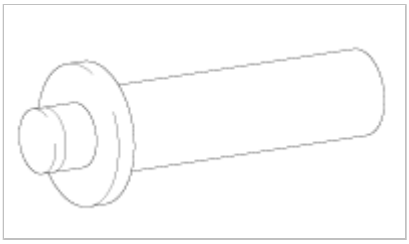
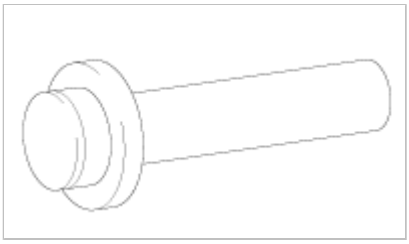
Specifications

Transmission type		A5SR1
Engine type		Gasoline 2.0 TCI
Gear ratio	1st	3.827
	2nd	2.368
	3rd	1.519
	4th	1.000
	5th	0.834
	Reverse	2.613
Final gear ratio		3.909

Lubricants

Items	Recommnend lubricant
Transmission gear oil	APOLLOIL ATF RED-1K

Special Service Tools

Tools (Number and name)	Illustration	Use
09452-4C200 Oil seal installer		Installation of transmission case oil seal
09452-4C300 Oil seal installer		Installation of extension housing oil seal

Description

The A5SR1 is a 5-speed, electronically controlled transmission featuring sports mode shifting. The control valve assembly features an integrated electronic control unit.

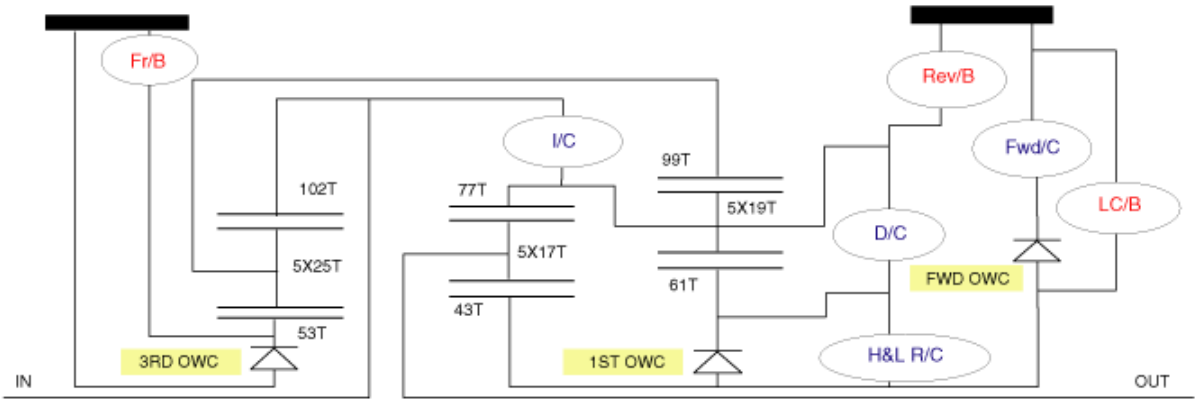
A5SR1

Item	Contents
Improved transmission feel	- Integrated control over engine and A/T (CAN communication control) system employed - Turbine sensor 1.2 employed - Real time feedback control at all phases applied
Improved driving	- Sports mode function employed - Gear ratio extension
Improved fuel consumption	- Full range lock-up employed (Larger lock-up zone) - E-flow torque converter employed (Improved driving efficiency) - Small transmission power train employed
Improved safety	- Transmission lock apparatus (P range maintenance apparatus affixed) employed
Improved maintenance	- Electronic system diagnosis tester (hi-scan) counterpart

Major Components And Their Functions

Part name	Acronyms	Function
Front brake	F/B	Fastens the front sun gear
Input clutch	I/ C	Engages the input shaft, with the middle annulus gear and the front annulus gear
Direct clutch	D/C	Engages the rear planetary carrier with a rear sun gear
High & low reverse clutch	H&L R/C	Engages the middle sun gear with the rear sun gear
Reverse brake	R/B	Fastens the rear planetary carrier
Forward brake	FWD/B	Fastens the middle sun gear
Low cost brake	LC/B	Fastens the middle sun gear
1st one-way clutch	1st OWC	Allows the rear sun gear to turn freely forward relative to the mid sun gear but fastens it for reverse rotation
Forward one-way clutch	FWD OWC	Allows the mid sun gear to turn freely in the forward direction but fastens it for reverse rotation
3rd one-way clutch	3rd OWC	Allows the front sun gear to turn freely in the forward direction but fastens it for reverse rotation

Operation

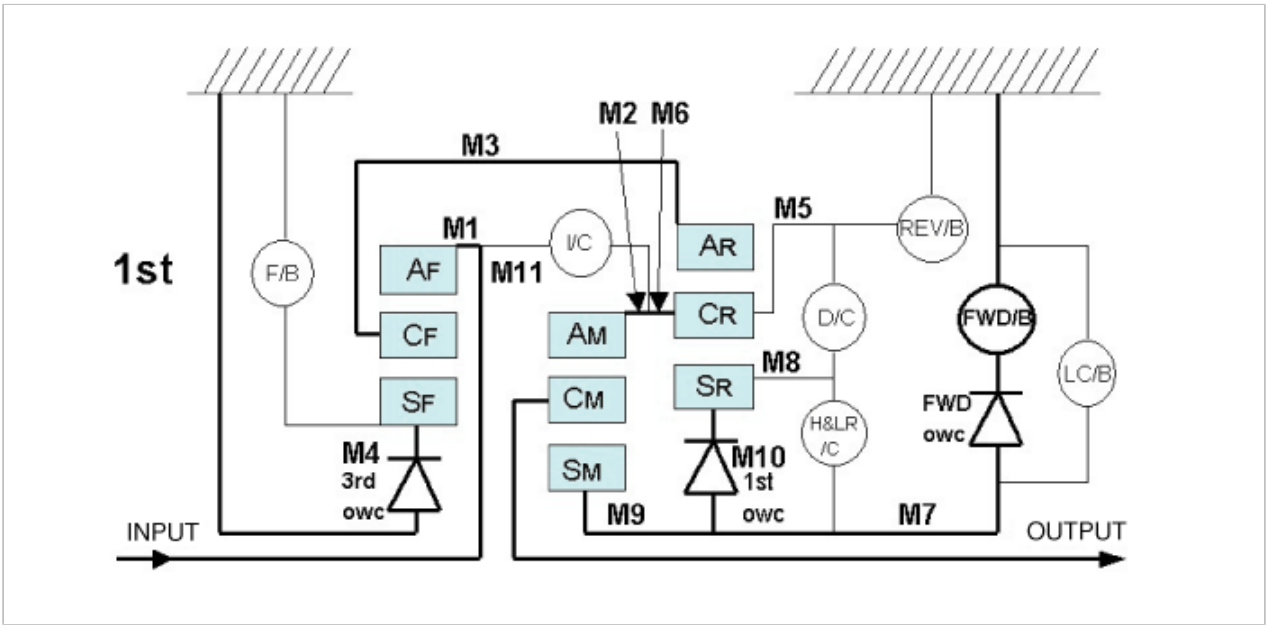


Shift positions		I/C	H&LR/C	D/C	Rev/B	F/B	LC/B	Fwd/B	1st OWC	Fwd OWC	3rd OWC	Remarks
P			△			△						Park
R			○		○	○			◎		◎	Reverse
N			△			△						Neutral
D	1st		△*			△	△*◇*	○	◎	◎	◎	Automatic Shifting 1↔2↔3↔ 4↔5
	2nd			○		△	◇*	○		◎	◎	
	3rd		○	○		○		△	◇		◎	
	4th	○	○	○				△	◇			
	5th	○	○			○		△	◇		◇	

○ : Operates.
◎ : Operates during accelerating.
◇ : Operates while vehicle is coasting.
◇ " : Operates only when Manual mode is selected.
△ : Operates but does not affect power transmission.
△ " : Operates in appropriate vehicle speed range.
Remark : Manual mode derivative is available

Operating Principles Of Each Range

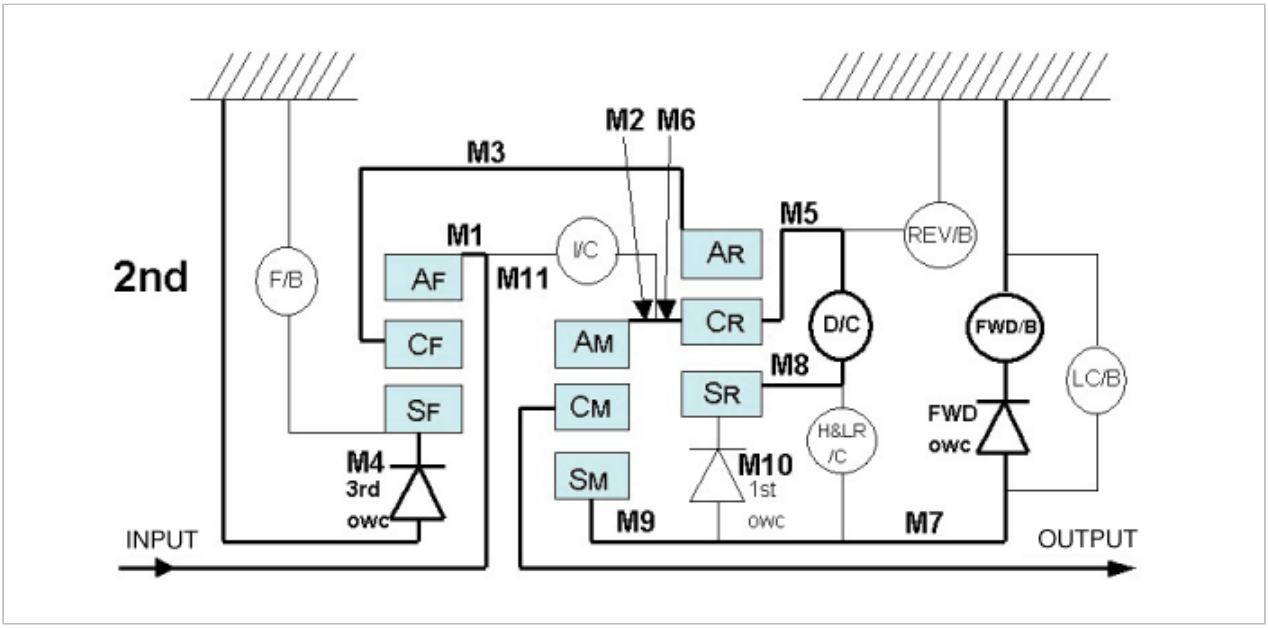
1. N range
   Since the forward and reverse brakes are released, driving force of input shaft is not transmitted to output shaft.
2. P range
   A. Since the forward and reverse brakes are released, as those in the N range, driving force of input shaft is not transmitted to output shaft.
   B. Parking pawl that is linked with select lever parking gear meshes with and fastens output shaft mechanically.
3. D, M2, M3, M4, M5 range 1st speed
   A. Fastens the front brake.
   B. The front brake and the forward one-way clutch regulate reverse rotation of the mid sun gear.
   C. The 1st one-way clutch regulates reverse rotation of the rear sun gear.
   D. The 3rd one-way clutch regulates reverse rotation of the front sun gear.



*** POWER FLOW**

Input shaft→Front internal gear→Front carrier→Rear internal gear→Rear carrier→Middle internal gear→ Middle carrier→Output shaft

4. D, M3, M4, M5 range ratio 2nd
   A. Fasten the front brake.
   B. The front brake and the forward one-way clutch regulate reverse rotation of the mid sun gear.
   C. The 3rd one-way clutch regulates reverse rotation of the front sun gear.

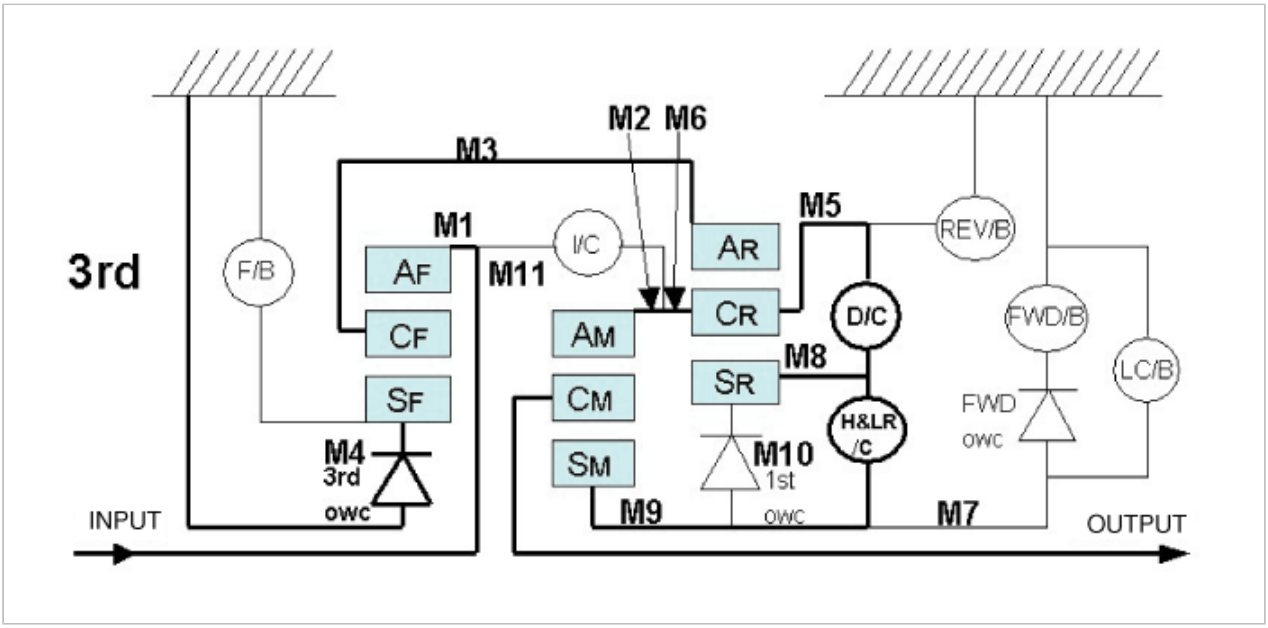


A. The direct clutch is coupled and the rear carrier and the rear sun gear are connected.

*** POWER FLOW**

Input shaft→Front internal gear→Front carrier→Rear internal gear→Rear carrier→Rear carrier→Middle internal gear→Middle carrier→Output shaft

5. D, M3, M4, M5 range 3rd speed
   A. Fastens the front brake.
   B. The 3rd one-way clutch regulates reverse rotation of the front sun gear.

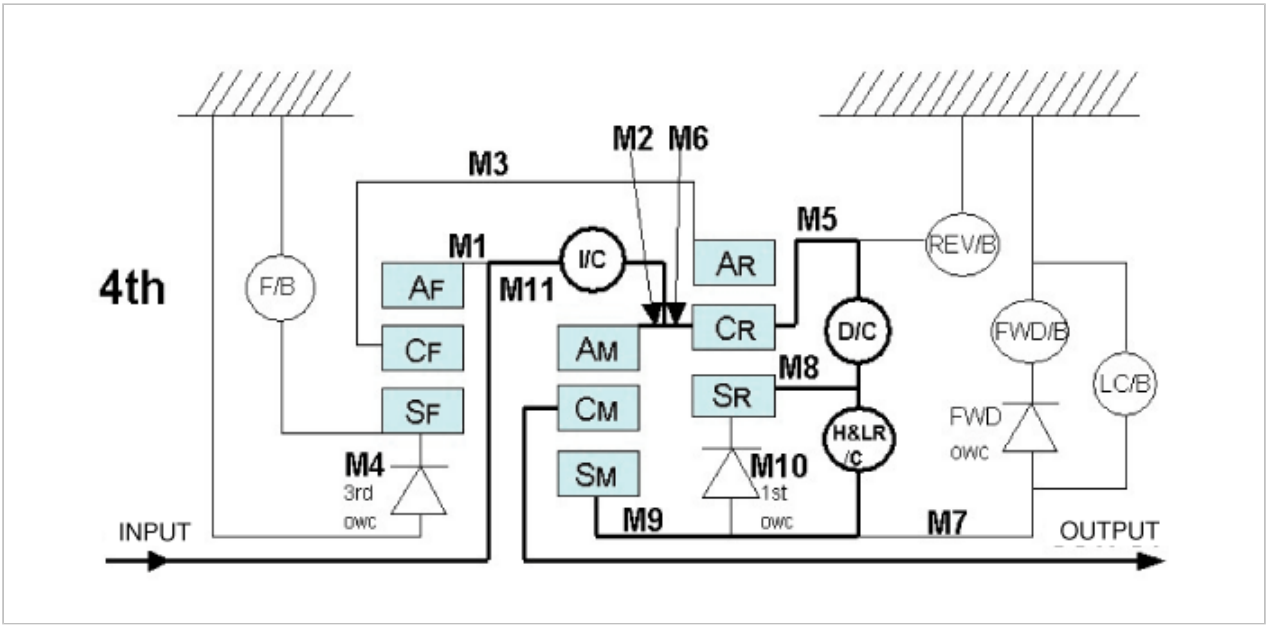


C. The high & low reverse clutch is coupled and the middle and rear sun gears are connected.

*** POWER FLOW**

Input shaft→Front internal gear→Front carrier→Rear internal gear→Rear carrier→Rear carrier→Middle internal gear→Middle carrier→Output shaft

6. D, M4, M5 range 4th speed
   A. The front brake is released and sun gear turns freely forward.
   B. The input clutch is coupled and the front and middle internal gears are connected.

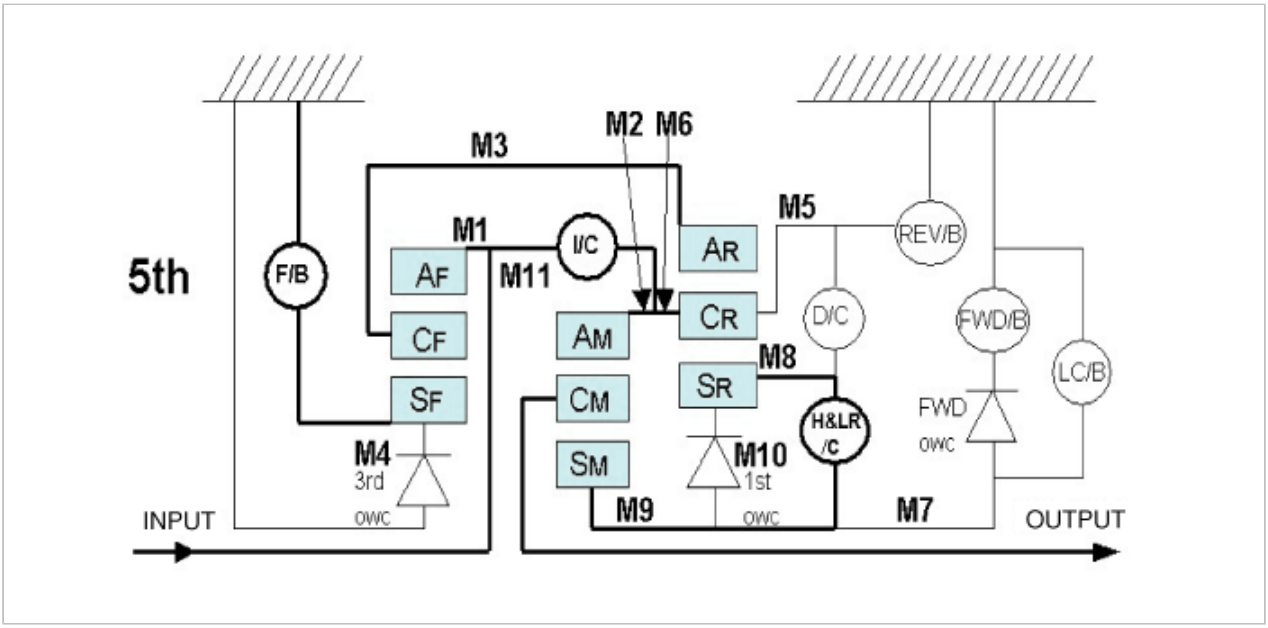


C. Driving force is conveyed to the front internal gear, the middle internal gear, and the rear carrier and the three planetary gears rotate forward as a unit.

*** POWER FLOW**

Input shaft→Front internal gear→Front carrier→Rear internal gear→Rear carrier→Middle internal carrier→Middle carrier→Output shaft

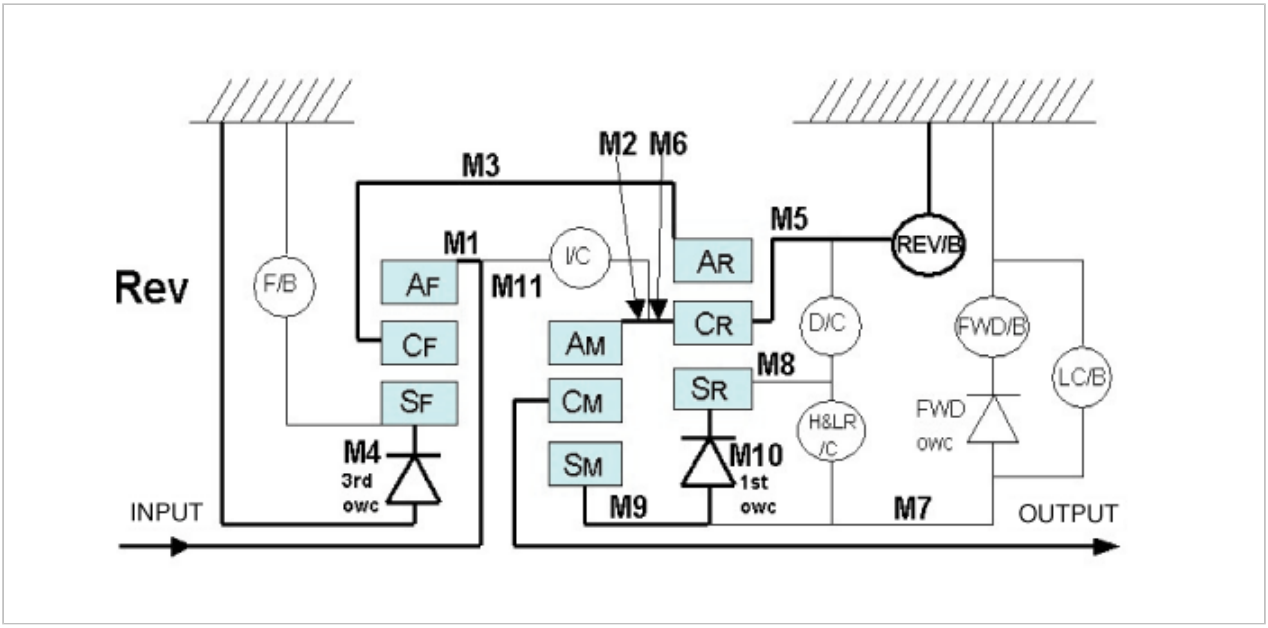
7. D, M5 range 5th speed
   A. The front brake fastens the front sun gear.
   B. The direct clutch is released and the rear carrier and rear sun gear are disconnected.



*** POWER FLOW**

Input shaft→Front internal→Front carrier→Rear internal input shaft→Middle internal→Rear carrier→Rear sun gear→Middle sun carrier→Middle carrier→Output shaft

8. R range
   A. The front brake fastens the front sun gear.
   B. The high & low reverse clutch is coupled and the middle and rear sun gears are connected.
   C. The reverse brake fastens the rear carrier.

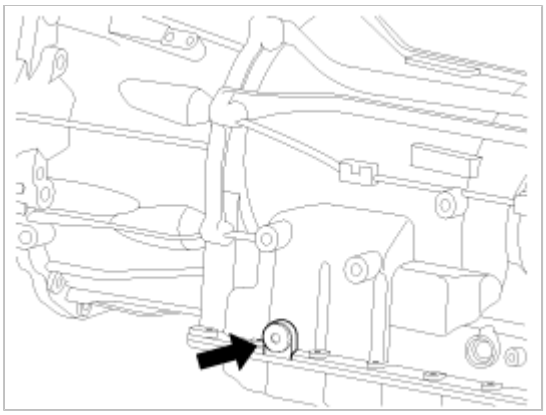


*** POWER FLOW**

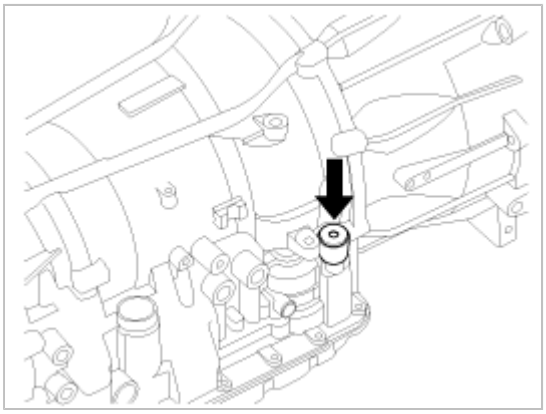
Input shaft→Front internal→Front carrier→Rear internal→Rear sun gear→Middle sun gear→Middle carrier→Output shaft

Procedure of ATF level adjusting

1. Park the vehicle on a flat road and lock the tires.
2. Shift the shift lever to the "P" range.
3. Remove the overflow plug by using a torx wrench.



4. Remove the filler plug by using a torx wrench.



5. Check if ATF flows out of the overflow hole. If ATF does not drop, add ATF until it drops.
6. Fix the overflow plug by using Torx wrench.

> NOTE
>
> Reuse the used gasket.

7. Add 1400cc of ATF from the oil filling hole.
8. Install it to the filler plug with a new gasket.
9. Tighten the filler plug by using Torx wrench with the specified torque.

Tightening torque :
15~25 Nm (1.5~2.5 kgf.m, 11.1~18.4 lb-ft)

10. Start the engine.
11. Raise ATF temperatirue on CAN signal up to 50°C at stabilized idle speed condition.
12. Shift from "P" to "D", then from "D" to "P", keeping each shift position "N","R" more than 2 seconds with foot braking.
13. Repeat 2 times above procedure "3".
14. Remove the overflow plug and the O-ring by using Torx wrench.

15. Check If the thin oil stream becomes drop by drop when ATF temperatirue on CAN signal is at 58~64°C.
16. Install it to the overflow plug with a new gasket.
17. Tighten the overflow plug by using Torx wrench with the specified torque.

Tightening torque :
35~45 Nm (3.6~4.6 kgf.m, 25.8~33.2 lb-ft)

NOTE

Be sure to wipe off spilled ATF completely after tightening the overflow plug.

Troubleshooting

Diagnostic Trouble Codes(Inspection Procedure)

Check the Diagnostic Trouble Codes

1. Turn the ignition switch to OFF.
2. Connect the Hi-scan tool to the DLC connector for diagnosis.
3. Turn the ignition switch to ON.
4. Check the diagnostic trouble codes using the Hi-scan tool.
5. Read the output diagnostic trouble codes. Then follow the remedy procedures according to the "DIAGNOSTIC TROUBLE CODE DESCRIPTION" on the following pages.

> NOTE
>
> - A maximum of 10 diagnostic trouble codes (in the sequence of occurrence) can be stored in the Random Access Memory (RAM) incorporated within the control module.
> - The same diagnostic trouble code can be stored one time only.
> - If the number of stored diagnostic trouble codes or diagnostic trouble patterns exceeds 10, already stored diagnostic trouble codes will be erased in sequence, beginning with the oldest.
> - If the same trouble code does not occur during 40 times continuously, memorized trouble code would be deleted automatically when the ATF temperature reaches 50°C(122°F).

6. Delete the diagnostic trouble code.
7. Disconnect the Hi-scan tool.

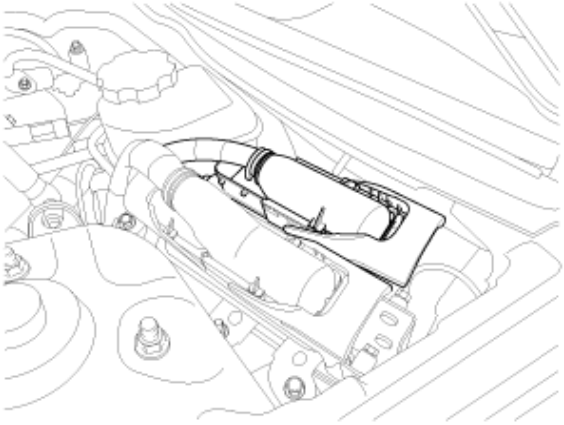
> NOTE
>
> DTC cleaning should only be done with the scan tool.

Inspection Chart For Diagnostic Trouble Codes(DTC)

No.	Code	Item	MIL
1	P0601	Internal Control Module Memory Check Sum Error	●
2	P0641	Sensor Reference Voltage 'A' Circuit/Open	●
3	P0705	Transmission Range Sensor Circuit Malfunction (PRND Input)	●
4	P0711	Transmission Fluid Temperature Sensor 'A' Circuit Range/Performance	●
5	P0712	Transmission Fluid Temperature Sensor 'A' Circuit Low Input	●
6	P0713	Transmission Fluid Temperature Sensor 'A' Circuit High Input	●
7	P0716	Input/Turbine Speed Sensor 'A' Circuit Range/Performance	●
8	P0717	Input/Turbine Speed Sensor 'A' Circuit No Signal	●
9	P0721	Output Speed Sensor Circuit Range/Performance	●
10	P0731	Gear 1 Incorrect Ratio	●
11	P0732	Gear 2 Incorrect Ratio	●
12	P0733	Gear 3 Incorrect Ratio	●
13	P0734	Gear 4 Incorrect Ratio	●
14	P0735	Gear 5 Incorrect Ratio	●
15	P0741	Torque Converter Clutch Circuit Performance or Stuck Off	●

16	P0743	Torque Converter Clutch Circuit Electrical	●
17	P0748	Pressure Control Solenoid Valve(VFS) 'A' Electrical	
18	P0753	Shift Control Solenoid Valve 'A' Electrical (Input Clutch Solenoid)	●
19	P0758	Shift Control Solenoid Valve 'B' Electrical(Front Brake Solenoid)	●
20	P0763	Shift Control Solenoid Valve 'C' Electrical(Direct Clutch Solenoid)	●
21	P0768	Shift Control Solenoid Valve 'D' Electrical(High/Low and Reverse Clutch Solenoid)	●
22	P0773	Shift Control Solenoid Valve 'E' Electrical(Low Coast Brake Solenoid)	●
23	U0001	High Speed CAN Communication Bus off	●
24	U0100	Lost Communication With ECM/PCM 'A'	

Component Location



General Description

A malfunction is detected by using a checksum technique for verifying data. The digital data is composed of zeros and ones. A checksum is the total of all ones in a string of data. By comparing the checksum value with a stored value, a malfunction can be detected.

DTC Description

By comparing the checksum value with a stored value, if the both data are not equal , TCM sets DTC P0601.

DTC Detectiong Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Rationality	• TCM
Enable Conditions	• IG "on"	
Threshold Value	• Checksum fault or TCU internal Failure	
Diagnostic Time	• More than 1sec	
Fail Safe	• Locked in 4th gear.	

Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Connect GDS and erase the DTC P0601 with GDS.
3. Turn IG OFF ↔ IG ON 2 or 3 times then, check that DTC P0601 is set again.
4. Is the DTC P0601set again ?

YES	▸ Replace a known-good PCM/TCM as necessary and then go to "Verification of Vehicle Repair" procedure.
NO	▸ 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. Throughly 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.

Verification of Vehicle Repair

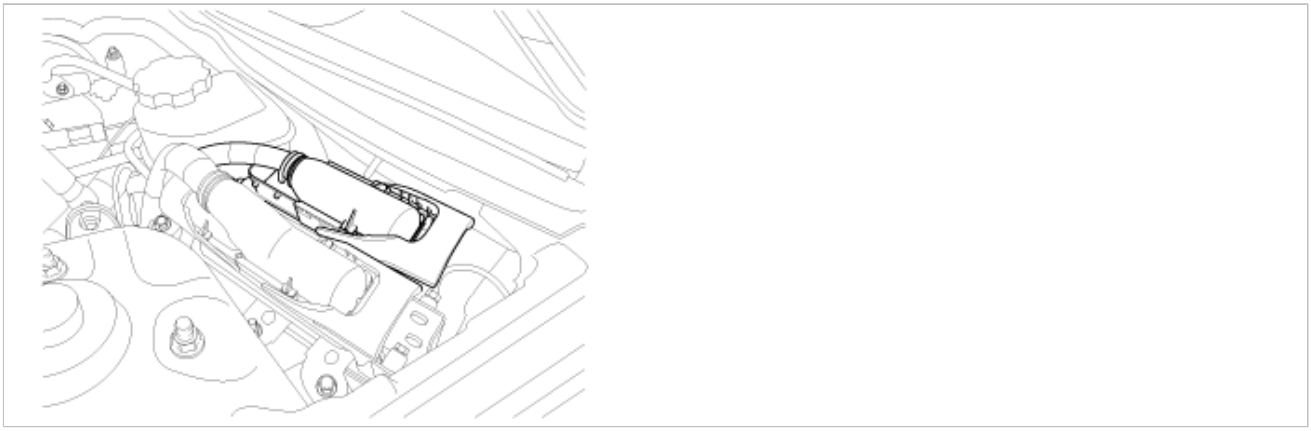
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a GDS, 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.

Component Location



General Description

The TCM monitors voltage supply to solenoid valve.

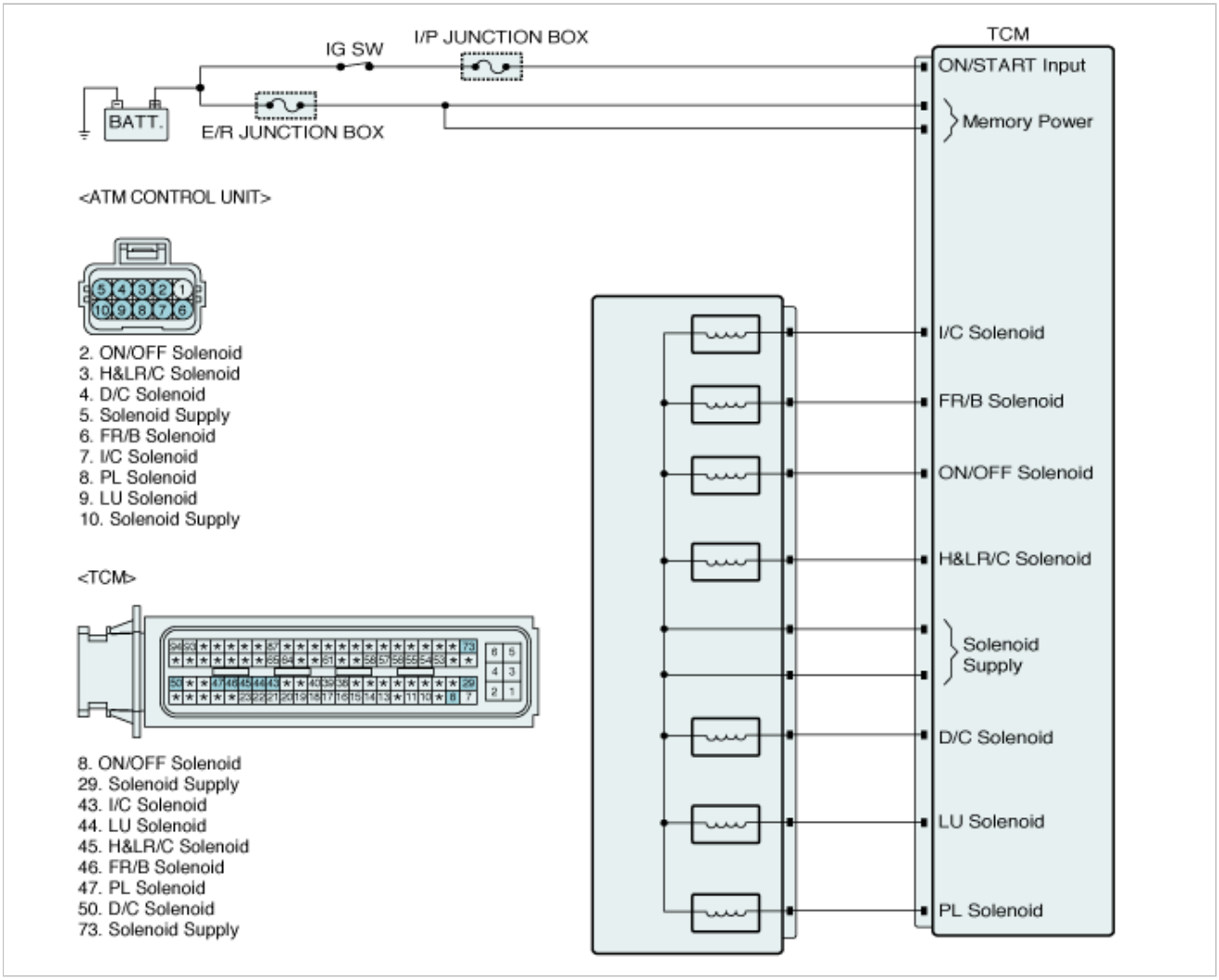
DTC Description

The TCM sets this code when suppling voltage to TCM is lower or higher than specification.

DTC Detectiong Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Check voltage range	• Open or shrot in harness • TCM
Enable Conditions	• Battery voltage > 9.7V	
Threshold Value	• 8.4V > Sensor supply voltage > 16V	
Diagnostic Time	• More than 0.2sec	
Fail Safe	• Damper clutch "OFF". • Prevention of pressure adaptation.	

Diagnostic Circuit Diagram



Monitor GDS Data

1. Connect GDS to data link connector(DLC)
2. Ignition "ON" & Engine "OFF".
3. Monitor the "BATTERY VOLTAGE and A/T MAIN RELAY VOLTAGE" parameter on the GDS.

Specification : Approx. 12V

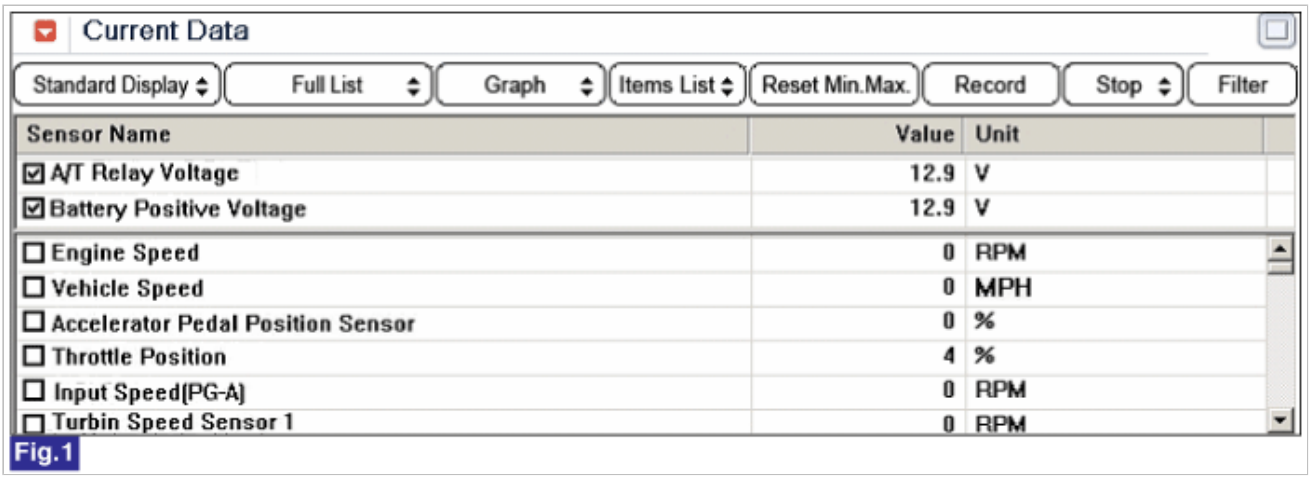


Fig 1) Power Supply - Normal

4. Does "BATTERY VOLTAGE and A/T MAIN RELAY VOLTAGE" follow the reference data?

YES	▸ 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. Throughly 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.
NO	▸ Go to "W/Harness Inspection" procedure.

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?

YES	▸ Repair as necessary and go to "verification of vehicle repair" procedure.
NO	▸ Go to "Power circuit inspection" procedure.

Power Circuit Inspection

1. Connect the "PCM/TCM" connector.
2. IG "ON" & Engine "OFF".
3. Measure the voltage between "Solenoid Supply" terminal of solenoid valve connector and chassis ground.

Specification : Battery Voltage

4. Is the measured voltage within specifications?

YES	▸ 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. Throughly 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.
NO	▸ Check open or short in harness. Repair as necessary and then, go to "Verification of Vehicle" procedure. ▸ If there is no problem in harness, substitute with know-good PCM/TCM and check for proper operation. If the problem is corrected, replace PCM/TCM as necessary and then go to "Verification of Vehicle Repair" procedure.

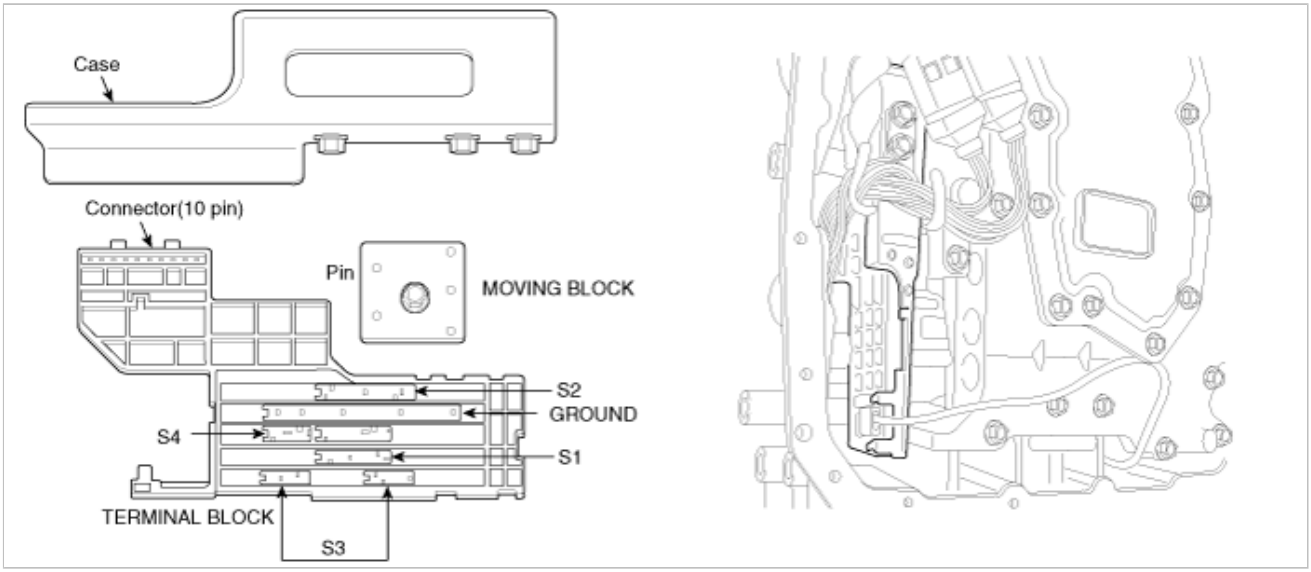
Verification of Vehicle Repair

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

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a GDS, 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.

Component Location



General Description

When the shift lever is in the D (Drive) position the output signal of Tansaxle Range Switch is 12V and in all other positions the voltage is 0V. The TCM judges the shift lever position by reading all signals, for the TRANSMISSION Range Switch, simultaneously.

DTC Description

The TCM sets this code when patterns are out of specification based on the table shown below.
The TRANSMISSION Range Switch has no output signal for an extended period of time.

DTC Detectiong Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Rationality	• OPEN OR SHORT IN CIRCUIT • Faulty TRANSMISSION RANGE SWITCH • Faulty TCM
Enable Conditions	• Sensor supply voltage in valid range OK	
Threshold Value	• Intermediate position pattern or Undefined pattern Inhibitor switch pattern check • Voltage of HW signal Voltage > 2.5V (If active) or Voltage < 2.5V (If not avtive) • Jump pattern Jump more than 5 steps	
Diagnostic Time	• More than 10sec	
Fail Safe	• SELECT POSITION IS REGARDED AS "D" • INDICATOR DECISION "OFF" • REVERSE LAMP SIGNAL "OFF"	

Specification

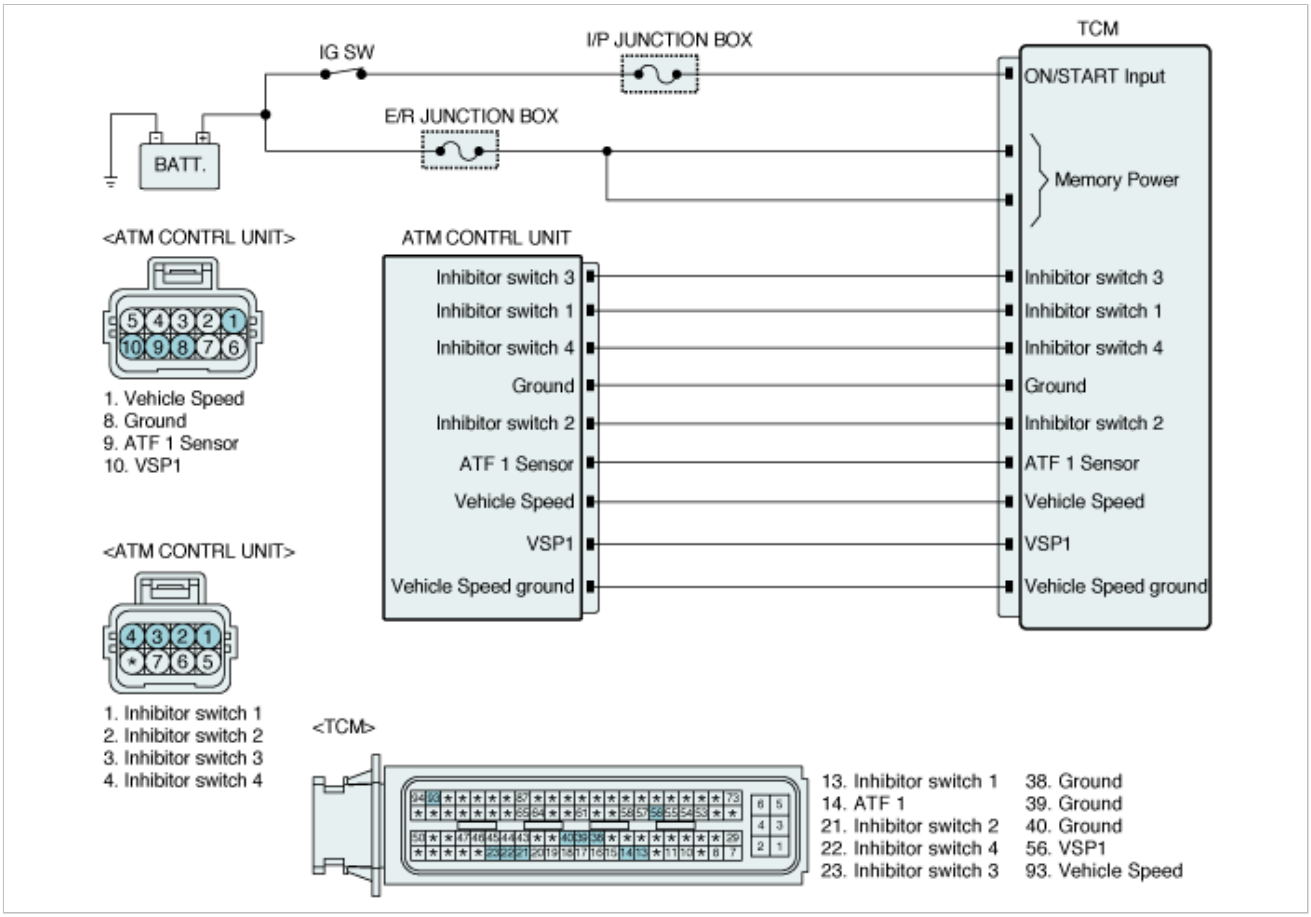
Figure 1) A/T range pattern

A/T Range Switch				Range Decision	Remarks
SW 1	SW 2	SW 3	SW 4		
OFF	OFF	OFF	OFF	Pst	P start
OFF	OFF	ON	OFF	P	P
OFF	OFF	ON	ON	P-R	Intermediate

ON	OFF	ON	ON	R	R
ON	OFF	ON	OFF	N-R	Intermediate
ON	OFF	OFF	OFF	Nst	N start
ON	OFF	OFF	ON	N-D	Intermediate
ON	ON	OFF	ON	D	D
OFF	ON	OFF	ON	3	3
OFF	ON	ON	ON	2	2
OFF	ON	ON	OFF	1	1
Irregular Pattern				Other	

[OFF= 5V, ON = 0V]

Diagnostic Circuit Diagram



Monitor GDS Data

1. Connect GDS to data link connector(DLC)
2. Ignition "ON" & Engine "OFF".
3. Monitor the "TRANSMISSION RANGE SWITCH" parameter on the GDS.
4. Move selector lever from "P" range to "D" range.

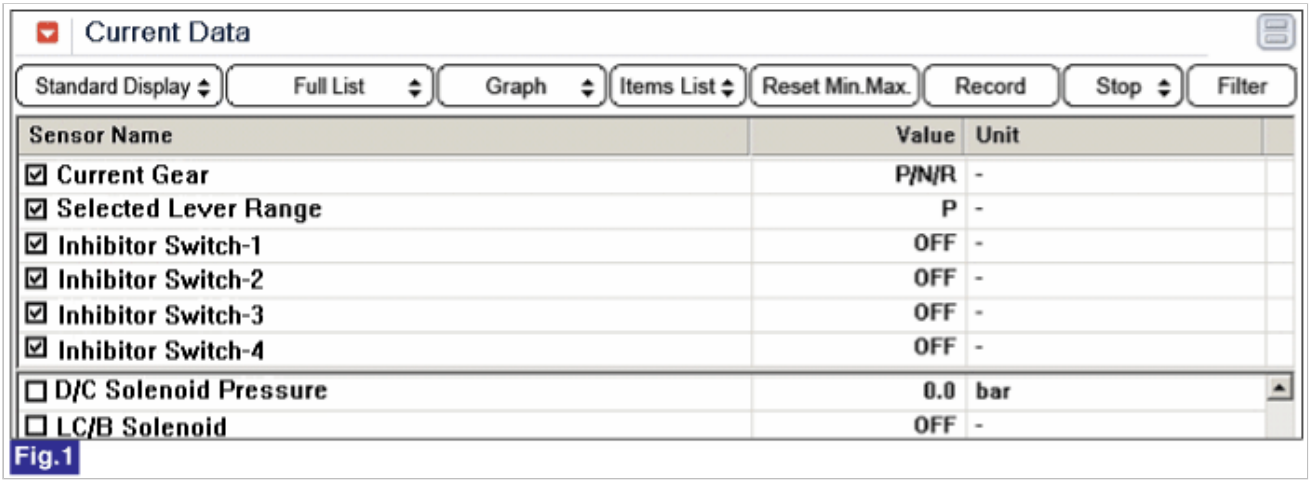


Fig.1

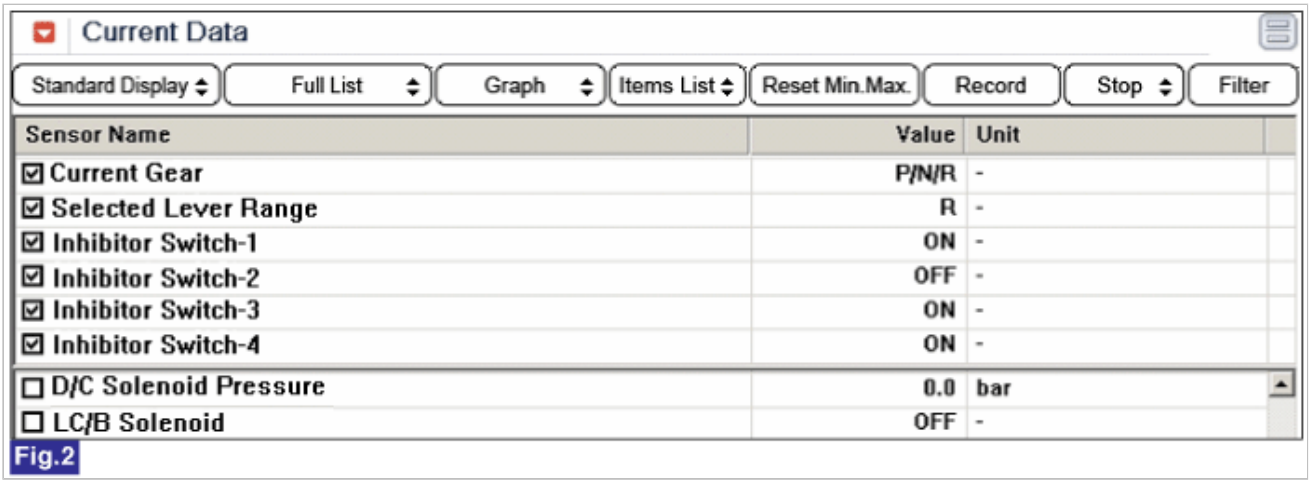


Fig.2

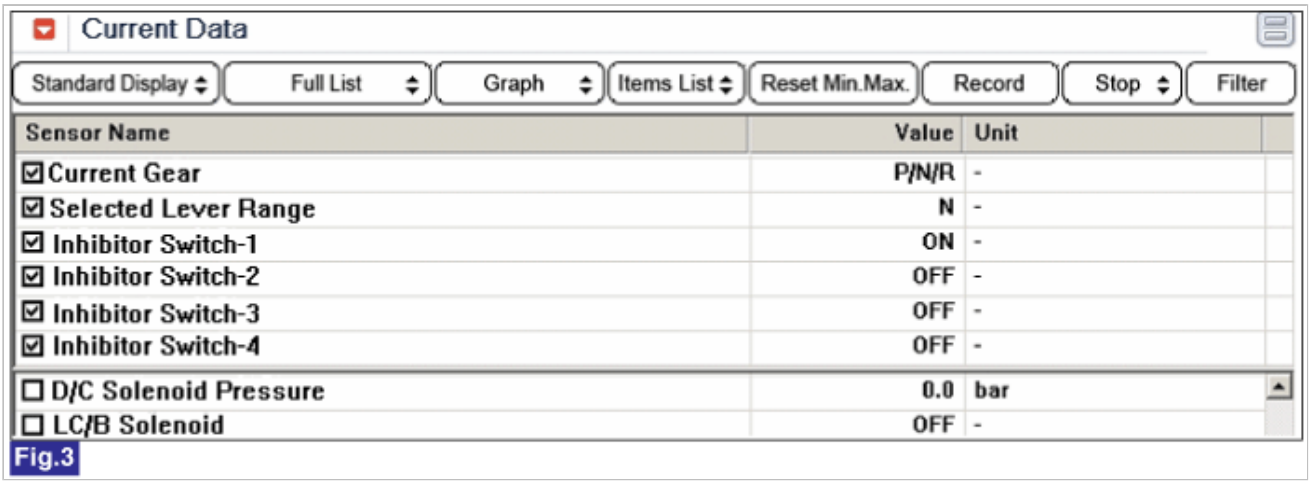


Fig.3

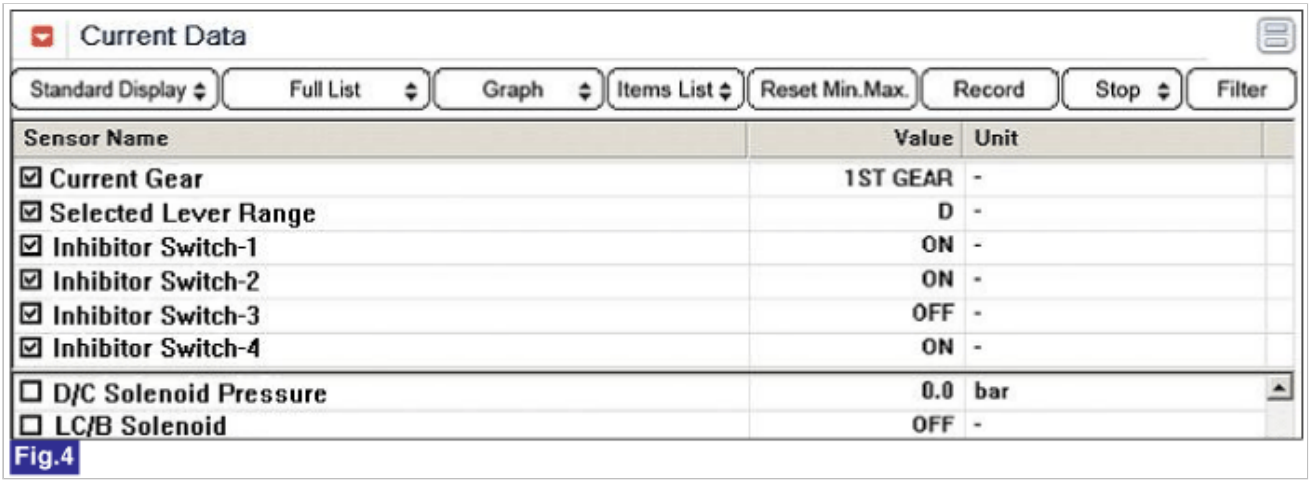


Fig 1) P range
Fig 2) R range
Fig 3) N range
Fig 4) D range

5. Does "TRANSMISSION RANGE SWITCH" follow the reference data?

YES	▸ 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. Throughly 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.
NO	▸ Go to "W/Harness Inspection" procedure.

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?

YES	▸ Repair as necessary and go to "verification of vehicle repair" procedure.
NO	▸ Go to "Signal circuit inspection" procedure.

Signal Circuit Inspection

1. Disconnect ATM control Unit connector.
2. Ignition "ON" & Engine "OFF".
3. Measure voltage between each range terminal of ATM control Unit connector and chassis ground with shifting from P to D range one by one.

Specification : Battery Voltage

Transmission Range Switch Combination

NO	IGN SW	SELECT	SIGNAL			
			Transmission Range Switch1 (S1)	Transmission Range Switch2 (S2)	Transmission Range Switch3 (S3)	Transmission Range Switch4 (S4)
1	ON	P range SW	5.47V	5.21V	4.17V	5.11V
2	ON	R range	0.11V	5.17V	0.12V	0.11V

		SW				
3	ON	N range SW	0.11V	5.17V	4.16V	5.08V
4	ON	D range SW	0.11V	0.11V	4.17V	0.11V

4. Is the measured voltage within specifications?

YES	▸ Go to "Component inspection" procedure.
NO	▸ Check for open or short in harness. Repair as necessary and Go to "verification of vehicle repair" procedure. ▸ If signal circuit in harness is OK, Substitute with a known-good PCM/TCM and check for proper operation. If the problem is corrected, replace PCM/TCM as necessary and go to "verification of vehicle repair" procedure.

Component Inspection

1. IG "OFF" & Engine "OFF".
2. Disconnect ATM control Unit(CHG75-1 & CHG75-3) connector.
3. Measure resistance between signal and ground terminal of range switch connector (Component Side)

Specification : Refer to below table

Normal Condition(Any other conditions are treated as failure)

PIN No (CHG75-3)	GND	TransmissionRange Switch1(S1)	TransmissionRange Switch1(S2)	TransmissionRange Switch1(S3)	TransmissionRange Switch1(S4)	IND
P-R (Middle)	●				●	-
R	●	●		●	●	R
N-R (Middle)	●	●	●		●	-
N-D (Middle)	●	●	●	●		-
D	●	●	●		●	R

● : SWITCH IS ON(GND LEVER)
- : RANGE INDICATER LAMP "OFF" AND MAINTAIN PREVIOUS RANGE

4. Is the measured resistance within specifications ?

YES	▸ Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.
NO	▸ Check for open or short in harness. Repair as necessary and Go to "verification of vehicle repair" procedure. ▸ If signal circuit in harness is OK, Substitute with a known-good "TRANSMISSION RANGE SWITCH" and check for proper operation. If the problem is corrected, replace "TRANSMISSION RANGE SWITCH" as necessary and go to "verification of vehicle repair" procedure.

Verification of Vehicle Repair

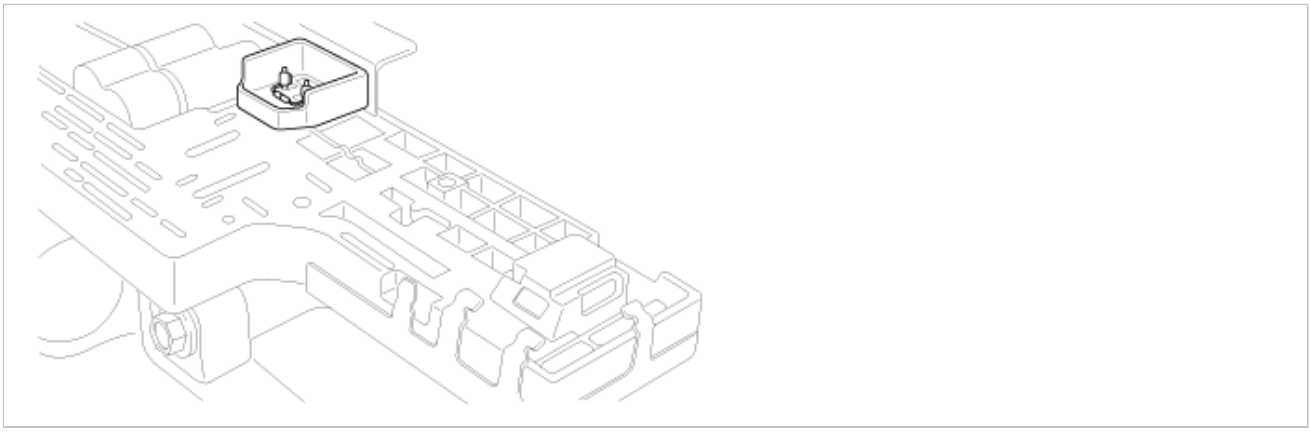
After a repair, it is essential to verify that the fault has been corrected.

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

2. Using a GDS, 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.

Component Location



General Description

The automatic transmission fluid(ATF) temperature sensor A is installed in the INHIBITOR SWITCH and fluid(ATF) temperature sensor B is installed in the valve body. The TCM supplies a 5V reference voltage to the sensor, and the output voltage of the sensor changes when the ATF temperature varies.

DTC Description

This DTC code is set when the ATF temperature output voltage is lower than a value generated by thermistor resistance, in a normal operating range, for approximately 1 second or longer. The TCM regards the ATF temperature as fixed at a value of 80°C(176°F)

DTC Detectiong Condition

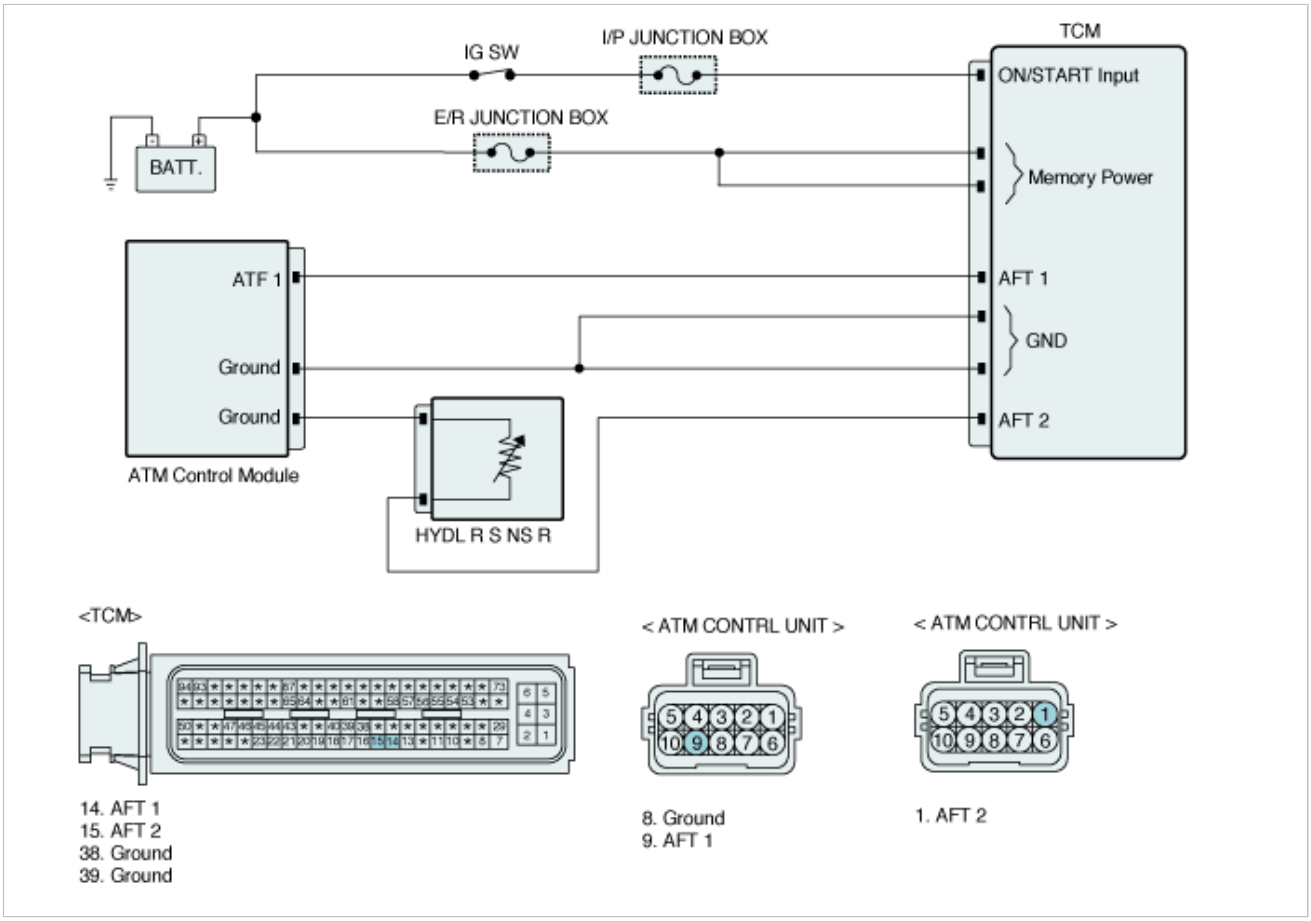
Item		Detecting Condition	Possible Cause
Case 1	DTC Strategy	• Rationality(Low stuck error)	※ ATF T/S :Automatic Transmission Fluid Temperature Sensor • OPEN OR SHORT IN CIRCUIT • Faulty ATF T/S 1 • TCM
	Enable Conditions	• Output speed > 400 RPM • Engine speed > 1000 RPM • Throttle opening > 3% • Oil temperature < 20°C(68°F)	
	Threshold Value	• Oil temperature (Present Oil Temp.-Oil Temp. when the time starts)<2°C(35°F) within 500 sec,	
Case 2	DTC Strategy	• Rationality(High stuck error)	
	Enable Conditions	• Oil Temperature. at IG on > 18°C(64°F) • Coolant Temp at IG off - Coolant Temp. at IG on >= 50°C (122°F) • Soaking Time from ECU > 15000[sec] • Engine coolent temperature at IG on > -20°C(68°F) • Time elasped since engine start 300 sec.	
	Threshold Value	• Oil temperature Oil Temp. at IG on - Coolant Temp. at IG on > 10°C(50°F)	
Case 3	DTC Strategy	• Rationality(Cold stuck error)	
	Enable Conditions	• Input speed or Engine speed > 600 RPM • Position Lever D, B, L • Oil Temperature at IG on < -10°C(50°F)	

	Threshold Value	• Oil temperature Accumulated time to reach target temperature after start. * Table.1	
Diagnostic Time		• More thn 2 sec.	
Fail Safe		• Fluid temperature is regarded as 80°C	

Specification

	Temperature(°C)	Resistance(KΩ)	Voltage(V)
ATF T/S 1	0°C(32°F)	Approx. 15KΩ	Approx. 3.3V
	20°C(68°F)	Approx. 6.5KΩ	Approx. 2.7V
	80°C(176°F)	Approx. 0.9KΩ	Approx. 0.9V
ATF T/S 2	0°C(32°F)	Approx. 10.5KΩ	Approx. 3.3V
	20°C(68°F)	Approx. 4.3KΩ	Approx. 2.5V
	80°C(176°F)	Approx. 0.5KΩ	Approx. 0.7V

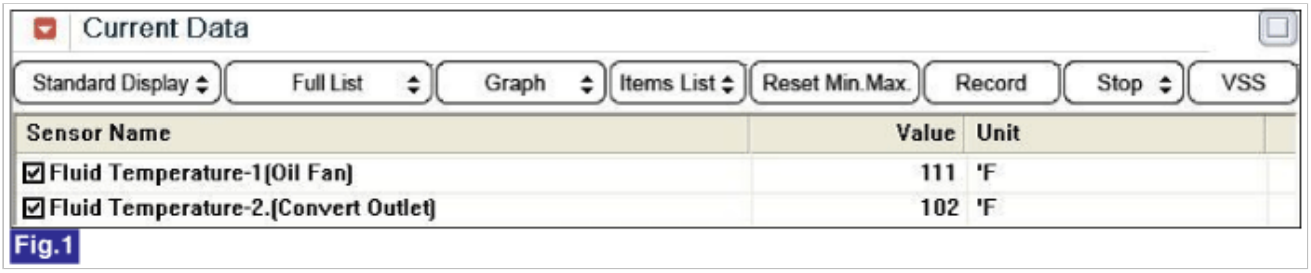
Diagnostic Circuit Diagram



Monitor GDS Data

1. Connect GDS to data link connector(DLC)
2. Engine "ON" .
3. Monitor the "TRANSAXLE FLUID TEMPERATURE SENSOR "1" parameter on the GDS.

Specification : Increasing Gradually



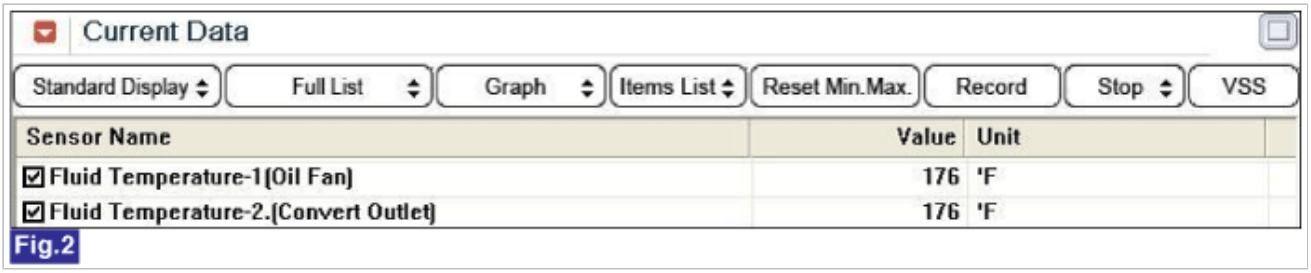


Fig 1) Normal Data
Fig 2) Open or short Data

4. Does "TRANSMISSION FLUID TEMPERATURE SENSOR " follow the reference data?

YES	▸ 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. Throughly 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.
NO	▸ Go to "W/Harness Inspection" procedure.

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?

YES	▸ Repair as necessary and go to "verification of vehicle repair" procedure.
NO	▸ Go to "Signal circuit inspection" procedure.

Signal Circuit Inspection

1. Ignition "ON" & Engine "OFF".
2. Disconnect ATM Control Unit connector.
3. Measure voltage between signal terminal of AFT at the ATM Control Unit harness connector and chassis ground.

Specification : Refer to bleow table

[Inspection Table]

	Temperature(°C)	Resistance(KΩ)	Voltage(V)
ATF T/S 1	0°C(32°F)	Approx. 15KΩ	Approx. 3.3V
	20°C(68°F)	Approx. 6.5KΩ	Approx. 2.7V
	80°C(176°F)	Approx. 0.9KΩ	Approx. 0.9V
ATF T/S 2	0°C(32°F)	Approx. 10.5KΩ	Approx. 3.3V
	20°C(68°F)	Approx. 4.3KΩ	Approx. 2.5V
	80°C(176°F)	Approx. 0.5KΩ	Approx. 0.7V

4. Is the measured voltage within specifications ?

YES	▸ Go to "Component Inspection" procedure.
NO	▸ Check for open or short in harness. And repair as necessary and then, go to "Verification of Vehicle Repair" procedure.

Component Inspection

■ Check TCM

1. Ignition "ON" & Engine "OFF".
2. Disconnect the "ATM Control Unit " connector.
3. Install GDS and slect a SIMU-SCAN,
4. Simulate voltage (0→5V) to "TRANSMISSION FLUID TEMPERATURE SENSOR 1, 2" signal circuit.

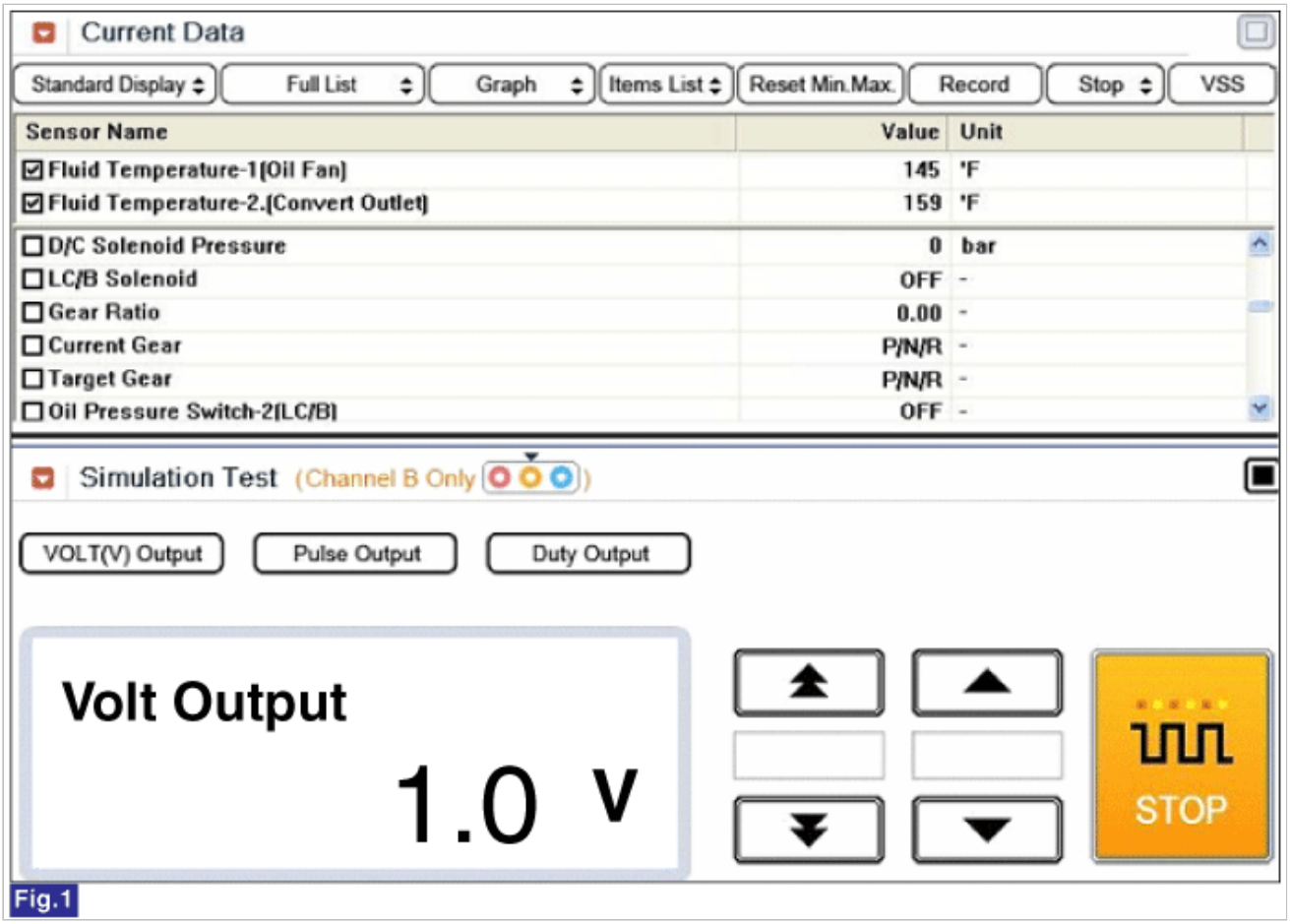


Fig.1

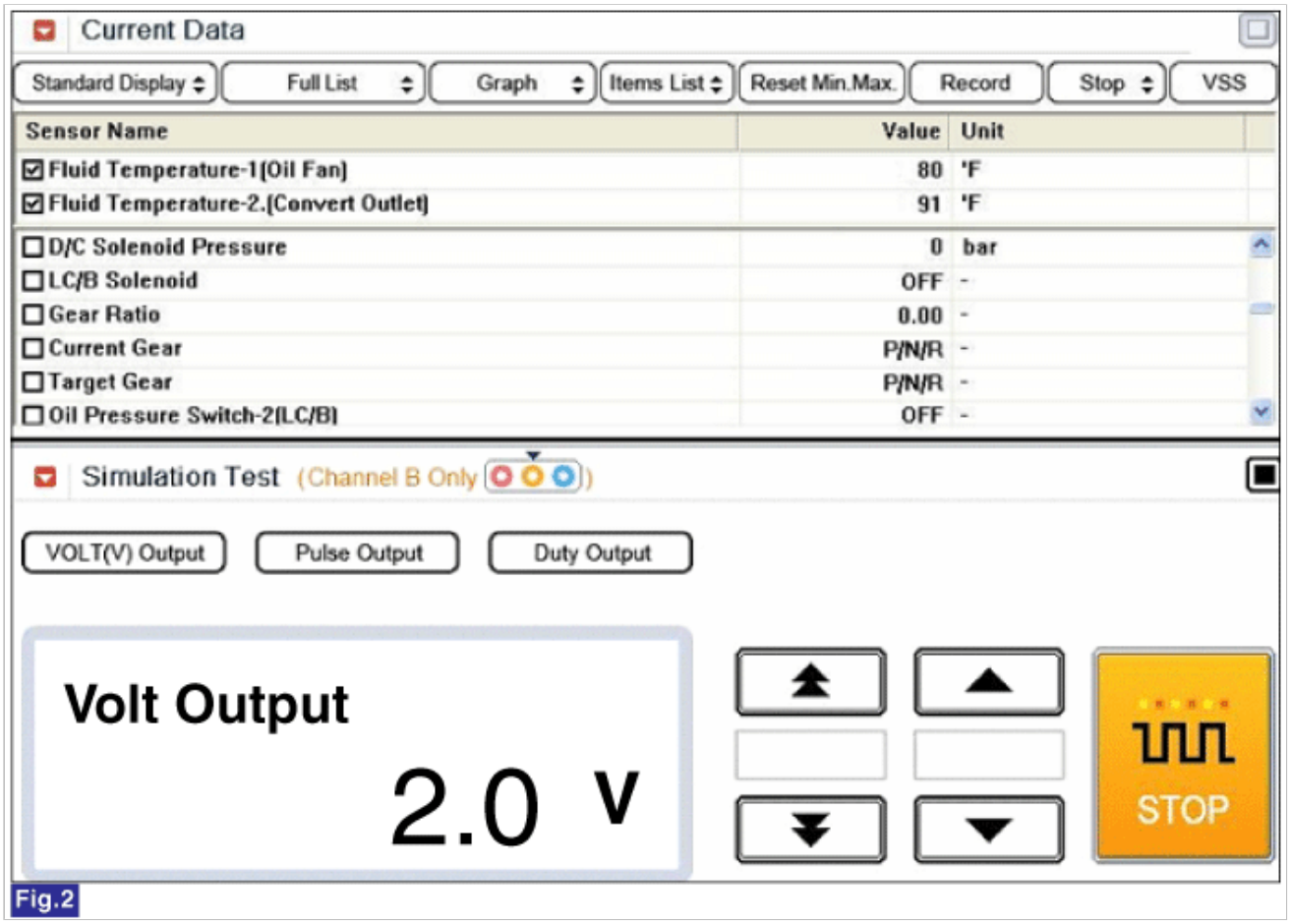


Fig 1) Simulation Output 1.00V → 145°F
Fig 2) Simulation Output 2.00V → 80°F
※ It is subject to change vehicle condition.

5. Is FLUID TEMP. SENSOR signal value changed according to simulation voltage?

YES	▸ Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.
NO	▸ Substitute with a known-good TCM and check for proper operation. If the problem is corrected, replace TCM as necessary and go to "Verification of Vehicle Repair" procedure.

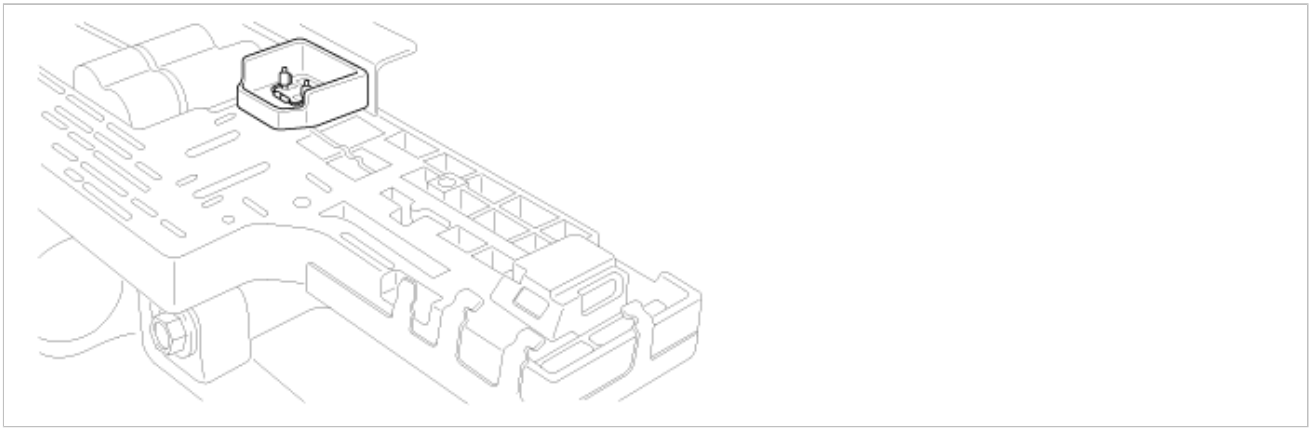
Verification of Vehicle Repair

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

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a GDS, 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.

Component Location



General Description

The automatic transmission fluid(ATF) temperature sensor A is installed in the INHIBITOR SWITCH and fluid(ATF) temperature sensor B is installed in the valve body. The TCM supplies a 5V reference voltage to the sensor, and the output voltage of the sensor changes when the ATF temperature varies.

DTC Description

This DTC is for checking sensor failure. This code is set if the temperture data from Oil Temperture sensor is fixed between -20°C and 0°C or 0°C and 20°C for 10min. after driving a vehicle.

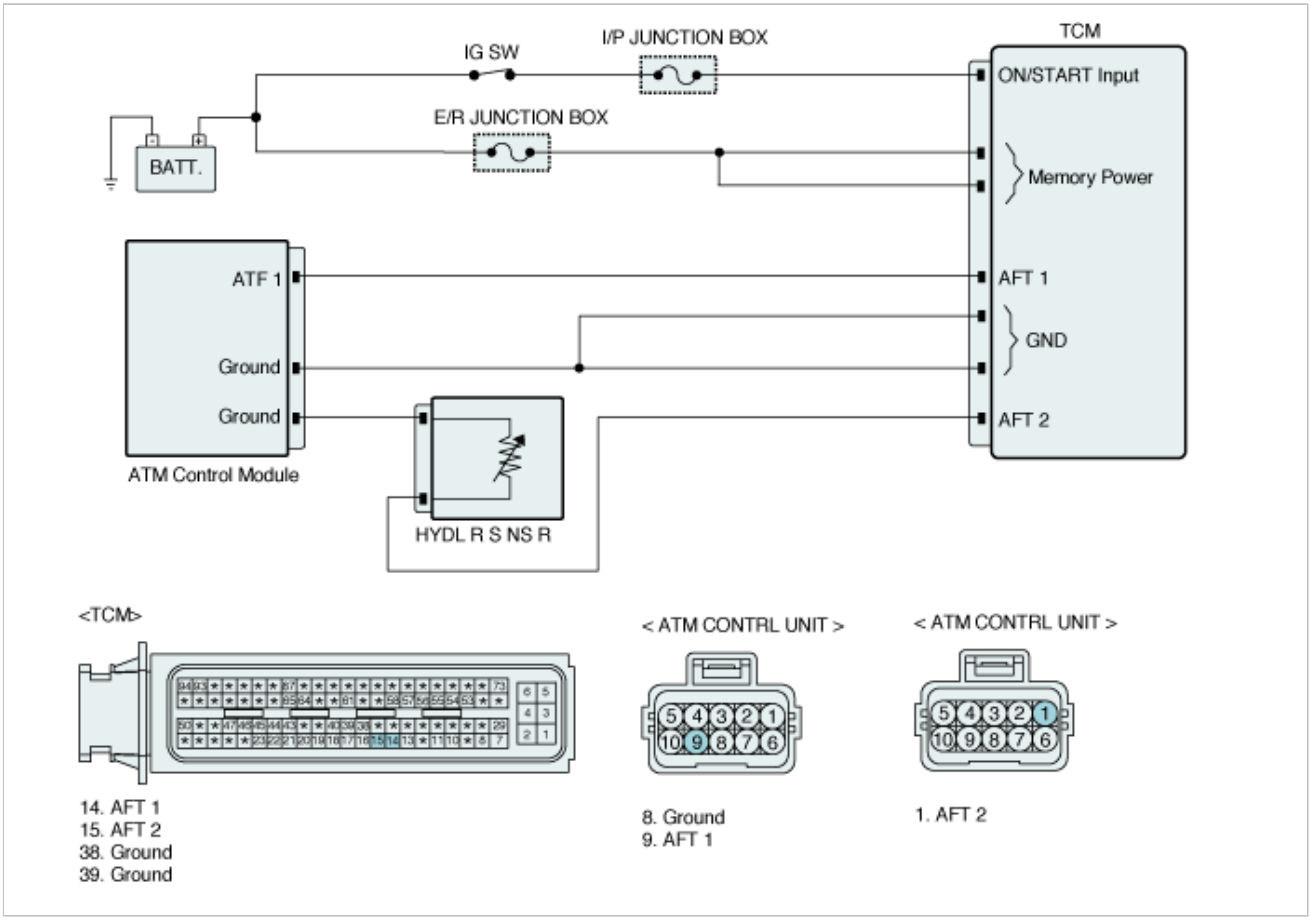
DTC Detectiong Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuty-ground	※ ATF T/S :Automatic Transmission Fluid Temperature Sensor • Open or Short to ground in circuit • Faulty ATF T/S 1 • TCM
Enable Conditions	• Battery voltage > 10V	
Threshold Value	• Oil temperature sensor voltage < 0.05V	
Diagnostic Time	• More thn 2 sec	
Fail Safe	• Fluid temperature is regarded as 80°C	

Specification

	Temperature(°C)	Resistance(KΩ)	Voltage(V)
ATF T/S 1	0°C(32°F)	Approx. 15KΩ	Approx. 3.3V
	20°C(68°F)	Approx. 6.5KΩ	Approx. 2.7V
	80°C(176°F)	Approx. 0.9KΩ	Approx. 0.9V
ATF T/S 2	0°C(32°F)	Approx. 10.5KΩ	Approx. 3.3V
	20°C(68°F)	Approx. 4.3KΩ	Approx. 2.5V
	80°C(176°F)	Approx. 0.5KΩ	Approx. 0.7V

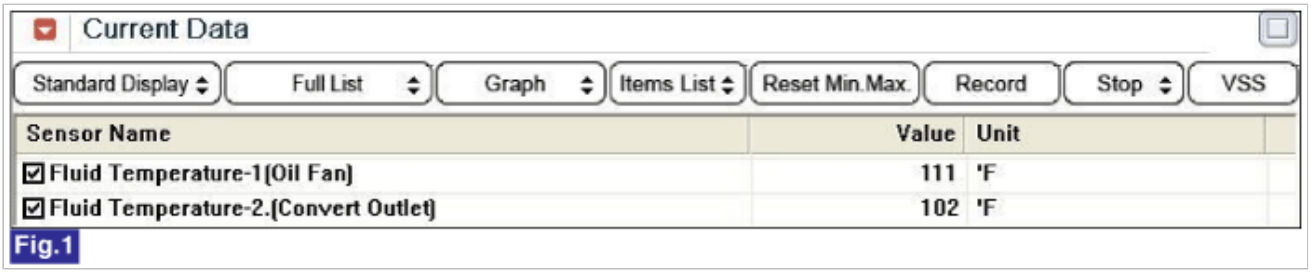
Diagnostic Circuit Diagram



Monitor GDS Data

1. Connect GDS to data link connector(DLC)
2. Engine "ON" .
3. Monitor the "TRANSAXLE FLUID TEMPERATURE SENSOR "1" parameter on the GDS.

Specification : Increasing Gradually



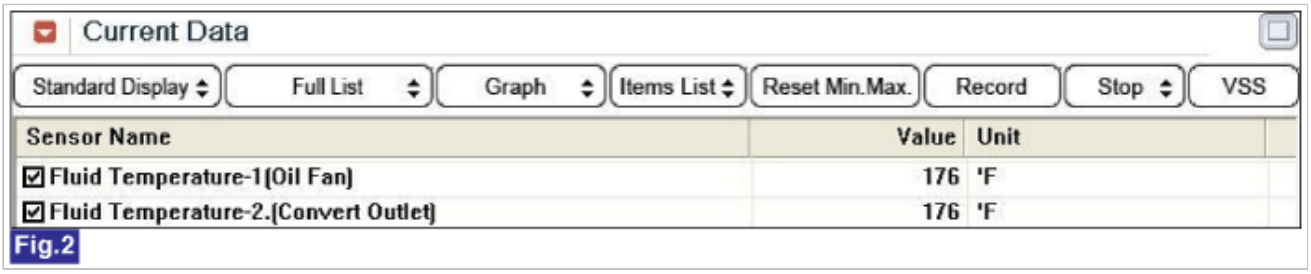


Fig 1) Normal Data
Fig 2) Open or short Data

4. Does "TRANSMISSION FLUID TEMPERATURE SENSOR " follow the reference data?

	▸ Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was

YES	repaired and PCM/TCM memory was not cleared. Throughly 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.
NO	▸ Go to "W/Harness Inspection" procedure.

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?

YES	▸ Repair as necessary and go to "verification of vehicle repair" procedure.
NO	▸ Go to "Signal circuit inspection" procedure.

Signal Circuit Inspection

1. Ignition "ON" & Engine "OFF".
2. Disconnect ATM Control Unit connector.
3. Measure voltage between signal terminal of AFT at the ATM Control Unit harness connector and chassis ground.

Specification : Refer to bleow table

[Inspection Table]

	Temperature(°C)	Resistance(KΩ)	Voltage(V)
ATF T/S 1	0°C(32°F)	Approx. 15KΩ	Approx. 3.3V
	20°C(68°F)	Approx. 6.5KΩ	Approx. 2.7V
	80°C(176°F)	Approx. 0.9KΩ	Approx. 0.9V
ATF T/S 2	0°C(32°F)	Approx. 10.5KΩ	Approx. 3.3V
	20°C(68°F)	Approx. 4.3KΩ	Approx. 2.5V
	80°C(176°F)	Approx. 0.5KΩ	Approx. 0.7V

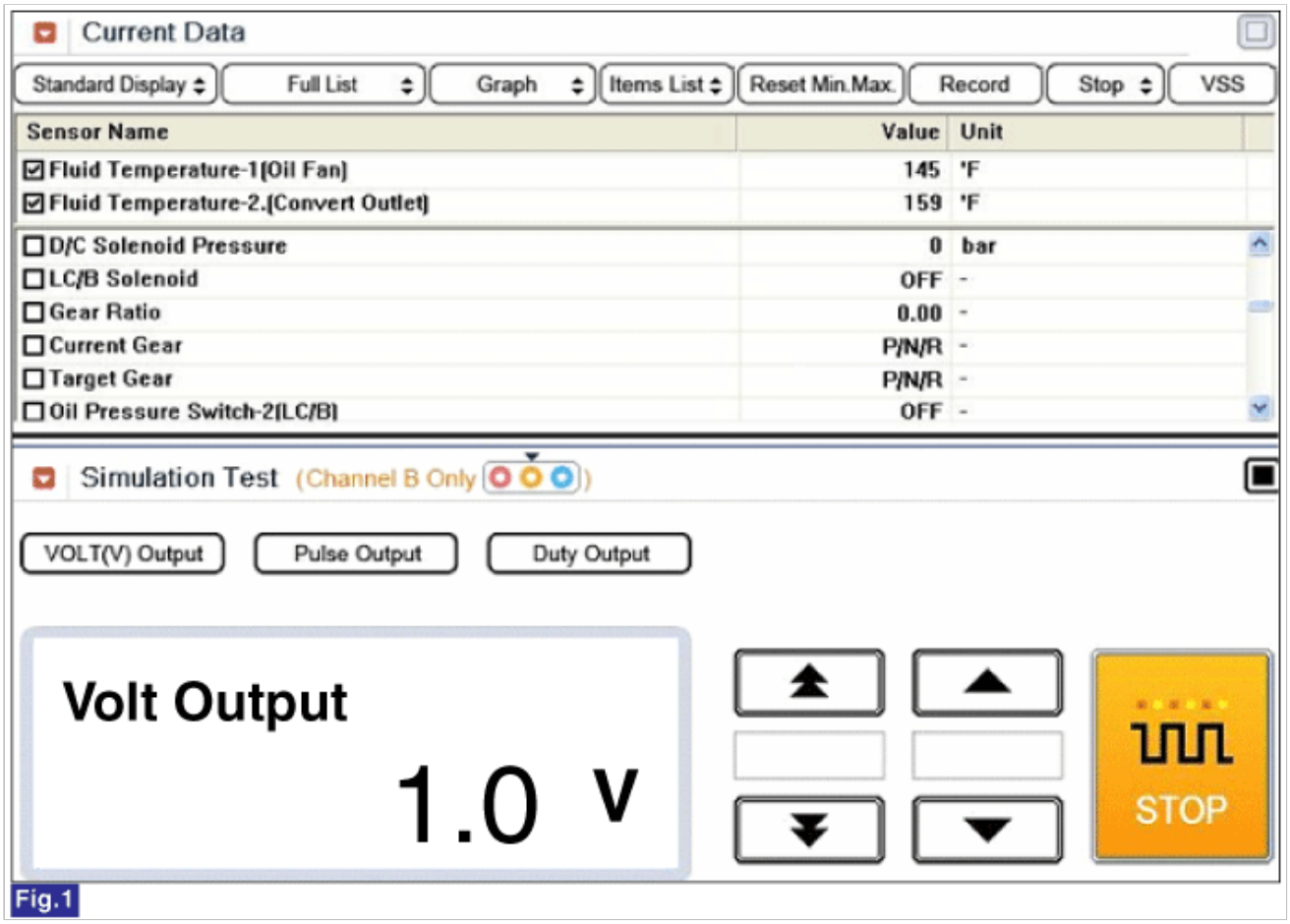
4. Is the measured voltage within specifications ?

YES	▸ Go to "Component Inspection" procedure.
NO	▸ Check for open or short in harness. And repair as necessary and then, go to "Verification of Vehicle Repair" procedure.

Component Inspection

■ Check TCM

1. Ignition "ON" & Engine "OFF".
2. Disconnect the "ATM Control Unit " connector.
3. Install GDS and slect a SIMU-SCAN,
4. Simulate voltage (0→5V) to "TRANSMISSION FLUID TEMPERATURE SENSOR 1, 2" signal circuit.


Current Data
Standard Display
Full List
Graph
Items List
Reset Min.Max.
Record
Stop
VSS
Sensor Name
Value
Unit
Fluid Temperature-1[Oil Fan]
145
'F
Fluid Temperature-2.[Convert Outlet]
159
'F
D/C Solenoid Pressure
0
bar
LC/B Solenoid
OFF
-
Gear Ratio
0.00
-
Current Gear
P/N/R
-
Target Gear
P/N/R
-
Oil Pressure Switch-2[LC/B]
OFF
-
Simulation Test
(Channel B Only
)
VOLT(V) Output
Pulse Output
Duty Output
Volt Output
1.0 v
STOP
Fig.1

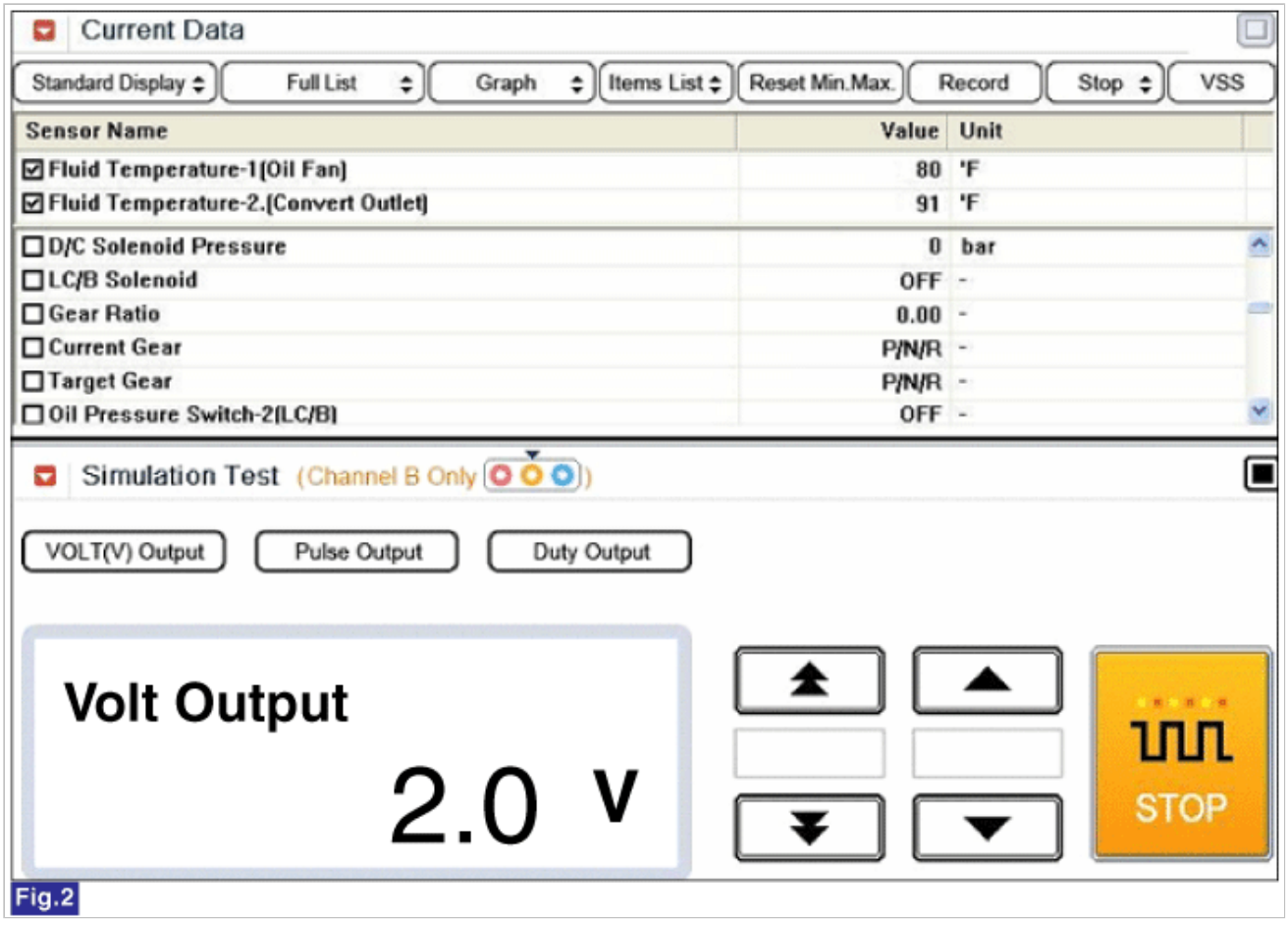

Current Data
Standard Display
Full List
Graph
Items List
Reset Min.Max.
Record
Stop
VSS
Sensor Name
Value
Unit
Fluid Temperature-1[Oil Fan]
80
'F
Fluid Temperature-2.[Convert Outlet]
91
'F
D/C Solenoid Pressure
0
bar
LC/B Solenoid
OFF
-
Gear Ratio
0.00
-
Current Gear
P/N/R
-
Target Gear
P/N/R
-
Oil Pressure Switch-2[LC/B]
OFF
-
Simulation Test
(Channel B Only
)
VOLT(V) Output
Pulse Output
Duty Output
Volt Output
2.0 v
STOP
Fig.2

Fig 1) Simulation Output 1.00V → 145°F
Fig 2) Simulation Output 2.00V → 80°F
※ It is subject to change vehicle condition.

5. Is FLUID TEMP. SENSOR signal value changed according to simulation voltage?

YES	▸ Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.
NO	▸ Substitute with a known-good TCM and check for proper operation. If the problem is corrected, replace TCM as necessary and go to "Verification of Vehicle Repair" procedure.

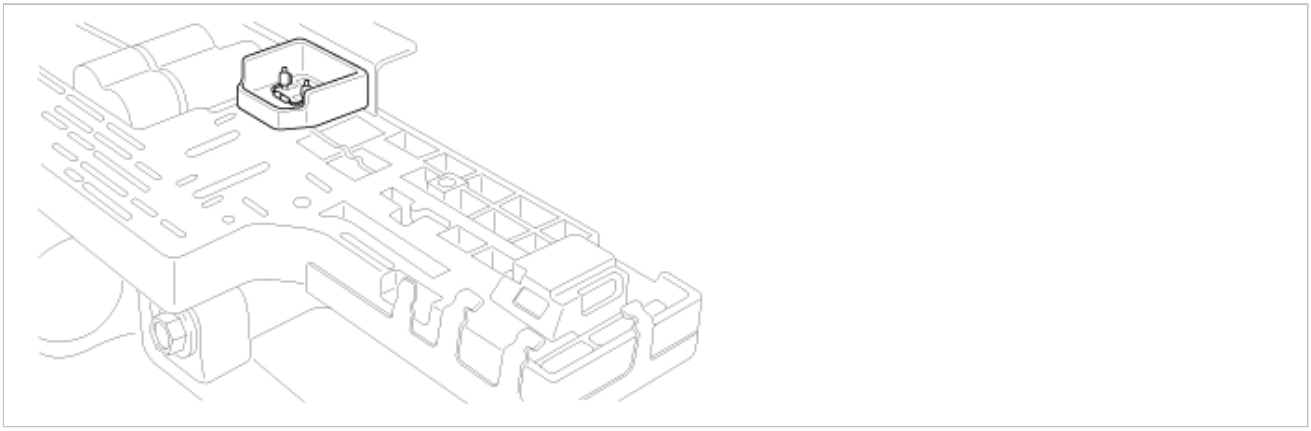
Verification of Vehicle Repair

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

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a GDS, 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.

Component Location



General Description

The automatic transmission fluid(ATF) temperature sensor A is installed in the INHIBITOR SWITCH and fluid(ATF) temperature sensor B is installed in the valve body. The TCM supplies a 5V reference voltage to the sensor, and the output voltage of the sensor changes when the ATF temperature varies.

DTC Description

This DTC is for checking sensor failure. This code is set if the temperture data from Oil Temperture sensor is fixed between -20℃ and 0℃ or 0℃ and 20℃ for 10min. after driving a vehicle.

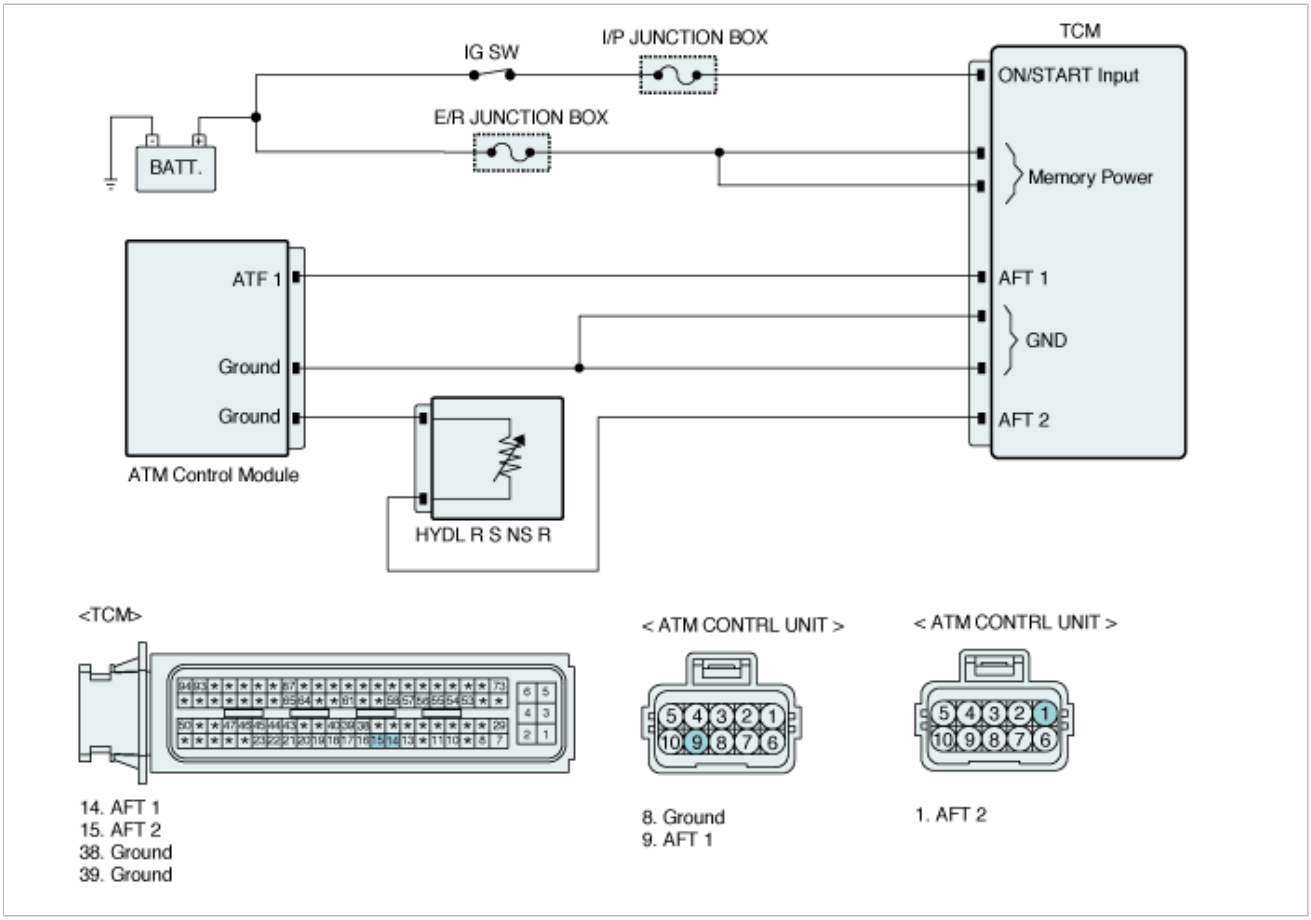
DTC Detectiong Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Check the voltage range	※ ATF T/S :Automatic Transmission Fluid Temperature Sensor • Open or shrot to battery in circuit • Faulty ATF T/S 1 • Faulty TCM
Enable Conditions	■ After IG ON • Battery Voltage > 10V • Oil temperature at IG On >= -38℃(100℉) ■ Before IG ON • Oil temperature at IG On ≤ -38℃(100℉) • Engien RPM > 1000rpm • Output Speed ≥ 500rpm • Delay Time = 350sec	
Threshold Value	• Sensor voltage > 4.8V (Short to battery) • 3.9V < Sensor voltage < 4.8V(Open)	
Diagnostic Time	• More than 2sec.	
Fail Safe	• Fluid temperature is regarded as 80℃	

Specification

	Temperature(°C)	Resistance(KΩ)	Voltage(V)
ATF T/S 1	0℃(32℉)	Approx. 15K Ω	Approx. 3.3V
	20℃(68℉)	Approx. 6.5K Ω	Approx. 2.7V
	80℃(176℉)	Approx. 0.8K Ω	Approx. 0.9V
ATF T/S 2	0℃(32℉)	Approx. 10.5K Ω	Approx. 3.3V
	20℃(68℉)	Approx. 4.3K Ω	Approx. 2.5V
	80℃(176℉)	Approx. 0.5K Ω	Approx. 0.7V

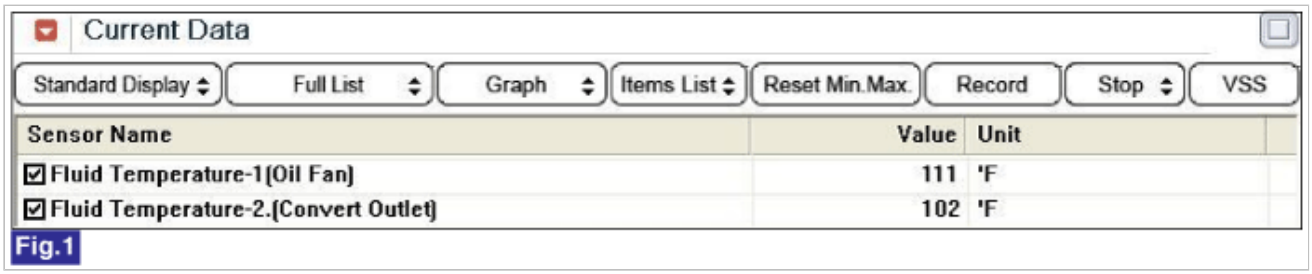
Diagnostic Circuit Diagram



Monitor GDS Data

1. Connect GDS to data link connector(DLC)
2. Engine "ON" .
3. Monitor the "TRANSAXLE FLUID TEMPERATURE SENSOR "1" parameter on the GDS.

Specification : Increasing Gradually



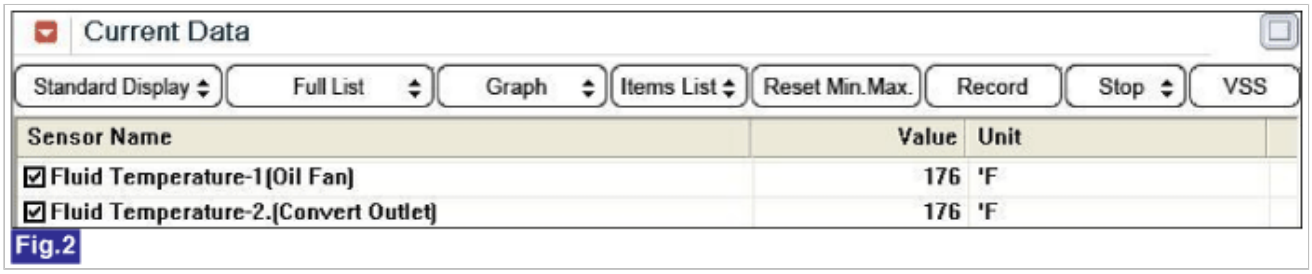


Fig 1) Normal Data
Fig 2) Open or short Data

4. Does "TRANSMISSION FLUID TEMPERATURE SENSOR " follow the reference data?

YES	▸ 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. Throughly 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.
NO	▸ Go to "W/Harness Inspection" procedure.

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?

YES	▸ Repair as necessary and go to "verification of vehicle repair" procedure.
NO	▸ Go to "Signal circuit inspection" procedure.

Signal Circuit Inspection

1. Ignition "ON" & Engine "OFF".
2. Disconnect ATM Control Unit connector.
3. Measure voltage between signal terminal of AFT at the ATM Control Unit harness connector and chassis ground.

Specification : Refer to bleow table

[Inspection Table]

	Temperature(°C)	Resistance(KΩ)	Voltage(V)
ATF T/S 1	0℃(32℉)	Approx. 15K Ω	Approx. 3.3V
	20℃(68℉)	Approx. 6.5K Ω	Approx. 2.7V
	80℃(176℉)	Approx. 0.8K Ω	Approx. 0.9V
ATF T/S 2	0℃(32℉)	Approx. 10.5K Ω	Approx. 3.3V
	20℃(68℉)	Approx. 4.3K Ω	Approx. 2.5V
	80℃(176℉)	Approx. 0.5K Ω	Approx. 0.7V

4. Is the measured voltage within specifications ?

YES	▸ Go to "Ground Circuit Inspection" procedure
NO	▸ Check for open or short in harness. And repair as necessary and then, go to "Verification of Vehicle Repair" procedure.

Ground Circuit Inspection

1. Ignition "OFF" & Engine "OFF".
2. Disconnect ATM Control Unit connector.
3. Measure continuity between signal terminal of AFT1 harness connector and chassis ground.

Specification : Continuity

4. Is the measured resistance within specifications?

YES	▸ Go to "CHECK PCM/TCM " as below.

NO	▸ Check for open in harness. Repair as necessary and Go to "verification of vehicle repair" procedure. ▸ Replace "TRANSMISSION FLUID TEMPERATURE SENSOR 1" as necessary and Go to "verification of vehicle repair" procedure.

Component Inspection

■ Check TCM

1. Ignition "ON" & Engine "OFF".
2. Disconnect the "ATM Control Unit " connector.
3. Install GDS and slect a SIMU-SCAN,
4. Simulate voltage (0→5V) to "TRANSMISSION FLUID TEMPERATURE SENSOR 1, 2" signal circuit.

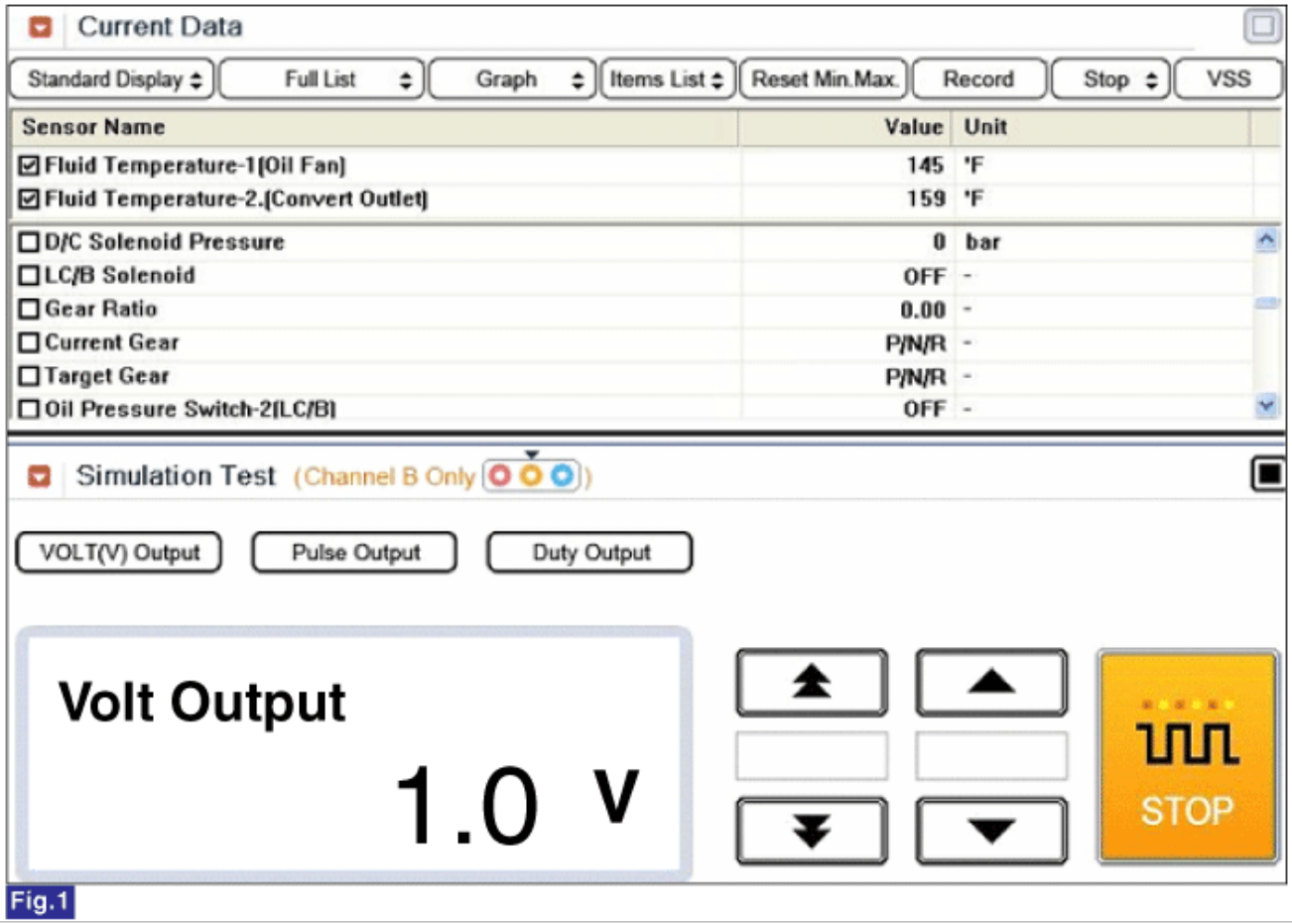


Fig.1

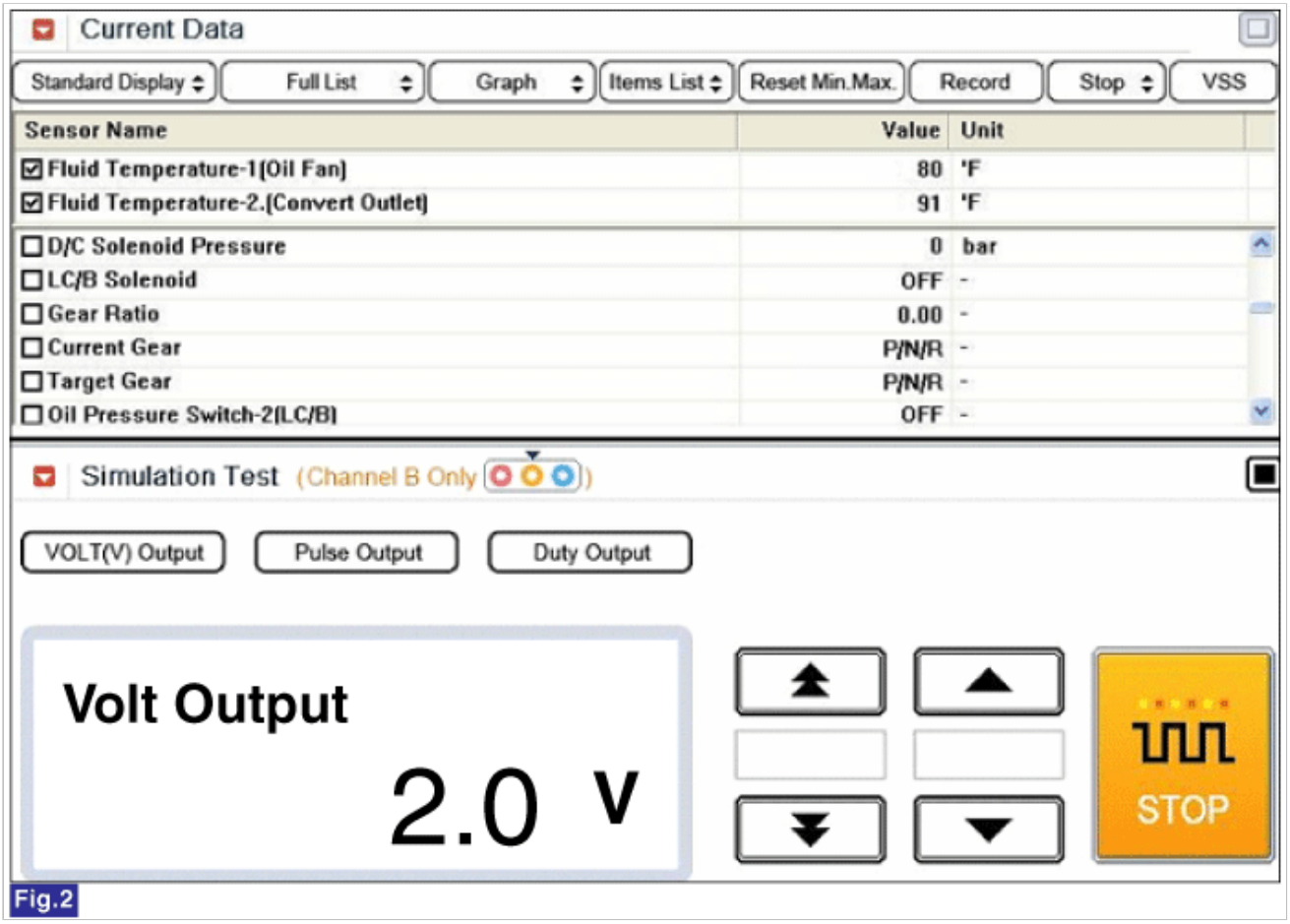


Fig 1) Simulation Output 1.00V → 145℉
Fig 2) Simulation Output 2.00V → 80℉
※ It is subject to change vehicle condition.

5. Is FLUID TEMP. SENSOR signal value changed according to simulation voltage?

YES	▸ Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.
NO	▸ Substitute with a known-good TCM and check for proper operation. If the problem is corrected, replace TCM as necessary and go to "Verification of Vehicle Repair" procedure.

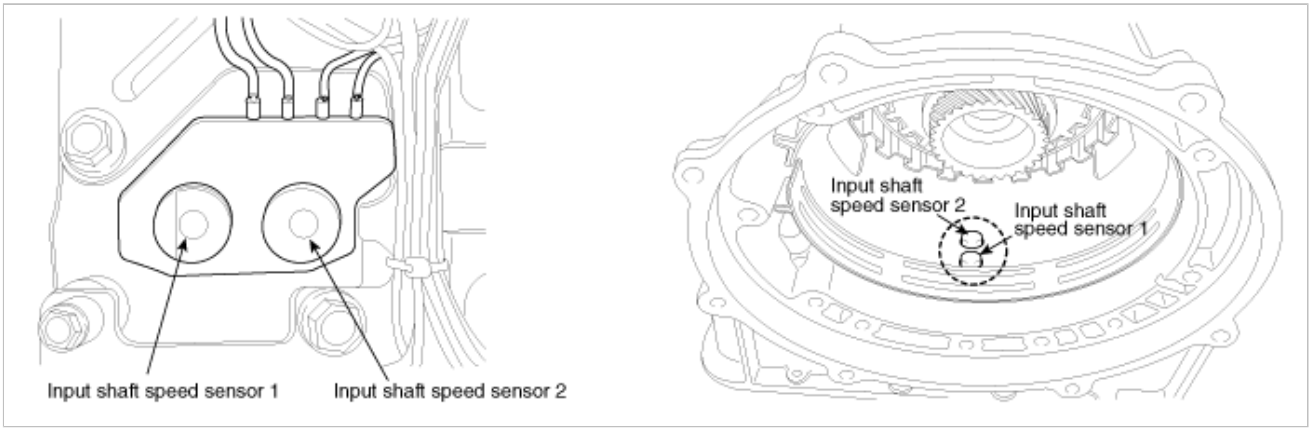
Verification of Vehicle Repair

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

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a GDS, 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.

Component Location



General Description

The Input Sensor of RXC Auto transmission is composed of S1(Sensor1) and S2(Sensor2). S1 inputs signal to TCM only at 4th gear and S2 does at 1st, 2nd, 3rd, 4th and 5th gear.
Therefore, sensing pulse frequency outputted from sensor 2, TCM calculates Inputshaft speed and compute Turbine rotation.. This value is mainly used to control the optimum fluid pressure during shifting.

DTC Description

The TCM sets this code if an output pulse-signal is not detected, from the INPUT SPEED SENSOR 1 or 2, when the vehicle is running faster than 24.85MPH(40km/h). The Fail-Safe function will be set by the TCM if this code is detected.

DTC Detecting Condition

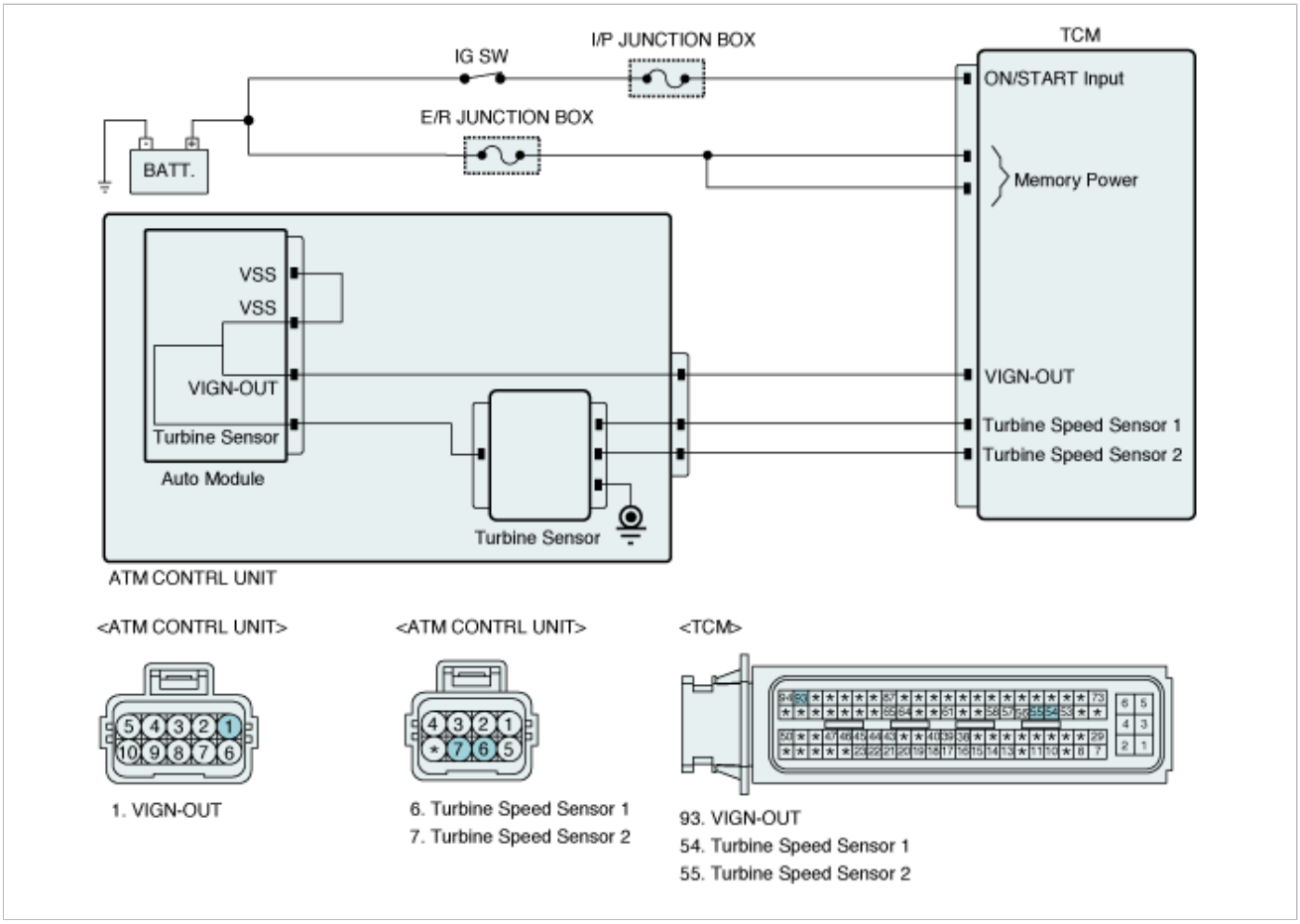
Item		Detecting Condition	Possible Cause
DTC Strategy		• Speed range & Rationality	
Enable Conditions	Case 1(Too High)	• Battery Voltage >10V	• Open or short in signal circuit • Open in power circuit • Open in ground ircuit • Faulty input speed sensor 1or 2 • Faulty TCM
	Case 2 (Rationality)	• Battery Voltage >10V • The time after the last shift was finished > 500msec. • Output Speed > 200RPM • Engine Speed > 700RPM	
Threshold Value	Case 1(Too High)	• Input speed 1 >= 10000rpm or Input speed 2 >= 10000rpm	
	Case 2 (Rationality)	• Input speed 1(1,2,3,5th gear) > 100rpm	
Diagnostic Time		• More than 2sec.	
Fail Safe		• Nt(Turbine speed 1) : fixed as 600rpm • Sports mode Inhibition • 5th gear Shifting Inhibition • Inhibition of pressure adaptation • Torque Conveter Clutch : OFF	

Specification

NAME	T01-3 PIN No.	Measurement Condition	Spec.
Turbine Sensor 1	6	• 1st gear • 20km/h • IDLE S/W OFF	

Turbine Sensor 2	7	• 4th gear • 50km/h • IDLE S/W OFF	Approx. 1.1K(Hz)

Diagnostic Circuit Diagram



Signal Waveform & Data

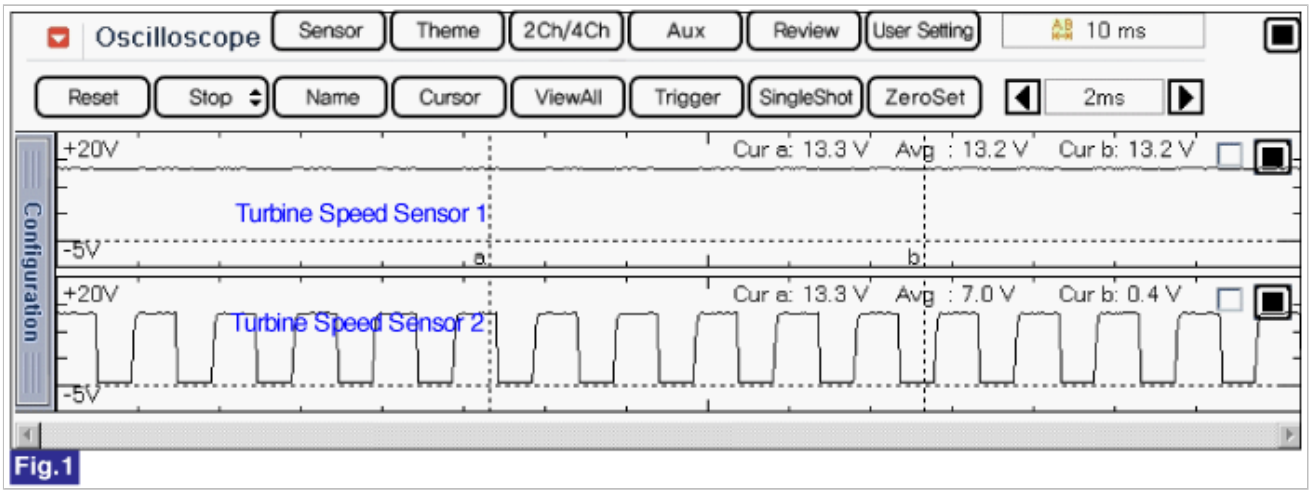


Fig.1

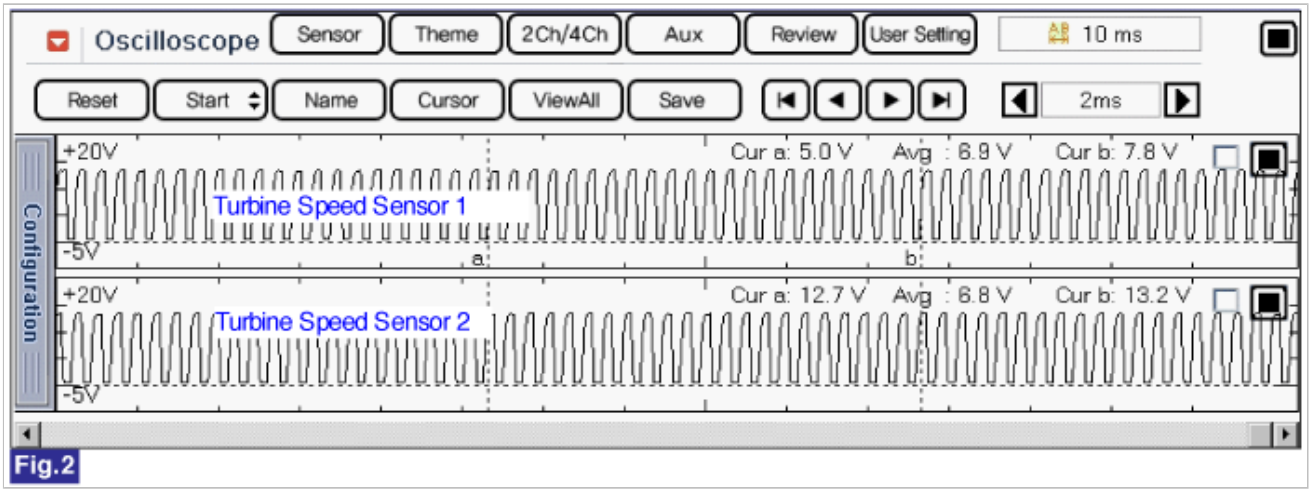
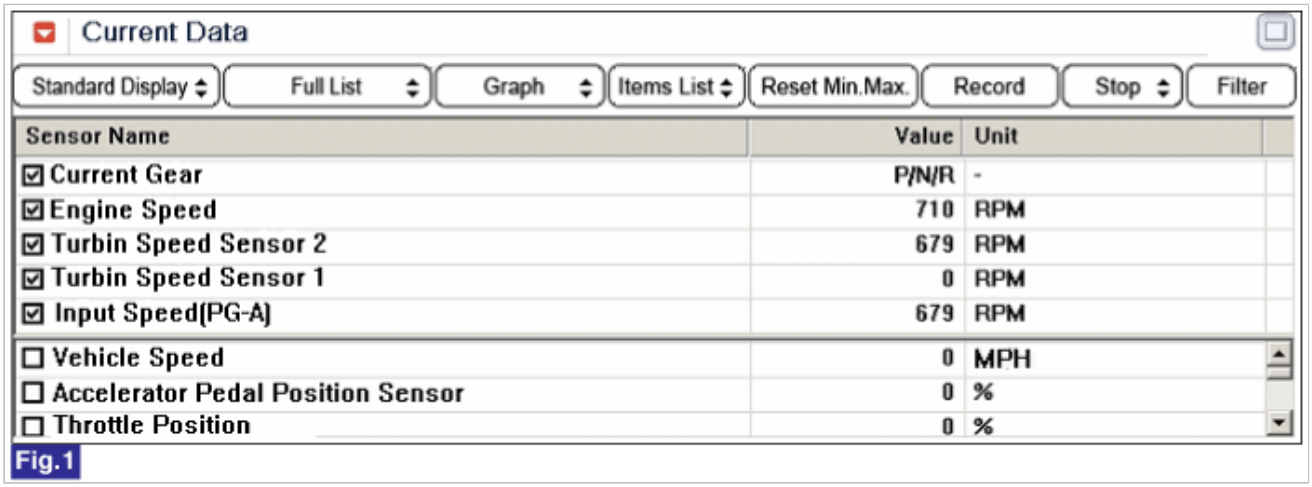


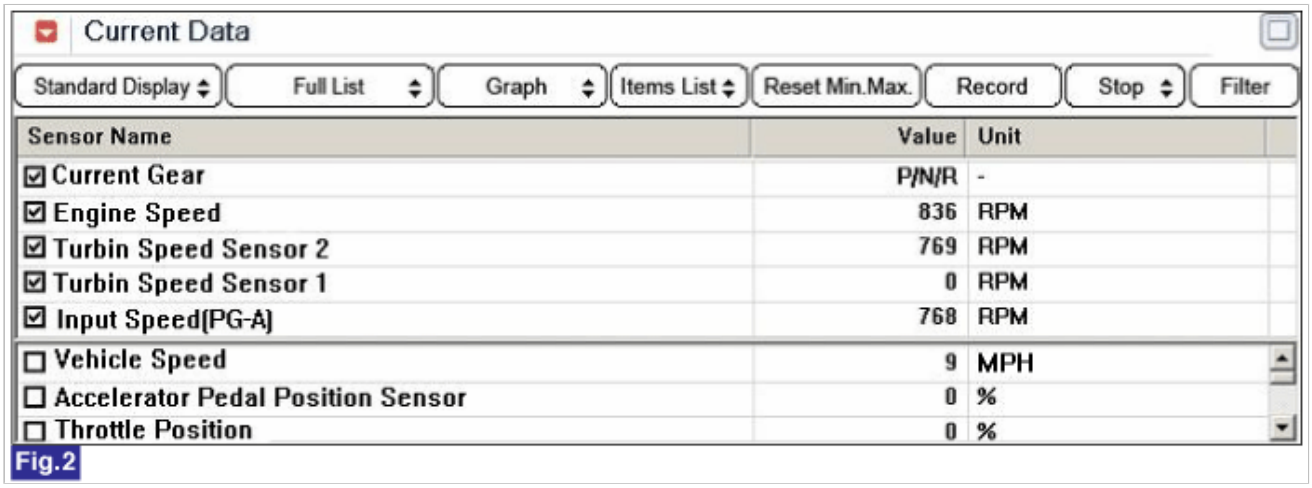
Fig 1) 1st gear in D range
Fig 2) 4th gear in D range

Monitor GDS Data

1. Connect GDS to data link connector(DLC)
2. Engine "ON" .
3. Monitor the "INPUT SPEED SENSOR 1" parameter on the GDS.
4. Drive the vehicle over 40 Km/h.

Specification : Increasing Gradually





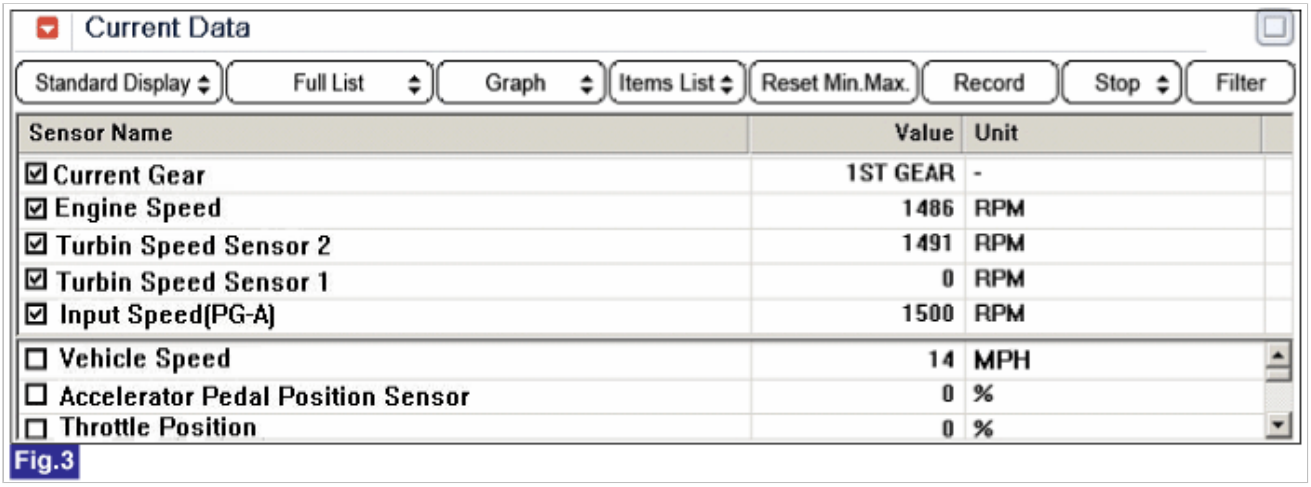


Fig.3

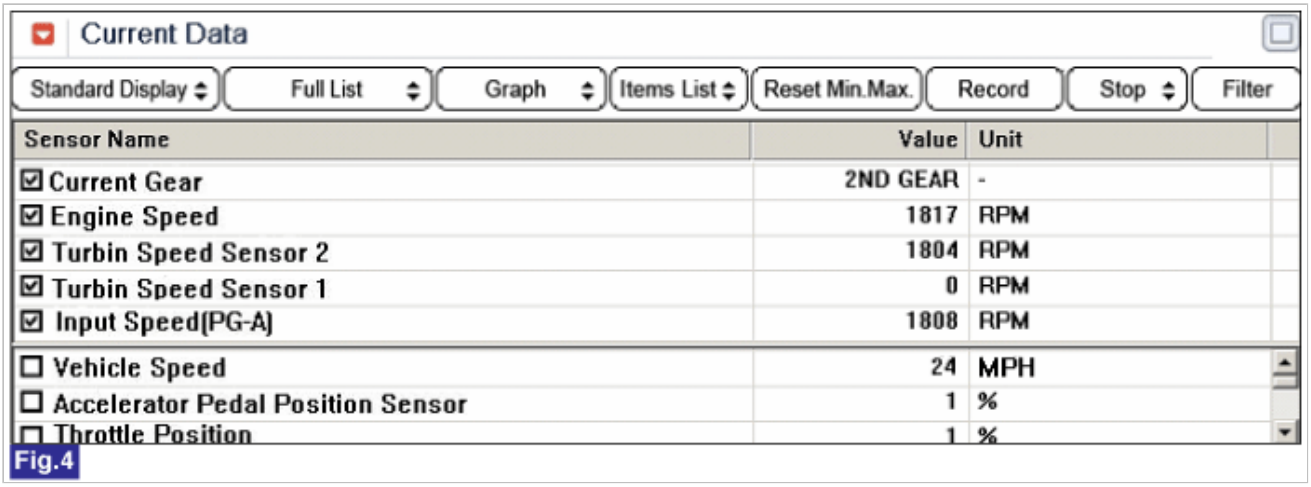


Fig.4

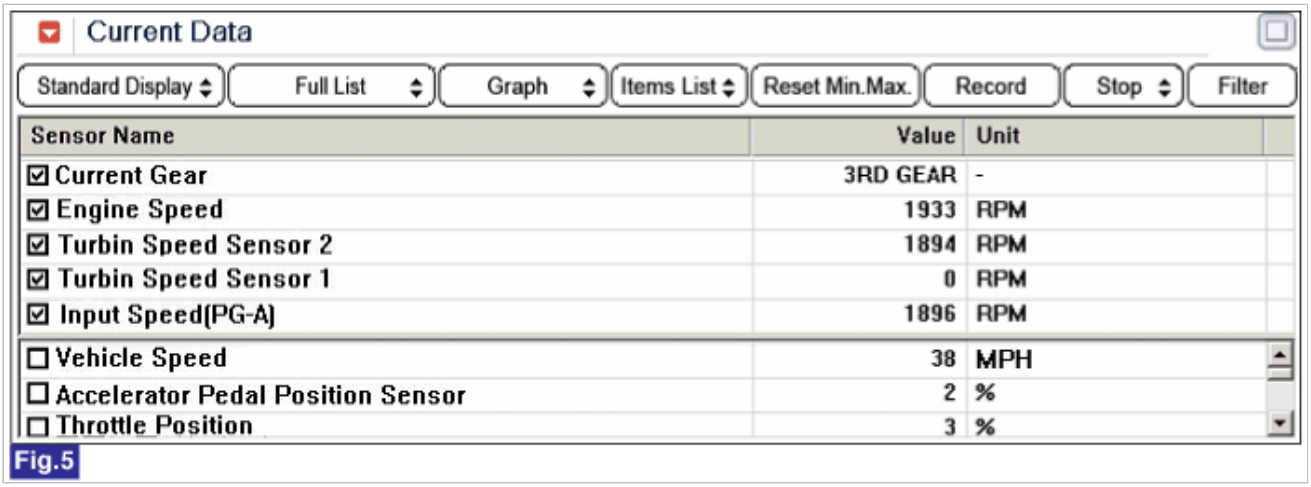


Fig.5

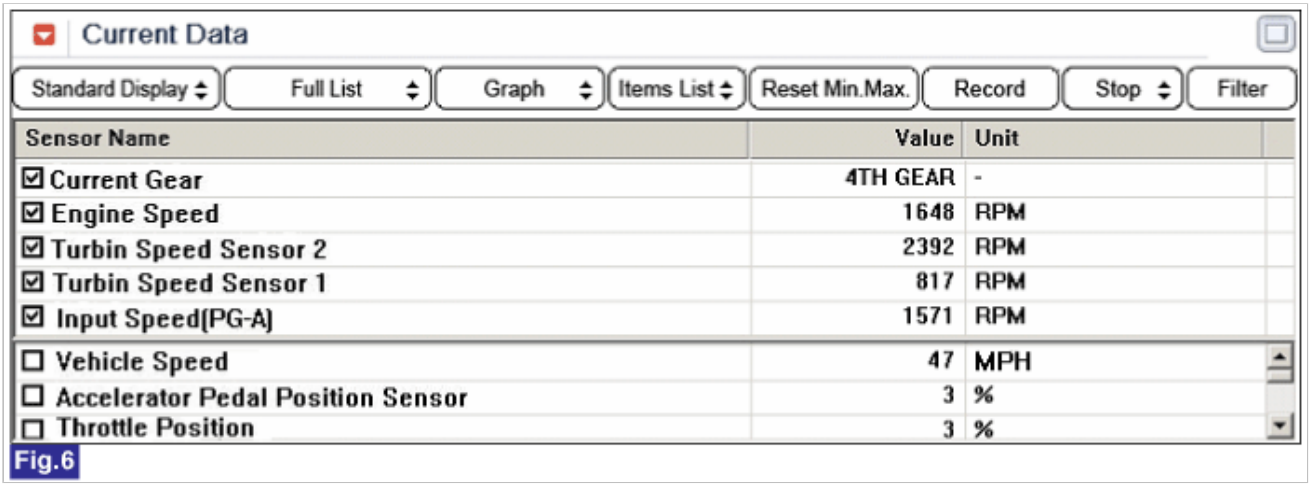


Fig.6

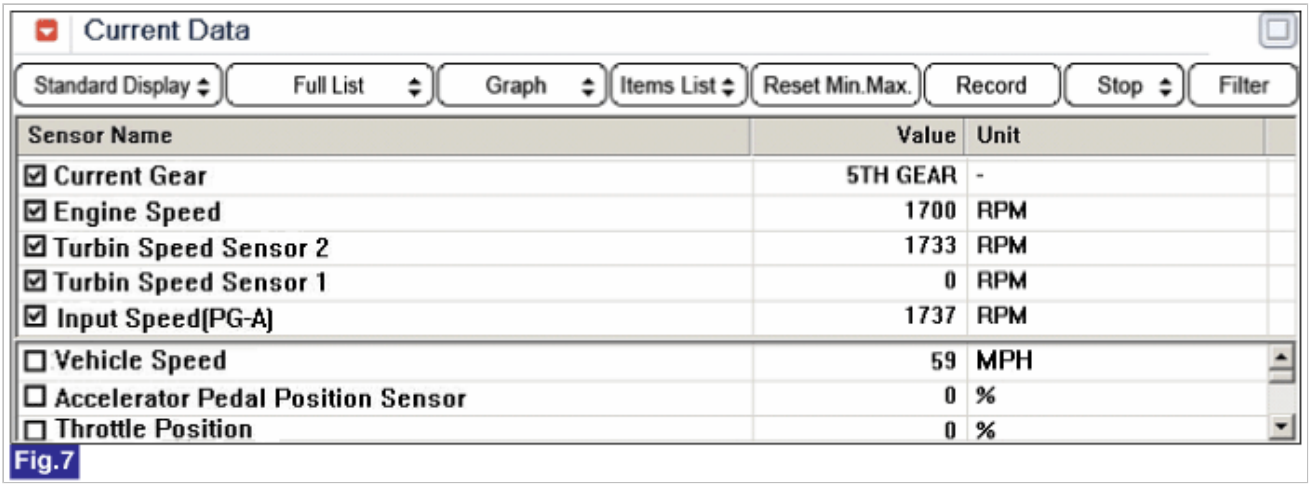


Fig.7

Fig 1) "P,N" range
Fig 2) "R" range
Fig 3) "D" range 1st gear
Fig 4) "D" range 2nd gear
Fig 5) "D" range 3rd gear
Fig 6) "D" range 4th gear
Fig 7) "D" range 5th gear

5. Does "INPUT SPEED SENSOR " follow the reference data?

YES	▸ 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. Throughly 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.
NO	▸ Go to "W/Harness Inspection" procedure.

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?

YES	▸ Repair as necessary and go to "verification of vehicle repair" procedure.
NO	▸ Go to "Signal circuit inspection" procedure.

Signal Circuit Inspection

1. Ignition "ON" & Engine "OFF".
2. Disconnect "ATM Control Unit connector.
3. Measure voltage between signal terminal of TCM harness connector and chassis ground.

Specification : Approx. 12V

4. Is the measured voltage within specifications?

YES	▸ Go to "Ground circuit Inspection" procedure.
NO	▸ Check for open or short in harness. Repair as necessary and Go to "verification of vehicle repair" procedure. ▸ If signal circuit in harness is OK, Go to "Check TCM" of the "Component Inspection" procedure.

Ground Circuit Inspection

1. Ignition "OFF".
2. Disconnect ATM Control Unit connector.
3. Remove the "OIL PAN" from the vehicle.
4. Measure continuity between ground terminal of Turbine sensor and chassis ground.

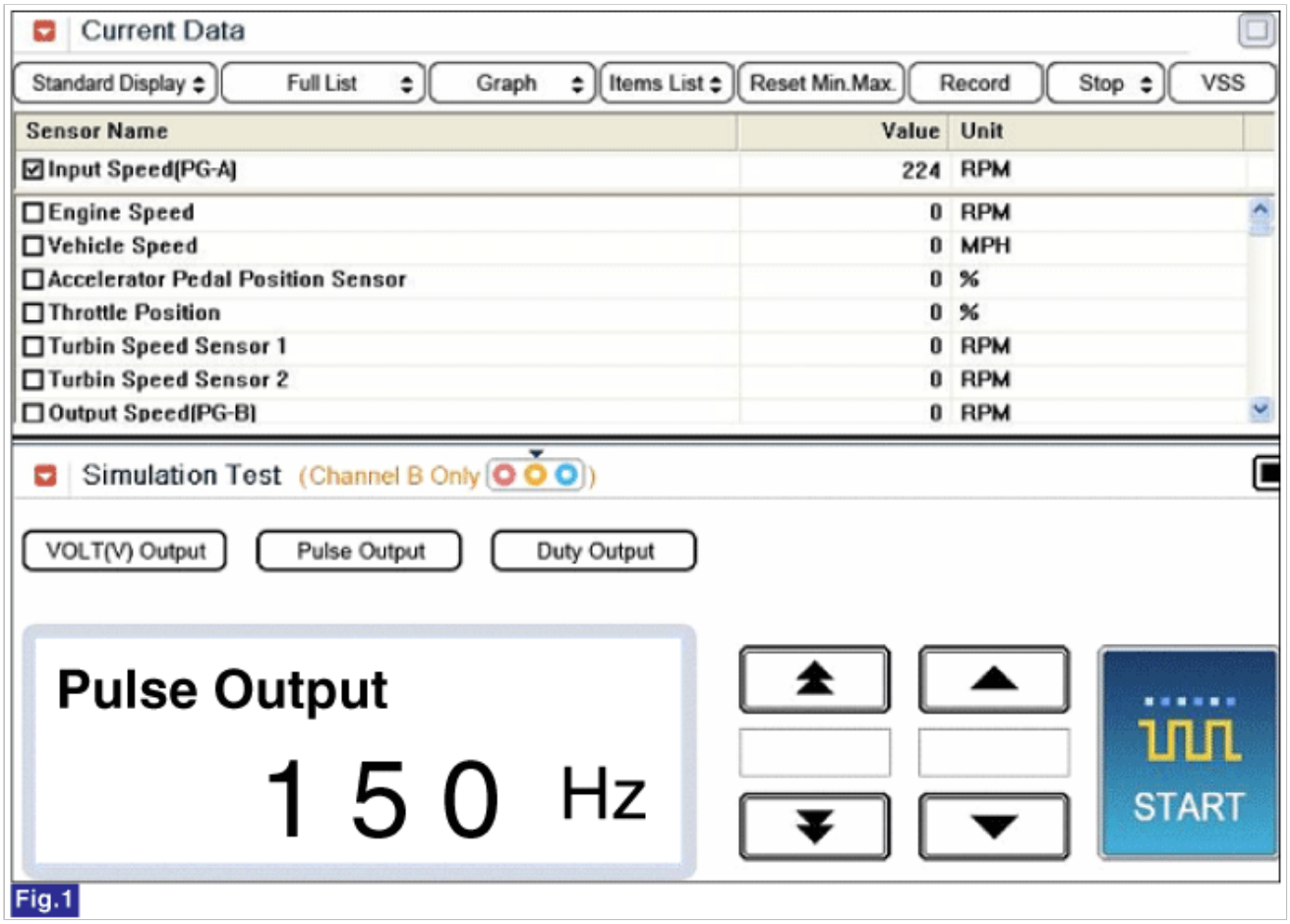
Specification : Continuity

5. Is the measured resistance within specifications ?

YES	▸ Go to "Component inspection" procedure.
NO	▸ Check for open in harness. Repair as necessary and Go to "verification of vehicle repair" procedure.

Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Disconnect "ATM Control Unit(CLG01-C)" connector.
3. Connect GDS and select 'Simulation Function"on the scanner.
4. Simulate duty pulse on signal terminal of "Input Speed Sensor 2" with scanner.
   ※ In a case of Input Speed Sensor 1, it is impossible to execute the simulation function.


Current Data
Standard Display
Full List
Graph
Items List
Reset Min.Max.
Record
Stop
VSS
Sensor Name
Value
Unit
Input Speed(PG-A) 224 RPM
Engine Speed 0 RPM
Vehicle Speed 0 MPH
Accelerator Pedal Position Sensor 0 %
Throttle Position 0 %
Turbin Speed Sensor 1 0 RPM
Turbin Speed Sensor 2 0 RPM
Output Speed(PG-B) 0 RPM
Simulation Test (Channel B Only)
VOLT(V) Output
Pulse Output
Duty Output
Pulse Output
150 Hz
START
Fig.1

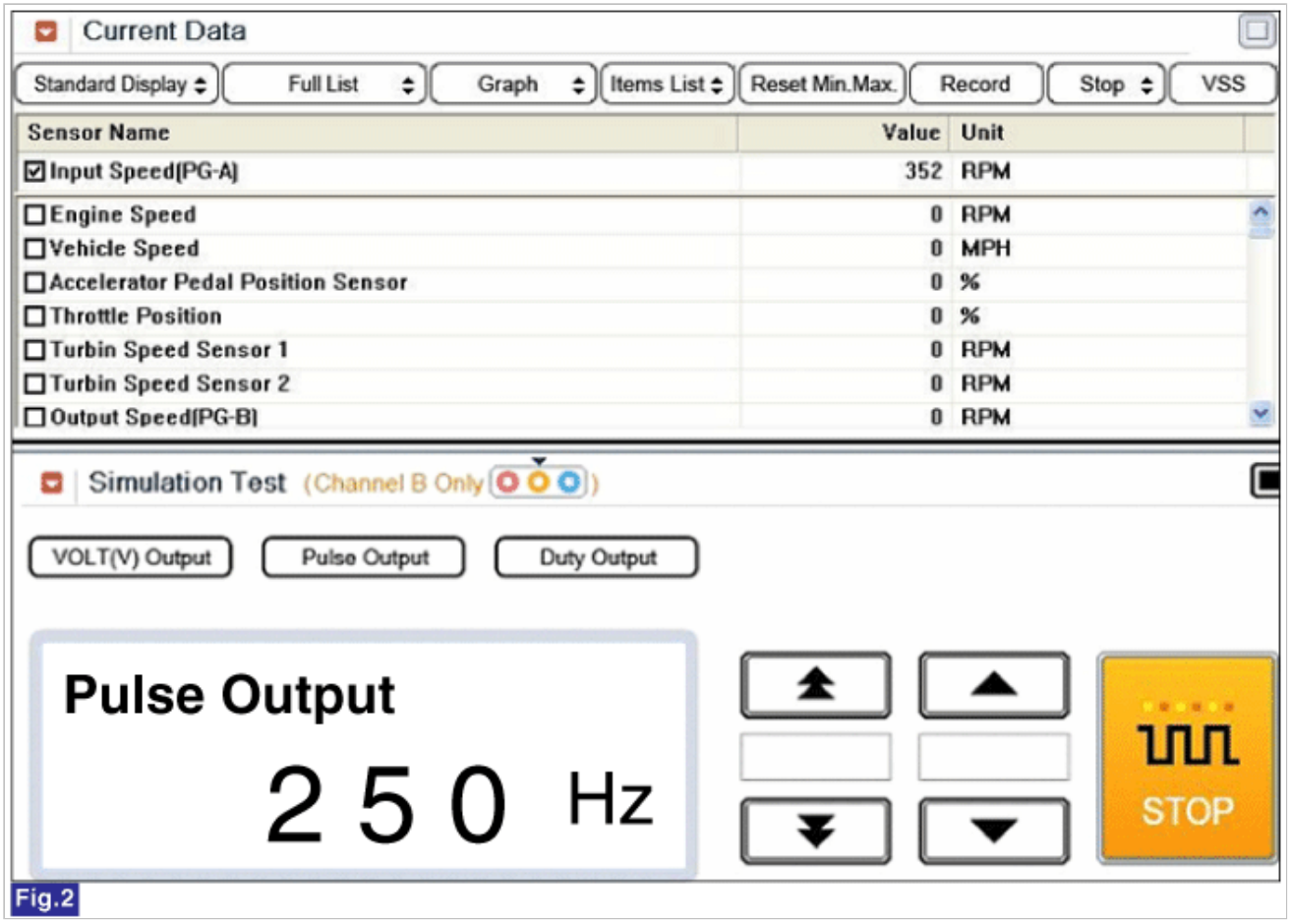

Current Data
Standard Display
Full List
Graph
Items List
Reset Min.Max.
Record
Stop
VSS
Sensor Name
Value
Unit
Input Speed(PG-A) 352 RPM
Engine Speed 0 RPM
Vehicle Speed 0 MPH
Accelerator Pedal Position Sensor 0 %
Throttle Position 0 %
Turbin Speed Sensor 1 0 RPM
Turbin Speed Sensor 2 0 RPM
Output Speed(PG-B) 0 RPM
Simulation Test (Channel B Only)
VOLT(V) Output
Pulse Output
Duty Output
Pulse Output
250 Hz
STOP
Fig.2

Fig 1) 150Hz Output → 224rpm
Fig 2) 250Hz Output → 352rpm
※ The values are subject to change according to vehicle model or conditions

5. Is "Input Speed Sensor 1& 2" signal value changed according to simulation frequency?

YES	▸ Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.
NO	▸ Substitute with a known-good TCM and check for proper operation. If the problem is corrected, replace TCM as necessary and go to "Verification of Vehicle Repair" procedure.

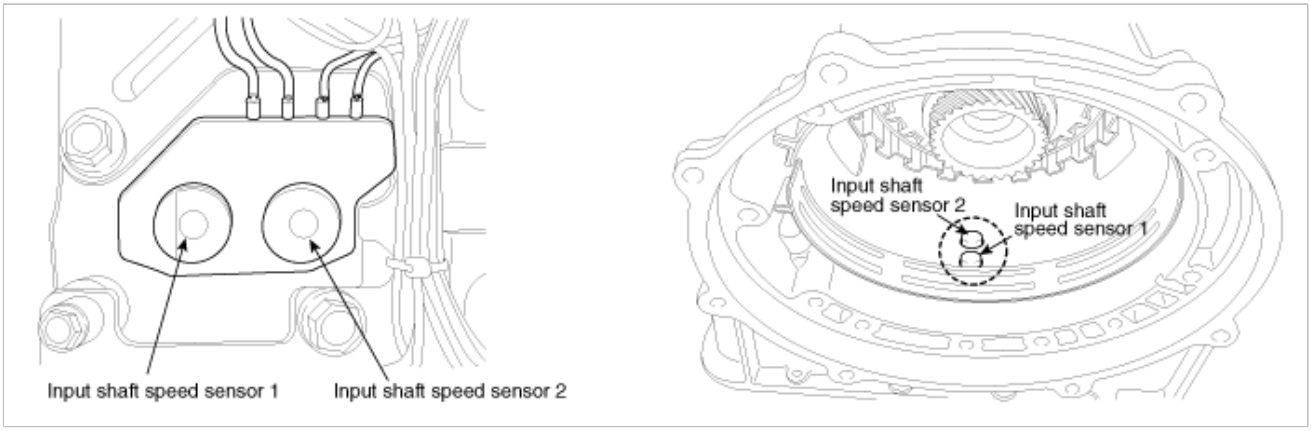
Verification of Vehicle Repair

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

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a GDS, 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.

Component Location



General Description

The Input Sensor of RX Auto transmission is composed of S1(Sensor1) and S2(Sensor2). S1 inputs signal to TCM only at 4th gear and S2 does at 1st, 2nd, 3rd, 4th and 5th gear.
Therefore, sensing pulse frequency outputted from sensor 2, TCM calculates Inputshaft speed and compute Turbine rotation.. This value is mainly used to control the optimum fluid pressure during shifting.

DTC Description

The TCM sets this code if an output pulse-signal is not detected, from the INPUT SPEED SENSOR 1 or 2, when the vehicle is running faster than 40km/h. The Fail-Safe function will be set by the TCM if this code is detected.

DTC Detectiong Condition

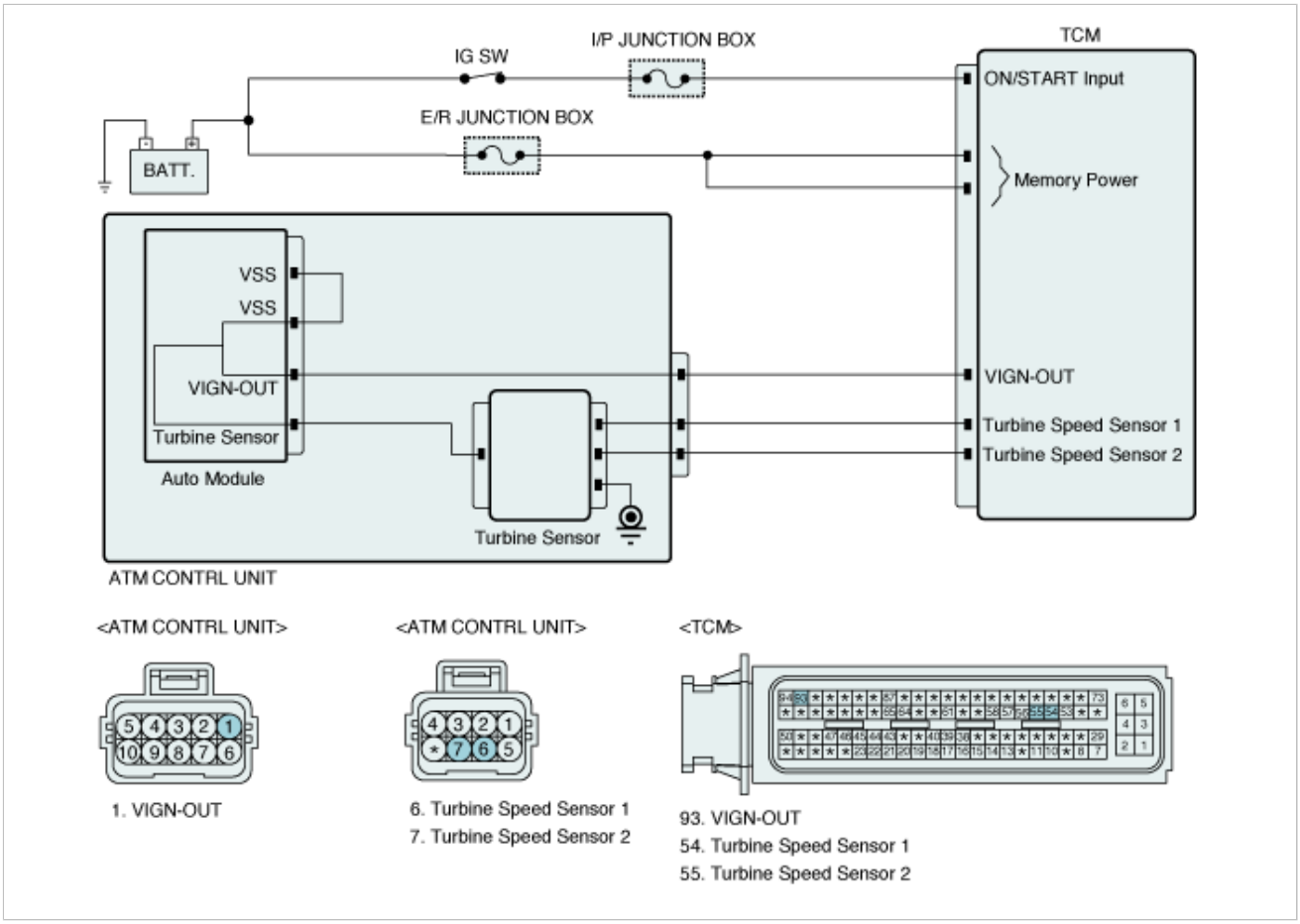
Item	Detecting Condition	Possible Cause
DTC Strategy	• Lack of circuit Continuity	• Open or shrot in signal circuit • Open in power circuit • Open in ground circuit • Faulty Input speed sensor 1. 2 • Faulty TCM
Enable Conditions	• Battery Voltage > 10V • Output Speed Sensor >1000rpm • Engine RPM(1st gear) >3000 rpm • Engine RPM (2.3.4.5th gear) >700 rpm • Position Lever D, B, L	
Threshold Value	• Input speed2(1, 2, 3, 4, 5Gear) Input speed1(4th Gear) Input Speed 1 ≤ 100rpm	
Diagnostic Time	• More than 2sec.	
Fail Safe	• Nt(Turbine speed 1) : fixed as 600rpm • Sports mode Inhibition • 5th gear Shifting Inhibition • Inhibition of pressure adaptation • Torque Conveter Clutch : OFF	

Specification

NAME	T01-3 PIN No.	Measurement Condition	Spec.
Turbine Sensor 1	6	• 1st gear • 20km/h • IDLE S/W OFF	Approx. 1.1K(Hz)
Turbine Sensor 2	7	• 4th gear • 50km/h	

		• IDLE S/W OFF	

Diagnostic Circuit Diagram



Signal Waveform & Data

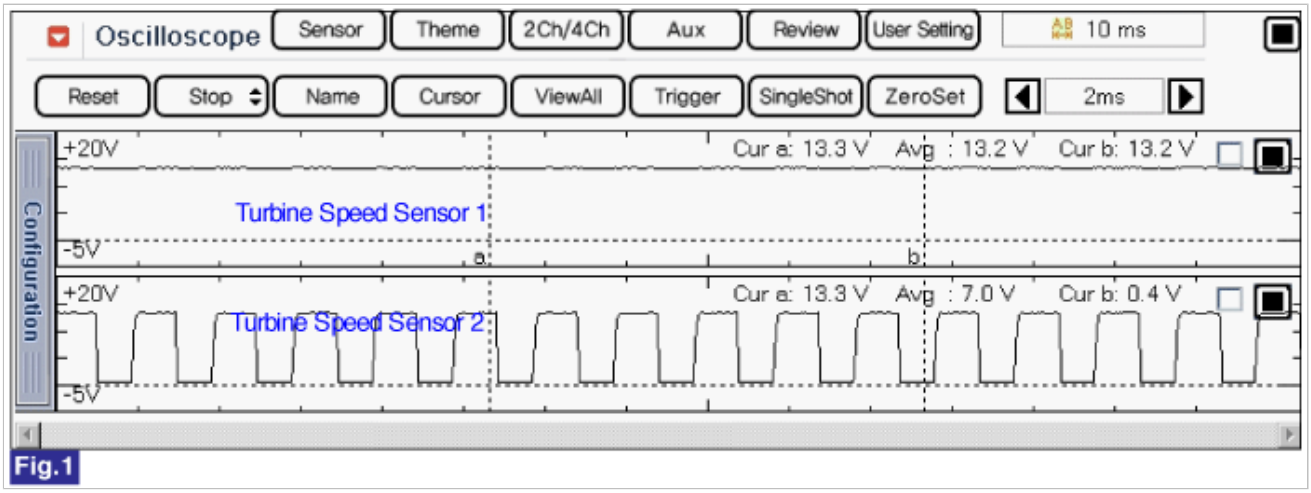


Fig.1

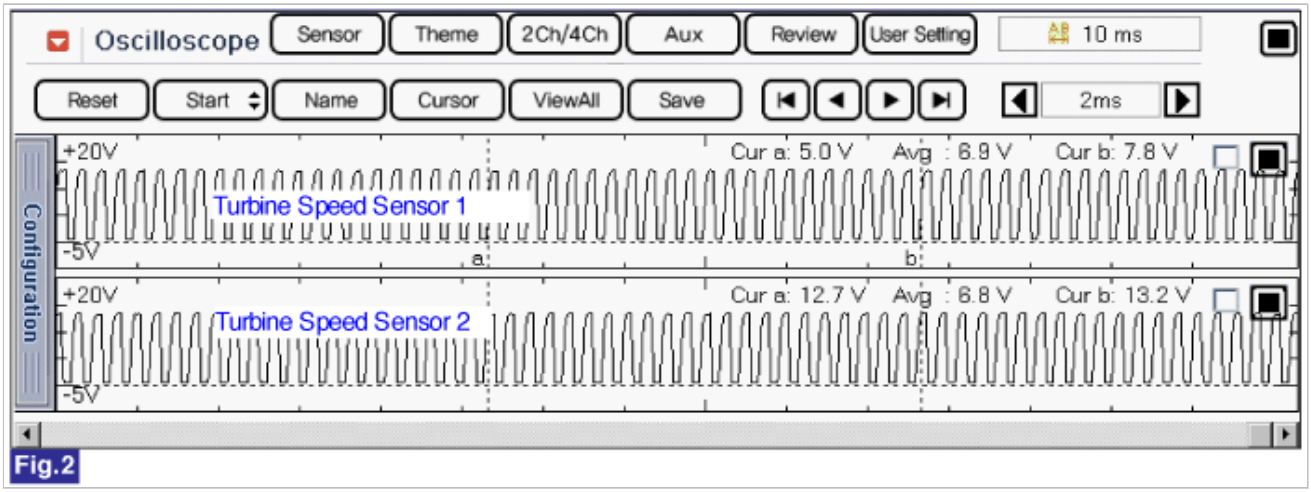
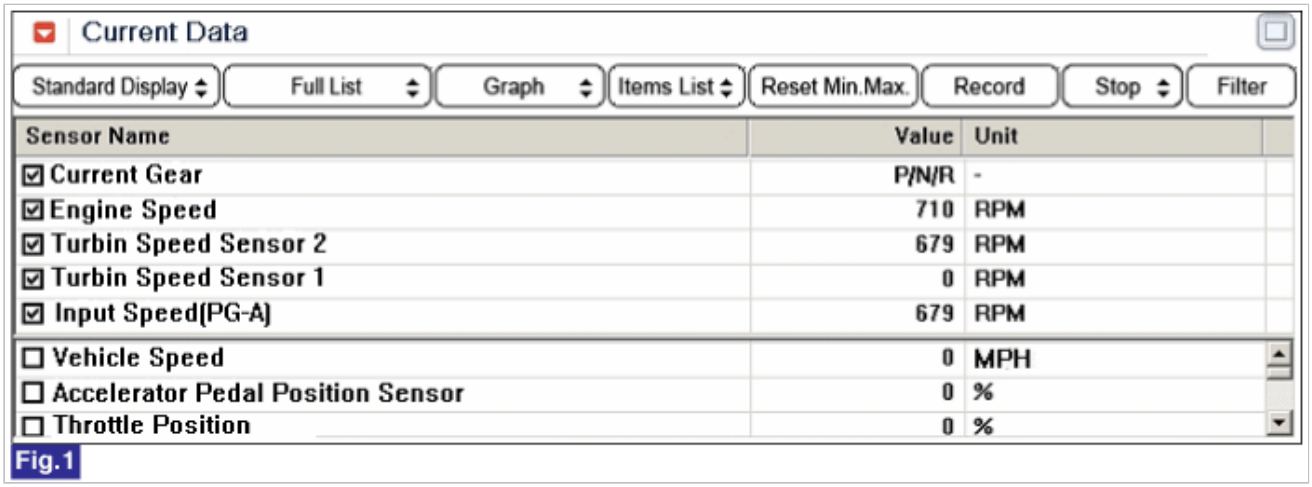


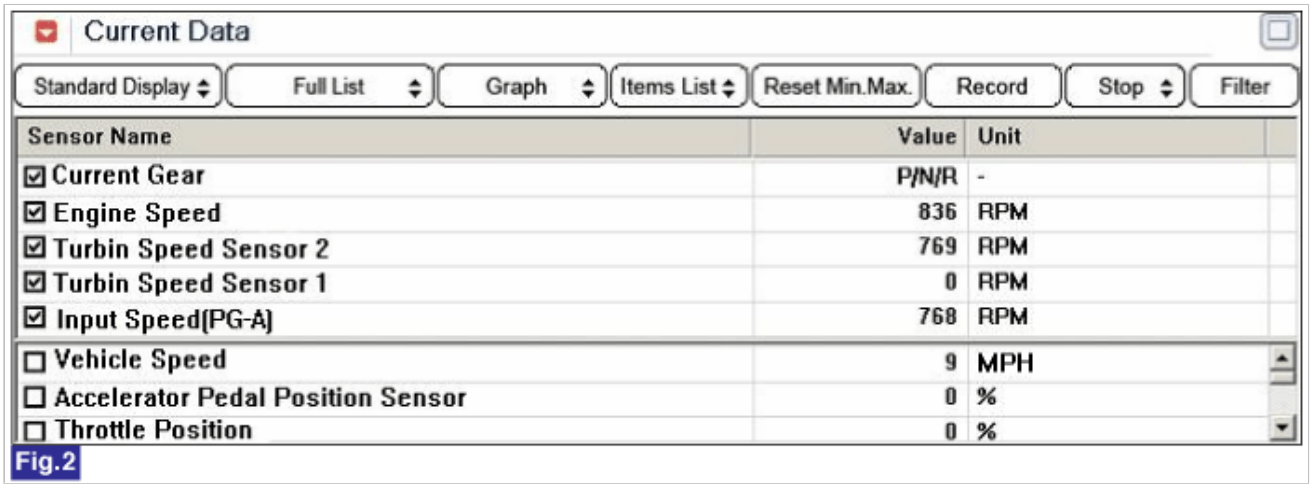
Fig 1) 1st gear in D range
Fig 2) 4th gear in D range

Monitor GDS Data

1. Connect GDS to data link connector(DLC)
2. Engine "ON" .
3. Monitor the "INPUT SPEED SENSOR 1" parameter on the GDS.
4. Drive the vehicle over 40 Km/h.

Specification : Increasing Gradually





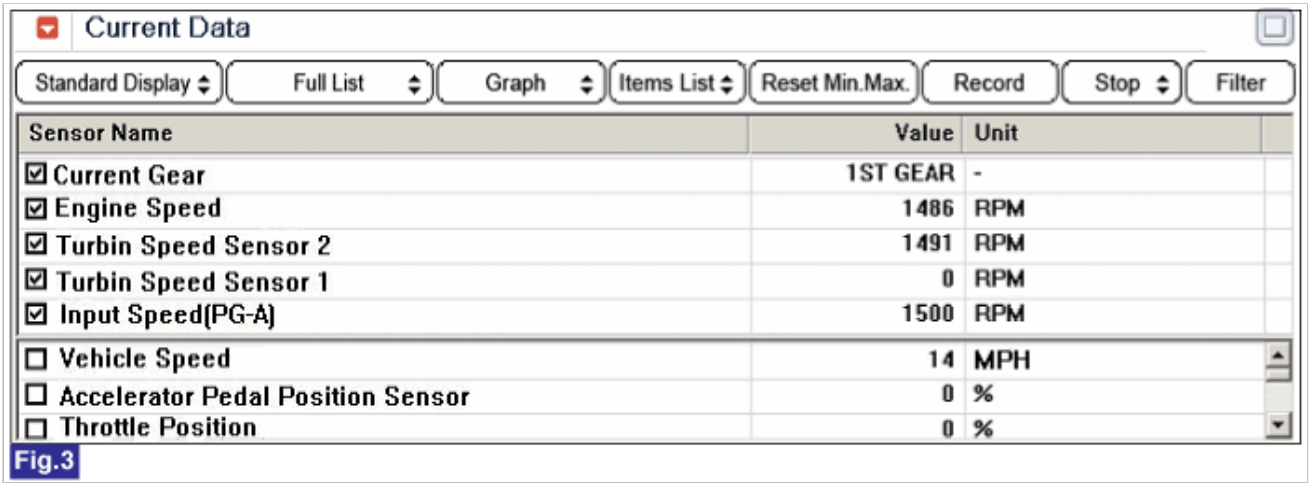


Fig.3

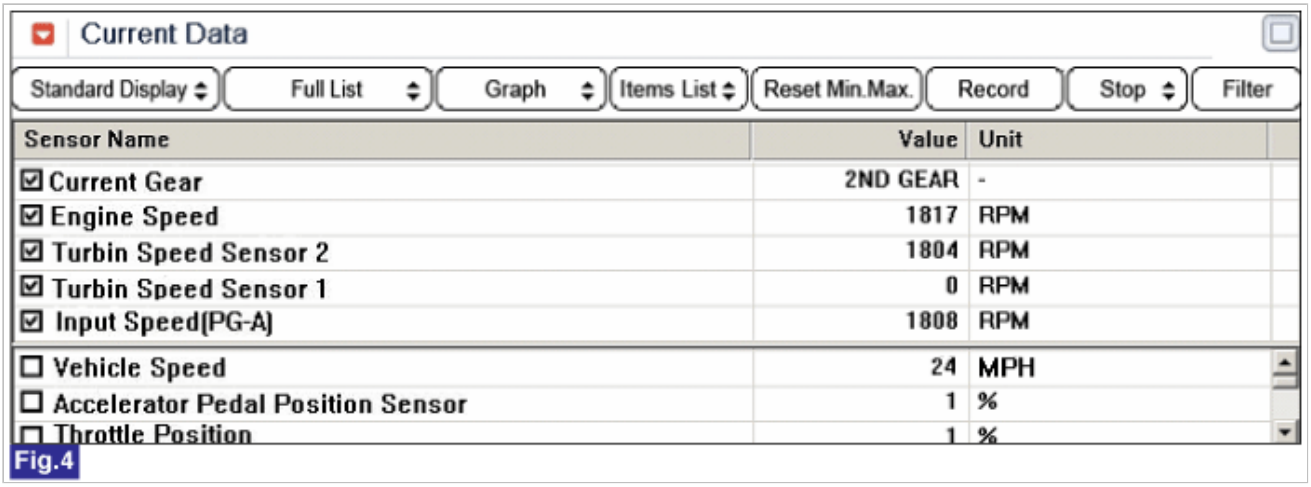


Fig.4

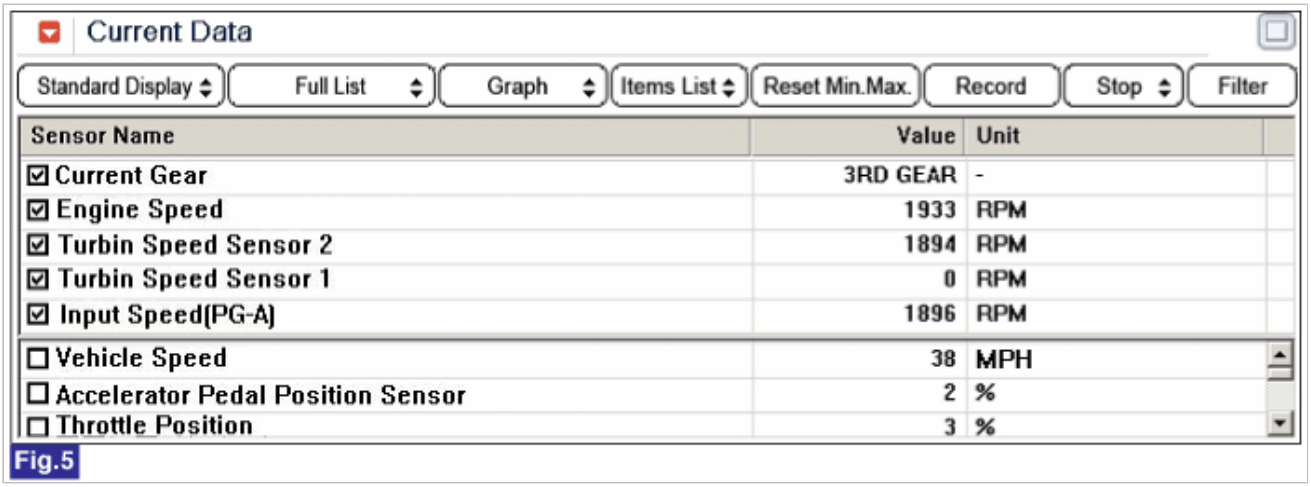


Fig.5

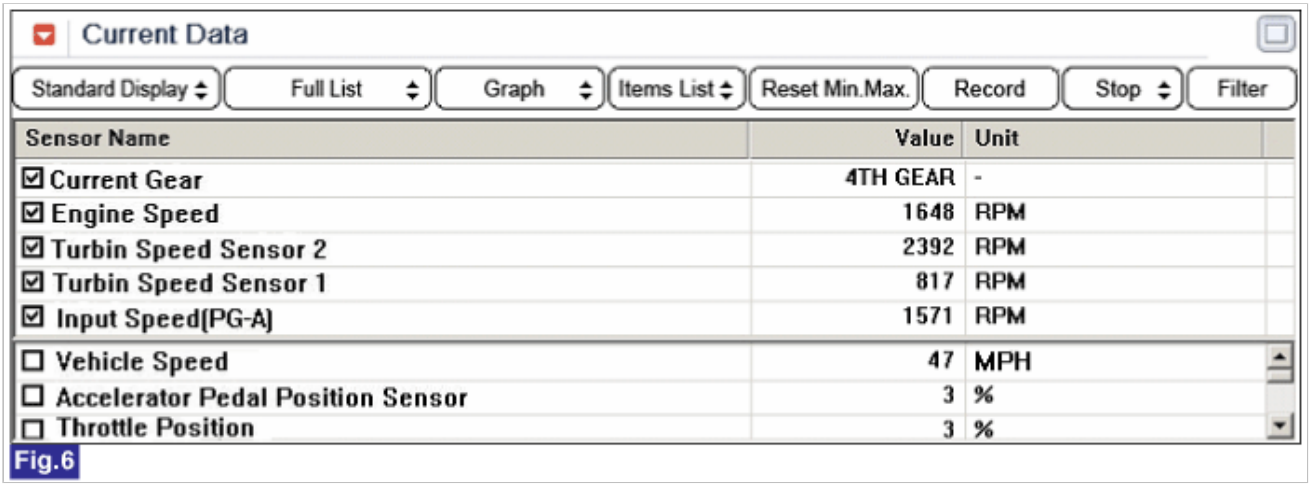


Fig.6

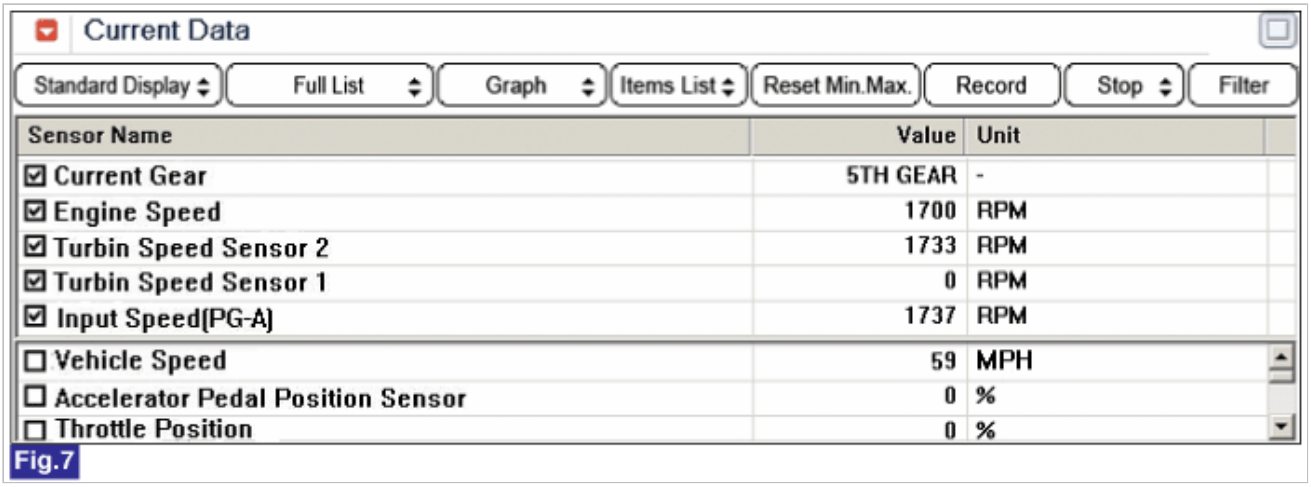


Fig.7

Fig 1) "P,N" range
Fig 2) "R" range
Fig 3) "D" range 1st gear
Fig 4) "D" range 2nd gear
Fig 5) "D" range 3rd gear
Fig 6) "D" range 4th gear
Fig 7) "D" range 5th gear

5. Does "INPUT SPEED SENSOR " follow the reference data?

YES	▸ 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. Throughly 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.
NO	▸ Go to "W/Harness Inspection" procedure.

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?

YES	▸ Repair as necessary and go to "verification of vehicle repair" procedure.
NO	▸ Go to "Signal circuit inspection" procedure.

Signal Circuit Inspection

1. Ignition "ON" & Engine "OFF".
2. Disconnect "ATM Control Unit connector.
3. Measure voltage between signal terminal of TCM harness connector and chassis ground.

Specification : Approx. 12V

4. Is the measured voltage within specifications?

YES	▸ Go to "Ground circuit Inspection" procedure.
NO	▸ Check for open or short in harness. Repair as necessary and Go to "verification of vehicle repair" procedure. ▸ If signal circuit in harness is OK, Go to "Check TCM" of the "Component Inspection" procedure.

Ground Circuit Inspection

1. Ignition "OFF".
2. Disconnect ATM Control Unit connector.
3. Remove the "OIL PAN" from the vehicle.
4. Measure continuity between ground terminal of Turbine sensor and chassis ground.

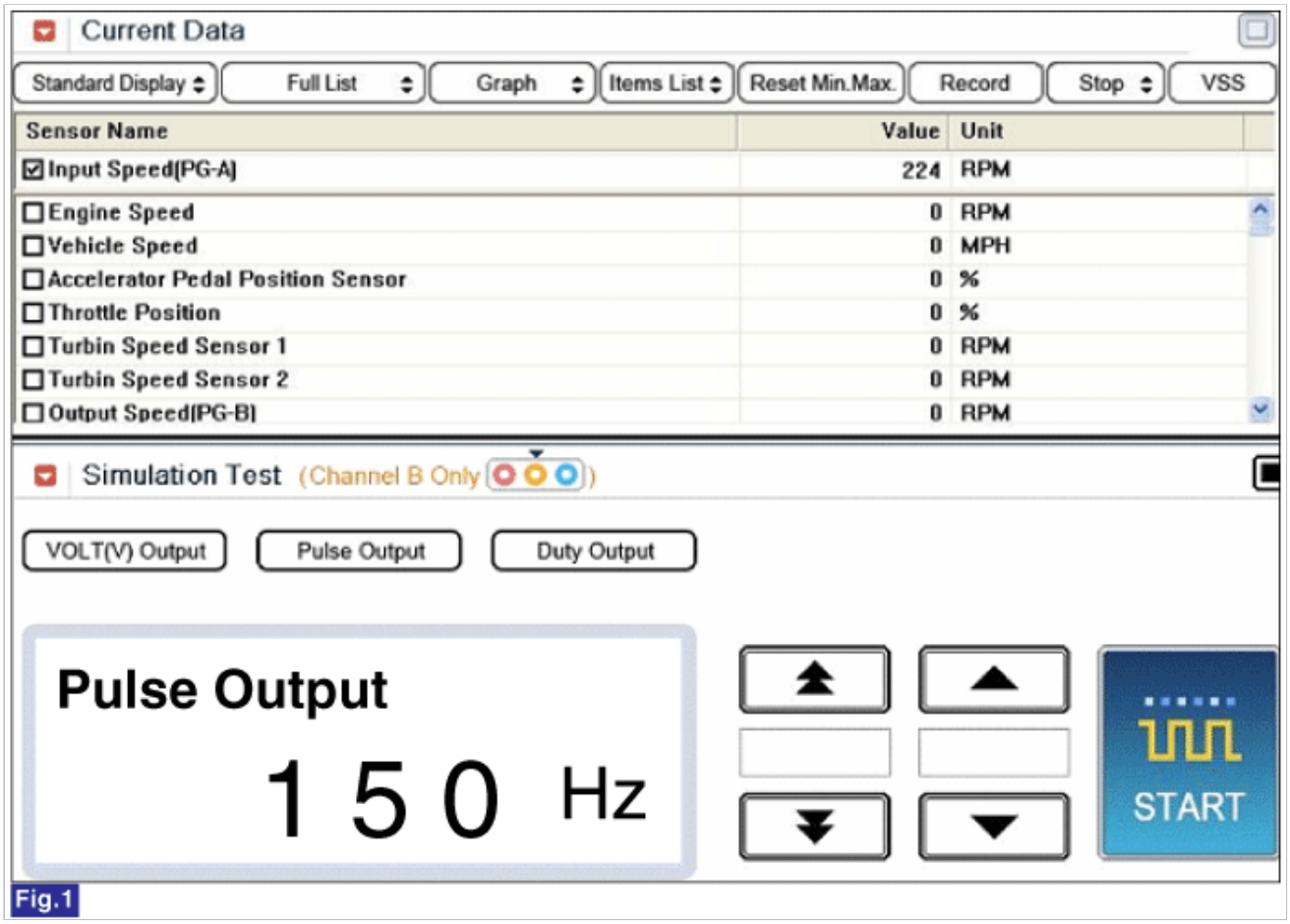
Specification : Continuity

5. Is the measured resistance within specifications ?

YES	▸ Go to "Component inspection" procedure.
NO	▸ Check for open in harness. Repair as necessary and Go to "verification of vehicle repair" procedure.

Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Disconnect "ATM Control Unit(CLG01-C)" connector.
3. Connect GDS and select 'Simulation Function"on the scanner.
4. Simulate duty pulse on signal terminal of "Input Speed Sensor 2" with scanner.
   ※ In a case of Input Speed Sensor 1, it is impossible to execute the simulation function.


Current Data
Standard Display
Full List
Graph
Items List
Reset Min.Max.
Record
Stop
VSS
Sensor Name
Value
Unit
Input Speed(PG-A) 224 RPM
Engine Speed 0 RPM
Vehicle Speed 0 MPH
Accelerator Pedal Position Sensor 0 %
Throttle Position 0 %
Turbin Speed Sensor 1 0 RPM
Turbin Speed Sensor 2 0 RPM
Output Speed(PG-B) 0 RPM
Simulation Test (Channel B Only)
VOLT(V) Output
Pulse Output
Duty Output
Pulse Output
150 Hz
START
Fig.1

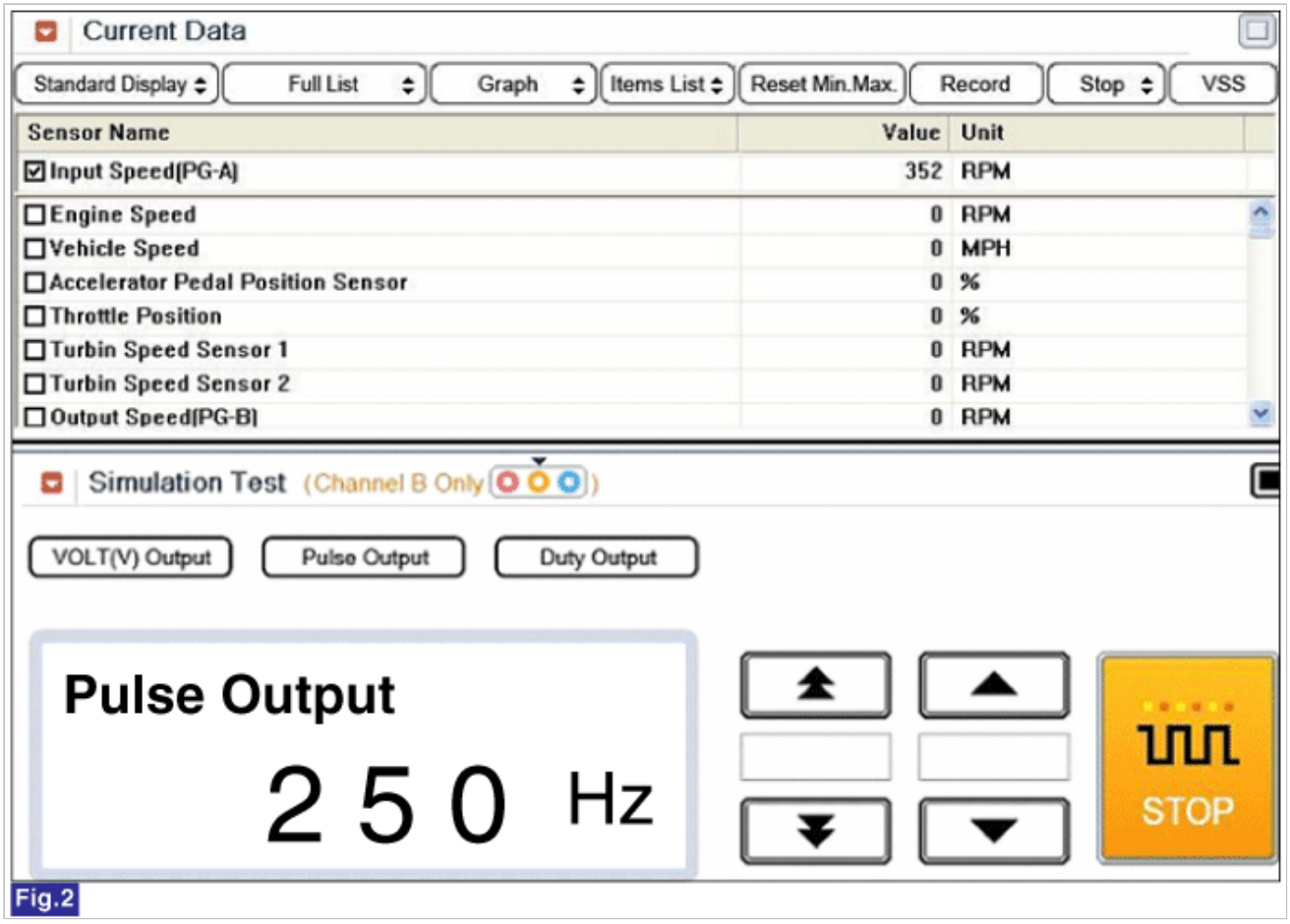

Current Data
Standard Display
Full List
Graph
Items List
Reset Min.Max.
Record
Stop
VSS
Sensor Name
Value
Unit
Input Speed(PG-A) 352 RPM
Engine Speed 0 RPM
Vehicle Speed 0 MPH
Accelerator Pedal Position Sensor 0 %
Throttle Position 0 %
Turbin Speed Sensor 1 0 RPM
Turbin Speed Sensor 2 0 RPM
Output Speed(PG-B) 0 RPM
Simulation Test (Channel B Only)
VOLT(V) Output
Pulse Output
Duty Output
Pulse Output
250 Hz
STOP
Fig.2

Fig 1) 150Hz Output → 224rpm
Fig 2) 250Hz Output → 352rpm
※ The values are subject to change according to vehicle model or conditions

5. Is "Input Speed Sensor 1& 2" signal value changed according to simulation frequency?

YES	▸ Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.
NO	▸ Substitute with a known-good TCM and check for proper operation. If the problem is corrected, replace TCM as necessary and go to "Verification of Vehicle Repair" procedure.

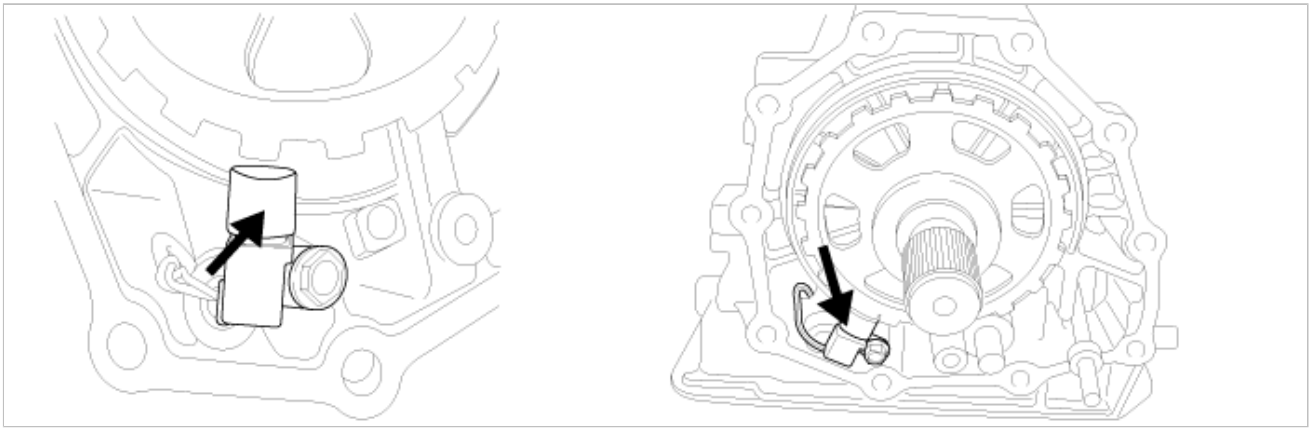
Verification of Vehicle Repair

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

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a GDS, 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.

Component Location



General Description

The OUTPUT SPEED SENSOR outputs waveform signals according to the revolutions of the output shaft of the transmission. The Output Speed Sensor is installed in front of the Parking Gear to determine the Parking Gear rpms by counting the frequency of the pulses. 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 signals is noticeably different from the value calculated, using the Vehicle Speed Sensor output, when the vehicle is running faster than 18.6MPH(30km/h). The TCM will initiate the fail safe function if this code is detected.

DTC Detectiong Condition

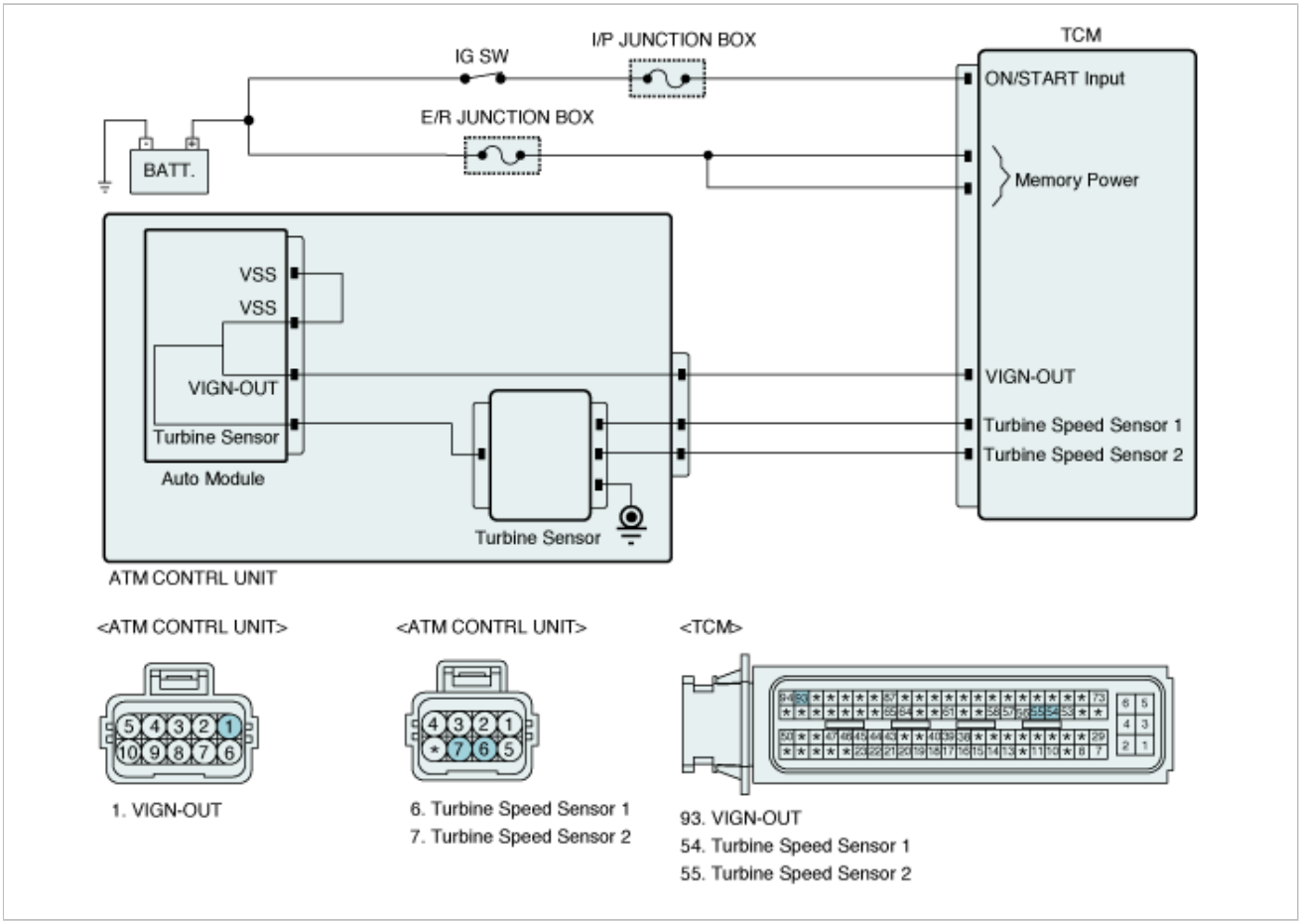
Item		Detecting Condition	Possible Cause
DTC Strategy		• Rationality	• Open or shrot in signal circuit • Open in power circuit • Open in ground circuit • Faulty Output speed sensor • Faulty TCM
Enable Conditions	Case 1	• Battery Voltage> 10V	
	Case 2	• Battery Voltage> 10V • Position Lever : D, B, L • State of the brake Off • Vehicle Speed≥ 25km/h(15mile) • Engine speed >3000 rpm • Pre-Filtering 1 sec • Throttle opening ≥15%	
	Case 3	• Battery Voltage> 10V • Position Lever : D, B • State of the brake Off • Input speed > 1800RPM • Engine speed > 3000RPM • Pre-Filtering 1 sec	
	Case 4	• Battery Voltage> 10V • Position Lever : D range • State of the brake Off • Input speed > 1200RPM • Engine speed > 3000RPM • Pre-Filtering 1 sec	
		• Battery Voltage> 10V • Position Lever : D range	

	Case 5	• State of the brake Off • Input speed > 700RPM • Input speed > 3000RPM • Pre-Filtering 1 sec	
	Case 6	• Battery Voltage> 10V • Shift lever switch : D range • State of the brake Off • Input speed > 800RPM • Engine speed > 3000RPM • Pre-Filtering More than 1 sec	
	Case 7	• Battery Voltage> 10V • Position Lever : D, B, L • Output speed before dropping > 1200RPM • Input speed > 1000RPM • Pre-Filtering More than 1 sec.	
Threshold Value	Case 1	• Output speed (NAB) Output speed >= 10000RPM	
	Case 2	• Output speed (NAB) Output speed = 0(Current gear: 1,L,B)	
	Case 3	• Output speed (NAB) Output speed = 0(Current gear : 2)	
	Case 4	• Output speed (NAB) Output speed = 0(Current gear : 3)	
	Case 5	• Output speed (NAB) Output speed = 0(Current gear : 4)	
	Case 6	• Output speed (NAB) Output speed = 0(Current gear : 5)	
	Case7	• Output speed gradient (nabg) Output speed gradient (during 20msec) > 300RPM	
Diagnostic Time		• More than 4.0 sec.	
Fail Safe		• No Sport Mode active. • 5th gear is forbidden. • Torque Converter Clutch : "OFF" • No pressure adoptation.	

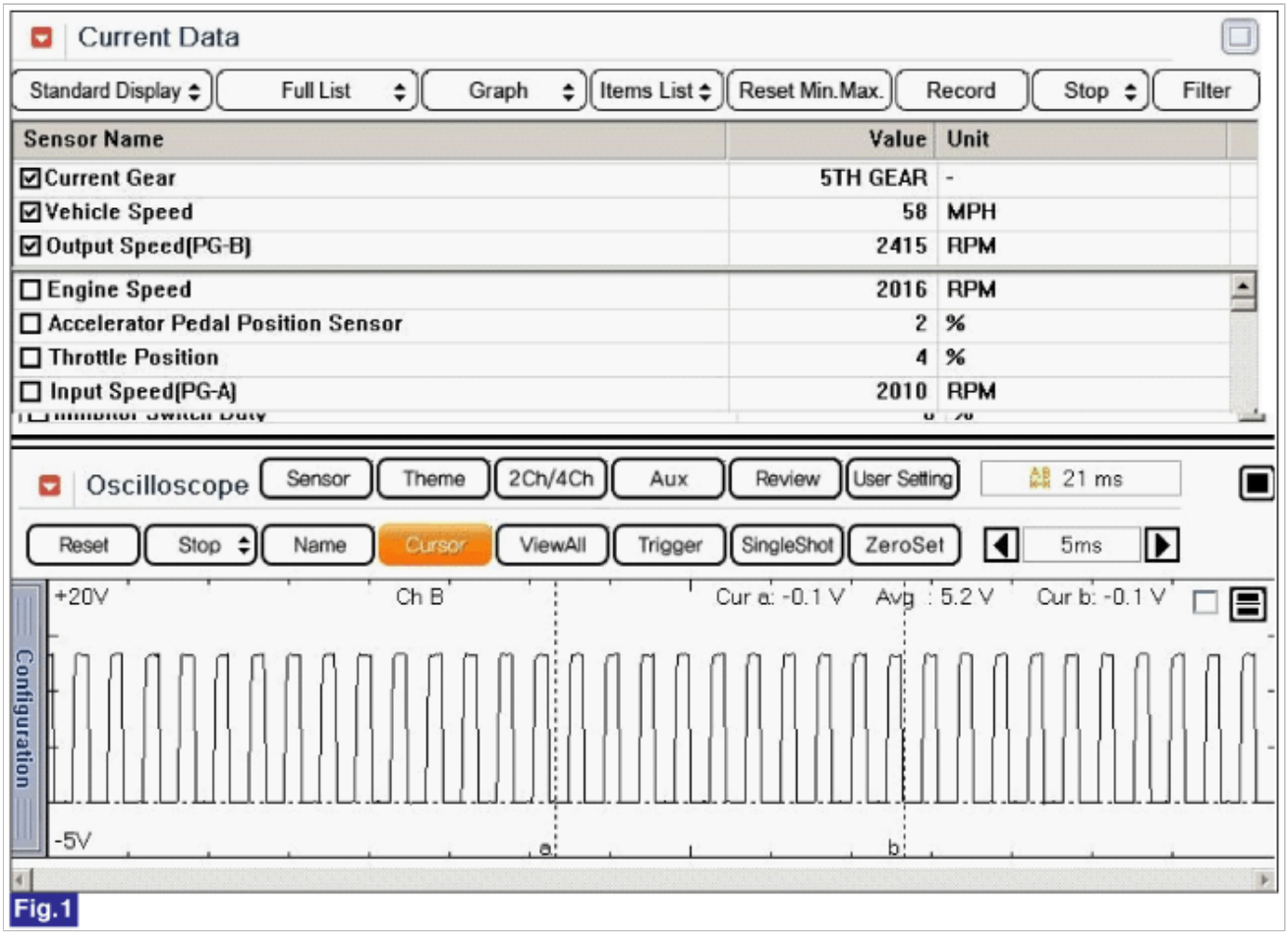
Specification

Item	Condition	Specification
Output Speed Sensor	• 20km/h	Approx. 149[Hz]

Diagnostic Circuit Diagram



Signal Waveform & Data


Current Data
Standard Display
Full List
Graph
Items List
Reset Min.Max.
Record
Stop
Filter
Sensor Name
Value
Unit
Current Gear
5TH GEAR
-
Vehicle Speed
58
MPH
Output Speed(PG-B)
2415
RPM
Engine Speed
2016
RPM
Accelerator Pedal Position Sensor
2
%
Throttle Position
4
%
Input Speed(PG-A)
2010
RPM
Oscilloscope
Sensor
Theme
2Ch/4Ch
Aux
Review
User Setting
21 ms
Reset
Stop
Name
Cursor
ViewAll
Trigger
SingleShot
ZeroSet
5ms
Configuration
+20V
Ch B
Cur a: -0.1 V
Avg : 5.2 V
Cur b: -0.1 V
-5V
a
b
Fig.1

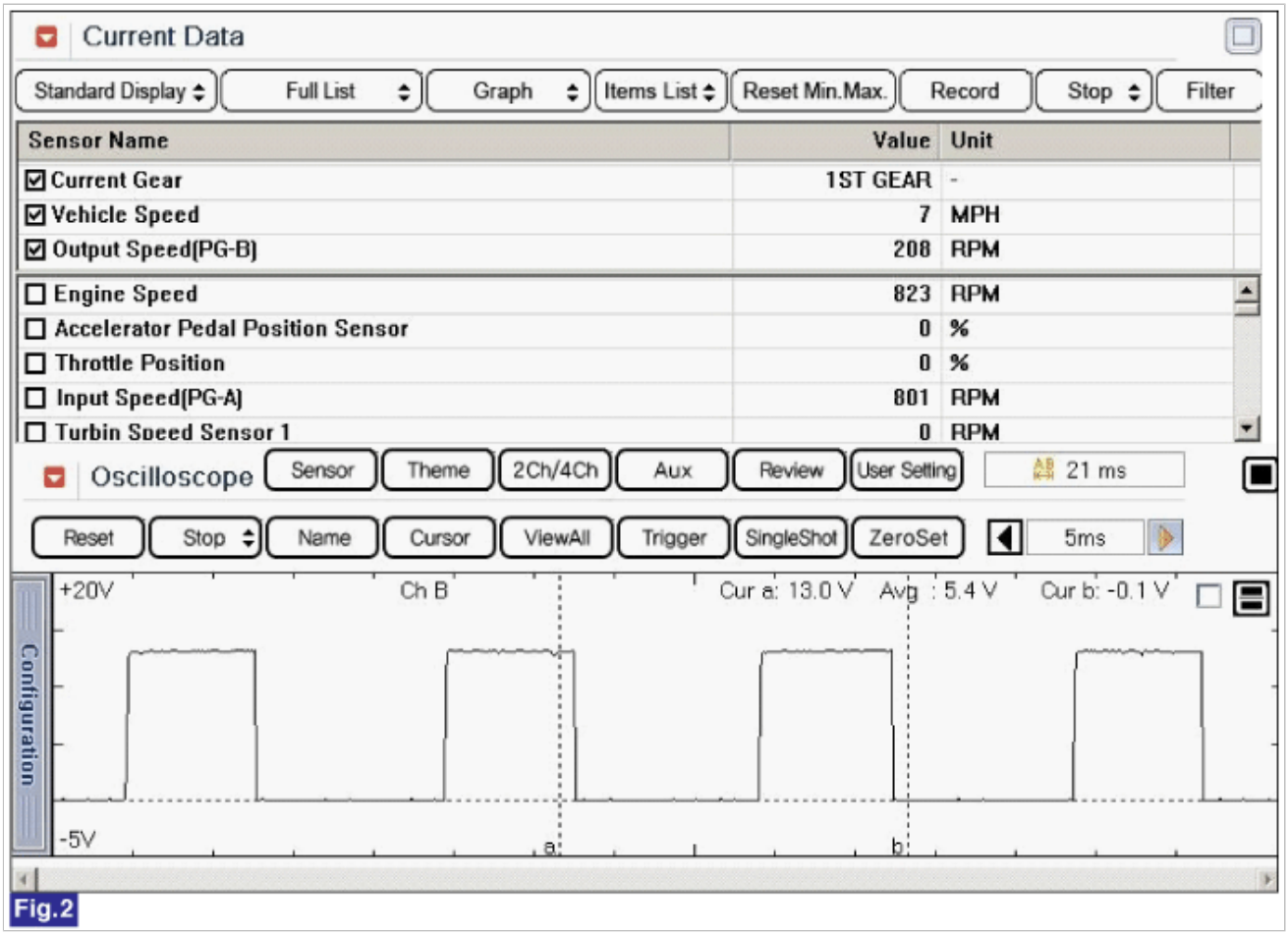
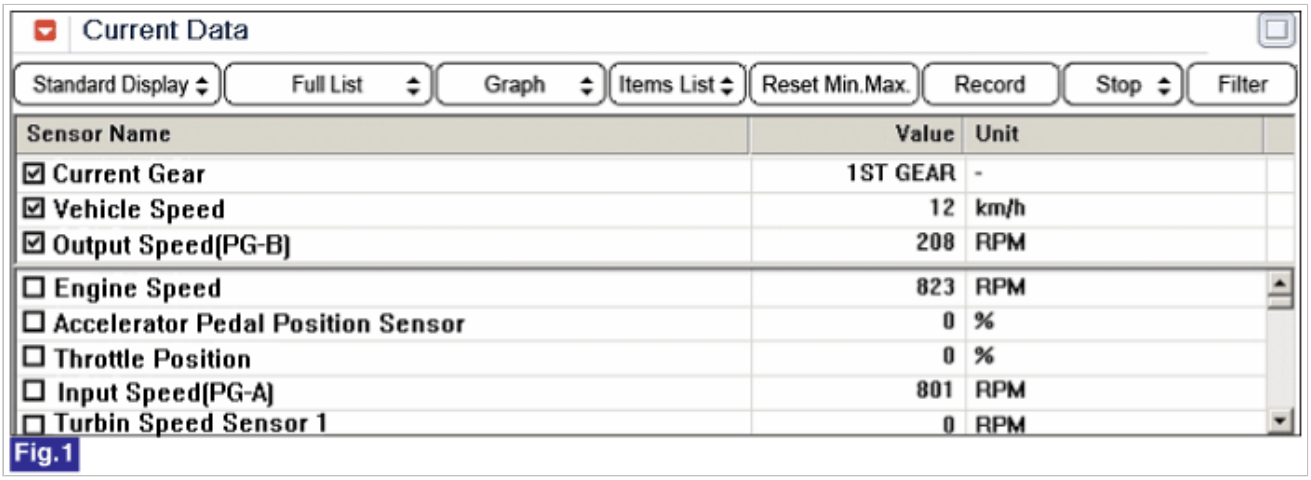

Current Data
Standard Display
Full List
Graph
Items List
Reset Min.Max.
Record
Stop
Filter
Sensor Name
Value
Unit
Current Gear
1ST GEAR
-
Vehicle Speed
7
MPH
Output Speed(PG-B)
208
RPM
Engine Speed
823
RPM
Accelerator Pedal Position Sensor
0
%
Throttle Position
0
%
Input Speed(PG-A)
801
RPM
Turbin Speed Sensor 1
0
RPM
Oscilloscope
Sensor
Theme
2Ch/4Ch
Aux
Review
User Setting
21 ms
Reset
Stop
Name
Cursor
ViewAll
Trigger
SingleShot
ZeroSet
5ms
Configuration
+20V
Ch B
Cur a: 13.0 V
Avg : 5.4 V
Cur b: -0.1 V
-5V
a
b
Fig.2

Fig 1) Low Speed
Fig 2) High Speed

Monitor GDS Data

1. Connect scantool to data link connector(DLC)
2. Engine "ON" .
3. Monitor the "OUTPUT SPEED SENSOR" parameter on the GDS.
4. Drive the vehicle more than 5km/h.

Specification : Increasing Gradually



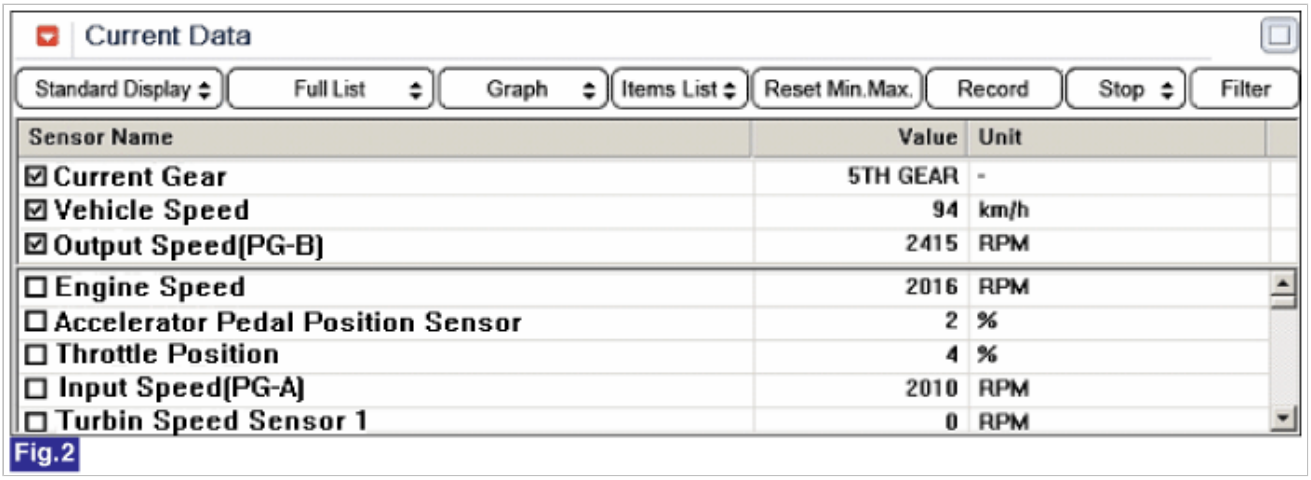


Fig 1) Low Speed
Fig 2) High Speed

5. Does "OUTPUT SPEED SENSOR " follow the reference data?

YES	▸ 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. Throughly 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.
NO	▸ Go to "W/Harness Inspection" procedure.

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?

YES	▸ Repair as necessary and go to "verification of vehicle repair" procedure.
NO	▸ Go to "Signal circuit inspection" procedure.

Signal Circuit Inspection

■ Check Output Speed Sensor(External Inspection)

1. Ignition "ON" & Engine "OFF".
2. Disconnect "ATM Control Unit connector.
3. Measure voltage between signal terminal of TCM harness connector and chassis ground.

Specification : Approx. 5V

4. Is the measured voltage within specifications ?

YES	▸ Go to "Check Output Speed Sensor(Internal Check)" procedure.
NO	▸ Check for open or short in harness. Repair as necessary and Go to "verification of vehicle repair" procedure. ▸ If there is no problems with signal circuit, go to "Component Inspection" procedure.

■ "Check Output Speed Sensor" (Internal Check)

1. Remove "OIL PAN".
2. Ignition "ON" & Engine "OFF".
3. Disconnect "Output Speed Sensor connector.
4. Perform the continuity check in the signal line of output speed sensor.

Specification : Continuity

5. Is the measured resistance within specifications ?

YES	▸ Go to "Ground circuit Inspection" procedure.
NO	▸ Check for open or short in harness. Repair as necessary and Go to "verification of vehicle repair" procedure. ▸ If signal circuit in harness is OK, Substitute with a known-good A/T Range Switch and check for proper operation. If the problem is corrected, replace A/T Range Switch as necessary and go to "verification of vehicle repair" procedure.

Ground Circuit Inspection

1. Ignition "OFF" & Engine "OFF".
2. Remove "OIL PAN".
3. Disconnect "Output Speed Sensor connector.
4. Measure continuity between ground terminal of Output Speed Sensor and chassis ground.

Specification : Approx. 0Ω

5. Is the measured resistance within specifications ?

YES	▸ Go to Component Inspection procedure.
NO	▸ Check for open in harness. Repair as necessary and Go to "verification of vehicle repair" procedure. ▸ If ground circuit in harness is OK, Substitute with a known-good A/T Range Switch and check for proper operation. If the problem is corrected, replace A/T Range Switch as necessary and go to "verification of vehicle repair" procedure.

Component Inspection

1. Ignition "ON" & Engine "OFF".
2. Disconnect "ATM Control Unit connector.
3. Connect scantool and select simulation function.
4. Simulate pulse out to output speed sensor (VSP1) terminal of TCM harness connector.

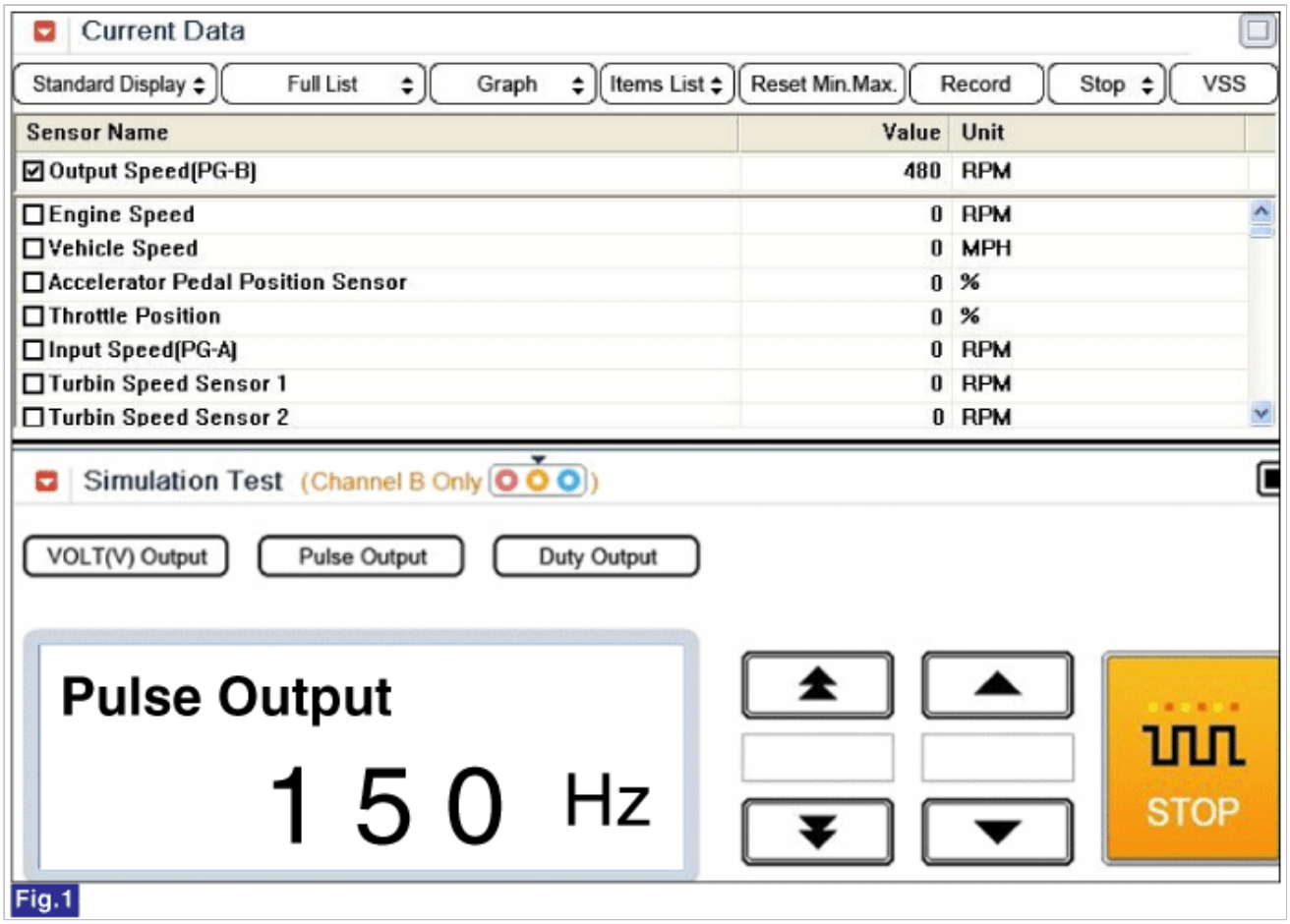


Fig.1

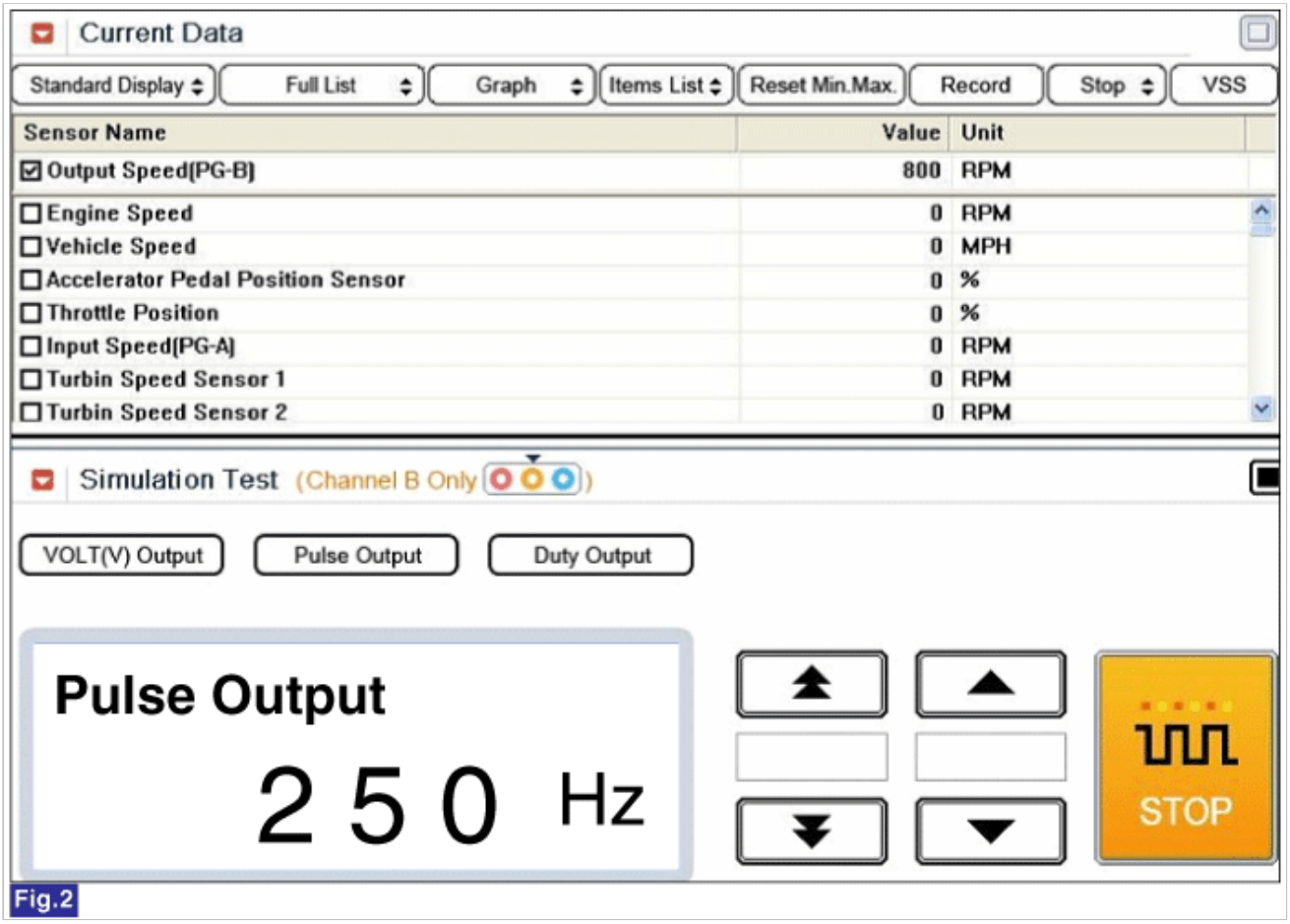


Fig 1) 150Hz → 480rpm
Fig 2) 250Hz → 800rpm
※ The values are subject to change according to vehicle model or conditions

5. Does the value of output speed sensor change according to the simulation frequence ?

YES	▸ Substitute with a known-good output speed sensor and check for proper operation. If the problem is corrected, replace output speed sensor as necessary and go to "Verification of Vehicle Repair" procedure.
NO	▸ Substitute with a known-good TCM/PCM and check for proper operation. If the problem is corrected, replace TCM/PCM as necessary and go to "Verification of Vehicle Repair" procedure.

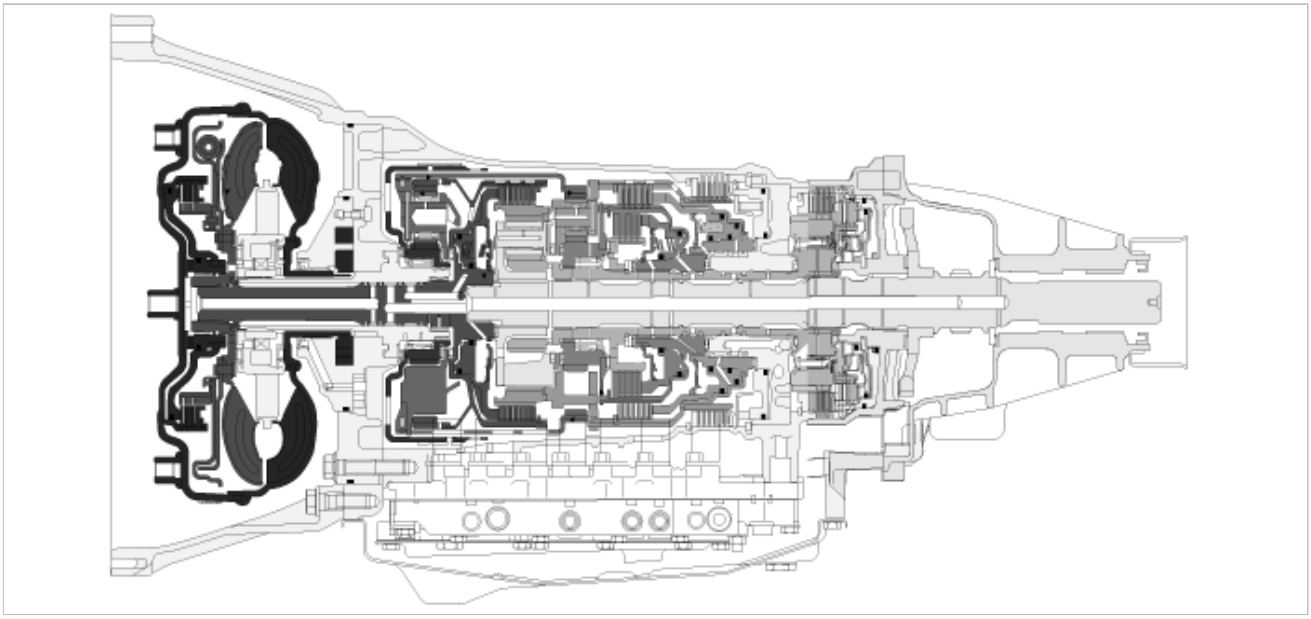
Verification of Vehicle Repair

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

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a GDS, 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.

Component Location



General Description

The value of the input shaft speed should be equal to the value of the output shaft speed, when multiplied by the 1st gear ratio, while the transaxle is engaged in the 1st gear. For example, if the output speed is 1000 rpm and the 1st gear ratio is 3.73, then the input speed is 3730 rpm.

DTC Description

This code is set if the value of input shaft speed is not equal to the value of the output shaft, when multiplied by the 1st gear ratio, while the transaxle is engaged in 1st gear. This malfunction is mainly caused by mechanical troubles such as control valve sticking or solenoid valve malfuctioning rather than an electrical issue.

DTC Detectiong Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• 1st gear incorrect ratio	• Faulty Input Speed Sensor • Faulty Output Speed Sensor • Faulty internal parts in transmission
Enable Conditions	• The time after the last shift was finished > 1 sec. • Oil temperature ≥ -10°C(14°F) • Engine speed > 600RPM • Position Lever D, B, L • Input Speed > 600rpm • 150rpm < Output Speed(NAB) < 6000rpm • Throttle opening > > 15%(Too Low Only) • Pre-Filtering 1 sec.	
Threshold Value	• Proportionality check between input speed and Output speed at 1st gear • Input speed > (Output speed *1st Gear Ratio)+200RPM (Rationality-high) • Input speed < (Output speed *1st Gear Ratio)-200RPM (Rationality-low)	
Diagnostic Time	• More than 1sec	
Fail Safe	• Locked as 4th gear	

Signal Waveform & Data

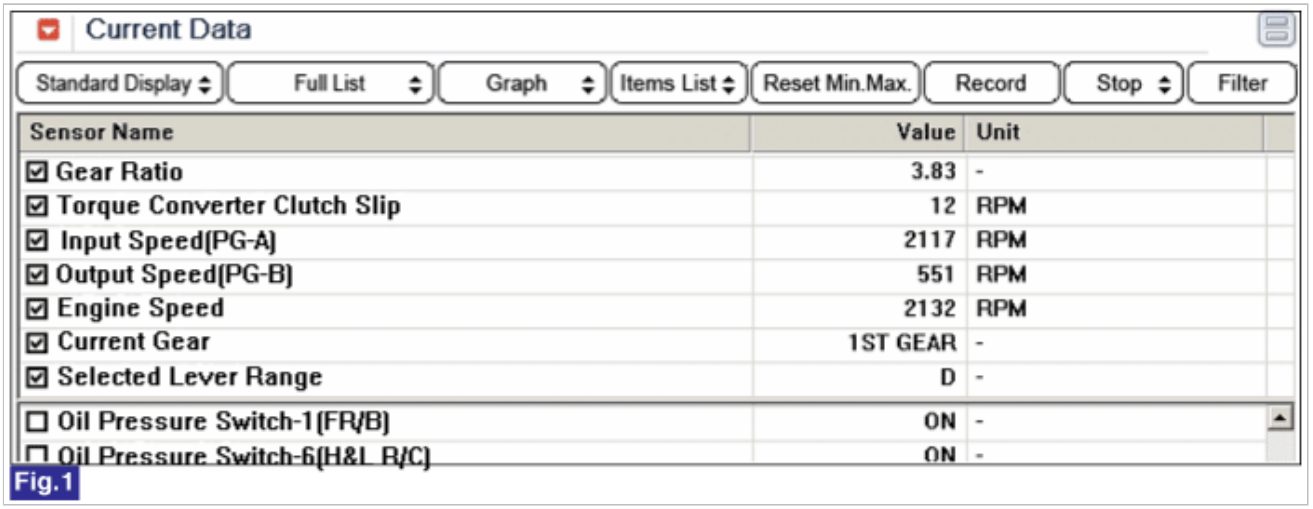


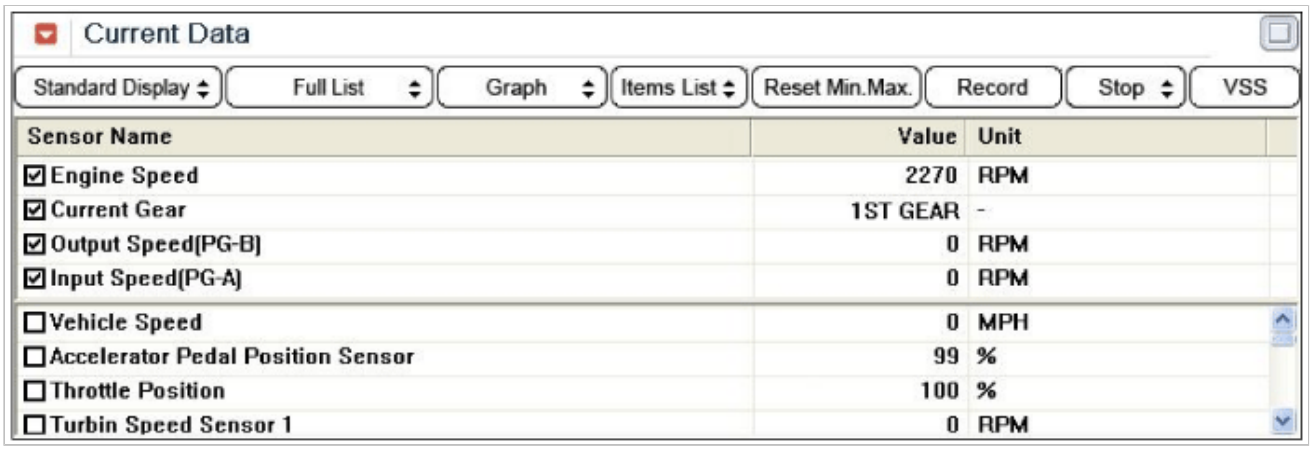
Fig 1) 1st gear in "D" range

Monitor GDS Data

■ Stall Test

1. Connect GDS to data link connector(DLC).
2. Engine "ON" .
3. Monitor the "ENGINE SPEED, INPUT SPEED SENSOR, OUTPUT SPEED SENSOR, GEAR POSITION" parameter on the GDS.
4. Perform the "STALL TEST" with gear position "1".

Specification : 2300 ± 200 engine rpm



OPERATING ELEMENT OF EACH SHIFTING RANGE

Shifting Position		Input clutch	High&Low ReverseClutch	Direct Clutch	Reverse Brake	Front Brake	Low Coast Brake	Forward Brake	1st OwnWay Clutch	Forward OwnWay Clutch	3rd OwnWay Clutch
P			▲			▲					
R			●		●	●			●		●
N			▲			▲					
D	1st gear		★			▲	★	●	●	●	●
	2nd gear			●		▲		●		●	●
	3rd gear		●	●		●		▲	◆		●
	4th gear	●	●	●				▲	◆		

	5th gear	●	●			●		▲	◆		◆

● : WORKING.
◆ : PARTICIPATE IN DELIVERY TORQUE WHEN COAST DRIVING.
▲ : SUPPLING OIL PRESSURE TO ELEMENT, BUT NOT EFFECT ON OUTPUT.
★ : TEMPORARY WORKING.

NOTE

Stall test procedure in D1 and reason
Procedure
1. Warm up the engine
2. After positioning the select lever in "D" ,depress the foot brake pedal fully after that, depress the accelerator pedal to the maximum
* The slippage of 1st gear operating parts can be detected by stall test in D
Reason for stall test
1. If there is no mechanical defaults in A/T, every slippage occur in torque converter.
2. Therfore, engine revolution is output, but input and output speed revolution must be "zero" due to wheel's lock.
3. If 1st gear operating parts have faults, input speed revolution will be out.
4. If oupput speed revolution is output. It means that the foot brake force is not applied fully. Remeasuring is required.

5. Is the meausred "STALL TEST " within specifications?

YES	▸ Go to "signal check" as follow
NO	▸ Go to "Component inspection" procedure.

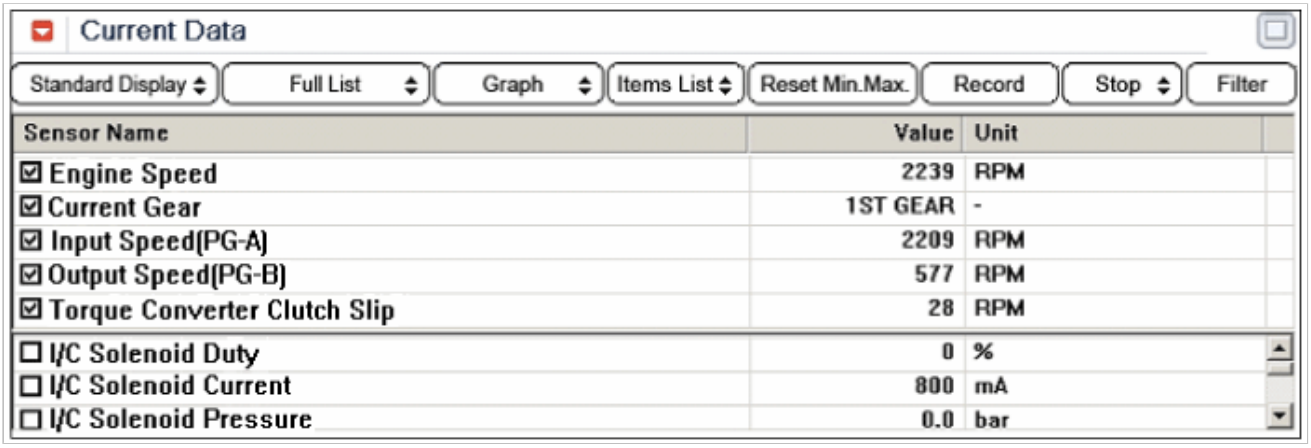
CAUTION

1. Do not let anybody stand in front of or behind the vehicle while this test is being carried out.
2. Check the A/T fluid level and temperature and the engine coolant temperature.
   • Fluid level : At the hot mark on the oil level gauge.
   • Fluid temperature : 176 °F~ 212 °F (80~100 °C).
   • Engine coolant temperature : 176 °F~ 212 °F (80~100 °C).
3. Chock both rear wheel(left and right).
4. Pull the parking brake lever on with the brake pedal fully depressed.
5. The throttle should not be left fully open for more than eight second.
6. If carrying out the stall test two or more time, move the select lever to the "N" position and run the engine at 1,000 rpm to let the A/T fluid cool down before carrying out subsequent.

■ Signal Check

1. Connect GDS.
2. Engine "ON" .
3. Monitor the "INPUT & OUTPUT SPEED SENSOR" parameter on the GDS.
4. Accelerate the Engine speed until about 2000 rpm in the 1st gear.

Specification : INPUT SPEED - (OUTPUT SPEED × 1st GEAR RATIO) ≥ 200 RPM

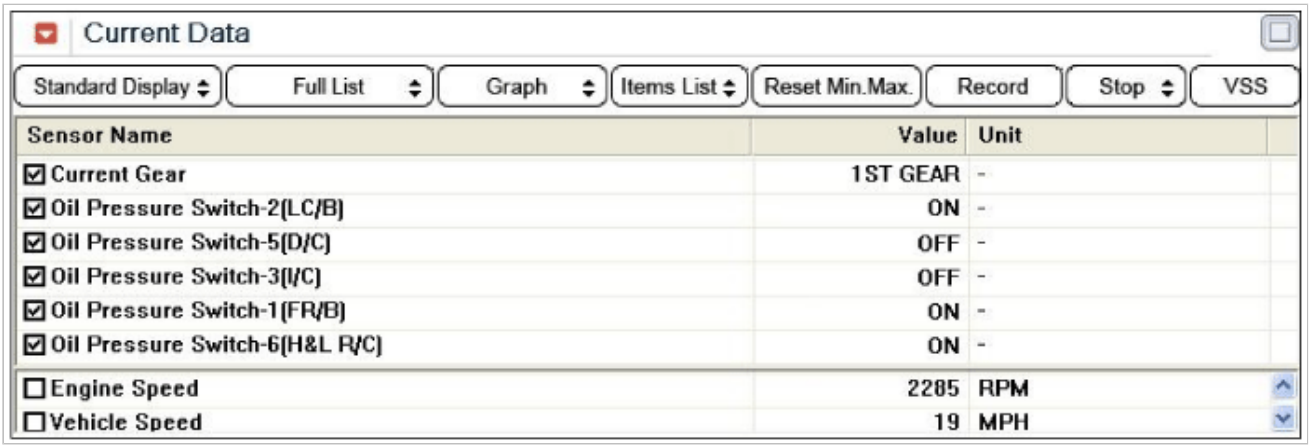


5. Does "INPUT & OUTPUT SPEED SENSOR" within specifications?

YES	▸ Go to "Component Inspection" procedure.
NO	▸ Check for electrical niose of circuit in INPUT & OUTPUT SPEED SENSOR or Replace INPUT & OUTPUT SPEED SENSOR. Repair as necessary and Go to "verification of vehicle repair" procedure.

Component Inspection

1. Connect GDS.
2. Engine "ON" .
3. Monitor the "OIL PRESSURE. S/W 1,2,3,5,6" parameter on the GDS.
4. Move select lever to "D" range and operate vehicle within 1st gear condition.



5. Does "OIL PRESSURE. S/W 1,2,3,5,6 " follow the reference data?

YES	▸ Repair AUTO TRANSAXLE(Clutch or Brake) as necessary and Go to "verification of vehicle repair" Repair " procedure.
NO	▸ Replace AUTO TRANSAXLE (BODY CONTROL VALVE faulty) as necessary and Go to "verification of vehicle repair " procedure.

Verification of Vehicle Repair

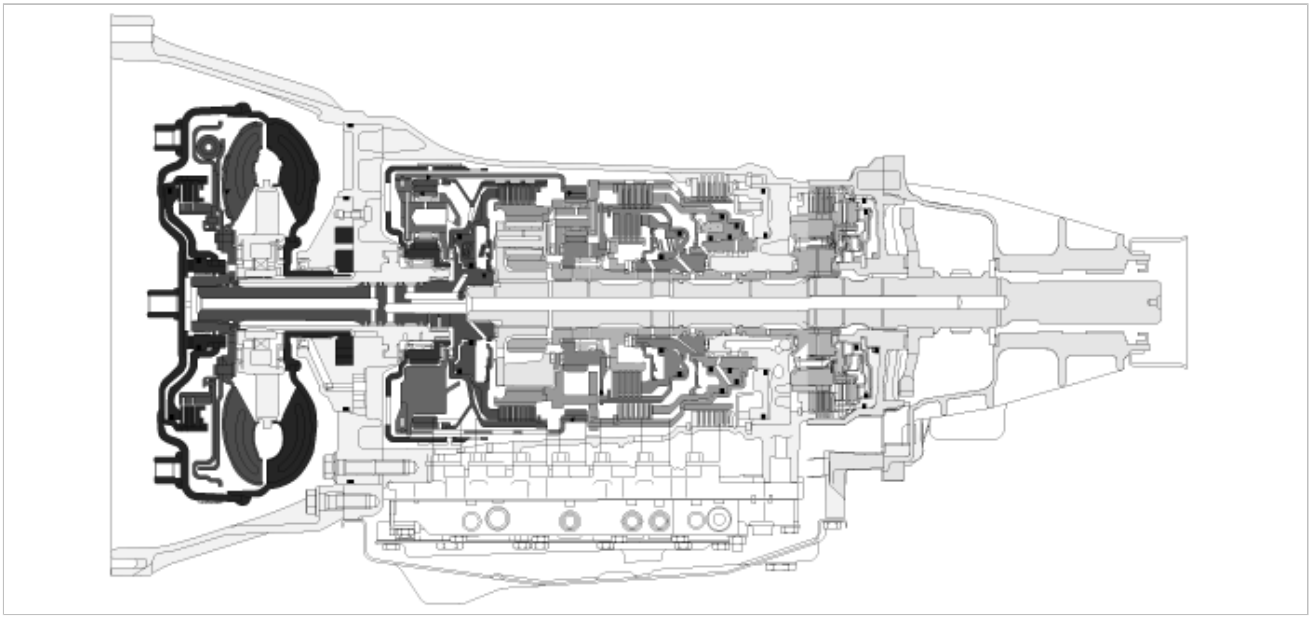
After a repair, it is essential to verify that the fault has been corrected.

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

	▸ Go to the applicable troubleshooting procedure.

YES	
NO	▸ System performing to specification at this time.

Component Location



General Description

The value of the input shaft speed should be equal to the value of the output shaft speed, when multiplied by the 2nd gear ratio, while the transaxle is engaged in the 2nd gear. For example, if the output speed is 1000 rpm and the 2nd gear ratio is 2.308, then the input speed is 2308 rpm.

DTC Description

This code is set if the value of input shaft speed is not equal to the value of the output shaft, when multiplied by the 2nd gear ratio, while the transaxle is engaged in 2nd gear. This malfunction is mainly caused by mechanical troubles such as control valve sticking or solenoid valve malfuctioning rather than an electrical issue.

DTC Detectiong Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• 2rd gear incorrect ratio	• Faulty Input Speed Sensor • Faulty Output Speed Sensor • Faulty internal parts in transmission
Enable Conditions	• The time after the last shift was finished > 1 sec. • Oil temperature ≥ -10°C(14°F) • Engine speed > 600RPM • Position Lever D, B • Input Speed > 600rpm • 300rpm < Output Speed(NAB) < 6000rpm • Throttle opening > > 15%(Too Low Only) • Pre-Filtering 1 sec.	
Threshold Value	• Proportionality check between input speed and Output speed at 2nd gear • Input speed > (Output speed *2nd Gear Ratio)+200RPM (Rationality-high) • Input speed < (Output speed *2nd Gear Ratio)-200RPM (Rationality-low)	
Diagnostic Time	• More than 1sec	
Fail Safe	• Locked as 4th gear	

Signal Waveform & Data

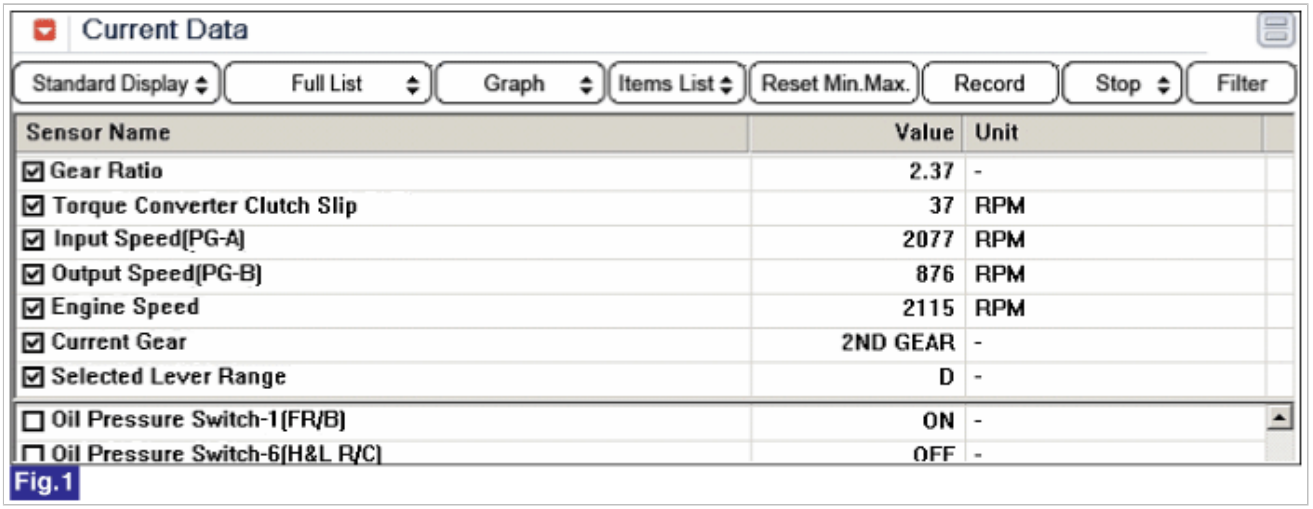


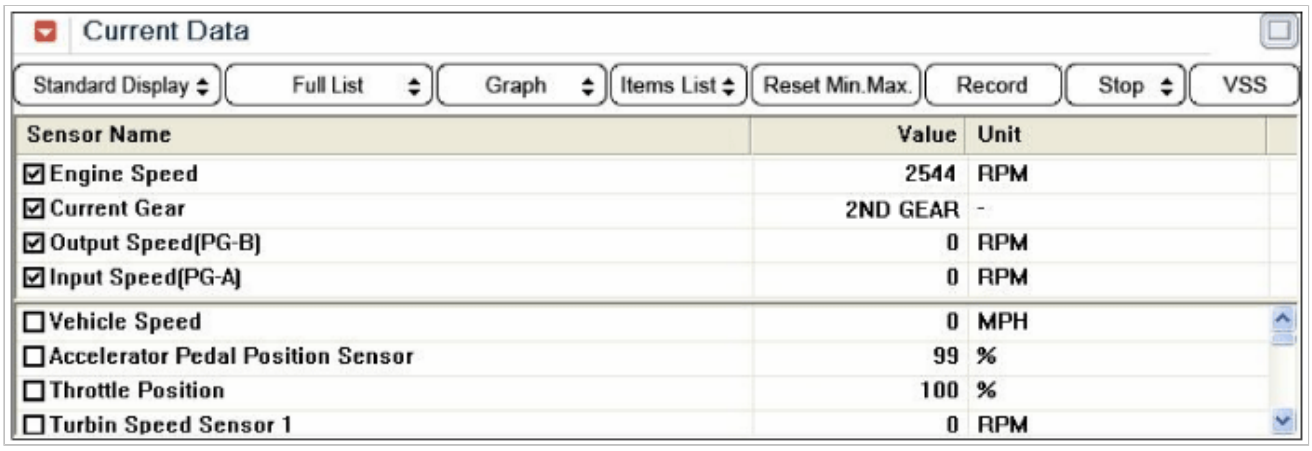
Fig 1) 2nd gear in "D" range

Monitor GDS Data

■ Stall Test

1. Connect GDS to data link connector(DLC).
2. Engine "ON" .
3. Monitor the "ENGINE SPEED, INPUT SPEED SENSOR, OUTPUT SPEED SENSOR, GEAR POSITION" parameter on the GDS.
4. Perform the "STALL TEST" with gear position "2".

Specification : 2300 ± 200 engine rpm



OPERATING ELEMENT OF EACH SHIFTING RANGE

Shifting Position		Input clutch	High&Low ReverseClutch	Direct Clutch	Reverse Brake	Front Brake	Low Coast Brake	Forward Brake	1st OwnWay Clutch	Forward OwnWay Clutch	3rd OwnWay Clutch
P			▲			▲					
R			●		●	●			●		●
N			▲			▲					
D	1st gear		★			▲	★	●	●	●	●
	2nd gear			●		▲		●		●	●
	3rd gear		●	●		●		▲	◆		●
	4th gear	●	●	●				▲	◆		

	5th gear	●	●			●		▲	◆		◆

● : WORKING.
◆ : PARTICIPATE IN DELIVERY TORQUE WHEN COAST DRIVING.
▲ : SUPPLING OIL PRESSURE TO ELEMENT, BUT NOT EFFECT ON OUTPUT.
★ : TEMPORARY WORKING.

NOTE

Stall test procedure in D2 and reason
Procedure
1. Warm up the engine
2. After positioning the select lever in "D" or "ON" of the HOLD SW (Operate UP SHIFT in case of "SPORTS MODE"),depress the foot brake pedal fully after that, depress the accelerator pedal to the maximum
* The slippage of 2nd gear operating parts can be detected by stall test in D2
Reason for stall test
1. If there is no mechanical defaults in A/T, every slippage occur in torque converter.
2. Therfore, engine revolution is output, but input and output speed revolution must be "zero" due to wheel's lock.
3. If 2nd gear operating parts have faults, input speed revolution will be out.
4. If oupput speed revolution is output. It means that the foot brake force is not applied fully. Remeasuring is required.

5. Is the meausred "STALL TEST " within specifications?

YES	▸ Go to "signal check" as follow.
NO	▸ Go to "Component inspection" procedure.

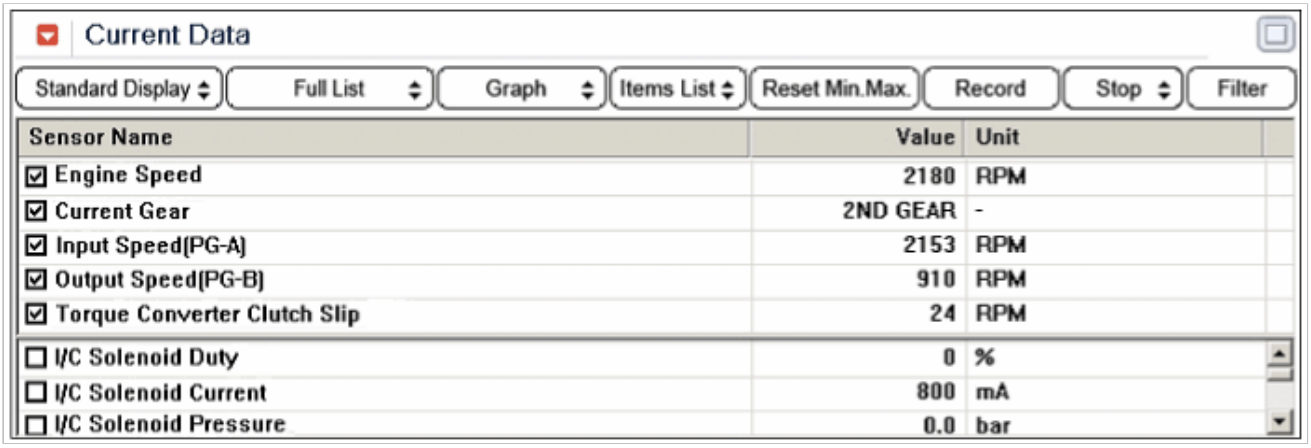
CAUTION

1. Do not let anybody stand in front of or behind the vehicle while this test is being carried out.
2. Check the A/T fluid level and temperature and the engine coolant temperature.
   • Fluid level : At the hot mark on the oil level gauge.
   • Fluid temperature : 176 °F~ 212 °F (80~100 °C).
   • Engine coolant temperature : 176 °F~ 212 °F (80~100 °C).
3. Chock both rear wheel(left and right).
4. Pull the parking brake lever on with the brake pedal fully depressed.
5. The throttle should not be left fully open for more than eight second.
6. If carrying out the stall test two or more time, move the select lever to the "N" position and run the engine at 1,000 rpm to let the A/T fluid cool down before carrying out subsequent.

■ Signal Check

1. Connect GDS.
2. Engine "ON" .
3. Monitor the "INPUT & OUTPUT SPEED SENSOR" parameter on the GDS.
4. Accelerate the Engine speed until about 2000 rpm in the 2nd gear.

Specification : INPUT SPEED - (OUTPUT SPEED × 2nd GEAR RATIO) ≤ 200 RPM

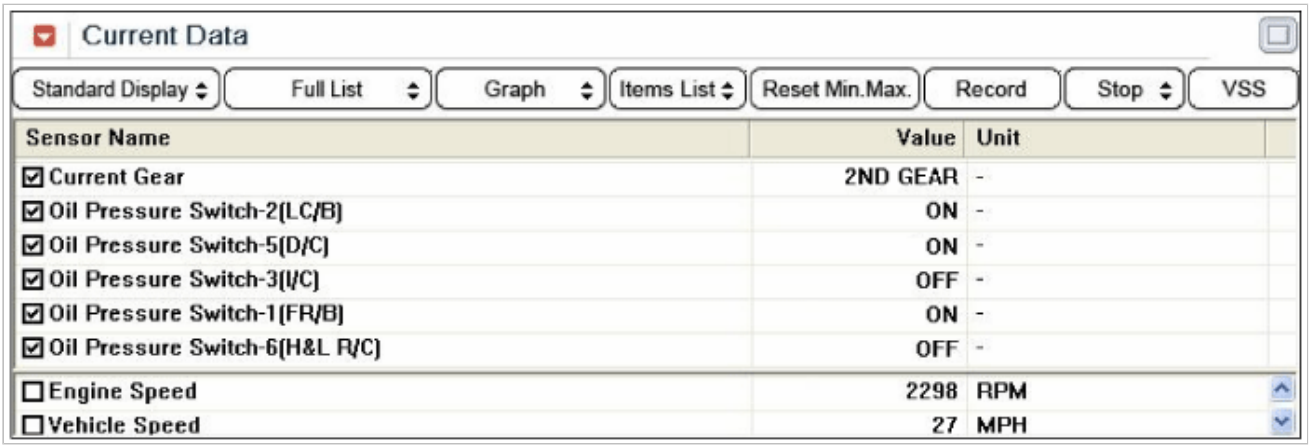


5. Does "INPUT & OUTPUT SPEED SENSOR" within specifications?

YES	▸ Go to "Component Inspection" procedure.
NO	▸ Check for electrical niose of circuit in INPUT & OUTPUT SPEED SENSOR or Replace INPUT & OUTPUT SPEED SENSOR. Repair as necessary and Go to "verification of vehicle repair" procedure.

Component Inspection

1. Connect GDS.
2. Engine "ON" .
3. Monitor the "OIL PRESSURE. S/W 1,2,3,5,6" parameter on the GDS.
4. Move select lever to "D" range and operate vehicle within 2nd gear condition.



5. Does "OIL PRESSURE. S/W 1,2,3,5,6 " follow the reference data?

YES	▸ Repair AUTO TRANSAXLE(Clutch or Brake) as necessary and Go to "verification of vehicle repair" Repair " procedure.
NO	▸ Replace AUTO TRANSAXLE (BODY CONTROL VALVE faulty) as necessary and Go to "verification of vehicle repair " procedure.

Verification of Vehicle Repair

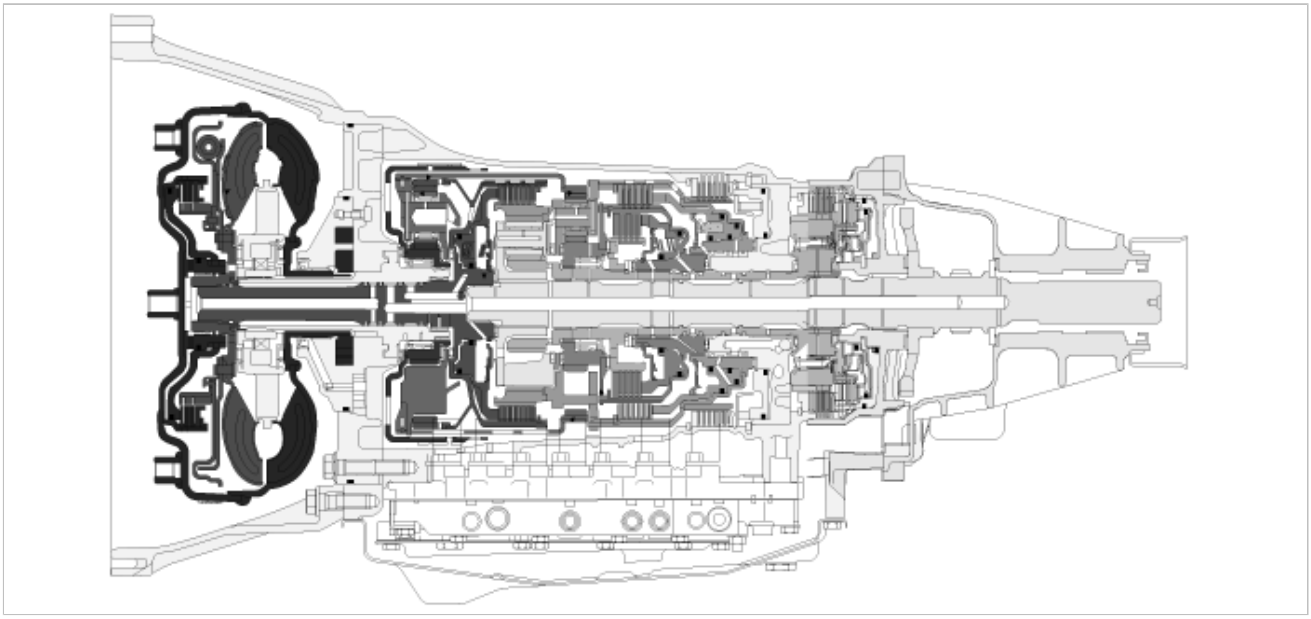
After a repair, it is essential to verify that the fault has been corrected.

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

	▸ Go to the applicable troubleshooting procedure.

YES	
NO	▸ System performing to specification at this time.

Component Location



General Description

The value of the input shaft speed should be equal to the value of the output shaft speed, when multiplied by the 3rd gear ratio, while the transaxle is engaged in the 3rd gear. For example, if the output speed is 1,000 rpm and the 3rd gear ratio is 1.519, then the input speed is 1519 rpm.

DTC Description

This code is set if the value of input shaft speed is not equal to the value of the output shaft, when multiplied by the 3rd gear ratio, while the transaxle is engaged in 3rd gear. This malfunction is mainly caused by mechanical troubles such as control valve sticking or solenoid valve malfuctioning rather than an electrical issue.

DTC Detectiong Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• 3rd gear incorrect ratio	• Faulty Input Speed Sensor • Faulty Output Speed Sensor • Faulty internal parts in transmission
Enable Conditions	• The time after the last shift was finished > 1 sec. • Oil temperature ≥ -10°C(14°F) • Engine speed > 600RPM • Position Lever D • Input Speed > 600rpm • 500rpm < Output Speed(NAB) < 6000rpm • Pre-Filtering 1 sec.	
Threshold Value	• Proportionality check between input speed and Output speed at 3rd gear • Input speed > (Output speed *3rd Gear Ratio)+200RPM (Rationality-high) • Input speed < (Output speed *3rd Gear Ratio)-200RPM (Rationality-low)	
Diagnostic Time	• More than 1sec	
Fail Safe	• 4th gear Limp-Home mode	

Signal Waveform & Data

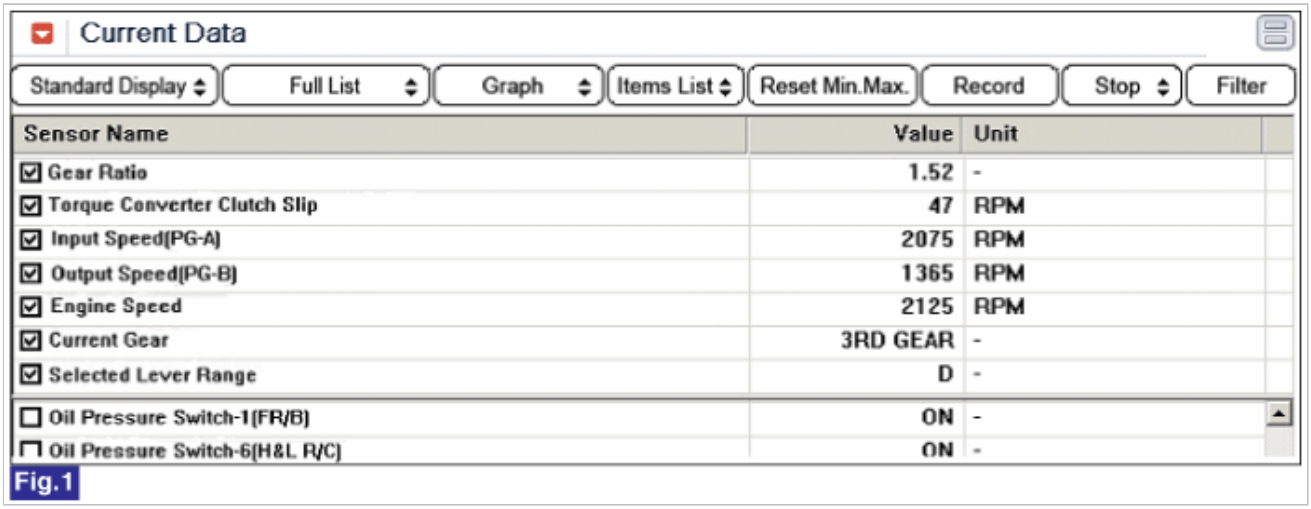


Fig 1) 3rd gear in "D" range

Monitor GDS Data

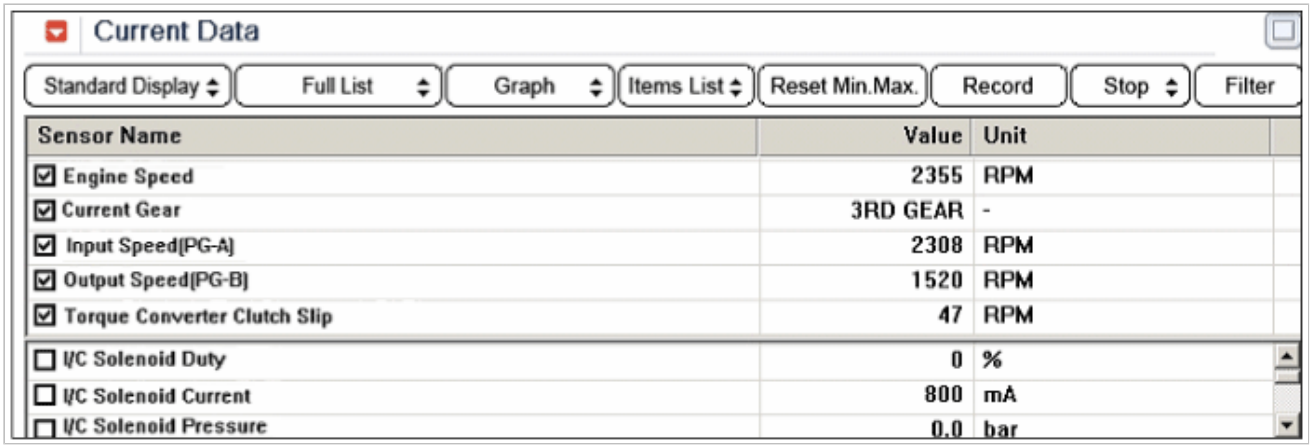
■ Stall Test

※ It is difficult to do "STALL TEST" in 3rd gear, therefore Go to "Signal Check" as follow.

■ Signal Check

1. Connect GDS.
2. Engine "ON" .
3. Monitor the "INPUT & OUTPUT SPEED SENSOR" parameter on the GDS.
4. Accelerate the Engine speed until about 2000 rpm in the 3rd gear.

Specification : INPUT SPEED - (OUTPUT SPEED × 3rd GEAR RATIO) ≥ 200 RPM

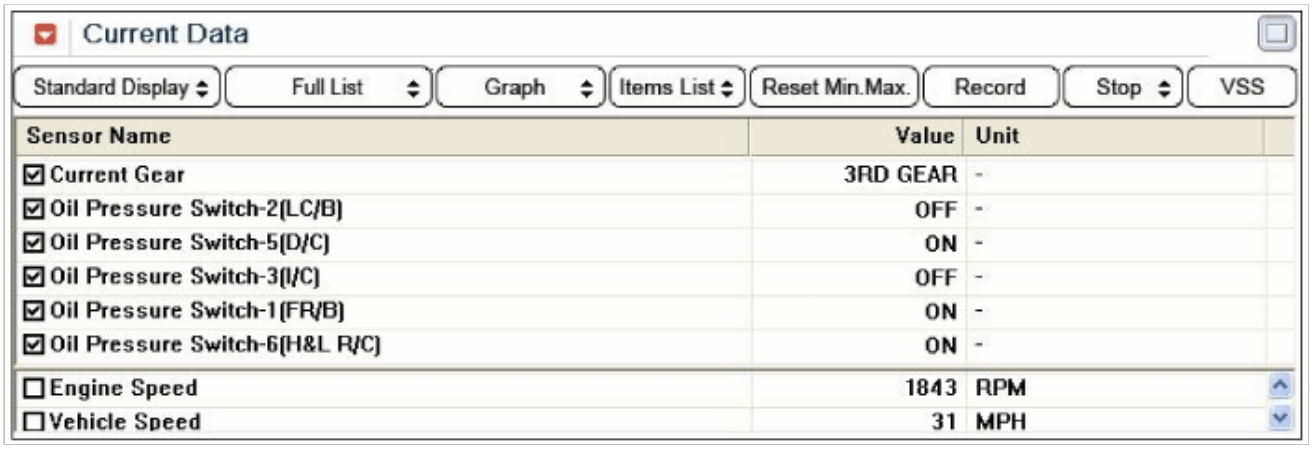


5. Does "INPUT & OUTPUT SPEED SENSOR" within specifications?

YES	▸ Go to "Component Inspection" procedure.
NO	▸ Check for electrical niose of circuit in INPUT & OUTPUT SPEED SENSOR or Replace INPUT & OUTPUT SPEED SENSOR. Repair as necessary and Go to "verification of vehicle repair" procedure.

Component Inspection

1. Connect GDS.
2. Engine "ON" .
3. Monitor the "OIL PRESSURE. S/W 1,2,3,5,6" parameter on the GDS.
4. Move select lever to "D" range and operate vehicle within 3rd gear condition.



5. Does "OIL PRESSURE. S/W 1,2,3,5,6 " follow the reference data?

YES	▸ Repair AUTO TRANSAXLE(Clutch or Brake) as necessary and Go to "verification of vehicle repair" Repair " procedure.
NO	▸ Replace AUTO TRANSAXLE (BODY CONTROL VALVE faulty) as necessary and Go to "verification of vehicle repair " procedure.

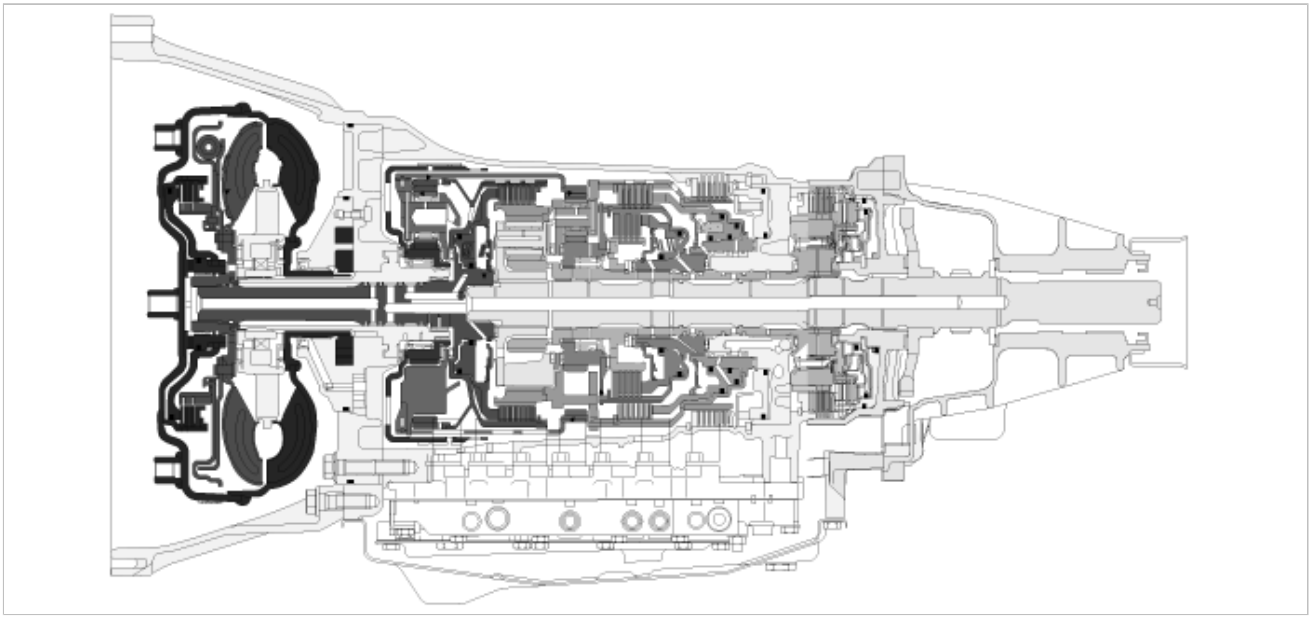
Verification of Vehicle Repair

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

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a GDS, 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.

Component Location



General Description

The value of the input shaft speed should be equal to the value of the output shaft speed, when multiplied by the 4th gear ratio, while the transaxle is engaged in the 4th gear. For example, if the output speed is 1,000 rpm and the 4th gear ratio is 1.000, then the input speed is 1000 rpm.

DTC Description

This code is set if the value of input shaft speed is not equal to the value of the output shaft, when multiplied by the 4th gear ratio, while the transaxle is engaged in 4th gear. This malfunction is mainly caused by mechanical troubles such as control valve sticking or solenoid valve malfuctioning rather than an electrical issue.

DTC Detectiong Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• 4th gear incorrect gear ration	• Faulty Input Speed Sensor • Faulty Output Speed Sensor • Faulty internal parts in transmission
Enable Conditions	• The time after the last shift was finished > 1 sec. • Oil temperature ≥ -10°C(14°F) • Engine speed > 600RPM • Position Lever D • Input Speed > 600rpm • 750rpm < Output Speed(NAB) < 6000rpm • Pre-Filtering 1 sec.	
Threshold Value	• Proportionality check between input speed and Output speed at 4th gear • Input speed > (Output speed *4th Gear Ratio)+200RPM (Rationality-high) • Input speed < (Output speed *4th Gear Ratio)-200RPM (Rationality-low)	
Diagnostic Time	• More than 1sec	
Fail Safe	• 4th gear Limp-Home mode	

Signal Waveform & Data

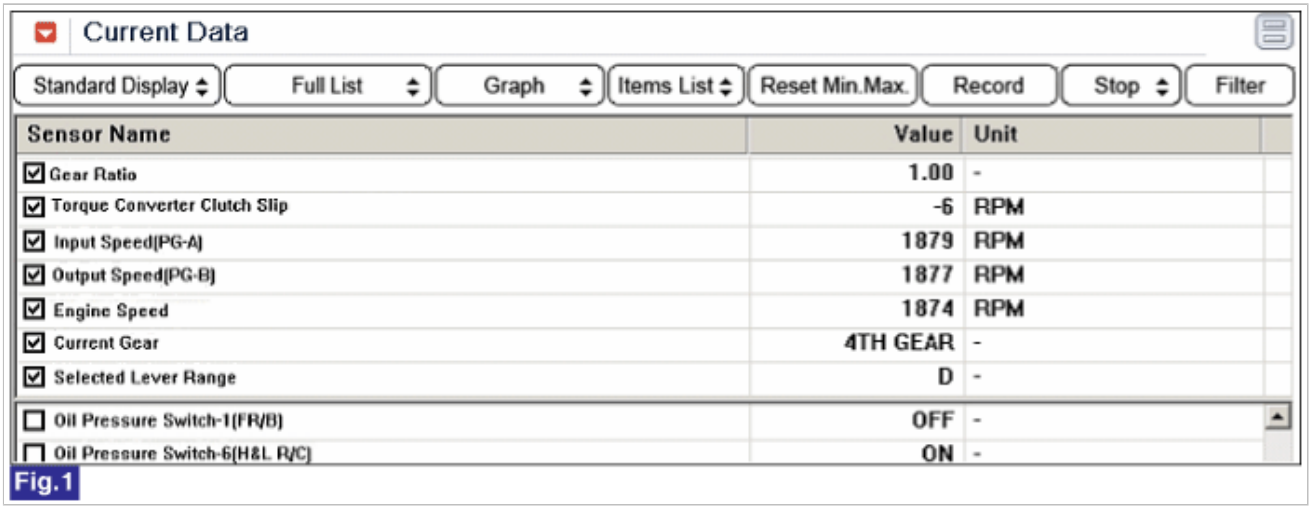


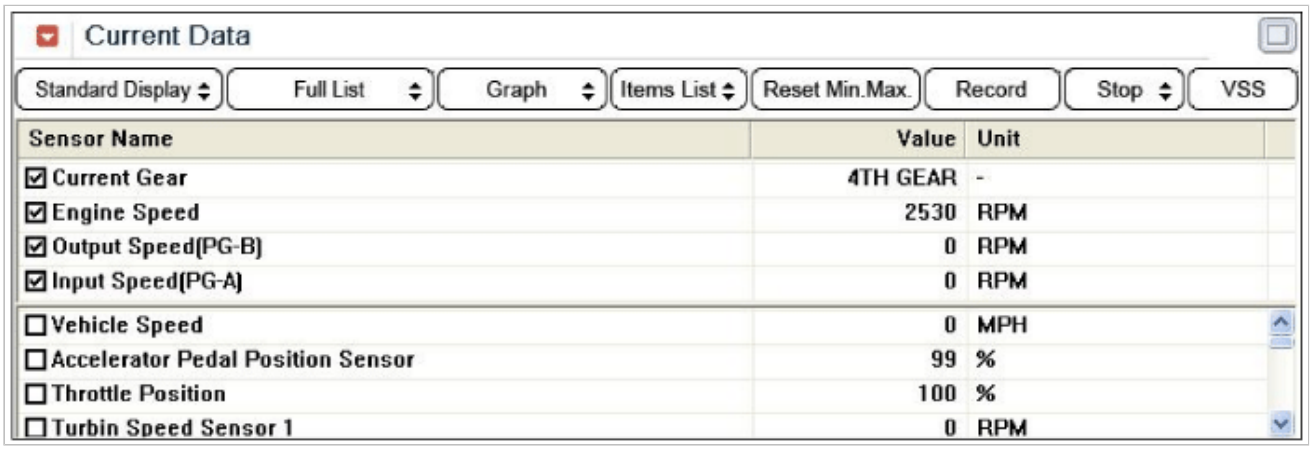
Fig 1) 4th gear in "D" range

Monitor GDS Data

■ Stall Test

1. Connect GDS to data link connector(DLC)
2. Engine "ON" .
3. Fix the 4th gear by disconneting solenoid valve connector.
4. Monitor the "ENGINE SPEED, INPUT SPEED SENSOR, OUTPUT SPEED SENSOR, GEAR POSITION" parameter on the GDS.
5. Perform the "STALL TEST" with gear position "4".

Specification : 2300 ± 200 engine rpm



OPERATING ELEMENT OF EACH SHIFTING RANGE

Shifting Position		Input clutch	High&Low ReverseClutch	Direct Clutch	Reverse Brake	Front Brake	Low Coast Brake	Forward Brake	1st OwnWay Clutch	Forward OwnWay Clutch	3rd OwnWay Clutch
P			▲			▲					
R			●		●	●			●		●
N			▲			▲					
D	1st gear		★			▲	★	●	●	●	●
	2nd gear			●		▲		●		●	●
	3rd gear		●	●		●		▲	◆		●

	4th gear	●	●	●				▲	◆		
	5th gear	●	●			●		▲	◆		◆

● : WORKING.
◆ : PARTICIPATE IN DELIVERY TORQUE WHEN COAST DRIVING.
▲ : SUPPLING OIL PRESSURE TO ELEMENT, BUT NOT EFFECT ON OUTPUT.
★ : TEMPORARY WORKING.

NOTE

Stall test procedure in D4 and reason
Procedure
1. Warm up the engine
2. After positioning the select lever in "D" or "ON" of the HOLD SW (Operate UP SHIFT in case of "SPORTS MODE"),depress the foot brake pedal fully after that, depress the accelerator pedal to the maximum
* The slippage of 4th gear operating parts can be detected by stall test in D2
Reason for stall test
1. If there is no mechanical defaults in A/T, every slippage occur in torque converter.
2. Therfore, engine revolution is output, but input and output speed revolution must be "zero" due to wheel's lock.
3. If 4th gear operating parts have faults, input speed revolution will be out.
4. If oupput speed revolution is output. It means that the foot brake force is not applied fully. Remeasuring is required.

6. Is the meausred "STALL TEST " within specifications?

YES	▸ Go to "signal check" as follow.
NO	▸ Go to "Component inspection" procedure.

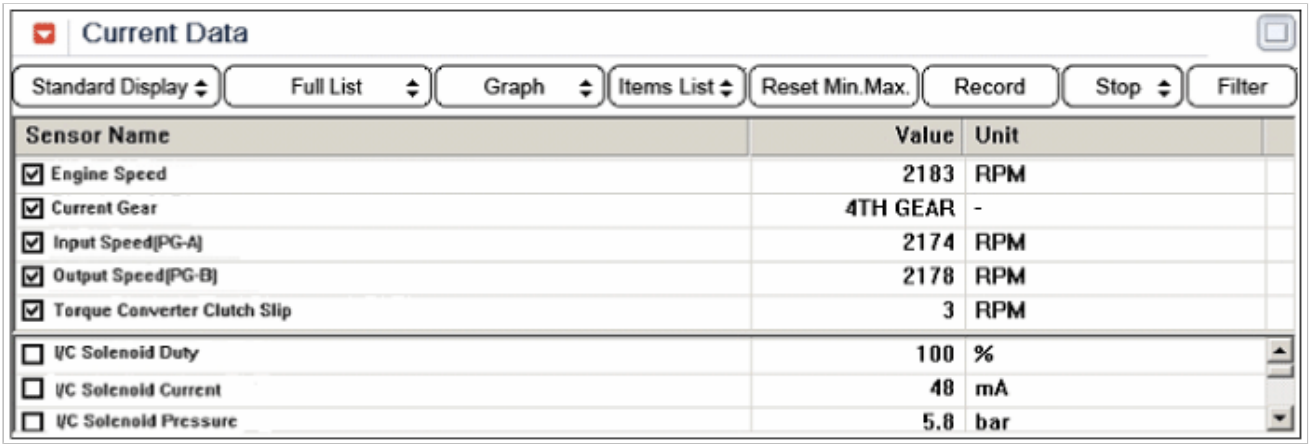
CAUTION

1. Do not let anybody stand in front of or behind the vehicle while this test is being carried out.
2. Check the A/T fluid level and temperature and the engine coolant temperature.
   • Fluid level : At the hot mark on the oil level gauge.
   • Fluid temperature : 176 °F~ 212 °F (80~100 °C).
   • Engine coolant temperature : 176 °F~ 212 °F (80~100 °C).
3. Chock both rear wheel(left and right).
4. Pull the parking brake lever on with the brake pedal fully depressed.
5. The throttle should not be left fully open for more than eight second.
6. If carrying out the stall test two or more time, move the select lever to the "N" position and run the engine at 1,000 rpm to let the A/T fluid cool down before carrying out subsequent.

■ Signal Check

1. Connect GDS.
2. Engine "ON" .
3. Monitor the "INPUT & OUTPUT SPEED SENSOR" parameter on the GDS.
4. Accelerate the Engine speed until about 2000 rpm in the 4th gear.

Specification : Input Speed /4th gear ratio - Output Speed ≥ 200rpm

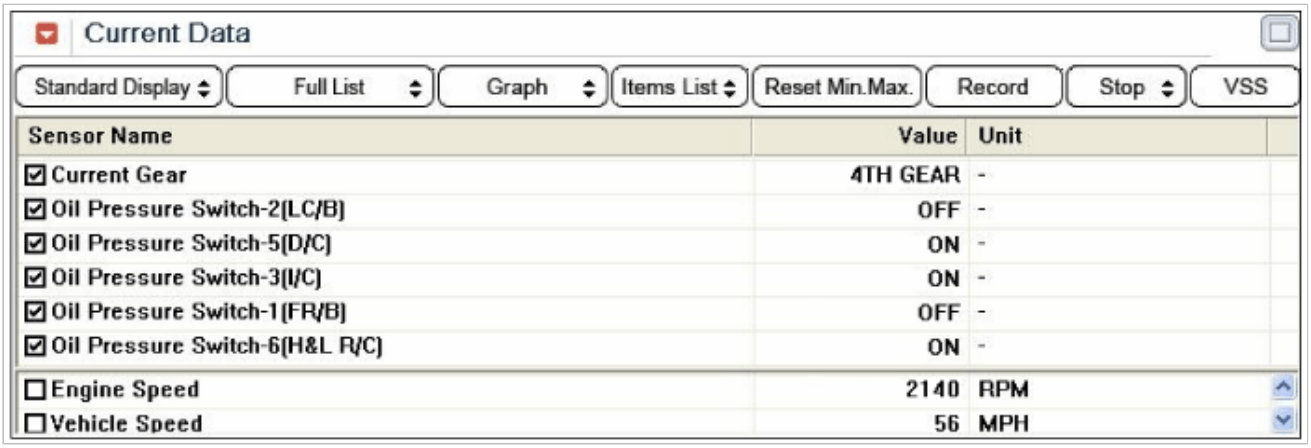


5. Does "INPUT & OUTPUT SPEED SENSOR" within specifications?

YES	▸ Go to "Component Inspection" procedure.
NO	▸ Check for electrical niose of circuit in INPUT & OUTPUT SPEED SENSOR or Replace INPUT & OUTPUT SPEED SENSOR. Repair as necessary and Go to "verification of vehicle repair" procedure.

Component Inspection

1. Connect GDS.
2. Engine "ON" .
3. Monitor the "OIL PRESSURE. S/W 1,2,3,5,6" parameter on the GDS.
4. Move select lever to "D" range and operate vehicle within 4th gear condition.



5. Does "OIL PRESSURE. S/W 1,2,3,5,6 " follow the reference data?

YES	▸ Repair AUTO TRANSAXLE(Clutch or Brake) as necessary and Go to "verification of vehicle repair" Repair " procedure.
NO	▸ Replace AUTO TRANSAXLE (BODY CONTROL VALVE faulty) as necessary and Go to "verification of vehicle repair " procedure.

Verification of Vehicle Repair

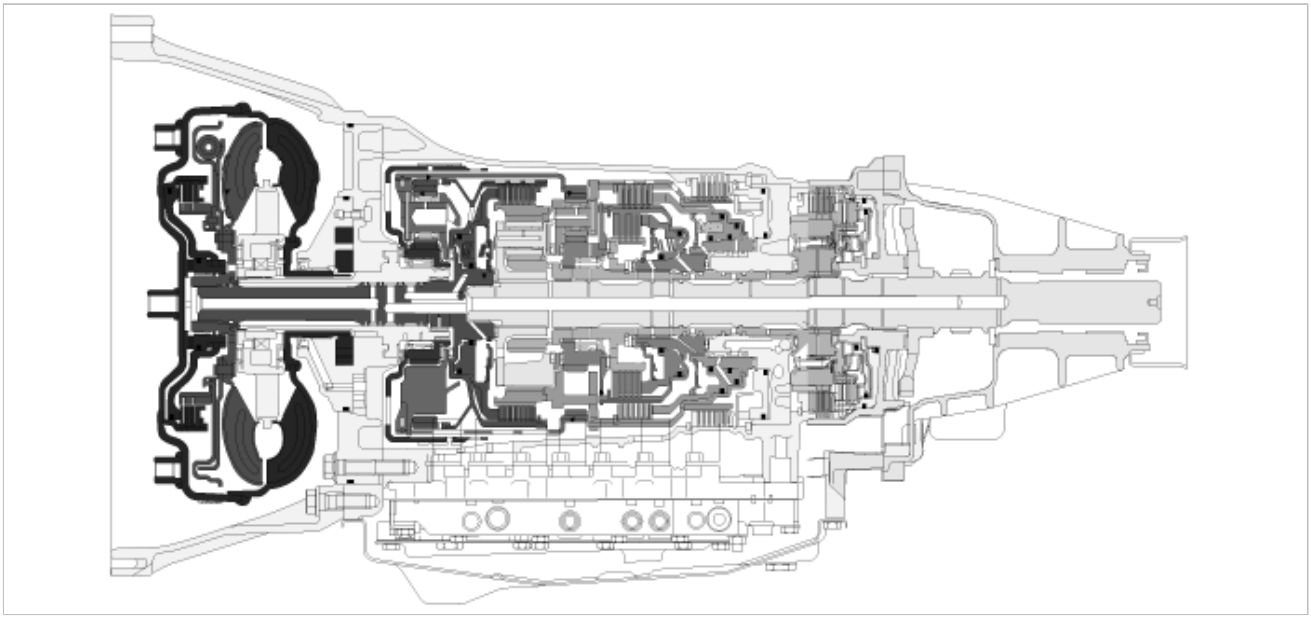
After a repair, it is essential to verify that the fault has been corrected.

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

	▸ Go to the applicable troubleshooting procedure.

YES	
NO	▸ System performing to specification at this time.

Component Location



General Description

The value of the input shaft speed should be equal to the value of the output shaft speed, when multiplied by the 4th gear ratio, while the transaxle is engaged in the 5th gear. For example, if the output speed is 1,000 rpm and the 5th gear ratio is 0.840, then the input speed is 840 rpm.

DTC Description

This code is set if the value of input shaft speed is not equal to the value of the output shaft, when multiplied by the 5th gear ratio, while the transaxle is engaged in 5th gear. This malfunction is mainly caused by mechanical troubles such as control valve sticking or solenoid valve malfuctioning rather than an electrical issue.

DTC Detectiong Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• 5th gear incorrect gear ratio	• Faulty Input Speed Sensor • Faulty Output Speed Sensor • Faulty internal parts in transmission
Enable Conditions	• The time after the last shift was finished > 1 sec. • Oil temperature ≥ -10°C(14°F) • Engine speed > 600RPM • Position Lever D • Input Speed > 600rpm • 1100rpm < Output Speed(NAB) < 6000rpm • Pre-Filtering 1 sec.	
Threshold Value	• Proportionality check between input speed and Output speed at 5th gear • Input speed > (Output speed *5th Gear Ratio)+200RPM (Rationality-high) • Input speed < (Output speed *5th Gear Ratio)-200RPM (Rationality-low)	
Diagnostic Time	• More than 1sec	
Fail Safe	• 4th gear Limp-Home mode	

Signal Waveform & Data

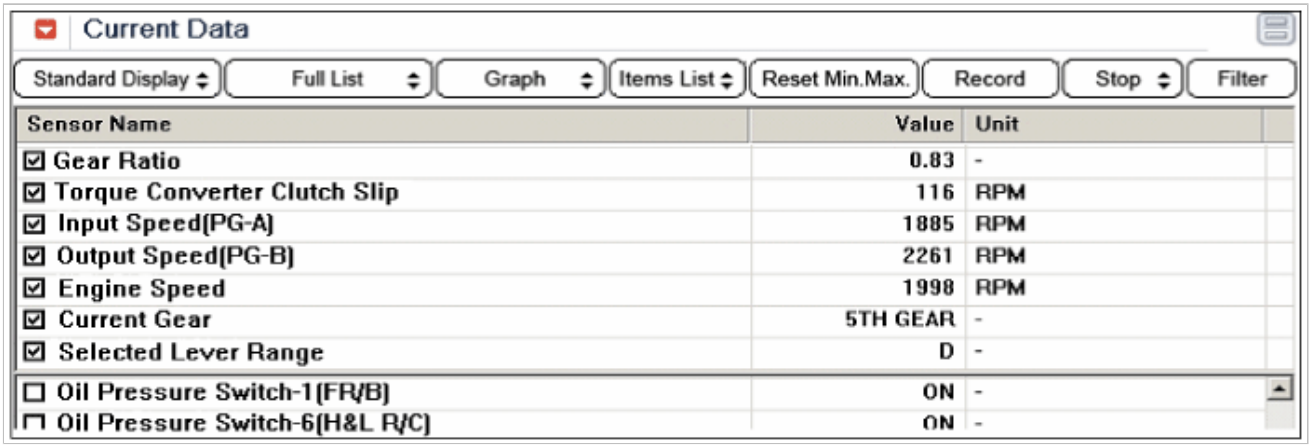


Fig 1) 5th gear in "D" range

Monitor GDS Data

■ Stall Test

※ It is difficult to do "STALL TEST" in 5th gear, so that Go to "signal check" procedure.

Operating Element Of Each Shifting Range

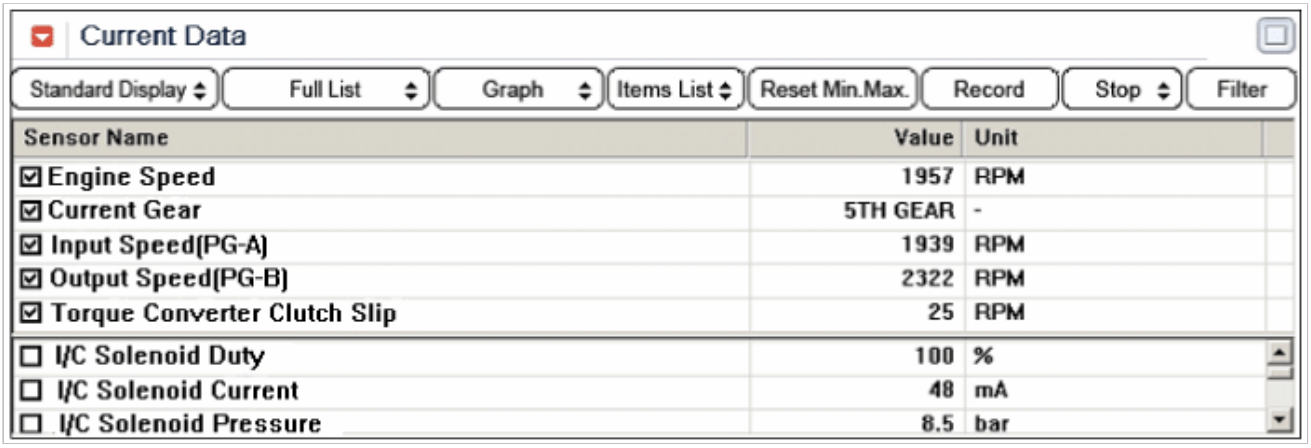
Shifting Position		Input clutch	High&Low ReverseClutch	Direct Clutch	Reverse Brake	Front Brake	Low Coast Brake	Forward Brake	1st OwnWay Clutch	Forward OwnWay Clutch	3rd OwnWay Clutch
P			▲			▲					
R			●		●	●			●		●
N			▲			▲					
D	1st gear		★			▲	★	●	●	●	●
	2nd gear			●		▲		●		●	●
	3rd gear		●	●		●		▲	◆		●
	4th gear	●	●	●				▲	◆		
	5th gear	●	●			●		▲	◆		◆

● : WORKING.
◆ : PARTICIPATE IN DELIVERY TORQUE WHEN COAST DRIVING.
▲ : SUPPLING OIL PRESSURE TO ELEMENT, BUT NOT EFFECT ON OUTPUT.
★ : TEMPORARY WORKING.

■ Signal Check

1. Connect GDS.
2. Engine "ON" .
3. Monitor the "INPUT & OUTPUT SPEED SENSOR" parameter on the GDS.
4. Accelerate the Engine speed until about 2000 rpm in the 5th gear.

Specification : INPUT SPEED - (OUTPUT SPEED × 5th GEAR RATIO) ≥ 200 RPM

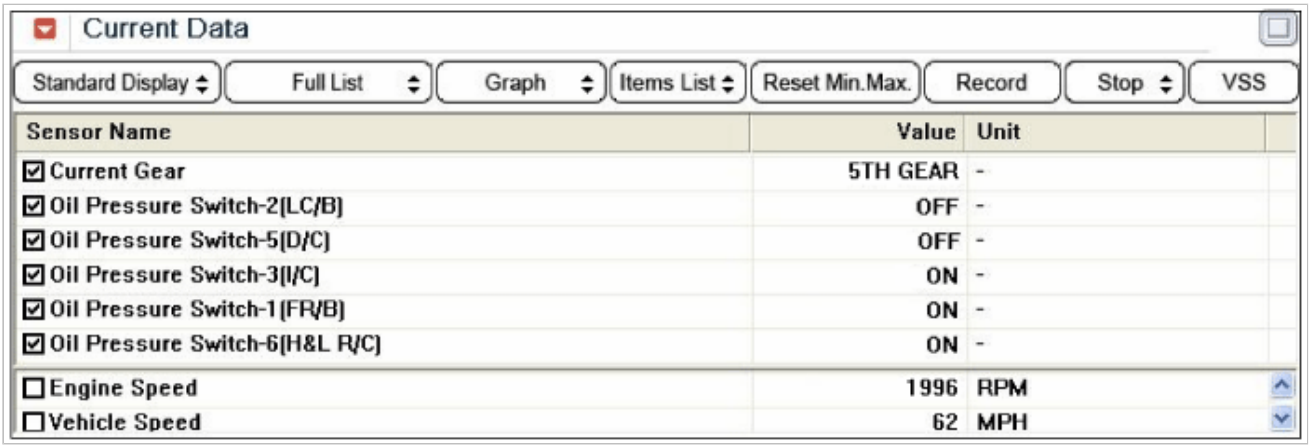


5. Does "INPUT & OUTPUT SPEED SENSOR" within specifications?

YES	▸ Go to "Component Inspection" procedure.
NO	▸ Check for electrical niose of circuit in INPUT & OUTPUT SPEED SENSOR or Replace INPUT & OUTPUT SPEED SENSOR. Repair as necessary and Go to "verification of vehicle repair" procedure.

Component Inspection

1. Connect GDS.
2. Engine "ON" .
3. Monitor the "OIL PRESSURE. S/W 1,2,3,5,6" parameter on the GDS.
4. Move select lever to "D" range and operate vehicle within 5th gear condition.



5. Does "OIL PRESSURE. S/W 1,2,3,5,6 " follow the reference data?

YES	▸ Repair AUTO TRANSAXLE(Clutch or Brake) as necessary and Go to "verification of vehicle repair" Repair " procedure.
NO	▸ Replace AUTO TRANSAXLE (BODY CONTROL VALVE faulty) as necessary and Go to "verification of vehicle repair " procedure.

Verification of Vehicle Repair

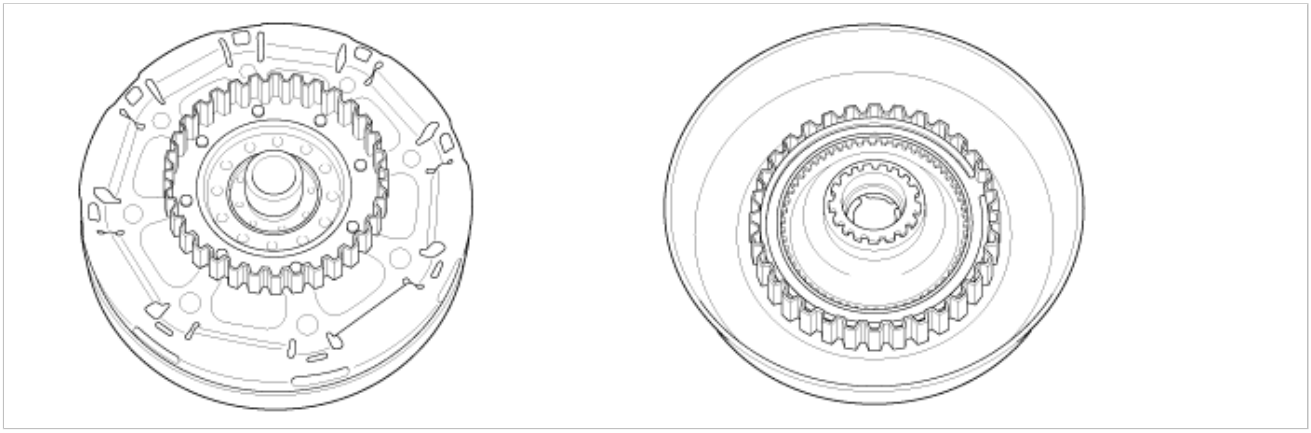
After a repair, it is essential to verify that the fault has been corrected.

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

	▸ Go to the applicable troubleshooting procedure.

YES	
NO	▸ System performing to specification at this time.

Component Location



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 appling hydraulic pressure. The main purpose of T/C clutch control is to save fuel by decreasing the hydraulic load inside the T/C. The TCM outputs duty pulses to control the Damper Clutch Control Solenoid Valve(DCCSV) and hydraulic pressure is applied to DC according to the DCC duty ratio value. When the duty ratio is high, high pressure is applied and the Damper Clutch is locked. The normal operating range of the Damper Clutch Control current is from 0.05A (unlocked) to 0.75A(locked).

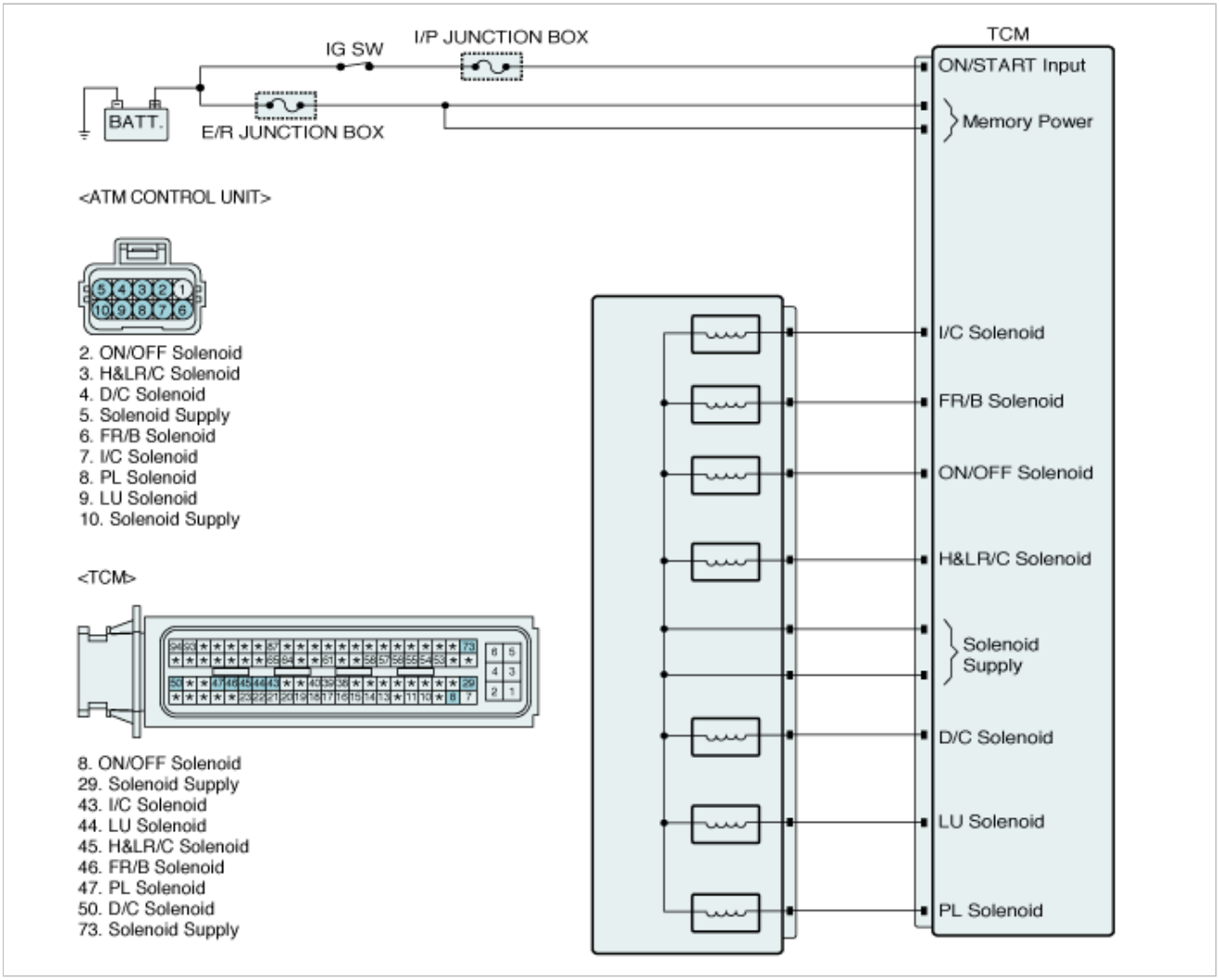
DTC Description

The PCM/TCM increases the duty ratio to engage the Damper Clutch by monitoring slip rpms (difference vlaue beteween engine speed and turbine speed).
To decrease the slip of the Damper Clutch, the TCM increases the duty ratio by appling more hyraulic pressure. When slip rpm does not drop under some value with 100% duty ratio, the PCM/TCM determines that the Torque Converter Clutch is stuck OFF and sets this code.

DTC Detectiong Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Rationality(Damper clutch open stuck)	※ Torque Converter Clutch = Damper Clutch • Faulty Torque Conveter Clutch • Faulty Torque Conveter Clutch Solenoid Valve • Faulty Valve Body • Fautly PCM/TCM
Enable Conditions	• Input speed > 0 • Duty of damper clutch solenoid valve 100%	
Threshold Value	• Amount of slip(engine speed-turbine speed) when DCSV is applied 100% duty • Engine speed-Input speed > 100 RPM	
Diagnostic Time	• More than 5sec	
Fail Safe	• Damper clutch "OFF"	

Diagnostic Circuit Diagram



Monitor GDS Data

1. Connect GDS to data link connector(DLC)
2. Engine "ON" .
3. Select "D RANGE" and drive vehicle from 1st gear to 5th gear.
4. Monitor the "TORQUE CONVERTER(DAMPER) CLUTCH" parameter on the GDS.

Specification : TCC SLIP<40RPM+ Vsp1/2 (TCCSV Current > 6.5A)

Current Data

Standard Display | Full List | Graph | Items List | Reset Min.Max. | Record | Stop | Filter

Sensor Name	Value	Unit
☑ Selected Lever Range	P	-
☑ Current Gear	P/N/R	-
☑ Torque Converter Clutch Slip	23	RPM
☑ Torque Converter Clutch Control Solenoid	0	%
☑ TCC Solenoid Current	48	mA
☑ TCC Solenoid Pressure	-3.0	bar
☐ Output Speed(PG-B)	0	RPM
☐ I/C Solenoid Duty	0	%

Fig.1

Current Data

Standard Display | Full List | Graph | Items List | Reset Min.Max. | Record | Stop | Filter

Sensor Name	Value	Unit
☑ Selected Lever Range	R	-
☑ Current Gear	P/N/R	-
☑ Torque Converter Clutch Slip	58	RPM
☑ Torque Converter Clutch Control Solenoid	0	%
☑ TCC Solenoid Current	48	mA
☑ TCC Solenoid Pressure	-3.0	bar
☐ Output Speed(PG-B)	299	RPM
☐ I/C Solenoid Duty	0	%

Fig.2

Current Data

Standard Display | Full List | Graph | Items List | Reset Min.Max. | Record | Stop | Filter

Sensor Name	Value	Unit
☑ Selected Lever Range	N	-
☑ Current Gear	P/N/R	-
☑ Torque Converter Clutch Slip	21	RPM
☑ Torque Converter Clutch Control Solenoid	0	%
☑ TCC Solenoid Current	48	mA
☑ TCC Solenoid Pressure	-3.0	bar
☐ Output Speed(PG-B)	0	RPM
☐ I/C Solenoid Duty	0	%

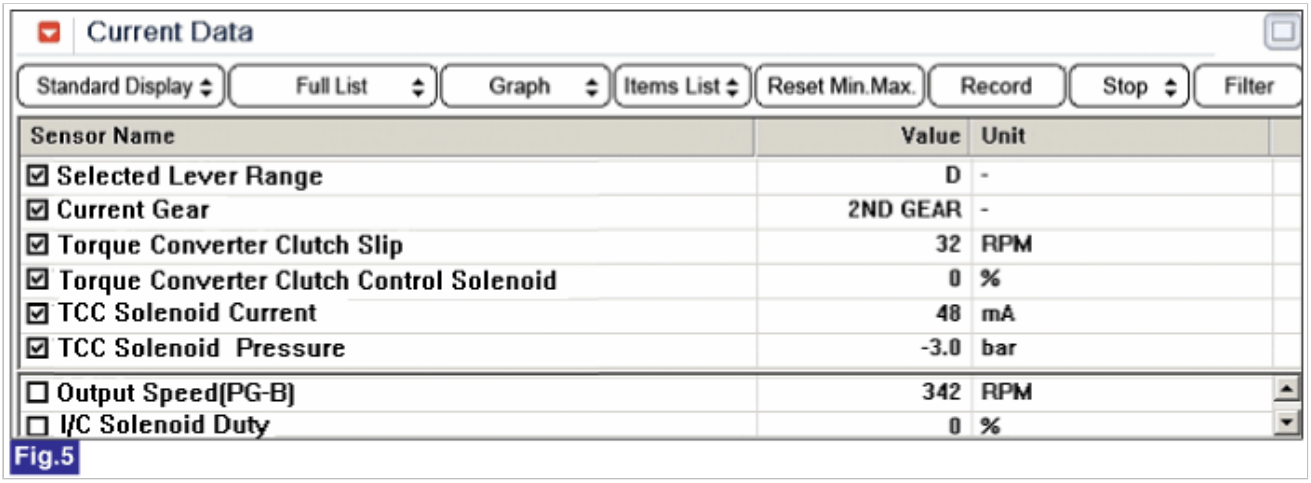
Fig.3

Current Data

Standard Display | Full List | Graph | Items List | Reset Min.Max. | Record | Stop | Filter

Sensor Name	Value	Unit
☑ Selected Lever Range	D	-
☑ Current Gear	1ST GEAR	-
☑ Torque Converter Clutch Slip	24	RPM
☑ Torque Converter Clutch Control Solenoid	0	%
☑ TCC Solenoid Current	48	mA
☑ TCC Solenoid Pressure	-3.0	bar
☐ Output Speed(PG-B)	209	RPM
☐ I/C Solenoid Duty	0	%

Fig.4

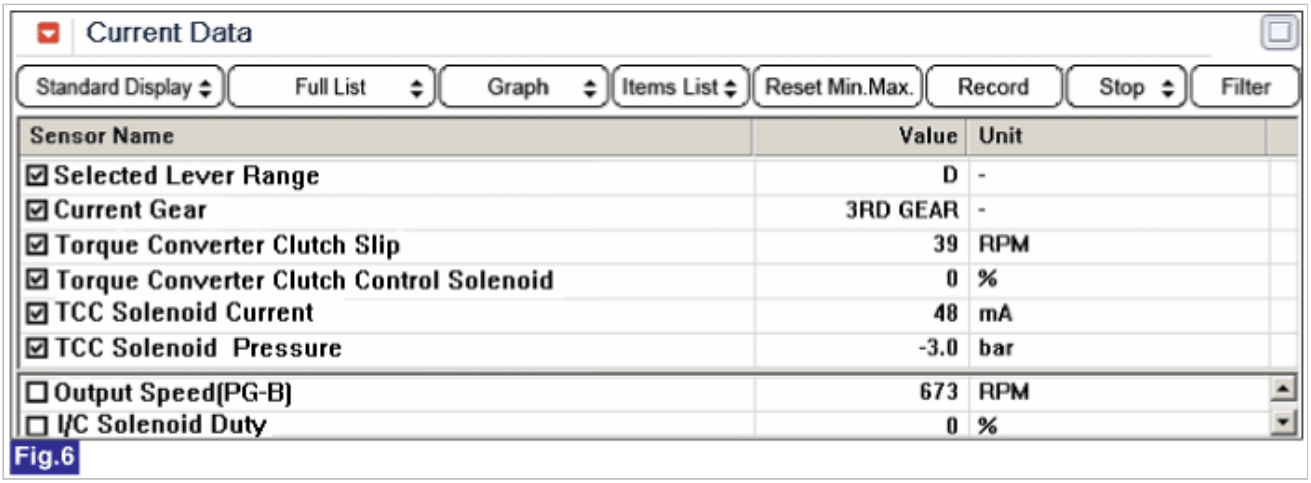


Current Data

Standard Display | Full List | Graph | Items List | Reset Min.Max. | Record | Stop | Filter

Sensor Name	Value	Unit
☑ Selected Lever Range	D	-
☑ Current Gear	2ND GEAR	-
☑ Torque Converter Clutch Slip	32	RPM
☑ Torque Converter Clutch Control Solenoid	0	%
☑ TCC Solenoid Current	48	mA
☑ TCC Solenoid Pressure	-3.0	bar
☐ Output Speed(PG-B)	342	RPM
☐ I/C Solenoid Duty	0	%

Fig.5

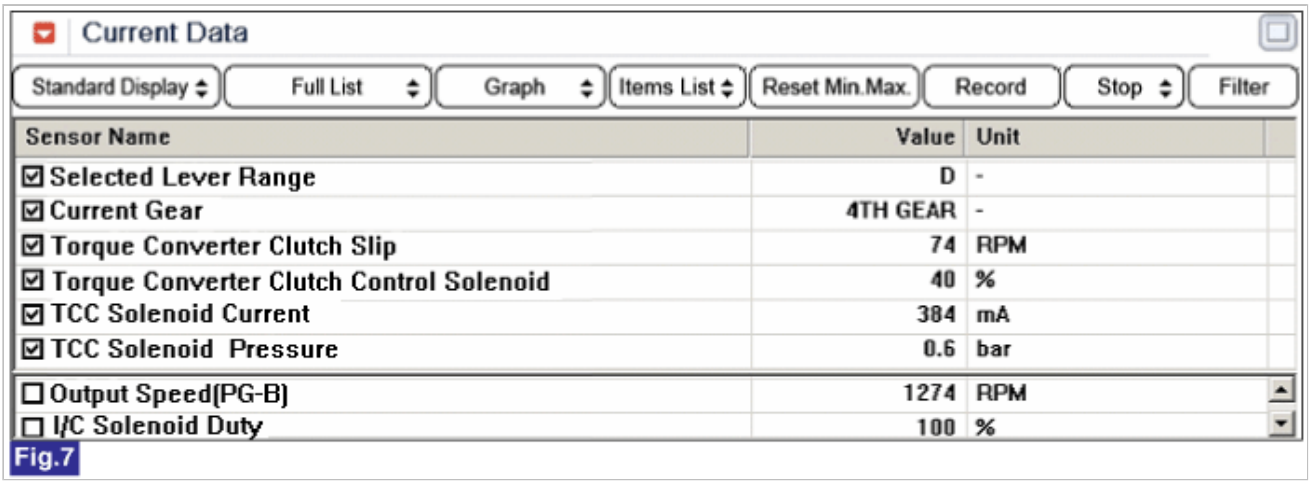


Current Data

Standard Display | Full List | Graph | Items List | Reset Min.Max. | Record | Stop | Filter

Sensor Name	Value	Unit
☑ Selected Lever Range	D	-
☑ Current Gear	3RD GEAR	-
☑ Torque Converter Clutch Slip	39	RPM
☑ Torque Converter Clutch Control Solenoid	0	%
☑ TCC Solenoid Current	48	mA
☑ TCC Solenoid Pressure	-3.0	bar
☐ Output Speed(PG-B)	673	RPM
☐ I/C Solenoid Duty	0	%

Fig.6



Current Data

Standard Display | Full List | Graph | Items List | Reset Min.Max. | Record | Stop | Filter

Sensor Name	Value	Unit
☑ Selected Lever Range	D	-
☑ Current Gear	4TH GEAR	-
☑ Torque Converter Clutch Slip	74	RPM
☑ Torque Converter Clutch Control Solenoid	40	%
☑ TCC Solenoid Current	384	mA
☑ TCC Solenoid Pressure	0.6	bar
☐ Output Speed(PG-B)	1274	RPM
☐ I/C Solenoid Duty	100	%

Fig.7

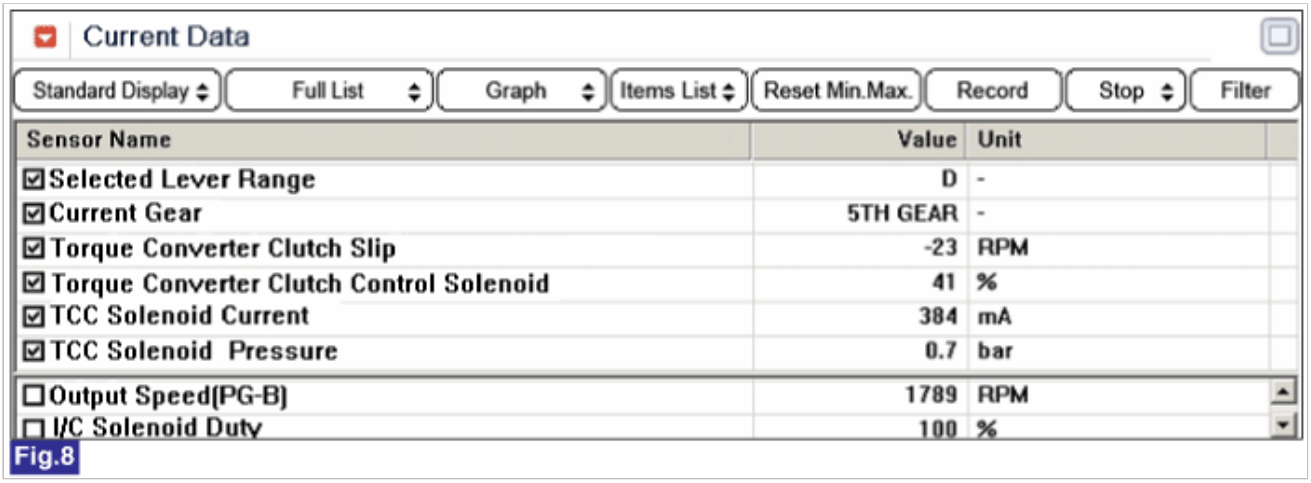


Fig.8

Fig 1) "P" range - No Torque Converter Clutch operation
Fig 2) "R" range - No Torque Converter Clutch operation
Fig 3) "N" range - No Torque Converter Clutch operation
Fig 4) 1st gear in "D" range - No Torque Converter Clutch operation
Fig 5) 2nd gear in "D" range - No Torque Converter Clutch operation
Fig 6) 3rd gear in "D" range - No Torque Converter Clutch operation
Fig 7) 4th gear in "D" range - Torque Converter Clutch operation
Fig 8) 5th gear in "D" range - Torque Converter Clutch operation

5. Is the measured "TCC SLIP(DAMPER CLUTCH SL.RPM)" within specifications ?

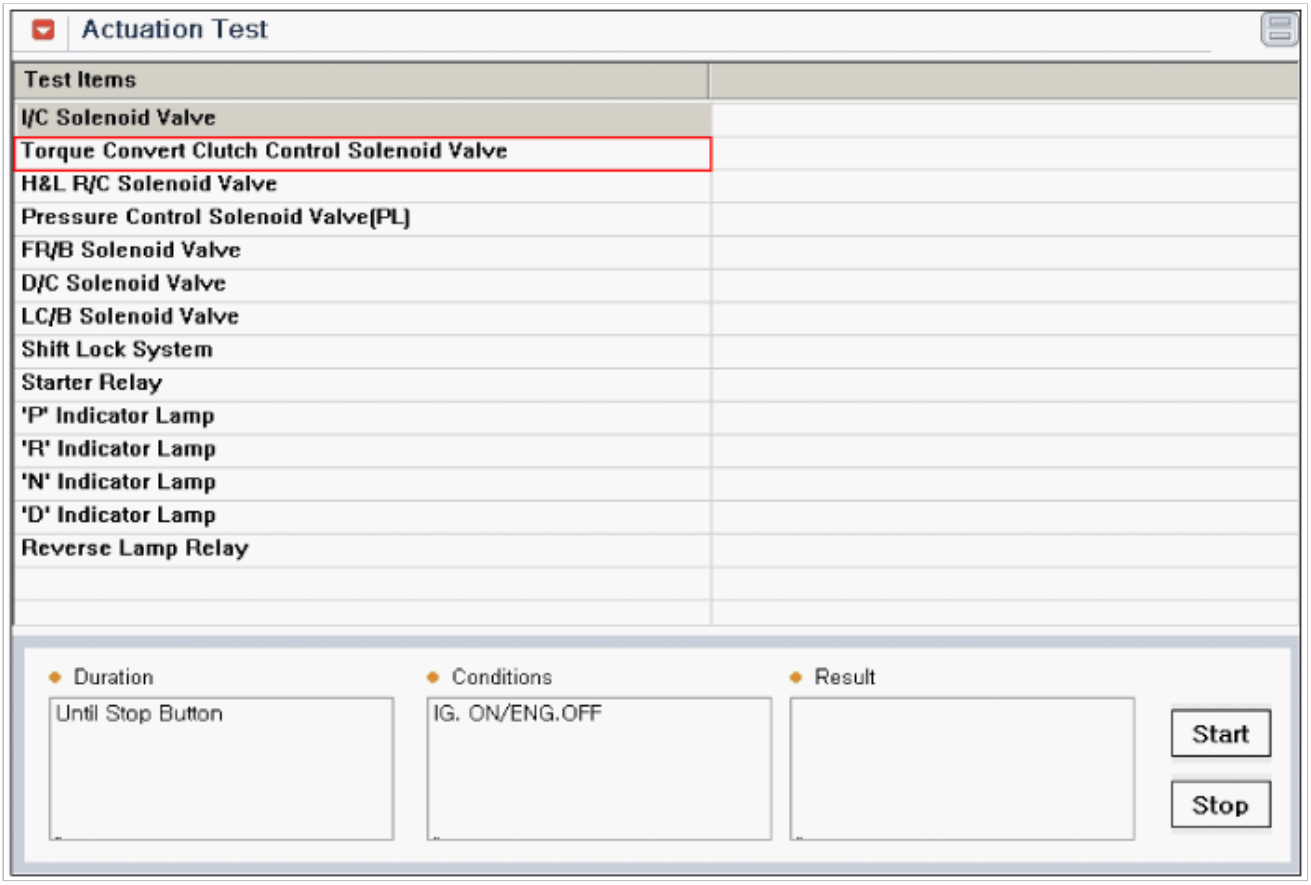
YES	▸ Fault is intermittent caused by poor contact in the sensor's and/or PCM/TCM's connector or was repaired and PCM/TCM memory was not cleared. Throughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go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

Component Inspection

■ Check TCC Solenoid Valve

1. Connect GDS.
2. IGNITION "ON", ENGINE "OFF".
3. Select Torque Converter Solenoid Valve in Actuation Test and Perform Actuation Test.

Specification : Operation



4. Does the solenoid valve operates when actuation test ?

YES	▸ Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.
NO	▸ Substitute with a known-good Torque Converter Solenoid Valve and check for proper operation. If the problem is corrected, replace Torque Converter Solenoid Valve as necessary and go to "Verification of Vehicle Repair" procedure.

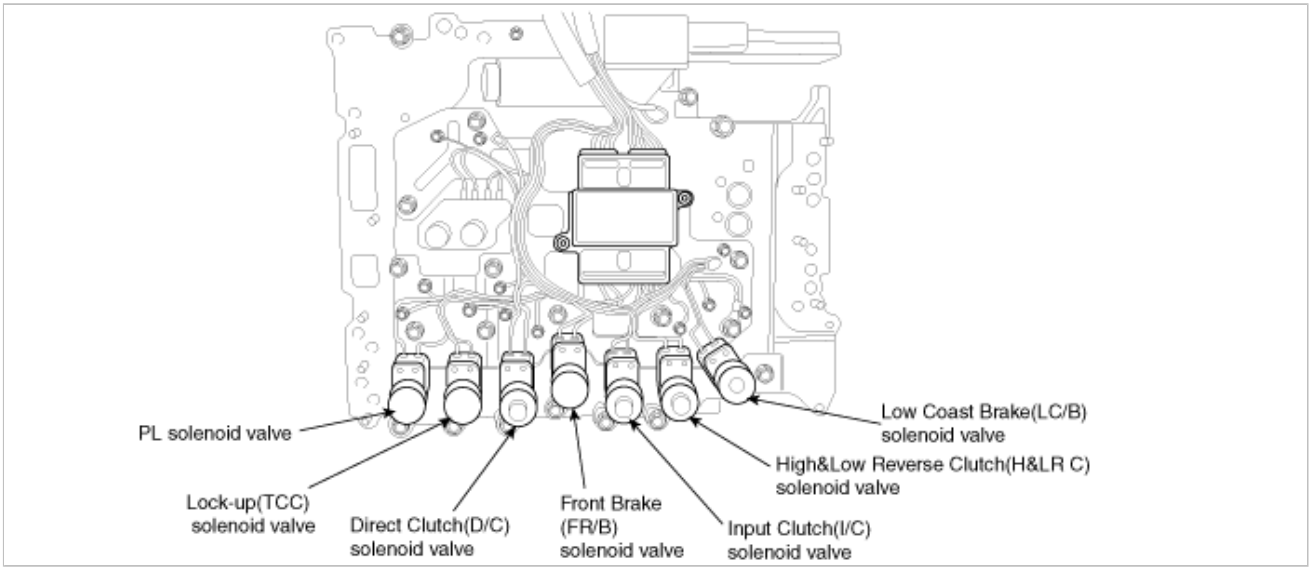
Verification of Vehicle Repair

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

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a GDS, 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.

Component Location



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 appling hydraulic pressure. The main purpose of T/C clutch control is to save fuel by decreasing the hydraulic load inside the T/C. The TCM outputs duty pulses to control the Damper Clutch Control Solenoid Valve(DCCSV) and hydraulic pressure is applied to DC according to the DCC duty ratio value. When the duty ratio is high, high pressure is applied and the Damper Clutch is locked. The normal operating range of the Damper Clutch Control current is from 0.05A (unlocked) to 0.75A(locked).

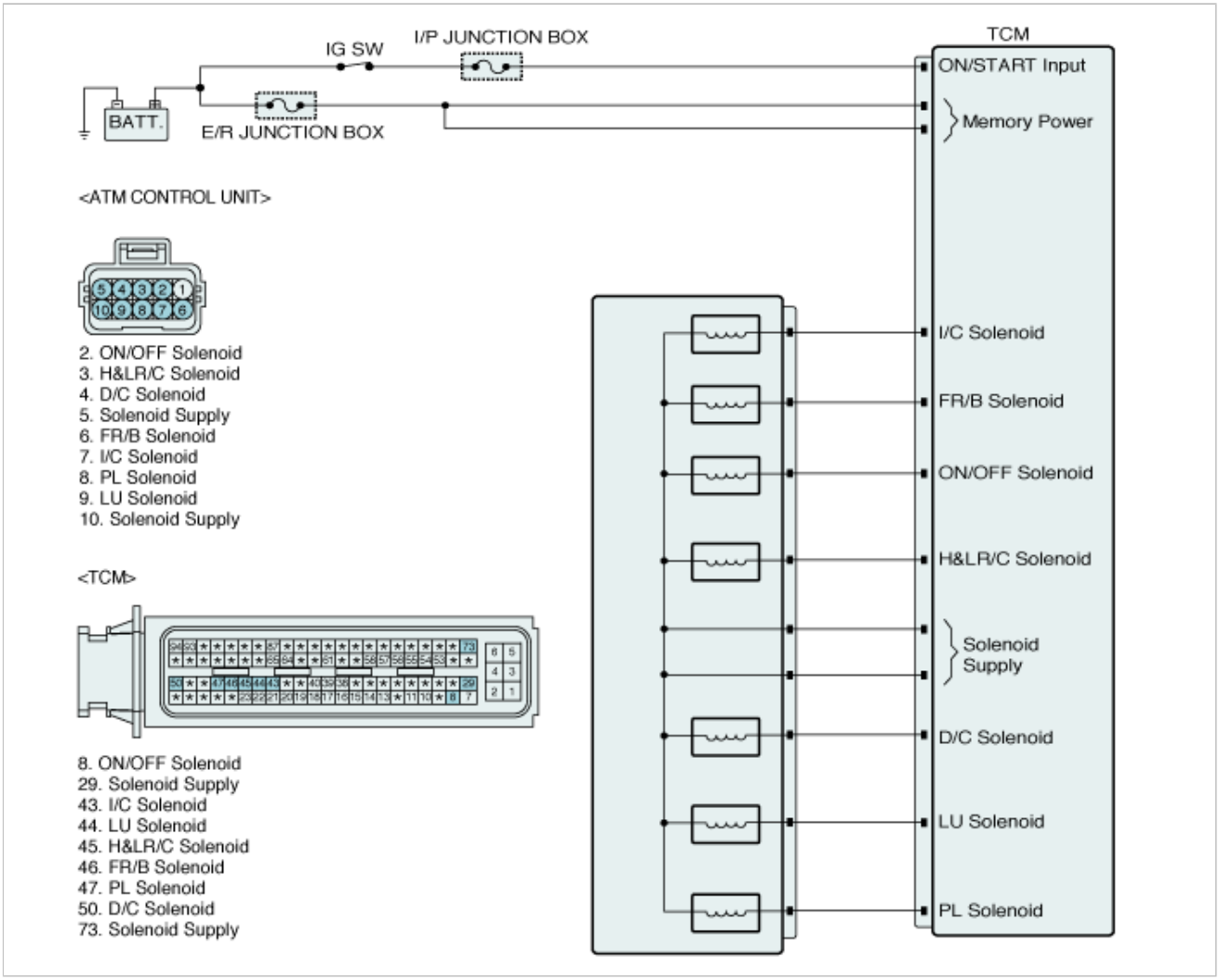
DTC Description

The TCM checks the Damper Clutch Control Signal by monitoring the feedback signal from the solenoid valve drive circuit. If an unexpected signal is monitored, (For example, high voltage is detected when low voltage is expected, or low voltage is detected when high voltage is expected) the TCM judges that the DCCSV circuit is malfunctioning and sets this code.

DTC Detectiong Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Check voltage range(Open, Shrot)	※ Torque Converter Clutch = Damper Clutch • Faulty Torque Conveter Clutch • Faulty Torque Conveter Clutch Solenoid Valve • Faulty Valve Body • Fautly PCM/TCM
Enable Conditions	• 10V < Actuator Supply Voltage < 16V	
Threshold Value	• Hardware IC check	
Diagnostic Time	• More than 0.2sec	
Fail Safe	• Torque Converter Clutch "OFF" • Locked as 4th gear	

Diagnostic Circuit Diagram



Monitor GDS Data

1. Connect GDS to data link connector(DLC)
2. Engine "ON" .
3. Monitor the "TCC SOL. VALVE" parameter on the GDS.
4. Select "D RANGE" and Operate the vehicle in 5th gear.
5. Check "TCC SOL. VALVE" parameter value changes while driving.

Specification : TCC SLIP<40RPM+ Vsp1/2 (TCCSV current > 6.5A)

Current Data

Standard Display | Full List | Graph | Items List | Reset Min.Max. | Record | Stop | Filter

Sensor Name	Value	Unit
☑ Selected Lever Range	P	-
☑ Current Gear	P/N/R	-
☑ Torque Converter Clutch Slip	23	RPM
☑ Torque Converter Clutch Control Solenoid	0	%
☑ TCC Solenoid Current	48	mA
☑ TCC Solenoid Pressure	-3.0	bar
☐ Output Speed(PG-B)	0	RPM
☐ I/C Solenoid Duty	0	%

Fig.1

Current Data

Standard Display | Full List | Graph | Items List | Reset Min.Max. | Record | Stop | Filter

Sensor Name	Value	Unit
☑ Selected Lever Range	R	-
☑ Current Gear	P/N/R	-
☑ Torque Converter Clutch Slip	58	RPM
☑ Torque Converter Clutch Control Solenoid	0	%
☑ TCC Solenoid Current	48	mA
☑ TCC Solenoid Pressure	-3.0	bar
☐ Output Speed(PG-B)	299	RPM
☐ I/C Solenoid Duty	0	%

Fig.2

Current Data

Standard Display | Full List | Graph | Items List | Reset Min.Max. | Record | Stop | Filter

Sensor Name	Value	Unit
☑ Selected Lever Range	N	-
☑ Current Gear	P/N/R	-
☑ Torque Converter Clutch Slip	21	RPM
☑ Torque Converter Clutch Control Solenoid	0	%
☑ TCC Solenoid Current	48	mA
☑ TCC Solenoid Pressure	-3.0	bar
☐ Output Speed(PG-B)	0	RPM
☐ I/C Solenoid Duty	0	%

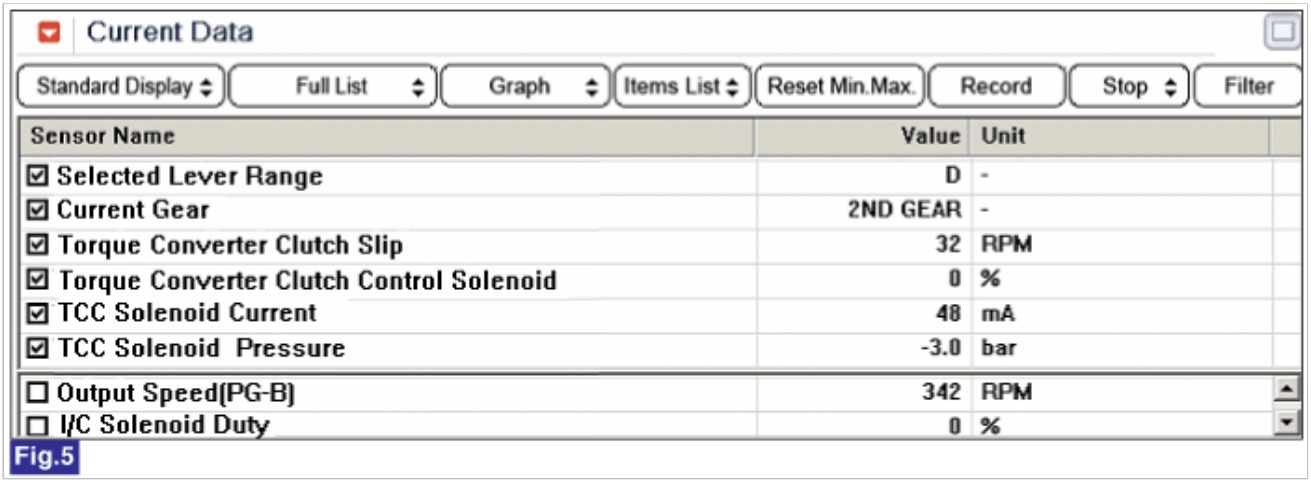
Fig.3

Current Data

Standard Display | Full List | Graph | Items List | Reset Min.Max. | Record | Stop | Filter

Sensor Name	Value	Unit
☑ Selected Lever Range	D	-
☑ Current Gear	1ST GEAR	-
☑ Torque Converter Clutch Slip	24	RPM
☑ Torque Converter Clutch Control Solenoid	0	%
☑ TCC Solenoid Current	48	mA
☑ TCC Solenoid Pressure	-3.0	bar
☐ Output Speed(PG-B)	209	RPM
☐ I/C Solenoid Duty	0	%

Fig.4

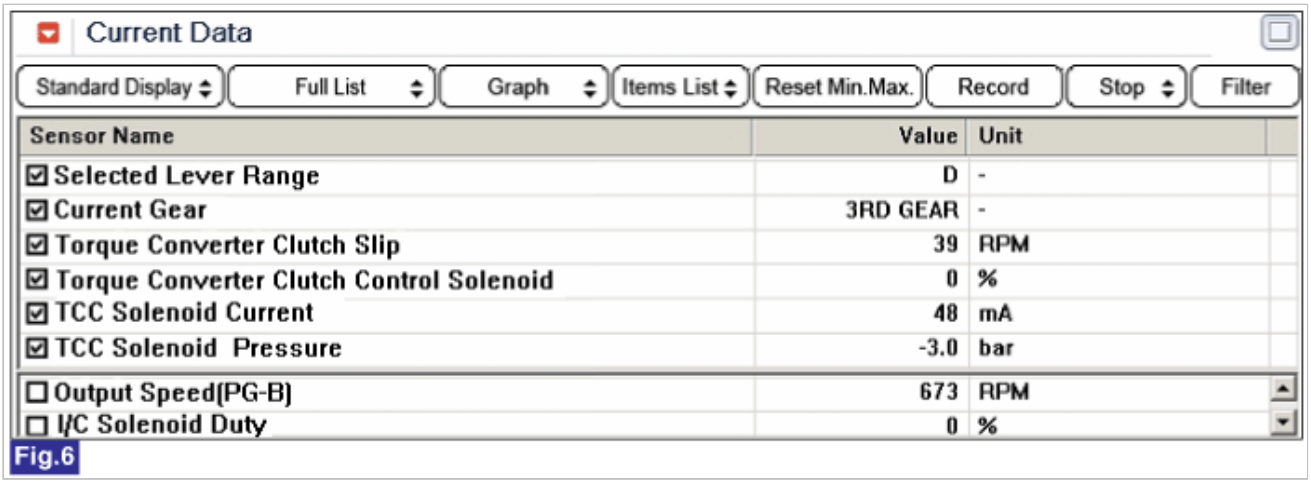


Current Data

Standard Display | Full List | Graph | Items List | Reset Min.Max. | Record | Stop | Filter

Sensor Name	Value	Unit
☑ Selected Lever Range	D	-
☑ Current Gear	2ND GEAR	-
☑ Torque Converter Clutch Slip	32	RPM
☑ Torque Converter Clutch Control Solenoid	0	%
☑ TCC Solenoid Current	48	mA
☑ TCC Solenoid Pressure	-3.0	bar
☐ Output Speed(PG-B)	342	RPM
☐ I/C Solenoid Duty	0	%

Fig.5

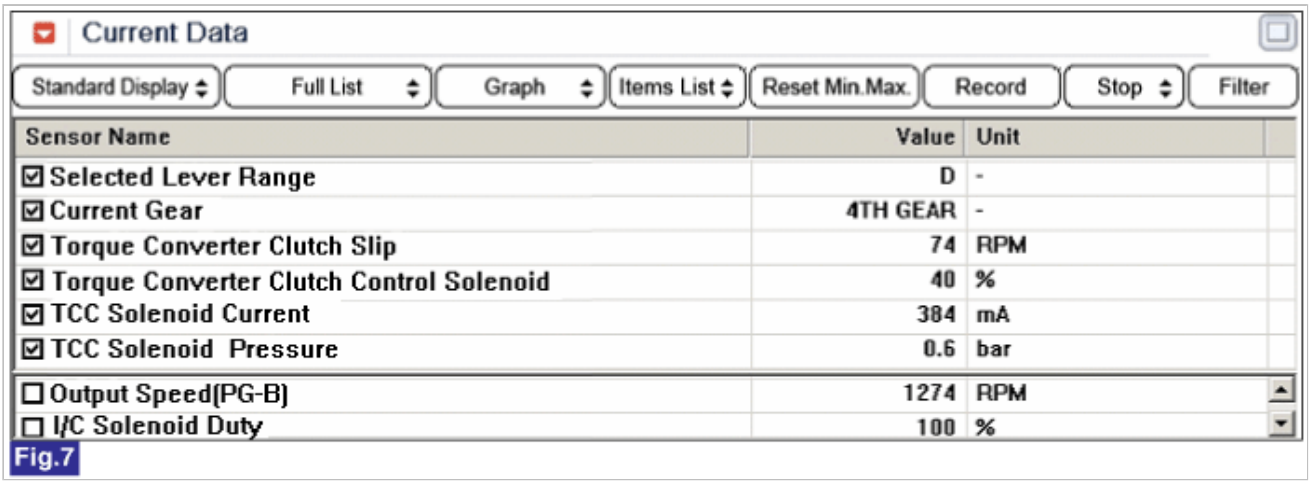


Current Data

Standard Display | Full List | Graph | Items List | Reset Min.Max. | Record | Stop | Filter

Sensor Name	Value	Unit
☑ Selected Lever Range	D	-
☑ Current Gear	3RD GEAR	-
☑ Torque Converter Clutch Slip	39	RPM
☑ Torque Converter Clutch Control Solenoid	0	%
☑ TCC Solenoid Current	48	mA
☑ TCC Solenoid Pressure	-3.0	bar
☐ Output Speed(PG-B)	673	RPM
☐ I/C Solenoid Duty	0	%

Fig.6



Current Data

Standard Display | Full List | Graph | Items List | Reset Min.Max. | Record | Stop | Filter

Sensor Name	Value	Unit
☑ Selected Lever Range	D	-
☑ Current Gear	4TH GEAR	-
☑ Torque Converter Clutch Slip	74	RPM
☑ Torque Converter Clutch Control Solenoid	40	%
☑ TCC Solenoid Current	384	mA
☑ TCC Solenoid Pressure	0.6	bar
☐ Output Speed(PG-B)	1274	RPM
☐ I/C Solenoid Duty	100	%

Fig.7

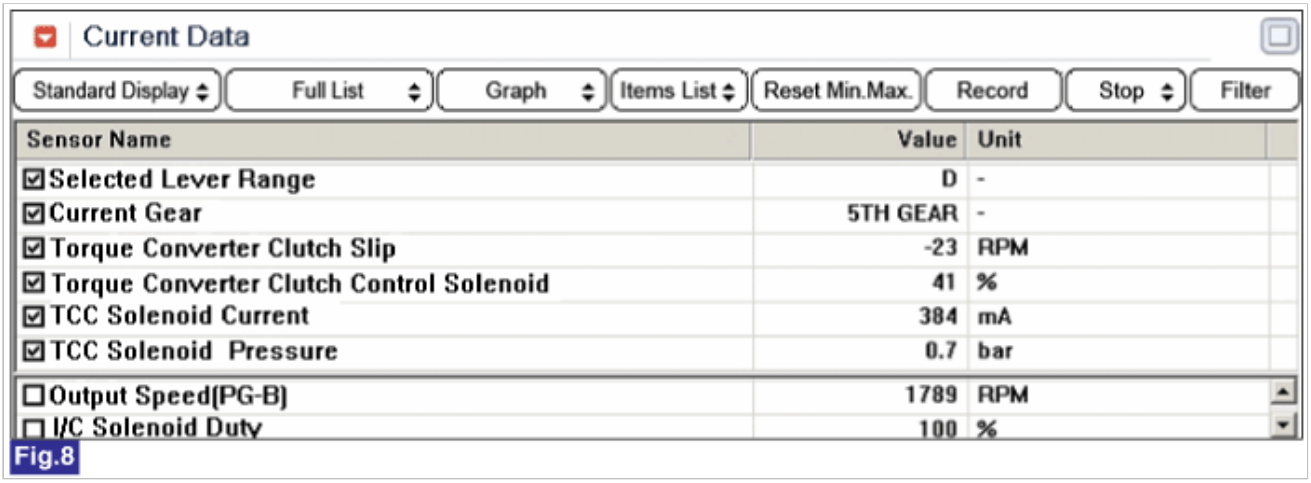


Fig.8

Fig 1) "P" range - No Torque Converter Clutch operation
Fig 2) "R" range - No Torque Converter Clutch operation
Fig 3) "N" range - No Torque Converter Clutch operation
Fig 4) 1st gear in "D" range - No Torque Converter Clutch operation
Fig 5) 2nd gear in "D" range - No Torque Converter Clutch operation
Fig 6) 3rd gear in "D" range - No Torque Converter Clutch operation
Fig 7) 4th gear in "D" range - Torque Converter Clutch operation
Fig 8) 5th gear in "D" range - Torque Converter Clutch operation

6. Is the measured "TCC SLIP(DAMPER CLUTCH SL.RPM)" within specifications ?

YES	▸ 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. Throughly 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.
NO	▸ Go to "W/Harness Inspection" procedure.

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?

YES	▸ Repair as necessary and go to "verification of vehicle repair" procedure.
NO	▸ Go to "Power circuit inspection" procedure.

Power Circuit Inspection

1. Connect "ATM Control Unit(CHG75-3)" connector.
2. IGNITION "ON", ENGINE "OFF".
3. Measure voltage between power terminal of LU solenoid valve and chassis ground.

Specification : Approx. Battery Voltage

4. Is the measured voltage within specifications ?

YES	▸ Go to "Component Inspection" procedure.
NO	▸ Check for open or short in harness. Repair as necessary and then, go to "Verification of Vehicle Repair" procedure. ▸ If the power circuit is O.K, Substitute with a known-good TCM and check for proper operation. If the

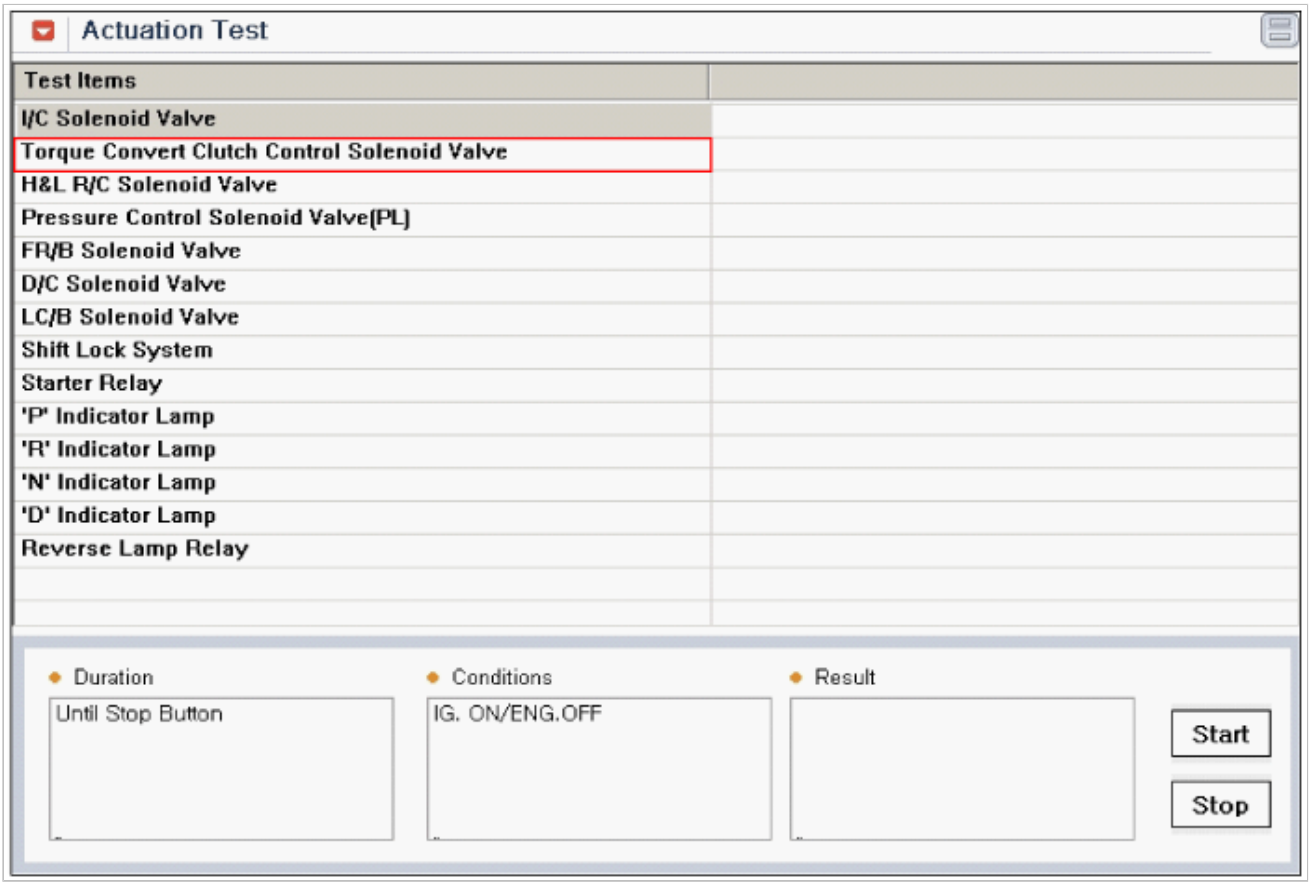
	problem is corrected, replace TCM as necessary and go to "verification of vehicle repair" procedure.

Component Inspection

■ Check TCC Solenoid Valve

1. Connect GDS.
2. IGNITION "ON", ENGINE "OFF".
3. Select Torque Converter Solenoid Valve in Actuation Test and Perform Actuation Test.

Specification : Operation



4. Does the solenoid valve operates when actuation test ?

YES	▸ Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.
NO	▸ Substitute with a known-good Torque Converter Solenoid Valve and check for proper operation. If the problem is corrected, replace Torque Converter Solenoid Valve as necessary and go to "Verification of Vehicle Repair" procedure.

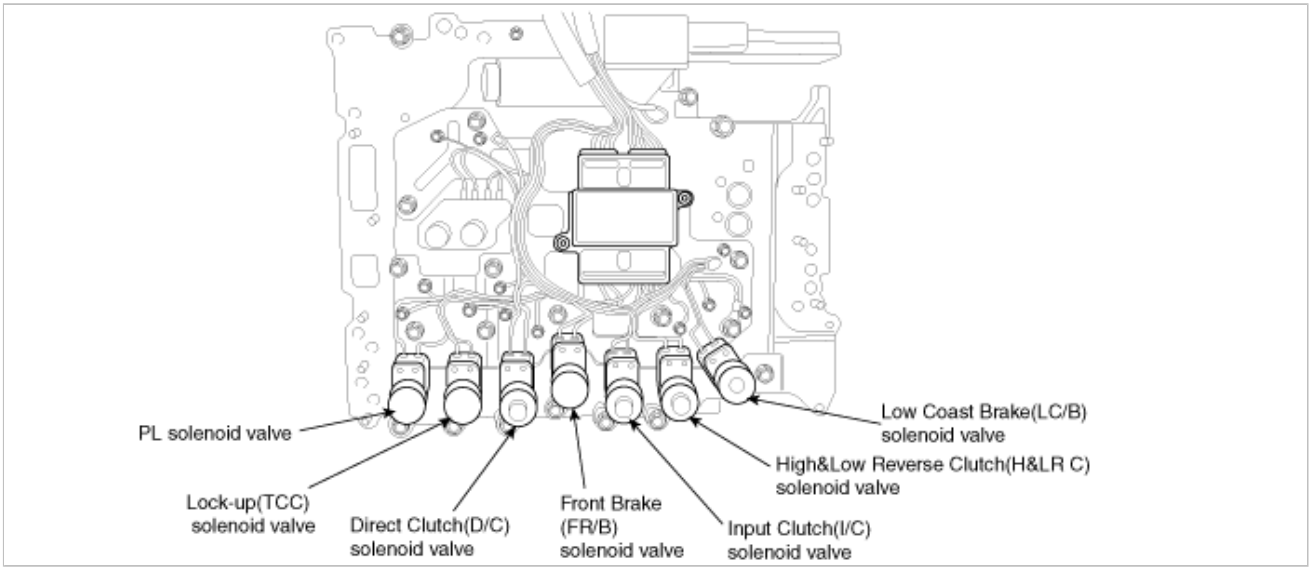
Verification of Vehicle Repair

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

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a GDS, 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.

Component Location



General Description

The line pressure solenoid valve regulates the oil pump discharge pressure to suit the driving condition in response to a signal sent from the TCM. The line pressure duty cycle valve is not consistent when the closed throttle position signal is "ON".

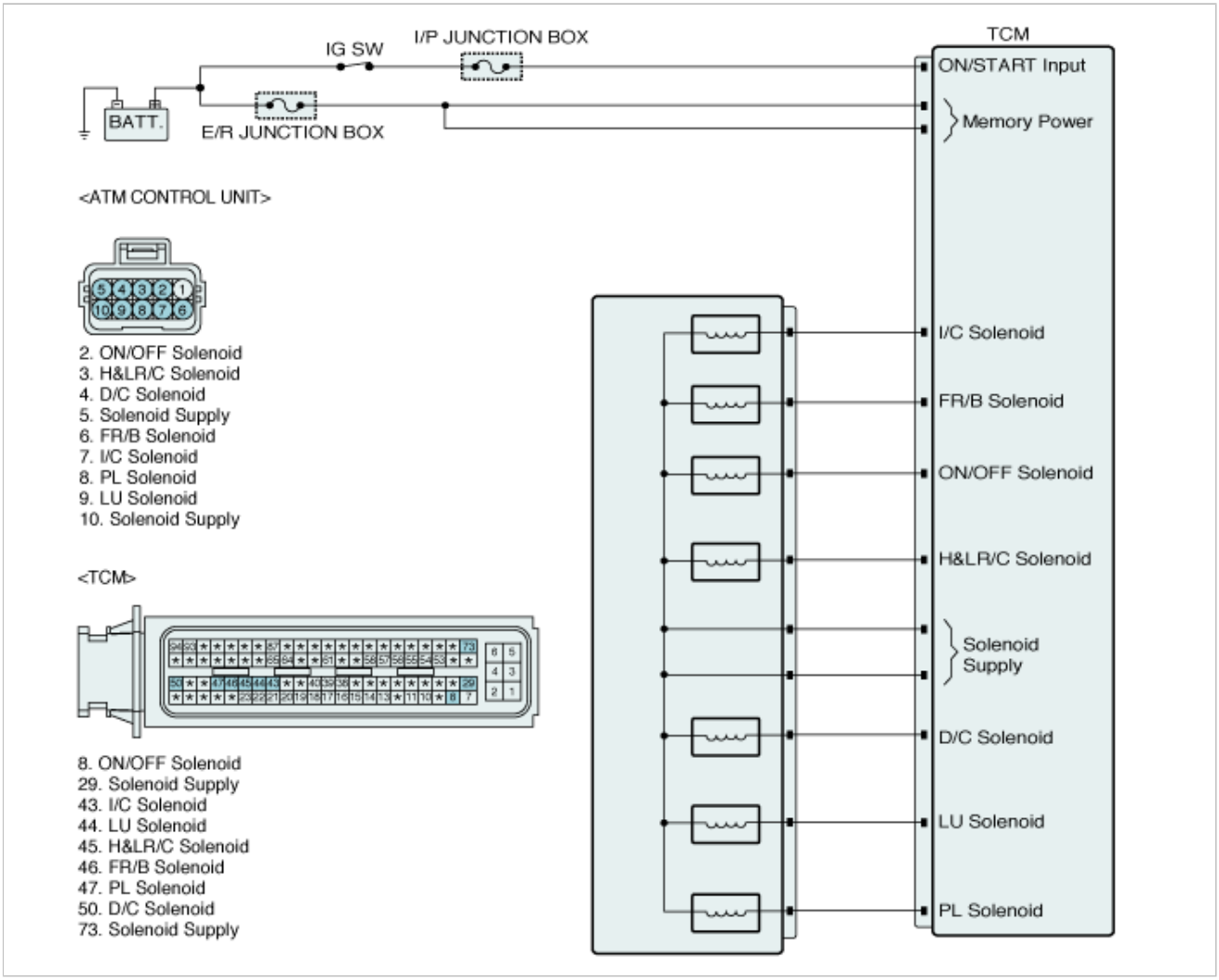
DTC Description

To confirm the line pressure duty cycle at low pressure, the accelerator (throttle) should be open until the closed throttle position signal is "OFF".

DTC Detectiong Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Check voltage range(Open , Short)	※ Pressure Control Solenoid Valve: PCSV(PL. SOL) • Open or short in circuit • Faulty PCSV • Fautly PCM/TCM
Enable Conditions	• 10V < Actuator Supply Voltage < 16V	
Threshold Value	• Hardware IC check	
Diagnostic Time	• More than 0.2sec	
Fail Safe	• Torque Converter Clutch "OFF" • Locked as 4th gear	

Diagnostic Circuit Diagram



Monitor GDS Data

1. Connect GDS to data link connector(DLC)
2. Engine "ON" .
3. Monitor the "PCSV" parameter on the GDS.
4. Select "D RANGE" and Operate the vehicle.
5. Check "PCSV" parameter value changes while driving.

Specification : Changeable correspondence with each gear postion

Current Data

Standard Display | Full List | Graph | Items List | Reset Min.Max. | Record | Stop | Filter

Sensor Name	Value	Unit
☑ Current Gear	P/N/R	-
☑ Pressure Control Solenoid Duty	56	%
☑ Pressure Control Solenoid Current	524	mA
☑ Pressure Control Solenoid Pressure	7.6	bar
☐ Output Speed(PG-B)	0	RPM
☐ Torque Converter Clutch Slip	27	RPM
☐ I/C Solenoid Duty	0	%
☐ I/C Solenoid Current	800	mA

Fig.1

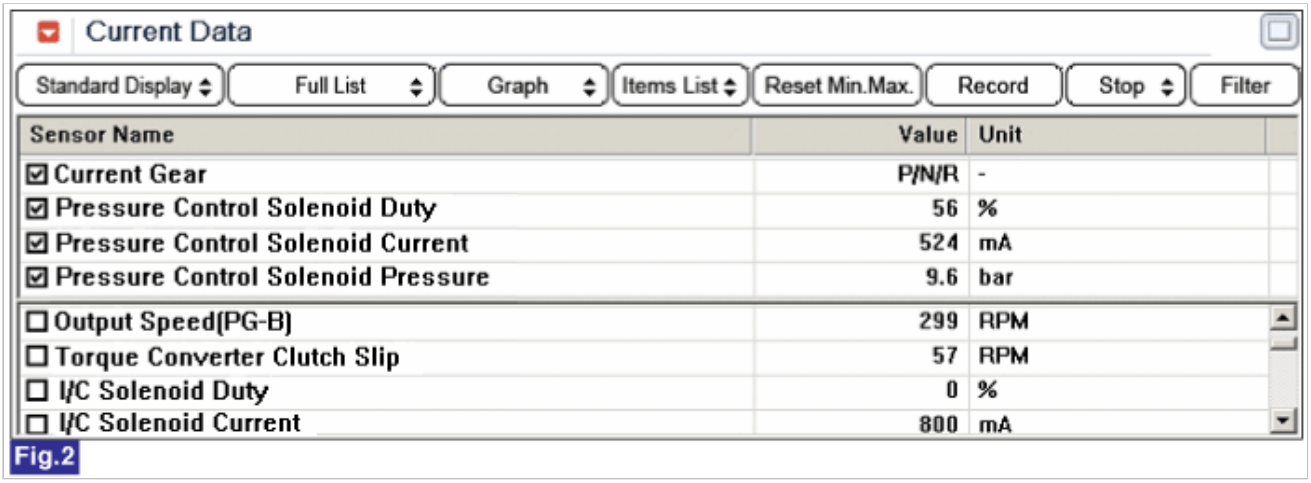


Fig.2

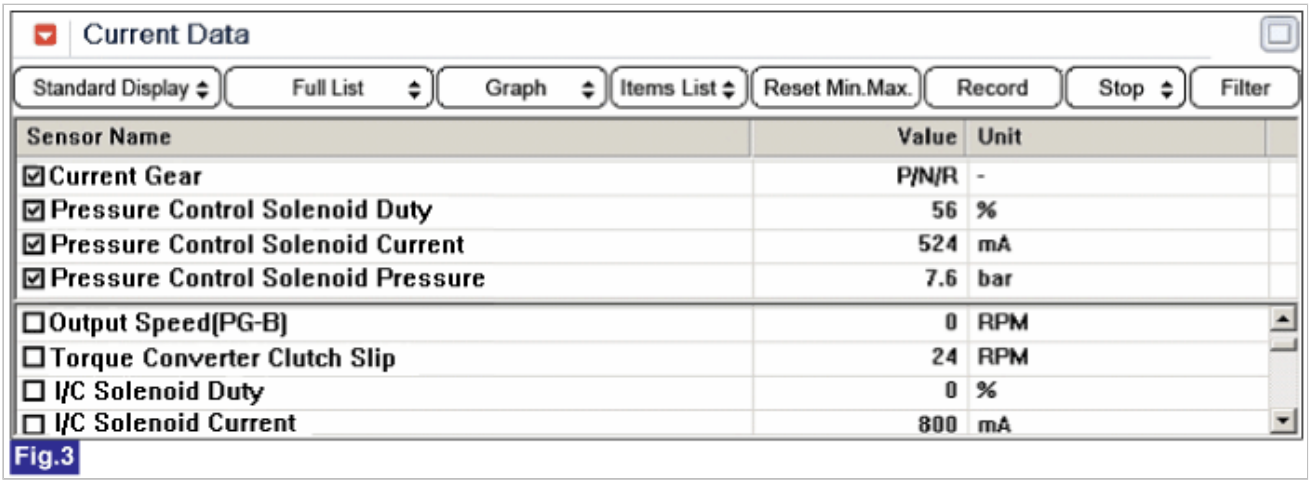


Fig.3

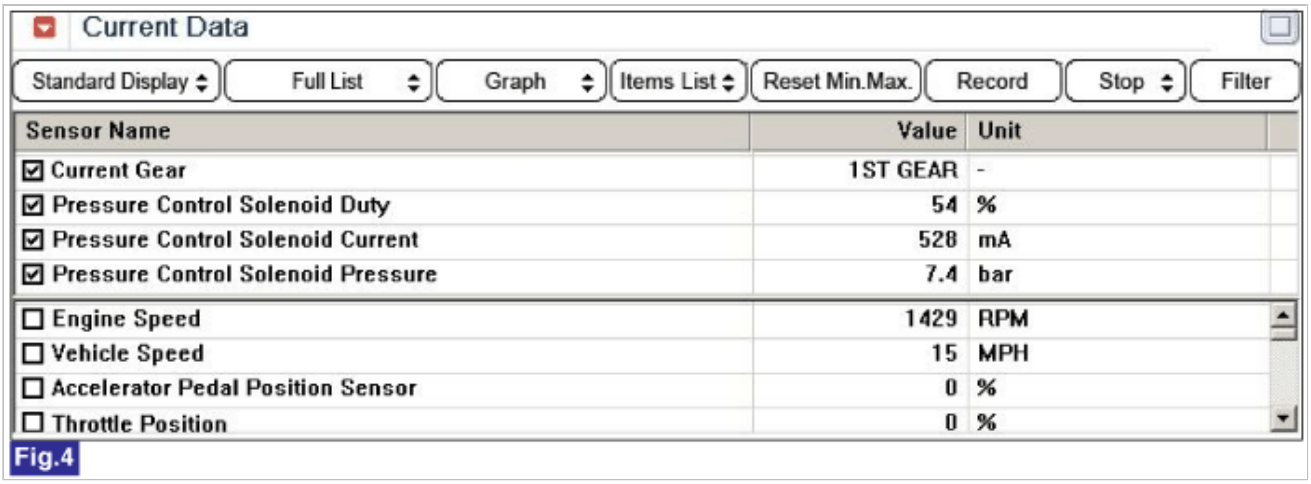


Fig.4

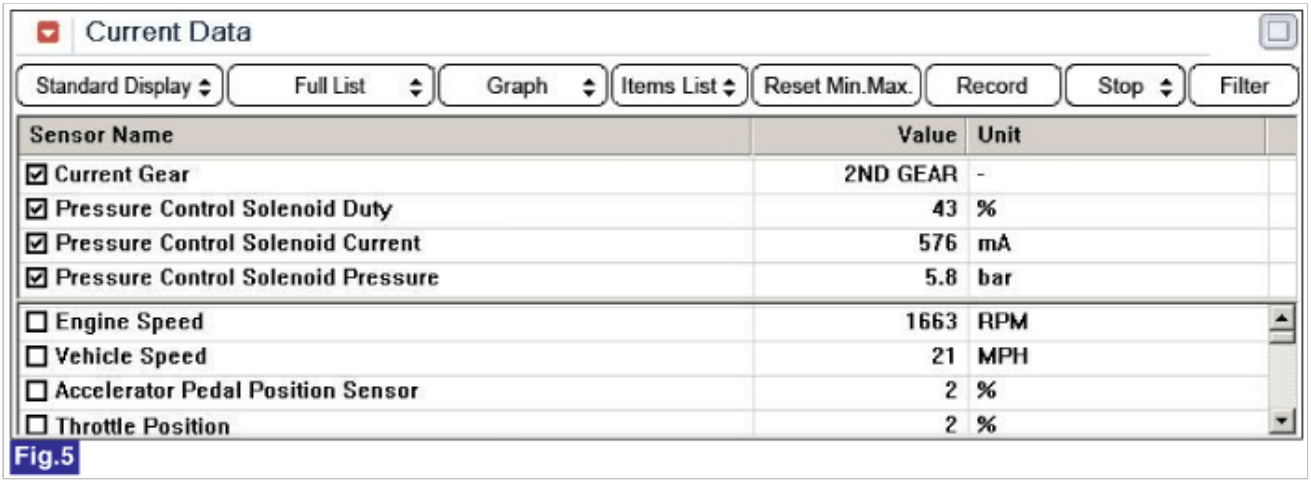


Fig.5

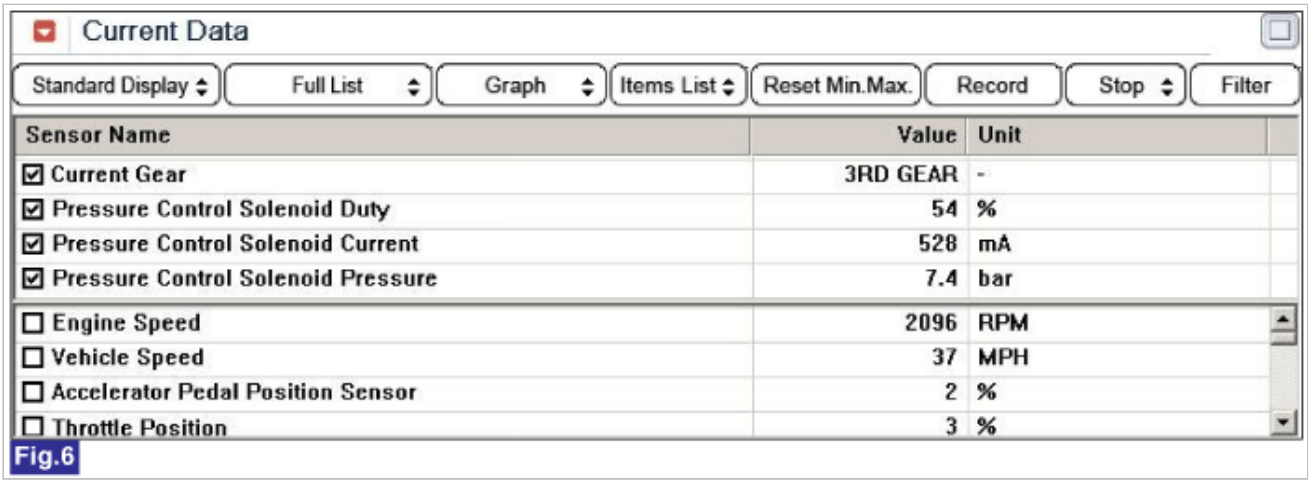


Fig.6

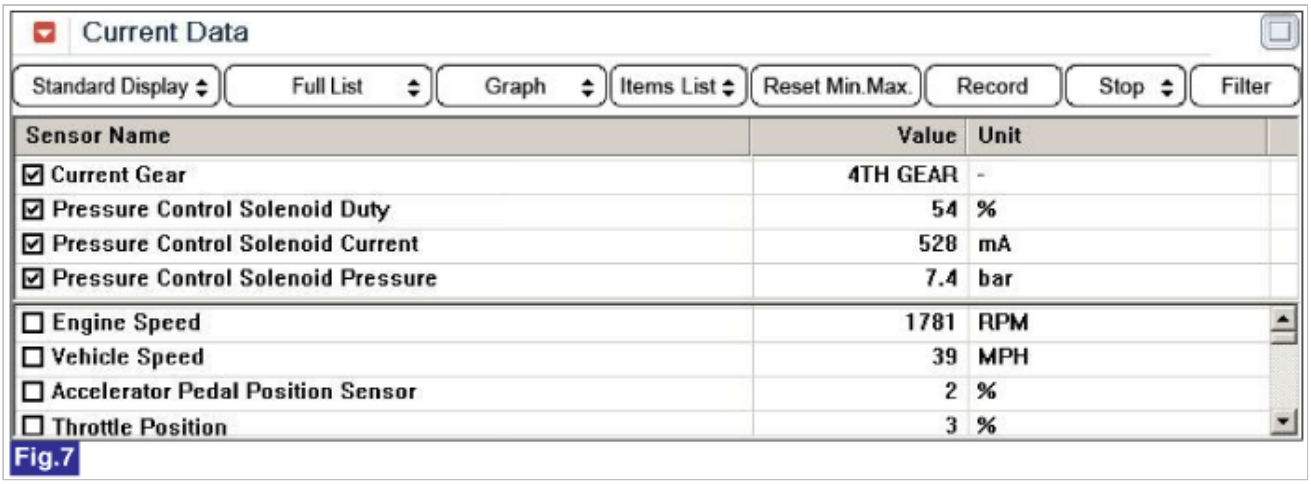


Fig.7

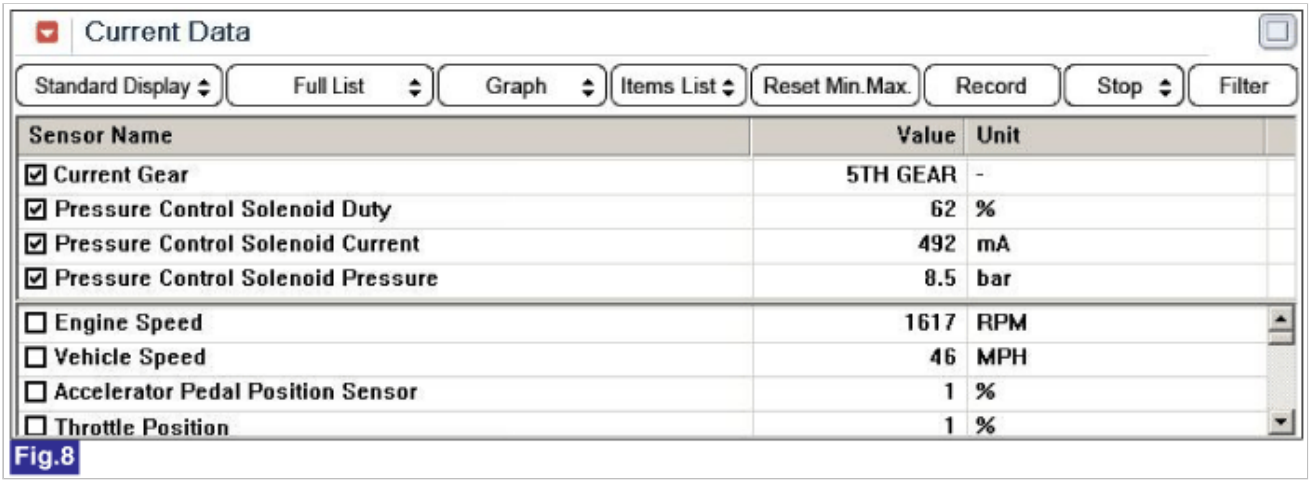


Fig.8

Fig 1) "P" range
Fig 2) "R" range
Fig 3) "N" range
Fig 4) 1st gear in "D" range
Fig 5) 2nd gear in "D" range
Fig 6) 3rd gear in "D" range
Fig 7) 4th gear in "D" range
Fig 8) 5th gear in "D" range

6. Does the "Pressure Control Solenoid Valve" follow the reference data ?

YES	▸ 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. Throughly 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.
NO	▸ Go to "W/Harness Inspection" procedure.

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?

YES	▸ Repair as necessary and go to "verification of vehicle repair" procedure.
NO	▸ Go to "Power circuit inspection" procedure.

Power Circuit Inspection

1. Disconnect " ATM Control Unit connector.
2. IGNITION "ON", ENGINE "OFF".
3. Measure voltage between power terminal of Pressure control Solenoid Valve harness connector and chassis ground.

Specification : Approx. Battery Voltage

4. Is the measured voltage within specifications ?

YES	▸ Go to "Component Inspection" procedure.
NO	▸ Check for open or short in harness. Repair as necessary and then, go to "Verification of Vehicle Repair" procedure. ▸ If the power circuit is O.K, Substitute with a known-good TCM and check for proper operation. If the

	problem is corrected, replace TCM as necessary and go to "verification of vehicle repair" procedure.

Component Inspection

■ Check Pressure Control Valve

1. Disconnect " ATM Solenoid Valve connector.
2. Ignition "OFF".
3. Measure continuity between ground terminal of PL Solenoid and chassis ground.

Specification : Approx. 3~9Ω

4. Is the measured resistance within specifications ?

YES	▸ Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.
NO	▸ Check for open or short in harness. Repair as necessary and then, go to "Verification of Vehicle Repair" procedure. ▸ If the power circuit is O.K, Substitute with a known-good TCCSV and check for proper operation. If the problem is corrected, replace TCCSV as necessary and go to "verification of vehicle repair" procedure.

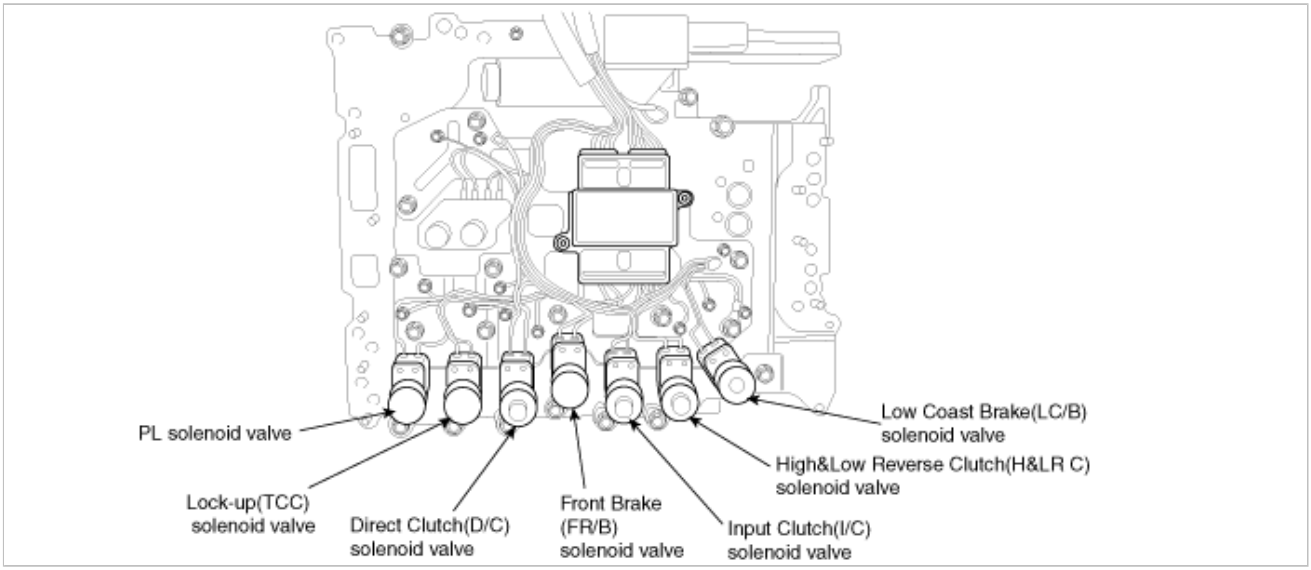
Verification of Vehicle Repair

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

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a GDS, 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.

Component Location



General Description

The Automatic Transmission changes the gear position of the transmission utilizing a combination of Clutches and Brakes, which are controlled by solenoid valves. Input clutch solenoid valve is controlled by the TCM in response to signals sent from the inhibitor switch, vehicle speed sensor and accelerator pedal position sensor (throttle position sensor).
Gears will then be shifted to the optimum position.

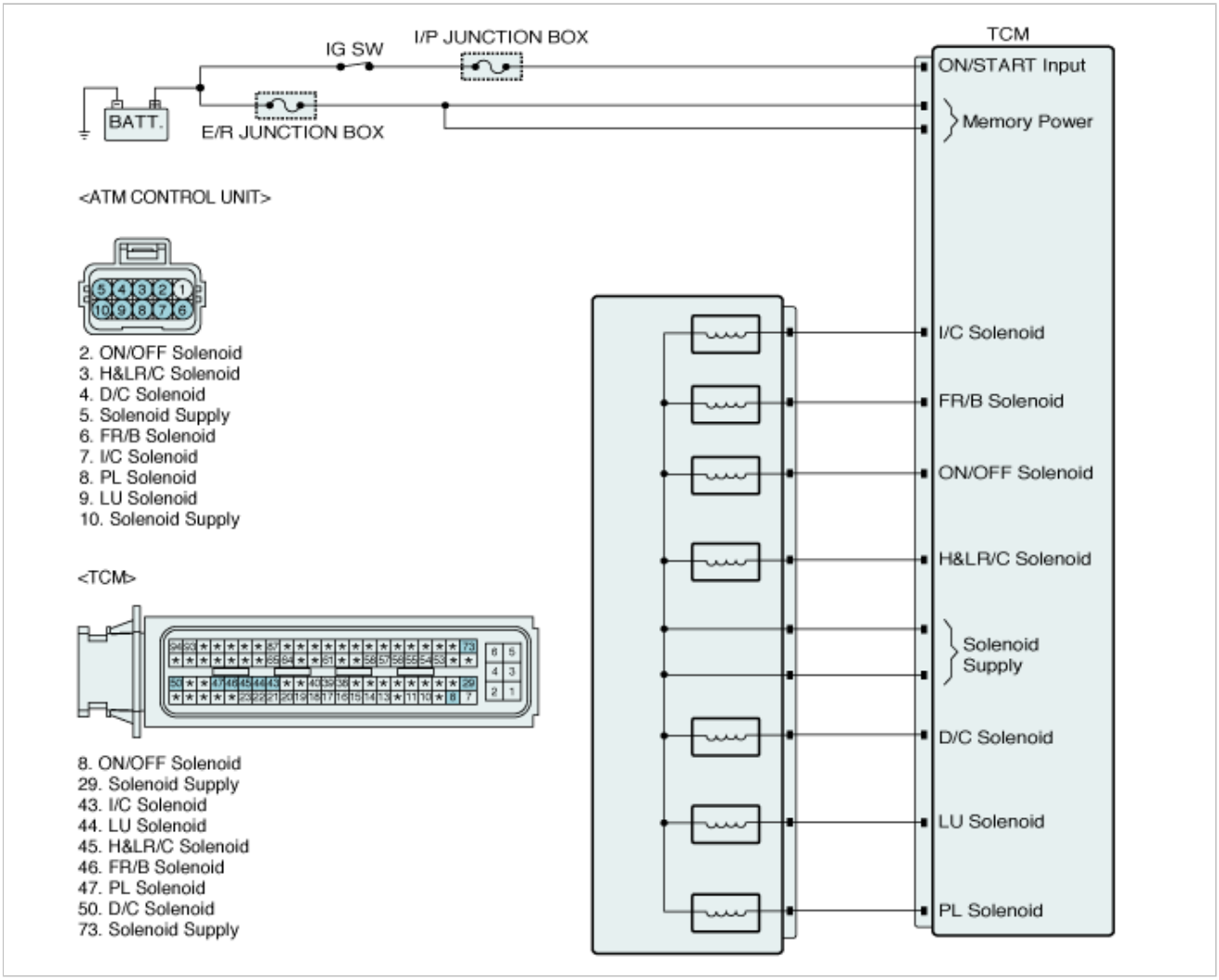
DTC Description

This is not only caused by electrical malfunction (circuits open or shorted) but also by mechanical malfunction such as control valve sticking, improper solenoid valve operation.

DTC Detectiong Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Voltage range Check (Open, Short)	• Open or short in circuit • Faulty pressure switch 3 • Faulty I/C solenoid valve • Faulty TCM
Enable Conditions	• 10V < Actuator Supply Voltage < 16V	
Threshold Value	• Hardware IC check	
Diagnostic Time	• More than 0.2sec	
Fail Safe	• Locked as 4th gear	

Diagnostic Circuit Diagram



Monitor GDS Data

1. Connect GDS to data link connector(DLC)
2. Engine "ON" .
3. Monitor the "I/C SOLENOID" parameter on the GDS.
4. Select "D RANGE" and Operate the vehicle.
5. Check "I/C SOLENOID" parameter value changes while driving.

Specification : Changeable correspondence with each gear postion

Current Data

Standard Display | Full List | Graph | Items List | Reset Min.Max. | Record | Stop | VSS

Sensor Name	Value	Unit
Shift Pattern Switch	No shift	-
Current Gear	P/N/R	-
Oil Pressure Switch-3[I/C]	OFF	-
I/C Solenoid Duty	0	%
I/C Solenoid Current	800	mA
I/C Solenoid Pressure	0.0	bar
Engine Speed	725	RPM
Vehicle Speed	0	MPH

Fig.1

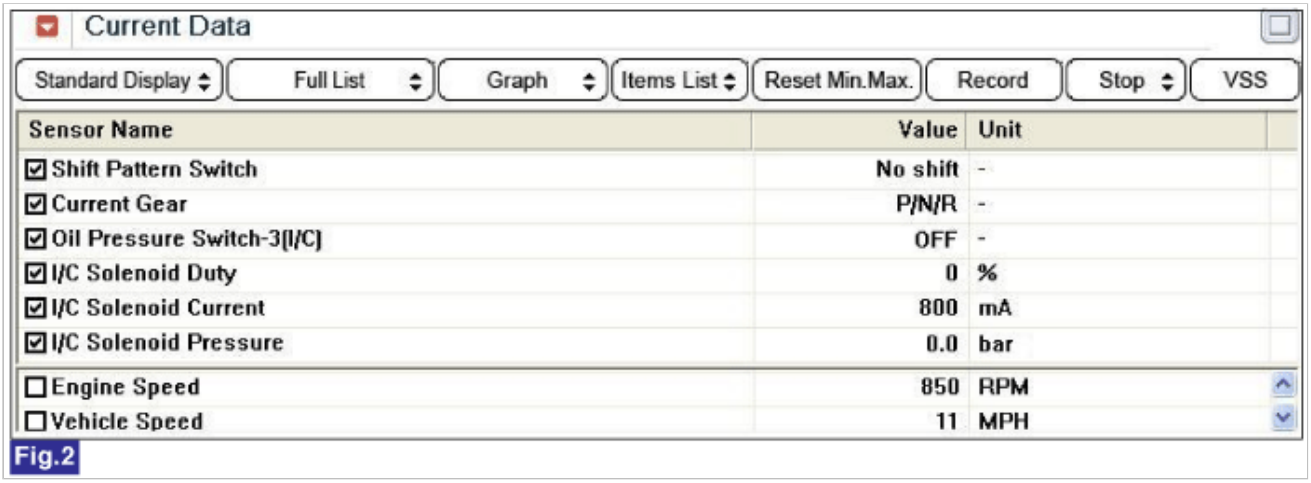


Fig.2

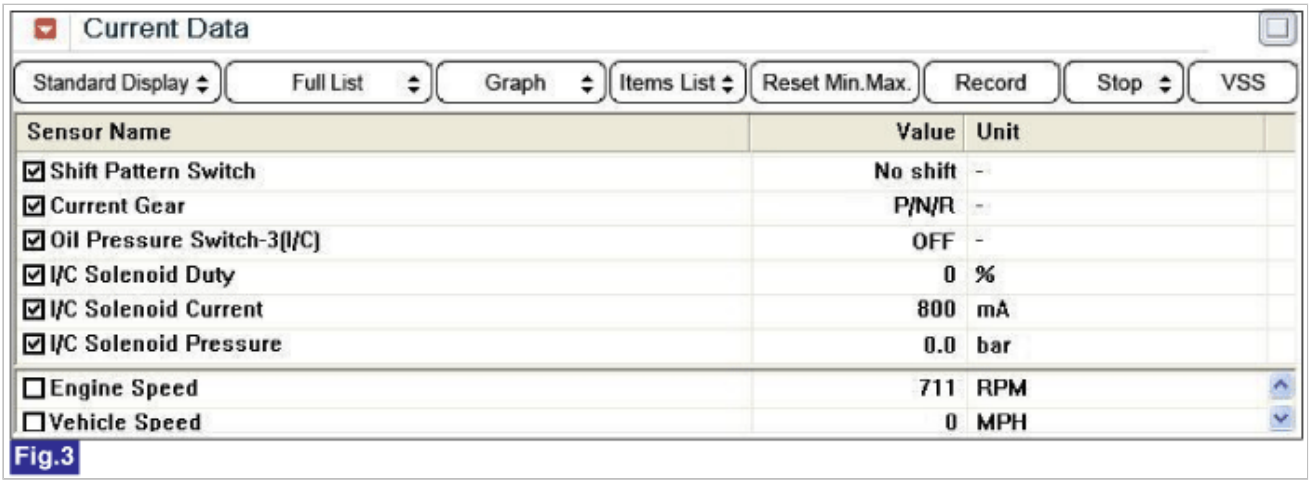


Fig.3

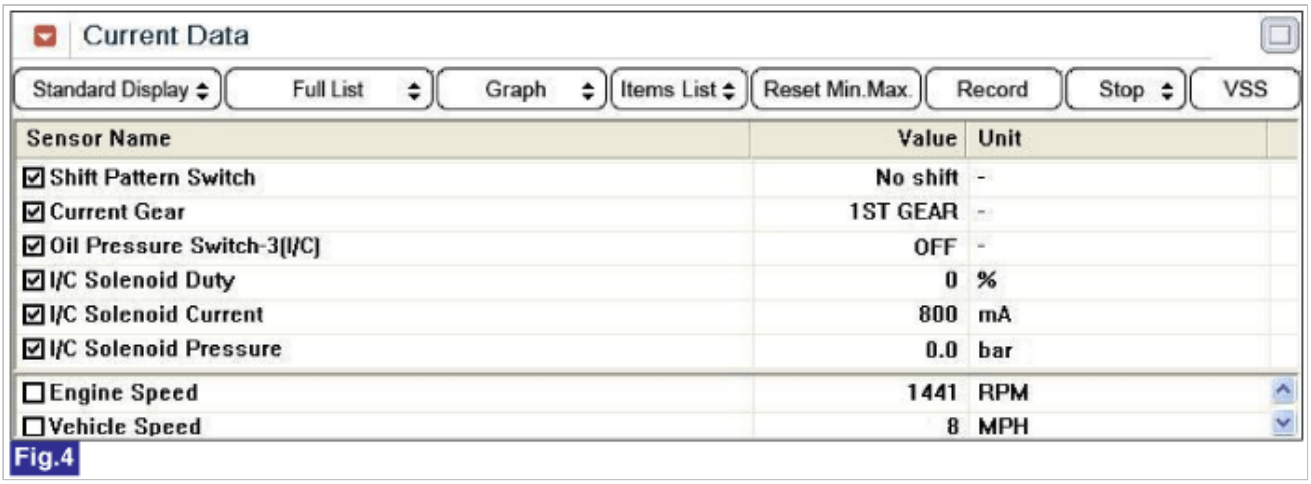


Fig.4

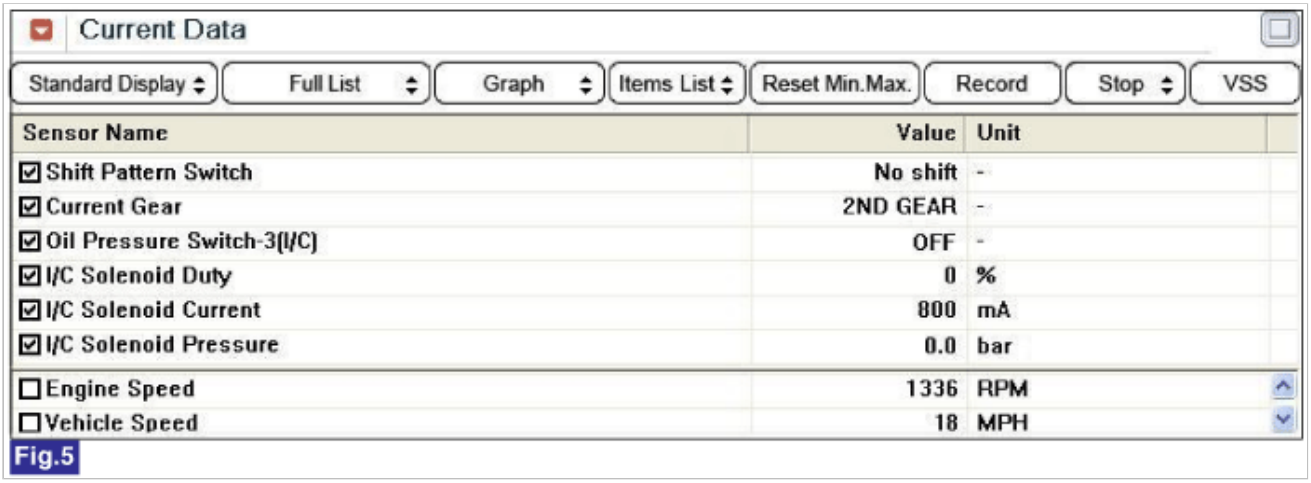


Fig.5

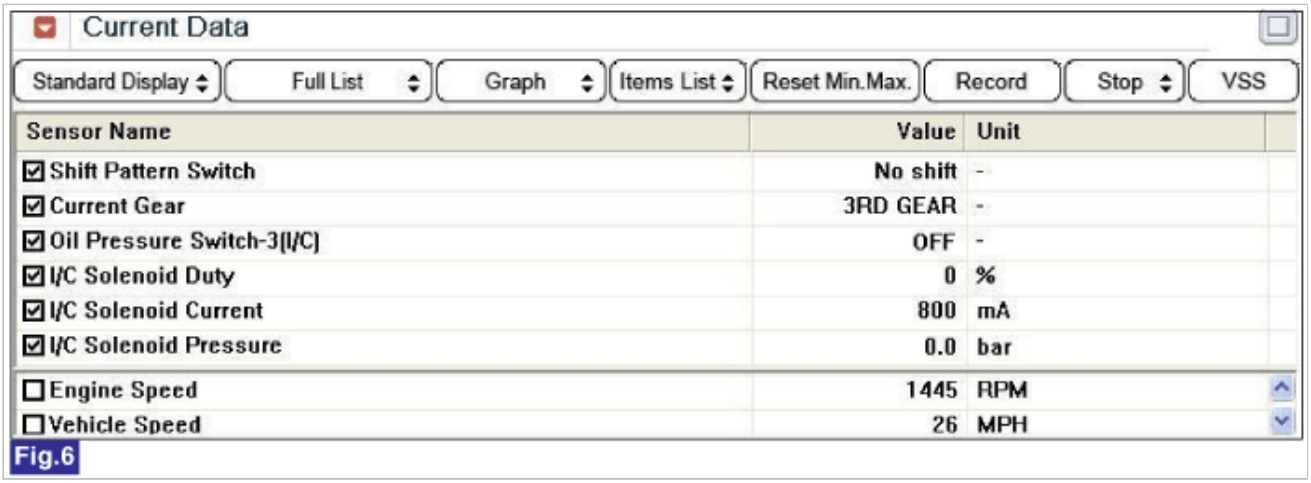


Fig.6

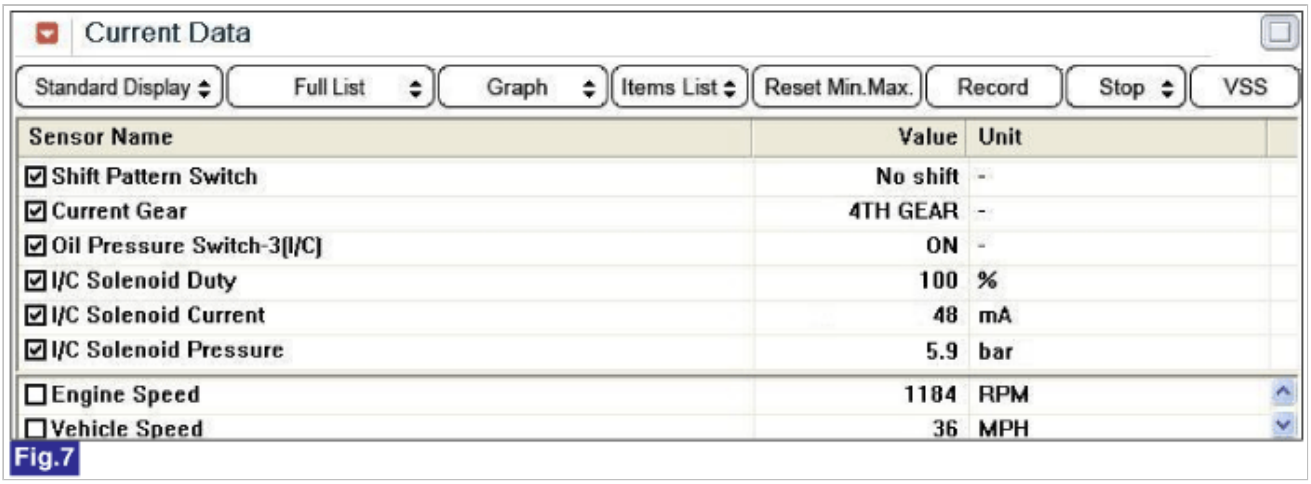


Fig.7

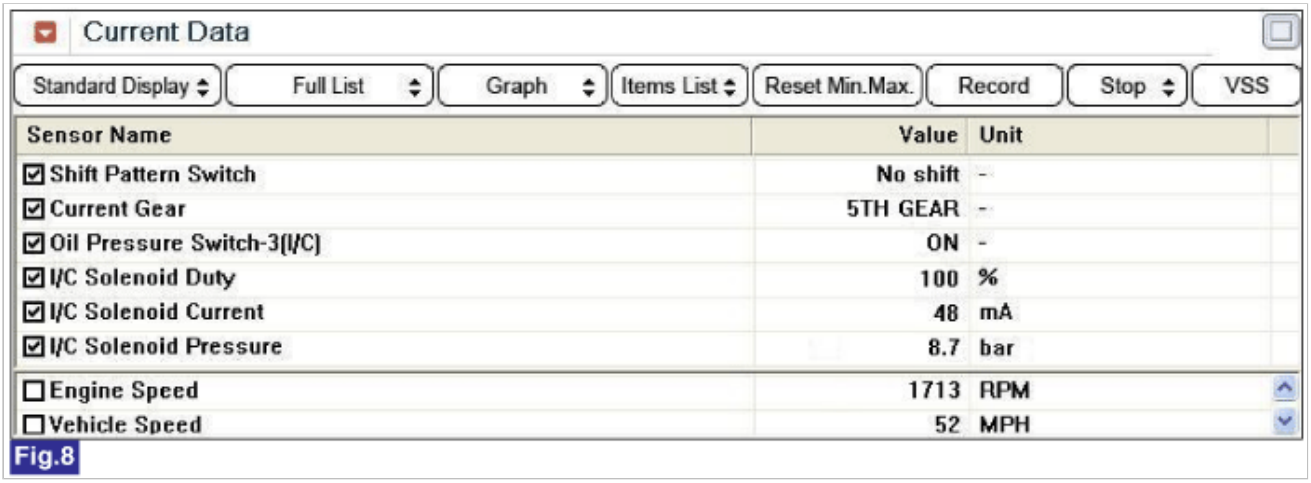


Fig 1) "P" range
Fig 2) "R" range
Fig 3) "N" range
Fig 4) 1st gear in "D" range
Fig 5) 2nd gear in "D" range
Fig 6) 3rd gear in "D" range
Fig 7) 4th gear in "D" range
Fig 8) 5th gear in "D" range

6. Does the "Shift Control Solenoid Valve" follow the reference data ?

YES	▸ 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. Throughly 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.
NO	▸ Go to "W/Harness Inspection" procedure.

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?

YES	▸ Repair as necessary and go to "verification of vehicle repair" procedure.
NO	▸ Go to "Power circuit inspection" procedure.

Power Circuit Inspection

1. Disconnect " ATM Control Unit connector.
2. IGNITION "ON", ENGINE "OFF".
3. Measure voltage between power terminal of I/C solenoid valve harness connector and chassis ground.

Specification : Approx. Battery Voltage

4. Is the measured voltage within specifications ?

YES	▸ Go to "Component Inspection" procedure.
NO	▸ Check for open or short in harness. Repair as necessary and then, go to "Verification of Vehicle Repair" procedure. ▸ If the power circuit is O.K, Substitute with a known-good TCM and check for proper operation. If the

	problem is corrected, replace TCM as necessary and go to "verification of vehicle repair" procedure.

Component Inspection

■ Check shift solenoid Valve "I/C"

1. Disconnect " ATM Solenoid Valve connector.
2. Ignition "OFF".
3. Measure continuity between ground terminal of IC Solenoid and chassis ground.

Specification : Approx. 3~9Ω

4. Is the measured resistance within specifications ?

YES	▸ Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.
NO	▸ Check for open or short in harness. Repair as necessary and then, go to "Verification of Vehicle Repair" procedure. ▸ If the power circuit is O.K, Substitute with a known-good TCCSV and check for proper operation. If the problem is corrected, replace TCCSV as necessary and go to "verification of vehicle repair" procedure.

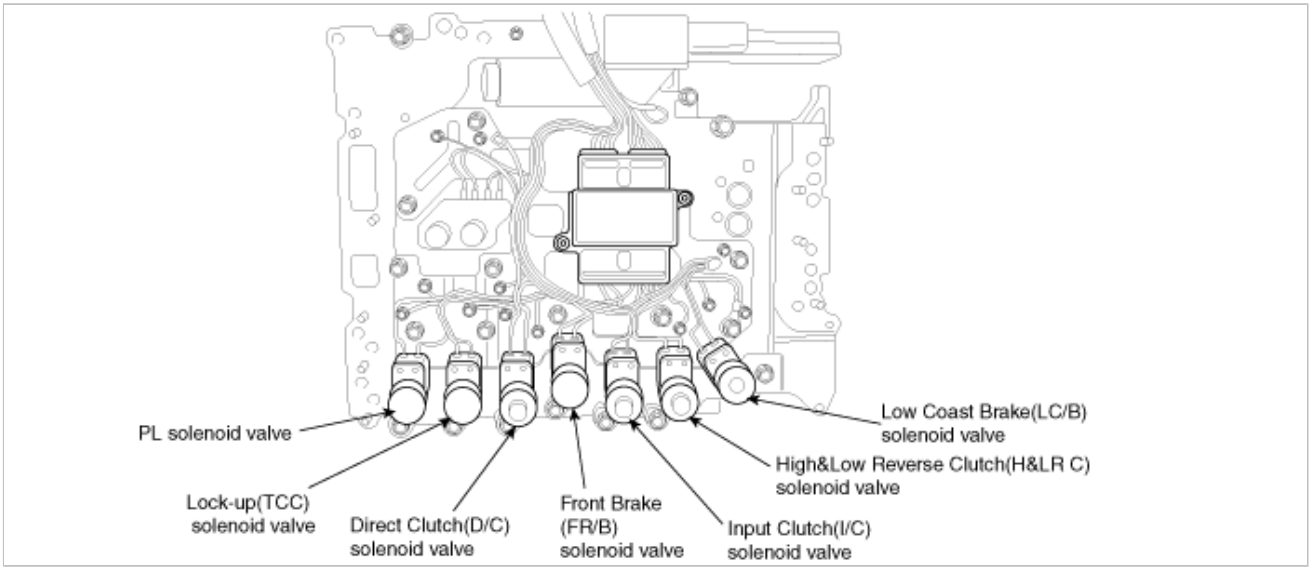
Verification of Vehicle Repair

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

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a GDS, 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.

Component Location



General Description

The Automatic Transmission changes the gear position of the transmission utilizing a combination of Clutches and Brakes, which are controlled by solenoid valves. Front brake solenoid valve is controlled by the TCM in response to signals sent from the inhibitor switch, vehicle speed sensor and accelerator pedal position sensor (throttle position sensor).
Gear will then be shifted to the optimum position.

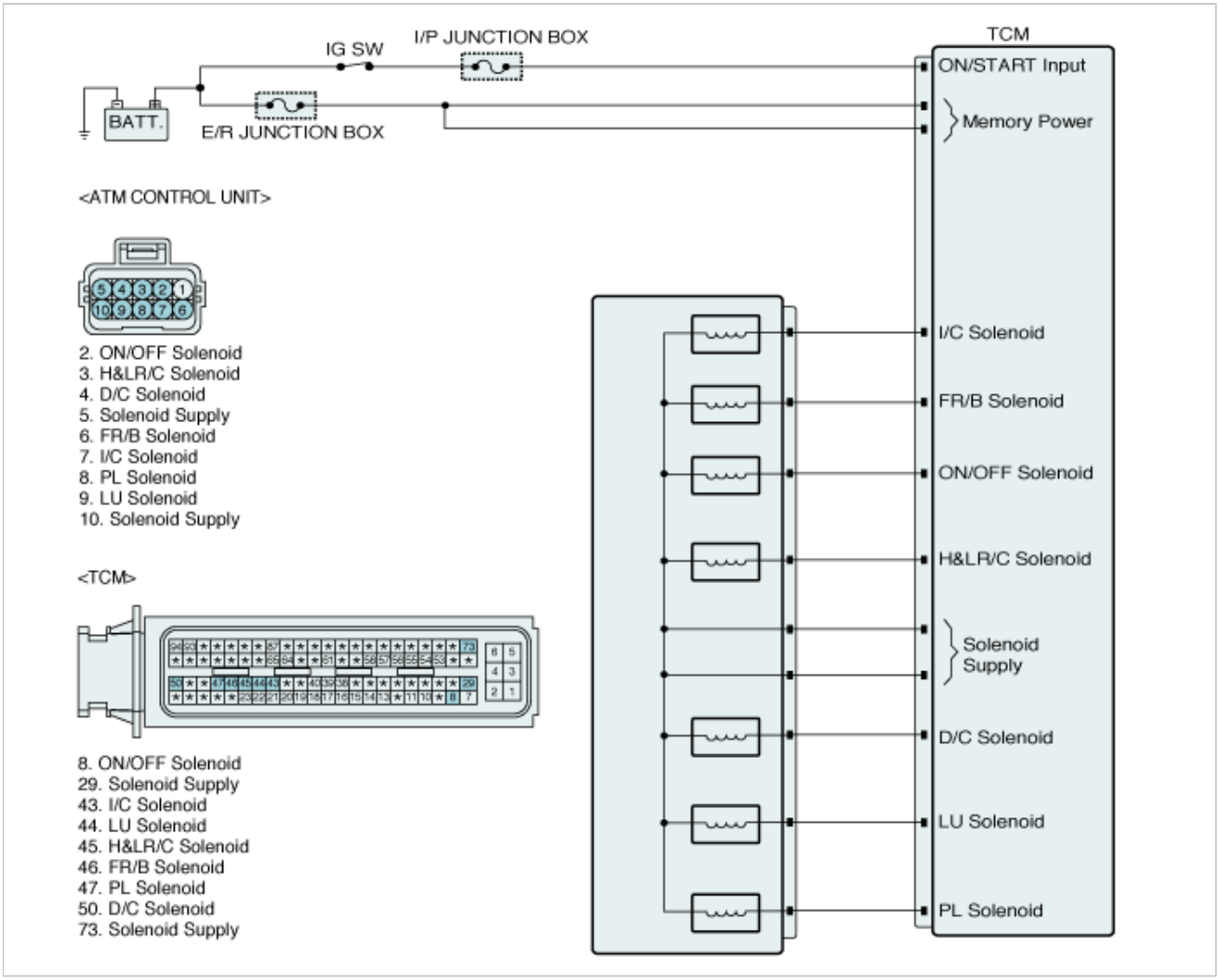
DTC Description

This is not only caused by electrical malfunction (circuit open or shorted) but also by mechanical malfunction such as control valve sticking, improper solenoid valve operation.

DTC Detectiong Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Check voltage range(Open, Short)	• Open or short in circuit • Faulty Pressure Switch 1 • Faulty Fr/B solenoid valve • Faulty TCM
Enable Conditions	• 10V < Actuator Supply Voltage < 16V	
Threshold Value	• Hardware IC check	
Diagnostic Time	• More than 0.2sec	
Fail Safe	• Locked as 4th gear	

Diagnostic Circuit Diagram



Monitor GDS Data

1. Connect GDS to data link connector(DLC)
2. Engine "ON" .
3. Monitor the Fr/B SOLENOID" parameter on the GDS.
4. Select "D RANGE" and Operate the vehicle.
5. Check "FR/B SOLENOID" parameter value changes while driving.

Specification : Changeable correspondence with each gear postion

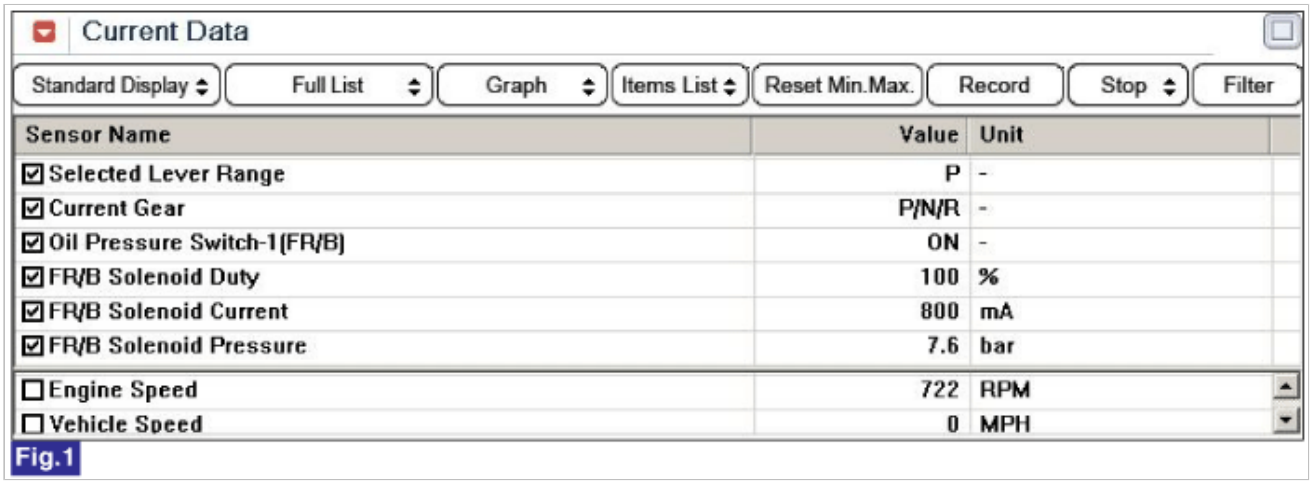


Fig.1

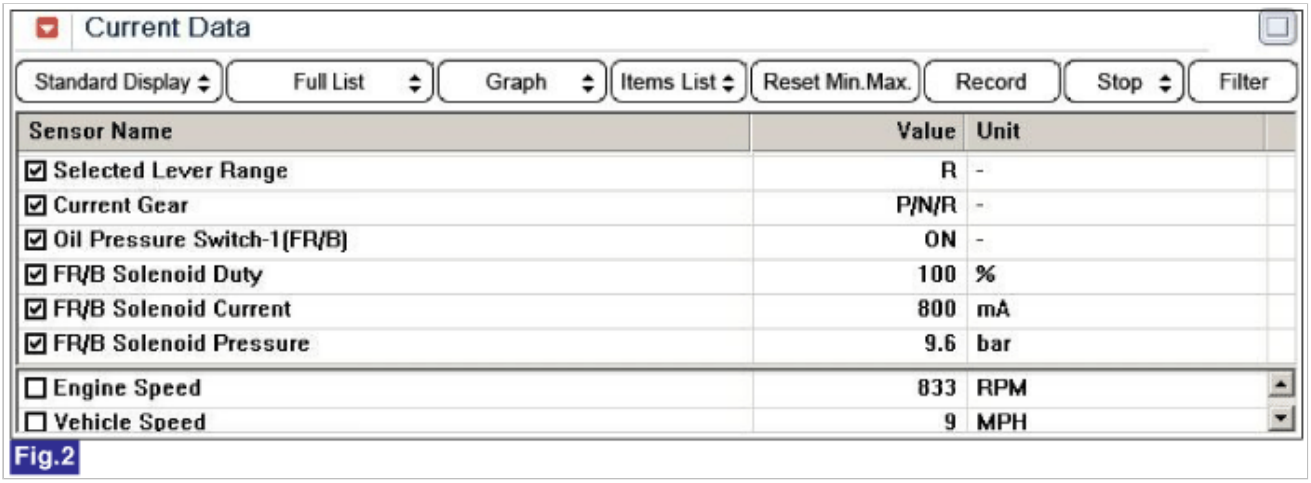


Fig.2

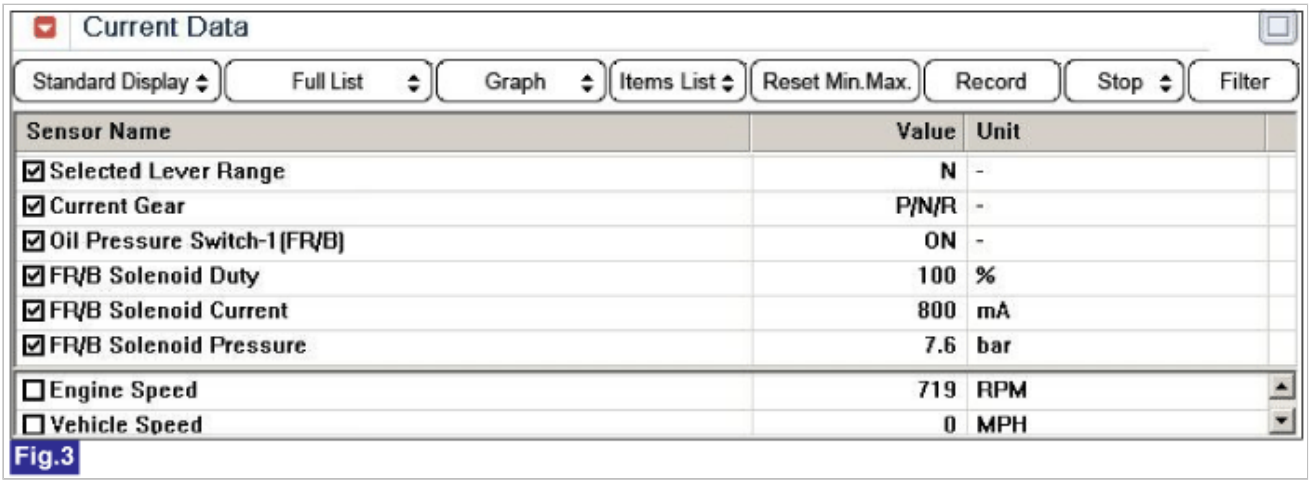


Fig.3

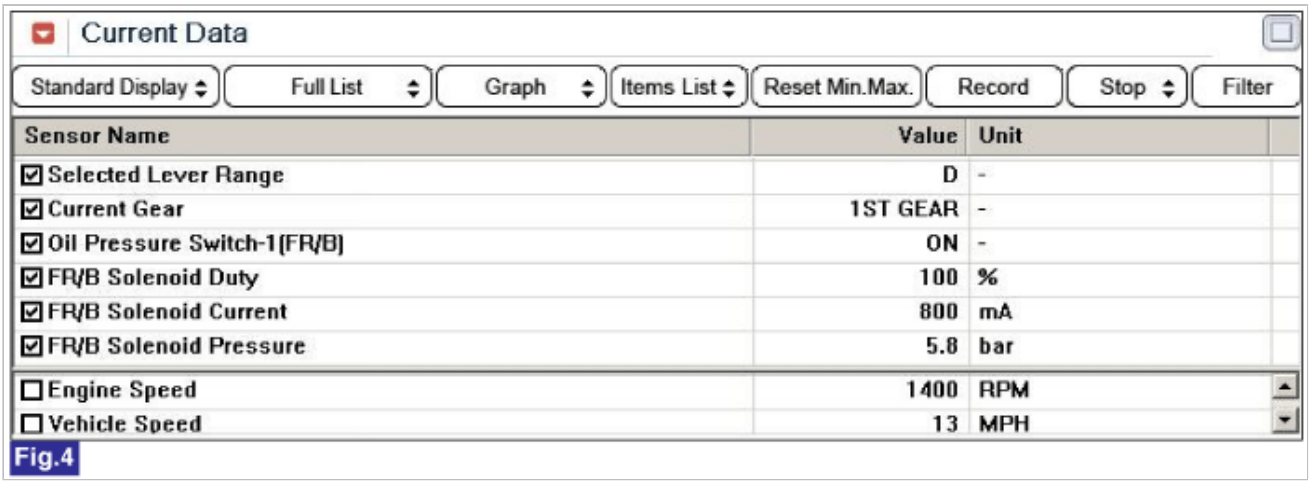


Fig.4

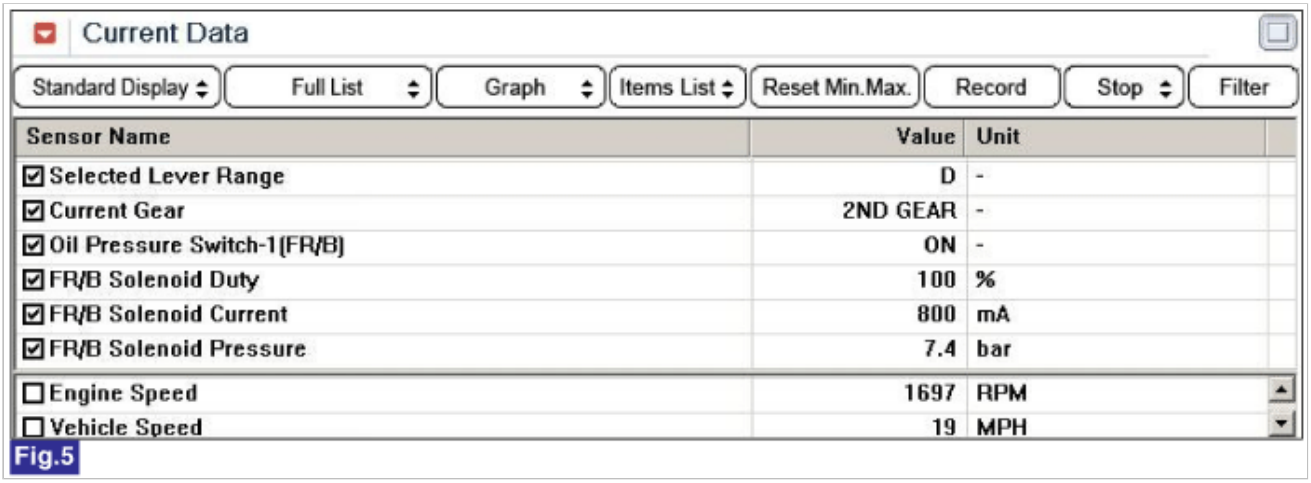


Fig.5

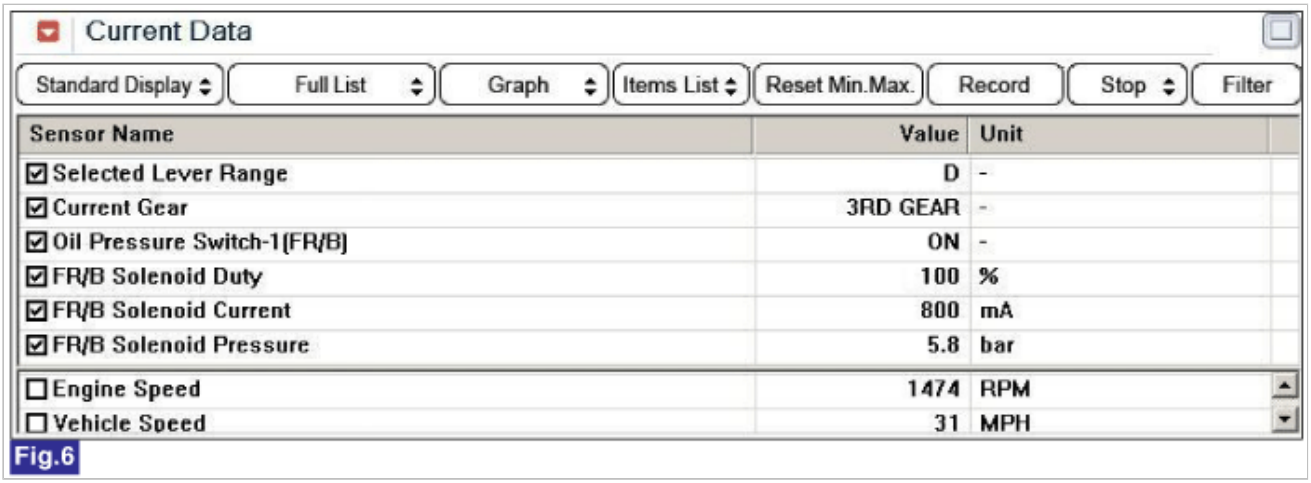


Fig.6

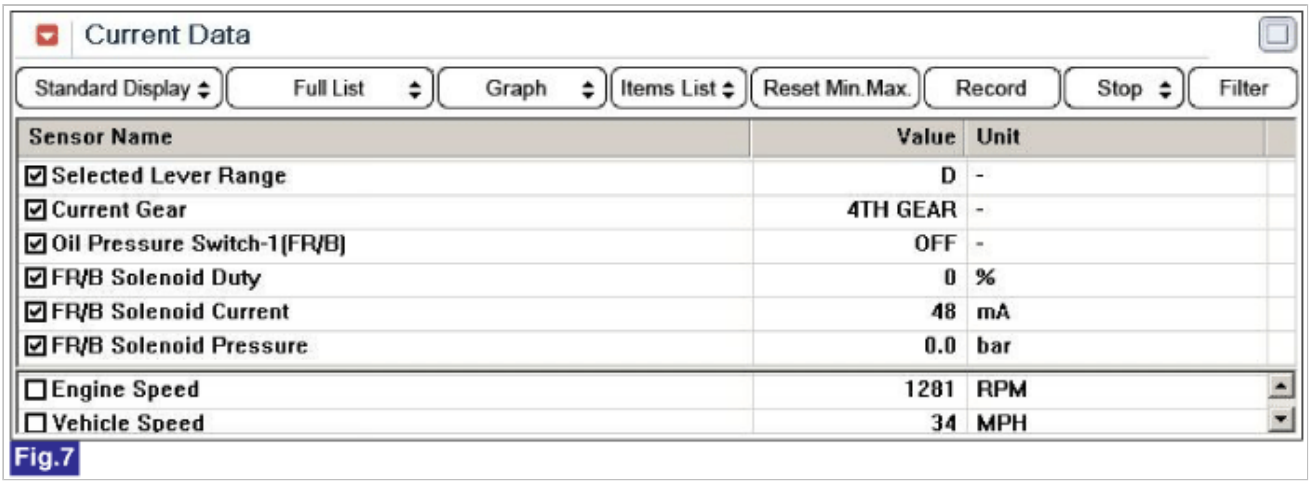


Fig.7

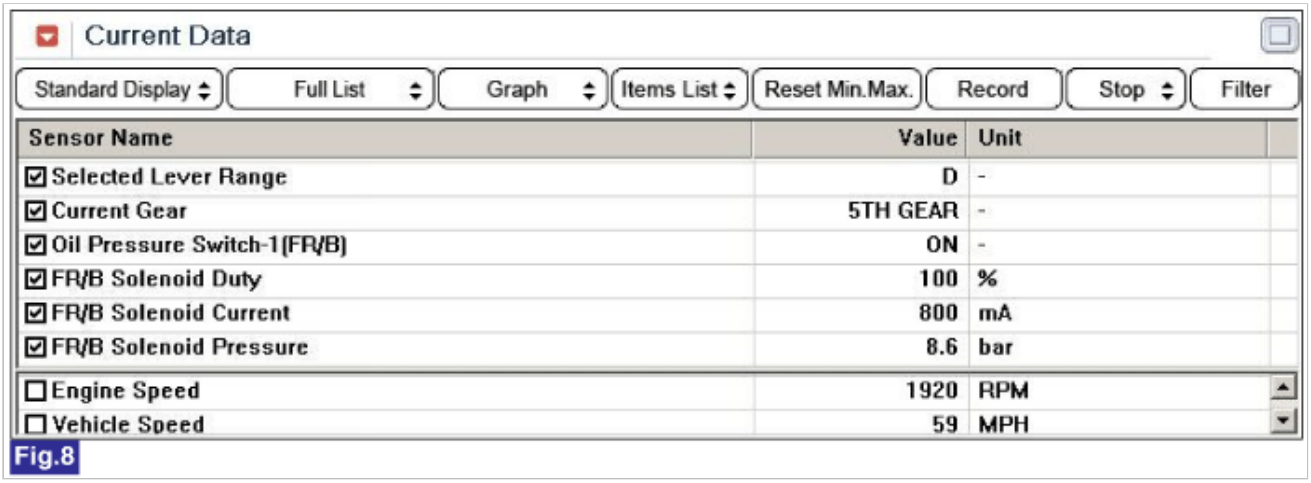


Fig.8

Fig 1) "P" range
Fig 2) "R" range
Fig 3) "N" range
Fig 4) 1st gear in "D" range
Fig 5) 2nd gear in "D" range
Fig 6) 3rd gear in "D" range
Fig 7) 4th gear in "D" range
Fig 8) 5th gear in "D" range

6. Does the "Shift Control Solenoid Valve" follow the reference data ?

YES	▸ 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. Throughly 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.
NO	▸ Go to "W/Harness Inspection" procedure.

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?

YES	▸ Repair as necessary and go to "verification of vehicle repair" procedure.
NO	▸ Go to "Power circuit inspection" procedure.

Power Circuit Inspection

1. Connect "ATM Control Unit connector.
2. IGNITION "ON", ENGINE "OFF".
3. Measure voltage between power terminal of FR/B solenoid valve harness connector and chassis ground.

Specification : Approx. Battery Voltage

4. Is the measured voltage within specifications ?

YES	▸ Go to "Component Inspection" procedure.
NO	▸ Check for open or short in harness. Repair as necessary and then, go to "Verification of Vehicle Repair" procedure. ▸ If the power circuit is O.K, Substitute with a known-good TCM and check for proper operation. If the

	problem is corrected, replace TCM as necessary and go to "verification of vehicle repair" procedure.

Component Inspection

■ Check shift solenoid valve "FR/B"

1. Disconnect " ATM Solenoid Valve connector.
2. Ignition "OFF".
3. Measure continuity between ground terminal ofFR/B Solenoid and chassis ground.

Specification : Approx. 3~9Ω

4. Is the measured resistance within specifications ?

YES	▸ Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.
NO	▸ Check for open or short in harness. Repair as necessary and then, go to "Verification of Vehicle Repair" procedure. ▸ If the power circuit is O.K, Substitute with a known-good TCCSV and check for proper operation. If the problem is corrected, replace TCCSV as necessary and go to "verification of vehicle repair" procedure.

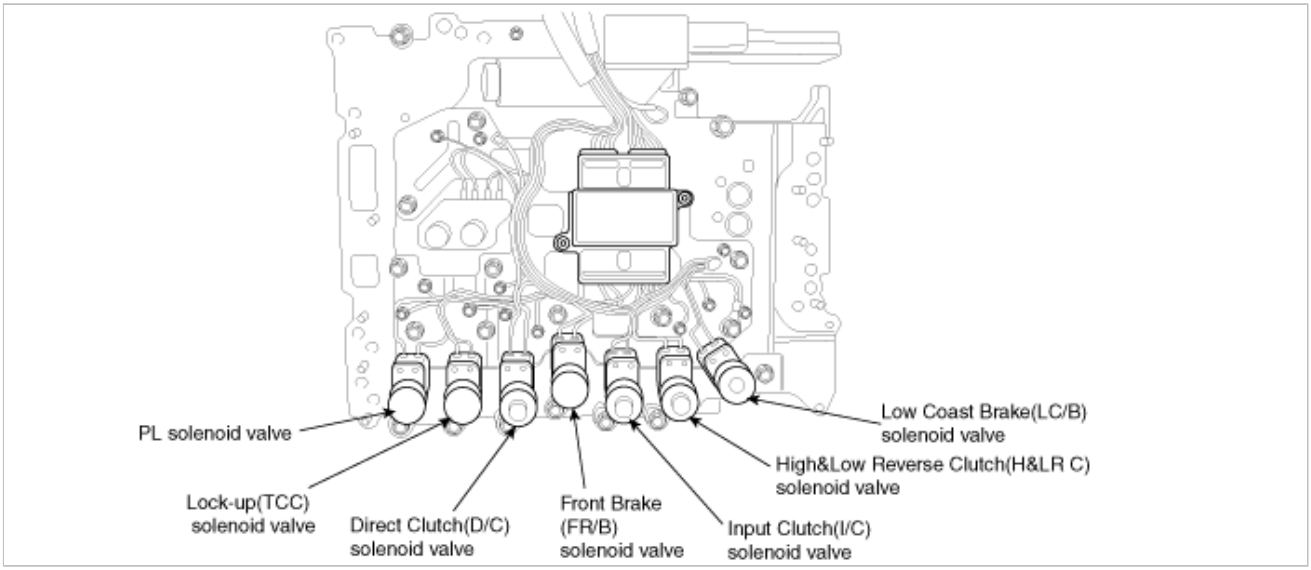
Verification of Vehicle Repair

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

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a GDS, 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.

Component Location



General Description

The Automatic Transmission changes the gear position of the transmission utilizing a combination of Clutches and Brakes, which are controlled by solenoid valves. Direct clutch solenoid valve is controlled by the TCM in response to signals sent from the inhibitor switch, vehicle speed sensor and accelerator pedal position sensor (throttle position sensor).
Gear will then be shifted to the optimum position.

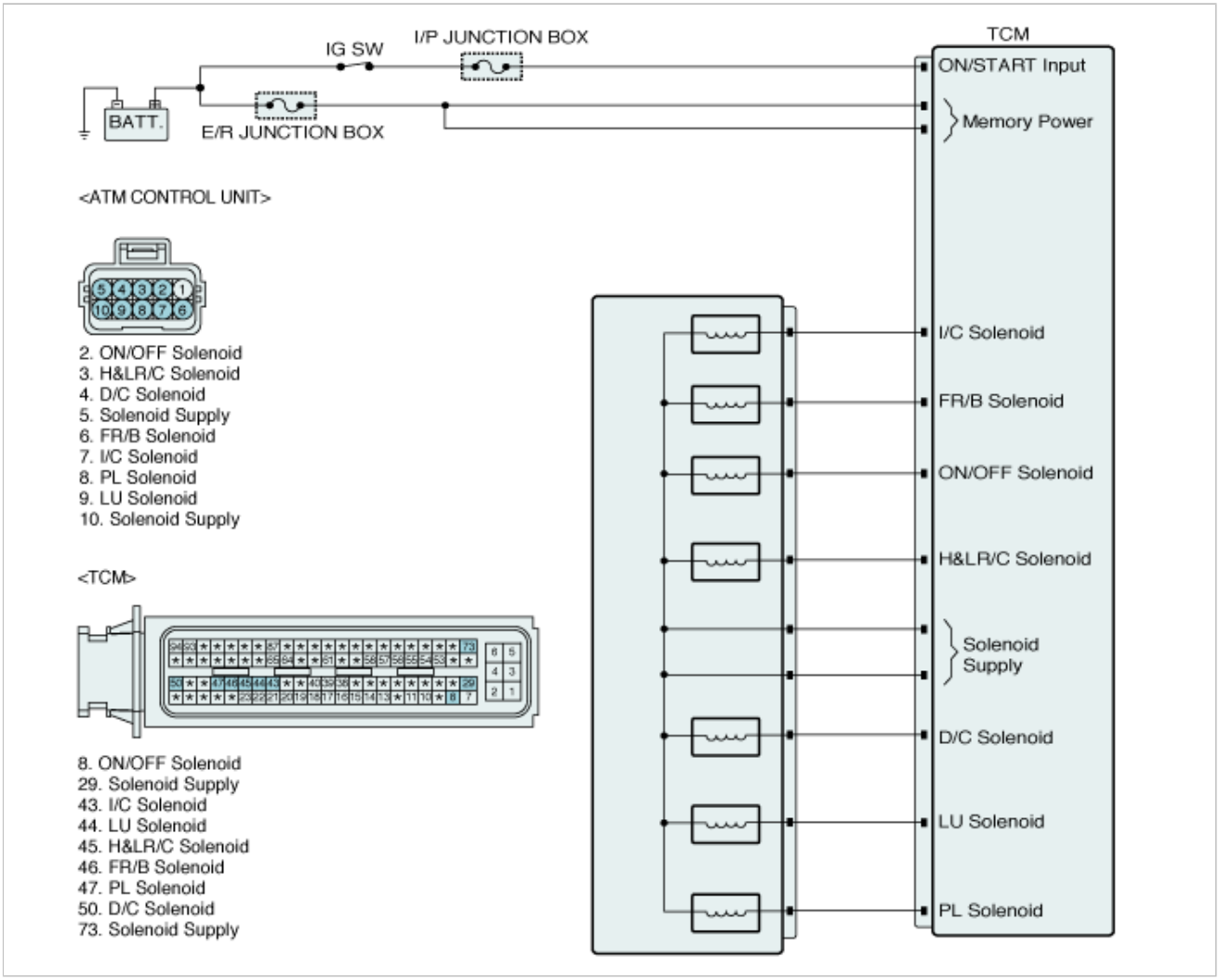
DTC Description

This is not only caused by electrical malfunction (circuits open or shorted) but also by mechanical malfunction such as control valve sticking, improper solenoid valve operation.

DTC Detectiong Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Check voltage range(Open, Short)	• Open or short in circuit • Faulty Pressure Switch 5 • Faulty DC solenoid valve • Faulty TCM
Enable Conditions	• 10V < Actuator Supply Voltage < 16V	
Threshold Value	• Hardware IC check	
Diagnostic Time	• More than 0.2sec	
Fail Safe	• Locked as 4th gear	

Diagnostic Circuit Diagram



Monitor GDS Data

1. Connect GDS to data link connector(DLC)
2. Engine "ON" .
3. Monitor the "D/C SOLENOID" parameter on the GDS.
4. Select "D RANGE" and Operate the vehicle.
5. Check "D/C SOLENOID" parameter value changes while driving.

Specification : Changeable correspondence with each gear postion

Current Data

Standard Display | Full List | Graph | Items List | Reset Min.Max. | Record | Stop | Filter

Sensor Name	Value	Unit
☑ Current Gear	P/N/R	-
☑ D/C Solenoid Duty	0	%
☑ D/C Solenoid Current	800	mA
☑ D/C Solenoid Pressure	0.0	bar
☐ Torque Converter Clutch Control Solenoid	0	%
☐ TCC Solenoid Current	48	mA
☐ TCC Solenoid Pressure	-3.0	bar
☐ H&LR/C Solenoid Duty	100	%

Fig.1

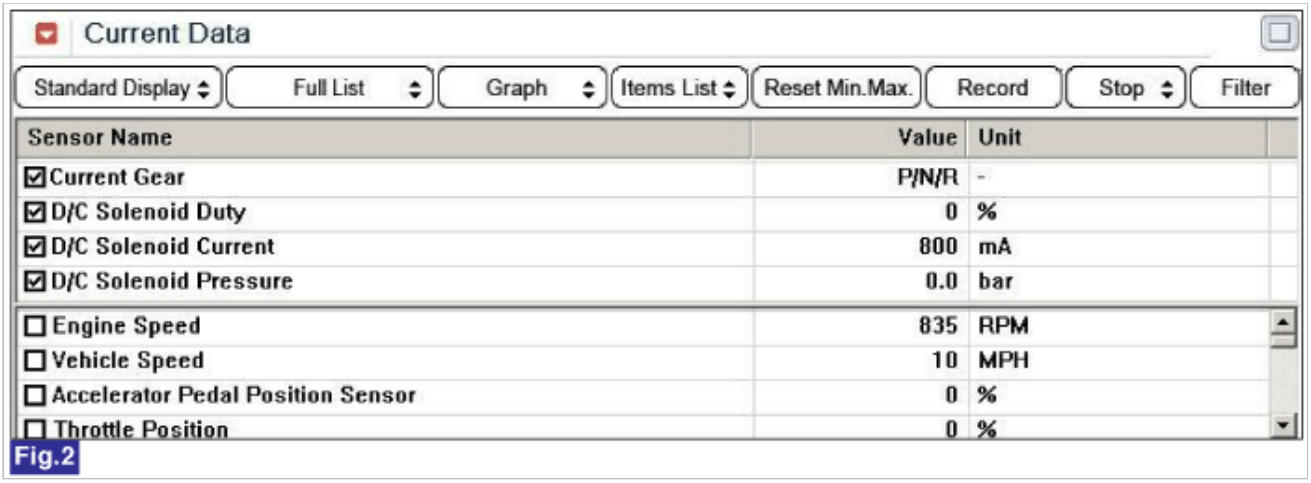


Fig.2

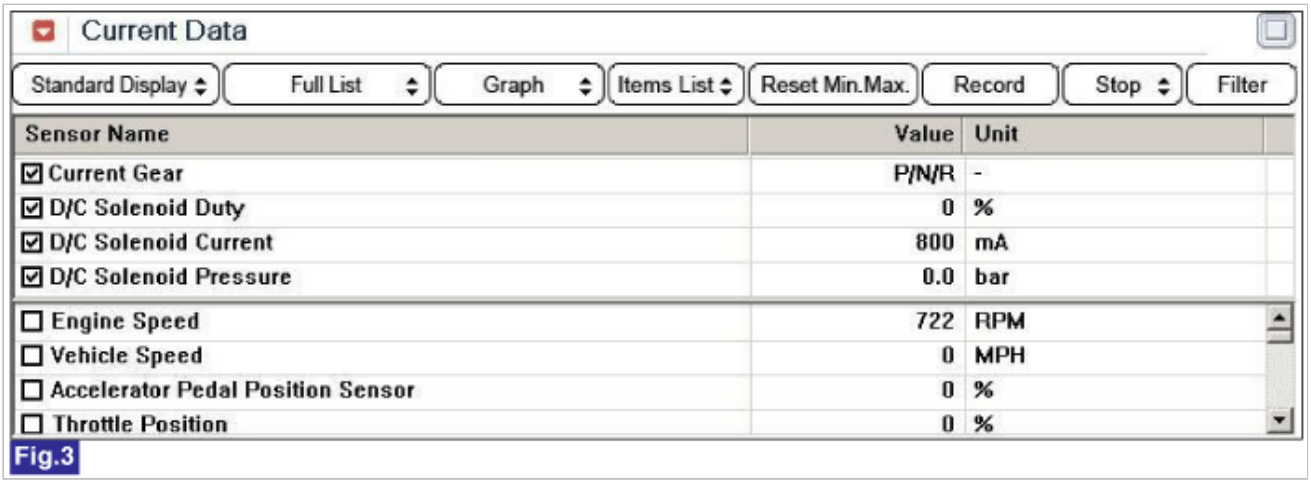


Fig.3

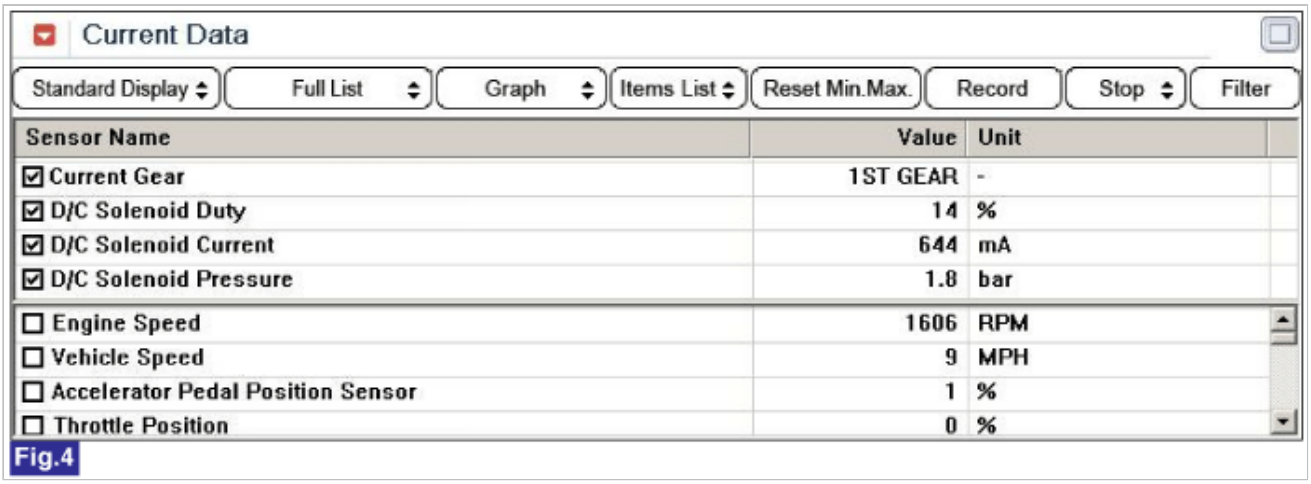


Fig.4

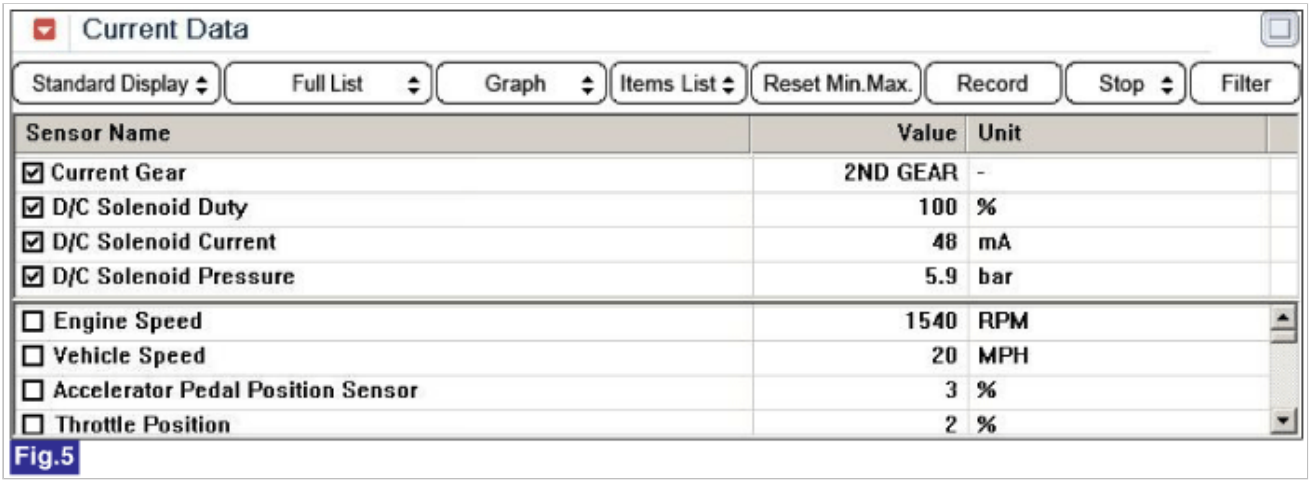


Fig.5

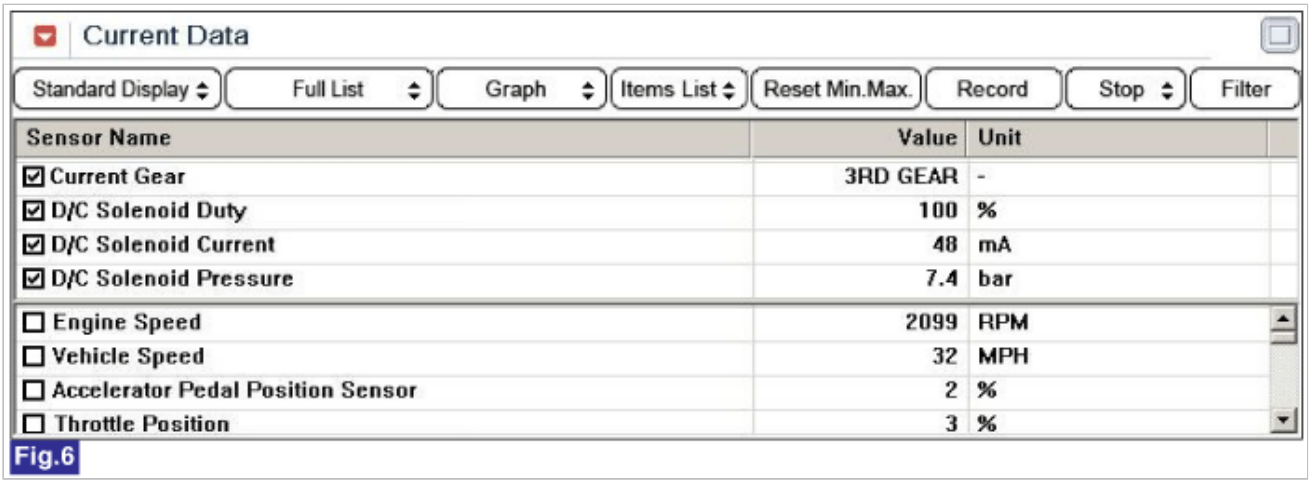


Fig.6

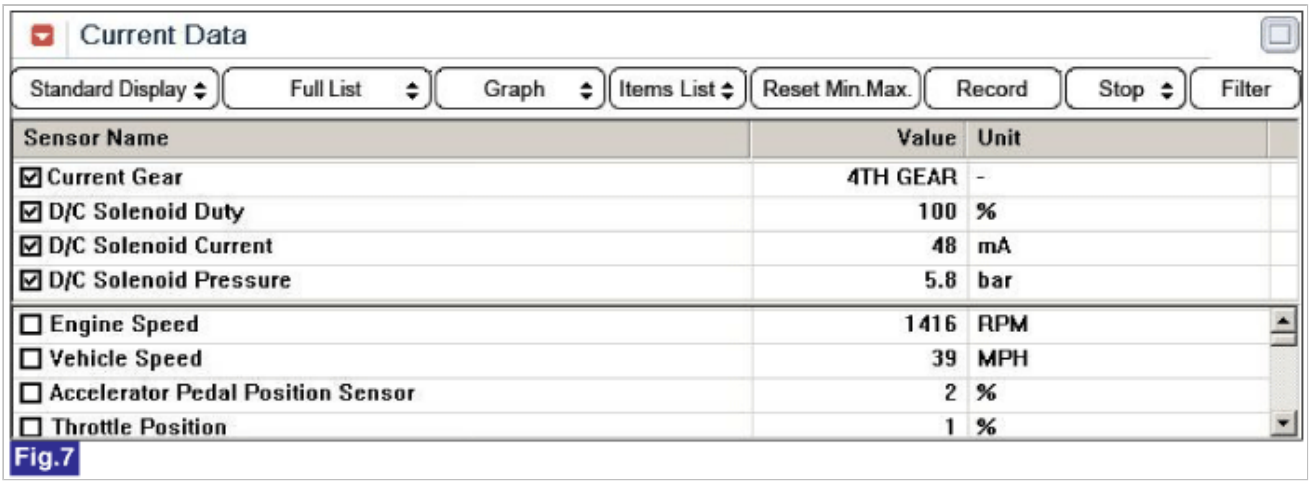


Fig.7

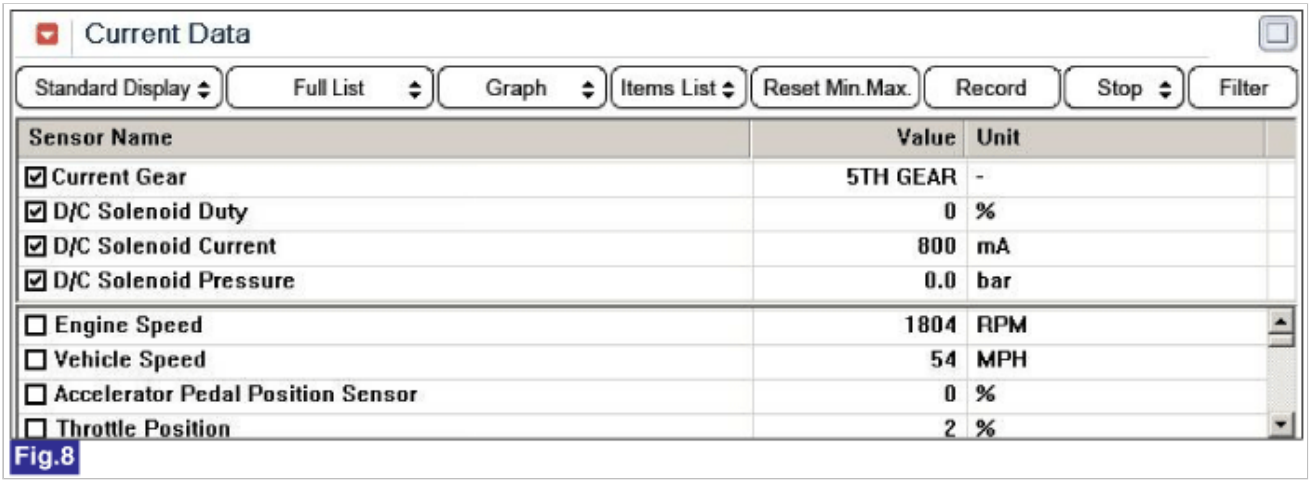


Fig.8

Fig 1) "P" range
Fig 2) "R" range
Fig 3) "N" range
Fig 4) 1st gear in "D" range
Fig 5) 2nd gear in "D" range
Fig 6) 3rd gear in "D" range
Fig 7) 4th gear in "D" range
Fig 8) 5th gear in "D" range

6. Does the "Shift Control Solenoid Valve" follow the reference data ?

YES	▸ 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. Throughly 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.
NO	▸ Go to "W/Harness Inspection" procedure.

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?

YES	▸ Repair as necessary and go to "verification of vehicle repair" procedure.
NO	▸ Go to "Power circuit inspection" procedure.

Power Circuit Inspection

1. Connect "ATM Control Unit connector.
2. IGNITION "ON", ENGINE "OFF".
3. Measure voltage between power terminal of DC solenoid valve harness connector and chassis ground.

Specification : Approx. Battery Voltage

4. Is the measured voltage within specifications ?

YES	▸ Go to "Component Inspection" procedure.
NO	▸ Check for open or short in harness. Repair as necessary and then, go to "Verification of Vehicle Repair" procedure. ▸ If the power circuit is O.K, Substitute with a known-good TCM and check for proper operation. If the

	problem is corrected, replace TCM as necessary and go to "verification of vehicle repair" procedure.

Component Inspection

■ Check shift solenoid valve "DC"

1. Disconnect " ATM Solenoid Valve connector.
2. Ignition "OFF".
3. Measure continuity between ground terminal of DC Solenoid and chassis ground.

Specification : Approx. 3~9Ω

4. Is the measured resistance within specifications ?

YES	▸ Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.
NO	▸ Check for open or short in harness. Repair as necessary and then, go to "Verification of Vehicle Repair" procedure. ▸ If the power circuit is O.K, Substitute with a known-good TCCSV and check for proper operation. If the problem is corrected, replace TCCSV as necessary and go to "verification of vehicle repair" procedure.

Verification of Vehicle Repair

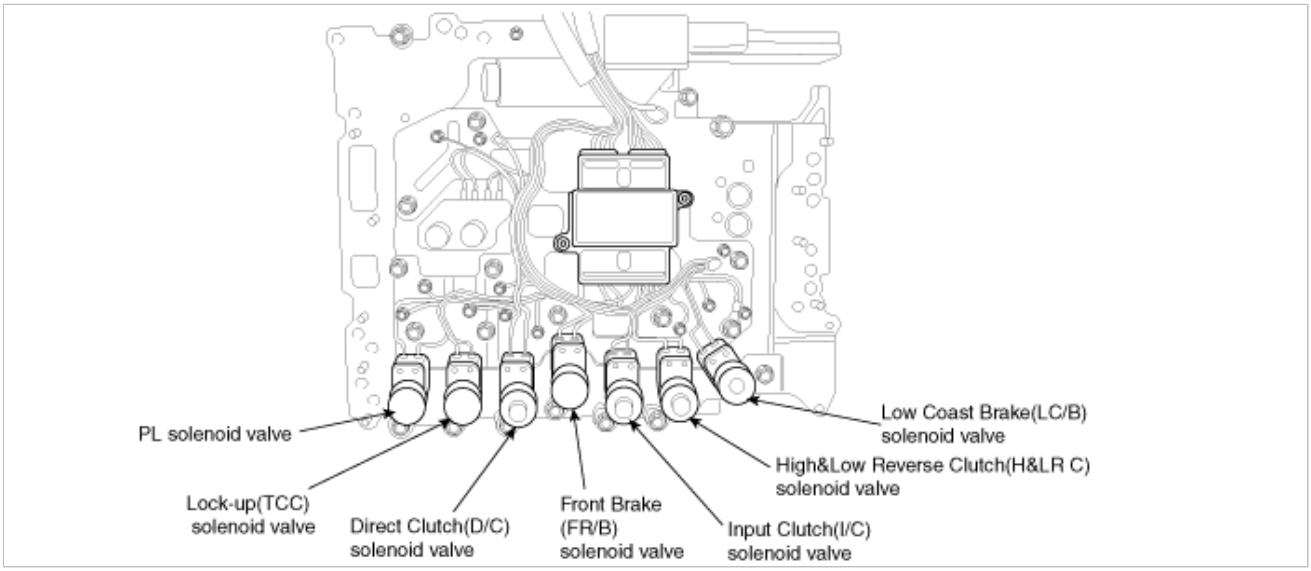
After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a GDS, 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.

GENESIS COUPE(BK) >2010 > G 2.0 DOHC > Automatic Transmission System > Automatic Transmission System > P0768 Shift Control Solenoid Valve \'D\' Electrical(High/Low and Reverse Clutch Solenoid)

Component Location



General Description

The Automatic Transmission changes the gear position of the transmission utilizing a combination of Clutches and Brakes, which are controlled by solenoid valves. High&low reverse clutch solenoid valve is controlled by the TCM in response to signals sent from the inhibitor switch, vehicle speed sensor and accelerator pedal position sensor (throttle position sensor). Gears will then be shifted to the optimum position.

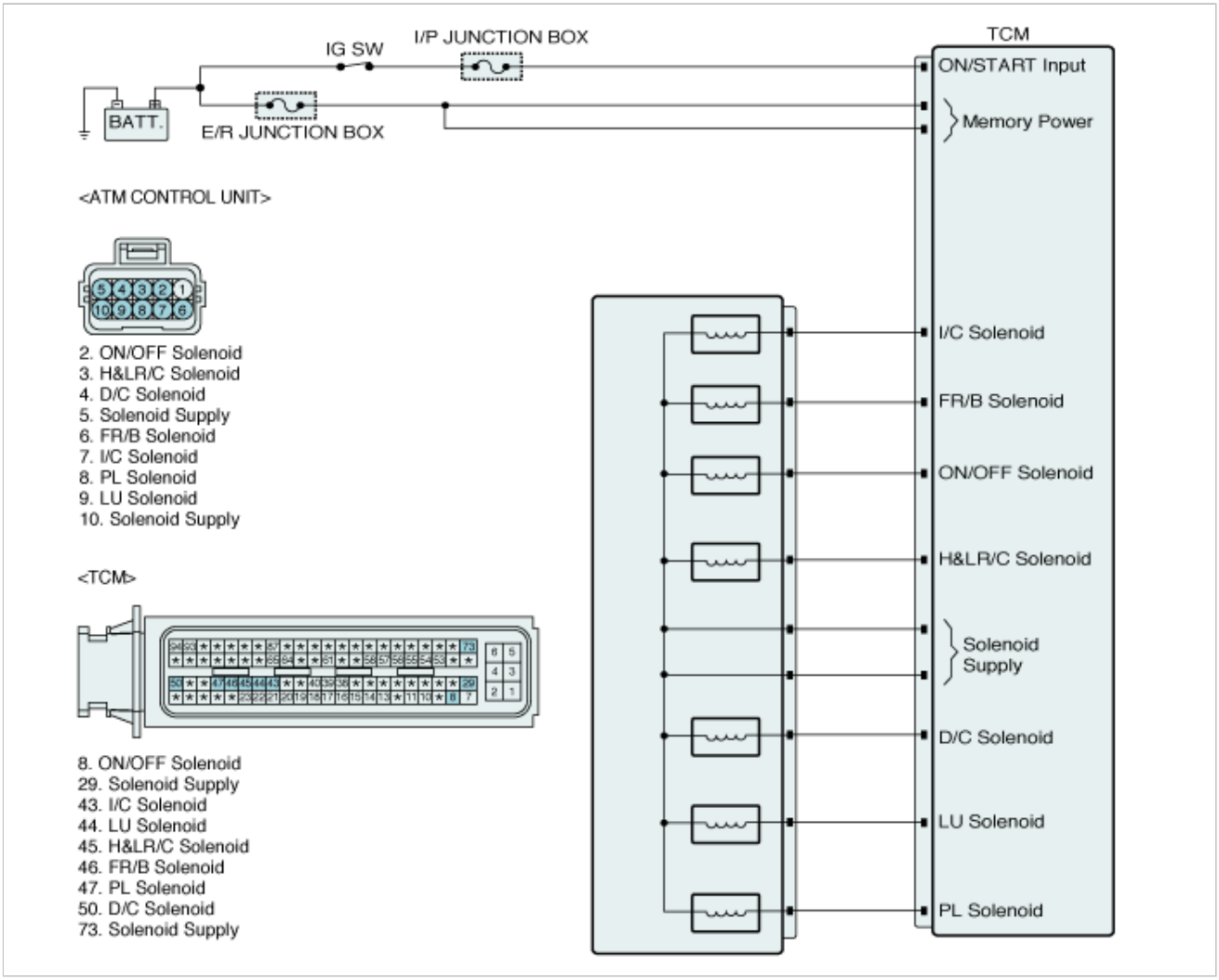
DTC Description

The PCM/TCM checks the Shift Control Solenoin Valve E control signal by monitoring the feedback signal from the solenoid valve drive circuit. If an unexpected signal is monitored, (For example, high voltage is detected when low voltage is expected, or low votage detected when high voltage is expected)

DTC Detectiong Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Check voltage range(Open, Short)	• Open or short in circuit • Faulty Pressure Switch 6 • Faulty H&L R/C solenoid valve • Faulty TCM
Enable Conditions	• 10V < Actuator Supply Voltage < 16V	
Threshold Value	• Hardware IC check	
Diagnostic Time	• More than 0.2sec	
Fail Safe	• Locked as 4th gear	

Diagnostic Circuit Diagram



Monitor GDS Data

1. Connect GDS to data link connector(DLC)
2. Engine "ON" .
3. Monitor the "H& LR/C SOLENOID" parameter on the GDS.
4. Select "D RANGE" and Operate the vehicle.
5. Check ""H& LR/C SOLENOID" parameter value changes while driving.

Specification : Changeable correspondence with each gear postion

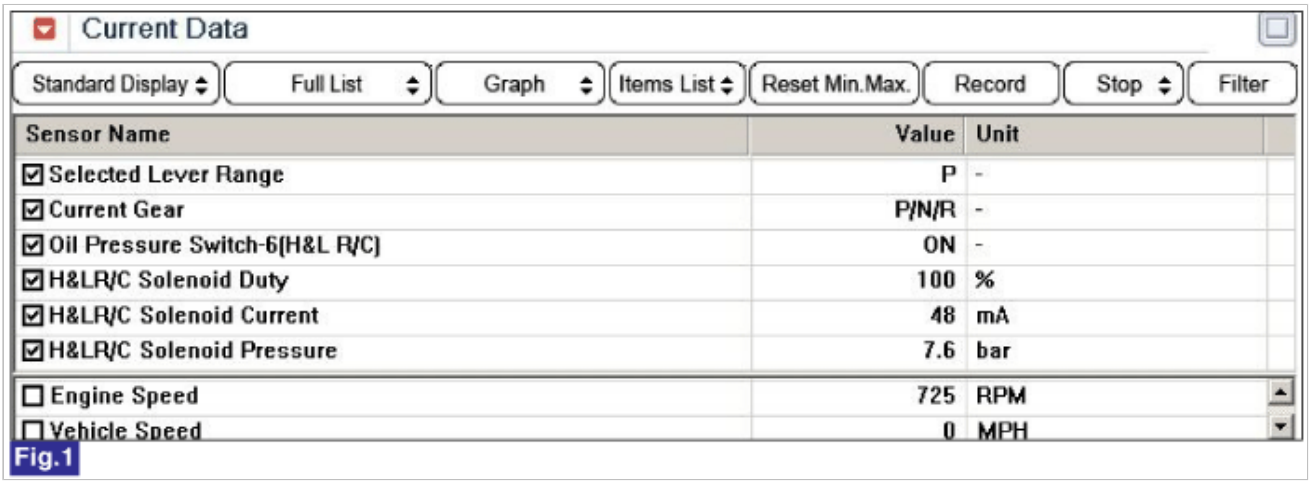


Fig.1

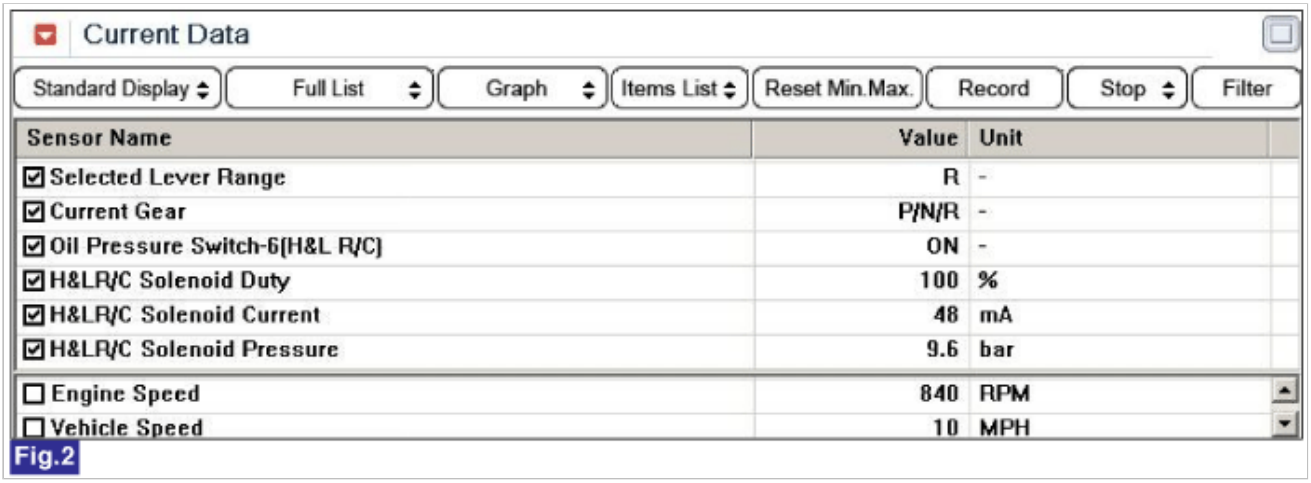


Fig.2

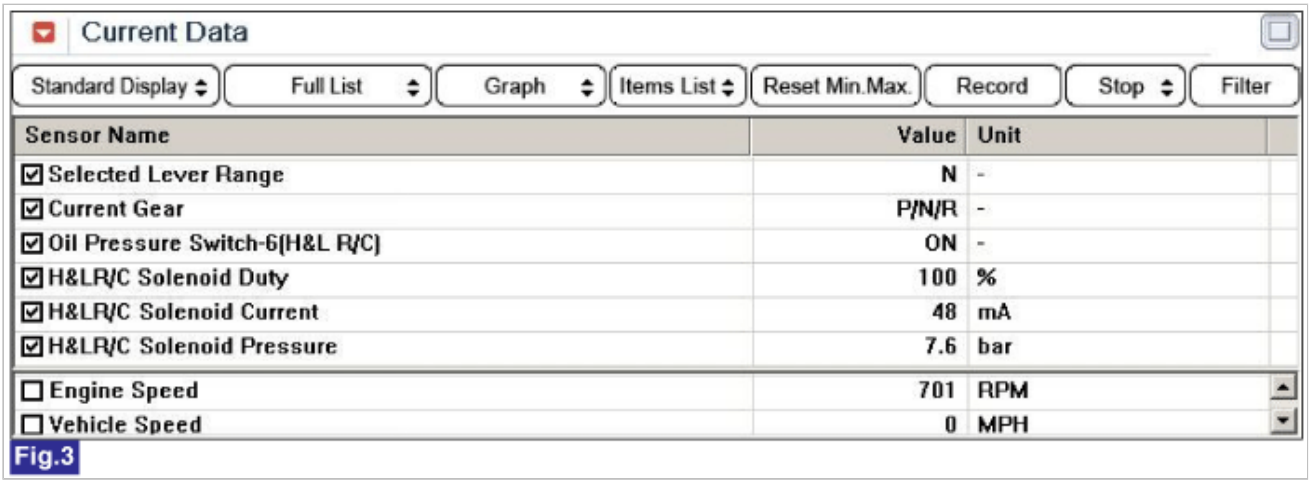


Fig.3

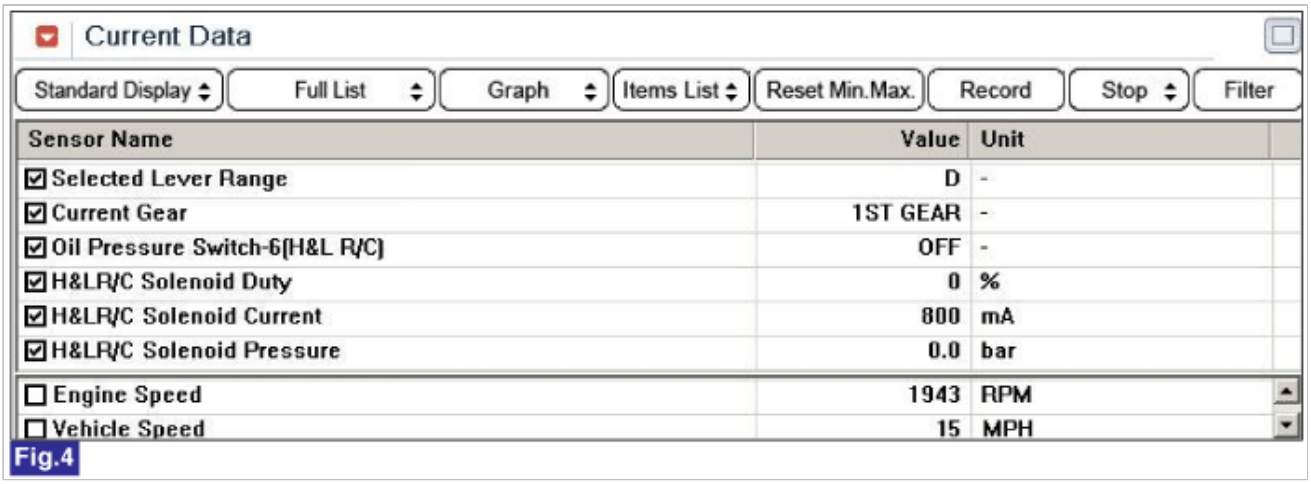


Fig.4

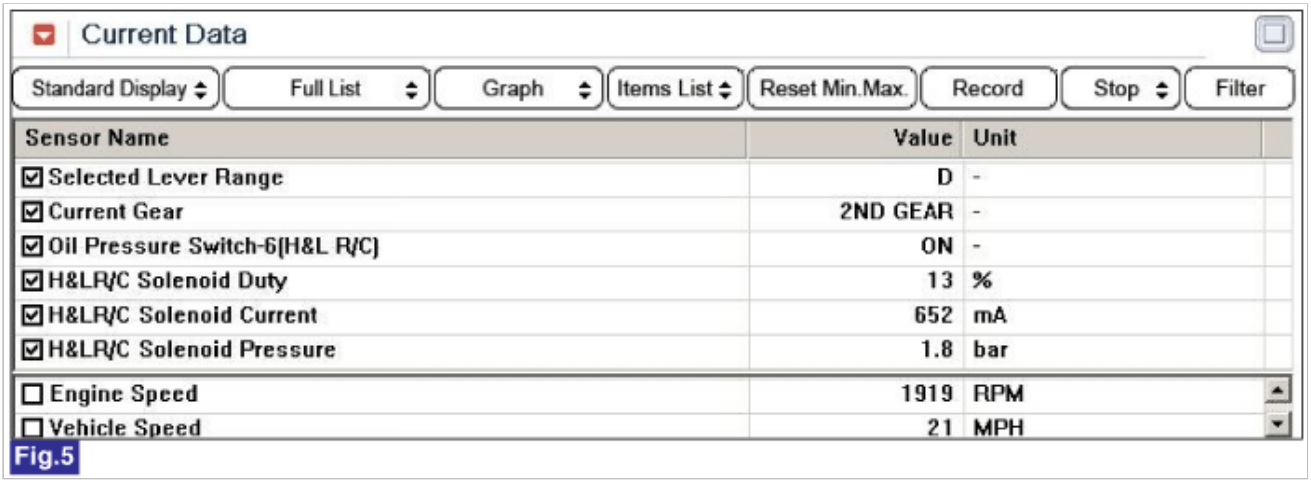


Fig.5

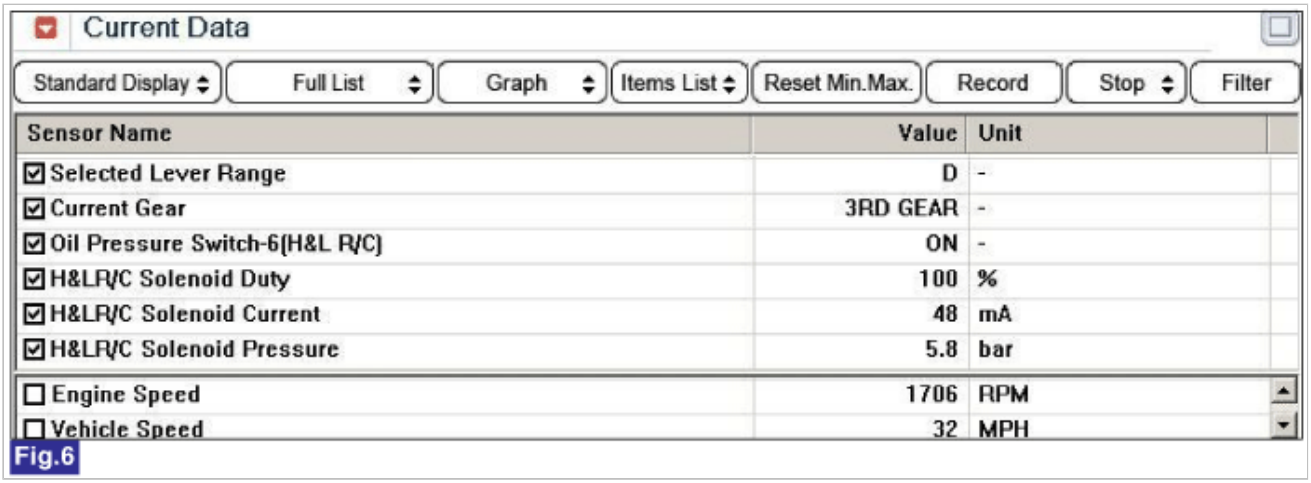


Fig.6

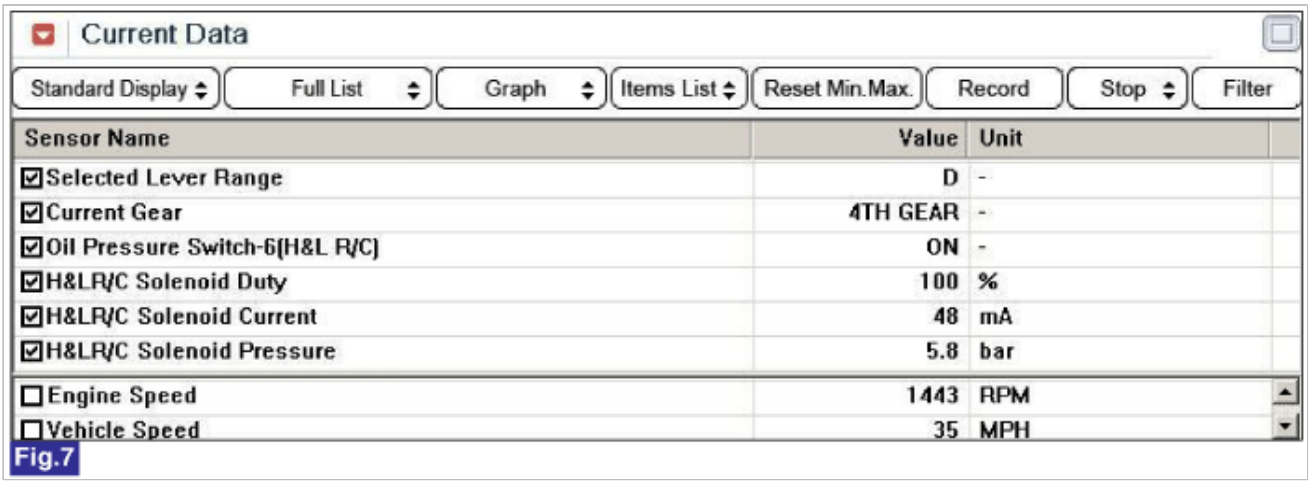


Fig.7

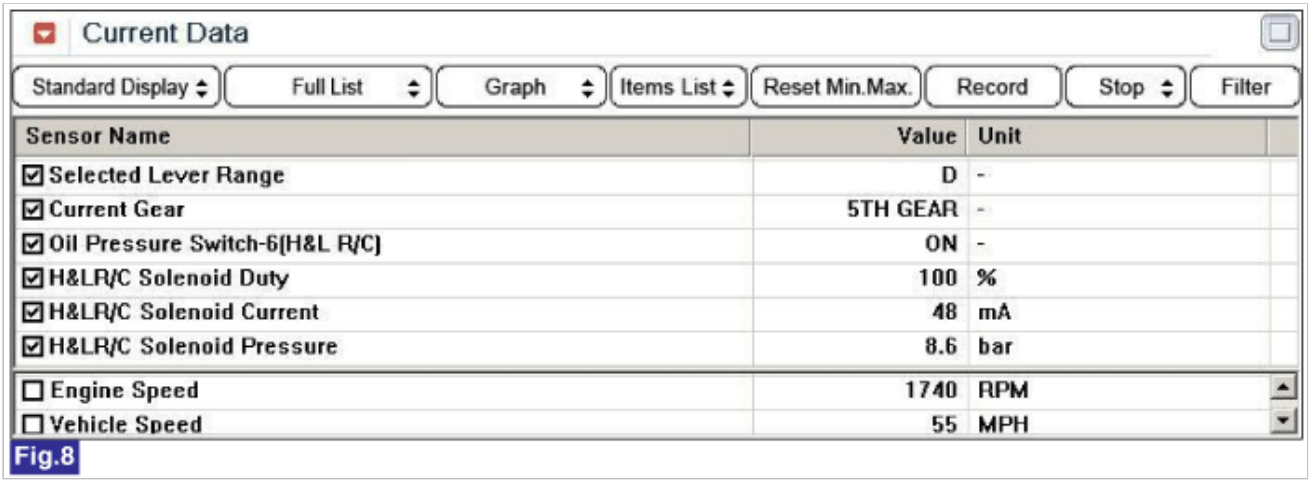


Fig.8

Fig 1) "P" range
Fig 2) "R" range
Fig 3) "N" range
Fig 4) 1st gear in "D" range
Fig 5) 1st gear in sports mode
Fig 6) 2nd gear in "D" range
Fig 7) 2nd gear in sports mode
Fig 8) 3rd gear in "D" range
Fig 9) 4th gear in "D" range
Fig 10) 5th gear in "D" range

6. Does the "Shift Control Solenoid Valve" follow the reference data ?

YES	▸ 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. Throughly 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.
NO	▸ Go to "W/Harness Inspection" procedure.

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?

YES	▸ Repair as necessary and go to "verification of vehicle repair" procedure.
NO	▸ Go to "Power circuit inspection" procedure.

Power Circuit Inspection

1. Connect "ATM Control Unit connector.
2. IGNITION "ON", ENGINE "OFF".
3. Measure voltage between power terminal of H& LR/C solenoid valve harness connector and chassis ground.

Specification : Approx. Battery Voltage

4. Is the measured voltage within specifications ?

YES	▸ Go to "Component Inspection" procedure.
	▸ Check for open or short in harness. Repair as necessary and then, go to "Verification of Vehicle

NO	Repair" procedure. ▸ If the power circuit is O.K, Substitute with a known-good TCM and check for proper operation. If the problem is corrected, replace TCM as necessary and go to "verification of vehicle repair" procedure.

Component Inspection

■ Check shift solenoid valve "H&LR/C"

1. Disconnect " ATM Solenoid Valve connector.
2. Ignition "OFF".
3. Measure continuity between ground terminal of H& LR/C Solenoid and chassis ground.

Specification : Approx. 3~9Ω

4. Is the measured resistance within specifications ?

YES	▸ Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.
NO	▸ Check for open or short in harness. Repair as necessary and then, go to "Verification of Vehicle Repair" procedure. ▸ If the power circuit is O.K, Substitute with a known-good TCCSV and check for proper operation. If the problem is corrected, replace TCCSV as necessary and go to "verification of vehicle repair" procedure.

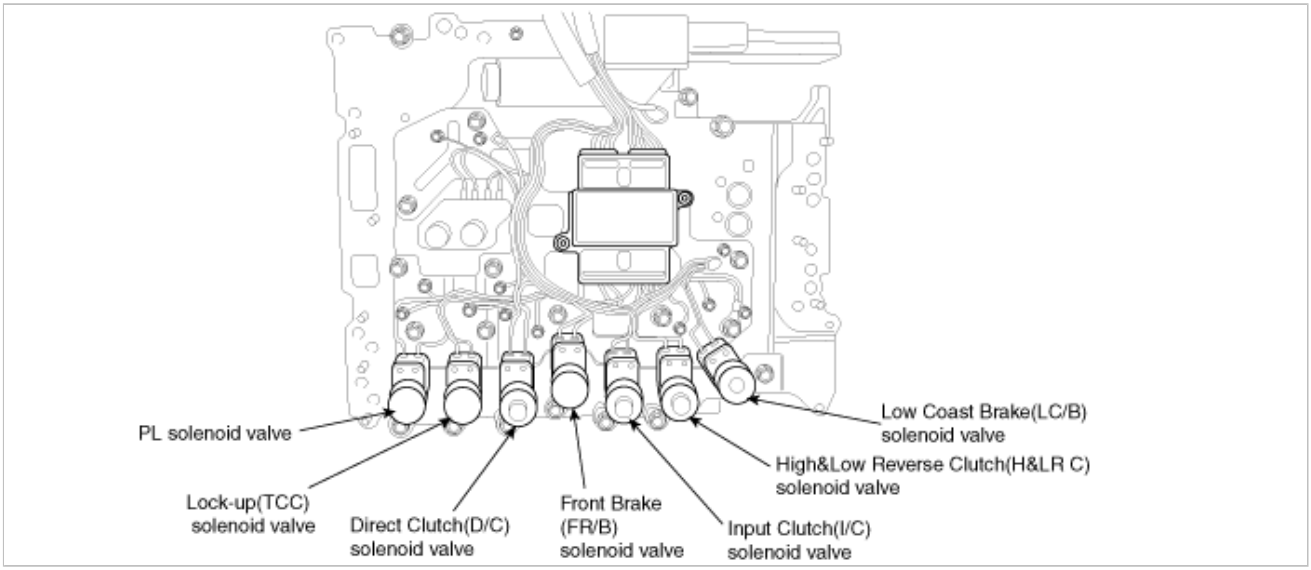
Verification of Vehicle Repair

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

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a GDS, 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.

Component Location



General Description

The Automatic Transmission changes the gear position of the transmission utilizing a combination of Clutches and Brakes, which are controlled by solenoid valves. High&low reverse clutch solenoid valve is controlled by the TCM in response to signals sent from the inhibitor switch, vehicle speed sensor and accelerator pedal position sensor (throttle position sensor). Gears will then be shifted to the optimum position.

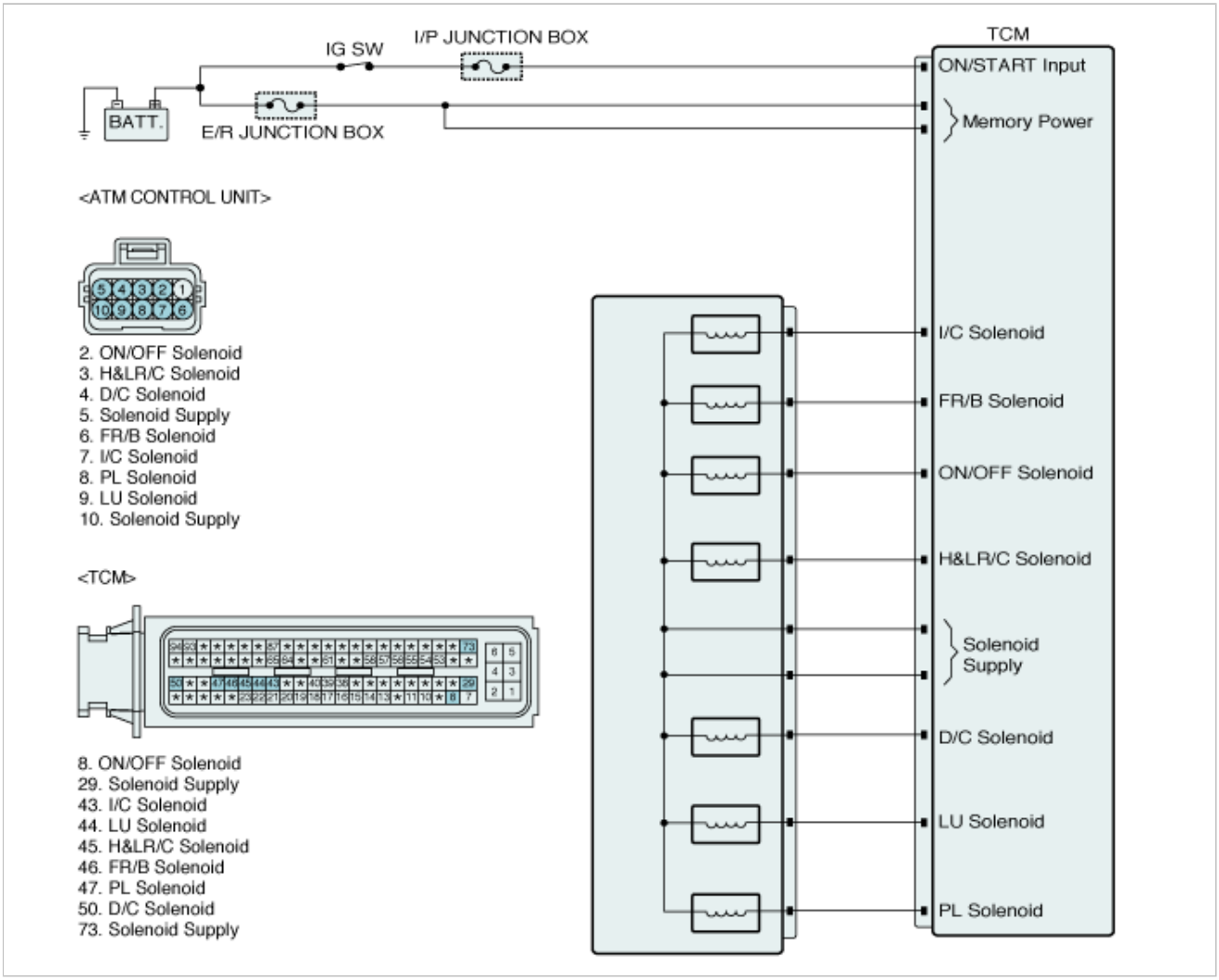
DTC Description

The PCM/TCM checks the Shift Control Solenoin Valve E control signal by monitoring the feedback signal from the solenoid valve drive circuit. If an unexpected signal is monitored, (For example, high voltage is detected when low voltage is expected, or low votage detected when high voltage is expected)

DTC Detectiong Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Check voltage range(Open, Short)	• Open or short in circuit • Faulty Pressure Switch 2 • Faulty LC/B solenoid valve • Faulty TCM
Enable Conditions	• 10V < Actuator Supply Voltage < 16V	
Threshold Value	• Hardware IC check	
Diagnostic Time	• More than 0.2sec	
Fail Safe	• OFF fail : Only LC/B OFF, The others are controlled as usual • ON fail : Lock as 4th gear	

Diagnostic Circuit Diagram



Monitor GDS Data

1. Connect GDS to data link connector(DLC)
2. Engine "ON" .
3. Monitor the "LC/B SOLENOID" parameter on the GDS.
4. Select "D RANGE" and Operate the vehicle.
5. Check ""LC/B SOLENOID" parameter value changes while driving.

Specification : Changeable correspondence with each gear postion

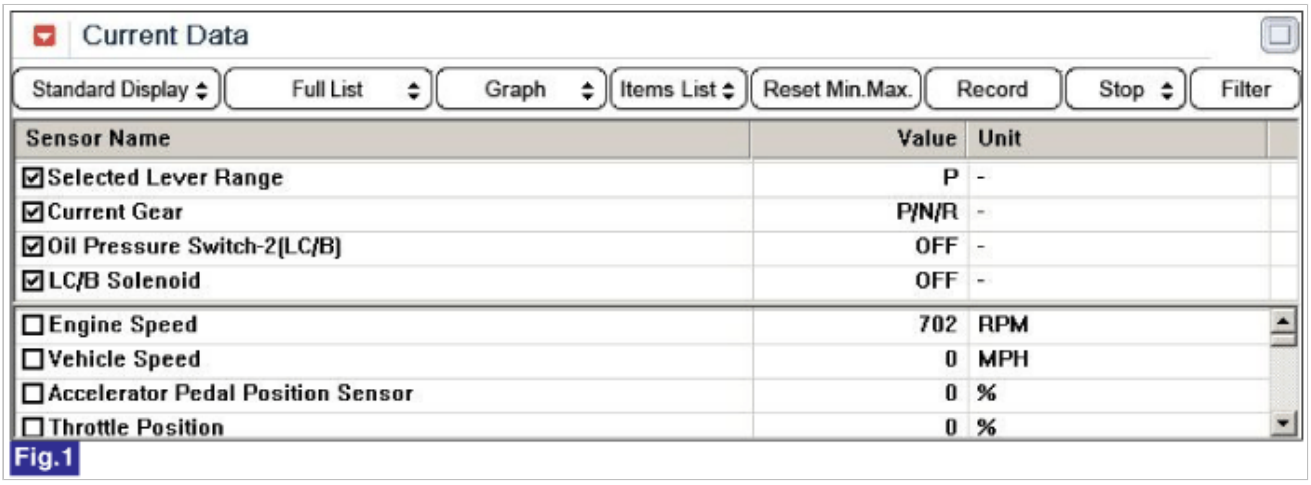


Fig.1

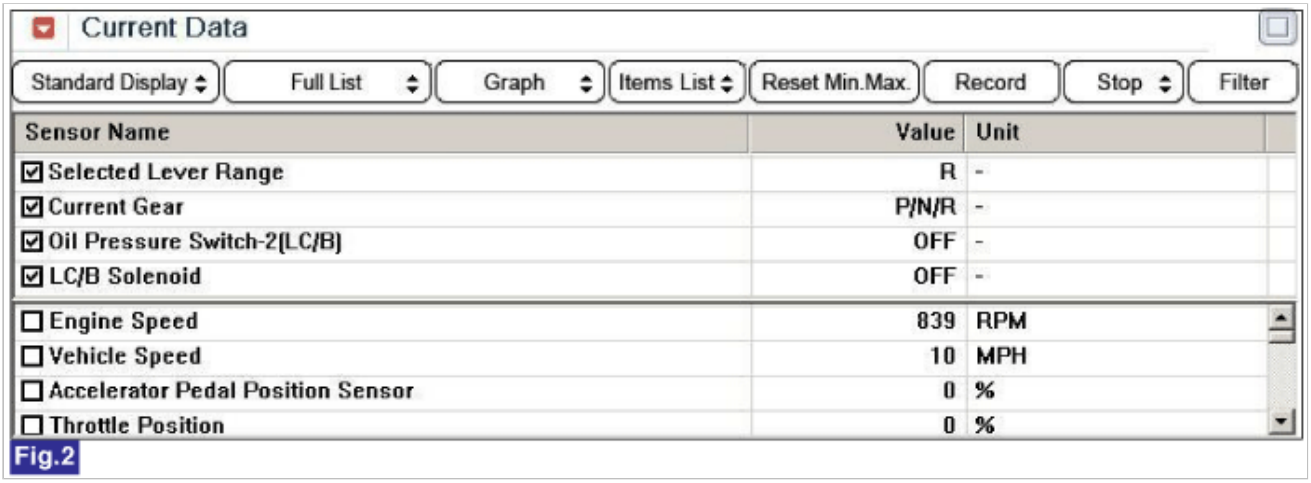


Fig.2

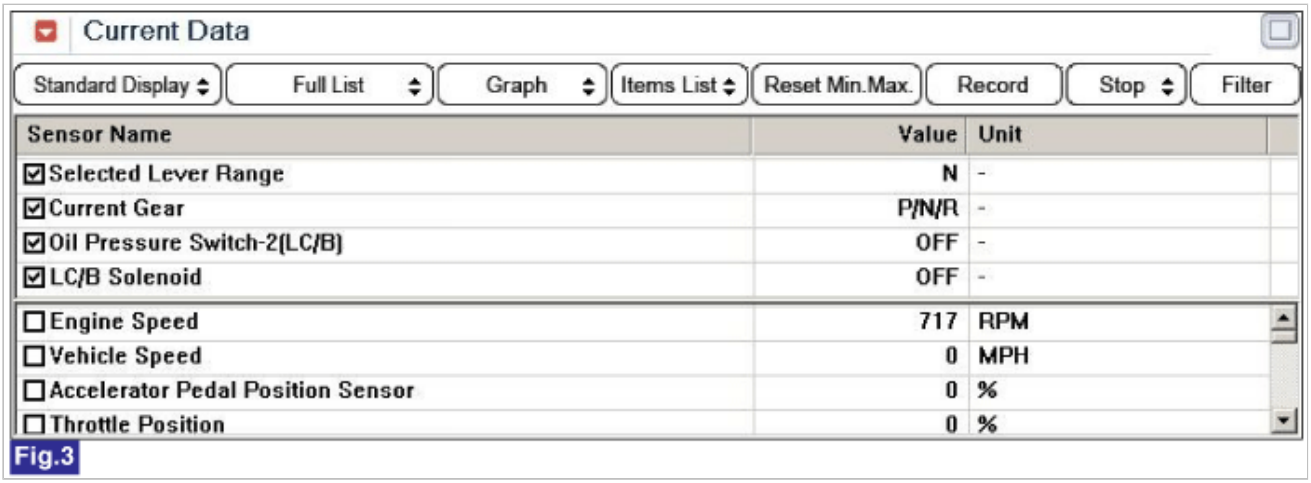


Fig.3

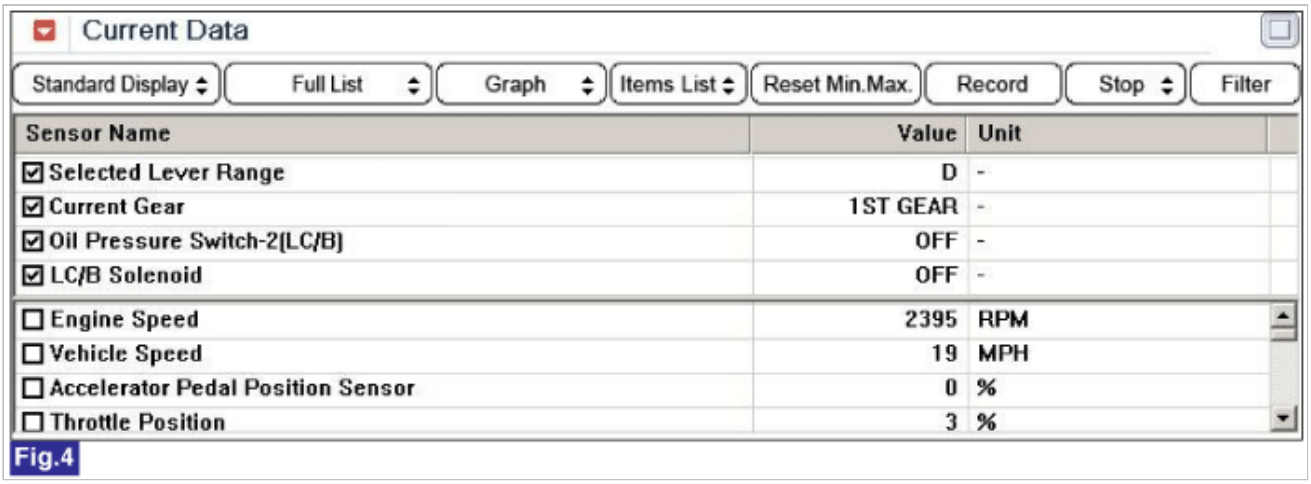


Fig.4

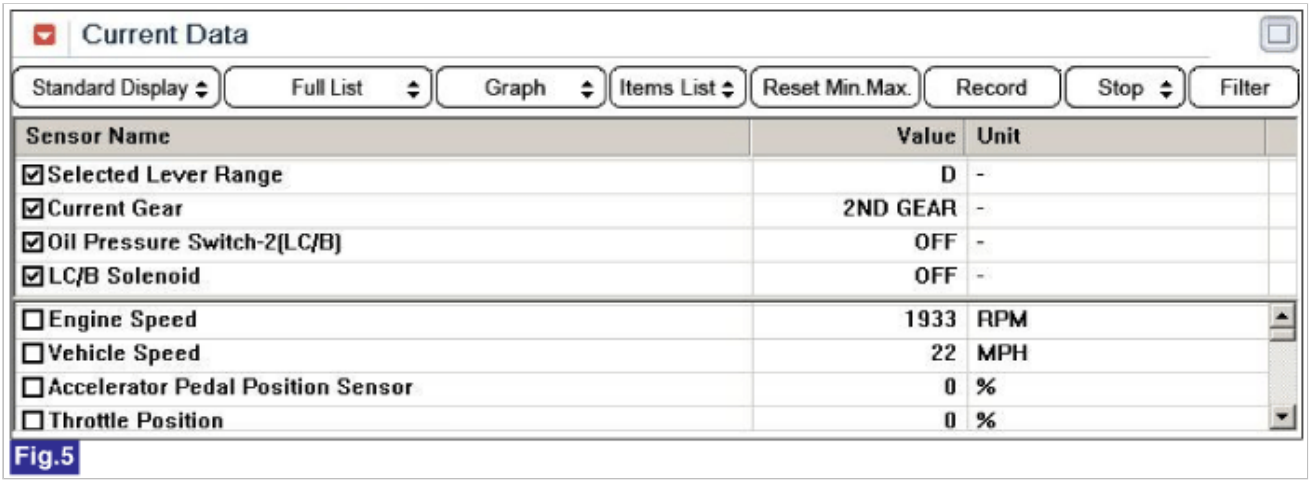


Fig.5

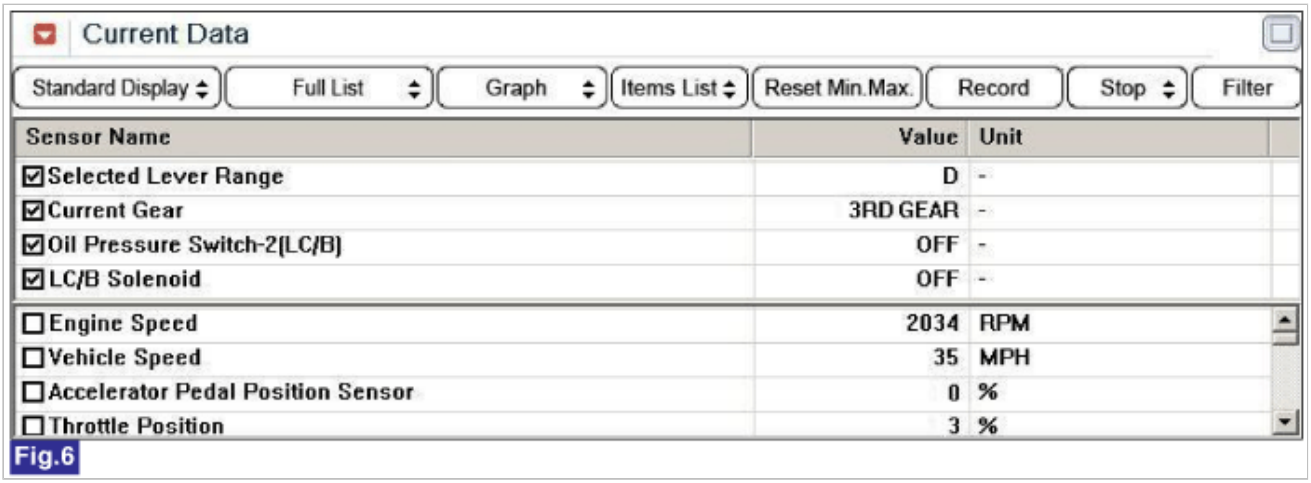


Fig.6

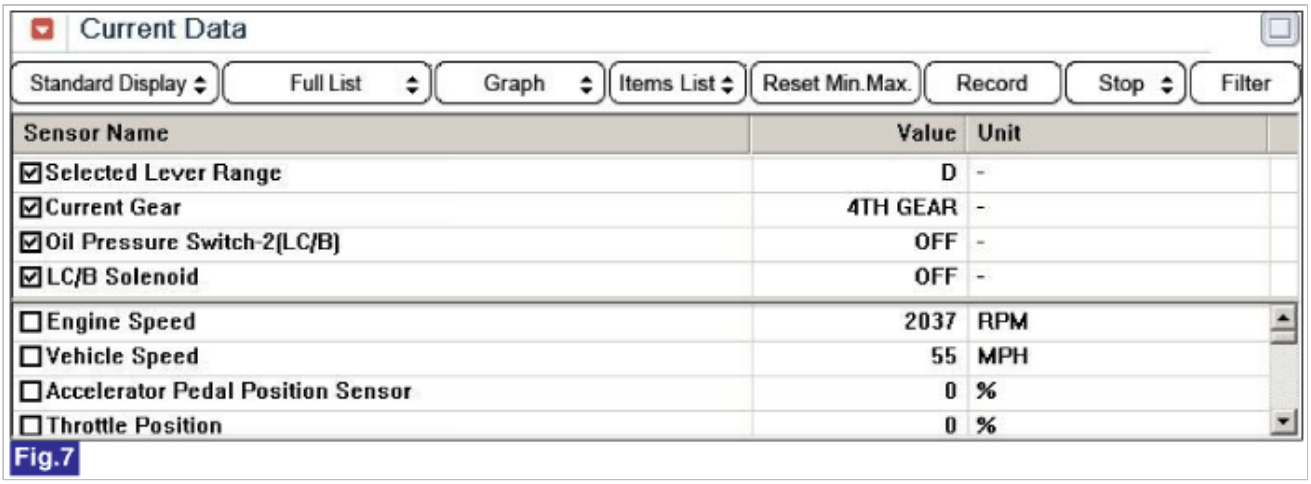


Fig.7

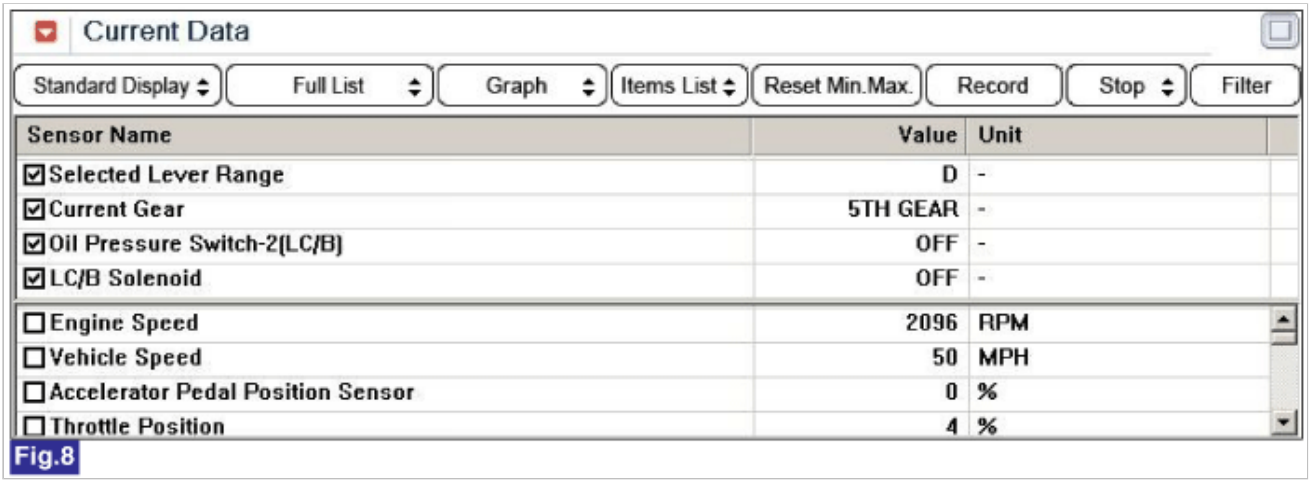


Fig.8

Fig 1) "P" range
Fig 2) "R" range
Fig 3) "N" range
Fig 4) 1st gear in "D" range
Fig 5) 1st gear in sports mode
Fig 6) 2nd gear in "D" range
Fig 7) 2nd gear in sports mode
Fig 8) 3rd gear in "D" range
Fig 9) 4th gear in "D" range
Fig 10) 5th gear in "D" range

6. Does the "Shift Control Solenoid Valve" follow the reference data ?

YES	▸ 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. Throughly 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.
NO	▸ Go to "W/Harness Inspection" procedure.

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?

YES	▸ Repair as necessary and go to "verification of vehicle repair" procedure.
NO	▸ Go to "Power circuit inspection" procedure.

Power Circuit Inspection

1. Connect "ATM Control Unit connector.
2. IGNITION "ON", ENGINE "OFF".
3. Measure voltage between power terminal of LC/B solenoid valve harness connector and chassis ground.

Specification : Approx. Battery Voltage

4. Is the measured voltage within specifications ?

YES	▸ Go to "Component Inspection" procedure.
	▸ Check for open or short in harness. Repair as necessary and then, go to "Verification of Vehicle

NO	Repair" procedure. ▸ If the power circuit is O.K, Substitute with a known-good TCM and check for proper operation. If the problem is corrected, replace TCM as necessary and go to "verification of vehicle repair" procedure.

Component Inspection

■ Check shift solenoid valve LC/B

1. Disconnect " ATM Solenoid Valve connector.
2. Ignition "OFF".
3. Measure continuity between ground terminal of LC/B Solenoid and chassis ground.

Specification : Approx. 3~9Ω

4. Is the measured resistance within specifications ?

YES	▸ Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.
NO	▸ Check for open or short in harness. Repair as necessary and then, go to "Verification of Vehicle Repair" procedure. ▸ If the power circuit is O.K, Substitute with a known-good TCCSV and check for proper operation. If the problem is corrected, replace TCCSV as necessary and go to "verification of vehicle repair" procedure.

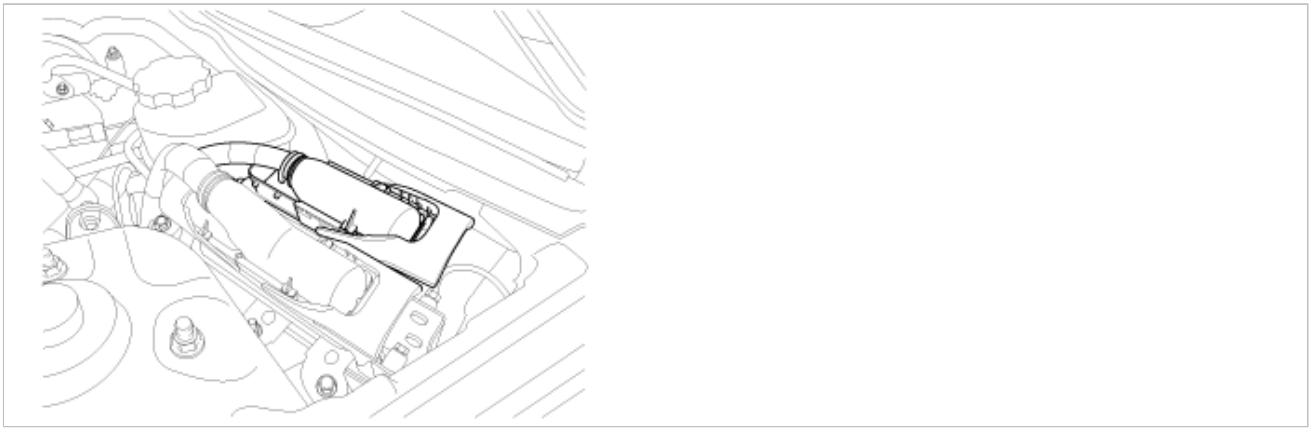
Verification of Vehicle Repair

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

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a GDS, 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.

Component Location



General Description

The TCM can either receive data from the Engine Control Module or ABS control module, or it can send data to the ECM and ABSCM by using CAN communication. The CAN communicaton is one of the vehicle communications method, which is now widely used to transfer the vehicle data.

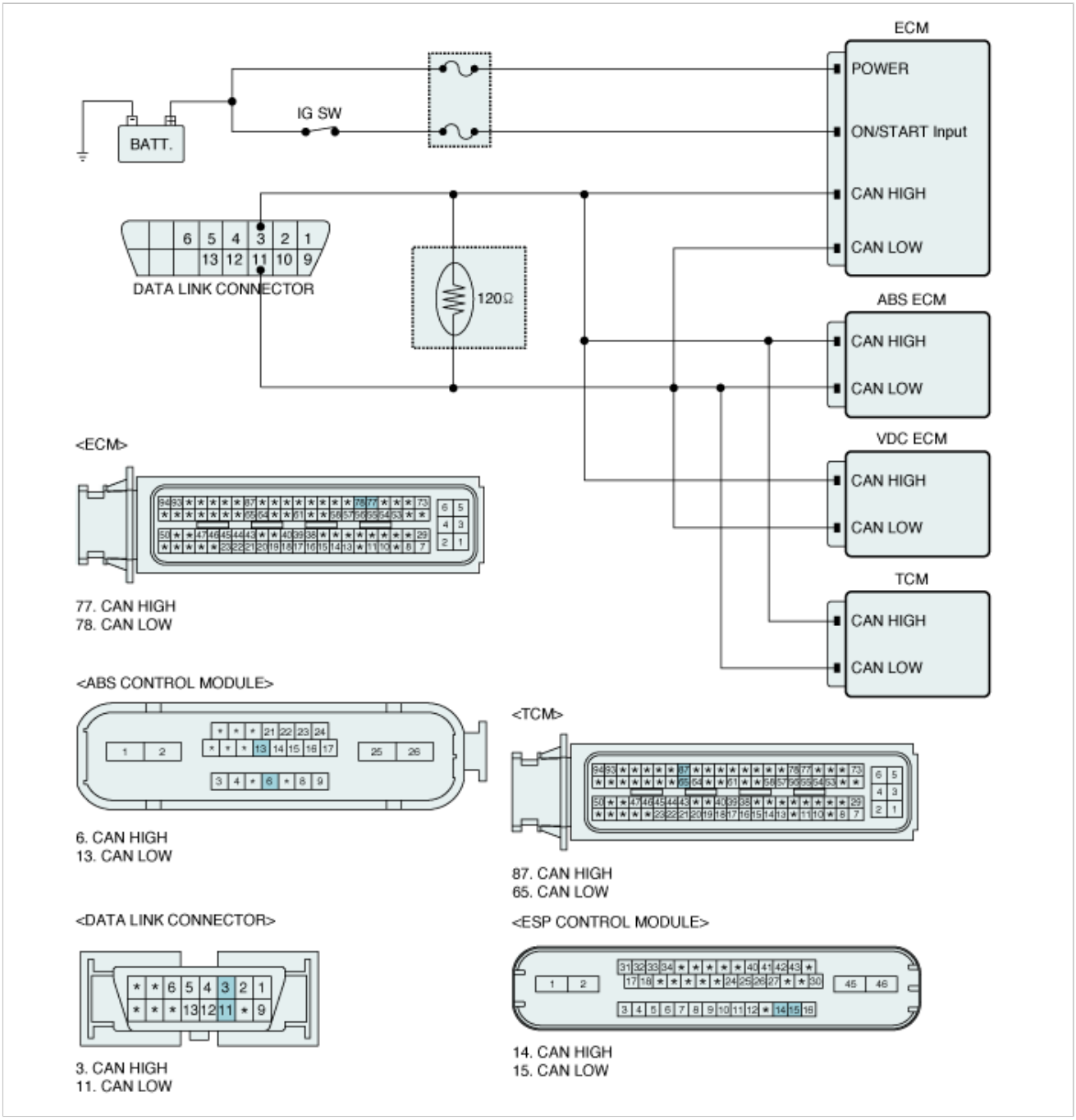
DTC Description

The TCM reads data on the CAN-BUS line and checks whether the data is equal to the data which the TCM sentbefore. If the data is not the same the TCM decides that either the CAN-BUS line or TCM are malfuncting and sets this code.

DTC Detectiong Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Message Check	• Open or short in CAN line • Faulty ECM • Faulty TCM
Enable Conditions	• IG "ON" • Battery Voltage > 10V • Input Speed > 300rpm	
Threshold Value	• Status of CAN chip BUS OFF	
Diagnostic Time	• More than 2sec.	
Fail Safe	• Default value	

Diagnostic Circuit Diagram



Signal Waveform & Data

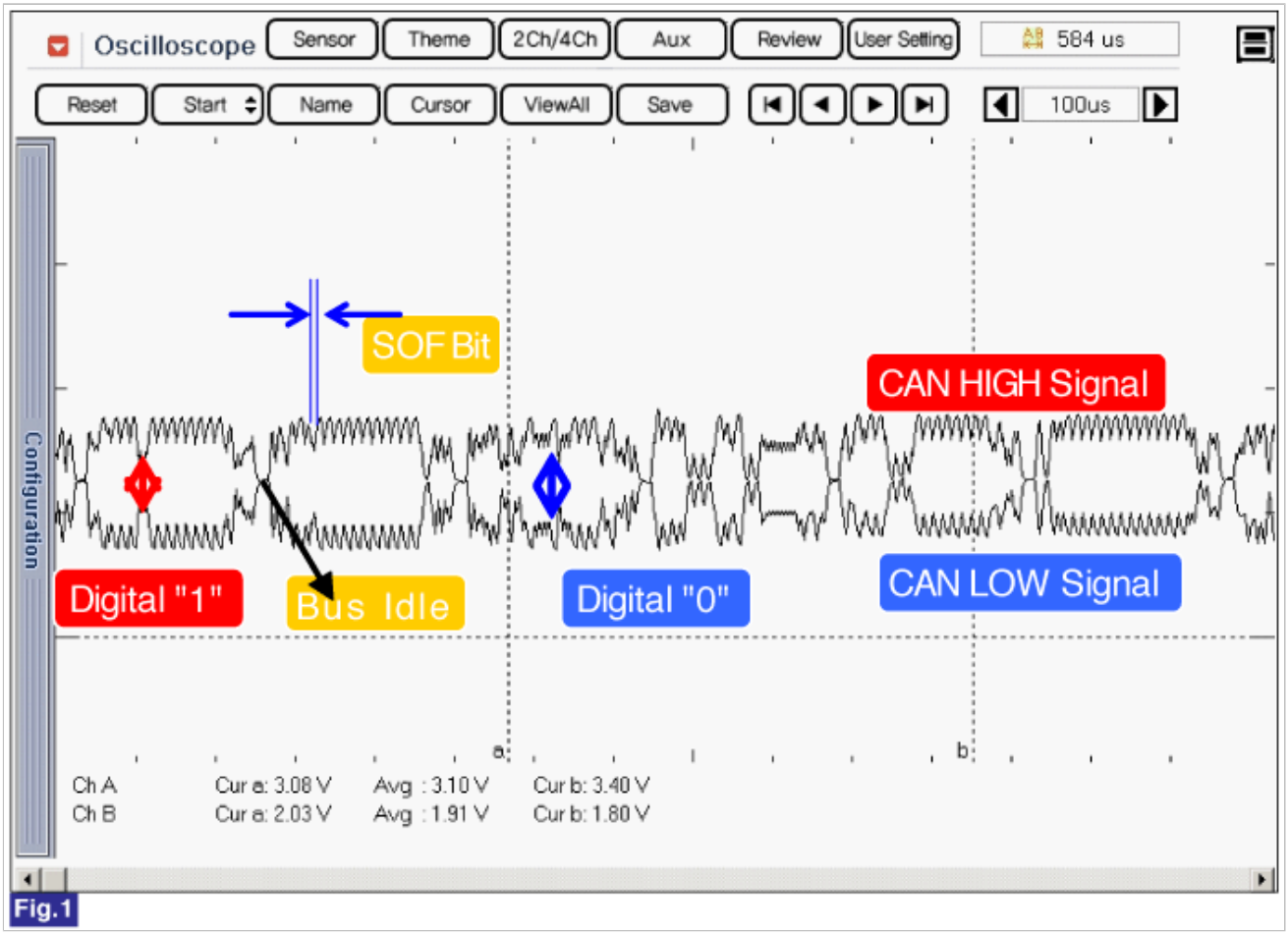
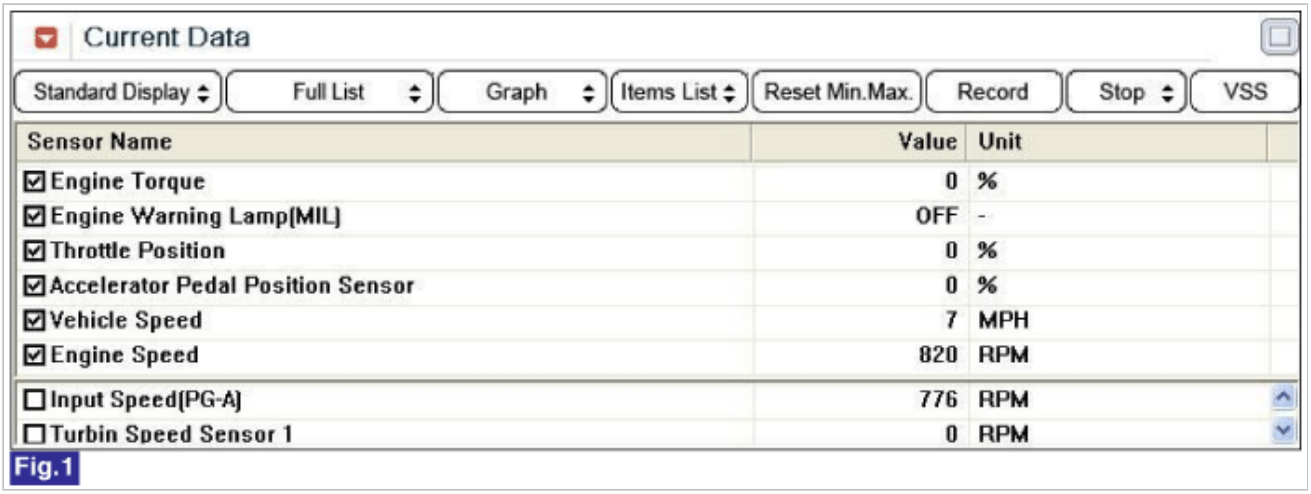


Fig 1) "CAN Communication"

Monitor GDS Data

1. Connect GDS to data link connector(DLC)
2. Engine "ON" .
3. Monitor the "CAN COMMUNICATION SERVICE DATA (ENGINE RPM, VEHICLE SPEED SENSOR, THROTTLE P. SENSOR)" parameters on the GDS.



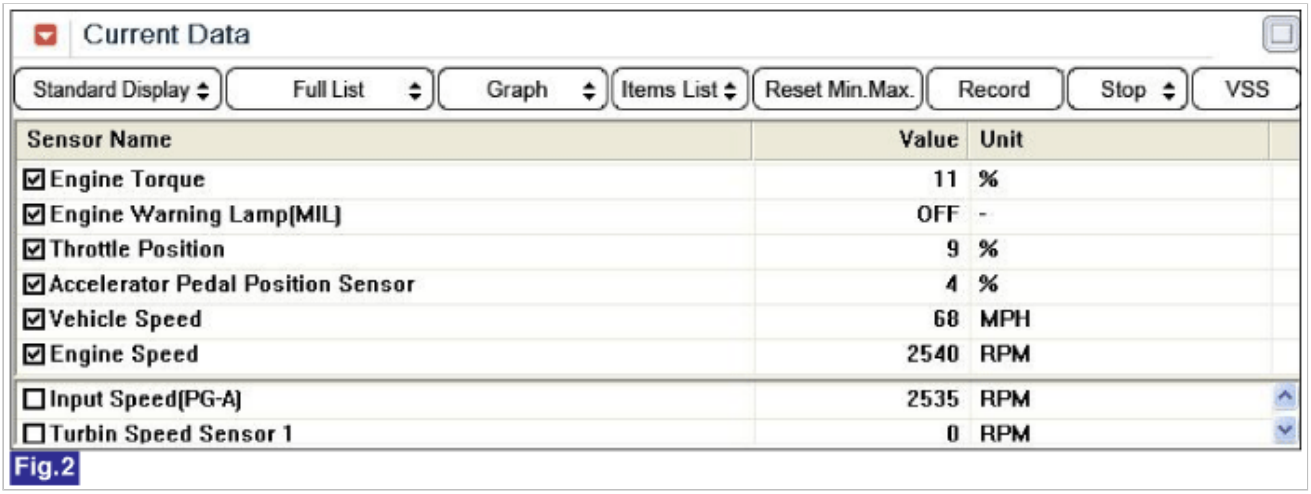


Fig 1) Low-speed
Fig 2) High-speed

4. Does "CAN BUS LINE DATA " follow the referance data?

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. Throughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.
NO	▸ Go to "W/Harness Inspection" procedure.

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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?

YES	▸ Repair as necessary and go to "verification of vehicle repair" procedure.
NO	▸ Go to "Signal circuit inspection" procedure.

Signal Circuit Inspection

1. Ignition "OFF".
2. Disconnect "ECU" connector.
3. Measure resistance between CAN high terminal and CAN low terminal of PCM/TCM harness connector.

Specification : Approx. 120 Ω ± 10Ω

4. Is the measured resistance within specifications ?

YES	▸ Substitute with a known-good "PCM/TCM" and check for proper operation. If the problem is corrected, replace "PCM/TCM" and Go to "verification of vehicle repair" procedure.
NO	▸ Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage and resistor for CAN communication is open. Repair as necessary and then, go to 'Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

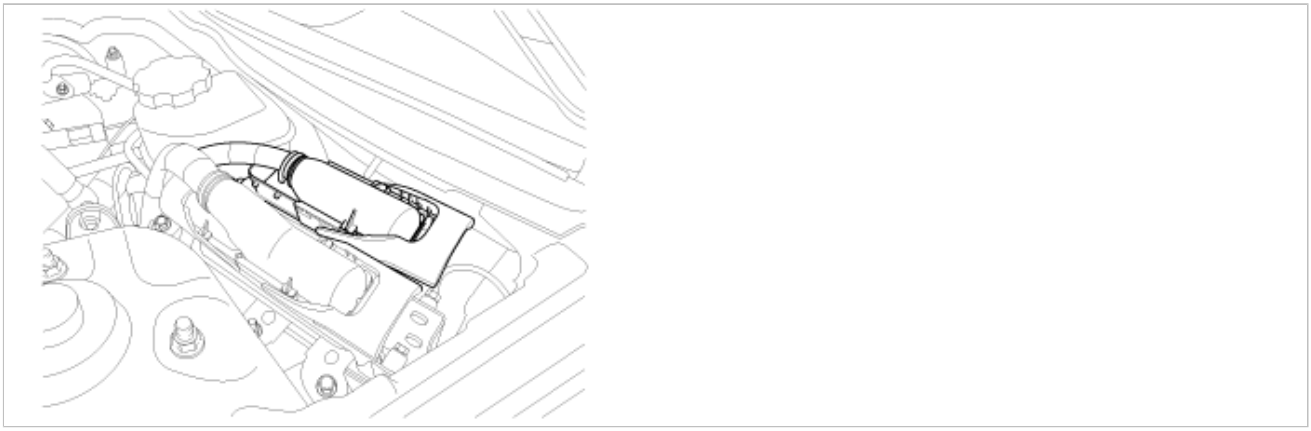
After a repair, it is essential to verify that the fault has been corrected.

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

2. Using a GDS, 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.

Component Location



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DTC Detectiong Condition

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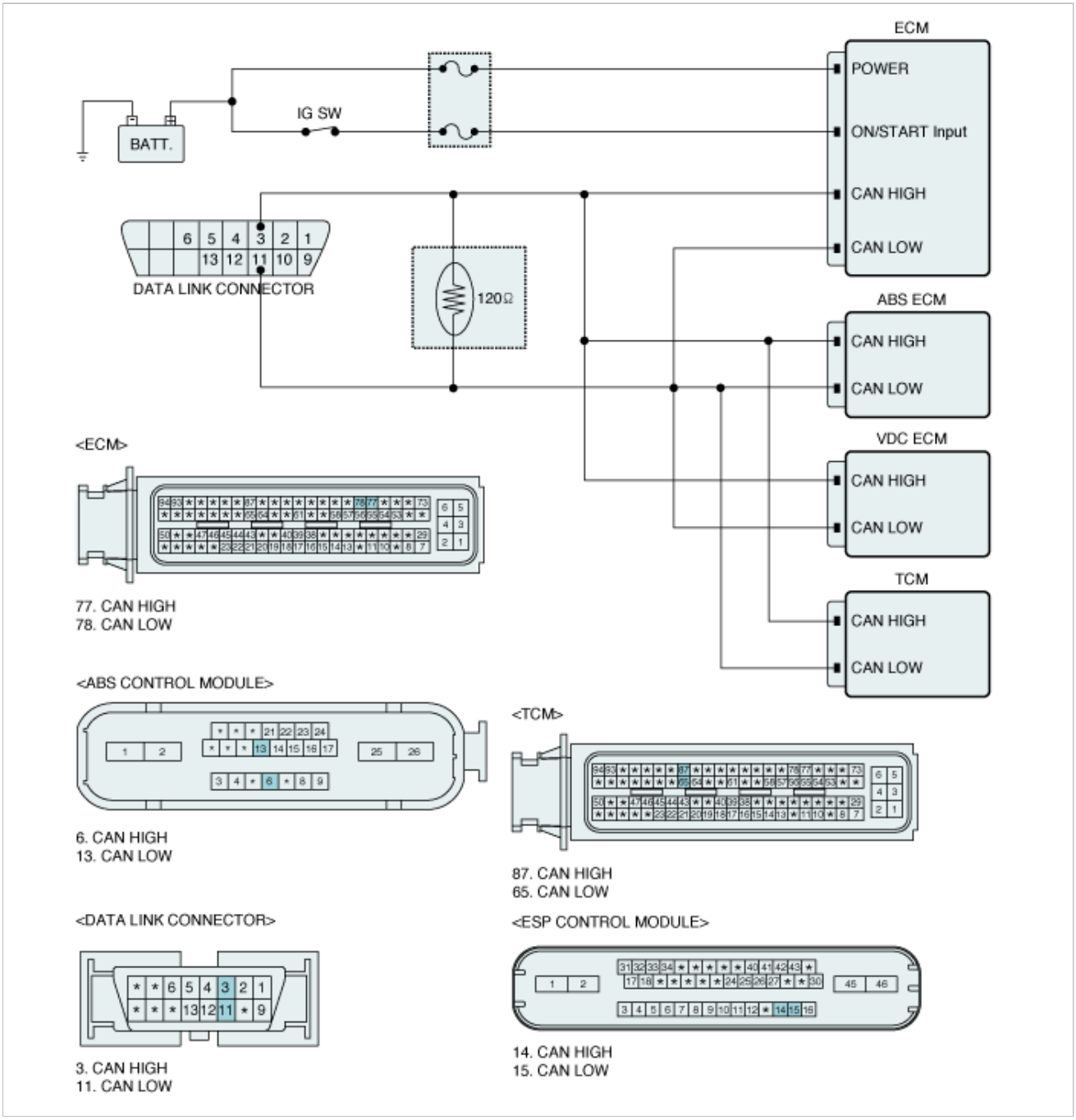
DTC Strategy	• Message Check	• Open or short in CAN line • Faulty ECM • Faulty TCM
Enable Conditions	• IG "ON" • Battery Voltage > 10V • Input Speed > 300rpm	
Threshold Value	• BUS OFF	
Diagnostic Time	• More than 2sec.	
Fail Safe	• Default value	

Diagnostic Circuit Diagram



Signal Waveform & Data

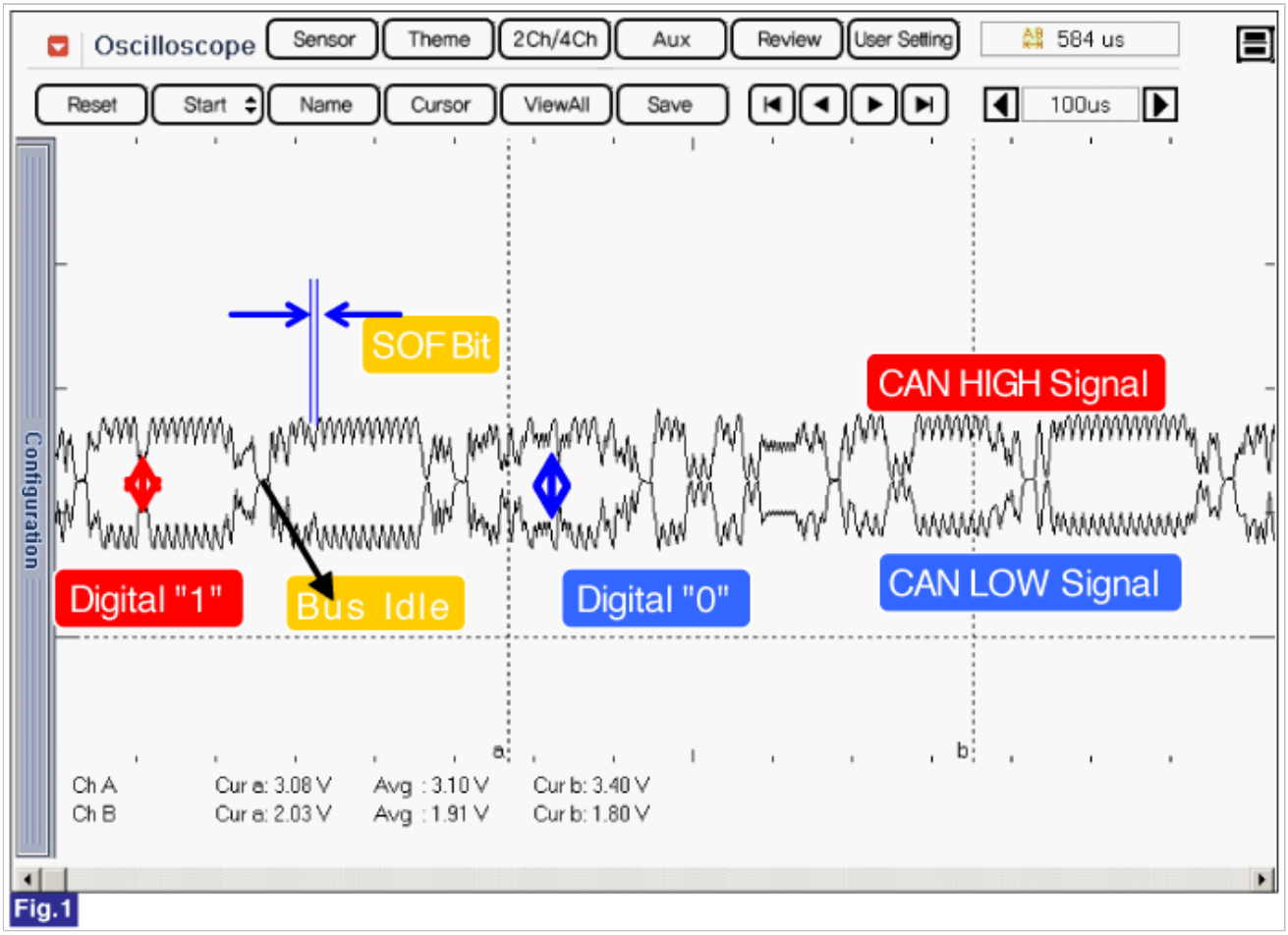
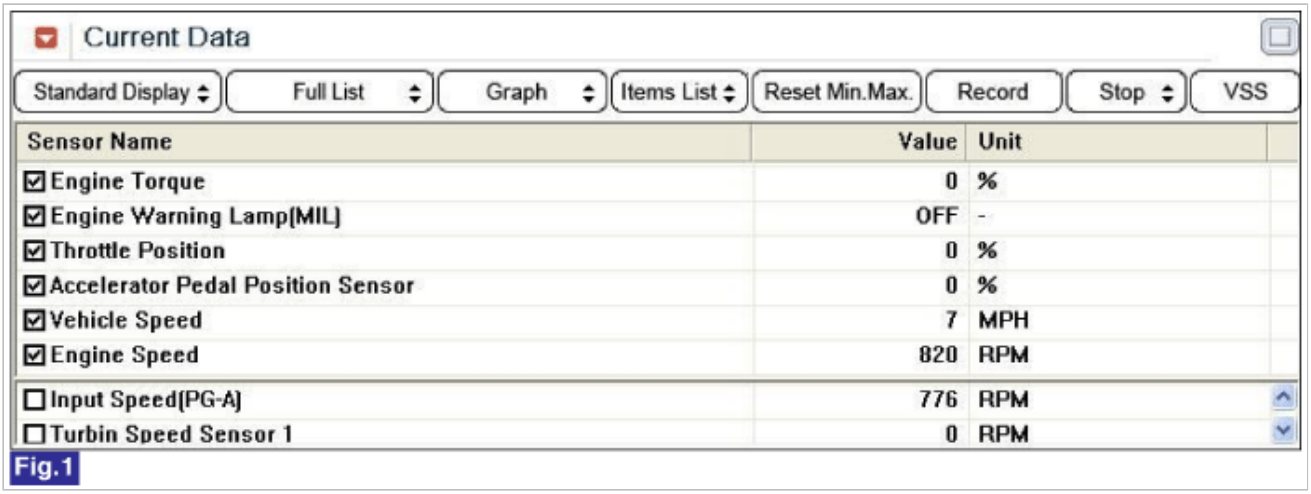


Fig 1) "CAN Communication"

Monitor GDS Data

1. Connect GDS to data link connector(DLC)
2. Engine "ON" .
3. Monitor the "CAN COMMUNICATION SERVICE DATA (ENGINE RPM, VEHICLE SPEED SENSOR, THROTTLE P. SENSOR)" parameters on the GDS.



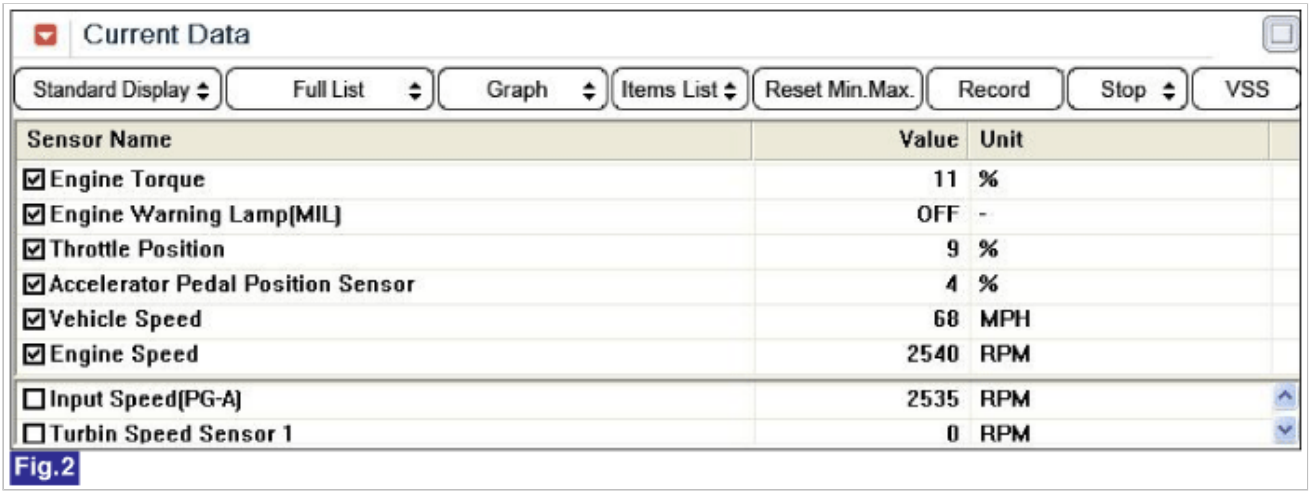


Fig 1) Low-speed
Fig 2) High-speed

4. Does "CAN BUS LINE DATA " follow the referance data?

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. Throughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.
NO	▸ Go to "W/Harness Inspection" procedure.

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?

YES	▸ Repair as necessary and go to "verification of vehicle repair" procedure.
NO	▸ Go to "Signal circuit inspection" procedure.

Signal Circuit Inspection

1. Ignition "OFF".
2. Disconnect "ECU" connector.
3. Measure resistance between CAN high terminal and CAN low terminal of PCM/TCM harness connector.

Specification : Approx. 120 Ω ± 10Ω

4. Is the measured resistance within specifications ?

YES	▸ Substitute with a known-good "PCM/TCM" and check for proper operation. If the problem is corrected, replace "PCM/TCM" and Go to "verification of vehicle repair" procedure.
NO	▸ Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage and resistor for CAN communication is open. Repair as necessary and then, go to 'Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

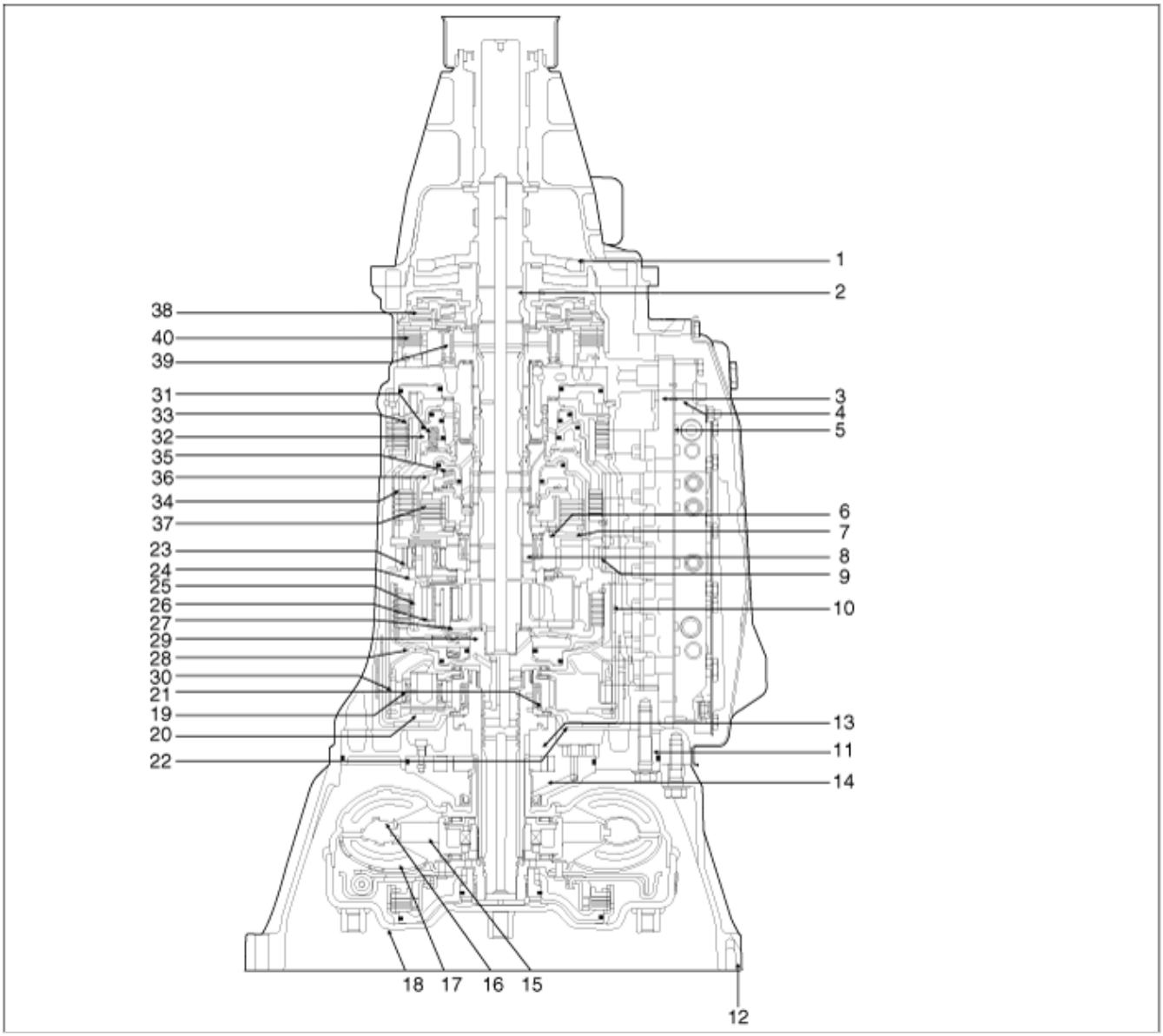
After a repair, it is essential to verify that the fault has been corrected.

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

2. Using a GDS, 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.

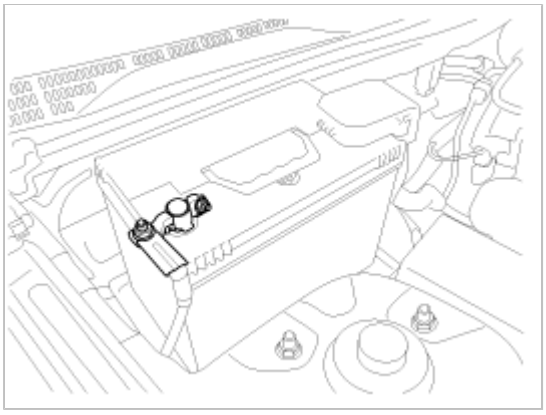
Components



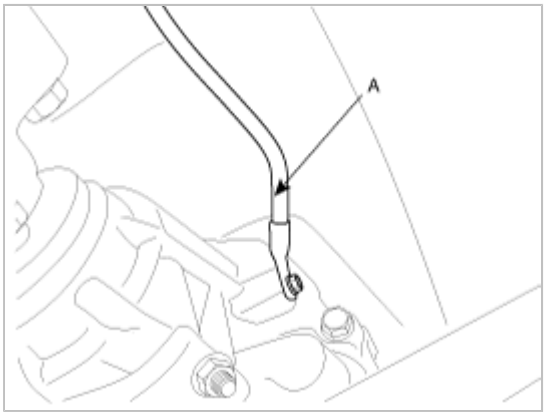
1. Parking gear	14. Oil pump housing	27. Middle planetary carrier
2. Output shaft	15. Stator	28. Input clutch drum
3. Control valve upper body	16. Impeller assembly	29. Input shaft
4. Control valve lower body	17. Turbine & lockup assembly	30. Front annulus gear
5. Separator plate assembly	18. Torque converter cover assembly	31. Direct clutch return spring
6. Rear sun gear	19. Front pinion gear	32. Direct clutch piston
7. Rear sun plate	20. Front planetary carrier	33. Reverse brake hub
8. Middle sun gear assembly	21. Front sun gear	34. Direct clutch assembly
9. Rear annulus gear assembly	22. Front brake drum	35. High & low reverse clutch return spring
10. Rear annulus cell	23. Rear pinion gear	36. High & low reverse clutch piston
11. Automatic transmission case	24. Rear planetary carrier	37. High & low reveres clutch assembly
12. Converter housing	25. Middle annulus gear	38. Low coast brake clutch assembly
13. Oil pump cover	26. Middle pinion gear	39. Forward one-way clutch

Removal

1. Disconnect (-) terminal from the battery in order to prevent current from flowing through wire.

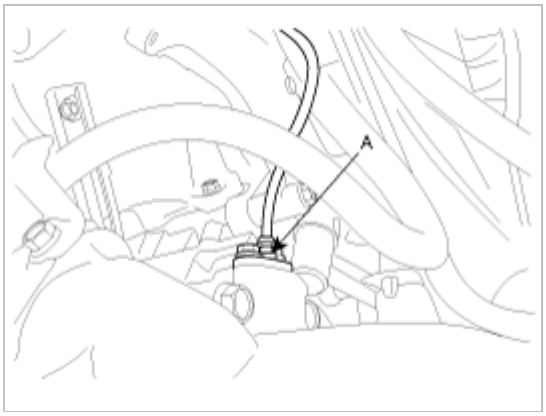


2. Remove the ground wire (A) by removing a bolt.

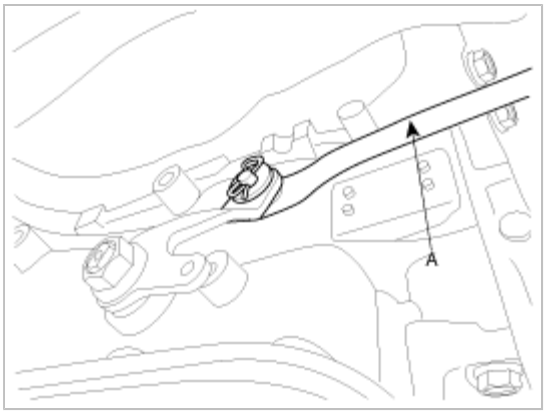


3. Disconnect the connectors (A).

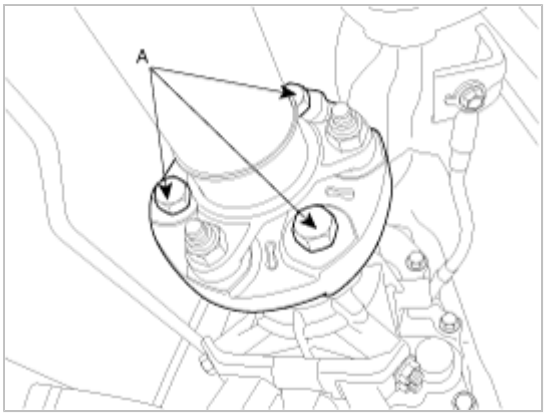
4. Remove the CKP sensor (A) by removing a bolt.



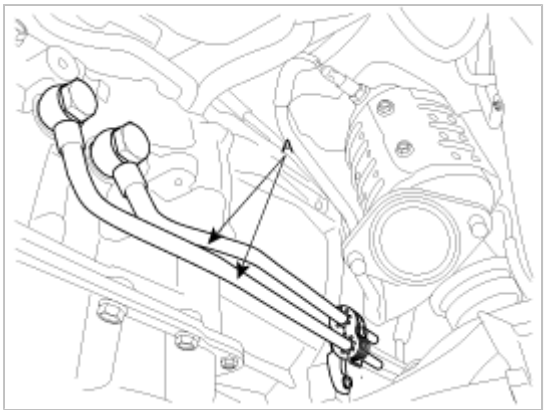
5. Remove the shift link (A) from the transmission by pulling out the snap pin.



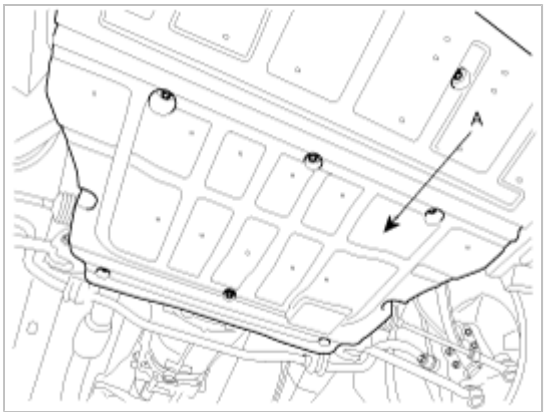
6. Remove the propellar shaft from the transmission by removing bolts (A-3ea).



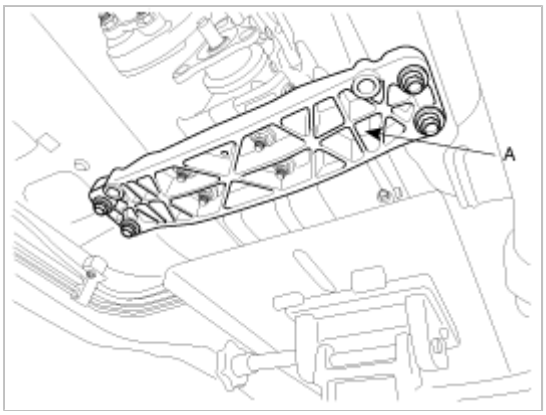
7. Remove the oil cooler tube assembly (A) by removing bolts(2ea).



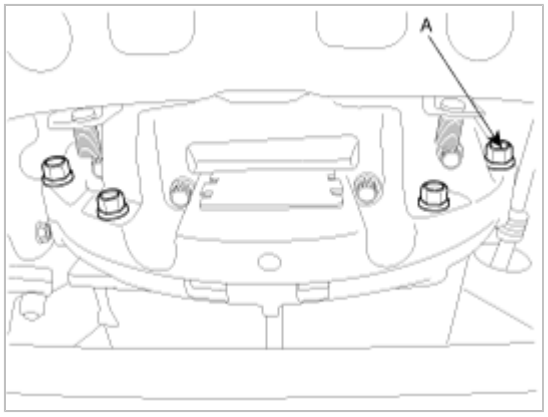
8. Remove the under shield cover (A).



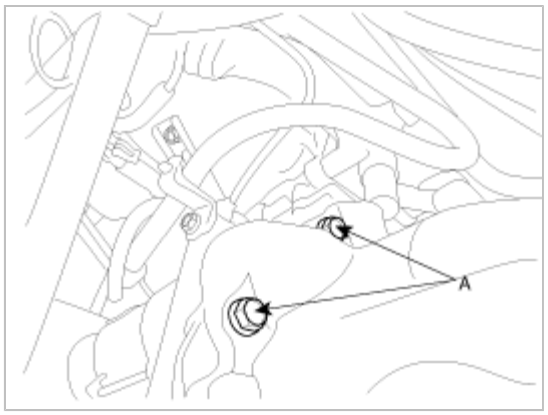
9. After supporting the transmission assembly with a jack, remove the crossmember from the vehicle by removing bolts(4ea).



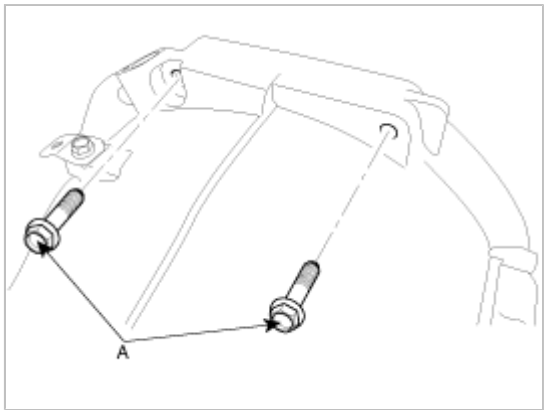
10. Remove the torque converter mounting bolts(6ea) by rotating the crankshaft.
11. Remove the mounting bolts (A-4ea) lower in the engine side.



12. Remove the mounting bolts(2ea) both sides in the engine side.
13. Remove the starter motor mounting bolts (A-2ea).



14. Remove the mounting bolts (A-2ea) on the transmission.



15. 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)

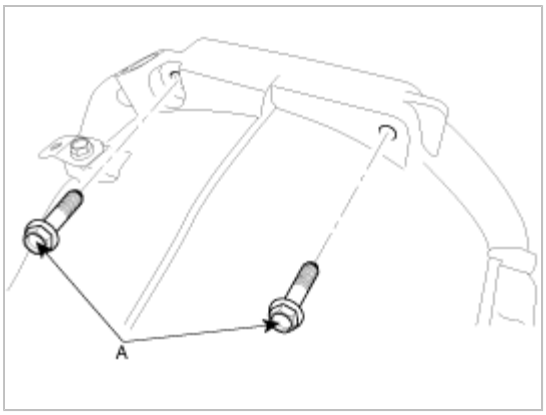
Installation

1. Temporarily install the transmission assembly by lifting the supporting jack.

> CAUTION
>
> Be careful not to damage tubes, hoses or wire.

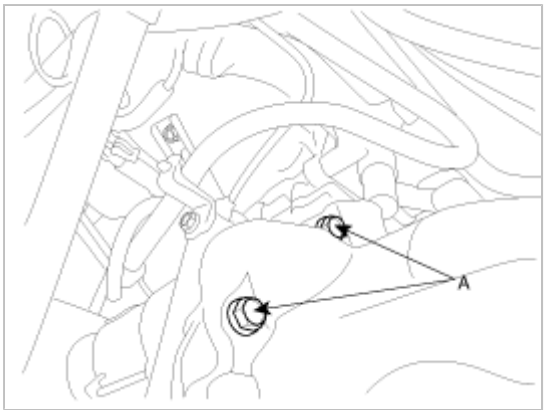
2. Install the mounting bolts (A-2ea) on the transmission.

Tightening torque:
43~55 Nm (4.3~5.5 kgf.m, 31.1~39.8 lb-ft)



3. Install the starter motor mounting bolts (A-2ea).

Tightening torque:
43~55 Nm (4.3~5.5 kgf.m, 31.1~39.8 lb-ft)

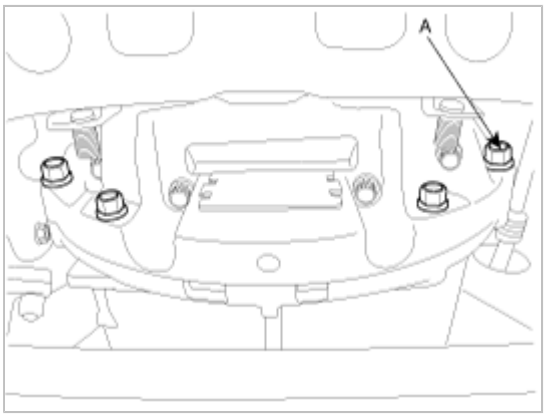


4. Install the mounting bolts(2ea) both sides in the engine side.

Tightening torque:
35~47 Nm (3.5~4.7 kgf.m, 25.3~34.0 lb-ft)

5. Install the mounting bolts (A-4ea) lower in the engine side..

Tightening torque:
43~49 Nm (4.3~4.9 kgf.m, 31.1~35.4 lb-ft)



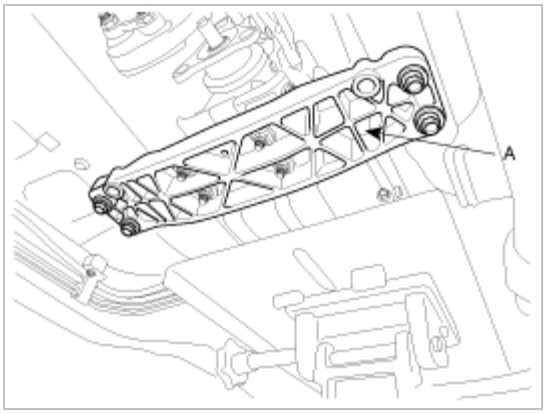
6. Install the torque converter mounting bolts(6ea) by rotating the crankshaft.

Tightening torque:

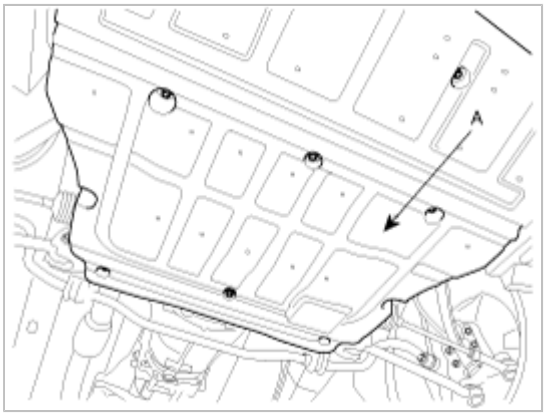
46~53 Nm (4.6~5.3 kgf.m, 33.3~38.3 lb-ft)

7. Install the crossmember from the vehicle by installing bolts(4ea) and put aside the supporting jack.

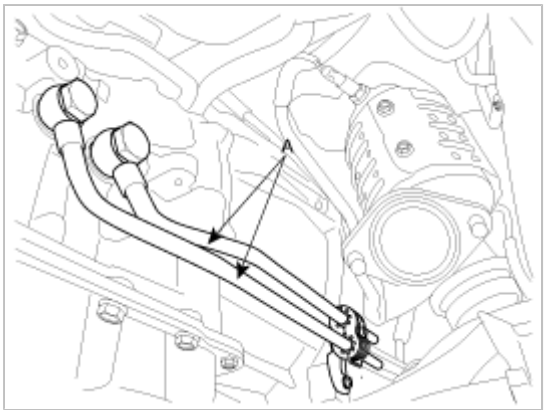
Tightening torque:
50~65 Nm (5.0~6.5 kgf.m, 36.2~47.0 lb-ft)



8. Install the under shield cover (A).

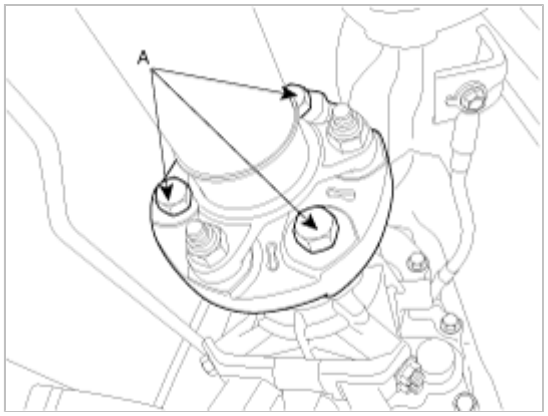


9. Install the oil cooler tube assembly (A) by installing bolts(2ea).

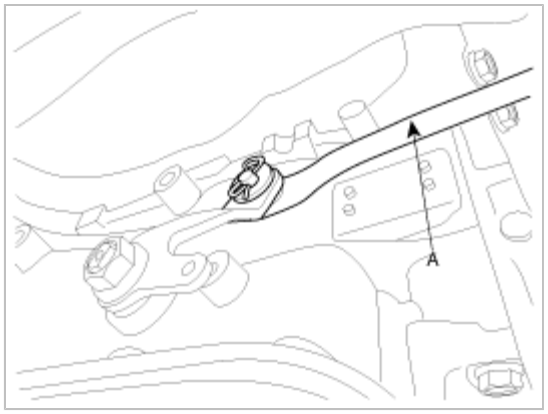


10. Install the propellar shaft to the transmission by installing bolts (A-3ea).

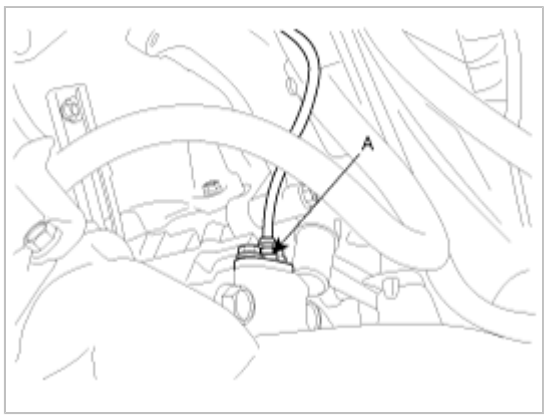
Tightening torque:
90~110 Nm (9~11 kgf.m, 65.0~79.5 lb-ft)



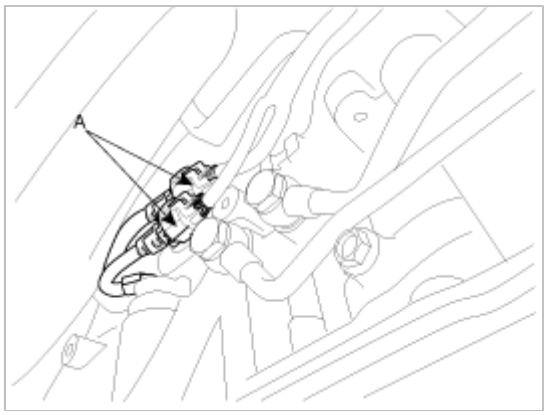
11. Install the shift link (A) to the transmission by inserting the snap pin.



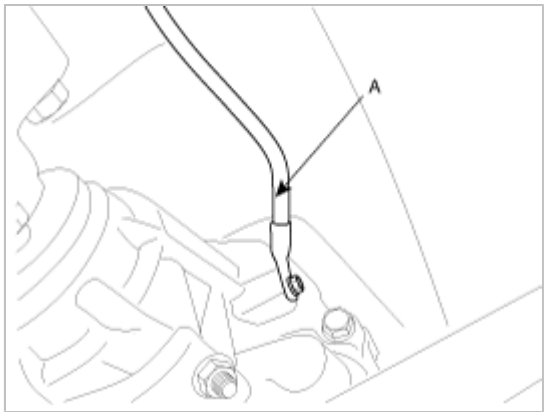
12. Install the CKP sensor (A) by installing a bolt.



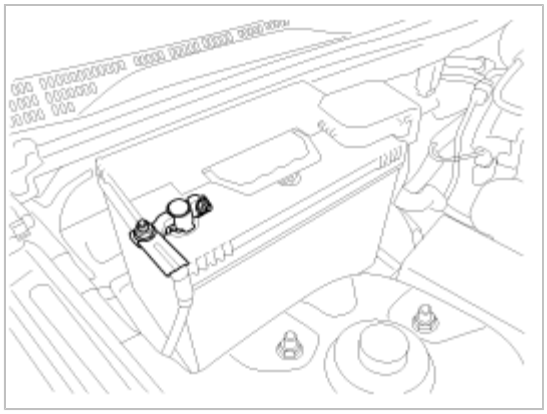
13. Connect the connectors (A).



14. Install the ground wire (A) by installing a bolt.

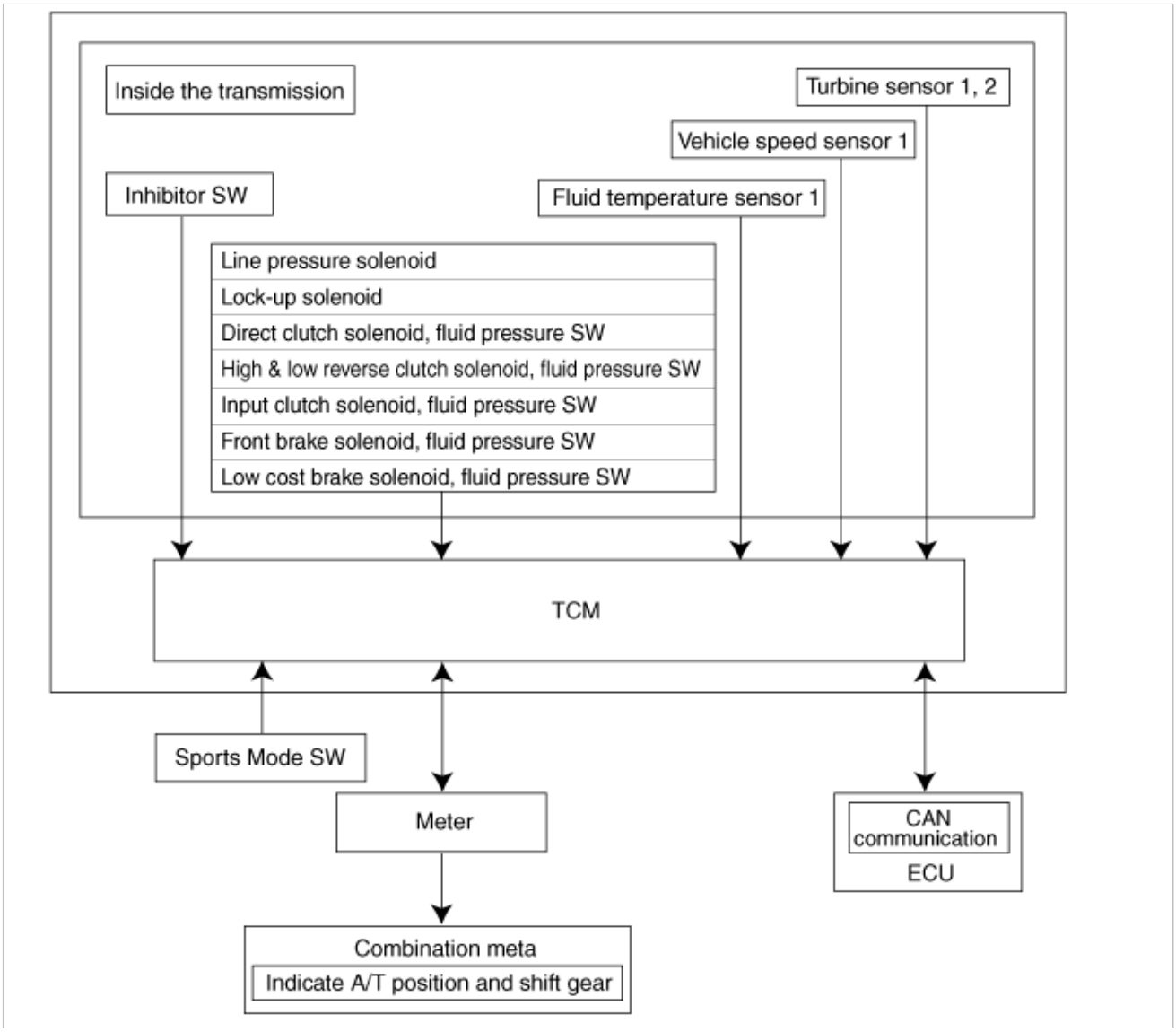


15. Connect (-) terminal to the battery.



16. Check the level of oil fluid. (refer to Procedure of ATF level adjusting)

Control System Diagram



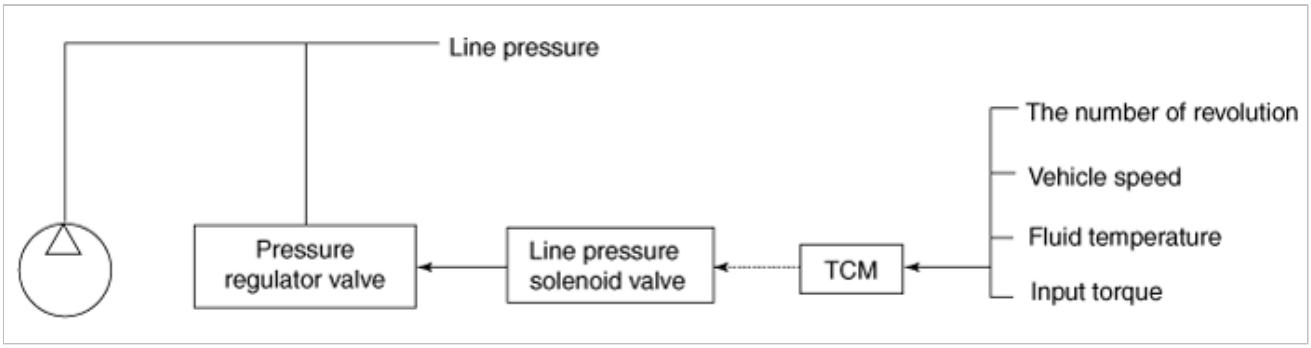
Main Communication Signal

Input to ECM(CAN)	Output to ECM(CAN)	Input from external sys.	Output to external sys.
-	-	A/T driving mode SW	Self-diagnosis indicator
Engine torque signal	Output revolution signal	Sports mode SW	Range signal (P, R, N, D)
Engine revolution signal	Turbine sensor signal	Up SW	Range signal
-	Torque reduction request signal	Down SW	Reverse lamp signal
Accelerator opening signal		Stop lamp SW	N position signal
Power		4 x 4 Low signal	

Line Pressure Control

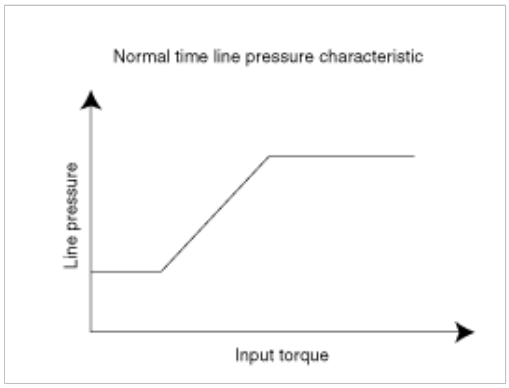
- If the engine control unit sends the input torque signal equivalent to the engine driving force to the A/T control unit (TCM), the A/T control unit (TCM) controls line pressure solenoid.
- This line pressure solenoid controls the pressure regulator valve as the signal pressure and adjusts the pressure of the operating oil discharged from the oil pump to the line pressure most appropriate to the driving plate.

Line Pressure System Diagram

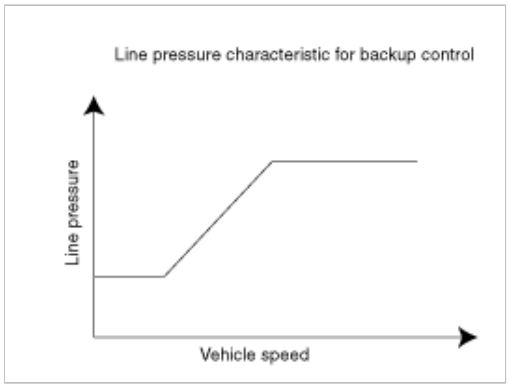


Line Pressure Control Based On Line Pressure Characteristic Pattern Of A/T Control Unit (TCM)

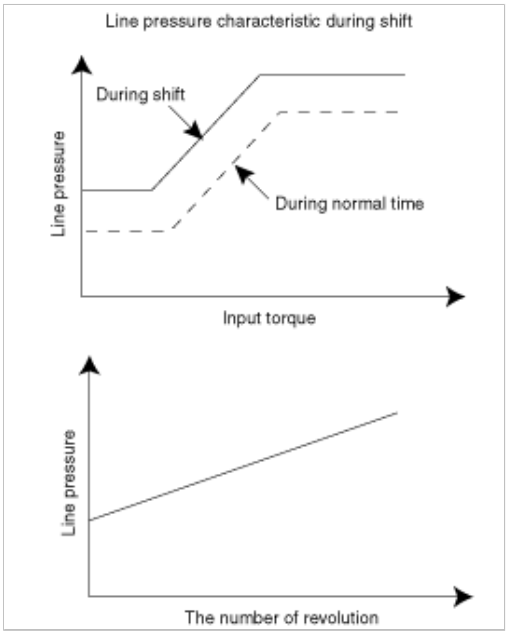
- A/T control unit (TCM) has stored in memory a number of patterns for the optimum line pressure characteristics according to driving conditions.
- In order to obtain the most appropriate line pressure characteristic to meet the current driving state, the TCM controls the line pressure solenoid current valve and thus controls the line pressure.
  - Normal line pressure control.
    Each clutch is adjusted to the necessary pressure to match the engine drive force.



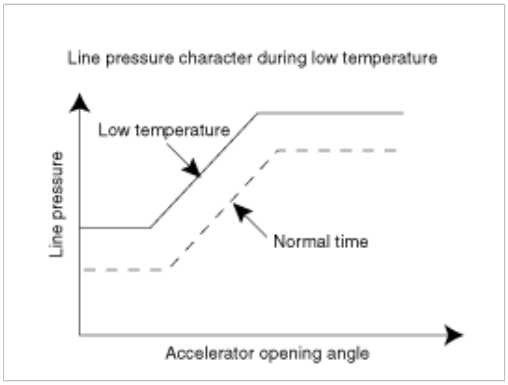
  - Back-up control (Engine brake)
    Line pressure according to speed is set during shift down by select operation while driving.



  - During shift change
    Set to line pressure that is necessary for shift change. Therefore, line pressure characteristic is set according to input torque and shift types.



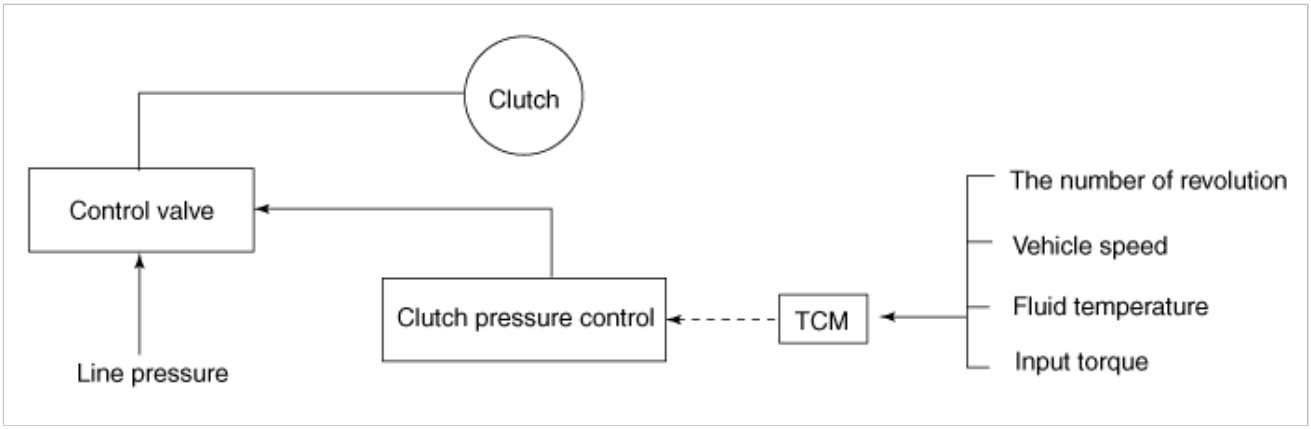
- At low fluid temperature
  When the A/T fluid temperature drops below the prescribed temperature, in order to speed up the action of each friction element, the line pressure is set higher than the normal line pressure characteristic.



Shift control

- The clutch pressure control solenoid is controlled by the signals from the switches and sensors. Thus the clutch pressure is adjusted to be appropriate to the engine load state and vehicle driving state. It becomes possible to finely control the clutch hydraulic pressure with high precision and a smoother shift change characteristic is attained.

Shift Control System Diagram



Shift description
Controls clutches with optimum timing and fluid pressure in response to engine speed, engine torque information, and etc.

Lock-up Control

Lock-up control is to enhance delivery efficiency by preventing the torque converter from slipping, engaging the lock-up piston

into the torque converter.
It operates lock-up solenoid control in response to a signal from A/T control unit (TCM) and lock-up control valve behavior control, engages or releases the lock up piston of the torque converter.

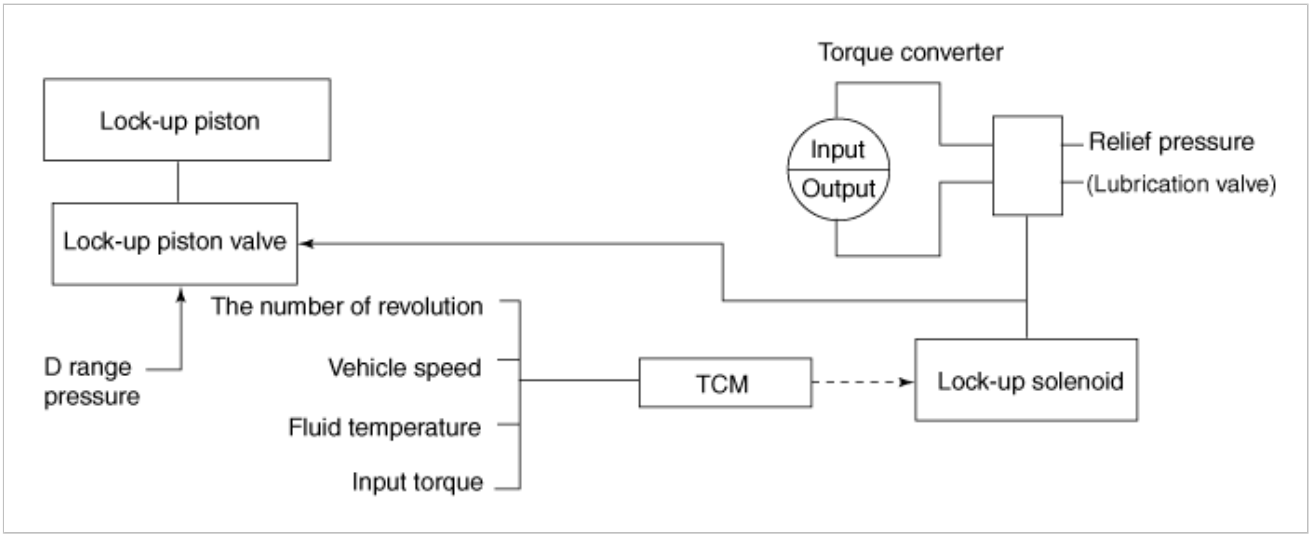
Lock-up Operating Condition Table

Select Lever	D range			Sports Mode	
Gear position	5	4	3	5	4
Lock-up	O	O	-	O	O

Lock-up control valve control

- In the lock-up control valve, there is operating fluid pressure circuit linked into the lock-up piston and lock-up solenoid operates valve shift in response to a signal from the A/T control unit.
- Operating fluid pressure circuit that is applied to the lock-up piston chamber is controlled with the release or apply sides.

Lock-up Control System Diagram



Lock-up released

- In the lock-up control valve, there is operating fluid pressure circuit connected into the lock-up piston and lock-up solenoid operates valve shift in response to a signal from the A/T control unit.
  Therefore, the lock-up piston is not coupled.

Lock-up applied

Smooth lock-up control

- A/T control unit (TCM) controls current value that is output to the lock-up solenoid when shifting lock-up applied state from lock-up released state.
  Therefore the lock-up clutch is temporarily set to half-clutched state when shifting the lock-up applied state to reduce the shock.
- During the lock-up applied status, lock-up apply pressure is generated having the lock-up control valve to L/U by the lock-up solenoid.
  Therefore, press the lock-up piston to be coupled.

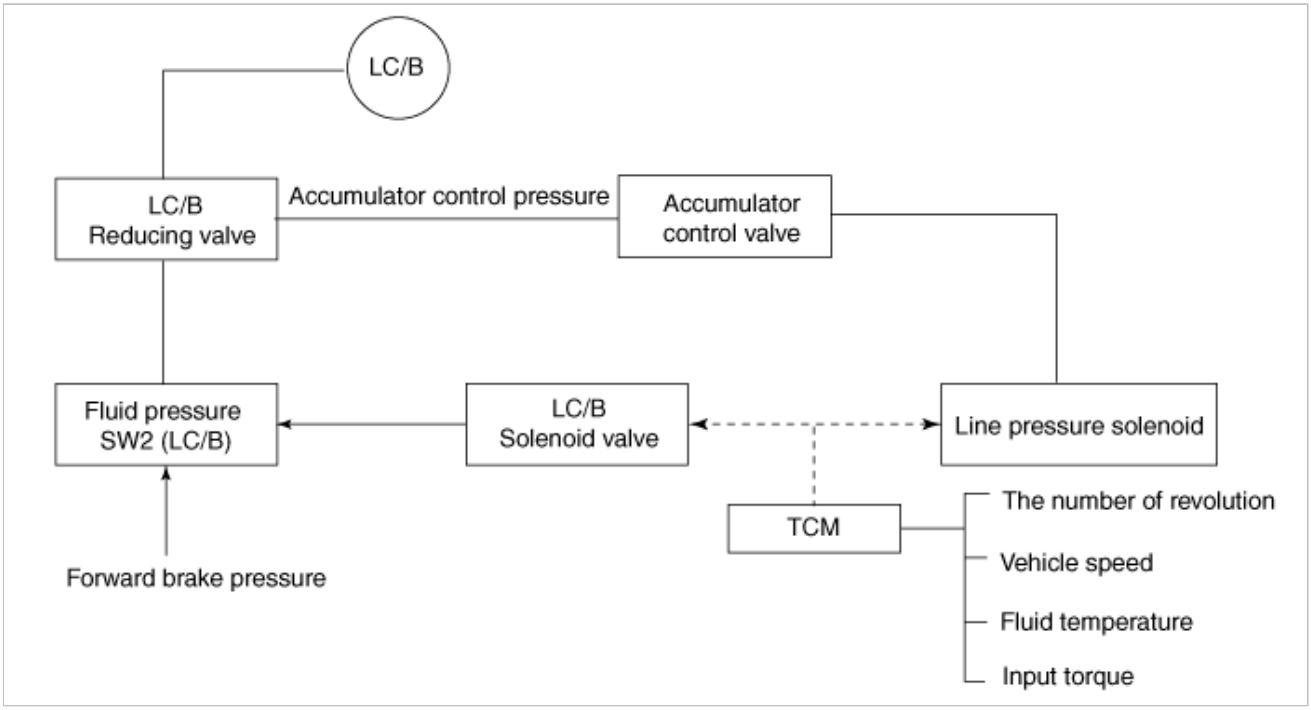
Half-clutched state

- Changes current value that is output to the lock-up solenoid from A/T control unit (TCM) to gradually increase lock-up solenoid pressure.
  In this way, the lock up apply pressure gradually rises and while the lock-up piston is put into half-clutched status, the lock-up piston operating pressure is increased and the coupling is completed smoothly.

Engine Brake Control

- The forward one-way clutch delivers driving force from the engine to the rear wheel but reverse driving from the wheel drive is not delivered since the one-way clutch is idling.
  Therefore low coast brake solenoid is operated to prevent the forward one-way clutch from idling so that the engine brake is operated in the same as before.

Engine Brake Control System Diagram



- The operation of the low coast brake solenoid switches the low coast brake switch valve and controls the coupling and releasing of the low coast brake.
  The low coast brake reducing valve controls the low coast brake coupling force.

Control Valve

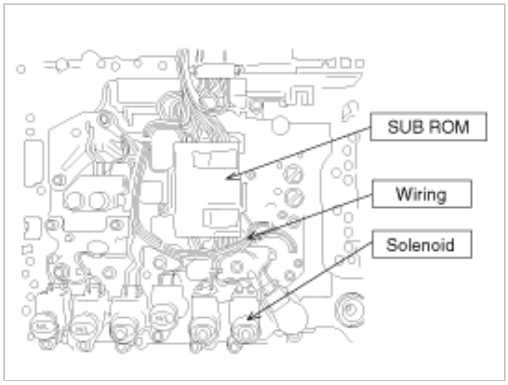
Control Valve Functions

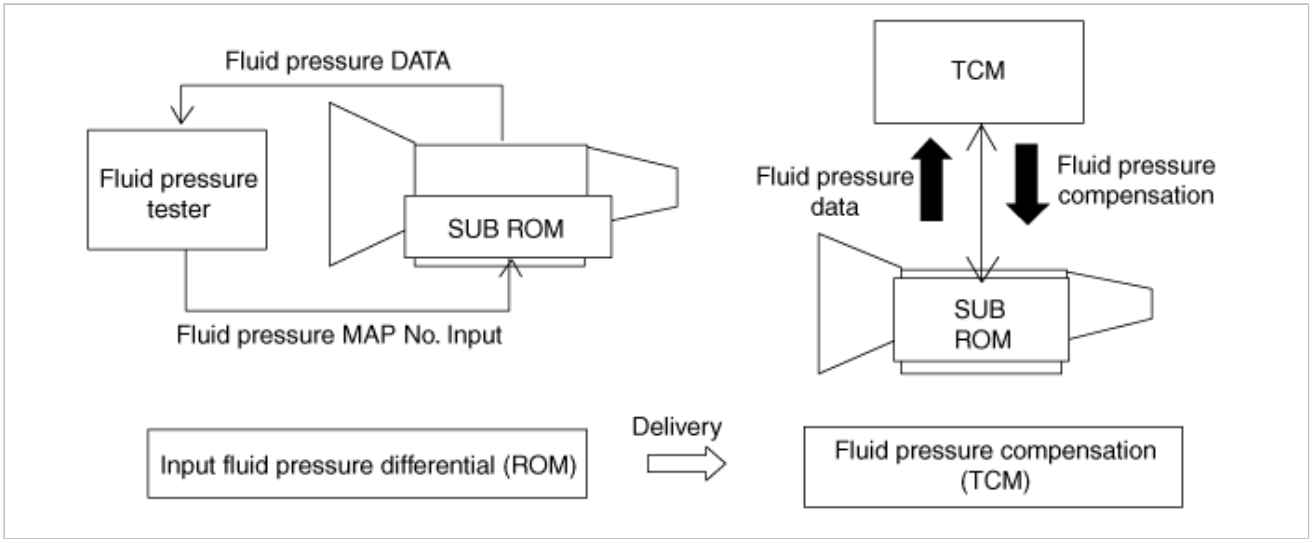
Valve name	Function
Torque converter regulator valve	Regulates line pressure to the optimum pressure (torque converter operating pressure) to prevent pressure applied to the torque converter from being excessive.
Pressure regulator valve Pressure regulator plug Pressure regulator sleeve	Regulates oil pump discharge pressure to the optimum pressure (line pressure) in response to the driving conditions.
Front brake control valve	Regulates line pressure to the optimum pressure (front brake pressure) to be applied to the front brake during the front brake apply.
Accumulator control valve	Regulates pressure applied to the accumulator piston, and the low coast reducing valve (accumulator control pressure) inresponse to the driving conditions (regulates clutch pressure at 1st, 2nd, 3rd, 5th gears).
Pilot valve A	Regulates line pressure to the regular pressure required by line pressure control, shift control, and lock-up control (pilot pressure).
Pilot valve B	Regulates line pressure to the regular pressure required by shift control (pilot pressure).
Low coast brake switching valve	Provides the low coast brake reducing valve with line pressure during engine brake operation.
Low coast brake reducing valve	Regulates line pressure to the optimum pressure to be applied to the low coast brake when the low coast brake is coupled.
N-R accumulator	Produces the stabilizing pressure for when N-R is selected.
Direct clutch piston switching valve	Operates in 4th gear and switches the direct clutch coupling capacity.
High&low reverse clutch control valve	Regulates line pressure to the optimum pressure (high&low reverse clutch pressure) to be applied to the high&low reverse clutch when the high&low reverse clutch is coupled (regulates clutch pressure in 1st, 3rd, 4th, 5th gears).
Input clutch control valve	Regulates line pressure to the optimum pressure (input clutch pressure) to be applied to the input clutch when the input clutch is coupled (regulates clutch pressure in 4th,

	5th gears).
Direct clutch control valve	Regulates line pressure to the optimum pressure (direct clutch pressure) to be applied to the direct clutch when the direct clutch is coupled (regulates clutch pressure in 2nd, 3rd, 4th gears).
Lock-up control valve Lock-up control plug Lock-up control sleeve	Switches lock-up to operating or released. Also, by performing the lock-up operation transiently, lock-up smoothly.
Torque converter lubrication valve	Operates to switch torque converter, cooling, and oil path of lubrication system during lock-up.
Cool bypass valve	Allows excess oil to by pass cooler circuit without being fed into it.
Line pressure relief valve	Discharges excess oil from line pressure circuit.
N-D accumulator	Produces the stabilizing pressure for when N-D is selected.
Manual valve	Delivers line pressure to each circuit in response to each select position. Circuit to which line pressure is not sent drain.

SUB ROM unit

1. Installing location: The valve body upper part
2. Function: To obtain A/T fluid pressure stability by compensating for solenoid&valve body unit fluid pressure differential.
3. Principle: Install additional ROM onto valve body of automatic transmission and input fluid pressure differential of solenoid &valve body so that TCM reads the input data to perform fluid pressure compensation.



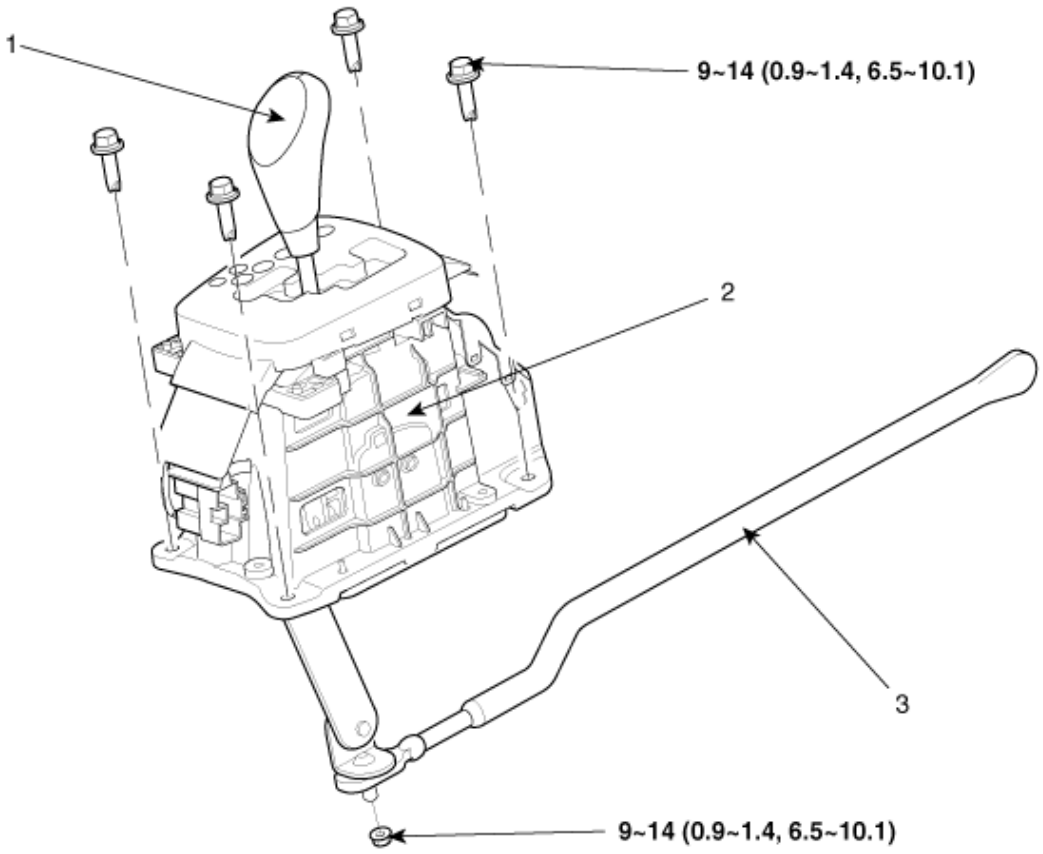


4. Maintenance
   (1) When replacing with a new TCM in the vehicle
      A. TCM automatically reads SUB ROM DATA during I.G ON. At this time, shift range valve is off for about 2.5 second.
   (2) When replacing A/T (regardless of new or old ones) in the vehicle

A. Must erase SUB ROM DATA stored in TCM.
B. Erase SUB ROM DATA in SCAN TOOL delete mode during shift stage in R-range + accelerator opening angle maintains 50% + I.G ON.
C. TCM reads SUB ROM DATA from a new A/T upon I.G ON again after I.G OFF.

(3) Moving TCM from vehicle A to another vehicle B
A. Perform the same way as in 2) above.

Components

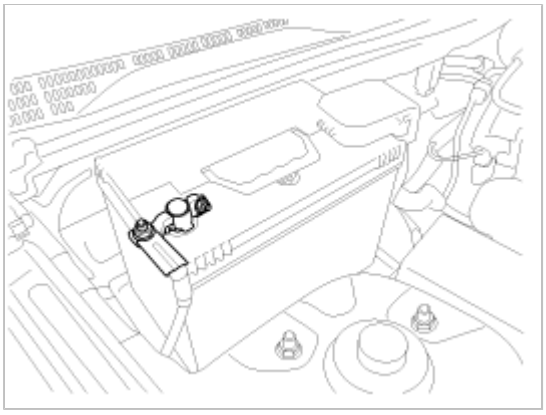


Torque : Nm (kgf.m, lb-ft)

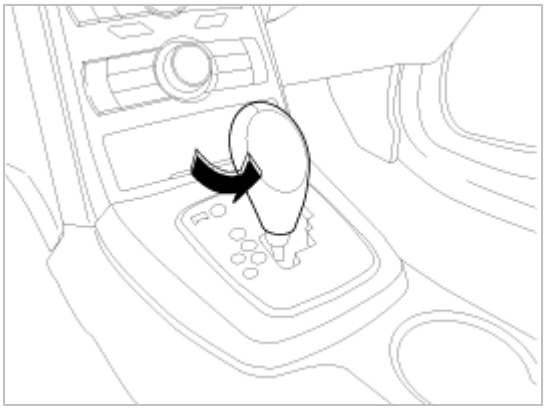
1. Shift lever knob
2. Shift lever assembly
3. Shift link

Removal

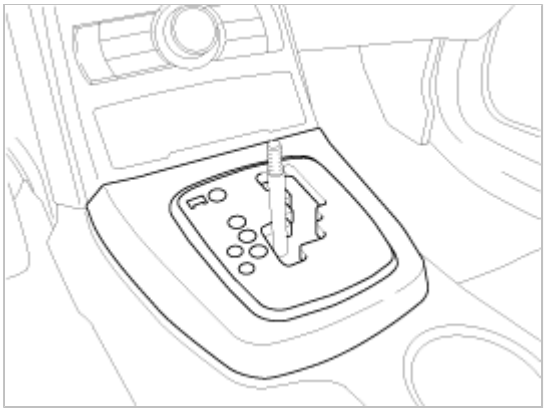
1. Disconnect (-) terminal from the battery in order to prevent current from flowing through wire.



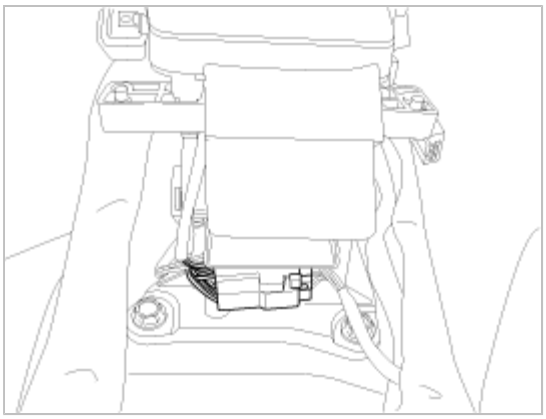
2. Remove the shift lever knob by rotating counter clockwise.



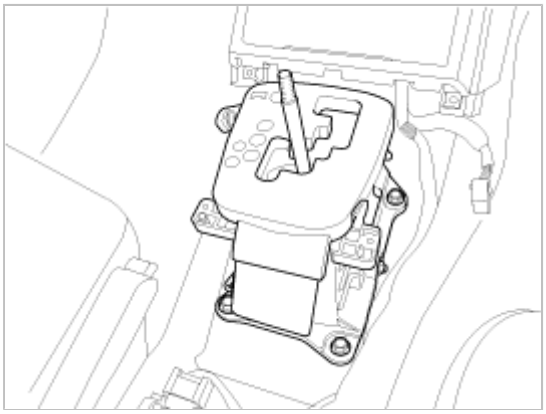
3. Remove the indicator assembly.



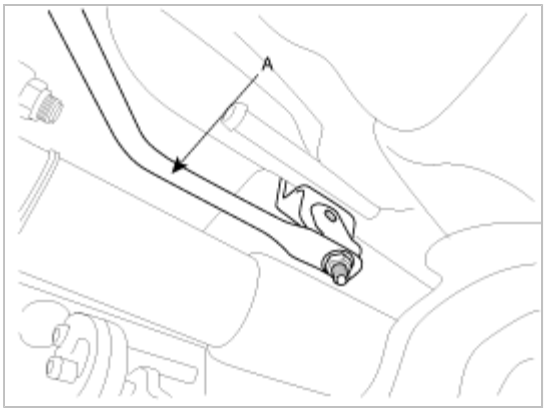
4. Disconnect the sports mode switch connector.



5. Remove the shift levet assembly by removing bolts(4ea).



6. Remove the shift link (A) by removing a nut.



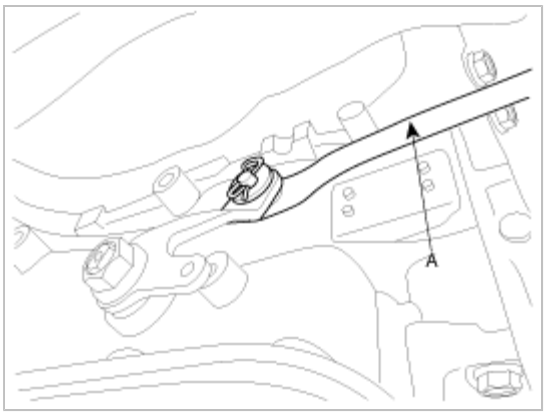
Inspection

1. Check the shift lever assembly for proper operation and for damage.
2. Check the shift link for damage.
3. Check the boots for damage.

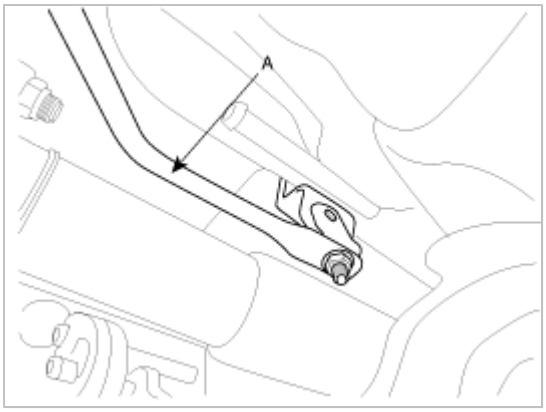
Adjustment

How To Adjust Shift Cable

1. Place the lever in 'N' position each of in-vehicle and of transmission.
2. Install the shift link (A) to the manual lever by inserting the snap pin.



3. Install the shift link (A) to the shift lever by installing a nut.

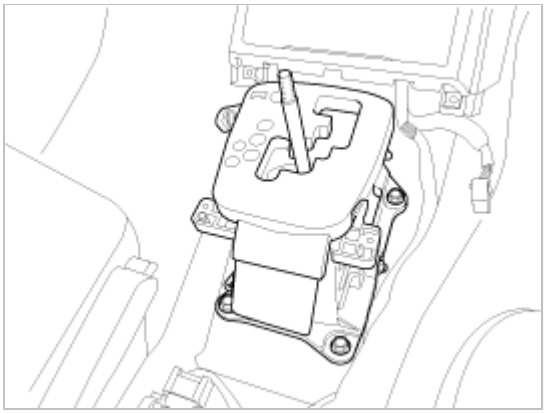


4. After adjusting according to procedure no. 3-4, check to be sure that this part operates surely at each range of T/M side corresponding to each position of room lever.

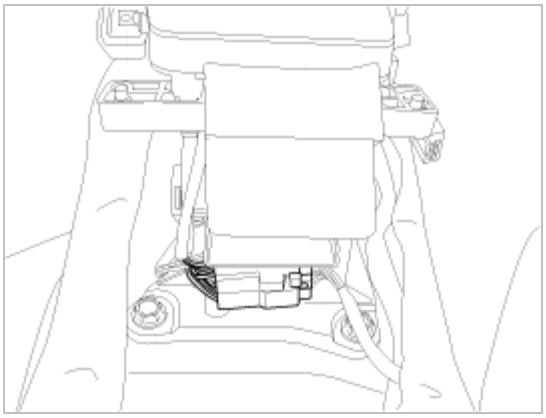
Installation

1. Install the shift levet assembly by installing bolts(4ea).

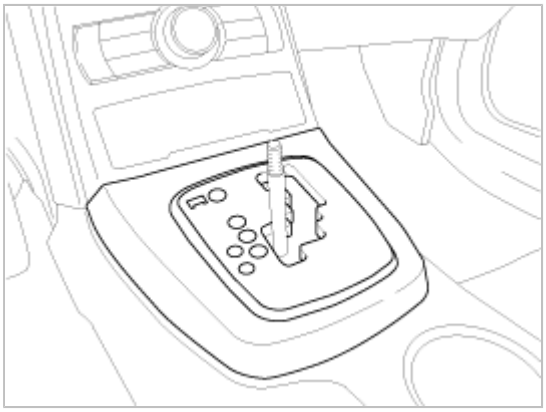
Tightening torque:
9~14 Nm (0.9~1.4 kgf.m, 6.5~10.1 lb-ft)



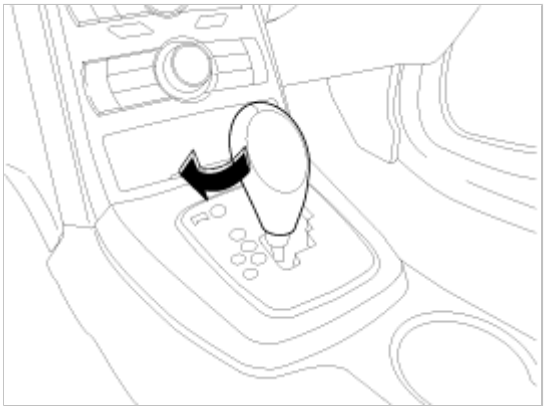
2. Connect the sports mode switch connector.



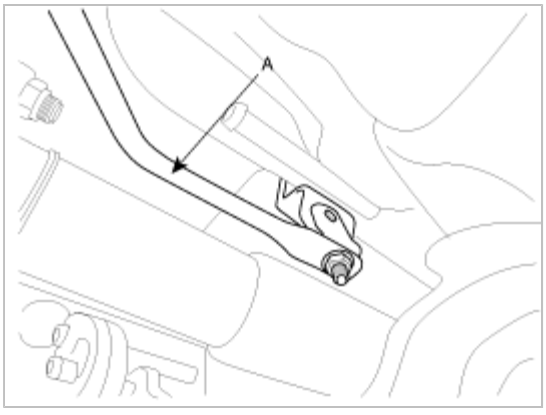
3. Install the indicator assembly.



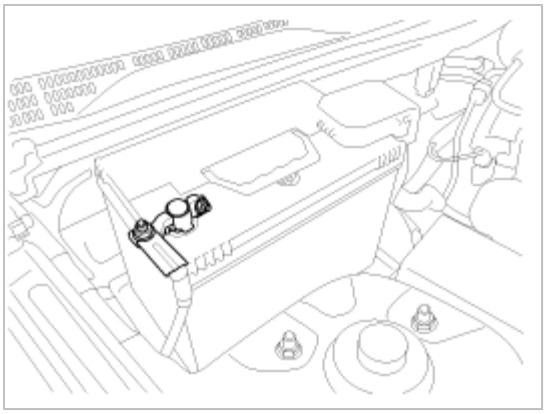
4. Install the shift lever knob by rotating clockwise.



5. Install the shift link (A) by installing a nut.

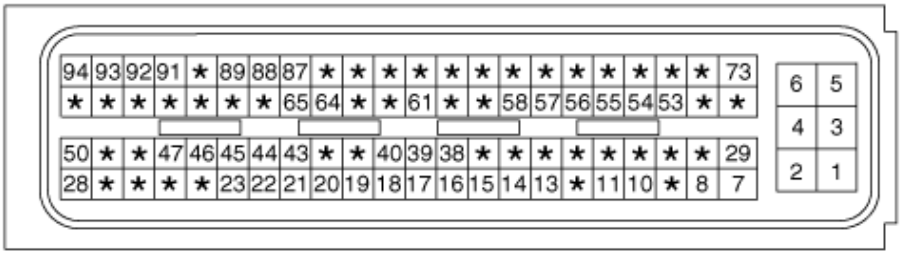


6. Connect (-) terminal to the battery.



TCU Input/Output Signal

TCU Connector



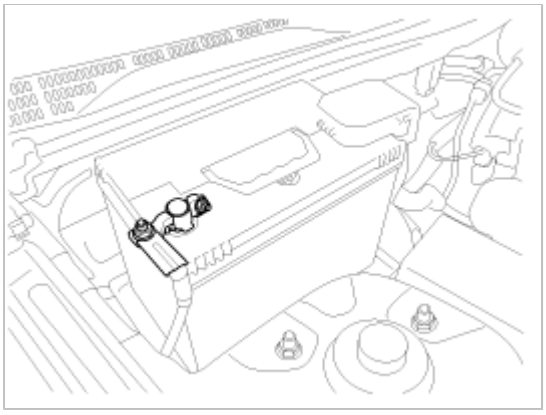
Function of TCU terminals

Terminal No.	Terms	Descriptions
1	Battery	Main power supply
2	Battery	Main power supply
3	ON/START	ON/START
4	GND-P	Ground
5	GND-P	Ground
6	GND-C	Ground
7	STARTER RELEY	Starter relay control
8	B3-ON/OFF SOL	LC/B(Low Coast Brake) Solenoid actuation output signal
10	STOP LAMP SW	Stop lamp switch
11	INH SW3-MON	Inhibiter switch-3 break monitoring input signal
13	INH SW1	Inhibiter switch-1 input signal
14	ATF1	Oil temperature sensor-1 (Oil pan)
15	ATF2	Oil temperature sensor-2 (Torque converter outlet)
16	Manual-up shift SW	Sport mode up shift switch input signal
17	Manual-down shift SW	Sport mode down shift switch input signal
18	PSC2	H&LR/C(High&Low Reverse Clutch) Oil pressure switch input signal
19	PSB2	Fr/B(Front Brake) Oil pressure switch input signal
20	K-LINE	K-Line Communication
21	INH SW-2	Inhibiter switch-2 input signal
22	INH SW-4	Inhibiter switch-4 input signal
23	INH SW-3	Inhibiter switch-3 input signal
28	SELECTED GEAR DISPLAY	Selected gear output
29	SOLENOID SUPPLY	Solenoid power supply
38	GND-A	Ground
39	GND-A1	Ground
40	GND-C	Ground
43	C1-SOL	I/C(Input Clutch) Solenoid actuation output signal
44	L/U-SOL	L/U(Lock UP) Solenoid actuation output signal

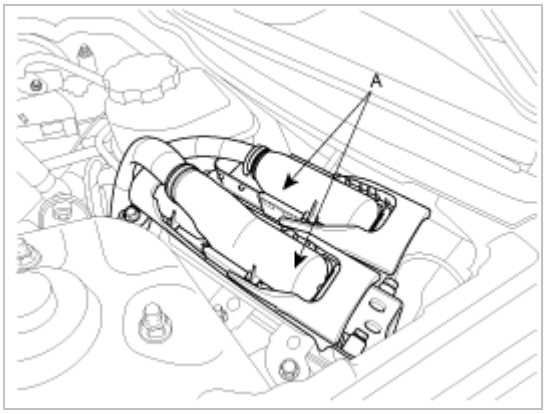
45	C2-SOL	H&LR/C(High&Low Reverse Clutch) Solenoid actuation output signal
46	B2-SOL	Fr/B(Front Brake) Solenoid actuation output signal
47	PL-SOL	PL(Line Pressure Control) Solenoid actuation output signal
50	C3-SOL	D/C(Direct Clutch) Solenoid actuation output signal
53	REV-LAMP RELAY	Back up lamp relay control
54	TURBIN 2	Turbine sensor-2 input signal (1,2,3,5th speed)
55	TURBIN1	Turbine sensor-1 input signal (4th speed)
56	VSP1	Vehicle speed sensor-1 (Output speed sonsor) input signal
57	SEL2	D/C(Direct Clutch) Oil pressure switch signal and System clock signal in Sub-ROM communication
58	SEL3	I/C(Input Clutch) Oil pressure switch signal and System clock signal in Sub-ROM communication
61	Manual Mode select SW	Sport mode select switch input signal
64	SEL1	LC/B(Low Coast Brake) Oil pressure switch signal and System clock signal in Sub-ROM communication
65	CAN-L	CAN Low
73	SOLENOID SUPPLY	Solenoid power supply
87	CAN-H	CAN High
88	R range LAMP	R range lamp output signal
89	N range LAMP	N range lamp output signal
91	D range LAMP	D range lamp output signal
92	P range LAMP	P range lamp output signal
93	VIGN-OUT	Control valve power supply
94	DATABIT 1	Control valve communication line

Repalcement

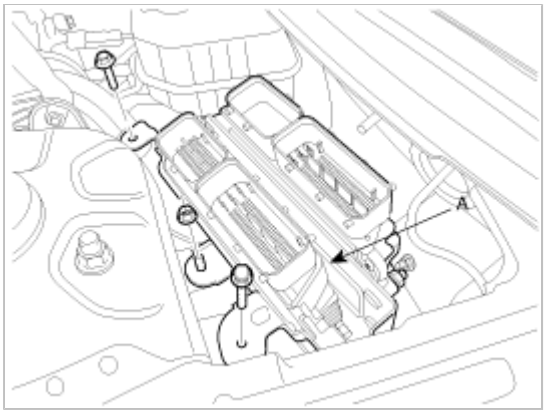
1. Disconnect (-) terminal from the battery.



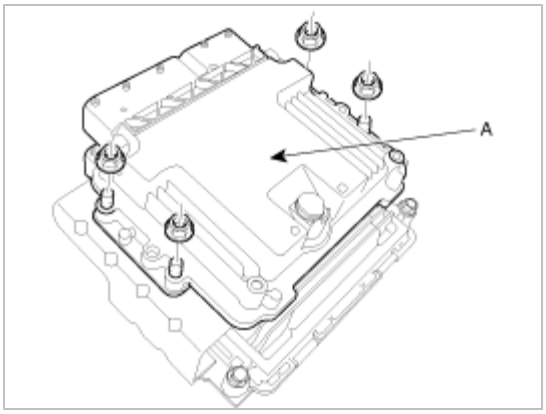
2. Disconnect the ECU and TCU connectors (A).



3. Remove the ECU and TCU with the bracket (C) by removing bolts (A-2ea) and a nut (B).



4. Remove the TCU (A) by removing bolts(4ea).



5. Replace the TCU with a new one.
6. Install the removed parts in reverse oder of removal.