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Service Category: Drivetrain	Section: Automatic Transmission/Transaxle	
Model Year: 2008	Model: LX570	Doc ID: RM000000W8305RX
Title: AB60F AUTOMATIC TRANSMISSION / TRANSAXLE: AUTOMATIC TRANSMISSION SYSTEM: DESCRIPTION (2008 LX570)		

DTC	P0894	Transmission Component Slipping
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DTC	P2714	Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT)
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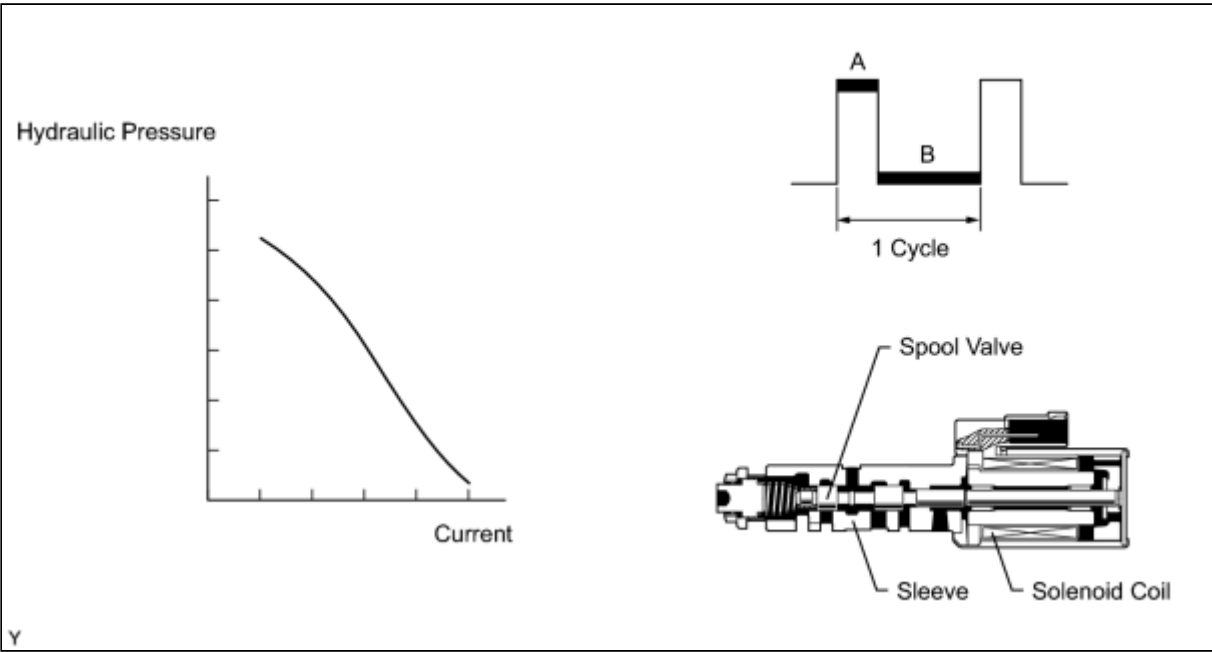
DESCRIPTION

The shift solenoid valve (SLT) controls the transmission line pressure for smooth transmission operation based on signals from the throttle position sensor and vehicle speed sensor. The ECM adjusts the duty ratio* of shift solenoid valve SLT to control the hydraulic line pressure coming from the primary regulator valve. Appropriate line pressure assures smooth shifting with varying engine outputs.

HINT:

*: The duty ratio is the ratio of the current ON time (A) to the total of the current ON and OFF time (A + B).

Duty Ratio (%) = A / (A + B) x 100



DTC CODE	DTC DETECTION CONDITION	TROUBLE AREA
P0894	The ECM detects a malfunction of shift solenoid valve SLT, S1, S2, S3, S4, SL2, gear 6 incorrect ratio (sequence valve) or 1-2 shift valves according to the revolution difference of the turbine and output shaft, and also by the oil pressure (2-trip detection logic).	- Shift solenoid valve SLT remains open or closed - Shift solenoid valve S1, S2, S3, S4 or SL2 remains open or closed - Gear 6 incorrect ratio (sequence valve) or 1-2

DTC CODE	DTC DETECTION CONDITION	TROUBLE AREA
		shift valve is stuck - Valve body is blocked - Automatic transmission (clutch, brake, gear, etc.)
P2714	The ECM detects a malfunction of shift solenoid valve SLT (ON side) according to the revolution difference of the turbine and output shaft, and also by the oil pressure (2 trip detection logic).	- Shift solenoid valve SLT remains open or closed - Shift solenoid valve S1, S2, S3, S4 or SL2 remains open or closed - Gear 6 incorrect ratio (sequence valve) or 1-2 shift valve is stuck - Valve body is blocked - Automatic transmission (clutch, brake, gear, etc.)

MONITOR DESCRIPTION

The ECM calculates the amount of heat absorbed by the friction material based on the difference in revolution (clutch slippage) between the turbine and output shaft. The ECM illuminates the MIL and stores these DTCs when the amount of heat absorption exceeds the specified value.

There are 2 causes of revolution difference.

- When shift solenoid valve SLT remains ON, oil pressure decreases, which causes the clutch engagement force to decrease.
- When the shift solenoid valve remains ON or OFF, the gear position commanded by the ECM and the actual gear position are not the same.

NOTICE:

If you continue driving under these conditions, the clutch will burn out and the vehicle will no longer be drivable.

MONITOR STRATEGY

Related DTCs	P0894: Automatic transmission slip malfunction P2714: Shift solenoid valve SLT/ON malfunction
Required sensors/Components	Shift solenoid valve SLT
Frequency of operation	Continuous
Duration	P0894 ON malfunction (A): Immediately P0894 ON malfunction (B): 0.4 sec. P2714: Immediately
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

ALL

The monitor will run whenever the following DTCs are not stored	None
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Turbine speed sensor circuit	Not circuit malfunction
Output speed sensor circuit	Not circuit malfunction
ATF temperature sensor circuit	Not circuit malfunction
Shift solenoid valve S1 circuit	Not circuit malfunction
Shift solenoid valve S2 circuit	Not circuit malfunction
Shift solenoid valve S3 circuit	Not circuit malfunction
Shift solenoid valve S4 circuit	Not circuit malfunction
Shift solenoid valve SR circuit	Not circuit malfunction
Shift solenoid valve SL1 circuit	Not circuit malfunction
Shift solenoid valve SL2 circuit	Not circuit malfunction
Shift solenoid valve SLT circuit	Not circuit malfunction
ECT (Engine Coolant Temperature) sensor circuit	Not circuit malfunction
KCS sensor circuit	Not circuit malfunction
ETCS (Electric Throttle Control System)	Not system down
Transmission position	D
Duration time from shifting N to D	4 sec. or more
ECT	40°C (104°F) or higher
Spark advance from max. retard timing by KCS control	0° crankshaft angle or more
Engine	Starting
Transfer position	HIGH*

HINT:

*: Following conditions met

Vehicle speed sensor circuit	Not circuit malfunction
Output shaft speed sensor circuit	Not circuit malfunction
Transfer output speed	143 rpm or more
Transfer input speed/Transfer output speed (NO/NOTf)	0.9 or more, and less than 1.1

TYPICAL MALFUNCTION THRESHOLDS**[P0894: ON malfunction]**

When either condition below is met: ON malfunction (A) or (B)

ON malfunction (A)

Summation of C1 clutch heat generations	Specified value
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ON malfunction (B)

Summation of C2 clutch heat generations	Specified value
Actual gear for SLT failure judgment	Not determined

[P2714: ON malfunction]

When one of following conditions is met: ON malfunction (A), (B), (C), (D), (E), (F), (G) or (H)

ON malfunction (A)

Summation of C1 clutch heat generations	Specified value
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ON malfunction (B)

Shift solenoid valve S1 OFF malfunction	Detected
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ON malfunction (C)

Shift solenoid valve S2 OFF malfunction	Detected
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ON malfunction (D)

Shift solenoid valve S3 ON malfunction	Detected
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ON malfunction (E)

Shift solenoid valve S4 OFF malfunction	Detected
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ON malfunction (F)

1-2 shift valve malfunction	Detected
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ON malfunction (G)

Sequence valve malfunction	Detected
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ON malfunction (H)

Shift solenoid valve SL2 ON malfunction	Detected
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INSPECTION PROCEDURE

PROCEDURE

1.	CHECK DTC OUTPUT (IN ADDITION TO DTCS P0894 AND P2714)
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- (a) Connect the Techstream to the DLC3.
- (b) Turn the engine switch on (IG).
- (c) Turn the Techstream on.
- (d) Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.
- (e) Read the DTCs using the Techstream.

Result

RESULT	PROCEED TO
- Only P0894 is output - Only P0894 and P2714 are output	A

RESULT	PROCEED TO
P0894, P2714 and other DTCs are output	B

HINT:

If any other codes besides P0894 and P2714 are output, perform troubleshooting for those DTCs first.

A

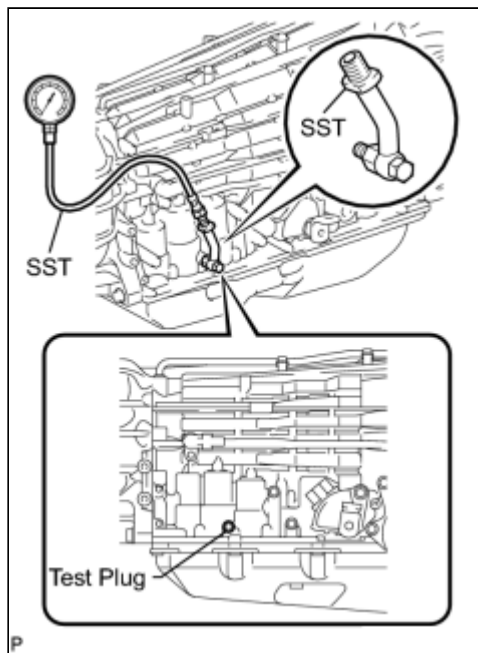
2.	PERFORM ACTIVE TEST USING TECHSTREAM (SHIFT SOLENOID VALVE SLT)
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NOTICE:

- Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).
- Be careful to prevent SST hose from interfering with the exhaust pipe.
- Perform the test with the A/C turned off.

HINT:

Using the Techstream to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.



(a) Remove the test plug on the transmission case center right side and connect SST.

SST: 09992-00095

09992-00231

09992-00271

- (b) Connect the Techstream to the DLC3.
- (c) Start the engine and warm it up.
- (d) Measure the line pressure with SST.
- (e) Turn the Techstream on.
- (f) Enter the following menus: Powertrain / Engine and ECT / Active Test.

(g) According to the display on the Techstream, perform the Active Test.

(h) Measure the line pressure.

Engine and ECT

TESTER DISPLAY	TEST PART	CONTROL RANGE	DIAGNOSTIC NOTE
Activate the Solenoid (SLT)*	Operate shift solenoid valve SLT and raise line pressure	ON or OFF HINT: - OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands shift solenoid valve SLT to turn OFF) - ON: No action (normal operation)	[Vehicle Condition] - The vehicle is stopped. - The engine is idling.

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test  as well. Note that the pressure values in the Active Test and hydraulic test are different.

OK:

The line pressure changes as specified when performing the Active Test.

OK



3.	PERFORM ACTIVE TEST USING TECHSTREAM (RUNNING TEST)
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CAUTION:

This test should always be performed with at least 2 people.

NOTICE:

- Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).
- Perform the test with the A/C turned off.

HINT:

Using the Techstream to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

(a) Connect the Techstream to the DLC3.

(b) Clear the DTC .

(c) Warm up the engine.

(d) Enter the following menus: Powertrain / Engine and ECT / Active Test.

(e) According to the display on the Techstream, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the Techstream.

Engine and ECT

TESTER DISPLAY	TEST PART	CONTROL RANGE	DIAGNOSTIC NOTE
Control the Shift Position	Operate shift solenoid valve and set each shift position	- Press "→" button: Shift up - Press "←" button: Shift down	It is possible to check the operation of the shift solenoid valves. [Vehicle Condition] The vehicle speed is 50 km/h (31 mph) or less.

HINT:

- This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.
- The 4th to 5th and 5th to 6th up-shifts must be performed with the accelerator pedal released.
- The 6th to 5th and 5th to 4th down-shifts must be performed with the accelerator pedal released.
- Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.
- The shift position commanded by the ECM is shown in the Data List display on the Techstream.

(f) Compare the ECM gear shift command and the actual gear position.

OK:

Gear position changes in accordance with the Techstream command.

Result

SYSTEM CONDITION			ECM GEAR SHIFT COMMAND						PROCEED TO
			1ST	2ND	3RD	4TH	5TH	6TH	
Malfunction	Shift solenoid valve S1	Stuck ON*1	2nd	2nd	3rd	4th	5th	6th	A
		Stuck OFF	1st	1st	3rd	4th	5th	N*2	
	Shift solenoid valve S2	Stuck ON	1st	2nd	2nd	4th	6th	6th	B
		Stuck OFF	3rd	3rd	3rd	4th	5th	5th	
	Shift solenoid valve S3	Stuck ON	1st	2nd	3rd	3rd	N*2	N*2	C
		Stuck OFF	3rd	4th	4th	4th	5th	6th	
	Shift solenoid valve S4	Stuck ON*3	1st	2nd	3rd	4th	5th	6th	D
		Stuck OFF	1st	2nd	3rd	4th	4th	4th	
Normal			1st	2nd	3rd	4th	5th	6th	E

HINT:

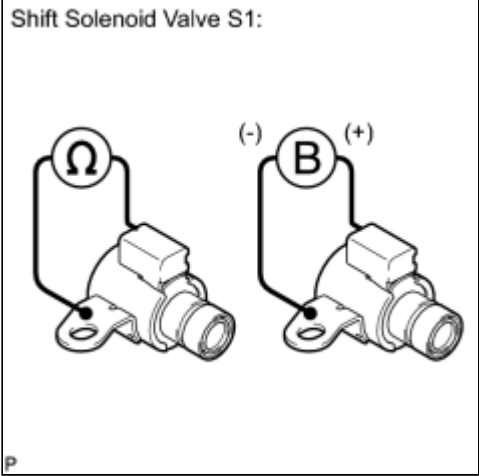
- *1: When shift solenoid valve S1 is stuck ON, the vehicle cannot drive in reverse.
- *2: Neutral
- *3: When shift solenoid valve S4 is stuck ON, gear shifting is normal.

A



4.	INSPECT SHIFT SOLENOID VALVE S1
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Shift Solenoid Valve S1:



(a) Remove shift solenoid valve S1.

(b) Measure the resistance according to the value(s) in the table below.

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
Shift solenoid valve S1 connector terminal - Shift solenoid valve S1 body	20°C (68°F)	11 to 15 Ω

(c) Apply battery voltage (12 V) to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

MEASUREMENT CONDITION	SPECIFIED CONDITION
- Battery positive (+) → Shift solenoid valve S1 connector - Battery negative (-) → Shift solenoid valve S1 body	Valve moves and makes an operating noise

OK



5.	INSPECT TRANSMISSION VALVE BODY ASSEMBLY
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(a) Check the transmission valve body assembly INFO .

OK:

There are no foreign objects on any valve.

OK



6.	INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY
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(a) Check the torque converter clutch assembly INFO .

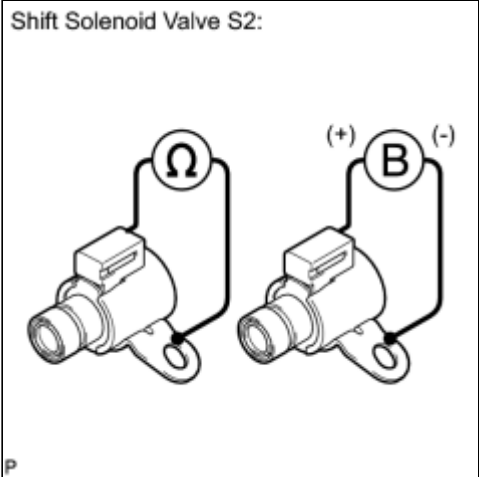
OK:

The torque converter clutch operates normally.

OK

8.

INSPECT SHIFT SOLENOID VALVE S2



(a) Remove shift solenoid valve S2.

(b) Measure the resistance according to the value(s) in the table below.

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
Shift solenoid valve S2 connector terminal - Shift solenoid valve S2 body	20°C (68°F)	11 to 15 Ω

(c) Apply battery voltage (12 V) to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

MEASUREMENT CONDITION	SPECIFIED CONDITION
- Battery positive (+) → Shift solenoid valve S2 connector - Battery negative (-) → Shift solenoid valve S2 body	Valve moves and makes an operating noise

OK

9.

INSPECT TRANSMISSION VALVE BODY ASSEMBLY

(a) Check the transmission valve body assembly

INFO

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OK:

There are no foreign objects on any valve.

OK

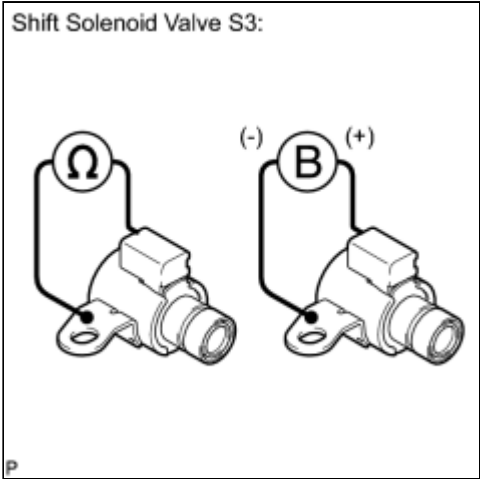
10. INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

(a) Check the torque converter clutch assembly INFO .

OK:
The torque converter clutch operates normally.

OK

12. INSPECT SHIFT SOLENOID VALVE S3



(a) Remove shift solenoid valve S3.

(b) Measure the resistance according to the value(s) in the table below.

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
Shift solenoid valve S3 connector terminal - Shift solenoid valve S3 body	20°C (68°F)	11 to 15 Ω

(c) Apply battery voltage (12 V) to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

MEASUREMENT CONDITION	SPECIFIED CONDITION
- Battery positive (+) → Shift solenoid valve S3 connector - Battery negative (-) → Shift solenoid valve S3 body	Valve moves and makes an operating noise

OK

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13.	INSPECT TRANSMISSION VALVE BODY ASSEMBLY
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- (a) Check the transmission valve body assembly INFO .
- OK:
- There are no foreign objects on any valve.

OK

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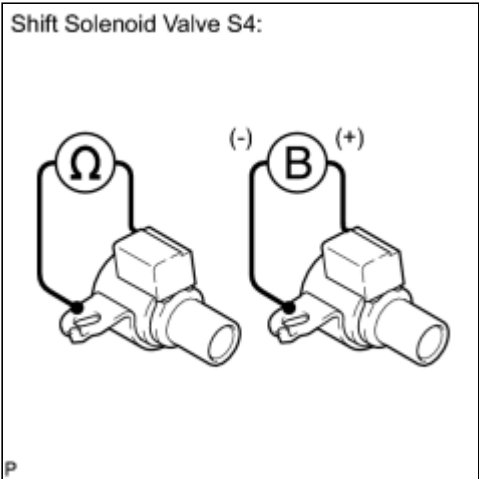
14.	INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY
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- (a) Check the torque converter clutch assembly INFO .
- OK:
- The torque converter clutch operates normally.

OK

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16.	INSPECT SHIFT SOLENOID VALVE S4
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- (a) Remove shift solenoid valve S4.

- (b) Measure the resistance according to the value(s) in the table below.
- Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
Shift solenoid valve S4 connector terminal - Shift solenoid valve S4 body	20°C (68°F)	11 to 15 Ω

(c) Apply battery voltage (12 V) to the shift solenoid valve and check that the valve moves and makes an operating noise.

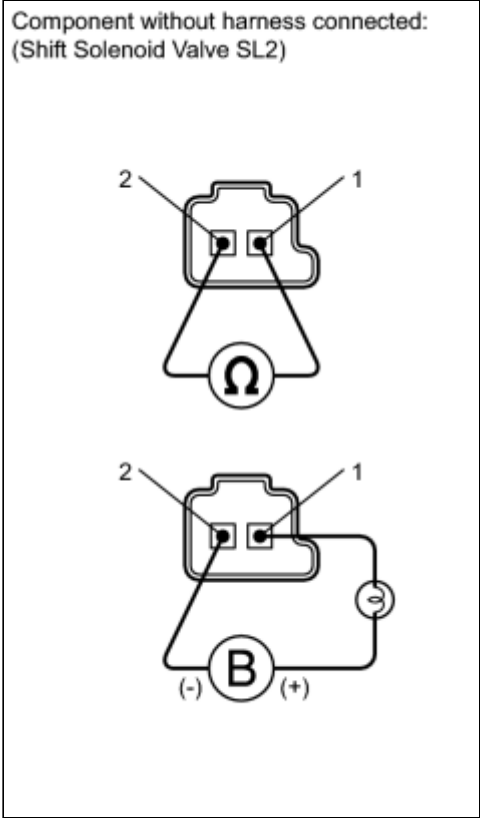
OK:

MEASUREMENT CONDITION	SPECIFIED CONDITION
• Battery positive (+) → Shift solenoid valve S4 connector • Battery negative (-) → Shift solenoid valve S4 body	Valve moves and makes an operating noise

OK

▼

17. INSPECT SHIFT SOLENOID VALVE SL2



(a) Remove shift solenoid valve SL2.

(b) Measure the resistance according to the value(s) in the table below.

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

(c) Apply battery voltage (12 V) to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

MEASUREMENT CONDITION	SPECIFIED CONDITION
• Battery positive (+) with a 21 W bulb → Terminal 1	Valve moves and makes an operating noise

MEASUREMENT CONDITION	SPECIFIED CONDITION
Battery negative (-) → Terminal 2	

OK

▼

18.

INSPECT TRANSMISSION VALVE BODY ASSEMBLY

- (a) Check the transmission valve body assembly INFO .
- OK:
- There are no foreign objects on any valve.

OK

▼

19.

INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

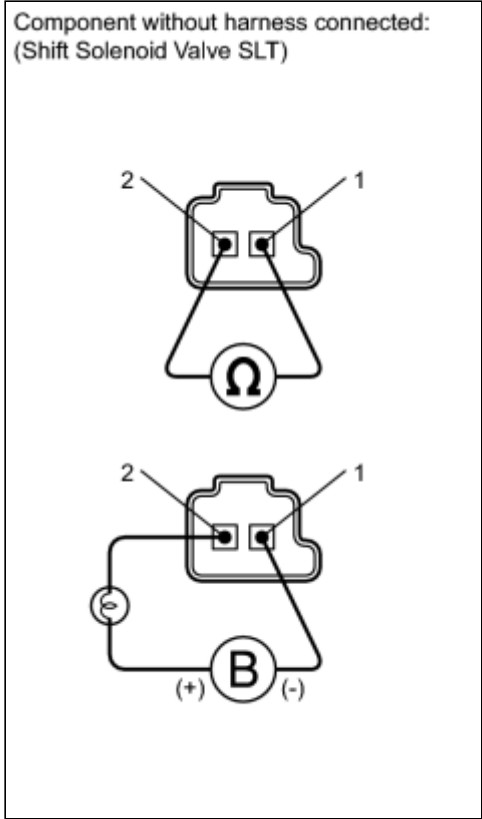
- (a) Check the torque converter clutch assembly INFO .
- OK:
- The torque converter clutch operates normally.

OK

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21.

INSPECT SHIFT SOLENOID VALVE SLT



(a) Remove shift solenoid valve SLT.

(b) Measure the resistance according to the value(s) in the table below.

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

(c) Apply battery voltage (12 V) to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

MEASUREMENT CONDITION	SPECIFIED CONDITION
- Battery positive (+) with a 21 W bulb → Terminal 2 - Battery negative (-) → Terminal 1	Valve moves and makes an operating noise

OK
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22.	INSPECT TRANSMISSION VALVE BODY ASSEMBLY
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(a) Check the transmission valve body assembly INFO.

OK:

There are no foreign objects on any valve.

OK

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23.	INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY
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- (a) Check the torque converter clutch assembly

INFO

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- OK:
- The torque converter clutch operates normally.

OK

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