FAIL–SAFE CHART

05HN3–01

1.   FAIL–SAFE

This function minimizes the loss of the ECT functions when any malfunction occurs in each sensor or solenoid.

Malfunction Part	Function
DTC P0717: Input Speed Sensor (NT)	During an input speed sensor malfunction, shift control is effected through the output speed sensor signal (SP2). During an input speed sensor malfunction, up–shift to the 5th and 6th, AI–SHIFT [1] and flex lock–up clutch control are prohibited.
DTC P0500: Output Speed Sensor (SP2)	During an output speed sensor malfunction, shift control is effected through the input speed sensor signal (NT). During an output speed sensor malfunction, up–shift to the 5th and 6th, AI–SHIFT [1] and flex lock–up clutch control are prohibited.
DTC P0710, P0712, P0713: ATF Temp. Sensor	During an ATF temperature sensor malfunction, up–shift to the 5th and 6th and flex lock–up clutch control are prohibited.
Shift Solenoid Valve S1, S2, S3, S4 and SR	The current to the failed solenoid valve is cut off and control is effected by operating the other solenoid valves. Shift control is effected depending on the failed solenoid as described in the table on the next page.
DTC P0748, P0778: Shift Solenoid Valve SL1 and SL2	During a solenoid valve SL1 or SL2 malfunction, up–shift to the 5th and 6th and flex lock–up clutch control are prohibited.
DTC P2757, P2759: Shift Solenoid Valve SLU	During a solenoid valve SLU malfunction, the current to the solenoid valve is stopped. This stops lock–up control and flex lock–up control, fuel economy decreases.
DTC P2714, P2716: Shift Solenoid Valve SLT	During a solenoid valve SLT malfunction, the current to the solenoid valve is stopped. This stops line pressure optimal control, the shift shock increases. However, shifting is effected through normal clutch pressure control.

[1]: AI (Artificial Intelligence) –SHIFT control

In addition to the switching of the shift pattern through the pattern select switch, the AI–SHIFT control enables the ECM to estimate the road conditions and the driver's intention in order to automatically select the optimal shift pattern. As a result, a comfortable ride has been realized.

(a)   Fail–safe operation for electronically malfunctioning shift solenoid valve (S1, S2, S3, S4 and SR):

HINT:

Fail–safe operation in the event of an electric system malfunction.

Fail safe function:

If either of the shift solenoid valve circuits has an open or short failure, the ECM turns the other shift solenoid "ON" and "OFF" in order to shift into the gear positions shown in the table below.

In case of a short circuit, the ECM stops sending current to the short circuited solenoid.

Even if starting the engine again in the fail–safe mode, the gear position remains in the same position.

Fail–safe chart for electrical malfunction:

Shift Lever Position	Gear	Normal Shift Solenoid (ECM output) S1	S2	S3	S4	SR	SL1	SL2	Gear *2	S1 Malfunction (P0973, P0974) Shift Solenoid (ECM output) S1	S2	S3	S4	SR	SL1	SL2
D,S6	1st	OFF	ON	ON	OFF	ON	OFF	ON	1st	X	ON	ON	OFF	ON	OFF	ON
	2nd	ON	ON	ON	OFF	ON	OFF	ON	1st→4th	X	ON→OFF	ON→OFF	OFF	ON	OFF	ON
	3rd	ON	OFF	ON	OFF	ON	OFF	ON	3rd→4th	X	OFF	ON→OFF	OFF	ON	OFF	ON
	4th	ON	OFF	OFF	OFF	ON	OFF	ON	4th	X	OFF	OFF	OFF	ON	OFF	ON
	5th	ON	OFF	OFF	ON	OFF	ON	OFF	5th	X	OFF	OFF	ON	OFF	ON	OFF
	6th	ON	ON	OFF	ON	OFF	ON	OFF	N→5th	X	ON→OFF	OFF	ON	OFF	ON	OFF
S5	1st	OFF	ON	ON	OFF	ON	OFF	ON	1st	X	ON	ON	OFF	ON	OFF	ON
	2nd	ON	ON	ON	OFF	ON	OFF	ON	1st→4th	X	ON→OFF	ON→OFF	OFF	ON	OFF	ON
	3rd	ON	OFF	ON	OFF	ON	OFF	ON	3rd→4th	X	OFF	ON→OFF	OFF	ON	OFF	ON
	4th	ON	OFF	OFF	OFF	ON	OFF	ON	4th	X	OFF	OFF	OFF	ON	OFF	ON
	5th	ON	OFF	OFF	ON	OFF	ON	OFF	5th	X	OFF	OFF	ON	OFF	ON	OFF
S4	1st	OFF	ON	ON	OFF	ON	OFF	ON	1st	X	ON	ON	OFF	ON	OFF	ON
	2nd	ON	ON	ON	OFF	ON	OFF	ON	1st→4th	X	ON→OFF	ON→OFF	OFF	ON	OFF	ON
	3rd	ON	OFF	ON	OFF	ON	OFF	ON	3rd→4th	X	OFF	ON→OFF	OFF	ON	OFF	ON
	4th	ON	OFF	OFF	OFF	ON	OFF	ON	4th	X	OFF	OFF	OFF	ON	OFF	ON
S3	1st	OFF	ON	ON	OFF	ON	OFF	ON	1st	X	ON	ON	OFF	ON	OFF	ON
	2nd	ON	ON	ON	OFF	ON	OFF	ON	1st→4th	X	ON→OFF	ON→OFF	OFF	ON	OFF	ON
	3rd (E/B)	ON	OFF	ON	OFF	ON	OFF	OFF	3rd (E/B)→4th	X	OFF	ON→OFF	OFF	ON	OFF	OFF→ON
S2	1st	OFF	ON	ON	OFF	ON	OFF	ON	1st	X	ON	ON	OFF	ON	OFF	ON
	2nd (E/B)	ON	ON	ON	ON	OFF	OFF	OFF	1st (E/B)→4th	X	ON→OFF	ON→OFF	OFF	ON	OFF	OFF→ON
S1	1st (E/B)	OFF	ON	ON	OFF	ON	OFF	OFF	1st (E/B)	X	ON	ON	OFF	ON	OFF	OFF

*2: Actual gear shift (gear position) under fail–safe operation

X: OFF (the ECM stops sending current to a malfunctioning solenoid valve)

→: Condition in the electrical malfunction is shown on the left of "→".
    Condition in the fail–safe mode is shown on the right of "→".

(E/B): Engine brake

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Fail–safe chart for electrical malfunction:

Shift Solenoid Valve S2 Electrical Malfunction (P0976, P0977)

Shift Lever Position	Gear *2	S1	S2	S3	S4	SR	SL1	SL2
D,S6	3rd	OFF→ON	X	ON	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON
	4th	ON	X	OFF	OFF	ON	OFF	ON
	5th	ON	X	OFF	ON	OFF	ON	OFF
	5th	ON	X	OFF	ON	OFF	ON	OFF
S5	3rd	OFF→ON	X	ON	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON
	4th	ON	X	OFF	OFF	ON	OFF	ON
	5th	ON	X	OFF	ON	OFF	ON	OFF
S4	3rd	OFF→ON	X	ON	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON
	4th	ON	X	OFF	OFF	ON	OFF	ON
S3	3rd→3rd (E/B)	OFF→ON	X	ON	OFF	ON	ON→OFF	OFF
	3rd→3rd (E/B)	ON	X	ON	OFF	ON	ON→OFF	OFF
	3rd (E/B)	ON	X	ON	OFF	ON	OFF	OFF
S2	3rd→3rd (E/B)	OFF→ON	X	ON	OFF	ON	ON→OFF	OFF
	3rd (E/B)	ON	X	ON	OFF	ON	OFF	OFF
S1	3rd (E/B)	OFF→ON	X	ON	OFF	ON	OFF	OFF

Shift Solenoid Valve S3 Electrical Malfunction (P0979, P0980)

Shift Lever Position	Gear *2	S1	S2	S3	S4	SR	SL1	SL2
D,S6	3rd→4th	OFF→ON	ON→OFF	X	OFF	ON	OFF	ON
	4th	ON	ON→OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	ON
	5th	ON	OFF	X	ON	OFF	ON	OFF
	6th	ON	ON	X	ON	OFF	ON	OFF
S5	3rd→4th	OFF→ON	ON→OFF	X	OFF	ON	OFF	ON
	4th	ON	ON→OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	ON
	5th	ON	OFF	X	ON	OFF	ON	OFF
S4	3rd→4th	OFF→ON	ON→OFF	X	OFF	ON	OFF	ON
	4th	ON	ON→OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	ON
S3	3rd→4th	OFF→ON	ON→OFF	X	OFF	ON	OFF	ON
	4th	ON	ON→OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	OFF→ON
S2	3rd→4th	OFF→ON	ON→OFF	X	OFF	ON	OFF	ON
	6th→4th	ON	ON→OFF	X	OFF	ON	OFF	OFF→ON
S1	1st (E/B)→4th	OFF→ON	ON→OFF	X	OFF	ON	OFF	OFF→ON

Shift Solenoid Valve S4 Electrical Malfunction (P0982, P0983)

Shift Lever Position	Gear *2	S1	S2	S3	S4	SR	SL1	SL2
D,S6	1st	OFF	ON	ON	X	ON	OFF	ON
	2nd	ON	ON	ON	X	ON	OFF	ON
	3rd	ON	OFF	ON	X	ON	OFF	ON
	4th	ON	OFF	OFF	X	ON	OFF	ON
	4th	ON	OFF	OFF	X	OFF→ON	ON→OFF	OFF→ON
	4th	ON	ON→OFF	OFF	X	OFF→ON	ON→OFF	OFF→ON
S5	1st	OFF	ON	ON	X	ON	OFF	ON
	2nd	ON	ON	ON	X	ON	OFF	ON
	3rd	ON	OFF	ON	X	ON	OFF	ON
	4th	ON	OFF	OFF	X	ON	OFF	ON
	4th	ON	OFF	OFF	X	OFF→ON	ON→OFF	OFF→ON
S4	1st	OFF	ON	ON	X	ON	OFF	ON
	2nd	ON	ON	ON	X	ON	OFF	ON
	3rd	ON	OFF	ON	X	ON	OFF	ON
	4th	ON	OFF	OFF	X	ON	OFF	ON
S3	1st	OFF	ON	ON	X	ON	OFF	ON
	2nd	ON	ON	ON	X	ON	OFF	ON
	3rd (E/B)	ON	OFF	ON	X	ON	OFF	OFF
S2	1st	OFF	ON	ON	X	ON	OFF	ON
	2nd (E/B)	ON	ON	ON	X	ON	OFF	OFF
S1	1st (E/B)	OFF	ON	ON	X	ON	OFF	OFF

Shift Solenoid Valve SR Electrical Malfunction (P0985, P0986)

Shift Lever Position	Gear *2	S1	S2	S3	S4	SR	SL1	SL2
D,S6	1st	OFF	ON	ON	OFF	X	OFF	ON
	2nd	ON	ON	ON	OFF	X	OFF	ON
	3rd	ON	OFF	ON	OFF	X	OFF	ON
	4th	ON	OFF	OFF	OFF	X	OFF	ON
	5th	ON	OFF	OFF	ON	X	ON	OFF
	6th	ON	ON	OFF	ON	X	ON	OFF
S5	1st	OFF	ON	ON	OFF	X	OFF	ON
	2nd	ON	ON	ON	OFF	X	OFF	ON
	3rd	ON	OFF	ON	OFF	X	OFF	ON
	4th	ON	OFF	OFF	OFF	X	OFF	ON
	5th	ON	OFF	OFF	ON	X	ON	OFF
S4	1st	OFF	ON	ON	OFF	X	OFF	ON
	2nd	ON	ON	ON	OFF	X	OFF	ON
	3rd	ON	OFF	ON	OFF	X	OFF	ON
	4th	ON	OFF	OFF	OFF	X	OFF	ON
S3	1st	OFF	ON	ON	OFF	X	OFF	ON
	2nd	ON	ON	ON	OFF	X	OFF	ON
	3rd	ON	OFF	ON	OFF	X	OFF	OFF
S2	1st	OFF	ON	ON	OFF	X	OFF	ON
	2nd	ON	ON	ON	OFF	X	OFF	OFF
S1	1st	OFF	ON	ON	OFF	X	OFF	OFF

*2: Actual gear shift (gear position) under fail–safe operation

X: OFF (the ECM stops sending current to a malfunctioning solenoid valve)

→: Condition in the electrical malfunction is shown on the left of "→".
    Condition in the fail–safe mode is shown on the right of "→".

(E/B): Engine brake

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(b)   Fail–safe operation for mechanically malfunction:
HINT:
Fail–safe operation in the event of a mechanical system malfunction.
Fail safe function:
The ECM controls the gear position as shown in the table below when malfunctions occur.

Fail–safe chart for mechanical malfunction:

DTC	Condition	Gear[2]					
		1st	2nd	3rd	4th	5th	6th
–	Normal	1st	2nd	3rd	4th	5th	6th
P0751	Shift solenoid valve S1: Stuck OFF malfunction	1st[3]	1st[3]	↑	3rd	3rd	3rd
P0761	Shift solenoid valve S3: Stuck ON malfunction	1st	2nd	↑	3rd	3rd	3rd
P0766	Shift solenoid valve S4, Shift solenoid valve SL2 or Valve body (Brake control valve): Malfunction	1st	2nd	↑	3rd	3rd	3rd
P0781	Valve body (1–2 shift valve): Malfunction	1st[3]	1st[3]	↑	3rd	3rd	3rd
P0729	Valve body (Reverse sequence valve): Malfunction	1st	2nd	↑	3rd	3rd	3rd

*2: Actual gear shift (gear position) under fail–safe operation
*3: Under engine braking, downshifting to 1st or 2nd gear is prohibited