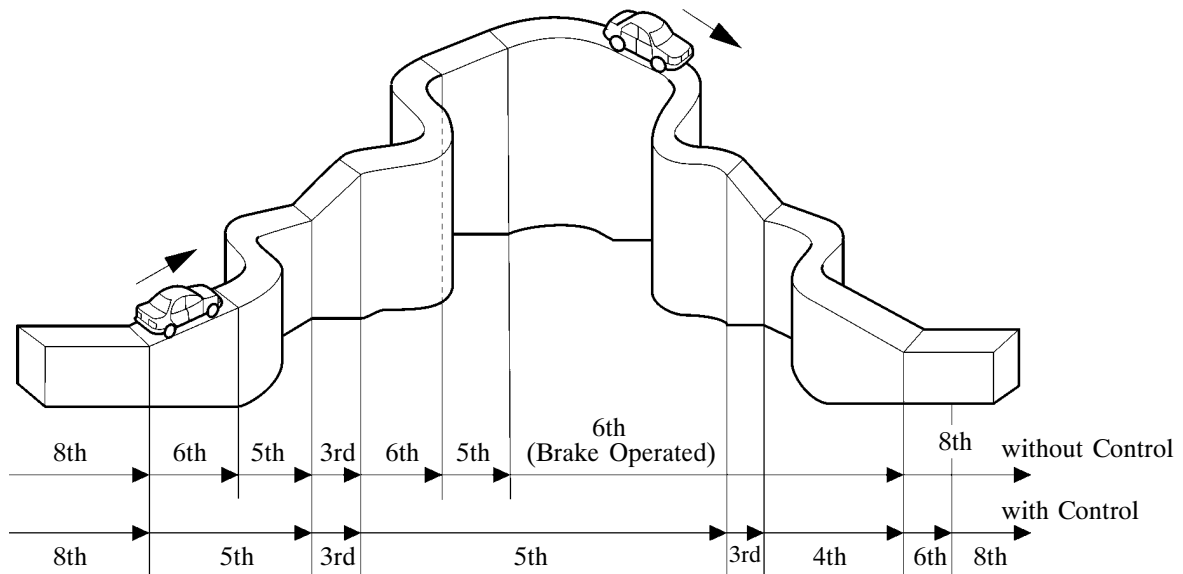


Road Condition Support Control

Under road condition support control, the ECM identifies the throttle valve opening angle and the vehicle speed to determine whether the vehicle is traveling uphill or downhill, and indicates the optimal gear to the TCM.

- To achieve the optimal drive force while driving uphill, this control prevents the transmission from upshifting to 6th or 7th or 8th gear.
- To achieve the optimal engine brake effect while driving downhill, this control automatically downshifts the transmission to 5th or 4th or 3rd gear.



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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.

13. Multi-mode Transmission

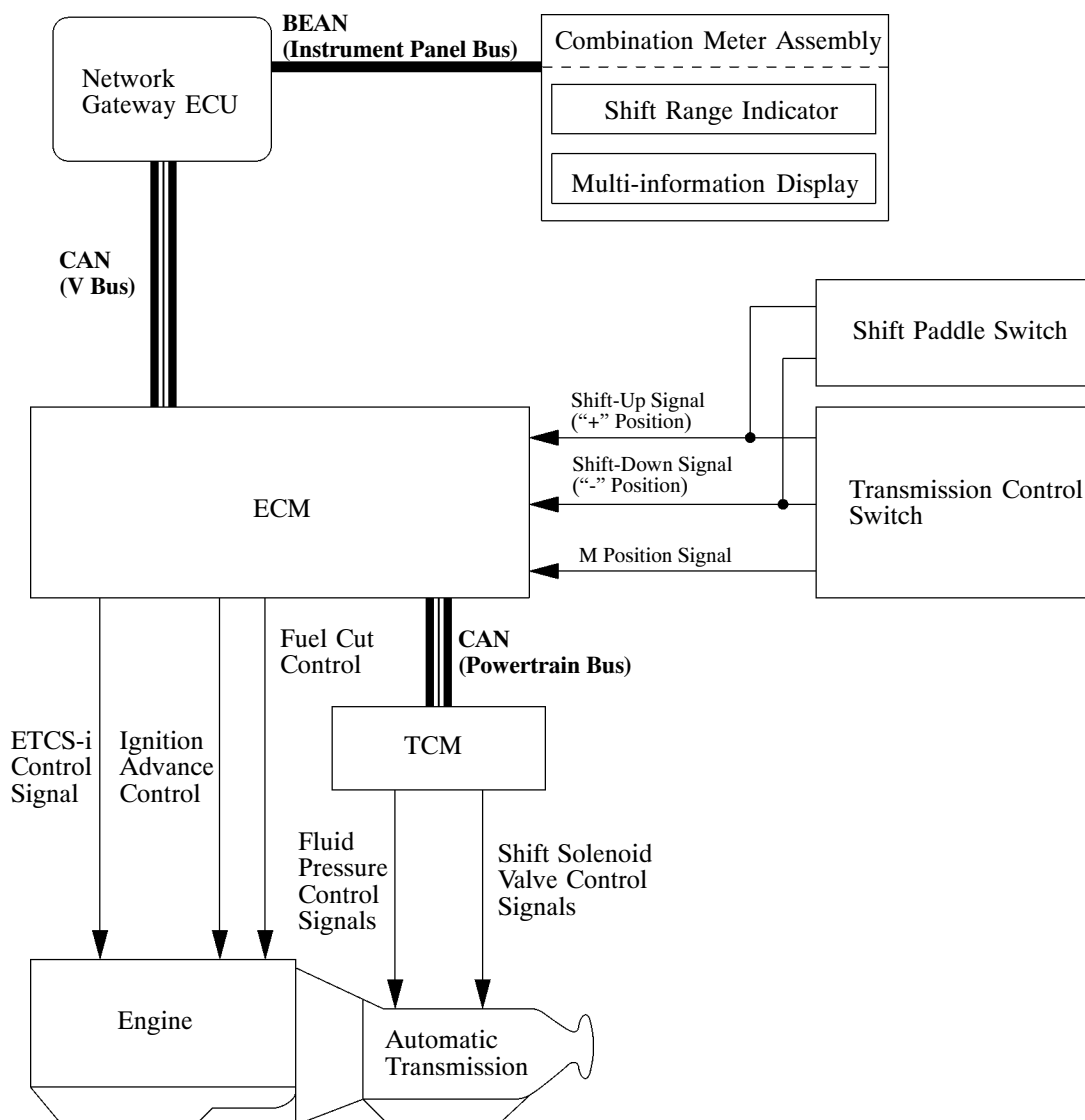
General

By moving the shift lever to the front (“+”position) or to the rear (“-”position), the driver can select the desired gear (only M position). Also, shift paddle switches are adopted, which enable changing the shift ranges or gears while the driver is holding the steering wheel. Thus, the driver is able to shift gears with a manual-like feel.

- When the shift lever is moved to the M position, automatic shift mode changes to 8-speed sport direct shift control, enabling the driver to drive the vehicle in a gear selected using the shift lever or shift paddle switches “+” (UP) or “-” (DOWN).

When the shift lever is in the D position, operating the shift paddle switch “-” (DOWN) enables D position (fixed range mode), allowing the driver to drive the vehicle in a desired gear range using the “+” (UP) or “-” (DOWN) shift paddle switches.

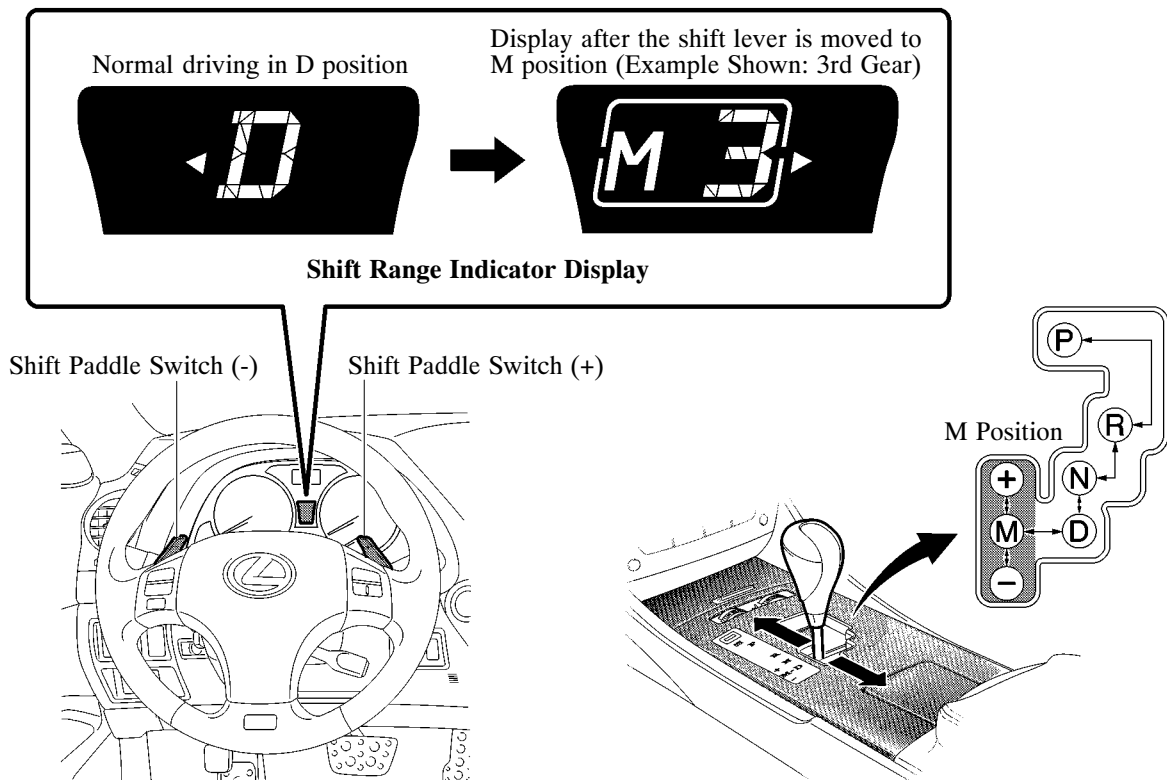
► System Diagram ◀



Selection of 8-speed Sport Direct Shift Control

When the shift lever is moved from the D position to the M position, 8-speed sport direct shift control is activated and gear hold type sequential shift mode is entered. At this time, the shift range indicator “M” illuminates to inform the driver that 8-speed sport direct shift control has been activated.

- When the shift lever or a shift paddle switch is operated “+” (UP), or “-” (DOWN), an upshift or downshift will be performed from the currently selected gear.
- The default gear when the shift lever is moved from the D position to the M position is the same gear as the gear that was in use while driving in the D position. (No gear shift occurs when the shift lever is moved from the D position to the M position.)
- If the shift lever is moved from the D position to the M position during the system check that occurs after the engine switch is turned on (IG) (while the “F” mark is displayed on the multi-information display), this will cause both D position control and the D indication on the shift range indicator to continue. If the shift lever is moved from the D position to the M position after the system check completes, 8-speed sport direct shift control will be performed.



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- To prevent engine overrevving, selection of lower gears using 8-speed sports direct shift control will not be permitted until the appropriate speed specified in the following table has been reached.

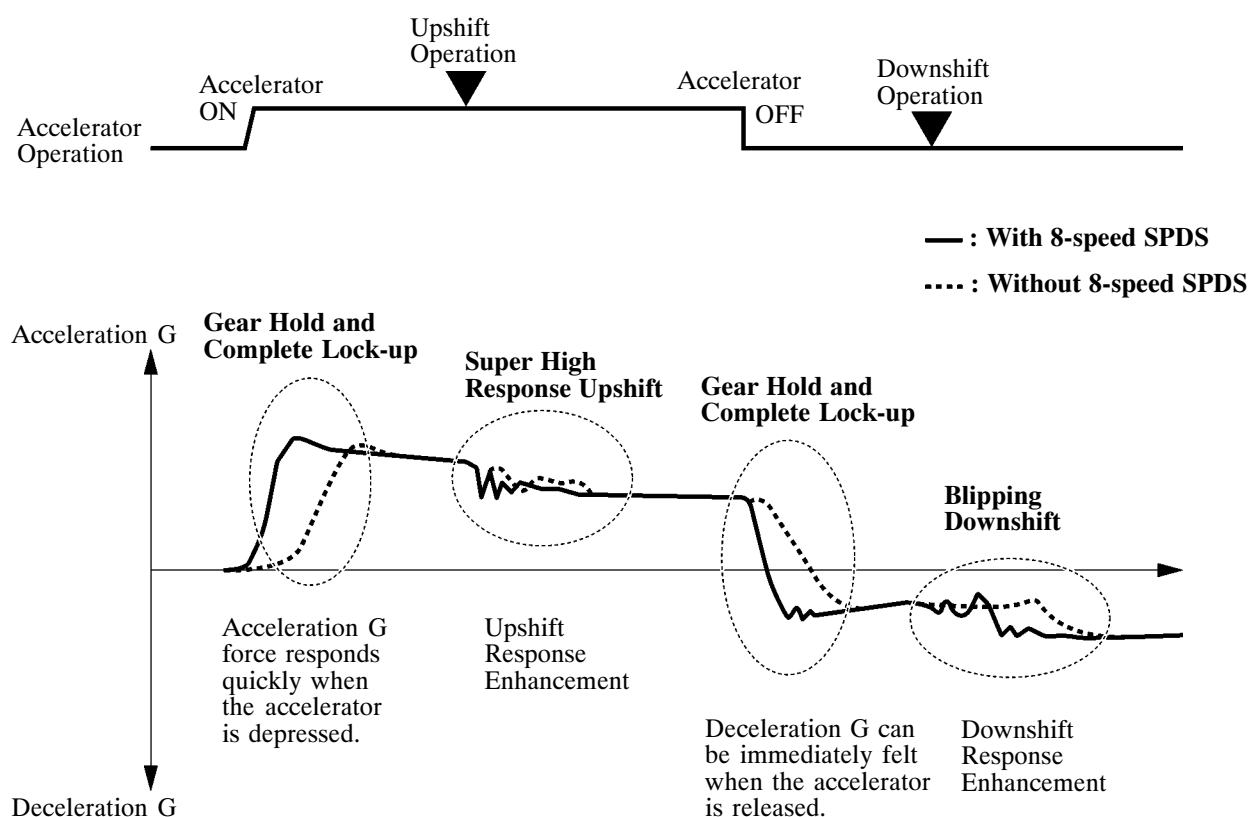
Downshift Permission Speed: mph [km/h]					
M2 → M1	M3 → M2	M4 → M3	M5 → M4	M6 → M5	M7 → M6
24 to 35 [38 to 57]	63 to 81 [102 to 130]	91 to 103 [147 to 165]	115 to 121 [185 to 194]	137 to 143 [220 to 230]	158 to 165 [255 to 265]

- When downshifting is attempted while driving at a vehicle speed at which downshifting is impossible, the buzzer sounds twice as a warning and the downshift is prohibited.

8-speed Sport Direct Shift Control

1) General

- When the shift lever is moved to the M position, 8-speed SPDS (Sports Direct Shift) control is enabled, placing an emphasis on shift response and feel, as well as maintaining a direct feel when the accelerator is operated.
- To produce a direct feeling in response to accelerator and gear shift operation, gear hold control, complete lock-up control, super high response upshift control, and blipping downshift control are adopted.



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2) Gear Hold Control

In M position, it is possible to make use of the highest engine speeds by holding the vehicle in a gear. Gear hold control means that gear shifts will not be performed as long as the paddle switches or shift lever are not operated in either the “+” (UP), or “-” (DOWN) direction.

- If the vehicle speed drops below any of the designated points shown in the following table, a downshift will be performed from the current gear. When the temperature of the ATF or engine coolant is low, shifts will be performed based on the shift points for low fluid temperature.

► Vehicle speed for each automatic downshift in the M position ◀

Vehicle Speed for Each Automatic Downshift: mph [km/h]						
M2 → M1	M3 → M2	M4 → M3	M5 → M4	M6 → M5	M7 → M5	M8 → M7
6 to 9 [10 to 15]	9 to 12 [15 to 20]	22 to 25 [35 to 41]	26 to 30 [42 to 48]	33 to 37 [53 to 59]	35 to 39 [56 to 62]	42 to 46 [67 to 74]

- When the vehicle comes to a stop, 1st gear (M1) will be automatically selected.

3) Complete Lock-up Control

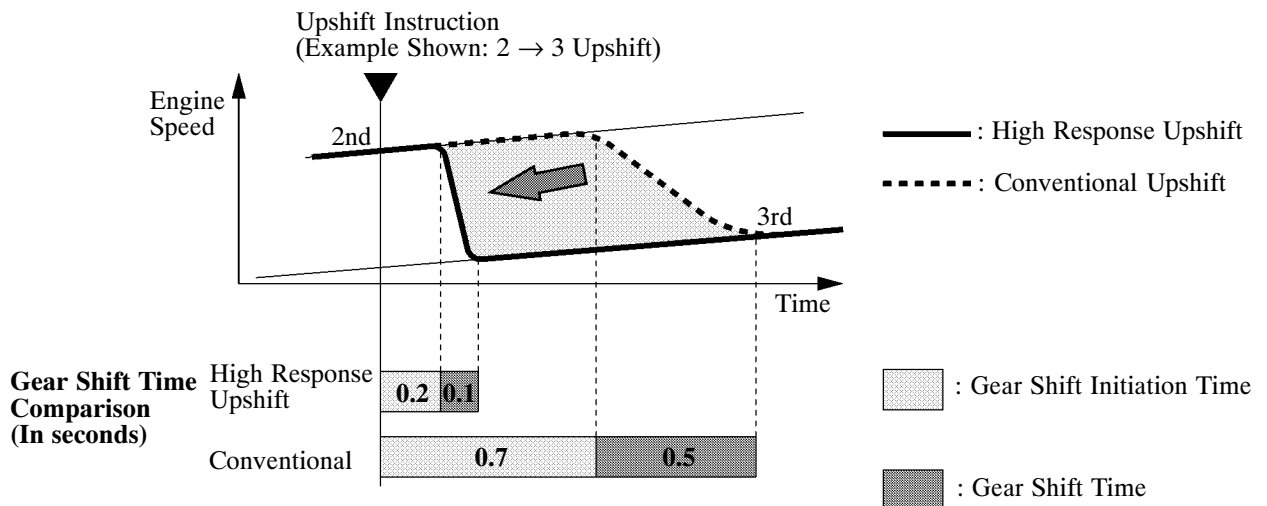
Complete lock-up control is used during both acceleration and deceleration when in 2nd gear and higher, without using the torque converter function. This enables changes in engine output to be transmitted directly to the transmission just as would occur with a manual transmission. However, even for 2nd gear and higher, if engine speed is too low to allow lock-up, the torque converter function will be used.

- For 1st gear, to make use of the torque increasing action of the torque converter, lock-up is not operated.

4) Super High Response Upshift Control

For 8-speed sports direct shift, the based on ECM instruction, the TCM uses clutch to clutch pressure control to directly control transmission clutch pressures and achieve high response gearshifts. In addition, the ECM manages the powertrain (engine and transmission) in an integrated manner.

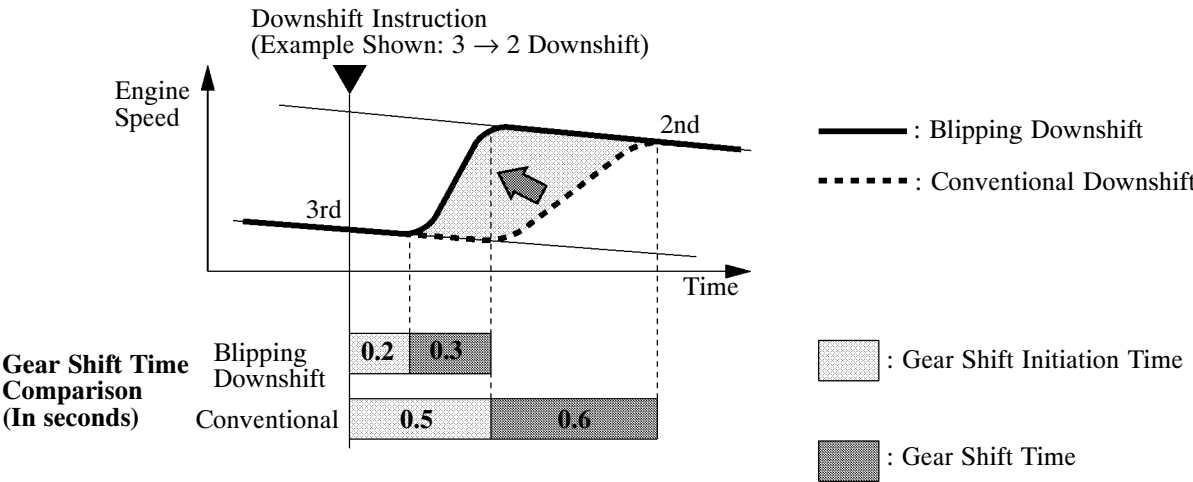
- When an upshift instruction is received, the TCM uses clutch to clutch pressure control to perform quick and precise control over engagement and disengagement of clutches. At the same time, the ECM sends instructions to manage the powertrain, finely controlling the engine torque and engine speed during a gear change. Through these rapidly performed cooperative controls, a quick gearshift speed is achieved, with a 0.2-second period for shift initiation and a 0.1-second gear shift.
- Engine torque moderation for gear changes is finely controlled by the ECM so that the ETCS-i (Electronic Throttle Control System-intelligent), fuel cut and ESA (Electronic Spark Advance) controls are optimized according to the driving conditions.



5) Blipping Downshift Control

Using powertrain management which resides in the ECM, similar to the controls for the super high response upshifts, the TCM and ECM perform downshifts and quick blipping of the throttle.

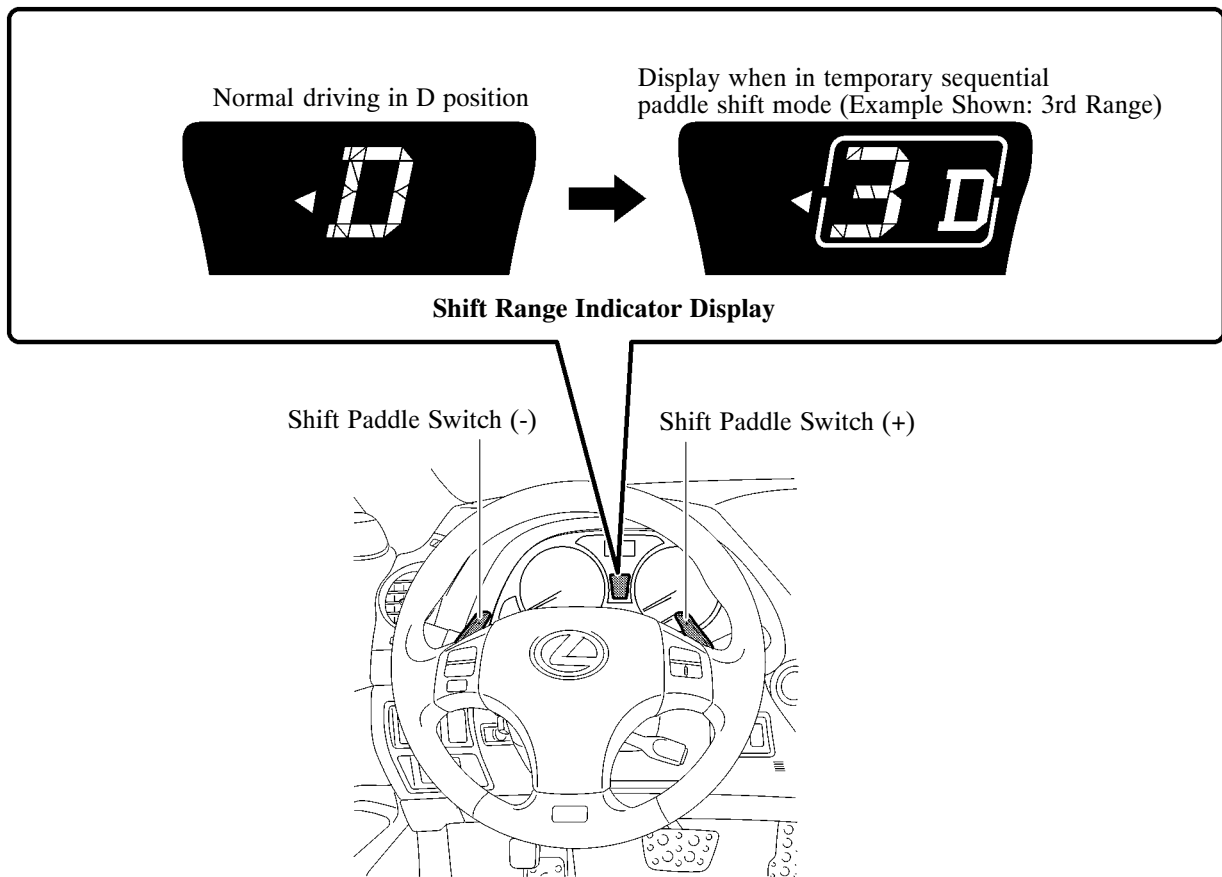
- When a downshift instruction is received, based on ECM instructions, the TCM uses clutch to clutch pressure control to quickly disengage the currently engaged clutch to produce neutral. Next, the ECM uses ETCS-i to quickly open the electronic throttle and instantaneously increases engine speed (blipping) to achieve the engine speed needed to match speeds for the gear change. At the same time, the TCM uses clutch to clutch pressure control to complete the gear change by smoothly and quickly engaging the clutch to be engaged.



D Position (Fixed Range Mode)**1) General**

When the shift lever is in the D position, operating the “-” side shift paddle switch will enter fixed range mode which restricts the highest gear. By operating the shift paddle switches “+” (UP) or “-” (DOWN), the shift range can be changed. At this time, the shift range indicator in the combination meter changes to inform the driver that the D position (fixed range mode) has been entered.

- If the vehicle is stopped, driving at a constant speed, or accelerating for more than a specified period of time, the vehicle will change back to normal D position operation. Alternately, if the “+” side paddle switch is operated for one second or more, normal D position operation will resume.



2) Initial Selection of a Shift Range

The driver selects D position (fixed range mode) by operating the “-” side shift paddle switch. When this mode is entered, the vehicle selects a gear range. The default gear range selected is based on vehicle speed and the gear that was in use prior to selecting this mode. In the following two tables, based on the gear in use and vehicle speed, there may be two different possible default gear ranges. The range that will be selected is the lower of the two.

► Table 1 ◀

Vehicle Speed: mph [km/h]	Default Gear Range
Below 36 to 40 [58 to 65]	D4
36 to 40 [58 to 65] or more ~ Below 52 to 56 [83 to 90]	D5
52 to 56 [83 to 90] or more ~ Below 121 to 126 [194 to 202]	D6
121 to 126 [194 to 202] or more	D7

► Table 2 ◀

Operation	Operating the “-” side shift paddle switch while driving in D position							
Gear in use when Driving in D position	1st	2nd	3rd	4th	5th	6th	7th	8th
Default Gear Range	D1	D1	D2	D3	D4	D5	D6	D7

3) Usable Gears

Under this control, the TCM performs 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.

Shift Range	Shift Range Indicator Indication	Usable Gear
D8	8 D	8th ↔ 7th ↔ 6th ↔ 5th ↔ 4th ↔ 3rd ↔ 2nd ↔ 1st
D7	7 D	7th ↔ 6th ↔ 5th ↔ 4th ↔ 3rd ↔ 2nd ↔ 1st
D6	6 D	6th ↔ 5th ↔ 4th ↔ 3rd ↔ 2nd ↔ 1st
D5	5 D	5th ↔ 4th ↔ 3rd ↔ 2nd ↔ 1st
D4	4 D	4th ↔ 3rd ↔ 2nd ↔ 1st
D3	3 D	3rd ↔ 2nd ↔ 1st
D2	2 D	2nd ↔ 1st
D1	1 D	1st

4) Selection of a Lower Shift Range

When the vehicle is operating in a shift range using this control, and the “-” shift paddle switch is operated, the TCM determines the shift range to be selected in accordance with the shift range and gear positions in use before the shift paddle switch is operated.

Gear position before shift paddle switch operation	Range in use before shift paddle switch operation							
	D8 Range	D7 Range	D6 Range	D5 Range	D4 Range	D3 Range	D2 Range	D1 Range
8th	D7 Range* ¹	—	—	—	—	—	—	—
7th	D6 Range* ¹	D6 Range* ¹	—	—	—	—	—	—
6th	D5 Range* ¹	D5 Range* ¹	D5 Range* ¹	—	—	—	—	—
5th	D4 Range* ¹	D4 Range* ¹	D4 Range* ¹	D4 Range* ¹	—	—	—	—
4th	D4 Range* ²	D4 Range* ²	D4 Range* ²	D4 Range* ²	D3 Range* ³	—	—	—
3rd						D2 Range* ³	—	—
2nd							D1 Range* ³	—
1st								D1 Range

*¹: The gear and shift range are downshifted by one step from the gear and shift range in use before the shift paddle switch is operated.

*²: D4 range is selected (no downshift will occur).

*³: The range selected is one lower than the range in use before the shift paddle switch is operated.

5) Speeds for Selection of a Lower Shift Range

- To prevent engine overrevving, selection of lower speed ranges using D position (fixed range mode) will not be permitted until the appropriate speed specified in the following table has been reached.

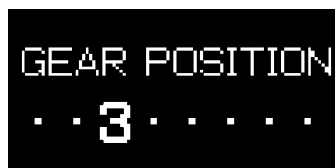
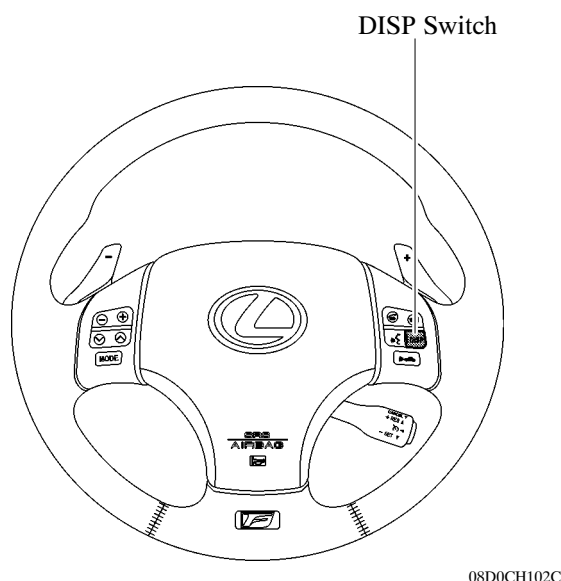
► Lowest Shift Range Permitted when “-” Paddle Operated ◀

Shift Range	D1	D2	D3	D4	D5	D6
Vehicle Speed: mph [km/h]	24 to 27 [38 to 44]	44 to 48 [71 to 78]	83 to 87 [133 to 140]	106 to 112 [171 to 180]	127 to 133 [205 to 214]	158 to 165 [255 to 265]

- When downshifting is attempted while driving at a vehicle speed at which downshifting is impossible, the buzzer sounds twice as a warning and the downshift is prohibited.

Gear Position Indicator

- The gear position indicator is added to the menus of the multi-information display.
- The gear position indicator can be displayed by operating the DISP switch on the steering wheel.
- The gear position indicator indicates the usable gears in the current shift range by using “.”, and the current gear position with the numerical number. Accordingly, both the shift range and the current gear position are clearly indicated to contribute to a sporty driving in the D position (fixed range mode). During 8-speed sport direct shift control (M position), the “F” mark is displayed on the multi-information display.



Third gear is in use and the shift lever is in D or the D8 range is selected.



First gear is in use and the D2 range is selected.



Display during 8-speed sport direct shift control (M position).



The shift lever is in a position other than D or M.

Gear position indicator display examples

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14. Diagnosis

- When the TCM detects a malfunction, the TCM records the malfunction and memorizes the information related to the fault. Furthermore, the TCM illuminates or blinks the MIL (Malfunction Indicator Lamp) in the combination meter assembly to inform the driver.
- The TCM will also store the DTC (Diagnostic Trouble Code) of the malfunctions. The DTC stored in the TCM are output to a Techstream connected to the DLC3 via the ECM.
- For details, see the 2008 LEXUS IS F Repair Manual (Pub. No. RM08D0U).

Service Tip

- The TCM uses the CAN protocol for diagnostic communication. Therefore, the Techstream is required for accessing diagnostic data. For details, see the 2008 LEXUS IS F Repair Manual (Pub. No. RM08D0U).
- To clear a DTC that is stored in the TCM, use the Techstream, disconnect the battery terminal or remove the EFI fuse for 1 minute or longer.

15. Fail-safe

The fail-safe functions minimize the loss of operability when an abnormality occurs in the following parts.

► Fail-safe Control List ◀

Malfunction Part	Function
Speed Sensor NT	<ul style="list-style-type: none"> • Shifting to 2nd and 8th is prohibited. • Lock-up clutch control is prohibited. • AI-SHIFT control is prohibited.
Speed Sensor NC3	<ul style="list-style-type: none"> • Lock-up clutch control is prohibited. • AI-SHIFT control is prohibited.
Speed Sensor SP2	<ul style="list-style-type: none"> • Shifting to 2nd and 8th is prohibited. • Lock-up clutch control is prohibited. • AI-SHIFT control is prohibited.
ATF Temperature Sensor	<ul style="list-style-type: none"> • Shifting between 1st to 5th gears is allowed. • Lock-up clutch control is prohibited. • AI-SHIFT control is prohibited.
ATF Pressure Switch	Performs the same control as when there is a shift solenoid valve SL1 ON malfunction.
TCM Power Supply (voltage is low)	<ul style="list-style-type: none"> • If the vehicle is being driven in 1st to 7th gears, the transmission is fixed in 7th gear. • If the vehicle is being driven in the 8th gear, the transmission is fixed in 8th gear.
CAN Communication	<ul style="list-style-type: none"> • Shifting to only either 1st or 3rd gears is allowed. • Lock-up clutch control is prohibited.
Knock Control Sensor	<ul style="list-style-type: none"> • If the vehicle is being driven in 1st to 5th gears, upshifting to 6th or higher is prohibited. • If the vehicle is driven in 6th gear or higher, upshifting to any gear higher than that being used when a malfunction is detected is prohibited. • Lock-up clutch control is prohibited.
Shift Solenoid Valve SL1, SL2, SL3, SL4, SL5 and SR	<ul style="list-style-type: none"> • When a shift solenoid valve listed at left fails, the 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. • Shift controls in fail-safe mode are described in the table on the next page. For details, see the 2008 LEXUS IS F Repair Manual (Pub. No. RM08D0U).

► 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.

(Continued)

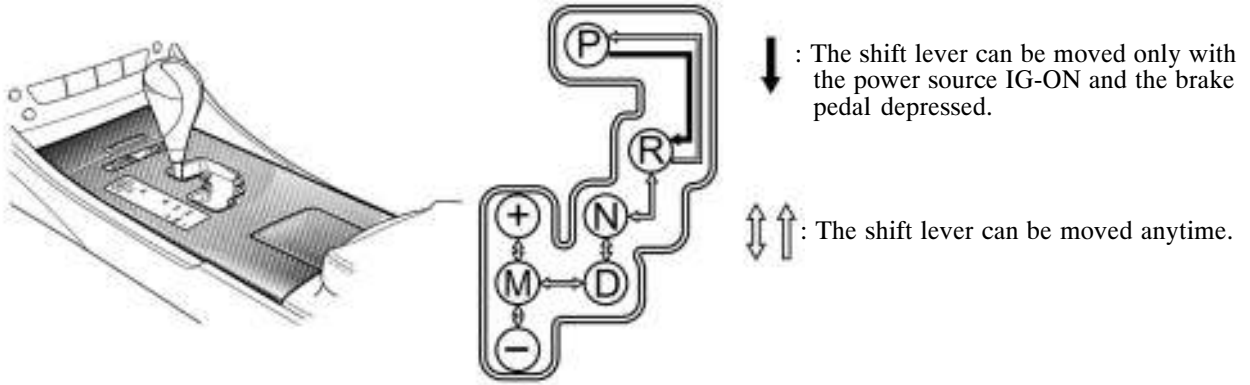
Gear Position in Normal Operation		1st	2nd	3rd	4th	5th	6th	7th	8th
SL4	ON Malfunction (Without Fail-safe Control)	4th	4th	3rd	4th	6th	6th	7th	6th
	Fail-safe Control during ON Malfunction (This malfunction is detected while driving in 4th or below.)	Fixed in 3rd							
	Fail-safe Control during ON Malfunction (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.

■ SHIFT CONTROL MECHANISM

1. General

- A gate type shift lever is used. With the gate type lever, the shift lever button and the overdrive switch of the straight type shift lever are discontinued. Similar functions are achieved through a single-shift operation (fore-aft and side-to-side).
- Shift pattern is provided with the M position to the side of the D position.
- A shift lock system is used.



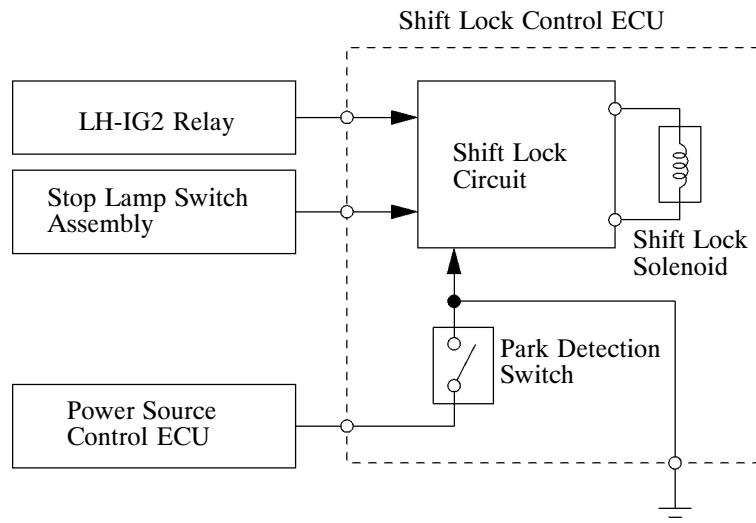
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2. Shift Lock System

General

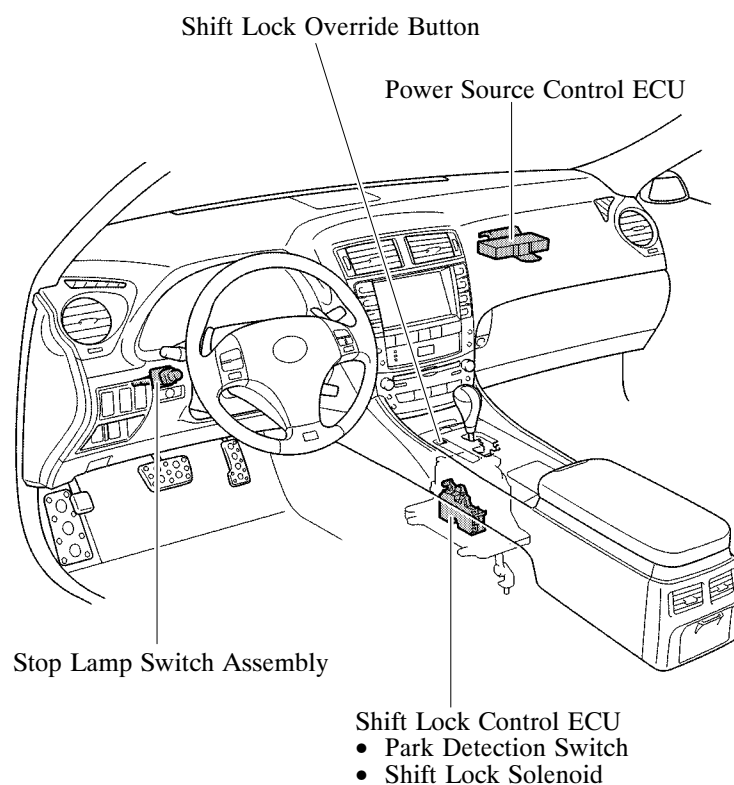
- The shift lock mechanism prevents the shift lever from being shifted from P, unless the engine switch is on (IG), and the brake pedal is depressed. This mechanism helps to prevent unintended acceleration.
- The shift lock system mainly consists of the shift lock control ECU and shift lock override button.
- The shift lock control ECU has a built-in park detection switch, and a shift lock solenoid.

► System Diagram ◀



08D0CH94C

Layout of Main Components



08D0CH95Z

System Operation

- The shift lock control ECU uses the park detection switch to detect the shift lever position, and receives inputs from the stop lamp switch assembly and the power source control ECU. Upon receiving these signals, the shift lock control ECU turns the shift lock solenoid on in order to release the shift lock.
- A shift lock override button, which manually overrides the shift lock mechanism, is used.