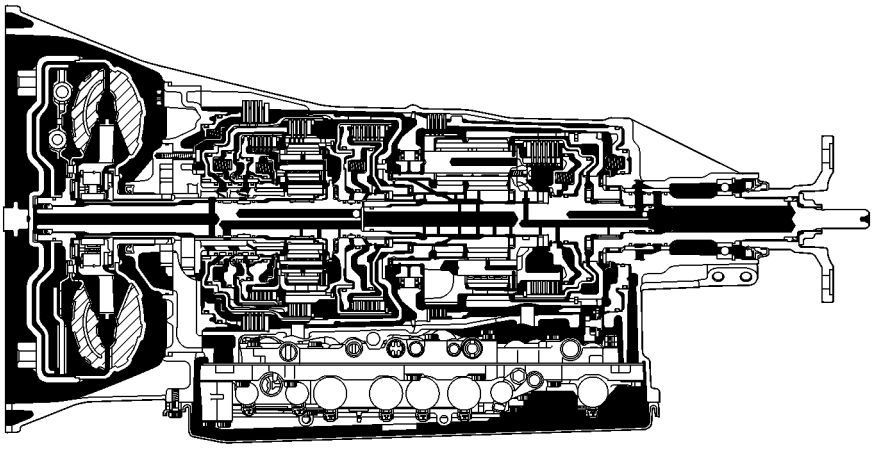
CHASSIS

AA80E AUTOMATIC TRANSMISSION

■DESCRIPTION

An AA80E automatic transmission is used. This automatic transmission is a compact, lightweight and high-capacity 8-speed sport direct shift gearbox.

- In the D position, gear shifting is sporty but comfortable. D position (fixed range mode) is adopted, enabling shift paddle switch operation when the shift lever is in the D position. For details, see page CH-53.
- When the shift lever is in the M position, the 8-speed sports direct shift control offers responsive gear shifting and a direct accelerator pedal feel to suit sporty driving. For details, see page CH-50.



036CH12Y

▶ Specifications ◀

Engine Type		2UR-GSE
Transmission Type		AA80E
Gear Ratio	1st	4.596
	2nd	2.724
	3rd	1.863
	4th	1.464
	5th	1.231
	6th	1.000
	7th	0.824
	8th	0.685
	Reverse	2.176
Fluid Type		Toyota Genuine ATF WS
Fluid Capacity	Liters (US qts, Imp. qts)	10.5 (11.1, 9.2)
Weight (Reference)*	kg (lb)	95.8 (211.2)

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

3. Transmission Power Flow

General

Shift Lever Position		Shift Solenoid Valve								Clutch				Brake		One-way Clutch
		SL1	SL2	SL3	SL4	SL5	SR	SL	SLU	C_1	C_2	C_3	C_4	B_1	B_2	F_1
P		○					○									
R					○		○	○					○		○	
N		○					○									
D	1st	○					○			○						○
	2nd	○				○	○			○				○		
	3rd	○		○			○			○		○				
	4th	○			○		○	○	Δ	○			○			
	5th	○	○				○	○	Δ	○	○					
	6th		○		○		○	○	Δ		○		○			
	7th		○	○			○	○	Δ		○	○				
	8th		○			○	○	○	Δ		○			○		
D*	D8 1st	○					○			○						○
	D8 2nd	○				○	○			○				○		
	D8 3rd	○		○			○			○		○				
	D8 4th	○			○		○	○	Δ	○			○			
	D8 5th	○	○				○	○	Δ	○	○					
	D8 6th		○		○		○	○	Δ		○		○			
	D8 7th		○	○			○	○	Δ		○	○				
	D8 8th		○			○	○	○	Δ		○			○		
	D7 1st	○					○			○						○
	D7 2nd	○				○	○			○				○		
	D7 3rd	○		○			○			○		○				
	D7 4th	○			○		○	○	Δ	○			○			
	D7 5th	○	○				○	○	Δ	○	○					
	D7 6th		○		○		○	○	Δ		○		○			
	D7 7th		○	○			○	○	Δ		○	○				
	D6 1st	○					○			○						○
	D6 2nd	○				○	○			○				○		
	D6 3rd	○		○			○			○		○				
	D6 4th	○			○		○	○	Δ	○			○			
	D6 5th	○	○				○	○	Δ	○	○					
	D6 6th		○		○		○	○	Δ		○		○			
	D5 1st	○					○			○						○
	D5 2nd	○				○	○			○				○		
	D5 3rd	○		○			○			○		○				
	D5 4th	○			○		○	○	Δ	○			○			
	D5 5th	○	○				○	○	Δ	○	○					

○: ON Δ: In accordance with flex lock-up or lock-up (Continued)

*: When in D position (fixed range mode)

Shift Lever Position			Shift Solenoid Valve								Clutch				Brake		One-way Clutch
			SL1	SL2	SL3	SL4	SL5	SR	SL	SLU	C_1	C_2	C_3	C_4	B_1	B_2	F_1
D*	D4	1st	○					○			○						○
		2nd	○				○	○			○				○		
		3rd	○		○			○			○		○				
		4th	○			○		○	○	Δ	○			○			
	D3	1st	○					○			○						○
		2nd	○				○	○			○				○		
		3rd	○		○			○			○		○				
	D2	1st	○					○			○						○
		2nd	○				○	○			○				○		
	D1	1st	○							○	○					○	○
M	M1	1st	○							○	○					○	○
	M2	2nd	○				○	○	○	Δ	○				○		
	M3	3rd	○		○			○	○	Δ	○		○				
	M4	4th	○			○		○	○	Δ	○			○			
	M5	5th	○	○				○	○	Δ	○	○					
	M6	6th		○		○		○	○	Δ		○		○			
	M7	7th		○	○			○	○	Δ		○	○				
	M8	8th		○			○	○	○	Δ		○			○		

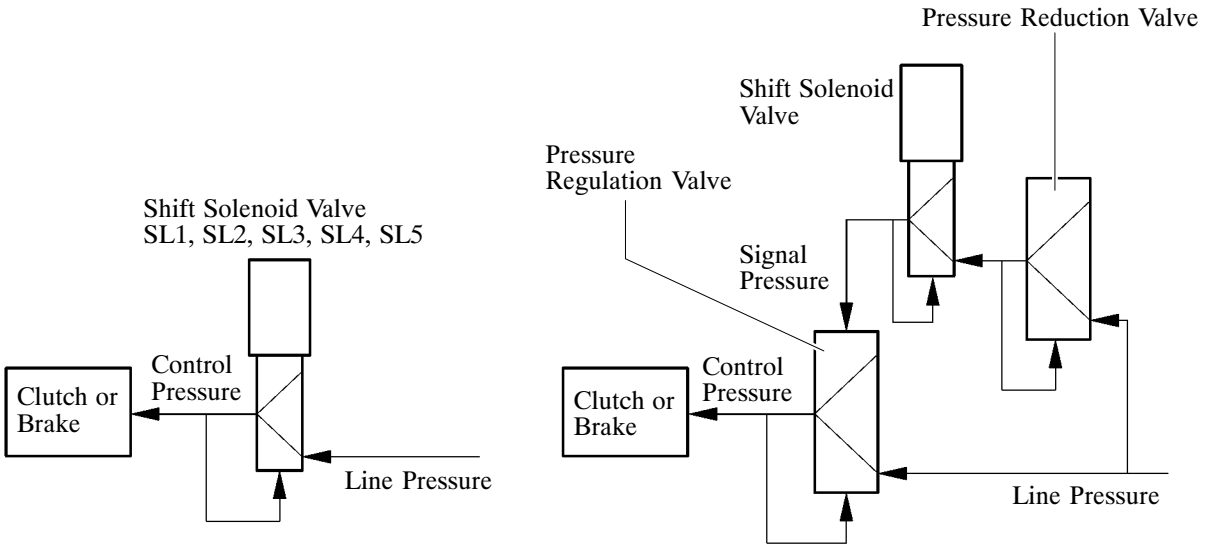
○: ON Δ: In accordance with flex lock-up or lock-up

*: When in D position (fixed range mode)

2. Shift Solenoid Valves

Shift Solenoid Valve SL1, SL2, SL3, SL4, SL5, SLU and SLT

- In order to provide a hydraulic pressure that is proportional to the current that flows to the solenoid coil, shift solenoid valves SL1, SL2, SL3, SL4, SL5, SLU and SLT linearly control the line pressure and clutch and brake engagement pressure based on the signals from the TCM.
- Shift solenoid valves SL1, SL2, SL3, SL4 and SL5 are high flow linear solenoid valves that can supply more pressure than conventional ones. These shift solenoid valves control engagement elements by directly regulating the line pressure without using a pressure regulation valve or a pressure reduction valve. Thus, the number of valves and the length of the valve body fluid passage have been reduced, the shifting response has been increased and the shift shock has been minimized.



'08 IS F **Conventional Models**

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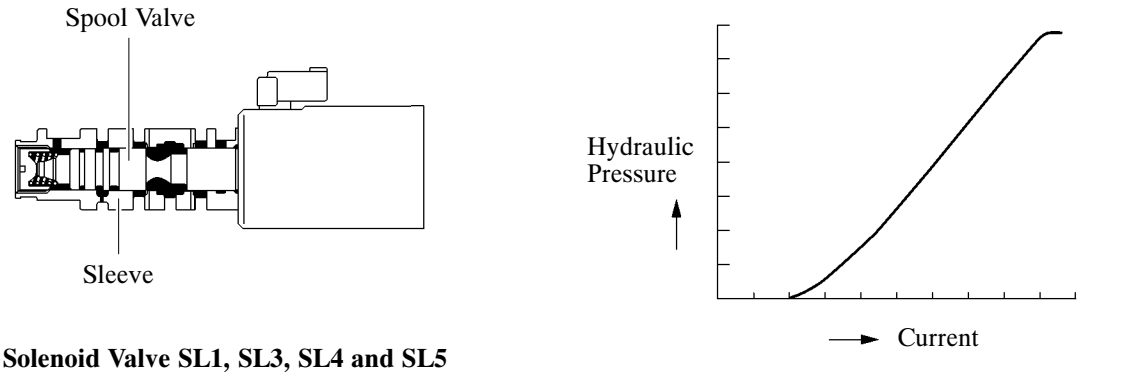

Shift Solenoid Valve SL1, SL3, SL4 and SL5

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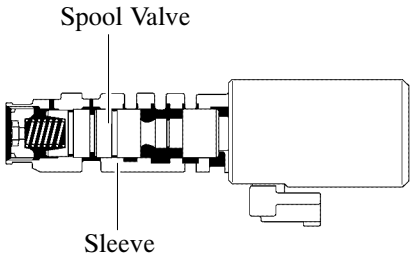

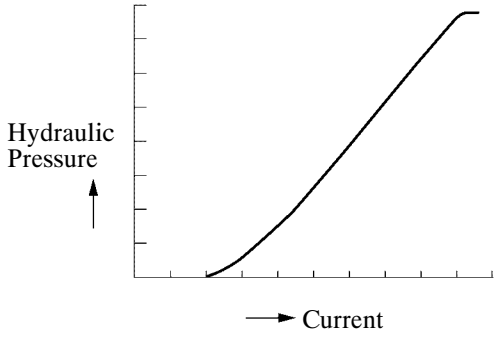

Shift Solenoid Valve SL2

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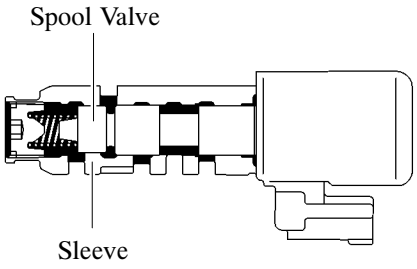

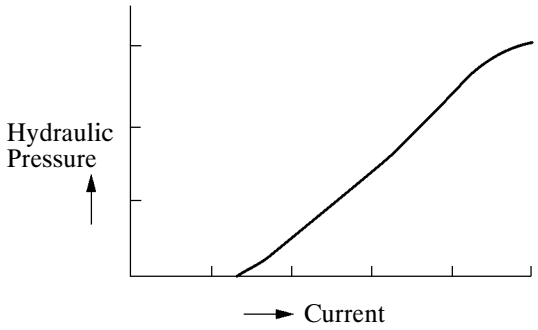

Shift Solenoid Valve SLU

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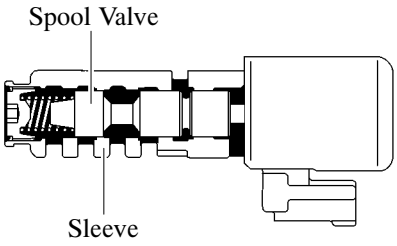

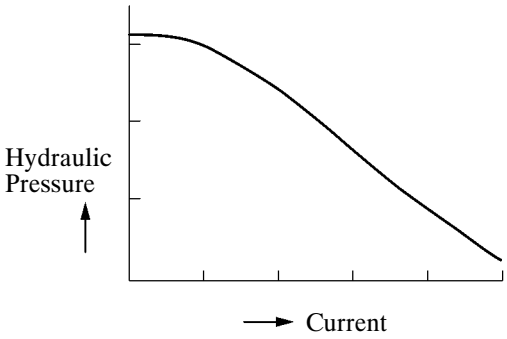

Shift Solenoid Valve SLT

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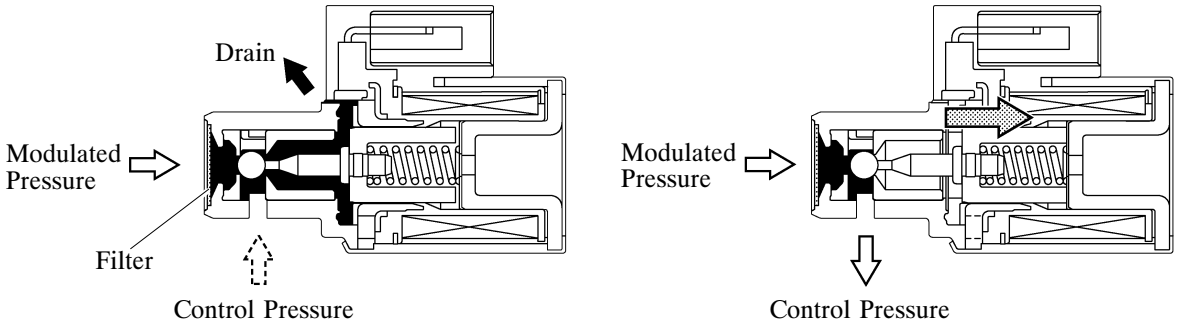
▶ Function of Shift Solenoid Valves ◀

Shift Solenoid Valve	Function
SL1	C_1 clutch pressure control
SL2	C_2 clutch pressure control
SL3	C_3 clutch pressure control
SL4	C_4 clutch pressure control
SL5	B_1 brake pressure control
SLU	• Lock-up clutch pressure control • B_2 brake pressure control
SLT	Line pressure control

Shift Solenoid Valve SL and SR

- Shift Solenoid valve SL and SR are 3-way solenoid valves.
- A filter is provided at the tip of the solenoid valve to further improve operational reliability.

▶ Shift Solenoid Valve SL ◀



OFF Condition **ON Condition**

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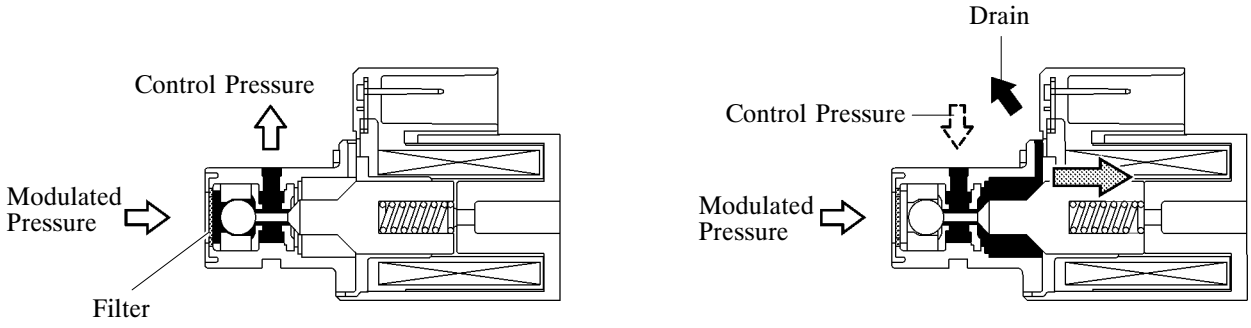
▶ Shift Solenoid Valve SR ◀



OFF Condition **ON Condition**

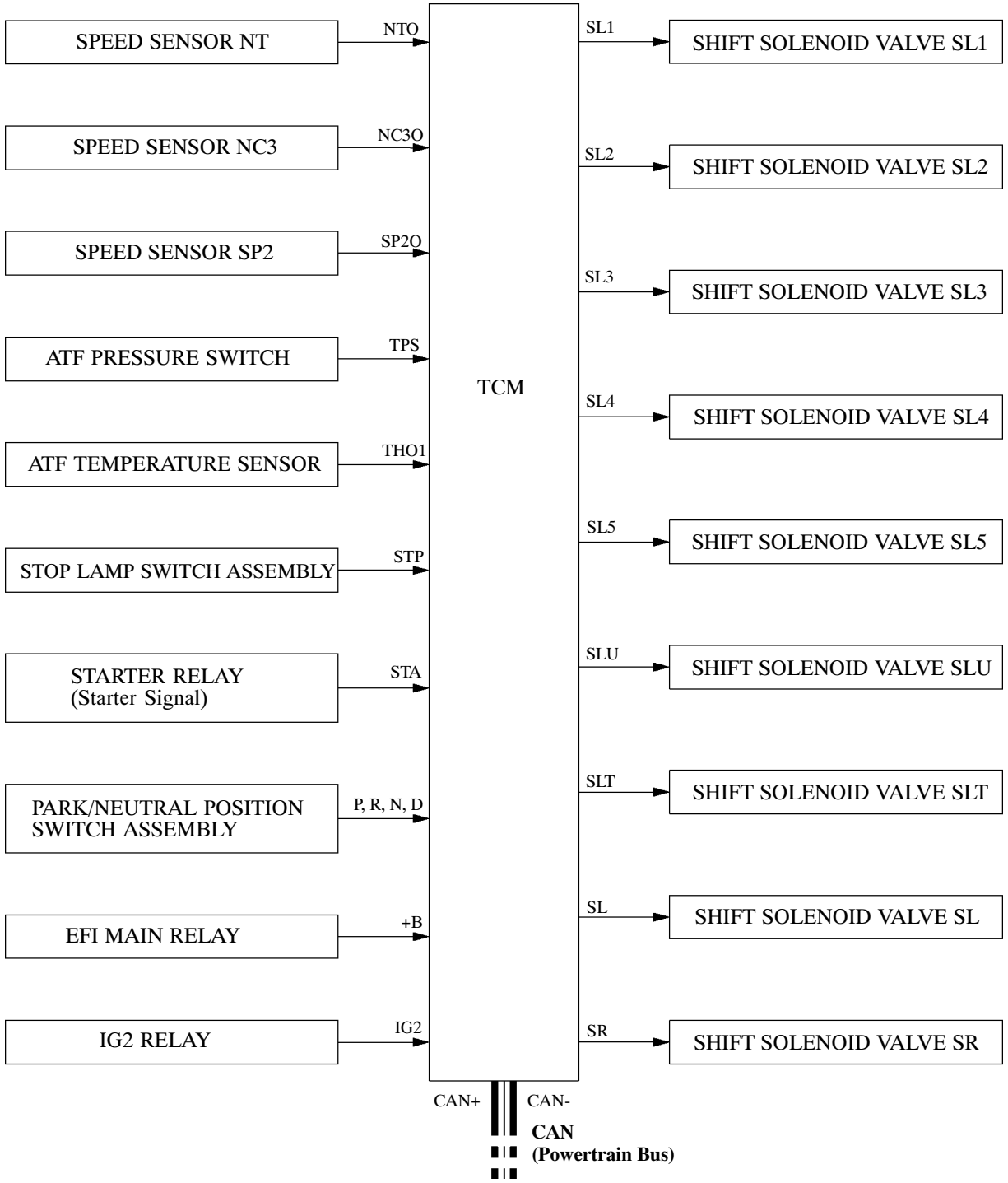
036CH31TE

▶ Function of Shift Solenoid Valve ◀

Shift Solenoid Valve	Type	Function
SL	3-way	• Switches the lock-up relay valve. • Switches the reverse control valve.
SR	3-way	• Switches the clutch apply control valve. • Switches the sequence control valve.

2. Construction

The configuration of the electronic control system in the AA80E automatic transmission is as shown in the following chart.



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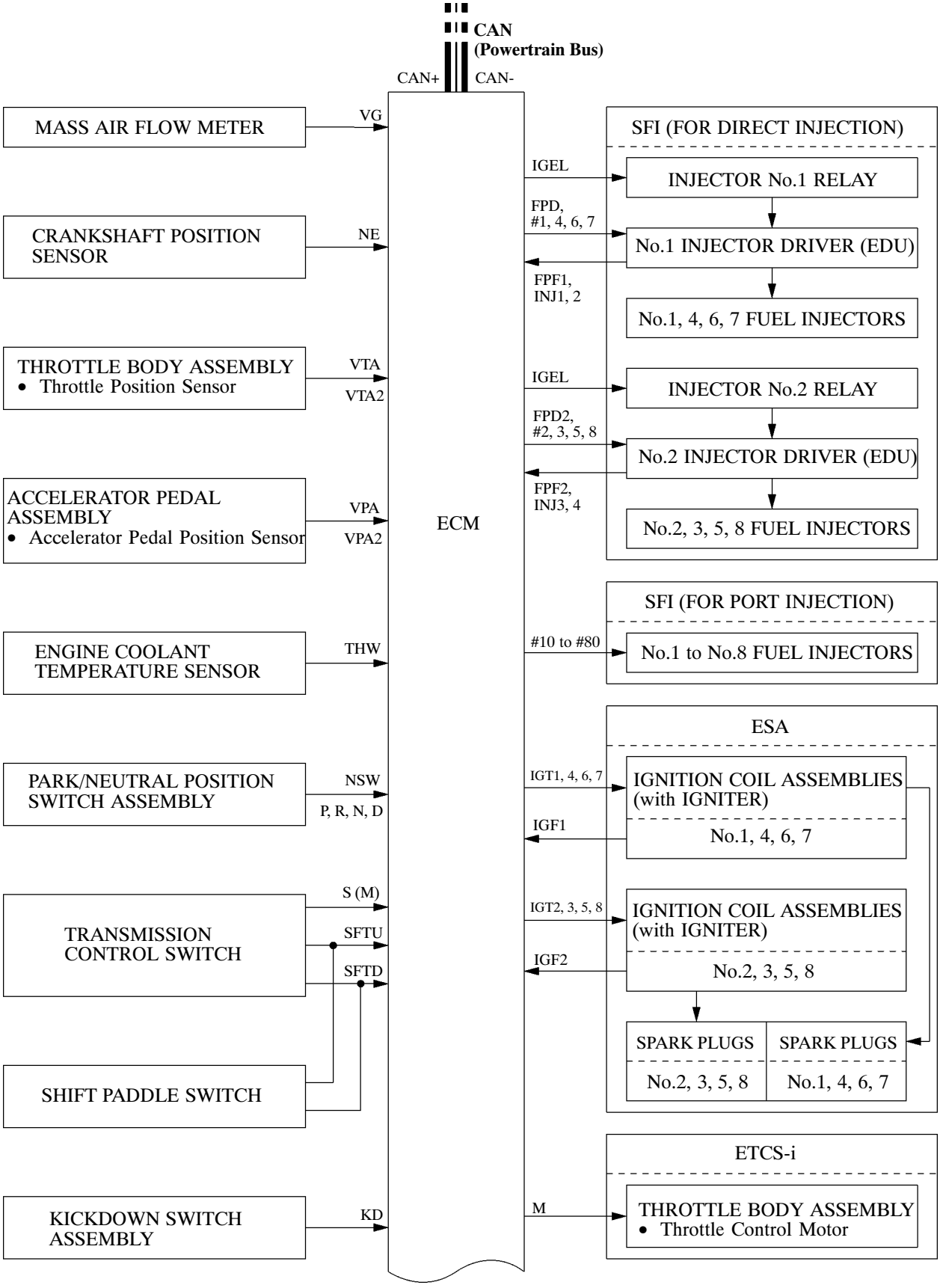

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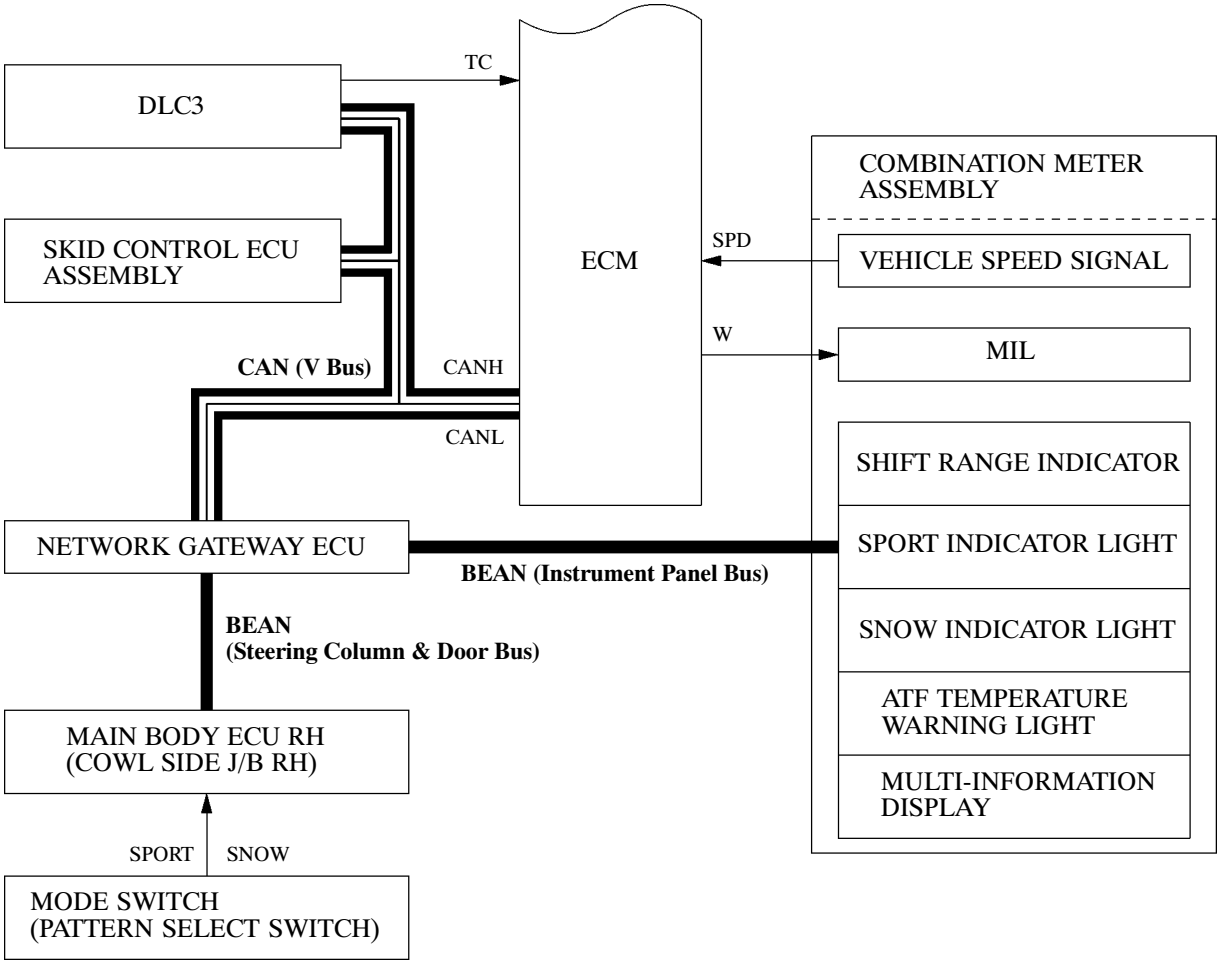

TC
DLC3
SKID CONTROL ECU ASSEMBLY
ECM
SPD
W
COMBINATION METER ASSEMBLY
VEHICLE SPEED SIGNAL
MIL
SHIFT RANGE INDICATOR
SPORT INDICATOR LIGHT
SNOW INDICATOR LIGHT
ATF TEMPERATURE WARNING LIGHT
MULTI-INFORMATION DISPLAY
CAN (V Bus)
CANH
CANL
NETWORK GATEWAY ECU
BEAN (Instrument Panel Bus)
BEAN
(Steering Column & Door Bus)
MAIN BODY ECU RH
(COWL SIDE J/B RH)
SPORT
SNOW
MODE SWITCH
(PATTERN SELECT SWITCH)

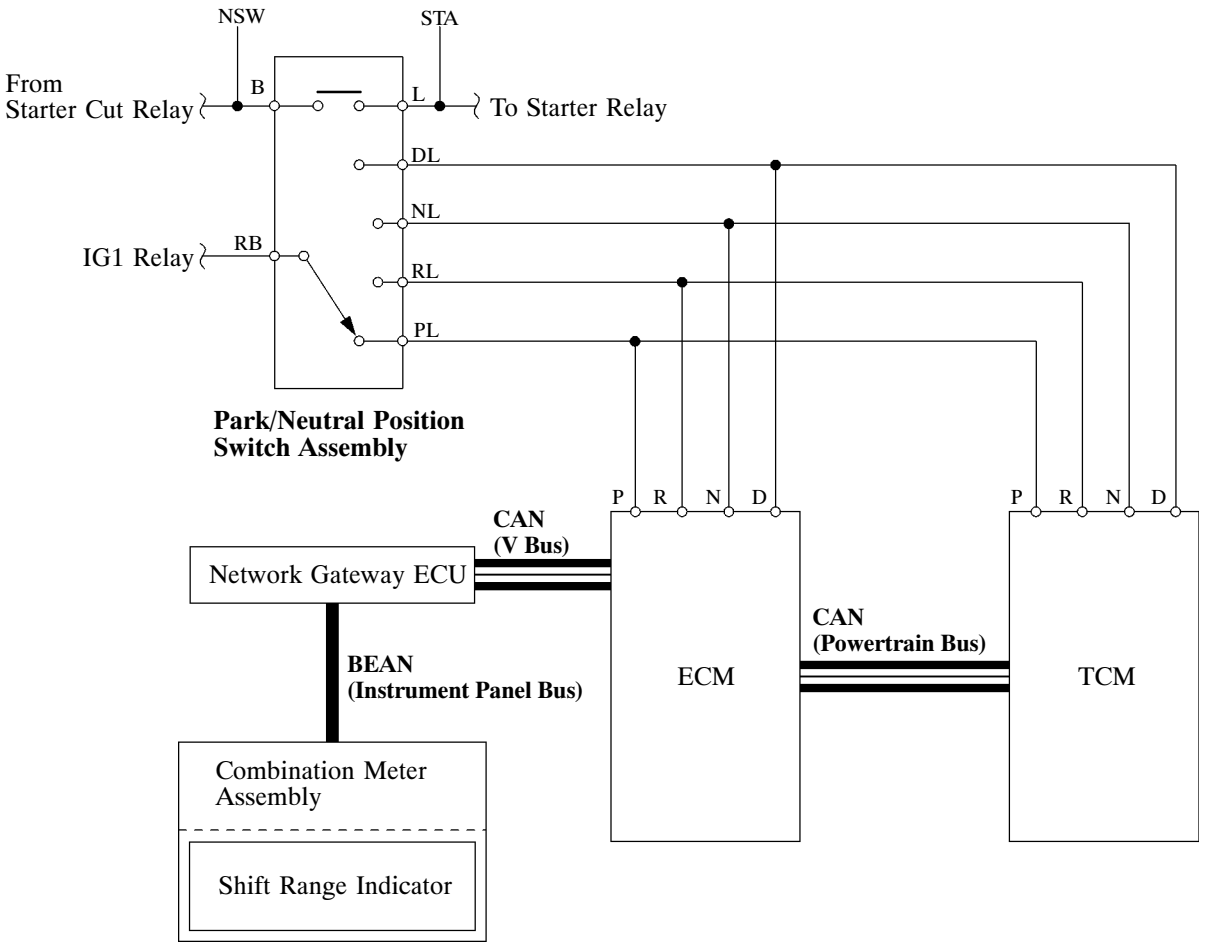
08D0CH62C

Park/Neutral Position Switch Assembly

The TCM and ECM use these switches to detect the shift lever position.

- The park/neutral position switch assembly detects the shift lever position (P, R, N or D) and transmits the signal to both the ECM and TCM. The ECM then transmits signals to the combination meter for the shift range indicator (P, R, N and D) in response to the signal it received from the switch.

▶ Wiring Diagram ◀



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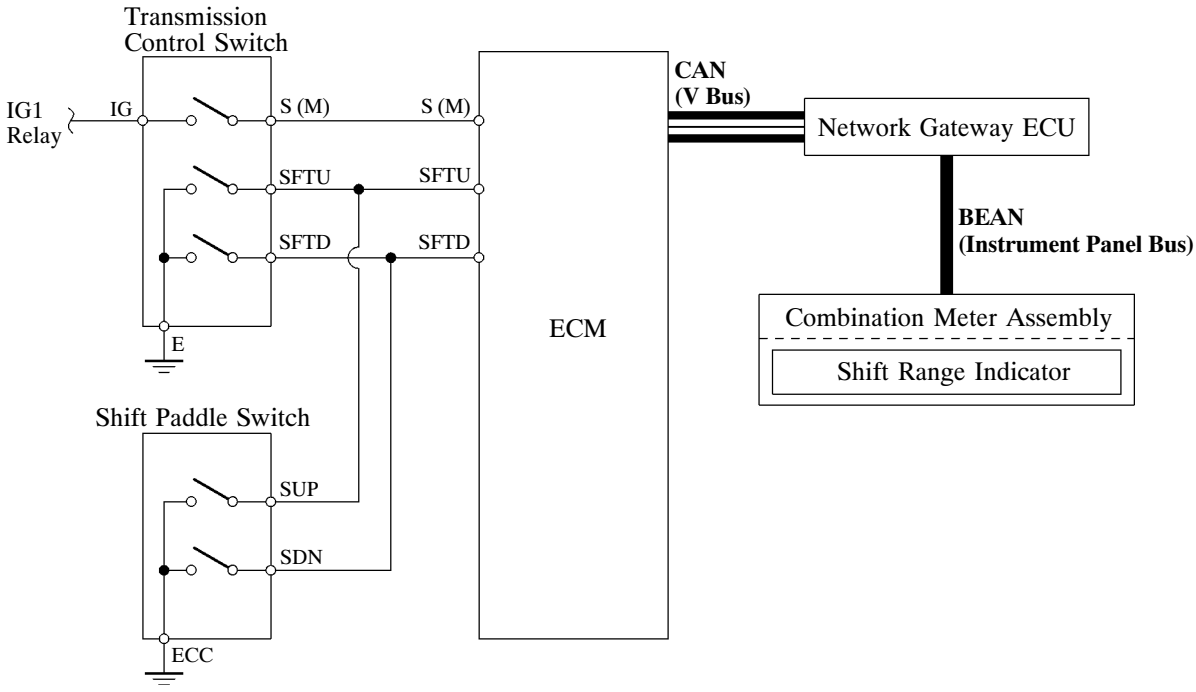
Transmission Control Switch and Shift Paddle Switch

- The transmission control switch is installed inside the shift lever assembly to inform the ECM of the shift lever position. The ECM turns on the shift range indicator.
- The transmission control switch detects whether the shift lever is in the D position or in the M position. If the shift lever is in the M position, the switch detects the operating conditions of the shift lever (front ["+" position] or rear ["-"position]), and sends signals to the ECM. At this time, the ECM turns on the shift range indicator for the selected range.
- The shift paddle switches are installed in the steering wheel assembly. The ECM detects the operation of the shift paddle switches (right ["+"position] or left ["-"position]) when the shift lever is in the D position or M position. At this time, the ECM turns on the shift range indicator for the selected range or gear.

▶ Wiring Diagram ◀



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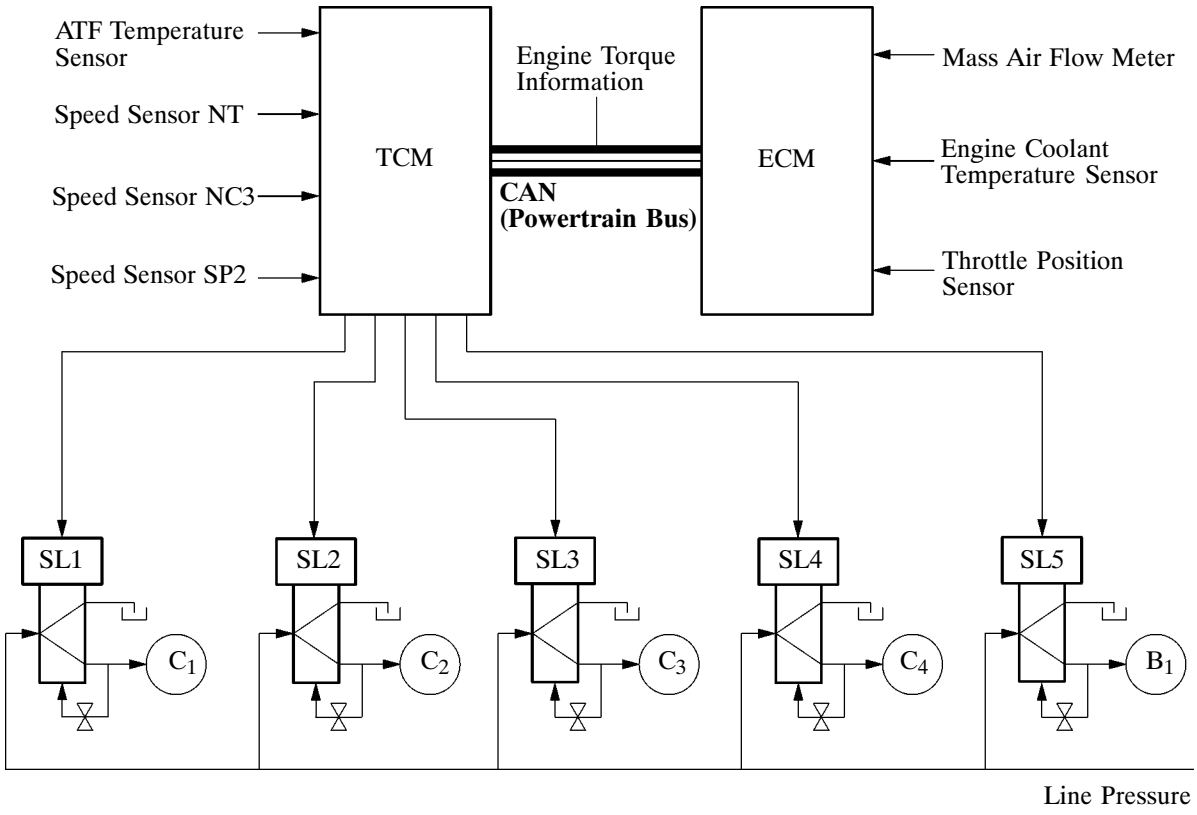
5. Clutch Pressure Control

Clutch to Clutch Pressure Control

- Clutch to clutch pressure control is used for shift control. As a result, shift control in 2nd gear or above is possible without using a one-way clutch, making the automatic transmission lightweight and compact.
- Based on ECM instructions, the TCM controls each clutch and brake accordingly with the optimum fluid pressure and timing in accordance with the information transmitted by the sensors, in order to shift the gears. The TCM does this using fluid pressure circuits which enable the clutches and brakes (C_1, C_2, C_3, C_4 and B_1) to be controlled independently, and high flow SL1, SL2, SL3, SL4 and SL5 shift solenoid valves, which directly control the line pressure. As a result, highly responsive and excellent shift characteristics have been realized.



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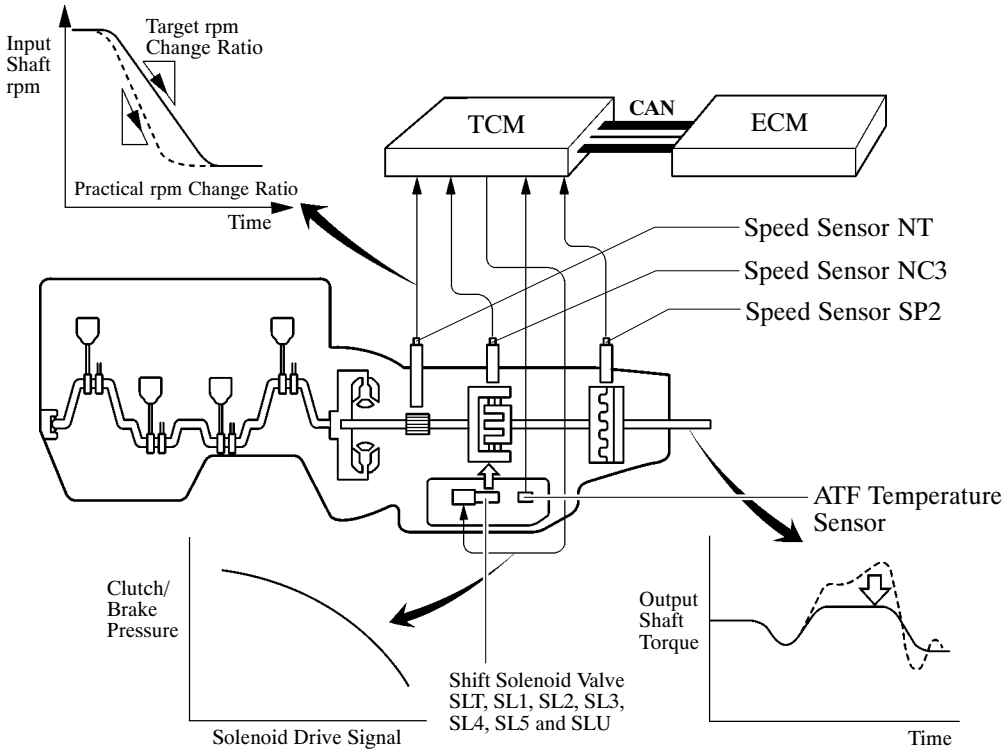
Clutch Pressure Optimal Control

The TCM monitors the signals from various types of sensors, such as the speed sensor NT and speed sensor NC3, allowing shift solenoid valves SLT, SL1, SL2, SL3, SL4, SL5 and SLU to minutely control the clutch pressure in accordance with engine output and driving conditions. As a result, smooth shift characteristics have been realized.



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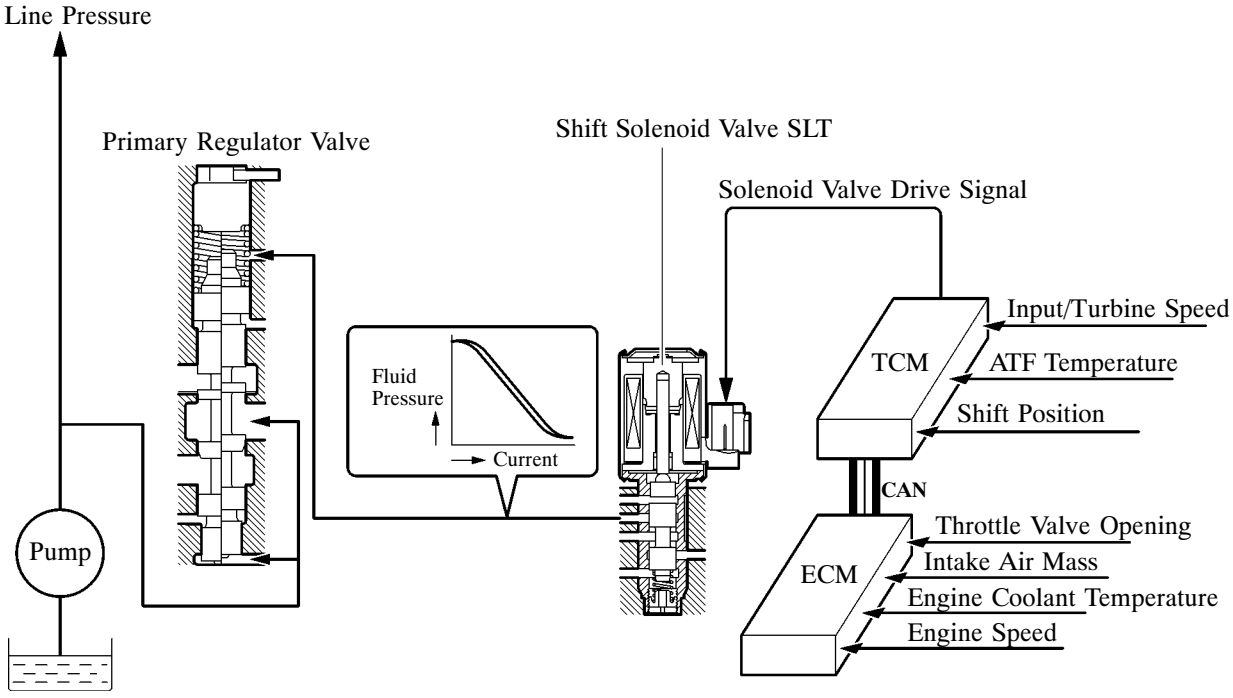
6. Line Pressure Optimal Control

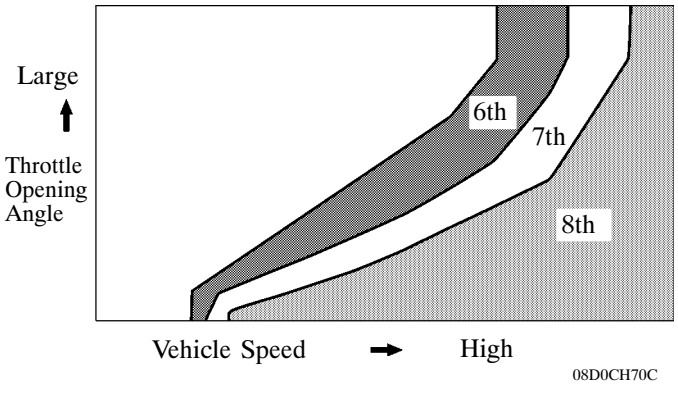
Through the use of the shift solenoid valve SLT, the line pressure is optimally controlled in accordance with the engine torque information, as well as with the internal operating conditions of the torque converter and the transmission.
Accordingly, the line pressure can be controlled minutely in accordance with the engine output, traveling condition, and the ATF temperature, thus realizing smooth shift characteristics and optimizing the workload of the oil pump (reducing unnecessary parasitic losses).



7. Lock-up Timing Control

The TCM uses lock-up timing control in order to improve the fuel consumption performance in 6th gear or higher when the shift lever is in D, or when D8, D7 or D6 range has been selected.

▶ Lock-up Operating Range ◀



▶ Lock-up Operation Gears in Each Range ◀

Gear \ Position or Range	D, D8	D7	D6
1st	×	×	×
2nd	×	×	×
3rd	×	×	×
4th	×	×	×
5th	×	×	×
6th	○	○	○
7th	○	○	—
8th	○	—	—

○: Available ×: Not available —: Not applicable

▶ Shift Solenoid Valve Normal Operation Chart ◀

Gear Position	1st	2nd	3rd	4th	5th	6th	7th	8th
Shift Solenoid Valve SL1	ON	ON	ON	ON	ON	OFF	OFF	OFF
Shift Solenoid Valve SL2	OFF	OFF	OFF	OFF	ON	ON	ON	ON
Shift Solenoid Valve SL3	OFF	OFF	ON	OFF	OFF	OFF	ON	OFF
Shift Solenoid Valve SL4	OFF	OFF	OFF	ON	OFF	ON	OFF	OFF
Shift Solenoid Valve SL5	OFF	ON	OFF	OFF	OFF	OFF	OFF	ON

▶ Fail-safe Control Chart ◀

Gear Position in Normal Operation		1st	2nd	3rd	4th	5th	6th	7th	8th
SL1	ON Malfunction (Without Fail-safe Control)	1st	2nd	3rd	4th	5th	6th	7th	8th
	Fail-safe Control during ON Malfunction	1st	2nd	3rd	4th	5th	5th	5th	5th
	OFF Malfunction (Without Fail-safe Control)	N	N	N	N	N	6th	7th	8th
	Fail-safe Control during OFF Malfunction	6th	6th	6th	6th	6th	6th	7th	8th
	Fail-safe Control during OFF Malfunction (From third trip onward)	Fixed in 3rd							
SL2	ON Malfunction (Without Fail-safe Control)	5th	8th	7th	6th	5th	6th	7th	8th
	Fail-safe Control during ON Malfunction	5th	5th	5th	5th	5th	6th	7th	8th
	OFF Malfunction (Without Fail-safe Control)	1st	2nd	3rd	4th	1st	N	N	N
	Fail-safe Control during OFF Malfunction (Until vehicle stops)	Fixed in 7th							
	Fail-safe Control during OFF Malfunction*	1st	2nd	3rd	4th	4th	4th	4th	4th
SL3	ON Malfunction (Without Fail-safe Control)	3rd	3rd	3rd	3rd	7th	7th	7th	7th
	Fail-safe Control during ON Malfunction (This malfunction is detected while driving in 4th or below.)	Fixed in 3rd							
	Fail-safe Control during ON Malfunction (This malfunction is detected while driving in 5th or above.)	Fixed in 7th (If vehicle stops once, then it is fixed in 3rd.)							
	OFF Malfunction (Without Fail-safe Control)	1st	2nd	1st	4th	5th	6th	N	8th
	Fail-safe Control during OFF Malfunction (This malfunction is detected while driving in 7th. However, shifting higher than 7th is prohibited once downshifted to 6th or below.)	1st	2nd	4th	4th	5th	6th	8th	8th
	Fail-safe Control during OFF Malfunction (This malfunction is detected while driving in 6th or below.)	1st	2nd	4th	4th	5th	6th	6th	6th

*: When vehicle is driven after fail-safe detection.

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Gear Position in Normal Operation		**1st**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**
SL4	ON Malfunction (Without Fail-safe Control)	4th	4th	3rd	4th	6th	6th	7th	6th
	Fail-safe Control during ON Malfunction (This malfunction is detected while driving in 4th or below.)	Fixed in 3rd							
	Fail-safe Control during ON Malfunction (This malfunction is detected while driving in 5th or above.)	Fixed in 7th (If vehicle stops once, then it is fixed in 3rd.)							
	OFF Malfunction (Without Fail-safe Control)	1st	2nd	3rd	1st	5th	N	7th	8th
	Fail-safe Control during OFF Malfunction (This malfunction is detected while driving in 6th. However, shifting to 4th, 6th, 7th, or 8th is prohibited once downshifted to 5th or below.)	1st	2nd	3rd	5th	5th	7th	7th	7th
	Fail-safe Control during OFF Malfunction (This malfunction is detected while driving in 4th.)	1st	2nd	3rd	5th	5th	5th	5th	5th
SL5	ON Malfunction (Without Fail-safe Control)	2nd	2nd	3rd	4th	8th	6th	7th	8th
	Fail-safe Control during ON Malfunction (This malfunction is detected while driving in 4th or below.)	Fixed in 3rd							
	Fail-safe Control during ON Malfunction (This malfunction is detected while driving in 5th or above.)	Fixed in 7th (If vehicle stops once, then it is fixed in 3rd.)							
	OFF Malfunction (Without Fail-safe Control)	1st	1st	3rd	4th	5th	6th	7th	N
	Fail-safe Control during OFF Malfunction	1st	3rd	3rd	4th	5th	6th	7th	7th
SR	OFF Malfunction (Malfunctions occur while driving in 5th or below.)	1st	2nd	3rd	4th	1st	7th	7th	7th
	OFF Malfunction (Malfunctions occur while driving in 6th or above, or after shifting to 7th.)	7th	7th	7th	7th	7th	7th	7th	7th
	Fail-safe Control during OFF Malfunction (This malfunction is detected while driving in 5th or above.)	Fixed in 7th							
	OFF Malfunction (Trip is commenced despite malfunctions having occurred in SR.)	3rd	3rd	3rd	3rd	7th	7th	7th	7th
	Fail-safe Control during OFF Malfunction (This malfunction is detected while driving in 4th or below.)	Fixed in 3rd							
	Fail-safe Control during OFF Malfunction* (This malfunction is detected while driving in 5th or above.)	Fixed in 7th (If vehicle stops once, then it is fixed in 3rd.)							

*: After trip is commenced despite malfunctions having occurred in SR.