DTC	P0973	Shift Solenoid "A" Control Circuit Low (Shift Solenoid Valve S1)

DTC	P0974	Shift Solenoid "A" Control Circuit High (Shift Solenoid Valve S1)

DESCRIPTION

Shifting from 1st to O/D is performed in combination with the ON and OFF operation of the shift solenoid valve S1 and S2 controlled by the ECM. If an open or short circuit occurs in either of the solenoid valves, the ECM controls the remaining normal solenoid valve to allow the vehicle to be operated safely (see page AX-32).

Fail-safe function:

If either of the solenoid valve circuits develops an open or short, the ECM turns the other solenoid valve ON and OFF to shift to the gear positions shown in the table below. The ECM also turns the shift solenoid valve ST OFF at the same time. If both solenoids are malfunctioning, hydraulic control cannot be performed electronically and must be done manually.

Manual shifting as shown in the table below must be done. In case of a short circuit, the ECM stops sending the current to the short circuited solenoid.

Position	Normal			Shift Solenoid Valve S1 Malfunctioning			Shift Solenoid Valve S2 Malfunctioning			Both Solenoid Valves Malfunctioning
	Solenoid Valve		Gear	Solenoid Valve		Gear	Solenoid Valve		Gear	Gear when shift selector is manually operated
	S1	S2		S1	S2		S1	S2		
D	ON	ON	1st	X	ON ↓ OFF	3rd	ON	X	2nd	3rd
	ON	OFF	2nd	X	OFF	3rd	ON	X	2nd	3rd
	OFF	OFF	3rd	X	OFF	3rd	OFF	X	3rd	3rd
	OFF	ON	O/D	X	ON	O/D	OFF	X	3rd	3rd
2	ON	ON	1st	X	ON ↓ OFF	3rd	ON	X	2nd	3rd
	ON	OFF	2nd	X	OFF	3rd	ON	X	2nd	3rd
	OFF	OFF	3rd	X	OFF	3rd	OFF	X	3rd	3rd
L	ON	ON	1st	X	ON ↓ OFF	3rd	ON	X	2nd	3rd
	ON	OFF	2nd	X	OFF	3rd	ON	X	2nd	3rd

HINT:

- X: OFF (the ECM stops sending current to a malfunctioning solenoid valve)
- ↓: Condition in the electrical operation is shown above the "↓".
- ↓: Condition in the fail-safe mode is shown below the "↓".

DTC No.	DTC Detection Condition	Trouble Area
P0973	ECM detects short in solenoid valve S1 circuit 2 times when solenoid valve S1 is operated (1 trip detection logic)	• Short in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM
P0974	ECM detects open in solenoid valve S1 circuit 2 times when solenoid valve S1 is not operated (1 trip detection logic)	• Open in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM

AX

MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. Also, the ECM performs the fail-safe function and turns the other normal shift solenoid valves ON/OFF. In case of a short circuit, the ECM stop sending the current to the short circuited solenoid.

MONITOR STRATEGY

Related DTCs	P0973: Shift solenoid valve S1/Range check (Low resistance) P0974: Shift solenoid valve S1/Range check (High resistance)
Required sensors/Components	Shift solenoid valve S1
Frequency of operation	Continuous
Duration	2 times or more
MIL operation	1 driving cycle
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P0973: Range check (Low resistance)

The monitor will run whenever the following DTCs are not present	None
Solenoid	ON
Time after solenoid OFF to ON	More than 0.008 sec.

P0974: Range check (High resistance)

The monitor will run whenever the following DTCs are not present	None
Solenoid	OFF
Time after solenoid ON to OFF	More than 0.008 sec.

TYPICAL MALFUNCTION THRESHOLDS

AX

P0973: Range check (Low resistance)

Intelligent power MOS diagnosis fail signals detected while the solenoid is operated	Fail at solenoid resistance: 8 Ω or less

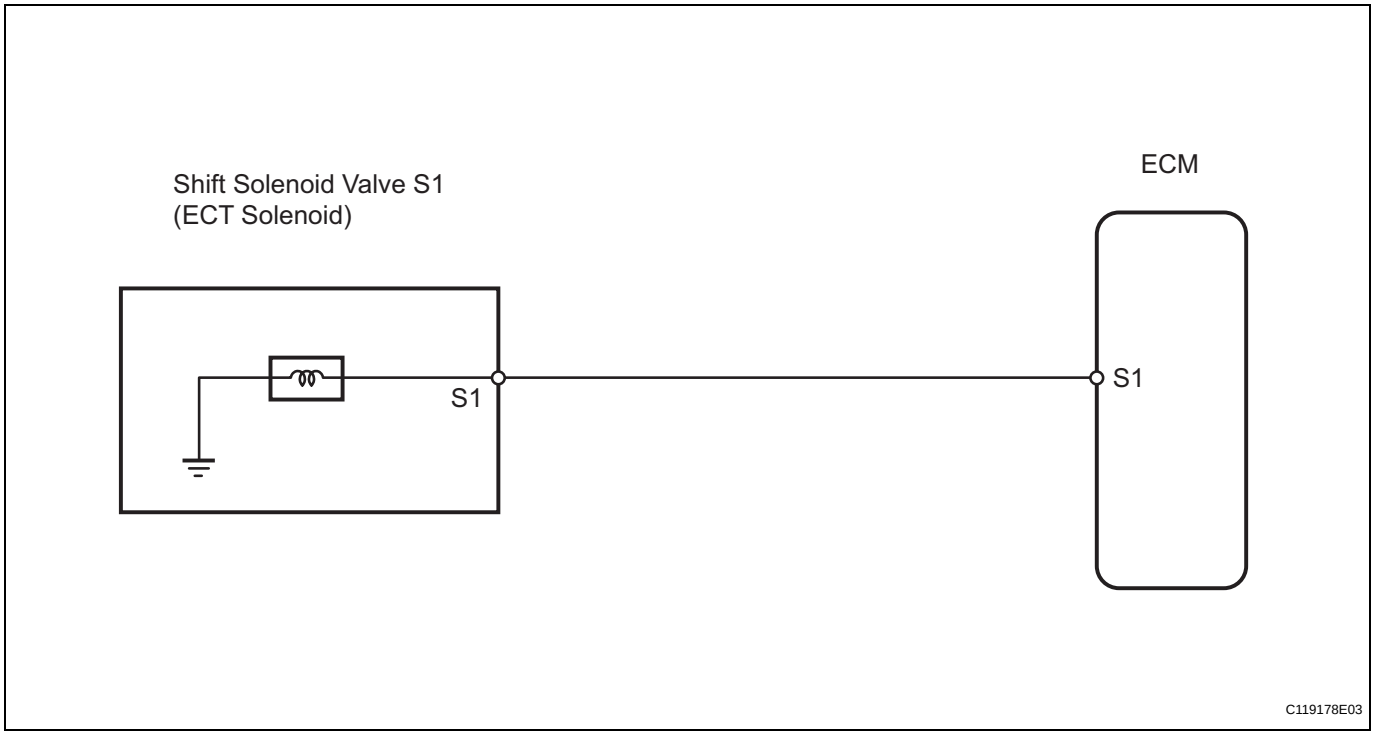
P0974: Range check (High resistance)

Intelligent power MOS diagnosis fail signals detected while the solenoid is not operated	Fail at solenoid resistance: 100 kΩ or more

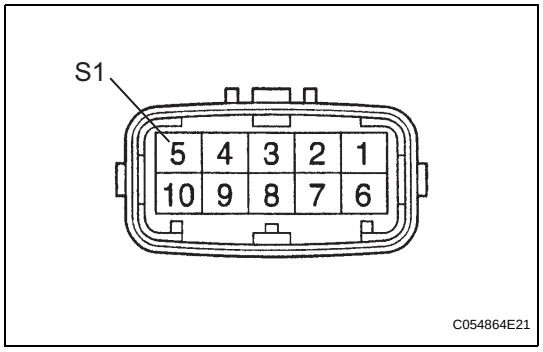
COMPONENT OPERATING RANGE

Shift solenoid valve S1	Resistance: 11 to 15 Ω at 20°C (68°F)

WIRING DIAGRAM



1	INSPECT TRANSMISSION WIRE (SHIFT SOLENOID VALVE S1)



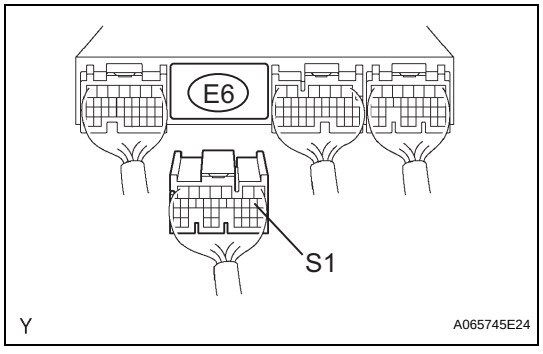
(a) Disconnect the E1 wire connector.
(b) Measure the resistance of the transmission wire.
Standard resistance

Tester Connection	Condition	Specified Condition
5 (S1) - Body ground	20°C (68°F)	11 to 15 Ω

OK → **Go to step 3**

OK

2	CHECK WIRE HARNESS (TRANSMISSION WIRE - ECM)



(a) Disconnect the E6 ECM connector.
(b) Measure the resistance of the wire harness side connector.
Standard resistance

Tester Connection	Condition	Specified Condition
E6-9 (S1) - Body ground	20°C (68°F)	11 to 15 Ω

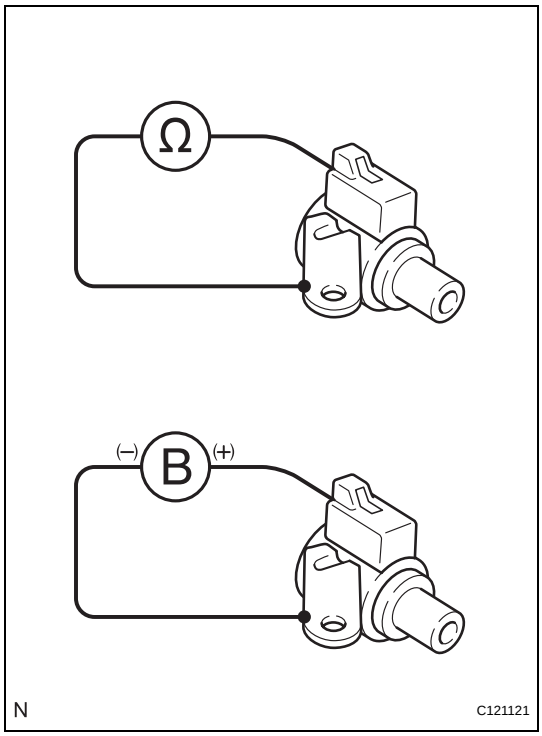
NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

AX

OK

REPLACE ECM

3	INSPECT SHIFT SOLENOID VALVE S1



(a) Remove the shift solenoid valve S1.
(b) Measure the resistance of the solenoid valve.
Standard resistance:
11 to 15 Ωat 20°C (68°F)
(c) Connect the battery's positive (+) lead to the terminal of the solenoid connector, and the negative (-) lead to the solenoid body.
(d) Check the operating noise of the solenoid valve.
OK:
Solenoid makes operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE S1**

AX

OK

REPAIR OR REPLACE TRANSMISSION WIRE