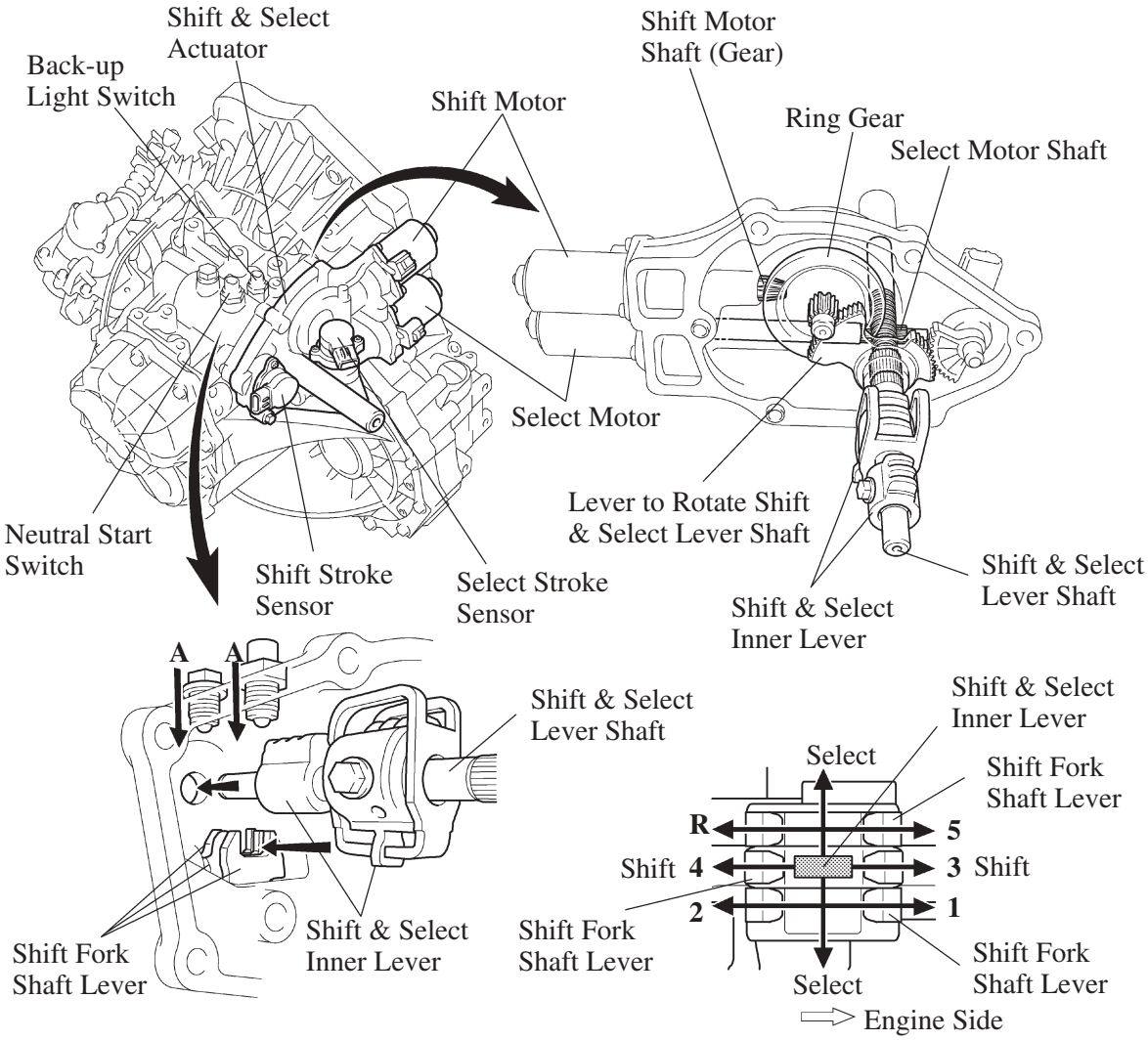
■CONSTRUCTION AND OPERATION

1. Shift & Select Actuator

General

- The shift & select actuator consists of a shift motor, select motor, shift stroke sensor, select stroke sensor, and shift & select mechanism (shift & select inner lever, shift & select lever shaft, shift motor shaft, select motor shaft, ring gear, and a lever to rotate the shift & select lever shaft). This actuator cannot be disassembled.
- The rotation of the shift motor is transmitted to the reduction gear (shift motor shaft, ring gear, lever to rotate shift & select lever shaft) and the shift & select lever shaft and causes the shift & select inner lever to rotate.
- The rotation of the select motor is transmitted to the rack & pinion gear and the shift & select lever shaft and causes the shift & select inner lever to slide.
- The movement of the shift & select inner lever is transmitted to the shift fork shaft via the shift fork shaft lever. As a result, the gear position changes.

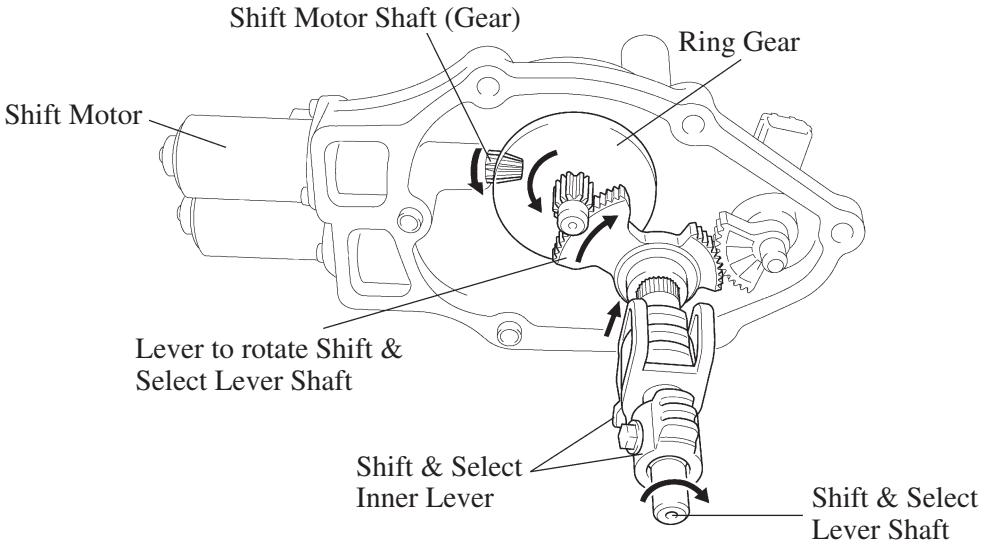
▶ C53A Multi-mode Manual Transmission Construction ◀



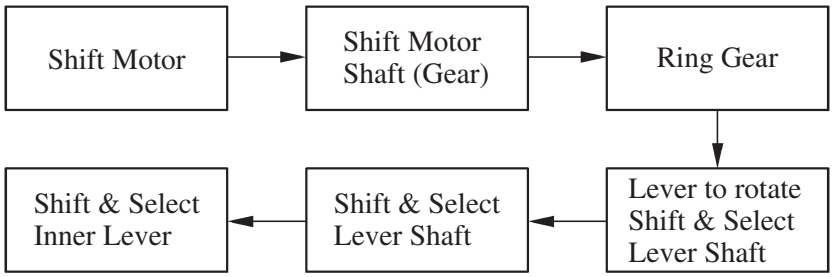
View of shift and select operation as seen from "A"

00SCH110Y

▶ Shift Operation ◀

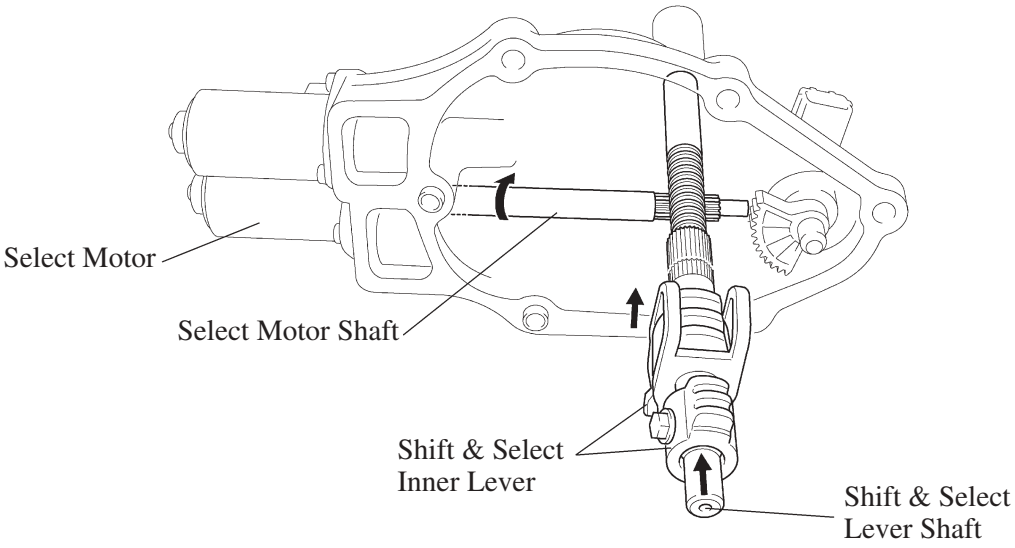


00SCH92Y

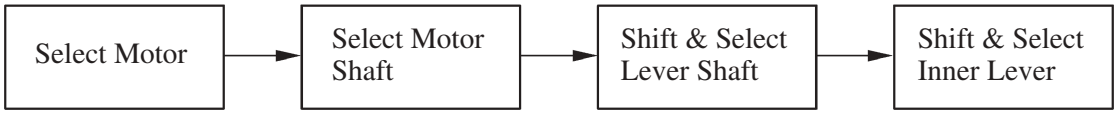


244CH32

▶ Select Operation ◀



00SCH93Y

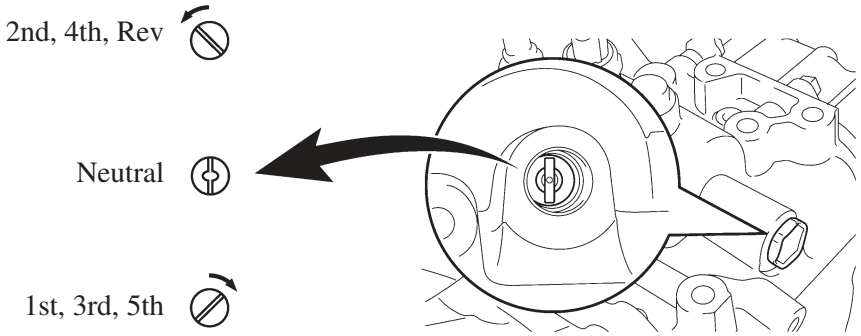


244CH33

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Service Tip

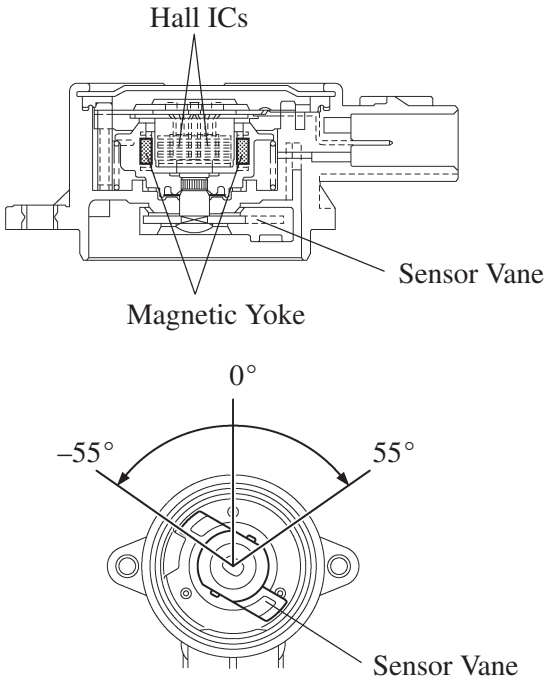
Make sure to set the gear position to neutral before removing the shift & select actuator. In case that the gear cannot be shifted to the neutral position due to malfunctions of the actuator and/or transaxle gear, remove the plug from the transmission case and observe the position of the slit within. If the slit is in a position other than neutral, use a screwdriver to set it to neutral.



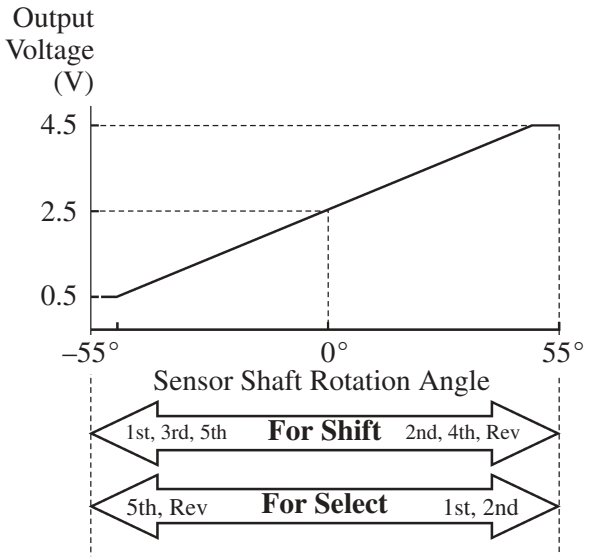
00SCH96Y

Shift and Select Stroke Sensor

- The shift and select stroke sensor consists of 2 Hall ICs and magnetic yoke that rotates in unison with the shift & select lever shaft movement. The shift and select stroke sensors convert the changes in the magnetic flux that are caused by the rotation of the shift motor and the select motor (hence, the rotation of the magnetic yoke) into electric signals, and output them to the M-MT ECU. The M-MT ECU determines the extent of the shift stroke and the select stroke from these electric signals in order to determine the present gear position.
- The main and sub circuits in the shift stroke sensor and the select stroke sensor exhibit the same output characteristics.

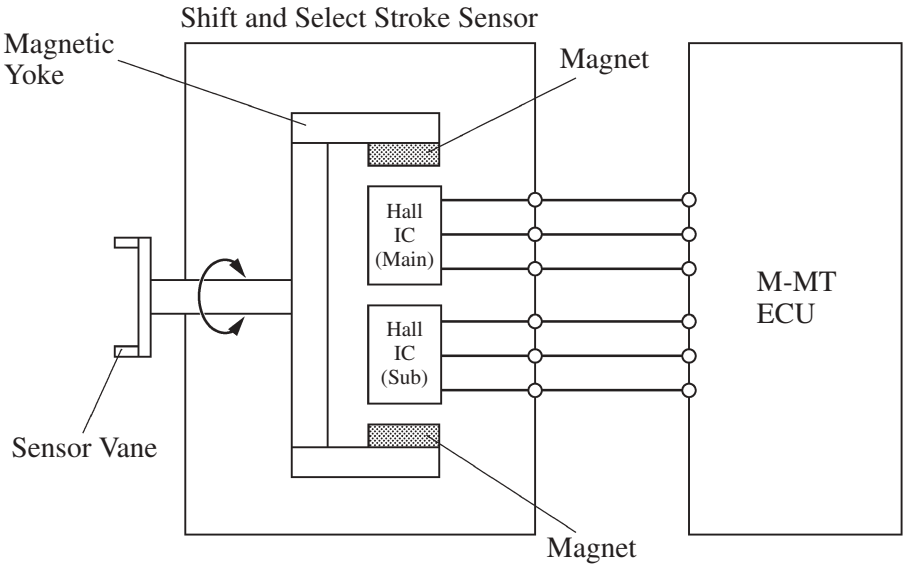


244CH07



244CH13

▶ System Diagram ◀



244CH09

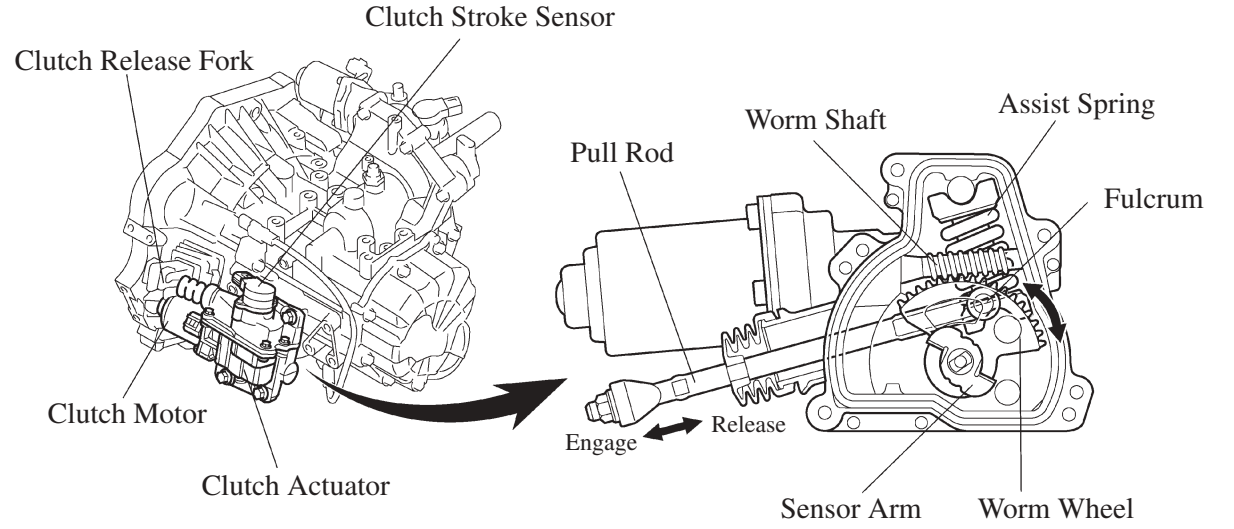
2. Clutch Actuator

General

- The clutch actuator consists of clutch motor, clutch stroke sensor, worm shaft, worm wheel, pull rod* and assist spring. This actuator cannot be disassembled.
- The rotation of the clutch motor travels to the reduction gear of the worm shaft and the worm wheel, thus causing the worm wheel to rotate. This movement causes the pull rod* to move via a fulcrum provided on the worm wheel, actuating the clutch release fork.
- The worm wheel is provided with an assist spring, which provides a force to assist the movement of the pull rod* when the clutch is being operated. This reduces the load on the clutch motor at the time the clutch is being released.

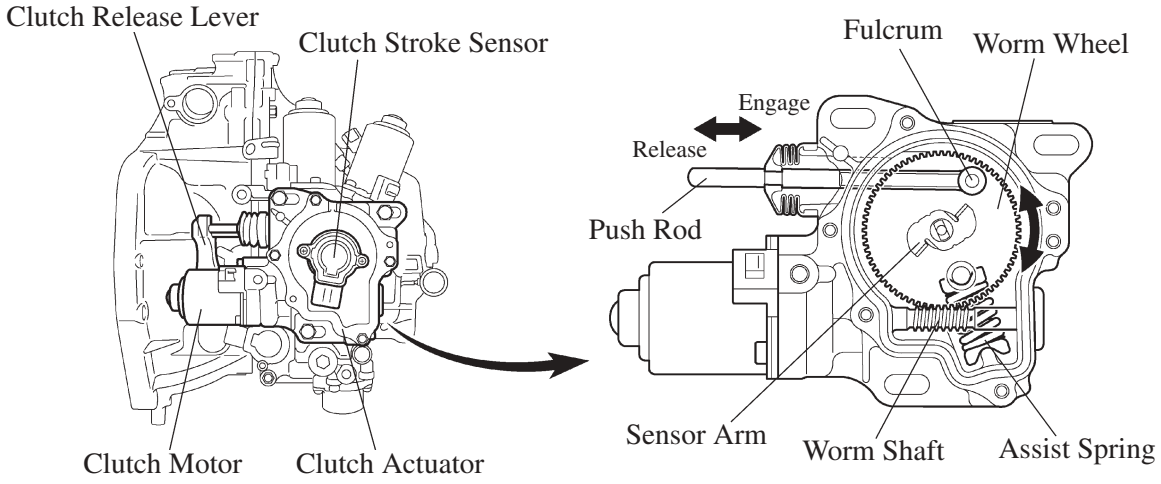
*: Only for the C53A multi-mode manual transmission. In the C551A multi-mode manual transmission, this part is called push rod.

▶ C53A Clutch Actuator ◀



263CH34

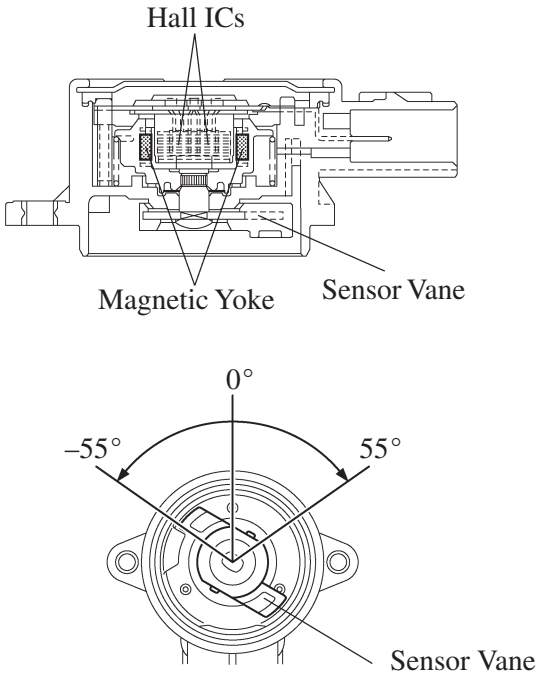
▶ C551A Clutch Actuator ◀



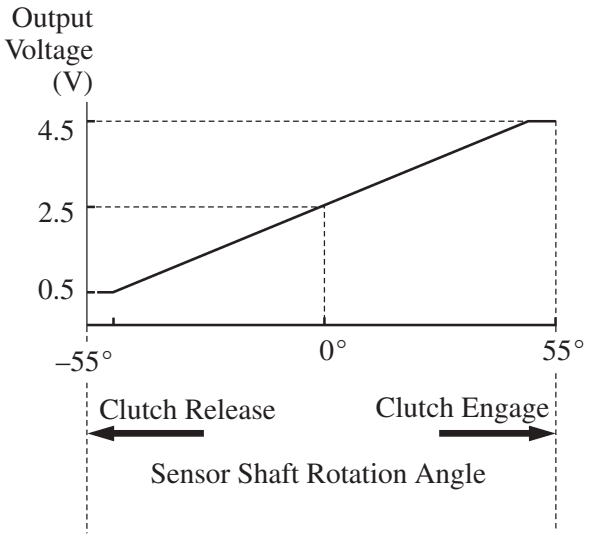
00SCH111Y

Clutch Stroke Sensor

- As same as the shift and select stroke sensors, the clutch stroke sensor consists primarily of 2 Hall ICs (main and sub), and a magnetic yoke that rotates in unison with the rotation of the worm wheel.
- The 2 Hall ICs convert the changes in the magnetic flux that are caused by the rotation of the clutch motor (hence, the rotation of the magnetic yoke) into electric signals, and output them to the M-MT ECU. The M-MT ECU determines the extent of the clutch stroke from these electric signals.
- The main and sub circuits in the clutch stroke sensor exhibit the same output characteristics.
- The basic construction and operation of the clutch stroke sensor is the same as those of the shift and select stroke sensors.

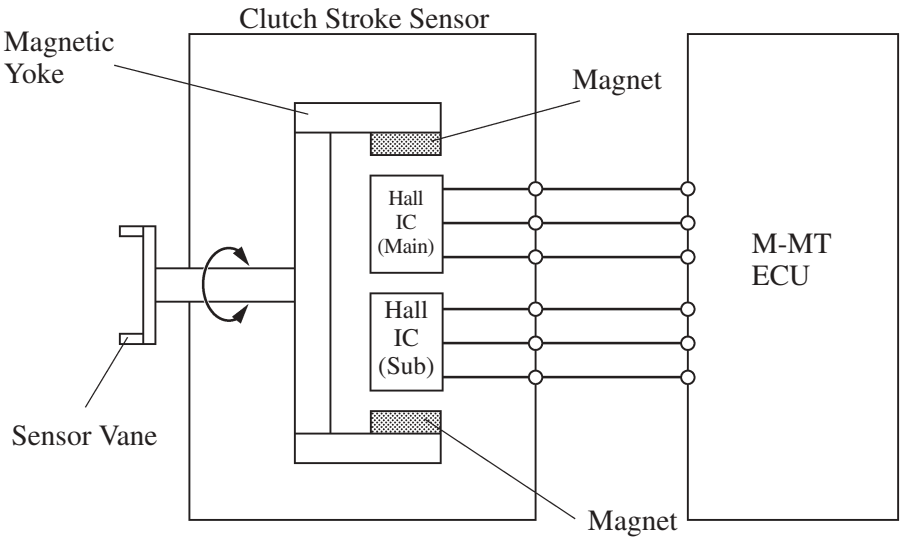


244CH07



244CH08

▶ System Diagram ◀

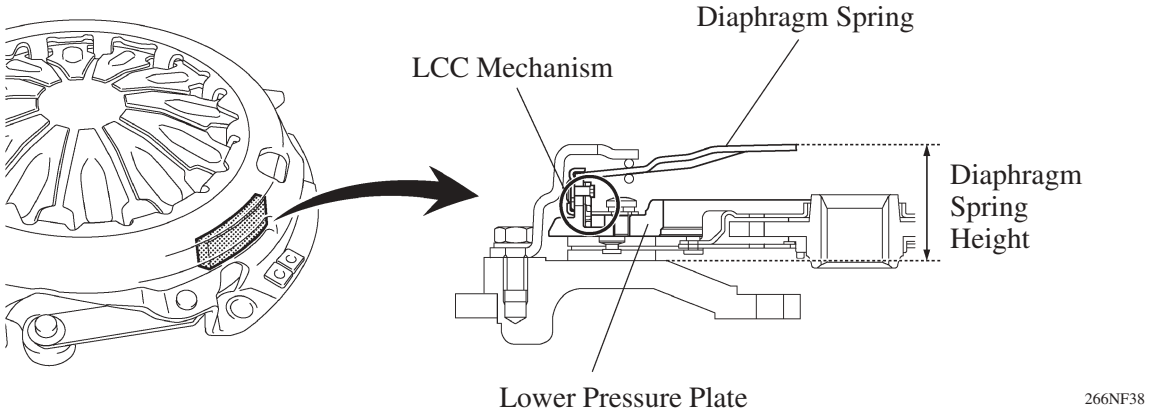


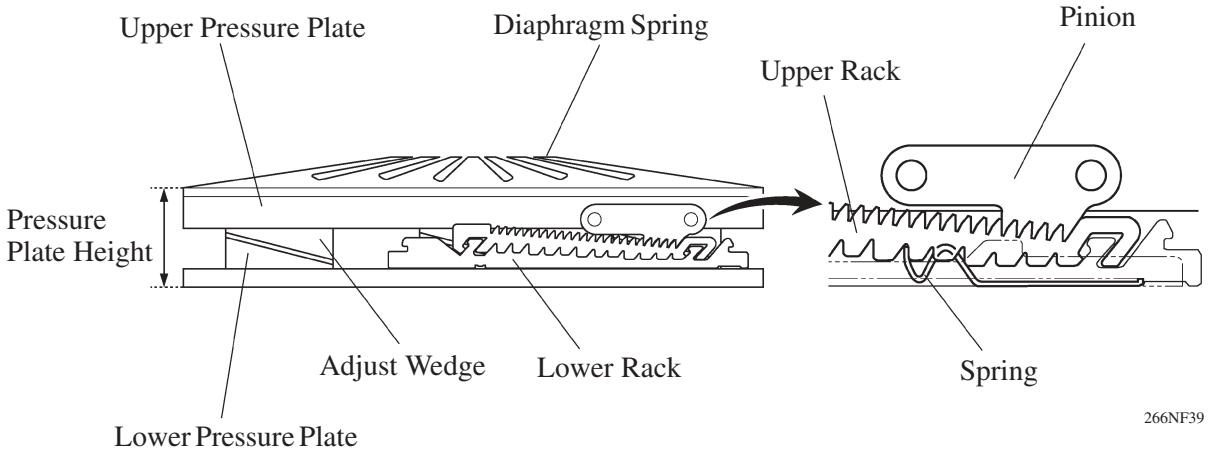
244CH09

3. LCC (Load Controlled Clutch cover) Mechanism

General

- To minimize the increase in the clutch operating load that results from the change in the pressure plate height with the wear of the clutch disc facing, the LCC (Load Controlled Clutch cover) mechanism mechanically adjusts the pressure plate height to a predetermined position.
- The LCC mechanism is provided in the clutch cover and consists of a pinion and diaphragm spring which are located on the upper pressure plate, and a lower rack, upper rack, adjust wedge, and spring which are located on the lower pressure plate.
- Upon determining an increase in the clutch operating load through the load (clutch motor amperage) that is applied to the clutch motor, the M-MT ECU operates the clutch actuator in order to move the diaphragm spring to the operating range of the LCC mechanism. This enables the LCC mechanism to operate and mechanically adjust the pressure plate height to a predetermined position.

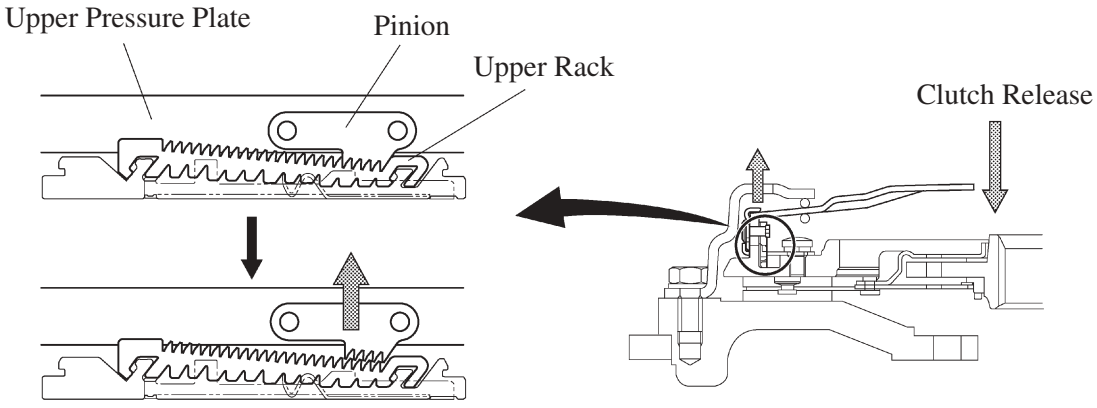




Operation

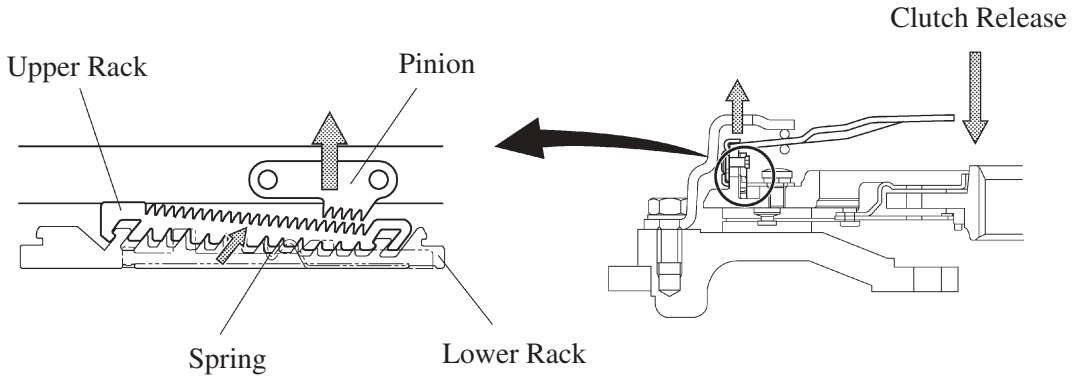
- Upon determining an increase in the clutch operating load through the load (clutch motor amperage) that is applied to the clutch motor, the M-MT ECU performs a clutch operation with an amount of clutch release that is greater than normal*1, soon after the power source mode is selected to OFF with the vehicle stopped. Thus, the diaphragm spring becomes more compressed than normal (LCC operation range), allowing the upper pressure plate and the pinion to move upward more than normal. As a result, the pinion and the upper rack become disengaged.

*1: The M-MT ECU starts this operation prior to the parking control (see page CH-35) that is performed when the power source mode is selected to OFF.



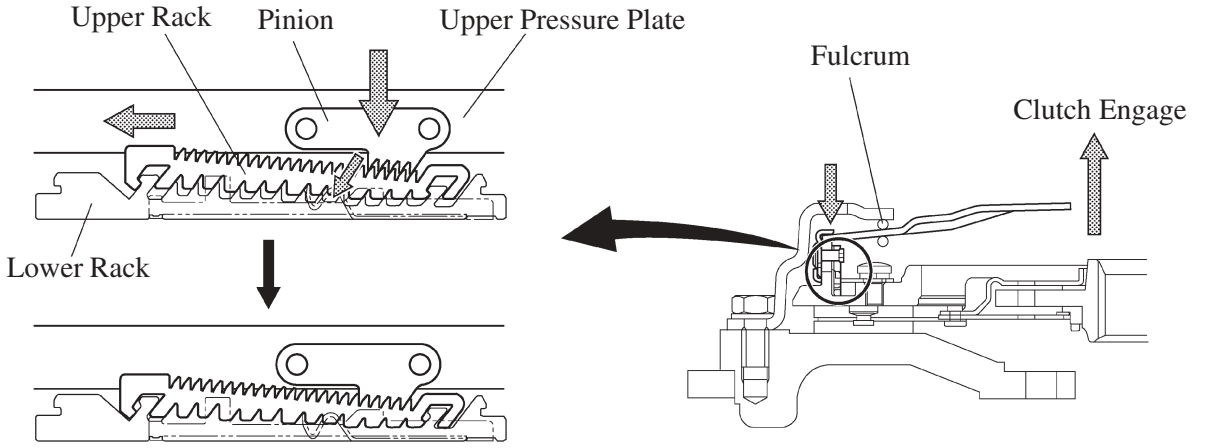
244CH17

- When the pinion and the upper rack are disengaged, the spring force causes the upper rack to move diagonally to the right along the teeth of the lower rack. As a result, the tooth position of the upper rack and the pinion shifts by 1 pitch as compared to before the operation of the LCC mechanism.

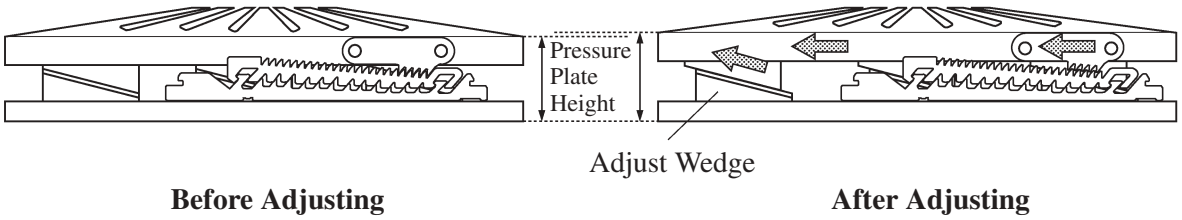


244CH18

- The M-MT ECU stops the clutch release operation and starts the clutch engagement operation. Because the tooth position of the pinion and the lower rack is shifted 1 pitch as compared to before the operation of the LCC mechanism, the pinion and the upper pressure plate move together to the left and engage with the lower rack.
- At this time, the upper pressure plate also moves to the left via the adjust wedge, causing the position of the upper pressure plate to become higher than before the operation of the LCC mechanism. Due to the rise in the upper pressure plate position, the diaphragm spring height decreases via the fulcrum. As a result, the diaphragm spring becomes adjusted to a lower height than before the operation of the LCC mechanism.



244CH19

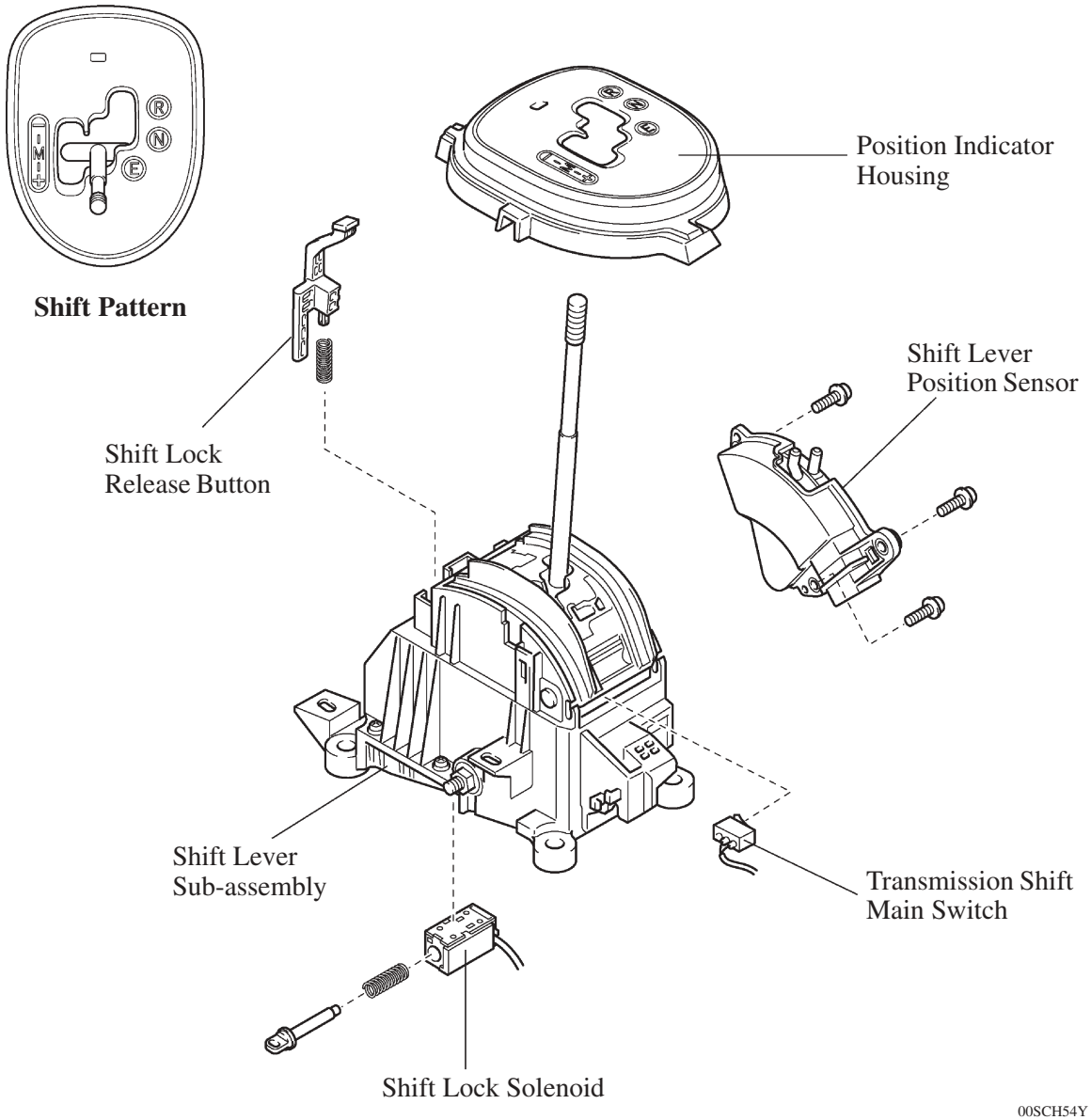


244CH34

4. Shift Lever

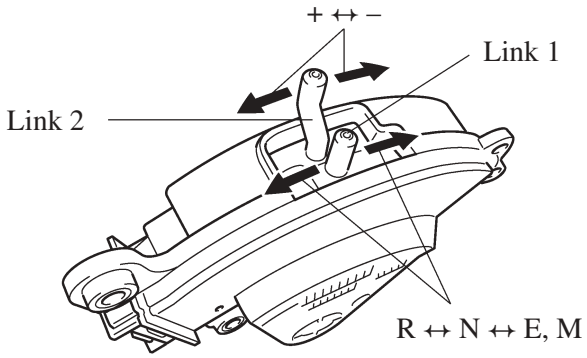
General

- The shift lever mainly consists of the shift lever position sensor, transmission shift main switch, shift lock solenoid and shift lever sub-assembly.
- The multi-mode manual transmission system uses a shift-by-wire system in which the M-MT ECU changes the gear position via actuators in accordance with the shift lever position that has been detected through the shift lever position sensor and the transmission shift main switch.
- An electrical shift lock mechanism that uses a shift lock solenoid to restrict the movement of the shift lever is used.



Shift Lever Position Sensor and Transmission Shift Main Switch

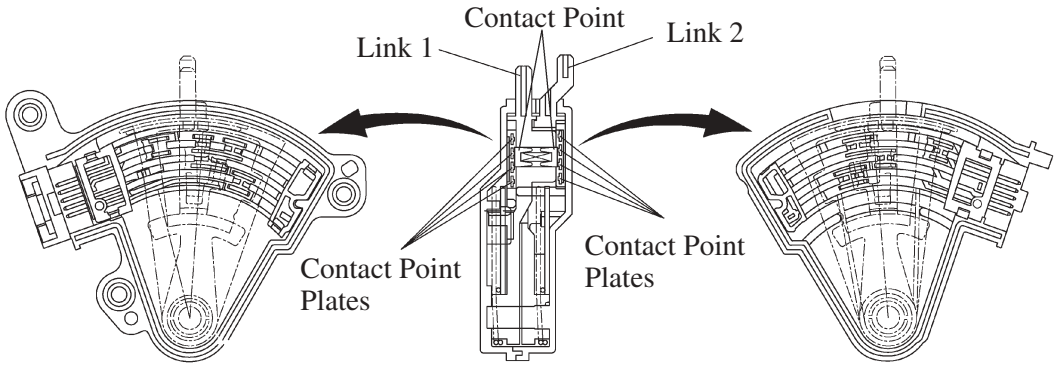
- The shift lever position sensor consists of a Link 1 circuit that detects the R, N, E, and M positions of the shift lever, and a Link 2 circuit that detects the "+" and "–" positions. The circuits are connected to the shift lever via the respective links. The contact switches (6 contact switches for Link 1, and 2 contact switches for Link 2) of the circuits turn ON and OFF in accordance with the fore-aft movement of the shift lever. The M-MT ECU determines the present shift lever position in accordance with the ON/OFF status of these contact switches.
- The transmission shift main switch detects the side-to-side movement of the shift lever. It turns OFF when the shift lever is in the R, N, or E position, and ON in the M, "+", or "–" position.



Shift Lever Position Sensor 244CH15

- The shift lever position sensor and the transmission shift main switch convert the shift lever position into electric signals and output them to the M-MT ECU. The M-MT ECU determines the present shift lever position from these signals and operates the actuators to change the gear position.

▶ Shift Lever Position Sensor Cross Section ◀



Contact Point for LSWR, LSSC, LSNC and LSW–

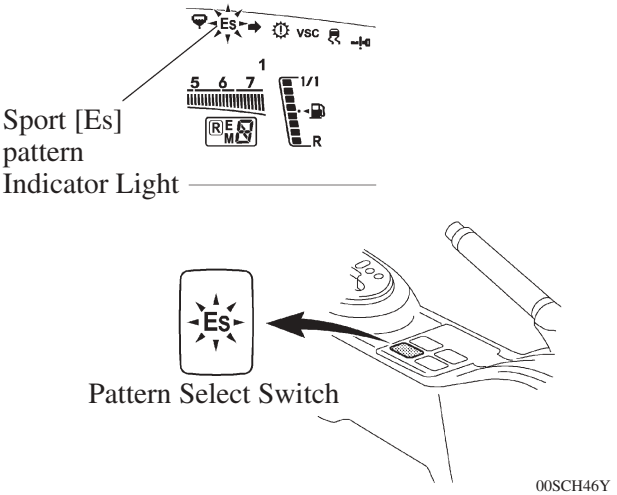
Contact Point for LSRC, LSWS, LSWN and LSW+

244CH30

Contact Point		Shift Lever Position					
		R	N	E	M	+	–
Link 1	LSRC (Shift Lever Switch Reverse Check)	OFF	ON	ON	ON	ON	ON
	LSWR (Shift Lever Switch Reverse)	ON	OFF	OFF	OFF	OFF	OFF
	LSSC (Shift Lever Switch Sequential Check)	ON	ON	OFF	OFF	OFF	OFF
	LSWS (Shift Lever Switch Sequential)	OFF	OFF	ON	ON	ON	ON
	LSNC (Shift Lever Switch Neutral Check)	ON	OFF	ON	ON	ON	ON
	LSWN (Shift Lever Switch Neutral)	OFF	ON	OFF	OFF	OFF	OFF
Link 2	LSW– (Shift Lever Switch –)	OFF	OFF	OFF	OFF	ON	OFF
	LSW+ (Shift Lever Switch +)	OFF	OFF	OFF	OFF	OFF	ON
Transmission Shift Main Switch		OFF	OFF	OFF	ON	ON	ON

Pattern Select Switch

- In the automatic shift mode (E-mode), the driver can select the automatic shift control patterns between the normal [E] pattern and the sporty [Es] pattern by pressing the Es switch that is located on the center console.
- The normal [E] pattern is always selected at the time the engine is started.

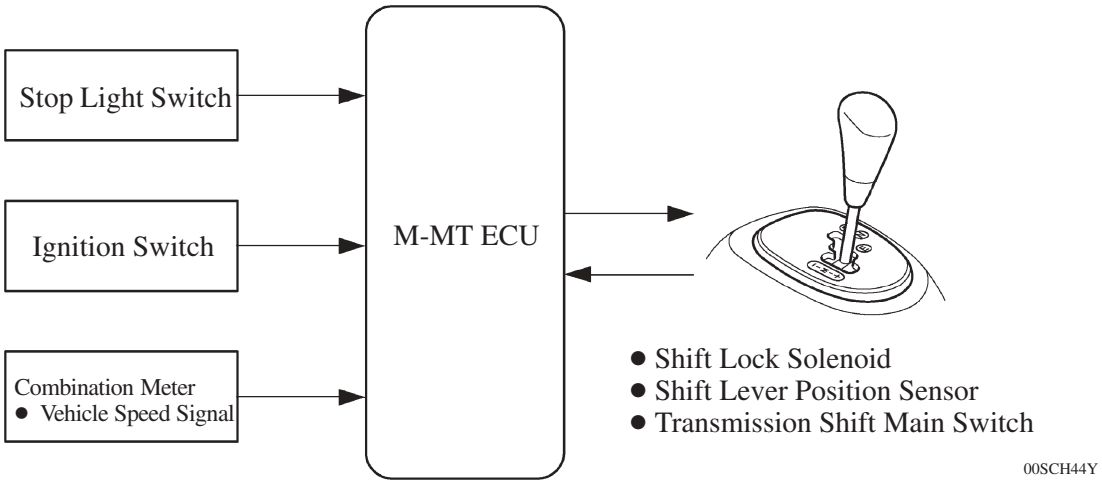


Shift Lock Mechanism

- The shift lock mechanism activates under the conditions listed below.
  - The shift lock mechanism activates when the power source mode is selected from IG-ON to OFF, and locks the shift lever in the position (R, N, E and M) that is selected when the power source mode has been selected to OFF. Thus, it disables the operation of the shift lever with the power source mode OFF (when the shift & select actuator is inactive). As a result, it prevents the shift position selected at the shift lever and the actual shift position in the transaxle from being mismatched, thus preventing the unintended operation of the shift lever.
  - When the brake pedal is not depressed for 2 seconds or longer while the following three conditions are satisfied, the shift lock mechanism activates to lock the shift lever in the neutral position:
    - Shift lever is in the neutral position
    - The vehicle speed is approximately 7 km/h (4 mph) or less
    - Engine is running

  Thus, it prevents the unintended operation of the shift lever, which prevents the vehicle from moving suddenly.
- The shift lock mechanism becomes deactivated when the power source mode is selected to IG-ON and the brake pedal is depressed, thus allowing the driver to operate the shift lever.
- A shift lock release button that can manually cancel the shift lock mechanism has been provided.

▶ System Diagram ◀



CH