

# GENESIS COUPE(BK) > 2010 > G 3.8 DOHC > Automatic Transmission System

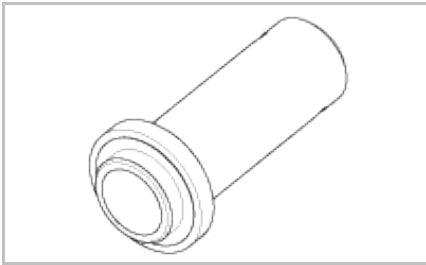
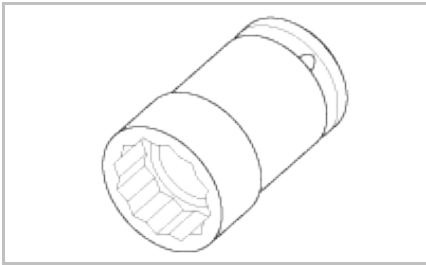
## Automatic Transmission System > General Information > Specifications

### Specifications

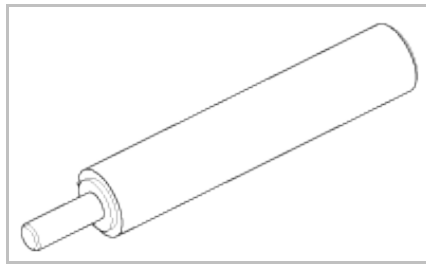
Transmission		6HP19 (ZF)
Engine		Gasoline 3.8L
Driving system		2WD
Oil pump system		Involute type (Engine driving)
Gear ratio	1st	4.171
	2nd	2.34
	3rd	1.521
	4th	1.143
	5th	0.867
	6th	0.691
	Reverse	3.403
Solenoid	3-way	1ea [MV1]
	Linear	6ea[EDS1,EDS2,EDS3,EDS4,EDS5,EDS6]
ATF		Shell M-1375.4

## Automatic Transmission System > General Information > Special Service Tools

### Special Service Tools

Tools (Number and Name)	Illustration	Use
09452-2J100 Oil seal installer		Installation of oil seal of oil pump.
09452-2J200 Locking nut socket		Removal and installation of locking nut.

09452-2J300  
Oil seal installer



Installation of oil seal of manual shatt.

## Automatic Transmission System > Automatic Transmission System > Description and Operation

### Brief Description

The 6 forward gears and the reverse gear are generated by a double planetary gear set (Ravigneaux) and a front-mounted simple planetary gear.

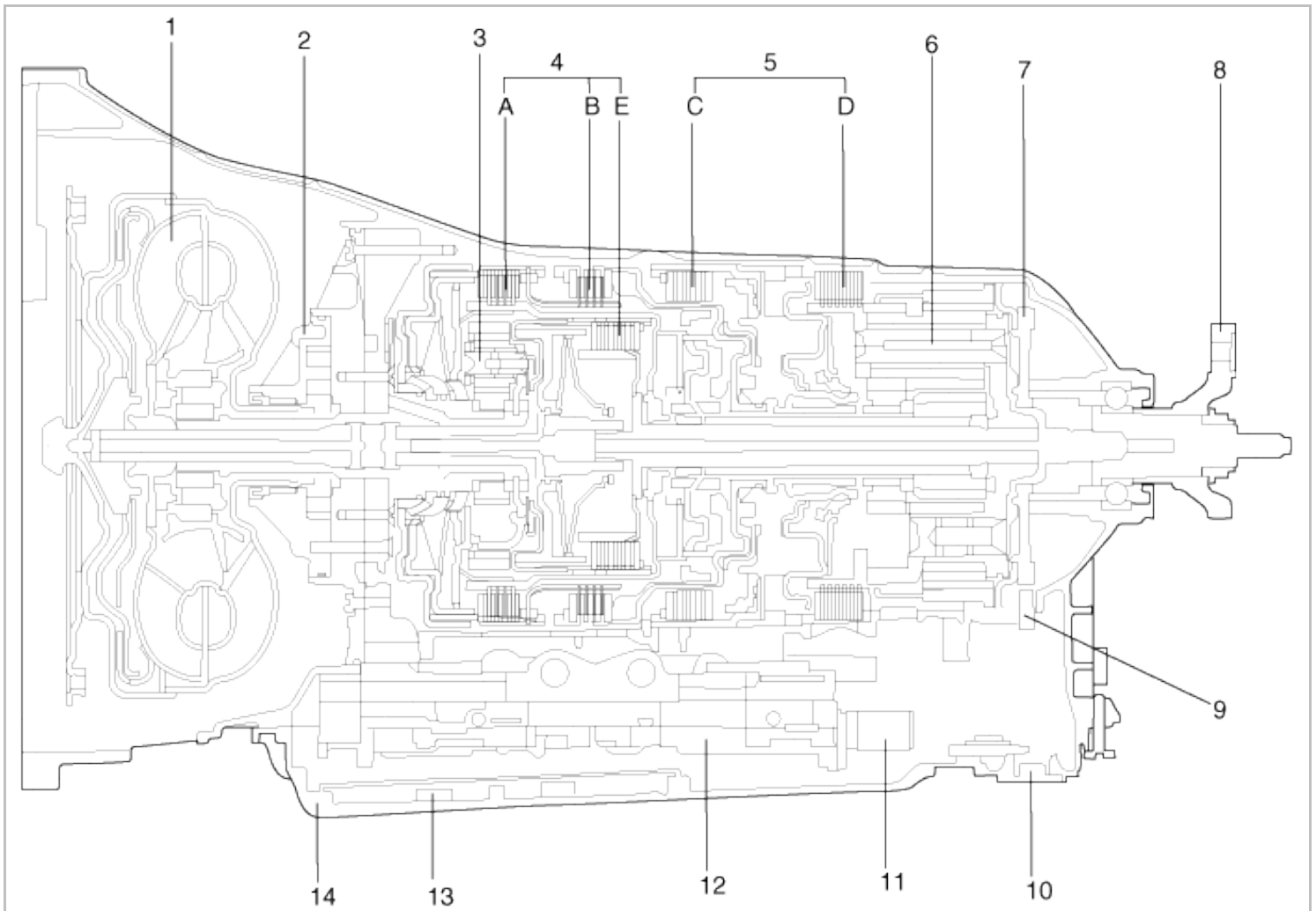
The way these planetary gear-sets work together, is patented (Lepelletier).

Also new: The stationary disconnect feature, what means that the gearbox is disconnected from the power train at standstill (clutch A is open).

This causes an additional reduction of fuel consumption.

Former the torque converter ran against the motor (foot on the brake) at standstill.

The 6HP19 uses the new "ASIS" shift strategy developed by ZF (Adaptive Shift Strategy).



1. Torque converter  
2. Oil pump

8. Output flange  
9. Parking lock pawl

3. Front single planetary gear	10. Drain plug
4. Clutch	11. Pressure regulator
5. Brake	13. Mechatronik(V/Body+TCU)
6. Front double planetary gear	14. Oil strainer
7. Parking lock wheel	15. Oil pan

## Operating Elements

Shift position	Solenoids							Clutch				Brake	
	MV1	P-EDS											
		1	2	3	4	5	6	A	B	E	LC	C	D
P (Parking)			○			○							○
R (Reverse)						○			○				○
N (Neutral)			○			○							○
D 1st		○	○			○	○	○			○		○
D 2nd		○	○	○	○	○	○	○			○	○	
D 3rd		○			○	○	○	○	○		○		
D 4th	○	○	○			○	○	○		○	○		
D 5th	○					○	○		○	○	○		
D 6th	○		○	○		○	○			○	○	○	

\*MV1 : EDS4 Switching function (OFF: Clutch-E, ON: Brake-D)

\*LC : Lock-up clutch

## Mechatronic

Mechatronic consists of the hydraulic valve body assembly and the TCU module.

There are the TCU, two speed sensors, position sensor(inhibitor switch), oil temperature sensor on the E-module.

### Position sensor

	P	Z1	R	Z2	N	Z3	D
L1	0	0	0	0	0	1	1
L2	0	0	0	1	1	1	1
L3	1	1	0	0	0	0	1
L4	0	1	1	1	0	0	0

Key to sensor coding:

Logical 0 means transistor block, electric high

Logical 1 means transistor pass, electric low

Z means intermediate position

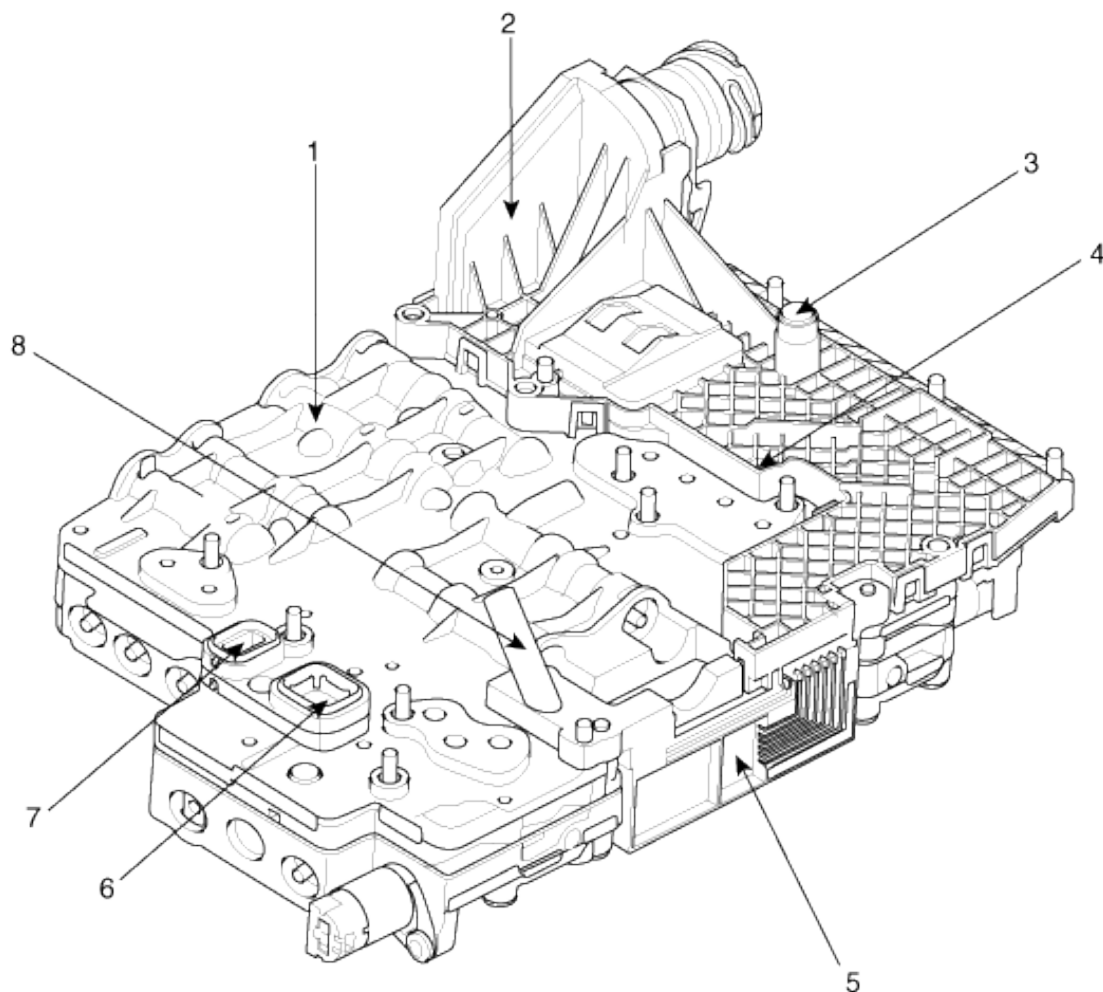
### Task of position sensor

Conversion of linear shift valve or parking lock movement into a parallel coded signal on 4 wires (L1, L2, L3, L4) in accordance with the positions P, R, N, D, 4, 3, 2 and P\_on and P\_off (parking lock engaged/disengaged)

The two speed sensors for turbine and output speeds and the oil temperature sensor and position switch are integrated into the TCU module and are not detachable.

The solenoid valves and pressure regulators are attached by the knife-edge clamping technique.

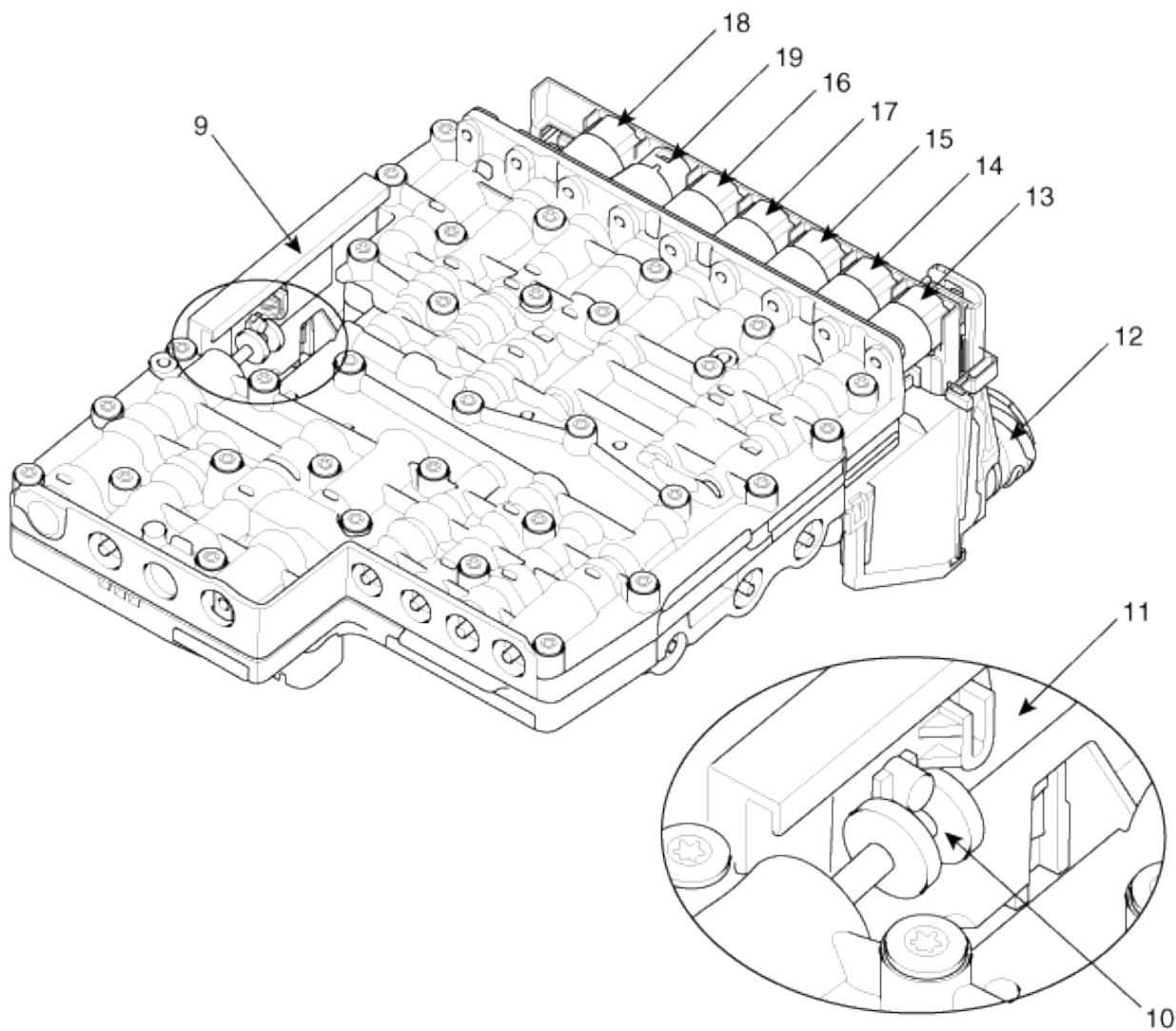
## Components(1)



- 1. Hydraulic Module
- 2. TCU Module
- 3. Output speed sensor
- 4. Oil temperature sensor

- 5. Position sensor
- 6. Discharge port
- 7. Suction port
- 8. Input speed sensor

## Components(2)



9. Position switch  
 10. Selector valve  
 11. Sliding block  
 12. TCU Module connector  
 13. EDS 1  
 14. EDS 2

15. EDS 3  
 16. EDS 4  
 17. EDS 5  
 18. EDS 6  
 19. MV 1

## Automatic Transmission System > Automatic Transmission System > Repair procedures

### Inspection And Adjustment

#### Procedure Of ATF Level Inspection

1. Park the vehicle on a level surface and set the parking brake.
2. Shift the shift lever to "P" range.
3. Start the engine.
4. Shift through all ranges (P-R-N-D-3). Stay in each range for more than 3 seconds. Then return to "P".

**NOTE**

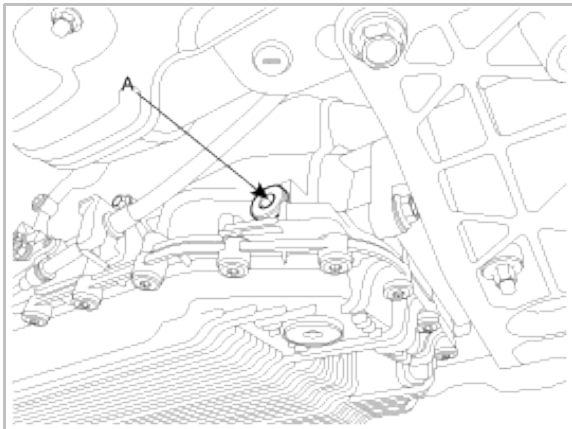
Use the sport mode to shift to "3".

- Wait until ATF temperature has reached at 30~35°C(86~95°F).

**CAUTION**

Do not raise ATF temperature by "Stall test"

- Using a TORX wrench (8mm), remove the filler plug (A).



- Check for ATF flow from the overflow hole. Add ATF as needed until fluid flows from the overflow hole.

**Specified ATF** : Shell M-1375.4

- Check that the ATF flows out of the overflow hole at 40~50°C(104~122°F).

**CAUTION**

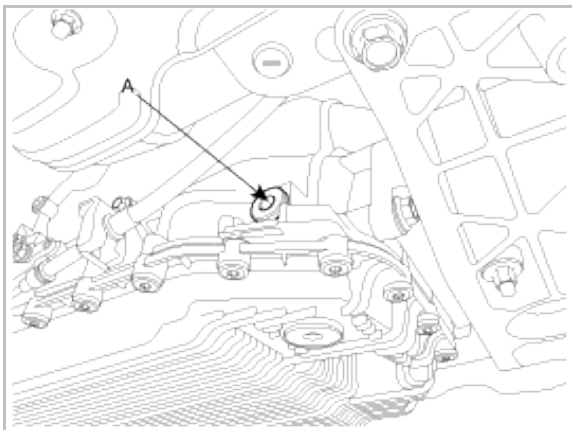
Be careful not to exceed 50°C(122°F) of the oil temperature.

- Using a TORX wrench, install the filler plug.

**Tightening torque** : 35 Nm(3.5 kgf.m, 25.3lb-ft)

## Procedure Of ATF Level Adjustment

- Park the vehicle on a flat load and lock the tires.
- Shift the shift lever to "P" range.
- Using a TORX wrench, remove the filler plug (A).



- If ATF does not drop, add ATF until it drops.

**Specified ATF** : Shell M-1375.4

5. Using a TORX wrench, install the filler plug.

**Tightening torque** : 35 Nm(3.5 kgf.m, 25.3lb-ft)

6. Start the engine.

7. Shift through all ranges (P-R-N-D-3). Stay in each range for more than 3 seconds.  
Then return to "P".

**NOTE**

Use the sport mode to shift to "3".

8. Wait until ATF temperature has reached at 30~35°C(86~95°F).

**CAUTION**

Do not raise ATF temperature by "Stall test"

9. Using a TORX wrench (8mm), remove the filler plug.

10. Check for ATF flow from the overflow hole. Add ATF as needed until fluid flows from the overflow hole.

**Specified ATF** : Shell M-1375.4

11. Check that the ATF flows out of the overflow hole at 40~50°C(104~122°F).

**CAUTION**

Be careful not to exceed 50°C(122°F) of the oil temperature.

12. Using a TORX wrench, install the filler plug.

**Tightening torque** : 35 Nm(3.5 kgf.m, 25.3lb-ft)

**Automatic Transmission System > Automatic Transmission System > Troubleshooting**

**TCU Terminal Description**



Terminal	Name	Terminal	Name
1	Select Switch	9	Power(IG)

2	CAN-Low	10	Start Relay
3	K-Line	11-12	-
4	Down Switch	13	Ground
5	Up Switch	14	Power(B+)
6	CAN-High	15	Reverse lamp relay
7	Sensor Power Supply	16	Ground
8	-		

#### Inspection Chart For Diagnostic Trouble Codes(DTC)

No.	Code	Description	MIL	Remark
1	P0120	Throttle/Pedal Position Sensor/Switch "A" Circuit		
2	P0219	Engine Overspeed Condition	●	
3	P0603	Internal Control Module Keep Alive Memory (KAM) Error	●	
4	P0605	Internal Control Module Read Only Memory(ROM) Error	●	
5	P0607	Control Module Performance	●	
6	P0616	Starter Relay Circuit Low		
7	P0634	PCM/ECM/TCM Internal Temperature Too High	●	
8	P0641	Sensor Reference Voltage "A" Circuit/Open	●	
9	P0642	Sensor Reference Voltage "A" Circuit Low	●	
10	P0666	PCM/ECM/TCM Internal Temperature Sensor Circuit		
11	P0667	PCM/ECM/TCM Internal Temperature Sensor Range/Performance		
12	P0703	Stop Lamp (Brake) Switch Circuit Malfunction		
13	P0705	Transmission Range Sensor Circuit Malfunction (PRNDL Input)	●	
14	P0706	Transmission Range Sensor Circuit Range/Performance	●	
15	P0707	Transmission Range Sensor Circuit Low Input	●	
16	P0708	Transmission Range Sensor Circuit High Input	●	
17	P0710	Transmission Fluid Temperature Sensor "A" Circuit	●	
18	P0711	Transmission Fluid Temperature Sensor "A" Circuit Range/Performance	●	
19	P0712	Transmission Fluid Temperature Sensor "A" Circuit Low Input	●	
20	P0713	Transmission Fluid Temperature Sensor "A" Circuit High Input	●	
21	P0716	Input/Turbine Speed Sensor "A" Circuit Range/Performance	●	
22	P0717	Input/Turbine Speed Sensor "A" Circuit No Signal	●	
23	P0721	Output Speed Sensor Circuit Range/Performance	●	
24	P0722	Output Speed Sensor Circuit No Signal	●	
25	P0727	Engine Speed Input Circuit No Signal	●	
26	P0729	Gear 6 Incorrect Ratio	●	
27	P0731	Gear 1 Incorrect Ratio	●	
28	P0732	Gear 2 Incorrect Ratio	●	

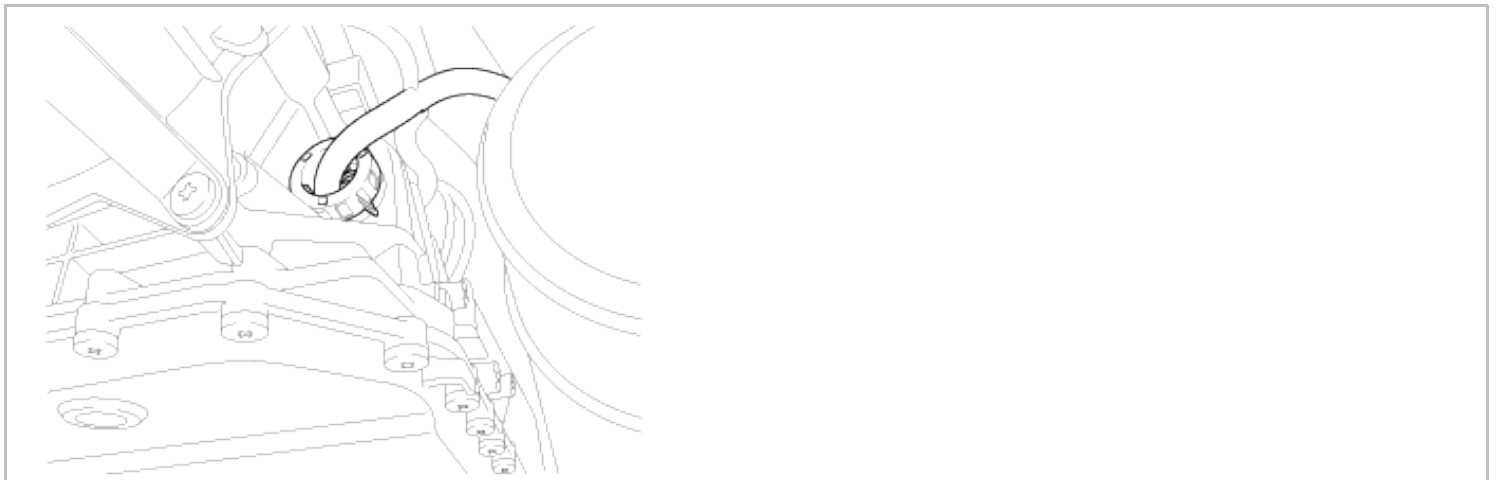


29	P0733	Gear 3 Incorrect Ratio	•	
30	P0734	Gear 4 Incorrect Ratio	•	
31	P0735	Gear 5 Incorrect Ratio	•	
32	P0736	Reverse Incorrect Ratio	•	
33	P0741	Torque Converter Clutch Circuit Stuck Off(SOL6)	•	
34	P0743	Torque Converter Clutch Circuit - Short to battery (SOL6)	•	
35	P0744	Torque Converter Clutch Circuit - Open or Short to ground (SOL6)	•	
36	P0746	Pressure Control Solenoid Valve "A" Performance or Stuck Off(SOL5)	•	
37	P0748	Pressure Control Solenoid Valve "A" - Short to Battery(SOL5 - Normal / High )		
38	P0749	Pressure Control Solenoid Valve "A" - Short to ground (SOL5 - Normal / High)	•	
39	P0751	Shift Control Solenoid Valve "A" Performance or Stuck Off (SOL1- Clutch "A" : Normal / Low)	•	
40	P0753	Shift Control Solenoid Valve "A" -Short to battery (SOL1- Clutch "A" : Normal / Low)	•	
41	P0754	Shift Control Solenoid Valve "A" - Open or Short to ground(SOL1-Clutch "A" - Normal / Low)	•	
42	P0756	Shift Control Solenoid Valve "B" Performance or Stuck Off(SOL2)	•	
43	P0758	Shift Control Solenoid Valve "B" - Short to battery (SOL2-Clutch B : Normal / High)	•	
44	P0759	Shift Control Solenoid Valve "B" Intermittent(SOL2)	•	
45	P0761	Shift Control Solenoid Valve "C" Performance or Stuck Off(SOL3)	•	
46	P0763	Shift Control Solenoid Valve "C" - Short to battery (SOL3 - Brake "C" : Normal / Low)	•	
47	P0764	Shift Control Solenoid Valve "C"-Open or Short to ground (SOL3 - Brake "C" : Normal / Low)	•	
48	P0766	Shift Control Solenoid Valve "D" Performance or Stuck Off(SOL4)	•	
49	P0768	Shift Control Solenoid Valve "D" - Short to battery (SOL4- Brake "D", Clutch "E" - Normal / High)	•	
50	P0769	Shift Control Solenoid Valve "D" - Open or Short to ground (SOL4- Brake"D", Clutch"E" : Normal / High)	•	
51	P0771	Shift Control Solenoid Valve "E" - Open(SOL 7 - ON/OFF : Normal / Close)	•	
52	P0773	Shift Control Solenoid Valve "E" - Short to battery (SOL 7 - ON/OFF : Normal / Close)	•	
53	P0774	Shift Control Solenoid Valve "E" - Short to ground (SOL 7 - ON/OFF : Normal / Close)	•	
54	P0781	1-2 Shift	•	
55	P0782	2-3 Shift	•	
56	P0783	3-4 Shift	•	
57	P0784	4-5 Shift	•	
58	P0829	5-6 Shift	•	
59	P0880	TCM Power Signal Error Open/Short (GND)	•	

60	P0889	TCM Power Supply to Solenoid Circuit Range/Performance	•	
61	P0890	TCM Power Relay Circuit Low	•	
62	P0891	TCM Power Relay Circuit High	•	
63	P0892	TCM Power Supply to Solenoid Valve Circuit - Open	•	
64	P0905	Gate Select Position Circuit Range/Performance	•	
65	P0924	Gear Shift Reverse Actuator Circuit/Open		
66	P0926	Gear Shift Reverse Actuator Circuit Low	•	
67	P0927	Gear Shift Reverse Actuator Circuit High		
68	P2637	Torque Management Feedback Signal "A"	•	
69	P2700	Transmission Friction Element "A" Apply Time Range/Performance	•	
70	P2701	Transmission Friction Element "B" Apply Time Range/Performance	•	
71	P2702	Transmission Friction Element "C" Apply Time Range/Performance	•	
72	P2703	Transmission Friction Element "D" Apply Time Range/Performance	•	
73	P2704	Transmission Friction Element "E" Apply Time Range/Performance	•	
74	U0001	High Speed CAN Communication Bus off	•	
75	U0100	Lost Communication With ECM/PCM "A"	•	
76	U0104	Lost Communication With Cruise Control Module		
77	U0114	Lost Communication With Four-Wheel Drive Clutch Control Module		
78	U0121	Lost Communication With Anti-Lock Brake System (ABS) Control Module		
79	U0122	Lost Communication With Vehicle Dynamics Control Module		
80	U0126	Lost Communication With Steering Angle Sensor Module		

## Automatic Transmission System > Automatic Transmission System > P0120 Throttle/Pedal Position Sensor/Switch 'A' Circuit

### Component Location



### General Description

TCM inputted this signal through CAN communication line so TCM recognize driver's intension to control shift point.

TCM realized optimum shift point use this signal.

## DTC Description

TCM set this code If detected not available TPS signal in condition that CAN signal is normal.

## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Check signal	• TPS
Enable Conditions	• Engine side CAN signal is normal • CAN BUS is normal • IG ON • Battery voltage > 9V	
Threshold Value	• No signal of TPS	
Diagnostic Time	• Immediately	
Fail Safe	• No self learning control (priority : 1)	

### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

Current Data		
Standard Display	Full List	Graph
Items List	Reset Min.Max.	Record
Stop	VSS	
Sensor Name	Value	Unit
<input checked="" type="checkbox"/> Accelerator Pedal Position Sensor	0	%
<input checked="" type="checkbox"/> Engine Speed	0	RPM
<input checked="" type="checkbox"/> Vehicle Speed	0	MPH
<input checked="" type="checkbox"/> Input Speed(PG-A)	0	RPM
<input checked="" type="checkbox"/> Output Speed(PG-B)	0	RPM
<input checked="" type="checkbox"/> Torque Converter Clutch Slip	0	RPM
<input type="checkbox"/> Throttle Position	6.3	%
<input type="checkbox"/> Transmission Fluid Temperature Sensor	124	'F
<input type="checkbox"/> Shift Lever Switch	P/N	-

Fig.1

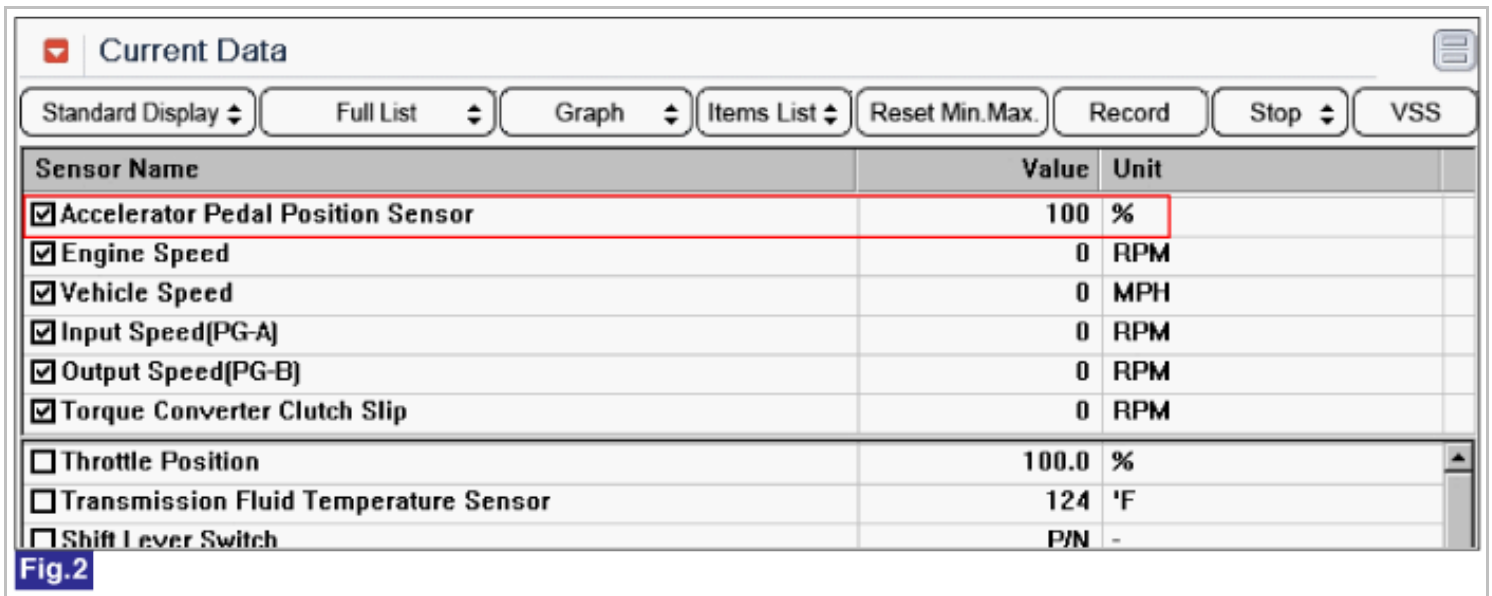
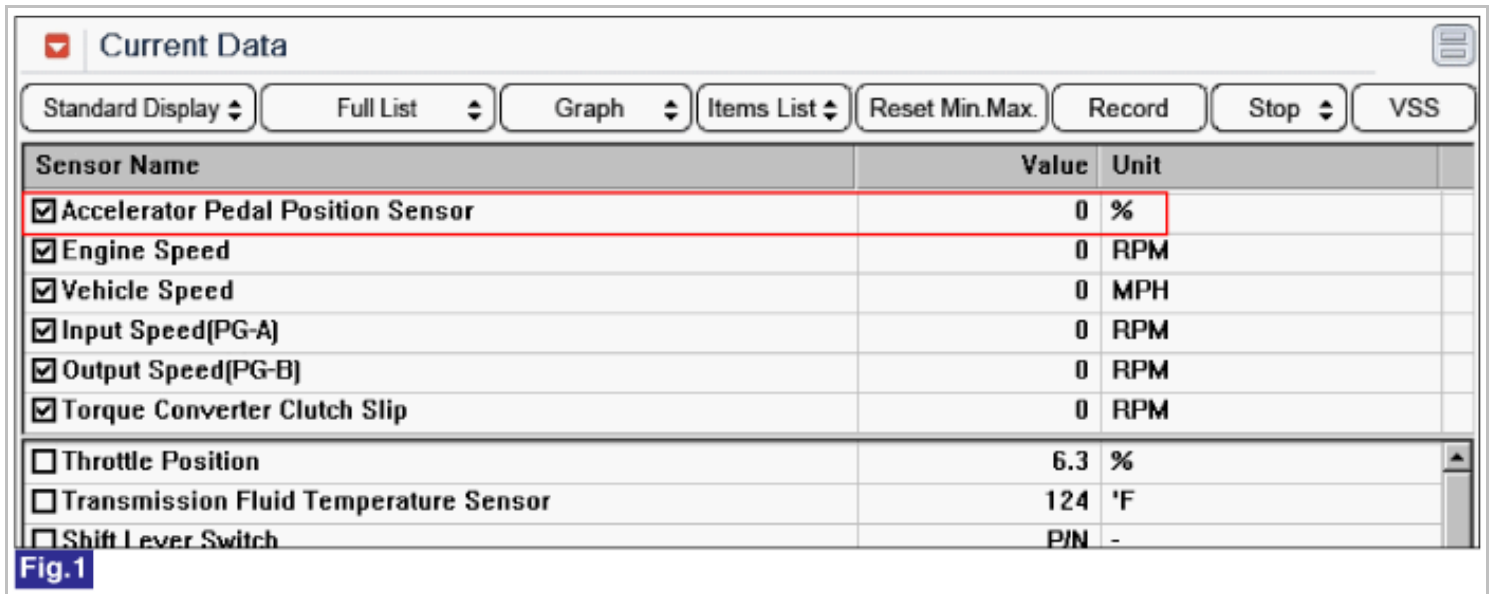


Fig 1) APS closed(IG ON)

Fig 2) APS wide-open(IG ON)

## Monitor Scantool Data

1. Connect scantool to Diagnostic Connector.
2. Ignition "ON" & Engine "OFF".
3. Monitor the "Accelerator Pedal Position Sensor" parameter on the scan tool.



Current Data					
Standard Display ▾			Full List ▾		
Graph ▾			Items List ▾		
Reset Min.Max.			Record		
Stop ▾			VSS		
Sensor Name	Value	Unit			
<input checked="" type="checkbox"/> Accelerator Pedal Position Sensor	100	%			
<input checked="" type="checkbox"/> Engine Speed	0	RPM			
<input checked="" type="checkbox"/> Vehicle Speed	0	MPH			
<input checked="" type="checkbox"/> Input Speed(PG-A)	0	RPM			
<input checked="" type="checkbox"/> Output Speed(PG-B)	0	RPM			
<input checked="" type="checkbox"/> Torque Converter Clutch Slip	0	RPM			
<input type="checkbox"/> Throttle Position	100.0	%			
<input type="checkbox"/> Transmission Fluid Temperature Sensor	124	'F			
<input type="checkbox"/> Shift Lever Switch	P/N	-			

Fig.2

Current Data					
Standard Display ▾			Full List ▾		
Graph ▾			Items List ▾		
Reset Min.Max.			Record		
Stop ▾			VSS		
Sensor Name	Value	Unit			
<input checked="" type="checkbox"/> Accelerator Pedal Position Sensor	0	%			
<input checked="" type="checkbox"/> Engine Speed	542	RPM			
<input checked="" type="checkbox"/> Vehicle Speed	0	MPH			
<input checked="" type="checkbox"/> Input Speed(PG-A)	518	RPM			
<input checked="" type="checkbox"/> Output Speed(PG-B)	0	RPM			
<input checked="" type="checkbox"/> Torque Converter Clutch Slip	24	RPM			
<input type="checkbox"/> Throttle Position	0.4	%			
<input type="checkbox"/> Transmission Fluid Temperature Sensor	122	'F			
<input type="checkbox"/> Shift Lever Switch	P/N	-			

Fig.3

Fig 1) APS closed(IG ON)

Fig 2) APS wide-open(IG ON)

Fig 3) APS open(Idle)

4. Is "Accelerator Pedal Position Sensor" output value within normal range ?

<b>YES</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.
<b>NO</b>	▶ Refer to the "Engine DTC guide", Repair as necessary and go to "Verification vehicle Repair" procedure.

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.

#### 4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure.
<b>NO</b>	▶ System performing to specification at this time.

### Automatic Transmission System > Automatic Transmission System > P0219 Engine Overspeed Condition

#### Component Location



#### General Description

Several control units are applied to electronically controlled vehicles. These units perform each control with informations from various sensors. Thus, sharing signal information from sensors is needed, so CAN communication type whose communication speed is high and insensitive to electrical noise by spark generation is adopted to controlling power-train(engine, automatic transaxle, ABS, TCS, ECS)

A/T, ESP, ABS control units share the informations that Engine rpm, APS signal, gear position, Torque reduction signal, using CAN communication to confirm active controlling.

#### DTC Description

TCM set this code If Pressure control valve is out of control due to too much increase of Engine rpm.(MIN "ON")

#### DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	<ul style="list-style-type: none"><li>• Check signal</li></ul>	<ul style="list-style-type: none"><li>• Crank angle sensor(CKP)</li></ul>
Enable Conditions	<ul style="list-style-type: none"><li>• Lever position = Not P,R, N range</li><li>• Engine rpm = normal</li><li>• Out of P,R,N range and after shifting 0.3 second</li></ul>	
Threshold Value	<ul style="list-style-type: none"><li>• Engine rpm &gt; 5000 RPM</li></ul>	
Diagnostic Time	<ul style="list-style-type: none"><li>• Immediately</li></ul>	
	<ul style="list-style-type: none"><li>• High speed : fixed at 5th gear, low speed : fixed at 3rd gear</li></ul>	

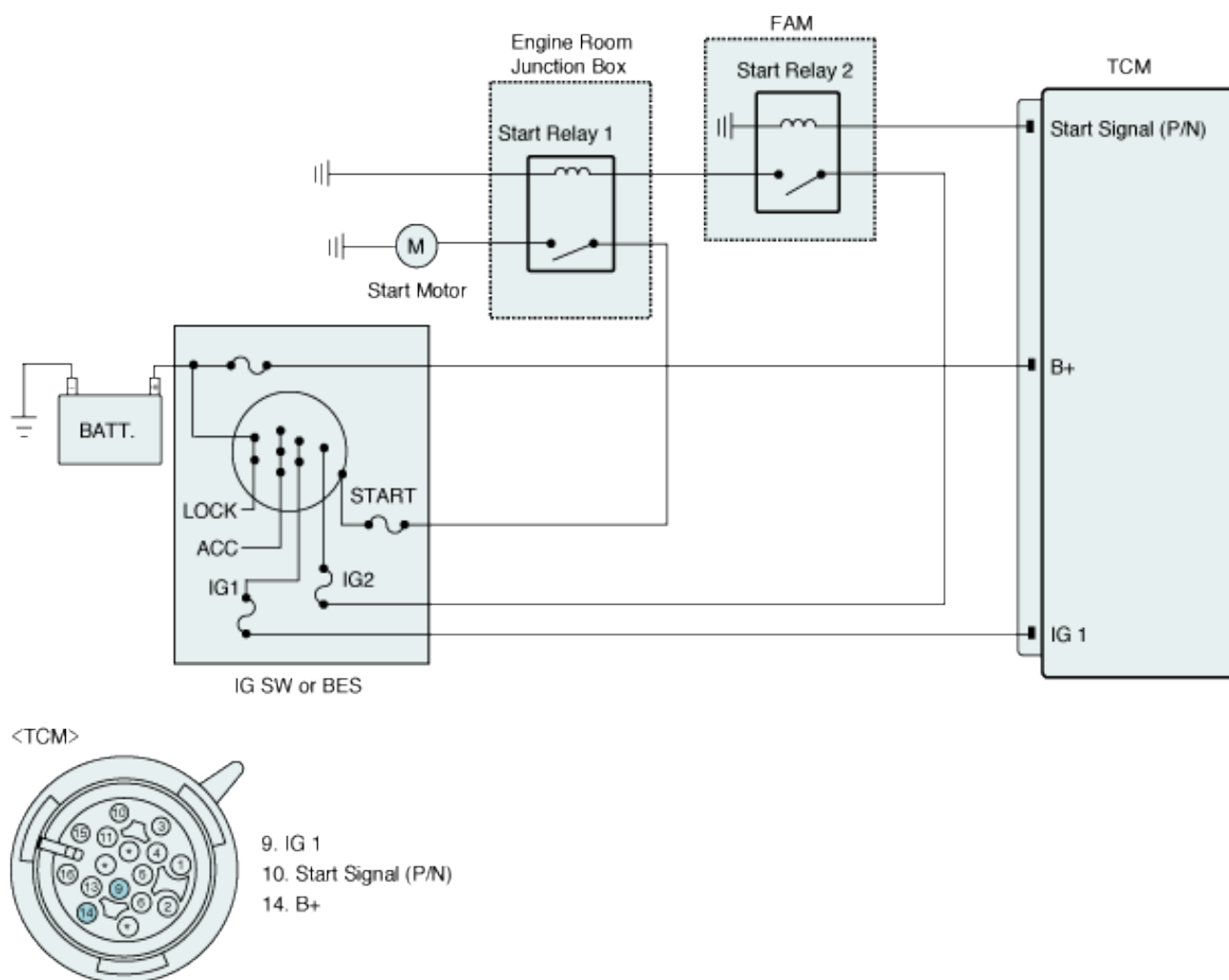
## Fail Safe

- Reverse : Shift lock(Push "Unlock button → possible to shift)  
(priority :3)

## CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Diagnostic Circuit Diagram



## Signal Waveform & Data

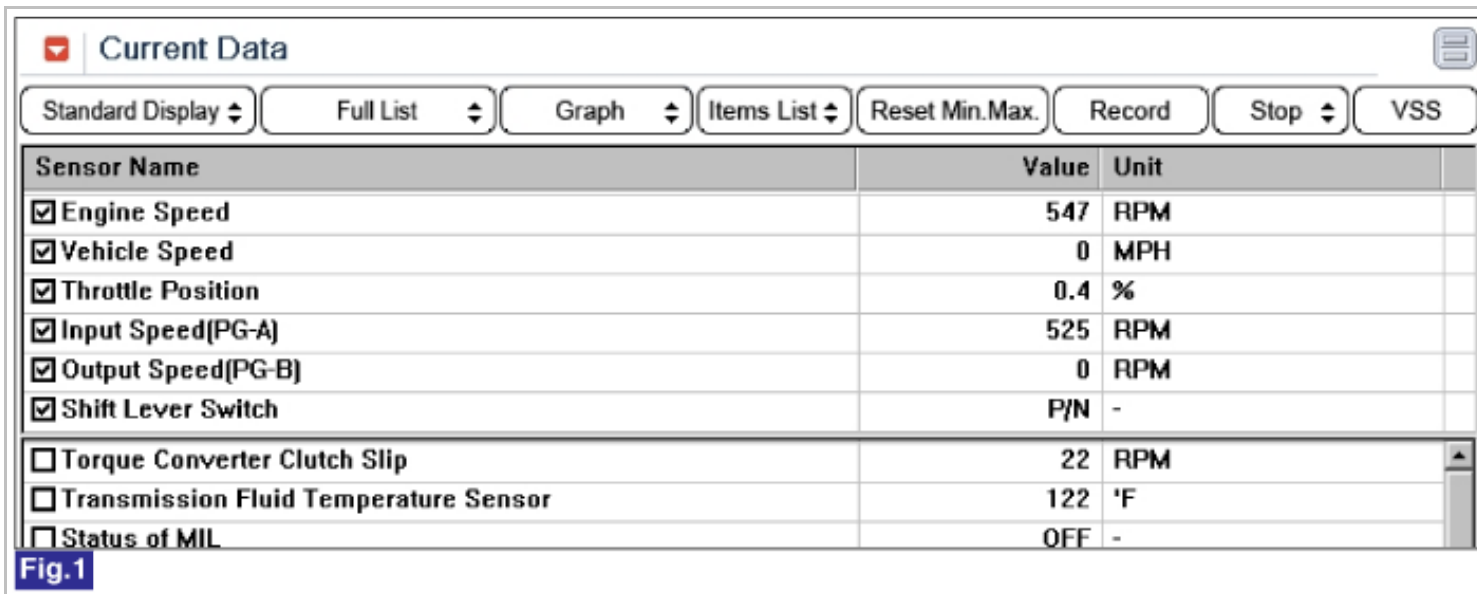


Fig 1) Engine rpm When Idle

## Monitor Scantool Data

1. Connect scantool to Diagnostic Connector.
2. Ignition "ON" & Engine "OFF".
3. Monitor the "Engine Speed" parameter on the scan tool.

**Specification :** 600±100rpm RPM

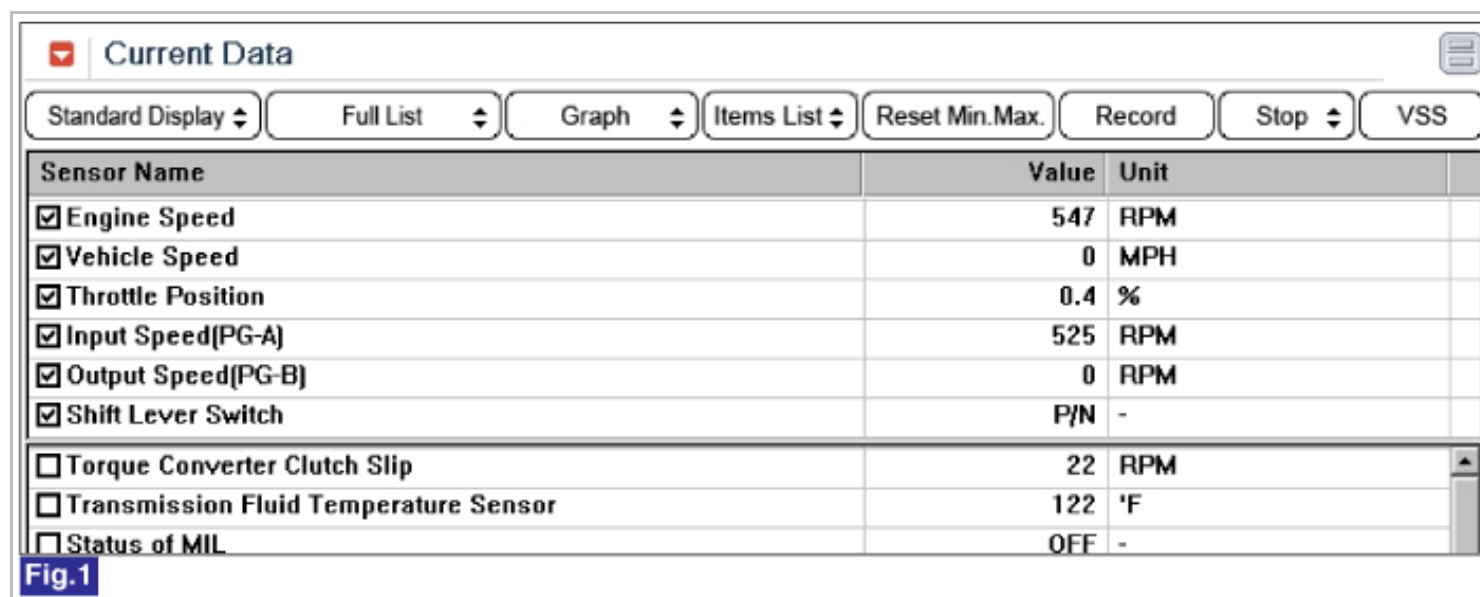


Fig 1) Engine RPM at Idle

4. Is "Engine Speed" output value within specification ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.
<b>NO</b>	► Refer to the "Engine DTC guide", Repair as necessary and go to "Verification vehicle Repair" procedure.



## Verification of Vehicle Repair

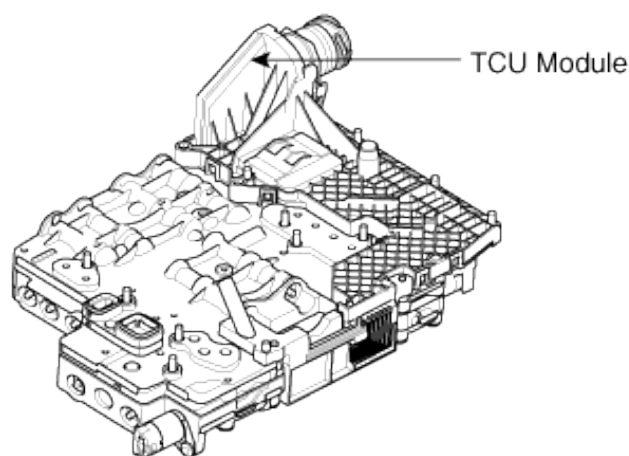
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure.
<b>NO</b>	▶ System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0603 Internal Control Module Keep Alive Memory (KAM) Error

### Component Location



### General Description

TCM is activated by power supply. Signals from several sensors, such as ATFS and APS, is inputted to TCM. Comparing inputted signals with control LOGIC saved at micro controller and EEPROM, TCM controls Transmission as actuating solenoids. To guarantee accurate control, TCM performs SELF TEST, DIAGNOSIS of several sensors and actuators. And if serious trouble which affects vehicle performance occurs, TCM sets DTCs. At certain cases, TCM inhibits shifting in order to prevent dangerous situation due to incorrect control.

### DTC Description

By comparing the checksum value with a stored value in flash ROM, a malfunction can be detected after IG ON.  
(MIL "ON" : Immediately or 2driving cycle)

### DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Watchdog / EEPROM	
Enable Conditions	• "IG KEY" ON	

Threshold Value	• Different from correct CHECKSUM value in flash ROM	• Mechatronics(Valve-body + TCM)
Diagnostic Time	• Immediately	
Fail Safe	• High speed : fixed at 5th gear, low speed : fixed at 3rd gear • Reverse : Shift lock(Push "Unlock button → possible to shift) (priority :4)	

#### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected,replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

#### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

(Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed.

Before learning, check for variable speed shock or shift shock.

#### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

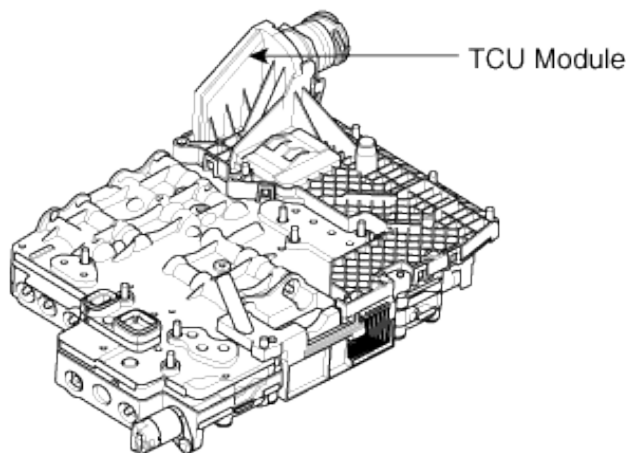
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure.
<b>NO</b>	▶ System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0605 Internal Control Module Read Only Memory(ROM) Error

### Component Location



### General Description

TCM is activated by power supply. Signals from several sensors, such as ATFS and APS, is inputted to TCM. Comparing inputted signals with control LOGIC saved at micro controller and EEPROM, TCM controls Transmission as actuating solenoids . To guarantee accurate control, TCM performs SELF TEST, DIAGNOSIS of several sensors and actuators. And if serious trouble which affects vehicle performance occurs, TCM sets DTCs. At certain cases, TCM inhibites shifting in order to prevent dangerous situation due to incorrect control.

### DTC Description

TCM detects internal RAM value by itself. If the value TCM wrote on RAM differs from the value TCM read, Malfunction can be detected.

## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Check SUM	• Mechatronics(Valve-body + TCM)
Enable Conditions	• "IG KEY" ON	
Threshold Value	• Different value of RAM calculated with EEPROM	
Diagnostic Time	• Immediately	
Fail Safe	• High speed : fixed at 5th gear, low speed : fixed at 3rd gear (priority :3)	

### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

#### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

## CAUTION

Don't raise the oil temperature by stalling the engine.

(Reference)

If the oil temperature is not between 50°C ( 122 °F) and 120°C ( 248 °F), initial learning can not be performed.  
Before learning, check for variable speed shock or shift shock.

STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear.  
RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

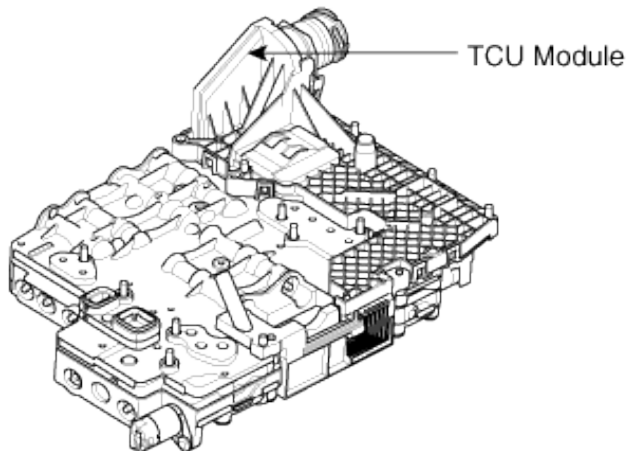
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure.
<b>NO</b>	▶ System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0607 Control Module Performance

### Component Location



### General Description

TCM is activated by power supply. Signals from several sensors, such as ATFS and APS, is inputted to TCM. Comparing inputted signals with control LOGIC saved at micro controller and EEPROM, TCM controls Transmission as actuating solenoids . To guarantee accurate control, TCM performs SELF TEST, DIAGNOSIS of several sensors and actuators. And if serious trouble which affects vehicle performance occurs, TCM sets DTCs. At certain cases, TCM inhibites shifting in order to prevent dangerous situation due to incorrect control.

## DTC Description

TCM set this code If the function of Fail-safe unstable status or detected solenoid operation in not controlling solenoid conditon.

(MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Check function	• Mechatronics(Valve-body + TCM)
Enable Conditions	• "IG KEY" ON	
Threshold Value	• Software malfunction	
Diagnostic Time	• Immediately	
Fail Safe	• High speed : fixed at 5th gear, low speed : fixed at 3rd gear • Reverse : Shift lock(Push "Unlock button → possible to shift) (priority :4)	

### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected,replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

## How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

(Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed.

Before learning, check for variable speed shock or shift shock.

### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear.

RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

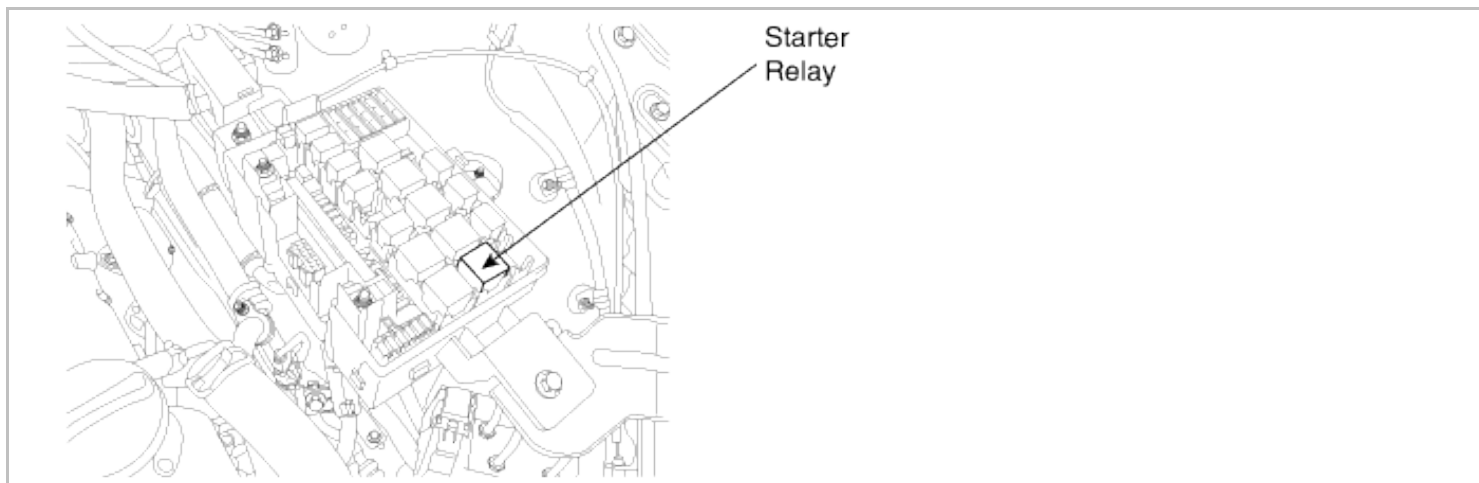
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure.
<b>NO</b>	▶ System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0616 Starter Relay Circuit Low

### Component Location



## General Description

Start relay is installed in FAM. TCM output 12V signal only "P, N" range, this signal grounded to FAM internal circuit through coil of start relay2. start signal of ignition s/w inputted, internal s/w closed that of starter relay 2 and that signal grounded to vehicle body through coil of starter relay1 that is located in Engine room junction box. Then KEY SW2 signal supplied to start motor through starter relay1 s/w and drives start motor.

## DTC Description

TCM set this code If impossible starting in "P,N" range condition or impossible starting in "P,N" range condition.(MIL OFF)

## DTC Detecting Condition

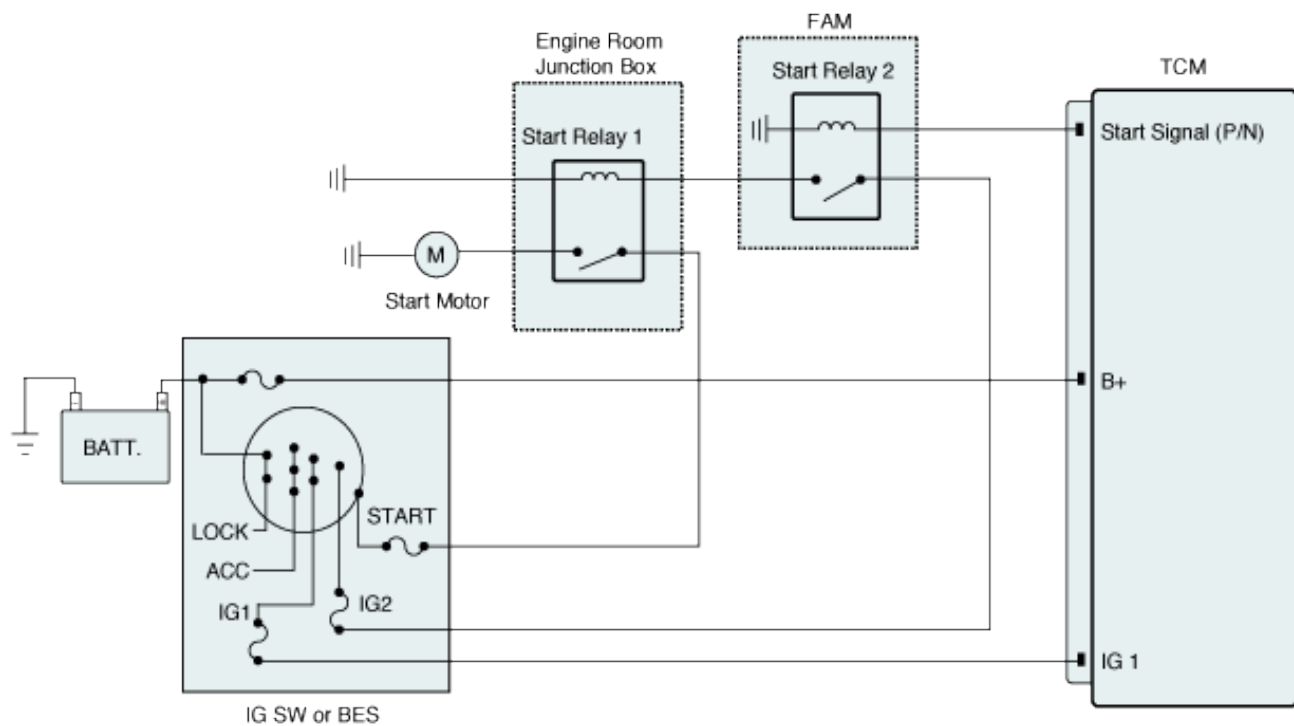
Item	Detecting Condition	Possible Cause
DTC Strategy	<ul style="list-style-type: none"><li>• Check the P/N range signal.</li></ul>	<ul style="list-style-type: none"><li>• Faulty in starter relay2(inside FAM)</li><li>• Mechatronics (Valve-body + TCM)</li></ul>
Enable Conditions	<ul style="list-style-type: none"><li>• "IG KEY" ON</li><li>• Power supply to sensor is normal</li><li>• No error in inhibitor s/w</li></ul>	
Threshold Value	<ul style="list-style-type: none"><li>• Impossible starting in "P,N" range condition &gt; 800mS (Faulty in starter relay)</li><li>• Impossible starting in "P,N" range condition &gt; 800mS (Faulty in P/N s/w)</li></ul>	
Diagnostic Time	<ul style="list-style-type: none"><li>• 0.45second</li></ul>	
Fail Safe	<ul style="list-style-type: none"><li>• - (priority : 1)</li></ul>	

### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Diagnostic Circuit Diagram





<TCM>



- 9. IG 1
- 10. Start Signal (P/N)
- 14. B+

## Signal Waveform & Data

Current Data		
Standard Display	Full List	Graph
Items List	Reset Min.Max.	Record
Stop	VSS	
Sensor Name	Value	Unit
<input checked="" type="checkbox"/> Starter Relay	ON	-
<input checked="" type="checkbox"/> Shift Lock System	OFF	-
<input checked="" type="checkbox"/> Ignition Key Status	ON	-
<input checked="" type="checkbox"/> Brake Switch	OFF	-
<input checked="" type="checkbox"/> Shift Lever Switch	P/N	-
<input checked="" type="checkbox"/> Battery Voltage	13.8	V
<input type="checkbox"/> SOL 5	776	mA

Fig.1

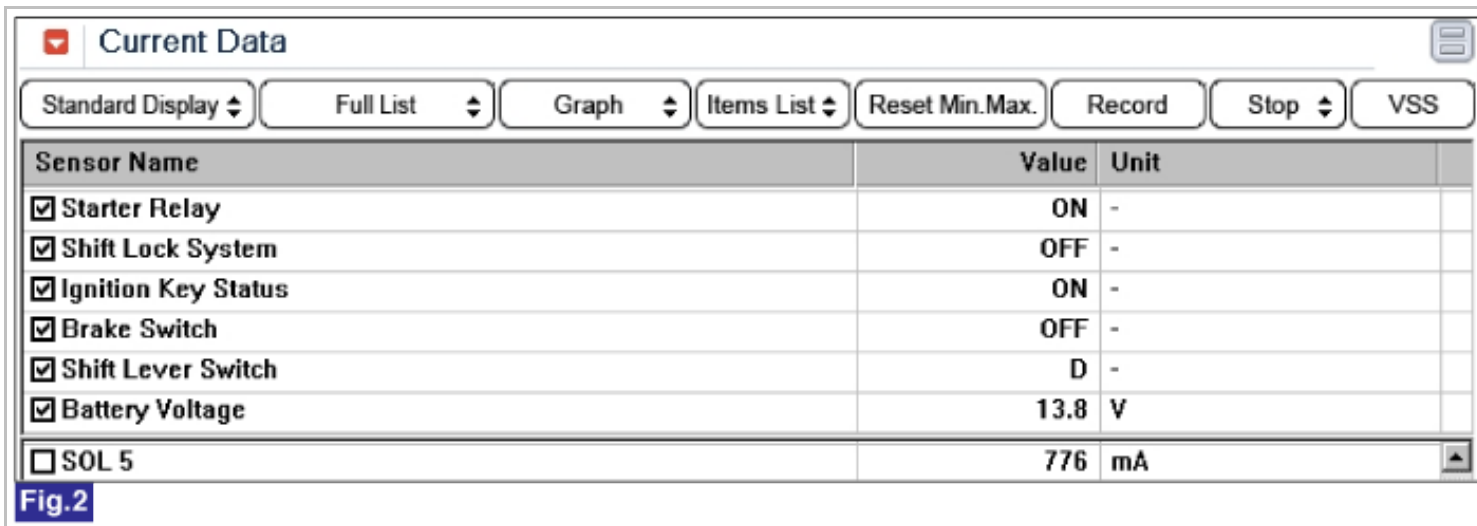


Fig 1) Inhibitor s/w P/N in "P" position : ON

Fig 2) Inhibitor s/w D in "D" position : OFF

## Monitor Scantool Data

1. Connect scantool to Diagnostic Connector.
2. Ignition "ON" & Engine "OFF".
3. Select "P,N" range and Confirm the "starter relay" parameter on the scan tool.

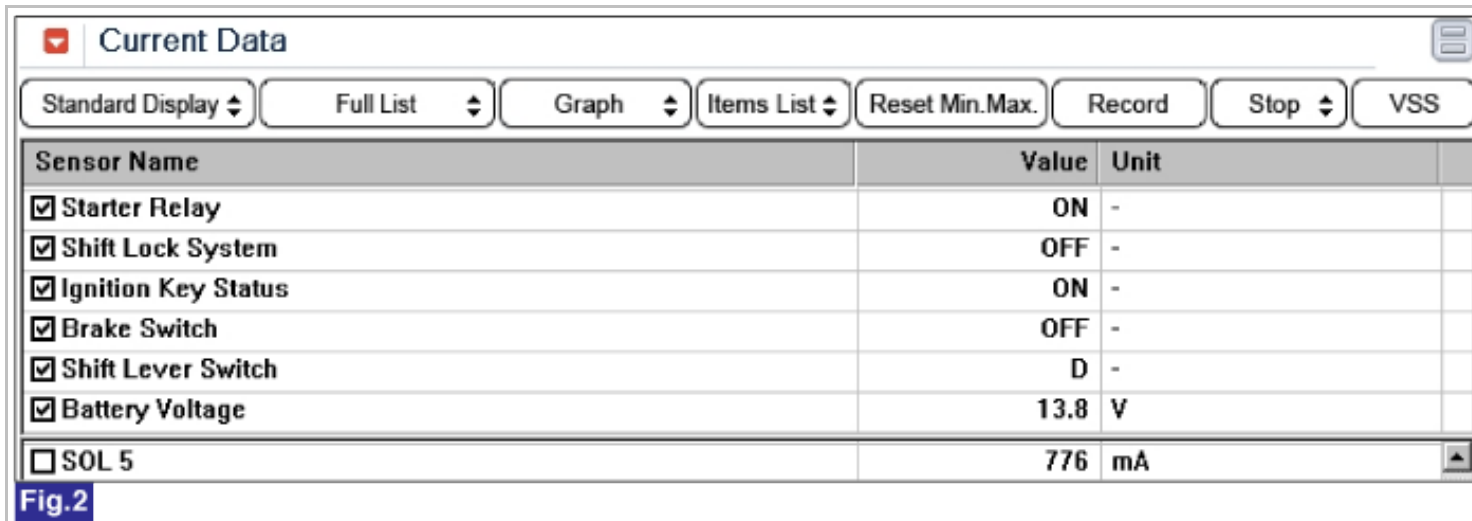
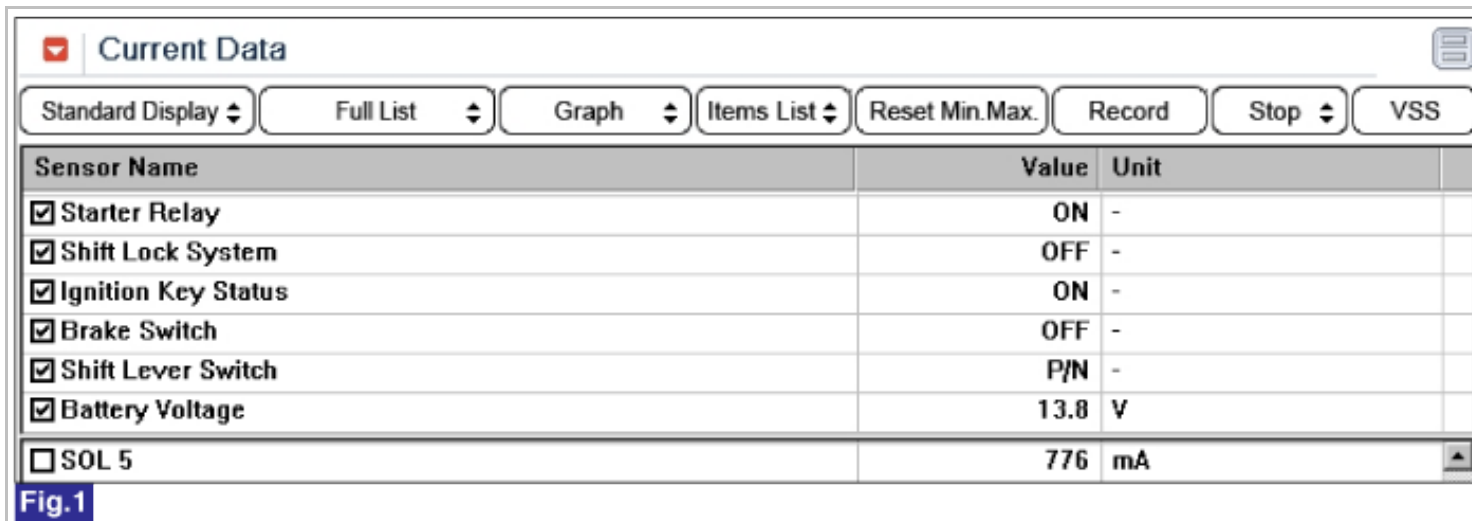


Fig 1) Inhibitor s/w P/N in "P" position : ON

Fig 2) Inhibitor s/w D in "D" position : OFF

4. Is normal operation in "P/N" position ?

<b>YES</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification Vehicle Repair" procedure
<b>NO</b>	▶ Substitute with a known-good FAM and check for proper operation. 1. If the operation is normal, then Replace FAM and go to "Verification Vehicle Repair" procedure. 2. If operation is abnormal, then perform the "Component inspection" procedure.

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

#### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

#### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal normally. Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

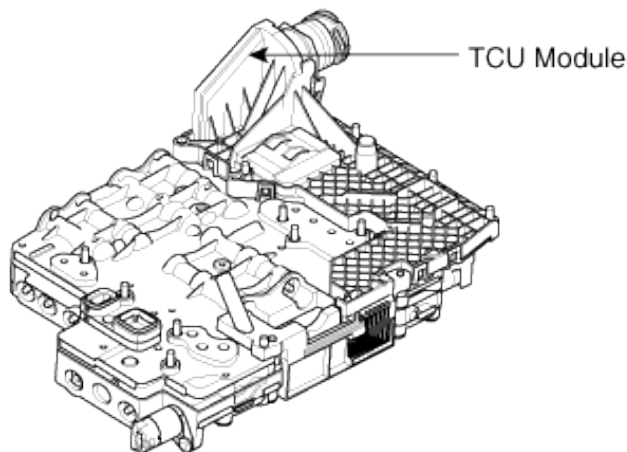
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure.
<b>NO</b>	▶ System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0634 PCM/ECM/TCM Internal Temperature Too High

### Component Location



### General Description

TCM installed in inside Automatic transmissiom with E-module. Temperature sensor detects temperature increasing for inside of TCU and prevent from obnormal operation of TCU.

### DTC Description

TCM set this code If Temperature sensor detects over 140°C.(MIL OFF)

### DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Check signal range	• Mechatronics (Valve-body + TCM)
Enable Conditions	• "IG KEY" ON	
Threshold Value	• TCM Temperature > 140°C	
Diagnostic Time	• Immediately	
	• High speed : fixed at 5th gear, low speed : fixed at 3rd gear	

Fail Safe	<ul style="list-style-type: none"> <li>• Reverse : Shift lock(Push "Unlock button → possible to shift) (priority :4)</li> </ul>
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### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

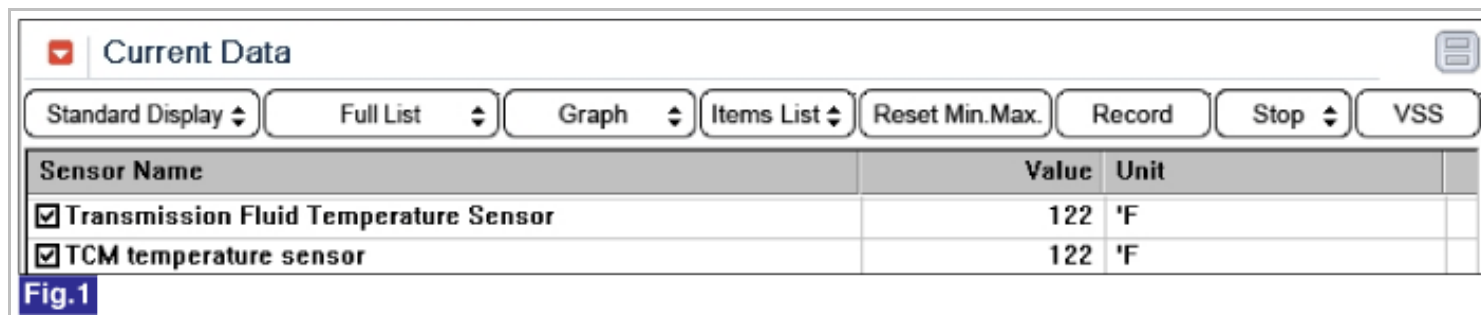


Fig 1) Temperature of TCU inside

## Monitor Scantool Data

1. Connect scantool to Diagnostic Connector.
2. Ignition "ON" & Engine "OFF".
3. Confirm the "TCM Temperature sensor" parameter on the scan tool.

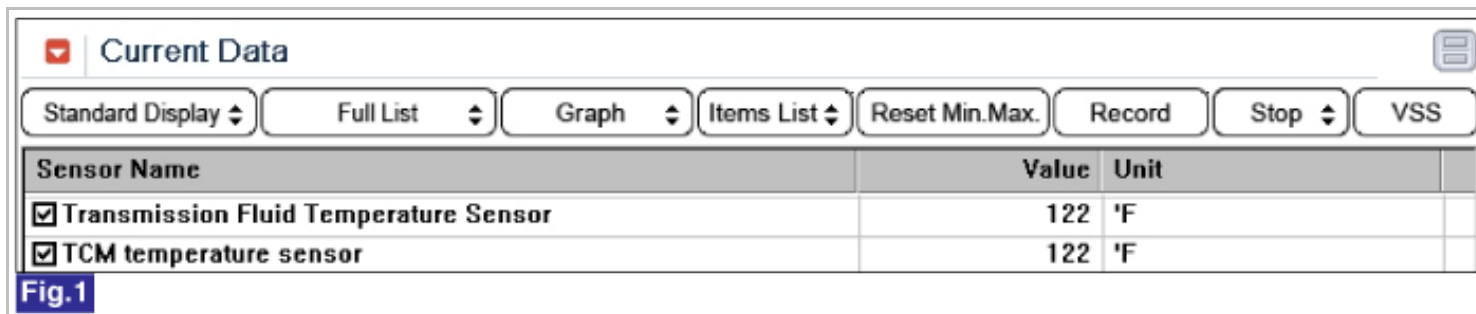


Fig 1) Temperature of TCU inside

4. Is the "TCM Temperature sensor" output value normal range ?

<b>YES</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.
<b>NO</b>	▶ Go to "Component inspection" procedure.

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

#### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed.

Before learning, check for variable speed shock or shift shock.

#### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear.

RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal normally. Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

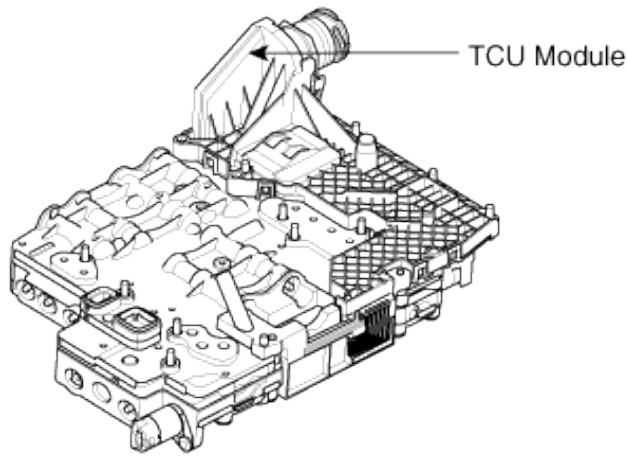
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure.
<b>NO</b>	▶ System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0641 Sensor Reference Voltage 'A' Circuit/Open

### Component Location



### General Description

TCM supply Power source to each sensors and solenoids in order to optimum control. It is difficult to check for power supply circuit because the E-module is installed inside the automatic transmission.

### DTC Description

TCM sets this code if the supplied voltage from TCM is too high. (MIL ON : 2 driving Cycle)

### DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	<ul style="list-style-type: none"><li>• Check signal range</li></ul>	<ul style="list-style-type: none"><li>• Faulty in Mechatronics (Valve-body + TCM)</li></ul>
Enable Conditions	<ul style="list-style-type: none"><li>• IG ON</li><li>• Battery voltage &gt; 7.8V</li></ul>	
Threshold Value	<ul style="list-style-type: none"><li>• Sensor supplying voltage &gt; 10V</li></ul>	
Diagnostic Time	<ul style="list-style-type: none"><li>• Immediately</li></ul>	
Fail Safe	<ul style="list-style-type: none"><li>• High speed : fixed at 5th gear, low speed : fixed at 3rd gear</li><li>• Maximum line-pressure control (D : 14kg/cm<sup>2</sup>, R : 20kg/cm<sup>2</sup>)</li><li>• Vehicle speed is transferred to wheel speed sensor</li><li>• Torque converter clutch : OFF</li><li>• No learning control</li><li>• Reverse : Shift lock (Push "Unlock button" → possible to shift) (priority :3)</li></ul>	

## CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is intentional.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

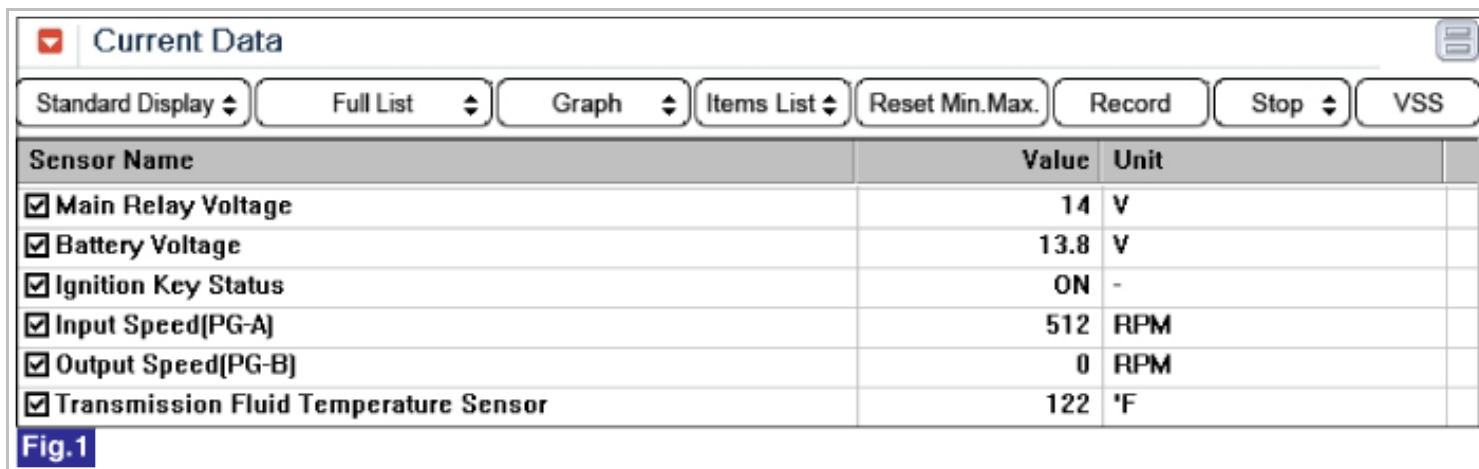


Fig 1) Main relay and Battery voltage(Idle status)

## Monitor Scantool Data

1. Connect scantool to Diagnostic Connector.
2. Ignition "ON" & Engine "OFF".
3. Confirm the "Battery Voltage,Ignition Key Status,Main Relay Voltage, parameter on the scan tool.

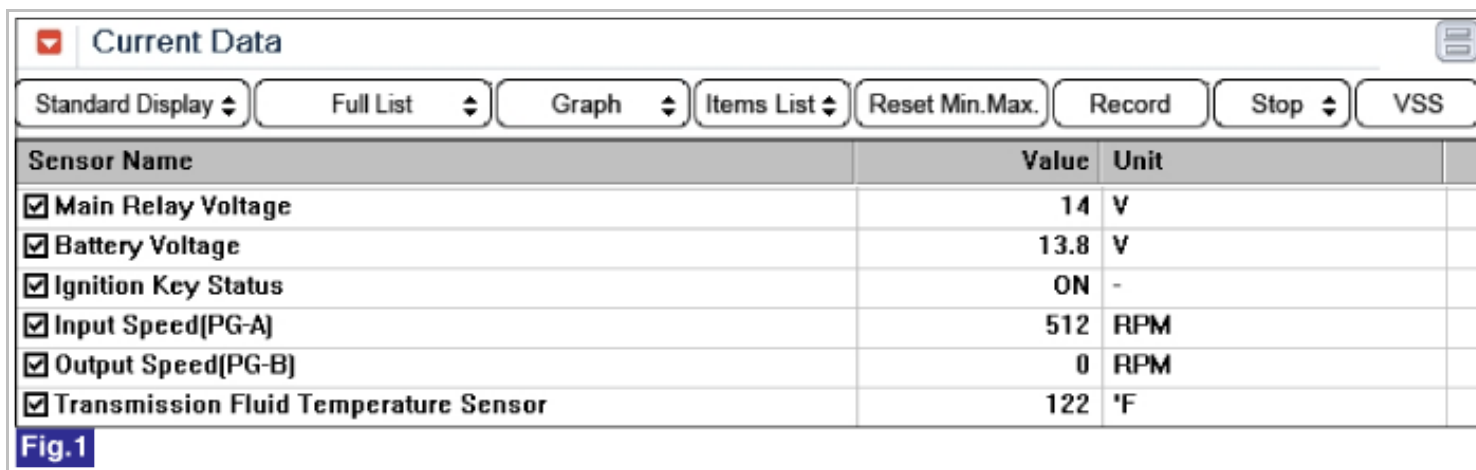


Fig 1) Main relay and Battery voltage(Idle status)

4. Is "Battery Voltage" output value within normal range ?

**YES**

► Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or



	replace as necessary and go to "Verification Vehicle Repair" procedure.
<b>NO</b>	► Go to "Component inspection" procedure.

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	► Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected,replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

#### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

#### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

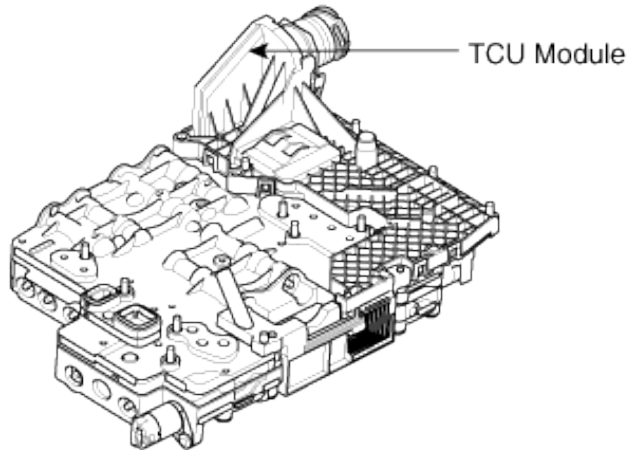
<b>YES</b>	► Go to the applicable troubleshooting procedure.
------------	---

NO

▶ System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0642 Sensor Reference Voltage 'A' Circuit Low

### Component Location



### General Description

TCM supply Power source to each sensors and solenoids in order to optimum control. It is difficult to check for power supply circuit because the E-module is installed inside the automatic transmission.

### DTC Description

TCM sets this code if the supplied voltage from TCM is too low. (MIL ON : 2 driving Cycle)

### DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	<ul style="list-style-type: none"> <li>Check signal range</li> </ul>	<ul style="list-style-type: none"> <li>Faulty in Mechatronics (Valve-body + TCM)</li> </ul>
Enable Conditions	<ul style="list-style-type: none"> <li>IG ON</li> <li>Battery voltage &gt; 7.8V</li> </ul>	
Threshold Value	<ul style="list-style-type: none"> <li>Supply voltage &lt; 6.51V</li> </ul>	
Diagnostic Time	<ul style="list-style-type: none"> <li>Immediately</li> </ul>	
Fail Safe	<ul style="list-style-type: none"> <li>High speed : fixed at 5th gear, low speed : fixed at 3rd gear</li> <li>Maximum line-pressure control (D : 14kg/cm<sup>2</sup>, R : 20kg/cm<sup>2</sup>)</li> <li>Vehicle speed is transferred to wheel speed sensor</li> <li>Torque converter clutch : OFF</li> <li>No learning control</li> <li>Reverse : Shift lock (Push "Unlock button → possible to shift) (priority :3)</li> </ul>	

### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

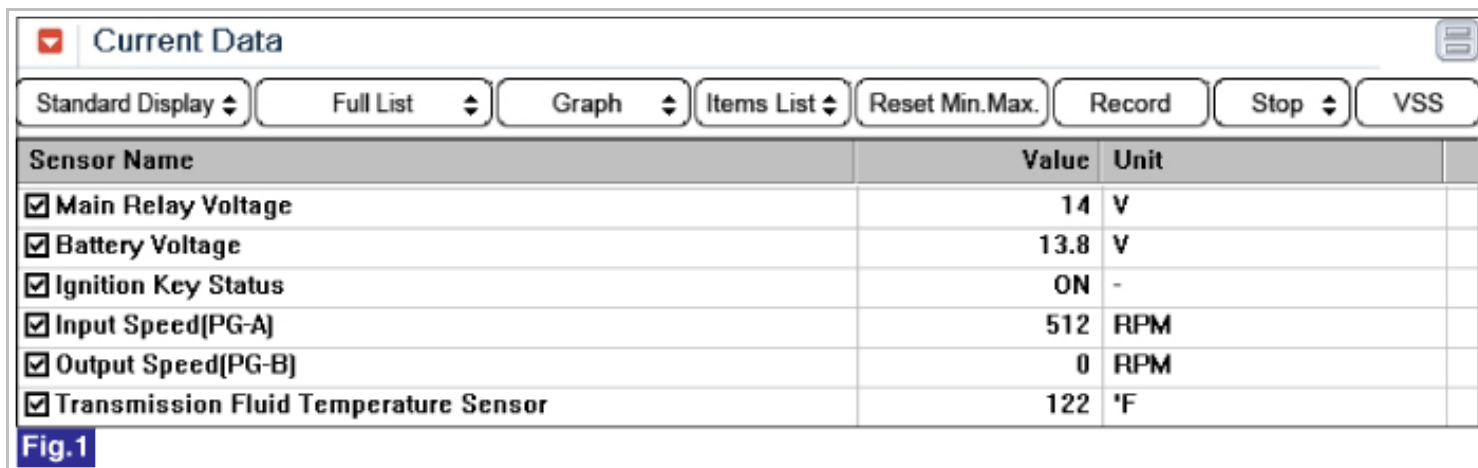


Fig 1) Main relay and Battery voltage(Idle status)

## Monitor Scantool Data

1. Connect scantool to Diagnostic Connector.
2. Ignition "ON" & Engine "OFF".
3. Confirm the "Battery Voltage, Ignition Key Status, Main Relay Voltage, parameter on the scan tool.

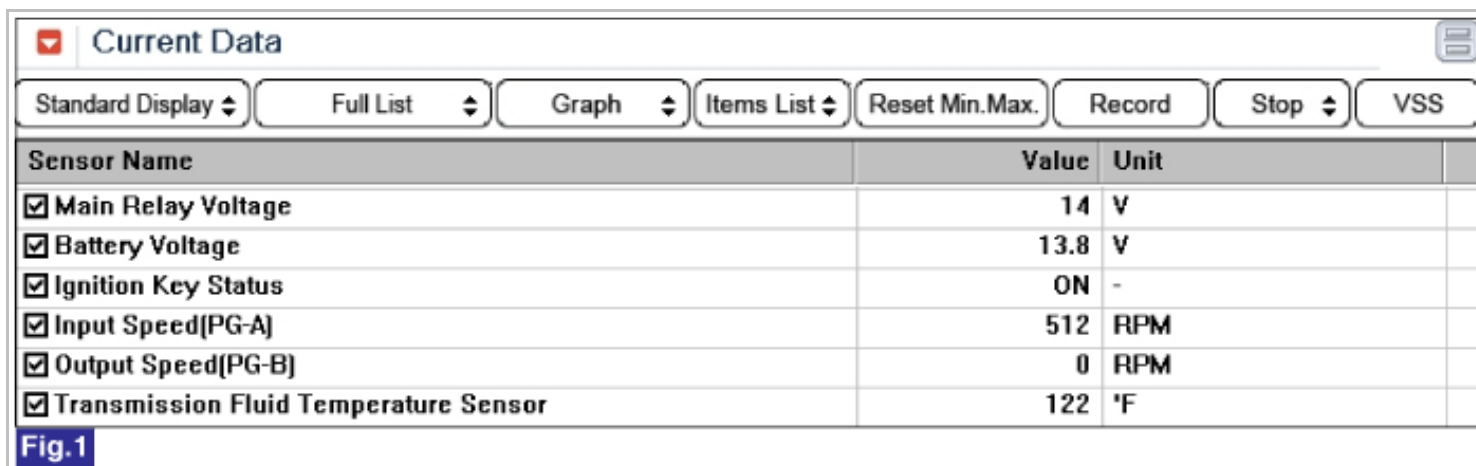


Fig 1) Main relay and Battery voltage(Idle status)

4. Is "Battery Voltage" output value within normal range ?

**YES**

▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or

	was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.
<b>NO</b>	► Go to "Component inspection" procedure.

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	► Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

#### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

#### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal normally. Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

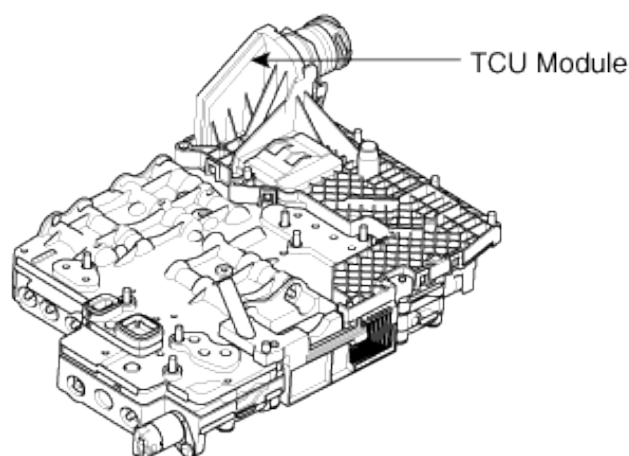
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.

#### 4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure.
<b>NO</b>	▶ System performing to specification at this time.

### Automatic Transmission System > Automatic Transmission System > P0666 PCM/ECM/TCM Internal Temperature Sensor Circuit

#### Component Location



#### General Description

TCM installed in inside Automatic transmissiom with E-module. Temperature sensor detects temperature increasing for inside of TCU and prevent from obnormal operation of TCU.

#### DTC Description

TCM set this code If detected damage in temperature chip-set internal TCM .(MIL : OFF)

#### DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Check signal range	• Faulty in Mechatronics (Valve-body + TCM)
Enable Conditions	• "IG KEY" ON	
Threshold Value	• Damage in temperature chip-set	
Diagnostic Time	• 1.5 second	
Fail Safe	• - • (priority : 2)	

#### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.

2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

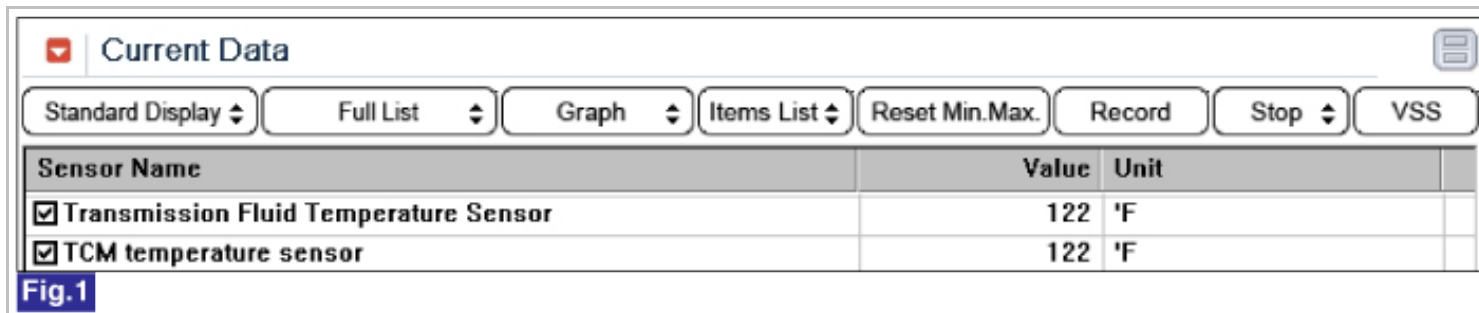


Fig 1) Temperature of TCU inside

## Monitor Scantool Data

1. Connect scantool to Diagnostic Connector.
2. Ignition "ON" & Engine "OFF".
3. Confirm the "TCM Temperature sensor" parameter on the scan tool.

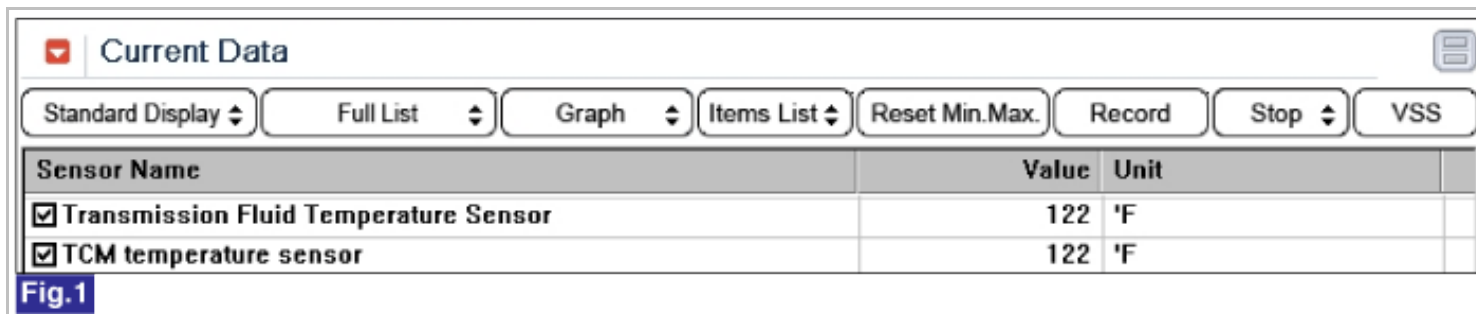


Fig 1) Temperature of TCU inside

4. Is the "TCM Temperature sensor" output value normal range ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.
<b>NO</b>	► Go to "Component inspection" procedure.

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.

5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C ( 122 °F) and 120°C ( 248 °F). If the ATF temperature is outside this range, work to bring the range.

**CAUTION**

Don't raise the oil temperature by stalling the engine.

(Reference)

If the oil temperature is not between 50°C ( 122 °F) and 120°C ( 248 °F), initial learning can not be performed.

Before learning, check for variable speed shock or shift shock.

STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear.

RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal normally. Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times. (Not necessary N-D, N-R Learning)

## Verification of Vehicle Repair

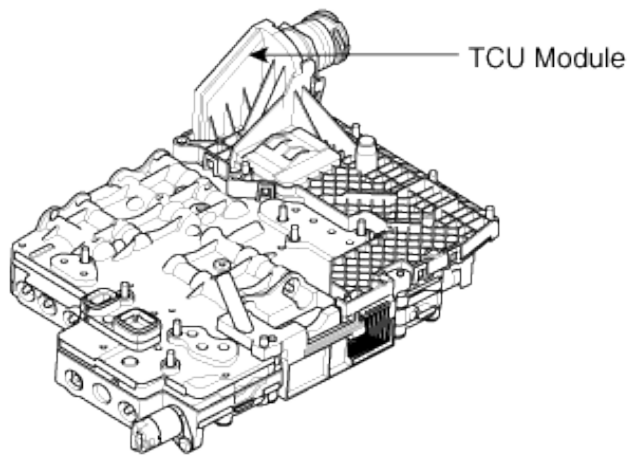
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure.
<b>NO</b>	▶ System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0667 PCM/ECM/TCM Internal Temperature Sensor Range/Performance

### Component Location



## General Description

TCM installed in inside Automatic transmission with E-module. Temperature sensor detects temperature increasing for inside of TCU and prevent from abnormal operation of TCU.

## DTC Description

TCM set this code If output value of Temperature sensor out of normal range or not changed for long term. (MIL OFF)

## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Check signal range	• Faulty in Mechatronics (Valve-body + TCM)
Enable Conditions	• "IG KEY" ON	
Threshold Value	• Output value of Temperature sensor out of normal range • Output value of Temperature sensor not changed for long term	
Diagnostic Time	• 1.5 second	
Fail Safe	• - • (priority : 2)	

### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.



## Signal Waveform & Data

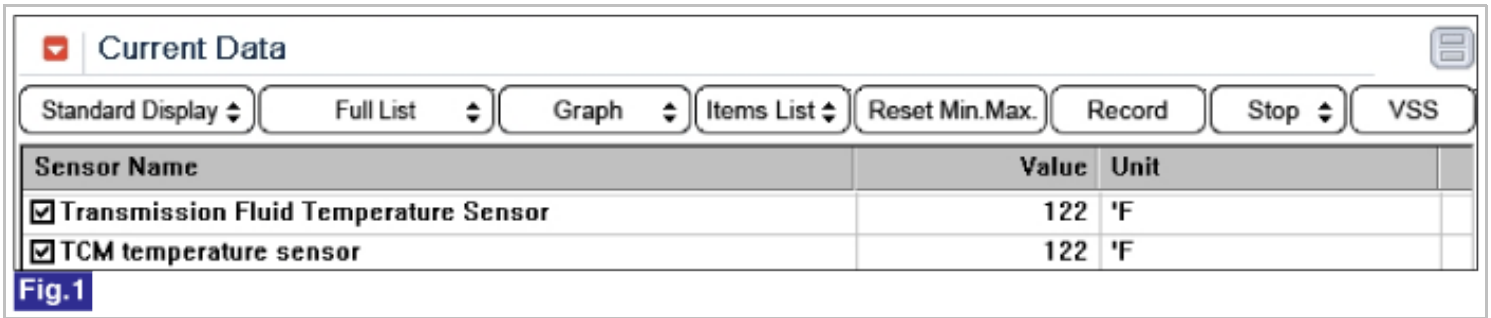


Fig 1) Temperature of TCU inside

## Monitor Scantool Data

1. Connect scantool to Diagnostic Connector.
2. Ignition "ON" & Engine "OFF".
3. Confirm the "TCM Temperature sensor" parameter on the scan tool.

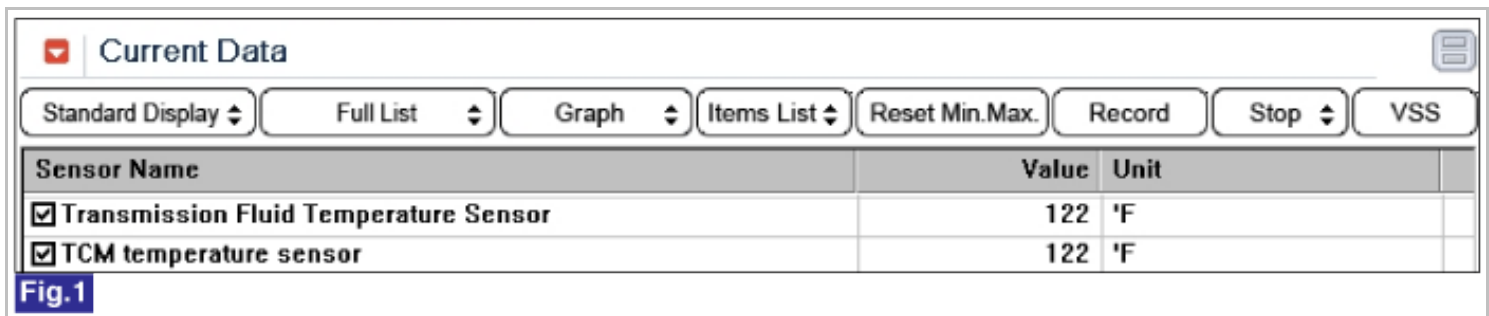


Fig 1) Temperature of TCU inside

4. Is the "TCM Temperature sensor" output value normal range ?

<b>YES</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.
<b>NO</b>	▶ Go to "Component inspection" procedure.

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected,replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as

necessary and go to "Verification of Vehicle Repair" procedure.

#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed.

Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear.

RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal normally. Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

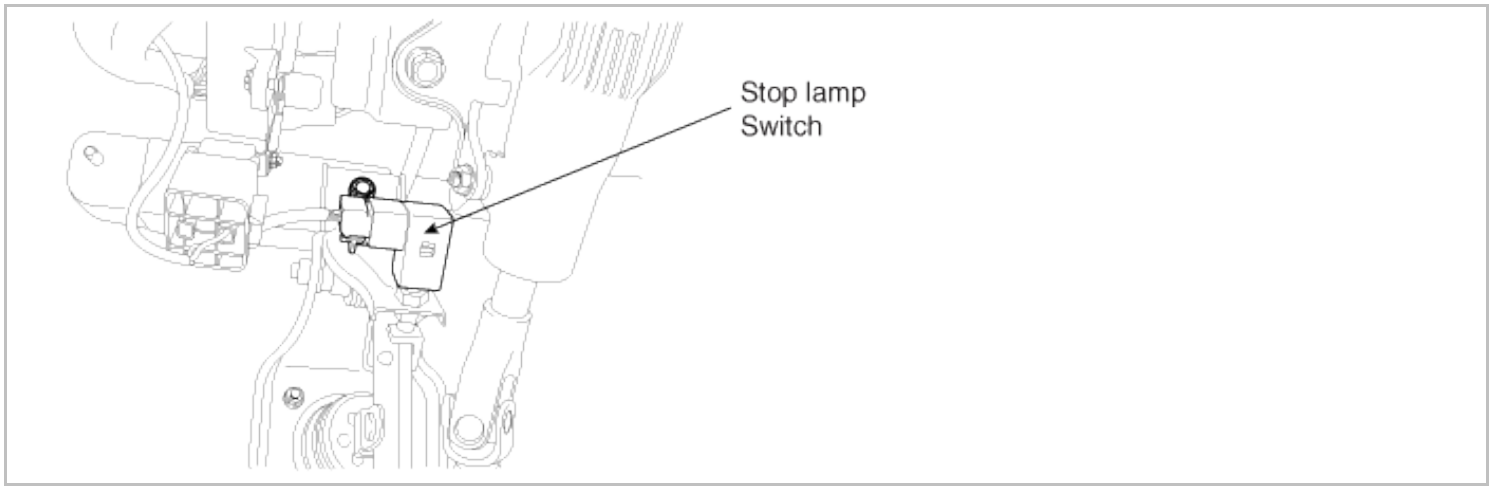
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	► Go to the applicable troubleshooting procedure.
<b>NO</b>	► System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0703 Stop Lamp (Brake) Switch Circuit Malfunction

### Component Location



## General Description

The Brake Switch provides important information by deciding whether the vehicle is decelerating by the depression of the brake pedal, or if the speed is decreasing because the vehicle is running on the uphill.

## DTC Description

TCM set this code If CAN signal normal condition and Brake s/w output abnormal signal to TCM.(MIL OFF)

## DTC Detecting Condition

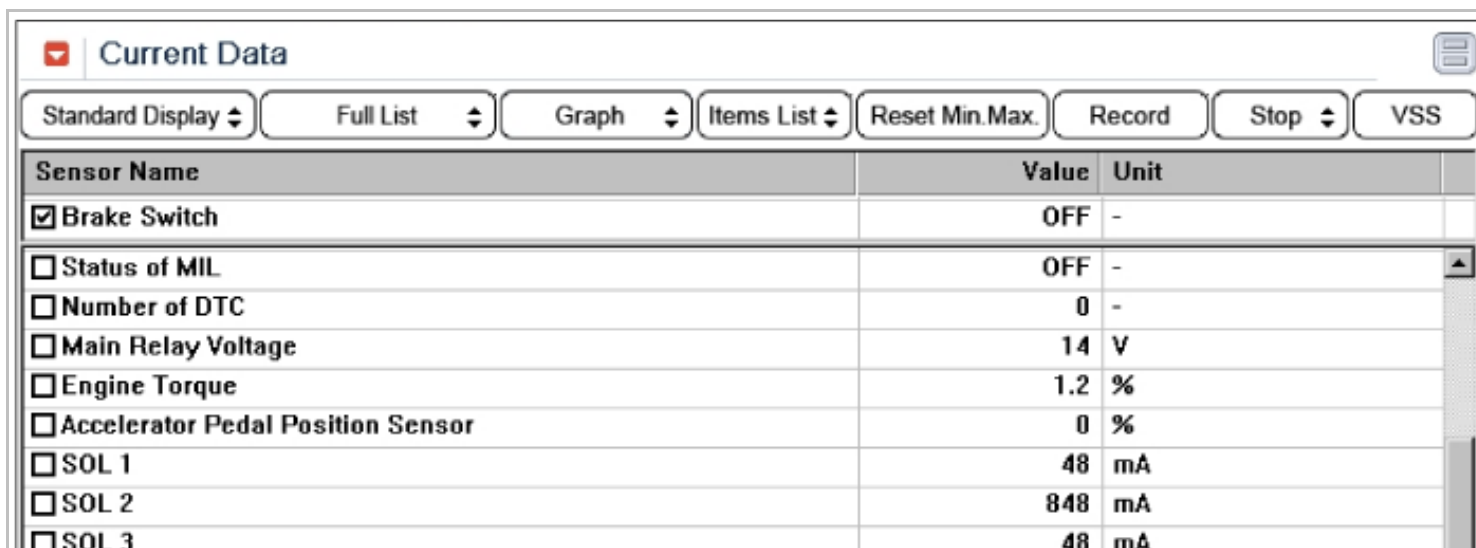
Item	Detecting Condition	Possible Cause
DTC Strategy	• Check signal	• Faulty in brake s/w circuit
Enable Conditions	<ul style="list-style-type: none"> <li>• CAN : normal</li> <li>• IG KEY "ON"</li> <li>• Battery voltage &gt; 9V</li> </ul>	
Threshold Value	• Detectde abnormal signal from CAN	
Diagnostic Time	• 0.6second	
Fail Safe	<ul style="list-style-type: none"> <li>• Shift lock : OFF</li> <li>• (priority : 4)</li> </ul>	

### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Monitor Scantool Data

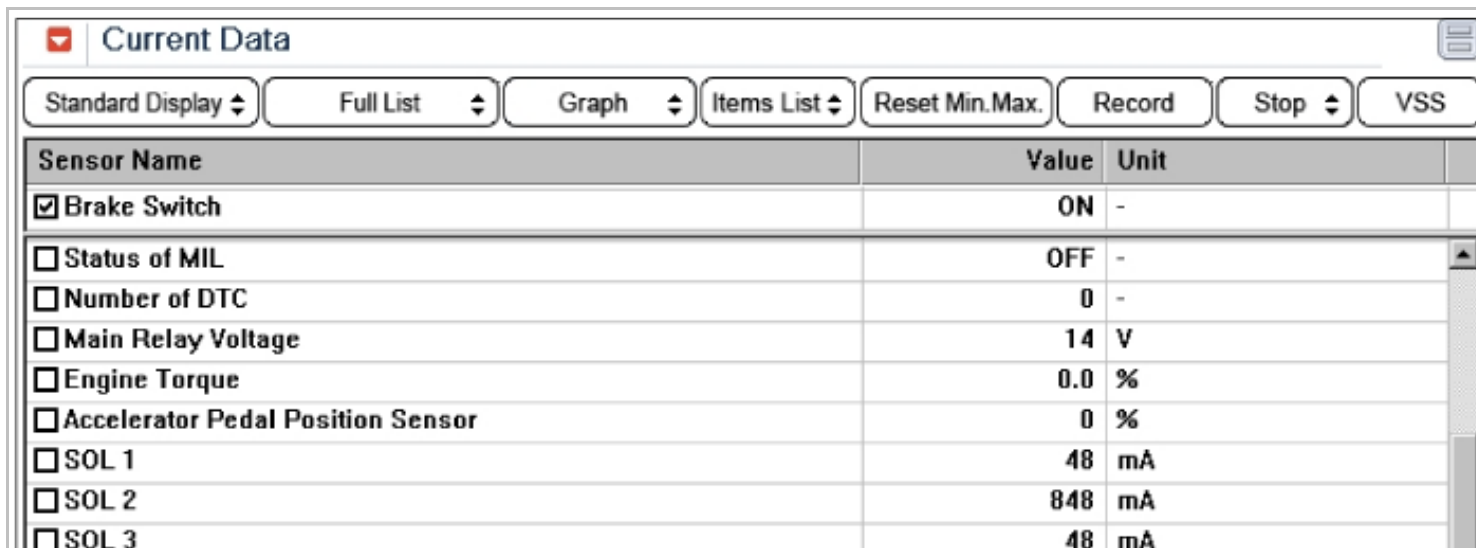
1. Connect scantool to data link connector(DLC).
2. Ignition "ON" & Engine "OFF".
3. Monitor the "BRAKE LAMP SWITCH" parameter on the scantool.
4. Depress and release Foot Brake pedal.



The screenshot shows the 'Current Data' window of a diagnostic tool. The 'Brake Switch' parameter is checked and shows a value of 'OFF'. Other parameters like MIL, DTC, and various sensors are also listed with their current values.

Sensor Name	Value	Unit
<input checked="" type="checkbox"/> Brake Switch	OFF	-
<input type="checkbox"/> Status of MIL	OFF	-
<input type="checkbox"/> Number of DTC	0	-
<input type="checkbox"/> Main Relay Voltage	14	V
<input type="checkbox"/> Engine Torque	1.2	%
<input type="checkbox"/> Accelerator Pedal Position Sensor	0	%
<input type="checkbox"/> SOL 1	48	mA
<input type="checkbox"/> SOL 2	848	mA
<input type="checkbox"/> SOL 3	48	mA

Fig.1



The screenshot shows the 'Current Data' window of a diagnostic tool. The 'Brake Switch' parameter is checked and shows a value of 'ON'. Other parameters like MIL, DTC, and various sensors are also listed with their current values.

Sensor Name	Value	Unit
<input checked="" type="checkbox"/> Brake Switch	ON	-
<input type="checkbox"/> Status of MIL	OFF	-
<input type="checkbox"/> Number of DTC	0	-
<input type="checkbox"/> Main Relay Voltage	14	V
<input type="checkbox"/> Engine Torque	0.0	%
<input type="checkbox"/> Accelerator Pedal Position Sensor	0	%
<input type="checkbox"/> SOL 1	48	mA
<input type="checkbox"/> SOL 2	848	mA
<input type="checkbox"/> SOL 3	48	mA

Fig.1

Fig 1) Brake s/w OFF

Fig 2) Brake s/w ON

5. Does "Brake s/w" follow the reference data?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.
<b>NO</b>	► Refer to "Engine" Daignostic Guide, repair as necessary, go to "Verification Vehicle Repair" procedure.

## Verification of Vehicle Repair

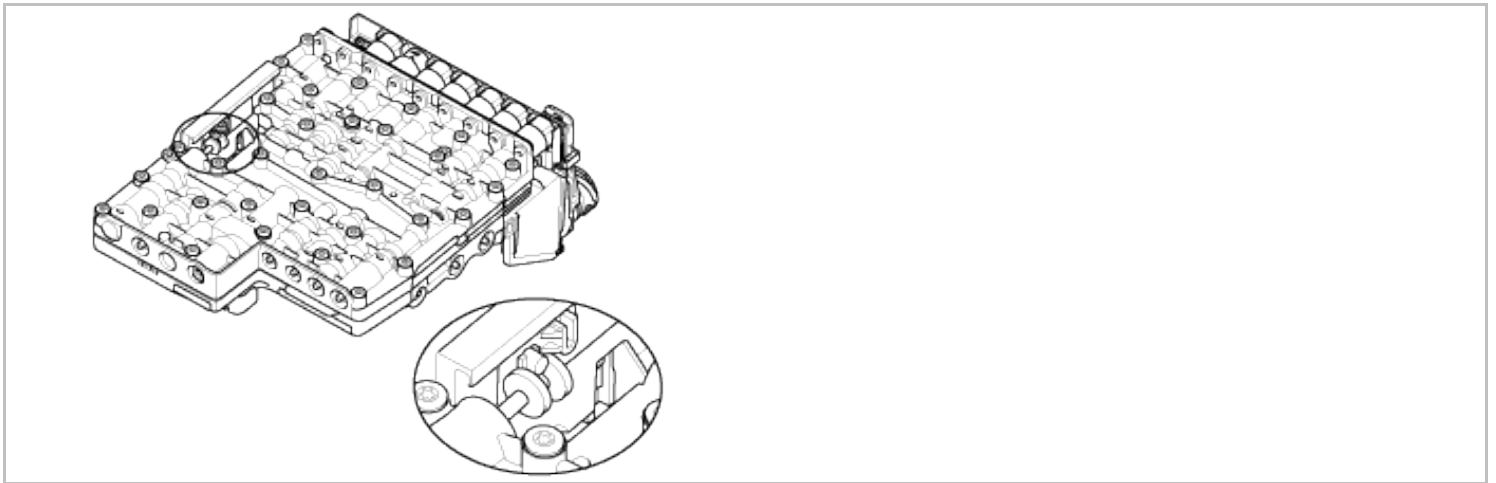
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure.
<b>NO</b>	▶ System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0705 Transmission Range Sensor Circuit Malfunction (PRNDL Input)

### Component Location



### General Description

Conversion of linear shift valve or parking lock movement into a parallel coded signal on 4 wires(L1, L2, L3, L4) in accordance with the position P, R, N, D, 3, 2, and P\_on and P\_off(parking lock engaged/disengaged).

	<b>P</b>	<b>Z<sub>1</sub></b>	<b>R</b>	<b>Z<sub>2</sub></b>	<b>N</b>	<b>Z<sub>3</sub></b>	<b>D</b>
L1	0	0	0	0	0	1	1
L2	0	0	0	1	1	1	1
L3	1	1	0	0	0	0	1
L4	0	1	1	1	0	0	0

P, R, N, D : shift range

L : 4 Tracks

0 : Electric high

1 : Electric low

Z : Intermediate position.

### DTC Description

TCM set this code If detected ground short for IC circuit of Inhibitor s/w.(MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Check signal	• Faulty in Mechatronics (Valve-body + TCM)
Enable Conditions	• 6.51V < supply voltage < 10V	
Threshold Value	• IC circuit open inside E-module / short to battery /system error	
Diagnostic Time	• Immediately	
Fail Safe	• High speed : fixed at 5th gear, low speed : fixed at 3rd gear. • Reverse : Shift lock(Push "Unlock button → possible to shift) (priority :3).	

### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is intentional.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

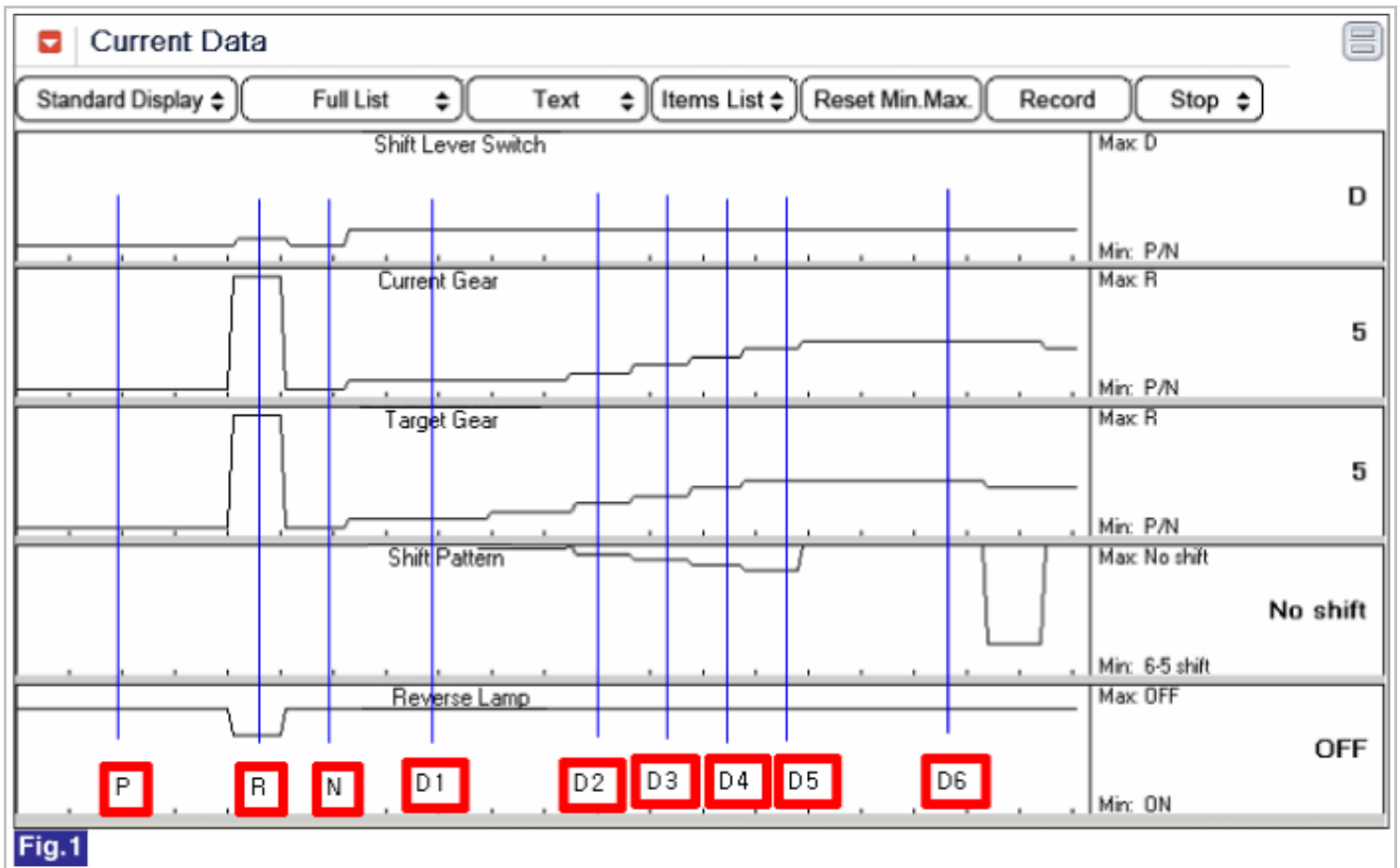


Fig 1) Working status of Inhibitor s/w

## Monitor Scantool Data

1. Connect scantool to data link connector(DLC).
2. Ignition "ON" & Engine "OFF".
3. Monitor the "Inhibitor s/w" parameter on the scantool.
4. Move selector lever from "P" range to "D" range.

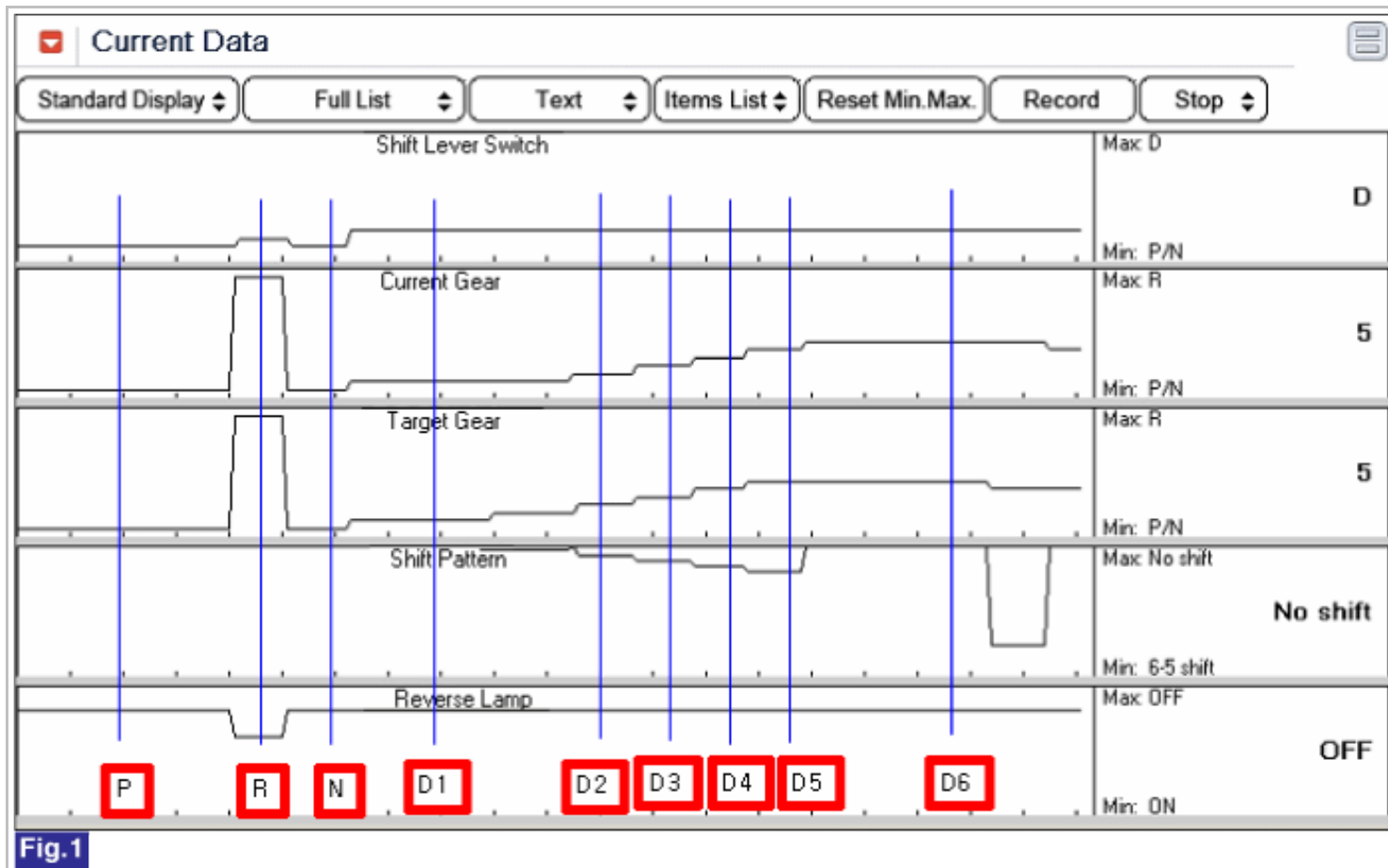


Fig 1) Working status of Inhibitor s/w

5. Does "Inhibitor s/w" follow the reference data?

<b>YES</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.
<b>NO</b>	▶ Go to "Component Inspection" procedure.

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.



## How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

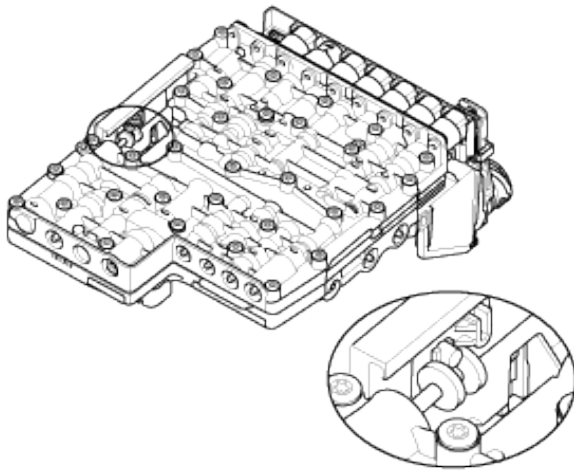
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	► Go to the applicable troubleshooting procedure.
<b>NO</b>	► System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0706 Transmission Range Sensor Circuit Range/Performance

### Component Location



## General Description

Conversion of linear shift valve or parking lock movement into a parallel coded signal on 4 wires(L1, L2, L3, L4) in accordance with the position P, R, N, D, 3, 2, and P\_on and P\_off(parking lock engaged/disengaged).

	P	Z <sub>1</sub>	R	Z <sub>2</sub>	N	Z <sub>3</sub>	D
L1	0	0	0	0	0	1	1
L2	0	0	0	1	1	1	1
L3	1	1	0	0	0	0	1
L4	0	1	1	1	0	0	0

P, R, N, D : shift range

L : 4 Tracks

0 : Electric high

1 : Electric low

Z : Intermediate position.

## DTC Description

TCM set this code If detected ground short for IC circuit of Inhibitor s/w.(MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Code combination error	• Faulty in Mechatronics (Valve-body + TCM)
Enable Conditions	• 6.51V < supply voltage < 10V	
Threshold Value	• Not match	
Diagnostic Time	• Immediately	
Fail Safe	• High speed : fixed at 5th gear, low speed : fixed at 3rd gear. • Reverse : Shift lock(Push "Unlock button → possible to shift) (priority :3).	

## CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

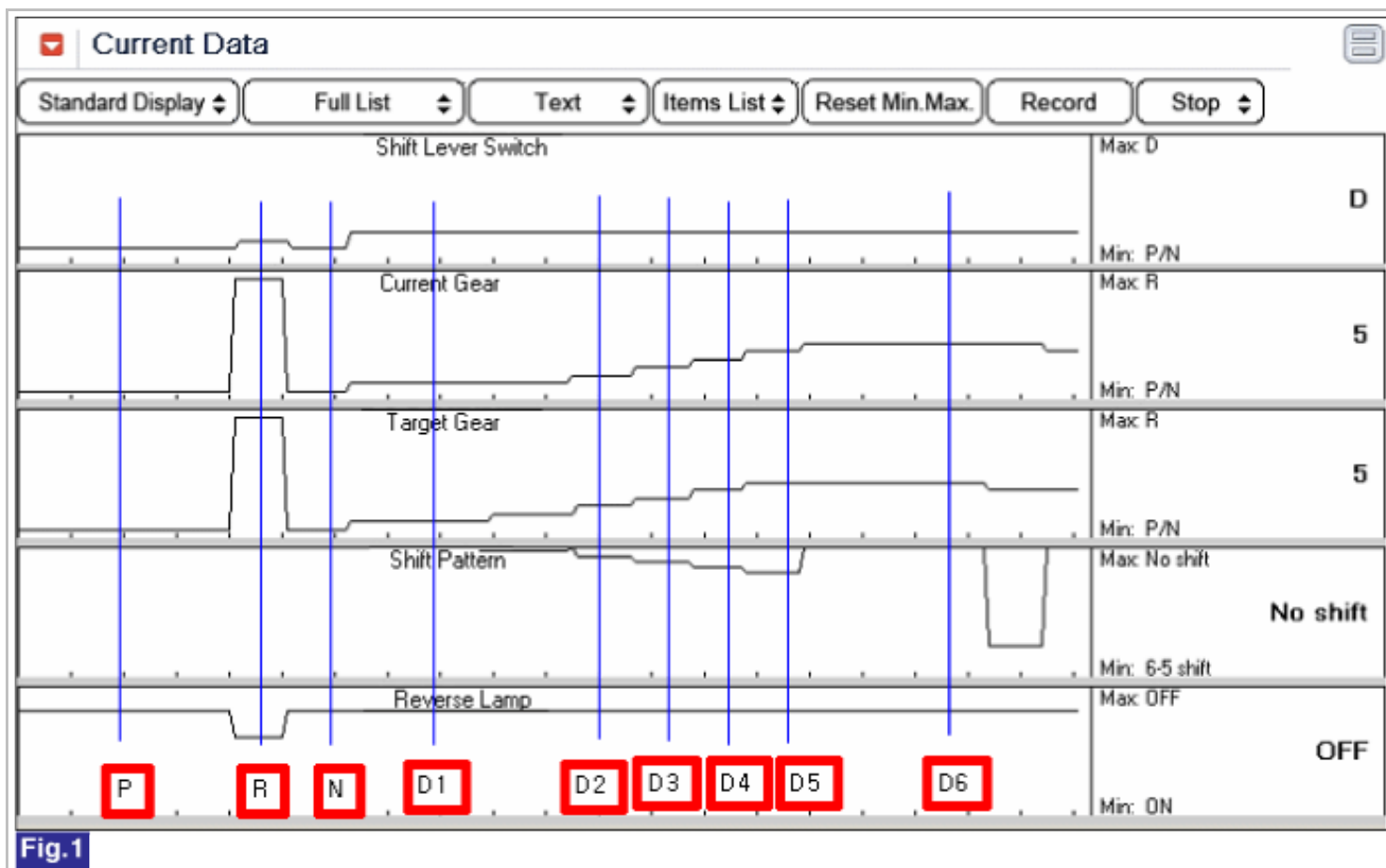


Fig 1) Working status of Inhibitor s/w

## Monitor Scantool Data

1. Connect scantool to data link connector(DLC).
2. Ignition "ON" & Engine "OFF".
3. Monitor the "Inhibitor s/w" parameter on the scantool.
4. Move selector lever from "P" range to "D" range.

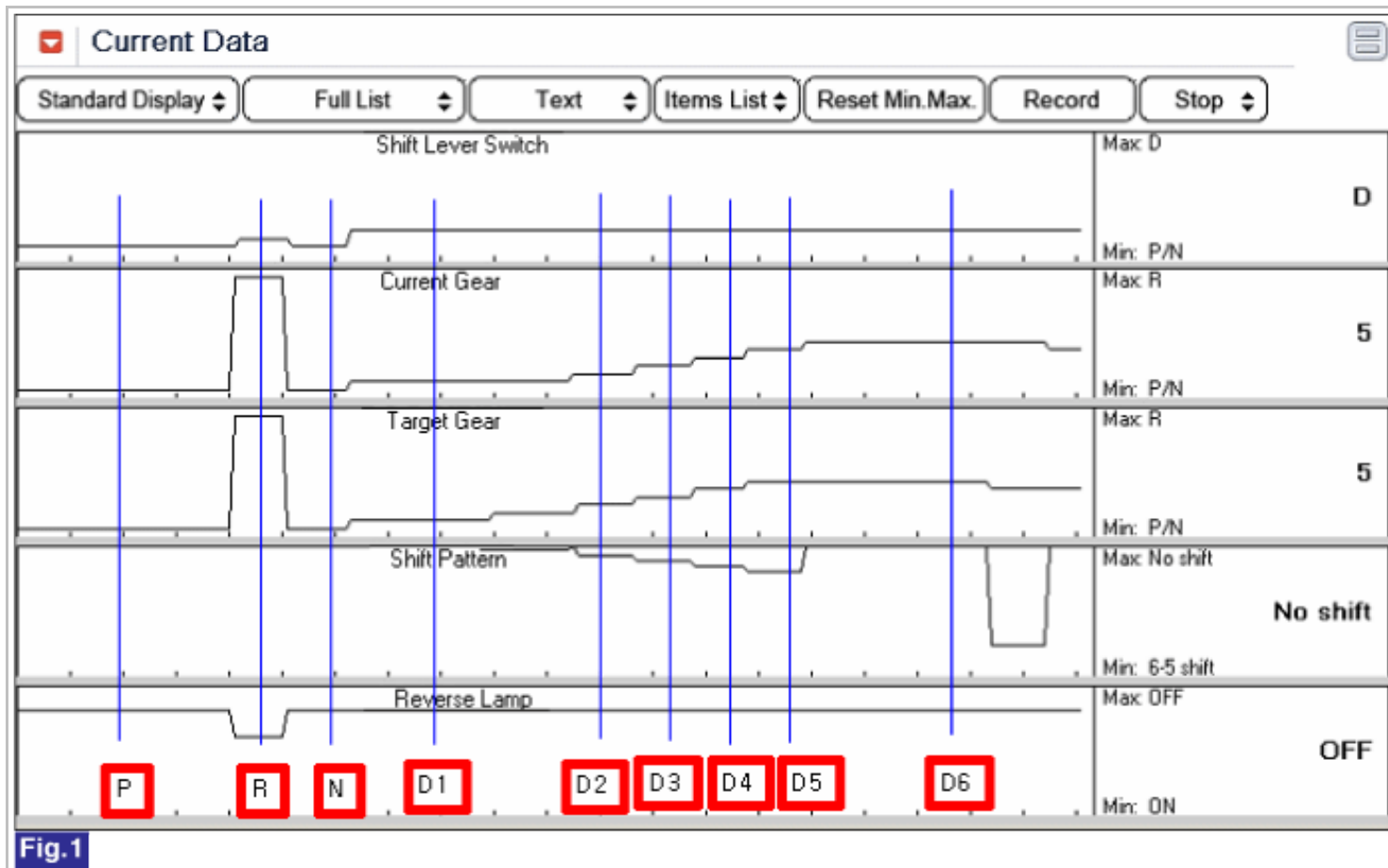


Fig 1) Working status of Inhibitor s/w

5. Does "Inhibitor s/w" follow the reference data?

<b>YES</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.
<b>NO</b>	▶ Go to "Component Inspection" procedure.

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

CAUTION

Don't raise the oil temperature by stalling the engine.

(Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60kM/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

Verification of Vehicle Repair

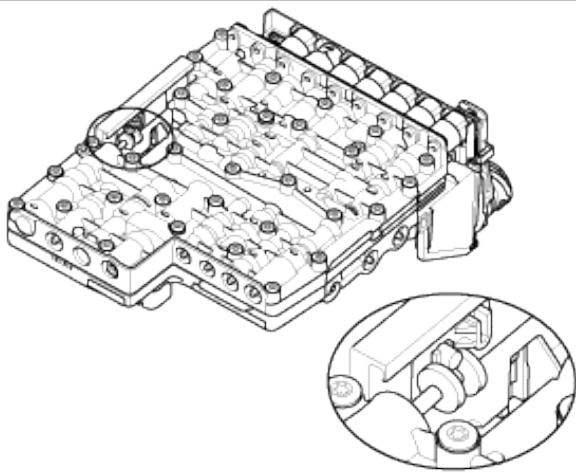
After a repair, it is essential to verify that the fault has been corrected.

- 1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
- 2. Using a scan tool, Clear DTC.
- 3. Operate the vehicle within DTC Enable conditions in General information.
- 4. Are any DTCs present ?

YES	► Go to the applicable troubleshooting procedure.
NO	► System performing to specification at this time.

Automatic Transmission System > Automatic Transmission System > P0707 Transmission Range Sensor Circuit Low Input

Component Location



## General Description

Conversion of linear shift valve or parking lock movement into a parallel coded signal on 4 wires(L1, L2, L3, L4) in accordance with the position P, R, N, D, 3, 2, and P\_on and P\_off(parking lock engaged/disengaged).

	P	Z <sub>1</sub>	R	Z <sub>2</sub>	N	Z <sub>3</sub>	D
L1	0	0	0	0	0	1	1
L2	0	0	0	1	1	1	1
L3	1	1	0	0	0	0	1
L4	0	1	1	1	0	0	0

P, R, N, D : shift range

L : 4 Tracks

0 : Electric high

1 : Electric low

Z : Intermediate position.

## DTC Description

TCM set this code If detected ground short for IC circuit of Inhibitor s/w.(MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Shrot to Ground	• Faulty in Mechatronics (Valve-body + TCM)
Enable Conditions	• 6.51V < supply voltage < 10V	
Threshold Value	• IC circuit open inside E-module / short to battery /system error	
Diagnostic Time	• Immediately	
Fail Safe	• High speed : fixed at 5th gear, low speed : fixed at 3rd gear. • Reverse : Shift lock(Push "Unlock button → possible to shift) (priority :3).	

### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

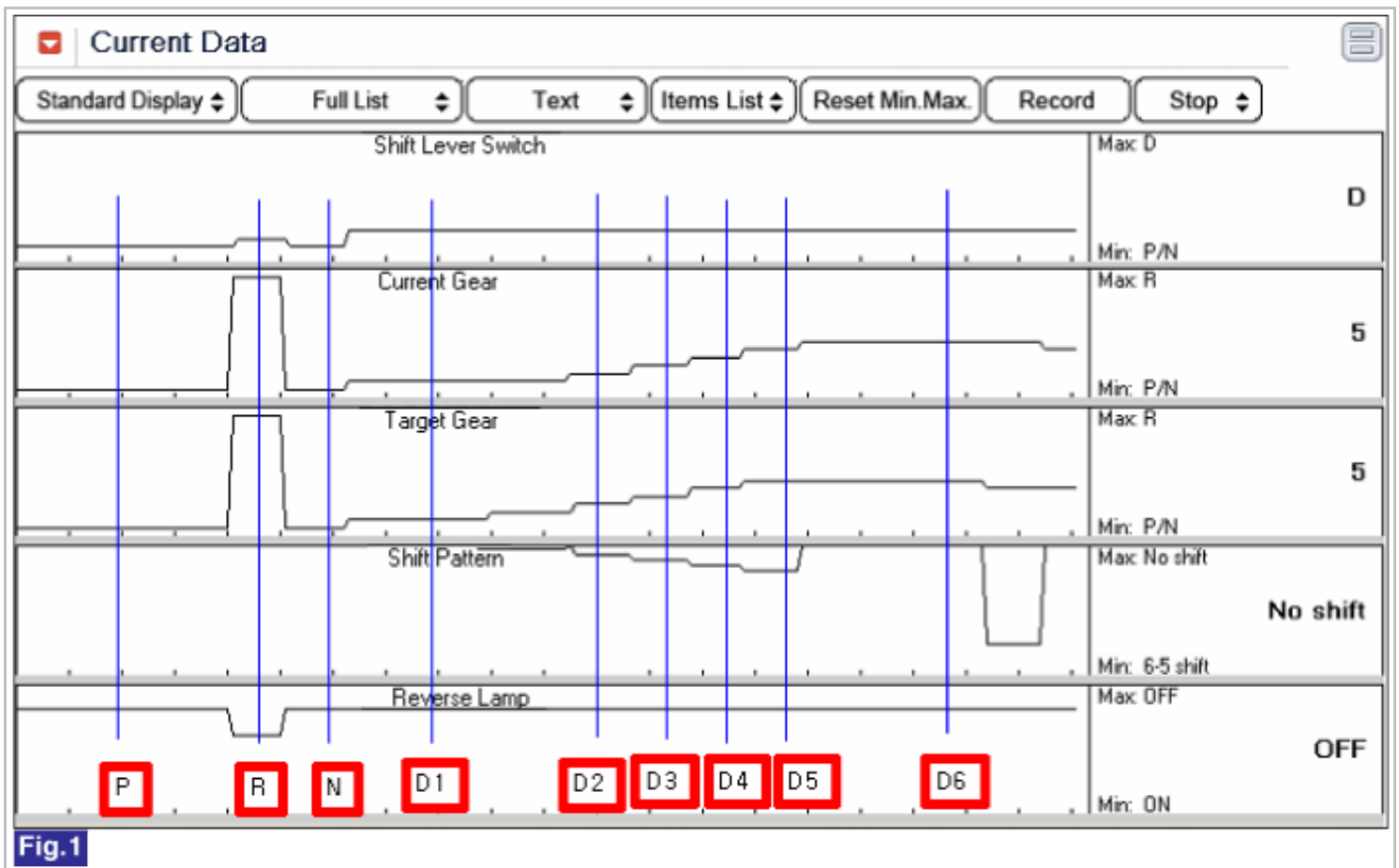


Fig 1) Working status of Inhibitor s/w

## Monitor Scantool Data

1. Connect scantool to data link connector(DLC).
2. Ignition "ON" & Engine "OFF".
3. Monitor the "Inhibitor s/w" parameter on the scantool.
4. Move selector lever from "P" range to "D" range.

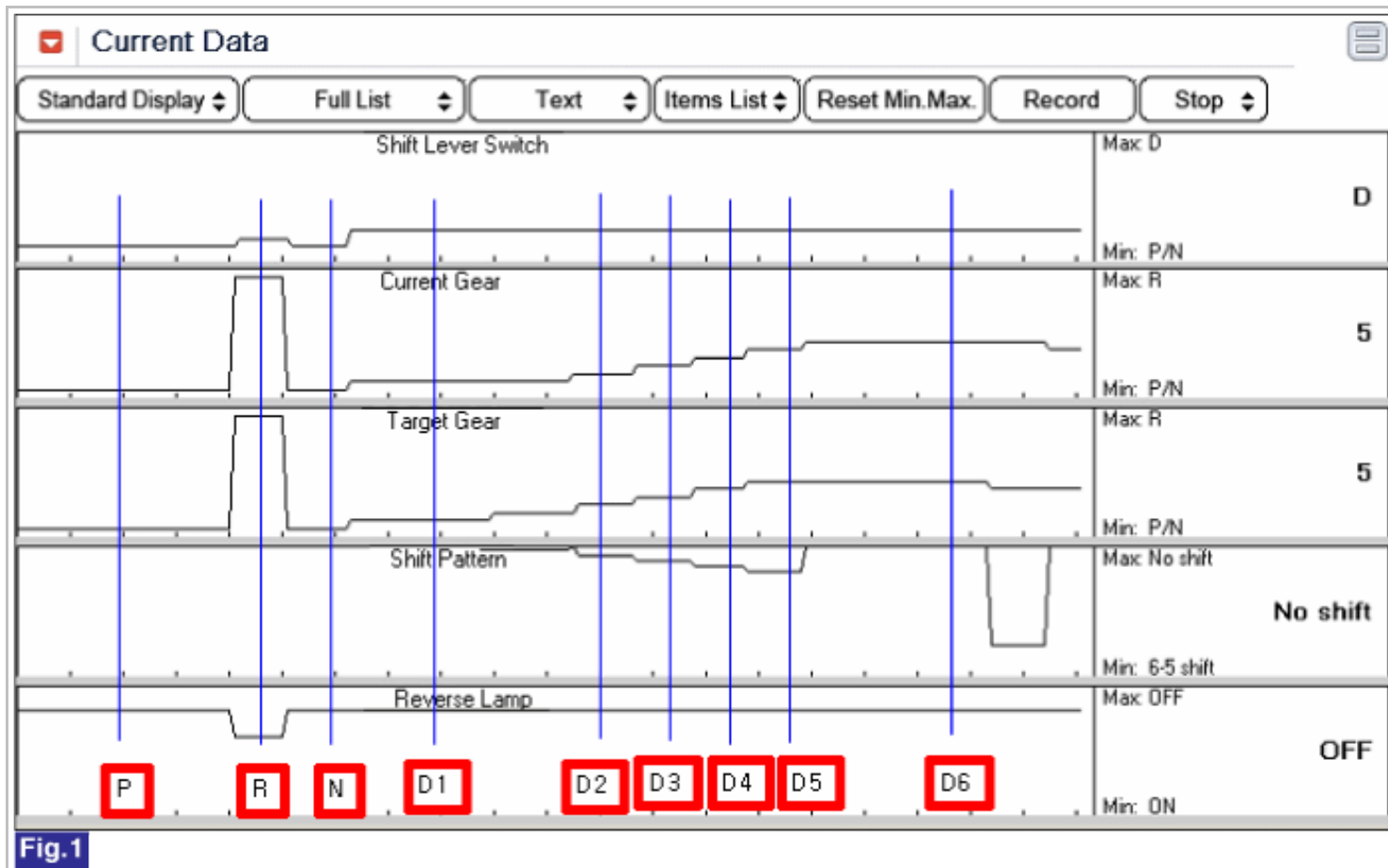


Fig 1) Working status of Inhibitor s/w

5. Does "Inhibitor s/w" follow the reference data?

<b>YES</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.
<b>NO</b>	▶ Go to "Component Inspection" procedure.

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.



How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

CAUTION

Don't raise the oil temperature by stalling the engine.

(Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60kM/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

Verification of Vehicle Repair

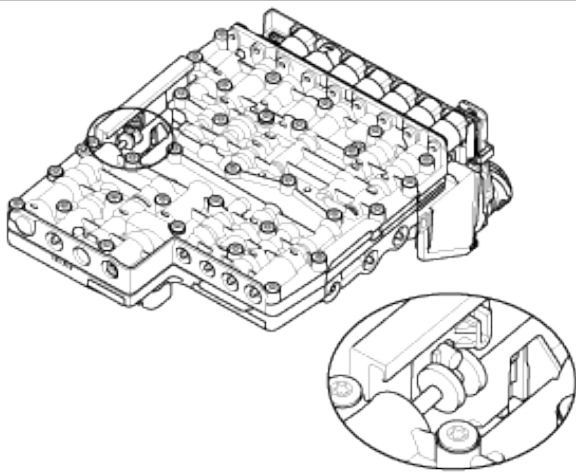
After a repair, it is essential to verify that the fault has been corrected.

- 1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
- 2. Using a scan tool, Clear DTC.
- 3. Operate the vehicle within DTC Enable conditions in General information.
- 4. Are any DTCs present ?

YES	► Go to the applicable troubleshooting procedure.
NO	► System performing to specification at this time.

Automatic Transmission System > Automatic Transmission System > P0708 Transmission Range Sensor Circuit High Input

Component Location



## General Description

Conversion of linear shift valve or parking lock movement into a parallel coded signal on 4 wires(L1, L2, L3, L4) in accordance with the position P, R, N, D, 3, 2, and P\_on and P\_off(parking lock engaged/disengaged).

	P	Z <sub>1</sub>	R	Z <sub>2</sub>	N	Z <sub>3</sub>	D
L1	0	0	0	0	0	1	1
L2	0	0	0	1	1	1	1
L3	1	1	0	0	0	0	1
L4	0	1	1	1	0	0	0

P, R, N, D : shift range

L : 4 Tracks

0 : Electric high

1 : Electric low

Z : Intermediate position.

## DTC Description

TCM set this code If detected ground short for IC circuit of Inhibitor s/w.(MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Short to Battery	• Faulty in Mechatronics (Valve-body + TCM)
Enable Conditions	• 6.51V < supply voltage < 10V	
Threshold Value	• IC circuit open inside E-module / short to battery /system error	
Diagnostic Time	• Immediately	
Fail Safe	• High speed : fixed at 5th gear, low speed : fixed at 3rd gear. • Reverse : Shift lock(Push "Unlock button → possible to shift) (priority :3).	

### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

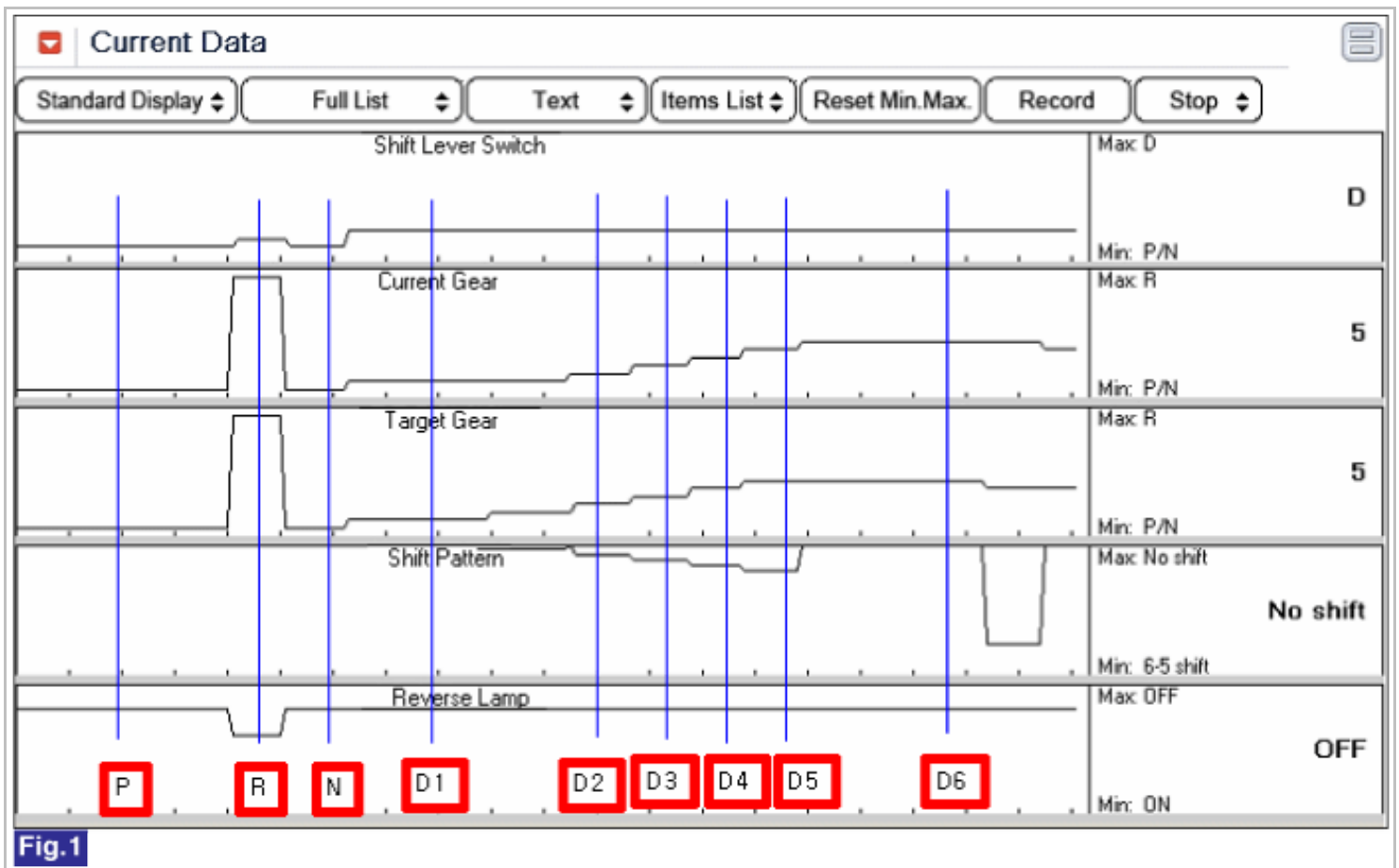


Fig 1) Working status of Inhibitor s/w

## Monitor Scantool Data

1. Connect scantool to data link connector(DLC).
2. Ignition "ON" & Engine "OFF".
3. Monitor the "Inhibitor s/w" parameter on the scantool.
4. Move selector lever from "P" range to "D" range.

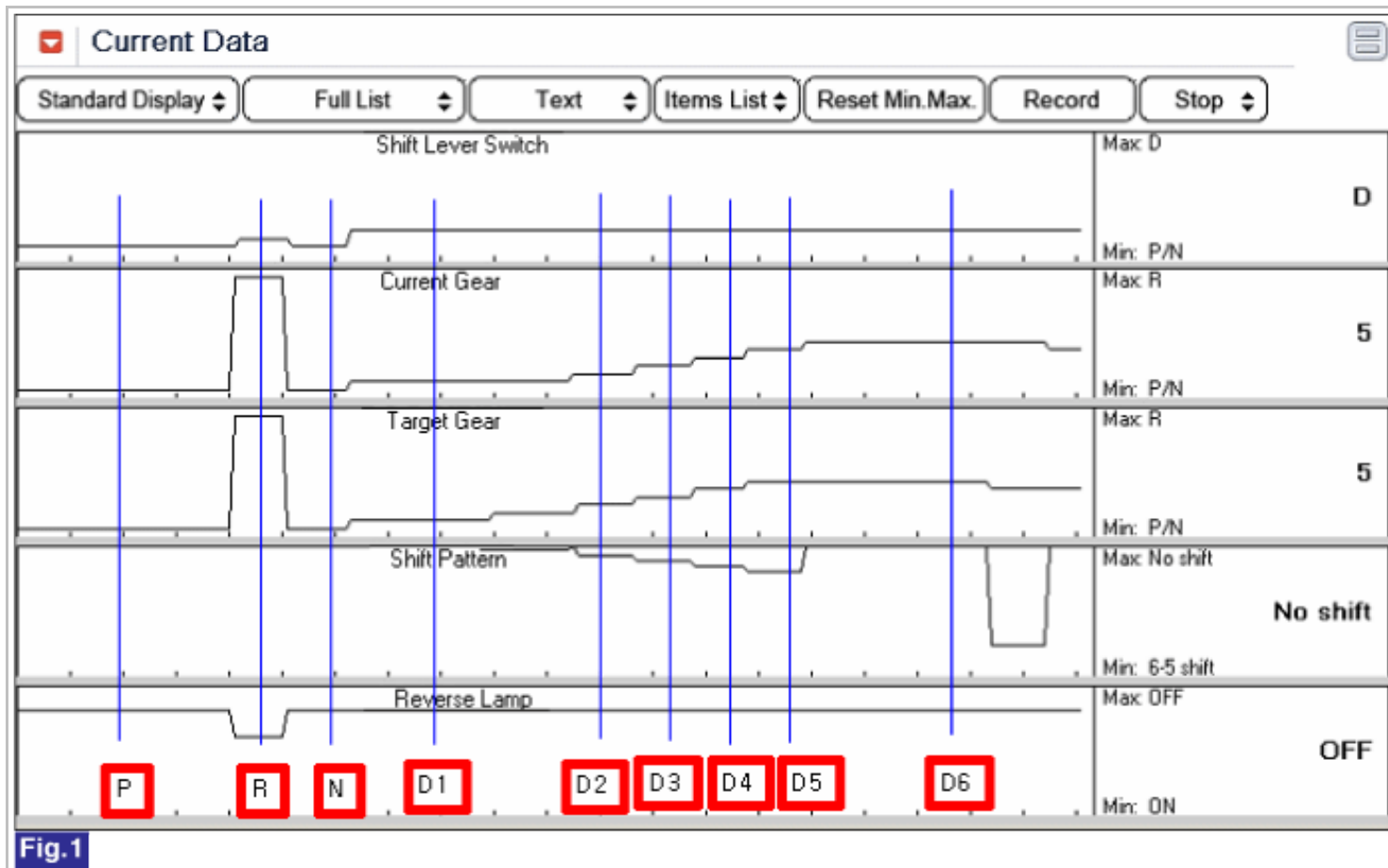


Fig 1) Working status of Inhibitor s/w

5. Does "Inhibitor s/w" follow the reference data?

<b>YES</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.
<b>NO</b>	▶ Go to "Component Inspection" procedure.

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

CAUTION

Don't raise the oil temperature by stalling the engine.

(Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60kM/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

Verification of Vehicle Repair

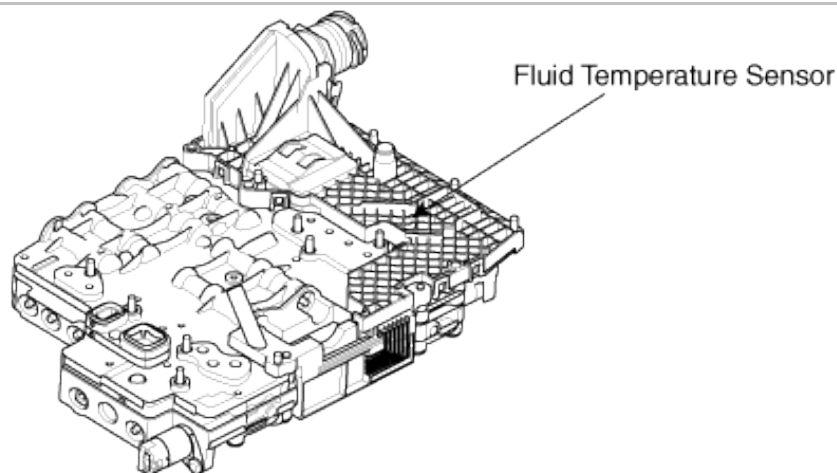
After a repair, it is essential to verify that the fault has been corrected.

- 1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
- 2. Using a scan tool, Clear DTC.
- 3. Operate the vehicle within DTC Enable conditions in General information.
- 4. Are any DTCs present ?

YES	► Go to the applicable troubleshooting procedure.
NO	► System performing to specification at this time.

Automatic Transmission System > Automatic Transmission System > P0710 Transmission Fluid Temperature Sensor 'A' Circuit

Component Location



## General Description

2 Oil temperature sensors are installed in Automatic-transmission, one of oil temperature measure measure for oil temperature in Automatic transmission and other one measure for ATF temperature. The automatic TRANSAXLE fluid(ATF) temperature provides very important data for the TCM's control of the Torque Converter Clutch, and is also used for many other purposes.

## DTC Description

TCM set this code If detected short or open for Oil temperature. The TCM regards the ATF temperature as fixed at a value of 90 °C.(MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Check signal range	• Faulty in Mechatronics (Valve-body + TCM)
Enable Conditions	• IG KEY "ON"	
Threshold Value	• Open / imperfectional short status / short	
Diagnostic Time	• 1.5 second	
Fail Safe	• - (priority :3)	

### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

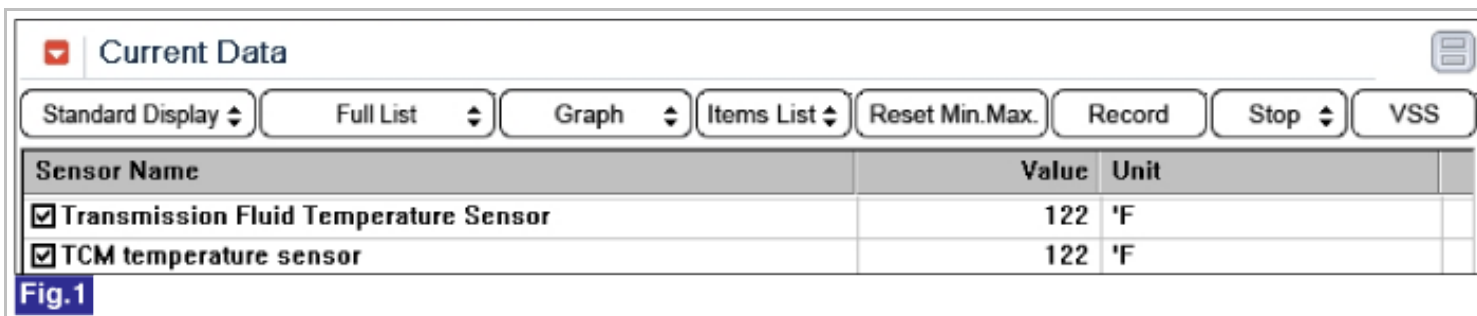


Fig 1) Oil temperature sensor(normal status)

## Monitor Scantool Data

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "Oil temperature sensor" parameter on the scantool.
4. Keep the idle status and then confirm changing output value of "Oil temperature sensor".

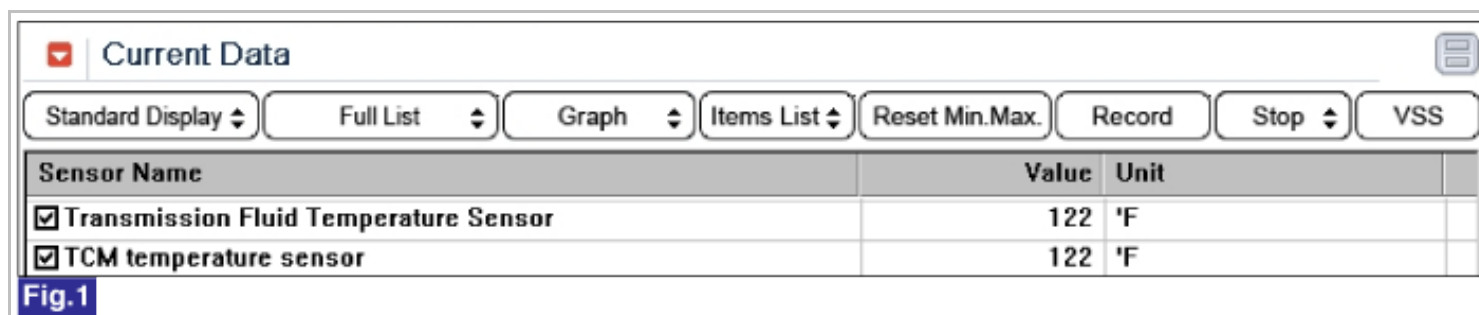


Fig 1) Oil temperature sensor(normal status)

5. Is "Oil temperature sensor" output value within normal range ?

<b>YES</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.
<b>NO</b>	▶ Go to "Component Inspection" procedure.

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected,replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as

necessary and go to "Verification of Vehicle Repair" procedure.

#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed.

Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear.

RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal normally. Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

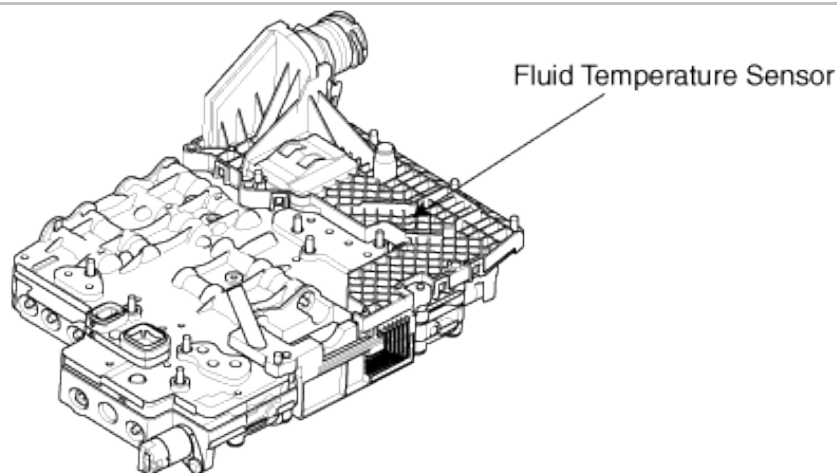
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	► Go to the applicable troubleshooting procedure.
<b>NO</b>	► System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0711 Transmission Fluid Temperature Sensor 'A' Circuit Range/Performance

### Component Location





## General Description

2 Oil temperature sensors are installed in Automatic-transmission, one of oil temperature measure measure for oil temperature in Automatic transmission and other one measure for ATF temperature. The automatic TRANSAXLE fluid(ATF) temperature provides very important data for the TCM's control of the Torque Converter Clutch, and is also used for many other purposes.

## DTC Description

TCM set this code If Oil temperature sensors output different value over 20°C each other or ATF temperature is higher than TCM inside temperature.(MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	<ul style="list-style-type: none"> <li>• Check signal range</li> </ul>	<ul style="list-style-type: none"> <li>• Faulty in Mechatronics (Valve-body + TCM)</li> </ul>
Enable Conditions	<ul style="list-style-type: none"> <li>• No error in temperature system</li> <li>• TCM inside temperature : normal</li> <li>• Engine RPM or Input speed &gt; 400RPM</li> </ul>	
Threshold Value	<ul style="list-style-type: none"> <li>• First detected temperature - later detected temperature &gt; 20°C</li> </ul>	
Diagnostic Time	<ul style="list-style-type: none"> <li>• 1.5 second</li> </ul>	
Fail Safe	<ul style="list-style-type: none"> <li>• - (priority :3)</li> </ul>	

## CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

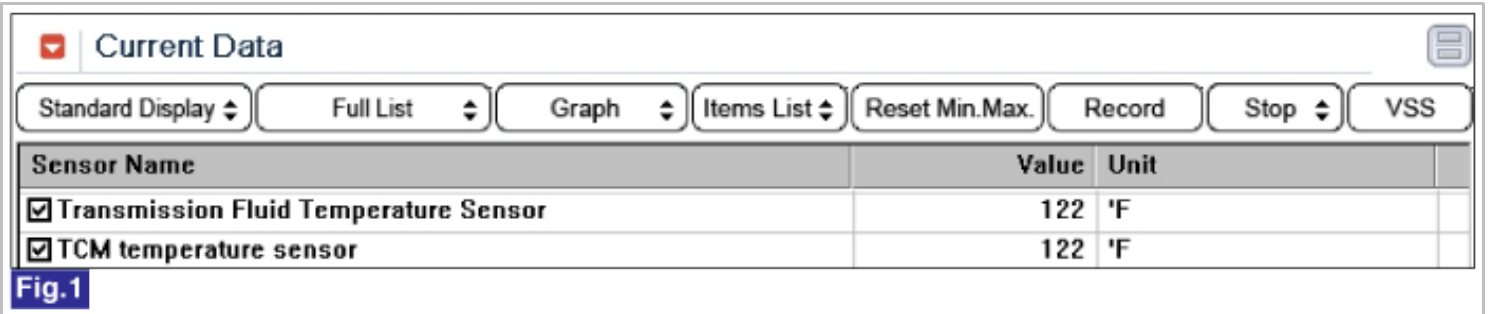


Fig 1) Oil temperature sensor(normal status)

## Monitor Scantool Data

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "Oil temperature sensor" parameter on the scantool.
4. Keep the idle status and then confirm changing output value of "Oil temperature sensor".

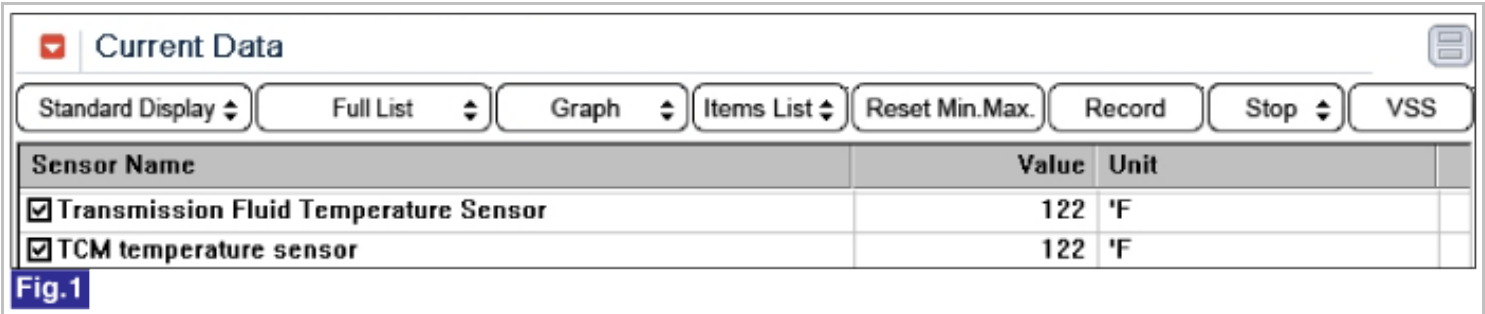


Fig 1) Oil temperature sensor(normal status)

5. Is "Oil temperature sensor" output value within normal range ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.
<b>NO</b>	► Go to "Component Inspection" procedure.

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	► Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected,replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
------------	---

**NO**

► Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

(Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

**YES**

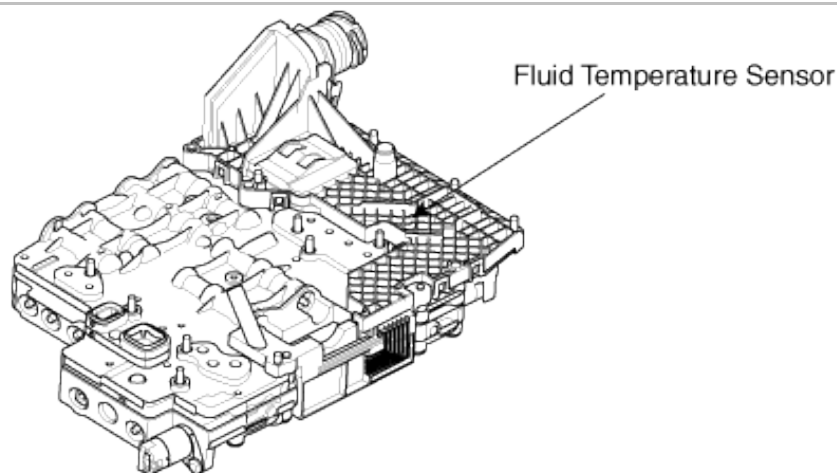
► Go to the applicable troubleshooting procedure.

**NO**

► System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0712 Transmission Fluid Temperature Sensor 'A' Circuit Low Input

### Component Location



## General Description

2 Oil temperature sensors are installed in Automatic-transmission, one of oil temperature measure measure for oil temperature in Automatic transmission and other one measure for ATF temperature. The automatic TRANSAXLE fluid(ATF) temperature provides very important data for the TCM's control of the Torque Converter Clutch, and is also used for many other purposes.

## DTC Description

TCM set this code If ATF temperature sensor that installed in Mechatronic module short to GND (MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Check signal range	• Faulty in Mechatronics (Valve-body + TCM)
Enable Conditions	• IG KEY "ON"	
Threshold Value	• Signal lower than available range	
Diagnostic Time	• 1.5 second	
Fail Safe	• - (priority :3)	

### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

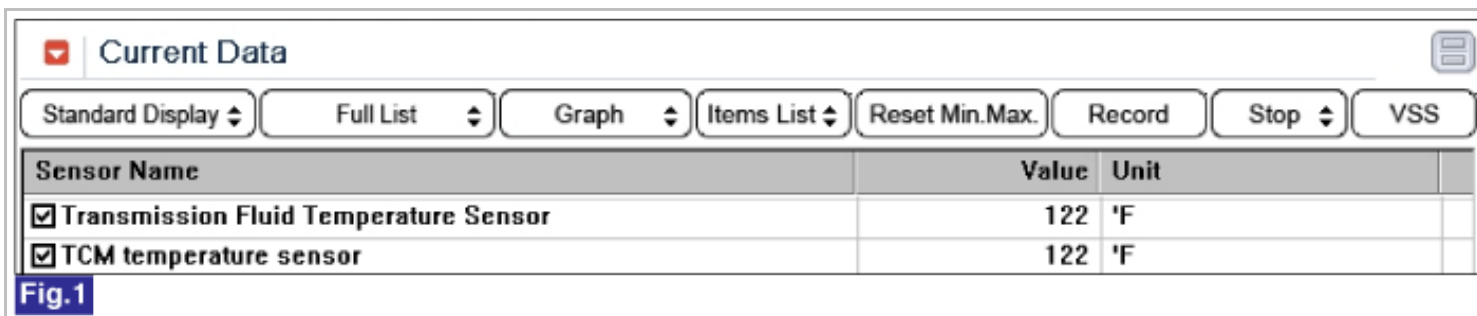


Fig 1) Oil temperature sensor(normal status)

## Monitor Scantool Data

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "Oil temperature sensor" parameter on the scantool.
4. Keep the idle status and then confirm changing output value of "Oil temperature sensor".

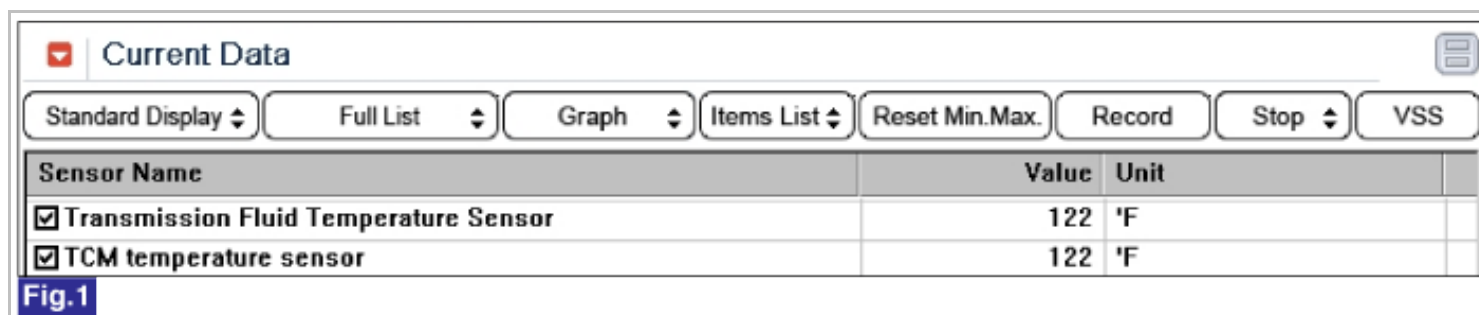


Fig 1) Oil temperature sensor(normal status)

5. Is "Oil temperature sensor" output value within normal range ?

<b>YES</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.
<b>NO</b>	▶ Go to "Component Inspection" procedure.

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected,replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as

necessary and go to "Verification of Vehicle Repair" procedure.

#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed.

Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear.

RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal normally. Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

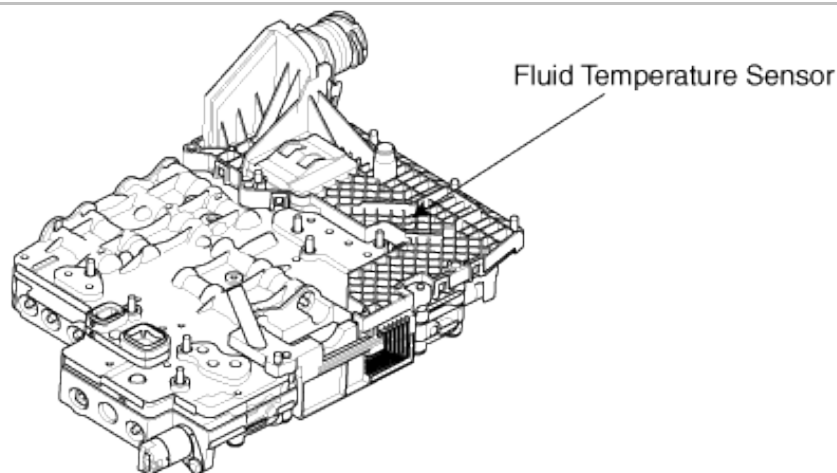
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	► Go to the applicable troubleshooting procedure.
<b>NO</b>	► System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0713 Transmission Fluid Temperature Sensor 'A' Circuit High Input

### Component Location



## General Description

2 Oil temperature sensors are installed in Automatic-transmission, one of oil temperature measure measure for oil temperature in Automatic transmission and other one measure for ATF temperature. The automatic TRANSAXLE fluid(ATF) temperature provides very important data for the TCM's control of the Torque Converter Clutch, and is also used for many other purposes.

## DTC Description

TCM set this code If ATF temperature sensor that installed in Mechatronic module short to Battery (MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Check signal range	• Faulty in Mechatronics (Valve-body + TCM)
Enable Conditions	• IG KEY "ON"	
Threshold Value	• Signal lower than available range	
Diagnostic Time	• 1.5 second	
Fail Safe	• - (priority :3)	

### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

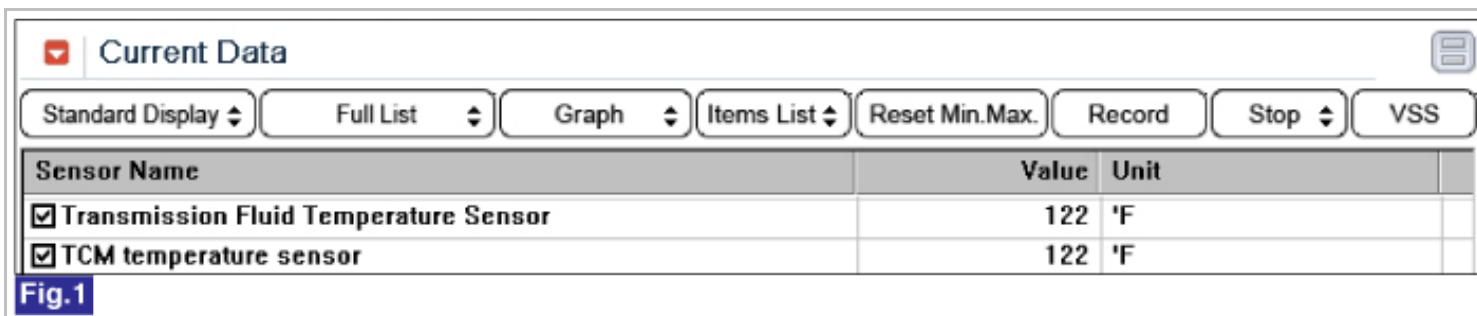


Fig 1) Oil temperature sensor(normal status)

## Monitor Scantool Data

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "Oil temperature sensor" parameter on the scantool.
4. Keep the idle status and then confirm changing output value of "Oil temperature sensor".

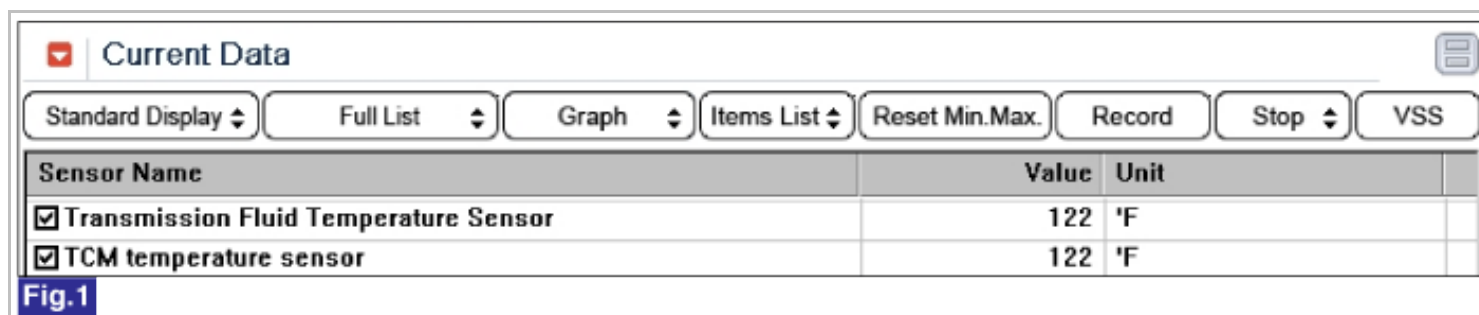


Fig 1) Oil temperature sensor(normal status)

5. Is "Oil temperature sensor" output value within normal range ?

<b>YES</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.
<b>NO</b>	▶ Go to "Component Inspection" procedure.

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected,replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as



necessary and go to "Verification of Vehicle Repair" procedure.

#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed.

Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear.

RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal normally. Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

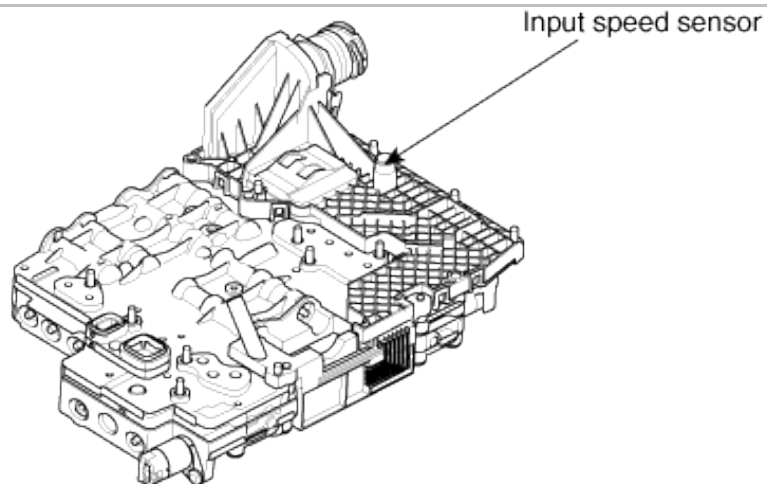
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	► Go to the applicable troubleshooting procedure.
<b>NO</b>	► System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0716 Input/Turbine Speed Sensor 'A' Circuit Range/Performance

### Component Location



## General Description

The input(turbine) speed sensor outputs pulse-signals according to the revolutions of the input shaft of the transmission. The TCM determines the input shaft speed by counting the frequency of the pulses. This value is mainly used to control the optimum fluid pressure during shifting.

## DTC Description

TCM set this code If output value is out of available range (MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	<ul style="list-style-type: none"> <li>• Check signal range</li> </ul>	<ul style="list-style-type: none"> <li>• Faulty in Mechatronics (Valve-body + TCM)</li> </ul>
Enable Conditions	<ul style="list-style-type: none"> <li>• Sensor supply power : normal</li> <li>• Engine rpm &gt; 600RPM</li> <li>• Engine speed : normal status</li> <li>• Output speed &gt; 500RPM</li> <li>• Output speed : notmal status</li> </ul>	
Threshold Value	<ul style="list-style-type: none"> <li>• 20RPM ≥ Input speed sensor ≥ 8000RPM</li> </ul>	
Diagnostic Time	<ul style="list-style-type: none"> <li>• 0.6 second</li> </ul>	
Fail Safe	<ul style="list-style-type: none"> <li>• Keep the persent gear status</li> <li>• Fixed at 3rd gear</li> <li>• Maximum line pressure control(D : 14kg/cm<sup>2</sup>, R : 20kg/cm<sup>2</sup>)</li> <li>• Torque convertor clutch : OFF</li> <li>• No learning control (priority : 3)</li> </ul>	

### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will

take precedence in this case.

3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

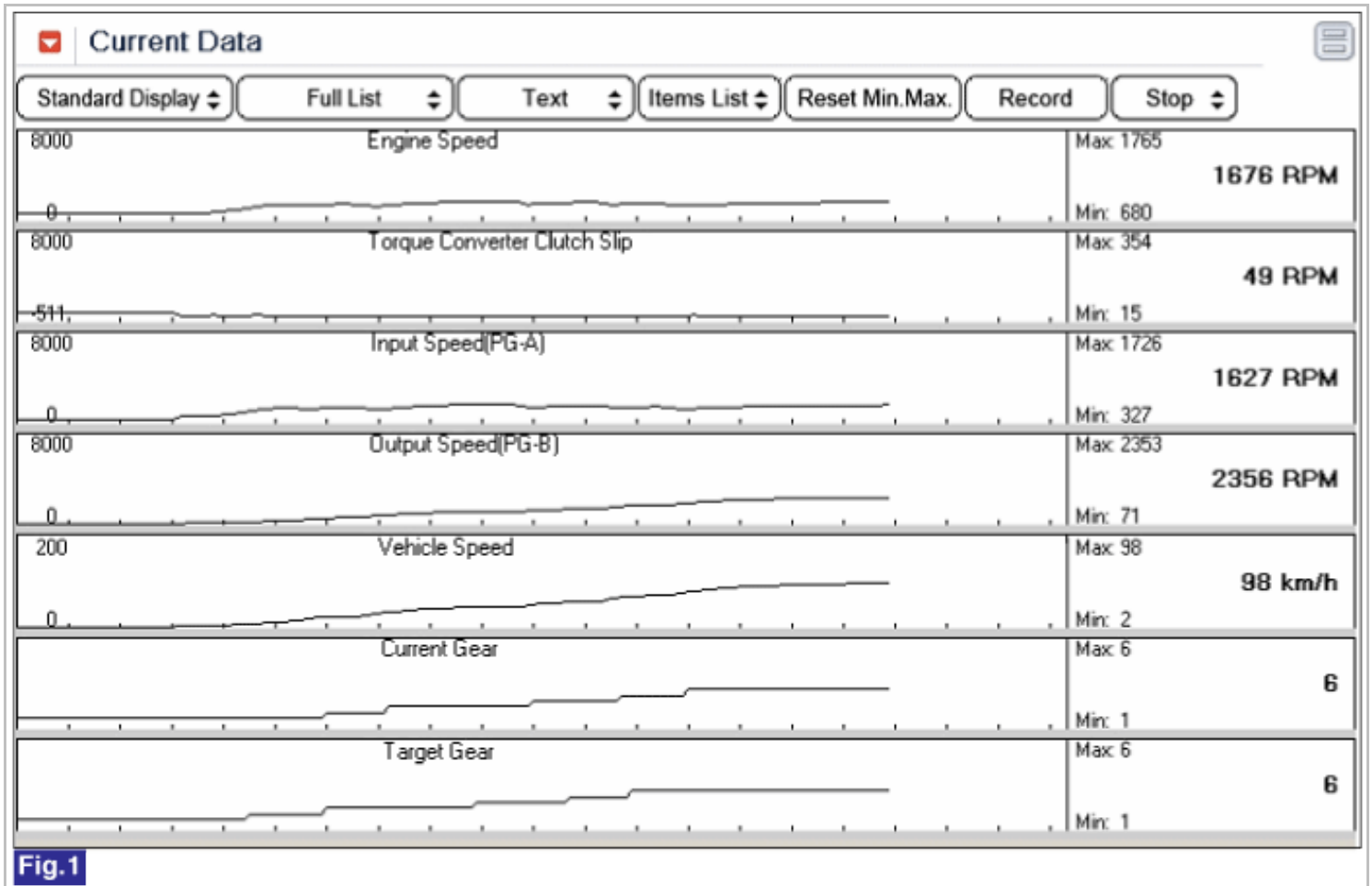


Fig 1) Input speed sensor

## Monitor Scantool Data

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "INPUT SPEED SENSOR" parameter on the scan tool.
4. Drive the vehicle.

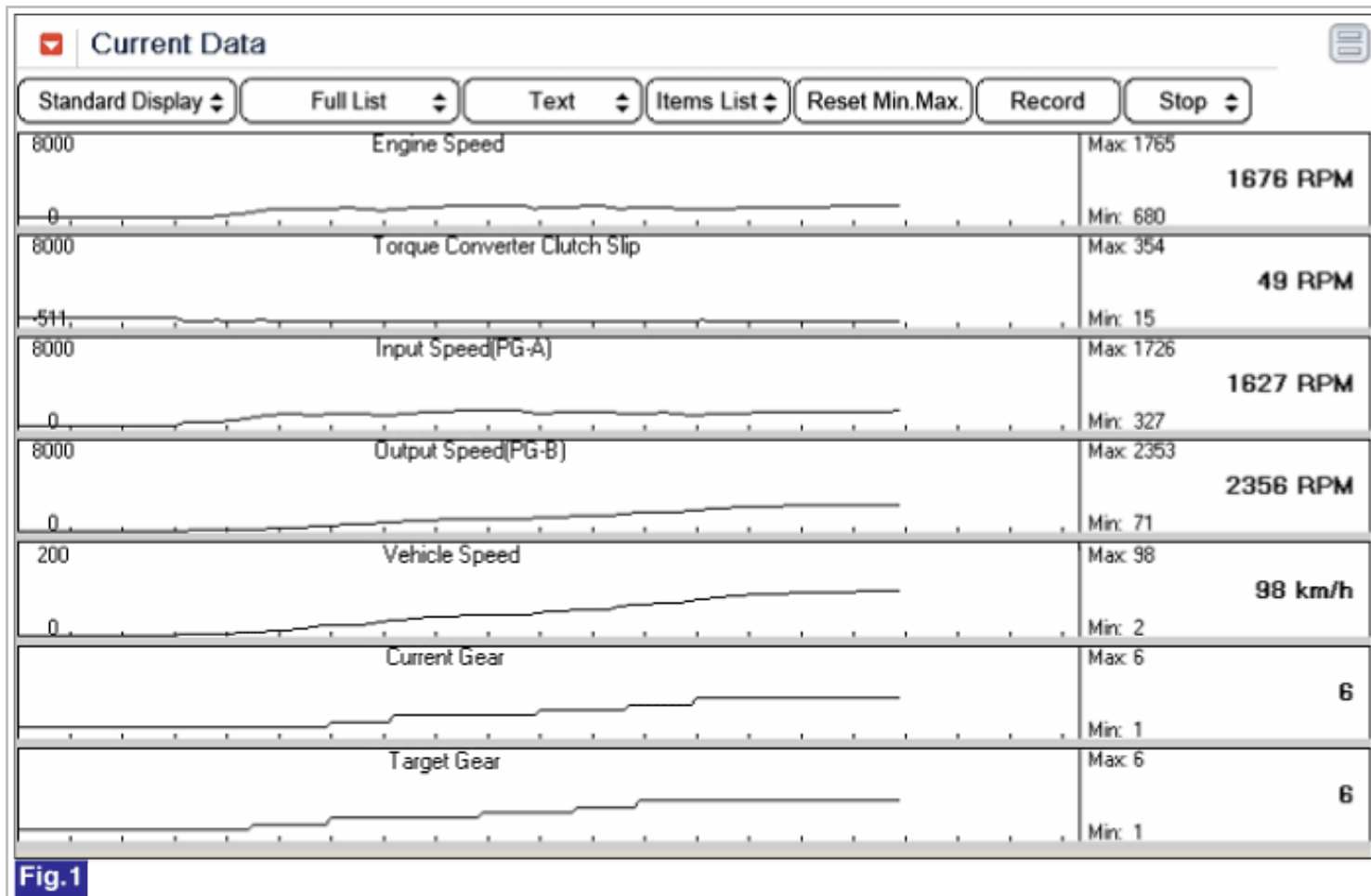


Fig 1) Input speed sensor signal while driving

5. Is "Input speed sensor" output value within normal range ?

<b>YES</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "verification of vehicle repair" procedure.
<b>NO</b>	▶ Go to "Component Inspection" procedure.

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

#### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed.

Before learning, check for variable speed shock or shift shock.

#### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear.

RKeep the vehicle speed over 60KM/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

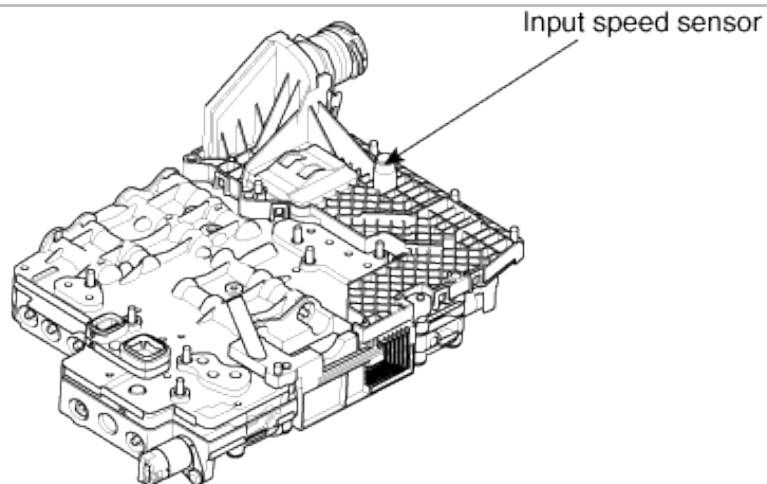
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	► Go to the applicable troubleshooting procedure.
<b>NO</b>	► System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0717 Input/Turbine Speed Sensor 'A' Circuit No Signal

### Component Location



## General Description

The input(turbine) speed sensor outputs pulse-signals according to the revolutions of the input shaft of the transmission. The TCM determines the input shaft speed by counting the frequency of the pulses. This value is mainly used to control the optimum fluid pressure during shifting.

## DTC Description

TCM set this code If detected short to battery, open, short to ground in this circuit.(MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Check signal range	• Faulty in Mechatronics (Valve-body + TCM)
Enable Conditions	• Sensor supply power : normal	
Threshold Value	• Circuit malfunction	
Diagnostic Time	• 0.6 second	
Fail Safe	<ul style="list-style-type: none"> <li>• Keep the present gear status</li> <li>• Fixed at 3rd gear</li> <li>• Maximum line pressure control(D : 14kg/cm<sup>2</sup>, R : 20kg/cm<sup>2</sup>)</li> <li>• Torque converter clutch : OFF</li> <li>• No learning control (priority : 3)</li> </ul>	

### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical

standpoint it is the only safe condition.

## Signal Waveform & Data

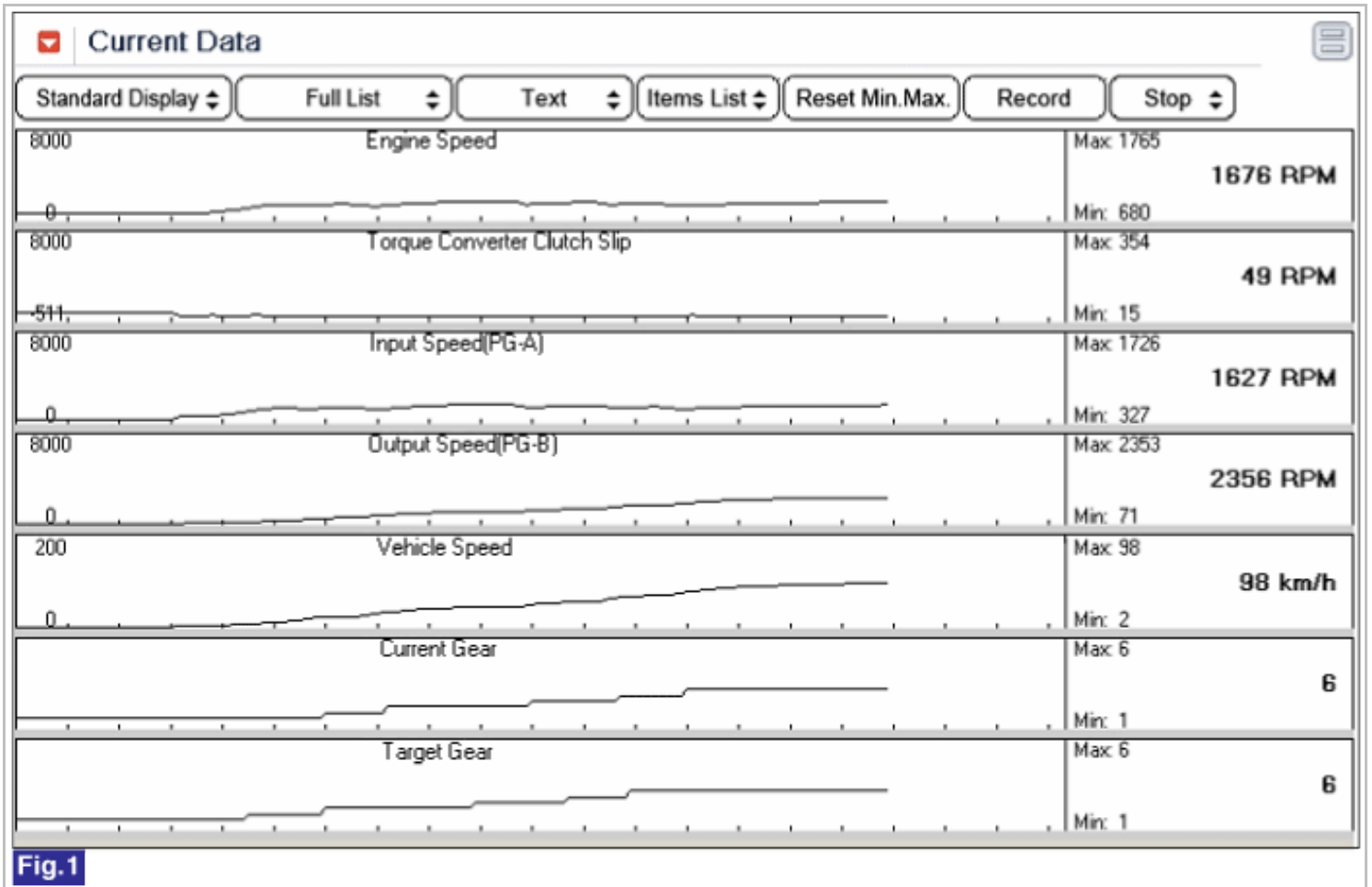


Fig 1) Input speed sensor

## Monitor Scantool Data

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "INPUT SPEED SENSOR" parameter on the scan tool.
4. Drive the vehicle.

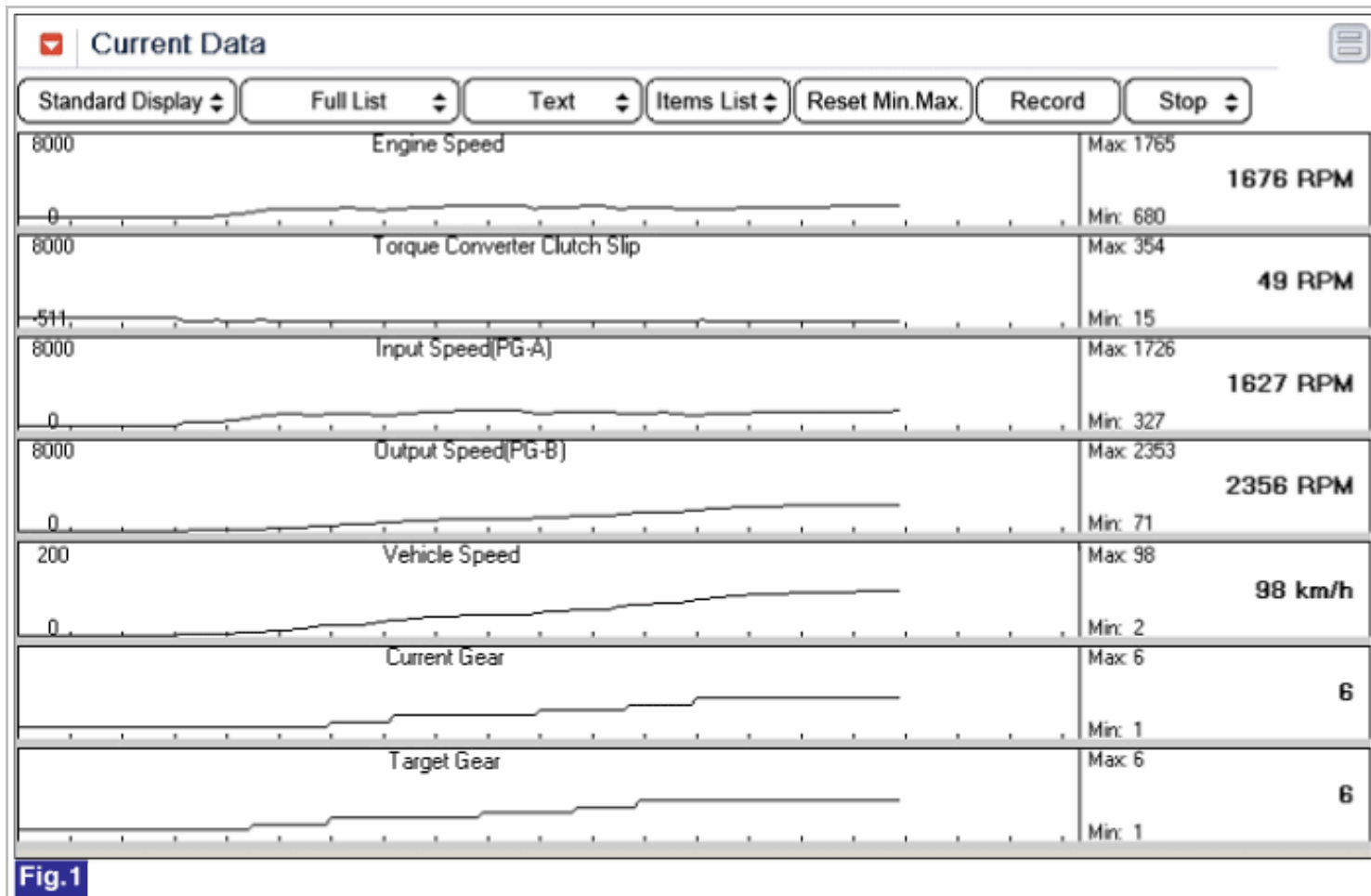


Fig 1) Input speed sensor signal while driving

5. Is "Input speed sensor" output value within normal range ?

<b>YES</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "verification of vehicle repair" procedure.
<b>NO</b>	▶ Go to "Component Inspection" procedure.

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.



## How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed.

Before learning, check for variable speed shock or shift shock.

### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear.

RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

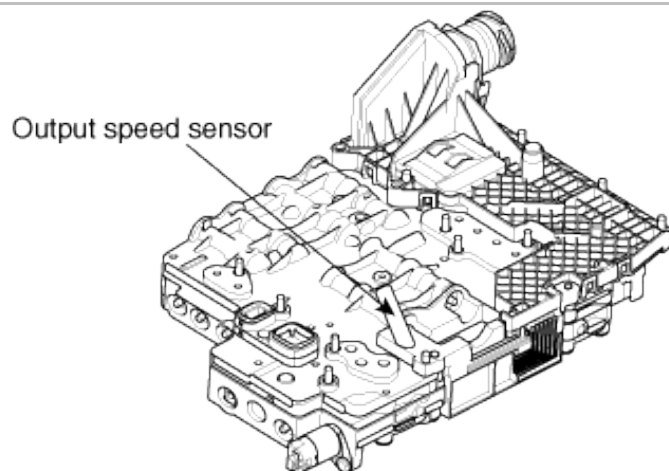
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	► Go to the applicable troubleshooting procedure.
<b>NO</b>	► System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0721 Output Speed Sensor Circuit Range/Performance

### Component Location



## General Description

The Output Speed Sensor outputs pulse-signals according to the revolutions of the output shaft of the transmission. The Output Speed Sensor is installed inside transmission. This value, together with the throttle position data, is mainly used to decide the optimum gear position.

## DTC Description

The TCM sets this code if the calculated value of the pulse-signal is noticeably different from the value calculated, using the Wheel Speed Sensor output. (MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item		Detecting Condition	Possible Cause
DTC Strategy		<ul style="list-style-type: none"> <li>Check signal range</li> </ul>	<ul style="list-style-type: none"> <li>Faulty in Mechatronics (Valve-body + TCM)</li> </ul>
Enable Conditions	CASE1	<ul style="list-style-type: none"> <li>Sensor supply power : normal</li> <li>No electrical error in sensor</li> </ul>	
	CASE2	<ul style="list-style-type: none"> <li>Transmission condition = friction locked</li> <li>Input speed sensor : normal</li> <li><math> \text{Input speed} / \text{gear ratio} - \text{output speed}  \geq 200\text{rpm}</math></li> </ul>	
	CASE3	<ul style="list-style-type: none"> <li>Transmission condition = friction locked</li> <li>Not shifting to "D" or "R"</li> <li>Power supply, Input speed sensor, Wheel speed sensor : normal</li> </ul>	
Threshold Value	CASE1	<ul style="list-style-type: none"> <li>Signal value &gt; 10000 rpm</li> </ul>	
	CASE2	<ul style="list-style-type: none"> <li>Difference with last speed and real speed &gt; -1000rpm</li> </ul>	
	CASE3	<ul style="list-style-type: none"> <li>Difference with Wheel speed sensor &gt; 500rpm</li> <li>Difference with Input speed sensor &gt; 200rpm</li> </ul>	
Diagnostic Time		<ul style="list-style-type: none"> <li>1second</li> </ul>	
Fail Safe		<ul style="list-style-type: none"> <li>Using Wheel speed</li> <li>No learning control</li> <li>Keep the present gear</li> <li>Fixed at 3rd gear</li> </ul>	

(In case of CASE2 : possible to normal shifting)  
(priority : 3)

#### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

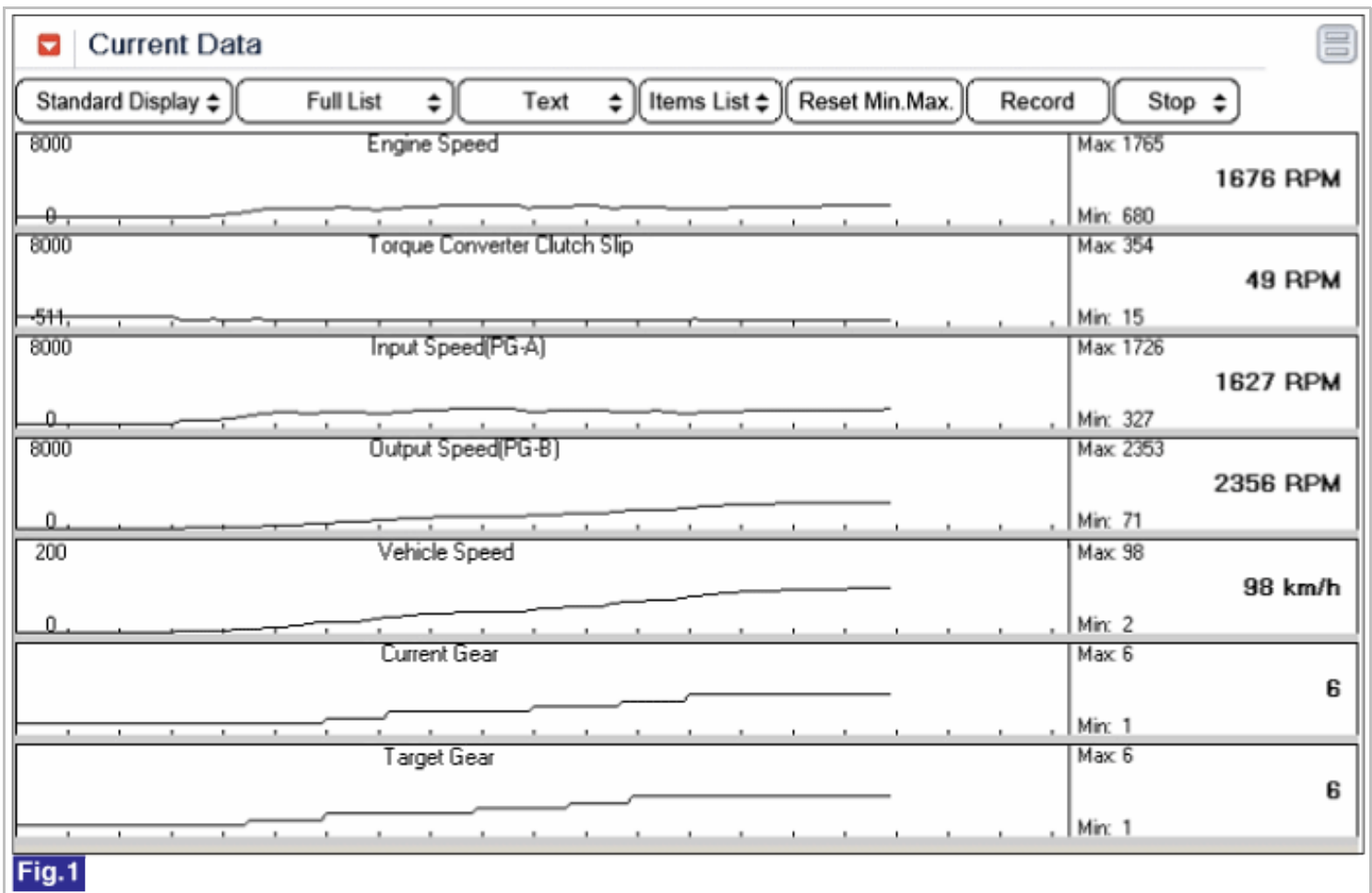


Fig 1) Output speed sensor

## Monitor Scantool Data

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "OUTPUT SPEED SENSOR" parameter on the scan tool.
4. Drive the vehicle.

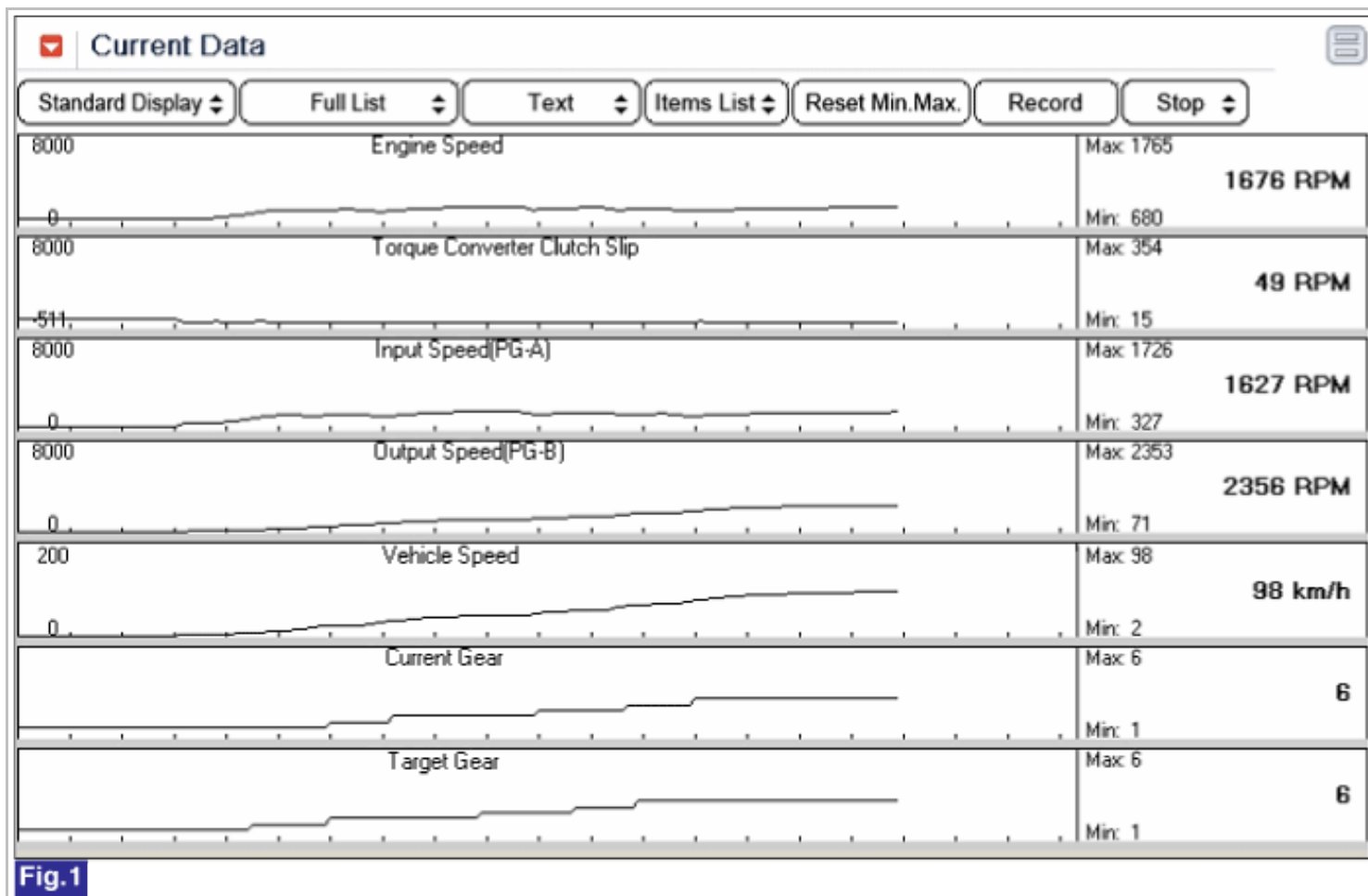


Fig 1) Input speed sensor signal while driving

5. Is "Output speed sensor" output value within normal range ?

<b>YES</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "verification of vehicle repair" procedure.
<b>NO</b>	▶ Go to "Component Inspection" procedure.

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as

necessary and go to "Verification of Vehicle Repair" procedure.

#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed.

Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear.

RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal normally. Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

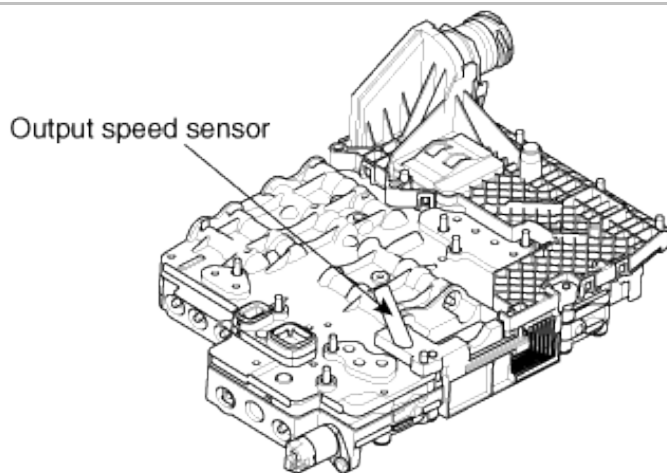
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	► Go to the applicable troubleshooting procedure.
<b>NO</b>	► System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0722 Output Speed Sensor Circuit No Signal

### Component Location



## General Description

The Output Speed Sensor outputs pulse-signals according to the revolutions of the output shaft of the transmission. The Output Speed Sensor is installed inside transmission. This value, together with the throttle position data, is mainly used to decide the optimum gear position.

## DTC Description

TCM set this code If detected short to battery, open, short to ground in this circuit.(MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Check signal range	• Faulty in Mechatronics (Valve-body + TCM)
Enable Conditions	• Sensor supply power : normal	
Threshold Value	• Circuit malfunction	
Diagnostic Time	• 0.6 second	
Fail Safe	<ul style="list-style-type: none"> <li>• Using Wheel speed</li> <li>• No learning control</li> <li>• Keep the present gear</li> <li>• Fixed at 3rd gear (In case of CASE2 : possible to normal shifting) (priority : 3)</li> </ul>	

### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

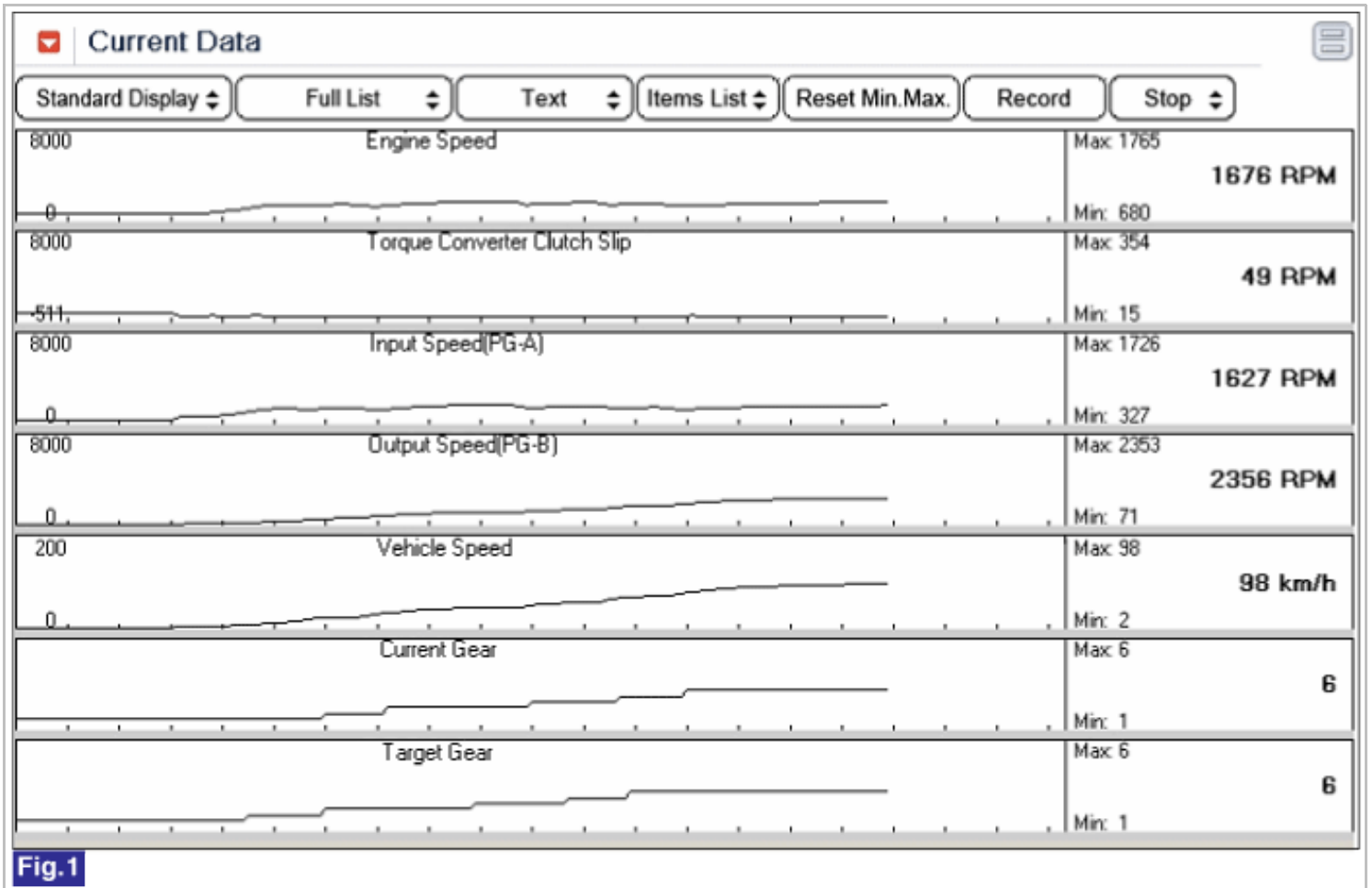
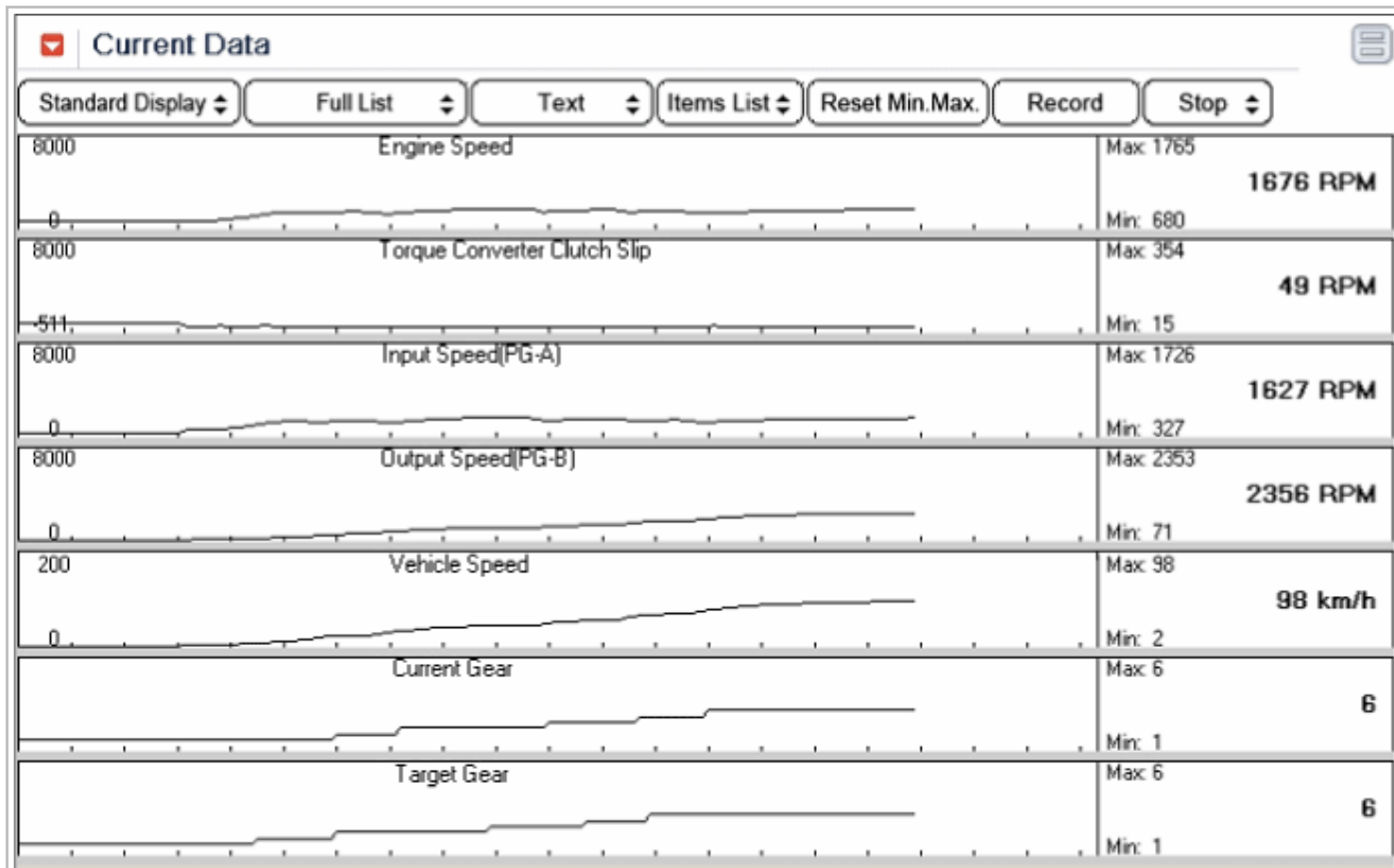


Fig 1) Output speed sensor

## Monitor Scantool Data

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "OUTPUT SPEED SENSOR" parameter on the scan tool.
4. Drive the vehicle.



**Fig.1**

Fig 1) Input speed sensor signal while driving

5. Is "Output speed sensor" output value within normal range ?

<b>YES</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "verification of vehicle repair" procedure.
<b>NO</b>	▶ Go to "Component Inspection" procedure.

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.



### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

#### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed.

Before learning, check for variable speed shock or shift shock.

#### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear.

RKeep the vehicle speed over 60KM/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

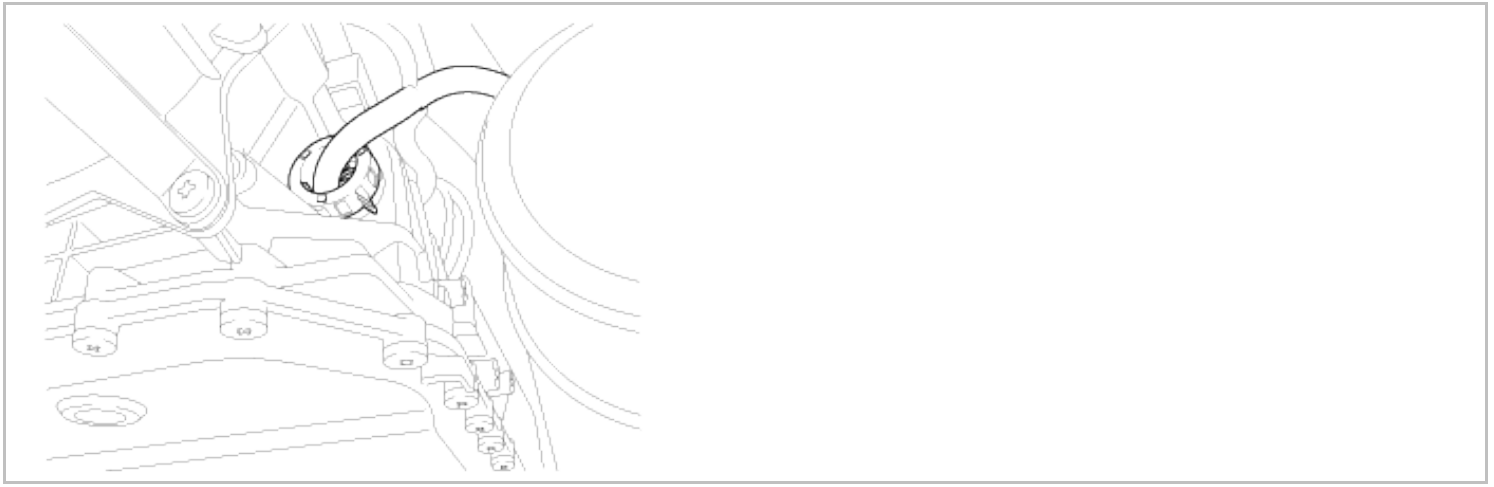
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	► Go to the applicable troubleshooting procedure.
<b>NO</b>	► System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0727 Engine Speed Input Circuit No Signal

### Component Location



## General Description

Several control units are applied to electronically controlled vehicles. These units perform each control with informations from various sensors. Thus, sharing signal information from sensors is needed, so CAN communication type whose communication speed is high and insensitive to electrical noise by spark generation is adopted to controlling power-train(engine, automatic transaxle, ABS, TCS, ECS)

A/T, ESP, ABS control units share the informations that Engine rpm, APS signal, gear position, Torque reduction signal, using CAN communication to confirm active controlling.

## DTC Description

TCM set this code If detected error in Engine rpm signal.(MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	<ul style="list-style-type: none"> <li>• Check signal range</li> </ul>	<ul style="list-style-type: none"> <li>• Check the Engine</li> </ul>
Enable Conditions	<ul style="list-style-type: none"> <li>• IG KEY "ON"</li> <li>• CAN BUS : normal</li> <li>• ECU CAN connect status : normal</li> <li>• Battery voltage &gt; 9V</li> </ul>	
Threshold Value	<ul style="list-style-type: none"> <li>• Circuit malfunction</li> </ul>	
Diagnostic Time	<ul style="list-style-type: none"> <li>• 1 second</li> </ul>	
Fail Safe	<ul style="list-style-type: none"> <li>• Maximum line pressure control(D : 14kg/cm<sup>2</sup>, R : 20kg/cm<sup>2</sup>)</li> <li>• Inhibite Torque convertor clutch control</li> <li>• Shift lock release</li> <li>• No learning control</li> <li>• Keep the present gear</li> <li>• Fixed at 3rd gear (In case of CASE2 : possible to normal shifting) (priority : 3)</li> </ul>	

**CAUTION**

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

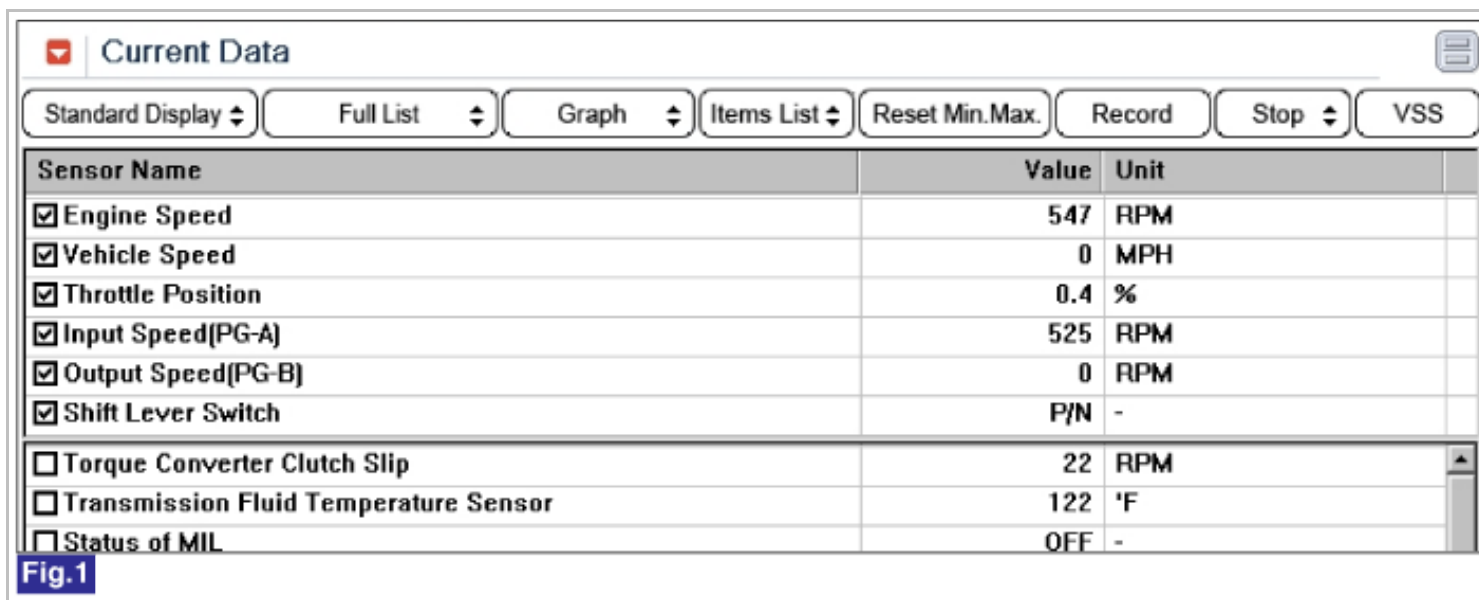


Fig 1) Engine rpm When Idle

## Monitor Scantool Data

1. Connect scantool to Diagnostic Connector.
2. Ignition "ON" & Engine "OFF".
3. Monitor the "Engine Speed" parameter on the scan tool.

**Specification :** 600±100rpm RPM

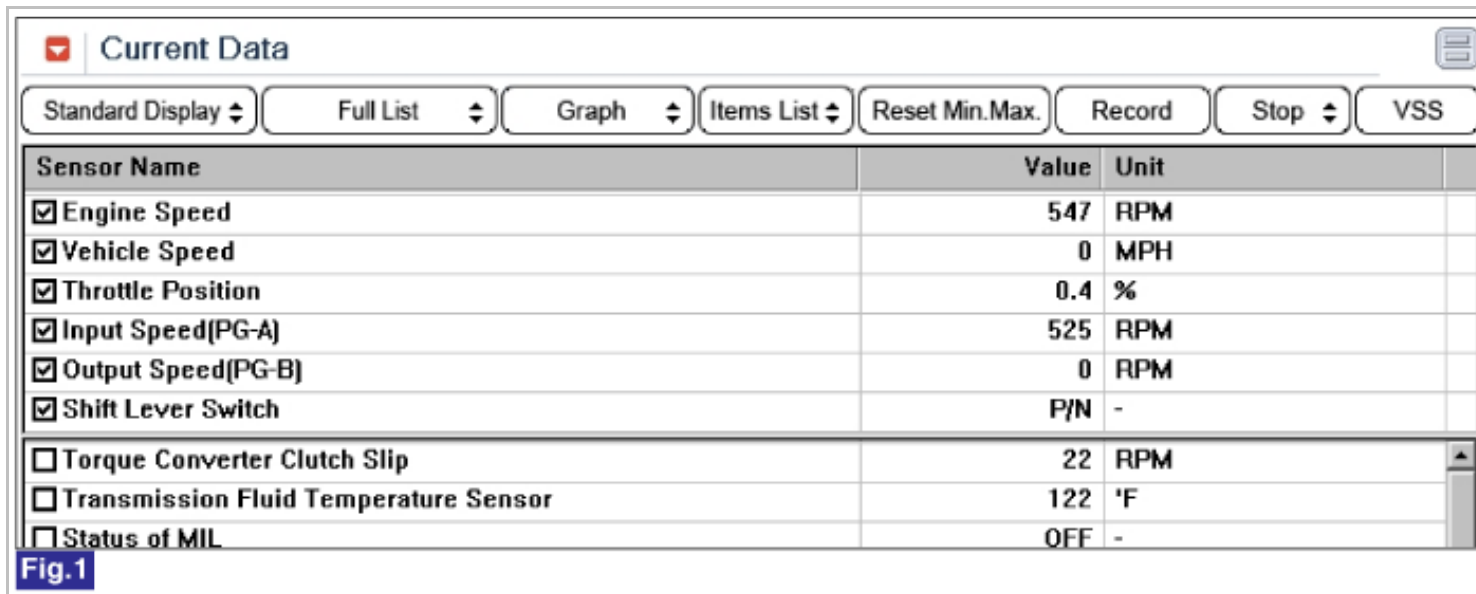


Fig 1) Engine RPM at Idle

4. Is "Engine Speed" output value within specification ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.
<b>NO</b>	► Go to "Component Inspection" procedure.

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	► Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

#### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

**CAUTION**

Don't raise the oil temperature by stalling the engine.

(Reference)

If the oil temperature is not between 50°C ( 122 °F) and 120°C ( 248 °F), initial learning can not be performed.  
Before learning, check for variable speed shock or shift shock.

STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear.  
RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal normally. Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure.
<b>NO</b>	▶ System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0729 Gear 6 Incorrect Ratio

### General Description

The ratio monitoring controls the nominal gear box ratio to the real gear box ratio. While driving in a gear(reverse, first second, third...) there is a calibrated rationality check between turbine speed and output speed of the corresponding gear. While up or down shifting from one gear to another there is a calibrated rationality check between turbine speed and output speed of the corresponding shift. While engaging the gear there is a calibrated rationality check between turbine speed and output speed of the corresponding shift if the actual output speed is higher or equal than a calibrated threshold.

While engaging the gear when the actual output speed is lower than the threshold there is a rationality check on the turbine speed.

### DTC Description

TCM set this code if the value of input speed(turbine speed) is not equal to the value of the output speed, when multiplied by the 1st gear ratio, while the transaxle is engaged in 1st gear. If this code outputted, Check the Engine system first and then follow this procedure.(MIL ON : 2 driving Cycle)

### DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Gear ratio monitoring	
CASE1	• Output speed ≤ 50 rmp	

Enable Conditions	CASE2	<ul style="list-style-type: none"> <li>• 1st gear shifting with 0.5 second</li> <li>• Output speed <math>\leq 50</math> rpm</li> </ul>	<ul style="list-style-type: none"> <li>• Check the Engine system and DTC</li> <li>• Mechatronics(E-module + Valvebody) =&gt; Solenoid valve"1"&amp;"4"</li> <li>• Replace ATM</li> </ul>
Threshold Value	CASE1	<ul style="list-style-type: none"> <li>• Actual engaging gear ratio <math>\geq</math> target gear ratio</li> <li>• Actual engaging gear ratio <math>&lt;</math> target gear ratio</li> </ul>	
	CASE2	<ul style="list-style-type: none"> <li>• Input speed when start to monitoring - actual Input speed <math>&lt; 40</math> rpm or</li> <li>• Input speed when start to monitoring - actual Input speed <math>\geq 40</math> rpm</li> </ul>	
Diagnostic Time		<ul style="list-style-type: none"> <li>• 3times function check</li> </ul>	
Fail Safe		<ul style="list-style-type: none"> <li>• No learning control</li> <li>• Fixed at 3rd gear (priority : 3)</li> </ul>	

### CAUTION

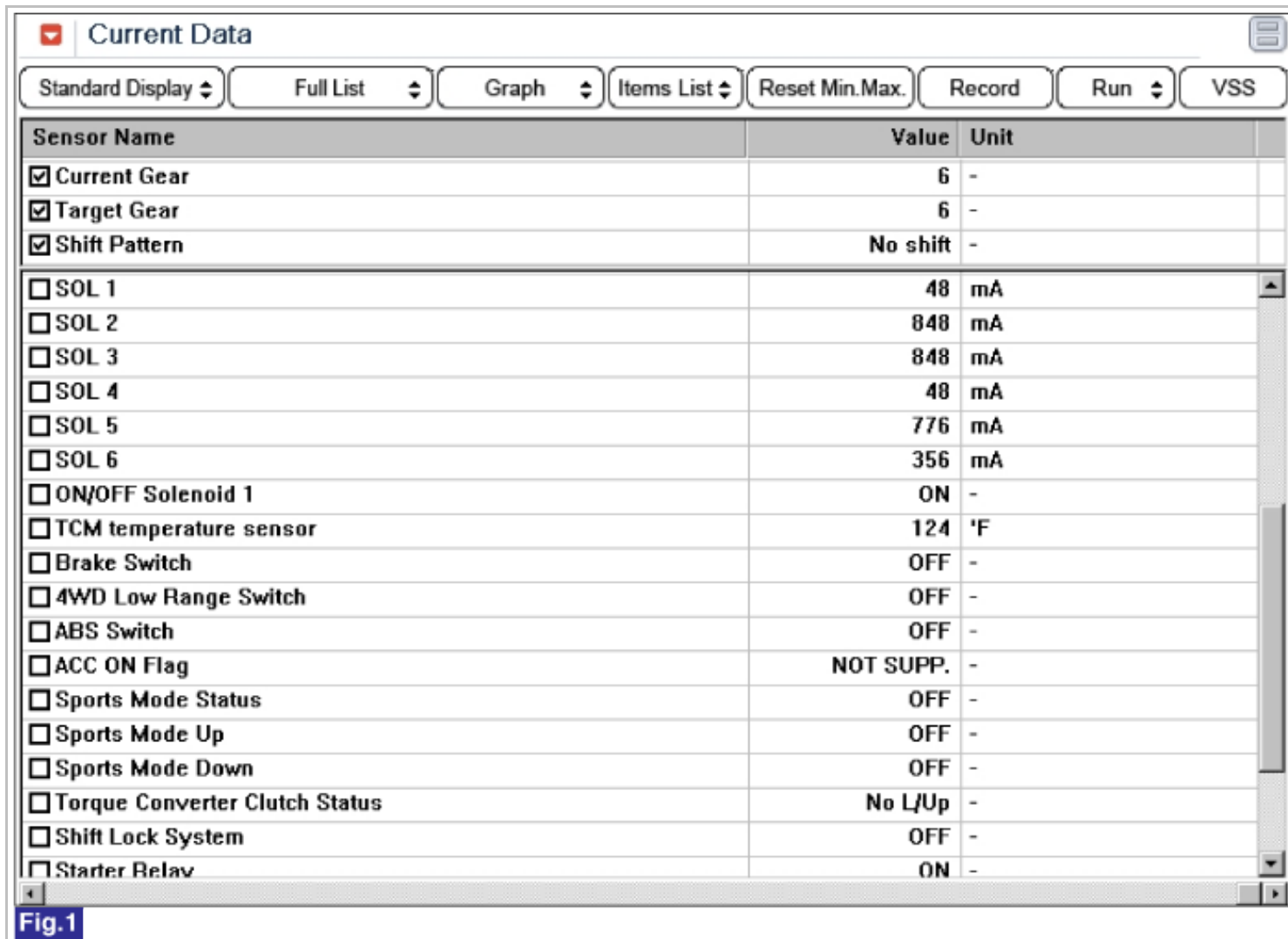
1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

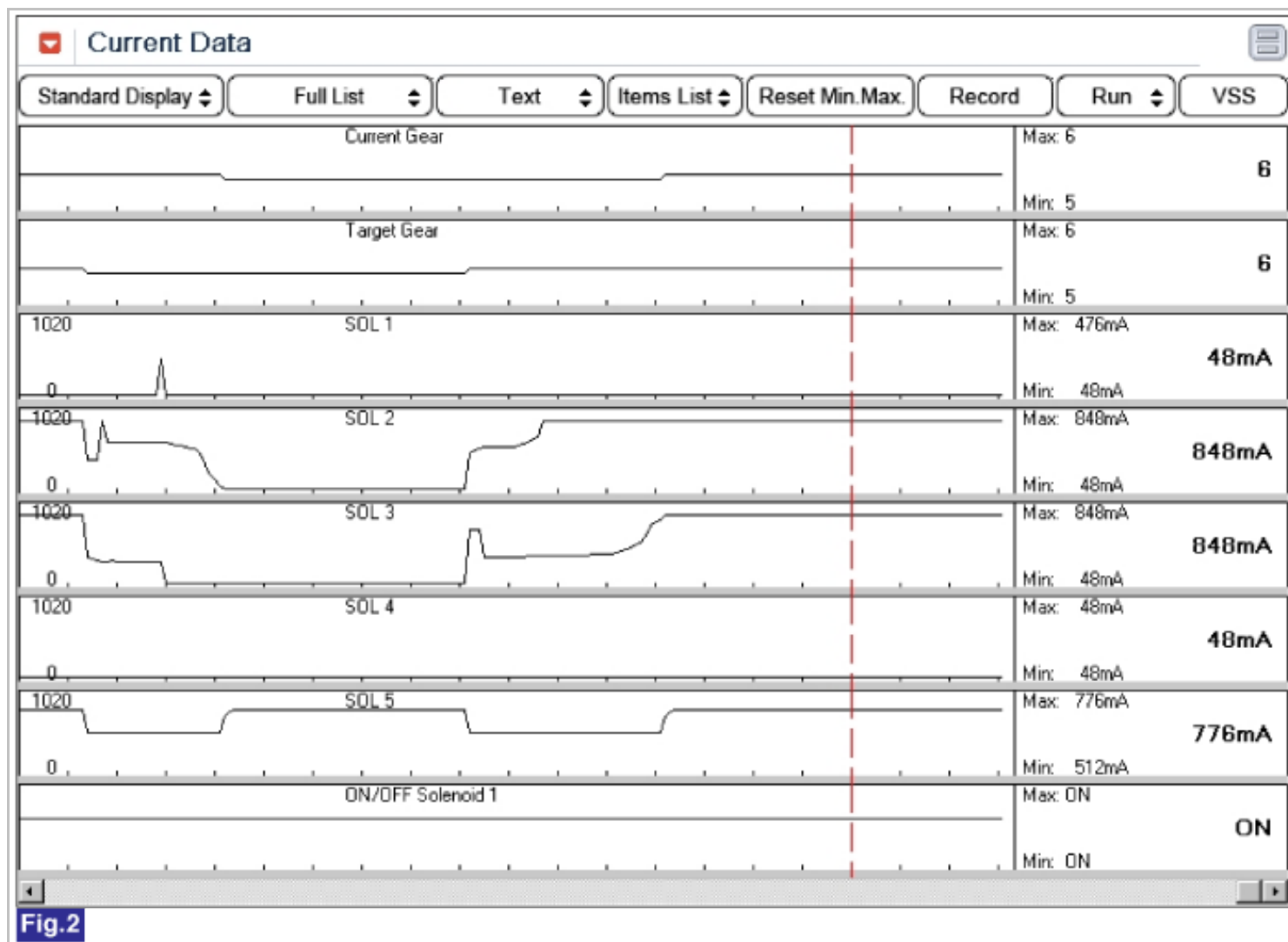
### Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control



**Fig.1**





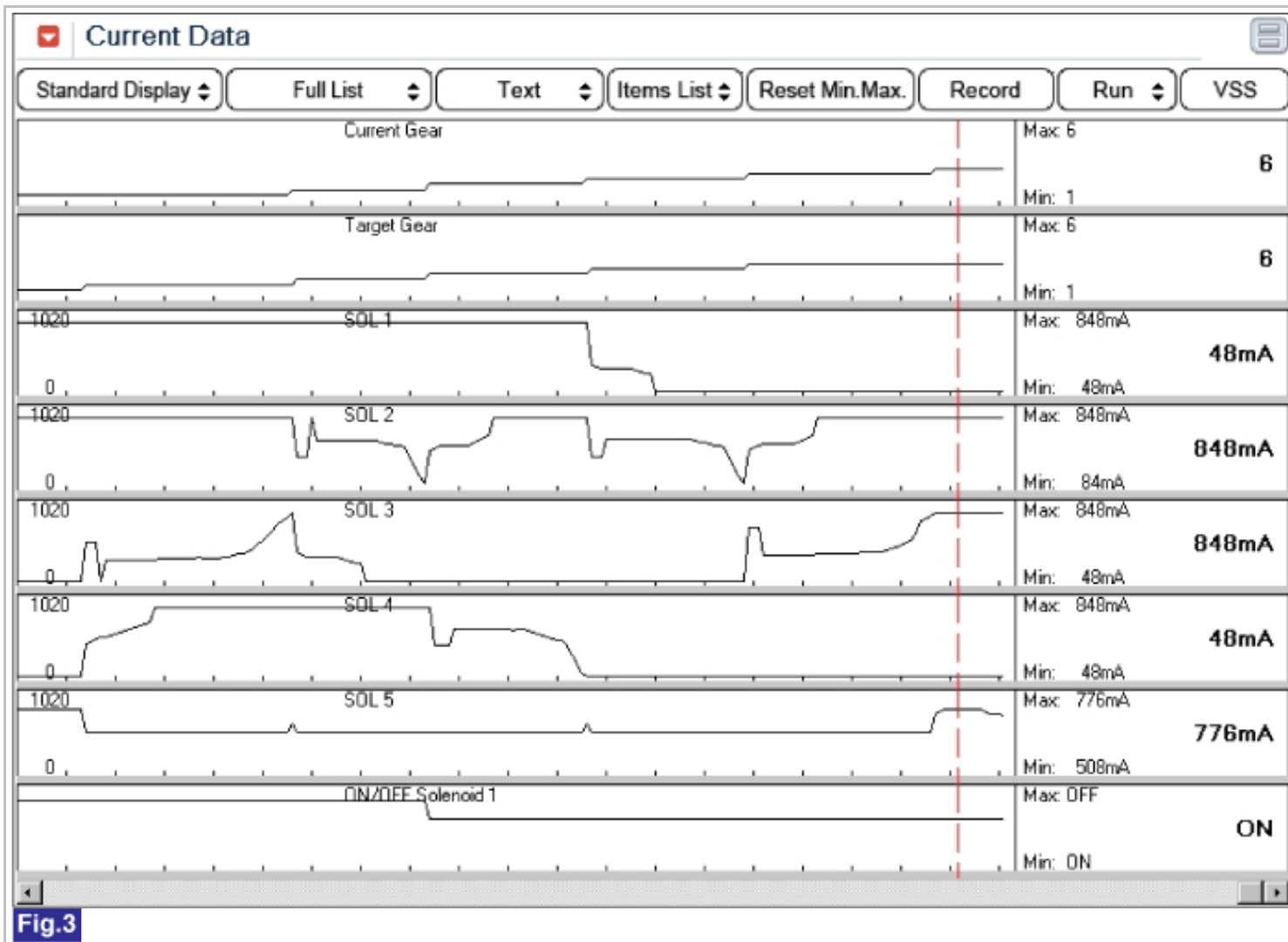


Fig 1) Solenoid valves in 6th gear

Fig 2) Solenoid valves in 6th gear-graph

Fig 3) Solenoid operating status - D1 gear to D6 gear

## Monitor Scantool Data

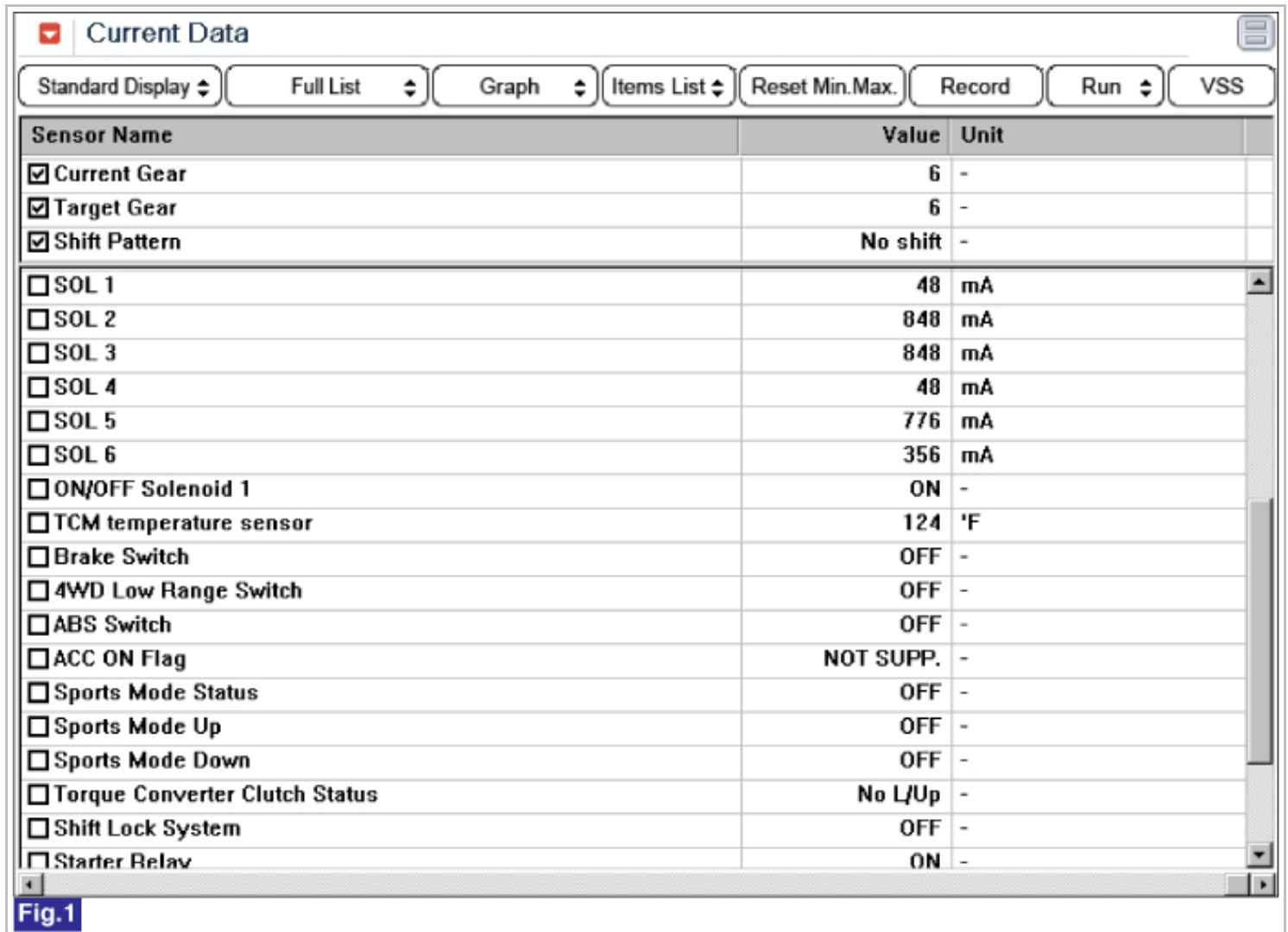
1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Current Gear, Target Gear, solenoid valves" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valves.

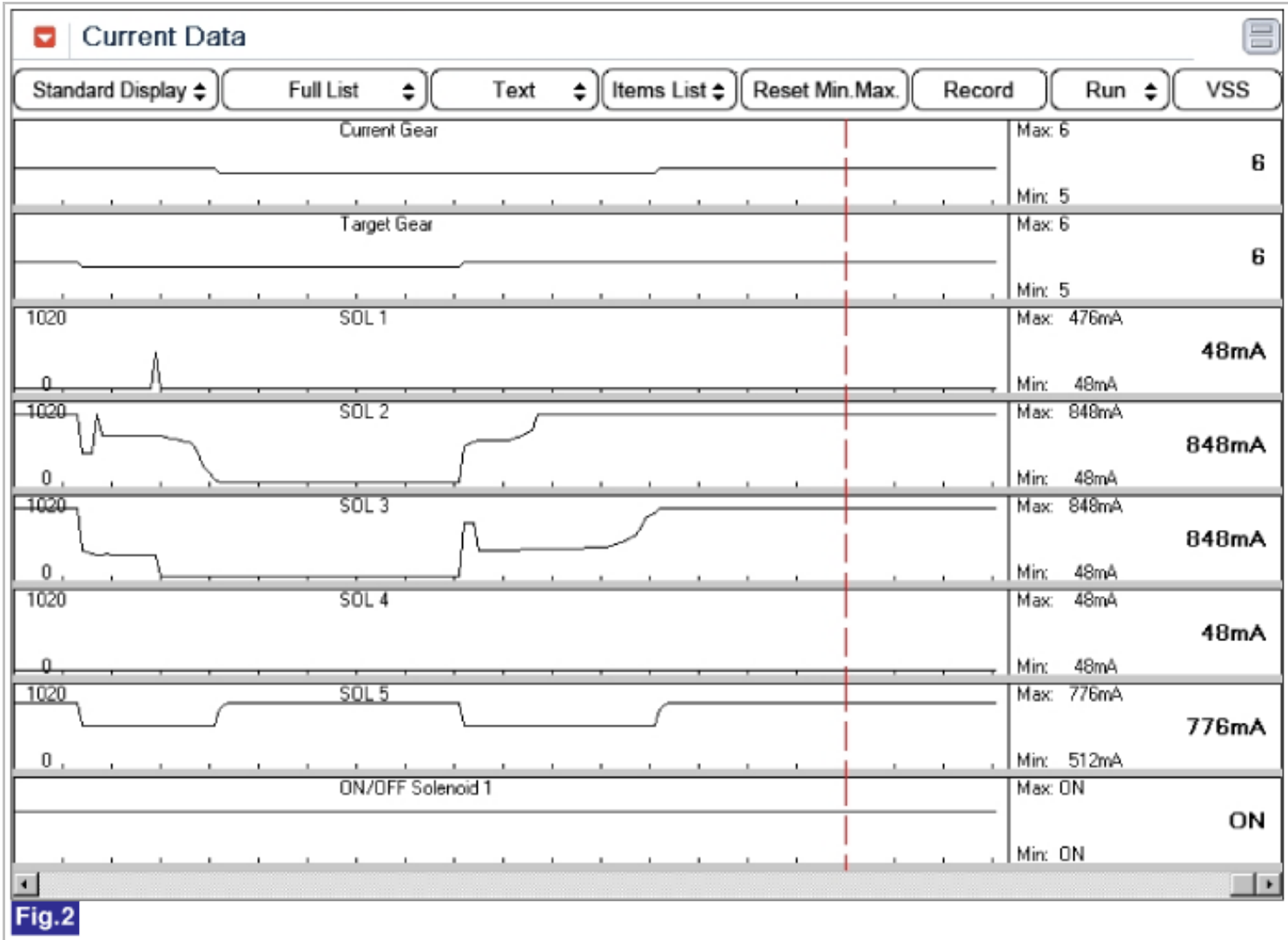
### Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-

D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control





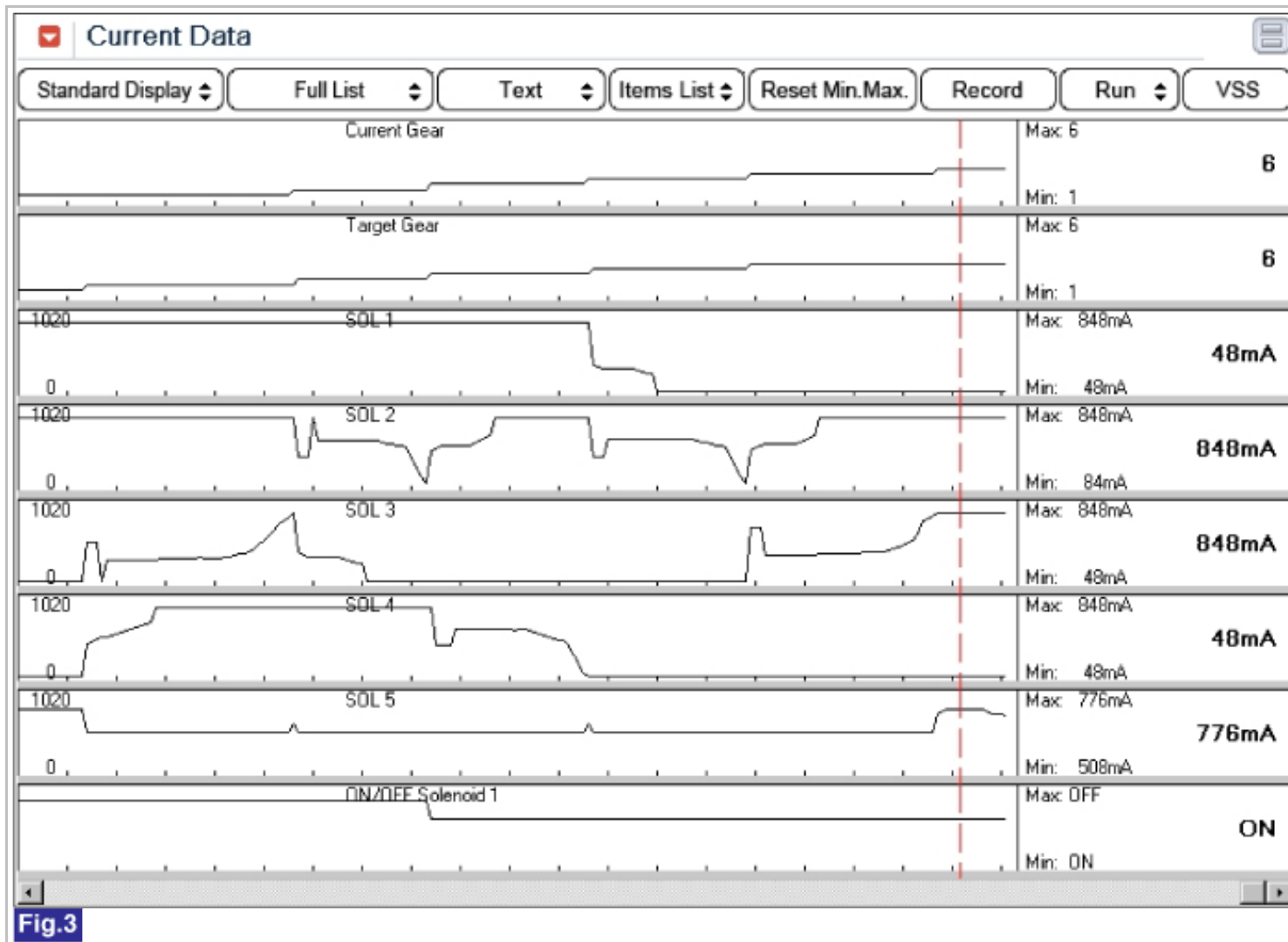


Fig 1) Solenoid valves in 6th gear

Fig 2) Solenoid valves in 6th gear-graph

Fig 3) Solenoid operating status - D1 gear to D6 gear

5. Does solenoid valves "3" & "4" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	► Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected,replace Mechatronics (Valve-body + TCM) and then go to
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	<p>"Verification of Vehicle Repair" procedure.</p> <p>► In case of Automatic Transaxle problem(clutchs, brakes), Check the oil level.</p> <p>If oil level is normal, replace Automatic Transaxle and Go to "Verification Vehicle Repair" procedure.</p>
<b>NO</b>	<p>► Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.</p>

#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

(Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed.

Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear.

RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	► Go to the applicable troubleshooting procedure.
<b>NO</b>	► System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0731 Gear 1 Incorrect Ratio

### General Description

The ratio monitoring controls the nominal gear box ratio to the real gear box ratio. While driving in a gear(reverse, first second, third...) there is a calibrated rationality check between turbine speed and output speed of the corresponding gear.

While up or down shifting from one gear to another there is a calibrated rationality check between turbine speed and

output speed of the corresponding shift. While engaging the gear there is a calibrated rationality check between turbine speed and output speed of the corresponding shift if the actual output speed is higher or equal than a calibrated threshold.

While engaging the gear when the actual output speed is lower than the threshold there is a rationality check on the turbine speed.

## DTC Description

TCM set this code if the value of input speed(turbine speed) is not equal to the value of the output speed, when multiplied by the 1st gear ratio, while the transaxle is engaged in 1st gear. If this code outputted, Check the Engine system first and then follow this procedure.(MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item		Detecting Condition	Possible Cause
DTC Strategy		• Gear ratio monitoring	<ul style="list-style-type: none"> <li>• Check the Engine system and DTC</li> <li>• Mechatronics(E-module + Valvebody) =&gt; Solenoid valve"1"&amp;"4"</li> <li>• Replace ATM</li> </ul>
Enable Conditions	CASE1	• Output speed ≤ 50 rmp	
	CASE2	<ul style="list-style-type: none"> <li>• 1st gear shifting with 0.5 second</li> <li>• Output speed ≤ 50 rmp</li> </ul>	
Threshold Value	CASE1	<ul style="list-style-type: none"> <li>• Actual engaging gear ratio ≥ target gear ratio</li> <li>• Actual engaging gear ratio &lt; target gear ratio</li> </ul>	
	CASE2	<ul style="list-style-type: none"> <li>• Input speed when start to monitoring - actual Input speed &lt; 40 rpm or</li> <li>• Input speed when start to monitoring - actual Input speed ≥ 40 rpm</li> </ul>	
Diagnostic Time		• 3times function check	
Fail Safe		<ul style="list-style-type: none"> <li>• No learning control</li> <li>• Fixed at 5th gear (priority : 3)</li> </ul>	

### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

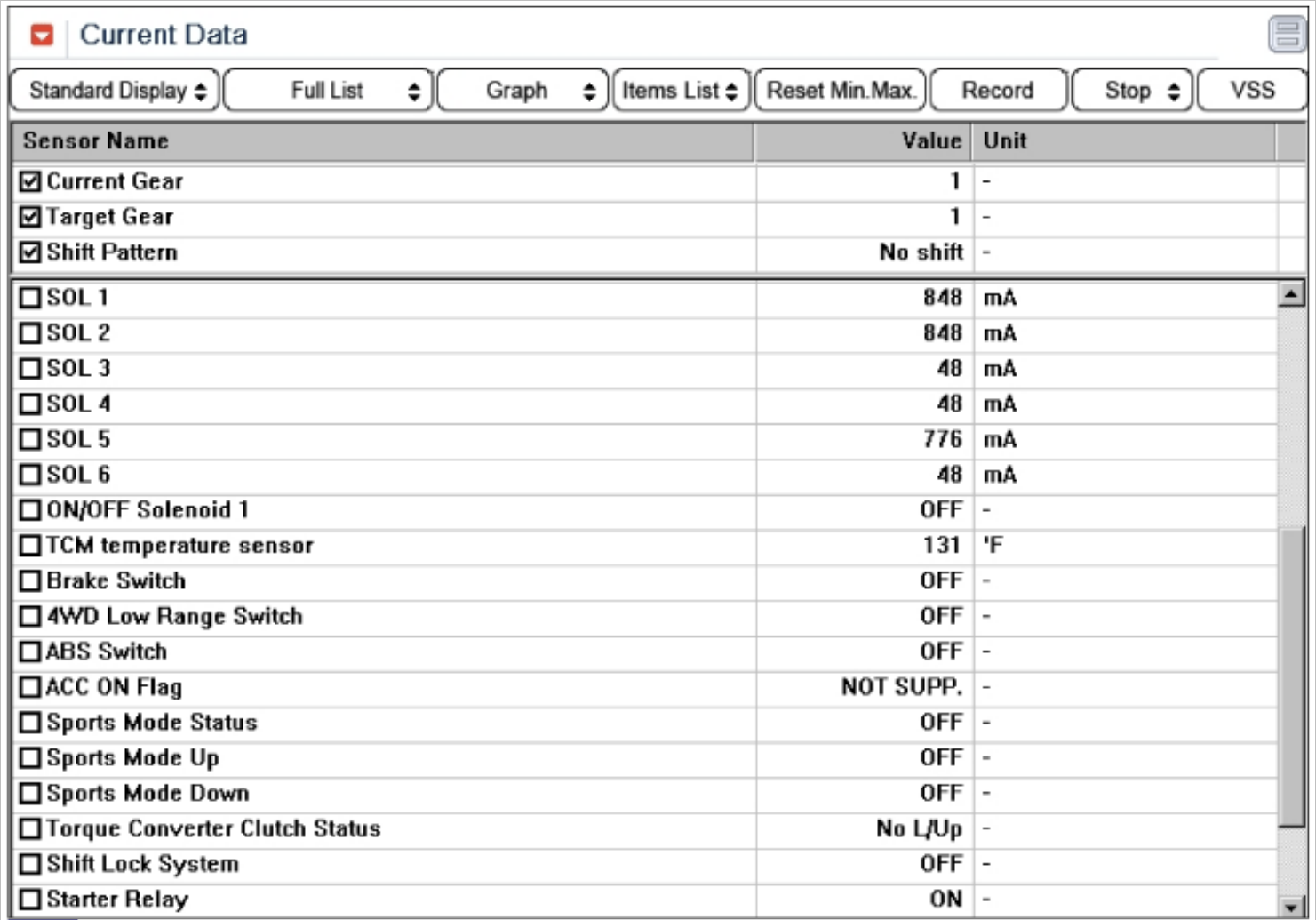
## Signal Waveform & Data

Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6

P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

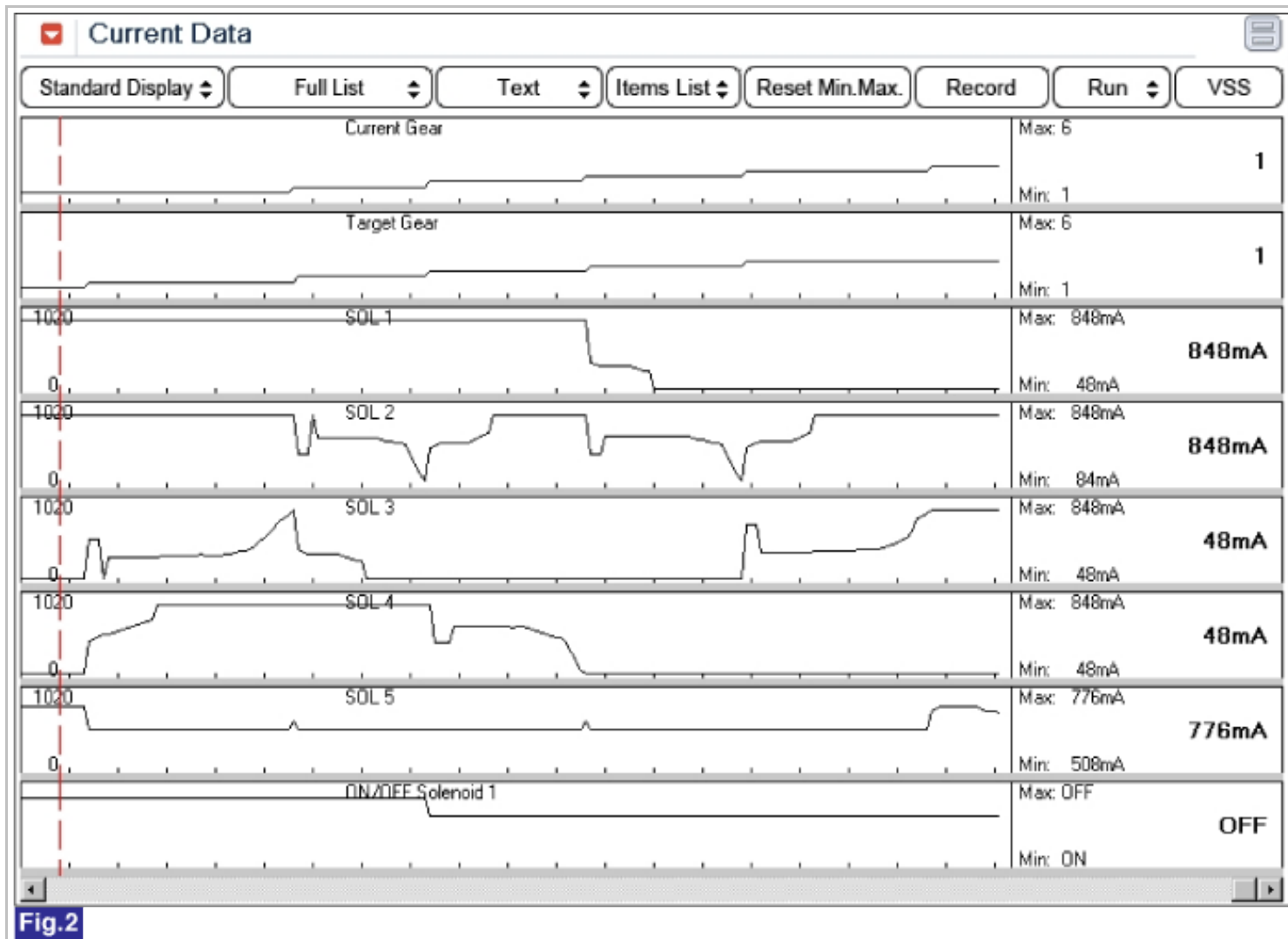
-O- : variable control



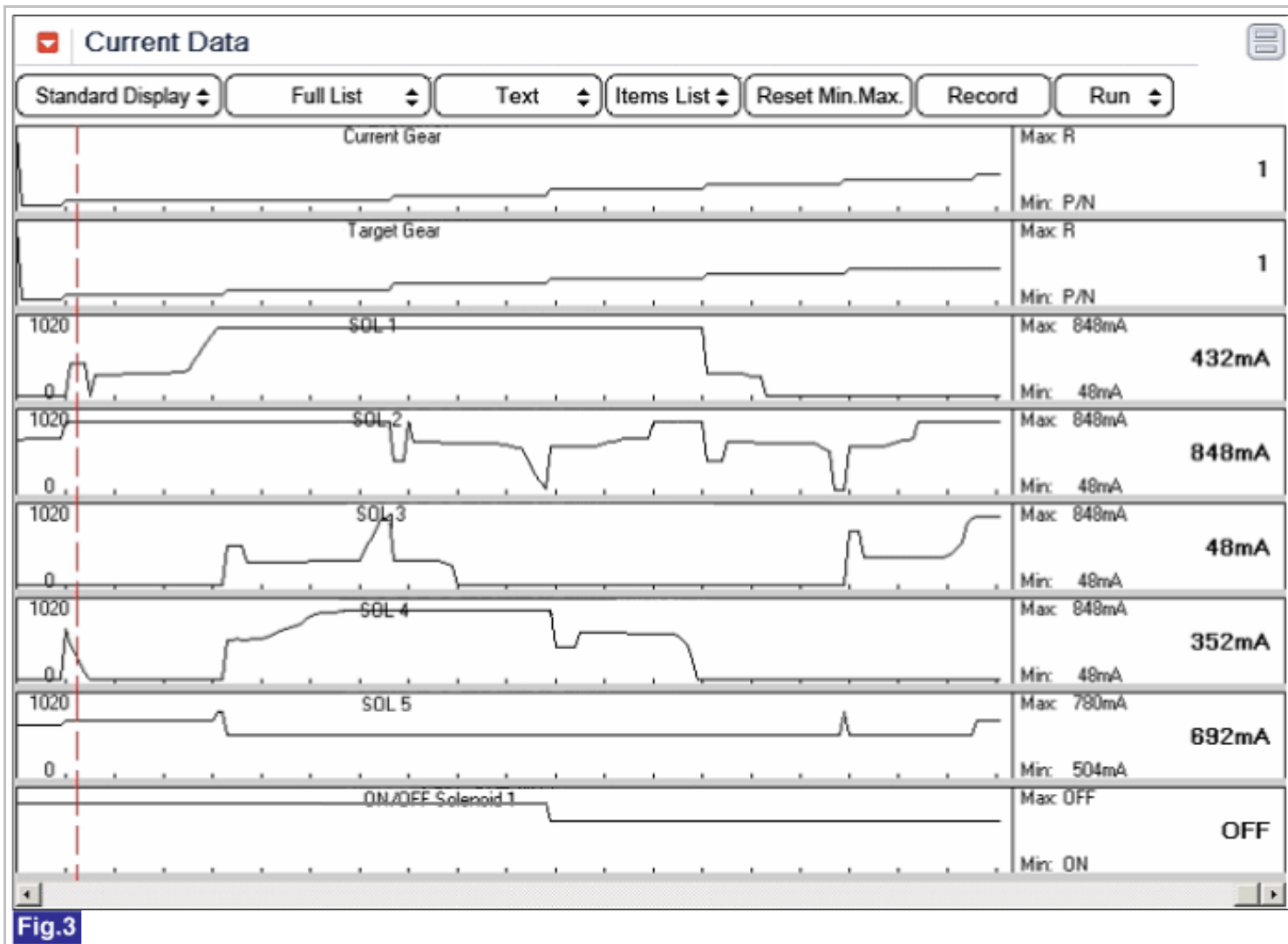
The screenshot shows a software window titled "Current Data". At the top, there are several buttons: "Standard Display" (selected), "Full List", "Graph", "Items List", "Reset Min.Max.", "Record", "Stop", and "VSS". Below these buttons is a table with three columns: "Sensor Name", "Value", and "Unit". The table lists various sensors and their current values. Some sensors are checked (e.g., Current Gear, Target Gear, Shift Pattern), while others are unchecked (e.g., SOL 1 through SOL 6, ON/OFF Solenoid 1, TCM temperature sensor, Brake Switch, 4WD Low Range Switch, ABS Switch, ACC ON Flag, Sports Mode Status, Sports Mode Up, Sports Mode Down, Torque Converter Clutch Status, Shift Lock System, Starter Relay). The values range from 1 to 848 mA, OFF, 131 °F, NOT SUPP., No L/Up, and ON.

Sensor Name	Value	Unit
<input checked="" type="checkbox"/> Current Gear	1	-
<input checked="" type="checkbox"/> Target Gear	1	-
<input checked="" type="checkbox"/> Shift Pattern	No shift	-
<input type="checkbox"/> SOL 1	848	mA
<input type="checkbox"/> SOL 2	848	mA
<input type="checkbox"/> SOL 3	48	mA
<input type="checkbox"/> SOL 4	48	mA
<input type="checkbox"/> SOL 5	776	mA
<input type="checkbox"/> SOL 6	48	mA
<input type="checkbox"/> ON/OFF Solenoid 1	OFF	-
<input type="checkbox"/> TCM temperature sensor	131	°F
<input type="checkbox"/> Brake Switch	OFF	-
<input type="checkbox"/> 4WD Low Range Switch	OFF	-
<input type="checkbox"/> ABS Switch	OFF	-
<input type="checkbox"/> ACC ON Flag	NOT SUPP.	-
<input type="checkbox"/> Sports Mode Status	OFF	-
<input type="checkbox"/> Sports Mode Up	OFF	-
<input type="checkbox"/> Sports Mode Down	OFF	-
<input type="checkbox"/> Torque Converter Clutch Status	No L/Up	-
<input type="checkbox"/> Shift Lock System	OFF	-
<input type="checkbox"/> Starter Relay	ON	-

**Fig.1**







- Fig 1) Solenoid valves in 1st gear  
 Fig 2) Solenoid valves in 1st gear-graph  
 Fig 3) Solenoid operating status - start to shift  
 Fig 4) Solenoid operating status - shifting  
 Fig 5) Solenoid operating status - down shift 2nd to 1st gear

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON".
2. Erase DTC and Engine "ON"
3. Monitor the "Current Gear, Target Gear, solenoid valves" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valves.

### Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-

D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control

**Current Data**

Standard Display

Full List

Graph

Items List

Reset Min.Max.

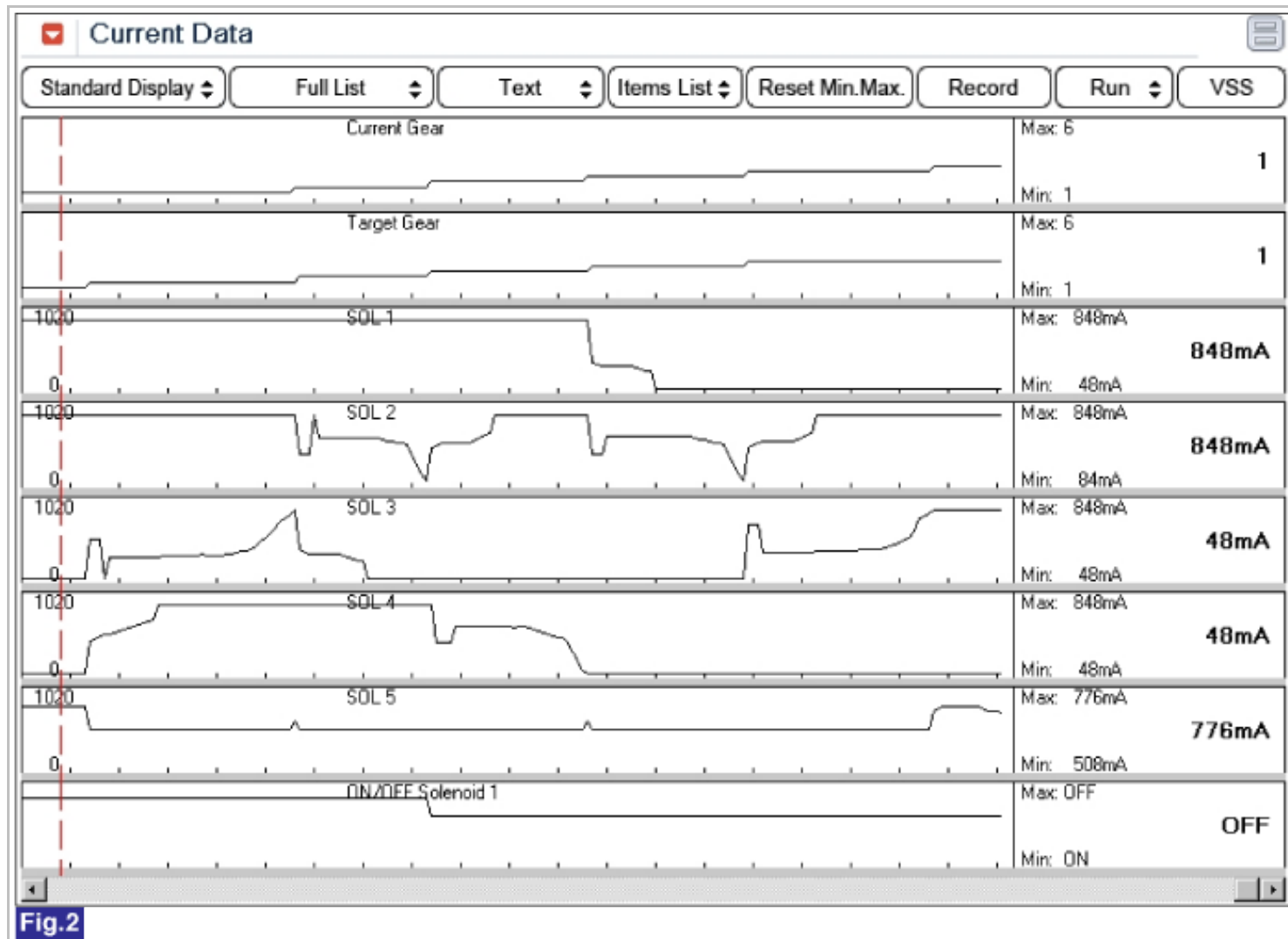
Record

Stop

VSS

Sensor Name	Value	Unit
<input checked="" type="checkbox"/> Current Gear	1	-
<input checked="" type="checkbox"/> Target Gear	1	-
<input checked="" type="checkbox"/> Shift Pattern	No shift	-
<input type="checkbox"/> SOL 1	848	mA
<input type="checkbox"/> SOL 2	848	mA
<input type="checkbox"/> SOL 3	48	mA
<input type="checkbox"/> SOL 4	48	mA
<input type="checkbox"/> SOL 5	776	mA
<input type="checkbox"/> SOL 6	48	mA
<input type="checkbox"/> ON/OFF Solenoid 1	OFF	-
<input type="checkbox"/> TCM temperature sensor	131	'F
<input type="checkbox"/> Brake Switch	OFF	-
<input type="checkbox"/> 4WD Low Range Switch	OFF	-
<input type="checkbox"/> ABS Switch	OFF	-
<input type="checkbox"/> ACC ON Flag	NOT SUPP.	-
<input type="checkbox"/> Sports Mode Status	OFF	-
<input type="checkbox"/> Sports Mode Up	OFF	-
<input type="checkbox"/> Sports Mode Down	OFF	-
<input type="checkbox"/> Torque Converter Clutch Status	No L/Up	-
<input type="checkbox"/> Shift Lock System	OFF	-
<input type="checkbox"/> Starter Relay	ON	-

**Fig.1**



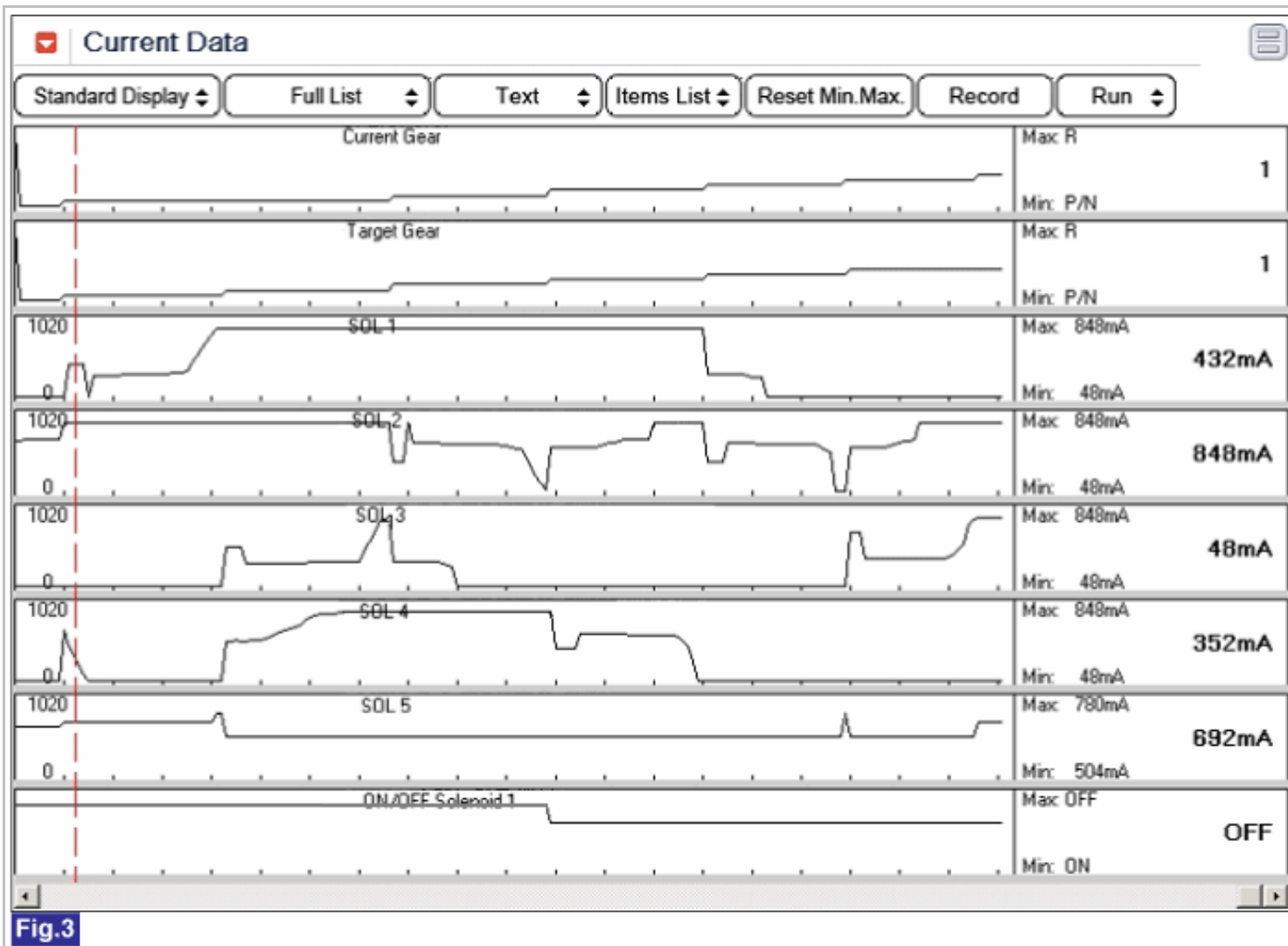


Fig 1) Solenoid valves in 1st gear

Fig 2) Solenoid valves in 1st gear-graph

Fig 3) Solenoid operating status - start to shift

Fig 4) Solenoid operating status - shifting

Fig 5) Solenoid operating status - down shift 2nd to 1st gear

5. Does solenoid valves "1" & "4" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure.

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	<p>▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.</p> <p>▶ In case of Automatic Transaxle problem (clutches, brakes), Check the oil level. If oil level is normal, replace Automatic Transaxle and Go to "Verification Vehicle Repair" procedure.</p>
<b>NO</b>	<p>▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.</p>

#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C ( 122 °F) and 120°C ( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C ( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal normally. Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times. (Not necessary N-D, N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes (DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure.
<b>NO</b>	▶ System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0732 Gear 2 Incorrect Ratio

### General Description

The ratio monitoring controls the nominal gear box ratio to the real gear box ratio. While driving in a gear (reverse, first second, third...) there is a calibrated rationality check between turbine speed and output speed of the corresponding

gear.

While up or down shifting from one gear to another there is a calibrated rationality check between turbine speed and output speed of the corresponding shift. While engaging the gear there is a calibrated rationality check between turbine speed and output speed of the corresponding shift if the actual output speed is higher or equal than a calibrated threshold.

While engaging the gear when the actual output speed is lower than the threshold there is a rationality check on the turbine speed.

## DTC Description

TCM set this code if the value of input speed(turbine speed) is not equal to the value of the output speed, when multiplied by the 2nd gear ratio, while the transaxle is engaged in 2nd gear. If this code outputted, Check the Engine system first and then follow this procedure.(MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item		Detecting Condition	Possible Cause
DTC Strategy		• Gear ratio monitoring	<ul style="list-style-type: none"><li>• Check the Engine system and DTC</li><li>• Mechatronics(E-module + Valvebody) =&gt; Solenoid valve"1"&amp;"3"</li><li>• Replace ATM</li></ul>
Enable Conditions		• 2nd gear shifting • Shifting monitoring status	
	CASE1	• Output speed $\leq$ 50 rpm	
	CASE2	• 2nd gear shifting with 0.5 second • Output speed $\leq$ 50 rpm	
Threshold Value	CASE1	• Actual engaging gear ratio $\geq$ target gear ratio • Actual engaging gear ratio $<$ target gear ratio	
	CASE2	• Input speed when start to monitoring - actual Input speed $<$ 40 rpm or • Input speed when start to monitoring - actual Input speed $\geq$ 40 rpm	
Diagnostic Time		• 3times function check	
Fail Safe		• No learning control • Fixed at 5th gear (priority : 3)	

### CAUTION

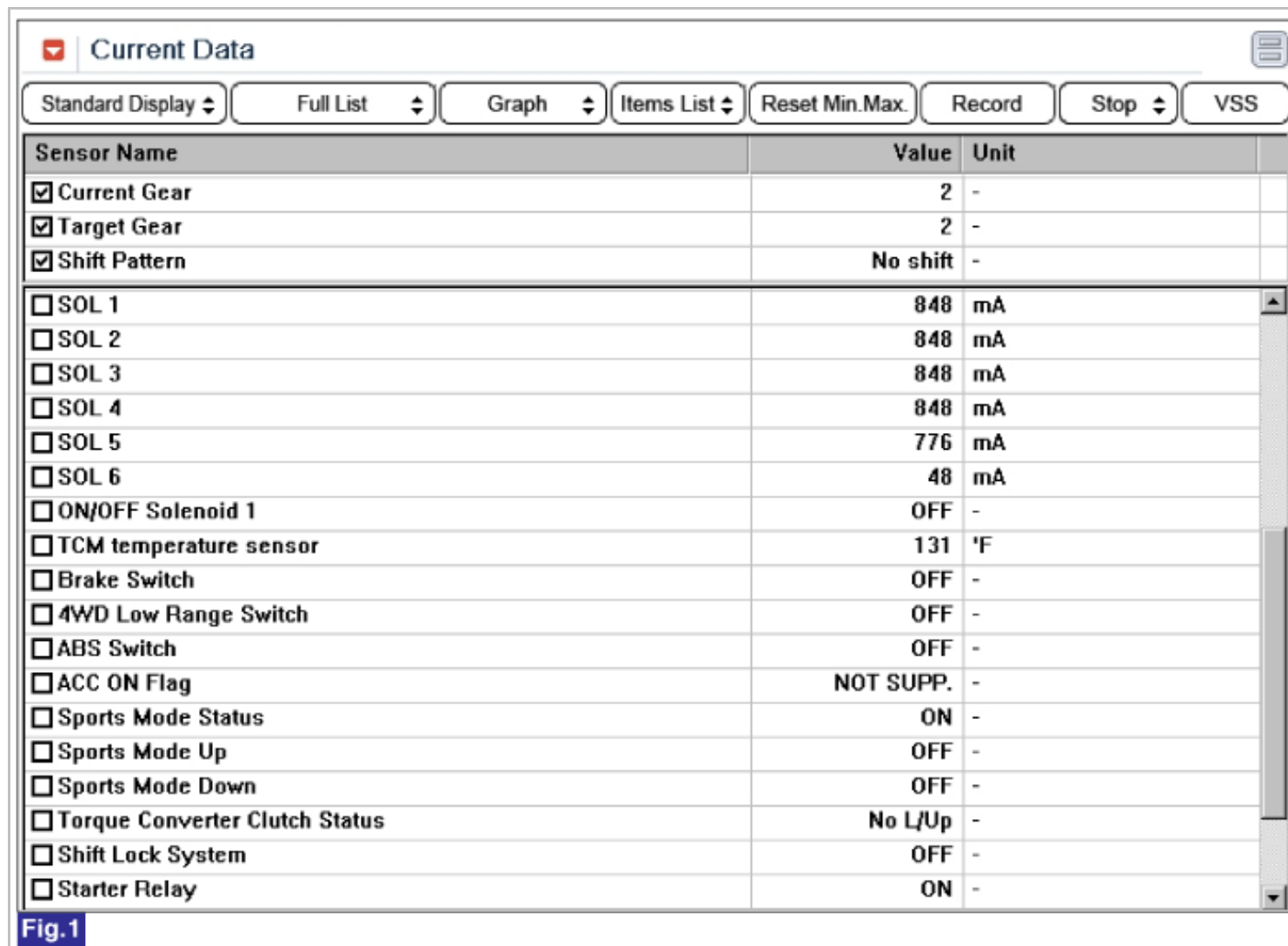
1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

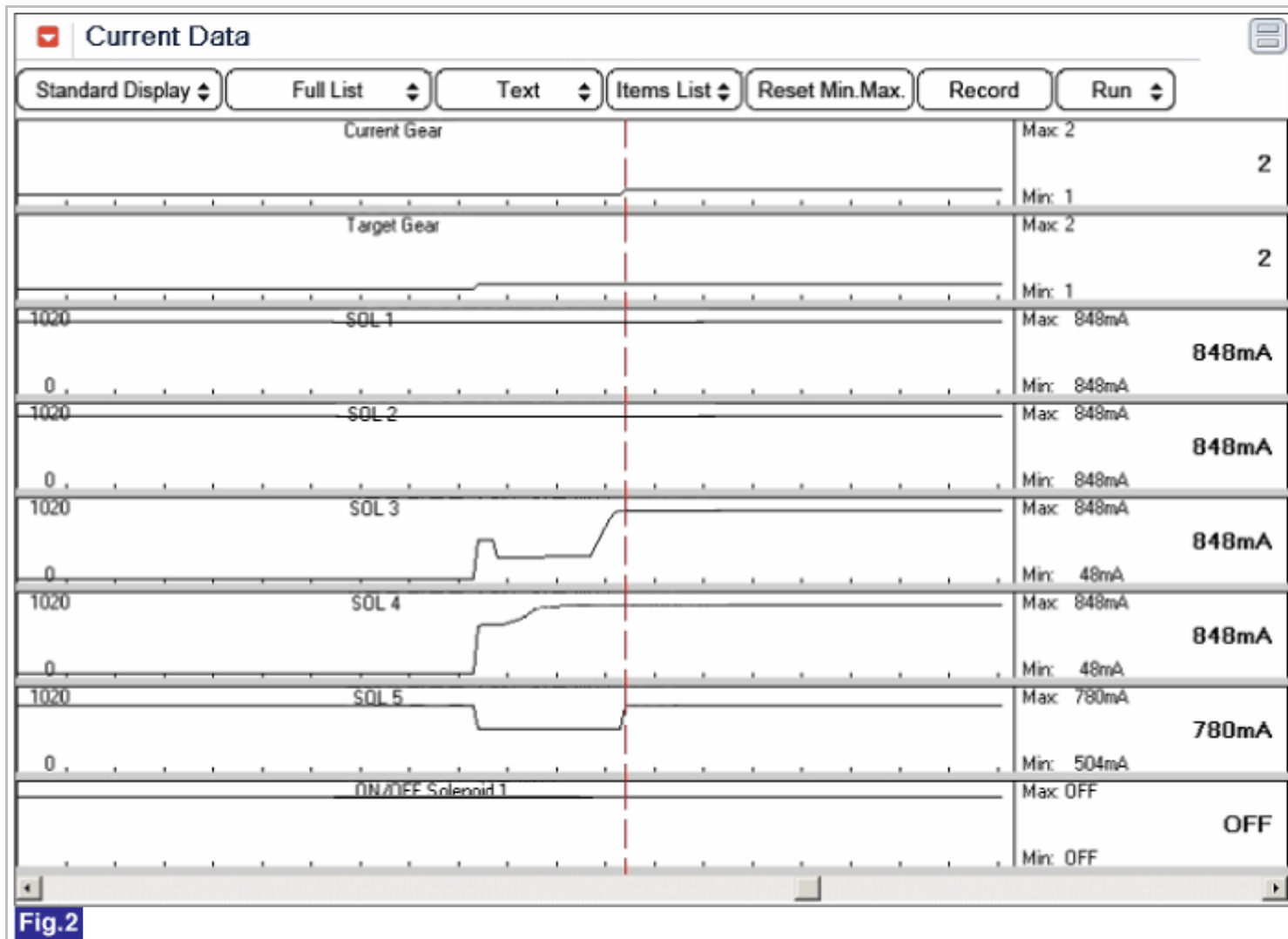
## Signal Waveform & Data

### Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control







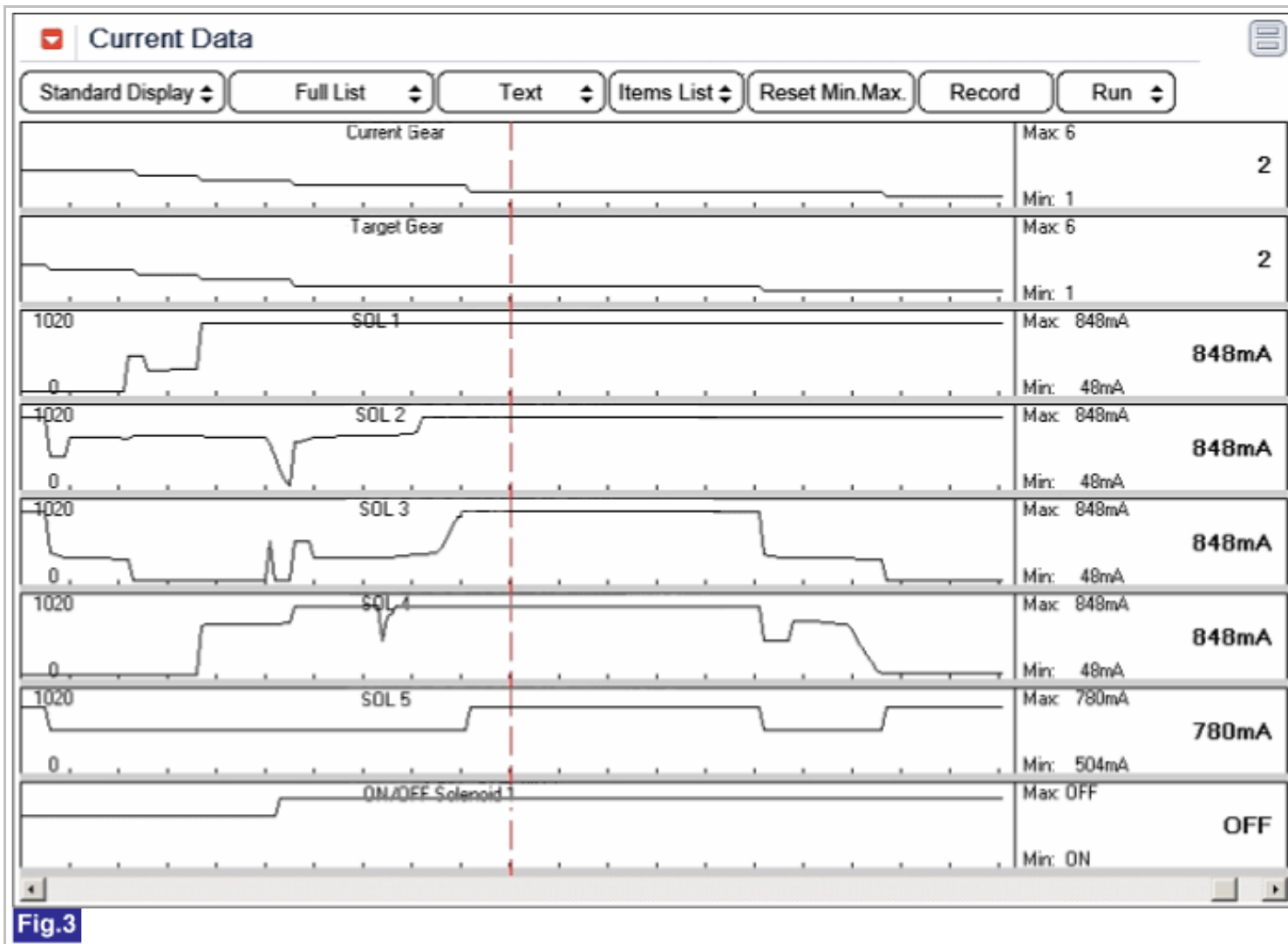


Fig 1) Solenoid valves in 2nd gear

Fig 2) Solenoid valves in 2nd gear-graph

Fig 3) Solenoid operating status - down shift 3rd to 2nd gear

## Monitor Scantool Data

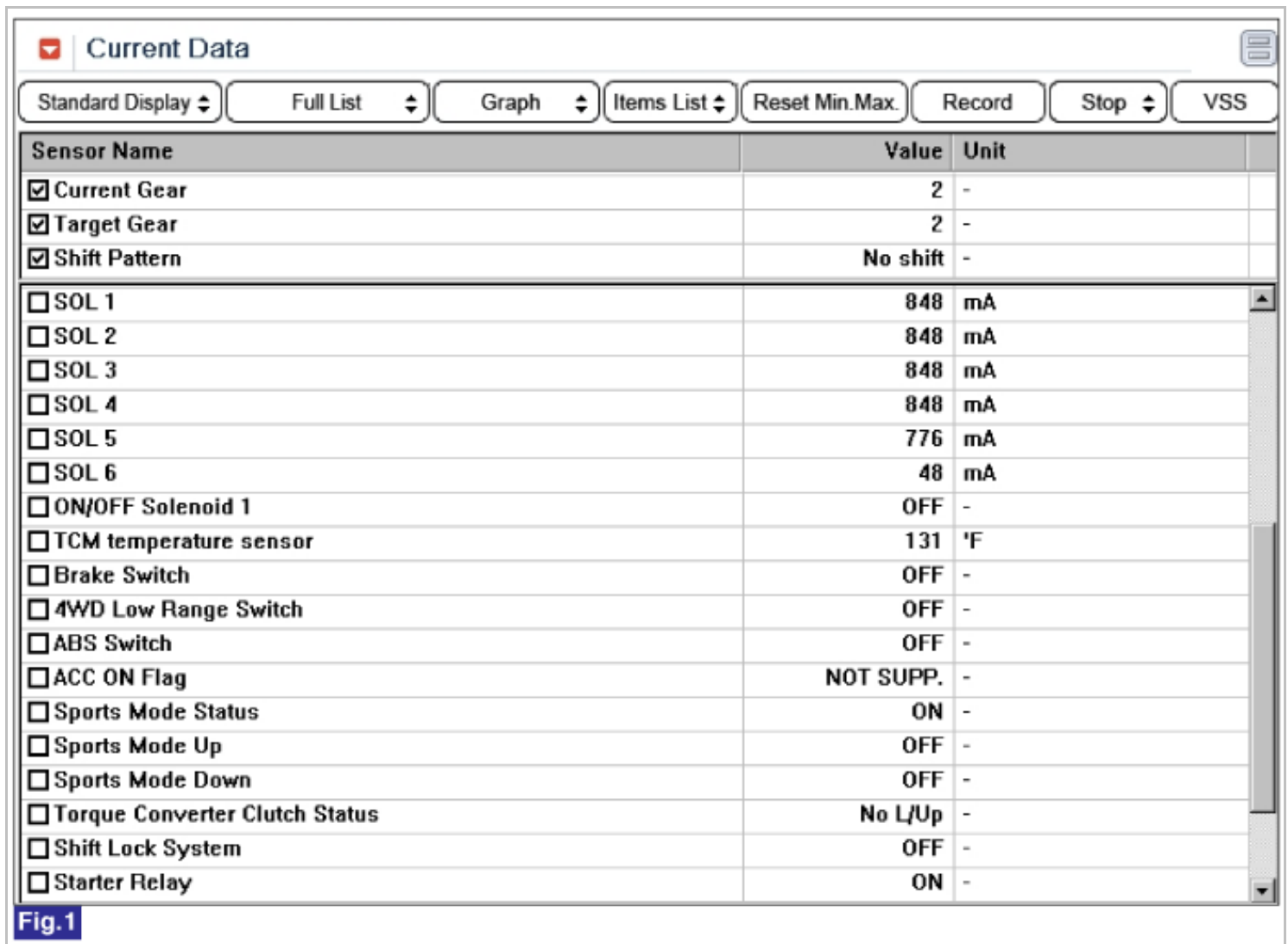
1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Current Gear, Target Gear, solenoid valves" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valves.

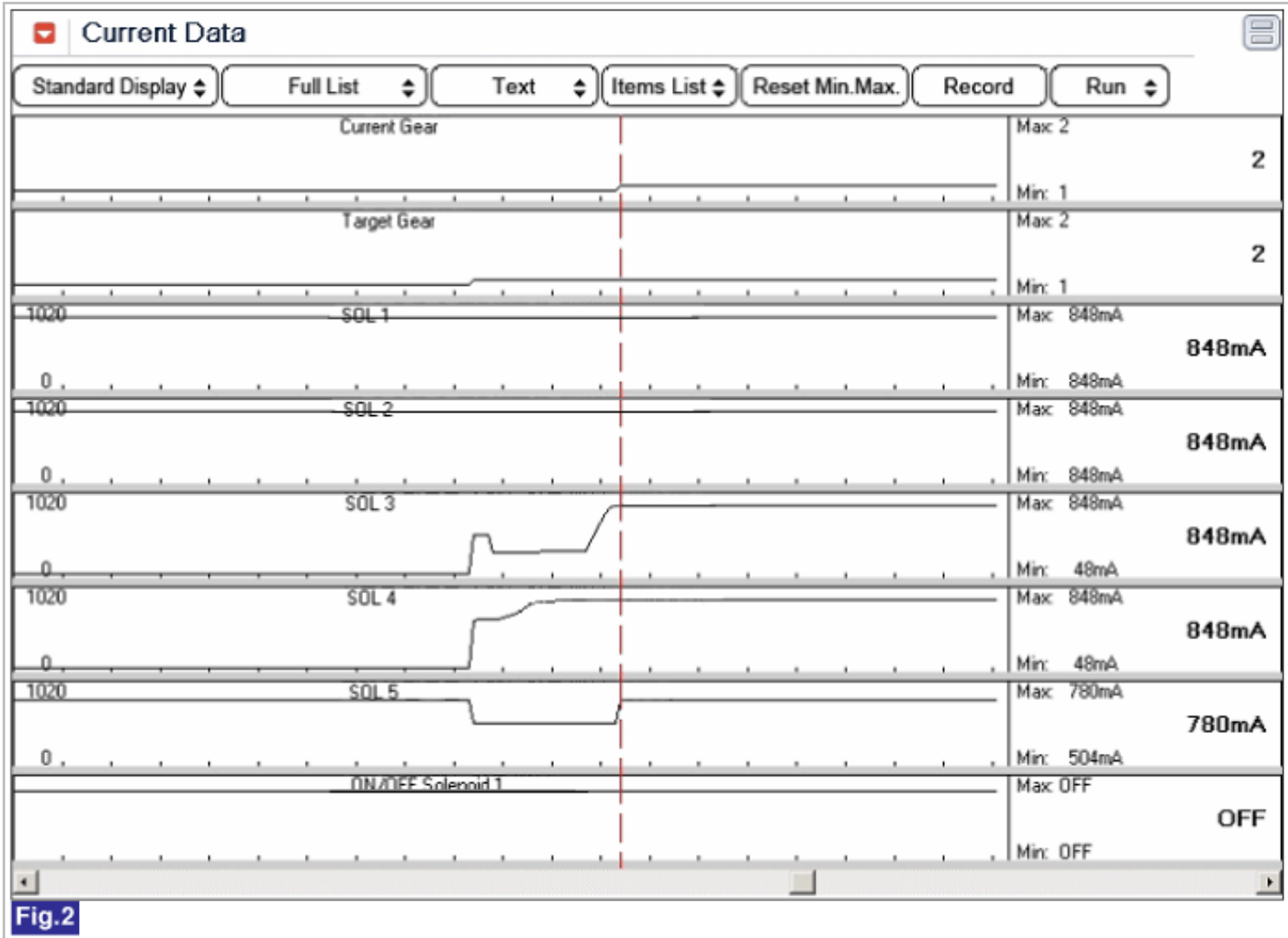
### Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-

D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control





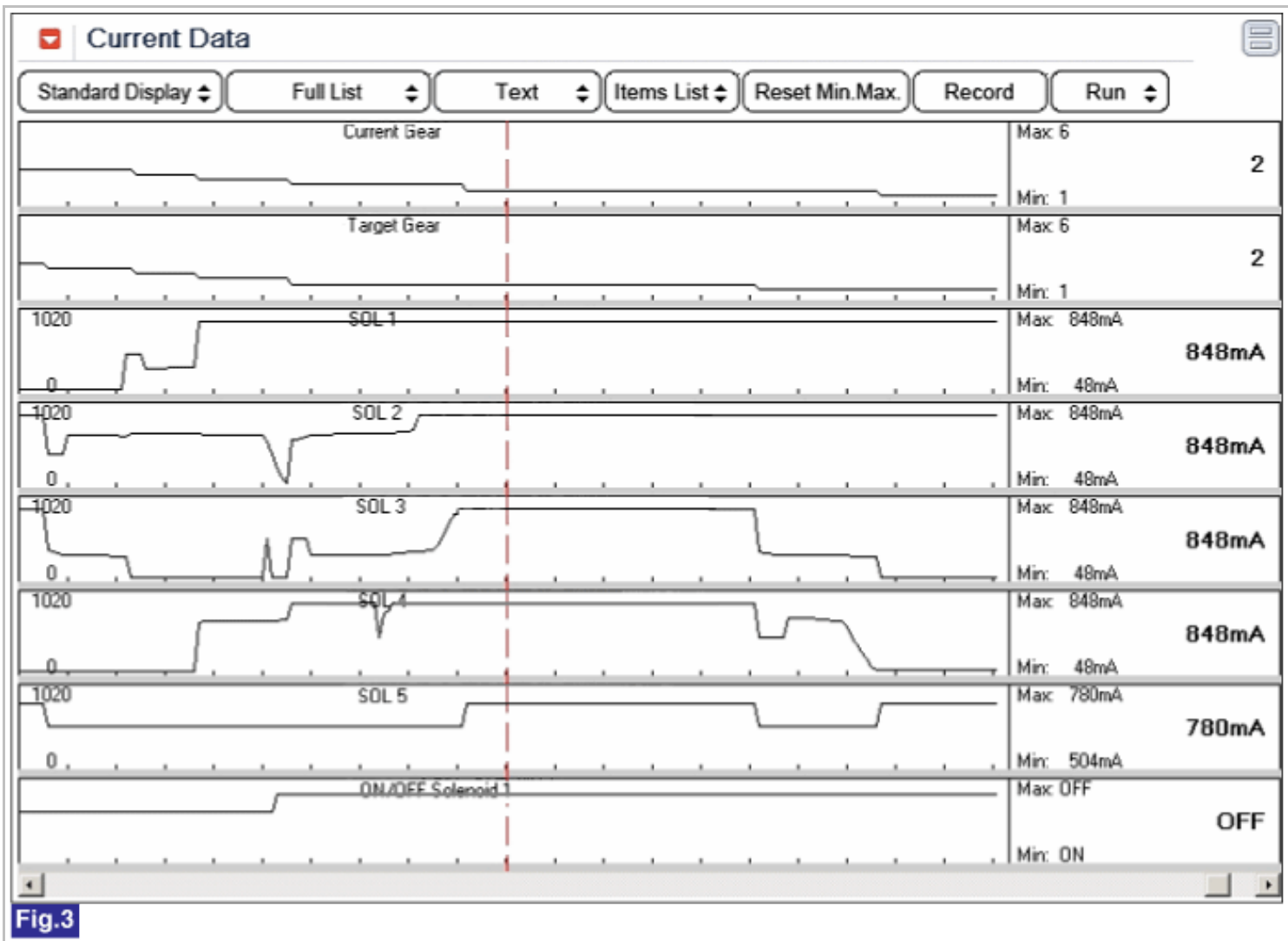


Fig 1) Solenoid valves in 2nd gear

Fig 2) Solenoid valves in 2nd gear-graph

Fig 3) Solenoid operating status - down shift 3rd to 2nd gear

5. Does solenoid valves "1" & "3" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	► Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected,replace Mechatronics (Valve-body + TCM) and then go to
------------	---

	<p>"Verification of Vehicle Repair" procedure.</p> <p>► In case of Automatic Transaxle problem(clutchs, brakes), Check the oil level.</p> <p>If oil level is normal, replace Automatic Transaxle and Go to "Verification Vehicle Repair" procedure.</p>
<b>NO</b>	<p>► Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.</p>

#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

(Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed.

Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear.

RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	► Go to the applicable troubleshooting procedure.
<b>NO</b>	► System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0733 Gear 3 Incorrect Ratio

### General Description

The ratio monitoring controls the nominal gear box ratio to the real gear box ratio. While driving in a gear(reverse, first second, third...) there is a calibrated rationality check between turbine speed and output speed of the corresponding gear.

While up or down shifting from one gear to another there is a calibrated rationality check between turbine speed and

output speed of the corresponding shift. While engaging the gear there is a calibrated rationality check between turbine speed and output speed of the corresponding shift if the actual output speed is higher or equal than a calibrated threshold.

While engaging the gear when the actual output speed is lower than the threshold there is a rationality check on the turbine speed.

DTC Description

TCM set this code if the value of input speed(turbine speed) is not equal to the value of the output speed, when multiplied by the 3rd gear ratio, while the transaxle is engaged in 3rd gear. If this code outputted, Check the Engine system first and then follow this procedure.(MIL ON : 2 driving Cycle)

DTC Detecting Condition

Item		Detecting Condition	Possible Cause
DTC Strategy		<ul style="list-style-type: none"><li>• Gear ratio monitoring</li></ul>	<ul style="list-style-type: none"><li>• Check the Engine system and DTC</li><li>• Mechatronics(E-module + Valvebody) =&gt; Solenoid valve"1"&amp;"2"</li><li>• Replace ATM</li></ul>
Enable Conditions	CASE1	<ul style="list-style-type: none"><li>• 3rd gear shifting with 0.5 second</li><li>• Shifting monitoring status</li><li>• Output speed ≥ 50 rmp</li></ul>	
	CASE2	<ul style="list-style-type: none"><li>• 3rd gear shifting with 0.5 second</li><li>• Output speed ≤ 50 rmp</li></ul>	
Threshold Value	CASE1	<ul style="list-style-type: none"><li>• Actual engaging gear ratio ≥ target gear ratio</li><li>• Actual engaging gear ratio &lt; target gear ratio</li></ul>	
	CASE2	<ul style="list-style-type: none"><li>• Input speed when start to monitoring - actual Input speed &lt; 40 rpm or</li><li>• Input speed when start to monitoring - actual Input speed ≥ 40 rpm</li></ul>	
Diagnostic Time		<ul style="list-style-type: none"><li>• 3times function check</li></ul>	
Fail Safe		<ul style="list-style-type: none"><li>• No learning control</li><li>• Fixed at 5th gear (priority : 3)</li></ul>	

CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.

2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.

3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.

4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

Signal Waveform & Data

Solenoid valve operating status according to gear position

gear							
------	--	--	--	--	--	--	--

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control

Current Data		
Standard Display	Full List	Graph
Items List	Reset Min.Max.	Record
Stop	VSS	
Sensor Name	Value	Unit
<input checked="" type="checkbox"/> Current Gear	3	-
<input checked="" type="checkbox"/> Target Gear	3	-
<input checked="" type="checkbox"/> Shift Pattern	No shift	-
<input type="checkbox"/> SOL 1	848	mA
<input type="checkbox"/> SOL 2	48	mA
<input type="checkbox"/> SOL 3	48	mA
<input type="checkbox"/> SOL 4	848	mA
<input type="checkbox"/> SOL 5	776	mA
<input type="checkbox"/> SOL 6	48	mA
<input type="checkbox"/> ON/OFF Solenoid 1	OFF	-
<input type="checkbox"/> TCM temperature sensor	133	'F
<input type="checkbox"/> Brake Switch	OFF	-
<input type="checkbox"/> 4WD Low Range Switch	OFF	-
<input type="checkbox"/> ABS Switch	OFF	-
<input type="checkbox"/> ACC ON Flag	NOT SUPP.	-
<input type="checkbox"/> Sports Mode Status	ON	-
<input type="checkbox"/> Sports Mode Up	OFF	-
<input type="checkbox"/> Sports Mode Down	OFF	-
<input type="checkbox"/> Torque Converter Clutch Status	No L/Up	-
<input type="checkbox"/> Shift Lock System	OFF	-
<input type="checkbox"/> Starter Relay	ON	-

Fig.1

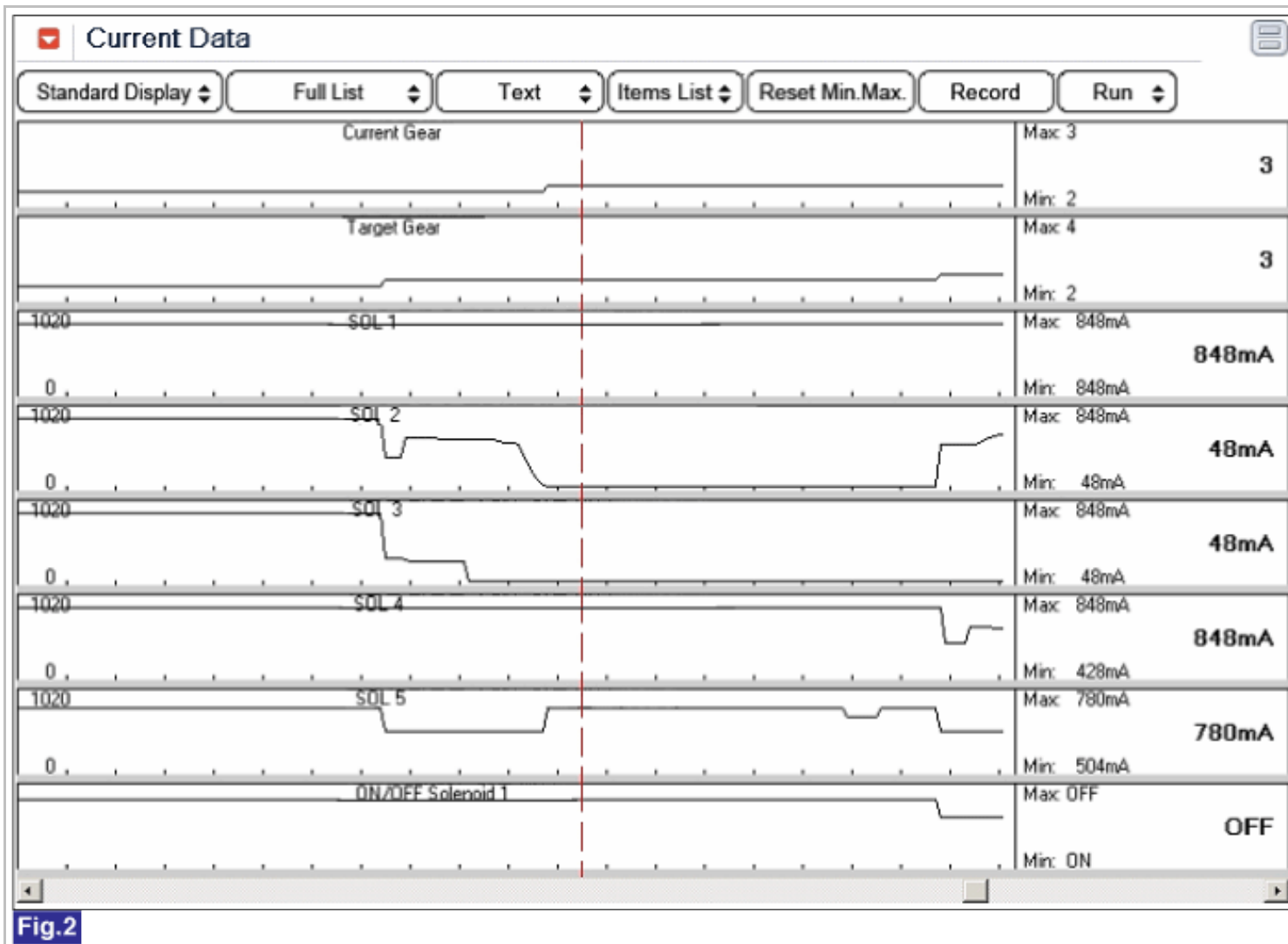


Fig 1) Solenoid valves in 3rd gear

Fig 2) Solenoid valves in 3rd gear-graph

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Current Gear, Target Gear, solenoid valves" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valves.

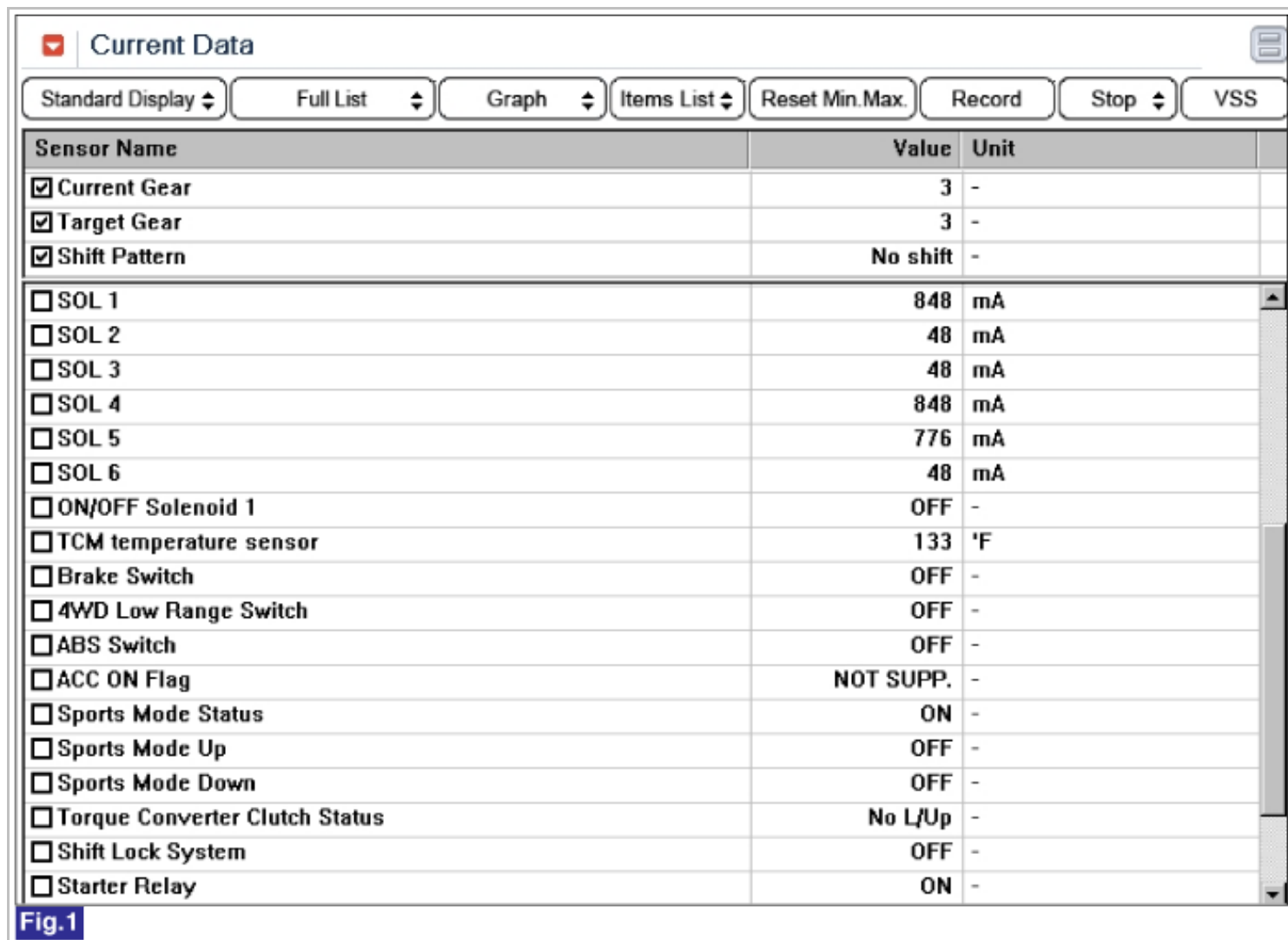
### Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-



D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control



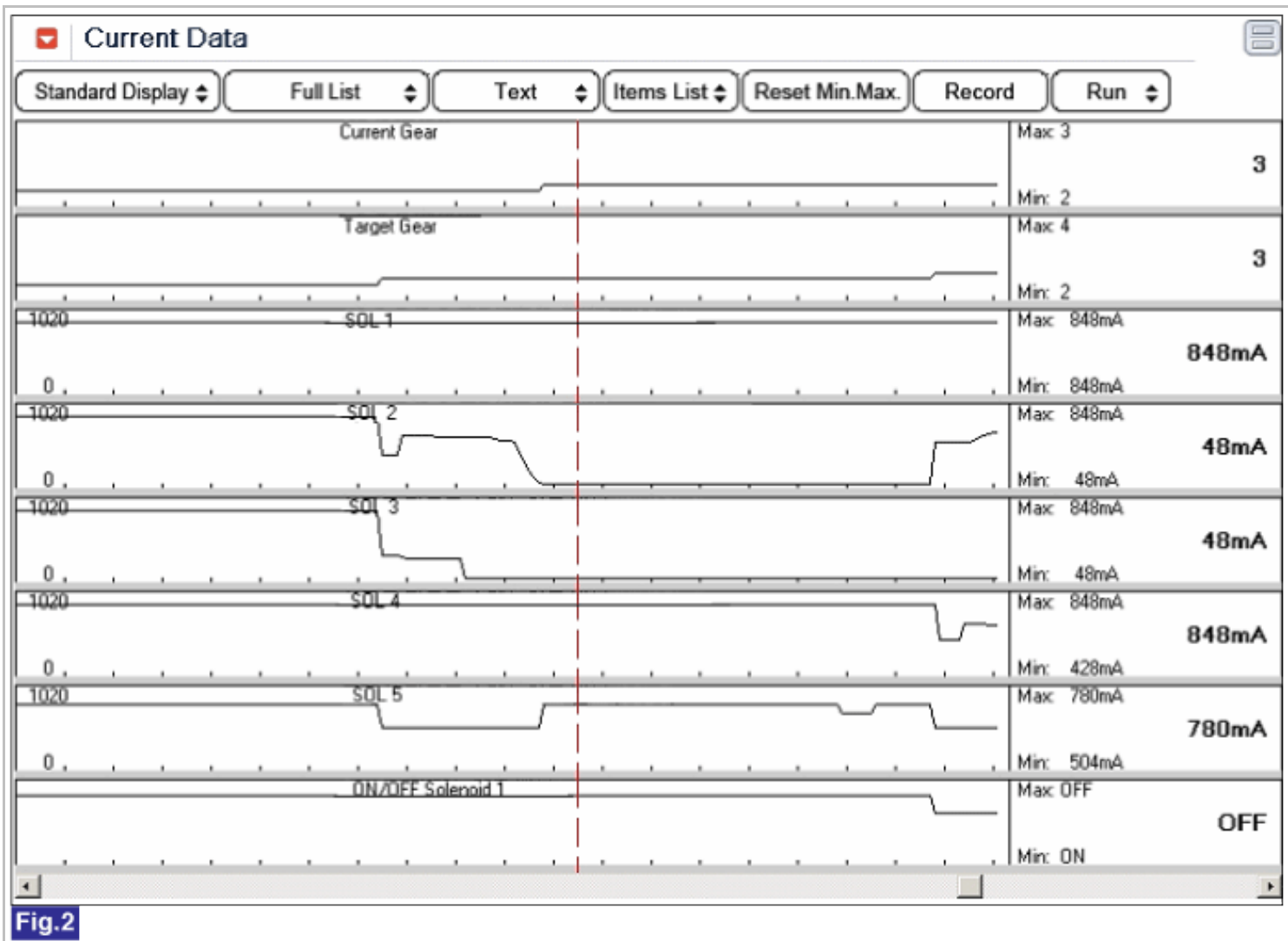


Fig 1) Solenoid valves in 3rd gear

Fig 2) Solenoid valves in 3rd gear-graph

5. Does solenoid valves "1" & "2" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	► Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected,replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
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	<p>► In case of Automatic Transaxle problem(clutchs, brakes), Check the oil level. If oil level is normal, replace Automatic Transaxle and Go to "Verification Vehicle Repair" procedure.</p>
<b>NO</b>	<p>► Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.</p>

#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed.  
Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear.  
RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	► Go to the applicable troubleshooting procedure.
<b>NO</b>	► System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0734 Gear 4 Incorrect Ratio

### General Description

The ratio monitoring controls the nominal gear box ratio to the real gear box ratio. While driving in a gear(reverse, first second, third...) there is a calibrated rationality check between turbine speed and output speed of the corresponding gear.

While up or down shifting from one gear to another there is a calibrated rationality check between turbine speed and output speed of the corresponding shift. While engaging the gear there is a calibrated rationality check between turbine

speed and output speed of the corresponding shift if the actual output speed is higher or equal than a calibrated threshold.

While engaging the gear when the actual output speed is lower than the threshold there is a rationality check on the turbine speed.

## DTC Description

TCM set this code if the value of input speed(turbine speed) is not equal to the value of the output speed, when multiplied by the 4th gear ratio, while the transaxle is engaged in 4th gear. If this code outputted, Check the Engine system first and then follow this procedure.(MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item		Detecting Condition	Possible Cause
DTC Strategy		• Gear ratio monitoring	<ul style="list-style-type: none"> <li>• Check the Engine system and DTC</li> <li>• Mechatronics(E-module + Valvebody) =&gt; Solenoid valve"1"&amp;"4"</li> <li>• Replace ATM</li> </ul>
Enable Conditions	CASE1	<ul style="list-style-type: none"> <li>• 4th gear shifting with 0.5 second</li> <li>• Shifting monitoring status</li> <li>• Output speed <math>\geq</math> 50 rpm</li> </ul>	
	CASE2	<ul style="list-style-type: none"> <li>• 4th gear shifting with 0.5 second</li> <li>• Output speed <math>\leq</math> 50 rpm</li> </ul>	
Threshold Value	CASE1	<ul style="list-style-type: none"> <li>• Actual engaging gear ratio <math>\geq</math> target gear ratio</li> <li>• Actual engaging gear ratio <math>&lt;</math> target gear ratio</li> </ul>	
	CASE2	<ul style="list-style-type: none"> <li>• Input speed when start to monitoring - actual Input speed <math>&lt;</math> 40 rpm or</li> <li>• Input speed when start to monitoring - actual Input speed <math>\geq</math> 40 rpm</li> </ul>	
Diagnostic Time		• 3times function check	
Fail Safe		<ul style="list-style-type: none"> <li>• No learning control</li> <li>• Fixed at 5th gear (priority : 3)</li> </ul>	

### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

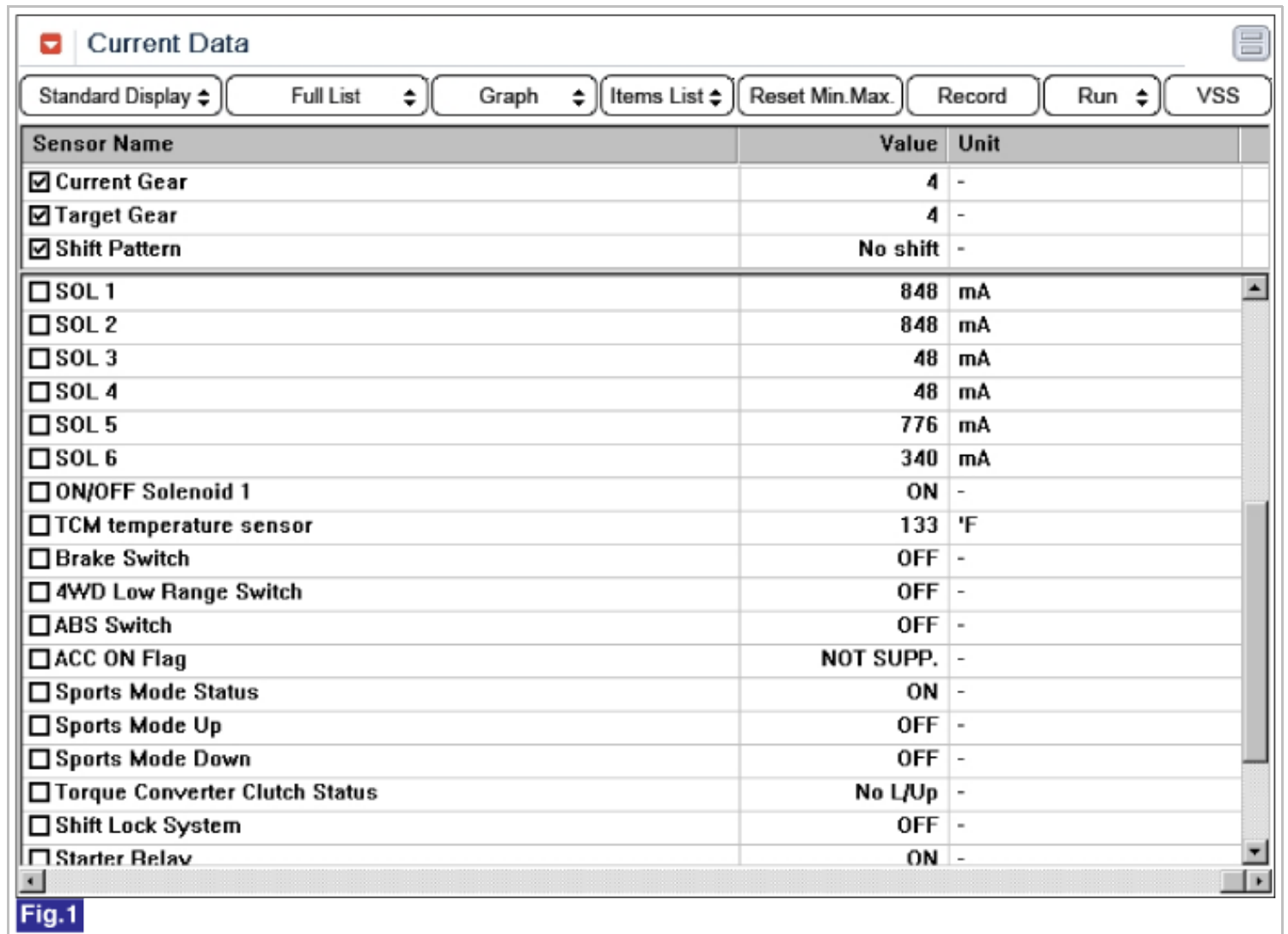
## Signal Waveform & Data

Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
---------------	---------	-------	-------	-------	--------	--------	--------

P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control



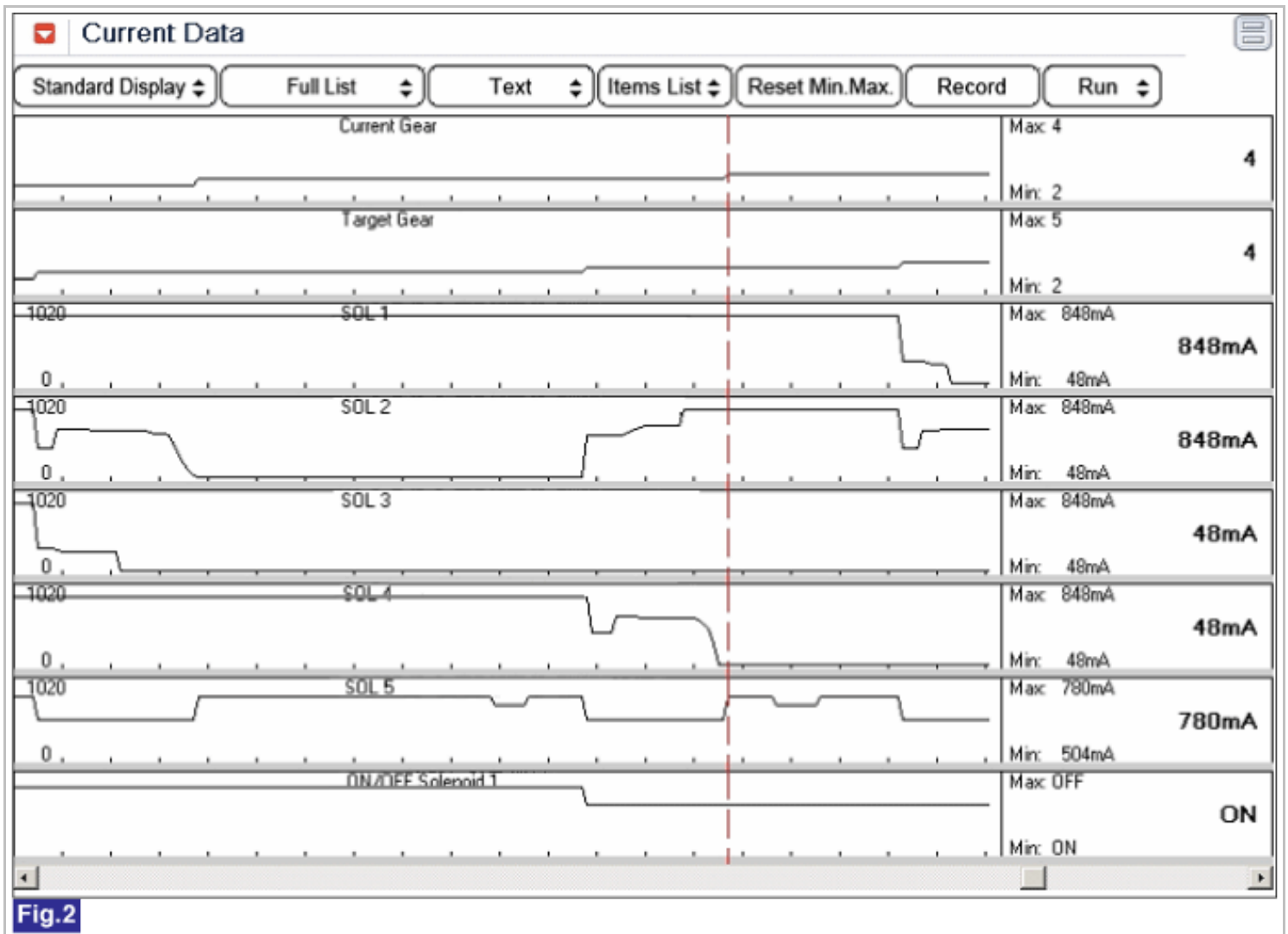


Fig 1) Solenoid valves in 4th gear

Fig 2) Solenoid valves in 4th gear-graph

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Current Gear, Target Gear, solenoid valves" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valves.

### Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-

D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control

**Current Data**

Standard Display ▾

Full List ▾

Graph ▾

Items List ▾

Reset Min.Max.

Record

Run ▾

VSS

Sensor Name	Value	Unit
<input checked="" type="checkbox"/> Current Gear	4	-
<input checked="" type="checkbox"/> Target Gear	4	-
<input checked="" type="checkbox"/> Shift Pattern	No shift	-
<input type="checkbox"/> SOL 1	848	mA
<input type="checkbox"/> SOL 2	848	mA
<input type="checkbox"/> SOL 3	48	mA
<input type="checkbox"/> SOL 4	48	mA
<input type="checkbox"/> SOL 5	776	mA
<input type="checkbox"/> SOL 6	340	mA
<input type="checkbox"/> ON/OFF Solenoid 1	ON	-
<input type="checkbox"/> TCM temperature sensor	133	'F
<input type="checkbox"/> Brake Switch	OFF	-
<input type="checkbox"/> 4WD Low Range Switch	OFF	-
<input type="checkbox"/> ABS Switch	OFF	-
<input type="checkbox"/> ACC ON Flag	NOT SUPP.	-
<input type="checkbox"/> Sports Mode Status	ON	-
<input type="checkbox"/> Sports Mode Up	OFF	-
<input type="checkbox"/> Sports Mode Down	OFF	-
<input type="checkbox"/> Torque Converter Clutch Status	No L/Up	-
<input type="checkbox"/> Shift Lock System	OFF	-
<input type="checkbox"/> Starter Relay	ON	-

**Fig.1**

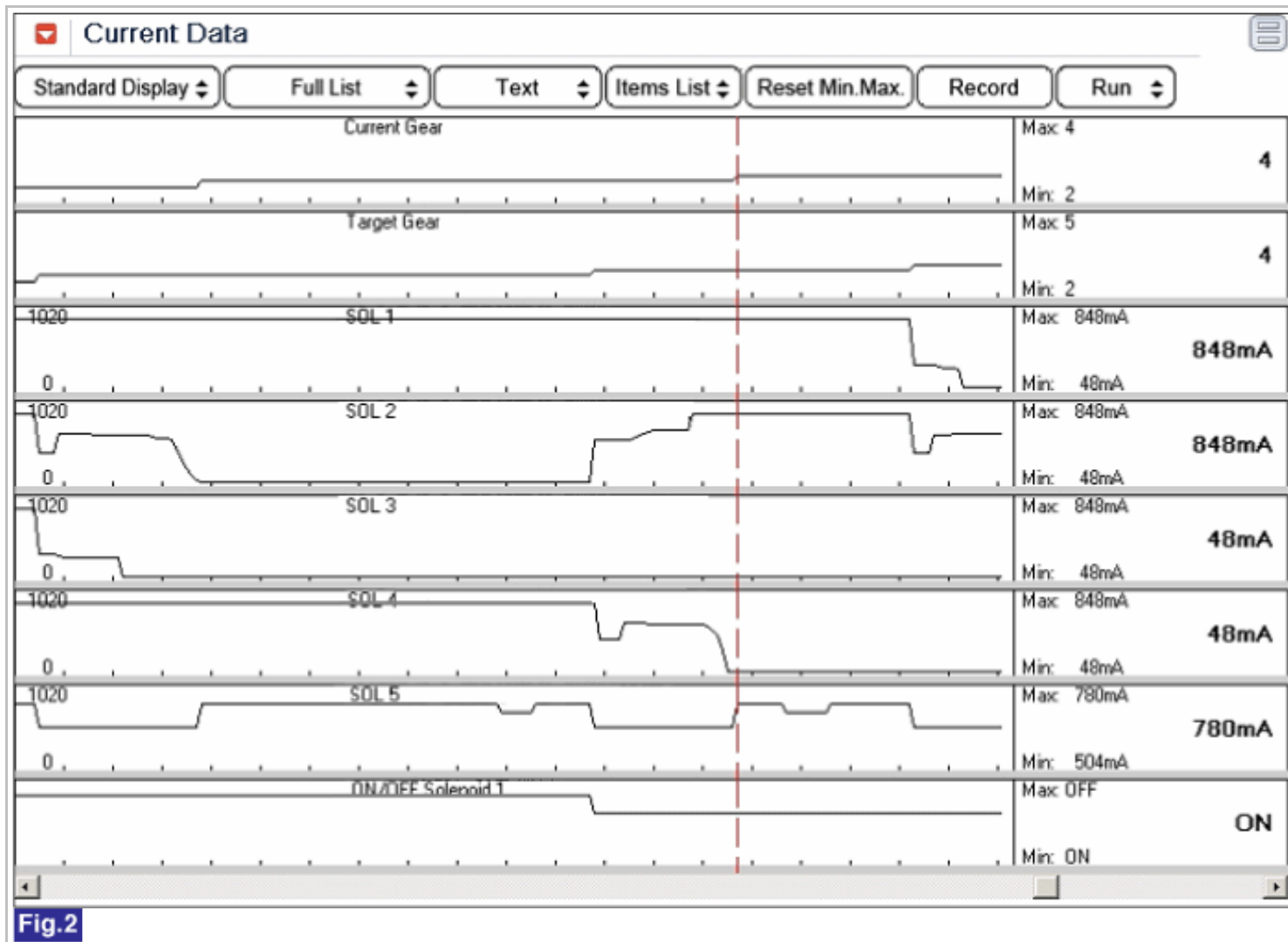


Fig 1) Solenoid valves in 4th gear

Fig 2) Solenoid valves in 4th gear-graph

5. Does solenoid valves "1" & "4" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	► Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected,replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
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	<p>► In case of Automatic Transaxle problem(clutchs, brakes), Check the oil level. If oil level is normal, replace Automatic Transaxle and Go to "Verification Vehicle Repair" procedure.</p>
<b>NO</b>	<p>► Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.</p>

#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed.  
Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear.  
RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	► Go to the applicable troubleshooting procedure.
<b>NO</b>	► System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0735 Gear 5 Incorrect Ratio

### General Description

The ratio monitoring controls the nominal gear box ratio to the real gear box ratio. While driving in a gear(reverse, first second, third...) there is a calibrated rationality check between turbine speed and output speed of the corresponding gear.

While up or down shifting from one gear to another there is a calibrated rationality check between turbine speed and output speed of the corresponding shift. While engaging the gear there is a calibrated rationality check between turbine

speed and output speed of the corresponding shift if the actual output speed is higher or equal than a calibrated threshold.

While engaging the gear when the actual output speed is lower than the threshold there is a rationality check on the turbine speed.

## DTC Description

TCM set this code if the value of input speed(turbine speed) is not equal to the value of the output speed, when multiplied by the 5th gear ratio, while the transaxle is engaged in 5th gear. If this code outputted, Check the Engine system first and then follow this procedure.(MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item		Detecting Condition	Possible Cause
DTC Strategy		<ul style="list-style-type: none"> <li>• Gear ratio monitoring</li> </ul>	<ul style="list-style-type: none"> <li>• Check the Engine system and DTC</li> <li>• Mechatronics(E-module + Valvebody) =&gt; Solenoid valve"2"&amp;"4"</li> <li>• Replace ATM</li> </ul>
Enable Conditions	CASE1	<ul style="list-style-type: none"> <li>• 5th gear shifting with 0.5 second</li> <li>• Shifting monitoring status</li> <li>• Output speed <math>\geq</math> 50 rpm</li> </ul>	
	CASE2	<ul style="list-style-type: none"> <li>• 5th gear shifting with 0.5 second</li> <li>• Output speed <math>\leq</math> 50 rpm</li> </ul>	
Threshold Value	CASE1	<ul style="list-style-type: none"> <li>• Actual engaging gear ratio <math>\geq</math> target gear ratio</li> <li>• Actual engaging gear ratio <math>&lt;</math> target gear ratio</li> </ul>	
	CASE2	<ul style="list-style-type: none"> <li>• Input speed when start to monitoring - actual Input speed <math>&lt;</math> 40 rpm or</li> <li>• Input speed when start to monitoring - actual Input speed <math>\geq</math> 40 rpm</li> </ul>	
Diagnostic Time		<ul style="list-style-type: none"> <li>• 3times function check</li> </ul>	
Fail Safe		<ul style="list-style-type: none"> <li>• No learning control</li> <li>• Fixed at 5th gear (priority : 3)</li> </ul>	

### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

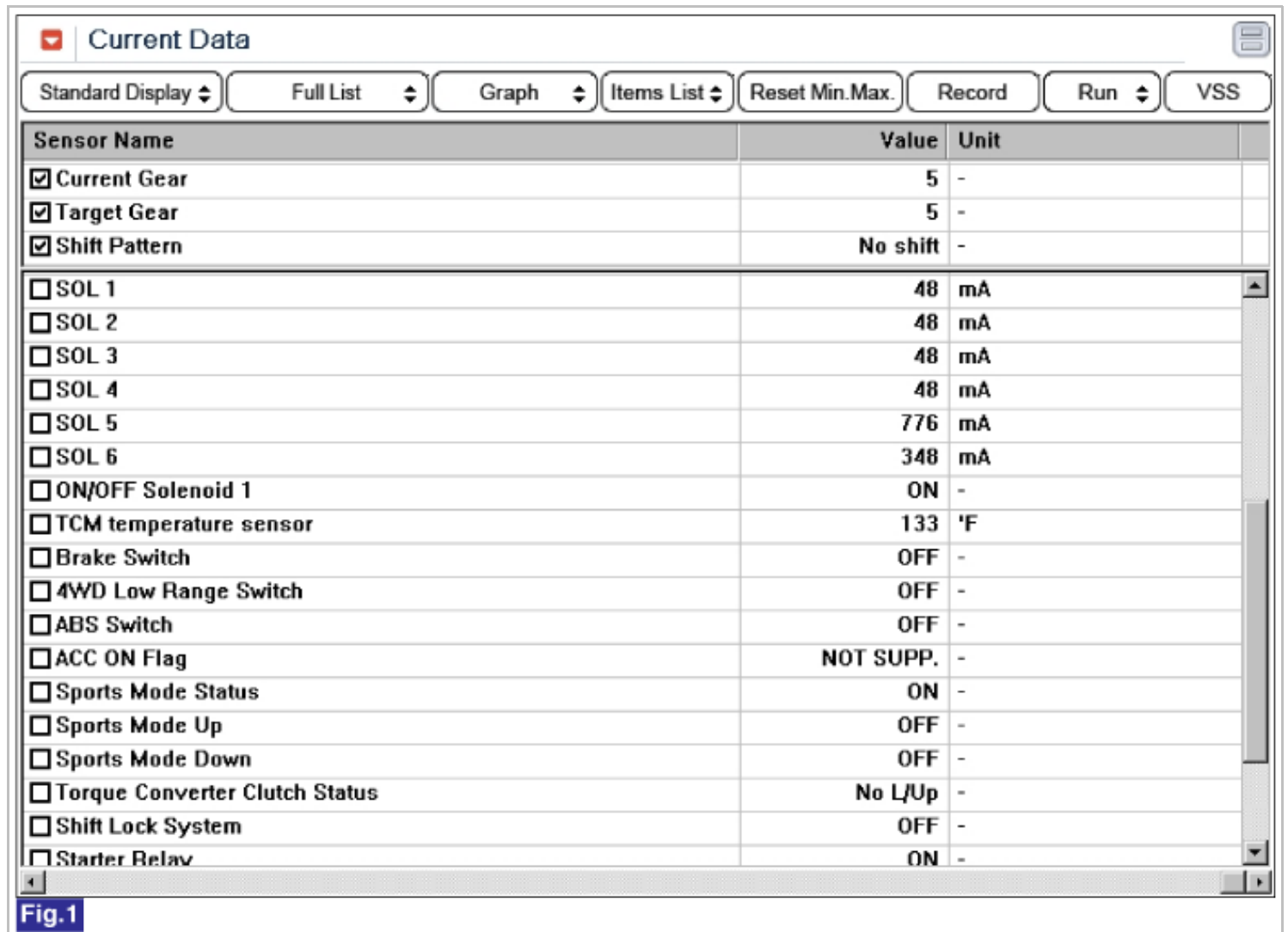
## Signal Waveform & Data

Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
---------------	---------	-------	-------	-------	--------	--------	--------

P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control



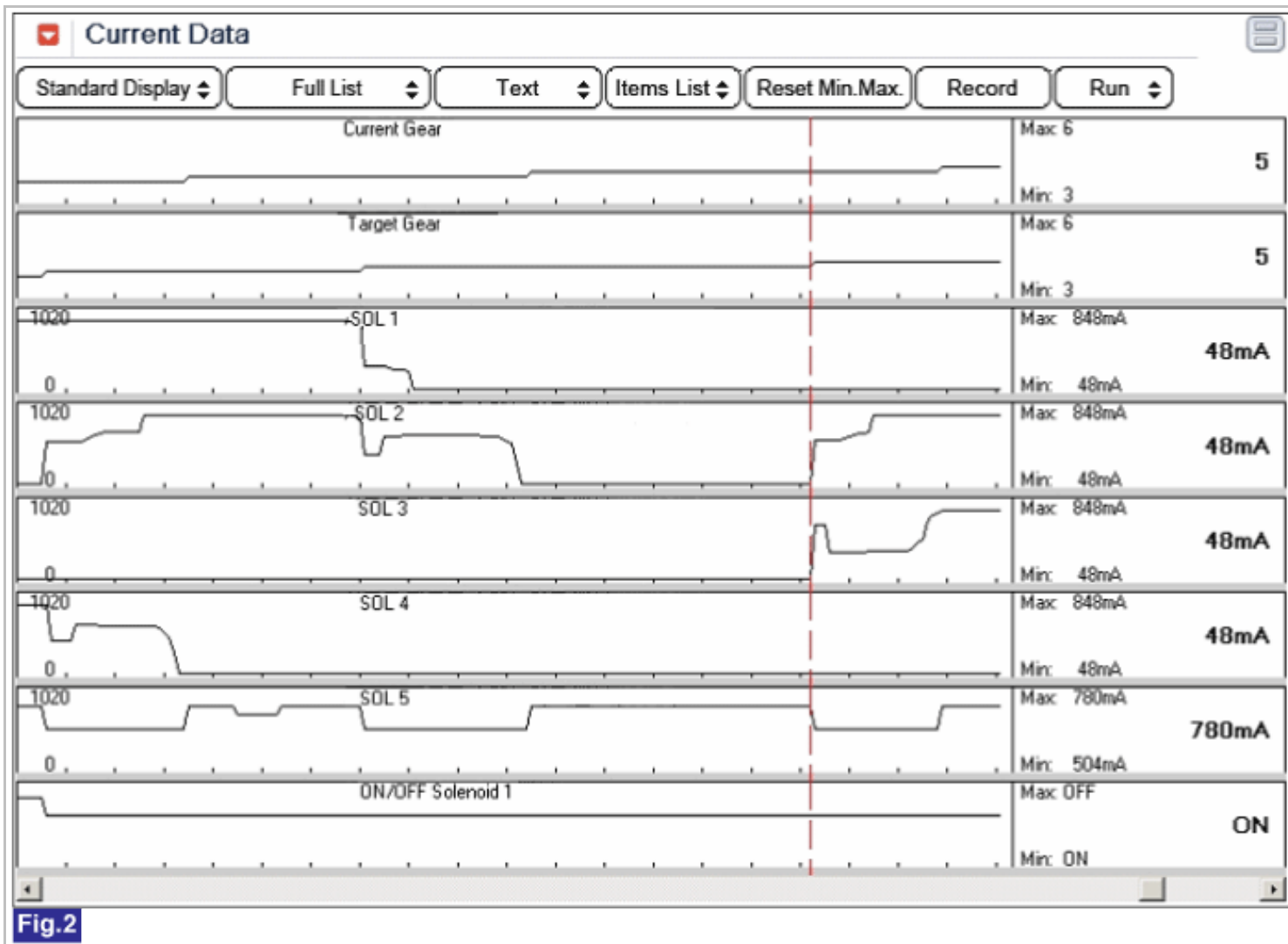


Fig 1) valves in 5th gear

Fig 2) Solenoid valves in 5th gear-graph

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Current Gear, Target Gear, solenoid valves" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valves.

### Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-

D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control

**Current Data**

Standard Display

Full List

Graph

Items List

Reset Min.Max.

Record

Run

VSS

Sensor Name	Value	Unit
<input checked="" type="checkbox"/> Current Gear	5	-
<input checked="" type="checkbox"/> Target Gear	5	-
<input checked="" type="checkbox"/> Shift Pattern	No shift	-
<input type="checkbox"/> SOL 1	48	mA
<input type="checkbox"/> SOL 2	48	mA
<input type="checkbox"/> SOL 3	48	mA
<input type="checkbox"/> SOL 4	48	mA
<input type="checkbox"/> SOL 5	776	mA
<input type="checkbox"/> SOL 6	348	mA
<input type="checkbox"/> ON/OFF Solenoid 1	ON	-
<input type="checkbox"/> TCM temperature sensor	133	'F
<input type="checkbox"/> Brake Switch	OFF	-
<input type="checkbox"/> 4WD Low Range Switch	OFF	-
<input type="checkbox"/> ABS Switch	OFF	-
<input type="checkbox"/> ACC ON Flag	NOT SUPP.	-
<input type="checkbox"/> Sports Mode Status	ON	-
<input type="checkbox"/> Sports Mode Up	OFF	-
<input type="checkbox"/> Sports Mode Down	OFF	-
<input type="checkbox"/> Torque Converter Clutch Status	No L/Up	-
<input type="checkbox"/> Shift Lock System	OFF	-
<input type="checkbox"/> Starter Relay	ON	-

**Fig.1**

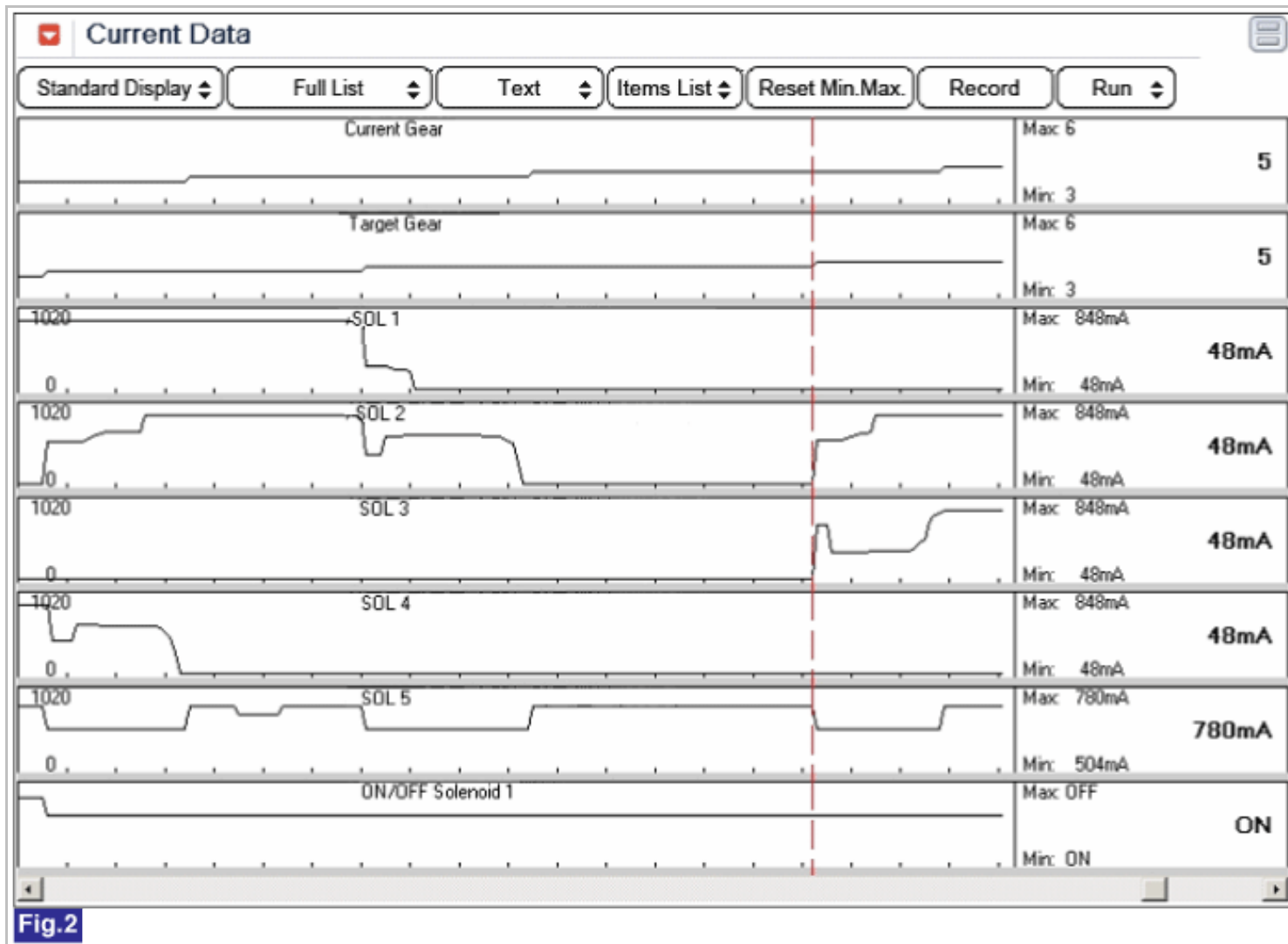


Fig 1) Solenoid valves in 5th gear

Fig 2) Solenoid valves in 5th gear-graph

5. Does solenoid valves "2" & "4" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	► Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
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	<p>► In case of Automatic Transaxle problem(clutchs, brakes), Check the oil level. If oil level is normal, replace Automatic Transaxle and Go to "Verification Vehicle Repair" procedure.</p>
<b>NO</b>	<p>► Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.</p>

#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122°F) and 120°C ( 248°F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear.

RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	► Go to the applicable troubleshooting procedure.
<b>NO</b>	► System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0736 Reverse Incorrect Ratio

### General Description

The ratio monitoring controls the nominal gear box ratio to the real gear box ratio. While driving in a gear(reverse, first second, third...) there is a calibrated rationality check between turbine speed and output speed of the corresponding gear.

While up or down shifting from one gear to another there is a calibrated rationality check between turbine speed and output speed of the corresponding shift. While engaging the gear there is a calibrated rationality check between turbine

speed and output speed of the corresponding shift if the actual output speed is higher or equal than a calibrated threshold.

While engaging the gear when the actual output speed is lower than the threshold there is a rationality check on the turbine speed.

## DTC Description

TCM set this code if the value of input speed(turbine speed) is not equal to the value of the output speed, when multiplied by the Reverse gear ratio, while the transaxle is engaged in Reverse gear. If this code outputted, Check the Engine system first and then follow this procedure.(MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item		Detecting Condition	Possible Cause
DTC Strategy		• Gear ratio monitoring	<ul style="list-style-type: none"> <li>• Check the Engine system and DTC</li> <li>• Mechatronics(E-module + Valvebody) =&gt; Solenoid valve"2"&amp;"4"</li> <li>• Replace ATM</li> </ul>
Enable Conditions	CASE1	<ul style="list-style-type: none"> <li>• 5th gear shifting with 0.5 second</li> <li>• Shifting monitoring status</li> <li>• Output speed <math>\geq</math> 50 rpm</li> </ul>	
	CASE2	<ul style="list-style-type: none"> <li>• 5th gear shifting with 0.5 second</li> <li>• Output speed <math>\leq</math> 50 rpm</li> </ul>	
Threshold Value	CASE1	<ul style="list-style-type: none"> <li>• Actual engaging gear ratio <math>\geq</math> target gear ratio</li> <li>• Actual engaging gear ratio <math>&lt;</math> target gear ratio</li> </ul>	
	CASE2	<ul style="list-style-type: none"> <li>• Input speed when start to monitoring - actual Input speed <math>&lt;</math> 40 rpm or</li> <li>• Input speed when start to monitoring - actual Input speed <math>\geq</math> 40 rpm</li> </ul>	
Diagnostic Time		• 3times function check	
Fail Safe		<ul style="list-style-type: none"> <li>• No learning control</li> <li>• Fixed at 5th gear (priority : 3)</li> </ul>	

### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
---------------	---------	-------	-------	-------	--------	--------	--------



P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control

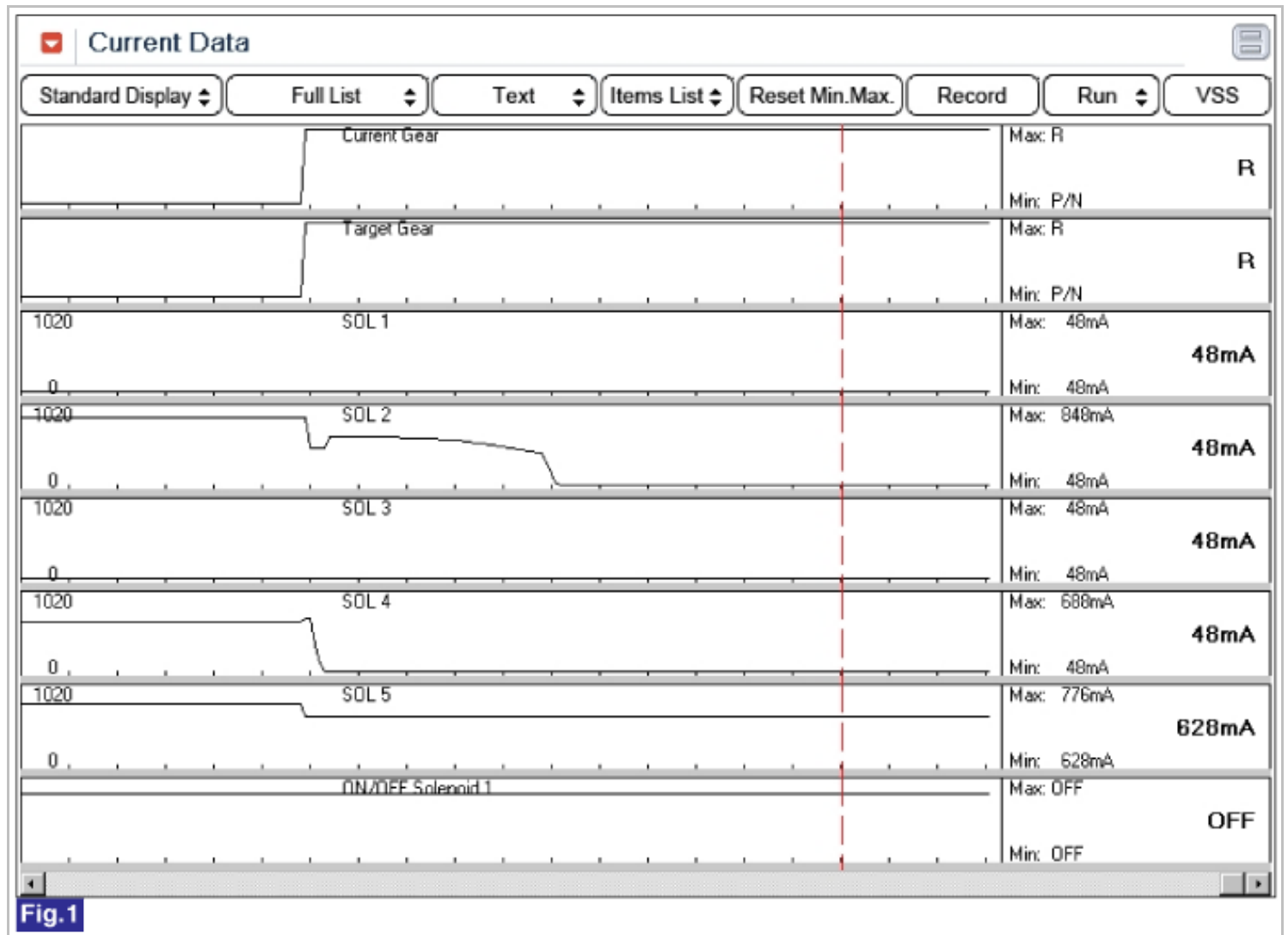


Fig 1) Solenoid valves in Reverse gear-graph

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Current Gear, Target Gear, solenoid valves" parameter on the scan tool.

4. Select "D" range and Drive vehicle, confirm output data of solenoid valves.

**Solenoid valve operating status according to gear position**

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control

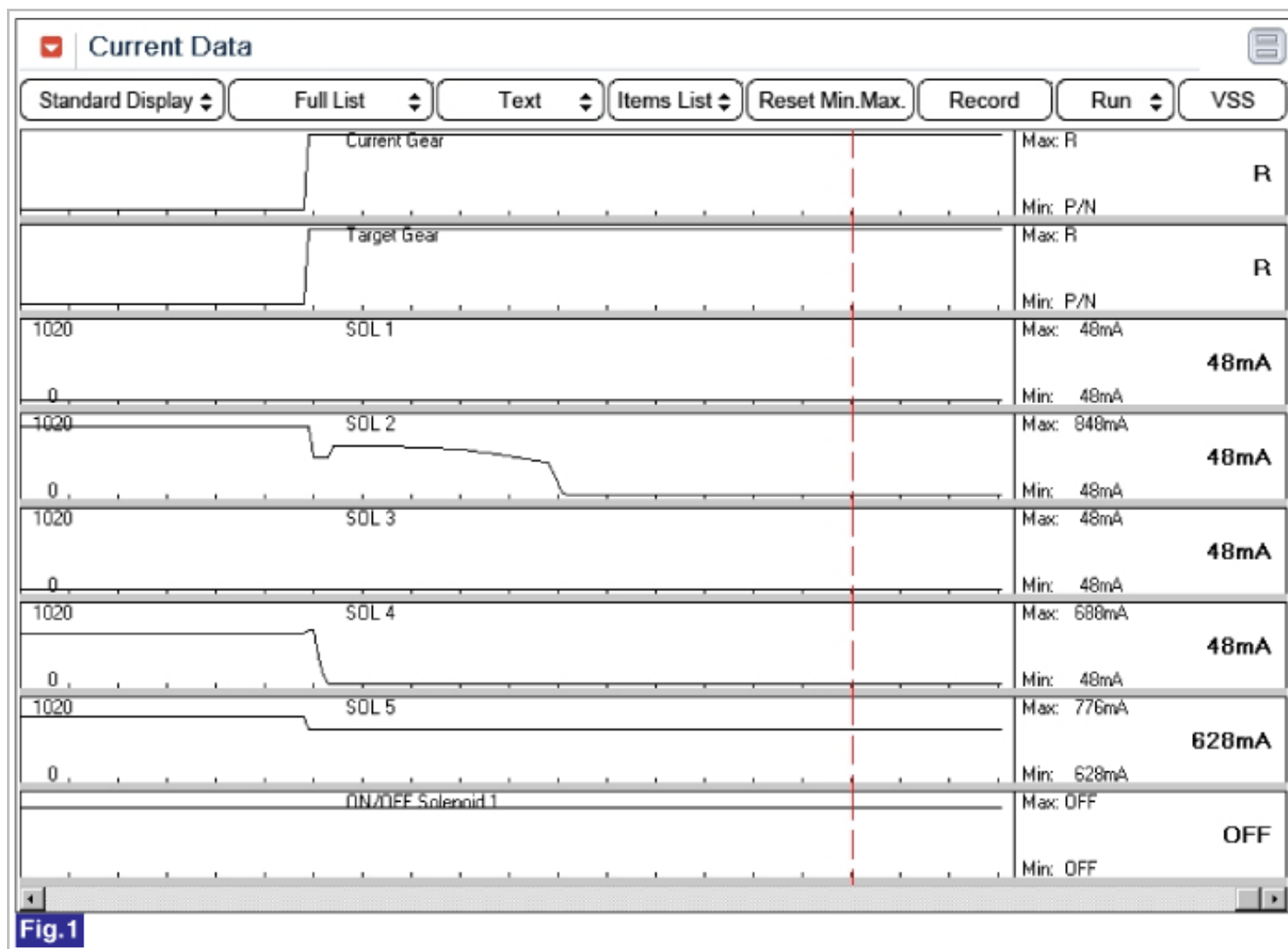


Fig 1) Solenoid valves in Reverse gear-graph

5. Does solenoid valves "2" & "4" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or
------------	--

	was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	▶ Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	<p>▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.</p> <p>▶ In case of Automatic Transaxle problem (clutches, brakes), Check the oil level. If oil level is normal, replace Automatic Transaxle and Go to "Verification Vehicle Repair" procedure.</p>
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

#### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C ( 122 °F) and 120°C ( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C ( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

#### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal normally. Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times. (Not necessary N-D, N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

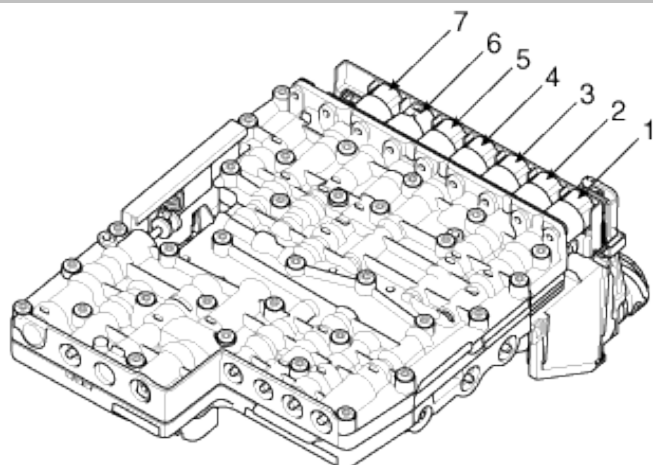
1. Connect scantool and select "Diagnostic Trouble Codes (DTCs)" mode.

2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure.
<b>NO</b>	▶ System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0741 Torque Converter Clutch Circuit Stuck Off(SOL6)

### Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

### General Description

The PCM/TCM controls the locking and unlocking of the Torque Converter Clutch ( or Damper Clutch ), to the input shaft of the transmission, by applying hydraulic pressure. The main purpose of T/C clutch control is to save fuel by decreasing the hydraulic load inside the T/C. The PCM/TCM outputs duty pulses to control the Damper Clutch Control Solenoid Valve( DCCSV ) and hydraulic pressure is applied to the DC according to the DCC duty ratio value. When the duty ratio is high, high pressure is applied and the Damper Clutch is locked.

### DTC Description

TCM set this code If supply voltage to solenoid is lower than available range.(MIL ON : 2 driving Cycle)

### DTC Detecting Condition

Item		Detecting Condition	Possible Cause
DTC Strategy		• Check function	<ul style="list-style-type: none"> <li>• Faulty in Torque convertor</li> <li>• Mechatronics(E-module +</li> </ul>
Enable Conditions	CASE1	• Torque convertor clutch solenoid continuously OFF	
	CASE2	• OFF operation mode	
Threshold Value	CASE1	• Average set-up value - Actual value > 40RPM (Faulty in Torque convertor)	
	CASE2	• Solenoid output voltage - Solenoid supply voltage < 0.5V (Faulty in Torque convertor clutch solenoid)	

	Short to ground in Torque converter clutch solenoid,	Valvebody)
Diagnostic Time	• 20second	
Fail Safe	<ul style="list-style-type: none"> <li>• No Torque converter clutch control(CASE 1)</li> <li>• Short to ground : High speed-Fixed at 5th gear, Low speed - Fixed at 3rd gear</li> <li>• No learning control (priority : 3)</li> </ul>	

#### CAUTION

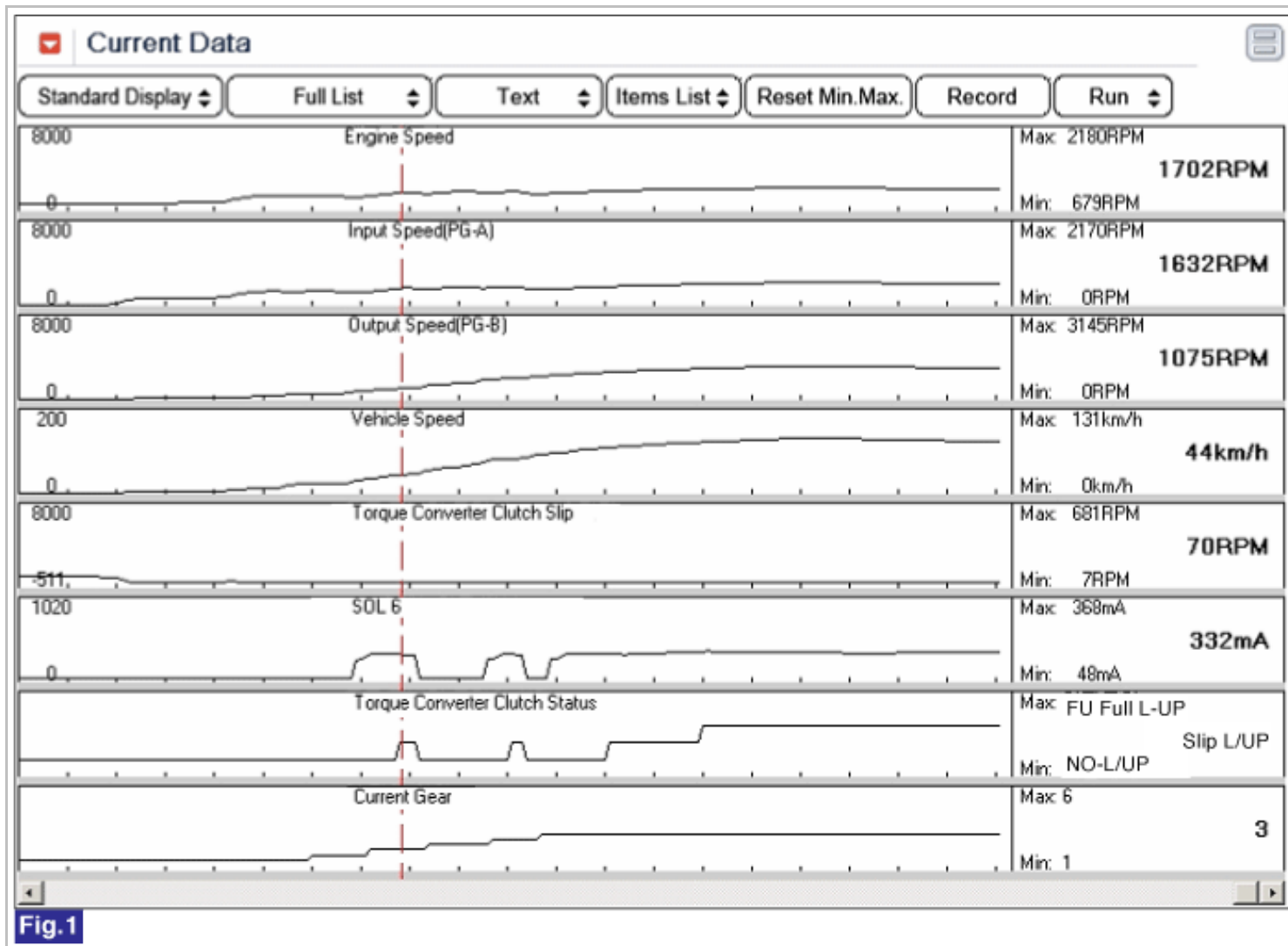
1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

### Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control



# Current Data



Standard Display

Full List

Text

Items List

Reset Min.Max.

Record

Run

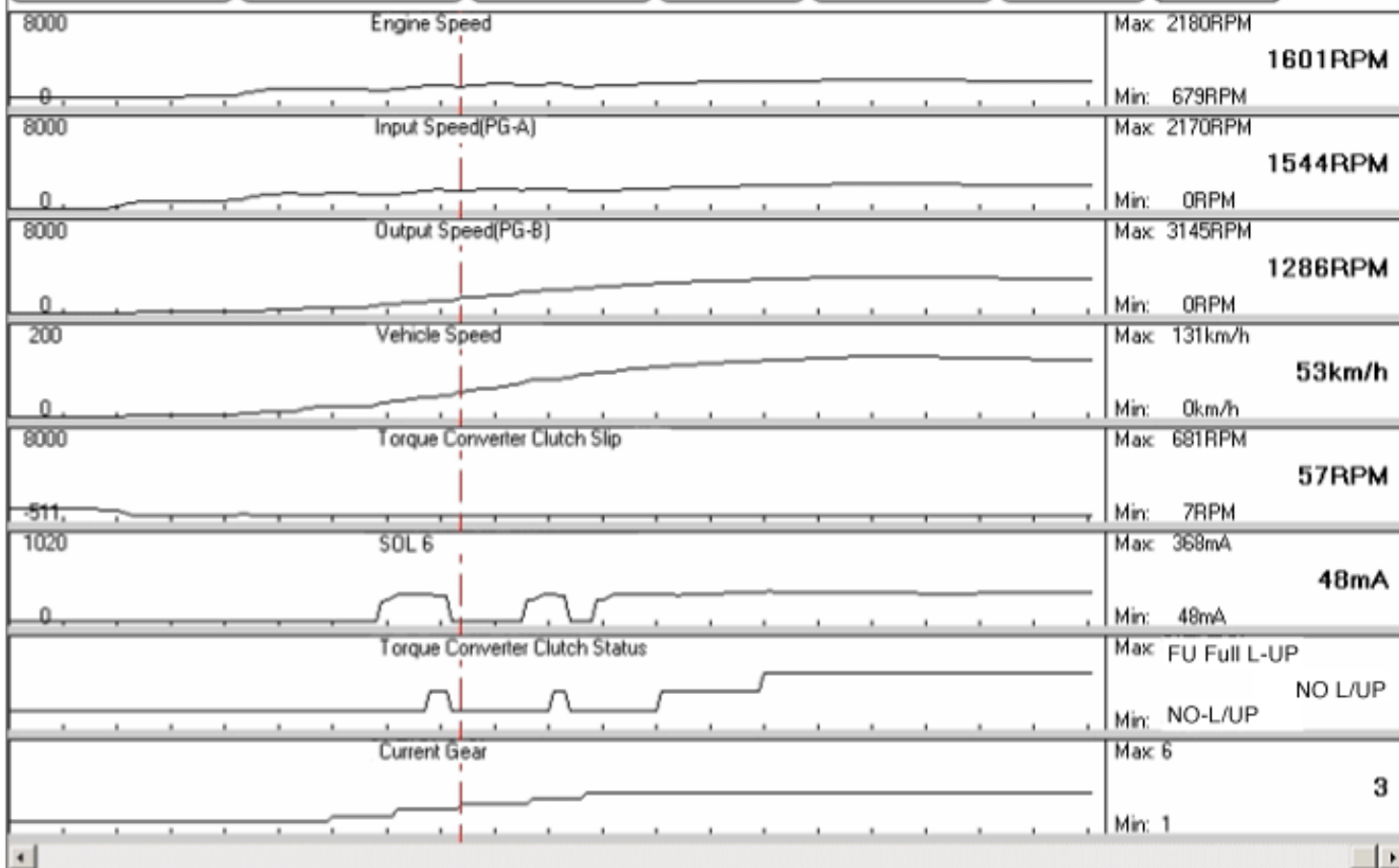
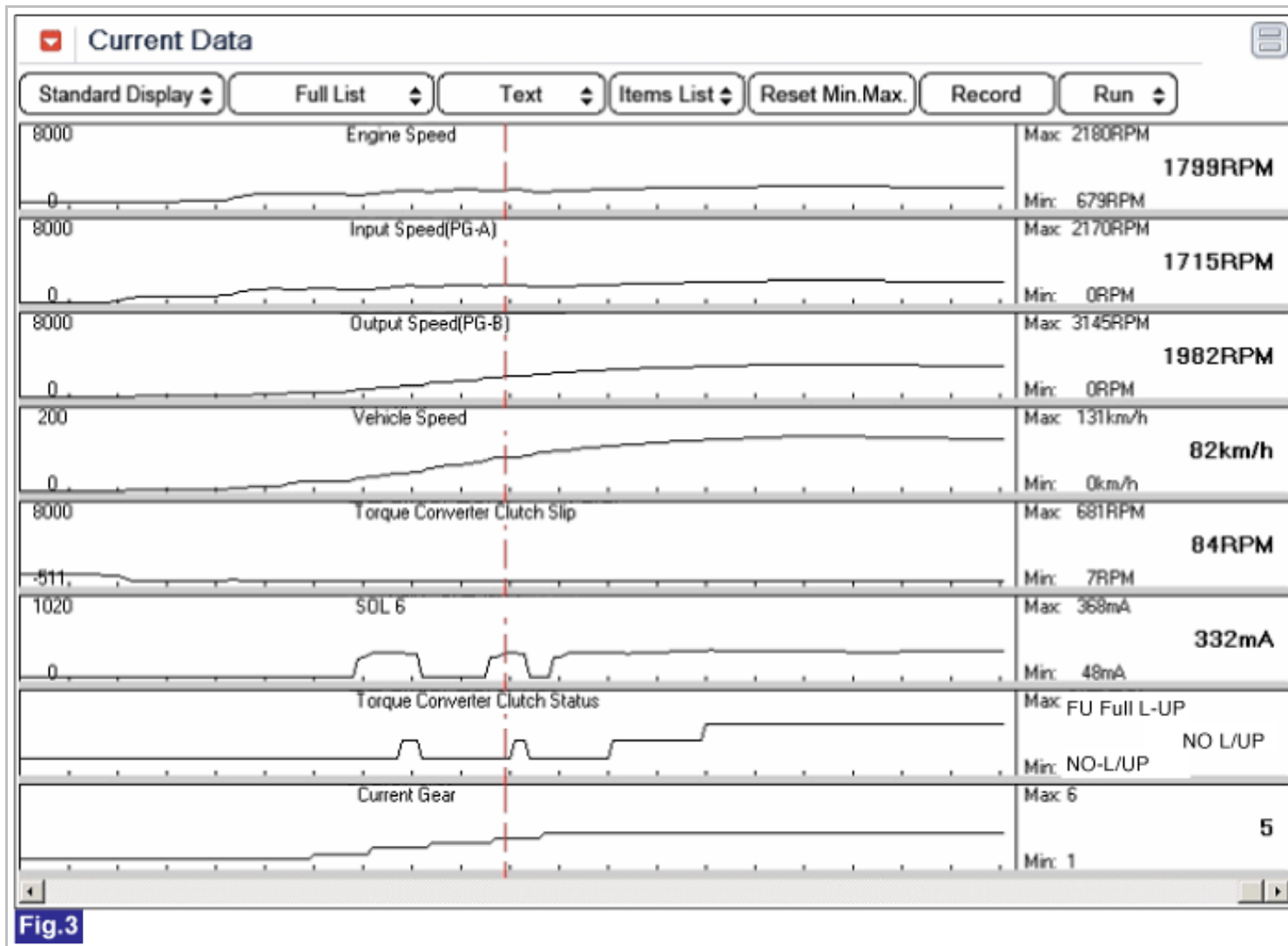


Fig.2





# Current Data



Standard Display

Full List

Text

Items List

Reset Min.Max.

Record

Run

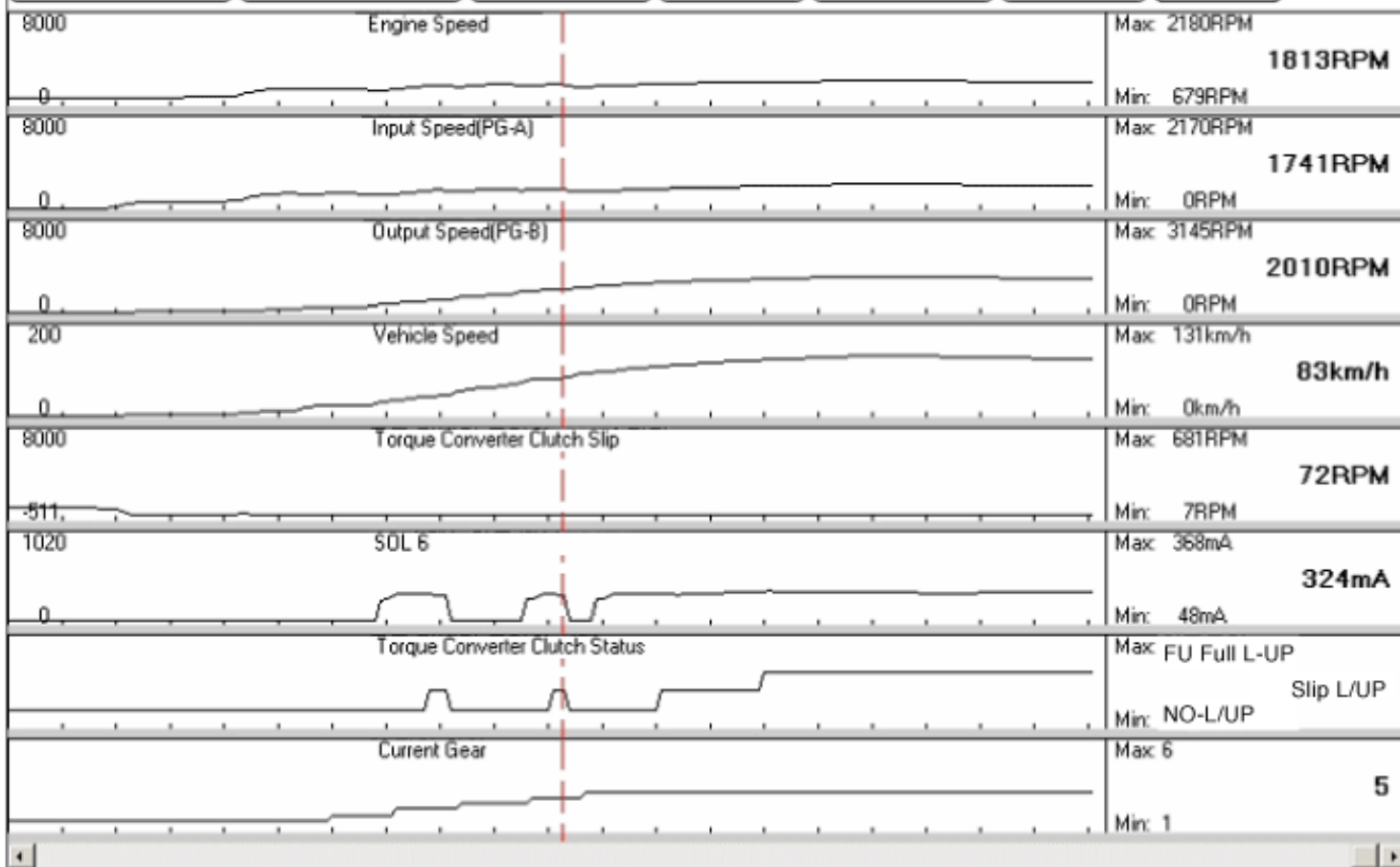


Fig.4

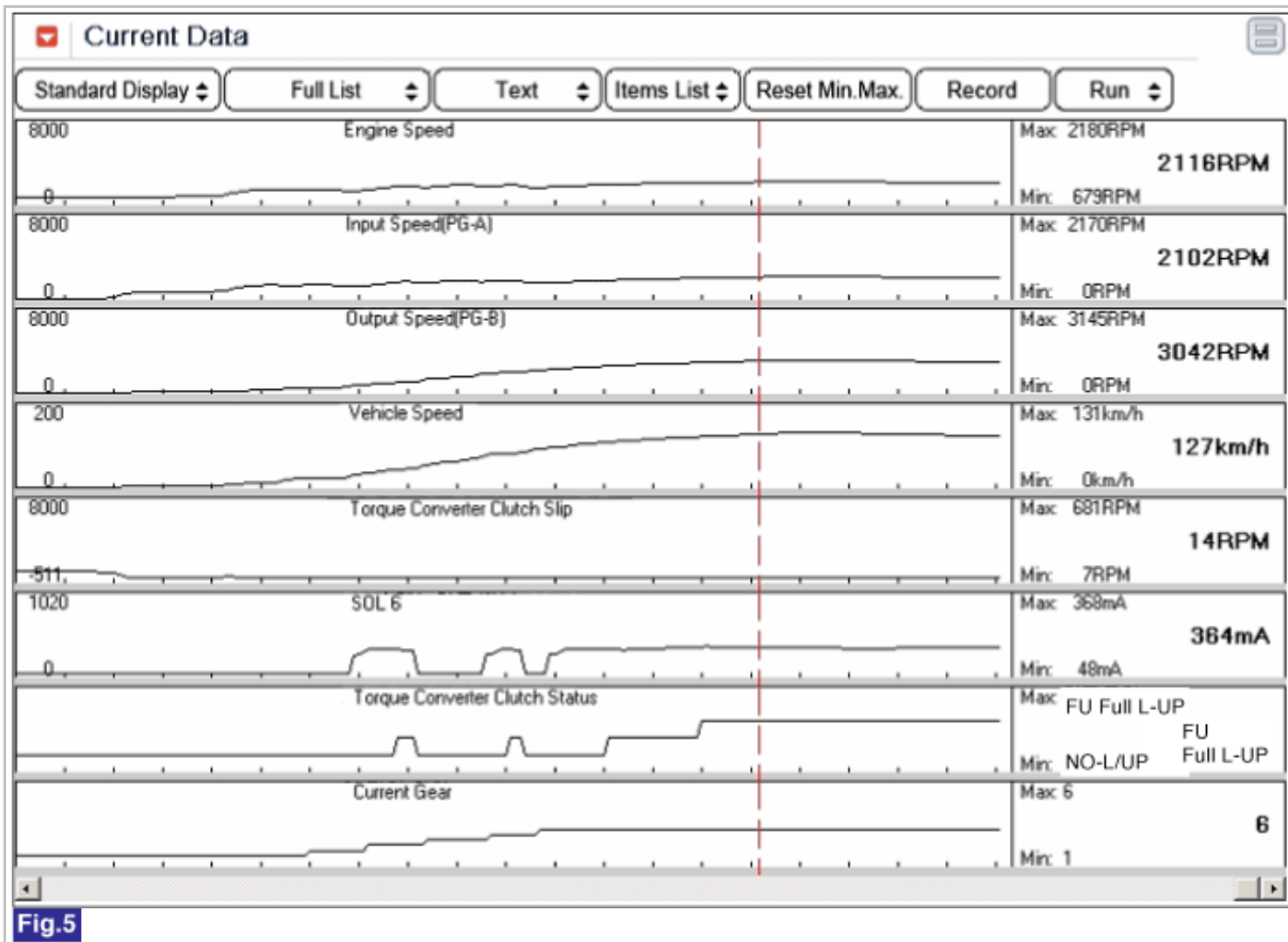


Fig 1) Lock-up status of Torque converter clutch in 3rd gear.

Fig 2) Release the Lock-up at 3rd to 4th gear shifting

Fig 3) Release the Lock-up status in 5th gear

Fig 4) Lock-up status in 5th gear

Fig 5) Lock-up status in 6th gear

## Monitor Scantool Data

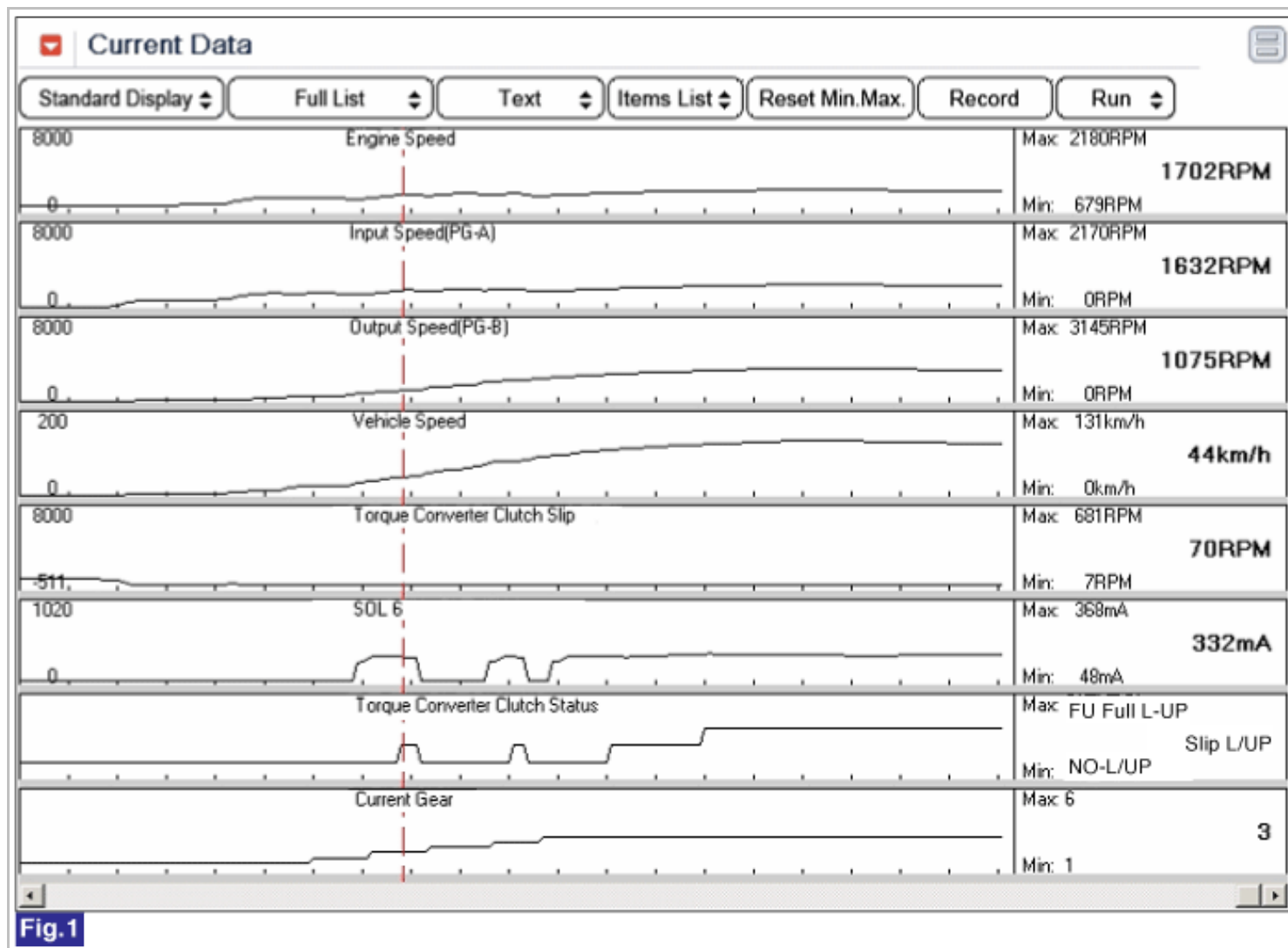
1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Current Gear, Target Gear, solenoid valves" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valves.

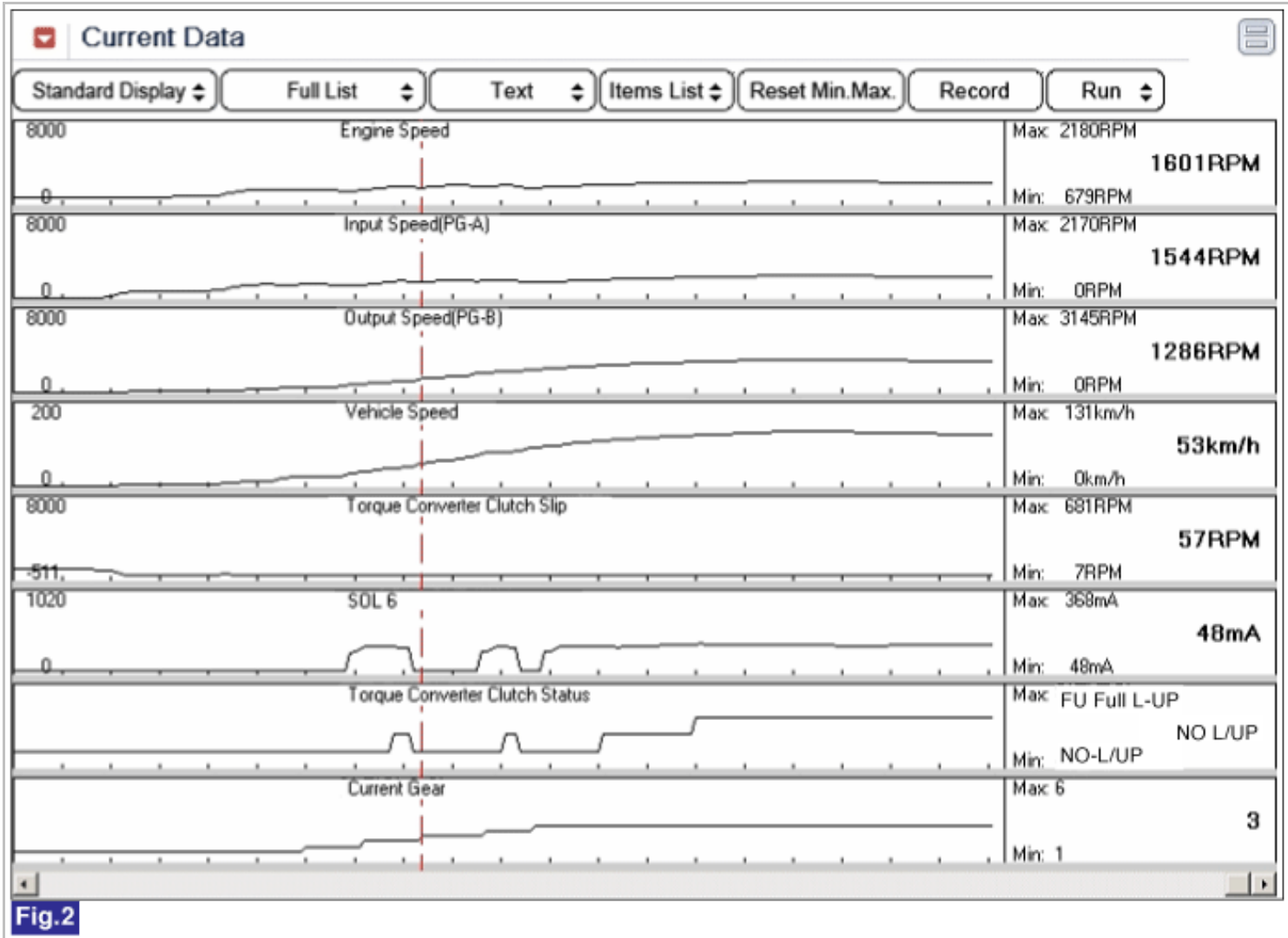
### Solenoid valve operating status according to gear position

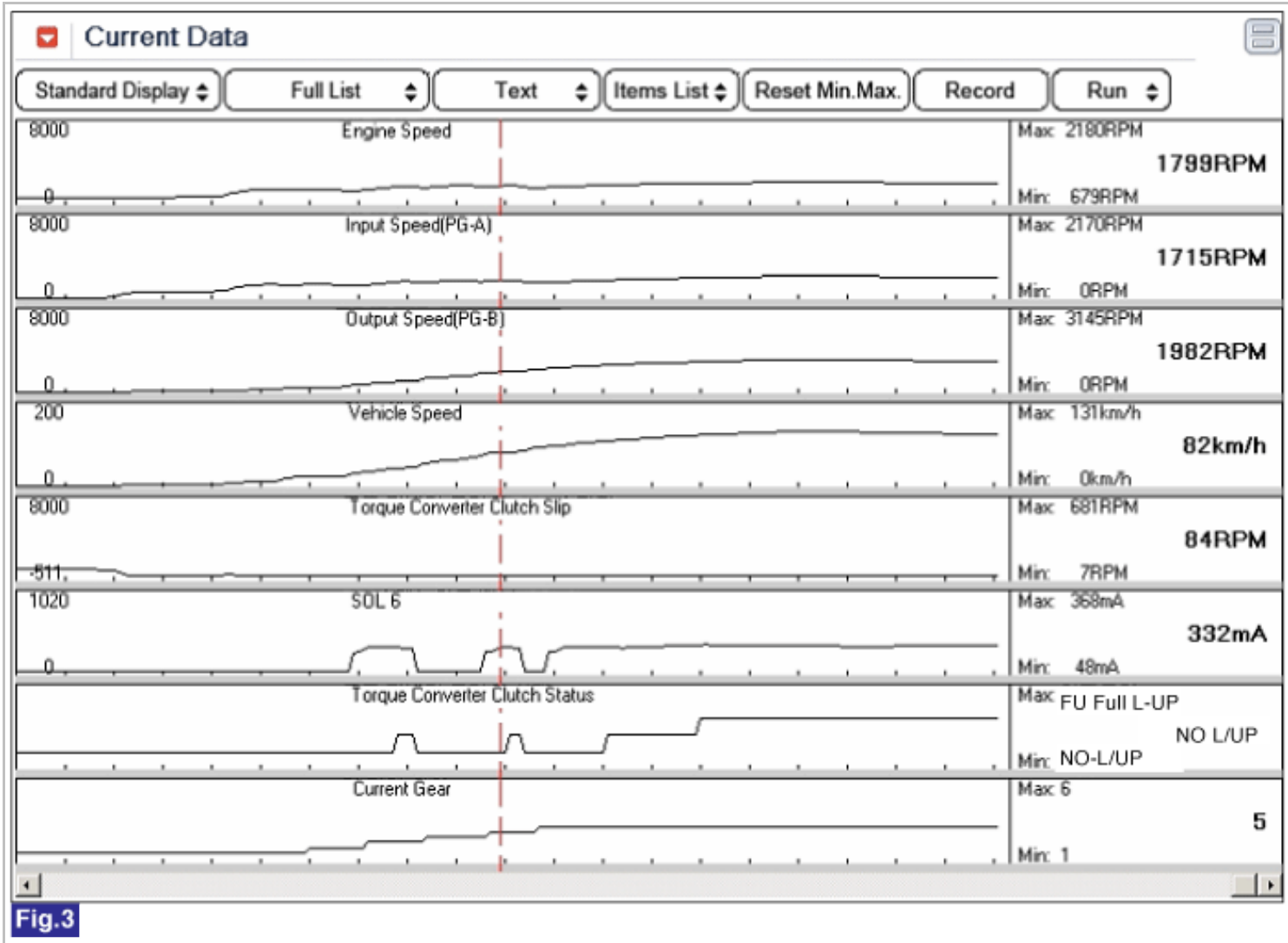
gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-

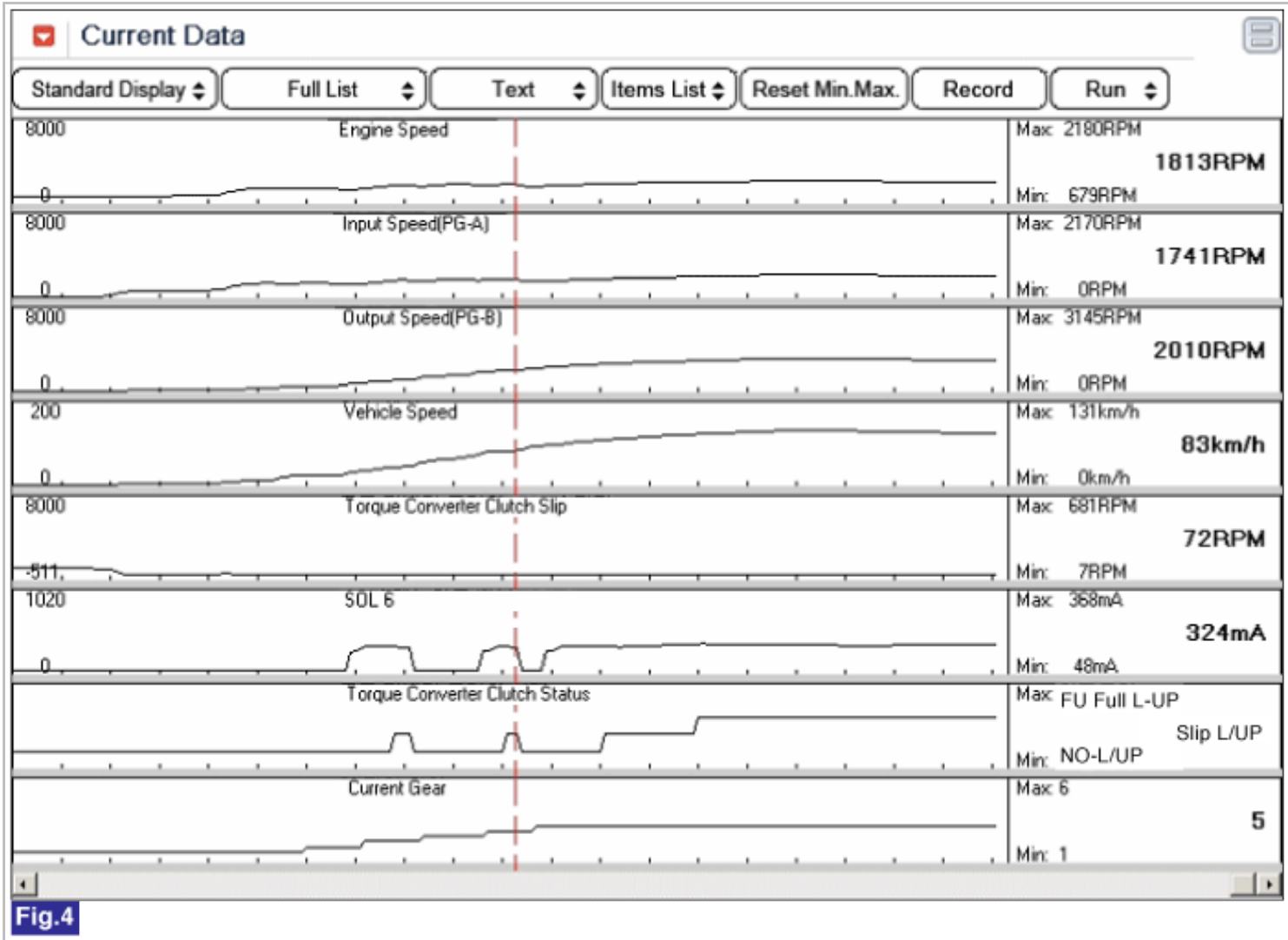
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control









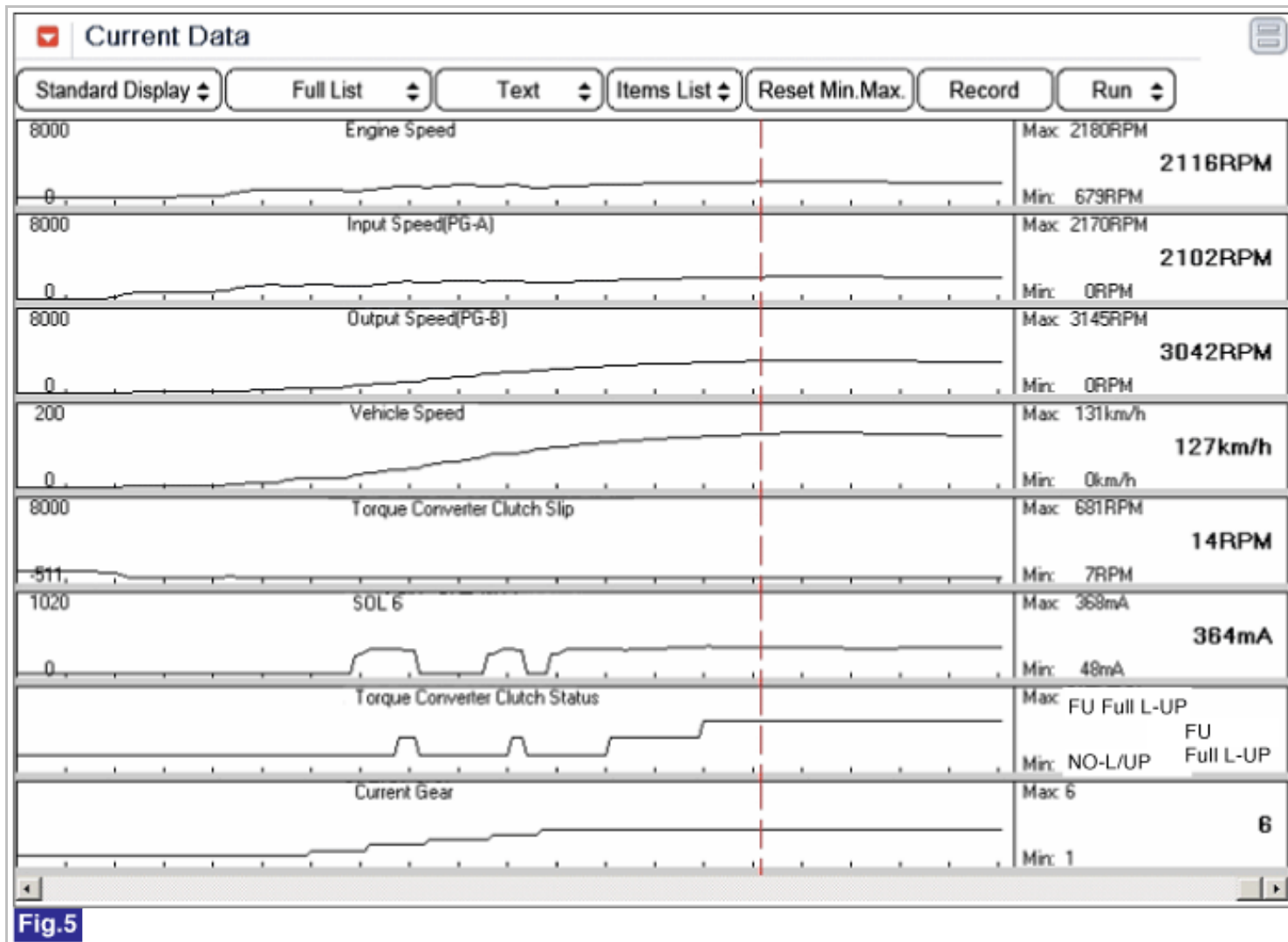


Fig 1) Lock-up status of Torque convertor clutch in 3rd gear.

Fig 2) Release the Lock-up at 3rd to 4th gear shifting

Fig 3) Release the Lock-up status in 5th gear

Fig 4) Lock-up status in 5th gear

Fig 5) Lock-up status in 6th gear

5. Does "TCC solenoid valve(SOL 6)" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	<p>► Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected,replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.</p> <p>► Good condition for ATF(level, color, smell) : Substitute with a known-good Torque Convertor and check for proper operation. If the problem is corrected,replace Torque Convertor and then go to "Verification of Vehicle Repair" procedure.</p> <p>Good condition for ATF(level, color, smell) : Substitute with a known-good Automatic Transmission and check for proper operation. If the problem is corrected,replace Automatic Transmission and then go to "Verification of Vehicle Repair" procedure.</p>
<b>NO</b>	<p>► Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.</p>

#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed.

Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear.

RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

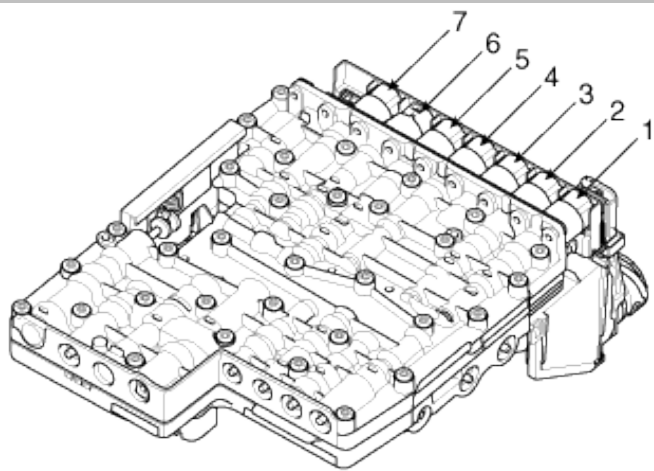
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	► Go to the applicable troubleshooting procedure.
<b>NO</b>	► System performing to specification at this time.

**Automatic Transmission System > Automatic Transmission System > P0743 Torque Converter Clutch Circuit - Short to battery (SOL6)**



## Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

## General Description

The PCM/TCM controls the locking and unlocking of the Torque Converter Clutch ( or Damper Clutch ), to the input shaft of the transmission, by applying hydraulic pressure. The main purpose of T/C clutch control is to save fuel by decreasing the hydraulic load inside the T/C. The PCM/TCM outputs duty pulses to control the Damper Clutch Control Solenoid Valve( DCCSV ) and hydraulic pressure is applied to the DC according to the DCC duty ratio value. When the duty ratio is high, high pressure is applied and the Damper Clutch is locked.

## DTC Description

TCM set this code If detected short to battery for Torque convertor clutch solenoid.(MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Short to battery	• Mechatronics(E-module + Valvebody)
Enable Conditions	• Supply voltage > 8,7V	
Threshold Value	• Short to battery	
Diagnostic Time	• 0.05second	
Fail Safe	• No Torque convertor clutch control • No learning control (priority : 3)	

### CAUTION

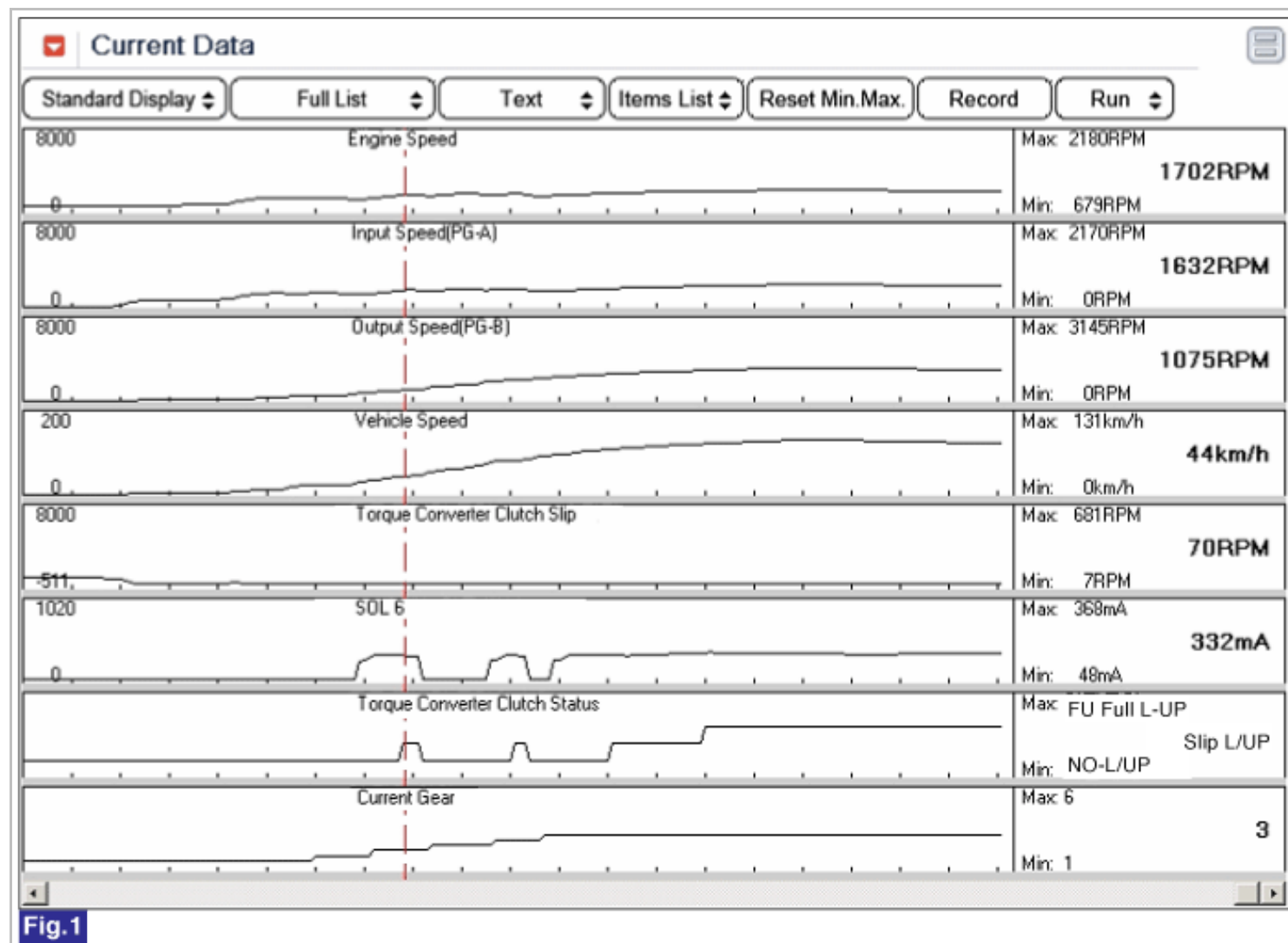
1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

### Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control



# Current Data



Standard Display

Full List

Text

Items List

Reset Min.Max.

Record

Run

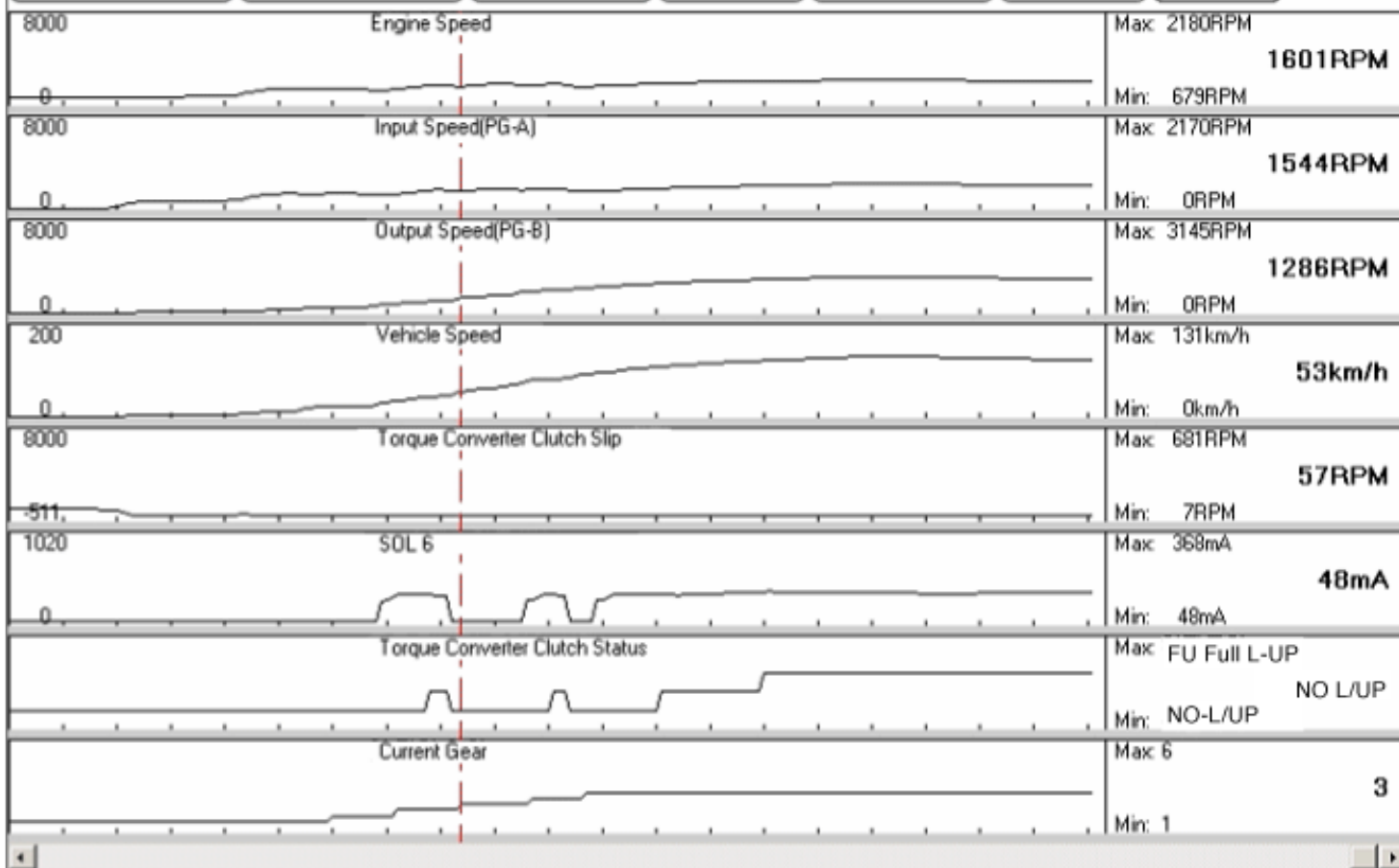
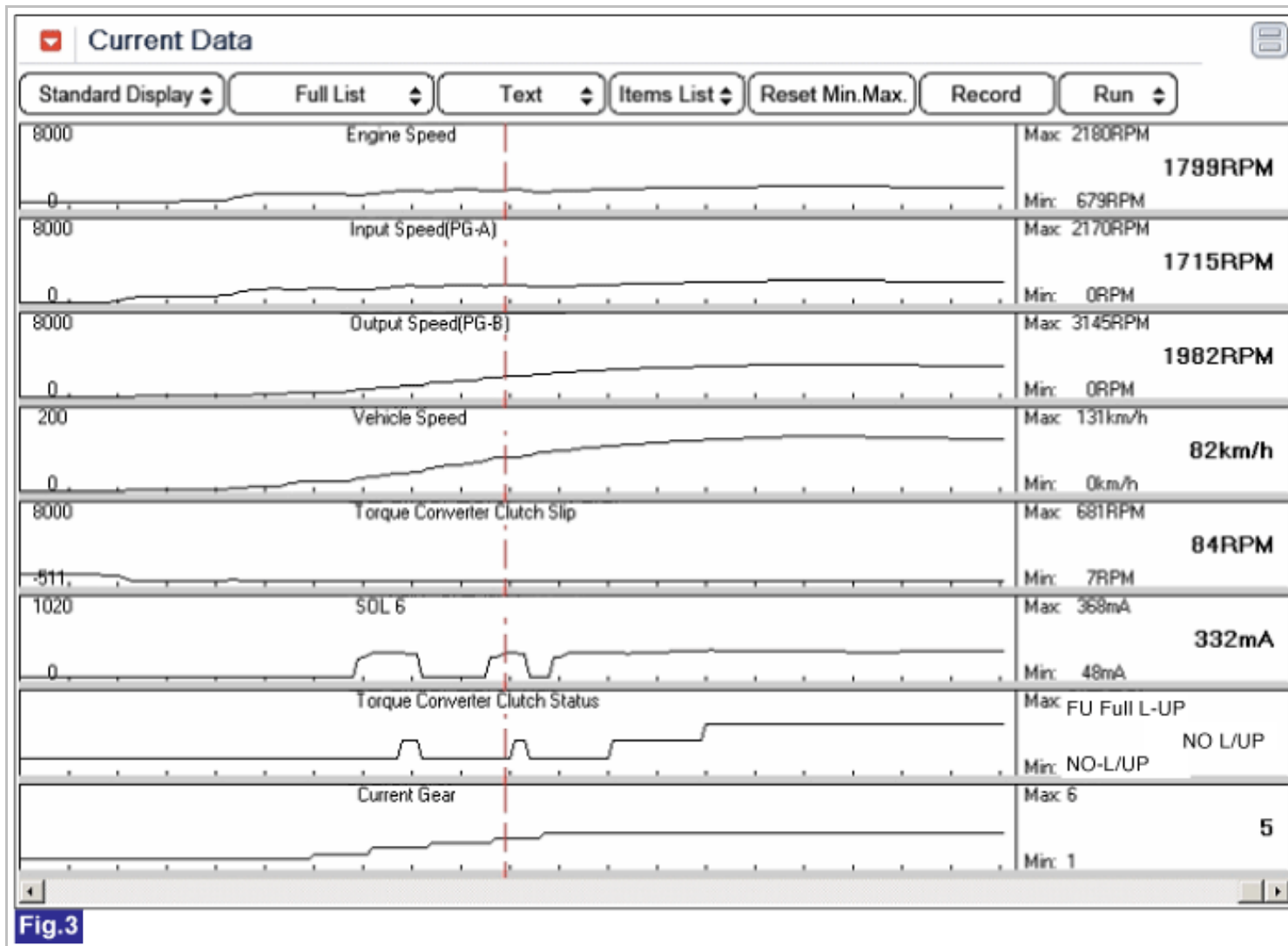


Fig.2



# Current Data



Standard Display

Full List

Text

Items List

Reset Min.Max.

Record

Run

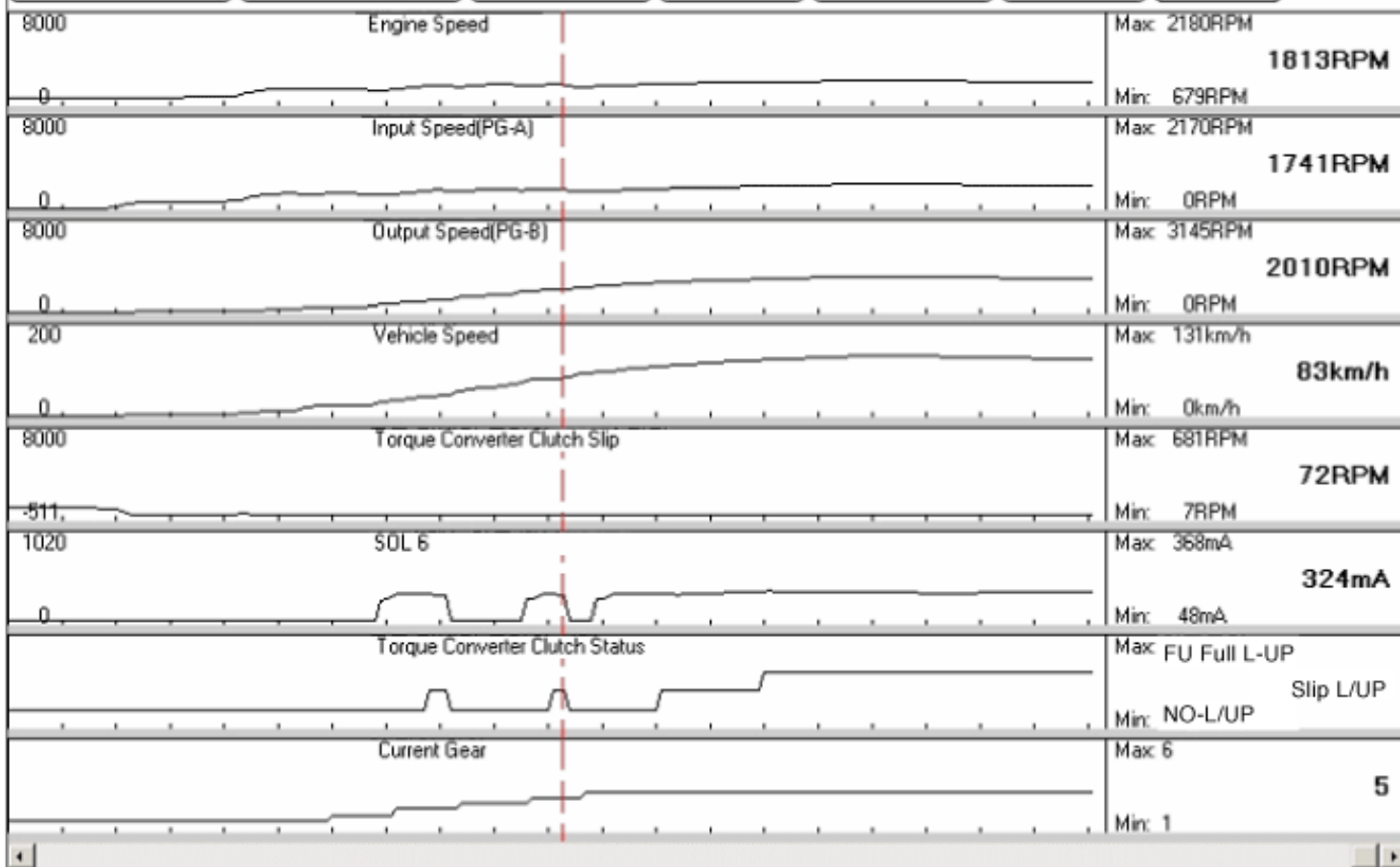


Fig.4

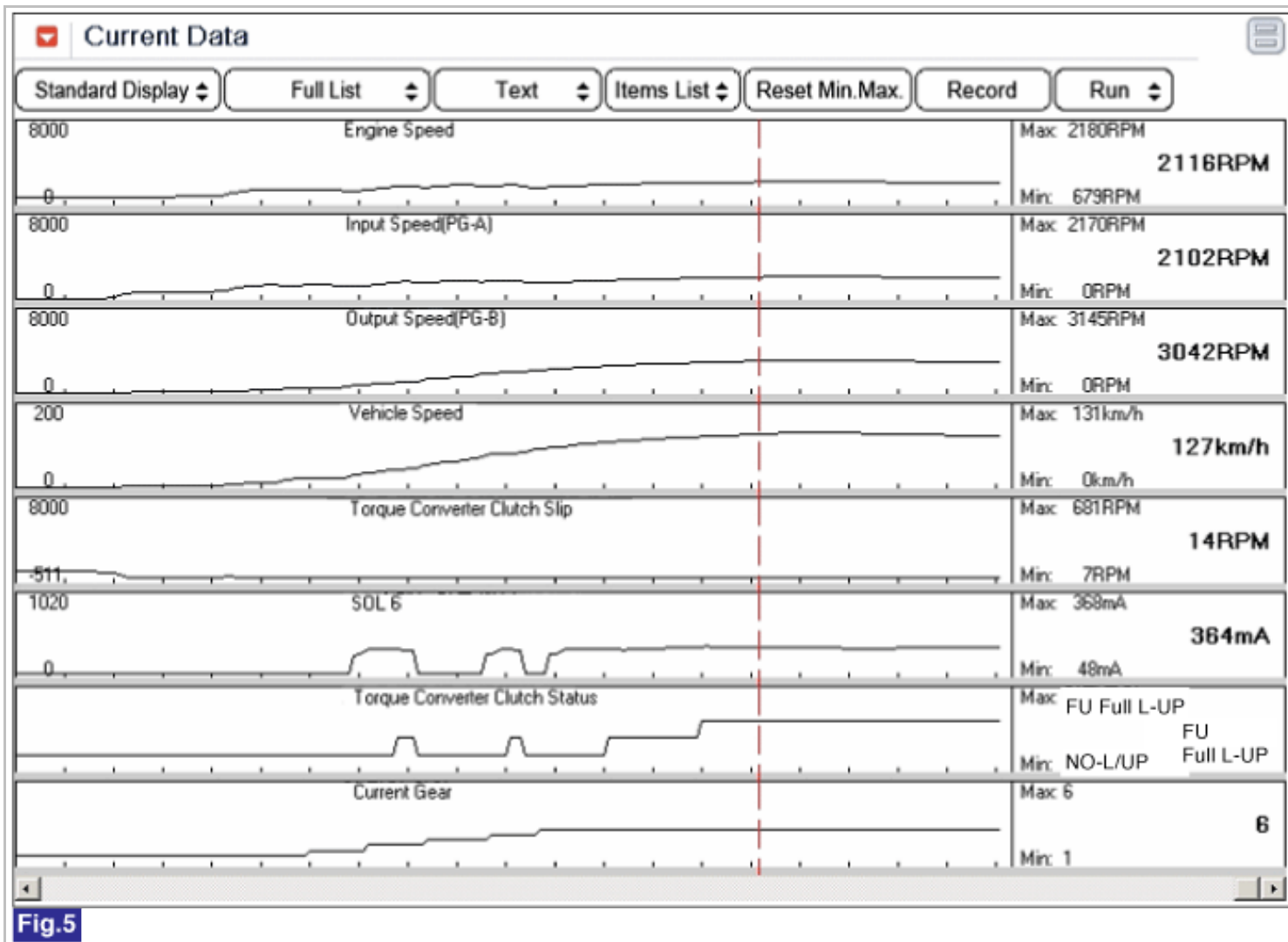


Fig 1) Lock-up status of Torque converter clutch in 3rd gear.

Fig 2) Release the Lock-up at 3rd to 4th gear shifting

Fig 3) Release the Lock-up status in 5th gear

Fig 4) Lock-up status in 5th gear

Fig 5) Lock-up status in 6th gear

## Monitor Scantool Data

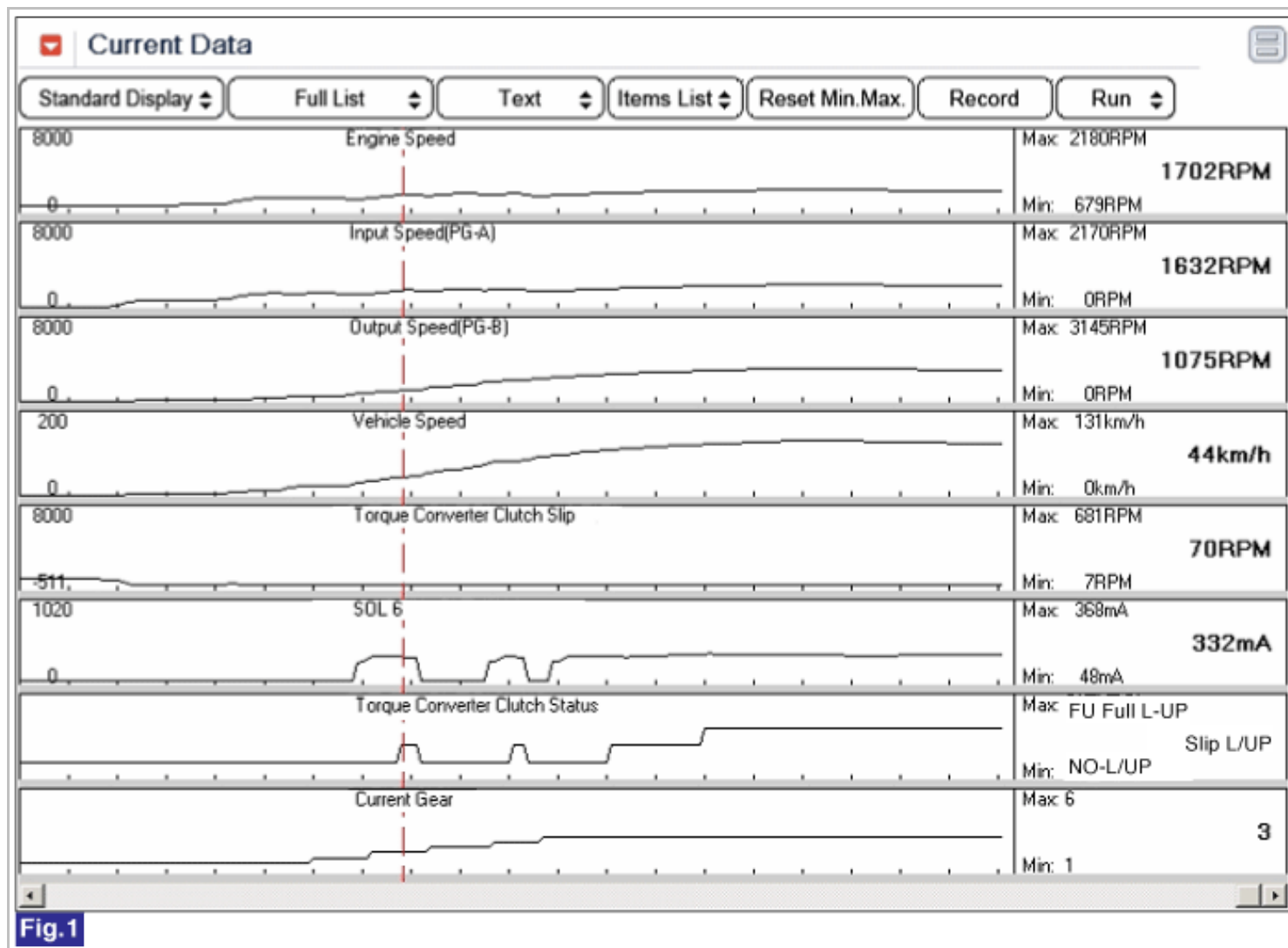
1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Current Gear, Target Gear, solenoid valves" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valves.

### Solenoid valve operating status according to gear position

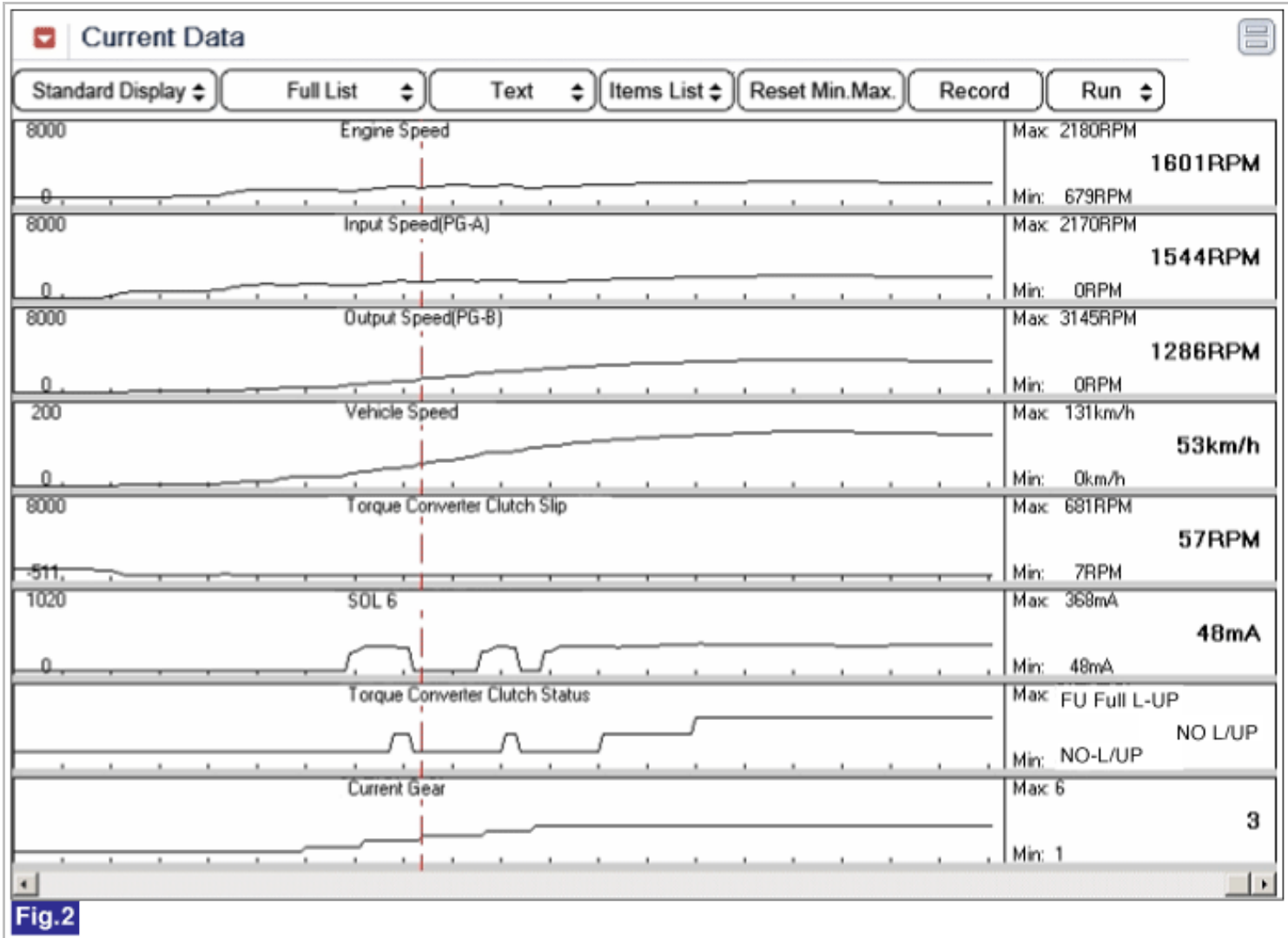
gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-

D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

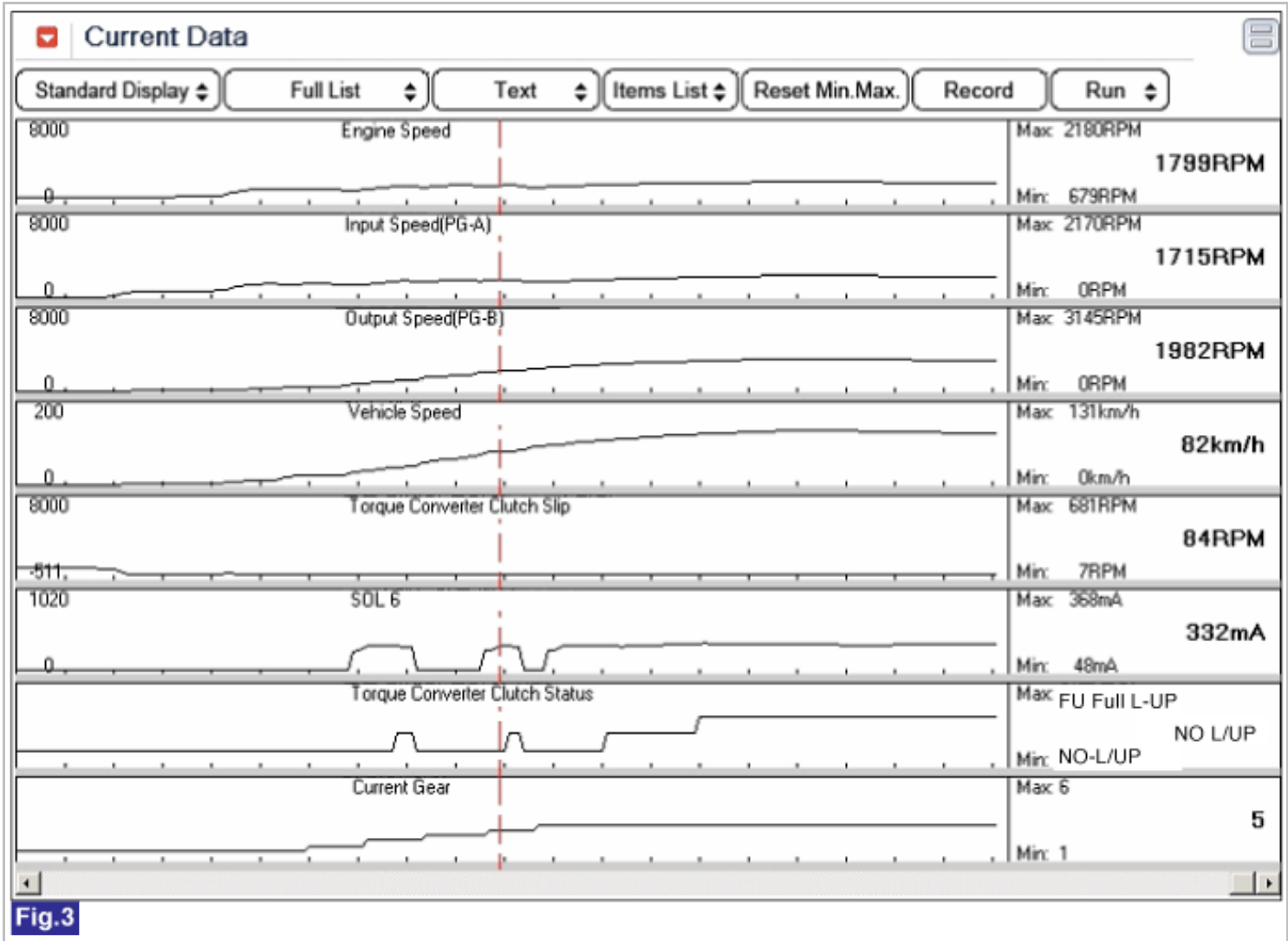
-O- : variable control

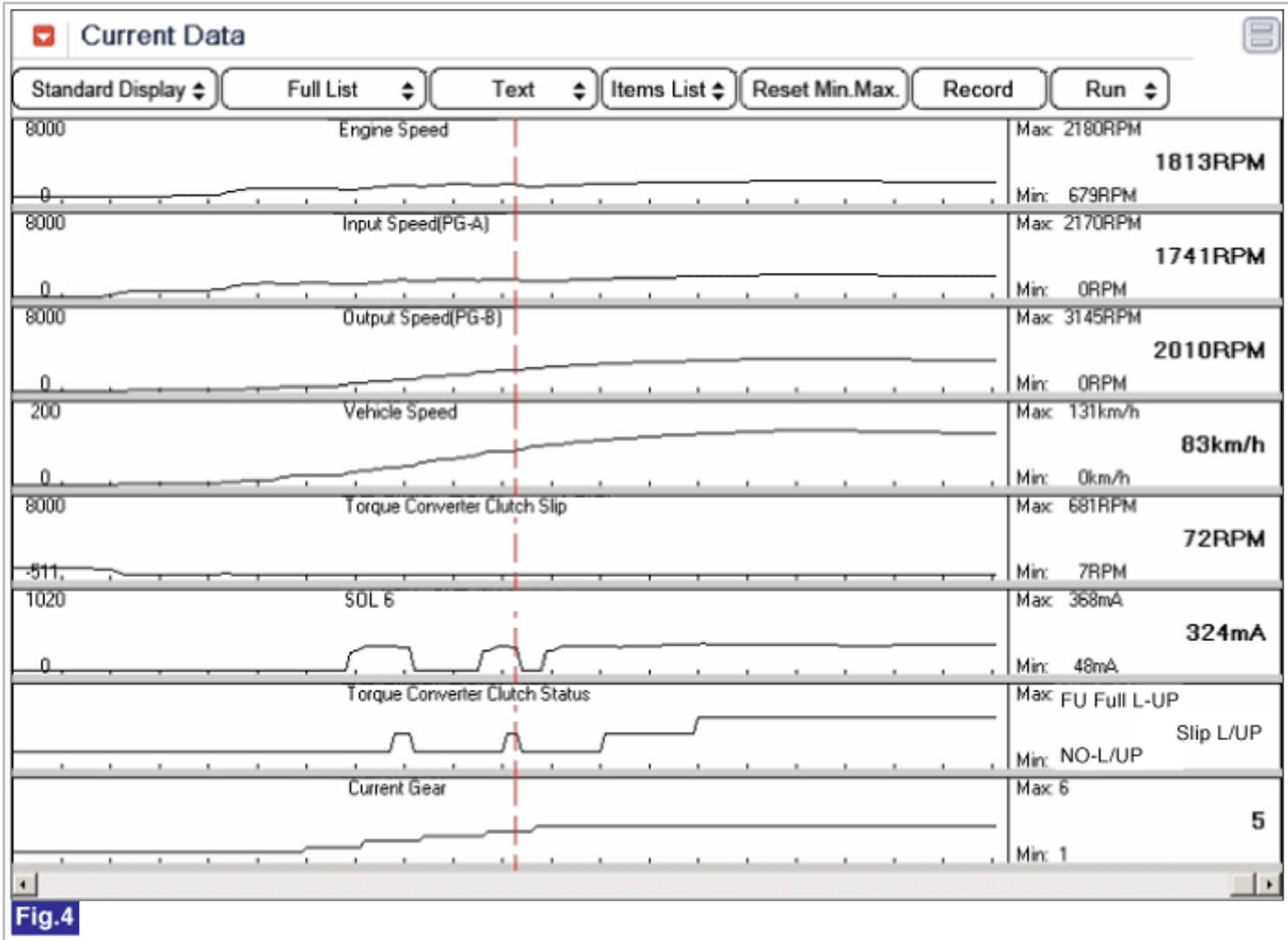


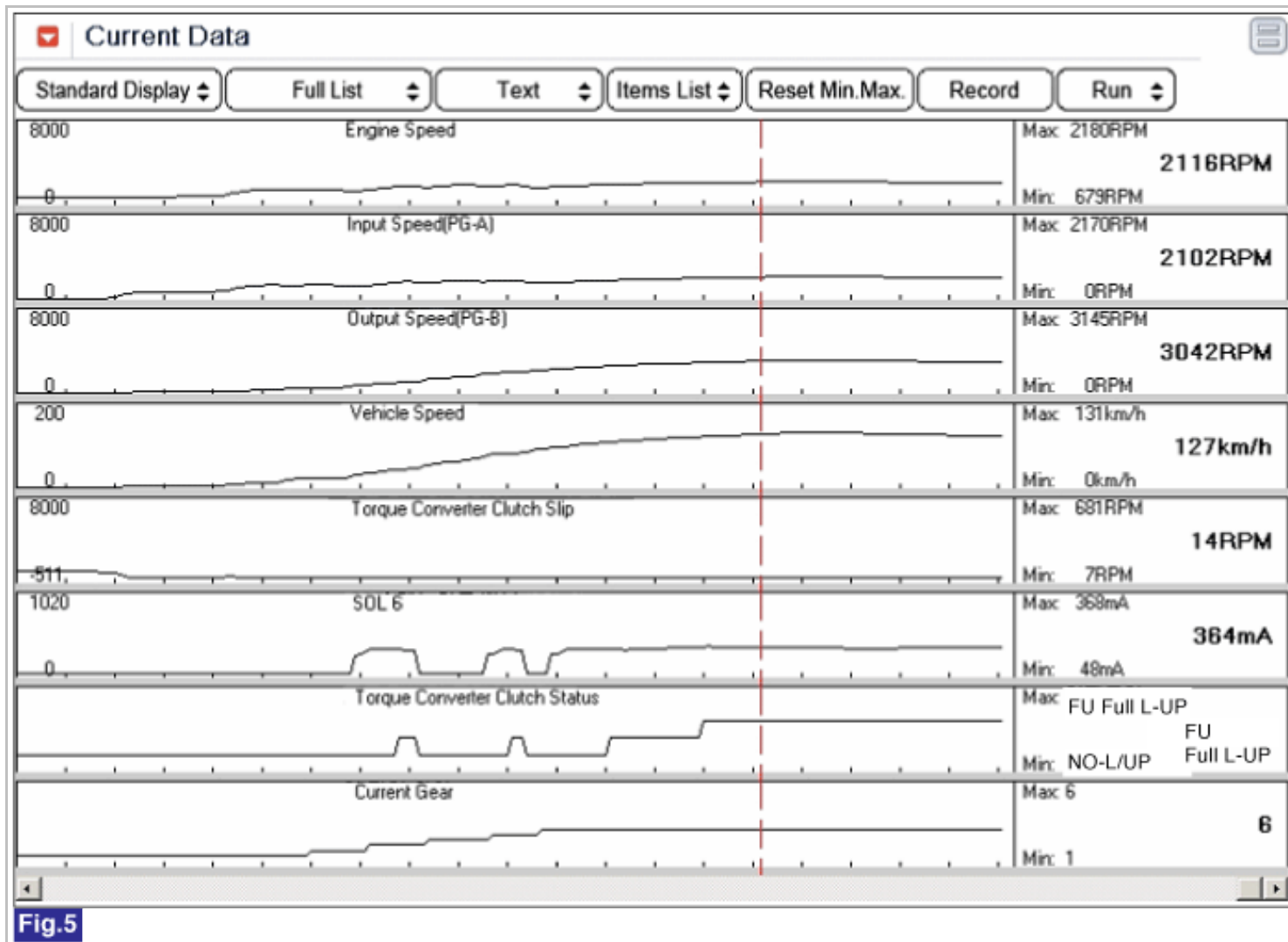
**Fig.1**











**Fig.5**

Fig 1) Lock-up status of Torque convertor clutch in 3rd gear.

Fig 2) Release the Lock-up at 3rd to 4th gear shifting

Fig 3) Release the Lock-up status in 5th gear

Fig 4) Lock-up status in 5th gear

Fig 5) Lock-up status in 6th gear

5. Does "TCC solenoid valve(SOL 6)" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	► Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal normally. Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

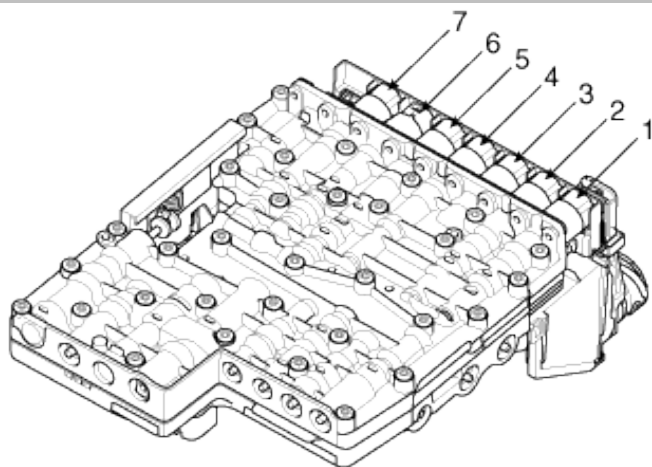
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	► Go to the applicable troubleshooting procedure.
<b>NO</b>	► System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0744 Torque Converter Clutch Circuit - Open or Short to ground (SOL6)

### Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

## General Description

The PCM/TCM controls the locking and unlocking of the Torque Converter Clutch ( or Damper Clutch ), to the input shaft of the transmission, by applying hydraulic pressure. The main purpose of T/C clutch control is to save fuel by decreasing the hydraulic load inside the T/C. The PCM/TCM outputs duty pulses to control the Damper Clutch Control Solenoid Valve( DCCSV ) and hydraulic pressure is applied to the DC according to the DCC duty ratio value. When the duty ratio is high, high pressure is applied and the Damper Clutch is locked.

## DTC Description

TCM set this code If detected short to Ground for Torque convertor clutch solenoid.(MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Short to Ground / Open	• Mechatronics(E-module + Valvebody)
Enable Conditions	• Supply voltage > 8,7V	
Threshold Value	• Short to Ground / Open	
Diagnostic Time	• 0.05second	
Fail Safe	• No Torque convertor clutch control • No learning control (priority : 3)	

### CAUTION

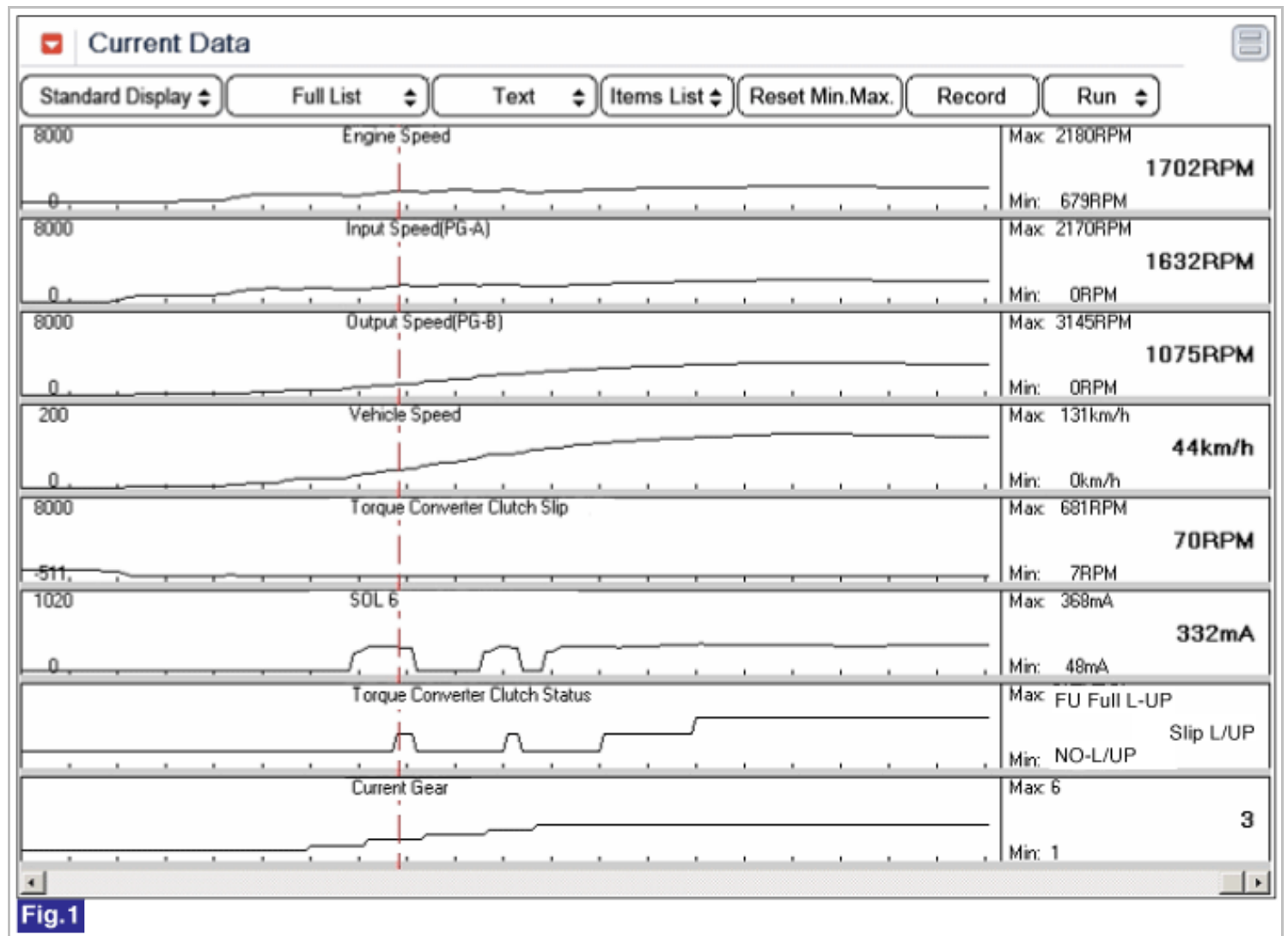
1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control



# Current Data



Standard Display

Full List

Text

Items List

Reset Min.Max.

Record

Run

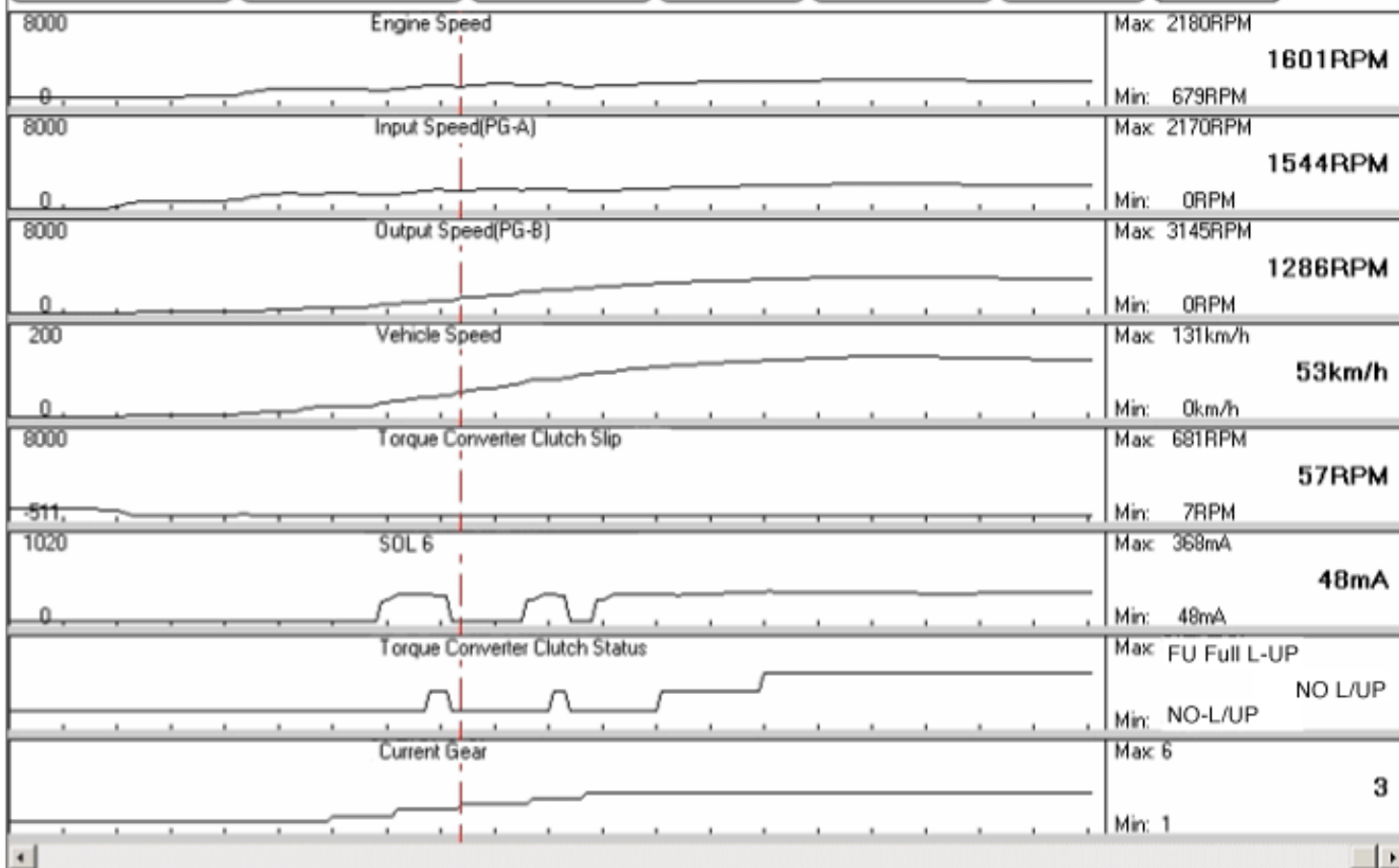
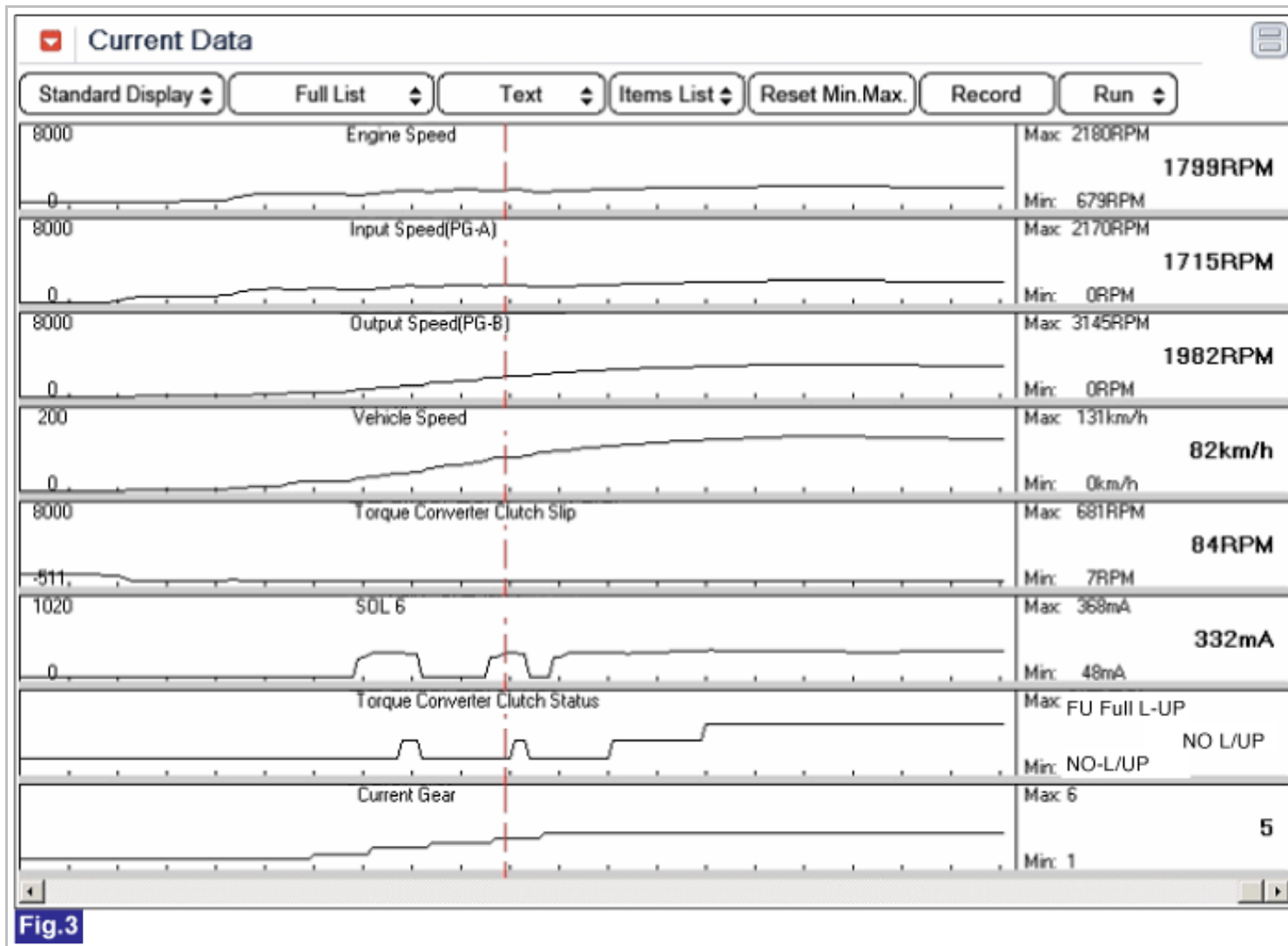


Fig.2





# Current Data



Standard Display

Full List

Text

Items List

Reset Min.Max.

Record

Run

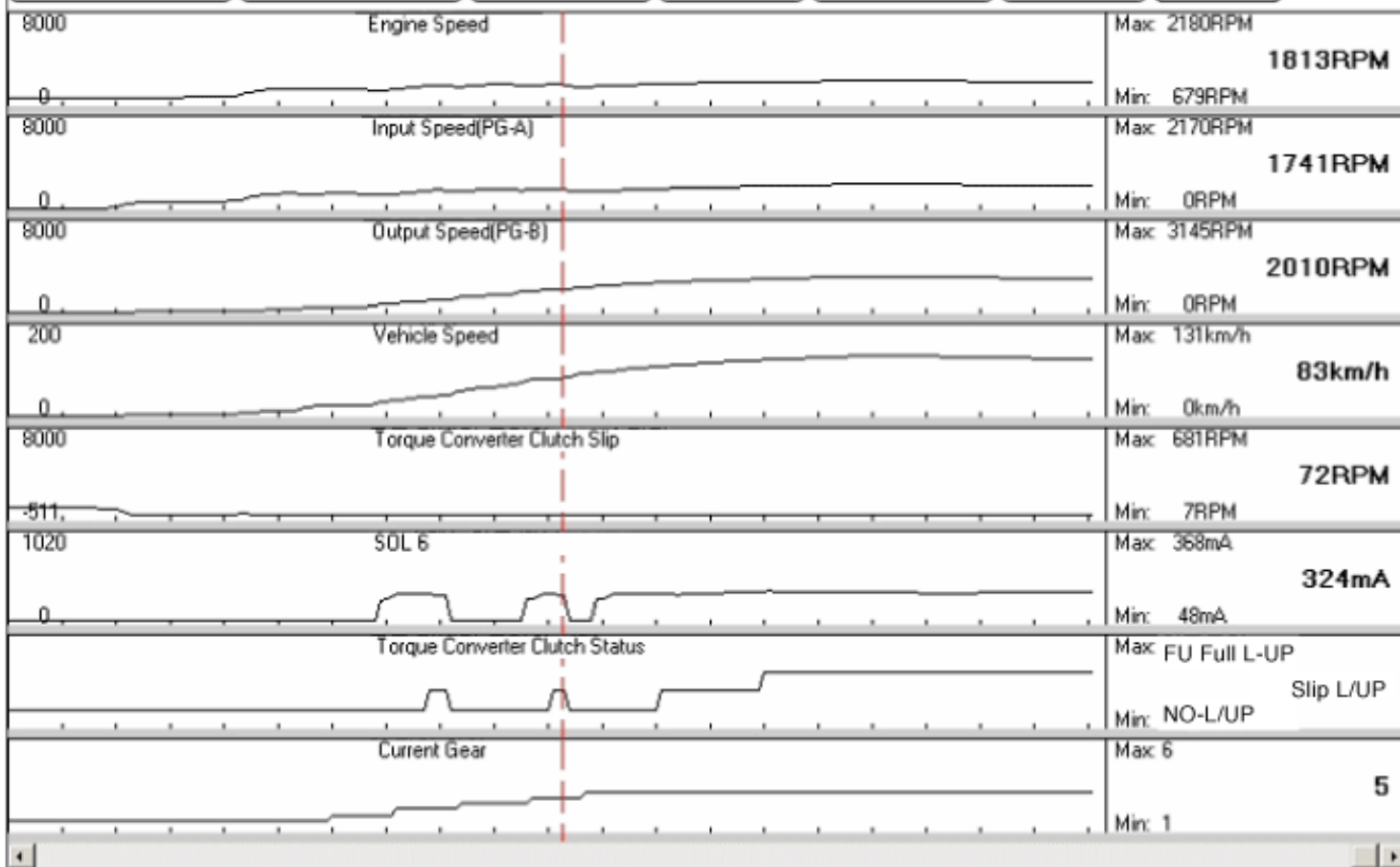


Fig.4

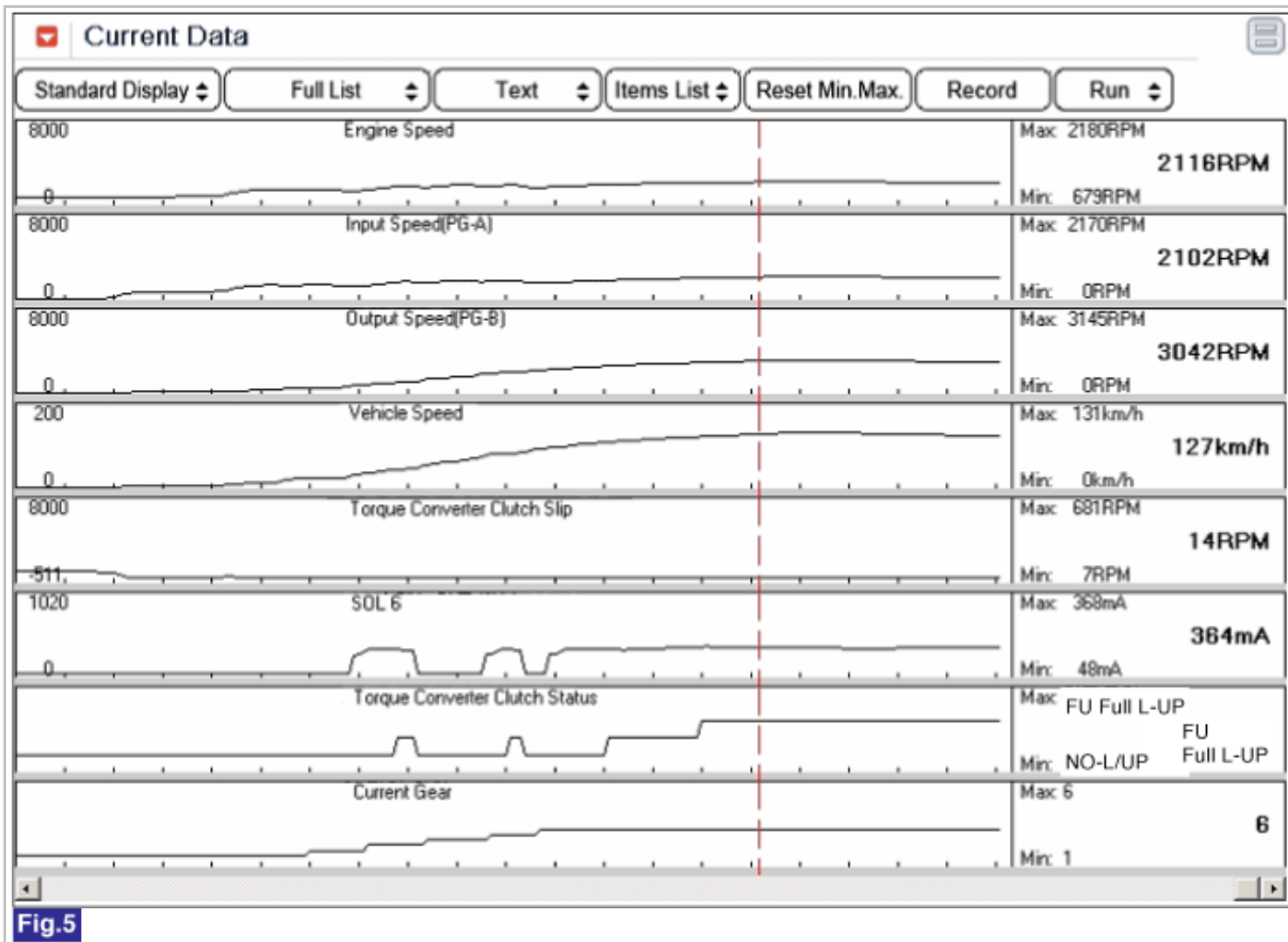


Fig 1) Lock-up status of Torque converter clutch in 3rd gear.

Fig 2) Release the Lock-up at 3rd to 4th gear shifting

Fig 3) Release the Lock-up status in 5th gear

Fig 4) Lock-up status in 5th gear

Fig 5) Lock-up status in 6th gear

## Monitor Scantool Data

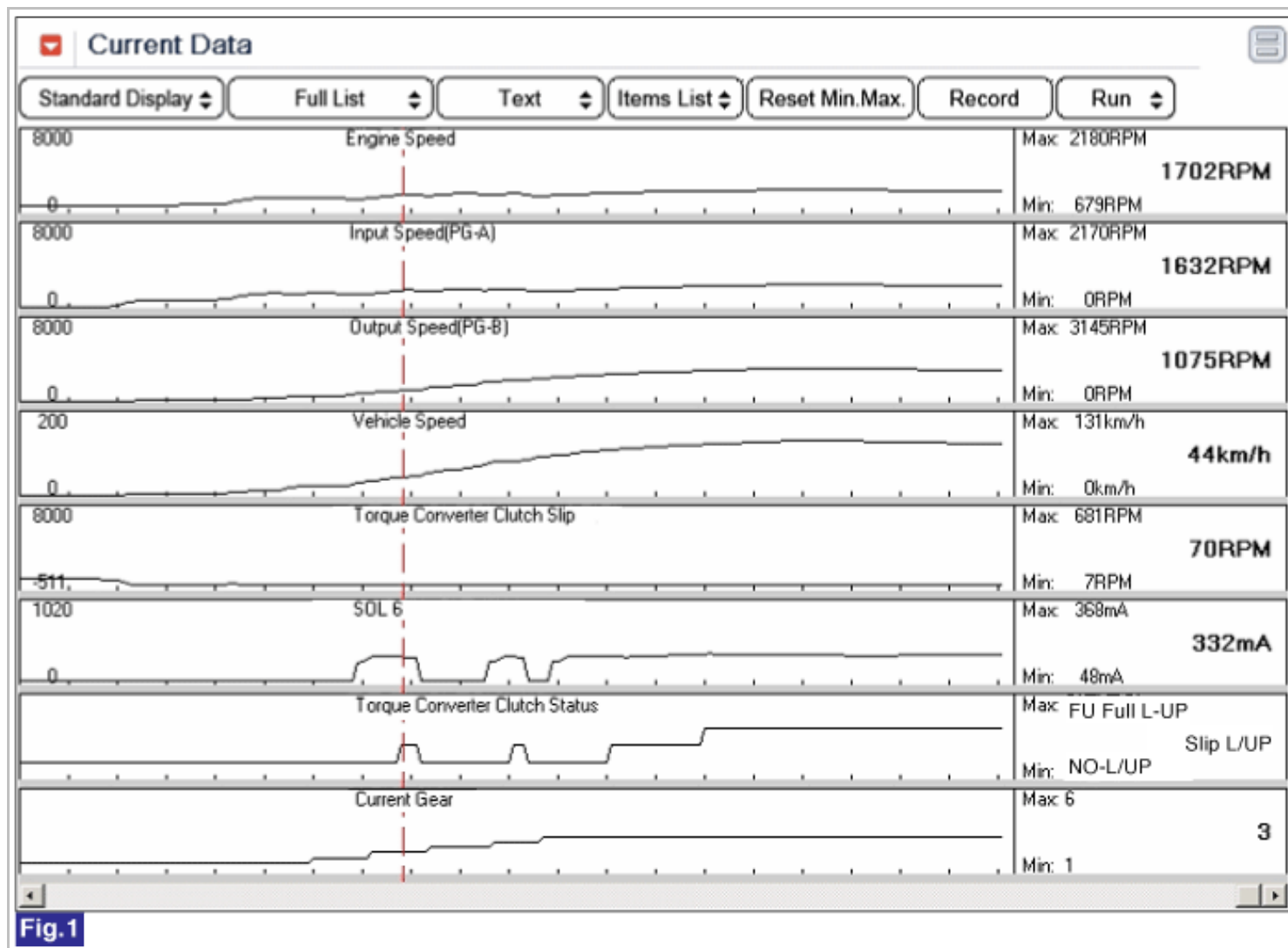
1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Current Gear, Target Gear, solenoid valves" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valves.

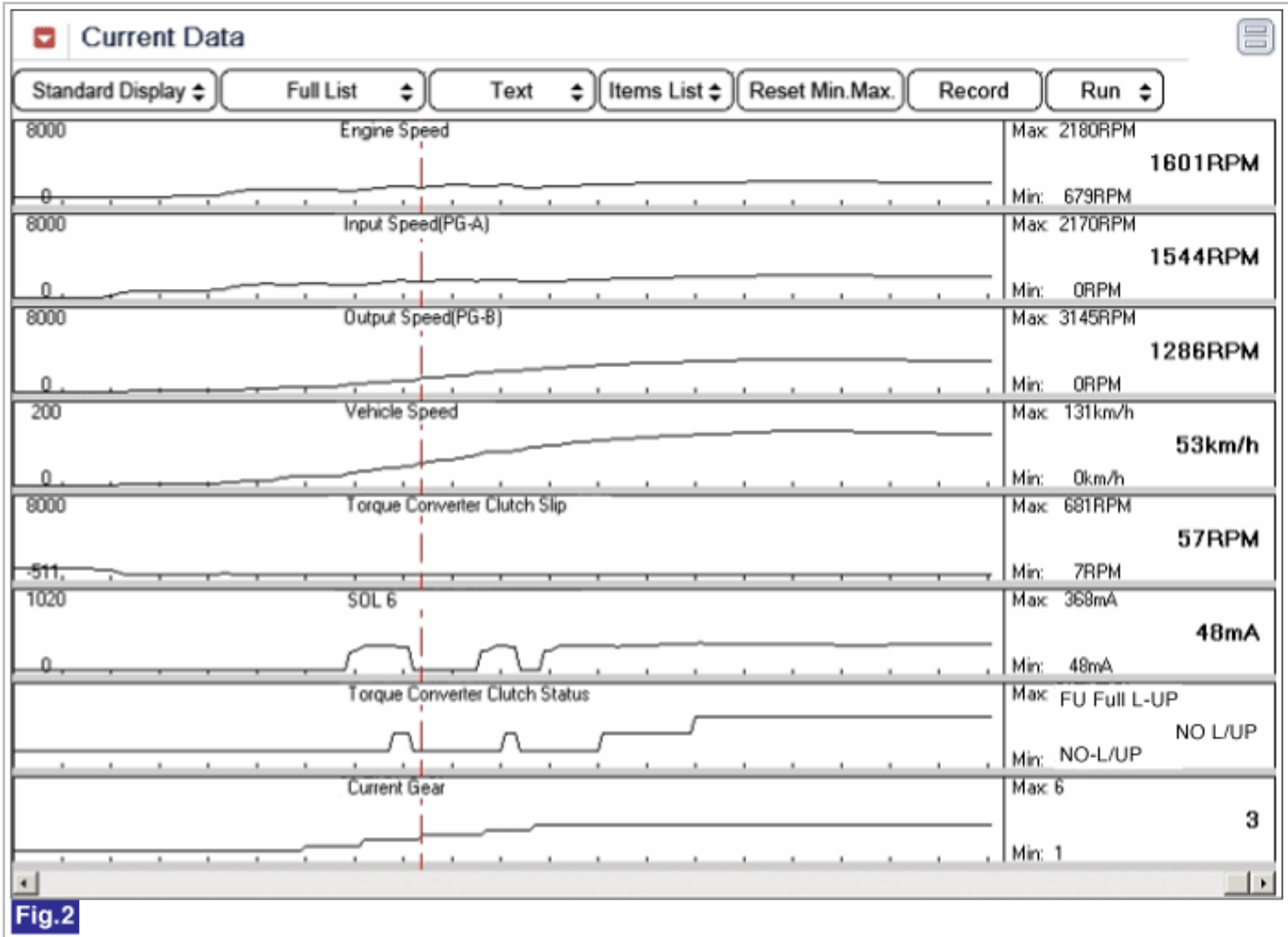
### Solenoid valve operating status according to gear position

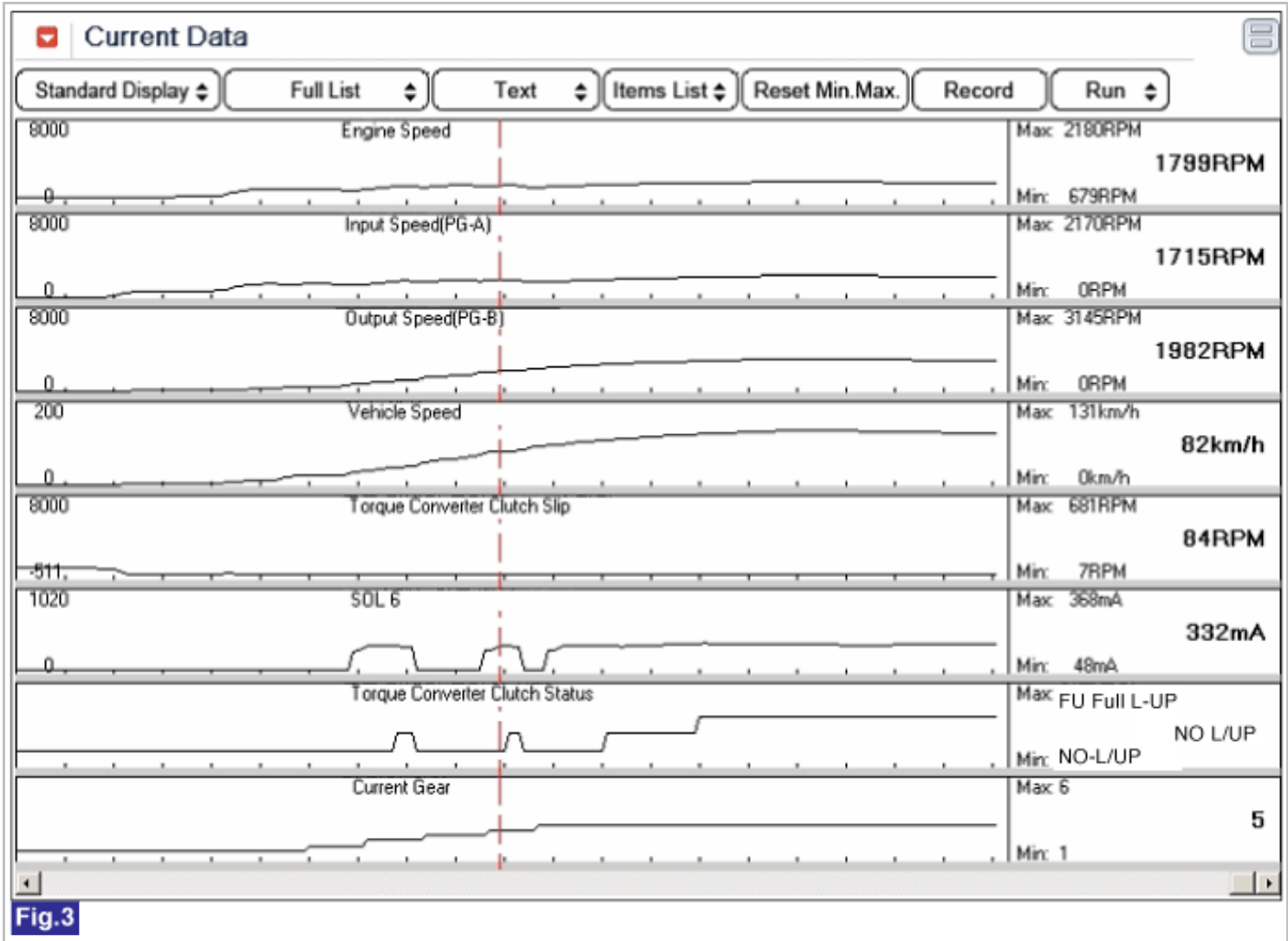
gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-

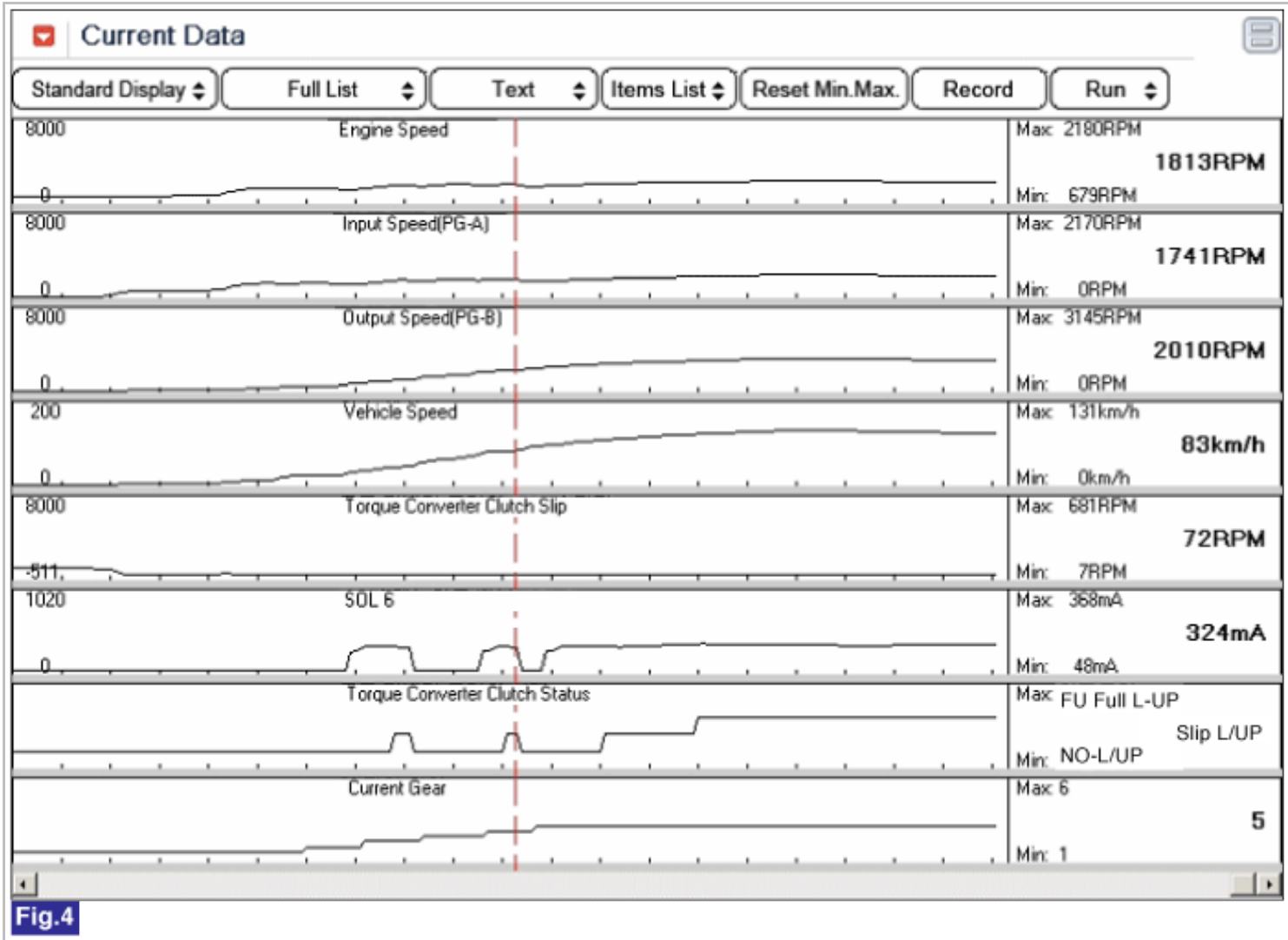
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control









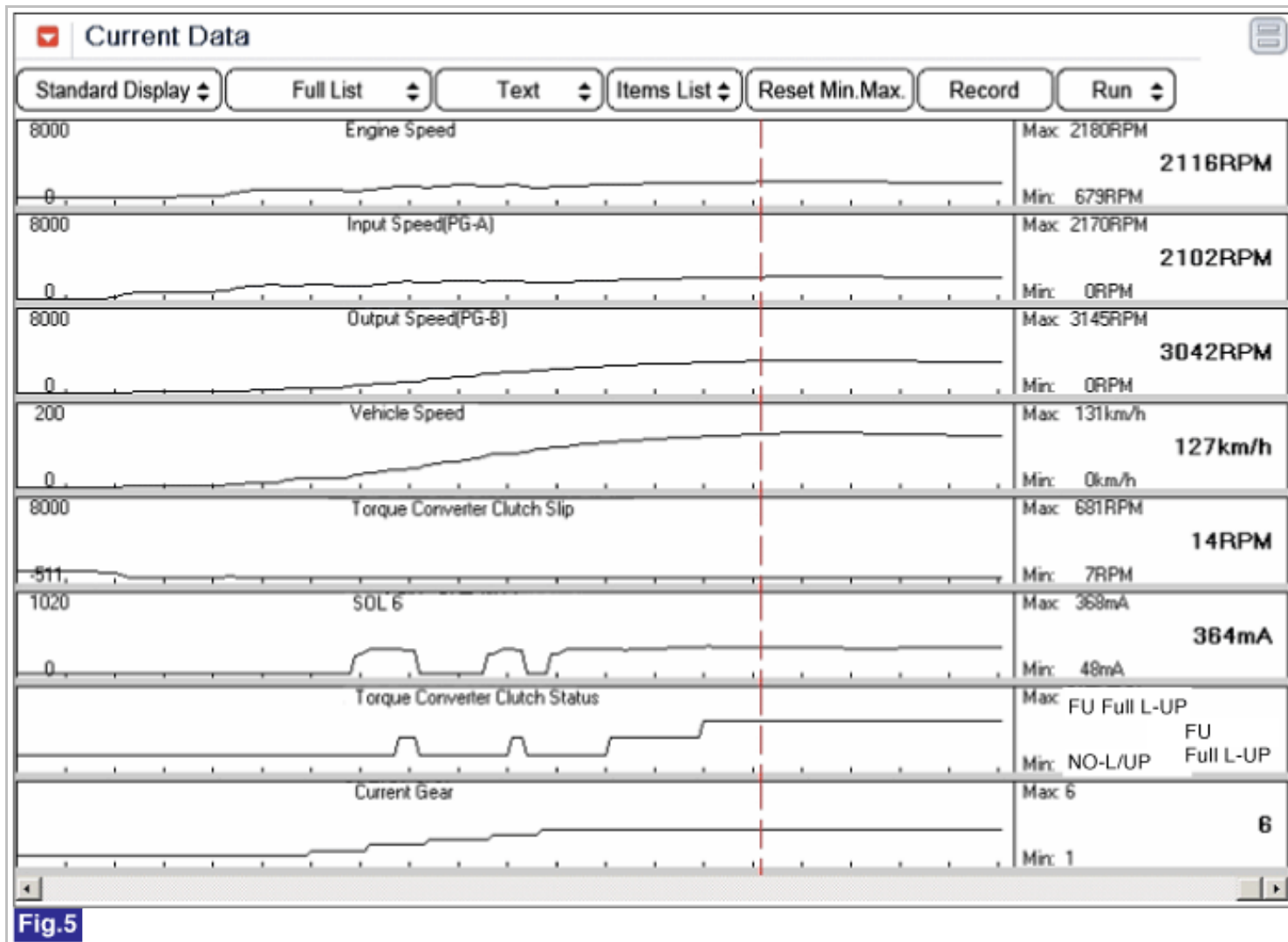


Fig 1) Lock-up status of Torque convertor clutch in 3rd gear.

Fig 2) Release the Lock-up at 3rd to 4th gear shifting

Fig 3) Release the Lock-up status in 5th gear

Fig 4) Lock-up status in 5th gear

Fig 5) Lock-up status in 6th gear

5. Does "TCC solenoid valve(SOL 6)" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal normally. Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

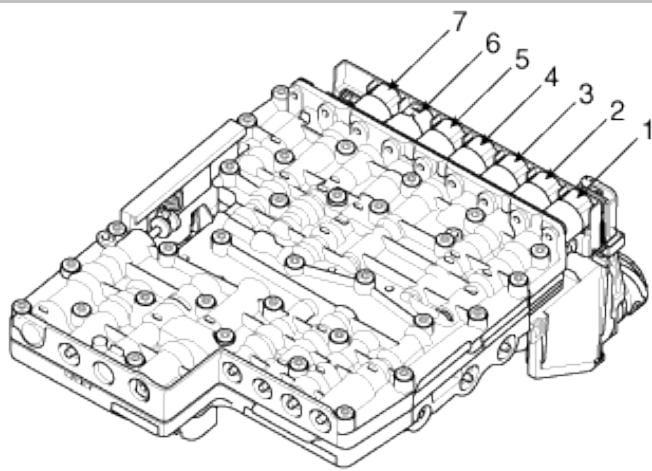
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure.
<b>NO</b>	▶ System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0746 Pressure Control Solenoid Valve 'A' Performance or Stuck Off(SOL5)

### Component Location





1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

## General Description

Pressure control solenoid valve make optimum oil pressure control oil pressure in Transmission. Pressure control solenoid valve decrease shift shock When engaging clutches and brakes uses optimum oil pressure.

## DTC Description

TCM set this code If detected circuit short or open or performance error.(MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item		Detecting Condition	Possible Cause
DTC Strategy	CASE1	• Check the voltage and current	• Mechatronics(E-module + Valvebody)
	CASE2	• Check the open	
Enable Conditions	CASE1	• OFF operation mode	
	CASE2	• Voltage drop at the voltage regulator $\leq 1V$ • Supply voltage $> 8.7V$	
Threshold Value	CASE1	• Short of current	
	CASE2	• Open	
Diagnostic Time		• 0.05second	
Fail Safe		• Maximum line pressure control(D : 14kg/cm <sup>2</sup> , R : 20kg/cm <sup>2</sup> ) • High speed : fixed at 5th gear, low speed : fixed at 3rd gear. • Reverse : Shift lock(Push "Unlock button → possible to shift) (priority :3)	

## CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.

3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

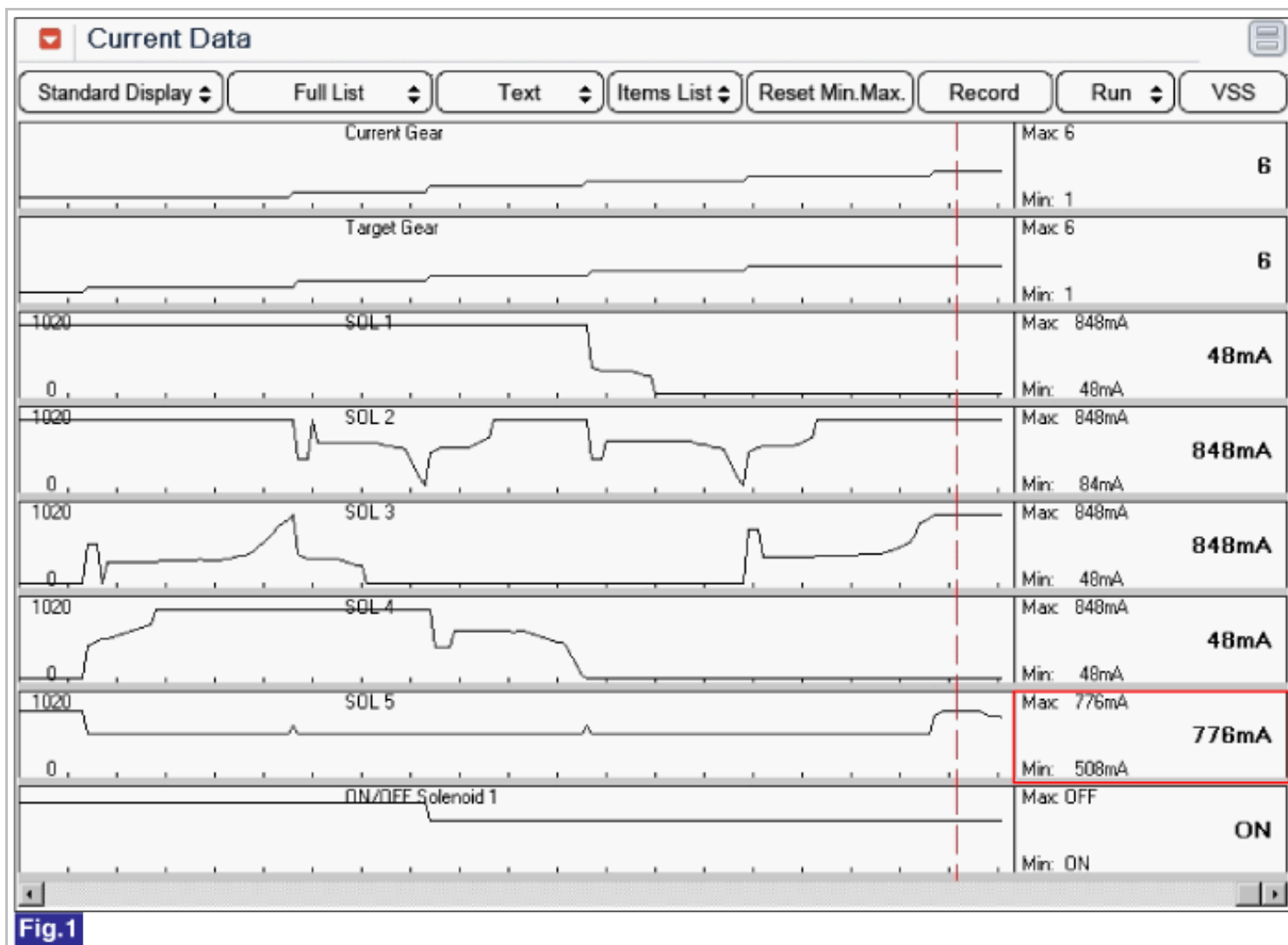
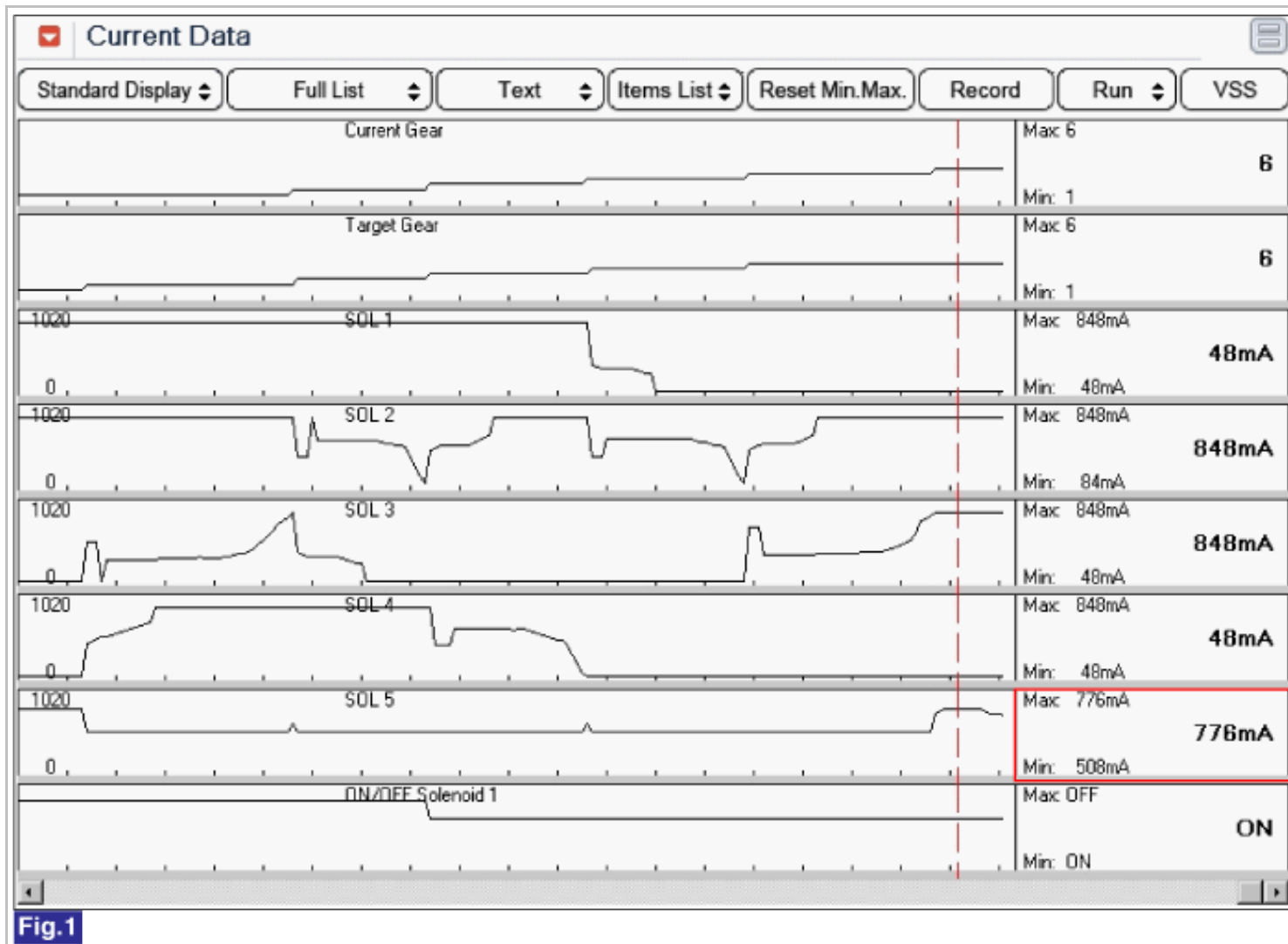


Fig 1) Pressure control solenoid valve

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Pressure control solenoid valve(SOL 5)" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valves.

**Speaication** : 48mA ~ 848mA



**Fig.1**

Fig 1) Pressure control solenoid valve

5. Dose "Pressure control solenoid valve(SOL 5)" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	► Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected,replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
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**NO**

► Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

(Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

**YES**

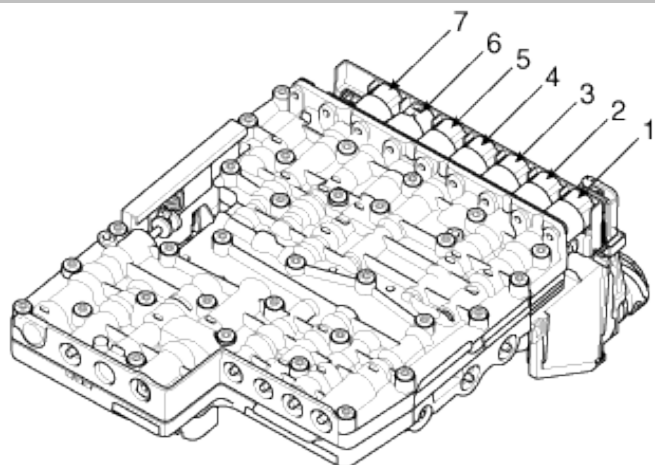
► Go to the applicable troubleshooting procedure.

**NO**

► System performing to specification at this time.

**Automatic Transmission System > Automatic Transmission System > P0748 Pressure Control Solenoid Valve 'A' - Short to Battery(SOL5 - Normal / High )**

## Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

## General Description

Pressure control solenoid valve make optimum oil pressure control oil pressure in Transmission. Pressure control solenoid valve decrease shift shock When engaging clutches and brakes uses optimum oil pressure.

## DTC Description

TCM set this code If detected short to battery for solenoid valve circuit.(MIL ON : 2 driving Cycle)

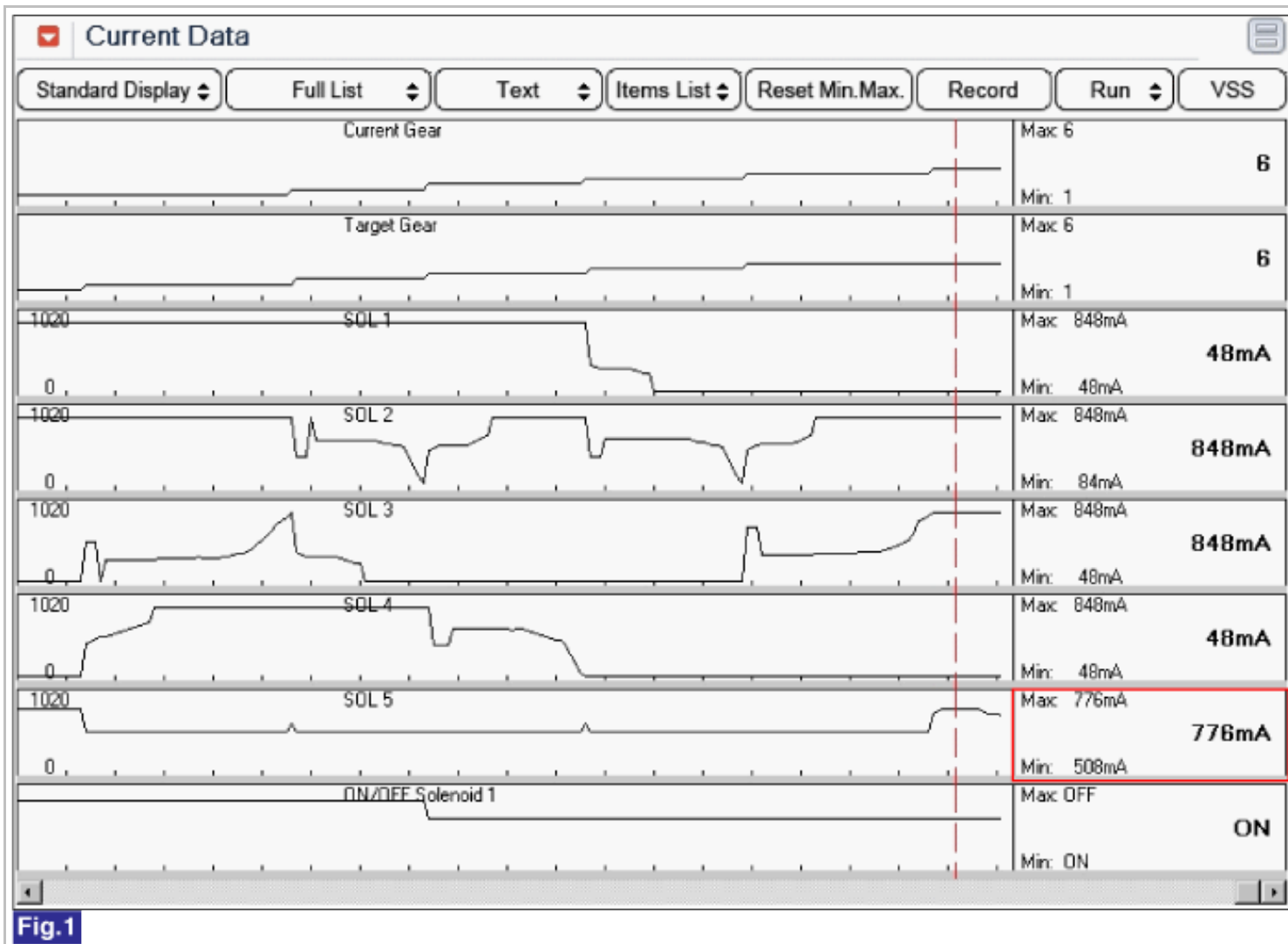
## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Short to battery	• Mechatronics(E-module + Valvebody)
Enable Conditions	• Supply voltage > 8,7V	
Threshold Value	• Short to battery	
Diagnostic Time	• 0.05second	
Fail Safe	• Maximum line pressure control(D : 14kg/cm <sup>2</sup> , R : 20kg/cm <sup>2</sup> ) • No learning control (priority : 3)	

### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data



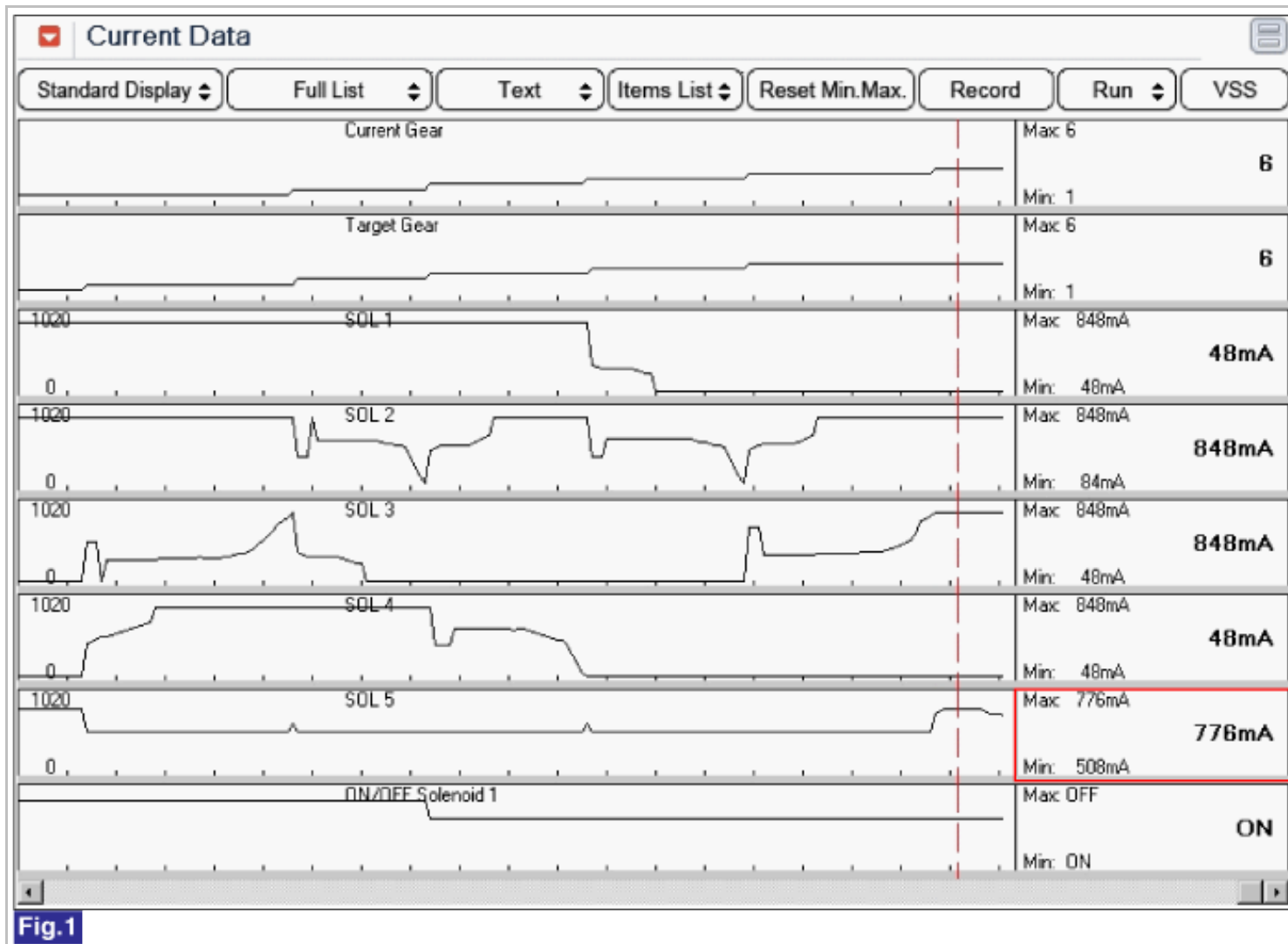
**Fig.1**

Fig 1) Pressure control solenoid valve

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Pressure control solenoid valve(SOL 5)" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valves.

**Speaication** : 48mA ~ 848mA



**Fig.1**

Fig 1) Pressure control solenoid valve

5. Dose "Pressure control solenoid valve(SOL 5)" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	► Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected,replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
------------	---

**NO**

► Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

(Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

**YES**

► Go to the applicable troubleshooting procedure.

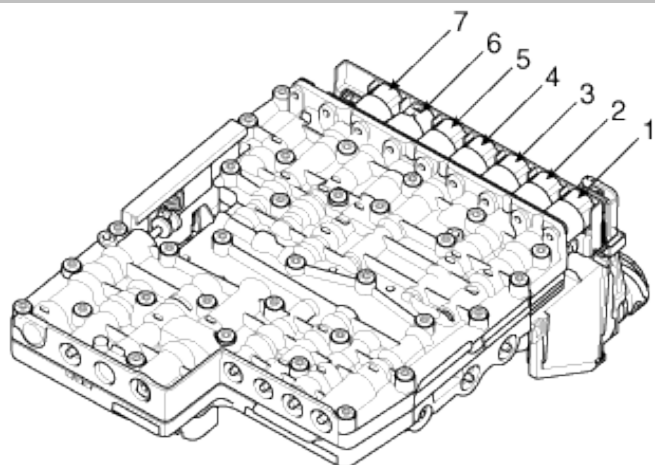
**NO**

► System performing to specification at this time.

**Automatic Transmission System > Automatic Transmission System > P0749 Pressure Control Solenoid Valve 'A' - Short to ground (SOL5 - Normal / High)**

## Component Location





1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

## General Description

Pressure control solenoid valve make optimum oil pressure control oil pressure in Transmission. Pressure control solenoid valve decrease shift shock When engaging clutches and brakes uses optimum oil pressure.

## DTC Description

TCM set this code If detected open/short to ground in circuit.(MIL ON : 2 driving Cycle)

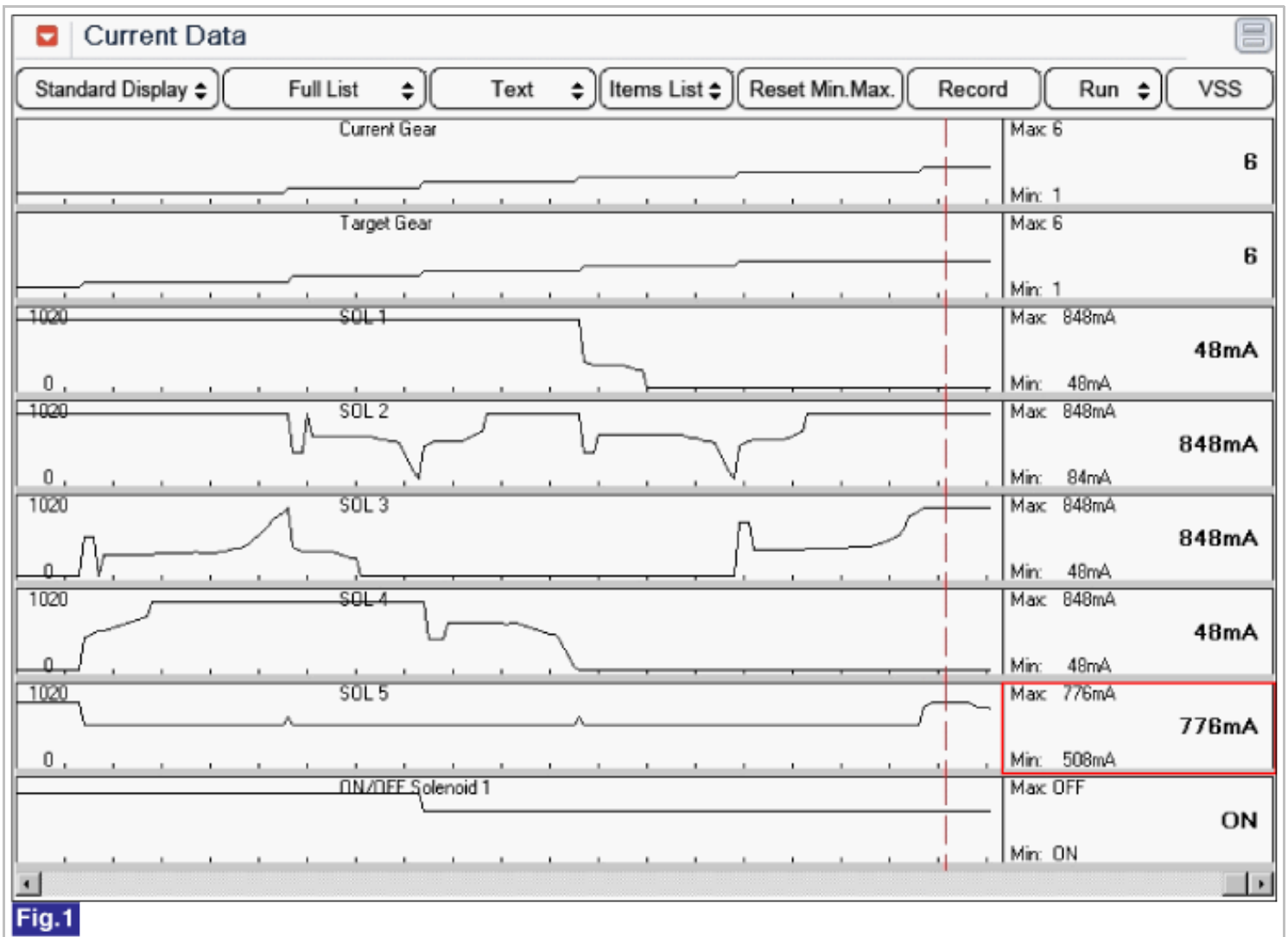
## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Short to Ground / Open	• Mechatronics(E-module + Valvebody)
Enable Conditions	• Power voltage > 8.7V • Voltage drop at FET ≤ 1V • Supply voltage ≥ 8.7V	
Threshold Value	• Short to Ground / Open	
Diagnostic Time	• 0.05second	
Fail Safe	• high speed : fixed at 5th gear, low speed : fixed at 3rd gear. • Reverse : Shift lock(Push "Unlock button → possible to shift) (priority : 3)	

## CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data



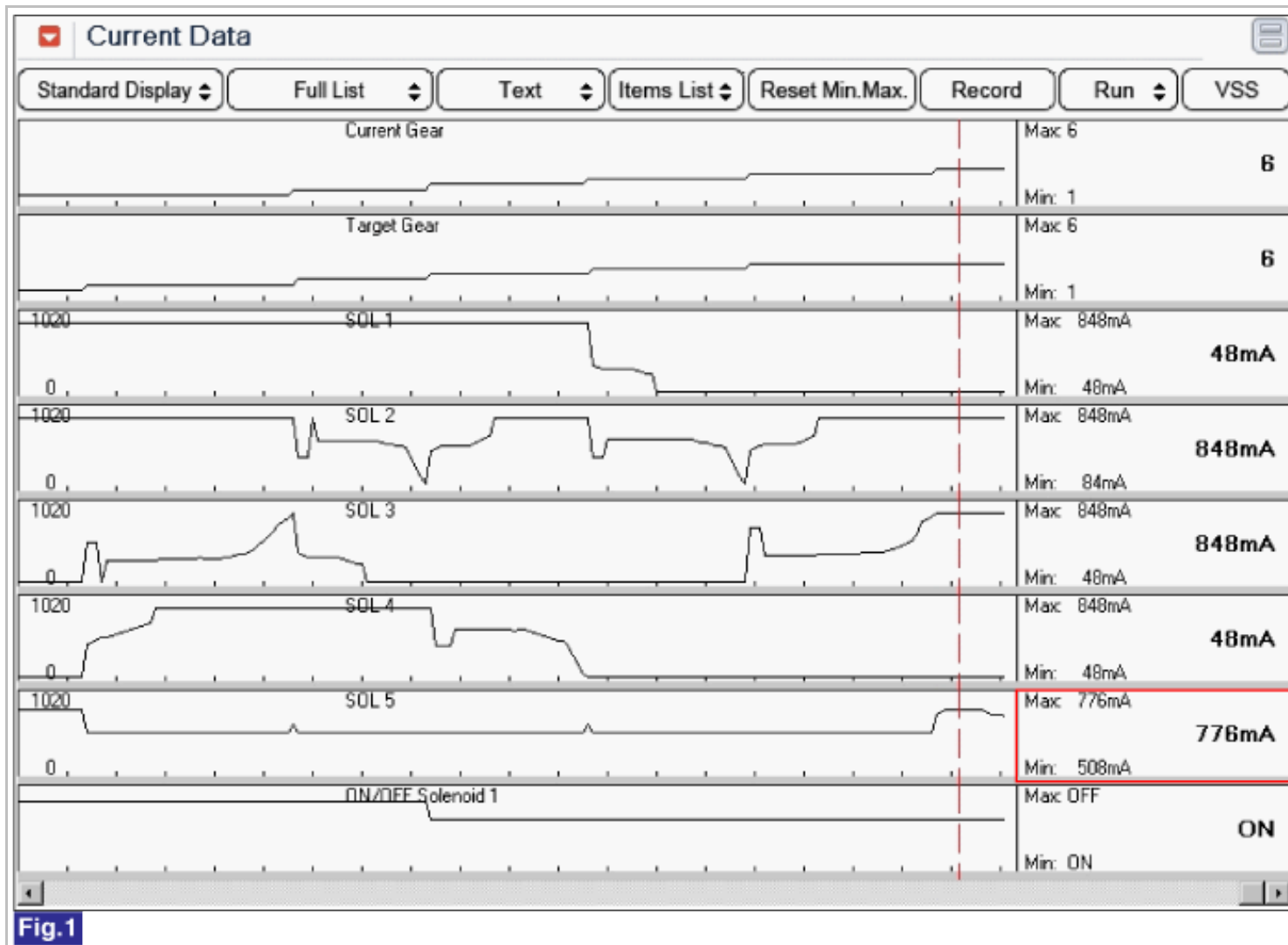
**Fig.1**

Fig 1) Pressure control solenoid valve

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Pressure control solenoid valve(SOL 5)" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valves.

**Speaication** : 48mA ~ 848mA



**Fig.1**

Fig 1) Pressure control solenoid valve

5. Dose "Pressure control solenoid valve(SOL 5)" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	► Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected,replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
------------	---

**NO**

► Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

(Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed.

Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear.

RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

**YES**

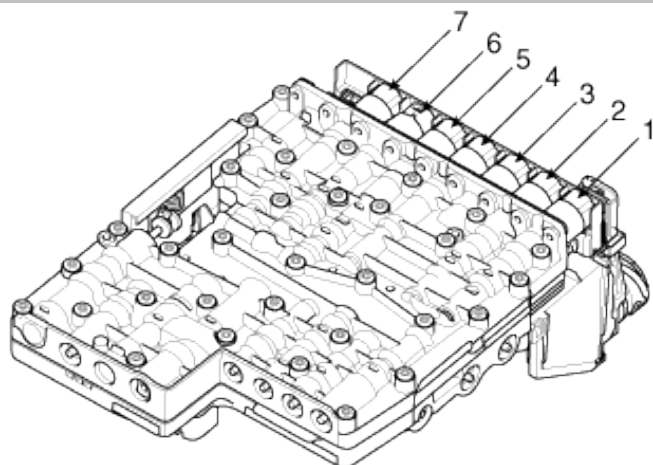
► Go to the applicable troubleshooting procedure.

**NO**

► System performing to specification at this time.

**Automatic Transmission System > Automatic Transmission System > P0751 Shift Control Solenoid Valve 'A' Performance or Stuck Off (SOL1- Clutch 'A' : Normal / Low)**

## Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

## General Description

Shift control solenoid valve is not supply oil pressure usually,TCM output electric signal to solenoid valve then oil pressure supplied to Clutch "A". Solenoid3(Brake C), Solenoid6(Torque convertor clutch) are same type solenoid valve.

## DTC Description

TCM set this code If detected open/short to ground in circuit.(MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item		Detecting Condition	Possible Cause
DTC Strategy	CASE1	• Check function	• Mechatronics(E-module + Valvebody)
	CASE2	• Check the voltage and current	
Enable Conditions		• Solenoid OFF status	
Threshold Value	CASE1	• Current > 50+170mA	
	CASE2	• Electric leakage of current	
Diagnostic Time		• 0.05second	
Fail Safe		<ul style="list-style-type: none"> <li>• High speed : fixed at 5th gear, low speed : fixed at 3rd gear</li> <li>• Reverse : Shift lock(Push "Unlock button → possible to shift) (priority :3)</li> </ul>	

## CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

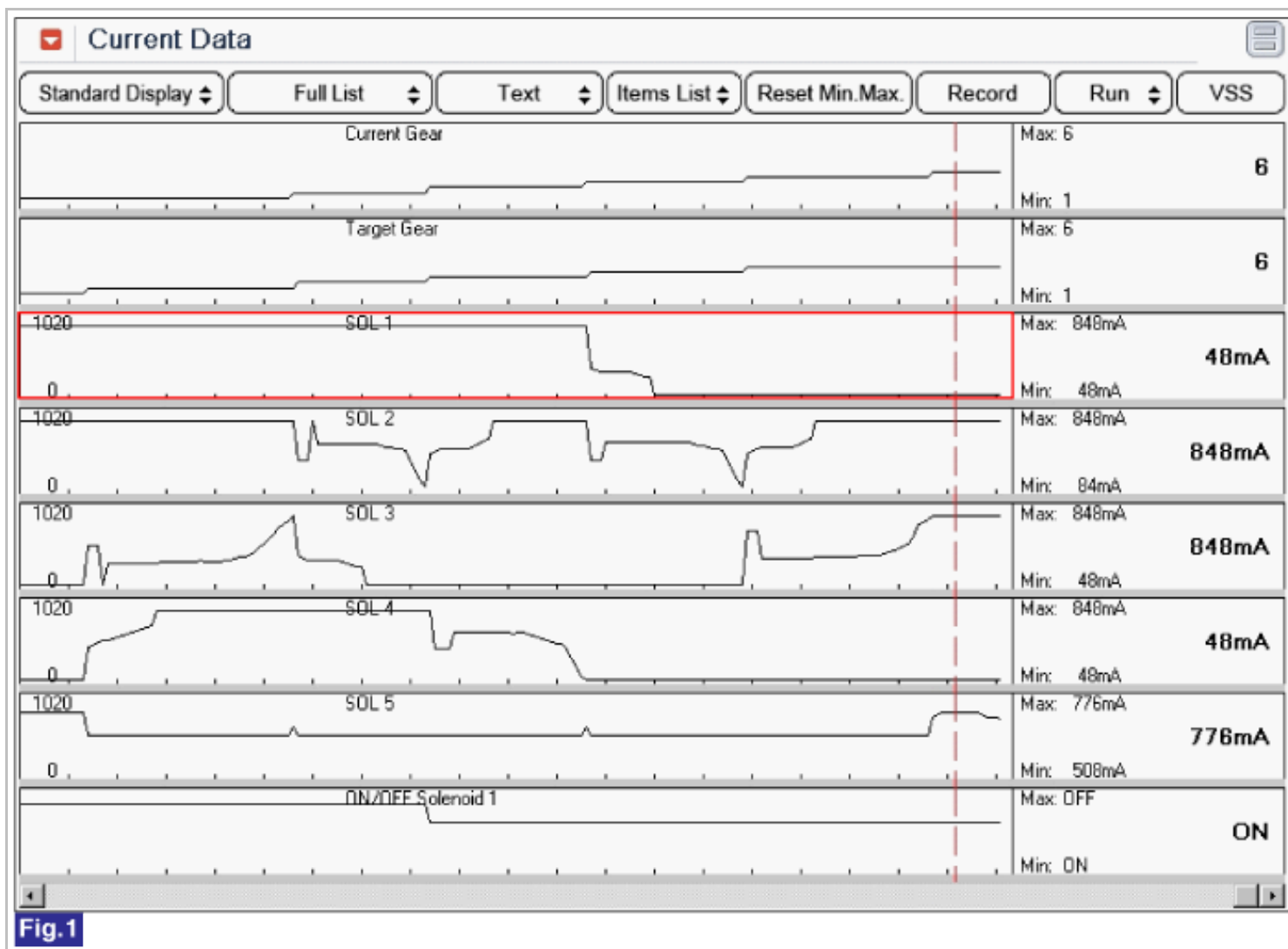


Fig 1) Shift control solenoid valve

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Shift control solenoid valve(SOL 1)" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valves.

**Speaication** : 48mA ~ 848mA

### Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF

D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control

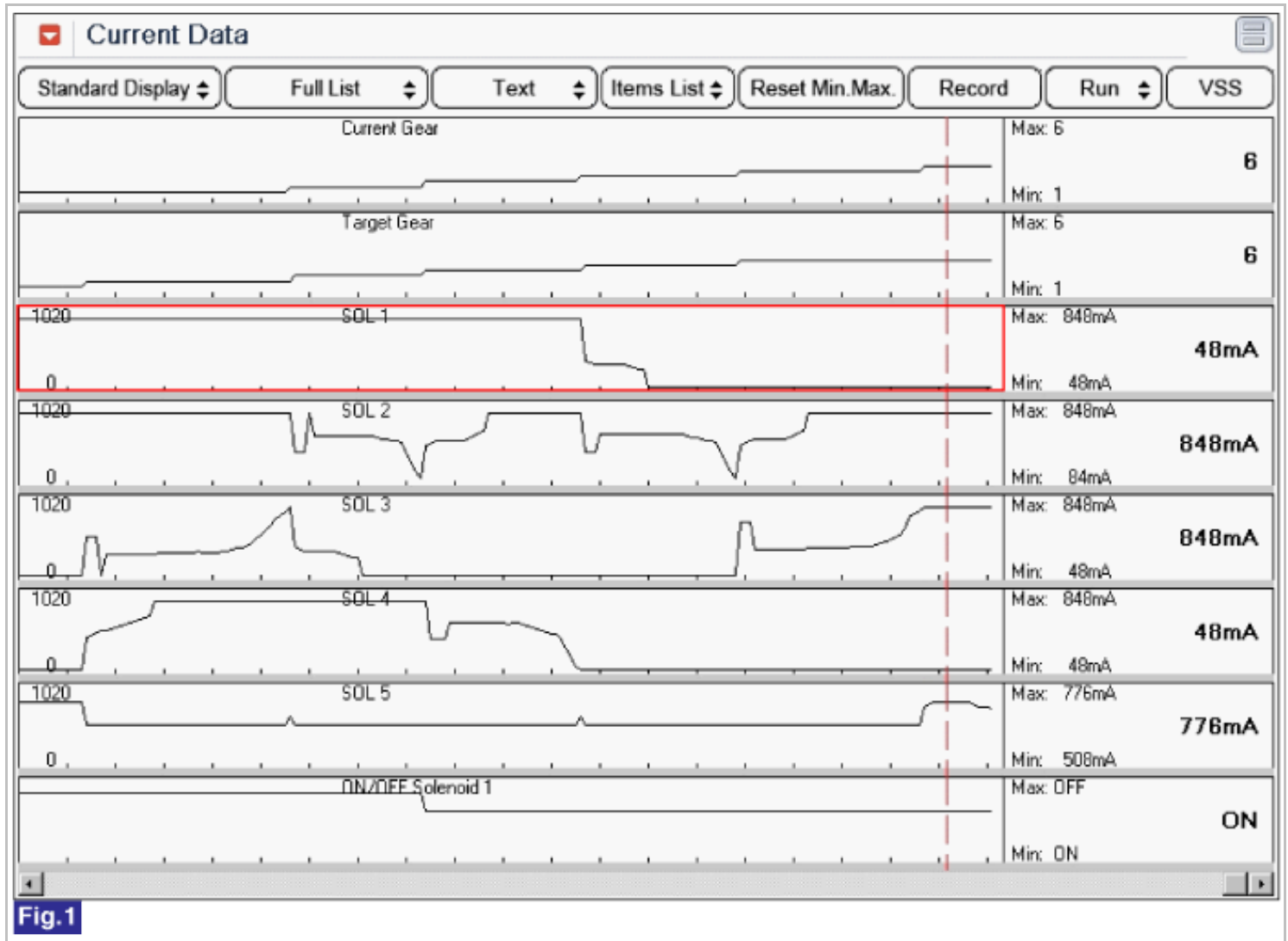


Fig 1) Shift control solenoid valve

5. Dose "Shift control solenoid valve(SOL 1)" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C ( 122 °F) and 120°C ( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C ( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal normally. Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times. (Not necessary N-D, N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

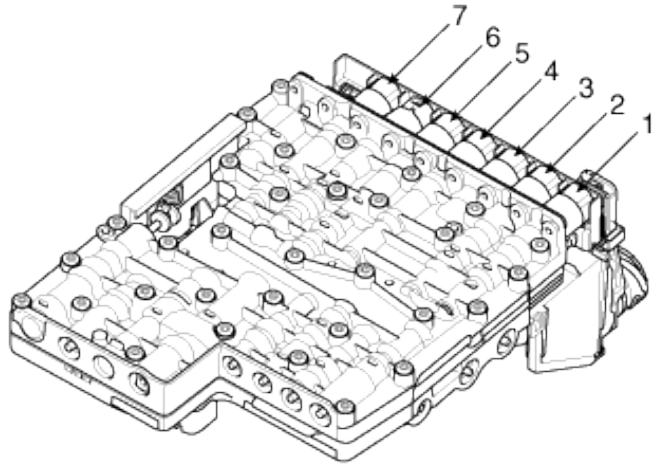
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure.
<b>NO</b>	▶ System performing to specification at this time.

**Automatic Transmission System > Automatic Transmission System > P0753 Shift Control Solenoid Valve 'A' -Short to battery (SOL1- Clutch 'A' : Normal / Low)**



## Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

## General Description

Shift control solenoid valve is not supply oil pressure usually,TCM output electric signal to solenoid valve then oil pressure supplied to Clutch "A". Solenoid3(Brake C), Solenoid6(Torque convertor clutch) are same type solenoid valve.

## DTC Description

TCM set this code If detected short to battery for solenoid valve circuit.(MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Short to battery	• Mechatronics(E-module + Valvebody)
Enable Conditions	• Supply voltage > 8,7V	
Threshold Value	• Short to battery	
Diagnostic Time	• 0.05second	
Fail Safe	• Maximum line pressure control(D : 14kg/cm <sup>2</sup> , R : 20kg/cm <sup>2</sup> ) • No learning control (priority : 3)	

### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

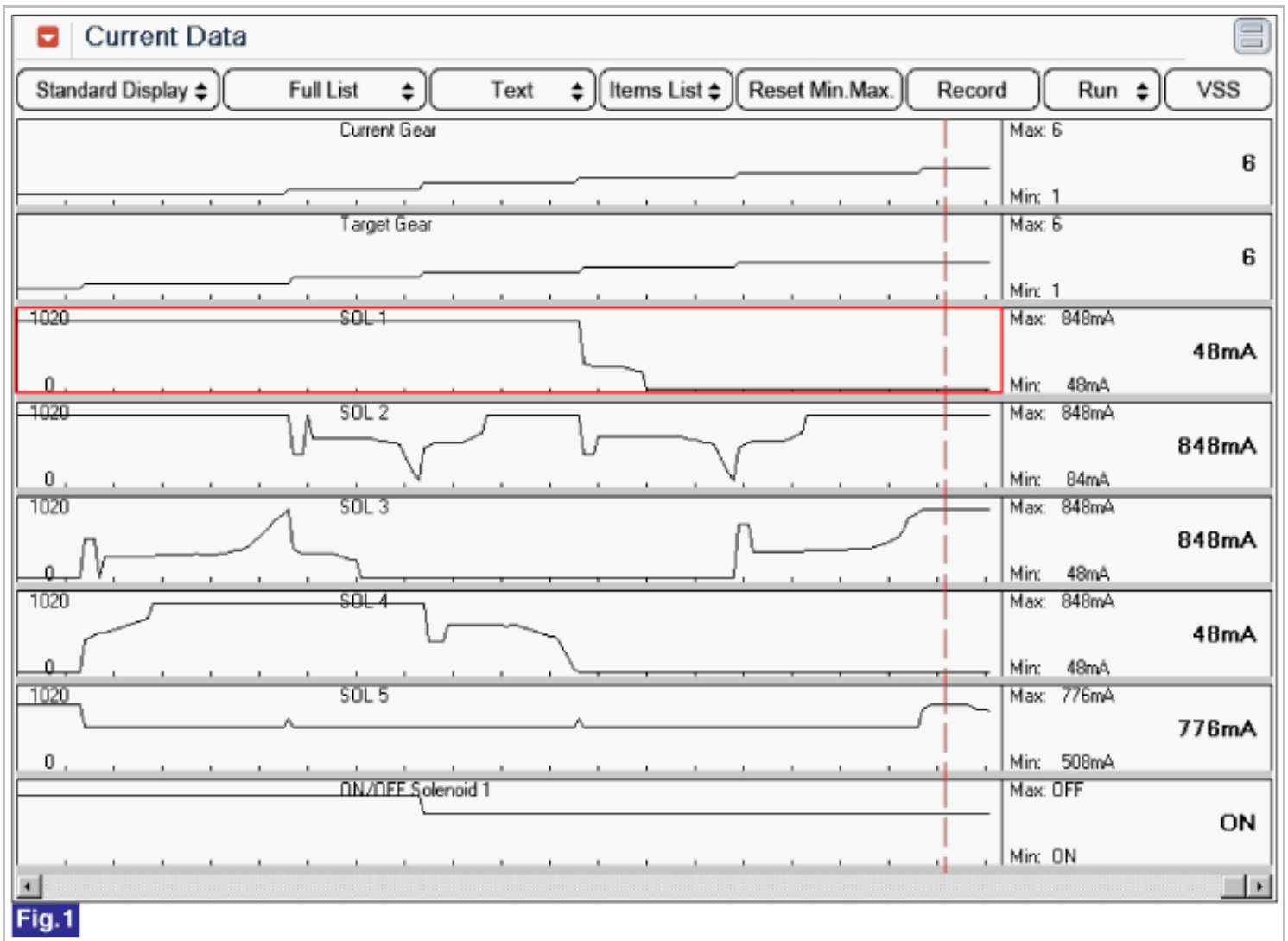


Fig 1) Shift control solenoid valve

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Shift control solenoid valve(SOL 1)" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valves.

**Speaication** : 48mA ~ 848mA

### Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-

D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control

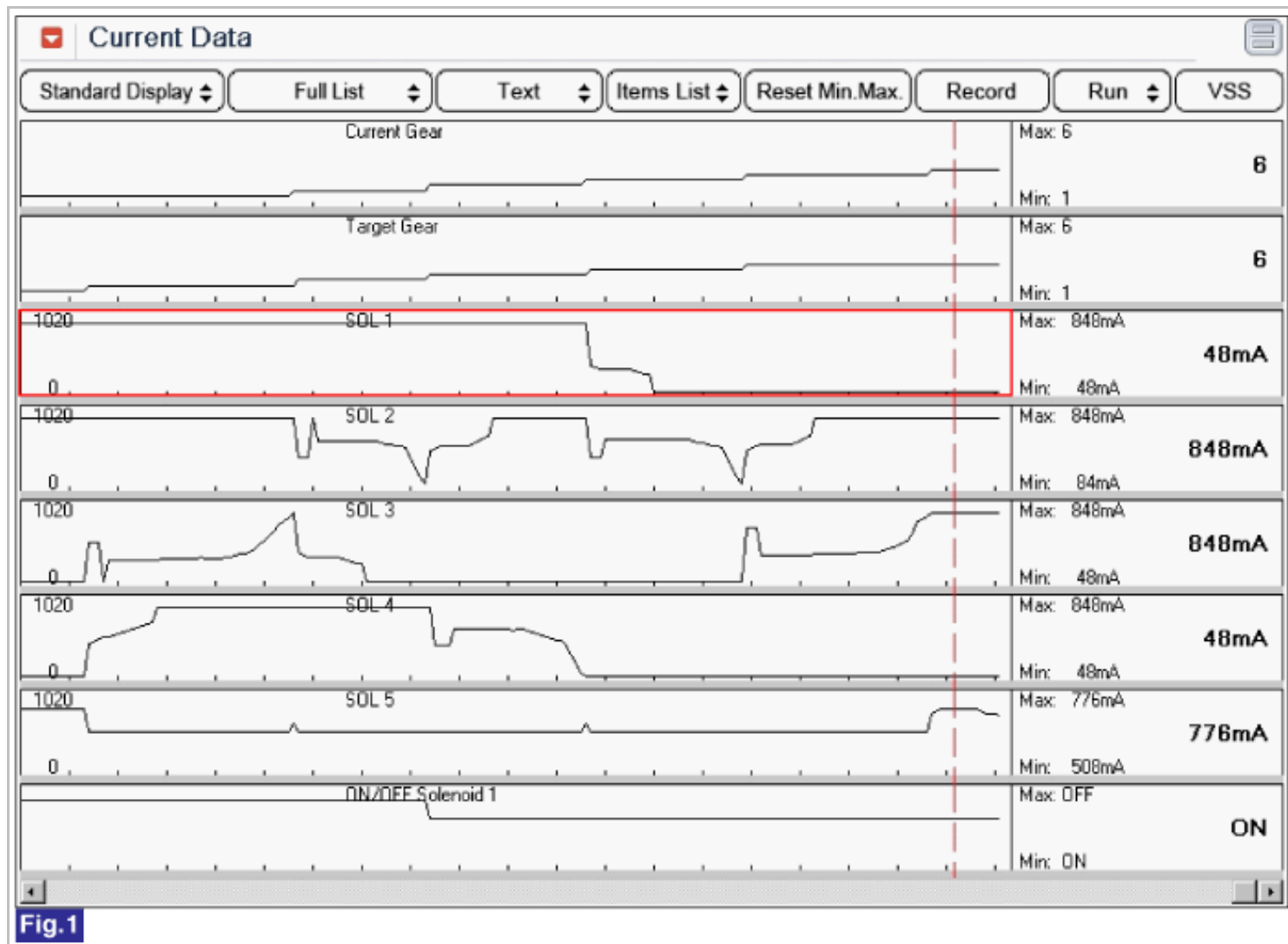


Fig 1) Shift control solenoid valve

5. Dose "Shift control solenoid valve(SOL 1)" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.

3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C ( 122 °F) and 120°C ( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C ( 122 °F) and 120°C ( 248 °F), initial learning can not be performed.

Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear.

Keep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal normally. Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times. (Not necessary N-D, N-R Learning)

## Verification of Vehicle Repair

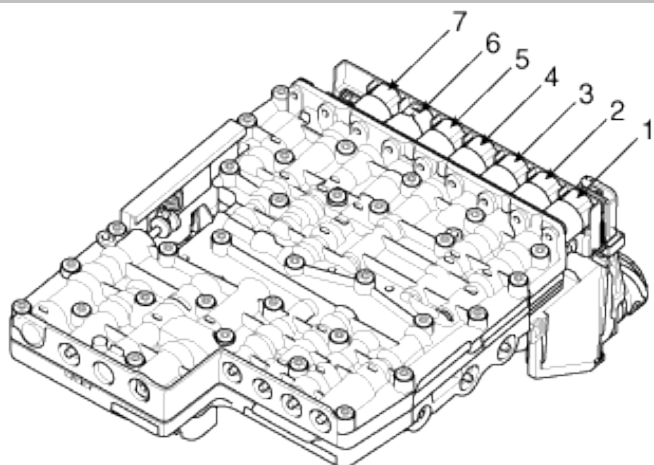
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure.
<b>NO</b>	▶ System performing to specification at this time.

**Automatic Transmission System > Automatic Transmission System > P0754 Shift Control Solenoid Valve 'A' - Open or Short to ground(SOL1-Clutch 'A' - Normal / Low)**

## Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

## General Description

Shift control solenoid valve is not supply oil pressure usually,TCM output electric signal to solenoid valve then oil pressure supplied to Clutch "A". Solenoid3(Brake C), Solenoid6(Torque convertor clutch) are same type solenoid valve.

## DTC Description

TCM set this code If detected short to ground / open for solenoid valve circuit.(MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Short to ground / open	• Mechatronics(E-module + Valvebody)
Enable Conditions	• Supply voltage > 8,7V • Voltage drop at FET ≤ 1V • Supply voltage ≥ 8.7V	
Threshold Value	• Short to ground / open	
Diagnostic Time	• 0.05second	
Fail Safe	• High speed : fixed at 5th gear, low speed : fixed at 3rd gear. • Reverse : Shift lock(Push "Unlock button → possible to shift) (priority : 3)	

## CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

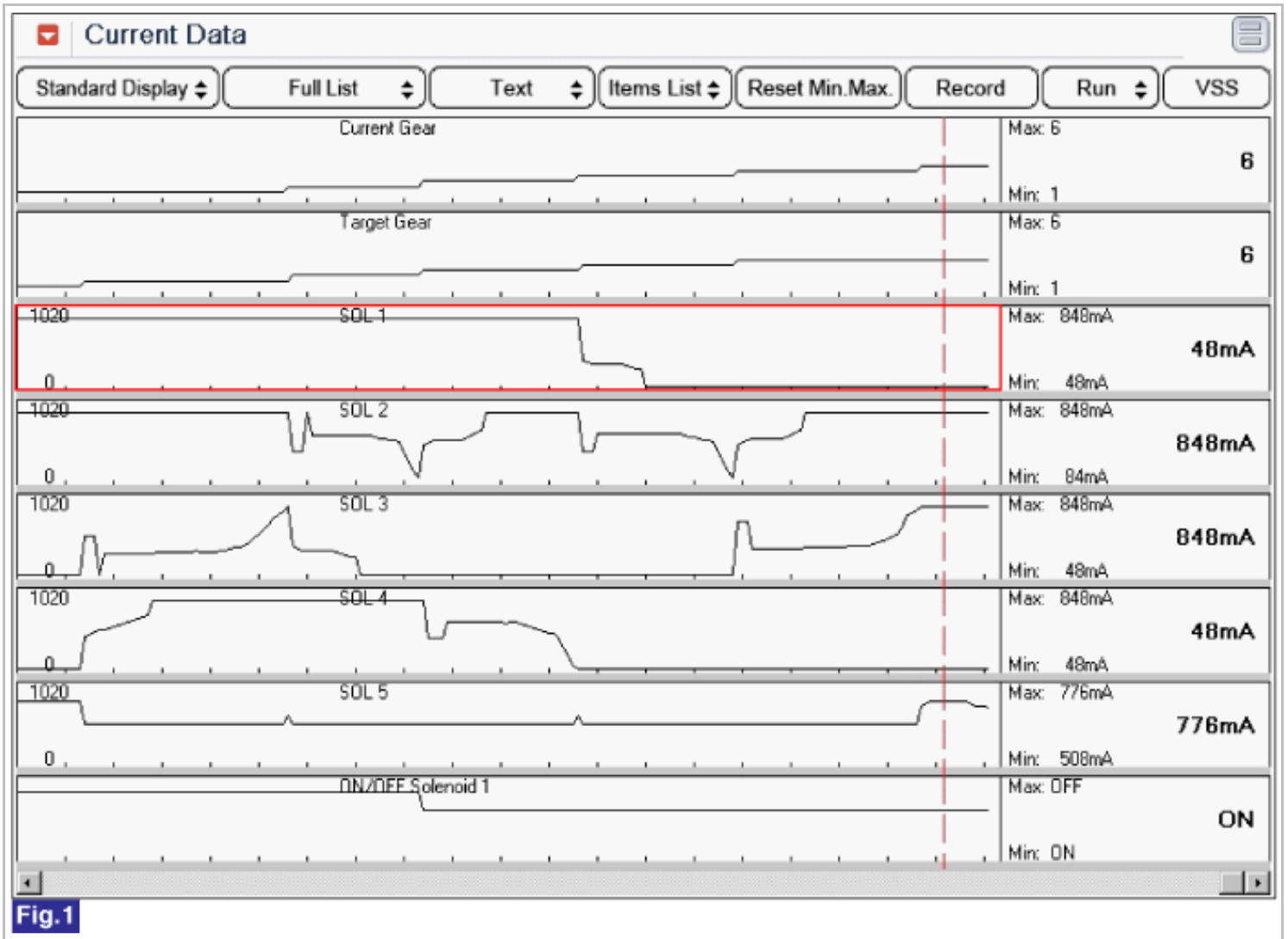


Fig 1) Shift control solenoid valve

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Shift control solenoid valve(SOL 1)" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valves.

**Speaication** : 48mA ~ 848mA

### Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-

D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control

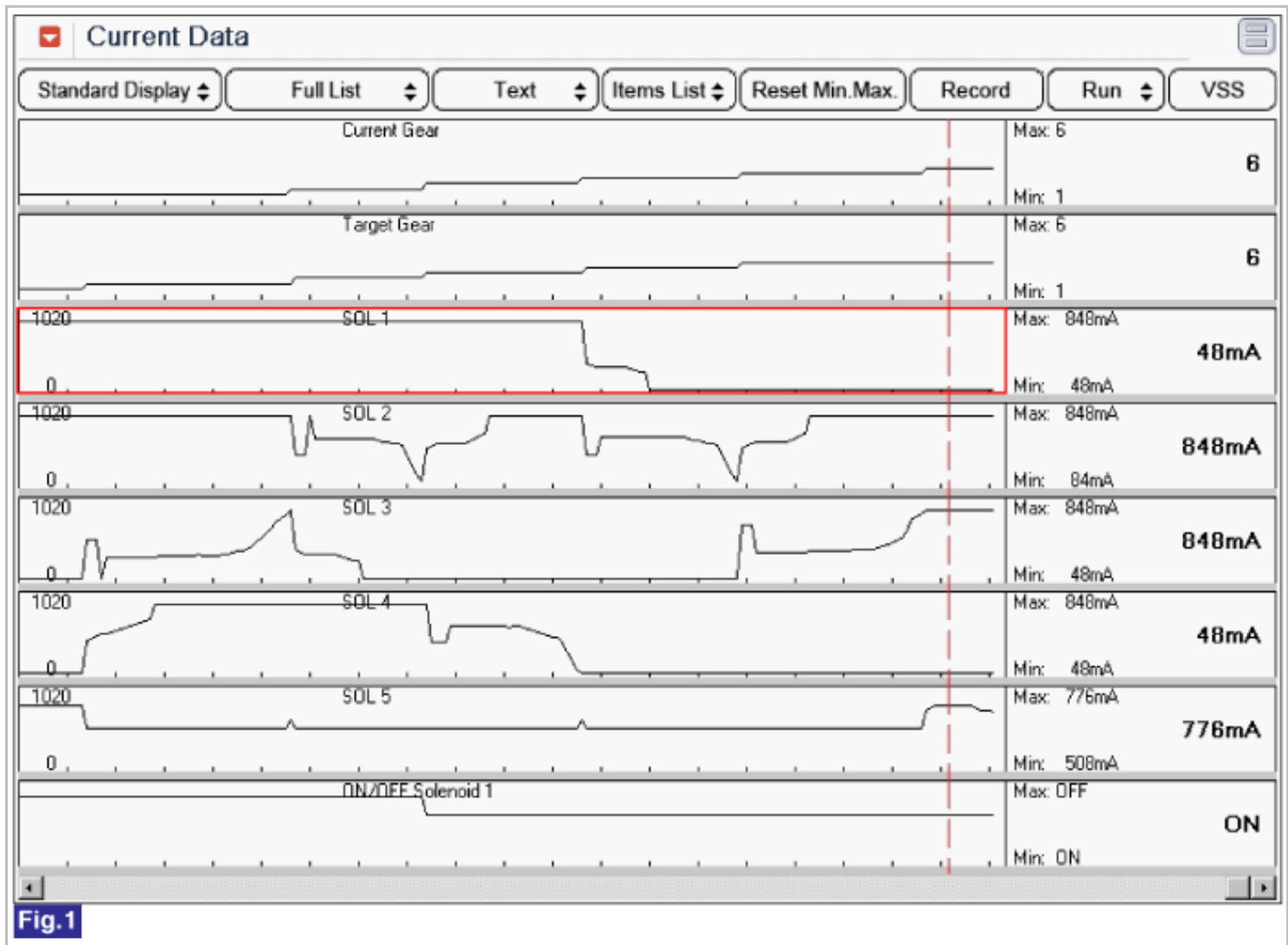


Fig 1) Shift control solenoid valve

5. Dose "Shift control solenoid valve(SOL 1)" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".

2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed.

Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear.

Keep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal normally. Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

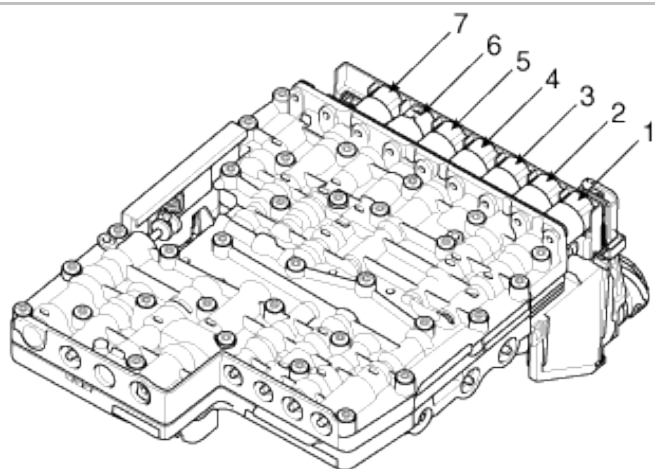
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure.
<b>NO</b>	▶ System performing to specification at this time.

**Automatic Transmission System > Automatic Transmission System > P0756 Shift Control Solenoid Valve 'B' Performance or Stuck Off(SOL2)**

## Component Location





1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

## General Description

Shift control solenoid valve is supply oil pressure usually,TCM output "ON" signal to solenoid valve then oil pressure not supplied to Clutch "B". Solenoid4(Clutch E & Brake D), Solenoid5(Line pressure) are same type solenoid valve. If electrical power source not supplied to all of solenoid valve, the oil pressure supplied to 3 solenoid valves and shift gear is fixed at 3rd gear as mechanical operation.

## DTC Description

TCM set this code If detected short to ground / open for solenoid valve circuit.(MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item		Detecting Condition	Possible Cause
DTC Strategy	CASE1	• Check function	• Mechatronics(E-module + Valvebody)
	CASE2	• Check the voltage and current	
Enable Conditions		• Solenoid OFF status	
Threshold Value	CASE1	• Current < (850 - 120) mA	
	CASE2	• Electric leakage of current	
Diagnostic Time		• 0.05second	
Fail Safe		<ul style="list-style-type: none"> <li>• High speed : fixed at 5th gear, low speed : fixed at 3rd gear</li> <li>• Reverse : Shift lock(Push "Unlock button → possible to shift) (priority :3)</li> </ul>	

### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.

4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

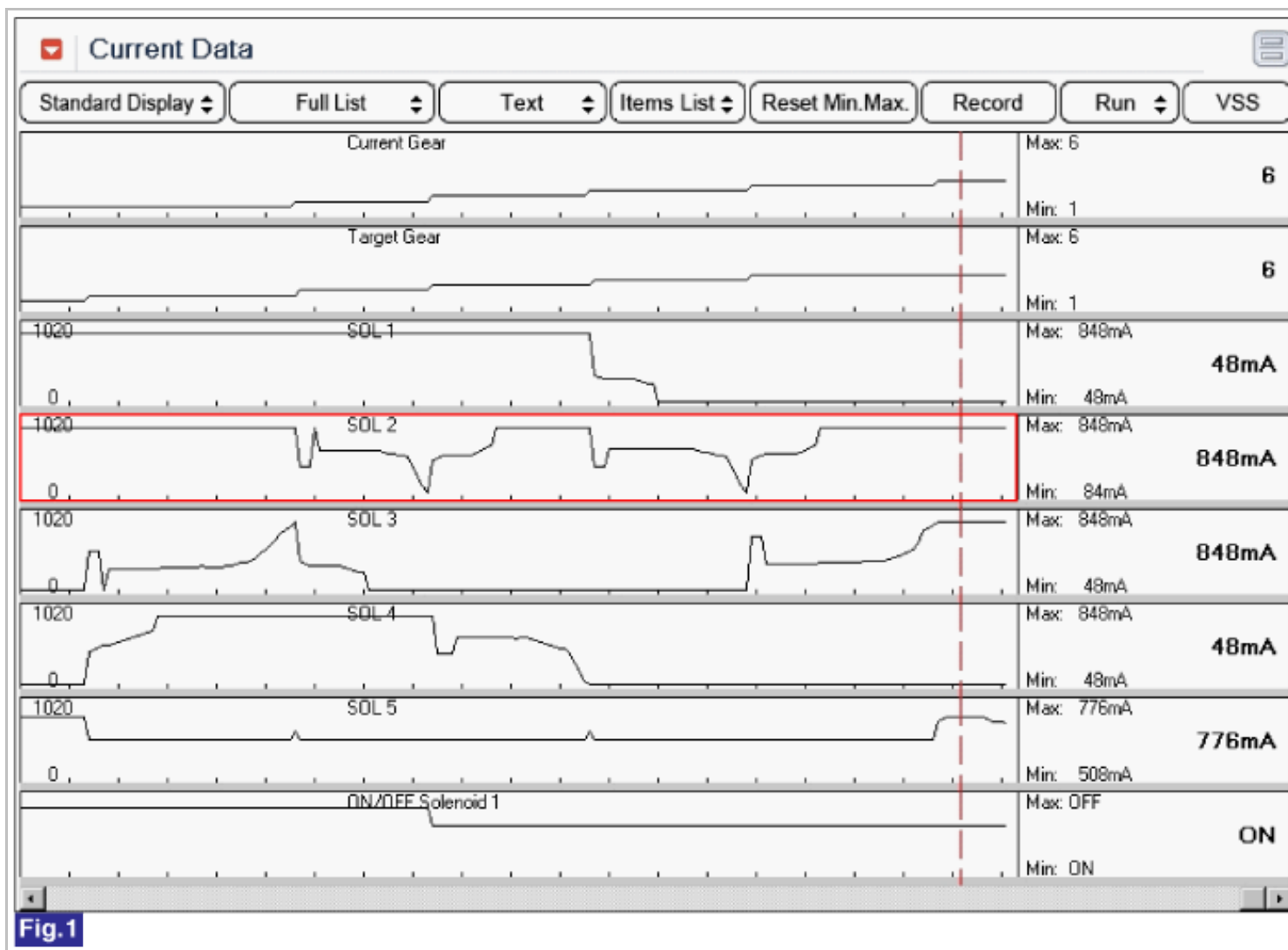


Fig 1) Shift control solenoid valve

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Shift control solenoid valve(SOL 2)" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valves.

**Speaication** : 48mA ~ 848mA

### Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF

N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control

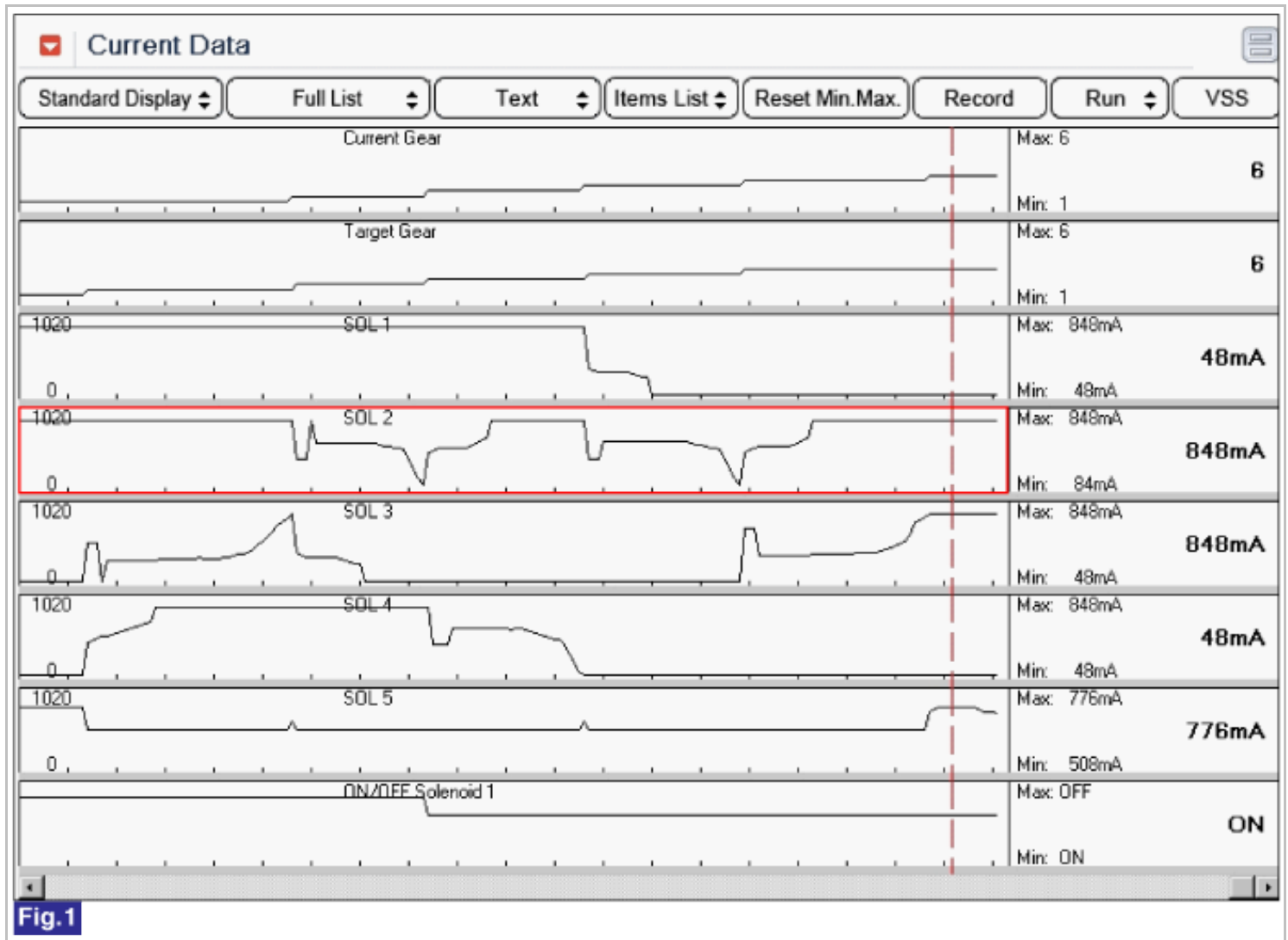


Fig 1) Shift control solenoid valve

5. Dose "Shift control solenoid valve(SOL 2)" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

#### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

#### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal normally. Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

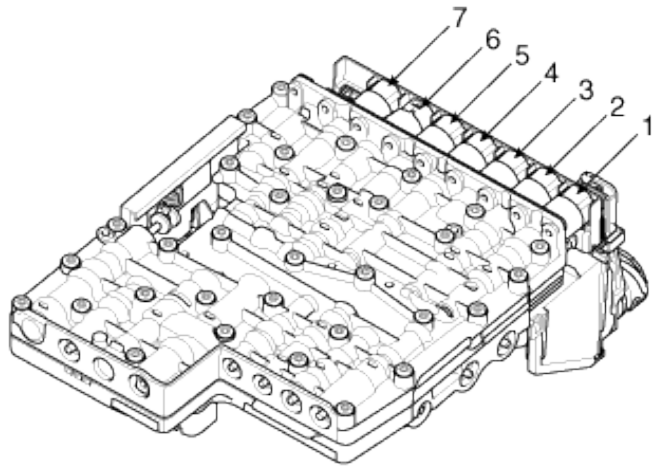
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure.
<b>NO</b>	▶ System performing to specification at this time.

## Solenoid Valve 'B' - Short to battery (SOL2-Clutch B : Normal / High)

### Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

### General Description

Shift control solenoid valve is supply oil pressure usually,TCM output "ON" signal to solenoid valve then oil pressure not supplied to Clutch "B". Solenoid4(Clutch E & Brake D), Solenoid5(Line pressure) are same type solenoid valve. If electrical power source not supplied to all of solenoid valve, the oil pressure supplied to 3 solenoid valves and shift gear is fixed at 3rd gear as mechanical operation.

### DTC Description

TCM set this code If detected short to battery for solenoid valve circuit.(MIL ON : 2 driving Cycle)

### DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Short to battery	• Mechatronics(E-module + Valvebody)
Enable Conditions	• Supply voltage > 8,7V	
Threshold Value	• Short to battery	
Diagnostic Time	• 0.05second	
Fail Safe	• Maximum line pressure control(D : 14kg/cm <sup>2</sup> , R : 20kg/cm <sup>2</sup> ) • No learning control (priority : 3)	

### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical

standpoint it is the only safe condition.

## Signal Waveform & Data

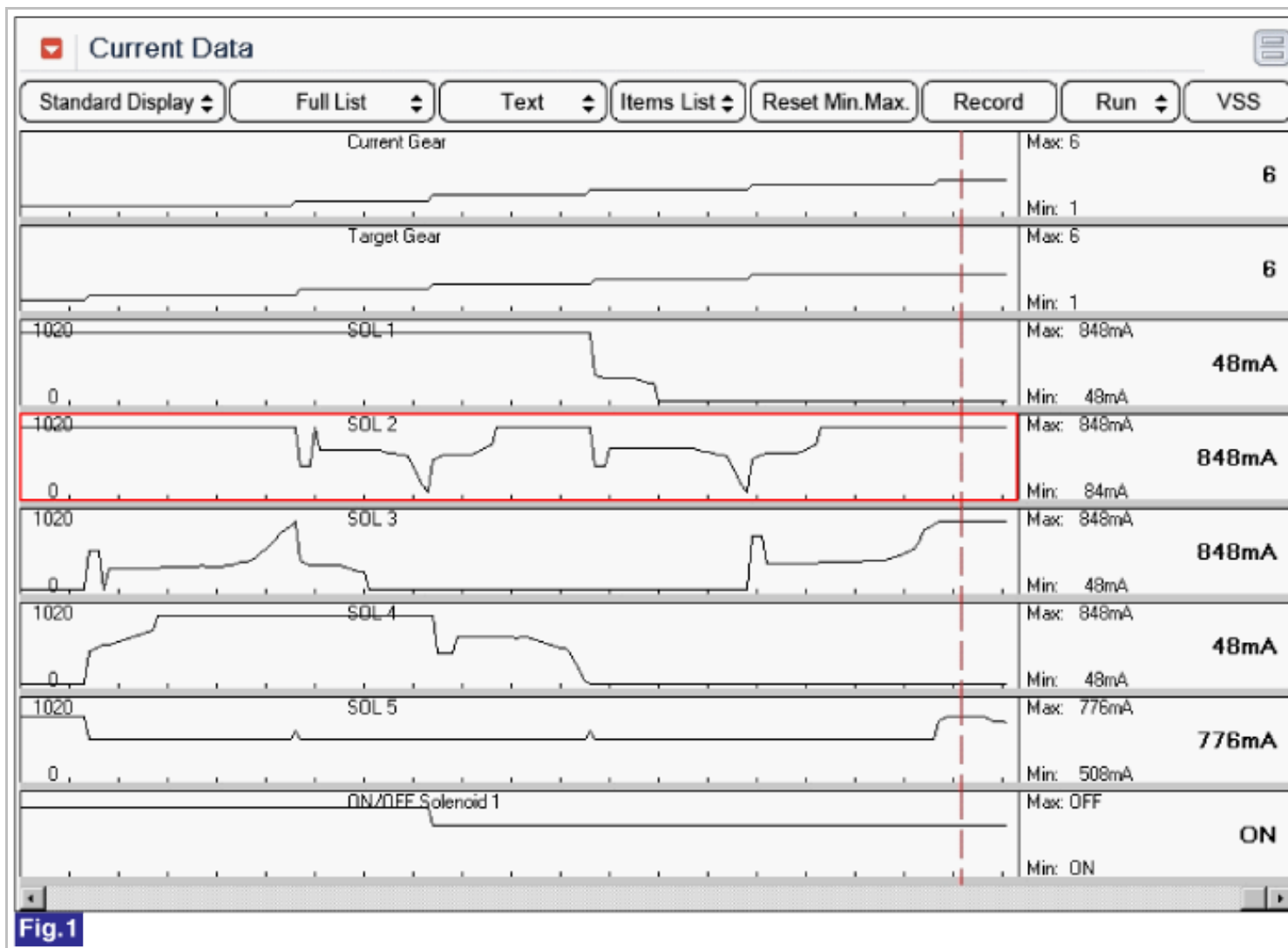


Fig 1) Shift control solenoid valve

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Shift control solenoid valve(SOL 2)" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valves.

**Speaication** : 48mA ~ 848mA

**Solenoid valve operating status according to gear position**

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF

N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control

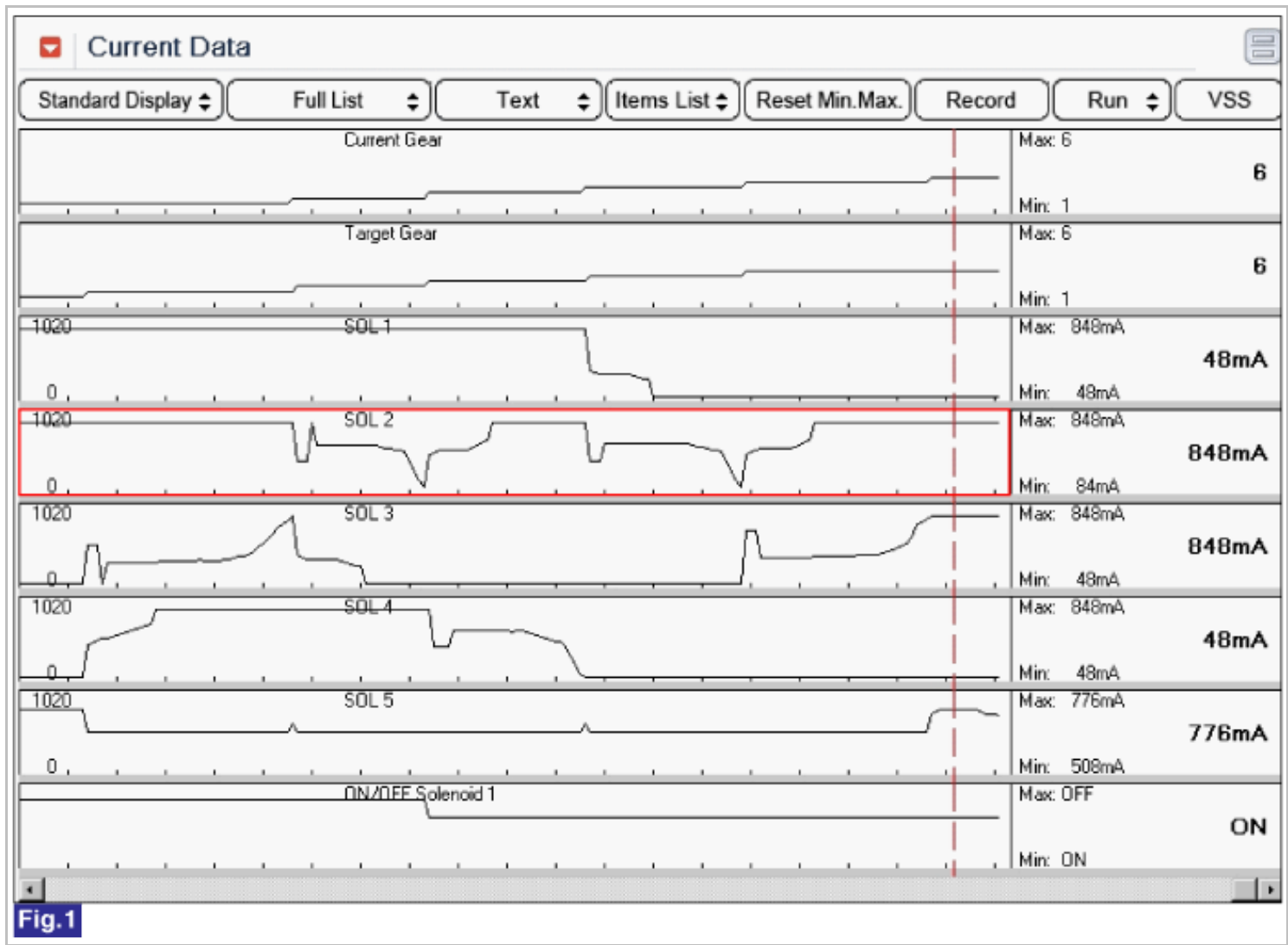


Fig 1) Shift control solenoid valve

5. Dose "Shift control solenoid valve(SOL 2)" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

#### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

#### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal normally. Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

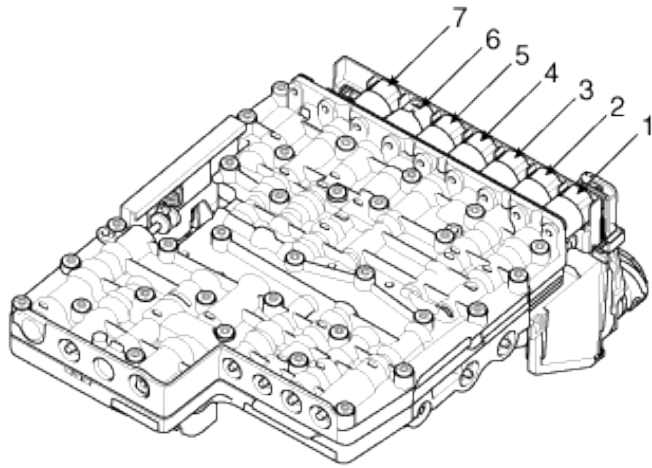
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure.
<b>NO</b>	▶ System performing to specification at this time.



## Solenoid Valve 'B' Intermittent(SOL2)

### Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

### General Description

Shift control solenoid valve is supply oil pressure usually,TCM output "ON" signal to solenoid valve then oil pressure not supplied to Clutch "B". Solenoid4(Clutch E & Brake D), Solenoid5(Line pressure) are same type solenoid valve. If electrical power source not supplied to all of solenoid valve, the oil pressure supplied to 3 solenoid valves and shift gear is fixed at 3rd gear as mechanical operation.

### DTC Description

TCM set this code If detected short to ground / open for solenoid valve circuit.(MIL ON : 2 driving Cycle)

### DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Short to ground / open	• Mechatronics(E-module + Valvebody)
Enable Conditions	• Voltage drop at the voltage regulator $\leq 1V$ • Supply voltage $\geq 8.7V$	
Threshold Value	• Short to ground / open	
Diagnostic Time	• 0.05second	
Fail Safe	• High speed : fixed at 5th gear, low speed : fixed at 3rd gear. • Reverse : Shift lock(Push "Unlock button → possible to shift) (priority : 3)	

#### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-

- priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

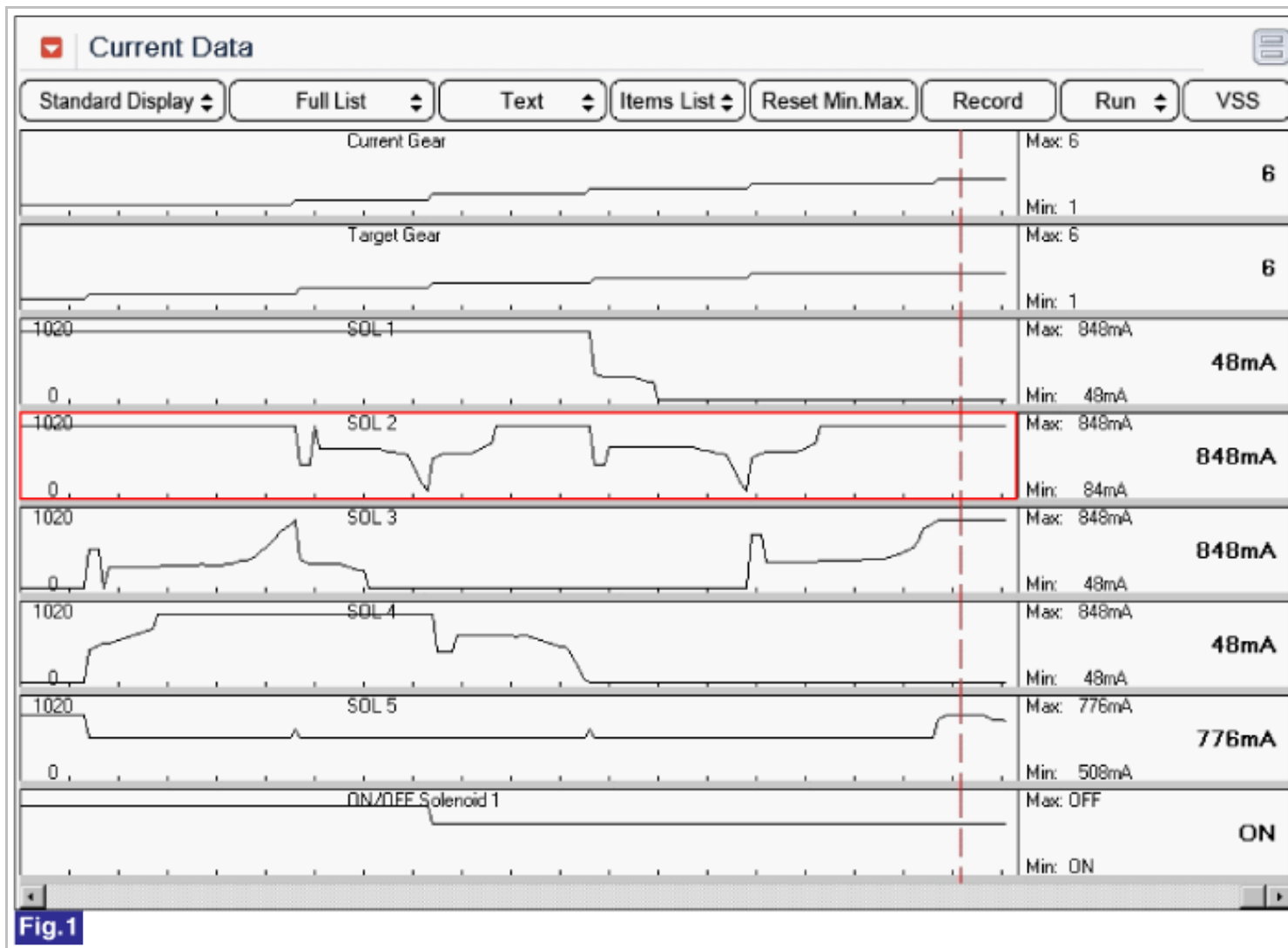


Fig 1) Shift control solenoid valve

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Shift control solenoid valve(SOL 2)" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valves.

**Speaication** : 48mA ~ 848mA

### Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF

R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control

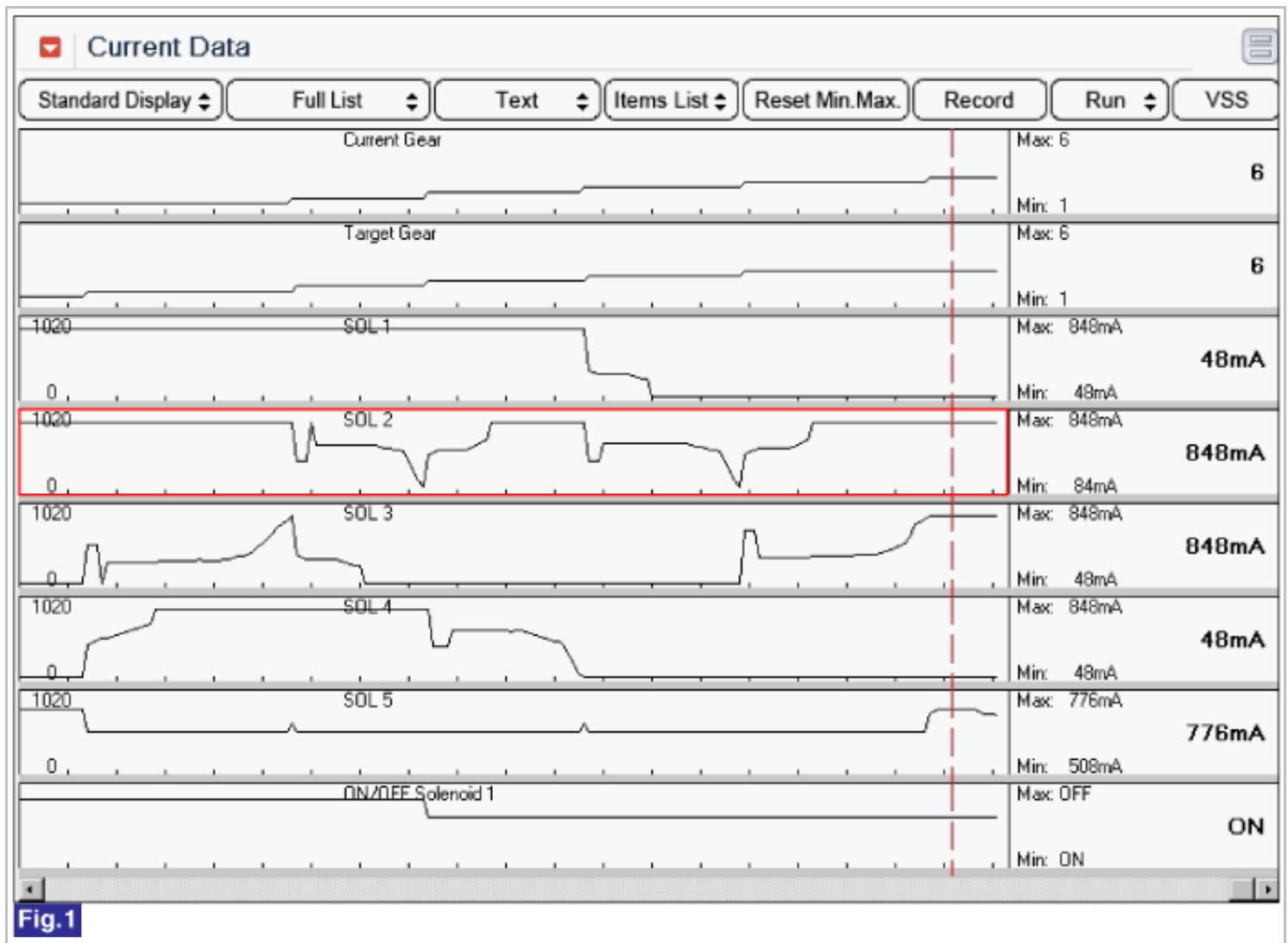


Fig 1) Shift control solenoid valve

5. Dose "Shift control solenoid valve(SOL 2)" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

#### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed.

Before learning, check for variable speed shock or shift shock.

#### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear.

RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal normally. Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

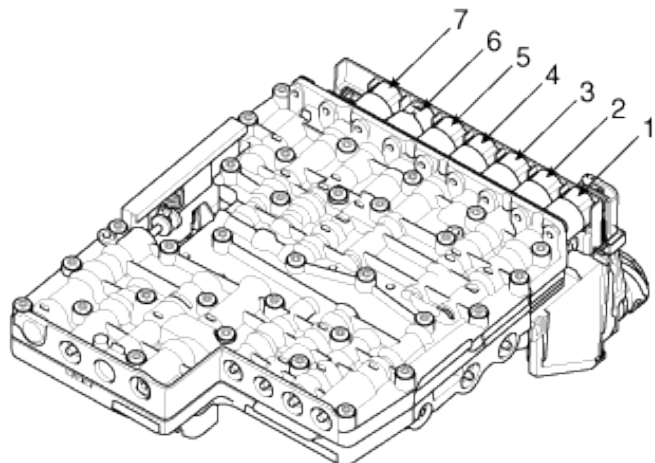
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure.
<b>NO</b>	▶ System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0761 Shift Control Solenoid Valve 'C' Performance or Stuck Off(SOL3)

### Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

### General Description

Shift control solenoid valve is not supply oil pressure usually,TCM output electric signal to solenoid valve then oil pressure supplied to Clutch "C". Solenoid1(Brake A), Solenoid6(Torque convertor clutch) are same type solenoid valve.

### DTC Description

TCM set this code If detected open/short to ground in circuit.(MIL ON : 2 driving Cycle)

### DTC Detecting Condition

Item		Detecting Condition	Possible Cause
DTC Strategy	CASE1	• Check function	• Mechatronics(E-module + Valvebody)
	CASE2	• Check the voltage and current	
Enable Conditions		• Solenoid OFF status	
Threshold Value	CASE1	• Current > 50+170mA	
	CASE2	• Electric leakage of current	
Diagnostic Time		• 0.05second	
Fail Safe		• High speed : fixed at 5th gear, low speed : fixed at 3rd gear • Reverse : Shift lock(Push "Unlock button → possible to shift) (priority :3)	

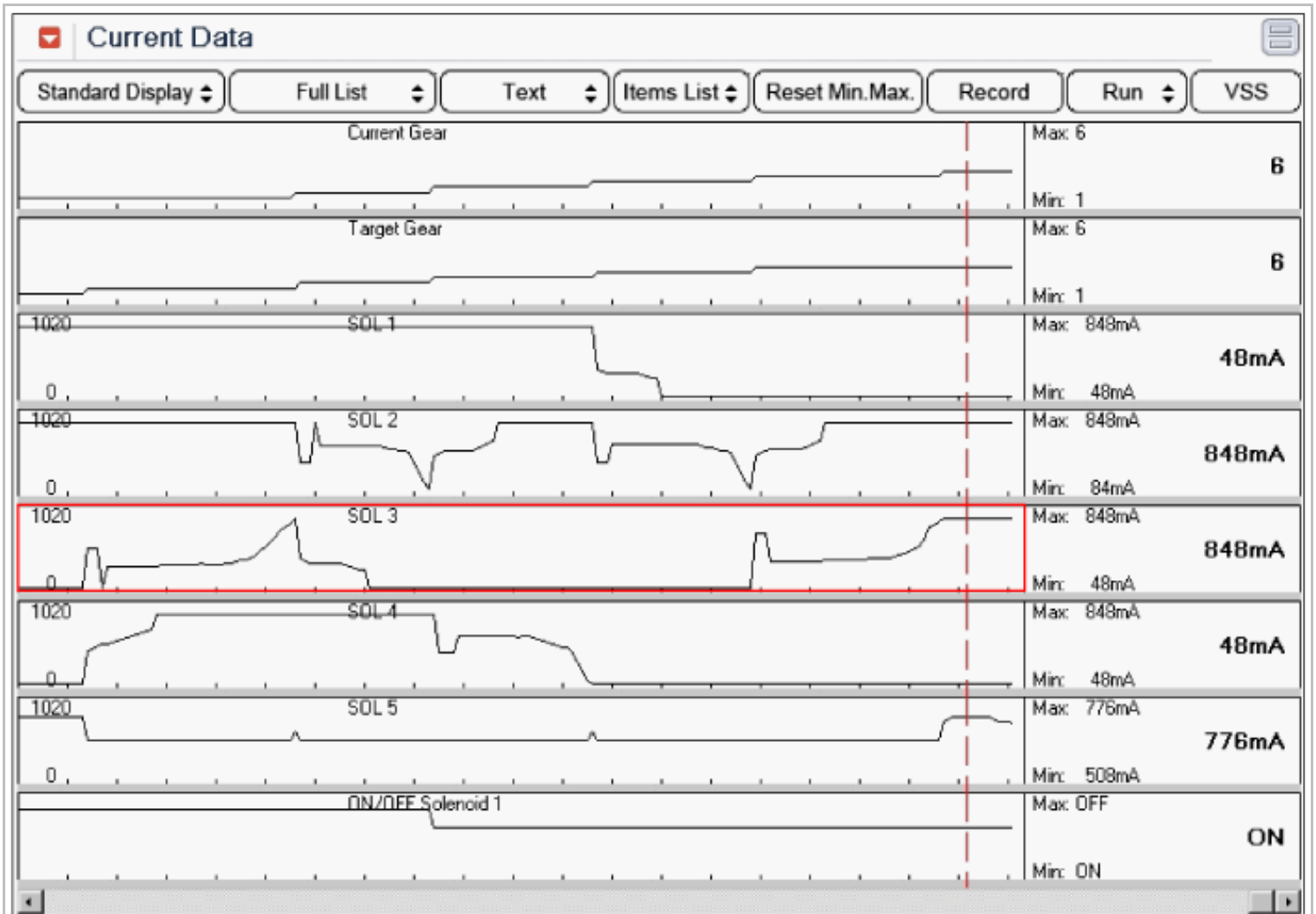
### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will

take precedence in this case.

3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data



**Fig.1**

Fig 1) Shift control solenoid valve3

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Shift control solenoid valve(SOL 3)" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valves.

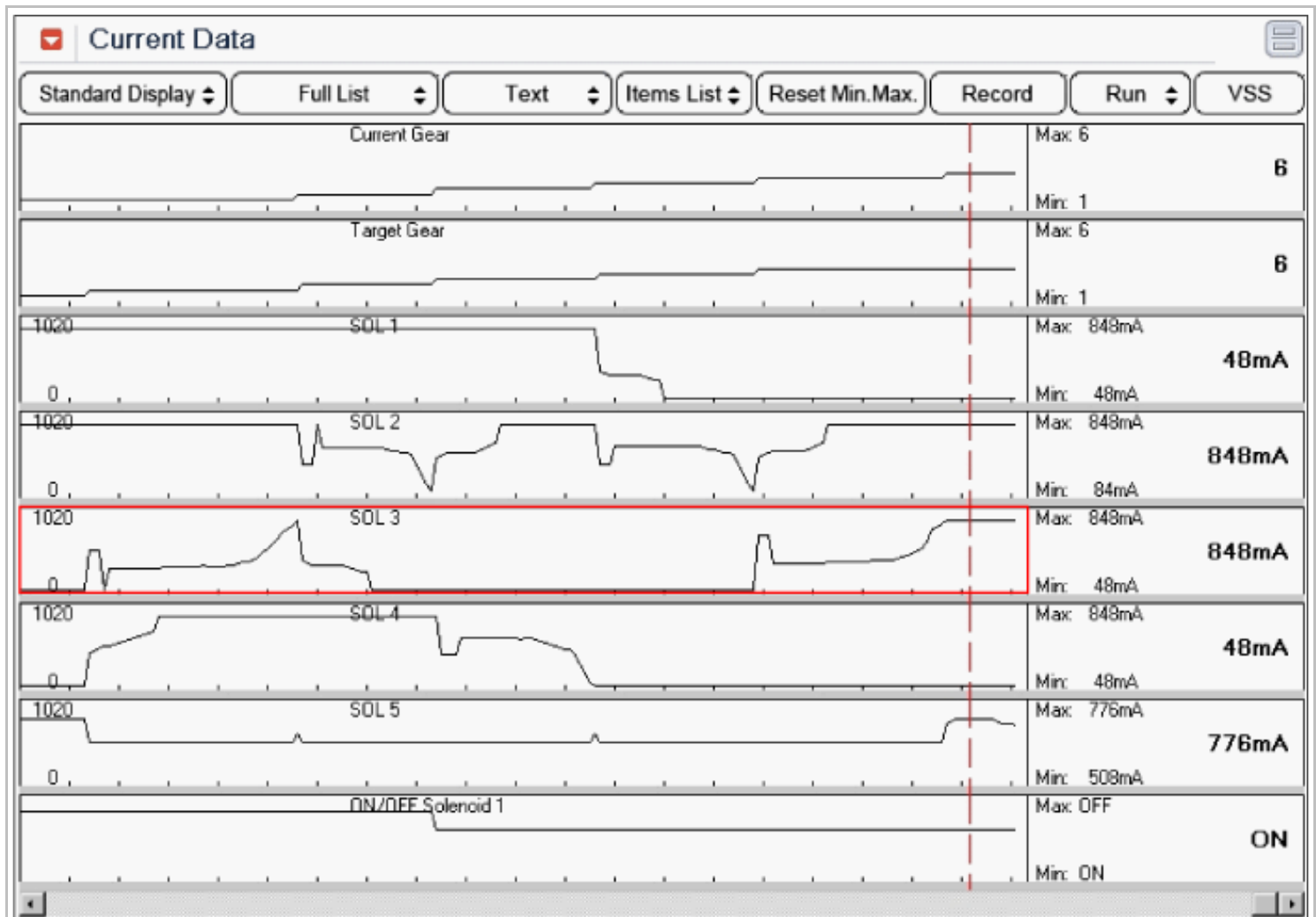
**Speaication** : 48mA ~ 848mA

**Solenoid valve operating status according to gear position**

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
---------------	---------	-------	-------	-------	--------	--------	--------

P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control



**Fig.1**

Fig 1) Shift control solenoid valve3

5. Dose "Shift control solenoid valve(SOL 3)" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

#### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed.

Before learning, check for variable speed shock or shift shock.

#### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear.

Keep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal normally. Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

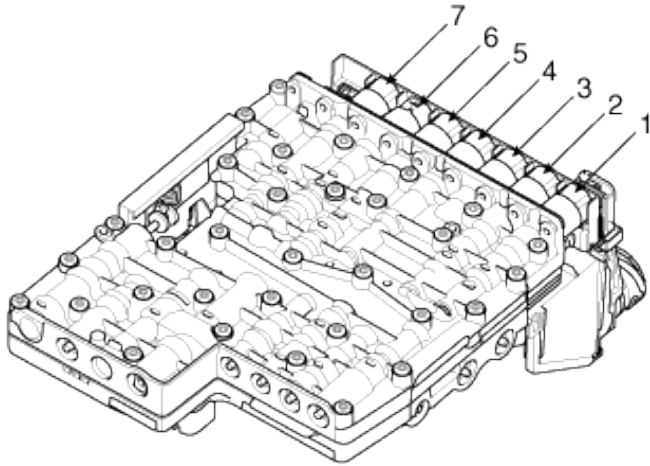
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure.
<b>NO</b>	▶ System performing to specification at this time.



## Automatic Transmission System > Automatic Transmission System > P0763 Shift Control Solenoid Valve 'C' - Short to battery (SOL3 - Brake 'C' : Normal / Low)

### Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

### General Description

Shift control solenoid valve is not supply oil pressure usually,TCM output electric signal to solenoid valve then oil pressure supplied to Clutch "C". Solenoid1(Brake A), Solenoid6(Torque convertor clutch) are same type solenoid valve.

### DTC Description

TCM set this code If detected short to battery for solenoid valve circuit.(MIL ON : 2 driving Cycle)

### DTC Detecting Condition

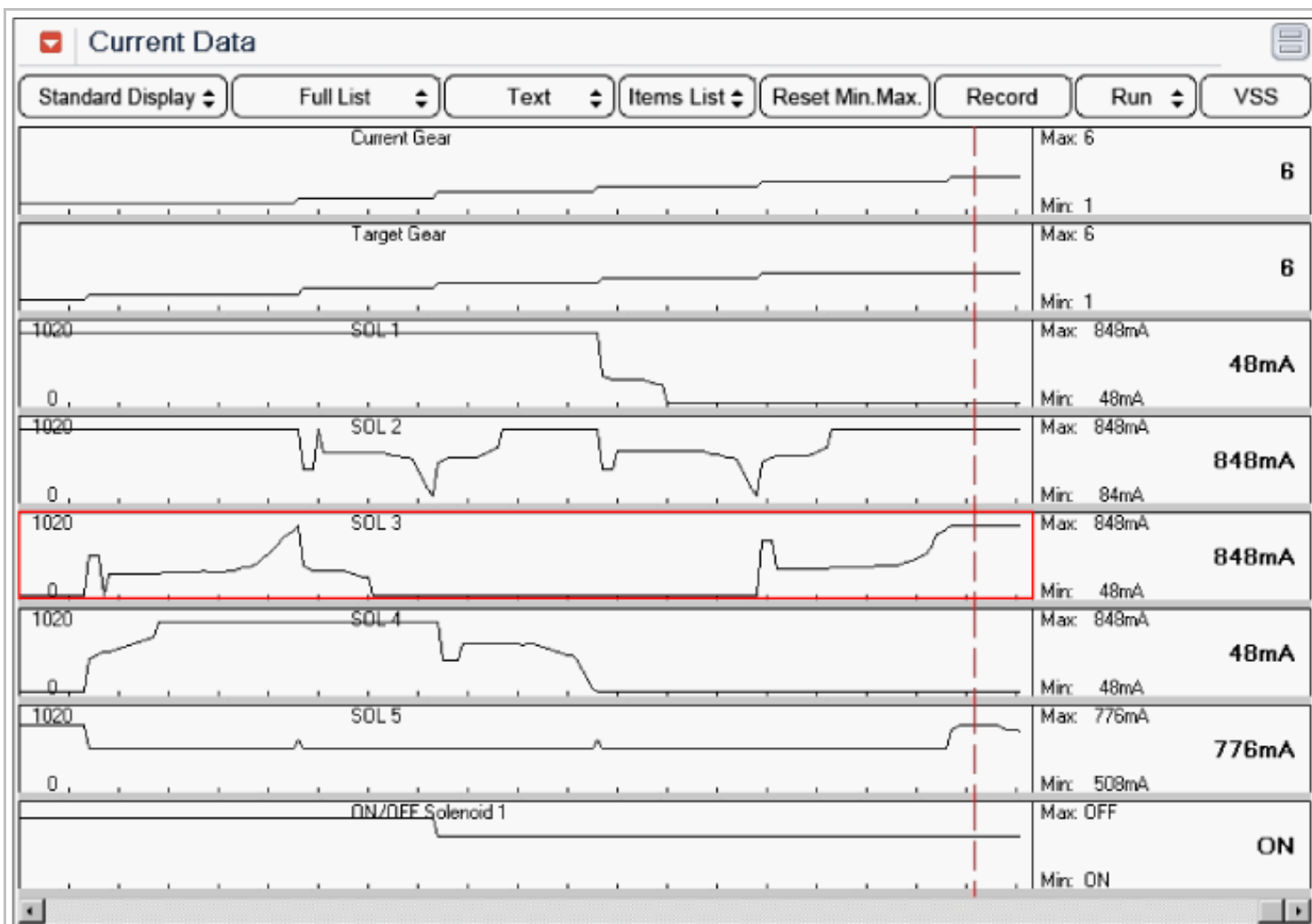
Item	Detecting Condition	Possible Cause
DTC Strategy	• short to battery	• Mechatronics(E-module + Valvebody)
Enable Conditions	• supply voltage > 8,7V	
Threshold Value	• short to battery	
Diagnostic Time	• 0.05second	
Fail Safe	• Maximum line pressure control(D : 14kg/cm <sup>2</sup> , R : 20kg/cm <sup>2</sup> ) • No learning control (priority :3).	

### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.

4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data



**Fig.1**

Fig 1) Shift control solenoid valve3

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Shift control solenoid valve(SOL 4)" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valve.

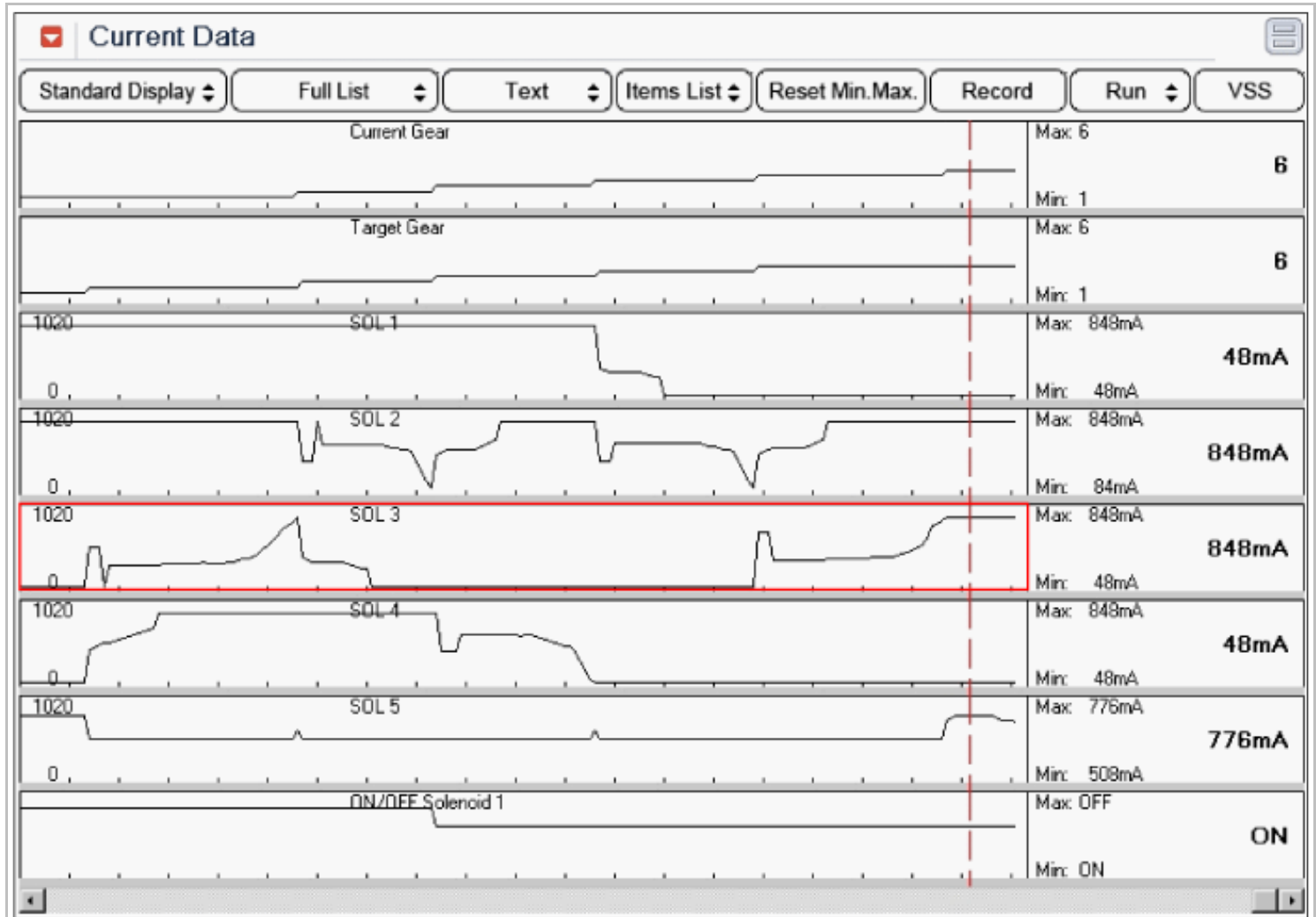
**Specification :** 48mA ~ 848mA

**Solenoid valve operating status according to gear position**

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF

N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control



**Fig.1**

Fig 1) Shift control solenoid valve3

5. Dose "Shift control solenoid valve(SOL 3)" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

#### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

#### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal normally. Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

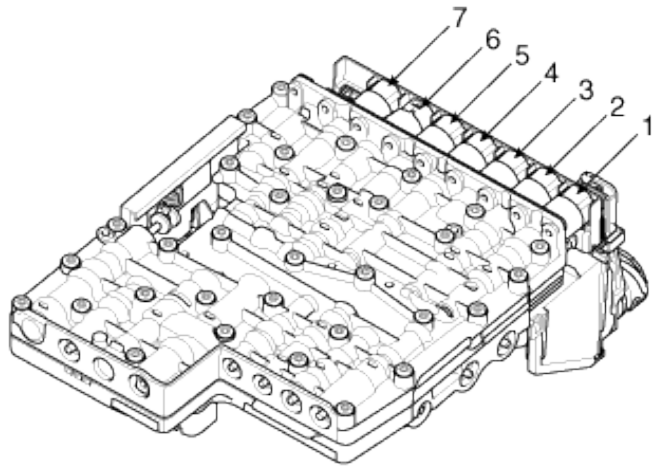
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure
<b>NO</b>	▶ System performing to specification at this time.

## Solenoid Valve 'C' -Open or Short to ground (SOL3 - Brake 'C' : Normal / Low)

### Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

### General Description

Shift control solenoid valve is not supply oil pressure usually,TCM output electric signal to solenoid valve then oil pressure supplied to Clutch "C". Solenoid1(Brake A), Solenoid6(Torque convertor clutch) are same type solenoid valve.

### DTC Description

TCM set this code If detected short to ground / open for solenoid valve circuit.(MIL ON : 2 driving Cycle)

### DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• short to ground / open	• Mechatronics(E-module + Valvebody)
Enable Conditions	• Voltage drop at the voltage regulator $\leq 1V$ • supply voltage $> 8.7V$	
Threshold Value	• short to ground / open	
Diagnostic Time	• 0.05second	
Fail Safe	• high speed : fixed at 5th gear, low speed : fixed at 3rd gear. • Reverse : Shift lock(Push "Unlock button → possible to shift) (priority :3).	

#### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical

standpoint it is the only safe condition.

## Signal Waveform & Data

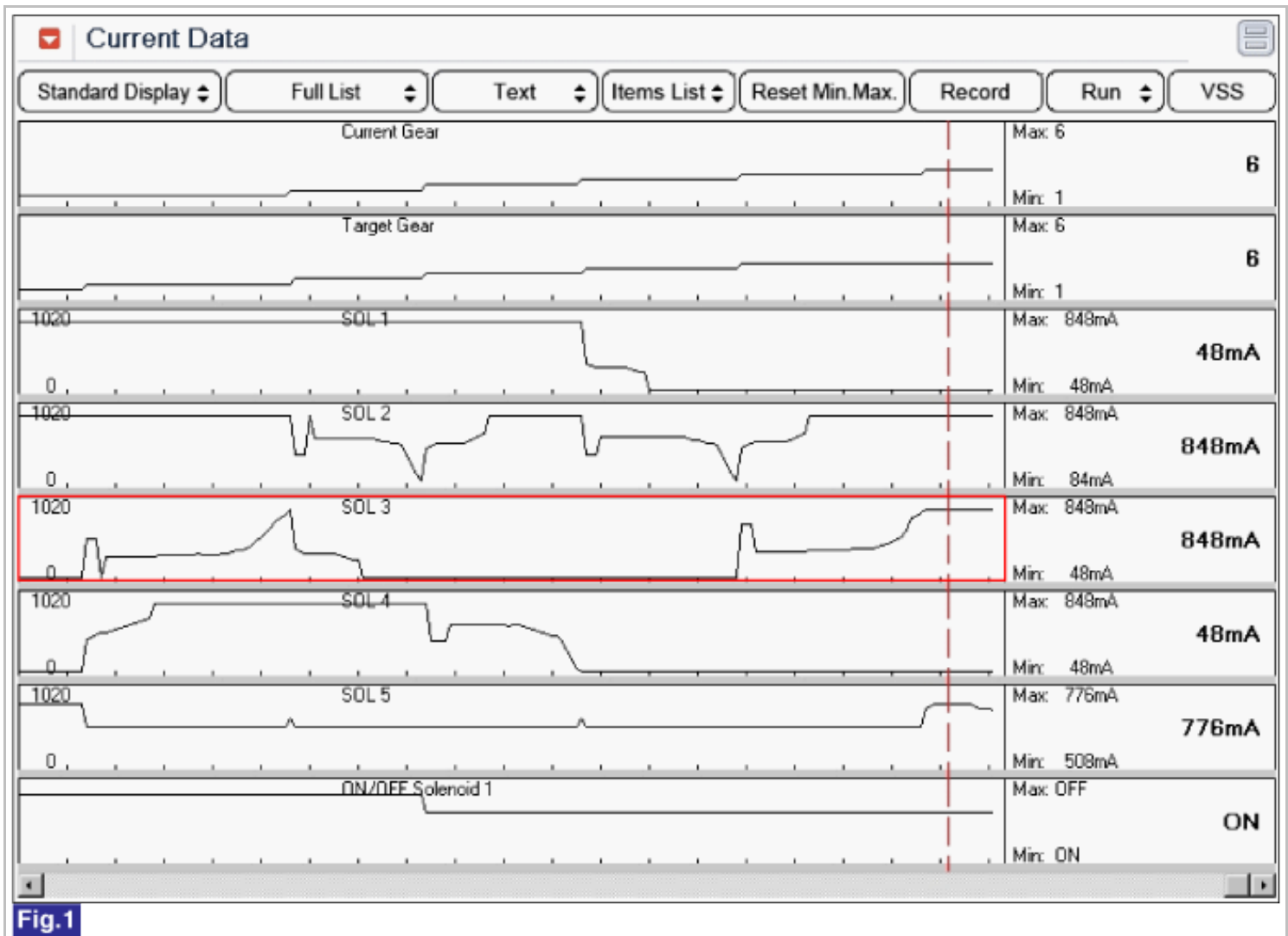


Fig 1 ) Shift control solenoid valve3

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Shift control solenoid valve(SOL 4)" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valve.

**Specification :** 48mA ~ 848mA

**Solenoid valve operating status according to gear position**

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF

N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control

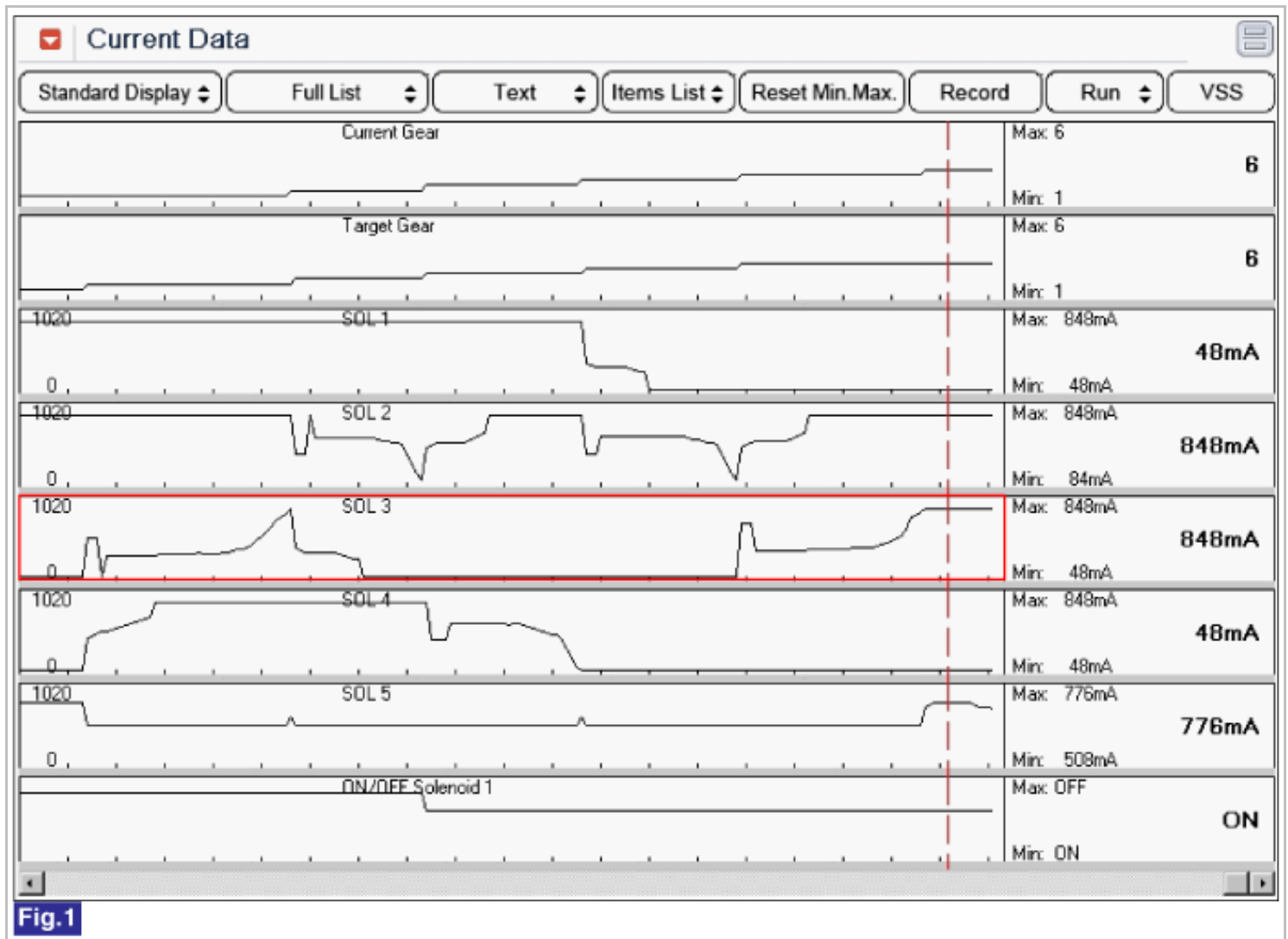


Fig 1) Shift control solenoid valve3

5. Dose "Shift control solenoid valve(SOL 3)" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

#### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

#### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal normally. Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

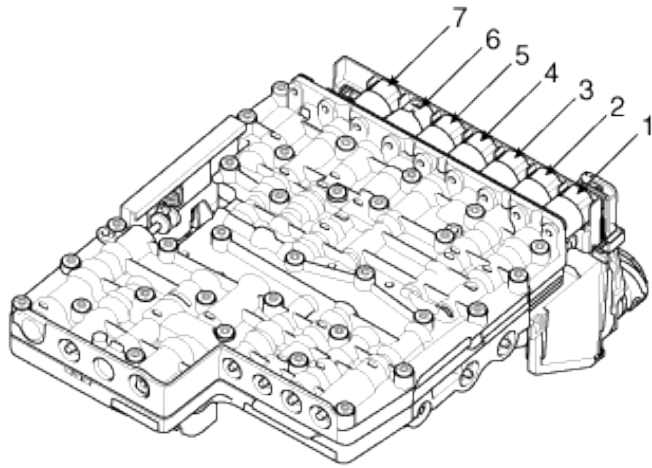
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure
<b>NO</b>	▶ System performing to specification at this time.



## Solenoid Valve 'D' Performance or Stuck Off(SOL4)

### Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

### General Description

Shift control solenoid valve is supply oil pressure usually,TCM output "ON" signal to solenoid valve then oil pressure not supplied to Clutch "B". Solenoid4(Clutch E & Brake D), Solenoid5(Line pressure) are same type solenoid valve. If electrical power source not supplied to all of solenoid valve, the oil pressure supplied to 3 solenoid valves and shift gear is fixed at 3rd gear as mechanical operation.

### DTC Description

TCM set this code If detected open/short to ground in circuit.(MIL ON : 2 driving Cycle)

### Diagnostic Circuit Diagram

Item		Detecting Condition	Possible Cause
DTC Strategy	CASE 1	• Check function.	• Mechatronics(E-module + Valvebody)
	CASE 2	• Check the voltage and current.	
Enable Conditions		• Solenoid OFF status	
Threshold Value	CASE 1	• Current < (850 - 120) mA	
	CASE 2	• Electric leakage of current	
Diagnostic Time		• 0.05second	
Fail Safe		• high speed : fixed at 5th gear, low speed : fixed at 3rd gear. • Reverse : Shift lock(Push "Unlock button → possible to shift) (priority :3)	

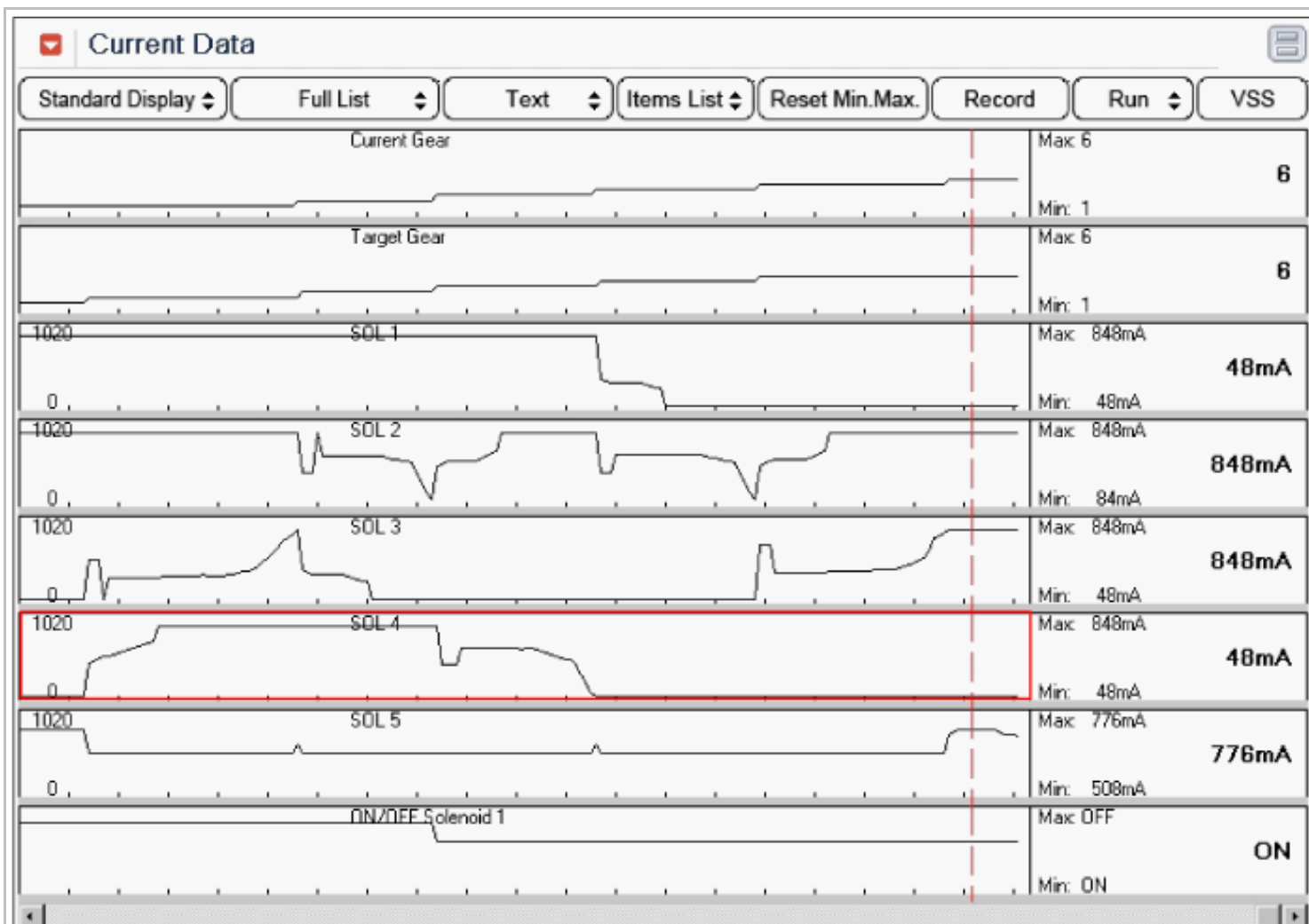
#### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will

take precedence in this case.

3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data



**Fig.1**

Fig 1) Shift control solenoid valve

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Shift control solenoid valve(SOL 4)" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valve.

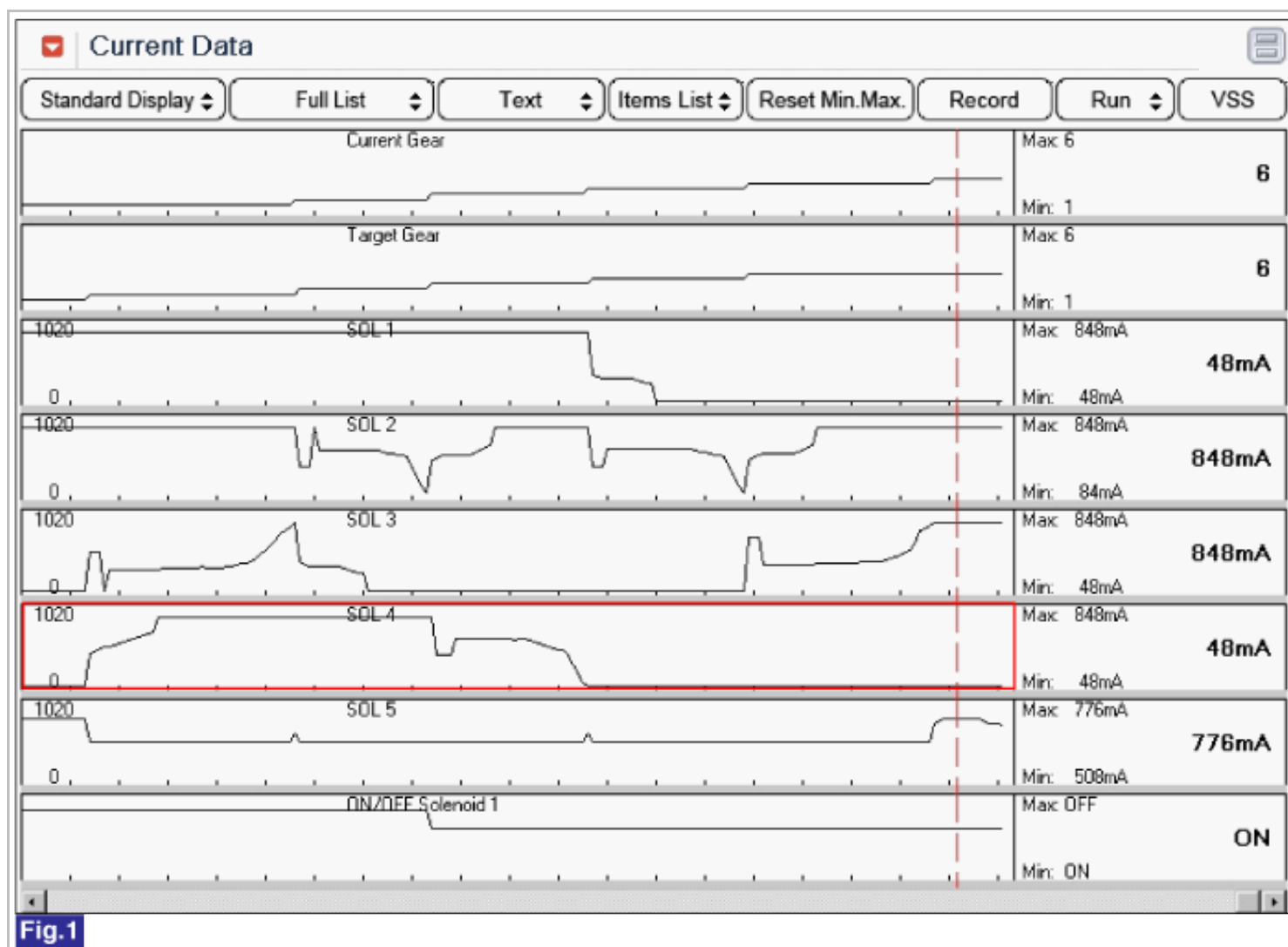
**Specification :** 48mA ~ 848mA

**Solenoid valve operating status according to gear position**

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
---------------	---------	-------	-------	-------	--------	--------	--------

P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control



**Fig.1**

Fig 1) Shift control solenoid valve

5. Dose "Shift control solenoid valve(SOL 4)" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

#### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed.

Before learning, check for variable speed shock or shift shock.

#### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear.

RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal normally. Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

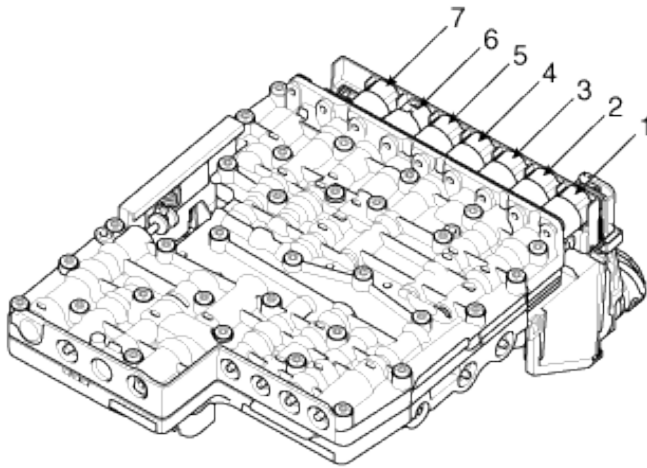
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure
<b>NO</b>	▶ System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0768 Shift Control Solenoid Valve 'D' - Short to battery (SOL4- Brake 'D', Clutch 'E' - Normal / High)

### Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

### General Description

Shift control solenoid valve is supply oil pressure usually,TCM output "ON" signal to solenoid valve then oil pressure not supplied to Clutch "B". Solenoid4(Clutch E & Brake D), Solenoid5(Line pressure) are same type solenoid valve. If electrical power source not supplied to all of solenoid valve, the oil pressure supplied to 3 solenoid valves and shift gear is fixed at 3rd gear as mechanical operation.

### DTC Description

TCM set this code If detected short to battery for solenoid valve circuit.(MIL ON : 2 driving Cycle)

### DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• short to battery	• Mechatronics(E-module + Valvebody)
Enable Conditions	• supply voltage > 8,7V	
Threshold Value	• short to battery	
Diagnostic Time	• 0.05second	
Fail Safe	• Maximum line pressure control(D : 14kg/cm <sup>2</sup> , R : 20kg/cm <sup>2</sup> ) • No learning control (priority :3)	

### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.

3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

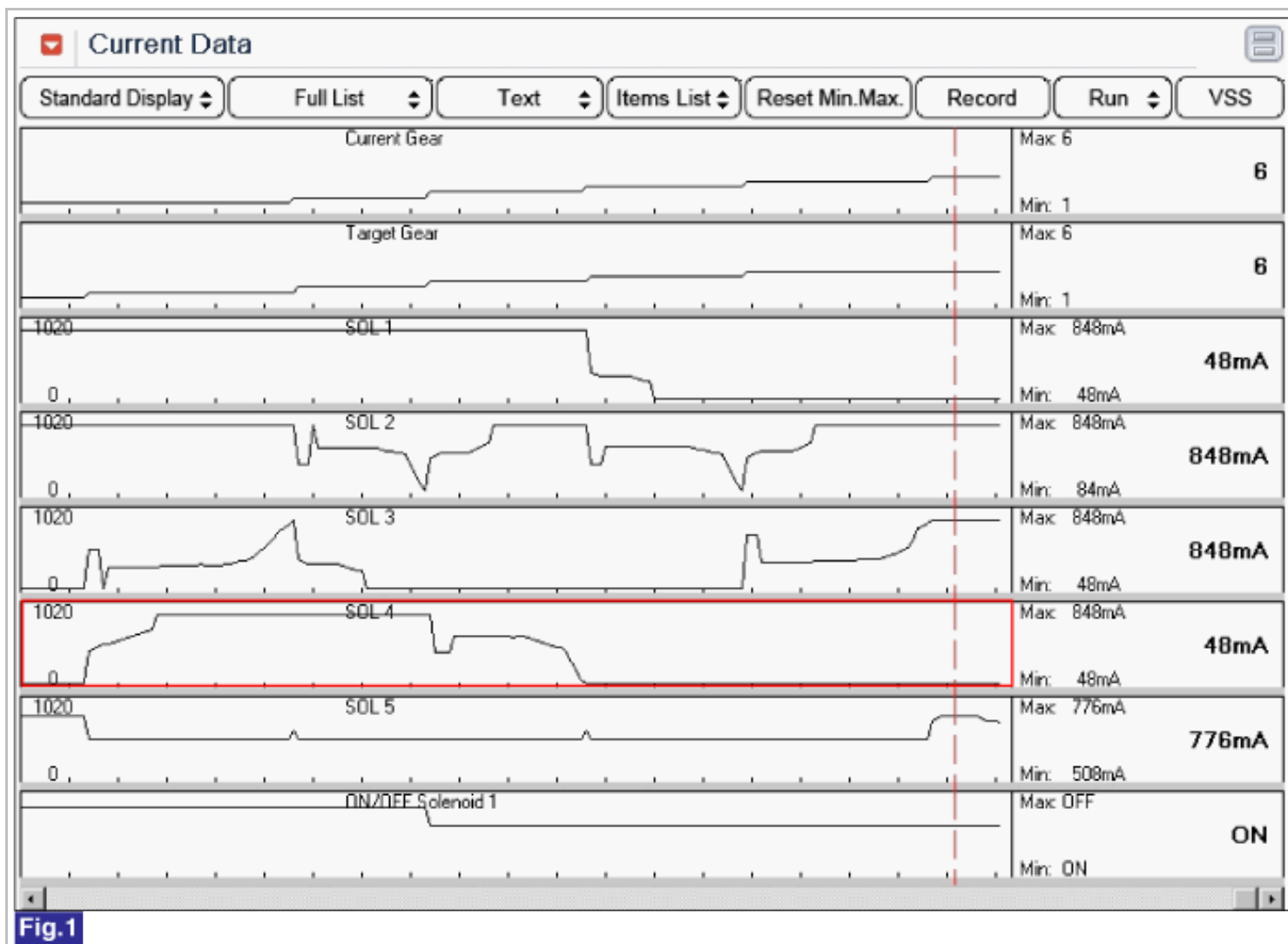


Fig 1 ) Shift control solenoid valve

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Shift control solenoid valve(SOL 4)" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valve.

**Specification :** 48mA ~ 848mA

**Solenoid valve operating status according to gear position**

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6

P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control

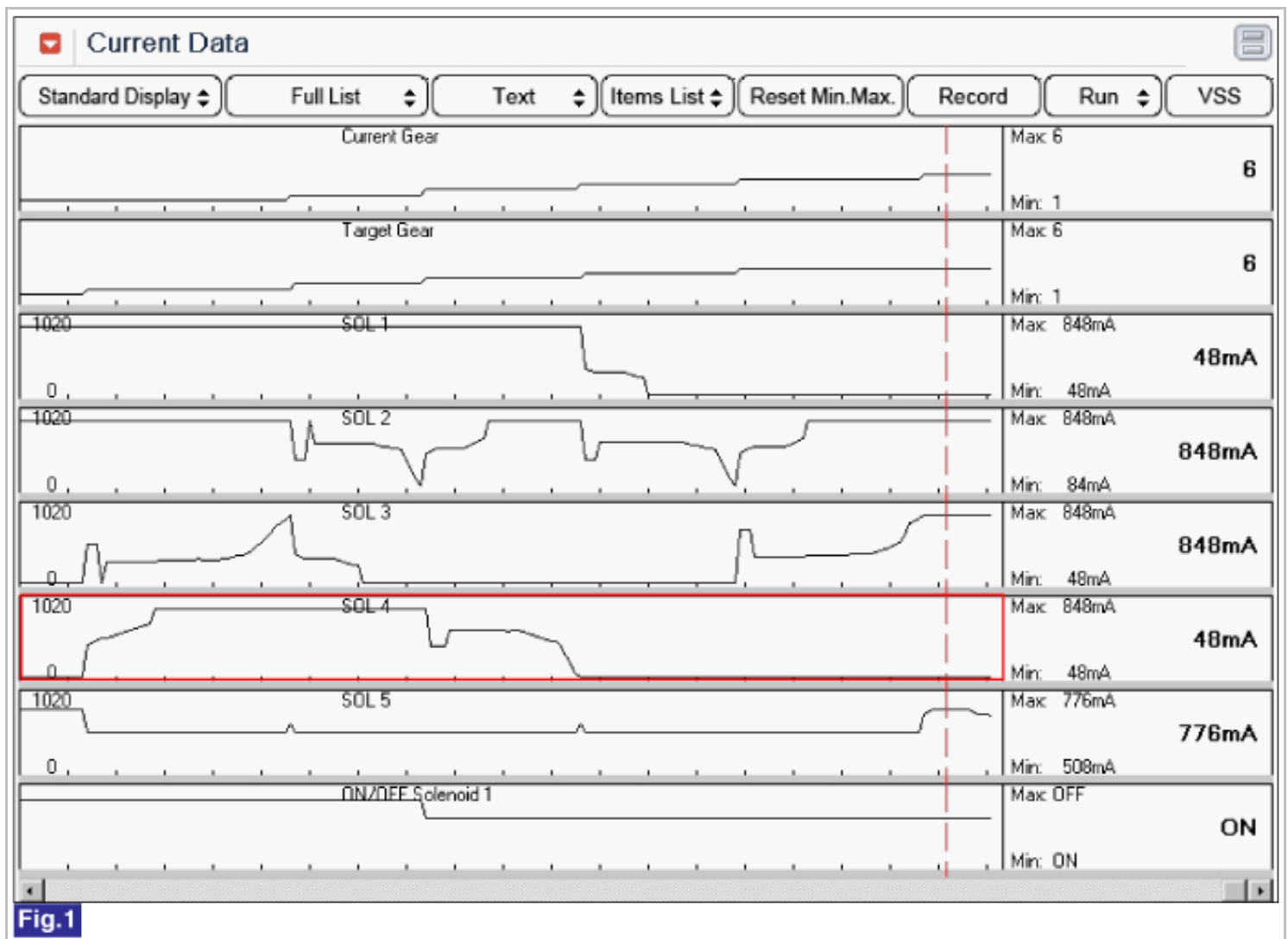


Fig 1) Shift control solenoid valve

5. Dose "Shift control solenoid valve(SOL 4)" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

#### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed.

Before learning, check for variable speed shock or shift shock.

#### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear.

RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal normally. Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

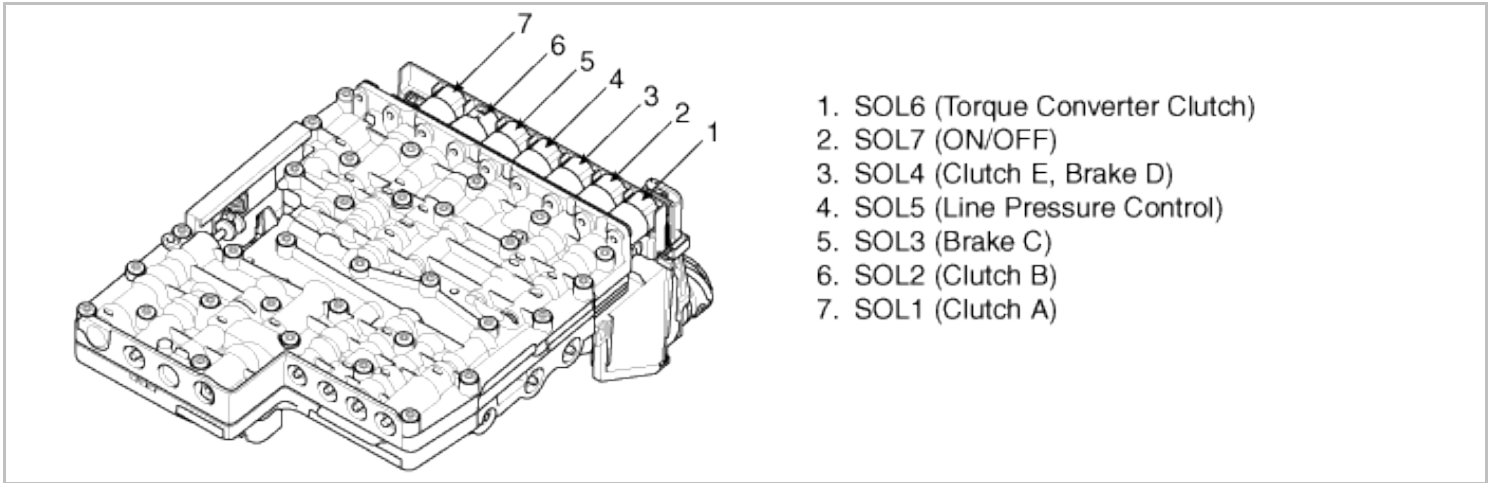
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure
<b>NO</b>	▶ System performing to specification at this time.



## Automatic Transmission System > Automatic Transmission System > P0769 Shift Control Solenoid Valve 'D' - Open or Short to ground (SOL4- Brake'D', Clutch'E' : Normal / High)

### Component Location



### Component Location

Shift control solenoid valve is supply oil pressure usually,TCM output "ON" signal to solenoid valve then oil pressure not supplied to Clutch "B". Solenoid4(Clutch E & Brake D), Solenoid5(Line pressure) are same type solenoid valve. If electrical power source not supplied to all of solenoid valve, the oil pressure supplied to 3 solenoid valves and shift gear is fixed at 3rd gear as mechanical operation.

### DTC Description

TCM set this code If detected short to ground / open for solenoid valve circuit.(MIL ON : 2 driving Cycle)

### DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• short to ground / open	• Mechatronics(E-module + Valvebody)
Enable Conditions	• Voltage drop at the voltage regulator $\leq 1V$ • supply voltage $> 8.7V$	
Threshold Value	• short to ground / open	
Diagnostic Time	• 0.05second	
Fail Safe	• high speed : fixed at 5th gear, low speed : fixed at 3rd gear. • Reverse : Shift lock(Push "Unlock button → possible to shift) (priority :3)	

#### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.

2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

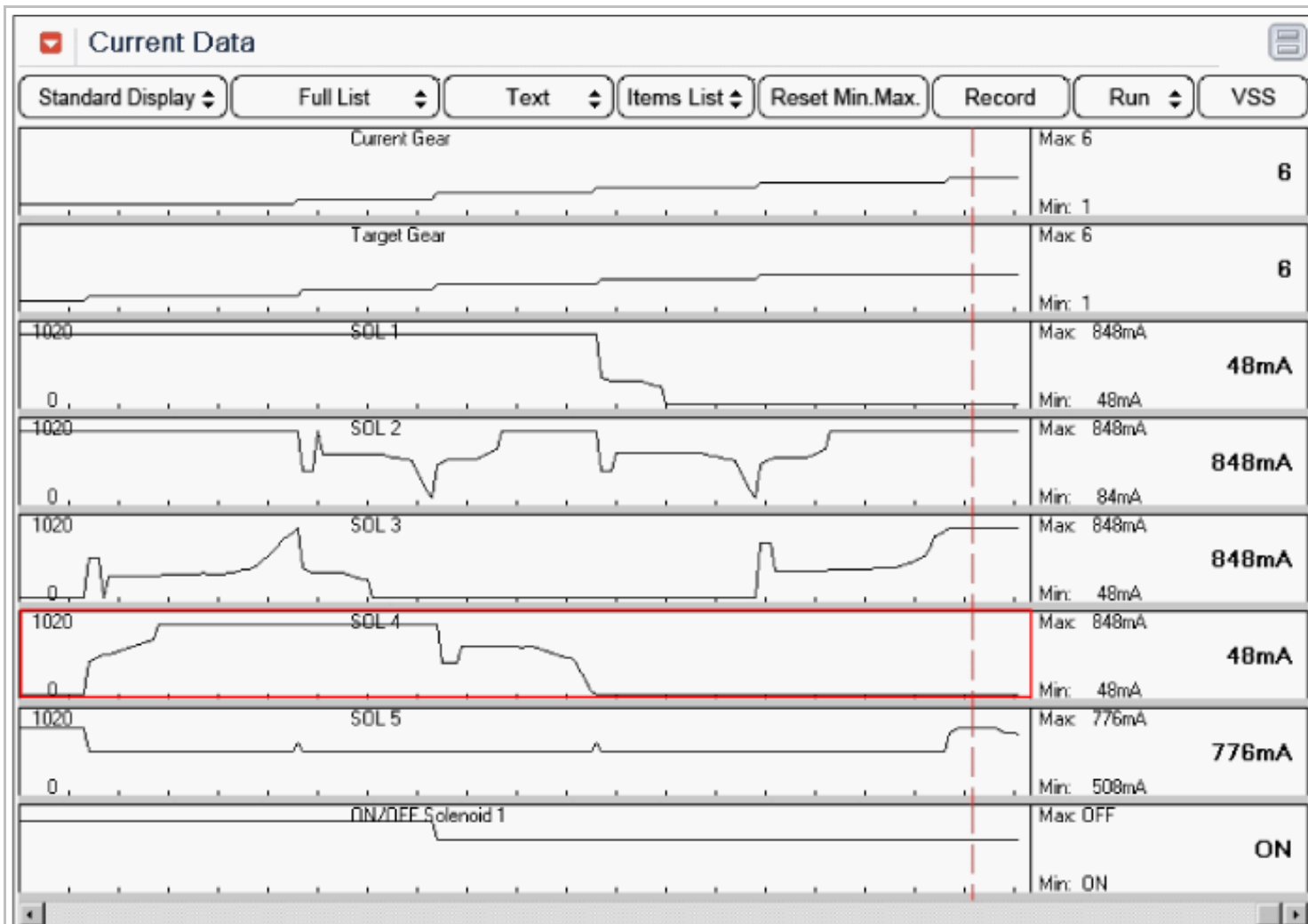


Fig.1

Fig 1) Shift control solenoid valve

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Shift control solenoid valve(SOL 4)" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valve.

**Specification :** 48mA ~ 848mA

**Solenoid valve operating status according to gear position**

gear							
------	--	--	--	--	--	--	--

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control

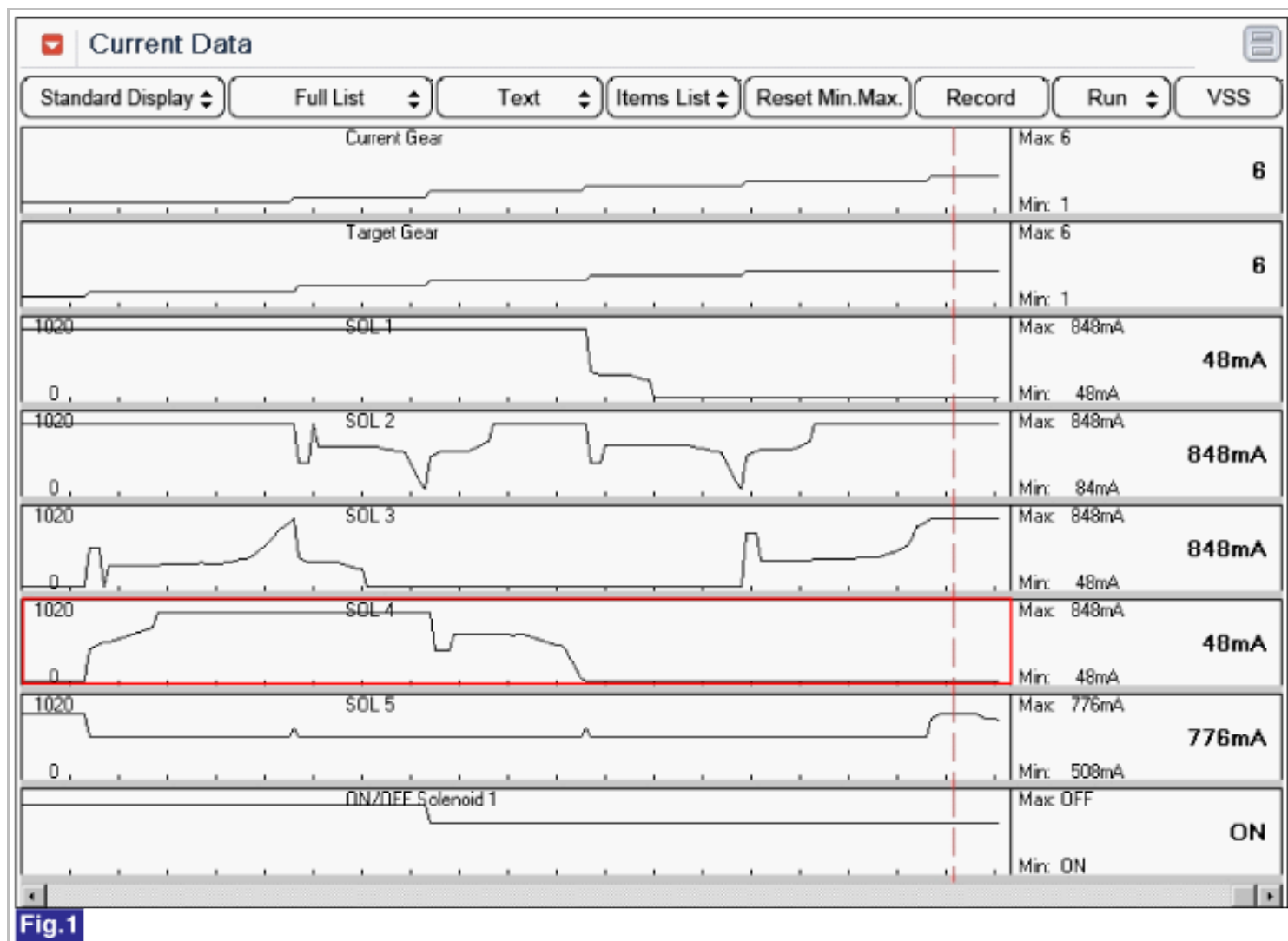


Fig 1) Shift control solenoid valve

5. Dose "Shift control solenoid valve(SOL 4)" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
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**NO**

▶ Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

#### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

#### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal normally. Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

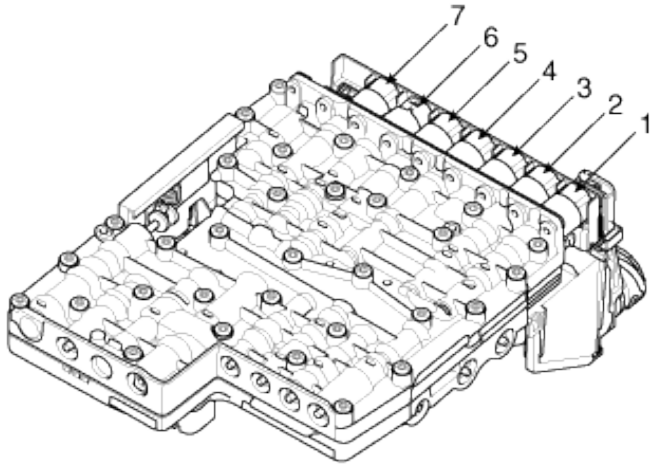
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

**YES**

▶ Go to the applicable troubleshooting procedure

## Automatic Transmission System > Automatic Transmission System > P0771 Shift Control Solenoid Valve 'E' - Open(SOL 7 - ON/OFF : Normal / Close)

### Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

### Component Location

ON/OFF solenoid valve maintain "close" status usually and controlled by TCM.TCM out "ON/OFF" signal, ON/OFF solenoid valve changes oil pressure direction to "Clutch E" or "Brake D".

### DTC Description

TCM set this code If detected open in circuit.(MIL ON : 2 driving Cycle)

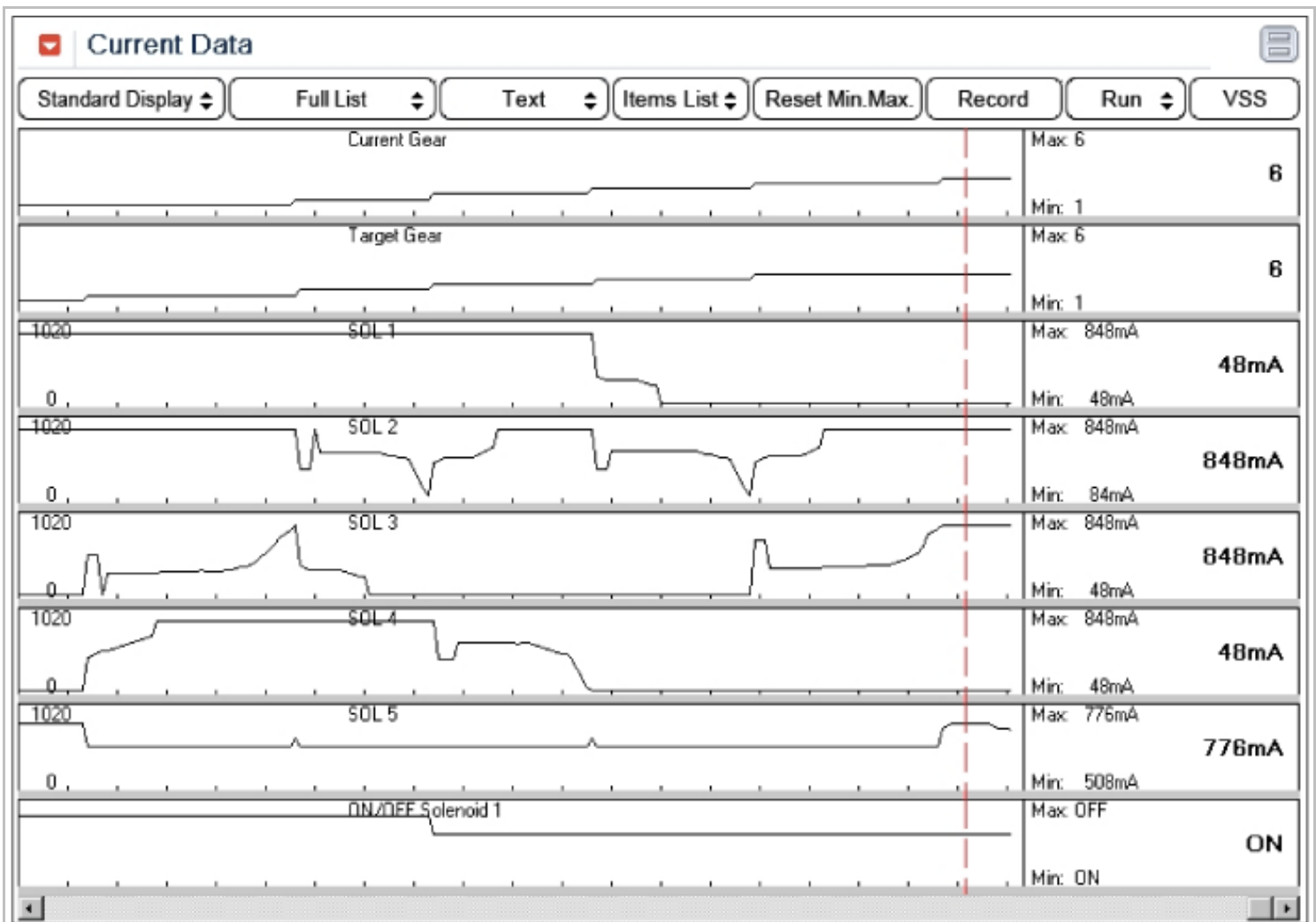
### DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Check open	• Mechatronics(E-module + Valvebody)
Enable Conditions	<ul style="list-style-type: none"> <li>• No error in high voltage generator</li> <li>• No error in low voltage generator</li> <li>• Voltage drop of high voltage generator <math>\leq 1V</math></li> </ul>	
Threshold Value	<ul style="list-style-type: none"> <li>• PWM = 0% → TCM detection automatically.</li> <li>• <math>0\% \leq \text{PWM} &lt; 7.6\%</math> : <math>0.75V &lt; \text{Feed back voltage}</math> : Solenoid valve OFF <math>&lt; 4V</math></li> <li>• <math>7.6\% \leq \text{PWM} \leq 92.4\%</math> → Feed back voltage : Solenoid valve ON <math>&lt; 0.75V</math> and <math>0.75V &lt; \text{Feed back voltage}</math> : Solenoid valve OFF <math>&lt; 4V</math></li> </ul>	
Diagnostic Time	• 0.05second	
Fail Safe	<ul style="list-style-type: none"> <li>• high speed : fixed at 5th gear, low speed : fixed at 3rd gear.</li> <li>• Reverse : Shift lock(Push "Unlock button → possible to shift) (priority :3)</li> </ul>	

### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data



**Fig.1**

Fig 1 ) ON/OFF Solenoid valve - 4th, 5th, 6th gear

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "ON/OFF solenoid valve(SOL 7)" parameter on the scan tool.

4. Select "D" range and Drive vehicle, confirm output data of solenoid valve.

**Specification** : 1st, 2nd, 3rd gear : OFF 4th, 5th 6th gear : ON

#### Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control

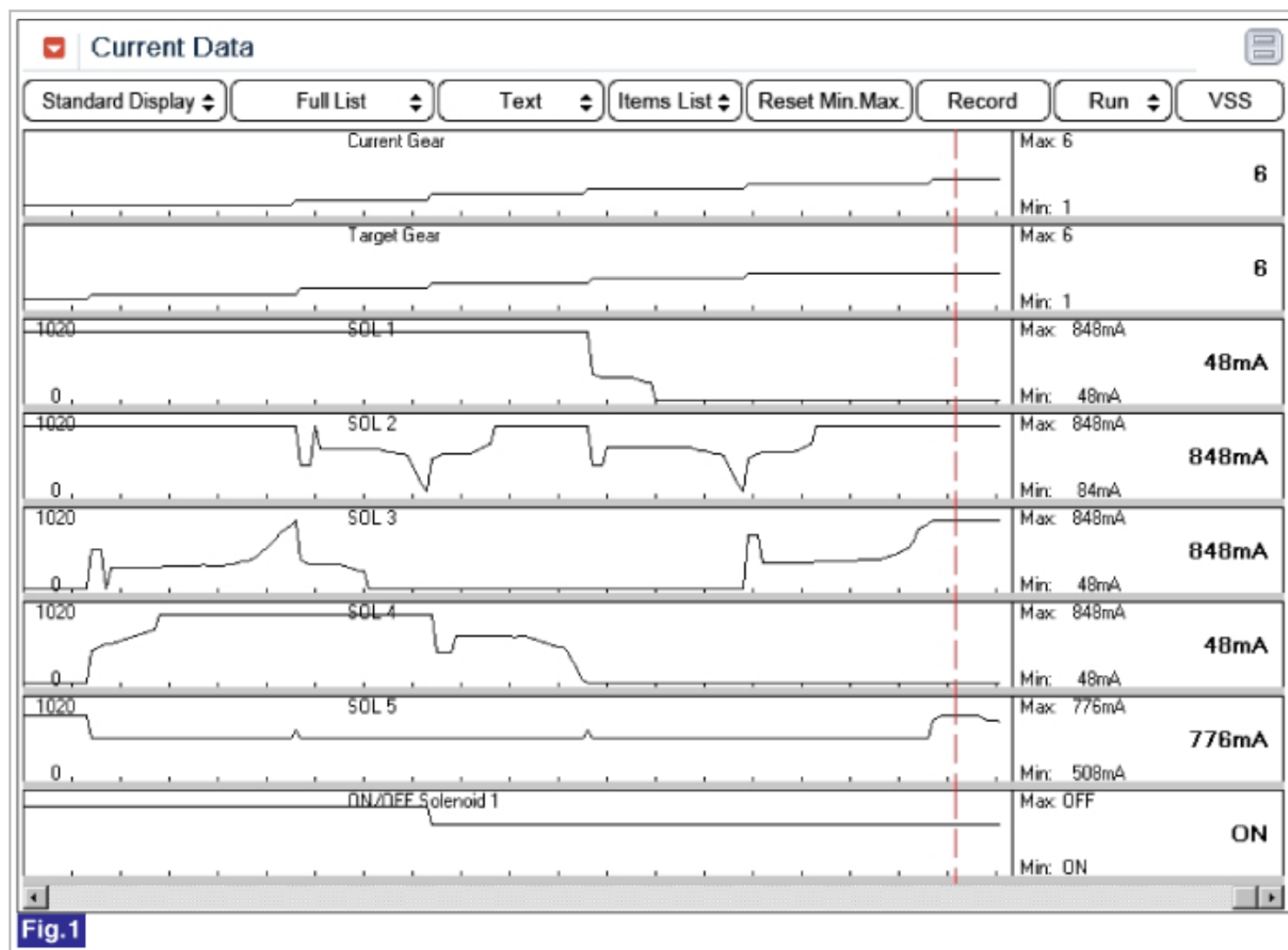


Fig 1) ON/OFF Solenoid valve - 4th, 5th, 6th gear

5. Dose "ON/OFF solenoid valve(SOL 7)" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	► Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected,replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

#### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

#### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.



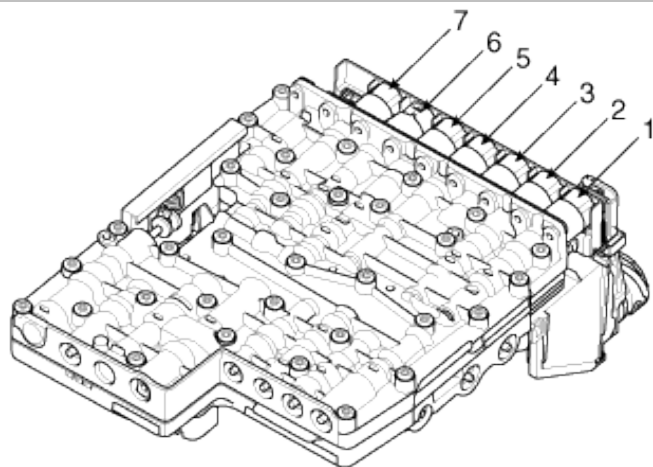
3. Operate the vehicle within DTC Enable conditions in General information.

4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure
<b>NO</b>	▶ System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0773 Shift Control Solenoid Valve 'E' - Short to battery (SOL 7 - ON/OFF : Normal / Close)

### Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

### General Description

ON/OFF solenoid valve maintain "close" status usually and controlled by TCM.TCM out "ON/OFF" signal, ON/OFF solenoid valve changes oil pressure direction to "Clutch E" or "Brake D".

### DTC Description

TCM set this code If detected short to battery for solenoid valve circuit.(MIL ON : 2 driving Cycle)

### DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	<ul style="list-style-type: none"><li>• short to battery</li></ul>	<ul style="list-style-type: none"><li>• Mechatronics(E-module + Valvebody)</li></ul>
Enable Conditions	<ul style="list-style-type: none"><li>• No error in high voltage generator</li><li>• No error in low voltage generator</li><li>• Voltage drop of high voltage generator <math>\leq 1V</math></li></ul>	
Threshold Value	<ul style="list-style-type: none"><li>• PWM = 100%, TCM detection automatically</li><li>• <math>7.6\% \leq \text{PWM} \leq 100\%</math>, voltage <math>&gt; 1.5V</math></li></ul>	
Diagnostic Time	<ul style="list-style-type: none"><li>• 0.05second</li></ul>	
Fail Safe	<ul style="list-style-type: none"><li>• high speed : fixed at 5th gear, low speed : fixed at 3rd gear.</li><li>• Reverse : Shift lock(Push "Unlock button → possible to shift)</li></ul>	

**CAUTION**

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

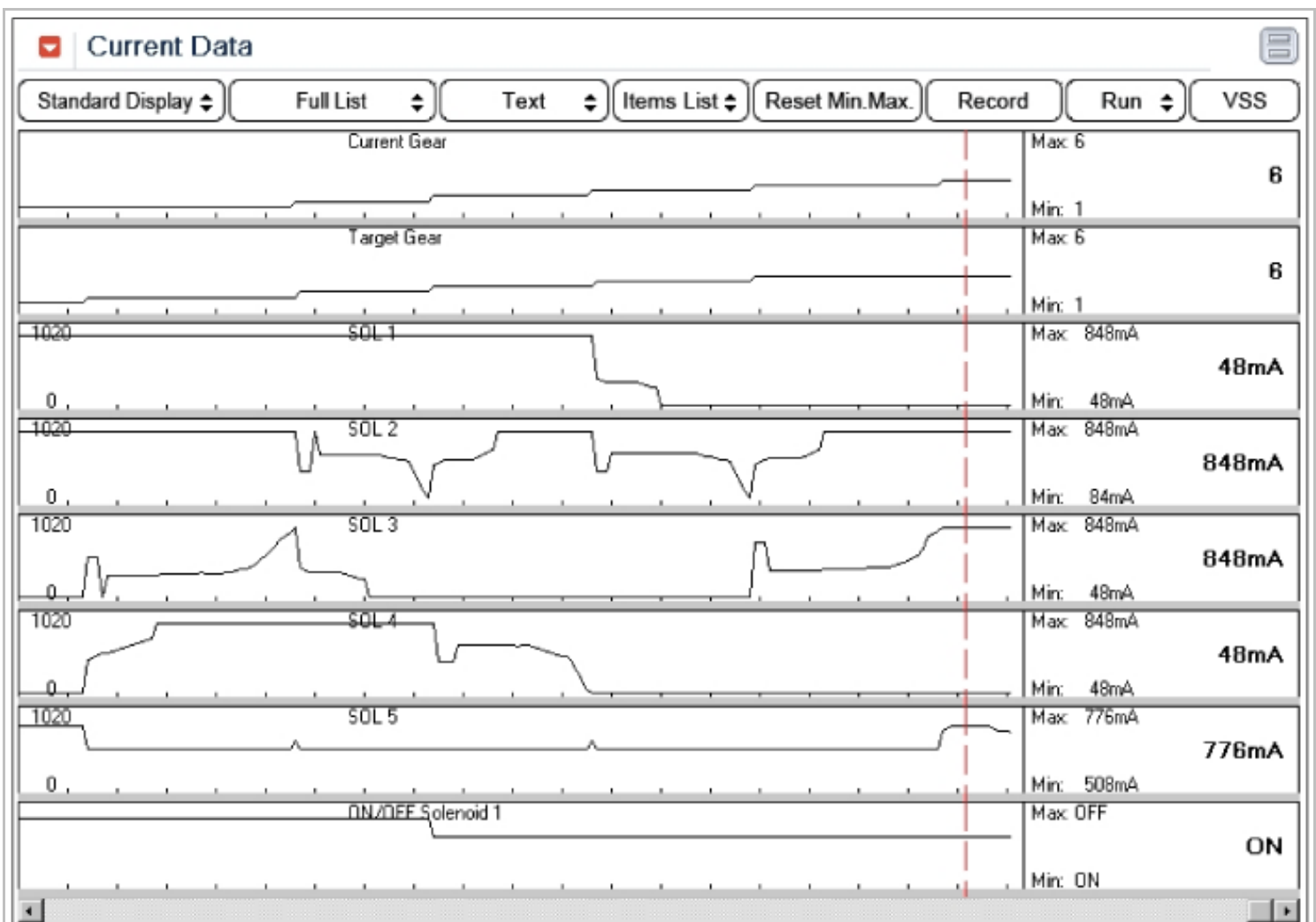
**Signal Waveform & Data****Fig.1**

Fig 1) ON/OFF Solenoid valve - 4th, 5th, 6th gear

**Monitor Scantool Data**

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"

3. Monitor the "ON/OFF solenoid valve(SOL 7)" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valve.

**Specification :** 1st, 2nd, 3rd gear : OFF 4th, 5th 6th gear : ON

#### Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control

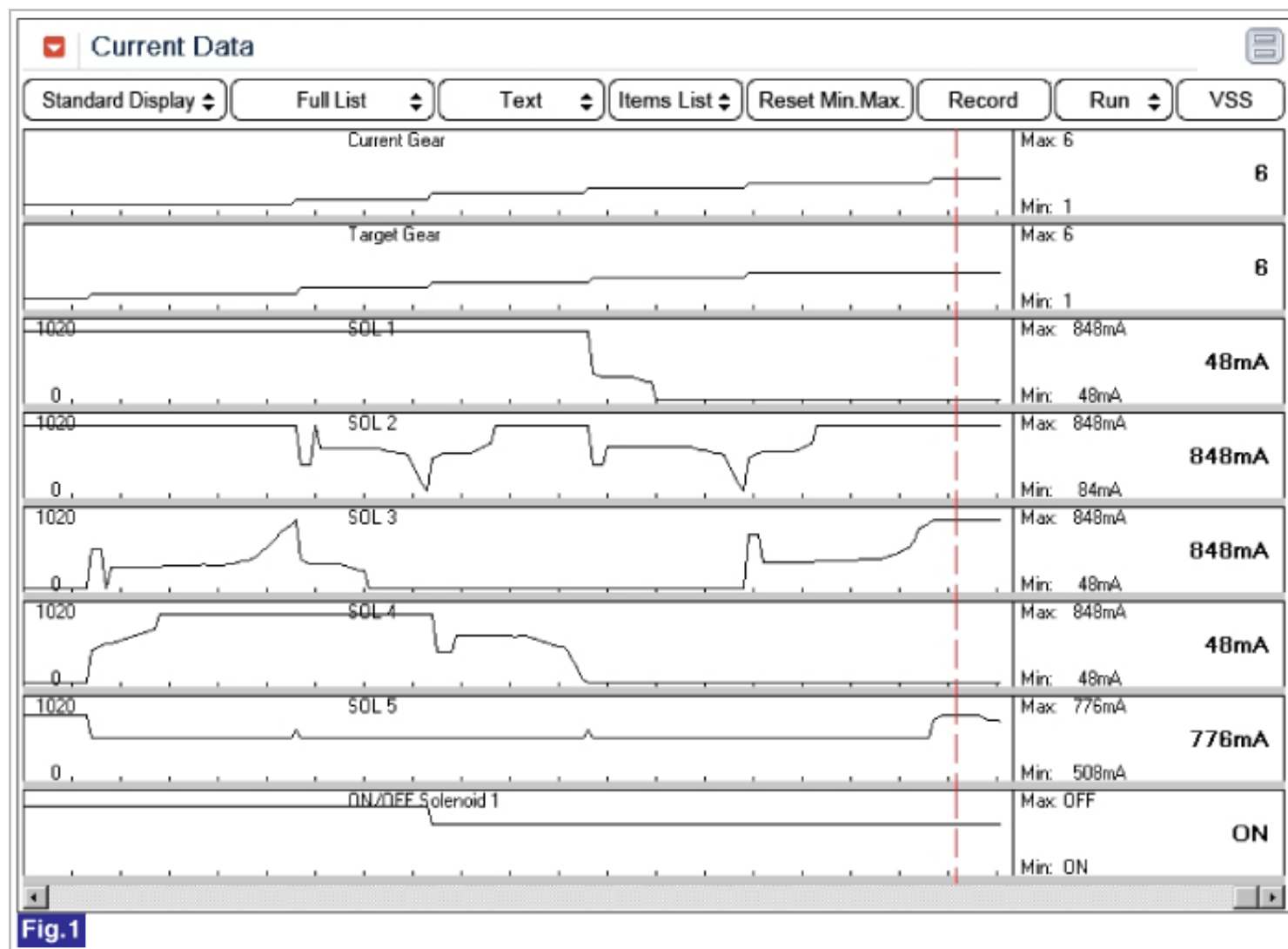


Fig 1) ON/OFF Solenoid valve - 4th, 5th, 6th gear

5. Dose "ON/OFF solenoid valve(SOL 7)" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	► Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected,replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

#### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

(Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

#### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

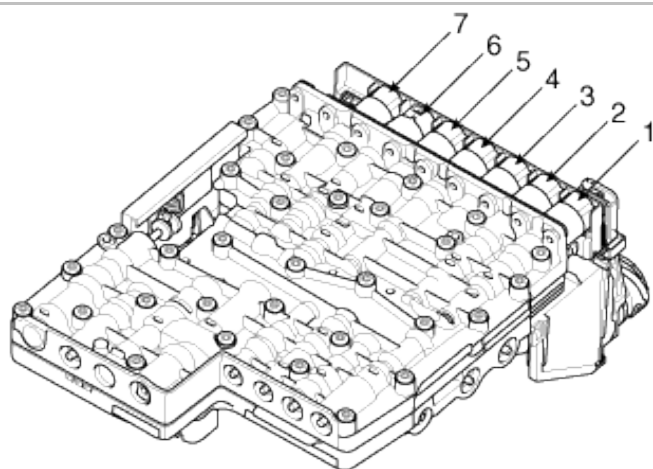
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.

2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure
<b>NO</b>	▶ System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0774 Shift Control Solenoid Valve 'E' - Short to ground (SOL 7 - ON/OFF : Normal / Close)

### Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

### General Description

ON/OFF solenoid valve maintain "close" status usually and controlled by TCM.TCM out "ON/OFF" signal, ON/OFF solenoid valve changes oil pressure direction to "Clutch E" or "Brake D".

### DTC Description

TCM set this code If detected short to ground / open for solenoid valve circuit.(MIL ON : 2 driving Cycle)

### DTC Detecting Condition

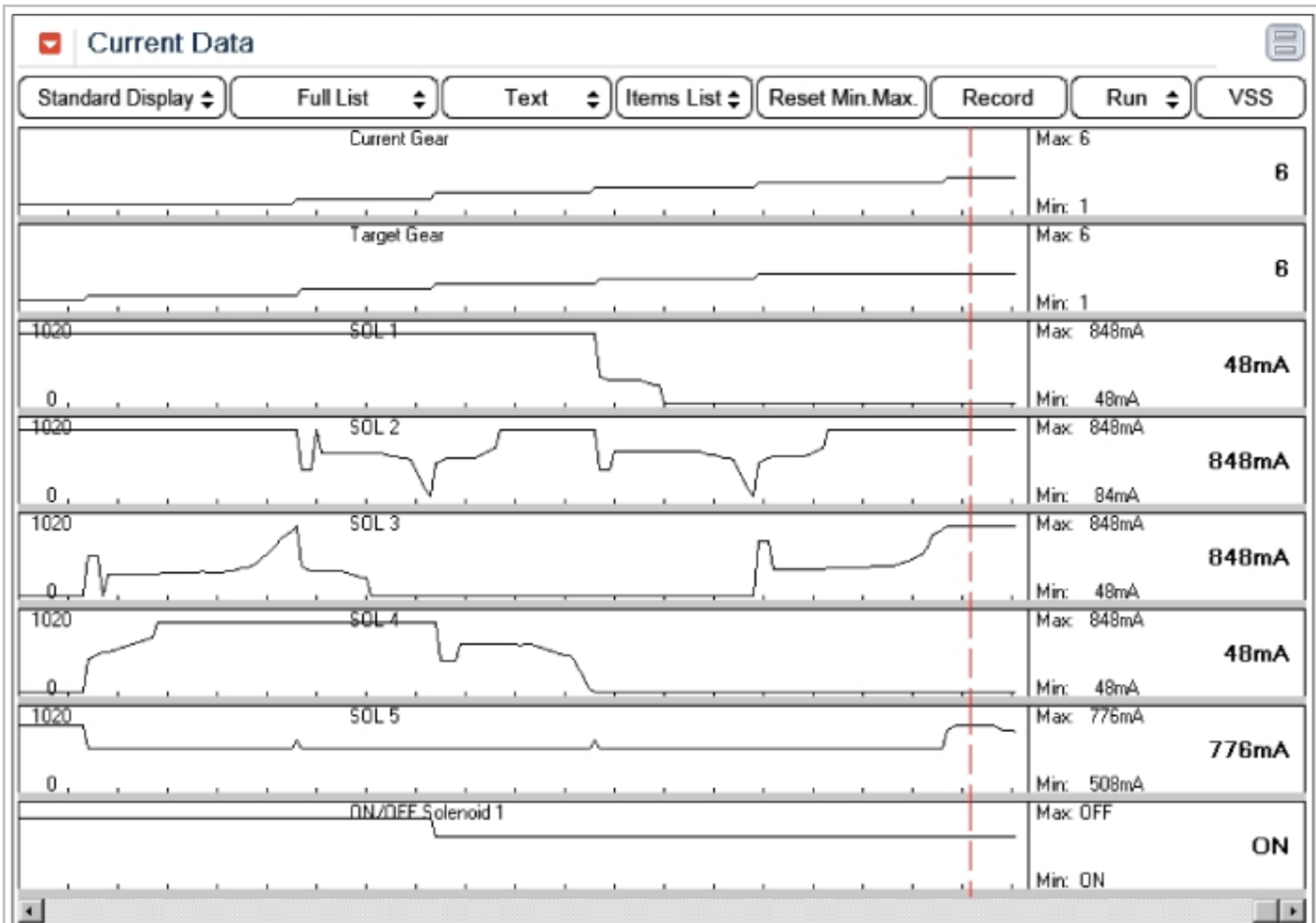
Item	Detecting Condition	Possible Cause
DTC Strategy	• short to ground / open	• Mechatronics(E-module + Valvebody)
Enable Conditions	<ul style="list-style-type: none"> <li>• No error in high voltage generator</li> <li>• No error in low voltage generator</li> <li>• Voltage drop of high voltage generator <math>\leq 1V</math></li> </ul>	
Threshold Value	<ul style="list-style-type: none"> <li>• if PWM = 0% TCM detection automatically</li> <li>• if <math>0\% \leq \text{PWM} &lt; 7.6\% \rightarrow</math> voltage : solenoid valve OFF <math>&lt; 0,75V</math></li> <li>• if <math>7.6\% \leq \text{PWM} \leq 92.4\% \rightarrow</math> voltage : solenoid valve ON <math>&lt; 0,75V</math> and voltage : solenoid valve OFF <math>&lt; 0,75V</math></li> </ul>	
Diagnostic Time	• 0.03second	

Fail Safe	<ul style="list-style-type: none"> <li>• high speed : fixed at 5th gear, low speed : fixed at 3rd gear.</li> <li>• Reverse : Shift lock(Push "Unlock button → possible to shift) (priority :3)</li> </ul>
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### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data



**Fig.1**

Fig 1) ON/OFF Solenoid valve - 4th, 5th, 6th gear

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "ON/OFF solenoid valve(SOL 7)" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valve.

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**Specification** : 1st, 2nd, 3rd gear : OFF 4th, 5th 6th gear : ON

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### Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control

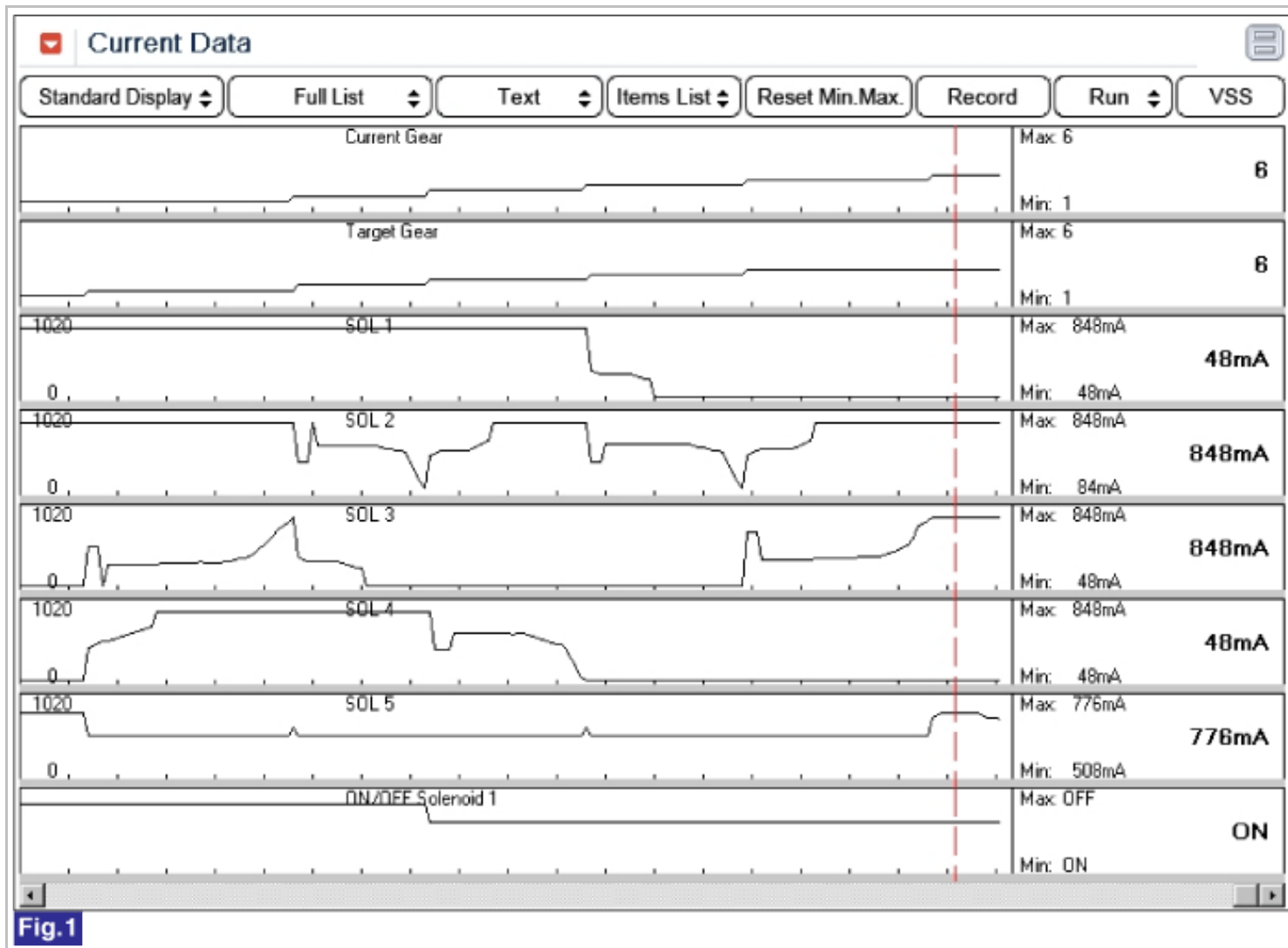


Fig 1) ON/OFF Solenoid valve - 4th, 5th, 6th gear

5. Dose "ON/OFF solenoid valve(SOL 7)" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	► Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected,replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
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**NO**

► Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

(Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

**YES**

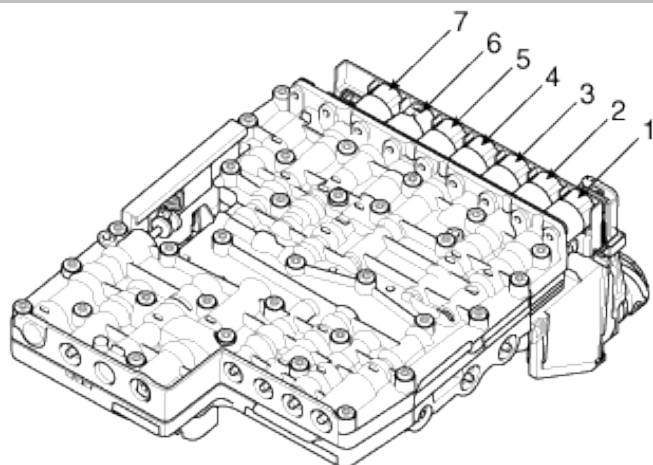
► Go to the applicable troubleshooting procedure

**NO**

► System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0781 1-2 Shift

### Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

## General Description

The ratio monitoring controls the nominal gear box ratio to the real gear box ratio. While driving in a gear(reverse, first second, third...) there is a calibrated rationality check between turbine speed and output speed of the corresponding gear. While up or down shifting from one gear to another there is a calibrated rationality check between turbine speed and output speed of the corresponding shift. While engaging the gear there is a calibrated rationality check between turbine speed and output speed of the corresponding shift if the actual output speed is higher or equal than a calibrated threshold. While engaging the gear when the actual output speed is lower than the threshold there is a rationality check on the turbine speed.

## DTC Description

TCM set this code If target gear ratio and actual gear ratio are not match in condition that 1st → 2nd gear or 2nd → 1st gear shifting.(MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item		Detecting Condition	Possible Cause
DTC Strategy		• Gear ratio monitoring	<ul style="list-style-type: none"> <li>• Refer to Engine daignostic system</li> <li>• E- Module (1st -&gt; 2nd shifting : solenoid valve "3" or 2nd -&gt; 1st shifting : solenoid valve "4"</li> <li>• Replace ATM</li> </ul>
Enable Conditions		• within 0.5 second after gear shift to 1st gear <-> 2nd gear.	
	CASE 1	• output speed $\geq$ 50 rmp	
	CASE 2	• output speed $\leq$ 50 rmp	
Threshold Value	CASE 1	<ul style="list-style-type: none"> <li>• actual gear ratio <math>\geq</math> monitoring gear ratio + targer gear ratio</li> <li>• actual gear ratio &lt; targer gear ratio</li> </ul>	
	CASE 2	• Not judge.	
Diagnostic Time		• 3times function check.	
Fail Safe		<ul style="list-style-type: none"> <li>• Fixed at 1st gear(bad shifting to 1st-&gt;2nd )</li> <li>• Fixed at 2nd gear(bad shifting to 2nd-&gt;1st )</li> <li>• No learning control (priority :3)</li> </ul>	

## CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

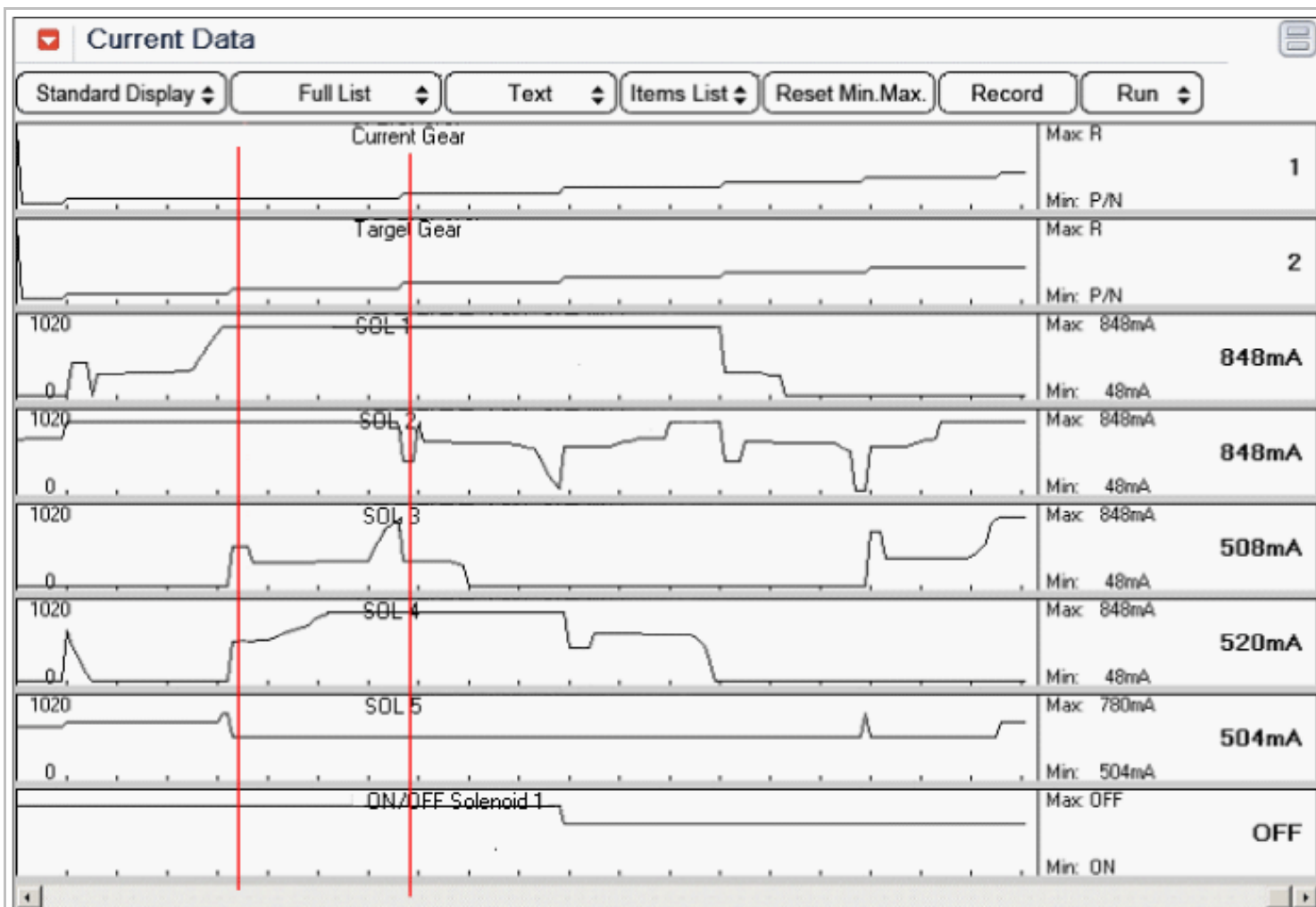


Fig.1

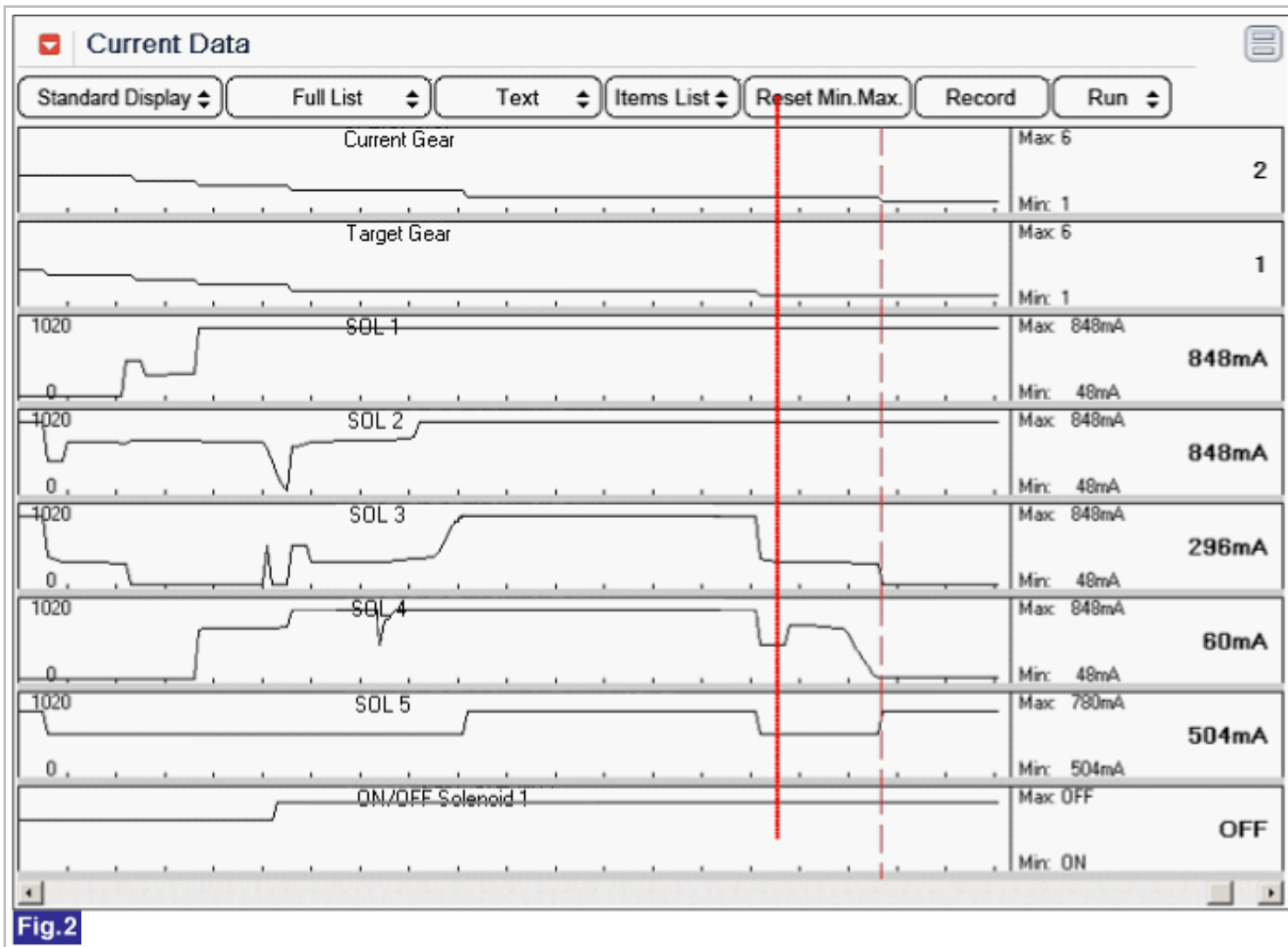


Fig 1 ) 1st-2nd gear shifting : Shift control solenoid valve3

Fig 2) 2nd-1st gear shifting : Shift control solenoid valve4

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Shift control solenoid valve3 & Shift control solenoid valve4" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valve.

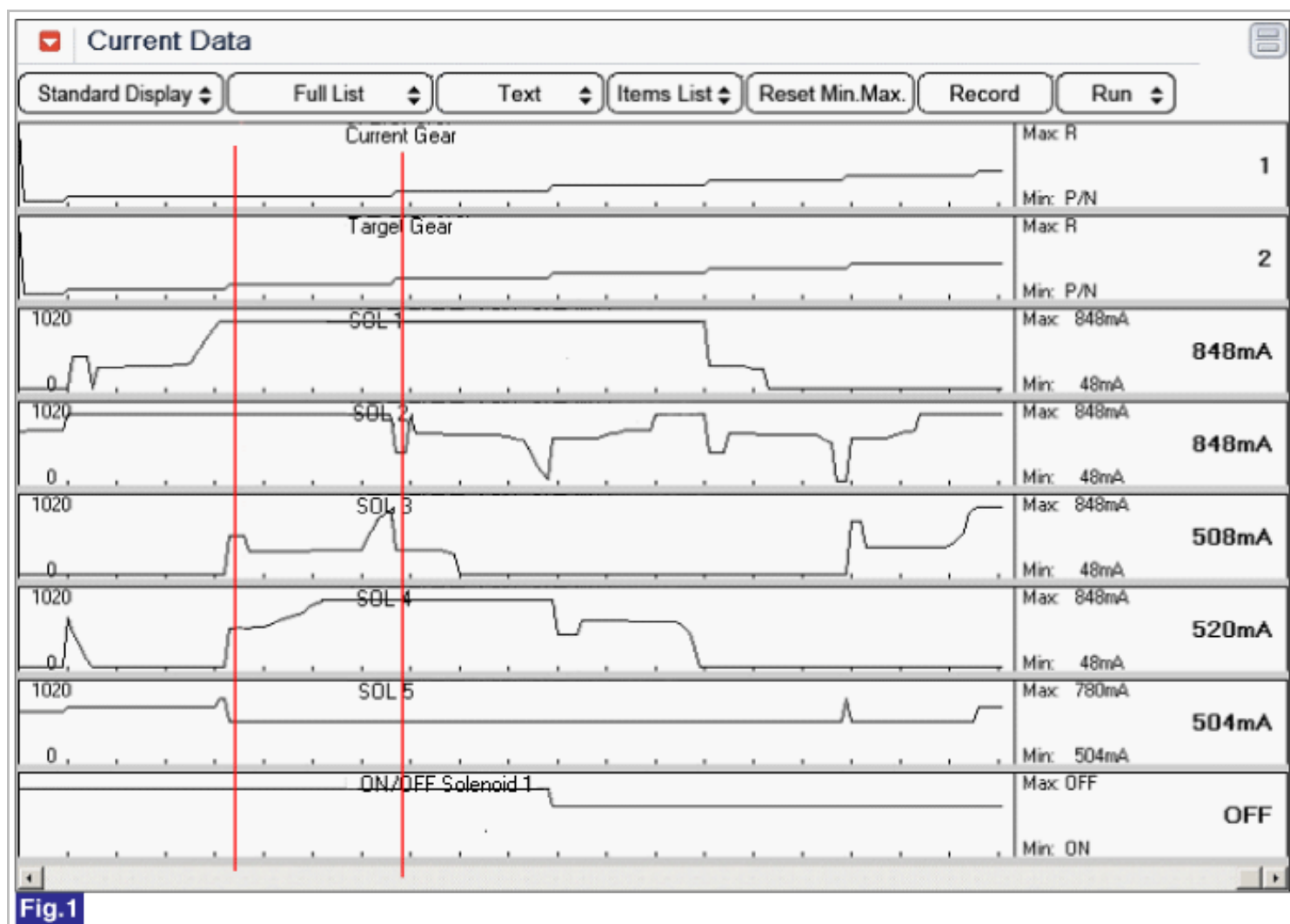
**Specification** :48mA ~ 848mA

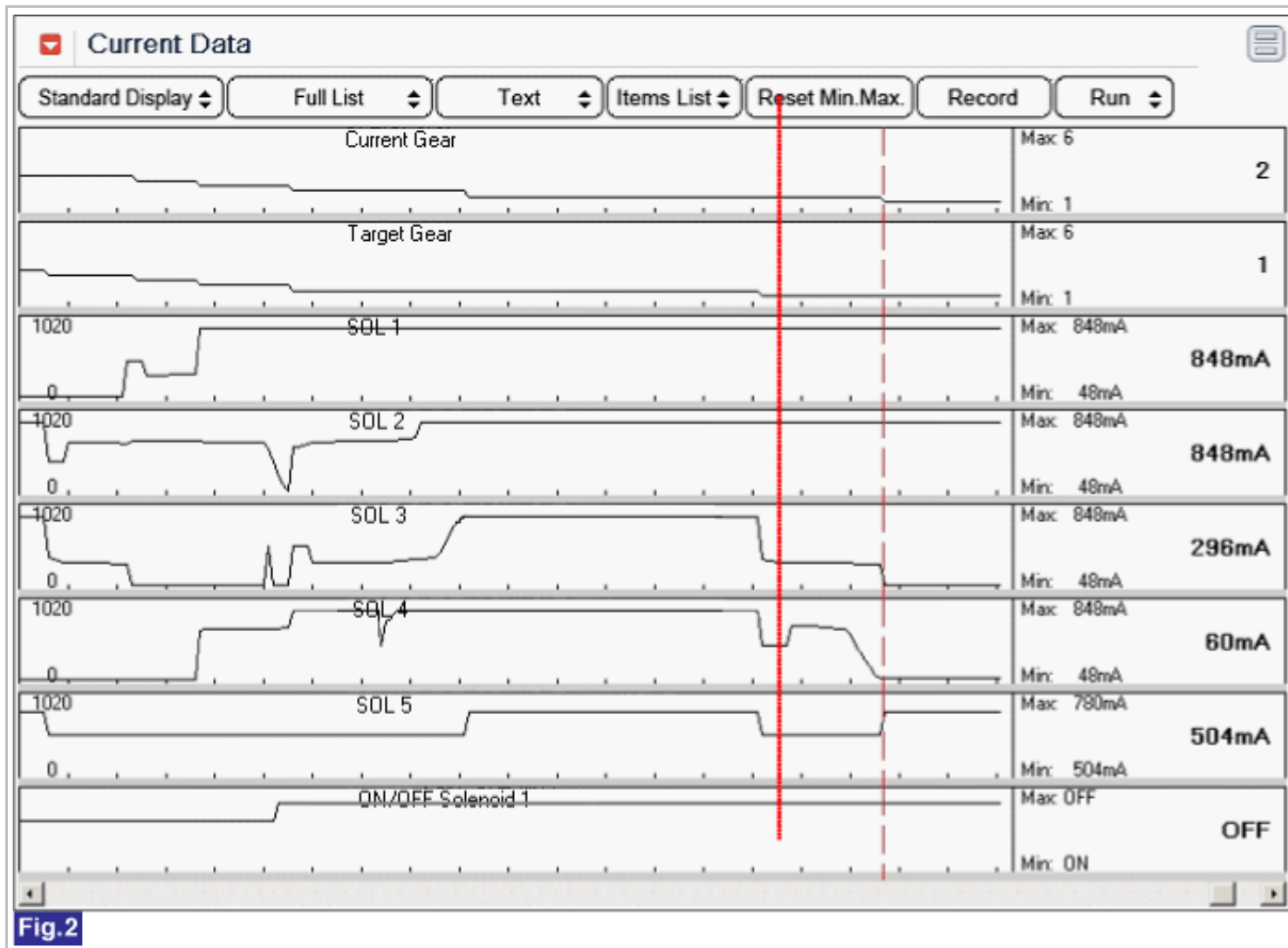
### Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-

D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control





**Fig.2**

Fig 1) 1st-2nd gear shifting : Shift control solenoid valve3

Fig 2) 2nd-1st gear shifting : Shift control solenoid valve4

5. Dose "Shift control solenoid valve3 & Shift control solenoid valve4" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	► Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected,replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
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<b>NO</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.
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#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed.

Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear.

RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

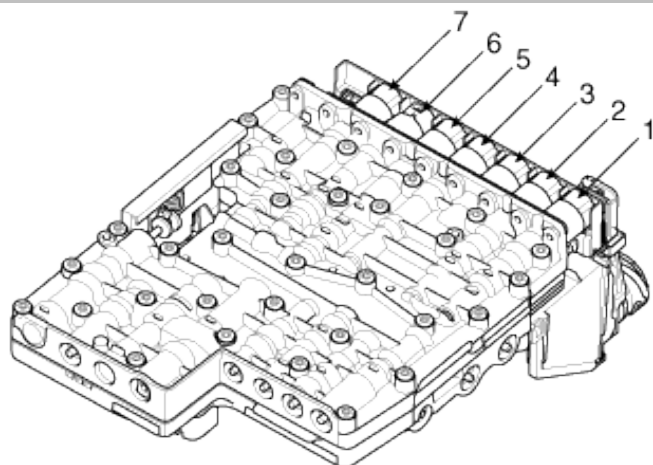
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	► Go to the applicable troubleshooting procedure
<b>NO</b>	► System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0782 2-3 Shift

### Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

## General Description

The ratio monitoring controls the nominal gear box ratio to the real gear box ratio. While driving in a gear(reverse, first second, third...) there is a calibrated rationality check between turbine speed and output speed of the corresponding gear. While up or down shifting from one gear to another there is a calibrated rationality check between turbine speed and output speed of the corresponding shift. While engaging the gear there is a calibrated rationality check between turbine speed and output speed of the corresponding shift if the actual output speed is higher or equal than a calibrated threshold. While engaging the gear when the actual output speed is lower than the threshold there is a rationality check on the turbine speed.

## DTC Description

TCM set this code If target gear ratio and actual gear ratio are not match in condition that 2nd → 3rd gear or 3rd → 2nd gear shifting.(MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item		Detecting Condition	Possible Cause
DTC Strategy		• Gear ratio monitoring	<ul style="list-style-type: none"> <li>• Refer to Engine daignostic system</li> <li>• E- Module (2nd -&gt; 3rd shifting : solenoid valve "2" or 3rd -&gt; 2nd shifting : solenoid valve "3"</li> <li>• Replace ATM</li> </ul>
Enable Conditions		• within 0.5 second after gear shift to 2nd gear <-> 3rd gear.	
	CASE 1	• output speed $\geq$ 50 rmp	
	CASE 2	• output speed $\leq$ 50 rmp	
Threshold Value	CASE 1	<ul style="list-style-type: none"> <li>• actual gear ratio <math>\geq</math> monitoring gear ratio + targer gear ratio</li> <li>• actual gear ratio &lt; targer gear ratio</li> </ul>	
	CASE 2	• Not judge.	
Diagnostic Time		• 3times function check.	
Fail Safe		<ul style="list-style-type: none"> <li>• Fixed at 2nd gear(bad shifting to 2nd-&gt;3rd )</li> <li>• Fixed at 3rd gear(bad shifting to 3rd-&gt;2nd )</li> <li>• No learning control (priority :3)</li> </ul>	



## CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is intentional.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

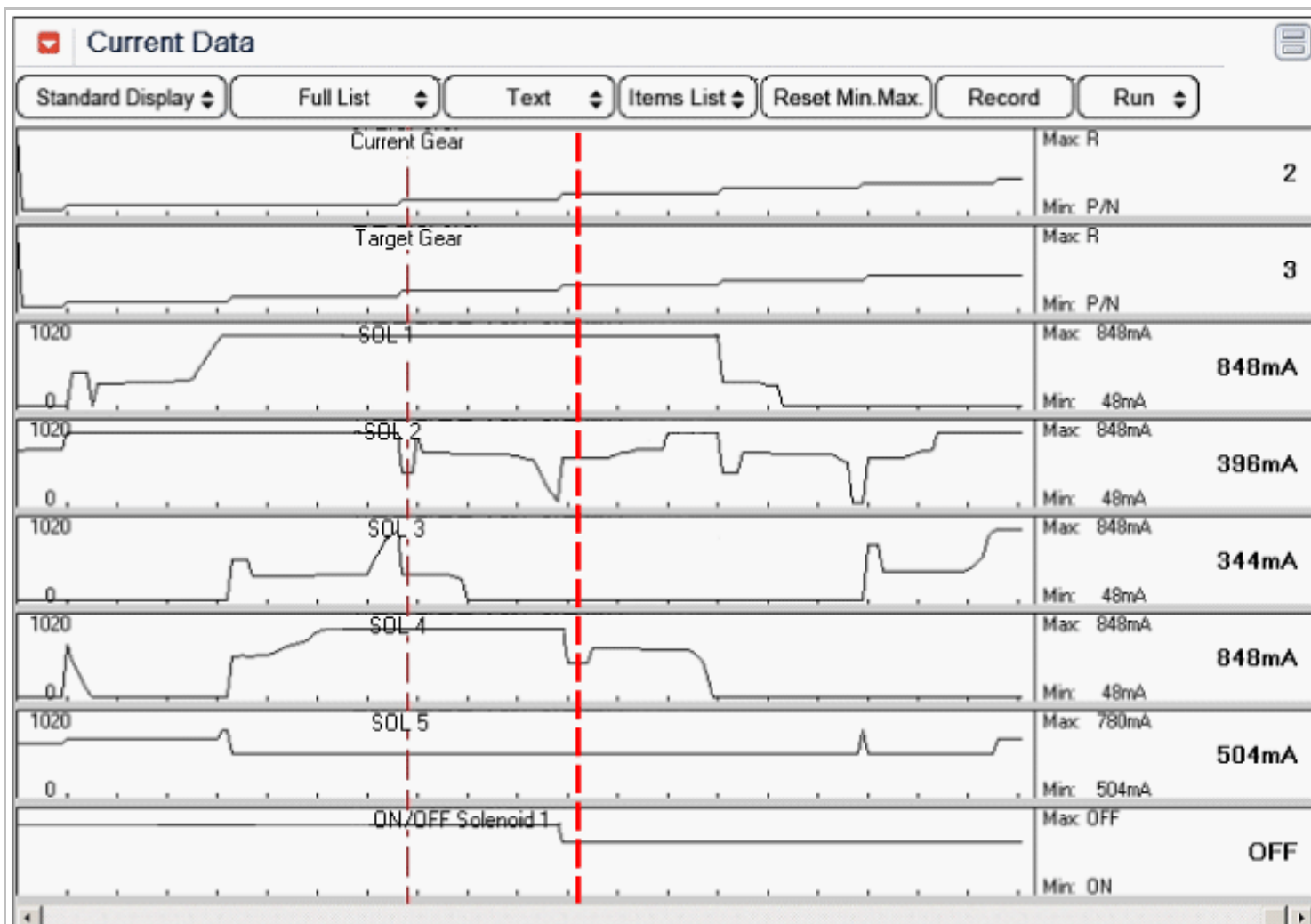


Fig.1

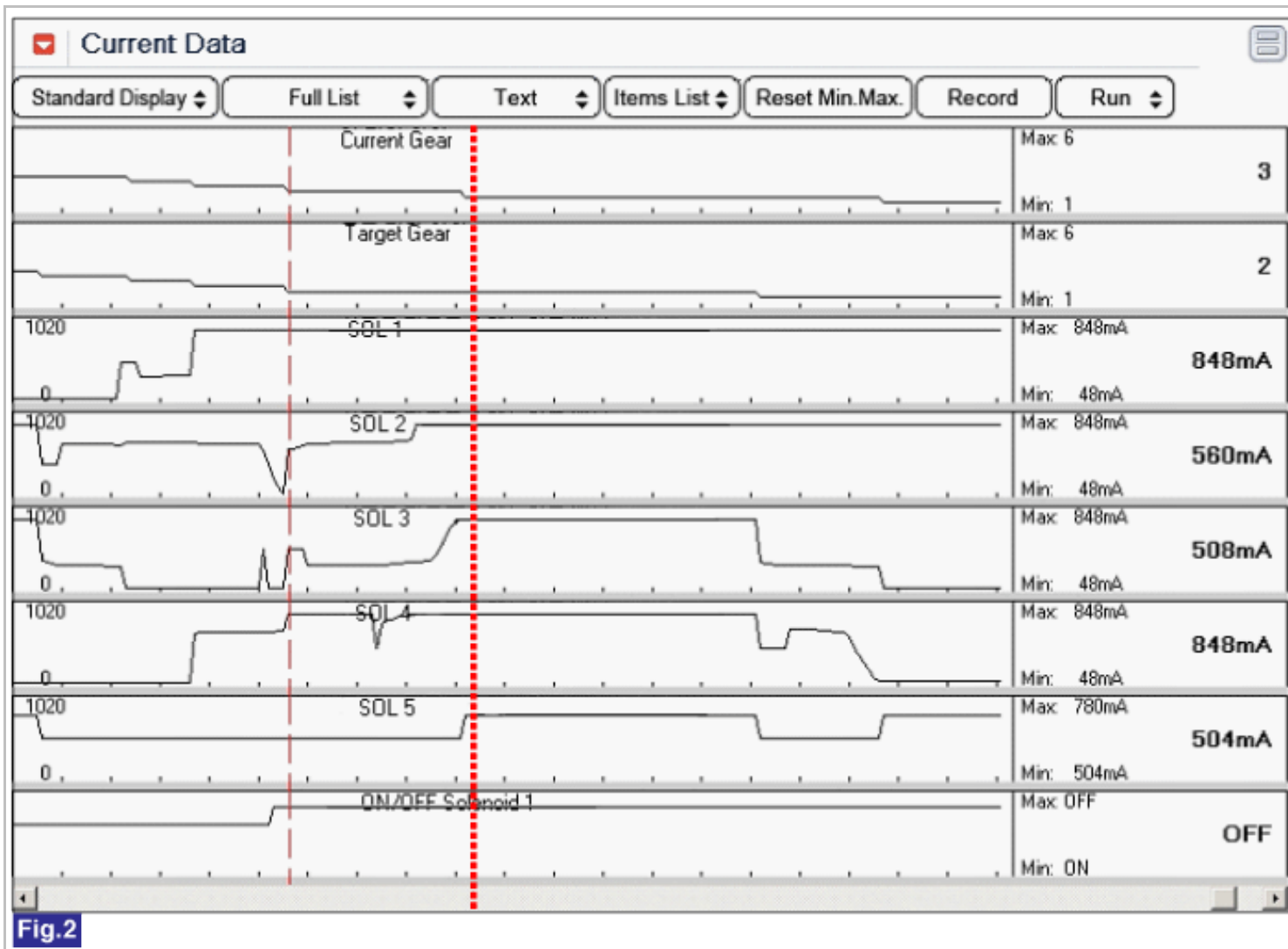


Fig 1 ) 2nd-3rd gear shifting : Shift control solenoid valve2

Fig 2) 3rd-2nd gear shifting : Shift control solenoid valve3

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Shift control solenoid valve2 & Shift control solenoid valve3" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valve.

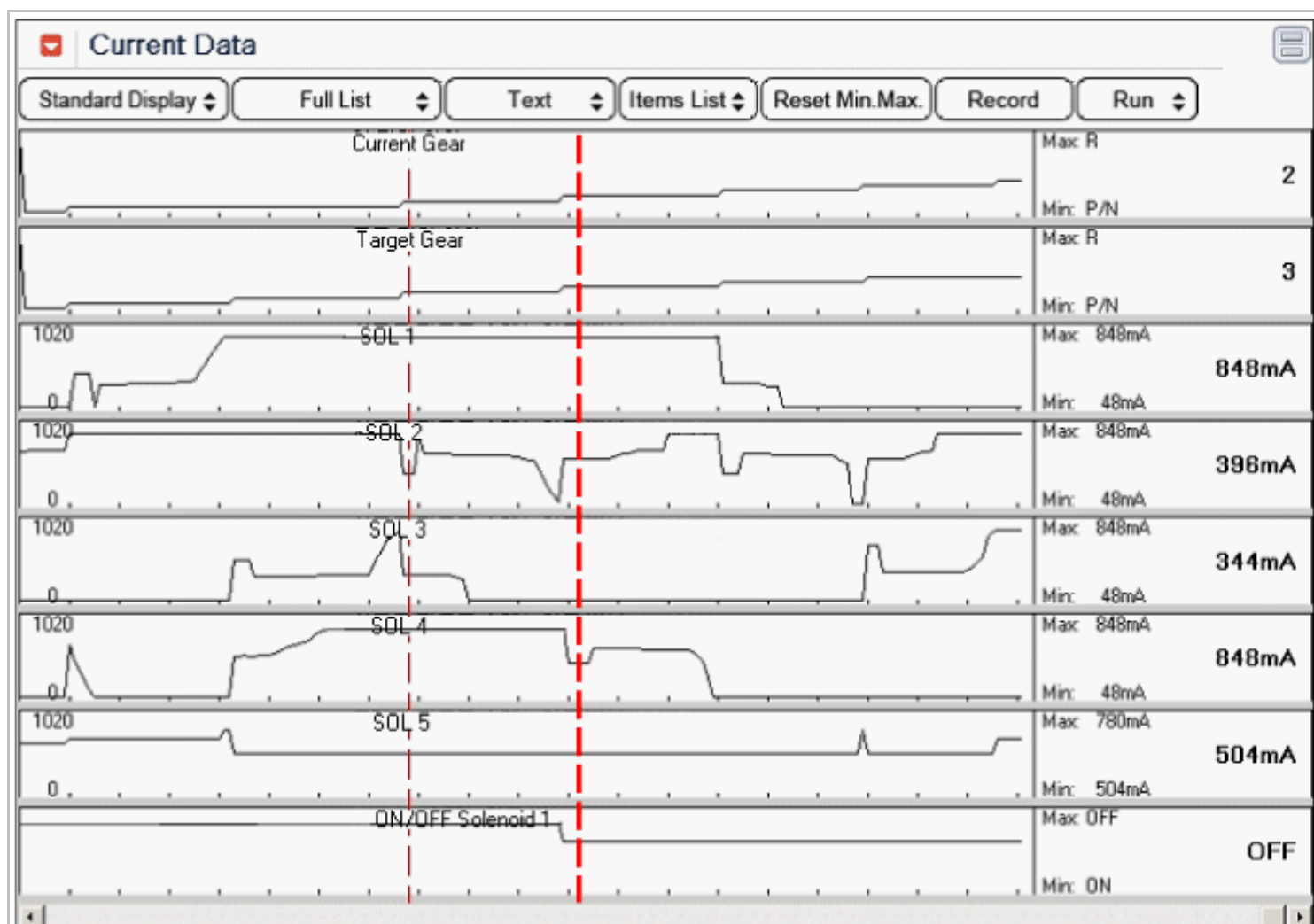
**Specification :** 48mA ~ 848mA

### Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-

D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control



**Fig.1**

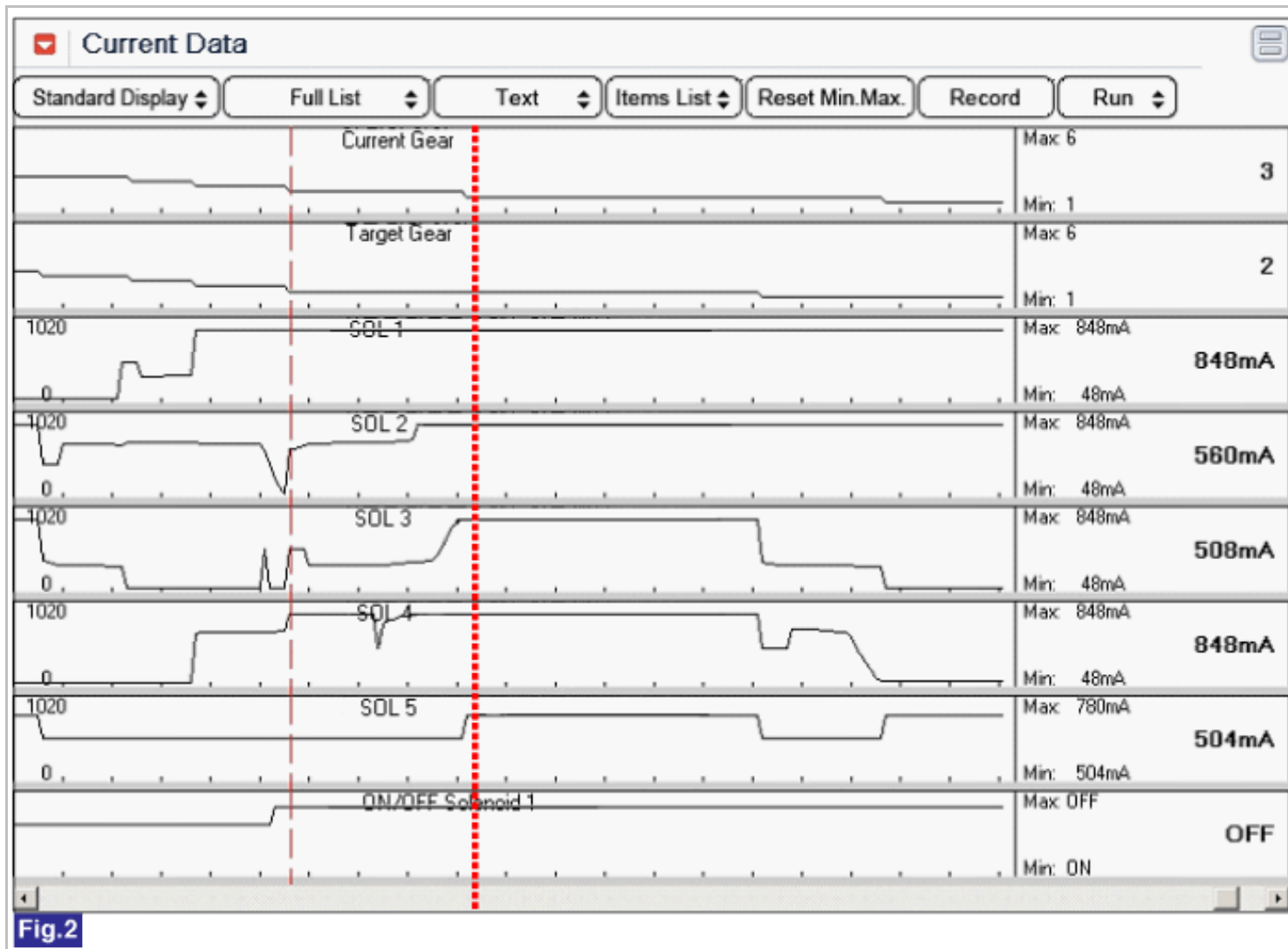


Fig 1) 2nd-3rd gear shifting : Shift control solenoid valve2

Fig 2) 3rd-2nd gear shifting : Shift control solenoid valve3

5. Dose "Shift control solenoid valve2 & Shift control solenoid valve3" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	► Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected,replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
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<b>NO</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.
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#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed.

Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal normally. Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

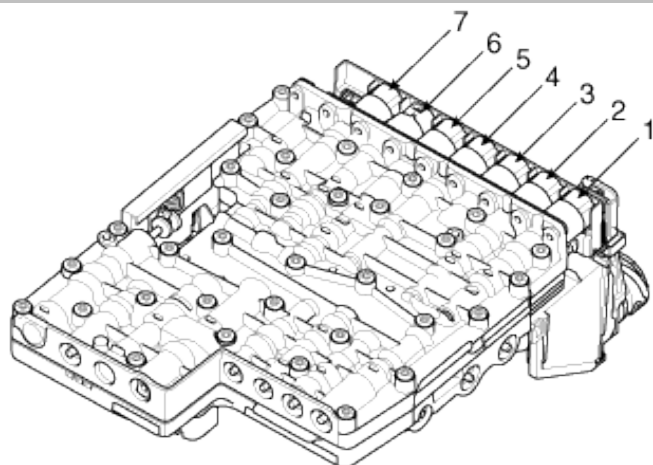
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	► Go to the applicable troubleshooting procedure
<b>NO</b>	► System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0783 3-4 Shift

### Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

## General Description

The ratio monitoring controls the nominal gear box ratio to the real gear box ratio. While driving in a gear(reverse, first second, third...) there is a calibrated rationality check between turbine speed and output speed of the corresponding gear. While up or down shifting from one gear to another there is a calibrated rationality check between turbine speed and output speed of the corresponding shift. While engaging the gear there is a calibrated rationality check between turbine speed and output speed of the corresponding shift if the actual output speed is higher or equal than a calibrated threshold. While engaging the gear when the actual output speed is lower than the threshold there is a rationality check on the turbine speed.

## DTC Description

TCM set this code If target gear ratio and actual gear ratio are not match in condition that 3rd → 4th gear or 4th → 3rd gear shifting.(MIL ON : 2 driving Cycle)

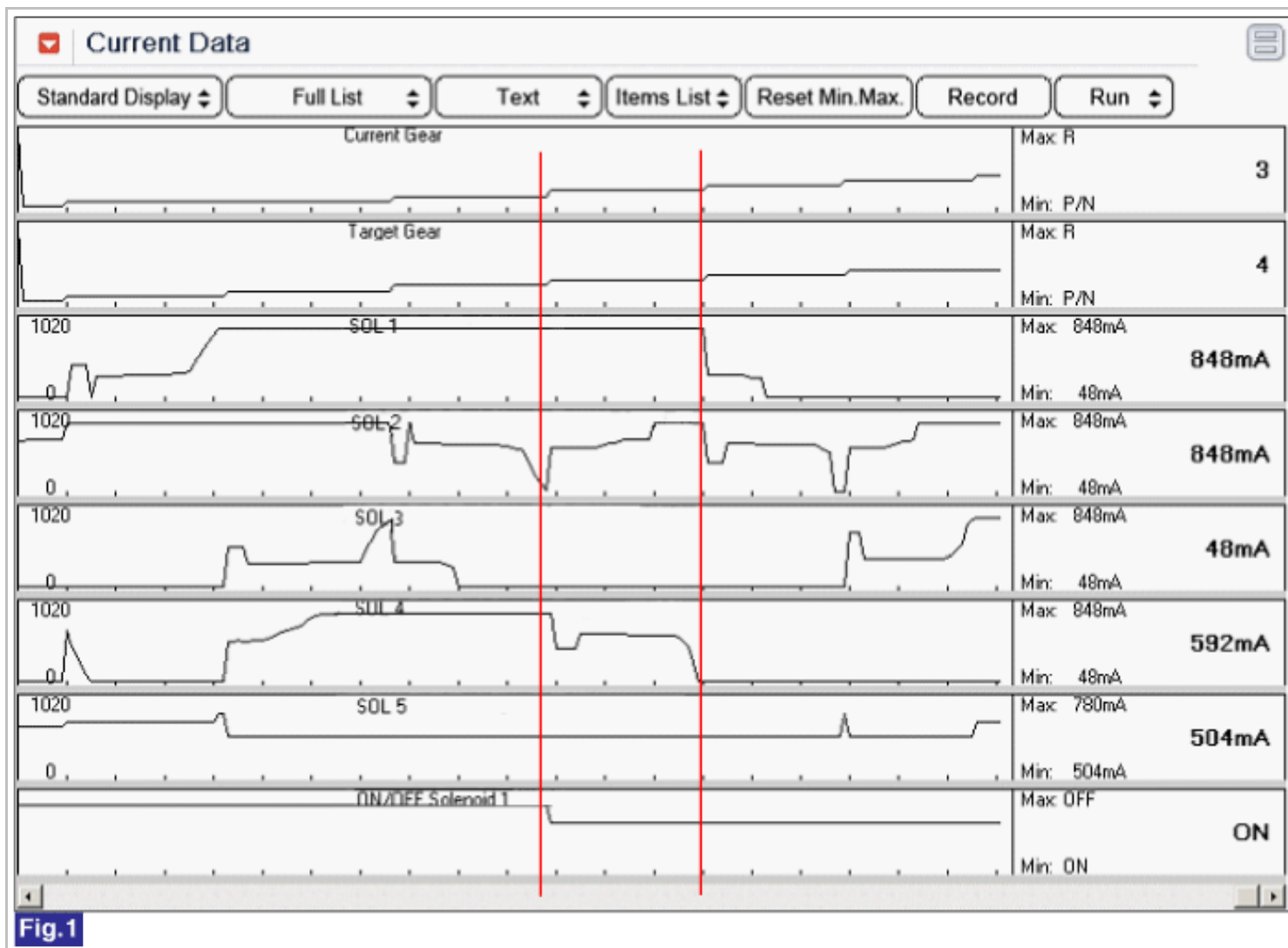
## DTC Detecting Condition

Item		Detecting Condition	Possible Cause
DTC Strategy		• Gear ratio monitoring	<ul style="list-style-type: none"> <li>• Refer to Engine daignostic system</li> <li>• E- Module (3rd -&gt; 4th shifting : solenoid valve "2" or 4th -&gt; 3rd shifting : solenoid valve "4"</li> <li>• Replace ATM</li> </ul>
Enable Conditions		• within 0.5 second after gear shift to 3rd gear <-> 4th gear.	
	CASE 1	• output speed $\geq$ 50 rmp	
	CASE 2	• output speed $\leq$ 50 rmp	
Threshold Value	CASE 1	<ul style="list-style-type: none"> <li>• actual gear ratio <math>\geq</math> monitoring gear ratio + targer gear ratio</li> <li>• actual gear ratio &lt; targer gear ratio</li> </ul>	
	CASE 2	• Not judge.	
Diagnostic Time		• 3times function check.	
Fail Safe		<ul style="list-style-type: none"> <li>• Fixed at 3rd gear(bad shifting to 3rd-&gt;4th )</li> <li>• Fixed at 4th gear(bad shifting to 4th-&gt;3rd )</li> <li>• No learning control (priority :3)</li> </ul>	

## CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is intentional.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data



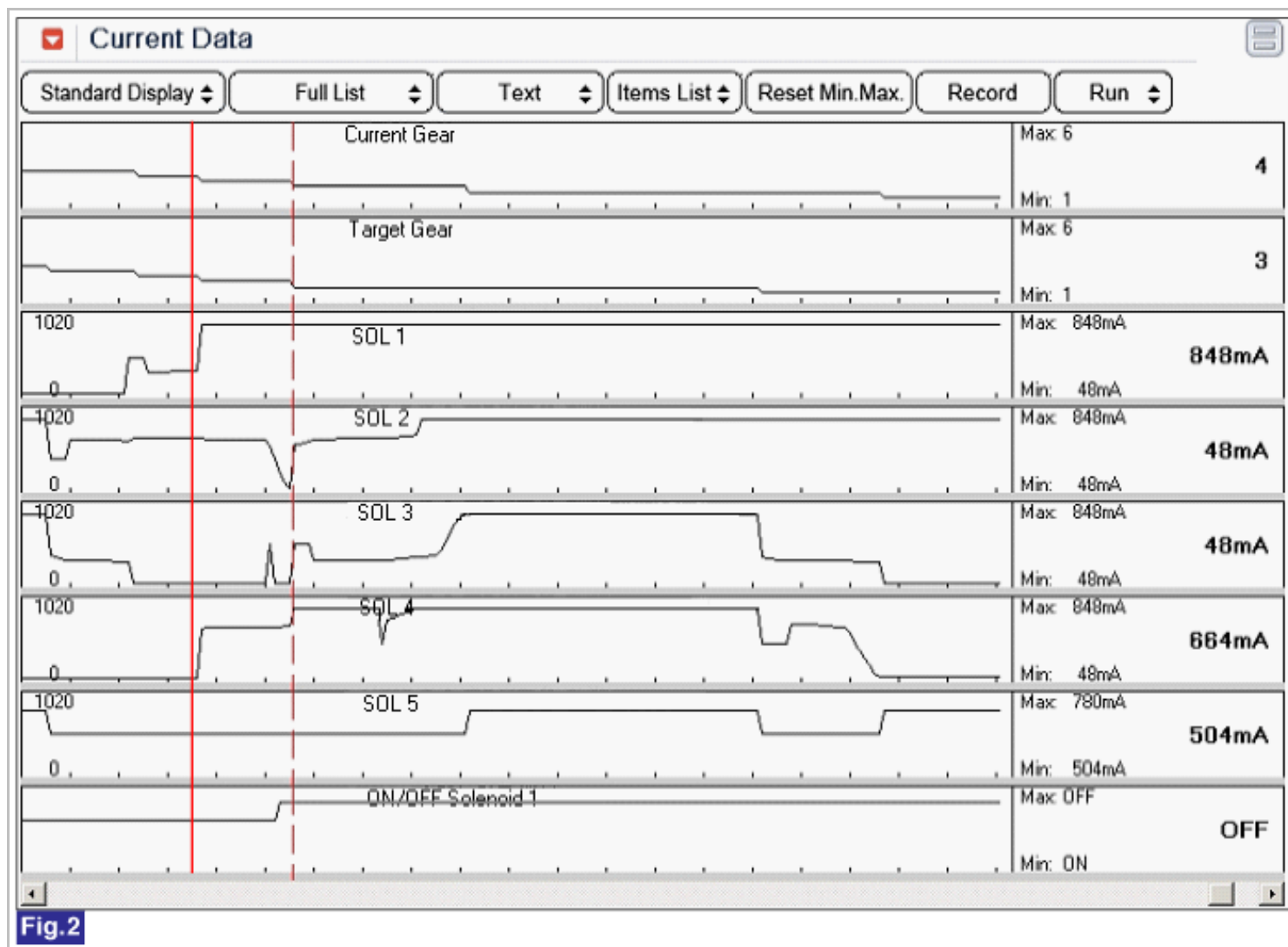


Fig 1) 3rd-4th gear shifting : Shift control solenoid valve2

Fig 2) 4th-3rd gear shifting : Shift control solenoid valve4

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Shift control solenoid valve2 & Shift control solenoid valve4" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valve.

**Specification** :48mA ~ 848mA

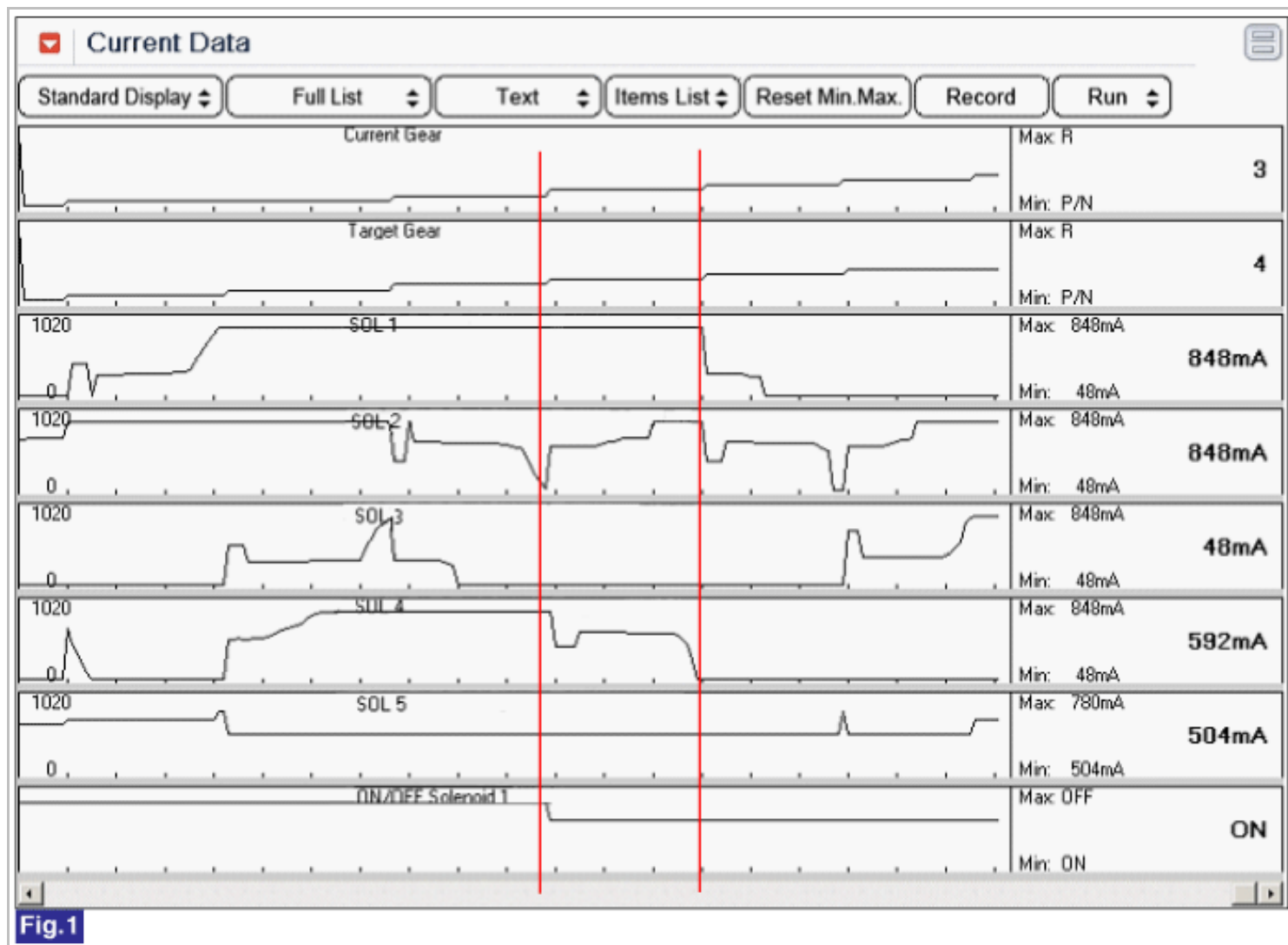
### Solenoid valve operating status according to gear position

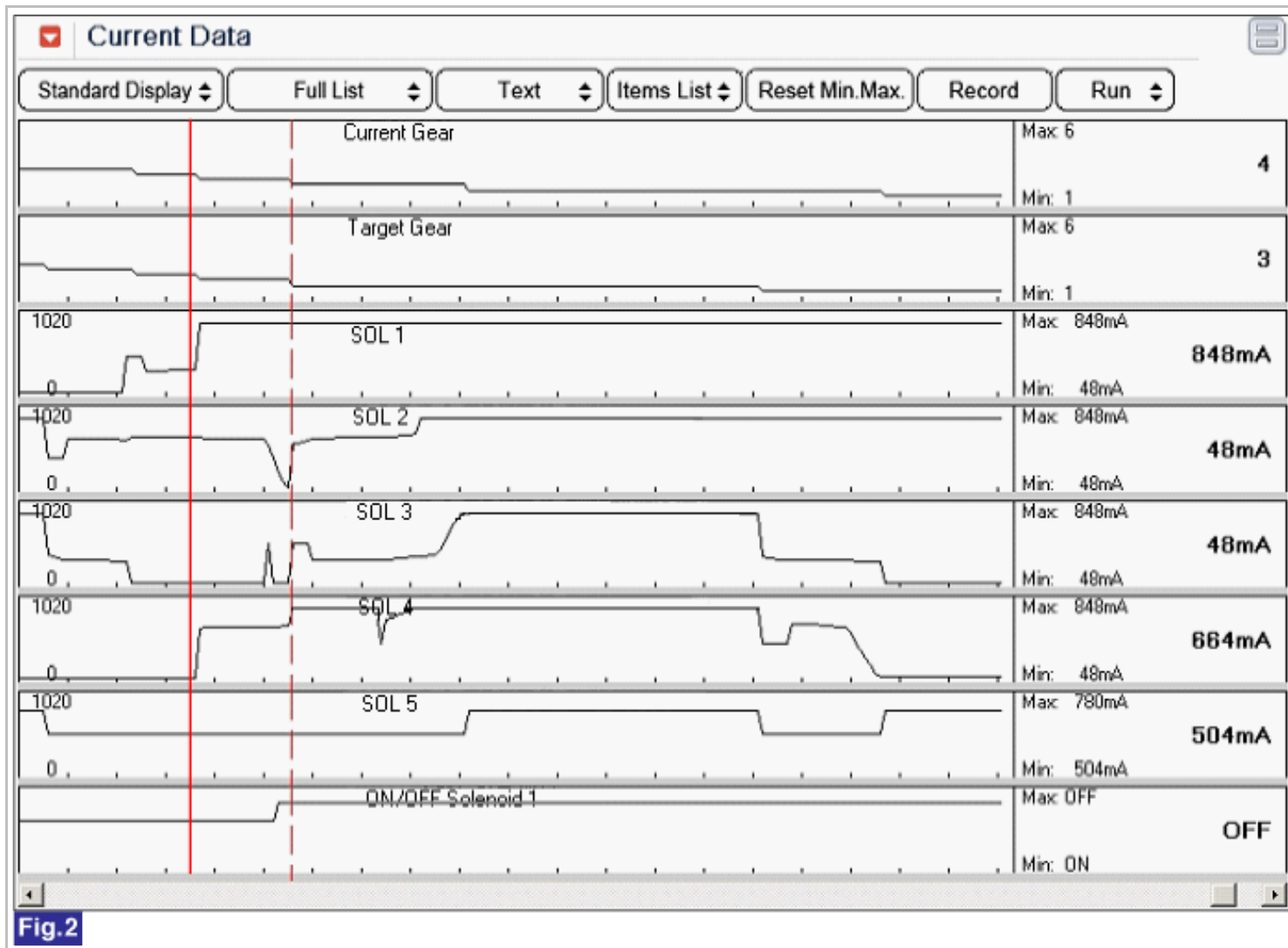
gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-



D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control





**Fig.2**

Fig 1) 3rd-4th gear shifting : Shift control solenoid valve2

Fig 2) 4th-3rd gear shifting : Shift control solenoid valve4

5. Dose "Shift control solenoid valve1 & Shift control solenoid valve2" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	► Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected,replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
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**NO**

► Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

(Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal normally. Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

**YES**

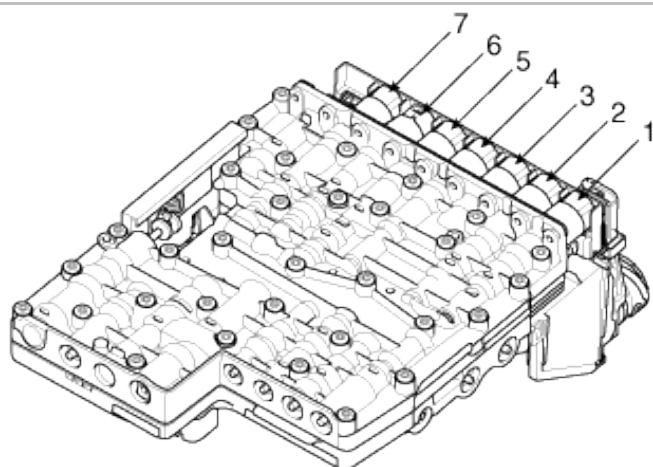
► Go to the applicable troubleshooting procedure

**NO**

► System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0784 4-5 Shift

### Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

## General Description

The ratio monitoring controls the nominal gear box ratio to the real gear box ratio. While driving in a gear(reverse, first second, third...) there is a calibrated rationality check between turbine speed and output speed of the corresponding gear. While up or down shifting from one gear to another there is a calibrated rationality check between turbine speed and output speed of the corresponding shift. While engaging the gear there is a calibrated rationality check between turbine speed and output speed of the corresponding shift if the actual output speed is higher or equal than a calibrated threshold. While engaging the gear when the actual output speed is lower than the threshold there is a rationality check on the turbine speed.

## DTC Description

TCM set this code If target gear ratio and actual gear ratio are not match in condition that 4th → 5th gear or 5th → 4th gear shifting.(MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item		Detecting Condition	Possible Cause
DTC Strategy		• Gear ratio monitoring	<ul style="list-style-type: none"> <li>• Refer to Engine daignostic system</li> <li>• E- Module (1st -&gt; 2nd shifting : solenoid valve "1" or 2nd -&gt; 1st shifting : solenoid valve "2"</li> <li>• Replace ATM</li> </ul>
Enable Conditions		• Within 0.5 second after gear shift to 4th gear <-> 5th gear.	
	CASE 1	• Output speed ≥ 50rpm	
	CASE 2	• Output speed ≤ 50 rpm	
Threshold Value	CASE 1	<ul style="list-style-type: none"> <li>• actual gear ratio ≥ monitoring gear ratio + targer gear ratio</li> <li>• actual gear ratio &lt; targer gear ratio</li> </ul>	
	CASE 2	• Not judge.	
Diagnostic Time		• 3times function check.	
Fail Safe		<ul style="list-style-type: none"> <li>• Fixed at 4th gear(bad shifting to 4th-&gt;5th )</li> <li>• Fixed at 5th gear(bad shifting to 5th-&gt;4th )</li> <li>• No learning control (priority :3)</li> </ul>	

## CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is intentional.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

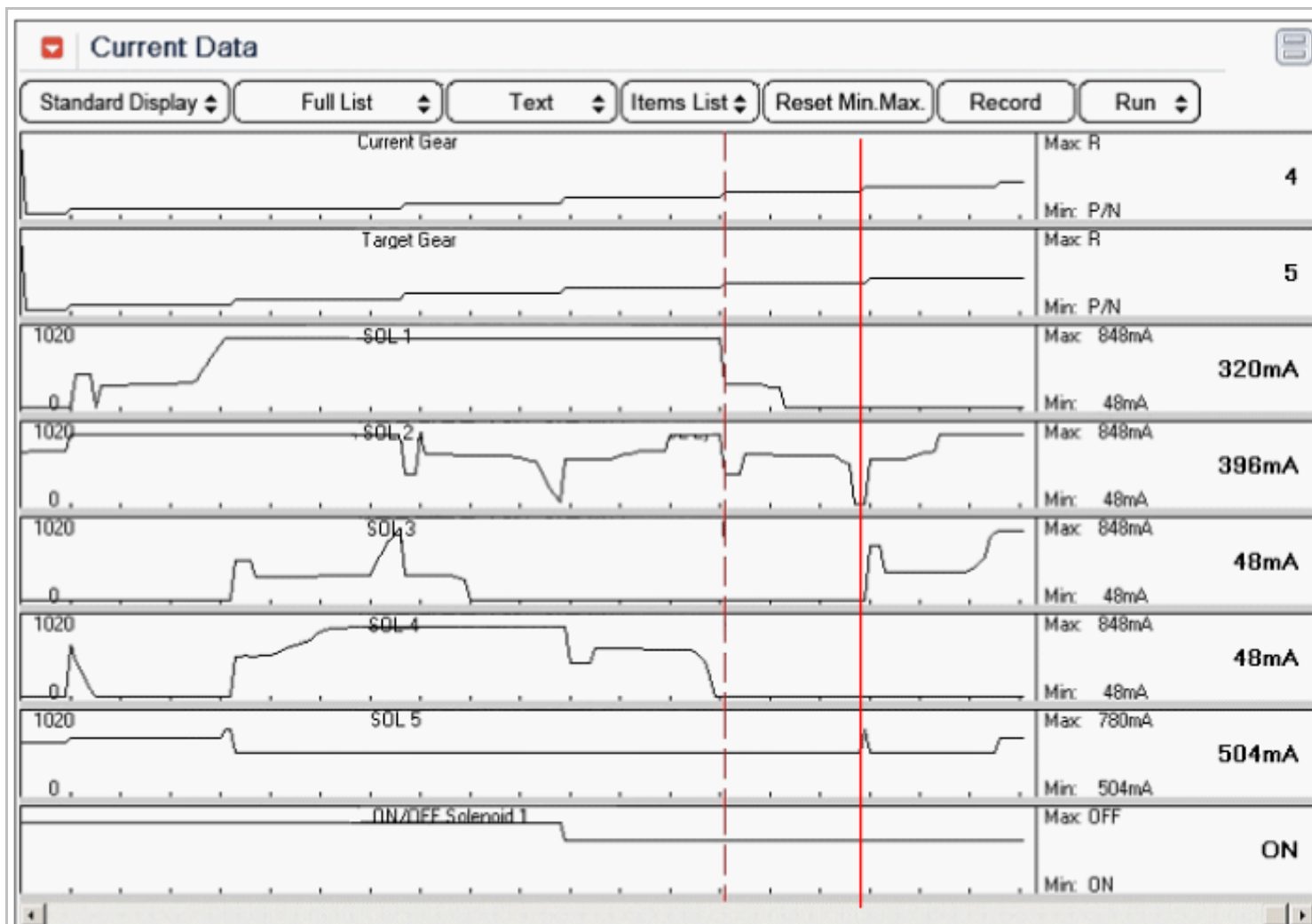


Fig.1

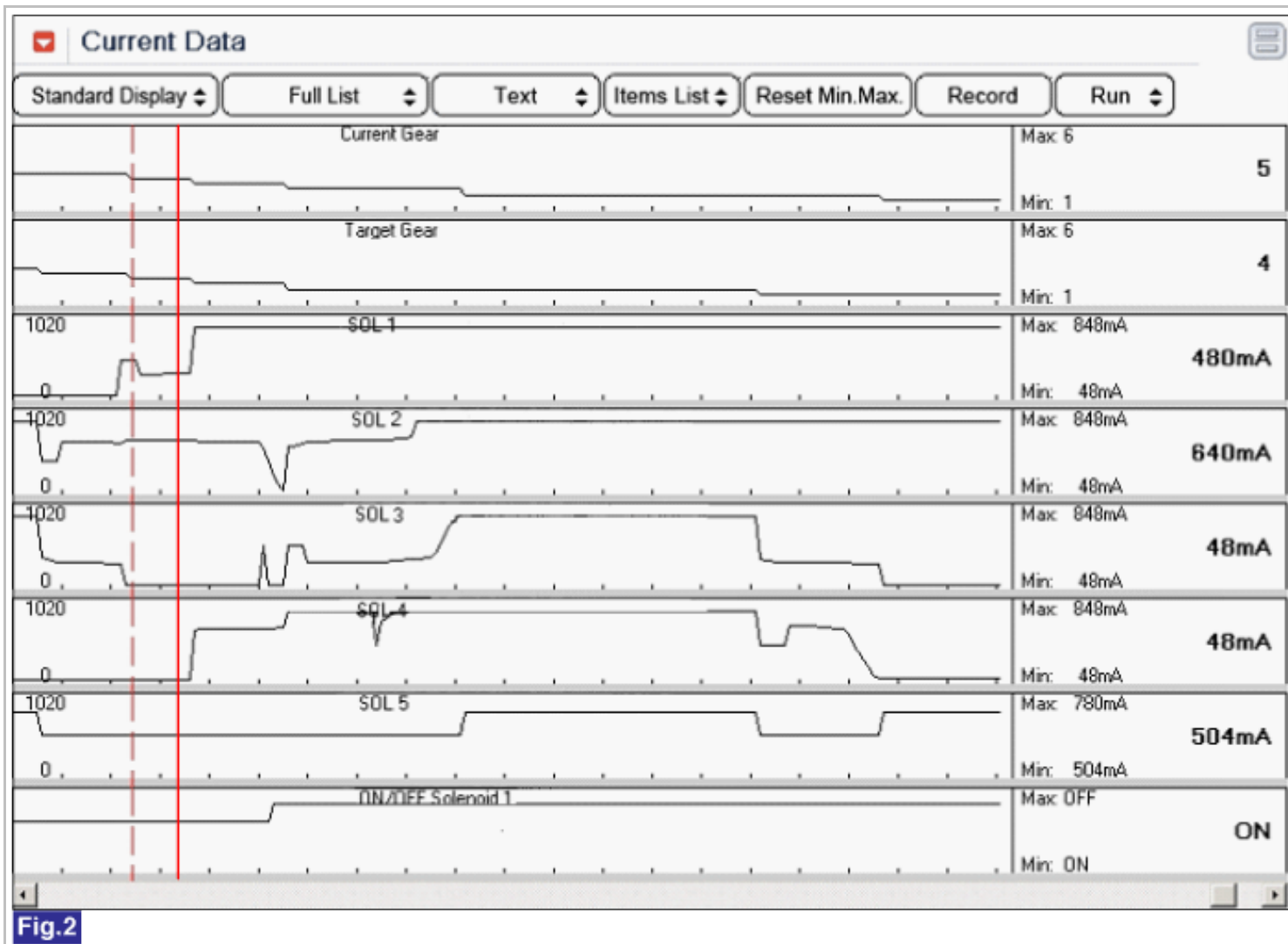


Fig 1) 4th-5th gear shifting : Shift control solenoid valve1

Fig 2) 5th-4th gear shifting : Shift control solenoid valve2

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Shift control solenoid valve1 & Shift control solenoid valve2" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valve.

**Specification** :48mA ~ 848mA

### Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-

D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control

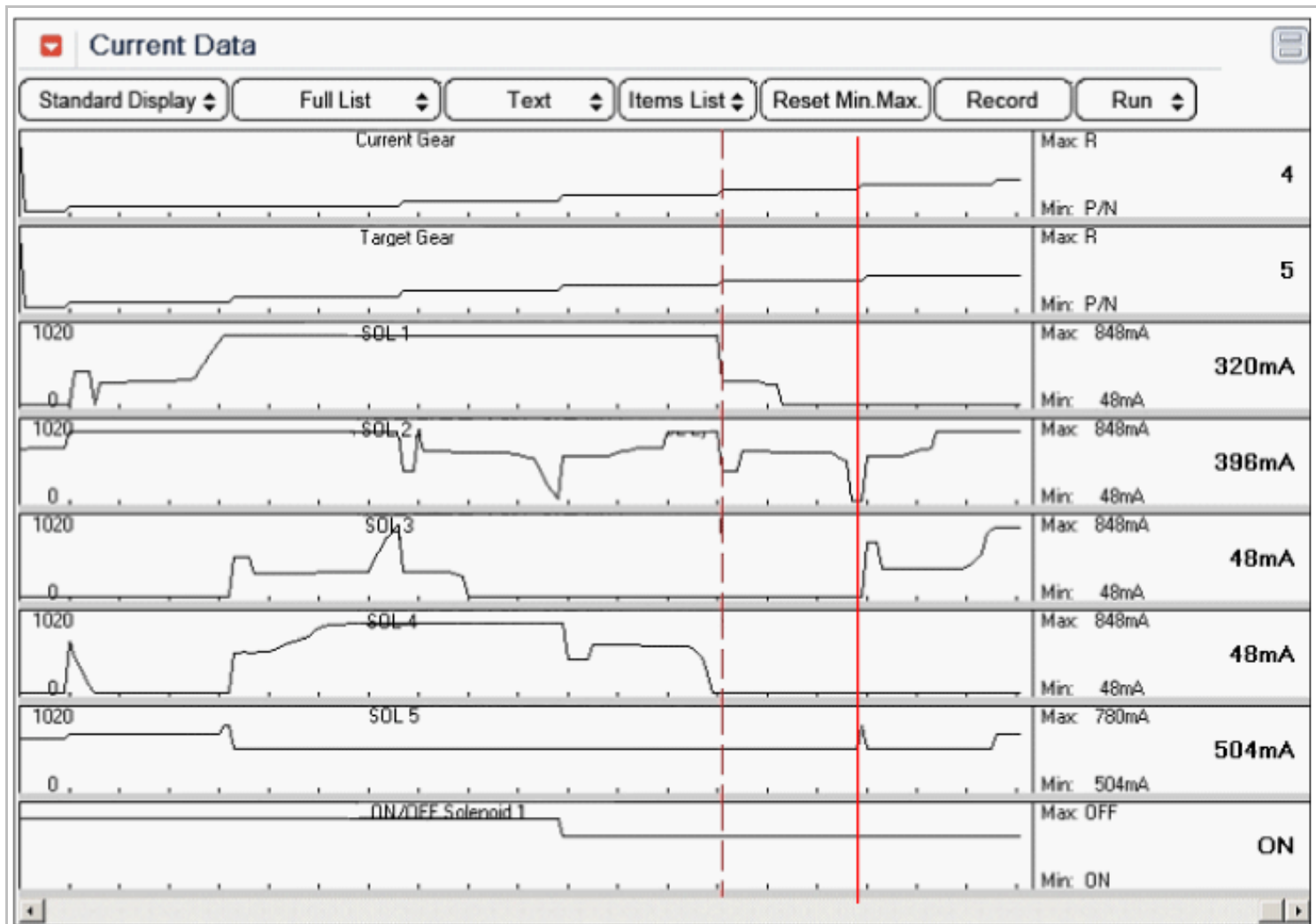


Fig.1

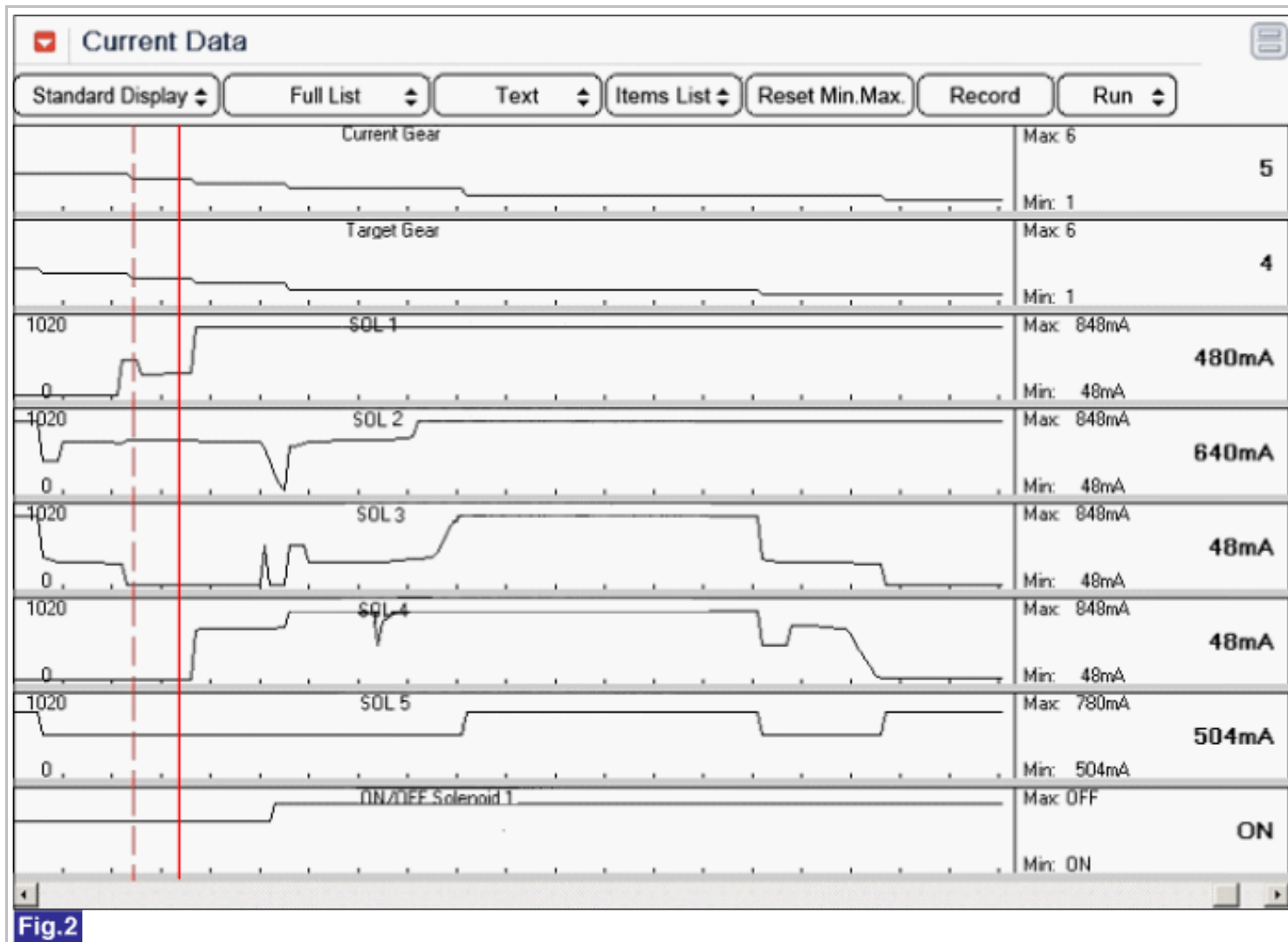


Fig 1) 4th-5th gear shifting : Shift control solenoid valve1

Fig 2) 5th-4th gear shifting : Shift control solenoid valve2

5. Dose "Shift control solenoid valve1 & Shift control solenoid valve2" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	► Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected,replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
------------	---



**NO**

► Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

**YES**

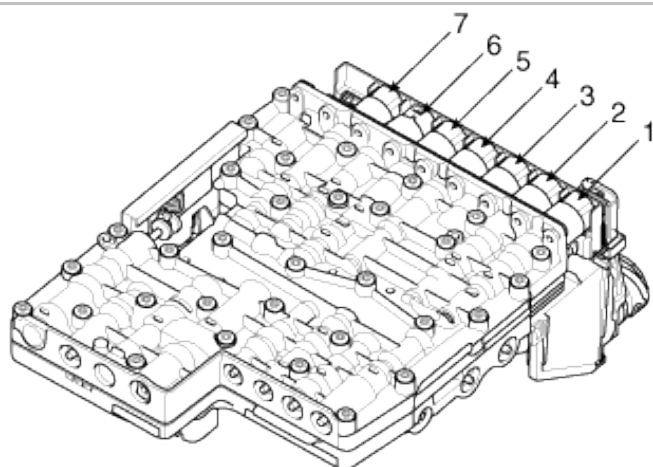
► Go to the applicable troubleshooting procedure

**NO**

► System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0829 5-6 Shift

### Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

## General Description

The ratio monitoring controls the nominal gear box ratio to the real gear box ratio. While driving in a gear(reverse, first second, third...) there is a calibrated rationality check between turbine speed and output speed of the corresponding gear. While up or down shifting from one gear to another there is a calibrated rationality check between turbine speed and output speed of the corresponding shift. While engaging the gear there is a calibrated rationality check between turbine speed and output speed of the corresponding shift if the actual output speed is higher or equal than a calibrated threshold. While engaging the gear when the actual output speed is lower than the threshold there is a rationality check on the turbine speed.

## DTC Description

TCM set this code If target gear ratio and actual gear ratio are not match in condition that 5th → 6th gear or 6th → 5th gear shifting.(MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item		Detecting Condition	Possible Cause
DTC Strategy		• Gear ratio monitoring	<ul style="list-style-type: none"> <li>• Refer to Engine daignostic system</li> <li>• E- Module (1st -&gt; 2nd shifting : solenoid valve "2" or 2nd -&gt; 1st shifting : solenoid valve "3"</li> <li>• Replace ATM</li> </ul>
Enable Conditions		• Within 0.5 second after gear shift to 5th gear <-> 6th gear.	
	CASE 1	• Output speed ≥ 50rpm	
	CASE 2	• Output speed < 50rpm	
Threshold Value	CASE 1	<ul style="list-style-type: none"> <li>• actual gear ratio ≥ monitoring gear ratio + targer gear ratio</li> <li>• actual gear ratio &lt; targer gear ratio</li> </ul>	
	CASE 2	• Not judge.	
Diagnostic Time		• 3times function check.	
Fail Safe		<ul style="list-style-type: none"> <li>• Fixed at 5th gear(bad shifting to 5th-&gt;6th )</li> <li>• Fixed at 6yh gear(bad shifting to 6th-&gt;5th )</li> <li>• No learning control (priority :3)</li> </ul>	

## CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

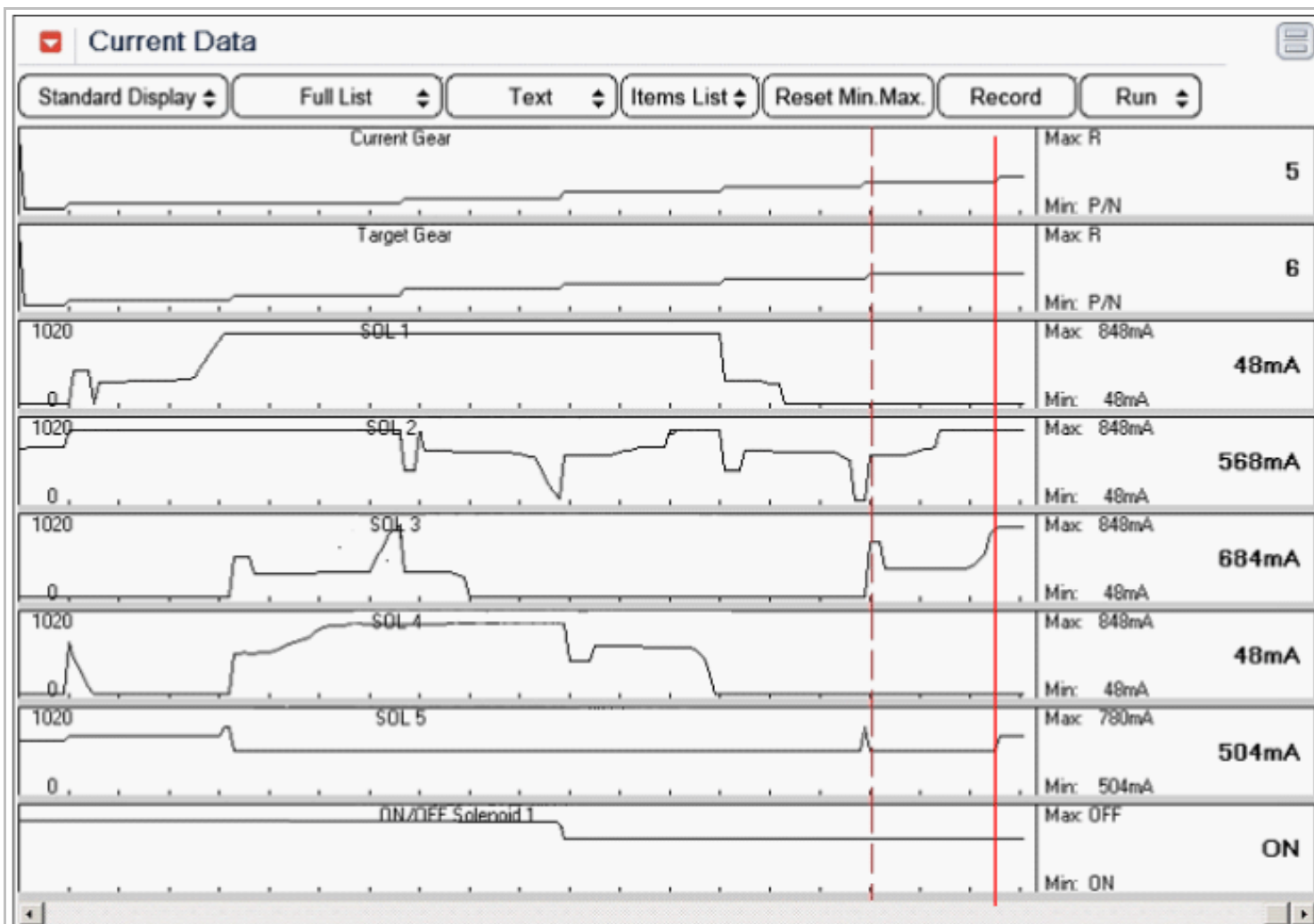


Fig.1

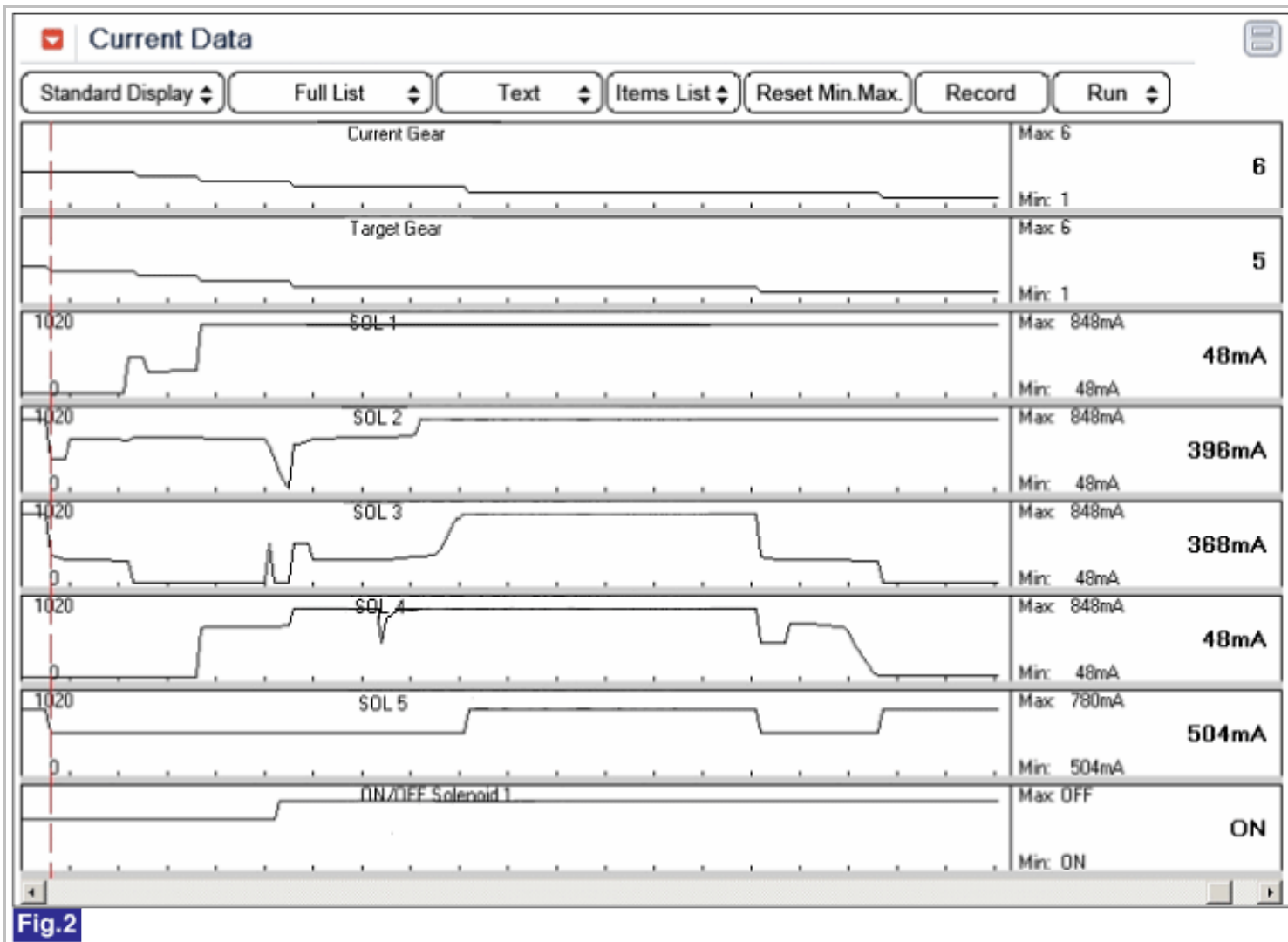


Fig 1) 5th-6th gear shifting : Shift control solenoid valve2

Fig 2) 6th-5th gear shifting : Shift control solenoid valve3

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Shift control solenoid valve2 & Shift control solenoid valve3" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valve.

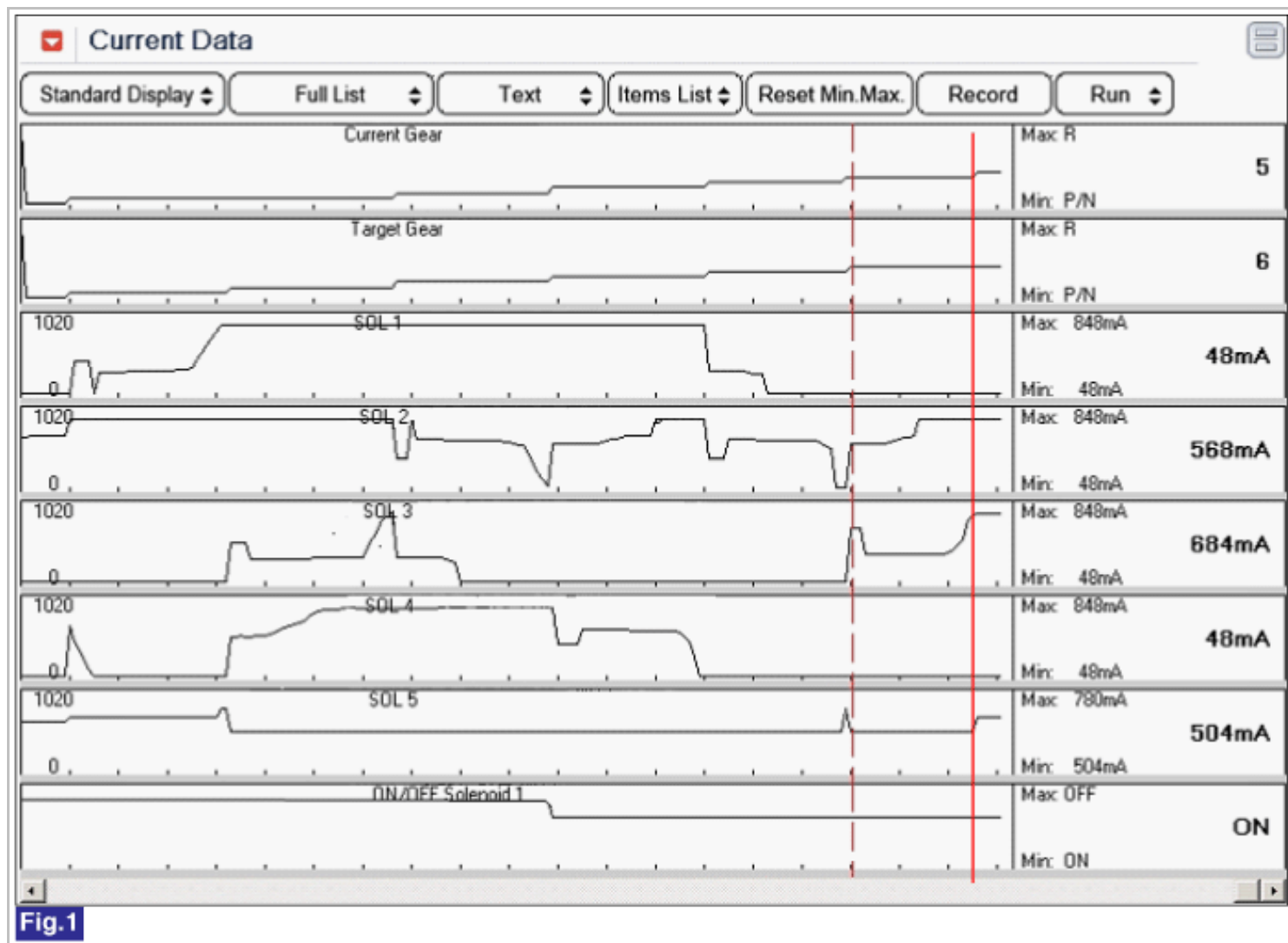
**Specification** :48mA ~ 848mA

### Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-

D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control



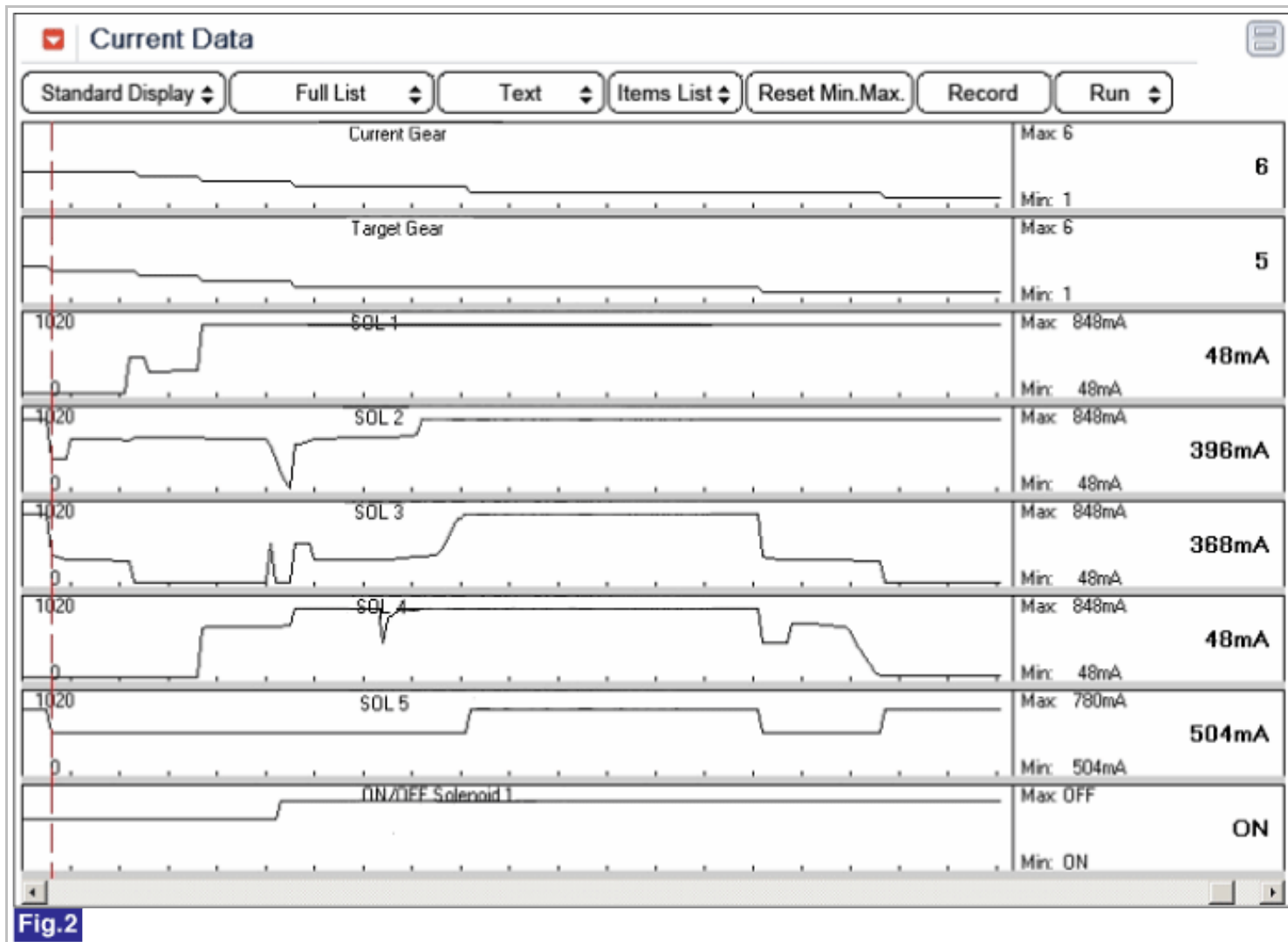


Fig 1) 5th-6th gear shifting : Shift control solenoid valve2  
 Fig 2) 6th-5th gear shifting : Shift control solenoid valve3

5. Dose "Shift control solenoid valve2 & Shift control solenoid valve3" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	► Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected,replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
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**NO**

► Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

**YES**

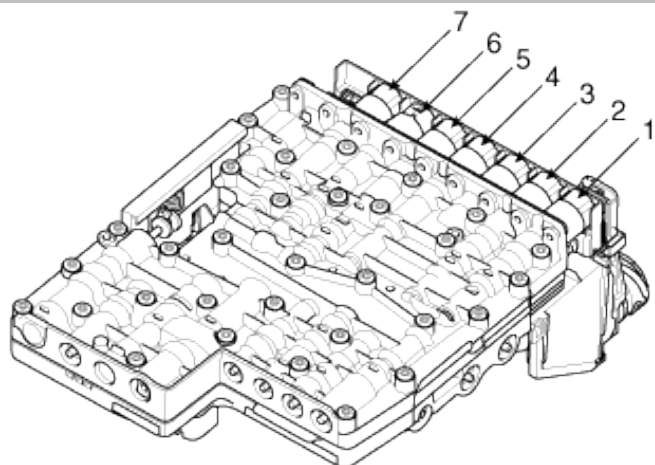
► Go to the applicable troubleshooting procedure

**NO**

► System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0880 TCM Power Signal Error Open/Short (GND)

### Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

## General Description

TCM monitors Battery voltage and power circuit usually, in order to maintain optimum condition of each sensors and solenoid-valve.

## DTC Description

TCM set this code If battery voltage that supplied to TCM is out of available range.(MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item		Detecting Condition	Possible Cause
DTC Strategy		<ul style="list-style-type: none"> <li>Check voltage range</li> </ul>	<ul style="list-style-type: none"> <li>Battery fuse</li> <li>Open circuit Battery to TCM</li> <li>Battery</li> <li>Alternator</li> </ul>
Enable Conditions	CASE 1	<ul style="list-style-type: none"> <li>Engine speed or Input speed &gt; 1400rpm</li> <li>Shift position level : N or P</li> <li>or</li> <li>Engine speed &gt; 500rpm</li> <li>Shift position level : N or P</li> </ul>	
	CASE 2	<ul style="list-style-type: none"> <li>Engine speed or Input speed &gt; 1400rpm</li> <li>Shift position level : N or P</li> <li>or</li> <li>Engine speed &gt; 500rpm</li> <li>Shift position level : N or P</li> </ul>	
	CASE 3	<ul style="list-style-type: none"> <li>Engine speed &gt; 400rpm</li> </ul>	
Threshold Value	CASE 1	<ul style="list-style-type: none"> <li>ATF 70°C : Battery voltage &lt; 7V</li> <li>ATF 140°C : Battery voltage &lt; 8.4V</li> </ul>	
	CASE 2	<ul style="list-style-type: none"> <li>Battery voltage &lt; 9V</li> </ul>	
	CASE 3	<ul style="list-style-type: none"> <li>Battery voltage &gt; 16V</li> </ul>	
Diagnostic Time	CASE 1	<ul style="list-style-type: none"> <li>0.05second</li> </ul>	
	CASE 2	<ul style="list-style-type: none"> <li>2.5second</li> </ul>	
	CASE 3	<ul style="list-style-type: none"> <li>2.5second</li> </ul>	
		<ul style="list-style-type: none"> <li>High speed : fixed at 5th gear, low speed : fixed at 3rd</li> </ul>	



Fail Safe

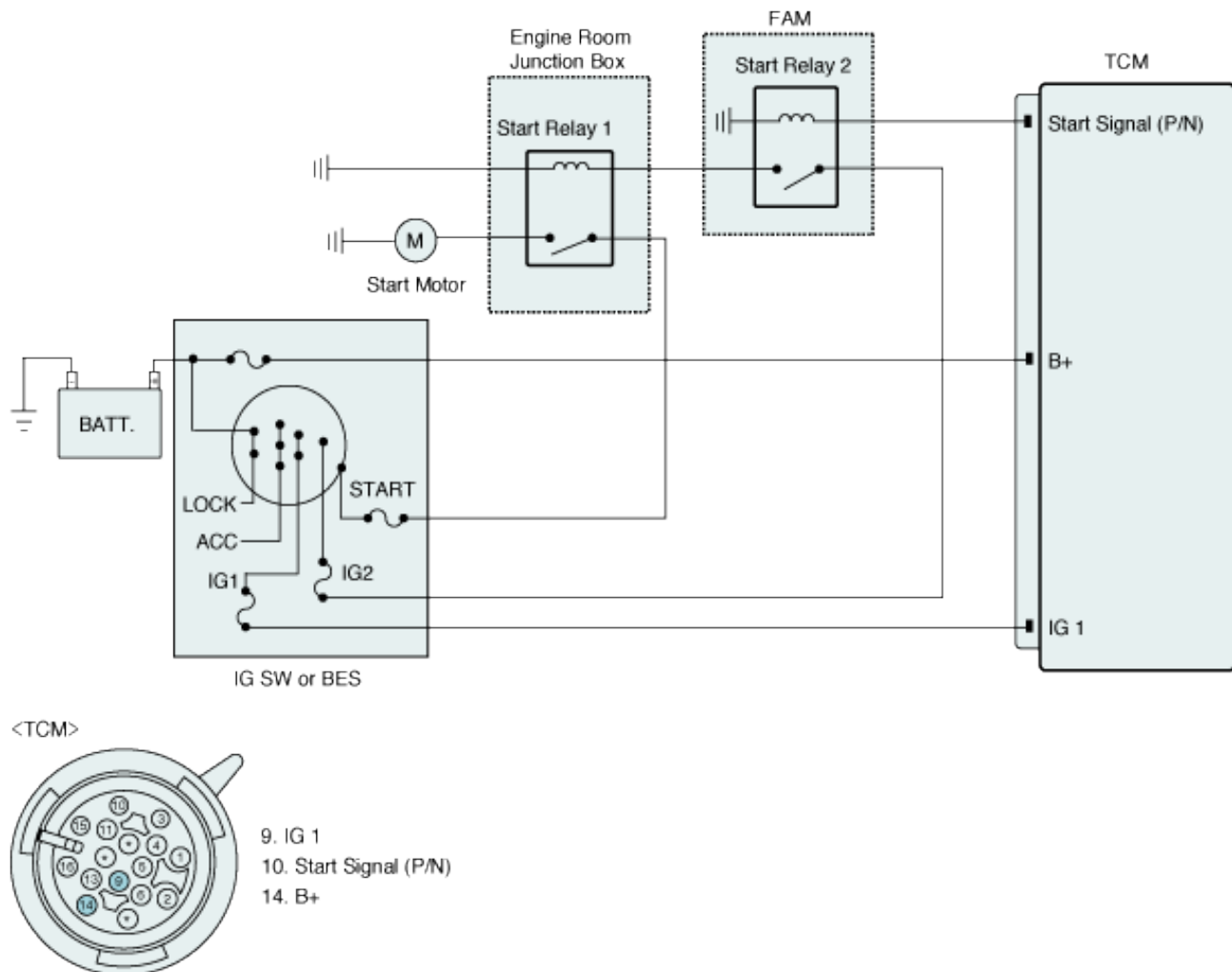
gear.

- Reverse : Shift lock(Push "Unlock button → possible to shift)  
(priority :3)

#### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

### Diagnostic Circuit Diagram



### Signal Waveform & Data

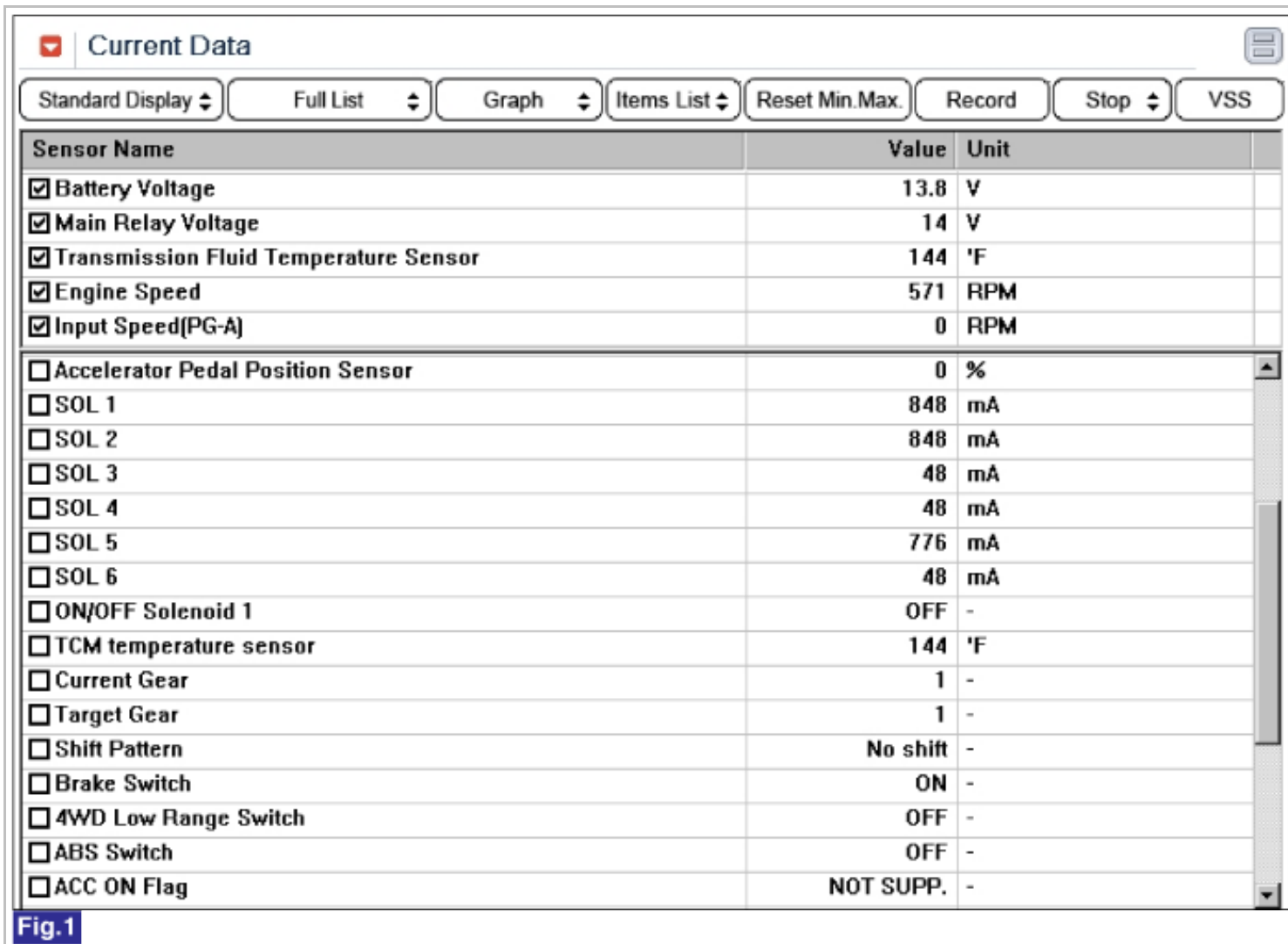


Fig 1) Battery voltage in Idle status

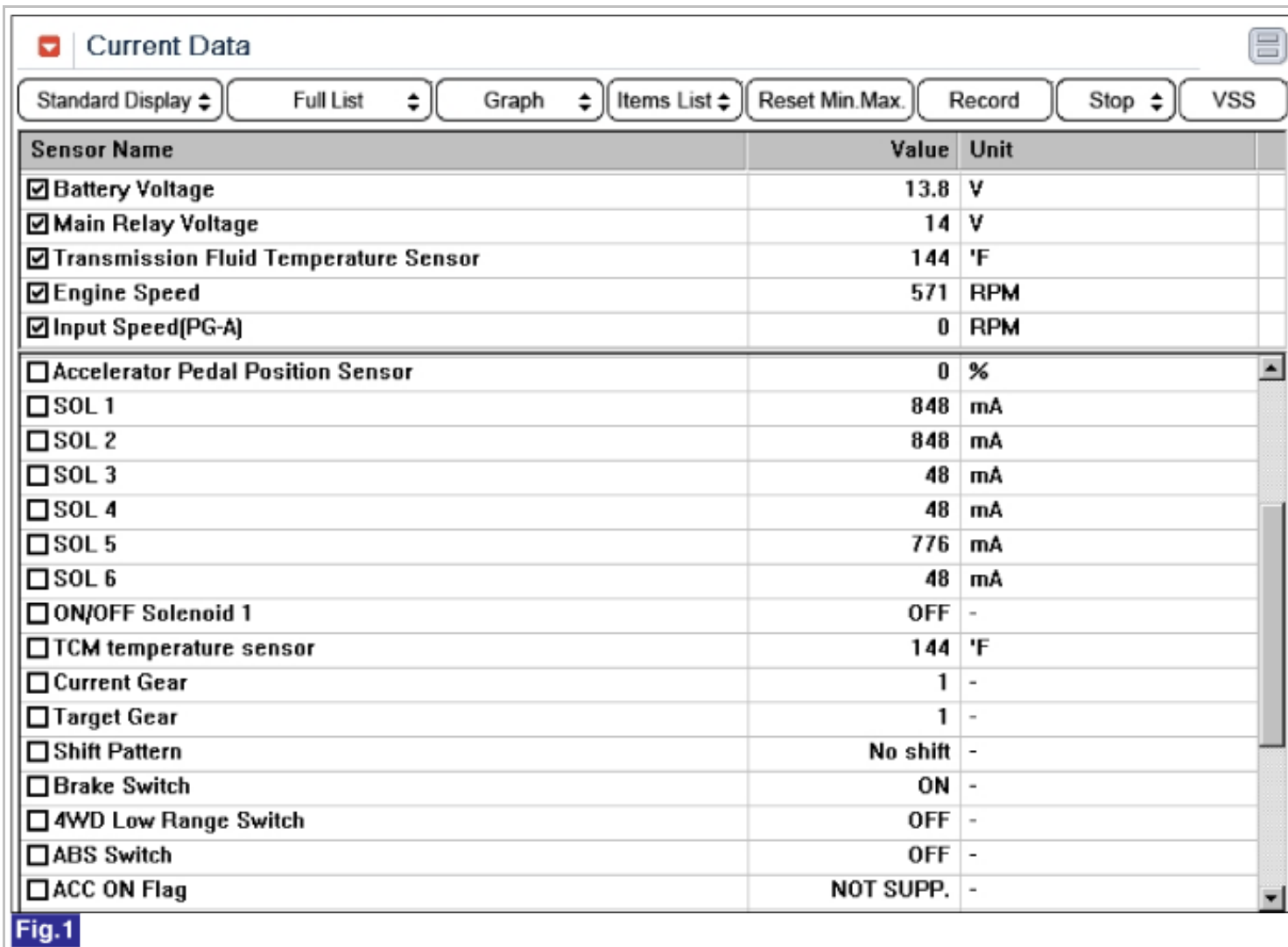
## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Battery voltage" parameter on the scan tool.
4. Confirm the Battery voltage in Idle status.

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**Specification : 13.5 ~ 14.5V**

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**Fig.1**

Fig 1) Battery voltage in Idle status

5. Is "Battery voltage" within specification ?

<b>YES</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	▶ Go to "Wiring circuit Inspection" procedure

## Terminal & Connector Inspection

1. Ignition "OFF".
2. Disconnect TCM connector.
3. Ignition "ON" & Engine "OFF".
4. Measure voltage between Power supply terminal of TCM wiring side and chassis ground.
5. Measure voltage between Power terminal(IG ON) of TCM wiring side and chassis ground.

**Specification :** 13.5 ~ 14.5V

6. Is "Measured voltage" within specification ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Check for open in harness or Fuse. Repair as necessary and Go to "Verification Vehicle Repair" procedure

## Verification of Vehicle Repair

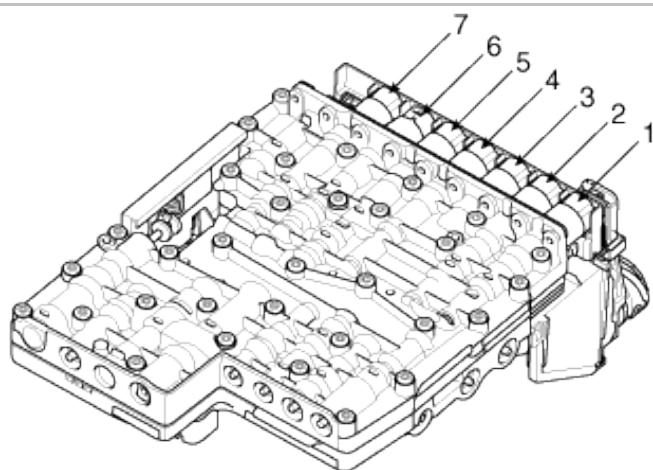
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	► Go to the applicable troubleshooting procedure
<b>NO</b>	► System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0889 TCM Power Supply to Solenoid Circuit Range/Performance

### Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

### General Description

TCM monitors Battery voltage and power circuit usually, in order to maintain optimum condition of each sensors and solenoid-valve.

### DTC Description

TCM set this code If can not drive for drive voltage generator of solenoid valve.(MIL ON : 2 driving Cycle)

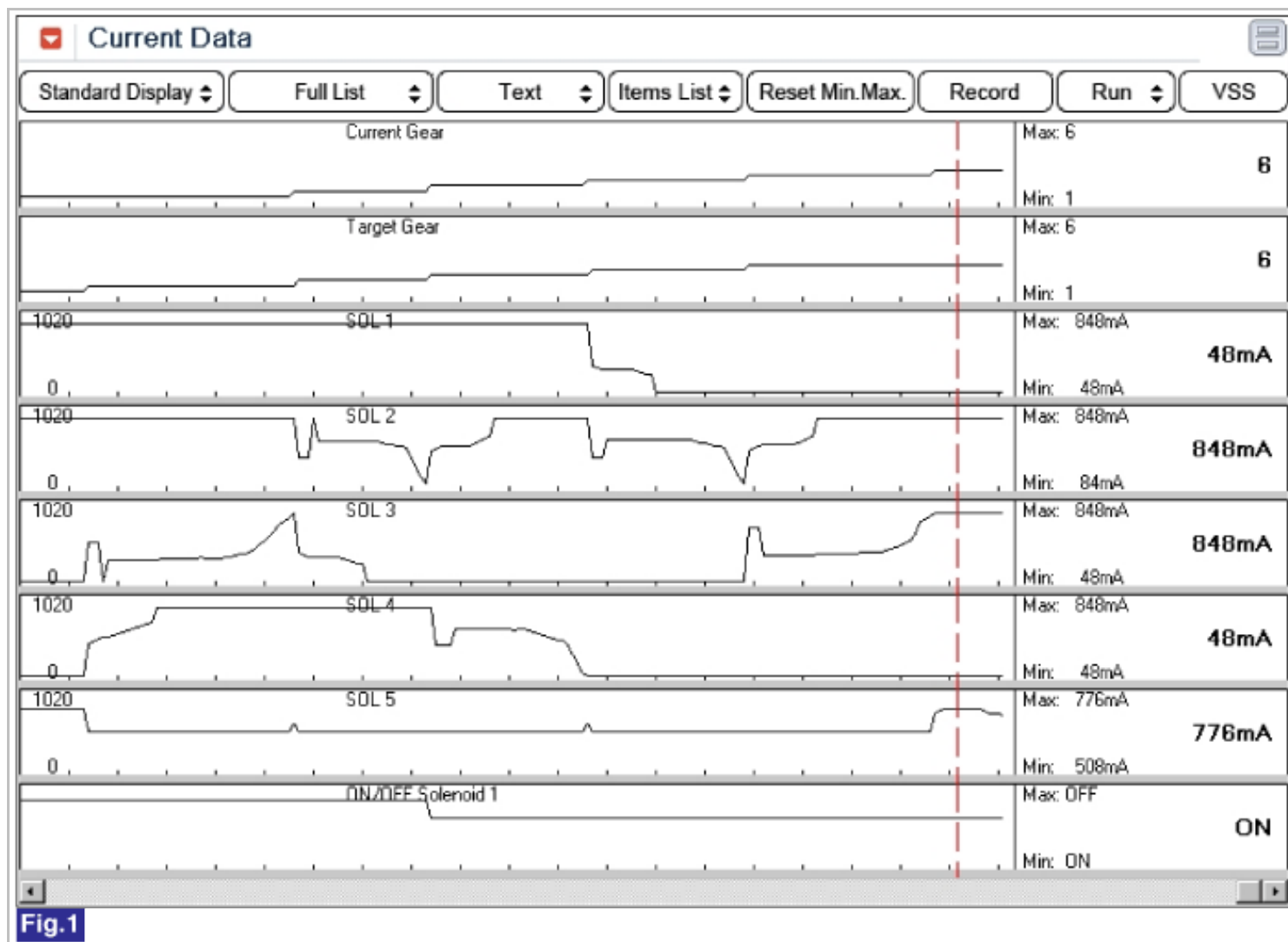
### DTC Detectiong Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Check Function	• Mechatronics(E-module + Valvebody)
Enable Conditions	• Calculated Vattery Voltage > 6,75V • No error in high side and low side valtage generator.	
Threshold Value	• Can not drive for drive voltage generator of solenoid valve.	
Diagnostic Time	• 0.03second	
Fail Safe	• High speed : fixed at 5th gear, low speed : fixed at 3rd gear. • Reverse : Shift lock(Push "Unlock button → possible to shift) (priority :3)	

#### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data



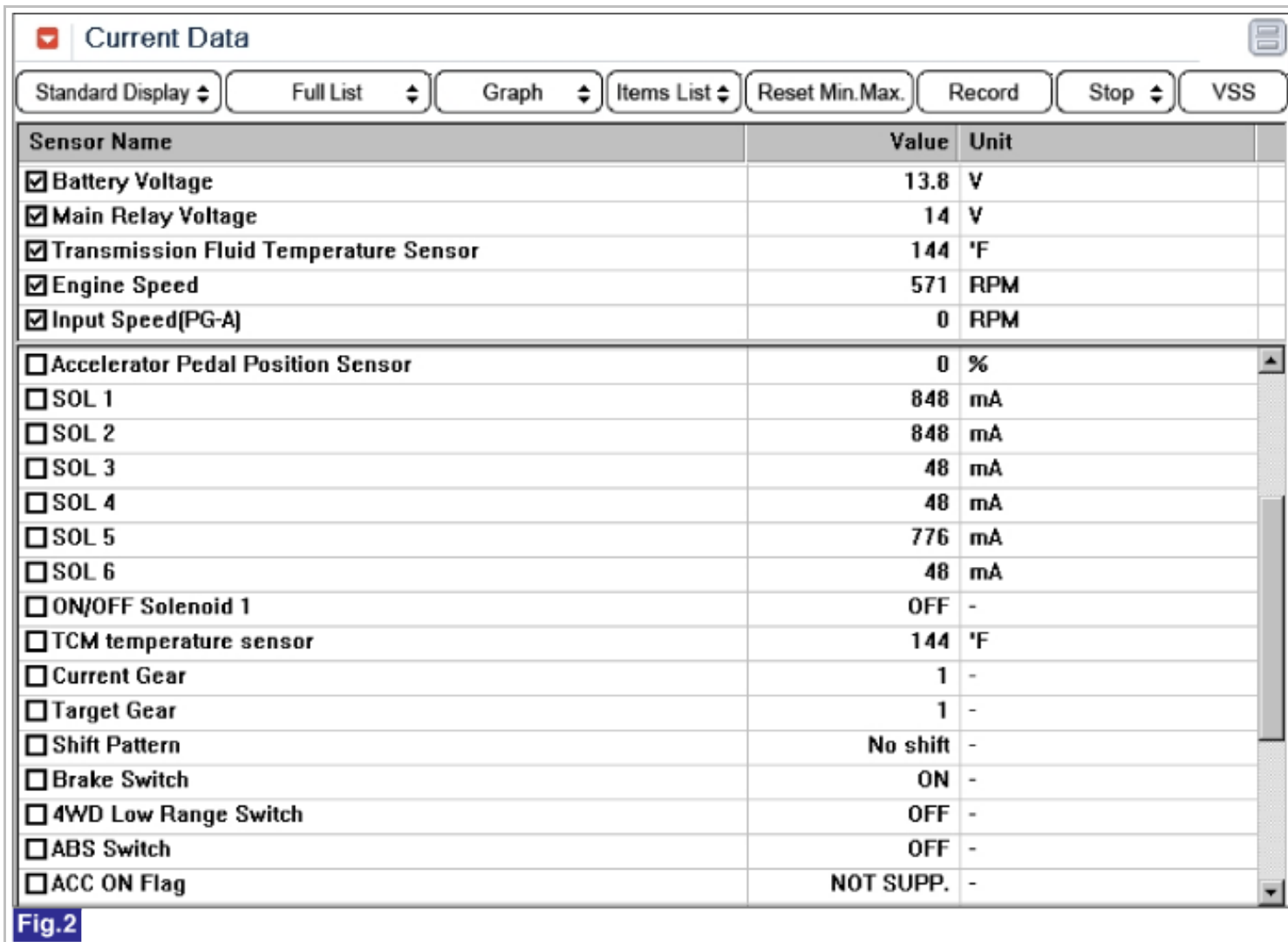


Fig.2

Fig 1) 1st~6th gear shifting : shift control solenoid valve  
 Fig 2) Battery voltage in Idle status

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Shift control solenoid valve" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valve.

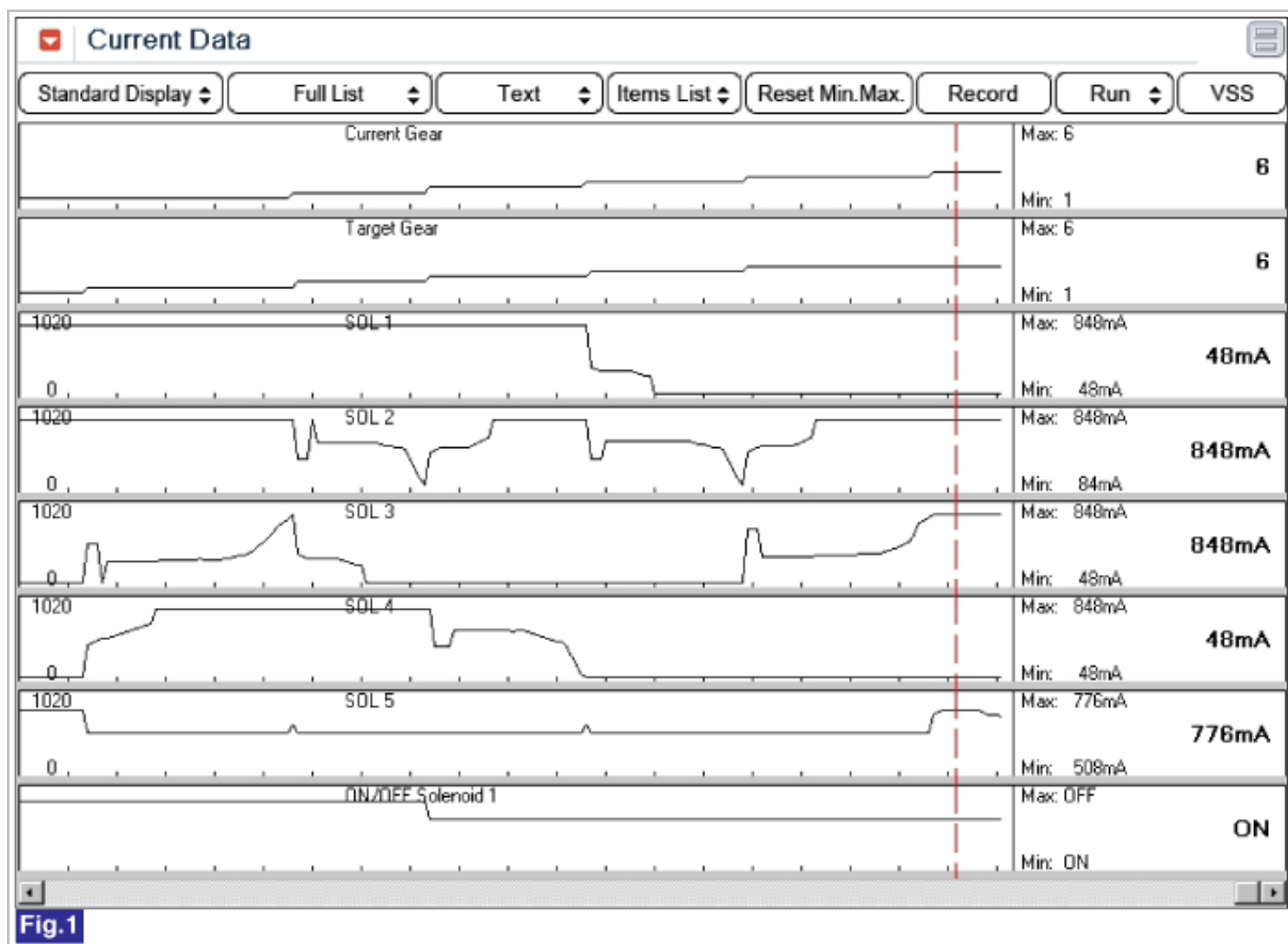
**Specification** :48mA ~ 848mA

### Solenoid valve operating status according to gear position

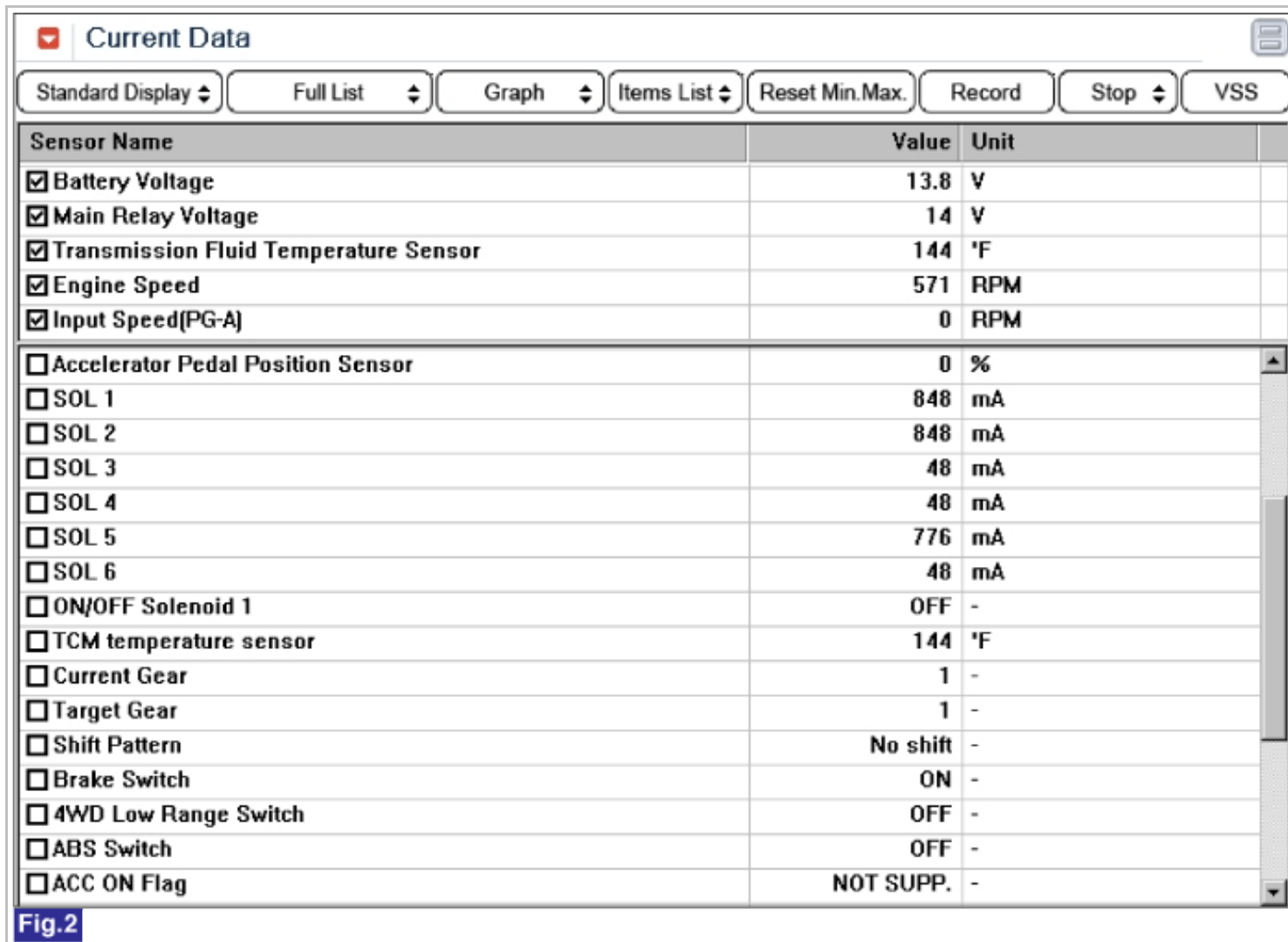
gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-

D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control







**Fig.2**

Fig 1) 1st~6th gear shifting : shift control solenoid valve

Fig 2) Battery voltage in Idle status

5. Are "Shift control solenoid valve & Battery voltage" within specification ?

<b>YES</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	▶ Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected,replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
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**NO**

► Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

**YES**

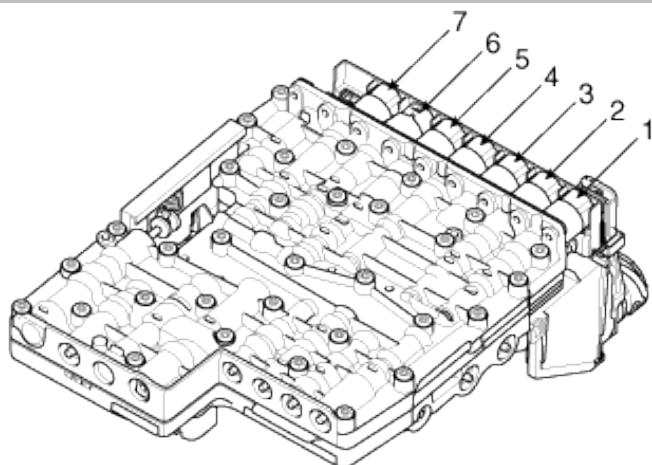
► Go to the applicable troubleshooting procedure

**NO**

► System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0890 TCM Power Relay Circuit Low

### Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

## General Description

TCM monitors Battery voltage and power circuit usually, in order to maintain optimum condition of each sensors and solenoid-valve.

## DTC Description

TCM set this code If detected lower voltage that drive voltage of solenoid valve than available range.(MIL ON : 2 driving Cycle)

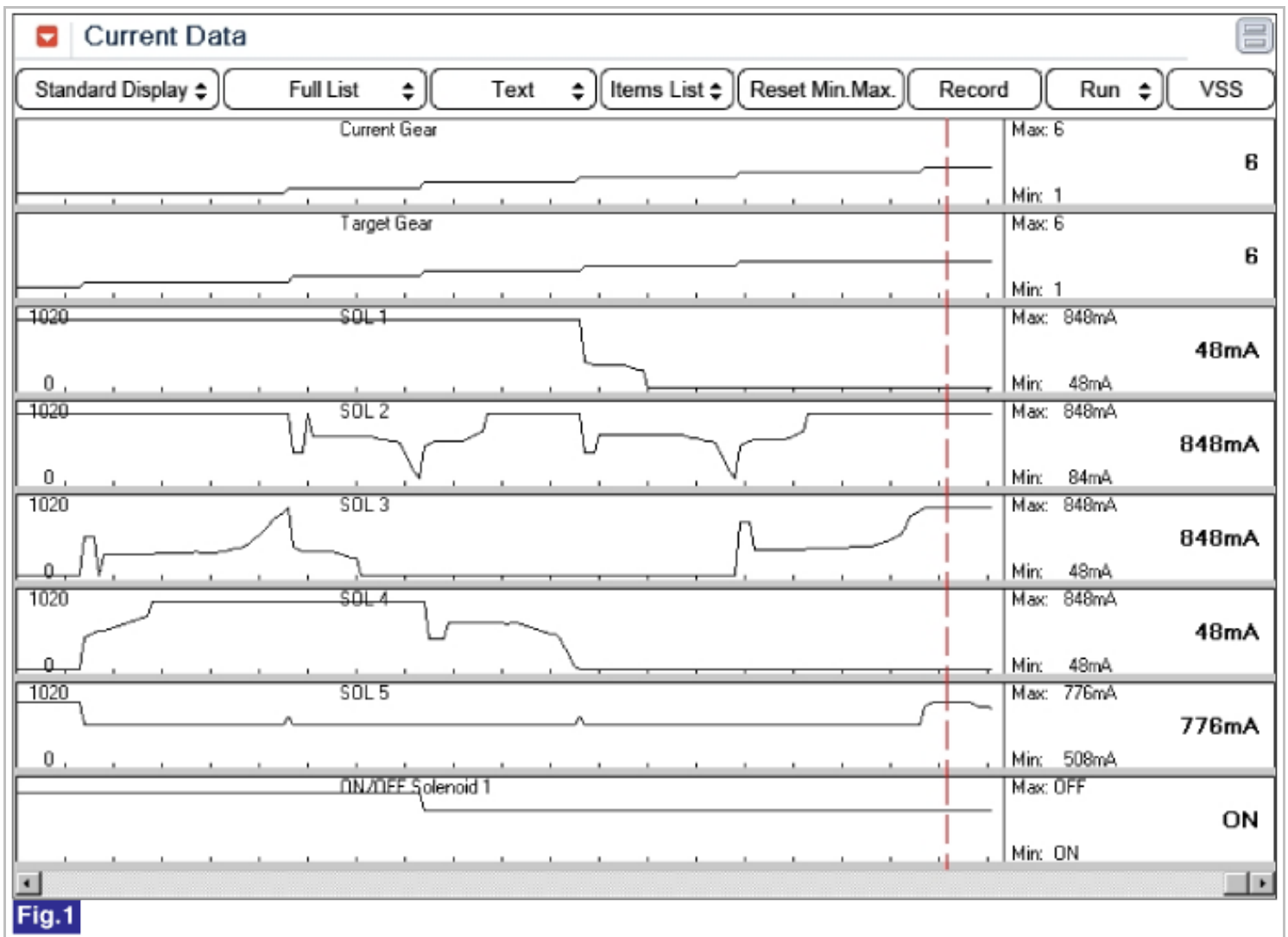
## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	<ul style="list-style-type: none"> <li>• Short to ground</li> </ul>	<ul style="list-style-type: none"> <li>• Mechatronics(E-module + Valvebody)</li> </ul>
Enable Conditions	<ul style="list-style-type: none"> <li>• calculated vattery voltage &gt; 6,75V</li> <li>• No error in high side and low side valtage generator.</li> </ul>	
Threshold Value	<ul style="list-style-type: none"> <li>• Supply voltage of solenoid valve &lt; 1.4V</li> <li>• Voltage drop at high side voltage generator &gt;1V</li> </ul>	
Diagnostic Time	<ul style="list-style-type: none"> <li>• 0.03second</li> </ul>	
Fail Safe	<ul style="list-style-type: none"> <li>• high speed : fixed at 5th gear, low speed : fixed at 3rd gear.gear.</li> <li>• Reverse : Shift lock(Push "Unlock button → possible to shift) (priority :3)</li> </ul>	

## CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data



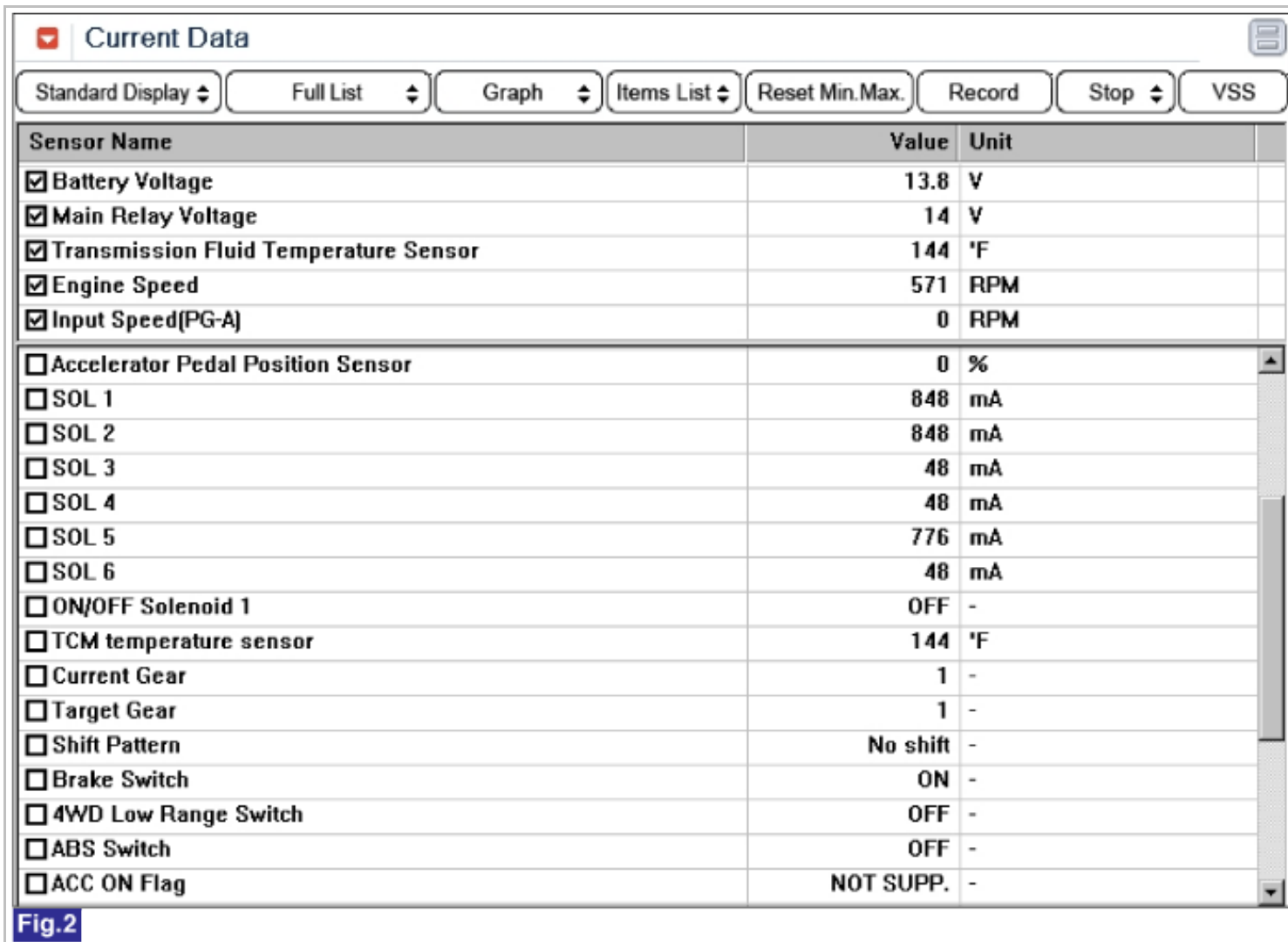


Fig.2

Fig 1) 1st~6th gear shifting : shift control solenoid valve

Fig 2) Battery voltage in Idle status

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Shift control solenoid valve" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valve.

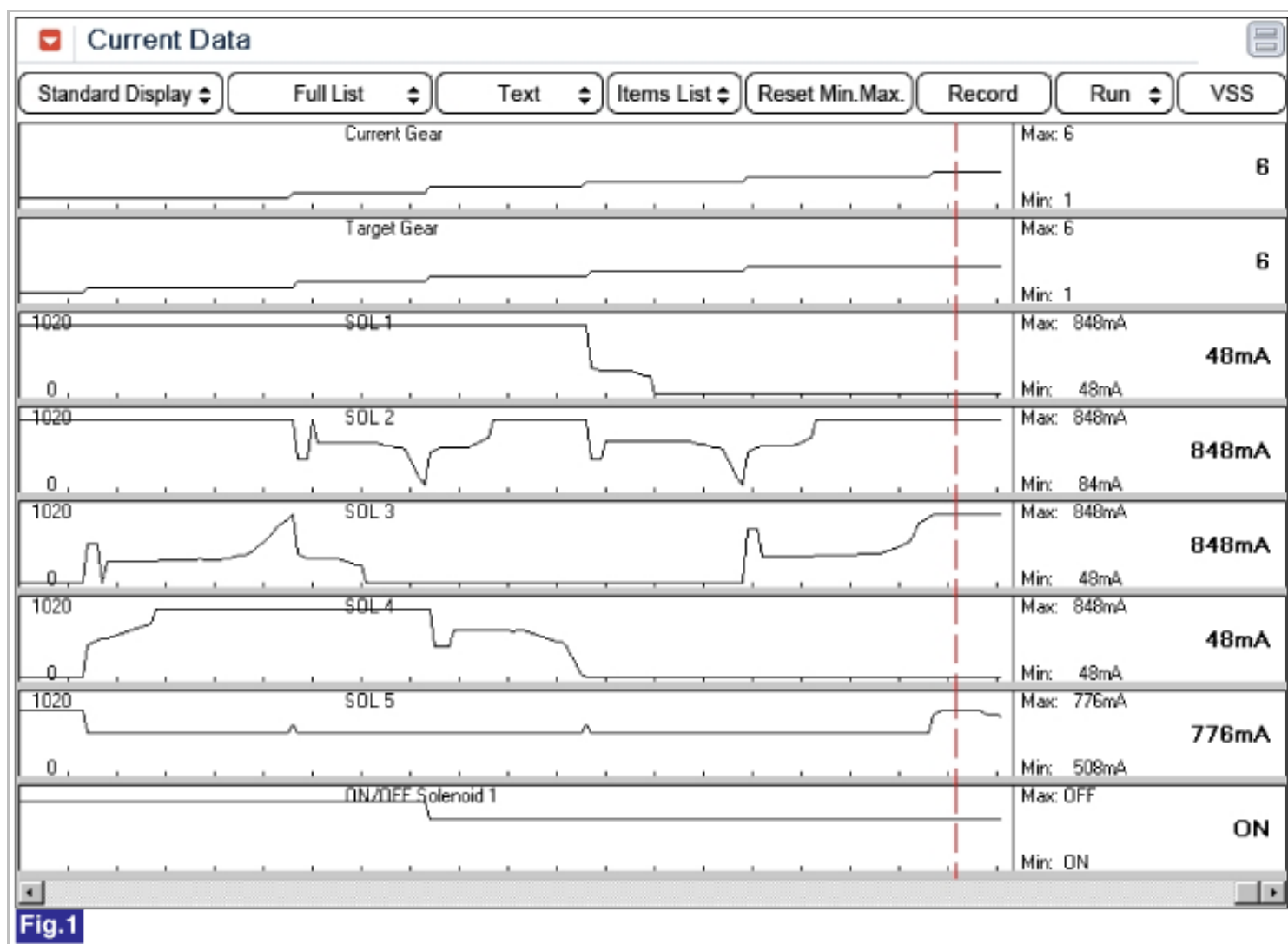
**Specification** :48mA ~ 848mA

### Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-

D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control



Current Data		
Standard Display	Full List	Graph
Items List	Reset Min.Max.	Record
Stop	VSS	
Sensor Name	Value	Unit
<input checked="" type="checkbox"/> Battery Voltage	13.8	V
<input checked="" type="checkbox"/> Main Relay Voltage	14	V
<input checked="" type="checkbox"/> Transmission Fluid Temperature Sensor	144	'F
<input checked="" type="checkbox"/> Engine Speed	571	RPM
<input checked="" type="checkbox"/> Input Speed(PG-A)	0	RPM
<input type="checkbox"/> Accelerator Pedal Position Sensor	0	%
<input type="checkbox"/> SOL 1	848	mA
<input type="checkbox"/> SOL 2	848	mA
<input type="checkbox"/> SOL 3	48	mA
<input type="checkbox"/> SOL 4	48	mA
<input type="checkbox"/> SOL 5	776	mA
<input type="checkbox"/> SOL 6	48	mA
<input type="checkbox"/> ON/OFF Solenoid 1	OFF	-
<input type="checkbox"/> TCM temperature sensor	144	'F
<input type="checkbox"/> Current Gear	1	-
<input type="checkbox"/> Target Gear	1	-
<input type="checkbox"/> Shift Pattern	No shift	-
<input type="checkbox"/> Brake Switch	ON	-
<input type="checkbox"/> 4WD Low Range Switch	OFF	-
<input type="checkbox"/> ABS Switch	OFF	-
<input type="checkbox"/> ACC ON Flag	NOT SUPP.	-

Fig.2

Fig 1) 1st~6th gear shifting : shift control solenoid valve

Fig 2) Battery voltage in Idle status

5. Are "Shift control solenoid valve & Battery voltage" within specification ?

<b>YES</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	▶ Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected,replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
------------	---

**NO**

► Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### **CAUTION**

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

**YES**

► Go to the applicable troubleshooting procedure

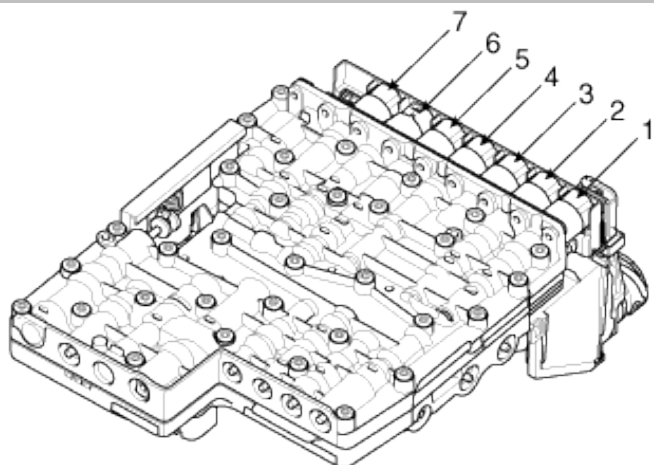
**NO**

► System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0891 TCM Power Relay Circuit High

### Component Location





1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

## General Description

TCM monitors Battery voltage and power circuit usually, in order to maintain optimum condition of each sensors and solenoid-valve.

## DTC Description

TCM set this code If detected higher voltage that drive voltage of solenoid valve than available range.(MIL ON : 2 driving Cycle)

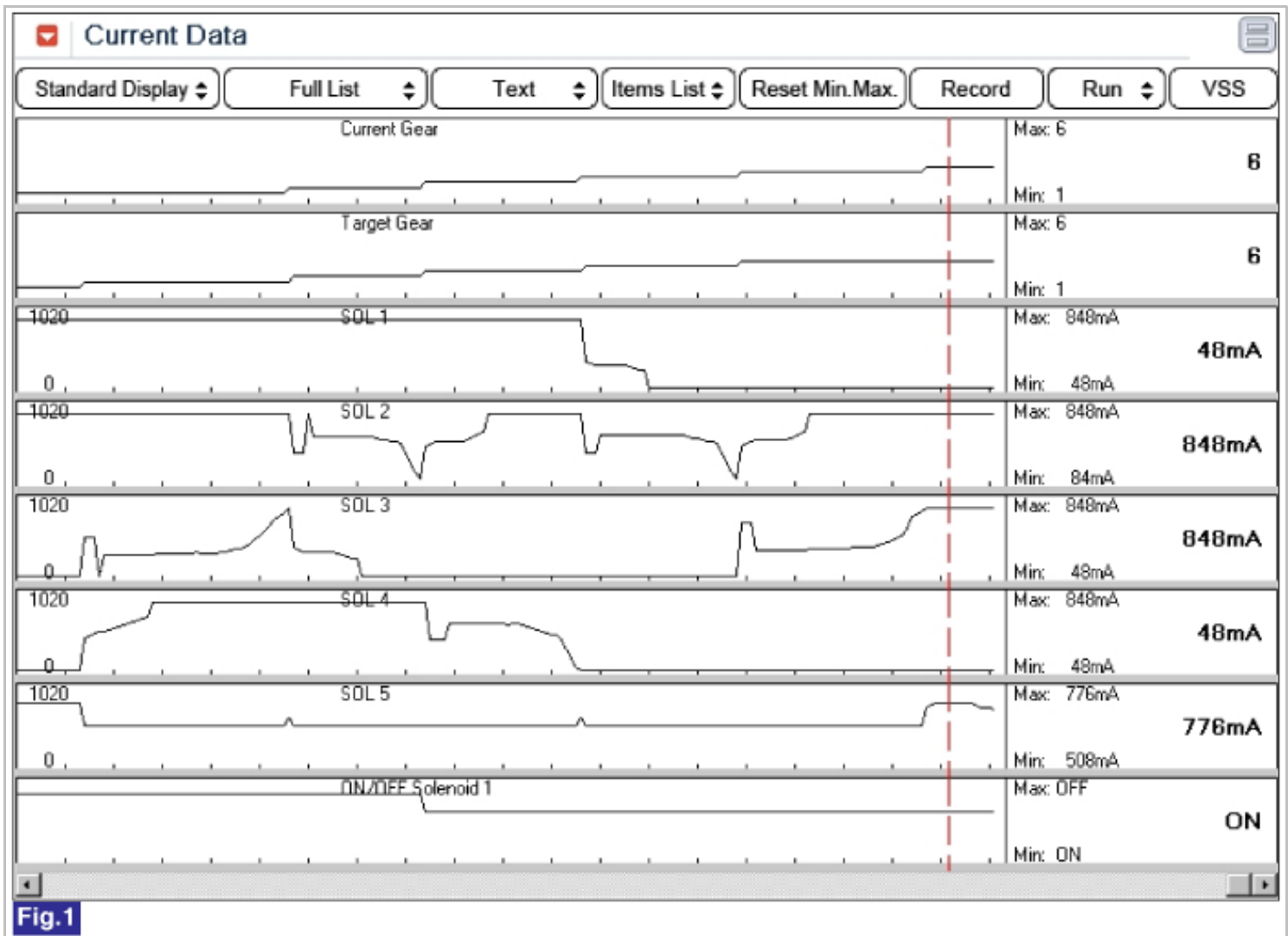
## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Short to battery	• Mechatronics(E-module + Valvebody)
Enable Conditions	• calculated vattery voltage > 6,75V • No error in high side and low side valtage generator.	
Threshold Value	• TCM detction automatically	
Diagnostic Time	• 0.03second	
Fail Safe	• high speed : fixed at 5th gear, low speed : fixed at 3rd gear. • Reverse : Shift lock(Push "Unlock button → possible to shift) (priority :3)	

## CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data



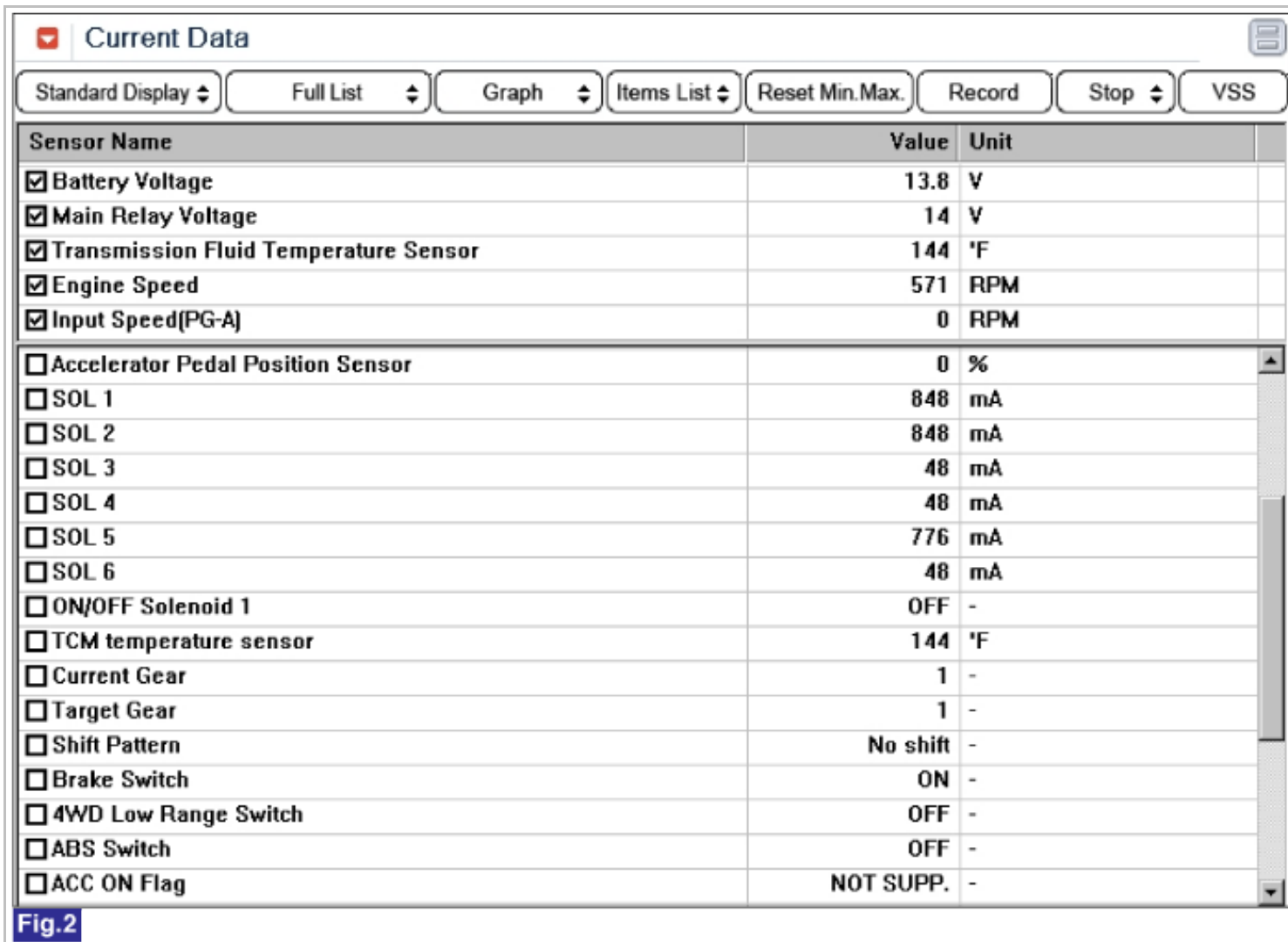


Fig.2

Fig 1) 1st~6th gear shifting : shift control solenoid valve

Fig 2) Battery voltage in Idle status

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Shift control solenoid valve" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valve.

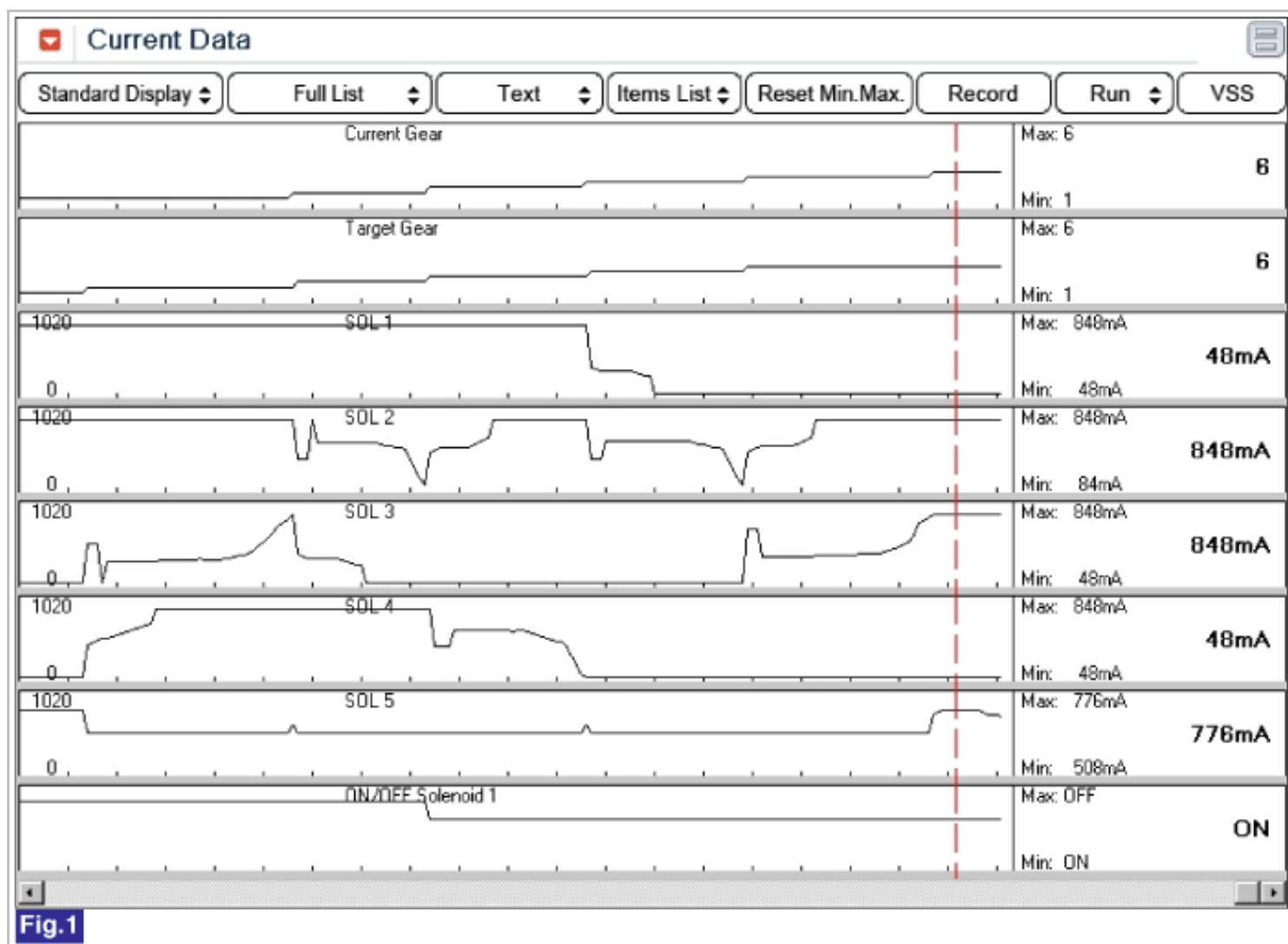
**Specification** :48mA ~ 848mA

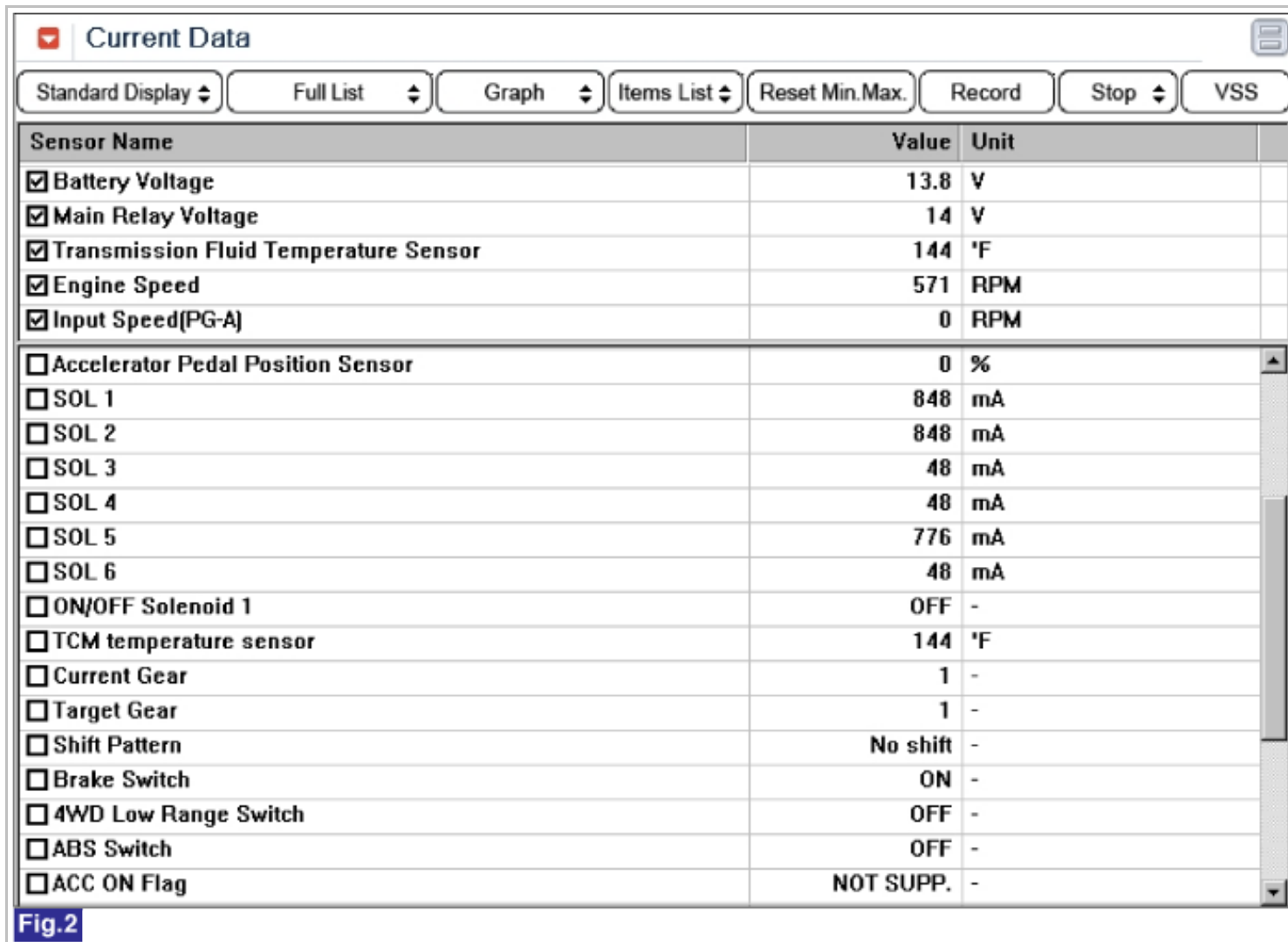
### Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-

D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control





**Fig.2**

Fig 1) 1st~6th gear shifting : shift control solenoid valve

Fig 2) Battery voltage in Idle status

5. Are "Shift control solenoid valve & Battery voltage" within specification ?

<b>YES</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	▶ Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
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**NO**

► Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### **CAUTION**

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

**YES**

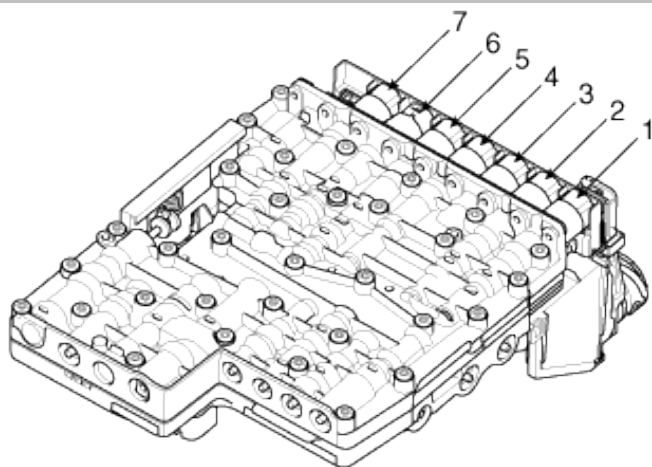
► Go to the applicable troubleshooting procedure

**NO**

► System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0892 TCM Power Supply to Solenoid Valve Circuit - Open

### Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

## General Description

TCM monitors Battery voltage and power circuit usually, in order to maintain optimum condition of each sensors and solenoid-valve.

## DTC Description

TCM set this code If detected lower voltage that drive voltage of solenoid valve than available range.(MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Open	• Mechatronics(E-module + Valvebody)
Enable Conditions	• calculated vattery voltage > 6,75V • No error in high side and low side valtage generator.	
Threshold Value	• TCM detction automatically	
Diagnostic Time	• 0.03second	
Fail Safe	• high speed : fixed at 5th gear, low speed : fixed at 3rd gear. • Reverse : Shift lock(Push "Unlock button → possible to shift) (priority :3)	

## CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

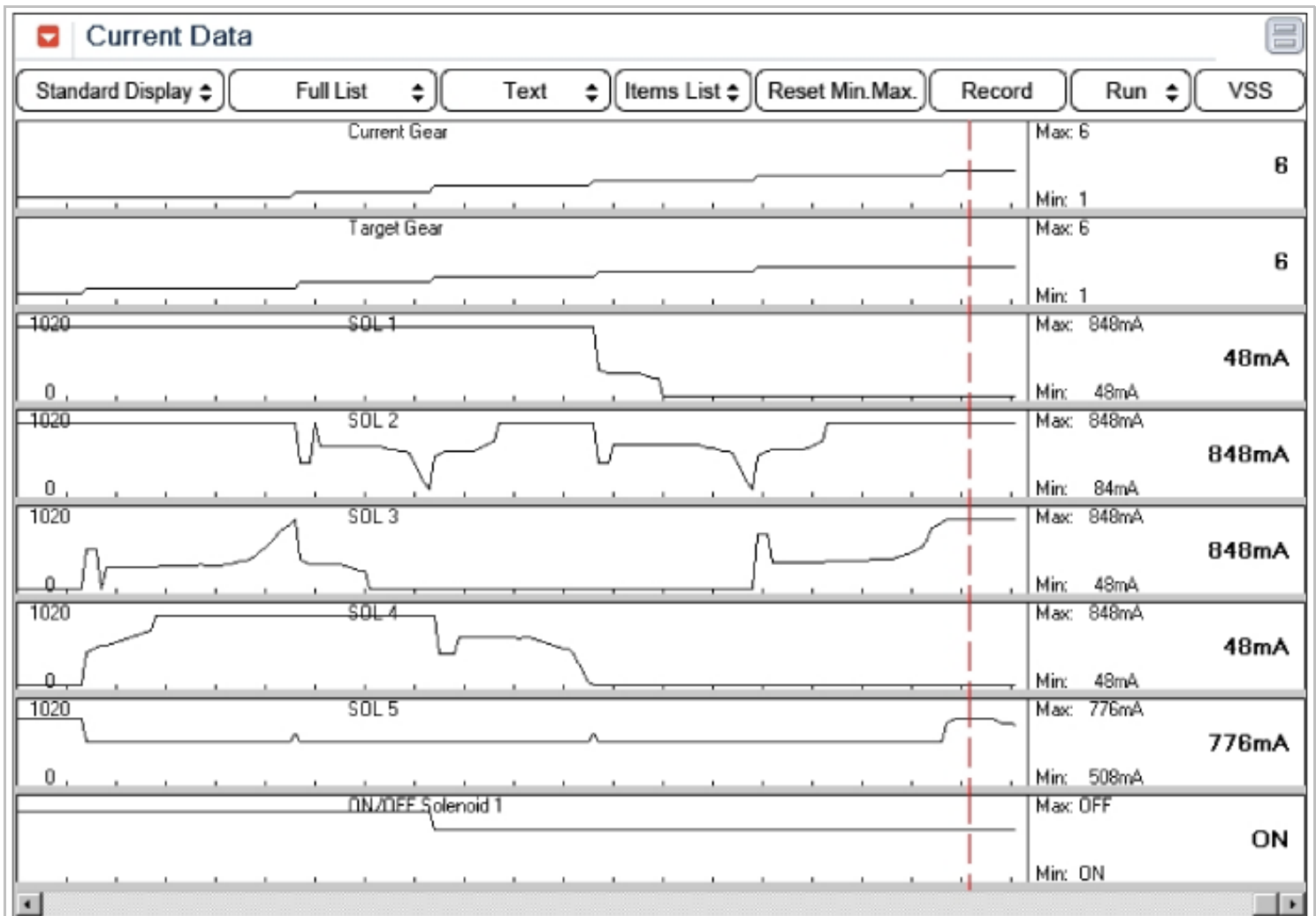


Fig.1



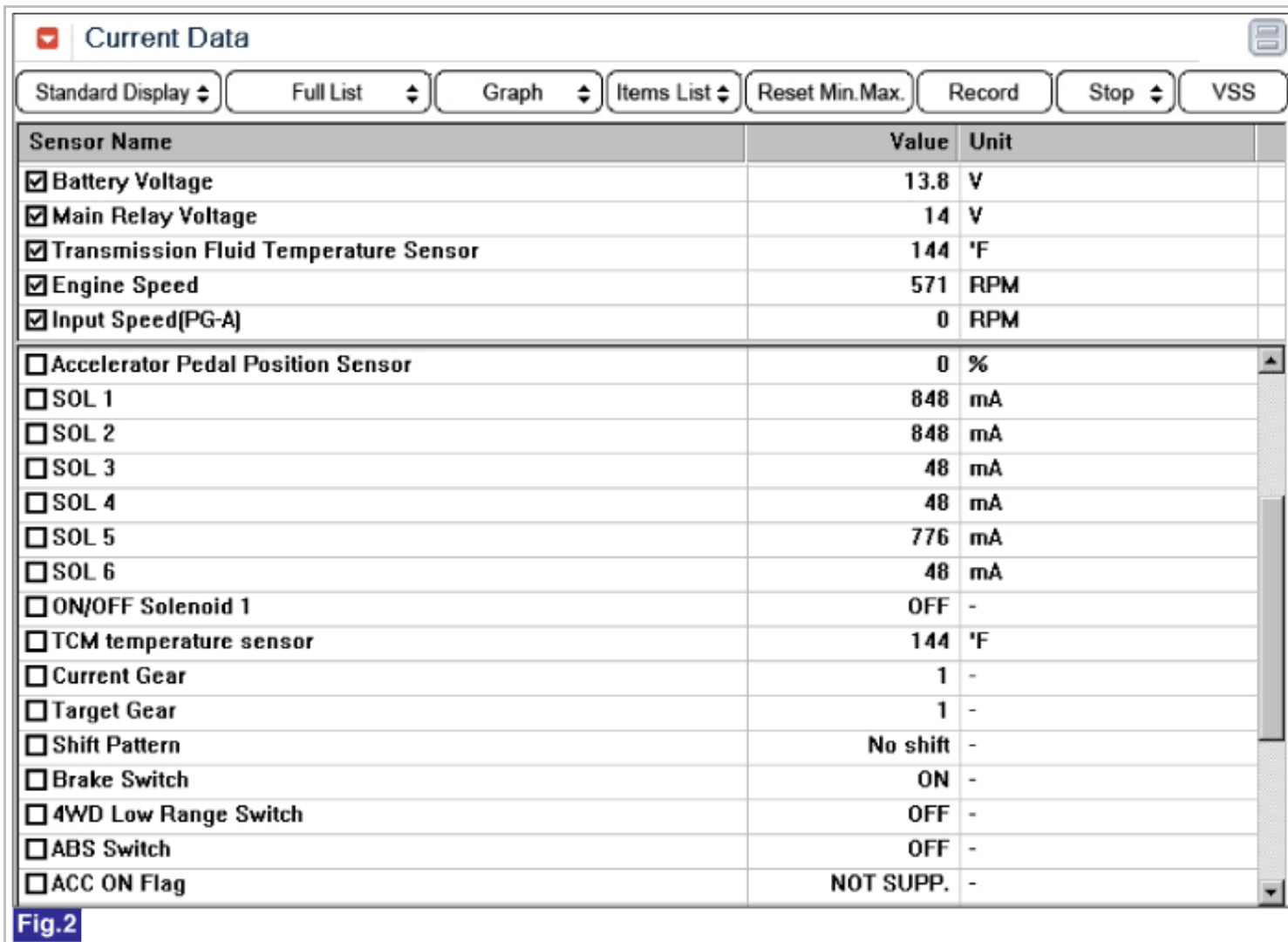


Fig.2

Fig 1) 1st-6th gear shifting : Shift control solenoid valve  
fig 2) Battery voltage in Idle status

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Shift control solenoid valve" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valve.

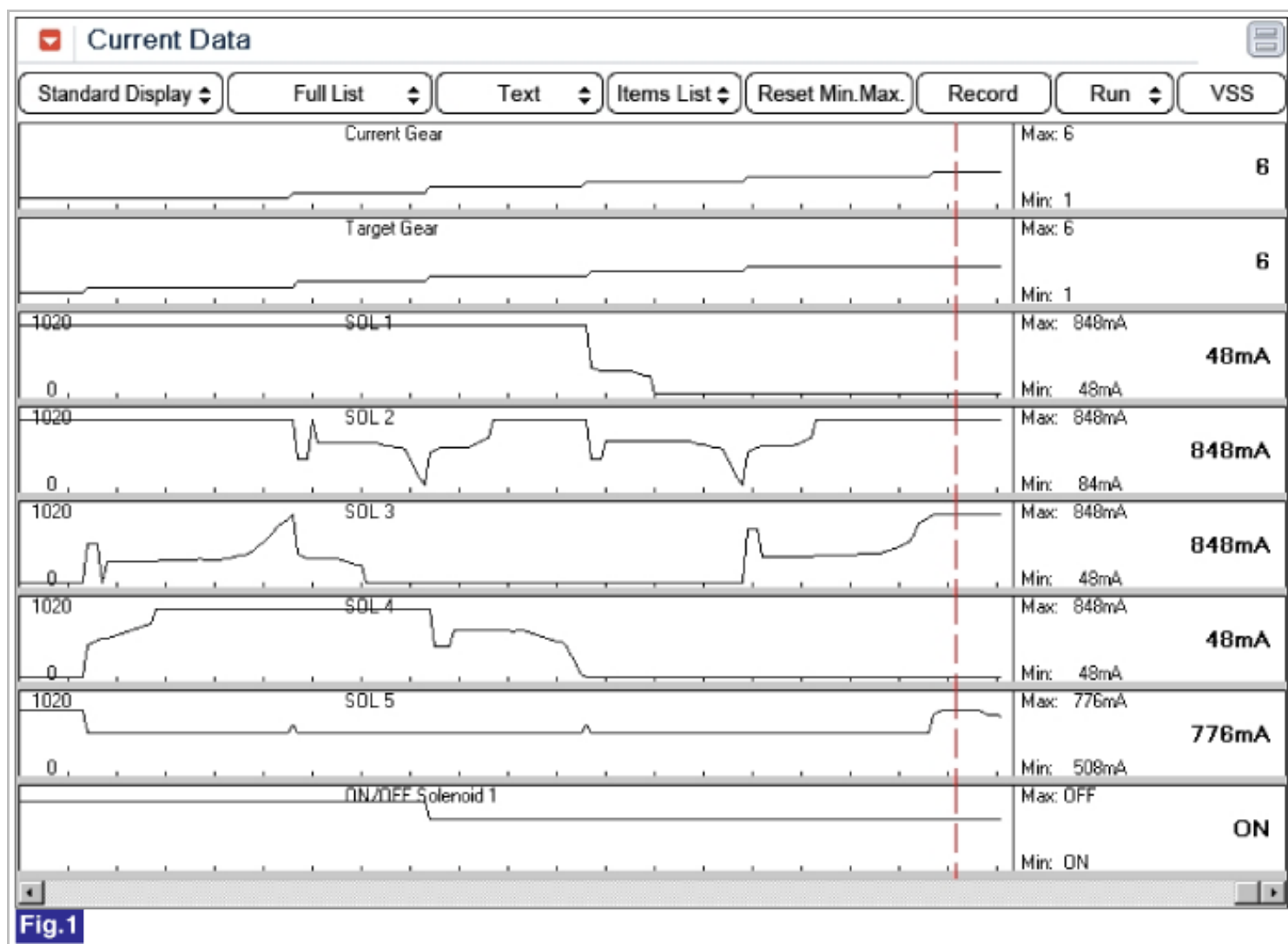
**Specification** :48mA ~ 848mA

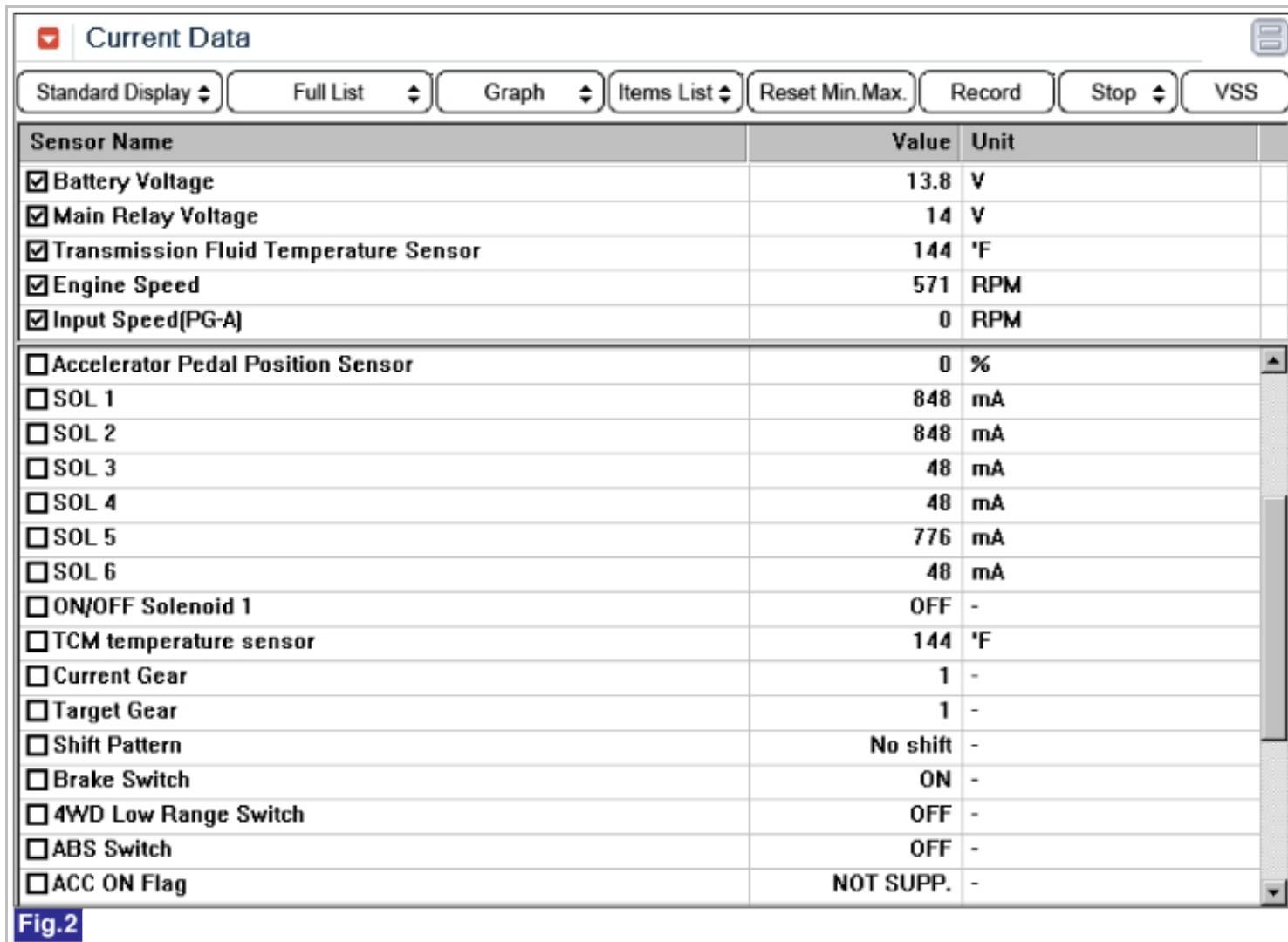
### Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-

D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control





**Fig.2**

Fig 1) 1st~6th gear shifting : shift control solenoid valve

Fig 2) Battery voltage in Idle status

5. Are "Shift control solenoid valve & Battery voltage" within specification ?

<b>YES</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	▶ Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected,replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
------------	---

**NO**

► Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### **CAUTION**

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

**YES**

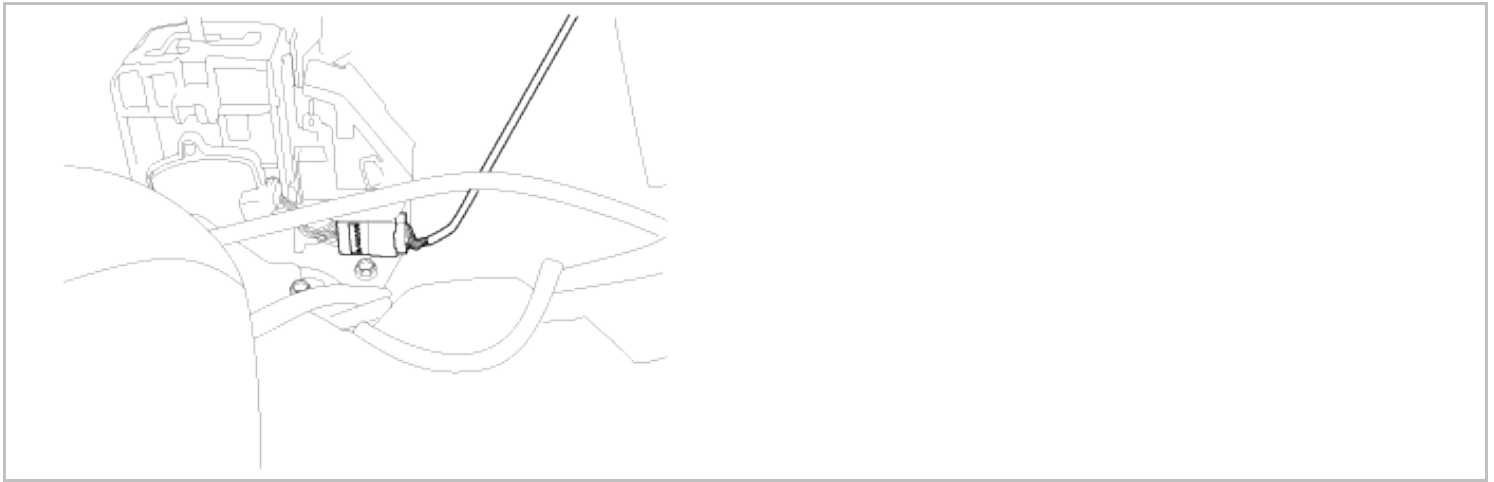
► Go to the applicable troubleshooting procedure

**NO**

► System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0905 Gate Select Position Circuit Range/Performance

### Component Location



## General Description

Sports mode provide similar shift feeling with Manual Transmission to Driver when select Sports mode. And also Driver can shift as Driver's intention in sports mode that uses "+" or "-"

## DTC Description

TCM set this code If detected abnormal operation in Sports mode.(MIL OFF)

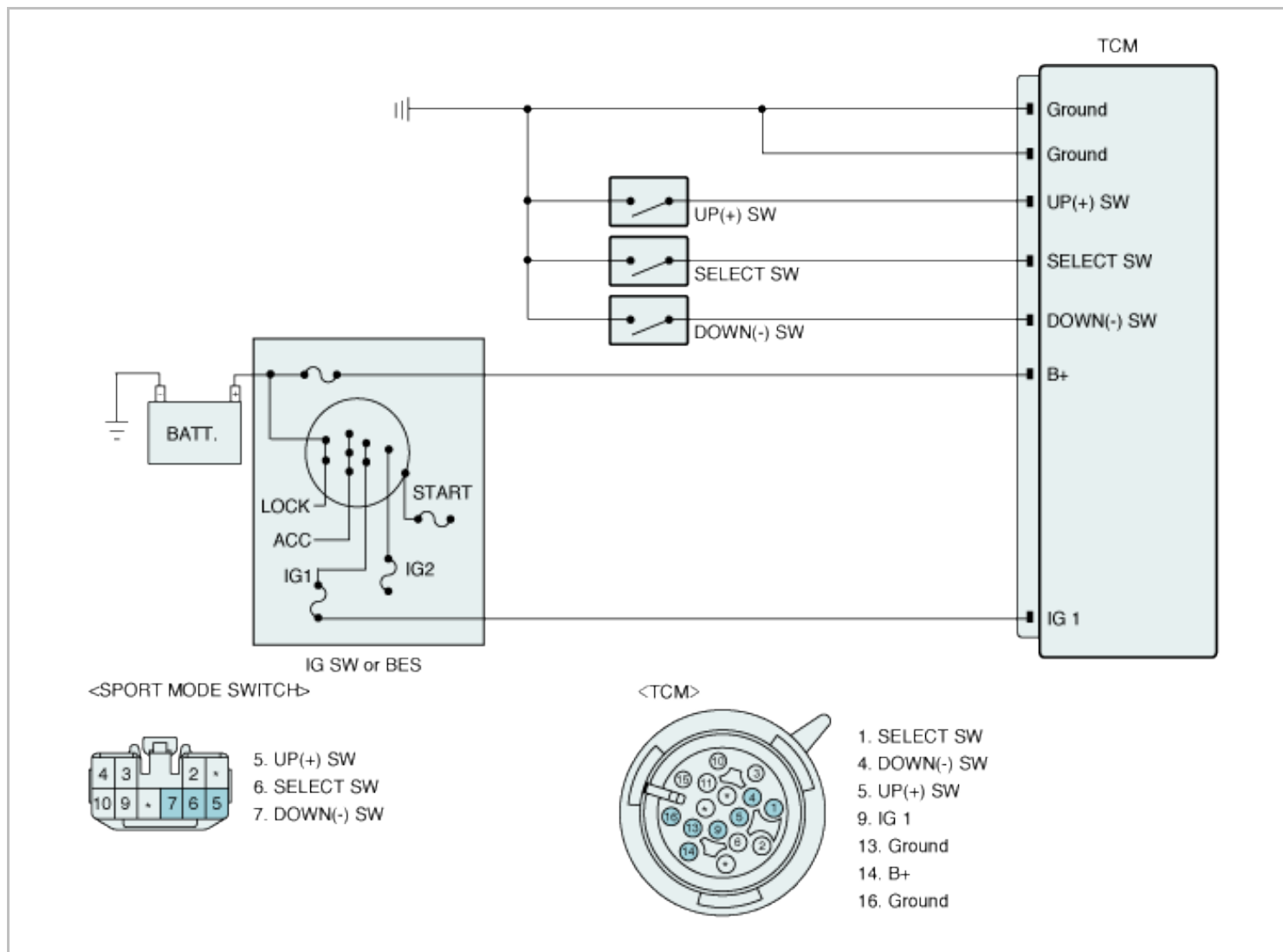
## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Check function	<ul style="list-style-type: none"> <li>• Wiring</li> <li>• Inhibitor s/w</li> <li>• Mechatronics(E-module + Valvebody)</li> </ul>
Enable Conditions	<ul style="list-style-type: none"> <li>• Inhibitor switch : normal</li> <li>• Range switch : normal</li> <li>• Range position : "D"</li> </ul>	
Threshold Value	<ul style="list-style-type: none"> <li>• Detcteted position change in not Sports mode</li> <li>• Detcteted "+, -" signal out of Sports mode</li> </ul>	
Diagnostic Time	• 1.06second	
Fail Safe	<ul style="list-style-type: none"> <li>• Normal driving in "D range" (priority : 2)</li> </ul>	

### CAUTION

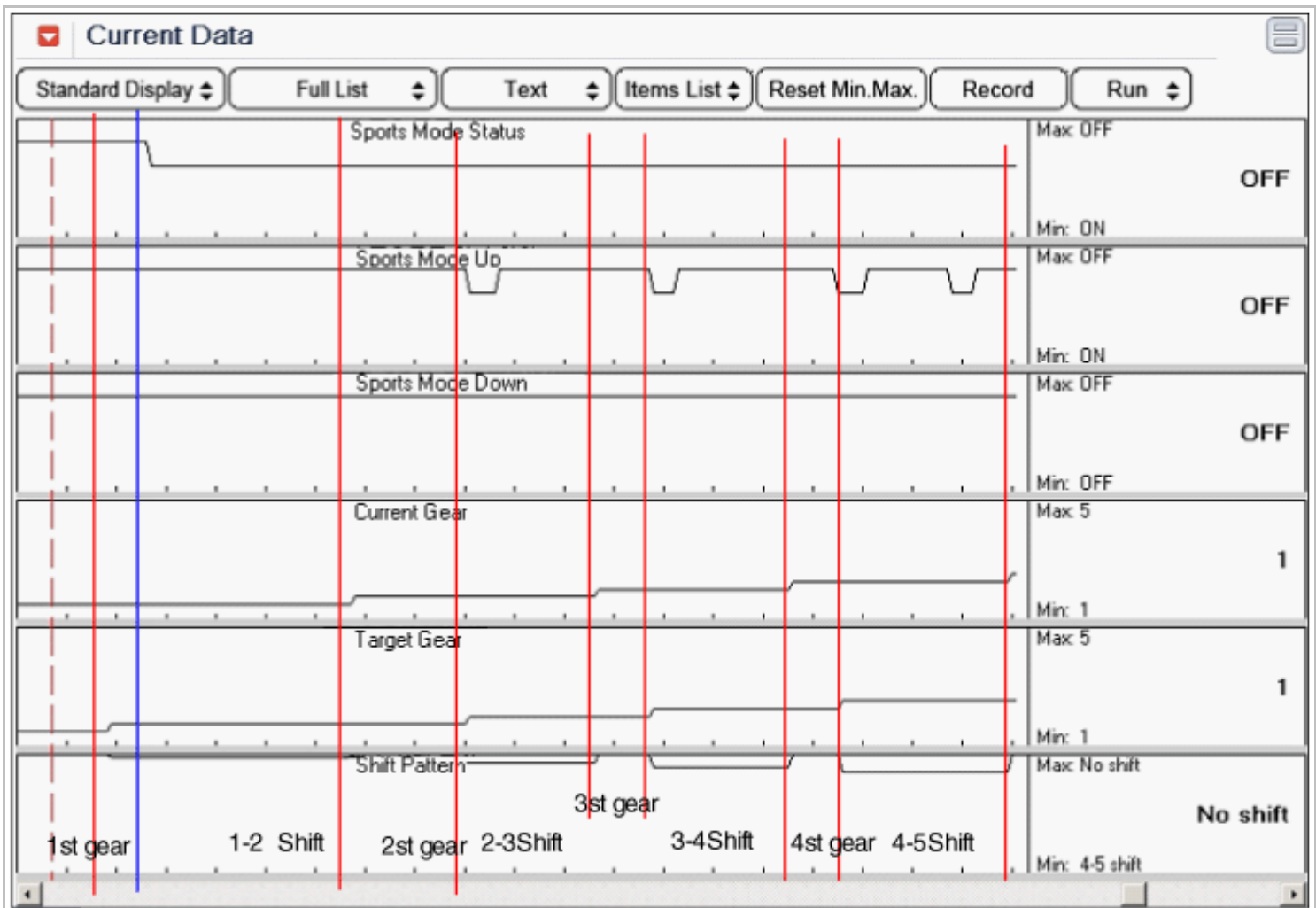
1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Diagnostic Circuit Diagram

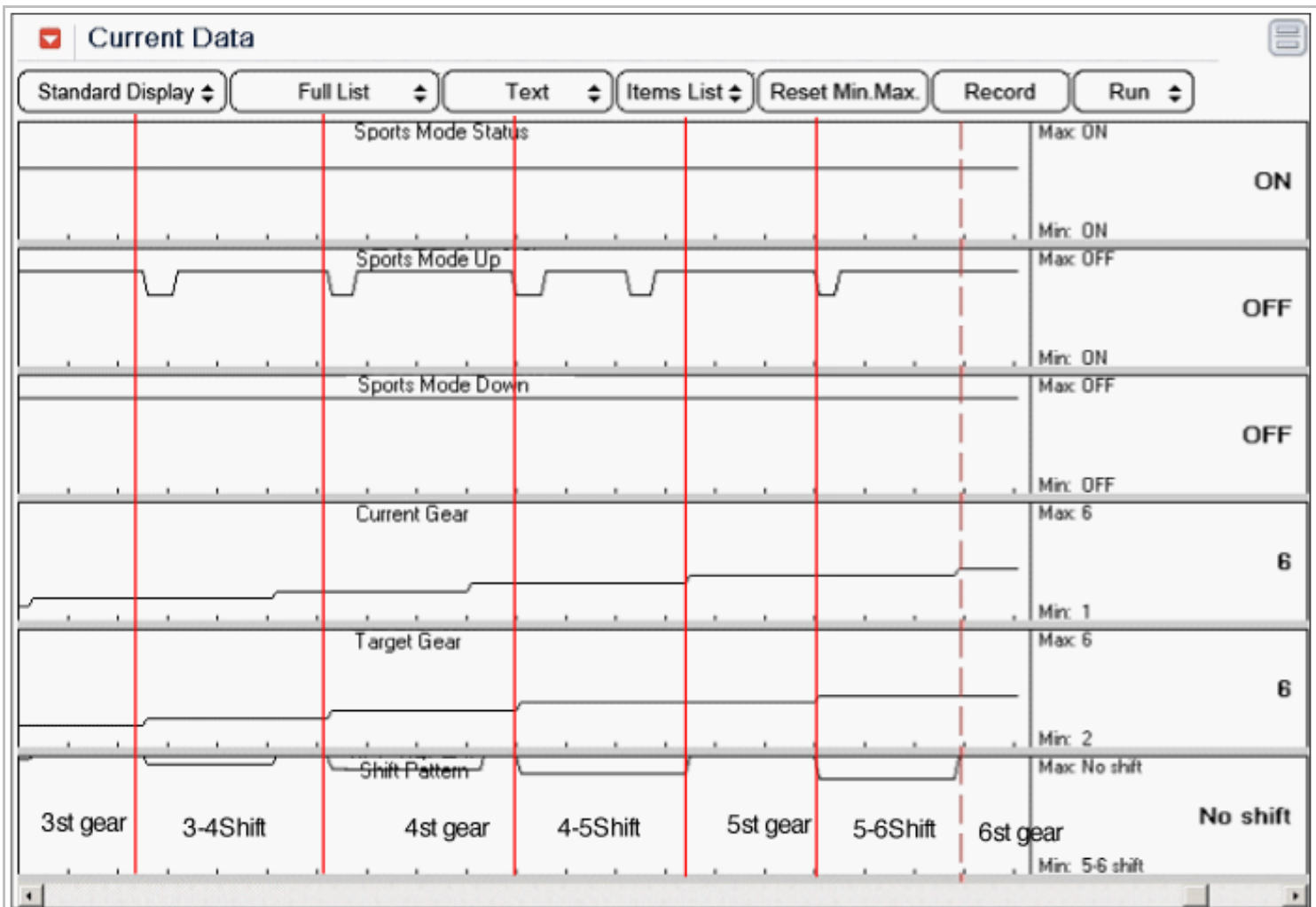


## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Sports mode, Sports mode up-s/w, Sports mode down-s/w" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data.



**Fig.1**



**Fig.2**

Fig 1) sports mode1

Fig 2) sports mode2

5. Is "Sports mode" operation normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Wiring circuit Inspection" procedure

## Terminal & Connector Inspection

1. Ignition "OFF".
2. Disconnect "Sports mode s/w" connector.
3. Ignition "ON" & Engine "OFF".
4. Measure the voltage between wiring side of "Sport mode select s/w, Sport mode up s/w, Sport mode down s/w" and chassis ground.

**Specification :** Approx. 12V

5. Is "Measured voltage" within specification ?



<b>YES</b>	► Go to "Component Inspection" procedure
<b>NO</b>	► Check for open or short in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure

## Component Inspection

1. Ignition "OFF".
2. Connect "Sports mode s/w" connector.
3. Ignition "ON" & Engine "OFF".
4. Measure the voltage between wiring side of "Sport mode select s/w, Sport mode up s/w, Sport mode down s/w" and chassis ground.
5. Confirm voltage change when select "+, -" .

**Specification :** 12V(Before select) -> 0V(After select)

6. Is "Measured voltage" within specification ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "verification of vehicle repair" procedure.
<b>NO</b>	► Check for open or short in harness. Repair as necessary "Inhibitor switch" and Go to "Verification Vehicle Repair" procedure

## Verification of Vehicle Repair

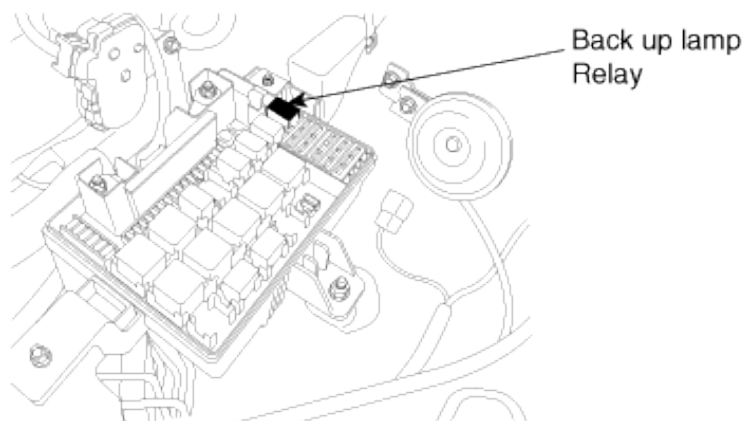
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	► Go to the applicable troubleshooting procedure
<b>NO</b>	► System performing to specification at this time.

**Automatic Transmission System > Automatic Transmission System > P0924 Gear Shift Reverse Actuator Circuit/Open**

## Component Location



## General Description

Back-up lamp relay is installed on the junction box in the engine room. It is a relay to control the back up lamp ON / OFF. When driver shifts to Reverse, TCM sends 12V to coil and ground this signal to control back-up lamp relay.

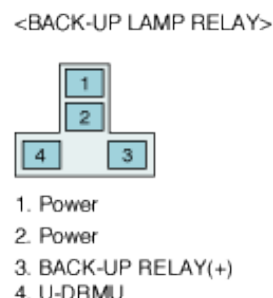
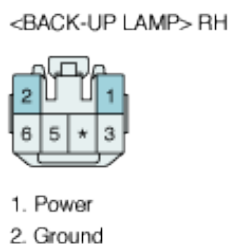
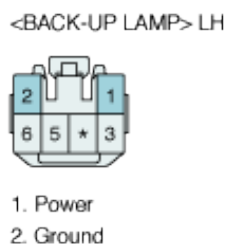
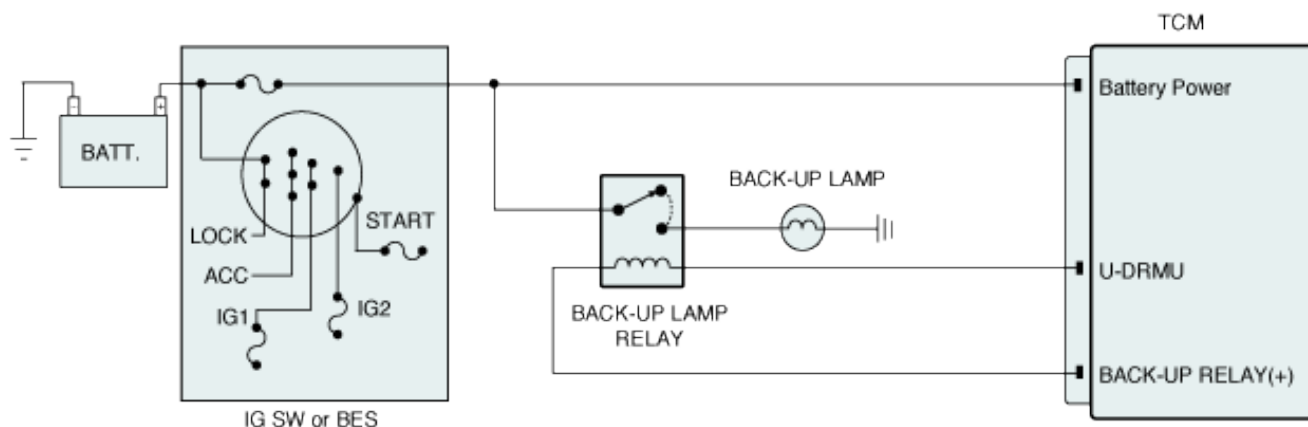
## DTC Description

TCM sets DTC P0924 if TCM detects that the power supply from the TCM power or control circuit are open.

## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Electrical Check	<ul style="list-style-type: none"> <li>• Open in power and control circuit</li> <li>• Faulty Back up lamp Relay</li> <li>• Faulty Mechatronics</li> </ul>
Enable Conditions	• IG ON	
Threshold Value	• Open	
Diagnostic Time	• Continuous	
Fail Safe	• Back up Lamp OFF (P,R, N, D1~6th gear shifting available)	

## Diagnostic Circuit Diagram



## Terminal and Connector Inspection

- Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
- Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
- Has a problem been found?

<b>YES</b>	▶ Repair as necessary and go to "Verification vehicle Repair" procedure.
<b>NO</b>	▶ Go to "Power Circuit Inspection".


## Power Circuit Inspection

- IG KEY "ON", ENGINE "OFF".
- Disconnect the "BACK-UP LAMP RELAY".
- Measure the voltage between power input terminal of "BACK-UP LAMP RELAY" connector and chassis ground.
- Measure the voltage between coil power terminal of "BACK-UP LAMP RELAY" connector and chassis ground.

**Specification :** Approx. 12 V

- Is the measured voltage within the specification?

<b>YES</b>	▶ Go to "Control Circuit Inspection".
<b>NO</b>	▶ Check that Fuse Back-up LP 10A is installed or not blown.

	► Check for open in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.
---	---

## Control Circuit Inspection

1. IG KEY "OFF", ENGINE "OFF".
2. Disconnect the "BACK-UP LAMP RELAY" and TCM connector.
3. Check the resistance of BACK-UP LAMP control circuit between TCM harness connector and BACK-UP LAMP harness side.

**Specification :** Continuity ( below 1.0Ω )

4. Is the measured resistance within the specification?

<b>YES</b>	► Go to "Component Inspection".
<b>NO</b>	► Check for open in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

## Component Inspection

### ■ Check BACK-UP LAMP RELAY component resistance

1. IG KEY "OFF", ENGINE "OFF".
2. Disconnect BACK-UP LAMP RELAY.
3. Measure the resistance between BACK-UP LAMP RELAY control terminals (Component side).

**Specification :** 80±10 Ω (20°C)

4. Is the measured resistance within the specification?

<b>YES</b>	► Go to "Check BACK-UP LAMP RELAY component operation" as follows.
<b>NO</b>	► Replace BACK-UP LAMP RELAY and go to "Verification of Vehicle Repair".

### ■ Check BACK-UP LAMP RELAY component operation

1. IG KEY "OFF", ENGINE "OFF".
2. Disconnect BACK-UP LAMP RELAY.
3. Supplies random B+ and ground to coil sides of BACK-UP LAMP RELAY. (Component side)
4. Check continuity between BACK-UP LAMP RELAY power supply terminals - 30 and 87. (Component side)

**Specification :**

When power is supplied : Continuity ( below 1.0Ω )

When power is not supplied : Discontinuity ( Infinite Ω )

5. Is the continuity test within the specification?

<b>YES</b>	► Go to "Verification of Vehicle Repair".
<b>NO</b>	► Replace BACK-UP LAMP RELAY and go to "Verification of Vehicle Repair".

※ Repeat this process 2~3 times.

## Verification of Vehicle Repair

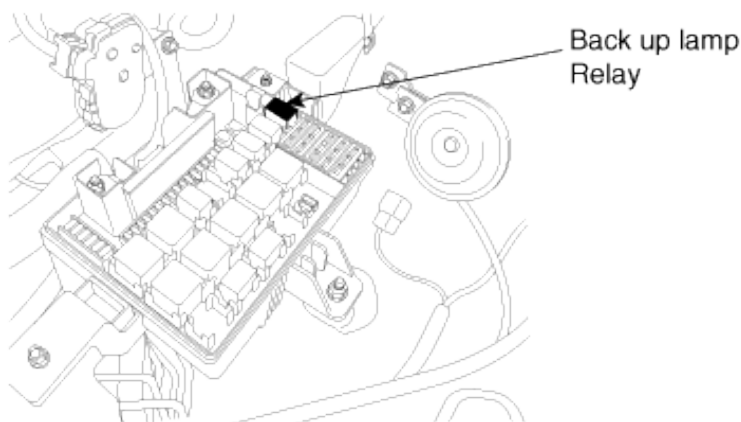
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure
<b>NO</b>	▶ System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0926 Gear Shift Reverse Actuator Circuit Low

### Component Location



### General Description

Back-up lamp relay is installed on the junction box in the engine room. It is a relay to control the back up lamp ON / OFF. When driver shifts to Reverse, TCM sends 12V to coil and ground this signal to control back-up lamp relay.

### DTC Description

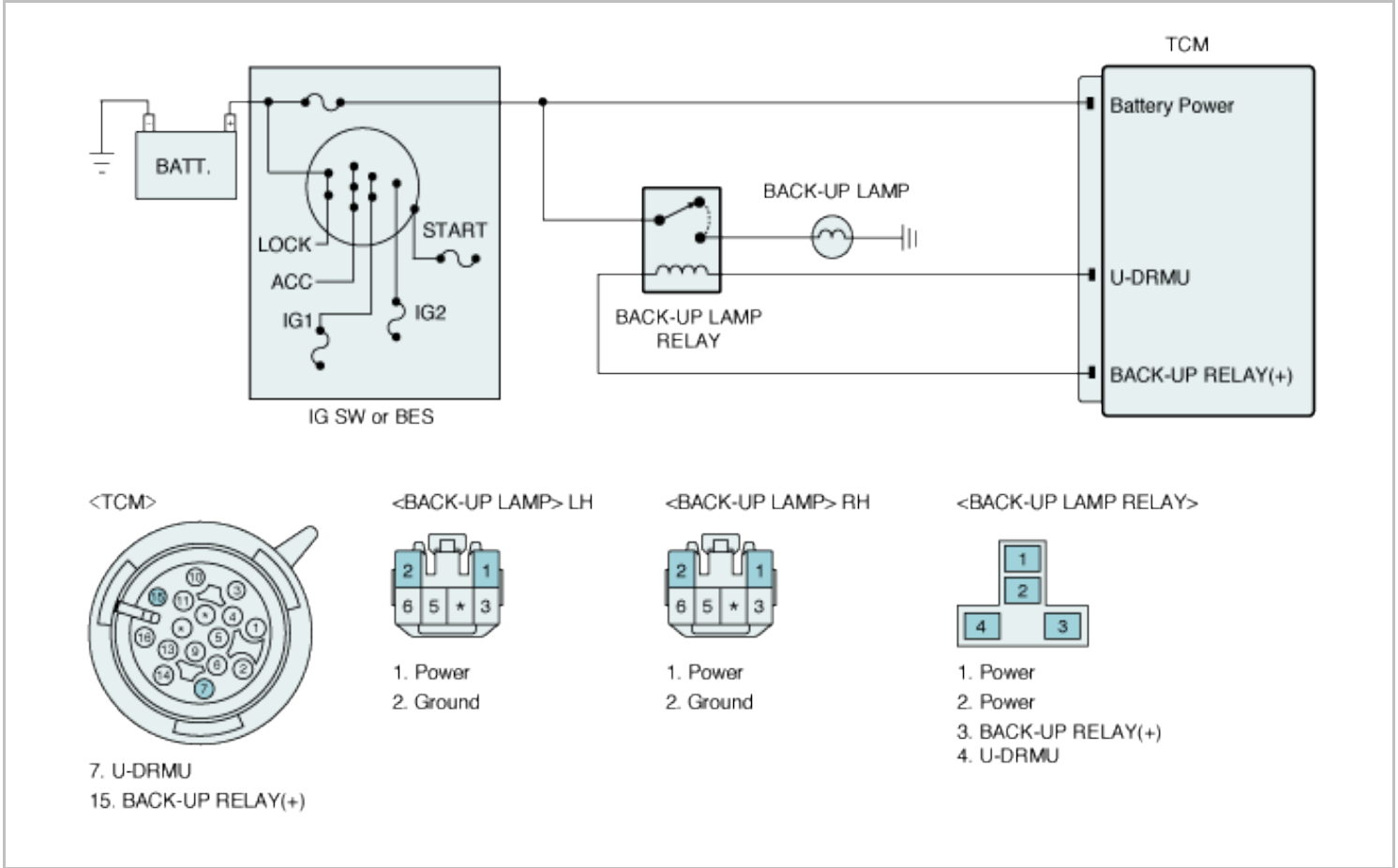
TCM sets DTC P0926 if the TCM detects that the power supply from the TCM power or control circuit are short to ground.

### DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Electrical Check	• Short to ground in power circuit
Enable Conditions	• IG ON	
Threshold Value	• Short to ground	

Diagnostic Time	<ul style="list-style-type: none"> <li>• Contineous</li> </ul>	<ul style="list-style-type: none"> <li>• Faulty Back up lamp Relay</li> <li>• Faulty Mechatronics</li> </ul>
Fail Safe	<ul style="list-style-type: none"> <li>• Back up Lamp OFF</li> <li>• Mechanical Shift lock               <ul style="list-style-type: none"> <li>- R &amp; N range are available after unlocking shift lock</li> <li>- D 1~6th gear shifting available</li> </ul> </li> </ul>	

Diagnostic Circuit Diagram



Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

<b>YES</b>	▶ Repair as necessary and go to "Verification vehicle Repair" procedure.
<b>NO</b>	▶ Go to "Power Circuit Inspection".

Power Circuit Inspection

1. IG KEY "ON", ENGINE "OFF".
2. Disconnect the "BACK-UP LAMP RELAY".

3. Measure the voltage between power input terminal of "BACK-UP LAMP RELAY" connector and chassis ground.
4. Measure the voltage between coil power terminal of "BACK-UP LAMP RELAY" connector and chassis ground.

**Specification :** Approx. 12 V

5. Is the measured voltage within the specification?

<b>YES</b>	▶ Go to "Component Inspection".
<b>NO</b>	▶ Check for short to ground in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

## Component Inspection

### ■ Check BACK-UP LAMP RELAY component resistance

1. IG KEY "OFF", ENGINE "OFF".
2. Disconnect BACK-UP LAMP RELAY.
3. Measure the resistance between BACK-UP LAMP RELAY control terminals (Component side).

**Specification :**  $80 \pm 10 \Omega$  (20°C)

4. Is the measured resistance within the specification?

<b>YES</b>	▶ Go to "Check BACK-UP LAMP RELAY component operation" as follows.
<b>NO</b>	▶ Replace BACK-UP LAMP RELAY and go to "Verification of Vehicle Repair".

### ■ Check BACK-UP LAMP RELAY component operation

1. IG KEY "OFF", ENGINE "OFF".
2. Disconnect BACK-UP LAMP RELAY.
3. Supplies random B+ and ground to coil sides of BACK-UP LAMP RELAY. (Component side)
4. Check continuity between BACK-UP LAMP RELAY power supply terminals - 30 and 87. (Component side)

**Specification :**

When power is supplied : Continuity ( below  $1.0 \Omega$  )

When power is not supplied : Discontinuity ( Infinite  $\Omega$  )

5. Is the continuity test within the specification?

<b>YES</b>	▶ Go to "Verification of Vehicle Repair".
<b>NO</b>	▶ Replace BACK-UP LAMP RELAY and go to "Verification of Vehicle Repair".

※ Repeat this process 2~3 times.

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.

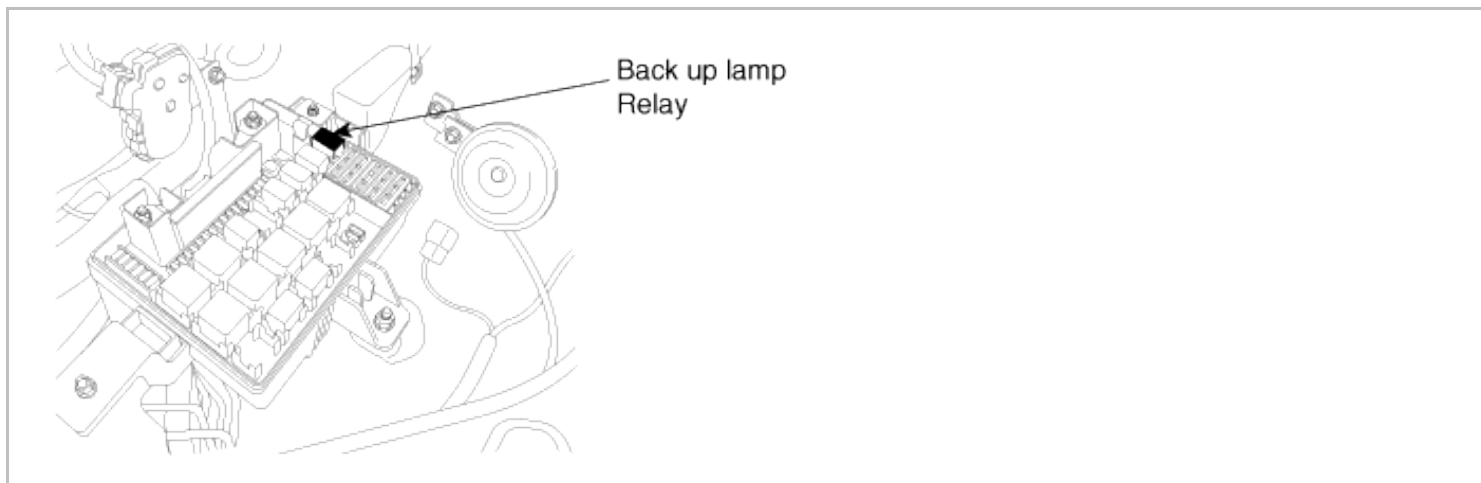
3. Operate the vehicle within DTC Enable conditions in General information.

4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure
<b>NO</b>	▶ System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P0927 Gear Shift Reverse Actuator Circuit High

### Component Location



### General Description

Back-up lamp relay is installed on the junction box in the engine room. It is a relay to control the back up lamp ON / OFF. When driver shifts to Reverse, TCM sends 12V to coil and ground this signal to control back-up lamp relay.

### DTC Description

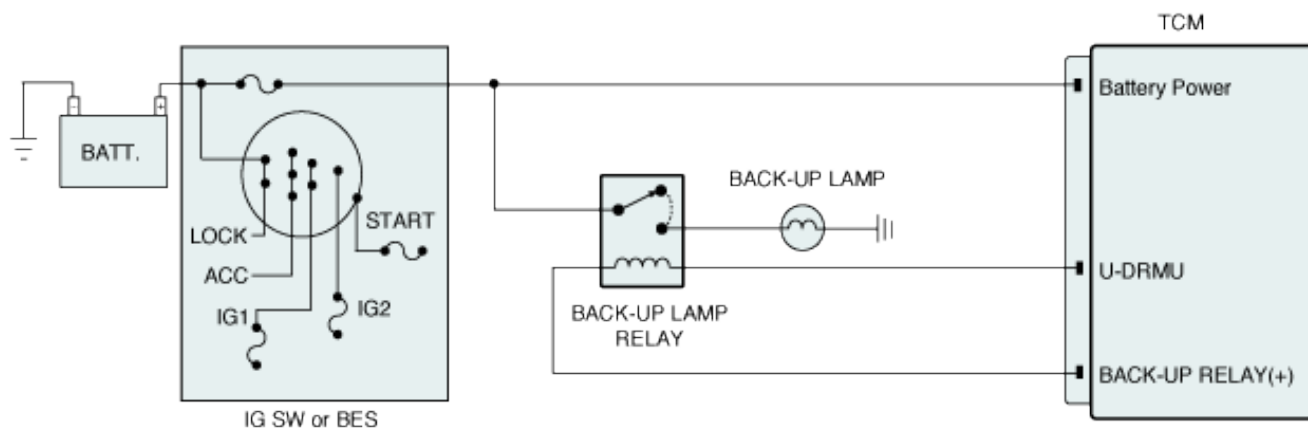
TCM sets DTC P0927 if the TCM detects that the power supply from the TCM power or control circuit are short to battery.

### DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Electrical Check	• Short to battery in power circuit • Faulty Back up lamp Relay • Faulty Mechatronics
Enable Conditions	• IG ON	
Threshold Value	• Short to battery	
Diagnostic Time	• Continous	
Fail Safe	• Back up Lamp OFF (P,R, N, D1~6th gear shifting available)	

### Diagnostic Circuit Diagram





7. U-DRMU  
15. BACK-UP RELAY(+)

<BACK-UP LAMP> LH



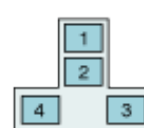
1. Power  
2. Ground

<BACK-UP LAMP> RH



1. Power  
2. Ground

<BACK-UP LAMP RELAY>



1. Power  
2. Power  
3. BACK-UP RELAY(+)  
4. U-DRMU

## Terminal and Connector Inspection

- Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
- Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
- Has a problem been found?

<b>YES</b>	▶ Repair as necessary and go to "Verification vehicle Repair" procedure.
<b>NO</b>	▶ Go to "Power Circuit Inspection".

## Power Circuit Inspection

- IG KEY "ON", ENGINE "OFF".
- Disconnect the "BACK-UP LAMP RELAY".
- Measure the voltage between power input terminal of "BACK-UP LAMP RELAY" connector and chassis ground.
- Measure the voltage between coil power terminal of "BACK-UP LAMP RELAY" connector and chassis ground.

**Specification :** Approx. 12 V

- Is the measured voltage within the specification?

<b>YES</b>	▶ Go to "Component Inspection".
<b>NO</b>	▶ Check for short to battery in harness. Repair as necessary and Go to "Verification Vehicle

## Component Inspection

### ■ Check BACK-UP LAMP RELAY component resistance

1. IG KEY "OFF", ENGINE "OFF".
2. Disconnect BACK-UP LAMP RELAY.
3. Measure the resistance between BACK-UP LAMP RELAY control terminals (Component side).

**Specification :**  $80 \pm 10 \Omega$  (20°C)

4. Is the measured resistance within the specification?

<b>YES</b>	▶ Go to "Check BACK-UP LAMP RELAY component operation" as follows.
<b>NO</b>	▶ Replace BACK-UP LAMP RELAY and go to "Verification of Vehicle Repair".

### ■ Check BACK-UP LAMP RELAY component operation

1. IG KEY "OFF", ENGINE "OFF".
2. Disconnect BACK-UP LAMP RELAY.
3. Supplies random B+ and ground to coil sides of BACK-UP LAMP RELAY. (Component side)
4. Check continuity between BACK-UP LAMP RELAY power supply terminals - 30 and 87. (Component side)

**Specification :**

When power is supplied : Continuity ( below  $1.0\Omega$  )

When power is not supplied : Discontinuity ( Infinite  $\Omega$  )

5. Is the continuity test within the specification?

<b>YES</b>	▶ Go to "Verification of Vehicle Repair".
<b>NO</b>	▶ Replace BACK-UP LAMP RELAY and go to "Verification of Vehicle Repair".

※ Repeat this process 2~3 times.

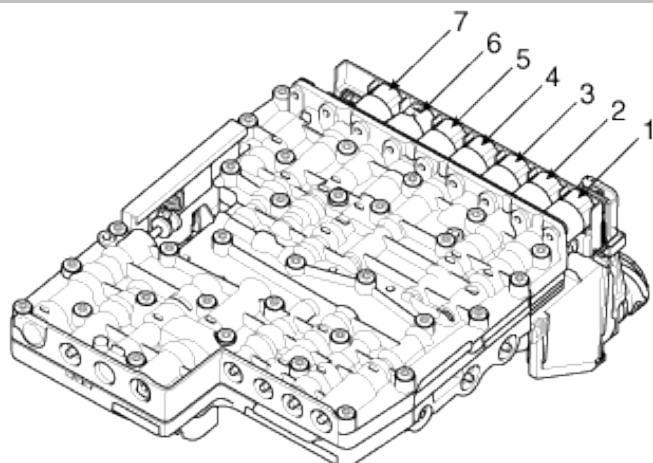
## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure
<b>NO</b>	▶ System performing to specification at this time.

## Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

## General Description

This data input goes through CAN communication line and TCM is able to request for "Shift Inhibite and torque reduction" on the basis of this signal.

## DTC Description

TCM set this code If not match Engine torque signal with TCM torque signal.(MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	<ul style="list-style-type: none"> <li>• Check signal</li> </ul>	<ul style="list-style-type: none"> <li>• ECM</li> </ul>
Enable Conditions	<ul style="list-style-type: none"> <li>• IG s/w "ON"</li> <li>• CAN BUS : normal</li> <li>• DME CAN : normal</li> <li>• Battery voltage &gt; 9V</li> </ul>	
Threshold Value	<ul style="list-style-type: none"> <li>• Torque signal abnormal in CAN message</li> </ul>	
Diagnostic Time	<ul style="list-style-type: none"> <li>• 0.5second</li> </ul>	
Fail Safe	<ul style="list-style-type: none"> <li>• Maintain present gear position at fault detecting.</li> <li>• Fixed at 3rd gear after stop</li> <li>• Maximum line pressure control (D : 14kg/cm<sup>2</sup>, R : 20kg/cm<sup>2</sup>)</li> <li>• No control Torque convertor clutch</li> <li>• No learning control (Priority : 3)</li> </ul>	

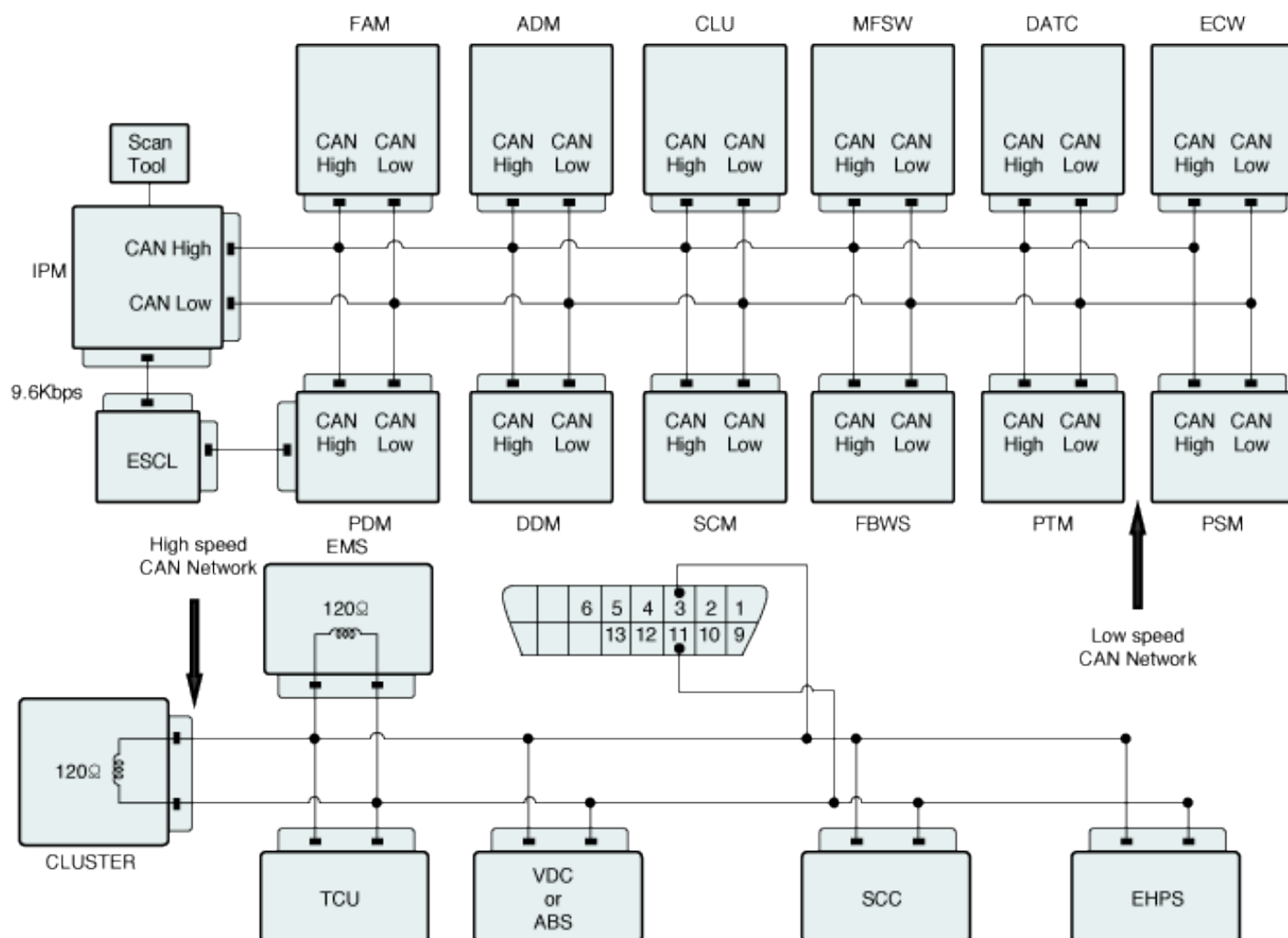
### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a

higher priority function.

2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Diagnostic Circuit Diagram



<ECM> CTG-K



66. C-CAN LOW  
88. C-CAN HIGH

<ESC CONTROL MODULE>



12. C-CAN HIGH  
13. C-CAN LOW

<INSTRUMENT CLUSTER>



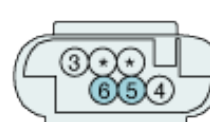
5. C-CAN LOW  
6. C-CAN HIGH

<DATA LINK CONNECTOR>



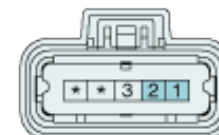
3. C-CAN HIGH  
11. C-CAN LOW

<SCC>



5. C-CAN LOW  
6. C-CAN HIGH

<EHPS>



5. C-CAN LOW  
6. C-CAN HIGH

<ECW>



- 4. Low
- 5. High

<MFSW>



- 5. High
- 6. Low

<ADM>



- 8. High
- 16. Low

<DDM>

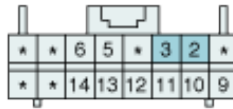


- 8. High
- 16. Low

<TCM> CTG-ZF

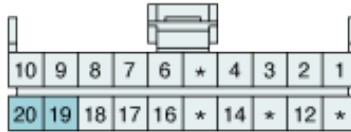


<IPM>



- 2. Low
- 3. High

<CLU>



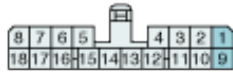
- 19. Low
- 20. High

<FBWS>



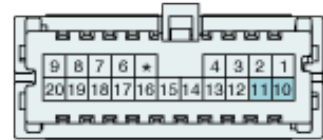
- 6. High
- 7. Low

<PTM>



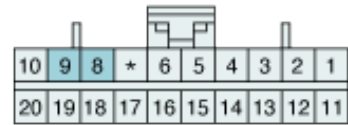
- 1. Low
- 9. High

<PDM>



- 10. Low
- 11. High

<TILT & TELE>



- 8. High
- 9. Low

<PSM>



- 4. High
- 5. Low

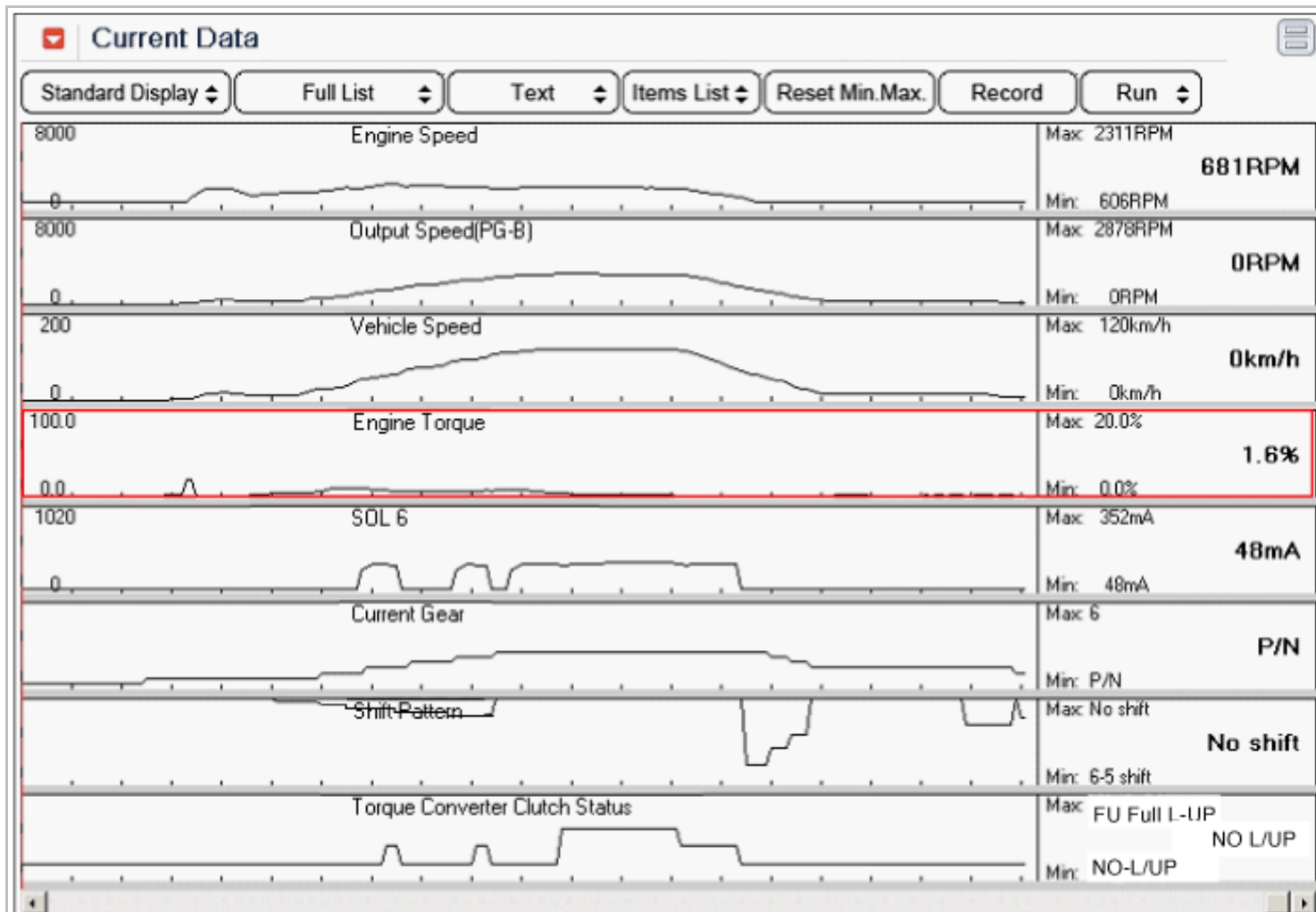
<FAM>



- 3. High
- 4. Low

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Engine Torque" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data.



**Fig.1**

Fig1 ) Engine Torque variation during driving

5. Does "Engine Torque" signal operated normally ?

<b>YES</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	▶ Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected,replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was

repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

## Verification of Vehicle Repair

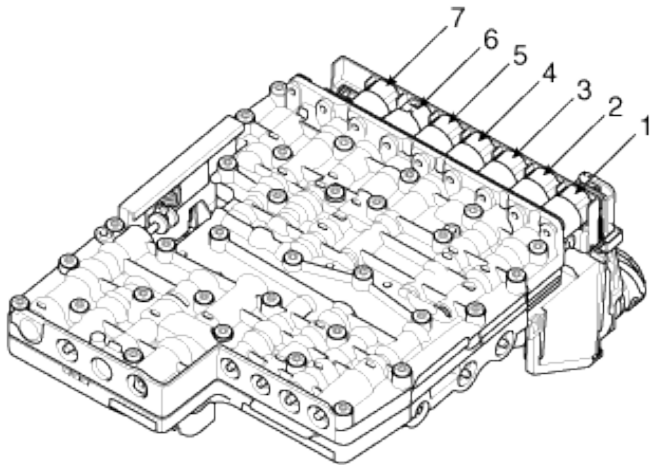
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	► Go to the applicable troubleshooting procedure
<b>NO</b>	► System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P2700 Transmission Friction Element "A" Apply Time Range/Performance

### Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

### General Description

The ratio monitoring controls the nominal gear box ratio to the real gear box ratio. While driving in a gear(reverse, first second, third...) there is a calibrated rationality check between turbine speed and output speed of the corresponding gear. While up or down shifting from one gear to another there is a calibrated rationality check between turbine speed and output speed of the corresponding shift. While engaging the gear there is a calibrated rationality check between turbine speed and output speed of the corresponding shift if the actual output speed is higher or equal than a calibrated threshold. While engaging the gear when the actual output speed is lower than the threshold there is a rationality check on the turbine speed.

### DTC Description

TCM set this code If detected not properly operation of "Clutch A" from 1st gear to 4th gear.(MIL ON : 2 driving Cycle)



## DTC Detecting Condition

Item		Detecting Condition	Possible Cause
DTC Strategy		• Check function (1st gear to 4th gear)	<ul style="list-style-type: none"> <li>• Check Engine system</li> <li>• E- Module</li> <li>• Replace ATM</li> </ul>
Enable Conditions		<ul style="list-style-type: none"> <li>• ATF temperature &gt; 0°C.</li> <li>• Engine speed &gt; 400rpm.</li> <li>• Input speed &gt; 0rpm.</li> <li>• Input speed : normal.</li> <li>• Inhibitor s/w : Not "P or N" position.</li> <li>• Within 0.5 second after shift.</li> </ul>	
	CASE 1	• Output speed ≥ 50rpm	
	CASE 2	• Output speed < 50rpm	
Threshold Value	CASE 1	Not shifting and not engaging status <ul style="list-style-type: none"> <li>• Actual gear ratio &gt; Target gear ratio</li> <li>• Actual gear ratio &lt; Target gear ratio</li> </ul>	
	CASE 2	Not shifting and not engaging status <ul style="list-style-type: none"> <li>• (Output speed * gear ratio) - Input speed &gt; 320rpm</li> </ul>	
Diagnostic Time		• 3times function check	
Fail Safe		<ul style="list-style-type: none"> <li>• Fixed at 5th gear</li> <li>• No learning control (Priority : 3)</li> </ul>	

### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data

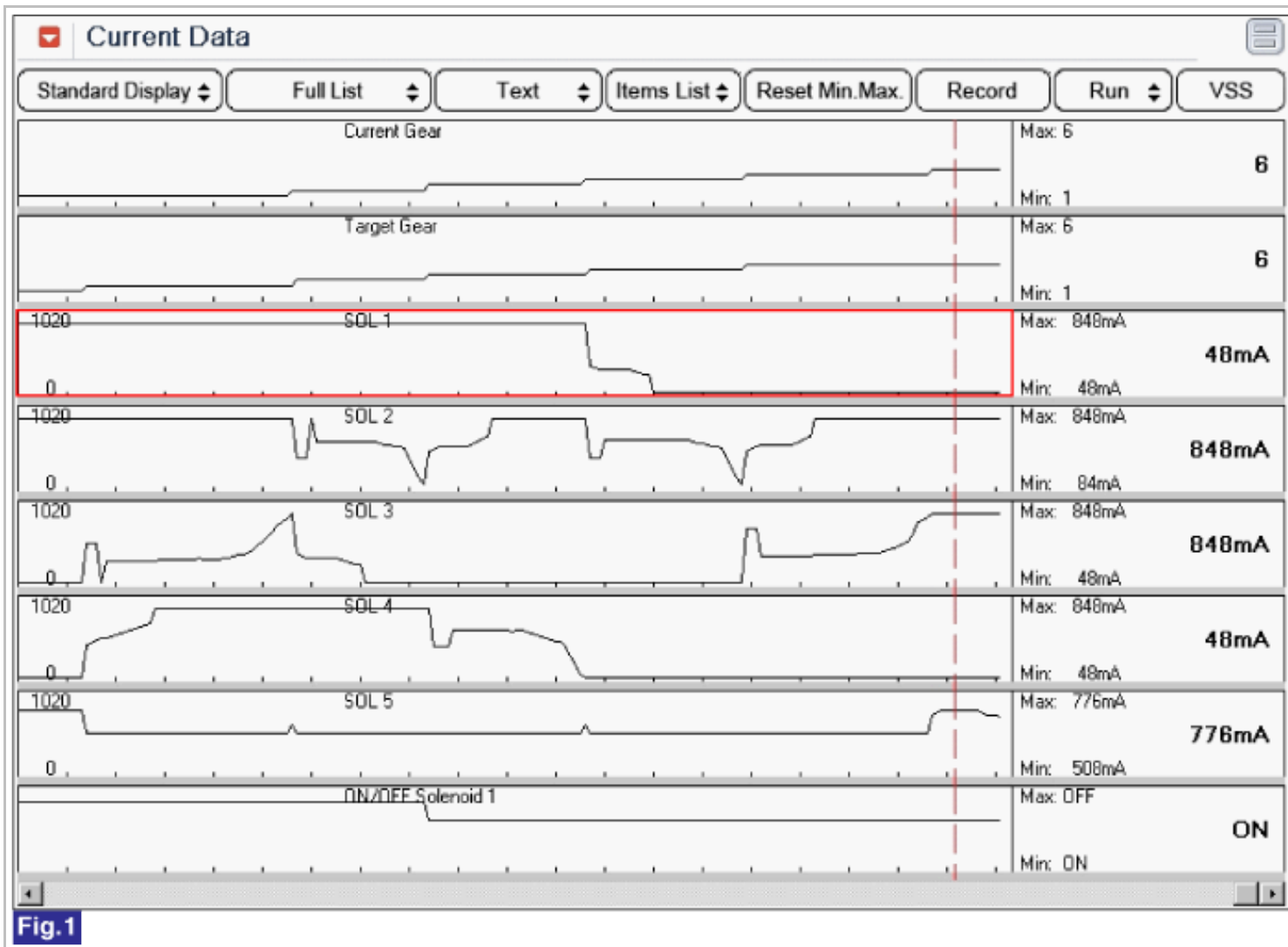


Fig 1) Shift control solenoid valve

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Shift control solenoid valve(SOL 1)" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valves.

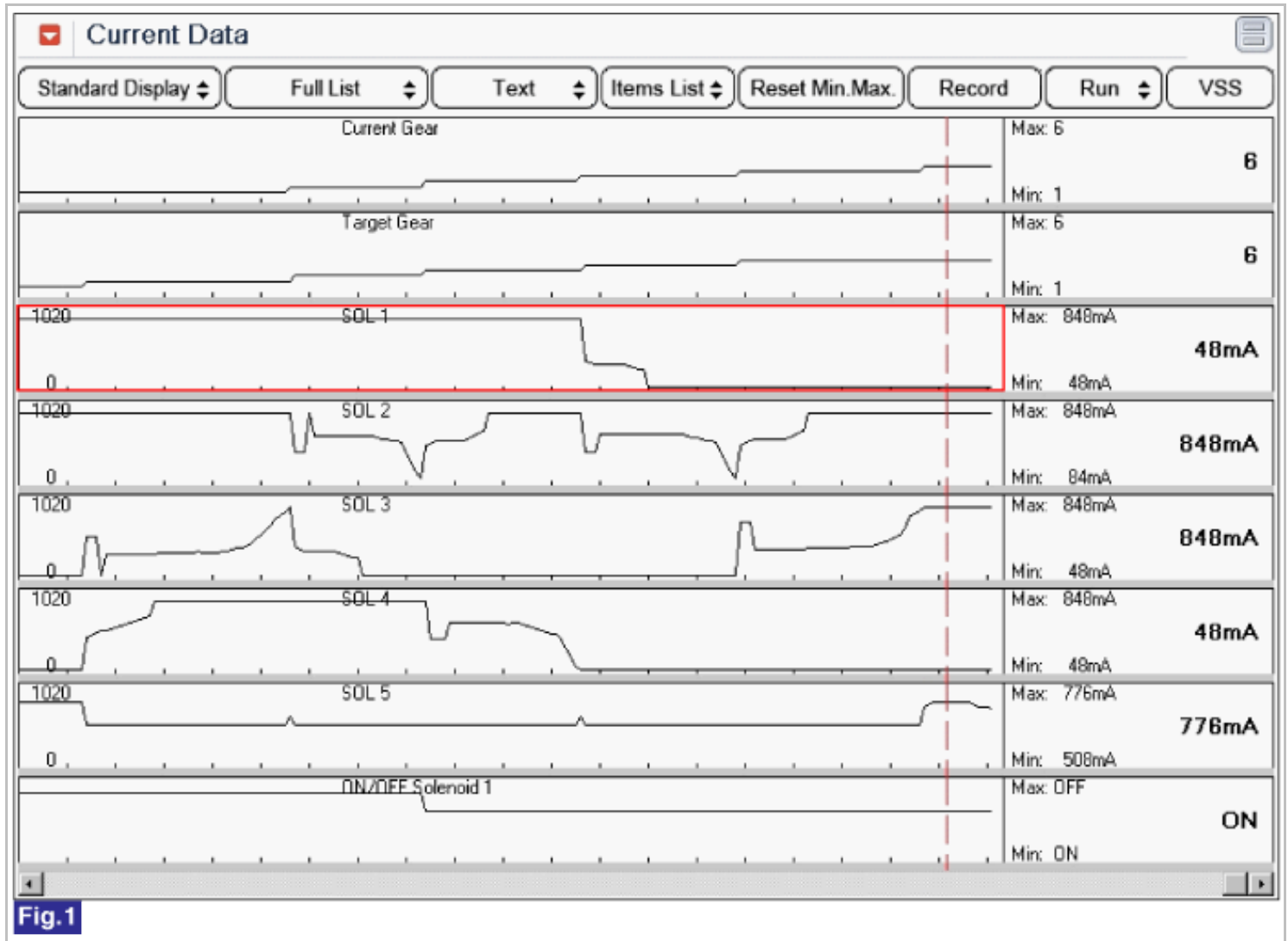
**Speaication** : 48mA ~ 848mA

### Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-

D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control



**Fig.1**

Fig 1) Shift control solenoid valve

5. Dose "Shift control solenoid valve(SOL 1)" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.

4. After turning IG OFF to IG ON twice or three times, check DTC again.

5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected,replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

(Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

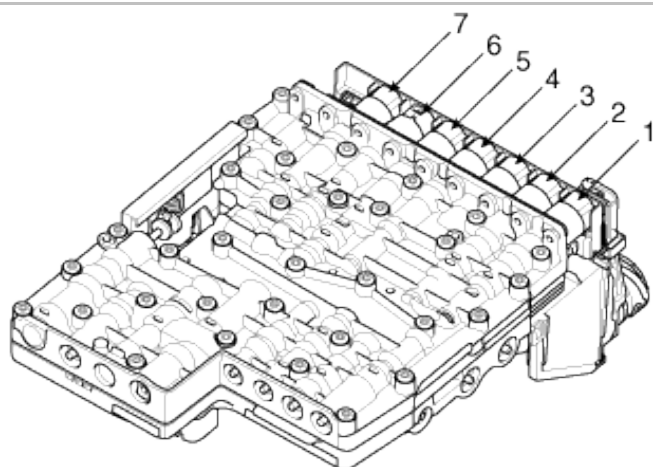
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure
<b>NO</b>	▶ System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P2701 Transmission Friction Element "B" Apply Time Range/Performance

### Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

## General Description

The ratio monitoring controls the nominal gear box ratio to the real gear box ratio. While driving in a gear(reverse, first second, third...) there is a calibrated rationality check between turbine speed and output speed of the corresponding gear. While up or down shifting from one gear to another there is a calibrated rationality check between turbine speed and output speed of the corresponding shift. While engaging the gear there is a calibrated rationality check between turbine speed and output speed of the corresponding shift if the actual output speed is higher or equal than a calibrated threshold. While engaging the gear when the actual output speed is lower than the threshold there is a rationality check on the turbine speed.

## DTC Description

TCM set this code If detected not properly operation of "Clutch B" in 3rd, 5th and Reverse gear.(MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item		Detecting Condition	Possible Cause
DTC Strategy		• Check function (3rd, 5th and Reverse gear)	<ul style="list-style-type: none"> <li>• Check Engine system</li> <li>• E- Module</li> <li>• Replace ATM</li> </ul>
Enable Conditions		<ul style="list-style-type: none"> <li>• ATF temperature &gt; 0°C.</li> <li>• Engine speed &gt; 400rpm.</li> <li>• Input speed &gt; 0rpm.</li> <li>• Input speed : normal.</li> <li>• Inhibitor s/w : Not "P or N" position.</li> <li>• Within 0.5 second after shift.</li> </ul>	
	CASE 1	• Output speed ≥ 50rpm	
	CASE 2	• Output speed < 50rpm	
Threshold Value	CASE 1	Not shifting and not engaging status <ul style="list-style-type: none"> <li>• Actual gear ratio &gt; Target gear ratio</li> <li>• Actual gear ratio &lt; Target gear ratio</li> </ul>	
	CASE 2	Not shifting and not engaging status <ul style="list-style-type: none"> <li>• (Output speed * gear ratio) - Input speed &gt; 320rpm</li> </ul>	
Diagnostic Time		• 3times function check	
		• Fixed at 4th gear	

Fail Safe	• No learning control (Priority : 3)	
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CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

Signal Waveform & Data

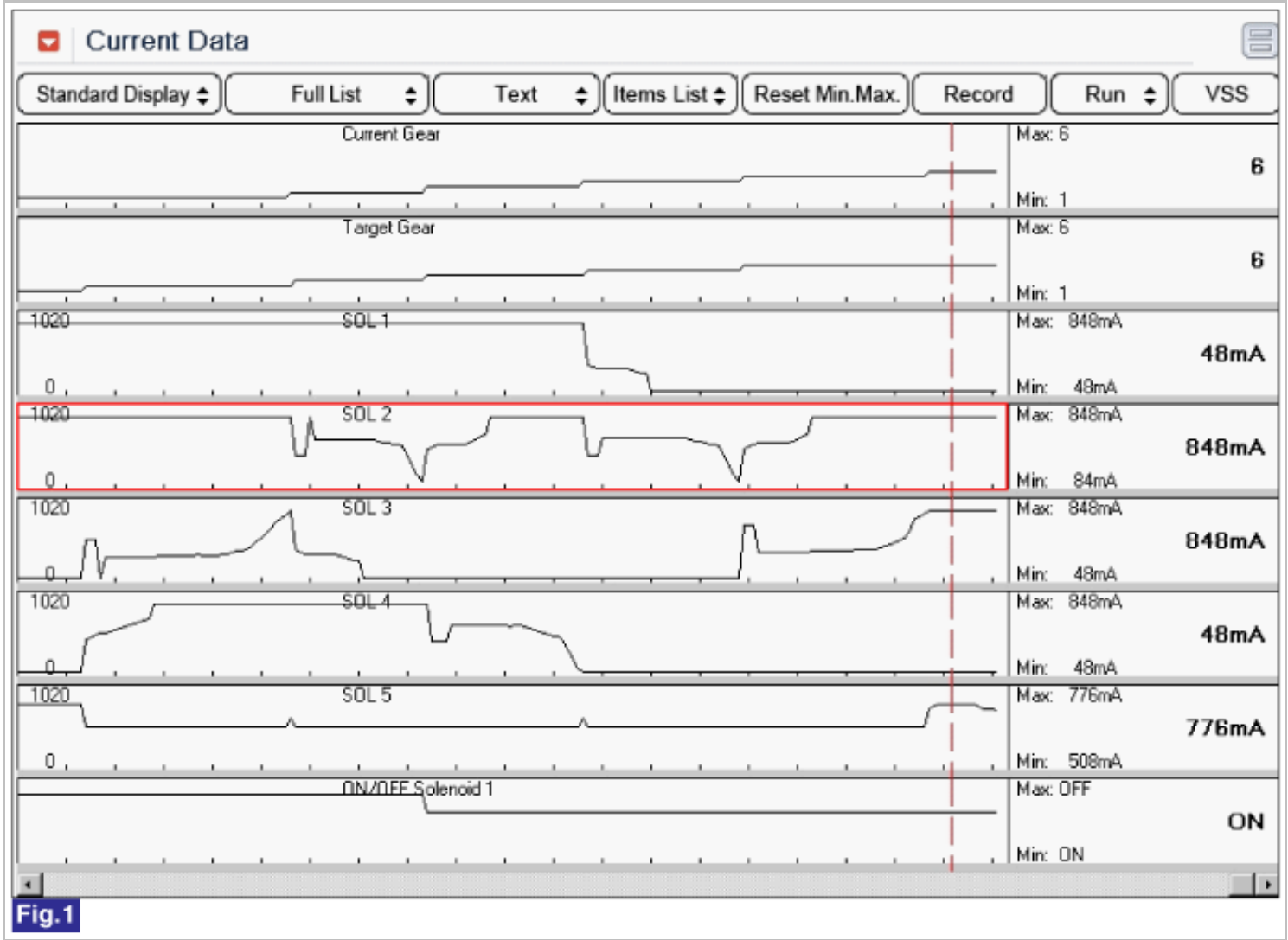


Fig 1) Shift control solenoid valve

Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"

2. Erase DTC and Engine "ON"
3. Monitor the "Shift control solenoid valve(SOL 2)" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valves.

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**Speaication** : 48mA ~ 848mA

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**Solenoid valve operating status according to gear position**

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control

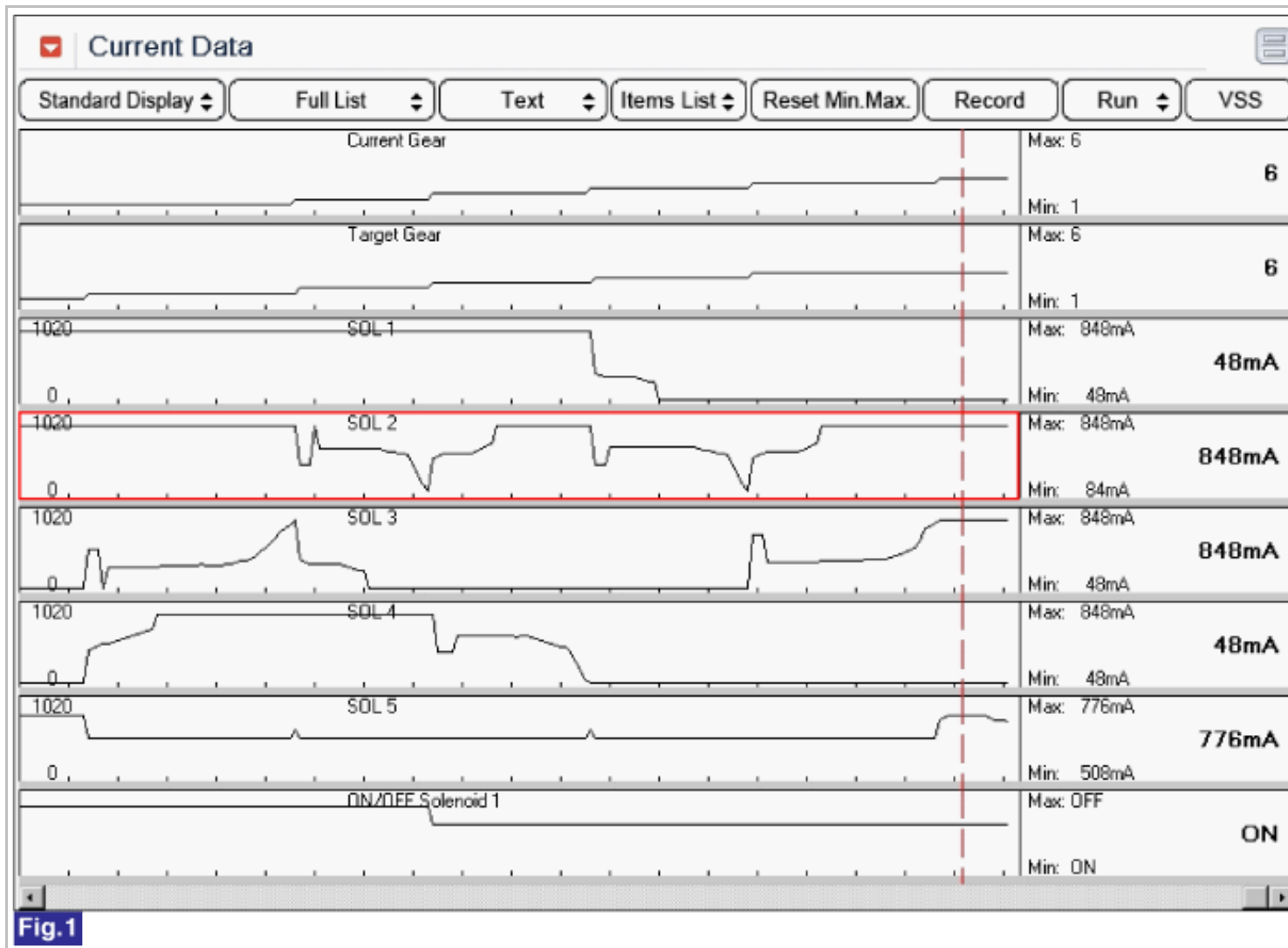


Fig 1) Shift control solenoid valve

5. Dose "Shift control solenoid valve(SOL 2)" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	► Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected,replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
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**NO**

► Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

(Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

**YES**

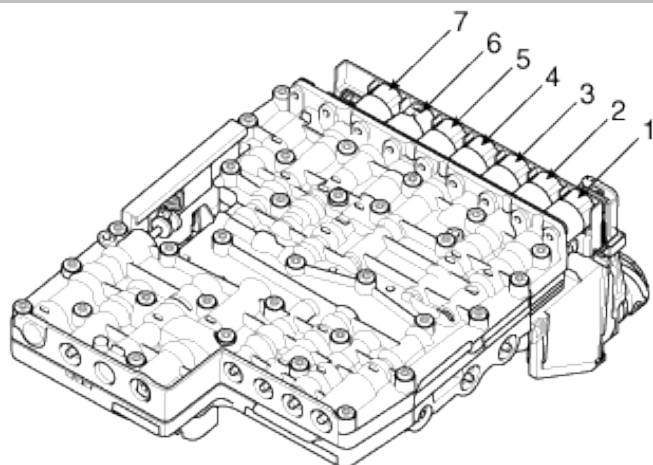
► Go to the applicable troubleshooting procedure

**NO**

► System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P2702 Transmission Friction Element "C" Apply Time Range/Performance

### Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

## General Description

The ratio monitoring controls the nominal gear box ratio to the real gear box ratio. While driving in a gear(reverse, first second, third...) there is a calibrated rationality check between turbine speed and output speed of the corresponding gear. While up or down shifting from one gear to another there is a calibrated rationality check between turbine speed and output speed of the corresponding shift. While engaging the gear there is a calibrated rationality check between turbine speed and output speed of the corresponding shift if the actual output speed is higher or equal than a calibrated threshold. While engaging the gear when the actual output speed is lower than the threshold there is a rationality check on the turbine speed.

## DTC Description

TCM set this code If detected not properly operation of "Brake C" in 2nd and 6th gear.(MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item		Detecting Condition	Possible Cause
DTC Strategy		• Check function (2nd and 6th gear)	<ul style="list-style-type: none"> <li>• Check Engine system</li> <li>• E- Module</li> <li>• Replace ATM</li> </ul>
Enable Conditions		<ul style="list-style-type: none"> <li>• ATF temperature &gt; 0°C.</li> <li>• Engine speed &gt; 400rpm.</li> <li>• Input speed &gt; 0rpm.</li> <li>• Input speed : normal.</li> <li>• Inhibitor s/w : Not "P or N" position.</li> <li>• Within 0.5 second after shift.</li> </ul>	
	CASE 1	• Output speed ≥ 50rpm	
	CASE 2	• Output speed < 50rpm	
Threshold Value	CASE 1	Not shifting and not engaging status <ul style="list-style-type: none"> <li>• Actual gear ratio &gt; Target gear ratio</li> <li>• Actual gear ratio &lt; Target gear ratio</li> </ul>	
	CASE 2	Not shifting and not engaging status <ul style="list-style-type: none"> <li>• (Output speed * gear ratio) - Input speed &gt; 320rpm</li> </ul>	
Diagnostic Time		• 3times function check	
Fail Safe		<ul style="list-style-type: none"> <li>• Fixed at 4th gear</li> <li>• No learning control</li> </ul>	

**CAUTION**

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

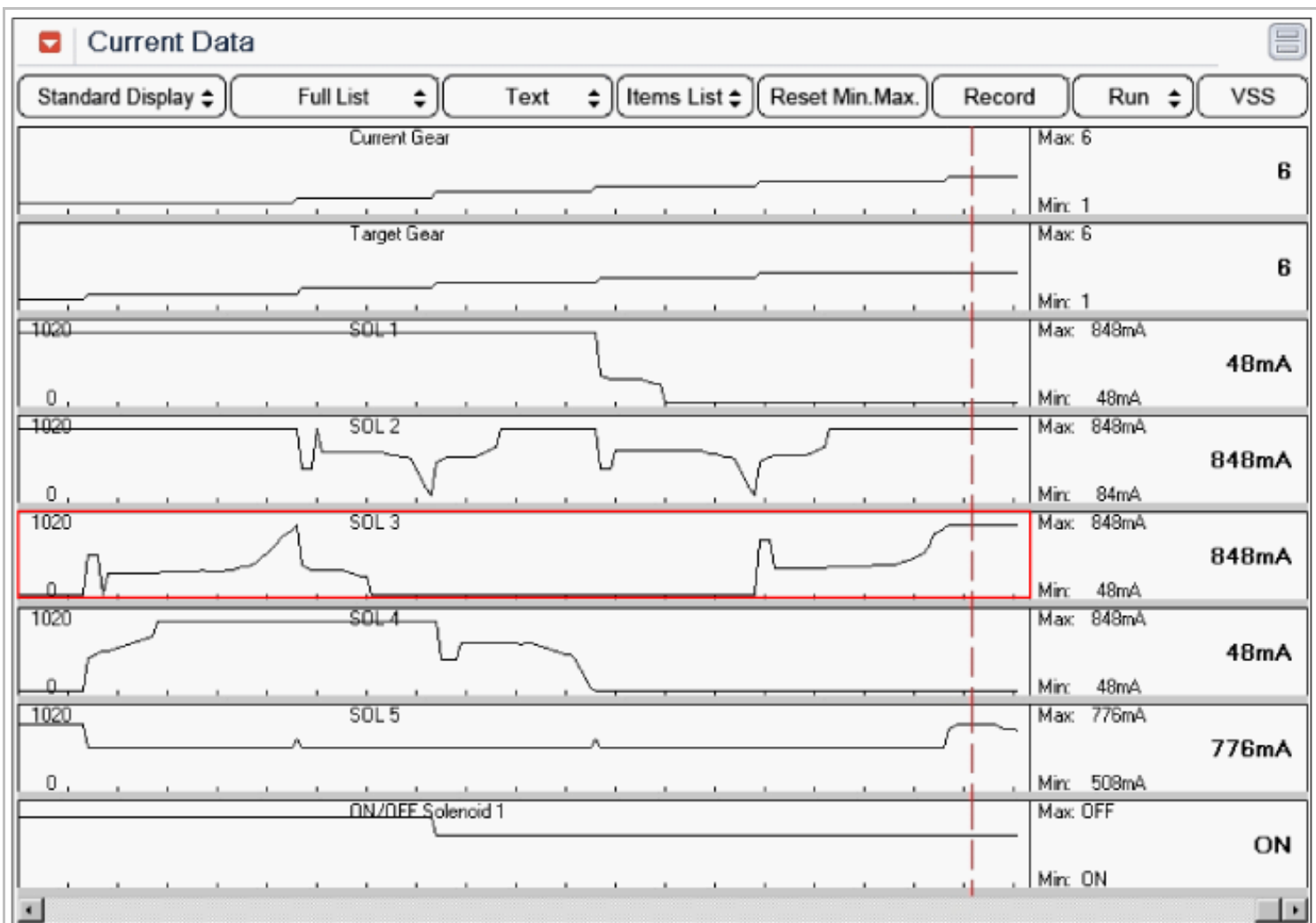
**Signal Waveform & Data****Fig.1**

Fig 1) Shift control solenoid valve3

**Monitor Scantool Data**

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"

3. Monitor the "Shift control solenoid valve(SOL 3)" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valves.

**Speaication** : 48mA ~ 848mA

#### Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control

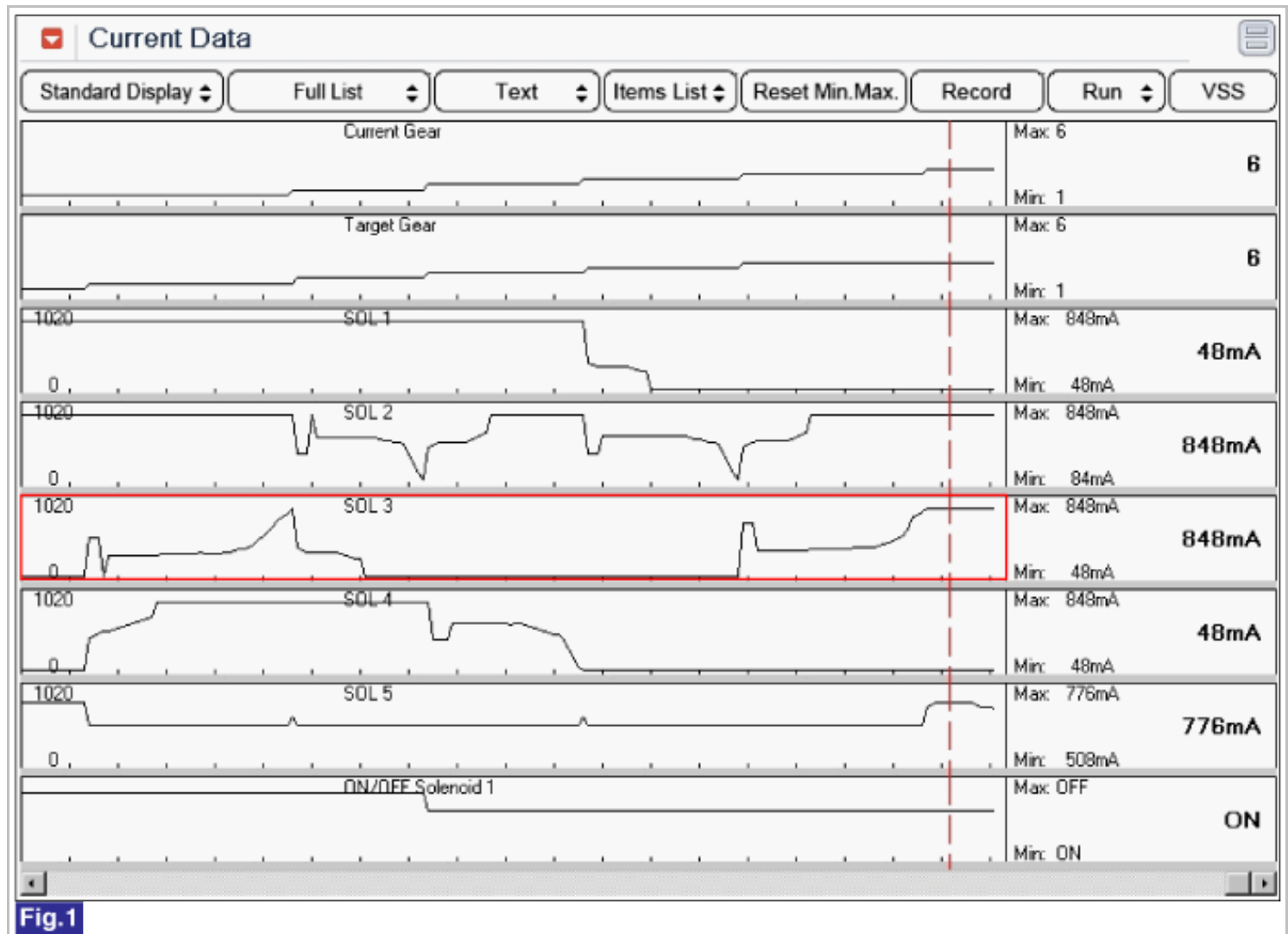


Fig 1) Shift control solenoid valve3

5. Does "Shift control solenoid valve(SOL 3)" operated normally ?

<b>YES</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	▶ Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

#### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C ( 122 °F) and 120°C ( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

#### (Reference)

If the oil temperature is not between 50°C ( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

#### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal normally. Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times. (Not necessary N-D, N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

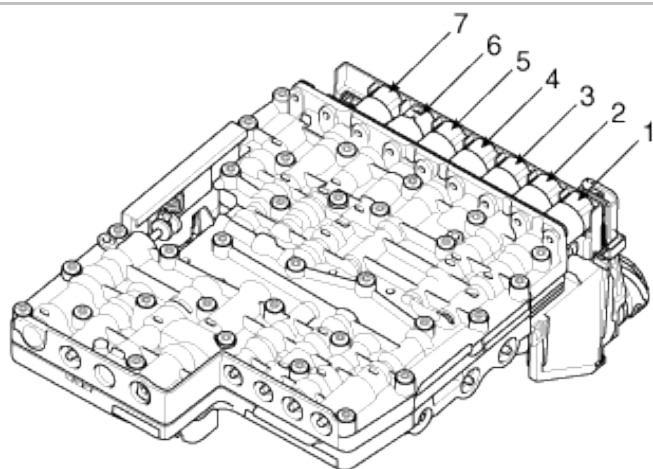
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.

2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure
<b>NO</b>	▶ System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > P2703 Transmission Friction Element "D" Apply Time Range/Performance

### Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

### General Description

The ratio monitoring controls the nominal gear box ratio to the real gear box ratio. While driving in a gear(reverse, first second, third...) there is a calibrated rationality check between turbine speed and output speed of the corresponding gear. While up or down shifting from one gear to another there is a calibrated rationality check between turbine speed and output speed of the corresponding shift. While engaging the gear there is a calibrated rationality check between turbine speed and output speed of the corresponding shift if the actual output speed is higher or equal than a calibrated threshold. While engaging the gear when the actual output speed is lower than the threshold there is a rationality check on the turbine speed.

### DTC Description

TCM set this code If detected not properly operation of "Brake D" in 1st and Reverse gear.(MIL ON : 2 driving Cycle)

### DTC Detectiong Condition

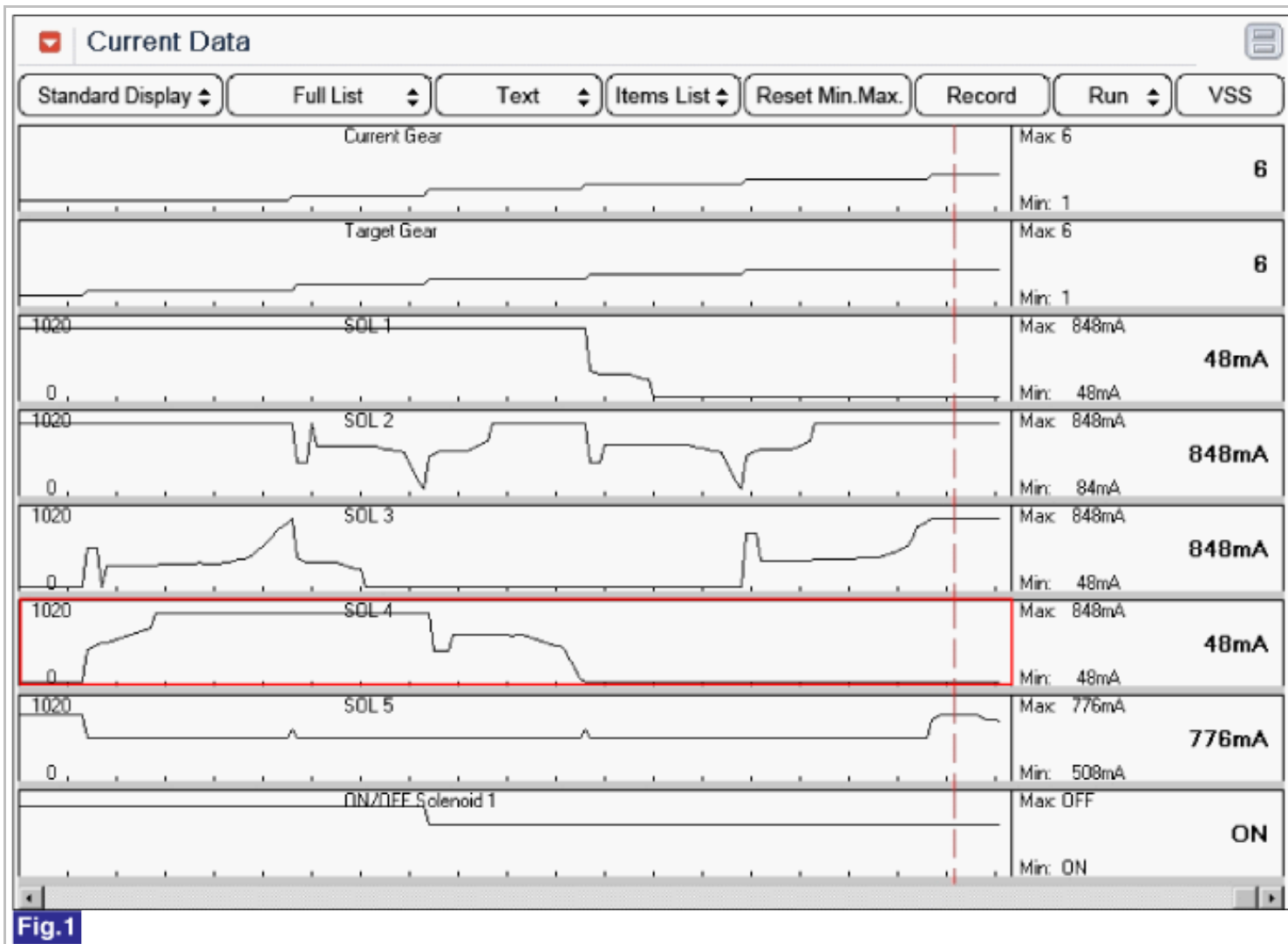
Item		Detecting Condition	Possible Cause
DTC Strategy		• Check function (1st and Reverse gear)	
Enable		<ul style="list-style-type: none"> <li>• ATF temperature &gt; 0°C.</li> <li>• Engine speed &gt; 400rpm.</li> <li>• Input speed &gt; 0rpm.</li> <li>• Input speed : normal.</li> <li>• Inhibitor Switch Not "D or N" position</li> </ul>	

Conditions		<ul style="list-style-type: none"> <li>• Inhibitor s/w : Not P or N position.</li> <li>• Within 0.5 second after shift.</li> </ul>	<ul style="list-style-type: none"> <li>• Check Engine system</li> <li>• E- Module</li> <li>• Replace ATM</li> </ul>
	CASE 1	<ul style="list-style-type: none"> <li>• Output speed <math>\geq</math> 50rpm</li> </ul>	
	CASE 2	<ul style="list-style-type: none"> <li>• Output speed <math>&lt;</math> 50rpm</li> </ul>	
Threshold Value	CASE 1	Not shifting and not engaging status <ul style="list-style-type: none"> <li>• Actual gear ratio <math>&gt;</math> Target gear ratio</li> <li>• Actual gear ratio <math>&lt;</math> Target gear ratio</li> </ul>	
	CASE 2	Not shifting and not engaging status <ul style="list-style-type: none"> <li>• (Output speed * gear ratio) - Input speed <math>&gt;</math> 320rpm</li> </ul>	
Diagnostic Time		<ul style="list-style-type: none"> <li>• 3times function check</li> </ul>	
Fail Safe		<ul style="list-style-type: none"> <li>• Fixed at 4th gear</li> <li>• No learning control (Priority : 3)</li> </ul>	

#### CAUTION

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

## Signal Waveform & Data



**Fig.1**

Fig 1) Shift control solenoid valve

## Monitor Scantool Data

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"
3. Monitor the "Shift control solenoid valve(SOL 4)" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valve.

**Specification :** 48mA ~ 848mA

### Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-



D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control

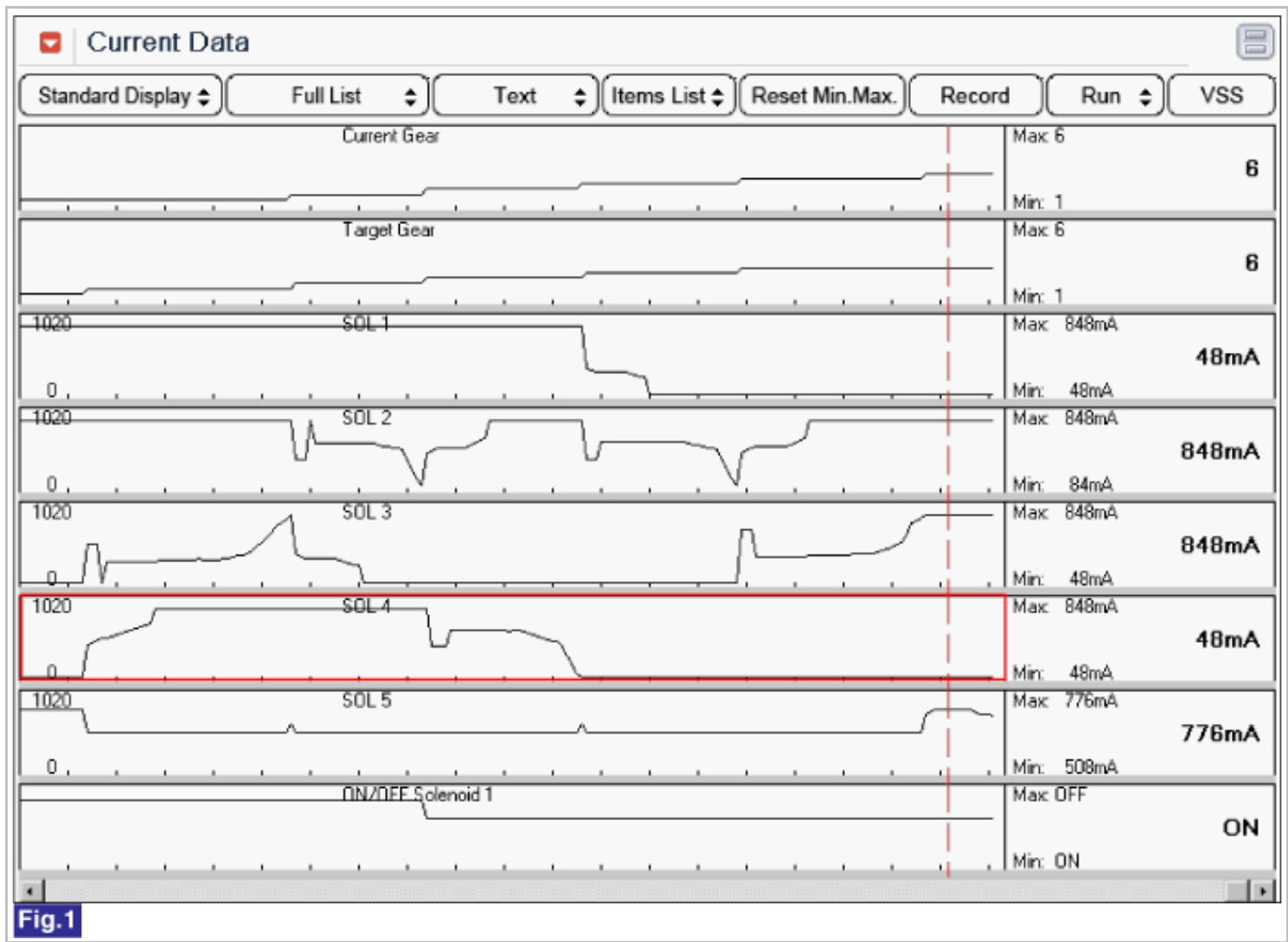


Fig 1) Shift control solenoid valve

5. Dose "Shift control solenoid valve(SOL 4)" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.

4. After turning IG OFF to IG ON twice or three times, check DTC again.

5. Does the scantool show same DTC again ?

<b>YES</b>	▶ Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected,replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

#### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

##### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

(Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

##### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally.Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

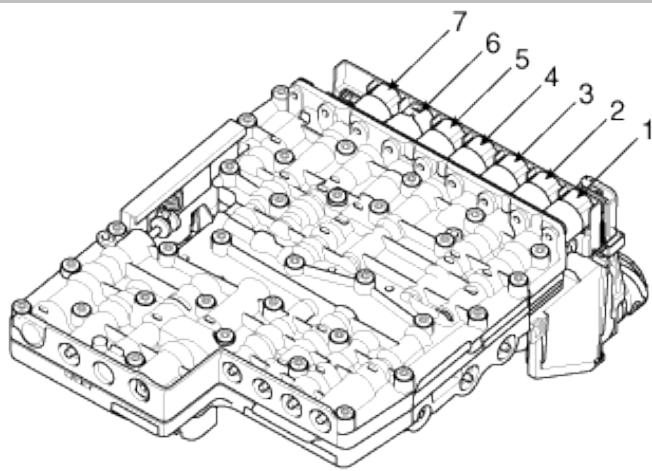
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure
<b>NO</b>	▶ System performing to specification at this time.

**Automatic Transmission System > Automatic Transmission System > P2704 Transmission Friction Element "E" Apply Time Range/Performance**

## Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

## General Description

The ratio monitoring controls the nominal gear box ratio to the real gear box ratio. While driving in a gear(reverse, first second, third...) there is a calibrated rationality check between turbine speed and output speed of the corresponding gear. While up or down shifting from one gear to another there is a calibrated rationality check between turbine speed and output speed of the corresponding shift. While engaging the gear there is a calibrated rationality check between turbine speed and output speed of the corresponding shift if the actual output speed is higher or equal than a calibrated threshold. While engaging the gear when the actual output speed is lower than the threshold there is a rationality check on the turbine speed.

## DTC Description

TCM set this code If detected not properly operation of "Clutch E" in 4th, 5th, 6th gear.(MIL ON : 2 driving Cycle)

## DTC Detecting Condition

Item		Detecting Condition	Possible Cause
DTC Strategy		• Check function (1st and Reverse gear)	<ul style="list-style-type: none"> <li>• Check Engine system</li> <li>• E- Module</li> <li>• Replace ATM</li> </ul>
Enable Conditions		<ul style="list-style-type: none"> <li>• ATF temperature &gt; 0°C.</li> <li>• Engine speed &gt; 400rpm.</li> <li>• Input speed &gt; 0rpm.</li> <li>• Input speed : normal.</li> <li>• Inhibitor s/w : Not "P or N" position.</li> <li>• Within 0.5 second after shift.</li> </ul>	
	CASE 1	• Output speed ≥ 50rpm	
	CASE 2	• Output speed < 50rpm	
Threshold Value	CASE 1	Not shifting and not engaging status <ul style="list-style-type: none"> <li>• Actual gear ratio &gt; Target gear ratio</li> <li>• Actual gear ratio &lt; Target gear ratio</li> </ul>	
	CASE 2	Not shifting and not engaging status <ul style="list-style-type: none"> <li>• (Output speed * gear ratio) - Input speed &gt; 320rpm</li> </ul>	
Diagnostic Time		• 3times function check	
Fail Safe		<ul style="list-style-type: none"> <li>• Fixed at 4th gear</li> <li>• No learning control</li> </ul>	

**CAUTION**

1. The function with the higher priority will always take precedence. However, a low-priority is not overruled by a higher priority function.
2. Functions from different priority categories can also run in parallel. It is important to note which function will take precedence in this case.
3. In such an event it is possible for a substitute function with low priority not be carried out if a second, higher-priority function is present. This has been taken into account when compiling the priority list and is international.
4. The mechanical emergency run function must always have the highest priority, since from the electrical standpoint it is the only safe condition.

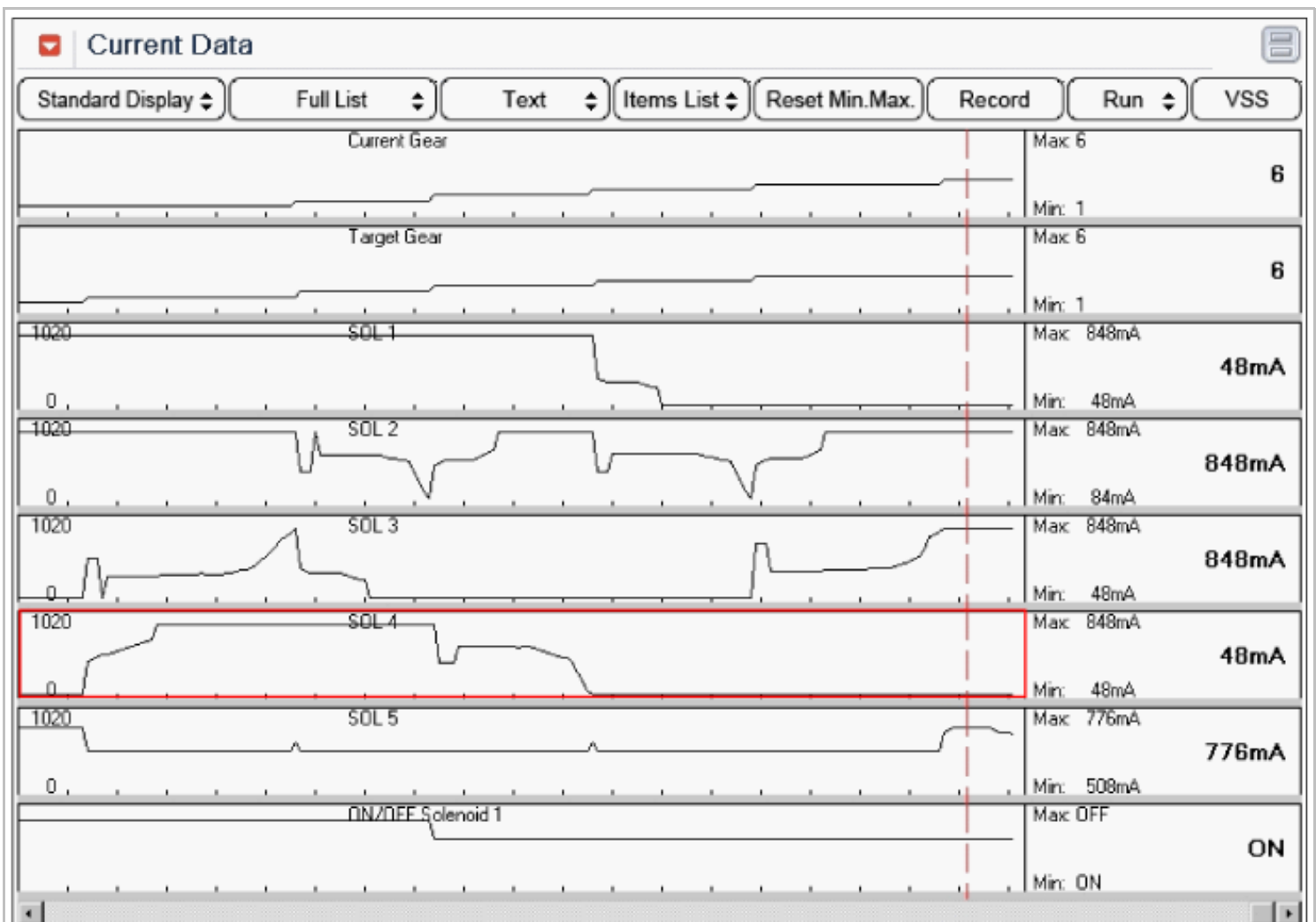
**Signal Waveform & Data****Fig.1**

Fig 1) Shift control solenoid valve

**Monitor Scantool Data**

1. Connect scan tool to data link connector(DLC), Ignition "ON"
2. Erase DTC and Engine "ON"

3. Monitor the "Shift control solenoid valve(SOL 4)" parameter on the scan tool.
4. Select "D" range and Drive vehicle, confirm output data of solenoid valve.

**Specification :** 48mA ~ 848mA

#### Solenoid valve operating status according to gear position

gear position	ON SOL.	SOL.1	SOL.2	SOL.3	SOL. 4	SOL. 5	SOL. 6
P	OFF	48mA	848mA	48mA	48mA	-O-	OFF
R	OFF	48mA	48mA	48mA	48mA	-O-	OFF
N	OFF	48mA	848mA	48mA	48mA	-O-	OFF
D1	OFF	848mA	848mA	48mA	48mA	-O-	-O-
D2	OFF	848mA	848mA	848mA	848mA	-O-	-O-
D3	OFF	848mA	48mA	48mA	848mA	-O-	-O-
D4	ON	848mA	848mA	48mA	48mA	-O-	-O-
D5	ON	48mA	48mA	48mA	48mA	-O-	-O-
D6	ON	48mA	848mA	848mA	48mA	-O-	-O-

-O- : variable control

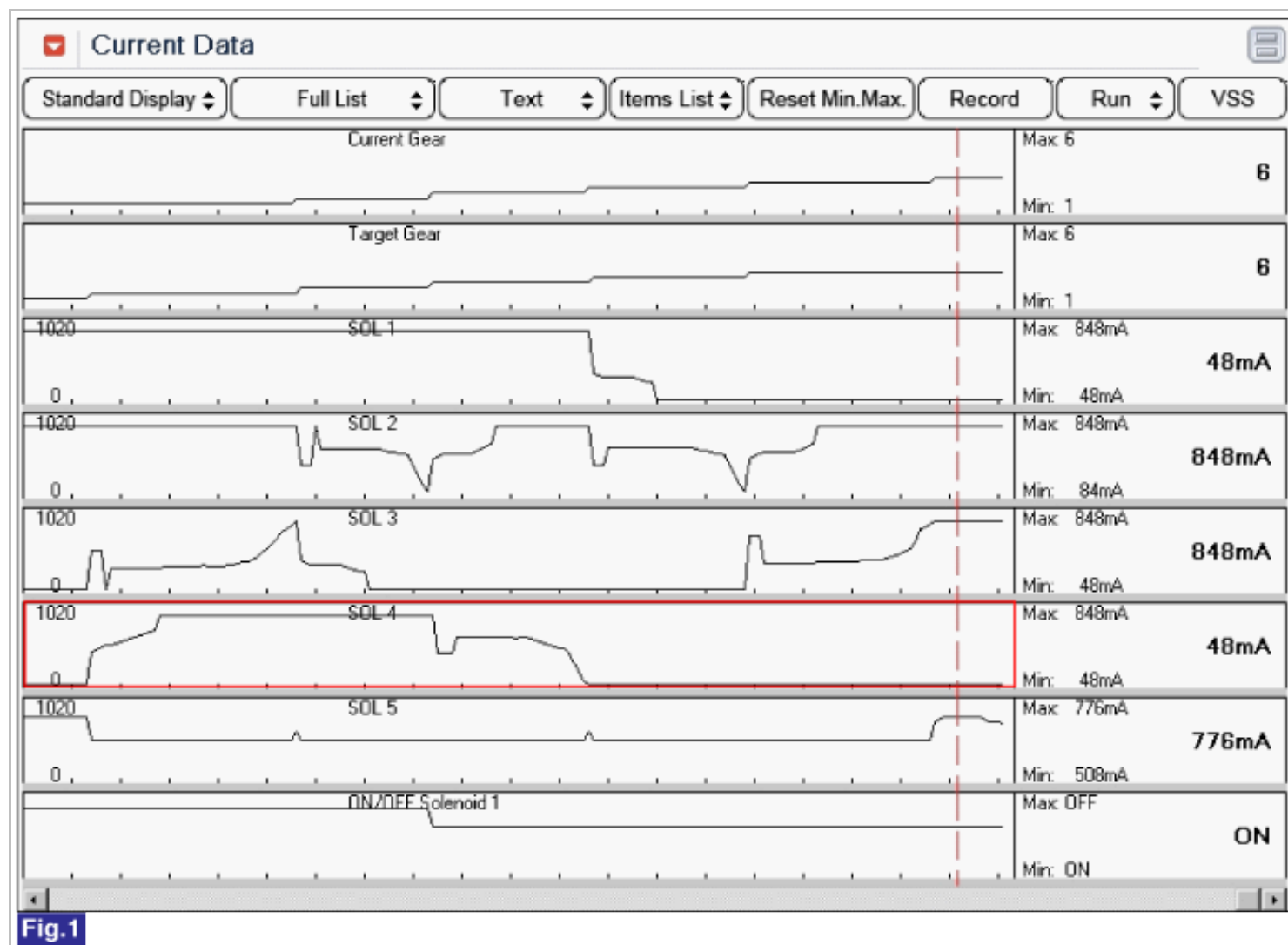


Fig 1) Shift control solenoid valve

5. Dose "Shift control solenoid valve(SOL 4)" operated normally ?

<b>YES</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "verification of vehicle repair" procedure
<b>NO</b>	► Go to "Component Inspection" procedure

## Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect scantool and check DTC.
3. Erase the DTC with scantool.
4. After turning IG OFF to IG ON twice or three times, check DTC again.
5. Does the scantool show same DTC again ?

<b>YES</b>	► Substitute with a known-good Mechatronics (Valve-body + TCM) and check for proper operation. If the problem is corrected, replace Mechatronics (Valve-body + TCM) and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	► Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

### How to perform Initial Learning

If you replace the automatic transmission or Mechatronics (Valve-body + TCM), or if you overwrite the TCU software, be sure to initialize the learned values and perform initial learning.

#### Step 1) Warm-up

Raise the ATF temperature by leaving the vehicle idling or performing city drive. Check the ATF temperature using the Scan-tool and make sure it is between 50°C( 122 °F) and 120°C( 248 °F). If the ATF temperature is outside this range, work to bring the range.

#### CAUTION

Don't raise the oil temperature by stalling the engine.

(Reference)

If the oil temperature is not between 50°C( 122 °F) and 120°C ( 248 °F), initial learning can not be performed. Before learning, check for variable speed shock or shift shock.

#### STEP 2) Driving learning

Select "D" range then depress accelerator pedal smoothly, and keep the APS value 17%, shift gear to 5th gear. RKeep the vehicle speed over 60km/h.

In condition that release the accelerator pedal and then depress the brake pedal narmally. Stop the vehicle then keep 5seconds.

STEP 3) Repeat this procedure 10 times.(Not necessary N-D,N-R Learning)

## Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

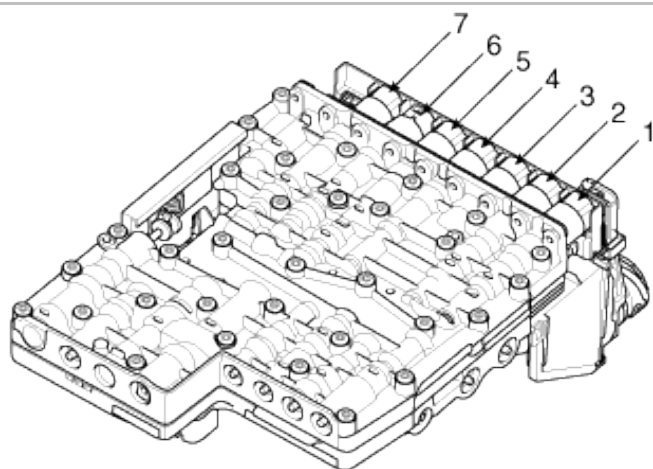
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.

2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure
<b>NO</b>	▶ System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > U0001 High Speed CAN Communication Bus off

### Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

### General Description

Several control units are applied to electronically controlled vehicles. These units perform each control with informations from various sensors. Thus, sharing signal information from sensors is needed, so CAN communication type whose communication speed is high and insensitive to electrical noise by spark generation is adopted to controlling power-train(TCM, ECM, CLUSTER,VDC,4WD,EAS,SAS, EPS)

CAN communication consists of CAN BUS HIGH, CAN BUS LOW and two 120Ω resistances in circuit.

### DTC Description

TCM set this code If detected error in CAN communication line. (MIL OFF)

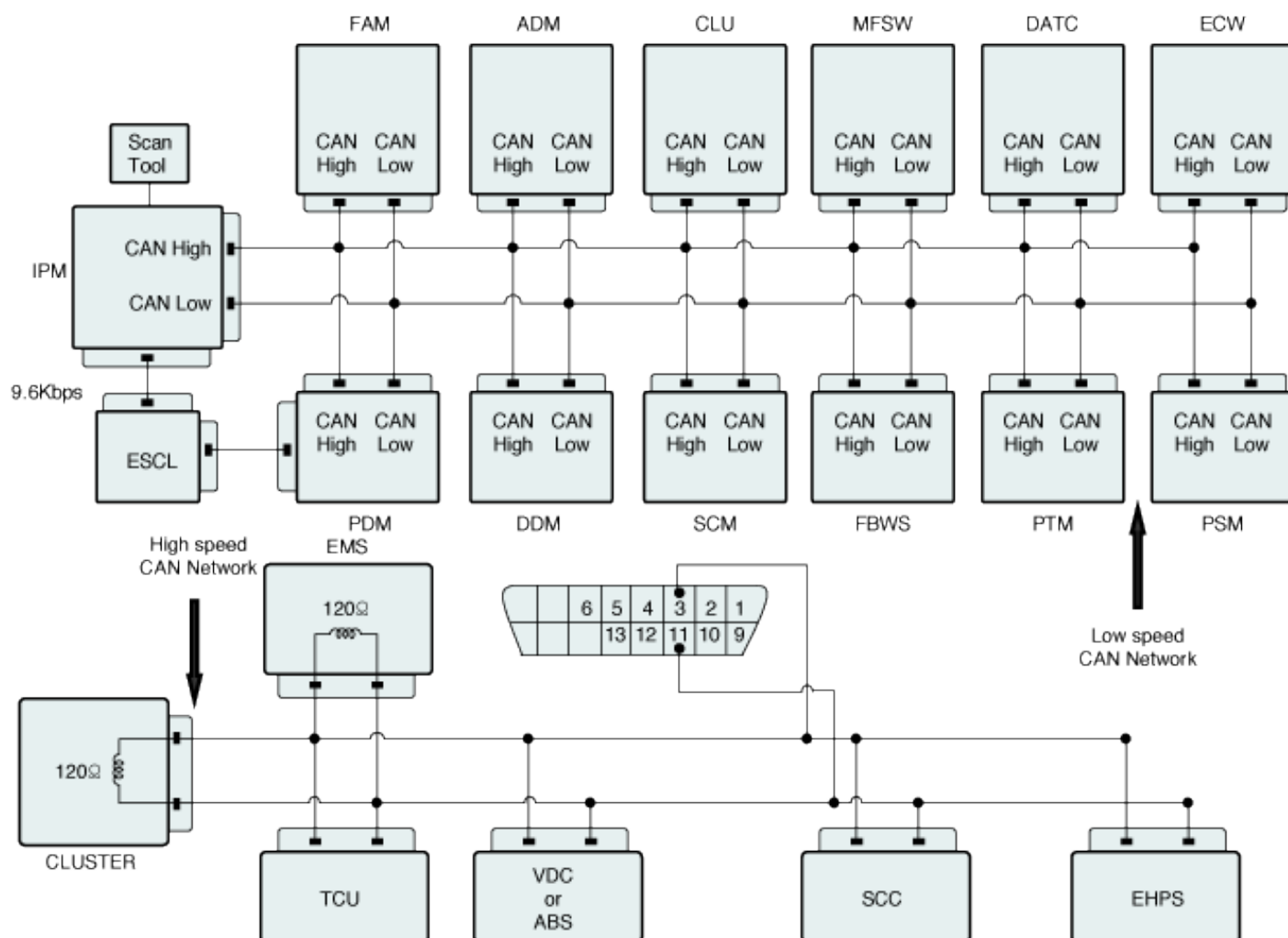
### DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Check function	<ul style="list-style-type: none"> <li>• CAN communication line open of TCM side</li> <li>• CAN communication line short of TCM side</li> </ul>
Enable Conditions	<ul style="list-style-type: none"> <li>• Battery voltage &gt; 9V</li> <li>• 0.5 second after IG ON</li> </ul>	
Threshold Value	<ul style="list-style-type: none"> <li>• CAN BUS<math>\uparrow</math> OFF (Not properly work CAN BUS)</li> <li>• CAN time-out</li> </ul>	
Diagnostic Time	• 0.56 second	

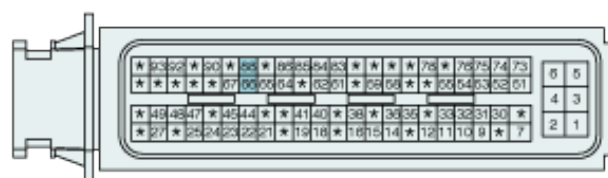
Fail Safe	<ul style="list-style-type: none"><li>• Maximum line pressure control (D : 14kg/cm<sup>2</sup>, R : 20kg/cm<sup>2</sup>)</li><li>• Vehicle speed is substituted wheel speed</li><li>• Release "Shift lock"</li><li>• Maintain present gear position at fault detecting.</li><li>• Fixed at 3rd gear after stop</li><li>• No control Torque convertor clutch</li><li>• No learning control (Priority : 3)</li></ul>	<p>on PCM side</p> <ul style="list-style-type: none"><li>• ECM</li><li>• CLUSTER</li><li>• Mechatronics(E-module + Valvebody)</li></ul>
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Diagnostic Circuit Diagram





<ECM> CTG-K



<ESC CONTROL MODULE>



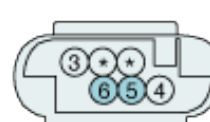
<INSTRUMENT CLUSTER>



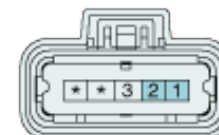
<DATA LINK CONNECTOR>



<SCC>



<EHPS>



<ECW>



4. Low  
5. High

<MFSW>



5. High  
6. Low

<ADM>



8. High  
16. Low

<DDM>

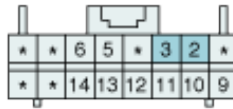


8. High  
16. Low

<TCM> CTG-ZF



<IPM>



2. Low  
3. High

<CLU>



19. Low  
20. High

<FBWS>



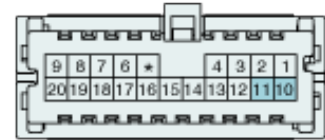
6. High  
7. Low

<PTM>



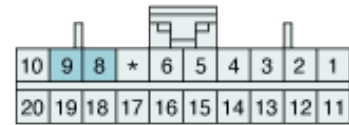
1. Low  
9. High

<PDM>



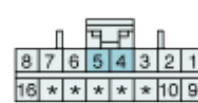
10. Low  
11. High

<TILT & TELE>



8. High  
9. Low

<PSM>



4. High  
5. Low

<FAM>



3. High  
4. Low

## Terminal & Connector Inspection

- Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
- Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
- Has a problem been found?

<b>YES</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification Vehicle Repair" procedure
<b>NO</b>	▶ Go to "W/Harness Inspection" procedure

## Check for resistance of CAN communication

### ■ Check resistance of CAN communication -1

1. IG KEY OFF .
2. Connect ECM, TCM, 4WD, VDC(ABS/TCS), EAS, SAS and CLUSTER connector.
3. Measure resistance between #3 terminal and #11 terminal of "DLC".

**Specification :** Approx. 60  $\Omega$

4. Is measured resistance within specifications ?

<b>YES</b>	▶ Check TCM connector as necessary and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Go to next procedure.

### ■ Check resistance of CAN communication -2

1. IG KEY OFF .
2. Disconnect ECM connector.
3. Measure resistance between #3 terminal and #11 terminal of "DLC"..

**Specification :** Approx. 120  $\Omega$

4. Is measured resistance within specifications ?

<b>YES</b>	▶ Go to next procedure.
<b>NO</b>	<ul style="list-style-type: none"><li>▶ Check TCM connector as necessary and then go to "Verification of Vehicle Repair" procedure.</li><li>▶ Perform open/short test with CAN communication line of TCM and ECM.</li><li>▶ Perform resistance test with CAN communication line of ECM.</li></ul>

### ■ Check resistance of CAN communication -3

1. IG KEY OFF .
2. Disconnect CLUSTER connector.
3. Measure resistance between #3 terminal and #11 terminal of "DLC".

**Specification :** Approx. 120  $\Omega$

4. Is measured resistance within specifications ?

<b>YES</b>	▶ Go to next procedure.
<b>NO</b>	<ul style="list-style-type: none"><li>▶ Check BMS connector as necessary and then go to "Verification of Vehicle Repair" procedure.</li><li>▶ Perform open/short test with CAN communication line of TCM and CLUSTER.</li><li>▶ Perform resistance test with CAN communication line of CLUSTER.</li></ul>

## CAN

### ■ Check short of CAN communication line.

1. IG KEY OFF .
2. Connect TCM, ECM, CLUSTER connector.

3. Measure voltage between TCM CAN HIGH and CAN LOW terminal.

**Specification :** Approx. 2.3V

4. Is measured voltage within specifications ?

<b>YES</b>	▶ Go to next procedure.
<b>NO</b>	▶ Repair shorted circuit in CAN communication line as necessary and then go to "Verification of Vehicle Repair" procedure.

#### ■ Check open in CAN communication line -1

1. IG KEY OFF .
2. Disconnect TCM, ECM and CLUSTER connector.
3. Measure resistance between TCM CAN HIGH or CAN LOW and CLUSTER CAN HIGH or CAN LOW terminal.

**Specification :** Approx. 0Ω

4. Is measured resistance within specifications ?

<b>YES</b>	▶ Go to next procedure.
<b>NO</b>	▶ Repair opened circuit in CAN communication line of CLUSTER as necessary and then go to "Verification of Vehicle Repair" procedure.

#### ■ Check open in CAN communication line -2

1. IG KEY OFF .
2. Disconnect TCM, ECM and CLUSTER connector.
3. Measure resistance between ECM CAN HIGH or CAN LOW and CLUSTER CAN HIGH or CAN LOW terminal.

**Specification :** Approx. 0Ω

4. Is measured resistance within specifications ?

<b>YES</b>	▶ Go to next procedure.
<b>NO</b>	▶ Repair opened circuit in CAN communication line of ECM as necessary and then go to "Verification of Vehicle Repair" procedure.

## Component Inspection

#### ■ Component inspection of ECM, CLUSTER.

1. IG KEY OFF .
2. Disconnect TCM, ECM and CLUSTER connector.
3. Measure resistance between ECM CAN HIGH or CAN LOW and CLUSTER CAN HIGH or CAN LOW terminal.

**Specification :** Approx. 120Ω

4. Is measured resistance within specifications ?

	▶ Go to next procedure.
--	-------------------------

<b>YES</b>	► Check poor connection between TCM and other component Repair as necessary and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	► Substitute with a known-good TCM or CLUSTER and check for proper operation. If the problem is corrected, replace PCM/TCM as necessary and then go to "Verification of Vehicle Repair" procedure.

## Verification of Vehicle Repair

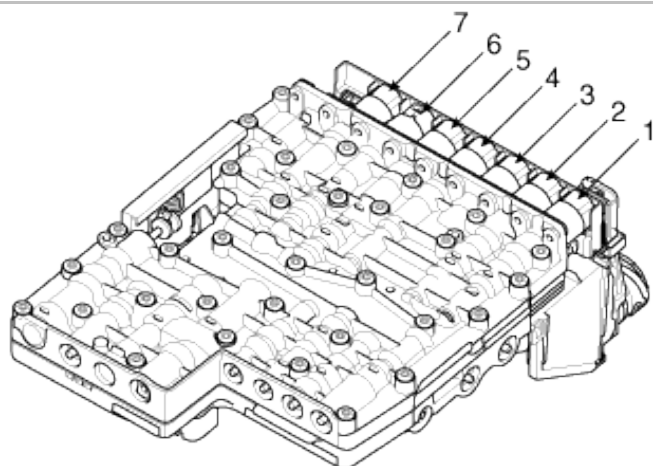
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	► Go to the applicable troubleshooting procedure
<b>NO</b>	► System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > U0100 Lost Communication With ECM/PCM 'A'

### Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

### General Description

Several control units are applied to electronically controlled vehicles. These units perform each control with informations from various sensors. Thus, sharing signal information from sensors is needed, so CAN communication type whose communication speed is high and insensitive to electrical noise by spark generation is adopted to controlling power-train(TCM, ECM, CLUSTER,VDC,4WD,EAS,SAS, EPS)

CAN communication consists of CAN BUS HIGH, CAN BUS LOW and two 120Ω resistances in circuit.

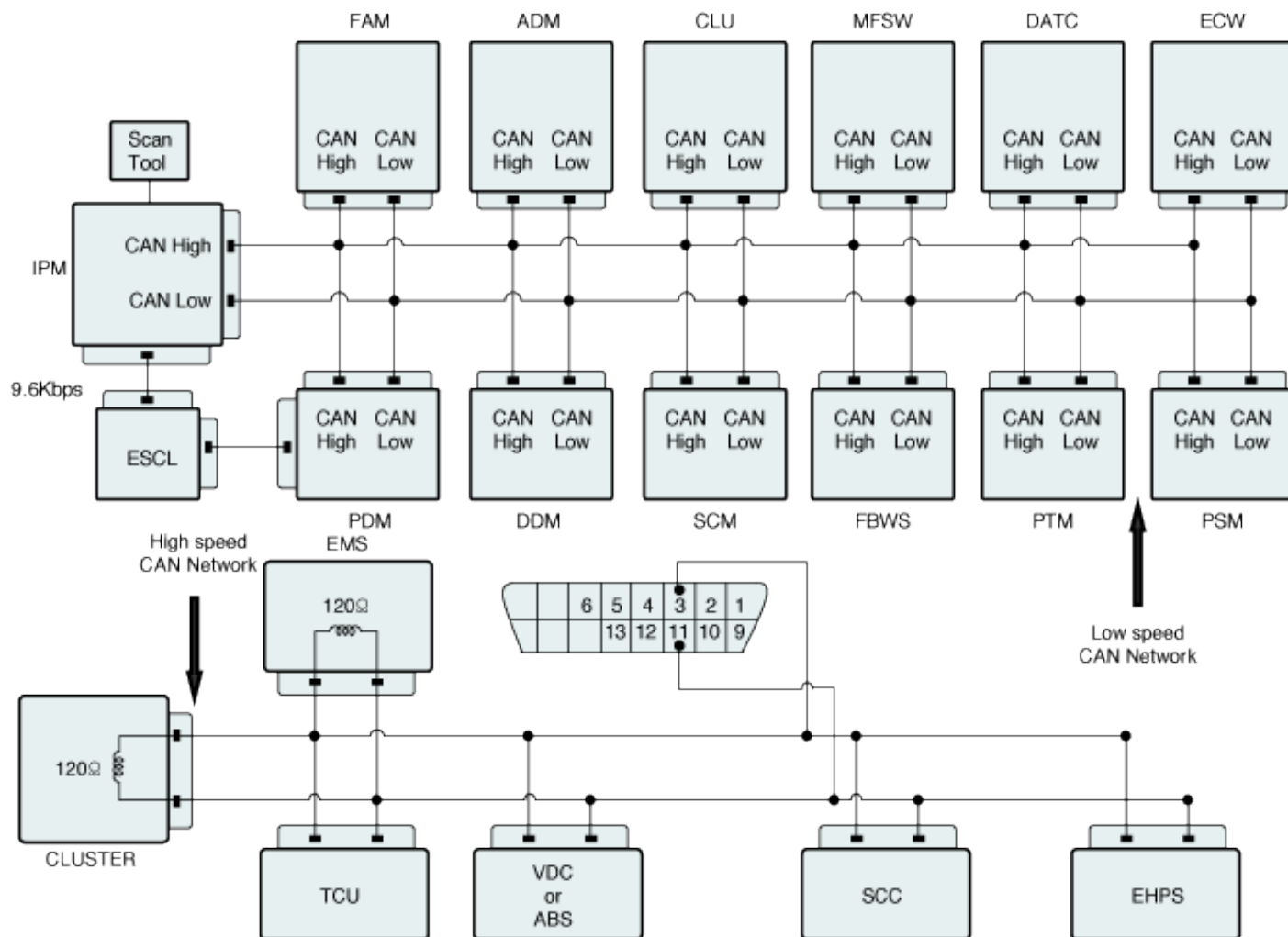
### DTC Description

TCM set this code If not receive CAN message form ECM.(MIL OFF)

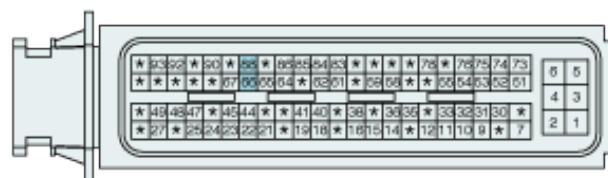
## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	<ul style="list-style-type: none"> <li>• Check signal</li> </ul>	<ul style="list-style-type: none"> <li>• CAN communication line open of TCM side</li> <li>• CAN communication line short of TCM side</li> <li>• ECM</li> <li>• CLUSTER</li> <li>• Mechatronics(E-module + Valvebody)</li> </ul>
Enable Conditions	<ul style="list-style-type: none"> <li>• No error in CAN BUS</li> <li>• 0.5 second after IG ON</li> <li>• Battery voltage &gt; 9V</li> </ul>	
Threshold Value	<ul style="list-style-type: none"> <li>• No message from ECM</li> <li>• Input Not available data</li> </ul>	
Diagnostic Time	<ul style="list-style-type: none"> <li>• 0.55 second</li> </ul>	
Fail Safe	<ul style="list-style-type: none"> <li>• Maximum line pressure control (D : 14kg/cm<sup>2</sup>, R : 20kg/cm<sup>2</sup>)</li> <li>• Vehicle speed is substituted wheel speed</li> <li>• Release "Shift lock"</li> <li>• Maintain present gear position at fault detecting.</li> <li>• Fixed at 3rd gear after stop</li> <li>• No control Torque convertor clutch</li> <li>• No learning control (Priority : 3)</li> </ul>	

## Diagnostic Circuit Diagram

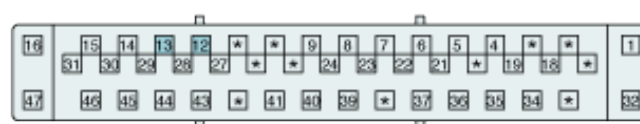


<ECM> CTG-K



66. C-CAN LOW  
88. C-CAN HIGH

<ESC CONTROL MODULE>



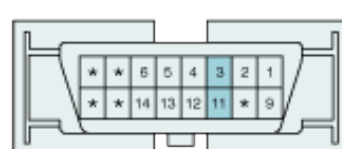
12. C-CAN HIGH  
13. C-CAN LOW

<INSTRUMENT CLUSTER>



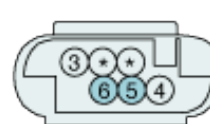
5. C-CAN LOW  
6. C-CAN HIGH

<DATA LINK CONNECTOR>



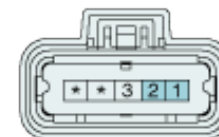
3. C-CAN HIGH  
11. C-CAN LOW

<SCC>



5. C-CAN LOW  
6. C-CAN HIGH

<EHPS>



5. C-CAN LOW  
6. C-CAN HIGH

<ECW>



4. Low  
5. High

<MFSW>



5. High  
6. Low

<ADM>



8. High  
16. Low

<DDM>

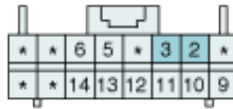


8. High  
16. Low

<TCM> CTG-ZF



<IPM>



2. Low  
3. High

<CLU>



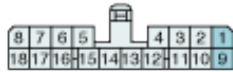
19. Low  
20. High

<FBWS>



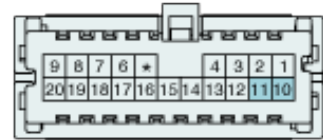
6. High  
7. Low

<PTM>



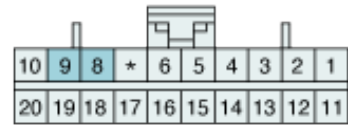
1. Low  
9. High

<PDM>



10. Low  
11. High

<TILT & TELE>



8. High  
9. Low

<PSM>



4. High  
5. Low

<FAM>



3. High  
4. Low

## Terminal & Connector Inspection

- Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
- Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
- Has a problem been found?

<b>YES</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification Vehicle Repair" procedure
<b>NO</b>	▶ Go to Check for resistance of CAN communication.



## Check for resistance of CAN communication

### ■ Check resistance of CAN communication -1

1. IG KEY OFF .
2. Connect ECM, TCM, 4WD, VDC(ABS/TCS), EAS, SAS and CLUSTER connector.
3. Measure resistance between #3 terminal and #11 terminal of "DLC".

**Specification :** Approx. 60  $\Omega$

4. Is measured resistance within specifications ?

<b>YES</b>	▶ Check TCM connector as necessary and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Go to next procedure.

### ■ Check resistance of CAN communication -2

1. IG KEY OFF .
2. Disconnect ECM connector.
3. Measure resistance between #3 terminal and #11 terminal of "DLC"..

**Specification :** Approx. 120  $\Omega$

4. Is measured resistance within specifications ?

<b>YES</b>	▶ Go to next procedure.
<b>NO</b>	<ul style="list-style-type: none"><li>▶ Check TCM connector as necessary and then go to "Verification of Vehicle Repair" procedure.</li><li>▶ Perform open/short test with CAN communication line of TCM and ECM.</li><li>▶ Perform resistance test with CAN communication line of ECM.</li></ul>

## CAN

### ■ Check short of CAN communication line.

1. IG KEY OFF .
2. Connect TCM, ECM, CLUSTER connector.
3. Measure voltage between TCM CAN HIGH and CAN LOW terminal.

**Specification :** Approx. 2.3V

4. Is measured voltage within specifications ?

<b>YES</b>	▶ Go to next procedure.
<b>NO</b>	▶ Repair shorted circuit in CAN communication line as necessary and then go to "Verification of Vehicle Repair" procedure.

### ■ Check open in CAN communication line

1. IG KEY OFF .
2. Disconnect TCM, ECM and CLUSTER connector.
3. Measure resistance between TCM CAN HIGH or CAN LOW and CLUSTER CAN HIGH or CAN LOW terminal.

**Specification :** Approx. 0Ω

4. Is measured resistance within specifications ?

<b>YES</b>	▶ Go to next procedure.
<b>NO</b>	▶ Repair opened circuit in CAN communication line of CLUSTER as necessary and then go to "Verification of Vehicle Repair" procedure.

## Component Inspection

### ■ Component inspection of ECM, CLUSTER.

1. IG KEY OFF .
2. Disconnect TCM, ECM and CLUSTER connector.
3. Measure resistance between ECM CAN HIGH or CAN LOW and CLUSTER CAN HIGH or CAN LOW terminal.

**Specification :** Approx. 120Ω

4. Is measured resistance within specifications ?

<b>YES</b>	▶ Check poor connection between TCM and other component Repair as necessary and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Substitute with a known-good TCM or CLUSTER and check for proper operation. If the problem is corrected, replace PCM/TCM as necessary and then go to "Verification of Vehicle Repair" procedure.

## Verification of Vehicle Repair

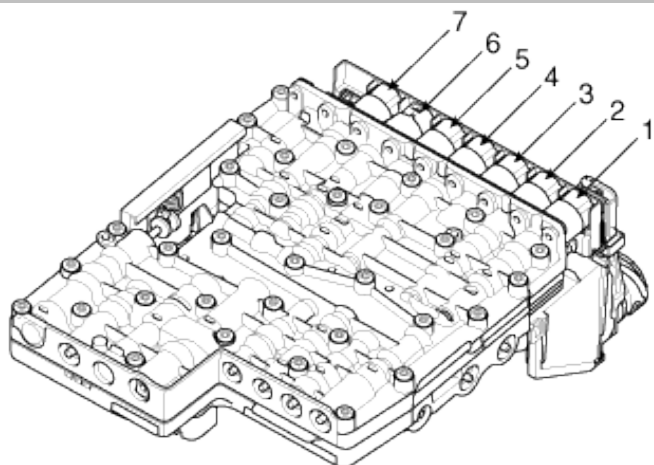
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure
<b>NO</b>	▶ System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > U0104 Lost Communication With Cruise Control Module

## Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

## General Description

Several control units are applied to electronically controlled vehicles. These units perform each control with informations from various sensors. Thus, sharing signal information from sensors is needed, so CAN communication type whose communication speed is high and insensitive to electrical noise by spark generation is adopted to controlling power-train(TCM, ECM, CLUSTER,VDC,4WD,EAS,SAS, EPS)

CAN communication consists of CAN BUS HIGH, CAN BUS LOW and two 120Ω resistances in circuit.

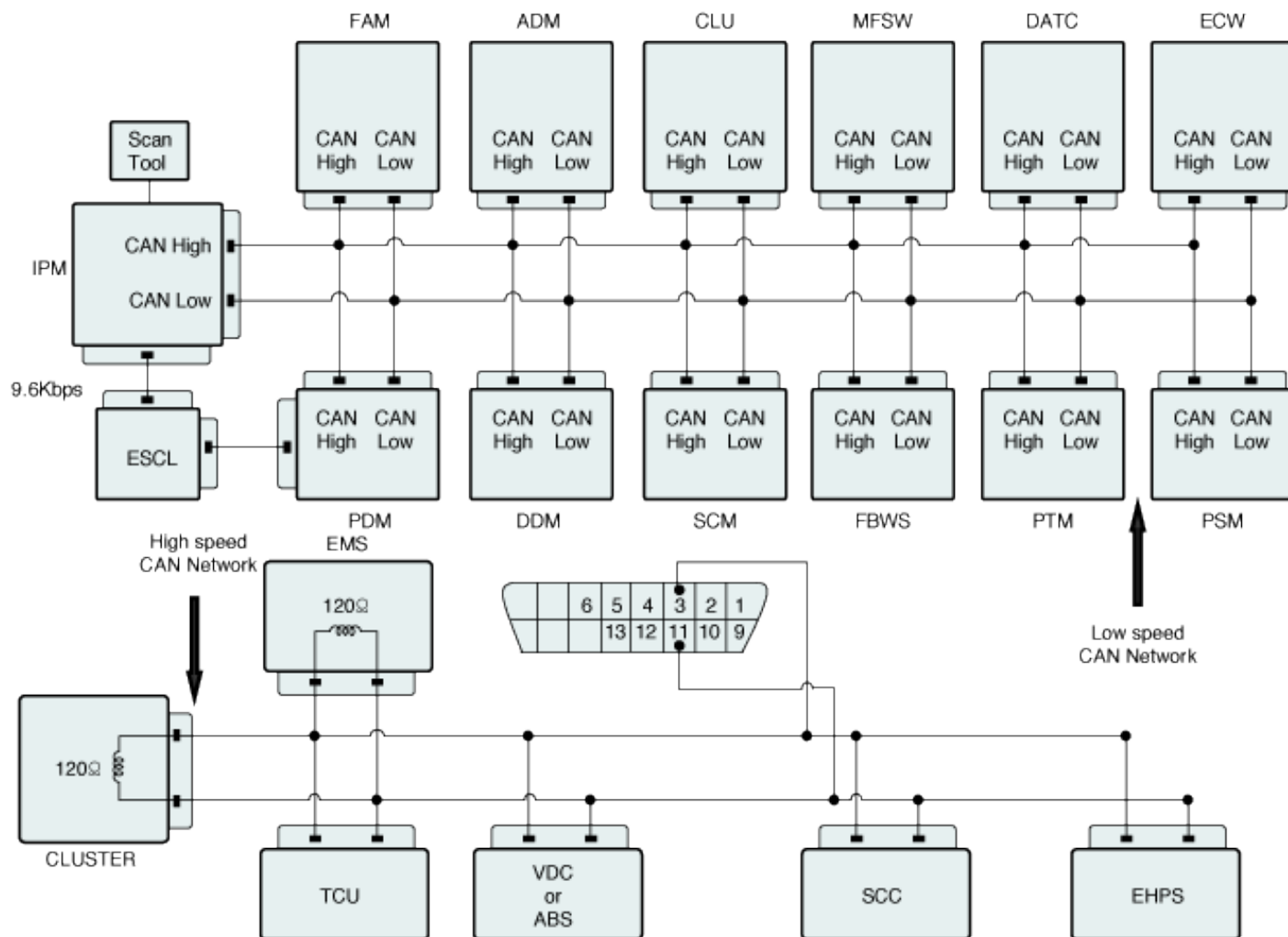
## DTC Description

TCM set this code If not receive CAN message form ACC.(MIL OFF)

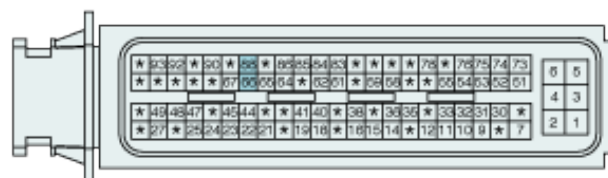
## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Check signal	<ul style="list-style-type: none"> <li>• CAN communication line open of ACC side</li> <li>• CAN communication line short of ACC side</li> <li>• ACCM</li> <li>• Mechatronics(E-module + Valvebody)</li> </ul>
Enable Conditions	<ul style="list-style-type: none"> <li>• 0.5 second after IG ON</li> <li>• Battery voltage &gt; 9V</li> </ul>	
Threshold Value	<ul style="list-style-type: none"> <li>• No message from ECM</li> <li>• Input Not available data</li> </ul>	
Diagnostic Time	• 0.56 second	
Fail Safe	• (Priority : 2)	

## Diagnostic Circuit Diagram

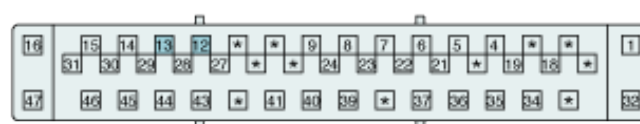


<ECM> CTG-K



66. C-CAN LOW  
88. C-CAN HIGH

<ESC CONTROL MODULE>



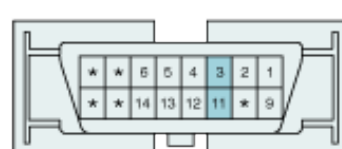
12. C-CAN HIGH  
13. C-CAN LOW

<INSTRUMENT CLUSTER>



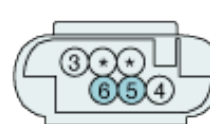
5. C-CAN LOW  
6. C-CAN HIGH

<DATA LINK CONNECTOR>



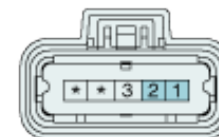
3. C-CAN HIGH  
11. C-CAN LOW

<SCC>



5. C-CAN LOW  
6. C-CAN HIGH

<EHPS>



5. C-CAN LOW  
6. C-CAN HIGH

&lt;ECW&gt;



4. Low  
5. High

&lt;MFSW&gt;



5. High  
6. Low

&lt;ADM&gt;



8. High  
16. Low

&lt;DDM&gt;

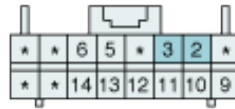


8. High  
16. Low

&lt;TCM&gt; CTG-ZF



&lt;IPM&gt;



2. Low  
3. High

&lt;CLU&gt;



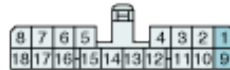
19. Low  
20. High

&lt;FBWS&gt;



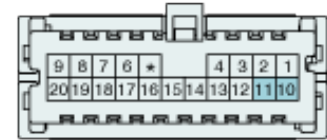
6. High  
7. Low

&lt;PTM&gt;



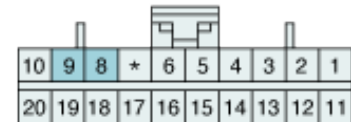
1. Low  
9. High

&lt;PDM&gt;



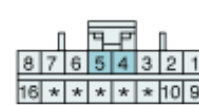
10. Low  
11. High

&lt;TILT &amp; TELE&gt;



8. High  
9. Low

&lt;PSM&gt;



4. High  
5. Low

&lt;FAM&gt;



3. High  
4. Low

## Terminal & Connector Inspection

- Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
- Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
- Has a problem been found?

<b>YES</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification Vehicle Repair" procedure
<b>NO</b>	▶ Go to Check for resistance of CAN communication.

## Check for resistance of CAN communication

### ■ Check resistance of CAN communication -1

1. IG KEY OFF .
2. Connect ECM, TCM, 4WD, VDC(ABS/TCS), EAS, SAS and CLUSTER connector.
3. Measure resistance between #3 terminal and #11 terminal of "DLC".

**Specification :** Approx. 60  $\Omega$

4. Is measured resistance within specifications ?

<b>YES</b>	▶ Check TCM connector as necessary and then go to "Verification of Vehicle Repair" procedure..
<b>NO</b>	▶ Go to next procedure.

### ■ Check resistance of CAN communication -2

1. IG KEY OFF .
2. Disconnect ECM connector.
3. Measure resistance between #3 terminal and #11 terminal of "DLC"..

**Specification :** Approx. 120  $\Omega$

4. Is measured resistance within specifications ?

<b>YES</b>	▶ Go to next procedure.
<b>NO</b>	<ul style="list-style-type: none"><li>▶ Check TCM connector as necessary and then go to "Verification of Vehicle Repair" procedure.</li><li>▶ Perform open/short test with CAN communication line of TCM and ECM.</li><li>▶ Perform resistance test with CAN communication line of ECM.</li></ul>

### ■ Check resistance of CAN communication -3

1. IG KEY OFF .
2. Disconnect CLUSTER connector.
3. Measure resistance between #3 terminal and #11 terminal of "DLC".

**Specification :** Approx. 120  $\Omega$

4. Is measured resistance within specifications ?

<b>YES</b>	▶ Go to next procedure.
<b>NO</b>	<ul style="list-style-type: none"><li>▶ Check BMS connector as necessary and then go to "Verification of Vehicle Repair" procedure.</li><li>▶ Perform open/short test with CAN communication line of TCM and CLUSTER.</li><li>▶ Perform resistance test with CAN communication line of CLUSTER.</li></ul>

## CAN

### ■ Check short of CAN communication line.

1. IG KEY OFF .
2. Connect TCM, ECM, CLUSTER connector.

3. Measure voltage between TCM CAN HIGH and CAN LOW terminal.

---

**Specification :** Approx. 2.3V

---

4. Is measured voltage within specifications ?

<b>YES</b>	▶ Go to next procedure.
<b>NO</b>	▶ Repair shorted circuit in CAN communication line as necessary and then go to "Verification of Vehicle Repair" procedure.

#### ■ Check open in CAN communication line

1. IG KEY OFF .
2. Disconnect TCM, ECM and CLUSTER connector.
3. Measure resistance between TCM CAN HIGH or CAN LOW and CLUSTER CAN HIGH or CAN LOW terminal.

---

**Specification :** Approx. 0Ω

---

4. Is measured resistance within specifications ?

<b>YES</b>	<p>▶ Substitute with a known-good ACCM and check for proper operation. If the problem is corrected, replace ACCM as necessary and then go to "Verification of Vehicle Repair" procedure.</p> <p>▶ Substitute with a known-good Mechatronics(E-module + Valvebody) and check for proper operation. If the problem is corrected, replace Mechatronics(E-module + Valvebody) as necessary and then go to "Verification of Vehicle Repair" procedure.</p>
<b>NO</b>	▶ Check open in ACCM circuit Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

## Verification of Vehicle Repair

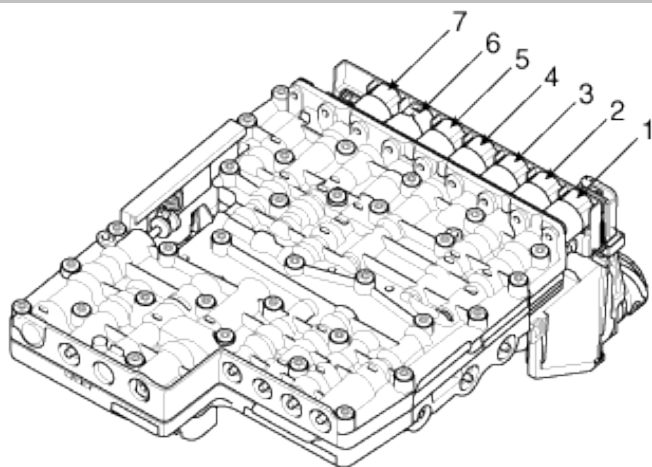
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure
<b>NO</b>	▶ System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > U0114 Lost Communication With Four-Wheel Drive Clutch Control Module

### Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

## General Description

Several control units are applied to electronically controlled vehicles. These units perform each control with informations from various sensors. Thus, sharing signal information from sensors is needed, so CAN communication type whose communication speed is high and insensitive to electrical noise by spark generation is adopted to controlling power-train(TCM, ECM, CLUSTER,VDC,4WD,EAS,SAS, EPS)

CAN communication consists of CAN BUS HIGH, CAN BUS LOW and two 120Ω resistances in circuit.

## DTC Description

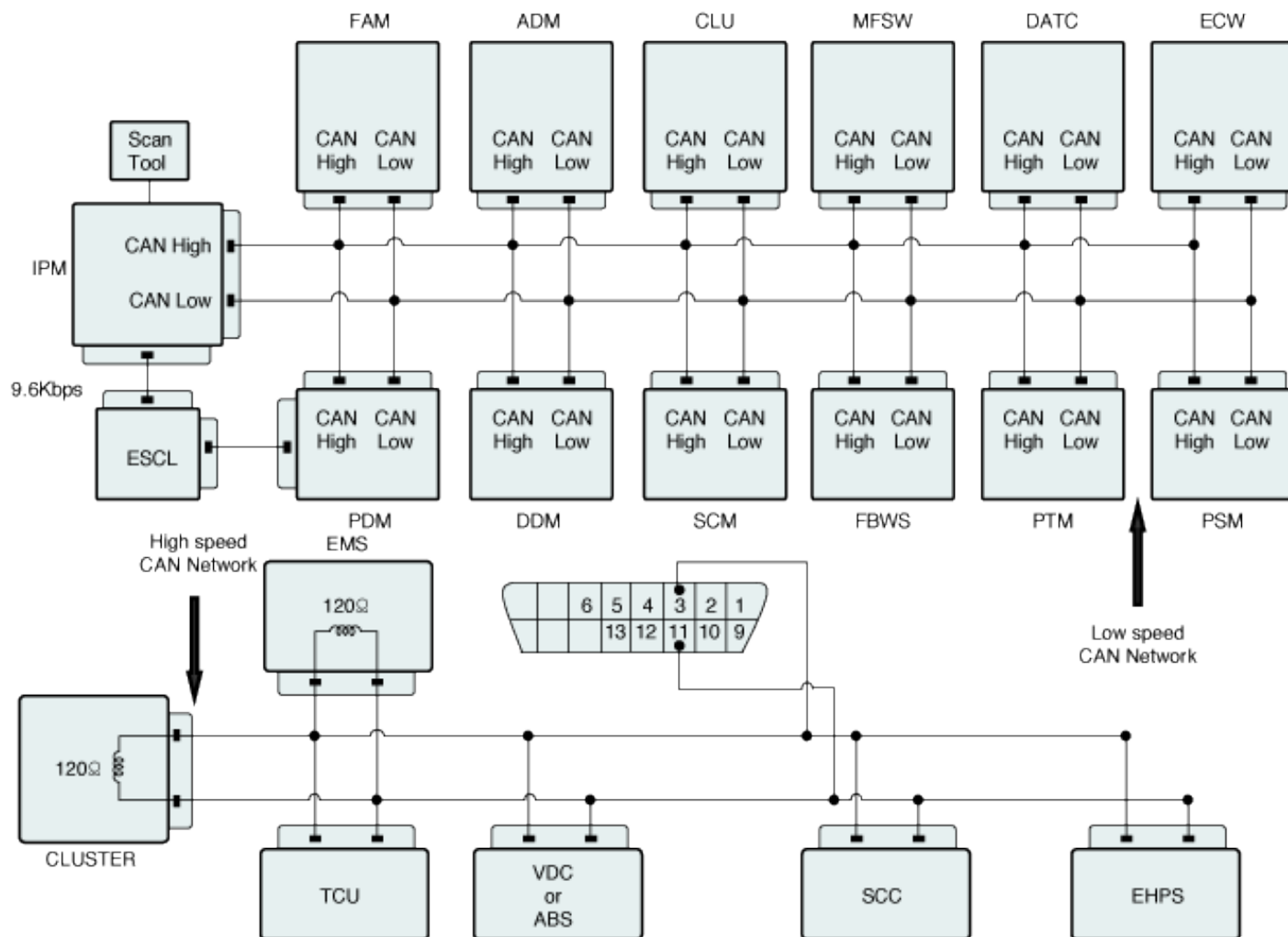
TCM set this code If not receive CAN message form 4WD.(MIL OFF)

## DTC Detecting Condition

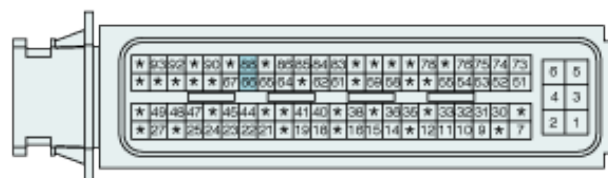
Item	Detecting Condition	Possible Cause
DTC Strategy	• Check signal	<ul style="list-style-type: none"> <li>• CAN communication line open of 4WD side</li> <li>• CAN communication line short of 4WD side</li> <li>• TCCM</li> <li>• Mechatronics(E-module + Valvebody)</li> </ul>
Enable Conditions	<ul style="list-style-type: none"> <li>• 0.5 second after IG ON</li> <li>• Battery voltage &gt; 9V</li> </ul>	
Threshold Value	<ul style="list-style-type: none"> <li>• No message from ECM</li> <li>• Input Not available data</li> </ul>	
Diagnostic Time	• 0.56 second	
Fail Safe	• (Priority : 2)	

## Diagnostic Circuit Diagram

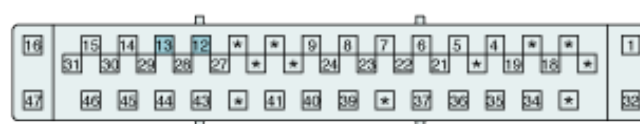




<ECM> CTG-K



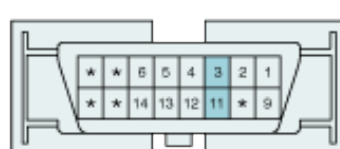
<ESC CONTROL MODULE>



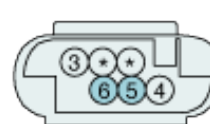
<INSTRUMENT CLUSTER>



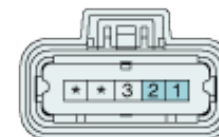
<DATA LINK CONNECTOR>



<SCC>



<EHPS>



<ECW>



4. Low  
5. High

<MFSW>



5. High  
6. Low

<ADM>



8. High  
16. Low

<DDM>

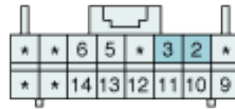


8. High  
16. Low

<TCM> CTG-ZF



<IPM>



2. Low  
3. High

<CLU>



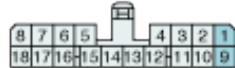
19. Low  
20. High

<FBWS>



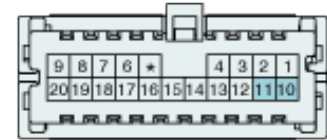
6. High  
7. Low

<PTM>



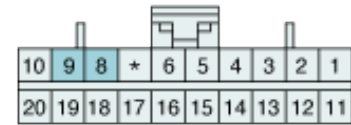
1. Low  
9. High

<PDM>



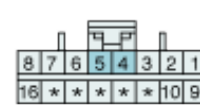
10. Low  
11. High

<TILT & TELE>



8. High  
9. Low

<PSM>



4. High  
5. Low

<FAM>



3. High  
4. Low

## Terminal & Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

<b>YES</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification Vehicle Repair" procedure
<b>NO</b>	▶ Go to Check for resistance of CAN communication.

## Check for resistance of CAN communication

### ■ Check resistance of CAN communication -1

1. IG KEY OFF .
2. Connect ECM, TCM, 4WD, VDC(ABS/TCS), EAS, SAS and CLUSTER connector.
3. Measure resistance between #3 terminal and #11 terminal of "DLC".

**Specification :** Approx. 60  $\Omega$

4. Is measured resistance within specifications ?

<b>YES</b>	▶ Check TCM connector as necessary and then go to "Verification of Vehicle Repair" procedure..
<b>NO</b>	▶ Go to next procedure.

### ■ Check resistance of CAN communication -2

1. IG KEY OFF .
2. Disconnect ECM connector.
3. Measure resistance between #3 terminal and #11 terminal of "DLC"..

**Specification :** Approx. 120  $\Omega$

4. Is measured resistance within specifications ?

<b>YES</b>	▶ Go to next procedure.
<b>NO</b>	<ul style="list-style-type: none"><li>▶ Check TCM connector as necessary and then go to "Verification of Vehicle Repair" procedure.</li><li>▶ Perform open/short test with CAN communication line of TCM and ECM.</li><li>▶ Perform resistance test with CAN communication line of ECM.</li></ul>

### ■ Check resistance of CAN communication -3

1. IG KEY OFF .
2. Disconnect CLUSTER connector.
3. Measure resistance between #3 terminal and #11 terminal of "DLC".

**Specification :** Approx. 120  $\Omega$

4. Is measured resistance within specifications ?

<b>YES</b>	▶ Go to next procedure.
<b>NO</b>	<ul style="list-style-type: none"><li>▶ Check BMS connector as necessary and then go to "Verification of Vehicle Repair" procedure.</li><li>▶ Perform open/short test with CAN communication line of TCM and CLUSTER.</li><li>▶ Perform resistance test with CAN communication line of CLUSTER.</li></ul>

## CAN

### ■ Check short of CAN communication line.

1. IG KEY OFF .
2. Connect TCM, ECM, CLUSTER connector.

3. Measure voltage between TCM CAN HIGH and CAN LOW terminal.

**Specification :** Approx. 2.3V

4. Is measured voltage within specifications ?

<b>YES</b>	▶ Go to next procedure.
<b>NO</b>	▶ Repair shorted circuit in CAN communication line as necessary and then go to "Verification of Vehicle Repair" procedure.

#### ■ Check open in CAN communication line

1. IG KEY OFF .
2. Disconnect TCM, ECM and CLUSTER connector.
3. Measure resistance between TCM CAN HIGH or CAN LOW and CLUSTER CAN HIGH or CAN LOW terminal.

**Specification :** Approx. 0Ω

4. Is measured resistance within specifications ?

<b>YES</b>	<p>▶ Substitute with a known-good TCCM and check for proper operation. If the problem is corrected, replace TCCM as necessary and then go to "Verification of Vehicle Repair" procedure.</p> <p>▶ Substitute with a known-good Mechatronics(E-module + Valvebody) and check for proper operation. If the problem is corrected, replace Mechatronics(E-module + Valvebody) as necessary and then go to "Verification of Vehicle Repair" procedure.</p>
<b>NO</b>	▶ Check open in TCCM circuit Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

## Verification of Vehicle Repair

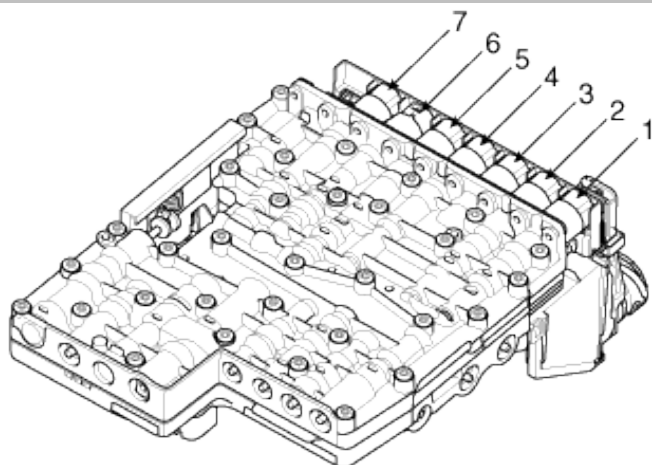
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure
<b>NO</b>	▶ System performing to specification at this time.

**Automatic Transmission System > Automatic Transmission System > U0121 Lost Communication With Anti-Lock Brake System (ABS) Control Module**

## Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

## General Description

Several control units are applied to electronically controlled vehicles. These units perform each control with informations from various sensors. Thus, sharing signal information from sensors is needed, so CAN communication type whose communication speed is high and insensitive to electrical noise by spark generation is adopted to controlling power-train(TCM, ECM, CLUSTER,VDC,4WD,EAS,SAS, EPS)

CAN communication consists of CAN BUS HIGH, CAN BUS LOW and two 120Ω resistances in circuit.

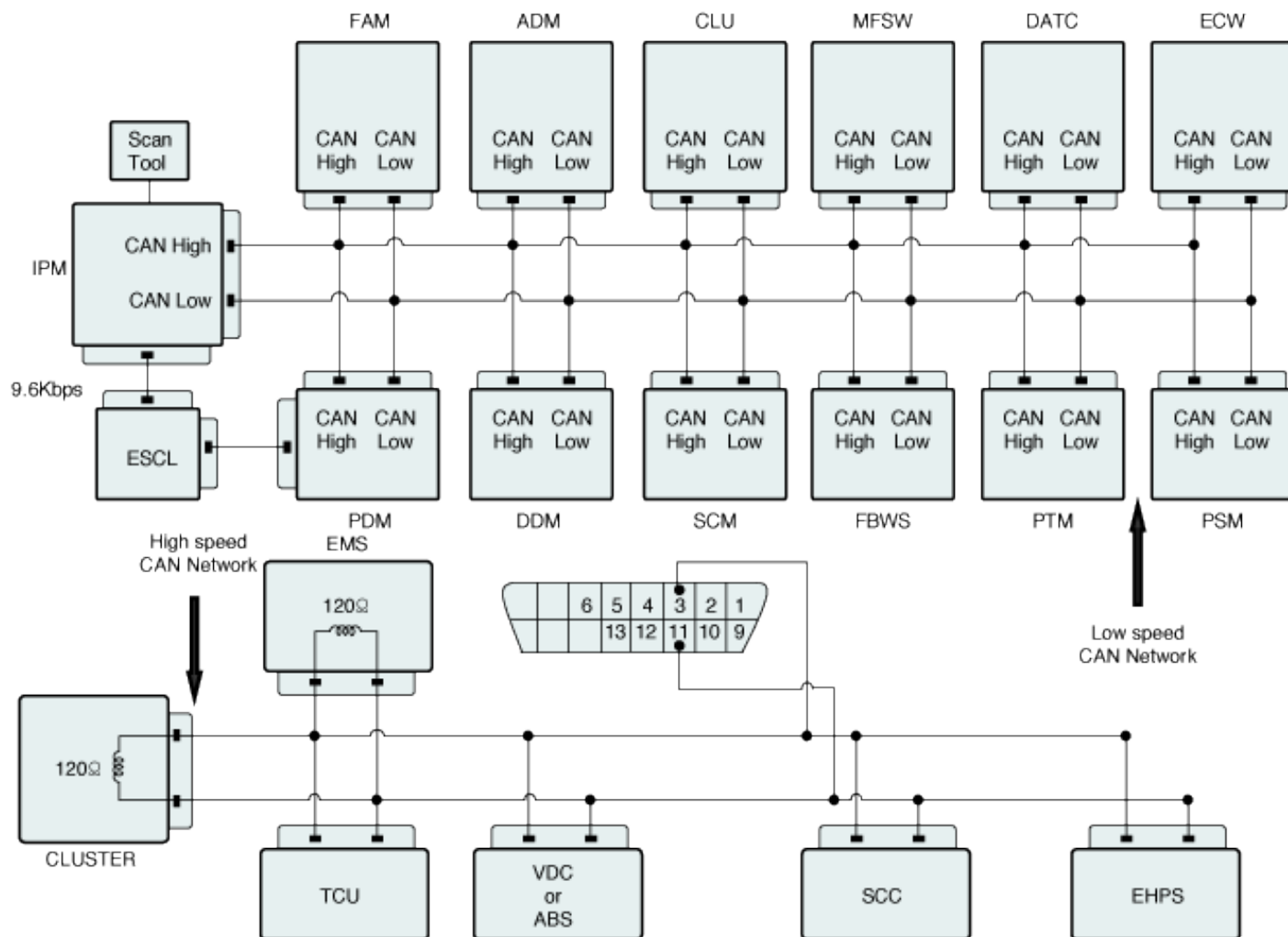
## DTC Description

TCM set this code If not receive CAN message form ABS.(MIL OFF)

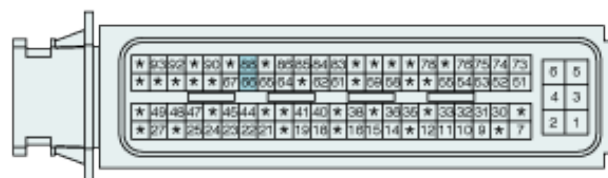
## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Check signal	<ul style="list-style-type: none"> <li>• CAN communication line open of ABS side</li> <li>• CAN communication line short of ABS side</li> <li>• ABS ECU</li> <li>• Mechatronics(E-module + Valvebody)</li> </ul>
Enable Conditions	<ul style="list-style-type: none"> <li>• 0.5 second after IG ON</li> <li>• Battery voltage &gt; 9V</li> </ul>	
Threshold Value	<ul style="list-style-type: none"> <li>• No message from ECM</li> <li>• Input Not available data</li> </ul>	
Diagnostic Time	• 0.56 second	
Fail Safe	• (Priority : 2)	

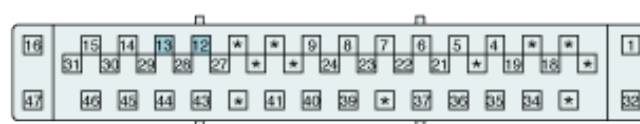
## Diagnostic Circuit Diagram



<ECM> CTG-K



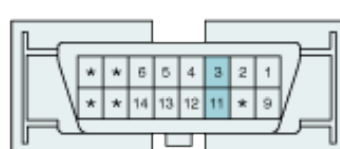
<ESC CONTROL MODULE>



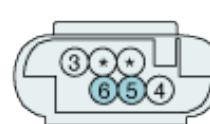
<INSTRUMENT CLUSTER>



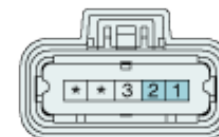
<DATA LINK CONNECTOR>



<SCC>



<EHPS>



<ECW>



4. Low  
5. High

<MFSW>



5. High  
6. Low

<ADM>



8. High  
16. Low

<DDM>

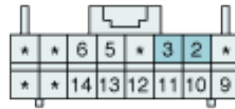


8. High  
16. Low

<TCM> CTG-ZF



<IPM>



2. Low  
3. High

<CLU>



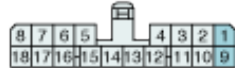
19. Low  
20. High

<FBWS>



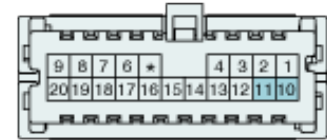
6. High  
7. Low

<PTM>



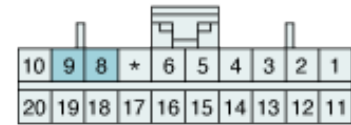
1. Low  
9. High

<PDM>



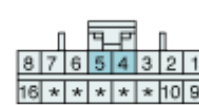
10. Low  
11. High

<TILT & TELE>



8. High  
9. Low

<PSM>



4. High  
5. Low

<FAM>



3. High  
4. Low

## Terminal & Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

<b>YES</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification Vehicle Repair" procedure
<b>NO</b>	▶ Go to Check for resistance of CAN communication.

## Check for resistance of CAN communication

### ■ Check resistance of CAN communication -1

1. IG KEY OFF .
2. Connect ECM, TCM, 4WD, VDC(ABS/TCS), EAS, SAS and CLUSTER connector.
3. Measure resistance between #3 terminal and #11 terminal of "DLC".

**Specification :** Approx. 60  $\Omega$

4. Is measured resistance within specifications ?

<b>YES</b>	▶ Check TCM connector as necessary and then go to "Verification of Vehicle Repair" procedure..
<b>NO</b>	▶ Go to next procedure.

### ■ Check resistance of CAN communication -2

1. IG KEY OFF .
2. Disconnect ECM connector.
3. Measure resistance between #3 terminal and #11 terminal of "DLC"..

**Specification :** Approx. 120  $\Omega$

4. Is measured resistance within specifications ?

<b>YES</b>	▶ Go to next procedure.
<b>NO</b>	<ul style="list-style-type: none"><li>▶ Check TCM connector as necessary and then go to "Verification of Vehicle Repair" procedure.</li><li>▶ Perform open/short test with CAN communication line of TCM and ECM.</li><li>▶ Perform resistance test with CAN communication line of ECM.</li></ul>

### ■ Check resistance of CAN communication -3

1. IG KEY OFF .
2. Disconnect CLUSTER connector.
3. Measure resistance between #3 terminal and #11 terminal of "DLC".

**Specification :** Approx. 120  $\Omega$

4. Is measured resistance within specifications ?

<b>YES</b>	▶ Go to next procedure.
<b>NO</b>	<ul style="list-style-type: none"><li>▶ Check BMS connector as necessary and then go to "Verification of Vehicle Repair" procedure.</li><li>▶ Perform open/short test with CAN communication line of TCM and CLUSTER.</li><li>▶ Perform resistance test with CAN communication line of CLUSTER.</li></ul>

## CAN

### ■ Check short of CAN communication line.

1. IG KEY OFF .
2. Connect TCM, ECM, CLUSTER connector.



3. Measure voltage between TCM CAN HIGH and CAN LOW terminal.

**Specification :** Approx. 2.3V

4. Is measured voltage within specifications ?

<b>YES</b>	▶ Go to next procedure.
<b>NO</b>	▶ Repair shorted circuit in CAN communication line as necessary and then go to "Verification of Vehicle Repair" procedure.

#### ■ Check open in CAN communication line

1. IG KEY OFF .
2. Disconnect TCM, ECM and CLUSTER connector.
3. Measure resistance between TCM CAN HIGH or CAN LOW and CLUSTER CAN HIGH or CAN LOW terminal.

**Specification :** Approx. 0Ω

4. Is measured resistance within specifications ?

<b>YES</b>	<p>▶ Substitute with a known-good ABS ECU and check for proper operation. If the problem is corrected, replace ABS ECU as necessary and then go to "Verification of Vehicle Repair" procedure.</p> <p>▶ Substitute with a known-good Mechatronics(E-module + Valvebody) and check for proper operation. If the problem is corrected, replace Mechatronics(E-module + Valvebody) as necessary and then go to "Verification of Vehicle Repair" procedure.</p>
<b>NO</b>	▶ Check open in ABS circuit Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

## Verification of Vehicle Repair

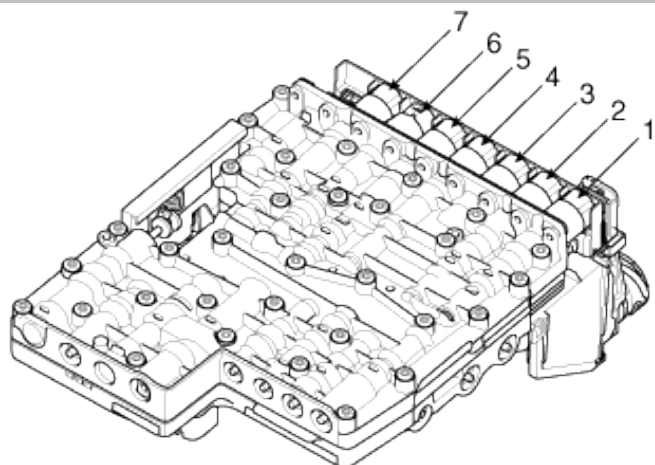
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure
<b>NO</b>	▶ System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > U0122 Lost Communication With Vehicle Dynamics Control Module

### Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

## General Description

Several control units are applied to electronically controlled vehicles. These units perform each control with informations from various sensors. Thus, sharing signal information from sensors is needed, so CAN communication type whose communication speed is high and insensitive to electrical noise by spark generation is adopted to controlling power-train(TCM, ECM, CLUSTER,VDC,4WD,EAS,SAS, EPS)

CAN communication consists of CAN BUS HIGH, CAN BUS LOW and two 120 $\Omega$  resistances in circuit.

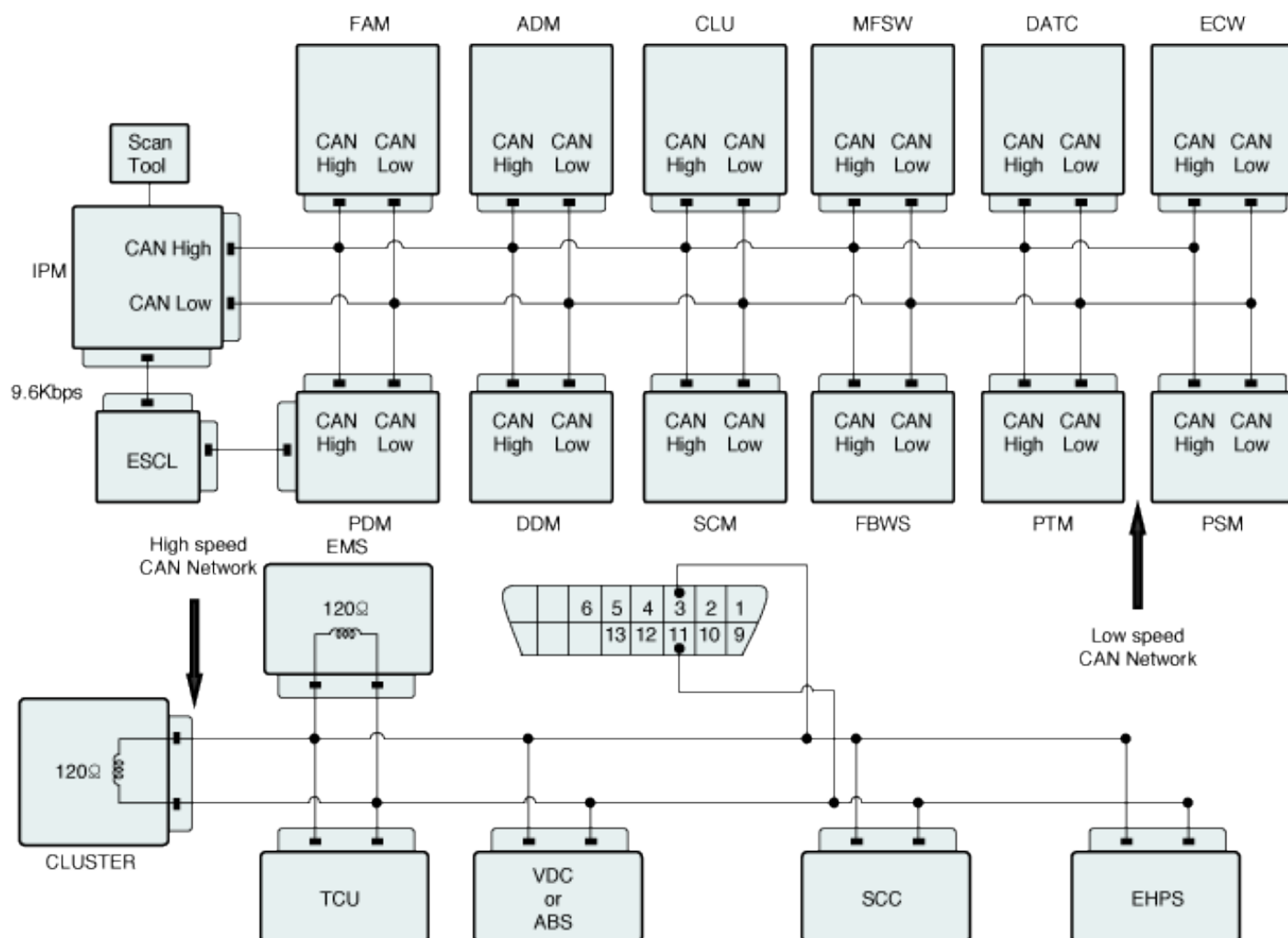
## DTC Description

TCM set this code If not receive CAN message form VDC.(MIL OFF)

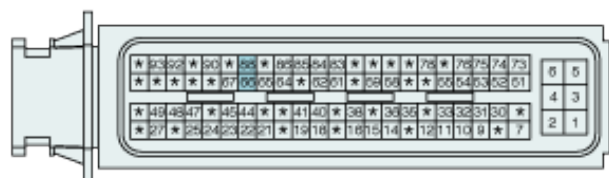
## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Check signal	<ul style="list-style-type: none"> <li>• CAN communication line open of VDC side</li> <li>• CAN communication line short of VDC side</li> <li>• VDC ECU</li> <li>• Mechatronics(E-module + Valvebody)</li> </ul>
Enable Conditions	<ul style="list-style-type: none"> <li>• 0.5 second after IG ON</li> <li>• Battery voltage &gt; 9V</li> </ul>	
Threshold Value	<ul style="list-style-type: none"> <li>• No message from ECM</li> <li>• Input Not available data</li> </ul>	
Diagnostic Time	• 0.56 second	
Fail Safe	• (Priority : 2)	

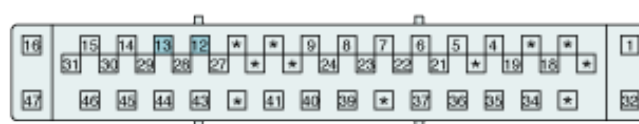
## Diagnostic Circuit Diagram



<ECM> CTG-K



<ESC CONTROL MODULE>



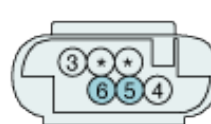
<INSTRUMENT CLUSTER>



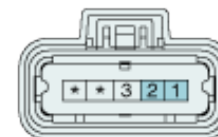
<DATA LINK CONNECTOR>



<SCC>



<EHPS>



&lt;ECW&gt;



4. Low  
5. High

&lt;MFSW&gt;



5. High  
6. Low

&lt;ADM&gt;



8. High  
16. Low

&lt;DDM&gt;

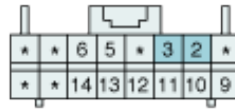


8. High  
16. Low

&lt;TCM&gt; CTG-ZF



&lt;IPM&gt;



2. Low  
3. High

&lt;CLU&gt;



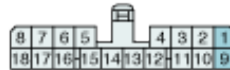
19. Low  
20. High

&lt;FBWS&gt;



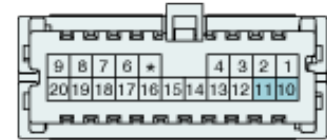
6. High  
7. Low

&lt;PTM&gt;



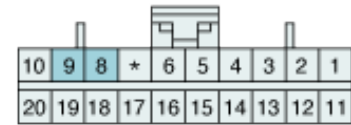
1. Low  
9. High

&lt;PDM&gt;



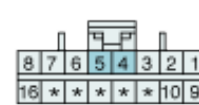
10. Low  
11. High

&lt;TILT &amp; TELE&gt;



8. High  
9. Low

&lt;PSM&gt;



4. High  
5. Low

&lt;FAM&gt;



3. High  
4. Low

## Terminal & Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

<b>YES</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification Vehicle Repair" procedure
<b>NO</b>	▶ Go to Check for resistance of CAN communication.

## Check for resistance of CAN communication

### ■ Check resistance of CAN communication -1

1. IG KEY OFF .
2. Connect ECM, TCM, 4WD, VDC(ABS/TCS), EAS, SAS and CLUSTER connector.
3. Measure resistance between #3 terminal and #11 terminal of "DLC".

**Specification :** Approx. 60  $\Omega$

4. Is measured resistance within specifications ?

<b>YES</b>	▶ Check TCM connector as necessary and then go to "Verification of Vehicle Repair" procedure..
<b>NO</b>	▶ Go to next procedure.

### ■ Check resistance of CAN communication -2

1. IG KEY OFF .
2. Disconnect ECM connector.
3. Measure resistance between #3 terminal and #11 terminal of "DLC"..

**Specification :** Approx. 120  $\Omega$

4. Is measured resistance within specifications ?

<b>YES</b>	▶ Go to next procedure.
<b>NO</b>	<ul style="list-style-type: none"><li>▶ Check TCM connector as necessary and then go to "Verification of Vehicle Repair" procedure.</li><li>▶ Perform open/short test with CAN communication line of TCM and ECM.</li><li>▶ Perform resistance test with CAN communication line of ECM.</li></ul>

### ■ Check resistance of CAN communication -3

1. IG KEY OFF .
2. Disconnect CLUSTER connector.
3. Measure resistance between #3 terminal and #11 terminal of "DLC".

**Specification :** Approx. 120  $\Omega$

4. Is measured resistance within specifications ?

<b>YES</b>	▶ Go to next procedure.
<b>NO</b>	<ul style="list-style-type: none"><li>▶ Check BMS connector as necessary and then go to "Verification of Vehicle Repair" procedure.</li><li>▶ Perform open/short test with CAN communication line of TCM and CLUSTER.</li><li>▶ Perform resistance test with CAN communication line of CLUSTER.</li></ul>

## CAN

### ■ Check short of CAN communication line.

1. IG KEY OFF .
2. Connect TCM, ECM, CLUSTER connector.

3. Measure voltage between TCM CAN HIGH and CAN LOW terminal.

**Specification :** Approx. 2.3V

4. Is measured voltage within specifications ?

<b>YES</b>	▶ Go to next procedure.
<b>NO</b>	▶ Repair shorted circuit in CAN communication line as necessary and then go to "Verification of Vehicle Repair" procedure.

#### ■ Check open in CAN communication line

1. IG KEY OFF .
2. Disconnect TCM, ECM and CLUSTER connector.
3. Measure resistance between TCM CAN HIGH or CAN LOW and CLUSTER CAN HIGH or CAN LOW terminal.

**Specification :** Approx. 0Ω

4. Is measured resistance within specifications ?

<b>YES</b>	<p>▶ Substitute with a known-good VDC ECU and check for proper operation. If the problem is corrected, replace VDC ECU as necessary and then go to "Verification of Vehicle Repair" procedure.</p> <p>▶ Substitute with a known-good Mechatronics(E-module + Valvebody) and check for proper operation. If the problem is corrected, replace Mechatronics(E-module + Valvebody) as necessary and then go to "Verification of Vehicle Repair" procedure.</p>
<b>NO</b>	▶ Check open in VDC circuit Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

## Verification of Vehicle Repair

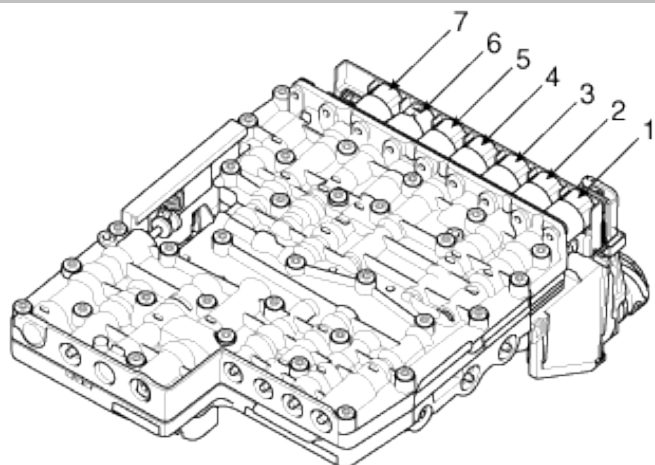
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure
<b>NO</b>	▶ System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > U0126 Lost Communication With Steering Angle Sensor Module

### Component Location



1. SOL6 (Torque Converter Clutch)
2. SOL7 (ON/OFF)
3. SOL4 (Clutch E, Brake D)
4. SOL5 (Line Pressure Control)
5. SOL3 (Brake C)
6. SOL2 (Clutch B)
7. SOL1 (Clutch A)

## General Description

Several control units are applied to electronically controlled vehicles. These units perform each control with informations from various sensors. Thus, sharing signal information from sensors is needed, so CAN communication type whose communication speed is high and insensitive to electrical noise by spark generation is adopted to controlling power-train(TCM, ECM, CLUSTER,VDC,4WD,EAS,SAS, EPS)

CAN communication consists of CAN BUS HIGH, CAN BUS LOW and two 120Ω resistances in circuit.

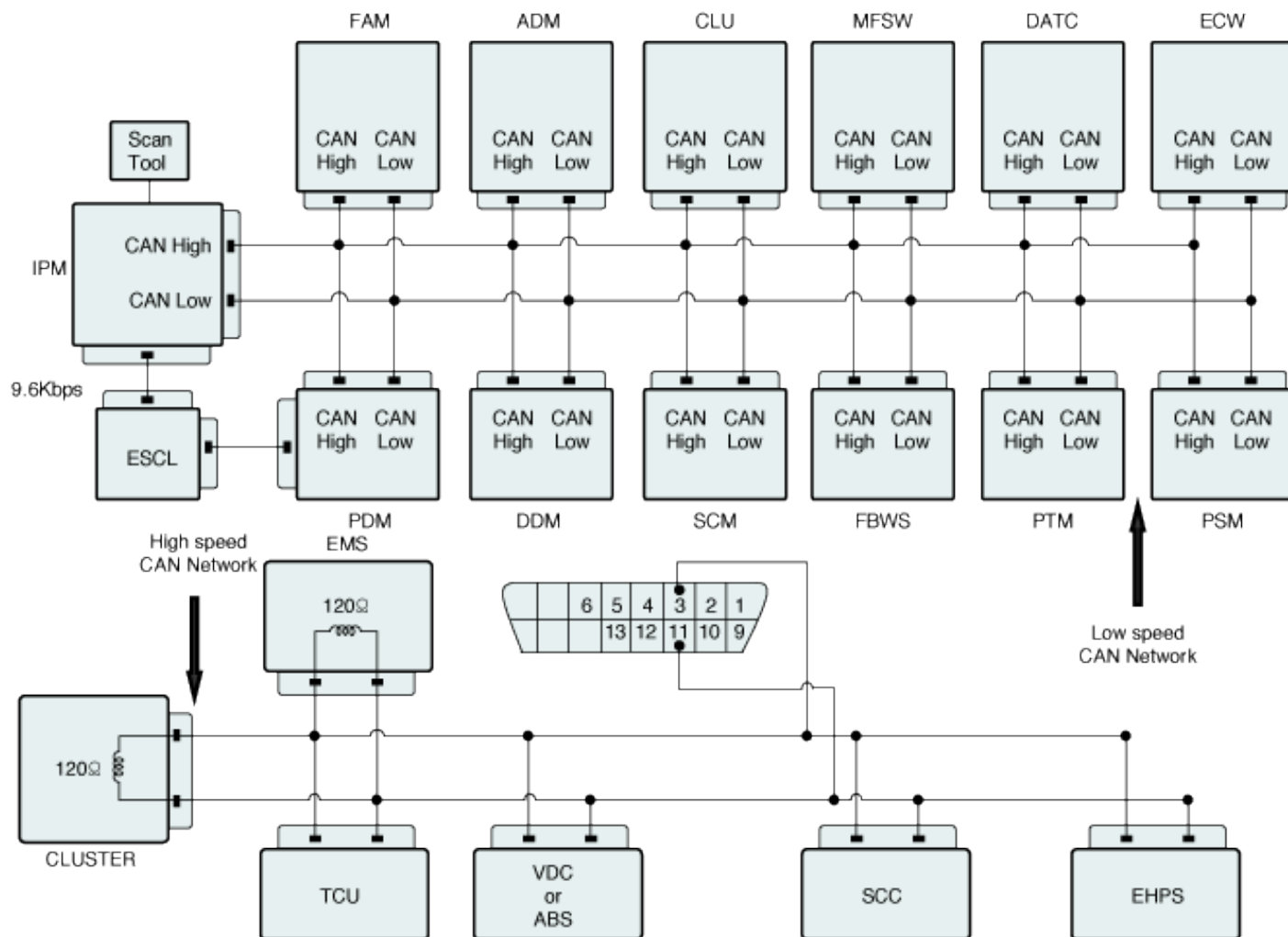
## DTC Description

TCM set this code If not receive CAN message form EPS.(MIL OFF)

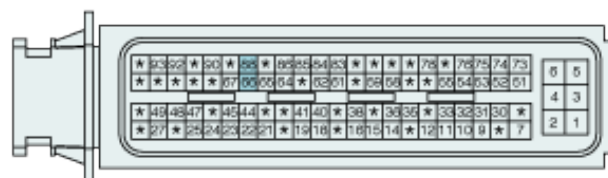
## DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Check signal	<ul style="list-style-type: none"> <li>• CAN communication line open of EPS side</li> <li>• CAN communication line short of EPS side</li> <li>• EPS ECU</li> <li>• Mechatronics(E-module + Valvebody)</li> </ul>
Enable Conditions	<ul style="list-style-type: none"> <li>• 0.5 second after IG ON</li> <li>• Battery voltage &gt; 9V</li> </ul>	
Threshold Value	<ul style="list-style-type: none"> <li>• No message from ECM</li> <li>• Input Not available data</li> </ul>	
Diagnostic Time	• 0.56 second	
Fail Safe	• (Priority : 2)	

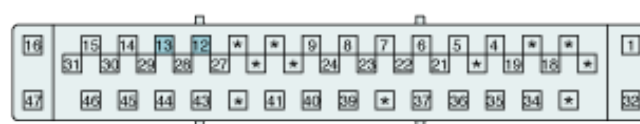
## Diagnostic Circuit Diagram



<ECM> CTG-K



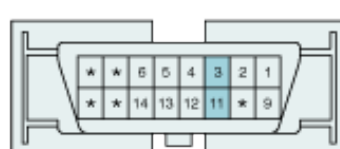
<ESC CONTROL MODULE>



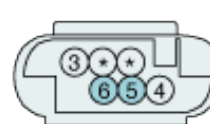
<INSTRUMENT CLUSTER>



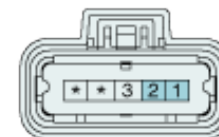
<DATA LINK CONNECTOR>



<SCC>



<EHPS>





&lt;ECW&gt;



4. Low  
5. High

&lt;MFSW&gt;



5. High  
6. Low

&lt;ADM&gt;



8. High  
16. Low

&lt;DDM&gt;

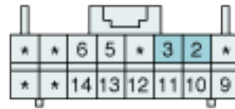


8. High  
16. Low

&lt;TCM&gt; CTG-ZF



&lt;IPM&gt;



2. Low  
3. High

&lt;CLU&gt;



19. Low  
20. High

&lt;FBWS&gt;



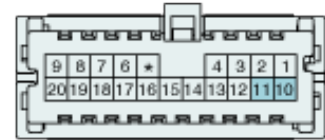
6. High  
7. Low

&lt;PTM&gt;



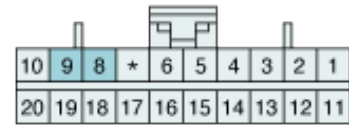
1. Low  
9. High

&lt;PDM&gt;



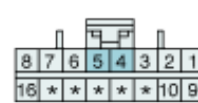
10. Low  
11. High

&lt;TILT &amp; TELE&gt;



8. High  
9. Low

&lt;PSM&gt;



4. High  
5. Low

&lt;FAM&gt;



3. High  
4. Low

## Terminal & Connector Inspection

- Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
- Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
- Has a problem been found?

<b>YES</b>	▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification Vehicle Repair" procedure
<b>NO</b>	▶ Go to Check for resistance of CAN communication.

## Check for resistance of CAN communication

### ■ Check resistance of CAN communication -1

1. IG KEY OFF .
2. Connect ECM, TCM, 4WD, VDC(ABS/TCS), EAS, SAS and CLUSTER connector.
3. Measure resistance between #3 terminal and #11 terminal of "DLC".

**Specification :** Approx. 60  $\Omega$

4. Is measured resistance within specifications ?

<b>YES</b>	▶ Check TCM connector as necessary and then go to "Verification of Vehicle Repair" procedure.
<b>NO</b>	▶ Go to next procedure.

### ■ Check resistance of CAN communication -2

1. IG KEY OFF .
2. Disconnect ECM connector.
3. Measure resistance between #3 terminal and #11 terminal of "DLC".

**Specification :** Approx. 120  $\Omega$

4. Is measured resistance within specifications ?

<b>YES</b>	▶ Go to next procedure.
<b>NO</b>	<ul style="list-style-type: none"><li>▶ Check TCM connector as necessary and then go to "Verification of Vehicle Repair" procedure.</li><li>▶ Perform open/short test with CAN communication line of TCM and ECM.</li><li>▶ Perform resistance test with CAN communication line of ECM.</li></ul>

### ■ Check resistance of CAN communication -3

1. IG KEY OFF .
2. Disconnect CLUSTER connector.
3. Measure resistance between #3 terminal and #11 terminal of "DLC".

**Specification :** Approx. 120  $\Omega$

4. Is measured resistance within specifications ?

<b>YES</b>	▶ Go to next procedure.
<b>NO</b>	<ul style="list-style-type: none"><li>▶ Check BMS connector as necessary and then go to "Verification of Vehicle Repair" procedure.</li><li>▶ Perform open/short test with CAN communication line of TCM and CLUSTER.</li><li>▶ Perform resistance test with CAN communication line of CLUSTER.</li></ul>

## CAN

### ■ Check short of CAN communication line.

1. IG KEY OFF .
2. Connect TCM, ECM, CLUSTER connector.

3. Measure voltage between TCM CAN HIGH and CAN LOW terminal.

**Specification :** Approx. 2.3V

4. Is measured voltage within specifications ?

<b>YES</b>	▶ Go to next procedure.
<b>NO</b>	▶ Repair shorted circuit in CAN communication line as necessary and then go to "Verification of Vehicle Repair" procedure.

#### ■ Check open in CAN communication line

1. IG KEY OFF .
2. Disconnect TCM, ECM and CLUSTER connector.
3. Measure resistance between TCM CAN HIGH or CAN LOW and CLUSTER CAN HIGH or CAN LOW terminal.

**Specification :** Approx. 0Ω

4. Is measured resistance within specifications ?

<b>YES</b>	<p>▶ Substitute with a known-good EPS ECU and check for proper operation. If the problem is corrected, replace EPS ECU as necessary and then go to "Verification of Vehicle Repair" procedure.</p> <p>▶ Substitute with a known-good Mechatronics(E-module + Valvebody) and check for proper operation. If the problem is corrected, replace Mechatronics(E-module + Valvebody) as necessary and then go to "Verification of Vehicle Repair" procedure.</p>
<b>NO</b>	▶ Check open in EPS circuit Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

## Verification of Vehicle Repair

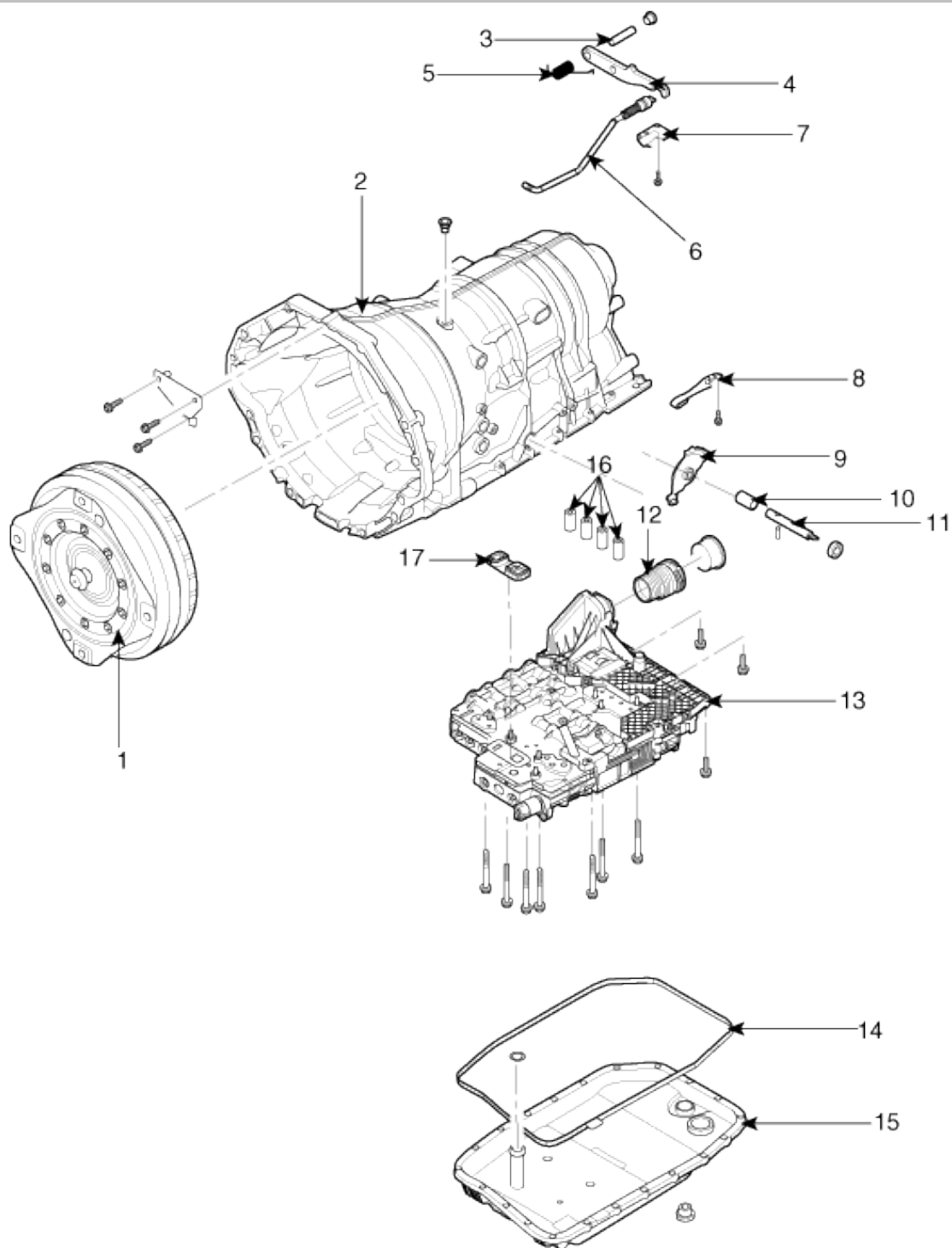
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scan tool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

<b>YES</b>	▶ Go to the applicable troubleshooting procedure
<b>NO</b>	▶ System performing to specification at this time.

## Automatic Transmission System > Automatic Transmission System > Automatic Transmission > Components and Components Location

### Components



1. Torque converter assembly  
 2. Transmission assembly  
 3. Pin  
 4. Parking lock pawl  
 5. Torsion spring  
 6. Connecting rod

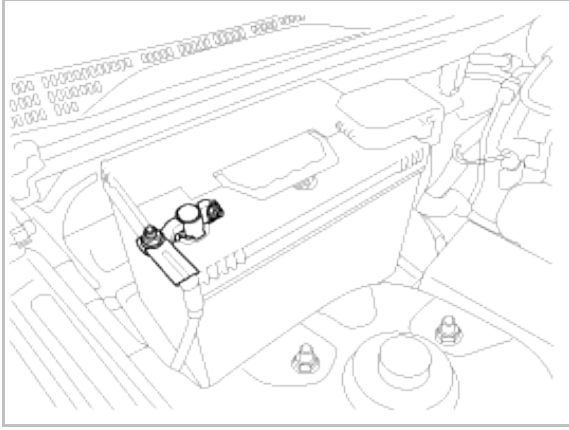
7. Guide plate  
 8. Detent spring  
 9. Detent disc  
 10. Shaft seal ring  
 11. Selector shaft  
 12. Shield cap

13. Mechatronic  
 14. Oil pan gasket  
 15. Oil pan  
 16. Oil seal  
 17. Adapter

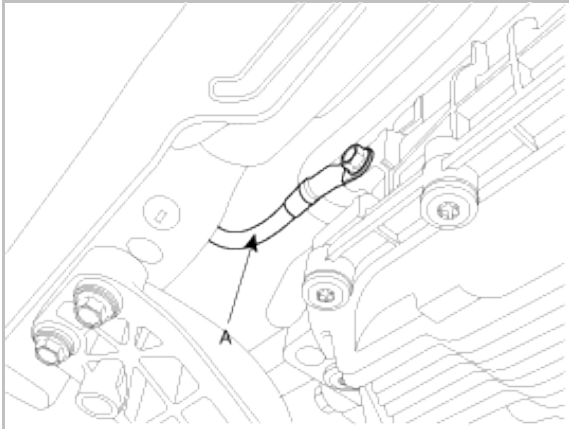
## Automatic Transmission System > Automatic Transmission System > Automatic Transmission > Repair procedures

### Removal

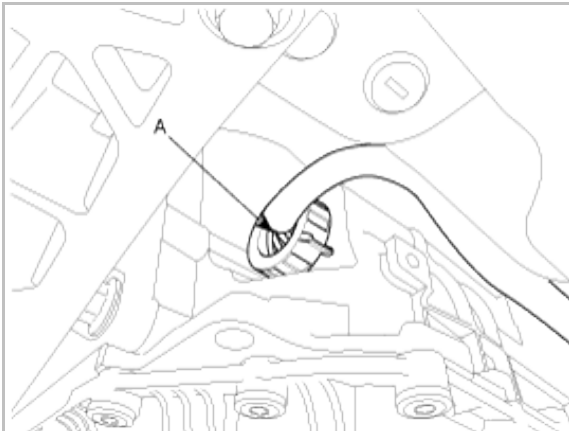
1. Disconnect (-) terminal from the battery in order to prevent current from flowing through wire.



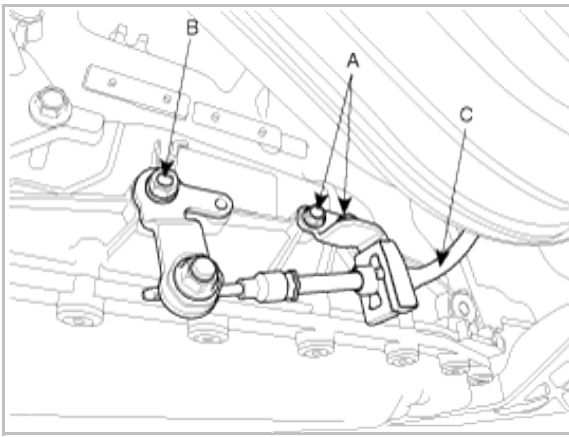
2. Remove the ground wire (A) by removing a bolt.



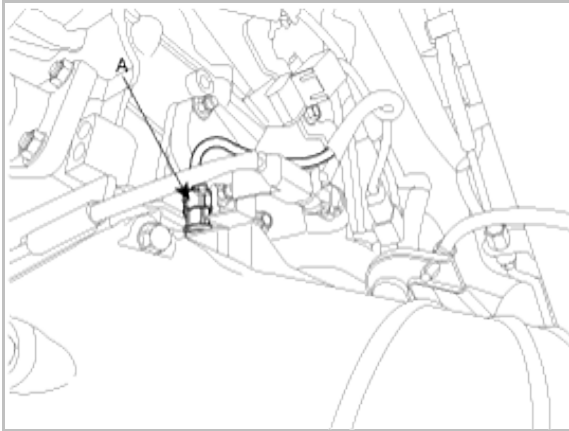
3. Disconnect the TCU connector (A).



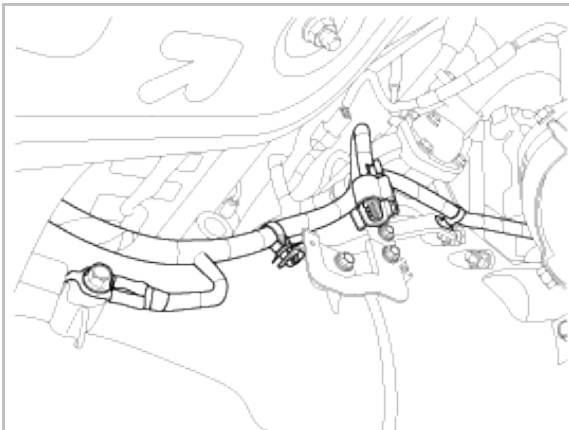
4. Remove the front muffler assembly. (refer to Intake And Exhaust System in EM group)
5. Remove the shift cable assembly (C) by removing the bracket bolts (A-2ea) and a nut (B).



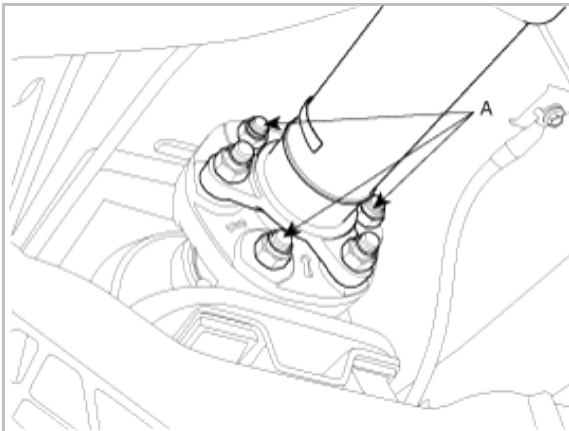
6. Remove the CKP sensor (A) by removing a bolt.



7. Remove the ground wires and wire holding brackets.



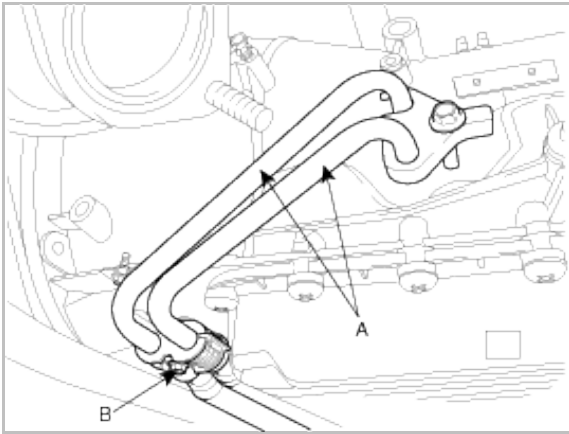
8. Remove the propellar shaft from the transmission by removing bolts (A-3ea).



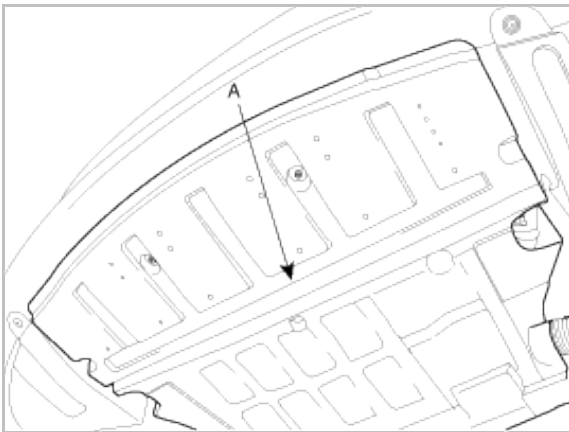
9. Remove the oil cooler tube assembly (A) by removing a bolt.

## NOTE

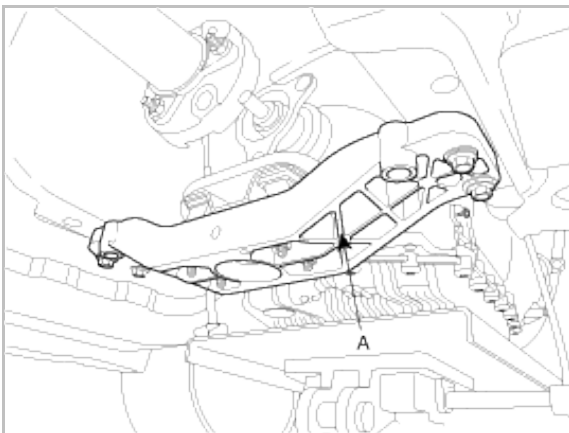
It makes easier to remove the tube that you remove a bolt (B) on the subframe.



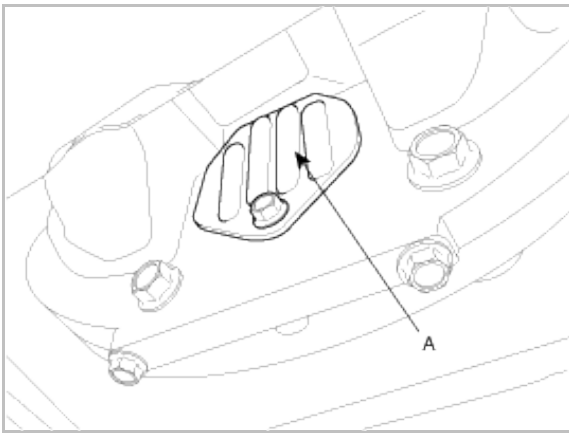
10. Remove the under shield cover (A).



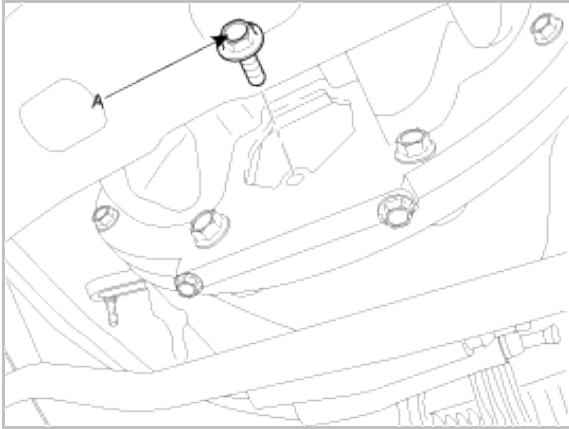
11. After supporting the transmission assembly with a jack, remove the crossmember (A) from the vehicle by removing bolts(4ea).



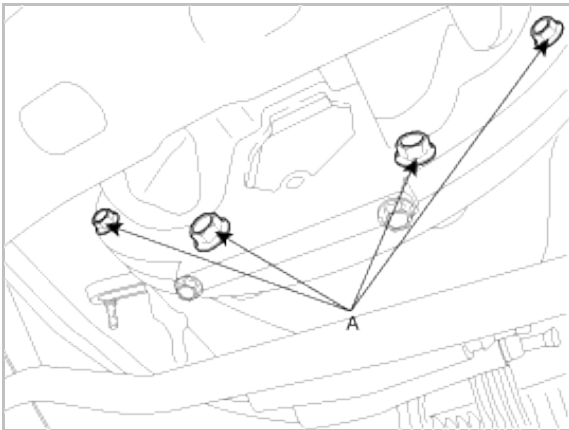
12. Remove the dust cover (A) by removing a nut.



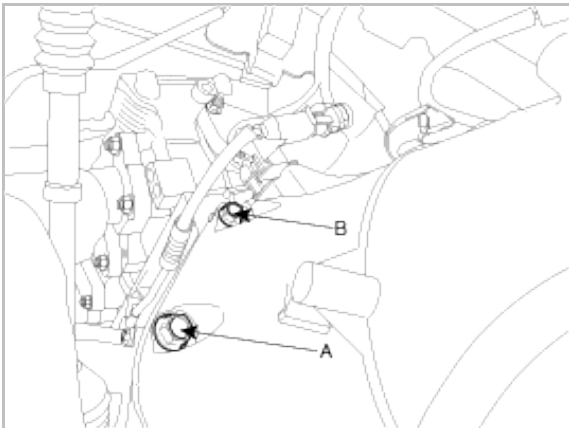
13. Remove the torque converter mounting bolts (A-6ea) by rotating the crankshaft.



14. Remove the mounting bolts (A-4ea) lower in the engine side.

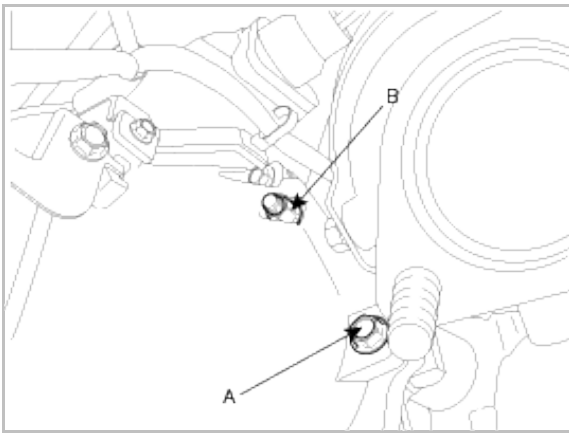


15. Remove the mounting bolts(A,B) left in the engine side.

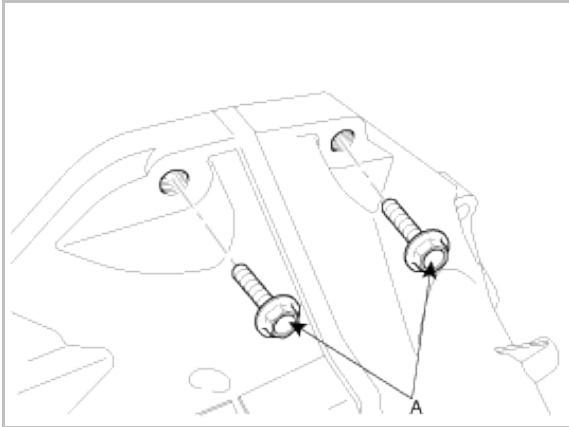


16. Remove the starter motor mounting bolt (A) and nut (B).





17. Remove the mounting bolts (A-2ea) on the transmission.



18. Remove the transmission assembly from the engine assembly and lower the jack.

#### CAUTION

Be careful not to damage tubes, hoses or wire.

#### NOTE

In case remove the transmission mounting bracket assembly from the transmission assembly.

#### Tightening torque:

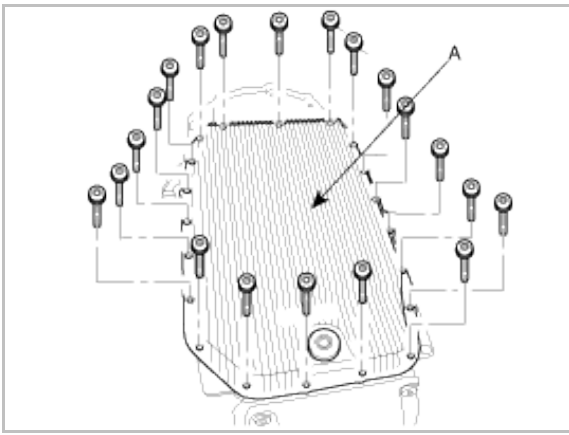
50~65 Nm (5.0~6.5 kgf.m, 36.2~47.0 lb-ft)

## Disassembly

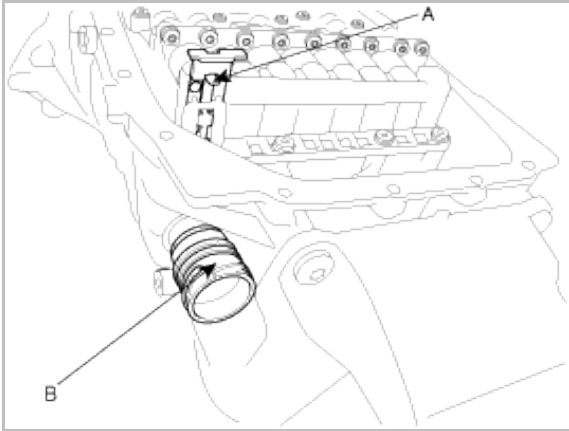
1. Drain the ATF by removing the drain plug and retighten the drain plug.
2. Remove the plastic oil pan (A) by removing the special bolts (20ea) with TORX wrench(T40).

#### CAUTION

Be careful not to drop or damage to the plastic oil pan.



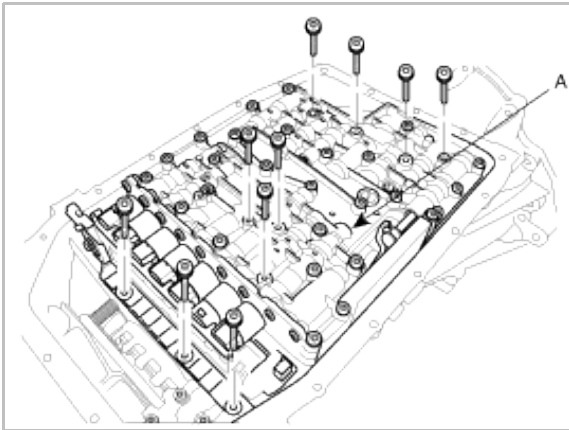
3. After pulling the white clip (A) upward, remove the connector housing (B).



4. Remove the mechatronik (A) by removing the special bolts (10ea) with TORX wrench(T40).

**CAUTION**

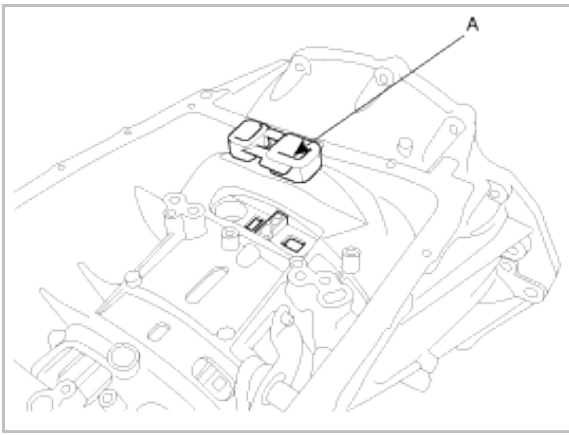
Be careful not to drop or damage to the mechatronik.



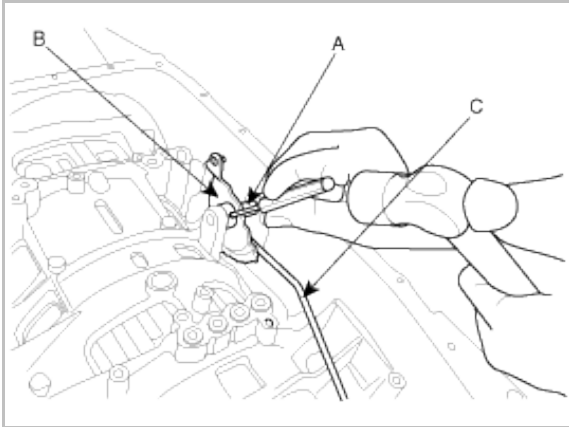
5. Remove the adapter (A).

**CAUTION**

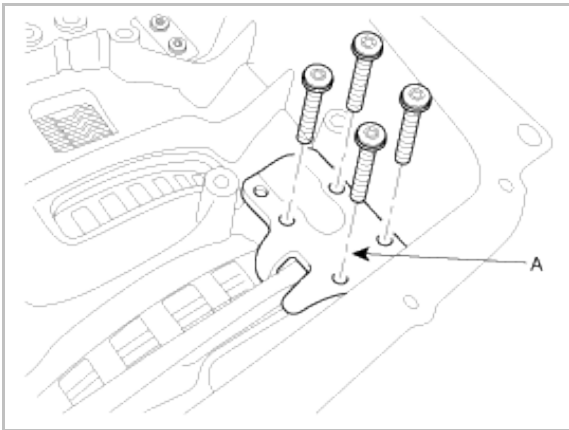
Must use new ones when reassembled.



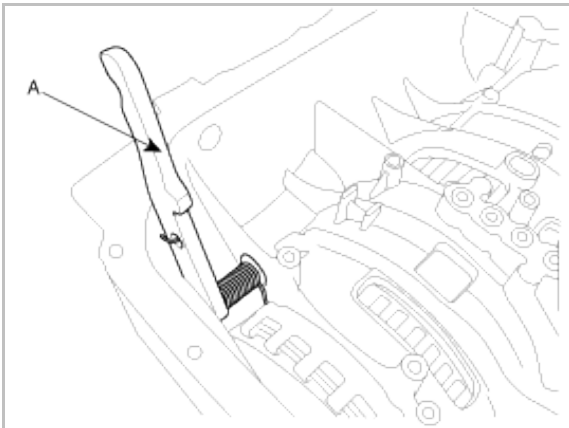
6. Remove the selector shaft (A), detent disk (B), and connecting rod (C) by removing the holding pin.



7. Remove the guide plate (A) by removing the special bolts (10ea) with TORX wrench(T27).



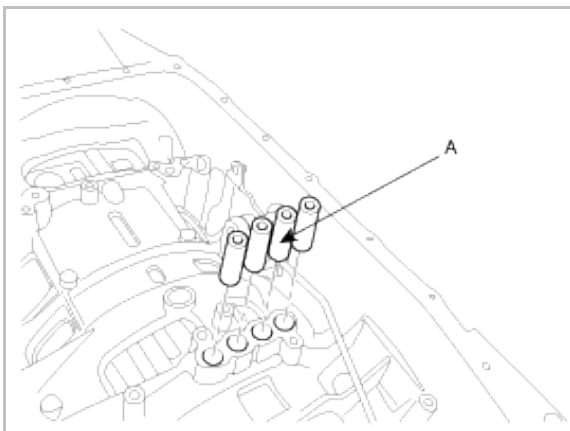
8. Remove the spring and ratchet (A) by pushing out the guide pin.



9. Pull out the four oil seal (A).

### CAUTION

Must use new ones when reassembled.

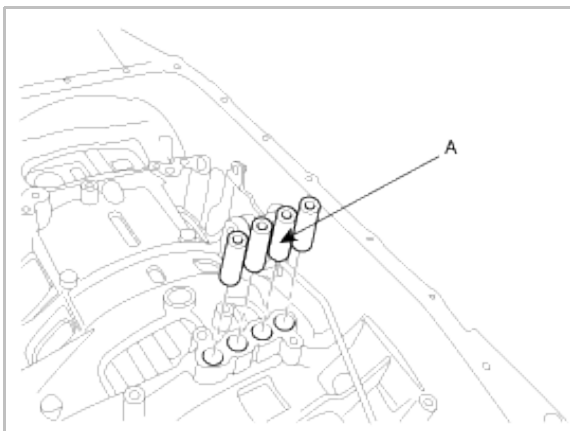


## Reassembly

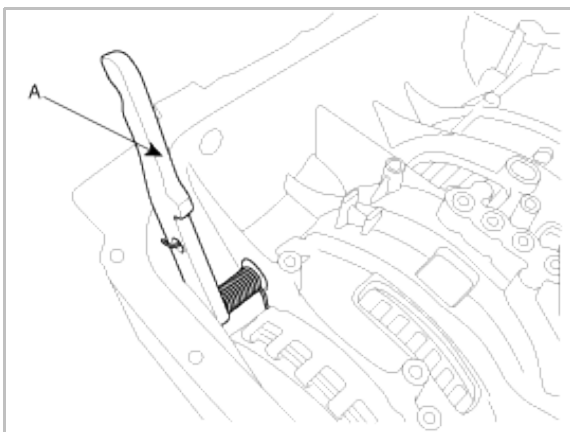
1. Insert the four oil seal (A).

### CAUTION

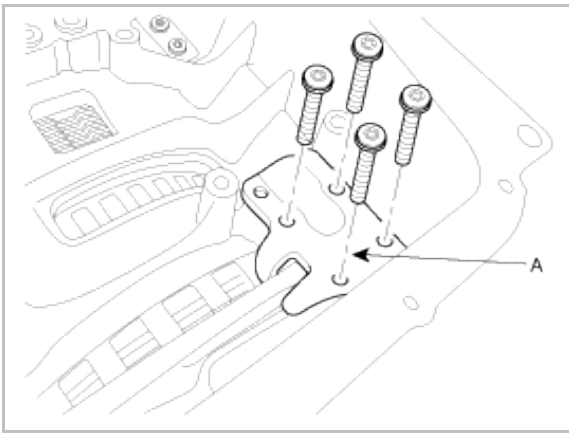
Must use new ones when reassembled.



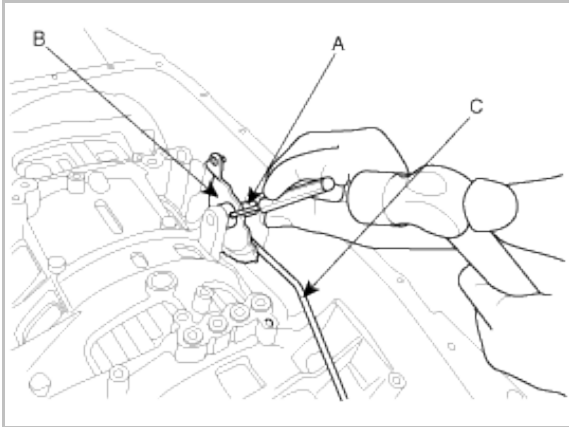
2. Install the spring and ratchet (A) by inserting the guide pin.



3. Install the guide plate (A) by installing the special bolts (10ea) with TORX wrench (T27).



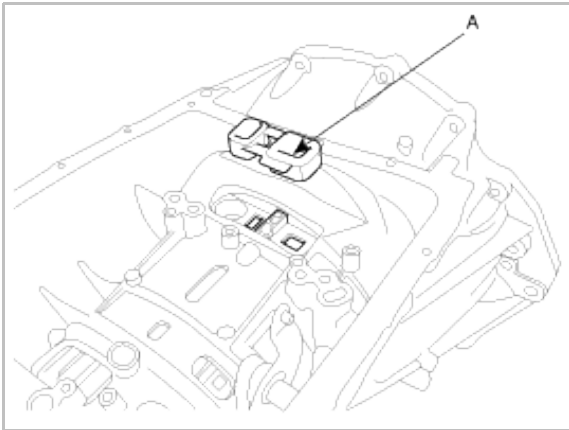
4. Install the selector shaft (A), detent disk (B), and connecting rod (C) by installing the holding pin.



5. Install the adapter (A).

**CAUTION**

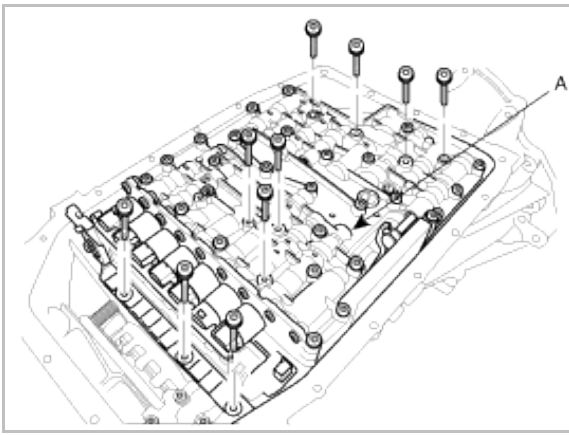
Must use new ones when reassembled.



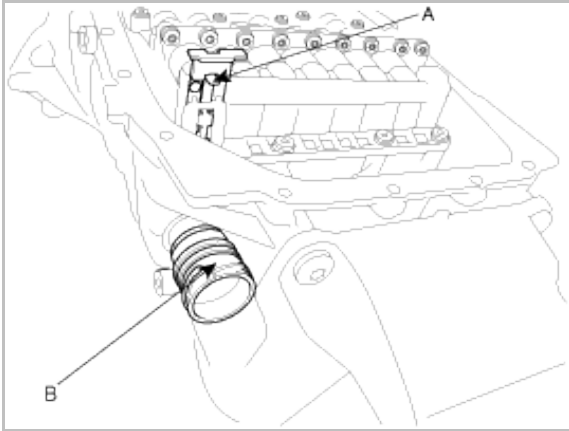
6. Install the mechatronic (A) by installing the special bolts (10ea) with TORX wrench(T40).

**CAUTION**

Be careful not to drop or damage to the mechatronik.



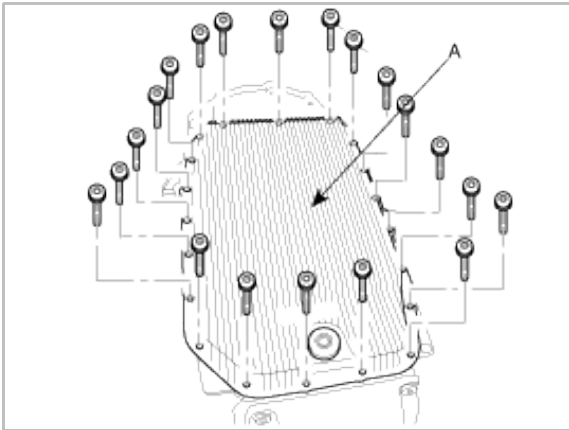
7. After installing the connector housing (B), push the white clip (A) downward.



8. Install the plastic oil pan (A) by installing the special bolts (20ea) with TORX wrench(T40).

#### CAUTION

Be careful not to drop or damage to the plastic oil pan.



9. Refill the ATF. (refer to Procedure Of ATF Level Adjustment)

## Installation

1. Temporarily install the transmission assembly by lifting the supporting jack.

#### CAUTION

Be careful not to damage tubes, hoses or wire.

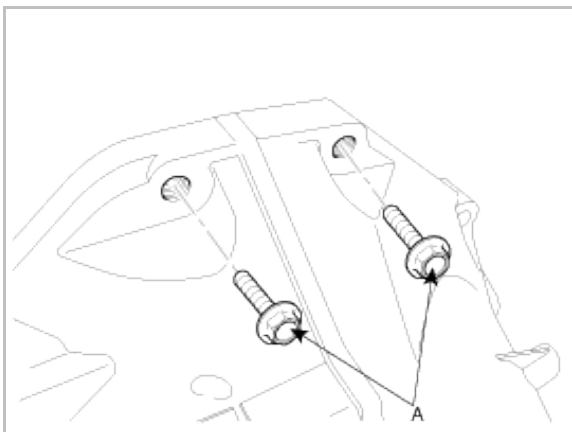
2. Install the mounting bolts (A-2ea) on the transmission.

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**Tightening torque:**

65~85 Nm (6.5~8.5 kgf.m, 47.0~61.5 lb-ft)

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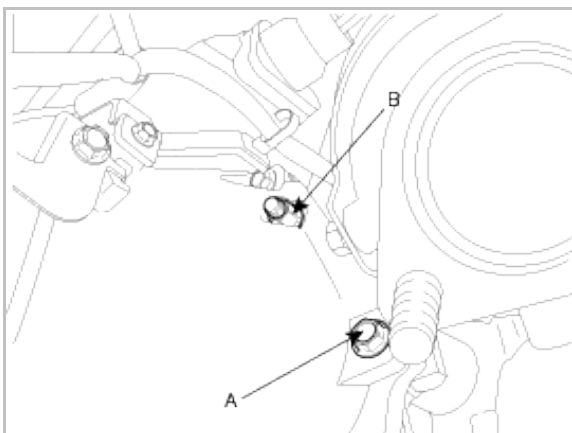
3. Install the starter motor mounting bolt (A) and nut (B).
- 

**Tightening torque:**

[A]50~65 Nm (5.0~6.5 kgf.m, 36.2~47.0 lb-ft)

[B]43~55 Nm (4.3~5.5 kgf.m, 31.1~39.8 lb-ft)

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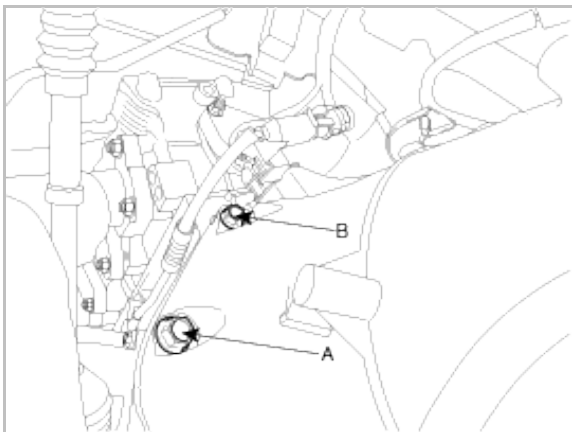
4. Install the mounting bolts(2ea) left in the engine side.
- 

**Tightening torque:**

[A]65~85 Nm (6.5~8.5 kgf.m, 47.0~61.5 lb-ft)

[B]35~47 Nm (3.5~4.7 kgf.m, 25.3~34.0 lb-ft)

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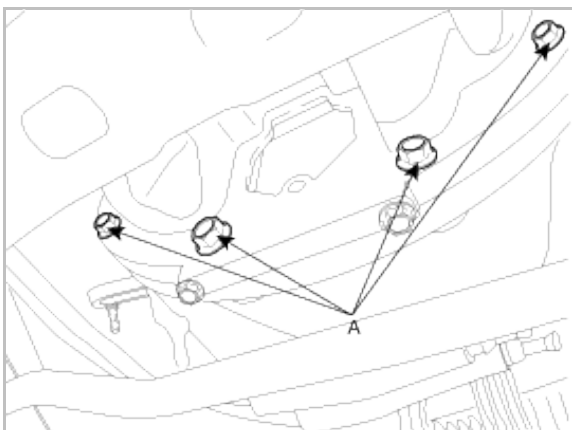


5. Install the mounting bolts (A-4ea) lower in the engine side..
-

**Tightening torque:**

40~47 Nm (4.0~4.7 kgf.m, 28.9~34.0 lb-ft)

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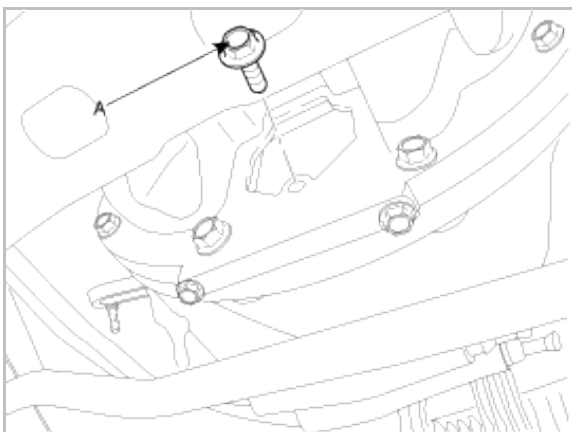


6. Install the torque converter mounting bolts (A-6ea) by rotating the crankshaft.
- 

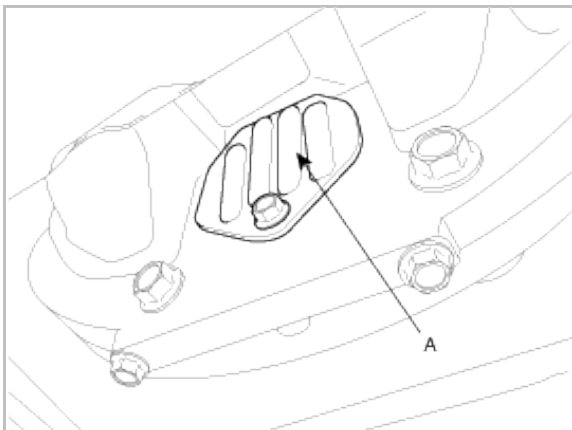
**Tightening torque:**

46~53 Nm (4.6~5.3 kgf.m, 31.1~39.8 lb-ft)

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7. Install the dust cover (A) by installing a nut.
- 



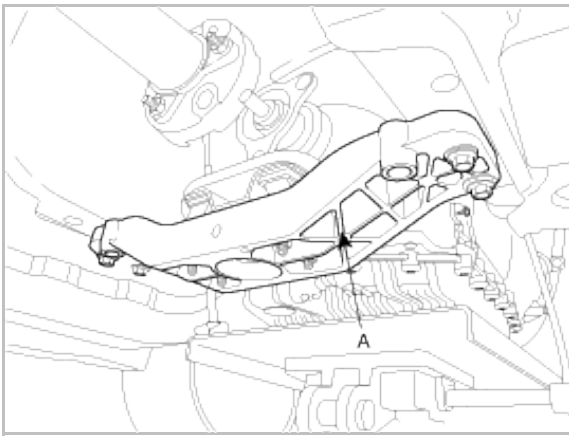
8. Install the crossmember (A) to the vehicle by installing bolts(4ea) and put aside the supporting jack.
- 

**Tightening torque:**

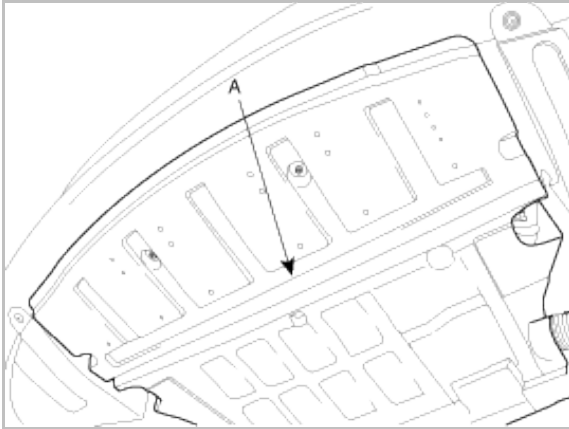
50~65 Nm (5.0~6.5 kgf.m, 36.2~47.0 lb-ft)

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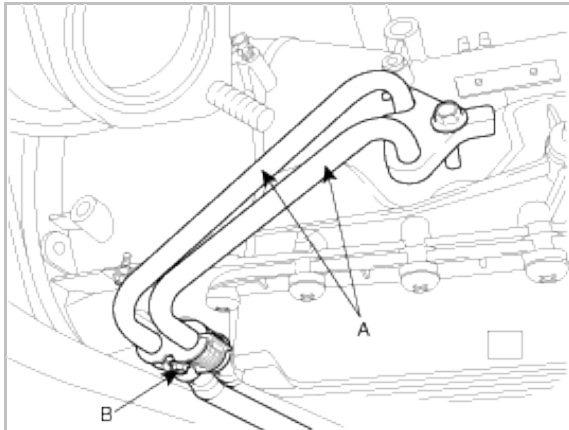
9. Install the under shield cover (A).



10. Install the oil cooler tube assembly (A) by installing a bolt.

**NOTE**

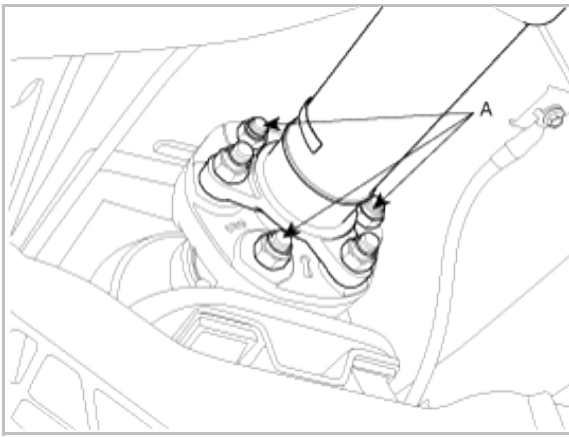
Install a bolt (B) on the subframe.



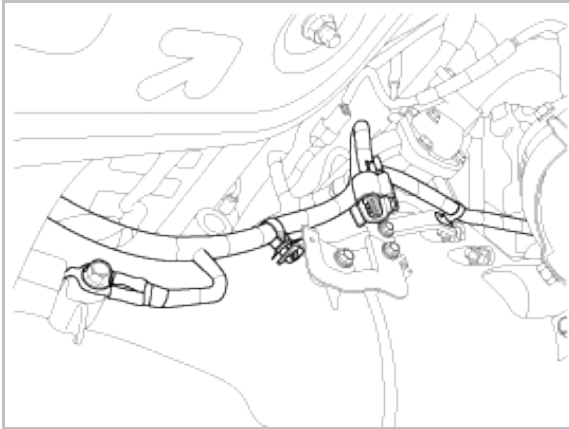
11. Install the propellar shaft to the transmission by installing bolts (A-3ea).

**Tightening torque:**

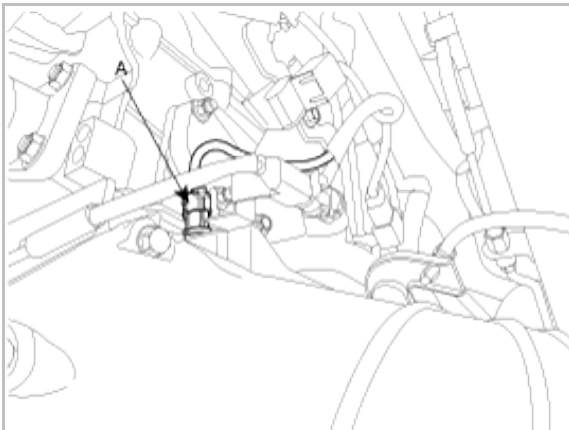
90~110 Nm (9~11 kgf.m, 65.1~79.5 lb-ft)



12. Install the ground wires and wire holding brackets.



13. Install the CKP sensor (A) by installing a bolt.



14. Install the shift cable assembly (C) by installing the bracket bolts (A-2ea) and a nut (B).

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**Tightening torque:**

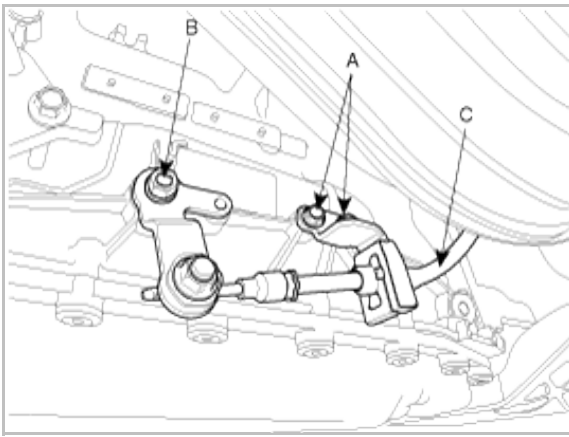
[A] 10~12 Nm (1.0~1.2kgf.m, 7.23~8.68 lb-ft)

[B] 17~26 Nm (1.7~2.6kgf.m, 12.3~18.8 lb-ft)

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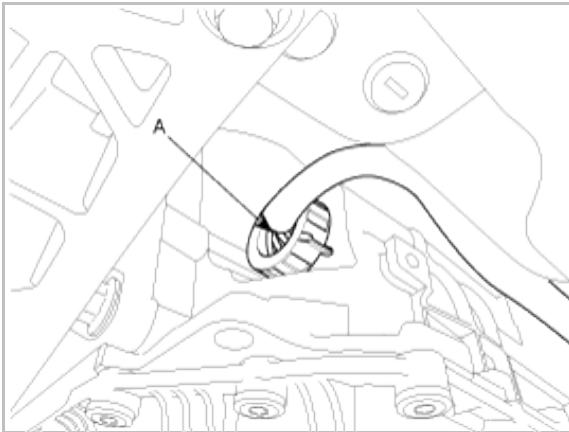
**CAUTION**

Place the manual lever in N position and check if the shift lever is in N position.

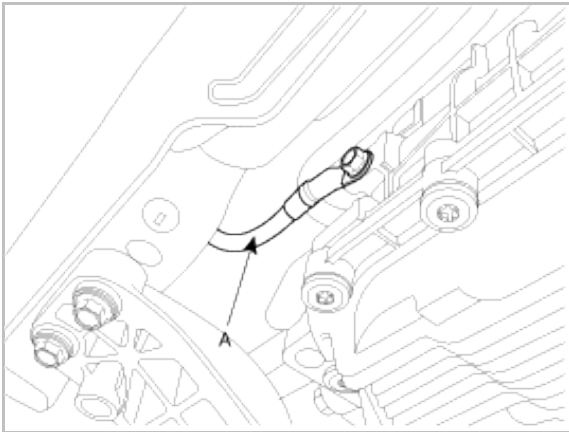


15. Install the front muffler assembly. (refer to Intake And Exhaust System in EM group)

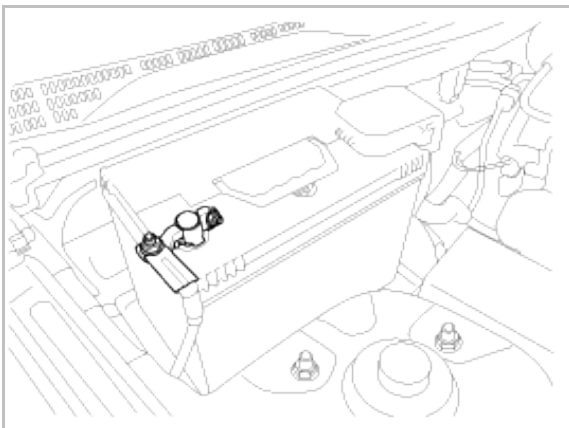
16. Connect the TCU connector (A).



17. Install the ground wire (A) by installing a bolt.



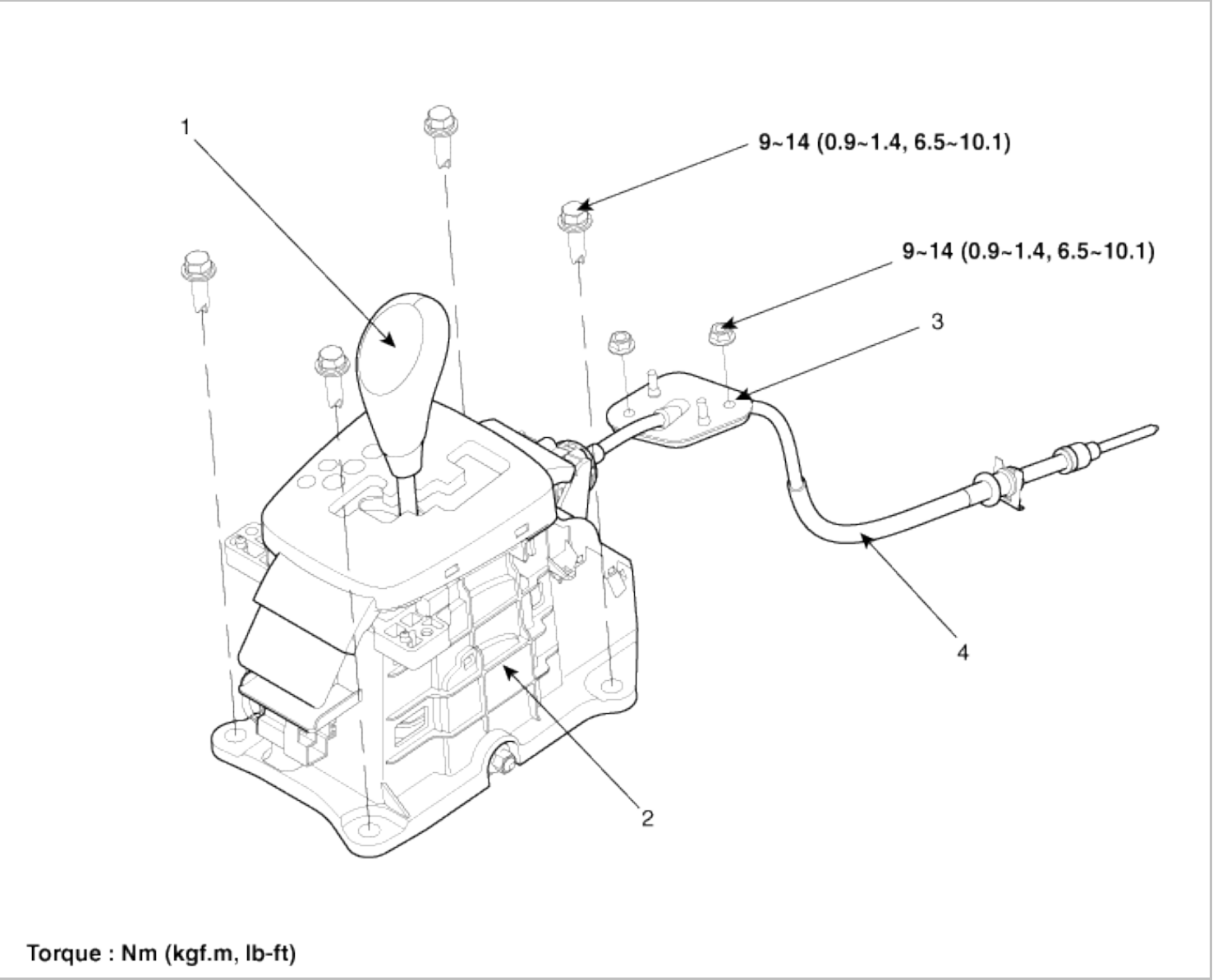
18. Connect (-) terminal to the battery.



19. Check the level of oil fluid. (refer to Procedure of ATF level adjusting)

Automatic Transmission System > Automatic Transmission Control System > Shift Lever > Components and Components Location

Components



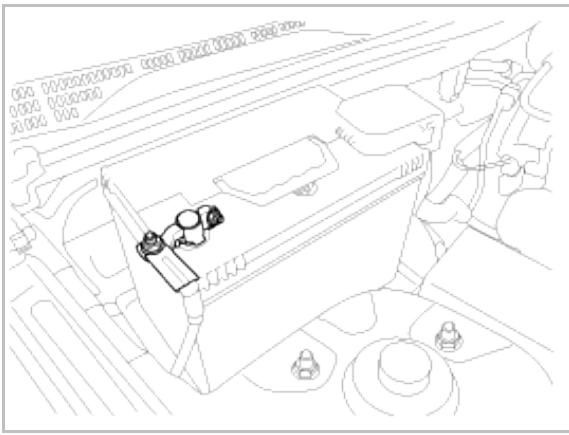
- 1. Shift lever knob
- 2. Shift lever assembly

- 3. Retainer
- 4. Shift cable assembly

Automatic Transmission System > Automatic Transmission Control System > Shift Lever > Repair procedures

Removal

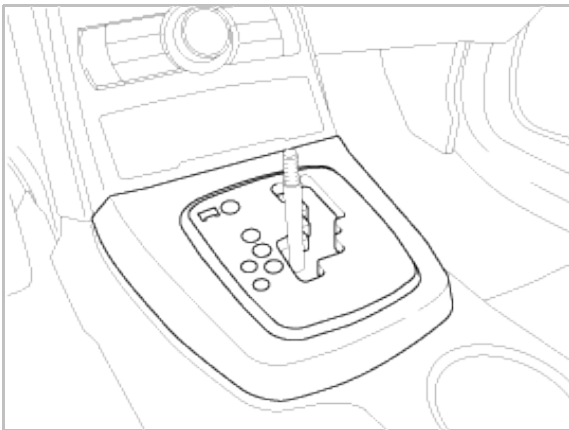
- 1. Disconnect (-) terminal from the battery in order to prevent current from flowing through wire.



2. Remove the shift lever knob by rotating counter clockwise.



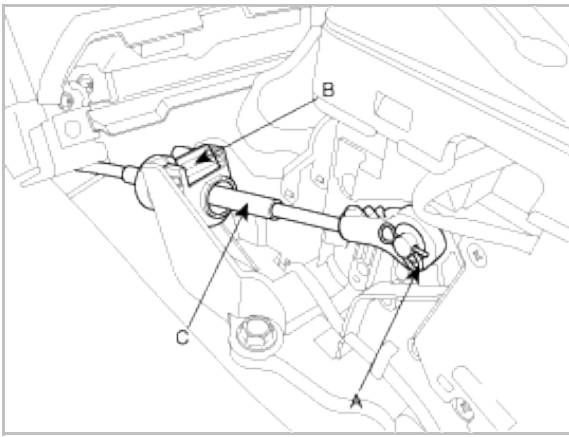
3. Remove the indicator assembly.



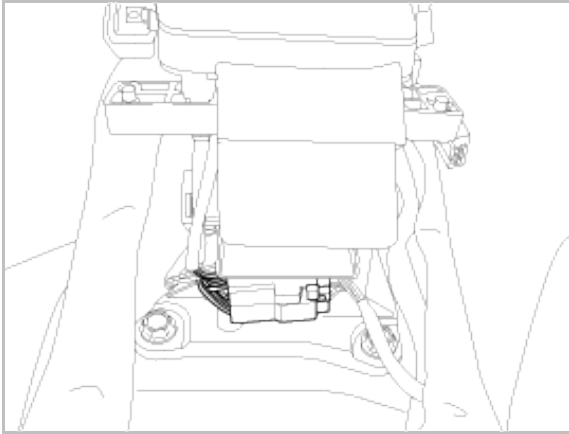
4. Remove the shift cable assembly (C) by pulling out the snap pin (A) and the socket (B).

**NOTE**

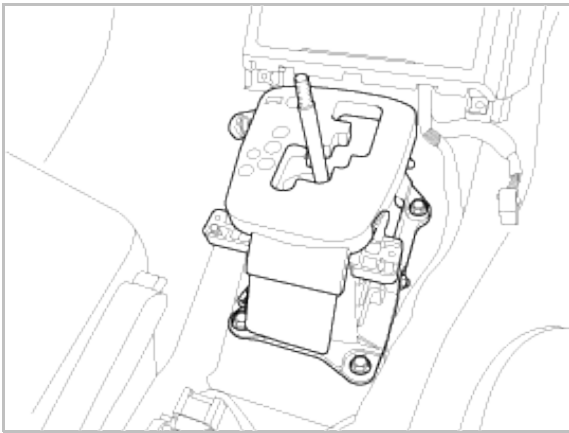
Remove the cable upward by pulling the marking part of the socket (B) with thumb.



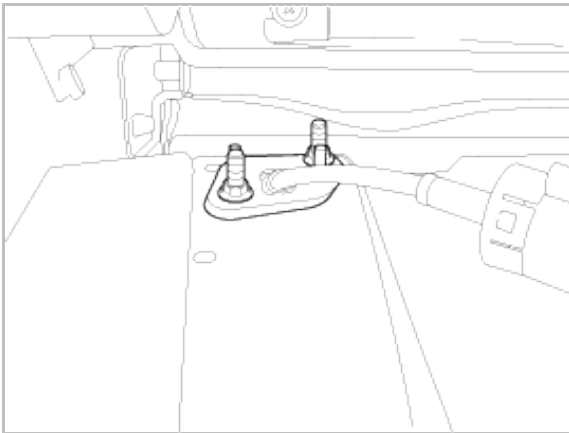
5. Disconnect the sports mode switch connector.



6. Remove the shift lever assembly by removing bolts(4ea).



7. Remove the retainer by removing nuts(2ea) on the floor.



8. After removing the shift cable assembly from the transmission, pull the shift cable assembly inside the vehicle.

#### NOTE

In case of replacing the shift cable assembly, do this procedure.

## Inspection

1. Check the shift cable assembly for proper operation and for damage.
2. Check the shift lever assembly for proper operation and for damage.

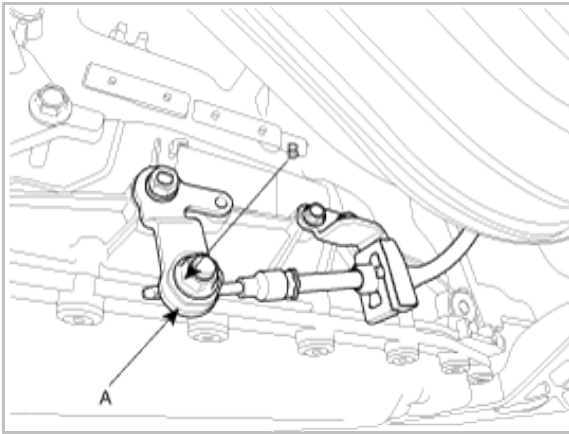
## Adjustment

### How To Adjust Shift Cable

1. Insert the shift cable to the bracket and hold it with a new clip.
2. Align the manual lever hole to the hole on the transmission case and hold the position with a bar.
3. Eliminate shift cable free play of the shift cable.
4. Firmly hold the special bolt (A) with a spanner and tighten the nut (B) with the specified torque.

#### Tightening torque :

13~16 Nm(1.3~1.6 kgf.m, 9.40~11.57 lb-ft)



5. Take off the bar holding the manual lever.
6. Shifting the each position, check that the shift lever moves smoothly.

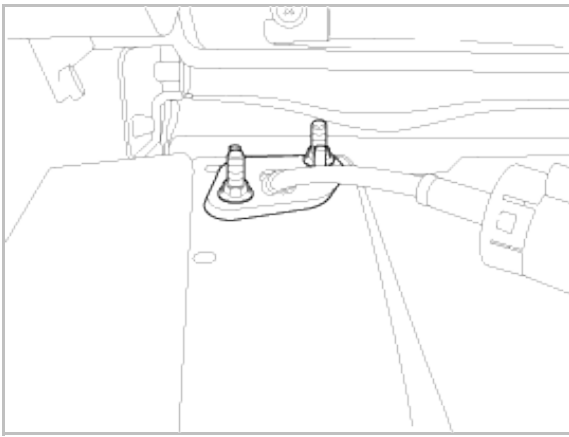
## Installation

1. After inserting the shift cable assembly inside the vehicle. install the shift cable assembly to the transmission,

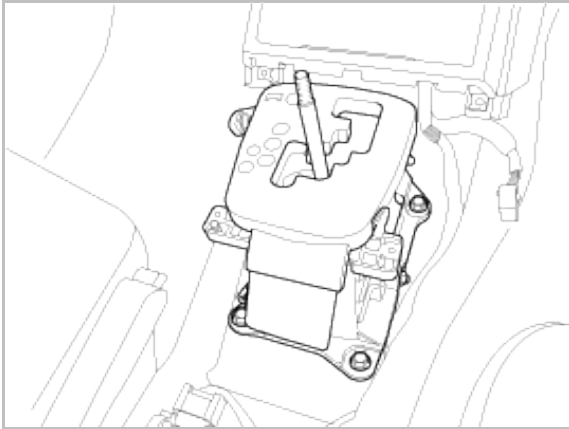
#### NOTE

In case of replacing the shift cable assembly, do this procedure.

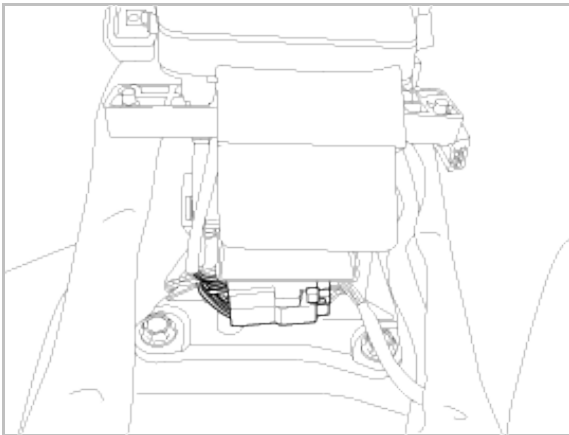
2. Install the retainer by installing nuts(2ea) on the floor.



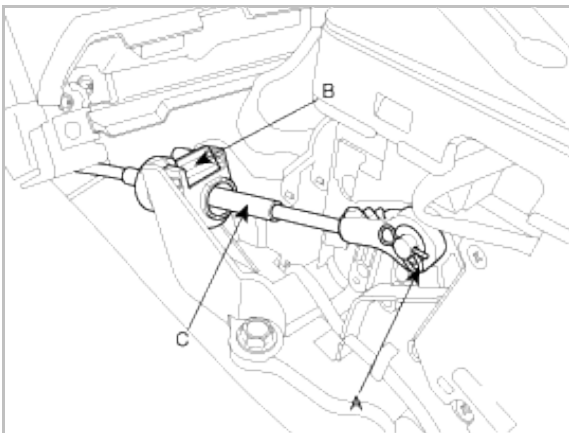
3. Install the shift lever assembly by installing bolts(4ea).



4. Connect the sports mode switch connector.

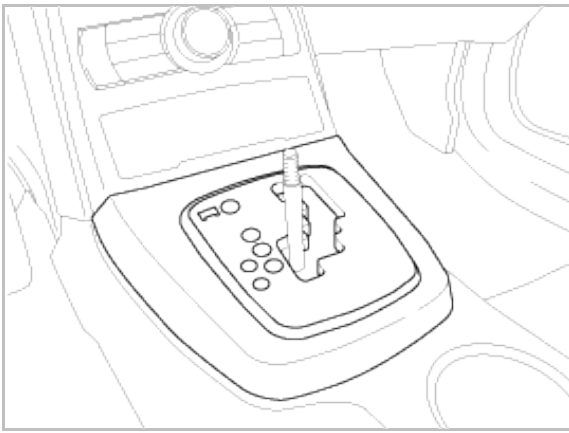


5. Install the shift cable assembly (C) by inserting the snap pin (A) and the socket (B).

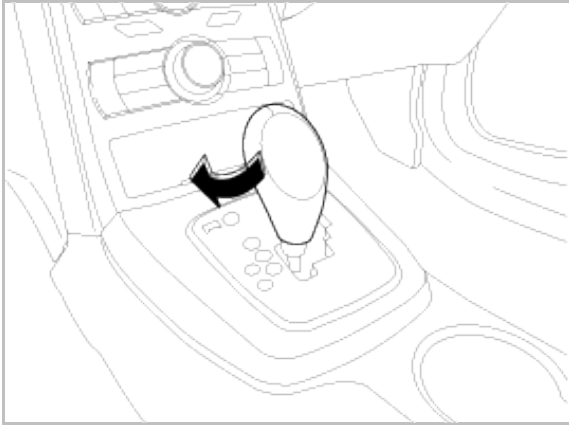


6. Install the indicator assembly.





7. Install the shift lever knob by rotating clockwise.



8. Connect (-) terminal to the battery.

