DSI 6 A/T

3110-01/3680-01/3722-01/3722-06

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DSI 6 SPEED AUTO TRANSAXLE

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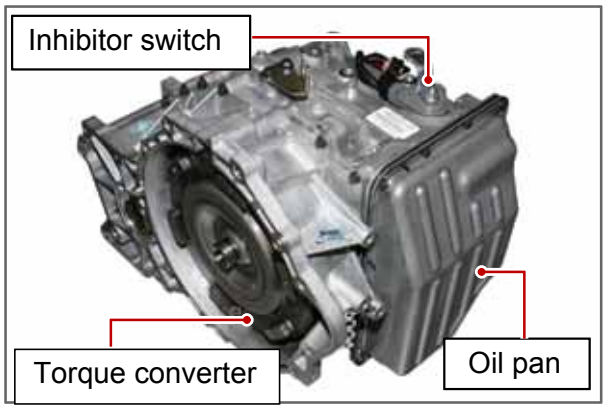
GENERAL INFORMATION

1. GENERAL INFORMATION

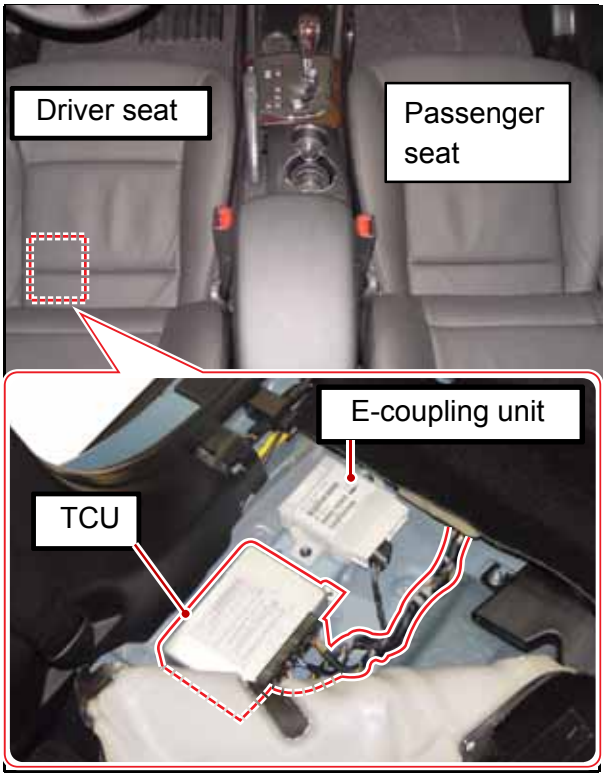


▶ Automatic transaxle (M11)

The Model 11 six speed automatic transaxle is available in two variants: four wheel drive and two wheel drive.

- Six forward speeds
- One reverse gear
- A toruqe converter with an integral converter lock-up clutch with slip control capabilities Electronic shift and pressure controls
- A single planetary gear-set
- A double planetary gear-set
- One hydraulically controlled brake bands
- Three multi-plate clutches
- One multi plate brake
- All hydraulic functions are directed by
- electronic solenoids to control:

1) Engagement feel
2) Shift feel
3) Shift scheduling
4) Modulated torque converter clutch applications



▶ TCU (located under driver's seat)

TCU is located under the driver's seat and controls the transaxle operations.
TCU is activated and deactivated by the ignition voltage, and connected to the transaxle through pin 26 in connector.
TCU receives and uses the signals from sensors and switches through CAN bus with analog and digital types.

▶ Tip switches on steering wheel

The shiftable gear can be adjusted by pressing the "UP (D+)" or "DOWN(D-)" switch when the gear selector lever is in "M" position.

▶ Meter cluster

This indicator shows the current position of the gear.

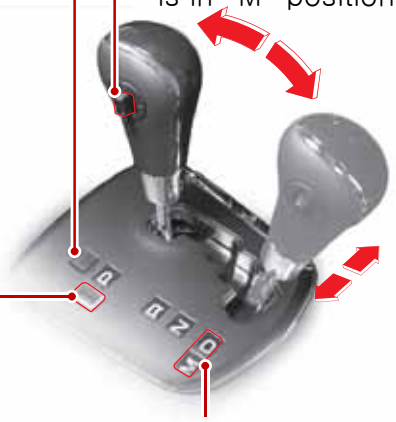
▶ Gear selector lever

Shift lock release button
If the selector lever cannot be moved from "P" or "N" position, try to move the lever while pushing down this button with finger. For safety, turn off the engine and depress the brake pedal before the attempt.

Lever positions
P : Park
R : reverse
N : Neutral
D : Drive

Mode switch
W: Winter mode (pressed "OUT")
S: Standard mode (pressed "IN")
Toggle the mode between winter mode and standard mode by pressing this switch.

Tip switch (manual shift switch)
The shiftable gear can be adjusted by moving this switch to forward and rearward when the gear selector lever is in "M" position.



Selection of Manual/Automatic Shift Function
D: Automatic shift according to the driving condition
M: Manual shift

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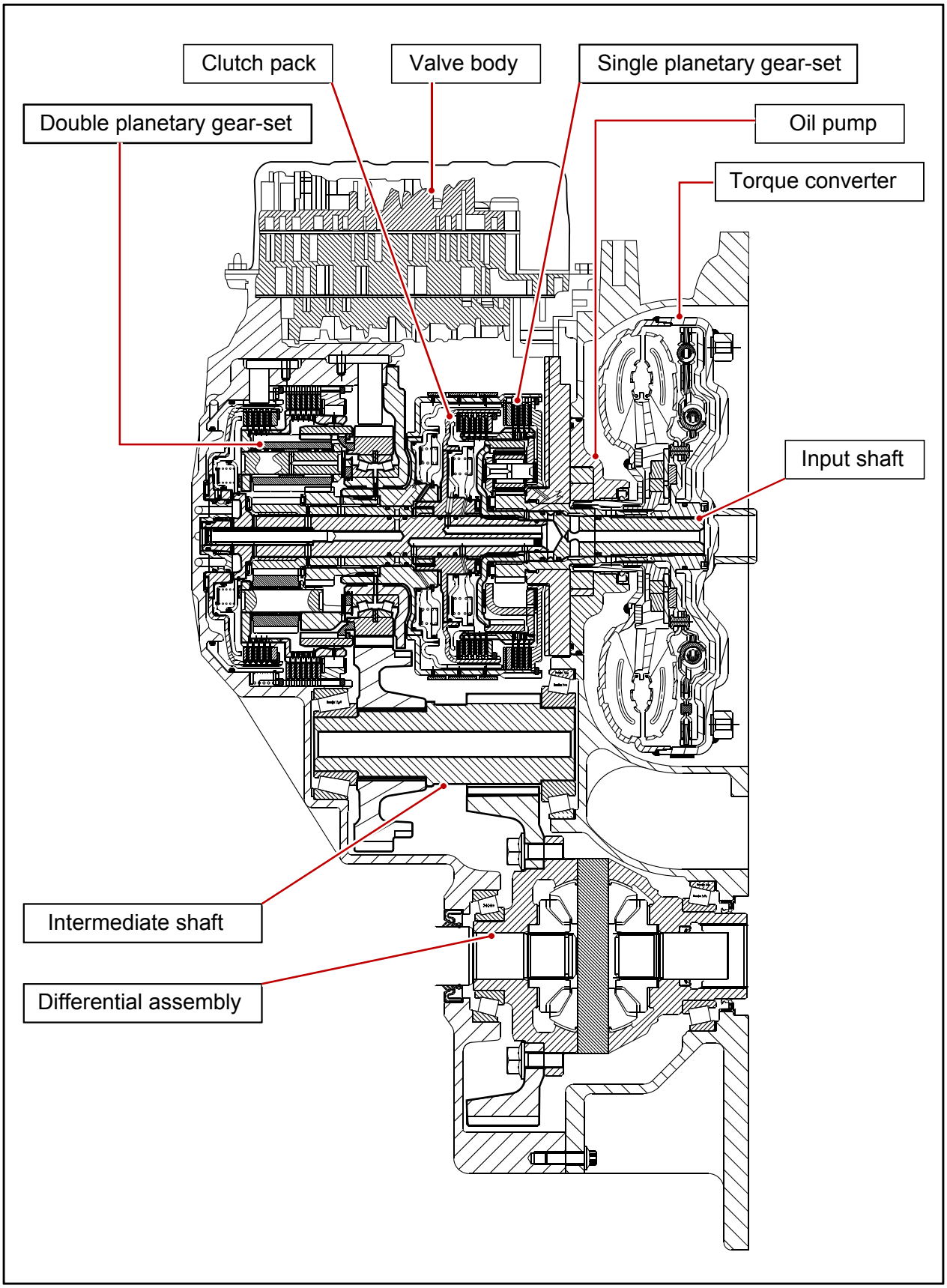
2. SPECIFICATIONS

1) Specifications

Descriptions		Specification
Gear ratio	1st gear	4.156
	2nd gear	2.375
	3rd gear	1.522
	4th gear	1.144
	5th gear	0.859
	6th gear	0.676
	Reverse gear	3.178
Oil	Type	Fuchs TITAN ATF 3292
	Capacity	approx. 7.5 L
	Change interval	EU : Change every 20000 km or 12 months (But, shorten the service interval under severe condition) General : Change every 15000 km or 12 months (But, shorten the service interval under severe condition)
Resistance of oil temperature sensor	-20	430.7 to 533.9 kΩ
	0	146.8 to 175.7 kΩ
	20	56.74 to 65.86 kΩ
	100	3.201 to 3.399 kΩ
Inhibitor switch	D	2.686 kΩ ±8%
	N	5.036 kΩ ±8%
	P	8.953 kΩ ±8%
	R	16.786 kΩ ±8%

Type/Weight	M11 6-speed automatic transaxle / approx. 102 kg (including ATF)
TORQUE	400 Nm
Overall length / Center length	367 mm / 205 mm

2) Sectional Diagram



Modification basis	
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3. TIGHTENING TORQUE

Descriptions		Size x Numbers	Tightening torque (Nm)
Automatic transaxle	Engine side mounting bolt	17 mm X 4	85.0 to 100
	Oil pan and engine side mounting bolt	14 mm X 4	56.0 to 62.0
	Oil filler plug	16 mm	25.0 to 30.0
	Oil drain plug	Hexagon 5 mm	25.0 to 30.0
Valve body	Assembly mounting screw	T30 mm X 9	16.0
	Oil pan bolt	10 mm X 15	7.0 to 8.0
	VBS screw	T30 mm	4.0
	Valve body screw	T30 mm X 25	16.0
Torque converter	Mounting bolt	13 mm X 6	40.0 to 42.0
Cable	Link nut (switch side)	13 mm X 1	13.7 to 19.6
	Link nut (cable side)	12 mm X 1	14.7 to 22.5
	Mounting nut (floor side)	12 mm X 1	17.6 to 21.6
	Mounting nut (dash panel side)	12 mm X 2	17.6 to 21.6
TGS lever	Mounting nut	12 mm X 4	17.6 to 21.6
TCU	Mounting nut	8 mm X 2	5.0 to 6.0
Inhibitor switch	Mounting nut	12 mm X 2	3.9 to 7.8
Transaxle bracket	Left bracket	17 mm X 3	85.0 to 100
	Right bracket	17 mm X 4	85.0 to 100
	Upper bracket	17 mm X 4	85.0 to 100
Oil cooler pipe	Mounting bolt	10 mm X 2	Max.: 13.0
	Bracket mounting bolt	10 mm X 1	13.0

OVERVIEW AND OPERATING PROCESS

1. OVERVIEW

Engine power reaches the transaxle via a torque converter with integral converter lock-up clutch. The six forward gears and one reverse gear are obtained from a single planetary set, followed by a double planetary set. This type of gear-set arrangement is commonly known as Lepelletier type gear-set.
The Model M11 6 speed automatic transaxle is electronically controlled. The control system is comprised of the following components:

- External transaxle control unit (TCU)
- Internal embedded memory module (EMM)
- Input and output speed sensors
- Valve body unit comprised of four ON/OFF solenoid valves and six variable bleed solenoids (VBS)
- Torque converter

2. FEATURES

1) Advantages

▶ Early Downshift with Hard Braking and Skip Shifts

When heavy braking is detected, the transaxle downshifts early and skips gears to provide increased engine braking to provide gear selection for tip-in.

▶ Gear Hold going Uphill/Downhill

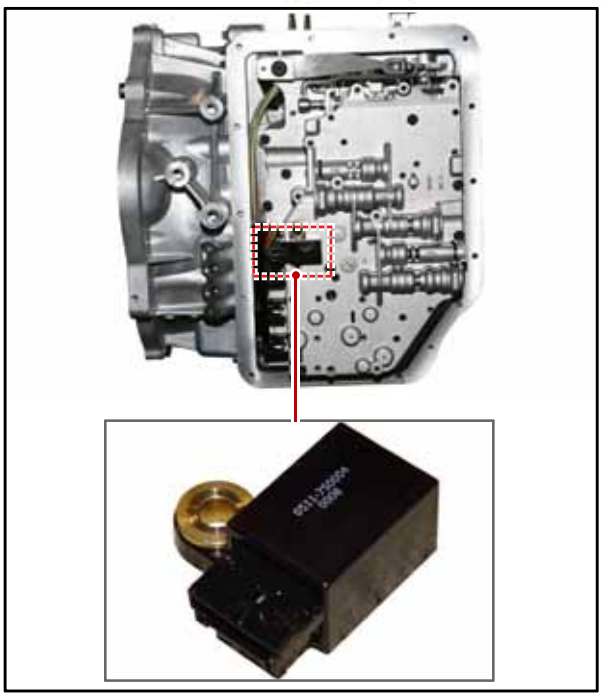
If the accelerator pedal is released when traveling uphill, upshifts are prevented to reduce busyness on grades. If the accelerator pedal is released when traveling downhill, upshifts are prevented to enhance engine braking.

▶ Drive and Reverse Engagement

A soft engagement feature avoids harsh take up of drive when selecting Drive or Reverse. This is achieved by limiting engine speed and engine torque which results in a rapid, but progressive engagement of either Drive or Reverse when moving from the Park or Neutral positions. Drive and Reverse engagements from either Park or Neutral are performed in less than 2.2 seconds. There is no drive engagement prevention strategy implemented on the transaxle system as there is sufficient engine strategy to protect the system. However, reverse engagement is prevented until engine speed is less than 1,400 rpm and the accelerator pedal position is less than 12% and vehicle speed is less than 10 km/h.

▶ Converter Clutch Lock-Up In All Gears

The transaxle features converter clutch lock-up in all gears. This feature provides improved fuel economy and vehicle performance. It also improves transaxle cooling efficiency when towing heavy loads at low speeds, e.g. in city driving or hill terrain.



▶ Embedded Memory Module (EMM)

The embedded memory module (EMM) is matched to the transaxle's valve bodies during transaxle assembly to ensure refined shift quality. The EMM is used to store data such as valve body calibration data and valve body serial number.
Upon installation, the TCU will download the data from the EMM and utilize this data in the operation of the transaxle.

2) Transaxle Cooling

The transaxle cooling system ensures rapid warm-up and constant operating temperature resulting in reduced fuel consumption and refined shift quality.
It also includes a cooler by-pass within the hydraulic system to allow sufficient lubrication to the transaxle drivetrain in the event of a blockage in the transaxle cooler.

3) Shift Strategy

▶ Gear Change

Transaxle gear change is controlled by the TCU. The TCU receives inputs from various engine and vehicle sensors to select shift schedules and to control the shift feel and torque converter clutch (TCC) operation at each gear change.

▶ Coast down

Coast down down shifts occur at 0% pedal when the vehicle is coasting down to a stop.

▶ Torque Demand

Torque demand down shifts occur (automatically) when the driver demand for torque is greater than the engine can provide at that gear ratio. If applied, the transaxle will disengage the TCC to provide added acceleration.

Modification basis	
Application basis	
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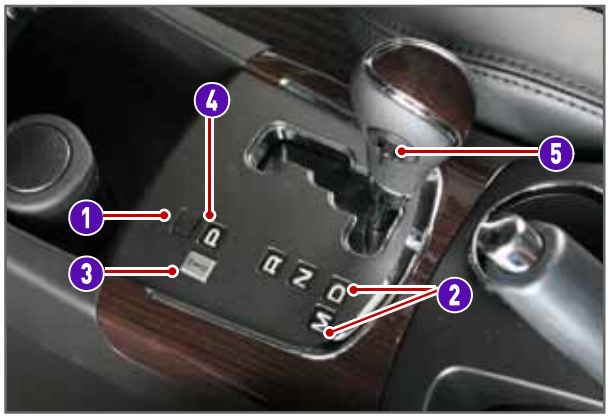
3. MODES AND FUNCTIONS

1) Functions



1. Shift lock release button
If the selector lever cannot be moved from "P" or "N" position, try to move the lever while pushing down this button with finger. For safety, turn off the engine and depress the brake pedal before the attempt.

2. Selection of Manual/Automatic Shift Function
D: Automatic shift according to the driving condition
M: Manual shift

3. Mode switch

W: Winter mode (pressed "OUT")
S: Standard mode (pressed "IN")
Toggle the mode between winter mode and standard mode by pressing this switch.

4. Lever positions
P : Park
R : reverse
N : Neutral
D : Drive

5. Tip switch (manual shift switch)
The shiftable gear can be adjusted by moving this switch to forward and rearward when the gear selector lever is in "M" position.

2) M Mode (Manual Mode)

This allows the driver to define the highest possible gear by selecting "+" or "−" on the gear selector when the lever is in the "M" position. When the lever is first moved to the manual "M" position the transaxle will select the lowest possible gear.

▶ 1st Gear State

- The 1st gear state will display on the instrument cluster. Unlike the normal 1st gear, engine braking will be available in this manual 1st state.

▶ 2nd Gear State

- The 2nd gear state will display on the instrument cluster. 2-1 automatic kick-down shifts are available. 2nd gear has engine braking available.

▶ 3rd Gear State

- The 3rd gear state will display on the instrument cluster. 3-2 and 3-1 automatic kick-down shifts are available. 3rd gear has engine braking available.

▶ 4th Gear State

- The 4th gear state will display on the instrument cluster. 4-3 and 4-2 automatic kick-down shifts are available. 4th gear has engine braking available.

▶ 5th Gear State

- The 5th gear state will display on the instrument cluster. 5-4 and 5-3 automatic kick-down shift is available. 5th gear has engine braking available.

▶ 6th Gear State

- The 6th gear state will display on the instrument cluster. 6-5 and 6-4 automatic kick-down shifts are available. 6th gear has engine braking available.

Modification basis	
Application basis	
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4. LIMP HOME MODE

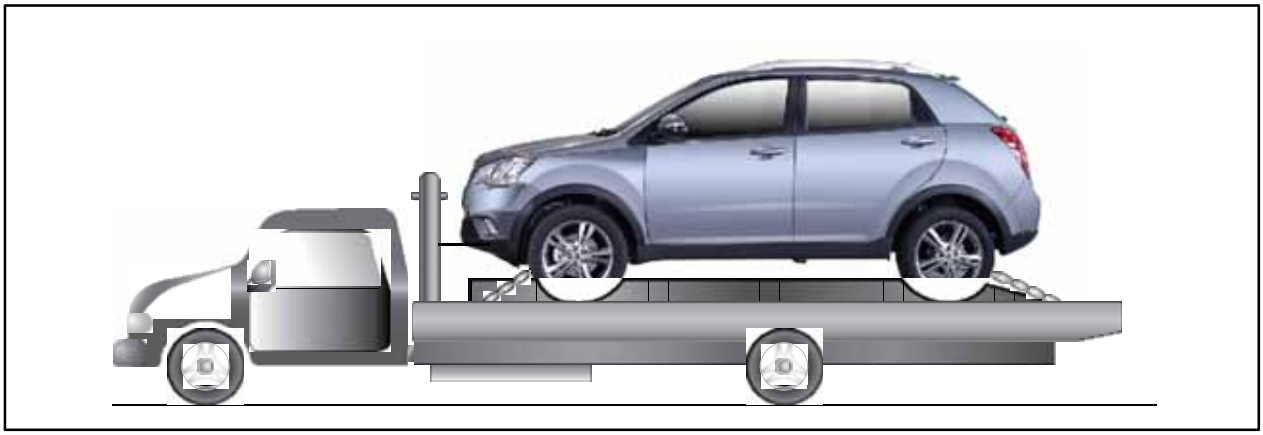
▶ When the transaxle is defective

1. In the event of a system fault, the TCU also provides for failure mode effect control (FMEC) to maintain maximum functional operation of the transaxle.
2. In the event of a total loss of control or electrical power, the basic transaxle functions (Park, Reverse, Neutral and Drive) are retained. The 4th and reverse gear ratios with the torque converter clutch in the unlocked state are the retained gear states the hydraulic system supports without any electrical assistance.
3. The TCU communicates with other vehicle electronic control modules by the controller area network (CAN). If a major fault develops, the transaxle may automatically operate in a "limp home" (failure) mode to enable the vehicle to be driven to an authorized dealer for repair.
4. The TCU also provides for transaxle diagnostics, which meet the requirements of OBD II legislation, monitoring all components which may effect vehicle emissions.

▶ When the transaxle overheats

1. Limp home mode may also be engaged if the battery charge falls below 8V.
2. If the transaxle overheats, the shift patterns will automatically change to enable improved transaxle cooling.
3. During transaxle overheat, the instrument cluster transaxle selector position display and the over temperature condition is indicated by flashing the “W(Winter)” indicator on the instrument cluster until normal transaxle operating temperature is reached.

▶ Towing the automatic transaxle equipped vehicle



CAUTION

- Flat-bed equipment is the best method of moving a disabled vehicle to avoid any damages.
- For AWD vehicle: The vehicle must be towed with a wheel lift and dollies or flatbed equipment with all the wheels off the ground.
  For 2WD vehicles: It is acceptable to tow the vehicle with the rear wheels on the ground without dollies and the front wheels off the ground. When being towed by a commercial towtruck and wheel dollies are not available, the front of the vehicle should be lifted, not the rear.

5. TRANSAXLE ELECTRONIC CONTROL SYSTEM

1) General Information

The transmission control unit (TCU) and its input/output network control the following transmission operations:

- Shift timing
- Line pressure
- Clutch pressure (shift feel)
- Torque converter clutch

also uses these signals when determining transaxle operating strategy. Using all of these input signals, the TCU can determine when the time and conditions are right for a shift, or when to apply or release the torque converter clutch. It will also determine the pressure needed to optimise shift feel. To accomplish this, the TCU operates six variable bleed control solenoids and four on/off solenoids to control transaxle operation.

2) TCU (Transmission Control Unit)

The transaxle control unit (TCU) is mounted under the driver's seat and controls the operation of the transaxle.
The TCU is activated and deactivated by the ignition power supply and is connected to the transaxle link harness by a 26 pin connector.
The TCU processes information received from internal sensors and signals received across the CAN bus in analogue and digital forms such as:

- Transaxle input speed
- Transaxle output speed
- Accelerator pedal position
- Gear selector position
- Engine torque
- Engine speed
- Transaxle fluid temperature
- Brake pedal status
- Engine oil temperature
- Engine coolant temperature
- Ambient air temperature
- Barometric pressure

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This information is used by the TCU to decide which shift pattern to select and for shift energy management. Electro-hydraulic solenoid valves and variable bleed solenoids control the transaxle gear changes.
Six variable bleed solenoids and four on/off solenoids are used to direct transaxle fluid flow to control the fluid pressure within the three clutches and two bands. Separate pressure regulators are used exclusively for torque converter clutch control and main transaxle line pressure.
The TCU monitors all TCU inputs and outputs to confirm correct system operation. If a fault occurs the TCU is able to perform default action and inform the driver of the problem through the instrument cluster warning lights. Detailed information is available via trouble codes which can be read with the service tool.

3) Shift Map Selection

The driver can manually select between normal (S) and winter modes (W) via the mode switch. Depending on the transaxle temperature, uphill and downhill grades and altitude, shift maps will be selected by the TCU to suit the driving conditions. The following maps are available.

▶ Standard (Normal) Mode

Normal Mode is selected when the lever is in the D position with the mode switch in the normal (S) position and the transaxle is within normal temperature ranges. Shift schedule points are optimised for fuel efficiency and general driving conditions.

▶ Uphill and Downhill Mode

In this mode, depending on the load of the vehicle, adaptive shift maps are selected to progressively adjust the shift points and torque converter lock points.

▶ Altitude Mode

Shift points are automatically adjusted at higher altitudes to compensate for changes in engine torque where the torque produced by the engine is greatly reduced by the effects of reduced barometric pressure and temperature.

▶ Winter (W) Mode

When winter mode is selected, starting in second gear is facilitated and the WINTER mode indicator light is switched ON. To prevent wheel spin on slippery surfaces, the transmission will not allow first gear unless manually overridden.

▶ Warm up Schedule

Used typically when transaxle fluid temperature is below 20°C.
The torque converter will not lock-up below 20°C to assist in transaxle warm-up.

▶ Hot Mode

The hot mode is progressively applied between temperatures of 110° ~ 200°C. The torque converter lock-up is increased to prevent heat generation by the torque converter.

Above 110℃	the electrical radiator fans are switch ON
Above 130℃	the engine torque will be reduced and the W light on the instrument cluster will flash
Above 200℃	the transaxle will neutralise until the fluid temperature falls below 200°C as a final protection.

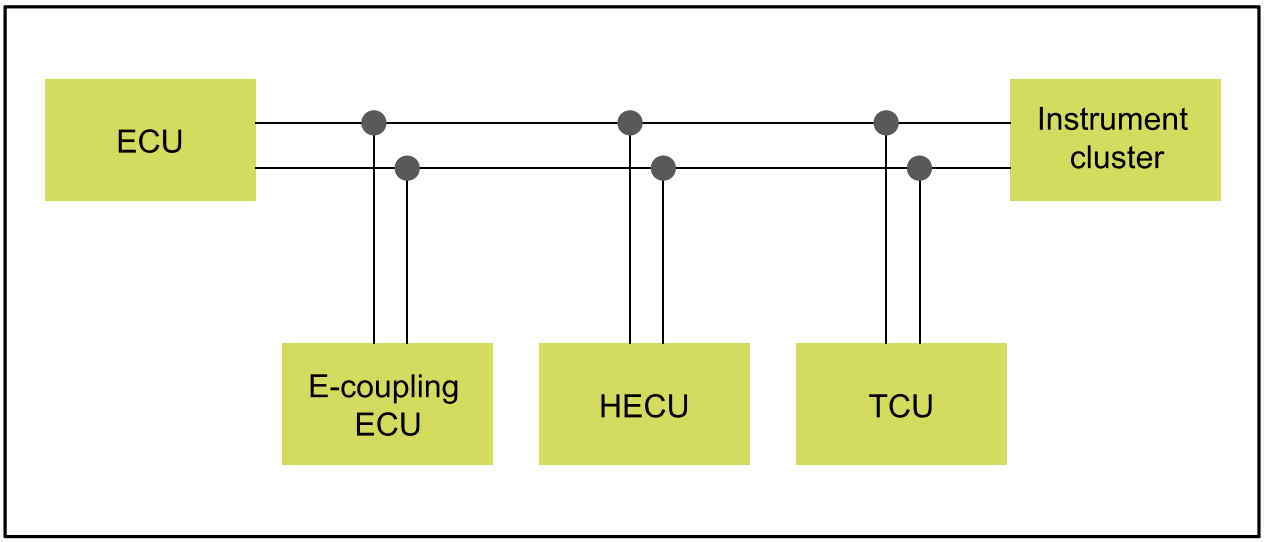
Activation of the hot mode inhibits other transmission performance features including uphill and downhill compensation and altitude compensation. Some degradation in shift feel may be experienced as the torque converter is not unlocked during shifting.

▶ Cruise Control Mode

When cruise control is activated the engine ECU may request the transaxle to downshift under trailing throttle conditions to increase engine braking.

6. CAN NETWORK

▶ **Schematic Diagram of Network Communication**



The TCU sends signals to be used by other vehicle systems via the CAN bus, such as:

- Selector lever position
- Selected gear state
- Manual mode activation
- Output torque
- Transaxle fluid temperature
- Engine torque reduction requests

7. POWER TRANSFER

Power transfer modes are as follow:

- Manual: 1st gear (position M)
- Drive: 1st gear
- Drive: 2nd gear
- Drive: 3rd gear
- Drive: 4th gear - limp home mode
- Drive: 5th gear
- Drive: 6th gear

1) Gear Selection and Engagement Element

Gear	Gear ratio	Engagement element (clutch/band)					
		C1	C2	C3	B1	B2	1-2 OWC
M1	4.156		ON			ON	
1st	4.156		ON				ON
2nd	2.375		ON		ON		
3rd	1.522		ON	ON			
4th	1.144	ON	ON				
5th	0.859	ON		ON			
6th	0.676	ON			ON		
Reverse	3.178			ON		ON	

Gear	ON/OFF solenoid valve				Variable bleed solenoid valve (VBS)					
	S1	S2	S3	S4	S5(A)	S6(A)	S7(A)	S8(A)	S9(A)	S10(A)
M1	ON				1	0	1			
1st	ON				1	0			0-1	
2nd	ON			ON	1	0		1	0-1	
3rd	ON		ON		1	0	1		0-1	
4th					0	0			0-1	
5th		ON			0	1	1		0-1	
6th		ON		ON	0	1		1	0-1	
Rev.	ON	ON	ON		1	1	1		0-1	

Modification basis	
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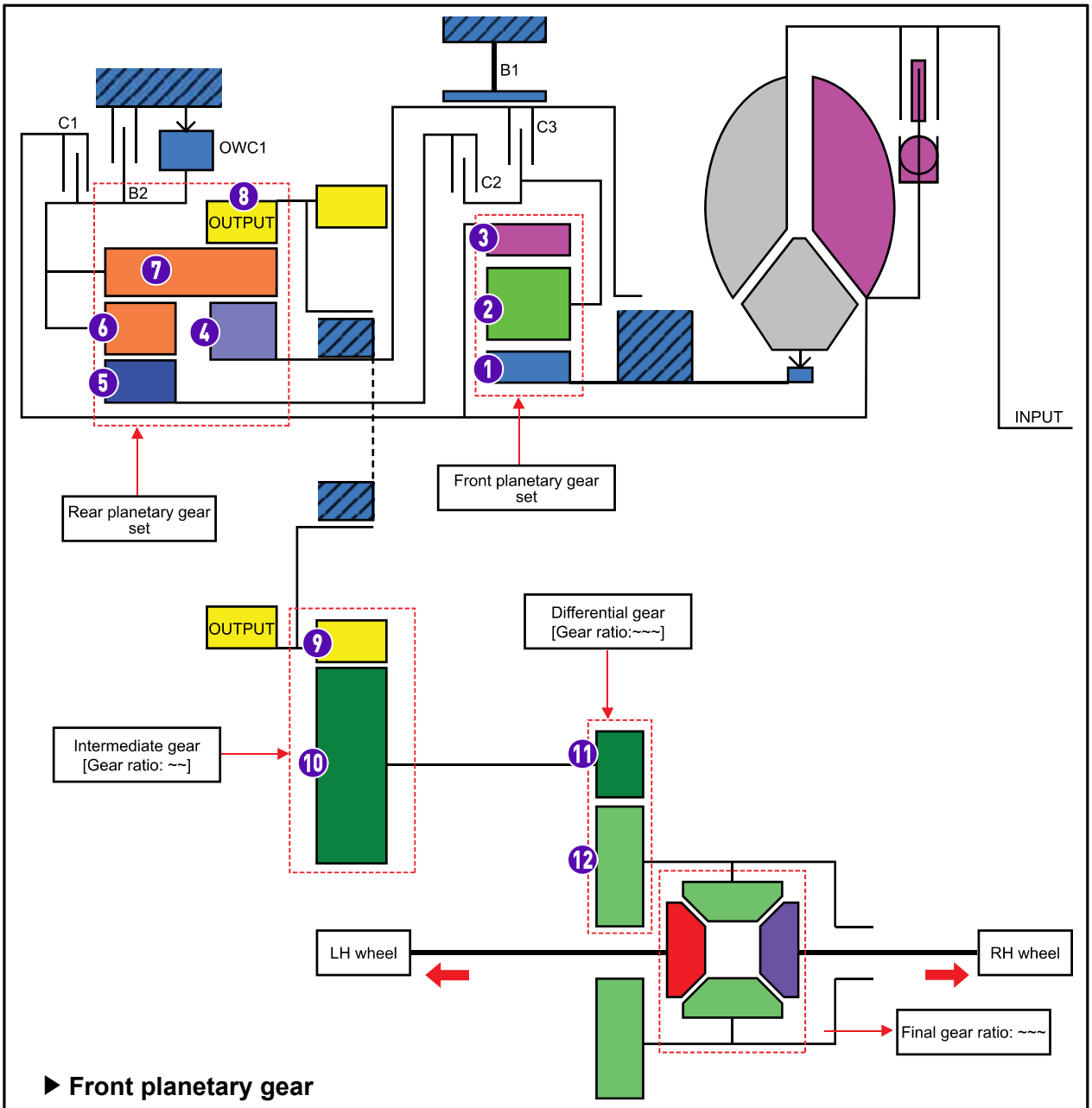
Affected VIN	

2) Power Flow



▶ **Front planetary gear**

1. Front sun gear (FSG)
2. Planetary hear pinion (PP)
3. Ring gear (Internal)

▶ **Rear planetary gear**

4. Forward sun gear (FSG)
5. Reverse sun gear (RSG)
6. Short pinion (SPP)
7. Long oinion (LPP)
8. Ring gear (RG)

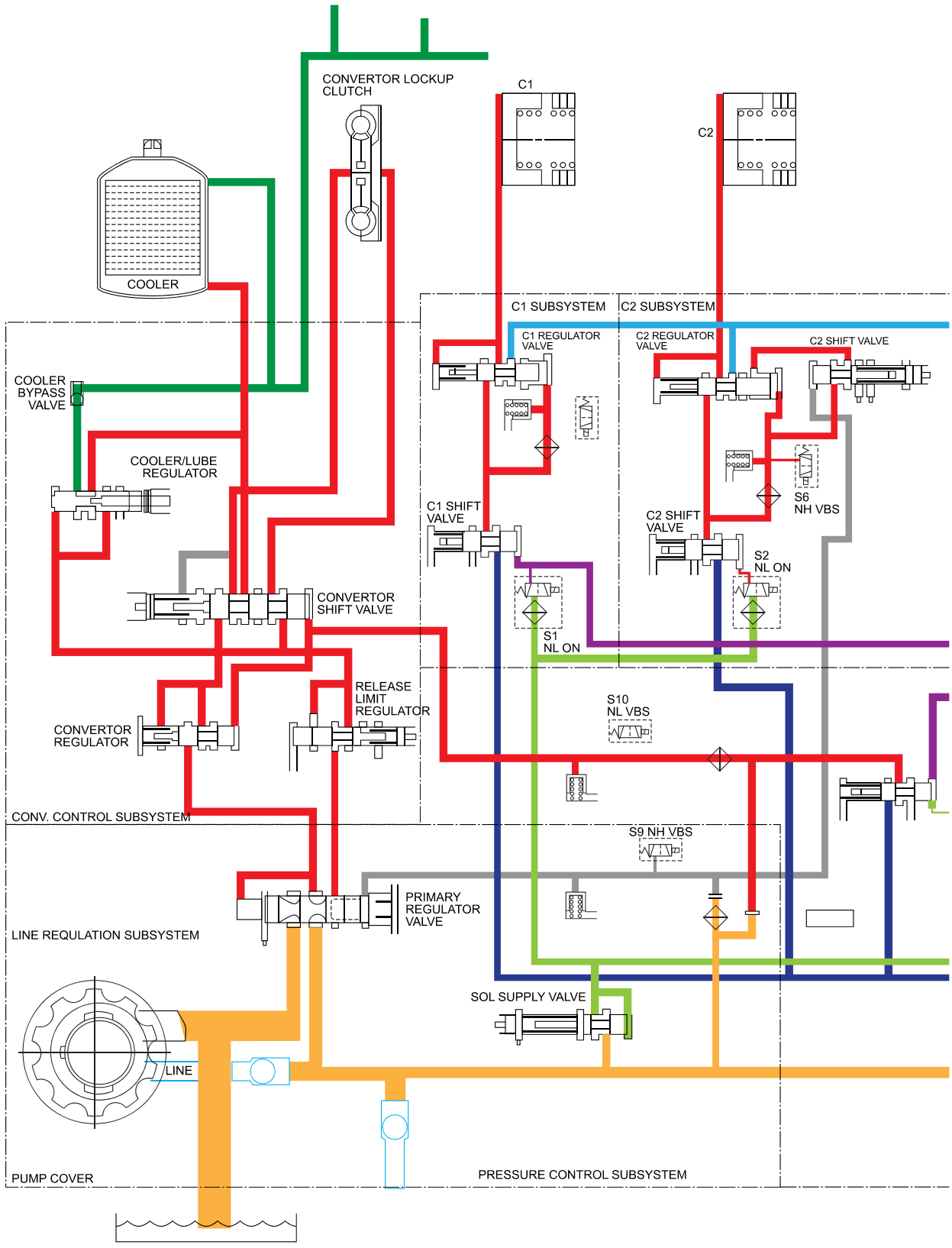
▶ **Intermediate gear**

9. Drive gear
10. Driven gear

▶ **Differential gear**

11. Pinion
12. Differential

3) Hydraulic Circuit Diagram



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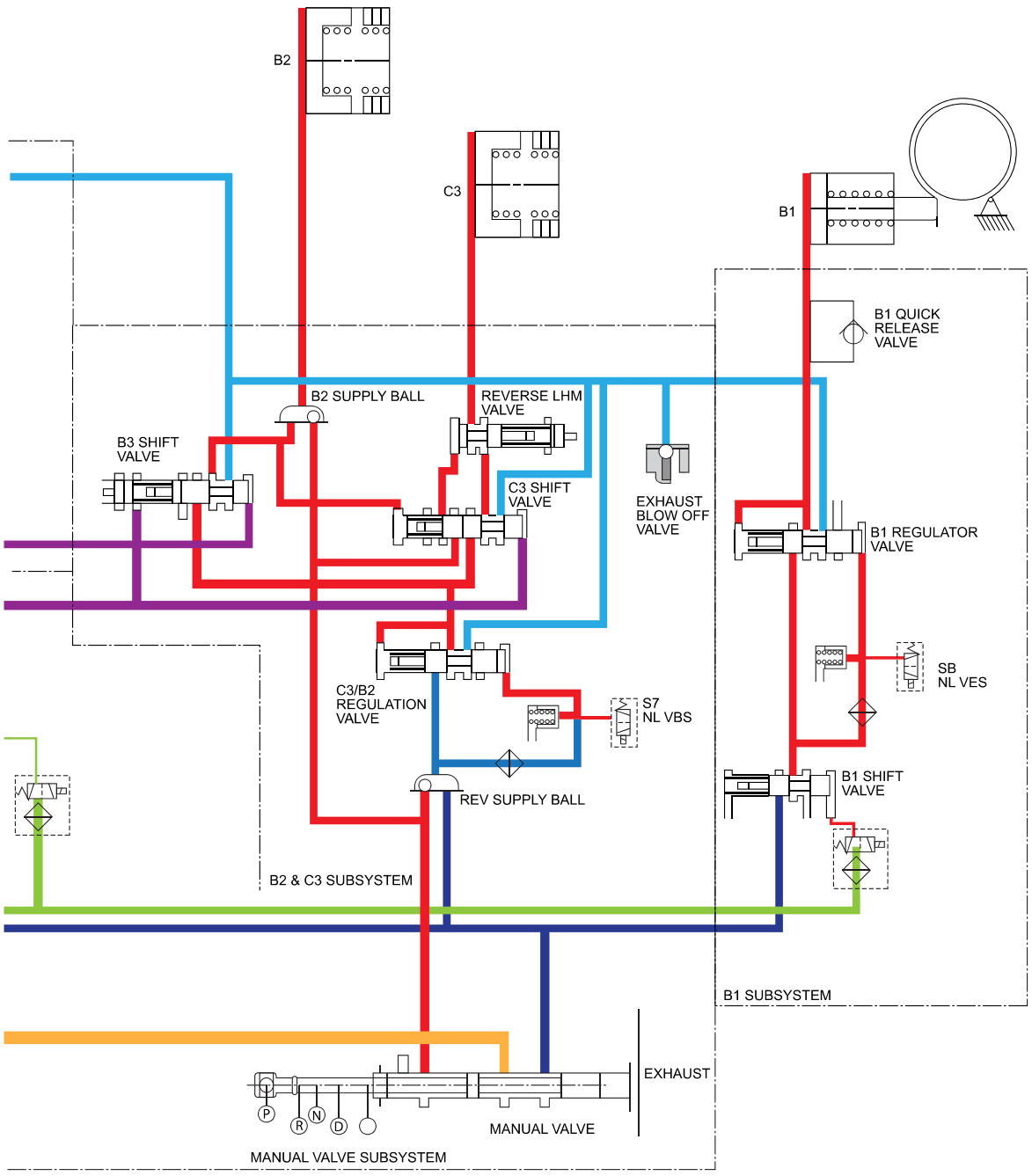


Modification basis	
Application basis	
Affected VIN	

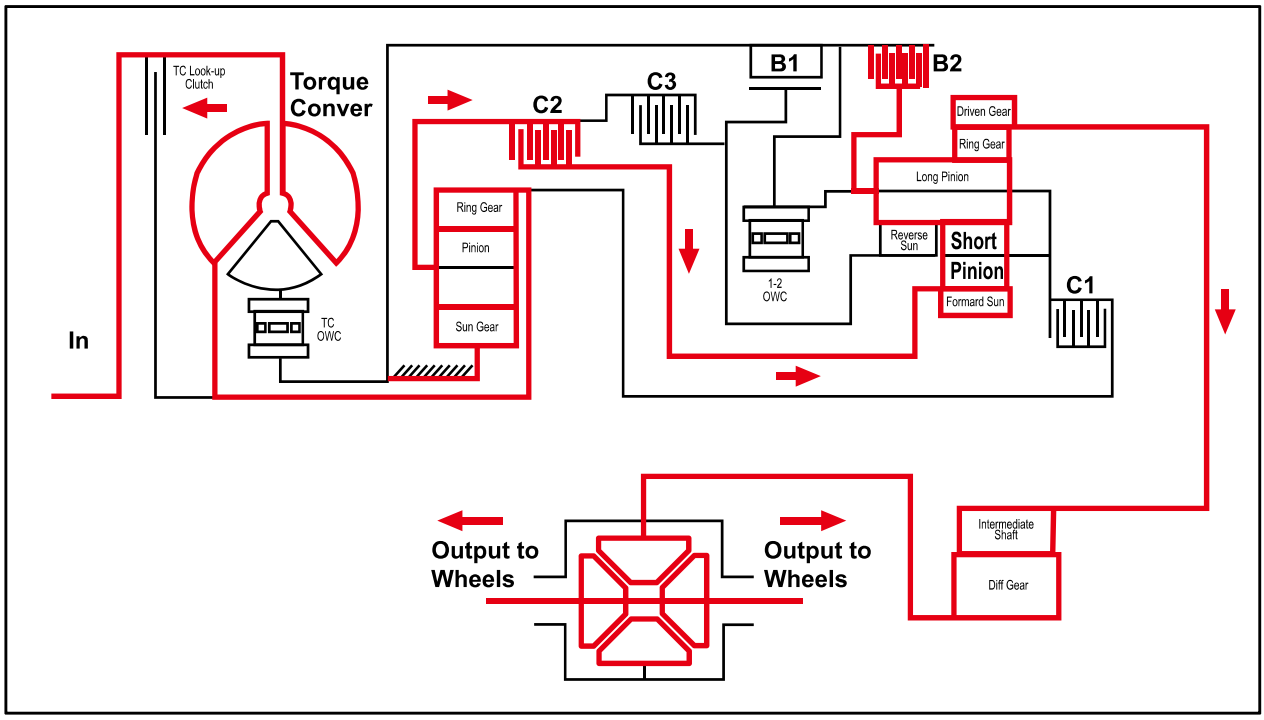
DSI 6 SPEED AUTO TRANSAXLE

undefined

4) Power Transfer in Each Gear

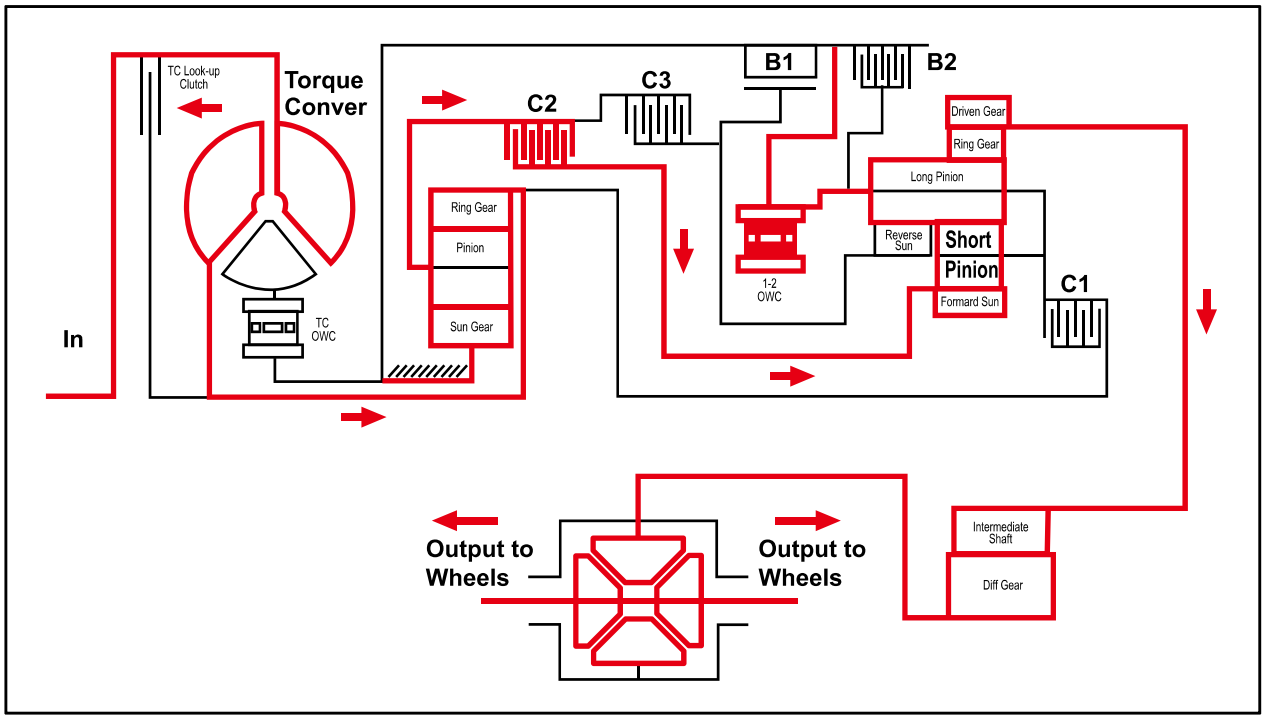
(1) Manual (position M) - 4.156 : 1

▶ **Power flow**



(2) Drive 1st Gear (1st Auto) - 4.156 : 1

▶ **Power flow**



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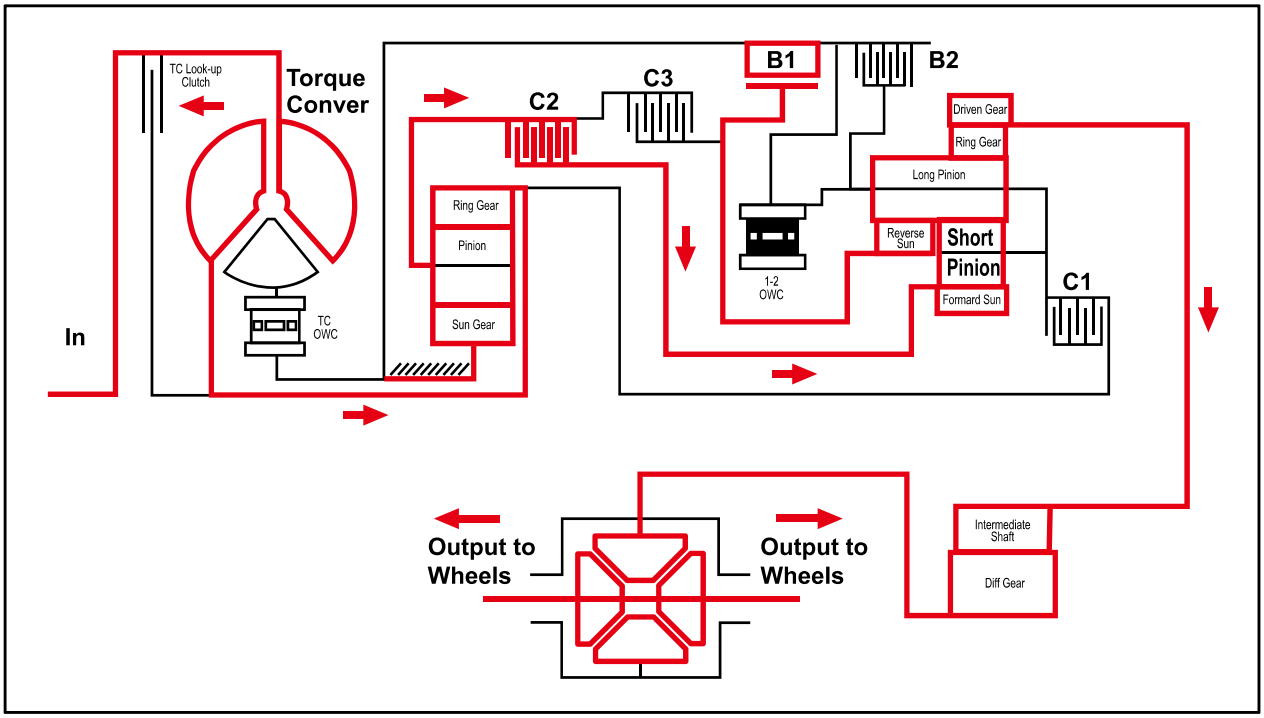
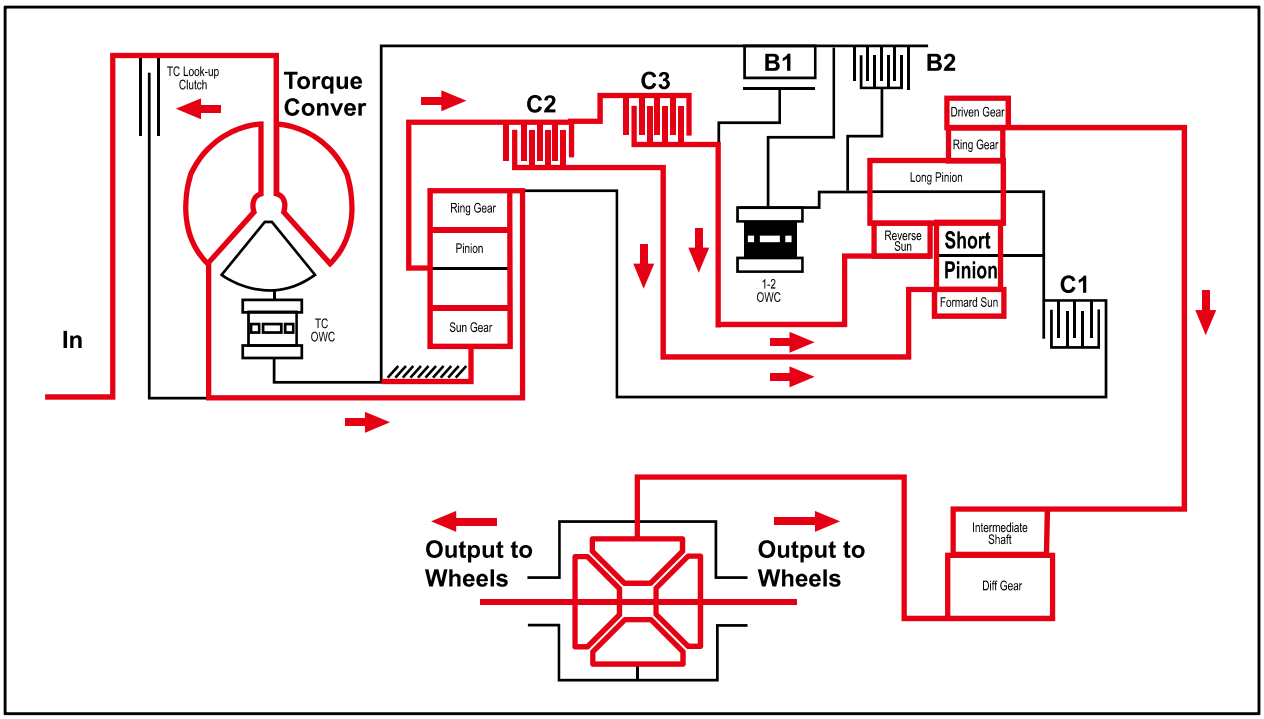
(3) Drive 2nd (2nd Auto) - 2.375 : 1

▶ **Power flow**



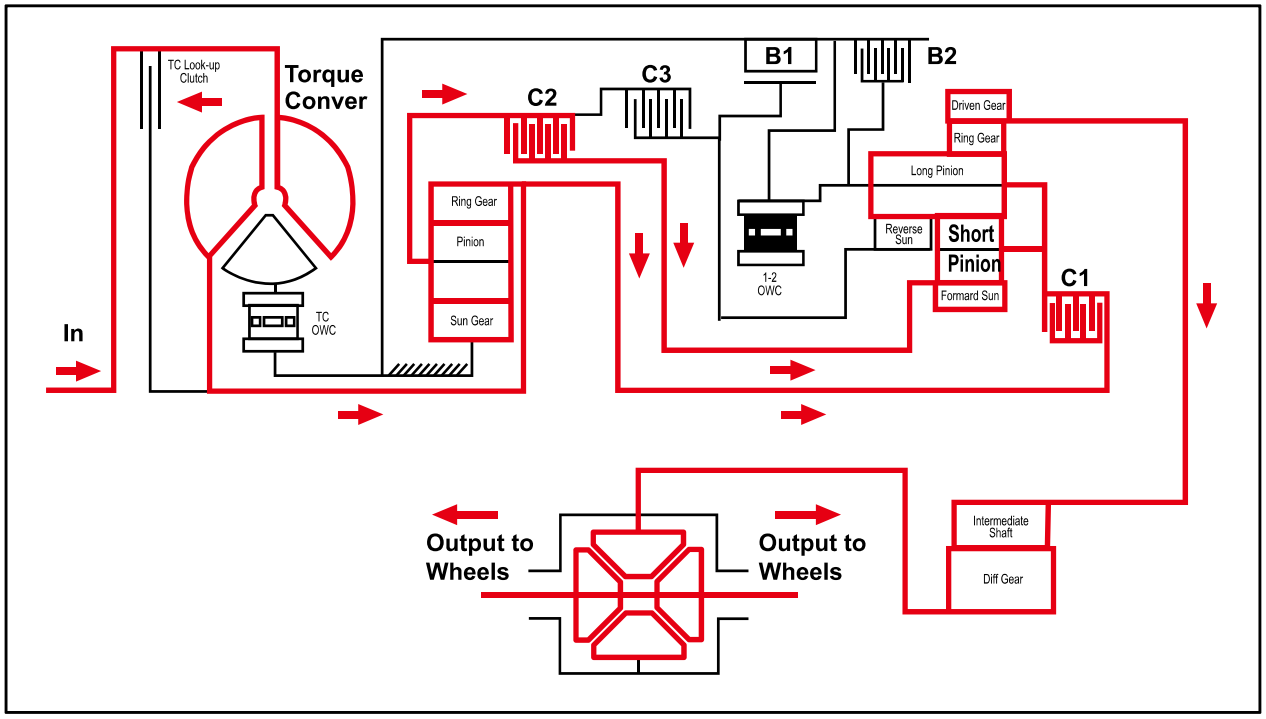
(4) Drive 3rd (3rd Auto) - 1.522 : 1

▶ **Power flow**



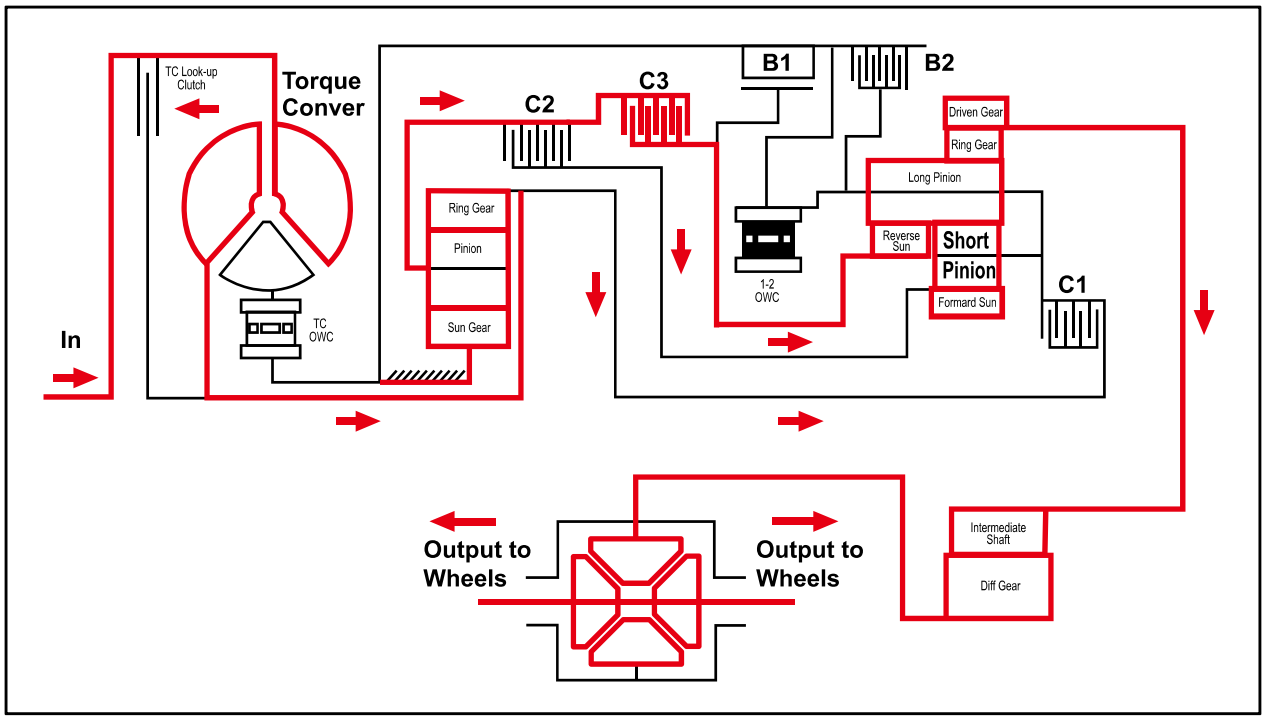
(5) Drive 4th (4th Auto) - 1.144 : 1

▶ **Power flow**



(6) Drive 5th (5th Auto) - 0.859 : 1

▶ **Power flow**



Modification basis	
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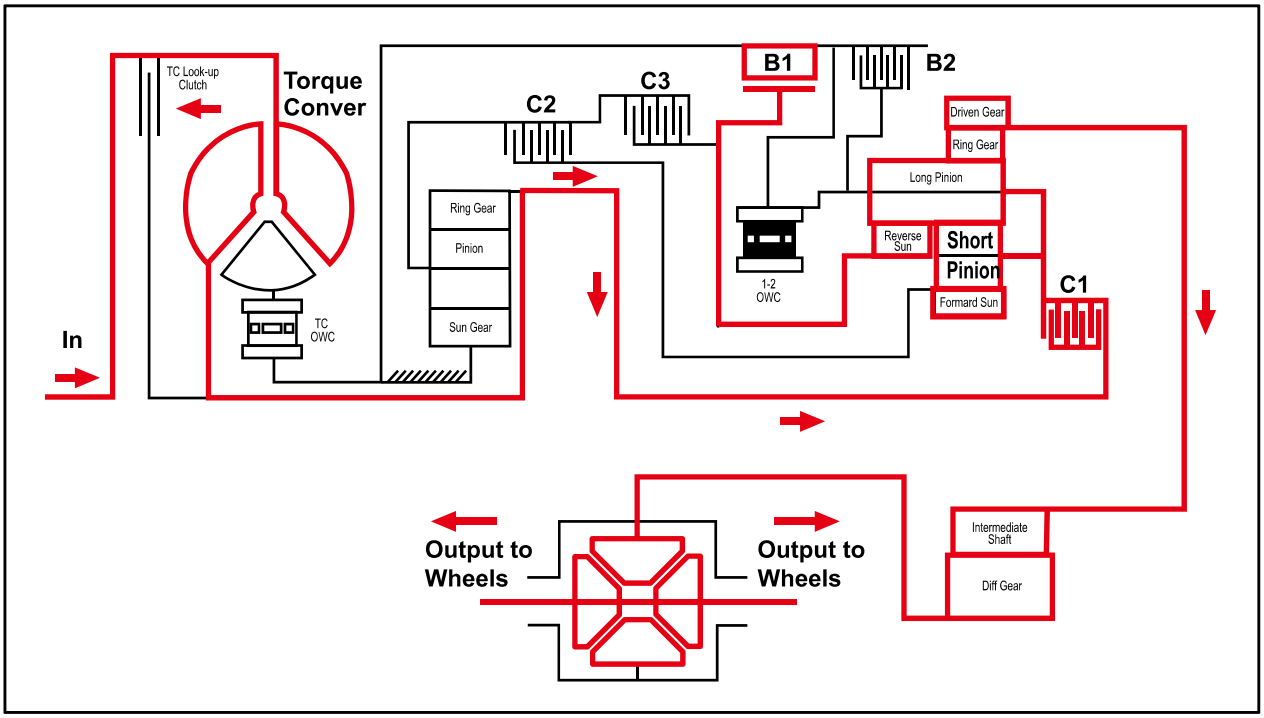
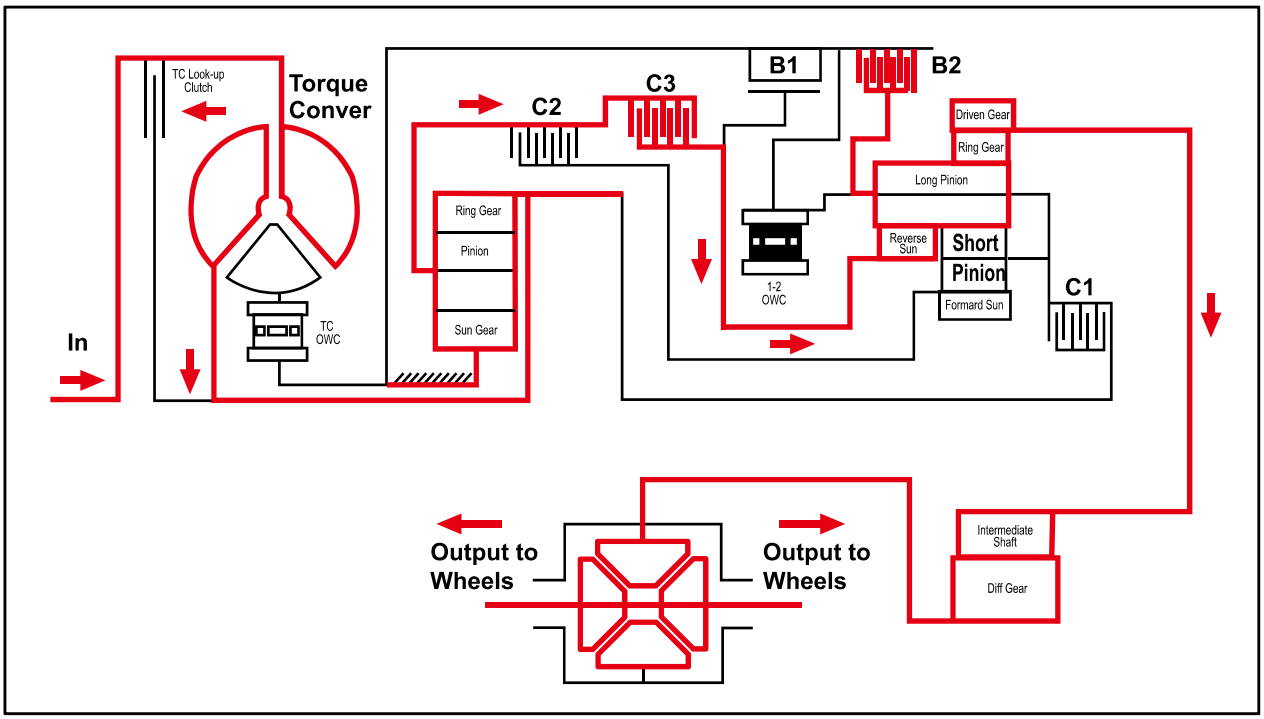
(7) Drive 6th (6th Auto) - 0.676 : 1

▶ **Power flow**



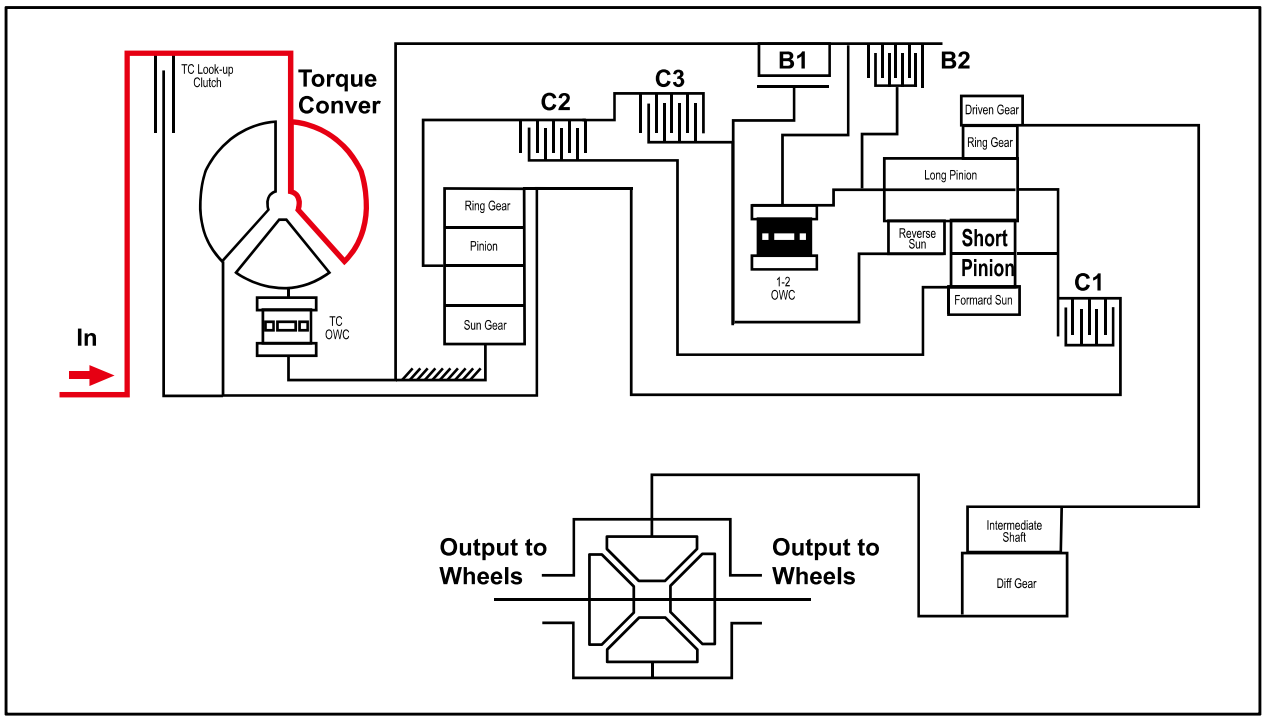
(8) Reverse - 3.178 : 1

▶ **Power flow**



(9) Neutral / Park

▶ Power flow



Modification basis	
Application basis	
Affected VIN	

CONFIGURATION AND FUNCTIONS

S.G.N. 3722-01

TGS LEVER

1) Overview

The TGS lever prevents inappropriate or unexpected shifting of gears to increase safety. It also helps the driver safely select a needed gear. The solenoid of the TGS lever has the factory-installed "P" Lock function which allows the driver to shift gears from the "P" position only when the brake pedal is depressed. Because drivers of vehicles without this system can shift gears by only operating the gear selection lever, their safety and convenience are limited. Sometimes, the gears could be changed unexpectedly or unintentionally by various factors. Therefore, two tip switches are installed to prevent such changes from happening.
For instance, when a vehicle is running on a severely curved road, the driver must hold the steering wheel with two hands. Shifting gears or using the engine brake while driving on the road will be dangerous. So, one tip switch is installed on the steering wheel. The other tip switch is installed on the knob to prevent unintended gear shifting.
This system is only activated when the TGS lever is engaged in the "M" position. When the lever is pushed to the "D" position, the tip switches will not change gears.

Locations

Tip switch (-)

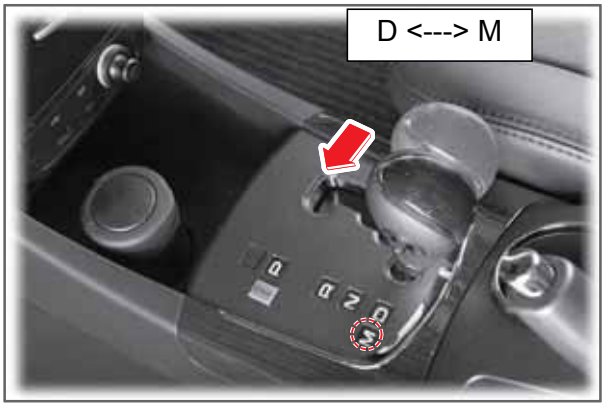
Tip switch (-)

TGS lever knob

TGS lever assembly

Modification basis	
Application basis	
Affected VIN	

2) TGS Lever Positions



▶ **Park**

P

The engine can be started. The parking pole stops the driving wheels from rolling.
To move the lever from "P" to another position, the brake pedal must be depressed (Parking Lock System).

▶ **Reverse**

R

By switching between the Standard and Winter switches, the reverse speed can be changed. The change should be made before shifting the selector lever to the "P" position.

▶ **Neutral, Engine Start or Towing**

N

It is possible to start the engine. This position is also for a brief stop or towing the vehicle. When towing the vehicle, the towing speed should be 50 km/h or less and the towing distance should not exceed 50 kilometers. It is recommended to load this vehicle on a flat-bed towing vehicle.

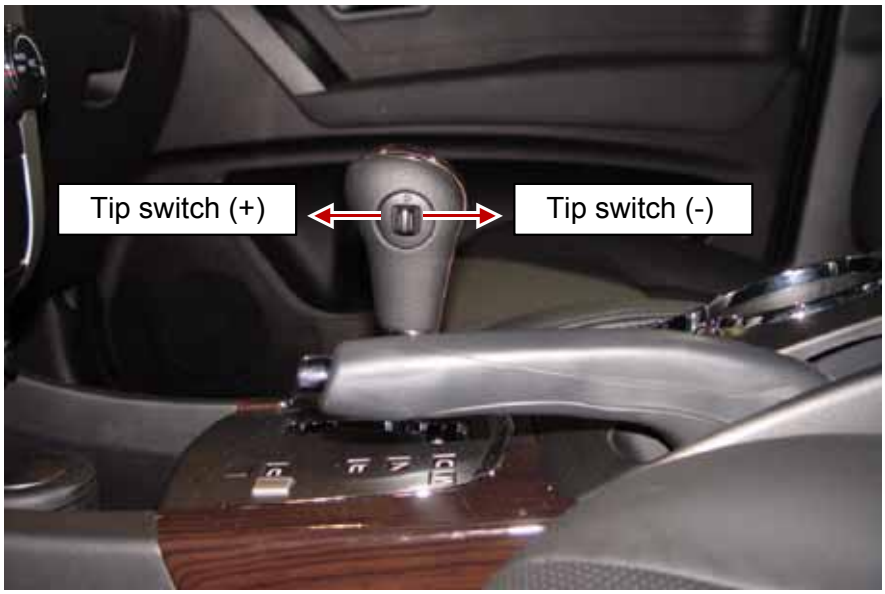
▶ **1 to 6 Gears**

D

This position is for normal driving on paved roads or high speed driving. The gear ratio of the 6th gear is 0.676:1.

Modification basis	
Application basis	
Affected VIN	

3) Manual Mode (M Position)



Driving gear can be adjusted by operating the tip switch after moving the gear selector lever from "D" to "M" position. If the gear selector level is moved to "M" position while driving, the gear is shifted down to the next lower gear. To prevent shift shock and to protect the system, in some cases, the current gear may not be shifted to the lower gear even if the gear selector lever is moved to "M" position.

▶ 1 to 6 gears (only available in the "M" position)

6

Normal driving position.
Automatically shifted to 1 to 6 gear same as "D" position.
Can downshift with tip switch.

▶ 1 to 5 gears (only available in the "M" position)

5

Normal driving position.
Automatically shifted to 1 to 5 gear.
Can shift to 5th gear with tip switch.

▶ **1 to 4 gears (only available in the "M" position)**

Use on a long and gentle slope.
Automatically shifted to 1 to 4 gear.
Can shift to 4th gear with tip switch.

▶ **1 to 3 gears (only available in the "M" position)**

Use on a long and gentle slope. Engine braking effect is available.
Automatically shifted to 1 to 3 gear.
Can shift to 3rd gear with tip switch.

▶ **1 to 2 gears (only available in the "M" position)**

Use on a unpaved road, steep hill. Engine braking effect is available.
Automatically shifted to 1 to 2 gear.
Can shift to 2nd gear with tip switch.

▶ **1st gear (only available in the "M" position)**

Use on a rugged road, mountain path and steep hill. Engine braking effect on steep hill is available.
Use only 1st gear.

Modification basis	
Application basis	
Affected VIN	

4) Shift Mode

(1) Manual (M) mode

To prevent any wrong shifting down or up in the "D" position, the manual mode can be activated only in the "M" position. When both tip switches on the steering wheel and the knob send out shifting up or down signals in the M mode to the controller of the selector lever, the controller only accepts the first signal and ignores the second signal.
When the driver briefly touches or continuously pushes one of the up or down shifting tip switch in the M mode, the signal is sent to the TCU. When the driver pushes and holds the switch, the TCU shifts down one or two gears without any jerking. If the driver briefly touches the switch once, the TCU shifts up or down gears one by one.

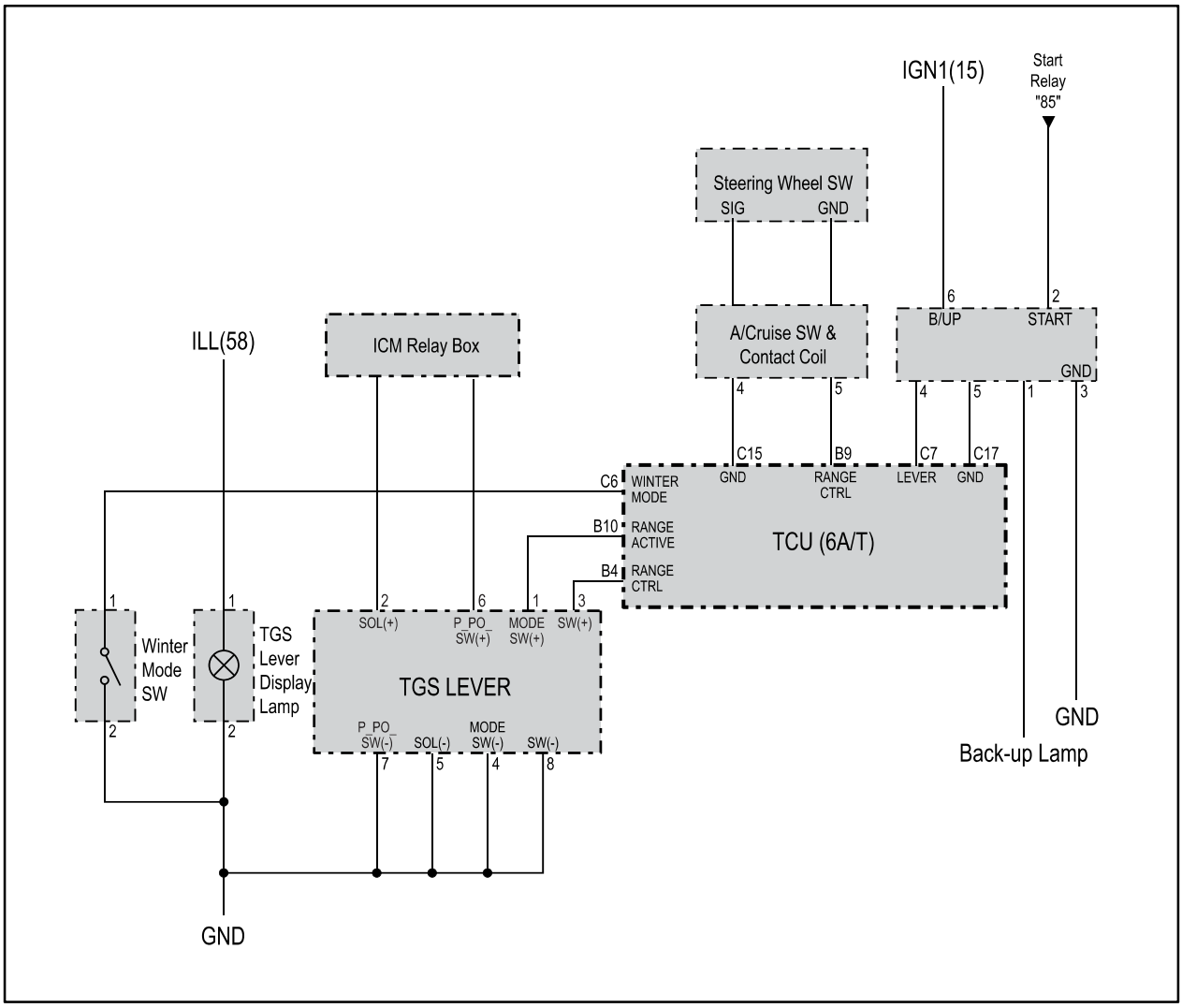
(2) When switching from D to M

When the selector lever is pushed from the D position to the M mode, the M mode sensor detects this change and sends a signal to the TCU, and the TCU shifts down one or two gears without any jerking. This means the newly engaged gear in the M mode is the one-level lower gear from the D position.

(3) When switching from M to D

When the selector lever is pushed to the D position from the M mode, the M position sensor detects the change and sends another signal to the TCU. Then, the TCU enables the transmission to choose from all available gears including the highest one (the D position).

(4) Circuit Diagram



Modification basis	
Application basis	
Affected VIN	

5) Mode Switch

W: Winter mode (pressed "OUT")
S: Standard mode (pressed "IN")
Toggle the mode between winter mode and standard mode by pressing this switch.

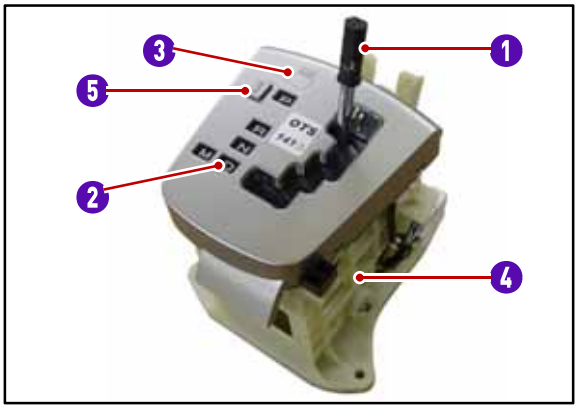
The mode switch is installed next to the gear selector lever as shown in the figure. It has the Standard (S) and Winter (W) modes.

- The S mode is for driving under normal conditions and uses the 1st gear to start off. It also ensures more enjoyable driving by analyzing the driver's driving habits and changing shifting patterns according to the habits. (Degree holding on a hilly road: approximately 11 to 13.5% or less)
- When the W mode is selected, the Winter lamp comes on the instrument panel. The mode uses the 2nd gear for the vehicle's smooth driving off.

The TGS unit sends the signal related to the mode switch to TCU through hard wire.

6) Parking Lock System

(1) Function



1. Gear selector lever
2. Shift pattern display
3. Parking lock release flap
4. TGS control unit (Integrated)
5. Mode switch

The parking lock system is built in the selector lever unit as shown in the figure. The wiring to detect the brake switch is connected to the selector lever unit so that the system detects the brake switch operation signal for allowing shift from the "P" to other positions. This system is a safety measure to prevent the selector lever from moving unless the brake pedal is depressed.

▶ Shift lock

Unless the ignition switch is turned to "ON" and the brake pedal is pressed, the TGS control unit does not activate the P Locking solenoid and the TGS lever stays locked. In this situation, the lock lever is engaged to the P lock position and the locking lever tap holds the lock lever. Therefore, the TGS lever cannot be shifted to other positions.

Modification basis	
Application basis	
Affected VIN	

▶ **Shift lock solenoid**

Input					Solenoid	Remarks
Lever position	Ignition	Brake	Speed (km/h)	Lock position		
X	OFF	X	X	1	OFF	
P	ON	OFF	X	1	OFF	P LOCK
P	ON	ON	X	2	ON	
P.R	ON	X	X			Use the last available gear position
R	ON	X	X	2	OFF	
R.N	ON	X	X			Use the last available gear position
N	ON	X	X	2	OFF	
N.D	ON	X	X			
D	ON	X	X	2	OFF	Use the last available gear position

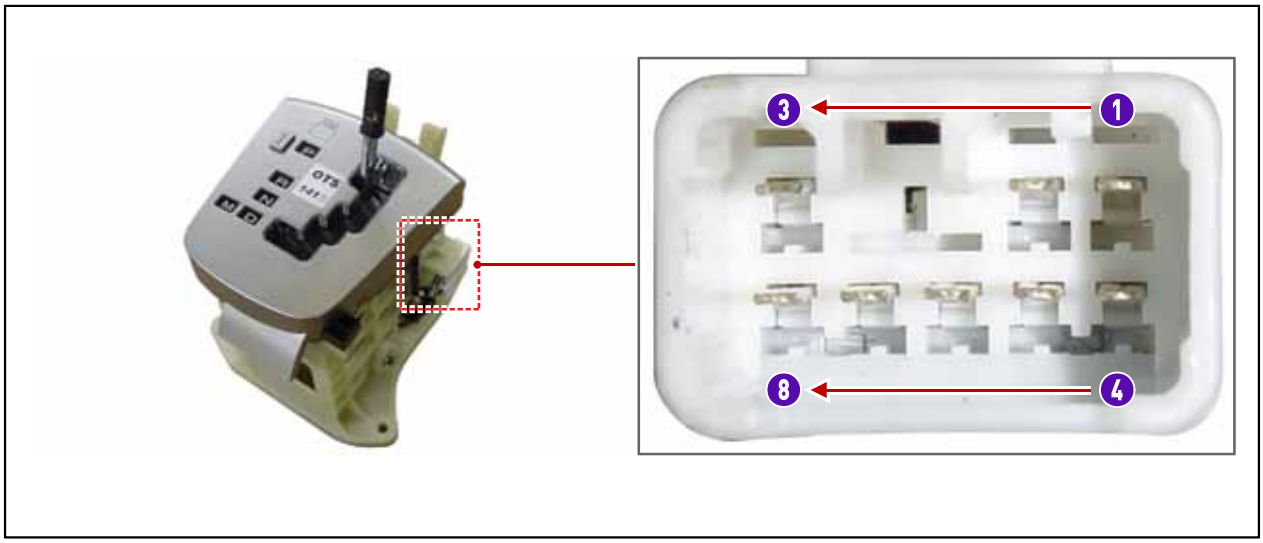
Lock position	P
1	LOCK
2	UNLOCK

7) Selector Lever Control Unit

(1) Function

The Selector Lever Unit performs the following:

a. Informs the TCU of the Selector Lever's position between the D and M modes though hard wires
b. Turns on the Selector Lever Illumination
c. Activates the Parking Lock system



▶ **Connector**

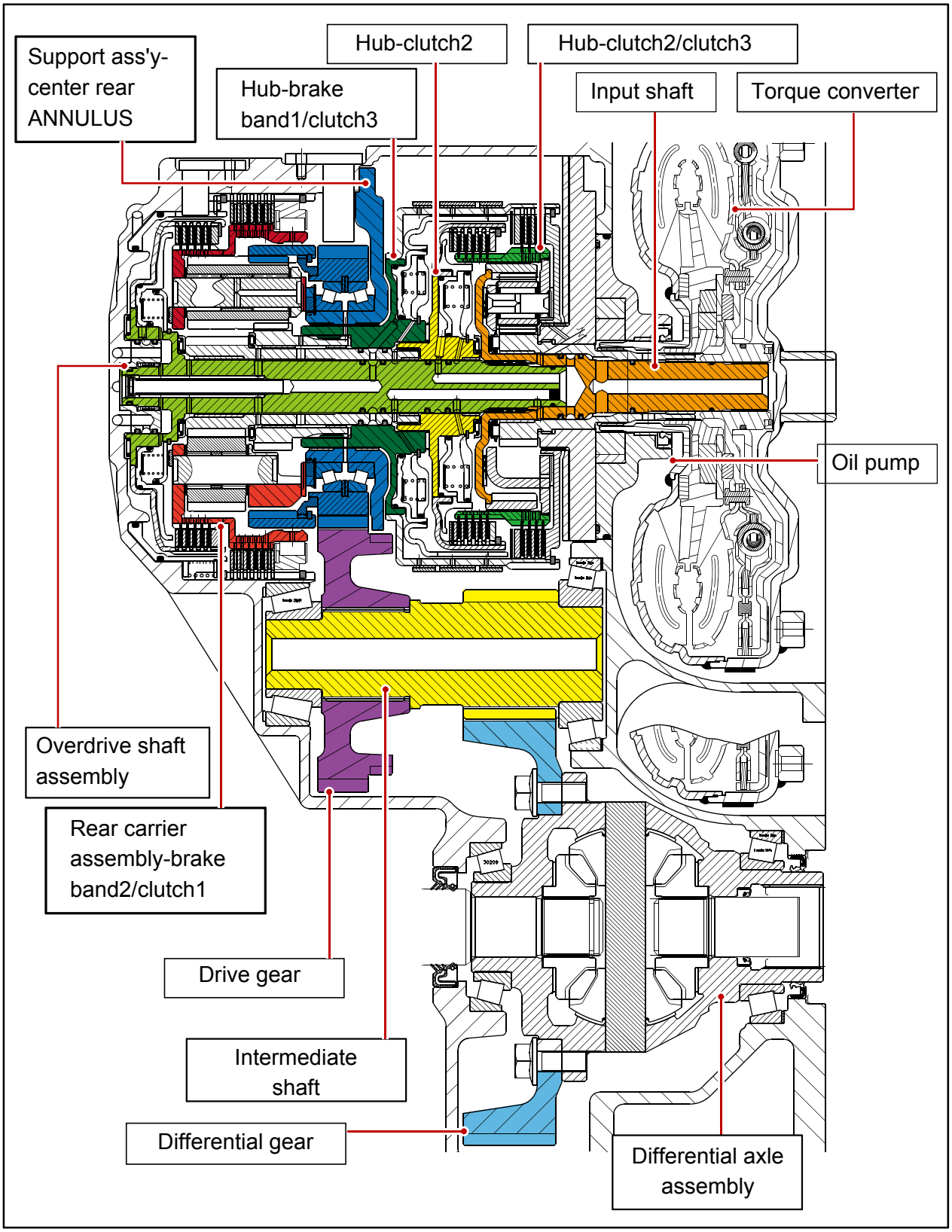
Pin No.	Function	Remarks
1	Mode switch (+)	Sends to TCU (B10)
2	Shift lock solenoid (+)	Sends to ICM relay box (C7)
3	Tip switch (+)	Sends to TCU (B4)
4	Mode switch (-)	Ground
5	Shift lock solenoid (-)	Ground
6	Parking position switch (+)	Sends to ICM relay box (C8)
7	Parking position switch (-)	Ground
8	Tip switch (-)	Ground

Modification basis	
Application basis	
Affected VIN	

S.G.N. 3680-01

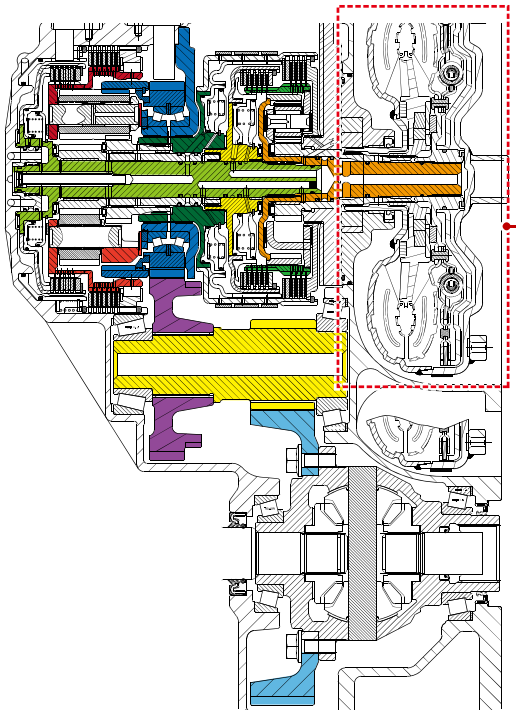
DSI 6 SPEED A/T ASSEMBLY

1) Sectional Diagram



Modification basis	
Application basis	
Affected VIN	

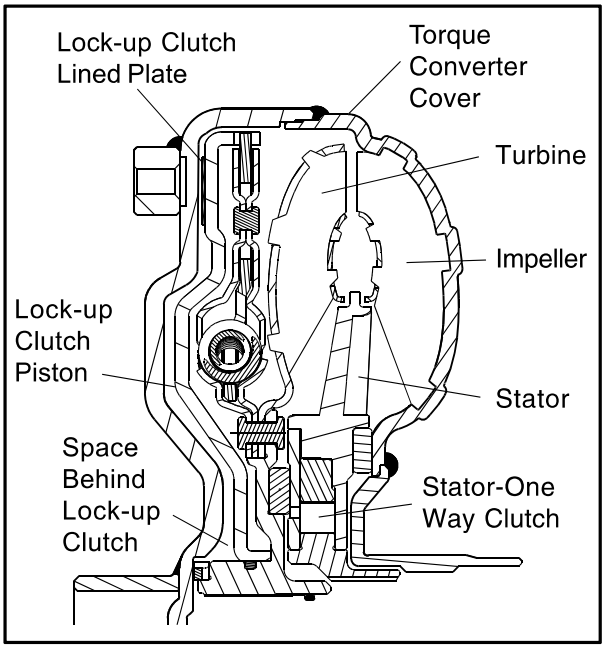
(1) Torque converter



Torque converter

▶ **Front view**

▶ **Rear view**



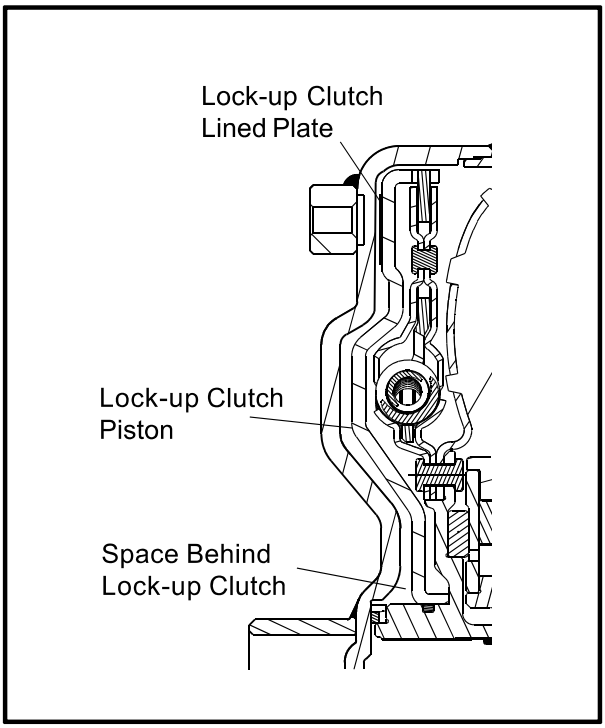
The torque converter is installed between the engine and the transmission. It is consisted of the impeller, turbine, stator, lockup clutch, and one-way clutch.
The torque converter contains a single plate lock-up clutch. The lock-up clutch can be controlled and engaged in any forward gear. The clutch is applied by removing transmission fluid pressure from one side of the plate and applying pressure to the other. The torque converter transmits and multiplies torque.

Modification basis	
Application basis	
Affected VIN	

▶ Operation

- The impeller, which is driven by the engine, imparts a circular flow to the transaxle fluid in the converter.
- This transaxle fluid strikes the turbine wheel, which causes the flow to change its direction.
- The transaxle fluid flows out of the turbine wheel close to the hub and strikes the stator where its direction is changed again to a direction suitable for re-entering the impeller.
- The change in direction at the stator generates a torque reaction which increases the torque reaching the turbine.
- The ratio between turbine and impeller torque is referred to as torque multiplication or conversion.
- The greater the difference in speed or rotation at the impeller and turbine, the greater the increase in torque. The maximum increase is obtained when the turbine wheel is stationary. As turbine wheel speed increases, the amount of torque multiplication gradually drops.
- When the turbine wheel is rotating at about 85% of the impeller speed, torque conversion reverts to one, that is to say torque at the turbine wheel is no higher than the torque at the impeller.
- The stator, which is prevented from rotating backwards by a one-way clutch and the shaft in the transaxle housing, runs freely in the transaxle fluid flow and overruns on the one-way clutch. From this point on, the converter acts only as a fluid coupling. During the torque conversion process, the stator ceases to rotate and bears against the housing by the one-way clutch.

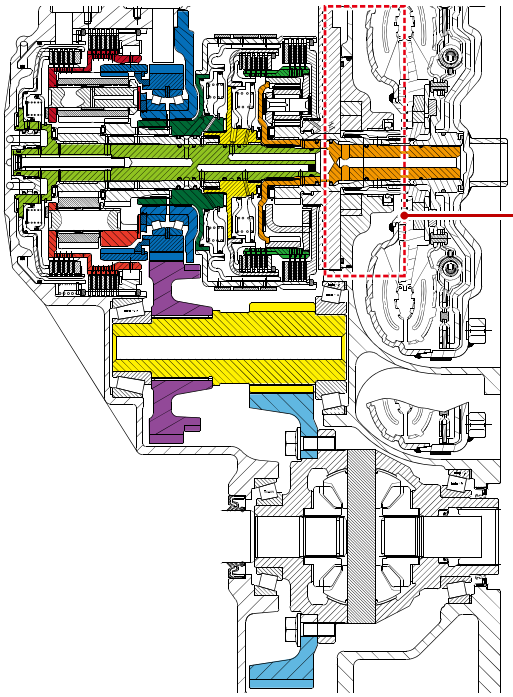
▶ Torque converter lock-up clutch



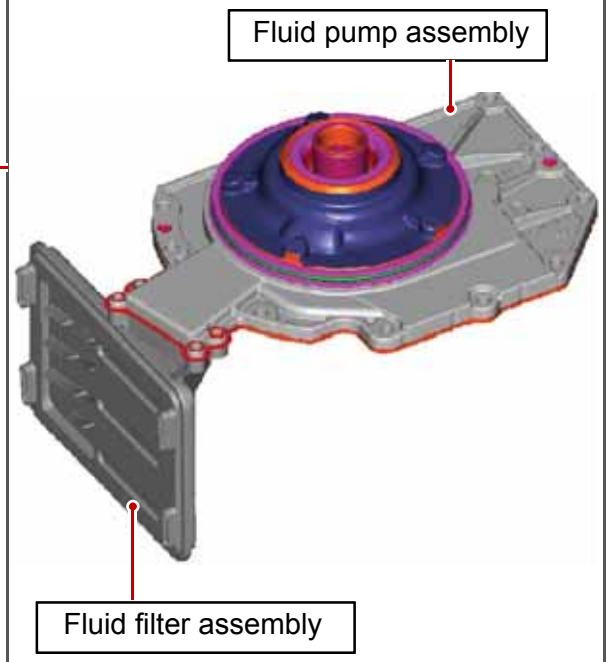
- The torque converter lock-up clutch is a device which eliminates slip in the torque converter and therefore helps to keep fuel consumption to a minimum.
- The torque converter lock-up clutch includes a cooling nozzle which allows for torque converter slip control. This functionality allows for partial torque converter lock-up at lower than normal engine rpm, which improves fuel economy.
- The torque converter lock-up clutch is engaged and released via the control system. Pressure at the torque converter lock-up clutch piston is determined by an electronic variable bleed solenoid (VBS).

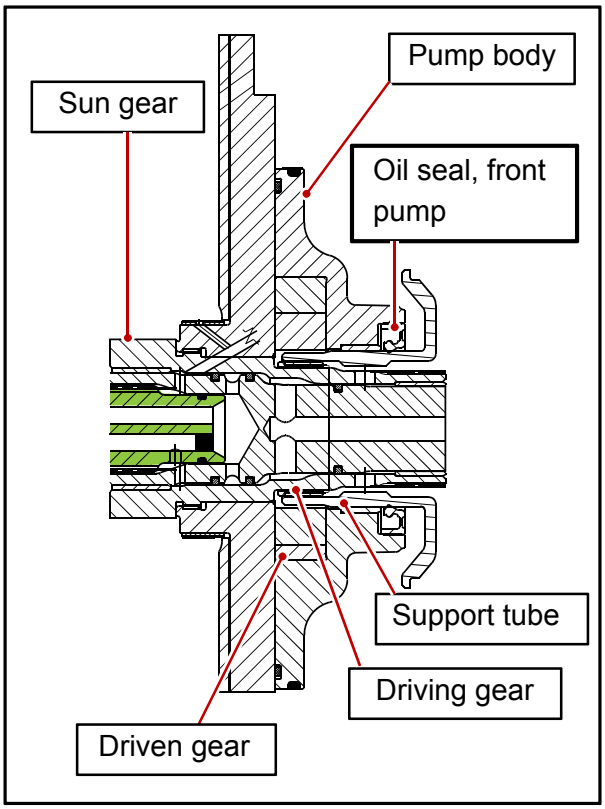
- The torque converter lock-up clutch can be controlled and engaged in any forward gear. When the torque converter lock-up clutch is released, transmission fluid pressure behind the lock-up clutch piston turbine area is equalized. The direction of flow is through the turbine hub and the area behind the piston into the turbine area.
- To engage the torque converter lock-up clutch the direction of transmission fluid flow is changed by a valve in the transmission pump. At the same time the space behind the torque converter lock-up clutch piston is vented. Fluid pressure extends from the turbine area to the torque converter lock-up clutch piston and presses it against the cover of the torque converter. This locks the turbine wheel between the piston and the cover and enables the drive to pass with limited slip to the planetary gear train in normal operating conditions.

(2) Fluid pump



Fluid pump

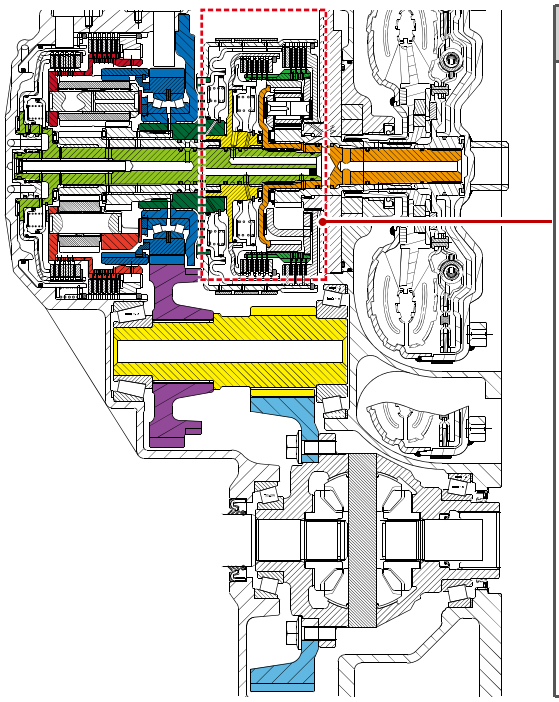




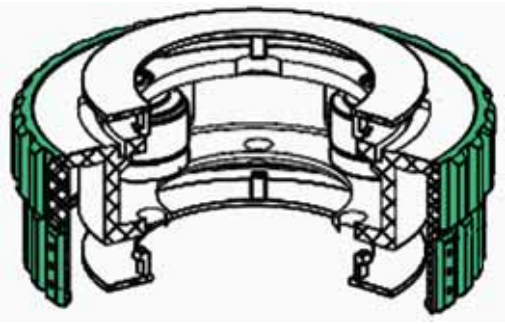
- The fluid pump is a parachoidal type pump delivering approximately 17.6 cc of transaxle fluid per revolution.
  It is located between the torque converter and the transaxle housing.
- The torque converter is supported in the fluid pump by a plain bush bearing. The fluid pump is driven directly from the engine by the torque converter cover and supplies transaxle fluid directly to the valve body and transaxle.
- The fluid pump draws in transaxle fluid through a filter and delivers it at high pressure to the valve body.

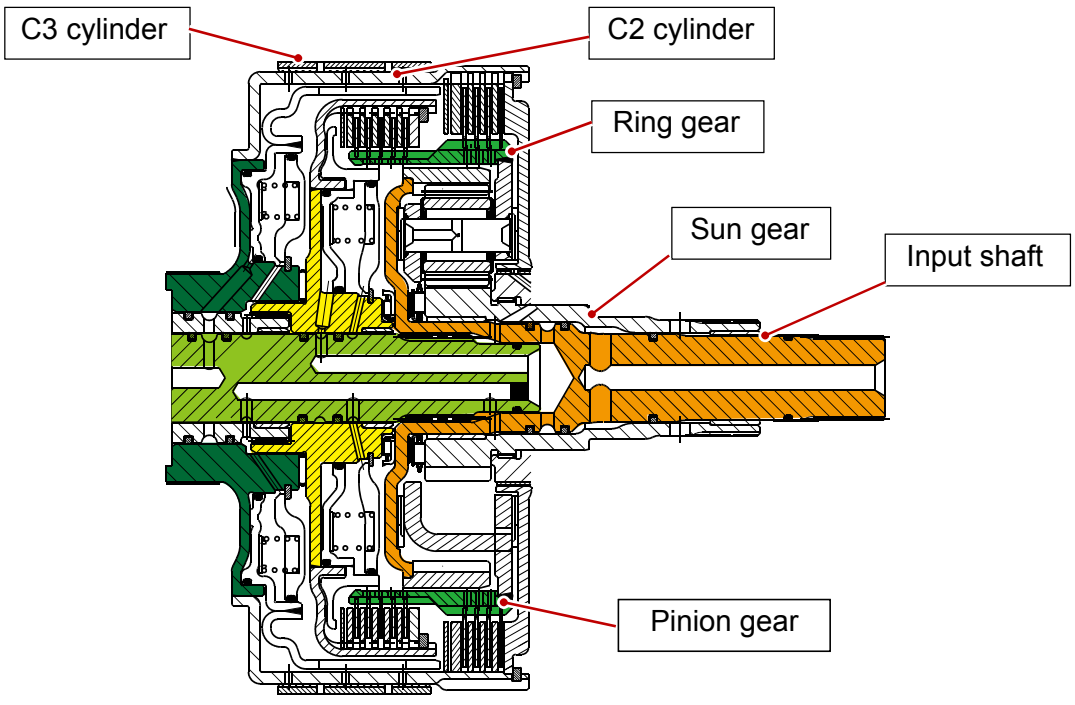
(3) Single planetary gear-set

The single planetary gear-set is driven by input shaft. The single planetary gear-set consists of:
- One sun gear
- Three planetary gears meshing with sun gear
- One planetary gear carrier
- One ring gear



Single planetary gear-set



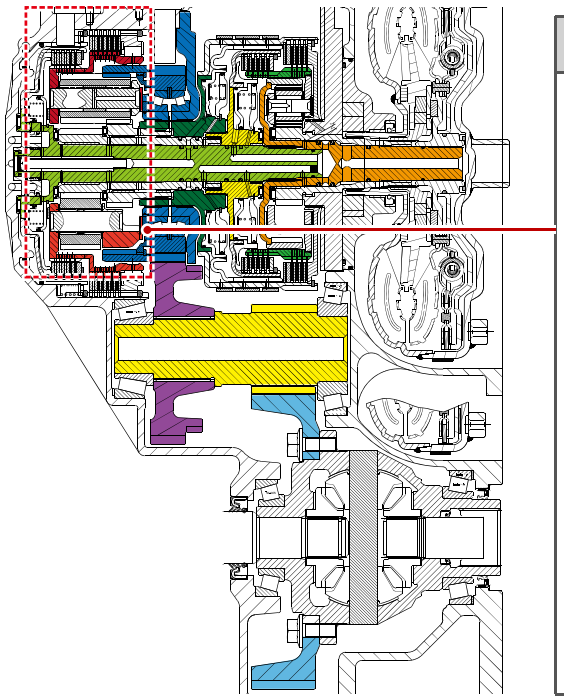


Modification basis	
Application basis	
Affected VIN	

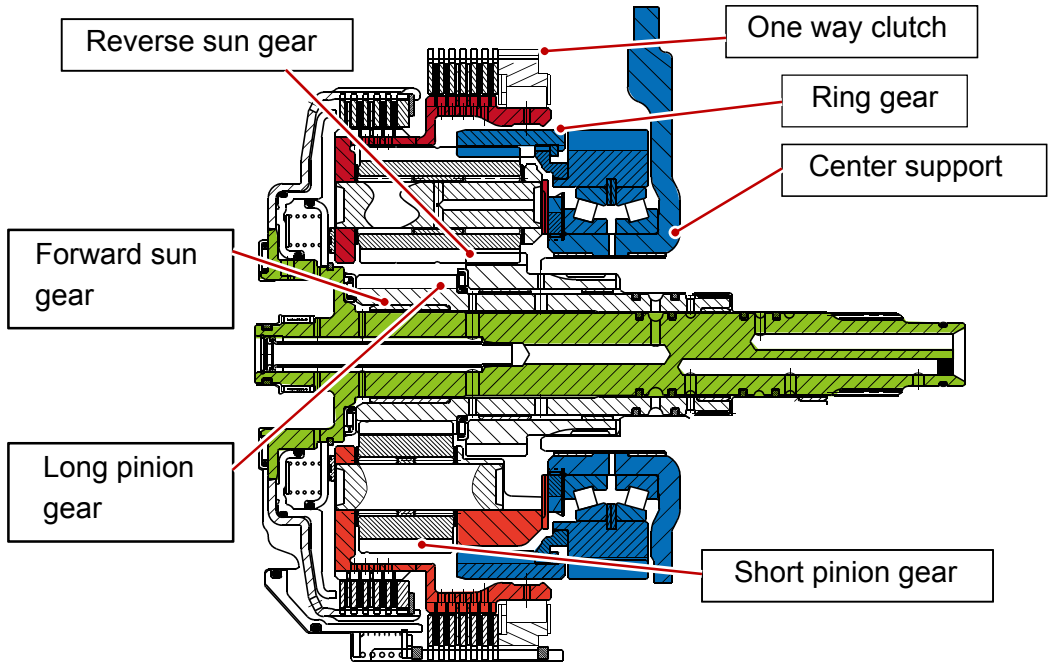
(4) Double planetary gear-set

The double planetary gear-set is splined to the Overdrive shaft. The double planetary gear-set consists of:

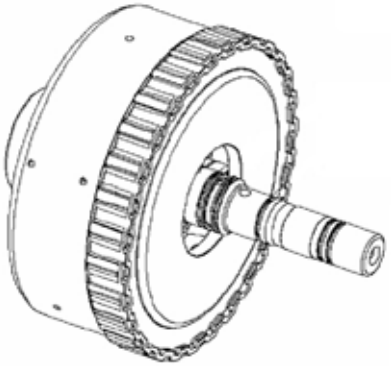
- Two sun gears (forward and reverse)
- Three short planetary gears and three long planetary gears meshing with sun gears
- One planetary gear carrier
- One ring gear

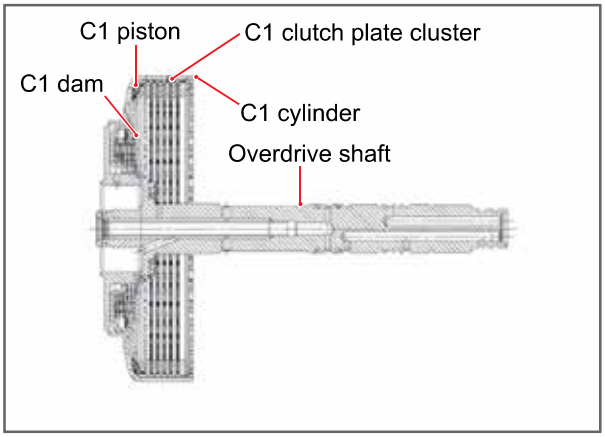


Double planetary gear-set



(5) Clutches and brake bands

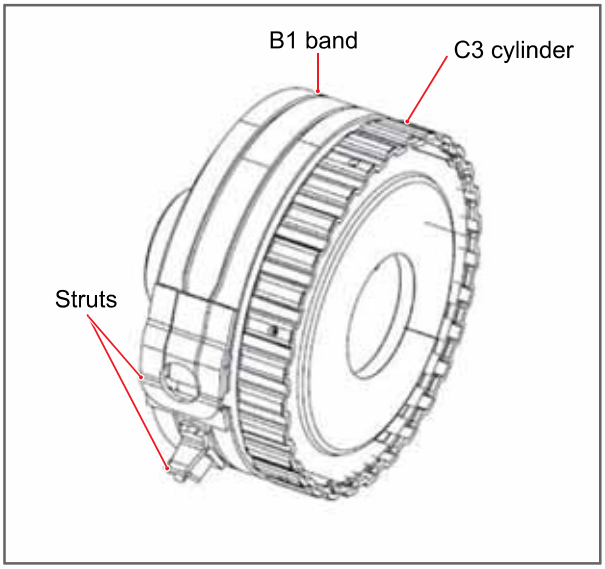
C1	C2 and C3
	



Other shift elements in addition to the torque converter lock-up clutch are:

- Four rotating multi-plate clutches C1, C2 and C3
- One brake clutch (B2)
- One brake band (B1)

The multi-plate clutches are equalized in terms of dynamic pressure. Its piston is exposed to the transaxle fluid flow on both sides in order to prevent pressure build up in the clutch as the speed of rotation increases. This pressure equalization is achieved by a piston dam.



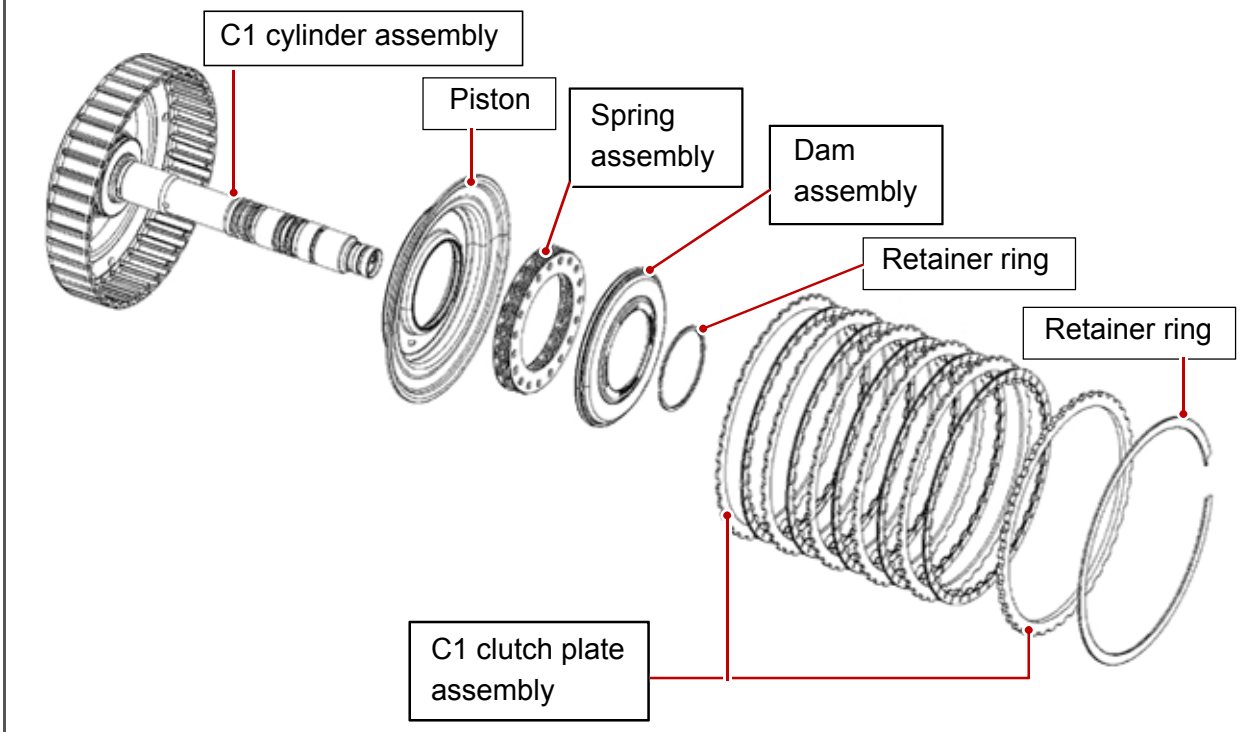
The advantages of this dynamic pressure equalization are:

- Reliable clutch engagement and release in all speed ranges
- Improved shift refinement

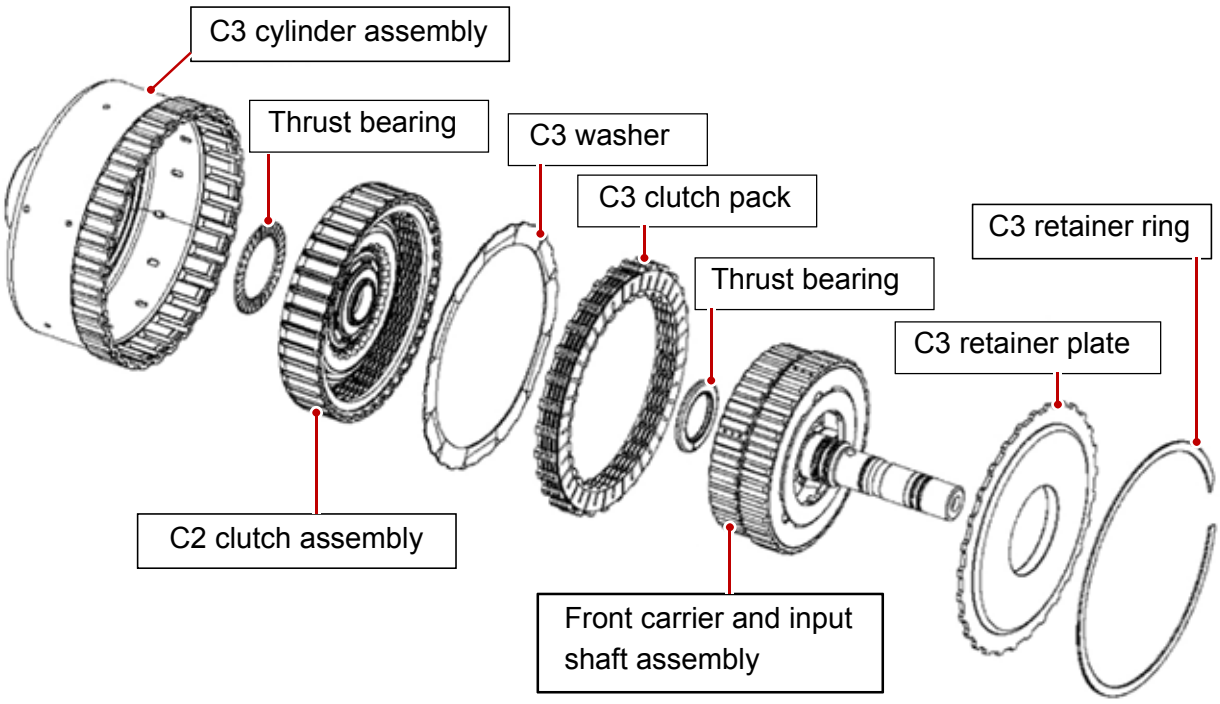
Modification basis	
Application basis	
Affected VIN	

▶ Components

C1 assembly



C2 and C3 assembly

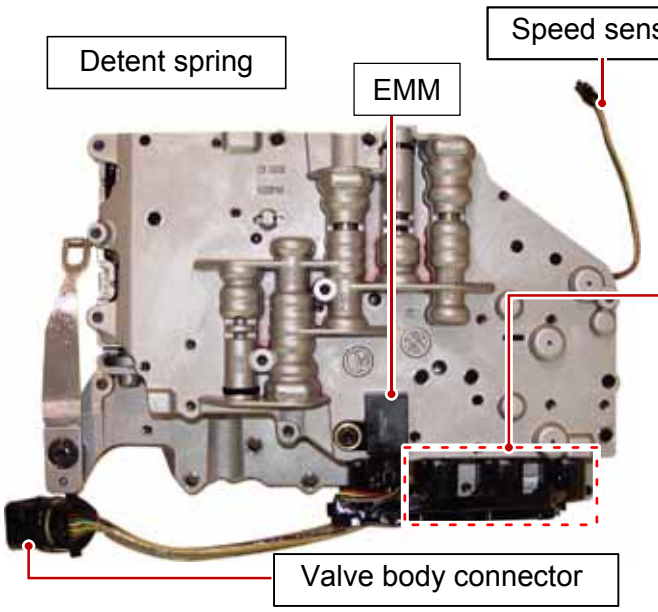


S.G.N. 3680-01 VALVE BODY ASSEMBLY

1) Overview

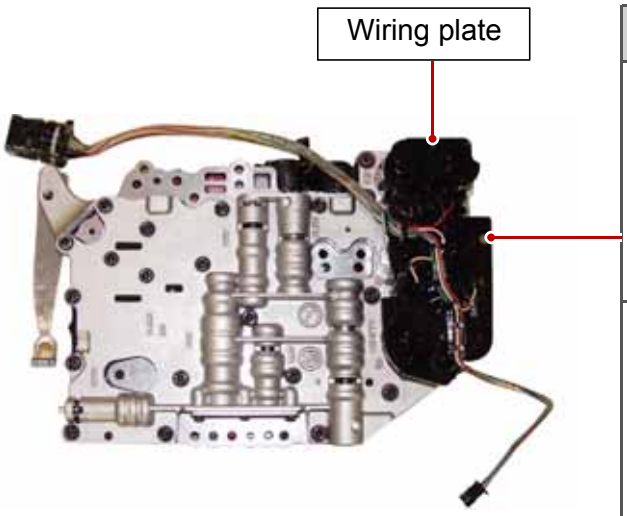
The valve body contains four on/off solenoid valves and six variable bleed solenoids. The on/off solenoid valves are actuated by the TCU and maintain two positions; open and closed. These valves are used to switch the shift valves.
The variable bleed solenoids convert an electric current into a proportional hydraulic pressure. They are energized by the TCU and supply variable pressure to each of the clutch or bands dedicated regulator valves.

Front



ON/OFF solenoid (S1 to S4)

Rear



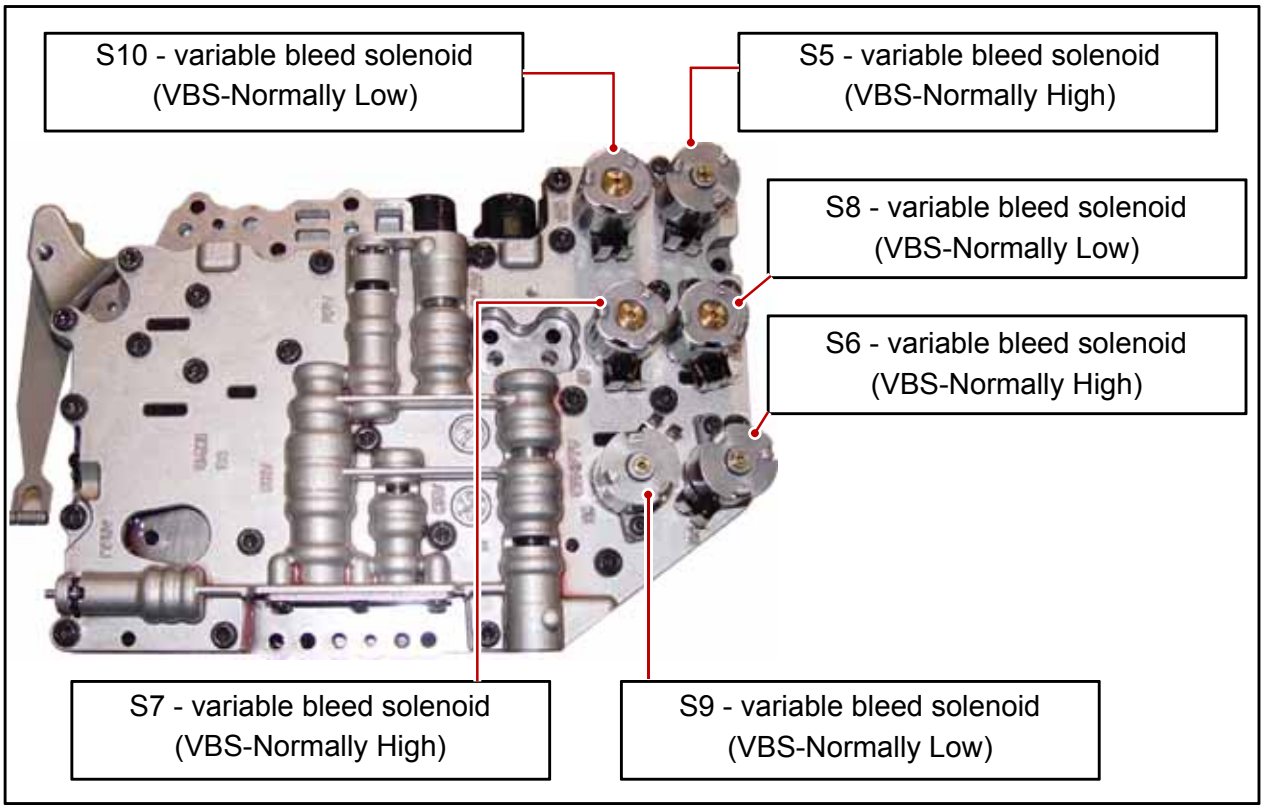
Variable bleed solenoid (S5 to S10)

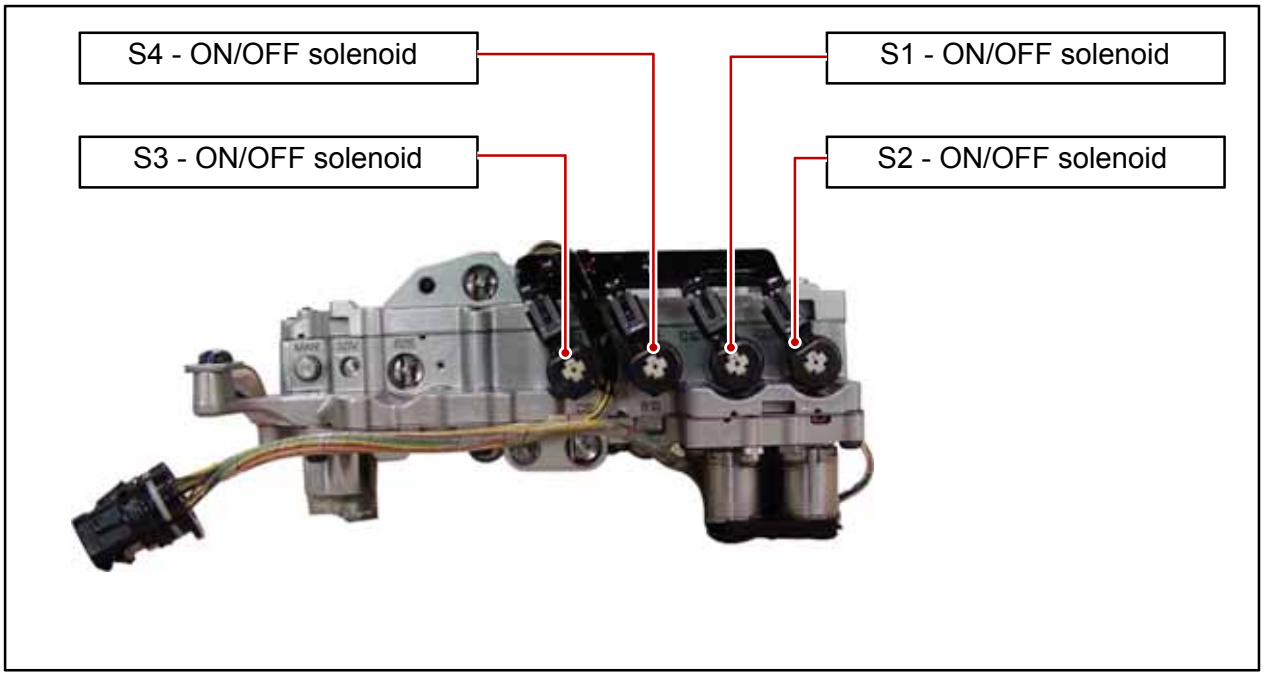
VBS - Normally High
(S5, S6, S9)

VBS - Normally Low
(S7, S8, S10)

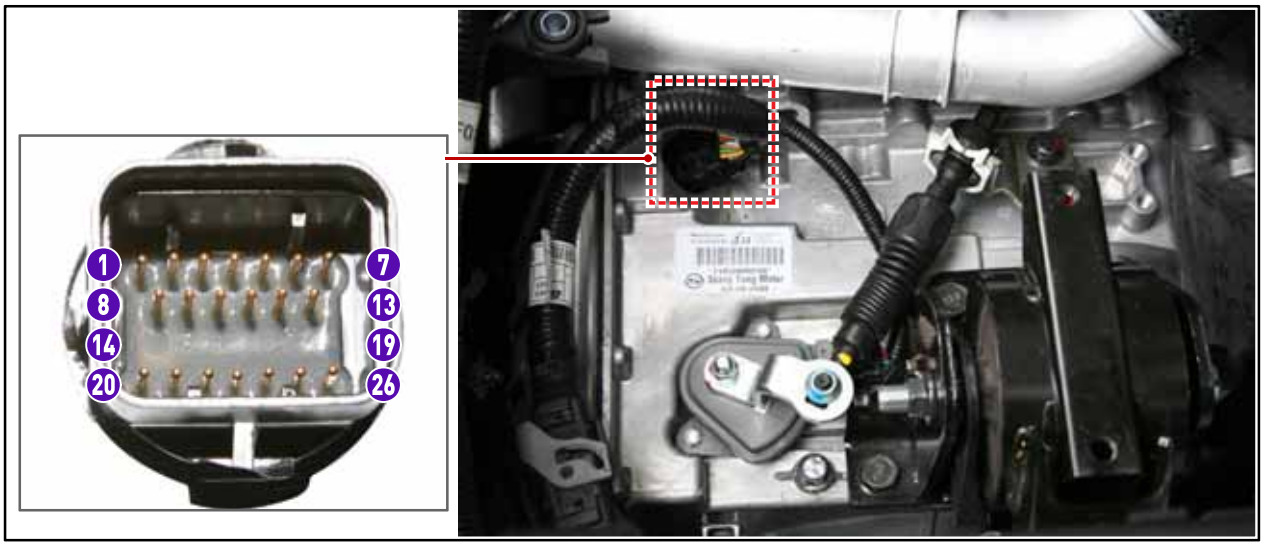
Modification basis	
Application basis	
Affected VIN	

▶ Locations of solenoids



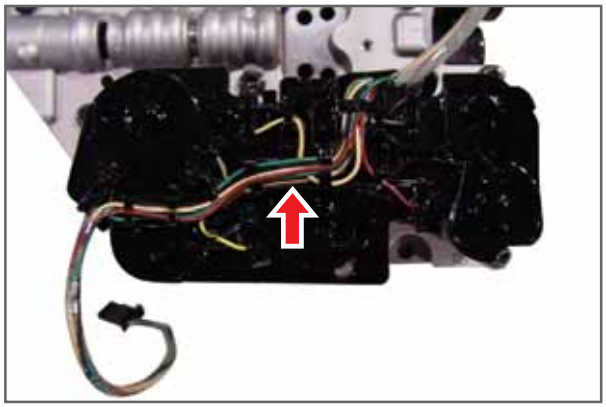


2) Connector



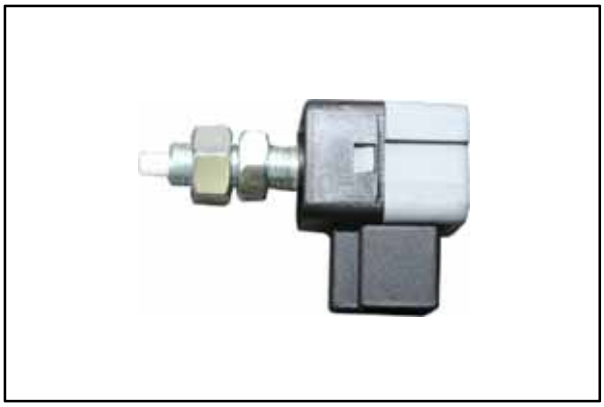
Pin No.	Function	Pin No.	Function
1	VBS solenoid, ground	14	-
2	VBS solenoid 5	15	-
3	VBS solenoid 6	16	-
4	VBS solenoid 7	17	-
5	VBS solenoid 8	18	-
6	VBS solenoid 9	19	-
7	VBS solenoid 10	20	ON/OFF solenoid, ground
8	EMM data/speed sensor, ground	21	ON/OFF solenoid 1
9	EMM/speed sensor, supply power	22	ON/OFF solenoid 2
10	Output speed	23	ON/OFF solenoid 3
11	Input speed	24	ON/OFF solenoid 4
12	EMM data	25	Transaxle oil temperature, ground
13	EMM clock	26	Transaxle oil temperature, power

3) Sensors



▶ Transaxle fluid temperature sensor

The TCU utilizes one transaxle fluid temperature sensor located in the valve body wiring loom. The TCU uses the sensor input to activate various shift strategies. The sensor is in the form of a temperature dependant resistor. The temperature sensor performs plausibility checks on each sensor reading. If the inputs from the temperature sensor are outside the working range it is possible the sensor is either short or open circuit.



▶ Brake pedal position switch

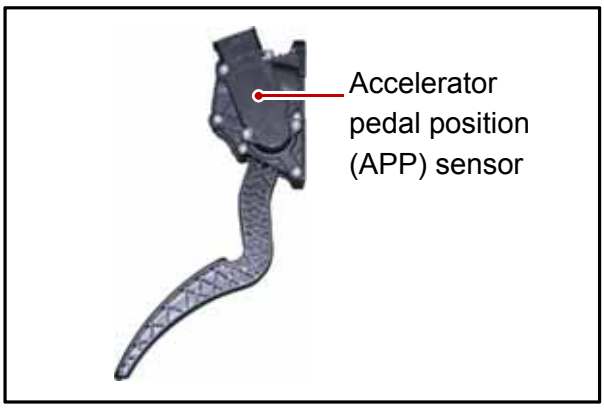
The brake pedal position (BPP) switch tells the TCU when the brakes are applied. The BPP is also used to disengage the transaxle gear selector (TGS) interlock when moving out of the Park position and as part of the shifting strategy.

▶ Engine intake temperature sensor

The engine intake temperature (EIT) sensor detects intake air temperature and supplies the information to the TCU.

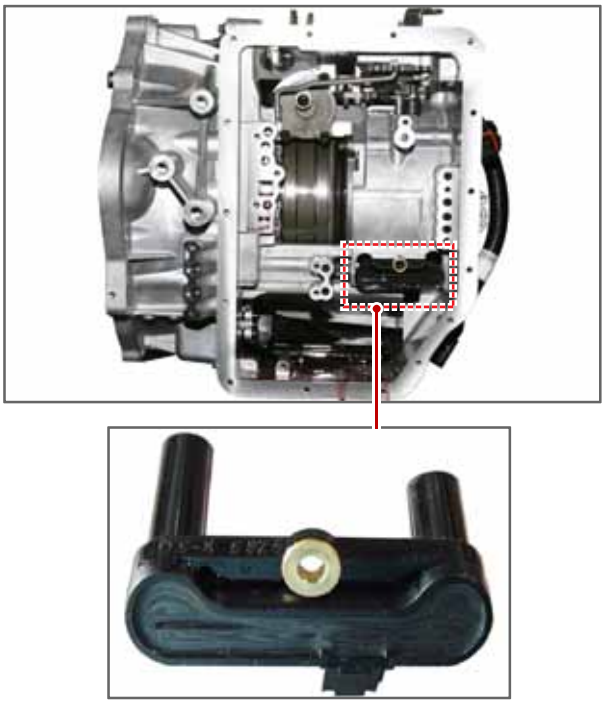
▶ Barometric Pressure Sensor

The barometric pressure (BARO) sensor detects the current air pressure and supplies the information to the TCU.



▶ Accelerator pedal position sensor

The accelerator pedal position (APP) sensor is a potentiometer mounted on the accelerator pedal. The APP sensor detects the position of the accelerator pedal and sends this information to the TCU. The APP sensor signal is used for shift scheduling and TCC lock-up.



▶ Speed sensor

The input speed sensor and output speed sensor are packaged in the one unit. Both sensors are a hall effect type sensor.
The sensor is mounted internally in the transaxle and is located under the valve body.

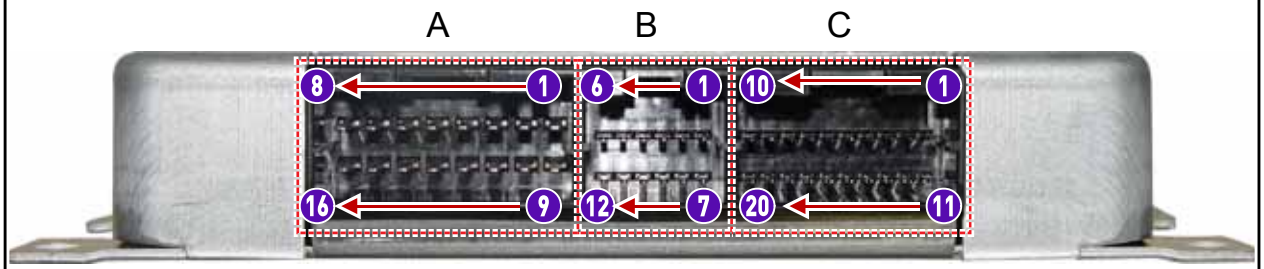
Modification basis	
Application basis	
Affected VIN	

S.G.N. 3110-01 TCU

1) Mounting Location

Located under driver's seat

2) Connector



(1) Connector A

Pin No.	Function	Pin No.	Function
1	VBS solenoid 9	9	ON/OFF solenoid 2
2	VBS solenoid 10	10	ON/OFF solenoid 1
3	VBS solenoid 7	11	ON/OFF solenoid 4
4	VBS solenoid 8	12	ON/OFF solenoid 3
5	VBS solenoid 5	13	-
6	VBS solenoid 6	14	-
7	VBS solenoid, ground	15	ON/OFF solenoid, ground
8	Ground	16	Ignition power supply

2) Connector B

Pin No.	Function	Pin No.	Function
1	CAN High	7	CAN Low
2	-	8	-
3	-	9	Tip switch on steering wheel signal
4	Transaxle gear selector range control	10	Manual gear shift (M)
5	-	11	-
6	-	12	-

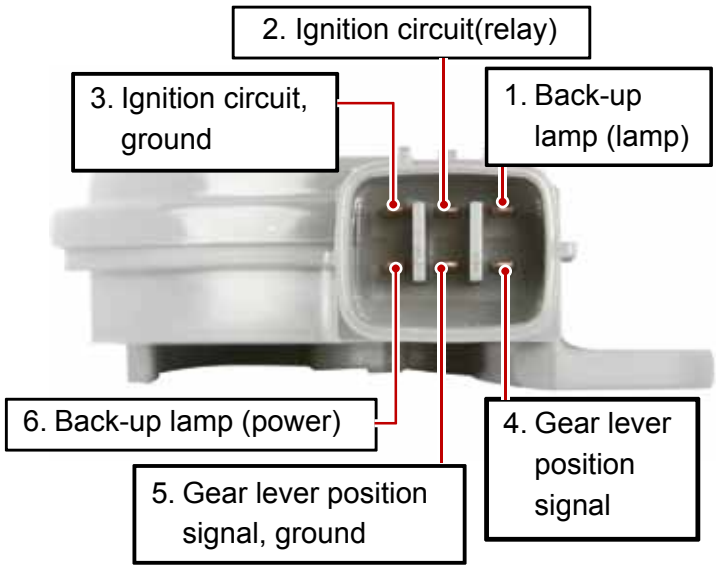
3) Connector C

Pin No.	Function	Pin No.	Function
1	Output speed	11	-
2	EMM/speed sensor, supply power	12	EMMspeed sensor, ground
3	Input speed	13	-
4	EMM data	14	EMM clock
5	-	15	Tip switch on steering wheel, ground
6	Winter mode signal	16	-
7	Inhibitor switch (gear selector lever)	17	(Inhibitor switch, ground) Gear selector lever, ground
8	Transaxle fluid temperature	18	Transaxle fluid temperature, ground
9	-	19	-
10	-	20	-

S.G.N. 3680-01 INHIBITOR SWITCH

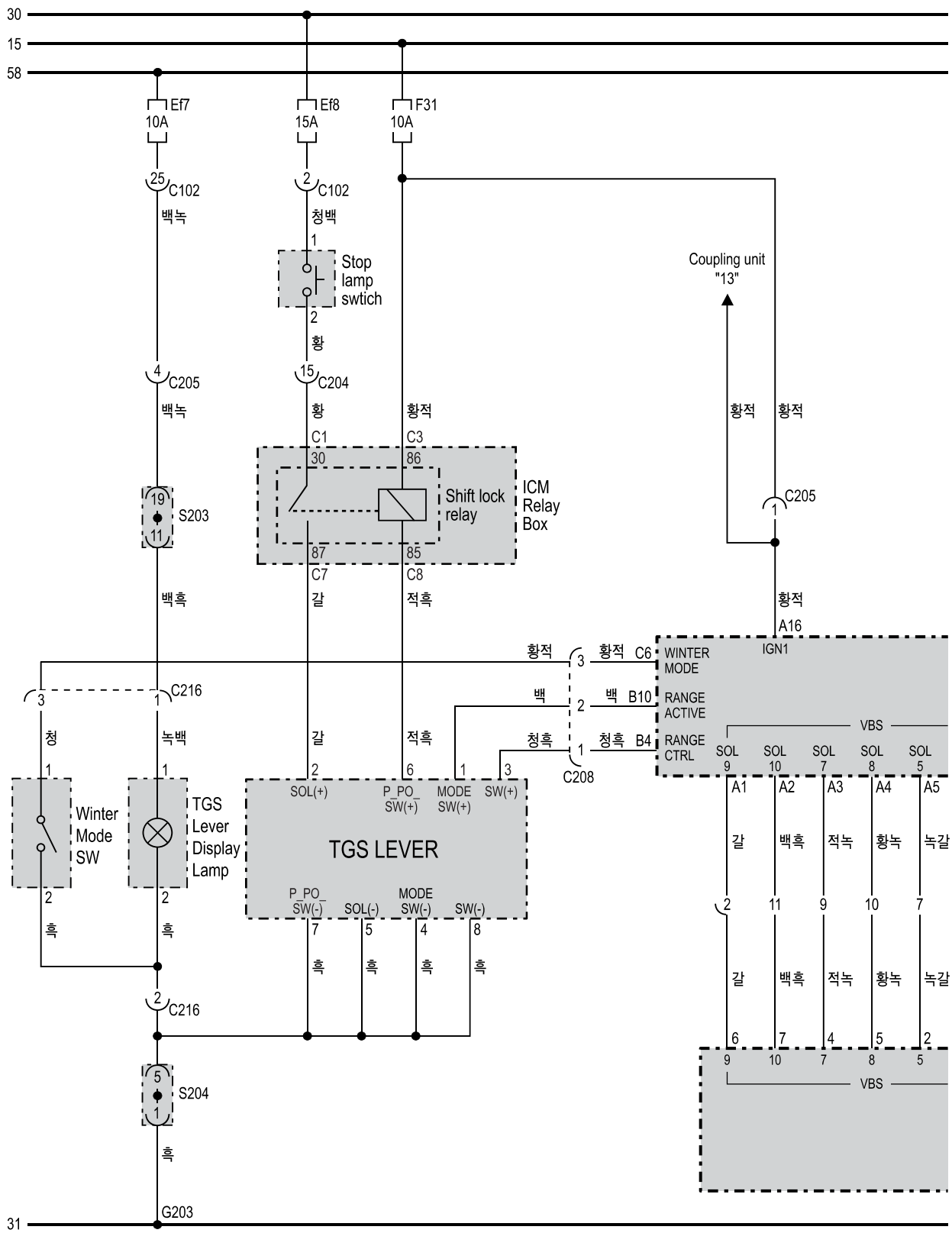
The TCU uses the position of this switch to determine the position of the selector lever. The selector lever is connected to the transmission via a linkage mechanism which operates the transmission selector shaft between positions Park, Reverse, Neutral and Drive. The inhibitor switch contains set resistances for each position which are read by the TCU. The TCU uses this information to control the shifts to reverse and drive.
For models equipped with manual mode, the TCU detects the driver's choice of manual range selection (+ or -) by means of switches directly connected to the selector lever and/or steering wheel. Movement of the lever between Park, Reverse, Neutral and Drive manually controls the flow of transmission fluid, the TCU having control of the forward gear selected in Drive.
If the lever is not in the Park or Neutral positions, or if the switch is disconnected, starting of the engine is inhibited.

▶ **Inhibitor sensor**

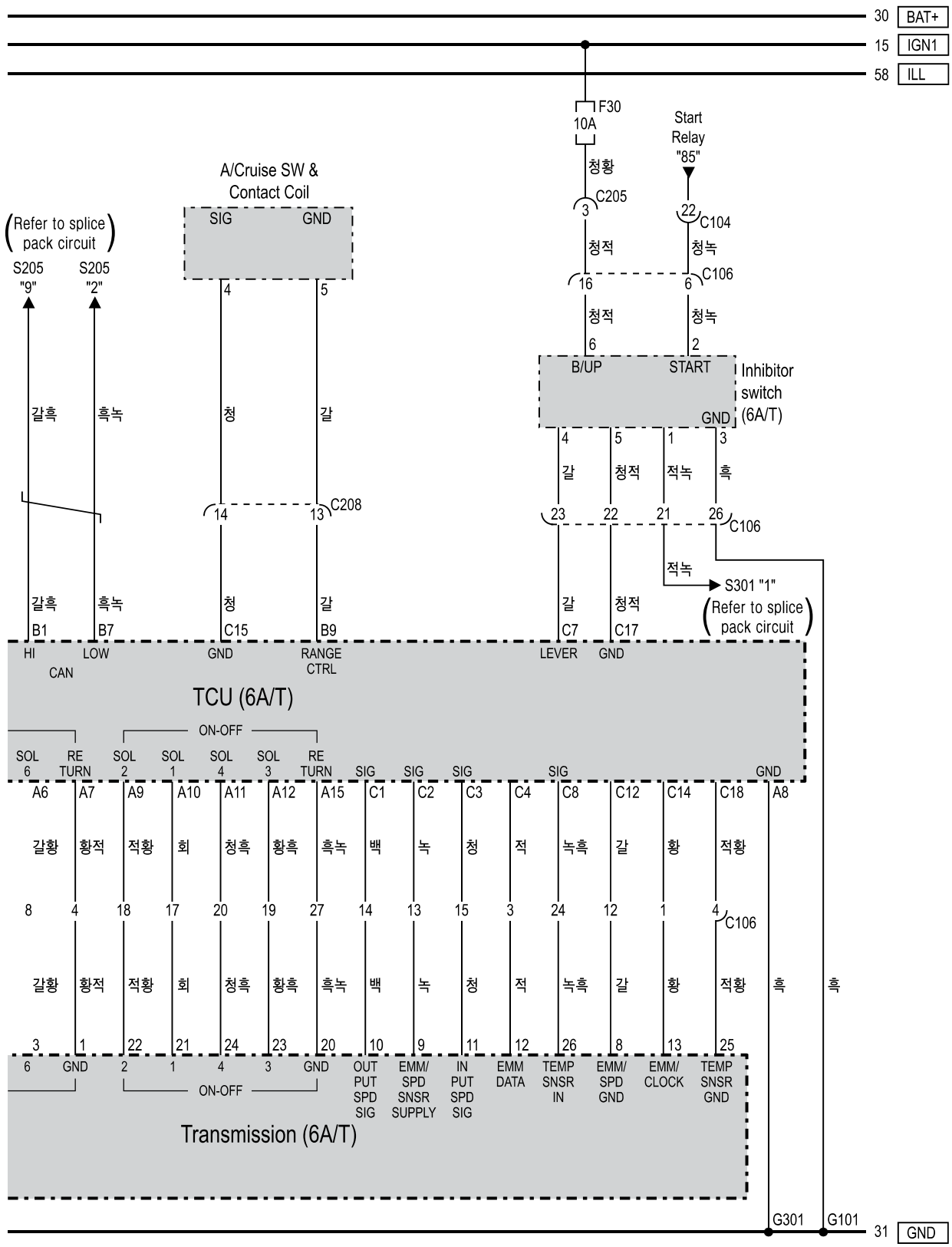
Connector pin No.	Switch pin No. and function
	

S.G.N. 3110-01

CIRCUIT DIAGRAM



Modification basis	
Application basis	
Affected VIN	



Modification basis	
Application basis	
Affected VIN	

REMOVAL AND INSTALLATION

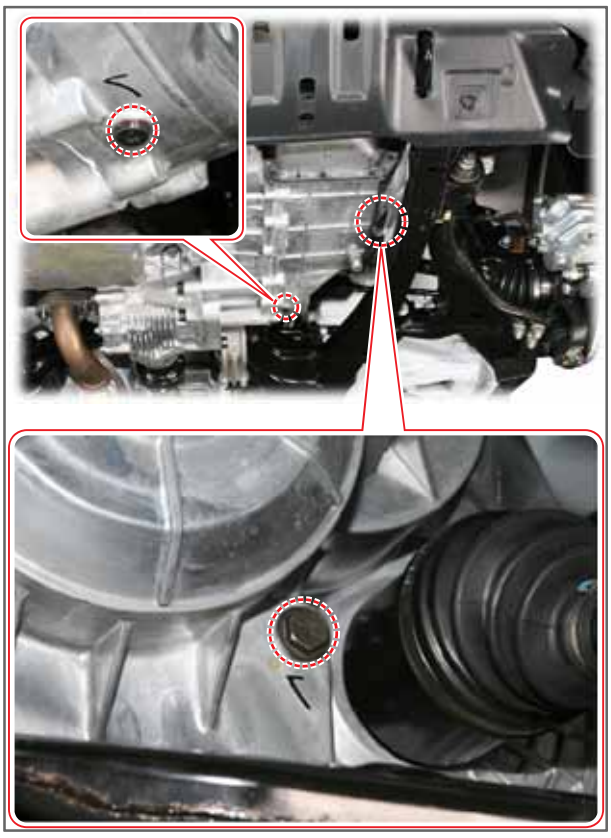
S.G.N. 3680-01 FLUID LEVEL INSPECTION

NOTE

As the temperature of the transmission fluid greatly affects the fluid level, this procedure must only be carried out with the transmission fluid temperature below 50°C). If the transmission fluid temperature is greater than 50°C and the correct procedure is not followed, the result could be a false reading of the fluid level.

Oil: Fuchs TITAN ATF 3292
Oil capacity: approx. 7.5 L

▶ Fluid level inspection



1. Drive the vehicle for approximately five minutes.
2. Connect the vehicle's diagnostic scan tool to the vehicles diagnostic connector.
3. ?With the gear select lever in the Neutral position, start the engine and allow to run at idle until the transmission fluid temperature reaches 50°C.
4. Raise the vehicle on a certified hoist.
5. When the transmission fluid temperature reaches 50°C turn off the engine.
6. Place a drain container below the fluid level hole and remove the transmission fluid level plug. Allow transmission fluid to drain from the fluid level hole for 50 seconds.
7. Reinstall the fluid level plug and tighten the plug to the correct torque specification.
8. Lower the vehicle to the ground and road test the vehicle to check vehicle operation and for fluid leaks.

CAUTION

Fluid level inspection must be carried out with the vehicle level.

Modification basis	
Application basis	
Affected VIN	

S.G.N. 3680-01 MAINTENANCE OPERATIONS

1) Stall Test

Stall testing can be performed on the Model 11 6 speed automatic transaxle to determine whether the transaxle clutches can hold the full engine torque without slipping.
Stall testing should be performed for a period no longer than 10 seconds.

- Apply Hand Brake
- Start Engine
- Press Brake Pedal
- Shift to "DRIVE
- Press Accelerator Pedal to 100 % for 6 seconds
- Observe Engine speed
- Release Accelerator Pedal
- Shift To Reverse
- Press Accelerator Pedal to 100 % for 6 seconds
- Observe Engine speed

If engine speed is observed > 3000 rpm; transmission hardware failure.

2) Transaxle reset procedure (replacement transaxle)

It is necessary to reset the adaptive data and green offsets stored within the transmission control unit (TCU) when the transmission and or TCU have been replaced.
The procedures outlined below must be carried out if either the transmission or TCU are replaced. The procedures must be carried out in the order as listed.

(1) Adaptive reset procedure

1. Connect the vehicle's diagnostic scan tool to the vehicles diagnostic connector. Refer to the vehicle repair manual for information on connecting the scan tool.
2. With the transmission gear select (TGS) lever in Park, turn the ignition key to the ON position (engine not running).
3. Run the task Reset Adaptive Data and wait for a positive response.
4. Run the Green Offset Activation Procedure as described below.

(2) Green offset activation procedure

1. Connect the vehicle's diagnostic scan tool to the vehicles diagnostic connector. Refer to the vehicle repair manual for information on connecting the scan tool.
2. With the transmission gear select (TGS) lever in Park, turn the ignition key to the ON position (engine not running).
3. Run the task Activate Adaptive Green Offset and wait for a positive response.
4. Run the Set Kilometres traveled Procedure as described below.

(3) Set kilometres traveled procedure

1. Connect the vehicle's diagnostic scan tool to the vehicles diagnostic connector. Refer to the vehicle repair manual for information on connecting the scan tool.
2. With the transmission gear select (TGS) lever in Park, turn the ignition key to the ON position (engine not running).
3. Using the scan tool, set the parameter Set Km traveled to the actual km traveled by the transmission. Note if the transmission is being replaced with a new or warranty replacement transmission then this should be set to 0km.
4. Run the Post Reset Procedure as described below.

(4) Post reset procedure

1. Turn the ignition key to the OFF position.
2. Start the vehicle and check for normal operation.
3. Run the Fast Adaptive Drive Cycle Procedure as described below.

(5) Fast adaptive drive cycle procedure

1. Warm up transmission to operating temperature (65°C to 100°C) by normal driving.
2. During the following steps a transmission sump temperature between 65°C and 95°C has to be maintained as those are the boundaries for the adaptive functionality
3. Complete 15 N-1 Shifts with vehicle stopped and foot on brake. A pause of 2 sec in neutral must be observed between each shift.
4. Complete 15 N-R Shifts with vehicle stopped and foot on brake. A pause of 2 sec in neutral must be observed between each shift.
5. Drive at steady throttle through all gears 1-6 at pedals from 10% to 100% in 10% increments. Each combination of pedal position and gear shift must be done at least 5 times.
6. Allow the vehicle to roll down from 6th gear to 1st gear with slight brake at least 5 times.
7. Complete WOT kickdowns from each gear at vehicle speed from 20Kph to 130Kph. Best results will be obtained if the pedal is not started from 0%. i.e 20% to 100% pedal kickdown. Repeat this sequence of kickdowns 5 times.

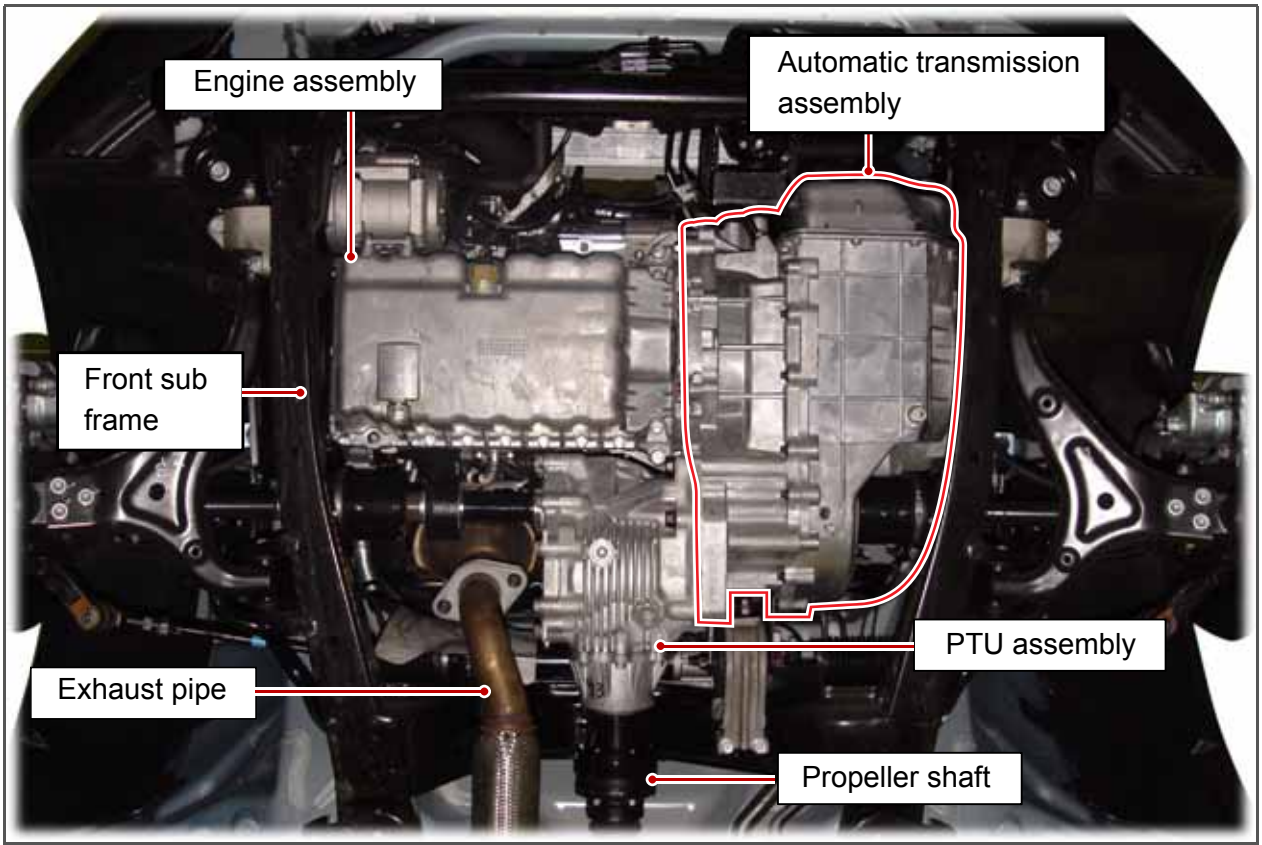
Modification basis	
Application basis	
Affected VIN	

S.G.N. 3680-01

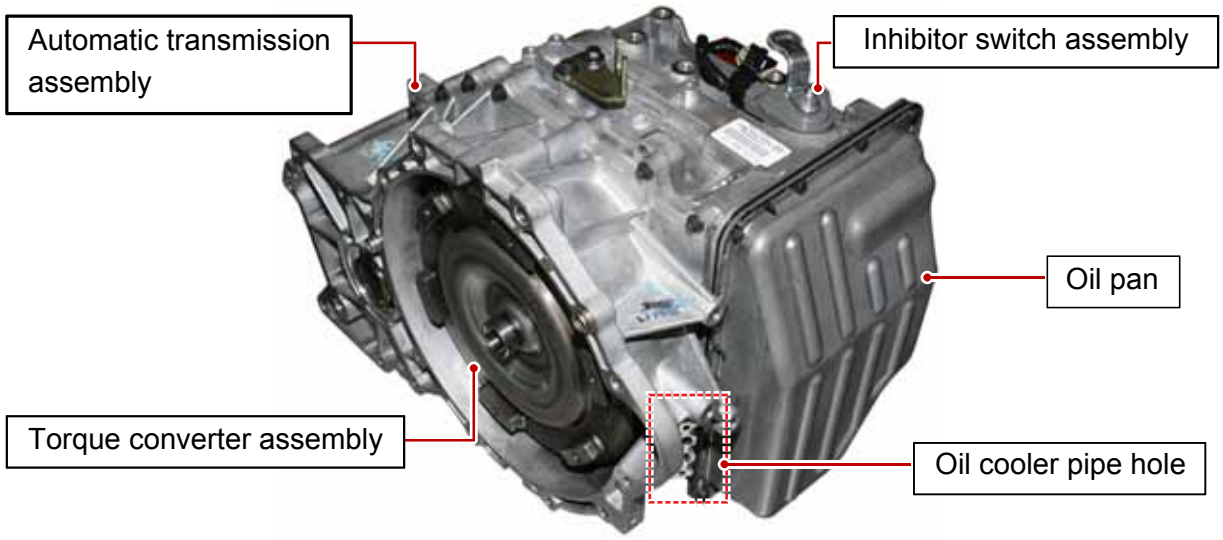
A/T ASSEMBLY

Preceding work Disconnect the negative battery cable and remove the front tires.

▶ **Mounting location**

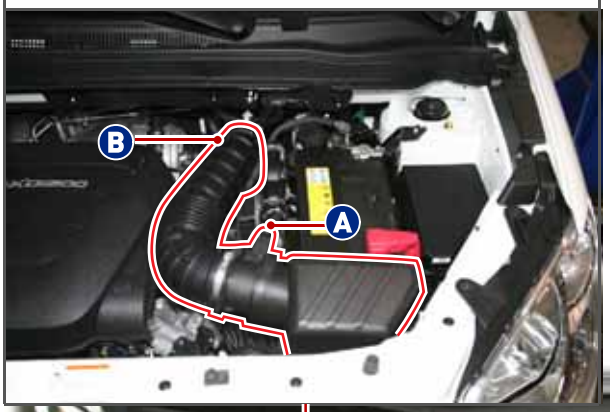


DSI 6-speed A/T assembly

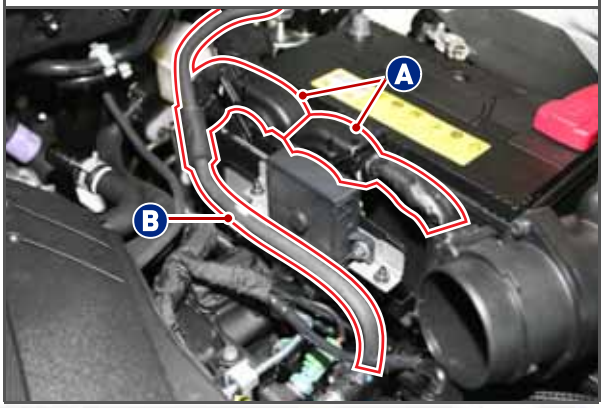


1) Removal and Installation of Surrounding Parts

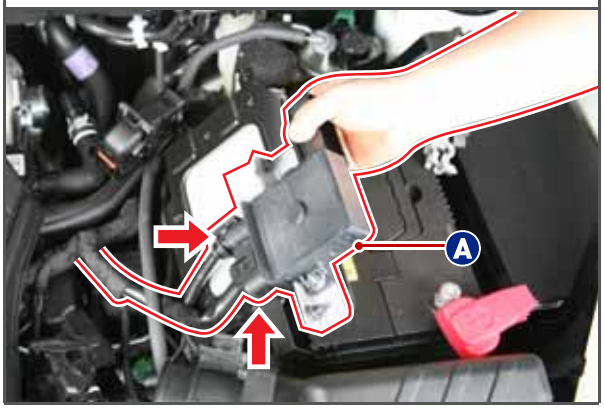
1. Disconnect the HFM sensor connector (A) to disconnect the air cleaner turbocharger hose (B).



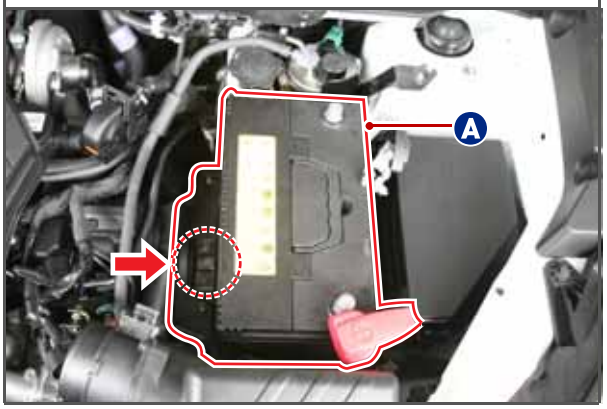
2. Separate the engine ECU connectors (A) and fuel hose (B).



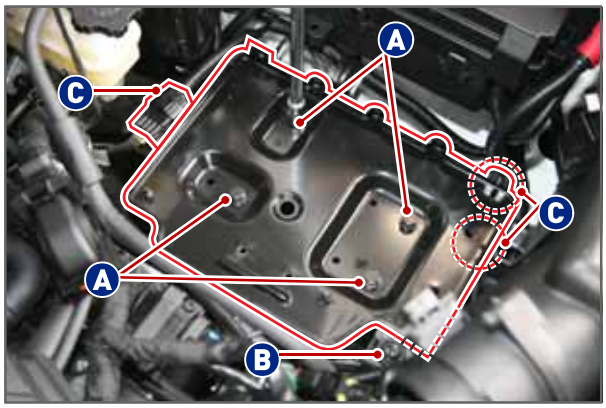
3. Unscrew the two mounting nuts (12 mm) of the engine ECU and disconnect the two connectors for the glow control unit (A) to remove the engine ECU assembly. Separate the ECU cable from the mounting part.



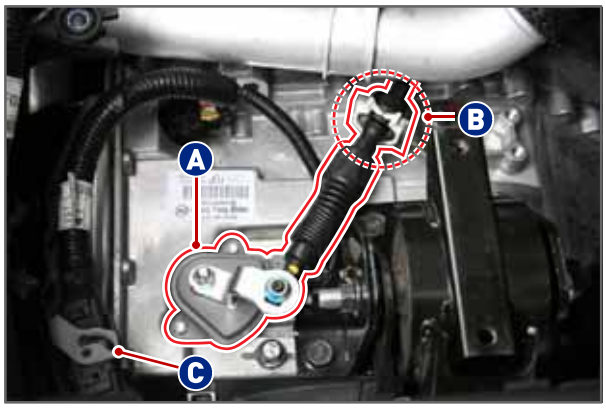
4. Unscrew the two battery bracket mounting nuts (12 mm) and remove the battery (A) and the bracket.



Modification basis	
Application basis	
Affected VIN	

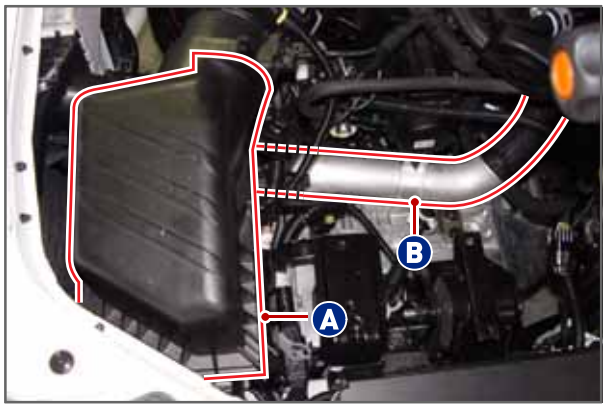


5. Unscrew the 4 mounting bolts (A, 14 mm) for the battery support and remove the cable mounting parts (C) mounted on this support to remove the support.



6. Unscrew the mounting nut (13 mm) for the TGS lever cable link (A) and remove the cable mounting part (B) to remove the intermediate connector (C) of the transmission.

Tightening torque for cable link mounting nut (13 mm)	14.0 to 20.0 Nm



7. Unscrew the mounting nut (10 mm) securing the air cleaner housing upper cover (A) and turbocharger intercooler pipe and hose (B) to remove the upper cover and inter cooler pipe.

8. Remove the engine acoustic cover and put an engine jack under the engine.

9. Unscrew the lower shaft mounting bolt (12 mm) for the column shaft and steering linkage gear box to separate the lower shaft.

CAUTION

Put an installation mark on the lower shaft. Turn the steering wheel so that the wheels are in straight ahead direction.

Tightening torque **19.6 to 24.5 Nm**

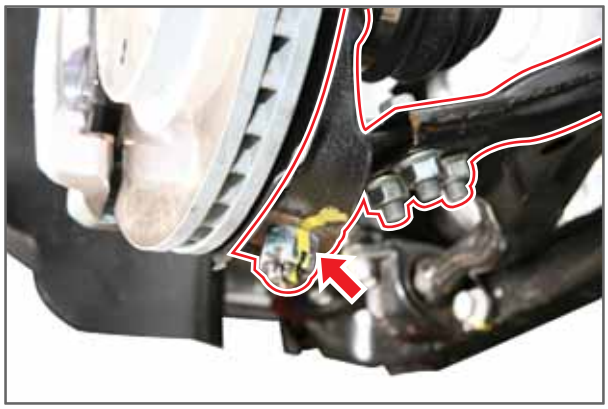
10. Collect the power steering oil from the power steering oil reservoir using an oil suction.

11. Put a proper container under the A/T and unscrew the A/T drain plug (hexagon 5 mm) to drain the oil, then fit the filler plug.

Tightening torque **25.0 to 30.0 Nm**

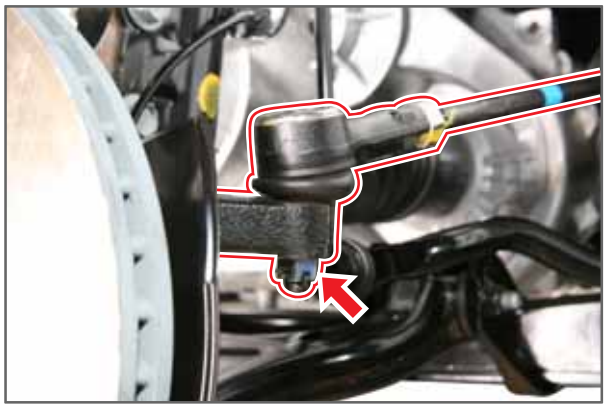
12. Remove the undercover from the vehicle.

Modification basis	
Application basis	
Affected VIN	



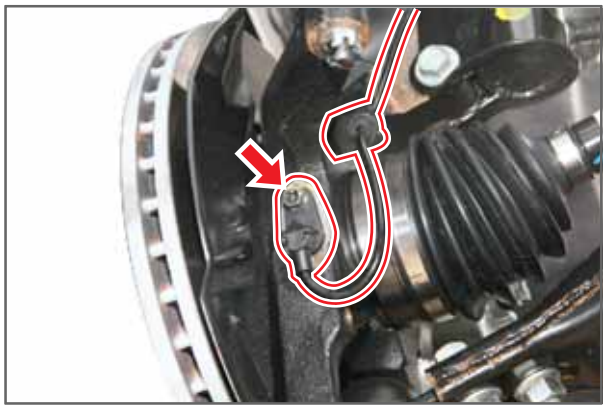
13.Remove the split pin of the ball joint mounting nut (24 mm) for the front lower arm to unscrew the mounting nut, and then separate the ball joint from the knuckle.

Tightening torque 117.6 to 156.8 Nm

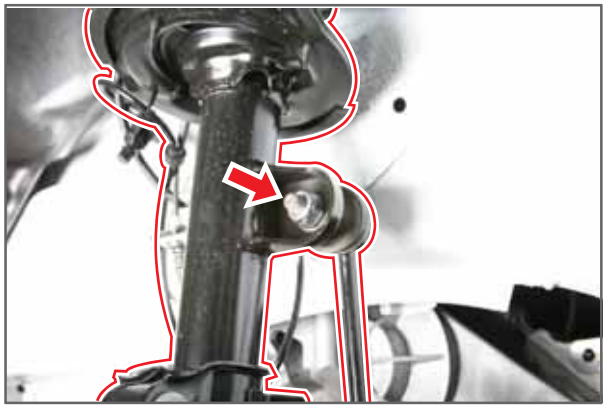


14.Remove the split pin of the tie rod end mounting nut (17 mm) for the steering gear box to unscrew the mounting nut, and then separate the tie rod end from the knuckle.

Tightening torque 44.1 to 53.9 Nm



15.Unscrew the wheel speed sensor mounting bolt (10 mm) to remove the wheel speed sensor and cable.

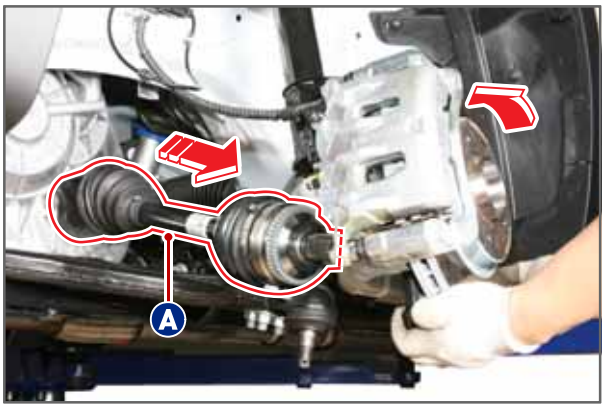


16.Unscrew the two stabilizer bar link upper mounting nuts (17 mm) to remove the link.

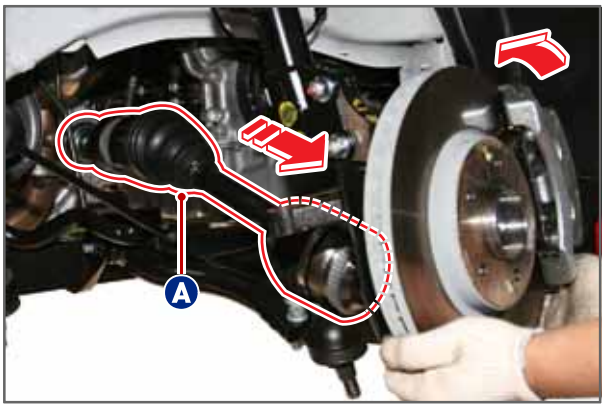
Tightening torque 49.0 to 68.6 Nm

17.Unscrew the hub nut (30mm).

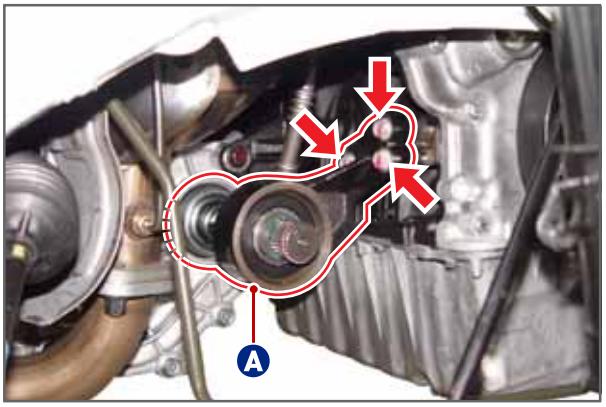
Tightening torque **245 to 343 Nm**



18.Remove the left drive shaft (A) by lifting up the brake disc assembly.



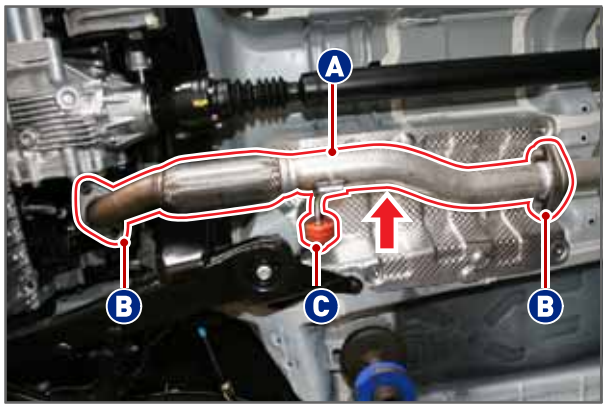
19.Remove the right drive shaft (A) from the intermediate shaft in the same way above.



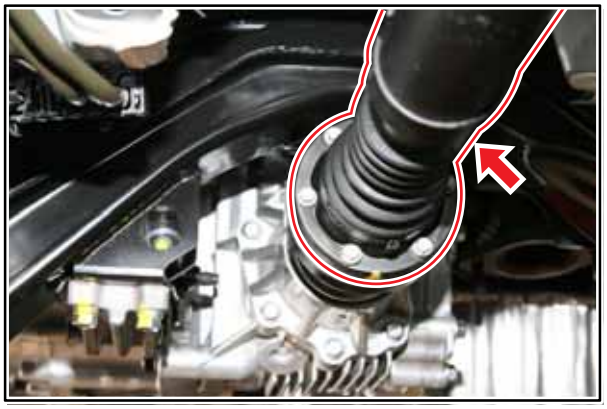
20.Unscrew the 3 mounting bolts (12 mm) for the intermediate shaft mounting bracket on the right side to remove the intermediate shaft (A).

Tightening torque **24.5 to 29.4 Nm**

Modification basis	
Application basis	
Affected VIN	



21.Unscrew the two mounting bolts (12 mm) on the No. 1 exhaust pipe (B), and remove the rubber hanger (C) to remove the exhaust pipe (A).



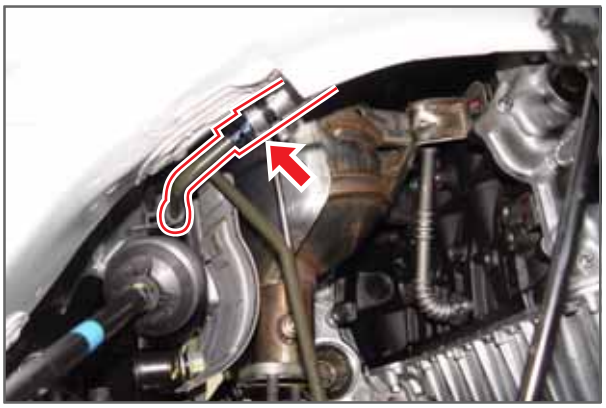
22.Remove the propeller shaft on the PTU side.
(6 mounting bolts: 8 mm)

Tightening torque 39.2 to 44.1 Nm

23.Remove the PTU assembly.
(6 mounting bolts: 19 mm)

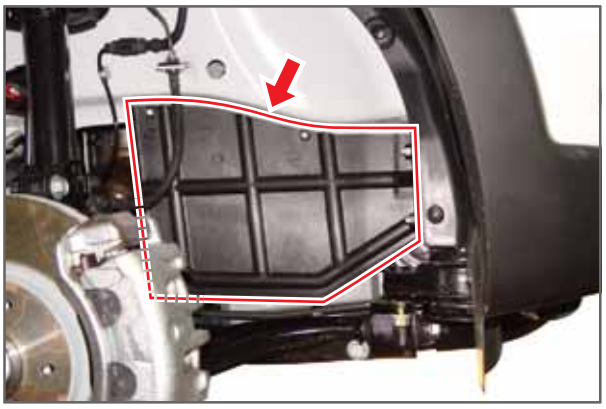
Tightening torque 80.4 to 100 Nm

24.Disconnect the power steering oil pipe and hose connected to the front right side of the vehicle.

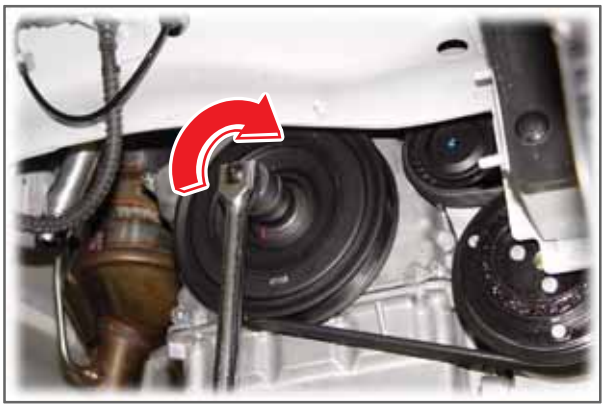


25.Unscrew the mounting nuts (21 mm & 17 mm) from the oil supply pipe of the power steering.

Tightening torque **8.8 to 13.7 Nm**



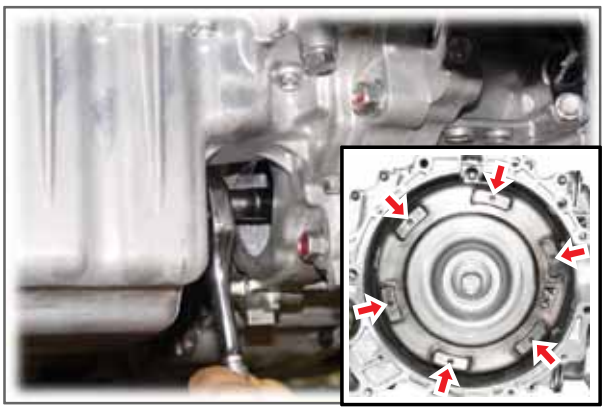
26.Remove the crankshaft main cover (A).



27.Remove the torque converter mounting bolt hole cap to remove the 6 torque converter mounting bolts (13 mm).

CAUTION

Turn the crankshaft clockwise when unscrewing and installing torque converter mounting bolt.



CAUTION

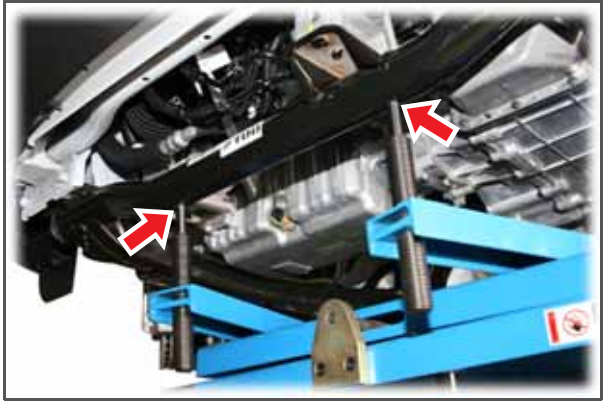
Turn the crankshaft so that the torque converter mounting bolt is positioned at the hole and unscrew the mounting bolts.

Tightening torque **40 to 42 Nm**

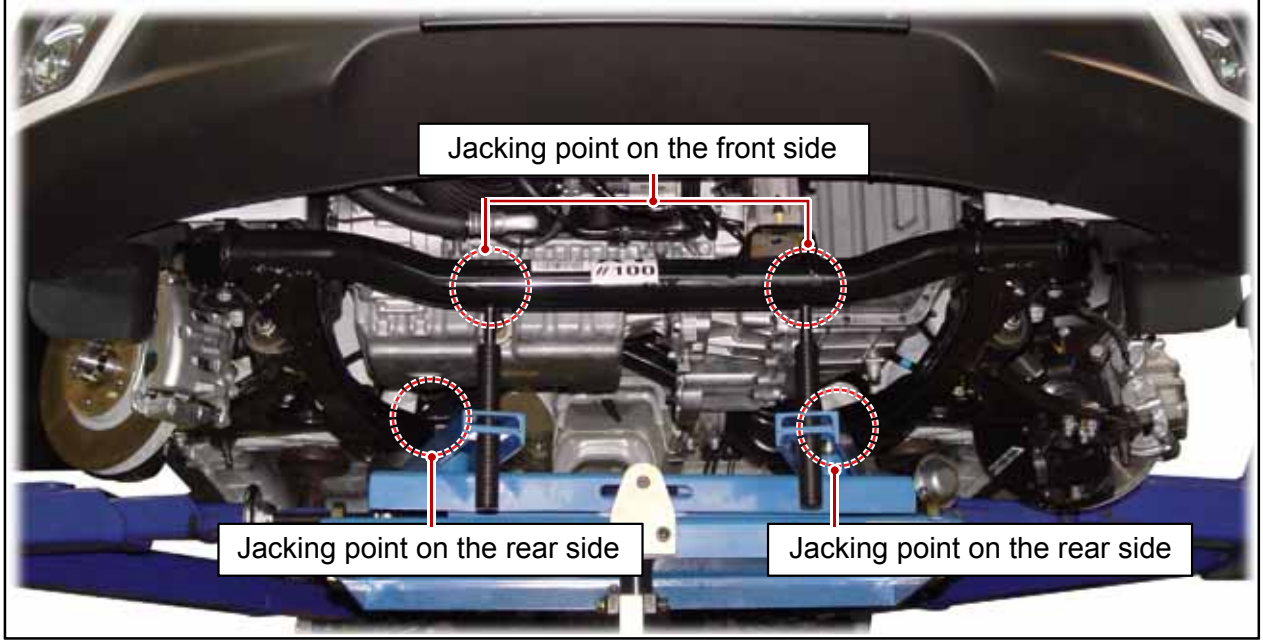
2) Removal and Installation of A/T Assembly

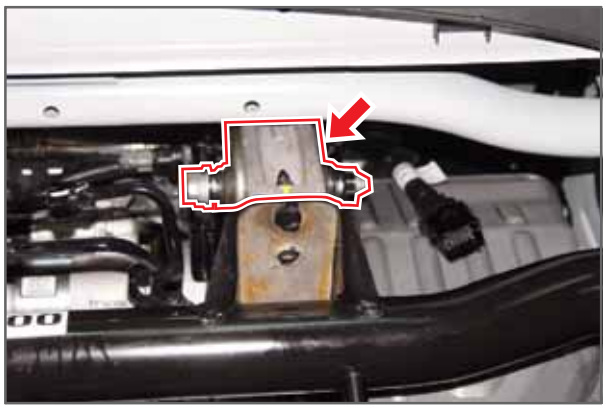
1. Place a jack under the front sub frame with surrounding parts of the A/T removed.

Jacking point on the front side

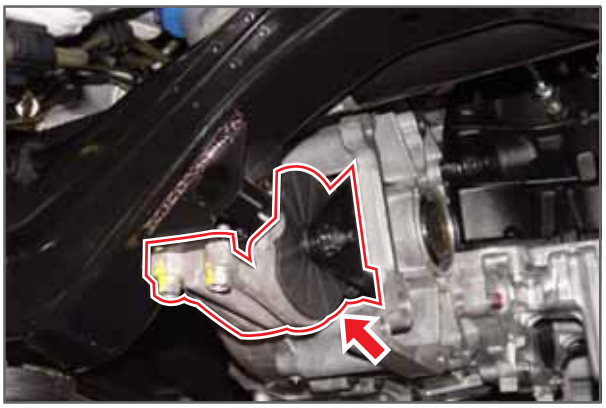


Jacking point on the rear side

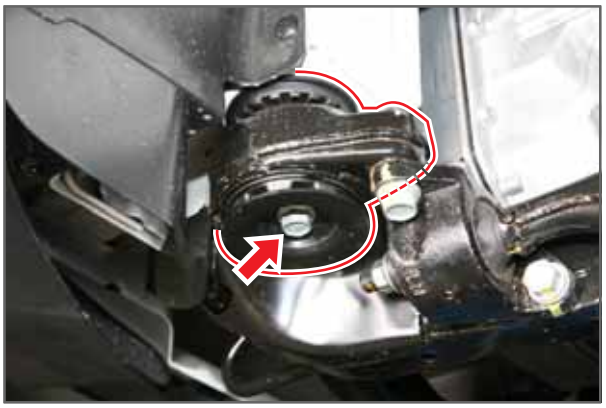




2. Remove the engine mounting insulator on the front side. For more details, refer to the section "Sub Frame" or "Engine".

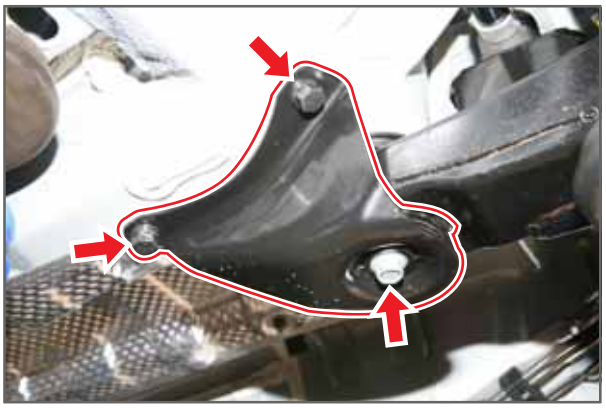


3. Remove the rear engine mounting insulator and then the insulator bracket mounted to the transmission. For more details, refer to the section "Sub Frame" or "Engine".



4. Unscrew the front LH/RH sub frame mounting bolts (17 mm).

Tightening torque **88.2 to 107.8 Nm**

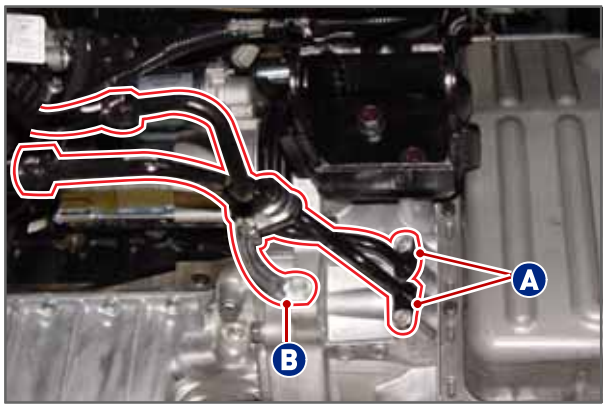


5. Unscrew the rear LH/RH sub frame mounting bolts (17 mm, 3 on each side).

Tightening torque **88.2 to 107.8 Nm**

6. Slowly lower the jack to remove the front sub frame, ensuring that the front sub frame does not interfere with surrounding parts.

Modification basis	
Application basis	
Affected VIN	



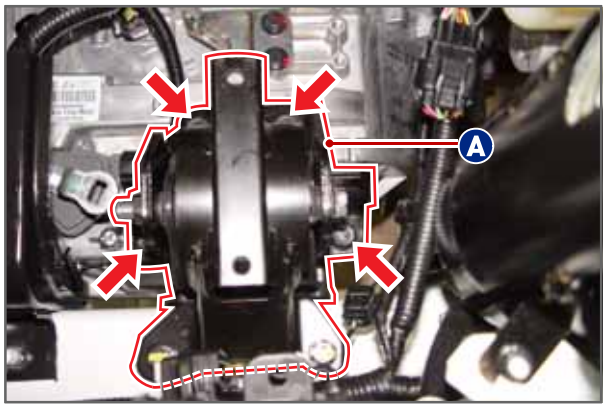
7. Unscrew the two mounting bolts (10 mm) for the oil cooler pipe (A) and pipe bracket (B) mounting bolt (10 mm) to remove the pipe.

Tightening torque for oil cooler pipe	13.0 Nm

8. Lower the lift and place a jack under the transmission.

NOTE

Installing a jack must be performed to remove the engine mounting insulator from the engine compartment.

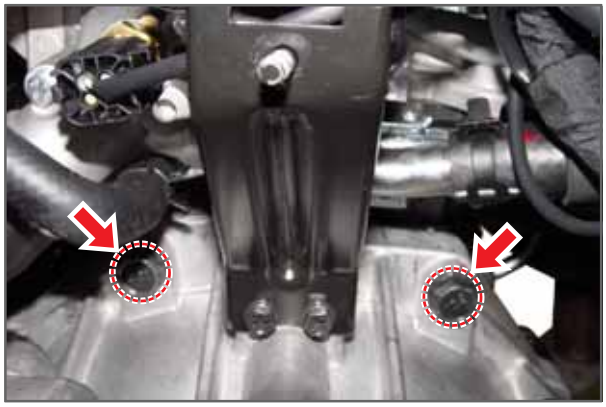


9. Unscrew the mounting bolt/nut (17 mm) for the engine mounting insulator from the engine compartment.

Tightening torque 68.6 to 88.2 Nm

CAUTION

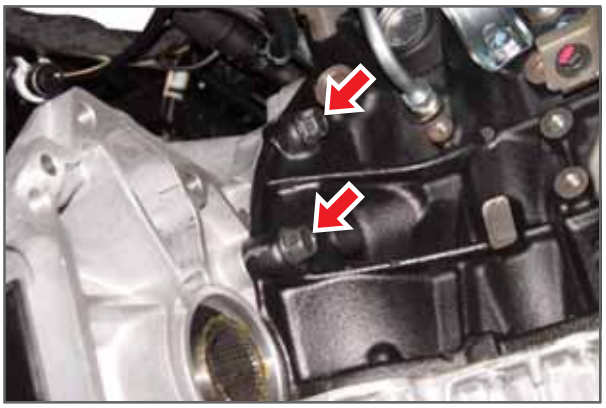
If the 4 mounting bolts (17 mm) for the engine mounting insulator bracket are removed, make sure to apply sealant when installing them. Do not unscrew the bracket mounting bolts as much as possible.



10. Unscrew the two upper mounting bolts (17 mm) on the transmission.

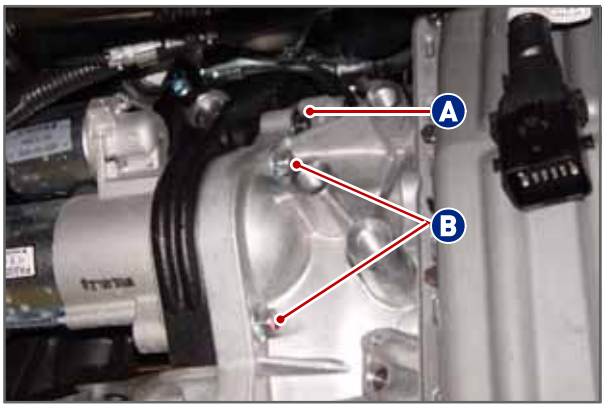
Tightening torque 85.0 to 100.0 Nm

11.Lift up the lift again and place a jack under the transmission.



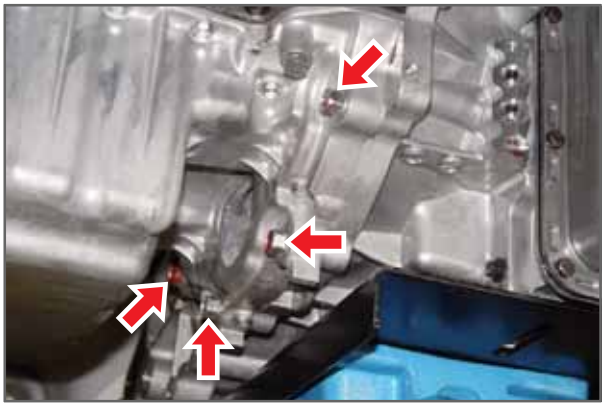
12.Unscrew the two right mounting bolts (17 mm) on the transmission.

Tightening torque **85.0 to 100.0 Nm**



13.Unscrew the left mounting bolt (14 mm) on the transmission and the two mounting bolts (14 mm) of the drive motor.

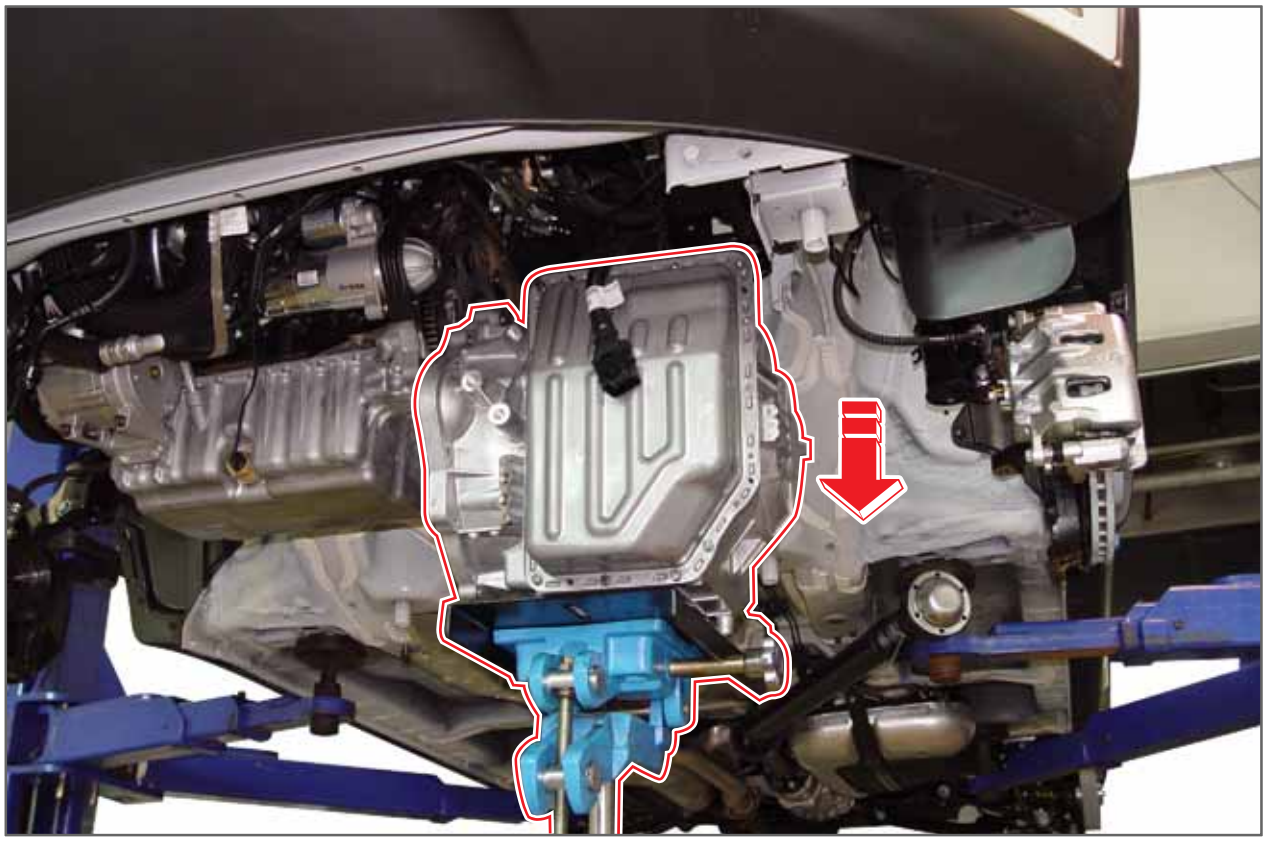
Tightening torque for left A/T mounting bolt A	54.0 Nm (rotate 15 to 20 deg. further after tightening)
Tightening torque B	54.0 Nm



14.Unscrew the 4 lower mounting bolts (14 mm) on the transmission.

Tightening torque **56.0 to 62.0 Nm**

15.Lower the jack slowly to remove the transmission from the vehicle. Make sure that there are interferences.



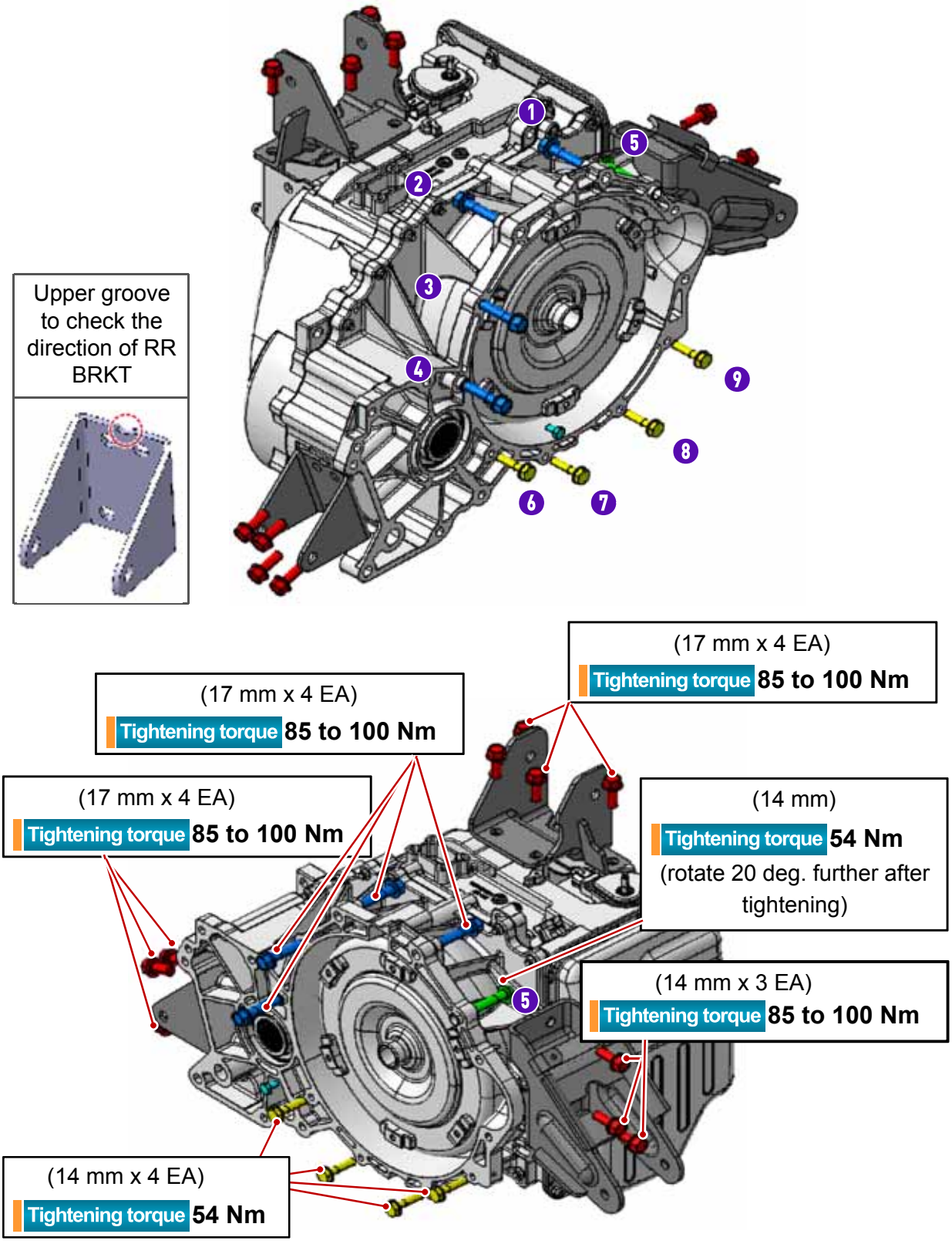
16.Install in the reverse order of removal and add the oil with the same specifications after reinstallation. Refer to the section "Oil change".

CAUTION

Lift up the jack to align the engine and transmission when installing. If the transmission is aligned at the correct position, tighten the engine mounting insulator and upper mounting bolt.

DSI 6-speed A/T assembly

Tightening sequence and tightening torque for A/T assembly mounting bolts

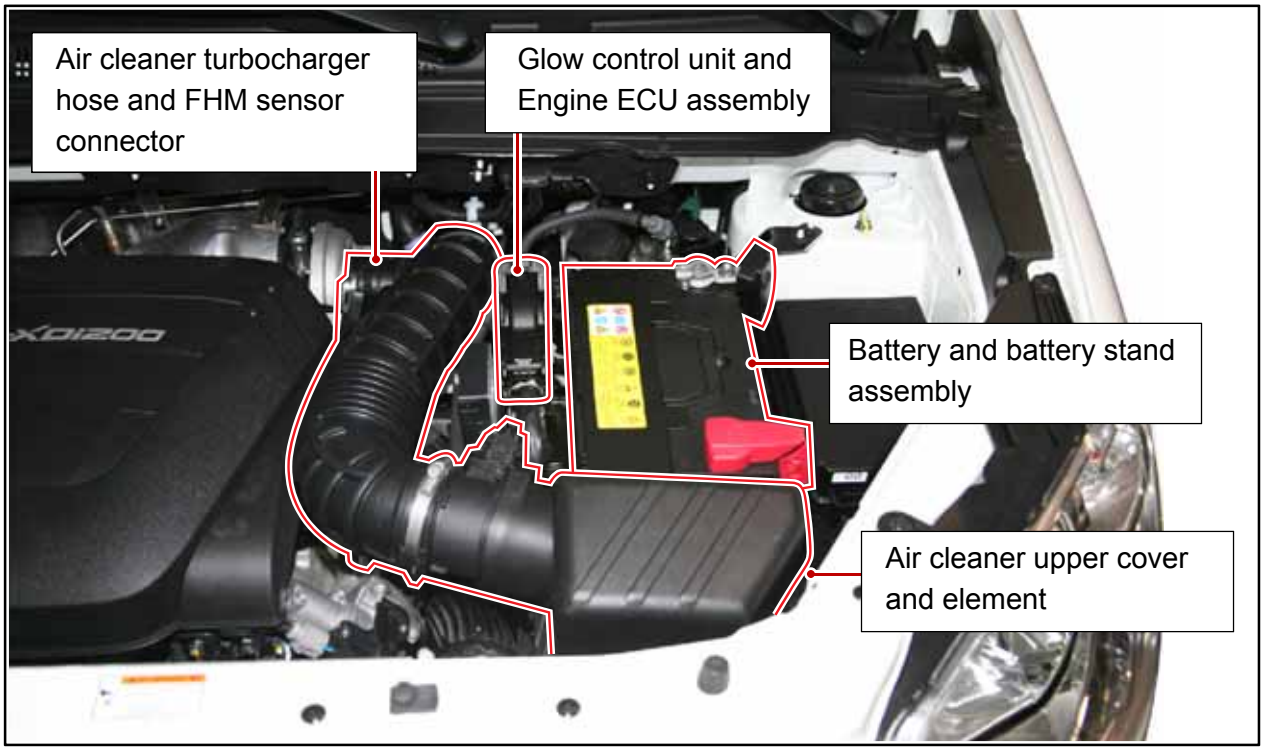


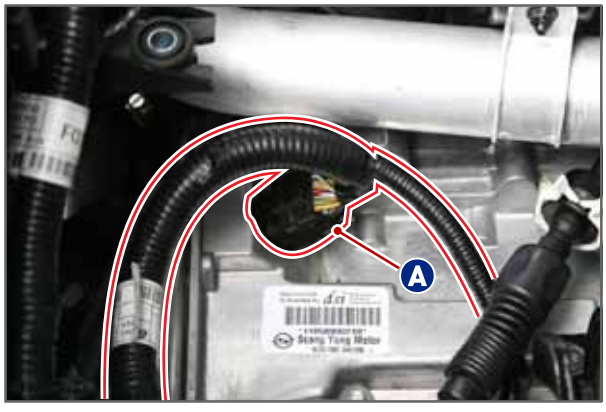
Modification basis	
Application basis	
Affected VIN	

S.G.N. 3680-01

VALVE BODY ASSEMBLY

Preceding work Disconnect the negative cable from the battery and remove below components from the engine compartment.



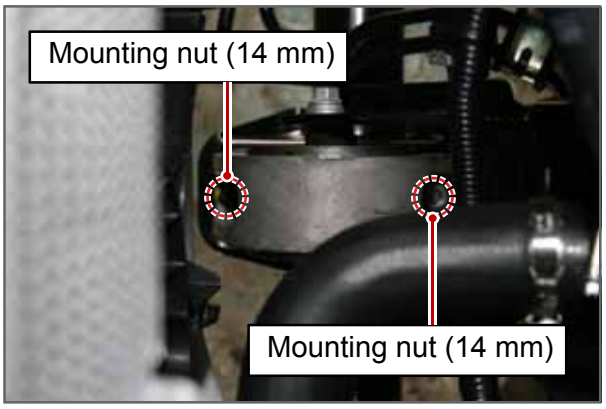


1. Disconnect the A/T connector (A).

2. Put a proper container under the A/T. Then remove the drain plug to drain the A/T fluid.

Tightening torque **25.0 to 30.0 Nm**

3. Remove the undercover.



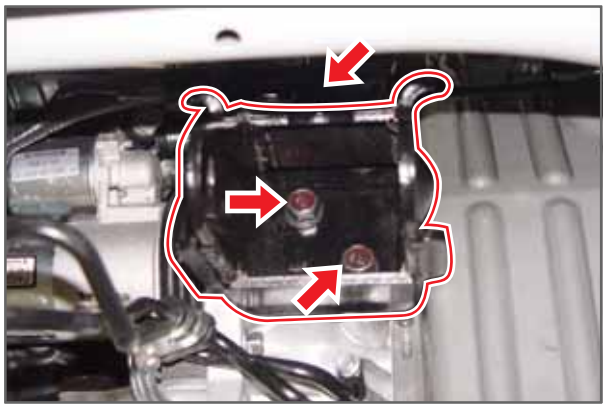
4. Unscrew the mounting bolt (14 mm) and the nut (14 mm) on the front side engine mounting insulator bracket.

Tightening torque **29.4 to 49.0 Nm**

5. Unscrew the mounting bolt (14 mm) and the nut (17 mm) on the front side engine mounting insulator.

Tightening torque **68.6 to 88.2 Nm**

6. Remove the engine mounting insulator on the front side from the engine bracket.



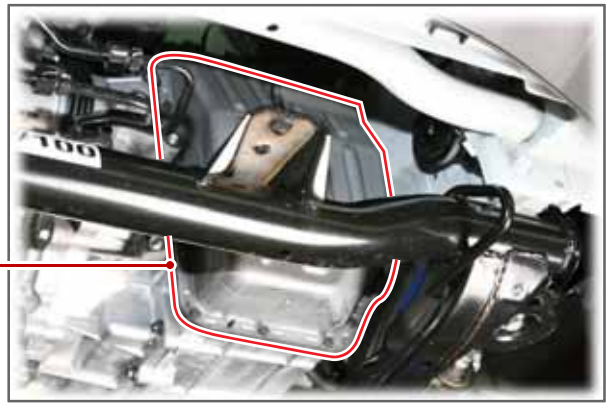
7. Unscrew the 3 engine bracket mounting bolts (17 mm) to remove the bracket.

Tightening torque **84.3 to 100.0 Nm**

8. Unscrew the 15 mounting bolts (10 mm) on the oil pan of the A/T to remove the oil pan.

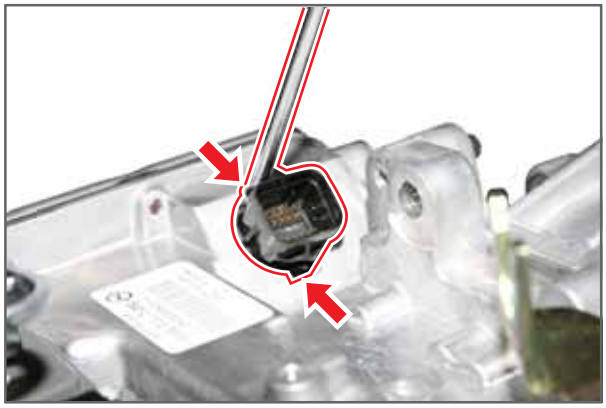
CAUTION
Make sure that the oil in the oil pan does not leak.

Mounting bolt location



CAUTION
Torque tighten the oil pan to the specified torque. Replace the gasket with a new one.

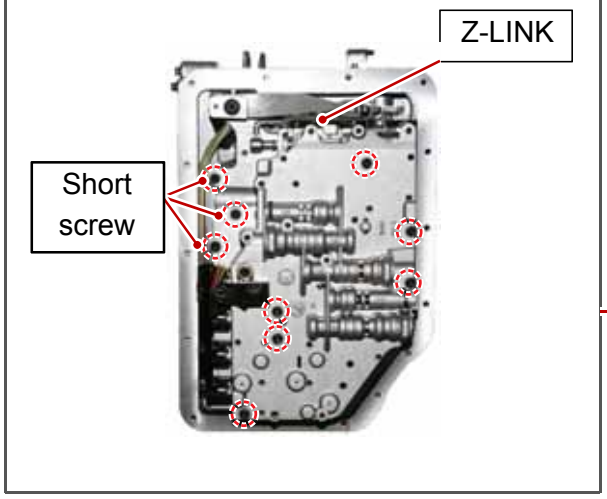
Tightening torque **7.0 to 8.0 Nm**



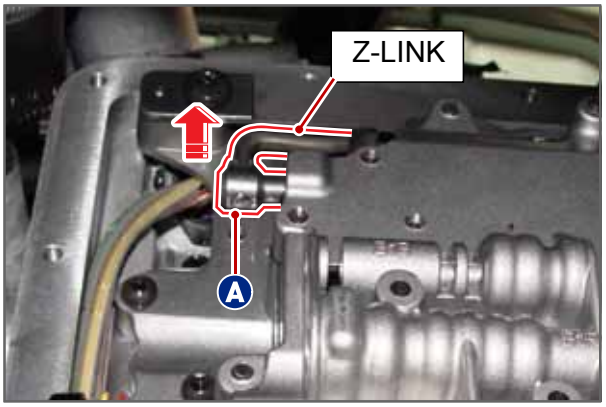
9. Insert a screwdriver into the holes and push the connector into the A/T.

10.Unscrew the 9 mounting screws (T30) on the valve body of the A/T.

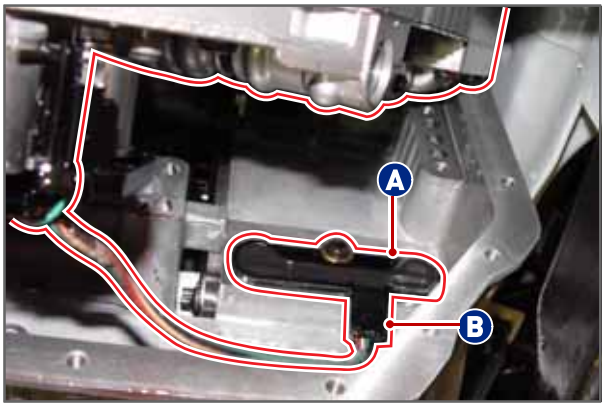
Location of valve body mounting screw



Tightening torque **16 Nm**



11.Remove the Z-link on the valve body from the selector valve (A).

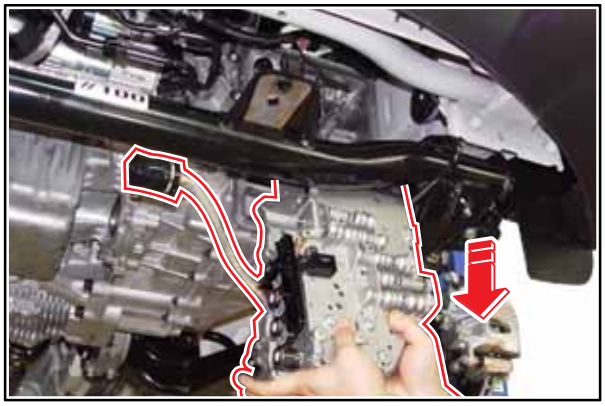


12.Disconnect the speed sensor connector (A) connected inside the valve body by lifting up the valve body slightly.

CAUTION

The connection of the speed sensor connector is located on the side (B).

Modification basis	
Application basis	
Affected VIN	

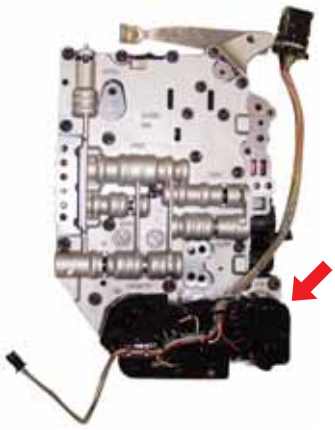
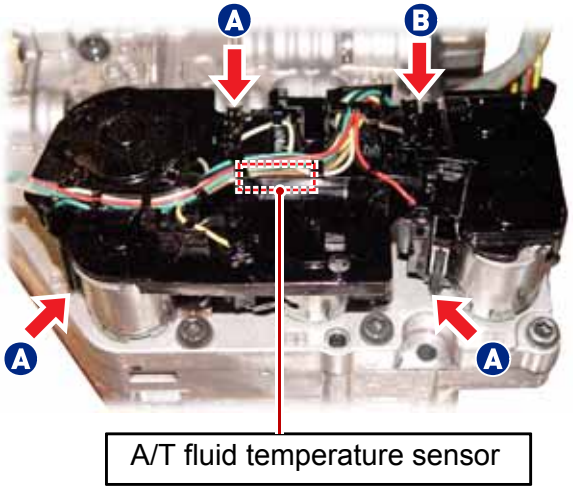


13.Remove the valve body assembly from the automatic transmission.

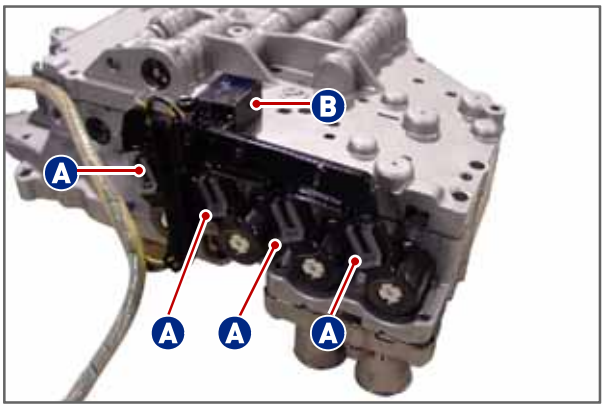
CAUTION

Be careful when removing the valve body because fluid in the A/T and valve body may drop out. Confirm that no transmission fluid contacts to other objects.
When removing the valve body, make sure it is not interfered with other parts.

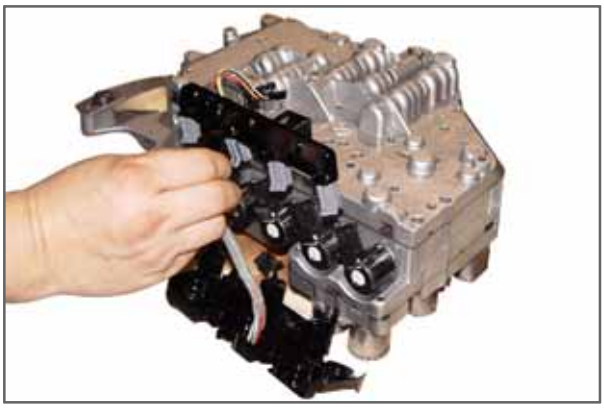
14.Remove the mountings (A) of the variable bleed solenoid wiring plate from the removed valve body assembly.

Valve body assembly	Plate mounting locations
	

15.Remove the variable bleed solenoid wiring plate assembly from the solenoid.

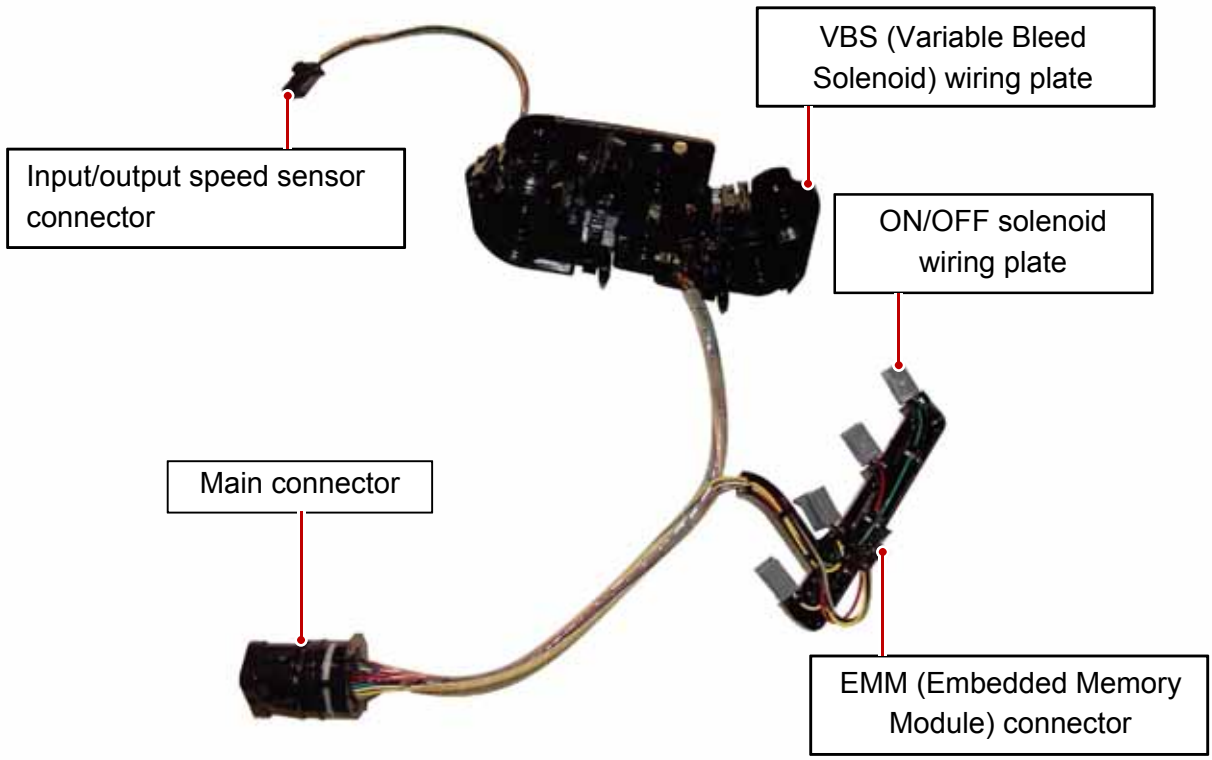


16.Disconnect the wiring connectors (A) for the ON/OFF solenoid and the connector (B) for the EMM (Embedded Memory Module).



17.Remove the solenoid wiring plate assembly from the valve body.

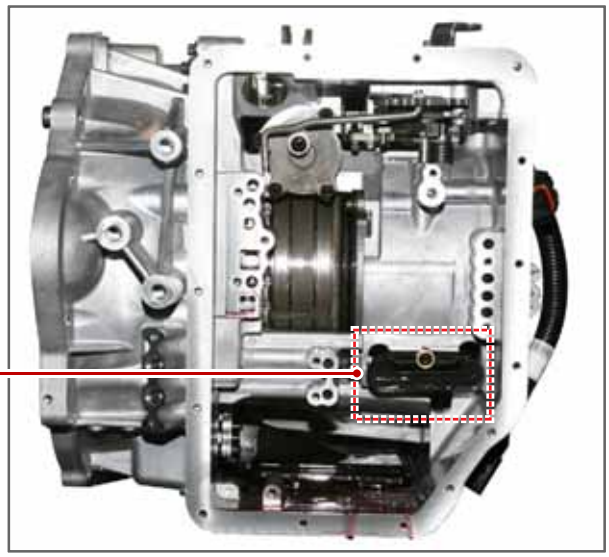
Solenoid wiring plate assembly



Modification basis	
Application basis	
Affected VIN	

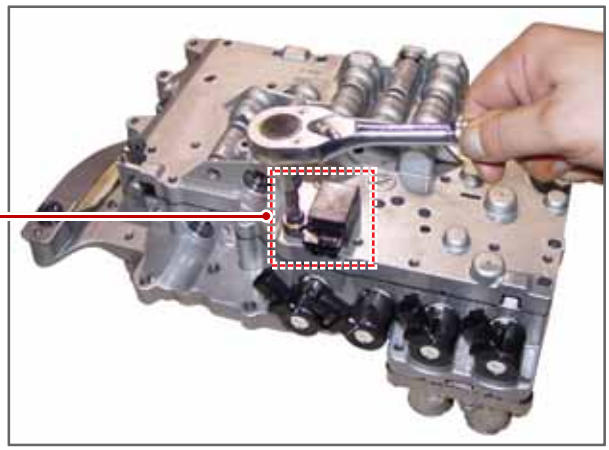
18.Unscrew the speed sensor mounting screw (T30) from the A/T to remove the speed sensor.

Speed sensor	
	
Tightening torque for mounting screw	4.0 Nm



19.Unscrew the EMM mounting screw (T30) to remove EMM from the valve body.

EMM	
	
Tightening torque for mounting screw	4.0 Nm



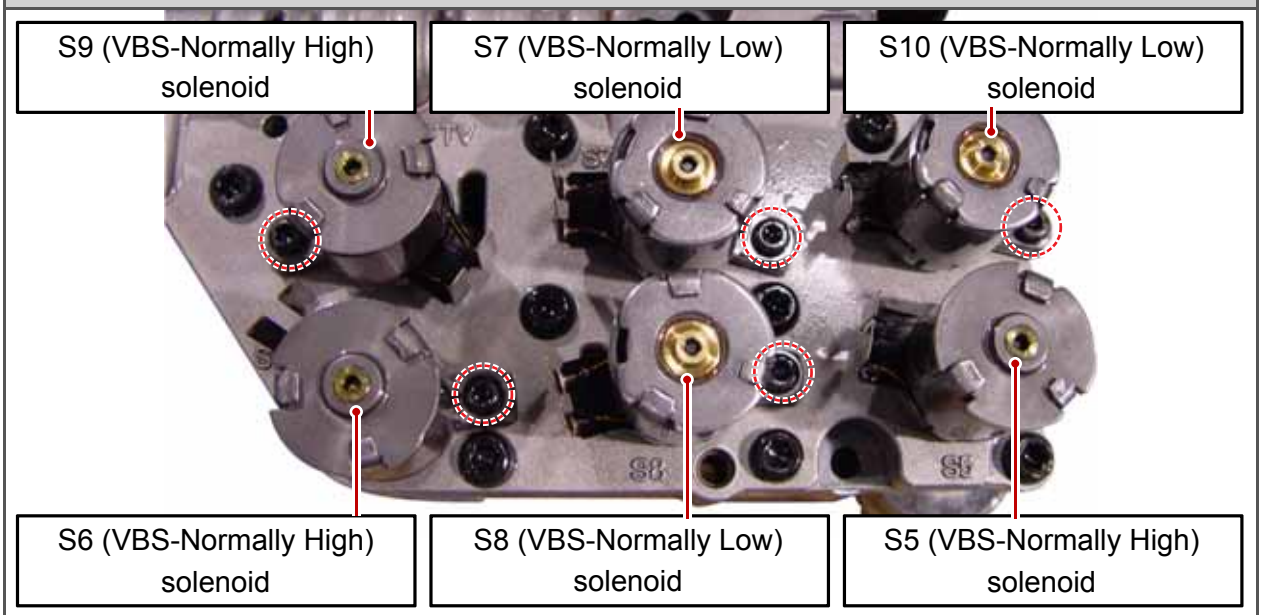
20. Unscrew the mounting screws (T30) for the VBS (Variable Bleed Solenoid) to remove the solenoid from the valve body.

CAUTION

1. Pay attention to the installation direction of the solenoid when installing it.
2. Make sure to keep the removed O-ring for the solenoid.

Tightening torque **4.0 Nm**

VBS installation status / Shape of solenoid



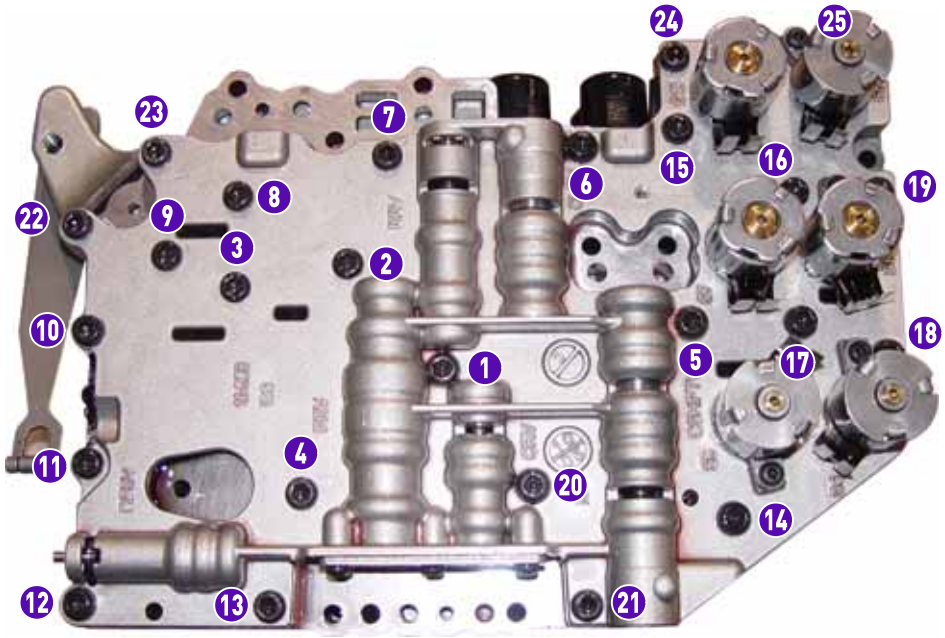
VBS - Normally High	VBS - Normally Low
	

Modification basis	
Application basis	
Affected VIN	

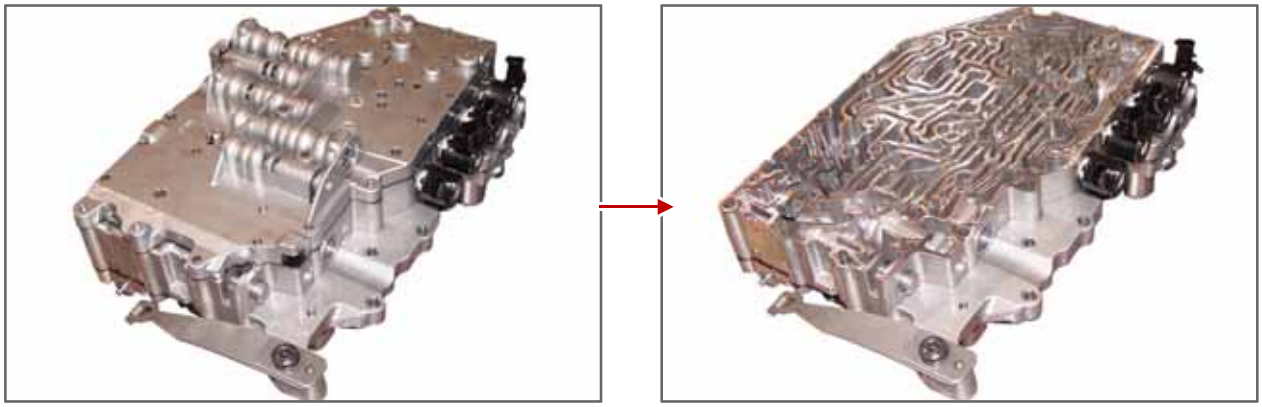
21.Remove and install the ON/OFF solenoid as follows:

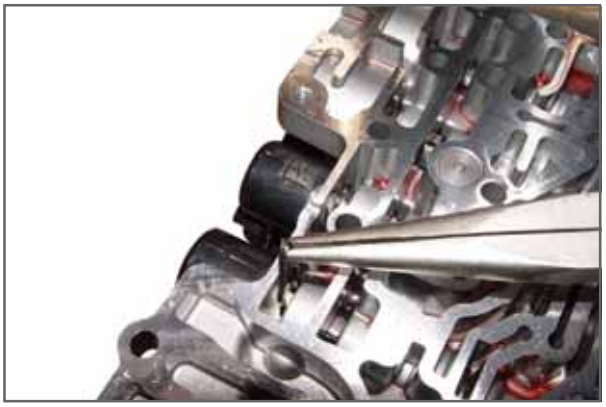
a. Unscrew the 25 valve body mounting screws (T30) from the removed valve body assembly.

Removing sequence of mounting screws **Tightening torque 16 Nm**

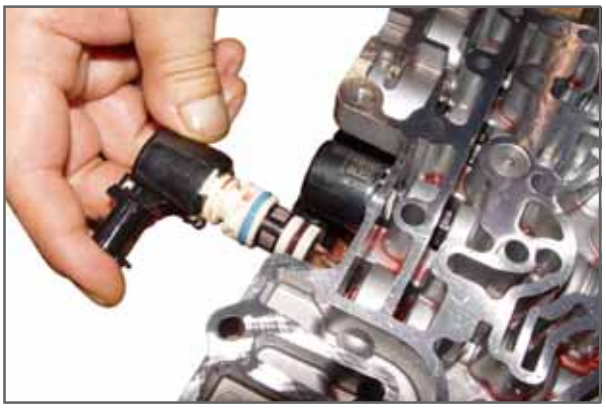


b. Remove the upper cover of the valve body.





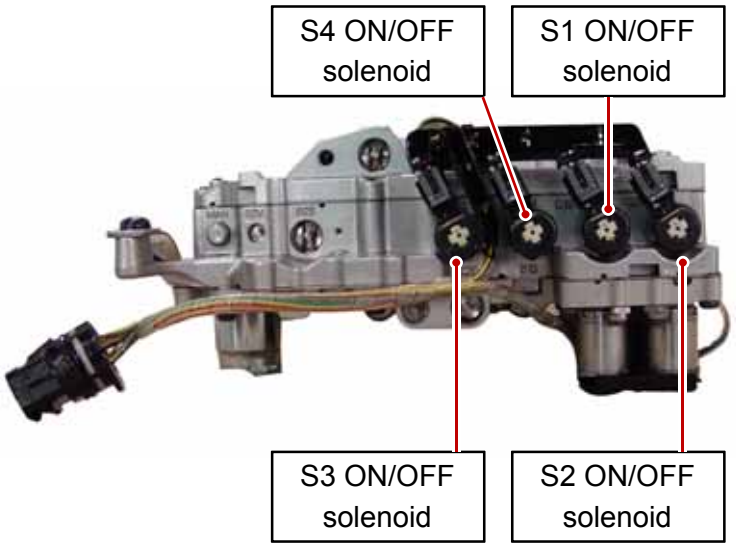
c. Remove the mounting pin for the ON/OFF solenoid.



d. Remove the ON/OFF solenoid from the valve body.

ON/OFF solenoid installation status / Shape of solenoid

Solenoid



22.Install in the reverse order of removal. Make sure to keep the removed O-ring for the solenoid.

CAUTION

Tighten the mountings to the specified torque. Make sure that the any foreign material does not come into contact with the valve body. Do not use the drained fluid. Always top up with the new fluid.

Modification basis	
Application basis	
Affected VIN	

S.G.N. 3680-00

TORQUE CONVERTER

Preceding work

- Remove the A/T assembly.
- Drain the fluid in the transmission before removing the torque converter. Otherwise, the fluid can be leaked to the air bleeder.

1. Fit the A/T with the torque converter facing upwards.

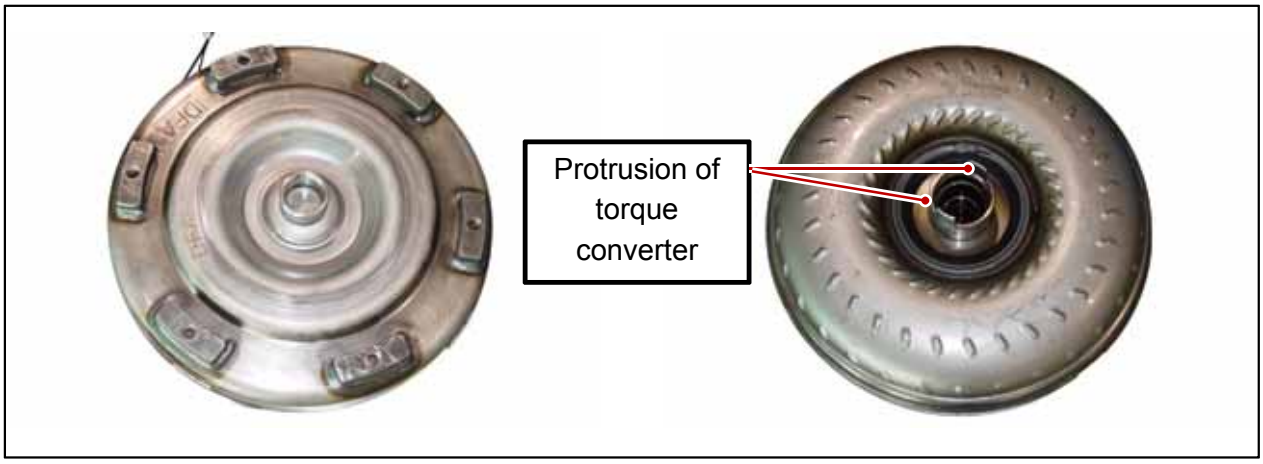
2. Remove the torque converter while keeping it level.

3. Install in the reverse order of removal. Align the protrusion of the torque converter with the groove on the housing.

CAUTION

Otherwise, the oil seal in the housing can be damaged.

▶ **Torque converter assembly**



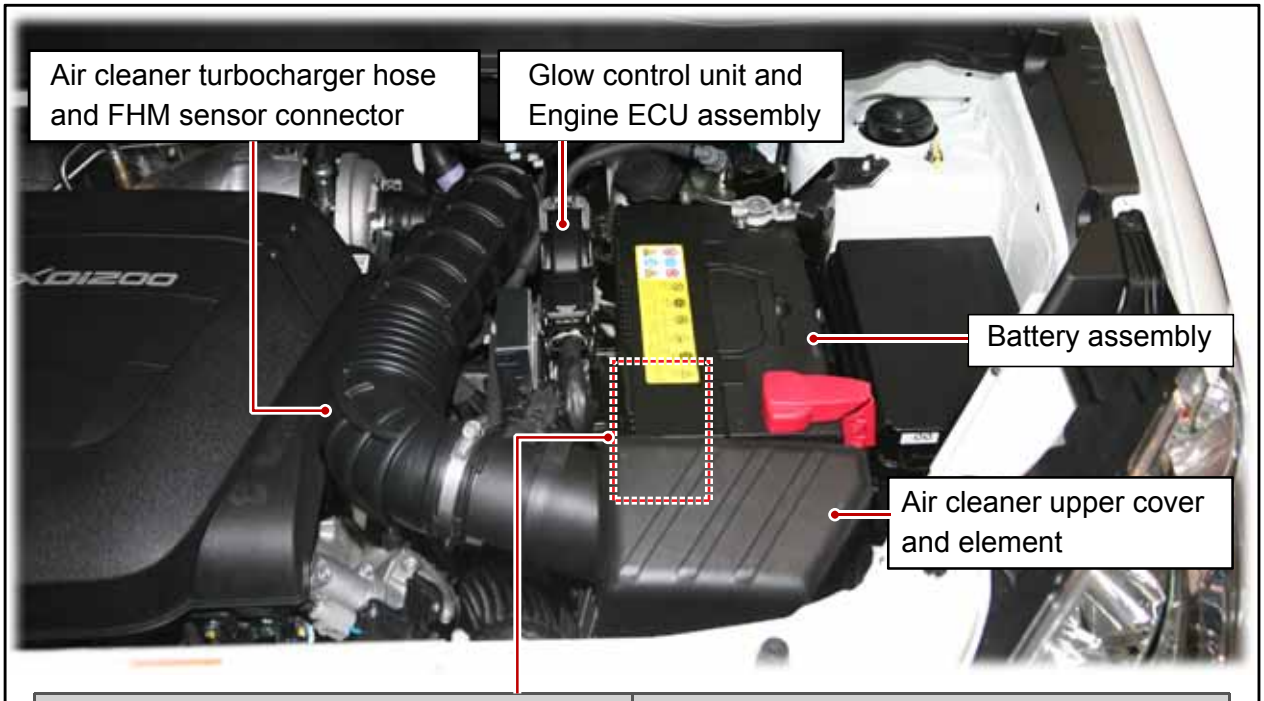
Modification basis	
Application basis	
Affected VIN	

S.G.N. 3680-00

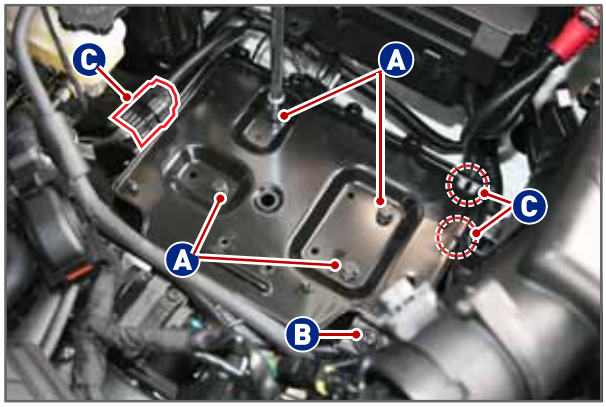
INHIBITOR SWITCH

Preceding work

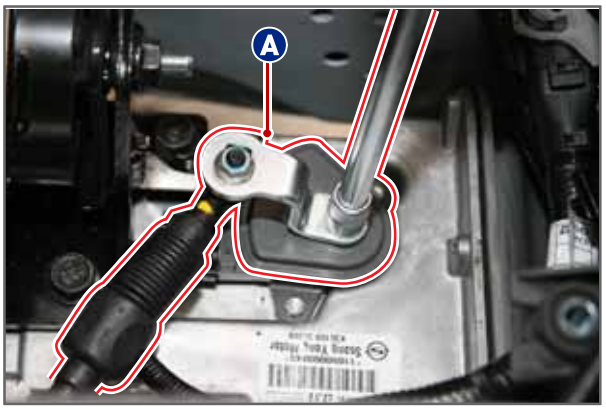
Disconnect the negative cable from the battery and remove below components from the engine compartment.



Installation status	Inhibitor assembly
	

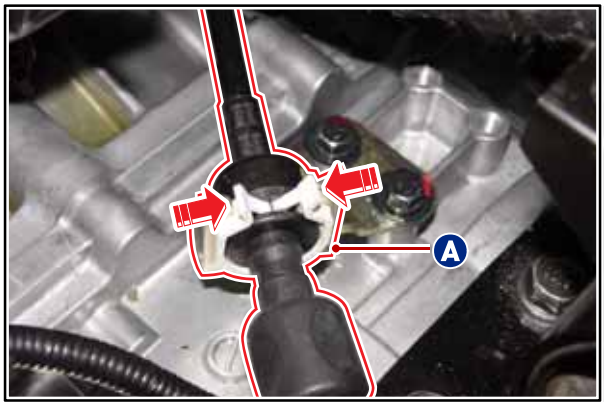


1. Unscrew the 4 mounting bolts (A, 14 mm) for the battery support and remove the cable mounting parts (C) mounted on this support to remove the support.



2. Unscrew the mounting nut (13 mm) for the TGS lever cable link (A).

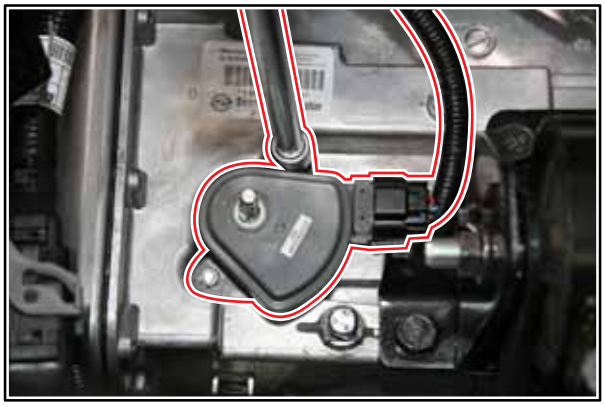
Tightening torque for cable link mounting nut (13 mm)	14.0 to 20.0 Nm



3. Disconnect the A/T cable from the cable mounting (A). Remove the cable by pressing both sides of the mountings inwards.

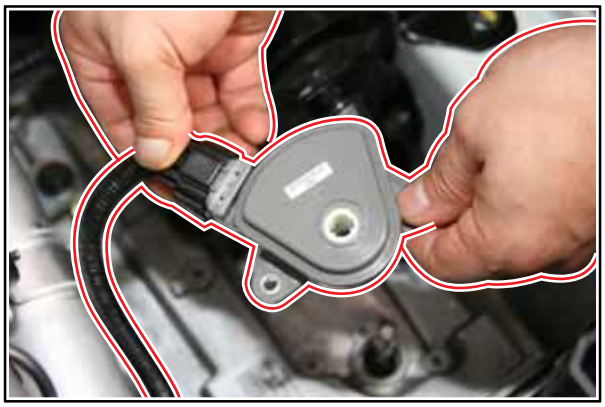
CAUTION

Make sure that the cable is connected firmly.



4. Unscrew the two inhibitor switch mounting nuts (12 mm).

Tightening torque 4.0 to 6.0 Nm

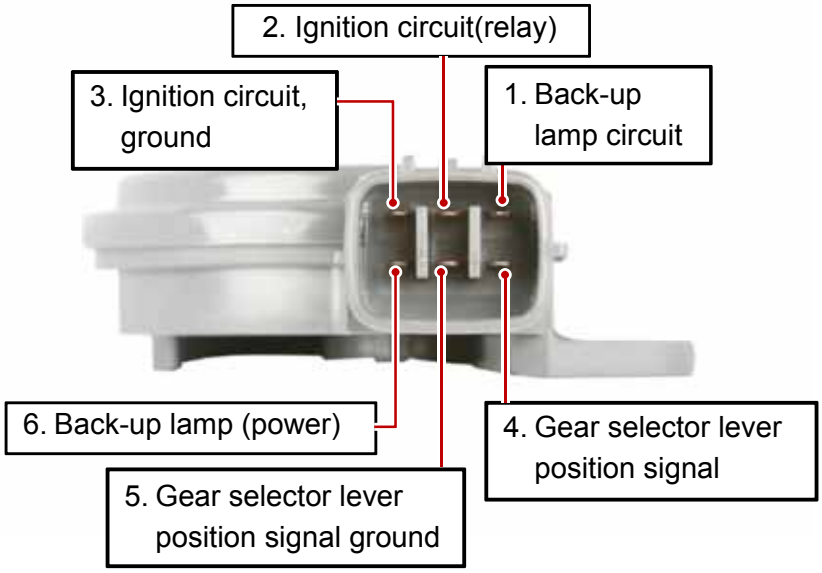


5. Disconnect the inhibitor switch connector (A) to remove the inhibitor switch.

6. Install in the reverse order of removal.

*** Connector pin no.**

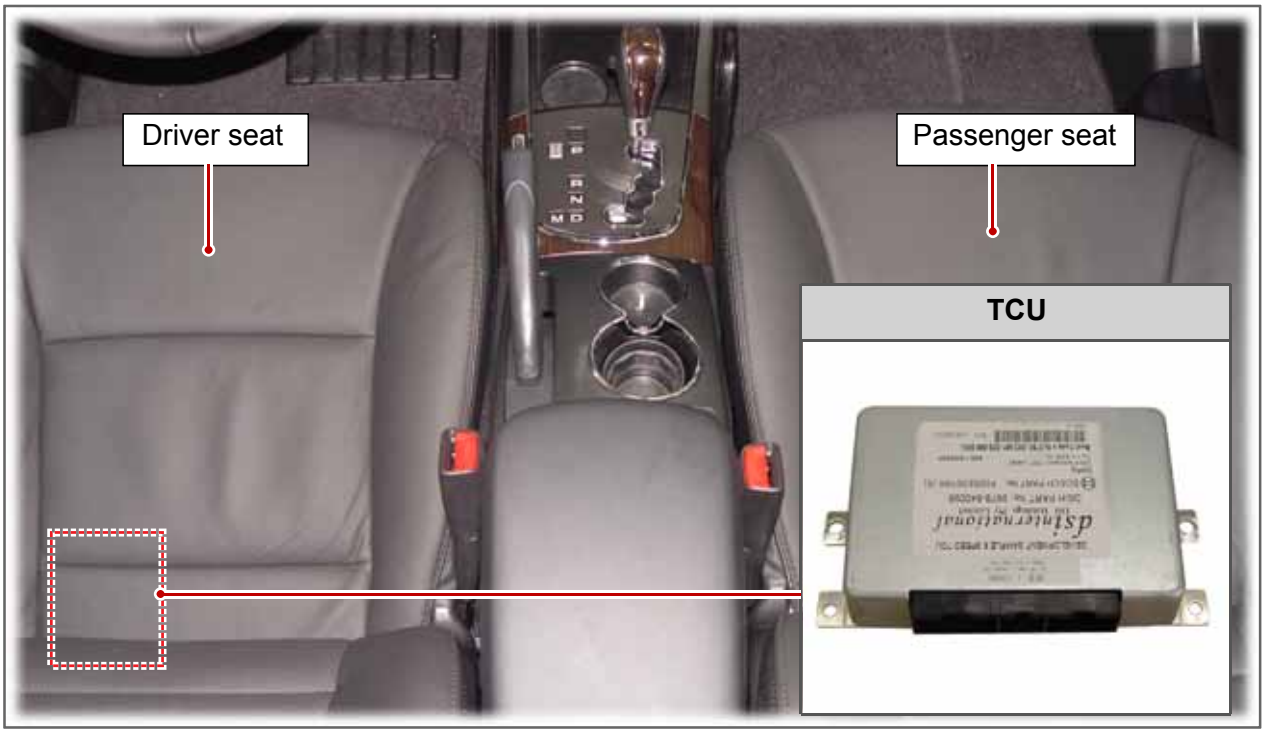
*** Switch pin no. and function**

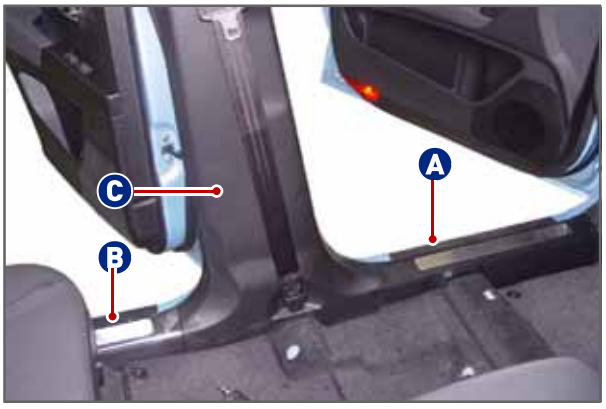


S.G.N. 3110-01

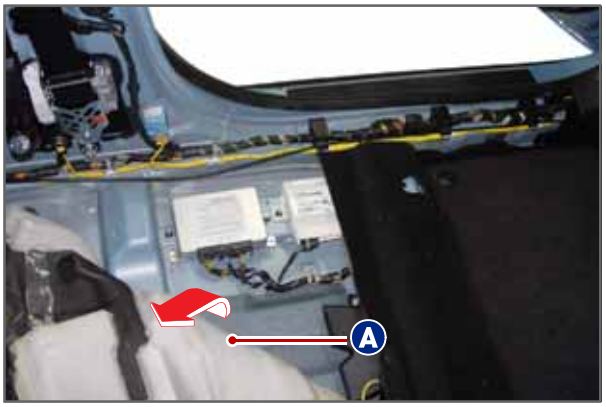
TCU

Preceding work Disconnect the negative cable from the battery.



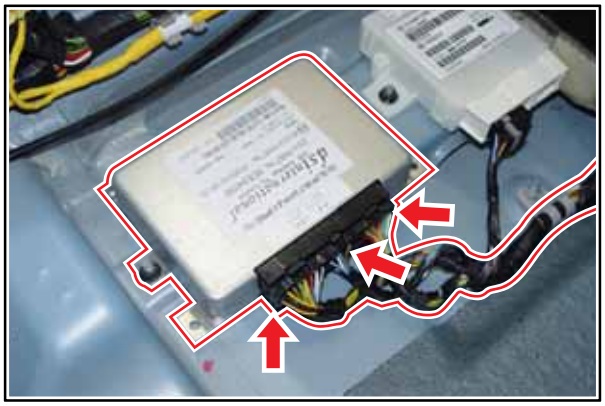


1. Remove the driver seat, front door scuff trim (A), rear door scuff trim (B), B-pillar lower trim (C).
   Refer to chapter "Body" for details of the procedure.



2. Turn back the rear carpet (A).

Modification basis	
Application basis	
Affected VIN	



3. Disconnect the 3 connectors connected to the TCU.

4. Unscrew the 2 mounting nuts (8 mm) on the TCU.

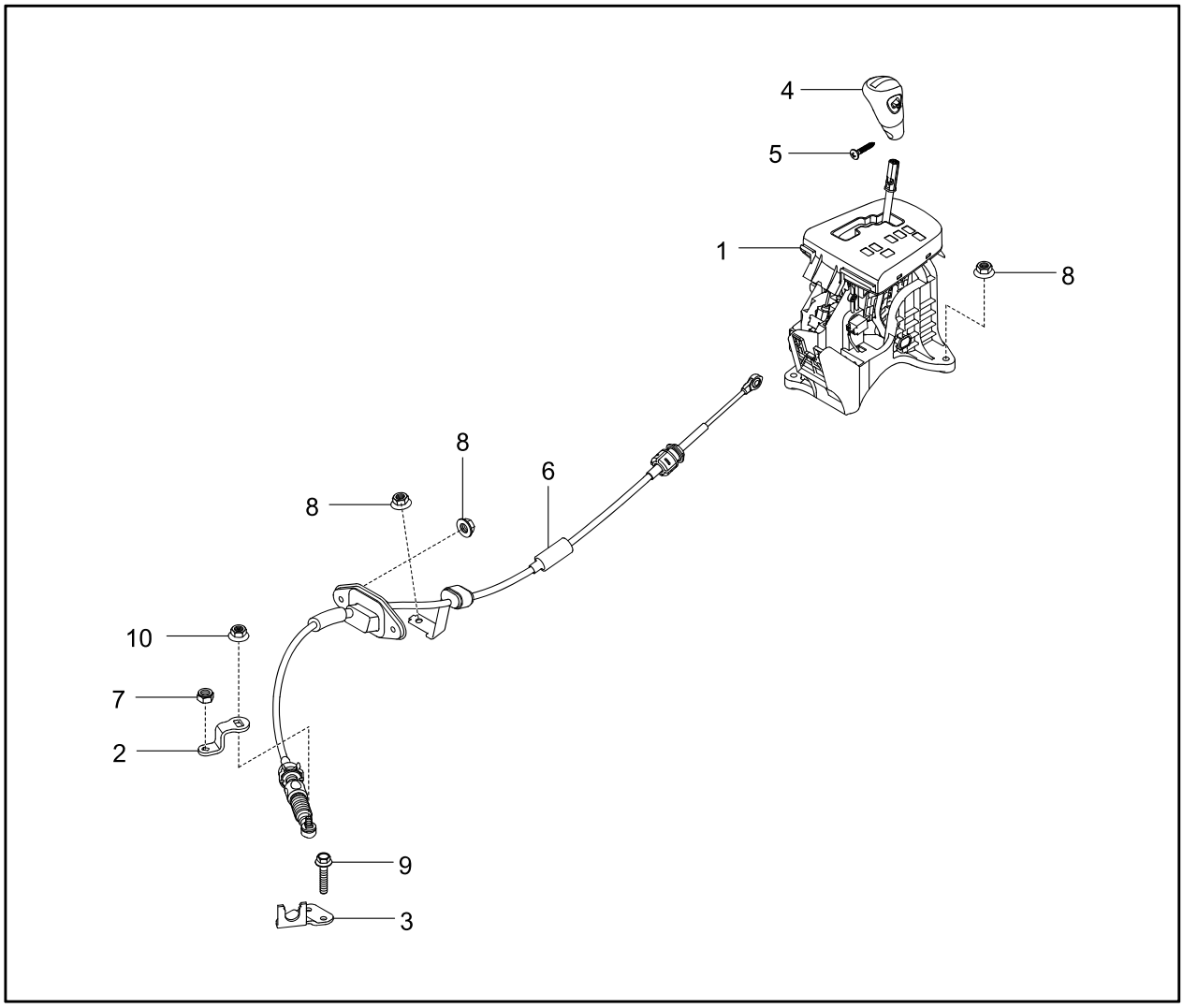
Tightening torque **5 to 6 Nm**

5. Remove the TCU from the vehicle body.

6. Install the sensor in reverse order of removal. During installation, make sure to engage the connectors securely.

S.G.N.
3722-01 TGS LEVER

▶ **Components**

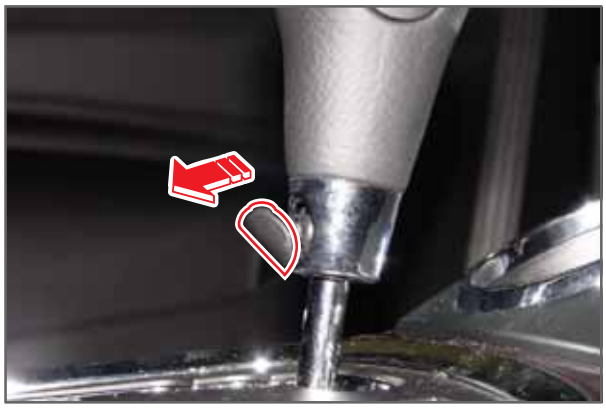


1. Lever Assy - TGS A/T
2. Lever Assy - Range Select
3. BRKT - TGS Cable MTG
4. Knob Assy - TGS A/T
5. Screw - Knob MTG
6. Cable Assy - TGS A/T
7. Nut
8. Nut
9. Bolt
10. Nut

Modification basis	
Application basis	
Affected VIN	

Preceding work Disconnect the negative cable from the battery.

1. Shift the TGS lever to the "D" position.

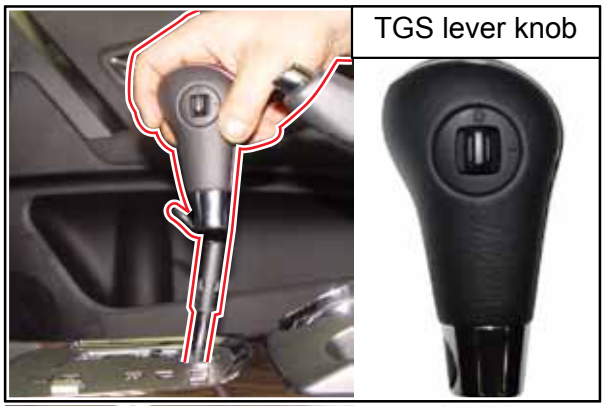


2. Open the TGS lever knob cover.

3. Remove the mounting screw with a cross-slotted screwdriver.

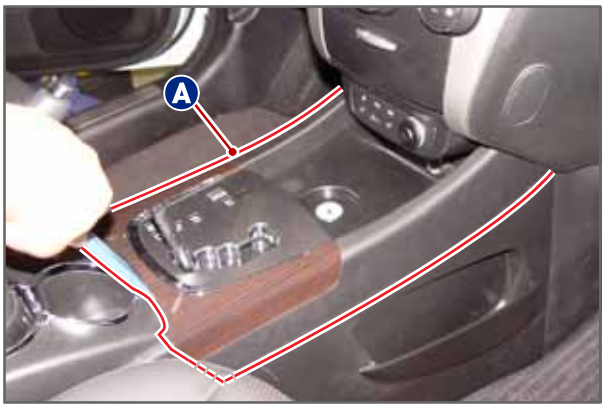
CAUTION

Apply LOCTITE to the mounting screw when installing it.



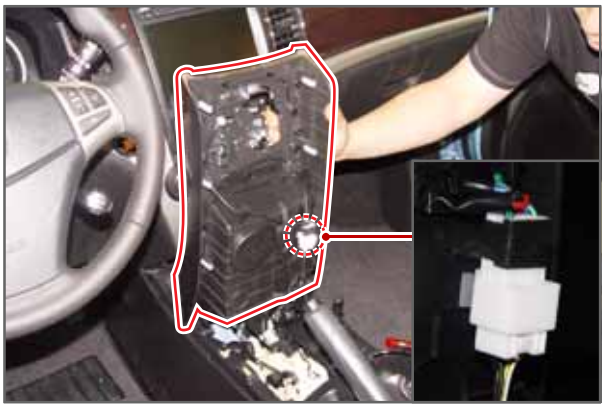
TGS lever knob

4. Remove the TGS lever knob by pulling it up.

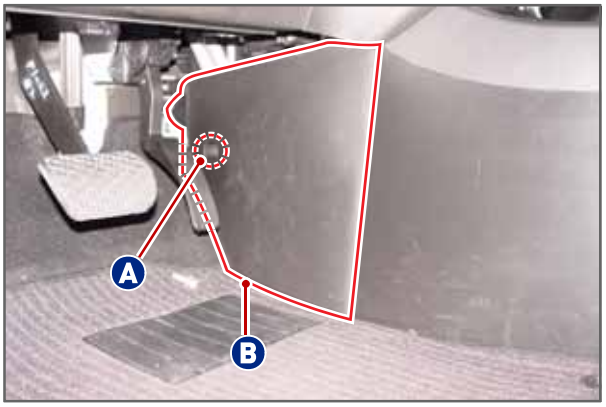


5. Remove the front console fascia assembly (A) with a hand remover.

6. Separate the mounting part of the front console fascia assembly (A) to lift up the front console fascia.



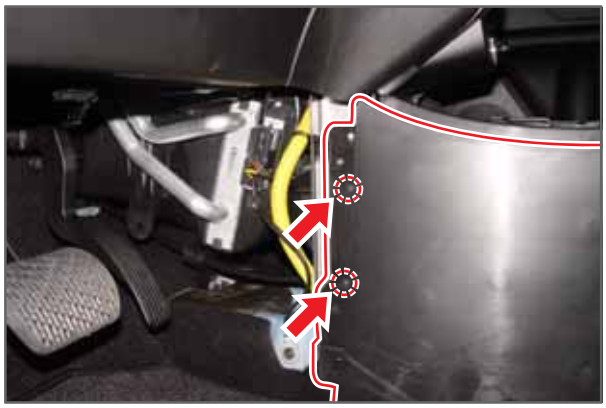
7. Disconnect the connector (A) with the front console fascia assembly lifted up, and then remove the front console fascia.



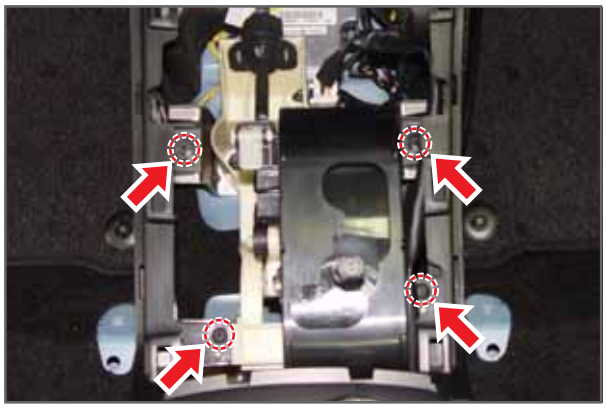
8. Remove the screw rivets (A) on both sides of the front end console cover to remove the both covers (B).

NOTE

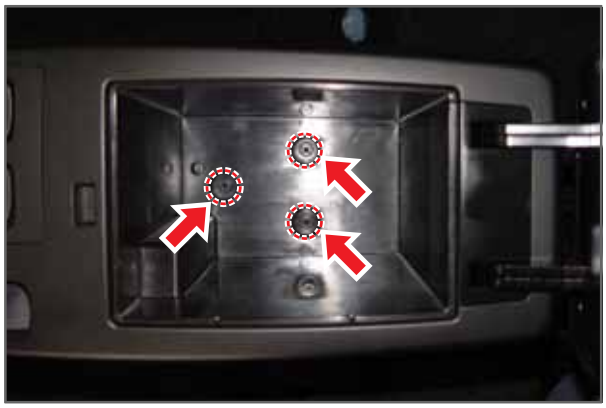
In this guide, the left and right seats are removed to be more specific. Normally, they need not to be removed.



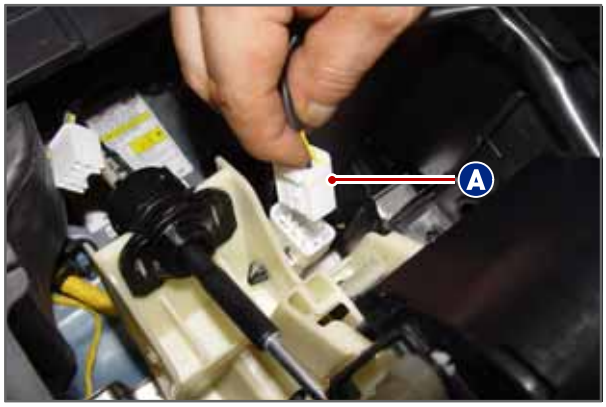
9. Unscrew the two front mounting screws (on both sides) of the center console assembly.



10. Unscrew the 4 center mounting screws of the center console assembly.

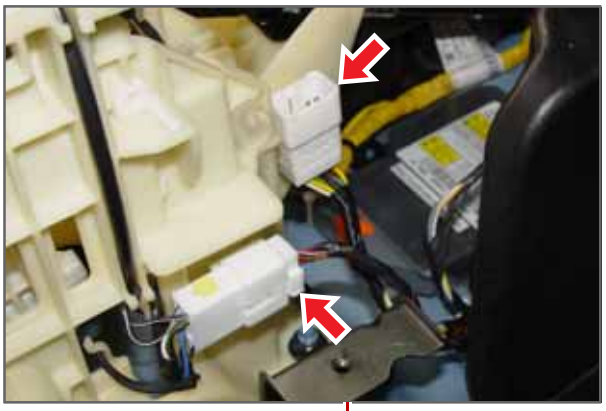


11. Unscrew the 3 mounting screws for the main upper fascia of the center console to remove the main upper fascia.

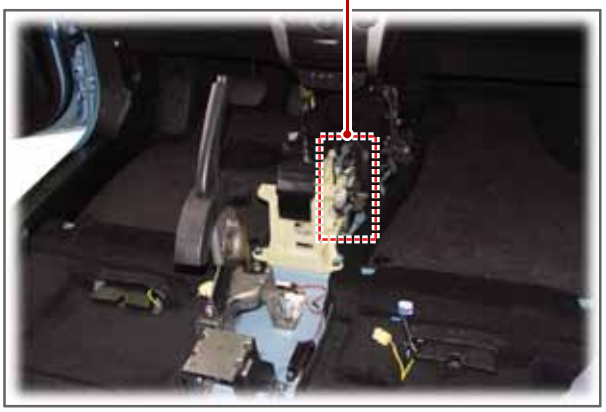


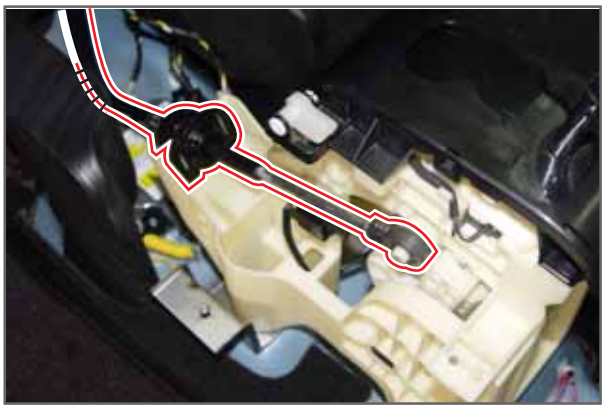
12. Disconnect the seat warmer switch connector (A) connected to the side of the TGS lever.

13.Remove the center console assembly by lifting up the rear side of it.



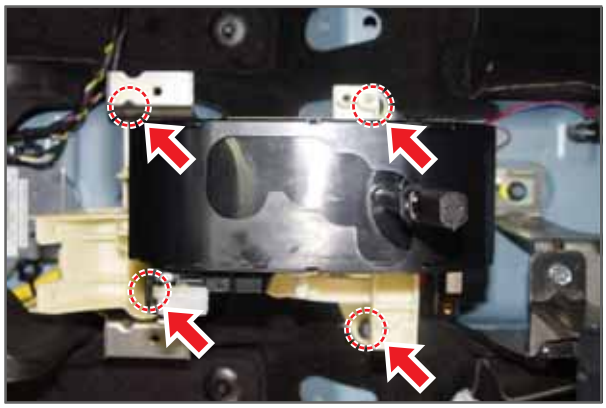
14.Disconnect the two connectors connected to the side of the TGS lever.





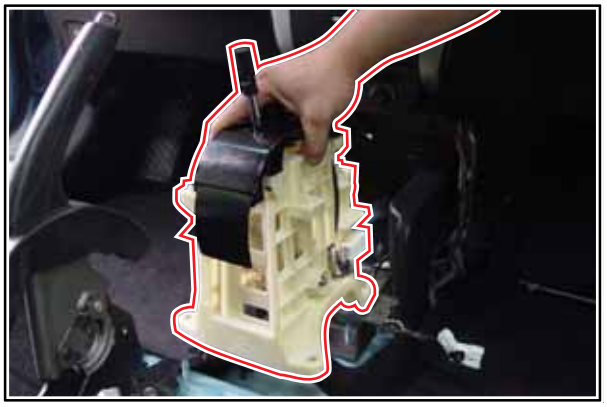
15.Remove the TGS cable.

Modification basis	
Application basis	
Affected VIN	



16.Unscrew the 4 TGS lever mounting nuts (12 mm).

Tightening torque **17.6 to 21.6 Nm**



17.Remove the TGS lever assembly.

18.Install in the reverse order of removal.

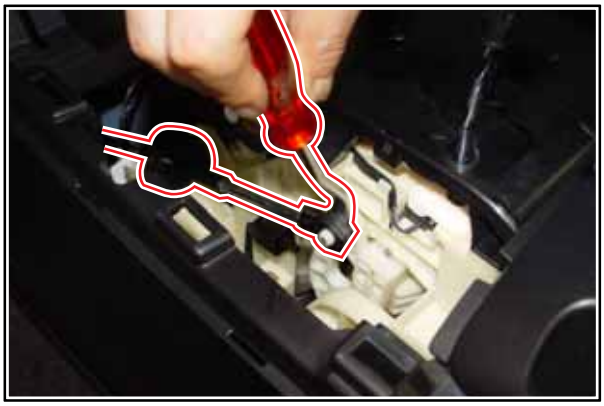
S.G.N.
3722-06

TGS CABLE

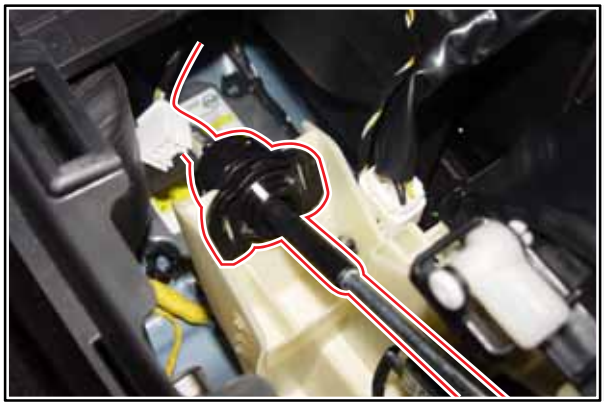
Preceding work 1. Disconnect the negative cable from the battery and remove below components from the center console.

2. Removing front console fascia assembly

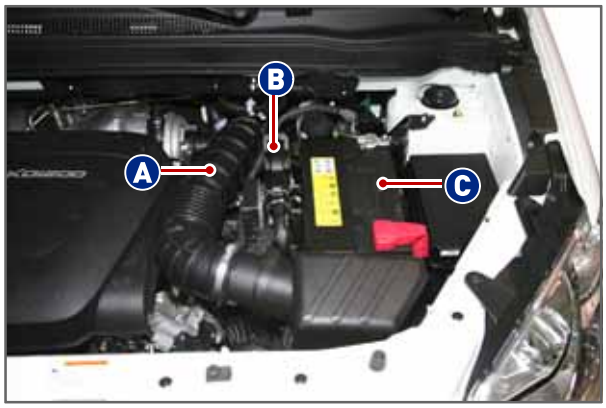
Modification basis	
Application basis	
Affected VIN	



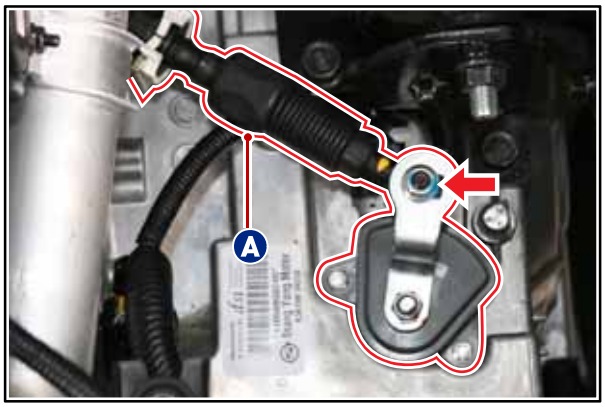
1. Separate the cable from the TGS lever.



2. Disconnect the TGS cable.



3. Remove the air cleaner turbo charger hose (A), engine ECU assembly (B) and battery and battery stand assembly (C) from the engine compartment.

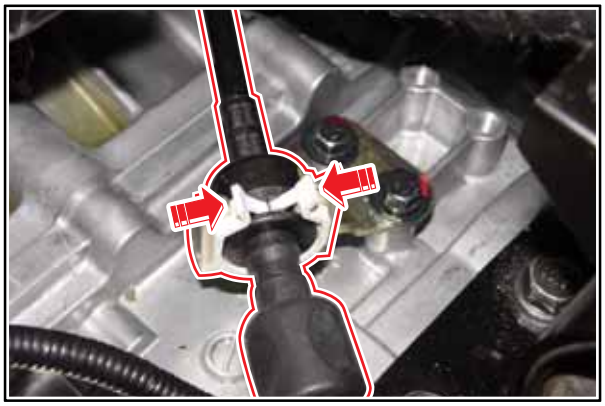


4. Unscrew the mounting nut on the TGS cable and remove the TGS cable (A) from the link.

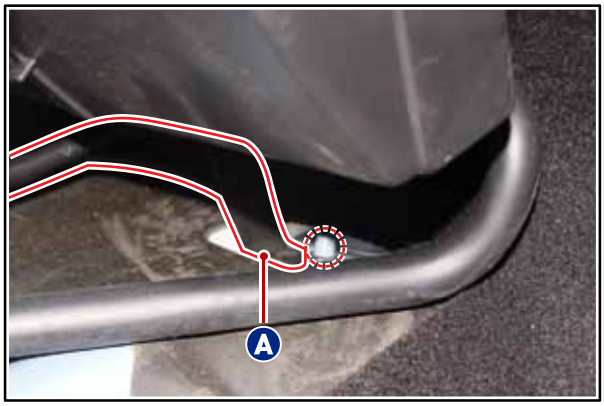
Tightening torque **14.7 to 22.5 Nm**

CAUTION

Do not twist the cable when installing it.

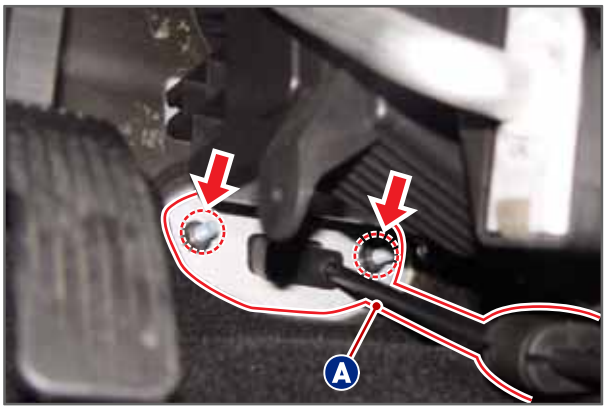


5. Disconnect the TGS cable from the automatic transmission cable bracket.



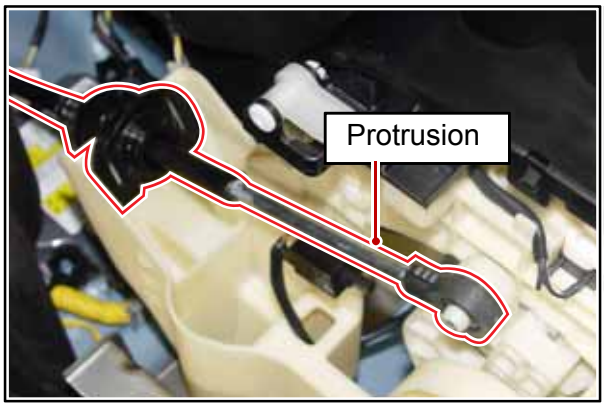
6. Unscrew the bracket mounting nut (12 mm) for TGS cable from the dash panel.

Tightening torque **17.6 to 21.6 Nm**



7. Unscrew the two bracket mounting nuts (12 mm) for TGS cable from the dash panel.

Tightening torque **17.6 to 21.6 Nm**



8. When installing the TGS cable, install it to the mounting firmly with the protrusion of the cable facing upwards.

Modification basis	
Application basis	
Affected VIN	

S.G.N. 3110-01 DTC

1) DTC List

DTC	Description	Sub system
P0603	TCU Adaptive Data Memory Error	TCU
P0604	TCU Adaptive Data Limit Reached	
P0700	Transmission Control System (MIL Request)	
P0707	Gear Lever Position Sensor Error Low	Inhibitor switch assembly
P0708	Gear Lever Position Sensor Error High	
P0711	Transmission Oil Temp Over Temp	Transmission cooling
P0712	Transmission Oil Temperature Sensor Error Low	Transmission fluid temperature sensor
P0713	Transmission Oil Temperature Sensor Error High (Open Circuit)	
P0716	Input Shaft/Turbine Speed Value	Input speed sensor
P0717	Input Shaft/Turbine Speed Sensor Erratic	
P071D	Manual Shift Control Up/Down (TGS) Switch Stuck	Transmission gear selector lever
P071E	Manual Shift Control Up/Down (TGS) Switch Signal Low	
P071F	Manual Shift Control Up/Down (TGS) Switch Signal High	
P0721	Output Shaft Speed Sensor Value	Ouput speed sensor
P0722	Output Shaft Speed Sensor Erratic	
P0729	Gear 6 Incorrect Ratio	Gear engagement
P0731	Gear 1 or M1 Incorrect Ratio	
P0732	Gear 2 Incorrect Ratio	
P0733	Gear 3 Incorrect Ratio	
P0734	Gear 4 Incorrect Ratio	
P0735	Gear 5 Incorrect Ratio	
P0736	Reverse Incorrect Ratio	
P0741	Torque converter clutch circuit stuck off	Torque converter control
P0742	Torque converter clutch circuit stuck on	
P0744	Torque converter clutch Slip Error	

DTC	Description	Sub system
P0826	Manual Shift Control Up/Down (Steering Wheel) Switch Stuck	Steering wheel
P0827	Manual Shift Control Up/Down (Steering Wheel) Switch Signal Low	
P0828	Manual Shift Control Up/Down (Steering Wheel) Switch Signal High	
P0962	Solenoid S9 Over Current	Variable bleed solenoid
P0963	Solenoid S9 Low Current	
P0966	Solenoid S10 Over Current	
P0967	Solenoid S10 Low Current	
P0973	Solenoid S1 Over Current	ON/OFF solenoid
P0974	Solenoid S1 Low Current	
P0976	Solenoid S2 Over Current	
P0977	Solenoid S2 Low Current	
P0979	Solenoid S3 Over Current	
P0980	Solenoid S3 Low Current	
P0982	Solenoid S4 Over Current	
P0983	Solenoid S4 Low Current	
P0985	Solenoid S5 Over Current	
P0986	Solenoid S5 Low Current	
P0998	Solenoid S6 Over Current	
P0999	Solenoid S6 Low Current	
P099B	Solenoid S7 Over Current	
P099C	Solenoid S7 Low Current	
P099E	Solenoid S8 Over Current	
P099F	Solenoid S8 Low Current	
P1604	TCU EMM Data Error	TCU
P1605	EMM Data Mismatch	Input speed sensor
P1610	EMM Comms Error	
P1611	EMM Data Error	
P1701	TCU Supply Voltage Low	TCU
P1703	TCU Supply Voltage High	

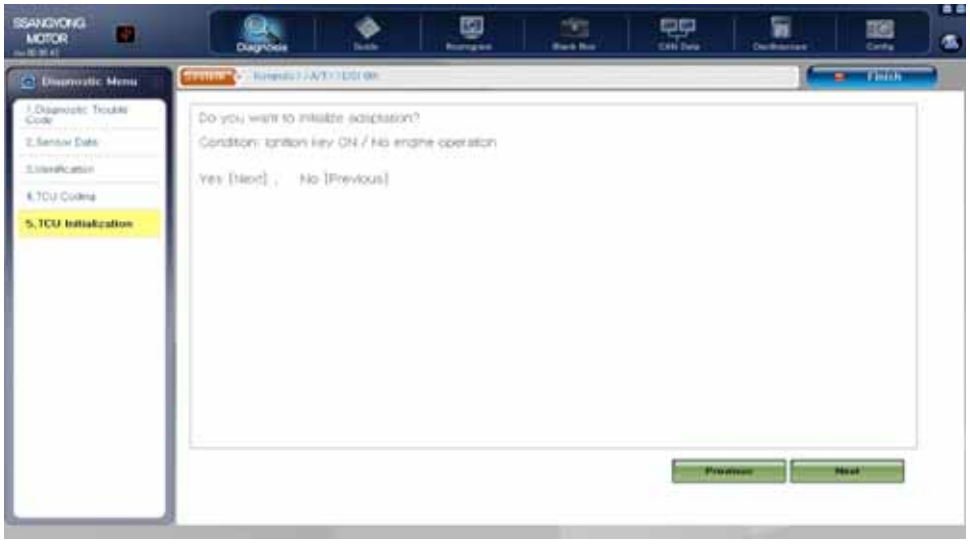
DTC	Description	Sub system
U0100	Cyclic CAN messages from Engine Management ECU are unavailable	CAN Network
U0102	Cyclic CAN messages from Transfer Case ECU are unavailable	
U0103	Cyclic CAN messages from TGS ECU are unavailable	
U0121	Cyclic CAN messages from Brake System ECU (ABS/ESP/TCS) are unavailable	
U0401	CAN signals from EMS are out of range or Invalid	
U0403	CAN signals from Transfer Case are out of range or Invalid	
U0404	CAN signals from Gear Lever ECU are out of range or Invalid	
U0415	CAN signals from Brake System ECU (ABS/ESP/TCS) are out of range or Invalid	
U1600	ECU Application Software Missing	ECU
U1601	ECU Application Software Missing or Corrupted	
U1606	TCU Calibration Error - Platform	TCU
U1607	TCU Calibration Error - Active Variant	
U1608	TCU VIN Coding Error	
U1609	TCU Hardware (pcb) Calibration Error	

2) How to Use Diagnostic Device

(1) Initialization

Carry out the TCU initialization on the diagnosis menu for the DSI 6-speed transmission in the following order:

1. Select “Initializing Adaption” or “Calibrating Initial Hydraulic Pressure” on the above screen, and follow the directions on the next screen.



Modification basis	
Application basis	
Affected VIN	

2. If you press the "Confirm" button after the initialization is done, the initialization process is completed.

3. After completing initialization, follow the instructions on the next screens.

Modification basis	
Application basis	
Affected VIN	

(2) TCU Coding

1. Select “TCU Coding” on the diagnosis menu for the DSI 6-speed transmission and follow the instructions on the screen.

2. Carry out the coding by selecting the item on the diagnosis menu and pressing “Start” button.

Modification basis	
Application basis	
Affected VIN	

3. The following screen is displayed when the process is finished. Follow the instructions on the screen.

4. When all the processes are carried out, the TCU initialization is completed.

Modification basis	
Application basis	
Affected VIN	

Memo