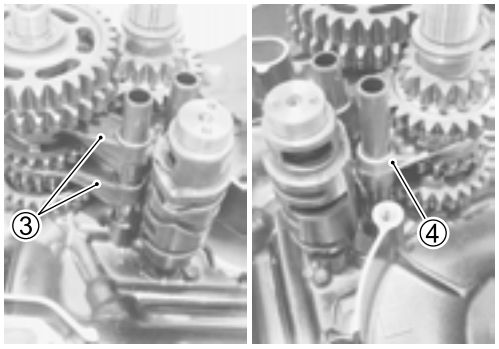


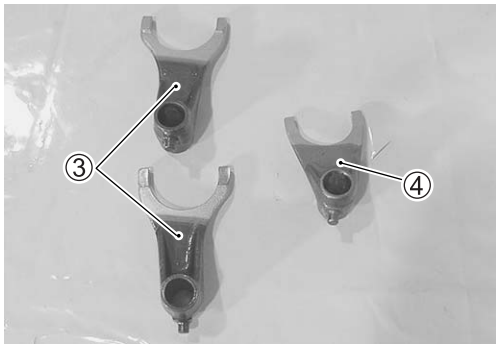
COUNTERSHAFT/DRIVESHAFT

- Install the countershaft assembly and driveshaft assembly.
- Install the over driving gear ① and bush ②.



• Install the gearshift forks ③ ④, gearshift fork shafts and gearshift cam.
③ No. 1 shift forks (For 4th and 5th driven gears)
④ No. 2 shift fork (For 3rd drive gear)





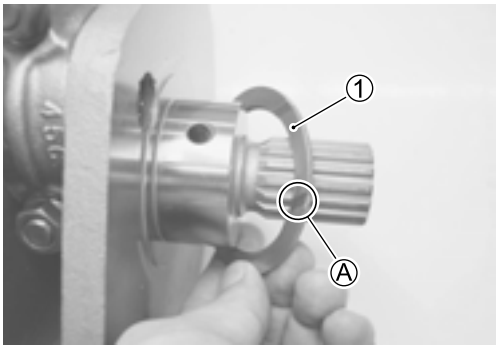
CRANKSHAFT

• Install the thrust shim ① on the crankshaft.

NOTE:

** The grooved face Ⓐ of thrust shim ① faces to crankshaft web side.*

** The thrust shim is selected by the crankshaft thrust clearance. (☞3-52)*

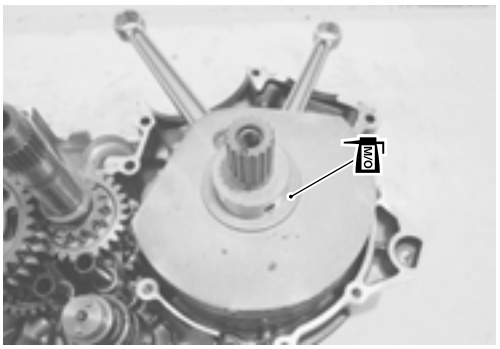


• Install the crankshaft into the left crankcase half.

NOTE:

Coat lightly moly paste to the crankshaft journal bearings and the thrust shim.

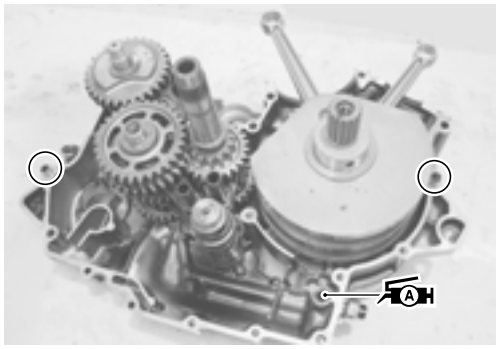
99000-25140: SUZUKI MOLY PASTE



CAUTION

Never strike the crankshaft with a plastic hammer when inserting it into the crankcase. It will be easy to install the crankshaft to left crankcase.

• Install the dowel pins and O-ring on the left crankcase half.



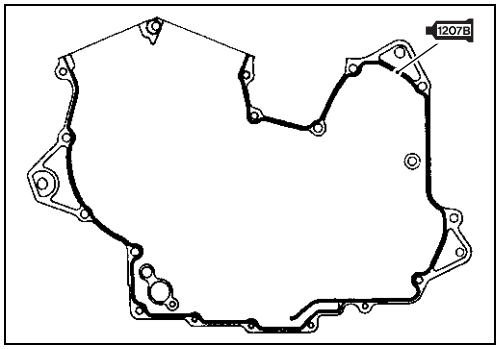
NOTE:
Apply grease to the O-ring.

99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

CAUTION

Use the new O-ring to prevent oil leakage.

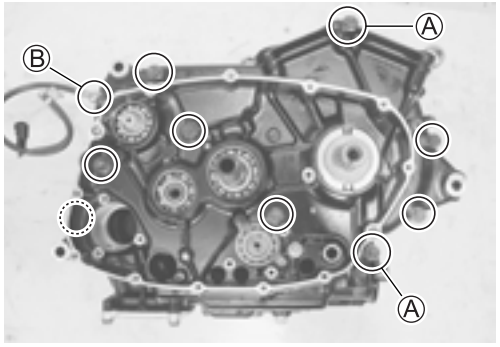
• Clean the mating surfaces of the left and right crankcase halves.
• Apply SUZUKI BOND "1207B" to the mating surface of the right crankcase.



99000-31140: SUZUKI BOND "1207B"

NOTE:
Use of SUZUKI BOND "1207B" is as follows:
** Make surfaces free from moisture, oil, dust and other foreign materials.*
** Spread on surfaces thinly to form an even layer, and assemble the crankcases within few minutes.*
** Take extreme care not to apply any BOND "1207B" to the oil hole, oil groove and bearing.*
** Apply to distorted surfaces as it forms a comparatively thick film.*

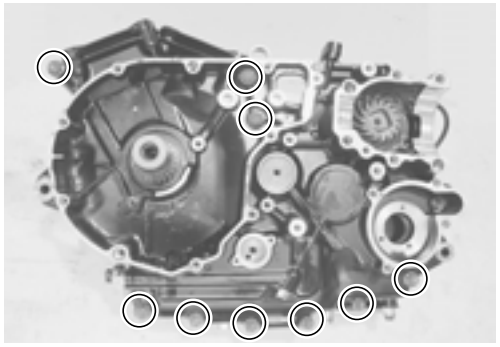
• Fit the gaskets to the bolts Ⓐ.
• Fit the lead wire to the bolt Ⓑ.
• When securing the right and left crankcase halves, tighten each bolt a little at a time to equalize the pressure. Tighten all the securing bolts to the specified torque values.



Crankcase 8 mm bolt:
Initial: 15 N·m (1.5 kgf-m, 11.0 lb-ft)
Final : 22 N·m (2.2 kgf-m, 16.0 lb-ft)
Crankcase 6 mm bolt: 11 N·m (1.1 kgf-m, 8.0 lb-ft)

CAUTION

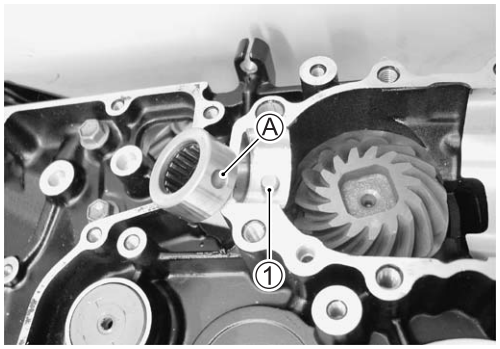
Do not drop the O-ring into the crankcase when assembling the right and left crankcase halves.



NOTE:
After the crankcase bolts have been tightened, check if the crankshaft, secondary drive bevel gear shaft, countershaft and the driveshaft rotate smoothly.

SECONDARY DRIVEN BEVEL GEAR

- Install the secondary driven bevel gear bearing and the pin ①.

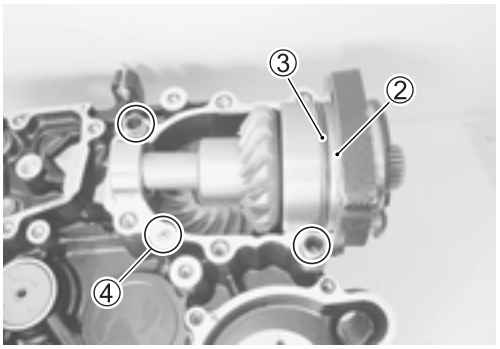


NOTE:

** Align the hole Ⓐ of the secondary driven bevel gear bearing with the pin ①.*

** The stamped mark side of the bearing face rearward.*

- Install the secondary driven bevel gear assembly, shim(s) ② and O-ring ③.
- Install the dowel pins and the oil jet ④.



CAUTION

Use the new O-ring to prevent oil leakage.

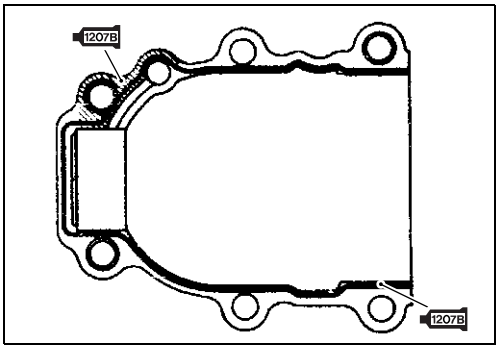
NOTE:

** Refer to the section 4 for shim selection.*

** Apply grease to the O-ring.*

A: 99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

- Clean the mating surfaces of the crankcase and the secondary gear case.
- Apply SUZUKI BOND "1207B" to the mating surface of the secondary gear case.



1207B: 99000-31140: SUZUKI BOND "1207B"

NOTE:

** Make surfaces free from moisture, oil, dust and other foreign materials.*

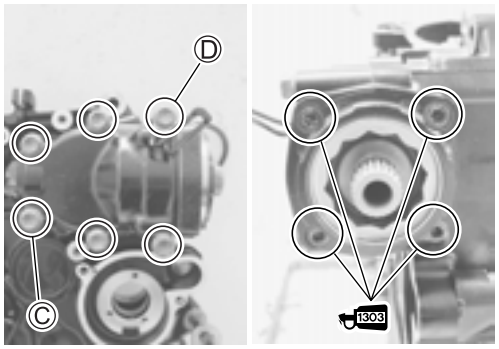
** Spread on surfaces thinly to form an even layer, and assemble the crankcases within few minutes.*

** Take extreme care not to apply any BOND "1207B" to the oil hole, oil groove and bearing.*

** Apply to distorted surfaces as it forms a comparatively thick film.*

- Tighten the secondary gear case bolts to the specified torque.

Secondary gear case bolt
Initial: 15 N·m (1.5 kgf-m, 11.0 lb-ft)
Final : 22 N·m (2.2 kgf-m, 16.0 lb-ft)



NOTE:

** Fit the washer to the bolt Ⓒ.*

** Fit the clamp to the bolt Ⓓ.*

• Tighten the secondary driven bevel gear bolt to the specified torque.

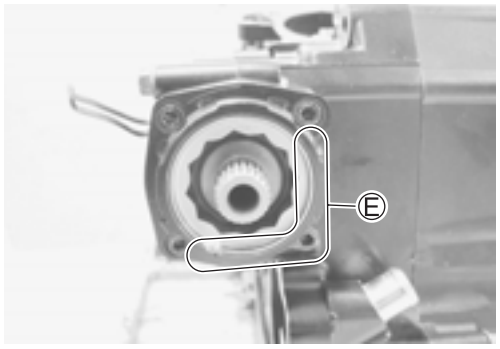
NOTE:

** Hollow portion Ⓔ of the secondary driven gear assembly faces inside.*

** Apply a small quantity of THREAD LOCK SUPER "1303" to the bolt.*

1303 99000-32030: THREAD LOCK SUPER "1303"

Secondary driven bevel gear bolt:
23 N·m (2.3 kgf-m, 16.5 lb-ft)

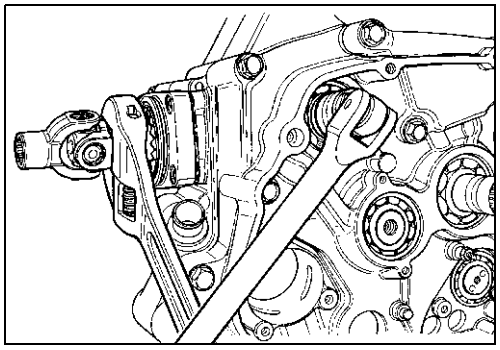


DRIVESHAFT BOLT/SECONDARY DRIVEN GEAR SHAFT NUT

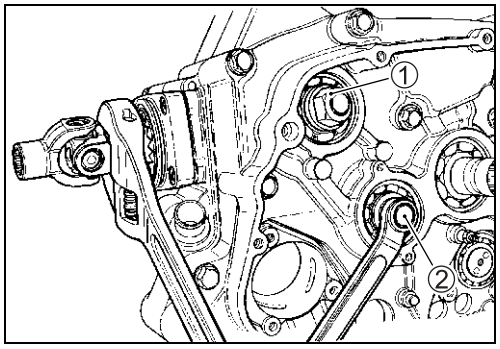
• Install the universal joint on the secondary driven gear shaft.
• While holding the universal joint with a adjustable wrench, tighten the secondary drive gear shaft nut ① and driveshaft bolt ② to the specified torque.

CAUTION

Driveshaft bolt ② has left-hand thread.



Secondary drive gear shaft nut:
105 N·m (10.5 kgf-m, 76.0 lb-ft)
Driveshaft bolt: 65 N·m (6.5 kgf-m, 47.0 lb-ft)



WATER PUMP

• Install the new O-ring and new gasket.
• Tighten the water pump mounting screws.

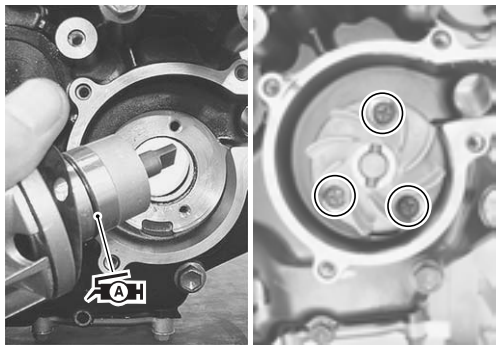
CAUTION

Use the new O-ring to prevent oil leakage.

NOTE:

Apply grease to the O-ring.

A 99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)



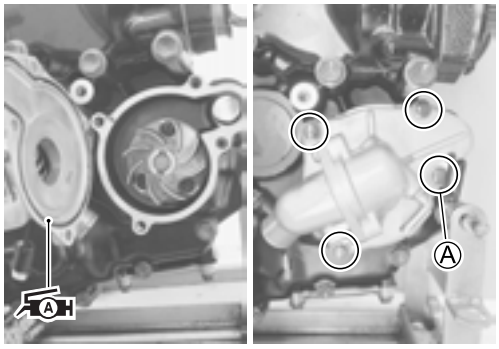
- Install the new O-ring.
- Install the water pump cover.

CAUTION

Use the new O-ring to prevent oil leakage.

NOTE:
** Fit the clamp to the bolt Ⓐ.*
** Apply grease to the O-ring.*

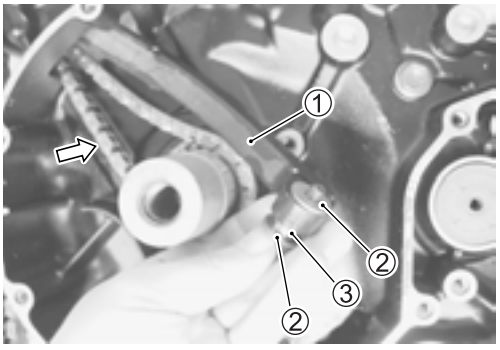
99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)



CAM CHAIN/CAM CHAIN TENSIONER

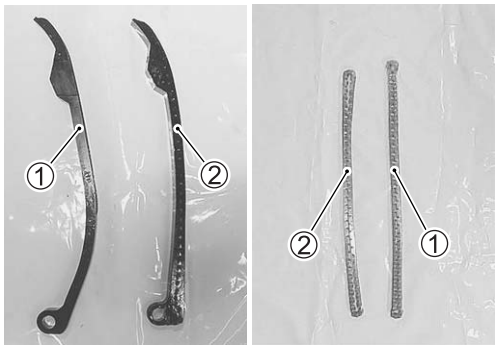
- Install the cam chain tensioner ①, washers ②, spacer ③ and cam chain.

Cam chain tensioner bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)



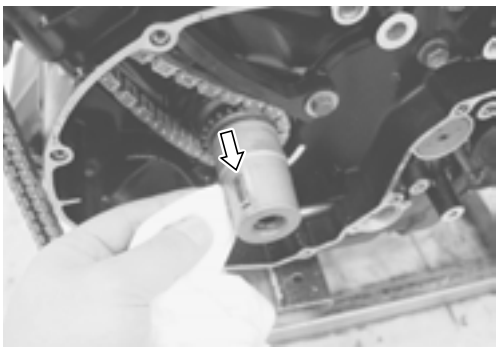
① For front cylinder
② For rear cylinder

NOTE:
The No. 2 cam chain (For front cylinder) is a little longer than the No. 1 cam chain.



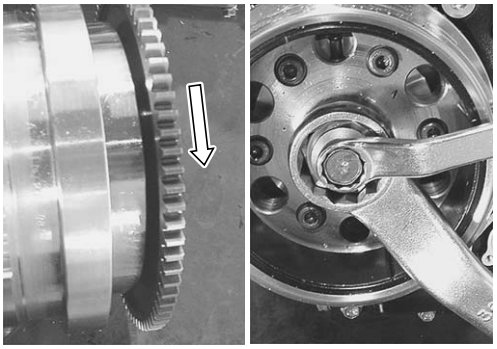
GENERATOR

- Degrease the tapered portion of the generator rotor assembly and also the crankshaft. Use nonflammable cleaning solvent to wipe off the oily or greasy matter to make these surfaces completely dry.
- Install the key.

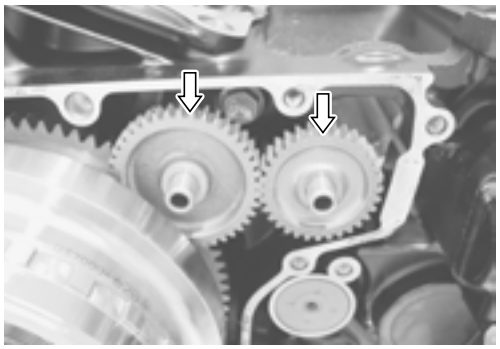


- Install the starter driven gear to the rotor.
- Install the generator rotor assembly and tighten its bolt to the specified torque.

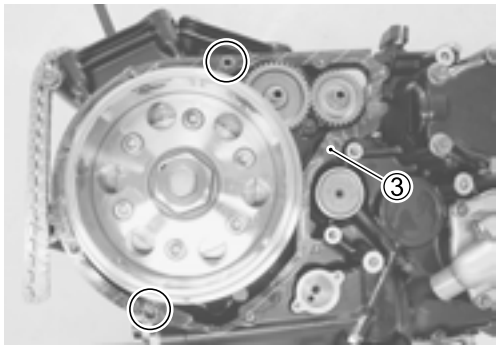
Generator rotor bolt: 160 N·m (16.0 kgf-m, 115.5 lb-ft)



- Install the starter driven gear and the idle gear.



- Install the new gasket ③ and dowel pins.



- Install the generator cover.

NOTE:
Fit the new gaskets to the bolts Ⓐ.

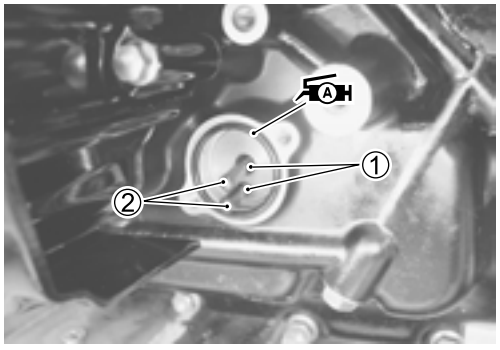


NEUTRAL SWITCH

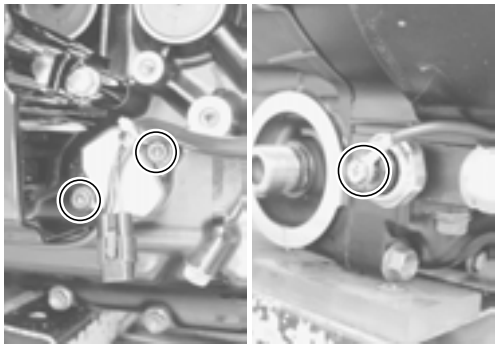
- Install the springs ① and switch contacts ②.

NOTE:
Apply grease to the O-ring.

99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)



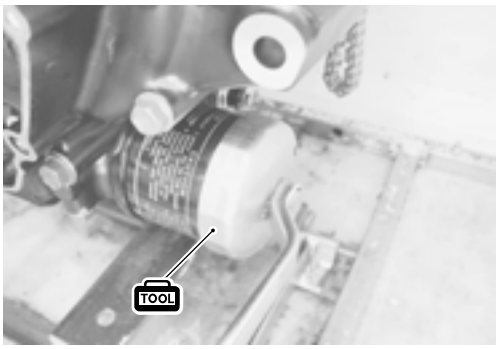
- Install the neutral switch.
- Install the oil pressure switch lead wire.



OIL FILTER

- Apply engine oil lightly to the gasket of the oil filter before installation.
- Install the oil filter turning it by hand until feeling that the filter gasket contacts the mounting surface. Then tighten it 2 turns using the oil filter wrench. (20 N·m, 2.0 kgf-m, 14.5 lb-ft)

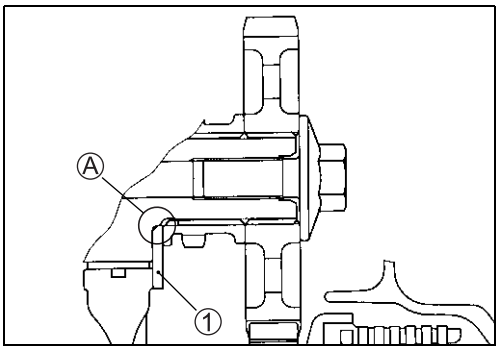
09915-40610: Oil filter wrench



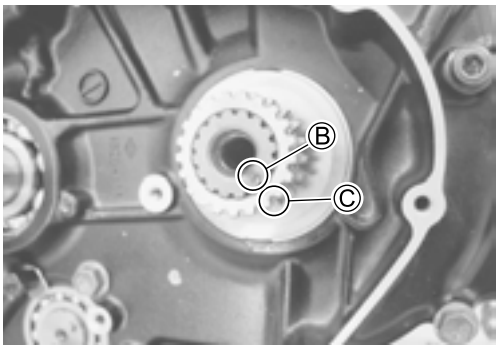
PRIMARY DRIVE GEAR

- Install the thrust washer ① onto the crankshaft.

NOTE:
The chamfer side Ⓐ of thrust washer ① face crankcase side.

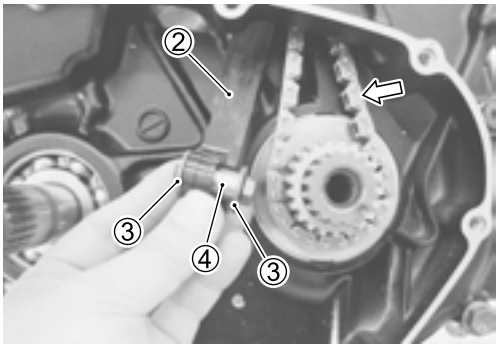


- Align the punch mark Ⓑ on the crankshaft with the punch mark Ⓒ on the camshaft drive sprocket.



- Install the cam chain, cam chain tensioner ②, washers ③ and spacer ④.
- Tighten the cam chain tensioner bolt to the specified torque.

Cam chain tensioner bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)

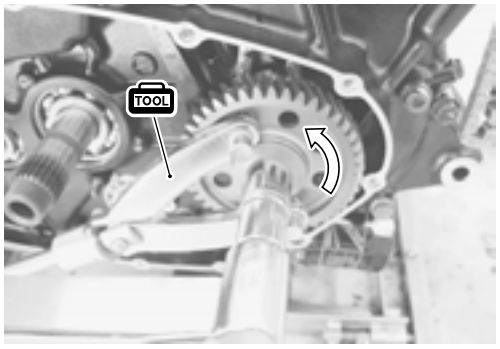


- Install the primary drive gear and tighten the primary drive gear bolt to the specified torque with the special tool.

Primary drive gear bolt: 95 N·m (9.5 kgf-m, 68.5 lb-ft)

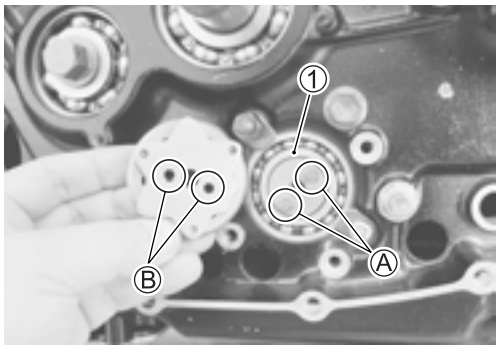
09930-40113: Rotor holder

NOTE:
This bolt has left-hand thread.



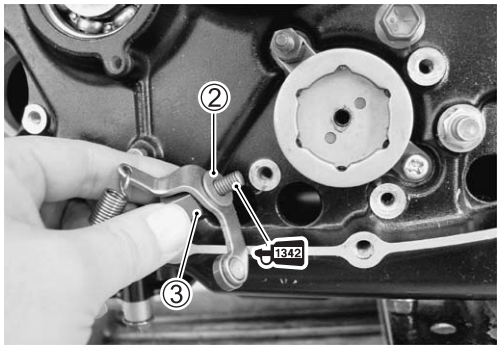
GEARSHIFT

- Install the washer ①.
- Install the gearshift cam stopper plate after aligning the gearshift cam pins Ⓐ with the gearshift cam stopper plate holes Ⓑ.

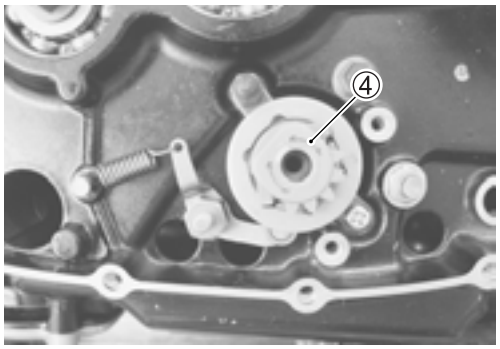


- Install the washer ②.
- Apply a small quantity of THREAD LOCK “1342” to the gearshift cam stopper bolt ③ and tighten it.

99000-32050: THREAD LOCK “1342”

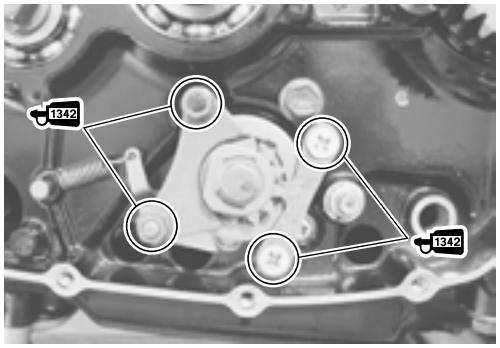


- Install the cam driven gear ④ after installing the springs, pins and gearshift pawls.

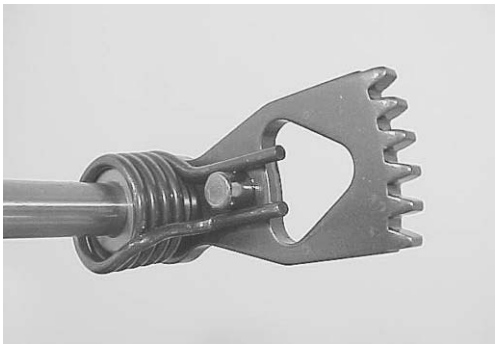


- Install the cam guide and the pawl lifter.
- Apply a small quantity of THREAD LOCK “1342” to the nuts.

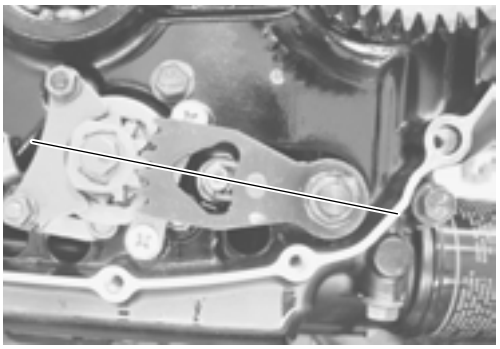
99000-32050: THREAD LOCK “1342”



• Install the gearshift return spring properly.



• Install the gearshift shaft with the center of shift gear on the shaft aligned the center of gearshift cam driven gear.



OIL PUMP

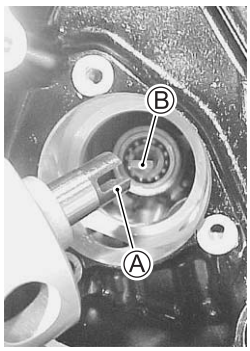
• Install the oil pump.

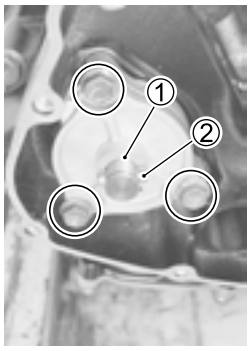
Oil pump mounting bolt: 11 N·m (1.1 kgf-m, 8 lb-ft)

NOTE:

Set the oil pump shaft end Ⓐ to the water pump shaft Ⓑ.

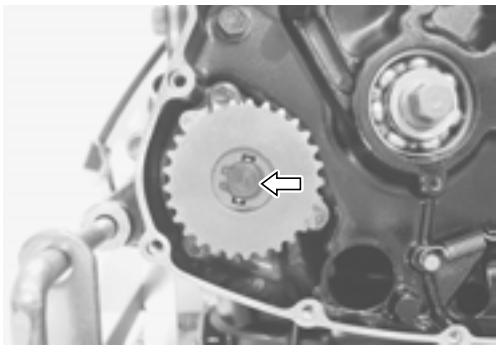
• Install the washer ① and pin ②.





• Install the oil pump driven gear and the snap ring.

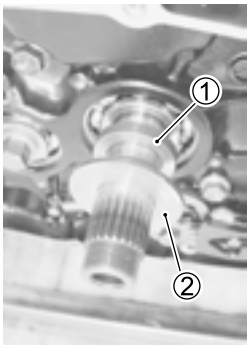
09900-06107: Snap ring pliers



CLUTCH

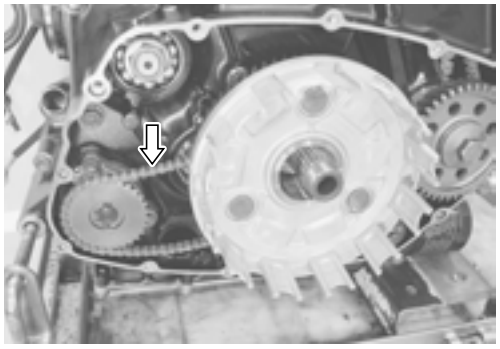
• Install the spacer ① and the thrust washer ②.

• Engage the chain with the oil pump drive gear.

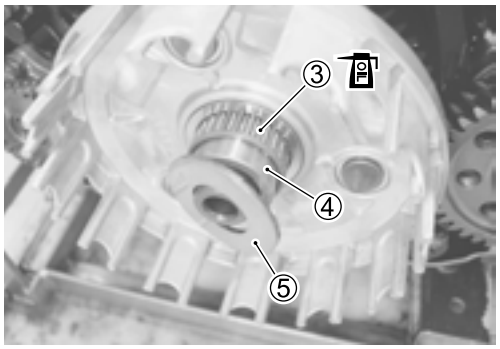




- Install the primary driven gear assembly and engage the chain with the oil pump driven gear.

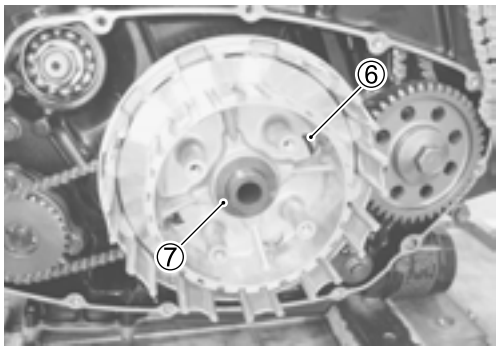


- Apply engine oil to the primary driven gear bearing ③ and install it.
- Install the spacer ④ and thrust washer ⑤.



- Install the clutch sleeve hub ⑥ and washer ⑦.

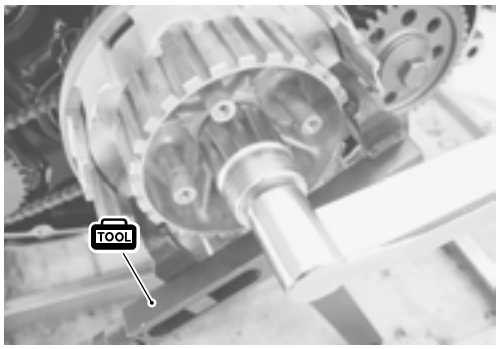
NOTE:
The convex side of the washer ⑦ faces outside.

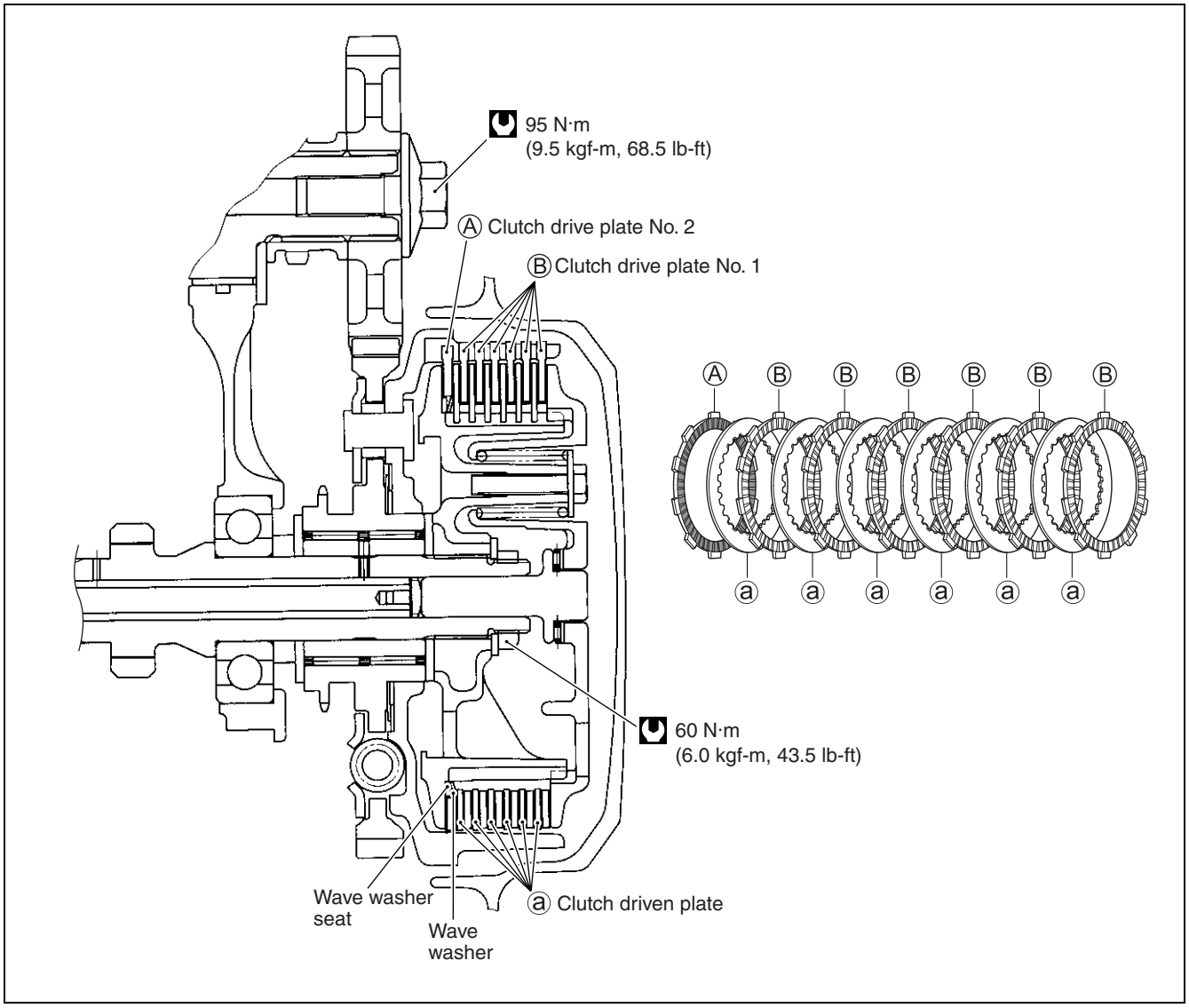


- Tighten the clutch sleeve hub nut to the specified torque with the special tool.

Clutch sleeve hub nut: 60 N·m (6.0 kgf-m, 43.5 lb-ft)

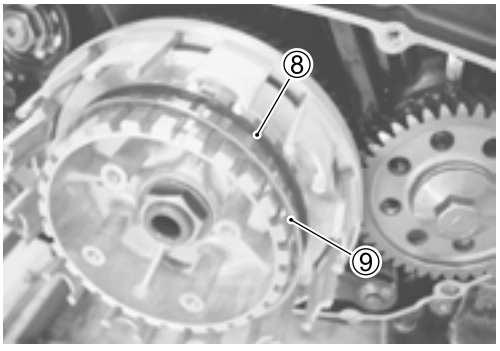
09920-53740: Clutch sleeve hub holder



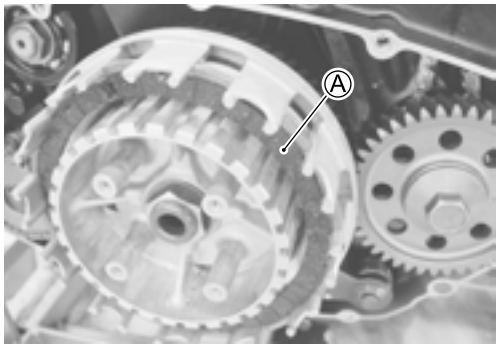


Ⓐ No. 2 Drive plate
Thickness: 3.5 mm (0.14 in) .....1 pc.
Ⓑ No. 1 Drive plate
Thickness: 3.0 mm (0.12 in) .....6 pcs.
ⓐ Driven plate .....6 pcs.

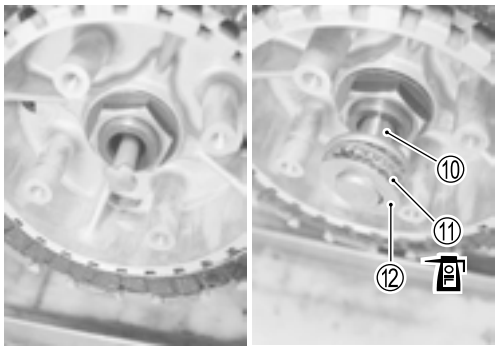
- Install the wave washer seat ⑧ and the wave washer ⑨.



- Install the clutch drive plate No. 2 Ⓐ first.
- Install the drive and driven plate one by one into the clutch sleeve hub.

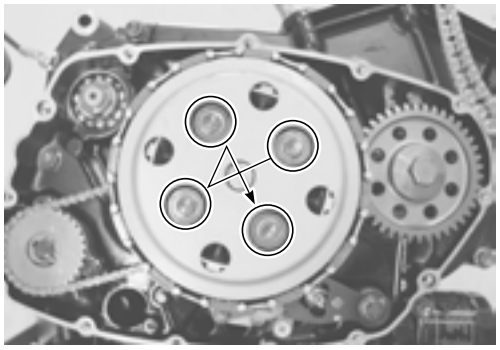


- Install the push rod.
- Install the clutch push piece ⑩, bearing ⑪ and thrust washer ⑫.
- Apply engine oil to the bearing.

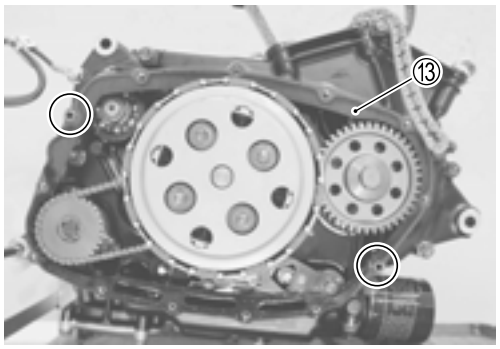


- Install the springs and tighten the clutch spring set bolts diagonally to the specified torque.

Clutch spring set bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)

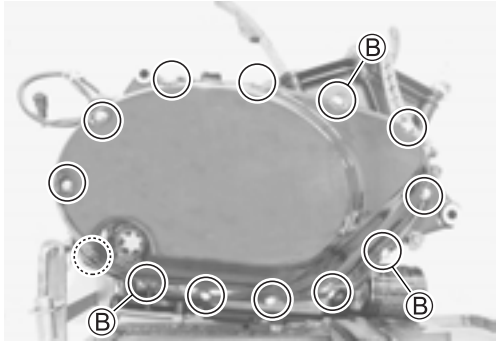


- Install the new gasket ⑬ and dowel pins.



- Install the clutch cover and tighten the bolts.

NOTE:
Fit the new gaskets to the bolts Ⓑ.

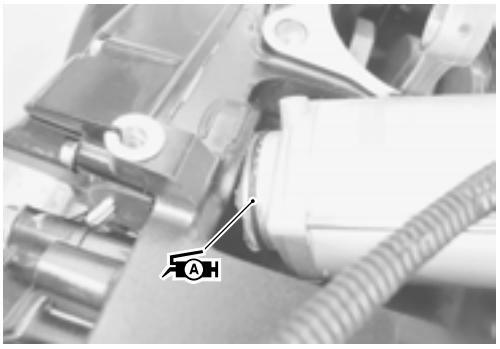


STARTER MOTOR

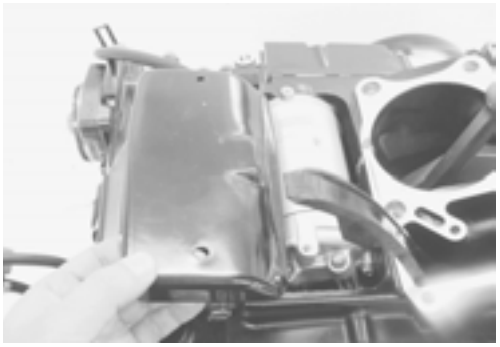
- Install the starter motor.

NOTE:
Apply grease to the new O-ring.

99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

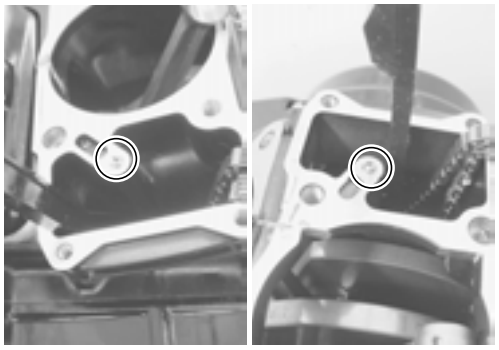


- Install the starter motor cover.



OIL JET

- Apply engine oil to the new O-ring and install the oil jets.

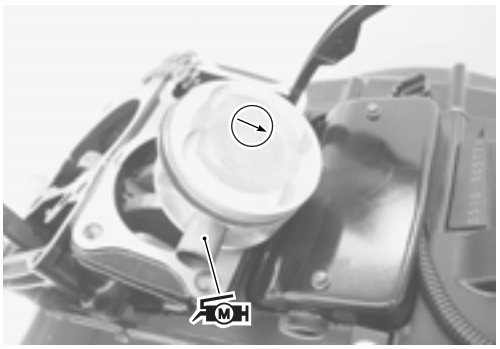


PISTON

- Apply a light coat of SUZUKI MOLY PASTE to the piston pins.

99000-25140: SUZUKI MOLY PASTE

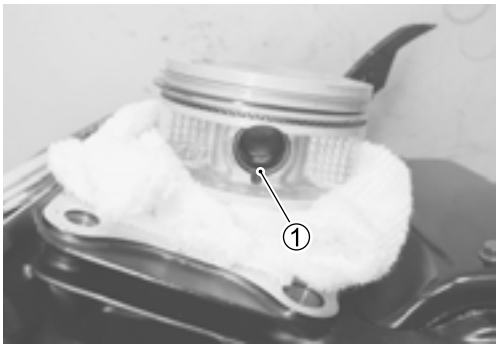
- When installing the piston, the arrow mark on the piston head is located to the exhaust side.



- Place a cloth beneath the piston, and install the circlip ①.

CAUTION

When turning the crankshaft, pull the cam chains upward, or the chains will be caught between the crankcase and the cam drive sprocket.



CYLINDER

- Install the cam chain tension adjuster to the cylinder.
- After unlocking the ratchet, push the cam chain tension adjuster rod.
- Insert the special tool between the ratchet and the adjuster body.

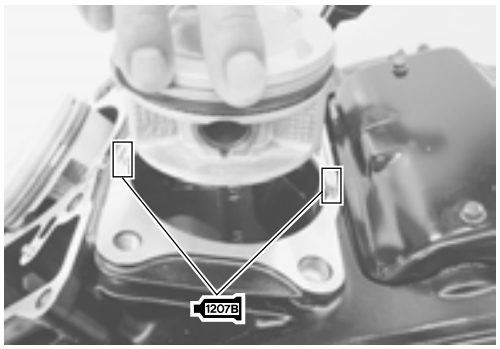
09918-53810: Chain tensioner lock tool

Cam chain tension adjuster mounting bolt:
10 N·m (1.0 kgf-m, 7.0 lb-ft)



- Coat SUZUKI BOND "1207B" lightly to the mating surfaces among the crankcase mating surfaces.

99000-31140: SUZUKI BOND "1207B"



- Fit the dowel pins and the new gasket ①.

CAUTION

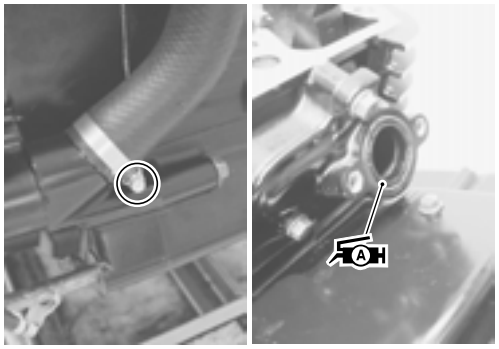
Use a new gasket to prevent gas leakage.



- Install the cylinder. (Rear cylinder)
- Install the water hose and pipe.

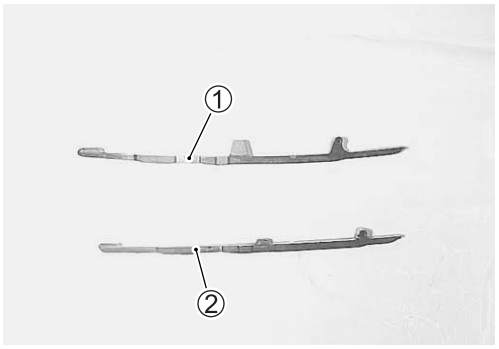
NOTE:
Apply grease to the new O-ring.

99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)



CYLINDER HEAD

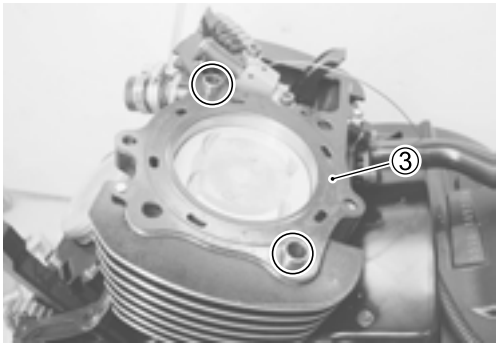
- Install the cam chain guide.
  ① For front cylinder
  ② For rear cylinder



- Fit the dowel pins and the new gasket ③.

CAUTION

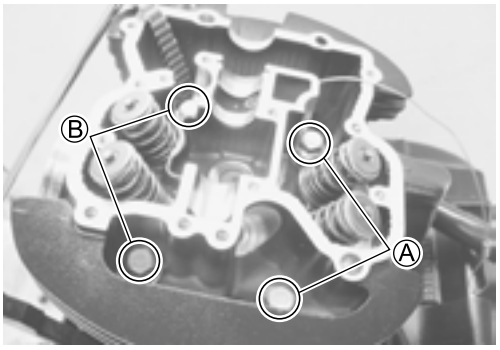
Use a new gasket to prevent gas leakage.



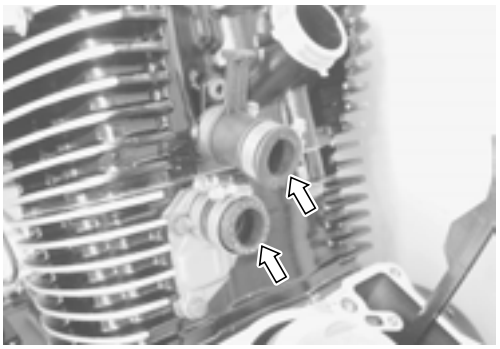
- Install the cylinder head and tighten the cylinder head bolts diagonally to the specified torque. (Rear cylinder)

Cylinder head bolt (M10):
Initial: 25 N·m (2.5 kgf-m, 18.0 lb-ft)
Final : 38 N·m (3.8 kgf-m, 27.5 lb-ft)

NOTE:
Bolt Ⓐ: 165 mm (6.5 in)
Bolt Ⓑ: 155 mm (6.1 in)



- Install the water hoses to the rear cylinder.

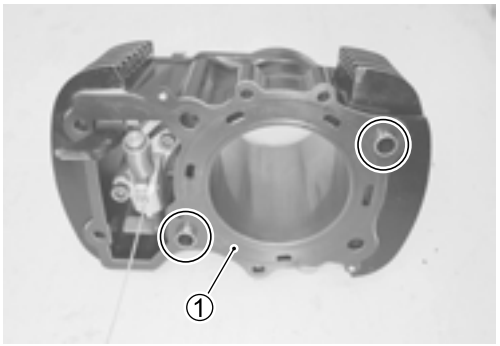


FRONT CYLINDER

- Fit the dowel pins and new gasket ①.

CAUTION

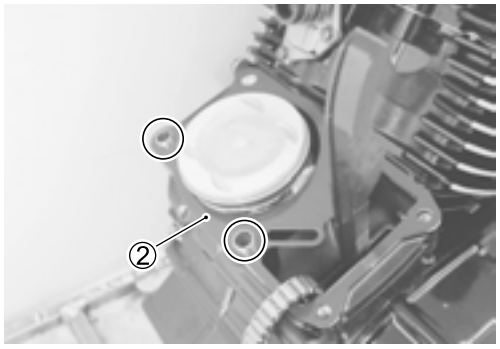
Use a new gasket to prevent gas leakage.



• Fit the dowel pins and the new gasket ②.

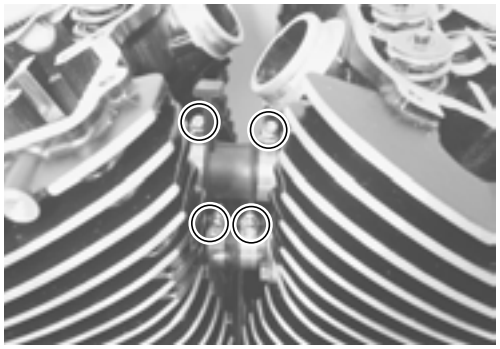
CAUTION

Use a new gasket to prevent gas leakage.



• Install the front cylinder assembly to the crankcase.

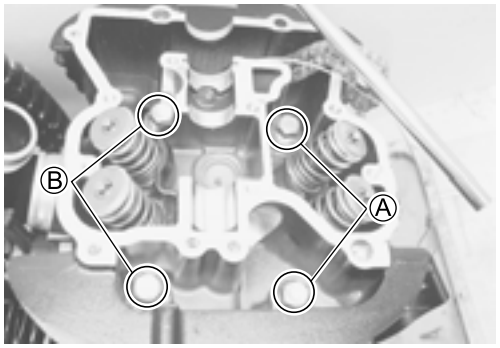
• Connect the water hoses.



• Tighten the cylinder head bolts diagonally to the specified torque.

Cylinder head bolt (M10):
Initial: 25 N·m (2.5 kgf-m, 18.0 lb-ft)
Final : 38 N·m (3.8 kgf-m, 27.5 lb-ft)

NOTE:
Bolt Ⓐ: 165 mm (6.5 in)
Bolt Ⓑ: 155 mm (6.1 in)

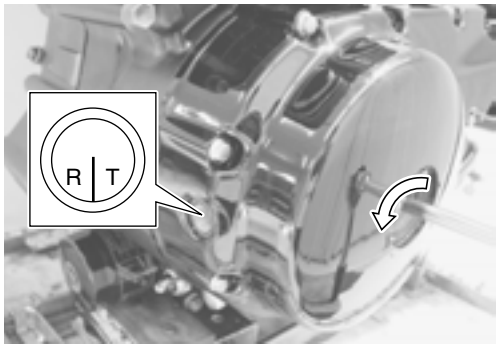


CAMSHAFT

• Position "R I T" mark on the generator rotor with the center of the valve timing inspection hole.

CAUTION

Pull the cam chains upward, or the chain will be caught between crankcase and cam drive sprocket.

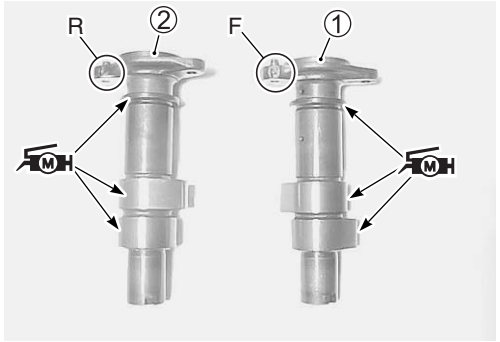


• Before installing the camshafts onto each cylinder head, apply SUZUKI MOLY PASTE onto the camshaft journals. Also, apply engine oil onto the camshaft journal holders.

99000-25140: SUZUKI MOLY PASTE

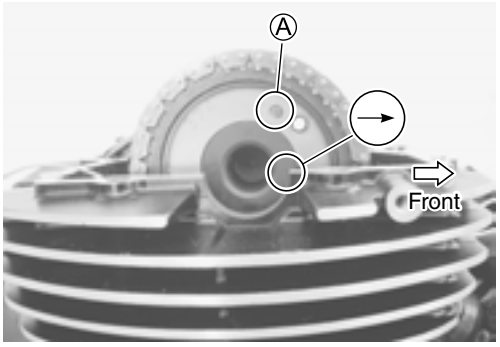
NOTE:
The camshaft is identified by the embossed letters "F" and "R".

① Front cam shaft
② Rear cam shaft



- Align the arrow marks on the front and rear camshafts so it is parallel with the surface of the cylinder heads.

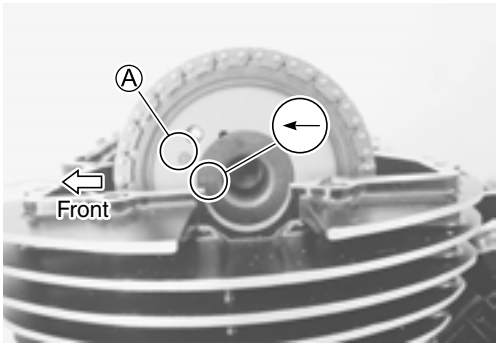
NOTE:
Arrow marks are located to forward.



- Engage the chains on the cam sprockets with the locating pin holes Ⓐ as shown in the photograph.

NOTE:
Do not rotate the generator rotor while doing this. When the sprocket is not positioned correctly, turn the sprocket.

- Recheck the position of the "R I T" mark on the generator rotor, arrow mark on the No. 1 (Rear) camshaft and arrow mark on the No. 2 (Front) camshaft.

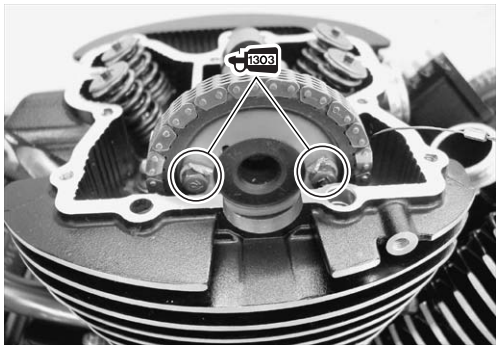


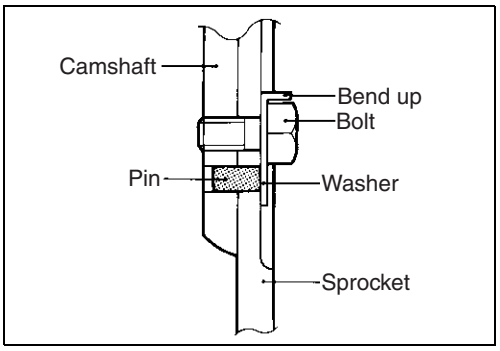
- Install the lock washer so that it is covering the locating pin.
- Apply THREAD LOCK SUPER "1303" to the bolts and tighten them to the specified torque.

Cam chain sprocket bolt: 15 N·m (1.5 kgf-m, 11.0 lb-ft)

1303 99000-32030: THREAD LOCK SUPER "1303"

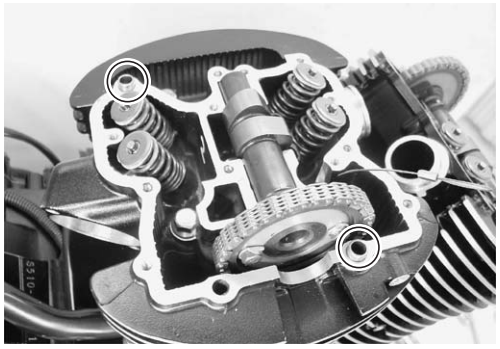
- Bend up the washer tongue positively to lock the bolts.





CYLINDER HEAD COVER

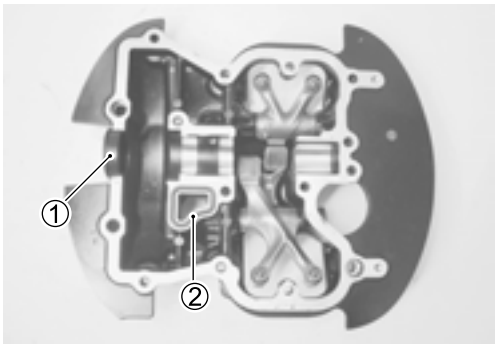
- Clean the mating surfaces of the cylinder head and head cover before matching.
- Install the dowel pins to the cylinder head.

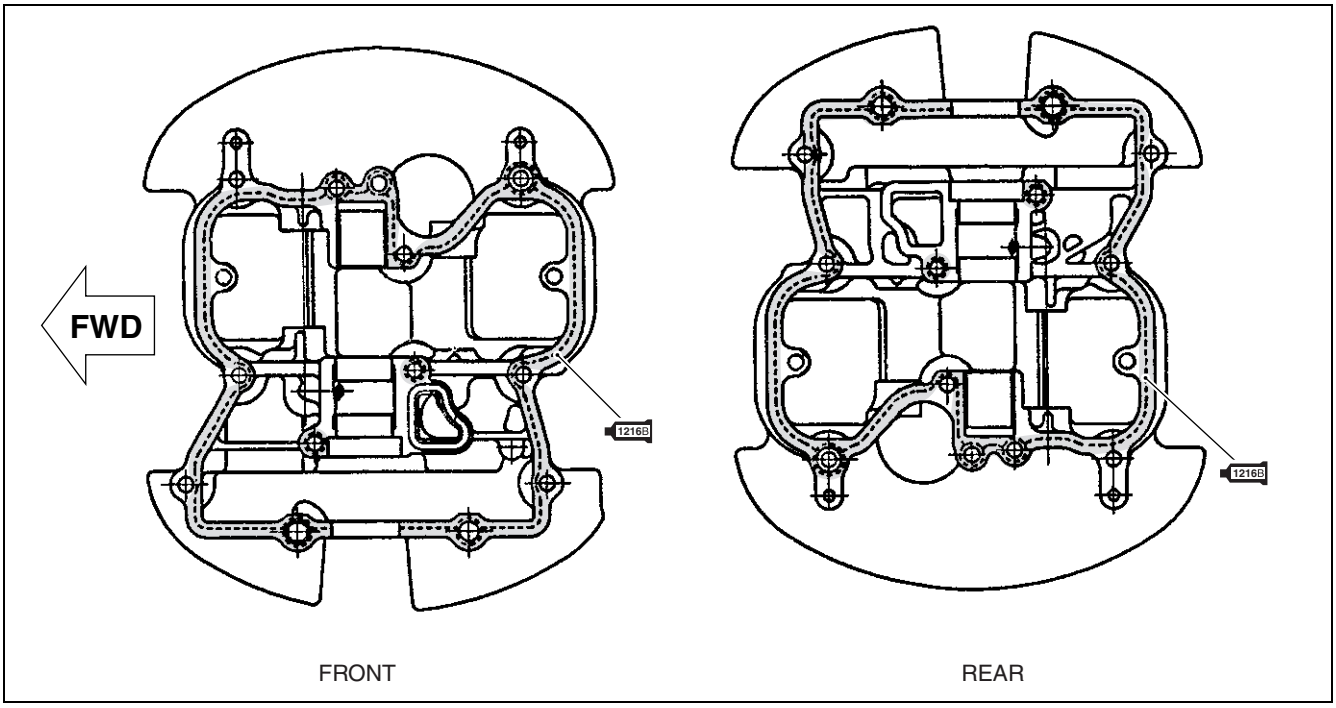


- Apply SUZUKI BOND “1216B” to the mating surface of the cylinder head cover.
- Fit the camshaft end caps ①.
- Apply grease to the new O-ring ② and install it. (Front cylinder only)

1216B **99000-31230: SUZUKI BOND “1216B”**

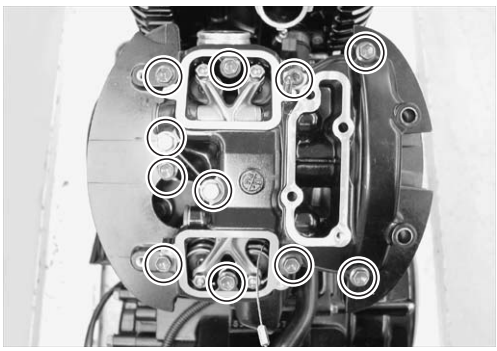
A **99000-25030: SUZUKI SUPER GREASE “A” (USA)**
99000-25010: SUZUKI SUPER GREASE “A” (Others)



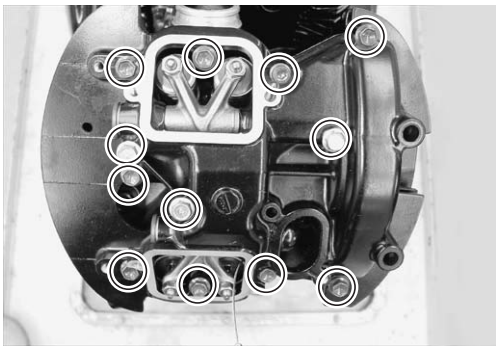


- Lightly tighten the cylinder head cover bolts diagonally, and then if everything is satisfactory, tighten securely with a torque wrench to the specified torque.

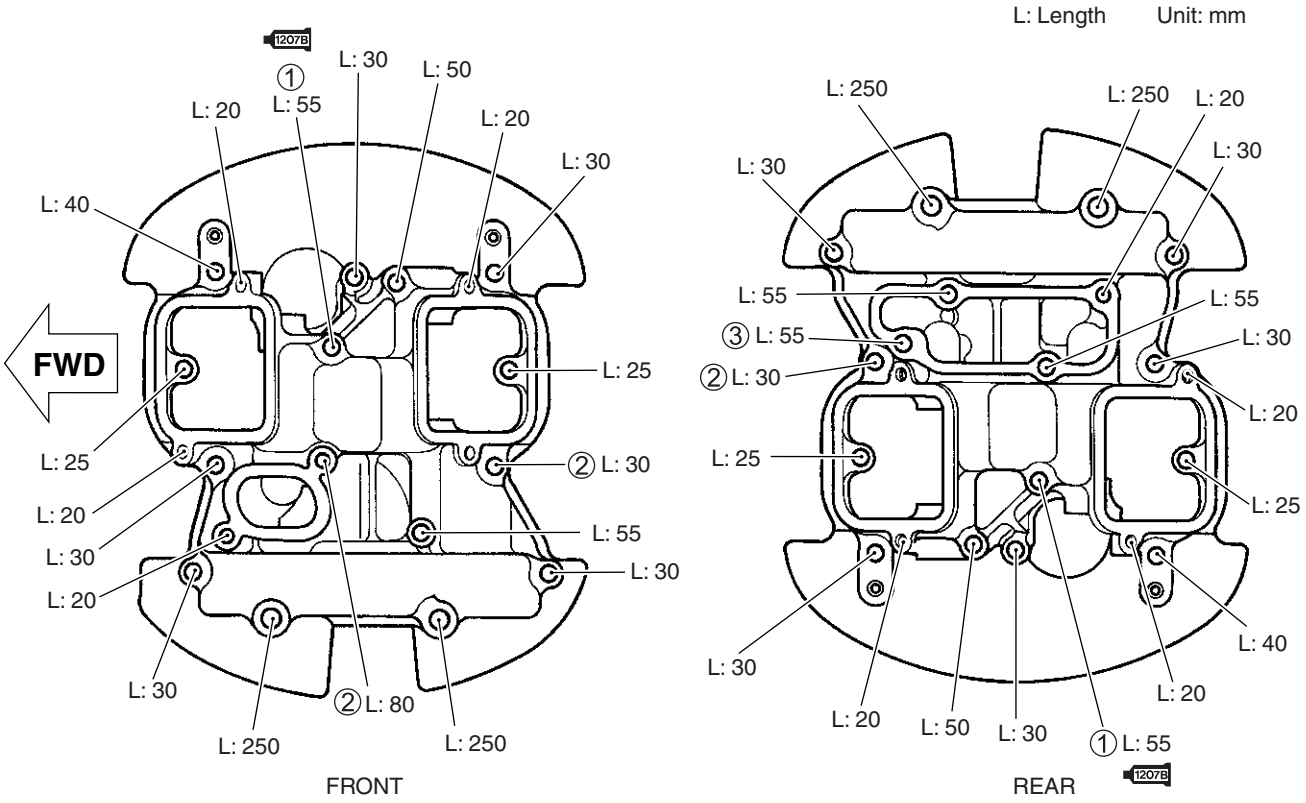
DATA **Cylinder head cover bolt**
(M6): 10 N·m (1.0 kgf-m, 7.0 lb-ft)
(M8): 25 N·m (2.5 kgf-m, 18.0 lb-ft)



NOTE:
When tightening the cylinder head cover bolts, the piston must be at top dead center on the compression stroke.
(☞3-12 and -13)



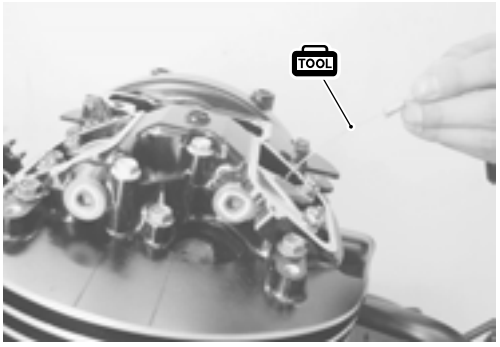
LOCATION OF CYLINDER HEAD COVER BOLT

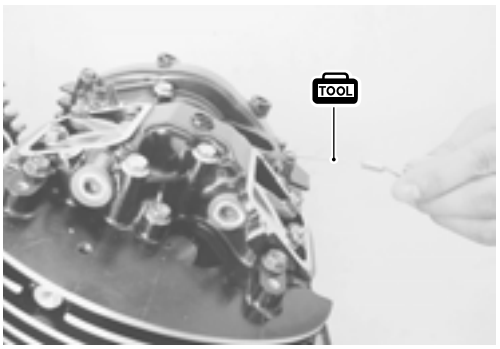


NOTE:
** Before installing the bolt ①, apply SUZUKI BOND "1207B" to the thread of the bolt.*
** Allen bolt: ②*
** Fit the gasket to the bolt ③.*

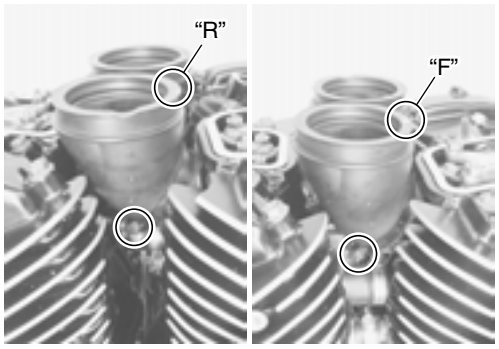
- Remove the tensioner lock tools.

NOTE:
Click sound is heard when the cam chain tension adjuster is released.





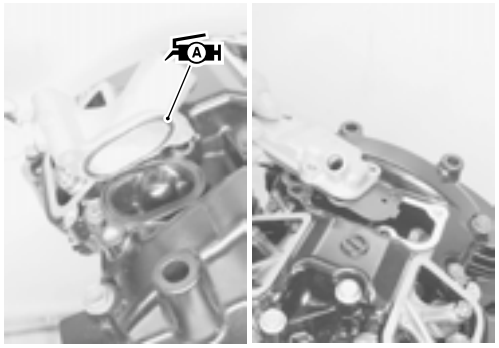
- Install the intake pipe.



- Apply grease to the new O-ring and install the water outlet union.

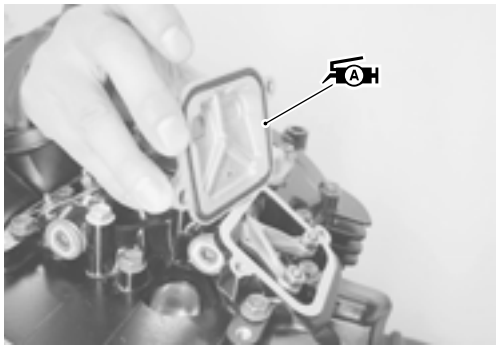
99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

- Install the gasket and the breather cover.

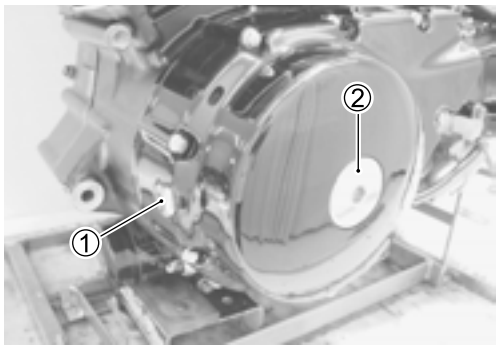


- Apply grease to the new O-rings and install the valve inspection caps.

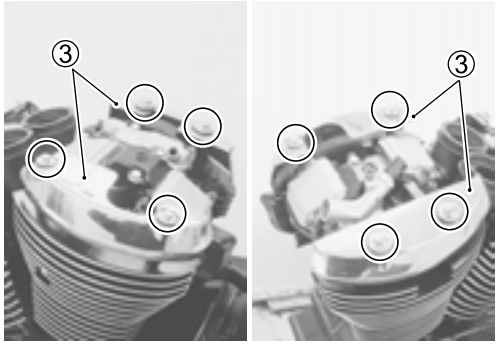
99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)



- Install the valve timing inspection plug ① and the generator cover cap ②.

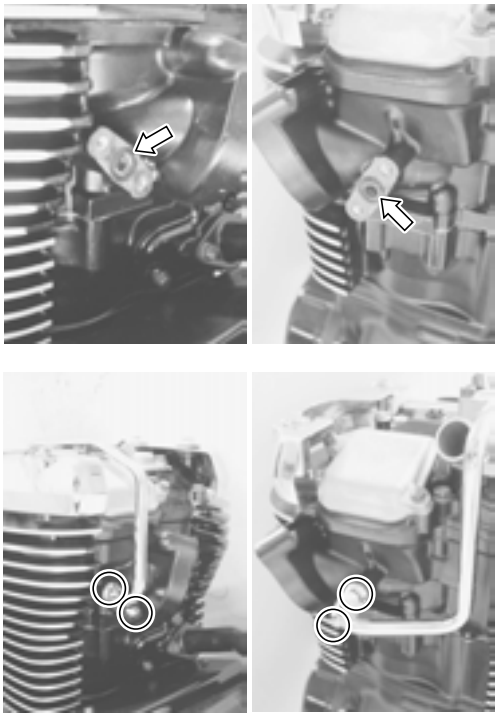


- Install the head cover caps ③.



- Install the new gaskets.
- Install the PAIR pipes.
- Install the spark plugs.

09930-10121: Spark plug wrench set

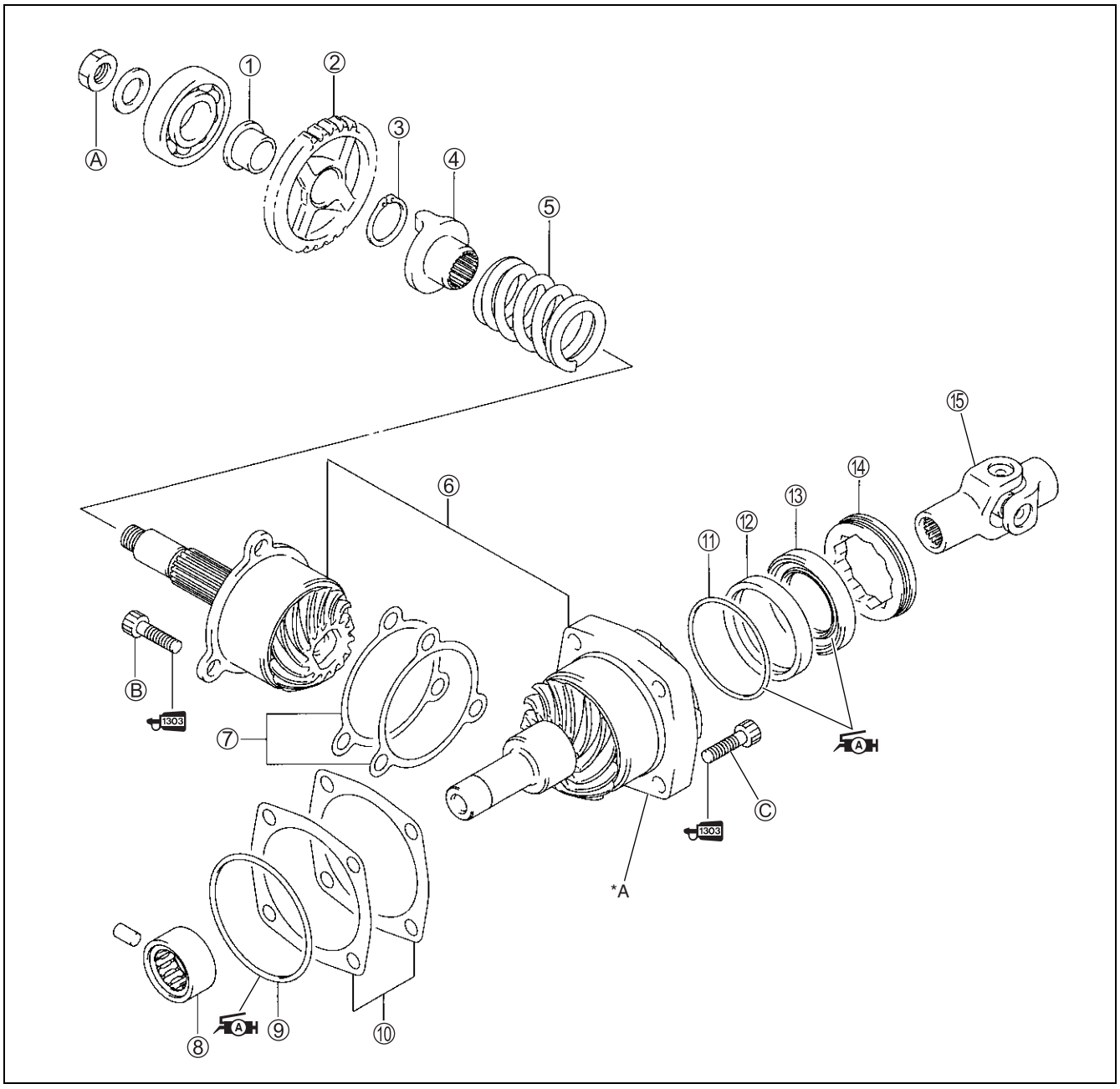


SHAFT DRIVE

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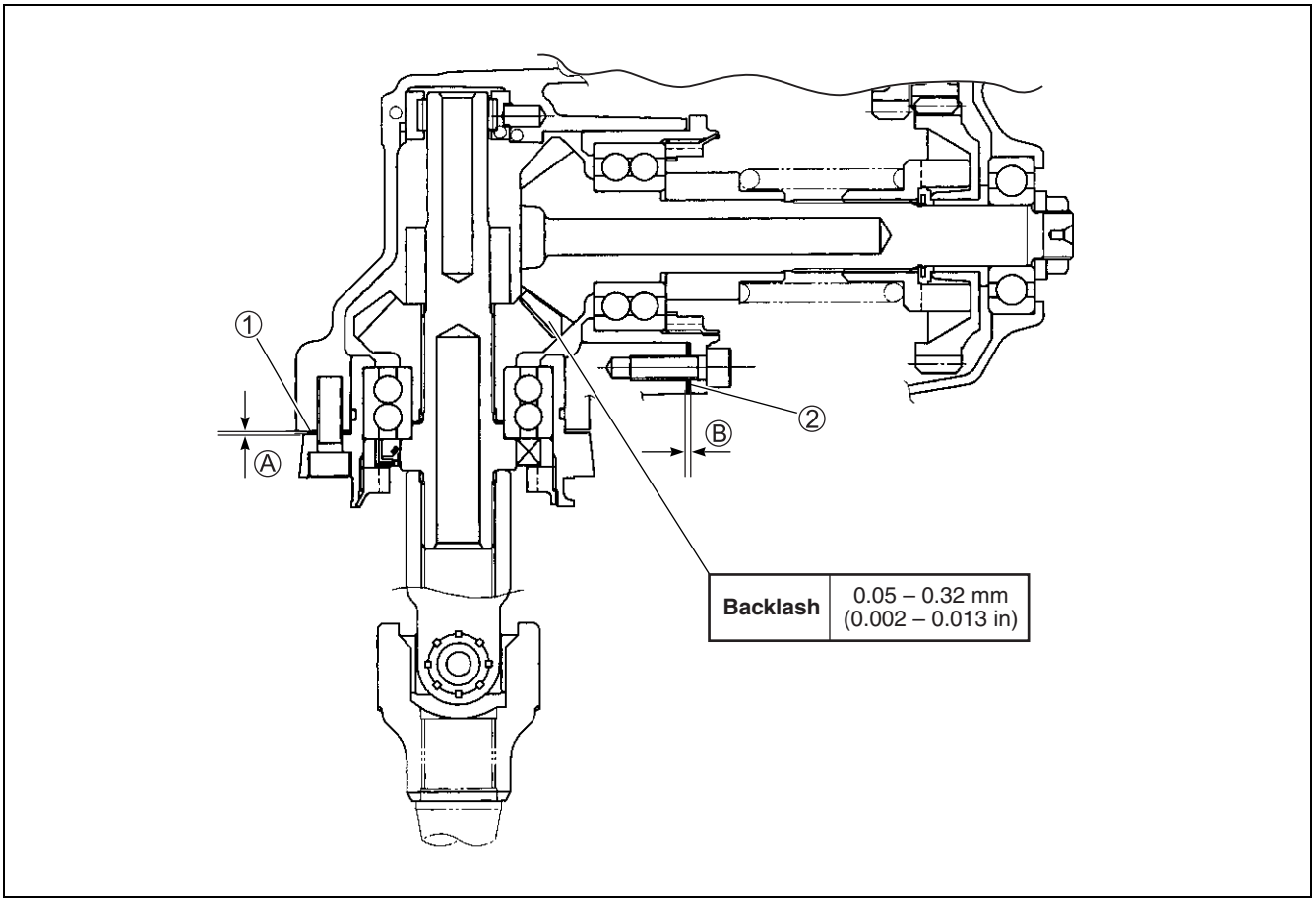
SECONDARY BEVEL GEARS
CONSTRUCTION



①	Bush	⑦	Shims (5 kinds)	⑬	Oil seal
②	Overdriving driven gear	⑧	Driven bevel gear bearing	⑭	Bearing stopper
③	Circlip	⑨	O-ring	⑮	Universal joint
④	Output cam dog	⑩	Shims (5 kinds)	Ⓐ	Secondary drive gear shaft nut
⑤	Damper spring	⑪	O-ring	Ⓑ	Secondary drive bevel gear bearing retainer bolt
⑥	Secondary bevel gear set	⑫	Oil seal housing	Ⓒ	Secondary driven bevel gear bolt

* A: Do not disassemble the secondary driven gear.

ITEM	N·m	kgf-m	lb-ft
Ⓐ	105	10.5	76.0
Ⓑ, Ⓒ	23	2.3	16.5



Standard clearance Ⓐ: 1.00 mm (0.039 in)
Ⓑ: 1.00 mm (0.039 in)

Adjust backlash by selecting shims. (Use two pieces of shims.)
Shim ① size table

Part number	Thickness
24945-05A-0A0	0.30 mm (0.012 in)
24945-05A-0B0	0.35 mm (0.014 in)
24945-05A-0C0	0.40 mm (0.016 in)
24945-05A-0D0	0.50 mm (0.020 in)
24945-05A-0E0	0.60 mm (0.024 in)

The shims ① are available as a set (24945-05810).

Shim ② size table

Part number	Thickness
24935-38A01-030	0.30 mm (0.012 in)
24935-38A01-035	0.35 mm (0.014 in)
24935-38A01-040	0.40 mm (0.016 in)
24935-38A01-050	0.50 mm (0.020 in)
24935-38A01-060	0.60 mm (0.024 in)

The shims ② are available as a set (24935-38810).

REMOVAL

SECONDARY DRIVE BEVEL GEAR

The crankcase must be separated to service the secondary drive bevel gear. The secondary drive bevel gear service requires engine removal and disassembly. Refer to the engine removal and the engine disassembly sections for secondary drive bevel gear assembly removal.

Engine removal ☞3-3

Engine disassembly ☞3-11



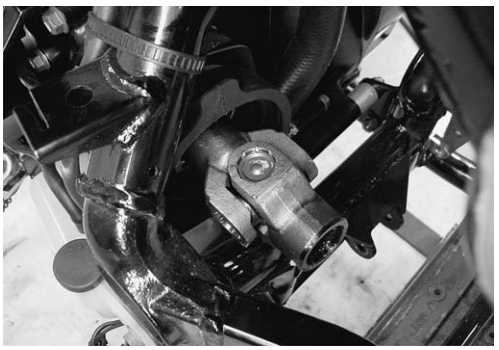
SECONDARY DRIVEN BEVEL GEAR

The following components must be removed in the described order before removing the secondary driven bevel gear.

NOTE:

Refer to the following pages for the details of each step.

- Remove the rear wheel. (☞8-33)
- Remove the swingarm. (☞8-40)
- Remove the universal joint.
- Remove the secondary driven bevel gear.

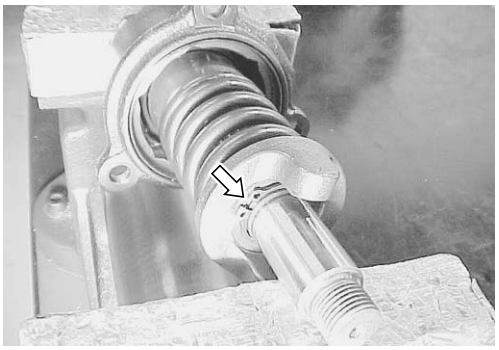


DISASSEMBLY

SECONDARY DRIVE BEVEL GEAR

- Compress the damper spring with a vice, and remove the snap ring with the special tool.

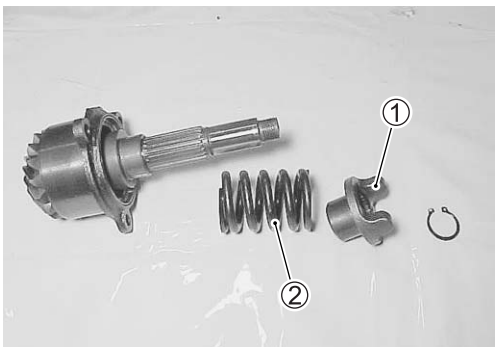
TOOL **09900-06107: Snap ring pliers**



- Remove the cam dog ① and damper spring ②.

CAUTION

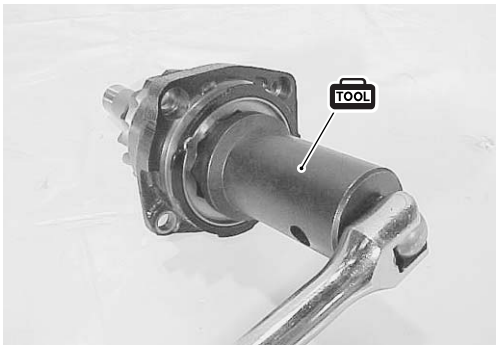
Do not attempt to remove the secondary drive bevel gear bearing. The secondary drive bevel gear and its bearing are available only as an assembly.



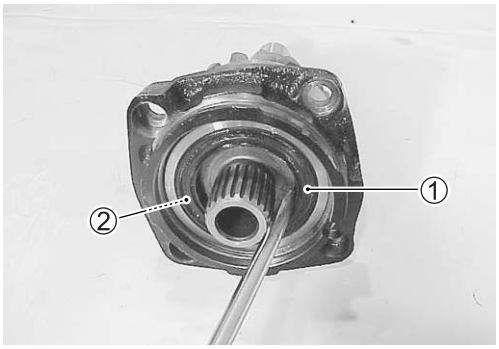
SECONDARY DRIVEN BEVEL GEAR

- Remove the bearing stopper with the special tool.

TOOL 09921-21820: Bearing retainer wrench



- Remove the oil seal ① and O-ring ②.



INSPECTION

Inspect the removed parts for the following abnormalities.

* Drive and driven bevel gears damage or wear
* Improper tooth contact
* Abnormal noise of bearings
* Bearing damage or wear
* Oil seal damage or wear
* Output cam dog wear or damage
* Universal joint spline damage or wear

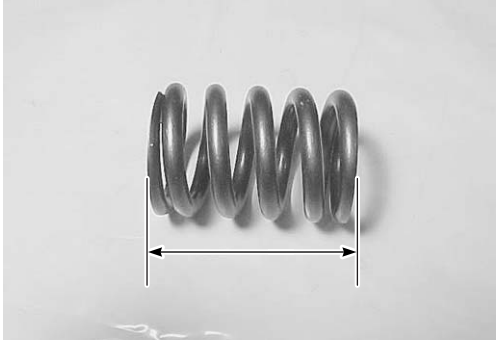




DAMPER SPRING

Measure the free length of the damper spring. If the length is shorter than the service limit, replace the spring with a new one.

DATA Damper spring free length
Service limit: 58.5 mm (2.30 in)



SECONDARY GEAR SHIMS ADJUSTMENT

BACKLASH

- Install the secondary drive bevel gear assembly with the removed shims and tighten the bolts to the specified torque.

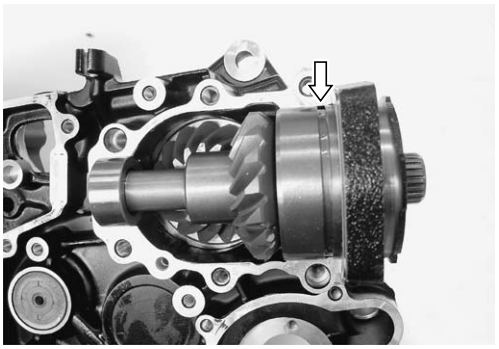
Secondary drive bevel gear bearing retainer bolt:
23 N·m (2.3 kgf-m, 16.5 lb-ft)



NOTE:
When replacing the secondary drive and driven bevel gears, install the removed shims to the secondary drive bevel gear assembly and tighten the bolts to the specified torque.

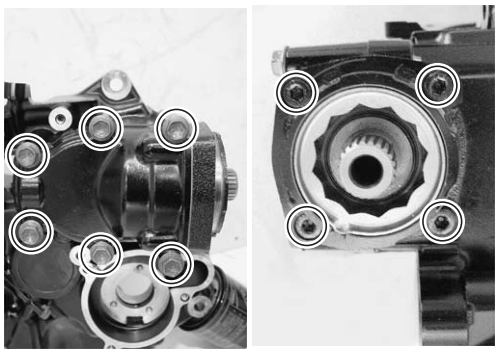
- Install the secondary driven bevel gear assembly with removed shims, the driven bevel gear bearing and secondary gear case.

NOTE:
Do not install the O-ring on the driven gear housing at this stage. O-ring is installed after backlash and tooth contact are correct.

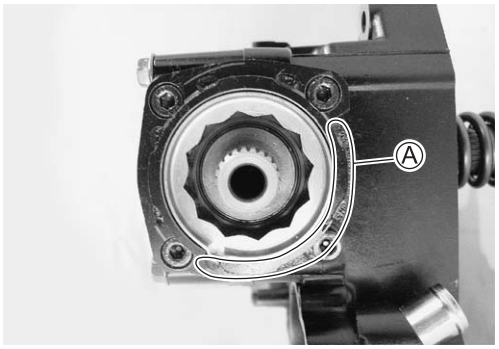


- Tighten the secondary bevel gear case bolts and secondary driven bevel gear bolts to the specified torque.

Secondary bevel gear case bolt:
22 N·m (2.2 kgf-m, 16.0 lb-ft)
Secondary driven bevel gear bolt:
23 N·m (2.3 kgf-m, 16.5 lb-ft)

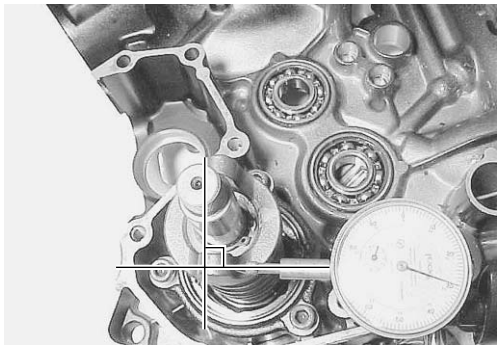


NOTE:
** Hollow portion Ⓐ of the secondary driven bevel gear assembly faces inside.*
** It is not necessary to apply SUZUKI BOND "1207B" to the matching surface at this stage.*

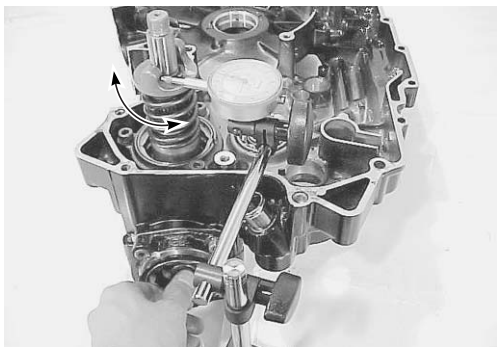


- Measure the backlash as follows.
- Set-up a dial gauge as shown in photo.

TOOL 09900-20606: Dial gauge (1/100 mm, 10 mm)
09900-20701: Magnetic stand



- Adjust the dial gauge so that it touches the secondary drive bevel gear cam dog; hold the driven bevel gear securely, and turn the drive bevel gear in each direction, reading the total backlash on the dial gauge.



DATA Secondary bevel gear backlash
Standard: 0.05 – 0.32 mm (0.002 – 0.013 in)

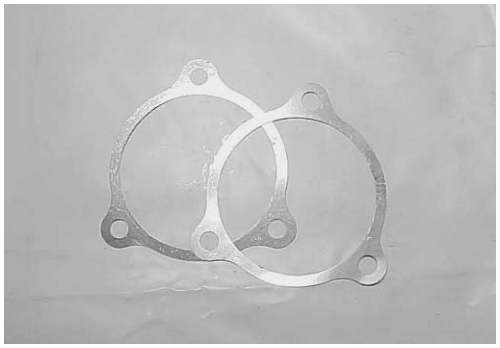
NOTE:
When measuring backlash, hold the left crankcase horizontally pull the secondary drive gear to take the bearing play out.

- If the backlash is not within specification, the shims (Driven bevel gear side) must be changed and the backlash should be re-checked until correct.
  Refer to the chart for appropriate changes.

NOTE:
When changing the shims (Driven bevel gear side), measure the thickness of old shims. Using the thickness of the old shims as a guide, adjust the backlash by referring to the chart.

Backlash	Shim adjustment
Under 0.05 mm (0.002 in)	Increase shim thickness
0.05 – 0.32 mm (0.002 – 0.013 in)	Correct
Over 0.32 mm (0.013 in)	Decrease shim thickness

SHIM SPECIFICATIONS
Drive bevel gear side



Part No.	Shim thickness
24935-38A01-030	0.30 mm (0.012 in)
24935-38A01-035	0.35 mm (0.014 in)
24935-38A01-040	0.40 mm (0.016 in)
24935-38A01-050	0.50 mm (0.020 in)
24935-38A01-060	0.60 mm (0.024 in)

NOTE:
The shims (drive bevel gear side) are available as a set (24935-38810).

Driven bevel gear side

Part No.	Shim thickness
24945-05A00-0A0	0.30 mm (0.012 in)
24945-05A00-0B0	0.35 mm (0.014 in)
24945-05A00-0C0	0.40 mm (0.016 in)
24945-05A00-0D0	0.50 mm (0.020 in)
24945-05A00-0E0	0.60 mm (0.024 in)

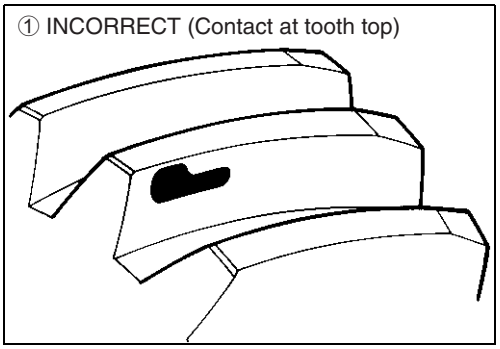


NOTE:
The shims (driven bevel gear side) are available as a set (24945-05810).

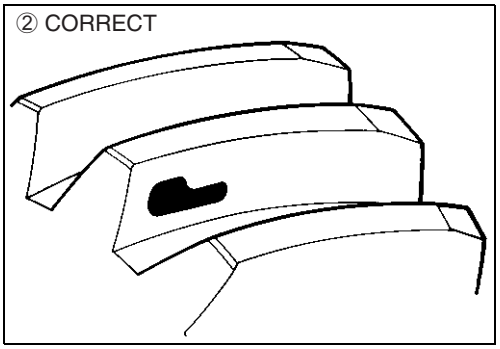
TOOTH CONTACT

After bringing the backlash within specification by changing the secondary driven bevel gear shims, it will be necessary to check tooth contact.

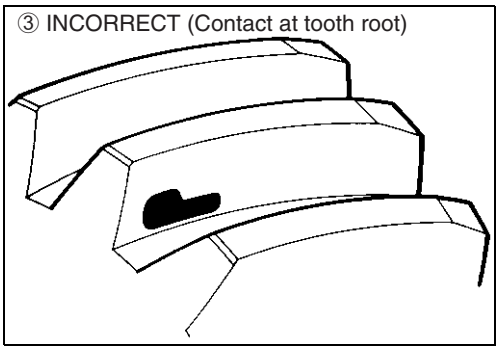
- Remove the drive bevel gear assembly from the crankcase.
- Clean and degrease the secondary drive bevel gear teeth, and apply a coating of machinist's layout dye or paste to several teeth.



- Reinstall the secondary drive bevel gear assembly, with correct shim, onto the secondary gear housing.
- Rotate the secondary driven bevel gear several turns in both directions.
- Remove the secondary drive bevel gear from the crankcase, and observe the tooth contact pattern made in the dye or paste.
- Compare the tooth contact pattern to the examples as shown in ①, ② and ③.



- If tooth contact is found to be incorrect, the shims of the secondary drive bevel gear and secondary driven bevel gear must be changed, tooth contact should be re-checked until correct.



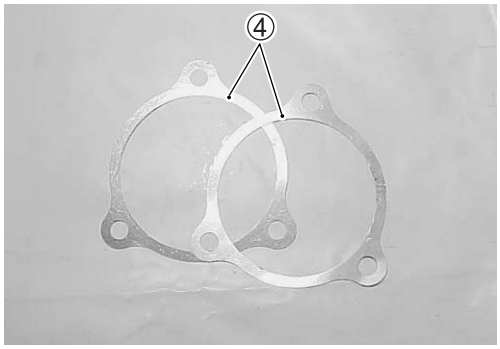
CAUTION

After the tooth contact adjustment is made, the backlash must be re-checked, as it may change. Refer to the backlash checking sub-section, and readjust until both backlash and tooth contact are correct.

Tooth contact	Shim adjustment
Contact at tooth top ①	Decrease thickness of shims ④ or ⑤
Contact at tooth root ③	Increase thickness of shims ④ or ⑤

SHIM SPECIFICATIONS

Drive bevel gear side

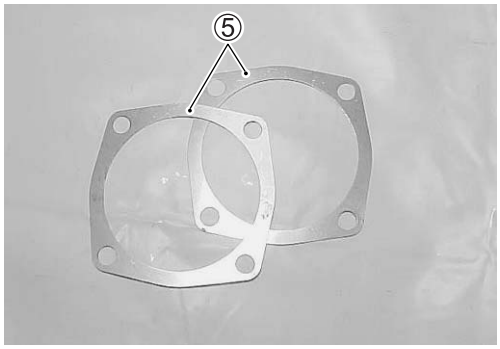


Part No.	Shim thickness
24935-38A01-030	0.30 mm (0.012 in)
24935-38A01-035	0.35 mm (0.014 in)
24935-38A01-040	0.40 mm (0.016 in)
24935-38A01-050	0.50 mm (0.020 in)
24935-38A01-060	0.60 mm (0.024 in)

NOTE:

The shims (drive bevel gear side) are available as a set (24935-38810).

Driven bevel gear side



Part No.	Shim thickness
24945-05A00-0A0	0.30 mm (0.012 in)
24945-05A00-0B0	0.35 mm (0.014 in)
24945-05A00-0C0	0.40 mm (0.016 in)
24945-05A00-0D0	0.50 mm (0.020 in)
24945-05A00-0E0	0.60 mm (0.024 in)

NOTE:

The shims (driven bevel gear side) are available as a set (24945-35810).

REASSEMBLY

SECONDARY DRIVEN BEVEL GEAR

- Apply grease to the lip of oil seal.

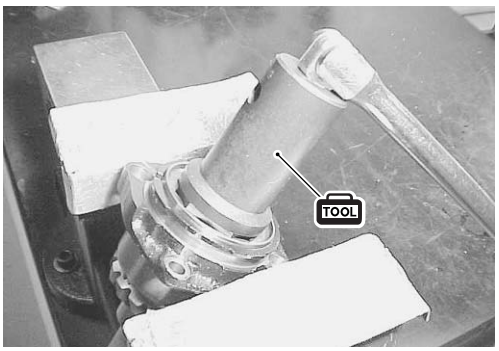
99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)



- Tighten the bearing stopper to the specified torque with the special tool.

Bearing stopper: 105 N·m (10.5 kgf-m, 76.0 lb-ft)

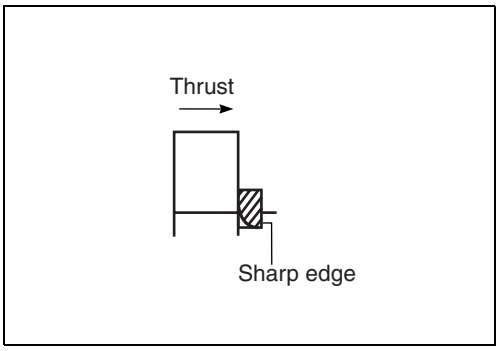
09921-21820: Bearing retainer wrench



SECONDARY DRIVE BEVEL GEAR

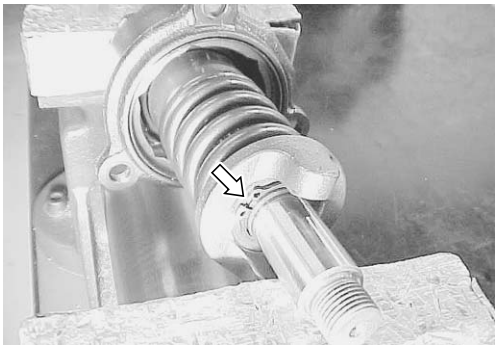
Reassemble the secondary drive bevel gear in the reverse order of disassembly. Pay attention to the following points.

- When installing a new circlip, pay attention to the direction of the snap ring. Fit the snap ring to the side where the thrust is, as shown in the illustration. The rounded side should be against the output cam dog surface.



CAUTION

*** Never reuse a snap ring. After a snap ring has been removed from a shaft, it should be discarded and a new circlip must be installed.**
*** When installing a new snap ring, do not expand the end gap larger than required to slip the circlip over the shaft.**
*** After installing a snap ring, make sure that it is completely seated in its groove and securely fitted.**



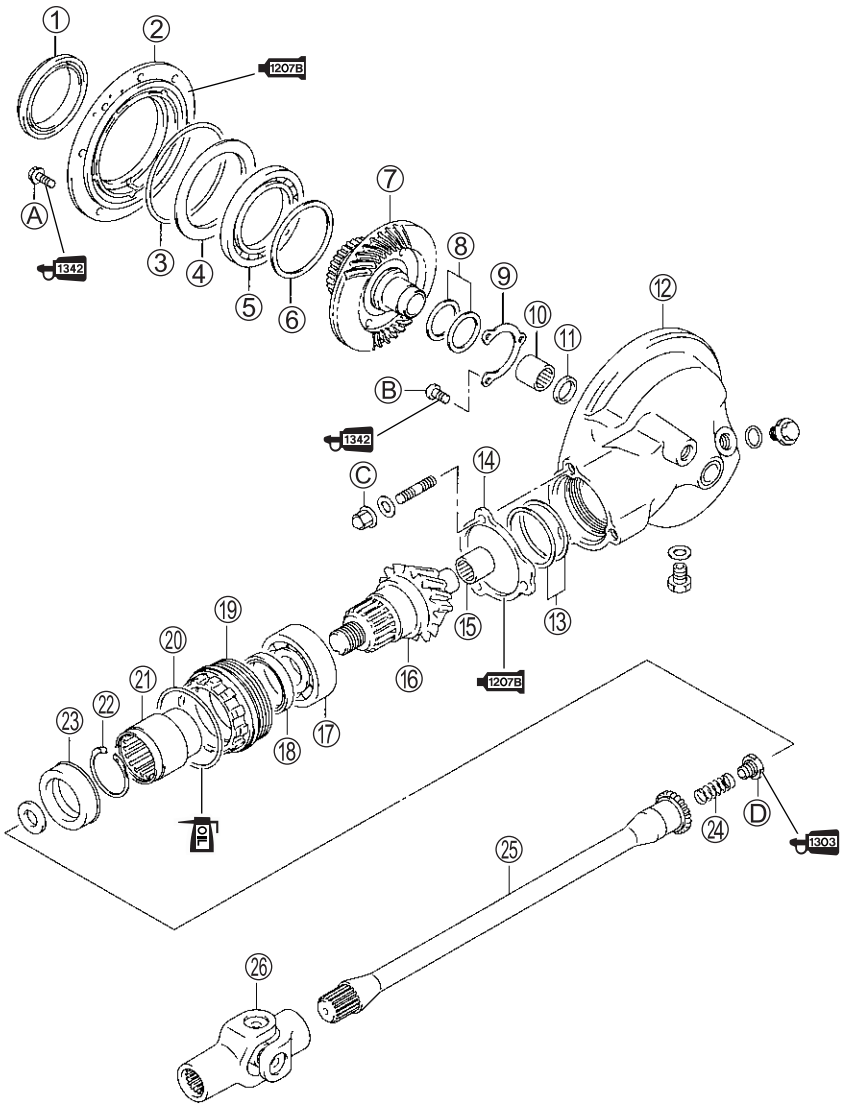
INSTALLATION

SECONDARY DRIVEN BEVEL GEAR/SECONDARY DRIVE BEVEL GEAR

- Refer to the engine reassembly sections.

Engine reassembly ☞3-65

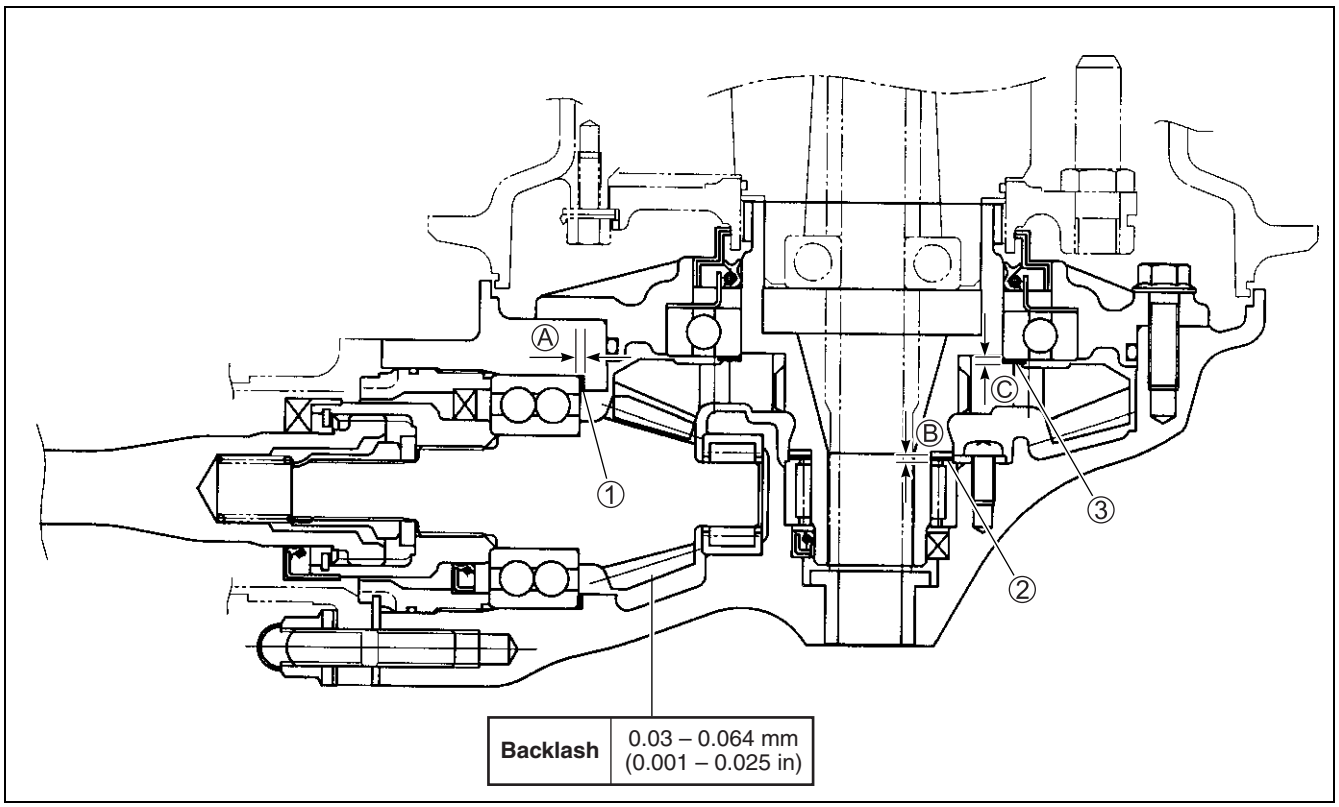
FINAL BEVEL GEARS
CONSTRUCTION



①	Oil seal	⑪	Oil seal	㉑	Final drive coupling
②	Final gear bearing case	⑫	Final gear case	㉒	Snap ring
③	O-ring	⑬	Shims (5 kinds)	㉓	Oil seal
④	Plate	⑭	Stopper plate (2 kinds)	㉔	Spring
⑤	Final driven gear bearing	⑮	Final drive gear bearing	㉕	Propeller shaft
⑥	Shims (4 kinds)	⑯	Final drive bevel gear	㉖	Universal joint
⑦	Final driven bevel gear	⑰	Final drive bevel gear bearing	Ⓐ	Final gear case bolt
⑧	Shims (8 kinds)	⑱	Oil seal	Ⓑ	Final driven bevel gear bearing retainer screw
⑨	Bearing retainer	⑲	Bearing stopper	Ⓒ	Final gear case nut
⑩	Final driven gear bearing	⑳	O-ring	Ⓓ	Final driven bevel gear coupling nut

ITEM	N·m	kgf-m	lb-ft
Ⓐ	23	2.3	16.5
Ⓑ	9	0.9	6.5

ITEM	N·m	kgf-m	lb-ft
Ⓒ	40	4.0	29.0
Ⓓ	100	10.0	72.5



Backlash	0.03 – 0.064 mm (0.001 – 0.025 in)

Standard clearance Ⓐ: 1.00 mm (0.039 in)
Shim ① size table

Part number	Thickness
27445-38A00-030	0.30 mm (0.012 in)
27445-38A00-035	0.35 mm (0.014 in)
27445-38A00-040	0.40 mm (0.016 in)
27445-38A00-050	0.50 mm (0.020 in)
27445-38A00-060	0.60 mm (0.024 in)

The shims ① are available as a set (27445-38810).

Standard clearance Ⓒ: 1.00 mm (0.039 in)
Shim ③ size table

Part number	Thickness
27327-34200	0.35 mm (0.014 in)
27327-34210	0.40 mm (0.016 in)
27327-34220	0.50 mm (0.020 in)
27327-34230	0.60 mm (0.024 in)

The shims ③ are available as a set (27327-34810).

Standard clearance Ⓑ: 2.3 mm (0.091 in)
Shim ② size table

Part number	Thickness
27326-34201	1.05 mm (0.041 in)
27326-34211	1.10 mm (0.043 in)
27326-34221	1.20 mm (0.047 in)
27326-34231	1.25 mm (0.049 in)
27326-34241	1.35 mm (0.053 in)
27326-34201-140	1.40 mm (0.055 in)
27326-34201-145	1.45 mm (0.057 in)
27326-34201-150	1.50 mm (0.059 in)

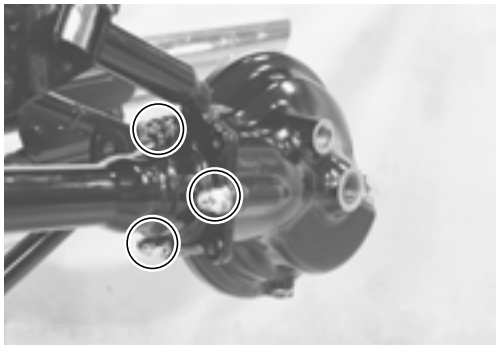
The shims ② are available as a set {27326-34810 (1.40 – 1.50), 27326-34820 (1.05 – 1.35)}.

FINAL GEAR CASE REMOVAL

After draining final gear oil, the following components must be removed in the described order before removing the final gear case.

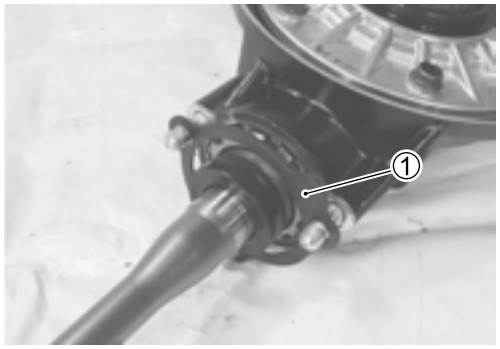
NOTE:
Refer to the following pages for the details of each step.

- Drain final gear oil. (☞2-19)
- Remove the rear wheel. (☞8-33)
- Remove the final gear case.



FINAL GEAR CASE DISASSEMBLY

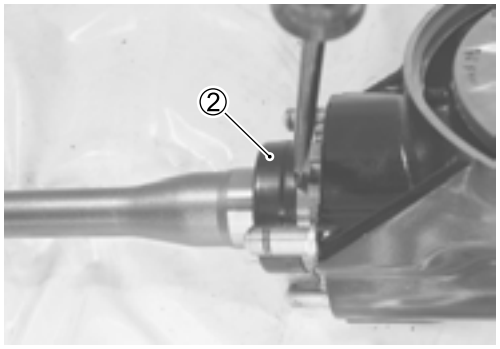
- Remove the plate ①.



- Remove the oil seal ②.

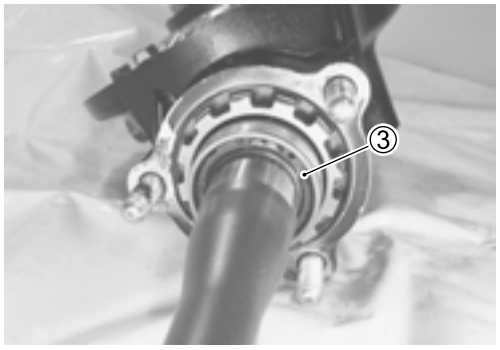
CAUTION

The removed oil seal must be replaced with a new one.

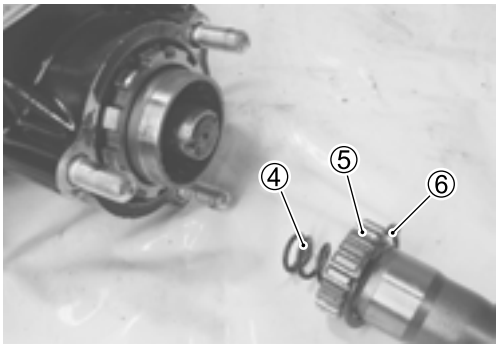


- Remove the snap ring ③ with the special tool and take off the propeller shaft and spring.

TOOL 09900-06108: Snap ring pliers



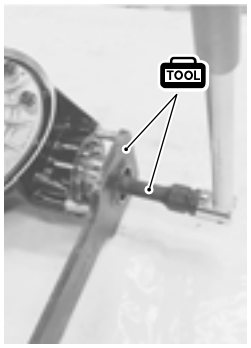
④ Spring
⑤ Propeller shaft
⑥ Snap ring



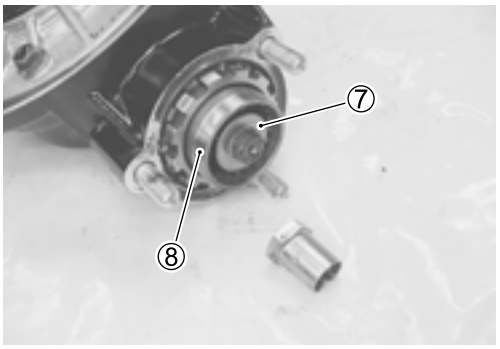
- Using a chisel, unlock the nut.
- Remove the final drive bevel gear coupling nut with the special tool.

09924-62430: 22 mm Long socket
09924-64510: Final drive gear coupling holder



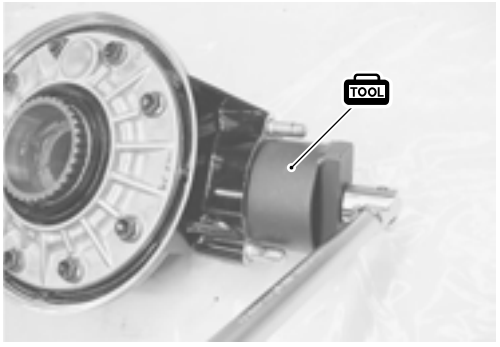


- Remove the washer ⑦ and the final drive coupling ⑧.

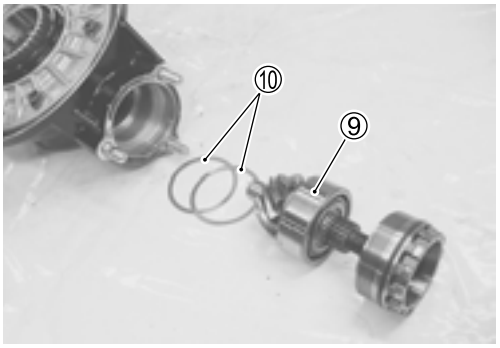


- Remove the bearing stopper by with the special tool.

09924-62410: Final drive gear bearing holder wrench

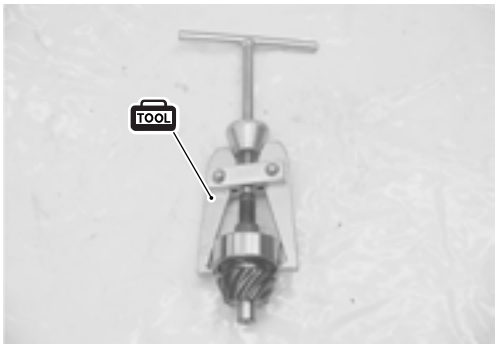


- Remove the final drive bevel gear ⑨ and shims ⑩.



- Remove the bearing from the final drive bevel gear with the special tool.

TOOL 09913-50121: Bearing puller



CAUTION

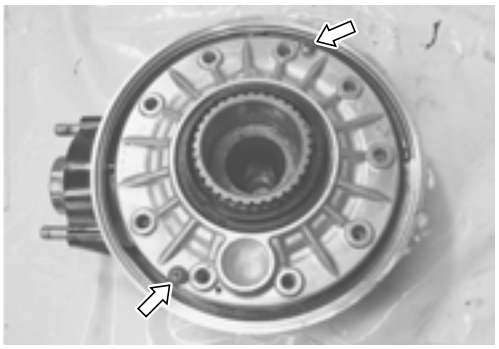
The removed bearing must be replaced with a new one.

NOTE:
If no abnormal noise, the bearing removal is not necessary.

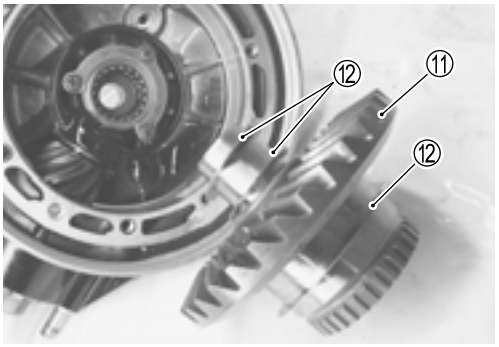
- Remove the final gear bearing case bolts.



- Remove the final gear bearing case from the final gear case, by using two 5 mm screws.



- Remove the final driven bevel gear ⑪ and shims ⑫.



- Remove the oil seal with the special tool.

TOOL 09913-50121: Oil seal remover

NOTE:
If no oil leakage, the oil seal removal is not necessary.



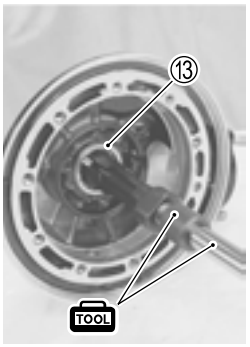
• Remove the bearing retainer screws, using an impact driver set.

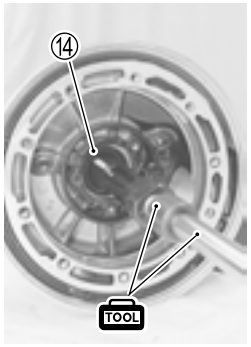
09900-09004: Impact driver set



• Remove the final driven gear bearing ⑬ and oil seal ⑭ with the special tools.

09941-64511: Bearing remover
09930-30104: Sliding shaft





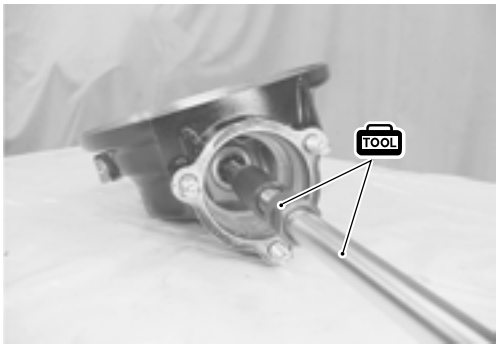
CAUTION

The removed bearing and oil seal must be replaced with new ones.

NOTE:
If no abnormal noise, the bearing removal is not necessary.

• Remove the final drive gear bearing with the special tools.

09923-73210: Bearing remover
09930-30104: Sliding shaft



CAUTION

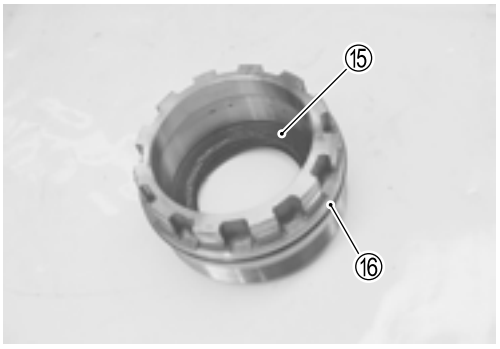
The removed bearing must be replaced with a new one.

NOTE:
If no abnormal noise, the bearing removal is not necessary.

• Remove the oil seal ⑮ and O-ring ⑯ from the bearing stopper.

CAUTION

The removed oil seal and O-ring must be replaced with new ones.



NOTE:
If no oil leakage, the oil seal removal is not necessary.

INSPECTION

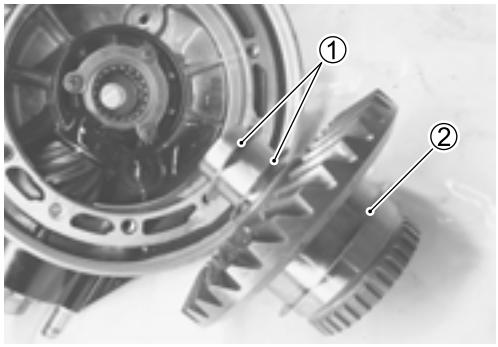
Inspect the removed parts for the following abnormalities.

* Drive and driven bevel gear damage or wear
* Improper tooth contact
* Abnormal noise of bearings
* Bearing damage or wear
* Oil seal damage or wear
* Propeller shaft spline damage or wear

FINAL GEAR SHIMS ADJUSTMENT

FINAL GEAR BEARING CASE SHIM CLEARANCE

- Install the final driven gear, shims (① and ②) and final gear bearing case to the final gear case.



- Tighten the final gear case bolts to the specified torque.

DATA Final gear case bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)

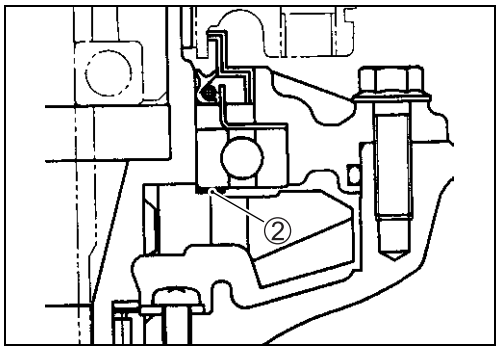
NOTE:
It is not necessary to apply SUZUKI BOND "1207B" to the matching surface at this stage.

- Measure the clearance between the shims and bearing. If it is not within the specification, the shims must be changed.



Standard

DATA Final gear case shim clearance
Standard: 1.00 mm (0.039 in)



Shims ② specifications

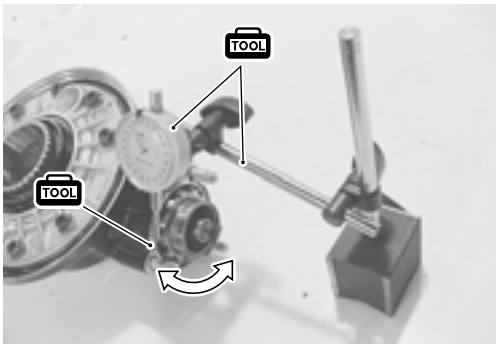
Part No.	Shim thickness
27327-34200	0.35 mm (0.014 in)
27327-34210	0.40 mm (0.016 in)
27327-34220	0.50 mm (0.020 in)
27327-34230	0.60 mm (0.024 in)

NOTE:
The shims ② are available as a set (27327-34810).

BACKLASH

After assembling the final gear case, measure the final bevel gear backlash as follows.

- Install the backlash measuring tool on the drive bevel gear coupling, and set-up a dial gauge as shown in photo.

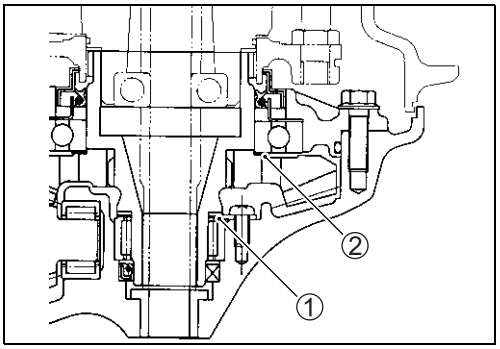


TOOL 09924-34510: Backlash measuring tool (27 – 50 mm)
09900-20607: Dial gauge (1/100 mm, 10 mm)
09900-20701: Magnetic stand

- Adjust the dial gauge so that it touches the backlash measuring tool arm at the mark; hold the final driven bevel gear securely, and turn the final drive bevel gear coupling slightly in each direction, reading the total backlash on the dial gauge.

DATA Final bevel gear backlash
Standard: 0.03 – 0.64 mm (0.001 – 0.025 in)

If the backlash is not within the specification, adjust the shim thickness as follows:



- Remove shims from final gear bearing case and final gear case, and measure total thickness.
- In order not to change the clearance between final driven bevel gear and bearing, the total thickness of the shims installed after a change is made must equal the original total thickness of shims.
- If backlash is too large:
  a) Install a thinner shim pack ① between final driven bevel gear and final gear case.
  b) Increase thickness of shims ② between final driven bevel gear bearing and bearing case by an amount equal to decrease above.
- If backlash is too small:
  a) Install a thicker shim pack ① between final driven bevel gear and final gear case.
  b) Decrease thickness of shims ② between final driven gear bearing and bearing case by an amount equal to increase above.

Shims ① specifications

Part No.	Shim thickness
27326-34201	1.05 mm (0.041 in)
27326-34211	1.10 mm (0.043 in)
27326-34221	1.20 mm (0.047 in)
27326-34231	1.25 mm (0.049 in)
27326-34241	1.35 mm (0.053 in)
27326-34201-140	1.40 mm (0.055 in)
27326-34201-145	1.45 mm (0.057 in)
27326-34201-150	1.50 mm (0.059 in)

The shims ① are available as a set {27326-34810 (1.40 – 1.50), 27326-34820 (1.05 – 1.35)}.

Shims ② specifications

Part No.	Shim thickness
27327-34200	0.35 mm (0.014 in)
27327-34210	0.40 mm (0.016 in)
27327-34220	0.50 mm (0.020 in)
27327-34230	0.60 mm (0.024 in)

The shims ① are available as a set (27327-34810).

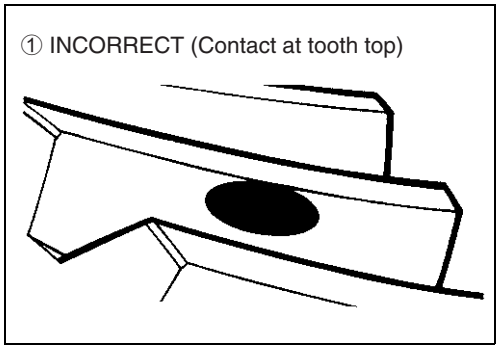
EXAMPLE:
Final gear to case shims ①; 1.45 mm + 1.40 mm = 2.85 mm
Final gear bearing to bearing case shims ②,
0.35 mm + 0.60 mm = 0.95 mm
Original total measurement = 3.80 mm

Backlash too large:
Final gear to case shims ①; 1.35 mm + 1.45 mm = 2.80 mm
Final gear bearing to bearing case shims ②,
0.60 mm + 0.40 mm = 1.00 mm
Total thickness = 3.80 mm

Backlash too small:
Final gear to case shims ①; 1.50 mm + 1.40 mm = 2.90 mm
Final gear bearing to bearing case shims ②;
0.50 mm + 0.40 mm = 0.90 mm
Total thickness = 3.80 mm

TOOTH CONTACT
After backlash adjustment is carried out, the tooth contact must be checked.

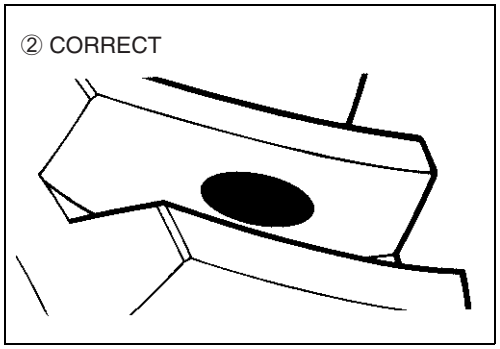
- Remove the bolts from the final gear bearing case, and remove the case with the two 5 mm screws. (☞4-15) Do not misplace the shims. Remove the final driven bevel gear.
- Clean and de-grease several teeth on the final driven bevel gear. Coat these teeth with machinist's dye or paste, preferably of a light color.



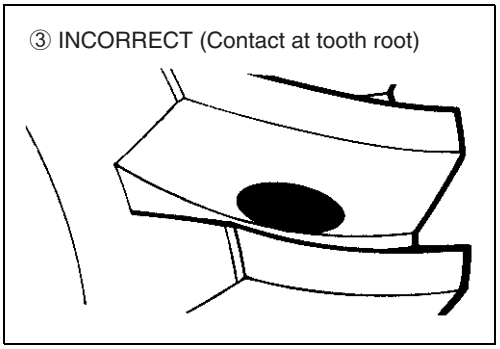
- Re-install the final driven bevel gear with shims in place, positioning the coated teeth so that they are centered on the final drive bevel gear.
- Re-install the final gear bearing case and bolts, and tighten to specification.

Final gear case bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)

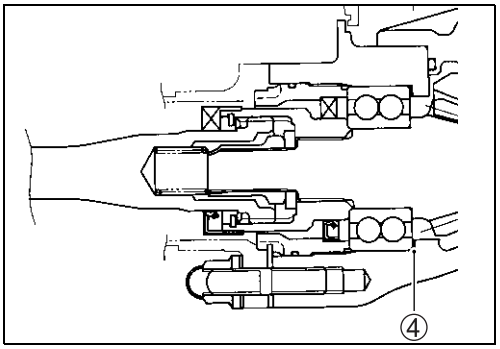
- Using a socket and handle on the final drive bevel gear coupling nut, rotate the final drive bevel gear several turns in each direction, while loading the final driven bevel gear. This will provide a contact pattern on the coated teeth of the driven bevel gear.



- Remove the final gear bearing case and final driven bevel gear, and inspect the coated teeth of the driven bevel gear. The contact patch should be as shown at right:
- If the tooth contact pattern is incorrect, as shown in ①, a thinner shim ④ is needed between the final drive bevel gear bearing and final gear case.
- If the tooth contact pattern is incorrect, as shown in ③, a thicker shim ④ is needed between the final drive bevel gear bearing and final gear case.
- If the tooth contact pattern is incorrect for either reason, the appropriate shim must be installed, and the tooth contact pattern rechecked by repeating the tooth coating procedure above.



NOTE:
If it is necessary to adjust the shim ④ thickness between final drive bevel gear bearing and final gear case, the final gear backlash may change, and should be re-checked according to the procedure outlined under the Backlash Measurement sub-section. Both adjustments may be needed until both backlash and tooth contact are correct.



Shims ④ specification

Part No.	Shim thickness
27445-38A00-030	0.30 mm (0.012 in)
27445-38A00-035	0.35 mm (0.014 in)
27445-38A00-040	0.40 mm (0.016 in)
27445-38A00-050	0.50 mm (0.020 in)
27445-38A00-060	0.60 mm (0.024 in)

The shims ④ are available as a set (27445-38810).

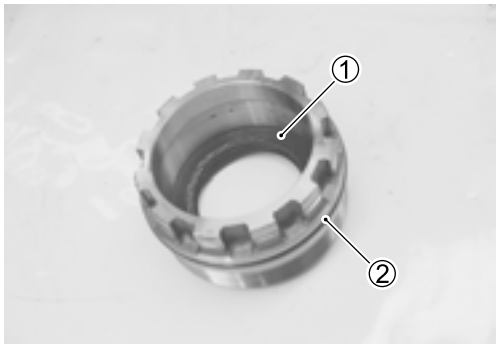
FINAL GEAR CASE REASSEMBLY

Reassemble the final gear case in the reverse order of disassembly. Pay attention to the following points.

- Install a new oil seal ① and O-ring ② to the bearing stopper.

CAUTION

Use new O-ring and oil seat to prevent oil leakage.

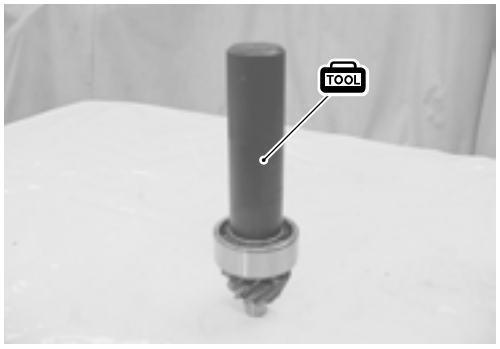


- Install the bearing to the final drive bevel gear with the special tool.

TOOL 09913-84510: Bearing installer

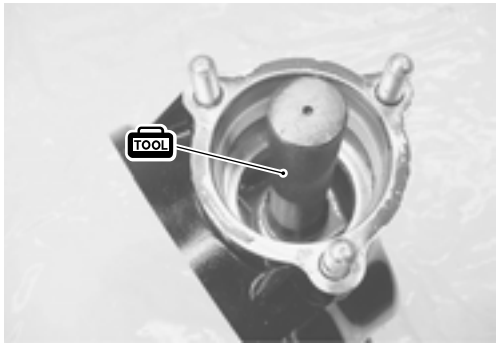
CAUTION

When replacing the drive bevel gear, replace the driven bevel gear also, as they must be replaced together.



- Install the needle roller bearing for the final drive bevel gear into the final gear case with the special tool.

TOOL 09913-75821 : Bearing installer

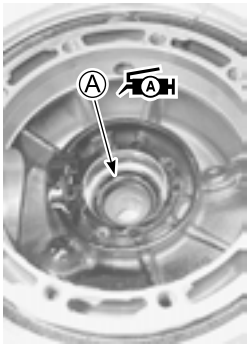


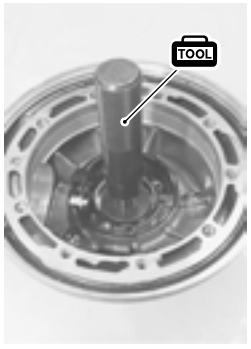
- Install the oil seal into the final gear case with the special tool.

TOOL 09913-70210: Bearing installer set (40 mm)

CAUTION

*** Use a new oil seal to prevent oil leakage.**
*** Apply final gear oil to the lip of the oil seal.**
*** The lip and spring of the oil seal should face Ⓐ to the driven bevel gear side.**

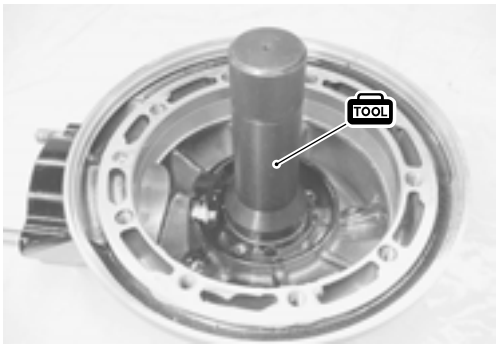




- Install the needle roller bearing for the final driven bevel gear into the final gear case with the special tool.

TOOL 09913-76010: Bearing installer

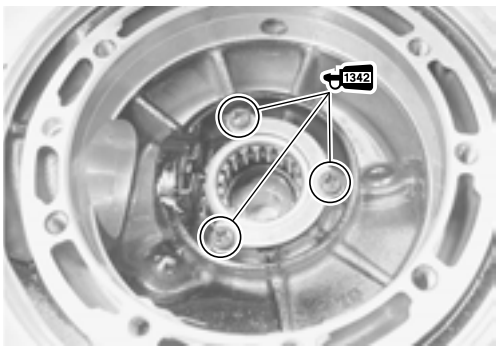
NOTE:
The boss on the bearing end should face to the driven bevel gear side.



- Install the bearing retainer. Apply a small quantity of the THREAD LOCK on the screws, and tighten them to the specified torque.

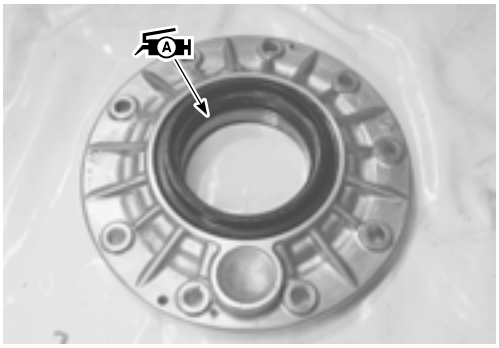
1342 99000-32050: THREAD LOCK "1342"

Bearing retainer screw: 9 N·m (0.9 kgf-m, 6.5 lb-ft)



- Install a new oil seal to the final gear bearing case.
- Apply grease to the lip of the oil seal.

A H 99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

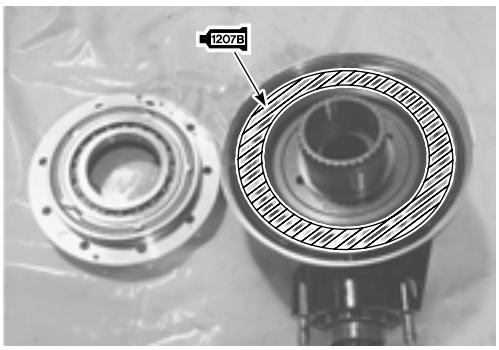


- Apply SUZUKI BOND to the mating surface of the final gear case and final gear bearing case.

CAUTION

Do not block the breather passage when applying SUZUKI BOND.

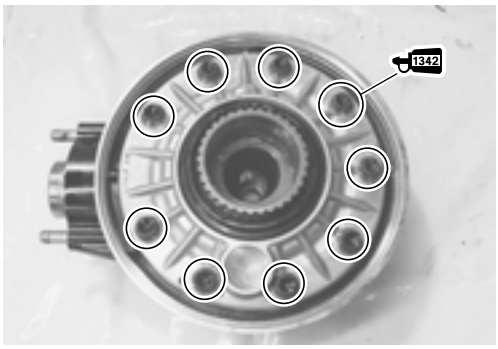
1207B 99000-31140: SUZUKI BOND "1207B"



- Apply THREAD LOCK to the final gear case bolts and tighten them to the specified torque.

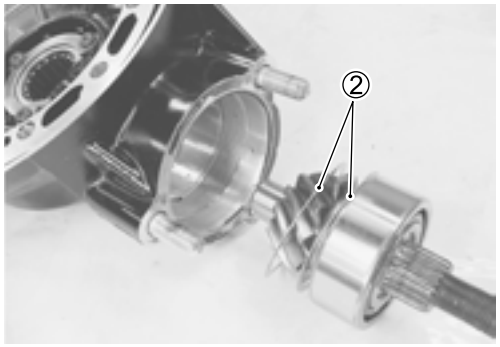
Final gear case bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)

1342 99000-32050: THREAD LOCK "1342"



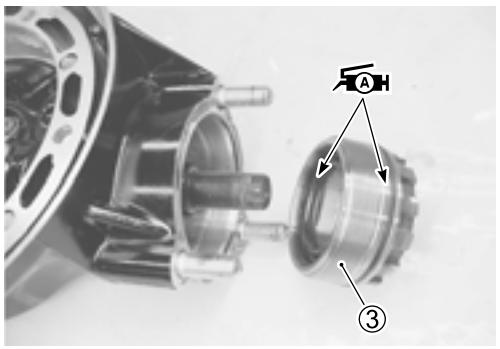
- Install the correct shims ② to the final drive bevel gear and install the bevel gear to the final gear case.

Shim adjustment (☞4-18)



- Apply grease to the O-ring and the oil seal.
- Install the bearing stopper ③.

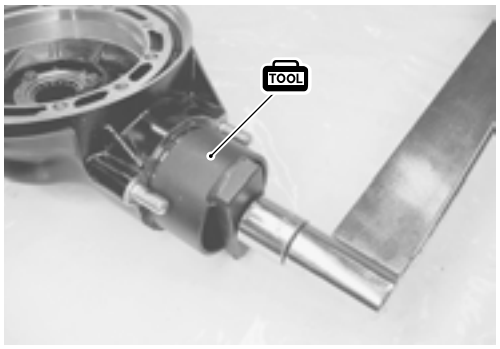
99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)



- Tighten the bearing stopper to the specified torque with the special tool.

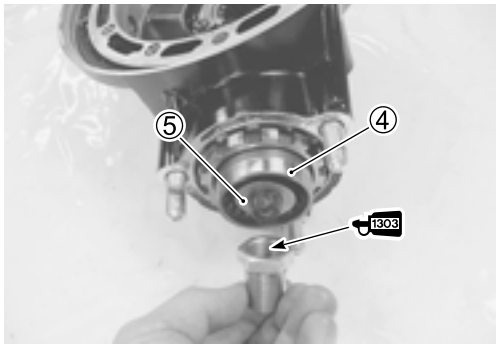
09924-62410: Final drive gear bearing holder wrench

Final drive bevel gear bearing stopper:
110 N·m (11.0 kgf-m, 79.5 lb-ft)



- Install the final drive coupling ④ and washer ⑤.
- Apply a small quantity of the THREAD LOCK to the final drive bevel gear coupling nut.

99000-32030: THREAD LOCK "1303"

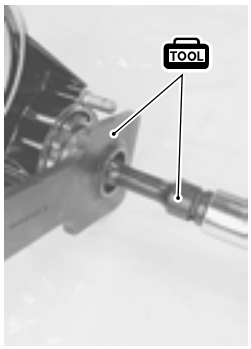


- Tighten the nut to the specified torque with the special tool.

Final drive bevel gear coupling nut:
100 N·m (10.0 kgf-m, 72.5 lb-ft)

09924-62430: 22 mm Long socket
09924-64510: Final drive gear coupling holder

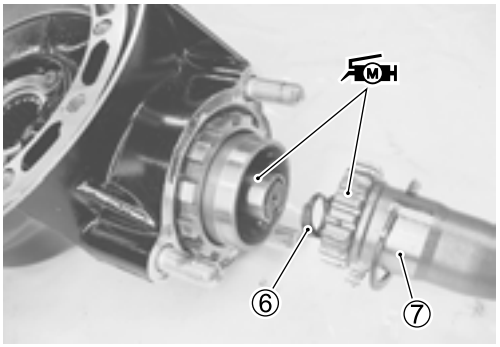
- Lock the final drive bevel gear coupling nut with a center punch.





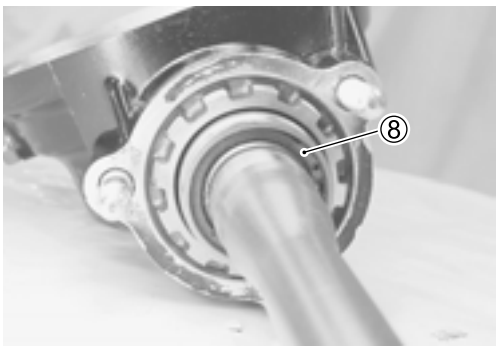
- Apply Lithium Base Molybdenum grease (NLGI #2) to the propeller shaft splines and final drive bevel gear coupling.
- Install the spring ⑥ and propeller shaft ⑦.

99000-25140: SUZUKI MOLY PASTE



- Install the snap ring ⑧.
- After installing the propeller shaft with a new snap ring, make sure that the propeller shaft turns smoothly without any hitch or bearing noise.

09900-06108: Snap ring pliers



- Install the oil seal with the special tool.

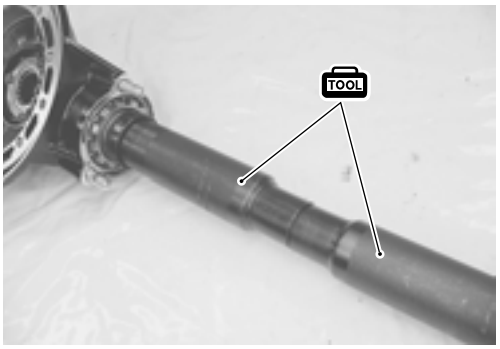
09940-51410: Steering bearing installer
09925-18011: Bearing installer

- Apply grease to the lip of the oil seal.

CAUTION

Use a new oil seal to prevent oil leakage.

99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

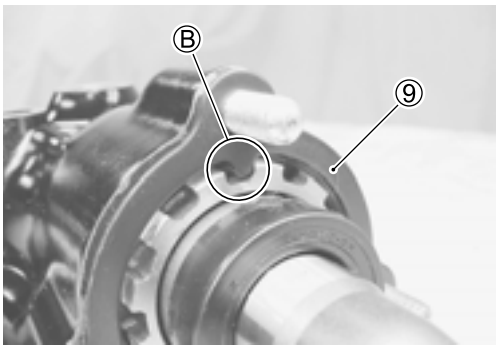


- Install the stopper plate ⑨.

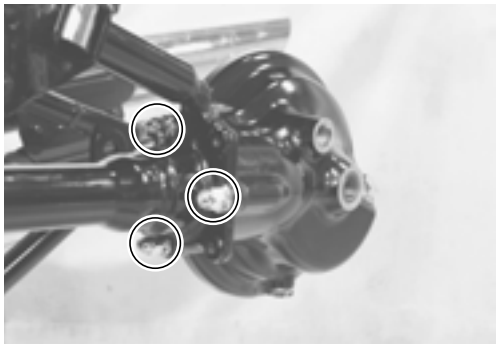
CAUTION

When installing the plate, fit the protrusion Ⓑ of plate to the one of the bearing stopper grooves.

NOTE:
Two kinds of plates are available to lock the stopper at the proper position.



FINAL GEAR CASE INSTALLATION



Installation is in the reverse order of removal.

NOTE:

Refer to the following pages for the details of each step.

- Install the final gear case.
- Tighten the final gear case bolts to the specified torque.

Final gear case nut: 40 N·m (4.0 kgf-m, 29.0 lb-ft)

- Install the rear wheel. (☞8-37)
- Pour final gear oil. (☞2-19)

FI SYSTEM

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FI SYSTEM

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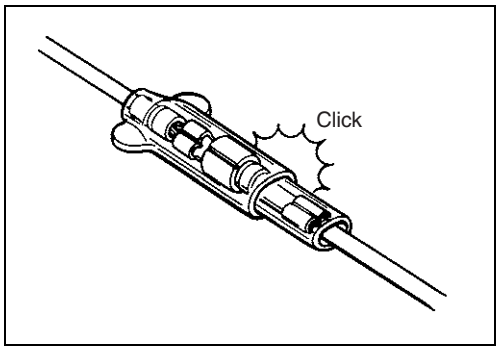
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PRECAUTIONS IN SERVICING

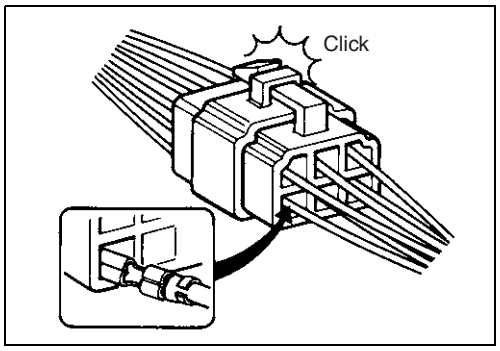
When handling the FI component parts or servicing the FI system, observe the following points for the safety of the system.

CONNECTOR/COUPLER

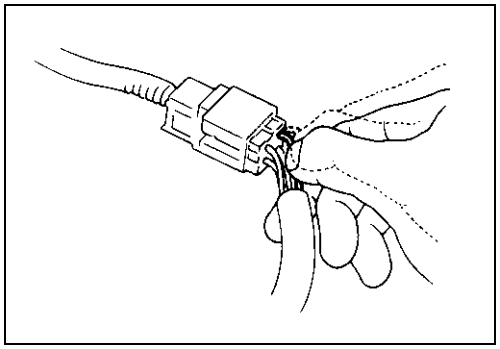
- When connecting a connector, be sure to push it in until a click is felt.
- With a lock type coupler, be sure to release the lock when disconnecting, and push in fully to engage the lock when connecting.
- When disconnecting the coupler, be sure to hold the coupler body and do not pull the lead wires.
- Inspect each terminal on the connector/coupler for looseness or bending.



- Inspect each terminal for corrosion and contamination.
  The terminals must be clean and free of any foreign material which could impede proper terminal contact.

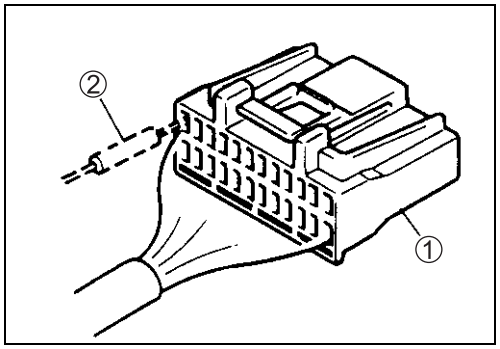


- Inspect each lead wire circuit for poor connection by shaking it by hand lightly. If any abnormal condition is found, repair or replace.

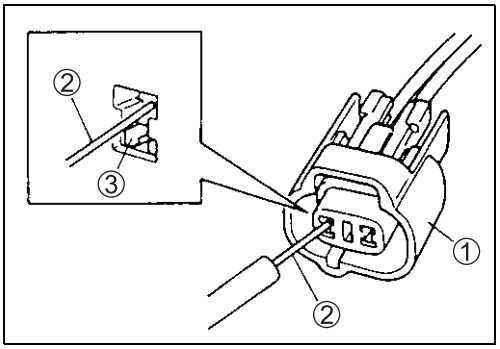


- When taking measurements at electrical connectors using a tester probe, be sure to insert the probe from the wire harness side (backside) of the connector/coupler.

① Coupler
② Probe



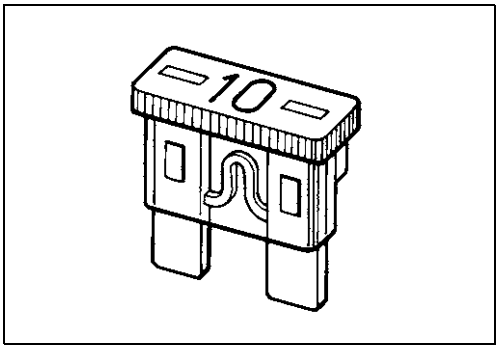
- When connecting meter probe from the terminal side of the coupler where (connection from harness side not being possible), use extra care not to force and cause the male terminal to bend or the female terminal to open.
  Connect the probe as shown to avoid opening of female terminal.
  Never push in the probe where male terminal is supposed to fit.
- Check the male connector for bend and female connector for excessive opening. Also check the coupler for locking (looseness), corrosion, dust, etc.



① Coupler
② Probe
③ Where male terminal fits

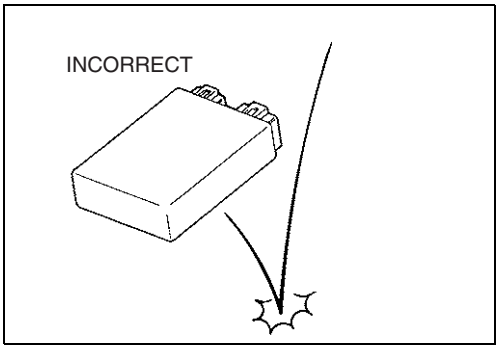
FUSE

- When a fuse blows, always investigate the cause to correct it and then replace the fuse.
- Do not use a fuse of a different capacity.
- Do not use wire or any other substitute for the fuse.

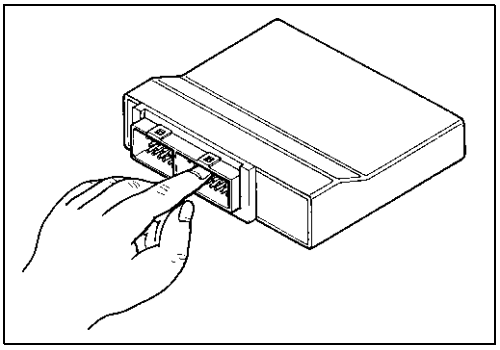


ECM/VARIOUS SENSORS

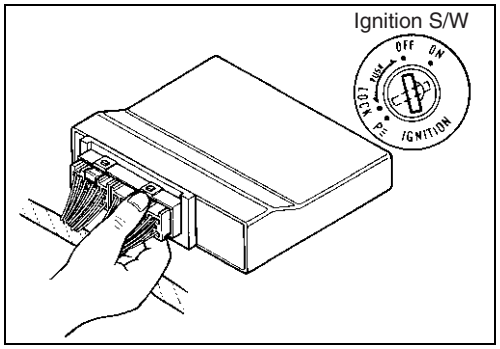
- Since each component is a high-precision part, great care should be taken not to apply any sharp impacts during removal and installation.



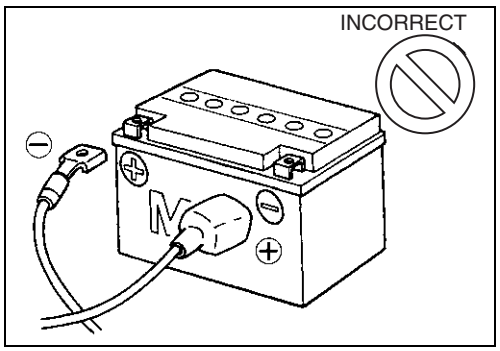
- Be careful not to touch the electrical terminals of the ECM. The static electricity from your body may damage this part.



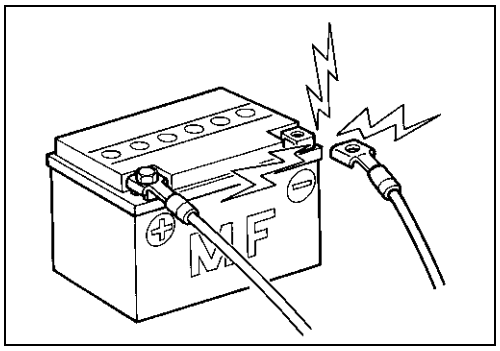
- When disconnecting and connecting the ECM couplers, make sure to turn OFF the ignition switch, or electronic parts may get damaged.



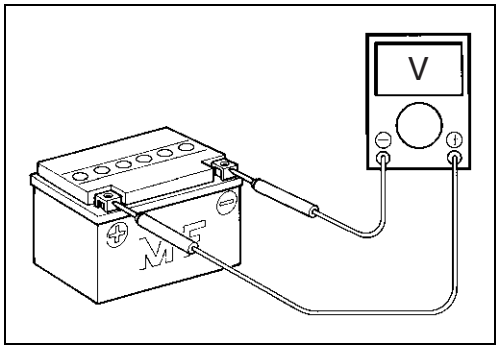
- Battery connection in reverse polarity is strictly prohibited. Such a wrong connection will damage the components of the FI system instantly when reverse power is applied.



- Removing any battery terminal of a running engine is strictly prohibited.
  The moment such removal is made, damaging counter electromotive force will be applied to the ECM which may result in serious damage.



- Before measuring voltage at each terminal, check to make sure that battery voltage is 11 V or higher. Terminal voltage check with a low voltage battery will lead to erroneous diagnosis.



- Never connect any tester (voltmeter, ohmmeter, or whatever) to the ECM when its coupler is disconnected. Otherwise, damage to the ECM may result.
- Never connect an ohmmeter to the ECM with its coupler connected. If attempted, damage to the ECM or sensors may result.
- Be sure to use a specified voltmeter/ohmmeter. Otherwise, accurate measurements may not be obtained and personal injury may result.

ELECTRICAL CIRCUIT INSPECTION PROCEDURE

While there are various methods for electrical circuit inspection, described here is a general method to check for open and short circuit using an ohmmeter and a voltmeter.

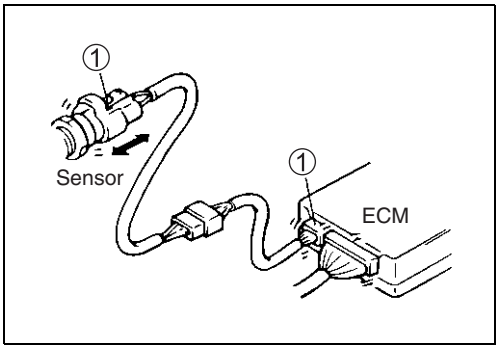
OPEN CIRCUIT CHECK

Possible causes for the open circuit are as follows. As the cause can exist in the connector/coupler or terminal, they need to be checked carefully.

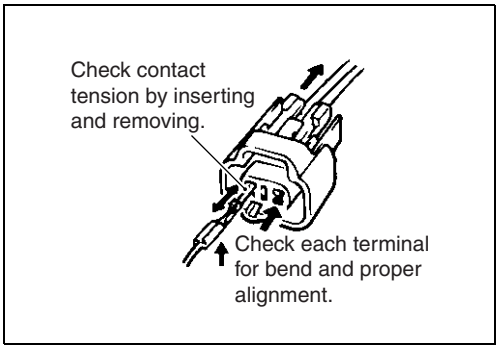
- Loose connection of connector/coupler
- Poor contact of terminal (due to dirt, corrosion or rust, poor contact tension, entry of foreign object etc.)
- Wire harness being open
- Poor terminal-to-wire connection

- Disconnect the negative cable from the battery.
- Check each connector/coupler at both ends of the circuit being checked for loose connection. Also check for condition of the coupler lock if equipped.

① Check for loose connection

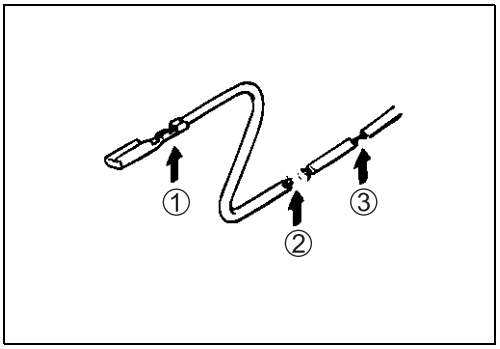


- Using a test male terminal, check the female terminals of the circuit being checked for contact tension.
  Check each terminal visually for poor contact (possibly caused by dirt, corrosion, rust, entry of foreign object, etc.). At the same time, check to make sure that each terminal is fully inserted in the coupler and locked.
  If contact tension is not enough, rectify the contact to increase tension or replace.
  The terminals must be clean and free of any foreign material which could impede proper terminal contact.



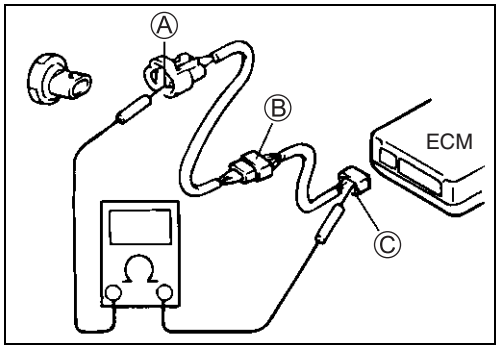
- Using continuity inspect or voltage check procedure as described below, inspect the wire harness terminals for open circuit and poor connection. Locate abnormality, if any.

① Looseness of crimping
② Open
③ Thin wire (a few strands left)

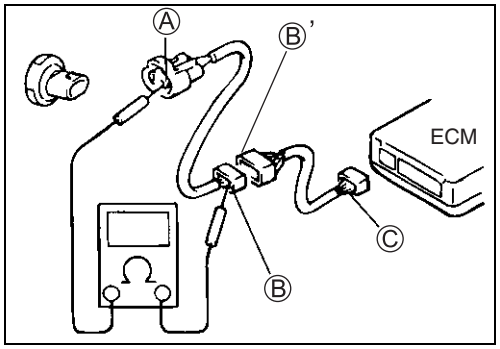


Continuity check

- Measure resistance across coupler Ⓑ (between Ⓐ and Ⓒ in the figure).
  If no continuity is indicated (infinity or over limit), the circuit is open between terminals Ⓐ and Ⓒ.



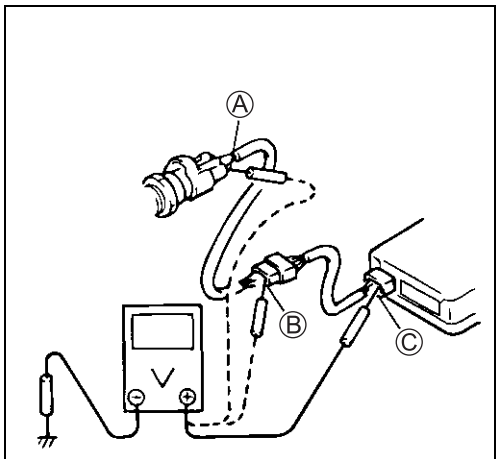
- Disconnect the coupler Ⓑ and measure resistance between couplers Ⓐ and Ⓑ.
  If no continuity is indicated, the circuit is open between couplers Ⓐ and Ⓑ. If continuity is indicated, there is an open circuit between couplers Ⓑ' and Ⓒ or an abnormality in coupler Ⓑ' or coupler Ⓒ.



VOLTAGE CHECK

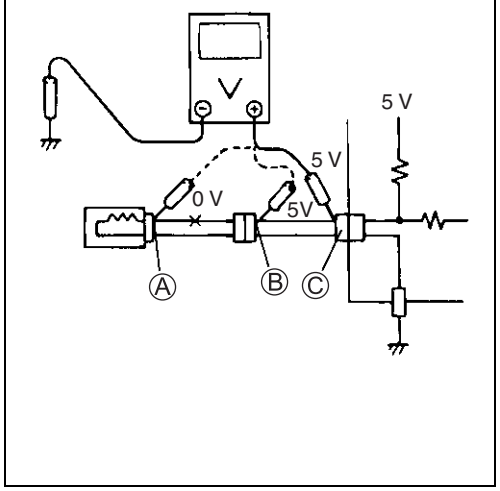
If voltage is supplied to the circuit being checked, voltage check can be used as circuit check.

- With all connectors/couplers connected and voltage applied to the circuit being checked, measure voltage between each terminal and body ground.



If measurements were taken as shown in the figure at the right and results are as listed below, it means that the circuit is open between terminals Ⓐ and Ⓑ.

Voltage Between:
Ⓒ and body ground: Approx. 5 V
Ⓑ and body ground: Approx. 5 V
Ⓐ and body ground: 0 V



Also, if measured values are as listed below, a resistance (abnormality) exists which causes the voltage drop in the circuit between terminals Ⓐ and Ⓑ.

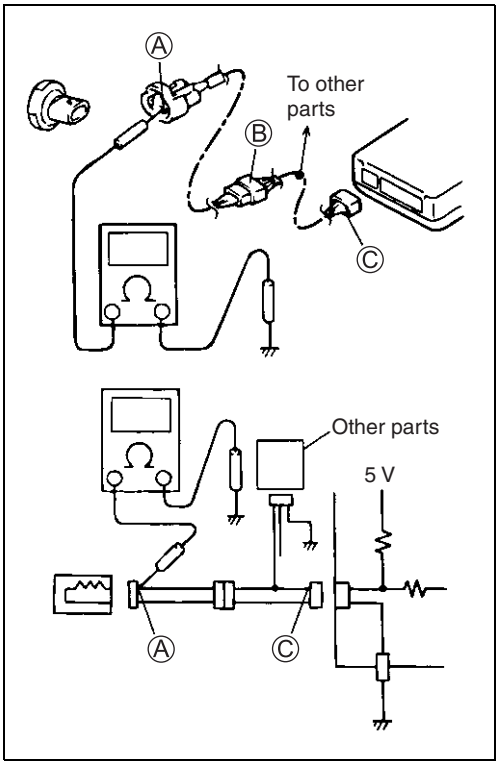
Voltage Between:
Ⓒ and body ground: Approx. 5 V
Ⓑ and body ground: Approx. 5 V
Ⓐ and body ground: 3 V
— 2 V voltage drop

SHORT CIRCUIT CHECK (WIRE HARNESS TO GROUND)

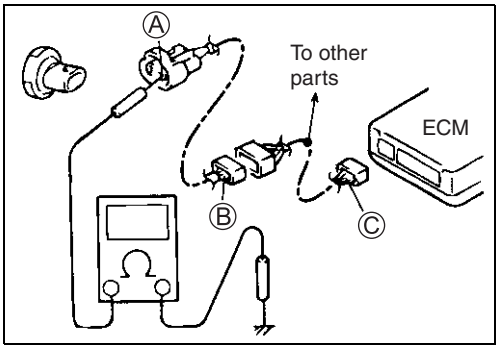
- Disconnect the negative cable from the battery.
- Disconnect the connectors/couplers at both ends of the circuit to be checked.

NOTE:
If the circuit to be checked branches to other parts as shown, disconnect all connectors/couplers of those parts. Otherwise, diagnosis will be misled.

- Measure resistance between terminal at one end of circuit (Ⓐ terminal in figure) and body ground. If continuity is indicated, there is a short circuit to ground between terminals Ⓐ and Ⓒ.

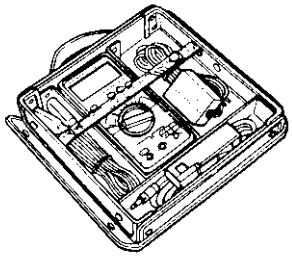


- Disconnect the connector/coupler included in circuit (coupler Ⓑ) and measure resistance between terminal Ⓐ and body ground.
  If continuity is indicated, the circuit is shorted to the ground between terminals Ⓐ and Ⓑ.



USING THE MULTI-CIRCUIT TESTER

- Use the Suzuki multi-circuit tester (09900-25008).
- Use well-charged batteries in the tester.
- Be sure to set the tester to the correct testing range.

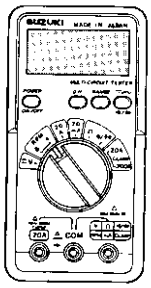


USING THE TESTER

- Incorrectly connecting the ⊕ and ⊖ probes may cause the inside of the tester to burnout.
- If the voltage and current are not known, make measurements using the highest range.
- When measuring the resistance with the multi-circuit tester, ∞ will be shown as 10.00 MΩ and "1" flashes in the display.
- Check that no voltage is applied before making the measurement. If voltage is applied, the tester may be damaged.
- After using the tester, turn the power off.

TOOL 09900-25008: Multi-circuit tester set

MULTI-CIRCUIT TESTER



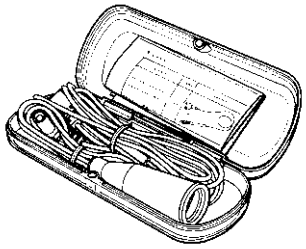
NOTE:

** When connecting the multi-circuit tester, use a needle pointed probe set to the back side of the lead wire coupler and connect the probes of tester to them.*

** Use a needle pointed probe set to prevent the rubber of the water proof coupler from damage.*

TOOL 09900-25009: Needle pointed probe set

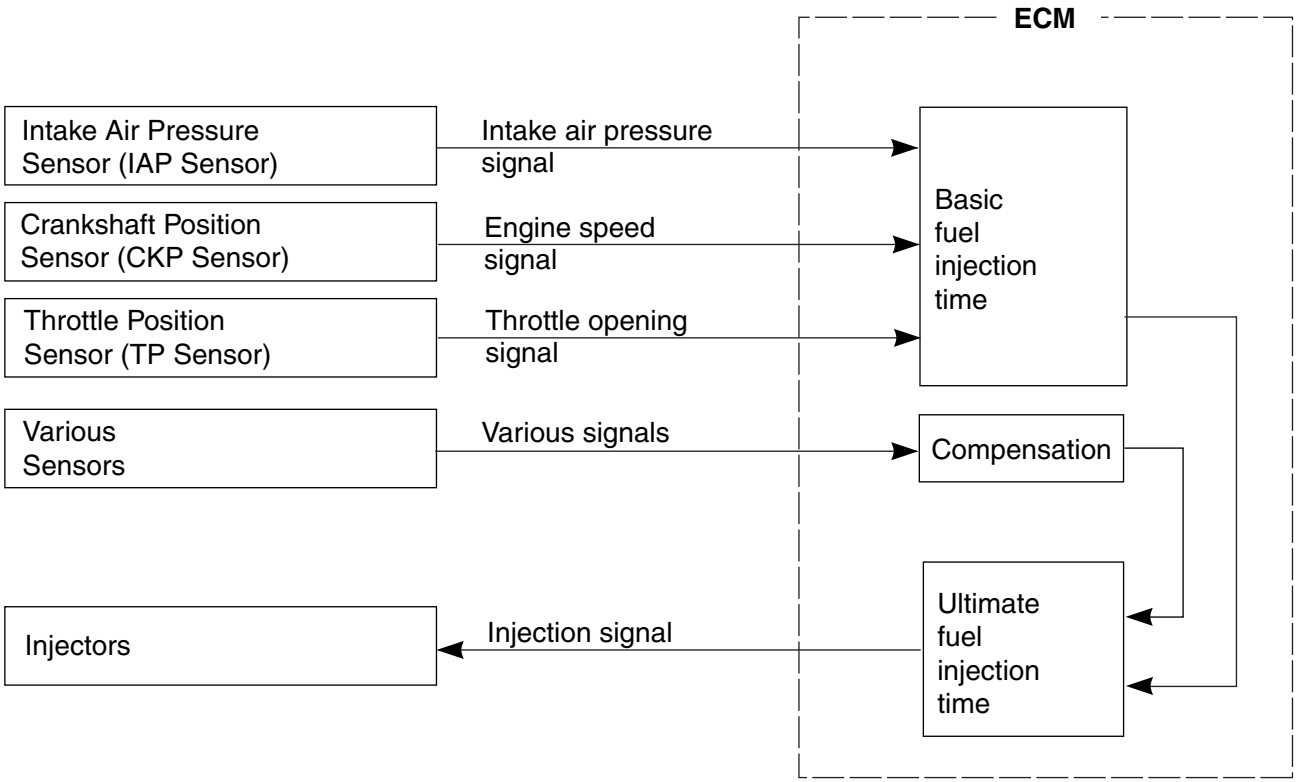
NEEDLE POINTED PROBE SET



FI SYSTEM TECHNICAL FEATURES

INJECTION TIME (INJECTION VOLUME)

The factors to determine the injection time include the basic fuel injection time which is calculated on the basis of the intake air pressure, engine speed and throttle opening angle, and various compensations. These compensations are determined according to the signals from various sensors that detect the engine and driving conditions.



COMPENSATION OF INJECTION TIME (VOLUME)

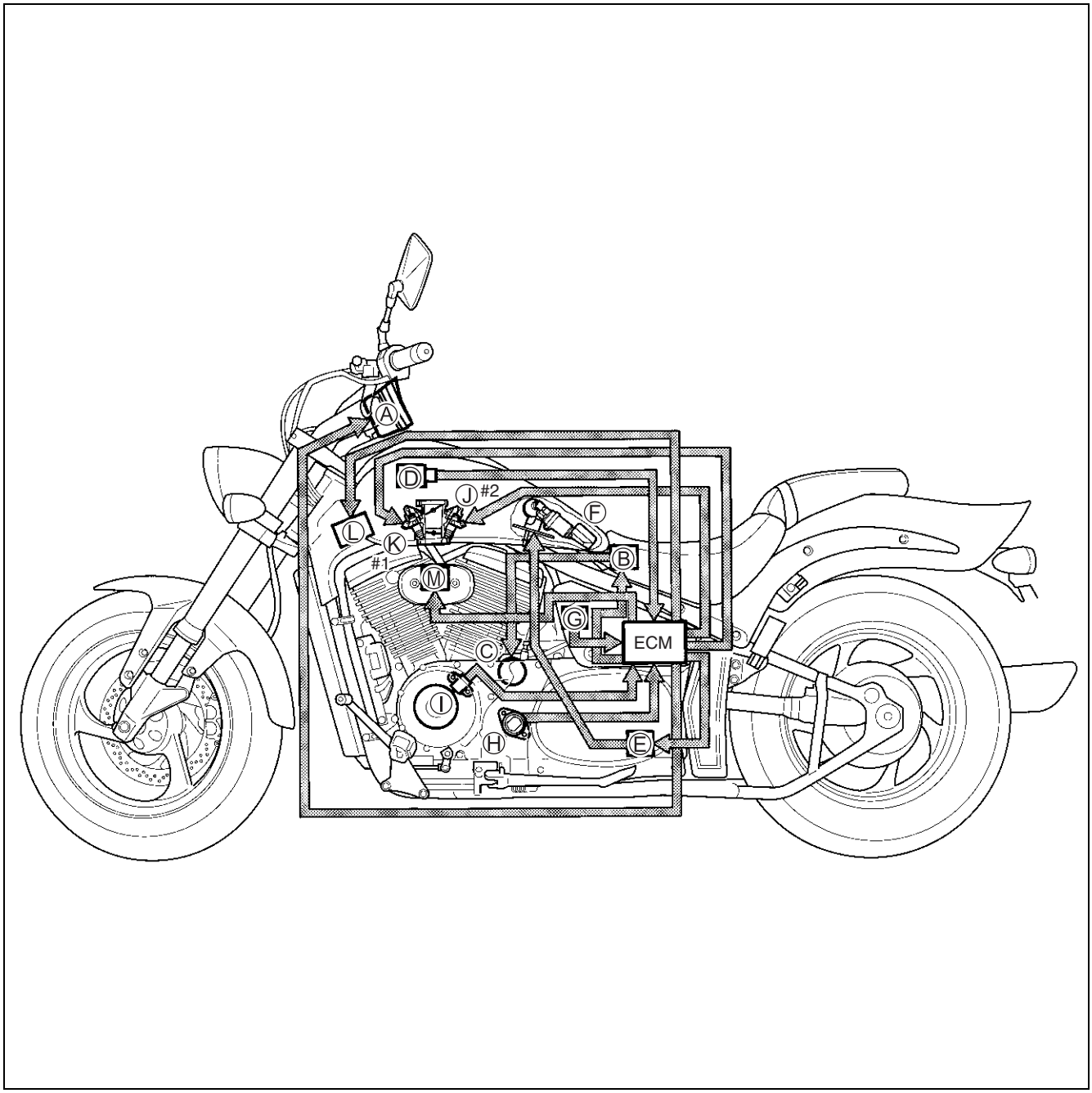
The following different signals are output from the respective sensors for compensation of the fuel injection time (volume).

SIGNAL	DESCRIPTION
ENGINE COOLANT TEMPERATURE SENSOR SIGNAL	When engine coolant temperature is low, injection time (volume) is increased.
INTAKE AIR TEMPERATURE SENSOR SIGNAL	When intake air temperature is low, injection time (volume) is increased.
HEATED OXYGEN SENSOR SIGNAL (FOR E-02, 19, 24)	Air/fuel ratio is compensated to the theoretical ratio from density of oxygen in exhaust gasses. The compensation occurs in such a way that more fuel is supplied if detected air/fuel ratio is lean and less fuel is supplied if it is rich.
BATTERY VOLTAGE SIGNAL	ECM operates on the battery voltage and at the same time, it monitors the voltage signal for compensation of the fuel injection time (volume). A longer injection time is needed to adjust injection volume in the case of low voltage.
ENGINE RPM SIGNAL	At high speed, the injection time (volume) is increased.
STARTING SIGNAL	When starting engine, additional fuel is injected during cranking engine.
ACCELERATION SIGNAL/ DECELERATION SIGNAL	During acceleration, the fuel injection time (volume) is increased, in accordance with the throttle opening speed and engine rpm. During deceleration, the fuel injection time (volume) is decreased.

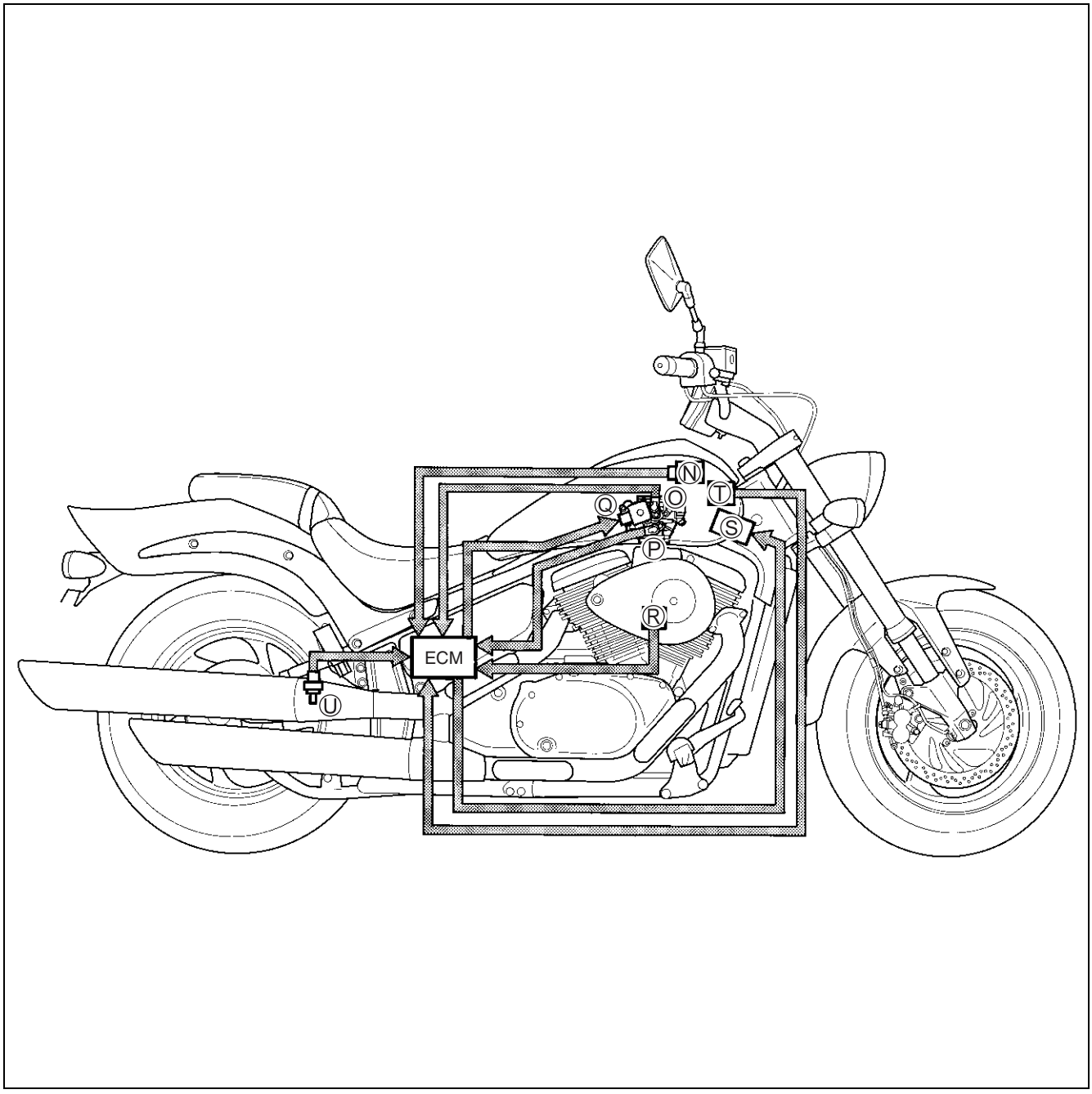
INJECTION STOP CONTROL

SIGNAL	DESCRIPTION
TIP-OVER SENSOR SIGNAL (FUEL SHUT-OFF)	When the motorcycle tips over, the tip-over sensor sends a signal to the ECM. Then, this signal cuts OFF current supplied to the fuel pump, fuel injectors and ignition coils.
OVER-REV. LIMITER SIGNAL	The fuel injectors stop operation when engine rpm reaches rev. limit rpm.

FI SYSTEM PARTS LOCATION

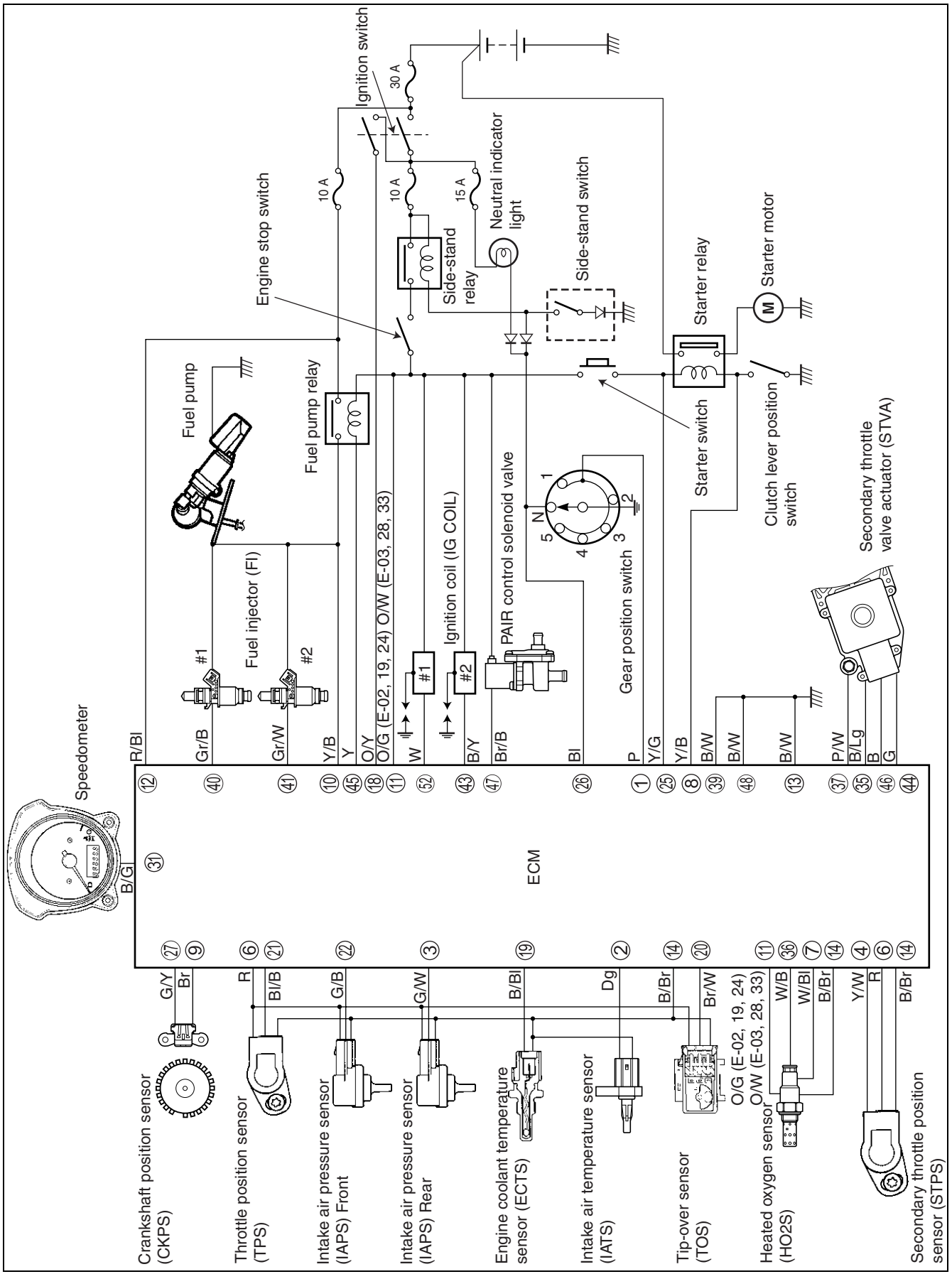


Ⓐ	Speedometer	Ⓗ	Gear position switch
Ⓑ	Starter relay	Ⓘ	Crankshaft position sensor (CKPS)
Ⓒ	Starter motor	Ⓙ	Fuel injector #2 (FI)
Ⓓ	Intake air pressure sensor #1 (IAPS)	Ⓚ	Fuel injector #1 (FI)
Ⓔ	Fuel pump relay (FP RELAY)	Ⓛ	Ignition coil #1 (IG COIL)
Ⓕ	Fuel pump	Ⓜ	PAIR solenoid valve
Ⓖ	Tip-over sensor (TOS)		

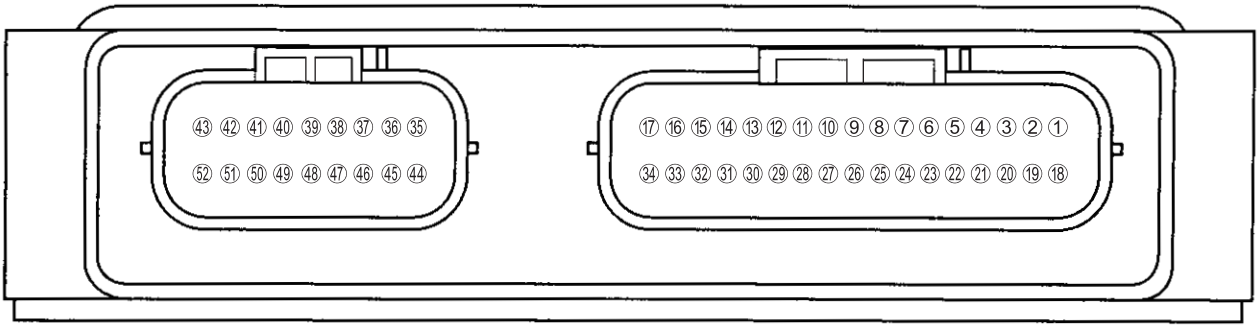


Ⓝ	Intake air pressure sensor #2 (IAPS)	Ⓡ	Intake air temperature sensor (IATS)
Ⓞ	Secondary throttle position sensor (STPS)	Ⓢ	Ignition coil #2 (IG COIL)
Ⓟ	Throttle position sensor (TPS)	Ⓣ	Engine coolant temperature sensor (ECTS)
Ⓠ	Secondary throttle valve actuator (STVA)	Ⓤ	HO2 sensor (HO2S) [For E-02, 19, 24]

FI SYSTEM WIRING DIAGRAM



ECM TERMINAL



TERMINAL NO.	CIRCUIT	TERMINAL NO.	CIRCUIT
①	GP switch signal (GP)	⑱	Ignition switch signal (AT)
②	IAT sensor signal (IAT)	⑲	ECT sensor signal (ECT)
③	Rear cylinder IAP sensor signal (IAP. R)	⑳	TO sensor signal (TOS)
④	STP sensor signal (STP)	㉑	TP sensor signal (TP)
⑤	Blank	㉒	Front cylinder IAP sensor signal (IAP. F)
⑥	Power source for sensors (VCC)	㉓	HO2 control selector (EXS) [For E-02, 19, 24]
⑦	HO2 sensor signal (HO2S) [For E-02, 19, 24]	㉔	Mode select switch (MS)
⑧	Clutch lever position switch (CLP)	㉕	Starter switch (STA)
⑨	CKP sensor signal (CKP-)	㉖	Neutral switch (NT)
⑩	Power source for fuel injector (VM)	㉗	CKP sensor signal (CKP+)
⑪	Power source (B+1)	㉘	–
⑫	Power source for back-up (B+2)	㉙	Blank
⑬	ECM ground (E1)	㉚	Blank
⑭	Sensors ground (E2)	㉛	Serial data for speedometer (TECH)
⑮	–	㉜	Serial data for self-diagnosis (SDL)
⑯	–	㉝	–
⑰	–	㉞	–

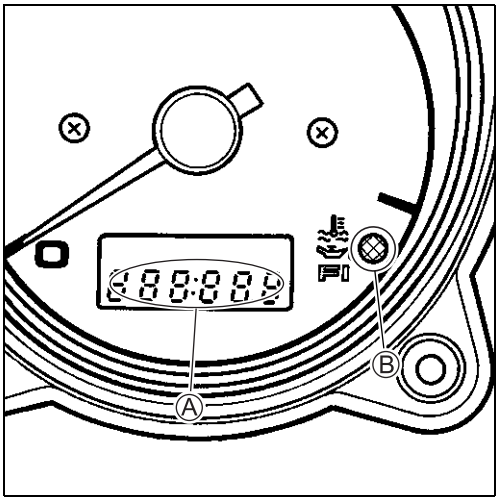
TERMINAL NO.	CIRCUIT	TERMINAL NO.	CIRCUIT
㉟	STVA signal (STVA. 1B)	㊹	STVA signal (STVA. 2B)
㊱	HO2 sensor heater (HO2. H) [For E-02, 19, 24]	㊺	Fuel pump relay (FP Relay)
㊲	STVA signal (STVA. 1A)	㊻	STVA signal (STVA. 2A)
㊳	Blank	㊼	PAIR control solenoid valve (PAIR)
㊴	Ground (E01)	㊽	Ground (E02)
㊵	Rear cylinder Fuel injector (#1)	㊾	Blank
㊶	Rear cylinder Fuel injector (#2)	㊿	Blank
㊷	Blank	(51)	Blank
㊸	Front cylinder Ignition coil (IG2)	(52)	Rear cylinder Ignition coil (IG1)

SELF-DIAGNOSIS FUNCTION

The self-diagnosis function is incorporated in the ECM. The function has two modes, “User mode” and “Dealer mode”. The user can only be notified by the LCD (DISPLAY) panel and LED (FI light). To check the function of the individual FI system devices, the dealer mode is prepared. In this check, the special tool is necessary to read the code of the malfunction items.

USER MODE

MALFUNCTION	LCD (DISPLAY) INDICATION Ⓐ	FI LIGHT INDICATION Ⓑ	INDICATION MODE
“NO”	Odometer *1	—	—
“YES”	Odometer (*1) and “FI” letters	FI light turns ON.	Each 2 sec. Odometer (*1) and “FI” are indicated alternately.
Engine can start	*2		
Engine can not start	“FI” letter *3	FI light turns ON and blinks.	“FI” is indicated continuously.



*1
Current letter displayed any one of the Odometer, Tripmeter or Clock.

*2
When one of the signals is not received by ECM, the fail-safe circuit works and injection is not stopped. In this case, “FI” and Odometer (*1) are indicated in the LCD panel and motorcycle can run.

*3
The injection signal is stopped, when the crankshaft position sensor signal, tip-over sensor signal, both #1/#2 ignition signals, both #1/#2 injector signals, fuel pump relay signal or ignition switch signal is not sent to ECM. In this case, “FI” is indicated in the LCD panel. Motorcycle does not run.

“CHEC”: The LCD panel indicates “CHEC” when no communication signal from the ECM is received for 3 seconds.

For Example

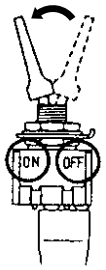
: The ignition switch is turned ON, and the engine stop switch is turned OFF. In this case, the speedometer does not receive any signal from ECM, and the panel indicates “CHEC”.
If CHEC is indicated, the LCD does not indicate the trouble code. It is necessary to check the wiring harness between ECM and speedometer couplers.
The possible cause of this indication is as follows;
Engine stop switch is in OFF position. Side-stand/ignition inter-lock system is not working. Ignition fuse is burnt.

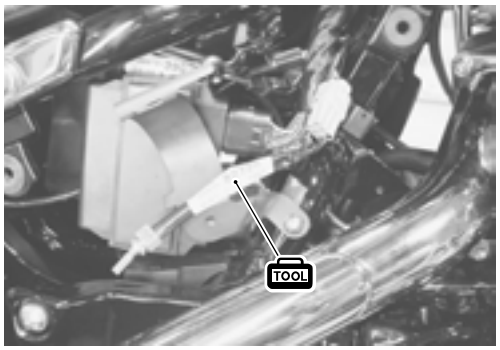
NOTE:
Until starting the engine, the FI light turns ON.
The FI light is also turned ON when engine temperature is high or oil pressure is low.

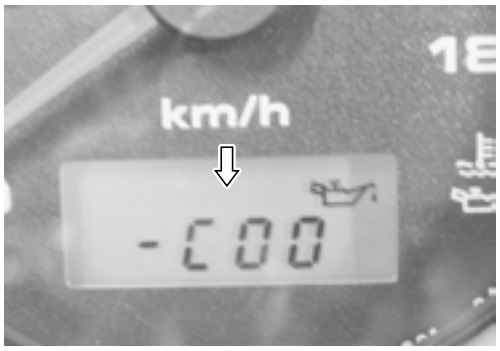
DEALER MODE

The defective function is memorized in the computer. Use the special tool's coupler to connect to the dealer mode coupler. The memorized malfunction code is displayed on the LCD (DISPLAY) panel. Malfunction means that the ECM does not receive signal from the devices. These affected devices are indicated in the code form.

09930-82720: Mode select switch







CAUTION

Before checking the malfunction code, do not disconnect the ECM lead wire couplers.
If the couplers from the ECM are disconnected, the malfunction code memory is erased and the malfunction code can not be checked.

MALFUNCTION	LCD (DISPLAY) INDICATION	FI LIGHT INDICATION	INDICATION MODE
"NO"	C00	FI light turns OFF.	—
"YES"	C** code is indicated from small numeral to large one.		For each 2 sec., code is indicated.

CODE	MALFUNCTION PART	REMARKS
C00	None	No defective part
C12	Crankshaft position sensor (CKPS)	Pick-up coil signal, signal generator
C13	Intake air pressure sensor #2 (IAPS #2)	For Front cylinder
C14	Throttle position sensor (TPS)	*1
C15	Engine coolant temp. sensor (ECTS)	
C17	Intake air pressure sensor #1 (IAPS #1)	For Rear cylinder
C21	Intake air temp. sensor (IATS)	
C23	Tip-over sensor (TOS)	
C24	Ignition signal #1 (IG coil #1)	For Rear cylinder
C25	Ignition signal #2 (IG coil #2)	For Front cylinder
C28	Secondary throttle valve actuator (STVA)	
C29	Secondary throttle valve position sensor (STPS)	*2
C31	Gear position signal (GP switch)	
C32	Injector signal #1 (FI #1)	For Rear cylinder
C33	Injector signal #2 (FI #2)	For Front cylinder
C41	Fuel pump control system (FP control system)	Fuel pump, fuel pump relay
C42	Ignition switch signal (IG switch signal)	Anti-theft
C44	Heated oxygen sensor (HO2S)	For E-02, 19, 24
C49	PAIR control solenoid valve (PAIR valve)	

In the LCD (DISPLAY) panel, the malfunction code is indicated from small code to large code.

*1

To get the proper signal from the throttle position sensor, the sensor basic position is indicated in the LCD (DISPLAY) panel. The malfunction code is indicated in three digits. In front of the three digits, a line appears in any of the three positions, upper, middle or lower line. If the indication is upper or lower line when engine rpm is 1 100 r/min, slightly turn the throttle position sensor and bring the line to the middle.

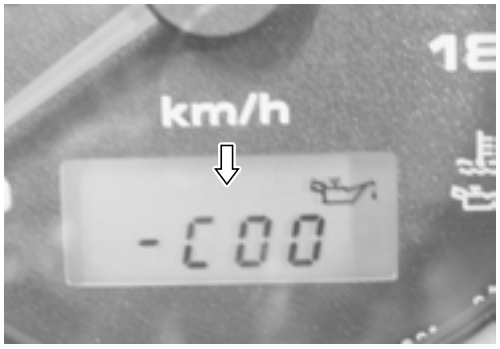
In the normal condition, the throttle valve stop screw pushes throttle valves slightly, and middle line will be indicated.

*2

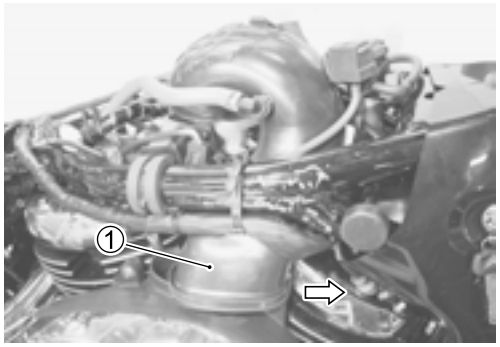
When the secondary throttle valve actuator and secondary throttle position sensor signals are not sent to ECM. In this case, C28 and C29 are indicated alternately.

TPS ADJUSTMENT

1. Warm up the engine and adjust the engine idle speed to 1 100 ± 100 r/min. (☞2-13)
2. Connect the special tool (Mode select switch) and select the dealer mode.



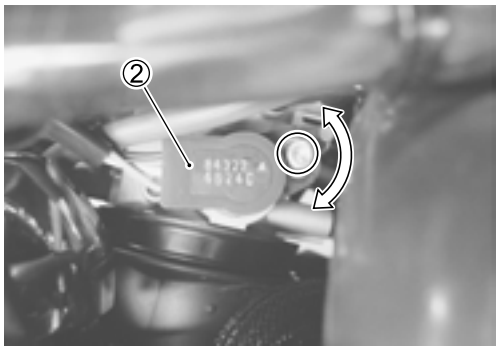
3. Remove the fuel tank. (☞6-3)
4. Loosen the inlet pipe screws. (☞5-47)
5. Move the inlet pipe ①.

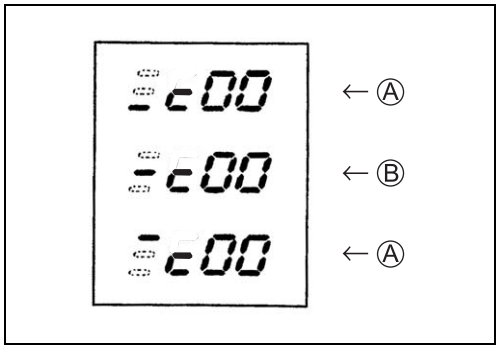


6. Loosen the screw with a torx wrench (T25) and turn the throttle position sensor ② and bring the line to the middle.
7. Then, tighten the screw to fix the throttle position sensor.

TOOL 09930-82720: Mode select switch

The LCD displays the line for 0.4 sec. at a time, and when such a display repeats two times, it indicates the current position where the sensor is fixed.





Ⓐ Incorrect
Ⓑ Correct position

FAIL-SAFE FUNCTION

FI system is provided with fail-safe function to allow the engine to start and the motorcycle to run in a minimum performance necessary even under malfunction condition.

ITEM	FAIL-SAFE MODE	STARTING ABILITY	RUNNING ABILITY
IAP sensor	Intake air pressure is fixed to 760 mmHg.	"YES"	"YES"
TP sensor	The throttle opening is fixed to full open position. Ignition timing is also fixed.	"YES"	"YES"
ECT sensor	Engine coolant temperature value is fixed to 80 °C (176 °F).	"YES"	"YES"
IAT sensor	Intake air temperature value is fixed to 40 °C (104 °F).	"YES"	"YES"
Ignition signal	#1 Ignition-off and #1 Fuel-cut	"YES"	"YES"
		#2 cylinder can run.	
	#2 Ignition-off and #2 Fuel-cut	"YES"	"YES"
		#1 cylinder can run.	
Injection signal	#1 Fuel-cut	"YES"	"YES"
		#2 cylinder can run.	
	#2 Fuel-cut	"YES"	"YES"
		#1 cylinder can run.	
Secondary throttle valve actuator	Secondary throttle valve is fixed to full close position. When motor disconnection or lock occurs, power from ECM is shut off.	"YES"	"YES"
STP sensor	Secondary throttle valve is fixed to full close position.	"YES"	"YES"
Gear position signal	Gear position signal is fixed to 5th gear.	"YES"	"YES"
Heated oxygen sensor (E-02, 19, 24)	Fuel-air compensation ratio is fixed to normal condition.	"YES"	"YES"
PAIR control solenoid valve	ECM stops controlling PAIR control solenoid valve.	"YES"	"YES"

The engine can start and can run even if the above signal is not received from each sensor. But, the engine running condition is not complete, providing only emergency help (by fail-safe circuit). In this case, it is necessary to bring the motorcycle to the workshop for complete repair.

When two ignition signals or two injector signals are not received by ECM, the fail-safe circuit can not work and ignition or injection is stopped.

FI SYSTEM TROUBLESHOOTING

CUSTOMER COMPLAINT ANALYSIS

Record details of the problem (failure, complaint) and how it occurred as described by the customer. For this purpose, use of an inspection form such as below will facilitate collecting information required for proper analysis and diagnosis.

EXAMPLE: CUSTOMER PROBLEM INSPECTION FORM

User name:	Model:	VIN:	
Date of issue:	Date Reg.	Date of problem:	Mileage:

Malfunction indicator lamp condition (LED)	☐ Always ON ☐ Sometimes ON ☐ Always OFF ☐ Good condition
Malfunction display/code (LCD)	User mode: ☐ No display ☐ Malfunction display ( )
	Dealer mode: ☐ No code ☐ Malfunction code ( )

PROBLEM SYMPTOMS	
☐ **Difficult Starting**	☐ **Poor Driveability**
☐ No cranking	☐ Hesitation on acceleration
☐ No initial combustion	☐ Back fire/☐ After fire
☐ No combustion	☐ Lack of power
☐ Poor starting at	☐ Surging
(☐ cold ☐ warm ☐ always)	☐ Abnormal knocking
☐ Other _____	☐ Engine rpm jumps briefly
	☐ Other _____
☐ **Poor Idling**	☐ **Engine Stall when**
☐ Poor fast idle	☐ Immediately after start
☐ Abnormal idling speed	☐ Throttle valve is opened
(☐ High ☐ Low) (r/min)	☐ Throttle valve is closed
☐ Unstable	☐ Load is applied
☐ Hunting (r/min to r/min)	☐ Other _____
☐ Other _____	
☐ OTHERS:	

MOTORCYCLE/ENVIRONMENTAL CONDITION WHEN PROBLEM OCCURS	
Environmental condition	
Weather	☐ Fair ☐ Cloudy ☐ Rain ☐ Snow ☐ Always ☐ Other _____
Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (°C/ °F) ☐ Always
Frequency	☐ Always ☐ Sometimes (times/ day, month) ☐ Only once
	☐ Under certain condition
Road	☐ Urban ☐ Suburb ☐ Highway ☐ Mountainous (☐ Uphill ☐ Downhill)
	☐ Tarmacadam ☐ Gravel ☐ Other _____
Motorcycle condition	
Engine condition	☐ Cold ☐ Warming up phase ☐ Warmed up ☐ Always ☐ Other at starting
	☐ Immediately after start ☐ Racing without load ☐ Engine speed (r/min)
Motorcycle condition	During driving: ☐ Constant speed ☐ Accelerating ☐ Decelerating
	☐ Right hand corner ☐ Left hand corner
	☐ At stop ☐ Motorcycle speed when problem occurs (km/h, mile/h)
	☐ Other _____

NOTE:
The above form is a standard sample. The form should be modified according to conditions and characteristics of each market.

VISUAL INSPECTION

- Prior to diagnosis using the mode select switch or SDS, perform the following visual inspections. The reason for visual inspection is that mechanical failures (such as oil leakage) cannot be displayed on the screen with the use of mode select switch or SDS.

* Engine oil level and leakage (☞2-11)
* Fuel level and leakage (☞2-10)
* Clogged air cleaner element (☞2-4)
* Battery condition (☞9-37)
* Throttle cable play (☞2-14)
* Vacuum hoses looseness, bend and disconnection
* Broken fuse
* FI light operation (☞5-16 and 9-29)
* Each warning light operation (☞9-29)
* Speedometer operation (☞9-31)
* Exhaust gas leakage and noise (☞2-24)
* Each coupler disconnection
* Clogged radiator core (☞7-5)
* Engine coolant level and leakage. (☞7-6)

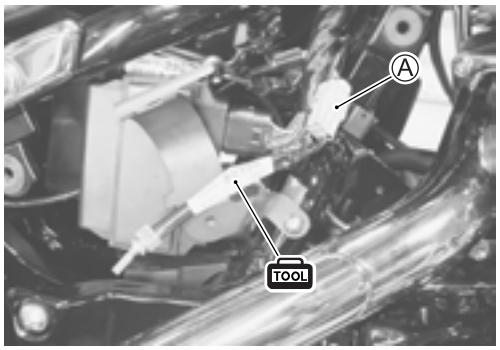
SELF-DIAGNOSTIC PROCEDURES

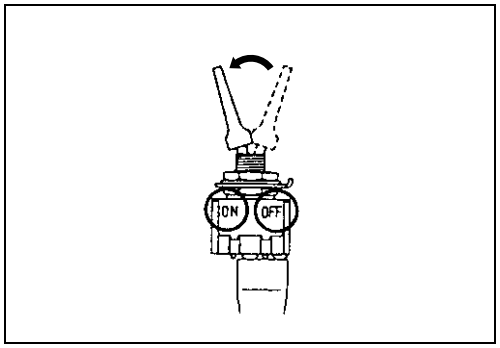
NOTE:

* *Don't disconnect couplers from the ECM, the battery cable from the battery, ECM ground wire harness from the engine or main fuse before confirming the malfunction code (self-diagnostic trouble code) stored in memory. Such disconnection will erase the memorized information in ECM memory.*
* *Malfunction code stored in ECM memory can be checked by the special tool.*
* *Before checking malfunction code, read SELF-DIAGNOSIS FUNCTION "USER MODE and DEALER MODE" (☞5-16 and -17) carefully to have good understanding as to what functions are available and how to use it.*
* *Be sure to read "PRECAUTIONS IN SERVICING" (☞5-3) before inspection and observe what is written there.*

- Remove the right frame cover. (☞8-4)
- Connect the special tool to the dealer mode coupler Ⓐ at the wiring harness, and start the engine or crank the engine for more than 4 seconds.
- Turn the special tool's switch ON and check the malfunction code to determine the malfunction part.

TOOL 09930-82720: Mode select switch



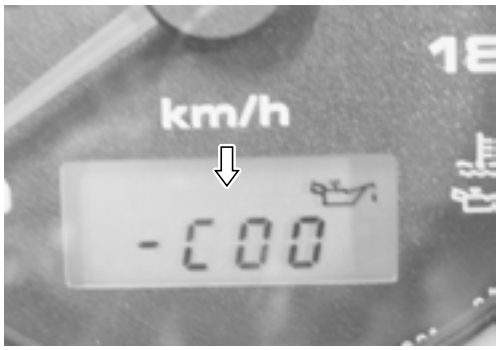


SELF-DIAGNOSIS RESET PROCEDURE

- After repairing the trouble, turn OFF the ignition switch and turn ON again.
- If the malfunction code indicates (C00), the malfunction is cleared.
- Disconnect the special tool from the dealer mode coupler.

NOTE:

* *Even though the malfunction code (C00) is indicated, the previous malfunction history code still remains stored in the ECM. Therefore, erase the history code memorized in the ECM using SDS.*
* *The malfunction code is memorized in the ECM also when the wire coupler of any sensor is disconnected. Therefore, when a wire coupler has been disconnected at the time of diagnosis, erase the stored malfunction history code using SDS.*

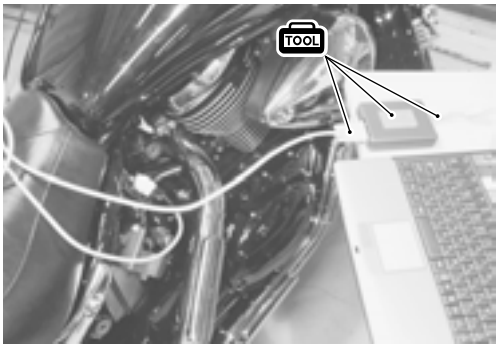


USE OF SDS DIAGNOSTIC PROCEDURES

** Don't disconnect couplers from ECM, the battery cable from the battery, ECM ground wire harness from the engine or main fuse before confirming the malfunction code (self-diagnostic trouble code) stored in memory. Such disconnection will erase the memorized information in ECM memory.*

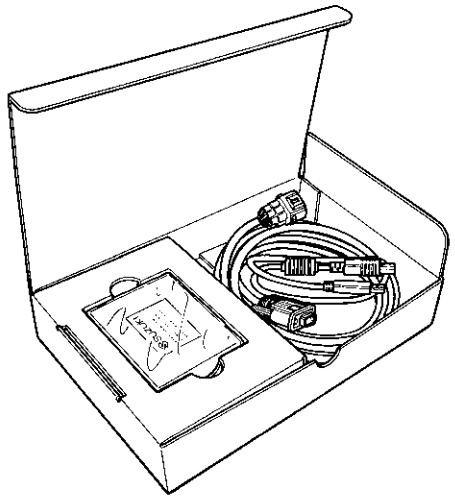
** Malfunction code stored in ECM memory can be checked by the SDS.*

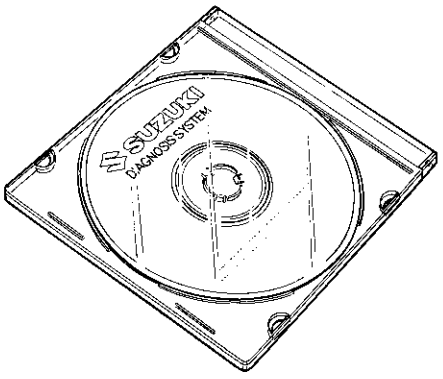
** Be sure to read "PRECAUTIONS IN SERVICING" (☞5-3) before inspection and observe what is written there.*



- Remove the right frame cover. (☞8-4)
- Set up the SDS tool. (Refer to the SDS operation manual for further details)
- Read the DTC (Diagnostic Trouble Code) and show data when trouble (displaying data at the time of DTC) according to instructions displayed on SDS.
- Not only is SDS used for detecting Diagnostic Trouble Codes but also for reproducing and checking on screen the failure condition as described by customers using the trigger.
- How to use trigger. (Refer to the SDS operation manual for further details.)

TOOL 09904-41010: SDS set tool
99565-01010-005: CD-ROM Ver. 5





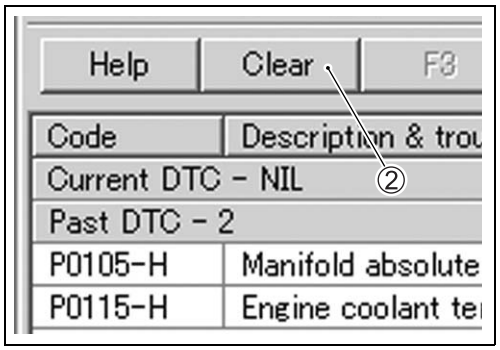
USE OF SDS DIAGNOSIS RESET PROCEDURE



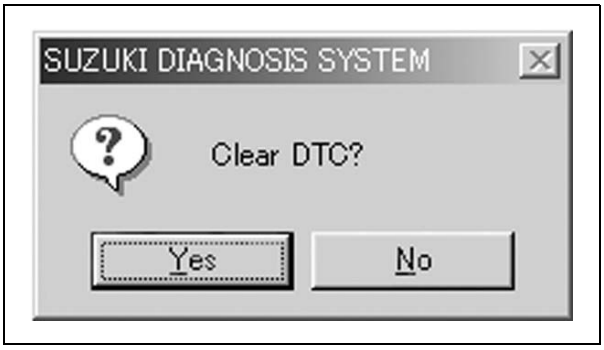
- After repairing the trouble, turn OFF the ignition switch and turn ON again.
- Click the DTC inspection button ①.
- Check the DTC.
- The previous malfunction history code (Past DTC) still remains stored in the ECM. Therefore, erase the history code memorized in the ECM using SDS tool.

NOTE:
The malfunction code is memorized in the ECM also when the wire coupler of any sensor is disconnected. Therefore, when a wire coupler has been disconnected at the time of diagnosis, erase the stored malfunction history code using SDS.

- Click “Clear” ② to delete history code (Past DTC).

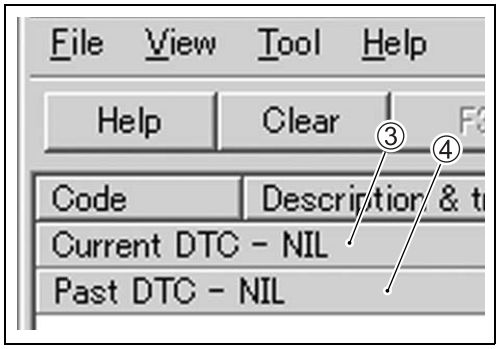


- Follow the displayed instructions.



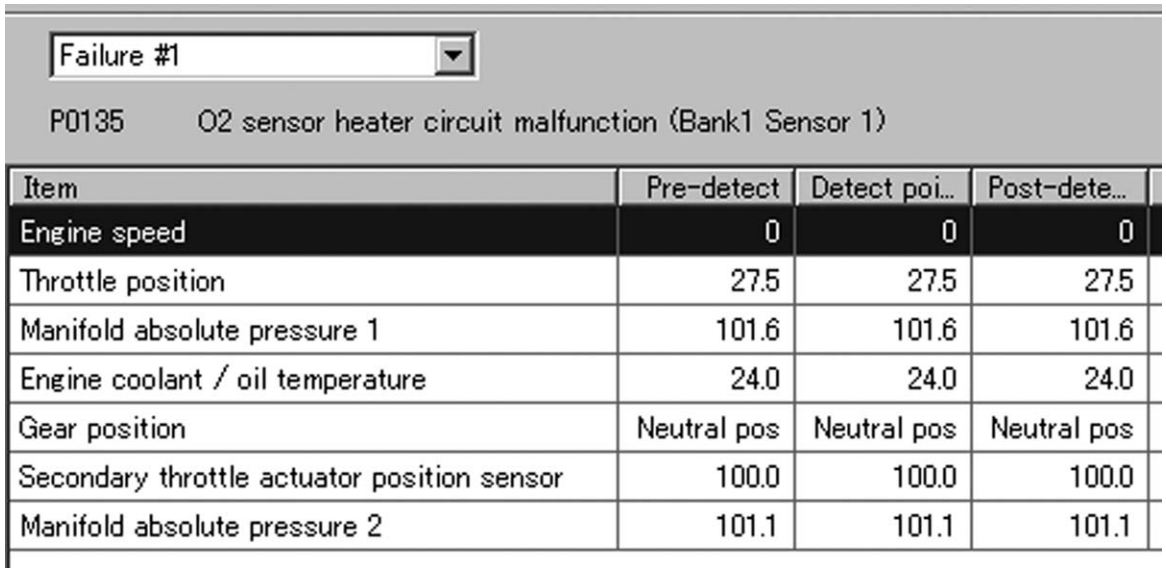


- Check that both “Current DTC” ③ and “Past DTC” ④ are deleted (NIL).



SHOW DATA WHEN TROUBLE (DISPLAING DATA AT THE TIME OF DTC)

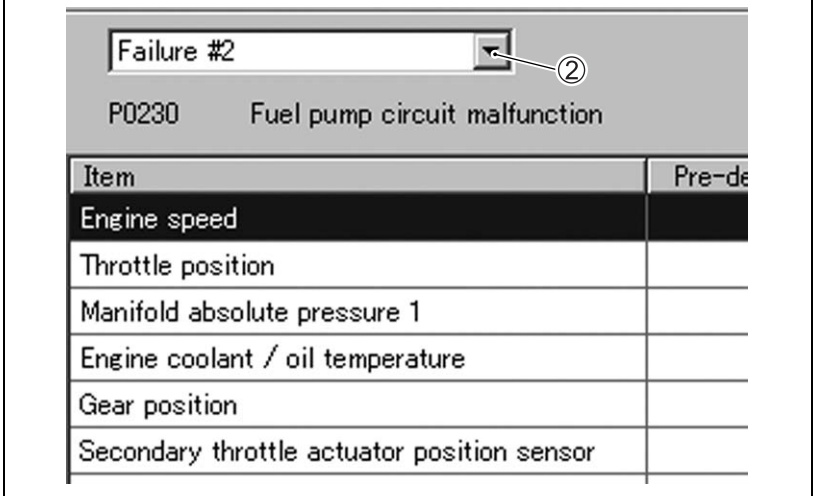
ECM stores the engine and driving conditions (in the form of data as shown in the figure) at the moment of the detection of a malfunction in its memory. This data is called “Show data when trouble”.
Therefore, it is possible to know engine and driving conditions (e.g., whether the engine was warm or not, where the motorcycle was running or stopped) when a malfunction was detected by checking the show data when trouble. This show data when trouble function can record the maximum of two Diagnostic Trouble Codes in the ECM.
Also, ECM has a function to store each show data when trouble for two different malfunctions in the order as the malfunction is detected. Utilizing this function, it is possible to know the order of malfunctions that have been detected. Its use is helpful when rechecking or diagnosing a trouble.



Item	Pre-detect	Detect poi...	Post-dete...
Engine speed	0	0	0
Throttle position	27.5	27.5	27.5
Manifold absolute pressure 1	101.6	101.6	101.6
Engine coolant / oil temperature	24.0	24.0	24.0
Gear position	Neutral pos	Neutral pos	Neutral pos
Secondary throttle actuator position sensor	100.0	100.0	100.0
Manifold absolute pressure 2	101.1	101.1	101.1

- Click “Show data when trouble” ① to display the data. By clicking the drop down button ②, either “Failure #1” or “Failure #2” can be selected.





MALFUNCTION CODE AND DEFECTIVE CONDITION

DTC No.		DETECTED ITEM	DETECTED FAILURE CONDITION	CHECK FOR
C00		NO FAULT	————	————
C12		CKP sensor	The signal does not reach ECM for 3 sec. or more, after receiving the starter signal.	CKP sensor wiring and mechanical parts CKP sensor, lead wire/coupler connection
P0335				
C13/C17		IAP sensor	The sensor should produce following voltage. 0.1 V $\leqq$ sensor voltage < 4.8 V In other than the above range, C13 (P1750) or C17 (P0105) is indicated.	IAP sensor, lead wire/coupler connection
P1750/P0105				
C14		TP sensor	The sensor should produce following voltage. 0.1 V $\leqq$ sensor voltage < 4.8 V In other than the above range, C14 (P0120) is indicated.	TP sensor, lead wire/coupler connection
P0120	H		Sensor voltage is higher than specified value.	TP sensor circuit shorted to VCC or ground circuit open
	L		Sensor voltage is lower than specified value.	TP sensor circuit open or shorted to ground or VCC circuit open
C15		ECT sensor	The sensor voltage should be the following. 0.1 V $\leqq$ sensor voltage < 4.6 V In other than the above range, C15 (P0115) is indicated.	ECT sensor, lead wire/coupler connection
P0115	H		Sensor voltage is higher than specified value.	ECT sensor circuit open or ground circuit open
	L		Sensor voltage is lower than specified value.	ECT sensor circuit shorted to ground

DTC No.		DETECTED ITEM	DETECTED FAILURE CONDITION	CHECK FOR
C21		IAT sensor	The sensor voltage should be the following. 0.1 V ≦ sensor voltage < 4.6 V In other than the above range, C21 (P0110) is indicated.	IAT sensor, lead wire/coupler connection
P0110	H		Sensor voltage is higher than specified value.	IAT sensor circuit open or ground circuit open
	L		Sensor voltage is lower than specified value.	IAT sensor circuit shorted to ground
C23		TO sensor	The sensor voltage should be the following for 2 sec. and more, after ignition switch is turned ON. 0.2 V ≦ sensor voltage ≦ 4.6 V In other than the above value, C23 (P1651) is indicated.	TO sensor, lead wire/coupler connection
P1651	H		Sensor voltage is higher than specified value.	TO sensor circuit open or shorted to VCC or ground circuit open
	L		Sensor voltage is lower than specified value.	TO sensor circuit shorted to ground or VCC circuit open
C24/C25		Ignition signal	CKP sensor (pick-up coil) signal is produced, but signal from ignition coil is interrupted 8 times or more continuously. In this case, the code C24 (P0351) or C25 (P0352) is indicated.	Ignition coil, lead wire/coupler connection, power supply from the battery
P0351/P0352				
C28		Secondary throttle valve actuator	When no actuator control signal is supplied from the ECM, communication signal does not reach ECM or operation voltage does not reach STVA motor, C28 (P1655) is indicated. STVA can not operate.	STVA motor, STVA lead wire/coupler
P1655				
C29		STP sensor	The sensor should produce following voltage. 0.1 V ≦ sensor voltage < 4.8 V In other than the above range, C29 is indicated.	STP sensor, lead wire/coupler connection
P1654	H		Sensor voltage is higher than specified value.	STP sensor circuit shorted to VCC or ground circuit open
	L		Sensor voltage is lower than specified value.	STP sensor circuit open or shorted to ground or VCC circuit open

DTC No.	DETECTED ITEM	DETECTED FAILURE CONDITION	CHECK FOR
C31 P0705	Gear position signal	Gear position signal voltage should be higher than the following for 3 seconds and more. Gear position sensor voltage > 0.6 V If lower than the above value, C31 (P0705) is indicated.	GP switch, lead wire/coupler connection, Gearshift cam, etc.
C32/C33 P0201/P0202	Fuel injector	CKP sensor (pickup coil) signal is produced, but fuel injector signal is interrupted 4 times or more continuously. In this case, the code C32 (P0201) or C33 (P0202) is indicated.	Fuel injector, wiring/coupler connection, power supply to the injector
C41 P0230	Fuel pump relay	No voltage is applied to the fuel pump, although fuel pump relay is turned ON, or voltage is applied to fuel pump, although fuel pump relay is turned OFF.	Fuel pump relay, lead wire/coupler connection. power source to the fuel pump relay and fuel injectors
C42 P1650	Ignition switch	Ignition switch signal is not input to ECM.	Ignition switch, lead wire/coupler
C44 P0130	HO2 sensor (E-02, 19, 24)	HO2 sensor output voltage is not input to ECM during engine operation and running condition. (Sensor voltage $\leqq$ 0.1 V) In other than the above value, C44 (P0130) is indicated.	HO2 sensor circuit open or shorted to ground
C44 P0135		The Heater can not operate so that heater operation voltage is not supply to the oxygen heater circuit, C44 (P0135) is indicated.	HO2 sensor lead wire/coupler connection Battery voltage supply to the HO2 sensor
C49 P1656	PAIR control solenoid valve	PAIR control solenoid valve voltage is not input to ECM.	PAIR control solenoid valve, lead wire/coupler

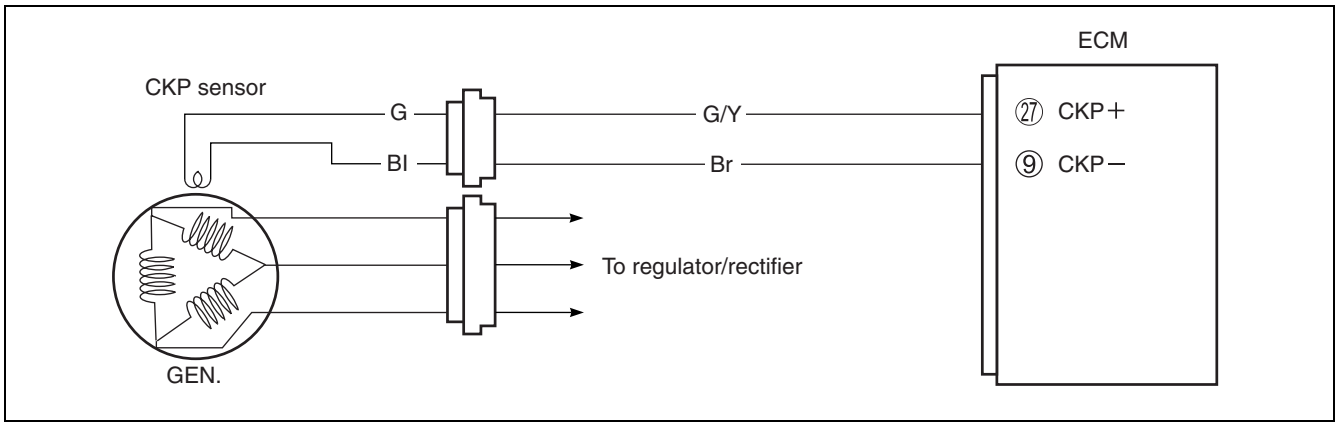
NOTE:

HO2 SENSOR VOLTAGE MEASURING CONDITION

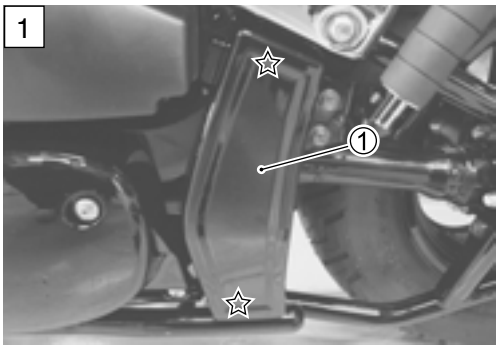
1. 10 minutes after the engine start (Idling) or 100 sec. after the engine start (Engine revolution is over 2 000 r/min).
2. Coolant temperature is upper 45 ºC (113 ºF).

"C12" (P0335) CKP SENSOR CIRCUIT MALFUNCTION

DETECTED CONDITION	POSSIBLE CAUSE
The signal does not reach ECM for 3 sec. or more, after receiving the starter signal.	• Metal particles or foreign material being stuck on the CKP sensor and rotor tip • CKP sensor circuit open or short • CKP sensor malfunction • ECM malfunction

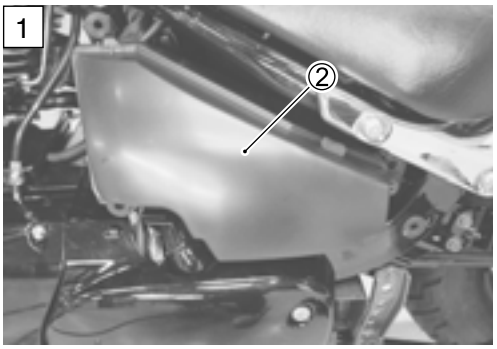


INSPECTION
Step 1
1) Remove the left frame cover (☞8-3)
2) Remove the left frame lower cover ①.

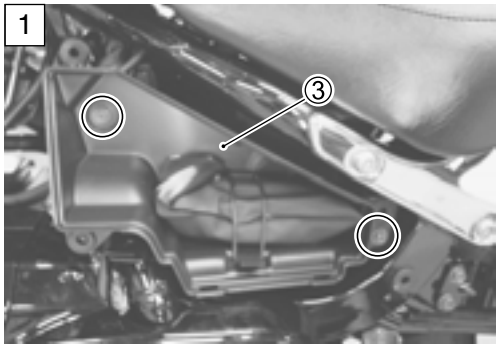


☆: Hooked part

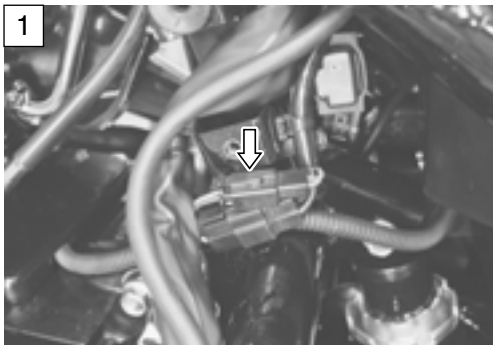
3) Remove the tool box cover ②.



4) Remove the tool box ③.

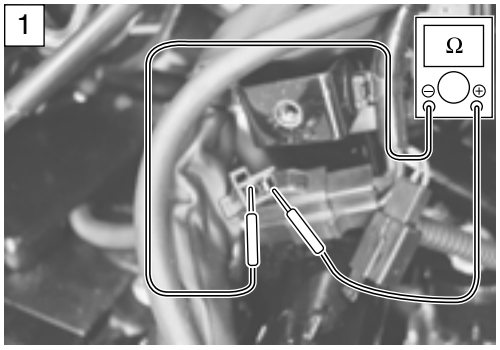


5) Turn the ignition switch OFF.
6) Check the CKP sensor coupler for loose or poor contacts.
If OK, then measure the CKP sensor resistance.



7) Disconnect the CKP sensor coupler and measure the resistance.

DATA CKP sensor resistance: 184 – 276 Ω
(Green – Blue)

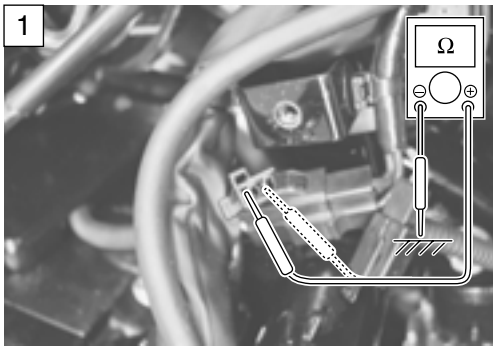


8) If OK, then check the continuity between each terminal and ground.

DATA CKP sensor continuity: ∞ Ω (Infinity)
(Blue – Ground)
(Green – Ground)

TOOL 09900-25008: Multi-circuit tester set

Tester knob indication: Resistance (Ω)



Are the resistance and continuity OK?

YES	Go to Step 2.
NO	Replace the CKP sensor with a new one.

9) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

Step 2

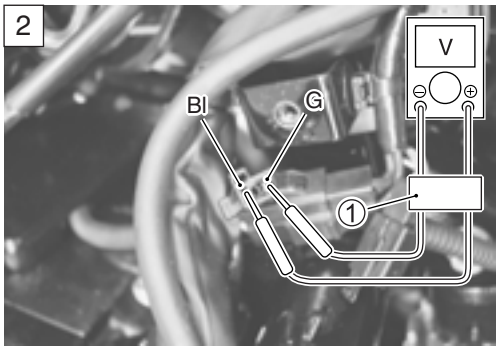
1) Crank the engine a few seconds with the starter motor, and measure the CKP sensor peak voltage at the coupler.
2) Repeat the above test procedure a few times and measure the highest peak voltage.

DATA CKP sensor peak voltage: 4.0 V and more (⊕ Green – ⊖ Blue)

① Peak volt adaptor

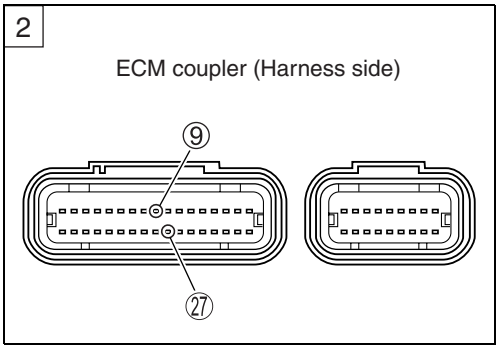
TOOL 09900-25008: Multi-circuit tester set

Tester knob indication: Voltage (⎓)



Is the voltage OK?

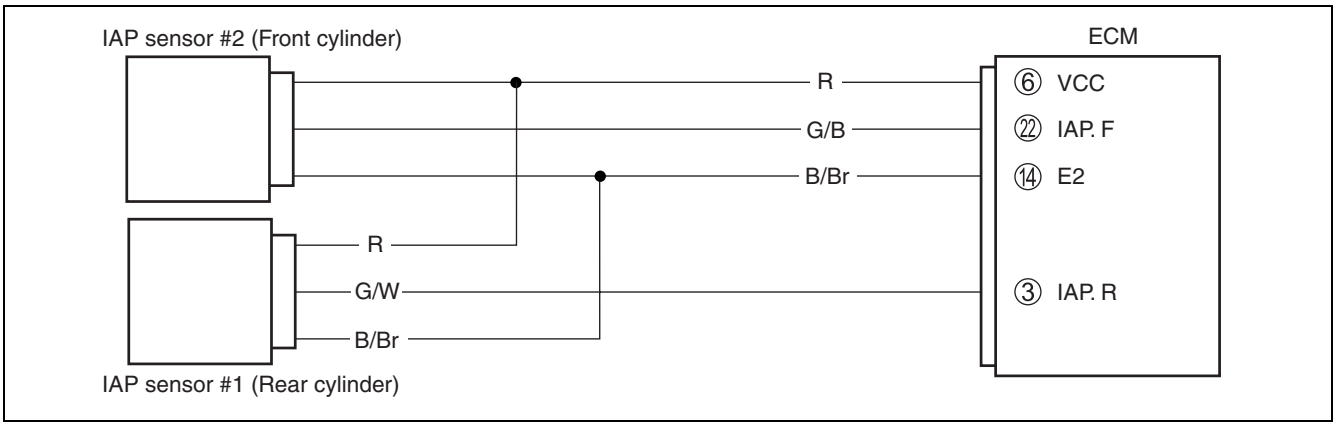
YES	• G/Y or Brown wire open or shorted to ground • Loose or poor contacts on the CKP sensor coupler or ECM coupler (terminal ⑨ or ㉗) • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection. • Replace the ECM with a known good one, and inspect it again.
NO	• Inspect that metal particles or foreign material stuck on the CKP sensor and rotor tip. • If there are no metal particles and foreign material, then replace the CKP sensor with a new one.



3) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

"C13" (P1750) or "C17" (P0105) IAP SENSOR CIRCUIT MALFUNCTION

DETECTED CONDITION	POSSIBLE CAUSE
IAP sensor voltage low or high (0.1 V ≦ Sensor voltage < 4.8 V) *NOTE:* *Note that atmospheric pressure varies depending on weather conditions as well as altitude.* *Take that into consideration when inspecting voltage.*	• Clogged vacuum passage between throttle body and IAP sensor • Air being drawn from vacuum passage between throttle body and IAP sensor • IAP sensor circuit open or shorted to ground • IAP sensor malfunction • ECM malfunction



INSPECTION

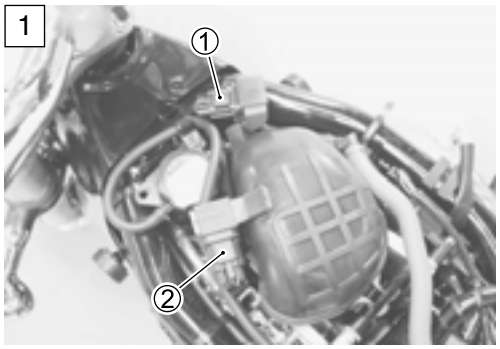
Step 1

(When indicating C13/P1750 for IAP sensor #2)

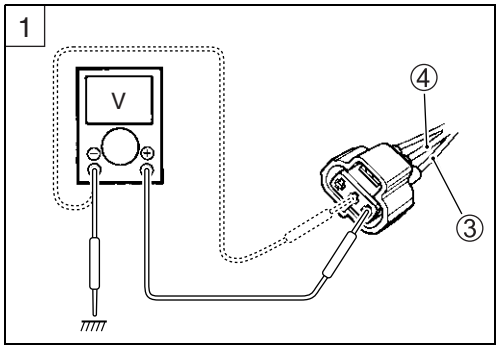
1) For the other inspection procedures are the same as C17/P0105.

(When indicating C17/P0105 for IAP sensor #1)

1) Remove the fuel tank. (☞6-3)
2) Turn the ignition switch OFF.
3) Check the IAP sensor coupler (Front cylinder side ① or Rear cylinder side ②) for loose or poor contacts.
   If OK, then measure the IAP sensor input voltage.



4) Disconnect the IAP sensor coupler.
5) Turn the ignition switch ON.
6) Measure the voltage at the Red wire ③ and ground.
7) Also, measure the voltage at the Red wire ③ and B/Br wire ④.



DATA IAP sensor input voltage: 4.5 – 5.5 V
(⊕ Red – ⊖ Ground)
(⊕ Red – ⊖ B/Br)

TOOL 09900-25008: Multi-circuit tester set

Tester knob indication: Voltage (⎓)

Is the voltage OK?

YES	Go to Step 2.
NO	• Loose or poor contacts on the ECM coupler (terminal ⑥ or ⑭) • Open or short circuit in the Red wire or B/Br wire

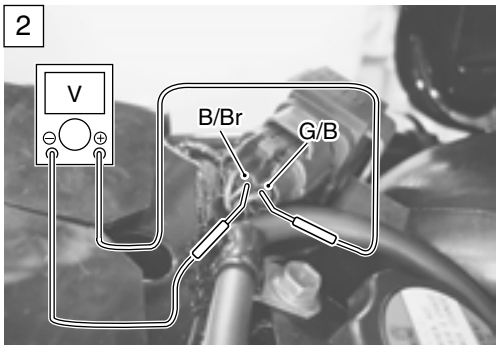
8) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

Step 2

1) Connect the IAP sensor coupler.
2) Reinstall the fuel tank and lift up the fuel tank.



3) Insert the needle pointed probes to the lead wire coupler.
4) Start the engine at idle speed and measure the IAP sensor output voltage at the wire side coupler.
   (Front cylinder side: between G/B and B/Br wires)
   (Rear cylinder side: between G/W and B/Br wires)



DATA IAP sensor output voltage: Approx. 2.6 V at idle speed
(Front cylinder side: ⊕ G/B – ⊖ B/Br)
(Rear cylinder side: ⊕ G/W – ⊖ B/Br)

TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Voltage (⎓)

Is the voltage OK?

YES	Go to Step 3.
NO	• Check the vacuum hose for crack or damage. • Open or short circuit in the G/B wire (Front cylinder side) • Open or short circuit in the G/W wire (Rear cylinder side) • If vacuum hose and wire are OK, replace the IAP sensor with a new one.

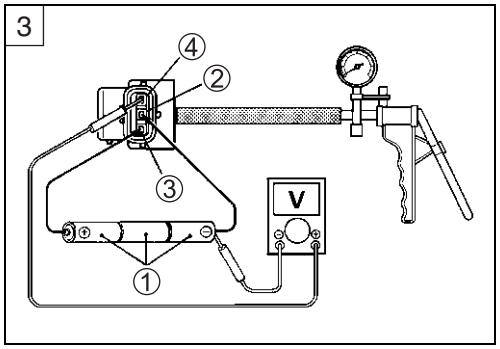
5) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

Step 3

1) Turn the ignition switch OFF.
2) Remove the IAP sensor. (☞5-75)
3) Connect the vacuum pump gauge to the vacuum port of the IAP sensor.
4) Arrange 3 new 1.5 V batteries in series ① (check that total voltage is 4.5 – 5.0 V) and connect ⊖ terminal to the ground terminal ② and ⊕ terminal to the VCC terminal ③.
5) Check the voltage between Vout ④ and ground. Also, check if voltage reduces when vacuum is applied up to 400 mmHg by using vacuum pump gauge. (☞5-36)

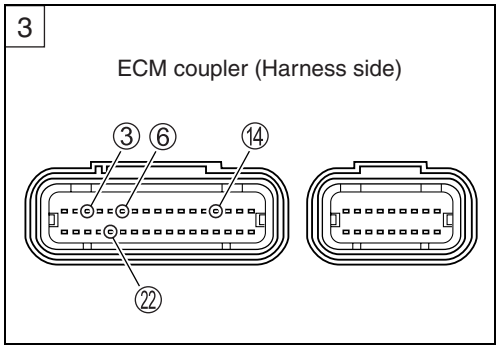
TOOL 09917-47011: Vacuum pump gauge
09900-25008: Multi-circuit tester set

Tester knob indication: Voltage (⎓)



Is the voltage OK?

YES	• Red, B/Br or G/B wire open or shorted to ground, or poor ⑥, ⑭ or ㉒ connection (Front cylinder side) • G/W, Red or B/Br wire open or shorted to ground, or poor ③, ⑥ or ⑭ connection (Rear cylinder side) • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection. • Replace the ECM with a known good one, and inspect it again.
NO	If check result is not satisfactory, replace the IAP sensor with a new one.



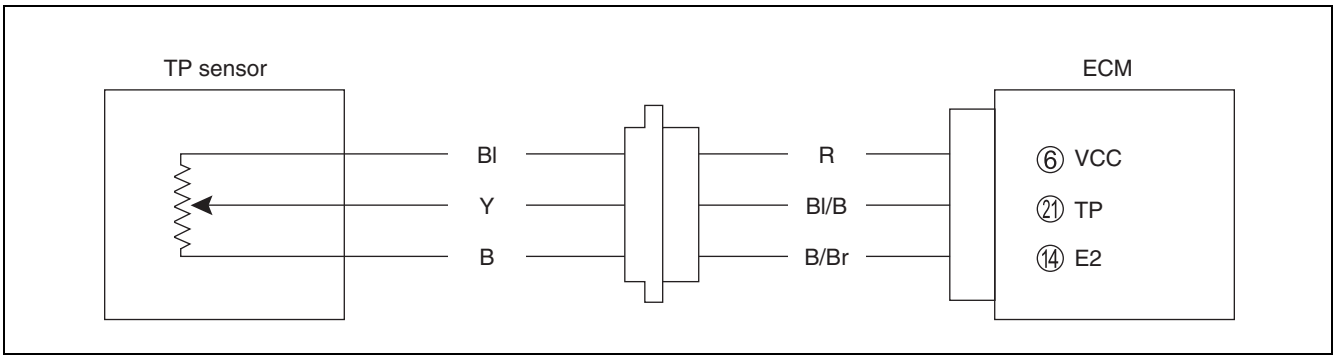
6) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

Output voltage (VCC voltage 4.5 – 5.0 V, ambient temp. 20 – 30 °C, 68 – 86 °F)

ALTITUDE (Reference)		ATMOSPHERIC PRESSURE		OUTPUT VOLTAGE
(ft)	(m)	(mmHg)	kPa	(V)
0 | 2 000	0 | 610	760 | 707	100 | 94	3.4 – 4.0
2 001 | 5 000	611 | 1 524	707 | 634	94 | 85	2.8 – 3.7
5 001 | 8 000	1 525 | 2 438	634 | 567	85 | 76	2.6 – 3.4
8 001 | 10 000	2 439 | 3 048	567 | 526	76 | 70	2.4 – 3.1

"C14" (P0120-H/L) TP SENSOR CIRCUIT MALFUNCTION

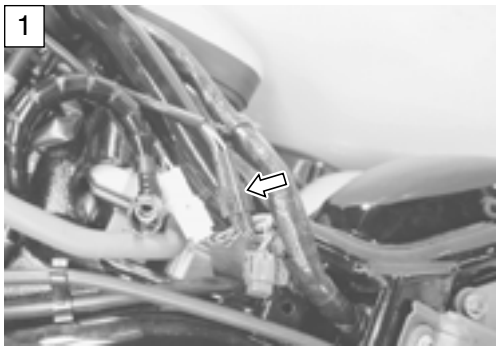
DETECTED CONDITION			POSSIBLE CAUSE
C14		Output voltage is not within the following range. Difference between actual throttle opening and opening calculated by ECM is larger than specified value. 0.1 V ≦ Sensor voltage < 4.8 V	• TP sensor maladjusted • TP sensor circuit open or short • TP sensor malfunction • ECM malfunction
P0120	H	Sensor voltage is higher than specified value.	• TP sensor circuit shorted to VCC or ground circuit open
	L	Sensor voltage is lower than specified value.	• TP sensor circuit open or shorted to ground or VCC circuit open



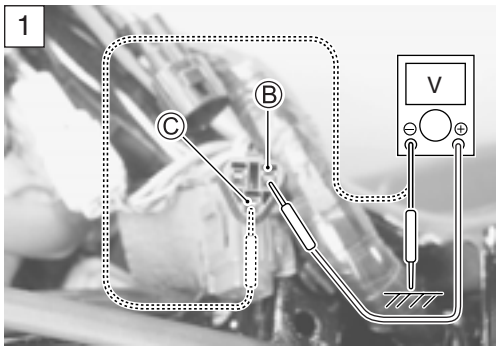
INSPECTION

Step 1 (When indicating C14:)

1) Remove the fuel tank. (☞6-3)
2) Turn the ignition switch OFF.
3) Check the TP sensor coupler for loose or poor contacts.
   If OK, then measure the TP sensor input voltage.
4) Disconnect the TP sensor coupler.
5) Turn the ignition switch ON.
6) Measure the voltage at the Red wire Ⓑ and ground.
7) Also, measure the voltage at the Red wire Ⓑ and B/Br wire Ⓒ.



DATA TP sensor input voltage: 4.5 – 5.5 V
(⊕ Red – ⊖ Ground)
(⊕ Red – ⊖ B/Br)



TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

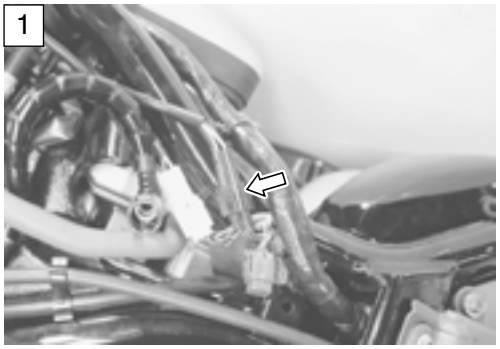
Tester knob indication: Voltage (⎓)

Is the voltage OK?

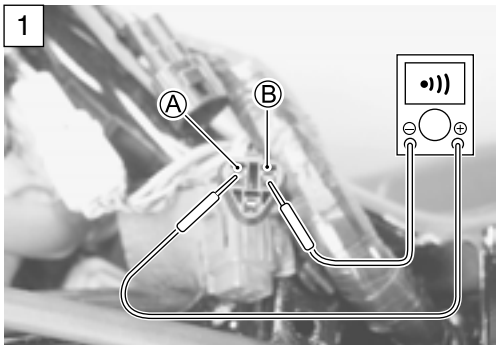
YES	Go to Step 2.
NO	• Loose or poor contacts on the ECM coupler (terminal ⑥ or ⑭) • Open or short circuit in the Red wire or B/Br wire

Step 1 (When indicating P0120-H:)

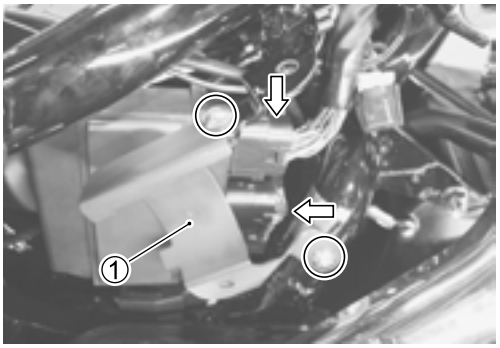
1) Remove the fuel tank. (☞6-3)
2) Turn the ignition switch OFF.
3) Check the TP sensor coupler for loose or poor contacts.
   If OK, then check the TP sensor lead wire continuity.



4) Disconnect the TP sensor coupler.
5) Check the continuity between BI/B wire Ⓐ and Red wire Ⓑ.
   If the sound is not heard from the tester, the circuit condition is OK.



6) Remove the right frame cover (☞8-4), ECM bracket ① and disconnect the ECM coupler.

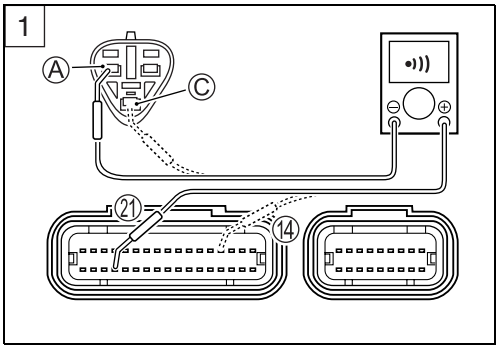


7) Check the continuity between BI/B wire Ⓐ and terminal ㉑.
8) Also, check the continuity between B/Br wire Ⓒ and terminal ⑭.

DATA TPS lead wire continuity: Continuity (•))))

TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Continuity test (•))))



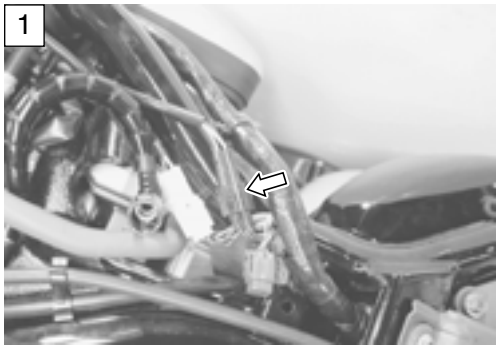
Is the continuity OK?

YES	Go to Step 2.
NO	BI/B wire shorted to VCC, or B/Br wire open

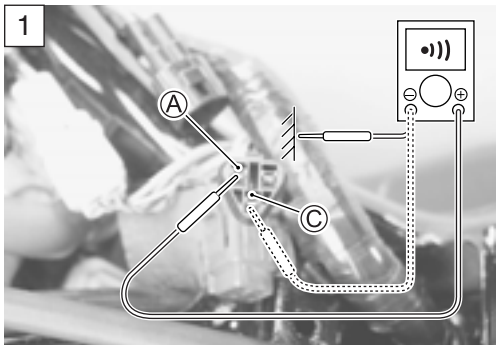
9) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

Step 1 (When indicating P0120-L:)

1) Remove the fuel tank. (☞6-3)
2) Turn the ignition switch OFF.
3) Check the TP sensor coupler for loose or poor contacts.
   If OK, then measure the TP sensor lead wire continuity.



4) Disconnect the TP sensor coupler.
5) Check the continuity between BI/B wire Ⓐ and ground.
6) Also, check the continuity between BI/B wire Ⓐ and B/Br wire Ⓒ. If the sound is not heard from the tester, the circuit condition is OK.

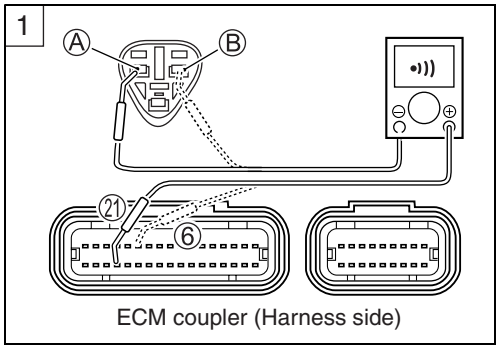


7) Remove the right frame cover. (☞8-4), ECM bracket (☞5-38) and disconnect the ECM coupler.
8) Check the continuity between BI/B wire Ⓐ and terminal ㉑.
9) Also, check the continuity between Red wire Ⓑ and terminal ⑥.

DATA TPS lead wire continuity: Continuity (•))))

TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Continuity test (•))))



ECM coupler (Harness side)

Is the continuity OK?

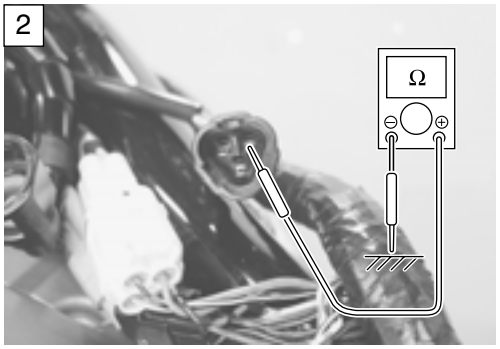
YES	Go to Step 1 (☞5-38) and go to Step 2.
NO	Red wire or BI/B wire open, or BI/B wire shorted to ground

10) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

Step 2

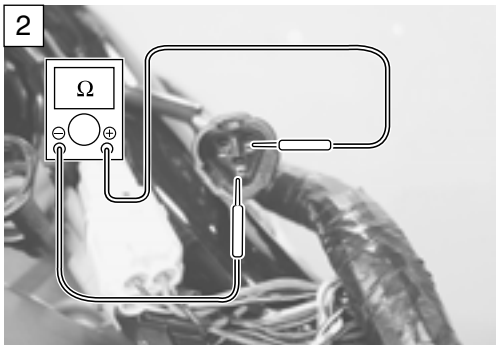
1) Turn the ignition switch OFF.
2) Disconnect the TP sensor coupler.
3) Check the continuity between Yellow wire and ground.

DATA **TP sensor continuity: ∞ Ω (Infinity)**
(Yellow – Ground)



4) If OK, then measure the TP sensor resistance at the terminals (between Yellow wire and Black wire).
5) Turn the throttle grip and measure the resistance.

DATA **TP sensor resistance**
Throttle valve is closed : Approx. 1.1 kΩ
Throttle valve is opened: Approx. 4.4 kΩ



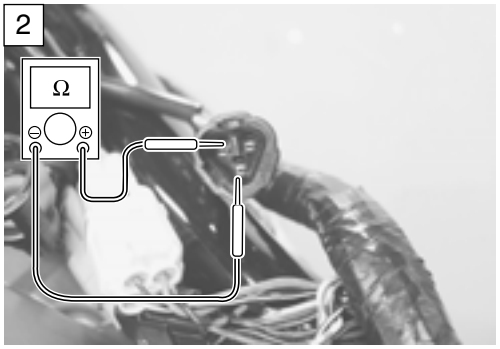
6) If OK, then measure the TP sensor resistance at the terminals (between Blue wire and Black wire).

DATA **TP sensor resistance: Approx. 4.66 kΩ**
(Blue wire – Black wire)

TOOL **09900-25008: Multi-circuit tester set**

Tester knob indication: Resistance (Ω)

Are the continuity and resistance OK?

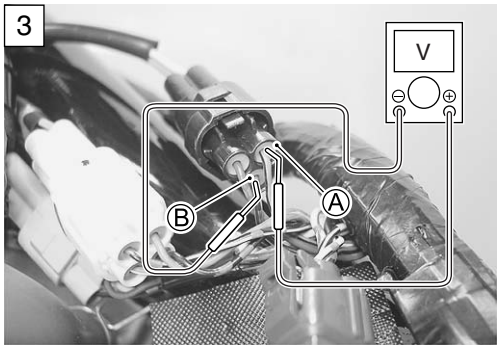


YES	Go to Step 3.
NO	• Reset the TP sensor position correctly. • Replace the TP sensor with a new one.

7) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

Step 3

1) Connect the TP sensor coupler.
2) Insert the needle pointed probes to the lead wire coupler.
3) Turn the ignition switch ON.
4) Measure the TP sensor output voltage at the coupler (between Bl/B wire Ⓐ and B/Br wire Ⓑ) by turning the throttle grip.

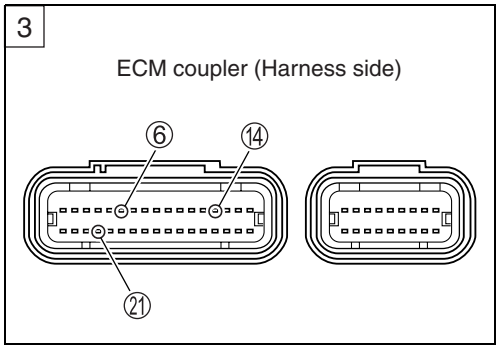


DATA TP sensor output voltage
Throttle valve is closed: Approx. 1.1 V
Throttle valve is opened: Approx. 4.4 V

TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Voltage (⎓)

Is the voltage OK?

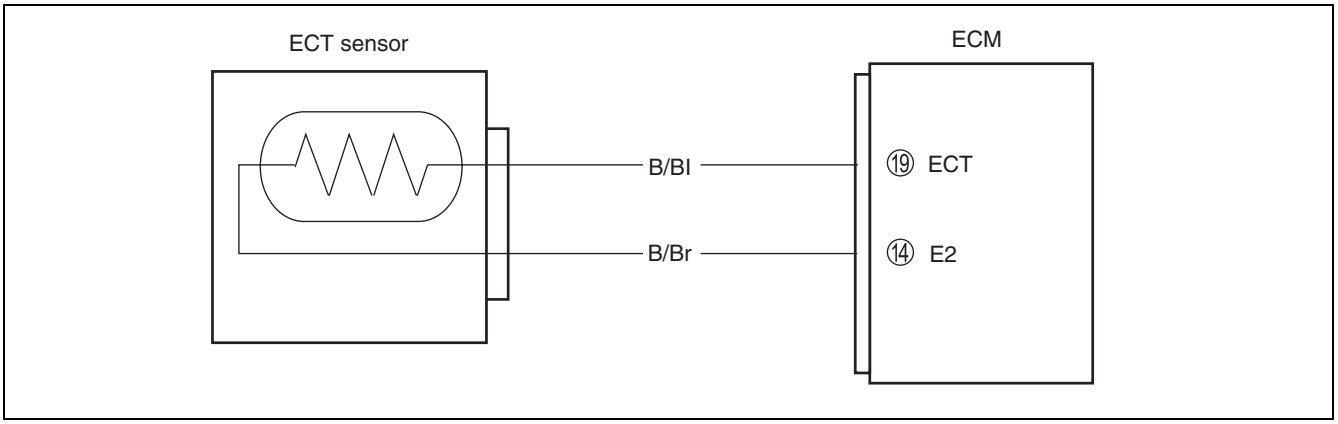


YES	• R, B/Br or Bl/B wire open or shorted to ground, or poor ⑥, ⑭ or ㉑ connection • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection. • Replace the ECM with a known good one, and inspect it again.
NO	If check result is not satisfactory, replace TP sensor with a new one.

5) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

"C15" (P0115-H/L) ECT SENSOR CIRCUIT MALFUNCTION

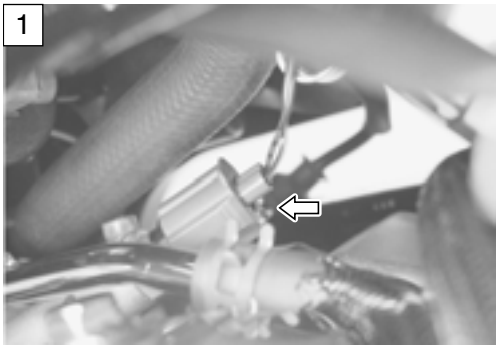
DETECTED CONDITION			POSSIBLE CAUSE
C15		Output voltage is not within the following range. 0.1 ≦ Sensor voltage < 4.6 V	• ECT sensor circuit open or short • ECT sensor malfunction • ECM malfunction
P0115	H	Sensor voltage is higher than specified value.	• ECT sensor circuit open or ground circuit open
	L	Sensor voltage is lower than specified value.	• ECT sensor circuit shorted to ground

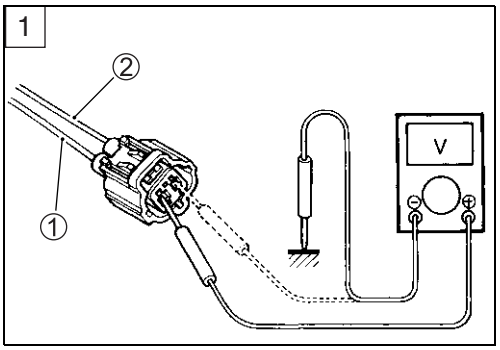


INSPECTION

Step 1 (When indicating C15:)

1) Remove the fuel tank. (☞6-3)
2) Turn the ignition switch OFF.
3) Check the ECT sensor coupler for loose or poor contacts.
   If OK, then measure the ECT sensor voltage at the wire side coupler.
4) Disconnect the ECT sensor coupler and turn the ignition switch ON.
5) Measure the voltage between B/Bl wire terminal ① and ground.
6) Also, measure the voltage between B/Bl wire terminal ① and B/Br wire terminal ②.





DATA ECT sensor input voltage: 4.5 – 5.5 V
(⊕ B/Bl – ⊖ Ground)
(⊕ B/Bl – ⊖ B/Br)

TOOL 09900-25008: Multi-circuit tester set

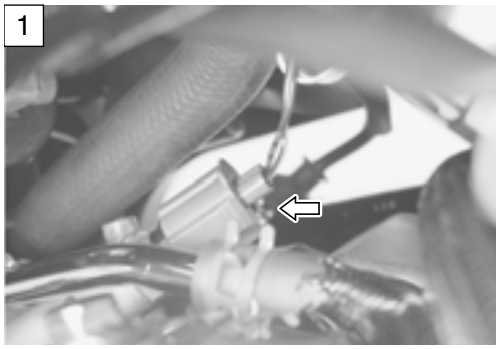
Tester knob indication: Voltage (⎓)

Is the voltage OK?

YES	Go to Step 2.
NO	• Loose or poor contacts on the ECM coupler (terminal ⑭ or ⑲) • Open or short circuit in the B/Bl wire or B/Br wire

Step 1 (When indicating P0115-H:)

1) Remove the fuel tank. (☞6-3)
2) Turn the ignition switch OFF.
3) Check the ECT sensor coupler for loose or poor contacts.
   If OK, then check the ECT sensor lead wire continuity.

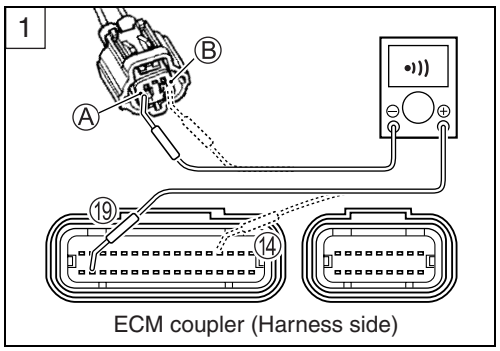


4) Remove the right frame cover. (☞8-4)
5) Disconnect the ECT sensor coupler.
6) Remove the ECM bracket (☞5-38) and ECM coupler.
7) Check the continuity between B/Bl wire Ⓐ and terminal ⑲.
8) Also, check the continuity between B/Br wire Ⓑ and terminal ⑭.

DATA ECTS lead wire continuity: Continuity (•))))

TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Continuity test (•))))



ECM coupler (Harness side)

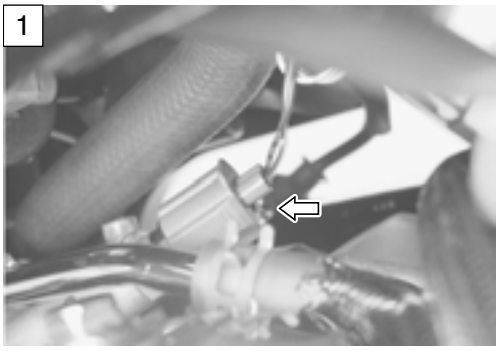
Is the continuity OK?

YES	Go to Step 2.
NO	B/Bl or B/Br wire open

9) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

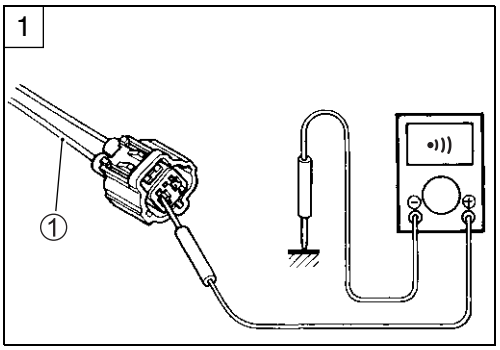
Step 1 (When indicating P0115-L:)

1) Remove the fuel tank. (☞6-3)
2) Turn the ignition switch OFF.
3) Check the ECT sensor coupler for loose or poor contacts.
   If OK, then check the ECT sensor lead wire continuity.



4) Disconnect the ECT sensor coupler.
5) Check the continuity between B/Bl wire ① and ground.
6) If the sound is not heard from the tester, the circuit condition is OK.

Tester knob indication: Continuity test (•))))

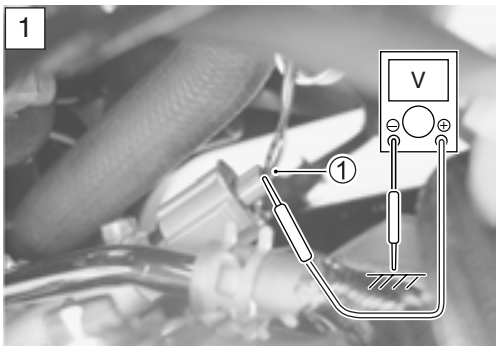


7) Connect the ECT sensor coupler.
8) Turn the ignition switch ON.
9) Measure the voltage between B/Bl wire ① and ground.

Output voltage: 0.1 – 4.6 V (⊕ B/Bl – ⊖ Ground)

09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Voltage (⎓)



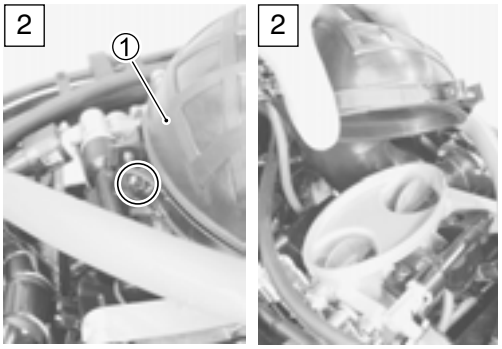
Are the continuity and voltage OK?

YES	Go to Step 2.
NO	B/Bl wire shorted to ground.

10) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

Step 2

1) Turn the ignition switch OFF.
2) Loosen the inlet pipe screw.
3) Lift up the inlet pipe ①.



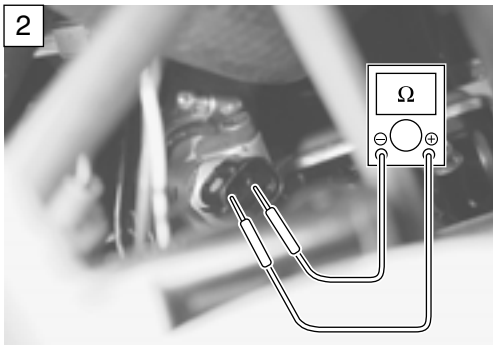
4) Disconnect the ECT sensor coupler.
5) Measure the ECT sensor resistance.

DATA ECT sensor resistance:

Approx. 2.3 – 2.6 kΩ at 20 °C (68 °F)
(Terminal – Terminal)

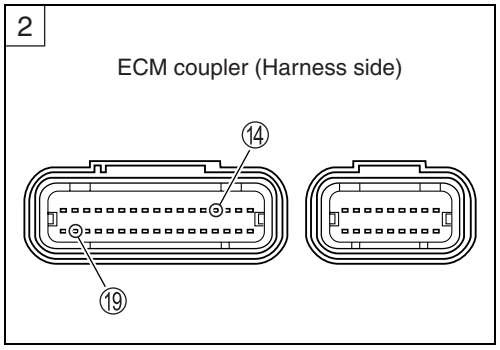
TOOL 09900-25008: Multi-circuit tester set

Tester knob indication: Resistance (Ω)



Refer to next page for details.

Is the resistance OK?



YES	• B/Bl or B/Br wire open or shorted to ground, or poor ⑭ or ⑲ connection • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection. • Replace the ECM with a known good one, and inspect it again.
NO	Replace the ECT sensor with a new one.

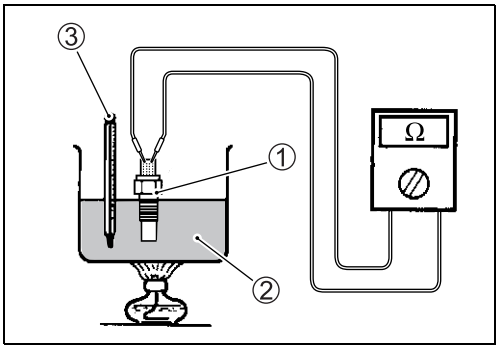
6) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

DATA ECT sensor specification

Engine Coolant Temp.	Resistance
20 °C (68 °F)	Approx. 2.45 kΩ
40 °C (104 °F)	Approx. 1.148 kΩ
60 °C (140 °F)	Approx. 0.587 kΩ
80 °C (176 °F)	Approx. 0.322 kΩ

ECT SENSOR INSPECTION

- Remove the ECT sensor. (☞5-77)
- Check the ECT sensor by testing it at the bench as shown in the figure. Connect the ECT sensor ① to a circuit tester and place it in the oil ② contained in a pan, which is placed on a stove.
- Heat the oil to raise its temperature slowly and read the column thermometer ③ and the ohmmeter.
- If the ECT sensor ohmic value does not change in the proportion indicated, replace it with a new one.



DATA ECT sensor specification

Engine Coolant Temp	Resistance
20 °C (68 °F)	Approx. 2.45 kΩ
40 °C (104 °F)	Approx. 1.148 kΩ
60 °C (140 °F)	Approx. 0.587 kΩ
80 °C (176 °F)	Approx. 0.322 kΩ

TOOL 09900-25008: Multi-circuit tester set

Tester knob indication: Resistance (Ω)

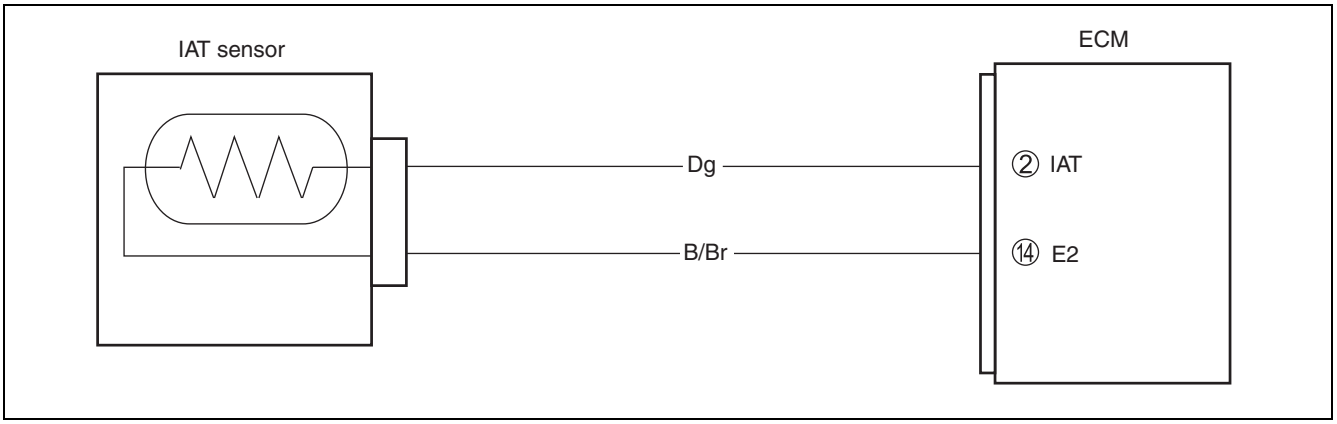
If the resistance is noted to show infinity or too much different resistance value, replace the ECT sensor with a new one.

CAUTION

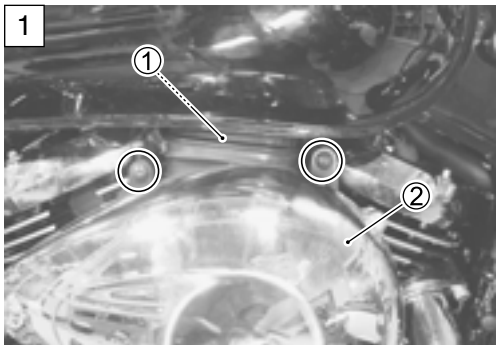
*** Take special care when handling the ECT sensor. It may cause damage if it gets a sharp impact.**
*** Do not contact the ECT sensor and the column thermometer with a pan.**

"C21" (P0110-H/L) IAT SENSOR CIRCUIT MALFUNCTION

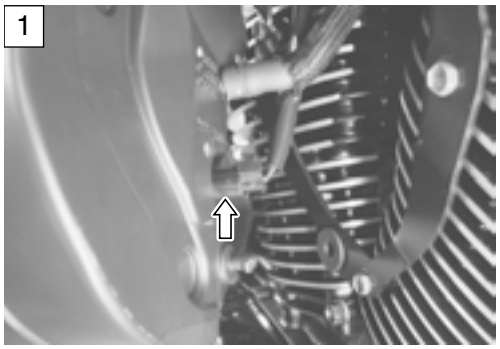
DETECTED CONDITION			POSSIBLE CAUSE
C21		Output voltage is not within the following range. 0.1 ≦ Sensor voltage < 4.6 V	• IAT sensor circuit open or short • IAT sensor malfunction • ECM malfunction
P0110	H	Sensor voltage is higher than specified value.	• IAT sensor circuit open or ground circuit open
	L	Sensor voltage is lower than specified value.	• IAT sensor circuit shorted to ground



INSPECTION
Step 1 (When indicating C21:)
1) Loosen the inlet pipe screw ①.
2) Remove the air cleaner box ②.



3) Turn the ignition switch OFF.
4) Check the IAT sensor coupler for loose or poor contacts.
   If OK, then measure the IAT sensor voltage at the wire side coupler.
5) Disconnect the IAT sensor coupler and turn the ignition switch ON.



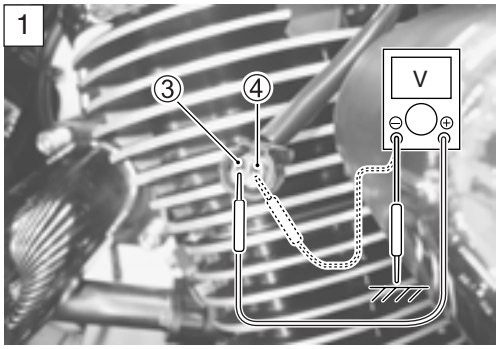
6) Measure the voltage between Dg wire terminal ③ and ground.
7) Also, measure the voltage between Dg wire terminal ③ and B/Br wire terminal ④.

DATA IAT sensor input voltage: 4.5 – 5.5 V
(⊕ Dg – ⊖ Ground)
(⊕ Dg – ⊖ B/Br)

TOOL 09900-25008: Multi-circuit tester set

Tester knob indication: Voltage (⎓)

1



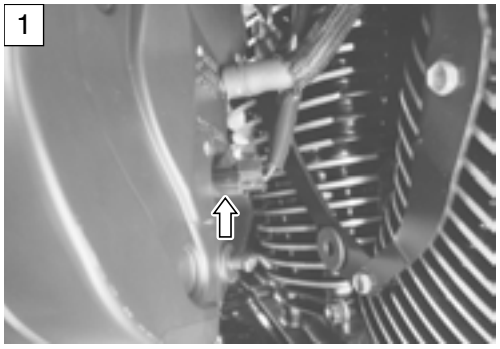
Is the voltage OK?

YES	Go to Step 2.
NO	• Loose or poor contacts on the ECM coupler (terminal ② or ⑭) • Open or short circuit in the Dg wire or B/Br wire

Step 1 (When indicating P0110-H:)

1) Loosen the inlet pipe screw. (☞5-47)
2) Remove the air cleaner box. (☞6-13)
3) Turn the ignition switch OFF.
4) Check the IAT sensor coupler for loose or poor contacts.
   If OK, then check the IAT sensor lead wire continuity.

1



5) Remove the right frame cover. (☞8-4)
6) Disconnect the IAT sensor coupler.
7) Remove the ECM bracket (☞5-38) and ECM coupler.
8) Check the continuity between Dg wire Ⓐ and terminal ②.
9) Also, check the continuity between B/Br wire Ⓑ and terminal ⑭.

DATA IATS lead wire continuity: Continuity (•))))

TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

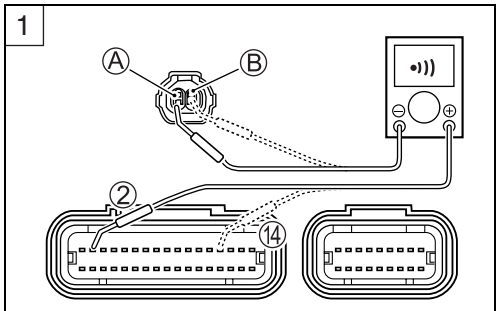
Tester knob indication: Continuity test (•))))

Is the continuity OK?

YES	Go to Step 2.
NO	Dg wire or B/Br wire open

10) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

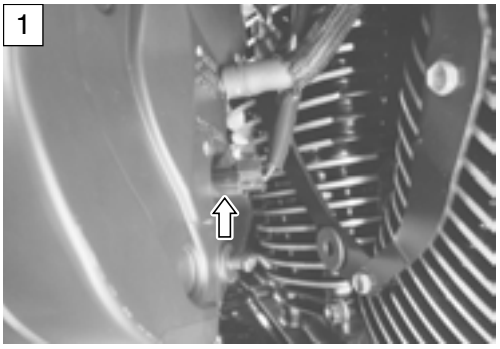
1



ECM coupler (Harness side)

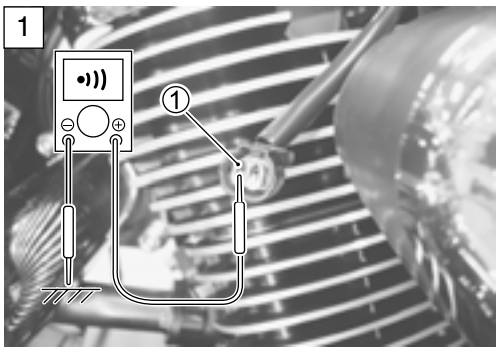
Step 1 (When indicating P0110-L:)

1) Loosen the inlet pipe screw. (☞5-47)
2) Remove the air cleaner box. (☞6-13)
3) Turn the ignition switch OFF.
4) Check the IAT sensor coupler for loose or poor contacts.
   If OK, then check the IAT sensor lead wire continuity.



5) Disconnect the IAT sensor coupler.
6) Check the continuity between Dg wire ① and ground. If the sound is not heard from the tester, the circuit condition is OK.

Tester knob indication: Continuity test (•))))

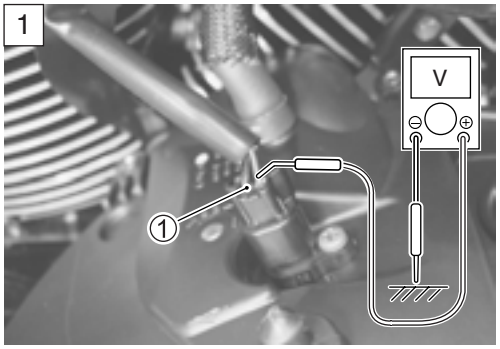


7) Connect the IAT sensor coupler and turn the ignition switch ON.
8) Measure the voltage between Dg wire ① and ground.

DATA IAT sensor output voltage: 0.1 – 4.6 V
(⊕ Dg – ⊖ Ground)

TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Voltage (⎓)



Are the continuity and voltage OK?

YES	Go to Step 2.
NO	• Dg wire shorted to ground • If wire is OK, go to Step 2.

9) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

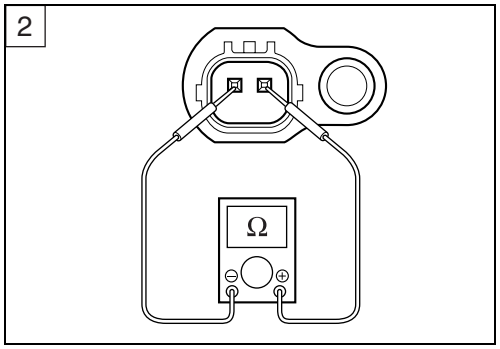
Step 2

1) Turn the ignition switch OFF.
2) Disconnect the IAT sensor coupler.
3) Measure the IAT sensor resistance.

DATA IAT sensor resistance: Approx. 2.6 kΩ at 20 °C (68 °F) (Terminal – Terminal)

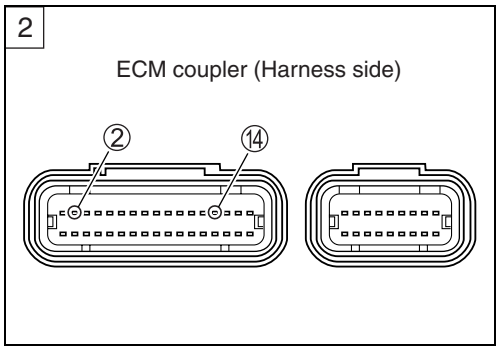
TOOL 09900-25008: Multi-circuit tester set

Tester knob indication: Resistance (Ω)



Is the resistance OK?

YES	• Dg or B/Br wire open or shorted to ground, or poor ② or ⑭ connection • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection. • Replace the ECM with a known good one, and inspect it again.
NO	Replace the IAT sensor with a new one.



DATA IAT sensor specification

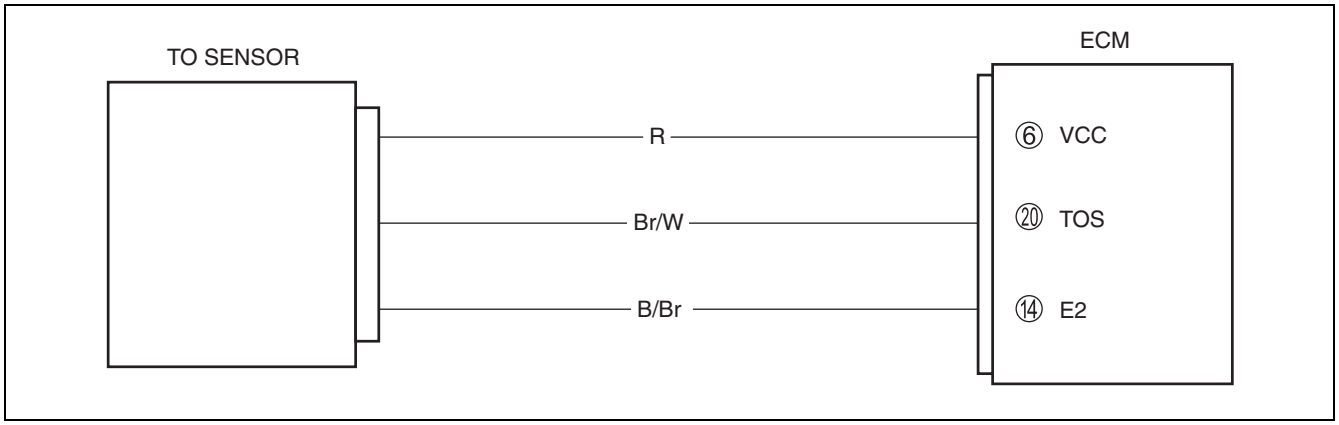
Intake Air Temp.	Resistance
20 °C (68 °F)	Approx. 2.6 kΩ
50 °C (122 °F)	Approx. 0.8 kΩ
80 °C (176 °F)	Approx. 0.3 kΩ
110 °C (230 °F)	Approx. 0.2 kΩ

NOTE:
IAT sensor resistance measurement method is the same way as that of the ECT sensor. Refer to 5-46 for details.

4) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

"C23" (P1651-H/L) TO SENSOR CIRCUIT MALFUNCTION

DETECTED CONDITION			POSSIBLE CAUSE
C23		The sensor voltage should be the following for 2 sec. and more, after ignition switch is turned ON. 0.2 ≦ Sensor voltage < 4.6 V	• TO sensor circuit open or short • TO sensor malfunction • ECM malfunction
P1651	H	Sensor voltage is higher than specified value.	• TO sensor circuit open or shorted to VCC or ground circuit open
	L	Sensor voltage is lower than specified value.	• TO sensor circuit shorted to ground or VCC circuit open

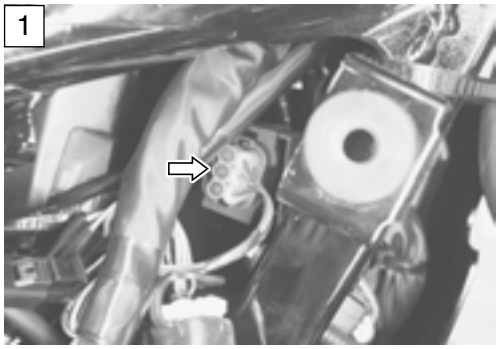


INSPECTION

Step 1 (When indicating C23:)

1) Remove the right frame cover. (☞8-4)
2) Turn the ignition switch OFF.
3) Check the TO sensor coupler for loose or poor contacts.
   If OK, then measure the TO sensor resistance.
4) Disconnect the TO sensor coupler.

1



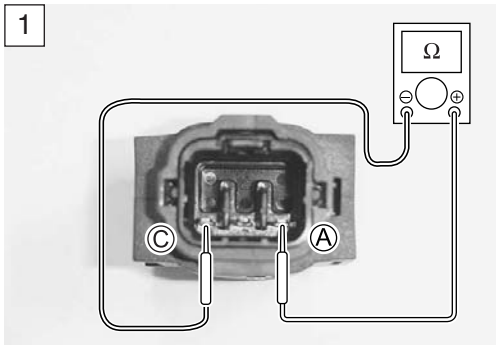
5) Measure the resistance between terminal Ⓐ and terminal Ⓒ.

DATA TO sensor resistance: 19.1 – 19.7 kΩ
(Terminal Ⓐ – Terminal Ⓒ)

TOOL 09900-25008: Multi-circuit tester set

Tester knob indication: Resistance (Ω)

1

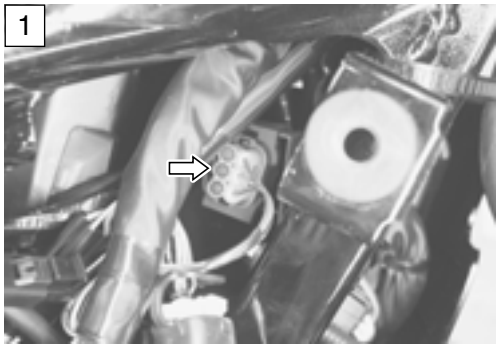


Is the resistance OK?

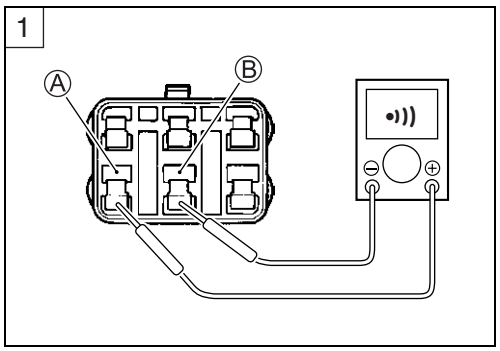
YES	Go to Step 2.
NO	Replace the TO sensor with a new one.

Step 1 (When indicating P1651-H:)

1) Remove the right frame cover. (☞8-4)
2) Turn the ignition switch OFF.
3) Check the TO sensor coupler for loose or poor contacts.
   If OK, then check the TO sensor lead wire continuity.



4) Disconnect the TO sensor coupler.
5) Check the continuity between Red wire Ⓐ and Br/W wire Ⓑ.
   If the sound is not heard from the tester, the circuit condition is OK.

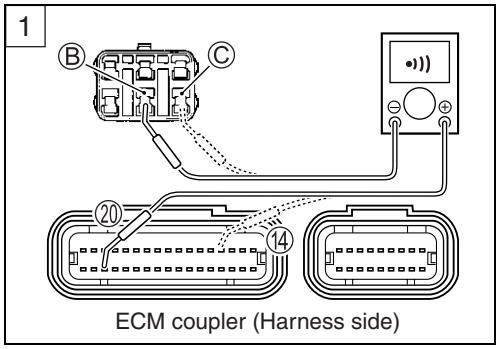


6) Remove the ECM bracket (☞5-38) and disconnect the ECM coupler.
7) Check the continuity between Br/W wire Ⓑ and terminal ⑳.
8) Also, check the continuity between B/Br wire Ⓒ and terminal ⑭.

DATA TOS lead wire continuity: Continuity (•))))

TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Continuity test (•))))



ECM coupler (Harness side)

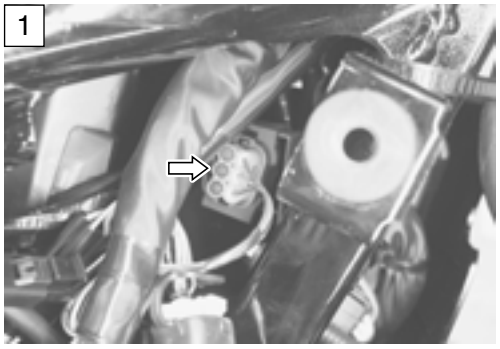
Is the continuity OK?

YES	Go to Step 2.
NO	Br/W wire shorted to VCC, or B/Br wire open

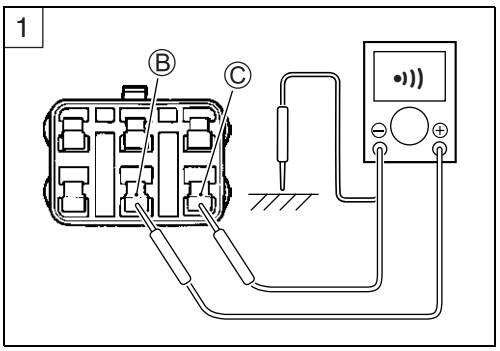
9) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

Step 1 (When indicating P1651-L:)

1) Remove the right frame cover. (☞8-4)
2) Turn the ignition switch OFF.
3) Check the TO sensor coupler for loose or poor contacts.
   If OK, then check the TO sensor lead wire continuity.



4) Disconnect the TO sensor coupler.
5) Check the continuity between Br/W wire Ⓑ and ground.
6) Also, check the continuity between Br/W wire Ⓑ and B/Br wire Ⓒ. If the sound is not heard from the tester, the circuit condition is OK.

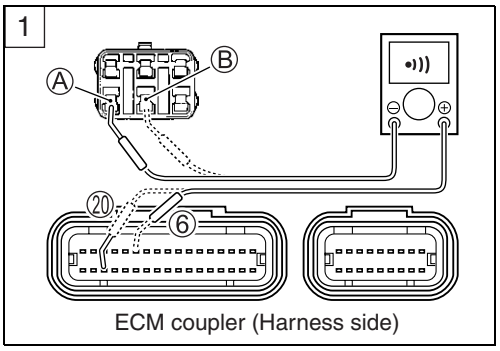


7) Remove the ECM bracket (☞5-38) and disconnect the ECM coupler.
8) Check the continuity between Red wire Ⓐ and terminal ⑥.
9) Also, then check the continuity between Br/W wire Ⓑ and terminal ⑳.

DATA TOS lead wire continuity: Continuity (•))))

TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Continuity test (•))))



Is the continuity OK?

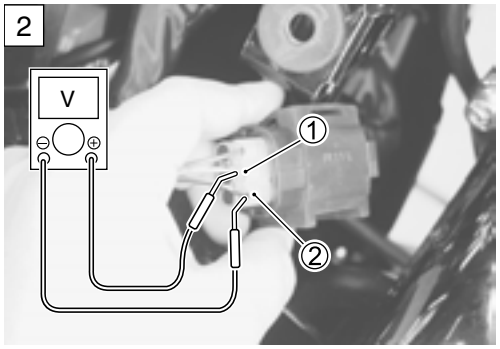
YES	Go to Step 2.
NO	Red or Br/W wire open, or Br/W wire shorted to ground

10) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

Step 2

1) Connect the TO sensor coupler.
2) Insert the needle pointed probes to the lead wire coupler.
3) Turn the ignition switch ON.
4) Measure the voltage at the wire side coupler between Br/W ① and B/Br ② wires.
   Also, measure the voltage when leaning the motorcycle.

DATA TO sensor voltage (Normal): 0.4 – 1.4 V
(⊕ Br/W – ⊖ B/Br)

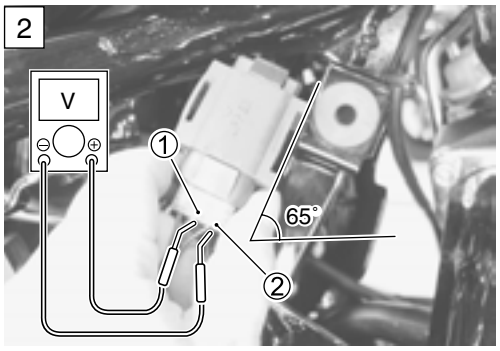


5) Dismount the TO sensor from its bracket and measure the voltage when it is leaned 65° and more, left and right, from the horizontal level.

DATA TO sensor voltage (Leaning): 3.7 – 4.4 V
(⊕ Br/W – ⊖ B/Br)

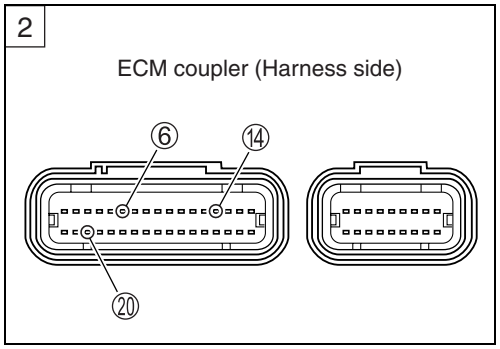
TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Voltage (⎓)



Is the voltage OK?

YES	• Red, Br/W or B/Br wire open or shorted to ground, or poor ⑥, ⑭ or ⑳ connection • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection. • Replace the ECM with a known good one, and inspect it again.
NO	• Loose or poor contacts on the ECM coupler • Open or short circuit • Replace the TO sensor with a new one.



6) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

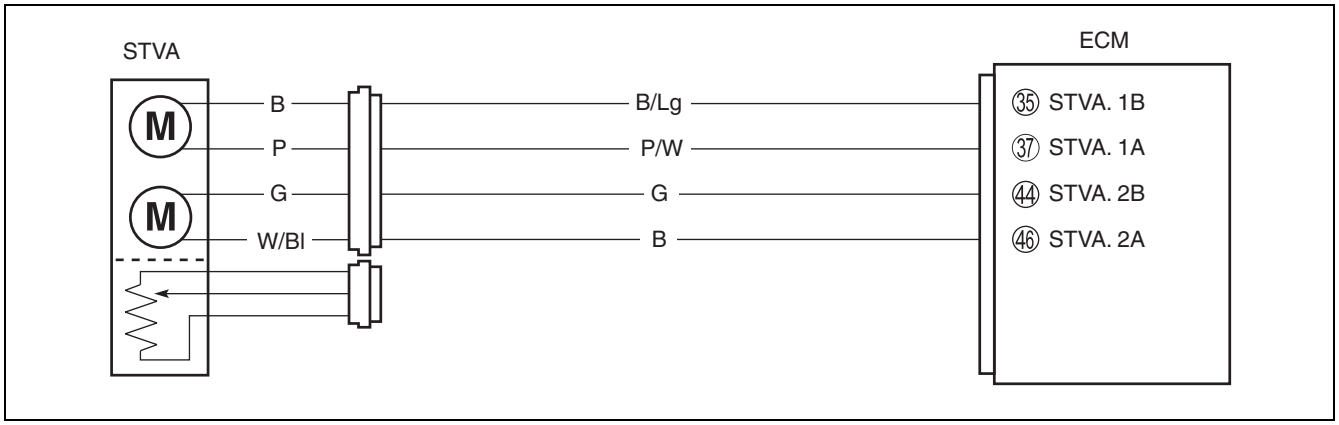
"C24" (P0351) or "C25" (P0352) IGNITION SYSTEM MALFUNCTION

(When indicating C24/P0351 for IG coil #1)
(When indicating C25/P0352 for IG coil #2)

*** Refer to the IGNITION SYSTEM for details. (☞9-20)**

"C28" (P1655) STV ACTUATOR CIRCUIT MALFUNCTION

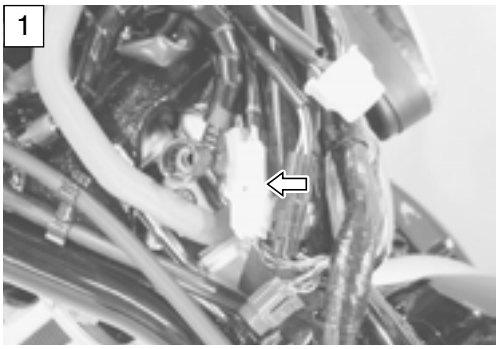
DETECTED CONDITION	POSSIBLE CAUSE
The operation voltage does not reach the STVA. ECM does not receive communication signal from the STVA.	• STVA malfunction • STVA circuit open or short • STVA motor malfunction



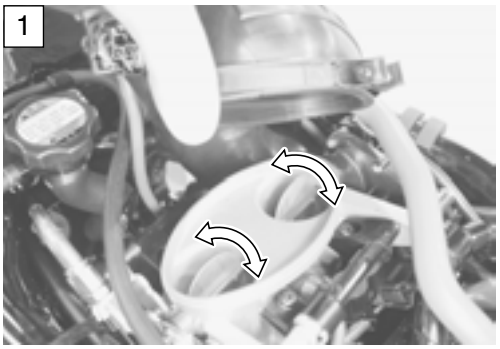
INSPECTION

Step 1

1) Remove the fuel tank. (☞6-3)
2) Turn the ignition switch OFF.
3) Check the STVA lead wire coupler for loose or poor contacts.



4) Loosen the inlet pipe screw. (☞2-7)
   Lift up the inlet pipe. (☞5-45)
5) Turn the ignition switch ON to check the STV operation.
   (STV operating order: 95% open → Full open → 95% open)



Is the operating OK?

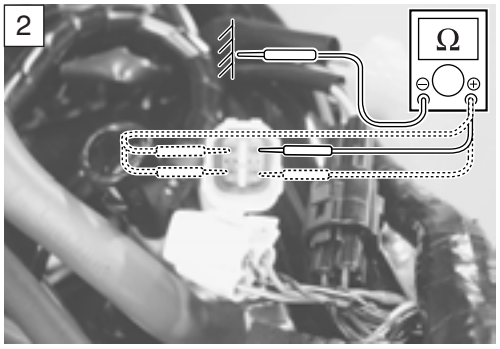
YES	Go to Step 2.
NO	• Loose or poor contacts on the STVA coupler • Open or short circuit in the B/Lg, P/W, Black or Green wires • If wire and connection are OK, go to Step 2.

6) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

Step 2

1) Turn the ignition switch OFF.
2) Disconnect the STVA lead wire coupler.
3) Check the continuity between each terminal and ground.

DATA **STVA continuity: ∞ Ω (Infinity)**
(Terminal – Ground)

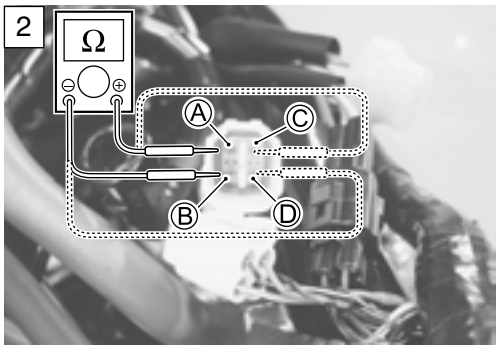


4) If OK, then measure the STVA resistance (between Black wire Ⓐ and Pink wire Ⓑ) and (between Green wire Ⓒ and W/Bl wire Ⓓ).

DATA **STVA resistance: Approx. 6.5 Ω**
(Black Ⓐ – Pink Ⓑ)
(Green Ⓒ – W/Bl Ⓓ)

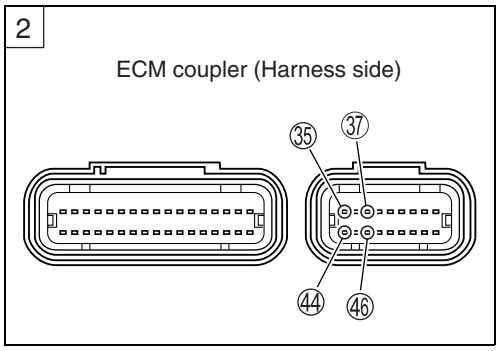
TOOL **09900-25008: Multi-circuit tester set**

Tester knob indication: Resistance (Ω)



Is the resistance OK?

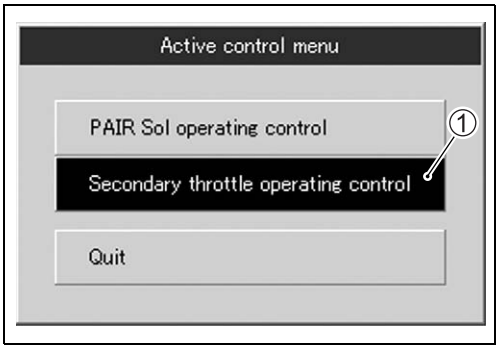
YES	• B/Lg, P/W, Green and Black wire open or shorted to ground, or poor ㉟, ㊲, ㊹ and ㊻ connection • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection. • Replace the ECM with a known good one, and inspect it again.
NO	• Loose or poor contacts on the ECM coupler • Replace the STVA with a new one.



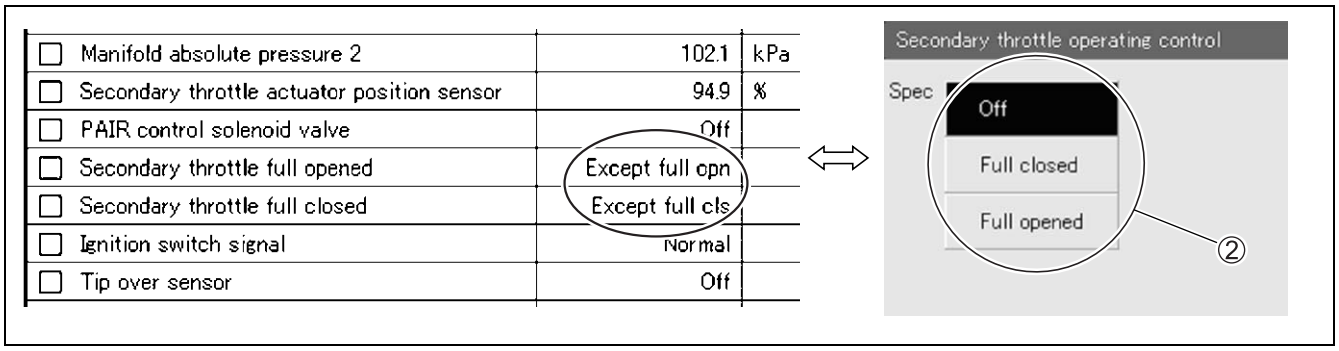
5) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

ACTIVE CONTROL INSPECTION

1) Set up the SDS tool. (Refer to the SDS operation manual for further details)
2) Turn the ignition switch ON.
3) Click “Secondary throttle operating control” ①.

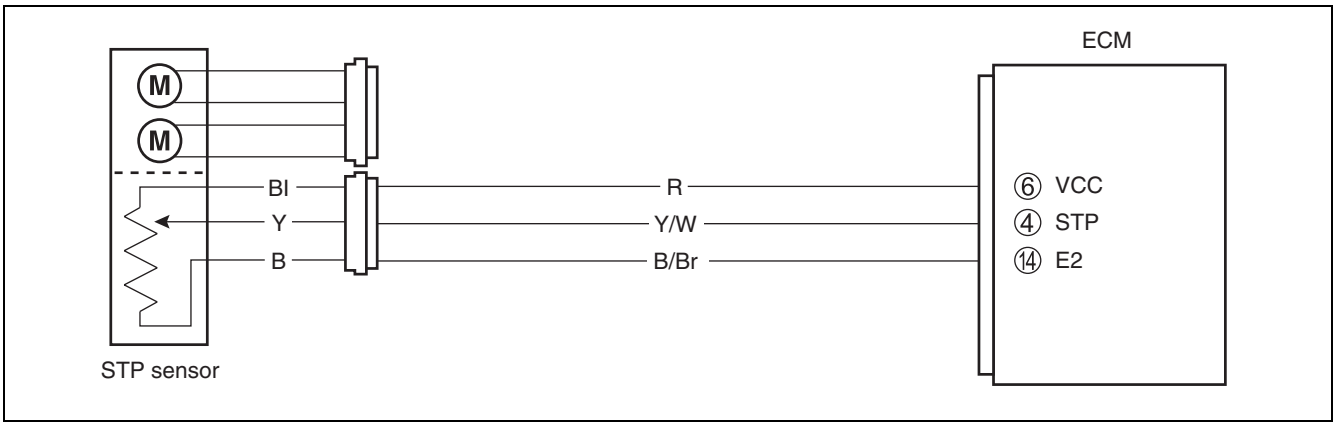


4) Click each button ②.
   At this time, if an operation sound is heard from the STVA, the function is normal.



"C29" (P1654-H/L) STP SENSOR CIRCUIT MALFUNCTION

DETECTED CONDITION			POSSIBLE CAUSE
C29		Signal voltage is not within the following range. Difference between actual throttle opening and opening calculated by ECM is larger than specified value. 0.1 V ≦ Sensor voltage < 4.8 V	• STP sensor maladjusted • STP sensor circuit open or short • STP sensor malfunction • ECM malfunction
P1654	H	Sensor voltage is higher than specified value.	• STP sensor circuit shorted to VCC or ground circuit open
	L	Sensor voltage is lower than specified value.	• STP sensor circuit open or shorted to ground or VCC circuit open



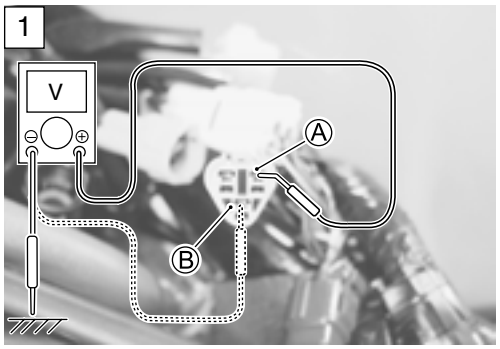
INSPECTION

Step 1 (When indicating C29:)

1) Remove the fuel tank. (☞6-3)
2) Turn the ignition switch OFF.
3) Check the STP sensor coupler for loose or poor contacts.
   If OK, then measure the STP sensor input voltage.
4) Disconnect the STP sensor coupler.
5) Turn the ignition switch ON.
6) Measure the voltage at the Red wire Ⓐ and ground.
7) Also, measure the voltage at the Red wire Ⓐ and B/Br wire Ⓑ.



DATA STP sensor input voltage: 4.5 – 5.5 V
(⊕ Red – ⊖ Ground)
(⊕ Red – ⊖ B/Br)



TOOL 09900-25008: Multi-circuit tester set

Tester knob indication: Voltage (⎓)

Is the voltage OK?

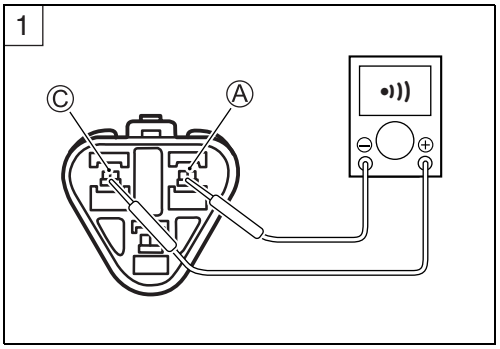
YES	Go to Step 2.
NO	• Loose or poor contacts on the ECM coupler (terminal ⑥ or ⑭) • Open or short circuit in the Red wire or B/Br wire

Step 1 (When indicating P1654-H:)

1) Remove the fuel tank. (☞6-3)
2) Turn the ignition switch OFF.
3) Check the STP sensor coupler for loose or poor contacts.
   If OK, then check the STP sensor lead wire continuity.



4) Disconnect the STP sensor coupler.
5) Check the continuity between Y/W wire Ⓒ and Red wire Ⓐ.
   If the sound is not heard from the tester, the circuit condition is OK.

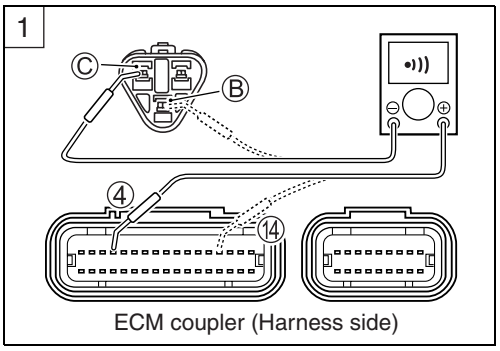


6) Remove the right frame cover. (☞8-4)
7) Remove the ECM bracket (☞5-38) and disconnect the ECM coupler.
8) Check the continuity between Y/W wire Ⓒ and terminal ④.
9) Also, check the continuity between B/Br wire Ⓑ and terminal ⑭.

DATA STPS lead wire continuity: Continuity (•))))

TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Continuity test (•))))



Is the continuity OK?

YES	Go to Step 2.
NO	Y/W wire shorted to VCC, or B/Br wire open

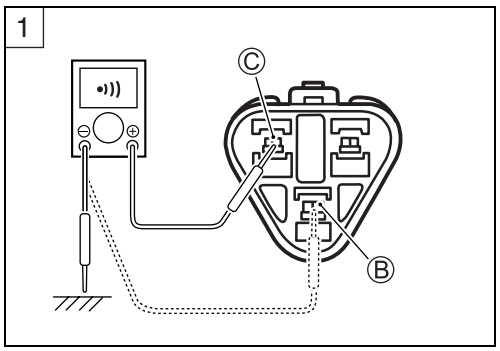
10) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

Step 1 (When indicating P1654-L:)

1) Remove the fuel tank. (☞6-3)
2) Turn the ignition switch OFF.
3) Check the STP sensor coupler for loose or poor contacts.
   If OK, then check the STP sensor lead wire continuity.



4) Disconnect the TO sensor coupler.
5) Check the continuity between Y/W wire Ⓒ and ground.
6) Also, check the continuity between Y/W wire Ⓒ and B/Br wire Ⓑ. If the sound is not heard from the tester, the circuit condition is OK.

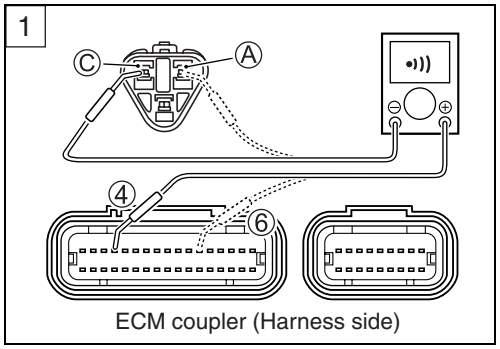


7) Remove the right frame cover. (☞8-4)
8) Remove the ECM bracket (☞5-38) and disconnect the ECM coupler.
9) Check the continuity between Y/W wire Ⓒ and terminal ④.
10) Also, check the continuity between Red wire Ⓐ and terminal ⑥.

DATA STPS lead wire continuity: Continuity (•))))

TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Continuity test (•))))



Is the continuity OK?

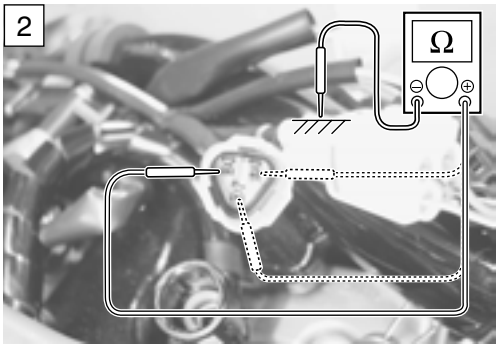
YES	Go to Step 1 (☞5-60) and go to Step 2.
NO	Red or Y/W wire open, or Y/W wire shorted to ground

11) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

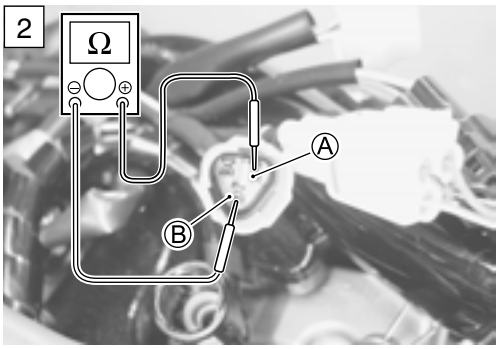
Step 2

1) Turn the ignition switch OFF.
2) Disconnect the STP sensor coupler.
3) Check the continuity between each terminal and ground.

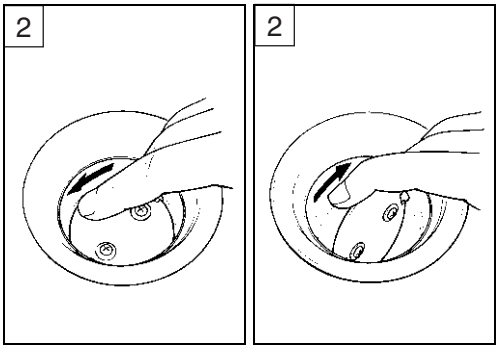
DATA STP sensor continuity: ∞ Ω (Infinity)
(Terminal – Ground)



4) If OK, then measure the STP sensor resistance at the wire terminals (between Yellow wire Ⓐ and Black wire Ⓑ).
5) Loosen the inlet pipe screw. (☞2-7)
Lift up the inlet pipe. (☞5-45)
6) Close and open the secondary throttle valve by finger, and measure the valve closing and opening resistance.



DATA STP sensor resistance
Secondary throttle valve is closed : Approx. 0.5 kΩ
Secondary throttle valve is opened: Approx. 3.9 kΩ
(Yellow Ⓐ – Black Ⓑ)

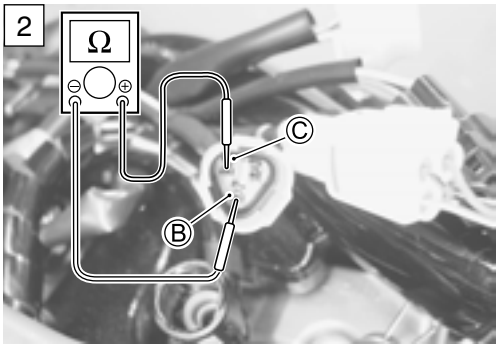


7) If OK, then measure the STP sensor resistance at the wire terminals (between Blue wire Ⓒ and Black wire Ⓑ).

DATA STP sensor resistance: Approx. 4.69 kΩ

TOOL 09900-25008: Multi-circuit tester set

Tester knob indication: Resistance (Ω)



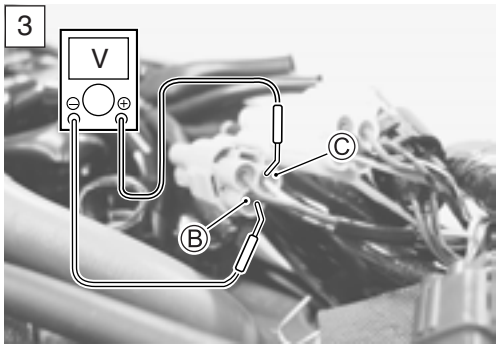
Are the continuity and resistance OK?

YES	Go to Step 3.
NO	• Reset the STP sensor position correctly. • Replace the STP sensor with a new one.

8) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

Step 3

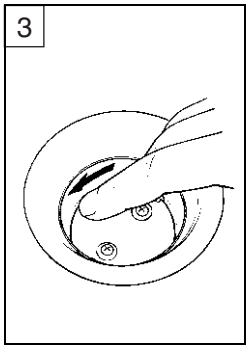
1) Turn the ignition switch OFF.
2) Connect the STP sensor coupler.
3) Insert the needle pointed probes to the STP sensor coupler.
4) Disconnect the STVA lead wire coupler.
5) Loosen the inlet pipe screw. (☞2-7)
   Lift the inlet pipe. (☞5-45)
6) Turn the ignition switch ON.
7) Measure the STP sensor output voltage at the coupler (between ⊕ Y/W Ⓒ wire and ⊖ B/Br Ⓑ wire) by turning the secondary throttle valve (close and open) with a finger.

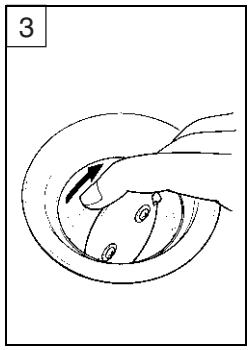


DATA STP sensor output voltage
Secondary throttle valve is closed: Approx. 0.5 V
Secondary throttle valve is opened: Approx. 3.9 V

TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

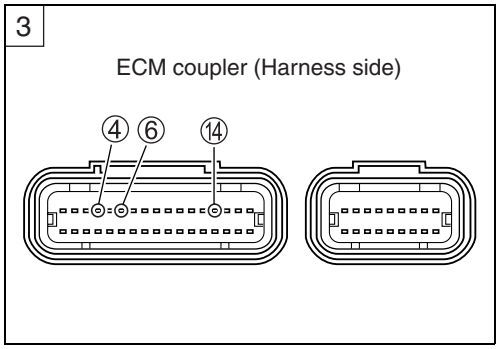
Tester knob indication: Voltage (⎓)





Is the voltage OK?

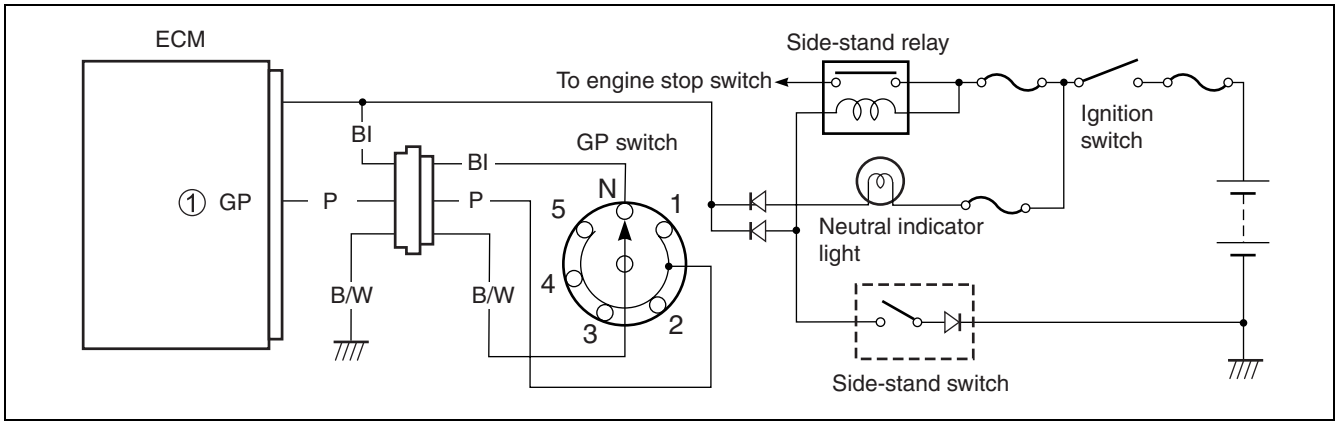
YES	• Red, Y/W or B/Br wire open or shorted to ground, or poor ④, ⑥ or ⑭ connection • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection. • Replace the ECM with a known good one, and inspect it again.
NO	If check result is not satisfactory, replace STP sensor with a new one.



8) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

"C31" (P0705) GP SWITCH CIRCUIT MALFUNCTION

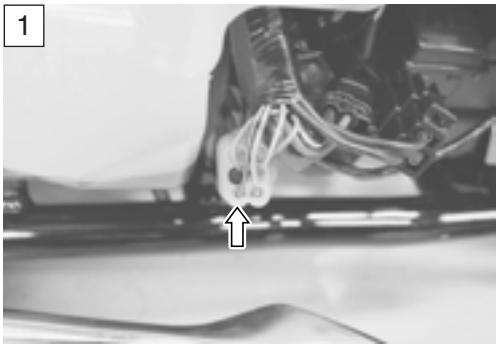
DETECTED CONDITION	POSSIBLE CAUSE
No Gear Position switch voltage. Switch voltage is not within the following range. Switch voltage > 0.6 V	• Gear Position switch circuit open or short • Gear Position switch malfunction • ECM malfunction



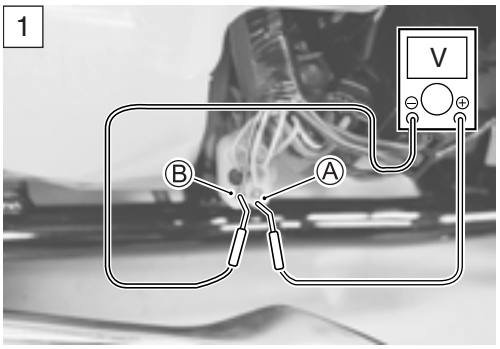
INSPECTION

Step 1

1) Remove the secondary gear case cover. (☞2-16)
2) Turn the ignition switch OFF.
3) Check the GP switch coupler for loose or poor contacts. If OK, then measure the GP switch voltage.



4) Support the motorcycle with a jack.
5) Fold the side-stand to up position.
6) Make sure the engine stop switch is in the "RUN" position.
7) Insert the needle pointed probe to the lead wire coupler.
8) Turn the ignition switch ON.
9) Measure the voltage at the wire side coupler between Pink wire Ⓐ and B/W wire Ⓑ, when shifting the gearshift lever from 1st to Top.



DATA GP switch voltage: 0.6 V and more
(⊕ P Ⓐ – ⊖ B/W Ⓑ)

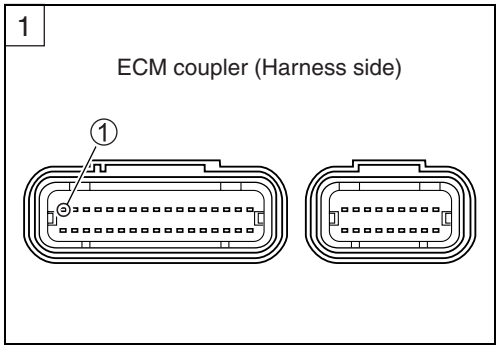
TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Voltage (⎓)

Is the voltage OK?

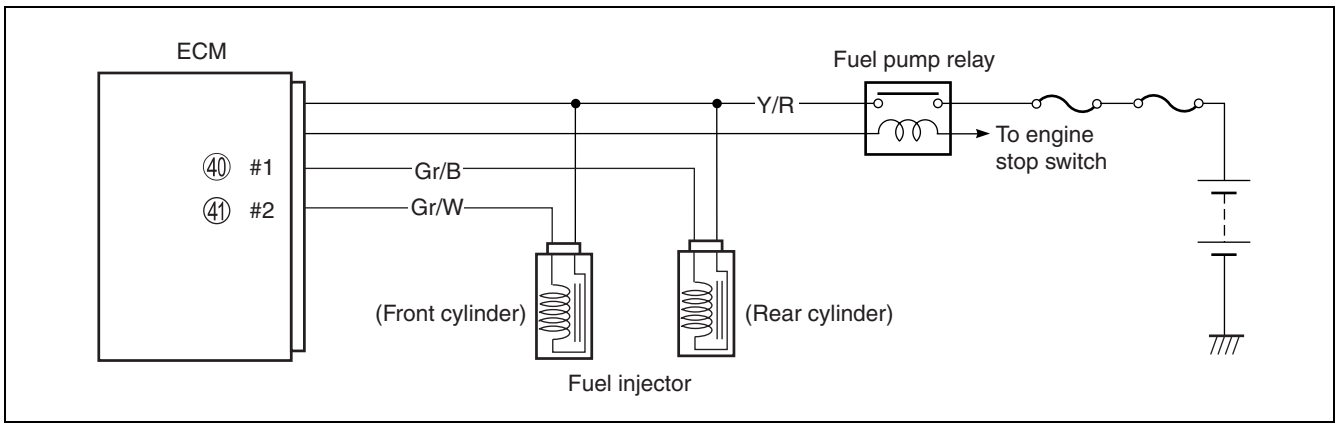
YES	• Pink wire open or shorted to ground • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection. • Replace the ECM with a known good one, and inspect it again.
NO	• P or B/W wire open, or Pink wire shorted to ground • Loose or poor contacts on the ECM coupler (terminal ①) • If wire and connection are OK, replace the GP switch with a new one.

10)After repairing the trouble, clear the DTC using SDS tool. (☞5-25)



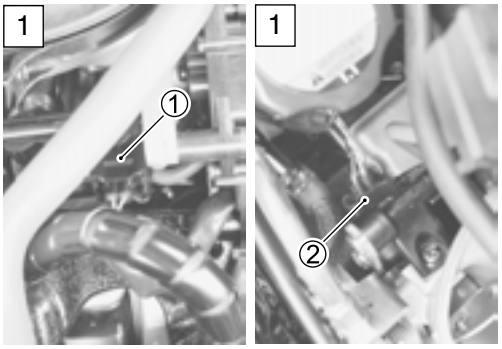
"C32" (P0201) or "C33" (P0202) FUEL INJECTOR CIRCUIT MALFUNCTION

DETECTED CONDITION	POSSIBLE CAUSE
CKP signals produced but fuel injector signal is interrupted continuous by 4 times or more.	• Injector circuit open or short • Injector malfunction • ECM malfunction



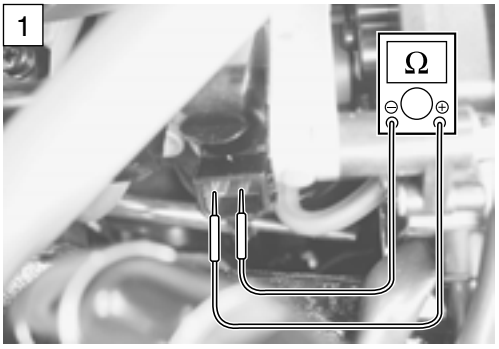
INSPECTION
(When indicating C32/P0201 for fuel injector #1)
(When indicating C33/P0202 for fuel injector #2)

Step 1
1) Remove the fuel tank. (☞6-3)
2) Loosen the inlet pipe screw. (☞2-7)
   Lift up the inlet pipe. (☞5-45)
3) Turn the ignition switch OFF.
4) Check the injector coupler (Front cylinder side ① or Rear cylinder side ②) for loose or poor contacts.
   If OK, then measure the injector resistance.



5) Disconnect the injector coupler and measure the resistance between terminals.

DATA **Injector resistance: Approx. 11.7 Ω at 20 °C (68 °F)**
(Terminal – Terminal)

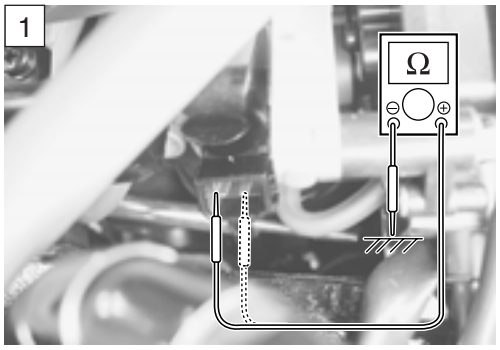


6) If OK, then check the continuity between each terminal and ground.

DATA STP sensor continuity: ∞ Ω (Infinity)

TOOL 09900-25008: Multi-circuit tester set

Tester knob indication: Resistance (Ω)



Are the resistance and continuity OK?

YES	Go to Step 2.
NO	Replace the injector with a new one. (☞6-22)

7) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

Step 2

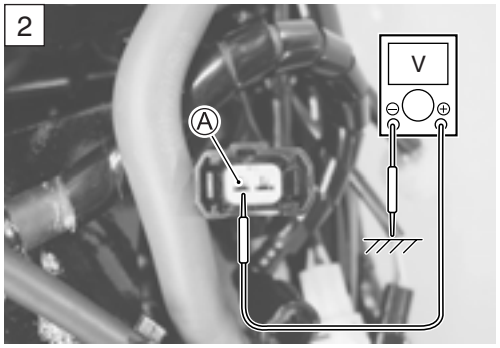
1) Turn the ignition switch ON.
2) Measure the injector voltage between Y/R wire Ⓐ and ground.

DATA Injector voltage: Battery voltage
(⊕ Y/R Ⓐ – ⊖ Ground)

NOTE:
Injector voltage can be detected only 3 seconds after ignition switch is turned ON.

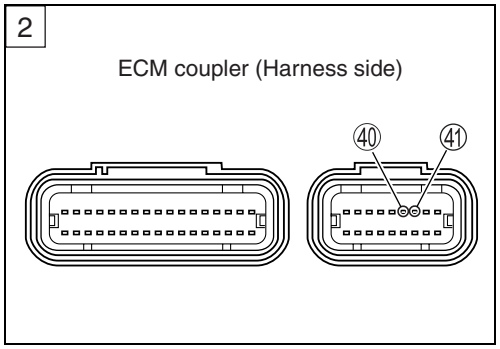
TOOL 09900-25008: Multi-circuit tester set

Tester knob indication: Voltage (⎓)



Is the voltage OK?

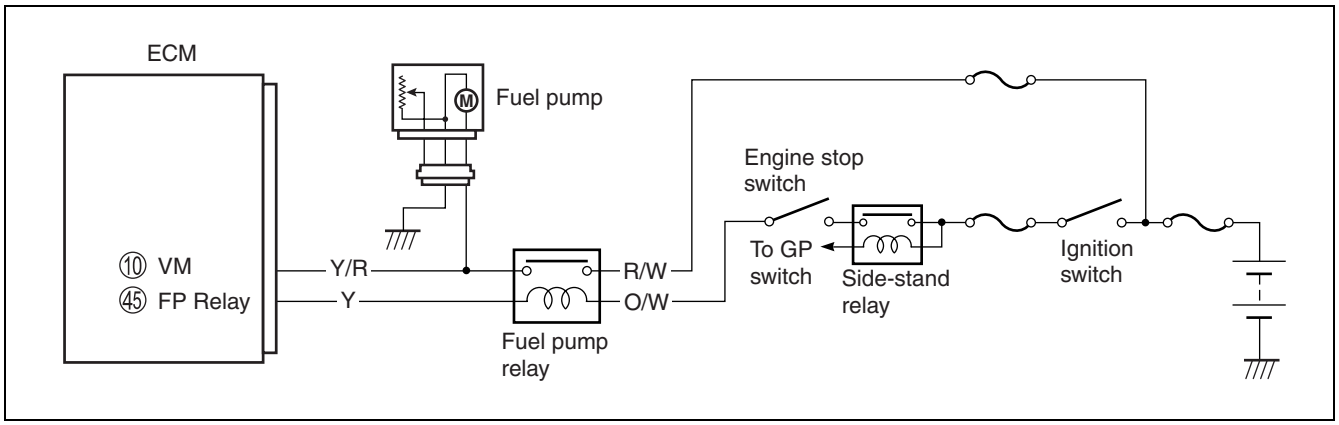
YES	• Gr/W wire open or shorted to ground, or poor ㊶ connection (Front cylinder side) • Gr/B wire open or shorted to ground, or poor ㊵ connection (Rear cylinder side) • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection. • Replace the ECM with a known good one, and inspect it again.
NO	Open circuit in the Y/R wire



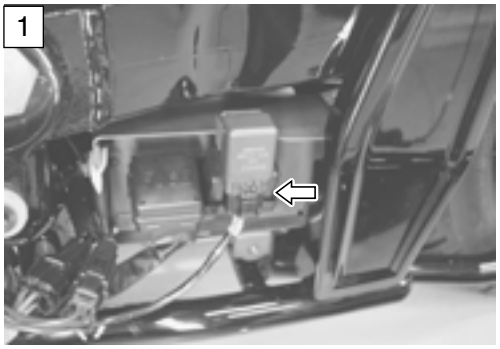
3) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

"C41" (P0230) FP RELAY CIRCUIT MALFUNCTION

DETECTED CONDITION	POSSIBLE CAUSE
No voltage is applied to fuel pump although fuel pump relay is turned ON, or voltage is applied to fuel pump, although fuel pump relay is turned OFF.	• Fuel pump relay circuit open or short • Fuel pump relay malfunction • ECM malfunction

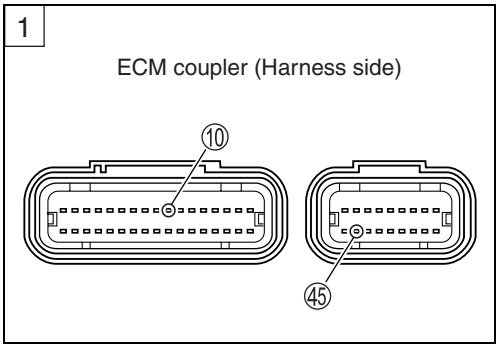


INSPECTION
Step 1
1) Remove the secondary gear case cover. (☞2-16)
2) Turn the ignition switch OFF.
3) Check the FP relay coupler for loose or poor contacts.
   If OK, then check the FP relay.
   (Refer to page 6-6 for details.)



Is the FP relay OK?

YES	• Yellow or O/W wire open or shorted to ground, or poor ㊺ connection • Y/R or R/W wire open or poor ⑩ connection • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection. • Replace the ECM with a known good one, and inspect it again.
NO	Replace the FP relay with a new one.



4)After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

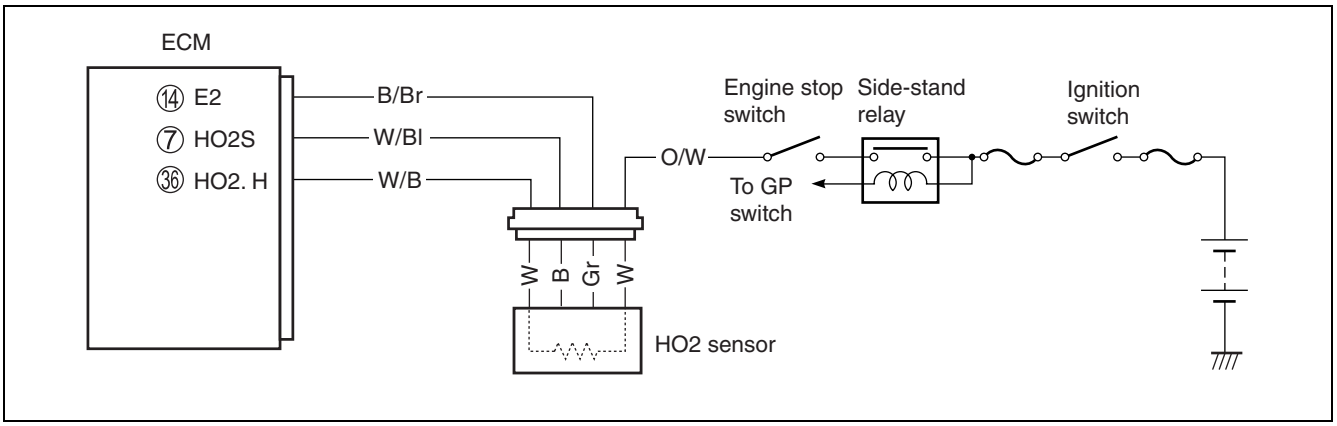
"C42" (P01650) IG SWITCH CIRCUIT MALFUNCTION

DETECTED CONDITION	POSSIBLE CAUSE
Ignition switch signal is not input in the ECM.	• Ignition system circuit open or short • ECM malfunction

INSPECTION
*** Refer to the IGNITION SWITCH INSPECTION for details. (☞9-36)**

"C44" (P0130/P0135) HO2 SENSOR (HO2S) CIRCUIT MALFUNCTION (FOR E-02, 19, 24)

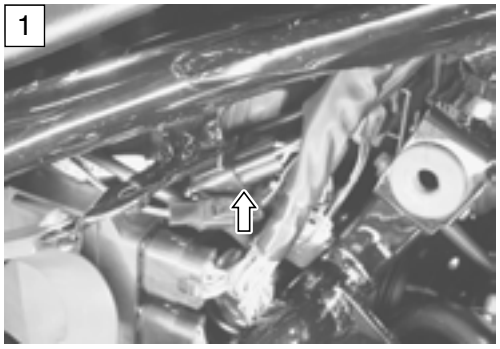
DETECTED CONDITION		POSSIBLE CAUSE
C44 (P0130)	HO2 sensor output voltage is not input to ECM during engine operation and running condition. (Sensor voltage $\leqq$ 0.1 V)	• HO2 sensor circuit open or shorted to ground • Fuel system malfunction • ECM malfunction
C44 (P0135)	The heater can not operate so that heater operation voltage is not supply to the oxygen heater circuit.	• Battery voltage supply to the HO2 sensor



INSPECTION

Step 1 (When indicating C44/P0130:)

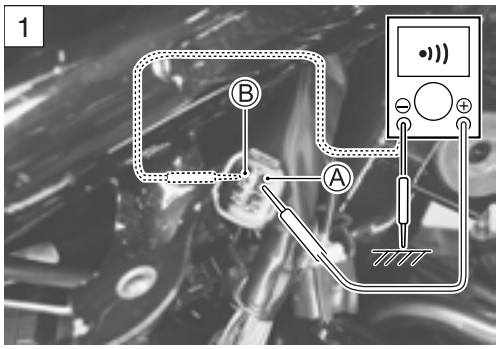
1) Remove the right frame cover. (☞8-4)
2) Turn the ignition switch OFF.
3) Check the HO2 sensor for loose or poor contacts.
   If OK, then check the HO2 sensor lead wire continuity.



4) Disconnect the HO2 sensor coupler
5) Check the continuity between W/Bl wire Ⓐ and ground.
6) Also, check the continuity between W/Bl wire Ⓐ and B/Br wire Ⓑ. If the sound is not heard from the tester, the circuit condition is OK.

TOOL 09900-25008: Multi-circuit tester set

Tester knob indication: Continuity test (•))))

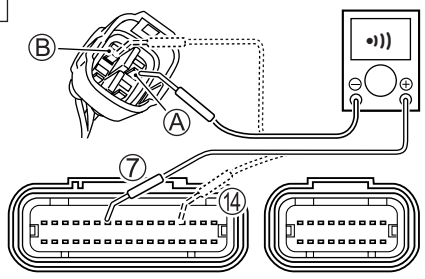


7) Remove the right frame cover. (☞8-4)
8) Remove the ECM bracket (☞5-38) and disconnect the ECM coupler.
9) Check the continuity between W/Bl wire Ⓐ and terminal ⑦.
10) Also, check the continuity between B/Br wire Ⓑ and terminal ⑭.

DATA HO2S lead wire continuity: Continuity (•))))

TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Continuity test (•))))

1


ECM coupler (Harness side)

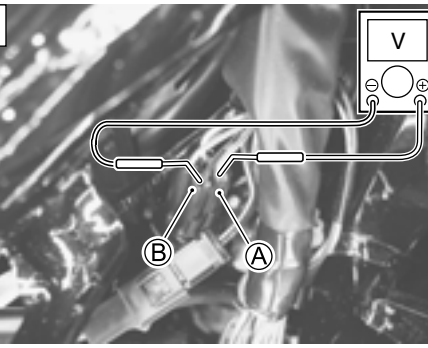
Is the continuity OK?

YES	Go to Step 2. (When indicating C44/P0130:)
NO	W/Bl wire shorted to ground, or W/Bl or B/Br wire open

11) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

Step 2 (When indicating C44/P0130:)
1) Connect the ECM coupler and HO2 sensor coupler.
2) Warm up the engine enough.
3) Insert the needle pointed probes to the HO2 sensor coupler.
4) Measure the HO2 sensor output voltage between W/Bl wire Ⓐ and B/Br wire Ⓑ, when idling condition.

DATA HO2 sensor output voltage at idle speed:
0.2 V and less (⊕ W/Bl Ⓐ – ⊖ B/Br Ⓑ)

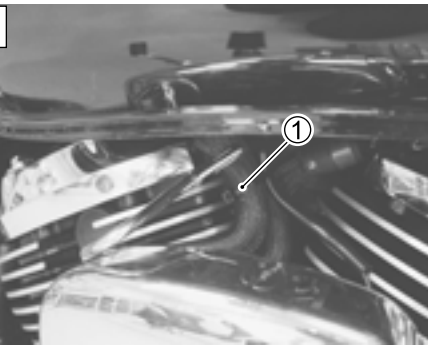
2


5) If OK, then pinch the PAIR hose ① with a proper hose clamp.
6) Measure the HO2 sensor output voltage while holding the engine speed at 5 000 r/min.

DATA HO2 sensor output voltage at 5 000 r/min:
0.7 V and more (⊕ W/Bl – ⊖ B/Br)

TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Voltage (⎓)

2


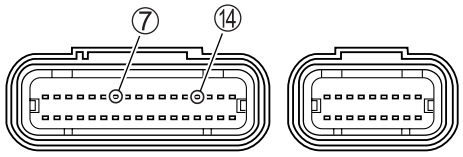
NOTE:
HO2 SENSOR VOLTAGE MEASURING CONDITION
1. 10 minutes after the engine start (Idling) or 100 sec. after the engine start (Engine revolution is over 2 000 r/min).
2. Coolant temperature is upper 45 °C (113 °F).

Is the voltage OK?

YES	• W/Bl wire or B/Br wire open or shorted to ground, or poor ⑦ or ⑭ connection • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection. • Replace the ECM with a known good one, and inspect it again.
NO	Replace the HO2 sensor with a new one.

3) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

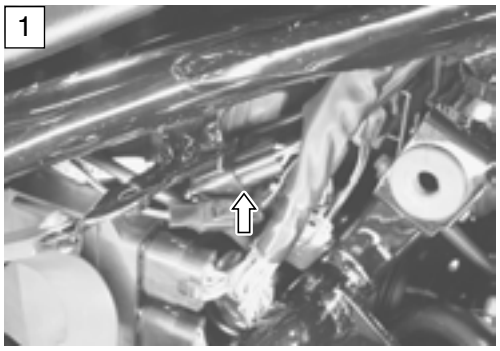
2



Step 1 (When indicating C44/P0135:)

1) Remove the right frame cover. (☞8-4)
2) Turn the ignition switch OFF.
3) Check the HO2 sensor for loose or poor contacts.
   If OK, then measure the HO2 sensor resistance.

1



4) Disconnect the HO2 sensor coupler and measure the resistance between terminals.

DATA HO2 heater resistance: 6.5 – 8.9 Ω at 23 °C (73.4 °F) (White – White)

NOTE:

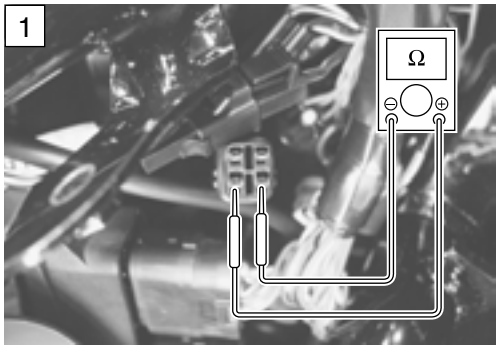
** Temperature of the sensor affects resistance value largely.*

** Make sure that the sensor heater is at correct temperature.*

TOOL 09900-25008: Multi-circuit tester set

Tester knob indication: Resistance (Ω)

1



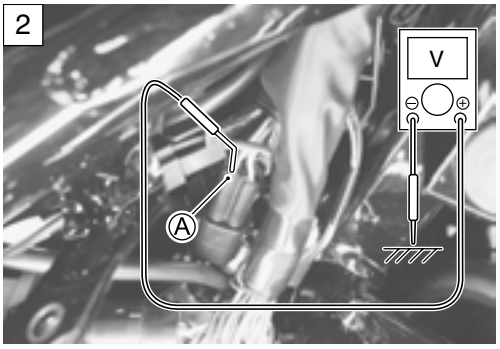
Is the voltage OK?

YES	Go to Step 2.
NO	Replace the HO2 sensor with a new one.

5) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

Step 2 (When indicating C44/P0135:)

1) Connect the HO2 sensor coupler.
2) Insert the needle pointed probes to the HO2 sensor coupler.
3) Turn the ignition switch ON and measure the heater voltage between W/B wire Ⓐ and ground.
4) If the tester voltage indicates the battery voltage, it is good condition.



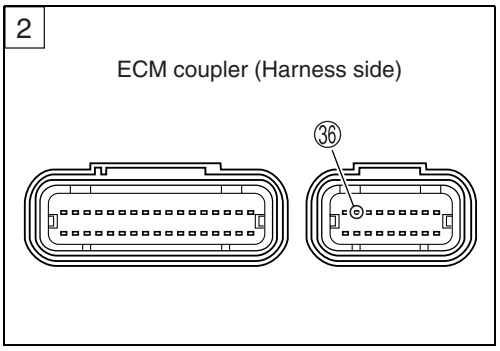
DATA Heater voltage: Battery voltage
(⊕ W/B Ⓐ – ⊖ Ground)

NOTE:
Battery voltage can be detected only before starting the engine.

TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Voltage (⎓)

Is the voltage OK?

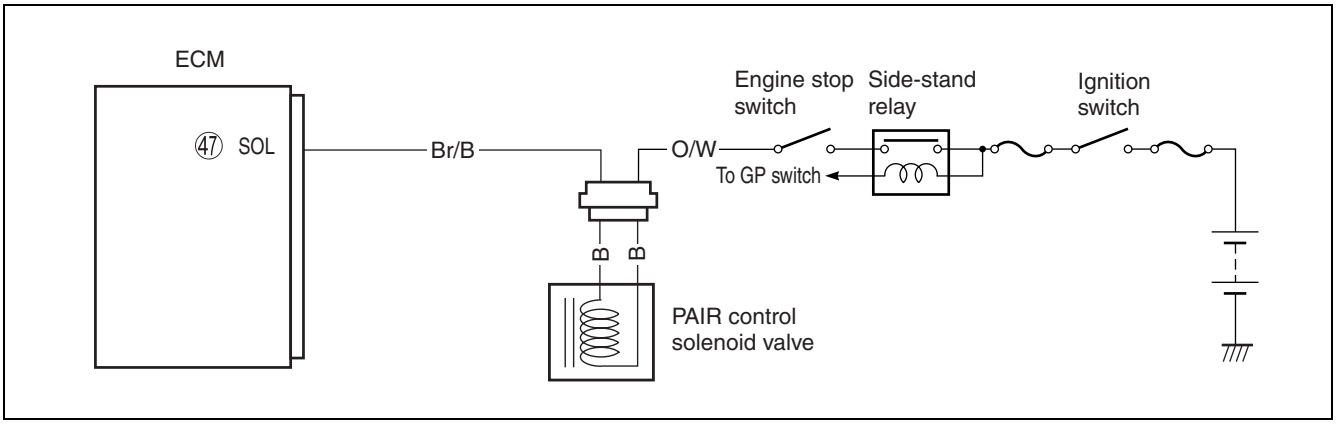


YES	• O/W or W/B wire open or shorted to ground, or poor ㊱ connection • Recheck each terminal and wire harness for open circuit and poor connection. • If wire and connection are OK, intermittent trouble or faulty ECM. • Replace the ECM with a known good one, and inspect it again.
NO	• Open or short circuit in the W/B wire or O/W wire • Loose or poor contacts on the ECM coupler (terminal ㊱) or HO2 sensor coupler

5) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

"C49" (P1656) PAIR CONTROL SOLENOID VALVE CIRCUIT MALFUNCTION

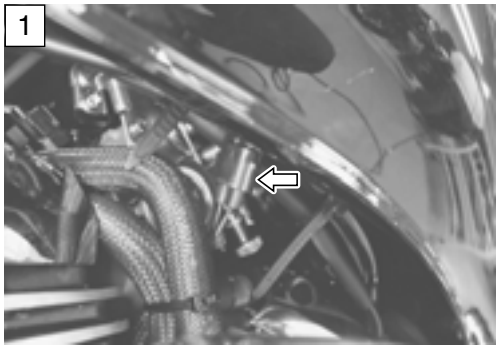
DETECTED CONDITION	POSSIBLE CAUSE
PAIR control solenoid valve voltage is not input to ECM.	• PAIR valve circuit open or short • PAIR valve malfunction • ECM malfunction



INSPECTION

Step 1

1) Turn the ignition switch OFF.
2) Check the PAIR control solenoid valve coupler for loose or poor contacts.
   If OK, then measure the PAIR control solenoid valve resistance.

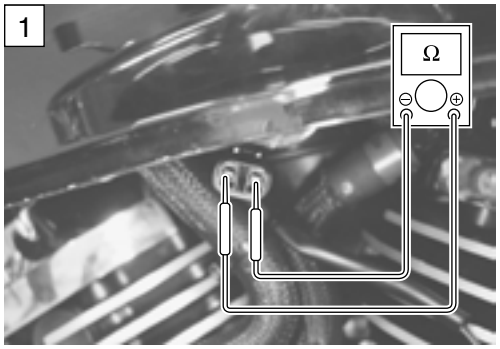


3) Disconnect the PAIR control solenoid valve coupler.
4) Measure the resistance between Black and Black wire terminals.

DATA PAIR valve resistance:
20 – 24 Ω at 20 – 30 °C (68 – 86 °F)
(Black – Black)

TOOL 09900-25008: Multi-circuit tester set

Tester knob indication: Resistance (Ω)

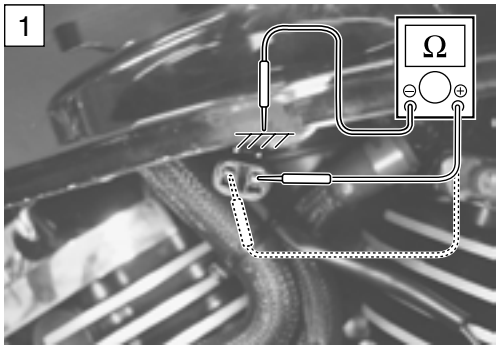


5) If OK, then check the continuity between each terminal and ground.

DATA PAIR valve resistance: ∞ Ω (Infinity)
(Terminal – Ground)

Tester knob indication: Resistance (Ω)

Is the resistance OK?



YES	Go to Step 2.
NO	Replace the PAIR valve with a new one.

6) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

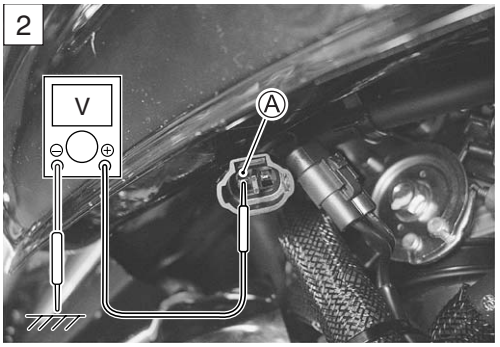
Step 2

1) Turn the ignition switch ON.
2) Measure the voltage between O/W wire Ⓐ and ground.

DATA PAIR valve voltage: Battery voltage
(⊕ O/W Ⓐ – ⊖ Ground)

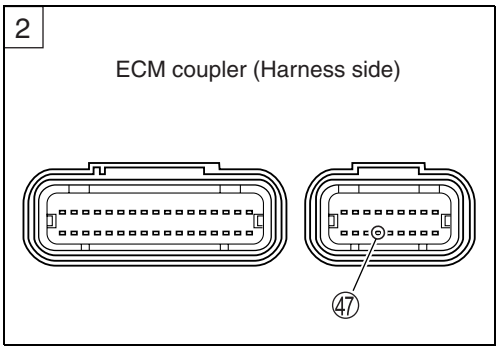
TOOL 09900-25008: Multi-circuit tester set

Tester knob indication: Voltage (⎓)



Is the voltage OK?

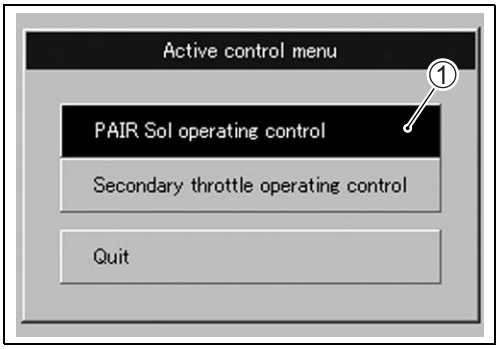
YES	• Br/B wire open or shorted to ground, or poor ㊼ connection • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection. • Replace the ECM with a known good one, and inspect it again.
NO	Open or short circuit in the O/W wire



3) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

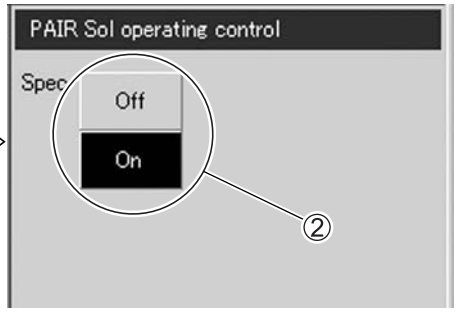
ACTIVE CONTROL INSPECTION

1) Set up the SDS tool. (Refer to the SDS operation manual for further details)
2) Turn the ignition switch ON.
3) Click “PAIR Sol operating control” ①.



4) Click each button ②.
At this time, if an operation sound is heard from the PAIR control solenoid valve, the function is normal.

☐ Gear position	Neutral pos	
☐ Manifold absolute pressure 2	102.1	kPa
☐ Secondary throttle actuator position sensor	94.9	%
☐ PAIR control solenoid valve	On	
☐ Ignition switch signal	Normal	
☐ Tip over sensor	Off	
☐ Clutch switch signal	Off	
☐ Starter signal	Off	



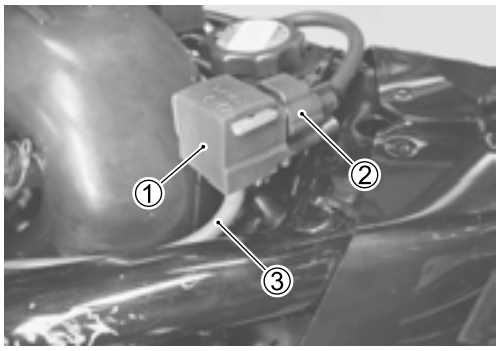
SENSORS

IAP SENSOR INSPECTION

The intake air pressure sensor is located on the air inlet pipe. (☞5-33)

IAP SENSOR REMOVAL/INSTALLATION

- Remove the fuel tank. (☞6-3)
- Remove the IAP sensors ① and disconnect the couplers ② and vacuum hoses ③.
- Installation is in the reverse order of removal.

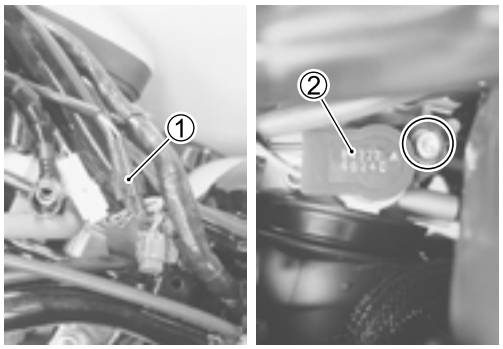


TP SENSOR INSPECTION

The throttle position sensor is installed on the No. 2 throttle body. (☞5-37)

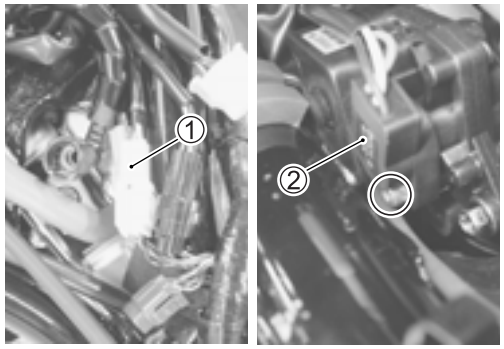
TP SENSOR REMOVAL/INSTALLATION

- Remove the fuel tank. (☞6-3)
- Loosen the inlet pipe screws. (☞5-47)
- Move the inlet pipe. (☞5-19)
- Disconnect the coupler ①.
- Remove the screw with a torx wrench (T25) and TP sensor ②.
- Install the TP sensor to the No. 2 throttle body. (☞6-18)
- TP sensor setting procedure. (☞5-19)



STP SENSOR INSPECTION

The secondary throttle position sensor is installed on the No. 2 throttle body. (☞5-59)

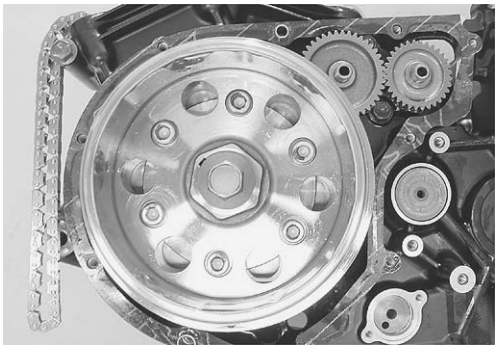


STP SENSOR REMOVAL/INSTALLATION

- Remove the fuel tank. (☞6-3)
- Disconnect the coupler ①.
- Remove the screw with a torx wrench (T25) and STP sensor ②.
- Install the STP sensor to the No. 2 throttle body. (☞6-18)
- STP sensor setting procedure. (☞6-21)

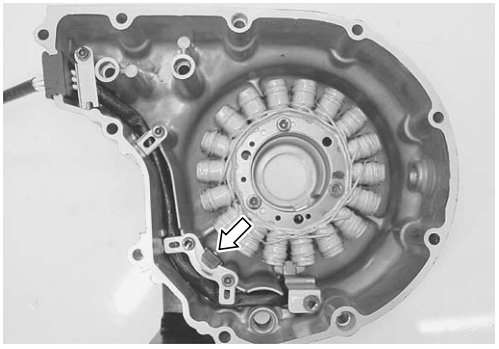
CKP SENSOR INSPECTION

The signal rotor is mounted on the generator rotor and crankshaft position sensor is installed at the inside of the generator cover. (☞5-30)



CKP SENSOR REMOVAL/INSTALLATION

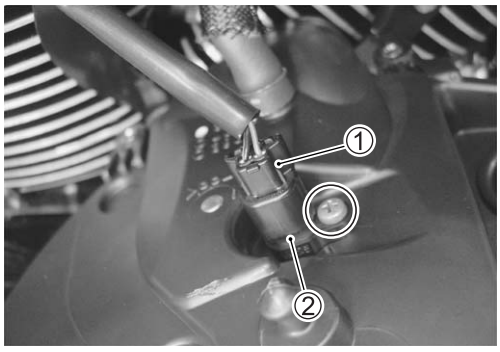
- Remove the generator cover. (☞3-22)
- Remove the CKP sensor.
- Installation is in the reverse order of removal.



IAT SENSOR INSPECTION

The intake air temperature sensor is installed at the back side of the air cleaner box. (☞5-47)

IAT SENSOR REMOVAL/INSTALLATION

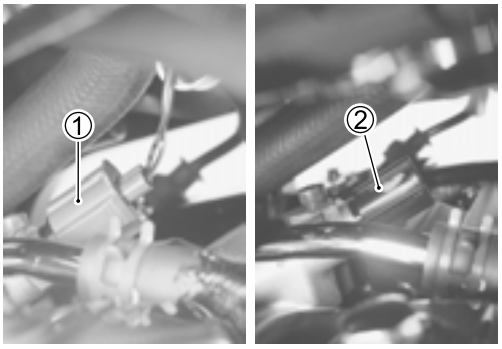


- Remove the air cleaner box. (☞5-47)
- Disconnect the IAT sensor coupler ① and remove the IAT sensor ②.
- Installation is in the reverse order of removal.

ECT SENSOR INSPECTION

The engine coolant temperature sensor is installed at the No. 2 cylinder head cover. (☞5-42)

ECT SENSOR REMOVAL/INSTALLATION



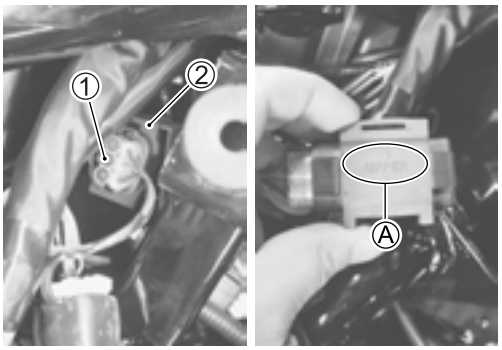
- Remove the fuel tank. (☞6-3)
- Disconnect the ECT sensor coupler ① and remove the ECT sensor ②.
- Installation is in the reverse order of removal.

ECT sensor: 18 N·m (1.8 kgf-m, 13.0 lb-ft)

TO SENSOR INSPECTION

The tip-over sensor is located under the front seat. (☞5-52)

TO SENSOR REMOVAL/INSTALLATION



- Remove the right frame cover. (☞8-4)
- Disconnect the coupler ① and remove the TO sensor ②.
- Installation is in the reverse order of removal.

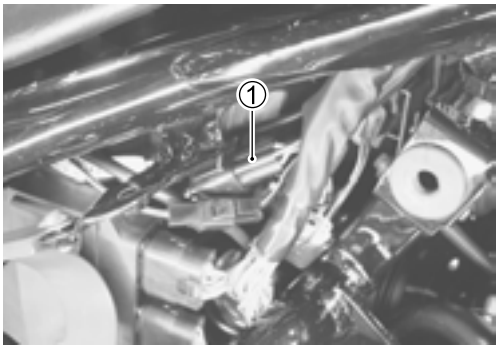
NOTE:
When installing the TO sensor, bring the "UPPER" letter Ⓐ on it to the top.

HO2 SENSOR INSPECTION (FOR E-02, 19, 24)

The heated oxygen sensor is installed on the pre-muffler.
(☞5-69)

HO2 SENSOR REMOVAL/INSTALLATION

- Remove the right frame cover. (☞8-4)
- Disconnect the coupler ① and remove the HO2 sensor unit.

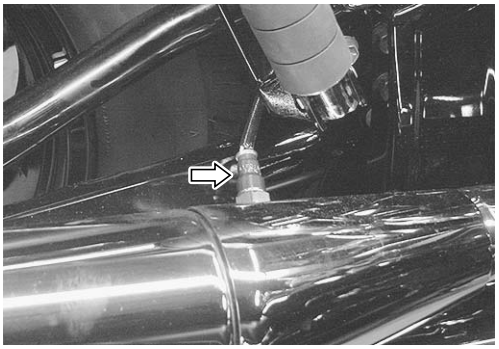


⚠ WARNING

Do not remove the HO2 sensor while it is hot.

CAUTION

Be careful not to expose it to excessive shock.
Do not use an impact wrench while removing or installing the HO2 sensor unit.
Be careful not to twist or damage the sensor lead wire.



- Installation is in the reverse order of removal.

CAUTION

Do not apply oil or other materials to the sensor air hole.

- Tighten the sensor unit to the specified torque.

HO2 SENSOR: 25 N·m (2.5 kgf-m, 18.0 lb-ft)

- Route the HO2 sensor lead wire properly.

FUEL SYSTEM AND THROTLE BODY

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FUEL SYSTEM 6- 3
- FUEL TANK REMOVAL 6- 3
- FUEL TANK INSTALLATION 6- 3
- FUEL PRESSURE INSPECTION 6- 4
- FUEL PUMP INSPECTION 6- 5
- FUEL DISCHARGE AMOUNT INSPECTION 6- 5
- FUEL PUMP RELAY INSPECTION 6- 6
- FUEL PUMP REMOVAL AND DISASSEMBLY 6- 7
- FUEL MESH FILTER INSPECTION AND CLEANING 6-11
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- FAST IDLE ADJUSTMENT 6-22
- THROTTLE VALVE SYNCHRONIZATION 6-24
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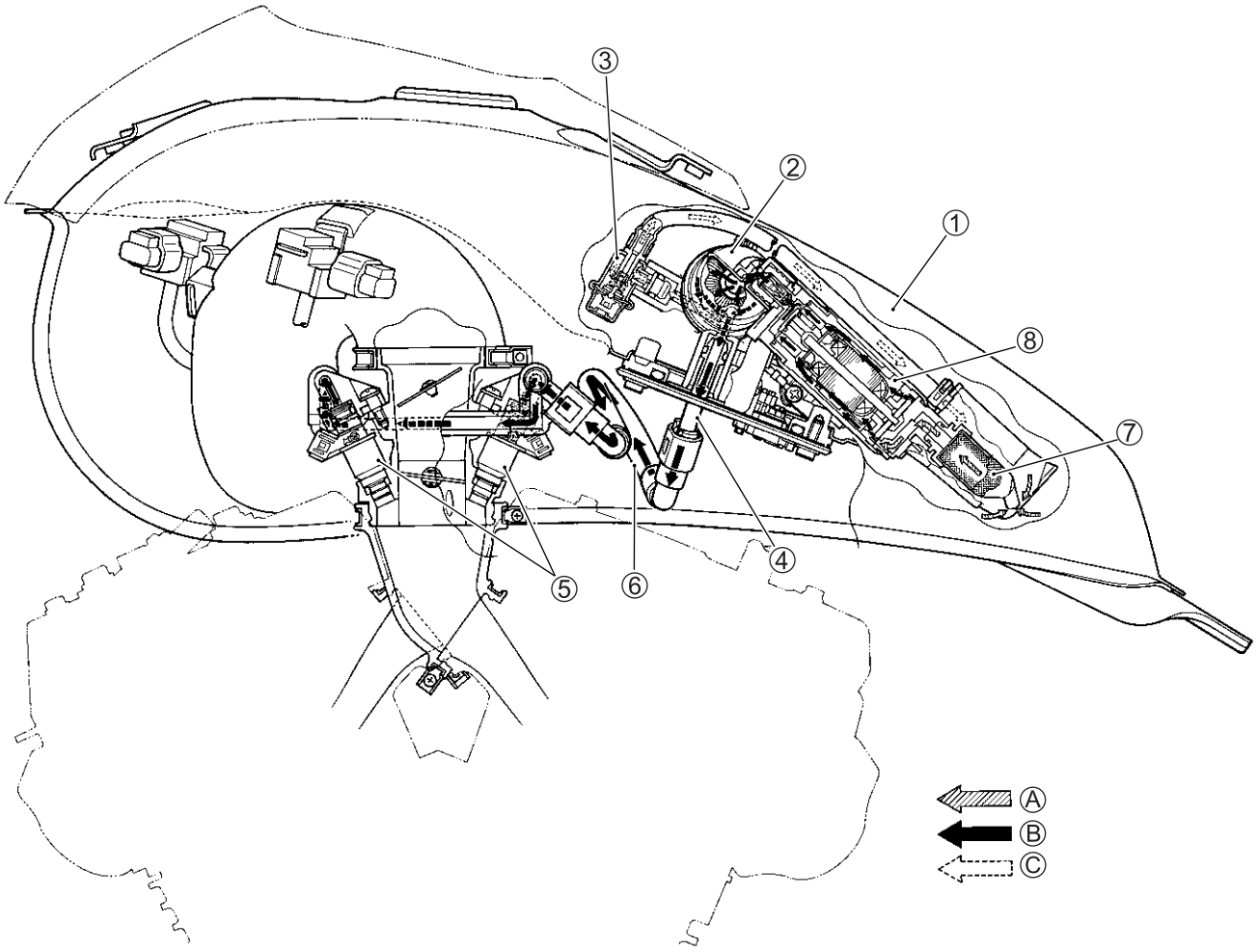
⚠ WARNING

Gasoline must be handled carefully in an area well ventilated and away from fire or sparks.

FUEL DELIVERY SYSTEM

The fuel delivery system consists of the fuel tank, fuel pump, fuel filters, fuel feed hose, fuel delivery pipe (including fuel injectors) and fuel pressure regulator. There is no fuel return hose. The fuel in the fuel tank is pumped up by the fuel pump and pressurized fuel flows into the injector installed in the fuel delivery pipe. Fuel pressure is regulated by the fuel pressure regulator. As the fuel pressure applied to the fuel injector (the fuel pressure in the fuel delivery pipe) is always kept at absolute fuel pressure of 3.0 kgf/cm² (300 kPa, 43 psi), the fuel is injected into the throttle body in conic dispersion when the injector opens according to the injection signal from the ECM.

The fuel relieved by the fuel pressure regulator flows back to the fuel tank.



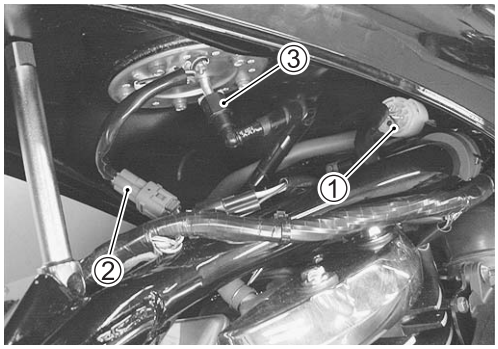
①	Fuel tank	⑦	Fuel mesh filter (For low pressure)
②	Fuel filter (For high pressure)	⑧	Fuel pump
③	Fuel pressure regulator	Ⓐ	Before-pressurized fuel
④	Fuel delivery pipe	Ⓑ	Pressurized fuel
⑤	Fuel injector	Ⓒ	Relieved fuel
⑥	Fuel feed hose		

FUEL SYSTEM

FUEL TANK REMOVAL



- Remove the seats. (☞8-3)
- Remove the fuel tank mounting bolt.



- Lift and support the fuel tank about 10 cm (3.94 in) with the proper stay.

NOTE:
Be careful not to lift the fuel more than about 10 cm (3.94 in), or hoses will be twisted.

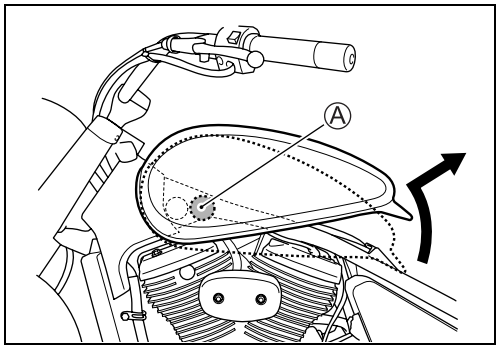
- Remove the pilot lamp coupler ①.
- Disconnect the fuel pump lead wire coupler ②.
- Place a rag under the fuel feed hose and remove the fuel feed hose ③.

CAUTION

When removing the fuel tank, do not leave the fuel feed hose ③ on the fuel tank side.

⚠ WARNING

Gasoline is highly flammable and explosive.
Keep heat, spark and flame away.



- Remove the fuel tank.

CAUTION

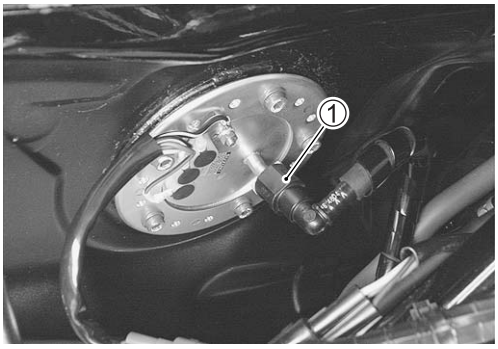
Be careful not to damage the frame Ⓐ by the fuel tank.

FUEL TANK INSTALLATION

- Installation is in the reverse order of removal.

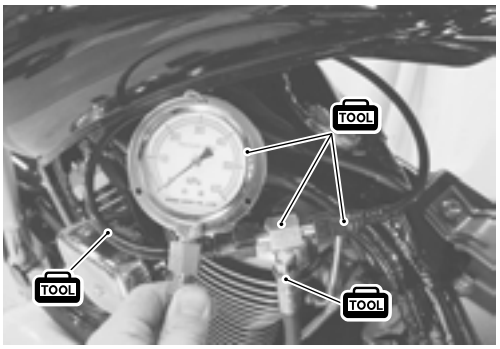
FUEL PRESSURE INSPECTION

- Lift and support the fuel tank. (☞6-3)
- Place a rag under the fuel feed hose.
- Remove the fuel feed hose ①.



- Install the special tools between the fuel tank and fuel delivery pipe.

TOOL 09940-40211: Fuel pressure gauge adaptor
09940-40220: Fuel pressure gauge hose attachment
09915-74511: Oil pressure gauge set



Turn the ignition switch ON and check the fuel pressure.

DATA Fuel pressure: Approx. 300 kPa (3.0 kgf/cm², 43 psi)

If the fuel pressure is lower than the specification, inspect the following items:

* Clogged fuel filter
* Pressure regulator
* Fuel pump

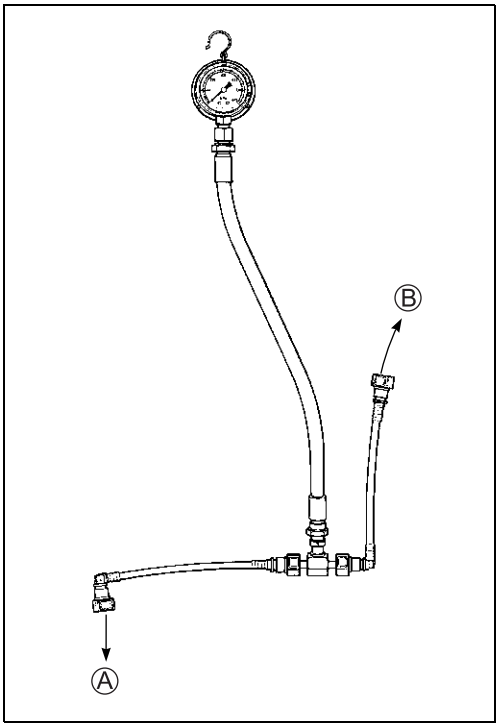
If the fuel pressure is higher than the specification, inspect the following items:

* Fuel pump check valve
* Pressure regulator

⚠ WARNING

*** Before removing the special tools, turn the ignition switch to OFF position and release the fuel pressure slowly.**
*** Gasoline is highly flammable and explosive. Keep heat, sparks and flame away.**

Ⓐ To fuel tank
Ⓑ To fuel delivery pipe



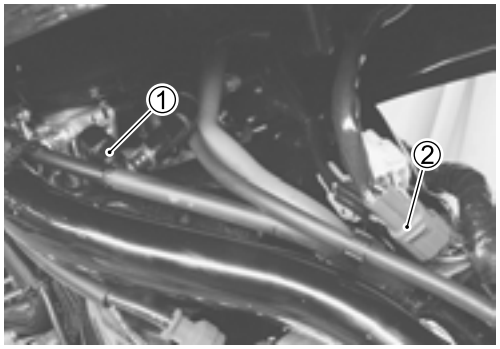
FUEL PUMP INSPECTION

Turn the ignition switch ON and check that the fuel pump operates for few seconds.
If the fuel pump motor does not make operating sound, inspect the fuel pump circuit connections or inspect the fuel pump relay and tip-over sensor.
If the fuel pump relay, tip-over sensor and fuel pump circuit connections are OK, the fuel pump may be faulty, replace the fuel pump with a new one.

FUEL DISCHARGE AMOUNT INSPECTION

⚠ WARNING

Gasoline is highly flammable and explosive.
Keep heat, spark and flame away.



- Lift and support the fuel tank. (☞6-3)
- Disconnect the fuel feed hose ① from the fuel delivery pipe.
- Disconnect the fuel pump lead wire coupler ②.



- Place the measuring cylinder and insert the fuel feed hose end into the measuring cylinder.



- Connect a proper lead wire into the fuel pump lead wire coupler (fuel pump side) and apply 12 volts to the fuel pump (between Y/R wire and B/W wire) for 10 seconds and measure the amount of fuel discharged.
  Battery ⊕ terminal ——(Yellow with red tracer)
  Battery ⊖ terminal ——(Black with white tracer)

If the pump does not discharge the amount specified, it means that the fuel pump is defective or that the fuel filter is clogged.

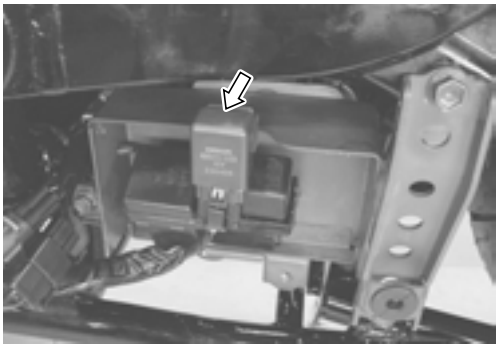
DATA Fuel discharge amount: 168 ml and more/10 sec.
(5.7/5.9 US/Imp oz)/10 sec.

NOTE:
The battery must be in fully charged condition.

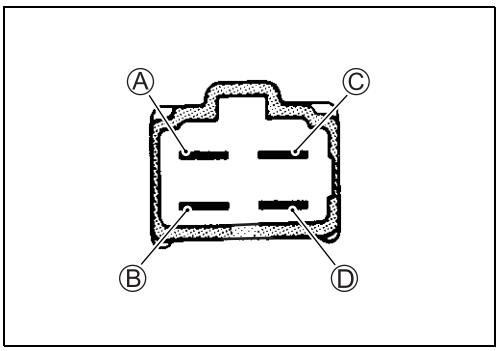
FUEL PUMP RELAY INSPECTION

Fuel pump relay is located inside the secondary gear case cover.

- Remove the secondary gear case cover. (☞2-16)
- Remove the fuel pump relay.

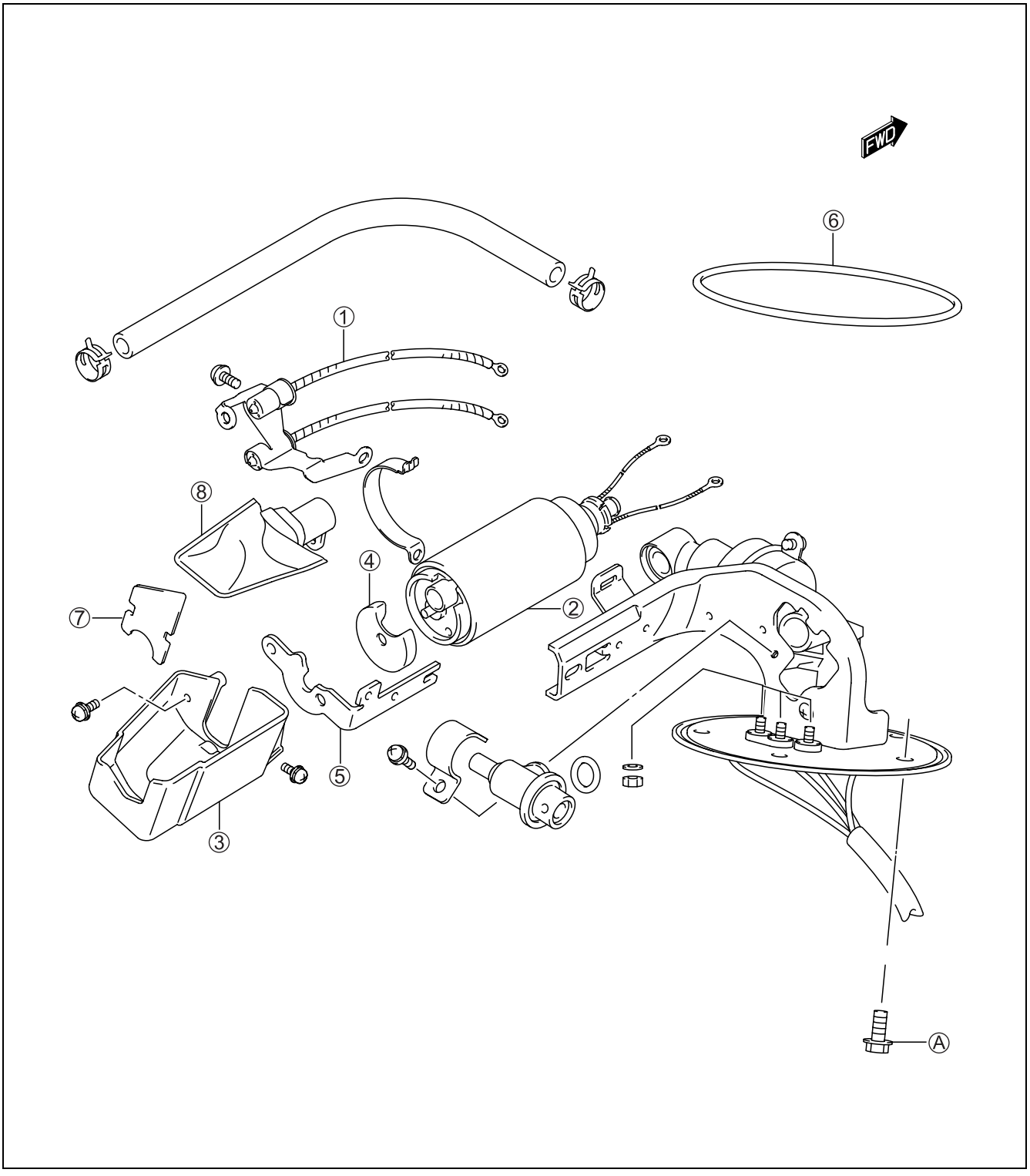


First, check the insulation between Ⓐ and Ⓑ terminals with pocket tester. Then apply 12 volts to Ⓒ and Ⓓ terminals, ⊕ to Ⓒ and ⊖ to Ⓓ, and check the continuity between Ⓐ and Ⓑ.
If there is no continuity, replace it with a new one.



FUEL PUMP REMOVAL AND DISASSEMBLY

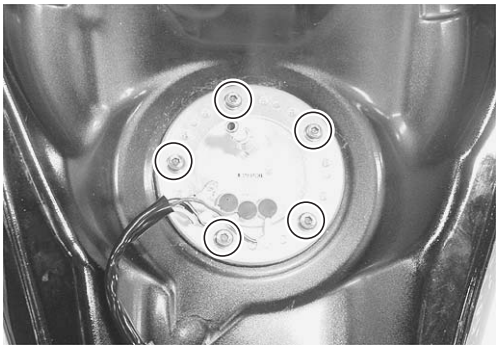
CONSTRUCTION



①	Thermistor	⑥	O-ring
②	Fuel pump	⑦	Cover
③	Vessel	⑧	Fuel mesh filter
④	Rubber cushion	Ⓐ	Fuel pump mounting bolt
⑤	Fuel pump holder		

ITEM	N·m	kgf-m	lb-ft
Ⓐ	10	1.0	7.0

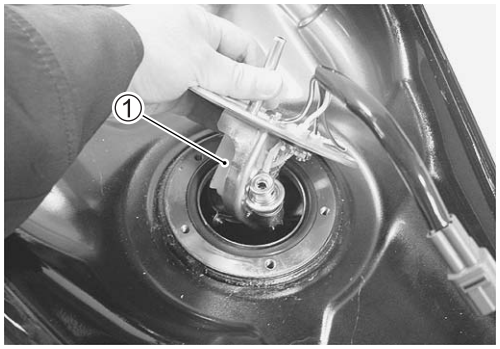
- Remove the fuel tank. (☞6-3)
- Remove the fuel pump assembly mounting bolts diagonally.



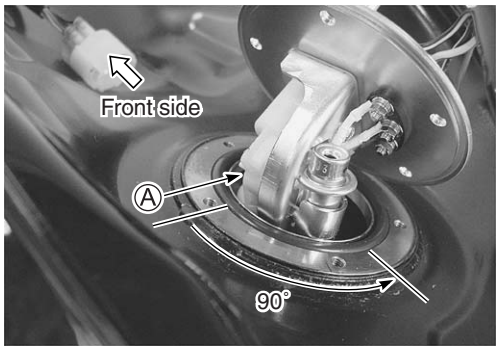
⚠ WARNING

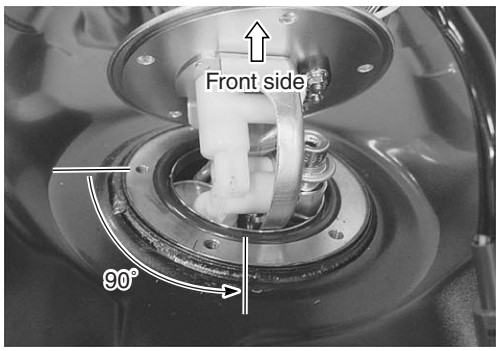
Gasoline is highly flammable and explosive.
Keep heat, spark and flame away.

- Lift the fuel pump assembly ① as shown in the photograph.

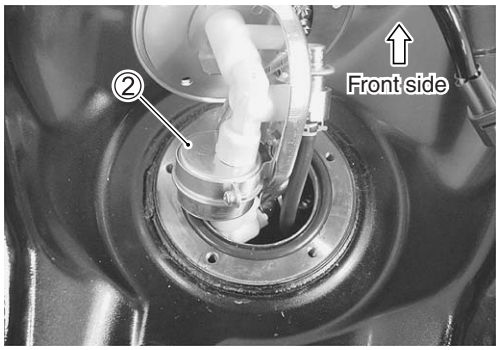


- With the recessed section Ⓐ of the delivery pipe positioned at the edge of the tank opening as shown in the photograph, turn the pump assembly 90° counterclockwise.

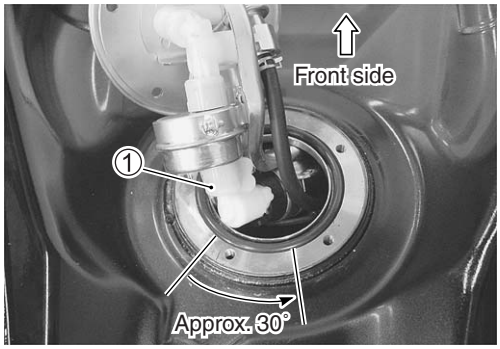


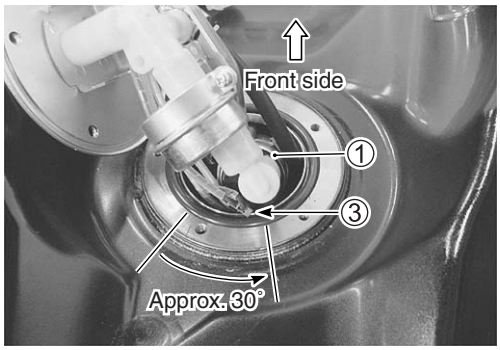


- Remove the high pressure filter ② from the tank opening.

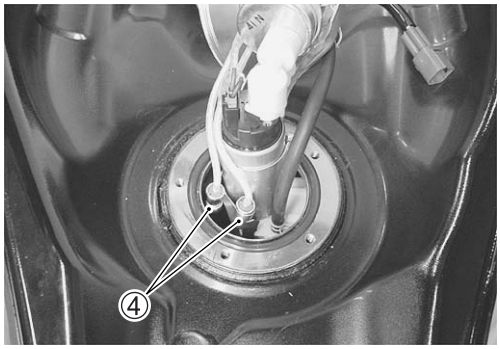


- With the fuel pump assembly ① being turned approximately 30° counterclockwise as shown in the photograph, pull the fuel pump wiring coupler ③ out of the tank opening while taking care not to cause it to interfere with the tank opening.

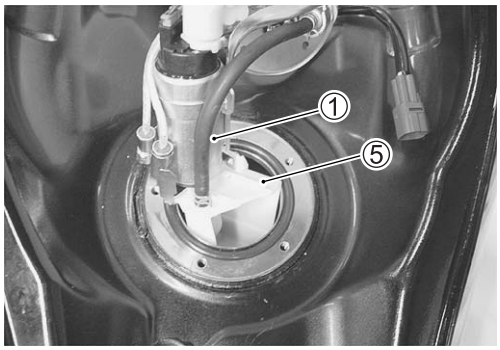




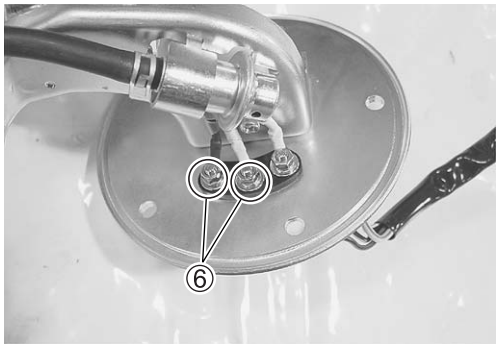
- Remove the thermistor ④ from the tank opening.



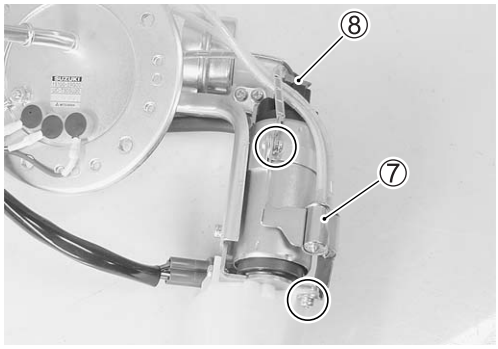
- Remove the fuel pump assembly ① along with the fuel mesh filter cover ⑤.



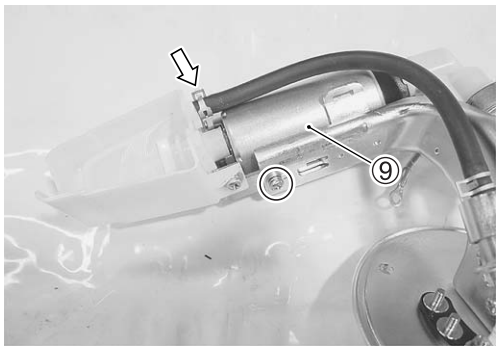
- Remove the nuts ⑥.



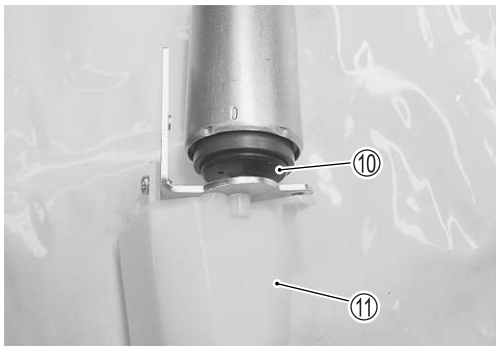
- Remove the thermistor ⑦.
- Disconnect fuel pump coupler ⑧.



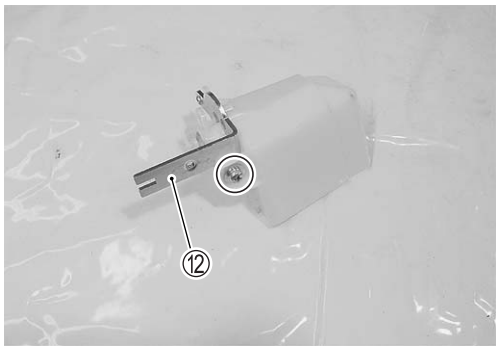
- Remove the fuel pump ⑨.



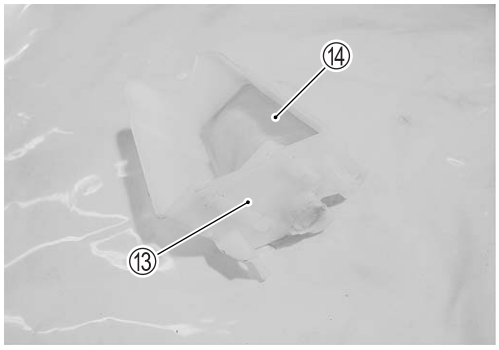
- Remove the rubber cushion ⑩ and vessel ⑪.



- Remove the fuel pump holder ⑫.



- Remove the cover ⑬ and fuel mesh filter ⑭.



FUEL MESH FILTER INSPECTION AND CLEANING

If the fuel mesh filter is clogged with sediment or rust, fuel will not flow smoothly and loss in engine power may result.
Blow the fuel mesh filter with compressed air.

NOTE:
If the fuel mesh filter is clogged with many sediment or rust, replace the fuel filter cartridge with a new one.



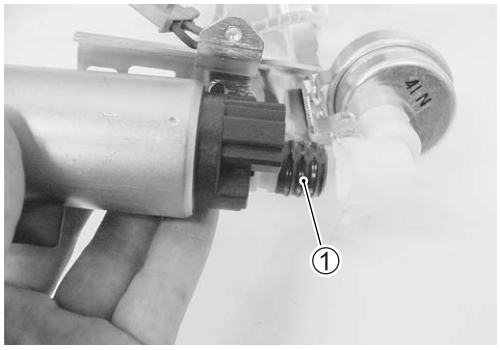
FUEL PUMP REASSEMBLY AND INSTALLATION

Install the fuel pump in the reverse order of removal and disassembly. Pay attention to the following points:

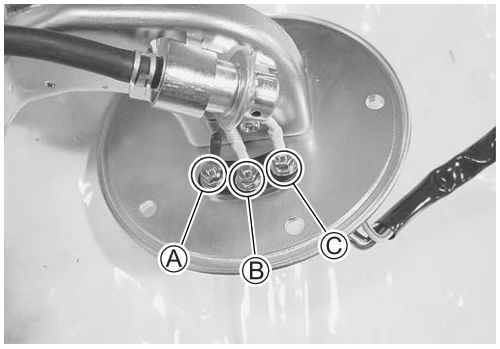
- Install a new bushing ① to the fuel pump.

CAUTION

Use the new bushing to prevent fuel leakage.



- Be sure to connect the wires to the proper terminals.
  Ⓐ ..... Thermistor (HIGH)
  Ⓑ ..... Thermistor (LOW)
  Ⓒ ..... Positive terminal for fuel pump

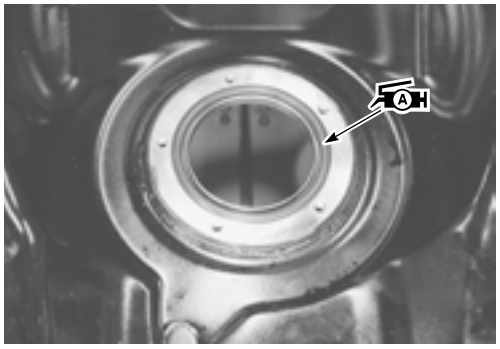


- Install a new O-ring and apply SUZUKI SUPER GREASE "A" to it.

99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

⚠ WARNING

The O-ring must be replaced with a new one to prevent fuel leakage.

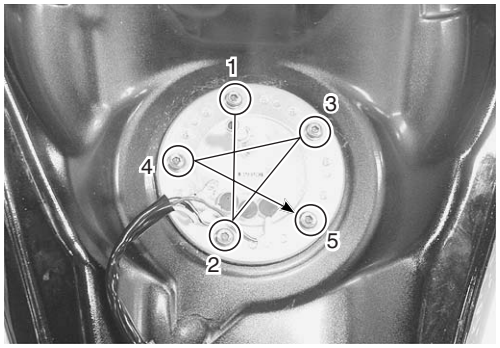


- When installing the fuel pump assembly, first tighten all the fuel pump mounting bolts lightly and then to the specified torque, in the ascending order of numbers.

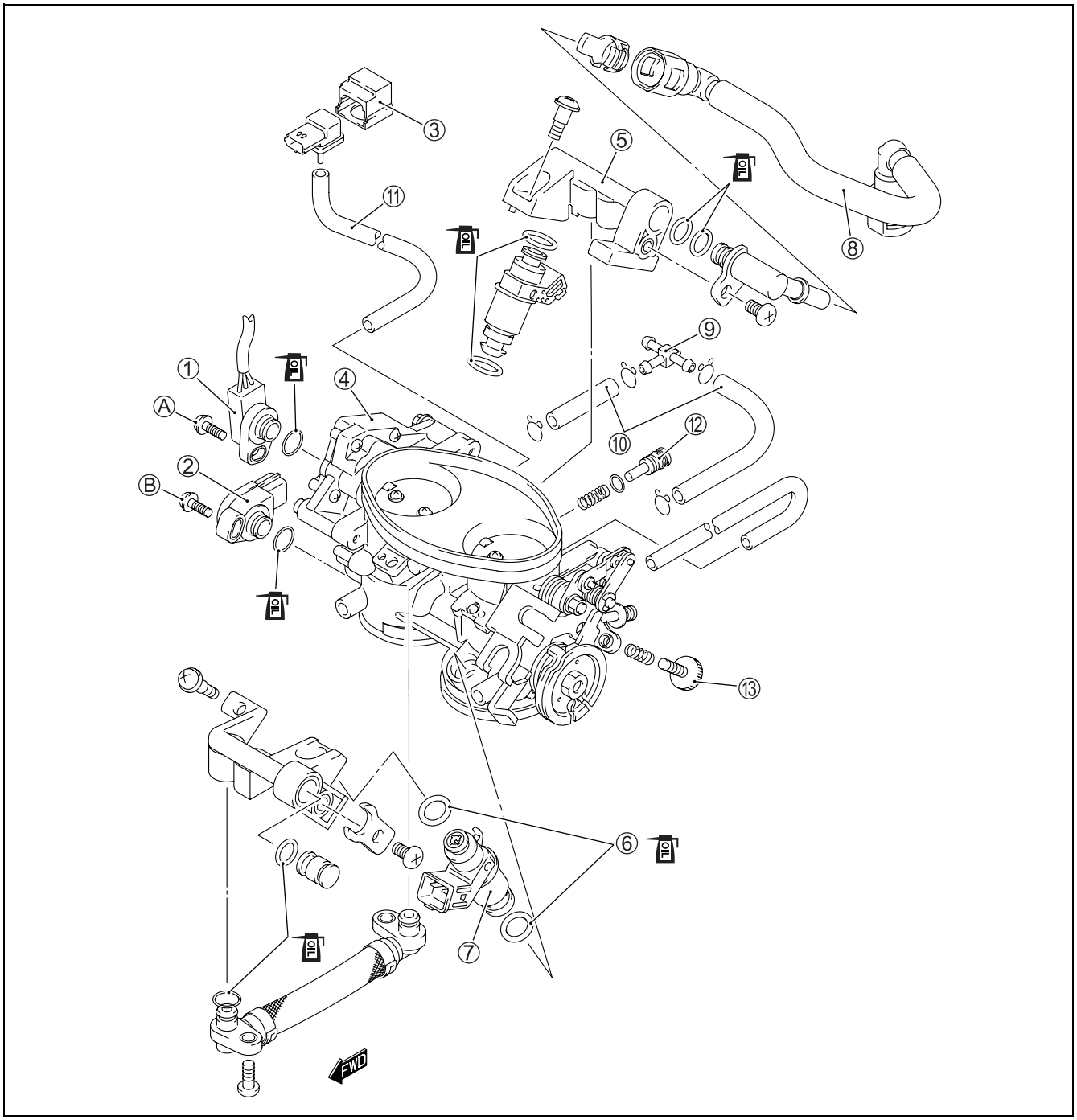
Fuel pump mounting bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)

NOTE:
Apply a small quantity of the THREAD LOCK to the thread portion of fuel pump mounting bolt.

1342 99000-32050: THREAD LOCK "1342"



THROTTLE BODY
CONSTRUCTION

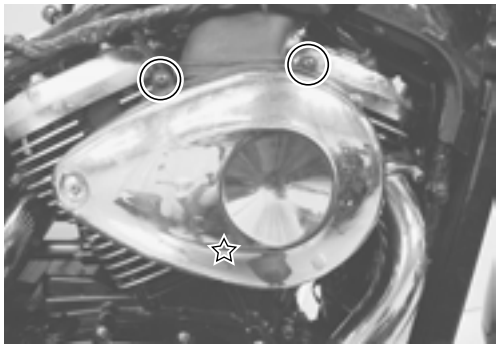


①	STP sensor	⑨	Three way joint (For E-33)
②	TP sensor	⑩	Hose (For E-33)
③	IAP sensor	⑪	Vacuum hoses
④	STVA	⑫	Throttle stop screw
⑤	Fuel delivery pipe	⑬	Idle adjusting screw
⑥	O-ring	Ⓐ	STP sensor mounting screw
⑦	Fuel injector	Ⓑ	TP sensor mounting screw
⑧	Fuel feed hose		

ITEM	N·m	kgf-m	lb-ft
Ⓐ	3.5	0.35	2.45
Ⓑ	3.5	0.35	2.45

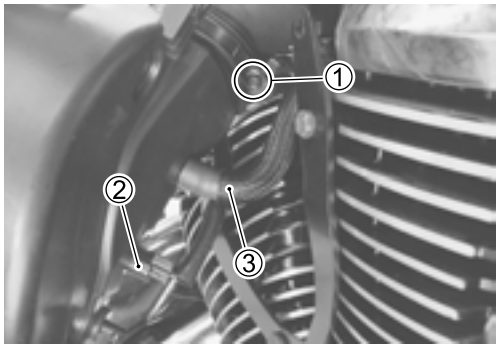
AIR CLEANER BOX REMOVAL

- Remove the fuel tank. (☞6-3)
- Remove the bolts.



☆: Hooked part

- Loosen the clamp screw ①.
- Disconnect the IAP sensor lead wire coupler ②.
- Disconnect the PAIR hose ③.
- Remove the air cleaner box.

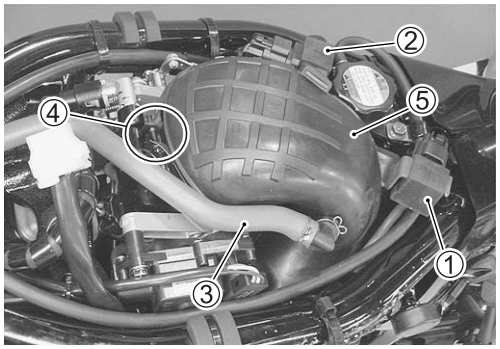


AIR CLEANER BOX INSTALLATION

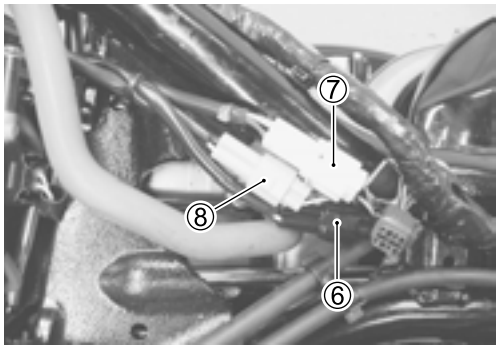
Installation is in the reverse order of removal.

THROTTLE BODY REMOVAL

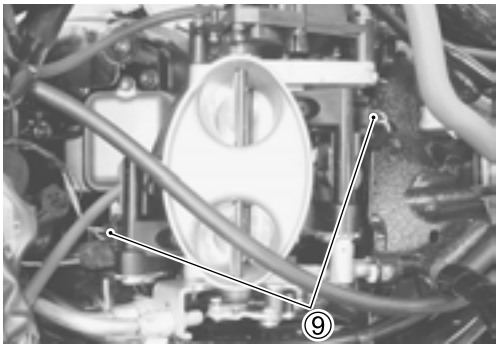
- Remove the air cleaner box. (☞Above)
- Remove the IAP sensors (Front cylinder side ① and Rear cylinder side ②) from the mount stay.
- Remove the PCV hose ③ and loosen the clamp screw ④.
- Remove the air intake pipe ⑤.



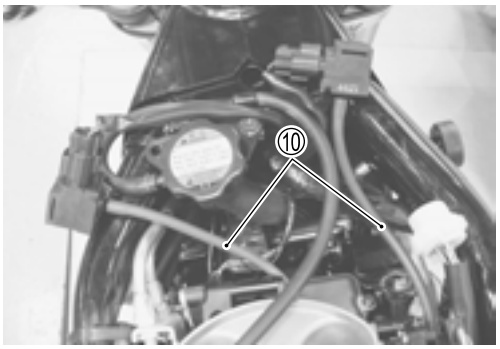
- Disconnect the TP sensor lead wire coupler ⑥, STVA lead wire coupler ⑦ and STP sensor lead wire coupler ⑧.



- Disconnect the fuel injector lead wire couplers ⑨.



- Disconnect the vacuum hoses ⑩.



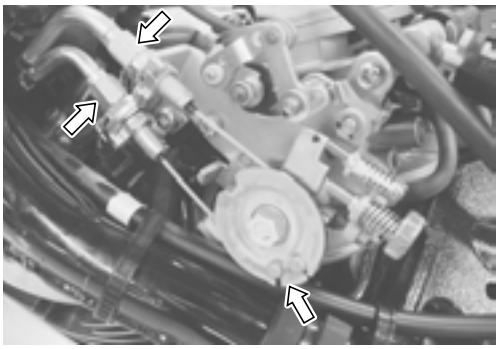
- Loosen the throttle body clamp screw at the intake pipe side.



- Disconnect the throttle cables from their drum.

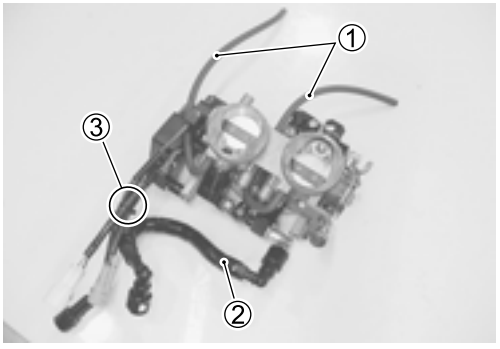
CAUTION

After disconnecting the throttle cables, do not snap the throttle valve from full open to full close. It may cause damage to the throttle valve and throttle body.

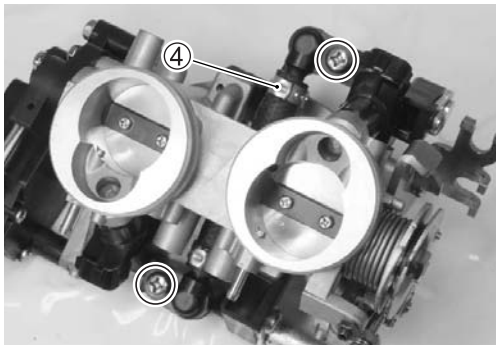


THROTTLE BODY DISASSEMBLY

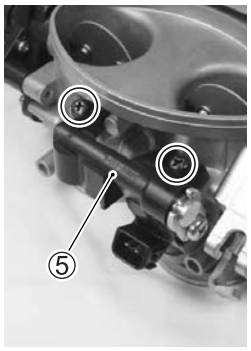
- Remove the vacuum hose ① and fuel feed hose ②.
- Remove the clamp ③.

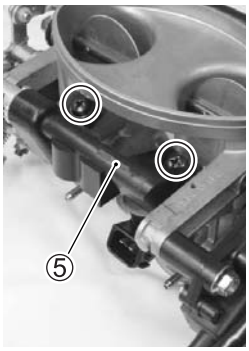


- Remove the fuel delivery hose ④.

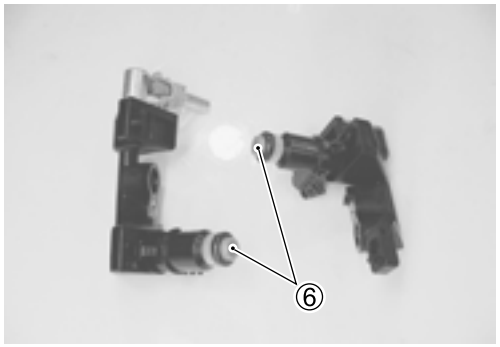


- Remove the fuel delivery pipes ⑤.





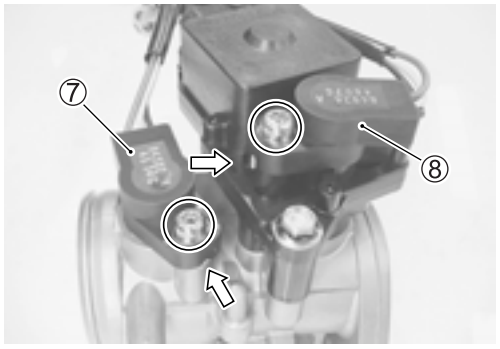
- Remove the fuel injectors ⑥.



- Remove the TP sensor ⑦ and STP sensor ⑧ with the special tool.

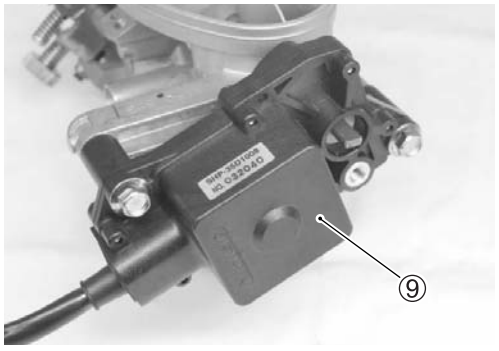
TOOL 09930-11950: Torx wrench

NOTE:
Prior to disassembly, mark each sensor's original position with a paint or scribe for accurate reinstallation.



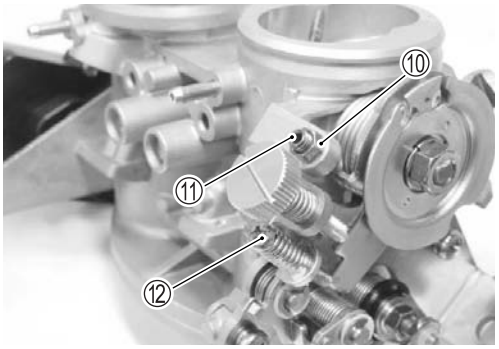
CAUTION

Never remove the STVA ⑨ from the throttle body.



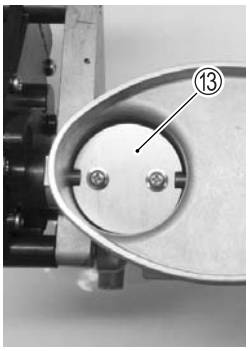
CAUTION

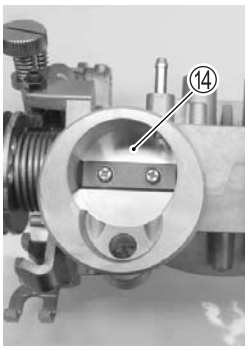
*** Do not loosen the nut ⑩.**
*** The fast idle screw ⑪ is factory-adjusted at the time of delivery and therefore avoid removing or turning it unless otherwise necessary.**
*** Do not turn the screw ⑫.**



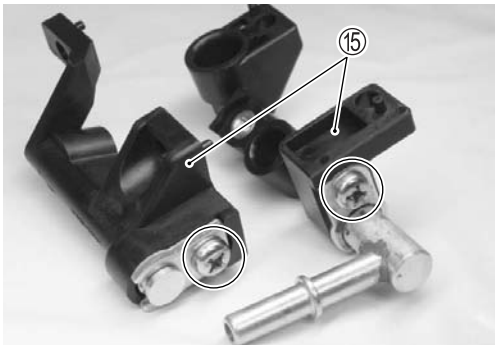
CAUTION

Never remove the secondary throttle valve ⑬ and throttle valve ⑭.





• Remove the fuel delivery pipes ⑮.



THROTTLE BODY CLEANING

⚠ WARNING

Some carburetor cleaning chemicals, especially dip-type soaking solutions, are very corrosive and must be handled carefully. Always follow the chemical manufacturer's instructions for proper use, handling and storage.

- Clean all passageways with a spray-type carburetor cleaner and blow dry with compressed air.

CAUTION

Do not use wire to clean passageways. Wire can damage passageways. If the components cannot be cleaned with a spray cleaner it may be necessary to use a dip-type cleaning solution and allow them to soak. Always follow the chemical manufacturer's instructions for proper use and cleaning of the throttle body components. Do not apply carburetor cleaning chemicals to the rubber and plastic materials.

INSPECTION

- Check following items for any damage or clogging.

* O-ring
* Throttle valve
* Secondary throttle valve
* Vacuum hose
* Delivery hose
* Injector dust seal

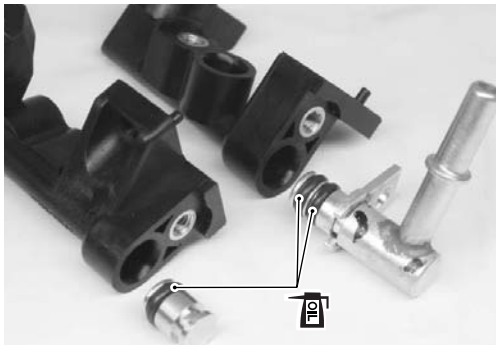
THROTTLE BODY REASSEMBLY

Reassemble the throttle body in the reverse order of disassembly. Pay attention to the following points:

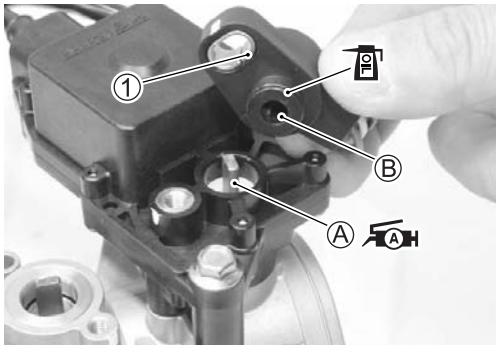
- Apply thin coat of the engine oil to the new O-rings.

CAUTION

Replace the O-rings with the new ones.



• With the STV fully opened, install the STP sensor ① and tighten the STP sensor mounting screw to the specified torque.

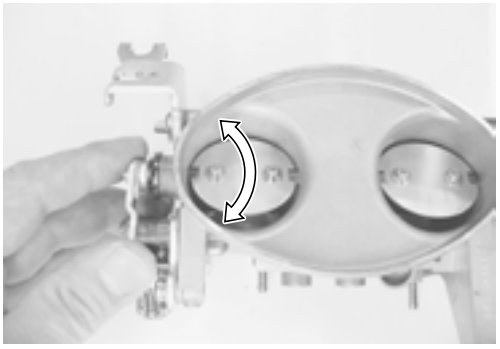


CAUTION

TPS and STPS resemble each other very closely in external appearance.
Make sure to check the color of coupler before installing.

STP sensor: Green color coupler

NOTE:
** Apply thin coat of the engine oil to the new O-ring.*
** Align the secondary throttle shaft end Ⓐ with the groove Ⓑ of STP sensor.*
** Apply SUZUKI SUPER GREASE "A" to the secondary throttle shaft end Ⓐ if necessary.*



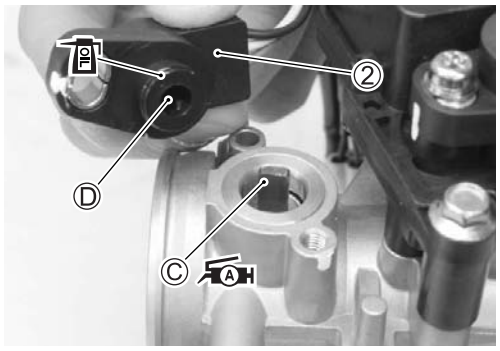
99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

09930-11950: Torx wrench

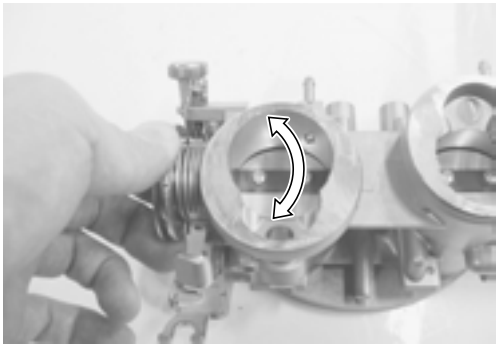
STP sensor mounting screw: 3.5 N·m (0.35 kgf-m, 2.45 lb-ft)

NOTE:
** Make sure the STP valve open or close smoothly.*
** If the STP sensor adjustment is necessary, refer to page 6-20 for STP sensor setting procedure.*

• With the throttle valve fully closed, install the TP sensor ② and tighten the TP sensor mounting screw to the specified torque.



NOTE:
** Apply thin coat of the engine oil to the new O-ring.*
** Align the throttle shaft end Ⓒ with the groove Ⓓ of TP sensor.*
** Apply SUZUKI SUPER GREASE "A" to the throttle shaft end Ⓒ if necessary.*



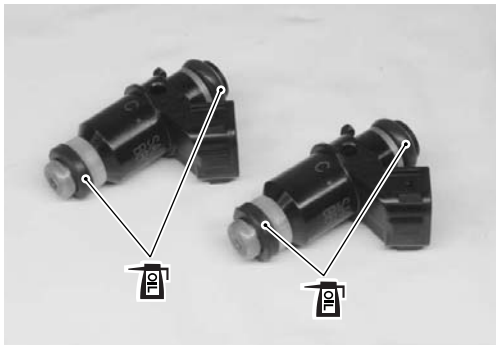
99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

09930-11950: Torx wrench

TP sensor mounting screw: 3.5 N·m (0.35 kgf-m, 2.45 lb-ft)

NOTE:
** Make sure throttle valve open or close smoothly.*
** TP sensor setting procedure. (☞5-19)*

- Install the O-rings and dust seals to each fuel injector.
- Apply thin coat of the engine oil to the new O-rings and dust seal.

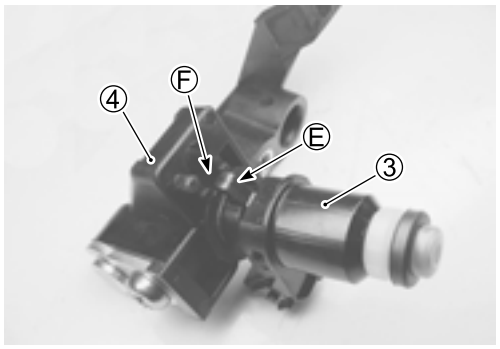


CAUTION

Replace the O-rings and dust seals with the new ones.

- Install the fuel injector ③ by pushing it straight to the delivery pipe ④.

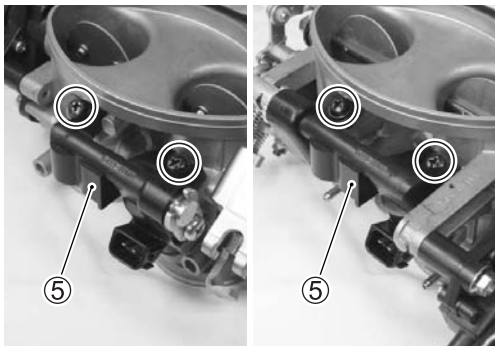
NOTE:
Align the boss Ⓔ of the injector with the groove Ⓕ of the delivery pipe.



CAUTION

Never turn the injector while pushing it.

- Install the fuel delivery pipes ⑤ to the throttle body assembly.



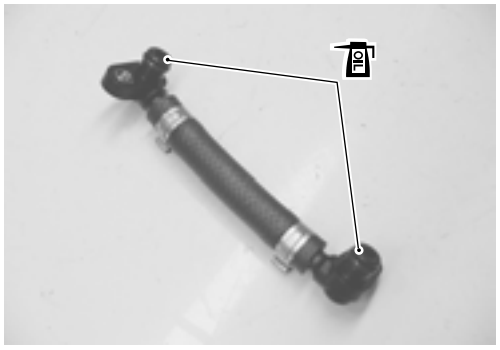
CAUTION

Never turn the fuel injectors while installing them.

- Tighten the fuel delivery pipe mounting screws to the specified torque.

Fuel delivery pipe mounting screw:
3.5 N·m (0.35 kgf-m, 2.45 lb-ft)

- Apply thin coat of the engine oil to the new O-rings.

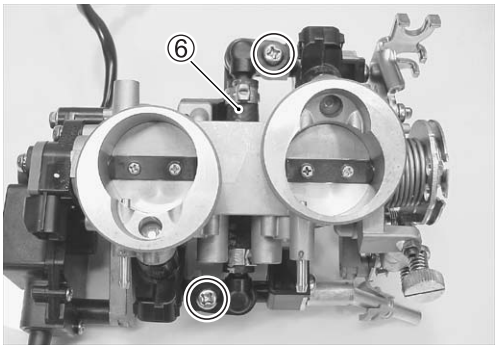


CAUTION

Replace the O-rings with the new ones.

- Install the fuel delivery pipe joint hose ⑥ to the delivery pipes.
- Tighten the fuel delivery pipe hose mounting screws to the specified torque.

Fuel delivery pipe joint hose mounting screw:
3.5 N·m (0.35 kgf-m, 2.5 lb-ft)



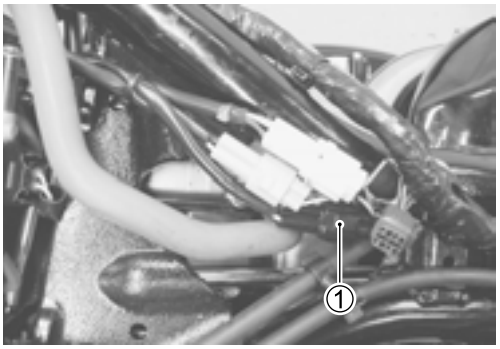
THROTTLE BODY INSTALLATION

Installation is in the reverse order of removal. Pay attention to the following points:

- Connect the TP sensor lead wire coupler ①.

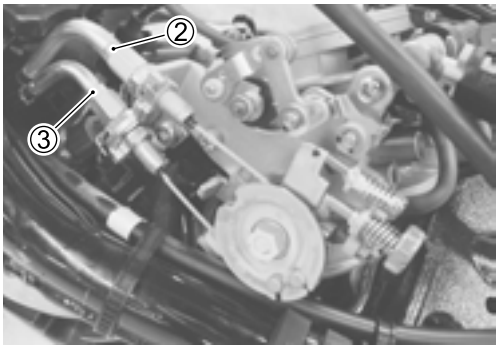
CAUTION

TP sensor lead wire coupler and STP sensor lead wire coupler resemble each other very closely in external appearance.
Make sure to check the color of coupler before installing.

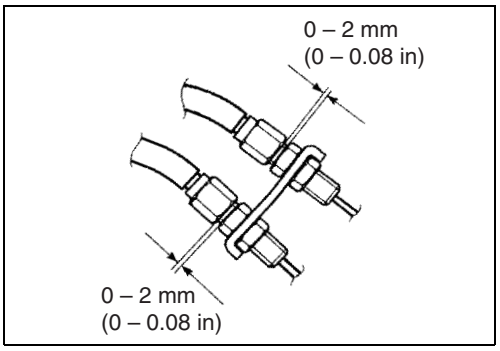


TP sensor lead wire coupler: Black

- Connect the throttle pulling cable ② and throttle returning cable ③ to the throttle cable drum.



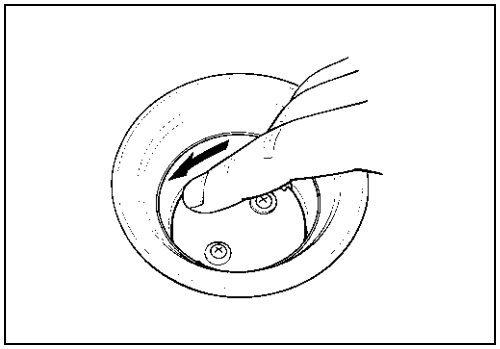
- Loosen each throttle cable lock-nut.
- Turn in each throttle cable adjuster fully and locate each outer cable so that the clearance is 0 – 2 mm (0 – 0.08 in).
- Tighten each lock-nut.
- Adjust the throttle cable play.
  Refer to page 2-14 and -15 for details.
- Install the air cleaner box and tighten the throttle body clamp screws as shown in the illustration. (☞10-19)



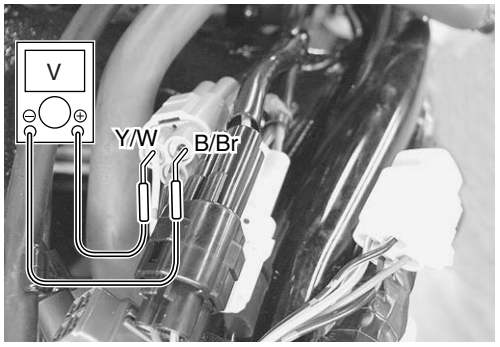
STP SENSOR ADJUSTMENT

If the STP sensor adjustment is necessary, measure the sensor out put voltage and adjust the STP sensor position as follows:

- Remove the air cleaner box. (☞6-13)
- Disconnect the STVA coupler. (☞6-13)
- Insert the needle pointed probes to the lead wire coupler.
- Turn the ignition switch ON.
- Close the secondary throttle valve by finger, and measure the STP sensor out put voltage.



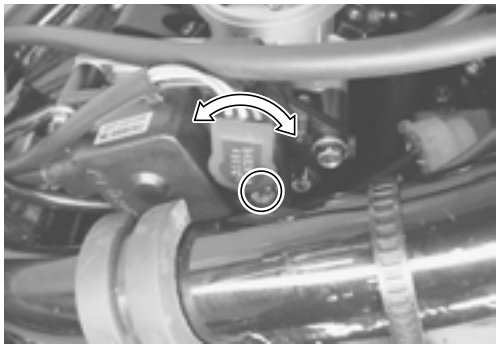
DATA STP sensor out put voltage
ST valve is fully closed: Approx. 0.5 V
(⊕ Y/W – ⊖ B/Br)



TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Voltage (⎓)

- If the STP sensor voltage is out of specification, loosen the STP sensor mounting screw and adjust the STP sensor voltage to specification.
- Tighten the STP sensor mounting screw.



TOOL 09930-11950: Torx wrench

STP sensor mounting screw:
3.5 N·m (0.35 kgf-m, 2.5 lb-ft)

FUEL INJECTOR REMOVAL

- Remove the fuel tank. (☞6-3)
- Remove the air intake pipe. (☞2-7)
- With battery negative cable disconnected, disconnect the injector couplers.
- Remove the fuel delivery pipes. (☞6-15)
- Remove the fuel injectors #1 and #2. (☞6-15)

FUEL INJECTOR INSPECTION

Check fuel injector filter for evidence of dirt and contamination. If present, clean and check for presence of dirt in the fuel lines and fuel tank.

The fuel injector can be checked without removing it from the throttle body.

Refer to page 5-66 for details.



FUEL INJECTOR INSTALLATION

- Apply thin coat of the engine oil to new injector dust seals and O-rings. (☞6-19)
- Install the injector by pushing it straight to the throttle body. Never turn the injector while pushing it. (☞6-19)

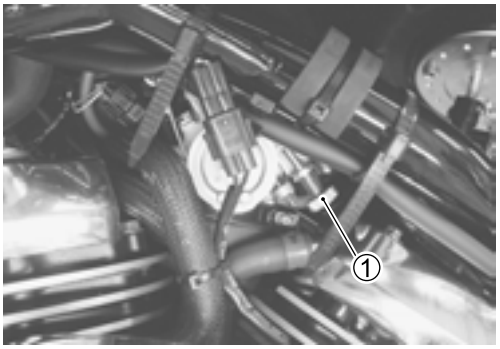
FAST IDLE

The fast idle system is automatic type.
When the fast idle cam is turned by the secondary throttle valve actuator, the cam pushes the lever on the throttle valve shaft causing the throttle valve to open and raise the engine speed. When the engine has warmed up, depending on the water temperature, ambient temperature and lapsed time, the fast idle is cancelled allowing the engine to resume idle speed.

Ambient Temp.	Fast idle rpm	Fast idle cancelling time
–5 °C (23 °F)	1 500 – 2 100 rpm	Approx. 100 sec.
15 °C (59 °F)	1 500 – 2 100 rpm	Approx. 60 sec.
25 °C (77 °F)	1 500 – 2 100 rpm	Approx. 50 sec.

FAST IDLE ADJUSTMENT

- Lift and support the fuel tank. (☞6-3)
- Start up the engine and run it in idling condition for warming up.
- Set the idle rpm to 1 100 rpm by the throttle stop screw ①.
- Check and adjust the TP sensor. (☞5-19)

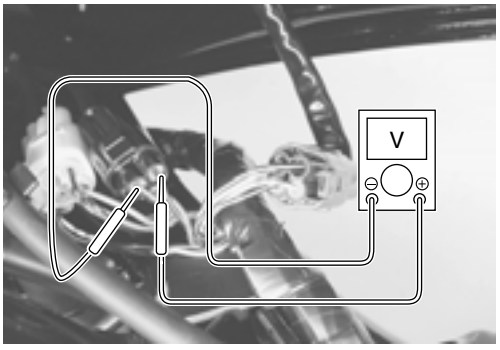


- Measure the TP sensor output voltage at the coupler (between ⊕ Bl/B wire and ⊖ B/Br wire).

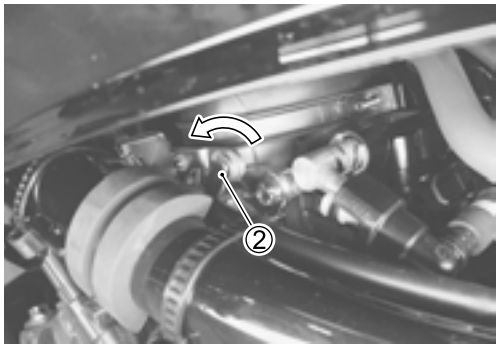
DATA TP sensor output voltage at idle position: Approx. 1.12 V

TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Voltage (⎓)



- Turn the ignition switch OFF.
- Disconnect the STVA coupler.
- Turn the ignition switch ON.
- Open the secondary throttle valve fully by moving the fast idle link with your finger.
- With the secondary throttle valve held at this position, measure the output voltage of the TP sensor as shown.



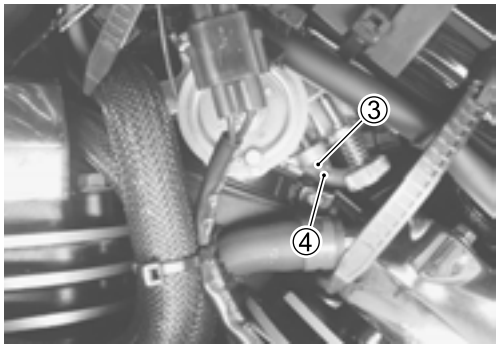
- Calculate the voltage difference between TP sensor output voltage at idle and TP sensor output voltage with the STV full opened.

Example: TP sensor output voltage with the STV fully open
Minus TP sensor output voltage at idle is 0.08 V

STV fully open	**1.20 V**
Idle	**- 1.12 V**
	0.08 V

DATA TP sensor output voltage variation: 0.064 – 0.096 V

- If the voltage variation is out of specification, loosen the lock-nut ② and turn in or out the fast idle adjust screw ③ to adjust the voltage to specification.



CAUTION

The fast idle screw is factory-adjusted at the time of delivery and therefore avoid removing or turning it unless otherwise necessary.

- Cool down the engine to ambient air temperature and start the engine to check the fast idle rpm comes within the specified rpm.

DATA Standard
Fast idle rpm: 1 500 – 2 100 rpm/Cold engine
Idle rpm : 1 100 ± 100 rpm/Warmed engine

- If it is not at the specified rpm, the cause may possibly be short-circuit in water temperature sensor or wiring harness or STVA.

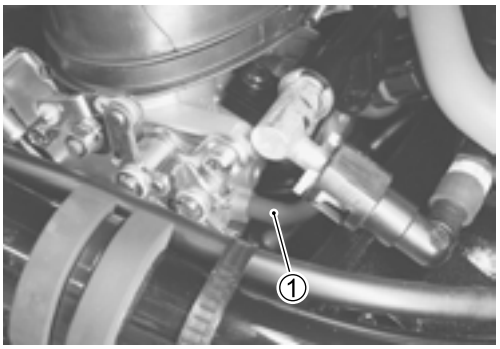
THROTTLE VALVE SYNCHRONIZATION

Check and adjust the throttle valve synchronization among two cylinders.

USE OF VACUUM BALANCER GAUGE

Calibrating each vacuum gauge

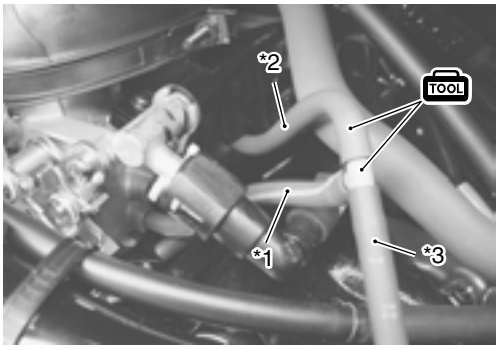
- Start up the engine and run it in idling condition for warming up.
- Stop the warmed-up engine.
- Disconnect the vacuum hose ① from the No. 1 (Rear cylinder) throttle body.



- Connect one of the vacuum balancer gauge hose to the vacuum nipple on the No. 1 throttle body with the special tools.

TOOL 13685-02FA0: Three way joint
13681-39F00-225: Hose

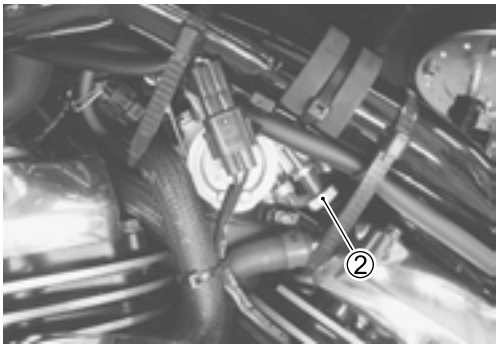
*1: To vacuum nipple
*2: To vacuum hose
*3: To vacuum balancer gauge hose



- Connect a tachometer.
- Start up the engine and keep it running at 1 100 rpm by turning throttle stop screw ②.

CAUTION

Avoid drawing dirt into the throttle body while running the engine without intake pipe and air cleaner box. Dirt drawn into the engine will damage the internal engine parts.

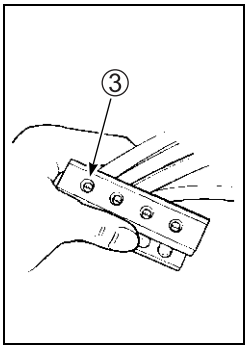


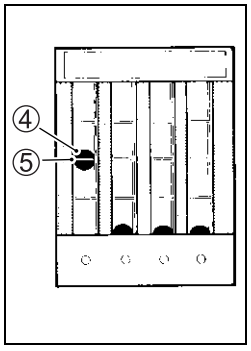
- Turn the air screw ③ of the gauge so that the vacuum acting on the tube of that hose will bring the steel ball ④ in the tube to the center line ⑤.

NOTE:

** The vacuum gauge is positioned vertical level.*

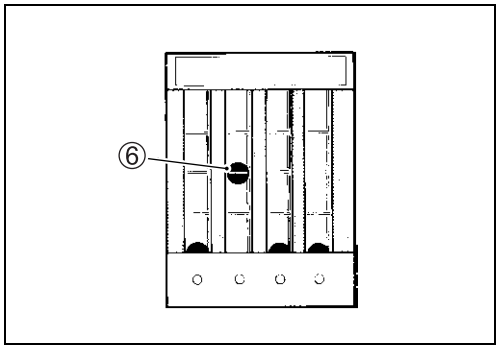
** During balancing the throttle valves, always set the engine rpm at 1 100 rpm, using throttle stop screw.*





- After making sure that the steel ball stays steady at the center line, disconnect the hose from the No. 1 throttle body vacuum nipple and connect the next hose to this vacuum nipple.
- Turn air screw to bring the other steel ball ⑥ to the center line.

The balancer gauge is now ready for use in balancing the throttle valves.

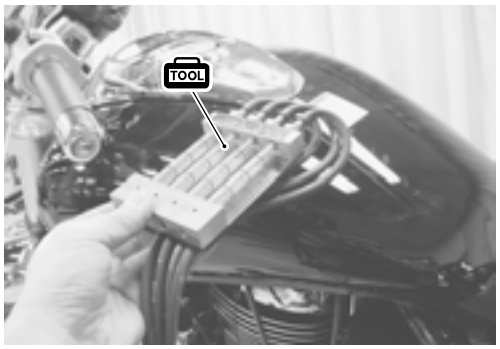


Throttle valve synchronization

Using the vacuum balancer gauge, inspect the throttle valve synchronization in the same manner of the digital vacuum tester. Pay attention to the following points:

The vacuum gauge is positioned vertical level, and in this position the two balls should be within one ball dia. If the difference is larger than one ball, turn the balance adjusting screw on the throttle body and bring the ball to the same level.

A correctly adjusted throttle valve synchronization has the balls in the No. 1 and No. 2 at the same level.



TOOL 09913-13121: Vacuum balancer gauge

NOTE:

** During balancing the throttle valves, always set the engine rpm at 1 100 rpm, using throttle stop screw.*

** After balancing the two valves, set the idle rpm to 1 100 rpm by the throttle stop screw.*

THROTTLE POSITION SENSOR (TPS) SETTING

After all adjustments are completed, check or adjust the TPS setting condition. (☞5-19)

COOLING AND LUBRICATION SYSTEM

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ENGINE COOLANT

At the time of manufacture, the cooling system is filled with a 50:50 mixture of distilled water and ethylene glycol anti-freeze. This 50:50 mixture will provide the optimum corrosion protection and excellent heat protection, and will protect the cooling system from freezing at temperatures above –31 °C (–24 °F).
If the motorcycle is to be exposed to temperatures below –31 °C (–24 °F), this mixing ratio should be increased up to 55% or 60% according to the figure.

CAUTION

- **Use a high quality ethylene glycol base anti-freeze, mixed with distilled water. Do not mix an alcohol base anti-freeze and different brands of anti-freeze.**
- **Do not put in more than 60% anti-freeze or less than 50%. (Refer to Right figure.)**
- **Do not use a radiator anti-leak additive.**

50% Engine coolant including reserve tank capacity

Anti-freeze	750 ml (1.6/1.3 US/Imp.pt)
Water	750 ml (1.6/1.3 US/Imp.pt)

Anti-freeze density	Freezing point
50%	–30 ˚C (–24 ˚F)
55%	–40 ˚C (–44 ˚F)
60%	–55 ˚C (–67 ˚F)

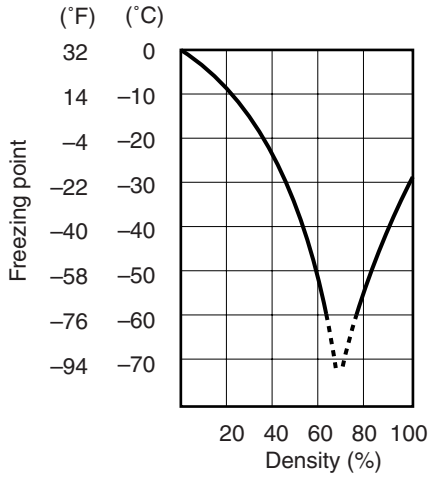


Fig.1 Engine coolant density-freezing point curve.

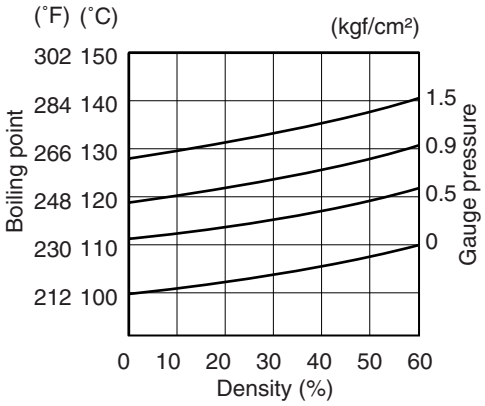
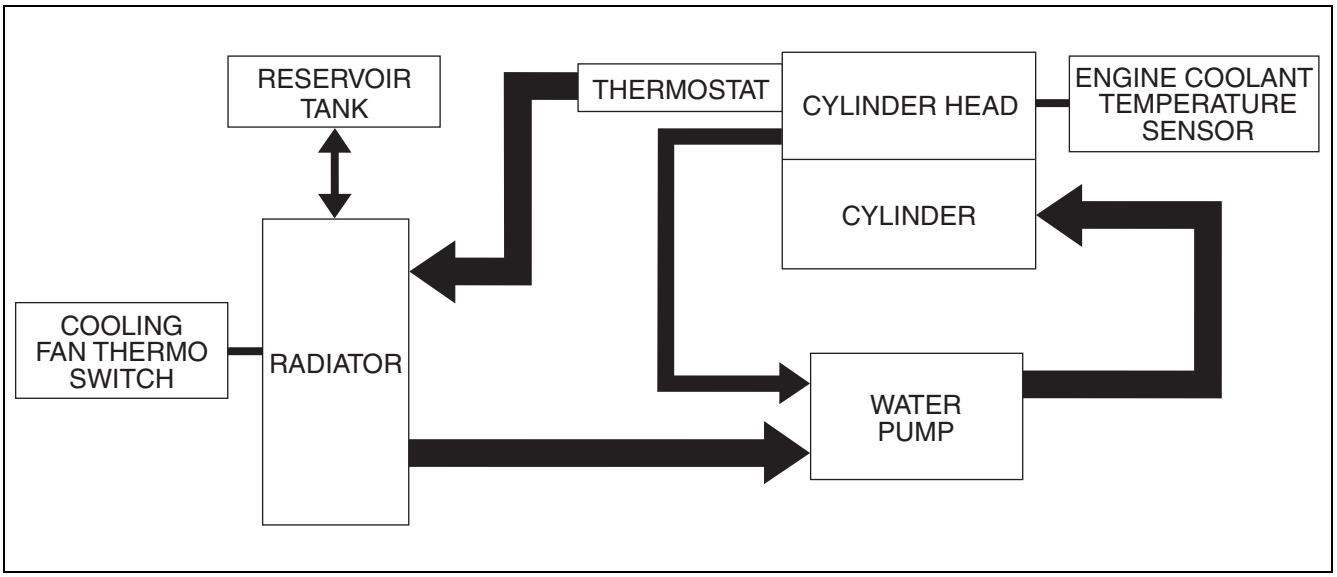


Fig.2 Engine coolant density-boiling point curve.

⚠ WARNING

- **You can be injured by scalding fluid or steam if you open the radiator cap when the engine is hot. After the engine cools, wrap a thick cloth around cap and carefully remove the cap by turning it a quarter turn to allow pressure to escape and then turn the cap all the way off.**
- **The engine must be cool before servicing the cooling system.**
- **Coolant is harmful;**
  - **If it comes in contact with skin or eyes, flush with water.**
  - **If swallowed accidentally, induce vomiting and call physician immediately.**
  - **Keep it away from children.**

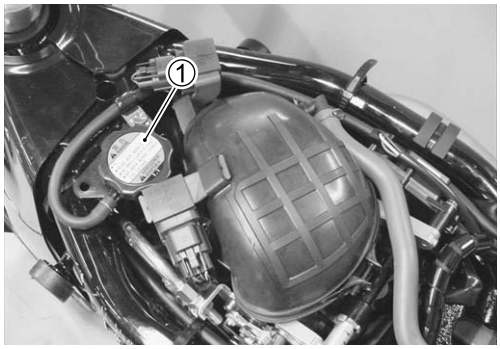
COOLING CIRCUIT



COOLING CIRCUIT INSPECTION

Before removing the radiator and draining the engine coolant, inspect the cooling circuit for tightness.

- Remove the fuel tank. (☞6-3)
- Remove the radiator cap ① and connect the tester ② to the filler.



⚠ WARNING

Do not remove the radiator cap when the engine is hot.

- Give a pressure of about 120 kPa (1.2 kgf/cm², 17 psi) and see if the system holds this pressure for 10 seconds.
- If the pressure should fall during this 10-second interval, it means that there is a leaking point in the system. In such a case, inspect the entire system and replace the leaking component or part.

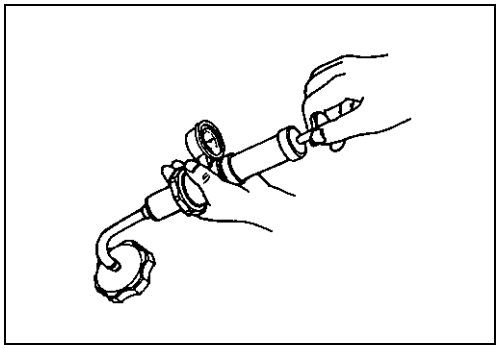


⚠ WARNING

When removing the radiator cap tester, put a rag on the filler to prevent spouting of engine coolant.

CAUTION

Do not allow the pressure to exceed the radiator cap release pressure, or the radiator can be damaged.

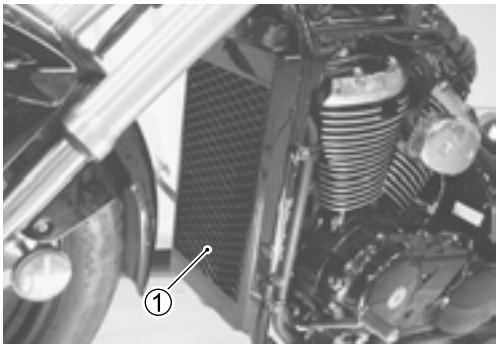


RADIATOR AND WATER HOSES

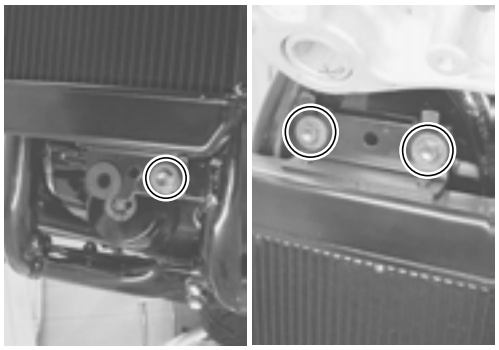
RADIATOR REMOVAL

- Remove the fuel tank. (☞6-3)
- Remove the frame head covers. (☞3-3)
- Drain the engine coolant. (☞2-17)

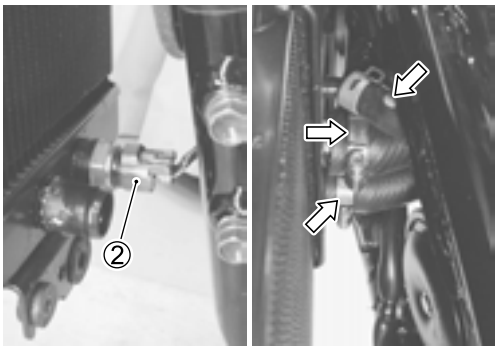
- Remove the radiator cover ①.



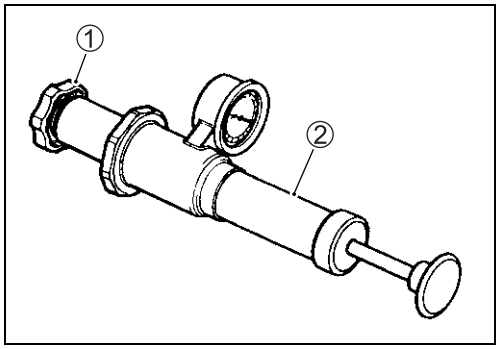
- Remove the radiator mounting bolts.



- Disconnect the ECT sensor coupler ② and water hoses.
- Remove the radiator.



RADIATOR CAP INSPECTION



- Fit the cap ① to the radiator cap tester ②.
- Build up pressure slowly by operating the tester. Make sure that the pressure build-up stops at 95 – 125 kPa (0.95 – 12.5 kgf/cm², 13.5 – 17.8 psi) and that, with the tester held stand-still, the cap is capable of holding that pressure for at least 10 seconds.
- Replace the cap if it is found not to satisfy either of these two requirements.

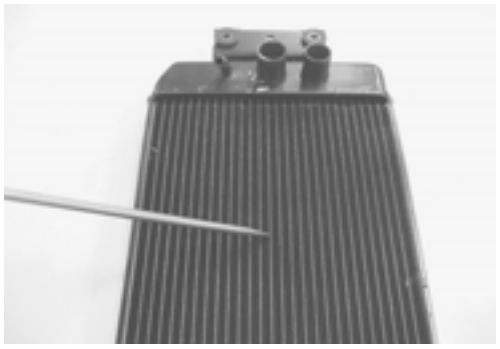
DATA Radiator cap valve opening pressure
Standard: 95 – 125 kPa
(0.95 – 1.25 kgf/cm², 13.5 – 17.8 psi)

RADIATOR INSPECTION AND CLEANING

- Road dirt or trash stuck to the fins must be removed.
- Use of compressed air is recommended for this cleaning.



- Fins bent down or dented can be repaired by straightening them with the blade of a small screwdriver.

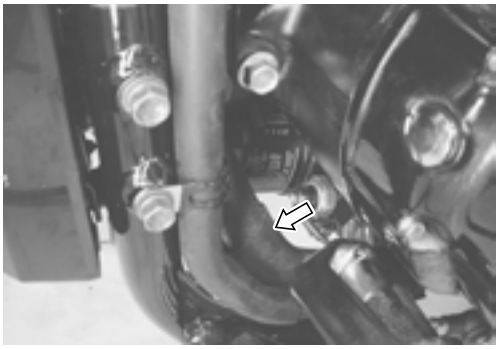


RADIATOR REMOUNTING

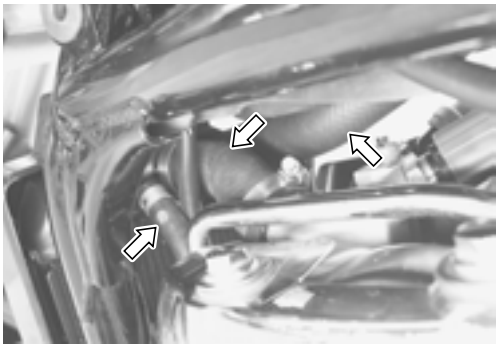
- The radiator is to be installed in the reverse order of the removal procedure.
- Install the radiator.
- Route the radiator hoses. (☞10-20)
- Bleed air from the cooling circuit. (☞2-18)

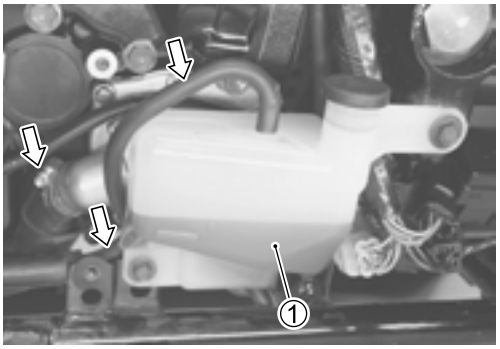
WATER HOSE AND RESERVOIR TANK INSPECTION

- Remove the fuel tank. (☞6-3)
- Remove the secondary gear case cover. (☞8-40)
- Remove the frame head covers. (☞3-3)
- Any water hose and reservoir tank ① found in a cracked condition or flattened must be replaced.
- Any leakage from the connecting section should be corrected by proper tightening.



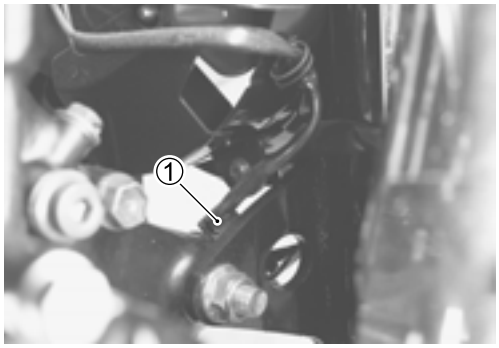




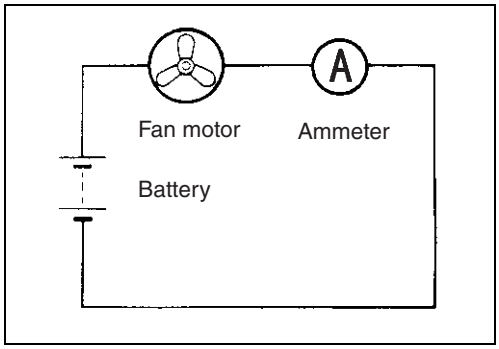


COOLING FAN

INSPECTION



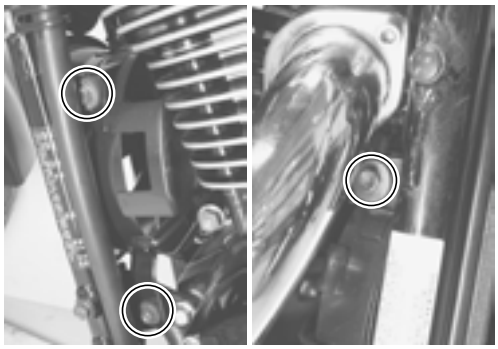
- Disconnect the cooling fan lead wire coupler ①.
- Test the cooling fan motor for load current with an ammeter connected as shown in the illustration.



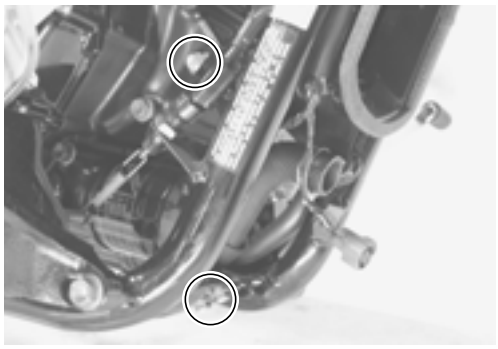
- The voltmeter is for making sure that the battery applies 12 volts to the motor. With the motor with electric motor fan running at full speed, the ammeter should be indicating not 5 amperes and more.
- If the fan motor does not turn, replace the motor assembly with a new one.

REMOVAL

- Remove the radiator. (☞7-4)
- Remove the cooling fan mounting bolts.

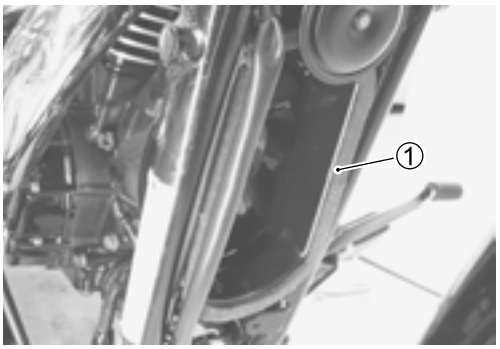


- Slightly move the down tube by removing its mounting bolts.





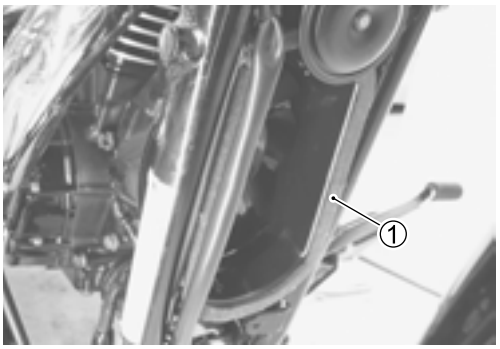
- Remove the cooling fan ① by disconnecting the cooling fan lead wire coupler.



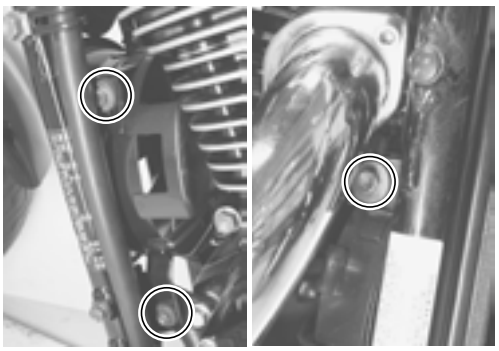
INSTALLATION

Install the cooling fan in the reverse order of removal. Pay attention to the following points:

- Put the cooling fan ① between the down tube and the engine.
- Temporary tighten the down tube mounting bolts. (☞3-9)

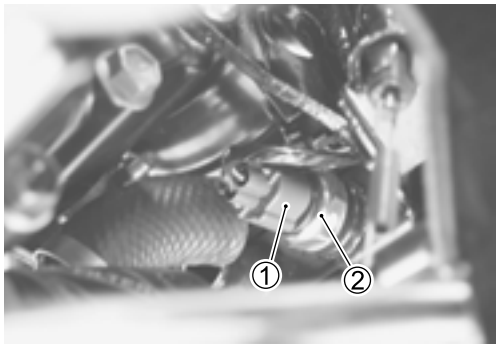


- Tighten the cooling fan mounting bolts.
- Tighten the down tube mounting bolts to the specified torque. (☞3-9)
- Install the radiator. (☞7-5)



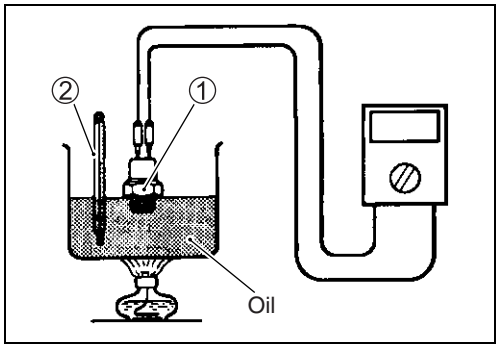
COOLING FAN THERMO-SWITCH

REMOVAL



- Drain the engine coolant. (☞2-17)
- Disconnect the cooling fan thermo-switch coupler ①.
- Remove the cooling fan thermo-switch ②.

INSPECTION



- Check the thermo-switch closing or opening temperatures by testing it at the bench as shown in the figure. Connect the thermo-switch to a circuit tester and place it in the oil contained in a pan, which is placed on a stove.
- Heat the oil to raise its temperature slowly, and read the column thermometer when the switch closes or opens.

TOOL 09900-25008: Multi circuit tester set

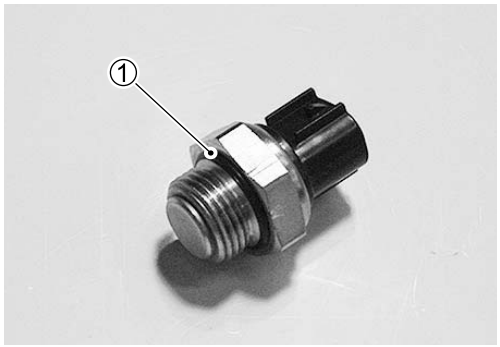
Tester knob indication: Continuity test (•))))

DATA Cooling fan thermo-switch operating temperature:
Standard (OFF→ON): Approx. 105 °C (221 °F)
(ON→OFF): Approx. 100 °C (212 °F)

CAUTION

*** Take special care when handling the thermo-switch. It may cause damage if it gets a sharp impact.**
*** Do not contact the cooling fan thermo-switch ① and the column thermometer ② with a pan.**

INSTALLATION



- Install the O-ring ①.
- Tighten the cooling fan thermo-switch to the specified torque.

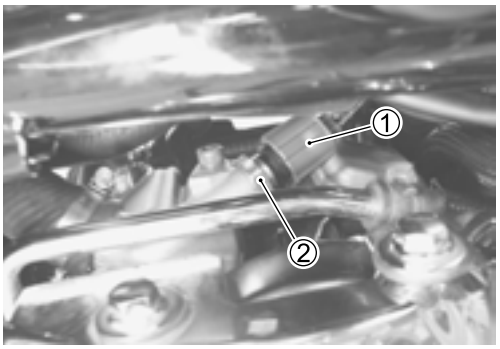
Cooling fan thermo-switch:
17 N·m (1.7 kgf-m, 12.5 lb-ft)

- Bleed air from the cooling circuit. (☞2-18)

ENGINE COOLANT TEMPERATURE SENSOR

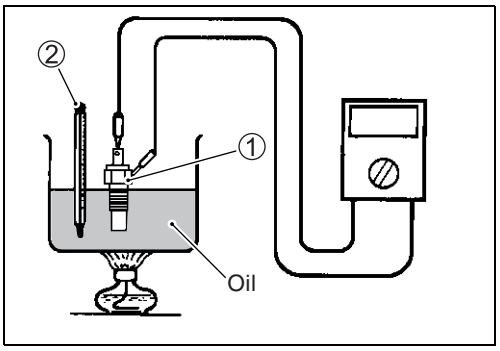
REMOVAL

- Lift and support the fuel tank. (☞6-3)
- Remove the frame head covers. (☞3-3)
- Disconnect the engine coolant temperature sensor coupler ①.
- Keep the motorcycle upright.
- Place a rag under the sensor and remove the engine coolant temperature sensor ②.



INSPECTION

- Check the engine coolant temperature sensor by testing it at the bench as shown in the figure. Connect the temperature sensor ① to a circuit tester and place it in the oil contained in a pan, which is placed on a stove.
- Heat the oil to raise its temperature slowly and read the column thermometer ② and the ohmmeter.



- If the temperature sensor ohmic value does not change in the proportion indicated, replace it with a new one.

DATA Temperature sensor specification

Temperature	Standard resistance
20 °C (68 °F)	Approx. 2.45 kΩ
40 °C (104 °F)	Approx. 1.148 kΩ
60 °C (140 °F)	Approx. 0.587 kΩ
80 °C (176 °F)	Approx. 0.322 kΩ

If the resistance is noted to show infinity or too much different resistance value, replace the temperature sensor with a new one.

CAUTION

*** Take special care when handling the temperature sensor. It may cause damage if it gets a sharp impact.**
*** Do not contact the engine coolant temperature sensor ① and the column thermometer ② with a pan.**

INSTALLATION



Install the engine coolant temperature sensor order of removal. Pay attention to the following points:

- Tighten the engine coolant temperature sensor to the specified torque.

Engine coolant temperature sensor:
18 N·m (1.8 kgf-m, 13.0 lb-ft)

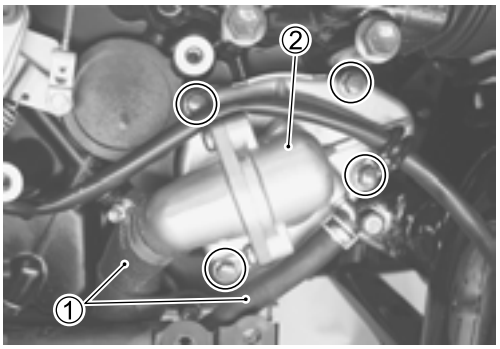
CAUTION

Take special care when handling the temperature sensor. It may cause damage if it gets a sharp impact.

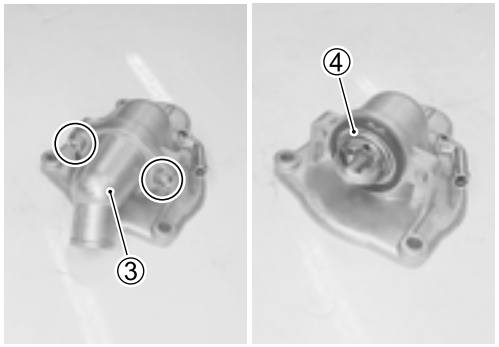
THERMOSTAT

REMOVAL

- Drain engine coolant. (☞2-17)
- Remove the reservoir tank. (☞3-4)
- Remove the water hoses ① and water pump case ②.



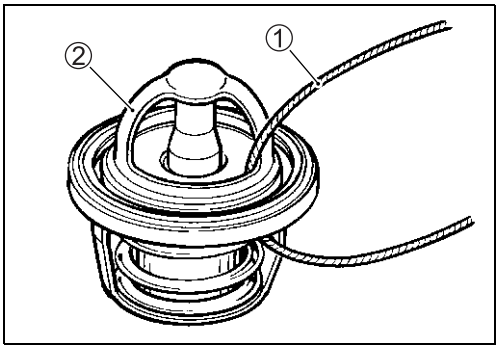
- Remove the thermostat case ③.
- Remove the thermostat ④.



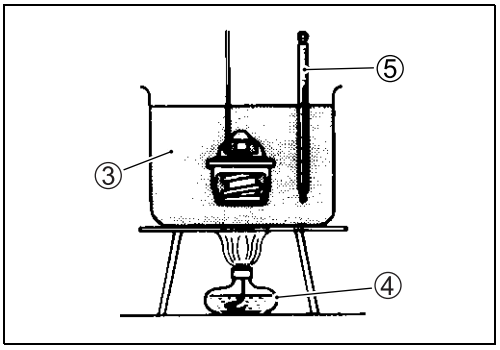
INSPECTION

Inspect the thermostat pellet for signs of cracking.
Test the thermostat at the bench for control action, in the following manner.

- Pass a string ① between flange of thermostat ②, as shown.
- Immerse the thermostat in the water contained in a beaker, as shown in the illustration. Note that the immersed thermostat is in suspension. Heat the water ③ by placing the beaker on a stove ④ and observe the rising temperature on a thermometer ⑤.

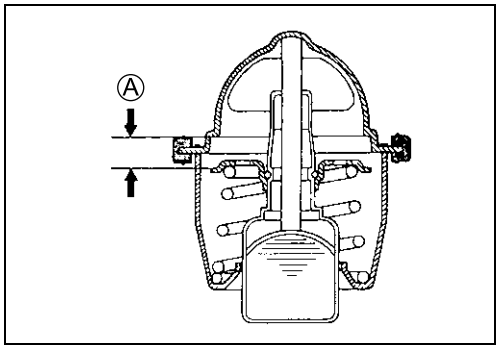


- Read the thermometer just when opening the thermostat. This reading, which is the temperature level at which the thermostat valve begins to open, should satisfy the standard value.



DATA **Thermostat valve opening temperature**
Standard: Approx. 75 °C (167 °F)

- Keep on heating the water to raise its temperature.
- Just when the water temperature reaches specified value, the thermostat valve should have lifted by at least 6.0 mm (0.24 in).



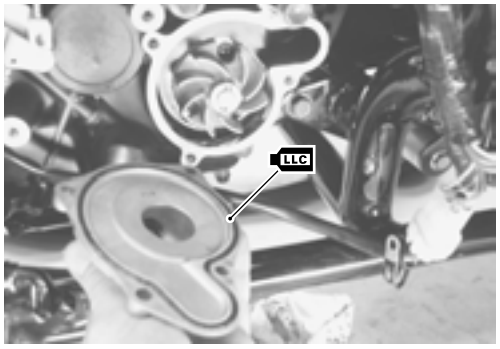
DATA Thermostat valve lift Ⓐ
Standard: 6.0 mm and over at 90 °C
(0.24 in and over at 194 °F)

- A thermostat failing to satisfy either of the two requirements (start-to-open temperature and valve lift) must be replaced.

INSTALLATION

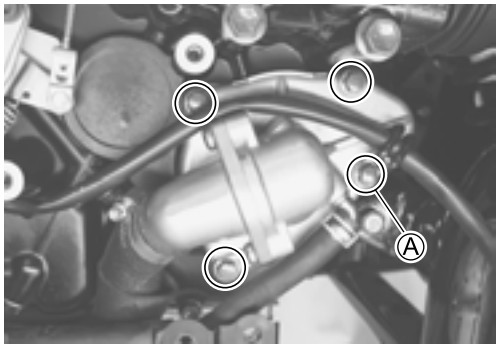
Install the thermostat in the revers order of removal. Pay attention to the following points:

- Apply engine coolant to the O-ring and install the water pump cover.



- Tighten the water pump cover bolts.

NOTE:
Fit the clamp to the bolt Ⓐ.

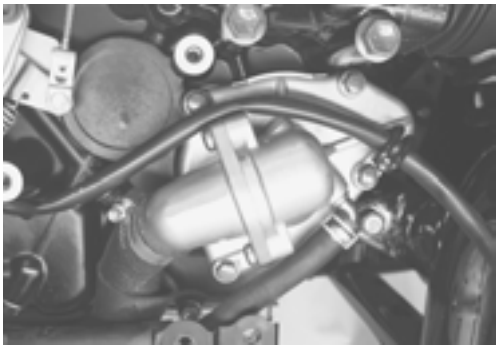


- Bleed air from the cooling circuit. (☞2-18)

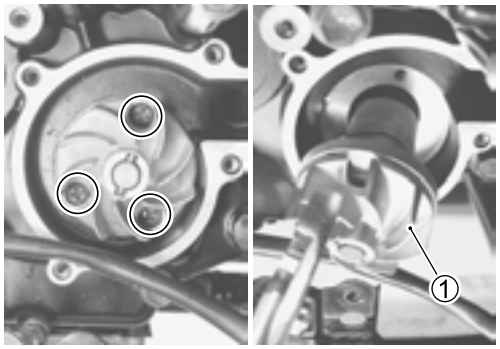
WATER PUMP
REMOVAL AND DISASSEMBLY

- Drain the engine oil. (☞2-11)
- Drain engine coolant. (☞2-17)
- Remove the water pump case. (☞7-12)

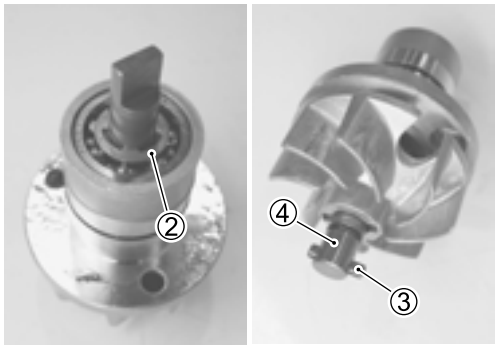
NOTE:
Before draining engine oil and engine coolant, inspect engine oil and coolant leakage between the water pump and crankcase. If engine oil is leaking, visually inspect the oil seal and O-ring. If engine coolant is leaking, visually inspect the mechanical seal and seal washer. (☞7-16)



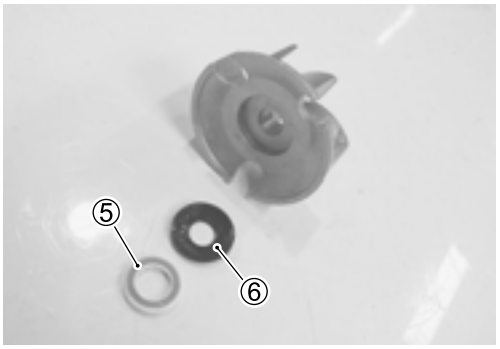
- Turn the crankshaft and align the water pump impeller holes with the screws.
- Remove the water pump ①.



- Remove the E-ring ②.
- Remove the pin ③ and draw out the impeller shaft ④.



- Remove the mechanical seal ring ⑤ and the rubber seal ⑥ from the impeller.



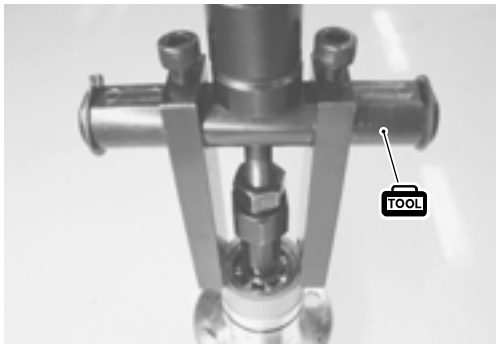
• Remove the bearings with the special tool.

TOOL 09921-20240: Bearing remover set

NOTE:
If there is no abnormal noise condition, bearing removal is not necessary.

CAUTION

The removed bearing must be replaced with a new one.



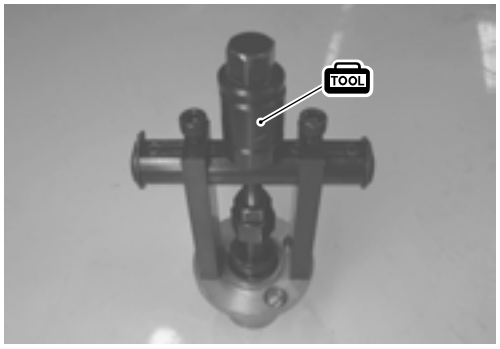
• Remove the mechanical seal with the special tool.

TOOL 09921-20240: Bearing remover set

NOTE:
If there is no abnormal condition, the mechanical seal removal is not necessary.

CAUTION

The removed mechanical seal must be replaced with a new one.

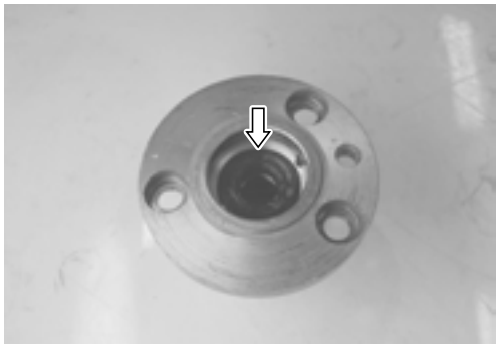


• Remove the oil seal using a suitable bar.

NOTE:
If no abnormal, the oil seal removal is not necessary.

CAUTION

The removed oil seal must be replaced with a new one.



INSPECTION

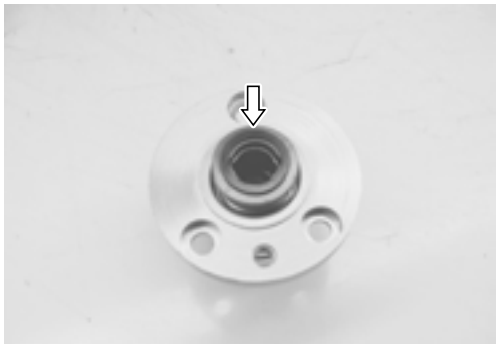
BEARING

- Inspect the play of the bearing by hand while it is in the water pump case.
- Rotate the inner race by hand to inspect for abnormal noise and smooth rotation.
- Replace the bearing if there is anything unusual.

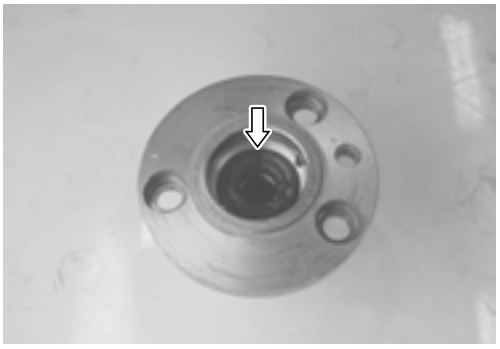


MECHANICAL SEAL

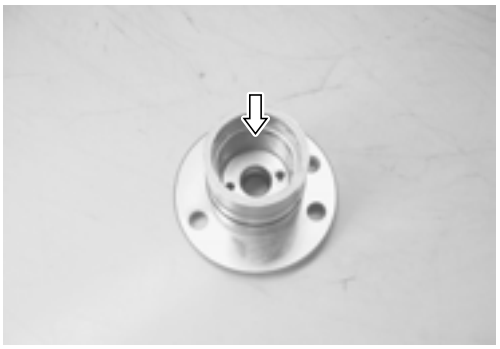
- Visually inspect the mechanical seal for damage, with particular attention given to the sealing face.
- Replace the mechanical seal that shows indications of leakage. Also replace the seal ring if necessary.



OIL SEAL
- Visually inspect the oil seal for damage, with particular attention given to the lip.
- Replace the oil seal that shows indications of leakage.



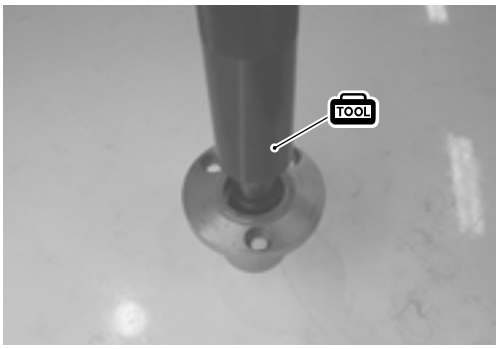
BEARING CASE
- Visually inspect the bearing case for damage.
- Replace the water pump body if necessary.



REASSEMBLY AND INSTALLATION
- Install the oil seal with the special tool.

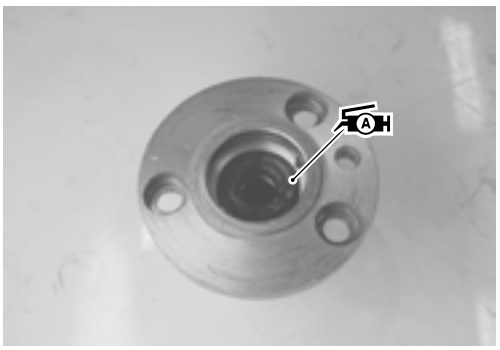
09913-70210: Bearing installer set

NOTE:
The stamped mark on the oil seal faces outside.



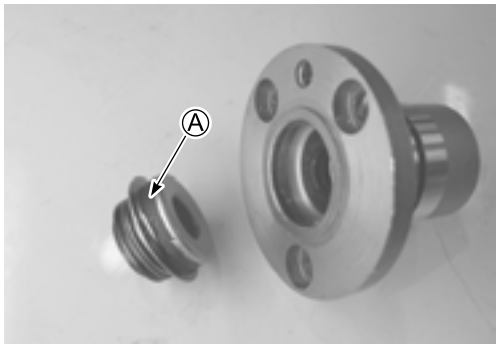
- Apply a small quantity of the SUZUKI SUPER GREASE “A” to the oil seal lip.

99000-25030: SUZUKI SUPER GREASE “A” (USA)
99000-25010: SUZUKI SUPER GREASE “A” (Others)



- Install the new mechanical seal using a suitable size socket wrench.

NOTE:
On the new mechanical seal, the sealer Ⓐ has been applied.

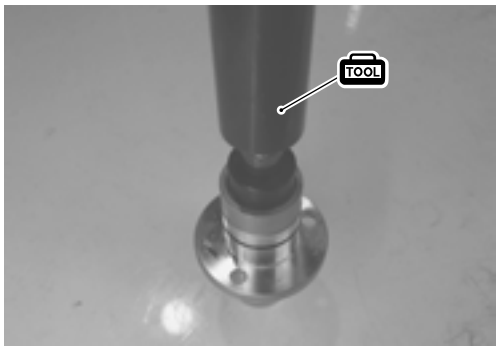




- Install the new bearings with the special tool.

TOOL 09913-70210: Bearing installer set

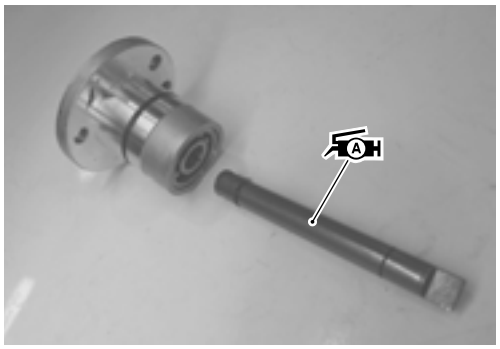
NOTE:
The stamped mark on the bearing faces crankcase side.



- Apply SUZUKI SUPER GREASE "A" to the impeller shaft.

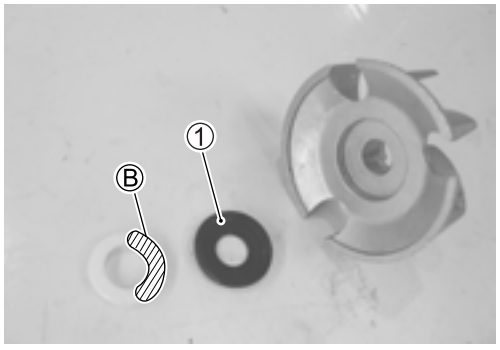
A 99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

- Install the impeller shaft to the water pump body.



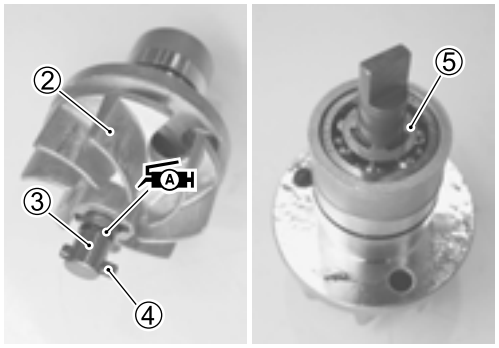
- Install the rubber seal ① into the impeller.
- After wiping off the oily or greasy matter from the mechanical seal ring, install it into the impeller.

NOTE:
The marked side Ⓑ of the mechanical seal ring faces the impeller.



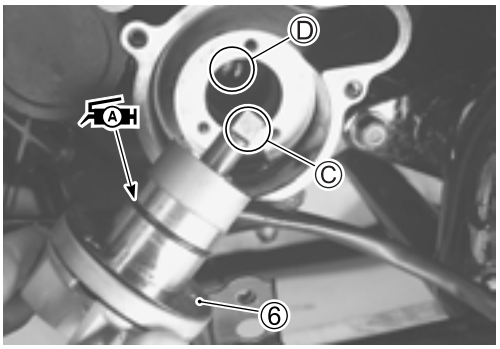
- Apply grease to the new O-ring.
- Install the impeller ② and impeller shaft ③ to the water pump body.
- Install the pin ④ and E-ring ⑤.

99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

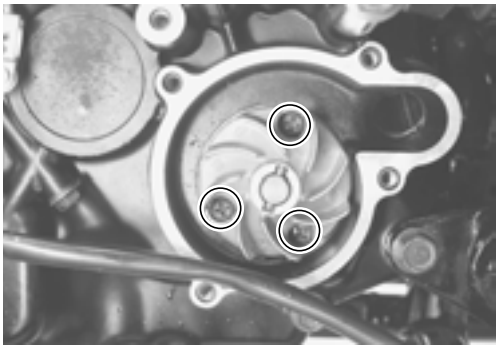


- Install the new gasket ⑥.
- Apply grease to the O-ring.
- Set the water pump shaft end Ⓒ to the oil pump shaft Ⓓ.

99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)



- Install the water pump.
- Tighten the screws.
- Install the water pump cover. (☞7-13)



- Connect the water hose.
- Install the reserve tank.
- Install the secondary gear case cover.
- Pour engine oil. (☞2-11)
- Bleed air from the cooling circuit. (☞2-18)

LUBRICATION SYSTEM

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OIL FILTER

☞2-12

OIL PRESSURE REGULATOR

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OIL STRAINER

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OIL JET

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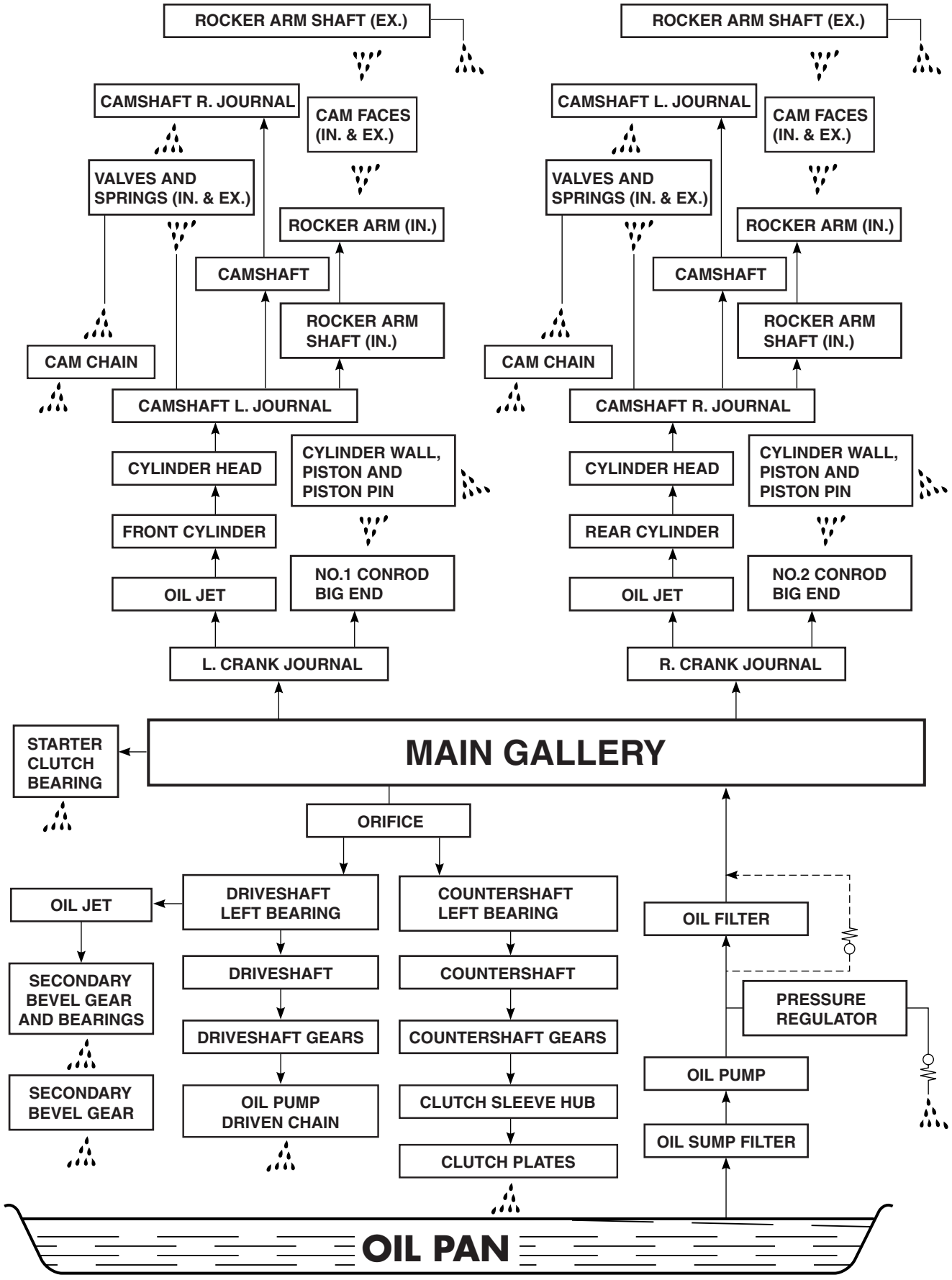
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OIL PRESSURE SWITCH

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ENGINE LUBRICATION SYSTEM CHART



CHASSIS

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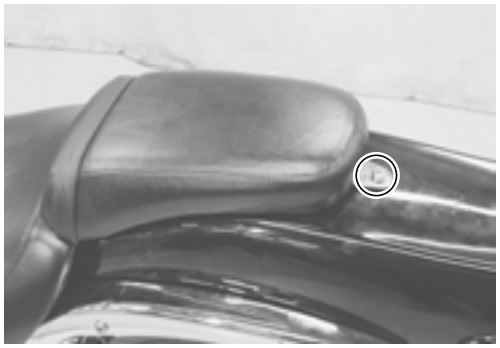
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EXTERIOR PARTS

REMOVAL

SEAT

- Remove the rear seat by removing the bolt.



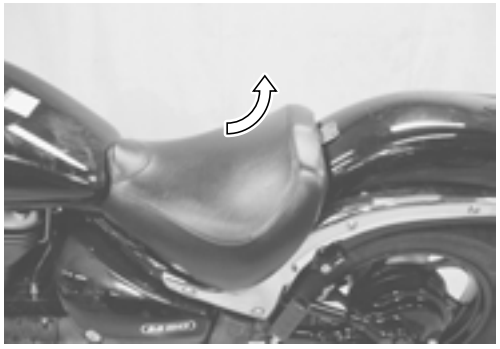
CAUTION

Be careful not to scratch the rear fender.

- Remove the rear seat grip band by removing the bolts.



- Remove the seat.

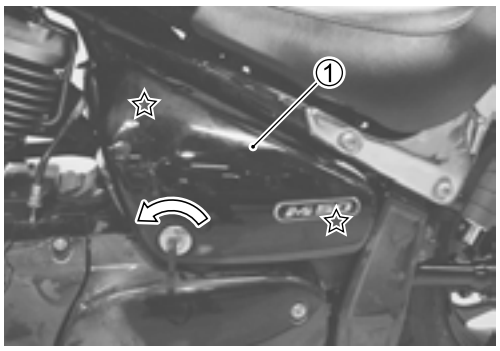


CAUTION

Be careful not to scratch the rear fender.

FRAME COVER

- Remove the left frame cover ① with the ignition key.

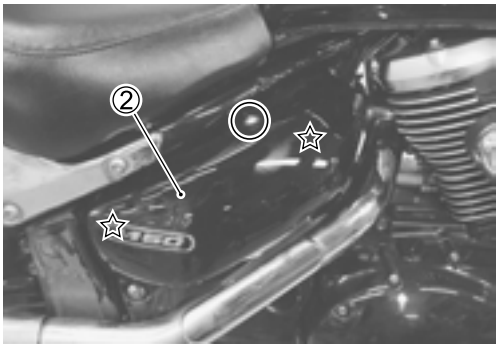


☆: Hooked part

• Remove the right frame covers ② by removing the bolts.

CAUTION

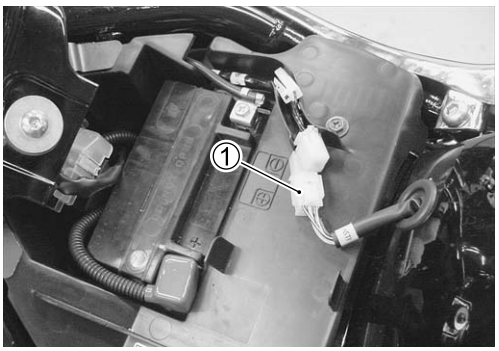
*** Wait until the engine and exhaust pipe are cool enough to touch with bare hands before draining oil.**
*** Be careful not to scratch the frame covers.**



☆: Hooked part

REAR FENDER

• Remove the seat. (☞8-3)
• Disconnect the coupler ①.

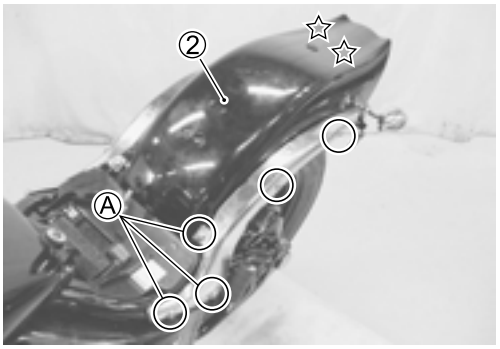


• Remove the left and right side frame handle grip.
• Remove the rear fender ②.

CAUTION

Be careful not to scratch the rear fenders.

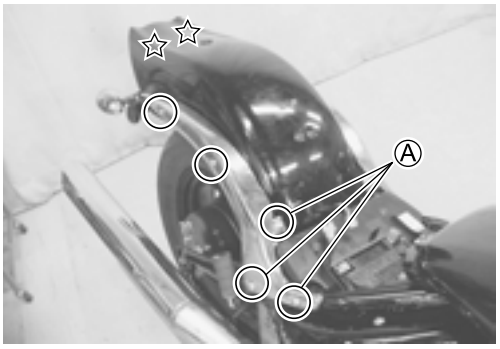
NOTE:
When installing the frame handle grip bolts, apply a small quantity of THREAD LOCK to its mounting bolts and tighten them to the specified torque.



☆: Hooked part

1303 99000-32030: THREAD LOCK SUPER "1303"

Frame handle grip mounting bolt Ⓐ (M10):
50 N·m (5.0 kgf-m, 36.0 lb-ft)

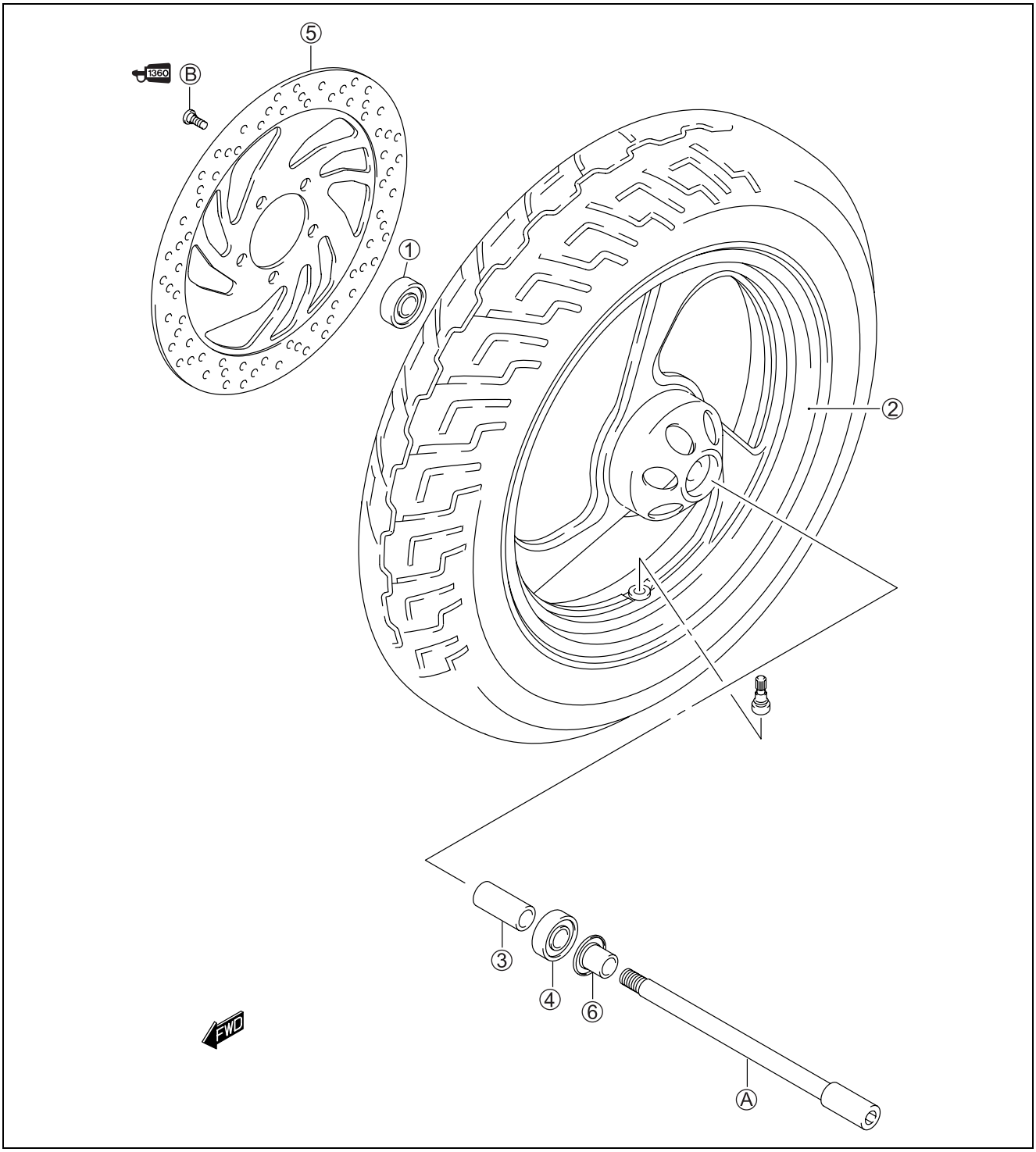


☆ : Hooked part

REMOUNTING

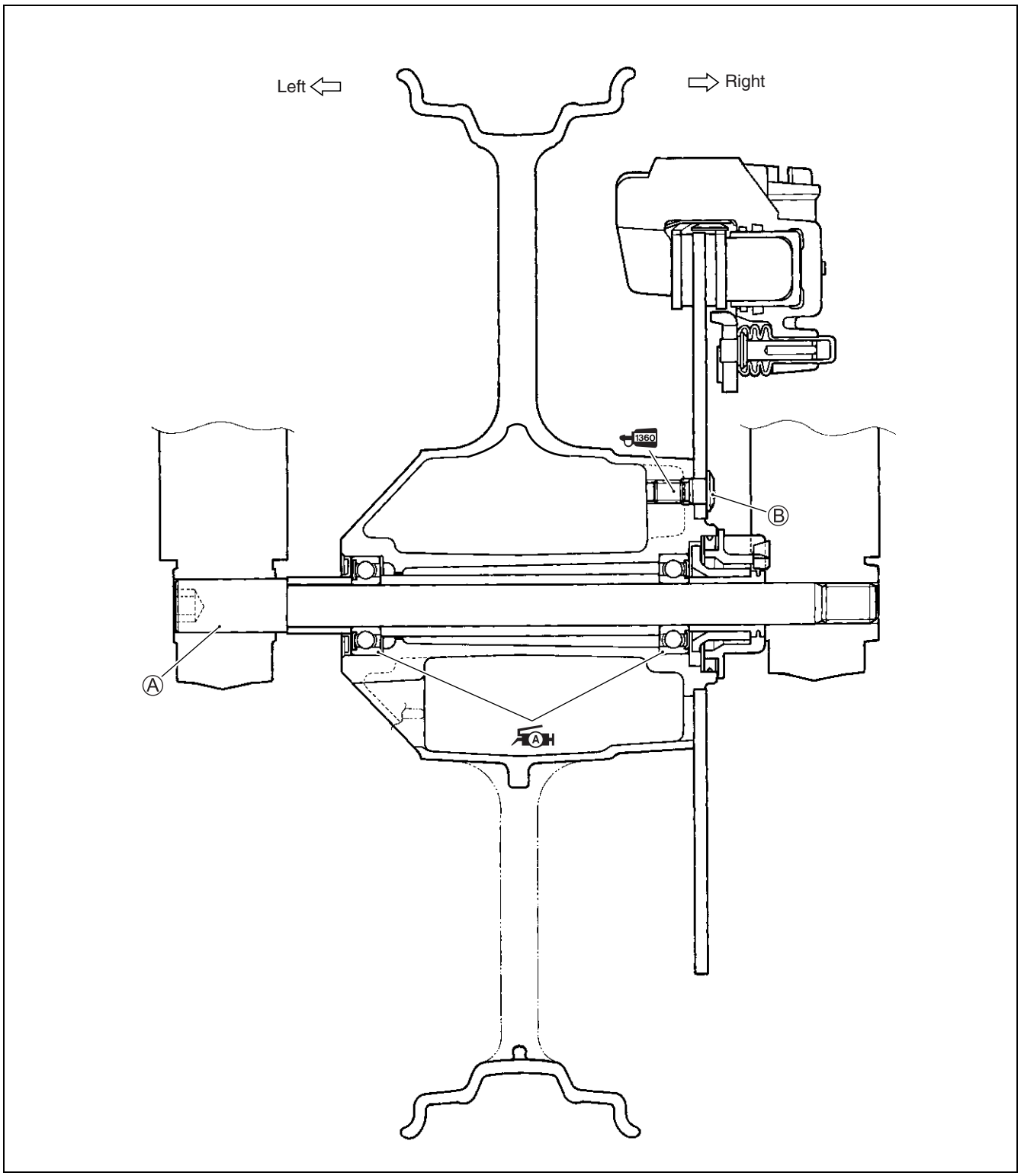
Remount the seats, covers and rear fender in the reverse order of removal.

FRONT WHEEL
CONSTRUCTION



①	Bearing (R)	⑤	Brake disc
②	Front wheel	⑥	Spacer
③	Spacer	Ⓐ	Front axle
④	Bearing (L)	Ⓑ	Brake disc mounting bolt

ITEM	N·m	kgf-m	lb-ft
Ⓐ	65	6.5	47.0
Ⓑ	23	2.3	16.5



Ⓐ	Front axle
Ⓑ	Brake disc bolt

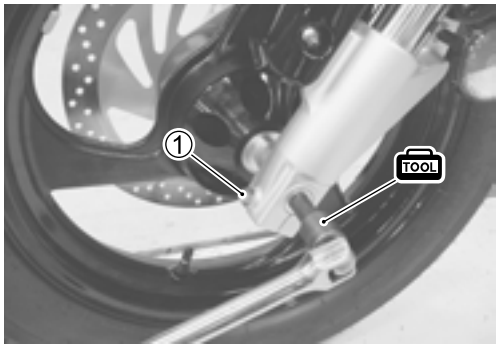
ITEM	N·m	kgf-m	lb-ft
Ⓐ	65	6.5	47.0
Ⓑ	23	2.3	16.5

REMOVAL AND DISASSEMBLY

- Loosen the front axle pinch bolt ①.
- Loosen the front axle with the special tool.

TOOL 09900-18710: Hexagon socket (12 mm)

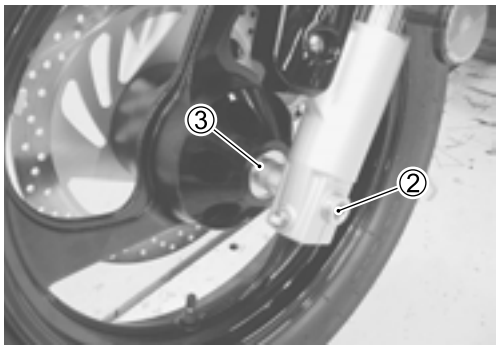
- Raise the front wheel off the ground with a jack or a wooden block.



- Remove the front axle ②, spacer ③ and front wheel.

CAUTION

Do not operate the brake lever during or after front wheel removal.



- Remove the brake disc by removing its bolts.

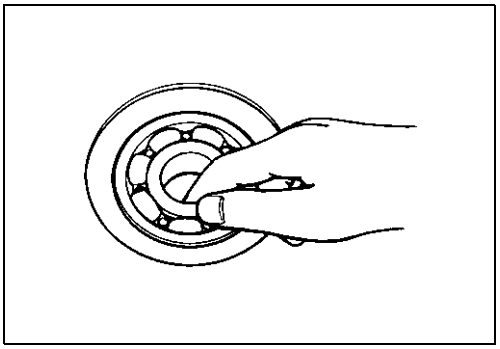


INSPECTION

WHEEL BEARINGS

Inspect the play of the wheel bearings by finger while they are in the wheel. Rotate the inner race by finger to inspect for abnormal noise and smooth rotation.

Replace the bearing in the following procedure if there is anything unusual.



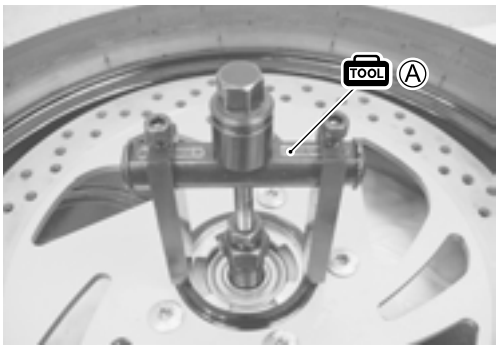
WHEEL BEARINGS REMOVAL

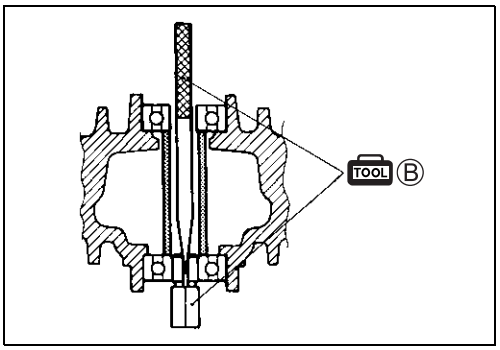
- Remove the wheel bearings by with the special tool Ⓐ or Ⓑ.

TOOL 09921-20240: Ⓐ Bearing remover set (17 mm)
or 09941-50111: Ⓑ Wheel bearing remover

CAUTION

The removed bearings should be replaced with new ones.

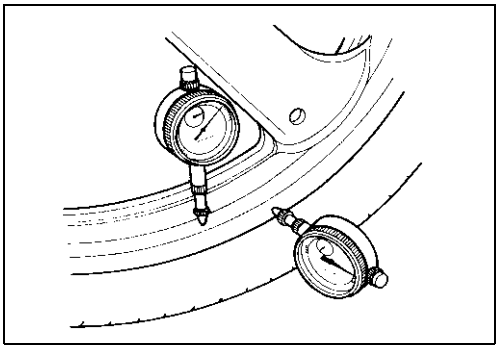




FRONT WHEEL

Make sure that the wheel runout (axial and radial) does not exceed the service limit when checked as shown. An excessive amount of runout is usually due to worn or loose wheel bearings and can be corrected by replacing the bearings. If bearing replacement fails to reduce the runout, replace the wheel with a new one.

DATA Wheel rim runout (axial and radial)
Service Limit: 2.0 mm (0.08 in)



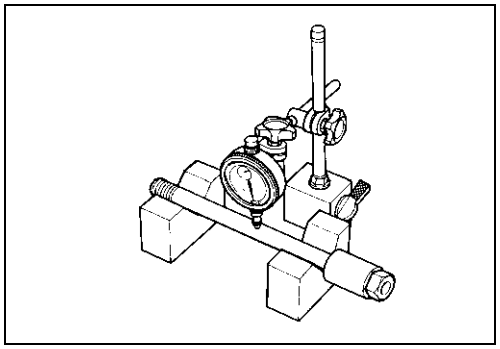
FRONT AXLE

Measure the front axle runout using the dial gauge. If the runout exceeds the service limit, replace the front axle with a new one.

TOOL 09900-20607: Dial gauge (1/100 mm)
09900-20701: Magnetic stand
09900-21304: V-block set (100 mm)

DATA Wheel axle runout
Service Limit: 0.25 mm (0.010 in)

TIRE ☞2-23



REASSEMBLY AND REMOUNTING

Reassemble and remount the front wheel in the reverse order of removal and disassembly. Pay special attention to the following points:

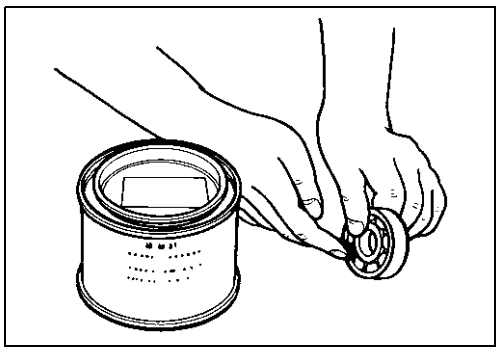
WHEEL BEARING

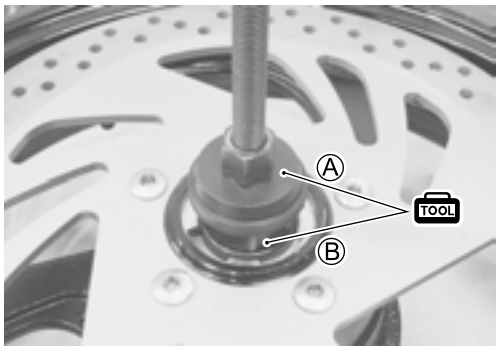
- Apply SUZUKI SUPER GREASE "A" to the bearings before installing.

A 99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

- Install the wheel bearings with the used bearings and special tool as described below.

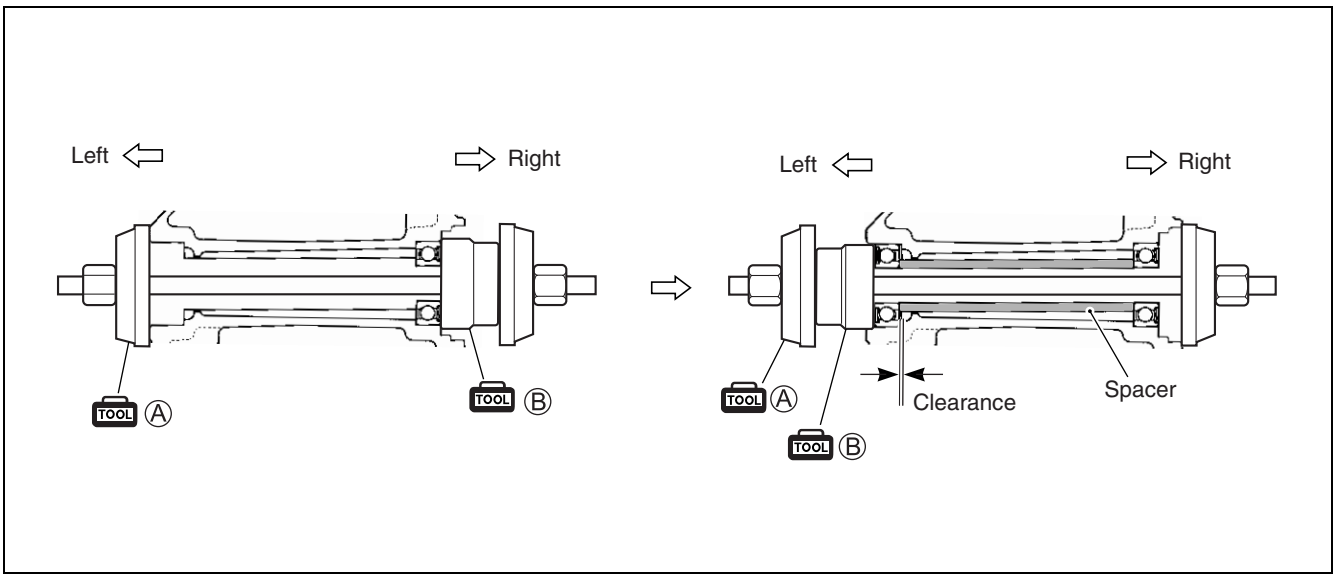
TOOL Ⓐ 09941-34513: Bearing installer set
Ⓑ 09913-70210: Bearing installer set (40 mm)





CAUTION

*** First install the right wheel bearing, then install the left wheel bearing.**
*** The sealed covers on the bearings must face to the outside.**

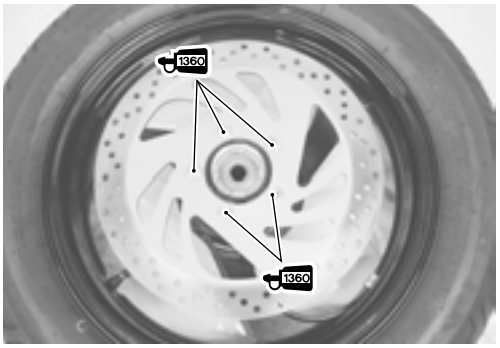


BRAKE DISC

- Make sure that the brake disc is clean and free of any grease. Apply THREAD LOCK SUPER to the brake disc bolts and tighten them to the specified torque.

1360 99000-32130: THREAD LOCK SUPER "1360"

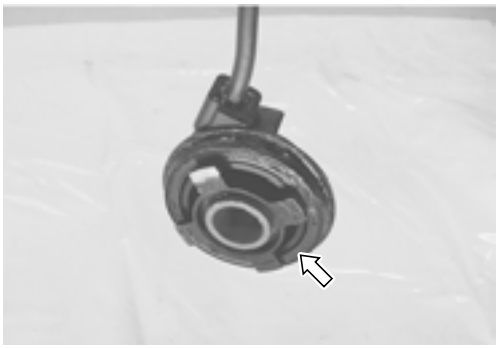
Brake disc bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)



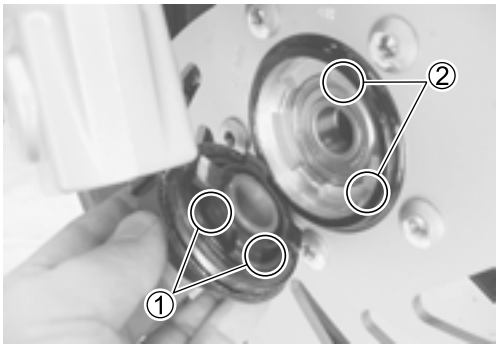
SPEED SENSOR

- Apply SUZUKI SUPER GREASE "A" to the speed sensor dust seal.

A 99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)



- Align the grooves ① on the speed sensor with the lugs ② on the wheel hub.

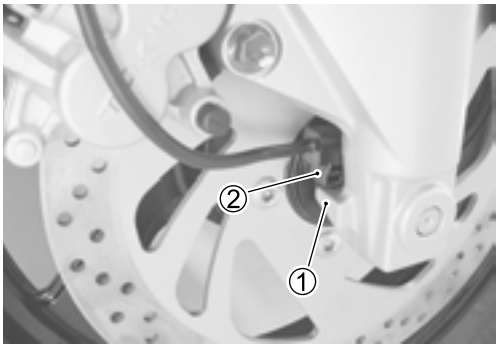


FRONT WHEEL

- Make sure that the front fork stopper ① and the speed sensor stopper ② are installed as shown.

CAUTION

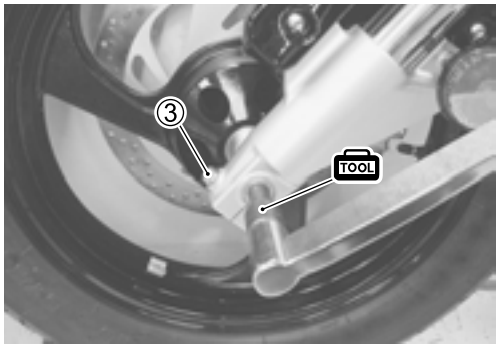
When installing the front wheel, position the brake disc between the brake pads. Be careful not to damage the brake pads.



- Tighten the front axle to the specified torque.
- Tighten the front axle pinch bolt ③ on the specified torque.

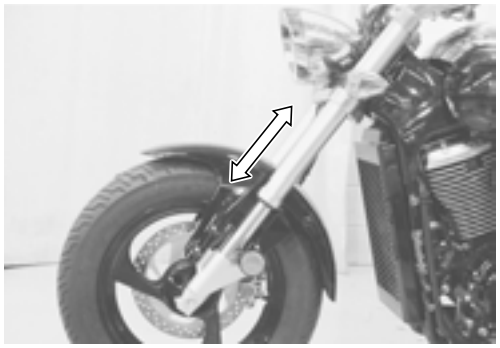
Front axle: 65 N·m (6.5 kgf-m, 47.0 lb-ft)
Front axle pinch bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)

09900-18710: Hexagon socket (12 mm)

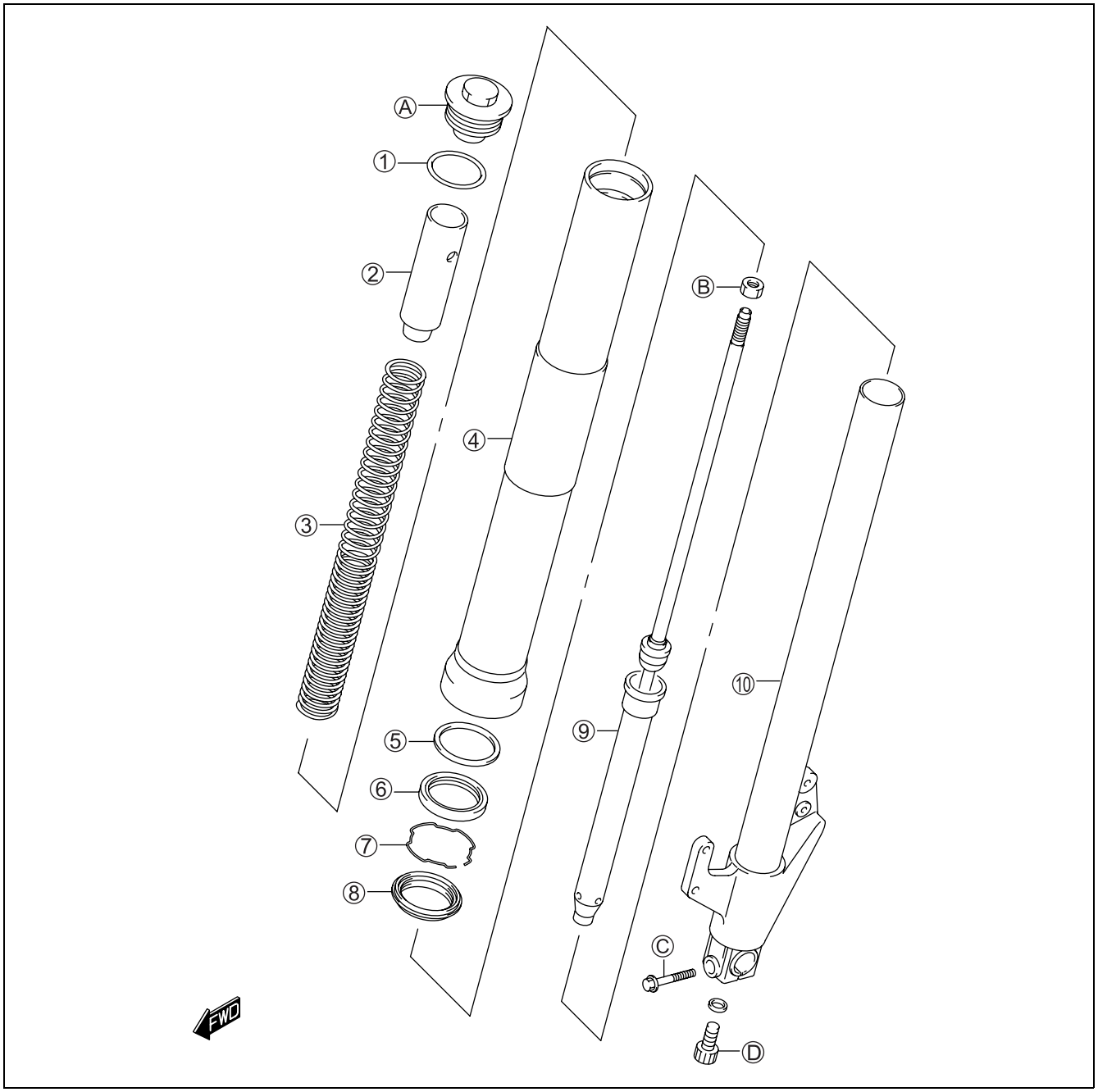


NOTE:
Before tightening the front axle pinch bolt ③, move the front fork up and down four or five times.

NOTE:
After remounting the front wheel, pump the brake lever a few times to check for proper brake operation.



FRONT FORK
CONSTRUCTION



①	O-ring	⑥	Oil seal	Ⓐ	Front fork cap bolt
②	Spacer	⑦	Oil seal stopper ring	Ⓑ	Inner rod lock-nut
③	Spring	⑧	Dust seal	Ⓒ	Front axle pinch bolt
④	Outer tube	⑨	Inner rod/Damper rod (cartridge)	Ⓓ	Caliper rod bolt
⑤	Oil seal retainer	⑩	Inner tube		

ITEM	N·m	kgf-m	lb-ft
Ⓐ	23	2.3	16.5
Ⓑ	15	1.5	11.0

ITEM	N·m	kgf-m	lb-ft
Ⓒ	33	3.3	24.0
Ⓓ	39	3.9	28.0

REMOVAL AND DISASSEMBLY

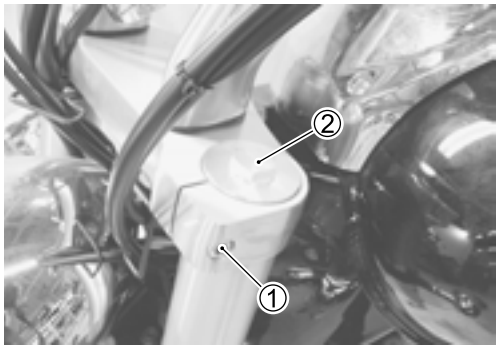
- Remove the front wheel. (☞8-7)
- Remove the front brake caliper. (☞8-52)
- Remove the front fender.



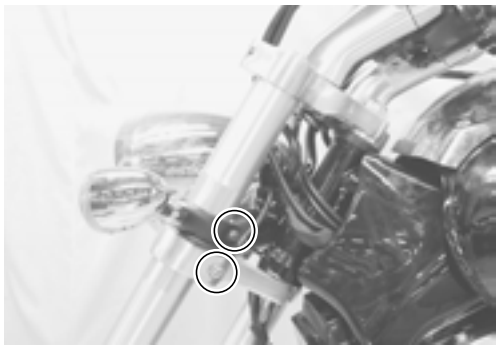


- Loosen the front fork upper clamp bolts ①.

NOTE:
Slightly loosen the front fork cap bolts ② before loosening the lower clamp bolts to facilitate later disassembly.

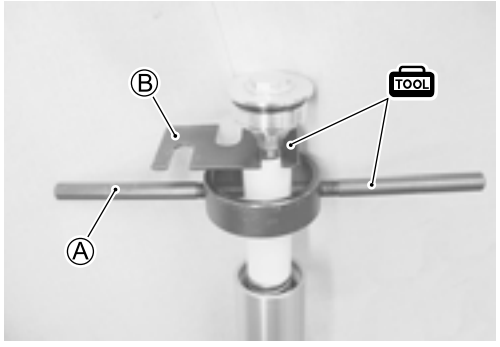


- Loosen the turn signal light clamp screws and front fork lower clamp bolts.
- Remove the front forks.

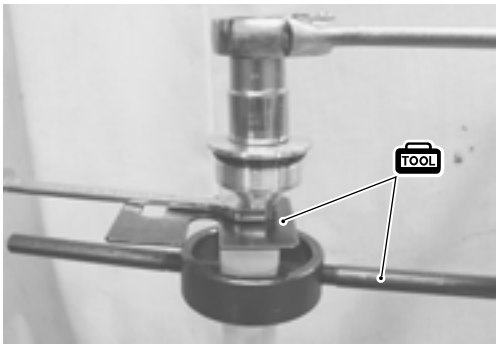


- Separate the front fork cap bolt from the front fork.
- Compress the front fork spring with the special tool Ⓐ and insert the special tool Ⓑ between the lock-nut and the spacer.

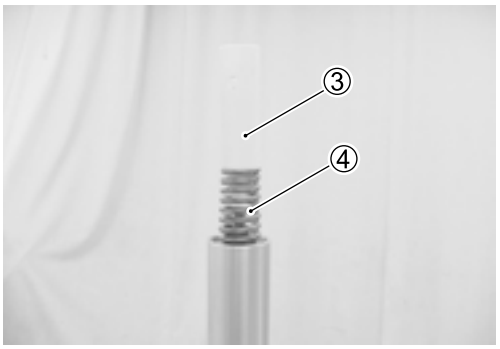
TOOL **09940-94930: Front fork spacer holder** Ⓐ
09940-94922: Stopper plate Ⓑ



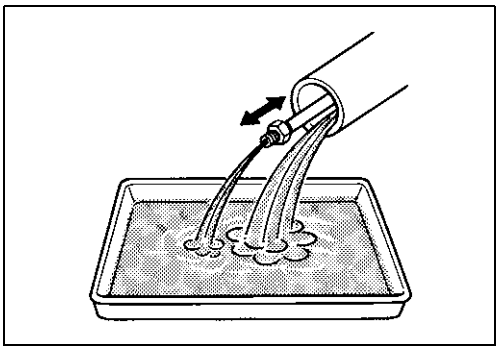
- Remove the front fork cap bolt from the inner rod by loosening the lock nut.
- Compress the fork spring with the special tool and remove the special tool.



- Remove the spacer ③ and spring ④.



- Invert the front fork and stroke the inner rod several times to let out fork oil.
- Under the inverted condition of front fork, drain oil completely by holding the fork for a while.



- Remove the damper rod bolt with the special tool.

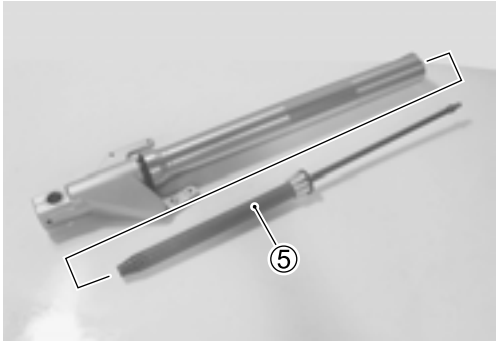
TOOL 09940-30221: Front fork assembling tool



- Remove the inner rod/damper rod (cartridge) ⑤.

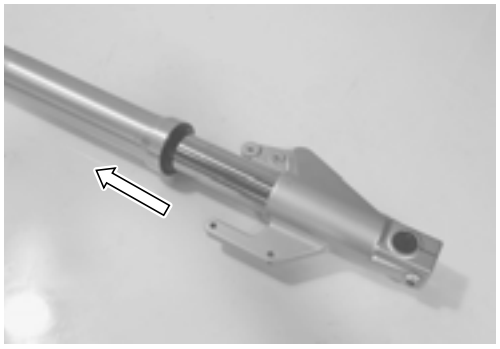
CAUTION

Do not disassemble the inner rod/damper rod (cartridge).

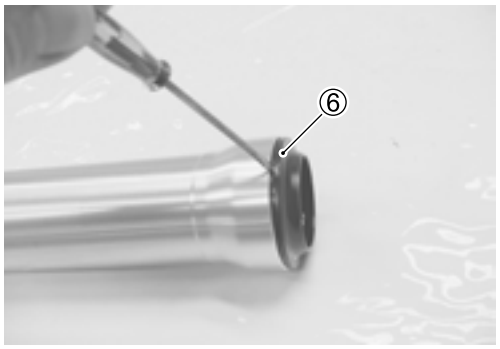


• Extract the outer tube from the inner tube.

NOTE:
Be careful not to damage the "ANTI-FRICTION" metals.



• Remove the dust seal ⑥.



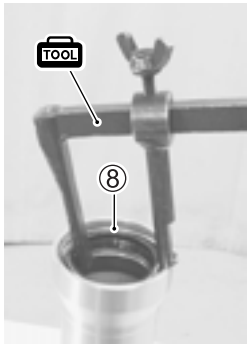
• Remove the oil seal stopper ring ⑦.
• Remove the oil seal ⑧ with the special tool.

TOOL 09913-50121: Oil seal remover

CAUTION

The removed oil seal must be replaced with a new one.





• Remove the oil seal retainer ⑨.



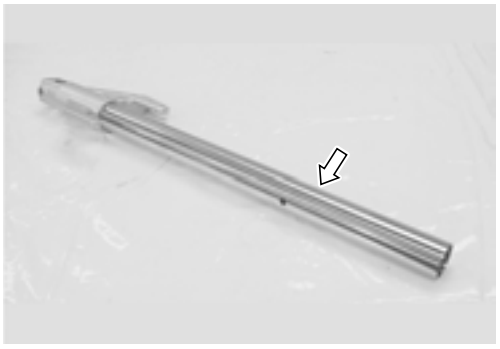
INSPECTION

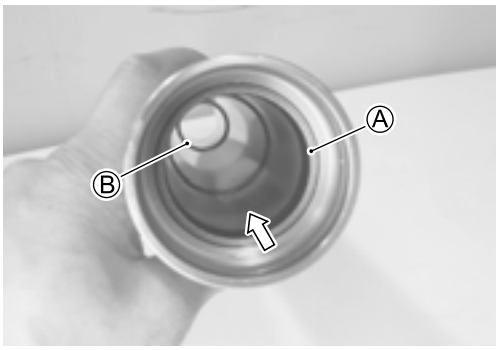
INNER AND OUTER TUBES

- Inspect the inner tube outer surface and outer tube inner surface for scratches.
- Inspect the “ANTI-FRICTION” metal surfaces for scratches.
- If any defects are found, replace them with a new one.

CAUTION

Do not remove the “ANTI-FRICTION” metal Ⓐ and Ⓑ.



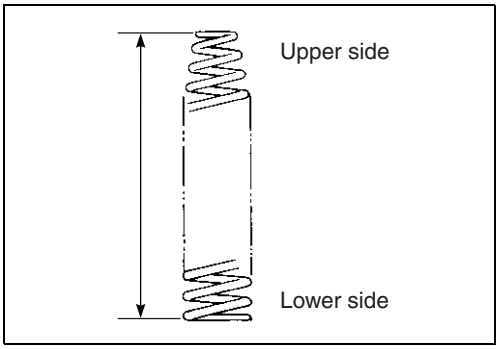


FORK SPRING

Measure the fork spring free length.

If it is shorter than the service limit, replace it with a new one.

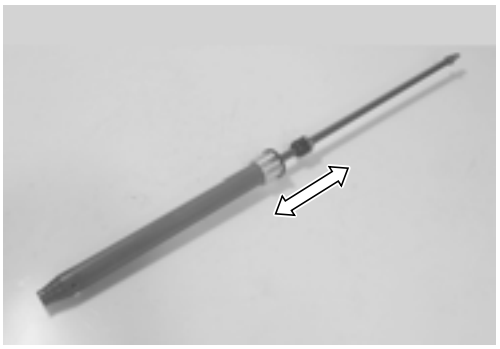
DATA Front fork spring free length:
Service Limit: 372 mm (14.6 in)



DAMPER ROD

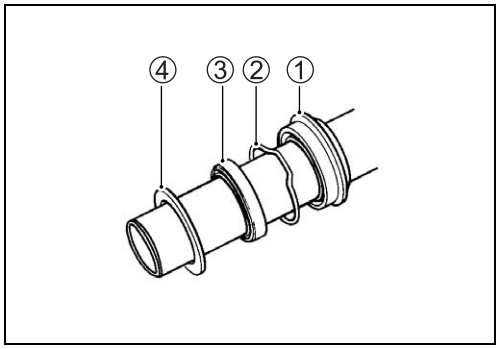
Move the inner rod by hand to examine it for smoothness.

If any defects are found, replace inner rod/damper rod (cartridge) with a new one.



REASSEMBLY AND REMOUNTING

Reassemble and remount the front fork in the reverse order of removal and disassembly. Pay attention to the following points:



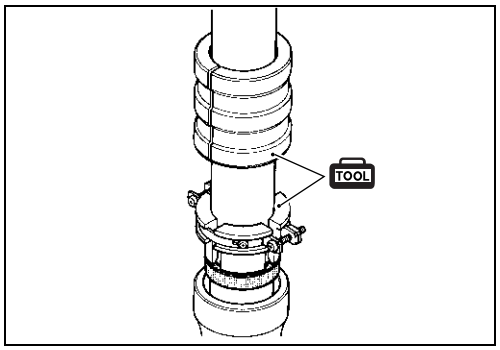
OIL SEAL AND DUST SEAL

- Install the dust seal, oil seal stopper ring, oil seal and oil seal retainer onto the inner tube.

① Dust seal
② Oil seal stopper ring
③ Oil seal
④ Oil seal retainer

CAUTION

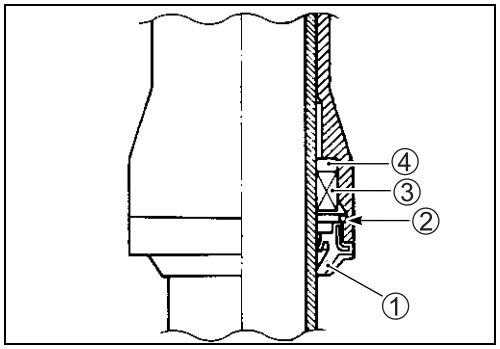
*** When installing the oil seal to outer tube, be careful not to damage the oil seal lip.**
*** Do not use solvents for washing to prevent oil seal damage.**
*** Apply fork oil to the Anti-friction metals and lip of the oil seal.**
*** Make sure that the oil seal stopper ring has been fitted securely.**



- Insert the inner tube into the outer tube and fit the oil seal and dust seal with the special tool.

TOOL 09940-52861: Front fork oil seal installer

NOTE:
Stamped mark on the oil seal should face outside.



DAMPER ROD BOLT

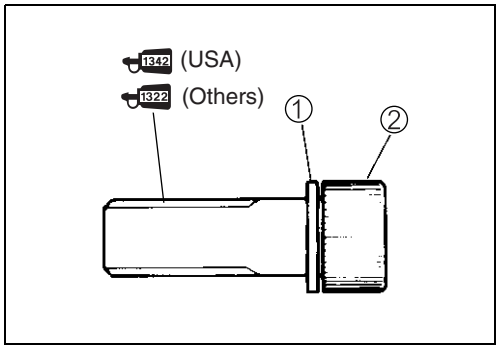
- Insert the inner rod/damper rod (cartridge) into the inner tube with the gasket ① fitted, apply the damper rod bolt ②.
- Apply THREAD LOCK to the damper rod bolt.

1342 99000-32050: THREAD LOCK "1342" (USA)

1322 99000-32110: THREAD LOCK SUPER "1322" (Others)

CAUTION

Replace the gasket with a new one.



- Tighten the damper rod bolt to the specified torque, using the special tool.

TOOL 09940-30221: Front fork assembling tool

Caliper rod bolt: 39 N·m (3.9 kgf-m, 28.0 lb-ft)

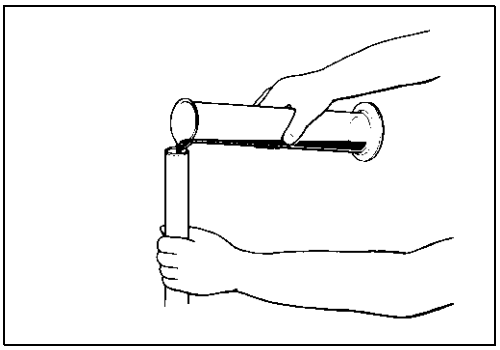


FORK OIL

- Place the front fork vertically without spring.
- Compress it fully.
- Pour specified front fork oil up to the top level of the outer tube.

DATA Capacity (each leg): 490 ml (16.6/17.3 US/Imp oz)

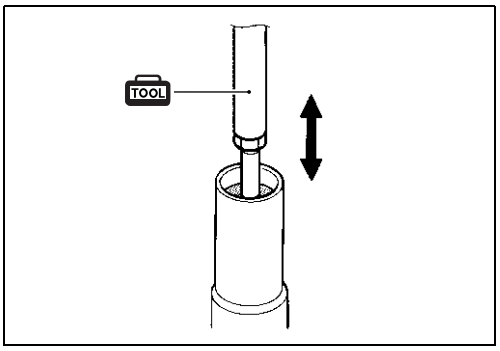
FORK 99000-99044-L01: SUZUKI FORK OIL L01 or an equivalent fork oil



- Move the inner rod slowly with the special tool ten times and more until no more bubbles come out from the oil.

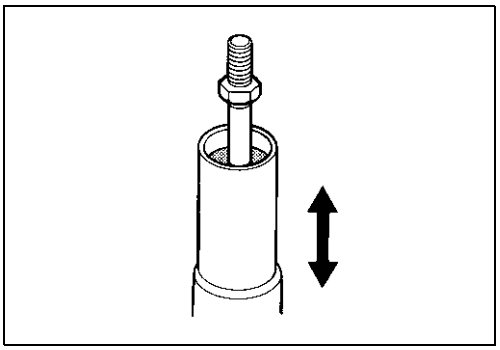
TOOL 09940-52841: Inner rod holder

NOTE:
Refill front fork oil up to the top of the outer tube so that bubbles are visible while bleeding air.



- Refill specified front fork oil up to the top level of the outer tube again. Move the outer tube up and down several strokes until no more bubbles come out from the oil.
- Keep the front fork vertically and wait 5 – 6 minutes.

NOTE:
** Always keep oil level over the cartridge top end, or air may enter the cartridge during this procedure.*
** Take extreme care so as to pump out air completely.*

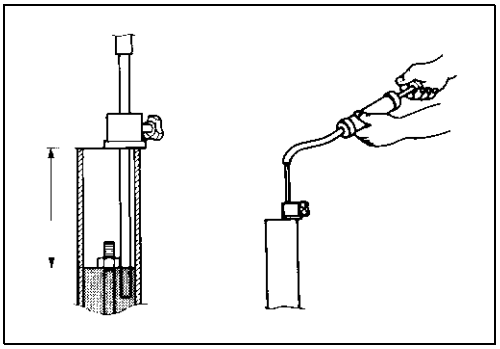


- Hold the front fork vertically and adjust fork oil level with the special tool.

NOTE:
When adjusting the fork oil level, compress the outer tube fully without the fork spring.

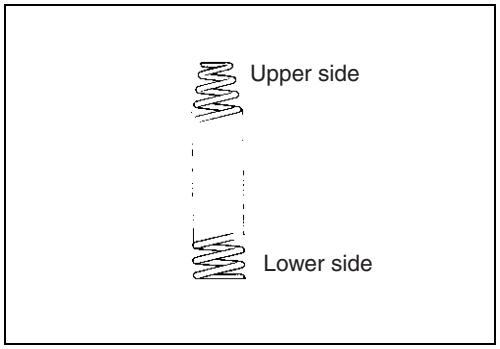
DATA Fork oil level: 153 mm (6.02 in)

TOOL 09943-74111: Front fork oil level gauge

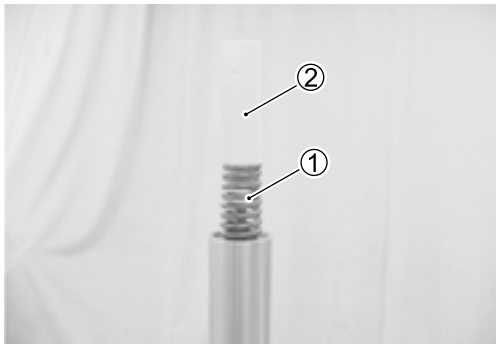


FORK SPRING

- Install the fork spring as shown in the illustration.



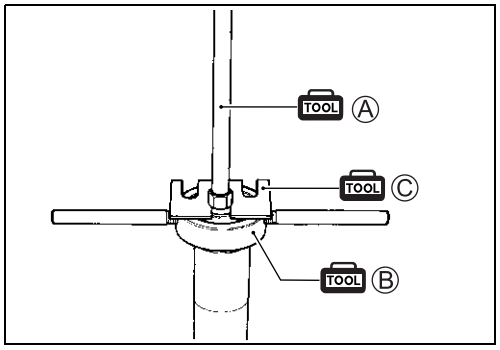
- Install the spring ① and spacer ②.



FRONT FORK CAP BOLT

- Pull up the inner rod with the special tool Ⓐ.
- Compress the spring with the special tool Ⓑ and then insert the special tool Ⓒ between the lock-nut and the spacer.

09940-52841: Inner rod holder Ⓐ
09940-94930: Front fork spacer holder Ⓑ
09940-94922: Stopper plate Ⓒ



- Slowly turn the cap bolt ① until the inner rod is lightly seated.
- Hold the cap bolt ① and tighten the lock-nut ② to the specified torque.

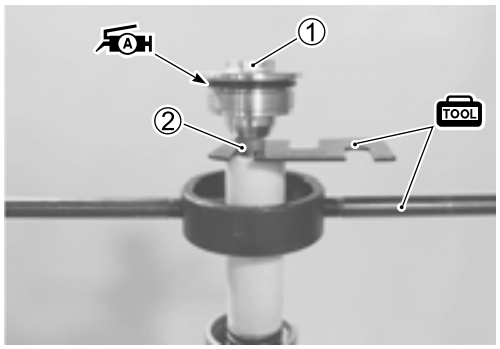
Inner rod lock-nut: 15 N·m (1.5 kgf-m, 11.0 lb-ft)

- Remove the special tools.
- Fit the O-ring to the front fork cap bolt and apply grease.

99000-25010: SUZUKI SUPER GREASE "A"

CAUTION

Use a new O-ring to prevent oil leakage.



- Install the front fork to the steering stem, turn signal clamps (☞10-22 and -23) and steering stem upper bracket.
- Align the upper surface of the outer tube with the upper surface of the steering stem upper bracket.
- After loosening the front fork upper clamp bolts ④ slightly, tighten the front fork cap bolt ③ to the specified torque.

Front fork cap bolt ③: 23 N·m (2.3 kgf-m, 16.5 lb-ft)

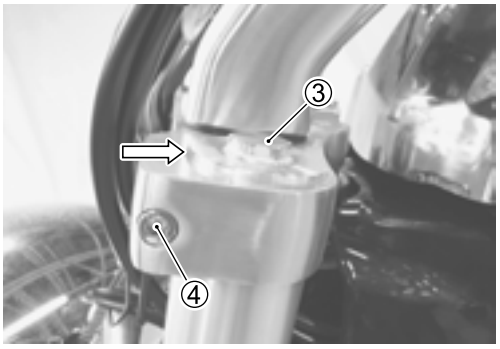
- Tighten the front fork upper clamp bolts ④ to the specified torque.

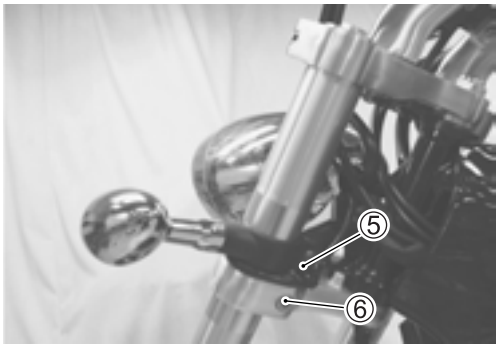
Front fork upper clamp bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)

- Tighten the turn signal light clamp bolts ⑤.
- Tighten the front lower clamp bolts ⑥ to the specified torque.

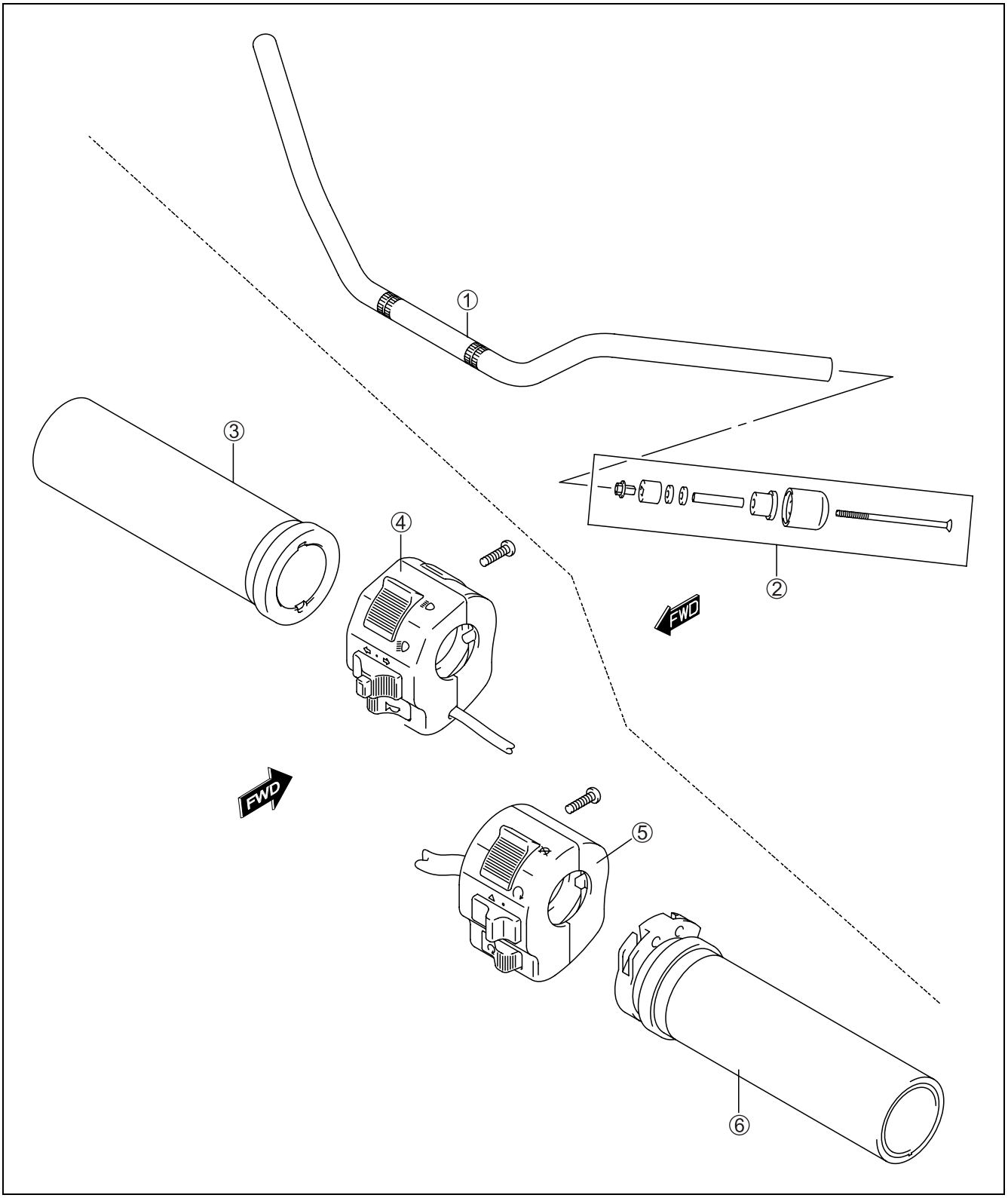
Front fork lower clamp bolt: 33 N·m (3.3 kgf-m, 24.0 lb-ft)

- Remount the front wheel. (☞8-10 to -11)





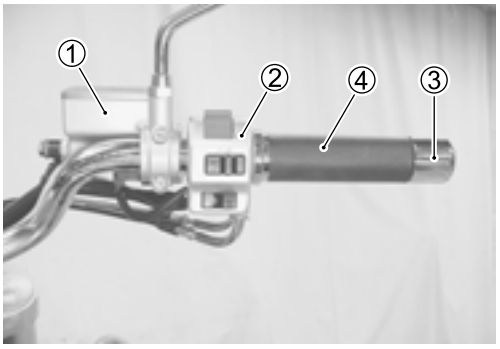
HANDLEBAR
CONSTRUCTION



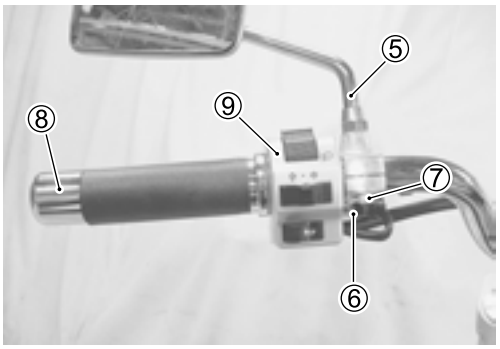
①	Handlebars	③	Left handle grip	⑤	Right handle grip
②	Handlebar balancer	④	Left handle switch	⑥	Right handle switch

REMOVAL AND DISASSEMBLY

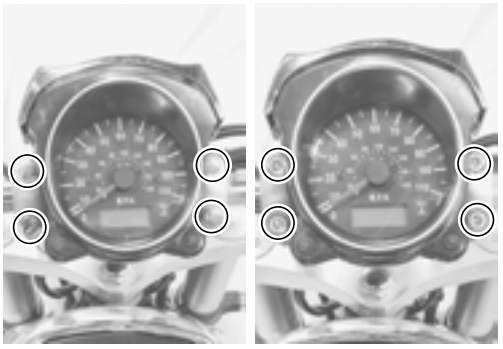
- Remove the brake master cylinder ①. (☞8-57)
- Remove the right handle switch ②.
- Remove the handle balancer ③.
- Remove the throttle grip ④.



- Remove the left rear view mirror ⑤.
- Disconnect the clutch lever position switch lead wires ⑥.
- Loosen the clutch lever holder bolt ⑦.
- Remove the left handlebar balancer ⑧ and the left handlebar switch ⑨.



- Remove the handlebar clamp bolt caps, handlebar clamp bolts and handlebar clamps.



- Remove the speedometer by removing the speedometer mounting bolts.
- Remove the handlebar.



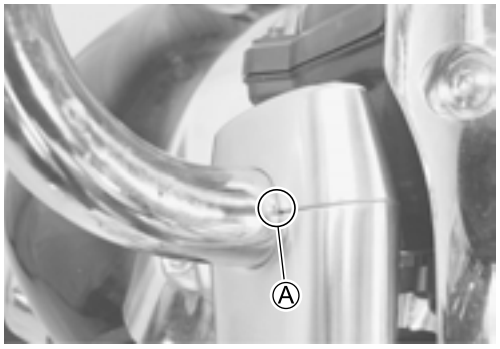
REASSEMBLY AND REMOUNTING

Reassemble and remount the handlebar in the reverse order of removal and disassembly. Pay attention to the following points:

- Install the handlebar.
- Install the speedometer.
- Tighten the speedometer mounting bolts.



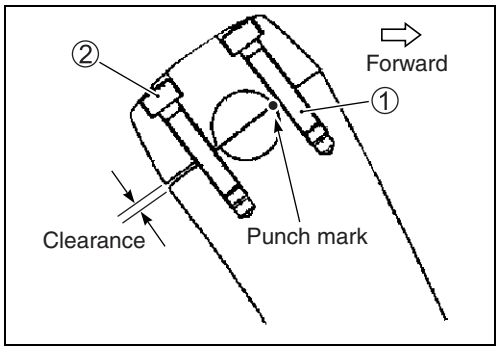
- Install the handlebars with the punch mark Ⓐ aligned with the handlebar clamp as shown.



- First, tighten the handlebar clamp bolts ① to the half of specified torque, and then tighten the handlebar clamp bolts ① and ② to the specified torque.

Handlebar set bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)

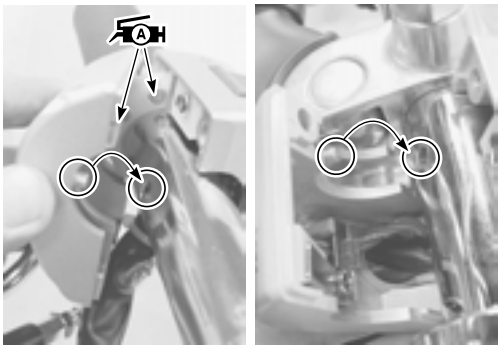
- Install the handlebar set bolt caps.



- Apply the SUZUKI SUPER GREASE "A" to the throttle cables and their holder.

99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

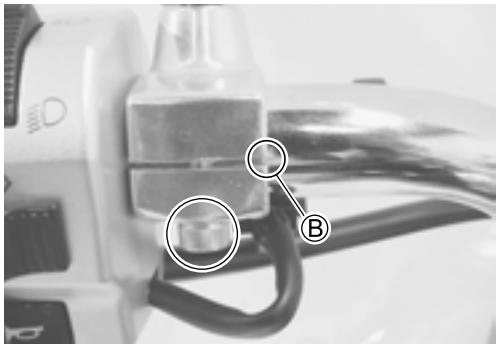
- When remounting the right and left handle switches, engage the stopper with the handlebar hole.



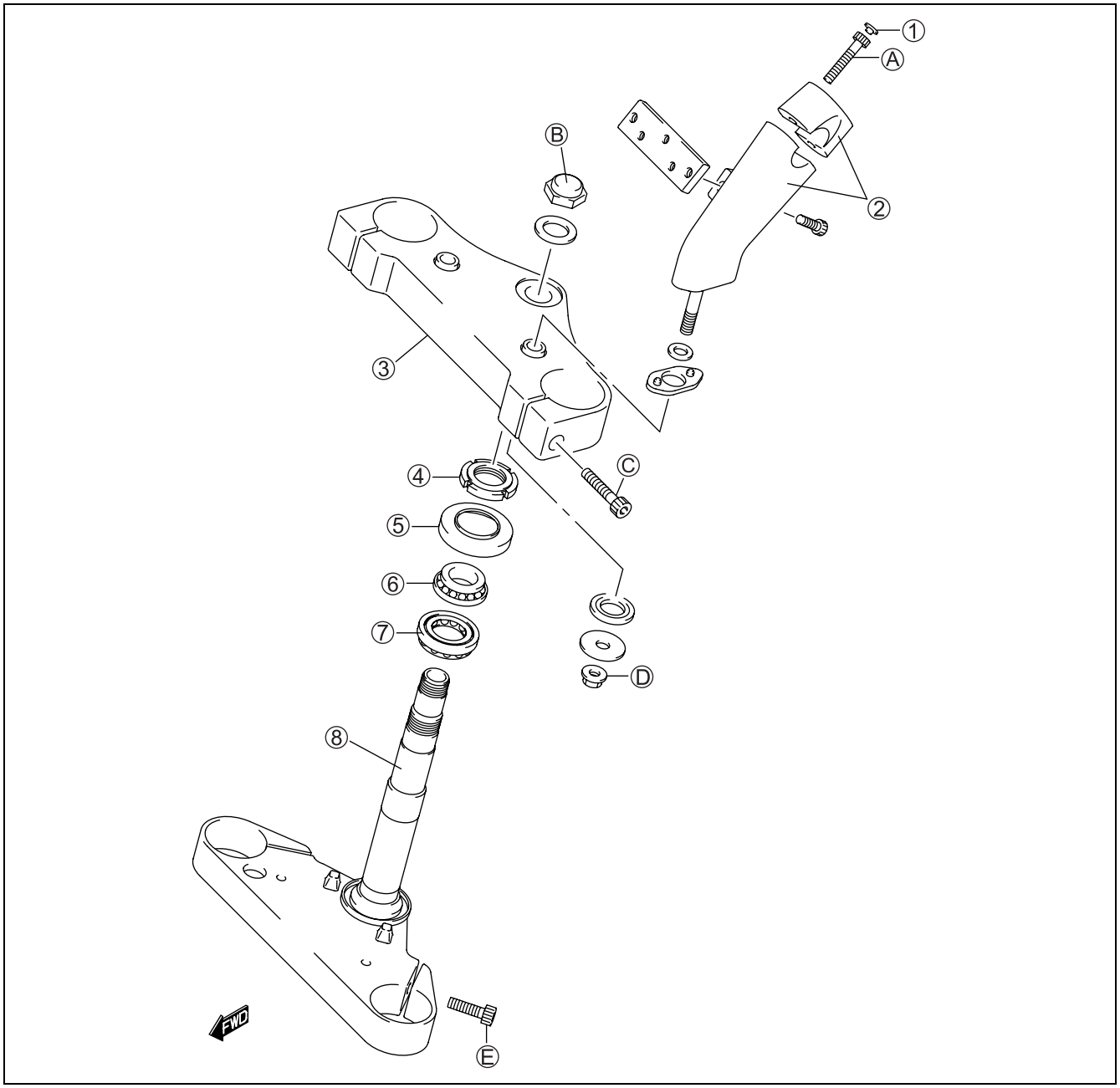
- Install the front brake master cylinder. (☞8-60)
- Install the clutch lever holder with the punch mark Ⓑ aligned with the clutch lever holder clamp as shown.

Clutch lever holder clamp bolt:
10 N·m (1.0 kgf-m, 7.3 lb-ft)

- Adjust the throttle cable play. (☞2-14)



STEERING
CONSTRUCTION



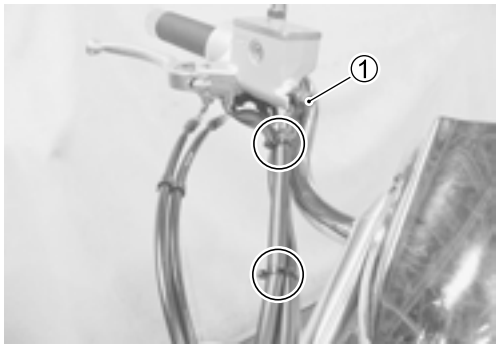
①	Handlebar set bolt cap	⑥	Steering stem upper bearing	Ⓒ	Front fork upper clamp bolt
②	Handlebar clamp/holder	⑦	Steering stem lower bearing	Ⓓ	Handlebar holder nut
③	Steering stem upper bracket	⑧	Steering stem	Ⓔ	Front fork lower clamp bolt
④	Steering stem nut	Ⓐ	Handlebar set bolt		
⑤	Dust seal	Ⓑ	Steering stem head nut		

ITEM	N·m	kgf-m	lb-ft
Ⓐ	23	2.3	16.5
Ⓑ	90	9.0	65.5
Ⓒ	23	2.3	16.5

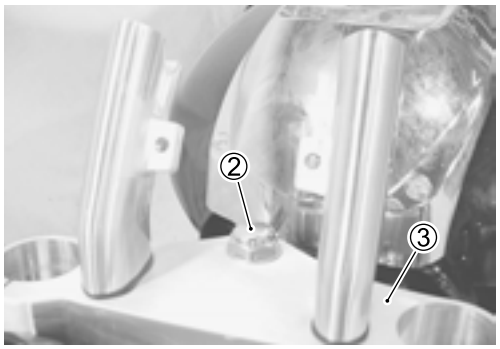
ITEM	N·m	kgf-m	lb-ft
Ⓓ	54	5.4	39.0
Ⓔ	33	3.3	24.0

REMOVAL AND DISASSEMBLY

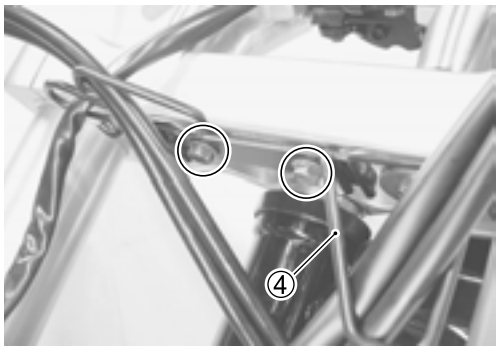
- Remove the front forks. (☞8-13)
- Remove the brake hose union bolt ①. (☞8-57)
- Disconnect the clamps.
- Remove the handlebar. (☞8-22)



- Remove the steering stem head nut ② and washer.
- Remove the steering stem upper bracket ③.



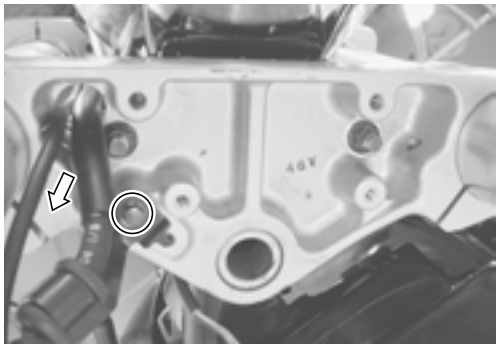
- Remove the speed sensor lead wire coupler. (☞9-31)
- Remove the cable guide ④.



- Remove the headlight mounting bolts.



- Remove the brake hose guide.
- Remove the brake hose and speed sensor lead wire.

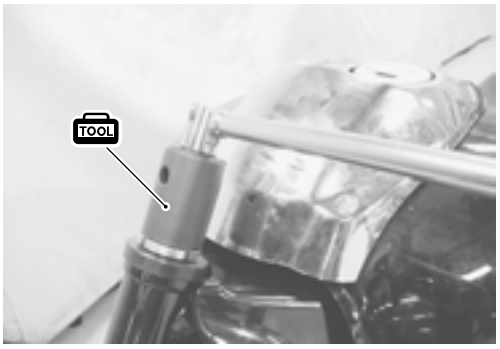


- Remove the steering stem nut with the special tool.

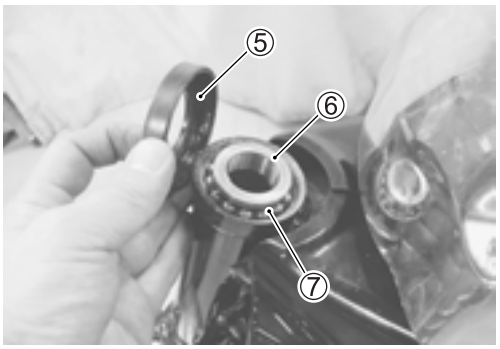
09940-14911: Steering stem nut wrench

- Remove the steering stem lower bracket.

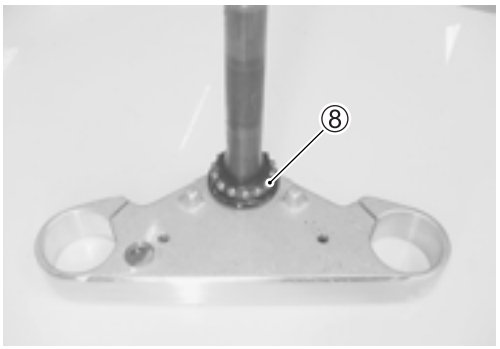
NOTE:
Hold the steering stem lower bracket to prevent it from falling.



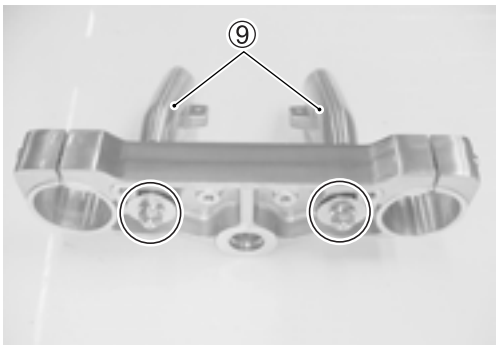
- Remove the dust seal ⑤, steering stem upper bearing inner race ⑥ and bearing ⑦.



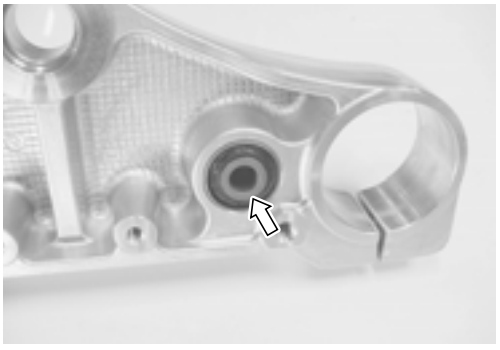
- Remove the steering stem lower bearing ⑧.



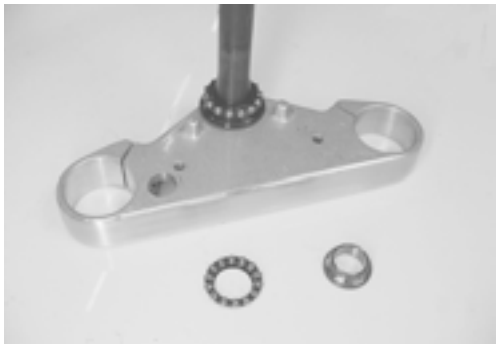
- Remove the handlebar holders ⑨ from the steering stem upper bracket.



- Remove the handlebar bushes with the proper tool.



INSPECTION AND DISASSEMBLY

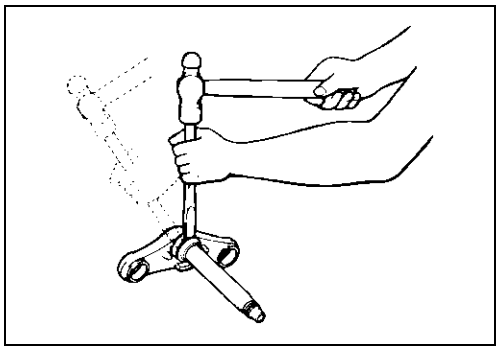


Inspect the removed parts for the following abnormalities.

* Handlebars distortion
* Race wear and brinelling
* Bearing wear or damage
* Abnormal noise of bearing

If any abnormal points are found, replace defective parts with the new ones.

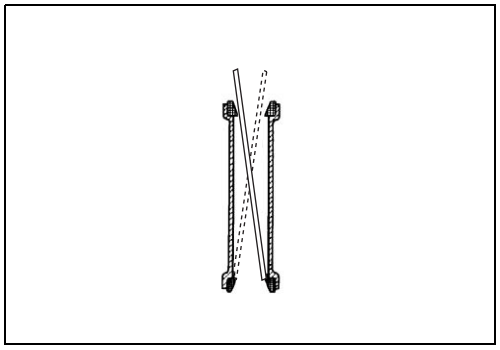
- Remove the steering stem lower bearing inner race with a chisel.



CAUTION

The removed bearing outer race must be replaced with a new one.

- Drive out the steering stem bearing outer races (upper and lower) using the steel rod.

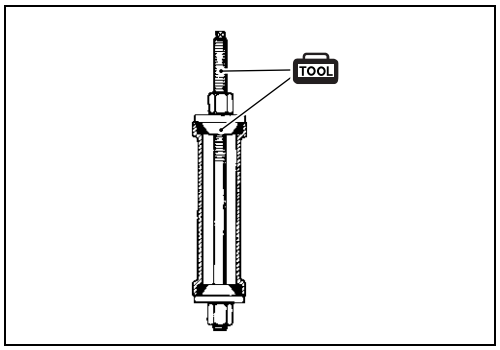


CAUTION

The removed bearing outer race must be replaced with a new one.

REASSEMBLY AND REMOUNTING

Reassemble and remount the steering stem in the reverse order of removal and disassembly. Pay attention to the following points:



OUTER RACE

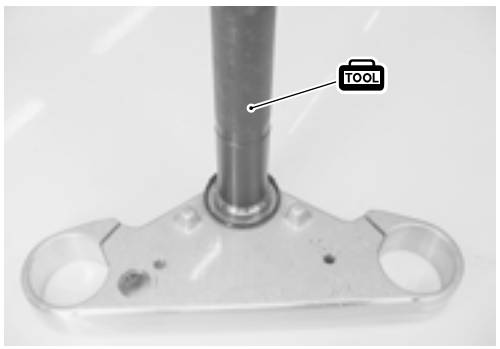
- Press in the upper and lower bearing outer races with the special tools.

TOOL 09941-34513: Steering outer race installer set

INNER RACE

- Press in the lower bearing inner race with the special tool.

TOOL 09941-74911: Steering bearing installer

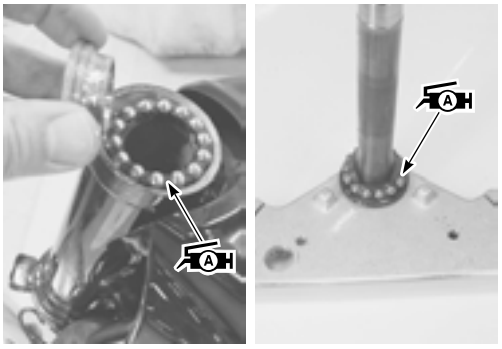


BEARING

- Apply SUZUKI SUPER GREASE "A" to the bearings and bearing races.

99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

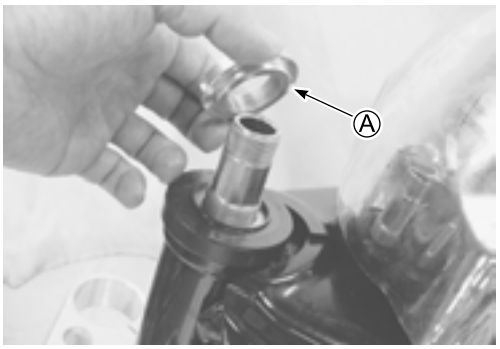
- Install the lower bearing to the steering stem lower bracket.
- Install the upper bearing and bearing inner race.



STEERING STEM NUT

- Install the dust seal.
- Install the steering stem.
- Install the steering stem nut as shown.

NOTE:
The flange side Ⓐ of the steering stem must face down.



- Tighten the steering stem nut to the specified torque with the special tool.

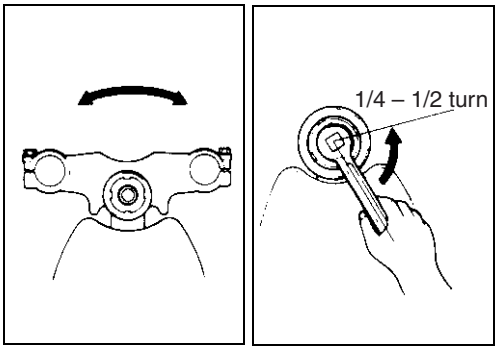
09940-14911: Steering stem nut wrench

Steering stem nut: 45 N·m (4.5 kgf-m, 32.5 lb-ft)



- Turn the steering stem lower bracket about five or six times to the left and right so that the angular ball bearings will be seated properly.
- Loosen the stem nut by 1/4 – 1/2 turn.

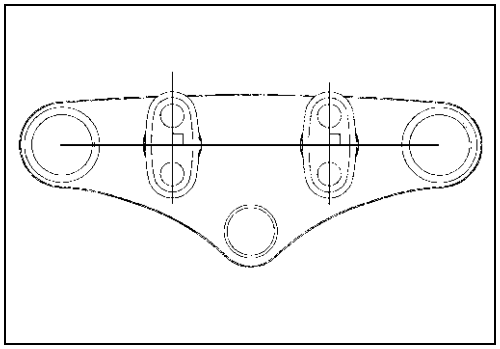
NOTE:
This adjustment will vary from motorcycle to motorcycle.

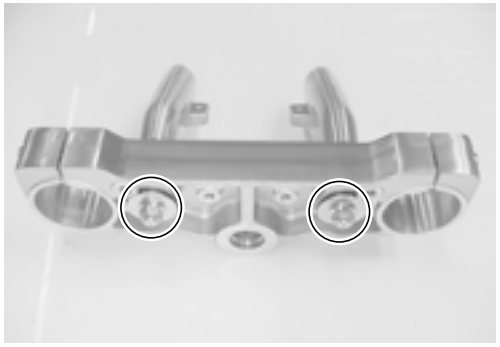


HANDLEBAR HOLDER

- Install the handlebar holders and related parts to the steering stem head.
- Tighten the handlebar holder nuts to the specified torque.

Handlebar holder nut: 54 N·m (5.4 kgf-m, 39.0 lb-ft)

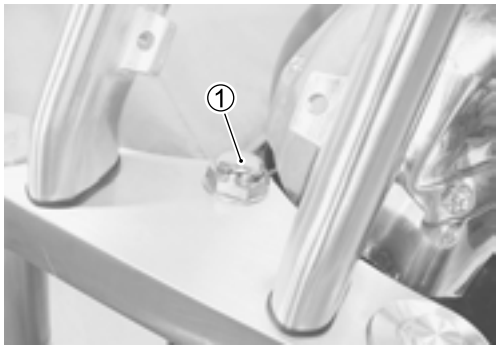




FRONT FORK AND STEERING STEM UPPER BRACKET

- Install the steering stem upper bracket, washer and steering stem head nut.
- Install the front forks. (☞8-20)
- Tighten the steering stem head nut ① to the specified torque.

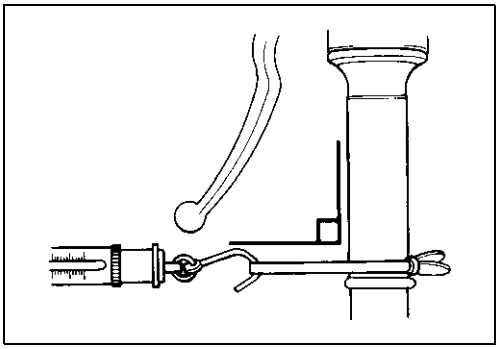
Steering stem head nut ①: 90 N·m (9.0 kgf-m, 65.0 lb-ft)



NOTE:
Rout the brake hose, throttle cables and handlebar switch lead wires, before installing the front forks. (☞10-15, -18 and -21)

- Speed sensor lead wire routing. (☞10-22)
- Install the handlebar. (☞8-22 to -23)
- Install the front wheel. (☞8-10 to -11)

STEERING TENSION ADJUSTMENT



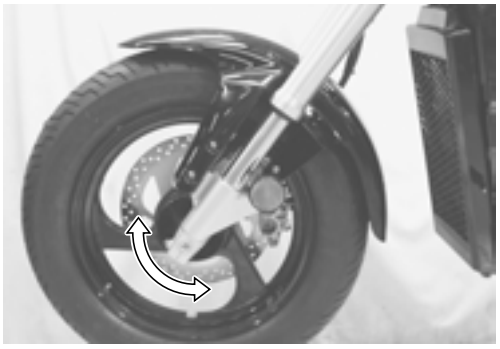
Check the steering movement in the following procedure.

- By supporting the motorcycle with a jack, lift the front wheel until it is off the floor by 20 – 30 mm (0.8 – 1.2 in).
- Check to make sure that the cables and wire harnesses are properly routed.
- With the front wheel in the straight ahead state, hitch the spring scale (special tool) on one handlebar grip end as shown in the figure and read the graduation when the handlebar starts moving. Do the same on the other grip end.

DATA Initial force: 200 – 500 grams

TOOL 09940-92720: Spring scale

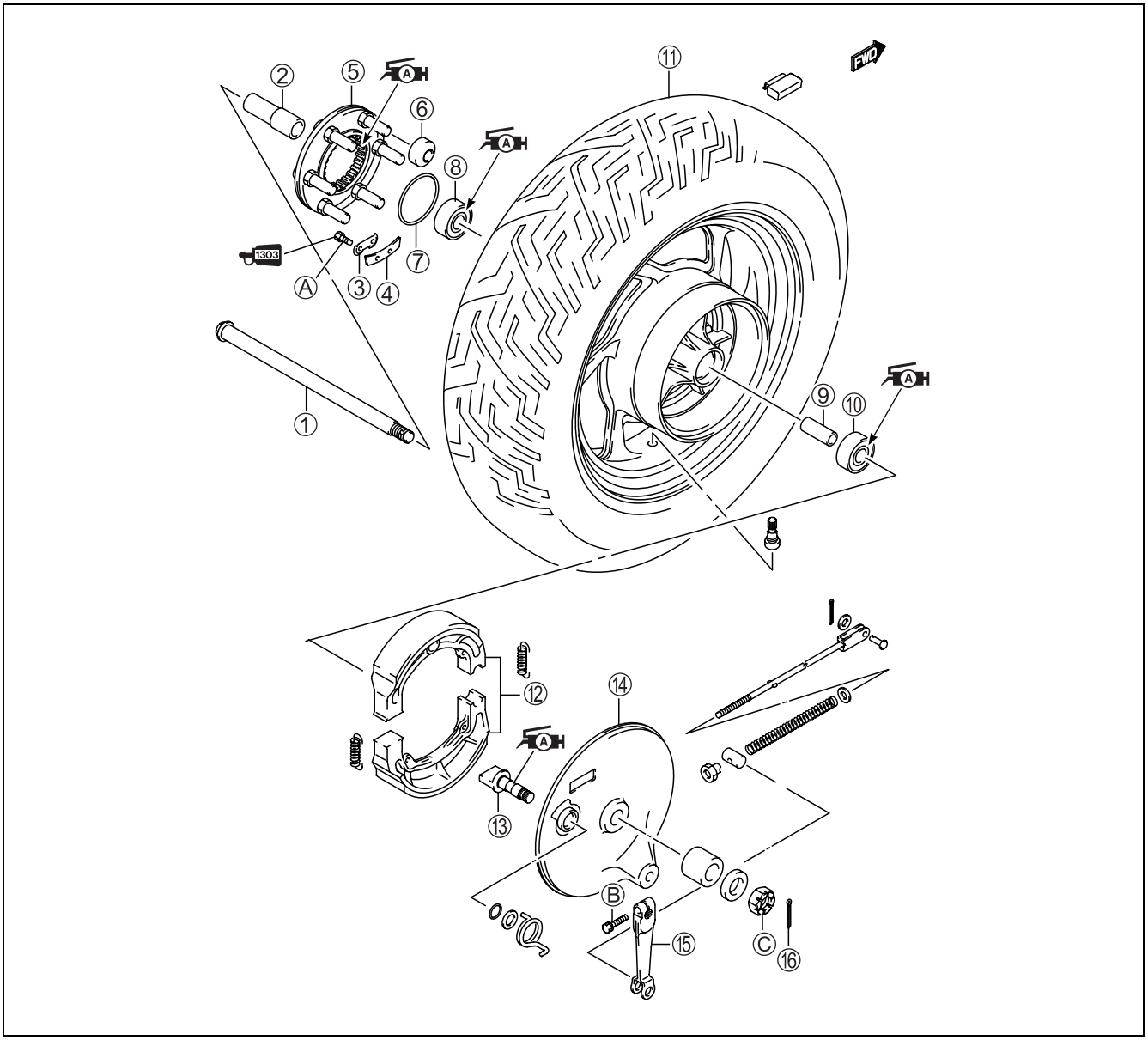
- If the initial force read on the scale when the handlebar starts turning is either too heavy or too light, adjust it till it satisfies the specification.



1) First, loosen the front fork upper clamp bolts, handlebar clamp bolts, steering stem head nut and steering stem lock-nut, and then adjust the steering stem nut by loosening or tightening it.
2) Tighten the steering stem lock-nut, stem head nut, handlebar clamp bolts and front fork upper clamp bolts to the specified torque and re-check the initial force with the spring scale according to the previously described procedure.
3) If the initial force is found within the specified range, adjustment has been completed.

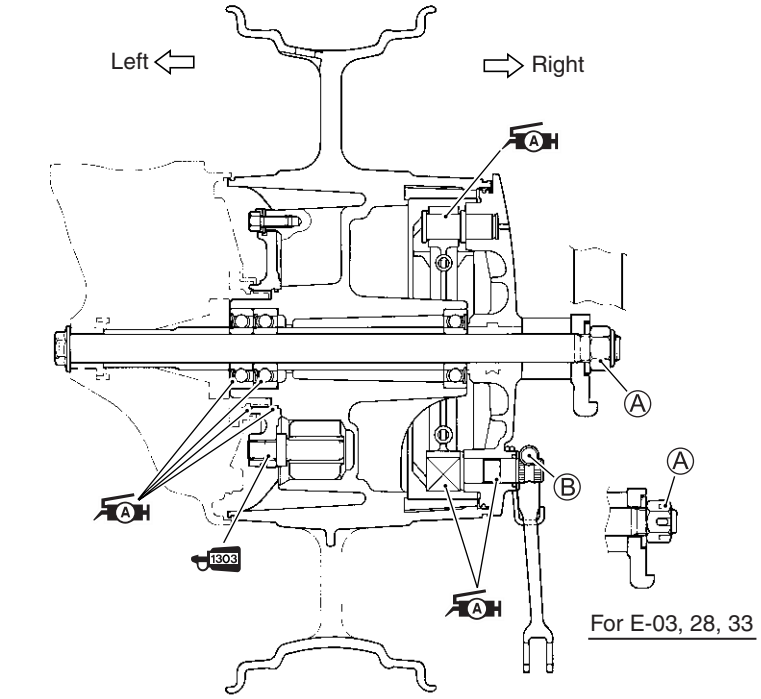
NOTE:
Hold the front fork legs, move them back and forth and make sure that the steering is not loose.

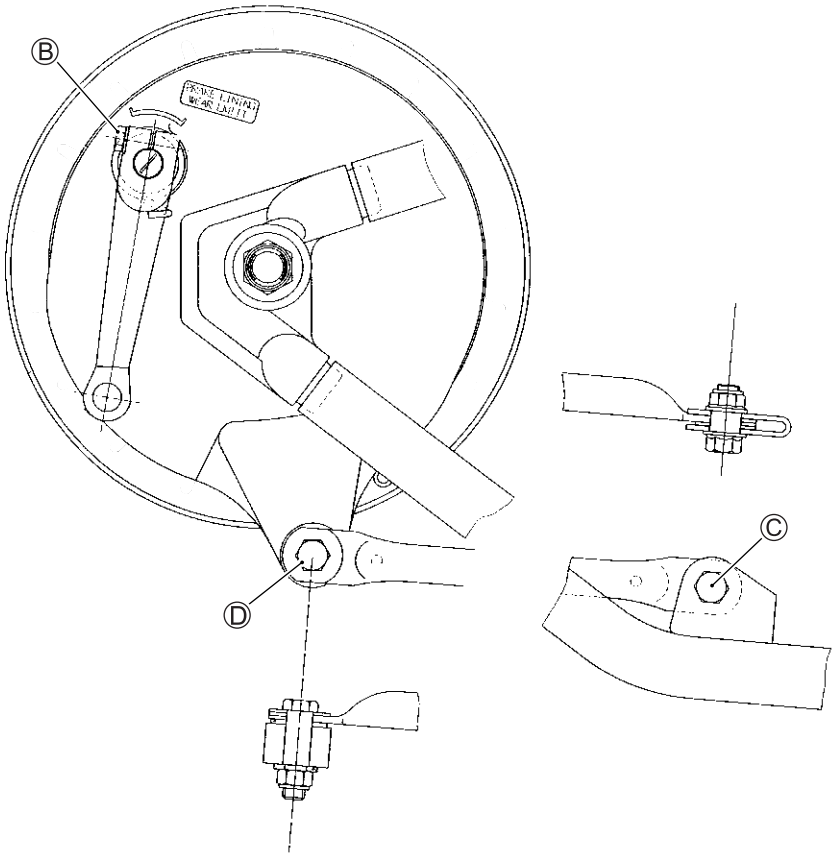
REAR WHEEL
CONSTRUCTION



①	Rear axle	⑧	Bearing (LH)	⑮	Brake cam lever
②	Spacer (LH)	⑨	Spacer (RH)	⑯	Cotter pin (For E-03, 28, 33)
③	Lock washer	⑩	Bearing (RH)	Ⓐ	Driven joint stopper bolt
④	Driven joint stopper	⑪	Rear wheel	Ⓑ	Rear brake cam lever bolt
⑤	Driven joint	⑫	Brake shoe	Ⓒ	Rear axle nut
⑥	Damper	⑬	Brake camshaft		
⑦	O-ring	⑭	Brake panel		

ITEM	N·m	kgf-m	lb-ft
Ⓐ	10	1.0	7.0
Ⓑ	10	1.0	7.0
Ⓒ	65	6.5	47.0





Ⓐ	Rear axle nut
Ⓑ	Brake cam lever nut
Ⓒ	Rear torque link nut (F)
Ⓓ	Rear torque link nut (R)

ITEM	N·m	kgf-m	lb-ft
Ⓐ	65	6.5	47.0
Ⓑ	10	1.0	7.0

ITEM	N·m	kgf-m	lb-ft
Ⓒ	35	3.5	25.5
Ⓓ	25	2.5	18.0

REMOVAL

- Raise the rear wheel off the ground and support the motorcycle with a jack or wooden block.
- Remove the rear brake rod ①.
- Remove the torque link rod ②.



- Remove the left frame cover. (☞8-3)
- Remove the left frame lower cover ③.

☆: Hooked part



- Remove the rear swingarm left cover mounting bolts.

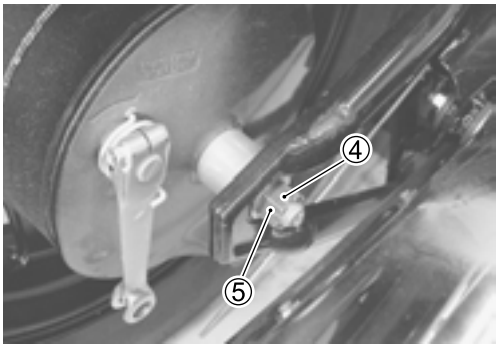


- Remove the rear swingarm left cover.



- Remove the cotter pin ④. (For E-03, 28, 33)
- Remove the axle nut ⑤ and draw out the rear axle.

NOTE:
The rear fender removal is not necessary when the rear part of motorcycle can be lifted high enough to take the rear wheel out smoothly.

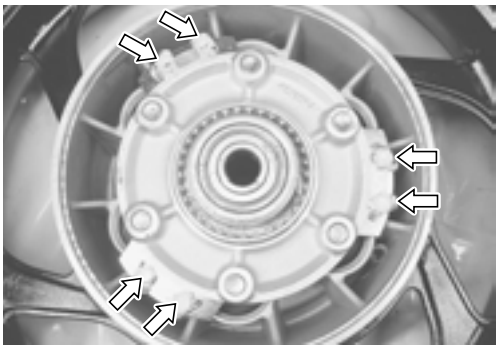


CAUTION

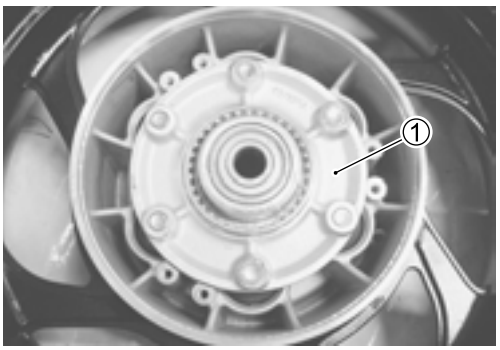
Do not operate the brake pedal while removing the rear wheel.

DISASSEMBLY

- Flatten the lock washers.
- Remove the fitting bolts, washers and plates.



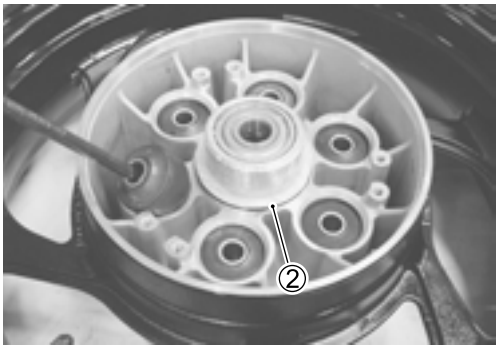
- Pull off the driven joint ①.



- Remove the O-ring ②.
- Remove the dampers with a screw driver.

CAUTION

The removed O-ring must be replaced with a new one.

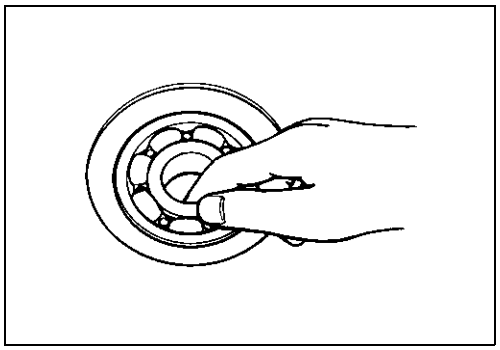


INSPECTION AND DISASSEMBLY

WHEEL (☞8-66)
TIRE (☞2-23 and 8-66)

WHEEL BEARINGS

Inspect the play of the wheel bearings by finger while they are in the wheel. Rotate the inner race by finger to inspect for abnormal noise and smooth rotation.
Replace the bearing in the following procedure if there is anything unusual.



- Remove the wheel bearings by with the special tool.

TOOL 09921-20240: Bearing remover set (17 mm)

CAUTION

The removed bearings should be replaced with new ones.

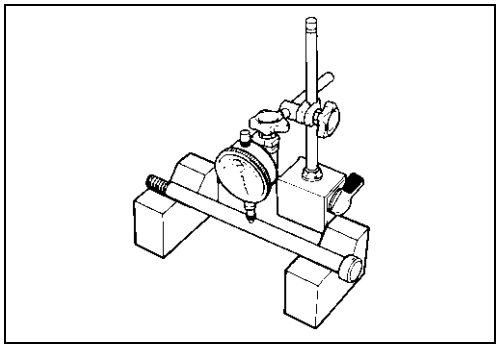


REAR AXLE

Using a dial gauge, check the rear axle for runout.
If the runout exceeds the limit, replace the rear axle.

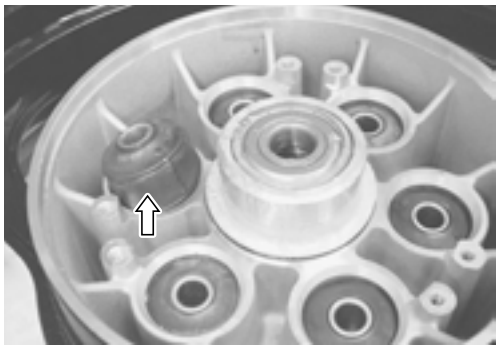
DATA Axle shaft runout
Service Limit: 0.25 mm (0.010 in)

TOOL 09900-20607: Dial gauge (1/100 mm)
09900-20701: Magnetic stand
09900-21304: V-block set (100 mm)



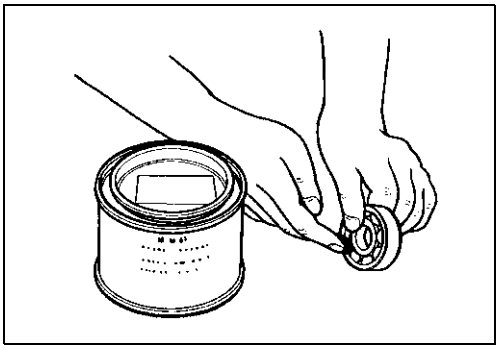
WHEEL DAMPER

Inspect the dampers for wear and damage.
Replace the dampers if there is anything unusual.



REASSEMBLY AND REMOUNTING

Reassemble and remount the rear wheel in the reverse order of removal and disassembly. Pay attention to the following points:



WHEEL BEARING

- Apply grease to the bearings before installation.

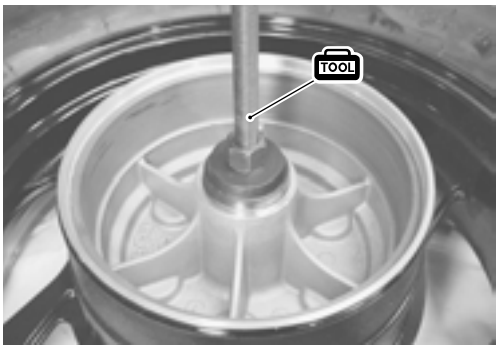
99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

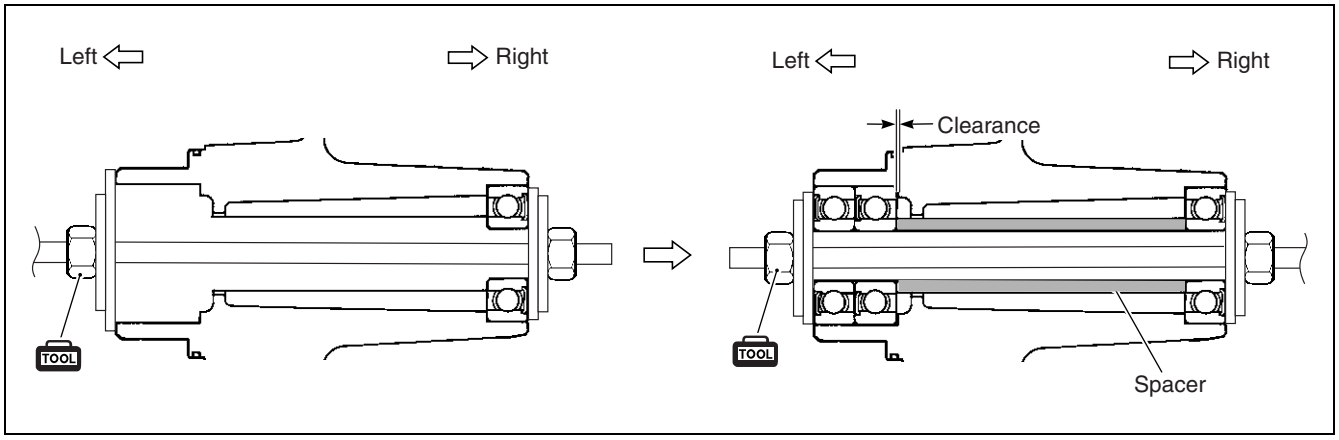
- Install the wheel bearings with the special tool.

09941-34513: Bearing installer set

CAUTION

*** First, install the right wheel bearing, then install the left wheel bearings.**
*** The sealed cover on the bearing must face out.**





WHEEL DAMPER

- Install the dampers.

NOTE:
If soap water is applied around the damper, it makes the job easier.

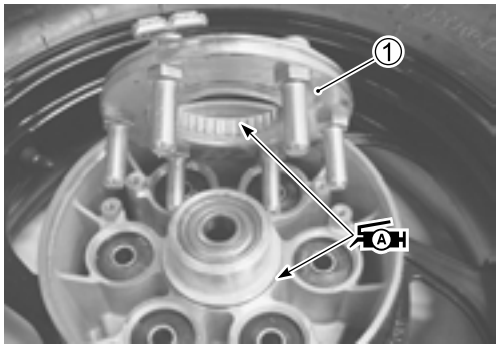


DRIVEN JOINT

- Install the driven joint ①.

NOTE:
Apply grease to the O-ring and the final gear spline before installing the driven joint.

99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)



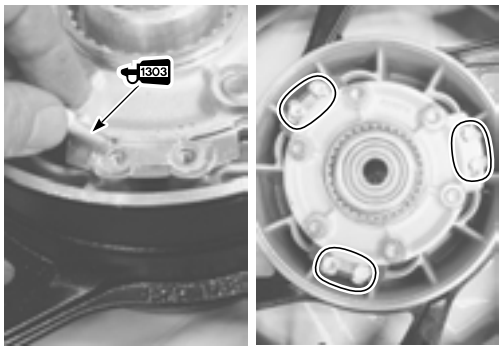
- Apply THREAD LOCK SUPER to the thread of driven joint stopper bolts.

99000-32030: THREAD LOCK SUPER "1303"

- Tighten the driven joint stopper bolts to the specified torque.

Driven joint stopper bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)

- Bend up the washer to lock the bolts.



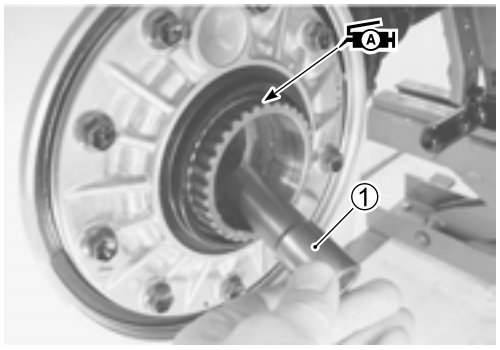
REAR WHEEL

- Install the spacer ①.
- Apply grease to the final gear spline before installing the rear wheel.

99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

- Remount the rear wheel spacer and rear axle.
- Install the washer and rear axle nut.

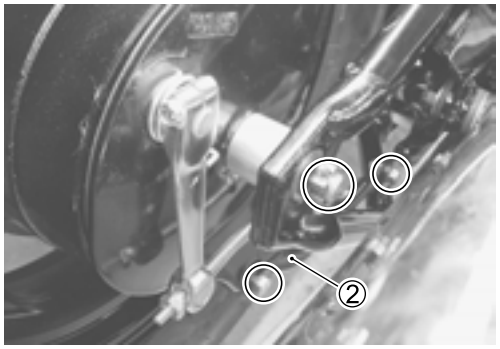
NOTE:
Refer to the page 8-31 for the spacer positioning.



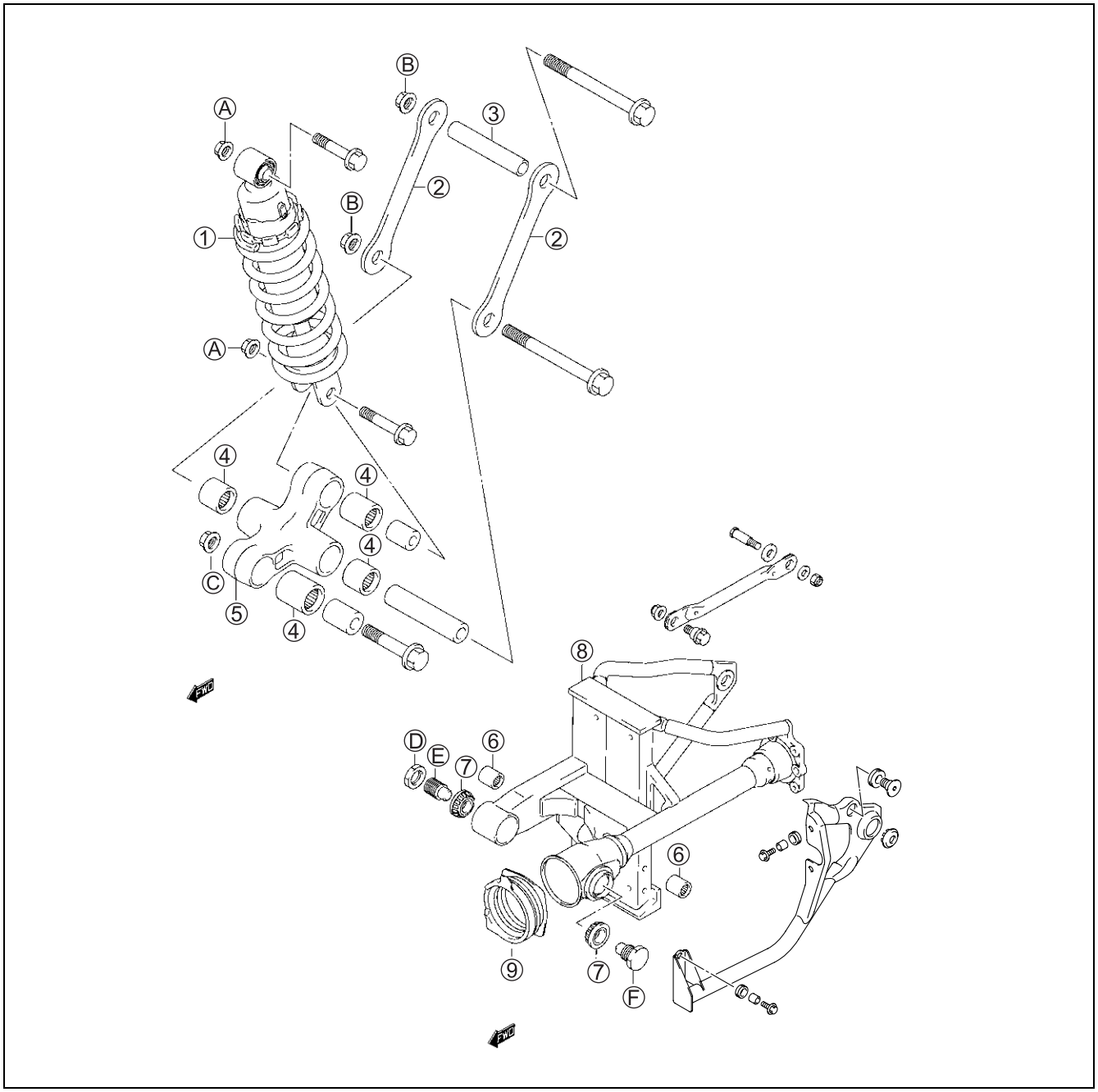
- Install the torque link rod ②.
- Tighten the rear axle nut and torque link bolts and nuts to the specified torque.

Rear axle nut: 65 N·m (6.5 kgf-m, 47 lb-ft)
Torque link nut (Front): 35 N·m (3.5 kgf-m, 25.5 lb-ft)
(Rear) : 25 N·m (2.5 kgf-m, 18.0 lb-ft)

NOTE:
After remounting the rear wheel, check for proper brake operation. (☞2-21)



REAR SUSPENSION
CONSTRUCTION

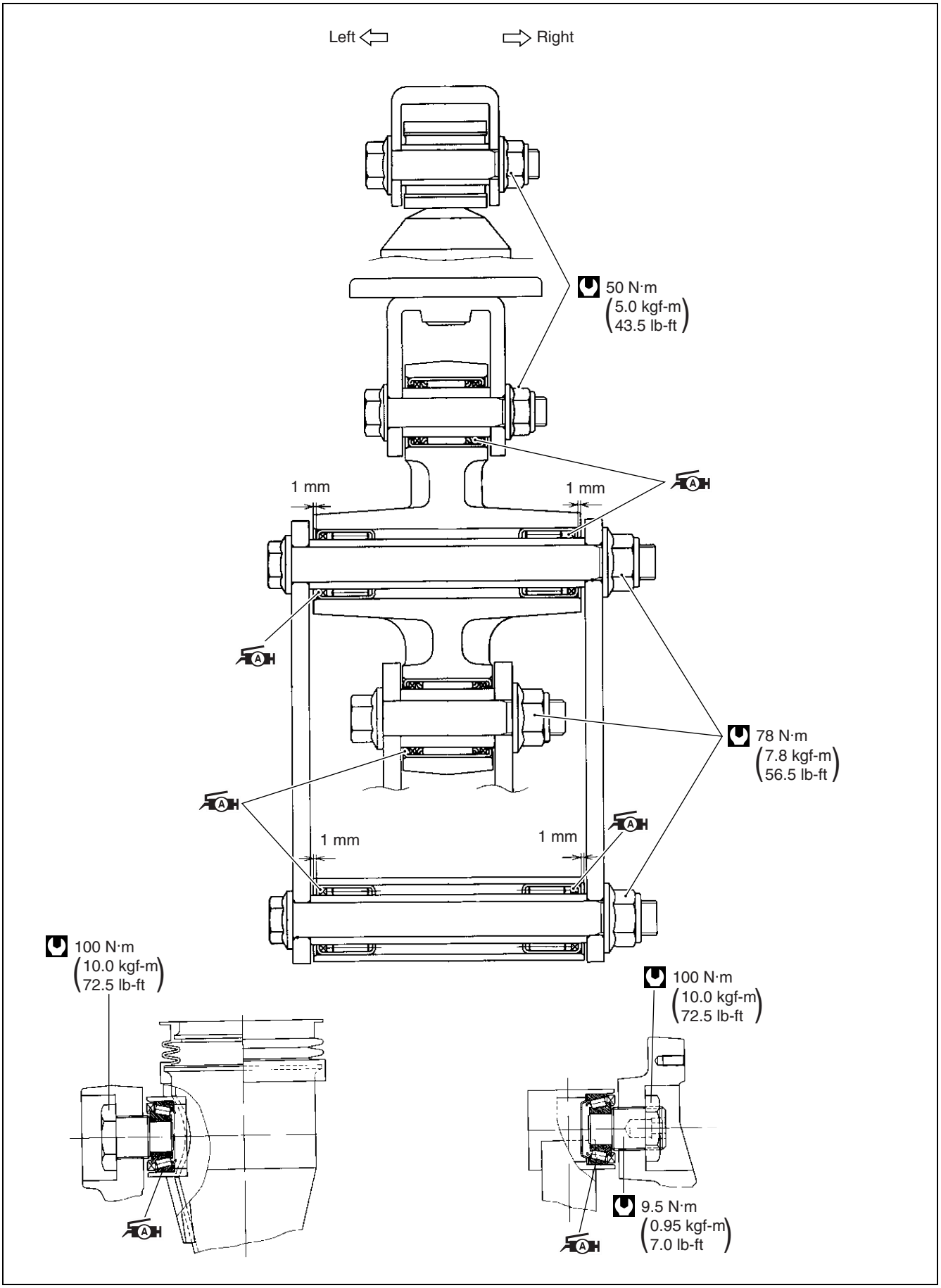


①	Rear shock absorber	⑥	Swingarm pivot bearing	Ⓑ	Rear cushion rod mounting nut
②	Rear cushion rod	⑦	Swingarm bearing	Ⓒ	Rear cushion lever mounting nut
③	Spacer	⑧	Swingarm	Ⓓ	Rear swingarm pivot bolt lock nut
④	Rear cushion lever bearing	⑨	Boot	Ⓔ	Rear swingarm pivot bolt (Right)
⑤	Rear cushion lever	Ⓐ	Rear shock absorber mounting nut	Ⓕ	Rear swingarm pivot bolt (Left)

ITEM	N·m	kgf-m	lb-ft
Ⓐ	50	5.0	36.0
Ⓑ	78	7.8	56.5

ITEM	N·m	kgf-m	lb-ft
Ⓒ	78	7.8	56.5
Ⓓ	100	10.0	72.5

ITEM	N·m	kgf-m	lb-ft
Ⓔ	9.5	0.95	7.0
Ⓕ	100	10.0	72.5

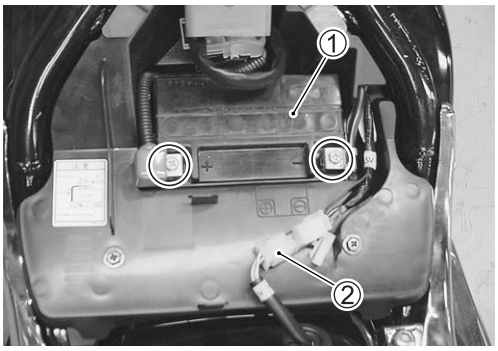

Left
Right
50 N·m
(5.0 kgf-m
43.5 lb-ft)
1 mm
1 mm
78 N·m
(7.8 kgf-m
56.5 lb-ft)
1 mm
1 mm
100 N·m
(10.0 kgf-m
72.5 lb-ft)
100 N·m
(10.0 kgf-m
72.5 lb-ft)
9.5 N·m
(0.95 kgf-m
7.0 lb-ft)

REMOVAL

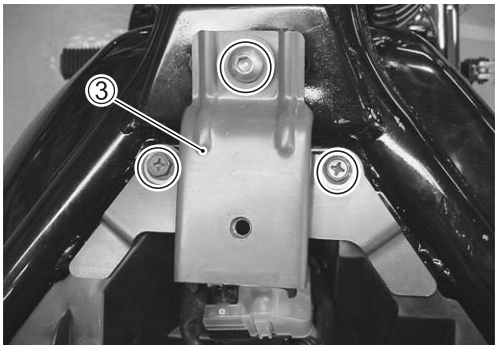
- Remove the rear wheel. (☞8-33)
- Remove the final gear case with propeller shaft.



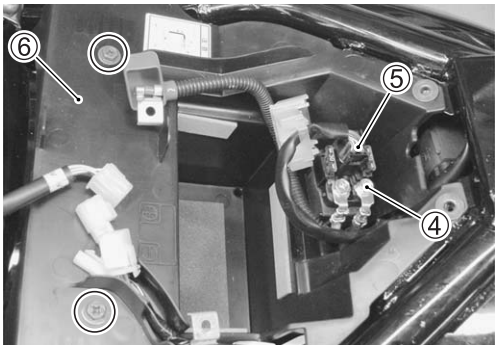
- Remove the fuel tank. (☞6-3)
- Remove the battery ① and disconnect the coupler ②.



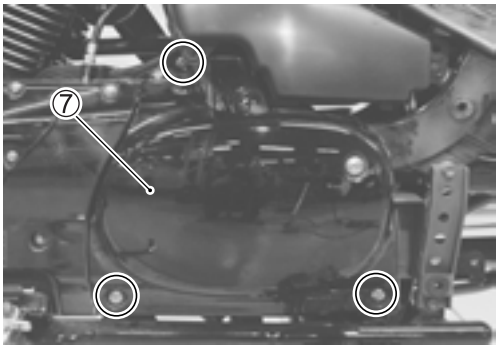
- Remove the set mounting bracket ③.



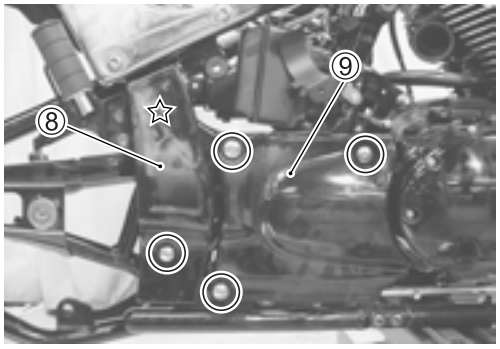
- Disconnect the starter motor lead wire ④ and starter relay coupler ⑤.
- Remove the battery case ⑥.



- Remove the frame covers (L & R). (☞8-3 to -4)
- Remove the exhaust pipesand mufflers. (☞3-6)
- Remove the secondary gear case cover ⑦.

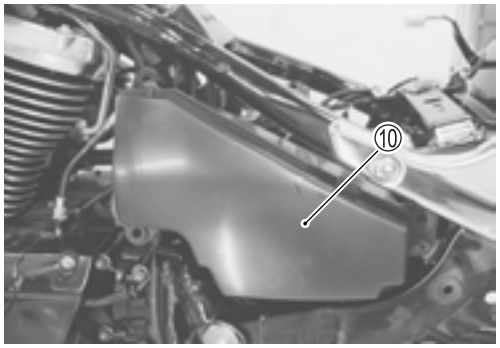


- Remove the right frame lower cover ⑧, clutch rear cover ⑨.

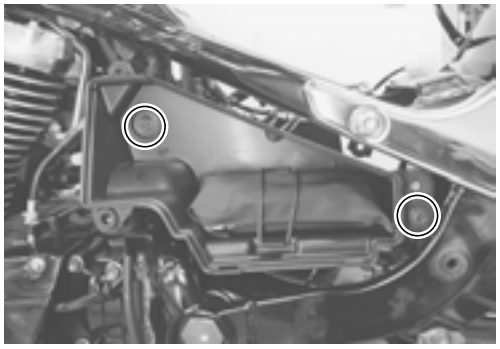


☆: Hooked part

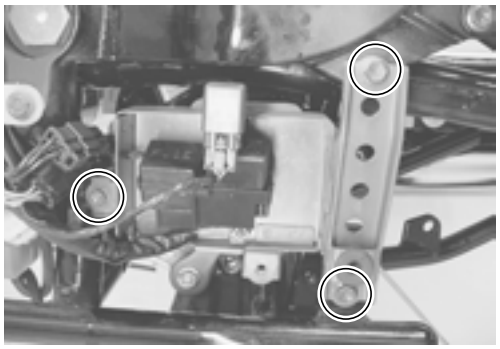
- Remove the tool box cover ⑩.



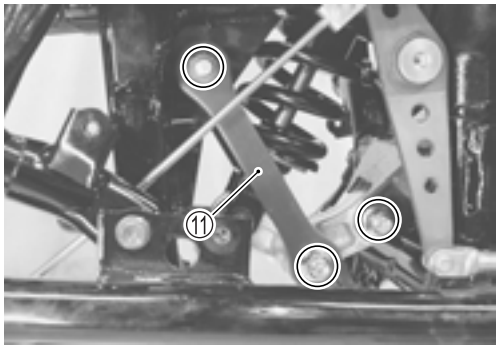
- Remove the tool box.



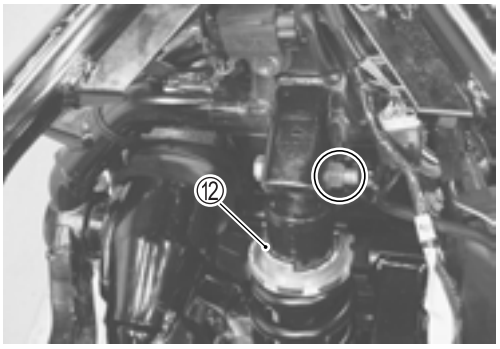
- Remove the fuse box and relay stay.



- Remove the cushion lever mounting bolt and nut and cushion rods ⑪ (L & R).



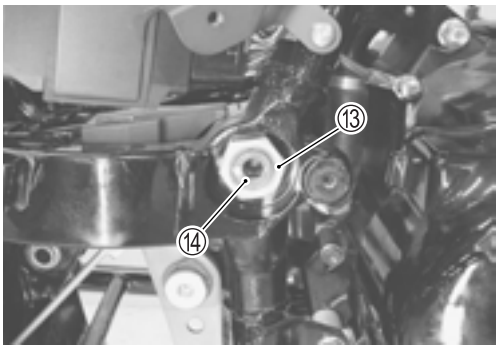
- Remove the shock absorber ⑫.

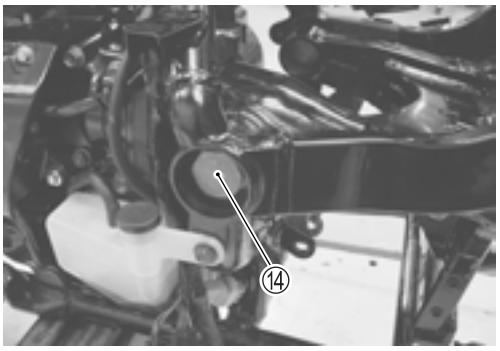


- Remove the right side swingarm pivot bolt lock nut ⑬.
- Remove the left and right side swingarm pivot bolts ⑭.

NOTE:
Slightly loosen the cushion rod mounting nuts and the shock absorber lower mounting nut before removing the swingarm to facilitate later disassembly.

- Remove the rear suspension assembly.





- Remove the tapered roller bearings.



- Remove the cushion lever.



INSPECTION AND DISASSEMBLY

SPACER

- Remove spacer from swingarm.
- Remove the spacers from the cushion lever.
- Inspect the spacers for any flaws or other damage. If any defects are found, replace the spacers with new ones.

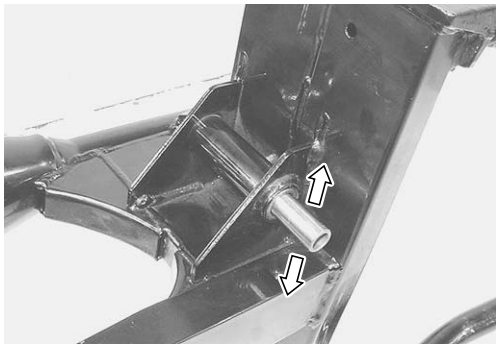




SWINGARM BEARING

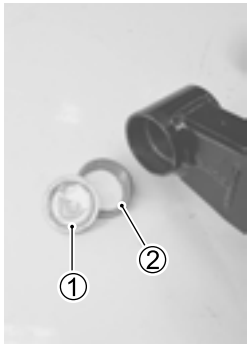
Insert the spacer into swingarm cushion rod upper side bearing and check the play to move the spacer up and down.
If excessive play is noted, replace the bearing with a new one.
Inspect the swingarm pivot bearing, its race and dust seal for wear or damage. If any defects are found, replace the bearing with a new one.

- Remove the swingarm pivot right side bearing plate ① and bearing races ② by using a suitable bar and so on.



NOTE:
The swingarm pivot right side bearing and its plate are available as one component.



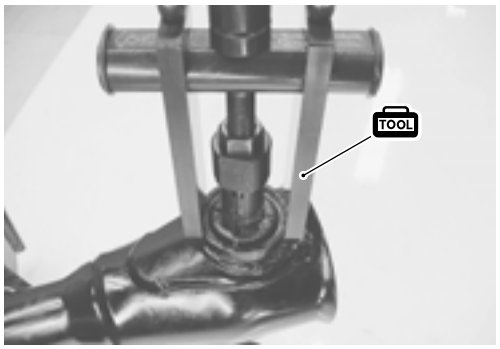


- Remove the swingarm pivot bearing races by with the special tool.

TOOL 09921-20240: Bearing remover set (30 mm)

CAUTION

The removed bearings must be replaced with new ones.

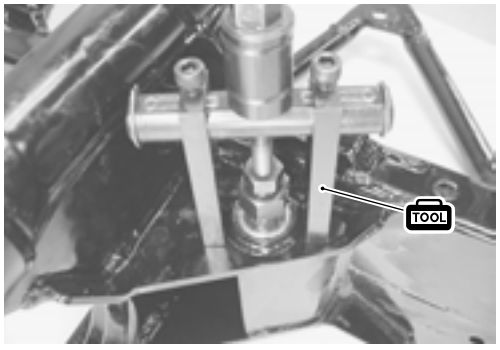


- Remove the swingarm cushion rod upper side bearings by with the special tool.

TOOL 09921-20240: Bearing remover set (17 mm)

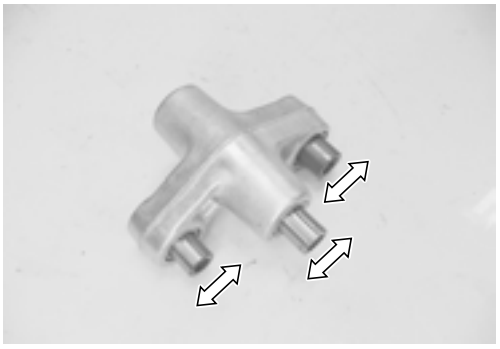
CAUTION

The removed bearings must be replaced with new ones.



CUSHION LEVER BEARING

Insert the spacer into bearing and check the play to move the spacer up and down. If an excessive play is noted, replace the bearing with a new ones.



- Remove the cushion rod lower side bearings by with the special tool.

TOOL 09921-20240: Bearing remover set (17 mm)

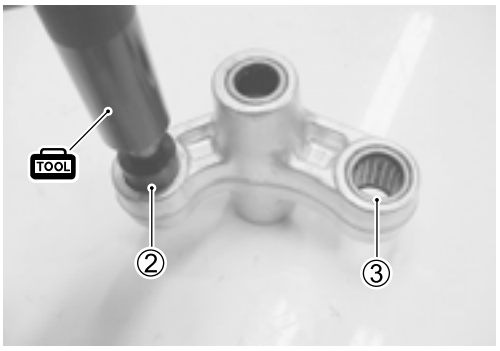


CAUTION

The removed bearings must be replaced with new ones.

- Remove the cushion lever mounting bearing ② and shock absorber lower side bearing ③ by using the special tool.

TOOL 09913-70210: Bearing installer set

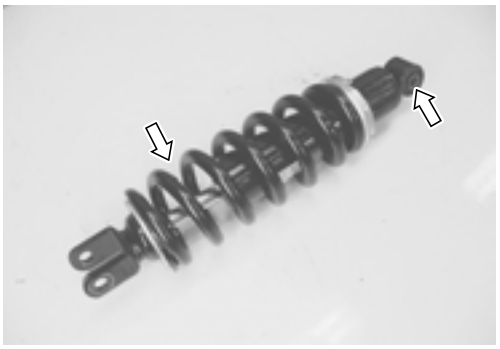


CAUTION

The removed bearings must be replaced with new ones.

SHOCK ABSORBER

Inspect the shock absorber body and bush for damage and oil leakage. If any defects are found, replace the shock absorber with a new one.

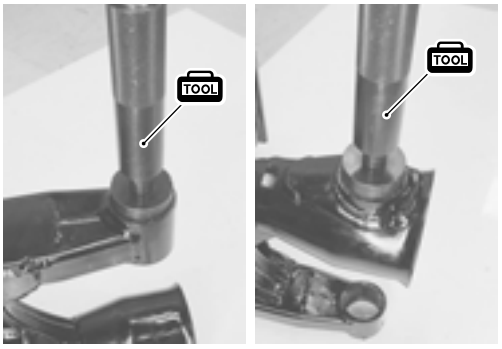


CAUTION

Do not attempt to disassemble the rear shock absorber unit. It is unserviceable.

REASSEMBLY

Reassemble the swingarm and shock absorber in the reverse order of disassembly and removal, and pay attention to the following points:



SWINGARM BEARING

- Install the swingarm pivot bearing races by with the special tool.

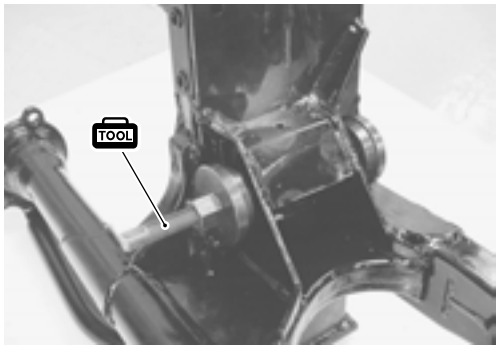
TOOL 09913-70210: Bearing installer set (40 mm)

NOTE:
The swingarm pivot bearing race with plate is positioned right side.

- Install the swingarm cushion rod upper side bearings with the special tool. (☞8-39)

TOOL 09924-84510: Bearing installer set

NOTE:
When reinstalling the bearings, stamped mark of bearing must face outside.

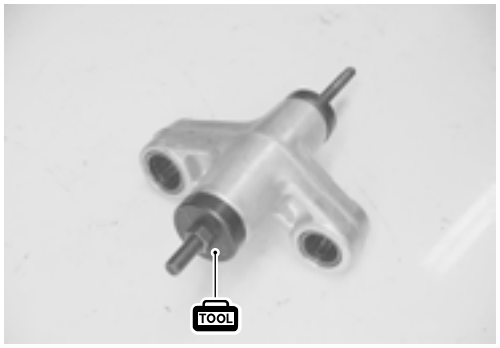


CUSHION LEVER BEARING

- Install the bearings into the cushion lever by with the special tool. (☞8-39)

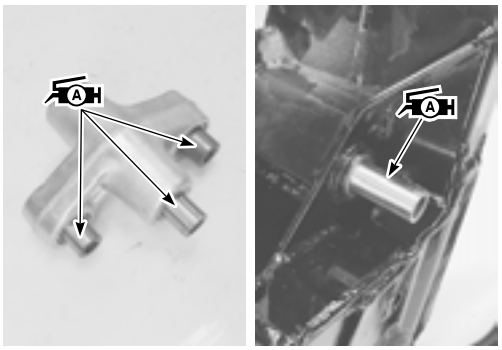
TOOL 09924-84521: Bearing installer

NOTE:
When installing the bearings, stamped mark of bearing must face outside.



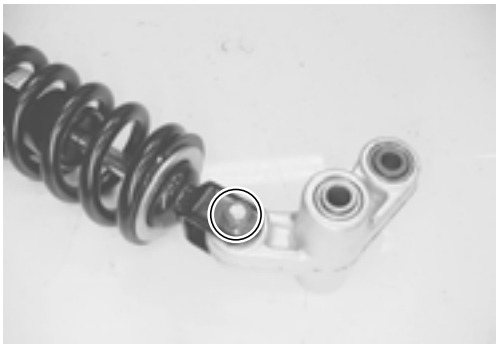
- Apply grease to the spacers and bearings.

A H 99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)



• Tighten the cushion lever to the specified torque.

Shock absorber mounting nut:
50 N·m (5.0 kgf-m, 36.0 lb-ft)



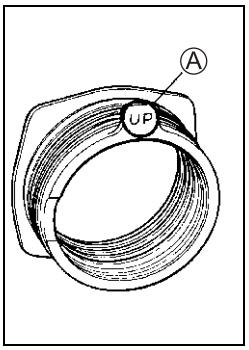
REMOUNTING

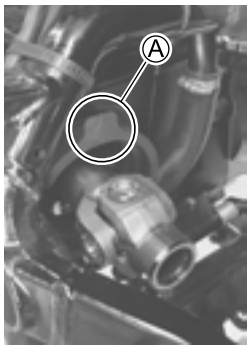
Remount the swingarm and shock absorber in the reverse order of disassembly and removal, and pay attention to the following points.

SWINGARM

• Before installing the swingarm, install the boot and the universal joint.

NOTE:
Make sure that the "UP" mark Ⓐ on the boot faces up.



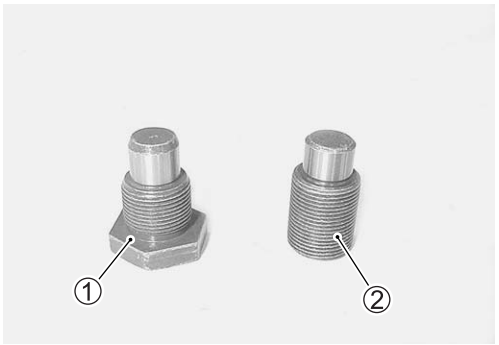


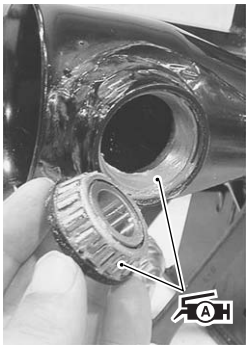
• Install the swingarm assembly, its pivot bearings and bolts (①, ②).

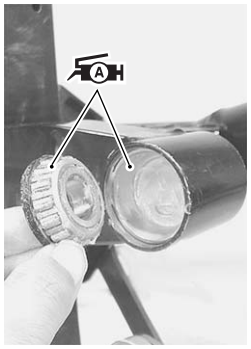
NOTE:
Apply grease to the swingarm pivot bearings.

99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

①: For left side swingarm pivot bolt
②: For right side swingarm pivot bolt



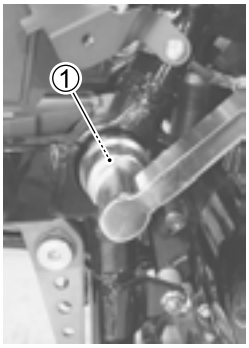




• Tighten the left side swingarm pivot bolt ① to the specified torque.

Swingarm pivot bolt (left side):
100 N·m (10.0 kgf-m, 72.5 lb-ft)

NOTE:
Before tightening the left side swingarm pivot bolt ①, loosen the right side one ②.



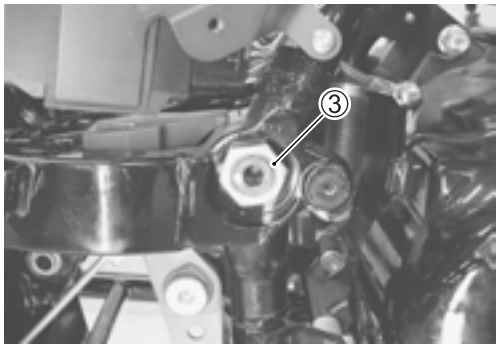


- Tighten the right side swingarm pivot bolt ② to the specified torque.

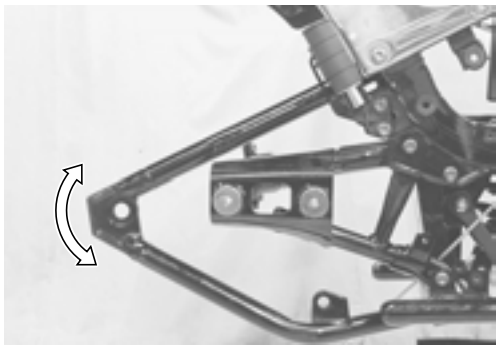
Swingarm pivot bolt (right side):
9.5 N·m (0.95 kgf-m, 7.0 lb-ft)

- Tighten the swingarm pivot lock nut ③ to the specified torque.

Swingarm pivot lock nut: 100 N·m (10.0 kgf-m, 72.5 lb-ft)



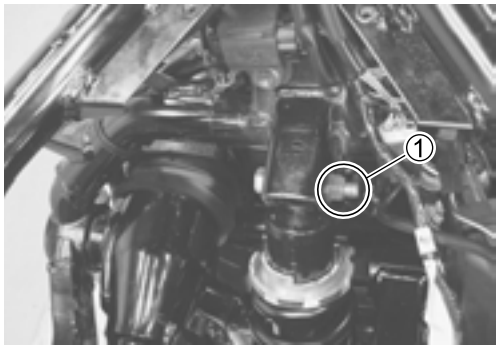
NOTE:
After tightening the swingarm pivot lock nut, be sure to check the swingarm operation.



SHOCK ABSORBER AND CUSHION LEVER

- Assemble the shock absorber and cushion rods onto the swingarm. (☞8-39)
- Tighten the shock absorber upper mounting nut ① to the specified torque.

Shock absorber mounting nut:
50 N·m (5.0 kgf-m, 36.0 lb-ft)



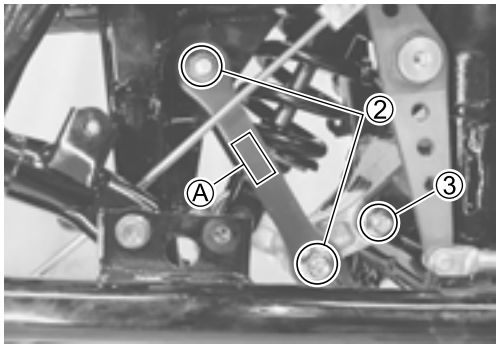
- Tighten the cushion rod nuts ② to the specified torque.

Cushion rod mounting nut: 78 N·m (7.8 kgf-m, 56.5 lb-ft)

NOTE:
The stamped marks Ⓐ on the cushion rod should be face outside.

- Tighten the cushion lever mounting nut ③ to the specified torque.

Cushion lever mounting nut:
78 N·m (7.8 kgf-m, 56.5 lb-ft)



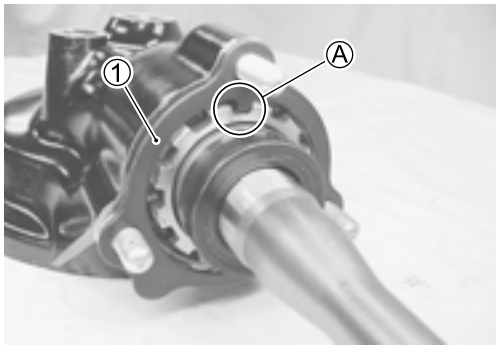
FINAL GEAR CASE

- Install the plate to the final gear case ①. Apply SUZUKI BOND to the mating surface of swingarm and final gear case.

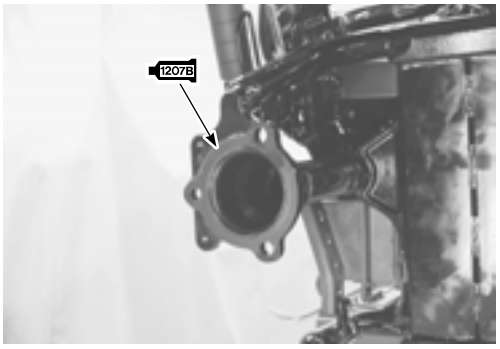
1207B 99000-31140: SUZUKI BOND "1207B"

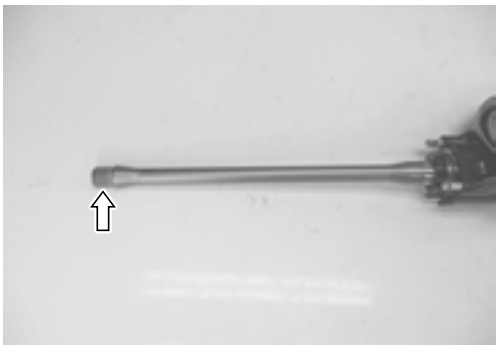
CAUTION

When installing the plate ①, align the lug Ⓐ of the plate ① to the bearing retainer groove.

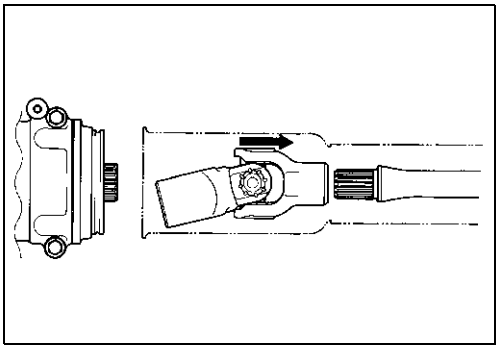


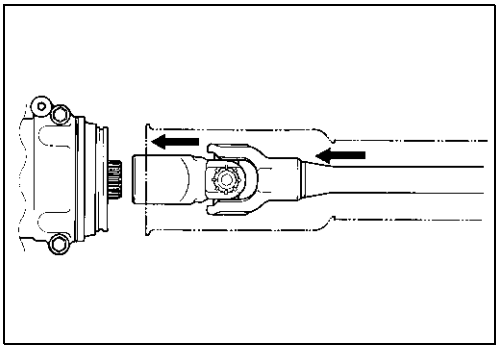
- Apply Lithium Base Molybdenum grease (NLGI #2) to the propeller shaft spline.





NOTE:
To install the final gear case easily, move the dust boot front and the universal joint back. Engage the universal joint to the propeller shaft first and then engage it to the secondary driven bevel gear shaft.





- Tighten the final gear case mounting nuts to the specified torque.

Final gear case nut: 40 N·m (4.0 kgf-m, 29.0 lb-ft)

- Install the rear wheel. (☞8-37)
- Install the exhaust pipes and mufflers. (☞3-10)



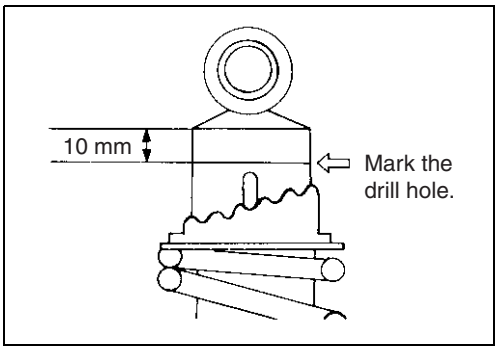
REAR SHOCK ABSORBER DISPOSAL

⚠ WARNING

The rear shock unit contains high-pressure nitrogen gas. Mishandling can cause explosion.
*** Keep away from fire and heat. High gas pressure caused by heat can cause an explosion.**
*** Release gas pressure before disposing.**

GAS PRESSURE RELEASE

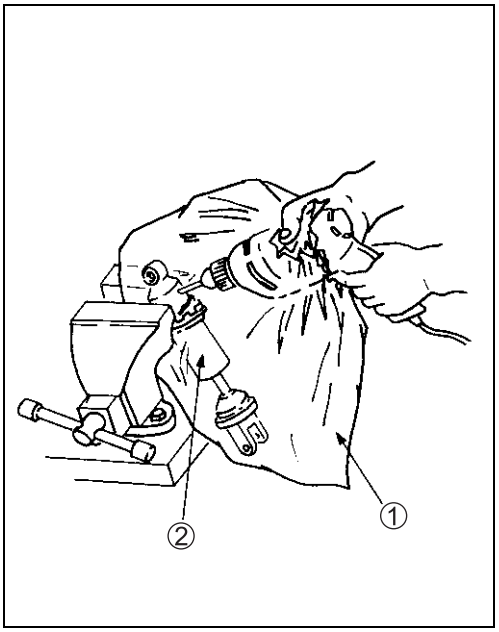
- Mark the drill hole with a center punch.



- Cover the rear shock absorber with a transparent plastic bag ①.
- Hold the rear shock absorber ② with a vice.
- Mark a hole with a 3 mm drill.

⚠ WARNING

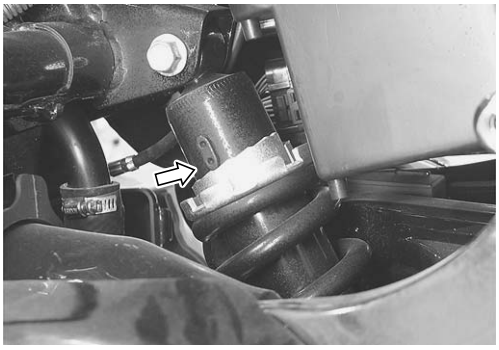
Wear eye protection to protect your eyes from released gas and metal chips.



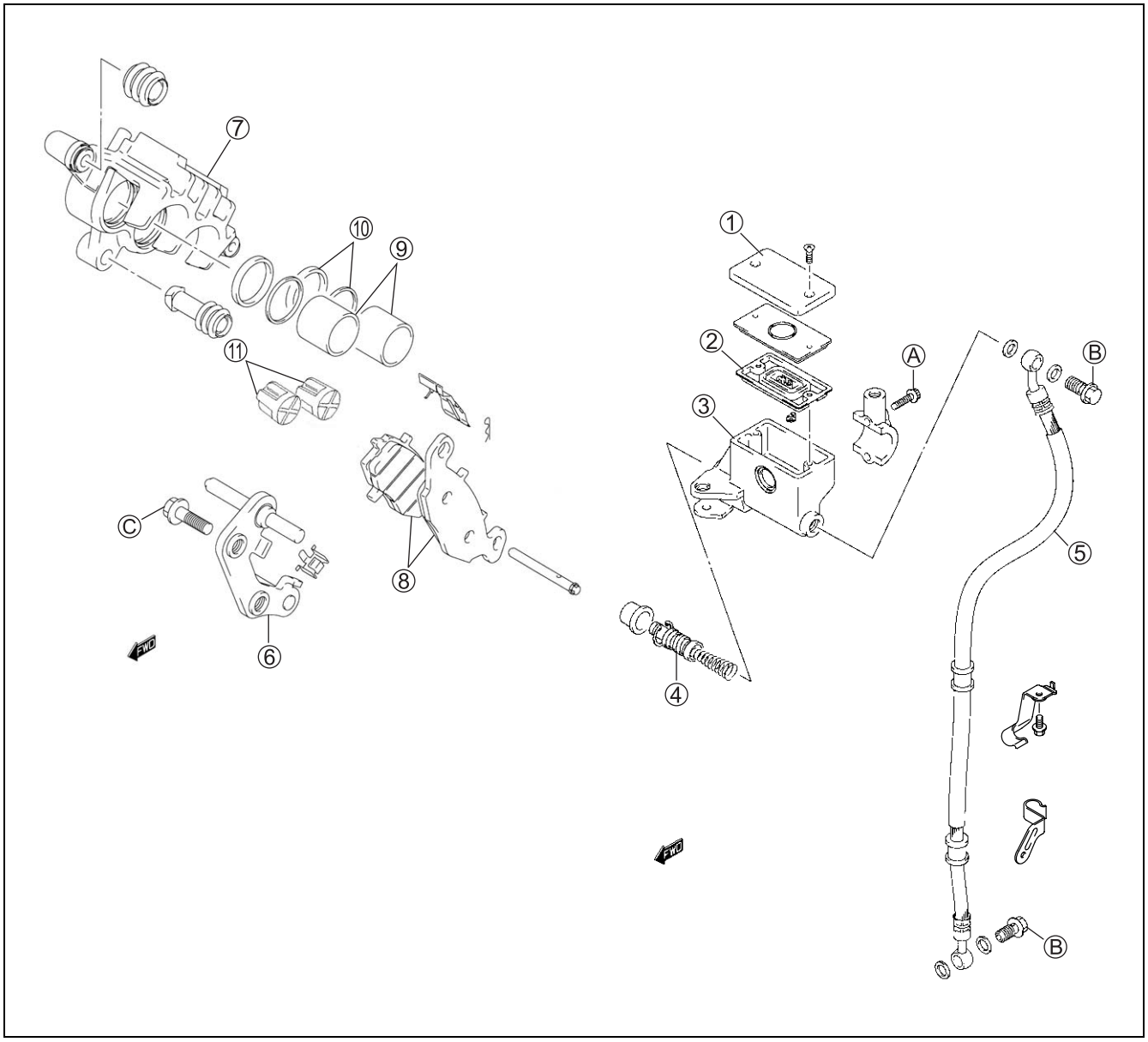
SUSPENSION SETTING

After installing the rear suspension, adjust the spring pre-load as follows.

Spring pre-load adjuster	3rd



FRONT BRAKE
CONSTRUCTION



①	Cap	⑥	Caliper holder	⑪	Insulator
②	Diaphragm	⑦	Caliper	Ⓐ	Master cylinder mounting bolt
③	Master cylinder	⑧	Pad set	Ⓑ	Brake hose union bolt
④	Piston set	⑨	Piston	Ⓒ	Brake caliper mounting bolt
⑤	Brake hose	⑩	Piston and dust seal		

ITEM	N·m	kgf-m	lb-ft
Ⓐ	10	1.0	7.0
Ⓑ	23	2.3	16.5
Ⓒ	39	3.9	28

⚠ WARNING

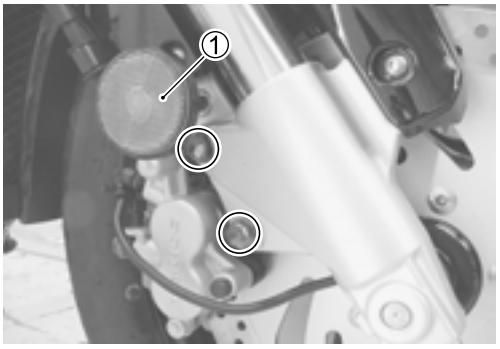
*** The brake system is filled with an glycol-based brake fluid, which is classified DOT 4. Do not use or mix other types of brake fluid, such as silicone-based and petroleum-based brake fluids when refilling the brake system, otherwise serious damage to the brake system will result.**
*** Do not use any brake fluid taken from old, used, or unsealed containers.**
*** Do not reuse brake fluid left over from the last servicing or which has been stored for a long period of time.**
*** When storing brake fluid, be sure to seal the container completely and keep it out of the reach of children.**
*** When replenishing brake fluid, be sure not to get any dust or other foreign materials in the fluid.**
*** When washing brake components, always use new brake fluid. Do not use cleaning solvent.**
*** A contaminated brake disc or brake pad reduces braking performance. Discard contaminated pads and clean the brake disc with high-quality brake cleaner or a neutral detergent.**

CAUTION

Handle brake fluid with care: the fluid reacts chemically with paint, plastics, rubber material, etc.

BRAKE PAD REPLACEMENT

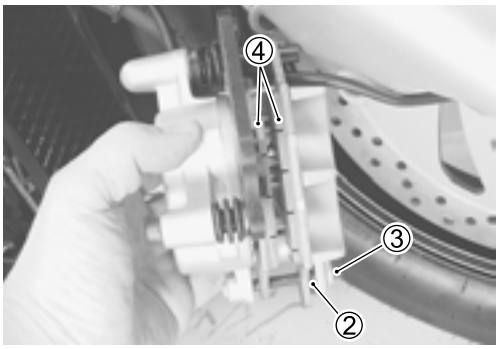
- Remove the reflex reflector ①. (For E-03, 28, 33)
- Remove the brake caliper by removing the brake caliper mounting bolts.



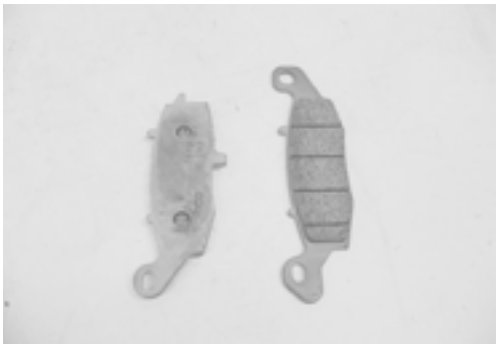
- Remove the pin ②.
- Remove the pad pin ③.
- Remove the brake pads ④.

CAUTION

*** Do not operate the brake lever during or after brake pad removal.**
*** Replace the brake pads as a set, otherwise braking performance will be adversely affected.**



- Install the new brake pads.

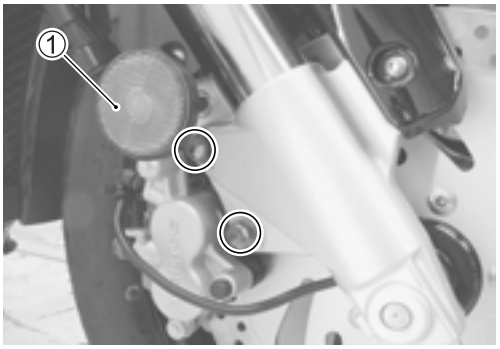


- Tighten the brake caliper mounting bolts to the specified torque.

Brake caliper mounting bolts: 39 N·m (3.9 kgf-m, 28 lb-ft)

- Install the reflex reflector ①. (For E-03, 28, 33)

NOTE:
After replacing the brake pads, pump the brake lever a few times to check for proper brake operation and then check the brake fluid level.



BRAKE FLUID REPLACEMENT



- Place the motorcycle on a level surface and keep the handlebar straight.
- Remove the master cylinder reservoir cap and diaphragm.
- Remove as much old brake fluid as possible.
- Fill the reservoir with new brake fluid.

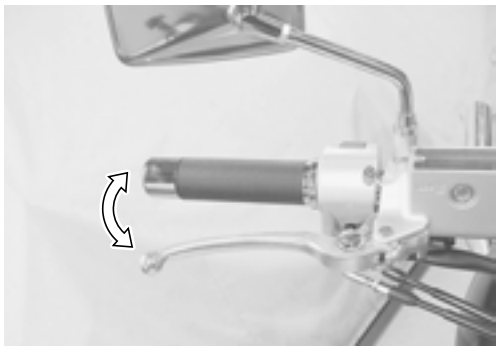
BF Specification and classification: DOT 4



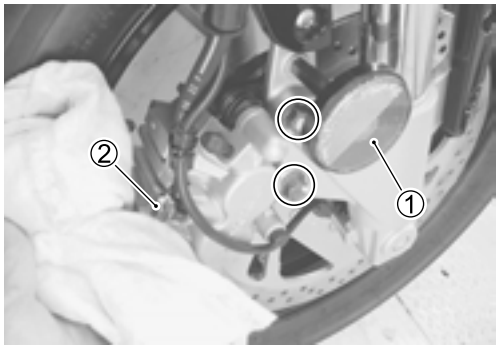
- Connect a clear hose to the air bleeder valve and insert the other end of the hose into a receptacle.
- Loosen the air bleeder valve and pump the brake lever until the old brake fluid is completely out of the brake system.
- Close the air bleeder valve and disconnect the clear hose. Fill the reservoir with new brake fluid to the upper end of the inspection window.

CAUTION

Bleed air from the brake system. (☞2-22)



BRAKE CALIPER REMOVAL AND DISASSEMBLY



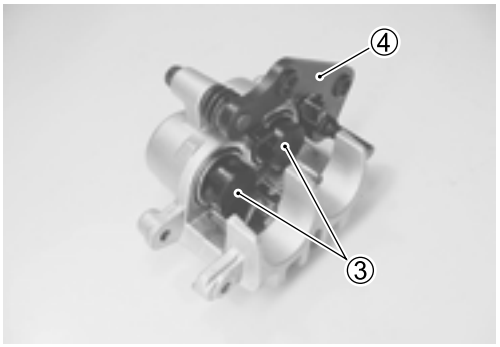
- Remove the reflex reflector ①. (For E-03, 28, 33)
- Disconnect the brake hose from the brake caliper by removing the brake hose union bolt ② and allow the brake fluid to drain into a suitable receptacle.
- Remove the brake caliper by removing the brake caliper mounting bolts.

⚠ WARNING

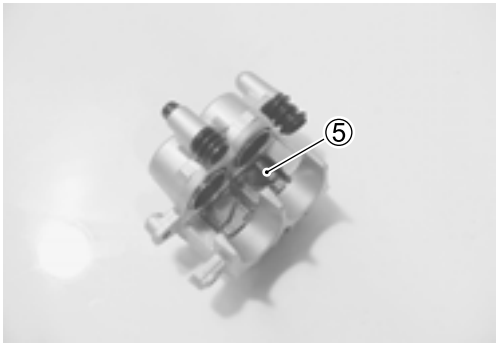
*** Do not reuse the brake fluid left over from the last servicing or which has been stored for a long period of time, otherwise serious damage to the brake system will result.**

*** Brake fluid, if it leaks, will interfere with safe running and discolor painted surfaces. Check the brake hose and hose joints for cracks and oil leakage.**

- Remove the brake pads. (☞8-52)
- Remove the insulator ③.
- Remove the brake caliper holder ④.



- Remove the spring ⑤.



- Place a rag over the brake caliper pistons to prevent them from popping out, and then force out the pistons using compressed air.

CAUTION

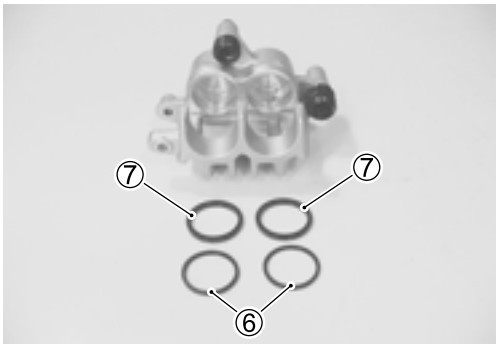
Do not use extremely high pressure to remove the brake caliper pistons, otherwise damage to the pistons will result.



- Remove the dust seals ⑥ and piston seals ⑦.

CAUTION

Do not reuse the dust seals and piston seals to prevent fluid leakage.



BRAKE CALIPER INSPECTION

BRAKE CALIPER

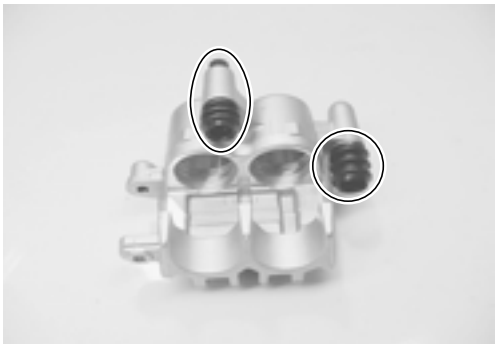
Inspect each brake caliper cylinder wall for nicks, scratches or other damage. If any damages are found, replace the brake caliper with a new one.

BRAKE CALIPER PISTONS

Inspect the brake caliper pistons for any scratches or other damage. If any damages are found, replace the piston with a new one.



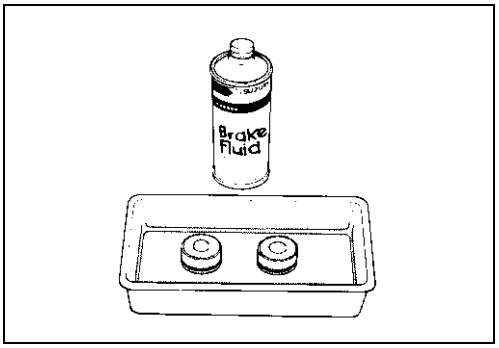
RUBBER PARTS
Replace the removed rubber parts with new ones.



BRAKE CALIPER REASSEMBLY AND REMOUNTING

Reassemble and remount the brake caliper in the reverse order of removal and disassembly. Pay special attention to the following points:

- Wash the caliper bores and pistons with the specified brake fluid. Thoroughly wash the dust seal grooves and piston seal grooves.



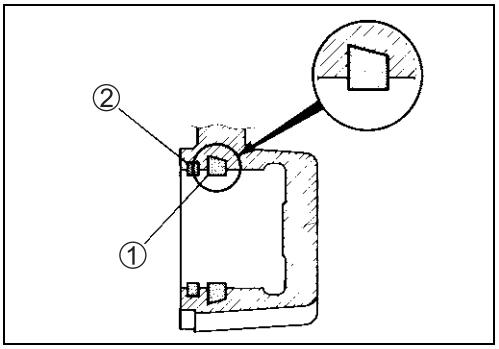
BF **Specification and classification: DOT 4**

CAUTION

*** Wash the brake caliper components with new brake fluid before reassembly.**
*** Do not wipe the brake fluid off after washing the components.**
*** When washing the components, use the specified brake fluid. Never use different types of fluid or cleaning solvents such as gasoline, kerosine, etc.**
*** Replace the removed piston seals and dust seals with new ones.**
*** Apply brake fluid to all of the seals, brake caliper bores and pistons before reassembly.**

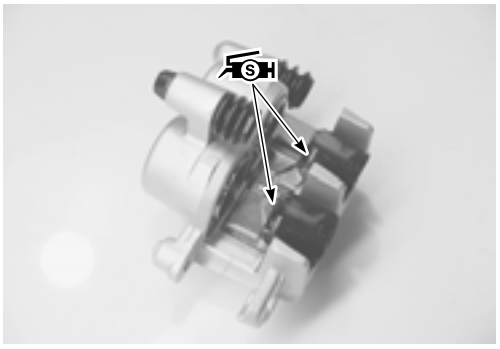
PISTON SEALS

- Install the piston seals ① and dust seals ② as shown.



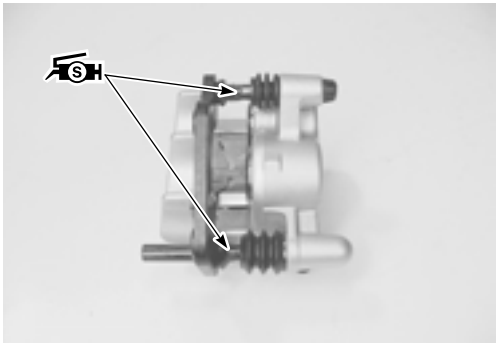
INSULATORS
- Apply SUZUKI SILICONE GREASE to the insulators.

99000-25100: SUZUKI SILICONE GREASE



BRAKE CALIPER HOLDER
- Apply SUZUKI SILICONE GREASE to the brake caliper holder.

99000-25100: SUZUKI SILICONE GREASE

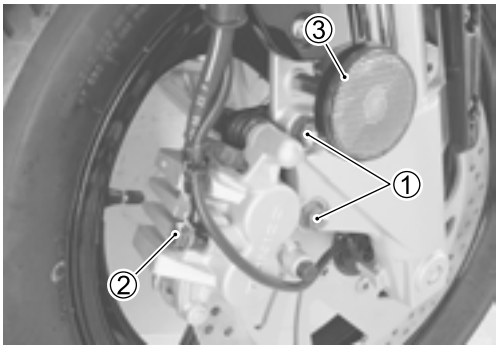


- Tighten the brake caliper mounting bolts ①, and brake hose union bolt ② to the specified torque.

Brake caliper mounting bolt: 39 N·m (3.9 kgf-m, 28 lb-ft)
Brake hose union bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)

- For assembly procedure of brake hose: (☞10-21)
- Install the reflex reflector ③. (For E-03, 28, 33)

NOTE:
Before remounting the brake caliper, push the brake caliper pistons all the way into the caliper.



CAUTION

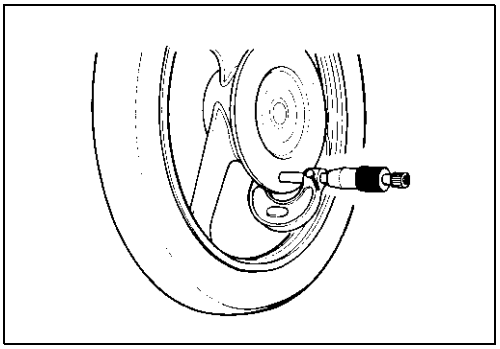
Bleed air from the system after reassembling the brake caliper. (☞2-22)

BRAKE DISC INSPECTION

Check the brake disc for cracks or damage and measure the thickness using the micrometer. If any damages are found or if the thickness is less than the service limit, replace the brake disc with a new one.

09900-20205: Micrometer (0 – 25 mm)

Brake disc thickness
Service Limit: 4.5 mm (0.098 in)

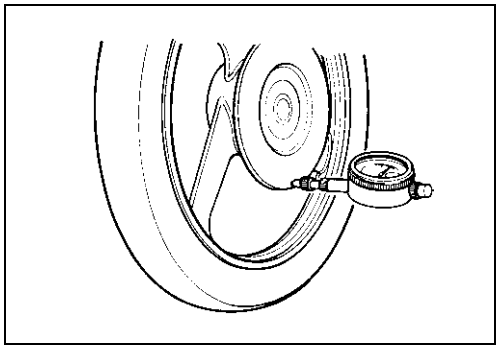


Measure the runout using the dial gauge. If the runout exceeds the service limit, replace the brake disc with a new one.

TOOL 09900-20607: Dial gauge (1/100 mm)
09900-20701: Magnetic stand

DATA Brake disc runout
Service Limit: 0.3 mm (0.012 in)

- If either measurement exceeds the service limit, replace the brake disc with a new one. (☞8-7 and -10)

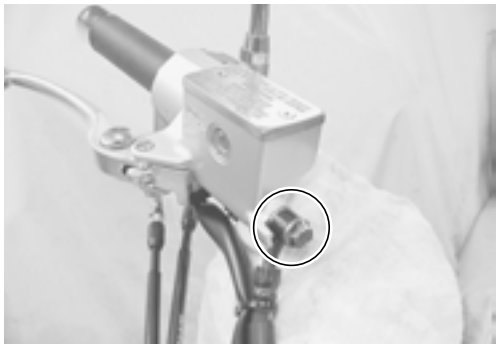


MASTER CYLINDER REMOVAL AND DISASSEMBLY

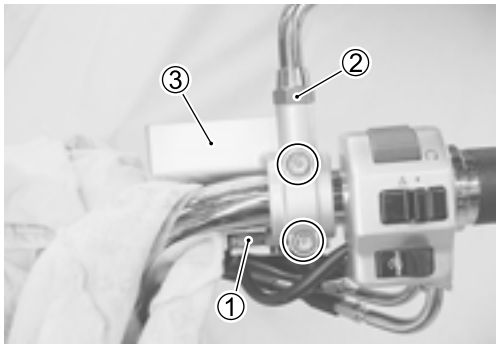
- Place a rag underneath the brake hose union bolt on the master cylinder to catch any spilt brake fluid. Remove the brake hose union bolt and disconnect the brake hose.

CAUTION

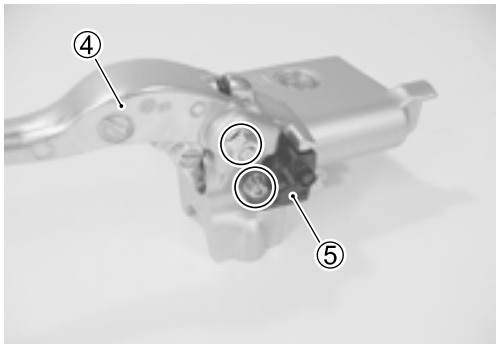
Immediately wipe off any brake fluid contacting any part of the motorcycle. The brake fluid reacts chemically with paint, plastics, rubber materials, etc., and will damage them severely.



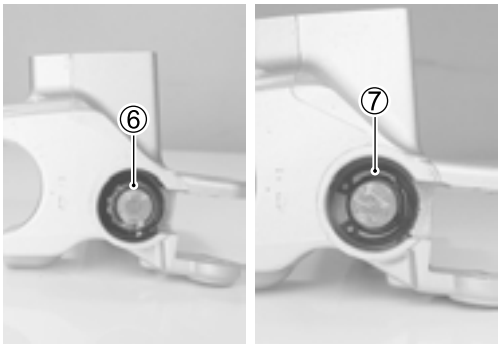
- Disconnect the front brake light switch lead wire ①.
- Remove the right rear view mirror ② and master cylinder assembly ③.



- Remove the brake lever ④ and front brake light switch ⑤.



• Pull the dust boot ⑥ out and remove the snap ring ⑦.



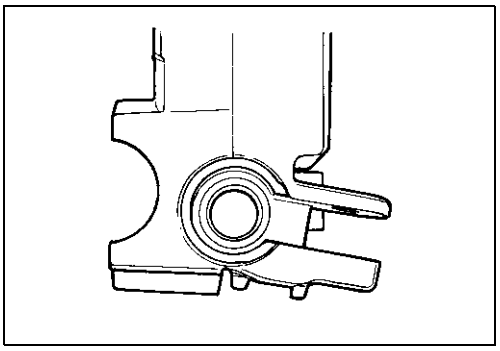
• Remove the piston assembly.



MASTER CYLINDER INSPECTION

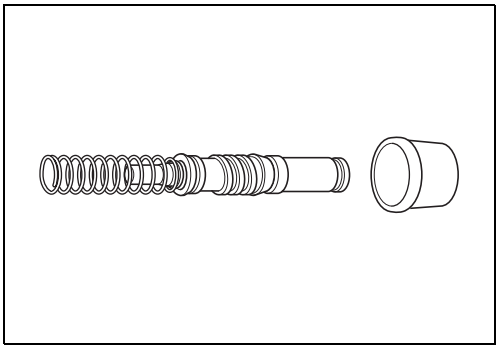
MASTER CYLINDER

Inspect the master cylinder bore for any scratches or damage. If any damages are found, replace the master cylinder with a new one.

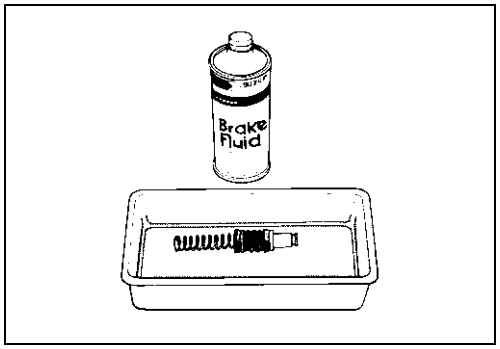


PISTON AND RUBBER PARTS

Inspect the piston surface, primary/secondary cup, and dust boot for any scratches, wear or damage. If any damages are found, replace the piston set with a new one.



MASTER CYLINDER REASSEMBLY AND REMOUNTING



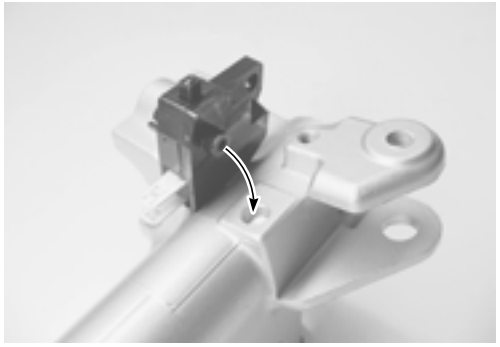
Reassemble and remount the master cylinder in the reverse order of removal and disassembly. Pay special attention to the following points:

CAUTION

*** Wash the master cylinder components with new brake fluid before reassembly.**
*** Do not wipe the brake fluid off after washing the components.**
*** When washing the components, use the specified brake fluid. Never use different types of fluid or cleaning solvents such as gasoline, kerosine, etc.**
*** Apply brake fluid to the master cylinder bore and all of the master cylinder components before reassembly.**

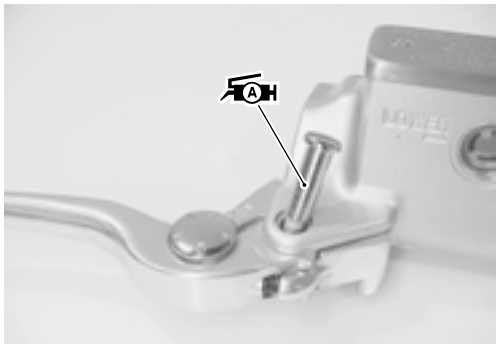
Specification and classification: DOT 4

- When installing the brake light switch, align the projection on the switch with the hole in the master cylinder.



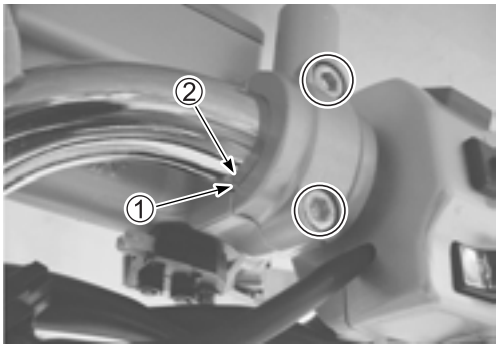
- Apply SUZUKI SUPER GREASE “A” to the bolt.

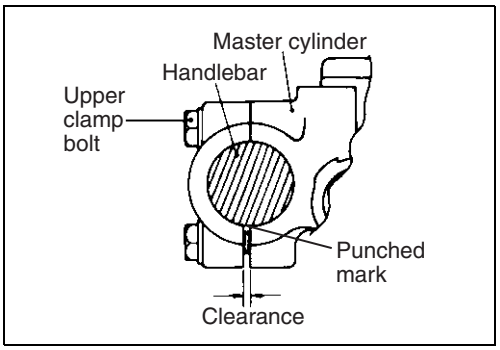
99000-25030: SUZUKI SUPER GREASE “A” (USA)
99000-25010: SUZUKI SUPER GREASE “A” (Others)



- When remounting the master cylinder onto the handlebars, align the master cylinder holder's mating surface ① with the punch mark ② on the handlebars and tighten the upper clamp bolt first.

Master cylinder mount bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)





- Tighten the brake hose union bolt to the specified torque.
- For assembly procedure of brake hose. (☞10-21)

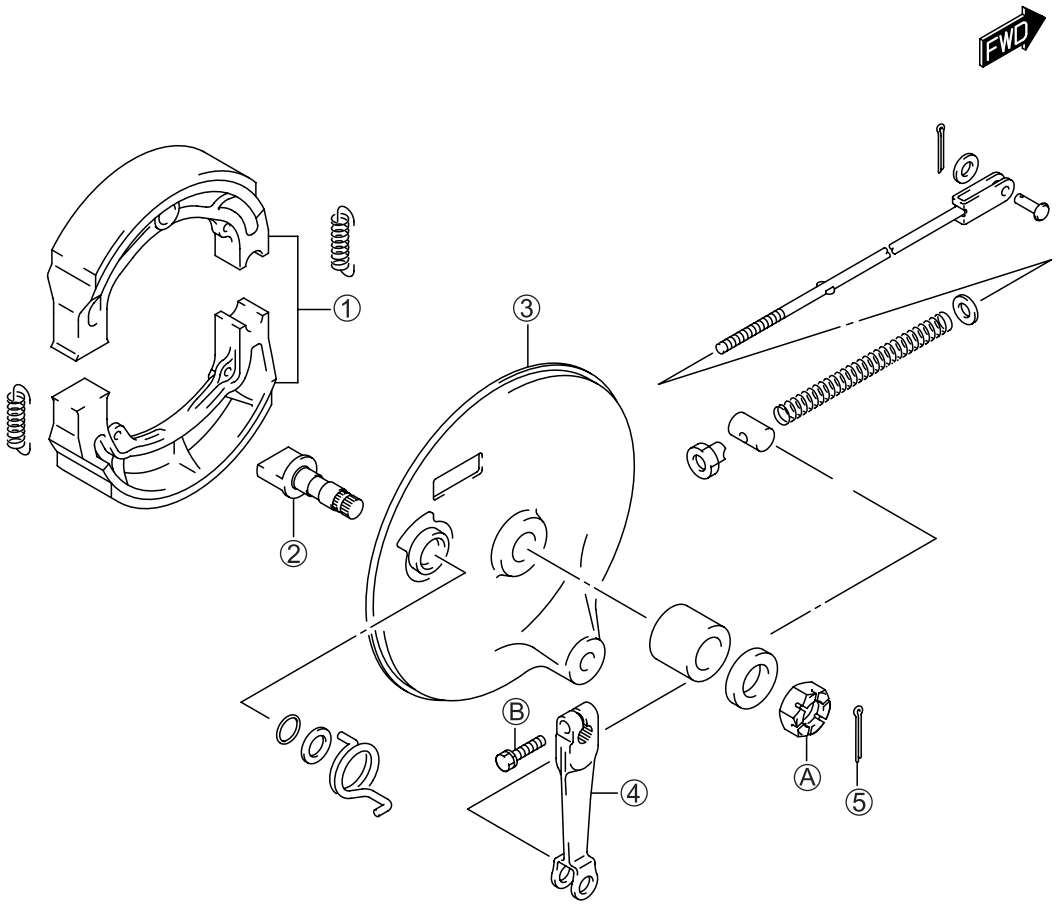
Brake hose union bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)

CAUTION

Bleed air from the brake system after installing the master cylinder. (☞2-22)



REAR BRAKE
CONSTRUCTION

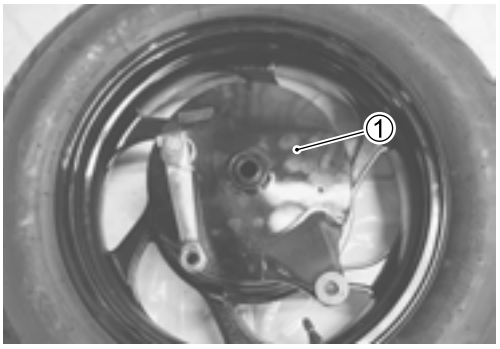


①	Brake shoe
②	Brake camshaft
③	Brake panel
④	Brake cam lever
⑤	Cotter pin (For E-03, 28, 33)
Ⓐ	Rear axle nut
Ⓑ	Rear brake cam lever bolt

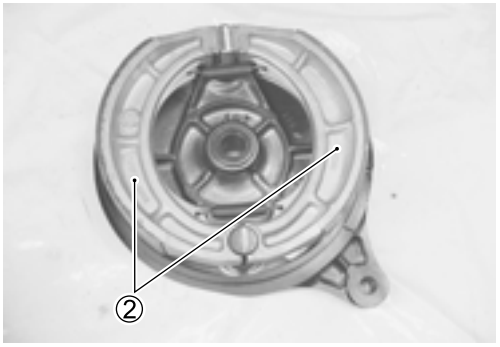
ITEM	N·m	kgf-m	lb-ft
Ⓐ	65	6.5	47.0
Ⓑ	10	1.0	7.0

REMOVAL AND DISASSEMBLY

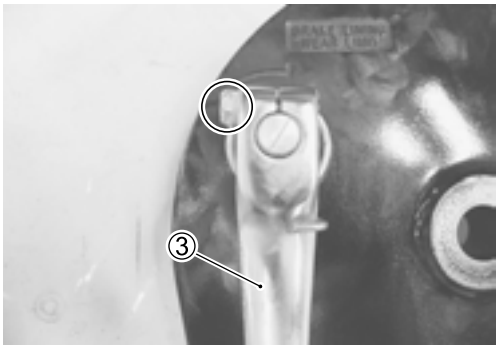
- Remove the rear wheel. (☞8-33)
- Remove the rear brake panel ①.



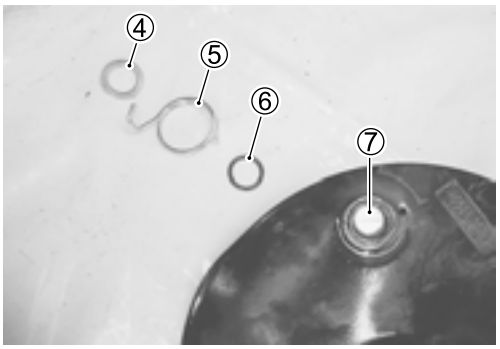
- Remove the brake shoes ②.



- Remove the rear brake cam lever ③ by removing bolt.



- Remove the washer ④, spring ⑤ and O-ring ⑥.
- Remove the rear brake cam ⑦.



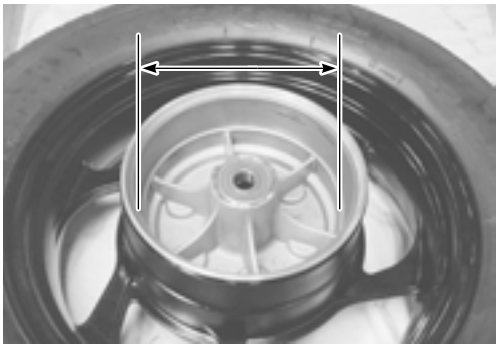
INSPECTION

BRAKE DRUM

Inspect the brake drum and measure the brake drum I.D. to determine the extent of wear. Replace the brake drum if the measurement exceeds the service limit. The value of this limit is indicated inside the brake drum.

TOOL 09900-20102: Vernier calipers

DATA Brake drum I.D.
Service Limit: 180.7 mm



BRAKE SHOES

Check the brake shoe wear (☞2-21) and decide whether it should be replaced or not.

CAUTION

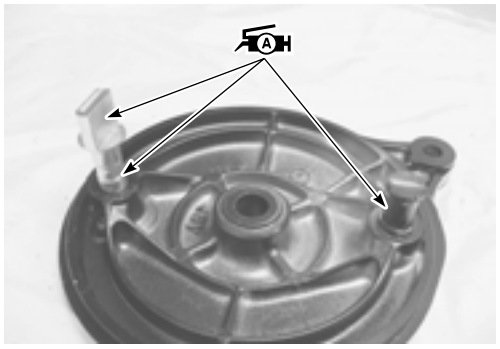
Replace the brake shoes as a set, otherwise braking performance will be adversely affected.

REASSEMBLY AND REMOUNTING

BRAKE CAMSHAFT

- When installing the brake camshaft, apply SUZUKI SUPER GREASE "A" to the camshaft and cam face.

99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)



- Install the brake shoes with spring hooks faced inside.

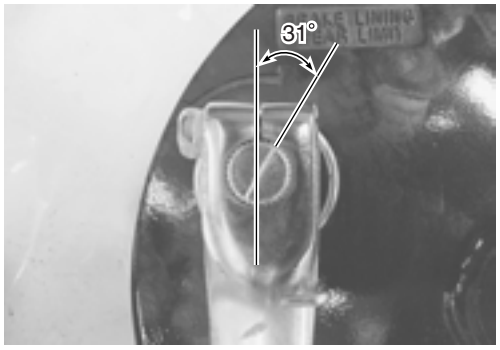
CAUTION

Be careful not to apply too much grease to the cam and pin. If grease gets on the lining, brake slippage will result.



BRAKE CAM LEVER

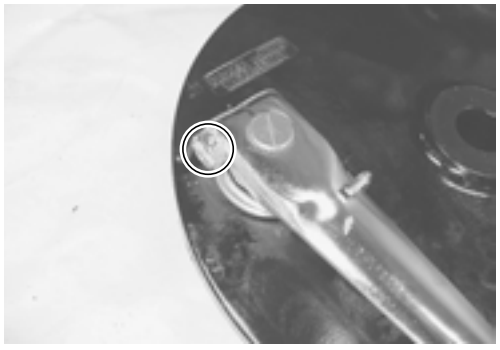
- Install the new O-ring and washer.
- Install the brake cam lever to the brake camshaft as shown.



- Tighten the brake cam lever bolt to the specified torque.

Brake cam lever bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)

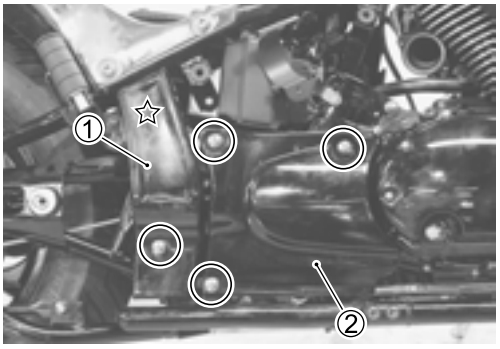
- Install the rear wheel. (☞8-37)
- Adjust the rear brake pedal free travel. (☞2-21)



REAR BRAKE ROD

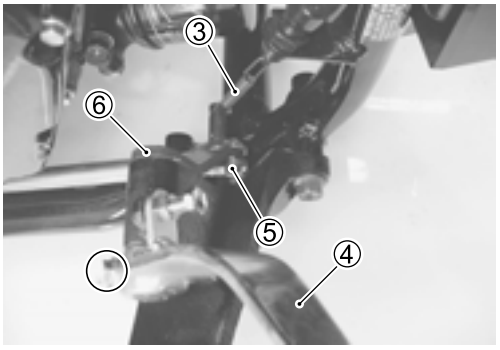
REMOVAL AND DISASSEMBLY

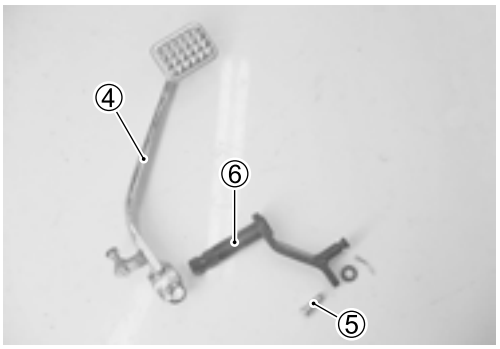
- Remove the exhaust pipes and mufflers assembly. (☞3-6)
- Remove the right frame lower cover ①, clutch rear cover ②.



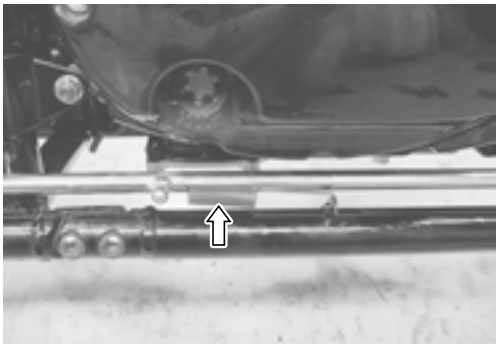
☆: Hooked part

- Remove the rear brake switch spring ③.
- Remove the rear brake pedal ④.
- Remove the cotter pin ⑤.
- Remove the rear brake pedal shaft ⑥.

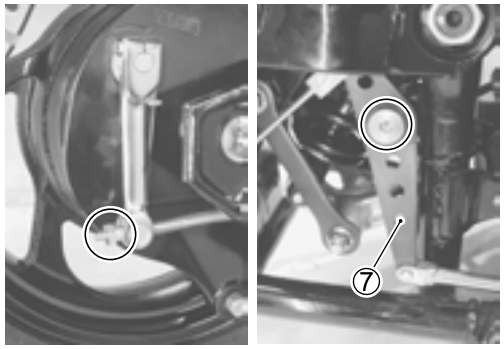




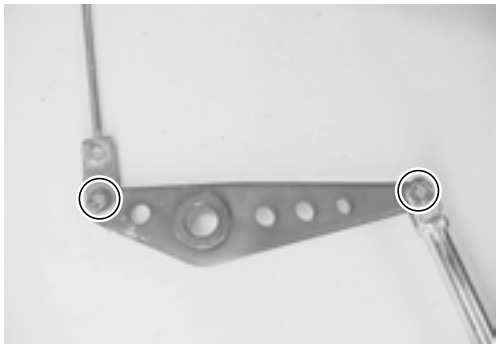
- Remove the return spring.



- Remove the rear brake adjust nut, spring and washer.
- Remove the rear brake link ⑦.



- Remove the cotter pins.



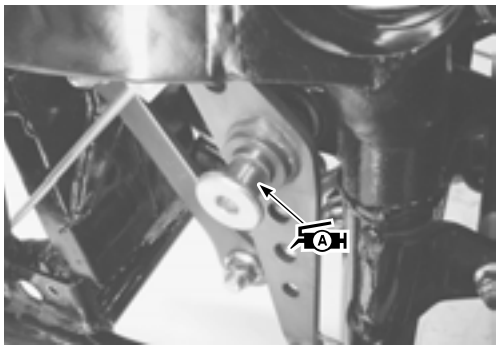
REASSEMBLY REMOUNTING

Reassemble and remount the rear brake rod in the reverse order of removal and disassembly. Pay attention to the following points.

- Apply grease to the rear brake link pivot bolt and tighten it to the specified torque.

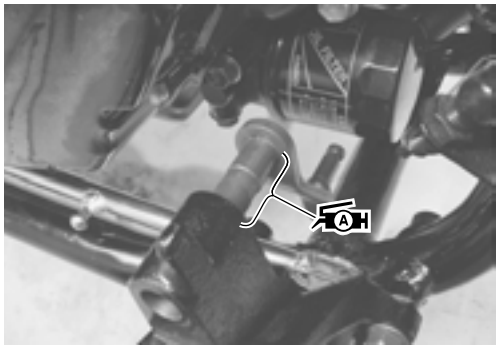
99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

Rear brake link pivot bolt: 29 N·m (2.9 kgf-m, 21 lb-ft)



- Apply grease to the rear brake pedal shaft.

99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)



- Tighten the rear brake pedal mount bolt to the specified torque.

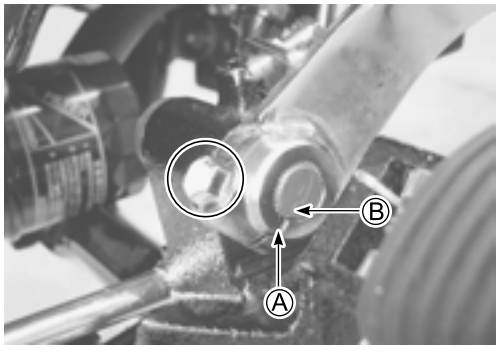
Rear brake pedal mount bolt: 11 N·m (1.1 kgf-m, 8.0 lb-ft)

NOTE:

** When remounting the rear brake pedal onto the rear brake pedal shaft, align the rear brake pedal mounting surface Ⓐ with the punch mark Ⓑ.*

** After remounting the rear wheel, check for proper brake operation. (☞2-21)*

- Install the exhaust pipes and mufflers. (☞3-10)

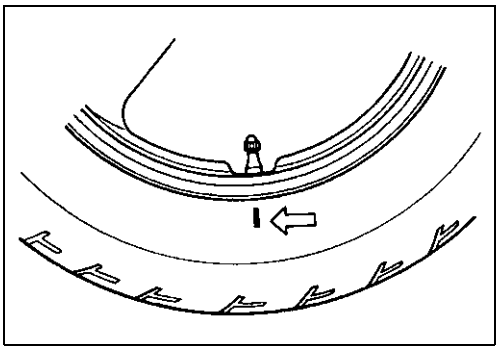


TIRE AND WHEEL

TIRE REMOVAL

The most critical factor of tubeless tire is the seal between the wheel rim and the tire bead. For this reason, it is recommended to use a tire changer that can satisfy this sealing requirement and can make the operation efficient as well as functional.
For operating procedures, refer to the instructions supplied by the tire changer manufacturer.

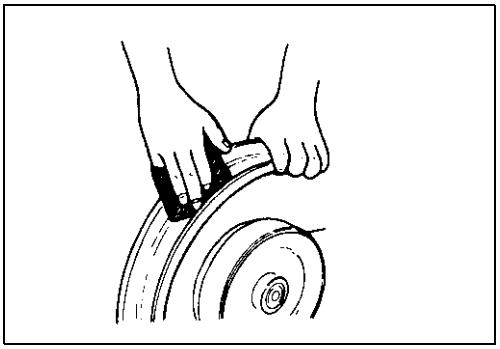
NOTE:
When removing the tire in the case of repair or inspection, mark the tire with a chalk to indicate the tire position relative to the valve position.
Even though the tire is refitted to the original position after repairing puncture, the tire may have to be balanced again since such a repair can cause imbalance.



INSPECTION

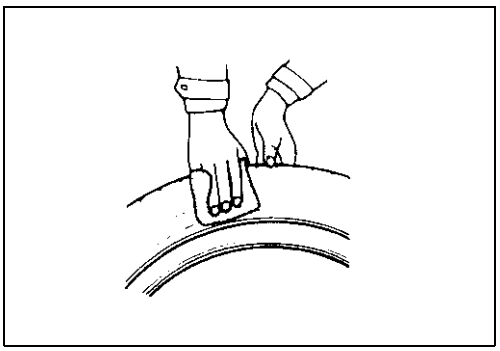
WHEEL

Wipe the wheel clean and check for the following:
- Distortion and crack
- Any flaws and scratches at the bead seating area.
- Wheel rim runout (☞8-8)



TIRE

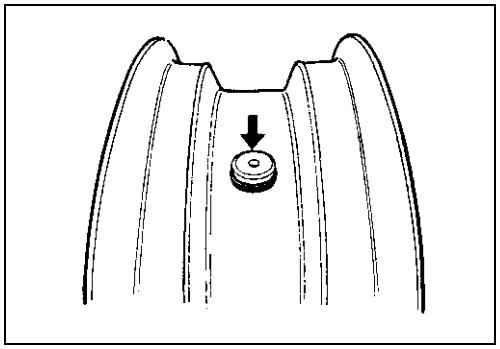
Tire must be checked for the following points:
- Nick and rupture on side wall
- Tire tread depth (☞2-23)
- Tread separation
- Abnormal, uneven wear on tread
- Surface damage on bead
- Localized tread wear due to skidding (Flat spot)
- Abnormal condition of inner liner

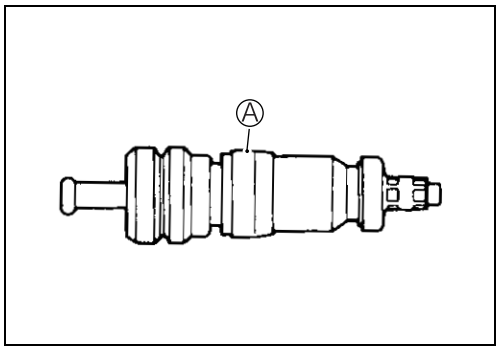


VALVE INSPECTION

Inspect the valve after the tire is removed from the rim. Replace the valve with a new one if the seal Ⓐ rubber is peeling or has damage.

NOTE:
If the external appearance of the valve shows no abnormal condition, removing of the valve is not necessary.
If the seal has abnormal deformation, replace the valve with a new one.



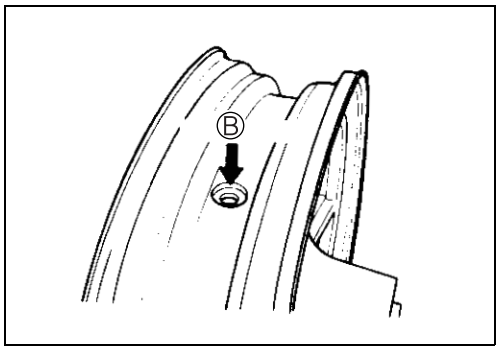


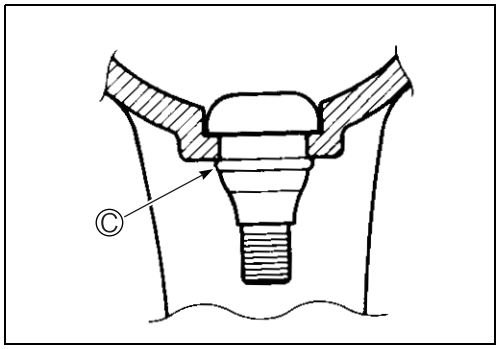
Any dust or rust around the valve hole Ⓑ must be cleaned off. Then install the valve Ⓒ in the rim.

NOTE:
To properly install the valve into the valve hole, apply a special tire lubricant or neutral soapy liquid to the valve.

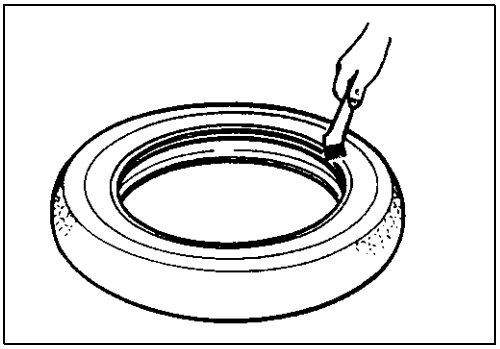
CAUTION

Be careful not to damage the lip Ⓒ of valve.





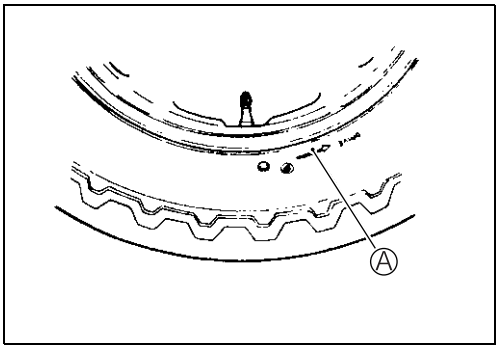
TIRE INSTALLATION



- Apply tire lubricant to the tire bead.
- When installing the tire onto the wheel, observe the following points.

CAUTION

*** Do not reuse the valve which has been once removed.**
*** Never use oil, grease or gasoline on the tire bead in place of tire lubricant.**



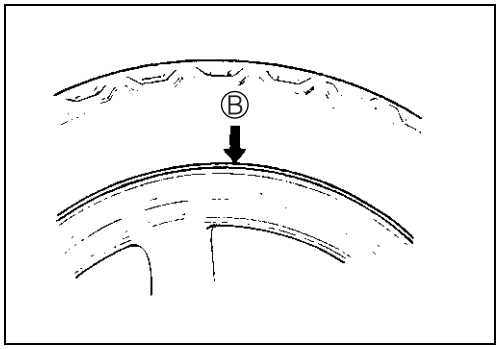
- When installing the tire, the arrow Ⓐ on the side wall should point to the direction of wheel rotation.
- Align the chalk mark put on the tire at the time of removal with the valve position.

- For installation procedure of tire onto the wheel, follow the instructions given by the tire changer manufacturer.
- Bounce the tire several times while rotating. This makes the tire bead expand outward to contact the wheel, thereby facilitating air inflation.
- Inflate the tire.

⚠ WARNING

*** Do not inflate the tire to more than 400 kPa (4.0 kgf/cm², 57 psi). If inflated beyond this limit, the tire can burst and possibly cause injury. Do not stand directly over the tire while inflating.**
*** In the case of preset pressure air inflator, pay special care for the set pressure adjustment.**

- In this condition, check the “rim line” Ⓑ cast on the tire side walls. The line must be equidistant from the wheel rim all around. If the distance between the rim line and wheel rim varies, this indicates that the bead is not properly seated. If this is the case, deflate the tire completely and unseat the bead for both sides. Coat the bead with lubricant and fit the tire again.
- When the bead has been fitted properly, adjust the pressure to specification.
- As necessary, adjust the tire balance.



CAUTION

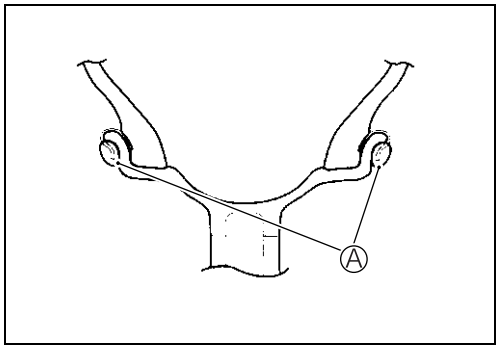
Do not run with a repaired tire at a high speed.

DATA Cold inflation tire pressure

	Front	Rear
Solo riding	200 kPa (2.00 kgf/cm², 29 psi)	250 kPa (2.50 kgf/cm², 36 psi)
Dual riding	200 kPa (2.00 kgf/cm², 29psi)	250 kPa (2.50 kgf/cm², 36 psi)

BALANCER WEIGHT INSTALLATION

- When installing the balancer weights to the wheel, set the two balancer weights Ⓐ on both sides of wheel rim.



CAUTION

Weight difference between the two balancer weights must be less than 10 g (0.02 lb).

ELECTRICAL SYSTEM

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ELECTRICAL SYSTEM

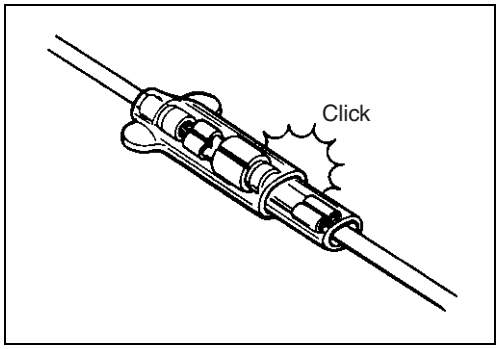
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CAUTIONS IN SERVICING

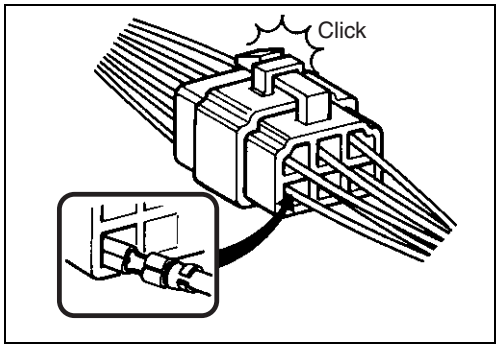
CONNECTOR

- When connecting a connector, be sure to push it in until a click is felt.
- Inspect the connector for corrosion, contamination and breakage in its cover.



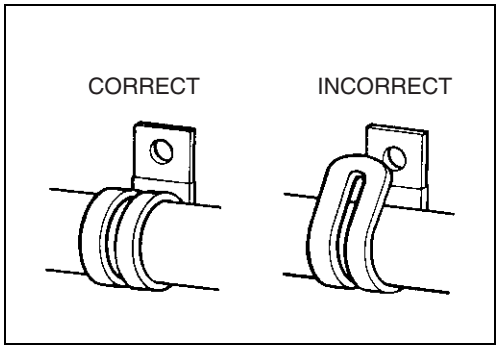
COUPLER

- With a lock type coupler, be sure to release the lock before disconnecting and push it in fully till the lock works when connecting.
- When disconnecting the coupler, be sure to hold the coupler itself and do not pull the lead wires.
- Inspect each terminal on the coupler for being loose or bent.
- Inspect each terminal for corrosion and contamination.



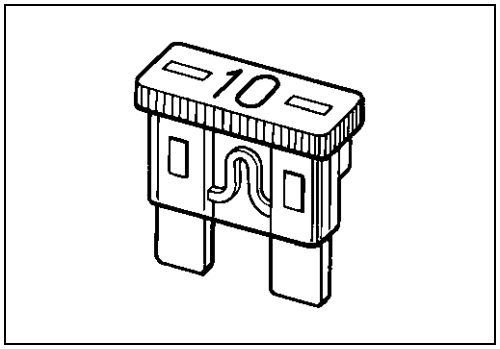
CLAMP

- Clamp the wire harness at such positions as indicated in “WIRE HARNESS ROUTING”. (☞10-15 to -16)
- Bend the clamp properly so that the wire harness is clamped securely.
- In clamping the wire harness, use care not to allow it to hang down.
- Do not use wire or any other substitute for the band type clamp.



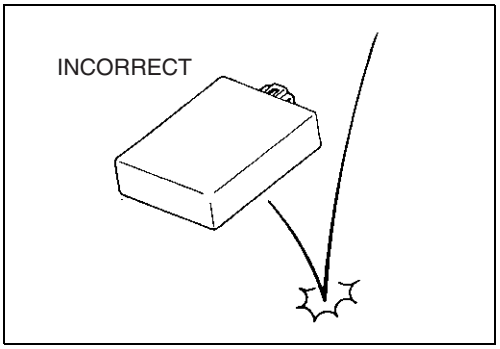
FUSE

- When a fuse blows, always investigate the cause, correct it and then replace the fuse.
- Do not use a fuse of a different capacity.
- Do not use wire or any other substitute for the fuse.



SEMI-CONDUCTOR EQUIPPED PART

- Be careful not to drop the part with a semi-conductor built in such as a ECM.
- When inspecting this part, follow inspection instruction strictly. Neglecting proper procedure may cause damage to this part.

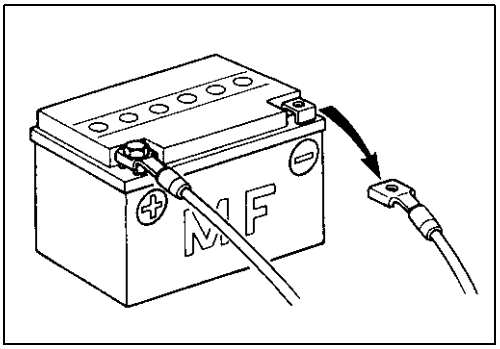


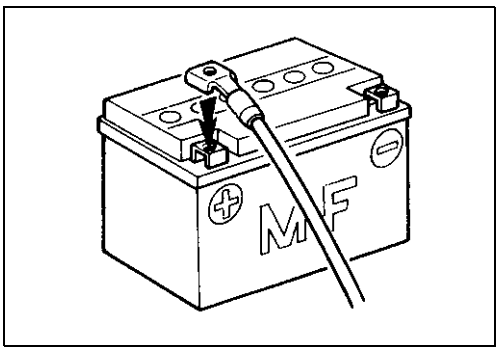
BATTERY

- The MF battery used in this motorcycle does not require maintenance (e.g., electrolyte level inspection, distilled water replenishment).
- During normal charging, no hydrogen gas is produced. However, if the battery is overcharged, hydrogen gas may be produced. Therefore, be sure there are no fire or spark sources (e.g., short circuit) nearby when charging the battery.
- Be sure to recharge the battery in a well-ventilated and open area.
- Note that the charging system for the MF battery is different from that of a conventional battery. Do not replace the MF battery with a conventional battery.

CONNECTING THE BATTERY

- When disconnecting terminals from the battery for disassembly or servicing, be sure to disconnect the ⊖ battery lead wire, first.
- When connecting the battery lead wires, be sure to connect the ⊕ battery lead wire, first.
- If the terminal is corroded, remove the battery, pour warm water over it and clean it with a wire brush.
- After connecting the battery, apply a light coat of grease to the battery terminals.
- Install the cover over the ⊕ battery terminal.



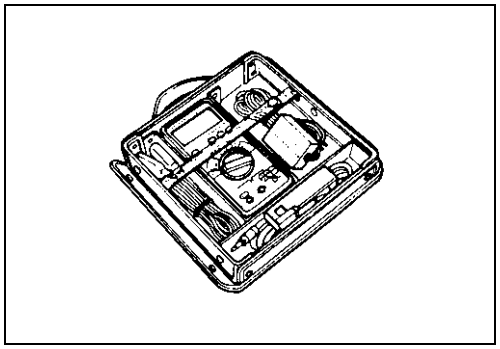


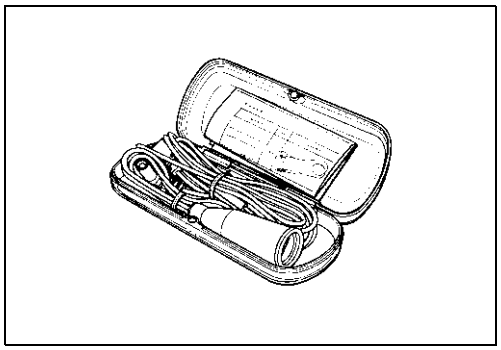
WIRING PROCEDURE

- Properly route the wire harness according to the “WIRE ROUTING” section. (☞10-15 to -16)

USING THE MULTI-CIRCUIT TESTER

- Properly use the multi-circuit tester ⊕ and ⊖ probes. Improper use can cause damage to the motorcycle and tester.
- If the voltage and current values are not known, begin measuring in the highest range.
- When measuring the resistance, make sure that no voltage is applied. If voltage is applied, the tester will be damaged.
- After using the tester, be sure to turn the switch to the OFF position.





TOOL 09900-25008: Multi-circuit tester set

CAUTION

Before using the multi-circuit tester, read its instruction manual.

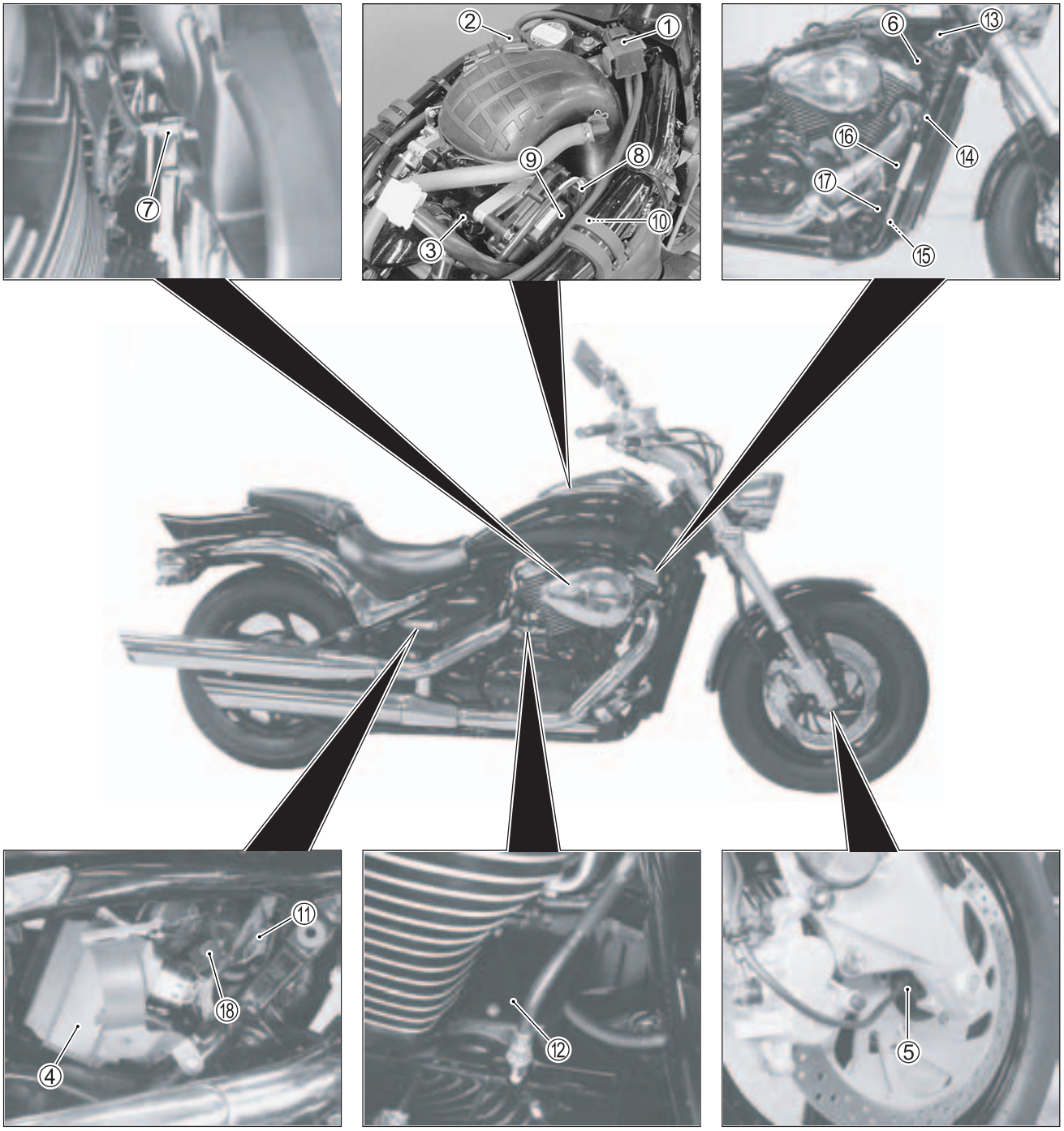
NOTE:

** When connecting the multi-circuit tester, use the needle pointed probe to the back side of the lead wire coupler and connect the probes of tester to them.*

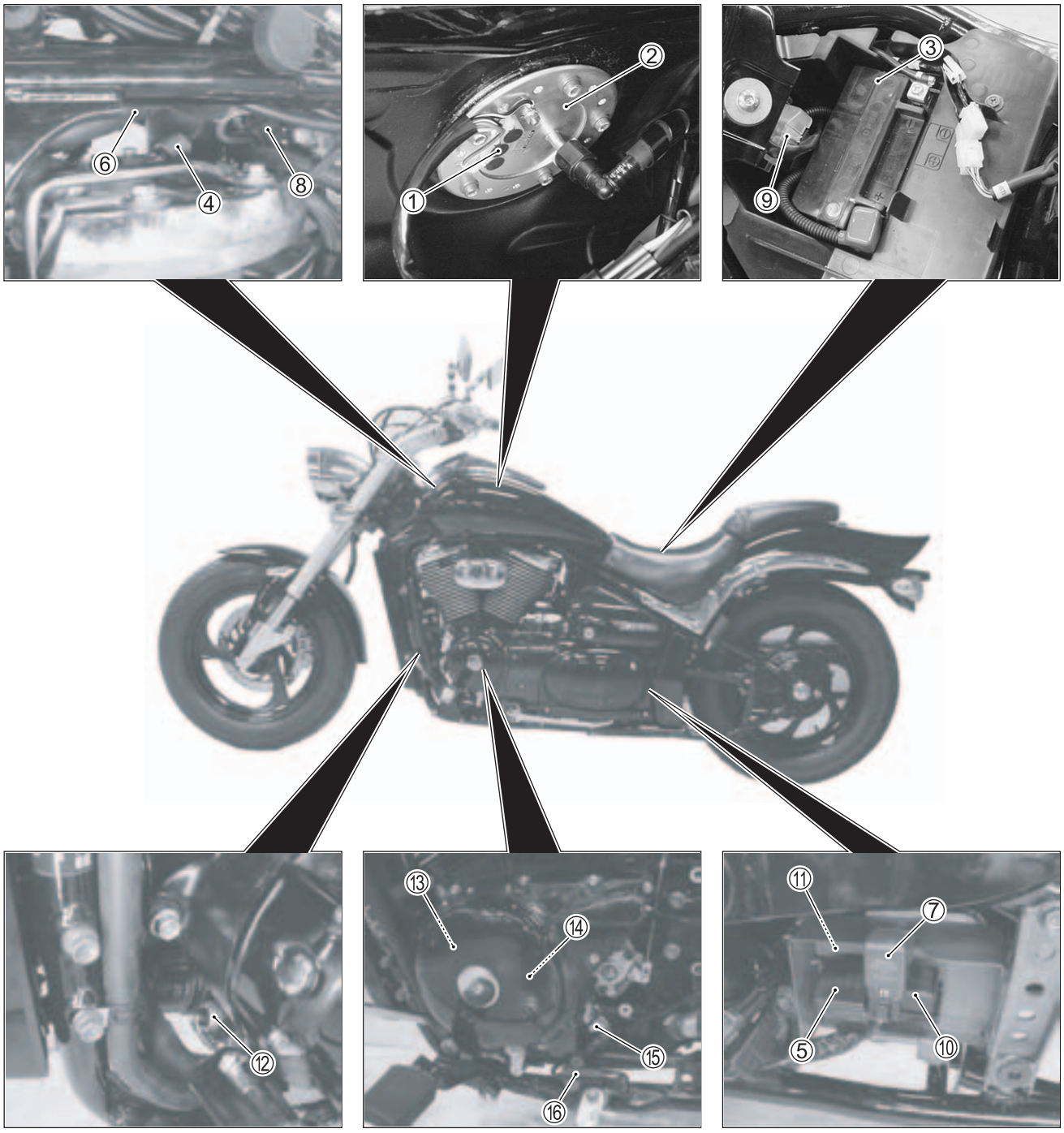
** Use the needle pointed probe to prevent the rubber of the water proof coupler from damage.*

TOOL 09900-25009: Needle pointed probe set

LOCATION OF ELECTRICAL COMPONENTS

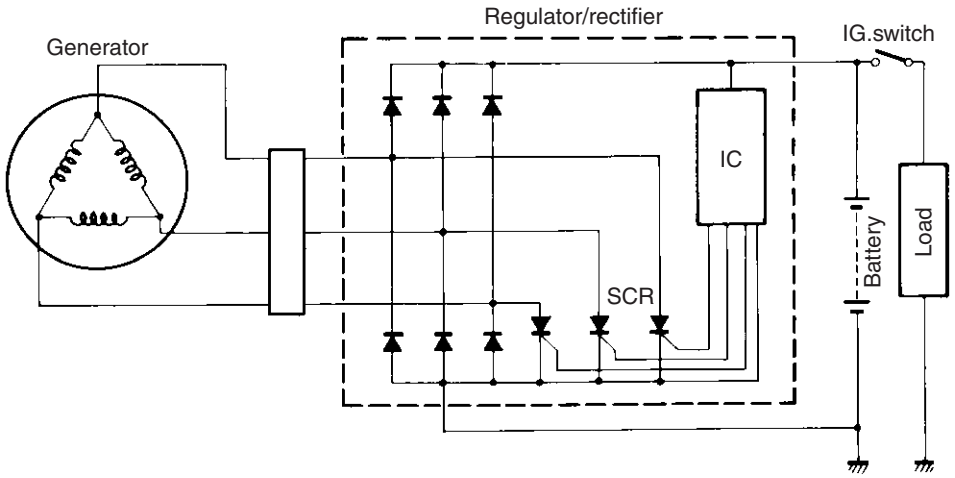


① IAP sensor (#2) (☞5-33)
② IAP sensor (#1) (☞5-33)
③ Fuel injector (#1) (☞5-66)
④ ECM (Engine Control Module)
⑤ Speed sensor
⑥ Ignition coil (#2)
⑦ IAT sensor (☞5-47)
⑧ STP sensor (☞5-59)
⑨ STV actuator (☞5-56)
⑩ TP sensor (☞5-37)
⑪ TO sensor (☞5-52)
⑫ Starter motor
⑬ Ignition switch
⑭ Horn
⑮ Cooling fan thermo-switch (☞7-9)
⑯ Cooling fan (☞7-7)
⑰ Rear brake switch
⑱ Mode selection switch coupler



① Fuel level switch
② Fuel pump (☞6-5)
③ Battery
④ ECT sensor (☞5-42)
⑤ Fuse box
⑥ Ignition coil (#1)
⑦ Fuel pump relay (☞6-6)
⑧ Fuel injector (#2) (☞5-66)
⑨ Starter relay/Main fuse
⑩ Turn signal/Side-stand relay
⑪ Regulator/Rectifier
⑫ Oil pressure switch
⑬ Generator
⑭ CKP sensor (☞5-30)
⑮ GP switch (☞5-64)
⑯ Side-stand switch

CHARGING SYSTEM



TROUBLESHOOTING

Battery runs down quickly

Step 1

1) Check accessories which use excessive amounts of electricity.
   Are accessories being installed?

YES	Remove accessories.
NO	Go to Step 2.

Step 2

1) Check the battery for current leaks. (☞9-9)
   Is the battery for current leaks OK?

YES	Go to Step 3.
NO	• Short circuit of wire harness • Faulty electrical equipment

Step 3

1) Measure the regulated voltage between the battery terminals. (☞9-10)
   Is the regulated voltage OK?

YES	• Faulty battery • Abnormal driving condition
NO	Go to Step 4.

Step 4

1) Measure the resistance of the generator coil. (☞9-10)
   Is the resistance of generator coil OK?

YES	Go to Step 5.
NO	• Faulty generator coil • Disconnected lead wires

Step 5

1) Measure the generator no-load voltage. (☞9-11)
   Is the generator no-load voltage OK?

YES	Go to Step 6.
NO	Faulty generator

Step 6

1) Inspect the regulator/rectifier. (☞9-11)
   Is the regulator/rectifier OK?

YES	Go to Step 7.
NO	Faulty regulator/rectifier

Step 7

1) Inspect wirings.
   Is the wirings OK?

YES	Faulty battery
NO	• Short circuit of wire harness • Poor contact of couplers

Battery overcharges

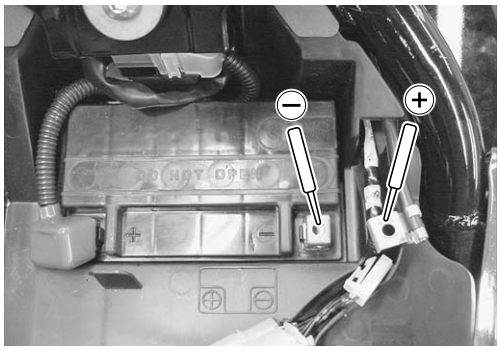
- Faulty regulator/rectifier
- Faulty battery
- Poor contact of generator lead wire coupler

INSPECTION

BATTERY CURRENT LEAKAGE

- Remove the seat. (☞8-3)
- Turn the ignition switch to the OFF position.
- Disconnect the battery ⊖ lead wire.

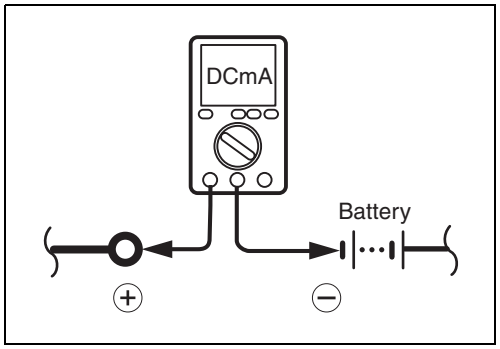
Measure the current between ⊖ battery terminal and the ⊖ battery lead wire using the multi circuit tester. If the reading exceeds the specified value, leakage is evident.



DATA Battery current (leak): Under 1 mA

TOOL 09900-25008: Multi circuit tester set

Tester knob indication: Current (⎓, 20 mA)



CAUTION

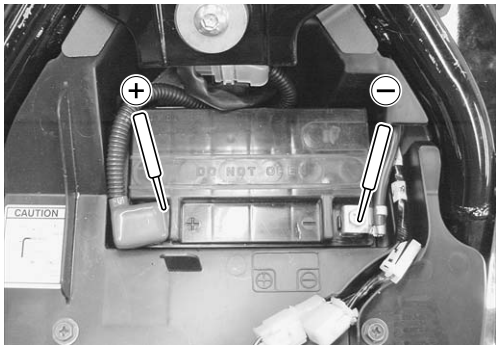
*** Because the current leak might be large, turn the tester to high range first to avoid tester damage.**
*** Do not turn the ignition switch to the "ON" position when measuring current.**

When checking for excessive current leakage, remove the couplers and connectors, one by one, so as to locate the position of trouble.

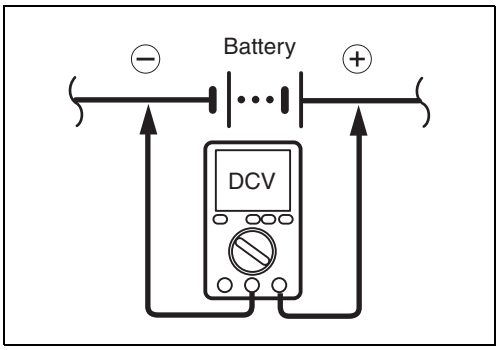
REGULATED VOLTAGE

- Remove the seat. (☞8-3)
- Start the engine and keep it running at 5 000 r/min. with lighting switch turned ON and dimmer switch turned HI position.

Measure the DC voltage between the ⊕ and ⊖ battery terminals using the multi circuit tester. If the voltage is not within the specified value, inspect the generator and regulator/rectifier. (☞9-10 and -11)



NOTE:
When making this test, be sure that the battery is in fully-charged condition.



DATA Regulated voltage (Charging output):
13.5 – 15.0 V at 5 000 r/min

TOOL 09900-25008: Multi circuit tester set

Tester knob indication: Voltage (⎓)

GENERATOR COIL RESISTANCE

- Remove the tool box. (☞8-41)
- Disconnect the generator coupler.

Measure the resistance between the three lead wires.
If the resistance is out of specified value, replace the stator with a new one. Also, check that the generator core is insulated properly.

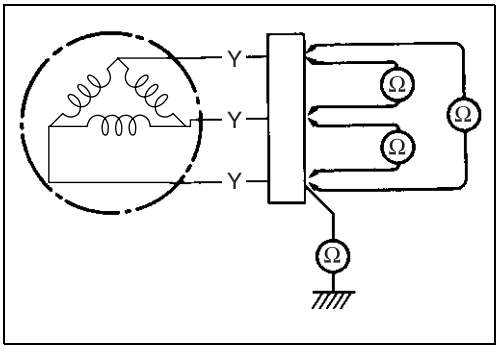


DATA Generator coil resistance: 0.2 – 1.5 Ω (Yellow – Yellow)
∞ Ω (Yellow – Ground)

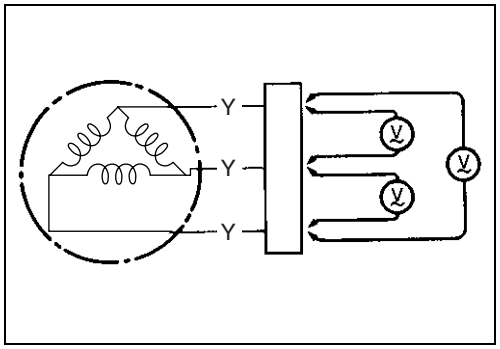
TOOL 09900-25008: Multi circuit tester set

Tester knob indication: Resistance (Ω)

NOTE:
When making above test, it is not necessary to remove the generator.



GENERATOR NO-LOAD PERFORMANCE



- Disconnect the generator coupler. (☞9-10)
- Start the engine and keep it running at 5 000 r/min.

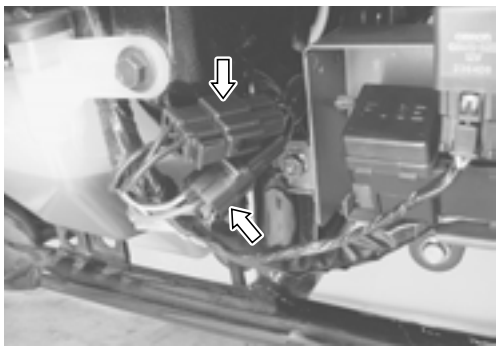
Using the multi circuit tester, measure the voltage between three lead wires.
If the tester reads under the specified value, replace the generator with a new one.

DATA Generator no-load performance:
More than 70 V at 5 000 r/min (When engine is cold)

TOOL 09900-25008: Multi circuit tester set

Tester knob indication: Voltage (~)

REGULATOR/RECTIFIER

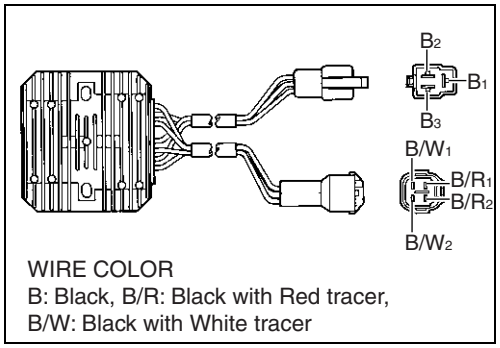


- Remove the secondary gear case cover. (☞8-40)
- Disconnect the regulator/rectifier couplers.

Measure the voltage between the lead wires using the multi circuit tester as indicated in the table below. If the voltage is not within the specified value, replace the regulator/rectifier with a new one.

TOOL 09900-25008: Multi circuit tester set

Tester knob indication: Diode test (⊣◀)



WIRE COLOR
B: Black, B/R: Black with Red tracer,
B/W: Black with White tracer

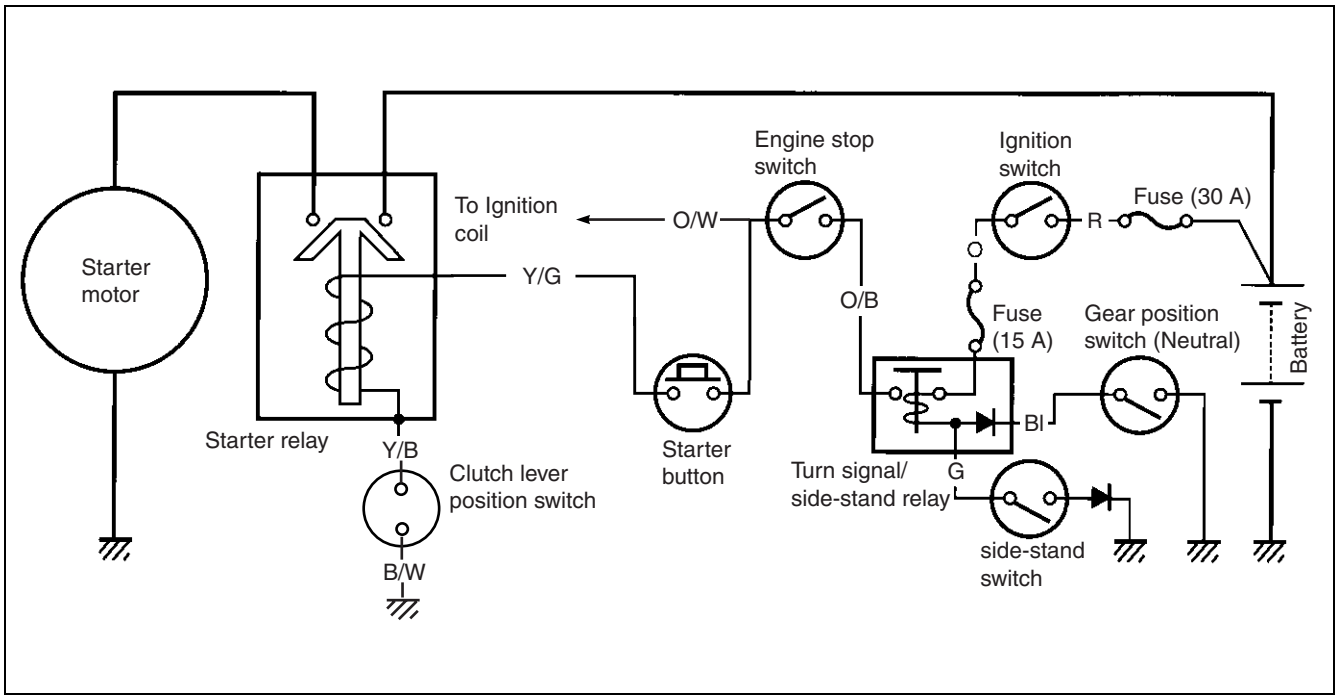
Unit: V

⊖ Probe of tester to: / ⊕ Probe of tester to:	B/R1	B/R2	B1	B2	B3	B/W1	B/W2
B/R1		0	0.4 – 0.7	0.4 – 0.7	0.4 – 0.7	0.5 – 1.2	0.5 – 1.2
B/R2	0		0.4 – 0.7	0.4 – 0.7	0.4 – 0.7	0.5 – 1.2	0.5 – 1.2
B1	∗	∗		∗	∗	0.4 – 0.7	0.4 – 0.7
B2	∗	∗	∗		∗	0.4 – 0.7	0.4 – 0.7
B3	∗	∗	∗	∗		0.4 – 0.7	0.4 – 0.7
B/W1	∗	∗	∗	∗	∗		0
B/W2	∗	∗	∗	∗	∗	0	

∗1.4 V and more (tester's battery voltage)

NOTE:
If the tester reads 1.4 V and below when the tester probes are not connected, replace its battery.

STARTER SYSTEM AND SIDE-STAND/IGNITION INTERLOCK SYSTEM



TROUBLESHOOTING

Starter motor will not run

Step 1

1) Shift the transmission to neutral.
2) Pull the clutch lever, turn on the ignition switch with the engine stop switch in the “RUN” position and listen for a click from the starter relay when the starter button is pushed.
   Is a click sound heard?

YES	Go to Step 2.
NO	Go to Step 3.

Step 2

1) Check if the starter motor runs when its terminal is connected to the battery ⊕ terminal. (Do not use thin “wire” because a large amount of current flows.)
   Does the starter motor run?

YES	• Faulty starter relay • Loose or disconnected starter motor lead wire • Loose or disconnected between starter relay and battery ⊕ terminal
NO	Faulty starter motor

Step 3

1) Measure the starter relay voltage at the starter relay connectors (between Y/G ⊕ and Y/B ⊖) when the starter button is pushed.
   Is a voltage OK?

YES	Go to Step 4.
NO	• Faulty engine stop switch • Faulty clutch lever position switch • Faulty gear position switch • Faulty turn signal/side-stand relay • Faulty starter button • Faulty ignition switch • Faulty side-stand switch • Poor contact of connector • Open circuit in wire harness

Step 4

1) Check the starter relay. (☞9-16 to -17)
   Is the starter relay OK?

YES	Poor contact of the starter relay
NO	Faulty starter relay

Starter motor runs but does not crank the engine

Step 1

1) The starter motor runs when the transmission is in neutral, but does not run when the transmission is in any position other than neutral, with the side-stand up.
2) Check the side-stand switch. (☞9-17)
   Is the side-stand switch OK?

YES	Go to Step 2.
NO	Faulty side-stand switch

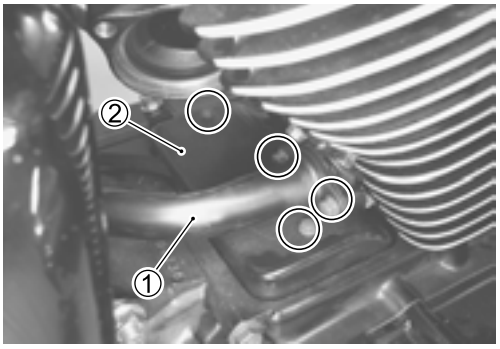
Step 2

1) Check the starter clutch.
   Is the starter clutch OK?

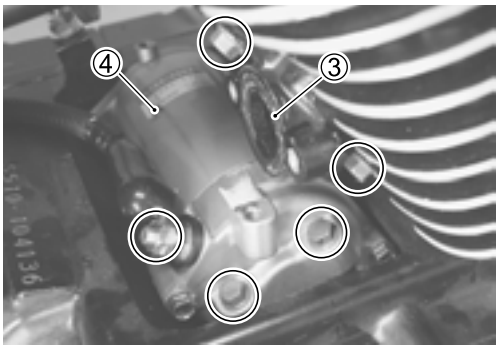
YES	Faulty starter clutch
NO	• Open circuit in wire harness • Poor contact of connector

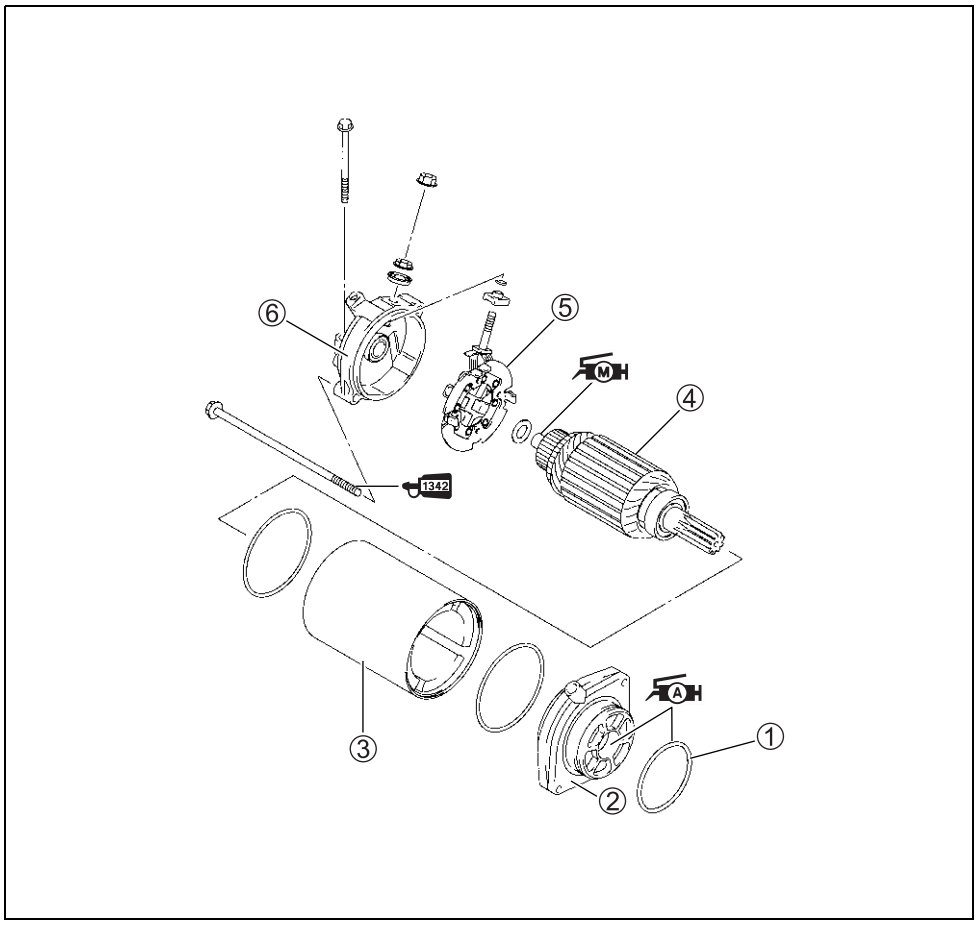
STARTER MOTOR REMOVAL AND DISASSEMBLY

- Disconnect the battery ⊖ lead wire.
- Drain engine coolant. (☞2-17)
- Remove the mufflers and exhaust pipe. (☞3-6)
- Remove the engine coolant pipe ①.
- Remove the starter motor cover ②.



- Remove the water union ③.
- Remove the starter motor ④.
- Disassemble the starter motor as shown in the illustration.



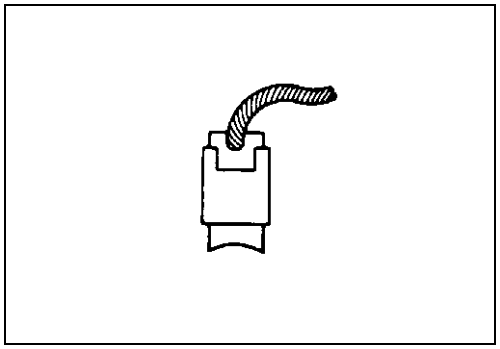


①	O-ring
②	Housing end (inside)
③	Starter motor case
④	Armature
⑤	Brush holder
⑥	Housing end (outside)

STARTER MOTOR INSPECTION

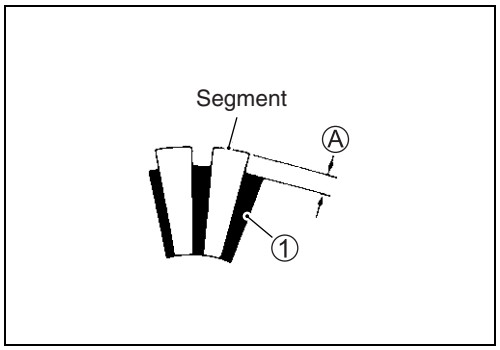
CARBON BRUSH

Inspect the brushes for abnormal wear, cracks, or smoothness in the brush holder.
If any damages are found, replace the brush assembly with a new one.



COMMUTATOR

Inspect the commutator for discoloration, abnormal wear or undercut Ⓐ.
If abnormal wear is found, replace the armature with a new one.
If the commutator surface is discolored, polish it with #400 sand paper and wipe it using a clean dry cloth.
If there is no undercut, scrape out the insulator ① with a saw blade.

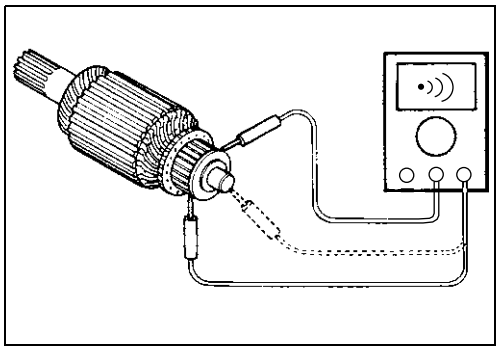


ARMATURE COIL INSPECTION

Check for continuity between each segment and between each segment and the armature shaft using the multi circuit tester.
If there is no continuity between the segments or there is continuity between the segments and shaft, replace the armature with a new one.

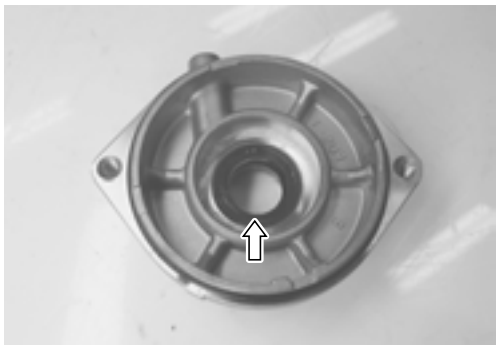
09900-25008: Multi circuit tester set

Tester knob indication: Continuity test (•))))



OIL SEAL INSPECTION

Check the oil seal lip for damage or leakage.
If any damage is found, replace the housing end.

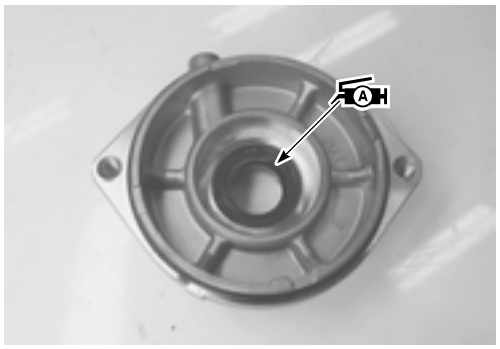


STARTER MOTOR REASSEMBLY

Reassemble the starter motor in the reverse order of disassembly. Pay attention to the following points:

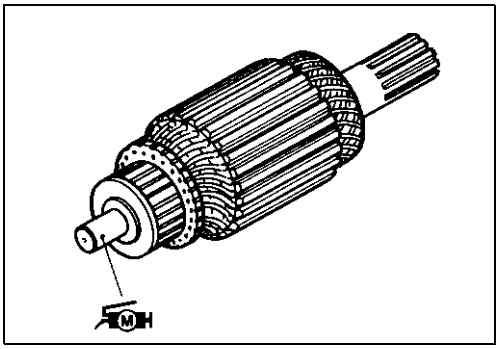
- Apply SUZUKI SUPER GREASE “A” to the lip of the oil seal.

99000-25030: SUZUKI SUPER GREASE “A” (USA)
99000-25010: SUZUKI SUPER GREASE “A” (Others)



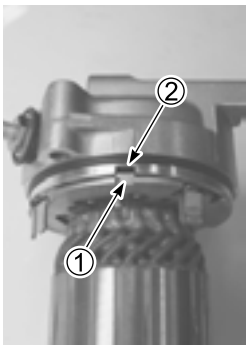
- Apply a small quantity of SUZUKI MOLY PASTE to the armature shaft.

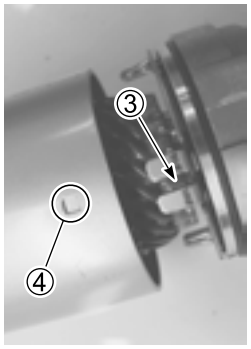
99000-25140: SUZUKI MOLY PASTE



- Align the torque ① on the brush holder with the groove ② on the housing end.
- Align the torque ③ on the brush holder with the mark ④ on the starter motor case.
- Align the threaded parts ⑤ on the housing end.
- Apply a small quantity of THREAD LOCK to the starter motor housing bolts.

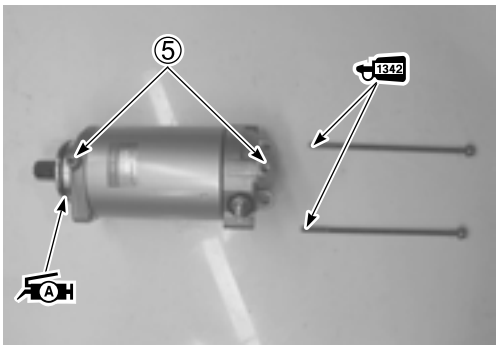
99000-32050: THREAD LOCK "1342"





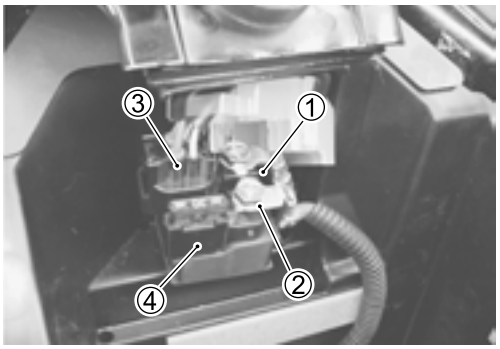
- Apply SUZUKI SUPER GREASE "A" to the O-ring.

99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

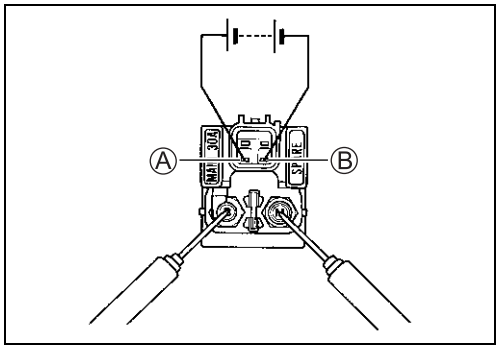


STARTER RELAY INSPECTION

- Remove the seats. (☞8-3)
- Remove the battery.
- Remove the starter relay cover.
- Disconnect the starter motor lead wire ①, battery lead wire ② and starter relay coupler ③.
- Remove the starter relay ④.



Apply 12 V to Ⓐ and Ⓑ terminals and check for continuity between the positive and negative terminals using the multi circuit tester. If the starter relay clicks and continuity is found, the relay is ok.



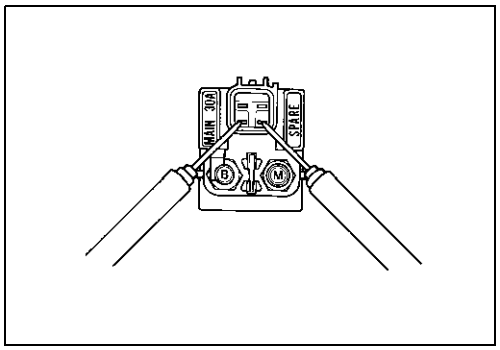
09900-25008: Multi circuit tester set

Tester knob indication: Continuity test (•))))

CAUTION

Do not apply a battery voltage to the starter relay for more than five seconds, since the relay coil may overheat and damaged.

Measure the relay coil resistance between the terminals using the multi circuit tester. If the resistance is not within the specified value, replace the starter relay with a new one.



09900-25008: Multi circuit tester set

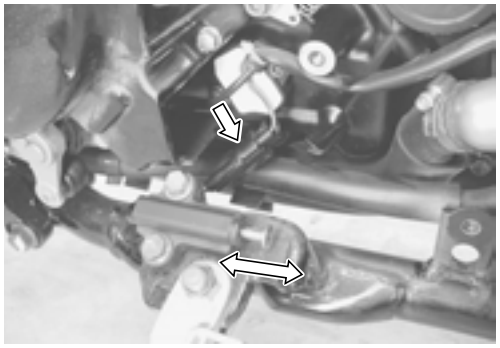
Starter relay resistance: 3 – 7 Ω

SIDE STAND/IGNITION INTERLOCK SYSTEM PARTS INSPECTION

Check the interlock system for proper operation. If the interlock system does not operate properly, check each component for damage or abnormalities. If any abnormality is found, replace the component with a new one.

SIDE-STAND SWITCH

- Remove the left frame lower cover. (☞8-3)
- Remove the secondary gear case cover. (☞8-40)
- Remove the secondary drive unit cover. (☞3-3)
- Disconnect the side-stand switch coupler and measure the voltage between Green and Black/White lead wires.



09900-25008: Multi circuit tester set

Tester knob indication: Diode test (⊣◀)

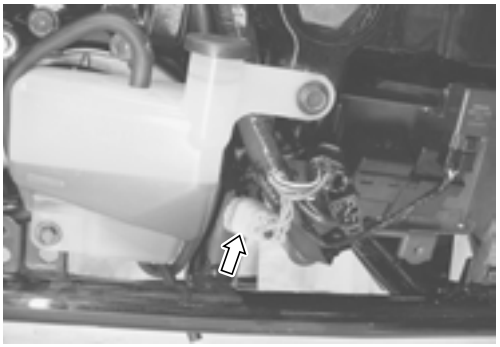
	Green (⊕ Probe)	Black/White (⊖ Probe)
ON (Side-stand up)	0.4 – 0.6 V	
OFF (Side-stand down)	1.4 V and more (Tester's battery voltage)	

NOTE:

If the tester reads 1.4 V and below when the tester probes are not connected, replace its battery.

GEAR POSITION SWITCH

- Remove the secondary gear case cover. (☞8-40)
- Disconnect the gear position switch coupler and check the continuity between Blue and Black/White with the transmission in “NEUTRAL”.



TOOL 09900-25008: Multi circuit tester set

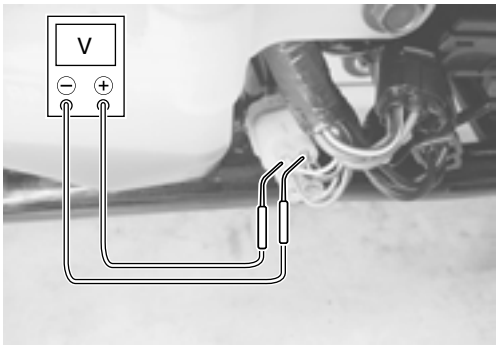
Tester knob indication: Continuity test (•))))

	Blue	Black/White
ON (Neutral)	○———	———○
OFF (Except neutral)		

CAUTION

When disconnecting and connecting the gear position switch coupler, make sure to turn OFF the ignition switch, or electronic parts may get damaged.

- Connect the gear position switch coupler to the wiring harness.
- Turn the ignition switch to “ON” position and side-stand to upright position.
- Insert the needle pointed probes to the gear position switch coupler.



Measure the voltage between Pink and Black/White lead wires using the multi circuit tester when shifting the gearshift lever from low to top.

TOOL 09900-25008: Multi circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Voltage (⎓)

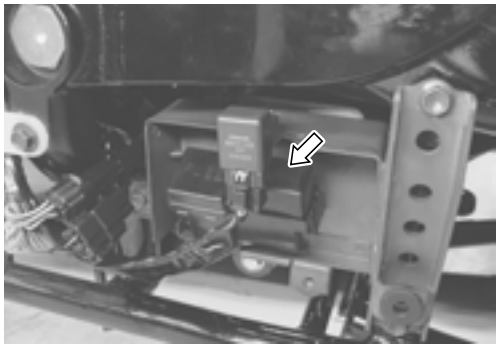
DATA Gear position switch voltage: 0.6 V and more

(* Low to top gear position, * Except neutral position) (Pink ⊕ – B/W ⊖)

TURN SIGNAL/SIDE-STAND RELAY

The turn signal/side-stand relay is composed of the turn signal relay, side-stand relay and diode.

- Remove the secondary gear case cover. (☞8-40)
- Remove the turn signal/side-stand relay.

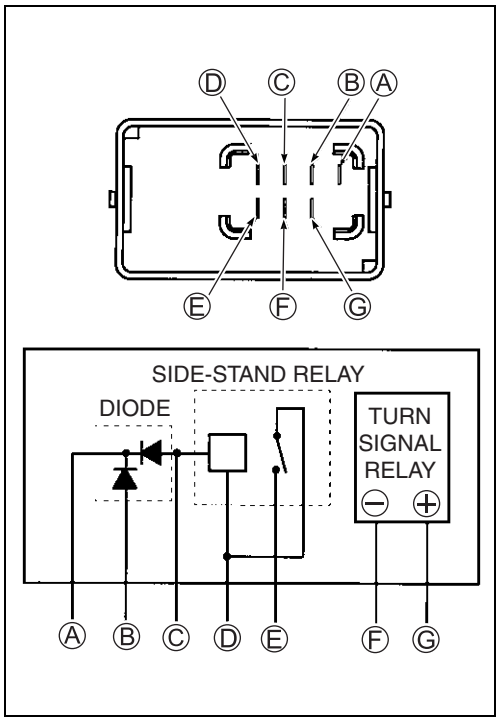


SIDE-STAND RELAY INSPECTION

First check the insulation between Ⓓ and Ⓔ terminals with the tester. Then apply 12 V to terminals Ⓓ and Ⓒ (⊕ to Ⓓ and ⊖ to Ⓒ) and check the continuity between Ⓓ and Ⓔ. If there is no continuity, replace the turn signal/side-stand relay with a new one.

09900-25008: Multi circuit tester set

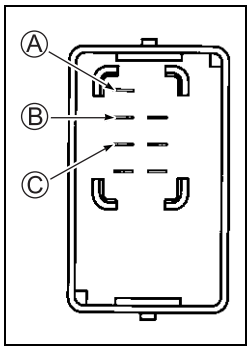
Tester knob indication: Continuity test (•))))

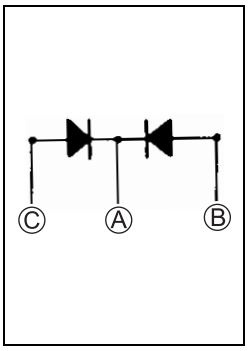


DIODE INSPECTION

Measure the voltage between the terminals using the multi circuit tester. Refer to the following table.

⊖ Probe of tester to:	⊕ Probe of tester to:		
		Ⓒ, Ⓑ	Ⓐ
Ⓒ, Ⓑ			1.4 V and more (Tester's battery voltage)
Ⓐ		0.4 – 0.6 V	





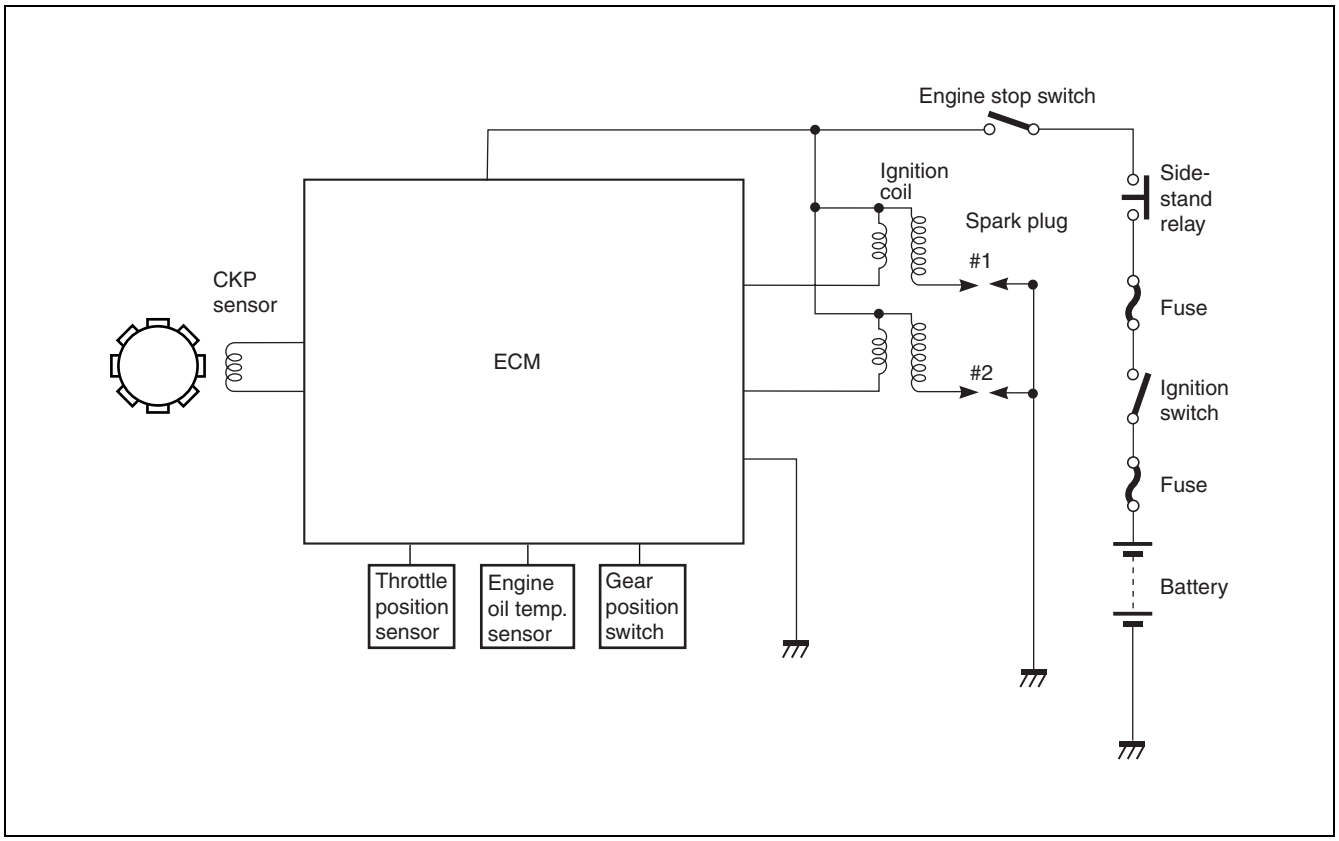
09900-25008: Multi circuit tester set

Tester knob indication: Diode test (⊣◀)

NOTE:

If the multi circuit tester reads 1.4 V and below when the tester probes are not connected, replace its battery.

IGNITION SYSTEM



NOTE:
The fuel cut-off circuit is incorporated in this ECM in order to prevent over-running of engine. When engine speed reaches 8 000 r/min during running, this circuit cuts off fuel at the fuel injector.

TROUBLESHOOTING

No spark or poor spark

NOTE:
Check that the transmission is in neutral and the engine stop switch is in the "RUN" position. Grasp the clutch lever. Check that the fuse is not blown and the battery is fully-charged before diagnosing.

Step 1

1) Check the ignition system couplers for poor connections.
   Is there connection in the ignition switch couplers?

YES	Go to Step 2.
NO	Poor connection of couplers

Step 2

1) Measure the battery voltage between input lead wires at the ECM with the ignition switch in the "ON" position. (E-02, 19, 24: O/G and B/W, E-03, 28, 33: O/W and B/W)
   Is the voltage OK?

YES	Go to Step 3.
NO	• Faulty ignition switch • Faulty turn signal/side-stand relay • Faulty engine stop switch • Broken wire harness or poor connection of related circuit couplers

Step 3

1) Measure the ignition coil primary peak voltage. (☞9-22)

NOTE:

This inspection method is applicable only with the multi circuit tester and the peak volt adaptor.

Is the peak voltage OK?

YES	Go to Step 4.
NO	Go to Step 5.

Step 4

1) Check the plug caps for poor contacts.
2) If OK, then inspect the spark plugs. (☞2-6)
   Are the spark plugs OK?

YES	Go to Step 5.
NO	Faulty spark plug(-s)

Step 5

1) Inspect the ignition coils. (☞9-23)
   Are the ignition coils OK?

YES	Go to Step 6.
NO	Faulty ignition coil(-s)

Step 6

1) Measure the CKP sensor peak voltage and its resistance. (☞9-23 to -24)

NOTE:

The CKP peak voltage inspection is applicable only with the multi-circuit tester and peak volt adaptor.

Are the peak voltage and its resistance OK?

YES	• Faulty ECM • Open or short circuit in wire harness • Poor connection of ignition couplers
NO	• Faulty CKP sensor • Metal particles or foreign material being stuck on the CKP sensor and rotor tip

INSPECTION

IGNITION COIL PRIMARY PEAK VOLTAGE

- Remove the fuel tank. (☞6-3)
- Remove the frame head covers. (☞3-3)
- Disconnect the spark plug caps.
- Connect new spark plugs to each spark plug cap and ground them to the cylinder head.

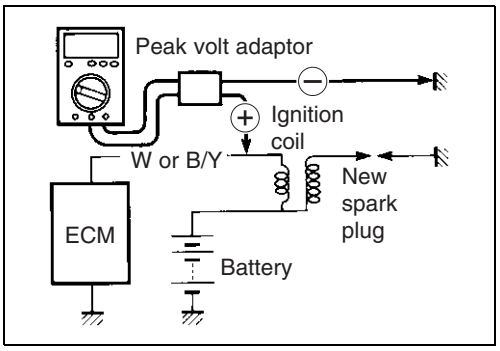


NOTE:
Make sure that all couplers and spark plugs are connected properly and the battery used is in fully-charged condition.

Measure the ignition coils primary peak voltage in the following procedure.

- Connect the multi-circuit tester with peak voltage adaptor as follows.

#1 ignition coil: ⊕ Probe: White terminal
⊖ Probe: Ground
2 ignition coil: ⊕ Probe: Black/Yellow terminal
⊖ Probe: Ground

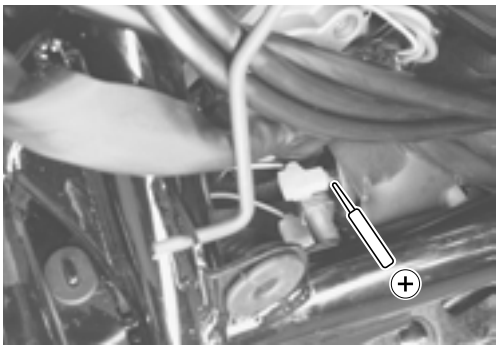


NOTE:
Do not disconnect the ignition coil primary wire coupler.

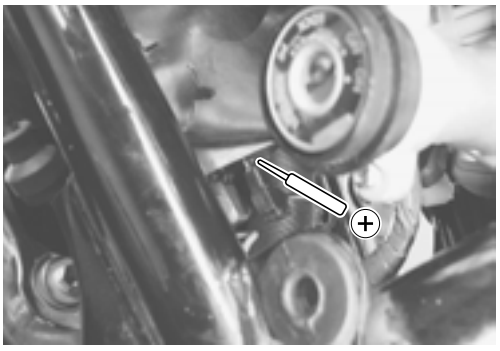
TOOL 09900-25008: Multi-circuit tester set

CAUTION

Before using the multi-circuit tester and peak volt adaptor, be sure to refer to the appropriate instruction manual.



- Shift the transmission into neutral and turn ignition switch "ON".
- Pull the clutch lever.
- Crank the engine a few seconds with the starter motor by depressing starter button and check the ignition coil primary peak voltage.
- Repeat the above procedure a few times and measure the highest ignition coil primary peak voltage. If the peak voltage is lower than the specified values, inspect the ignition coil.

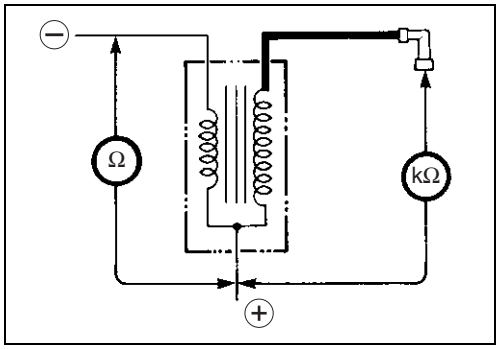


DATA Ignition coil primary peak voltage: 205 V and more
Tester knob indication: Voltage (⎓)

⚠ WARNING

Avoid touching the tester probes and spark plugs to prevent an electric shock while testing.

IGNITION COIL RESISTANCE

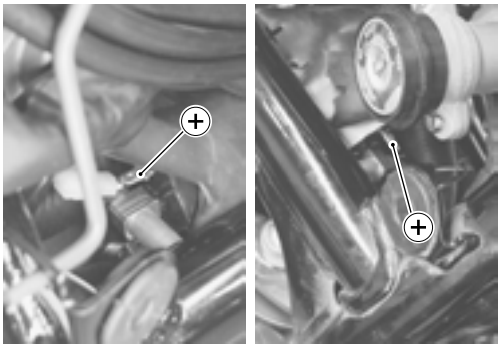


- Remove the fuel tank. (☞6-3)
- Remove the frame head covers. (☞3-3)
- Disconnect the spark plug caps.
- Measure the ignition coil resistance in both the primary and secondary windings. If the resistance is not within the standard range, replace the ignition coil with a new one.

DATA Ignition coil resistance
Primary: 2 – 6 Ω (⊕ terminal – ⊖ terminal)
Secondary: 15 – 30 kΩ (Plug cap – ⊕ terminal)

TOOL 09900-25008: Multi-circuit tester set

Tester knob indication: Resistance (Ω)

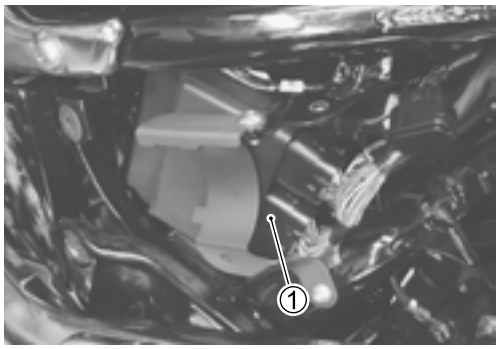


CKP SENSOR PEAK VOLTAGE

- Remove the right frame cover. (☞8-4)

NOTE:
Be sure that all couplers are connected properly and the battery used is in fully-charged condition.

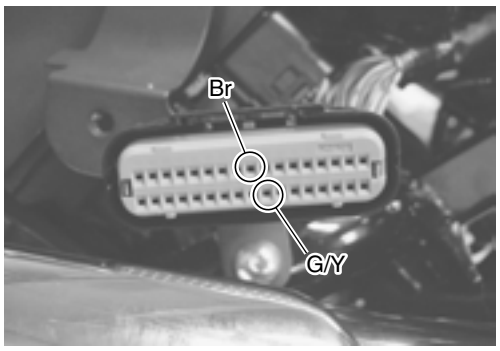
- Disconnect the ECM coupler ①.
- Connect the multi circuit tester with peak volt adaptor as follows.
- Insert the needle pointed probes to the ECM coupler.



- Measure the CKP sensor peak voltage between Green/Yellow and Yellow/Brown lead wires at the ECM coupler.

Green/Yellow (⊕ Probe) – Brown (⊖ Probe)

TOOL 09900-25008: Multi circuit tester set
09900-25009: Needle pointed probe set



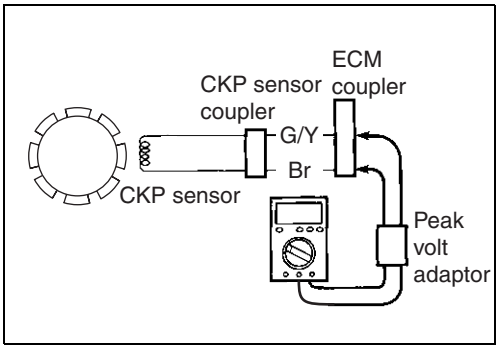
CAUTION

Before using the multi circuit tester and peak volt adaptor, be sure to refer to the appropriate instruction manual.

- Shift the transmission into the neutral and turn ignition switch "ON".
- Crank the engine a few seconds with the starter motor by depressing starter button and check the CKP sensor peak voltage.
- Repeat the above test procedure a few times and measure the highest peak voltage.

Tester knob indication: Voltage (⎓)

DATA CKP sensor peak voltage: 4.0 V and more (Green/Yellow – Brown)

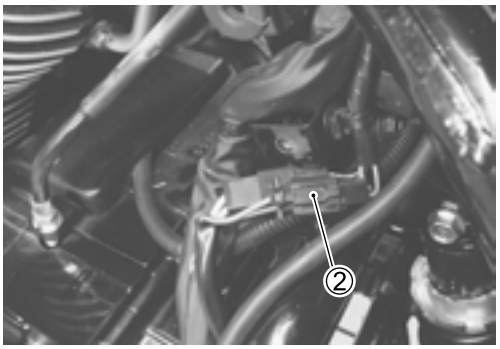


If the peak voltage is lower than the standard range, check the peak voltage at the CKP sensor lead wire coupler.

- Remove the secondary gear case cover. (☞8-40)
- Remove the tool box. (☞8-41)
- Disconnect the CKP sensor lead wire coupler ② and connect the multi circuit tester with the peak volt adaptor.

Blue (⊕ Probe) – Green (⊖ Probe)

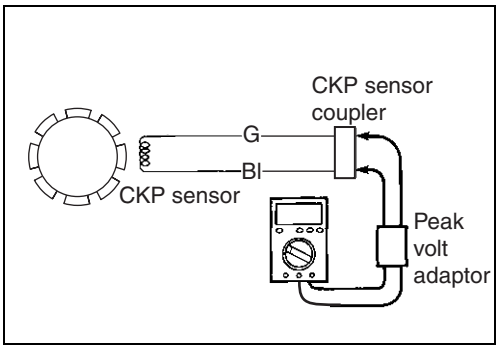
- Measure the CKP sensor peak voltage at the CKP sensor lead wire coupler.



Tester knob indication: Voltage (⎓)

DATA CKP sensor peak voltage: 4.0 V and more (Green – Bl)

If the peak voltage is lower than the standard range, check each coupler at both ends of the circuit or replace the CKP sensor and inspect it again.



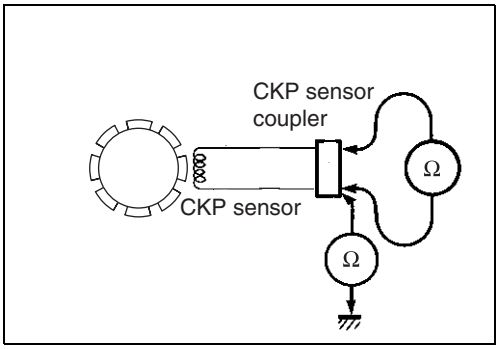
CKP SENSOR RESISTANCE

- Measure the resistance between the lead wires and ground. If the resistance is not as specified, the CKP sensor must be replaced.

TOOL 09900-25008: Multi circuit tester set

Tester knob indication: Resistance (Ω)

DATA CKP sensor resistance: 184 – 276 Ω (Green – Blue)
∞ Ω (Green – Ground)



SPEEDOMETER AND PILOT LAMP BOX

DESCRIPTION

This speedometer mainly consists of the stepping motor, LCD (Liquid Crystal Display) and LED (Light Emitting Diode). This speedometer is light, thin and of high response compared to those currently in use because of this composition.

The speedometer pointer is driven by the stepping motor.

The LCD indicates Odo/Trip 1/Trip 2/Clock/oil pressure and engine coolant temp respectively.

NOTE:

If the engine stop switch is turned OFF while the ignition switch is ON, the LCD displays "CHEC". But it is not a malfunction.

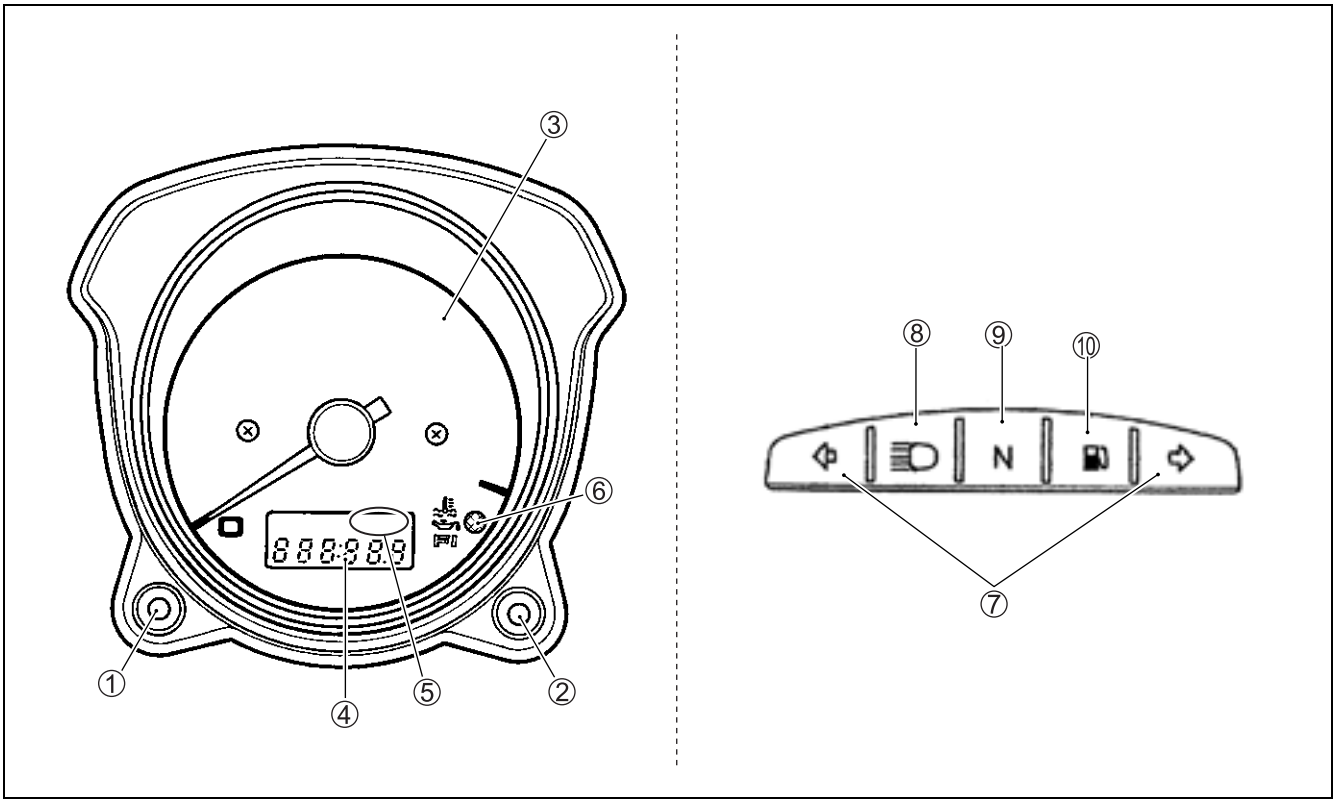
This condition implies that combination meter receives no signal from the ECM.

In that case, they are restored to normal indication by turning the engine stop switch to RUN position.

LED (Light Emitting Diode)

LED is used for the illumination light and each indicator light.

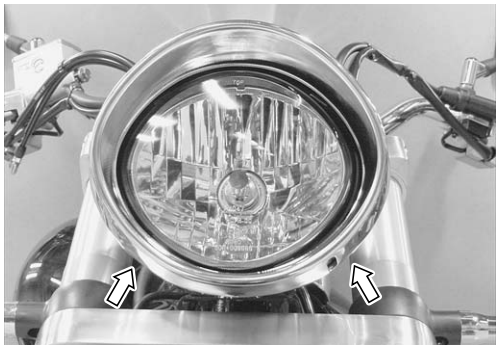
LED is maintenance free. LED is less electric-power consuming and stronger to vibration resistance compared to the bulb.



①	Select switch (Odo/Trip/Clock)	⑥	LED (FI/Oil pressure/Engine coolant temperature indicator light)
②	Adjust switch	⑦	LED (Turn signal indicator light)
③	Speedometer	⑧	LED (High-beam indicator light)
④	LCD (Odo/Trip1/Trip2/Clock/FI)	⑨	LED (Neutral indicator light)
⑤	LCD (Oil pressure/Engine coolant temperature indicator light)	⑩	LED (Fuel level)

SPEEDOMETER REMOVAL AND DISASSEMBLY

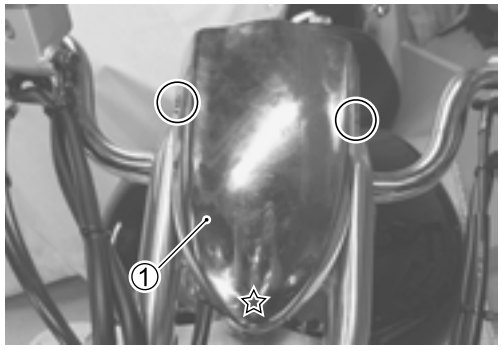
- Remove the headlight.



- Disconnect the speedometer lead wire couplers.



- Remove the speedometer cover ①.



☆: Hooked part

- Remove the speedometer.

CAUTION

When disconnecting and reconnecting the speedometer coupler, make sure to turn OFF the ignition switch, or electronic parts may get damaged.

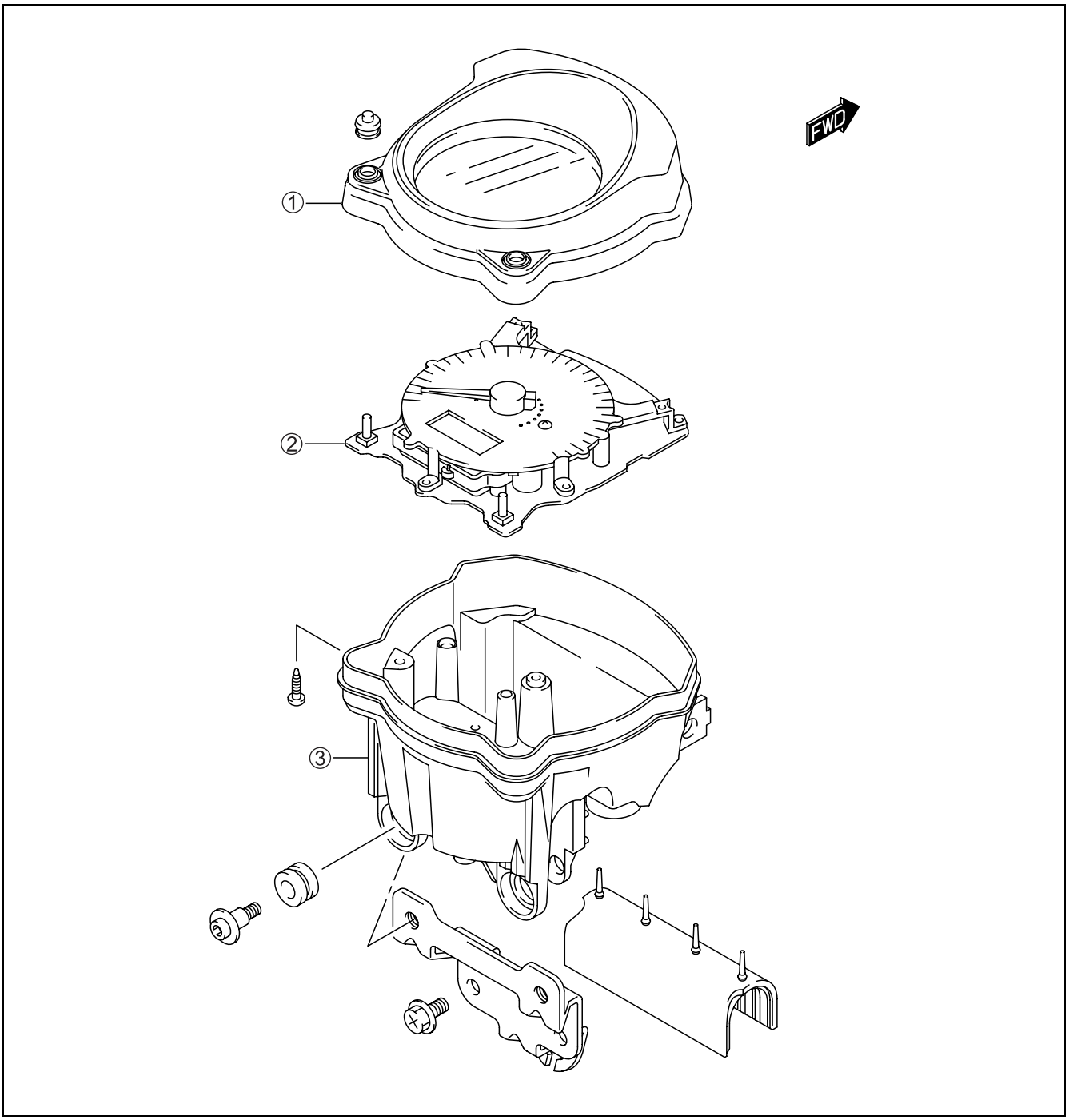




• Disassemble the speedometer as follows.

CAUTION

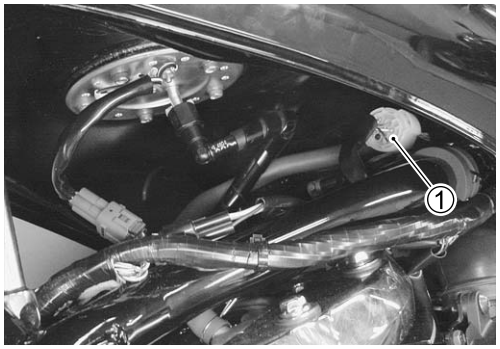
Do not attempt to disassemble the speedometer unit.



①	Speedometer cover	②	Speedometer unit	③	Speedometer case

PILOT LAMP BOX REMOVAL AND DISASSEMBLY

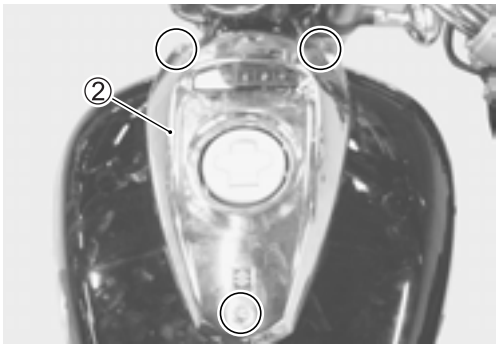
- Lift and support the fuel tank. (☞6-3)
- Remove the coupler ①.



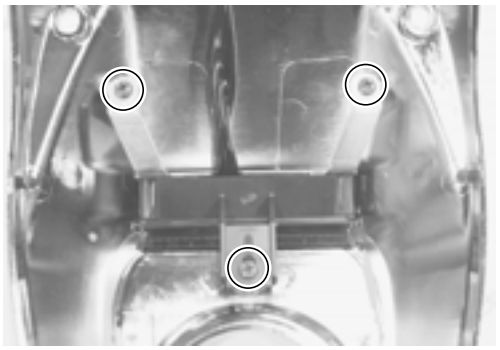
CAUTION

When disconnecting and reconnecting the pilot lamp box coupler, make sure to turn OFF the ignition switch, or electronic parts may get damaged.

- Remove the fuel tank upper cover ②.



- Remove the pilot lamp box.



INSPECTION

LED (LIGHT EMITTING DIODE)

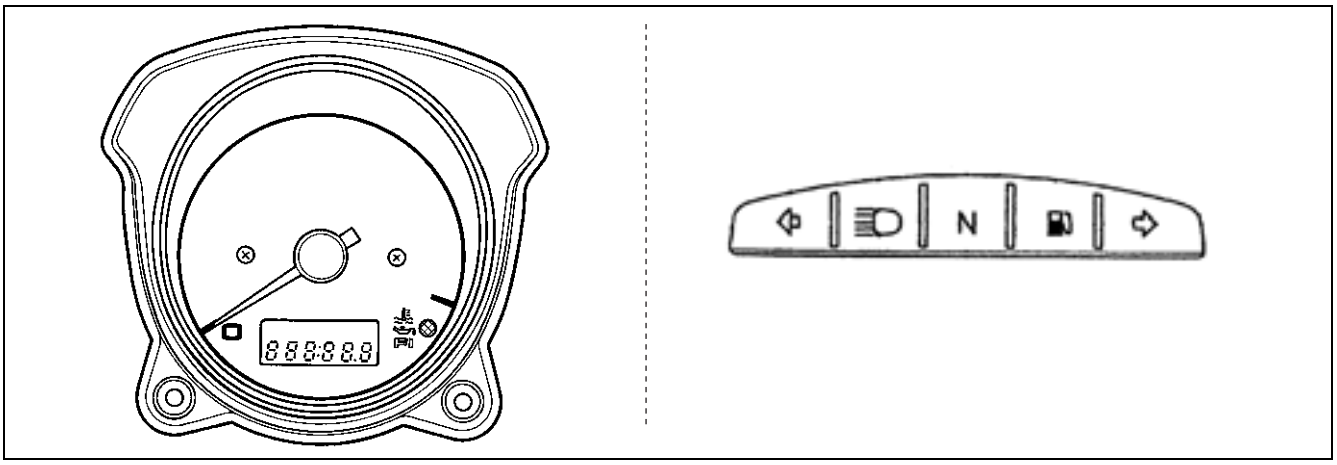
Check that the LED lights (FI light, Oil pressure indicator light, Engine coolant indicator light and Fuel level indicator light) immediately after turning the ignition switch on. Also, other LED lights (Neutral indicator light, High-beam indicator light and Turn signal indicator light) can be checked by depending on each switch position.

If the LED fails in operation, replace the speedometer unit with a new one after checking its wire harness/coupler.

STEPPING MOTOR

Check that the pointer calibrates itself immediately after turning the ignition switch on and stops at zero point.

If abnormal condition is found, replace the speedometer unit with a new one after checking its wire harness/coupler.



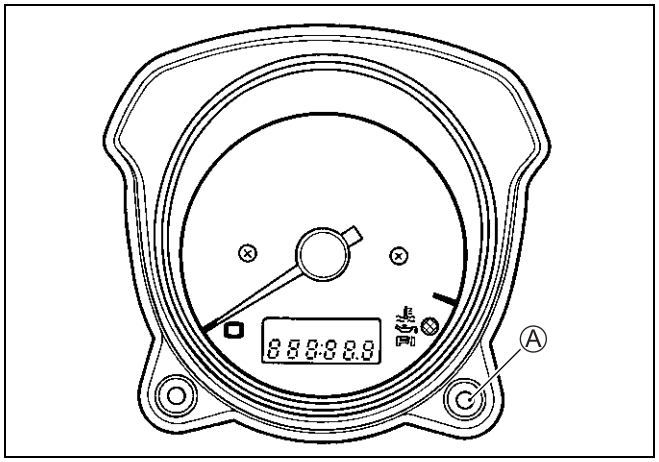
NOTE:

The pointer may not return to the proper position even turning the ignition switch on under low temperature condition. In that case, you can reset the pointer to the proper position by following the instruction below:

1) With the function switch Ⓐ pressed, turn the ignition switch on.
2) Release the function switch Ⓐ, 3 to 5 seconds after turning the ignition switch on.
3) Press the function switch Ⓐ twice (within 1 second). →Reset

* Complete the operation within 10 seconds after the ignition switch has been turned on.

Time	Ignition switch	Adjuster switch Ⓐ
	OFF	PUSH
0	ON	
• •		
3 sec. • 5 sec.		Release
• • • •		Push Push→Reset
10 sec.		

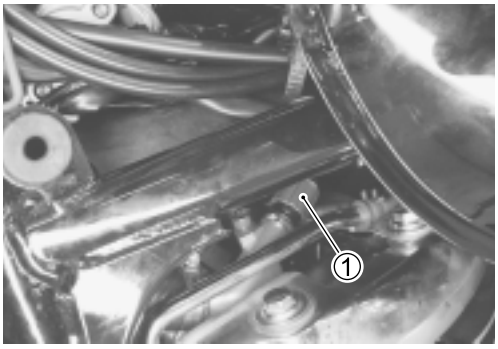


Pointer will return to the starting point right after the completion of the operation. In the case of the pointer not returning to the proper position after doing above, replace the speedometer unit.

ENGINE COOLANT TEMPERATURE METER AND INDICATOR

ECT sensor inspection. (☞7-10)

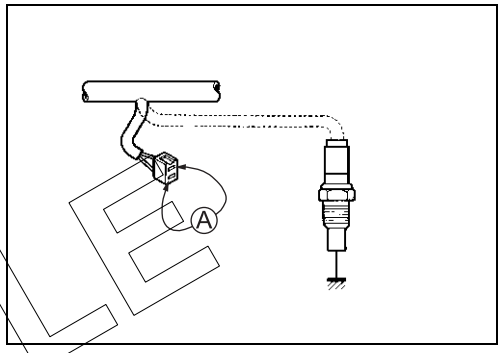
- Remove the fuel tank. (☞6-3)
- Remove the frame head covers. (☞3-3)
- Disconnect the ECT sensor coupler ①.



CAUTION

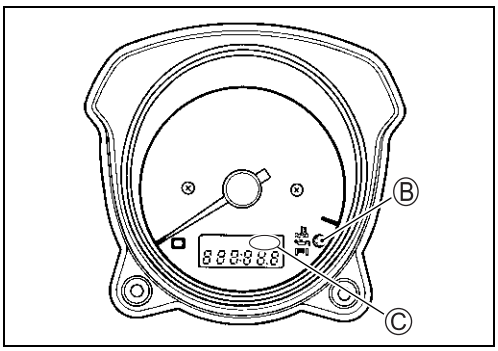
When connecting and disconnecting the engine coolant temperature sensor lead wire coupler, make sure to turn OFF the ignition switch, or electronic parts may get damaged.

- Connect the variable resistor Ⓐ between the terminals.
- Turn the ignition switch ON.
- Check the LCD and LED operation when the resistance is adjusted to the specified values.



Resistance Ⓐ	LED Ⓑ	LCD Ⓒ	Water temperature
2.45 kΩ and over	OFF	—	19 °C and below
Approx. 0.811 kΩ	OFF	—	Approx. 50 °C
Approx. 0.1 kΩ	ON	Flicker	120 – 139 °C
0 Ω (Jumper wire)	ON	Flicker	140 °C and over

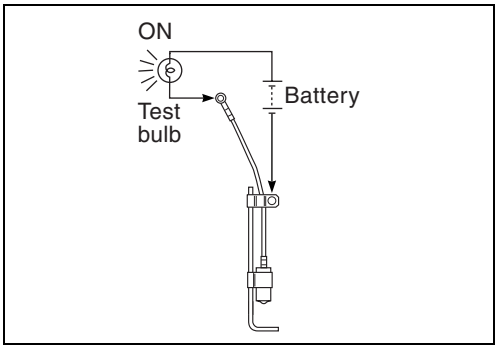
If either one or all indication are abnormal, replace the speedometer with a new one.



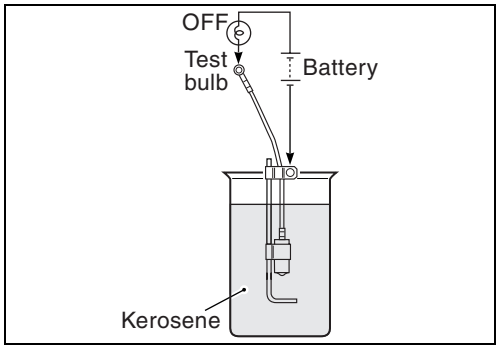
SAMPLE

FUEL LEVEL INDICATOR SWITCH INSPECTION

- Remove and disassemble the fuel pump assembly. (☞6-8)
- Connect 12 V battery and test bulb (12 V, 3.4 W) to the fuel level indicator switch as shown in the right illustration. The bulb should come on after one minutes if the switch is in good condition.



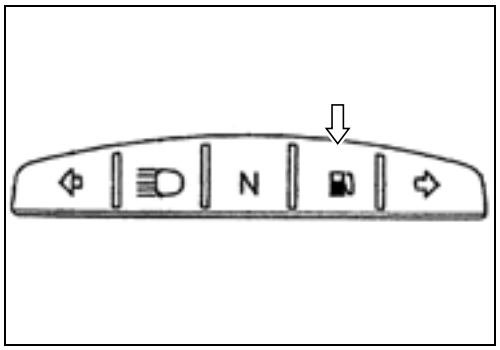
• When the switch is immersed in kerosene under the above condition, the bulb should go out. If the bulb remains lit, replace the unit with a new one.



FUEL LEVEL INDICATOR LIGHT INSPECTION

If the fuel level indicator light does not function properly, check the fuel level indicator switch and its lead wire/coupler.

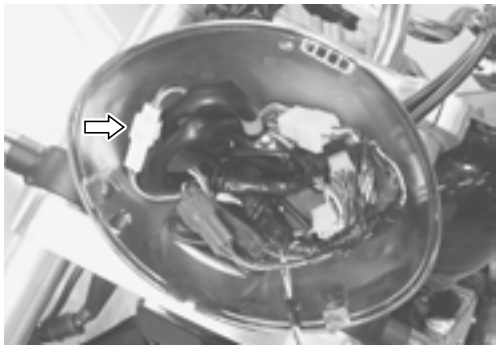
If the fuel level indicator switch and its lead wire/coupler are functioning properly, replace the combination meter with a new one.



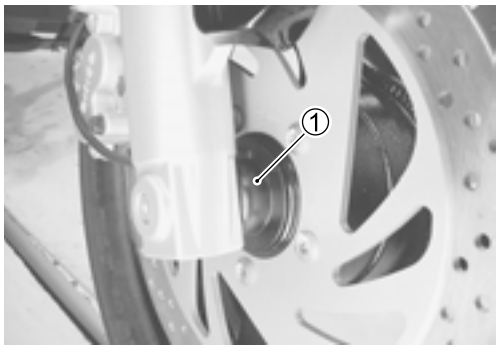
SPEED SENSOR INSPECTION

If the speedometer, odometer or tripmeter does not function properly. Inspect the speed sensor and connection of couplers. If the speed sensor and connection is all right, replace the unit with a new one.

• Remove the front wheel. (☞8-7)
• Remove the head light. (☞9-26)
• Disconnect the speed sensor lead wire couplers.



• Remove the speed sensor ①. (☞8-7)



- Connect 12 V battery (between O/R and B/W), 10 kΩ resistor (between O/R and P) and the multi circuit tester (⊕ probe of tester to O/R and ⊖ to P) as shown right illustration.

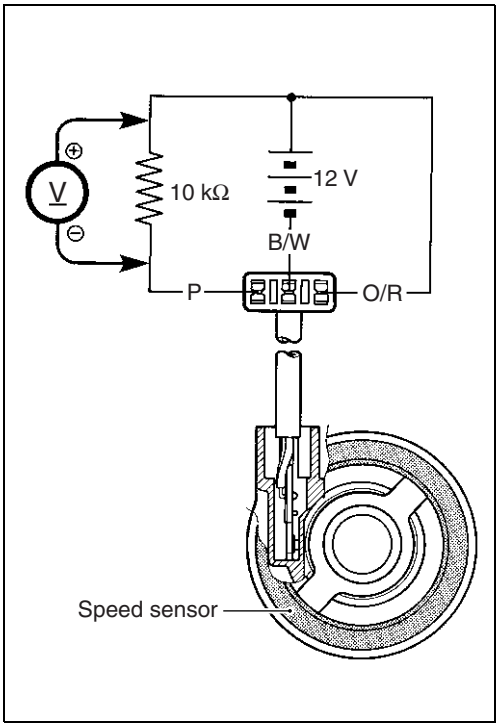
O/R : Orange with Red tracer
B/W : Black with White tracer
P : Pink

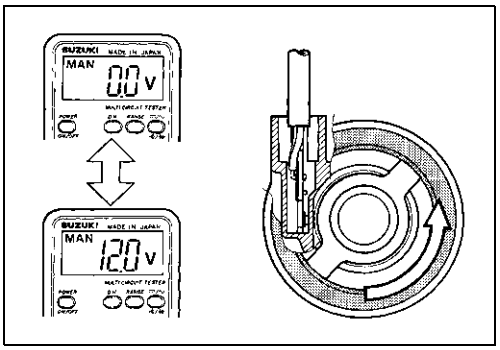
09900-25008: Multi circuit tester set

Tester knob indication: Voltage (⎓)

Under above condition, by rotating the drive lugs of speed sensor slowly, the tester reading voltage relatively changes (0 V → 12 V or 12 V → 0 V). If the tester reading voltage does not change, replace the speed sensor with a new one.

NOTE:
The highest tester reading voltage (12 V) while testing is same as battery voltage.

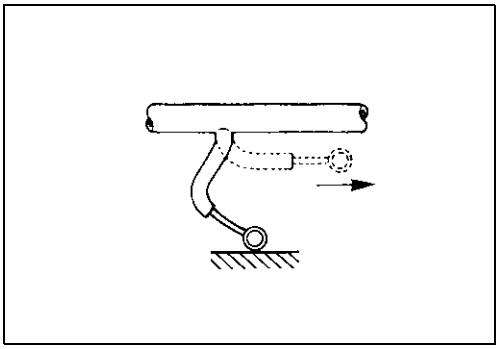




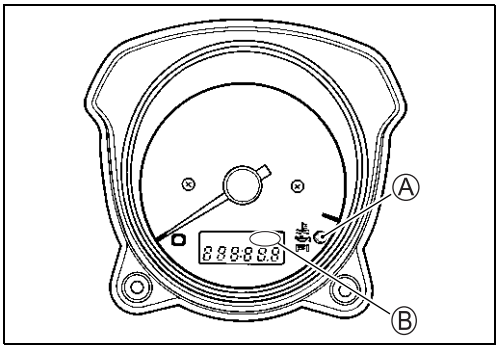
OIL PRESSURE INDICATOR

NOTE:
Before inspecting the oil pressure switch, check if the engine oil level is correct. (☞2-11)

- Disconnect the oil pressure switch lead wire from the oil pressure switch.
- Turn the ignition switch ON.
- Check if the oil pressure indicator Ⓐ will light and LCD Ⓑ will flicker, when grounding the lead wire.



If any indications are abnormal, replace the speedometer with a new one after checking connection of couplers.

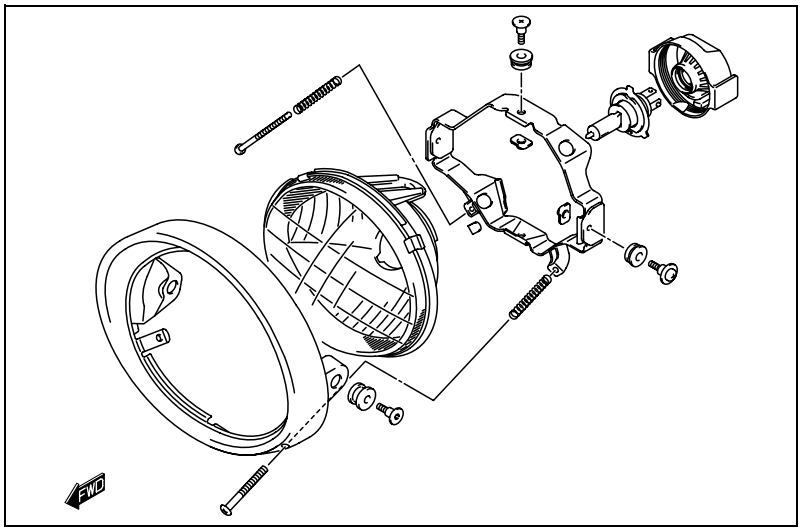


LAMPS

HEADLIGHT, BRAKE LIGHT/TAILLIGHT, LICENSE PLATE LIGHT AND TURN SIGNAL LIGHT

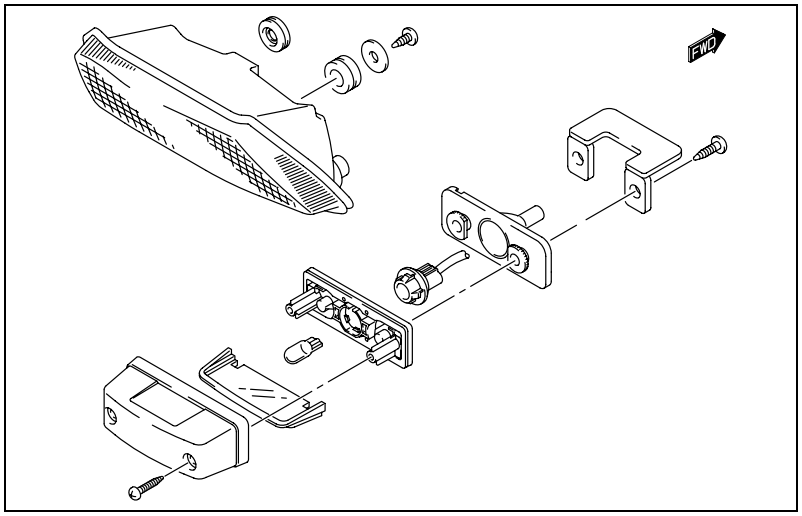
HEADLIGHT
12 V 60/55 W

POSITION LIGHT
12 V 5 W (E-02, 19)



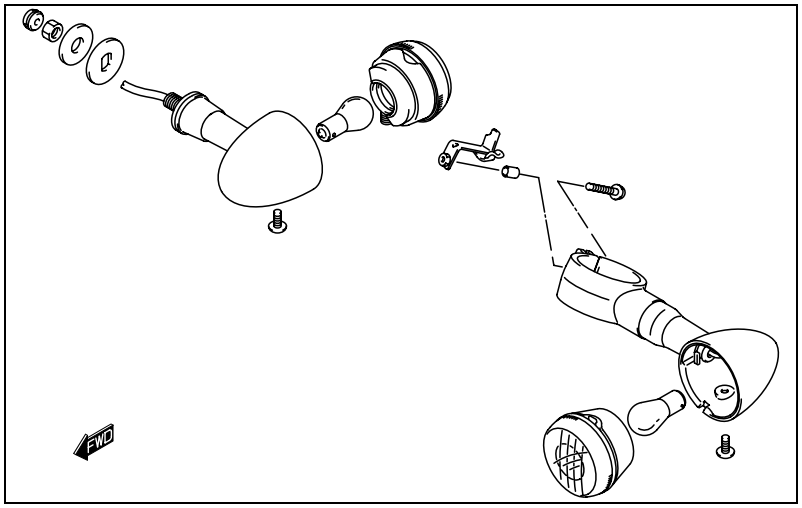
BRAKE LIGHT/TAILLIGHT
LED

LICENCE PLATE LIGHT ④
12 V 5 W



TURN SIGNAL LIGHT ⑤
Front
12 V 21/5 W ..... (E-03, 28, 33)
12 V 21 W ..... (E-02, 19, 24)

Rear
12 V 21 W



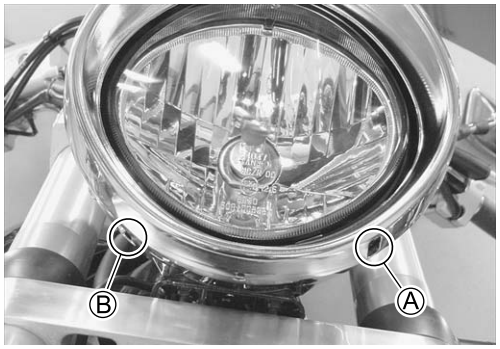
CAUTION

If you have touched and the bulb with your bare hands, clean it with a cloth moistened with alcohol or soapy water to maintain lens clarity.

HEADLIGHT BEAM ADJUSTMENT

- Adjust the headlight beam.

Ⓐ: Vertical adjuster
Ⓑ: Horizontal adjuster

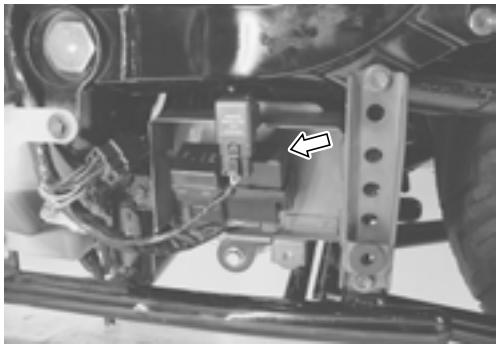


NOTE:
To adjust the headlight beam, adjust the beam horizontally first, then adjust vertically.

RELAYS

TURN SIGNAL/SIDE-STAND RELAY

The turn signal/side-stand relay is composed of the turn signal relay, side-stand relay and diode.



INSPECTION

Before removing the turn signal/side-stand relay, check the operation of the turn signal light.

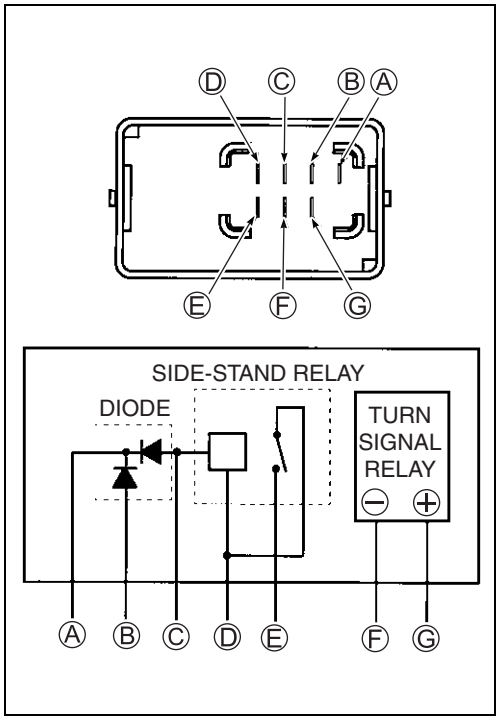
If the turn signal light does not illuminate, inspect the bulb, turn signal switch and circuit connection.

If the bulb, turn signal switch and circuit connection are OK, the turn signal relay may be faulty. In this case, replace the turn signal/side-stand relay with a new one.

NOTE:

** Make sure that the battery is fully charged.*

** Refer to the page 9-16 for the side-stand relay and diode inspection.*



STARTER RELAY

☞9-16 to -17

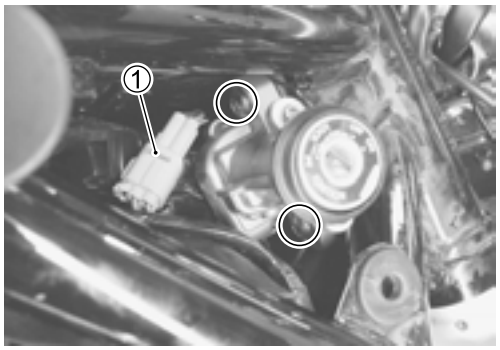
FUEL PUMP RELAY

☞6-6

SWITCHES

IGNITION SWITCH REMOVAL

- Remove the fuel tank. (☞6-3)
- Remove the frame head covers. (☞3-3)
- Disconnect the coupler ①.
- Remove the ignition switch mounting bolts with the special tools.



TOOL 09930-11920: Torx bit JT40H
09930-11940: Bit holder

CAUTION

When reusing the ignition switch bolt, clean thread and apply the THREAD LOCK.

1342 99000-32050: THREAD LOCK "1342" (USA)

1322 99000-32110: THREAD LOCK SUPER "1322" (Others)

Inspect each switch for continuity with a tester. If any abnormality is found, replace the respective switch assemblies with new ones.

HAZARD SWITCH

Color / Position	B	Lbl	Lg
• (OFF)			
⚠ (ON)	○	○	○

IGNITION SWITCH

Color / Position	R	O	O/Y	Br
ON	○	○	○	○
OFF				
LOCK				
P	○			○

DIMMER SWITCH

Color / Position	W	Y	Y/W
HI (≡D)		○	○
LO (≡D)	○		○

TURN SIGNAL SWITCH

Color / Position	Lg	Lbl	B
L		○	○
PUSH			
R	○	○	

PASSING LIGHT SWITCH

Color / Position	O/R	Y
•		
PUSH	○	○

ENGINE STOP SWITCH

Color / Position	O/B	O/W
OFF (⊗)		
RUN (Ω)	○	○

STARTER BUTTON

Color / Position	O/W	Y/G	Y/W	O/R
•			○	○
PUSH	○	○		

HORN BUTTON

Color / Position	B/Bl	B/W
•		
PUSH	○	○

FRONT BRAKE SWITCH

Color / Position	B/R	B/Bl
OFF		
ON	○	○

REAR BRAKE SWITCH

Color / Position	O/G	W/B
OFF		
ON	○	○

CLUTCH LEVER POSITION SWITCH

Color / Position	B/Y	B/Y
OFF		
ON	○	○

OIL PRESSURE SWITCH

Color / Position	G/Y	Ground
ON (engine is at stop)	○	○
OFF (engine is running)		

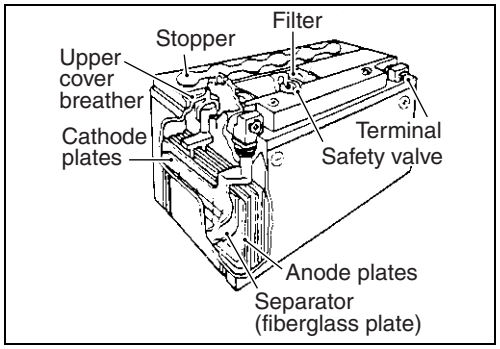
NOTE:
Before inspecting the oil pressure switch, check if the engine oil level is correct. (☞2-11)

WIRE COLOR

B : Black
Br : Brown
Gr : Gray
G : Green
Lbl : Light blue
Lg : Light green
O : Orange
R : Red
Y : Yellow
W : White
B/Bl : Black with Blue tracer
B/W : Black with White tracer
B/Y : Black with Yellow tracer
B/R : Black with Red tracer
G/Y : Green with Yellow tracer
O/B : Orange with Black tracer
O/Bl : Orange with Blue tracer
O/G : Orange with Green tracer
O/R : Orange with Red tracer
O/W : Orange with White tracer
O/Y : Orange with Yellow tracer
W/B : White with Black tracer
Y/G : Yellow with Black tracer
Y/W : Yellow with White tracer

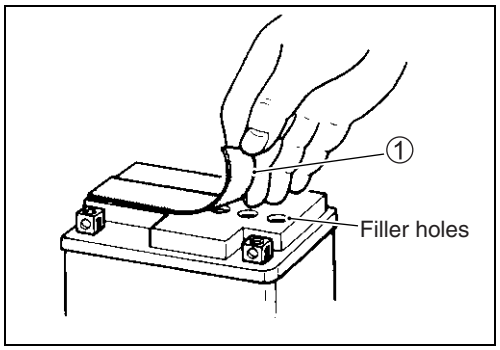
BATTERY
SPECIFICATIONS

Type designation	FTX12-BS
Capacity	12 V, 36 kC (10 Ah)/10 HR



INITIAL CHARGING
Filling electrolyte

- Remove the aluminum tape ① sealing the battery electrolyte filler holes.

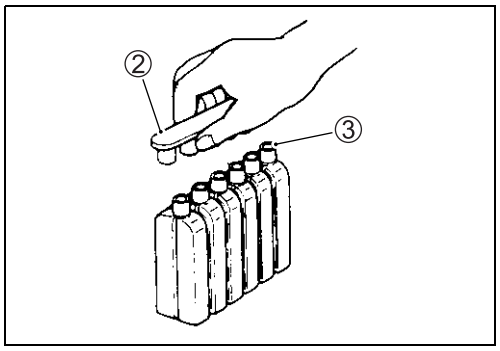


- Remove the caps ②.

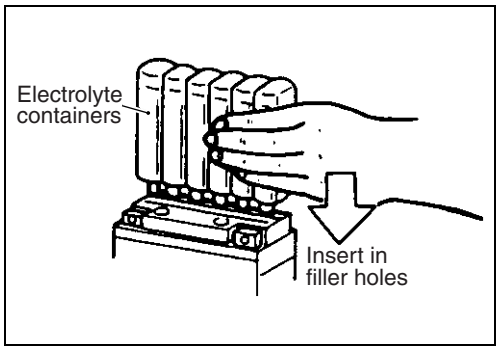
NOTE:

** After filling the electrolyte completely, use the removed cap ② as sealing caps of battery-filler holes.*

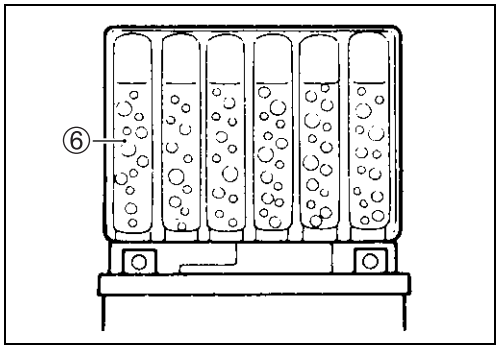
** Do not remove or pierce the sealed areas ③ of the electrolyte container.*



Insert the nozzles of the electrolyte container into the battery's electrolyte filler holes, holding the container firmly so that it does not fall. Take precaution not to allow any of the fluid to spill.

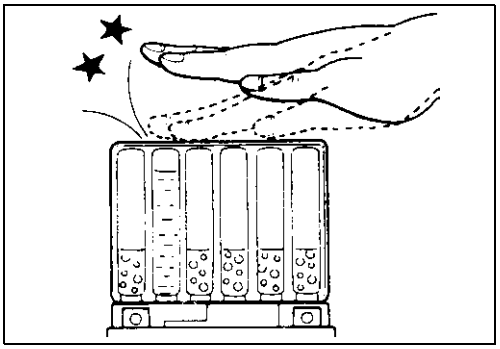


- Make sure air bubbles ⑥ are coming up each electrolyte container, and leave in this position for about more than 20 minutes.

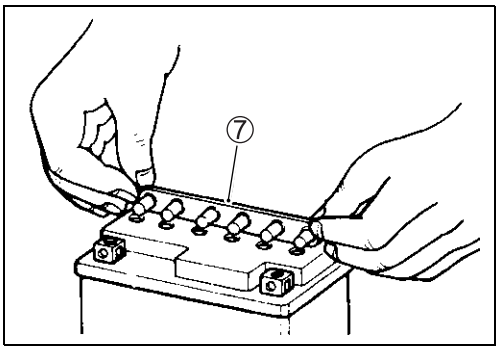


NOTE:
If no air bubbles are coming up from a filler port, tap the bottom of the electrolyte container two or three times.
Never remove the container from the battery.

- After confirming that the electrolyte has entered the battery completely, remove the electrolyte containers from the battery. Wait for about more than 20 minutes.

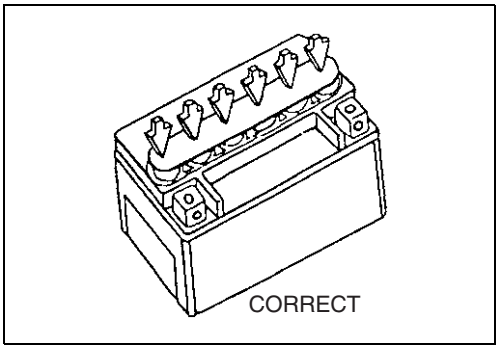


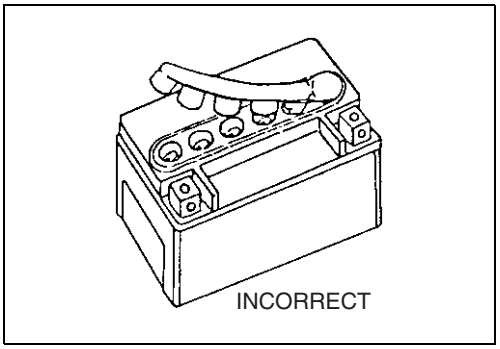
- Insert the caps ⑦ into the filler holes, pressing in firmly so that the top of the caps do not protrude above the upper surface of the battery's top cover.



CAUTION

*** Never use anything except the specified battery.**
*** Once the caps have been installed to the battery, do not remove the caps.**
*** Do not tap the caps with a tool such as hammer when installing them.**





- For initial charging, use the charger specially designed for MF battery.

CAUTION

*** For charging the battery, make sure to use the charger specially designed for MF battery. Otherwise, the battery may be overcharged resulting in shortened service life.**
*** Do not remove the cap during charging.**
*** Position the battery with the cap facing upward during charging.**

SERVICING

Visually inspect the surface of the battery container. If any signs of cracking or electrolyte leakage from the sides of the battery have occurred, replace the battery with a new one. If the battery terminals are found to be coated with rust or an acidic white powdery substance, clean the battery terminals with sandpaper.

RECHARGING OPERATION

- Using the multi circuit tester, check the battery voltage. If the voltage reading is less than the 12.0 V (DC), recharge the battery with a battery charger.

CAUTION

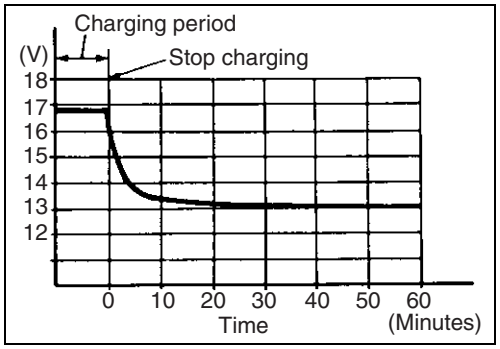
*** When recharging the battery, remove the battery from the motorcycle.**
*** Do not remove the caps on the battery top while recharging.**

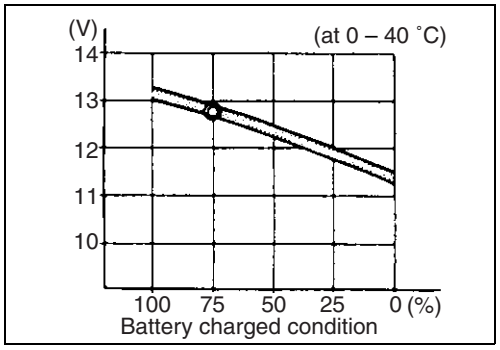
Recharging time: 5 A for 1 hour or 1.2 A for 5 to 10 hours

CAUTION

Be careful not to permit the charging current to exceed 5 A at any time.

- After recharging, wait for more than 30 minutes and check the battery voltage with a multi circuit tester.
- If the battery voltage is less than the 12.5 V, recharge the battery again.
- If battery voltage is still less than 12.5 V, after recharging, replace the battery with a new one.
- When the motorcycle is not used for a long period, check the battery every 1 month to prevent the battery discharge.





SERVICING INFORMATION

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TROUBLESHOOTING

FI SYSTEM MALFUNCTION CODE AND DEFECTIVE CONDITION

DTC No.		DETECTED ITEM	DETECTED FAILURE CONDITION	CHECK FOR
C00		NO FAULT	————————	————————
C12		CKP sensor	The signal does not reach ECM for 3 sec. or more, after receiving the starter signal.	CKP sensor wiring and mechanical parts (CKP sensor, lead wire/coupler connection)
P0335				
C13/C17		IAP sensor	The sensor should produce following voltage. 0.1 V ≦ sensor voltage < 4.8 V In other than the above range, C13 (P1750) or C17 (P0105) is indicated.	IAP sensor, lead wire/coupler connection
P1750/P0105				
C14		TP sensor	The sensor should produce following voltage. 0.1 V ≦ sensor voltage < 4.8 V In other than the above range, C14 (P0120) is indicated.	TP sensor, lead wire/coupler connection
P0120	H		Sensor voltage is higher than specified value.	TP sensor circuit shorted to VCC or ground circuit open
	L		Sensor voltage is lower than specified value.	TP sensor circuit open or shorted to ground or VCC circuit open
C15		ECT sensor	The sensor voltage should be the following. 0.1 V ≦ sensor voltage < 4.6 V In other than the above range, C15 (P0115) is indicated.	ECT sensor, lead wire/coupler connection
P0115	H		Sensor voltage is higher than specified value.	ECT sensor circuit open or ground circuit open
	L		Sensor voltage is lower than specified value.	ECT sensor circuit shorted to ground

DTC No.		DETECTED ITEM	DETECTED FAILURE CONDITION	CHECK FOR
C21		IAT sensor	The sensor voltage should be the following. 0.1 V $\leqq$ sensor voltage < 4.6 V In other than the above range, C21 (P0110) is indicated.	IAT sensor, lead wire/coupler connection
P0110	H		Sensor voltage is higher than specified value.	IAT sensor circuit open or ground circuit open
	L		Sensor voltage is lower than specified value.	IAT sensor circuit shorted to ground
C23		TO sensor	The sensor voltage should be the following for 2 sec. and more, after ignition switch is turned ON. 0.2 V $\leqq$ sensor voltage $\leqq$ 4.6 V In other than the above value, C23 (P1651) is indicated.	TO sensor, lead wire/coupler connection
P1651	H		Sensor voltage is higher than specified value.	TO sensor circuit open or shorted to VCC or ground circuit open
	L		Sensor voltage is lower than specified value.	TO sensor circuit shorted to ground or VCC circuit open
C24/C25		Ignition signal	CKP sensor (pick-up coil) signal is produced, but signal from ignition coil is interrupted 8 times or more continuously. In this case, the code C24 (P0351) or C25 (P0352) is indicated.	Ignition coil, lead wire/coupler connection, power supply from the battery
P0351/P0352				
C28		Secondary throttle valve actuator	When no actuator control signal is supplied from the ECM, communication signal does not reach ECM or operation voltage does not reach STVA motor, C28 (P1655) is indicated. STVA can not operate.	STVA motor, STVA lead wire/coupler
P1655				
C29		STP sensor	The sensor should produce following voltage. 0.1 V $\leqq$ sensor voltage < 4.8 V In other than the above range, C29 is indicated.	STP sensor, lead wire/coupler connection
P1654	H		Sensor voltage is higher than specified value.	STP sensor circuit shorted to VCC or ground circuit open
	L		Sensor voltage is lower than specified value.	STP sensor circuit open or shorted to ground or VCC circuit open

DTC No.	DETECTED ITEM	DETECTED FAILURE CONDITION	CHECK FOR
C31 P0705	Gear position signal	Gear position signal voltage should be higher than the following for 3 seconds and more. Gear position sensor voltage > 0.6 V If lower than the above value, C31 (P0705) is indicated.	GP switch, lead wire/coupler connection. Gearshift cam, etc.
C32/C33 P0201/P0202	Fuel injector	CKP sensor (pickup coil) signal is produced, but fuel injector signal is interrupted 4 times or more continuously. In this case, the code C32 (P0201) or C33 (P0202) is indicated.	Fuel injector, wiring/coupler connection, power supply to the injector
C41 P0230	Fuel pump relay	No voltage is applied to the fuel pump, although fuel pump relay is turned ON, or voltage is applied to fuel pump, although fuel pump relay is turned OFF.	Fuel pump relay, lead wire/coupler connection. power source to the fuel pump relay and fuel injectors
C42 P1650	Ignition switch	Ignition switch signal is not input to ECM.	Ignition switch, lead wire/coupler
C44 P0130	HO2 sensor (E-02, 19, 24)	HO2 sensor output voltage is not input to ECM during engine operation and running condition. (Sensor voltage $\leqq$ 0.1 V) In other than the above value, C44 (P0130) is indicated.	HO2 sensor circuit open or shorted to ground
C44 P0135		The Heater can not operate so that heater operation voltage is not supply to the oxygen heater circuit, C44 (P0135) is indicated.	HO2 sensor lead wire/coupler connection Battery voltage supply to the HO2 sensor
C49 P1656	PAIR control solenoid valve	PAIR control solenoid valve voltage is not input to ECM.	PAIR control solenoid valve, lead wire/coupler

ENGINE

Complaint	Symptom and possible causes	Remedy
Engine will not start or is hard to start.	**Compression too low**	
	1. Out of adjustment valve clearance	Adjust.
	2. Worn valve guides or poor seating of valves	Repair or replace.
	3. Mistiming valves	Adjust.
	4. Excessively worn piston rings	Replace.
	5. Worn-down cylinder bores	Replace.
	6. Too slowly starter motor cranks	See electrical section.
	7. Poor seating of spark plugs	Retighten.
	Plug not sparking	
	1. Fouled spark plugs	Clean.
	2. Wet spark plugs	Clean and dry.
	3. Defective ignition coil	Replace.
	4. Defective CKP sensor	Replace.
	5. Defective ECM	Replace.
	6. Open-circuited wiring connections	Repair or Replace.
	7. Open or short in high-tension cords	Replace.
	No fuel reaching the intake manifold	
	1. Clogged fuel filter or fuel hose	Clean or replace.
	2. Defective fuel pump	Replace.
	3. Defective fuel pressure regulator	Replace.
	4. Defective fuel injector	Replace.
	5. Defective fuel pump relay	Replace.
	6. Defective ECM	Replace.
	7. Open-circuited wiring connections	Check and repair.
	Incorrect fuel/air mixture	
	1. Out of adjustment TP sensor	Adjust.
	2. Defective fuel pump	Replace.
	3. Defective fuel pressure regulator	Replace.
	4. Defective TP sensor	Replace.
	5. Defective CKP sensor	Replace.
	6. Defective IAP sensor	Replace.
	7. Defective ECM	Replace.
	8. Defective ECT sensor	Replace.
	9. Defective IAT sensor	Replace.

Complaint	Symptom and possible causes	Remedy
Engine idles poorly.	1. Out of adjustment valve clearance	Adjust.
	2. Poor seating of valves	Replace or repair.
	3. Defective valve guides	Replace.
	4. Worn down camshafts	Replace.
	5. Too wide spark plug gaps	Adjust or replace.
	6. Defective ignition coil	Replace.
	7. Defective CKP sensor	Replace.
	8. Defective ECM	Replace.
	9. Defective TP sensor	Replace.
	10. Defective fuel pump	Replace.
	11. Imbalanced throttle valve	Adjust.
	12. Damaged or cracked vacuum hose	Replace.
Engine stalls easily.	**Incorrect fuel/air mixture**	
	1. Defective IAP sensor or circuit	Repair or replace.
	2. Clogged fuel filter	Clean or replace.
	3. Defective fuel pump	Replace.
	4. Defective fuel pressure regulator	Replace.
	5. Defective ECT sensor	Replace.
	6. Defective thermostat	Replace.
	7. Defective IAT sensor	Replace.
	8. Damaged or cracked vacuum hose	Replace.
	Improperly working fuel injector	
	1. Defective fuel injector	Replace.
	2. No injection signal from ECM	Repair or replace.
	3. Open or short circuited wiring connection	Repair or replace.
	4. Defective battery or low battery voltage	Replace or recharge.
	Improperly working control circuit or sensors	
	1. Defective ECM	Replace.
	2. Defective fuel pressure regulator	Replace.
	3. Defective TP sensor	Replace.
	4. Defective IAT sensor	Replace.
	5. Defective CKP sensor	Replace.
	6. Defective ECT sensor	Replace.
	7. Defective fuel pump relay	Replace.
	Improperly working engine internal parts	
	1. Fouled spark plugs	Clean.
	2. Defective CKP sensor or ECM	Replace.
	3. Clogged fuel hose	Clean.
	4. Out of adjustment valve clearance	Adjust.

Complaint	Symptom and possible causes	Remedy
Noisy engine	**Excessive valve chatter**	
	1. Too large valve clearance	Adjust.
	2. Weakened or broken valve springs	Replace.
	3. Worn tappet or cam surface	Replace.
	4. Worn and burnt camshaft journal	Replace.
	Noise seems to come from piston	
	1. Worn down pistons or cylinders	Replace.
	2. Fouled with carbon combustion chambers	Clean.
	3. Worn piston pins or piston pin bore	Replace.
	4. Worn piston rings or ring grooves	Replace.
	Noise seems to come from timing chain	
	1. Stretched chain	Replace.
	2. Worn sprockets	Replace.
	3. Not working tension adjuster	Repair or replace.
	Noise seems to come from clutch	
	1. Worn splines of countershaft or hub	Replace.
	2. Worn teeth of clutch plates	Replace.
	3. Distorted clutch plates, driven and drive	Replace.
	4. Worn clutch release bearing	Replace.
	5. Weakened clutch dampers	Replace the primary driven gear.
	Noise seems to come from crankshaft	
	1. Due to wear rattling bearings	Replace.
	2. Worn and burnt crank pin bearings	Replace.
	3. Worn and burnt journal bearings	Replace.
	4. Too large thrust clearance	Replace thrust bearing.
	Noise seems to come from transmission	
	1. Worn or rubbing gears	Replace.
	2. Worn splines	Replace.
	3. Worn or rubbing primary gears	Replace.
	4. Worn bearings	Replace.
	Noise seems to come from water pump	
	1. Too much play on pump shaft bearing	Replace.
	2. Worn or damaged impeller shaft	Replace.
	3. Worn or damaged mechanical seal	Replace.
	4. Touches pump case and impeller	Replace.

Complaint	Symptom and possible causes	Remedy
Engine runs poorly in high speed range.	**Defective engine internal/electrical parts**	
	1. Weakened valve springs	Replace.
	2. Worn camshafts	Replace.
	3. Valve timing out of adjustment	Adjust.
	4. Too narrow spark plug gaps	Adjust.
	5. Ignition not advanced sufficiently due to poorly working timing advance circuit	Replace ECM.
	6. Defective ignition coils	Replace.
	7. Defective CKP sensor	Replace.
	8. Defective ECM	Replace.
	9. Clogged air cleaner element	Clean.
	10. Clogged fuel hose, resulting in inadequate fuel supply to injector	Clean and prime.
	11. Defective fuel pump	Replace.
	12. Defective TP sensor	Replace.
	13. Defective STP sensor or STV actuator	Replace.
	Defective air flow system	
	1. Clogged air cleaner element	Clean or replace.
	2. Defective throttle valve	Adjust or replace.
	3. Defective secondary throttle valve	Adjust or replace.
	4. Sucking air from throttle body joint	Repair or replace.
	5. Defective ECM	Replace.
	6. Imbalancing throttle valve synchronization	Adjust.
	Defective control circuit or sensor	
	1. Low fuel pressure	Repair or replace.
	2. Defective TP sensor	Replace.
	3. Defective IAT sensor	Replace.
	4. Defective CKP sensor	Replace.
	5. Defective GP sensor	Replace.
	6. Defective IAP sensor	Replace.
	7. Defective ECM	Replace.
	8. Out of adjustment TP sensor	Replace.
	9. Defective STP sensor and/or STV actuator	Replace.

Complaint	Symptom and possible causes	Remedy
Engine lacks power.	**Defective engine internal/electrical parts**	
	1. Loss of valve clearance	Adjust.
	2. Weakened valve springs	Replace.
	3. Out of adjustment valve timing	Adjust.
	4. Worn piston rings or cylinders	Replace.
	5. Poor seating of valves	Repair.
	6. Fouled spark plugs	Clean or replace.
	7. Incorrect spark plugs	Adjust or replace.
	8. Clogged injectors	Clean.
	9. Out of adjustment TP sensor	Adjust.
	10. Clogged air cleaner element	Clean.
	11. Imbalancing throttle valve synchronization	Adjust.
	12. Sucking air from throttle valve or vacuum hose	Retighten or replace.
	13. Too much engine oil	Drain out excess oil.
	14. Defective fuel pump or ECM	Replace.
	15. Defective CKP sensor and ignition coils	Replace.
	Defective control circuit or sensor	
	1. Low fuel pressure	Repair or replace.
	2. Defective TP sensor	Replace.
	3. Defective IAT sensor	Replace.
	4. Defective CKP sensor	Replace.
	5. Defective GP sensor	Replace.
	6. Defective IAP sensor	Replace.
	7. Defective ECM	Replace.
	8. Out of adjustment TP sensor	Replace.
	9. Defective STP sensor and/or STV actuator	Replace.
	10. Defective EXCV actuator	Replace.
Engine overheats	**Defective engine internal parts**	
	1. Heavy carbon deposit on piston crowns	Clean.
	2. Not enough oil in the engine	Add oil.
	3. Defective oil pump or clogged oil circuit	Replace or clean.
	4. Sucking air from intake pipes	Retighten or replace.
	5. Use incorrect engine oil	Change.
	6. Defective cooling system	See radiator section.
	Lean fuel/air mixture	
	1. Short-circuited IAP sensor/lead wire	Repair or replace.
	2. Short-circuited IAT sensor/lead wire	Repair or replace.
	3. Sucking air from intake pipe joint	Clean or replace.
	4. Defective fuel injectors	Repair or replace.
	5. Defective ECT sensor	Replace.
	The other factors	
	1. Ignition timing is too advanced due to defective timing advance system (ECT sensor, GP sensor, CKP sensor and ECM).	Replace.
	2. Drive chain is too tight.	Adjust.

Complaint	Symptom and possible causes	Remedy
Dirty or heavy exhaust smoke	1. Too much engine oil in the engine	Check with inspection window drain out excess oil.
	2. Worn piston rings or cylinders	Replace.
	3. Worn valve guides	Replace.
	4. Scored or scuffed cylinder walls	Replace.
	5. Worn valves stems	Replace.
	6. Defective stem seal	Replace.
	7. Worn oil ring side rails	Replace.
Slipping clutch	1. Weakened clutch springs	Replace.
	2. Worn or distorted pressure plates	Replace.
	3. Distorted clutch plates or pressure plates	Replace.
Dragging clutch	1. Some clutch spring weakened while others are not.	Replace.
	2. Distorted pressure plates or clutch plates	Replace.
Transmission will not shift.	1. Broken gearshift cam	Replace.
	2. Distorted gearshift forks	Replace.
	3. Worn gearshift pawl	Replace.
Transmission will not shift back.	1. Broken return spring on shift shaft	Replace.
	2. Rubbing or stickily shift shaft	Repair or replace.
	3. Distorted or worn gearshift forks	Replace.
Transmission jumps out of gear.	1. Worn shifting gears on driveshaft or countershaft	Replace.
	2. Distorted or worn gearshift forks	Replace.
	3. Weakened stopper spring on gearshift stopper	Replace.
	4. Worn gearshift cam plate	Replace.

RADIATOR (COOLING SYSTEM)

Complaint	Symptom and possible causes	Remedy
Engine overheats	1. Not enough engine coolant	Add coolant.
	2. Clogged with dirt or trashes radiator core	Clean.
	3. Faulty cooling fan	Repair or replace.
	4. Defective cooling fan thermo-switch	Replace.
	5. Clogged water passage	Clean.
	6. Air trapped in the cooling circuit	Bleed out air.
	7. Defective water pump	Replace.
	8. Use incorrect coolant	Replace.
	9. Defective thermostat	Replace.
Engine overcools	1. Defective cooling fan thermo-switch	Replace.
	2. Extremely cold weather	Put on the radiator cover.
	3. Defective thermostat	Replace.

CHASSIS

Complaint	Symptom and possible causes	Remedy
Heavy steering	1. Overtightened steering stem nut	Adjust.
	2. Broken bearing in steering stem	Replace.
	3. Distorted steering stem	Replace.
	4. Not enough pressure in tires	Adjust.
Wobbly handlebars	1. Loss of balance between right and left front forks	Adjust.
	2. Distorted front fork	Repair or replace.
	3. Distorted front axle or crooked tire	Replace.
	4. Loose steering stem nut	Adjust.
	5. Worn or incorrect tire or wrong tire pressure	Adjust or replace.
	6. Worn bearing/race in steering stem	Replace.
Wobbly front wheel	1. Distorted wheel rim	Replace.
	2. Worn front wheel bearings	Replace.
	3. Defective or incorrect tire	Replace.
	4. Loose axle or axle pinch bolt	Retighten.
	5. Incorrect front fork oil level	Adjust.
Front suspension too soft	1. Weakened springs	Replace.
	2. Not enough fork oil	Replenish.
	3. Wrong weight fork oil	Replace.
	4. Improperly set front fork spring adjuster	Adjust.
	5. Improperly set front fork damping force adjuster	Adjust.
Front suspension too stiff	1. Too viscous fork oil	Replace.
	2. Too much fork oil	Drain excess oil.
	3. Improperly set front fork spring adjuster	Adjust.
	4. Improperly set front fork damping force adjuster	Adjust.
	5. Bent front axle	Replace.
Noisy front suspension	1. Not enough fork oil	Replenish.
	2. Loose bolts on suspension	Retighten.
Wobbly rear wheel	1. Distorted wheel rim	Replace.
	2. Worn rear wheel bearing or swingarm bearings	Replace.
	3. Defective or incorrect tire	Replace.
	4. Worn swingarm and rear suspension bearings	Replace.
	5. Loose nuts or bolts on rear suspensions	Retighten.
Rear suspension too soft	1. Weakened spring of shock absorber	Replace.
	2. Leakage oil or gas of shock absorber	Replace.
	3. Improperly set rear spring pre-load adjuster	Adjust.
	4. Improperly set damping force adjuster	Adjust.
Rear suspension too stiff	1. Bent shock absorber shaft	Replace.
	2. Bent swingarm	Replace.
	3. Worn swingarm and rear suspension bearings	Replace.
	4. Improperly set rear spring pre-load adjuster	Adjust.
	5. Improperly set damping force adjuster	Adjust.
Noisy rear suspension	1. Loose nuts or bolts on rear suspension	Retighten.
	2. Worn swingarm and suspension bearings	Replace.

SHAFT DRIVE

Complaint	Symptom and possible causes	Remedy
Noisy shaft drive	**Noise seems to come from secondary bevel gear and final bevel gear assemblies.**	
	1. Oil level too low	Refill. (Check oil jet./Replace oil seal.)
	2. Drive and driven bevel gears damaged or worn	Replace.
	3. Excessive backlash	Adjust.
	4. Improper tooth contact	Adjust.
	5. Damage to bearings	Replace.
	Noise seems to come from propeller shaft area.	
	1. Propeller shaft universal joint damaged	Replace.
	2. Propeller shaft splines damaged or worn	Replace.
	3. Insufficient lubricant	Refill. (Replace oil seal.)
	4. Cam dog contacting surface damaged or worn	Replace.

BRAKES

Complaint	Symptom and possible causes	Remedy
Insufficient brake power	1. Leakage of brake fluid from hydraulic system	Repair or replace.
	2. Worn pads	Replace.
	3. Oil adhesion of engaging surface of pads/shoe	Clean disc and pads.
	4. Worn disc	Replace.
	5. Air in hydraulic system	Bleed air.
	6. Not enough brake fluid in the reservoir	Replenish.
Brake squeaking	1. Carbon adhesion on pad surface	Repair surface with sandpaper.
	2. Tilted pad	Modify pad fitting or replace.
	3. Damaged wheel bearing	Replace.
	4. Loosen front-wheel axle or rear-wheel axle	Tighten to specified torque.
	5. Worn pads	Replace.
	6. Foreign material in brake fluid	Replace brake fluid.
	7. Clogged return port of master cylinder	Disassemble and clean master cylinder.
Excessive brake lever stroke	1. Air in hydraulic system	Bleed air.
	2. Insufficient brake fluid	Replenish fluid to specified level; bleed air.
	3. Improper quality of brake fluid	Replace with correct fluid.
Leakage of brake fluid	1. Insufficient tightening of connection joints	Tighten to specified torque.
	2. Cracked hose	Replace.
	3. Worn piston and/or cup	Replace piston and/or cup.
Brake drags	1. Rusty part	Clean and lubricate.
	2. Insufficient brake lever or brake pedal pivot lubrication	Lubricate.

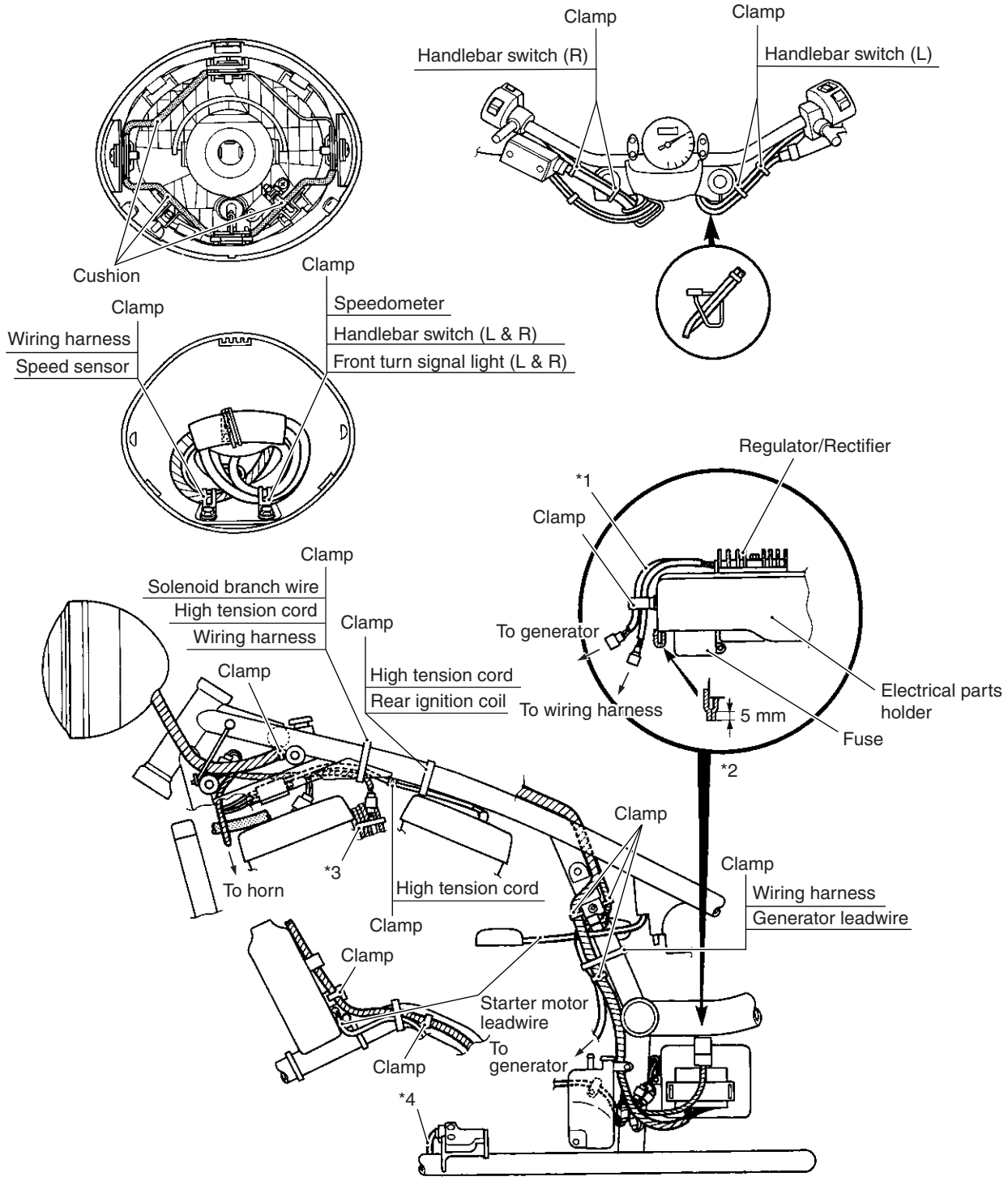
ELECTRICAL

Complaint	Symptom and possible causes	Remedy
No sparking or poor sparking	1. Defective ignition coils or CKP sensor	Replace.
	2. Defective spark plugs	Replace.
	3. Defective ECM	Replace.
	4. Defective tip over sensor	Replace.
	5. Open-circuited wiring connections	Check and repair.
Spark plug soon become fouled with carbon.	1. Mixture too rich	Inspect FI system.
	2. Idling speed set too high	Adjust fast idle or throttle stop screw.
	3. Incorrect gasoline	Change.
	4. Dirty element in air cleaner	Clean or replace.
	5. Too cold spark plugs	Replace with hot type plug.
Spark plug become fouled too soon.	1. Worn piston rings	Replace.
	2. Worn piston or cylinders	Replace.
	3. Excessive clearance of valve stems in valve guides	Replace.
	4. Worn stem oil seal	Replace.
Spark plug electrodes overheat or burn.	1. Too hot spark plugs	Replace with cold type plugs.
	2. Overheated engine	Tune-up.
	3. Loose spark plugs	Retighten.
	4. Too lean mixture	Inspect FI system.
Generator does not charge.	1. Open or short lead wires, or loose lead connections.	Repair or replace or retighten.
	2. Shorted, grounded or open generator coils	Replace.
	3. Shorted or punctured regulator/rectifier	Replace.
Generator does charge, but charging rate is below the specification.	1. Lead wires tend to get shorted or open-circuited or loosely connected at terminals	Repair or retighten.
	2. Grounded or open-circuited generator coils or generator	Replace.
	3. Defective regulator/rectifier	Replace.
	4. Defective cell plates in the battery	Replace the battery.
Generator overcharges	1. Internal short-circuit in the battery	Replace the battery.
	2. Damaged or defective regulator/rectifier	Replace.
	3. Poorly grounded regulator/rectifier	Repair, replace, or connect properly.
Unstable charging	1. Lead wire insulation frayed due to vibration, resulting in intermittent shorting	Repair or replace.
	2. Internally shorted generator	Replace.
	3. Defective regulator/rectifier	Replace.
Starter button is not effective.	1. Run down battery	Repair or replace.
	2. Defective switch contacts	Replace.
	3. Not seating properly brushes on commutator in starter motor	Repair or replace.
	4. Defective starter relay/starter interlock switch	Replace.
	5. Defective main fuse	Replace.

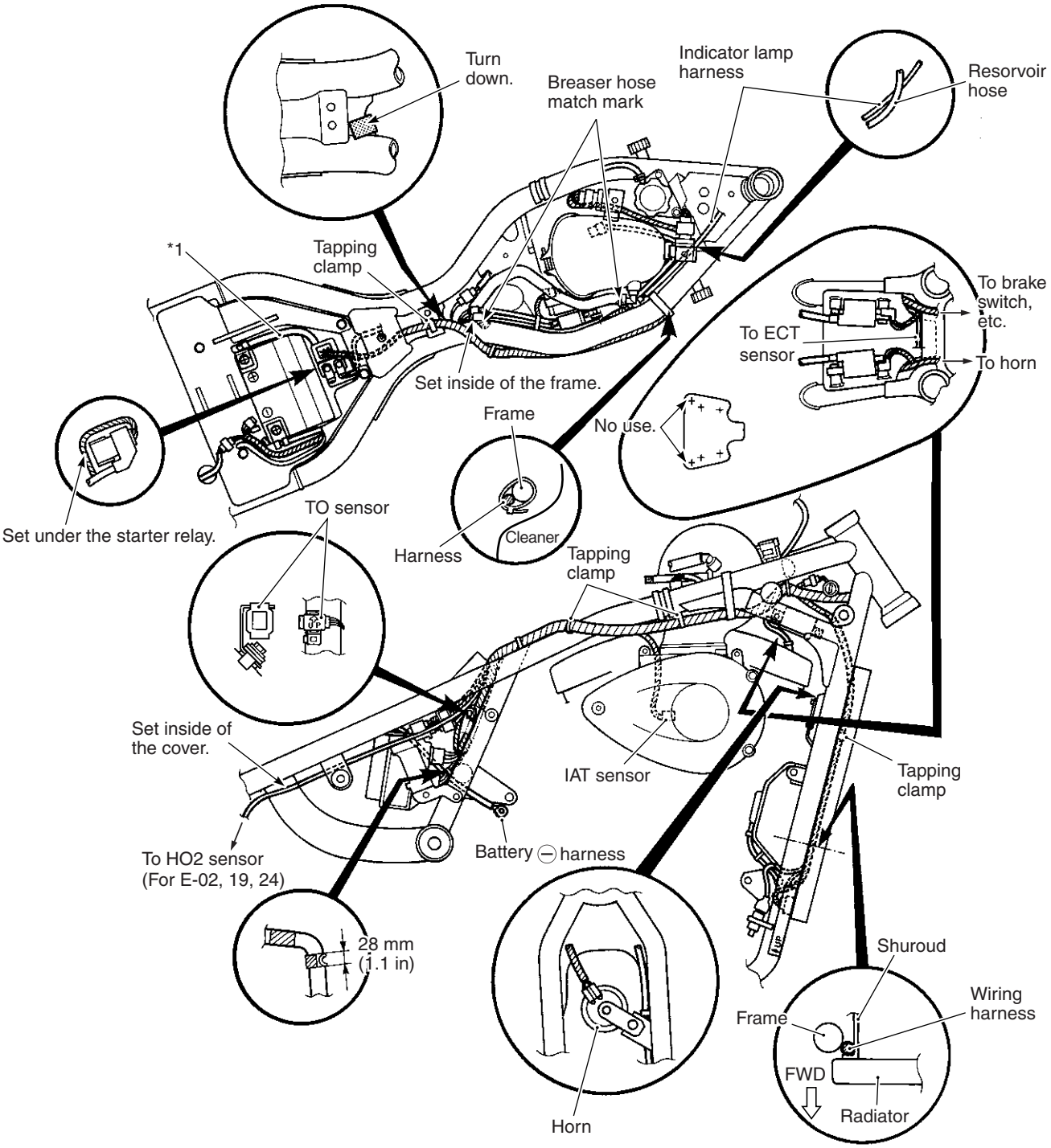
BATTERY

Complaint	Symptom and possible causes	Remedy
"Sulfation", acidic white powdery substance or spots on surface of cell plates.	1. Cracked battery case 2. Battery has been left in a run-down condition for a long time.	Replace the battery. Replace the battery.
Battery runs down quickly.	1. Not correct the charging system 2. Cell plates have lost much of their active material as a result of overcharging. 3. Internal short-circuit in the battery 4. Too low battery voltage 5. Too old battery	Check the generator, regulator/rectifier and circuit connections and make necessary adjustments to obtain specified charging operation. Replace the battery, and correct the charging system. Replace the battery. Recharge the battery fully. Replace the battery.
Battery "sulfation"	1. Incorrect charging rate (When not in use batteries should be checked at least once a month to avoid sulfation.) 2. The battery was left un used in a cold climate for too long.	Replace the battery. Replace the battery if badly sulfated.

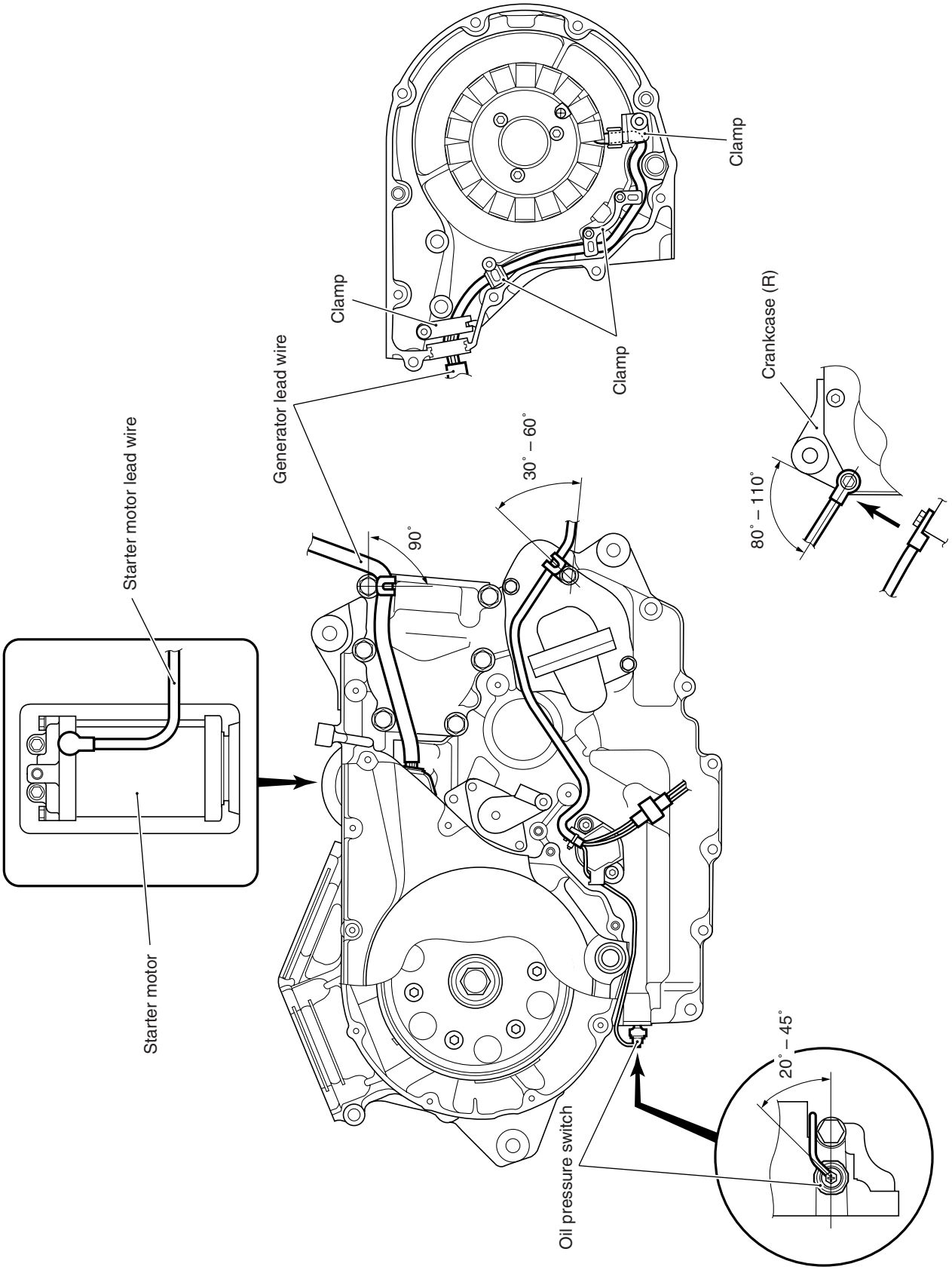
WIRING HARNESS, CABLE AND HOSE ROUTING
WIRING HARNESS ROUTING



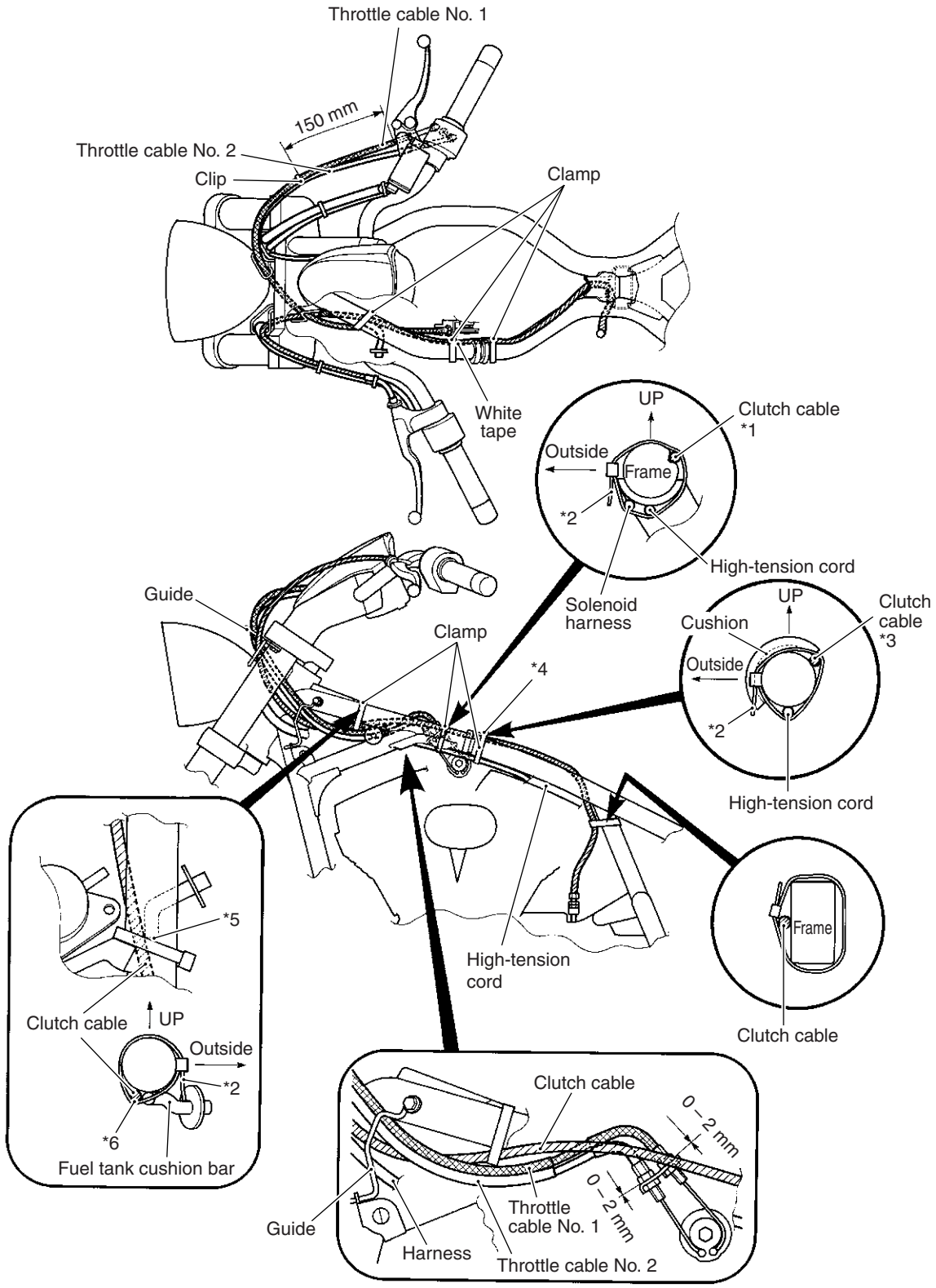
*1	Do not slacker.	*3	Cut after excess clamp.
*2	Do not pass through the harness on the bracket.	*4	Connect with the gear position switch inside cover.



*1	Pass through the ⊕ harness under the starter relay.

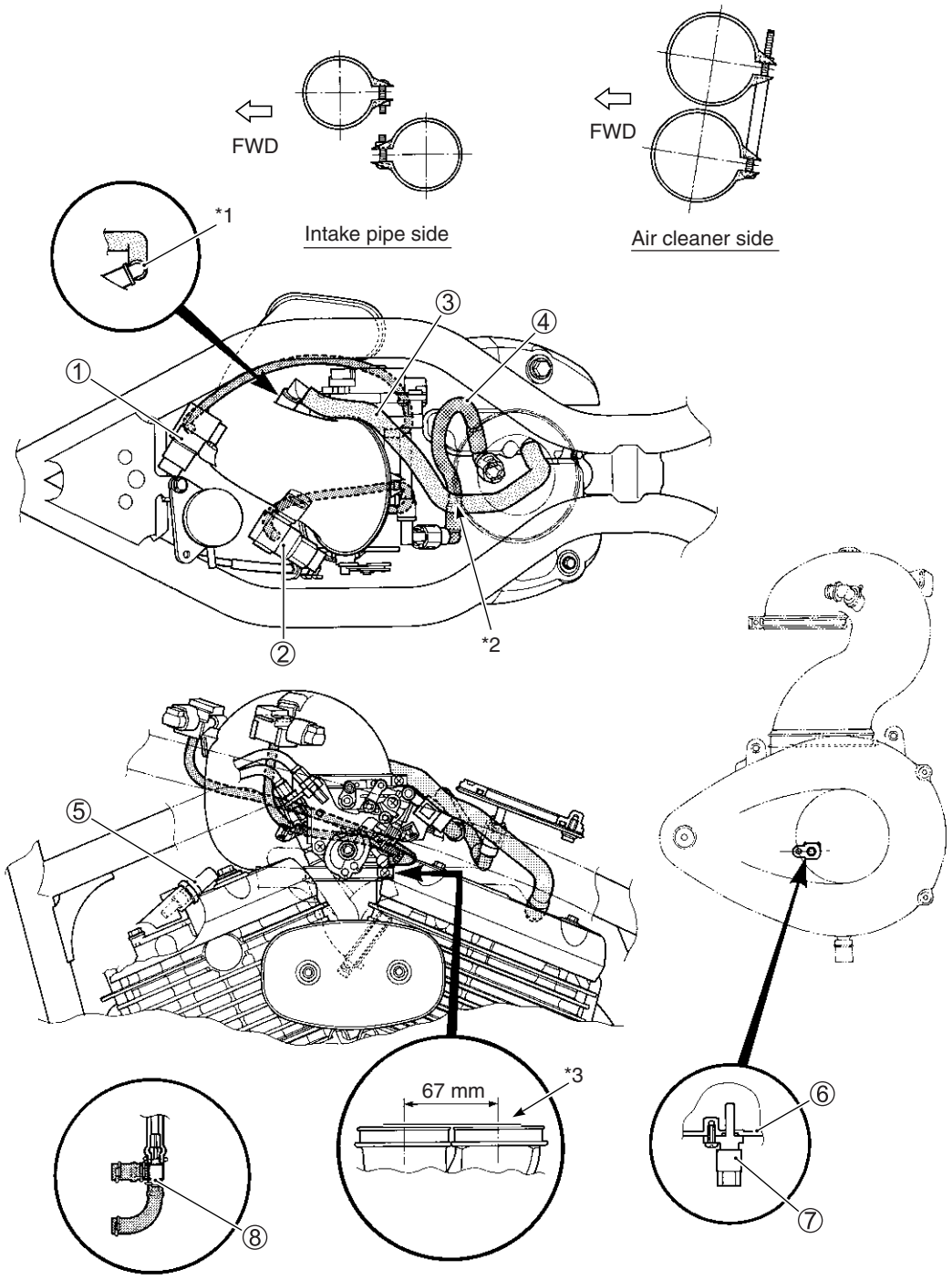

Clamp
Clamp
Clamp
Generator lead wire
Starter motor lead wire
90˚
30˚ – 60˚
Crankkcase (R)
80˚ – 110˚
Starter motor
Oil pressure switch
20˚ – 45˚

CABLE ROUTING



*1	Set the clutch cable dented part and clamp the clutch cable at white tape of cable.	*4	Clamp the back side of cushion.
*2	Clamp with this direction.	*5	Do not hang the clamp on the bar.
*3	Clamp the clutch cable attach to the cushion.	*6	Clamp inside the bar.

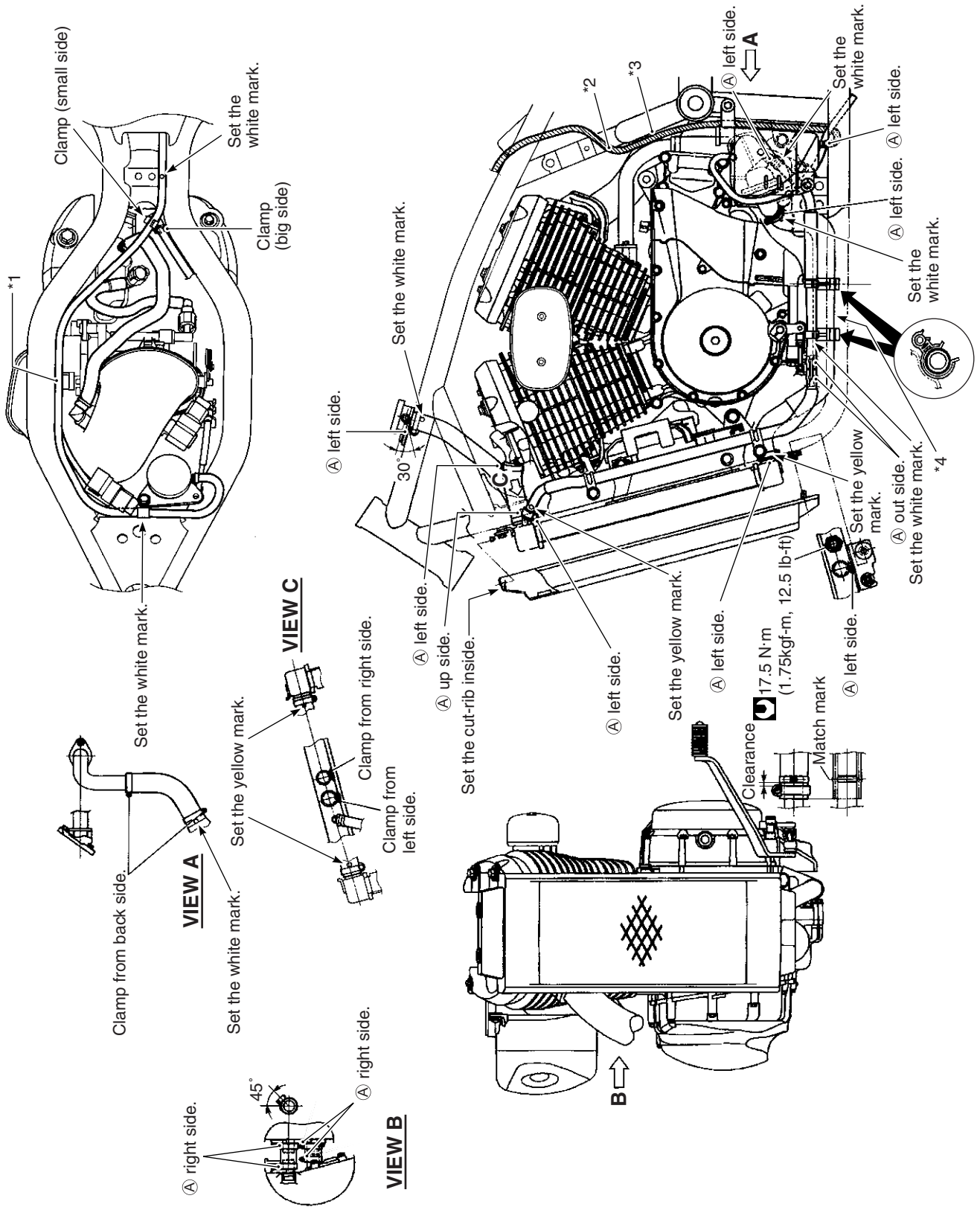
THROTTLE BODY INSTALLATION



①	IAP sensor (Front cylinder)	⑦	IAT sensor
②	IAP sensor (Rear cylinder)	⑧	Purge hose (E-33 only)
③	PCV (Breather) hose	*1	Match mark
④	Fuel feed hose	*2	Pass through the PCV (Breather) hose upper the fuel hose.
⑤	ECT sensor	*3	Install intake pipe with top surface being horizontal.
⑥	Cleaner case		

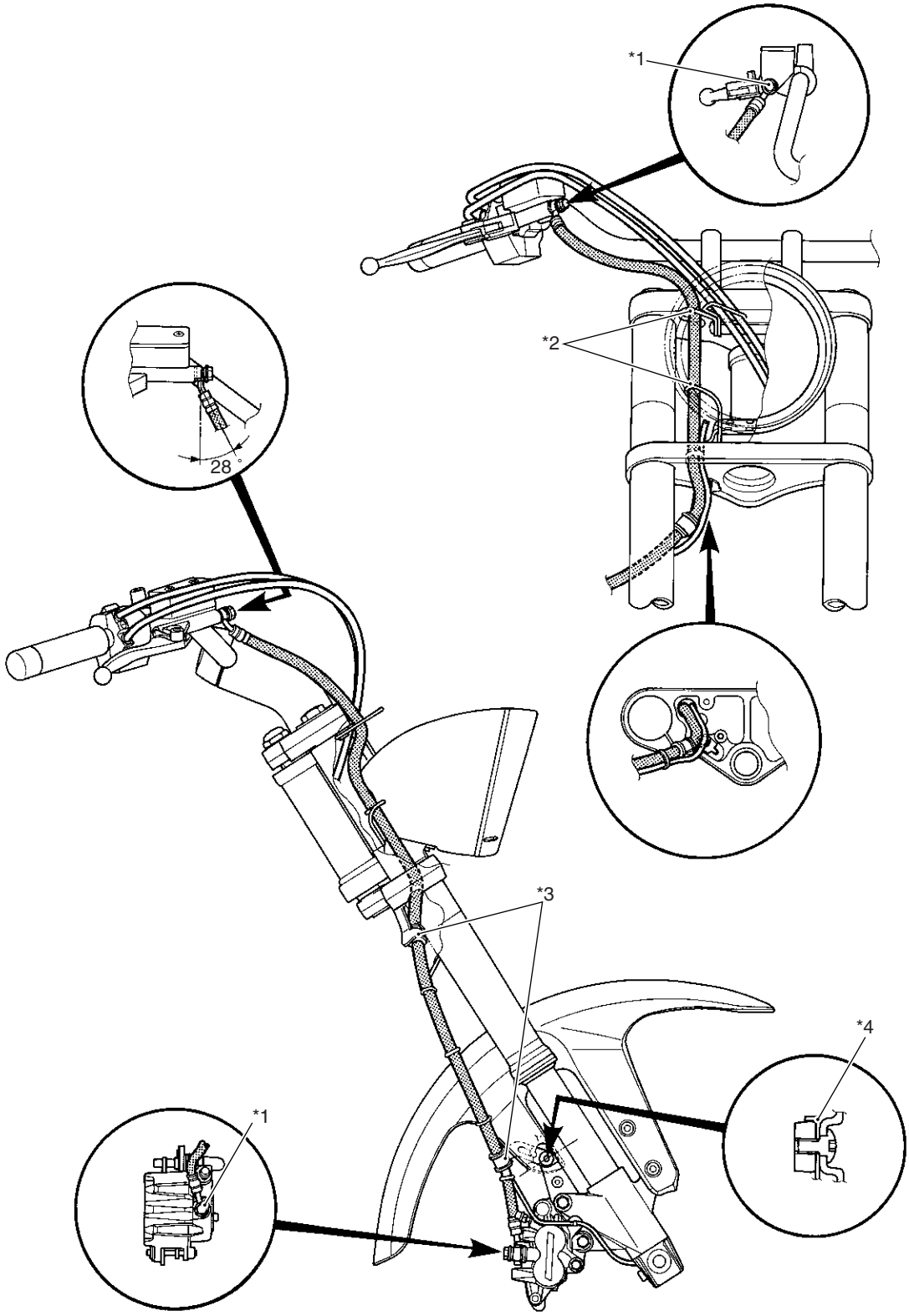
ITEM	N·m	kgf-m	lb-ft
⑤	18	1.8	13.0

COOLING SYSTEM HOSE ROUTING



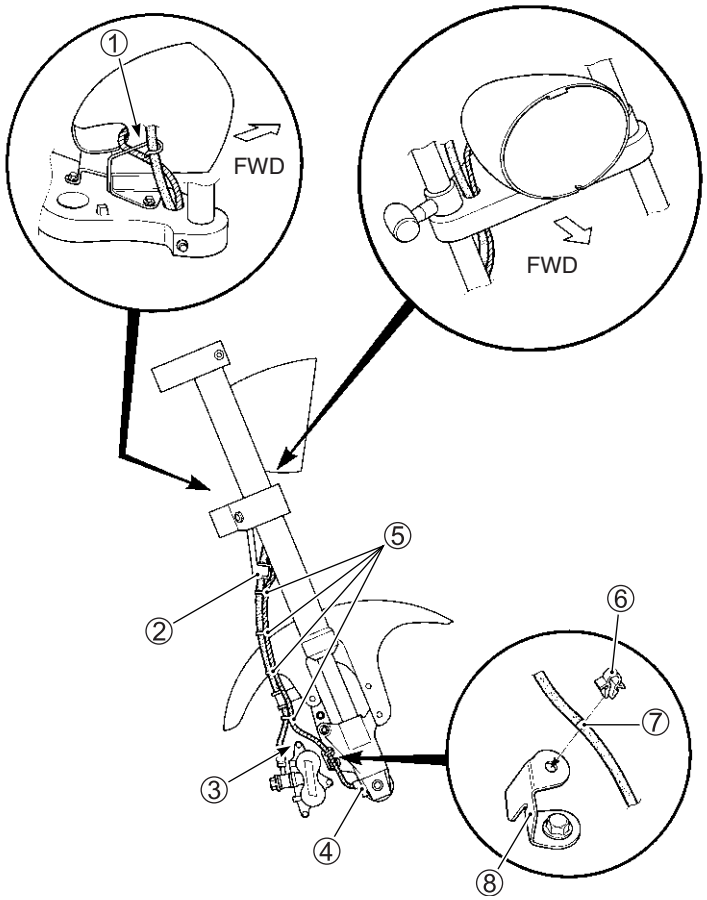
*1	Pass through the reservoir hose between frame and throttle valve actuator.	*4	Set the hose with dent of engine case.
*2	Clamp the hose with frame and harness.	Ⓐ	The end of the clamp should face...
*3	Be careful not to dent hose with frame cover.		

FRONT BRAKE ROUTING



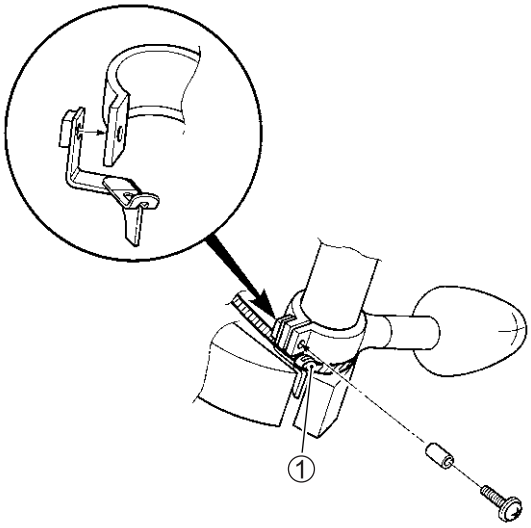
*1	After the brake hose union touching to the stopper, tighten the union bolt.	*3	Clamp the sleeve firmly.
*2	Pass through the brake hose firmly.	*4	Set the clamp with stopper before tightening.

SPEED SENSOR HARNESS ROUTING



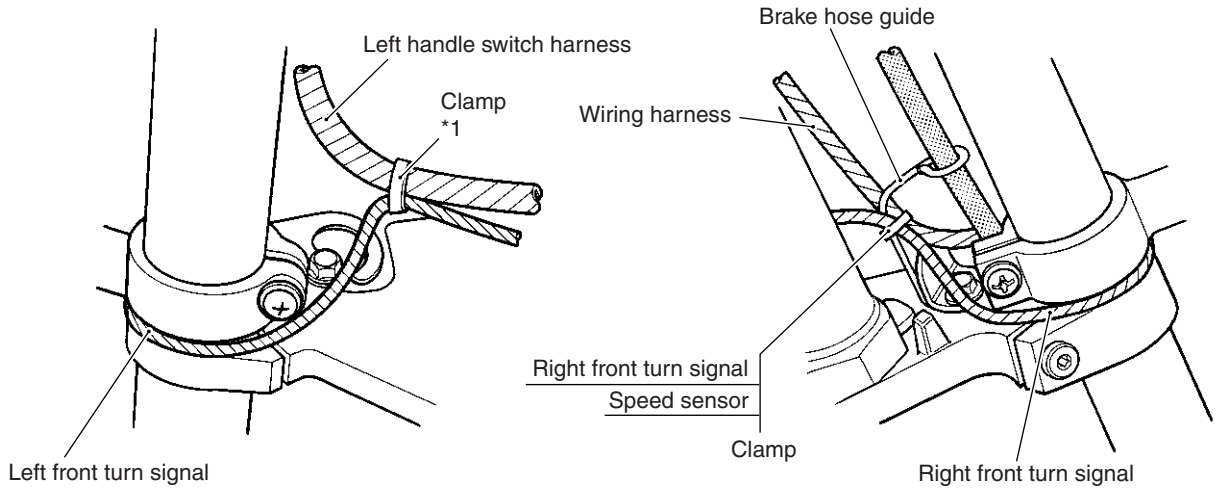
①	Pass through the speed sensor harness in front of the brake hose and guide.	⑤	Clamp
②	Pass through the speed sensor harness in front of the brake hose.	⑥	Clip
③	Do not catch the speed sensor harness to the caliper boss.	⑦	Yellow mark
④	Touch the stopper	⑧	Guide

FRONT TURN SIGNAL INSTALLATION



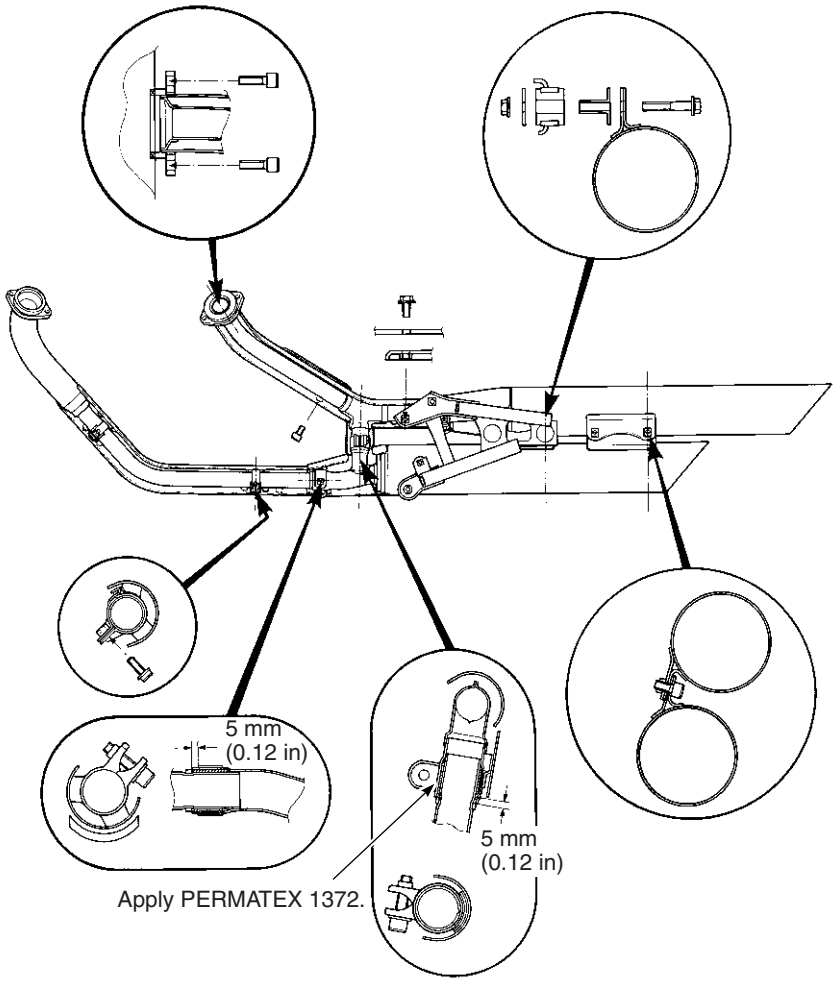
①	No slack

FRONT TURN SIGNAL LEAD WIRE ROUTING

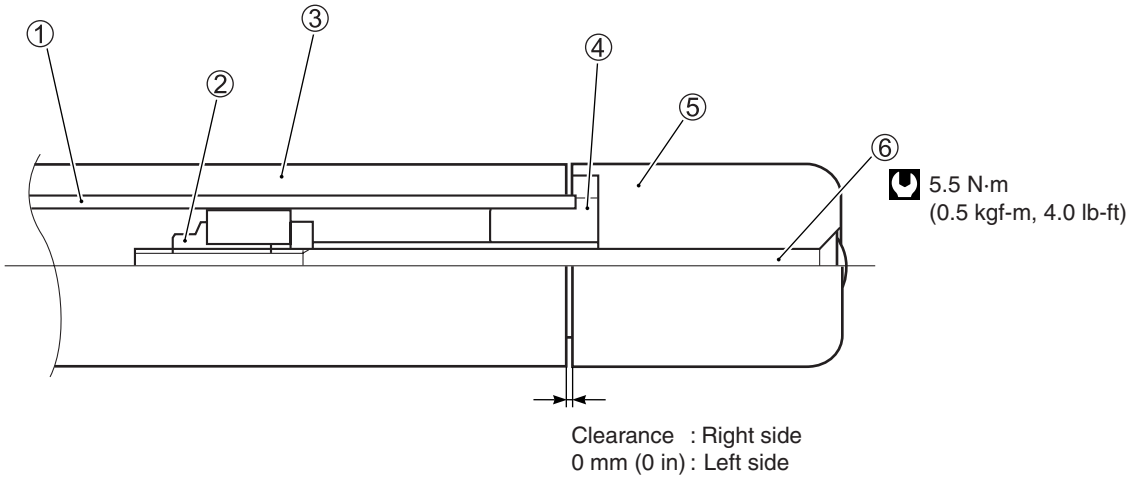


*1	Cut after clamping.

MUFFLER & EXHAUST PIPE INSTALLATION

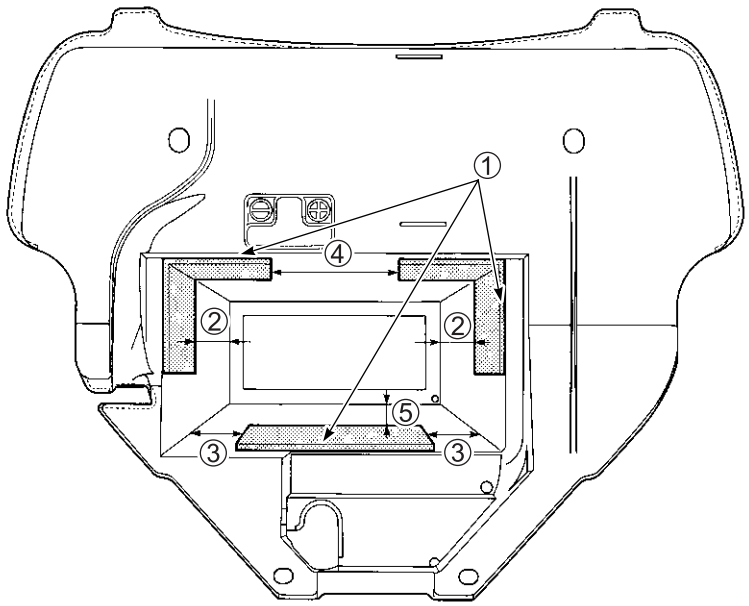


HANDLEBAR BALANCER



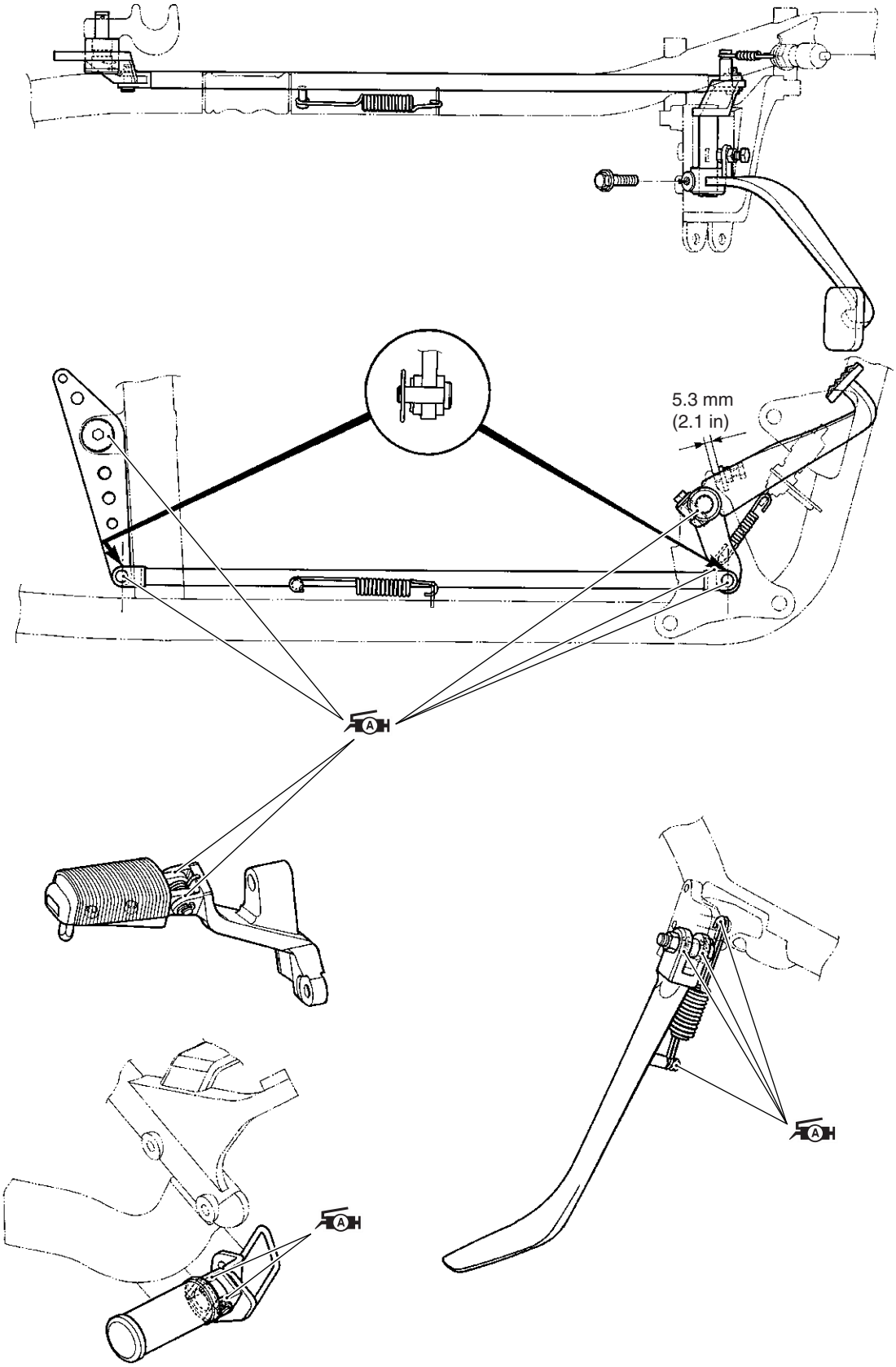
①	Handlebar	④	Handle balancer expander
②	Nut	⑤	Handlebar balancer
③	Throttle grip	⑥	Screw

BATTERY PROTECTOR

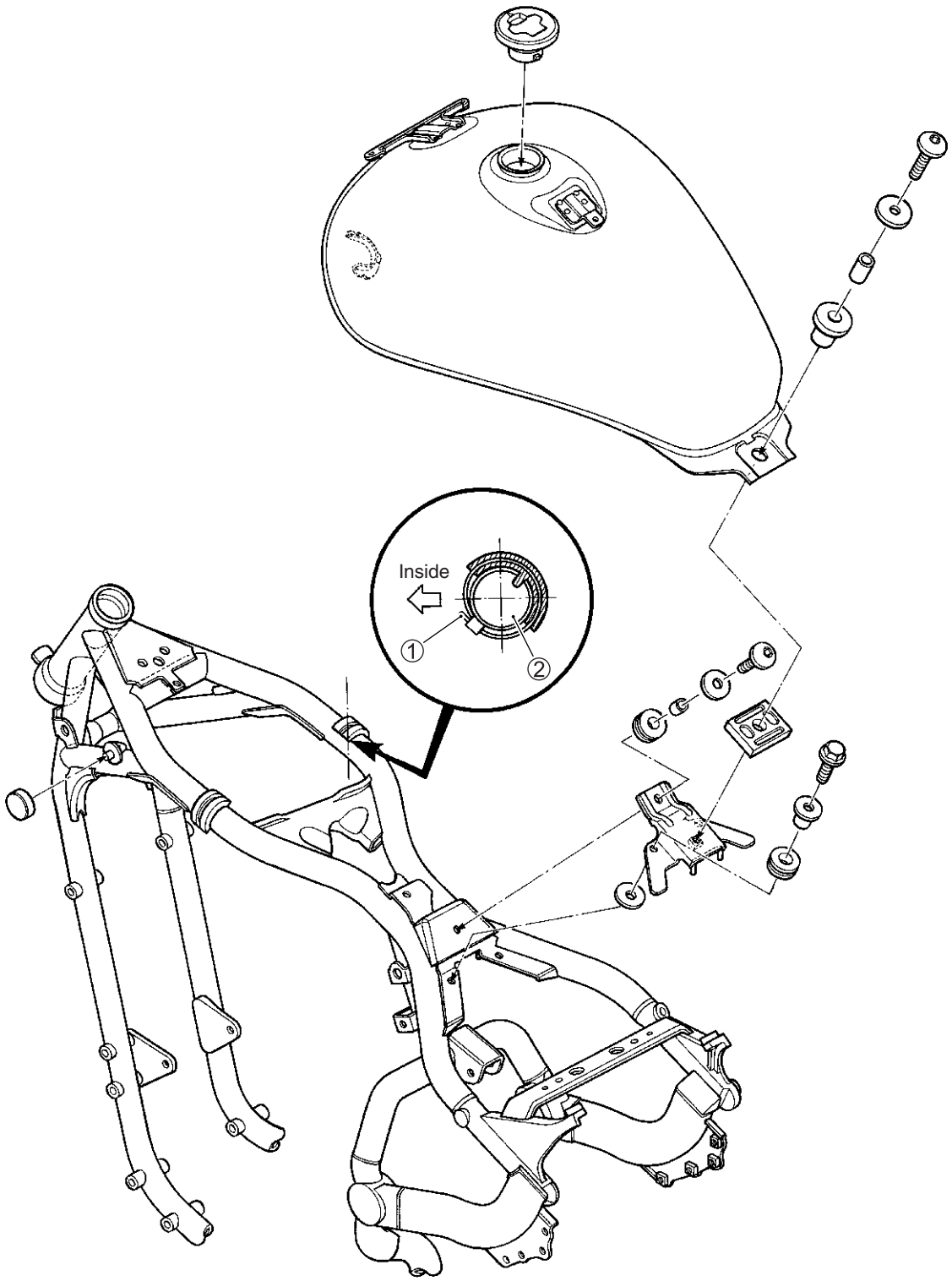


①	Stick protectors to upper end of this surface.	④	60 mm (2.36 in)
②	90 mm (3.54 in)	⑤	65 mm (2.56 in)
③	30 mm (1.18 in)		

LUBRICATION POINTS

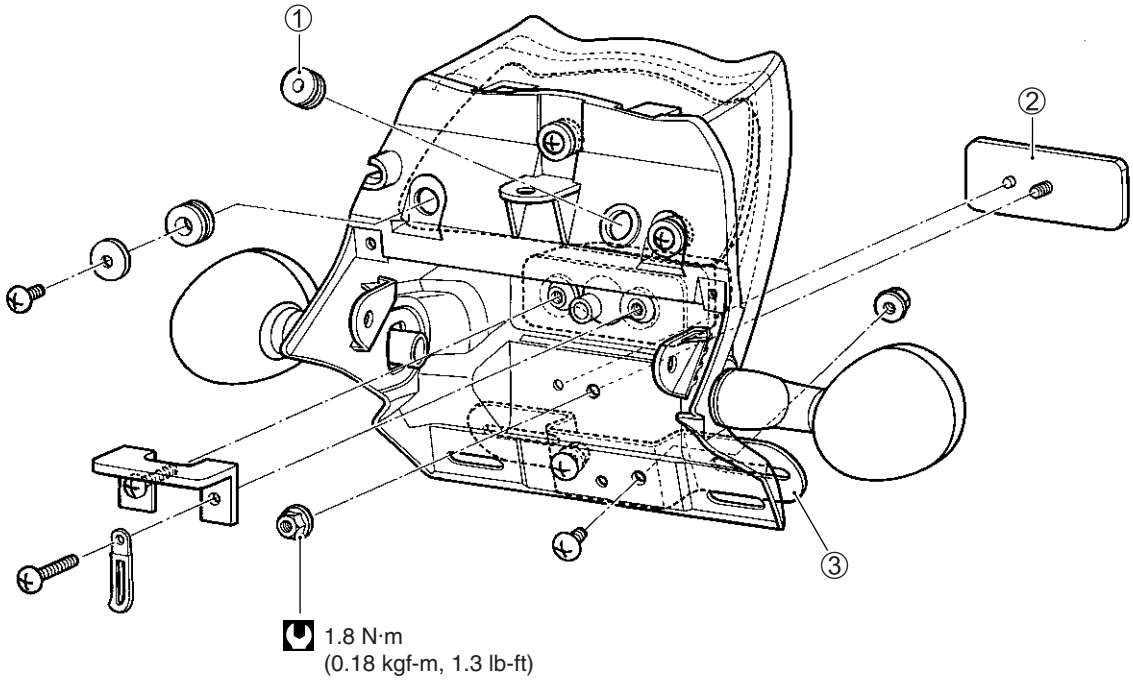


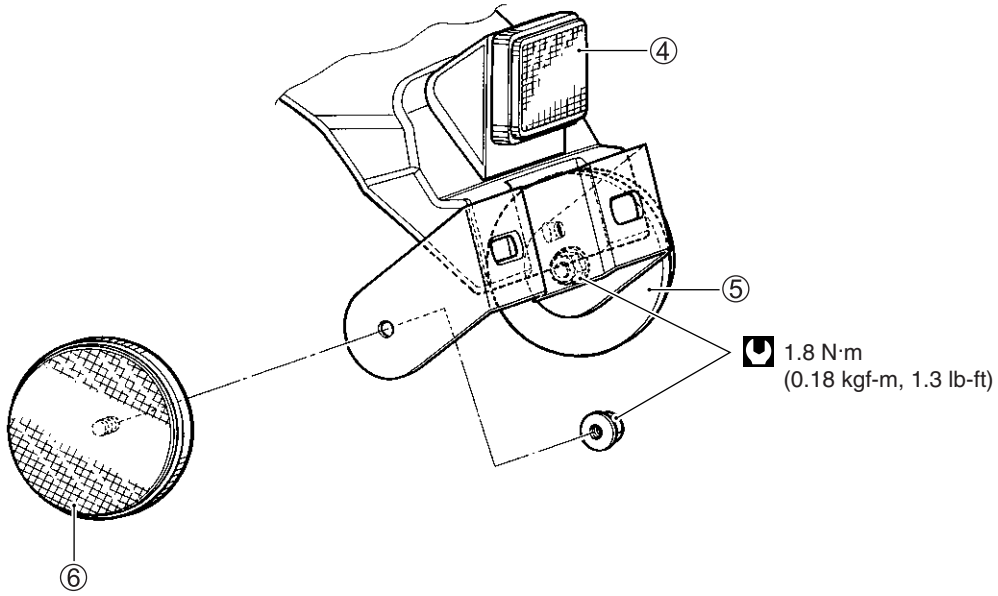
FUEL TANK INSTALLATION



①	Cut after clamping.	②	Frame

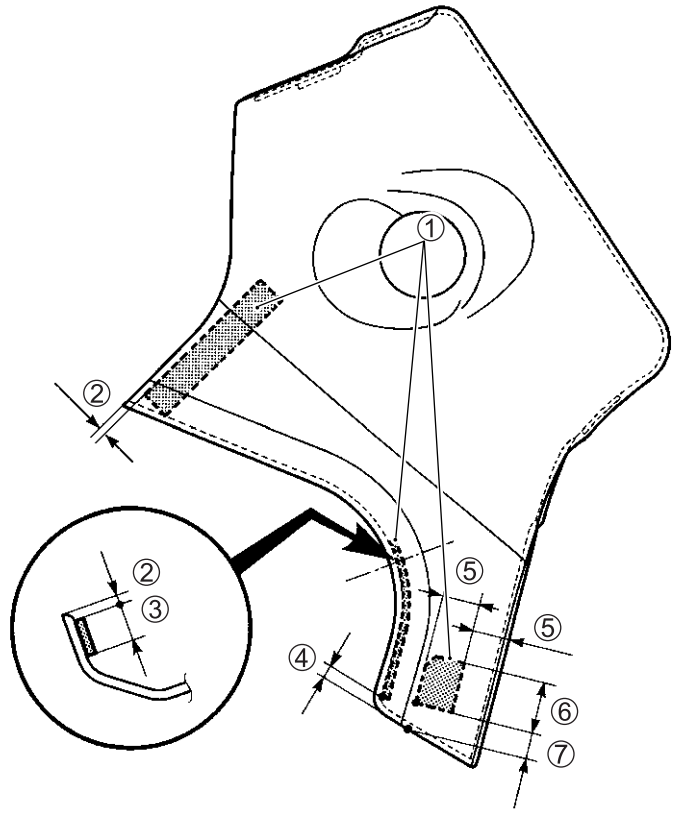
REAR COMBINATION LAMP INSTALLATION





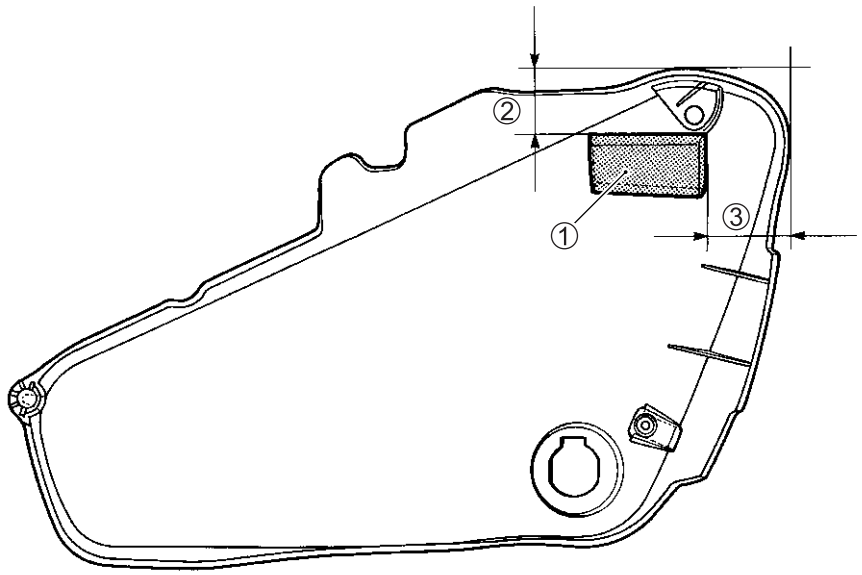
①	Pass through the left turn signal harness.	④	Reflex reflector
②	Reflex reflector	⑤	Right reflex reflector (For E-03, 28, 33)
③	License plate bracket (For E-02, 19, 24)	⑥	Left reflex reflector (For E-03, 28, 33)

FRAME HEAD COVER CUSHION INSTALLATION



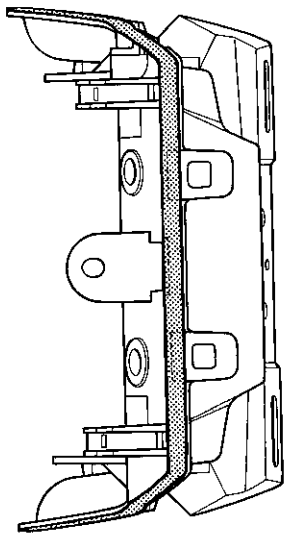
①	Cushion	④	5 mm (0.20 in)	⑦	10 mm (0.39 in)
②	3 mm (0.12 in)	⑤	15 mm (0.59 in)		
③	12 mm (0.47 in)	⑥	20 mm (0.79 in)		

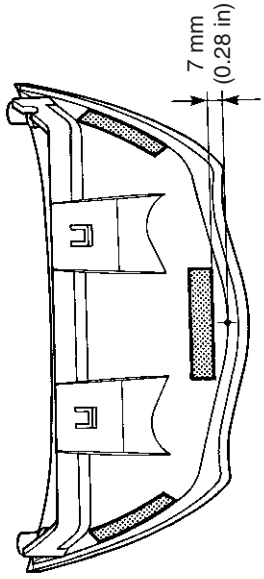
LEFT SIDE COVER CUSHION INSTALLATION

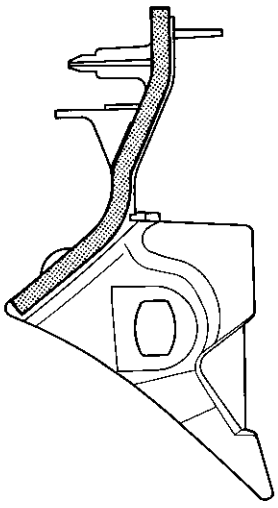


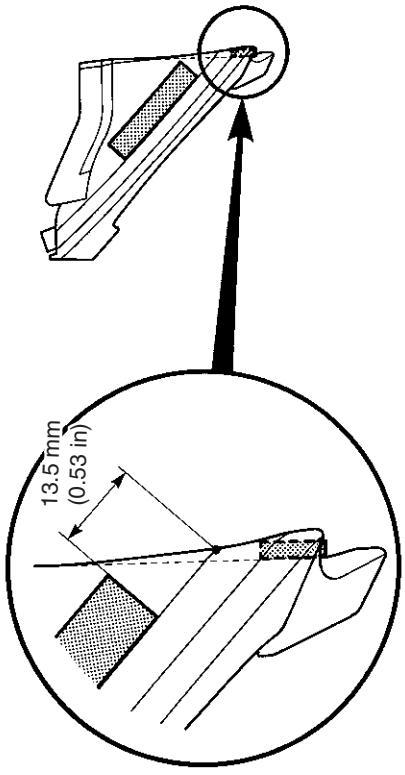
①	Cushion	②	27 mm (1.06 in)	③	35 mm (1.38 in)

REAR FENDER CUSHION INSTALLATION

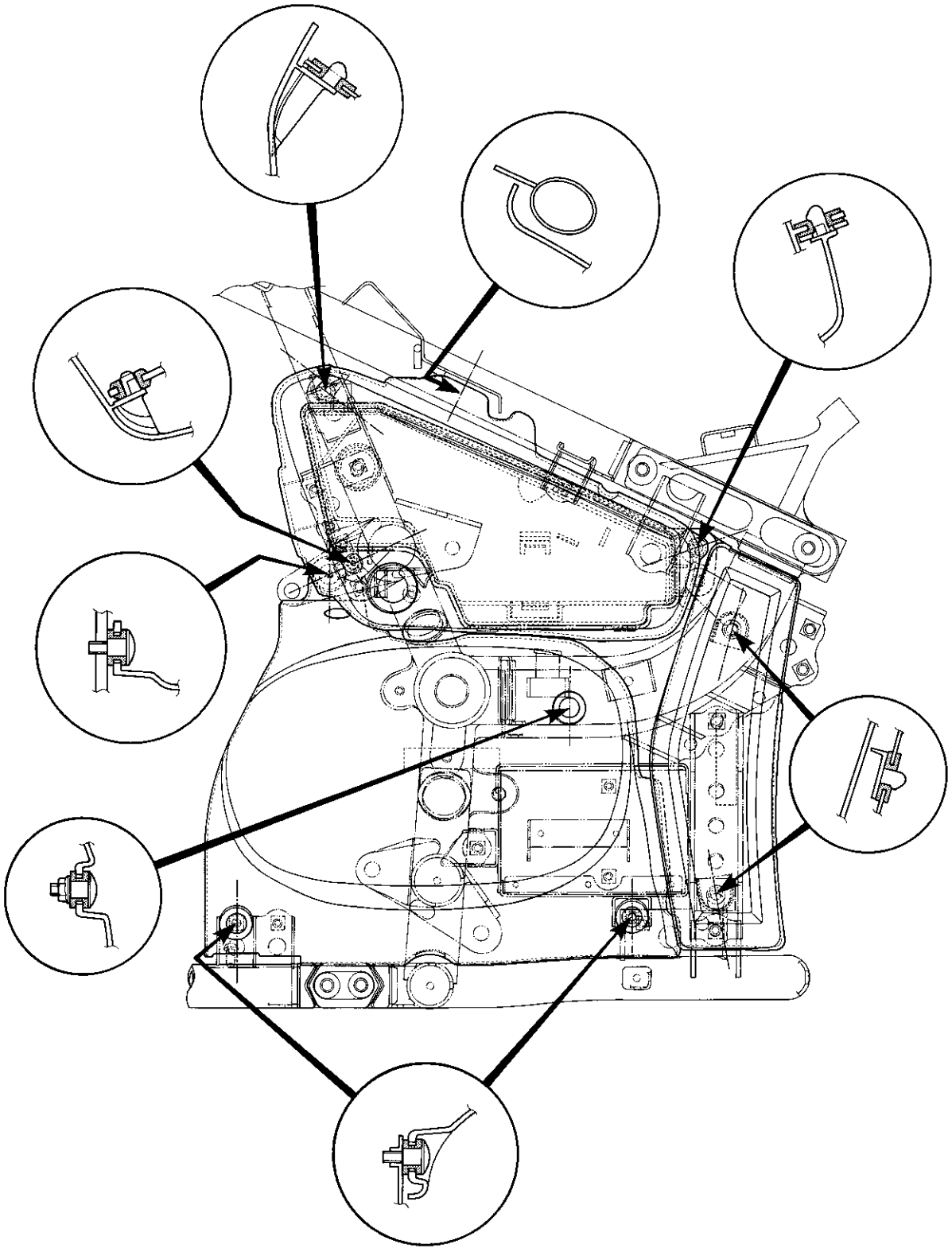




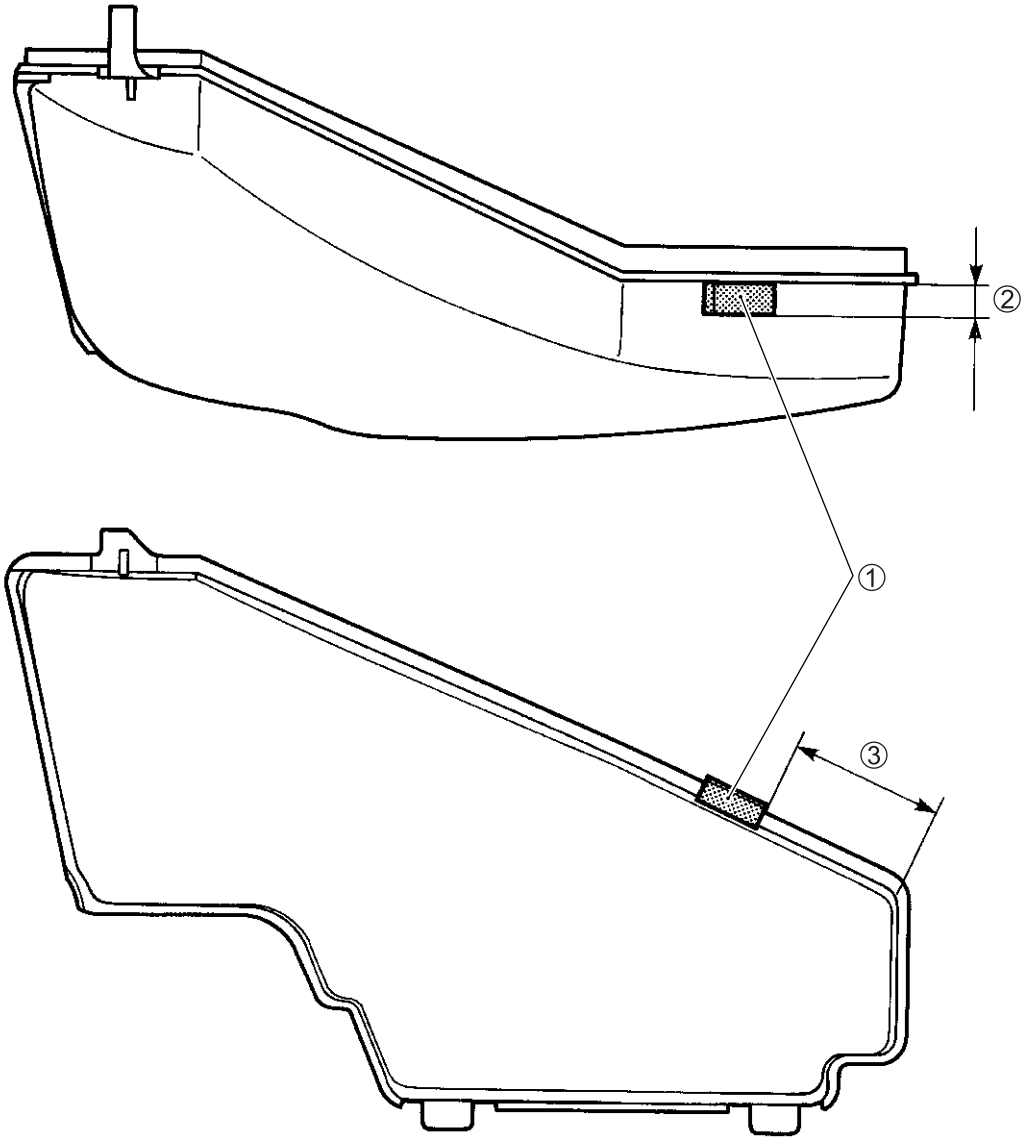




LEFT SIDE COVER INSTALLATION

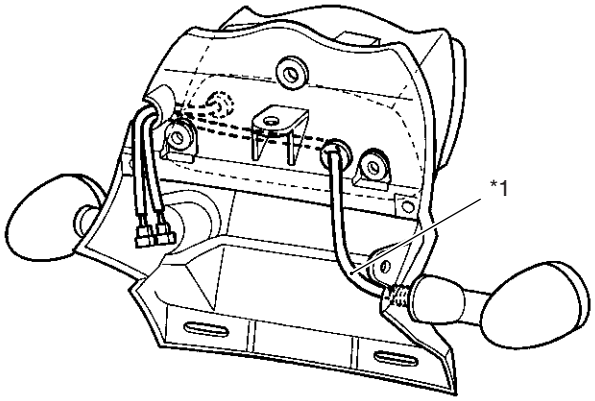


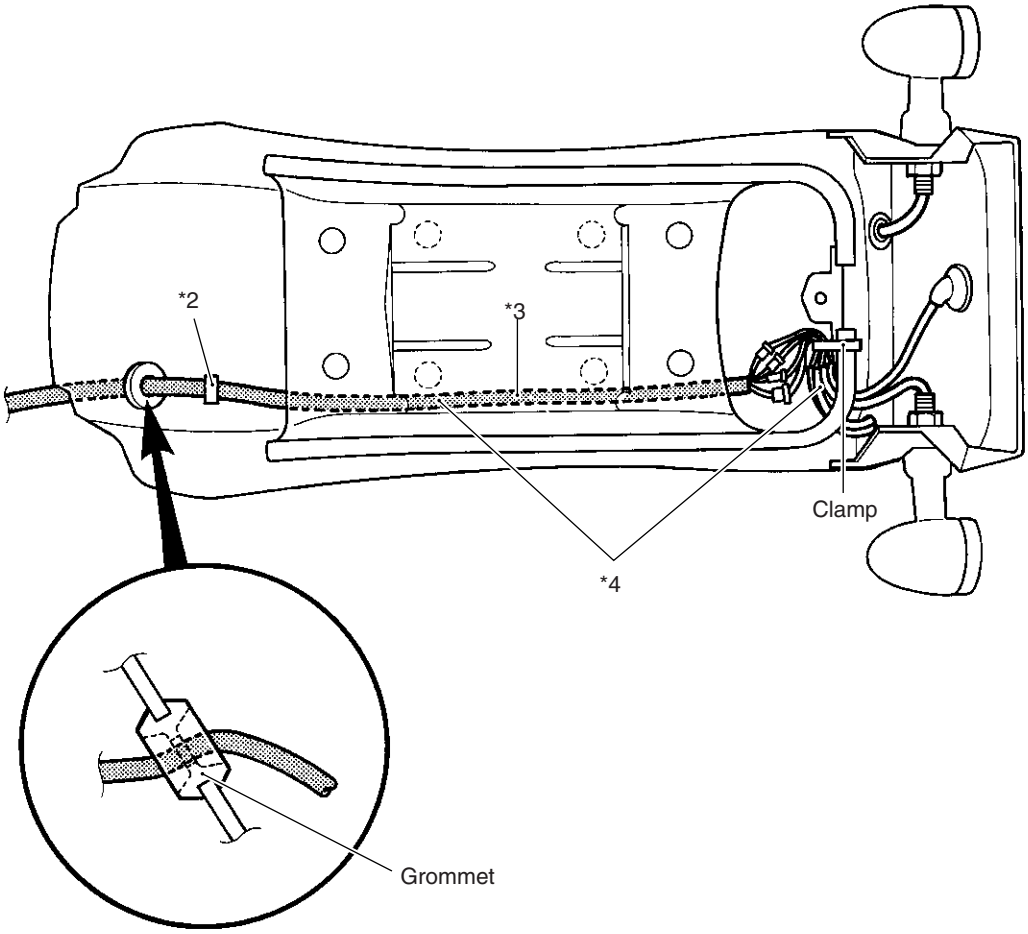
LID CUSHION INSTSALLATION



①	Cushion	②	10 mm (0.39 in)	③	45 mm (1.77 in)

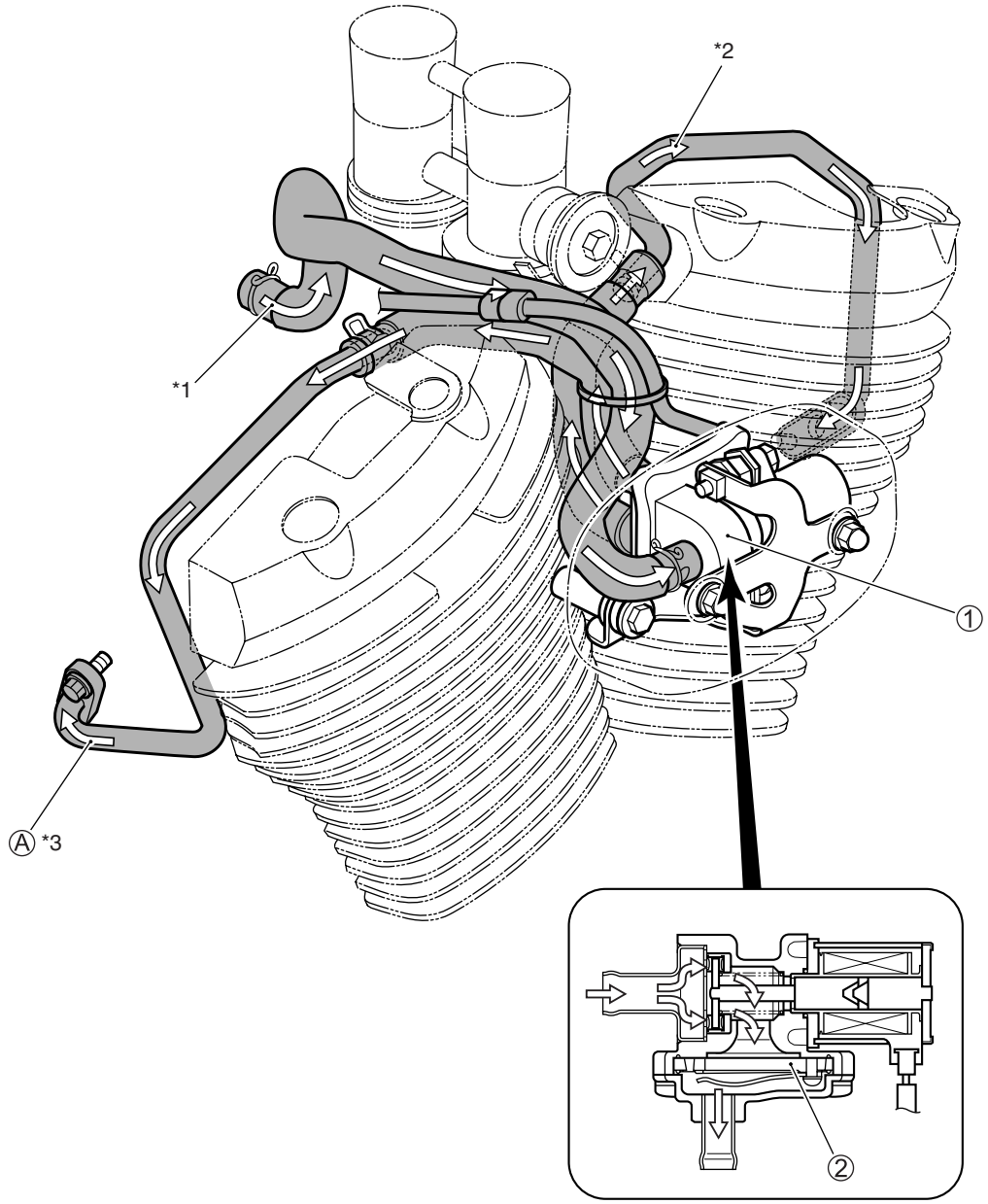
TAIL LAMP INSTALLATION





*1	Pass through the tail lamp harness and left turn signal harness over the right side mounting boss.	*3	Pass through the wiring harness outside of cushions.
*2	Assemble to the rear fender.	*4	Pass through the wiring harness between rear fender and rear brace.

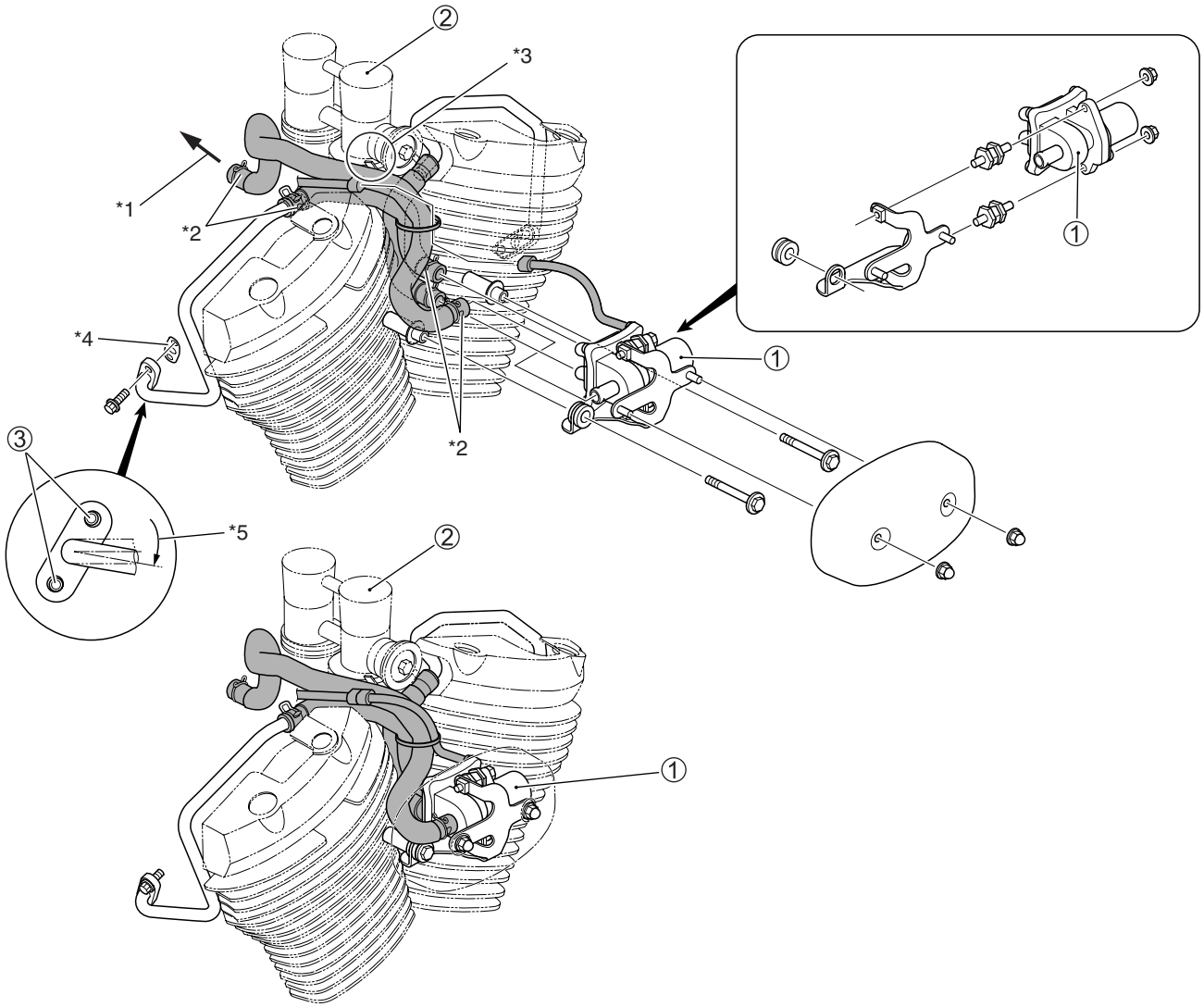
PAIR (AIR SUPPLY) SYSTEM DIAGRAM



⇦ Ⓐ

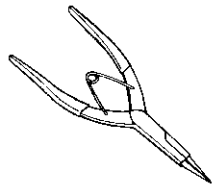
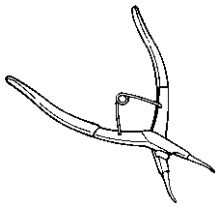
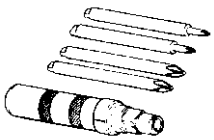
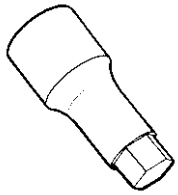
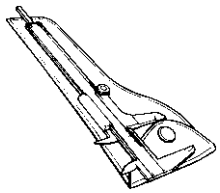
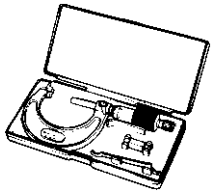
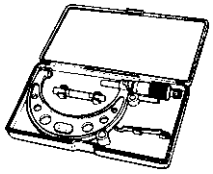
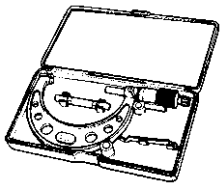
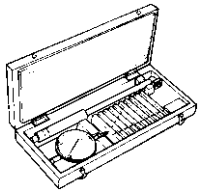
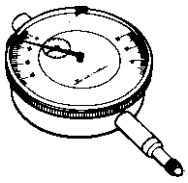
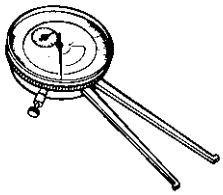
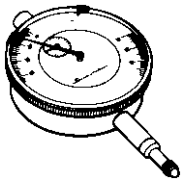
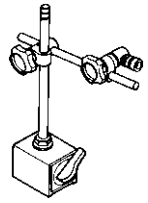
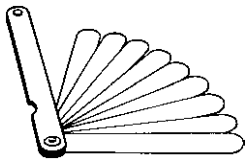
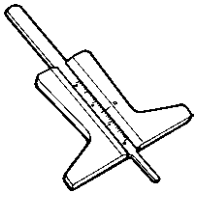
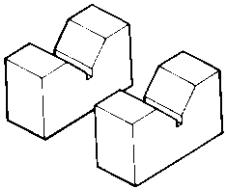
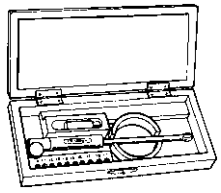
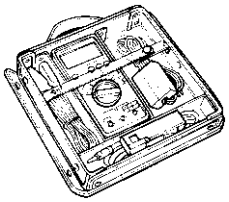
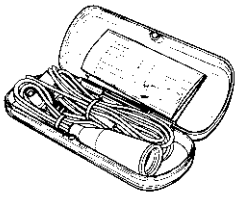
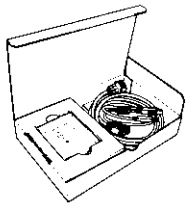
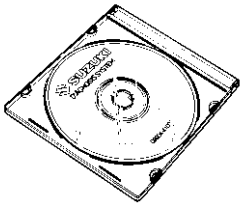
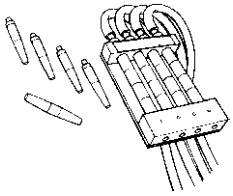
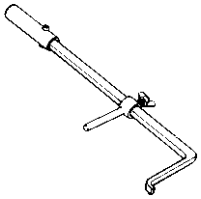
①	PAIR control solenoid valve	*1	From air cleaner
②	PAIR reed valve	*2	To #1 cylinders
Ⓐ	FRESH AIR	*3	To #2 cylinders

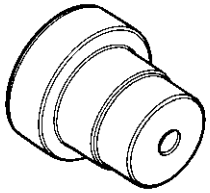
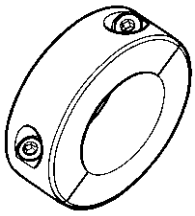
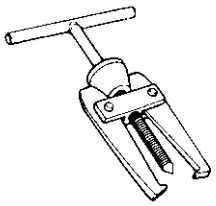
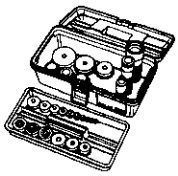
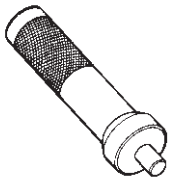
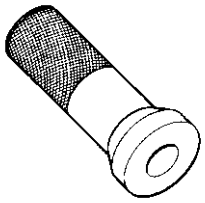
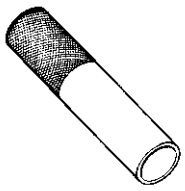
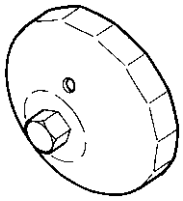
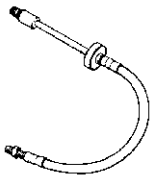
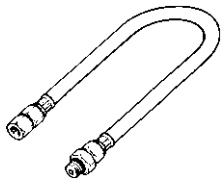
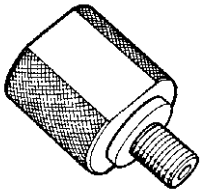
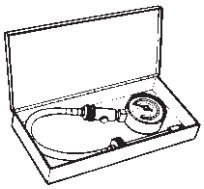
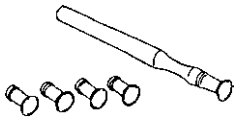
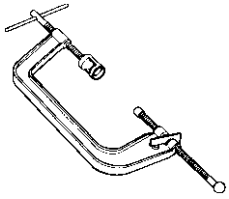
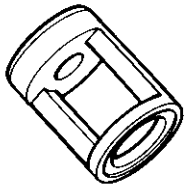
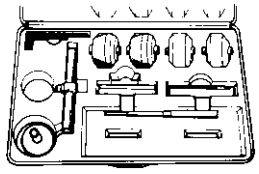
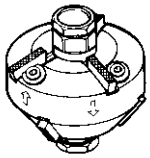
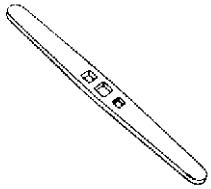
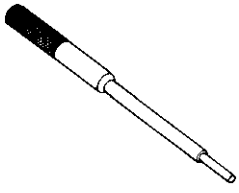
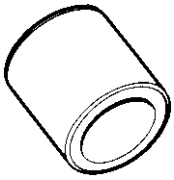
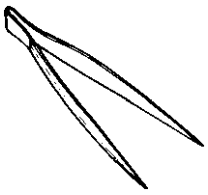
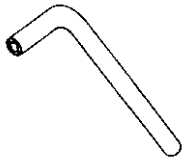
PAIR (AIR SUPPLY) SYSTEM HOSE ROUTING

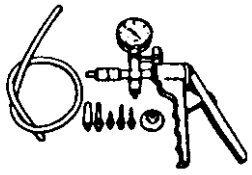
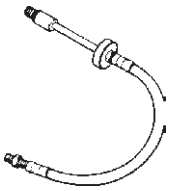
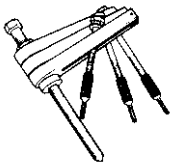
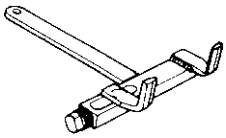
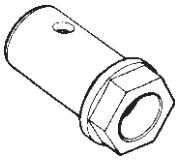
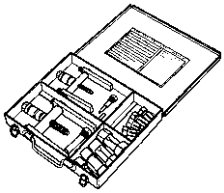
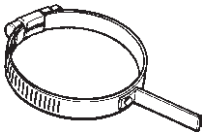
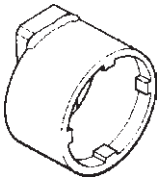
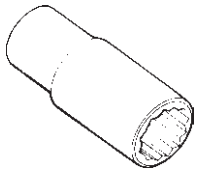
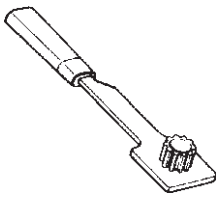
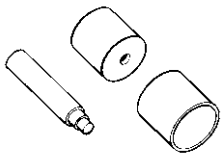
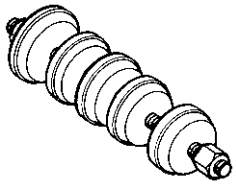
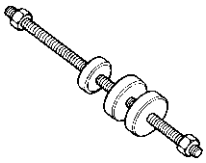
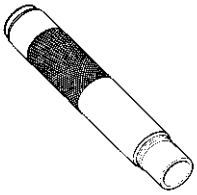
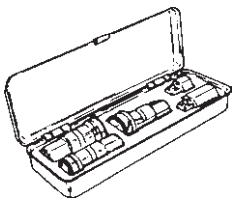
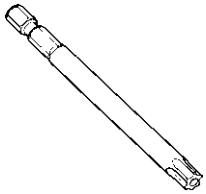
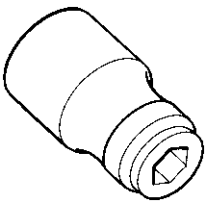
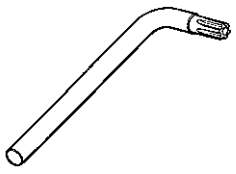
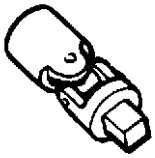
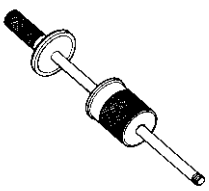
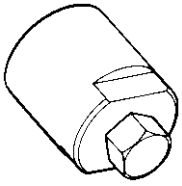
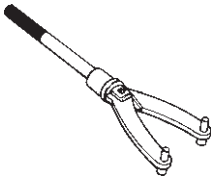
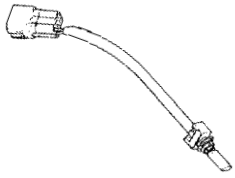


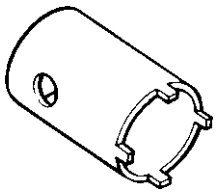
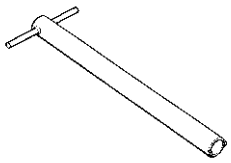
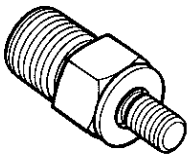
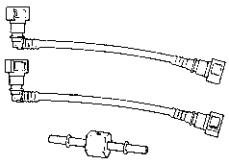
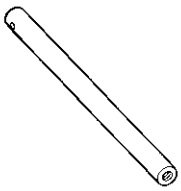
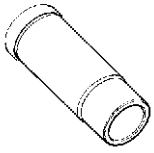
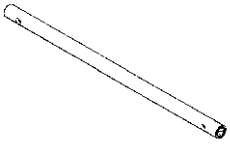
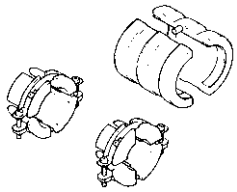
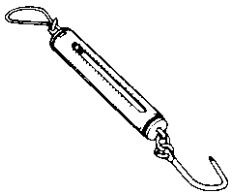
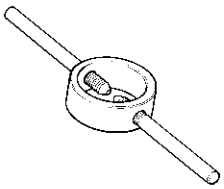
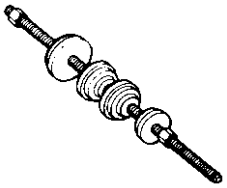
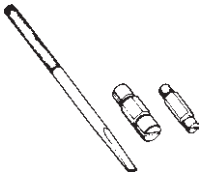
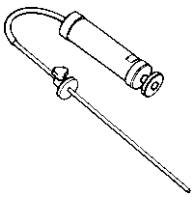
①	PAIR control solenoid valve	*2	Matching mark
②	Throttle body	*3	Do not contact the hose and throttle cable drum.
③	Bolt	*4	The sealant side should face PAIR pipe side.
*1	To air cleaner box	*5	With the bolt lightly contacted with the PAIR pipe, tighten the bolt.

SPECIAL TOOLS

 09900-06107 Snap ring pliers	 09900-06108 Snap ring pliers	 09900-09004 Impact driver set	 09900-18710 Hexagon socket (12 mm)	 09900-20101 09900-20102 Vernier calipers
 09900-20202 Micrometer (25 – 50 mm)	 09900-20203 Micrometer (50 – 75 mm)	 09900-20204 Micrometer (75 – 100 mm)	 09900-20205 Micrometer (0 – 25 mm)	 09900-20508 Cylinder gauge set
 09900-20602 Dial gauge (1/1000 mm, 1 mm)	 09900-20605 Dial calipers (1/100 mm, 10 – 34 mm)	 09900-20607 Dial gauge (1/100 mm, 10 mm)	 09900-20701 Magnetic stand	 09900-20803 09900-20806 Thickness gauge
 09900-20805 Tire depth gauge	 09900-21304 V-block set (100 mm)	 09900-22301 09900-22302 Plastigauge	 09900-22401 (10 – 18 mm) 09900-22403 (18 – 35 mm) Small bore gauge	 09900-25008 Multi circuit tester set
 09900-25009 Needle pointed probe set	 09904-41010 SDS Set	 99565-01010-005 CD-ROM Ver. 5	 09913-13121 Vacuum balancer gauge	 09913-50121 Oil seal remover

 **09913-60230** **Journal bearing remover/installer**	 **09913-60241** **Journal bearing remover/installer**	 **09913-60910** **Bearing puller**	 **09913-70210** **Bearing installer set**	 **09913-75821** **Bearing installer**
 **09913-76010** **Bearing installer**	 **09913-84510** **Bearing installer**	 **09915-40610** **Oil filter wrench**	 **09915-63210** **Adaptor**	 **09915-74511** **Oil pressure gauge hose**
 **09915-74532** **Oil pressure gauge adaptor**	 **09915-64512** **Compression gauge set**	 **09915-77331** **Meter (for high pressure)**	 **09916-10911** **Valve lapper set**	 **09916-14510** **Valve lifter**
 **09916-14910** **Valve lifter attachment**	 **09916-21111** **Valve seat cutter set**	 **09916-22430** **Valve seat cutter (N-128)**	 **09916-34542** **Reamer handle**	 **09916-34550** **Valve guide reamer (5.5 mm)**
 **09916-34580** **Valve guide reamer (10.8 mm)**	 **09916-44910** **Valve guide remover/installer**	 **09916-44920** **Valve guide installer attachment**	 **09916-84511** **Tweezers**	 **09917-10410** **Valve adjust driver**

				
09917-47011 **Vacuum pump gauge**	**09918-03810** **Compression gauge adaptor**	**09918-53810** **Chain tensioner lock tool**	**09920-13120** **Crankcase & Shaft remover**	**09920-53740** **Clutch sleeve hub holder**
				
09921-21820 **Bearing retainer wrench**	**09921-20240** **Bearing remover set**	**09923-73210** **Bearing remover**	**09924-34510** **Backlash measuring tool (ϕ27 – 50)**	**09924-62410** **Final drive gear bearing holder wrench**
				
09924-62430 **22 mm Long socket**	**09924-64510** **Final drive gear coupring holder**	**09924-74570** **Final drive gear bearing remover/installer**	**09924-84510** **Bearing installer set**	**09924-84521** **Bearing installer**
				
09925-18011 **Steering bearing installer**	**09930-10121** **Spark plug wrench set**	**09930-11920** **Torx bit JT40H**	**09930-11940** **Bit holder**	**09930-11950** **Torx wrench**
				
09930-14530 **Universal joint**	**09930-30104** **Sliding shaft**	**09930-33730** **Rotor remover**	**09930-40113** **Rotor holder**	**09930-82720** **Mode selection switch**

 **09940-14911 Steering stem nut wrench**	 **09940-30221 Front fork assembling tool**	 **09940-40211 Fuel pressure gauge adaptor**	 **09940-40220 Fuel pressure gauge hose attachment**	 **09940-50120 Front fork inner rod holder**
 **09940-51410 Bearing installer**	 **09940-52841 Inner rod holder**	 **09940-52861 Front fork oil seal installer**	 **09940-92720 Spring scale**	 **09940-94922 Front fork spring stopper plate**
 **09940-94930 Front fork spacer holder**	 **09941-34513 Steering race installer**	 **09941-50111 Bearing remover set**	 **09941-64511 Bearing remover**	 **09941-74911 Steering bearing installer**
 **09943-74111 Fork oil level gauge**				

NOTE:
When order the special tool, please confirm whether it is available or not.

TIGHTENING TORQUE
ENGINE

ITEM			N·m	kgf-m	lb-ft
Rocker arm shaft			27	2.7	19.5
Cylinder head cover bolt		6 mm	10	1.0	7.0
		8 mm	25	2.5	18.0
Cylinder head bolt and nut	8 mm	Initial	10	1.0	7.0
		Final	25	2.5	18.0
	10 mm	Initial	25	2.5	18.0
		Final	38	3.8	27.5
Cam sprocket bolt			15	1.5	11.0
Cam chain tension adjuster mounting bolt			10	1.0	7.0
Cam chain tensioner bolt			10	1.0	7.0
Primary drive gear bolt			95	9.5	68.5
Clutch spring set bolt			10	1.0	7.0
Clutch sleeve hub nut			60	6.0	47.0
Driveshaft bolt			65	6.5	44.2
Secondary drive gear shaft nut			105	10.5	76.0
Secondary gear case bolt		Initial	15	1.5	11.0
		Final	22	2.2	16.0
Generator rotor bolt			160	16.0	115.5
Starter clutch allen bolt			26	2.6	19.0
Crankcase bolt	6 mm		11	1.1	8.0
	8 mm	Initial	15	1.5	11.0
		Final	22	2.2	16.0
Conrod cap nut		Initial	25	2.5	18.0
		Final	51	5.1	37.0
Oil pressure regulator			28	2.8	20.0
Oil pump mounting bolt			11	1.1	8.0
Oil pressure switch			14	1.4	10.0
Oil drain plug			21	2.1	15.0
Rocker arm valve adjuster bolt			15	1.5	11.0
Oil plug		6 mm	6.0	0.6	4.3
		8 mm	18	1.8	13.0
		10 mm	15	1.5	11.0
		14 mm	23	2.3	16.5
		16 mm	35	3.5	25.5
Engine mounting bolt			79	7.9	57.0
Engine mounting bracket bolt			23	2.3	16.5
Frame mounting bolt/nut		8 mm	23	2.3	16.5
		10 mm	50	5.0	36.0
Exhaust pipe clamp bolt			23	2.3	16.5
Muffler mounting bolt			23	2.3	16.5
Speed sensor rotor bolt			100	10.0	72.5
Spark plug			18	1.8	13.0

SECONDARY AND FINAL

ITEM		N·m	kgf-m	lb-ft
Secondary drive bevel gear bearing retainer bolt		23	2.3	16.5
Secondary driven bevel gear bolt		23	2.3	16.5
Secondary driven bevel gear bearing stopper		105	10.5	76.0
Secondary drive gear shaft nut		105	10.5	76.0
Final gear case nut		40	4.0	29.0
Final drive bevel gear coupling nut		100	10.0	72.5
Final drive bevel gear bearing stopper		110	11.0	79.5
Final gear case oil drain plug		23	2.3	16.5
Final gear case bolt	8 mm	23	2.3	16.5
	10 mm	50	5.0	36.0
Final driven bevel gear bearing retainer screw		9	0.9	6.5

FI SYSTEM AND INTAKE AIR SYSTEM

ITEM	N·m	kgf-m	lb-ft
CKP sensor mounting bolt	8	0.8	6.0
IAT sensor	18	1.8	13.0
Fuel delivery pipe mounting screw	3.5	0.35	2.5
Fuel pump mounting bolt	10	1.0	7.0
TPS and STPS mounting screw	3.5	0.35	2.5

COOLING SYSTEM

ITEM	N·m	kgf-m	lb-ft
Water pump cover bolt	6	0.6	4.5
Water pump mounting screw	10	1.0	7.0
Cooling fan thermo-switch	17	1.7	12.5
ECT sensor	18	1.8	13.0

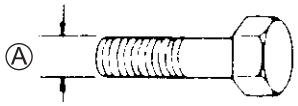
CHASSIS

ITEM	N·m	kgf-m	lb-ft
Front axle	65	6.5	47.0
Front axle pinch bolt	23	2.3	16.5
Brake disc bolt	23	2.3	16.5
Front fork cap bolt	23	2.3	16.5
Front fork spring stopper nut	35	3.5	25.5
Front fork damper rod bolt	40	4.0	29.0
Front fork upper clamp bolt	23	2.3	16.5
Front fork lower clamp bolt	30	3.0	21.5
Front fork inner rod lock-nut	15	1.5	11.0
Steering stem head nut	90	9.0	65.0
Steering stem nut	45	4.5	32.5
Front master cylinder mounting bolt	10	1.0	7.0
Front brake caliper mounting bolt	39	3.9	28.0
Brake hose union bolt	23	2.3	16.5
Air bleeder valve	7.5	0.75	5.5
Handlebar set bolt	23	2.3	16.5
Handlebar holder nut	45	4.5	32.5
Front footrest bracket mounting bolt	55	5.5	40.0
Frame down tube mounting bolt (M8)	23	2.3	16.5
Frame down tube mounting bolt (M10)	50	5.0	36.0
Rear brake pedal bolt	11	1.1	8.0
Rear swingarm pivot bolt (Left)	100	10.0	72.5
Rear swingarm pivot bolt (Right)	9.5	0.95	7.0
Rear swingarm pivot bolt lock nut	100	10.0	72.5
Rear shock absorber mounting nut (Upper and Lower)	50	5.0	36.0
Rear cushion lever/rod mounting nut	78	7.8	57.5
Rear axle nut	65	6.5	47.0
Rear torque link nut (front)	35	3.5	25.5
Rear torque link nut (rear)	25	2.5	18.0
Rear brake link pivot bolt	29	2.9	21.0
Rear brake cam lever bolt	10	1.0	7.3
Driven joint stopper bolt	10	1.0	7.0
Frame handle grip mounting bolt (M10)	50	5.0	36.0
Fuel level gauge mounting bolt	10	1.0	7.0

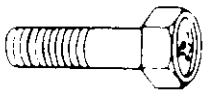
TIGHTENING TORQUE CHART

For other nuts and bolts not listed in the preceding page, refer to this chart:

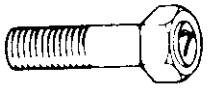
Bolt Diameter Ⓐ (mm)	Conventional or "4" marked bolt			"7" marked bolt		
	N·m	kgf-m	lb-ft	N·m	kgf-m	lb-ft
4	1.5	0.15	1.0	2.3	0.23	1.5
5	3	0.3	2.0	4.5	0.45	3.0
6	5.5	0.55	4.0	10	1.0	7.0
8	13	1.3	9.5	23	2.3	16.5
10	29	2.9	21.0	50	5.0	36.0
12	45	4.5	32.5	85	8.5	61.5
14	65	6.5	47.0	135	13.5	97.5
16	105	10.5	76.0	210	21.0	152.0
18	160	16.0	115.5	240	24.0	173.5



Conventional bolt



"4" marked bolt



"7" marked bolt

SERVICE DATA

VALVE + GUIDE

Unit: mm (in)

ITEM	STANDARD		LIMIT
Valve diam.	IN.	30 (1.18)	—
	EX.	26 (1.02)	—
Valve clearance (when cold)	IN.	0.08 – 0.13 (0.003 – 0.005)	—
	EX.	0.17 – 0.22 (0.007 – 0.009)	—
Valve guide to valve stem clearance	IN.	0.010 – 0.037 (0.0004 – 0.0015)	—
	EX.	0.030 – 0.057 (0.0012 – 0.0022)	—
Valve guide I.D.	IN. & EX.	5.500 – 5.512 (0.2165 – 0.2170)	—
Valve stem O.D.	IN.	5.475 – 5.490 (0.2156 – 0.2161)	—
	EX.	5.455 – 5.470 (0.2148 – 0.2154)	—
Valve stem deflection	IN. & EX.	—	0.35 (0.014)
Valve stem runout	IN. & EX.	—	0.05 (0.002)
Valve head thickness	IN. & EX.	—	0.5 (0.02)
Valve stem end length	IN. & EX.	—	3.1 (0.12)
Valve seat width	IN. & EX.	0.9 – 1.1 (0.035 – 0.043)	—
Valve head radial runout	IN. & EX.	—	0.03 (0.001)
Valve spring free length	INNER	—	38.3 (1.51)
	OUTER	—	40.1 (1.58)
Valve spring tension	INNER	64 – 73 N (6.51 – 7.49 kgf, 14.35 – 16.51 lbs) at length 32.5 mm (1.28 in)	—
	OUTER	119 – 136 N (12.09 – 13.91 kgf, 26.65 – 30.67 lbs) at length 36.0 mm (1.42 in)	—

CAMSHAFT + CYLINDER HEAD

Unit: mm (in)

ITEM	STANDARD		LIMIT
Cam height	IN.	35.50 – 35.54 (1.398 – 1.399)	35.20 (1.386)
	EX.	36.58 – 36.62 (1.440 – 1.442)	36.28 (1.428)
Camshaft journal oil clearance	0.032 – 0.066 (0.0013 – 0.0026)		0.150 (0.0059)
Camshaft journal holder I.D.	Rear left side Front right side	20.012 – 20.025 (0.7879 – 0.7884)	—
	Rear right side Front left side	25.012 – 25.025 (0.9847 – 0.9852)	—
Camshaft journal O.D.	Rear left side Front right side	19.959 – 19.980 (0.7858 – 0.7866)	—
	Rear right side Front left side	24.959 – 24.980 (0.9826 – 0.9835)	—
Camshaft runout	—		0.10 (0.004)
Rocker arm I. D.	IN. & EX.	12.000 – 12.018 (0.4724 – 0.4731)	—
Rocker arm shaft O. D.	IN. & EX.	11.977 – 11.995 (0.4715 – 0.4722)	—
Cylinder head distortion	—		0.05 (0.002)
Cylinder head cover distortion	—		0.05 (0.002)

CYLINDER + PISTON + PISTON RING

Unit: mm (in)

ITEM	STANDARD			LIMIT
Compression pressure	1 300 – 1 700 kPa (13 – 17 kgf/cm², 185 – 242 psi)			1 100 kPa (11 kgf/cm² 156 psi)
Compression pressure difference	—			200 kPa (2 kgf/cm² 28 psi)
Piston to cylinder clearance	0.045 – 0.055 (0.0018 – 0.0022)			0.120 (0.0047)
Cylinder bore	83.000 – 83.015 (3.2677 – 3.2683)			83.085 (3.2711)
Piston diam.	82.950 – 82.965 (3.2657 – 3.2663) Measure at 15 mm (0.6 in) from the skirt end.			82.880 (3.2630)
Cylinder distortion	—			0.05 (0.002)
Piston ring free end gap	1st		Approx. 9.6 (0.38)	7.7 (0.30)
	2nd	R	Approx. 11.8 (0.46)	9.4 (0.37)
Piston ring end gap	1st		0.20 – 0.35 (0.008 – 0.014)	0.70 (0.028)
	2nd		0.20 – 0.35 (0.008 – 0.014)	0.70 (0.028)
Piston ring to groove clearance	1st		—	0.180 (0.007)
	2nd		—	0.150 (0.006)

ITEM	STANDARD		LIMIT
Piston ring groove width	1st	1.01 – 1.03 (0.0398 – 0.0406)	—
	2nd	1.21 – 1.23 (0.0476 – 0.0484)	—
	Oil	2.51 – 2.53 (0.0988 – 0.0996)	—
Piston ring thickness	1st	0.970 – 0.990 (0.0382 – 0.0390)	—
	2nd	1.170 – 1.190 (0.0461 – 0.0469)	—
Piston pin bore	20.002 – 20.008 (0.7875 – 0.7877)		20.030 (0.7886)
Piston pin O.D.	19.992 – 20.000 (0.7871 – 0.7874)		19.980 (0.7866)

CONROD + CRANKSHAFT

Unit: mm (in)

ITEM	STANDARD	LIMIT
Conrod small end I.D.	20.010 – 20.018 (0.7878 – 0.7881)	20.040 (0.7890)
Conrod big end side clearance	0.10 – 0.20 (0.004 – 0.008)	0.30 (0.012)
Conrod big end width	21.95 – 22.00 (0.864 – 0.866)	—
Crank pin width	22.10 – 22.15 (0.870 – 0.872)	—
Conrod big end oil clearance	0.024 – 0.042 (0.0009 – 0.0017)	0.080 (0.0031)
Crank pin O.D.	40.982 – 41.000 (1.6135 – 1.6142)	—
Crankshaft journal oil clearance	0.002 – 0.029 (0.00008 – 0.0011)	0.080 (0.0031)
Crankshaft journal O.D.	47.965 – 47.980 (1.8884 – 1.8890)	—
Crankshaft thrust bearing thickness	1.925 – 2.175 (0.0758 – 0.0856)	—
Crankshaft thrust clearance	0.05 – 0.10 (0.002 – 0.004)	—
Crankshaft runout	—	0.05 (0.002)

OIL PUMP

ITEM	STANDARD	LIMIT
Oil pressure (at 60 °C, 140 °F)	350 – 650 kPa (3.5 – 6.5 kgf/cm^2, 50 – 92 psi) at 3 000 r/min	—

CLUTCH

Unit: mm (in)

ITEM	STANDARD		LIMIT
Clutch lever play	10 – 15 (0.4 – 0.6)		—
Clutch release screw	1/4 turn back		—
Drive plate thickness	No. 1	2.92 – 3.08 (0.115 – 0.121)	2.62 (0.103)
	No. 2	3.42 – 3.58 (0.135 – 0.141)	3.12 (0.123)
Drive plate claw width	15.9 – 16.0 (0.626 – 0.630)		15.1 (0.594)
Driven plate distortion	—		0.10 (0.004)
Clutch spring free length	49.2 (1.94)		46.8 (1.84)

TRANSMISSION

Unit: mm (in) Except ratio

ITEM		STANDARD		LIMIT
Primary reduction ratio		1.690 (71/42)		—
Secondary reduction ratio		1.000 (30/30)		—
Final reduction ratio		3.503 (17/15 × 34/11)		—
Gear ratios	Low	2.461 (32/13)		—
	2nd	1.631 (31/19)		—
	3rd	1.227 (27/22)		—
	4th	1.000 (25/25)		—
	Top	0.814 (22/27)		—
Shift fork to groove clearance		No. 1	0.10 – 0.30 (0.004 – 0.012)	0.50 (0.020)
		No. 2	0.10 – 0.30 (0.004 – 0.012)	0.50 (0.020)
Shift fork groove width		No. 1	5.50 – 5.60 (0.217 – 0.220)	—
		No. 2	4.50 – 4.60 (0.177 – 0.181)	—
Shift fork thickness		No. 1	5.30 – 5.40 (0.209 – 0.213)	—
		No. 2	4.30 – 4.40 (0.169 – 0.173)	—

SHAFT DRIVE

Unit: mm (in)

ITEM	STANDARD		LIMIT
Secondary bevel gear backlash	0.05 – 0.32 (0.002 – 0.013)		—
Final bevel gear backlash	Drive side	0.03 – 0.064 (0.001 – 0.025)	—
Damper spring free length	—		58.5 (2.30)

THERMOSTAT + RADIATOR + FAN + ENGINE COOLANT

ITEM	STANDARD/SPECIFICATION		NOTE
Thermostat valve opening temperature	Approx. 75 °C (167 °F)		—
Thermostat valve lift	Over 6 mm (0.24 in) at 90 °C (194 °F)		—
ECT sensor resistance	20 °C (68 °F)	Approx. 2.45 kΩ	—
	40 °C (104 °F)	Approx. 1.148 kΩ	—
	60 °C (140 °F)	Approx. 0.587 kΩ	—
	80 °C (176 °F)	Approx. 0.322 kΩ	—
Radiator cap valve opening pressure	95 – 125 kPa (0.95 – 1.25 kgf/cm², 13.5 – 17.8 psi)		—
Cooling fan thermo-switch operating temperature	OFF→ON	Approx. 105 °C (221 °F)	—
	ON→OFF	Approx. 100 °C (212 °F)	—
Engine coolant type	Use an antifreeze/coolant compatible with aluminum radiator, mixed with distilled water only, at the ratio of 50:50.		—
Engine coolant capacity	1 500 ml (1.6/1.3 US/Imp qt)		—

INJECTOR + FUEL PUMP + FUEL PRESSURE REGULATOR

ITEM	SPECIFICATION	NOTE
Injector resistance	11 – 13 Ω at 20 °C (68 °F)	
Fuel pump discharge amount	Approx. 168 ml (5.7/5.9 US/Imp oz) and more/10 sec.	
Fuel pressure regulator operating set pressure	Approx. 300 kPa (3.0 kgf/cm², 43 psi)	

FI SENSORS+ SECONDARY THROTTLE VALVE ACTUATOR

ITEM	SPECIFICATION		NOTE
CKP sensor resistance	184 – 276 Ω		
CKP sensor peak voltage	4.0 V and more		When cranking
IAP sensor input voltage	4.5 – 5.5 V		
IAP sensor output voltage	Approx. 2.6 V at idle speed		
TP sensor input voltage	4.5 – 5.5 V		
TP sensor resistance	Closed	Approx. 1.1 kΩ	
	Opened	Approx. 4.4 kΩ	
TP sensor output voltage	Closed	Approx. 1.1 V	
	Opened	Approx. 4.4 V	
ECT sensor input voltage	4.5 – 5.5 V		
ECT sensor resistance	Approx. 2.45 kΩ at 20 °C (68 °F)		
IAT sensor input voltage	4.5 – 5.5 V		
IAT sensor resistance	Approx. 2.6 kΩ at 20 °C (68 °F)		
TO sensor resistance	19.1 – 19.7 kΩ		
TO sensor voltage	Normal	0.4 – 1.4 V	
	Leaning	3.7 – 4.4 V	When leaning 65°
GP switch voltage	0.6 V and more		From 1st to Top
Injector voltage	Battery voltage		
STP sensor input voltage	4.5 – 5.5 V		
STP sensor resistance	Closed	Approx. 0.5 kΩ	
	Opened	Approx. 3.9 kΩ	
STP sensor output voltage	Closed	Approx. 0.5 V	
	Opened	Approx. 3.9 V	
STV actuator resistance	Approx. 6.5 Ω		
Heated oxygen sensor output voltage	0.2 V and less at idle speed		For E-02, 19, 24
	0.7 V and more at 5 000 r/min		
Heated oxygen sensor resistance	6.5 – 8.9 Ω at 23 °C (73.4 °F)		
PAIR solenoid valve resistance	20 – 24 Ω at 20 – 30 °C (68 – 86 °F)		

THROTTLE BODY

ITEM	SPECIFICATION
Bore size	34 mm
I.D. No.	41F1 (For E-33), 41F0 (For the others)
Idle r/min	1 100 ± 100 r/min
Fast idle r/min	1 800 r/min (When cold engine)
Throttle cable play	2.0 – 4.0 mm (0.08 – 0.16 in)

ELECTRICAL

Unit: mm (in)

ITEM			SPECIFICATION		NOTE	
Firing order			1·2			
Spark plug			Type	NGK: DPR7EA-9 DENSO: X22EPR-U9		
			Gap	0.8 – 0.9 (0.031 – 0.035)		
Spark performance			Over 8 (0.3) at 1 atm.			
CKP sensor resistance			184 – 276 Ω			
CKP sensor peak voltage			4.0 V and more			
Ignition coil resistance			Primary	2 – 6 Ω	Terminal – Terminal	
			Secondary	15 – 30 kΩ	Plug cap – Terminal	
Ignition coil primary peak voltage			205 V and more		#1	⊕ W ⊖ Ground
					#2	⊕ B/Y ⊖ Ground
Generator coil resistance			0.2 – 1.5 Ω			
Generator no-load voltage (when engine is cold)			70 V (AC) and more at 5 000 r/min		Y – Y	
Regulated voltage			14.0 – 15.5 V at 5 000 r/min		Y – Y	
Generator maximum output			350 W at 5 000 r/min			
Starter relay resistance			3 – 7 Ω			
GP switch voltage			0.6 V and more (From 1st to top without neutral)			
Battery	Type designation		FTX12-BS			
	Capacity		12 V 36 kC (10 Ah)/10 HR			
Fuse size	Headlight	HI	10 A			
		LO	10 A			
	Signal		10 A			
	Ignition		15 A			
	Fuel		10 A			
	Main		30 A			
	Power source		10 A			

WATTAGE

Unit: W

ITEM		SPECIFICATION		
		E-03, 28, 33	E-24	Others
Headlight	HI	60	←	←
	LO	55	←	←
Position/Parking light				5
Brake light/Taillight		LED	←	←
Turn signal light		21/5 (Front), 21 (Rear)	21	←
Licence plate light		5	←	←
Speedometer light		LED	←	←
Engine coolant temp. warning light		LED	←	←
Turn signal indicator light		LED	←	←
High beam indicator light		LED	←	←
Neutral indicator light		LED	←	←
Oil pressure indicator light		LED	←	←
FI indicator light		LED	←	←

BRAKE + WHEEL

Unit: mm (in)

ITEM	STANDARD		LIMIT
Rear brake pedal free travel	20 – 30 (0.8 – 1.2)		—
Rear brake pedal height	75 – 85 (3.0 – 3.3)		—
Brake drum I.D.	Rear	—	180.7 (7.11)
Brake disc thickness	Front	4.8 – 5.2 (0.19 – 0.21)	4.5 (0.18)
Brake disc runout	—		0.30 (0.012)
Master cylinder bore	Front	12.700 – 12.743 (0.5000 – 0.5017)	—
Master cylinder piston diam.	Front	12.657 – 12.684 (0.4983 – 0.4993)	—
Brake caliper cylinder bore	Front	30.230 – 30.306 (1.1901 – 1.1931)	—
Brake caliper piston diam.	Front	30.150 – 30.200 (1.1870 – 1.1889)	—
Wheel rim runout	Axial	—	2.0 (0.08)
	Radial	—	2.0 (0.08)
Wheel axle runout	Front	—	0.25 (0.010)
	Rear	—	0.25 (0.010)
Wheel rim size	Front	J16 M/C × MT 3.00	—
	Rear	J15 M/C × MT 4.00	—

TIRE

ITEM	STANDARD		LIMIT
Cold inflation tire pressure (Solo riding)	Front	200 kPa (2.00 kgf/cm², 29 psi)	—
	Rear	250 kPa (2.50 kgf/cm², 36 psi)	—
Cold inflation tire pressure (Dual riding)	Front	200 kPa (2.00 kgf/cm², 29 psi)	—
	Rear	250 kPa (2.50 kgf/cm², 36 psi)	—
Tire size	Front	130/90-16 M/C 67H	—
	Rear	170/80-15 M/C 77H	—
Tire type	Front	IRC GS-23F A	—
	Rear	IRC GS-23R A	—
Tire tread depth	Front	—	1.6 (0.06)
	Rear	—	2.0 (0.08)

SUSPENSION

Unit: mm (in)

ITEM	STANDARD	LIMIT
Front fork stroke	140 (5.5)	—
Front fork spring free length	380.4 (14.98)	372 (14.6)
Front fork oil level (without spring)	153 (6.02)	—
Front fork oil type	SUZUKI FORK OIL L01 or an equivalent fork oil	—
Front fork oil capacity (each leg)	490 ml (16.6/17.3 US/Imp oz)	—
Front fork inner tube outside diam.	41 (1.61)	—
Rear shock absorber spring adjuster	3rd	—
Rear wheel travel	105 (4.13)	—
Swingarm pivot shaft runout	—	0.3 (0.01)

FUEL + OIL

ITEM	SPECIFICATION		NOTE
Fuel type	Use only unleaded gasoline of at least 87 pump octane (R/2 + M/2) or 91 octane or higher rated by the research method. Gasoline containing MTBE (Methyl Tertiary Butyl Ether), less than 10% ethanol, or less than 5% methanol with appropriate cosolvents and corrosion inhibitor is permissible.		E-03, 28, 33
	Gasoline used should be graded 91 octane or higher. An unleaded gasoline is recommended.		Others
Fuel tank capacity	Including reserve	15.0 L (4.0/3.3 US/Imp gal)	E-33
	Including reserve	15.5 L (4.1/3.4 US/Imp gal)	Others
	Fuel level indicator light lighting	1.5 L (0.4/0.3 US/Imp gal)	
Engine oil type	SAE 10 W-40, API, SF/SG or SH/SJ with JASO MA		
Engine oil capacity	Change	3 000 ml (3.2/2.6 US/Imp qt)	
	Filter change	3 400 ml (3.6/3.0 US/Imp qt)	
	Overhaul	3 700 ml (3.9/3.3 US/Imp qt)	
Final bevel gear oil type	SAE 90 hypoid gear oil with GL-5 under API classification		
Final bevel gear oil capacity	200 – 220 ml (6.8/7.0 – 7.4/7.7 US/Imp oz)		
Brake fluid type	DOT 4		

EMISSION CONTROL INFORMATION

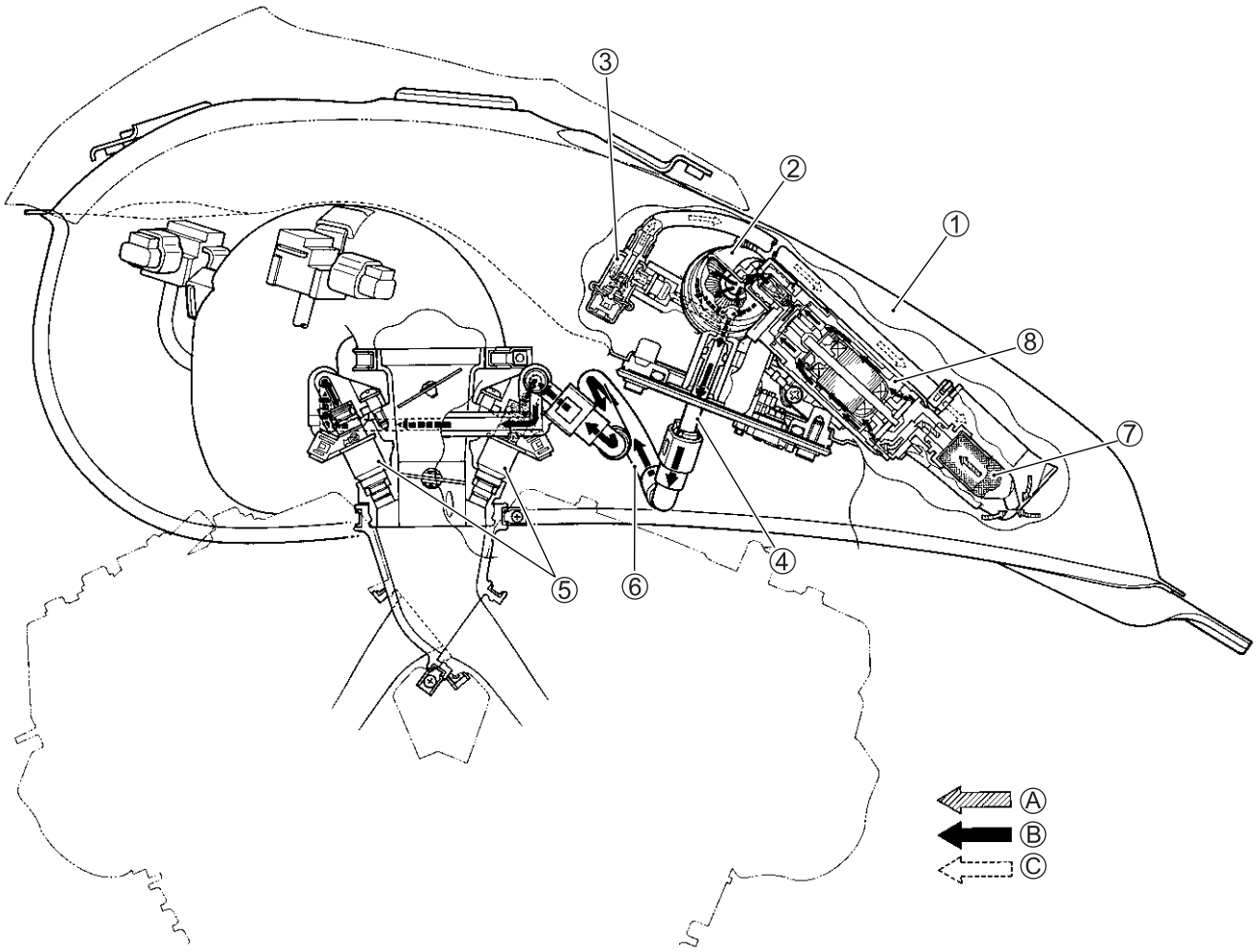
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EMISSION CONTROL SYSTEMS

FUEL INJECTION SYSTEM

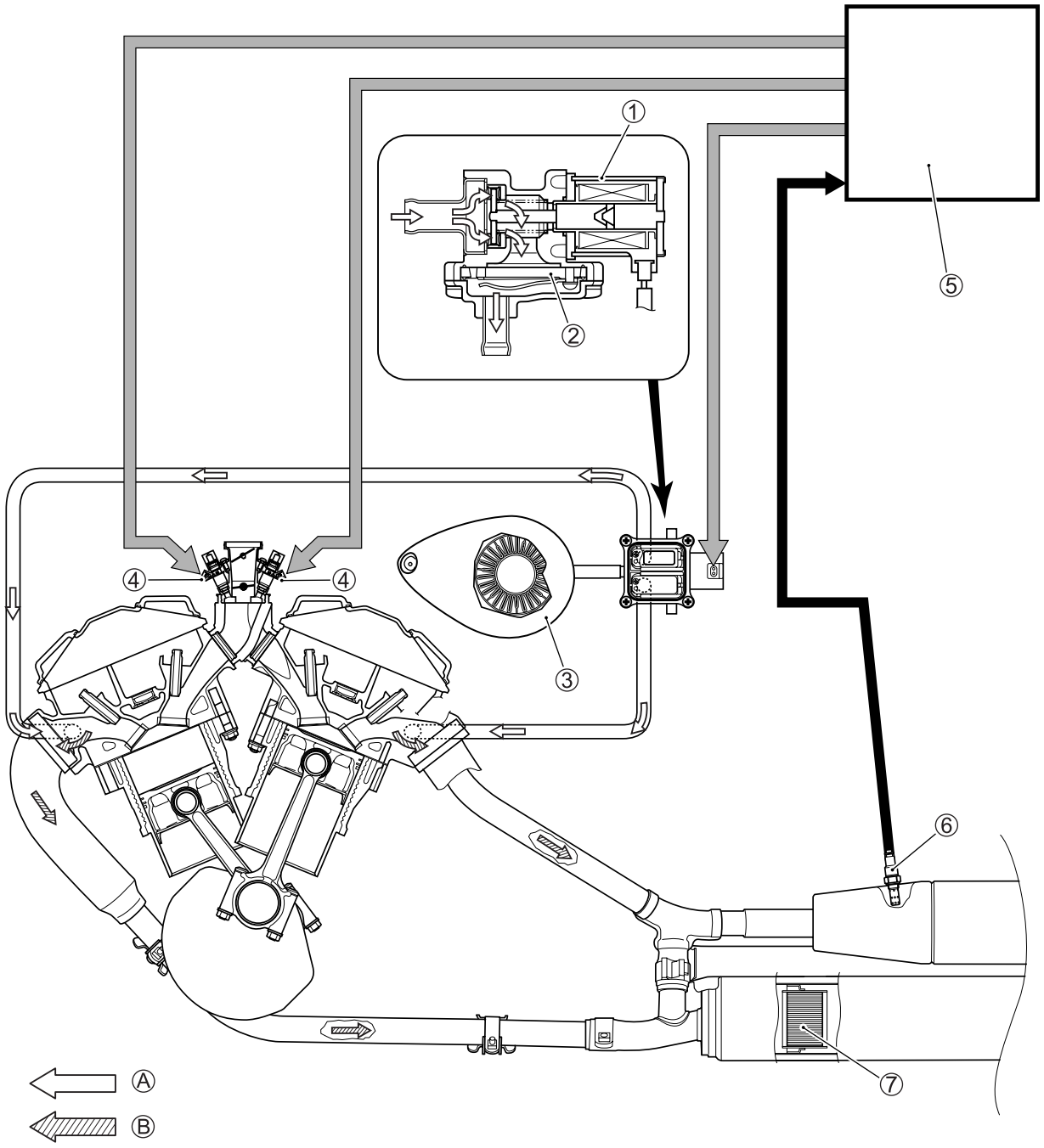
VZ800 motorcycles are equipped with a fuel injection system for emission level control.
This fuel injection system is precision designed, manufactured and adjusted to comply with the applicable emission limits.



①	Fuel tank	⑦	Fuel mesh filter (For low pressure)
②	Fuel filter (For high pressure)	⑧	Fuel pump
③	Fuel pressure regulator	Ⓐ	Before-pressurized fuel
④	Fuel delivery pipe	Ⓑ	Pressurized fuel
⑤	Fuel injector	Ⓒ	Relieved fuel
⑥	Fuel feed hose		

EXHAUST EMISSION CONTROL SYSTEM (PAIR SYSTEM)

The exhaust emission control system is composed of the PAIR system and THREE-WAY CATALYST system (For E-02, 19, 24, 33). The fresh air is drawn into the exhaust port with the PAIR control solenoid valve and PAIR reed valve. The PAIR control solenoid valve is operated by the ECM, and the fresh air flow is controlled according to the TPS, ECTS, IATS, IAPS and CKPS.



①	PAIR control solenoid valve	⑥	HO2 sensor (E-02, 19, 24)
②	PAIR reed valve	⑦	Threeway catalyst (E-02, 19, 24, 33)
③	Air cleaner box	Ⓐ	FRESH AIR
④	Fuel injector	Ⓑ	EXHAUST GAS
⑤	ECM		

NOISE EMISSION CONTROL SYSTEM

TAMPERING WITH THE NOISE CONTROL SYSTEM PROHIBITED: Local law prohibits the following acts or the causing thereof:

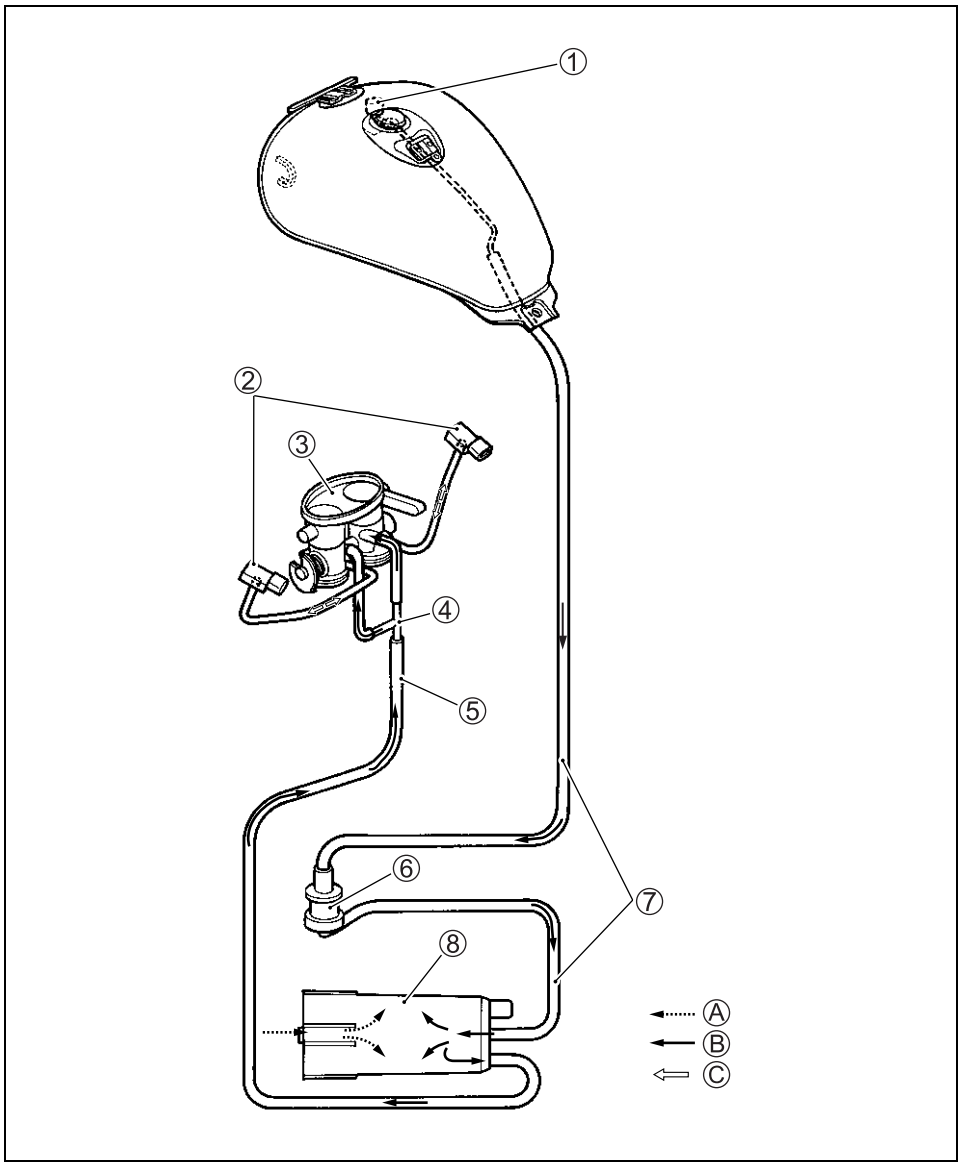
1. The removal or rendering inoperative by any person, other than for purposes of maintenance, repair or replacement, of any device or element of design incorporated into any new vehicle for the purpose of noise control prior to its sale or delivery to the ultimate purchaser or while it is in use, or
2. The use of the vehicle after such device or element of design has been removed or rendered inoperative by any person.

AMONG THOSE ACTS PRESUMED TO CONSTITUTE TAMPERING ARE THE ACTS LISTED BELOW:

- Removing or puncturing the muffler, baffles, header pipes, screen type spark arrester (if equipped) or any other component which conducts exhaust gases.
- Removing or puncturing the air cleaner case, air cleaner cover, baffles or any other component which conducts intake air.
- Replacing the exhaust system or muffler with a system or muffler not marked with the same model specific code as the code listed on the Motorcycle Noise Emission Control Information label.

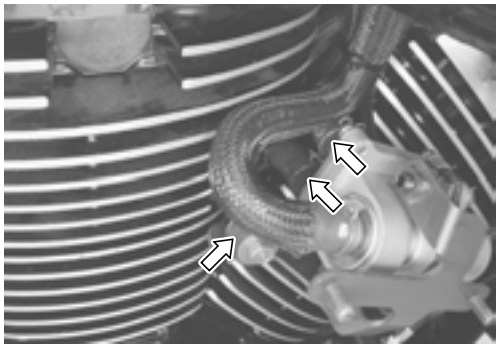
EVAPORATIVE EMISSION CONTROL SYSTEM (Only for E-33)

①	Fuel-vapor separator
②	IAP sensor
③	Throttle body
④	3-way connector
⑤	Purge hose
⑥	Fuel shut-off valve
⑦	Surge hose (red stripe)
⑧	EVAP canister
Ⓐ	FRESH AIR
Ⓑ	HC VAPOR
Ⓒ	VACUUM



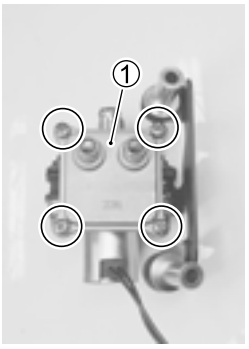
PAIR (AIR SUPPLY) SYSTEM INSPECTION

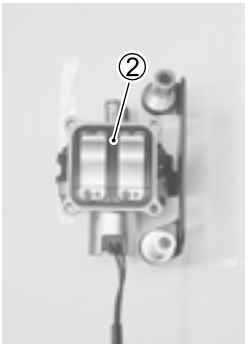
HOSES



- Remove the PAIR cover. (☞3-5)
- Inspect the hoses for wear or damage.
- Inspect that the hoses for secure connection.

PAIR REED VALVE

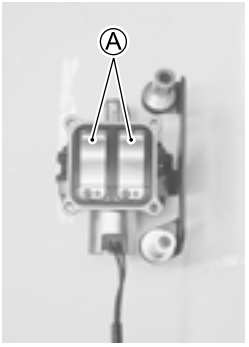


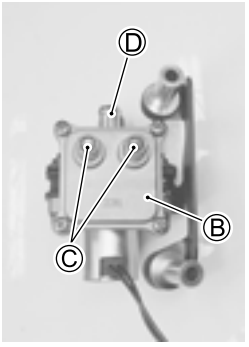


- Remove the PAIR control solenoid valve. (☞3-5)
- Remove the reed valve case ① and PAIR reed valve ②.



- Inspect the reed valve for the carbon deposit.
- If the carbon deposit is found in the reed valve, replace the PAIR control solenoid valve with a new one.

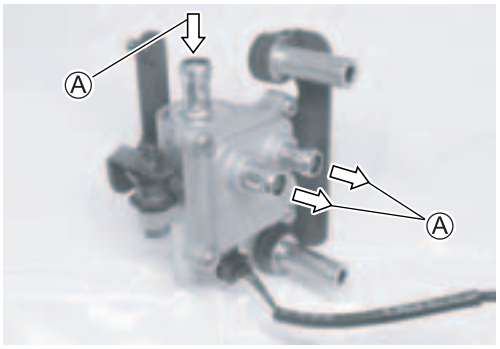




- Install the reed valve Ⓐ and its case Ⓑ with outlet pipes Ⓒ the facing the inlet pipe Ⓓ.

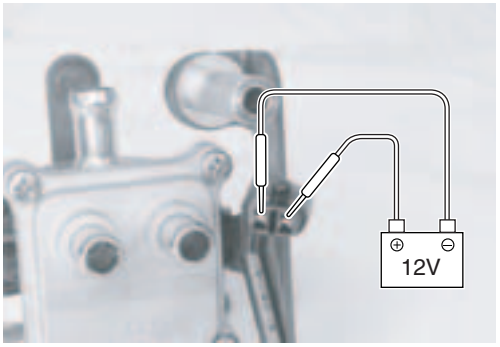
PAIR CONTROL SOLENOID VALVE

- Remove the PAIR control solenoid valve. (☞3-5)
- Check that air flows through the air inlet port to the air outlet port.
- If air does not flow out, replace the PAIR control solenoid valve with a new one.



Ⓐ Air flow

- Connect the 12 V battery to the PAIR control solenoid valve terminals and check the air flow.
- If air does not flow out, the solenoid valve is in normal condition.

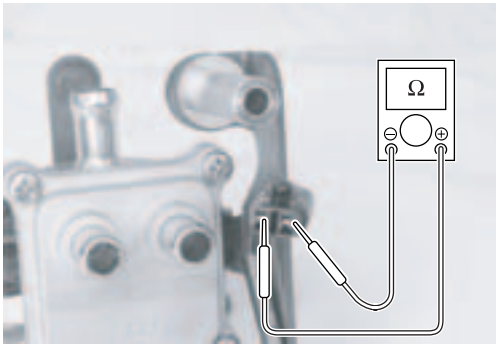


- Check the resistance between the terminals of the PAIR control solenoid valve.

DATA Resistance: 20 – 24 Ω at 20 – 30 °C (68 – 86 °F)

TOOL 09900-25008: Multi-circuit tester set

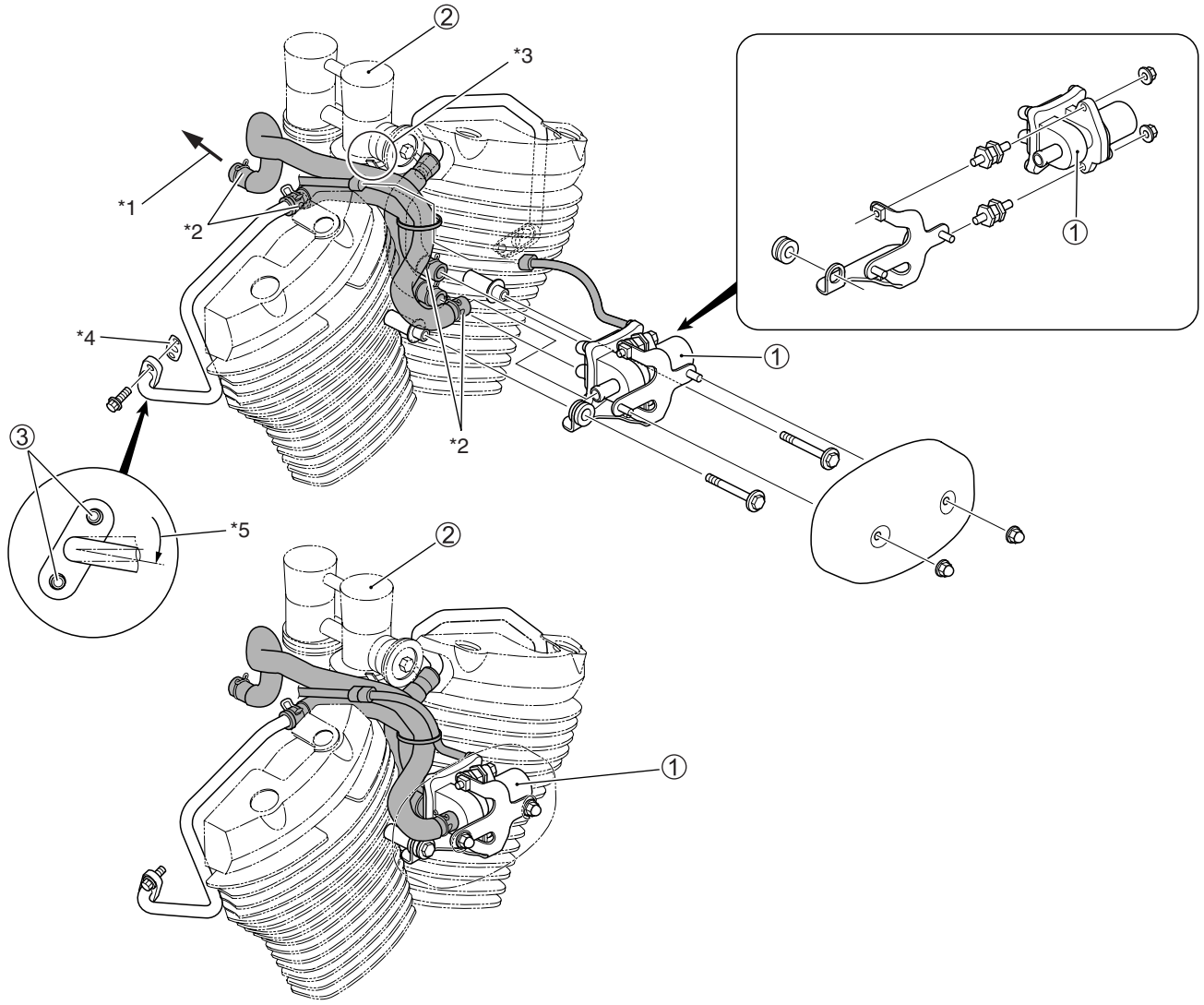
Tester knob indication: Resistance (Ω)



If the resistance is not within the standard range, replace the PAIR control solenoid valve with a new one.
Installation is in the reverse order of removal.

- Connect the PAIR control solenoid valve lead wire coupler and PAIR hoses securely.
- PAIR system hose routing. (☞11-7)

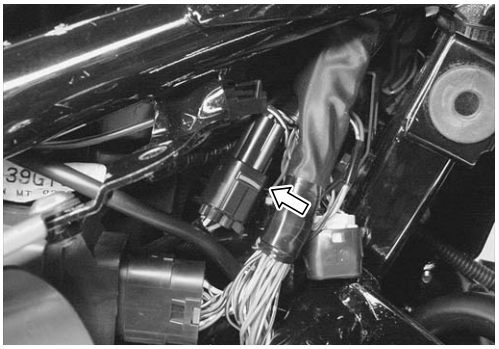
PAIR (AIR SUPPLY) SYSTEM HOSE ROUTING



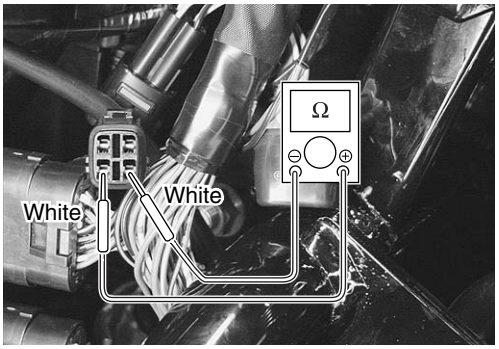
①	PAIR control solenoid valve	*2	Matching mark
②	Throttle body	*3	Do not contact the hose and throttle cable drum.
③	Bolt	*4	The sealant side should face PAIR pipe side.
*1	To air cleaner box.	*5	With the bolt lightly contacted with the PAIR pipe, tighten the bolt.

HEATED OXGEN SENSOR (HO2S) INSPECTION (FOR E-02, 19, 24)

- Disconnect the HO2 sensor lead wire coupler. (☞5-69)
- Inspect the HO2 sensor and its circuit referring to flow table of the malfunction code C44 (P0130/P0135).



- Check the resistance between the terminals of the HO2 sensor.



DATA Resistance: 6.5 – 8.9 Ω at 23 °C (73.4 °F)
(White – White)

TOOL 09900-25008: Multi-circuit tester set

Tester knob indication: Resistance (Ω)

If the resistance is not within the standard range, replace the HO2 sensor with a new one.

NOTE:

** Temperature of the sensor affects resistance value largely.*

** Make sure that the sensor heater is at correct temperature.*

⚠ WARNING

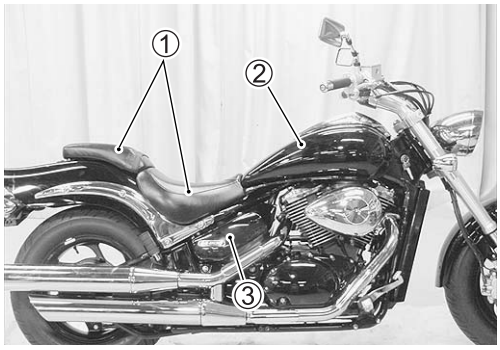
Do not remove the HO2 sensor while it is hot.

CAUTION

Be careful not to expose it to excessive shock.
Do not use an impact wrench while removing or installing the HO2 sensor unit.
Be careful not to twist or damage the sensor lead wire.

EVAPORATIVE EMISSION CONTROL SYSTEM INSPECTION (Only for E-33)

- Remove the seats ①. (☞8-3)
- Remove the fuel tank ②. (☞6-3)
- Remove the right frame cover ③. (☞8-4)



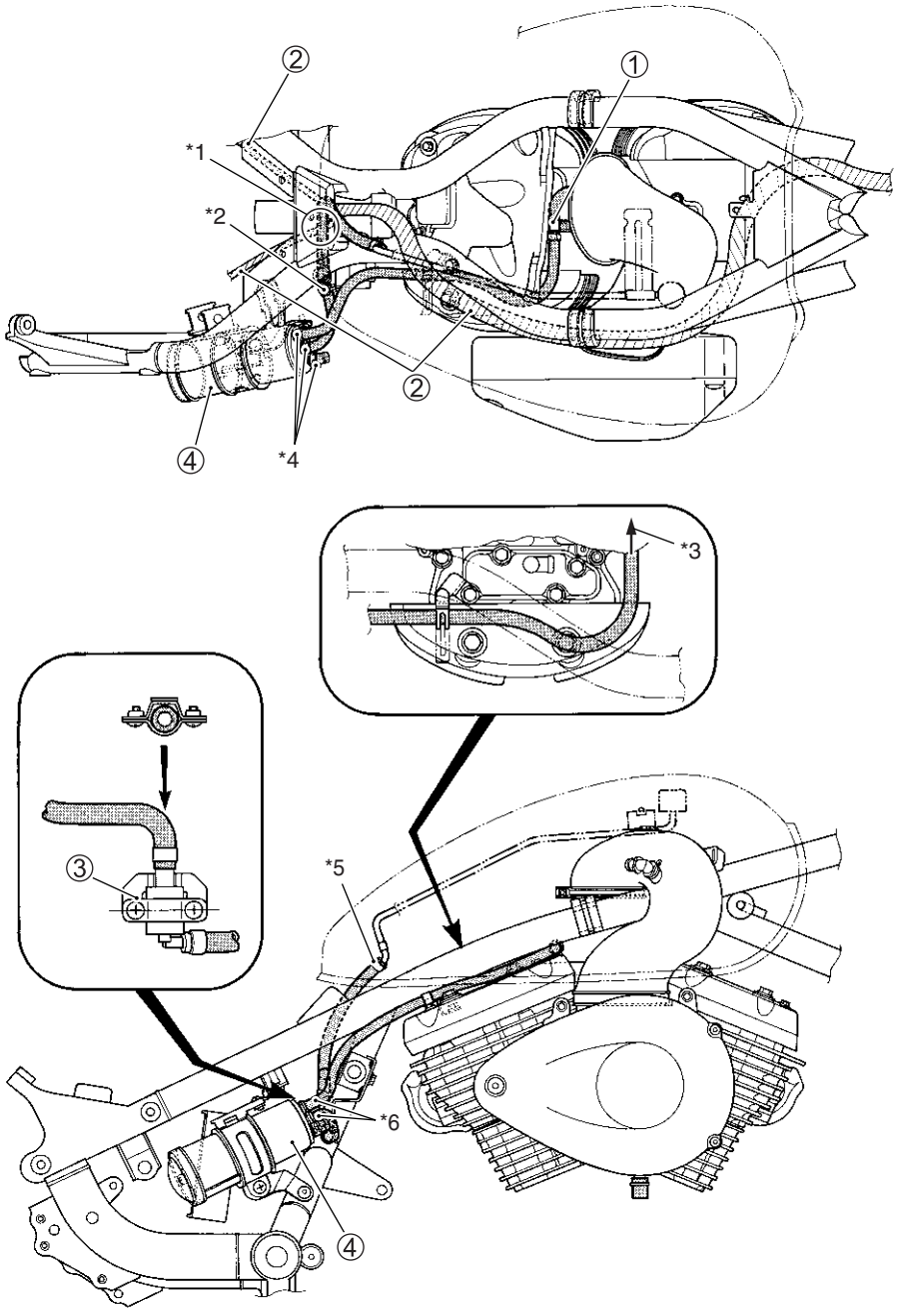
HOSES (EVAP hose)

Inspect the hoses for wear or damage.
Make sure that the hoses are securely connected.

EVAP CANISTER

Inspect the canister for damage to the body.

EVAP CANISTER HOSE ROUTING (Only for E-33)

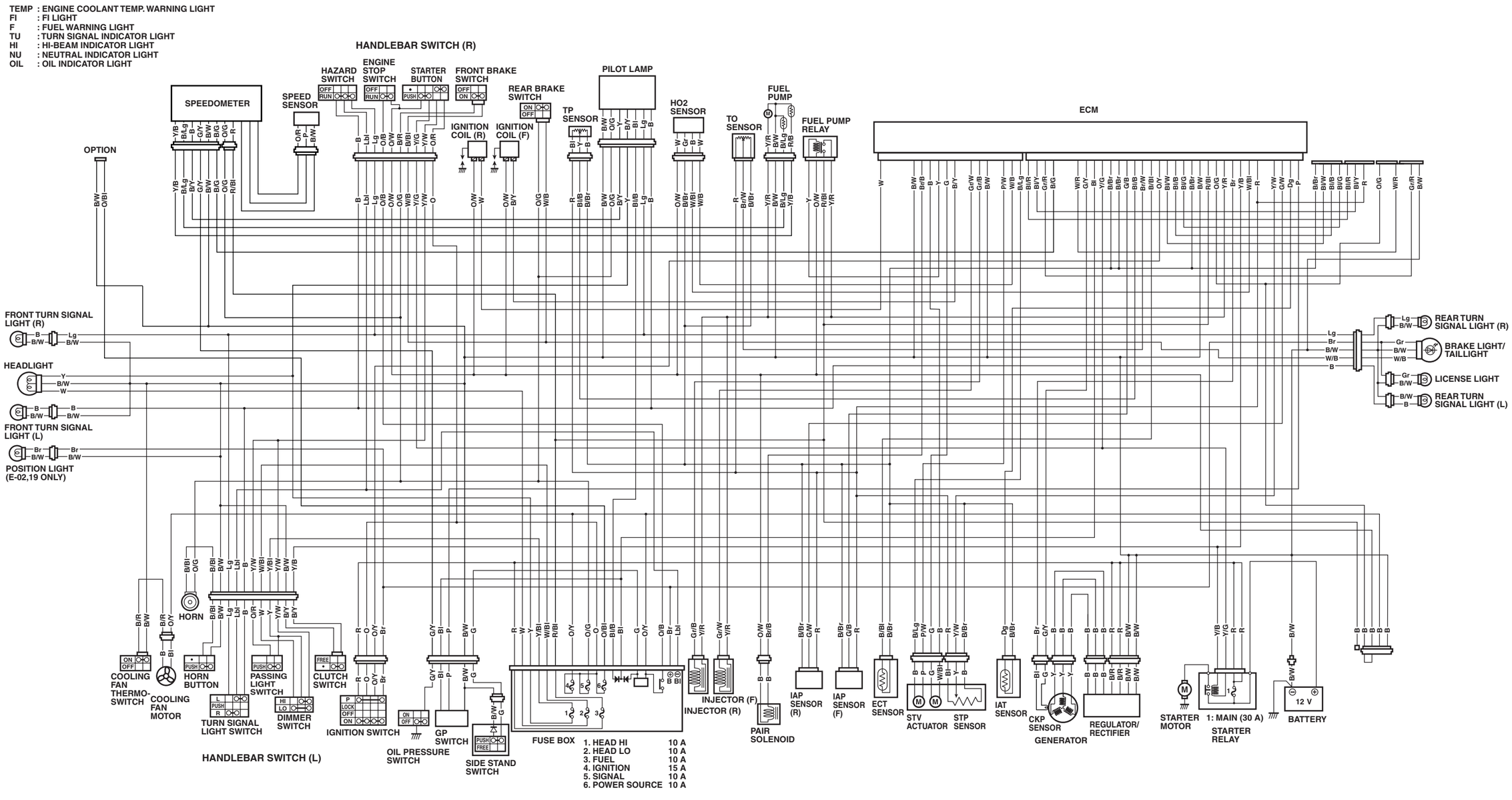


①	Three way joint	*2	White paint mark should face upside.
②	Wiring harness	*3	To three way joint.
③	Fuel shut-off valve	*4	Face the clamp end right side.
④	EVAP canister	*5	Face the clamp end right side.
*1	Pass through the purge hose over the wiring harness.	*6	Face the clamp end forward.

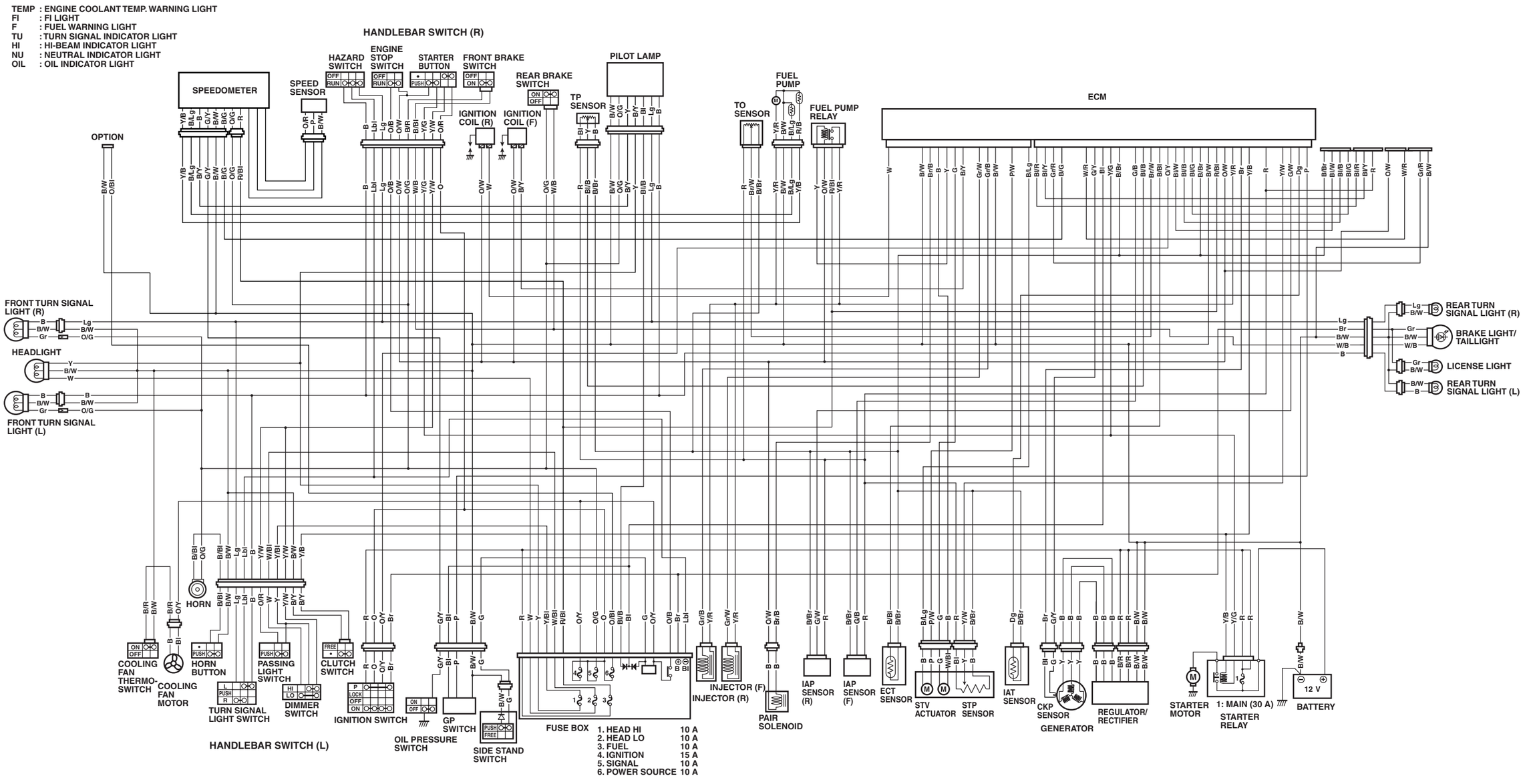
WIRING DIAGRAM

E-02, 19, 24

Wiring diagrams wire color, refer to section “WIRE COLOR”.



E-03, 28, 33


TEMP : ENGINE COOLANT TEMP. WARNING LIGHT
FI : FI LIGHT
F : FUEL WARNING LIGHT
TU : TURN SIGNAL INDICATOR LIGHT
HI : HI-BEAM INDICATOR LIGHT
NU : NEUTRAL INDICATOR LIGHT
OIL : OIL INDICATOR LIGHT
HANDLEBAR SWITCH (R)
HAZARD SWITCH
ENGINE STOP SWITCH
STARTER BUTTON
FRONT BRAKE SWITCH
REAR BRAKE SWITCH
PILOT LAMP
SPEEDOMETER
SPEED SENSOR
IGNITION COIL (R)
IGNITION COIL (F)
TP SENSOR
TO SENSOR
FUEL PUMP
FUEL PUMP RELAY
ECM
OPTION
FRONT TURN SIGNAL LIGHT (R)
HEADLIGHT
FRONT TURN SIGNAL LIGHT (L)
REAR TURN SIGNAL LIGHT (R)
BRAKE LIGHT/ TAILLIGHT
LICENSE LIGHT
REAR TURN SIGNAL LIGHT (L)
HORN
COOLING FAN THERMO-SWITCH
COOLING FAN MOTOR
HORN BUTTON
PASSING LIGHT SWITCH
CLUTCH SWITCH
TURN SIGNAL LIGHT SWITCH
DIMMER SWITCH
IGNITION SWITCH
HANDLEBAR SWITCH (L)
OIL PRESSURE SWITCH
GP SWITCH
SIDE STAND SWITCH
FUSE BOX
1. HEAD HI 10 A
2. HEAD LO 10 A
3. FUEL 10 A
4. IGNITION 15 A
5. SIGNAL 10 A
6. POWER SOURCE 10 A
INJECTOR (F)
INJECTOR (R)
PAIR SOLENOID
IAP SENSOR (R)
IAP SENSOR (F)
ECT SENSOR
STV ACTUATOR
STP SENSOR
IAT SENSOR
CKP SENSOR
GENERATOR
REGULATOR/ RECTIFIER
STARTER MOTOR
1: MAIN (30 A)
STARTER RELAY
12 V
BATTERY

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