

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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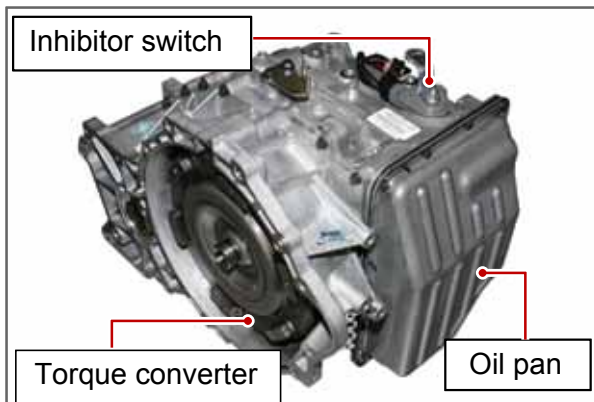
DSI 6 SPEED AUTO TRANSAXLE

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<i>Modification basis</i>	
<i>Application basis</i>	
<i>Affected VIN</i>	

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 torque 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:

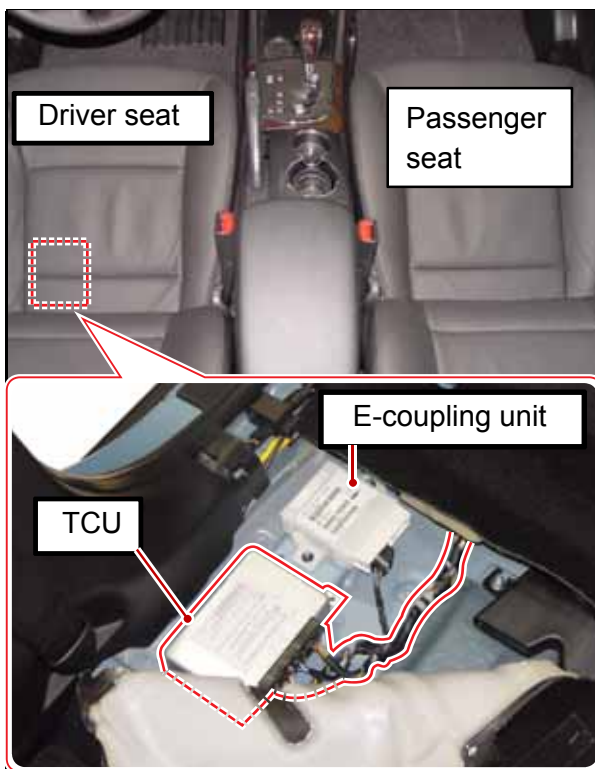
- 1) Engagement feel
- 2) Shift feel
- 3) Shift scheduling
- 4) Modulated torque converter clutch applications

► 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.



Modification basis	
Application basis	
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► **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

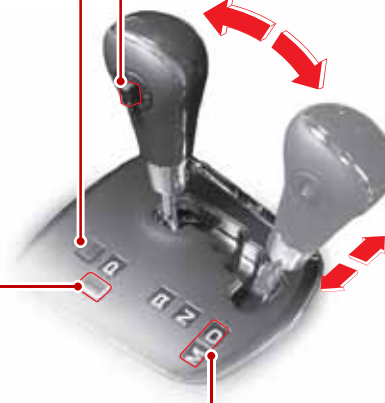
- P : Park
- R : reverse
- N : Neutral
- D : Drive

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

Modification basis	
Application basis	
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2. SPECIFICATIONS

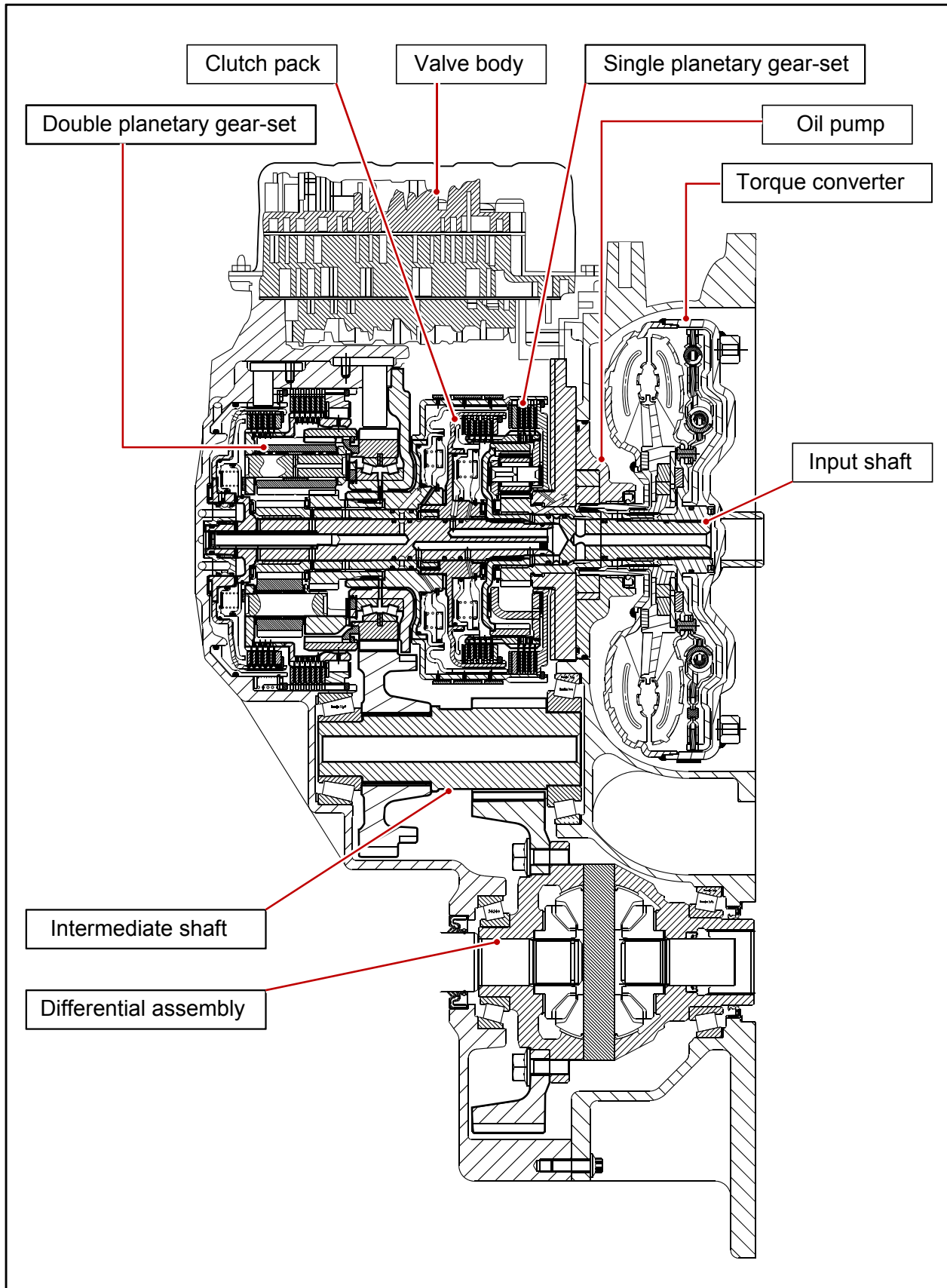
1) Specifications

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 k Ω
	0	146.8 to 175.7 k Ω
	20	56.74 to 65.86 k Ω
	100	3.201 to 3.399 k Ω
Inhibitor switch	D	2.686 k Ω \pm 8%
	N	5.036 k Ω \pm 8%
	P	8.953 k Ω \pm 8%
	R	16.786 k Ω \pm 8%

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

Modification basis	
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2) Sectional Diagram



Modification basis	
Application 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

Modification basis	
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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

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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

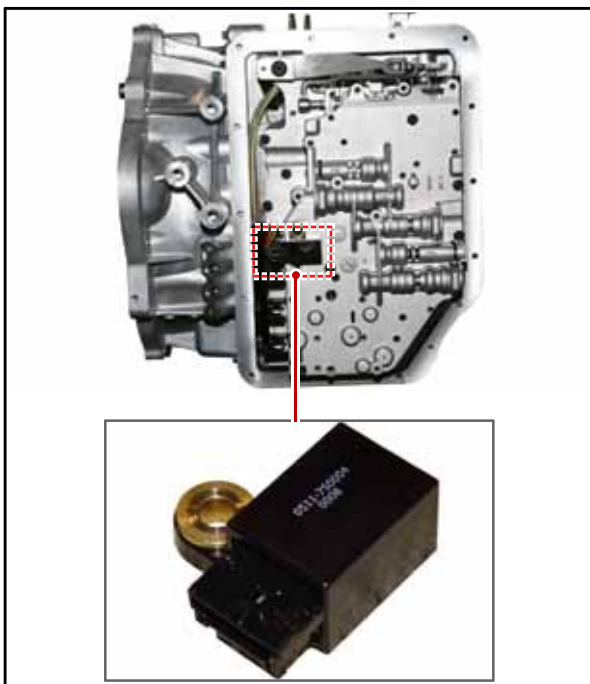
If the accelerator pedal is released when traveling uphill, upshifts are prevented to reduce busyness on grades. If the accelerator pedal is released when traveling downhill, upshifts are prevented to enhance engine braking.

► 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.

Modification basis	
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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.

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