■ DETAILS

1. Function of Main Components

Component		Function
Torque Converter Assembly		● Transmits the engine power to the transmission. ● Increases engine torque.
Oil Pump		Provides oil pressure necessary for the transmission operation.
Overdrive Direct Clutch (C_0)		Connects the overdrive planetary sun gear and the overdrive planetary carrier.
Forward Clutch (C_1)		Connects the input shaft and the front planetary ring gear.
Direct Clutch (C_2)		Connects the input shaft and the front and rear planetary sun gear.
Overdrive Brake (B_0)		Prevents the overdrive planetary sun gear from turning either clockwise or counterclockwise.
2nd Coast Brake (B_1)		Prevents the front and rear sun gear from turning either clockwise or counterclockwise.
2nd Brake (B_2)		Prevents the outer race of F_1 from turning either clockwise or counterclockwise, thus preventing the front and rear sun gear from turning counterclockwise.
1st and Reverse Brake (B_3)		Prevents the front planetary carrier from turning either clockwise or counterclockwise.
Overdrive 1-way Clutch (F_0)		Connects the overdrive planetary sun gear and the planetary carrier when engine power is transmitted to the overdrive input shaft.
1-way Clutch Assembly (F_1)		Prevents the front and rear planetary sun gear from turning counterclockwise when B_2 is operating.
No. 2 1-way Clutch (F_2)		Prevents the front planetary carrier from turning counterclockwise.
Planetary Gears		Change power transmission route in accordance with clutch and brake operation, and increase or decrease output shaft revolutions accordingly.
Shift Solenoid Valve S1 and S2		Switch the shift valves.
Shift Solenoid Valve SLT		Controls line pressure.
Shift Solenoid Valve SL		Controls the lock-up clutch.
Temperature Sensor		Detects the ATF temperature.
Speed Sensor (NC0)		Detects the input speed of the transmission.
Transmission Revolution Sensor (SP2)		Detects the output speed of the transmission.
Park/Neutral Position Switch Assembly		Detects the shift lever position (P, R, N, D, 2, L).
Shift Lock Control Unit Assembly	Transmission Control Switch	Detects that the shift lever is in 3.
ECM		● Controls each shift solenoid valve and engine output in response to a signal from each sensor and switch. ● Makes a diagnosis and memorizes the failed section when the ECM detects a malfunction.
Combination Meter Assembly	Shift Position Indicator Light	Indicates the shift lever position.
	MIL	Illuminates or blinks to inform the driver when the ECM detects a malfunction.
DLC3		The Diagnostic Trouble Codes (DTCs) can be read by connecting an intelligent tester II.

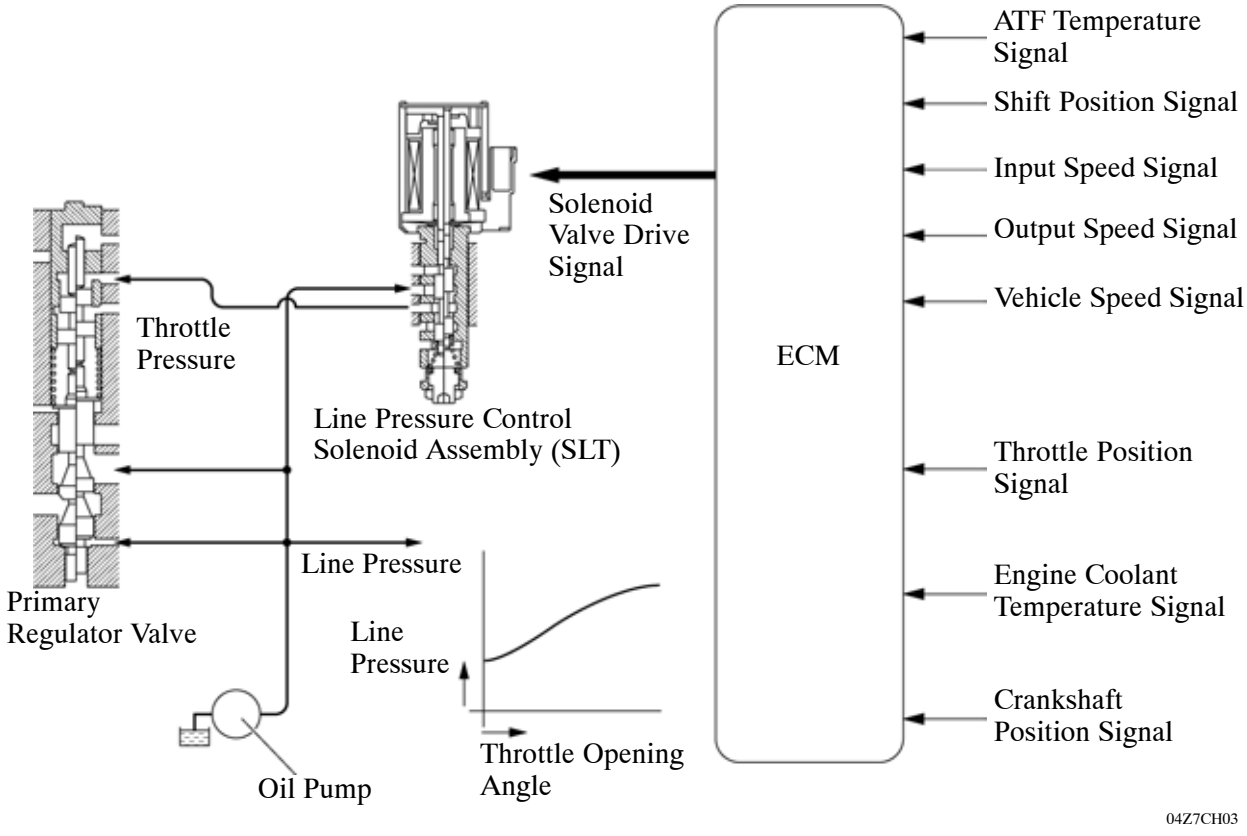
2. System Control

▶ Electronic Control of Automatic Transmission ◀

Control	Function
Shift Timing Control	The ECM sends current to the shift solenoid valves S1 and/or S2 based on signals from various sensors in order to shift the gears.
Line Pressure Control	Actuates the shift 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 ignition timing temporarily to improve shift feeling during upshifting or downshifting.
N to D Squat Control	When the shift lever is moved from N to D, the gear is temporarily engaged to the 3rd and then to the 1st to reduce vehicle squat.
Lock-up Timing Control	The ECM sends current to the shift solenoid valve SL based on signals from various sensors and engages or disengages the lock-up clutch.

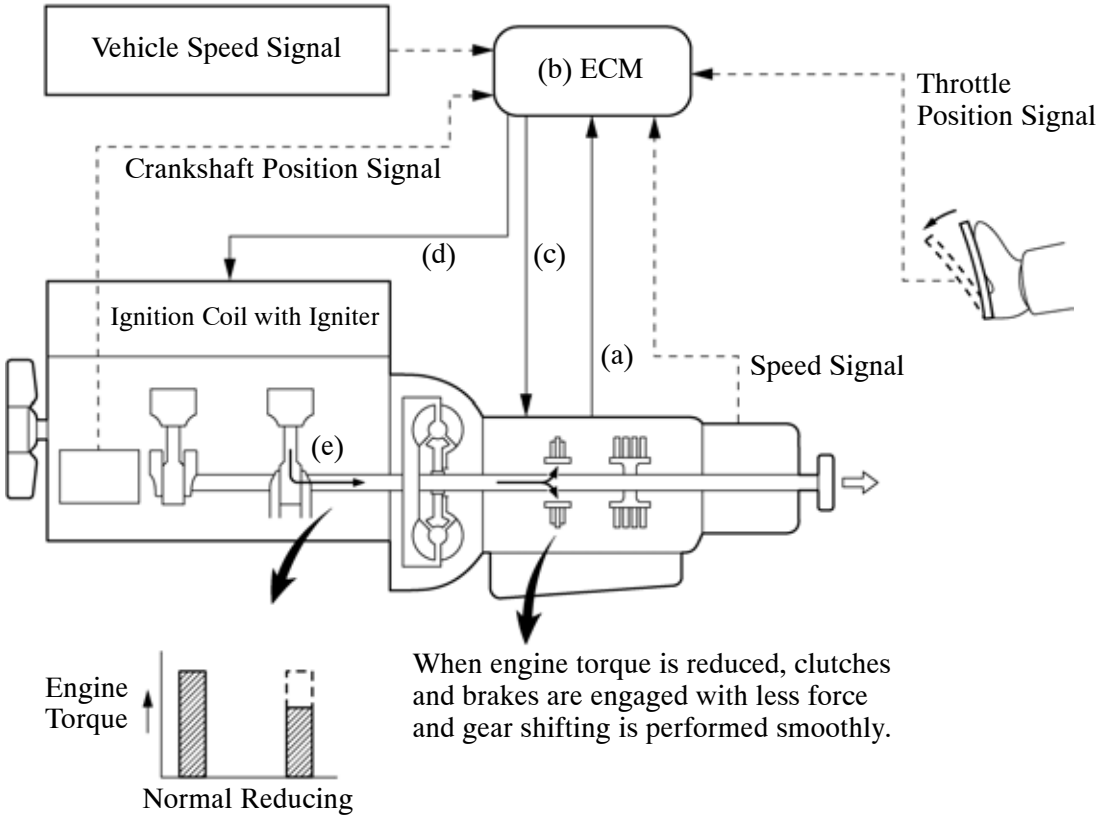
(a) Line Pressure Control

(1) In order to obtain a predetermined line pressure characteristic in accordance with each sensor signal, the ECM activates the shift solenoid valve SLT to regulate the throttle pressure.
(2) This makes it possible for the primary regulator valve to precisely and minutely control the line pressure in accordance with the engine output, thus providing smoother shift characteristics.



(b) Engine Torque Control

(1) Engagement of the clutches and brakes of the planetary gear unit in the transmission is controlled smoothly by momentarily retarding the engine ignition timing when gears are shifted up or down in the transmission. When the ECM judges a gear shift timing in accordance with signals, it activates the shift solenoid valves to perform gear shifting. When the gear shifting starts, the ECM retards the engine ignition timing to reduce the engine torque. As a result, engagement force of the clutches and brakes of the planetary gear units is weakened and the gear change is performed smoothly.



(a) : Judgment of gear shifting

(b) : Determination of ignition timing retard angle

(c) : Gear shifting

(d) : Retarding ignition timing

(e) : Torque reduction

04Z7CH04

(c) Lock-up Timing Control

(1) The ECM operates the lock-up timing control in order to improve the fuel consumption performance in the top gear when the shift lever is in D or 3.

▶ Lock-up Timing Control Operation ◀

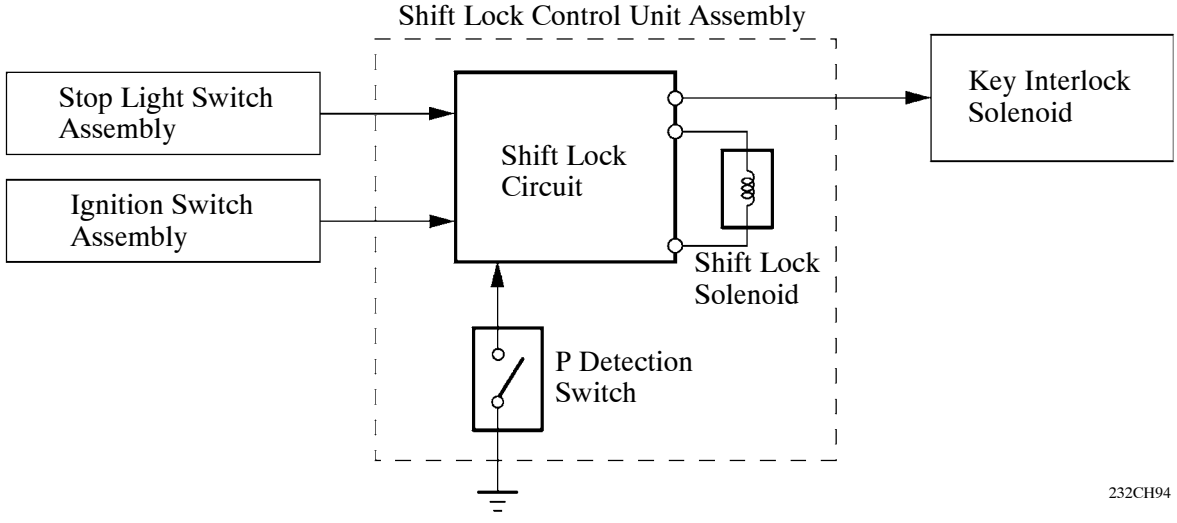
Gear	Shift Lever Position	
	D	3
1st	×	×
2nd	×	×
3rd	×	○
4th	○	—

HINT:
○: Operates
×: Does not operate
—: Not applicable

3. Function

(a) Shift Lock System

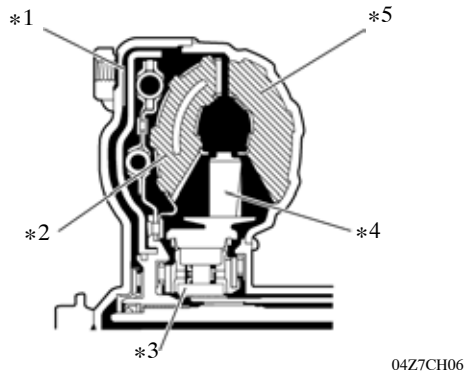
(1) The key interlock device prevents the key from being pulled out after the ignition switch assembly is turned OFF, unless the shift lever is moved to the P position. Thus, the driver is urged to park the vehicle in the P position.
(2) The shift lock mechanism prevents the shift lever from being shifted to any position other than the P position, unless the ignition switch assembly is ON and the brake pedal is pressed. It prevents the vehicle from starting off suddenly against the wish of the driver.
(3) The shift lock control unit assembly uses the P detection switch to detect the shift lever position, and receives the inputs of the stop light switch and ignition switch signals. Upon receiving these signals, the shift lock control unit assembly turns ON the key interlock solenoid and the shift lock solenoid in order to release the key interlock and shift lock.
(4) A shift lock release button, which manually overrides the shift lock mechanism, is provided.



4. Construction

(a) Torque Converter Assembly

(1) A compact, lightweight and high-capacity torque converter assembly is used. The torque converter supports lock-up clutch control, thus improving fuel economy.

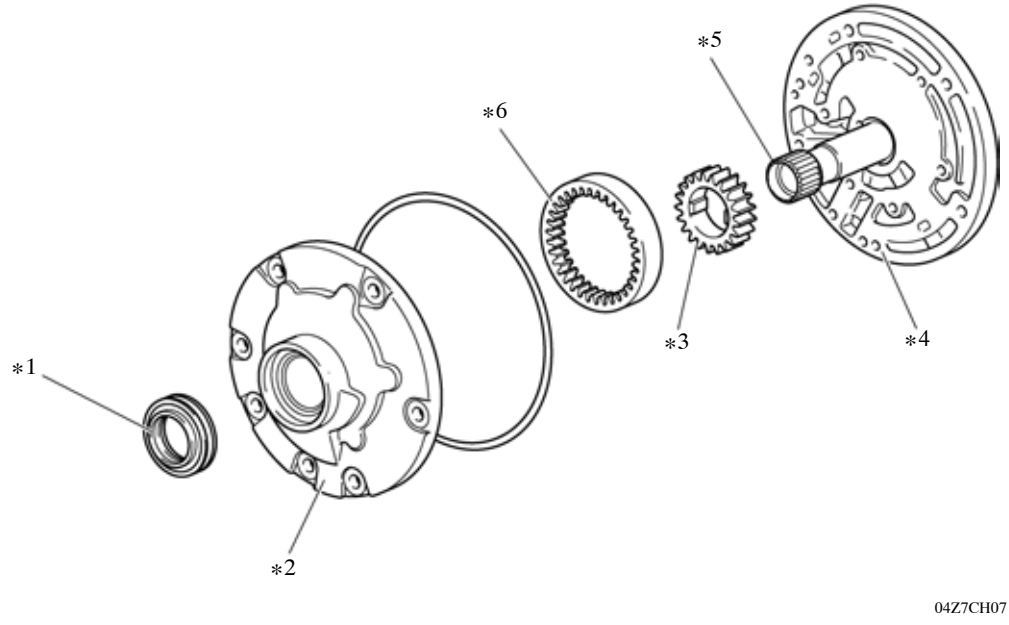


▶ **Text in Illustration** ◀

*1	Lock-up Clutch	*2	Turbine Runner
*3	1-way Clutch	*4	Stator
*5	Pump Impeller	—	—

(b) Oil Pump Assembly

(1) The oil pump is operated by the torque converter assembly. It lubricates the planetary gear units and supplies operating fluid pressure for hydraulic control. The front oil pump drive gear is continually driven by the engine via the pump impeller. The pump has sufficient capacity to supply the necessary fluid pressure throughout all speed ranges, as well as in reverse.

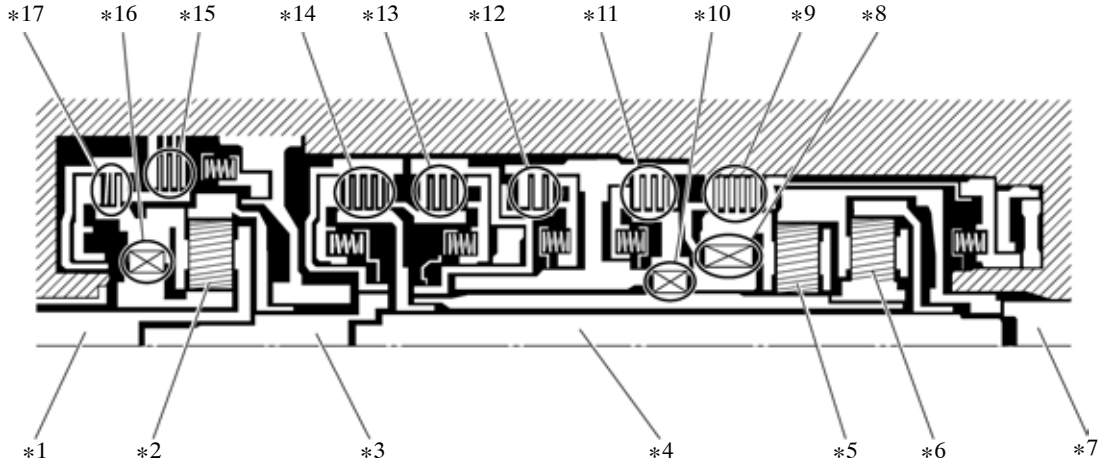


▶ **Text in Illustration** ◀

*1	Oil Seal	*2	Front Oil Pump Body Sub-assembly
*3	Front Oil Pump Drive Gear	*4	Oil Pump Cover
*5	Stator Shaft Assembly	*6	Front Oil Pump Driven Gear

(c) Planetary Gear Unit

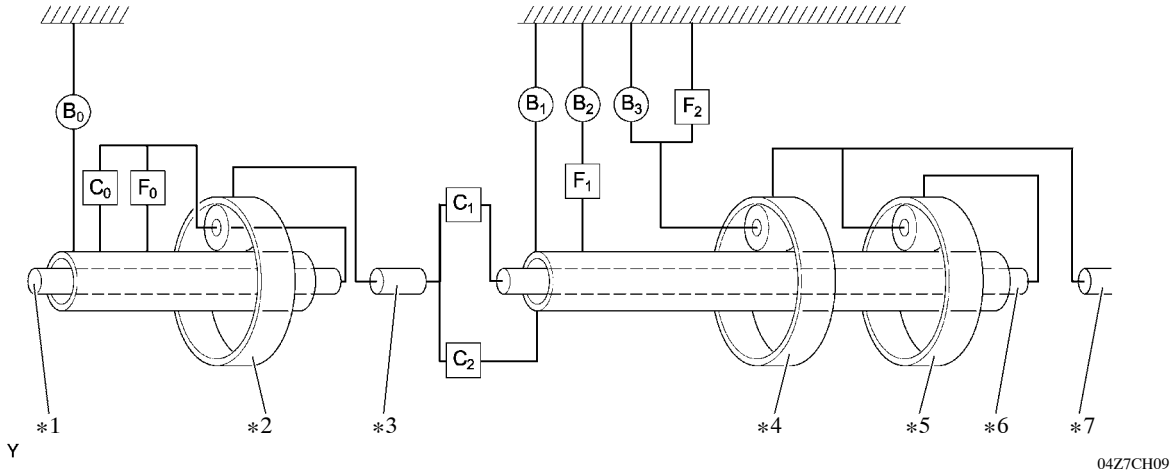
(1) The gear train consists of 3 multi-plate clutches, 3 multi-plate brakes, a single band type brake, 3 1-way clutches, and 3 sets of planetary gears each consisting of a sun gear, a pinion gear and a ring gear.



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▶ Text in Illustration ◀

∗1	Overdrive Input Shaft	∗2	Overdrive Planetary Gear Assembly
∗3	Input Shaft	∗4	Intermediate Shaft
∗5	Front Planetary Gear Assembly	∗6	Rear Planetary Gear Assembly
∗7	Output Shaft	∗8	No. 2 1-way Clutch (F_2)
∗9	1st and Reverse Brake (B_3)	∗10	1-way Clutch Assembly (F_1)
∗11	2nd Brake (B_2)	∗12	2nd Coast Brake (B_1)
∗13	Direct Clutch (C_2)	∗14	Forward Clutch (C_1)
∗15	Overdrive Brake (B_0)	∗16	Overdrive 1-way Clutch (F_0)
∗17	Overdrive Direct Clutch (C_0)	—	—

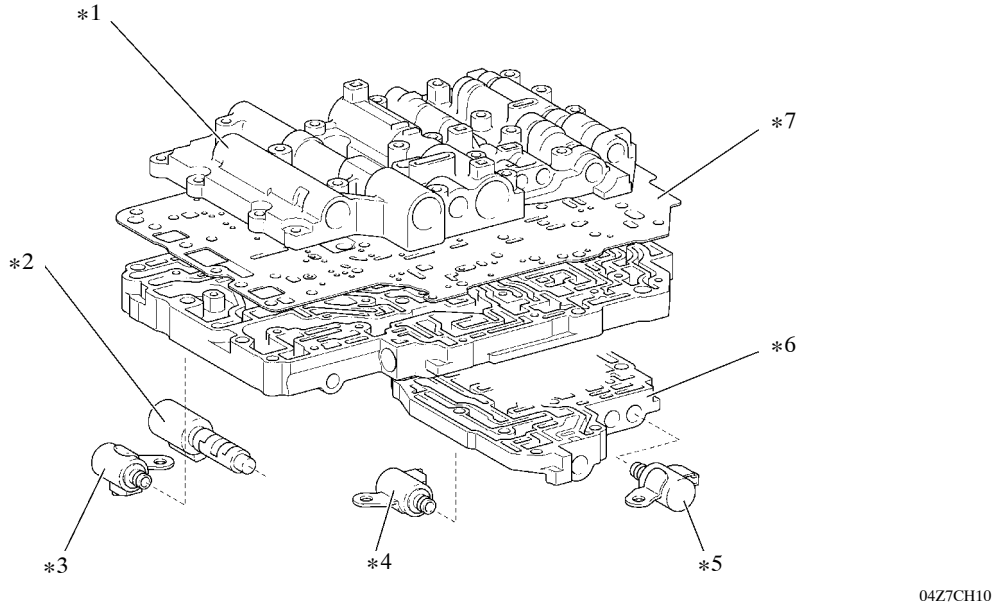


▶ Text in Illustration ◀

∗1	Overdrive Input Shaft	∗2	Overdrive Planetary Gear Assembly
∗3	Input Shaft	∗4	Front Planetary Gear Assembly
∗5	Rear Planetary Gear Assembly	∗6	Intermediate Shaft
∗7	Output Shaft	—	—

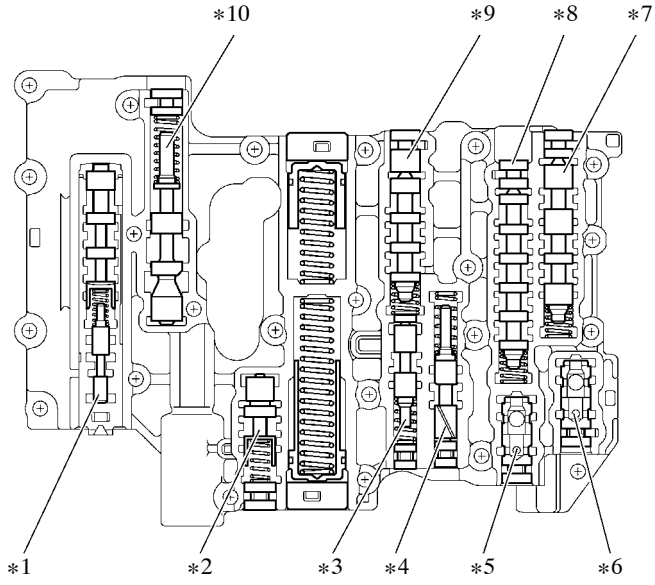
(d) Transmission Valve Body Assembly

(1) The transmission valve body assembly consists of upper and lower valve bodies and 4 shift solenoid valves.



▶ Text in Illustration ◀

∗1	Upper Valve Body	∗2	Shift Solenoid Valve SLT
∗3	Shift Solenoid Valve SL	∗4	Shift Solenoid Valve S1
∗5	Shift Solenoid Valve S2	∗6	Lower Valve Body Cover
∗7	Plate	—	—

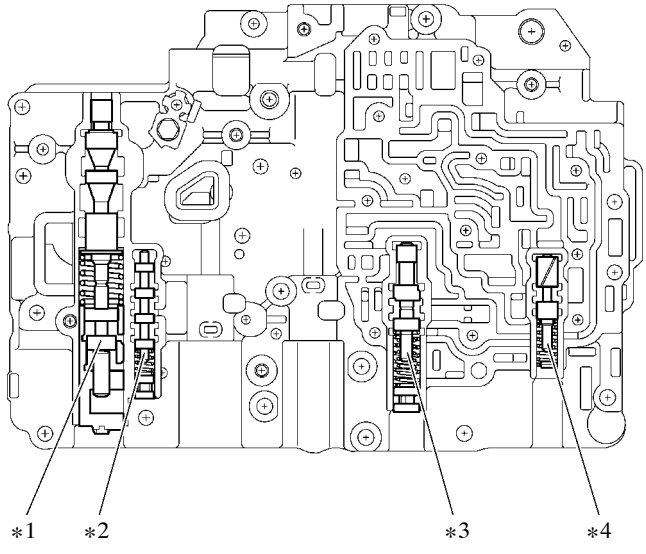


Y

04Z7CH11

▶ Text in Illustration (Upper Valve Body) ◀

∗1	Lock-up Relay Valve	∗2	Reverse Control Valve
∗3	Reverse Sequence Valve	∗4	Solenoid Modulator Valve
∗5	C_2 Check Valve	∗6	B_3 Check Valve
∗7	1-2 Shift Valve	∗8	2-3 Shift Valve
∗9	3-4 Shift Valve	∗10	Secondary Regulator Valve



Y

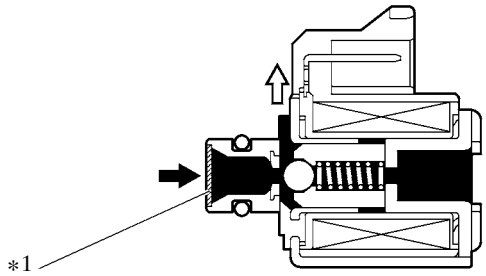
04Z7CH12

▶ Text in Illustration (Lower Valve Body Cover) ◀

∗1	Primary Regulator Valve	∗2	Cut Back Valve
∗3	C-1 Orifice Control Valve	∗4	Low Coast Modulator Valve

(e) Shift Solenoid Valves S1 and S2

(1) The shift solenoid valves S1 and S2 are 2-way solenoid valves.
(2) A filter is provided at the tip of each solenoid valve to further improve operational reliability.



Y

04Z7CH13

▶ Text in Illustration (Shift Solenoid Valves S1 and S2) ◀

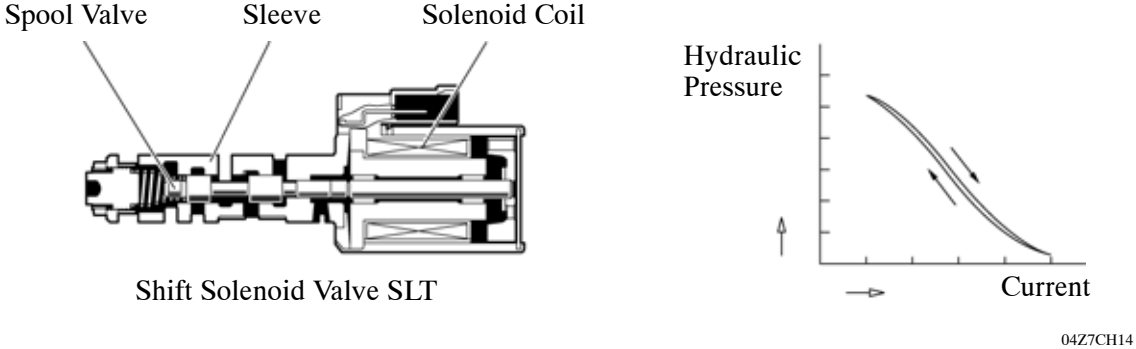
*1	Filter	—	—
04Z7CH27	Line Pressure	04Z7CH28	Control Pressure

▶ Function of Shift Solenoid Valves S1 and S2 ◀

Shift Solenoid Valve	Function
S1	Switches the 2-3 shift valve.
S2	Switches the 1-2 shift valve and the 3-4 shift valve.

(f) Shift Solenoid Valves SLT and SL

(1) In order to provide a hydraulic pressure that is proportional to the current that flows to the solenoid coil, the shift solenoid valve SLT linearly controls the line pressure based on the signals it receives from the ECM.

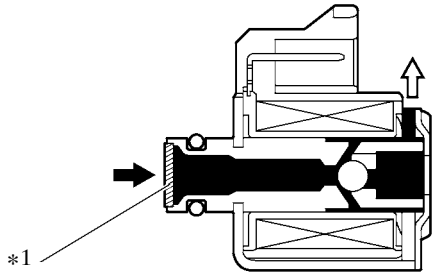


Y

04Z7CH14

(2) The shift solenoid valve SL is a 2-way solenoid valve.

(3) A filter is provided at the tip of the solenoid valve to further improve operational reliability.



Y

04Z7CH15

▶ Text in Illustration (Shift Solenoid Valve SL) ◀

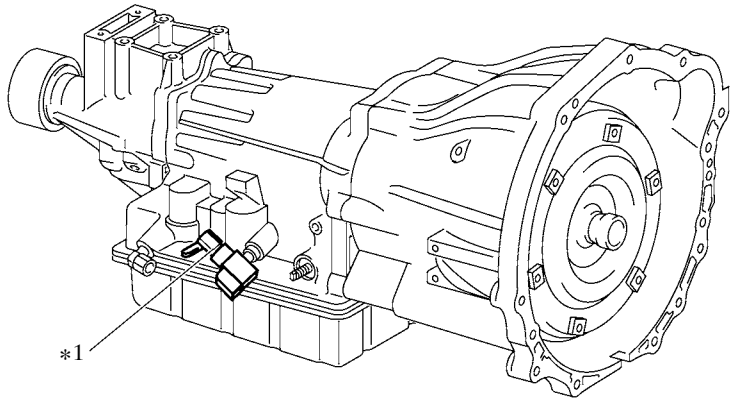
*1	Filter	—	—
04Z7CH27	Line Pressure	04Z7CH28	Control Pressure

▶ Function of Shift Solenoid Valves SLT and SL ◀

Shift Solenoid Valve	Function
SLT	● Line pressure control ● Accumulator back pressure control
SL	● Lock-up clutch pressure control ● Accumulator back pressure control

(g) ATF Temperature Sensor

(1) A temperature sensor, which is provided on the oil outlet, detects the ATF temperature necessary for shifting and for various controls and sends the information to the ECM.



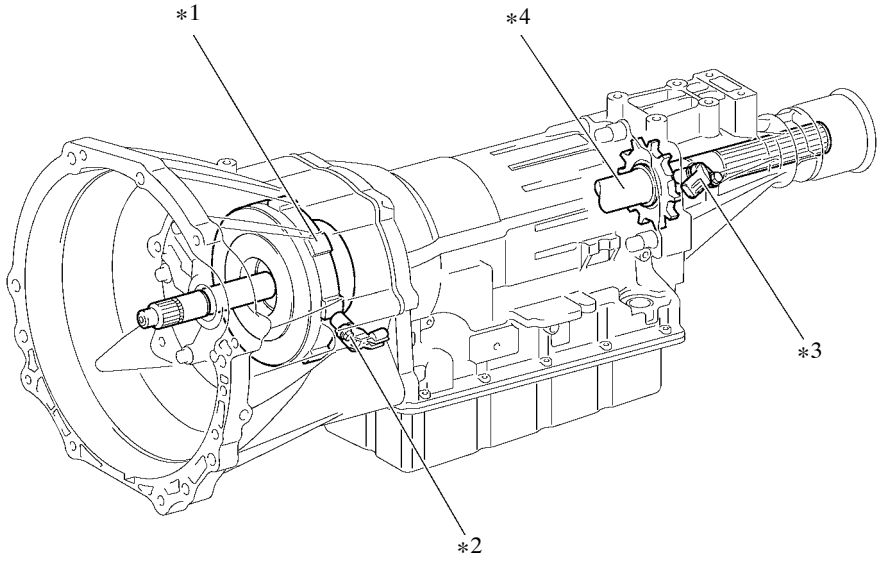
04Z7CH16

▶ Text in Illustration ◀

*1	Temperature Sensor	—	—

(h) Speed Sensors

(1) This automatic transmission uses a speed sensor (for NC0 signal) and a transmission revolution 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.
(2) These speed sensors are the pick-up coil type.
(3) The speed sensor detects the input speed of the transmission. The overdrive direct clutch drum is used as the timing rotor for this sensor.
(4) The transmission revolution sensor detects the speed of the output shaft assembly.

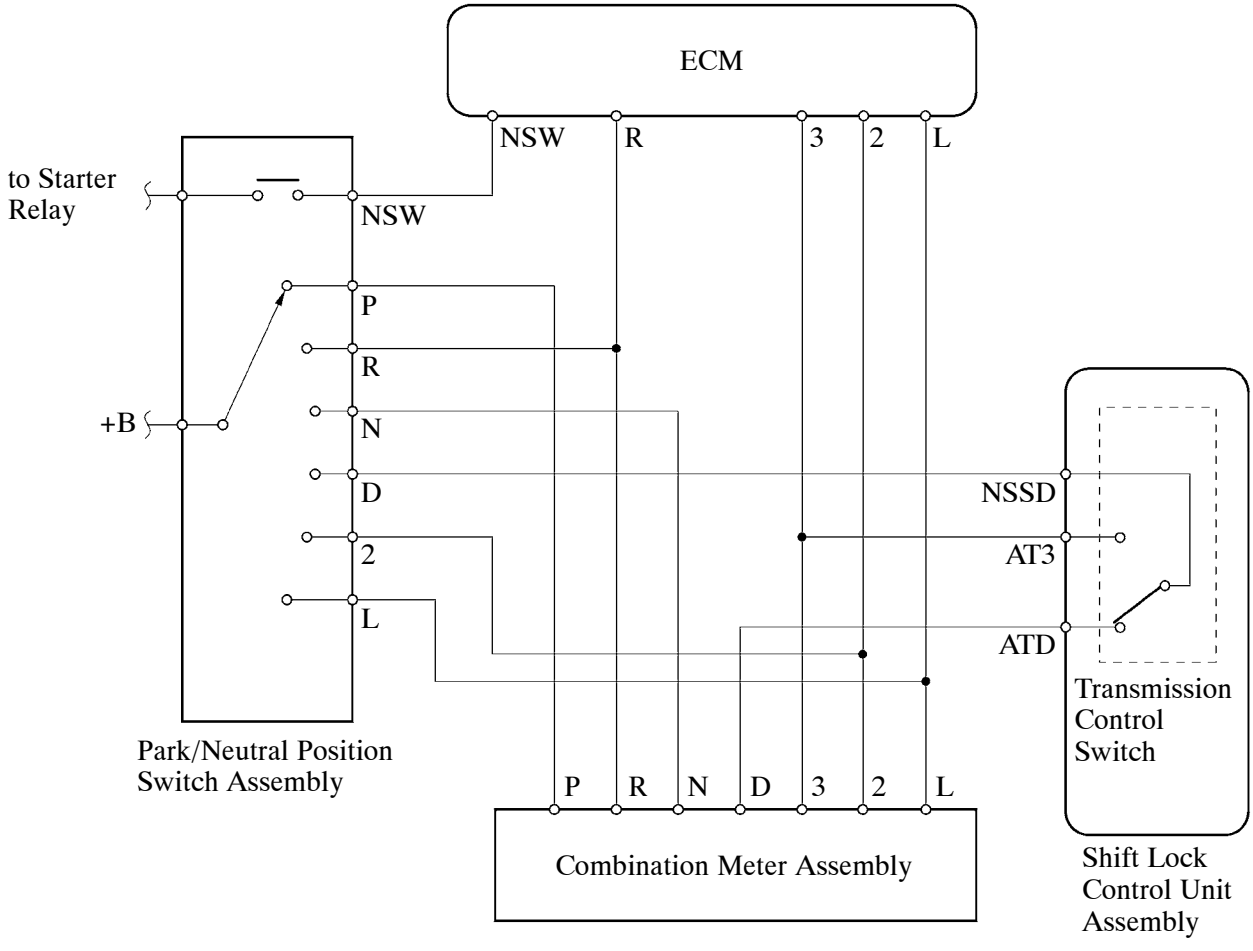


▶ Text in Illustration ◀

*1	Overdrive Direct Clutch Drum	*2	Speed Sensor
*3	Transmission Revolution Sensor	*4	Output Shaft Assembly

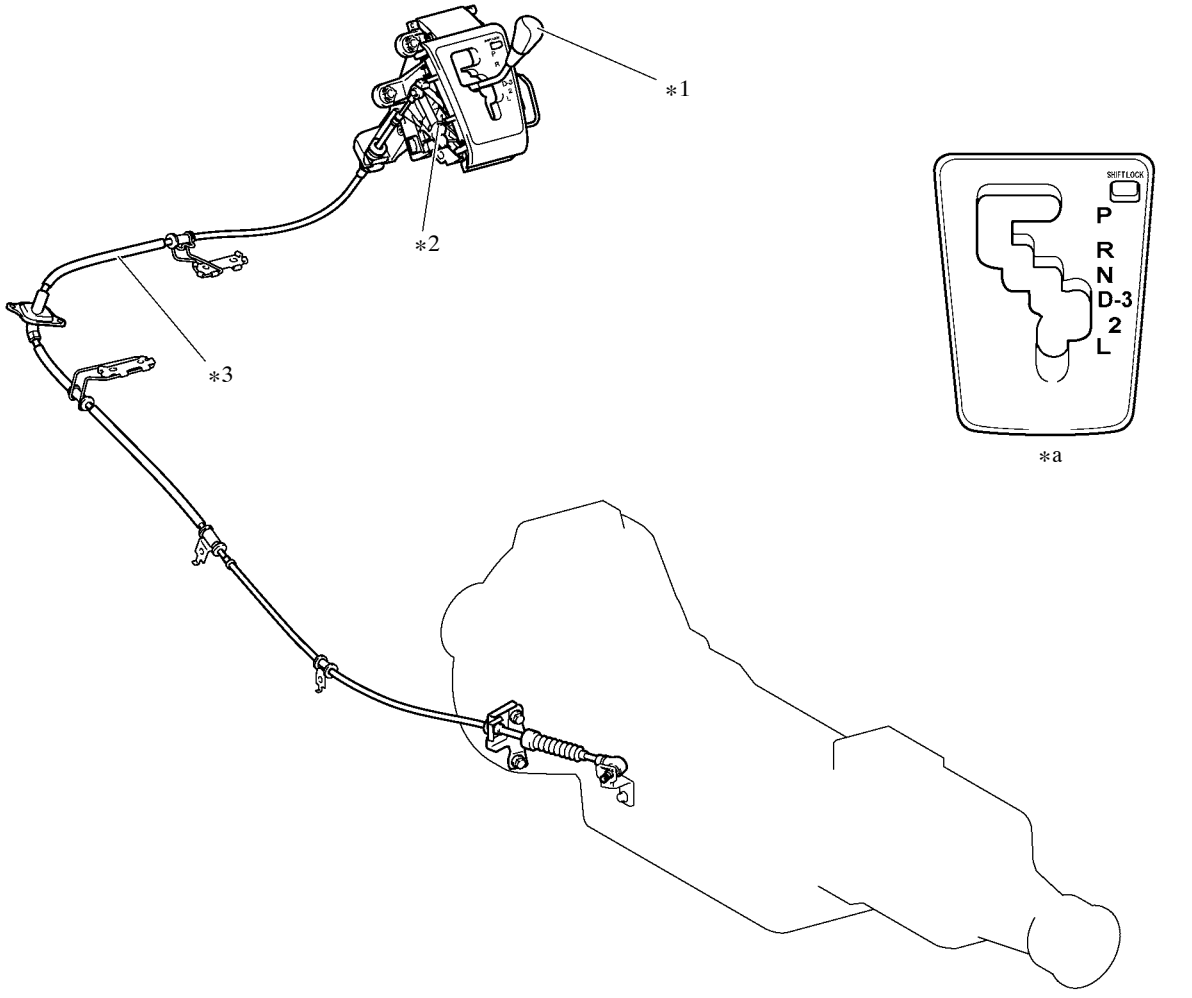
(i) Park/Neutral Position Switch Assembly and Transmission Control Switch

(1) The ECM uses the park/neutral position switch assembly and the transmission control switch to detect the shift lever position.
(2) The park/neutral position switch assembly sends the R, 2, L and NSW signals to the ECM. It also sends signals for the shift position indicator “P, R, N, 2 and L” in the combination meter assembly.
(3) The transmission control switch is located in the shift lock control unit assembly. This switch sends the 3 signal to the ECM. It also sends a signal for the shift position indicator “D and 3” in the combination meter assembly.



(j) Shift Control Mechanism

(1) A gate type shift lever that uses a transmission control cable is used.
(2) The shift control mechanism consists of a shift lock control unit assembly and a transmission control cable assembly.



04Z7CH19

▶ Text in Illustration ◀

∗1	Shift Lever Knob	∗2	Shift Lock Control Unit Assembly
∗3	Transmission Control Cable Assembly	—	—
∗a	Shift Pattern	—	—

5. Operation

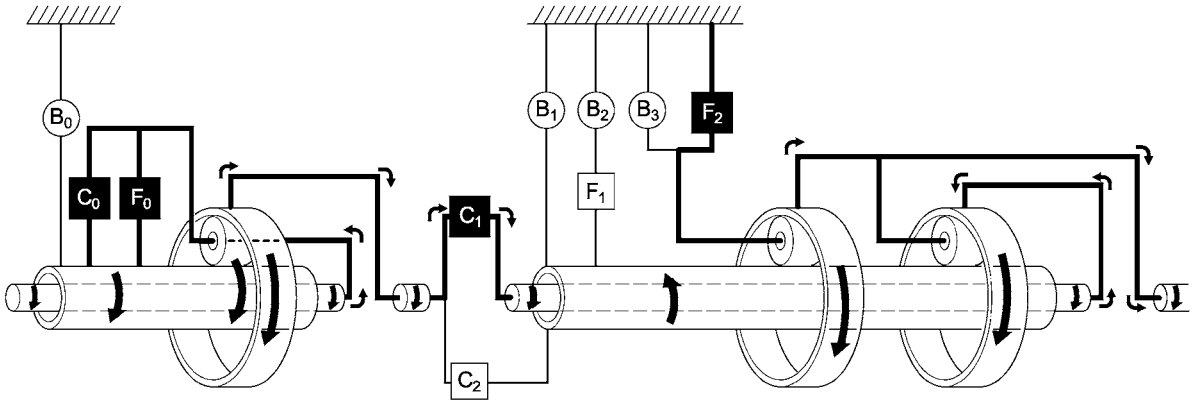
(a) Transmission Power Flow

▶ Operating Condition ◀

Shift Lever Position and Gear Range	Gear Position	Shift Solenoid Valve		Clutch				Brake					1-way Clutch		
		S_1	S_2	C_0	C_1	C_2		B_0	B_1	B_2	B_3		F_0	F_1	F_2
						IP	OP				IP	OP			
P	Park	On	Off	○	—	—	—	—	—	—	—	—	—	—	—
R	Reverse	On	Off	○	—	○	○	—	—	—	○	○	○	—	—
N	Neutral	On	Off	○	—	—	—	—	—	—	—	—	—	—	—
D	1st	On	Off	○	○	—	—	—	—	—	—	—	○	—	○
	2nd	On	On	○	○	—	—	—	—	○	—	—	○	○	—
	3rd	Off	On	○	○	○	—	—	—	○	—	—	○	—	—
	4th	Off	Off	—	○	○	—	○	—	○	—	—	—	—	—
3	1st	On	Off	○	○	—	—	—	—	—	—	—	○	—	○
	2nd	On	On	○	○	—	—	—	—	○	—	—	○	○	—
	3rd	Off	On	○	○	○	—	—	—	○	—	—	○	—	—
2	1st	On	Off	○	○	—	—	—	—	—	—	—	○	—	○
	2nd	On	On	○	○	—	—	—	○	○	—	—	○	○	—
L	1st	On	Off	○	○	—	—	—	—	—	○	○	○	—	○

HINT:
○: Operates
—: Does not operate
IP: Inner Piston
OP: Outer Piston

(1) 1st Gear (Shift Lever in D, 3 or 2)



Y

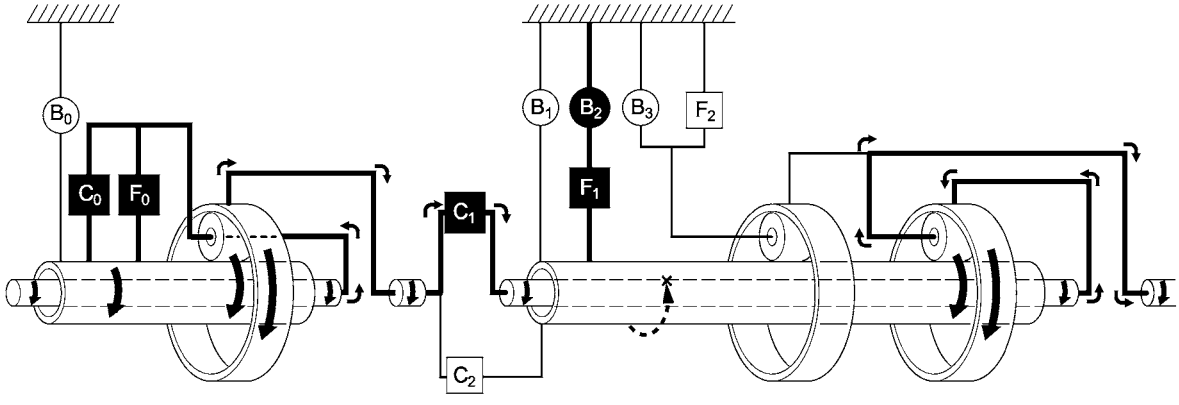
04Z7CH20

▶ Text in Illustration ◀

04Z7CH29	Operates	—	—

	C_0	C_1	C_2 IP	C_2 OP	B_0	B_1	B_2	B_3	F_0	F_1	F_2
1st	○	○	—	—	—	—	—	—	○	—	○

(2) 2nd Gear (Shift Lever in D or 3)



Y

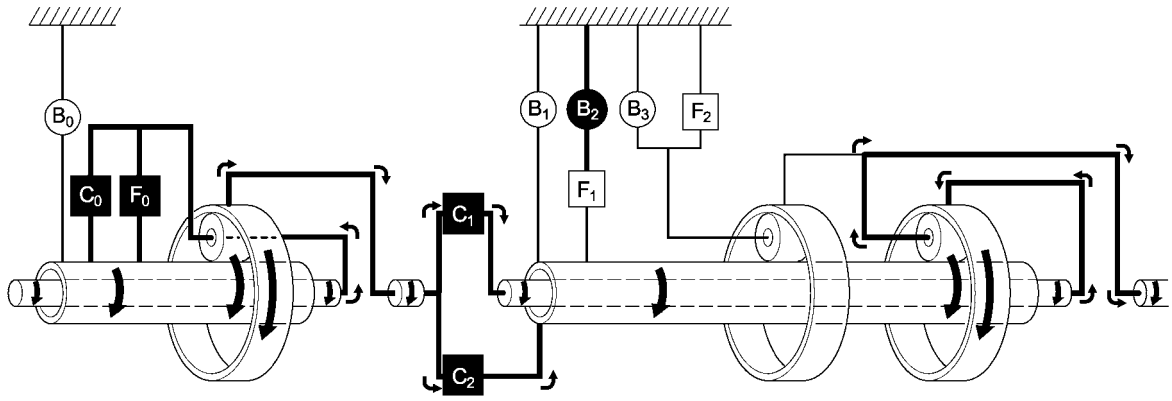
04Z7CH21

▶ Text in Illustration ◀

04Z7CH29	Operates	—	—

	C_0	C_1	C_2 IP	C_2 OP	B_0	B_1	B_2	B_3	F_0	F_1	F_2
2nd	○	○	—	—	—	—	○	—	○	○	—

(3) 3rd Gear (Shift Lever in D or 3)



Y

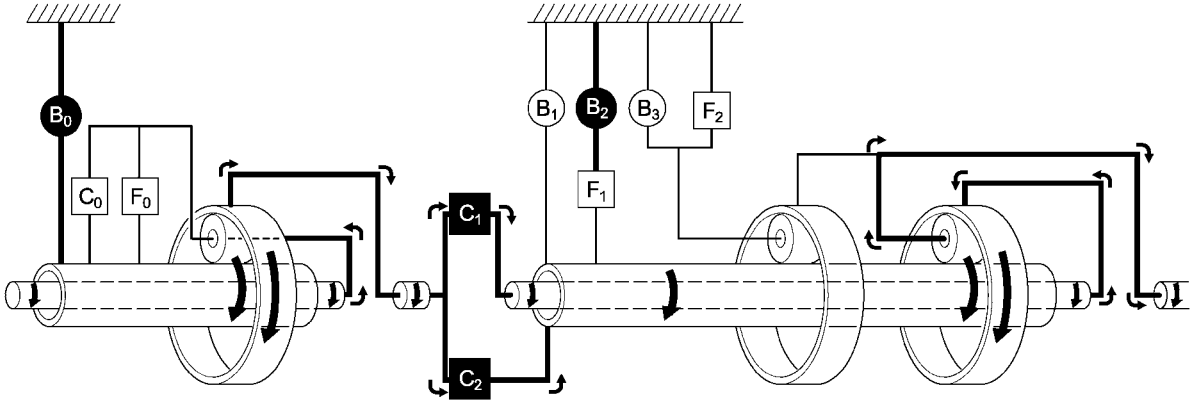
04Z7CH22

▶ Text in Illustration ◀

■ 04Z7CH29	Operates	—	—

	C_0	C_1	C_2 IP	C_2 OP	B_0	B_1	B_2	B_3	F_0	F_1	F_2
3rd	○	○	○	○	—	—	○	—	○	—	—

(4) 4th Gear (Shift Lever in D)



Y

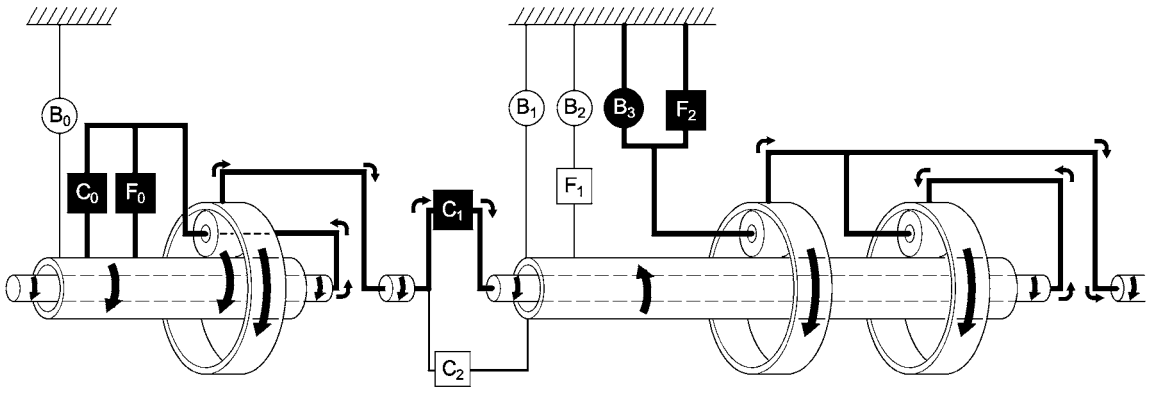
04Z7CH23

▶ Text in Illustration ◀

■ 04Z7CH29	Operates	—	—

	C_0	C_1	C_2 IP	C_2 OP	B_0	B_1	B_2	B_3	F_0	F_1	F_2
4th	—	○	○	○	○	—	○	—	—	—	—

(5) Engine Braking in 1st Gear (Shift Lever in L)



Y

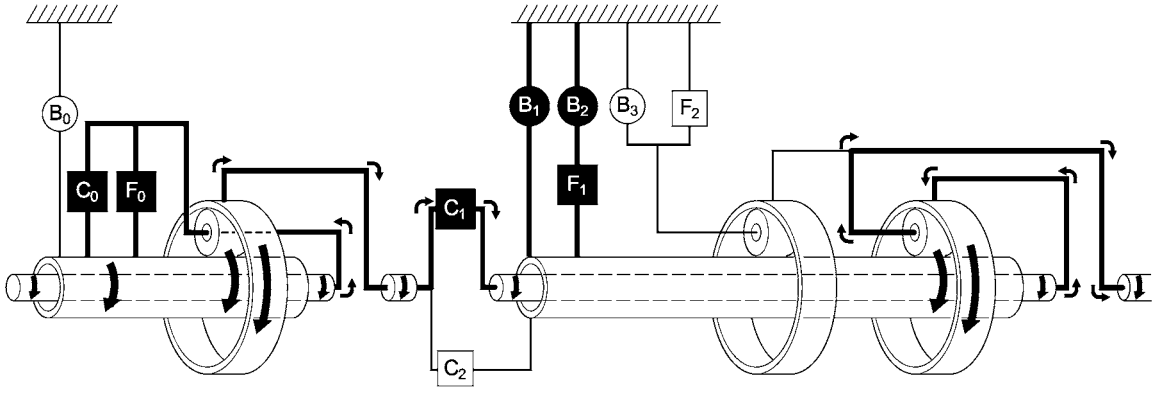
04Z7CH24

▶ Text in Illustration ◀

04Z7CH29	Operates	—	—

	C_0	C_1	C_2 IP	C_2 OP	B_0	B_1	B_2	B_3	F_0	F_1	F_2
1st	○	○	—	—	—	—	—	○	○	—	○

(6) Engine Braking in 2nd Gear (Shift Lever in 2 or L)



Y

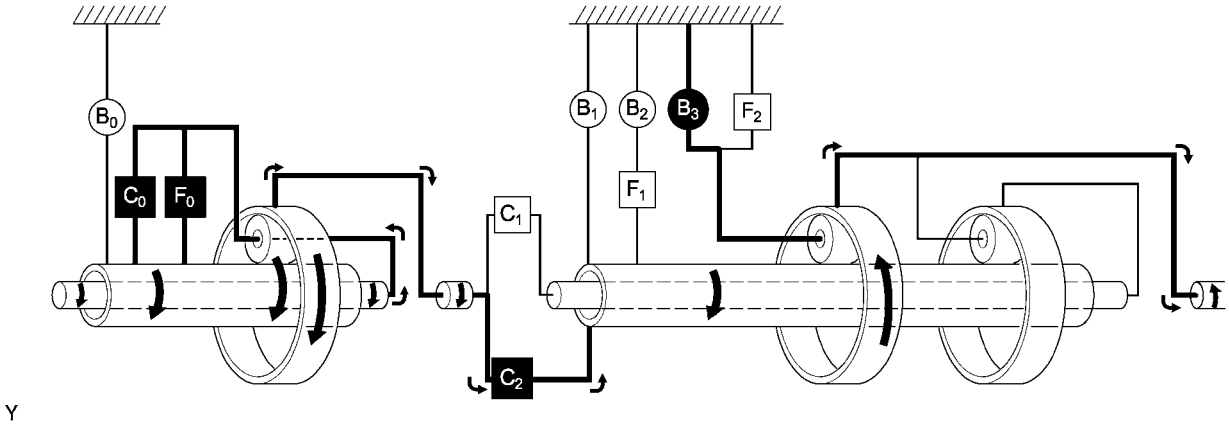
04Z7CH25

▶ Text in Illustration ◀

04Z7CH29	Operates	—	—

	C_0	C_1	C_2 IP	C_2 OP	B_0	B_1	B_2	B_3	F_0	F_1	F_2
2nd	○	○	—	—	—	○	○	—	○	○	—

(7) Reverse Gear (Shift Lever in R)



▶ Text in Illustration ◀

■ 04Z7CH29	Operates	—	—

	C_0	C_1	C_2 IP	C_2 OP	B_0	B_1	B_2	B_3	F_0	F_1	F_2
R	○	—	○	○	—	—	—	○	○	—	—

6. Fail-Safe

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

▶ Fail-safe Control List ◀

Malfunction Part	Function
Transmission Revolution Sensor (SP2)	During a transmission revolution sensor malfunction, shift control is effected through the speed sensor signal (NC0) or engine speed signal (NE).
Temperature Sensor	During a malfunction of the temperature sensor, the system effects control by fixing the ATF temperature at 80°C (176°F).
Shift Solenoid Valve S1/S2	The current to the failed shift solenoid valve is cut off and control is effected by operating the other solenoid valves with normal operation.
Shift Solenoid Valve SLT	During a shift solenoid valve SLT malfunction, the current to the shift solenoid valve is stopped. This stops line pressure control, thus increasing shift shock. However, shifting is effected through normal clutch pressure control.
Shift Solenoid Valve SL	During a shift solenoid valve SL malfunction, the current to the shift solenoid valve is stopped. This stops lock-up control, thus decreasing fuel economy.

7. Diagnosis

(a) When the ECM detects a malfunction, it makes a diagnosis and memorizes the failed section. Furthermore, the ECM illuminates or blinks the MIL in the combination meter assembly to inform the driver.

(b) The ECM will also store the Diagnostic Trouble Codes (DTCs) of the malfunctions.

(c) The DTCs can be read by connecting an intelligent tester II to the DLC3.

(d) For details, refer to the corresponding Repair Manual for this model.