A750E AND A750F AUTOMATIC TRANSMISSION

●DESCRIPTION

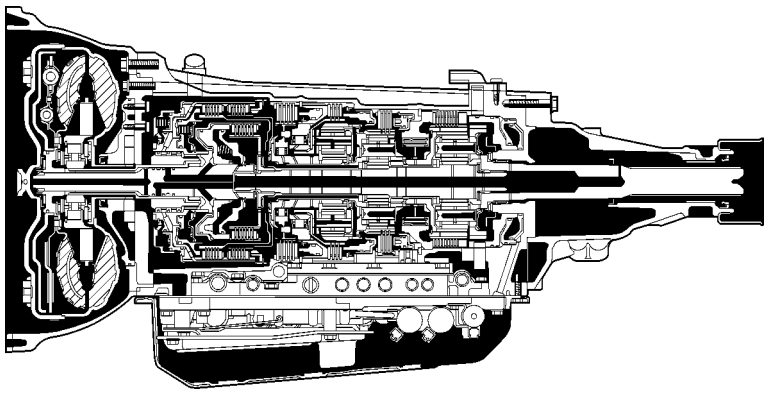
An A750E (for 2WD model) or A750F (for 4WD model) 5-speed Super ECT (Electronic Controlled Transmission) is used. The only difference between the A750E and A750F is in the extension housing and output shaft.

- These automatic transmissions are equipped with multi-mode automatic transmission function. For details, see page CH-34.
- These automatic transmissions are equipped with an ATF warmer as standard equipment to warm up ATF.
- Some models are also equipped with an ATF cooler as an option to ensure high ATF cooling performance.
- Either a column shift lever or floor shift lever is available depending on the seat type (bench type or separate type).
- The ATF warmer, ATF cooler, column shift lever and floor shift lever are available as shown below.

×: Standard OP: Option -: Not Equipped

Engine Type (Transmission Type)	**1GR-FE (A750E)**			**2UZ-FE (A750E, A750F)**				
Cab Type	Regular		Double	Regular		Double		CrewMax
Deck type	Standard	Long	Standard	Standard	Long	Standard	Long	Short
ATF Warmer	×	×	×	×	×	×	×	×
ATF Cooler	-	-	-	OP	OP	OP	×	OP
Column Shift Lever	×	×	×	×	×	×*1	×	×*1
Floor Shift Lever	OP	-	OP	OP	-	OP*1, ×*2	OP	×*2

*1: Except Limited Grade *2: Limited Grade Only



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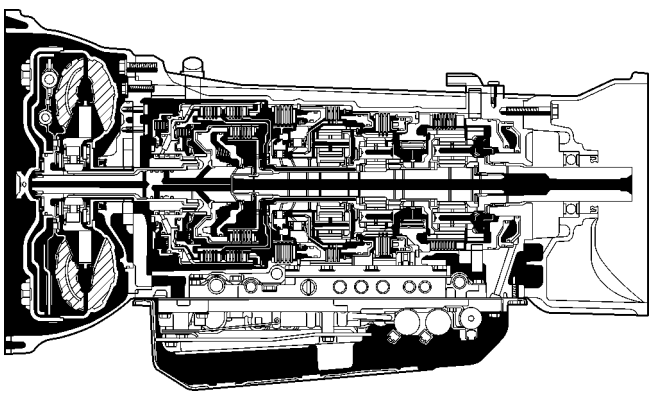
A750E (For 2WD)



A750F (For 4WD) 04E0CH124C

4. Diagnosis

When the ECM detects a malfunction, the ECM records the malfunction and memorizes the information related to the fault. Furthermore, the MIL (Malfunction Indicator Lamp) in the combination meter illuminates or blinks to inform the driver.
The ECM will also store the DTCs (Diagnostic Trouble Codes) of the malfunctions. The DTCs can be accessed using the hand-held tester or Techstream*.
For details, see the 2007 TOYOTA TUNDRA Repair Manual (Pub. No. RM04E2U).

Service Tip

The ECM uses the CAN protocol for diagnostic communication. Therefore, a hand-held tester or Techstream* and a dedicated adapter [CAN VIM (Vehicle Interface Module)] are required for accessing diagnostic data.
To clear DTCs that are stored in the ECM, use a hand-held tester or Techstream*, disconnect the battery terminal or remove the EFI fuse for 1 minute or longer.
For details, see the 2007 TOYOTA TUNDRA Repair Manual (Pub. No. RM04E2U).

*: Techstream is the name for the diagnostic tester in North America, but other countries will continue to use the hand-held tester.

5. Fail-safe

The fail-safe function minimizes the loss of operability when any abnormality occurs in a sensor or solenoid.

- **Fail-safe Control List ●**

Malfunction Part	Function
Input Speed Sensor (NT)	During an input speed sensor malfunction, shift control is effected based on the output speed sensor signal (SP2). During an input speed sensor malfunction, up-shifts to 5th, AI-SHIFT and flex lock-up clutch control are prohibited.
Output Speed Sensor (SP2)	During an output speed sensor malfunction, shift control is effected based on the input speed sensor signal (NT). During an output speed sensor malfunction, up-shifts to 5th, AI-SHIFT and flex lock-up clutch control are prohibited.
ATF Temperature Sensor No.1 (THO1)	During an ATF temperature sensor No.1 malfunction, up-shifts to 5th and flex lock-up clutch control are prohibited.
Solenoid Valve S1, S2, and SR	When a solenoid valve listed at left malfunctions, current to the failed solenoid valve is cut off. Shift control is changed to a fail-safe mode to shift gears using the normal solenoid valves to allow continued driving. Refer to the table on the next page for operation example.
Solenoid Valve SL1 and SL2	During a solenoid valve SL1 or SL2 malfunction, up-shifts to 5th and flex lock-up clutch control are prohibited.
Solenoid Valve SLU	During a solenoid valve SLU malfunction, the current to the solenoid valve is stopped. Because this stops lock-up control and flex lock-up control, fuel economy decreases.
Solenoid Valve SLT	During a solenoid valve SLT malfunction, the current to the solenoid valve is stopped. Because this stops line pressure optimal control, the shift shock will increase. However, shifting is effected based on normal clutch pressure control.

Position	**Normal**					
	Shift Solenoid Valve					Gear
	S1	S2	SR	SL1	SL2	
D, S5	ON	OFF	OFF	OFF	ON	1st
	ON	ON	OFF	OFF	ON	2nd
	OFF	ON	OFF	OFF	ON	3rd
	OFF	OFF	OFF	OFF	ON	4th
	OFF	OFF	ON	ON	OFF	5th
S4	ON	OFF	OFF	OFF	ON	1st
	ON	ON	OFF	OFF	ON	2nd
	OFF	ON	OFF	OFF	ON	3rd
	OFF	OFF	OFF	OFF	ON	4th
S3	ON	OFF	OFF	OFF	ON	1st
	ON	ON	OFF	OFF	ON	2nd
	OFF	ON	OFF	OFF	OFF	3rd (E/B)
S2	ON	OFF	OFF	OFF	ON	1st
	ON	ON	ON	OFF	OFF	2nd (E/B)
S1	ON	OFF	OFF	OFF	OFF	1st (E/B)

- **Example ●**

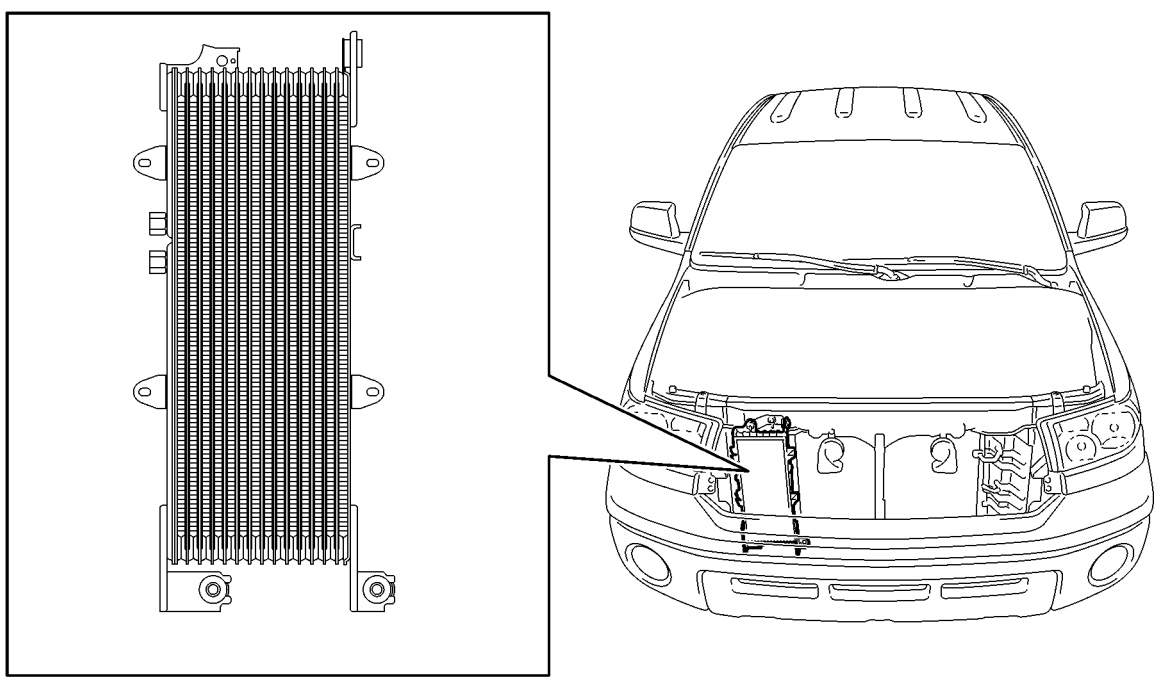
Position	**Shift Solenoid Valve S1 Malfunction**					
	Shift Solenoid Valve					Gear
	S1	S2	SR	SL1	SL2	
D, S5	×	OFF ↔ ON	OFF	OFF	ON	4th ↔ 3rd
	×	ON	OFF	OFF	ON	3rd
	×	ON	OFF	OFF	ON	3rd
	×	OFF	OFF	OFF	ON	4th
	×	OFF	ON	ON	OFF	5th
S4	×	OFF ↔ ON	OFF	OFF	ON	4th ↔ 3rd
	×	ON	OFF	OFF	ON	3rd
	×	ON	OFF	OFF	ON	3rd
	×	OFF	OFF	OFF	ON	4th
S3	×	OFF ↔ ON	OFF	OFF	ON ↔ OFF	3rd ↔ 3rd (E/B)
	×	ON	OFF	OFF	ON ↔ OFF	3rd ↔ 3rd (E/B)
	×	ON	OFF	OFF	OFF	3rd (E/B)
S2	×	OFF	OFF	OFF	ON	1st
	×	ON	ON	OFF	OFF	3rd (E/B)
S1	×	OFF	OFF	OFF	OFF	1st (E/B)

E/B: Engine Brake

●ATF COOLER

An air-cooled type ATF cooler is used to maintain ATF cooling performance under high loads.

ATF Cooler Core



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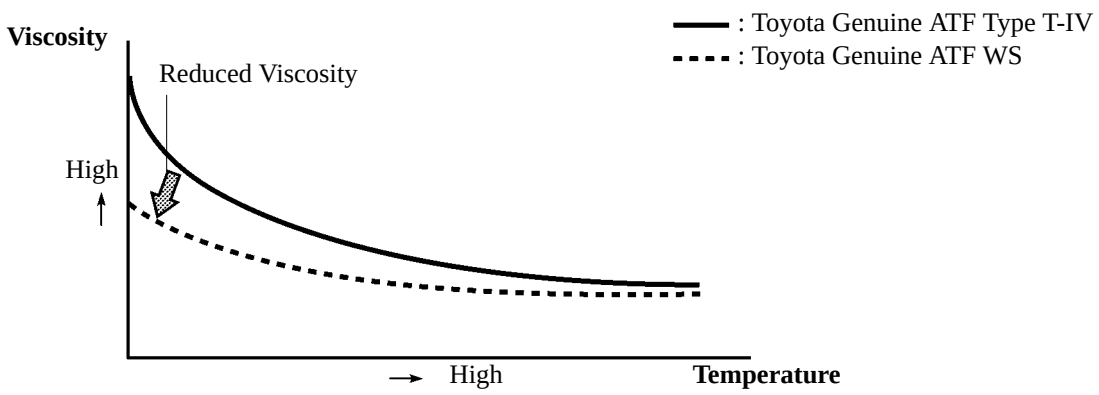
●TOYOTA GENUINE ATF WS

- Toyota genuine ATF WS is used to reduce the resistance of the ATF and improve fuel economy by reducing its viscosity in the practical operating temperature range. At higher-fluid temperatures, the viscosity is the same as that of Toyota genuine ATF Type T-IV, to ensure the durability of the automatic transmission.
- There is no interchangeability between the Toyota genuine ATF WS and other types of ATF (Toyota Genuine ATF Type T-IV, D-II).

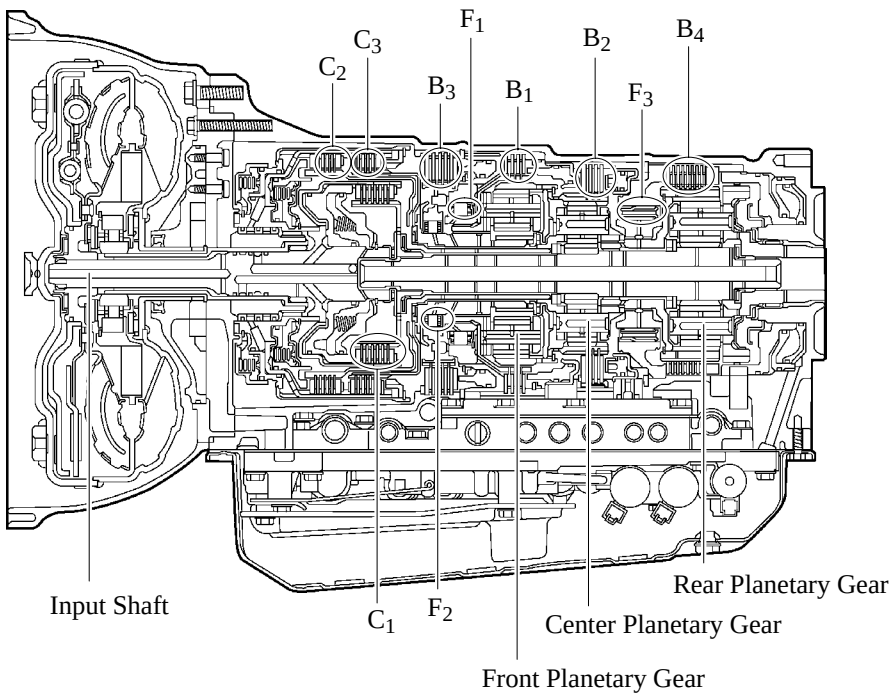


259LSK03

• SPECIFICATIONS

Engine Type		**1GR-FE**	**2UZ-FE**	
Transmission Type		**A750E**	**A750E**	**A750F**
Gear Ratio	1st	3.520	↔	↔
	2nd	2.042	↔	↔
	3rd	1.400	↔	↔
	4th	1.000	↔	↔
	5th	0.716	↔	↔
	Reverse	3.224	↔	↔
Fluid Type		Toyota Genuine ATF WS	↔	↔
Fluid Capacity Liters (US qts, Imp. qts)	Without ATF Cooler	10.5 (11.1, 9.2)	↔	↔
	With ATF Cooler	-	11.1 (11.7, 9.8)	↔
Weight (Reference)* kg (lb)	Without ATF Cooler	85.5 (188.5)	84.7 (186.7)	85.5 (188.5)
	With ATF Cooler	-	85.2 (187.8)	86.0 (189.6)

*: The figure shown is the weight of the part including fluid.



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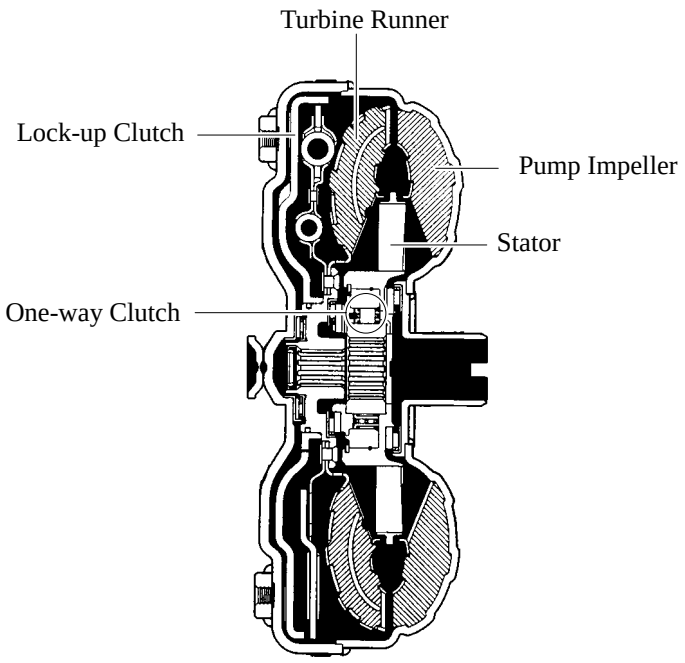
Engine Type				1GR-FE	2UZ-FE	
Transmission Type				A750E	A750E	A750F
C_1	No.1 Clutch	The No. of Discs		6	7	↔
C_2	No.2 Clutch			5	6	↔
C_3	No.3 Clutch			5	↔	↔
B_1	No.1 Brake			3	4	↔
B_2	No.2 Brake			3	↔	↔
B_3	No.3 Brake			4	↔	↔
B_4	No.4 Brake			8	↔	↔
F_1	No.1 One-way Clutch	The No. of Sprags		18	↔	↔
F_2	No.2 One-way Clutch			25	↔	↔
F_3	No.3 One-way Clutch			26	↔	↔
Front Planetary Gear		The No. of Sun Gear Teeth		40	↔	↔
		The No. of Pinion Gear Teeth	Inner	22	↔	↔
			Outer	21	↔	↔
		The No. of Ring Gear Teeth		91	↔	↔
Center Planetary Gear		The No. of Sun Gear Teeth		31	↔	↔
		The No. of Pinion Gear Teeth		23	↔	↔
		The No. of Ring Gear Teeth		77	↔	↔
Rear Planetary Gear		The No. of Sun Gear Teeth		25	↔	↔
		The No. of Pinion Gear Teeth		19	↔	↔
		The No. of Ring Gear Teeth		63	↔	↔

TORQUE CONVERTER

A compact, lightweight and high-capacity torque converter is used. The torque converter supports flex lock-up clutch control, thus allowing for improved fuel economy.



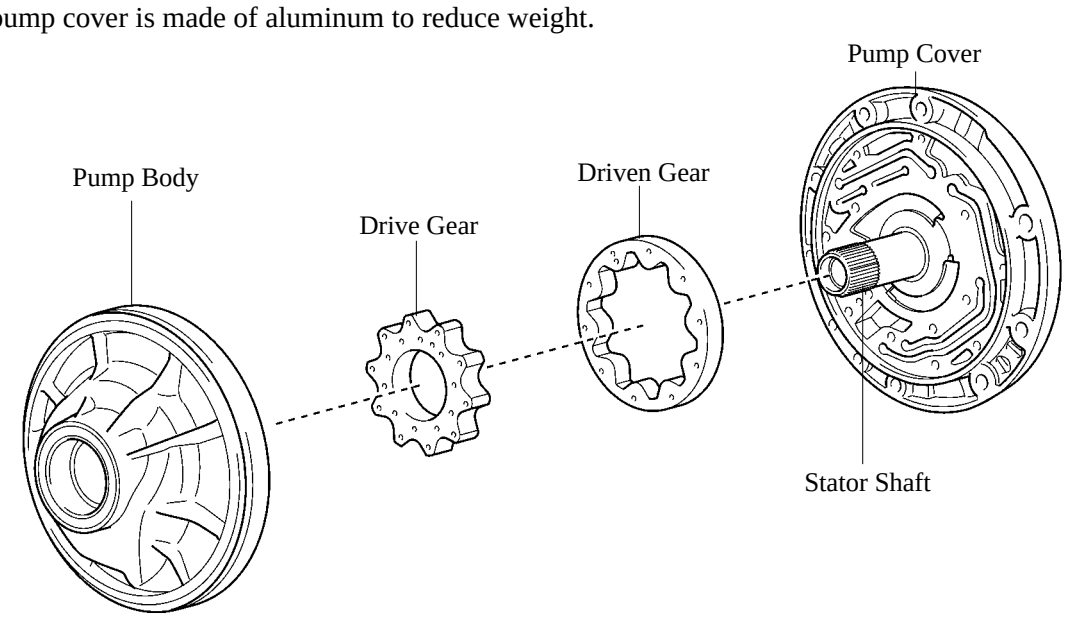
279CH08

- **Specifications ●**

Engine Type	1GR-FE	2UZ-FE	
Transmission Type	**A750E**	**A750E**	**A750F**
Stall Torque Ratio	1.85	1.80	
Type	3-Element, 1-Step, 2-Phase		

OIL PUMP

The oil pump is driven by the torque converter. It lubricates the planetary gear units and supplies operating fluid pressure for hydraulic control.
The pump cover is made of aluminum to reduce weight.



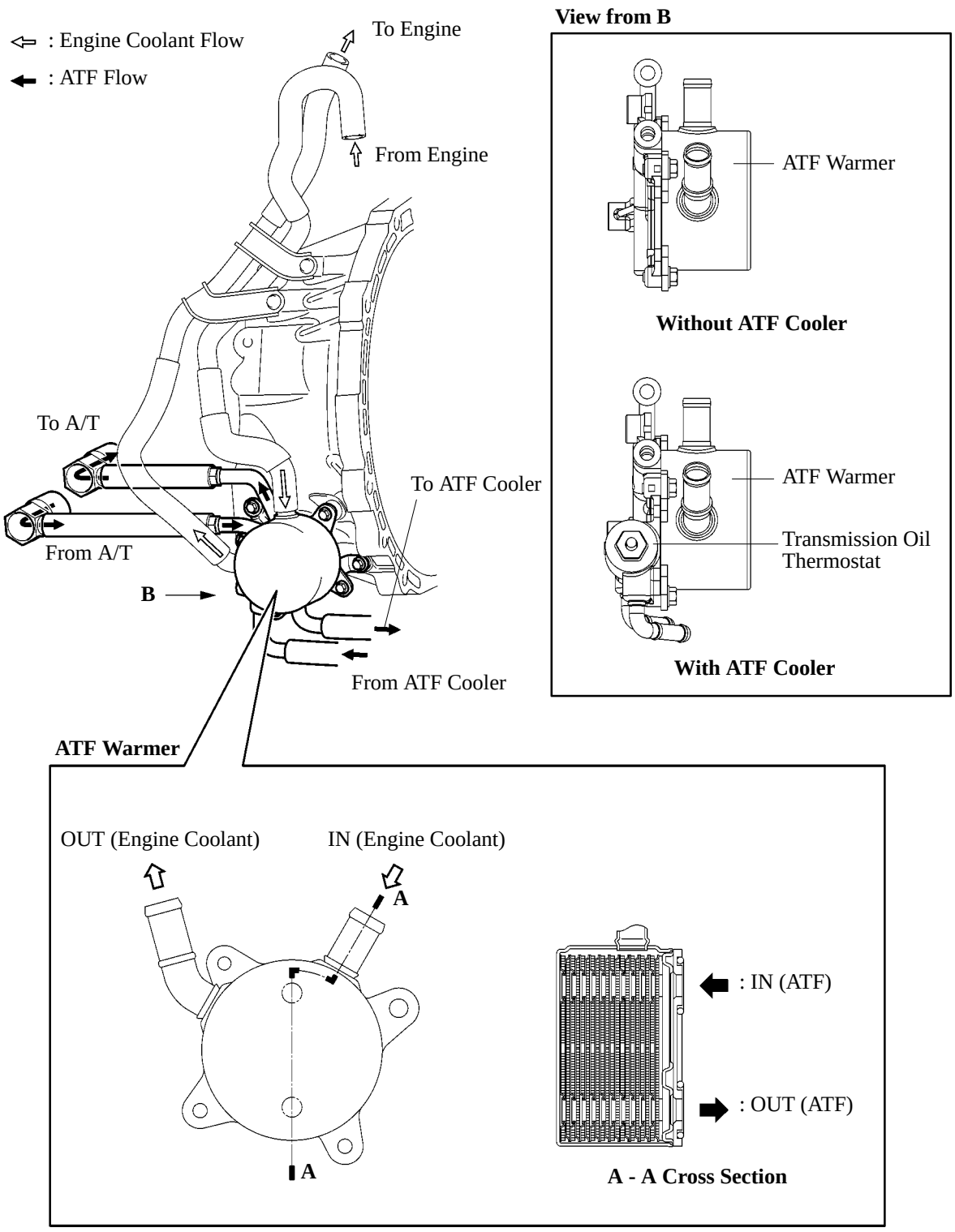
232CH89

●ATF WARMER

1. General

The ATF warmer uses engine coolant to warm up the ATF quickly and keep the ATF temperature higher (within limits). Consequently, the friction losses of the automatic transmission are quickly reduced, thus improving fuel economy.

- Models equipped with an ATF cooler have a transmission oil thermostat to switch the ATF passages.



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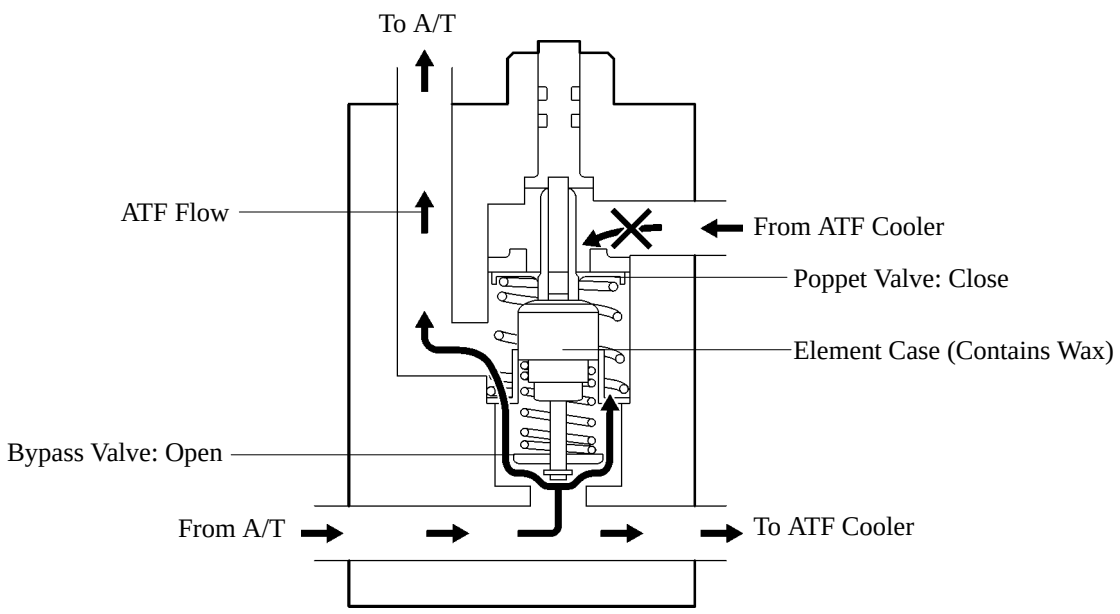
2. Transmission Oil Thermostat

The transmission oil thermostat consists of the poppet valve, bypass valve and element case (contains wax). When the ATF temperature changes from low to high, the wax will expand to start to open the poppet valve and close the bypass valve, thus switching the ATF passages.



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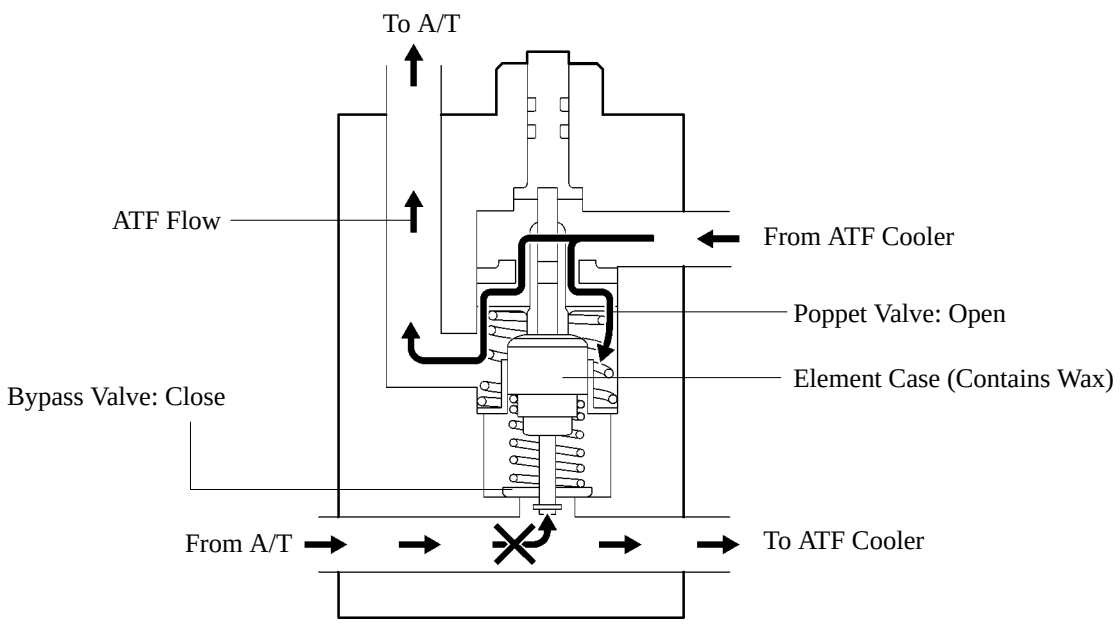
ATF Temperature: Low



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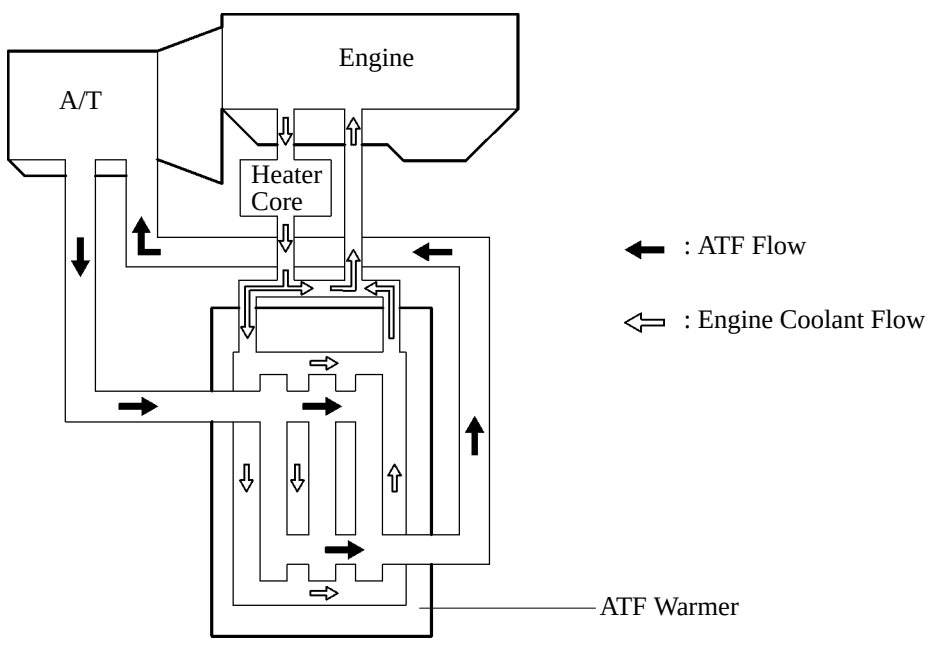
ATF Temperature: High

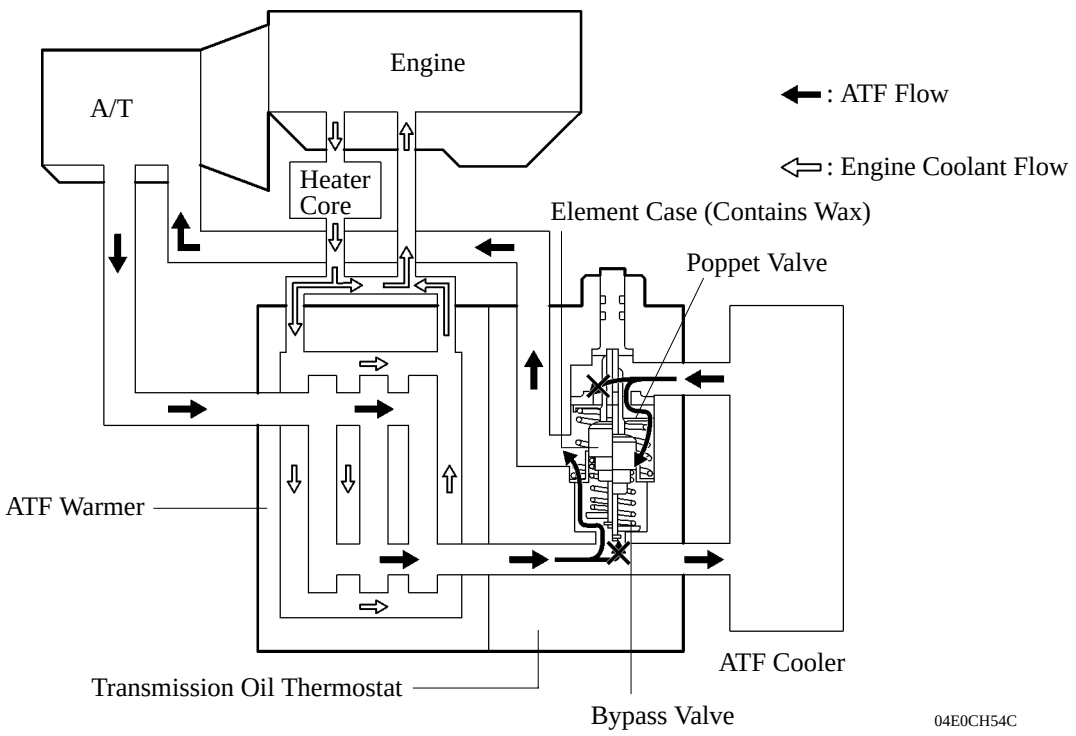
3. ATF and Engine Coolant Circuits

Models without ATF Cooler



Models with ATF Cooler

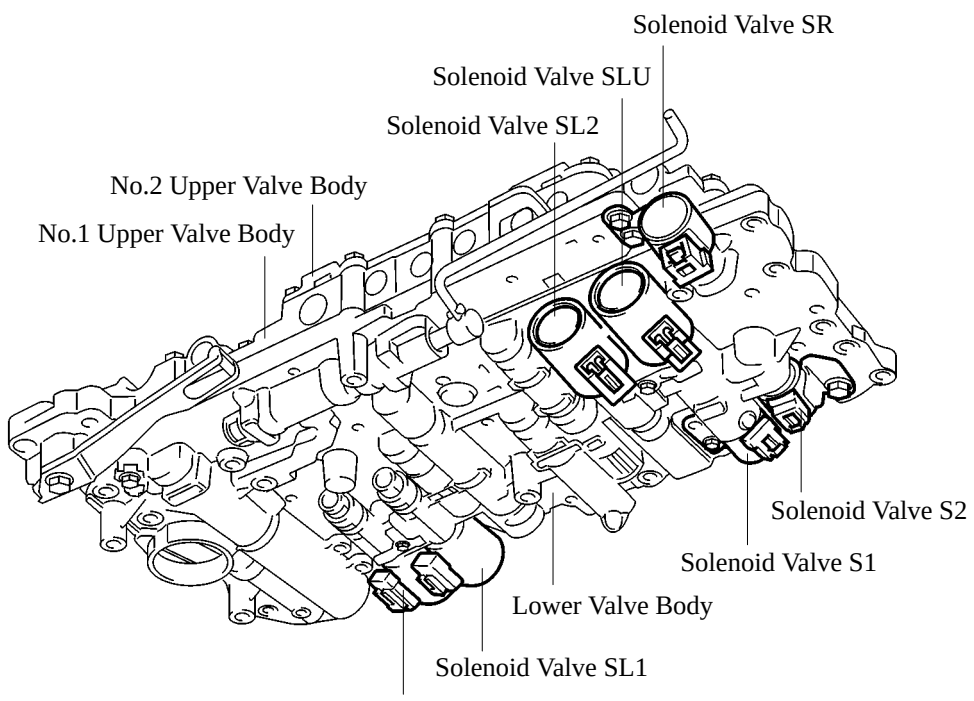
- When the ATF is at a low temperature, it is warmed up by the engine coolant in the ATF warmer.
- When the ATF is at a high temperature, it flows to the ATF warmer and then to the ATF cooler, thus it is cooled down.



○VALVE BODY UNIT

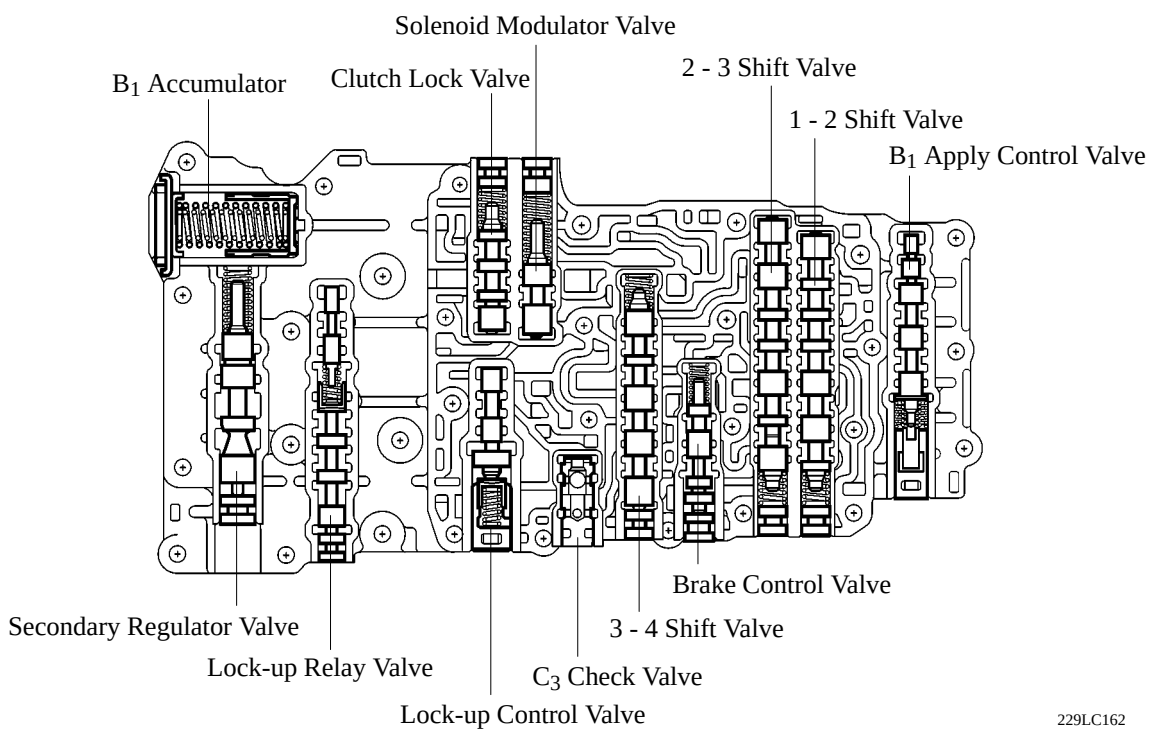
1. General

The valve body unit consists of the upper (No.1 and No.2) and lower valve bodies and 7 solenoid valves.



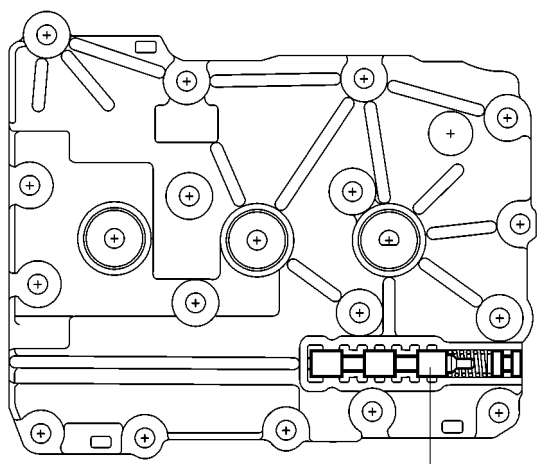
229LC161

- **No.1 Upper Valve Body ●**



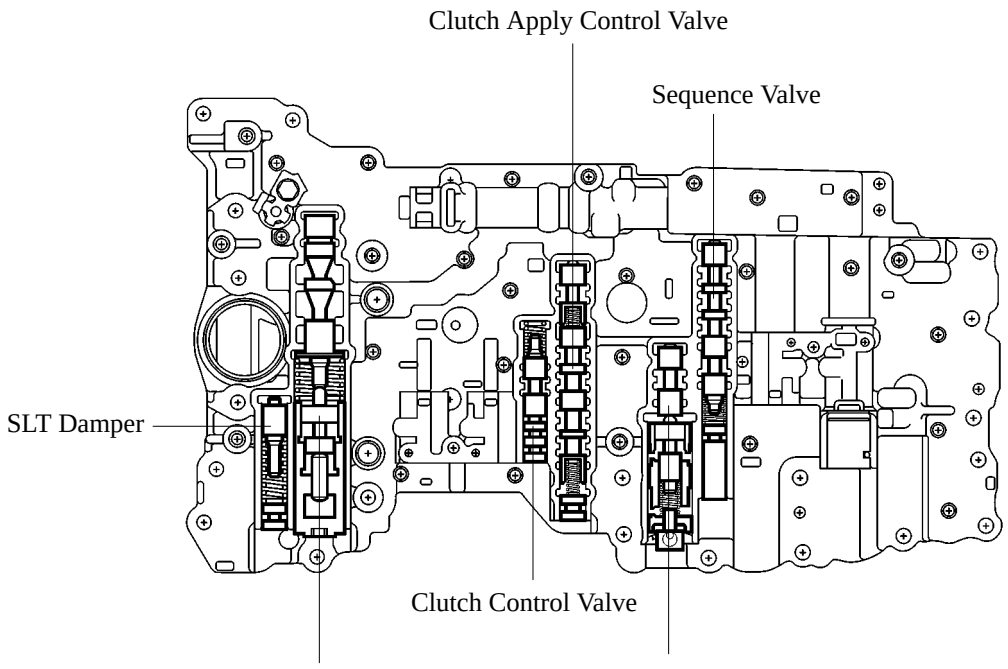
229LC162

- **No.2 Upper Valve Body ●**



229LC163

- **Lower Valve Body ●**

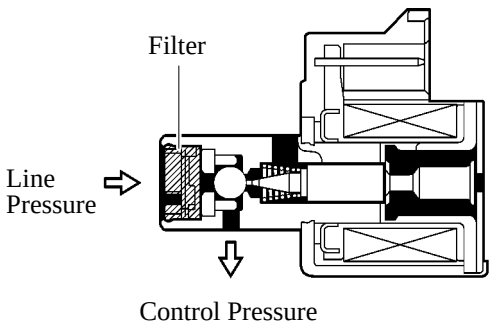


229LC164

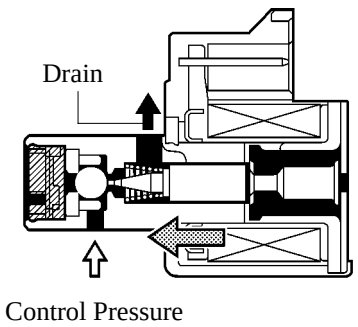
2. Solenoid Valve

Solenoid Valve S1, S2 and SR

Solenoid valves S1 and SR use a 3-way solenoid valve.
Solenoid valve S2 uses a 2-way solenoid valve.
A filter is provided at the tip of each solenoid valve to further improve operational reliability.

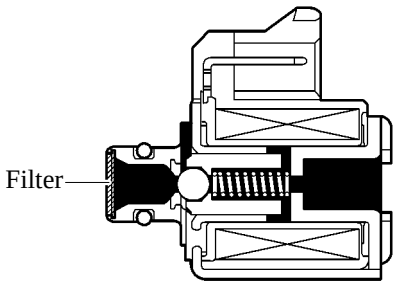


Solenoid Valve S1 OFF

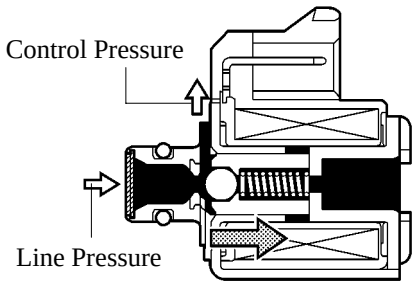


Solenoid Valve S1 ON

229LC165



Solenoid Valve S2 OFF



Solenoid Valve S2 ON

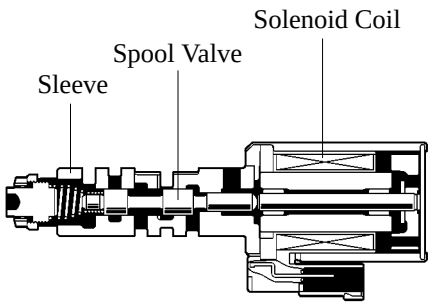
229LC166

- **Function of Solenoid Valve S1, S2 and SR ●**

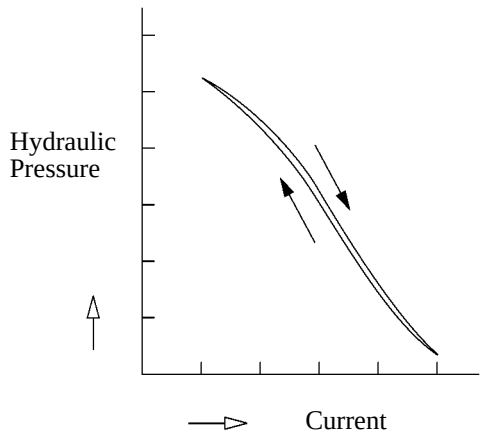
Solenoid Valve	Type	Function
S1	3-way	Switches the 2 - 3 shift valve
S2	2-way	• Switches the 1 - 2 shift valve • Switches the 3 - 4 shift valve
SR	3-way	Switches the clutch apply control valve

Solenoid Valve SL1, SL2, SLT and SLU

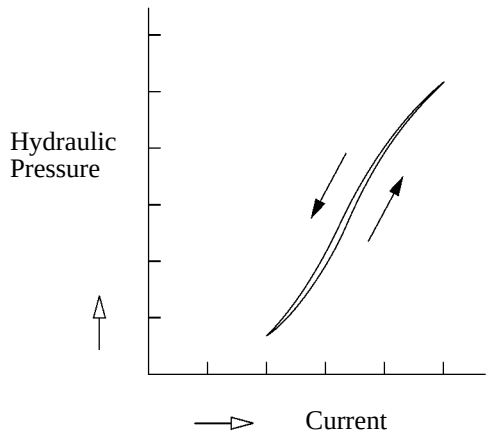
SL1, SL2, SLT, and SLU are used by the ECM to control hydraulic pressures in a linear fashion based on the current that the ECM causes to flow through their solenoid coils. They control line, clutch, and brake engagement pressure based on the signals received from the ECM.
The solenoid valves SL1, SL2, SLT, and SLU have the same basic structure.



Solenoid Valve SLT



Solenoid Valve SL1, SL2, and SLT



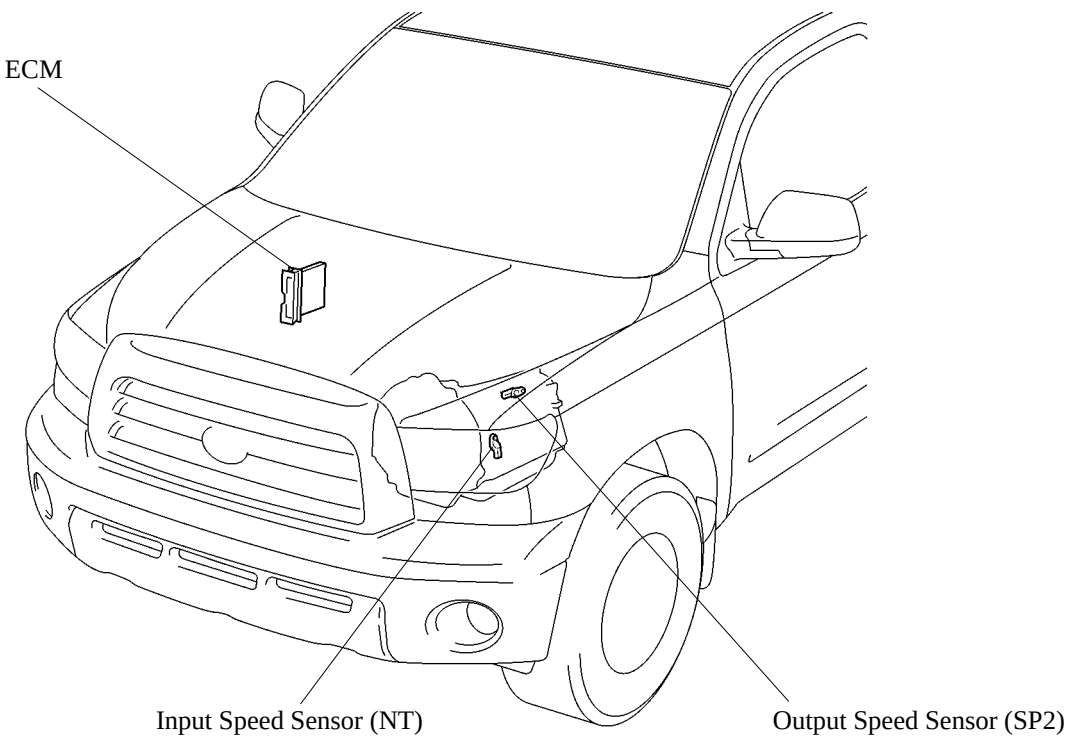
Solenoid Valve SLU

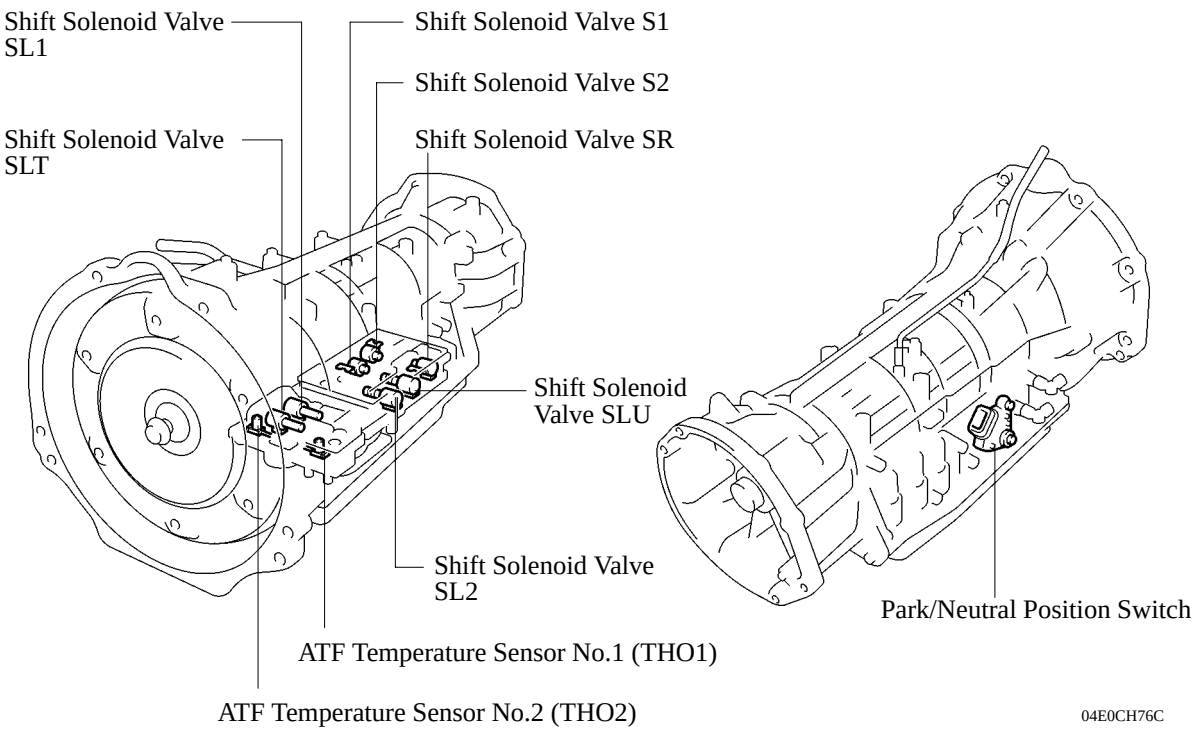
229LC181

- **Function of Solenoid Valve SL1, SL2, SLT and SLU ●**

Solenoid Valve	Function
SL1	• Clutch pressure control • Accumulator back pressure control
SL2	Brake pressure control
SLT	• Line pressure control • Accumulator back pressure control
SLU	Lock-up clutch pressure control

4. Layout of Main Components





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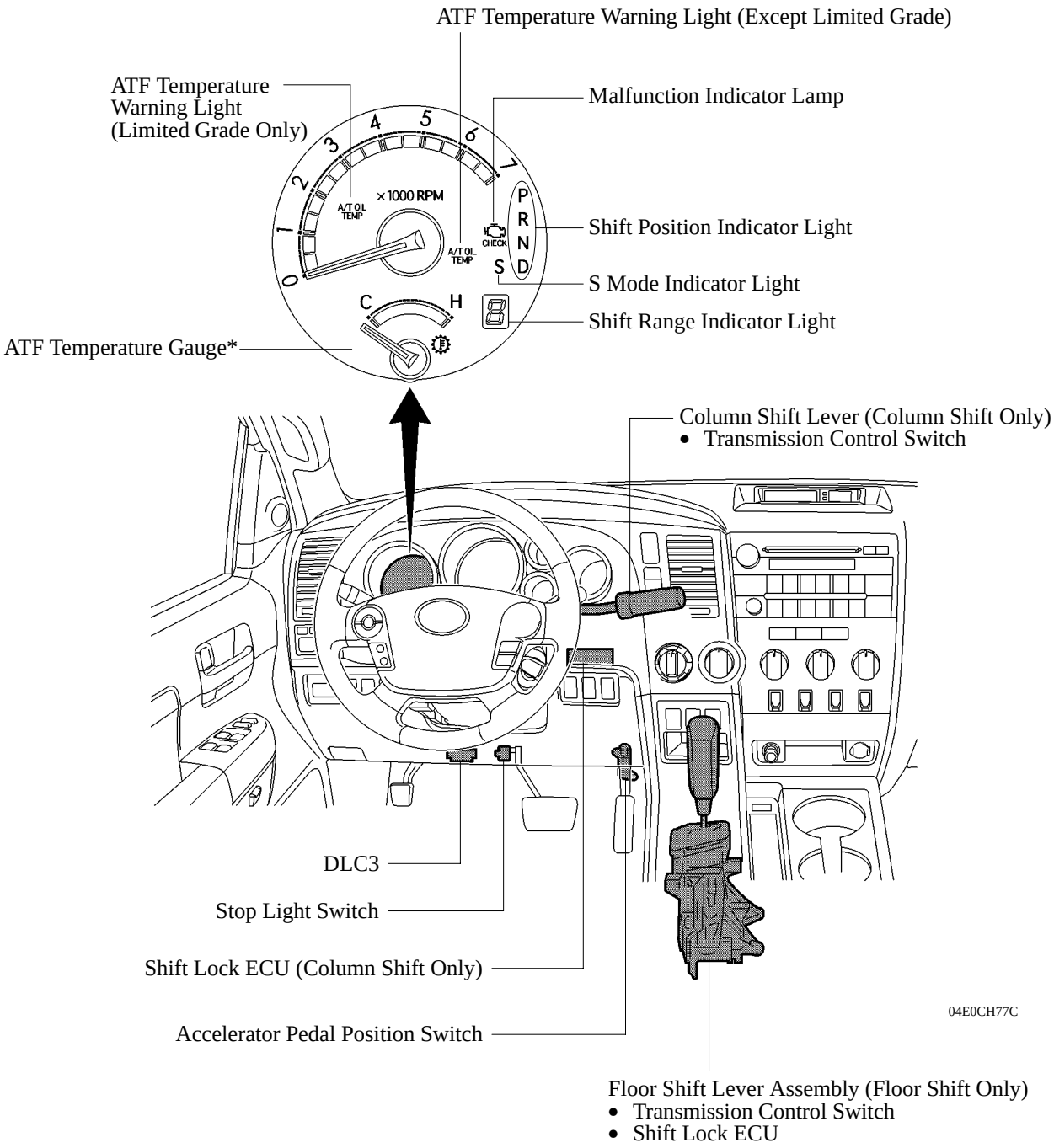


*: The ATF temperature gauge is used on models with 2UZ-FE engines only. For details, see page BE-31.

• ELECTRONIC CONTROL SYSTEM

1. General

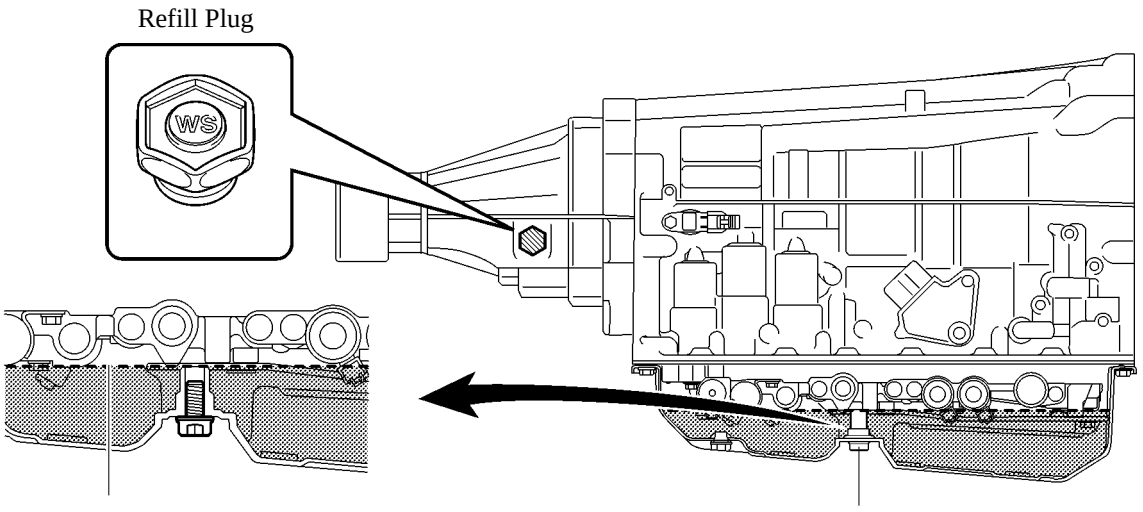
The electronic control system of the A750E and A750F automatic transmissions consists of the control functions listed below.

System	Function
Shift Timing Control	The ECM sends current to solenoid valves S1, S2 and/or SR based on signals from various sensors in order to shift the gears.
Clutch Pressure Control (See Page CH-29)	• Controls the pressure that is applied directly to B_1 brake and C_1 clutch by actuating the linear solenoid valves SL1 and SL2 in accordance with the ECM signals. • The solenoid valve SLT and SL1 minutely controls the clutch pressure in accordance with the engine output and driving conditions.
Line Pressure Optimal Control (See Page CH-30)	Actuates the solenoid valve SLT to control the line pressure in accordance with information from the ECM and the operating conditions of the transmission.
Engine Torque Control	Retards the engine ignition timing temporarily to improve shift feeling while up-shifts or downshifts occur.
Lock-up Timing Control	The ECM sends current to the solenoid valve SLU based on signals from various sensors and engages or disengages the lock-up clutch.
Flex Lock-up Clutch Control (See Page CH-31)	Controls the solenoid valve SLU, provides an intermediate mode for when the lock-up clutch is between ON and OFF, increasing the operating range of the lock-up clutch to improve fuel economy.
“N” to “D” Squat Control	When the shift lever is shifted from “N” to “D” position, 2nd gear is temporarily engaged before 1st to reduce vehicle squat.
AI (Artificial Intelligence) -SHIFT Control (See Page CH-32)	Based on the signals from various sensors, the ECM determines the road conditions and the intention of the driver. Thus, an appropriate shift pattern is automatically determined, thus improving drivability.
Multi-Mode Automatic Transmission (See page CH-34)	The ECM appropriately controls the automatic transmission in accordance with the range position selected while the shift lever is in the S mode position.
Diagnosis (See Page CH-37)	When the ECM detects a malfunction, the ECM records the malfunction and memorizes the information that relates to the fault.
Fail-safe (See Page CH-37)	If a malfunction is detected in the sensors or solenoids, the ECM effects fail-safe control to prevent the vehicle’s drivability from being affected significantly.

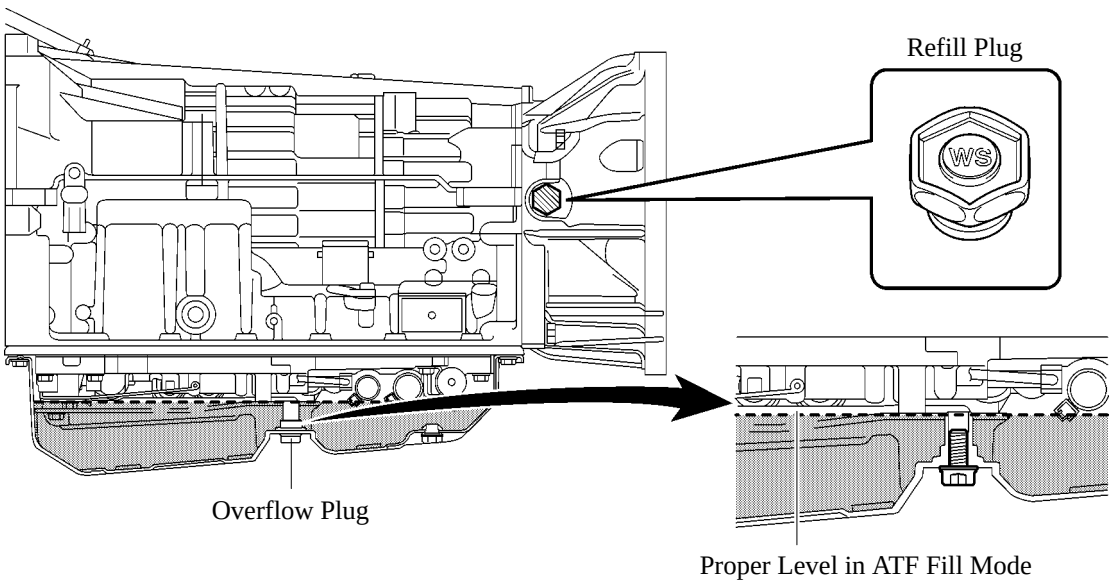
● ATF FILLING PROCEDURE

An ATF filling procedure is used in order to improve the accuracy of the ATF level when the transmission is being repaired or replaced. As a result, the oil filler tube and the oil level gauge used in the conventional automatic transmission have been discontinued, eliminating the need to inspect the fluid level as a part of routine maintenance.

- This filling procedure uses a refill plug, overflow plug, ATF temperature sensor No.2, and shift position indicator light “D”.
- ATF filling procedures are different for models with an ATF cooler and without an ATF cooler.



A750E Automatic Transmission



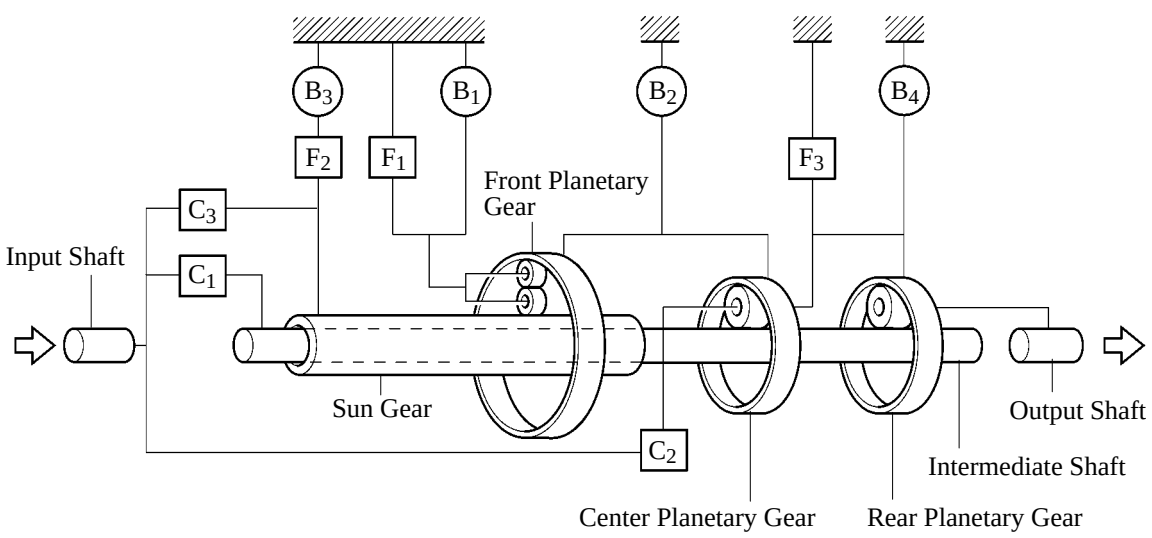
A750F Automatic Transmission

PLANETARY GEAR UNIT

1. Construction

The planetary gear unit consists of three planetary gear units, three clutches, four brakes, and three one-way clutches.

- A front planetary carrier made of aluminum is used to reduce weight.
- A centrifugal fluid pressure canceling mechanism is used in the C_1, C_2, and C_3 clutches that are applied when shifting from 2nd ↔ 3rd, 3rd ↔ 4th, and 4th ↔ 5th. For details, see page CH-16.



04E0CH01C

2. Function of Components

Component		Function
C_1	No.1 Clutch	Connects the input shaft and intermediate shaft.
C_2	No.2 Clutch	Connects the input shaft and center planetary carrier.
C_3	No.3 Clutch	Connects the input shaft and front sun gear.
B_1	No.1 Brake	Prevents the front planetary carrier from turning either clockwise or counterclockwise.
B_2	No.2 Brake	Prevents the front and center ring gear from turning either clockwise or counterclockwise.
B_3	No.3 Brake	Prevents the outer race of F_2 from turning either clockwise or counterclockwise.
B_4	No.4 Brake	Prevents the center planetary carrier and rear ring gear from turning either clockwise or counterclockwise.
F_1	No.1 One-way Clutch	Prevents the front planetary carrier from turning counterclockwise.
F_2	No.2 One-way Clutch	When B_3 is operating, this one-way clutch prevents the front planetary sun gear from turning counterclockwise.
F_3	No.3 One-way Clutch	Prevents the center planetary carrier and rear ring gear from turning counterclockwise.
Planetary Gears		These gears change the route through which driving force is transmitted, in accordance with the operation of each clutch and brake, in order to increase or reduce the input and output speed.

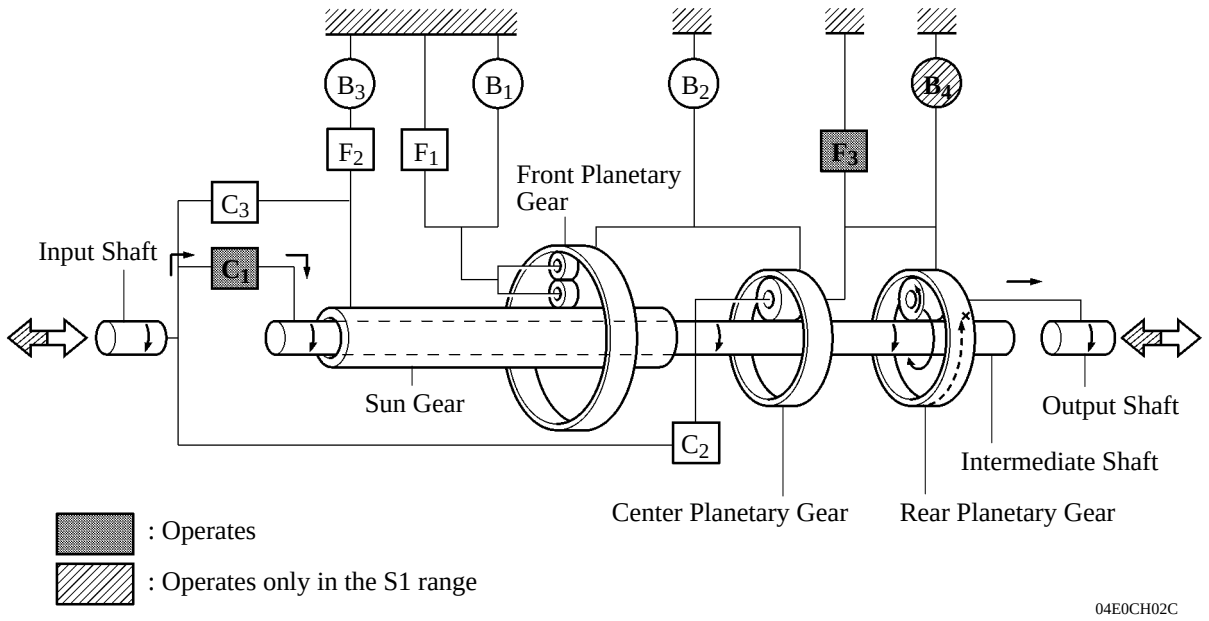
3. Transmission Power Flow

General

Shift Lever Position		Solenoid Valve						Clutch			Brake				One-way Clutch		
		S1	S2	SR	SL1	SL2	SLU	C_1	C_2	C_3	B_1	B_2	B_3	B_4	F_1	F_2	F_3
P		ON				ON											
R*		ON				ON				○	(○)			○	○		
N		ON				ON											
D, S5	1st	ON				ON		○									○
	2nd	ON	ON			ON		○					○		○	○	
	3rd		ON			ON		○		○			●		○		
	4th*					ON		○	○	●			●				
	5th*			ON	ON		ON		○	○	○		●				
S4	1st	ON				ON		○									○
	2nd	ON	ON			ON		○					○		○	○	
	3rd		ON			ON		○		○			●		○		
	4th*					ON	ON	○	○	●			●				
S3	1st	ON				ON		○									○
	2nd	ON	ON			ON		○					○		○	○	
	3rd*		ON					○		○	(○)		●		○		
S2	1st	ON				ON		○									○
	2nd*	ON	ON	ON				○				(○)	○		○	○	
S1	1st*	ON						○						(○)			○

○: Operates
●: Operates but is not related to power transmission
(○): Operates during engine braking *: Engine Braking occurs

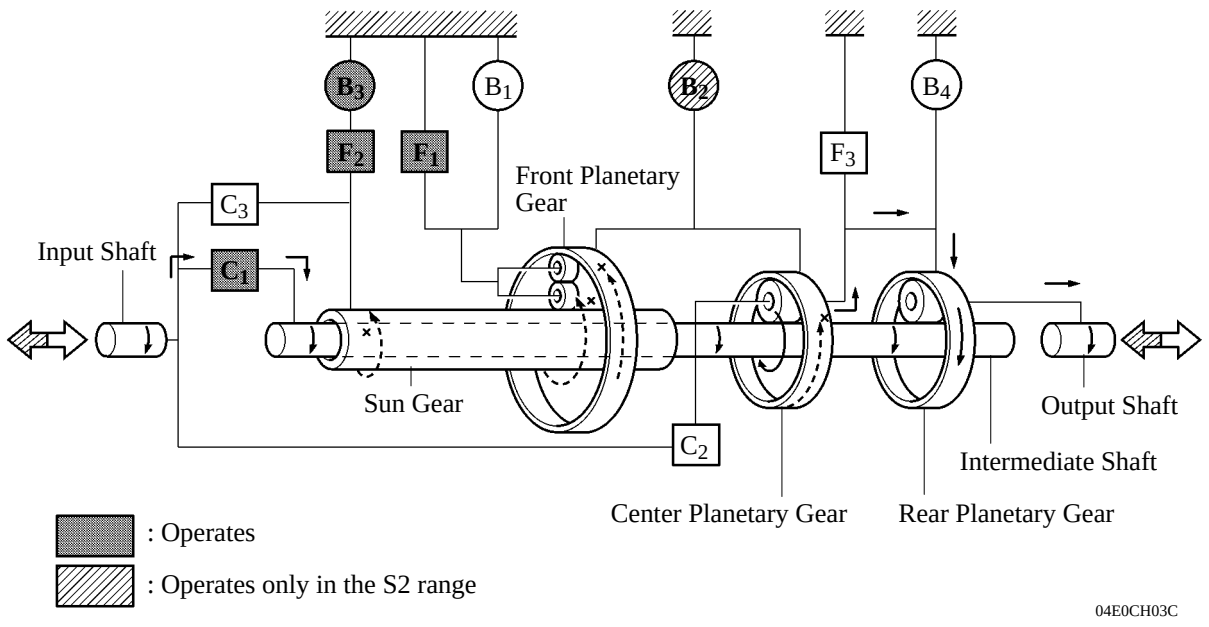
1st Gear (D Position or S Mode)



C_1	C_2	C_3	B_1	B_2	B_3	B_4	F_1	F_2	F_3
○						(○)			○

○: Operates (○): Operates only in the S1 range

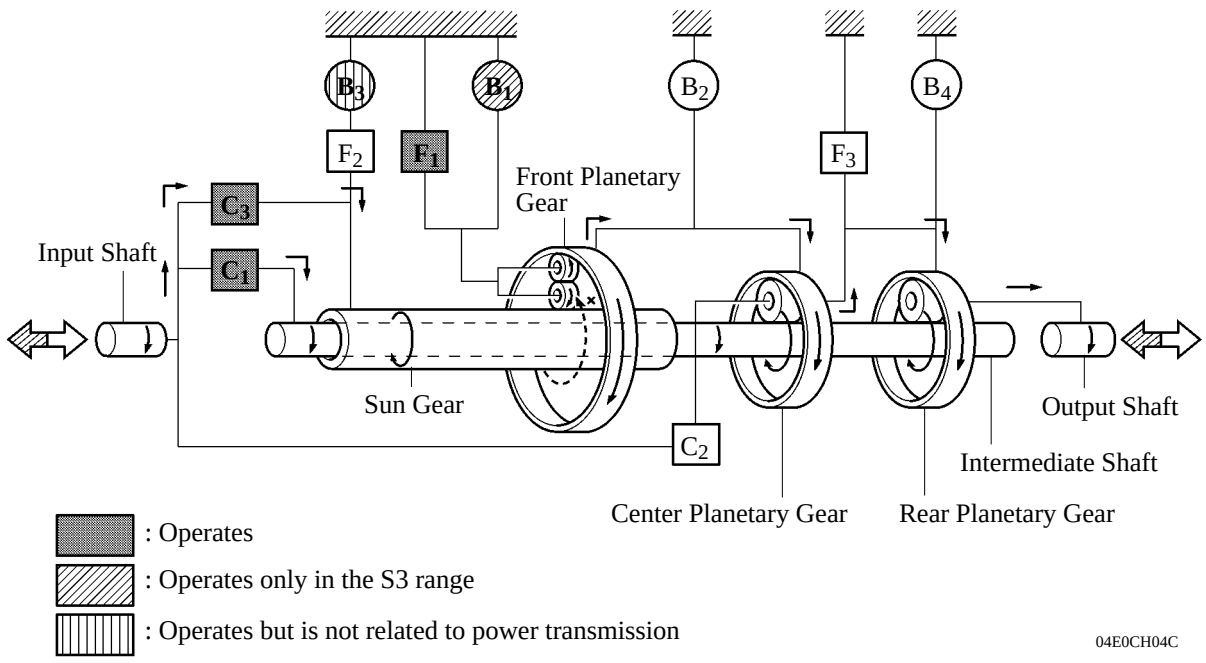
2nd Gear (D Position or S Mode)



C_1	C_2	C_3	B_1	B_2	B_3	B_4	F_1	F_2	F_3
○				(○)	○		○	○	

○: Operates (○): Operates only in the S2 range

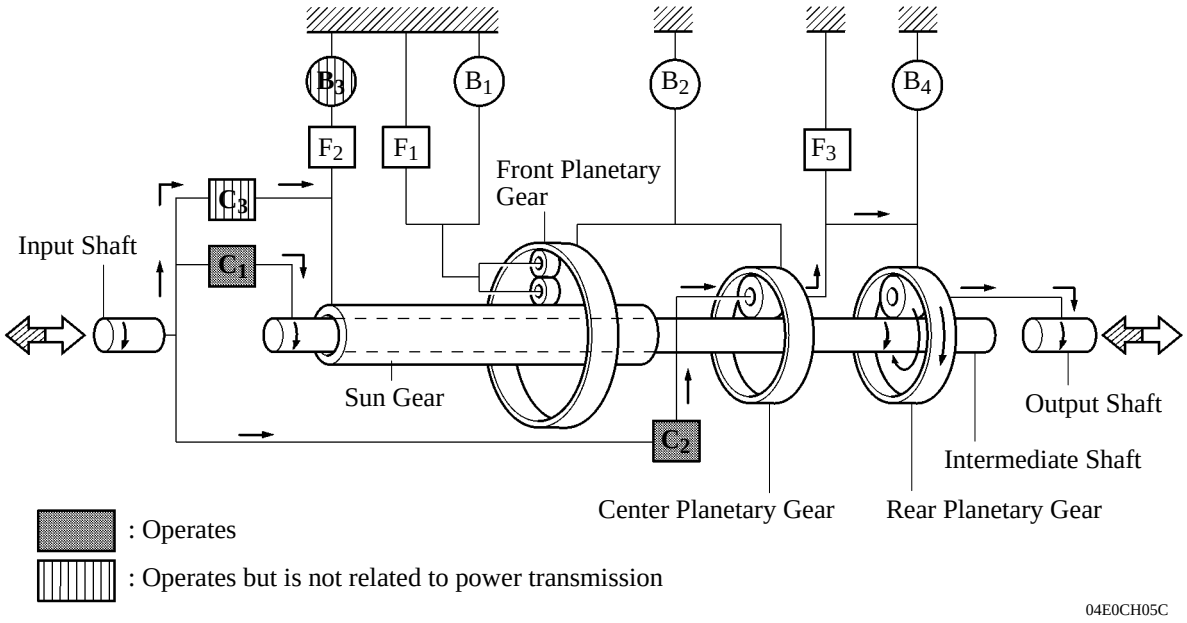
3rd Gear (D Position or S Mode)



C_1	C_2	C_3	B_1	B_2	B_3	B_4	F_1	F_2	F_3
○		○	(○)		●		○		

○: Operates (○): Operates only in the S3 range
●: Operates but is not related to power transmission

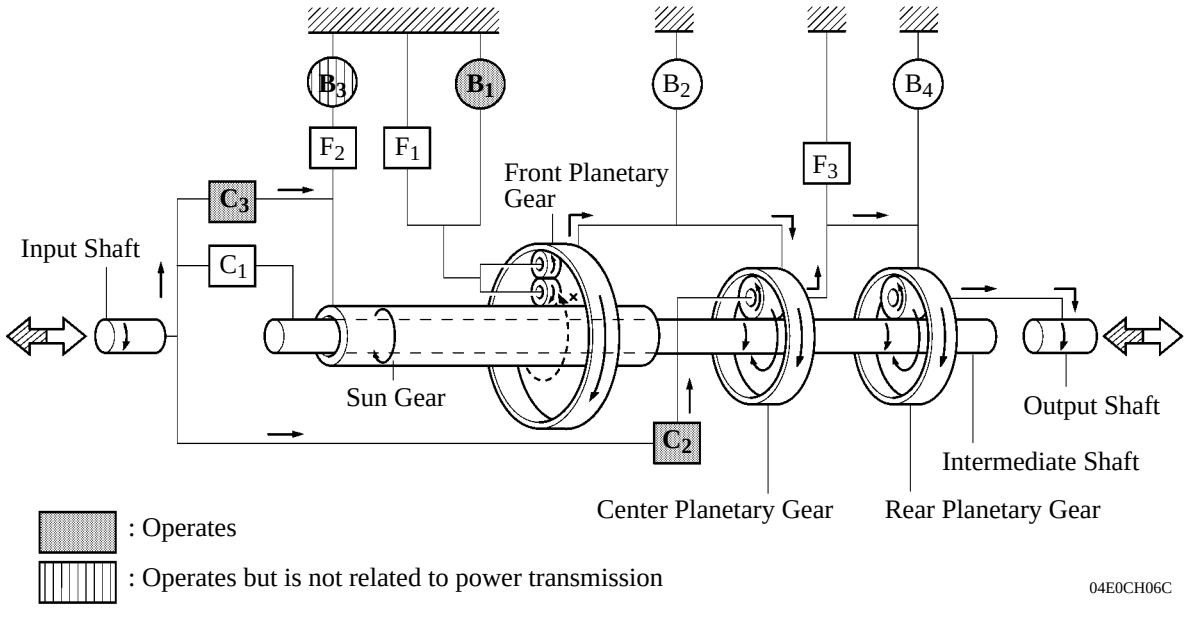
4th Gear (D Position or S mode)



C_1	C_2	C_3	B_1	B_2	B_3	B_4	F_1	F_2	F_3
○	○	●			●				

○: Operates ●: Operates but is not related to power transmission

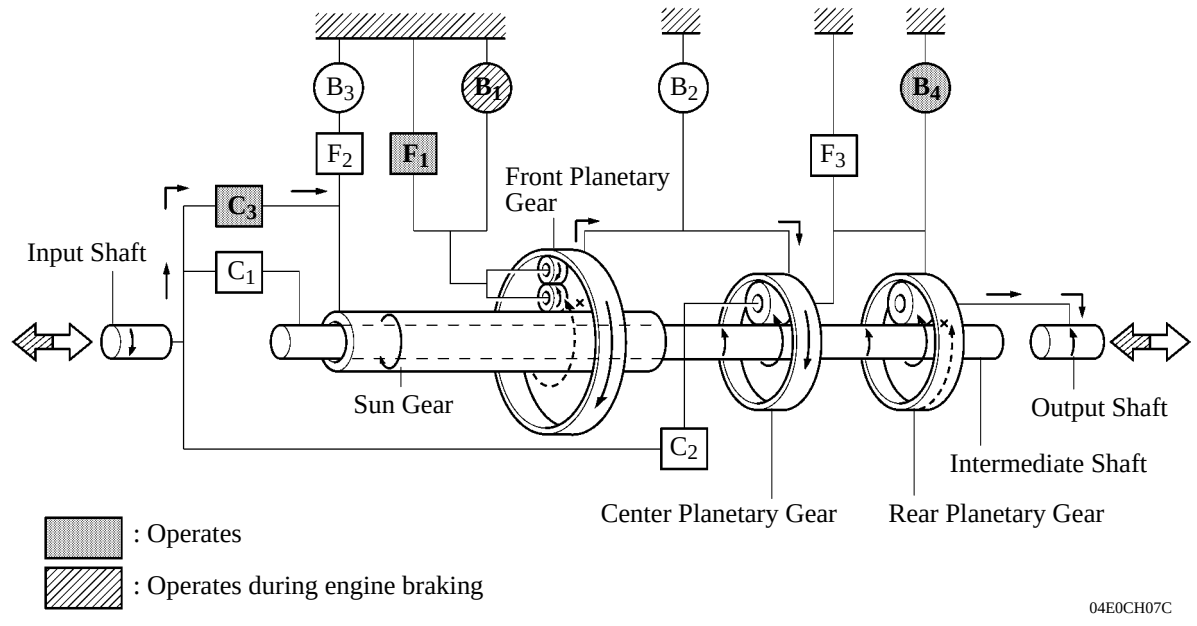
5th Gear (D Position or S Mode)



C_1	C_2	C_3	B_1	B_2	B_3	B_4	F_1	F_2	F_3
	○	○	○		●				

○: Operates ●: Operates but is not related to power transmission

Reverse Gear (R Position)



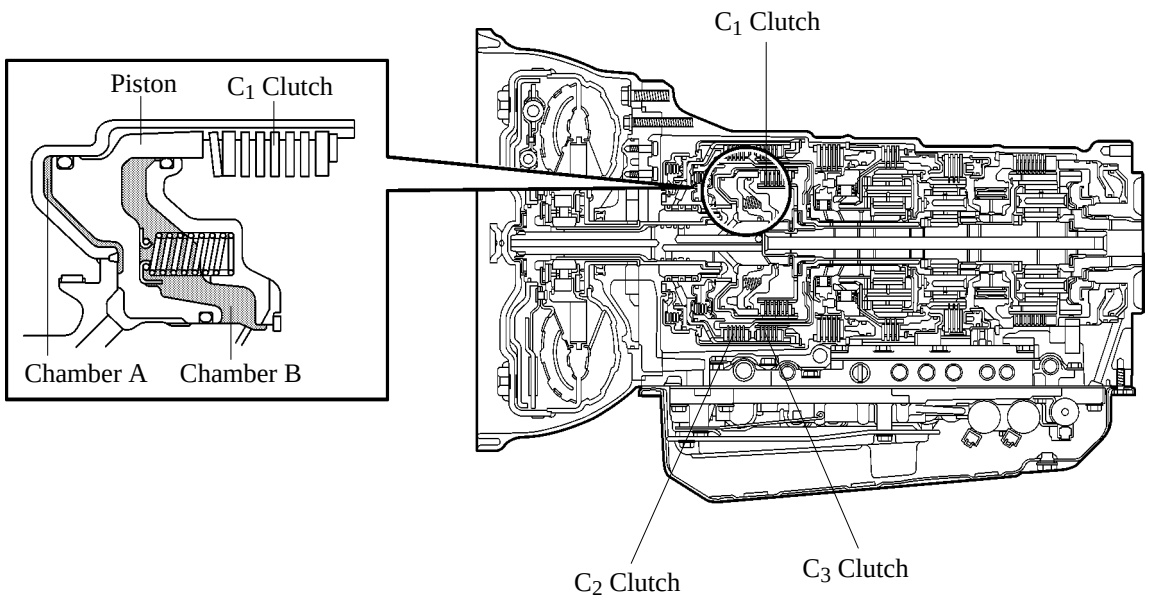
C_1	C_2	C_3	B_1	B_2	B_3	B_4	F_1	F_2	F_3
		○	(○)			○	○		

○: Operates (○): Operates during engine braking

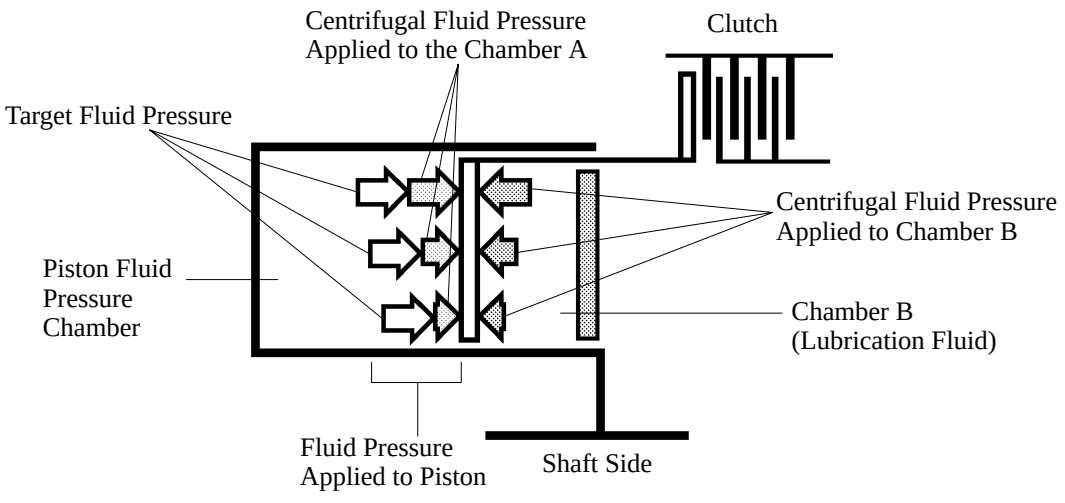
4. Centrifugal Fluid Pressure Canceling Mechanism

For the following reason, the centrifugal fluid pressure canceling mechanism is used on the C_1, C_2, and C_3 clutches.

- Clutch shifting operation is affected not only by the valve body controlling fluid pressure but also by centrifugal fluid pressure that is present due to fluid in the clutch piston oil pressure chamber. The centrifugal fluid pressure canceling mechanism has chamber B to reduce this affect applied to the chamber A. As a result, smooth shifting with excellent response has been achieved.



04E0CH127C



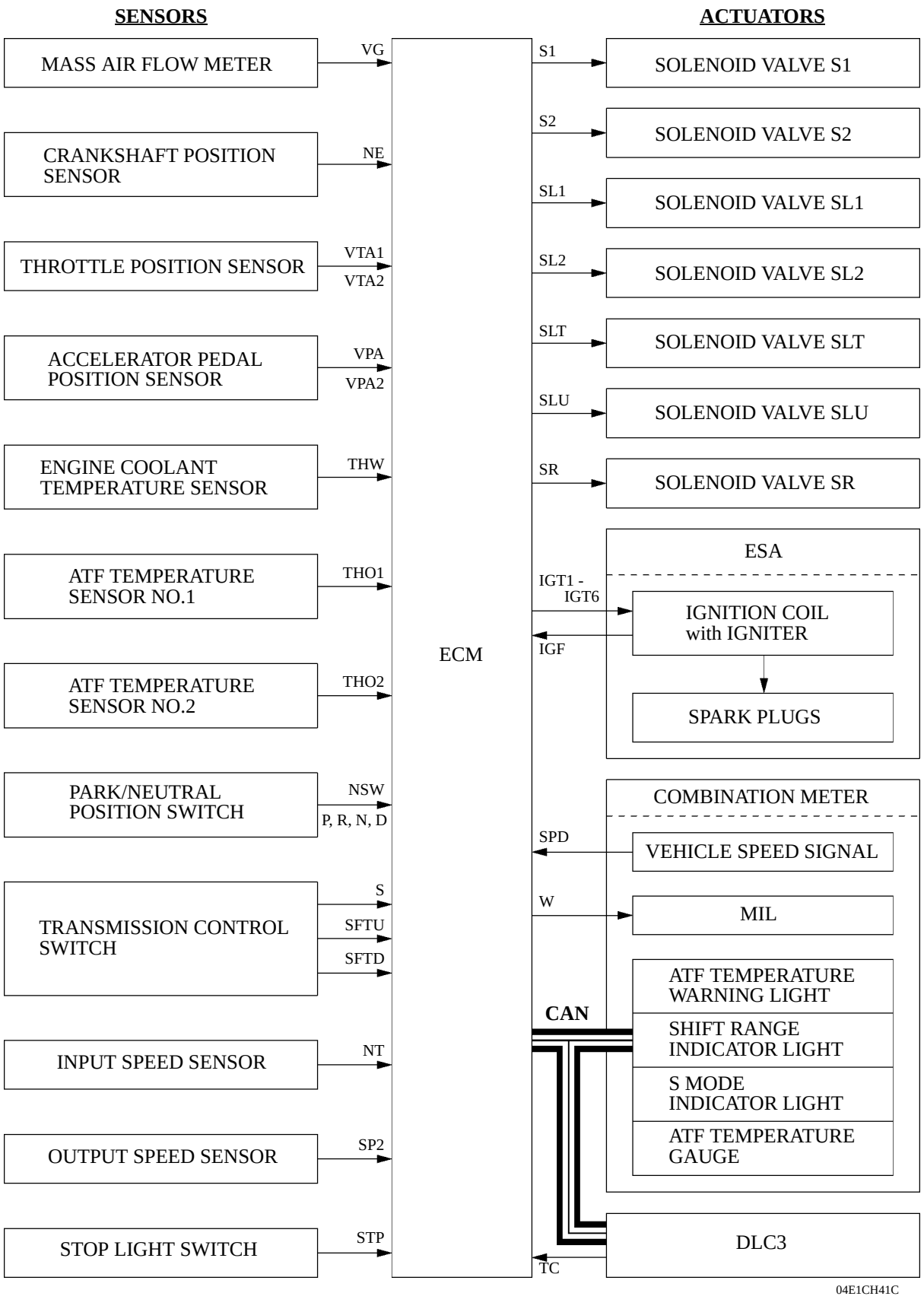
157CH17

Fluid pressure applied to piston	—	Centrifugal fluid pressure applied to chamber B	=	Target fluid pressure (original clutch pressure)

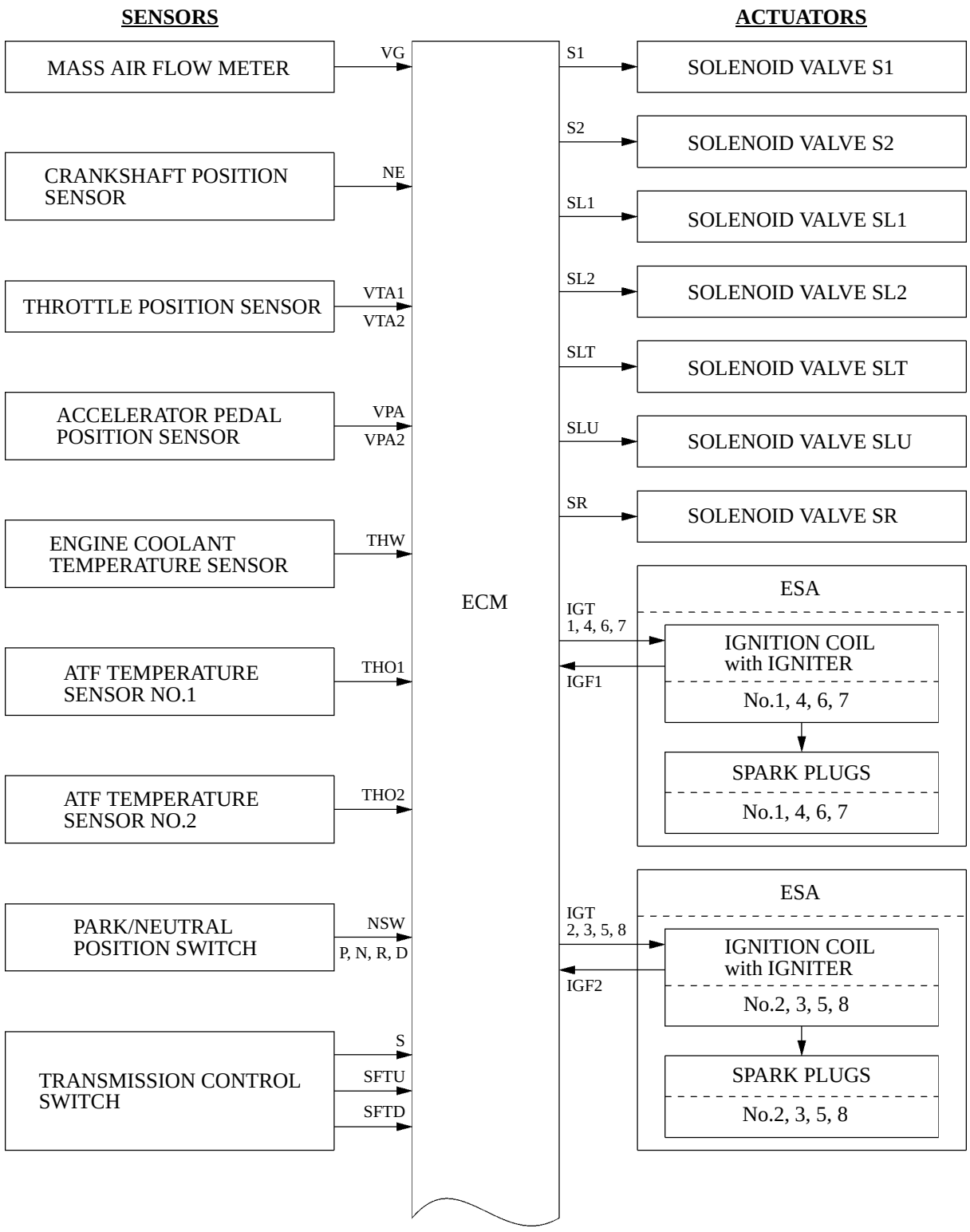
2. Construction

The configurations of the electronic control system for the A750E and A750F automatic transmissions are as shown in the following charts.

- **1GR-FE × A750E ●**



- **2UZ-FE × A750E, A750F ●**



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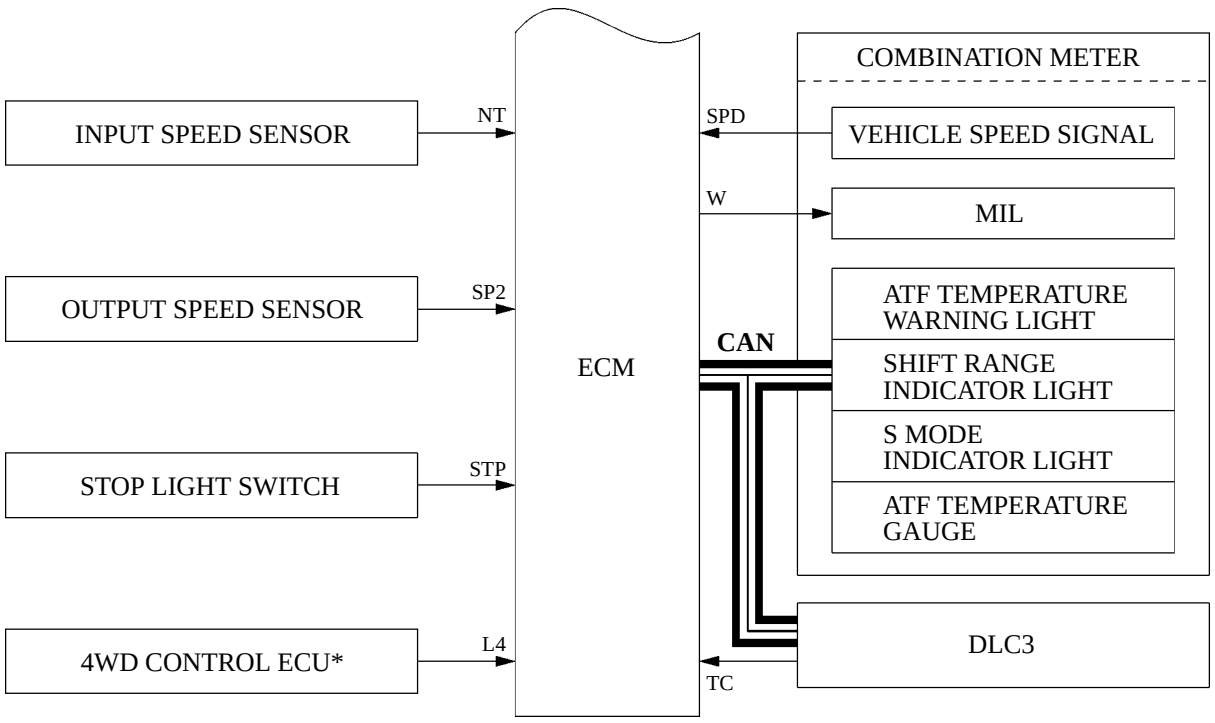


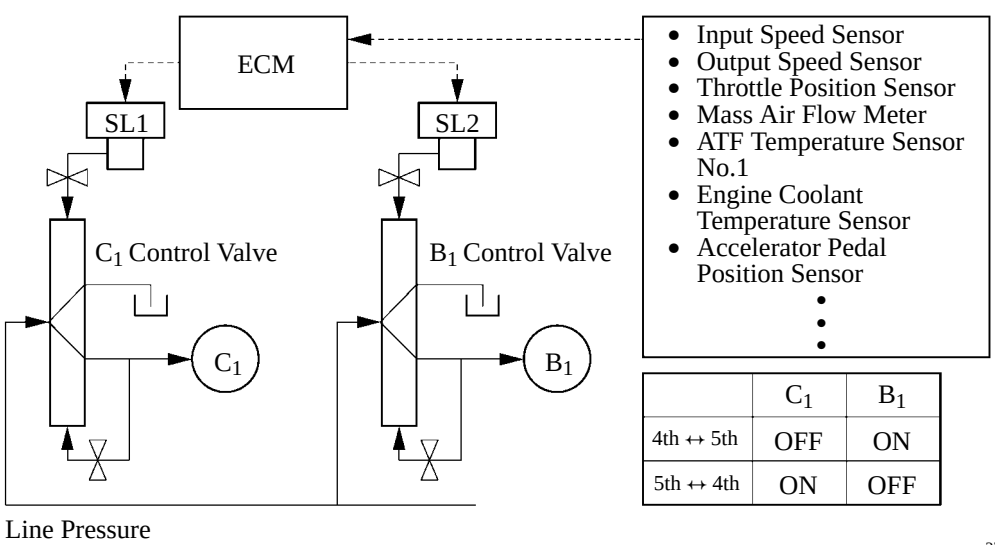
04E1CH43C

*: Only for 4WD Models

3. Clutch Pressure Control

Clutch to Clutch Pressure Control

This control is used for shifting from 4th to 5th gear and from 5th to 4th gear.
The ECM actuates solenoid valves SL1 and SL2 in accordance with various signals. The output from these solenoid valves acts directly on control valves B_1 and C_1 in order to regulate the line pressure that acts on the B_1 brake and C_1 clutch.
As a result, high response and excellent shift characteristics have been realized.

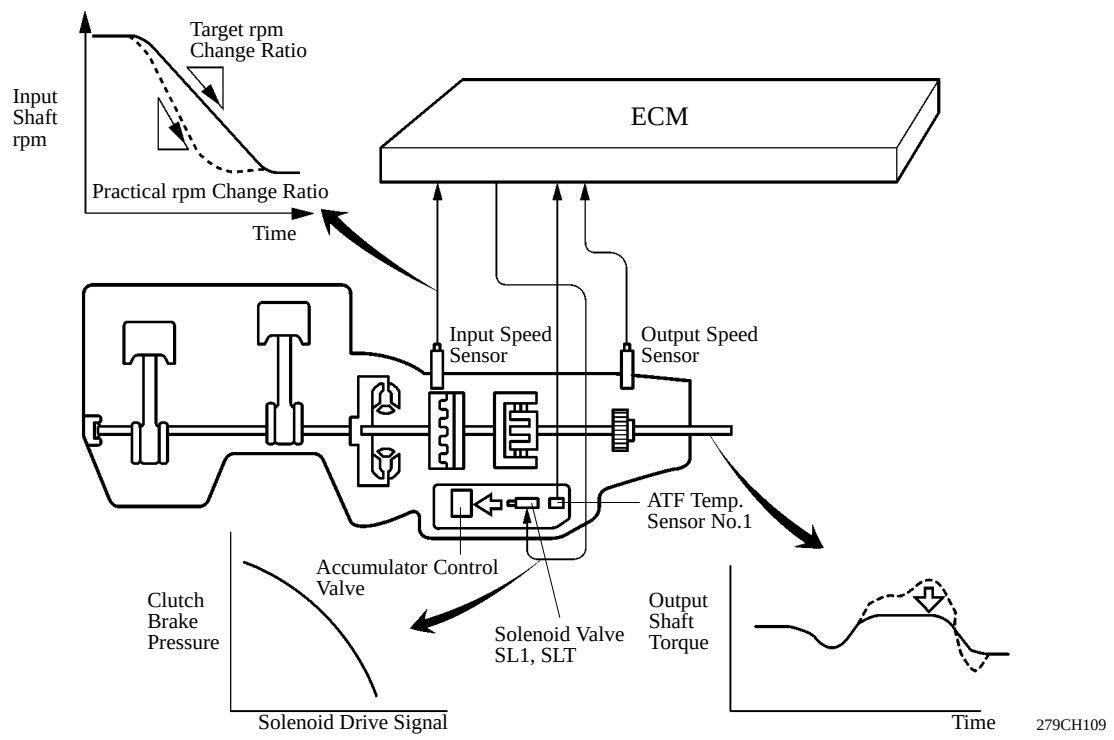


	C_1	B_1
4th ↔ 5th	OFF	ON
5th ↔ 4th	ON	OFF

232CH141

Clutch Pressure Optimal Control

The ECM monitors the signals from various types of sensors, such as the input speed sensor, allowing shift solenoid valves SLT and SL1 to minutely control the clutch pressure in accordance with engine output and driving conditions. As a result, smooth shift characteristics are realized.

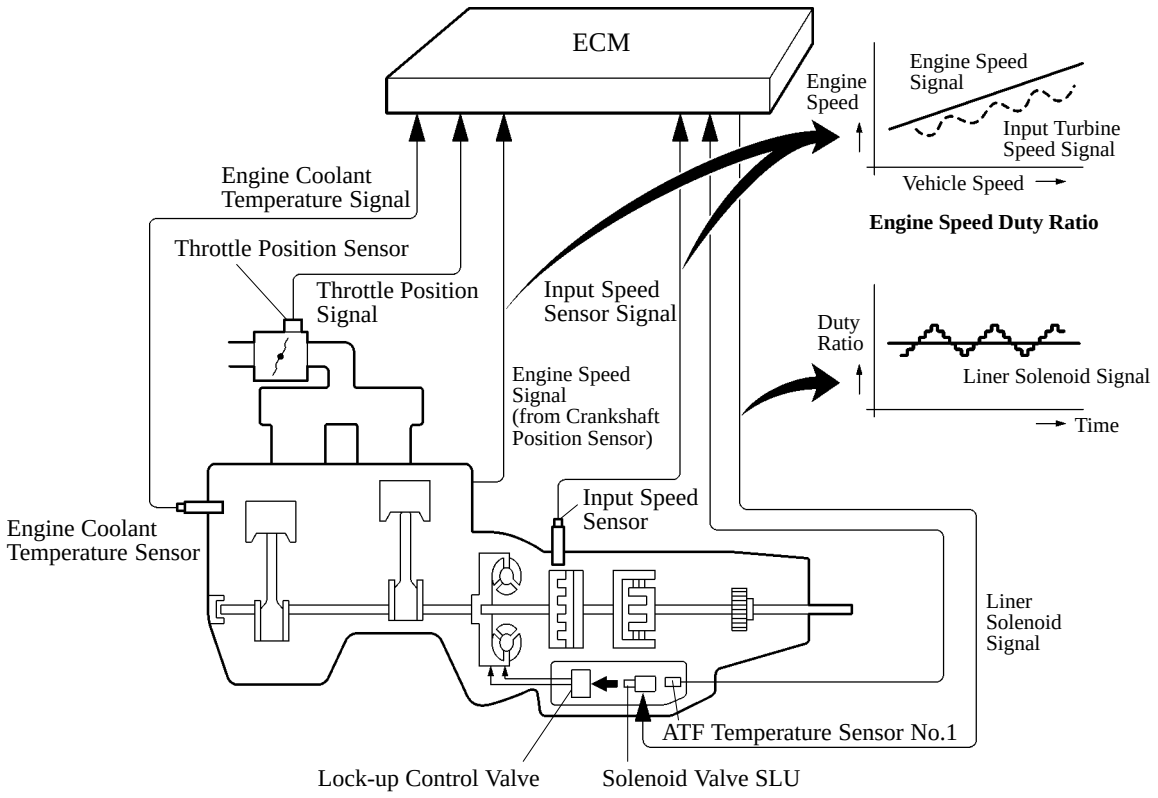


279CH109

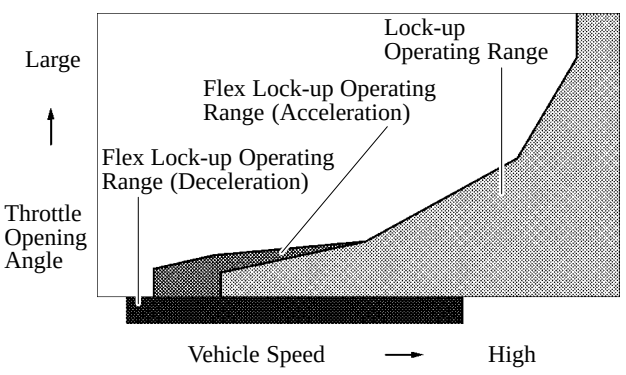
4. Flex Lock-up Clutch Control

In the low-to-mid-speed range, this flex lock-up clutch control regulates the solenoid valve SLU to provide an intermediate mode between the ON/OFF operation of the lock-up clutch in order to improve the energy transmitting efficiency in this range.
As a result, the operating range of the lock-up clutch has been increased and fuel economy has been improved. The flex lock-up clutch control operates in the 3rd, 4th and 5th gears in the D position and S5 range, 4th gears in the S4 range.

Even when the vehicle is decelerating (the accelerator pedal is released), the flex lock-up clutch control operates. Therefore, fuel-cut area of the engine has been expanded and fuel-economy has been improved.



04E0CH122C



0140CH141C

- **Flex Lock-up Operation Gears in Each Range ●**

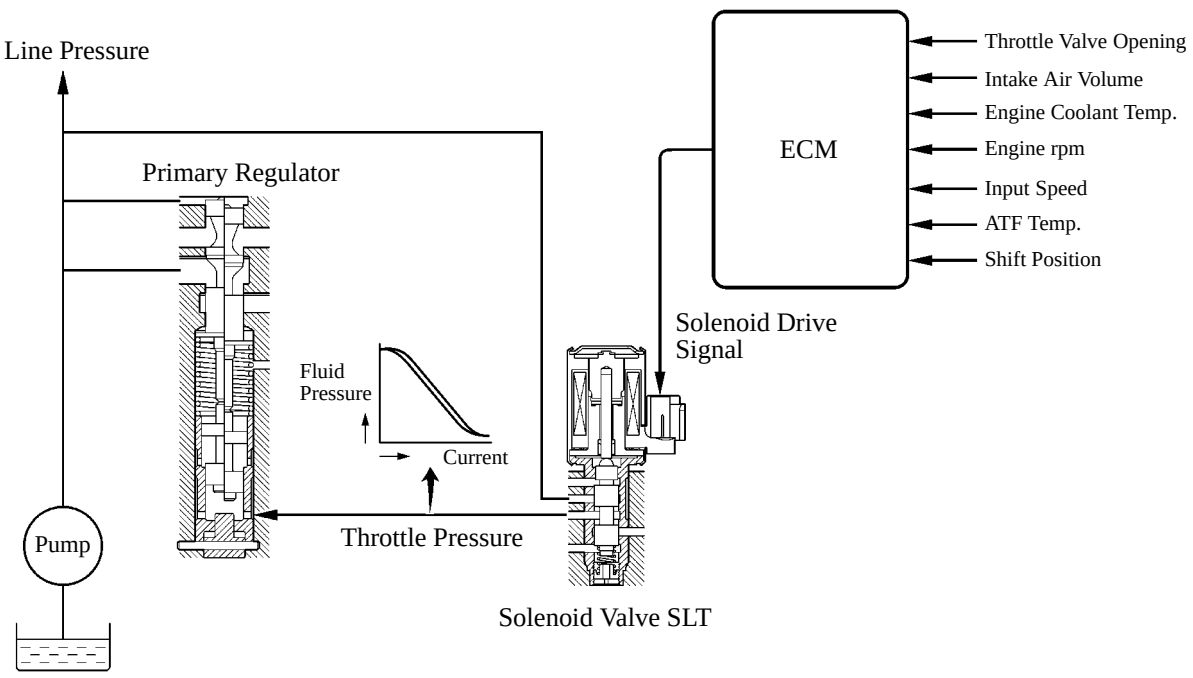
Range	Gear	Acceleration Flex Lock-up	Deceleration Flex Lock-up
D, S5	1st	×	×
	2nd	×	×
	3rd	○	×
	4th	○	○
	5th	○	○
S4	1st	×	×
	2nd	×	×
	3rd	×	×
	4th	×	○

× = Off ○ = Operates

5. Line Pressure Optimal Control

Through the use of the solenoid valve SLT, the line pressure is optimally controlled in accordance with the engine torque information, as well as with the internal operating conditions of the torque converter and the transmission.

Accordingly, the line pressure can be controlled minutely in accordance with the engine output, traveling condition, and ATF temperature, thus realizing smooth shift characteristics and optimizing the workload of the oil pump (reducing unnecessary parasitic losses).



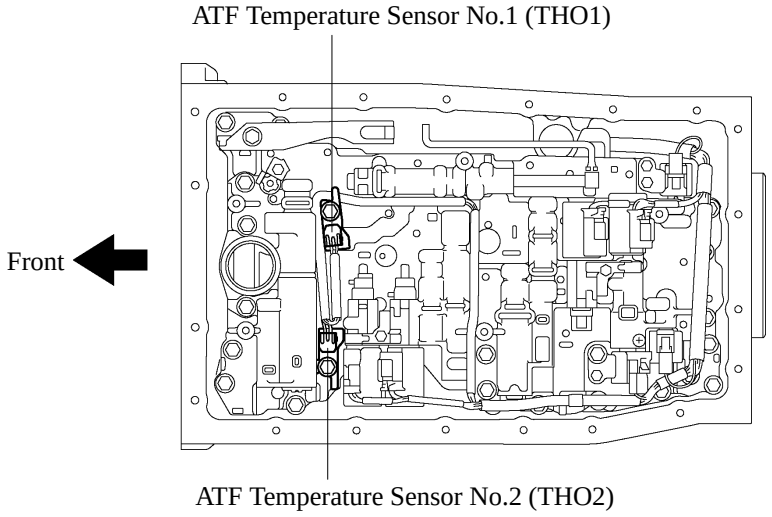
279CH110

6. Construction and Operation of Main Components

ATF Temperature Sensor No.1 and No.2

ATF temperature sensor No.1 (THO1) is used for hydraulic pressure control. This sensor is used for revision of the pressure that is used to apply clutches and brakes in the transmission. This helps to ensure smooth shift quality.

ATF temperature sensor No.2 (THO2) is used as a basis for modifying the ECT shift timing control when the ATF temperature is high. It is also used for the ATF temperature warning light.



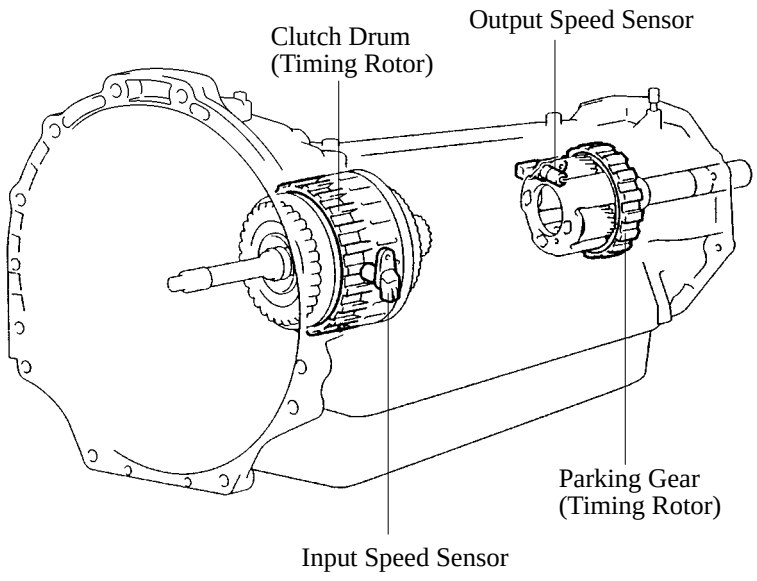
Input Speed Sensor and Output Speed Sensor

The A750E and A750F automatic transmissions use an input speed sensor (for NT signal) and output speed sensor (for SP2 signal). Thus, the ECM can detect the timing of the shifting of the gears and appropriately control the engine torque and hydraulic pressure in response to various conditions.

These speed sensors are the pick-up coil type.

The input speed sensor detects the input speed of the transmission. The clutch drum is used as the timing rotor for this sensor.

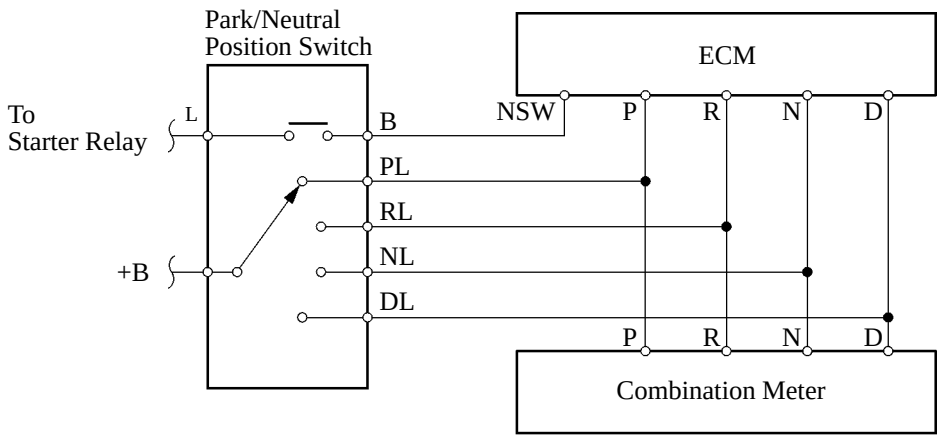
The output speed sensor detects the speed of the output shaft. The parking gear on the rear planetary gear is used as the timing rotor for this sensor.



Park/Neutral Position Switch

The park/neutral position switch sends the P, R, N, D and NSW position signals to the ECM. It also sends signals for the shift position indicator light (P, R, N, and D).

- **Wiring Diagram ●**



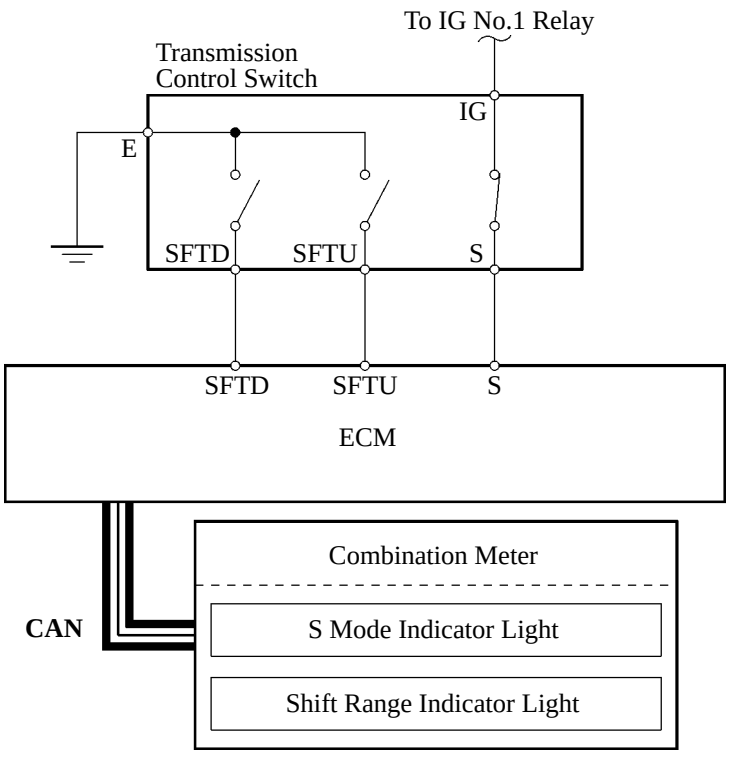
04E0CH40C

Transmission Control Switch

The transmission control switch is installed inside the shift lever assembly to detect the shift lever position and to inform the ECM. The ECM turns on the shift position indicator light and S mode indicator light.

The transmission control switch detects whether the shift lever is in the D position or in the S mode position, and detects the operating conditions of the shift lever (“+” position or “-” position) if the S mode is selected, and sends signals to the ECM. At this time, the ECM turns on the shift range indicator light for the selected range.

- **Wiring Diagram ●**



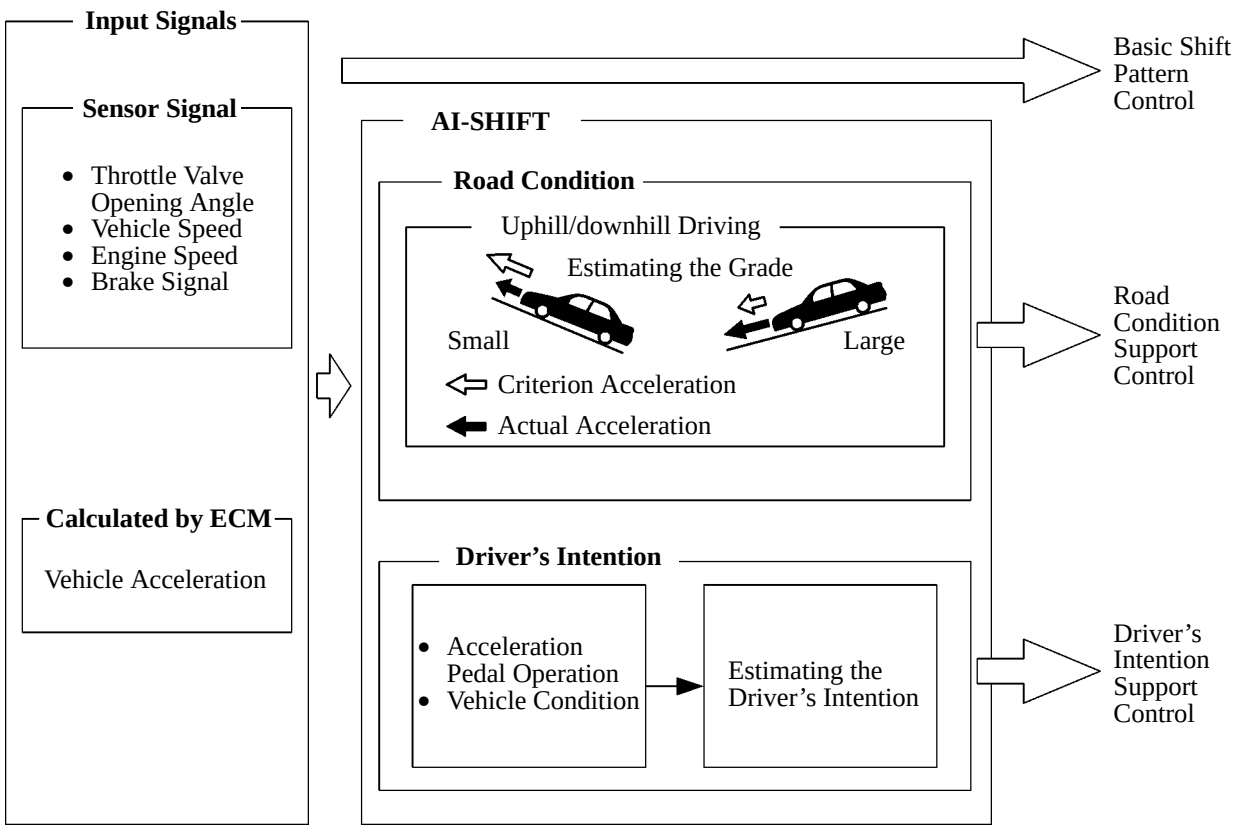
04E0CH41C

4. AI (Artificial Intelligence) - SHIFT Control

General

The AI-SHIFT control includes a road condition support control and a driver's intention support control. The AI-SHIFT control determines optimal transmission control based on input signals and automatically changes the shift pattern. As a result, a high caliber of transmission operation is achieved.

- AI-SHIFT control is effect only with the shift lever in the D position, based on the accelerator and brake operation data. AI-SHIFT control will be canceled when the driver selects the S mode.

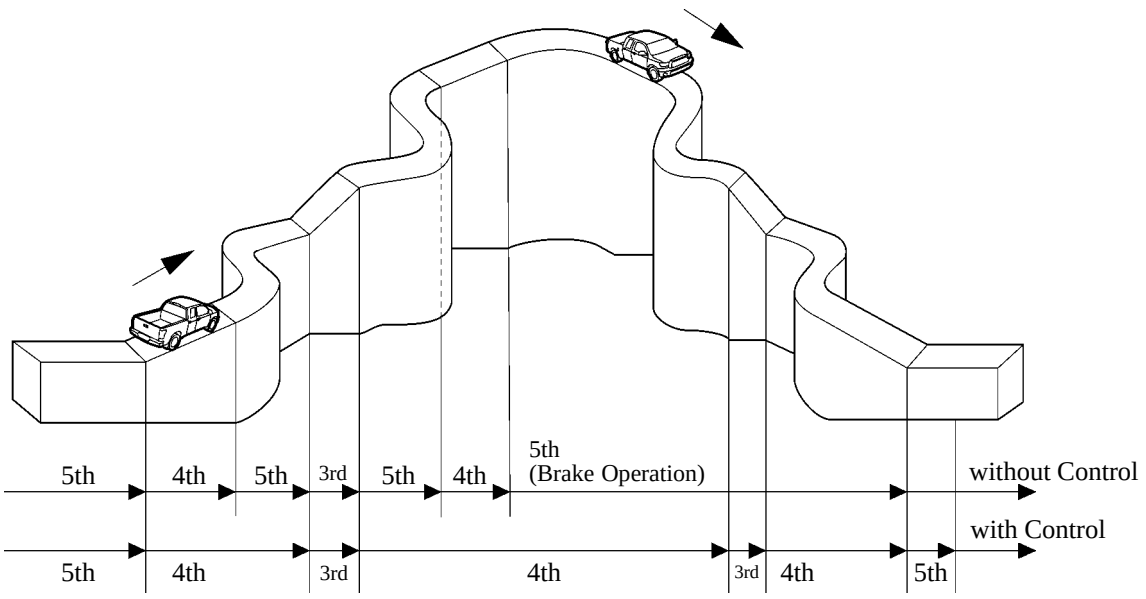


0240CH06C

Road Condition Support Control

Under road condition support control, the ECM identifies throttle valve opening angle and the vehicle speed to determine whether the vehicle is being driven uphill or downhill.

- To achieve an optimal drive force while driving uphill, this control prevents the transmission from up-shifting to 4th or 5th gear.
- To achieve an optimal engine braking effect while driving downhill, this control automatically downshifts the transmission to 4th or 3rd gear.



04E1CH31C

Driver’s Intention Support Control

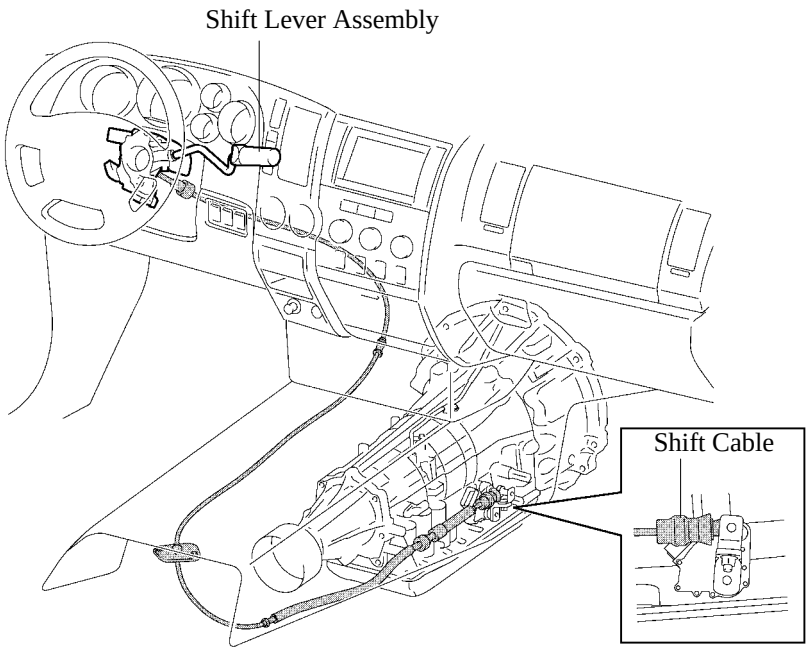
This control estimates the driver’s intention based on the accelerator operation and vehicle condition and selects a shift pattern that is well-suited to each driver.

●SHIFT CONTROL MECHANISM

1. General

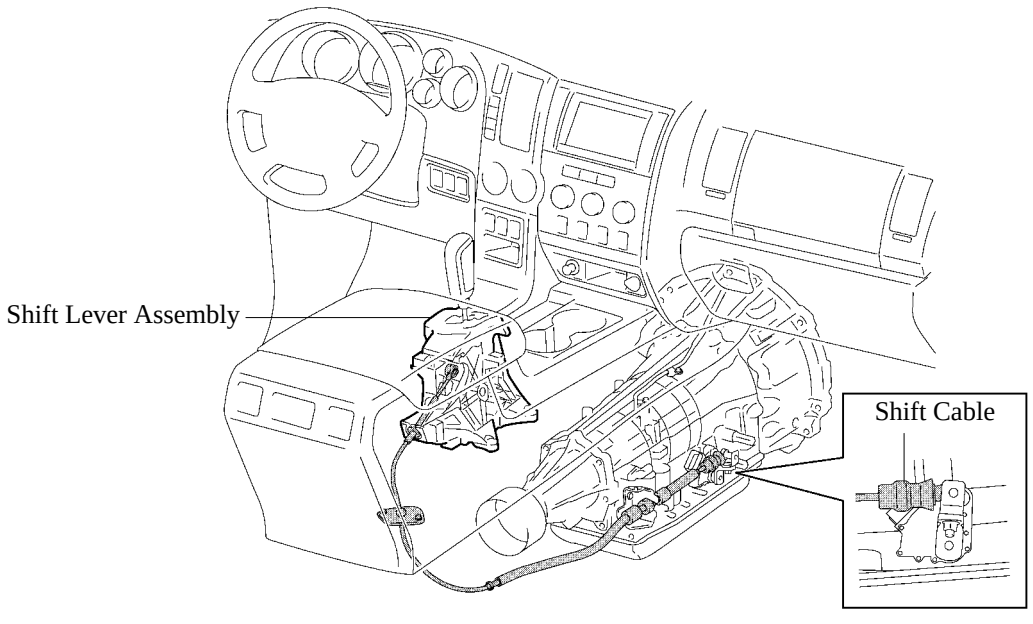
The shift control mechanism consists of the shift cable, the shift lever assembly, and the shift lock system.

- The shift cable with a length adjustment mechanism is used.



Column Shift

04E0CH89C

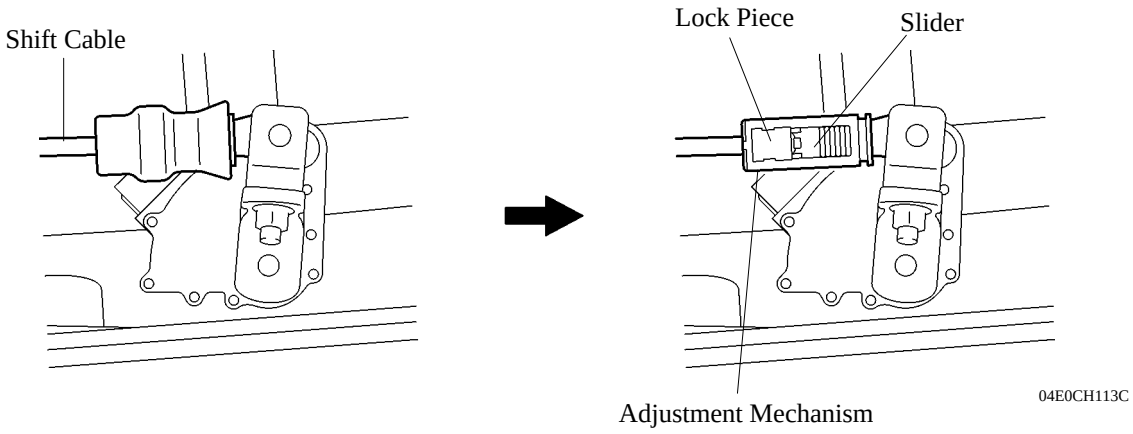


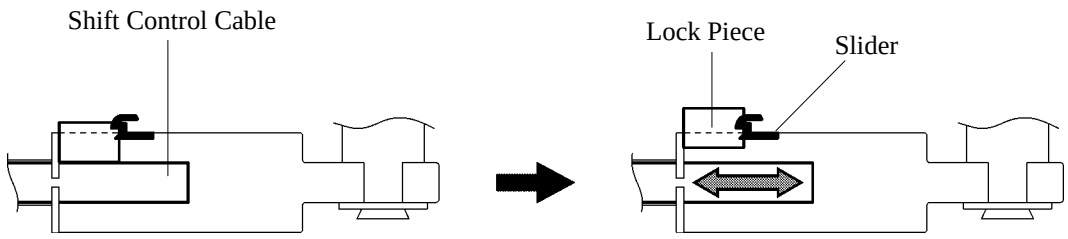
Floor Shift

04E0CH108C

Service Tip

The shift cable is secured by the lock piece of the adjustment mechanism. Adjustment of the shift cable is possible by releasing the lock piece from the cable. For details, see the 2007 TOYOTA TUNDRA Repair Manual (Pub. No. RM04E2U).





Adjustment Mechanism Cross Section

04E1CH44C

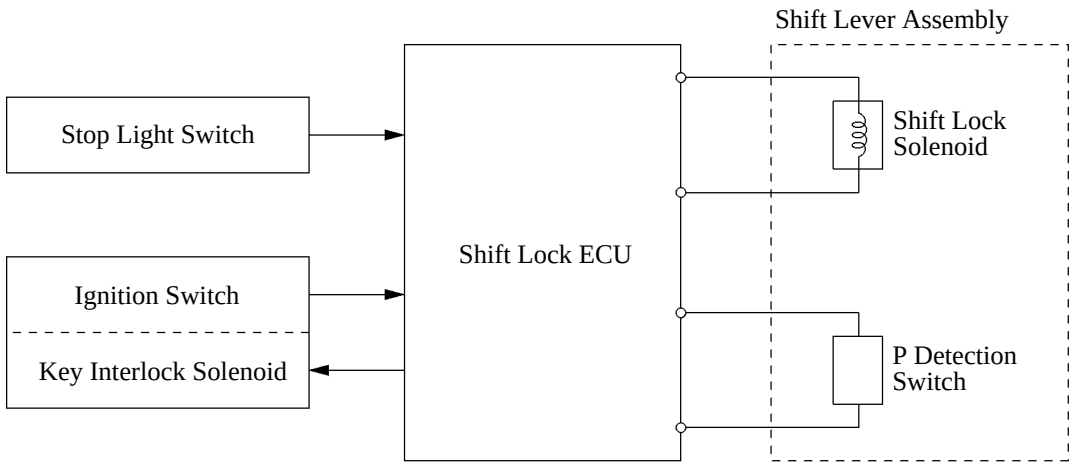
2. Shift Lock System

General

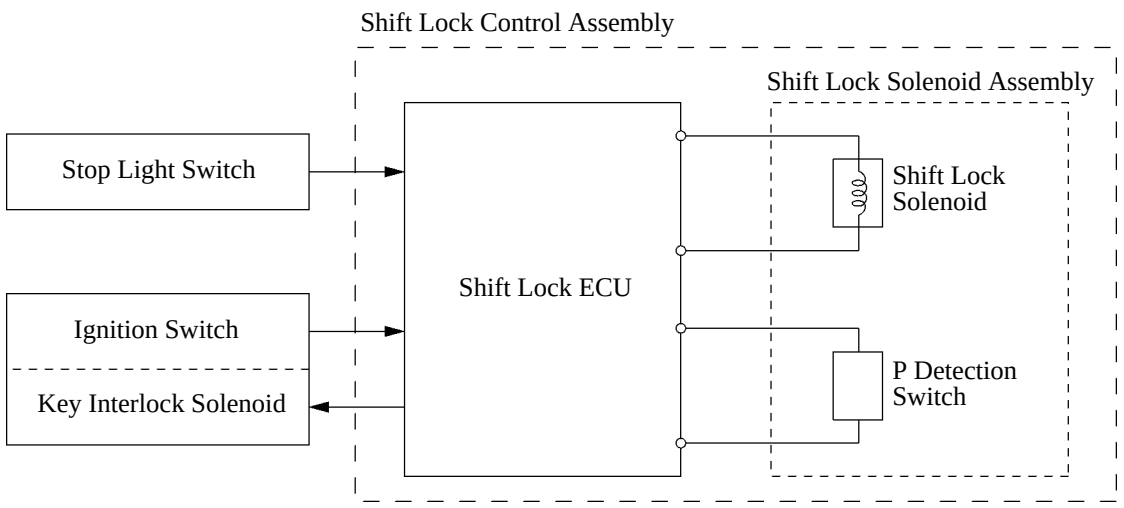
The shift lock system is controlled by the Shift Lock ECU and it has a key interlock function and shift lock function.

- The key interlock function prevents the key from being pulled out after the ignition switch is turned OFF, unless the shift lever is moved to the P position. Thus, parking of the vehicle in the P position is encouraged.
- The shift lock function prevents the shift lever from being shifted from P position, unless the ignition switch is ON and the brake pedal is pressed.
- The Shift Lock ECU turns the key interlock solenoid and the shift lock solenoid on in order to release the key interlock and shift lock.
- A concealed shift lock override button is allows a manual override of the shift lock system if this is necessary.

System Diagram



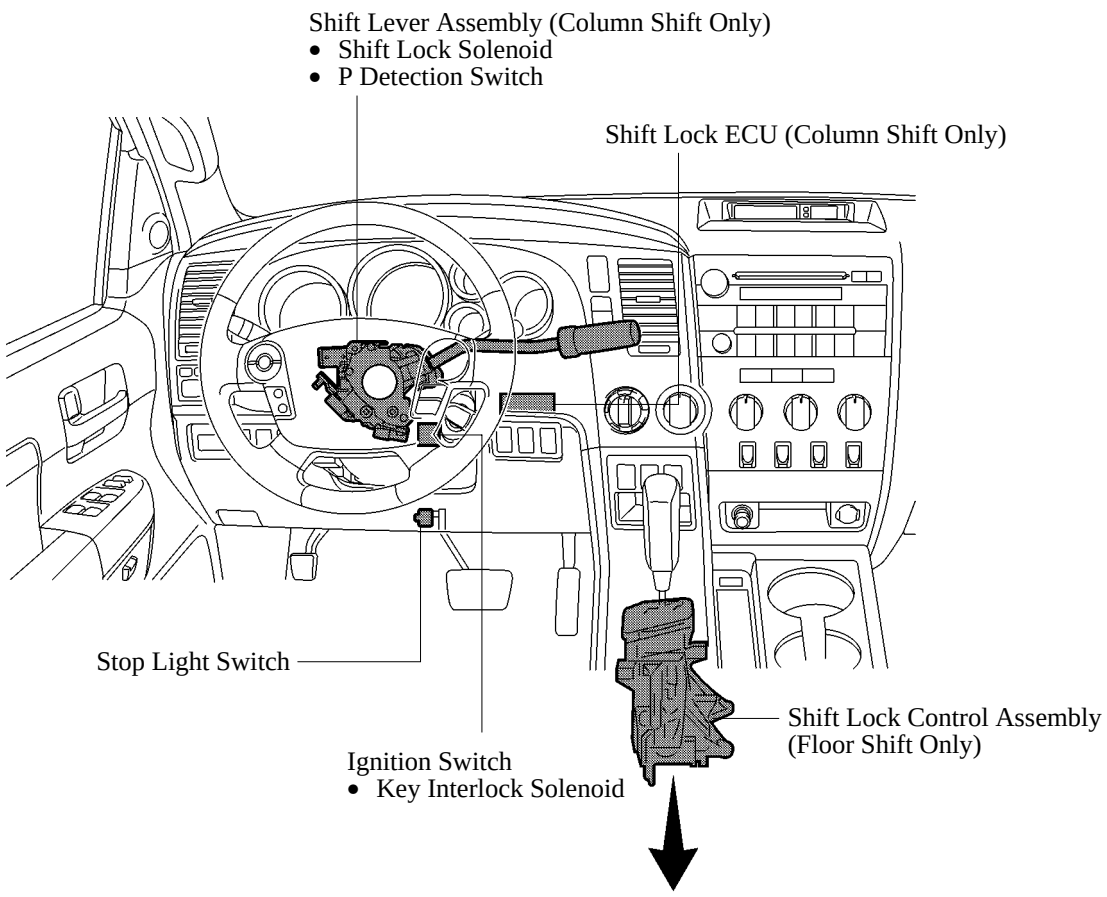
Column Shift

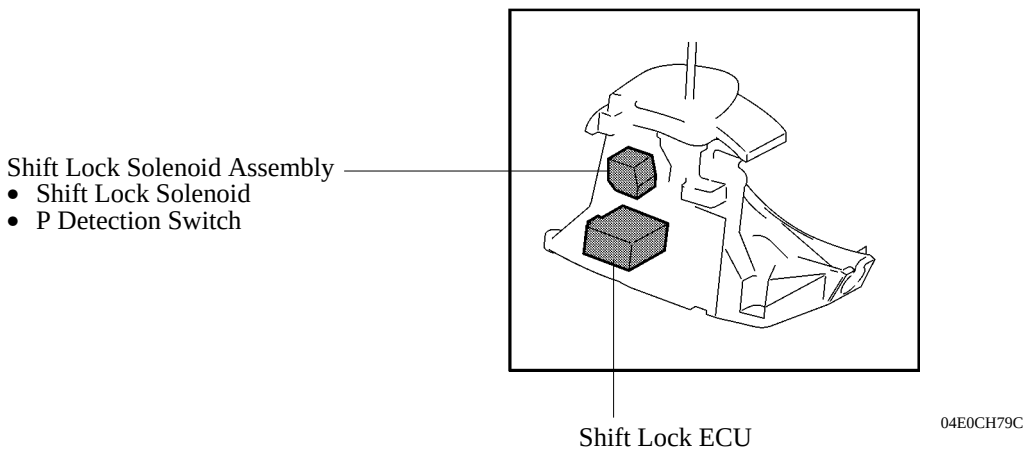


Floor Shift

04E0CH78C

Layout of Main Components





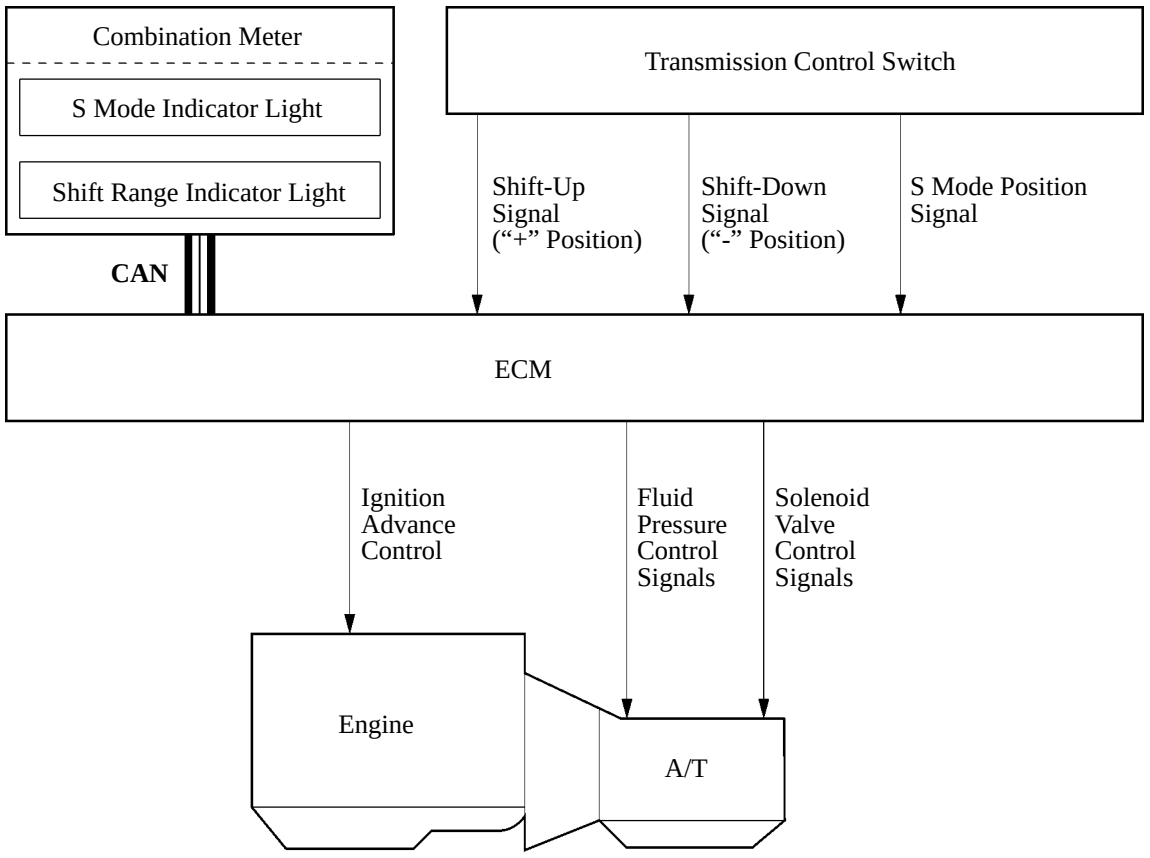
04E0CH79C

3. Multi-mode Automatic Transmission

General

A multi-mode automatic transmission is designed to allow the driver to switch the gear ranges (a multi-mode transmission is not for manually selecting single gears). After shifting the shift lever to the S mode position and moving the shift lever to the "+" position or to the "-" position, the driver can select the desired shift range. Thus, the driver is able to shift gears with a manual-like feel.

- **System Diagram ●**

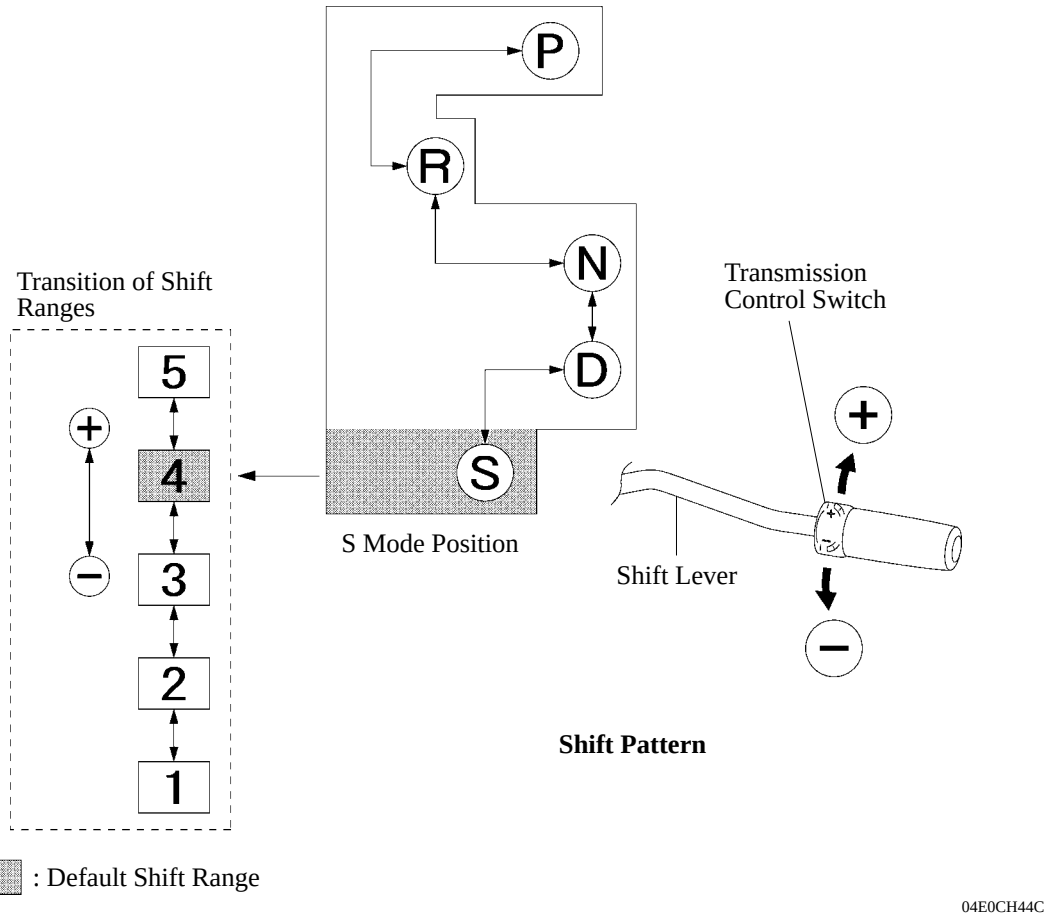


04E0CH42C

Operation

5) Column Shift Lever

The driver selects the S mode position by engaging the shift lever. At this time, the shift range position selects the 4th range. (During AI-Shift control, the shift range that has the currently controlled gear position as the maximum usable gear position will be displayed.) Then, the shift range positions change one at a time, as the driver moves the transmission control switch to the up ("+" position) or to the down ("-" position).
Under this control, the ECM effects optimal shift control within the usable gear range that the driver has selected. As with an ordinary automatic transmission, it shifts to the 1st gear when the vehicle is stopped.
Holding the transmission control switch in the "+" position with the shift lever in the S mode position will change the shift range to the 5th range regardless of range position (1st to 4th).
When the shift lever is in the S mode position, the S mode indicator light in the combination meter illuminates. The shift range indicator light indicates the state of the shift range position that the driver has selected.



Shift Pattern

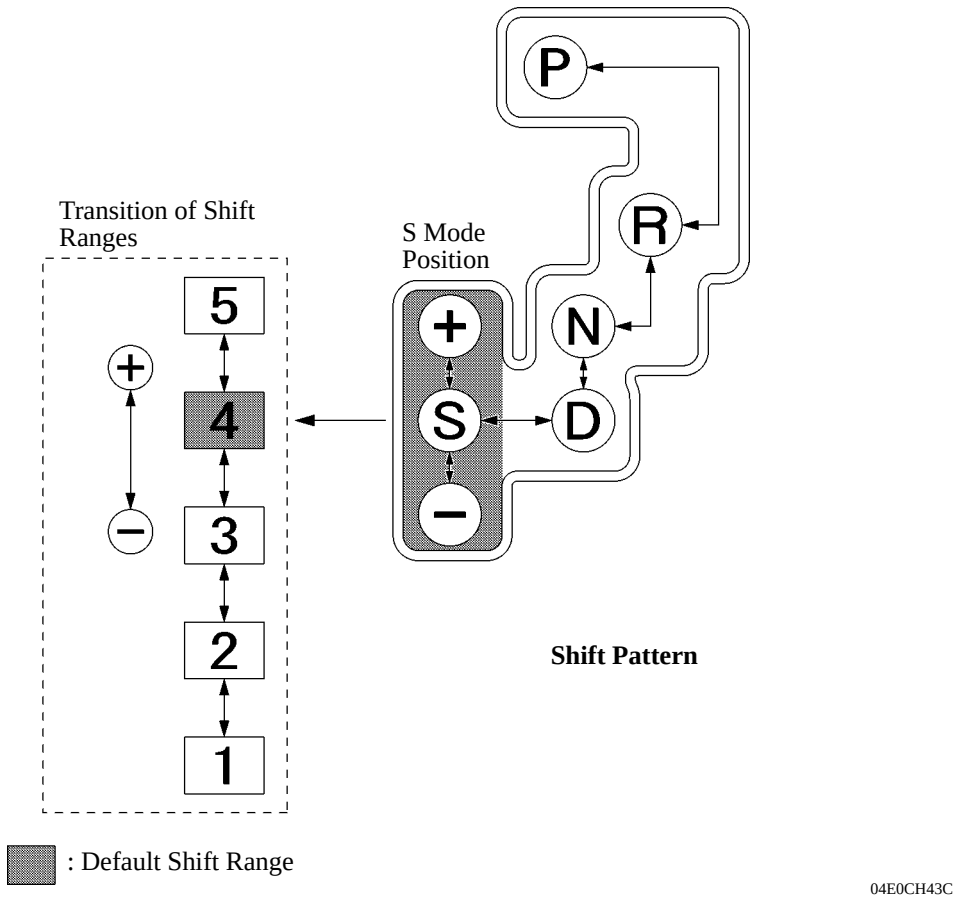
04E0CH44C

- **Usable Gear Chart ●**

Shift Range	Shift Range Indicator Light Indication	Usable Gear
5th	5	5th ↔ 4th ↔ 3rd ↔ 2nd ↔ 1st
4th	4	4th ↔ 3rd ↔ 2nd ↔ 1st
3rd	3	3rd ↔ 2nd ↔ 1st
2nd	2	2nd ↔ 1st
1st	1	1st

6) Floor Shift Lever

The driver selects the S mode position by engaging the shift lever. At this time, the shift range position selects the 4th range. (During AI-Shift control, the shift range that has the currently controlled gear position as the maximum usable gear position will be displayed.) Then, the shift range positions change one at a time, as the driver moves the shift lever to the front ("+" position) or to the rear ("-" position). Under this control, the ECM effects optimal shift control within the usable gear range that the driver has selected. As with an ordinary automatic transmission, it shifts to the 1st gear when the vehicle is stopped.
Holding the transmission control switch in the "+" position with the shift lever in the S mode position will change the shift range to the 5th range regardless of range position (1st to 4th).
When the shift lever is in the S mode position, the S mode indicator light in the combination meter illuminates. The shift range indicator light indicates the state of the shift range position that the driver has selected.



- **Usable Gear Chart ●**

Shift Range	Shift Range Indicator Light Indication	Usable Gear
5th	5	5th ↔ 4th ↔ 3rd ↔ 2nd ↔ 1st
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3rd	3	3rd ↔ 2nd ↔ 1st
2nd	2	2nd ↔ 1st
1st	1	1st