Automatic Transmission - 4L80-E

Specifications

Temperature vs Resistance

Temperature	Temperature	Minimum Resistance	Nominal Resistance	Maximum Resistance	Signal
°F	°C	Ω	Ω	Ω	volts
-40	-40	90636	100707	110778	5.00
-22	-30	47416	52684	57952	4.78
-4	-20	25809	28677	31545	4.34
14	-10	14558	16176	17794	3.89
32	0	8481	9423	10365	3.45
50	10	5104	5671	6238	3.01
68	20	3164	3515	3867	2.56
86	30	2013	2237	2461	1.80
104	40	1313	1459	1605	1.10
122	50	876	973	1070	3.25
140	60	600	667	734	2.88
158	70	420	467	514	2.56
176	80	299	332	365	2.24
194	90	217	241	265	1.70
212	100	159	177	195	1.42
230	110	119	132	145	1.15
248	120	89.9	99.9	109.9	0.87
266	130	69.1	76.8	84.5	0.60
284	140	53.8	59.8	65.8	0.32
302	150	42.5	47.2	51.9	0.00

Fastener Tightening Specifications (On-Vehicle)

Application	N·m	Lb Ft	Lb In
Accumulator Cover Bolts	11	—	97
Auxiliary Valve Body To Case Bolts	11	—	97
Converter Cover Bolts	33	24	—
Cooler Line To Oil Cooler Nut	20	15	—
Control Lever Nut	28	21	—
Crossmember To Frame Bolts	77	56	—
Detent Spring To Valve Body Bolts	22	16	—
Filler Tube To Engine Bolt	47	35	—
Oil Cooler Bracket Bolts	10	—	89
Oil Cooler To Radiator Bolts	10	—	89
Oil Cooler Nuts	23	17	—
Oil Pan Bolts	24	11	—
Oil Passage Cover To Case Bolts	11	—	97
Park/Neutral Position Switch Bolts	28	21	—
Parking Bracket Bolts	31	23	—

Fastener Tightening Specifications (On-Vehicle) (cont'd)

Application	N·m	Lb Ft	Lb In
Pressure Switch	11	—	97
Spacer Plate Support Plate Bolts	11	—	97
Solenoid Assembly to Pump Bolts	11	—	97
TCC Solenoid Bolts	11	—	97
Torque Converter To Flywheel Bolts	63	46	—
Transmission Control Lever Nut	28	21	—
Transmission Mount To Crossmember Nuts	52	38	—
Transmission Mount To Transmission Bolts	47	35	—
Transmission Oil Pan Bolts	11	—	97
Transmission To Engine Studs	47	34	—
Valve Body To Case Bolts	11	—	97
Vehicle Speed Sensor Bolts	11	—	97
Vent Hose Clip Bolt	10	—	89

Fastener Tightening Specifications (Overhaul)

Application	N·m	Lb Ft	Lb In
Solenoid to Valve Body	8	—	71
Control Valve Assembly to Case	11	—	97
Oil Test Hole Plug	11	—	97
Flywheel Housing Cover to Transmission	7	—	62
Pump Body to Cover	24	18	—
Pump Assembly to Case	24	18	—
Rear Servo Cover to Case	24	18	—
Pressure Control Solenoid Bracket to Valve Body	8	—	71
Parking Pawl Bracket to Case	24	18	—
Accumulator Housing to Valve Body	11	—	97
Fourth Clutch	23	17	—
Oil Pan to Case	24	18	—
Extension Housing to Case	34	25	—
Manual Shaft to Detent Lever Nut	24	18	—
Speed Sensor and Bracket Assembly to Case	11	—	97
Case Center Support	44	32	—
Flywheel to Converter	44	32	—
Transmission Case to Engine	44	32	—
Cooler Pipe Connector Nut at Case and Radiator	38	28	—
Valve Body to Case/Lube Pipe	11	—	97
Engine Rear Mount to Transmission Bolt	44	32	—
Engine Rear Support Bracket to Frame Nut	44	32	—
Valve Body to Case/PSM	11	—	97
Drain Plug, Oil Pan	34	25	—

Scan Tool Data Value Examples (Gas)

If you have completed the On-Board Diagnostic (OBD) system check, if the diagnostics are functioning properly and if no DTCs display, you may use the Typical Scan Values in the table below for comparison. These typical values are an average of display values recorded from normally operating vehicles. They represent the display from a normally functioning system.

You should never use a scan tool that displays faulty data. The condition should be reported to the manufacturer. The use of a faulty scan tool can result in misdiagnosis and the unnecessary replacement of parts.

Only the parameters listed below are used in this manual for diagnosing. If a scan tool displays other parameters, the values are not recommended by General Motors for use in diagnosis.

Scan tests are performed under the following driving conditions:

- Engine idling
- Upper radiator hose is hot
- Closed throttle
- Transmission is in Park
- Closed Loop
- Accessories OFF

Scan Tool Data Value Examples (Gas)

Tech 2 Parameter	Units Displayed	Typical Scan Values
Engine Torque	N·m (lb ft)	Varies
TP Sensor	Volts	0.59V
TP Angle	Percent applied	0%
Engine Speed	RPM	610 RPM
Transmission ISS	RPM	680 RPM
Turbine Speed	RPM	680 RPM
Transmission OSS	RPM	0
Vehicle Speed	km/h (mph)	0
Current Gear	1,2,3,4	1
1-2 Sol.	ON/OFF	ON
2-3 Sol.	ON/OFF	OFF
Gear Ratio	Ratio	8.00:1
Speed Ratio	Ratio	8.00:1
1-2 Sol. Open/Short to Ground	Yes	No
1-2 Sol. Shorted/to Voltage	Yes/No	No
2-3 Sol. Open/Short to Ground	Yes/No	No
2-3 Sol. Shorted/to Voltage	Yes/No	No
TFP Switch A/B/C	ON/OFF	OFF/ON/OFF
ECT	°C (°F)	83°C (181°F)
Trans. Fluid Temp.	°C (°F)	Varies
TFT Sensor	Volts	Varies

Scan Tool Data Value Examples (Gas) (cont'd)

Tech 2 Parameter	Units Displayed	Typical Scan Values
IAT Sensor	°C (°F)	Varies
Transmission Hot Mode	ON/OFF	OFF
PC Sol. Actual Current	amps	0.96 amps
PC Sol. Ref. Current	amps	0.96 amps
PC Sol. Duty Cycle	Percent On Time	57%/Varies
TCC Brake Switch	Open/Closed	Closed
TCC Duty Cycle	%	0%
TCC Slip Speed	RPM	-70 Varies
TCC Duty Cycle Open Short to Ground	Yes/No	No
TCC Duty Cycle Short to Voltage	Yes/No	No
1-2 Shift Time	Seconds	Varies
2-3 Shift Time	Seconds	Varies
3-4 Shift Time	Seconds	Varies
Adaptable Shift	Yes/No	No
Engine Run Time	Hr:Min:Sec	00:00:00
Ignition Voltage	Volts	13.5-14.5
Cruise	ENABLED/DISABLED	DISABLED
A/C Clutch	ON/OFF	OFF
4WD	ENABLED/DISABLED	DISABLED
Power Take-Off	Yes/No	No

Scan Tool Data Value Examples (Diesel)

If you have completed the On-Board Diagnostic (OBD) system check, if the diagnostics are functioning properly and if no DTCs display, you may use the Typical Scan Values in the table below for comparison. These typical values are an average of display values recorded from normally operating vehicles. They represent the display from a normally functioning system.

You should never use a scan tool that displays faulty data. The condition should be reported to the manufacturer. The use of a faulty scan tool can result in misdiagnosis and the unnecessary replacement of parts.

Only the parameters listed below are used in this manual for diagnosing. If a scan tool displays other parameters, the values are not recommended by General Motors for use in diagnosis.

Scan tests are performed under the following driving conditions:

- Engine idling
- Upper radiator hose is hot
- Closed throttle
- Transmission is in Park
- Closed Loop
- Accessories OFF

Scan Tool Data Value Examples (Diesel)

Tech 2 Parameter	Units Displayed	Typical Scan Values
Engine Torque	N·m (lb ft)	29 N·m (19 lb ft)
APP Angle	%	0%
Engine Speed	RPM	620 RPM
Transmission ISS	RPM	700 RPM
Turbine Speed	RPM	700 RPM
Transmission OSS	RPM	0 RPM
Vehicle Speed	km/h (mph)	0 km/h (0 mph)
Current Gear	1,2,3,4	1
1-2 Sol.	On/Off	On
2-3 Sol.	On/Off	Off
Gear Ratio	Ratio	8.00:1
Speed Ratio	Ratio	8.00:1
1-2 Sol. Open/Short to Ground	Yes/No	No
1-2 Sol. Short to Volts	Yes/No	No
2-3 Sol. Open/Short to Ground	Yes/No	No
2-3 Sol. Short to Volts	Yes/No	No
TFP Sw. A/B/C	On/Off	Off/On/Off
ECT	°C/°F	83°C (181°F) (Varies)
Trans. Fluid Temp.	°C/°F	80°C (118°F) (Varies)
TFT Sensor	Volts	2.25 Volts (Varies)
IAT	°C/°F	Varies
Transmission Hot Mode	On/Off	Off
PC Sol. Actual Current	Amps	0.83 amps
PC Sol. Ref. Current	Amps	0.83 amps
PC Sol. Duty Cycle	%	43%
TCC Brake Switch	Open/Closed	Open
TCC Duty Cycle	%	0%
TCC Slip Speed	RPM	-80 RPM
TCC Duty Cycle Open/Short to Ground	Yes/No	No
TCC Duty Cycle Short to Volts	Yes/No	No
Latest Shift	Seconds	Varies
1-2 Shift Time	Seconds	Varies
2-3 Shift Time	Seconds	Varies
3-4 Shift Time	Seconds	Varies
Adaptable Shift	Yes/No	No
Engine Run Time	Hour/Minutes/Seconds	Varies
Ignition Voltage	Volts	13.5–14.5 Volts
Cruise	Enabled/Disabled	Disabled
A/C Clutch	On/Off	Off
Power Take Off	Yes/No	No
4WD	Enabled/Disabled	Disabled
4WD Low	Enabled/Disabled	Disabled

Transmission Scan Tool Data Definitions

1-2 Shift Time: Displays 0.00–6.38 seconds. This parameter is the actual time of the last 1-2 shift. The shift time is based on the gear ratio change after the commanded 1-2 shift. This value is only accurate if the Adaptable Shift parameter indicates Yes.

1-2 Sol (Solenoid): Displays ON or OFF. These parameters are the commanded status of the 1-2 Shift Solenoid Valves. ON represents a commanded energized state (current is flowing through the solenoid). OFF represents a non-commanded state (current is not flowing through the solenoid).

1-2 Sol. (Solenoid) Open/Shorted to Ground: Displays Yes or No. This parameter indicates if an open or a short to ground exists in the feedback signal from the 1-2 Shift Solenoid Valve to the VCM.

1-2 Sol. (Solenoid) Shorted to Voltage: Displays Yes or No. This parameter indicates if a short to B+ exists in the feedback signal from the 1-2 Shift Solenoid Valve to the VCM.

1–2 TAP Cell (4–16): Scan tool displays kPa or psi. This parameter displays the amount of pressure varied from a calibrated base line pressure for shifts. Each TAP Cell is based on a calibrated shift torque value. Each TAP Cell value is calculated from the last shift time. This cell pressure is used in addition to the calibrated base line pressure to adjust the apply of a clutch or band during the next shift.

2-3 Shift Time: Displays 0.00–6.38 seconds. This parameter is the actual time of the last 2-3 shift. The shift time is based on the gear ratio change after the commanded 2-3 shift. This value is only accurate if the Adaptable Shift parameter indicates Yes.

2-3 Sol. (Solenoid): Displays ON or OFF. These parameters are the commanded status of the 2-3 Shift Solenoid valves. ON represents a commanded energized state (current is flowing through the solenoid). OFF represents a non-commanded state (current is not flowing through the solenoid).

2-3 Sol. (Solenoid) Open/Shorted to Ground: Displays Yes or No. This parameter indicates if an open or a short to ground exists in the feedback signal from the 2-3 Shift Solenoid Valve to the VCM.

2-3 Sol. (Solenoid) Shorted to Voltage: Displays Yes or No. This parameter indicates if a short to B+ exists in the feedback signal from the 2-3 Shift Solenoid Valve to the VCM.

2–3 TAP Cell (4–16): Scan tool displays kPa or psi. This parameter displays the amount of pressure varied from a calibrated base line pressure for shifts. Each TAP Cell is based on a calibrated shift torque value. Each TAP Cell value is calculated from the last shift time. This cell pressure is used in addition to the calibrated base line pressure to adjust the apply of a clutch or band during the next shift.

3-4 Shift Time: Displays 0.00–6.38 seconds. This parameter is the actual time of the last 3-4 shift. The shift time is based on the gear ratio change after the commanded 3-4 shift. This value is only accurate if the Adaptable Shift parameter indicates Yes.

3–4 TAP Cell (4–16): Scan tool displays kPa or psi. This parameter displays the amount of pressure varied from a calibrated base line pressure for shifts. Each TAP Cell is based on a calibrated shift torque value. Each TAP Cell value is calculated from the last shift time. This cell pressure is used in addition to the calibrated base line pressure to adjust the apply of a clutch or band during the next shift.

4WD: Displays Enabled or Disabled. This parameter indicates whether the vehicle is currently in a four-wheel drive mode.

4WD Low: Displays Enabled or Disabled. This parameter is the signal state of the four-wheel drive low circuit. Enabled indicates a 0 voltage signal requesting 4WD Low. Disabled indicates a B+ voltage signal which does not request 4WD Low.

A/C Clutch: Displays ON or OFF. This represents the commanded state of the A/C clutch control relay. The clutch should be engaged whenever ON is displayed. The VCM/PCM will compensate for the additional engine load that is accompanied with the A/C clutch engaged.

Adaptable Shift: The scan tool displays Yes or No. Yes indicates that the proper operating conditions (i.e. TP Sensor Delta, Engine Torque, Vehicle Speed Data, Engine Vacuum, Shift Delay, etc.) were all within the proper operating range during the last shift and the Shift Time was accurate. This shift information is then used through the adaptive function to update the adapt cells. No indicates that not all of the operating conditions were met in order to enable this function and that the adapt cells were not updated.

APP (Accelerator Pedal Position) Angle: Diesel application: Displays a range of 0–100%. The APP angle is computed by the PCM from APP voltage. The APP angle should display 0% at idle and 100% at wide open throttle (WOT).

Cruise: Displays ENABLED or DISABLED. This parameter indicates whether the VCM/PCM is allowing cruise operation. The VCM/PCM has the ability to disable cruise control under certain conditions.

Current Gear: Displays 1, 2, 3, or 4. This parameter indicates the current commanded state of the shift solenoids.

Current TAP (Transmission Adaptive Pressure): Displays a Torque Based Cell range of 0–16. This parameter indicates the current cell used for line pressure modification (adaptation).

ECT (Engine Coolant Temperature): Displays -40°C to 151°C (-40°F to 304°F). This parameter is the input signal of the engine coolant temperature sensor. Engine coolant temperature is high when the signal voltage is low (0 volts), and engine coolant temperature is low when the signal voltage is high (5 volts).

Engine Run Time: Displays a range of 0:00:00–18:12:15 Hr/Min/Sec. This parameter measures how long the engine has been operating. When you turn the ignition switch Off, the value resets to zero.

Engine Speed: Displays 0–8192 RPM. This parameter indicates the rotational speed of the engine expressed as revolutions per minute.

Engine Torque: Displays 0–9999 ft/lb. This parameter is a calculated value based on engine load, throttle position, Mass Air Flow, and other engine and transmission inputs. This parameter is accurate to within 15 ft/lb of actual measured engine torque.

Gear Ratio: Displays a range of 0.00 to 8.00:1. This parameter is the actual gear ratio of the current commanded gear. In the current gear of R, D3, D2, and D1, it is calculated by dividing the input speed by the output speed. In the current gear of D4 with TCC lock up, the gear ratio is calculated by dividing the turbine speed by the output speed.

Hot Mode: Displays ON or OFF. This parameter monitors the transmission fluid temperature. Yes indicates that the transmission fluid temperature has exceeded 135°C (275°F).

Ignition Voltage: Displays 0.0–25.5 volts. This parameter represents the system voltage measured by the VCM/PCM at its ignition feed.

Latest Shift: Displays 0.00–6.38 seconds. This parameter is the actual shift time of the last upshift. This value is only accurate if the Adaptable Shift parameter indicates Yes.

PC (Pressure Control) Sol. Act. (Actual) Current: Displays 0.00–1.1 amps. This parameter is the actual current of the pressure control solenoid circuit at the control module. Zero amp (no current flow) indicates an actual higher line pressure. A reading of 1.1 amp (high current flow) indicates an actual lower line pressure.

PC (Pressure Control) Sol. Duty Cycle: Displays 0%–100%. This parameter is the commanded state of the pressure control solenoid expressed as a percentage of energized ON time. A reading of 0% indicates zero ON time (non energized), or no current flow. Approximately 60% at idle indicates maximum ON time (energized), or high current flow.

PC (Pressure Control) Sol. Ref. (Reference) Current: Displays 0.00–1.1 amps. This parameter is the commanded current of the pressure control solenoid circuit at the control module. Zero amp (no current flow) indicates a commanded higher line pressure. A reading of 1.1 amp (high current flow) indicates a commanded lower line pressure.

Speed Ratio: The scan tool displays a range of 0.00:1–8.00:1. This parameter indicates engine speed divided by transmission output speed.

Standard TAP (Transmission Adaptive Pressure): Displays Yes or No. The standard TAP is an amount of pressure that is added to the base line pressure. If the shift requires standard TAP to achieve the shift, the scan tool displays Yes. If the shift requires more or less than the standard TAP to achieve the shift, the scan tool displays No. This reading indicates that the TAP is out of the standard range.

TCC Brake Switch (PCM Application): Displays Open or Closed. This parameter indicates the state of the TCC brake switch circuit input. Open indicates a zero voltage input (the brake switch is open and the brake pedal is not applied). Closed indicates a B+ voltage input (the brake switch is closed when the brake pedal is applied).

TCC Brake Switch (VCM Application): Displays Open or Closed. This parameter indicates the state of the TCC brake switch circuit input. Open indicates a zero voltage input (the brake switch is open and the brake pedal is applied). Closed indicates a B+ voltage input (the brake switch is closed and the brake pedal is not applied).

TCC Duty Cycle: Displays 0%–100%. This parameter is the commanded percentage of ON time of the TCC PWM solenoid. 90% represents an ON (energized) commanded state. 0% represents an OFF (non-energized) commanded state.

TCC Duty Cycle Open/Shorted to Ground: Displays Yes or No. This parameter indicates if an open or a short to ground exists in the feedback signal from the TCC PWM Sol. Valve to the VCM.

TCC Duty Shorted to Voltage: Displays Yes or No. This parameter indicates if a short to B+ exists in the feedback signal from the TCC PWM Sol. Valve to the VCM.

TCC (Torque Converter Clutch) Slip Speed: Displays -4080 to +4079 RPM. This parameter is the difference between transmission input speed and engine speed. A negative value indicates that the engine speed is less than the input speed (deceleration). A positive value indicates that the engine speed is greater than the input speed (acceleration). A value of zero indicates that the engine speed is equal to the input speed (TCC is applied).

TFP Switch A/B/C: Displays On/Off, On/Off, On/Off. These parameters are the three inputs from the Automatic Transmission Fluid Pressure Manual Valve Position Switch Assembly. ON represents a 0 voltage signal. OFF represents a B+ voltage signal.

TFT (Transmission Fluid Temperature) Sensor: Displays 0.00–5.00 volts. When the transmission fluid is cold, the sensor resistance is high and the VCM will sense a high signal voltage. As the transmission fluid temperature warms to normal operating temperature, the sensor resistance becomes less and the voltage decreases to about 1.5–2.0 volts.

TP (Throttle Position) Angle: Displays a range of 0%–100%. The TP Angle is computed by the VCM from TP voltage. The TP Angle should display 0% at idle and 100% at Wide Open Throttle (WOT).

TP (Throttle Position) Sensor: Scan tool displays a range of 0.00–5.00 volts. The VCM uses the TP Sensor in order to determine the amount of throttle demanded by the driver. Voltage will be below 1 volt at idle. Voltage will be above 4 volts at Wide Open Throttle (WOT).

Trans. Fluid Temp. (TFT): Displays -40°C to 151°C (-40°F to 304°F). This parameter is the input signal of the transmission fluid temperature sensor. Transmission fluid temperature is high when the signal voltage is low (0 volts), and transmission fluid temperature is low when the signal voltage is high (5 volts).

Transmission ISS (Input Shaft Speed): Displays 0–8192 RPM. This parameter measures the rotational speed of the input shaft expressed as revolutions per minute.

Transmission OSS (Output Shaft Speed): Displays 0–8192 RPM. This parameter indicates the rotational speed of the transmission output shaft expressed as revolutions per minute. On four-wheel drive applications, the transfer case output shaft speed is measured.

Turbine Speed: Displays 0–8192 RPM. This parameter indicates the rotational speed of the Torque Converter Turbine Shaft expressed as revolutions per minute. In commanded gears 1, 2, and 3, the turbine speed equals the input speed. In commanded gear 4, the turbine speed equals 3/4 of the input speed.

Vehicle Speed: Displays 0–255 km/h (0–158 mph). This parameter is the input signal from the OSS sensor.

Diagnostic Trouble Code Identification (Gas)

DTC	Description	DTC Type	Default Action
P0218	Transmission Fluid Overtemperature	*D*	• The VCM freezes shift adapts. • DTC P0218 is stored in the VCM history.
P0502	Vehicle Speed Sensor Circuit — Low Input	*D /B*	• The VCM illuminates the MIL for California emissions. • The VCM freezes shift adapts. • The VCM commands maximum line pressure • The VCM defaults a calculated OSS from the A/T ISS Sensor output. • DTC P0502 is stored in the VCM history.
P0503	Vehicle Speed Sensor Circuit — Intermittent	*D /B*	• The VCM illuminates the MIL for California emissions. • The VCM freezes shift adapts. • The VCM commands maximum line pressure • The VCM defaults a calculated OSS from the A/T ISS Sensor output. • DTC P0503 is stored in the VCM history.
P0560	System Voltage Malfunction	*D*	• The VCM commands an immediate landing to second gear. • The VCM freezes shift adapts. • The VCM turns off all transmission output devices • DTC P0560 is stored in VCM history
P0711	Automatic Transmission Fluid Temperature (TFT) Sensor Circuit Range/Performance	*D*	• The VCM freezes shift adapts. • The VCM defaults the TFT to 140°C (284°F). • DTC P0711 is stored in the VCM history.
P0712	Transmission Fluid Temperature Sensor Circuit — Low Input	*D*	• The VCM freezes shift adapts • The VCM defaults TFT to 140°C (284°F) for shift scheduling (hot mode pattern) • DTC P0712 is stored in VCM history

Diagnostic Trouble Code Identification (Gas) (cont'd)

DTC	Description	DTC Type	Default Action
P0713	Transmission Fluid Temperature Sensor Circuit — High Input	D	• The VCM freezes shift adapts. • The VCM defaults TFT to 140°C (284°F) for shift scheduling (hot mode pattern) • DTC P0713 is stored in VCM history.
P0716	Input Speed Sensor Circuit — Intermittent	D /B	• The VCM illuminates the MIL for California emissions. • The VCM freezes shift adapts. • The VCM commands maximum line pressure • DTC P0716 is stored in VCM history.
P0717	Input Speed Sensor Circuit — Low Input	D /B	• The VCM illuminates the MIL for California emissions. • The VCM freezes shift adapts. • The VCM commands maximum line pressure. • DTC P0717 is stored in VCM history.
P0719	Brake Switch Circuit — Low Input	D	DTC P0719 is stored in VCM history.
P0724	Brake Switch Circuit — High Input	D	DTC P0724 is stored in VCM history.
P0730	Incorrect Gear Ratio	D	• The VCM commands maximum line pressure. • The VCM freezes shift adapts. • DTC P0730 is stored in VCM history
P0741	Torque Converter Clutch System Stuck Off	D /B	• The VCM illuminates the MIL for California emissions. • The VCM inhibits TCC engagement. • The VCM inhibits fourth gear engagement. • DTC P0741 is stored in VCM history.
P0742	Torque Converter Clutch System Stuck On	D /B	• The VCM illuminates the MIL for California emissions. • The VCM commands maximum line pressure. • The VCM freezes shift adapts. • DTC P0742 is be stored in VCM history.
P0748	Pressure Control Circuit — Electrical	D	• The VCM disables the PC Sol. Valve. • The VCM freezes shift adapts. • DTC P0748 is stored in VCM history.
P0751	1-2 Shift Solenoid Valve — Performance	D /B	• The VCM illuminates the MIL for California emissions. • The VCM commands maximum line pressure. • The VCM freezes shift adapts. • 3-2 downshifts above 25 MPH are inhibited. • DTC P0751 is stored in VCM history.

Diagnostic Trouble Code Identification (Gas) (cont'd)

DTC	Description	DTC Type	Default Action
P0753	1-2 Shift Solenoid Valve Circuit — Electrical	D/A	• The VCM illuminates the MIL for California emissions. • The VCM freezes shift adapts. • 3-2 downshifts above 25 MPH are inhibited. • The VCM commands maximum line pressure. • DTC P0753 is stored in VCM history.
P0756	2-3 Shift Solenoid Valve — Performance	D /A	• The VCM illuminates the MIL for California emissions. • The VCM commands an immediate landing to second gear. • The VCM freezes shift adapts. • The VCM commands maximum line pressure. • DTC P0756 is stored in VCM history.
P0758	2-3 Shift Solenoid Valve Circuit— Electrical	D /A	• The VCM illuminates the MIL for California emissions. • The VCM commands maximum line pressure. • The VCM freezes shift adapts. • The VCM commands an immediate landing to second gear. • DTC P0758 is stored in VCM history
P1810	Automatic Transmission Fluid Pressure Manual Valve Position Switch Circuit Malfunction	D /B	• The VCM illuminates the MIL for California emissions. • The VCM freezes shift adapts. • The VCM assumes D4 shift pattern. • The VCM commands maximum line pressure. • The VCM forces TCC apply when fourth gear is commanded. • DTC P1810 is stored in VCM history.
P1860	Torque Converter Clutch Pulse Width Modulation Solenoid Valve Circuit-Electrical	D /A	• The VCM illuminates the MIL for California emissions. • The VCM inhibit s TCC engagement. • The VCM inhibits fourth gear engagement. • The VCM freezes shift adapts. • DTC P1860 is stored in VCM history
P1870	Transmission Component Slipping	D /B	• The VCM illuminates the MIL for California emissions. • The VCM commands maximum line pressure. • The VCM inhibits TCC engagement. • The VCM inhibits fourth gear engagement. • The VCM freezes shift adapts. • DTC P1870 is stored in VCM history.

Diagnostic Trouble Code Identification (Gas) (cont'd)

DTC	Description	DTC Type	Default Action
P1875	Four-Wheel Drive Low Switch Circuit Electrical	*D* /*B*	• The VCM illuminates the MIL for California emissions. • The VCM freezes shift adapts. • The VCM assumes a 4WD Lo state if the switch fails when open, or the VCM assumes a 4WD High state if the switch fails when closed, for a transmission shift pattern. • The VCM inhibits fourth gear engagement. • The VCM freezes shift adapts. • DTC P1875 is stored in VCM history.

DTC Types:

- A – Emission related, will turn on the MIL after the first failure
- B – Emission related, will turn on the MIL after two consecutive trips with a failure
- C – Non-emission related, will turn on the service lamp after the first failure
- D – Non-emission related, no lamps

Diagnostic Trouble Code Identification (Diesel)

DTC	Description	DTC Type	Default Action
P0218	Transmission Fluid Overtemperature	*D*	• The PCM freezes shift adapts. • DTC P0218 is stored in the PCM history.
P0560	System Voltage Malfunction	*D*	• The PCM inhibits TCC engagement. • The PCM freezes shift adapts. • The PCM turns off the PC Sol. Valve. • The PCM commands an immediate landing into 2nd gear. • DTC P0560 is stored in PCM history.
P0711	Transmission Fluid Temperature Sensor Circuit Range/Performance	*D*	• The PCM uses a TFT default value of 140°C (284°F). • The PCM freezes shift adapts. • DTC P0711 is stored in the PCM history.
P0712	Transmission Fluid Temperature Sensor Circuit — Low Input	*D*	• The PCM freezes shift adapts. • The PCM uses a TFT default value of 140°C (284°F). • DTC P0712 is stored in PCM history.
P0713	Transmission Fluid Temperature Sensor Circuit — High Input	*D*	• The PCM freezes shift adapts. • The PCM uses a TFT default value of 140°C (284°F). • DTC P0713 is stored in PCM history.
P0716	Input Speed Sensor Circuit — Intermittent	*B*	• The PCM illuminates the MIL. • The PCM freezes shift adapts. • The PCM commands maximum line pressure • DTC P0716 is stored in PCM history.

Diagnostic Trouble Code Identification (Diesel) (cont'd)

DTC	Description	DTC Type	Default Action
P0717	Input Speed Sensor Circuit — Low Input	*B*	• The PCM illuminates the MIL. • The PCM freezes shift adapts. • The PCM commands maximum line pressure. • DTC P0717 is stored in PCM history.
P0719	Brake Switch Circuit — Low Input	*D*	DTC P0719 is stored in PCM history.
P0722	Output Speed Sensor — Low Input	*B*	• The PCM illuminates the MIL. • The PCM freezes shift adapts. • The PCM commands maximum line pressure. • The PCM calculates OSS from ISS. • DTC P0722 is stored in the PCM history.
P0723	Output Speed Sensor Intermittent	*B*	• The PCM illuminates the MIL. • The PCM freezes shift adapts. • The PCM commands maximum line pressure. • The PCM calculates OSS from ISS. • DTC P0723 is stored in the PCM history.
P0724	Brake Switch Circuit — High Input	*D*	• Apply TCC if APP is greater than 0.5% and the vehicle speed is greater than 30 mph. • DTC P0724 is stored in VCM history.
P0730	Incorrect gear ratio	*D*	• The PCM commands maximum line pressure. • The PCM freezes shift adapts. • DTC P0730 is stored in PCM history.
P0741	Torque Converter Clutch System Stuck Off	*B*	• The PCM illuminates the MIL. • The PCM inhibits TCC engagement. • The PCM inhibits fourth gear engagement. • The PCM commands increased line pressure. • DTC P0741 is stored in PCM history.
P0742	Torque Converter Clutch System Stuck On	*B*	• The PCM illuminates the MIL. • The PCM freezes shift adapts. • The PCM commands maximum line pressure. • DTC P0742 is stored in PCM history.
P0748	Pressure Control Solenoid Circuit — Electrical	*D*	• The PCM freezes shift adapts. • The PCM commands maximum line pressure by disabling the PC Sol. Valve. • DTC P0748 is stored in PCM history.
P0751	1-2 Shift Solenoid Valve —Performance	*B*	• The PCM illuminates the MIL. • The PCM freezes shift adapts. • The PCM commands maximum line pressure. • DTC P0751 is stored in PCM history.

Diagnostic Trouble Code Identification (Diesel) (cont'd)

DTC	Description	DTC Type	Default Action
P0753	1-2 Shift Solenoid Valve — Electrical	A	• The PCM illuminates the MIL. • The PCM freezes shift adapts. • The PCM commands maximum line pressure. • MIL. • DTC P0753 is stored in PCM history.
P0756	2-3 Shift Solenoid Valve — Performance	A	• The PCM illuminates the MIL. • The PCM commands an immediate landing into second gear. • The PCM freezes shift adapts. • The PCM commands maximum line pressure. • DTC P0756 is stored in PCM history.
P0758	2-3 Shift Solenoid Valve — Electrical	A	• The PCM illuminates the MIL. • The PCM commands an immediate landing to second gear. • The PCM freezes shift adapts. • The PCM commands maximum line pressure. • DTC P0758 is stored in the PCM history
P1810	Transmission Fluid Pressure Manual Valve Position Switch Assembly — Circuit Malfunction	B	• The PCM illuminates the MIL. • The PCM freezes shift adapts. • The PCM assumes a D4 shift pattern. • The PCM commands maximum line pressure. • The PCM commands TCC apply with 4th gear commanded ON. • DTC P1810 is stored in PCM history.
P1811	Maximum Adapt and Long Shift	D	• The PCM freezes shift adapts. • The PCM commands maximum line pressure. • DTC P1811 is stored in PCM history.
P1860	Torque Converter Clutch Pulse Width Modulation Solenoid Circuit — Electrical	A	• The PCM illuminates the MIL. • The PCM inhibits TCC engagement. • The PCM inhibits fourth gear engagement. • The PCM freezes shift adapts. • DTC P1860 is stored in PCM history
P1870	Transmission Component Slipping	B	• The PCM illuminates the MIL. • The PCM commands maximum line pressure. • The PCM inhibits TCC engagement. • The PCM inhibits fourth gear engagement. • The PCM freezes shift adapts. • DTC P1870 is stored in PCM history.

Diagnostic Trouble Code Identification (Diesel) (cont'd)

DTC	Description	DTC Type	Default Action
P1875	Four-Wheel Drive Low Switch Circuit — Electrical	*B*	• The PCM illuminates the MIL. • The PCM freezes shift adapts. • The PCM assumes a 4WD Lo state if the switch fails when open, or the PCM assumes a 4WD High state if the switch fails when closed, for a transmission shift pattern. • DTC P1875 is stored in PCM history.
DTC Types: A – Emission related, will turn on the MIL after the first failure. B – Emission related, will turn on the MIL after two consecutive trips with a failure. C – Non-emission related, will turn on the service lamp after the first failure. D – Non-emission related, no lamps.			

Fluid Capacity Specifications

	Liters	Quarts
(approximate)		
Dry	12.8	13.5
Oil Pan Removal	7.3	7.7

Range Reference

Range	Park	Reverse	Neutral	OD				D			2		1	
Gear	N	R	N	1st	2nd	3rd	4th	1st	2nd	3rd	1st	2nd	1st	2nd
@1–2 Shift Solenoid	ON	ON	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	OFF	ON	OFF
@2–3 Shift Solenoid	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	ON	OFF	OFF	OFF	OFF
Fourth Clutch	—	—	—	—	—	—	A	—	—	—	—	—	—	—
Overrun Clutch	—	—	—	—	—	—	—	A	A	A	A	A	A	A
Overdrive Roller Clutch	H	H	H	H	H	H	OR	A	A	A	A	A	A	A
Forward Clutch	—	—	—	A	A	A	A	A	A	A	A	A	A	A
Direct Clutch	—	A	—	—	—	A	A	—	—	A	—	—	—	—
Front Band	—	—	—	—	—	—	—	—	—	—	—	A	—	A
Inter Sprag Clutch	—	—	—	*	H	OR	OR	*	H	OR	*	H	*	H
Inter Clutch	—	—	—	—	A	A	A	—	A	A	—	A	—	A

Range Reference (cont'd)

Range	Park	Reverse	Neutral	OD				D			2		1	
Gear	N	R	N	1st	2nd	3rd	4th	1st	2nd	3rd	1st	2nd	1st	2nd
Lo Roller Clutch	—	—	—	H	OR	OR	OR	H	OR	OR	H	OR	H	OR
Rear Band	—	A	—	—	—	—	—	—	—	—	—	—	A	—

A = Applied
H = Holding
OR = Overrunning
* = Holding but not effective
ON = The solenoid is energized.
OFF = The solenoid is de-energized
@ = The solenoid's state follows a shift pattern which depends upon vehicle speed and throttle position. The pattern does not depend upon the selected gear.

Gear Ratios

Gear	Gear Ratio
First	2.48
Second	1.48
Third	1.00
Fourth	0.75
Reverse	2.08

Shift Solenoid Valve State and Gear Ratio

Gear	1-2 SS Valve	2-3 SS Valve	Gear Ratio
1	ON	OFF	2.48:1
2	OFF	OFF	1.48:1
3	OFF	ON	1.00:1
4	ON	ON	0.75:1
R	ON	OFF	2.08:1

Shift Speed

		1–2 Shift @ +/- 150 RPM Output Shaft Speed			2–3 Shift @ +/- 200 RPM Output Shaft Speed			3–4 Shift @ +/- 250 RPM Output Shaft Speed			3–2 @ +/- 100 RPM Output Shaft Speed	2–1 @ +/- 100 RPM Output Shaft Speed	1–2 Wide Open Throttle Shift	2–3 Wide Open Thrott le Shift
% of TPS		10	25	50	10	25	50	10	25	50	0	0	100	100
Model	RPO													
4.3L	L35	512	628	1046	1023	1209	2139	2464	2464	3953	697	419	2096	3446
5.7L	L31	520	700	1070	930	1210	2090	1560	2090	3950	700	420	2090	3490
6.5L	L56	465	581	1023	744	1163	1790	1279	1721	2883	651	395	977	2093
6.5L	L65	465	628	1023	744	1232	1790	1279	1721	2883	651	395	1163	2093
7.4L	L29	488	721	1302	930	1349	2325	1395	1907	3581	814	419	1674	3069

Range Signal

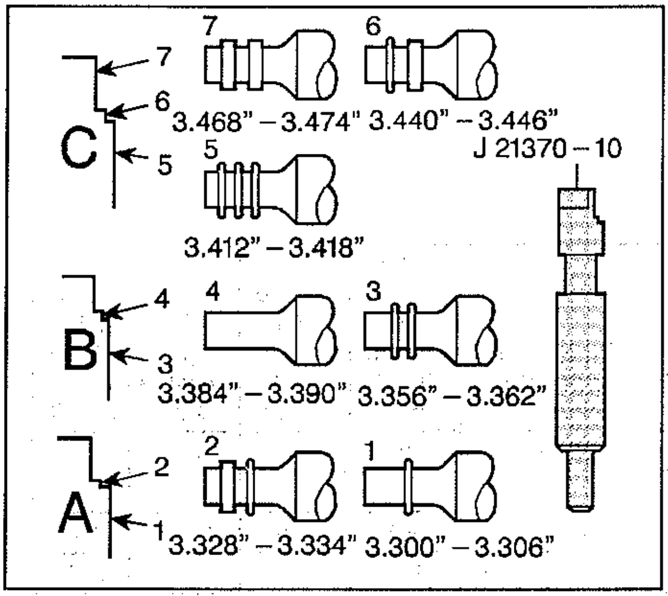
Range Signal	A	B	C
Park	OFF	ON	OFF
Reverse	ON	ON	OFF
Neutral	OFF	ON	OFF
D4	OFF	ON	ON
D3	OFF	OFF	ON
D2	OFF	OFF	OFF
D1	ON	OFF	OFF
Illegal	ON	OFF	ON
Illegal	ON	ON	ON
ON = 0 volts. OFF = B+ volts.			

Transmission General Specifications

	Length (mm)	Length (in)
Direct Clutch Piston Travel Specification	3.07–4.72	0.121–0.186
Intermediate Clutch Piston Travel Specification	1.02–2.72	0.040–0.107
Forward Clutch Piston Travel Specification	3.07–4.72	0.121–0.186
Overrun Clutch Piston Travel Specification	0.838–2.38	0.033–0.094

Rear Servo Pin Specification

Refer to the rear servo pin selection chart in order to determine the correct pin usage.



28391

Line Pressure

Pressure Control Solenoid Current (Amp)	Approximate Line Pressure (PSI)
0.02	157-177
0.10	151-176
0.20	140-172
0.30	137-162
0.40	121-147
0.50	102-131
0.60	88-113
0.70	63-93
0.80	43-73
0.90	37-61
0.98	35-55

Component Resistance

Component	Wire Color	Pass-Thru Pin	Resistance at 20°C (68°F)	Circuit Number
1-2 Shift Solenoid Valve (1-2 SS Valve)	Red	* E	20–40 Ω	839A
	LT Green	A		1222
2-3 Shift Solenoid Valve (2-3 SS Valve)	Red	* E	20–40 Ω	839B
	Yellow	B		1223
Pressure Control Solenoid Valve (PC Sol. Valve)	Purple	C	3.5–8 Ω	1228
	LT Blue	D		1229
TCC Solenoid Valve (TCC Sol. Valve)	Red	* E	10–15 Ω	839C
	Black	S		418
Automatic Transmission Fluid Temperature (TFT) Sensor	Brown	L	3333–3689 Ω	1227
	Gray	M		452
Automatic Transmission Input Shaft Speed (A/T ISS) Sensor	Red/Black	**	1042–2088 Ω	1230
	Blue/White	**		1231
Automatic Transmission Output Shaft Speed (A/T OSS) Sensor	Purple/White	***	1042–2088 Ω	821
	LT Green/Black	***		822

1. * Spliced Internally to Pin E (circuit #839)
2. ** A/T ISS Sensor Harness
3. ***A/T OSS Sensor Harness

Diagnostic Information and Procedures

Functional Test Procedure

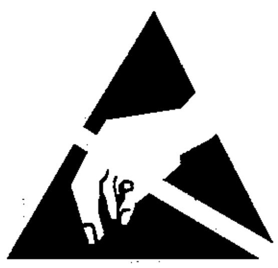
Step	Action	Value(s)	Yes	No
1	• Perform the *Transmission Fluid Checking Procedure.* • Fill the reservoir to the suggested level. Is the fluid level correct?	—	*Go to Step 2*	—
2	Check for PCM trouble codes, both current and history. Are PCM trouble codes present?	—	Go to *Diagnostic Trouble Code Identification (Diesel)* or *Diagnostic Trouble Code Identification (Gas)*	*Go to Step 3*
3	Perform the *Road Test Procedure.* Was the condition duplicated?	—	*Go to Step 4*	*Go to Step 12*
4	Is a harsh or soft shift condition present	—	*Go to Step 7*	*Go to Step 5*
5	Is the vehicle's performance poor?	—	Go to *Torque Converter Clutch Diagnosis*	*Go to Step 6*
6	Is the engagement into Drive or Reverse delayed or missing?	—	*Go to Step 7*	*Go to Step 9*
7	Perform the *Line Pressure Check Procedure.* Is the line pressure correct?	—	*Go to Step 8*	Refer to Symptom Diagnosis Tables
8	Inspect the transmission wire harness connectors and the transmission range switch. Was the problem found and corrected?	—	System OK	Refer to Symptom Diagnosis Tables
9	Is vibration or noise a concern?	—	Refer to *Flywheel/Torque Converter Vibration Test*	*Go to Step 10*
10	Is the fluid leaking?	—	Refer to *Fluid Leak Diagnosis and Repair*	*Go to Step 11*
11	Are other transmission conditions present?	—	Refer to Symptom Diagnosis Tables	*Go to Step 12*
12	Was the condition corrected?	—	Exit Table	*Go to Step 1*

Schematic and Routing Diagrams

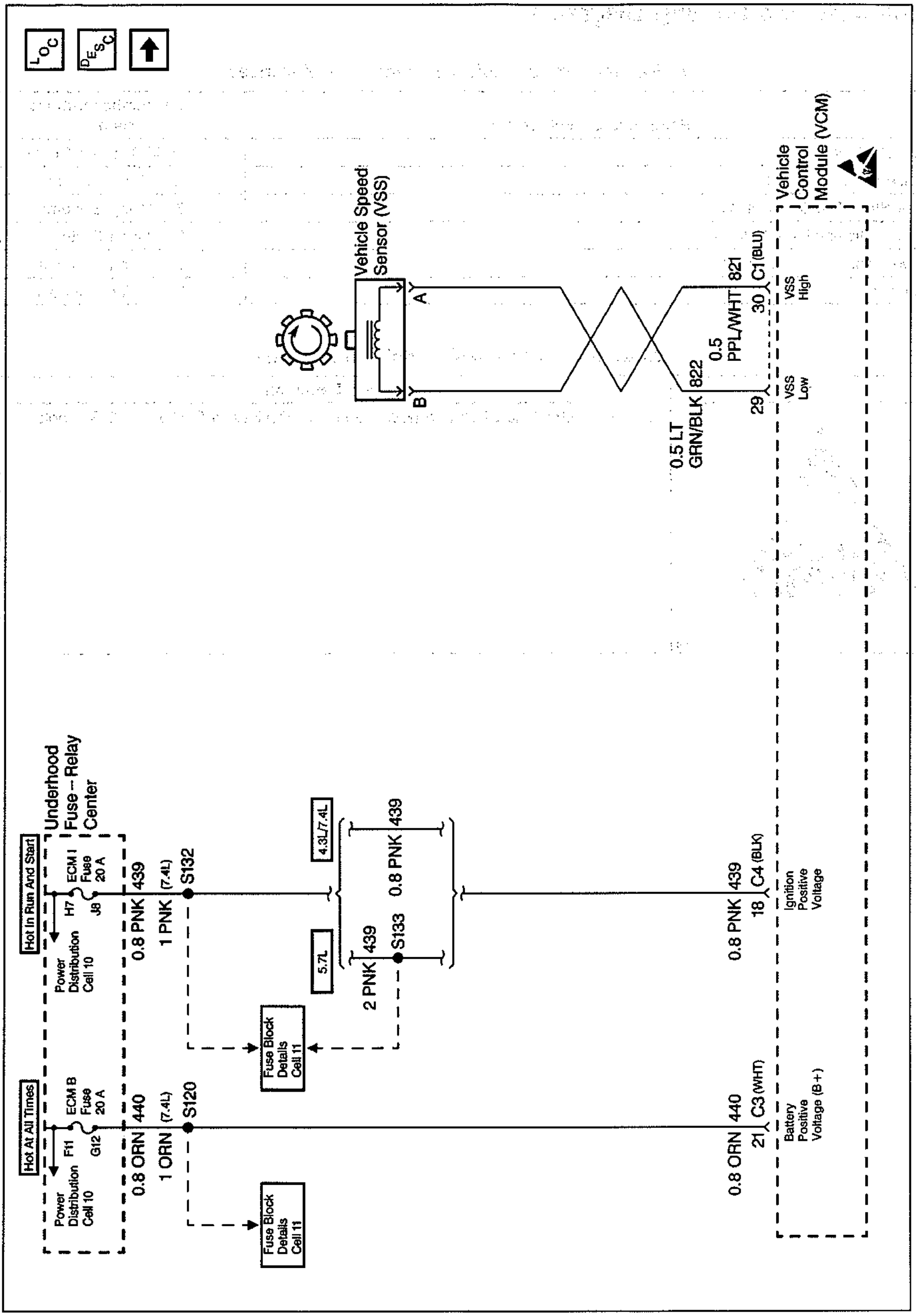
Automatic Transmission Schematic References

Reference on Schematic	Section Number Subsection Name
Antilock Brakes	5 - ABS Traction Control
Cruise Control - Cell 34	8 - Cruise Control
Fuse Block Details - Cell 11	8 - Wiring Systems
Ground Distribution - Cell 14	8 - Wiring Systems
Power Distribution - Cell 10	8 - Wiring Systems
Sensors	6 - Engine Controls

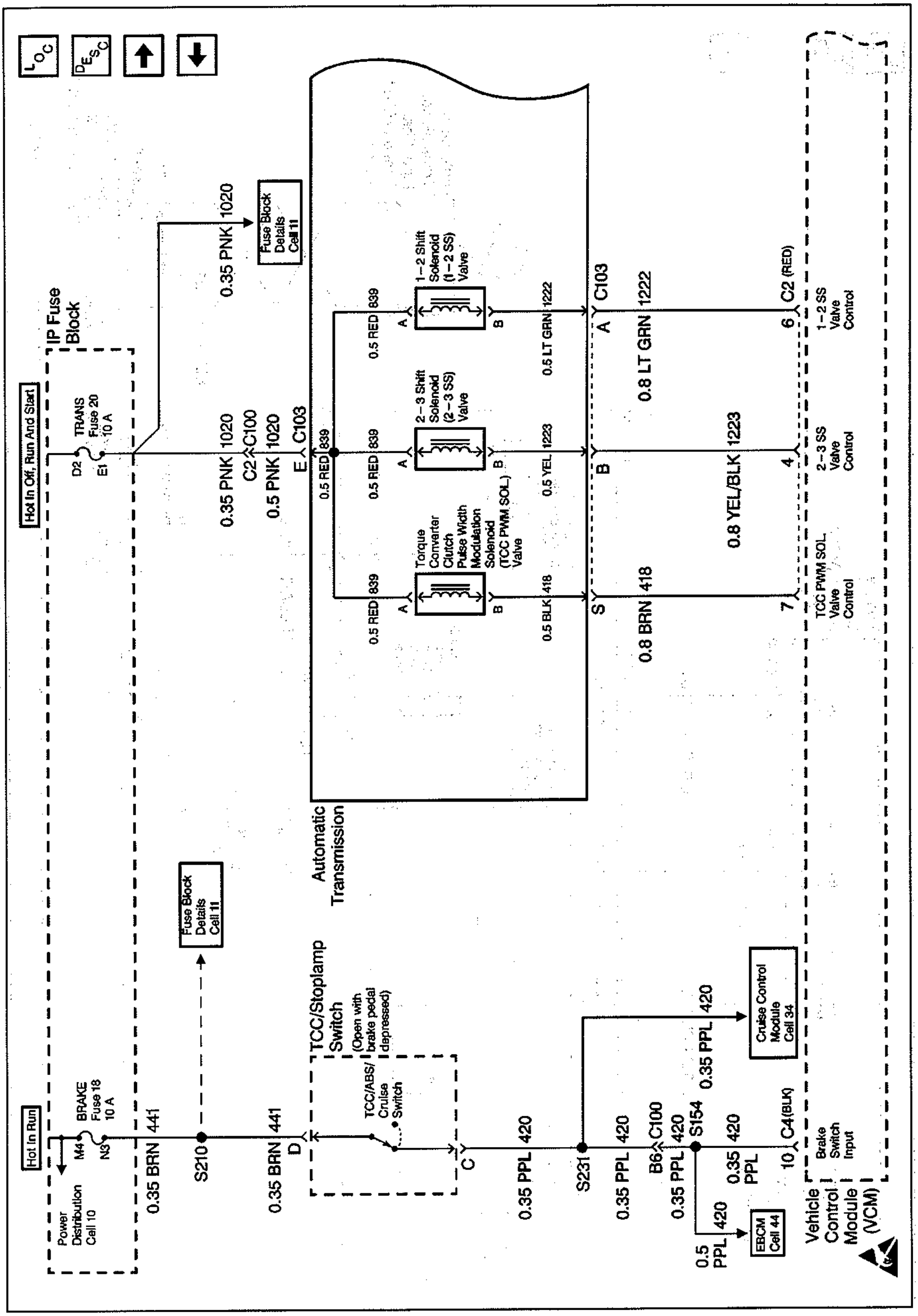
Automatic Transmission Schematic Icons

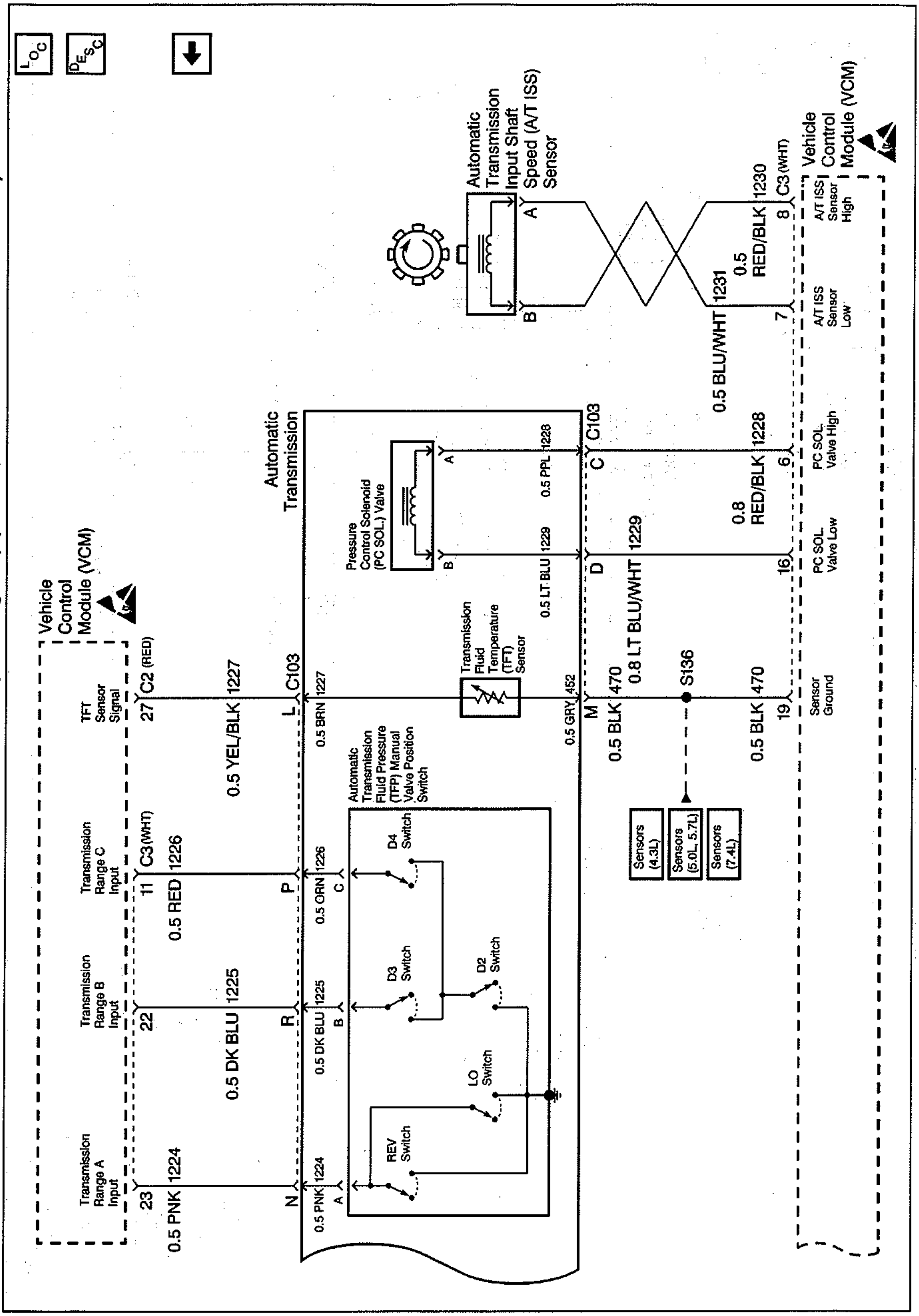
Icon	Icon Definition
 19384	Refer to Electrostatic Discharge (ESD) Sensitive Devices in Section 8A-3 Symbols

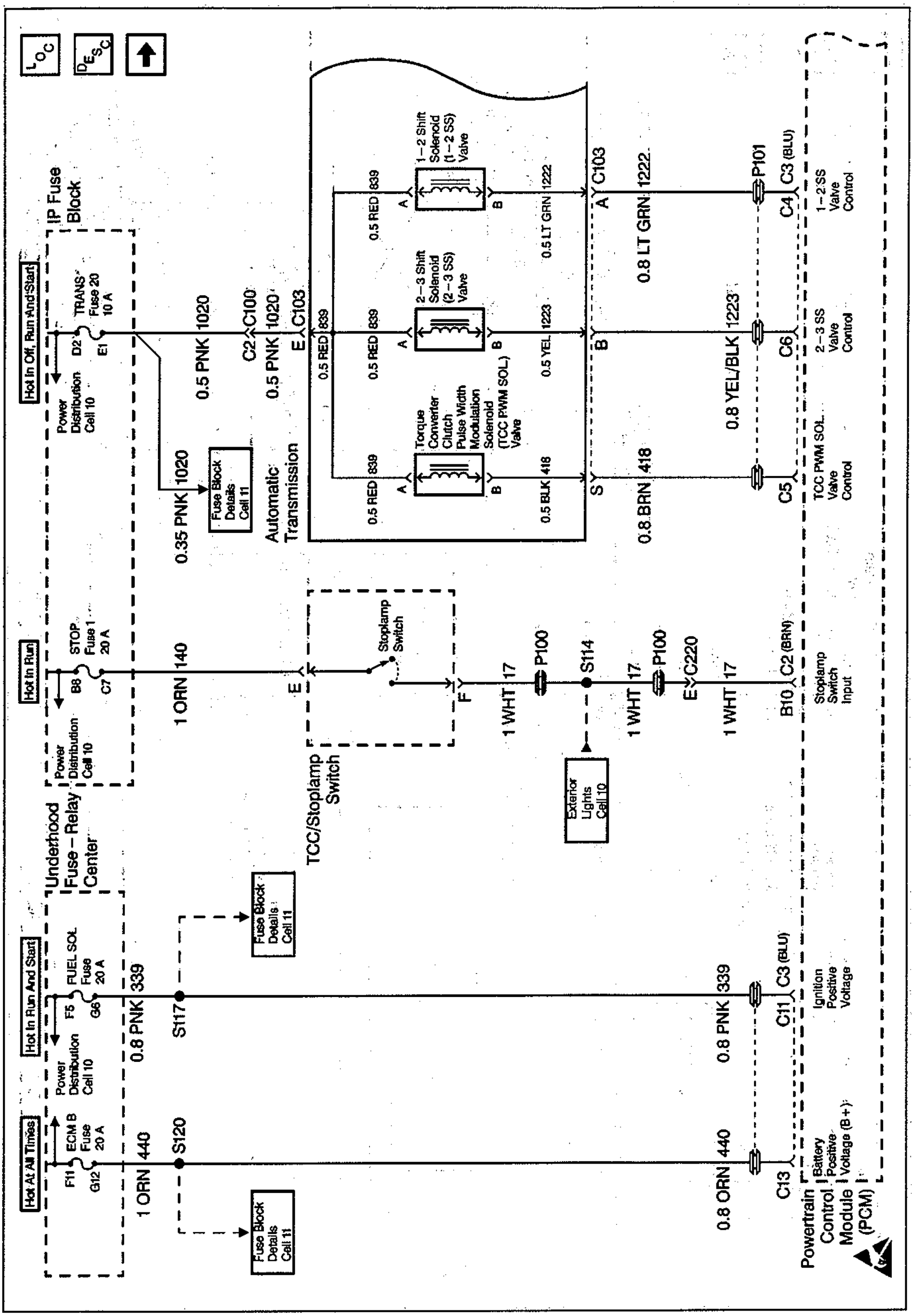
Automatic Transmission Controls Schematics (Gas Engines) (PWR and VSS Controls)



Automatic Transmission Controls Schematics (Gas Engines) (Solenoid and TCC/Stoplamp Controls)

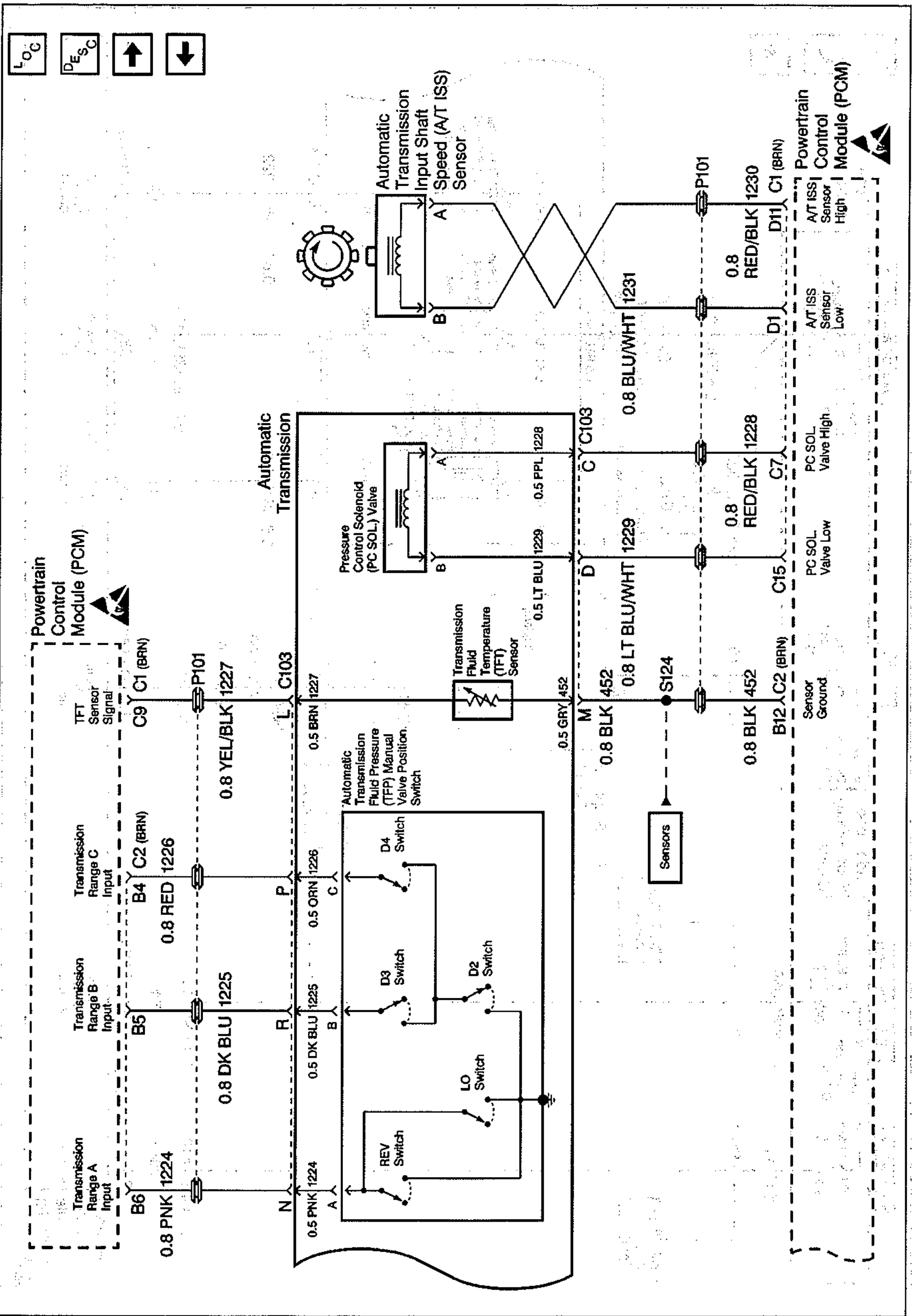



Automatic Transmission Controls Schematics (Gas Engines) (Sensor, Solenoid and GND Controls)
176100
Vehicle Control Module (VCM)
Transmission Range A Input
Transmission Range B Input
Transmission Range C Input
TFT Sensor Signal
23
22
11
27
C3 (WHT)
C2 (RED)
0.5 PNK 1224
0.5 DK BLU 1225
0.5 RED 1226
0.5 YEL/BLK 1227
N
R
P
L
C103
Automatic Transmission
0.5 PNK 1224
0.5 DK BLU 1225
0.5 ORN 1226
0.5 BRN 1227
A
B
C
Automatic Transmission Fluid Pressure (TFP) Manual Valve Position Switch
REV Switch
LO Switch
D2 Switch
D3 Switch
D4 Switch
Transmission Fluid Temperature (TFT) Sensor
0.5 GRY 452
Pressure Control Solenoid (PC SOL.) Valve
0.5 LT BLU 1229
0.5 PPL 1228
M
D
C
0.5 BLK 470
0.8 LT BLU/WHT 1229
S136
0.5 BLK 470
0.8 RED/BLK 1228
Sensors (4.3L)
Sensors (5.0L, 5.7L)
Sensors (7.4L)
19
16
6
7
8
Sensor Ground
PC SOL Valve Low
PC SOL Valve High
A/T ISS Sensor Low
A/T ISS Sensor High
Automatic Transmission Input Shaft Speed (A/T ISS) Sensor
A
B
0.5 BLU/WHT 1231
0.5 RED/BLK 1230
C3 (WHT)
Vehicle Control Module (VCM)

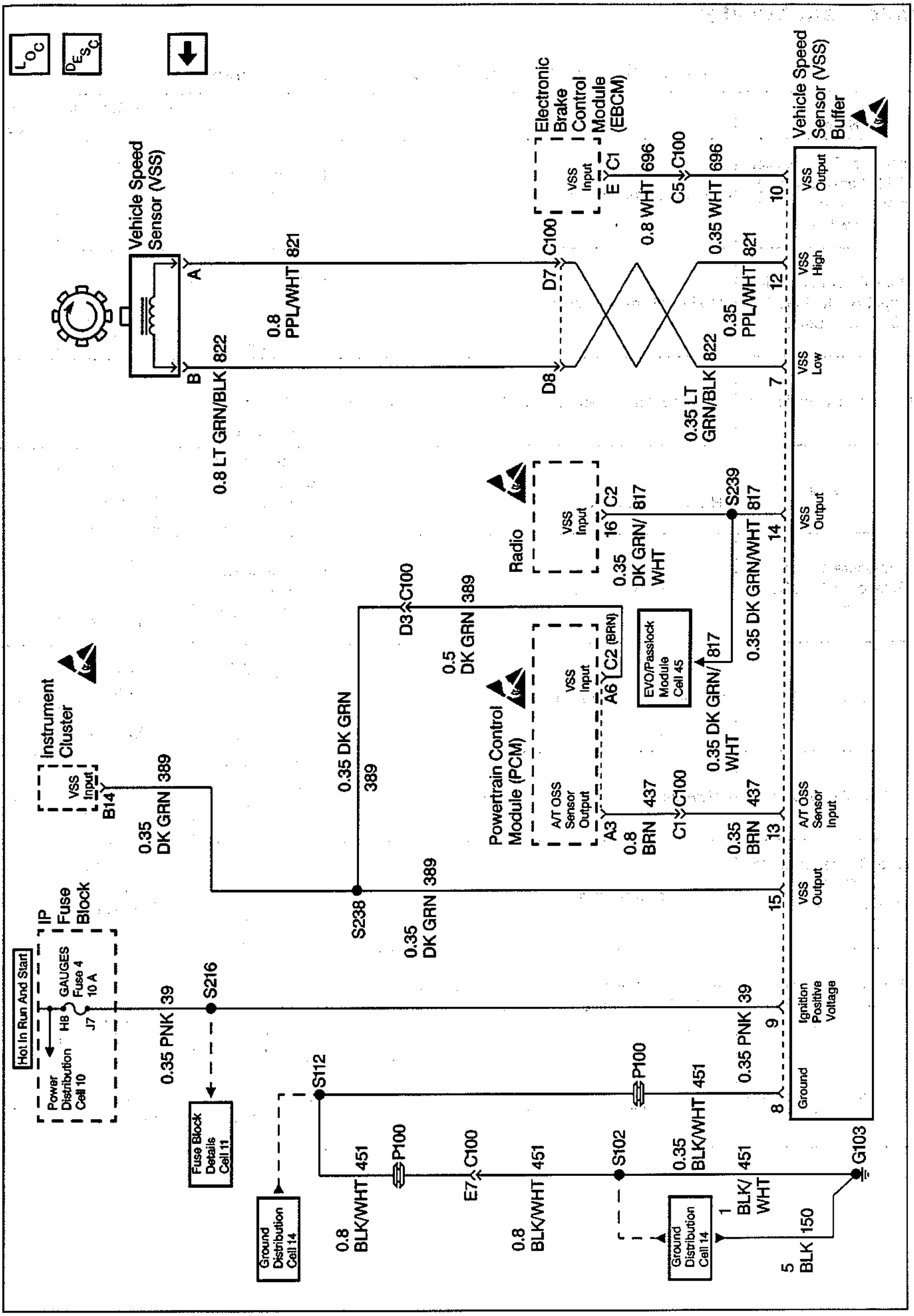


Automatic Transmission Controls Schematics (Diesel Engines) (PWR, Solenoids, TCC/Stoplamp Controls)
176109
Hot At All Times
Hot In Run And Start
Hot In Run
Hot In Off, Run And Start
Power Distribution Cell 10
ECM B Fuse 20 A
F11
G12
FUEL SOL Fuse 20 A
F5
G6
STOP Fuse 1 20 A
B8
C7
TRANS Fuse 20 10 A
D2
E1
Underhood Fuse – Relay Center
IP Fuse Block
1 ORN 440
0.8 PNK 339
1 ORN 140
0.5 PNK 1020
0.35 PNK 1020
S120
S117
Fuse Block Details Cell 11
C2
C100
E
C103
TCC/Stoplamp Switch
Stoplamp Switch
F
Automatic Transmission
0.5 RED 839
A
B
Torque Converter Clutch Pulse Width Modulation Solenoid (TCC PWM SOL) Valve
2–3 Shift Solenoid (2–3 SS) Valve
1–2 Shift Solenoid (1–2 SS) Valve
0.5 BLK 418
0.5 YEL 1223
0.5 LT GRN 1222
S
1 WHT 17
P100
S114
C220
Exterior Lights Cell 10
0.8 BRN 418
0.8 YEL/BLK 1223
0.8 LT GRN 1222
P101
0.8 ORN 440
C13
C11
C3 (BLU)
B10
C2 (BRN)
C5
C6
C4
Battery Positive Voltage (B+)
Ignition Positive Voltage
Stoplamp Switch Input
TCC PWM SOL Valve Control
2–3 SS Valve Control
1–2 SS Valve Control
Powertrain Control Module (PCM)

Automatic Transmission Controls Schematics (Diesel Engines) (Sensor, Solenoid and GND Controls)



Automatic Transmission Controls Schematics (Diesel Engines) (VSS and Sensor Controls)



Component Locator

Automatic Transmission Components (Gas Engines)

Name	Location	Locator View	Connector End View	Group No.
Automatic Transmission Fluid Pressure (TFP) Manual Valve Position Switch	Internal to transmission	*Automatic Transmission Electronic Component Views*	*AT Inline Harness Connector End View*	—
Automatic Transmission Input Shaft Speed (A/T ISS) Sensor	LH side of transmission	*Automatic Transmission Electronic Component Views*	*AT Inline Harness Connector End View*	—
Automatic Transmission	Under center of vehicle, attached to rear of engine	Component Location Views in Electrical Diagnosis	—	—
IP Fuse Block	LH lower kick panel	Component Location Views in Electrical Diagnosis	Connector End Views in Electrical Diagnosis	—
Pressure Control Solenoid (PC SOL) Valve	Internal to transmission	*Automatic Transmission Electronic Component Views*	Connector End Views in Electrical Diagnosis	—
Shift Solenoid 1,2,3	Internal to transmission	*Automatic Transmission Electronic Component Views*	Connector End Views in Electrical Diagnosis	—
TCC/Stoplamp Switch	Below center of IP, near brake pedal lever	Component Location Views in Electrical Diagnosis	*AT Inline Harness Connector End View*	—
Torque Convertor Clutch Pulse Width Modulation Solenoid (TCC PWM SOL) Valve	Internal to transmission	*Automatic Transmission Electronic Component Views*	Connector End Views in Electrical Diagnosis	—
Transmission Fluid Temperature (TFT) Sensor	Part of Automatic Transmission Fluid Pressure (TFP) Manual Valve Position Switch. Internal to transmission	*Automatic Transmission Electronic Component Views*	*AT Inline Harness Connector End View*	—
Underhood Fuse—Relay Center	Engine compartment, left fender	Component Location Views in Electrical Diagnosis	Connector End Views in Electrical Diagnosis	—

Automatic Transmission Components (Gas Engines) (cont'd)

Name	Location	Locator View	Connector End View	Group No.
Vehicle Control Module (VCM)	Engine compartment, LH fender	Component Views in Engine Controls	*VCM Connector End Views*	—
Vehicle Speed Sensor (VSS)	LH side of transmission	*Automatic Transmission Electronic Component Views*	*AT Inline Harness Connector End View*	—
C100	LH rear of engine compartment at bulkhead	Component Location Views in Electrical Diagnosis	Connector End Views in Electrical Diagnosis	—
C103	LH on transmission	Component Location Views in Electrical Diagnosis	*AT Inline Harness Connector End View*	—
S120 (5.0L, 5.7L)	Engine harness, approx 4cm from C100 breakout toward ECT sensor breakout	—	—	—
S120	Engine harness, approx 19cm from C100 breakout toward EGR sensor breakout	—	—	—
S132 (5.0L, 5.7L)	Engine harness, approx 8cm into fuel injector harness breakout	—	—	—
S132	Engine harness, appox 4cm from EGR valve breakout toward knock sensor breakout	—	—	—
S133 (5.0L, 5.7L)	Engine harness, approx 15cm into fuel injector harness breakout	—	—	—
S136 (5.0L, 5.7L)	Engine harness, approx 7cm RH HO2 sensor breakout toward fuel injector breakout	—	—	—
S136	Engine harness, approx 7cm from engine coolant temperature sensor toward EGR valve breakout	—	—	—
S137 (5.0L, 5.7L)	Engine harness approx 17cm from ECT sensor breakout toward C100	—	—	—
S154 (5.0L, 5.7L)	Engine harness 20cm from fuel injector breakout towards G103 breakout	—	—	—
S154	Engine harness 27cm from MAF sensor breakout towards underhood fuse-relay center	—	—	—
S210	IP harness, approx 4 cm into TCC/Stoplamp switch breakout	—	—	—
S231	IP harness, approx 2.5 cm from convenience center breakout	—	—	—

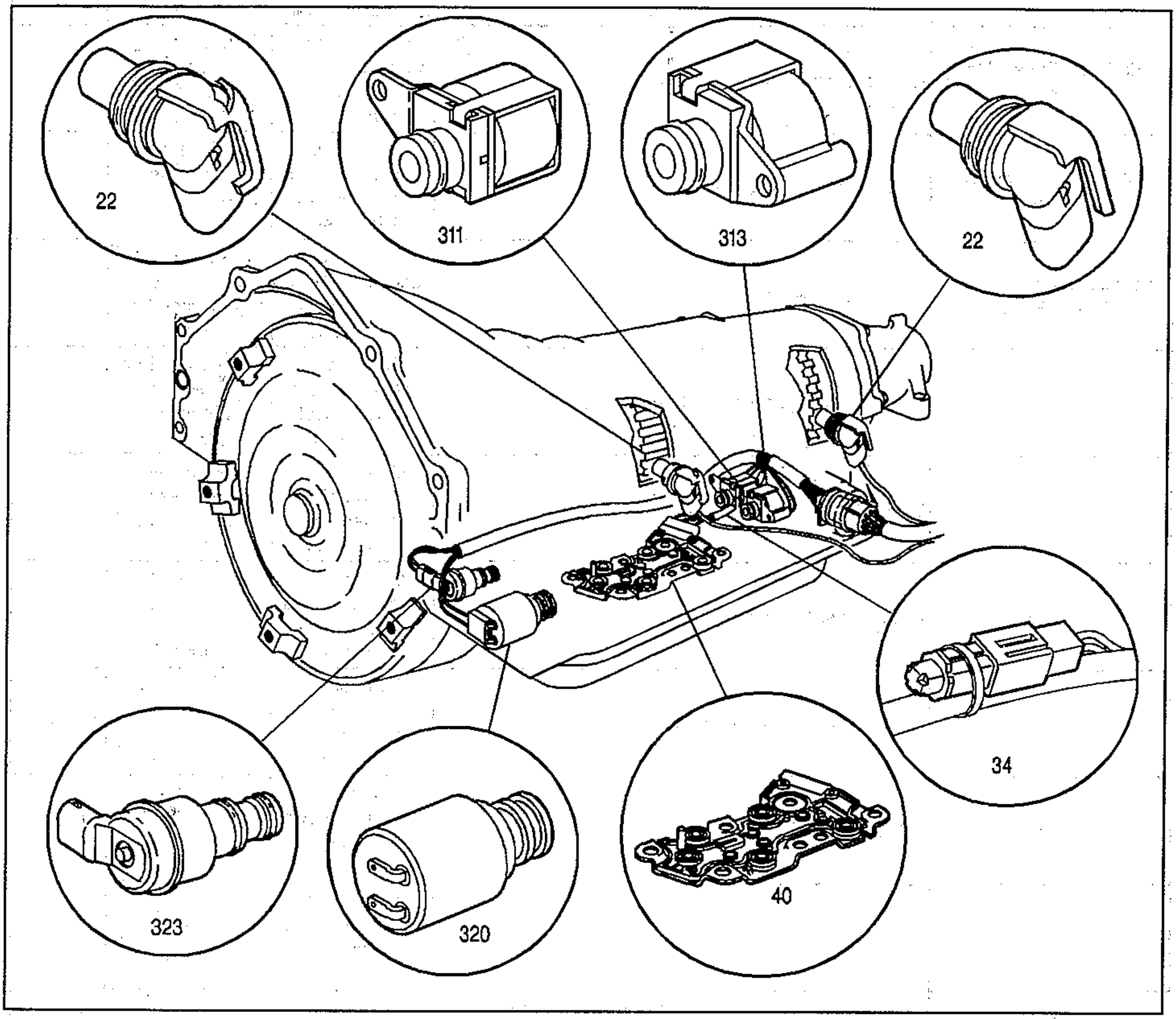
Automatic Transmission Components (Diesel Engines)

Name	Location	Locator View	Connector End View	Group No.
Automatic Transmission Fluid Pressure (TFP) Manual Valve Position Switch	Internal to transmission	*Automatic Transmission Electronic Component Views*	*AT Internal Connector End Views*	—
Automatic Transmission Input Shaft Speed (A/T ISS) Sensor	LH side of transmission	*Automatic Transmission Electronic Component Views*	*AT Inline Harness Connector End View*	—
Automatic Transmission	Under center of vehicle, attached to rear of engine	Component Location Views in Electrical Diagnosis	—	—
Electronic Brake Control Module (EBCM)	LH frame rail near center of vehicle	*Antilock Brakes System Component Views*	*Antilock Brakes System Connector End Views*	—
Instrument Cluster	LH side of IP	Component Location Views in Electrical Diagnosis	Connector End Views in Electrical Diagnosis	—
Pressure Control Solenoid (PC SOL) Valve	Internal to transmission	*Automatic Transmission Electronic Component Views*	*AT Internal Connector End Views*	—
Powertrain Control Module (PCM)	Behind center of IP	Component Location Views in Electrical Diagnosis	*PCM Connector End Views*	—
Radio	Center of I/P	Component Location Views in Electrical Diagnosis	Connector End Views in Electrical Diagnosis	—
Shift Solenoid 1,2,3	Internal to transmission	*Automatic Transmission Electronic Component Views*	*AT Internal Connector End Views*	—
TCC/Stoplamp Switch	Below center of IP, near brake pedal lever	Component Location Views in Electrical Diagnosis	*AT Inline Harness Connector End View*	—
Torque Convertor Clutch Pulse Width Modulation Solenoid (TCC PWM SOL) Valve	Internal to transmission	*Automatic Transmission Electronic Component Views*	*AT Internal Connector End Views*	—
Transmission Fluid Temperature (TFT) Sensor	Part of Automatic Transmission Fluid Pressure (TFP) Manual Valve Position Switch. Internal to transmission	*Automatic Transmission Electronic Component Views*	*AT Internal Connector End Views*	—

Automatic Transmission Components (Diesel Engines) (cont'd)

Name	Location	Locator View	Connector End View	Group No.
Underhood Fuse—Relay Center	Engine compartment, left fender	Component Location Views in Electrical Diagnosis	Connector End Views in Electrical Diagnosis	—
Vehicle Speed Sensor (VSS)	LH side of transmission	Component Location Views in Electrical Diagnosis	*AT Inline Harness Connector End View*	—
Vehicle Speed Sensor (VSS) Buffer	Below LH side of IP, near steering column	Component Location Views in Electrical Diagnosis	*AT Inline Harness Connector End View*	—
C100	LH rear of engine compartment at bulkhead	Component Location Views in Electrical Diagnosis	Connector End Views in Electrical Diagnosis	—
C103	LH on transmission	Component Location Views in Electrical Diagnosis	*AT Inline Harness Connector End View*	—
C220	IP harness, RH side of IP	Component Location Views in Electrical Diagnosis	Connector End Views in Electrical Diagnosis	—
G103	Engine harness, at generator bracket	Component Location Views in Electrical Diagnosis	—	—
P100	LH rear of engine compartment at bulkhead	Component Location Views in Electrical Diagnosis	—	—
P101	Under RH side of IP	Component Location Views in Electrical Diagnosis	—	—
S102	Engine harness, approx 4cm from main harness breakout that leads to blower motor toward C100	—	—	—
S112	IP harness, approx 40cm from C100 toward P102	—	—	—
S114	IP harness, approx 14cm from C100 toward P102	—	—	—
S117	Engine harness, approx 11cm into main harness breakout that leads to blower motor resistor/relay and starter solenoid breakouts	—	—	—
S120	Engine harness, approx 4cm into main harness breakout that leads to blower motor resistor and starter solenoid breakouts	—	—	—
S124	Engine harness, approx 15cm from C107 breakout toward C100 breakout	—	—	—
S216	IP harness, approx 8cm from C200 breakout toward instrument cluster breakout	—	—	—
S238	IP harness, approx 4cm from instrument cluster breakout toward IP relay center	—	—	—
S239	IP harness, approx 17cm into VSSB breakout	—	—	—

Automatic Transmission Electronic Component Views

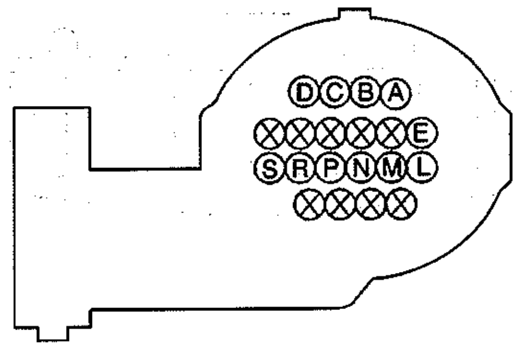


Legend

(313) 1-2 Shift Solenoid Valve (1-2 SS Valve)
(22 (right)) Automatic Transmission Output (Shaft) Speed Sensor (A/T OSS Sensor)
(34) Automatic Transmission Fluid Temperature Sensor (TFT Sensor)
(40) Automatic Transmission Fluid Pressure Manual Valve Position Switch (TFP Val. Position Sw.)
(320) Pressure Control Solenoid Valve (PC Sol. Valve)
(323) Torque Converter Clutch Pulse Width Modulation Solenoid Valve (TCC PWM Sol. Valve)
(22 (left)) Automatic Transmission Input (Shaft) Speed Sensor (A/T ISS Sensor)
(311) 2-3 Shift Solenoid (2-3 SS Valve)

AT Inline Harness Connector End View

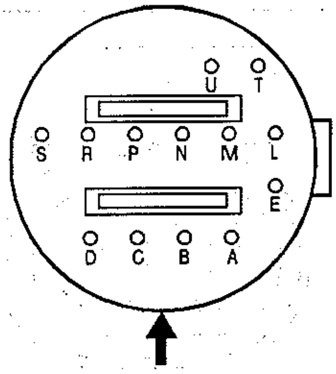
Inline Harness Connector C103, Engine Side



68781

Connector Part Information	• 12160490 • 20MF Micro-Pack 100W Series • (Gray)		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	LT GRN	1222	1-2 Shift Solenoid (1-2 SS) Valve Control
B	YEL/BLK	1223	2-3 Shift Solenoid (2-3 SS) Valve Control
C	RED/BLK	1228	Pressure Control Solenoid (PC Sol.) Valve HIGH
D	LT BLU/WHT	1229	PC Sol. Valve LOW
E	PNK	1020	Fuse Output - Type III Fuse (Off, Run, Crank)
L	YEL/BLK	1227	Transmission Fluid Temperature (TFT) Sensor HIGH
M (Gas)	BLK	470	TFT Sensor LOW
M (Diesel)	BLK	452	TFT Sensor LOW
N	PNK	1224	Range Signal A
P	RED	1226	Range Signal C
R	DK BLU	1225	Range Signal B
S	BRN	418	Torque Converter Clutch Solenoid (TCC Sol.) Valve Control

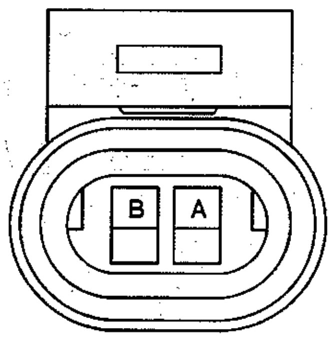
Inline Harness Connector C103, Transmission Side



13270

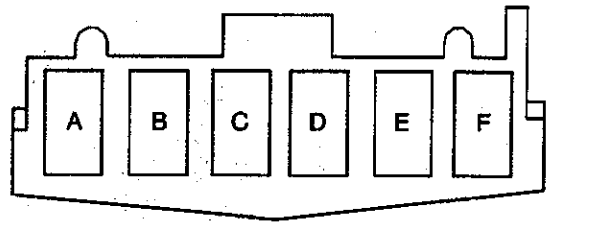
Connector Part Information	• 12146483 • 20M Micro-Pack 100W Series • (Gray)		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	LT GRN	1222	1-2 Shift Solenoid (1-2 SS) Valve Control
B	YEL	1223	2-3 Shift Solenoid (2-3 SS) Valve Control
C	PPL	1228	Pressure Control Solenoid (PC Sol.) Valve HIGH
D	LT BLU	1229	PC Sol. Valve LOW
E	RED	839	Fuse Output - Type III Fuse (Off, Run, Crank)
L	BRN	1227	Transmission Fluid Temperature (TFT) Sensor HIGH
M (Gas)	GRY	452	TFT Sensor LOW
M (Diesel)	GRY	452	TFT Sensor LOW
N	PNK	1224	Range Signal A
P	ORN	1226	Range Signal C
R	DK BLU	1225	Range Signal B
S	BLK	418	Torque Converter Clutch Solenoid (TCC Sol.) Valve Control

Automatic Transmission Input Shaft Speed (A/T ISS) Sensor Connector



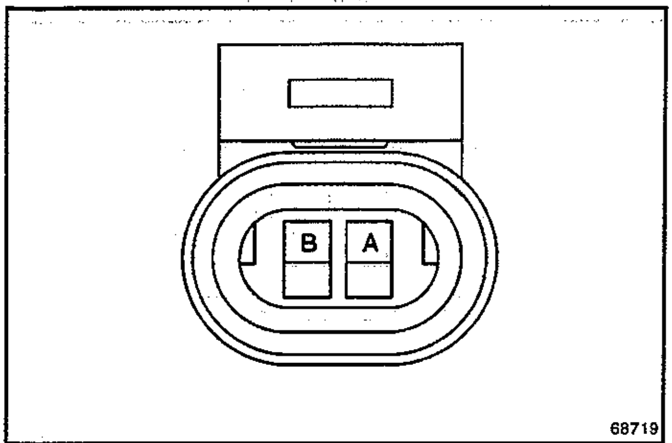
Connector Part Information	• 12162194 • ASM 2F M/P 150.2 P2S (BLACK)		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	RED/BLK	1230	Transmisson Input Speed Sensor Signal Low
B	DK BLU/WHT	1231	Transmisson Input Speed Sensor Signal High

TCC/Stoplamp Switch



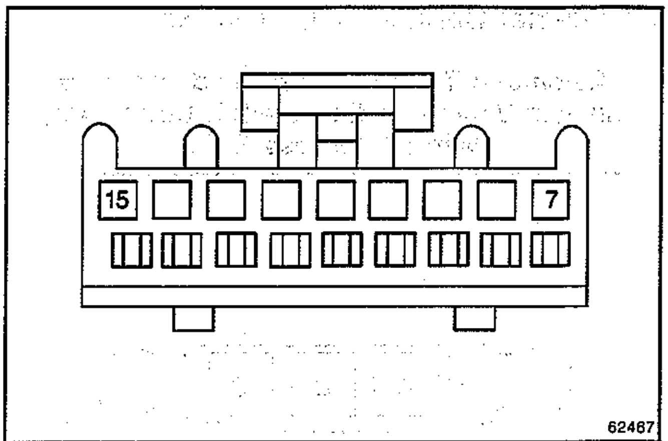
Connector Part Information	• 12040551 • 6F M/P 480 (BLACK)		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	BRN	1135	Brake transmission Shift Interlock SOL Feed
B	LT GRN	275	Trans Mounted Neutral Safty Switch Output
C	PPL	420	Brake Pedal Switch Output (TCC)
D	BLK/WHT	441	Fuse Output - IGN 3 - Type III Fuse
E	WHT	140	Fuse Output - Battery - Type III Fuse
F	WHT	17	Stoplamp Switch Output

Vehicle Speed Sensor



Connector Part Information	• 12162194 • ASM 2F M/P 150.2 P2S (BLACK)		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	PPL/WHT	821	Vehicle Speed Sensor Signal
B	LT GRN/BLK	822	Vehicle Speed Sensor Return

Vehicle Speed Sensor (VSSB) Buffer

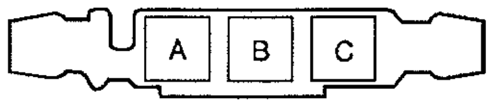


Connector Part Information	• 12066130 • ASM 9F MIC/P 100 (NATURAL)		
Pin	**Wire Color**	**Circuit No.**	**Function**
7	LT GRN/BLK	822	VSS Return
8	BLK/WHT	451	Ground
9	PNK	39	Fuse Output - Ign 1 - Type III Fuse
10	WHT	696	Brake Control to Cluster SPO Signal
11	—	—	—
12	PPL/WHT	821	Vehicle Speed Sensor Signal
13	BRN	437	Vehicle Speed Signal
14	DK GRN/WHT	817	Vehicle Speed Signal (4000 Pulses Per Mile)
15	DK GRN	389	Vehicle Speed Signal (4000 Pulses Per Mile)

Visual Identification

AT Internal Connector End Views

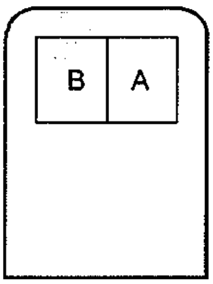
Automatic Transmission Fluid Pressure Manual Valve Position Switch Connector, Wiring Harness Side



177157

Connector Part Information	• 12162200 • Conn 3F M/P 150.2 P2S • RED		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	0.8 PNK	1224	Range Signal A Input
B	0.8 DK BLU	1225	Range Signal B Input
C	0.8 ORN	1226	Range Signal C Input

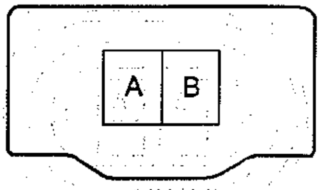
1–2 Shift Solenoid Valve Connector, Wiring Harness Side



168428

Connector Part Information	• 12162201 • Conn 2F M/P 150.2 P2S • NAT		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	0.8 LT GRN	1222	1-2 Shift Solenoid (1-2 SS) Valve Control
B	0.8 RED	839B	Transmission Solenoid Power

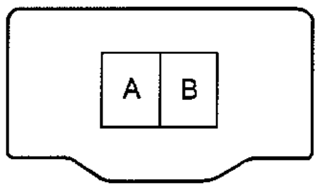
2–3 Shift Solenoid Valve Connector, Wiring Harness Side



177158

Connector Part Information	• 12162205 • Conn 2F M/P 150.2 P2S • MDGRA		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	0.8 RED	839A	Transmission Solenoid Power
B	0.8 YEL	1223	2-3 Shift Solenoid (2-3 SS) Valve Control

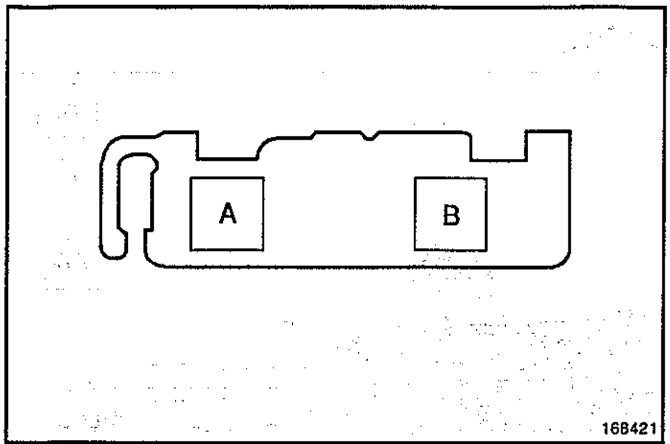
Torque Converter Clutch Pulse Width Modulated (TCC PWM) Solenoid Valve Connector, Wiring Harness Side



177158

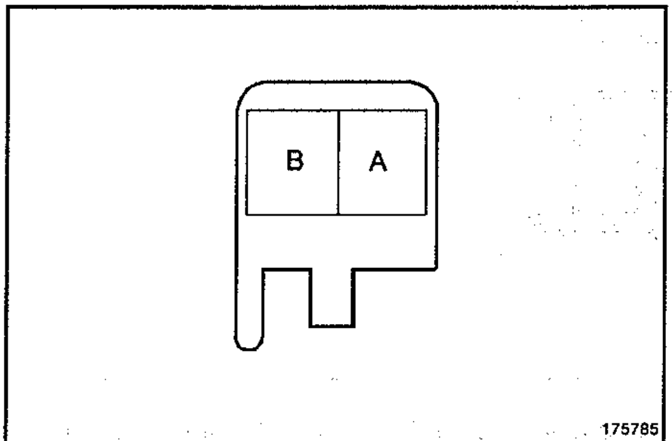
Connector Part Information	• 12162205 • Conn 2F M/P 150.2 P2S • MDGRA		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	0.8 RED	839C	Transmission Solenoid Power
B	0.8 BLK	418	Torque Converter Clutch Pulse Width Modulated Solenoid (TCC PWM Sol.) Valve

Pressure Control Solenoid Valve Connector, Wiring Harness Side



Connector Part Information	• 12146800 • Conn 2F M/P 480 SPL • NAT		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	0.8 PPL	1228	Pressure Control Solenoid (PC Sol.) Valve HIGH Control
B	0.8 LT BLU	1229	PC Sol. Valve LOW Control

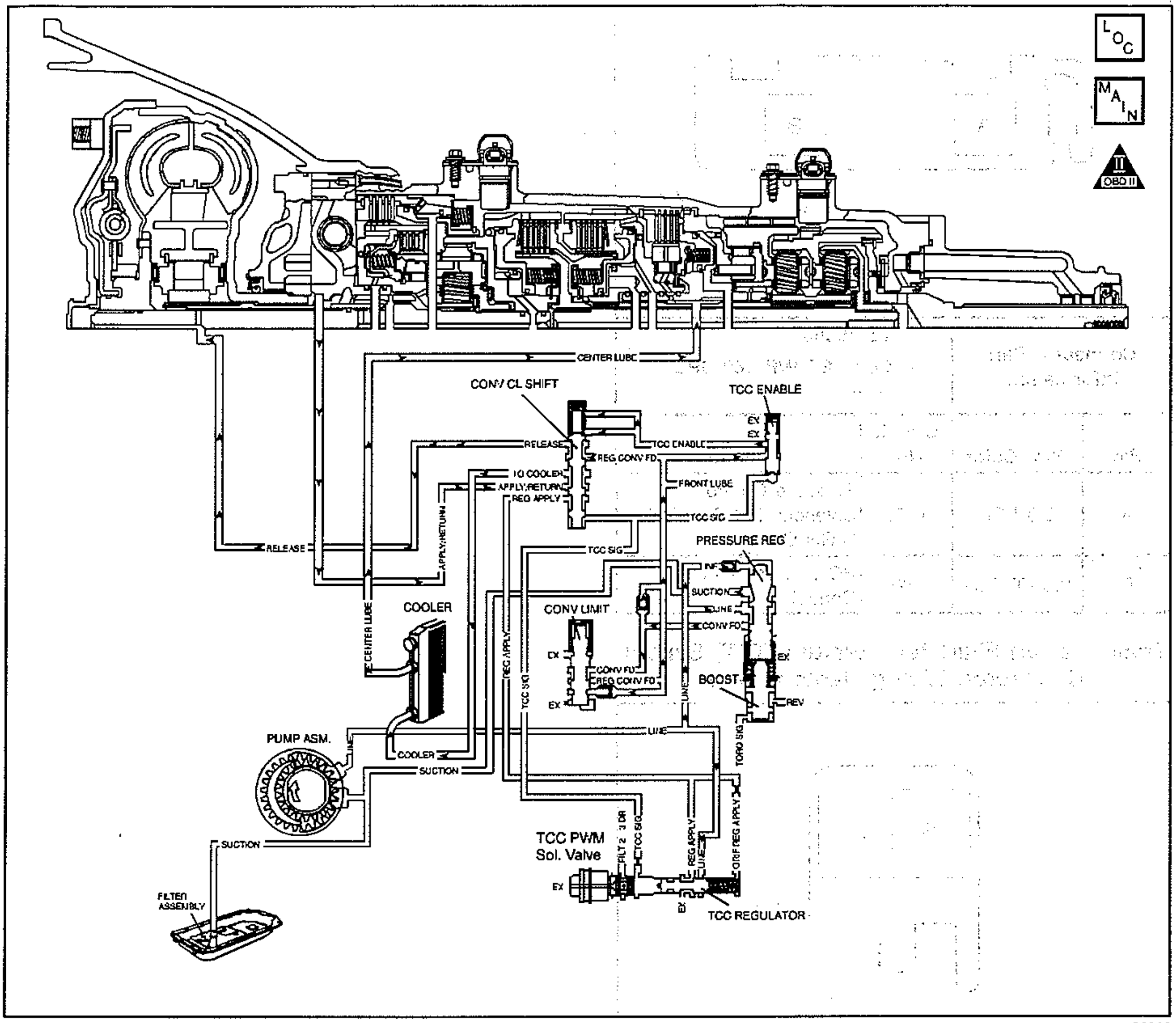
Transmission Fluid Temperature (TFT) Sensor Connector, Wiring Harness Side



Connector Part Information	• 12047662 • CONN 2F M/P 150 • BLK		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	0.8 BRN	1227	Transmission Fluid Temperature (TFT) Sensor Signal
B	0.8 GRY	452	TFT Sensor Ground

Diagnostic Information and Procedures

DTC P0218 Transmission Fluid Overtemperature (Gas)



199392

Circuit Description

The flow of transmission fluid starts in the transmission pan. It is then drawn through the filter and transmission case into the oil pump assembly. The oil pump assembly pressurizes the fluid (line pressure), which becomes the main supply line of fluid. This fluid is directed to various components and hydraulic circuits within the transmission. The pressure regulator valve receives this fluid and directs it to the converter clutch shift valve. The converter clutch shift valve directs hot fluid leaving the torque converter or regulated converter feed fluid, through the cooler line to the transmission oil cooler. The transmission oil cooler is located in the radiator. The vehicle may also be equipped with an auxiliary oil cooler. The cooled fluid (center lube) is returned to the transmission trough the return cooler line and into center lube port of the transmission.

The Automatic Transmission Fluid Temperature (TFT) Sensor, senses the fluid temperature in the transmission pan.

If the Vehicle Control Module (VCM) detects a high TFT for a long period of time, then DTC P0218 sets. DTC P0218 is a type D DTC.

Conditions for Setting the DTC

- No TFT Sensor DTCs P0712 or P0713.
- The TFT is greater than 130°C (266°F).
- All conditions are met for 410 seconds.

Action Taken When the DTC Sets

- The VCM does not illuminate the Malfunction Indicator Lamp (MIL).

- The VCM freezes shift adapts from being updated.
- DTC P0218 is stored in the VCM history.

Conditions for Clearing the DTC

- A scan tool can clear the DTC from the VCM history. The VCM clears the DTC from the VCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The VCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the VCM.

Diagnostic Aids

- Inspect the cooling system fluid level and condition.
- Verify the customer's driving habits, such as trailer towing, etc...
- The scan tool Trans. Fluid Temp. (TFT) should rise steadily during warm-up cycles then stabilize.
- DTC P0218 may set approximately 600 seconds after DTC P0711 has set. Follow the diagnostic table for DTC P0711 before proceeding to the diagnostic table for DTC P0218. Repairing the condition that set DTC P0711 will likely eliminate DTC P0218.
- First diagnose and clear any engine DTCs or TP Sensor codes that are present. Then inspect for any transmission DTCs that may have reset.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

3. DTC P0711 may also set a DTC P0218. Go to the DTC P0711 table for diagnosis.
4. This step inspects for air restrictions and loss of transmission fluid flow, causing an extremely high TFT.

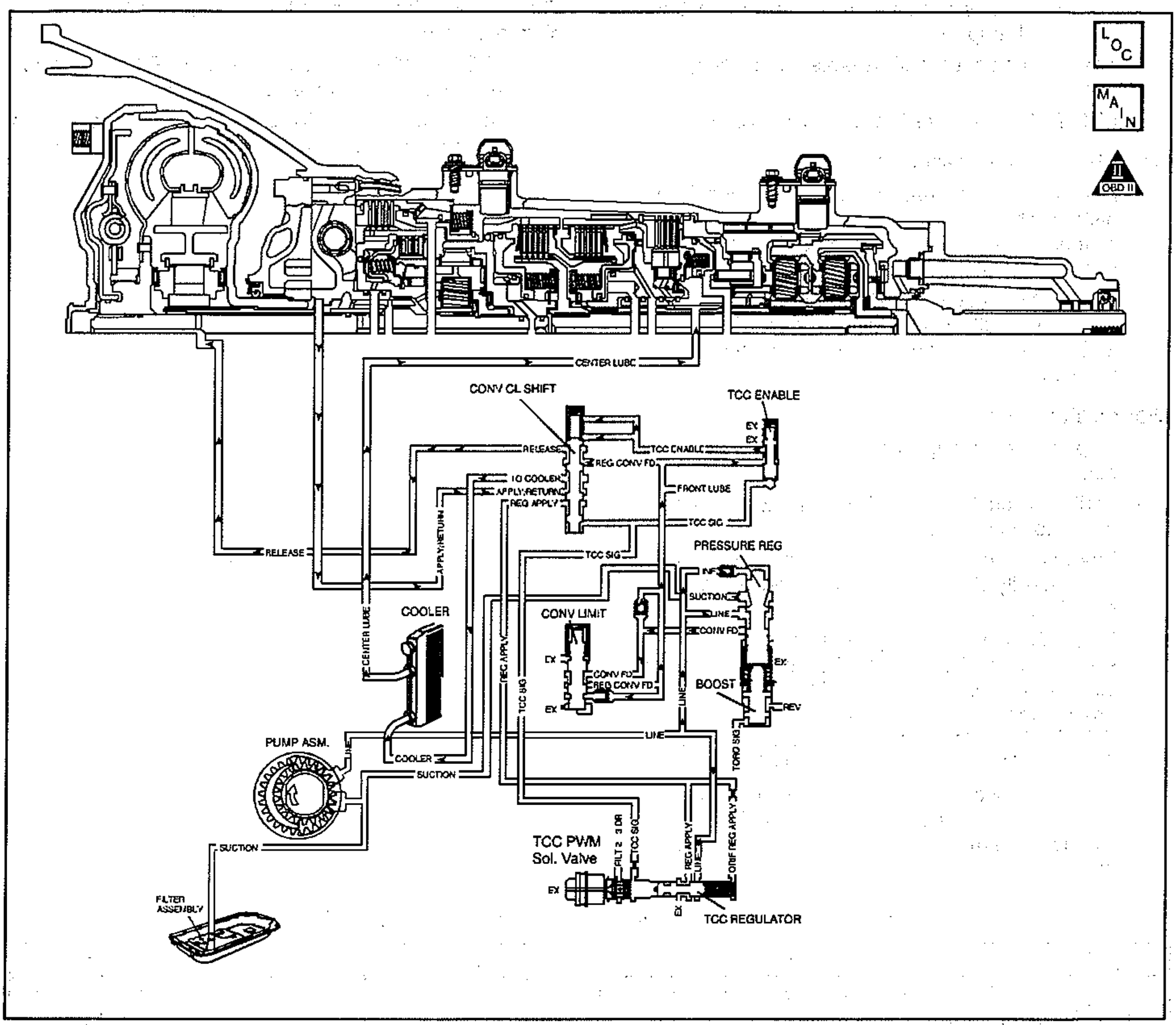
DTC P0218 Transmission Fluid Overtemperature (Gas)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check* (4.3L) or *Powertrain OBD System Check* (5.7L) or *Powertrain OBD System Check* (7.4L)
2	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Freeze Frame and Failure Records for reference. Using the Clear Info function erases the stored Failure Records from the VCM. 3. Record the DTC Failure Records then clear the DTC. 4. Perform the Transmission Fluid Checking Procedure. Refer to *Transmission Fluid Checking Procedure* Was the Transmission Fluid Checking Procedure performed?	—	*Go to Step 3*	Go to *Transmission Fluid Checking Procedure*

DTC P0218 Transmission Fluid Overtemperature (Gas) (cont'd)

Step	Action	Value(s)	Yes	No
3	Is DTC P0711 also set?	—	Go to Diagnostic Aids	*Go to Step 4*
4	1. Inspect the engine cooling system for the following conditions: • Air flow restrictions • Air flow blockage • Debris 2. Inspect the transmission cooling system for the following conditions: • Air flow restrictions • Air flow blockage • Debris • Damaged cooler lines or hoses • Low A/T Fluid cooler flow. Refer to *AT Oil Cooler Flow Test* Was a condition found?	—	Go to Step 7	*Go to Step 5*
5	Perform the Line Pressure Check Procedure. Refer to *Line Pressure Check Procedure.* Was a condition found?	—	*Go to Step 7*	*Go to Step 6*
6	Inspect the torque converter stator for damage. Refer to the *Torque Converter Clutch Diagnosis* Was a condition found?	—	*Go to Step 7*	Go to *Transmission Overheats*
7	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle under the following conditions. • Turn the ignition switch to the RUN position. • The TFT must be less than 129°C (265°F) for at least 5 seconds. 4. Select Specific DTC. Enter DTC P0218. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0218 Transmission Fluid Overtemperature (Diesel)



Circuit Description

The flow of transmission fluid starts in the transmission pan. It is then drawn through the filter and transmission case into the oil pump assembly. The oil pump assembly pressurizes the fluid (line pressure), which becomes the main supply line of fluid. This fluid is directed to various components and hydraulic circuits within the transmission. The pressure regulator valve receives this fluid and directs it to the converter clutch shift valve. The converter clutch shift valve directs hot fluid leaving the torque converter or regulated converter feed fluid, through the cooler line to the transmission oil cooler. The transmission oil cooler is located in the radiator. The vehicle may also be equipped with an auxiliary oil cooler. The cooled fluid (center lube) is returned to the transmission trough the return cooler line and into center lube port of the transmission. The Automatic Transmission Fluid Temperature (TFT) Sensor, senses the fluid temperature in the transmission pan.

If the Powertrain Control Module (PCM) detects a high TFT for a long period of time, then DTC P0218 sets. DTC P0218 is a type D DTC.

Conditions for Setting the DTC

- No TFT Sensor DTCs P0712 or P0713.
- The TFT is greater than 130°C (266°F).
- All conditions are met for 410 seconds.

Action Taken When the DTC Sets

- The PCM does not illuminate the Malfunction Indicator Lamp (MIL).
- The PCM freezes shift adapts from being updated.
- DTC P0218 is stored in the PCM history.

Conditions for Clearing the DTC

- A scan tool can clear the DTC from the PCM history. The PCM clears the DTC from the PCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The PCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the PCM.

Diagnostic Aids

- Inspect the cooling system fluid level and condition.
- Verify the customer's driving habits, such as trailer towing, etc...
- The scan tool Trans. Fluid Temp. (TFT) should rise steadily during warm-up cycles then stabilize.
- DTC P0218 may set approximately 600 seconds after DTC P0711 has set. Follow the diagnostic table for DTC P0711 before proceeding to the diagnostic table for DTC P0218. Repairing the condition that set DTC P0711 will likely eliminate DTC P0218.
- First diagnose and clear any engine DTCs or TP Sensor codes that are present. Then inspect for any transmission DTCs that may have reset.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

3. DTC P0711 may also set a DTC P0218. Go to the DTC P0711 table for diagnosis.
4. This step inspects for air restrictions and loss of transmission fluid flow, causing an extremely high TFT.

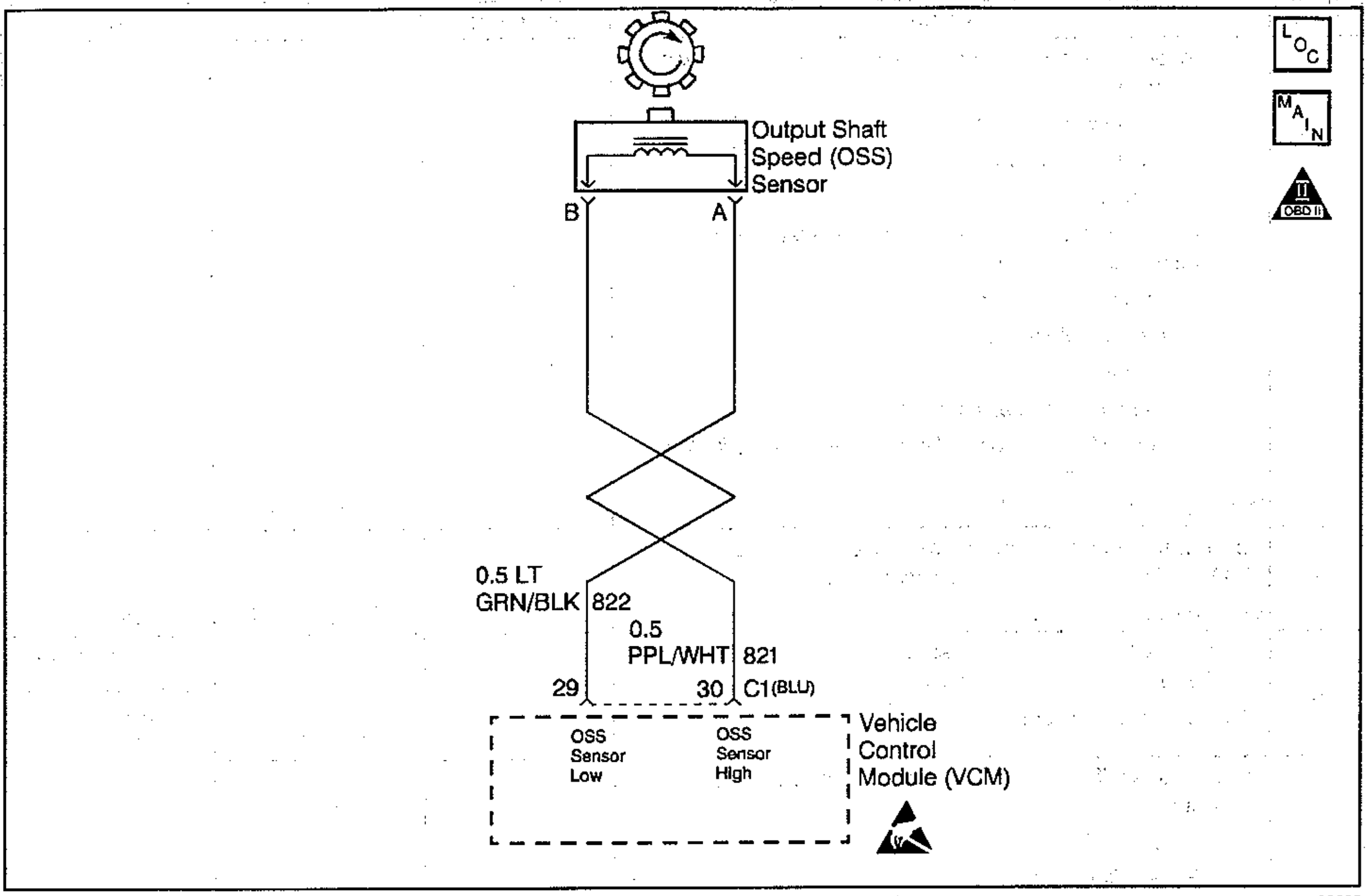
DTC P0218 Transmission Fluid Overtemperature (Diesel)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	Go to Step 2	Go to *Powertrain OBD System Check*
2	1. Install the *scan tool*. 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Freeze Frame and Failure Records for reference. Using the Clear Info function erases the stored Failure Records from the PCM. 3. Record the DTC Failure Records then clear the DTC. 4. Perform the transmission fluid checking procedure. Refer to 4L80-E *Transmission Fluid Checking Procedure.* Was the fluid checking procedure performed?	—	*Go to Step 3*	Go to *Transmission Fluid Checking Procedure*
3	Is DTC P0711 also set?	—	Go to Diagnostic Aids	*Go to Step 4*

DTC P0218 Transmission Fluid Overtemperature (Diesel) (cont'd)

Step	Action	Value(s)	Yes	No
4	1. Inspect the engine cooling system for the following conditions: • Air flow restrictions • Air flow blockage • Debris 2. Inspect the transmission cooling system for the following conditions: • Air flow restrictions • Air flow blockage • Debris • Damaged cooler lines or hoses. • Low A/T fluid cooler flow. Refer to *AT Oil Cooler Flow Test.* Was the condition found?	—	Go to Step 7	*Go to Step 5*
5	Perform the line pressure check procedure. Refer to 4L80-E *Line Pressure Check Procedure.* Was the condition found?	—	*Go to Step 7*	*Go to Step 6*
6	Inspect the torque converter stator for damage. Refer to the *Torque Converter Clutch Diagnosis.* Was the condition found?	—	*Go to Step 7*	Go to System Diagnosis Table Transmission Overheating
7	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle under the following conditions. • Turn the ignition switch to the RUN position. • The TFT must be less than 129°C (264°F) for at least 5 seconds. 4. Select Specific DTC. Enter DTC P0218. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1.*

DTC P0502 Vehicle Speed Sensor Circuit Low Input (Gas Only)



69908

Circuit Description

The Output Shaft Speed Sensor (OSS Sensor), which is a Permanent Magnet (PM) generator, provides the vehicle speed information to the Vehicle Control Module (VCM). The PM generator produces a pulsing AC voltage as the transmission speed sensors rotor teeth pass through the sensor's magnetic field. The AC voltage level and the number of pulses increase as the speed of the vehicle increases. The VCM then converts the pulsing voltage to a digital signal for vehicle speed. The vehicle speed is used for engine and transmission calculations.

If the VCM detects a low vehicle speed and there is a high engine speed in a drive gear range, DTC P0502 sets. DTC P0502 is a type D DTC. For California emissions, DTC P0502 is a type B DTC.

Conditions for Setting the DTC

- No Mass Air Flow (MAF) sensor DTCs P0101, P0102 or P0103.
- No MAP DTCs P0106, P0107 or P0108.
- No Throttle Position (TP) Sensor DTCs P0122 or P0123.
- No TFP Val. Position Sw. DTC P1810.
- No A/T ISS Sensor DTC P0716 or P0717.
- The engine torque must be 60 N·m (80 lb ft) to the following:
  - 406 N·m (300 lb ft) 4.3L
  - 542 N·m (400 lb ft) 5.7L
  - 677 N·m (500 lb ft) 7.4L
- The A/T ISS is greater than 1500 RPM.
- The gear range is not Park or Neutral.
- TP angle is greater than 10%.
- The engine is running more than 475 RPM for 7 seconds.
- The OSS is less than 50 RPM for at least 4 seconds.

Action Taken When the DTC Sets

- For California emissions, the VCM illuminates the Malfunction Indicator Lamp (MIL).
- The VCM commands maximum line pressure.
- The VCM freezes the shift adapts.
- The VCM defaults a calculated output speed value by using the ISS values.
- DTC P0502 is stored in the VCM history.

Conditions for Clearing the MIL/DTC

- For California emissions, the VCM turns off the MIL after three consecutive trips without a failure reported.
- A scan tool can clear the DTC from the VCM history. The VCM clears the DTC from the VCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The VCM cancels the DTC default actions when the fault no longer exists and the ignition is cycled OFF long enough in order to power down the VCM.

Diagnostic Aids

- DTC P0502 sets when no vehicle speed is detected at the start off.
- Inspect the wiring at the VCM, the OSS Sensor connector and all other circuit connecting points for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation.
  - Moisture intrusion
  - Corrosion
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- First diagnose and clear any engine DTCs or TP Sensor codes. Then inspect for any transmission DTCs that may have reset.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

4. This step tests for voltage in the 822 low circuit.
6. This step tests the 5-volt and ground circuit of the VCM.
11. This step tests the integrity of the OSS Sensor.
13. This step tests the OSS circuit.

DTC P0502 Vehicle Speed Sensor Circuit Low Input (Gas Only)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	Go to Step 2	Go to *Powertrain OBD System Check* (4.3L) or *Powertrain OBD System Check* (5.7L) or *Powertrain OBD System Check* (7.4L)
2	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Freeze Frame and Failure Records for reference. Using the Clear Info function erases the stored Freeze Frame and Failure records from the VCM. 3. Record the DTC Freeze Frame and Failure Records, then clear the DTCs. 4. Raise and support the drive axle assembly. 5. Place the Transmission in neutral. 6. Observe the transmission OSS on the scan tool, while rotating a drive wheel. Ensuring that the drive shaft is rotating, does the Transmission OSS increase with the drive wheel speed?	—	Go to Diagnostic Aids	*Go to Step 3*

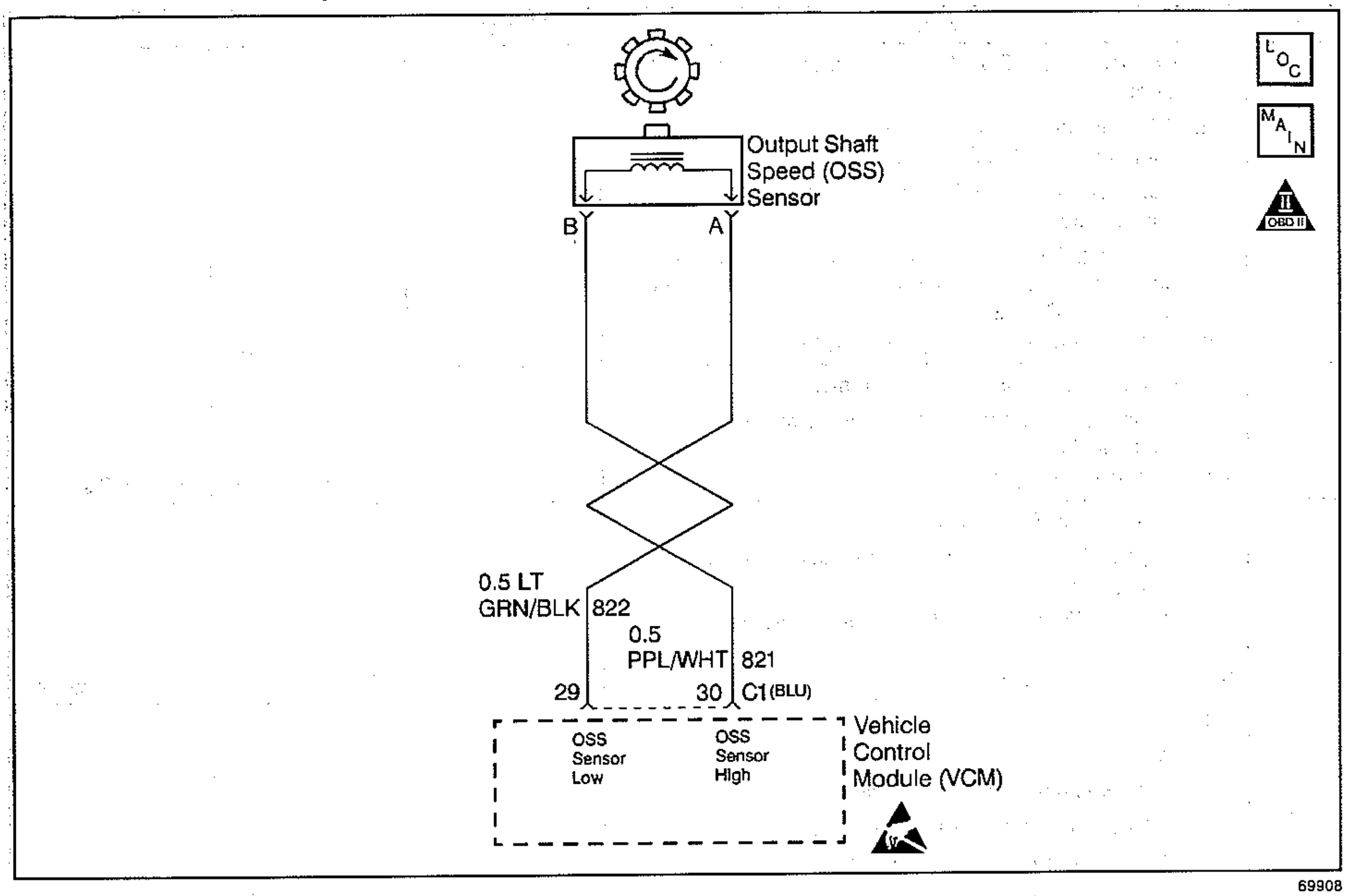
DTC P0502 Vehicle Speed Sensor Circuit Low Input (Gas Only) (cont'd)

Step	Action	Value(s)	Yes	No
3	1. Turn the ignition OFF. 2. Disconnect the OSS Sensor harness connector from the sensor. 3. Turn the ignition switch to the Run position. 4. Using the *J 39200* DMM on DC volts and *J 35616-A* Connector Test Adapter Kit, measure the voltage between the OSS Sensor harness connector terminal A (PPL/WHT) and a good ground. Is the voltage within the specified value?	4.0–5.1 volts DC	*Go to Step 4*	*Go to Step 5*
4	With the ignition switch in the RUN position, measure the voltage between terminal B (GRN/BLK) of the OSS Sensor harness connector and a good ground. Is the voltage less than the specified value?	0.2 volts	*Go to Step 6*	*Go to Step 12*
5	Was the voltage reading in Step 3 greater than the specified value?	5.1 volts	*Go to Step 12*	*Go to Step 7*
6	With the ignition switch in the Run position, measure the voltage between terminals A and B of the OSS Sensor harness connector. Is the voltage within the specified value?	4.0–5.1 volts	*Go to Step 10*	*Go to Step 8*
7	Inspect circuit 821 for high resistance or an open circuit. Refer to General Electrical Diagnosis Procedures. Did you find the condition?	—	*Go to Step 18*	*Go to Step 9*
8	Inspect circuit 822 for an open circuit between the connector and the VCM. Did you find the condition?	—	*Go to Step 18*	*Go to Step 13*
9	Inspect circuit 821 for a short to ground. Did you find the condition?	—	*Go to Step 18*	*Go to Step 13*
10	Using the *J 39200* DMM, measure the resistance between terminals A and B of the OSS Sensor. Is the resistance within the specified value?	1042–2088Ω	*Go to Step 11*	*Go to Step 17*
11	1. Place the transmission in Neutral. 2. With the *J 39200* DMM on terminals A and B, select the AC volts. 3. Rotate the rear wheels ensuring that the driveshaft is turning. Is the voltage greater than the specified value?	0.5 volts AC	*Go to Step 13*	*Go to Step 15*
12	1. Inspect circuit 821 for a short to voltage B+. Refer to General Electrical Diagnosis Procedures. 2. Inspect circuit 822 for a short to voltage B+. Refer to General Electrical Diagnosis Procedures. 3. Inspect circuits 821 and 822 for a short together. Refer to General Electrical Diagnosis Procedures. Did you find the condition?	—	*Go to Step 18*	*Go to Step 14*

DTC P0502 Vehicle Speed Sensor Circuit Low Input (Gas Only) (cont'd)

Step	Action	Value(s)	Yes	No
13	1. Reconnect the OSS Sensor connector to the OSS Sensor. 2. With the ignition OFF disconnect the VCM connector C1 (blue) from the VCM. 3. Connect the *J 39200* DMM to terminals C1–29 and C1–30. 4. While rotating the rear wheels and ensuring that the driveshaft is turning, measure the voltage with the DMM on AC volts. Is the voltage greater than the specified value?	0.5 volts AC	*Go to Step 14*	—
14	1. Inspect the VCM pins for corrosion or poor tension. 2. Inspect the connector C1 terminals for corrosion or poor tension. Did you find the condition?	—	*Go to Step 18*	*Go to Step 16*
15	1. Remove the OSS Sensor. 2. Inspect the Output Shaft Speed Sensor Rotor for damage or misalignment. Refer to Transmission Overhaul Procedure, in Unit Repair. Did you find the condition?	—	*Go to Step 18*	*Go to Step 17*
16	Replace the VCM. Refer to: • *VCM Replacement/Programming* (4.3L) • *VCM Replacement/Programming* (5.7L) • *VCM Replacement/Programming* (7.4L) Is the replacement complete?	—	*Go to Step 18*	—
17	Replace the OSS Sensor. Refer to Speed Sensor Replacement, in On-Vehicle Service. Is the replacement complete?	—	*Go to Step 18*	—
18	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle so that the transmission OSS is greater than 500 RPM for 1 second. 4. Select Specific DTC. 5. Enter DTC P0502. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0503 Vehicle Speed Sensor CKT Intermittent (Gas Only)



Circuit Description

The Output Shaft Speed Sensor (OSS Sensor), which is a Permanent Magnet (PM) generator, provides the vehicle speed information to the Vehicle Control Module (VCM). The PM generator produces a pulsing AC voltage as the transmission speed sensors rotor teeth pass through the sensor's magnetic field. The AC voltage level and the number of pulses increase as the speed of the vehicle increases. The VCM then converts the pulsing voltage to a digital signal for vehicle speed. The vehicle speed is used for engine and transmission calculations.

If the VCM detects a low vehicle speed and there is a high engine speed in a drive gear range, DTC P0503 sets. DTC P0503 is a type D DTC. For California emissions, DTC P0503 is a type B DTC.

Conditions for Setting the DTC

- No TFP Val. Position Sw. DTC P1810.
- No TFP Val. Position Sw. changes in less than 10 seconds.
- The A/T ISS is greater than 1500 RPM.
- The gear range is not Park or Neutral.
- The engine is running more than 475 RPM for 7 seconds.
- No VSS increase greater than 250 RPM within 2 seconds.
- The OSS RPM has dropped more than 1000 RPM for at least 4 seconds.

Action Taken When the DTC Sets

- For California emissions, the VCM illuminates the Malfunction Indicator Lamp (MIL).
- The VCM commands maximum line pressure.
- The VCM freezes the shift adapts.
- The VCM defaults a calculated output speed value by using the ISS values.
- DTC P0503 is stored in the VCM history.

Conditions for Clearing the MIL/DTC

- For California emissions, the VCM turns off the MIL after three consecutive trips without a failure reported.
- A scan tool can clear the DTC from the VCM history. The VCM clears the DTC from the VCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The VCM cancels the DTC default actions when the fault no longer exists and the ignition is cycled OFF long enough in order to power down the VCM.

Diagnostic Aids

- DTC P0503 sets when the VCM detects an OSS loss.
- Inspect the wiring at the VCM, the OSS Sensor connector and all other circuit connecting points for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation.
  - Moisture intrusion
  - Corrosion
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- The vehicle may need to be driven to duplicate the intermittent condition.
- First diagnose and clear any engine DTCs or TP Sensor codes. Then inspect for any transmission DTCs that may have reset.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

3. This step tests the integrity of the OSS Sensor.
5. This step tests for voltage in the 822 low circuit.
7. This step tests the 5-volt and ground circuit of the OSS sensor circuit.
13. This step tests the OSS sensor and the circuit.

DTC P0503 Vehicle Speed Sensor CKT Intermittent (Gas Only)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	Go to Step 2	Go to *Powertrain OBD System Check* (4.3L) or *Powertrain OBD System Check* (5.7L) or *Powertrain OBD System Check* (7.4L)
2	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Freeze Frame and Failure Records for reference. Using the Clear Info function erases the stored Freeze Frame and Failure records from the VCM. 3. Record the DTC Freeze Frame and Failure Records and DTCs. 4. Raise and support the drive axle assembly. 5. Select *scan tool* Transmission OSS. 6. Start the engine and place the transmission selector in D3 range. 7. With the drive wheels rotating, slowly accelerate to 2000 engine RPM and hold. Does the Transmission OSS drop or fluctuate more than the specified value?	1000 RPM	*Go to Step 3*	No fault verified at this time. Go to Diagnostic Aids

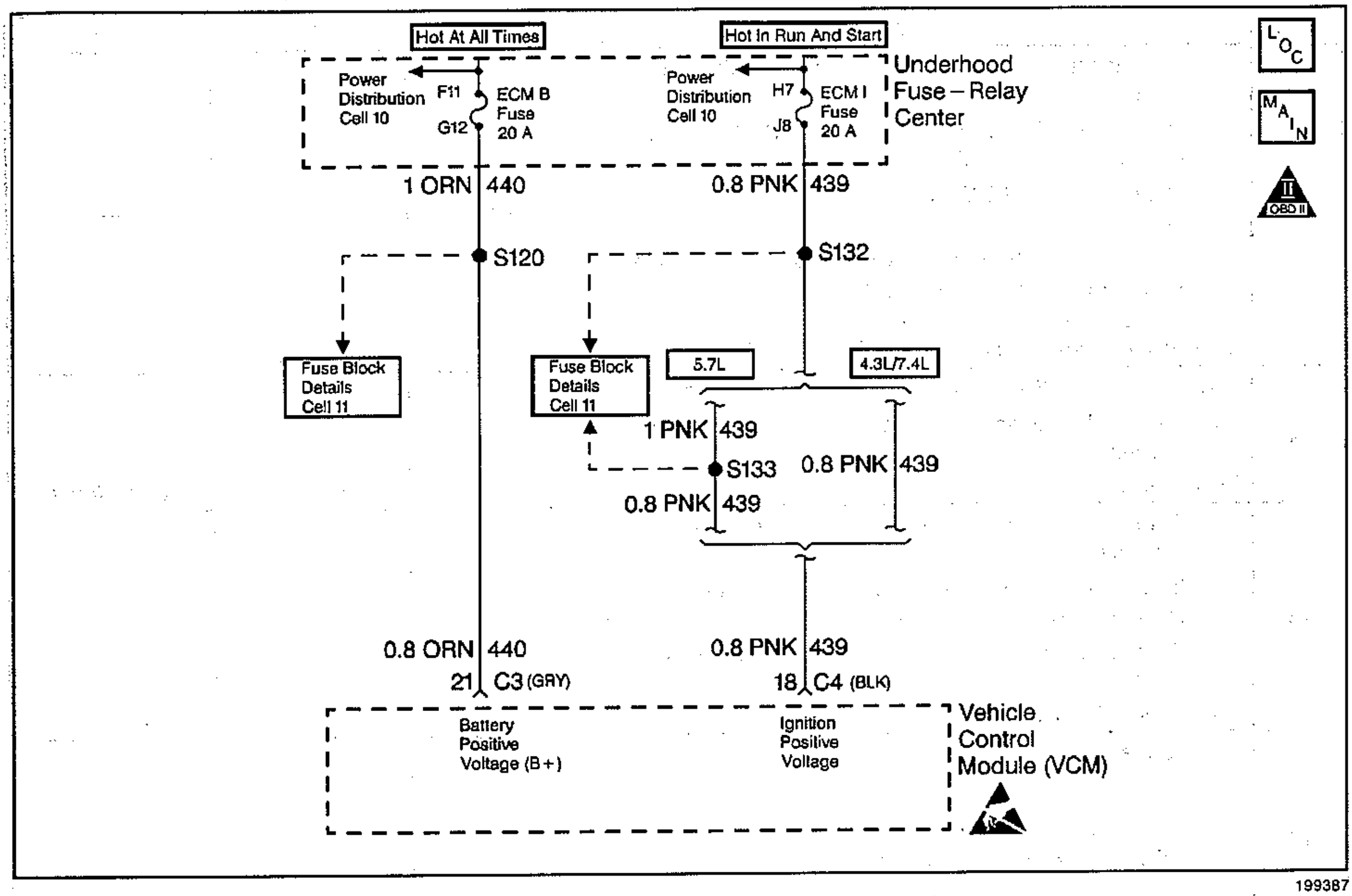
DTC P0503 Vehicle Speed Sensor CKT Intermittent (Gas Only) (cont'd)

Step	Action	Value(s)	Yes	No
3	1. Turn the ignition switch to the OFF position. 2. Disconnect the OSS Sensor harness connector from the OSS sensor. 3. Using a *J 39200* DMM on AC voltage scale, and *J 35616-A* Connector Test Adapter Kit, connect the *J 39200* DMM to terminals A and B on the OSS Sensor. 4. Turn the ignition switch to the Run position and start the engine. 5. Place the transmission selector in D3 range. 6. With the drive wheels rotating, slowly accelerate to 2000 engine RPM and hold. Does the DMM voltage drop or fluctuate at 2000 RPM?	—	*Go to Step 11*	*Go to Step 4*
4	1. With the engine OFF, turn the ignition switch to the RUN position. 2. Using the *J 39200* DMM on DC volts, connected to a good ground, measure the voltage at cavity A, (circuit 821 PPL/WHT), of the OSS Sensor connector. Is the voltage within the specified value and steady?	4.0-5.1 volts DC	*Go to Step 5*	*Go to Step 6*
5	With the ignition switch in the Run position, measure the voltage at cavity B, (circuit 822 GRN/BLK), of the OSS Sensor connector. Is the voltage less than the specified value?	0.2 volts	Go to Step 7	*Go to Step 12*
6	Is the voltage reading in Step 4 greater than the specified value?	5.1 volts	*Go to Step 12*	*Go to Step 8*
7	1. Connect the *J 39200* DMM leads to cavity A and cavity B of the OSS Sensor connector. 2. With the ignition switch in the RUN position, record the voltage. Is the voltage within the specified value and steady?	4.0-5.1 volts DC	*Go to Step 13*	*Go to Step 9*
8	Inspect circuit 821 (PPL/WHT) for high resistance or an open circuit. Refer to General Electrical Diagnosis Procedures. Did you find the condition?	—	*Go to Step 18*	*Go to Step 10*
9	Inspect circuit 822 (GRN/BLK) for high resistance or an open circuit. Refer to General Electrical Diagnosis Procedures. Did you find the condition?	—	*Go to Step 18*	—
10	Inspect circuit 821 (PPL/WHT) for a short to ground. Refer to General Electrical Diagnosis Procedures. Did you find the condition?	—	*Go to Step 18*	*Go to Step 13*
11	Using the *J 39200* DMM, measure the resistance between terminals A and B of the OSS Sensor. Is the resistance within the specified value?	1042-2088Ω	*Go to Step 15*	*Go to Step 17*
12	Inspect circuits 821 and 822 for a short to B+ voltage or shorted together. Refer to General Electrical Diagnosis Procedures. Did you find a shorted condition?	—	*Go to Step 18*	*Go to Step 14*

DTC P0503 Vehicle Speed Sensor CKT Intermittent (Gas Only) (cont'd)

Step	Action	Value(s)	Yes	No
13	1. Reconnect the OSS Sensor connector to the OSS Sensor. 2. With the ignition OFF disconnect the C1 (blue) VCM connector from the VCM. 3. Connect the *J 39200* DMM to terminals C1–29 and C1–30. 4. While rotating the rear wheels by hand and ensuring that the driveshaft is turning, measure the output voltage with the DMM on AC volts. Is the voltage greater than the specified value?	0.5 volts AC	*Go to Step 14*	—
14	1. Inspect the VCM pins for corrosion or poor tension. 2. Inspect the connector terminals for corrosion or poor tension. Did you find a condition?	—	*Go to Step 18*	*Go to Step 16*
15	1. Remove the OSS Sensor. Refer to Speed Sensor Replacement. 2. Inspect the Output Shaft Speed Sensor Rotor for looseness, damage or misalignment. Refer to Transmission Overhaul Procedure, in Unit Repair. Did you find the condition?	—	*Go to Step 18*	*Go to Step 17*
16	Replace the VCM. Refer to: • *VCM Replacement/Programming* (4.3L) • *VCM Replacement/Programming* (5.7L) • *VCM Replacement/Programming* (7.4L) Is the replacement complete?	—	*Go to Step 18*	—
17	Replace the OSS Sensor. Refer to Speed Sensor Replacement, in On-Vehicle Service. Is the replacement complete?	—	*Go to Step 18*	—
18	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle so that the transmission OSS is greater than 500 RPM with no RPM change greater than 450 for one second. 4. Select Specific DTC. Enter DTC P0503. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0560 System Voltage Malfunction (Gas)



Circuit Description

Circuits 439 is the ignition voltage feed for the Vehicle Control Module (VCM). Circuit 440 is the battery voltage feed for the VCM.

If the VCM detects a low voltage, a high voltage for a long time, or a high voltage for a short amount of time, then DTC P0560 sets. DTC P0560 is a type D DTC.

Conditions for Setting the DTC

System Voltage Low:

- The engine speed is greater than 1500 RPM.
- One of the following conditions exists for greater than 15 seconds.
  - The system voltage is less than 10.5 volts at a maximum transmission temperature of 152°C (305°F) or:
  - The system voltage is less than 6.7 volts at a minimum transmission temperature of -40°C (-40°F).

System Voltage High:

The system voltage is greater than 19 volts for 10 seconds.

Action Taken When the DTC Sets

- The VCM does not illuminate the Malfunction Indicator Lamp (MIL).
- The VCM causes an immediate landing to second gear.
- The VCM turns off the PC Sol. Valve.
- The VCM inhibits the TCC engagement.
- The VCM freezes the shift adapts.
- DTC P0560 is stored in VCM history.

Conditions for Clearing the DTC

- A scan tool can clear the DTC from the VCM history. The VCM clears the DTC from the VCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The VCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the VCM.

Diagnostic Aids

- Charging the battery with a battery charger and jumpstarting an engine may set this DTC.
- If this DTC is set when an accessory is operated, inspect for faulty connections or an excessive current draw.
- Inspect for faulty electrical connections at the starter solenoid.
- Inspect for faulty electrical connections at the fusible link.
- Inspect for loose or damaged terminals at the generator.
- Inspect the generator belt condition and tension.
- First diagnose and clear any engine DTCs or TP Sensor codes that are present. Then inspect for any transmission DTCs that may have reset.

Test Description

4. This step tests the charging system voltage.
5. This step tests the battery voltage input at the VCM.
6. This step tests the ignition voltage and battery voltage inputs at the VCM.

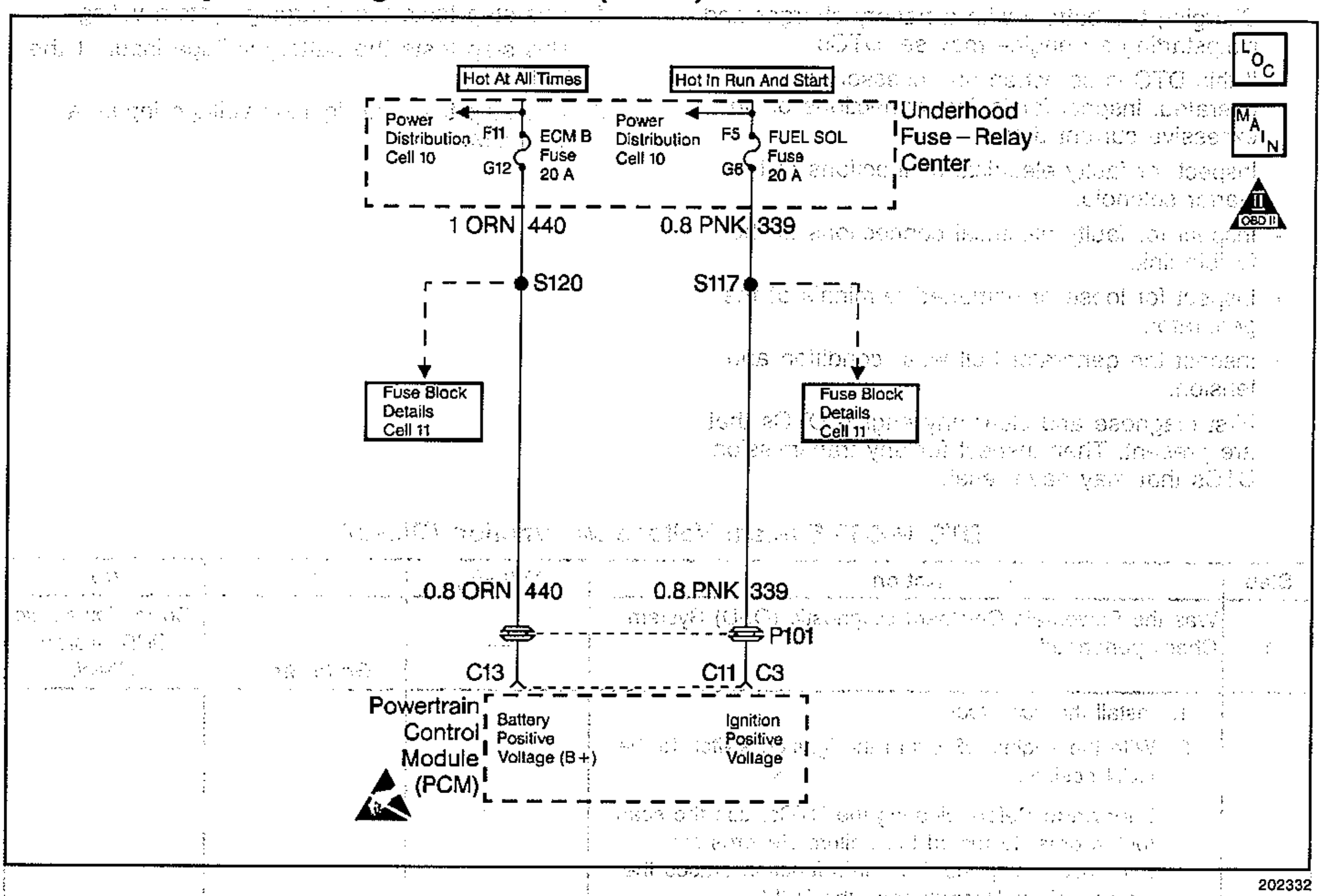
DTC P0560 System Voltage Malfunction (Gas)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check* (4.3L) or *Powertrain OBD System Check* (5.7L) or *Powertrain OBD System Check* (7.4L)
2	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record Failure Records for reference. The Clear Info function erases the stored Failure Records from the VCM. 3. Record the DTC Failure Records. 4. Using the *J 39200* DMM, measure the battery voltage across the battery terminals. Is the voltage higher than the specified value?	10 volts	*Go to Step 3*	Go to Battery Diagnosis
3	1. Start the engine. 2. Warm the engine to normal operating temperature. Is the generator/check engine light ON?	—	Go to Charging System Diagnosis	*Go to Step 4*
4	1. Turn the headlights and the heater blower motor to the ON position. 2. Increase the engine speed to 1500 RPM. 3. Observe the *J 39200* DMM battery voltage and record your voltage reading for reference. Is the DMM voltage within the specified range?	13-15 volts	*Go to Step 5*	Go to Charging System Diagnosis
5	1. Increase the engine speed to 1500 RPM. 2. Observe the *scan tool* Ignition voltage. Is the scan tool Ignition Voltage within the specified range?	13-15 volts	System Checks OK Go to Diagnosis Aids	*Go to Step 6*

DTC P0560 System Voltage Malfunction (Gas) (cont'd)

Step	Action	Value(s)	Yes	No
6	1. Turn the ignition switch to the OFF position. 2. Locate terminal C4-18 (circuit 439 PNK) and terminal C3-21 (circuit 440 ORN) in the VCM connectors. Do not disconnect the VCM connectors. 3. Connect the *J 39200* DMM black lead to ground. 4. Start the engine. 5. Run the engine at 1500 RPM with the headlights and the blower motor ON. 6. Using the DMM and the *J 35616-A* Connector Test Adaptor Kit, backprobe terminals C4-18 and C3-21 to measure the battery voltage and the ignition voltage input at VCM connectors. Is there a voltage variance between the voltage measured at the battery (taken in Step 4) and at terminals C4-18 and C3-21 that is greater than the specified value?	0.5 volts	*Go to Step 7*	*Go to Step 10*
7	Does terminal C4-18 (circuit 439) have the voltage variance?	—	*Go to Step 8*	*Go to Step 9*
8	Repair the high resistance condition in circuit 439. Refer to Wiring Repairs. Is the repair complete?	—	*Go to Step 11*	—
9	Repair the high resistance condition in circuit 440. Refer to Wiring Repairs. Is the repair complete?	—	*Go to Step 11*	—
10	Replace the VCM. Refer to: • *VCM Replacement/Programming* (4.3L) • *VCM Replacement/Programming* (5.7L) • *VCM Replacement/Programming* (7.4L) Is the replacement complete?	—	*Go to Step 11*	—
11	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle under the following conditions: • Start the vehicle. • Warm the engine to normal operating temperature. • Ensure that the *scan tool* Ignition Voltage is 12–18 volts. 4. Select Specific DTC. Enter DTC P0560. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0560 System Voltage Malfunction (Diesel)



Circuit Description

Circuit 339 is the ignition voltage feed for the Powertrain Control Module (PCM). Circuit 440 is the battery feed for the PCM.

If the PCM detects either a low system voltage or a high system voltage for a short time, then DTC P0560 sets. DTC P0560 is a type D DTC.

Conditions for Setting the DTC

System Voltage Low

- The engine speed is greater than 1500 RPM.
- One of the following conditions exists for greater than 15 seconds:
  - The system voltage is less than 10.5 volts at a maximum transmission temperature of 152°C (305°F).
  - The system voltage is less than 6.7 volts at a minimum transmission temperature of -40°C (-40°F).

System Voltage High

System voltage is greater than 19 volts for 10 seconds.

Action Taken When the DTC Sets

- The PCM does not illuminate the Malfunction Indicator Lamp (MIL).
- The PCM commands an immediate landing to second gear.
- The PCM turns off the PC Sol. Valve.
- The PCM inhibits the TCC engagement.
- The PCM freezes the shift adapts.
- DTC P0560 is stored in PCM history.

Conditions for Clearing the DTC

- A scan tool can clear the DTC from the PCM history. The PCM clears the DTC from the PCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The PCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the PCM.

Diagnostic Aids

- Charging the battery with a battery charger and jumpstarting an engine may set DTCs.
- If this DTC is set when an accessory is operated, inspect for faulty connections or an excessive current draw.
- Inspect for faulty electrical connections at the starter solenoid.
- Inspect for faulty electrical connections at the fusible link.
- Inspect for loose or damaged terminals at the generator.
- Inspect the generator belt wear condition and tension.
- First diagnose and clear any engine DTCs that are present. Then inspect for any transmission DTCs that may have reset.

Test Description

4. This step tests the charging system voltage.
5. This step tests the battery voltage input at the PCM.
7. This step tests the ignition voltage inputs at the PCM.

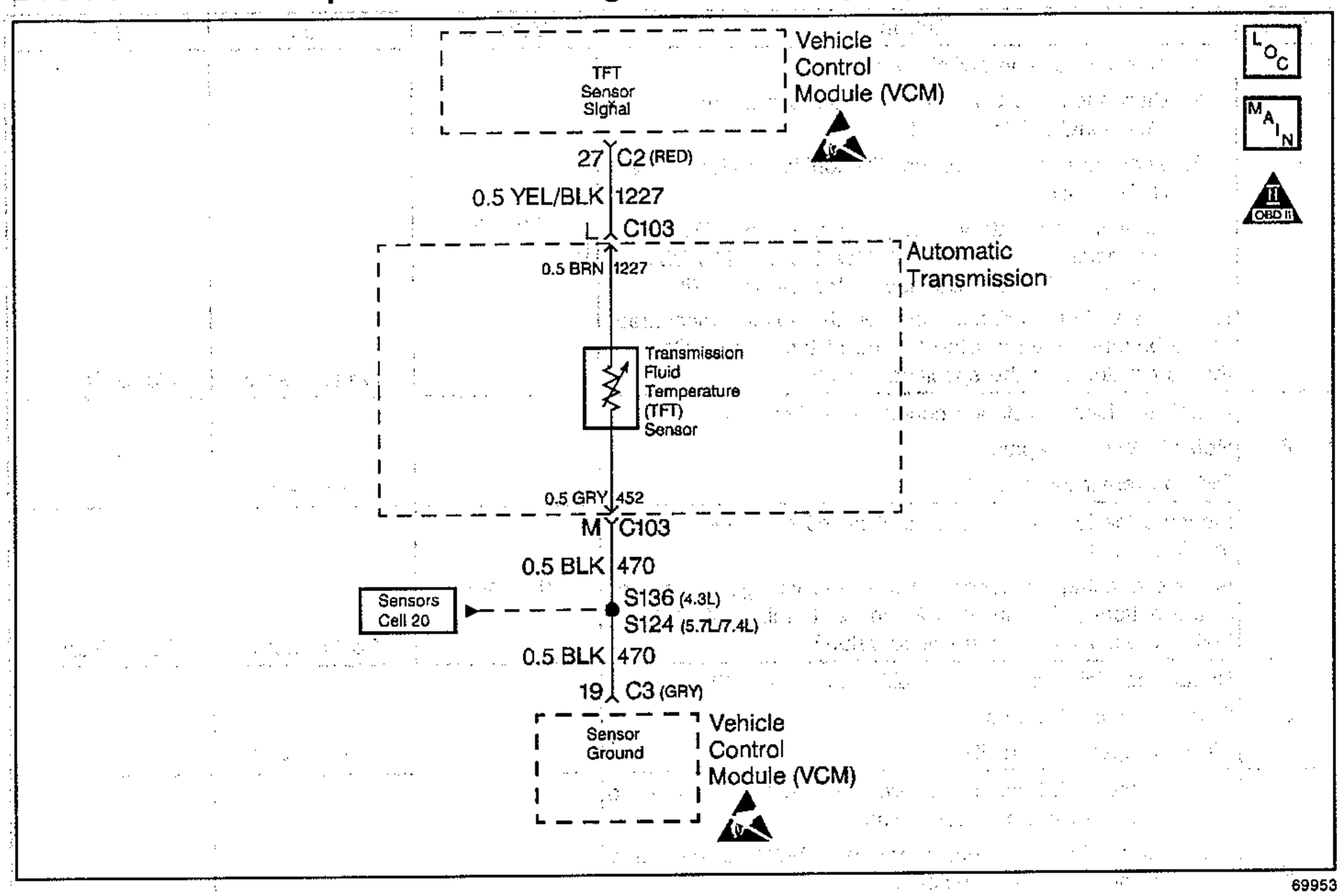
DTC P0560 System Voltage Malfunction (Diesel)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check*
2	1. Install the *scan tool*. 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Failure Records for reference. Using the Clear Info function erases the stored Failure Records from the PCM. 3. Record the DTC Failure Records, then clear the DTC. 4. If any DTCs are present, refer to their applicable diagnostic tables before continuing. 5. Using the *J 39200* DMM, measure the battery voltage across the battery terminals. 6. Record the battery voltage measurement for future reference. Is the voltage higher than the specified value?	10.5 volts	*Go to Step 3*	Go to Charging System Diagnosis
3	1. Start the engine. 2. Allow the engine to warm to normal operating temperature. Is the generator lamp ON?	—	Go to Charging System Diagnosis	*Go to Step 4*
4	1. Increase the engine speed to greater than 1500 RPM. 2. Observe the scan tool ignition voltage. Is the ignition voltage within the specified range?	13-15 volts	*Go to Step 5*	Go to Charging System Diagnosis

DTC P0560 System Voltage Malfunction (Diesel) (cont'd)

Step	Action	Value(s)	Yes	No
5	1. Turn the ignition switch OFF. 2. Disconnect the C3 (blue-32) PCM connector (Additional DTCs will set). 3. With the engine OFF, turn the ignition switch in the RUN position. 4. Measure the battery voltage input at the PCM connector terminal C3-C13. Use the *J 39200* DMM and the *J 35616-A* Connector Test Adaptor Kit. Is there a voltage variance between the voltage measured at the battery (taken in Step 2) and at terminal C3-C13 that is greater than the specified value?	0.5 volts	*Go to Step 6*	*Go to Step 7*
6	Repair the high resistance condition in circuit 440. Refer to Wiring Repairs. Did you repair the circuit?	—	*Go to Step 11*	—
7	Measure the ignition voltage input at PCM connector terminal C3-C11. Is there a voltage variance between the voltage measured at the battery (taken in Step 2) and at terminal C3-C11 that is greater than the specified value?	0.5 volts	*Go to Step 8*	*Go to Step 9*
8	Repair the high resistance condition in circuit 339. Refer to Wiring Repairs. Did you repair the circuit?	—	*Go to Step 11*	—
9	1. Inspect PCM connector terminal C3-C13 for damaged or backed out connector pins. 2. Inspect PCM connector terminal C3-C11 for damaged or backed out connector pins. 3. Inspect for weak terminal tension. Did you find the condition?	—	*Go to Step 11*	*Go to Step 10*
10	Replace the PCM. Refer to *PCM Replacement/Programming.* Is the replacement complete?	—	*Go to Step 11*	—
11	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle under the following conditions: • Start the vehicle. • Warm the vehicle to normal operating temperature. • Using the scan tool, verify that the PCM sees an ignition voltage between 8.3 and 16.5 volts. 4. Select Specific DTC. Enter DTC P0560. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0711 Fluid Temp Sensor CKT Range/Performance (Gas)



69953

Circuit Description

The Automatic Transmission Fluid Temperature (TFT) Sensor is part of the 4L80–E Automatic Transmission Wiring Harness Assembly (A/T Wiring Harness Assy). The TFT Sensor is a resistor, or thermistor, which changes value based on temperature. The sensor has a negative-temperature coefficient. This means that as the temperature increases, the resistance decreases, and as the temperature decreases the resistance increases. The Vehicle Control Module (VCM) supplies a 5-volt reference signal to the sensor on circuit 1227 and measures the voltage drop in the circuit. When the transmission fluid is cold, the sensor resistance is high and the VCM detects high signal voltage. As the fluid temperature warms to a normal operating temperature, the resistance becomes less and the signal voltage decreases. The VCM uses this information to control shift quality and torque converter clutch apply.

The DTC P0711 will set if either of the following conditions occur:

- The TFT sensor resistance has no change.
- The TFT sensor resistance has an unrealistic change in a short amount of time (multiple changes within seconds).

DTC P0711 is a type D DTC.

Conditions for Setting the DTC

- No A/T OSS sensor DTC P0502 or P0503.
- No A/T ISS sensor DTC P0716 or P0717.
- No Engine Coolant Temperature (ECT) DTCs P0117 or P0118.
- No A/T Component Slipping DTC P1870.
- System voltage is 10.0-16.0 volts.
- The engine is running greater than 475 RPM for at least 35 seconds.
- The TFT is -40° to +21°C (-40° to +70°F) at start up.
- The Engine Coolant Temperature (ECT) is greater than 85°C (185°F).
- ECT has changed at least 55°C (130°F) since start up.
- The vehicle speed is greater than 5 mph for at least 900 seconds (15 minutes).
- The TCC slip speed is greater than 60 RPM for at least 800 seconds (13.3 minutes).
- DTC P0711 will set if all of the above conditions have been met and one of the following conditions exist:
  - The TFT has not changed more than 2.25°C (4°F), in more than 800 seconds (13.3 minutes) (No TFT change).
  - The TFT has changed more than 20°C (68°F) 14 times in 7 seconds (unrealistic temperature change).

Action Taken When the DTC Sets

- The VCM does not illuminates the Malfunction Indicator Lamp (MIL).
- The VCM commands increased line pressure.
- The VCM freezes shift adapts.
- The VCM determines a TFT default Transmission Temperature (TFT) using the following matrix:
  - If the Engine Run Time is less than 60 seconds then Default TFT equals the Intake AIR Temperature (IAT), plus 5 degrees.
  - If the Engine Coolant Temperature (ECT) is less than 85°C (185°F) then Default TFT equals IAT plus 10 degrees.
  - If the ECT is 85°-110°C (185°-230°F) then Default TFT equals ECT plus 10 degrees.
  - If the ECT is greater 110°C (230°F) then Default TFT is set to 140°C (284°F) and transmission shift pattern is in Hot Mode.
  - If ECT and TFT DTCs are both set then Default TFT is 140°C (284°F).
- DTC P0711 is stored in VCM history.

Conditions for Clearing the DTC

- A scan tool can clear the DTC from the VCM history. The VCM clears the DTC from the VCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The VCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the VCM.

Diagnostic Aids

- Inspect the wiring at the VCM, the transmission connector and all other circuit connecting points for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation.
  - Moisture intrusion
  - Corrosion
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- First diagnose and clear any engine DTCs or TP Sensor DTCs that are present. Then inspect for any transmission DTCs that may have reset.
- DTC P0218 may set approximately 600 seconds after DTC P0711 has set. Follow the diagnostic table for DTC P0711 before proceeding to the diagnostic table for DTC P0218.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2. This step tests for proper A/T fluid level and condition.
3. This step verifies which condition has set DTC P0711.
5. The 12-volt test lamp is used as a fixed resistance.
6. This step ensures that the VCM monitors circuit 1227.

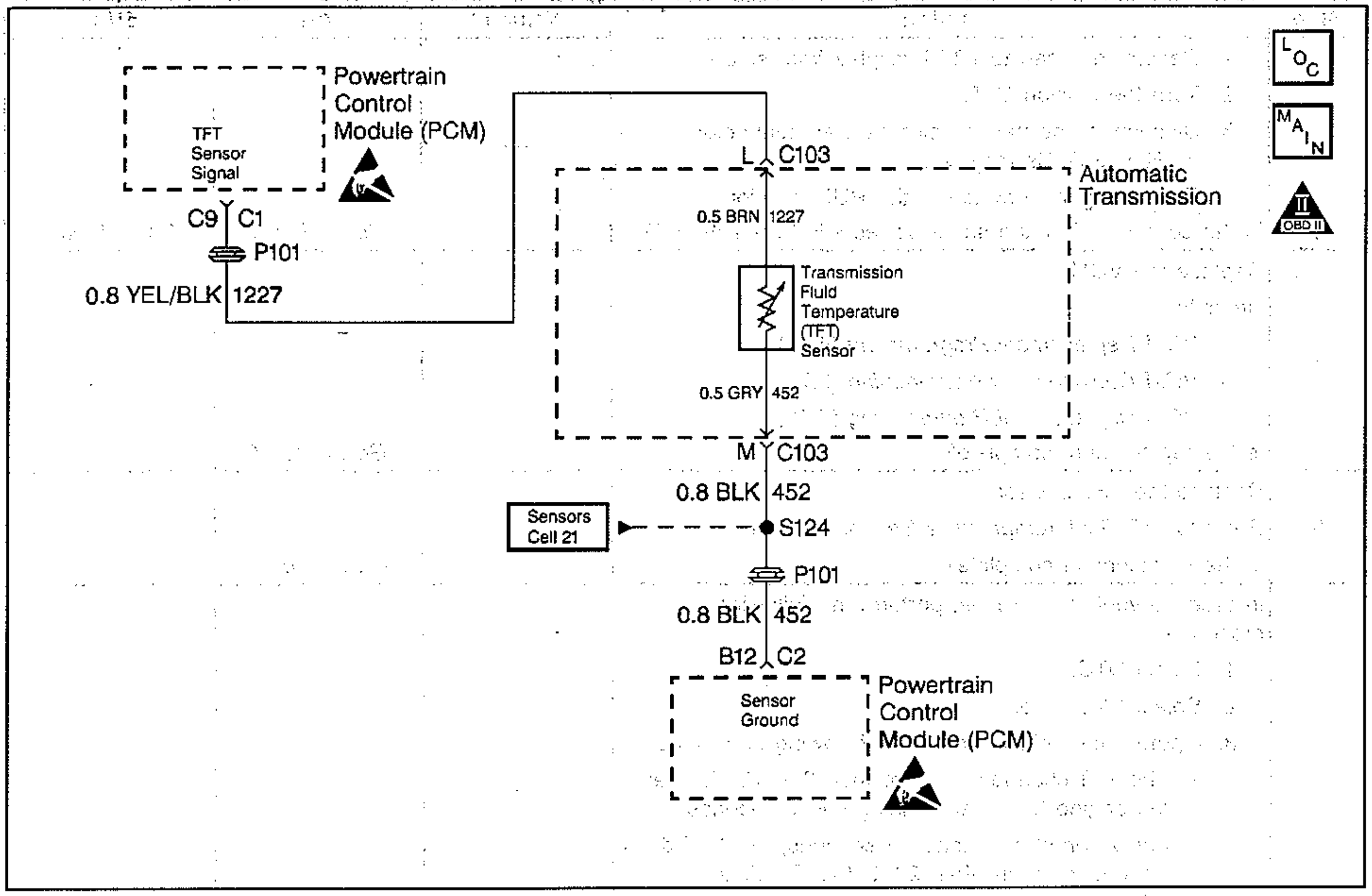
DTC P0711 Fluid Temp Sensor CKT Range/Performance (Gas)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check* (4.3L) or *Powertrain OBD System Check* (5.7L) or *Powertrain OBD System Check* (7.4L)
2	Perform the Transmission Fluid Checking Procedure. Refer to *Transmission Fluid Checking Procedure.* Did you perform the Transmission Fluid Checking Procedure?	—	*Go to Step 3*	Go to *Transmission Fluid Checking Procedure*
3	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the stored Failure Records for reference. The Clear Info function erases the Failure Records from the VCM. 3. Record the DTC Failure Records. 4. Clear the DTC Freeze Frame and Failure Records. 5. Select TFT on the scan tool. 6. Drive the vehicle and observe the scan tool for one of the following conditions: • No TFT change or, • An unrealistic TFT change (The TFT change is greater than 20°C (36°F) 14 times in 7 seconds). Did either of the fail conditions occur?	—	*Go to Step 4*	Fault is not present. Refer to Diagnostic Aids
4	Did the scan tool display an unrealistic TFT change?	—	*Go to Step 5*	*Go to Step 6*
5	1. Turn the ignition switch OFF. 2. Disconnect the transmission 20-way connector. Additional DTCs may set. 3. Using the *J 35616-A* Connector Test Adapter Kit, install a 12 volt test lamp between terminals L and M of the engine side of the transmission 20-way connector. 4. Turn the ignition switch to the run position. Does the scan tool TFT display an unrealistic TFT change?	—	*Go to Step 7*	*Go to Step 8*

DTC P0711 Fluid Temp Sensor CKT Range/Performance (Gas) (cont'd)

Step	Action	Value(s)	Yes	No
6	1. Record the scan tool TFT display from step 4. 2. Turn the ignition OFF. 3. Disconnect the transmission 20-way connector. Additional DTCs may set. 4. Turn the ignition switch to the RUN position. Is the scan tool TFT the same as recorded from Step 4?	—	*Go to Step 7*	*Go to Step 8*
7	Replace the VCM. Refer to: • *VCM Replacement/Programming* (4.3L) • *VCM Replacement/Programming* (5.7L) • *VCM Replacement/Programming* (7.4L) Is the replacement complete?	—	*Go to Step 9*	—
8	Replace the TFT Sensor. Refer to A/T Fluid Temperature Sensor Replacement. Is the replacement complete?	—	*Go to Step 9*	—
9	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle under the following conditions: • The TFT changes by more than 3°C (5°F) after the engine has been running for 35 seconds. • For a period of at least 11 seconds, the TFT does not change more than 20°C (36°F) within 0.2 seconds. 4. Select Specific DTC. Enter DTC P0711. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0711 Fluid Temp Sensor CKT Range/Performance (Diesel)



69998

Circuit Description

The Automatic Transmission Fluid Temperature (TFT) Sensor is part of the 4L80–E Automatic Transmission Wiring Harness Assembly (A/T Wiring Harness Assy.). The TFT Sensor is a resistor, or thermistor, which changes value based on temperature. The sensor has a negative-temperature coefficient. This means that as the temperature increases, the resistance decreases, and as the temperature decreases the resistance increases. The Powertrain Control Module (PCM) supplies a 5-volt reference signal to the sensor on circuit 1227 and measures the voltage drop in the circuit. When the transmission fluid is cold, the sensor resistance is high and the PCM detects high signal voltage. As the fluid temperature warms to a normal operating temperature, the resistance becomes less and the signal voltage decreases. The PCM uses this information to control shift quality and torque converter clutch apply.

The DTC P0711 will set if either of the following conditions occur:

- The TFT sensor resistance has no change.
- The TFT sensor resistance has an unrealistic change in a short amount of time (multiple changes within seconds).

DTC P0711 is a type D DTC.

Conditions for Setting the DTC

- No A/T OSS sensor DTC P0722 or P0723.
- No A/T ISS sensor DTC P0716 or P0717.
- No Engine Coolant Temperature (ECT) DTCs P0117 or P0118.
- No A/T Component Slipping DTC P1870.
- System voltage is 10.0-16.0 volts.
- The engine is running greater than 475 RPM for at least 35 seconds.
- The TFT is -40° to +21°C (-40° to +70°F) at start up.
- The Engine Coolant Temperature (ECT) is greater than 85°C (185°F).
- ECT has changed at least 55°C (130°F) since start up.
- The vehicle speed is greater than 5 mph for at least 900 seconds (15 minutes).
- The TCC slip speed is greater than 60 RPM for at least 800 seconds (13.3 minutes).
- DTC P0711 will set if all of the above conditions have been met and one of the following conditions exist:
  - The TFT has not changed more than 2.25°C (4°F), in more than 800 seconds (13.3 minutes) (No TFT change).
  - The TFT has changed more than 20°C (68°F) 14 times in 7 seconds (unrealistic temperature change).

Action Taken When the DTC Sets

- The PCM does not illuminates the Malfunction Indicator Lamp (MIL).
- The PCM commands increased line pressure.
- The PCM freezes shift adapts.
- The PCM determines a TFT default Transmission Temperature (TFT) using the following matrix:
  - If the Engine Run Time is less than 60 seconds then Default TFT equals the Intake AIR Temperature (IAT), plus 5 degrees.
  - If the Engine Coolant Temperature (ECT) is less than 85°C (185°F) then Default TFT equals IAT plus 10 degrees.
  - If the ECT is 85°-110°C (185°-230°F) then Default TFT equals ECT plus 10 degrees.
  - If the ECT is greater 110°C (230°F) then Default TFT is set to 140°C (284°F) and transmission shift pattern is in Hot Mode
  - If ECT and TFT DTCs are both set then Default TFT is 140°C (284°F).
- DTC P0711 is stored in PCM history.

Conditions for Clearing the DTC

- A scan tool can clear the DTC from the PCM history. The PCM clears the DTC from the PCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The PCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the PCM.

Diagnostic Aids

- Inspect the wiring at the PCM, the transmission connector and all other circuit connecting points for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation
  - Moisture intrusion
  - Corrosion
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- First diagnose and clear any engine DTCs or APP Sensor DTCs that are present. Then inspect for any transmission DTCs that may have reset.
- DTC P0218 may set approximately 600 seconds after DTC P0711 has set. Follow the diagnostic table for DTC P0711 before proceeding to the diagnostic table for DTC P0218.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2. This step tests for proper A/T fluid level and condition.
3. This step verifies which condition has set DTC P0711.
5. The 12-volt test lamp is used as a fixed resistance.
6. This step ensures that the PCM monitors circuit 1227.

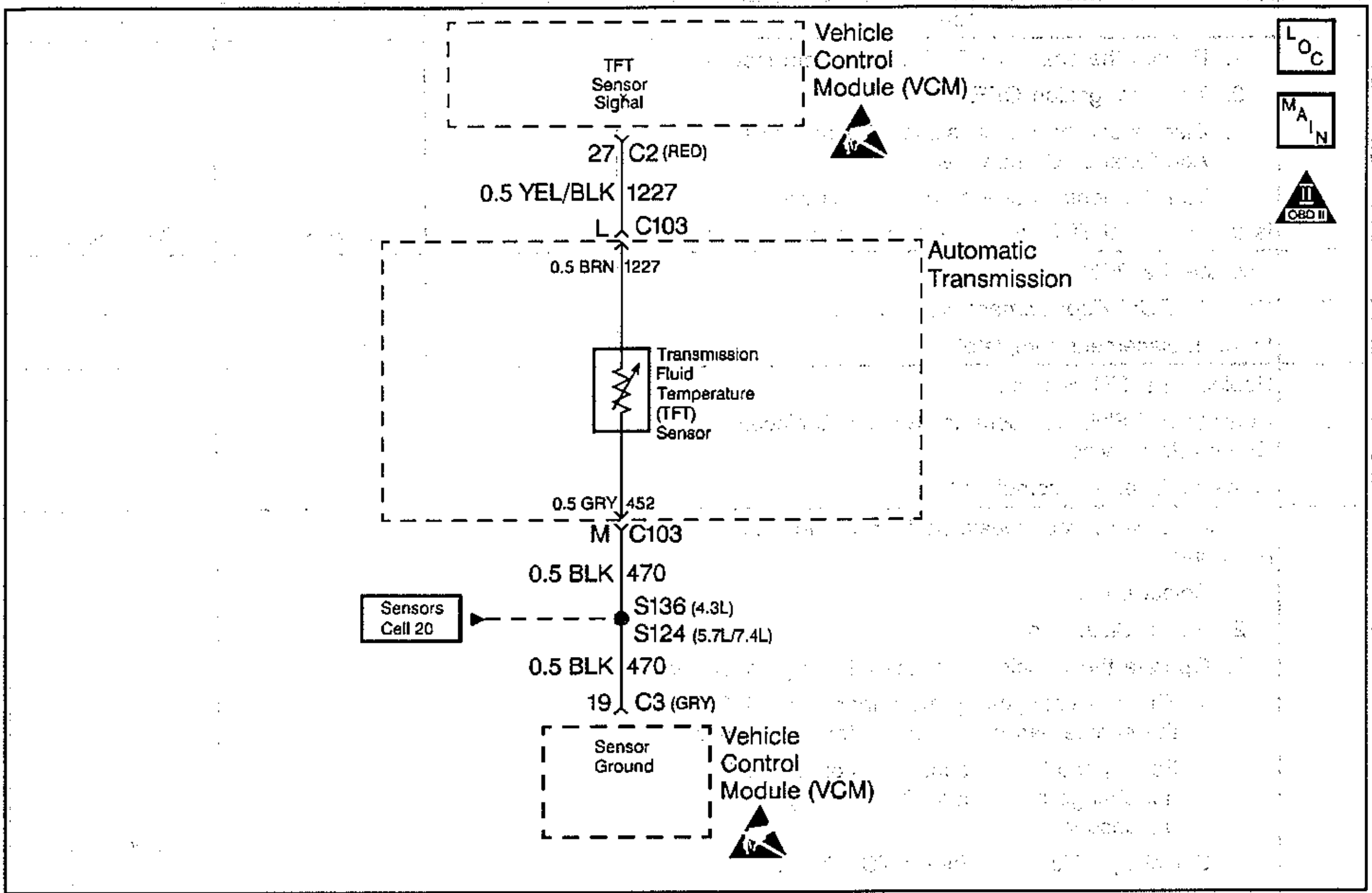
DTC P0711 Fluid Temp Sensor CKT Range/Performance (Diesel)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check*
2	Perform the Transmission Fluid Checking Procedure. Refer to *Transmission Fluid Checking Procedure* Did you perform the fluid checking procedure?	—	*Go to Step 3*	Go to *Transmission Fluid Checking Procedure*
3	1. Install the *scan tool*. 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Failure Records for reference. Using the Clear Info function erases the Failure Records from the PCM. 3. Record the DTC Failure Records, then clear the DTC. 4. Select TFT on the scan tool. 5. Drive the vehicle and observe the scan tool for one of the following conditions: • No TFT change • An unrealistic TFT change (The TFT change is greater than 20°C (36°F) 14 times in 7 seconds) Did either of the fail conditions occur?	—	*Go to Step 4*	Fault is not present. Refer to Diagnostic Aids
4	Did the scan tool display an unrealistic temperature change?	—	*Go to Step 5*	*Go to Step 6*
5	1. Turn the ignition switch OFF. 2. Disconnect the transmission 20-way connector (multiple DTCs will set). 3. Using the *J 35616-A* Connector Test Adapter Kit, install a 12 volt test lamp between terminals L and M of the engine side of the transmission 20-way connector. 4. Turn the ignition switch to the RUN position. Does the scan tool TFT display an unrealistic temperature change?	—	*Go to Step 7*	*Go to Step 8*

DTC P0711 Fluid Temp Sensor CKT Range/Performance (Diesel) (cont'd)

Step	Action	Value(s)	Yes	No
6	1. Record the scan tool TFT display from step 4. 2. Turn the ignition OFF. 3. Disconnect the transmission 20-way connector. Additional DTCs may set. 4. Turn the ignition switch to the RUN position. Is the scan tool TFT the same as recorded from step 4?	—	*Go to Step 7*	*Go to Step 8*
7	Replace the PCM. Refer to *PCM Replacement/Programming.* Is the replacement complete?	—	*Go to Step 9*	—
8	Replace the TFT Sensor. Refer to A/T Fluid Temperature Sensor Replacement, in On-vehicle Service. Is the replacement complete?	—	*Go to Step 9*	—
9	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle under the following conditions: • The TFT changes by more than 3°C (5°F) after the engine has been running for 30 seconds. • For a period of at least 30 seconds, the TFT does not change more than 20°C (36°F) within 0.2 seconds. 4. Select Specific DTC. Enter DTC P0711. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0712 Fluid Temperature Sensor CKT Low Input (Gas)



69953

Circuit Description

The Automatic Transmission Fluid Temperature (TFT) Sensor is part of the 4L80–E Automatic Transmission Wiring Harness Assembly (A/T Wiring Harness Assy). The TFT Sensor is a resistor, or thermistor, which changes value based on temperature. The sensor has a negative-temperature coefficient. This means that as the temperature increases, the resistance decreases, and as the temperature decreases the resistance increases. The Vehicle Control Module (VCM) supplies a 5 volt reference signal to the sensor on circuit 1227 and measures the voltage drop in the circuit. When the transmission fluid is cold, the sensor resistance is high and the VCM detects high signal voltage. As the fluid temperature warms to a normal operating temperature, the resistance becomes less and the signal voltage decreases. The VCM uses this information to control shift quality and torque converter clutch apply.

If the VCM detects a continuous short to ground in the TFT Sensor or signal circuit, then DTC P0712 sets. DTC P0712 is a type D DTC.

Conditions for Setting the DTC

- The ignition is ON.
- The TFT Sensor indicates a voltage of less than 0.14 volts.
- All conditions met for 15 seconds.

Action Taken When the DTC Sets

- The VCM does not illuminates the Malfunction Indicator Lamp (MIL).
- The VCM commands increased line pressure.
- The VCM freezes shift adapts.
- The VCM determines a TFT default Transmission Temperature (TFT) using the following matrix:
  - If the Engine Run Time is less than 60 seconds then Default TFT equals the Intake AIR Temperature (IAT), plus 5 degrees.
  - If the Engine Coolant Temperature (ECT) is less than 85°C (185°F) then Default TFT equals IAT plus 10 degrees.
  - If the ECT is 85°-110°C (185°-230°F) then Default TFT equals ECT plus 10 degrees.
  - If the ECT is greater 110°C (230°F) then Default TFT is set to 140°C (284°F) and transmission shift pattern is in Hot Mode.
  - If ECT and TFT DTCs are both set then Default TFT is 140°C (284°F).
- DTC P0712 is stored in VCM history.

Conditions for Clearing the DTC

- A scan tool can clear the DTC from the VCM history. The VCM clears the DTC from the VCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The VCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the VCM.

Diagnostic Aids

- Inspect the wiring at the VCM, the transmission connector and all other circuit connecting points for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation.
  - Moisture intrusion
  - Corrosion
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- Test the TFT Sensor at various temperatures in order to evaluate the possibility of a skewed (mis-scaled) sensor. Use the *Temperature vs Resistance* table. A skewed sensor may cause delayed garage shifts or TCC complaints.
- Verify the customer driving habits, trailer towing, weight, or towing in Overdrive.
- First diagnose and clear any engine DTCs or TP Sensor codes that are present. Then inspect for any transmission DTCs that may have reset.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

3. This step tests for a short to ground or a "skewed" sensor by verifying the fault still exists.
4. This step tests for an internal fault within the transmission by creating an open.
6. This step inspects circuit 1227, of the A/T Wiring Harness Assy., for being shorted to ground.

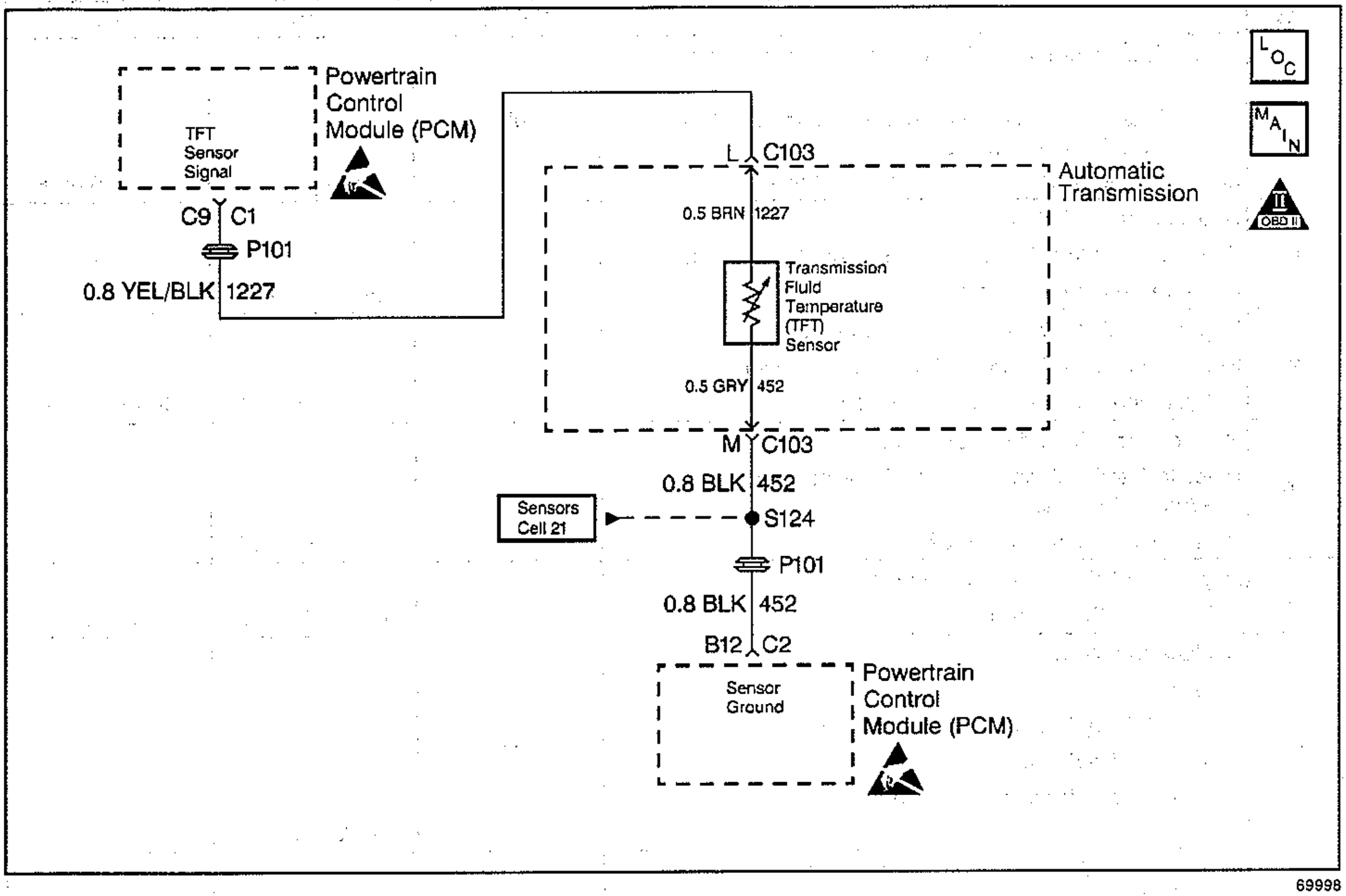
DTC P0712 Fluid Temperature Sensor CKT Low Input (Gas)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check* (4.3L) or *Powertrain OBD System Check* (5.7L) or *Powertrain OBD System Check* (7.4L)
2	Perform the Transmission Fluid Checking Procedure. Refer to *Transmission Fluid Checking Procedure.* Did you perform the Transmission Fluid Checking Procedure?	—	*Go to Step 3*	Go to *Transmission Fluid Checking Procedure*
3	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Failure Records for reference. The Clear Info function erases the stored Failure Records from the VCM. 3. Record the DTC Failure Records. Does the scan tool display a TFT Sensor signal voltage less than the specified value?	0.14 volts	*Go to Step 4*	Go to Diagnostic Aids
4	1. Turn the ignition OFF. 2. Disconnect the transmission 20-way harness connector. Multiple DTCs may set. 3. Turn the ignition switch to the RUN position. Does the scan tool display a TFT Sensor signal voltage greater than the specified value?	4.92 volts	*Go to Step 5*	*Go to Step 9*
5	1. Turn the ignition OFF. 2. Install the *J 39775* Jumper Harness on the transmission side of the 20-way connector (Automatic Transmission Connector End View). 3. Using the *J 39200* DMM and the *J 35616-A* Connector Test Adapter Kit, measure the resistance between terminals L and M. Refer to *Electronic Component Description.* Is the resistance within the specified values?	16kΩ at 10°C (50°F) to 133Ω at 110°C (230°F)	*Go to Step 6*	*Go to Step 7*
6	Measure the resistance between terminal L and a good ground on the transmission case. Is the resistance less than the specified value?	50 kΩ	*Go to Step 10*	Go to Diagnostic Aids

DTC P0712 Fluid Temperature Sensor CKT Low Input (Gas) (cont'd)

Step	Action	Value(s)	Yes	No
7	1. Disconnect the TFT Sensor from the A/T Wiring Harness. 2. Measure the resistance between terminals L and M of the jumper harness. Is the resistance less than the specified value?	50K Ω	*Go to Step 10*	*Go to Step 8*
8	Replace the TFT Sensor. Refer to A/T Fluid Temperature Sensor Replacement. Is the replacement complete?	—	*Go to Step 13*	—
9	Inspect circuit 1227 for a short to ground. Refer to General Electrical Diagnosis Procedures. Did you find a short to ground condition?	—	*Go to Step 13*	*Go to Step 11*
10	Replace the A/T Wiring Harness Assy. Refer to Interior Wiring Harness Replacement, in On-Vehicle Service. Is the replacement complete?	—	*Go to Step 13*	—
11	Inspect the VCM for faulty connections. Did you find the condition?	—	*Go to Step 13*	*Go to Step 12*
12	Replace the VCM. Refer to: • *VCM Replacement/Programming* (4.3L) • *VCM Replacement/Programming* (5.7L) • *VCM Replacement/Programming* (7.4L) Is the replacement complete?	—	*Go to Step 13*	—
13	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Be sure the TFT Sensor indicates a voltage greater than 0.16 volts for 15 seconds. 4. Select Specific DTC. Enter DTC P0712. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0712 Fluid Temperature Sensor CKT Low Input (Diesel)



Circuit Description

The Automatic Transmission Fluid Temperature (TFT) Sensor is part of the 4L80–E Automatic Transmission Wiring Harness Assembly (A/T Wiring Harness Assy.). The TFT Sensor is a resistor, or thermistor, which changes value based on temperature. The sensor has a negative-temperature coefficient. This means that as the temperature increases, the resistance decreases, and as the temperature decreases the resistance increases. The Powertrain Control Module (PCM) supplies a 5-volt reference signal to the sensor on circuit 1227 and measures the voltage drop in the circuit. When the transmission fluid is cold, the sensor resistance is high and the PCM detects high signal voltage. As the fluid temperature warms to a normal operating temperature, the resistance becomes less and the signal voltage decreases. The PCM uses this information to control shift quality and torque converter clutch apply.

DTC P0712 is a type D DTC.

Conditions for Setting the DTC

- The ignition is ON.
- The TFT Sensor indicates a voltage less than 0.14 volts.
- All conditions are met for 15 seconds.

Action Taken When the DTC Sets

- The PCM does not illuminates the Malfunction Indicator Lamp (MIL).
- The PCM commands increased line pressure.
- The PCM freezes shift adapts.
- The PCM determines a TFT default Transmission Temperature (TFT) using the following matrix:
  - If the Engine Run Time is less than 60 seconds then Default TFT equals the Intake AIR Temperature (IAT), plus 5 degrees.
  - If the Engine Coolant Temperature (ECT) is less than 85°C (185°F) then Default TFT equals IAT plus 10 degrees.
  - If the ECT is 85°-110°C (185°-230°F) then Default TFT equals ECT plus 10 degrees.
  - If the ECT is greater 110°C (230°F) then Default TFT is set to 140°C (284°F) and transmission shift pattern is in Hot Mode
  - If ECT and TFT DTCs are both set then Default TFT is 140°C (284°F).
- DTC P0712 is stored in PCM history.

Conditions for Clearing the DTC

- A scan tool can clear the DTC from the PCM history. The PCM clears the DTC from the PCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The PCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the PCM.

Diagnostic Aids

- Inspect the wiring at the PCM, the transmission connector and all other circuit connecting points for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation
  - Moisture intrusion
  - Corrosion
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- First diagnose and clear any engine DTCs or APP Sensor DTCs that are present. Then inspect for any transmission DTCs that may have reset.
- DTC P0218 may set approximately 600 seconds after DTC P0712 has set. Follow the diagnostic table for DTC P0712 before proceeding to the diagnostic table for DTC P0218.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

3. This step tests for a short to ground or a "skewed" sensor by verifying the fault still exists.
4. This step tests for an internal fault within the transmission by creating an open.
6. This step inspects circuit 1227 of the A/T Wiring Harness Assy. for being shorted to ground.

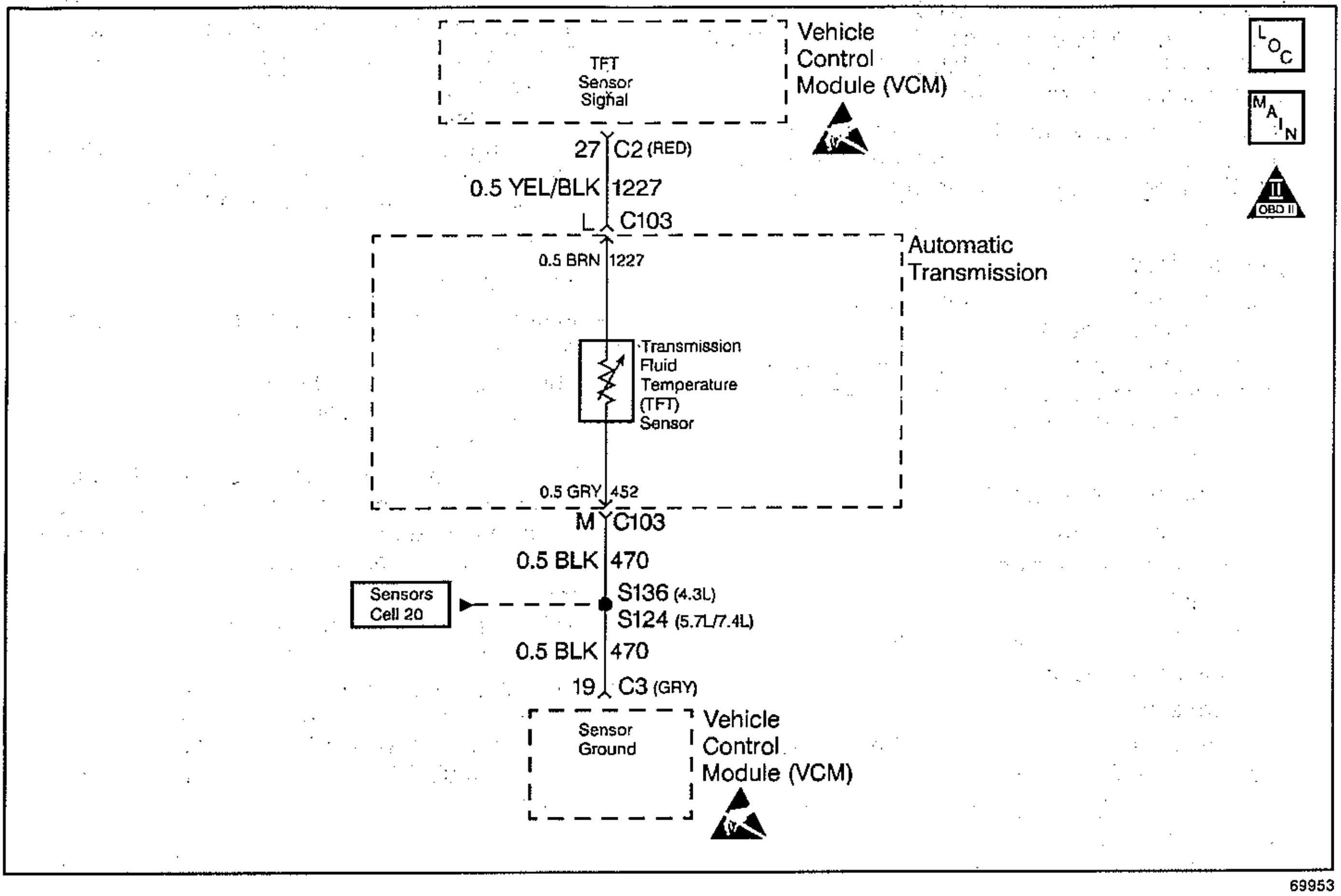
DTC P0712 Fluid Temperature Sensor CKT Low Input (Diesel)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check*
2	Perform the Transmission Fluid Checking Procedure. Refer to *Transmission Fluid Checking Procedure.* Did you perform the fluid checking procedure?	—	*Go to Step 3*	Go to *Transmission Fluid Checking Procedure*
3	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Failure Records for reference. Using the Clear Info function erases the stored Failure Records from the PCM. 3. Record the DTC Failure Records, then clear the DTC. Does the scan tool display a TFT Sensor voltage less than the specified value?	0.13 volts	*Go to Step 4*	Go to Diagnostic Aids

DTC P0712 Fluid Temperature Sensor CKT Low Input (Diesel) (cont'd)

Step	Action	Value(s)	Yes	No
4	1. Turn the ignition OFF. 2. Disconnect the transmission 20-way harness connector (Multiple DTCs will set). 3. Turn the ignition ON. Does the scan tool display a TFT Sensor voltage greater than the specified value?	4.92 volts	*Go to Step 5*	*Go to Step 9*
5	1. Turn the ignition OFF. 2. Install the *J 39775* Jumper Harness on the transmission side of the 20-way connector. 3. Using the *J 39200* DMM and the *J 35616-A* Connector Test Adapter Kit, measure the resistance between terminals L and M. Refer to *Electronic Component Description.* Is the resistance within specified values?	16,000Ω at 10°C (50°F) to 133Ω at 110°C (230°F)	*Go to Step 6*	*Go to Step 7*
6	Measure the resistance between terminal L and a good ground on the transmission case. Is the resistance less than the specified value?	50k Ω	*Go to Step 10*	Go to Diagnostic Aids
7	1. Disconnect the TFT Sensor from the A/T Wiring Harness Assy. 2. Measure the resistance between terminals L and M of the jumper harness. Is the resistance less than the specified value?	50k Ω	*Go to Step 10*	*Go to Step 8*
8	Replace the TFT Sensor. Refer to A/T Fluid Temperature Sensor Replacement. Is the replacement complete?	—	*Go to Step 13*	—
9	Inspect circuit 1227 for a short to ground. Refer to General Electrical Diagnosis Procedures. Did you find the condition?	—	*Go to Step 13*	*Go to Step 11*
10	Replace the Automatic Transmission Wiring Harness Assembly. Refer to Interior Wiring Harness Replacement, in On-vehicle Service. Is the replacement complete?	—	*Go to Step 13*	—
11	Inspect the PCM for faulty connections. Did you find the condition?	—	*Go to Step 13*	*Go to Step 12*
12	Replace the PCM. Refer to *PCM Replacement/Programming.* Is the replacement complete?	—	*Go to Step 13*	—
13	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Be sure the TFT sensor indicates a voltage greater than 0.16 volts for 10 seconds. 4. Select Specific DTC. Enter DTC P0712. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0713 Fluid Temperature Sensor CKT High Input (Gas)



Circuit Description

The Automatic Transmission Fluid Temperature (TFT) Sensor is part of the 4L80–E Automatic Transmission Wiring Harness Assembly (A/T Wiring Harness Assy). The TFT Sensor is a resistor, or thermistor, which changes value based on temperature. The sensor has a negative-temperature coefficient. This means that as the temperature increases, the resistance decreases, and as the temperature decreases the resistance increases. The Vehicle Control Module (VCM) supplies a 5-volt reference signal to the sensor on circuit 1227 and measures the voltage drop in the circuit. When the transmission fluid is cold, the sensor resistance is high and the VCM detects high signal voltage. As the fluid temperature warms to a normal operating temperature, the resistance becomes less and the signal voltage decreases. The VCM uses this information to control shift quality and torque converter clutch apply.

If the VCM detects a continuous open or short to the power in the TFT signal circuit or the TFT Sensor, then DTC P0713 sets. DTC P0713 is a type D DTC.

Conditions for Setting the DTC

- The TFT Sensor indicates a voltage greater than 4.94 volts.
- The ignition is ON.
- All conditions met for 400 seconds.

Action Taken When the DTC Sets

- The VCM does not illuminate the Malfunction Indicator Lamp (MIL).
- The VCM commands increased line pressure.
- The VCM freezes shift adapts.
- The VCM determines a TFT default Transmission Temperature (TFT) using the following matrix:
  - If the Engine Run Time is less than 60 seconds then Default TFT equals the Intake AIR Temperature (IAT), plus 5 degrees.
  - If the Engine Coolant Temperature (ECT) is less than 85°C (185°F) then Default TFT equals IAT plus 10 degrees.
  - If the ECT is 85°-110°C (185°-230°F) then Default TFT equals ECT plus 10 degrees.
  - If the ECT is greater 110°C (230°F) then Default TFT is set to 140°C (284°F) and transmission shift pattern is in Hot Mode.
  - If ECT and TFT DTCs are both set then Default TFT is 140°C (284°F).
- DTC P0713 is stored in VCM history.

Conditions for Clearing the DTC

- A scan tool can clear the DTC from the VCM history. The VCM clears the DTC from the VCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The VCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the VCM.

Diagnostic Aids

- Inspect the harness for a faulty connection or an open in circuit 1227.
- Inspect the wiring at the VCM, the transmission connector and all other circuit connecting points for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation
  - Moisture intrusion
  - Corrosion
- High voltage (B+) in circuit 1227 may also damage the TFT Sensor.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- The scan tool displays the transmission fluid temperature (TFT) in degrees. After the transmission operates, the temperature rises steadily to about 100°C (212°F). The temperature then stabilizes.
- Test the TFT Sensor at the various temperatures in order to evaluate the possibility of a skewed (mis-scaled) sensor. Use the *Temperature vs Resistance* table. A skewed sensor may cause firm shifts or TCC complaints.
- First diagnose and clear any engine DTCs or TP Sensor codes that are present. Then inspect for any transmission DTCs that may have reset.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

4. This step tests for higher than normal circuit voltage which may also damage the TFT Sensor.
6. This step simulates a TFT Sensor DTC P0712. If the VCM recognizes the low signal voltage (high temperature), and the scan tool displays 146°C (295°F) or greater, the VCM and the wiring are OK.
7. This step verifies a problem in the TFT Sensor circuit inside the transmission.
8. This step inspects the TFT Sensor and the Automatic Transmission Wiring Harness Assembly (A/T Wiring Harness Assy). for an open. Circuit 470 becomes circuit 452 inside the transmission.

DTC P0713 Fluid Temperature Sensor CKT High Input (Gas)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check* (4.3L) or *Powertrain OBD System Check* (5.7L) or *Powertrain OBD System Check* (7.4L)
2	Perform the Transmission Fluid Checking Procedure. Refer to *Transmission Fluid Checking Procedure.* Did you perform the Transmission Fluid Checking Procedure?	—	*Go to Step 3*	Go to *Transmission Fluid Checking Procedure*

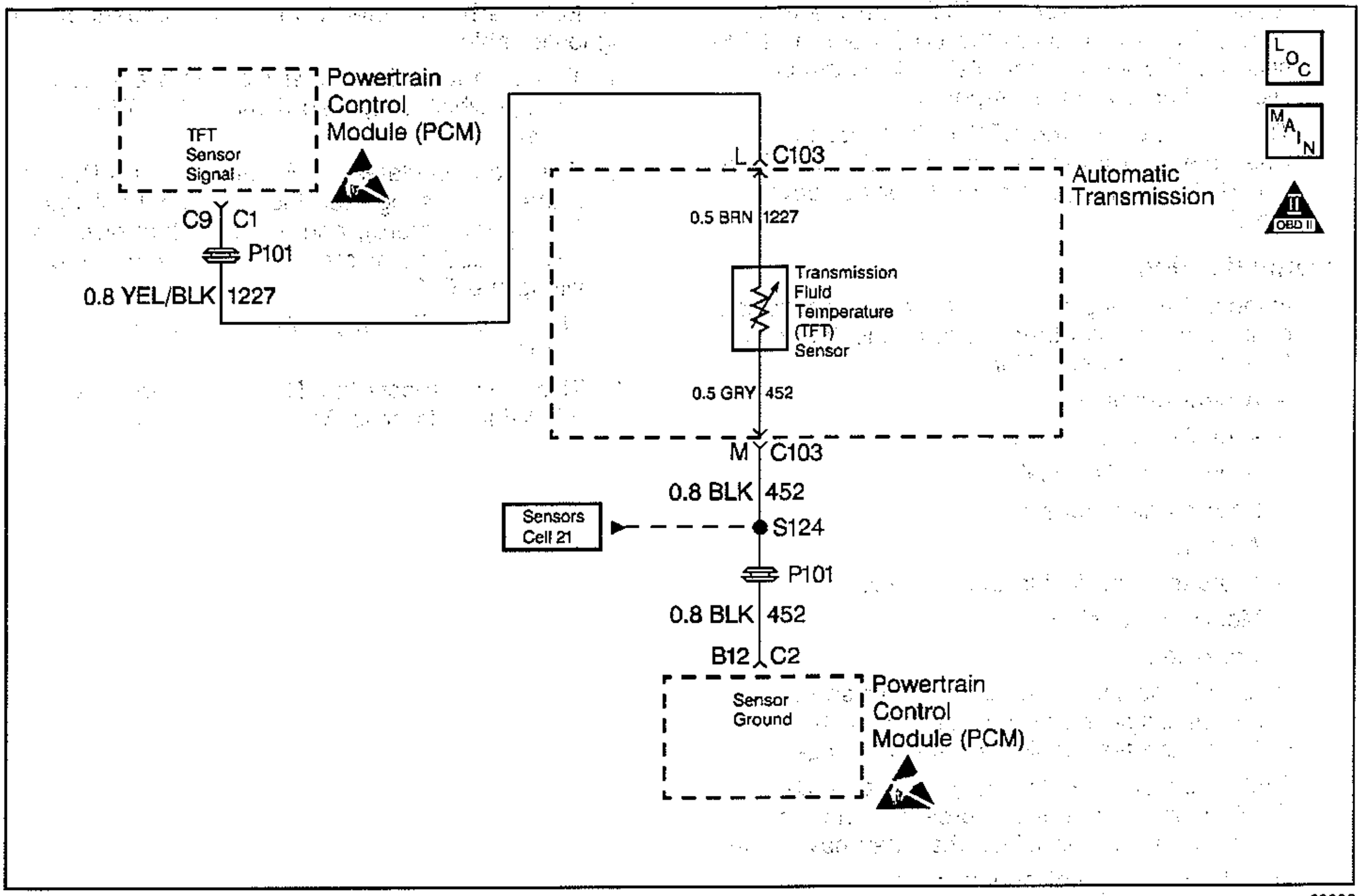
DTC P0713 Fluid Temperature Sensor CKT High Input (Gas) (cont'd)

Step	Action	Value(s)	Yes	No
3	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Failure Records for reference. The Clear Info function erases the stored Failure Records from the VCM. 3. Record the DTC Failure Records. Does the scan tool display a TFT Sensor signal voltage greater than the specified value?	4.92 volts	*Go to Step 4*	Go to Diagnostic Aids
4	**Important:** Refer to *Test Description* for information about Step 4. Does the scan tool display a TFT voltage greater than the specified value?	5.1 volts	*Go to Step 11*	*Go to Step 5*
5	1. Turn the ignition OFF. 2. Disconnect the transmission 20-way connector. 3. Install the *J 39775* Jumper Harness on the engine side of the 20-way connector. 4. Using the *J 39200* DMM and the *J 35616-A* Connector Test Adapter Kit, measure the voltage between jumper harness terminal L and a good ground. Refer to *Electronic Component Description.* 5. Turn the ignition switch to the RUN position. Is the voltage within the specified value?	4.9–5.0 Volts	*Go to Step 6*	*Go to Step 10*
6	1. Turn the ignition OFF. 2. Install a *J 36169-A* Fused Jumper Wire between terminals L and M on the transmission 20-way connector (Automatic Transmission Connector End View). 3. Turn the ignition switch to the RUN position. Is the scan tool TFT Sensor signal voltage less than the specified value?	0.2 volts	*Go to Step 7*	*Go to Step 12*
7	1. Turn the ignition OFF. 2. Install the *J 39775* Jumper Harness to the transmission side of the 20-way connector (Automatic Transmission Connector End View). 3. Using the *J 39200* DMM, measure the resistance between terminals L and M. Refer to *Electronic Component Description.* Is the resistance within the specified values?	16kΩ at 10°C (50°F) to 133Ω at 110°C (230°F)	Go to Diagnostic Aids	*Go to Step 8*

DTC P0713 Fluid Temperature Sensor CKT High Input (Gas) (cont'd)

Step	Action	Value(s)	Yes	No
8	1. Remove the transmission oil pan. Refer to Changing the Fluid and Filter, in On-Vehicle Service. 2. Inspect the A/T Wiring Harness Assy. for an open in circuits 1227 and 452. Refer to General Electrical Diagnosis Procedures. Did you find the open condition?	—	*Go to Step 9*	*Go to Step 15*
9	Replace the A/T Wiring Harness Assy. Refer to Interior Wiring Harness Replacement, in On-Vehicle Service. Is the replacement complete?	—	*Go to Step 16*	—
10	Inspect circuit 1227 for high resistance or an open. Refer to General Electrical Diagnosis Procedures. Did you find the condition?	—	*Go to Step 16*	*Go to Step 13*
11	Inspect circuit 1227 for a short to voltage B+. Refer to General Electrical Diagnosis Procedures. Did you find the condition?	—	*Go to Step 16*	*Go to Step 13*
12	Inspect circuit 470 for an open. Refer to General Electrical Diagnosis Procedures. Did you find the condition?	—	*Go to Step 16*	*Go to Step 13*
13	Inspect the VCM for faulty or intermittent connections. Did you find the condition?	—	*Go to Step 16*	*Go to Step 14*
14	Replace the VCM. Refer to: • *VCM Replacement/Programming* (4.3L) • *VCM Replacement/Programming* (5.7L) • *VCM Replacement/Programming* (7.4L) Is the Replacement complete?	—	*Go to Step 16*	—
15	Replace the TFT Sensor. Refer to A/T Fluid Temperature Sensor Replacement. Is the replacement complete?	—	*Go to Step 16*	—
16	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle so that the TFT Sensor indicates a voltage less than 4.92 volts for 400 seconds (6.8 minutes). 4. Select Specific DTC. Enter DTC P0713. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0713 Fluid Temperature Sensor CKT High Input (Diesel)



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Circuit Description

The Automatic Transmission Fluid Temperature (TFT) Sensor is part of the 4L80–E Automatic Transmission Wiring Harness Assembly (A/T Wiring Harness Assy.). The TFT Sensor is a resistor, or thermistor, which changes value based on temperature. The sensor has a negative-temperature coefficient. This means that as the temperature increases, the resistance decreases, and as the temperature decreases the resistance increases. The Powertrain Control Module (PCM) supplies a 5-volt reference signal to the sensor on circuit 1227 and measures the voltage drop in the circuit. When the transmission fluid is cold, the sensor resistance is high and the PCM detects high signal voltage. As the fluid temperature warms to a normal operating temperature, the resistance becomes less and the signal voltage decreases. The PCM uses this information to control shift quality and torque converter clutch apply.

DTC P0713 is a type D DTC.

Conditions for Setting the DTC

- The ignition is ON.
- The TFT Sensor indicates a voltage greater than 4.94 volts.
- All conditions are met for 400 seconds.

Action Taken When the DTC Sets

- The PCM does not illuminate the Malfunction Indicator Lamp (MIL).
- The PCM commands increased line pressure.
- The PCM freezes shift adapts.
- The PCM determines a TFT default Transmission Temperature (TFT) using the following matrix:
  - If the Engine Run Time is less than 60 seconds then Default TFT equals the Intake AIR Temperature (IAT), plus 5 degrees.
  - If the Engine Coolant Temperature (ECT) is less than 85°C (185°F) then Default TFT equals IAT plus 10 degrees.
  - If the ECT is 85°-110°C (185°-230°F) then Default TFT equals ECT plus 10 degrees.
  - If the ECT is greater 110°C (230°F) then Default TFT is set to 140°C (284°F) and transmission shift pattern is in Hot Mode.
  - If ECT and TFT DTCs are both set then Default TFT is 140°C (284°F).
- DTC P0713 is stored in PCM history.

Conditions for Clearing the DTC

- A scan tool can clear the DTC from the PCM history. The PCM clears the DTC from the PCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The PCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the PCM.

Diagnostic Aids

- Inspect the wiring at the PCM, the transmission connector and all other circuit connecting points for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation.
  - Moisture intrusion
  - Corrosion
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- First diagnose and clear any engine DTCs or TP Sensor DTCs that are present. Then inspect for any transmission DTCs that may have reset.
- DTC P0218 may set approximately 600 seconds after DTC P0713 has set. Follow the diagnostic table for DTC P0713 before proceeding to the diagnostic table for DTC P0218.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

4. This step tests for higher than normal circuit voltage which may also damage the TFT Sensor.
6. This step simulates a TFT Sensor DTC P0712. If the PCM recognizes the low signal voltage (high temperature), and the scan tool displays 146°C (295°F) or greater, the PCM and the wiring are OK.
7. This step verifies a problem in the TFT Sensor circuit.
8. This step inspects the TFT sensor and the A/T Wiring Harness Assy. for an open.

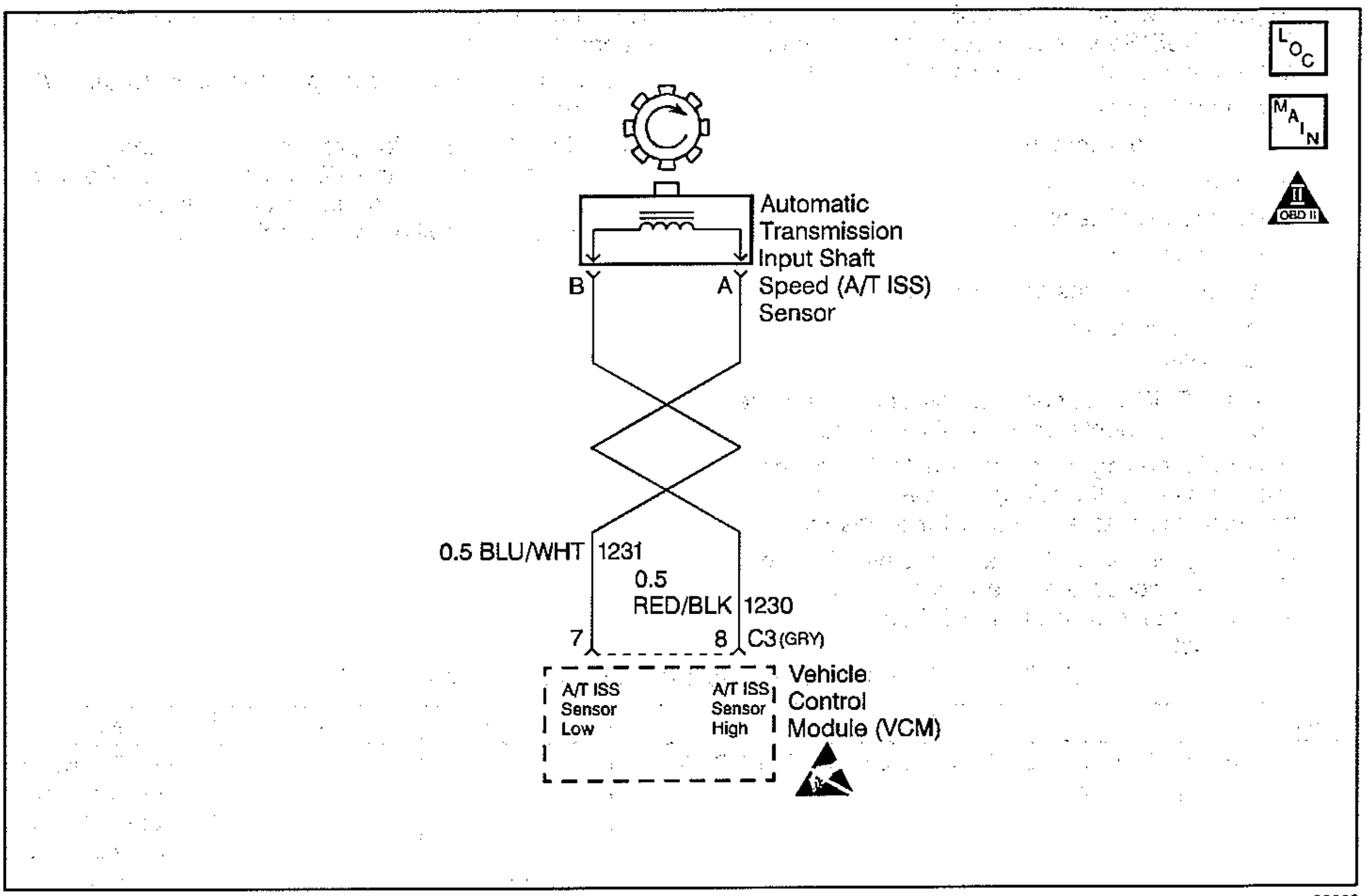
DTC P0713 Fluid Temperature Sensor CKT High Input (Diesel)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check*
2	Perform the Transmission Fluid Checking Procedure. Refer to *Transmission Fluid Checking Procedure.* Did you perform the fluid checking procedure?	—	*Go to Step 3*	Go to *Transmission Fluid Checking Procedure*
3	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Failure Records for reference. Using the Clear Info function erases the stored Failure Records from the PCM. 3. Record the DTC Failure Records, then clear the DTC. Does the scan tool display a TFT Sensor signal voltage greater than the specified value?	4.92 volts	*Go to Step 4*	Go to Diagnostic Aids
4	**Important:** Refer to *Test Description* for information about Step 4. Does the scan tool display a TFT voltage greater than the specified value?	5.1 volts	*Go to Step 11*	*Go to Step 5*
5	1. Turn the ignition OFF. 2. Disconnect the transmission 20-way connector (multiple DTCs will set). 3. Install the *J 39775* Jumper Harness on the engine side of the 20-way connector. 4. Using the *J 39200* DMM and the *J 35616-A* Connector Test Adapter Kit, measure the voltage between Jumper Harness terminal L and a good ground. 5. Turn the ignition switch to the RUN position. Is the voltage within the specified value?	4.9–5.0 volts	*Go to Step 6*	*Go to Step 10*
6	1. Turn the ignition OFF. 2. Install a *J 36169-A* Fused Jumper Wire between terminals L and M of the transmission 20-way connector. 3. Turn the ignition switch to the RUN position. Is the TFT sensor signal voltage less than the specified value?	0.2 volts	*Go to Step 7*	*Go to Step 12*
7	1. Turn the ignition OFF. 2. Install the *J 39775* Jumper Harness to the transmission side of the 20-way connector. 3. Using the DMM, measure the resistance between terminals L and M. Refer to *Electronic Component Description.* Is the resistance within the specified values?	16kΩ at 10°C (50°F) to 133Ω at 110°C (230°F)	Go to Diagnostic Aids	*Go to Step 8*

DTC P0713 Fluid Temperature Sensor CKT High Input (Diesel) (cont'd)

Step	Action	Value(s)	Yes	No
8	1. Remove the transmission oil pan. Refer to On-Vehicle Service, Transmission Pan removal. 2. Inspect the Automatic Transmission Wiring Harness Assembly (A/T Wiring Harness Assy.) for an open in circuit 1227. 3. Inspect for an open in A/T Wiring Harness Assy. circuit 452. Refer to General Electrical Diagnosis Procedures. Did you find the open condition?	—	*Go to Step 9*	*Go to Step 15*
9	Replace the A/T Wiring Harness Assy. Refer to Interior Wiring Harness Replacement, in On-vehicle Service. Is the replacement complete?	—	*Go to Step 16*	—
10	Inspect circuit 1227 for high resistance or an open. Refer to General Electrical Diagnosis Procedures. Did you find the condition?	—	*Go to Step 16*	*Go to Step 13*
11	Inspect circuit 1227 for a short to voltage B+. Refer to General Electrical Diagnosis Procedures. Did you find the condition?	—	*Go to Step 16*	*Go to Step 13*
12	Inspect circuit 452 for an open. Refer to General Electrical Diagnosis Procedures. Did you find the condition?	—	*Go to Step 16*	*Go to Step 13*
13	Inspect the PCM for faulty or intermittent connections. Did you find the condition?	—	*Go to Step 16*	*Go to Step 14*
14	Replace the PCM. Refer to *PCM Replacement/Programming.* Is the Replacement complete?	—	*Go to Step 16*	—
15	Replace the TFT Sensor. Refer to A/T Fluid Temperature Sensor Replacement. Is the Replacement complete?	—	*Go to Step 16*	—
16	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle so that the TFT Sensor indicates a voltage less than 4.92 volts for 10 seconds. 4. Select Specific DTC. Enter DTC P0713. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0716 Input Speed Sensor Circuit Intermittent (Gas)



Circuit Description

The Automatic Transmission Input (Shaft) Speed (A/T ISS) Sensor provides transmission input speed to the Vehicle Control Module (VCM). The A/T ISS Sensor is a Permanent Magnet (PM) generator. The sensor mounts into the transmission case and maintains a slight air gap between the sensor and the Forward Clutch Housing. The PM generator produces an AC voltage as the Forward Clutch Housing rotor teeth pass through the sensor's magnetic field. The AC voltage level increases as the turbine shaft speed increases. The VCM converts the AC voltage into a digital signal. The VCM determines actual turbine speed using the digital signal. The VCM uses the input speed to calculate torque converter slip speed, and gear ratios.

When the VCM detects an unreasonably large change in the input speed, in a very short period of time, then DTC P0716 sets. DTC P0716 is a type D DTC. For California emissions vehicles, DTC P0716 is a type B DTC.

Conditions for Setting the DTC

- No Throttle Position (TP) Sensor DTCs P0121, P0122 or P0123.
- No OSS Sensor DTC P0502 or P0503.
- No A/T ISS Sensor DTC P0717.
- No Shift Solenoid DTC P0751 or P0753.
- The TP is greater than 10%.
- The vehicle speed is greater than 25 mph.
- The transmission is not in Park or Neutral.
- The engine is running greater than 375 RPM for more than 7 seconds.
- The input speed varies by 1300 RPM for greater than 5 seconds.

Action Taken When the DTC Sets

- For California emission vehicles only, the VCM illuminates the Malfunction Indicator Lamp (MIL).
- The VCM commands maximum line pressure.
- The VCM freezes shift adapts.
- DTC PO716 is stored in VCM history.

Conditions for Clearing the MIL/DTC

- For California emissions vehicles, the VCM turns OFF the MIL after three consecutive trips without a failure reported.
- A scan tool can clear the DTC from the VCM history. The VCM clears the DTC from the VCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The VCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the VCM.

Diagnostic Aids

- Inspect the wiring at the VCM, the Output Shaft Speed (OSS)Sensor connector and all other circuit connecting points for the following:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation
  - Moisture intrusion
  - Corrosion
  - The A/T ISS sensor harness being near the DIS components or the ignition wires.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- First diagnose and clear any engine DTCs or TP Sensor codes that are present. Then inspect for any transmission DTCs that may have reset.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2. This step tests for proper operation to the A/T ISS Sensor.
6. This step tests for proper A/T ISS circuit operation up to the VCM connections. Remove the fuel pump relay in order to eliminate a flooding condition during this step.

DTC P0716 Input Speed Sensor Circuit Intermittent (Gas)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check* (4.3L) or *Powertrain OBD System Check* (5.7L) or *Powertrain OBD System Check* (7.4L)
2	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Freeze Frame and Failure Records for reference. Using the Clear Info function erases the stored Freeze Frame and Failure Records from the VCM. 3. Record the DTC Freeze Frame and Failure Records. 4. With the vehicle in Park, start the engine. 5. Raise the drive wheels. 6. Select scan tool Transmission ISS and Engine RPM. 7. Observe the Transmission ISS while slowly accelerating the engine to 2000 RPM and hold. Is the scan tool Transmission ISS more than 800 RPM?	—	Go to Diagnostic Aids	*Go to Step 3*

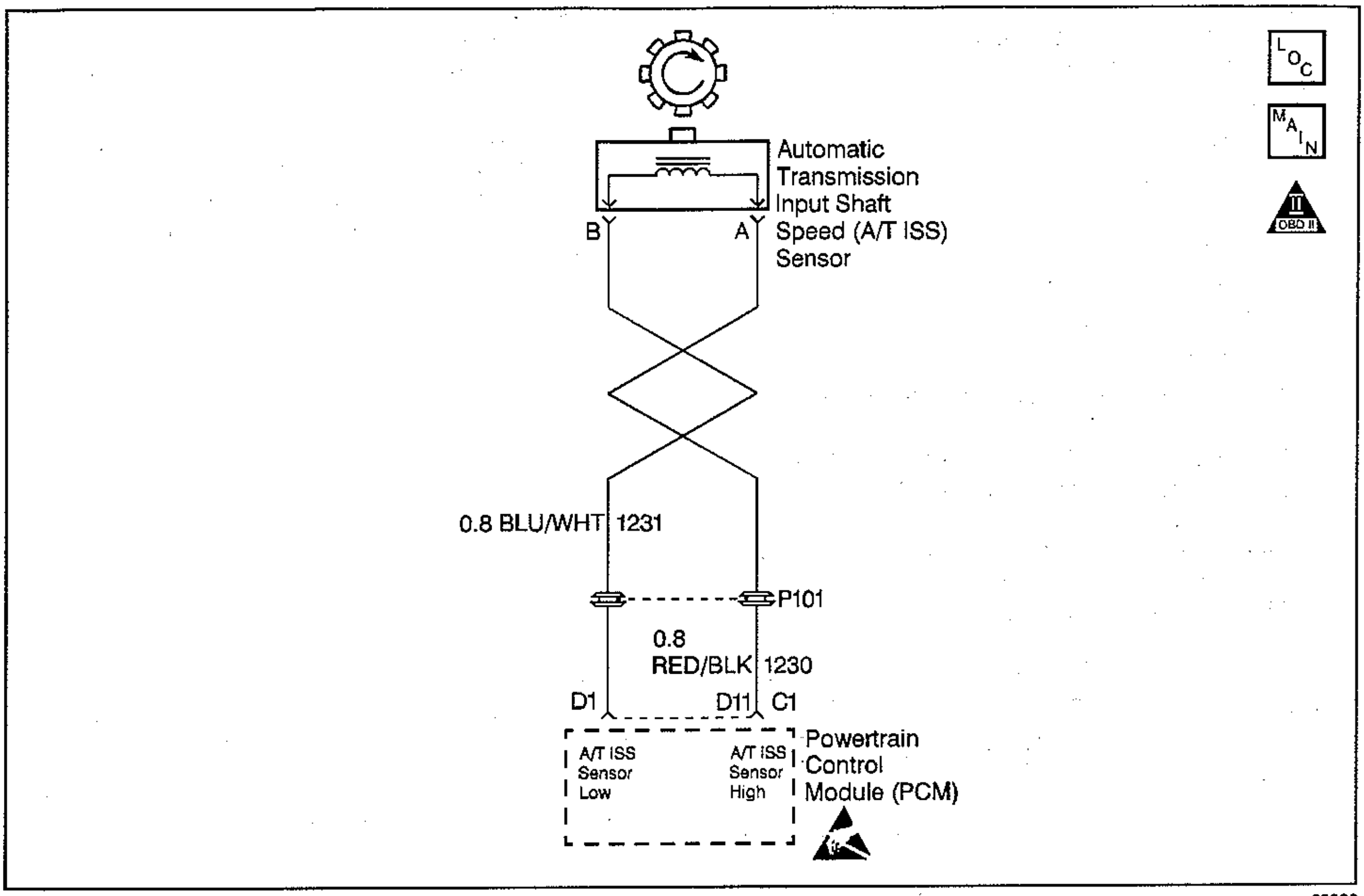
DTC P0716 Input Speed Sensor Circuit Intermittent (Gas) (cont'd)

Step	Action	Value(s)	Yes	No
3	1. Turn the ignition switch to the OFF position. 2. Remove the connector from the A/T ISS sensor. 3. Remove the A/T ISS Sensor from the transmission. 4. Using the *J 39200* DMM and *J 35616* Connector Test Adaptor Kit, measure the resistance of the A/T ISS Sensor. Is the sensor resistance within the specified value?	1042-2088Ω	*Go to Step 4*	*Go to Step 9*
4	Inspect circuit 1230 (RED/BLK) for an open or a short to ground. Refer to General Electrical Diagnosis Procedures. Did you find an open or short to ground condition?	—	*Go to Step 7*	*Go to Step 5*
5	Inspect circuit 1231 (BLU/WHT) for an open. Refer to General Electrical Diagnosis Procedures. Did you find an open condition?	—	*Go to Step 8*	*Go to Step 6*
6	1. Re-install the A/T ISS Sensor in the transmission. 2. Reconnect the A/T ISS Sensor connector to the sensor. 3. Disconnect VCM connector C3 (Clear) (additional DTCs may set). 4. Probe across terminal C3–7 and terminal C3–8 at VCM connector C3 with *J 39200* DMM on AC voltage. 5. Remove the fuel pump relay. Refer to *Automatic Transmission Components (Gas Engines).* 6. With the vehicle in Park, crank the engine. Is the voltage above the specified value?	0.5 volts AC	*Go to Step 10*	Go to Diagnostic Aids
7	Repair the open or short to ground in circuit 1230. Refer to Wiring Repairs. Did you correct the condition?	—	*Go to Step 12*	—
8	Repair the open in circuit 1231. Refer to Wiring Repairs. Did you correct the open condition?	—	*Go to Step 12*	—
9	Replace the Input Shaft Speed Sensor. Refer to Speed Sensor Replacement, in On-Vehicle Service. Is the replacement complete?	—	*Go to Step 12*	—

DTC P0716 Input Speed Sensor Circuit Intermittent (Gas) (cont'd)

Step	Action	Value(s)	Yes	No
10	1. Inspect the VCM pins for corrosion or weak tension. 2. Inspect the C3 connector terminals for corrosion or weak tension. Did you find the condition?	—	*Go to Step 12*	*Go to Step 11*
11	Replace the VCM. Refer to: • *VCM Replacement/Programming* (4.3L) • *VCM Replacement/Programming* (5.7L) • *VCM Replacement/Programming* (7.4L) Is the replacement complete?	—	*Go to Step 12*	—
12	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle under the following conditions: • The engine must be running and Transmission ISS must be greater than 500 RPM. • The VCM must see an input speed change of less than 200 RPM for 1 second. 4. Select Specific DTC. Enter DTC P0716. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0716 Input Speed Sensor Circuit Intermittent (Diesel)



Circuit Description

The Automatic Transmission Input (Shaft) Speed (A/T ISS) Sensor provides transmission input speed to the Powertrain Control Module (PCM). The A/T ISS Sensor is a Permanent Magnet (PM) generator. The sensor mounts into the transmission case and maintains a slight air gap between the sensor and the Forward Clutch Housing. The PM generator produces an AC voltage as the Forward Clutch Housing rotor teeth pass through the sensor's magnetic field. The AC voltage level increases as the turbine shaft speed increases. The PCM converts the AC voltage into a digital signal. The PCM determines actual turbine speed using the digital signal. The PCM uses the input speed to calculate torque converter slip speed, and gear ratios.

When the PCM detects an unrealistically large change in input speed, then DTC P0716 sets. DTC P0716 is a type B DTC.

Conditions for Setting the DTC

- No A/T ISS Sensor DTC P0717.
- No OSS Sensor DTCs P0722 or P0723.
- No Shift Solenoid DTCs P0751 or P0753.
- System voltage is 9.0 volts.
- Engine speed is greater than 475 RPM.
- The APP Angle is greater than 15%.
- Transmission Fluid Pressure Manual Valve Position Switch is not indicating Park or Neutral.
- The vehicle speed is greater than 32 Km/h (20 mph).
- The A/T ISS varies by more than 1200 RPM within 4 seconds.

Action Taken When the DTC Sets

- The PCM illuminates the Malfunction Indicator Lamp (MIL).
- The PCM commands maximum line pressure.
- The PCM freezes shift adapts.
- DTC P0716 is stored in PCM history.

Conditions for Clearing the MIL/DTC

- The PCM turns OFF the MIL after three consecutive trips without a failure reported.
- A scan tool can clear the DTC from the PCM history. The PCM clears the DTC from the PCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The PCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the PCM.

Diagnostic Aids

- Inspect the wiring at the PCM, the transmission connector and all other circuit connecting points for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation
  - Moisture intrusion
  - Corrosion
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- You may have to drive the vehicle in order to experience a fault.
- First diagnose and clear any engine DTCs that are present. Then inspect for any transmission DTCs that may have reset.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

4. This step tests for proper operation of the A/T ISS Sensor.
8. This step tests for proper A/T ISS Sensor circuit operation up to the PCM connections. You remove the Fuel Sol. Fuse in order to eliminate a flooding condition during this step.
10. This step tests for a short to ground in the A/T ISS Sensor circuit.

DTC P0716 Input Speed Sensor Circuit Intermittent (Diesel)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check*
2	1. Install the *scan tool.* 2. Turn the ignition to the RUN position with the engine OFF. **Important:** Before clearing the DTCs, use the scan tool in order to record the Freeze Frame and Failure Records for reference. Using the Clear Info function erases the stored Freeze Frame and Failure Records from the PCM. 3. Record the DTC Freeze Frame and Failure Records, then clear the DTC. 4. With the transmission in Park, start the engine. 5. Observe the scan tool, Transmission ISS. 6. Run the engine to 2000 RPM and hold the engine speed steady. Does the Transmission ISS RPM change by more than 1200 RPM at steady engine speed?	—	*Go to Step 3*	*Exit DTC table. No fault at this time*
3	1. Turn the ignition to the OFF position. 2. Disconnect the A/T ISS Sensor harness connector from the A/T ISS Sensor. 3. Using the *J 35616-A* Connector test Adapter Kit select the OHMS scale. Connect the *J 39200* DMM to the A/T ISS Sensor terminals. Is the A/T ISS Sensor resistance within the specified value?	1042–2088Ω	*Go to Step 4*	*Go to Step 15*

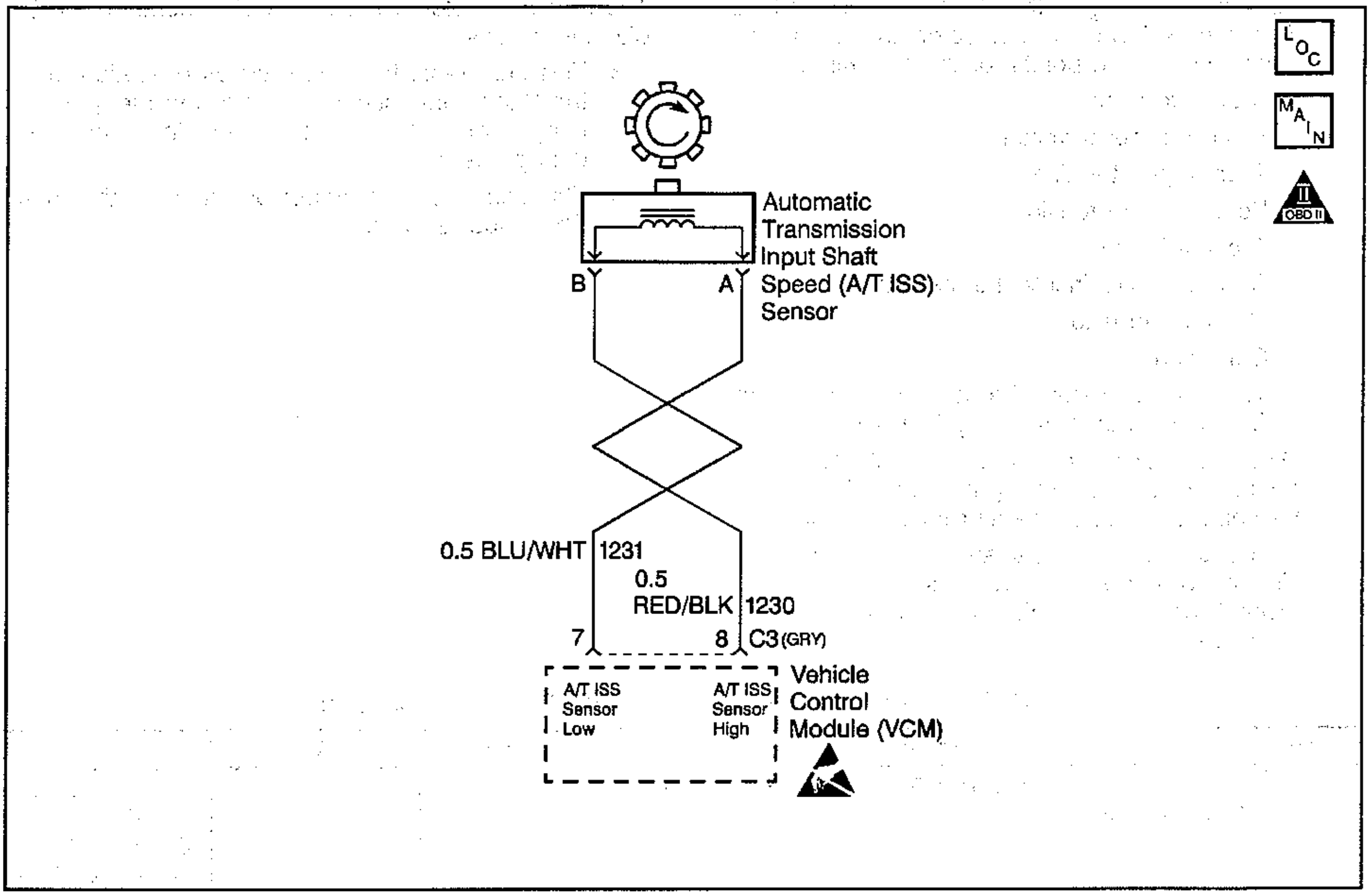
DTC P0716 Input Speed Sensor Circuit Intermittent (Diesel) (cont'd)

Step	Action	Value(s)	Yes	No
4	1. With the *J 39200* DMM connected to the ISS sensor, select AC Volts. 2. With the transmission in Park, start the engine. 3. Run the engine to 2000 RPM and hold the engine speed steady. Is the DMM voltage steady?	Greater than 10.0 volts AC	*Go to Step 5*	*Go to Step 15*
5	1. Turn the ignition to the OFF position. 2. Select DC Volts on the *J 39200* DMM. 3. Turn the ignition to the RUN position with the engine OFF. 4. Measure the voltage at both A/T ISS Sensor harness connector terminals A and B to a good ground. Is either voltage reading greater than the specified value?	10.5 volts DC	*Go to Step 6*	*Go to Step 8*
6	1. Inspect circuit 1230 for a short to power. 2. Inspect circuit 1231 for a short to power. Refer to General Electrical Diagnosis Procedures. Did you find the condition?	—	*Go to Step 7*	*Go to Step 16*
7	Repair the short to power in circuits 1230 and/or 1231. Refer to Wiring Repairs. Is the repair complete?	—	*Go to Step 18*	—
8	1. Reconnect the A/T ISS harness connector to the A/T ISS Sensor. 2. Turn the ignition to the OFF position. 3. Disconnect the PCM C1 (BRN-32 Pin) connector. 4. Connect the *J 39200* DMM on AC Volts to the C1 connector terminals D1 and D11. 5. Remove the Fuel Sol. Fuse in the Fuse/Relay Center. Refer to *Automatic Transmission Components (Diesel Engines).* 6. Turn the ignition to the RUN position and crank the engine while observing the *J 39200* DMM. Is the voltage greater than the specified value and steady?	0.4 volts AC	*Go to Step 16*	*Go to Step 9*
9	With the *J 39200* DMM measure the resistance between terminals D1 and D11 of the PCM C1 connector. Is the circuit resistance within the specified value?	1042–2088Ω	*Go to Step 10*	*Go to Step 12*
10	1. Measure the resistance from both PCM C1 connector terminals D1 and D11 to a good ground. 2. Measure the resistance from C1 connector terminal C1–D11 to a good ground. Is either resistance less than the specified value?	50kΩ	*Go to Step 11*	Go to Diagnostic Aids
11	Inspect circuits 1230 and 1231 for short to ground. Refer to General Electrical Diagnosis Procedures. Did you find and correct the condition?	—	*Go to Step 18*	—

DTC P0716 Input Speed Sensor Circuit Intermittent (Diesel) (cont'd)

Step	Action	Value(s)	Yes	No
12	Is the resistance reading from Step 9 less than the specified value?	1042–2088Ω	*Go to Step 13*	*Go to Step 14*
13	Repair circuits 1230 and 1231 for a short together. Refer to Wiring Repairs. Is the repair complete?	—	*Go to Step 18*	—
14	1. Inspect circuit 1230 for high resistance or an open. 2. Inspect circuit 1231 for high resistance or an open. Refer to General Electrical Diagnosis Procedures. Did you find and correct the condition?	—	*Go to Step 18*	—
15	Replace the A/T ISS Sensor. Refer to Speed Sensor Replacement, in On-Vehicle Service. Is the replacement complete?	—	*Go to Step 18*	—
16	Inspect the PCM pins and connector terminals for corrosion or weak tension. Did you find the condition?	—	*Go to Step 18*	*Go to Step 17*
17	Replace the PCM. Refer to *PCM Replacement/Programming.* Is the replacement complete?	—	*Go to Step 18*	—
18	In order to verify your repair, perform the following procedure: 1. Select DTC. **Important:** Failure to clear codes first may cause poor engine performance and high idle at start up. 2. Select Clear Info. 3. Operate the vehicle under the following conditions: • Start and run the engine greater than 475 RPM. • The PCM must see an A/T ISS change of less than 500 RPM for 1 second. 4. Select Specific DTC. Enter DTC P0716. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0717 Input Speed Sensor Circuit Low Input (Gas)



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Circuit Description

The Automatic Transmission Input (Shaft) Speed (A/T ISS) Sensor provides transmission input speed to the Vehicle Control Module (VCM). The A/T ISS Sensor is a Permanent Magnet (PM) generator. The sensor mounts into the transmission case and maintains a slight air gap between the sensor and the Forward Clutch Housing. The PM generator produces an AC voltage as the Forward Clutch Housing rotor teeth pass through the sensor's magnetic field. The AC voltage level increases as the turbine shaft speed increases. The VCM converts the AC voltage into a digital signal. The VCM determines actual turbine speed using the digital signal. The VCM uses the input speed to calculate torque converter slip speed, and gear ratios.

When the VCM detects a low or no input speed during high vehicle and high engine speeds, then DTC P0717 sets. DTC P0717 is a type D DTC. For California emissions vehicles, DTC P0717 is a type B DTC.

Conditions for Setting the DTC

- No OSS DTC P0502 or PO503.
- No TFP Val. Position Sw. DTC P1810.
- TFP Val. position switch is not Park or Neutral.
- The vehicle speed is greater than 12 mph.
- The engine runs greater than 475 RPM for at least 5 seconds.
- The measured input speed is less than 50 RPM for at least 5.0 seconds.

Action Taken When the DTC Sets

- For California emissions only, the VCM illuminates the Malfunction Indicator Lamp (MIL).
- The VCM defaults the transmission to maximum line pressure.
- The VCM freezes shift adapts.
- DTC P0717 is stored in VCM history.

Conditions for Clearing the MIL/DTC

1. For California Emissions, the VCM turns OFF the MIL after three consecutive ignition cycles without a failure reported.
2. A scan tool can clear the DTC from the VCM history. The VCM clears the DTC from the VCM history if the vehicle completes 40 warm-up cycles without a failure reported.
3. The VCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the VCM.

Diagnostic Aids

- Inspect the wiring at the VCM, the Output Shaft Speed (OSS) Sensor connector and all other circuit connecting points for the following:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation
  - Moisture intrusion
  - Corrosion
  - The A/T ISS sensor harness being near the DIS components or the ignition wires.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- First diagnose and clear any engine DTCs or TP Sensor codes that are present. Then inspect for any transmission DTCs that may have reset.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

3. This step tests for proper circuit operation up to the VCM connections. Remove the fuel pump relay in order to eliminate a flooding condition during this step.
5. This step tests for proper operation of the Input Shaft Speed Sensor.

DTC P0717 Input Speed Sensor Circuit Low Input (Gas)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check* (4.3L) or *Powertrain OBD System Check* (5.7L) or *Powertrain OBD System Check* (7.4L)
2	1. Install the *scan tool*. 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Freeze Frame and Failure Records for reference. The Clear Info function erases the stored Freeze Frame and Failure Records from the VCM. 3. Record the DTC Freeze Frame and Failure Records. 4. With the vehicle in Park, start the engine and idle greater than 500 RPM. 5. Select scan tool Transmission ISS and Engine RPM. Is the Transmission ISS greater than 50 RPM?	—	Go to Diagnostic Aids	*Go to Step 3*

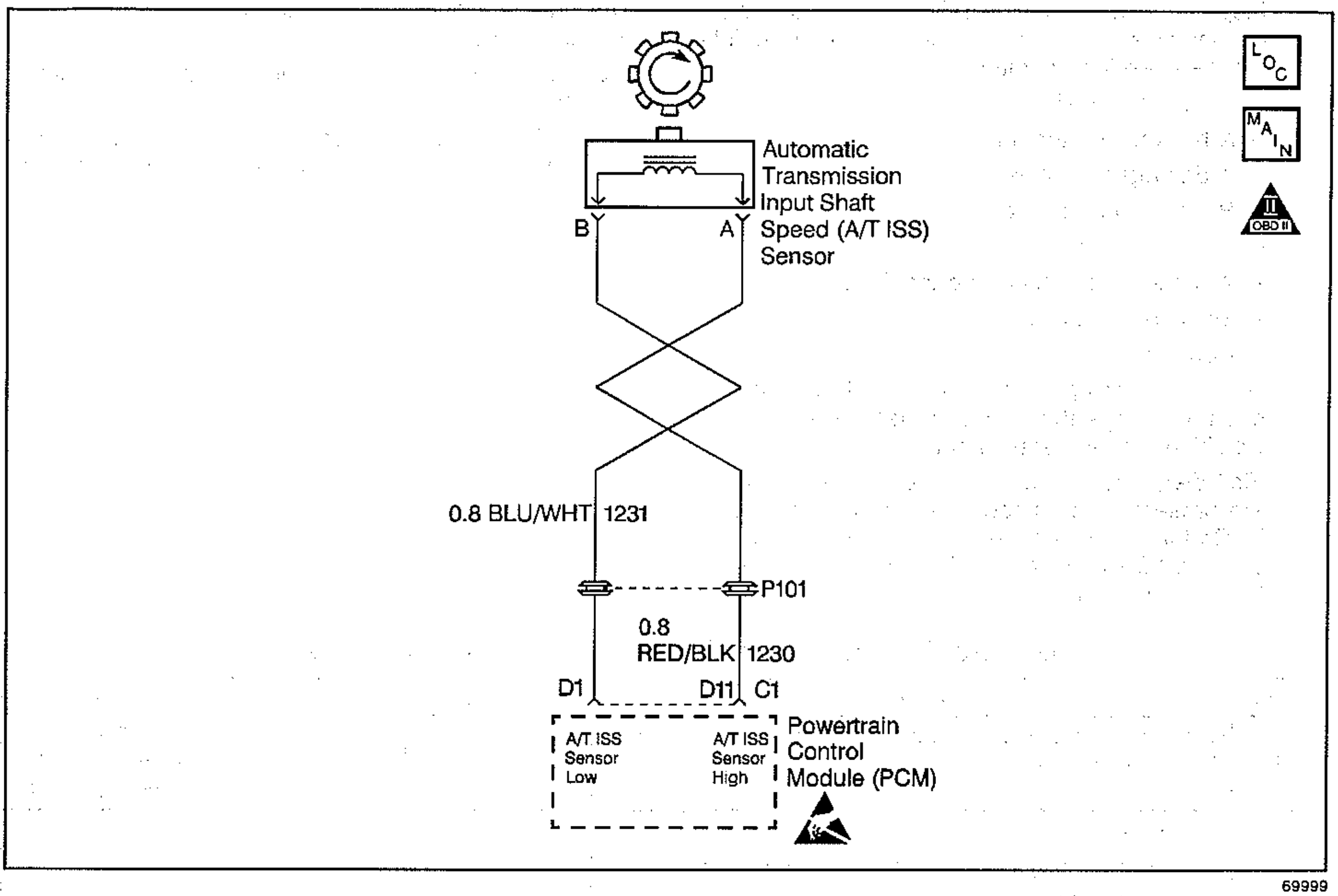
DTC P0717 Input Speed Sensor Circuit Low Input (Gas) (cont'd)

Step	Action	Value(s)	Yes	No
3	1. Turn the ignition switch to the OFF position. 2. Disconnect VCM connector C3 (Clear) (additional DTCs may set). 3. Probe across terminal C3–7 and terminal C3–8 at VCM connector with *J 39200* DMM on AC voltage. 4. Remove the fuel pump relay. Refer to *Automatic Transmission Components (Gas Engines).* 5. With the vehicle in Park, crank the engine. Is the voltage above the specified value?	0.5 volts AC	*Go to Step 12*	*Go to Step 4*
4	1. Turn the ignition switch to the OFF position. 2. Remove the connector from the A/T ISS Sensor. 3. Using the *J 39200* DMM and *J 35616* Connector Test Adaptor Kit, measure the resistance between terminal A and terminal B of the A/T ISS Sensor. Is the sensor's resistance within the specified value?	1042-2088Ω	*Go to Step 5*	*Go to Step 11*
5	1. Select AC volts on the *J 39200* DMM. 2. With the vehicle in Park, crank the engine. Is the DMM voltage greater than the specified value?	0.5 volts AC	*Go to Step 7*	*Go to Step 6*
6	1. Remove the A/T ISS Sensor from the transmission. 2. Inspect the A/T ISS Sensor. 3. Inspect the forward clutch housing for damage (rotor teeth). Did you find the condition?	—	*Go to Step 14*	*Go to Step 11*
7	Inspect circuit 1230 (RED/BLK) for an open or short to ground. Refer to General Electrical Diagnosis Procedures. Did you find a condition?	—	*Go to Step 8*	*Go to Step 9*
8	Repair the open or short to ground in circuit 1230. Refer to Wiring Repairs. Did you correct the condition?	—	*Go to Step 14*	—
9	Inspect circuit 1231 (BLU/WHT) for an open or short to ground. Refer to General Electrical Diagnosis Procedures. Did you find a condition?	—	*Go to Step 10*	Go to Diagnostic Aids
10	Repair the open or short to ground in circuit 1231. Refer to Wiring Repairs. Did you correct the condition?	—	*Go to Step 14*	—

DTC P0717 Input Speed Sensor Circuit Low Input (Gas) (cont'd)

Step	Action	Value(s)	Yes	No
11	Replace the Input Shaft Speed Sensor. Refer to Speed Sensor Replacement, in On-Vehicle Service. Is the replacement complete?	—	*Go to Step 14*	—
12	1. Inspect the VCM pins for corrosion or weak tension. 2. Inspect the C3 connector terminals for corrosion or weak tension. Did you find the condition?	—	*Go to Step 14*	*Go to Step 13*
13	Replace the VCM. Refer to: • *VCM Replacement/Programming* (4.3L) • *VCM Replacement/Programming* (5.7L) • *VCM Replacement/Programming* (7.4L) Is the replacement complete?	—	*Go to Step 14*	—
14	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle under the following conditions: • The vehicle in drive range and the engine must be running. • Vehicle speed greater than 12 MPH. • The VCM must see an input speed greater than 500 RPM for 1 second. 4. Select Specific DTC. Enter DTC P0717. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0717 Input Speed Sensor Circuit Low Input (Diesel)



Circuit Description

The Automatic Transmission Input (Shaft) Speed (A/T ISS) Sensor provides transmission input speed to the Powertrain Control Module (PCM). The A/T ISS Sensor is a Permanent Magnet (PM) generator. The sensor mounts into the transmission case and maintains a slight air gap between the sensor and the Forward Clutch Housing. The PM generator produces an AC voltage as the Forward Clutch Housing rotor teeth pass through the sensor's magnetic field. The AC voltage level increases as the turbine shaft speed increases. The PCM converts the AC voltage into a digital signal. The PCM determines actual turbine speed using the digital signal. The PCM uses the input speed to calculate torque converter slip speed, and gear ratios.

When the PCM detects a low or no input speed during high vehicle and high engine speeds, then DTC P0717 sets. DTC P0717 is a type B DTC.

Conditions for Setting the DTC

- No OSS Sensor DTCs P0722 or P0723.
- No TFP Val. Position Sw. DTC P1810.
- TFP Val. Position Sw. is not in Park or Neutral.
- The vehicle speed is greater than 32 Km/h (20 mph).
- System voltage is 9.0 volts.
- The engine runs greater than 475 RPM 7 seconds.
- The A/T ISS is less than 50 RPM for at least 5 seconds.

Action Taken When the DTC Sets

- The PCM illuminates the Malfunction Indicator Lamp (MIL).
- The PCM defaults the transmission to maximum line pressure.
- The PCM freezes shift adapts.
- DTC P0717 is stored in PCM history.

Conditions for Clearing the MIL/DTC

- The PCM turns OFF the MIL after three consecutive trips without a failure reported.
- A scan tool can clear the DTC from the PCM history. The PCM clears the DTC from the PCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The PCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the PCM.

Diagnostic Aids

- Inspect the wiring at the PCM, the transmission connector and all other circuit connecting points for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation
  - Moisture intrusion
  - Corrosion
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- First diagnose and clear any engine DTCs that are present. Then inspect for any transmission DTCs that may have reset. If a DTC P0717 and a DTC P0730 are both present, diagnose DTC P0717 first.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2. This step tests for proper operation of the A/T ISS Sensor.
4. This step tests for proper A/T ISS Sensor and circuit operation. Remove the Fuel Sol. fuse in order to eliminate a flooding condition.

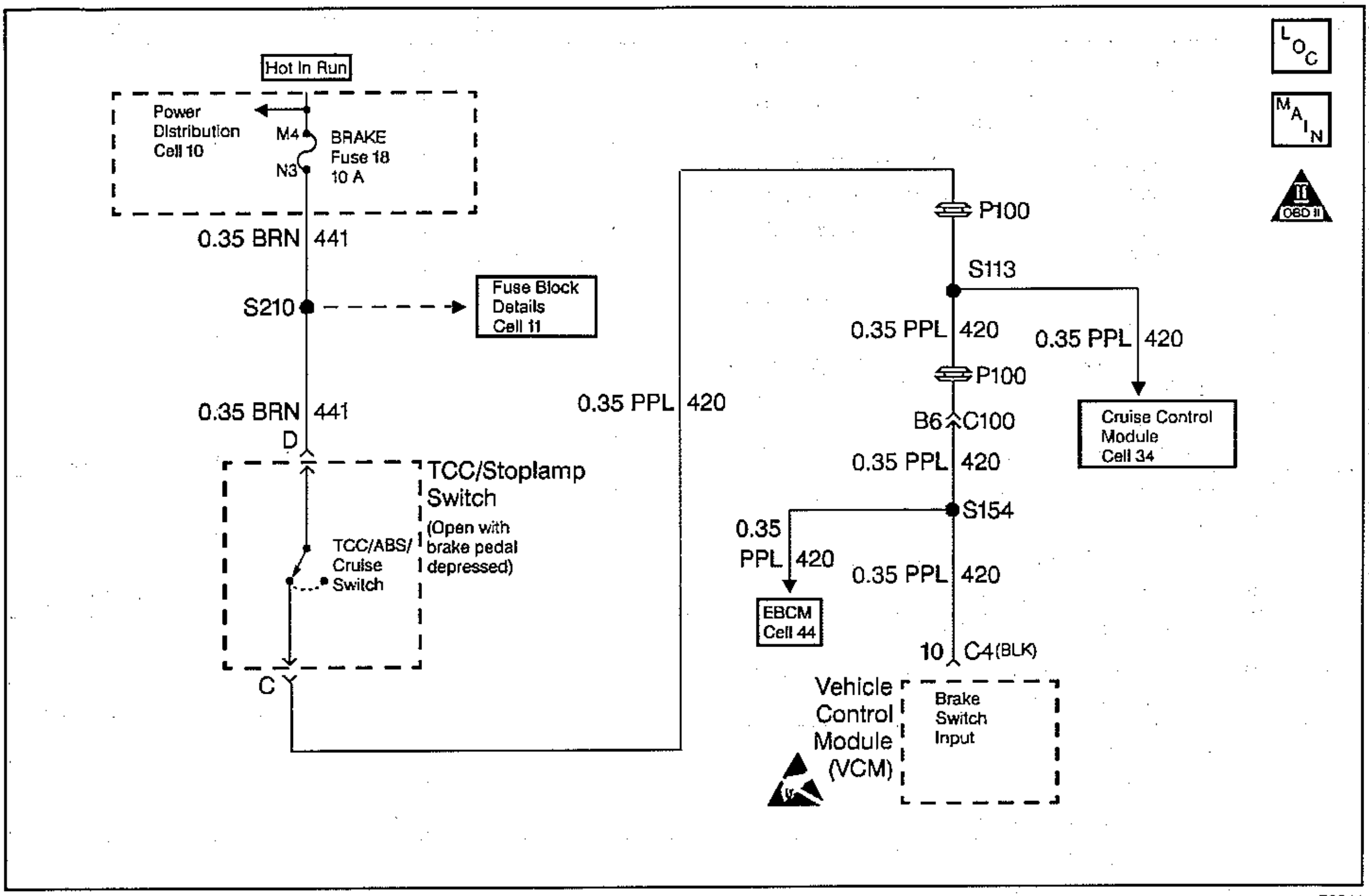
DTC P0717 Input Speed Sensor Circuit Low Input (Diesel)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check*
2	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Freeze Frame and Failure Records for reference. Using the Clear Info function erases the stored Freeze Frame and Failure Records from the PCM. 3. Record the DTC Freeze Frame and Failure Records, then clear the DTC. **Important:** If a DTC P0730 is also present, refer to the Diagnostic Aids. 4. Disconnect the wiring harness at the Input Shaft Speed Sensor. 5. Using the *J 39200* DMM and the *J 35616-A* Connector Test Adapter Kit, connect the test leads to the A/T ISS Sensor terminals. Set the *J 39200* DMM selector on OHMS. 6. Measure the resistance of the A/T ISS Sensor. Is the resistance within the specified value?	1042-2088 Ω	*Go to Step 3*	*Go to Step 9*
3	1. With the leads on the A/T ISS Sensor, select AC volts on the *J 39200* DMM. 2. With the selector in park position, start the engine and idle above 700 RPM. Is the DMM voltage greater than the specified value?	3.0 volts AC	*Go to Step 4*	*Go to Step 9*

DTC P0717 Input Speed Sensor Circuit Low Input (Diesel) (cont'd)

Step	Action	Value(s)	Yes	No
4	1. Reconnect the A/T ISS Harness to the sensor. 2. With the ignition in the OFF position, disconnect the PCM C1 (BRN-32 Pin) connector. 3. Probe across terminals D11 and D1 at the PCM connector C1 with the *J 39200* DMM on AC voltage. 4. Remove the Fuel Sol. Fuse located in the Fuse/Relay Center. Refer to *Automatic Transmission Components (Diesel Engines).* 5. With the vehicle in Park, turn the ignition to the switch to the Start position in order to crank the engine. Is the voltage greater than the specified value?	0.4 volts AC	*Go to Step 10*	*Go to Step 5*
5	Inspect circuit 1230 for an open, a short to B+, or a short to ground. Refer to General Electrical Diagnosis Procedures. Did you find the condition?	—	*Go to Step 7*	*Go to Step 6*
6	Inspect circuit 1231 for a short to B+, or an open. Refer to General Electrical Diagnosis Procedures. Did you find the condition?	—	*Go to Step 8*	Refer to Diagnostic Aids
7	Repair the condition in circuit 1230. Refer to Wiring Repairs. Did you correct the condition?	—	*Go to Step 12*	—
8	Repair the condition in circuit 1231. Refer to Wiring Repairs. Did you correct the condition?	—	*Go to Step 12*	—
9	Replace the Input Shaft Speed Sensor. Refer to Speed Sensor Replacement, in On-Vehicle Service. Is the replacement complete?	—	*Go to Step 12*	—
10	Inspect the PCM pins and the C1 connector terminals. Did you find the condition?	—	*Go to Step 12*	*Go to Step 11*
11	Replace the PCM. Refer to *PCM Replacement/Programming.* Is the replacement complete?	—	*Go to Step 12*	—
12	In order to verify your repair, perform the following procedure: 1. Select DTC. **Important:** Failure to clear codes before continuing may cause poor engine performance and high idle at start up. 2. Select Clear Info. 3. Operate the vehicle under the following conditions: • Start and run the engine above 500 RPM. • Drive the Vehicle greater than 12 mph. • The PCM must see a Trans. ISS greater than 500 RPM for 1 second. 4. Select Specific DTC. Enter DTC P0717. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0719 Brake Switch Circuit Low Input (Gas)



Circuit Description

The TCC/Stoplamp switch indicates the brake pedal status. The normally-closed TCC/Stoplamp switch supplies a B+ signal on circuit 420 to the Vehicle Control Module (VCM). The signal voltage circuit opens when the brakes are applied.

If the VCM detects an open TCC/Stoplamp Switch circuit during accelerations, then DTC P0719 sets. DTC P0719 is a type D DTC.

Conditions for Setting the DTC

- No OSS DTC P0502 or DTC P0503.
- The VCM detects an open TCC/Stoplamp switch circuit (0 volts) for 15 minutes.
- The following sequence of events occurs eight consecutive times:
  - The vehicle speed is less than 8 km/h (5 mph).
  - Then the vehicle speed is 8–40 km/h (5–25 mph) for 3.5 seconds.
  - Then the vehicle speed is greater than 40 km/h (25 mph) for 6 seconds.

Action Taken When the DTC Sets

- The VCM does not illuminate the Malfunction Indicator Lamp (MIL).
- For TCC scheduling, the VCM disregards the brake switch state if the TP Sensor is greater than 1% and the vehicle speed is greater than 20 MPH.
- DTC P0719 is stored in VCM history.

Conditions for Clearing the DTC

- A scan tool can clear the DTC from the VCM history. The VCM clears the DTC from the VCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The VCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the VCM.

Diagnostic Aids

- Inspect the wiring at the VCM, the TCC/Stoplamp Switch and all other circuit connecting points for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation
  - Moisture intrusion
  - Corrosion
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- Ask about the customer's driving habits and any unusual driving conditions he or she might have, such as stop and go traffic or expressway driving.
- Inspect the brake switch for proper mounting and adjustment.
- Inspect for the most current calibration ID and the latest bulletins.
- First diagnose and clear any engine DTCs or TP Sensor codes that are present. Then inspect for any transmission DTCs that may have reset.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

4. This step tests for TCC/Stoplamp switch voltage to the VCM connector.
7. This step isolates the TCC/Stoplamp switch as a source for setting the DTC.
10. This step tests for a short to ground in circuit 441 (ignition voltage) to the TCC/Stoplamp switch.
12. This step tests for a short to ground in circuit 420, from the TCC/Stoplamp switch to the VCM.
13. This step isolates the VCM as a source for causing the fuse to open.

DTC P0719 Brake Switch Circuit Low Input (Gas)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check* (4.3L) or *Powertrain OBD System Check* (5.7L) or *Powertrain OBD System Check* (7.4L)
2	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Failure Records for reference. The Clear Info function erases the stored Failure Records from the VCM. 3. Record the DTC Failure Records then clear the DTC. 4. Select the TCC Brake Switch on the scan tool. 5. Do not apply the brake pedal. Does the scan tool TCC Brake Sw. indicate CLOSED, when the brake pedal is not applied?	—	Go to Diagnostic Aids	*Go to Step 3*
3	1. Remove the Brake fuse. 2. Inspect the Brake fuse for an open. Refer to General Electrical Diagnosis Procedures. Is the fuse open?	—	*Go to Step 10*	*Go to Step 4*

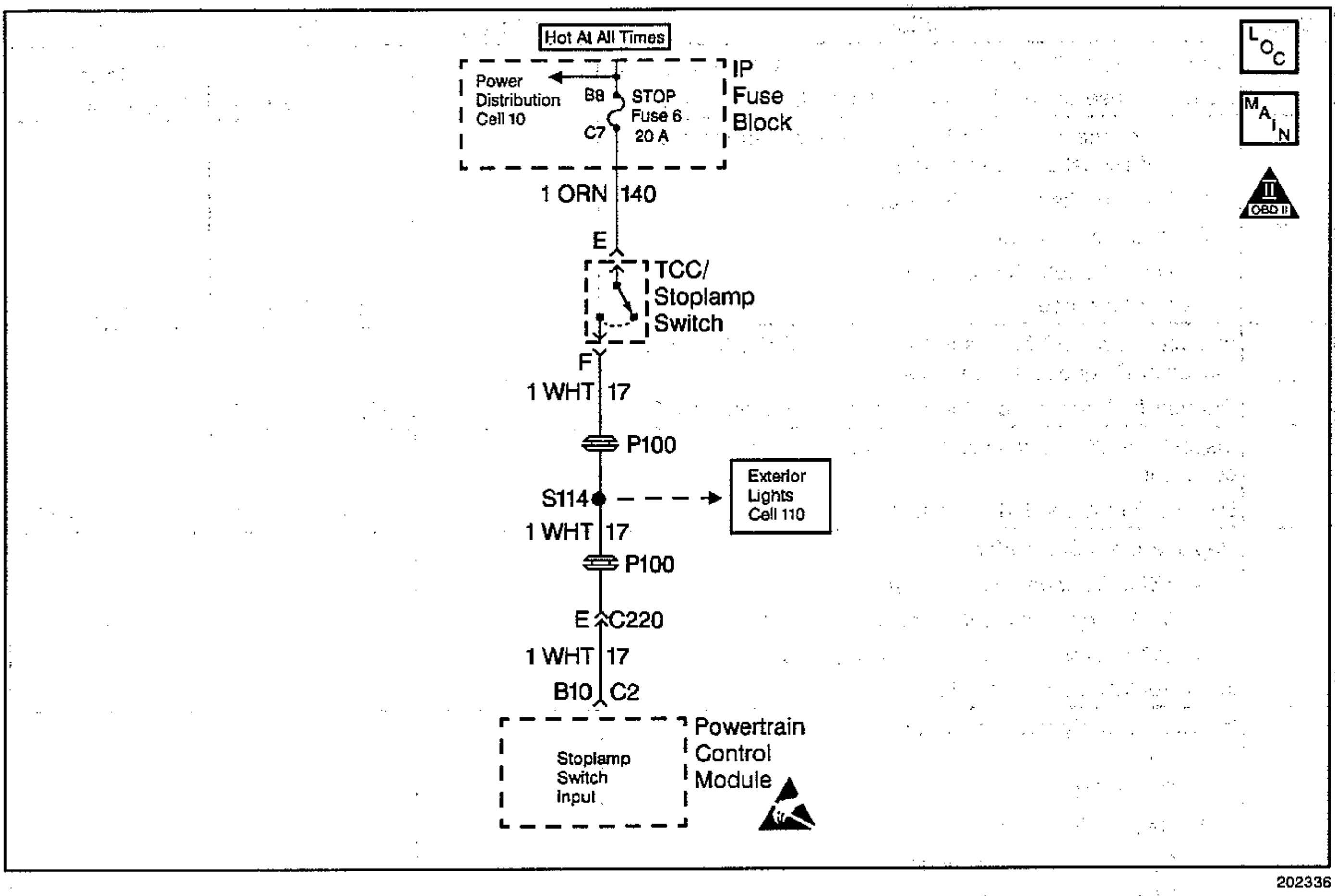
DTC P0719 Brake Switch Circuit Low Input (Gas) (cont'd)

Step	Action	Value(s)	Yes	No
4	1. Turn the ignition switch to the OFF position. 2. Disconnect the C4 (BLK) connector from the VCM. 3. Connect a 12-volt test lamp to a good ground. 4. Using the *J 35616* Connector Test Adaptor Kit and the 12-volt test lamp, probe terminal C4-10 (420 PPL). 5. Re-install the fuse. 6. Turn the ignition switch to the RUN position. 7. Do not apply the brake pedal. Is the test lamp on?	—	*Go to Step 15*	*Go to Step 5*
5	1. Turn the ignition key to the OFF position. 2. Remove the connector from the TCC/Stoplamp switch. 3. Use the *J 39200* DMM to measure B+ voltage at terminal D (441 BRN) of the brake switch connector. 4. Turn the ignition switch to the RUN position. Is B+ voltage indicated?	10-13 volts	*Go to Step 7*	*Go to Step 6*
6	Inspect circuit 441 for an open. Refer to General Electrical Diagnosis Procedures. Did you find and correct an open condition?	—	*Go to Step 17*	—
7	1. Turn the key to the RUN position. 2. Install a fused jumper wire from terminal C (420 PPL) to terminal D (441 BRN) of the TCC Stoplamp switch connector. 3. Probe the VCM connector terminal C4-10 (420 PPL) with the test lamp. Is the test lamp on?	—	*Go to Step 9*	*Go to Step 8*
8	Inspect circuit 420 for an open. Refer to General Electrical Diagnosis Procedures. Did you find and correct an open condition?	—	*Go to Step 17*	—
9	Replace the stoplamp switch. Refer to Stoplamp Switch Replacement. Is the replacement complete?	—	*Go to Step 17*	—
10	1. Turn the key to the RUN position. 2. Apply and hold the brake pedal. 3. Install a new fuse while keeping the brake pedal applied. Does the fuse open with the brake pedal applied?	—	*Go to Step 11*	*Go to Step 12*
11	Inspect circuit 441 for a short to ground. Refer to General Electrical Diagnosis Procedures. Did you find and correct the short to ground condition?	—	*Go to Step 17*	—

DTC P0719 Brake Switch Circuit Low Input (Gas) (cont'd)

Step	Action	Value(s)	Yes	No
12	With the key in the RUN position, release the brake pedal. Does the fuse open when the brake pedal is released?	—	*Go to Step 13*	Go to Diagnostic Aids
13	1. Disconnect the C4 (BLK) connector from the VCM (additional DTCs may set). 2. Turn the key to the RUN position. 3. Install a new fuse. 4. Do not apply the brake pedal. Does the fuse open?	—	*Go to Step 14*	*Go to Step 15*
14	Inspect circuit 420 for a short to ground. Refer to General Electrical Diagnosis Procedures. Did you find and correct the short to ground condition?	—	*Go to Step 17*	—
15	Inspect the VCM terminals for corroded or weak connections. Did you find a shorted condition?	—	*Go to Step 17*	*Go to Step 16*
16	Replace the VCM. Refer to: • *VCM Replacement/Programming* (4.3L) • *VCM Replacement/Programming* (5.7L) • *VCM Replacement/Programming* (7.4L) Is the replacement complete?	—	*Go to Step 17*	—
17	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle under the following conditions: • With the engine OFF, turn the ignition switch to the RUN position. • The brake pedal is not applied. • Select TCC Brake Sw. on the scan tool. Does the TCC Brake Sw. indicate Closed when the brake pedal is not applied, then indicate Open when the brake pedal is applied?	—	Repair verified, exit DTC table	*Begin Diagnosis again, Go to Step 1*

DTC P0719 Brake Switch Circuit Low Input (Diesel)



Circuit Description

The normally open TCC/Stoplamp switch indicates brake pedal status to the Powertrain Control Module (PCM). Applying the brake pedal closes the switch, supplying voltage to the PCM. Releasing the brake pedal interrupts voltage to the PCM.

If the PCM detects an open TCC/Stoplamp Switch (stuck OFF) during decelerations, then DTC P0719 sets. DTC P0719 is a type D DTC.

Conditions for Setting the DTC

- No OSS Sensor DTC P0722 or P0723.
- The PCM detects an open TCC/Stoplamp switch/circuit (0 volts) and the following sequence of events occur ten consecutive times:
  1. the vehicle speed is greater than 32 km/h (20 mph) for 6 seconds.
  2. Then the vehicle speed is 8–32 km/h (5–20 mph) for 3 seconds.
  3. Then the vehicle speed is less than 8 km/h (5 mph).
  4. DTC P0719 has not passed.

Action Taken When the DTC Sets

- The PCM does not illuminate the Malfunction Indicator Lamp (MIL).
- DTC P0719 is stored in PCM history.

Conditions for Clearing the DTC

- A scan tool can clear the DTC from the PCM history. The PCM clears the DTC from the PCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The PCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the PCM.

Diagnostic Aids

- Inspect the wiring at the PCM, the TCC/Stoplamp switch connector and all other circuit connecting points for the following conditions:
  – A bent terminal
  – A backed out terminal
  – A damaged terminal
  – Poor terminal tension
  – A chafed wire
  – A broken wire inside the insulation
  – Moisture intrusion
  – Corrosion
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.

- Ask about the customer's driving habits and any unusual driving conditions he or she might have, such as stop and go traffic or expressway driving.
- A short in the stoplamp circuit will cause the fuse to open.
- Inspect the TCC/Stoplamp switch for proper mounting and adjustment.
- First diagnose and clear any engine DTCs codes that are present. Then inspect for any transmission DTCs that may have reset.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

3. This step isolates the TCC/Stoplamp Switch as a source for setting the DTC.
5. This step tests for a short to ground between the fuse and the TCC/Stoplamp Switch.
7. This step tests for a short to ground in circuit 17.
8. This step removes the PCM from circuit 17 as the source of a short to ground.

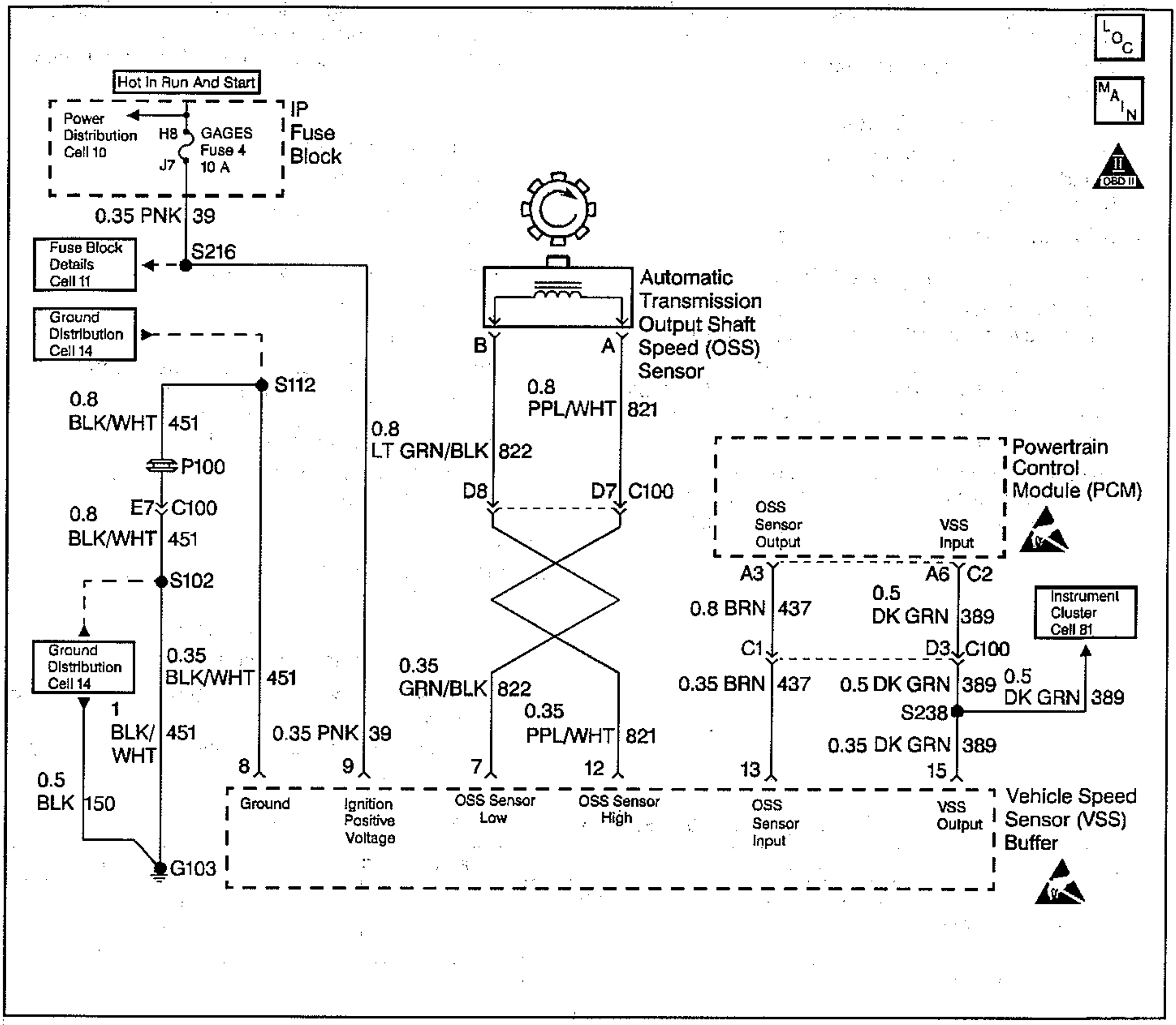
DTC P0719 Brake Switch Circuit Low Input (Diesel)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check*
2	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Freeze Frame and Failure Records for reference. Using the Clear Info function erases the stored Failure Records from the PCM. 3. Record the DTC Failure Records, then clear the DTC. 4. Select the TCC/Brake Switch on the scan tool. 5. Disconnect the TCC/Stoplamp Switch connector from the TCC/Stoplamp Switch. 6. Connect a test lamp from cavity B (circuit 140 ORN) of the TCC/Stoplamp Switch connector to a known good ground. Is the test lamp ON?	—	*Go to Step 3*	*Go to Step 4*
3	Install a *J 36169-A* Fused Jumper Wire from terminal E (circuit 140 ORN) to terminal F (circuit 17 WHT) of the TCC/Stoplamp Switch connector. Did the scan tool TCC/Brake Switch status change from Open to Closed?	—	*Go to Step 10*	*Go to Step 12*
4	1. Remove the Stop/Hazard fuse. 2. Inspect the Stop/Hazard fuse for an open. Refer to General Electrical Diagnosis Procedures. Is the fuse open?	—	*Go to Step 5*	*Go to Step 11*
5	Replace the Stop/Hazard fuse. Does the replacement fuse open immediately?	—	*Go to Step 6*	*Go to Step 7*
6	Inspect circuit 140 for a short to ground. Refer to General Electrical Diagnosis Procedures. Did you find and repair the condition?	—	*Go to Step 15*	—
7	1. Reconnect the TCC/Stoplamp Switch connector. 2. Apply the brake pedal. Does the fuse open immediately?	—	*Go to Step 8*	Intermittent short to ground. Go to Diagnostic Aids.

DTC P0719 Brake Switch Circuit Low Input (Diesel) (cont'd)

Step	Action	Value(s)	Yes	No
8	1. Disconnect the C2 (BRN-24 Pin) connector from the PCM. 2. Replace the Stop/Hazard fuse. 3. Apply the brake pedal. Does the fuse open immediately?	—	*Go to Step 9*	*Go to Step 13*
9	Inspect circuit 17 for a short to ground. Refer to General Electrical Diagnosis Procedures. Did you find and repair the condition?	—	*Go to Step 15*	—
10	Replace the Stoplamp Switch. Refer to Stoplamp Switch Replacement. Is the replacement complete?	—	*Go to Step 15*	—
11	Inspect circuit 140 for an open. Refer to General Electrical Diagnosis Procedures. Did you find and correct the condition?	—	*Go to Step 15*	—
12	Inspect circuit 17 for an open. Refer to General Electrical Diagnosis Procedures. Did you find the condition?	—	*Go to Step 15*	*Go to Step 13*
13	Inspect the PCM pins, the connector terminals, and the wiring for corrosion or shorting together. Did you find the condition?	—	*Go to Step 15*	*Go to Step 14*
14	Replace the PCM. Refer to *PCM Replacement/Programming.* Is the replacement complete?	—	*Go to Step 15*	—
15	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle under the following conditions: • With the engine OFF, the ignition switch is in the RUN position. • Depress the brake pedal. • The scan tool TCC Brake Switch status must indicate Closed (12 volts) for 2 seconds. 4. Select Specific DTC. Enter DTC P0719. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0722 Output Speed Sensor Circuit Low Input (Diesel Only)



Circuit Description

The speed sensor circuit consists of a magnetic induction type sensor, which is the Output Shaft Speed (OSS) Sensor, a Vehicle Speed Sensor (VSS) Buffer Module, and wiring. Gear teeth pressed onto the output shaft carrier assembly induce an alternating voltage into the sensor. This signal transmits to the VSS Buffer Module. The VSS Buffer Module compensates for various final drive ratios. The VSS Buffer Module also converts the AC OSS Sensor signal into a 40 pulse per revolution (PPR) 5-volt DC square wave form signal on circuit 437 to indicate transmission output speed.

When the Powertrain Control Module (PCM) detects a low output speed when the vehicle has a high engine speed in a drive gear range, then DTC P0722 sets. DTC P0722 is a type B DTC.

Conditions for Setting the DTC

- No MAP DTCs P0106, P0107 or P0108.
- No TFP Val. Position Sw. DTC P1810.
- The APP Angle is greater than 10%.
- The engine torque must be 108–642 N.m (80–475 lb ft).
- Engine speed is greater than 475 RPM for 7 seconds.
- The engine speed is less than 3800 RPM.
- The A/T ISS Sensor speed is greater than 1500 RPM.
- The transmission is not in Park or Neutral.
- System voltage is 9.0–16.0 volts.
- The OSS Sensor speed is less than 200 RPM for at least 3 seconds.

Action Taken When the DTC Sets

- The PCM illuminates the Malfunction Indicator Lamp (MIL).
- The PCM commands to maximum line pressure.
- The PCM freezes shift adapts.
- The PCM defaults to the calculated output speed value using the Input Shaft Speed Sensor values.
- DTC P0722 is stored in PCM history.

Conditions for Clearing the MIL/DTC

- The PCM turns OFF the MIL after three consecutive trips without a failure reported.
- A scan tool can clear the DTC from the PCM history. The PCM clears the DTC from the PCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The PCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the PCM.

Diagnostic Aids

- Inspect the wiring at the PCM, the A/T OSS and the VSS Buffer Module connectors, and all other circuit connecting points for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation
  - Moisture intrusion
  - Corrosion
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change. It may be necessary to drive the vehicle.
- Inspect the Speed Sensor wiring for contact with sharp metal edges.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2. This step verifies the fault condition.
3. This step tests sensor integrity.
9. This step verifies power and ground to the VSS Buffer Module.
15. This step verifies the PCM input controlled by the Speed Buffer.

DTC P0722 Output Speed Sensor Circuit Low Input (Diesel Only)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check*
2	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Freeze Frame and Failure Records for reference. Using the Clear Info function erases the stored Freeze Frame and Failure Records from the PCM. 3. Record the DTC Freeze Frame and Failure Records and DTCs, then clear the DTC. 4. Raise the drive wheels and support the axle assembly. 5. Start the engine and place the transmission in D1 range. 6. Gradually increase the wheel speed. Does the Transmission OSS increase with the drive wheel speed?	—	Cannot verify fault. Exit the DTC table and go to Diagnostic Aids	*Go to Step 3*

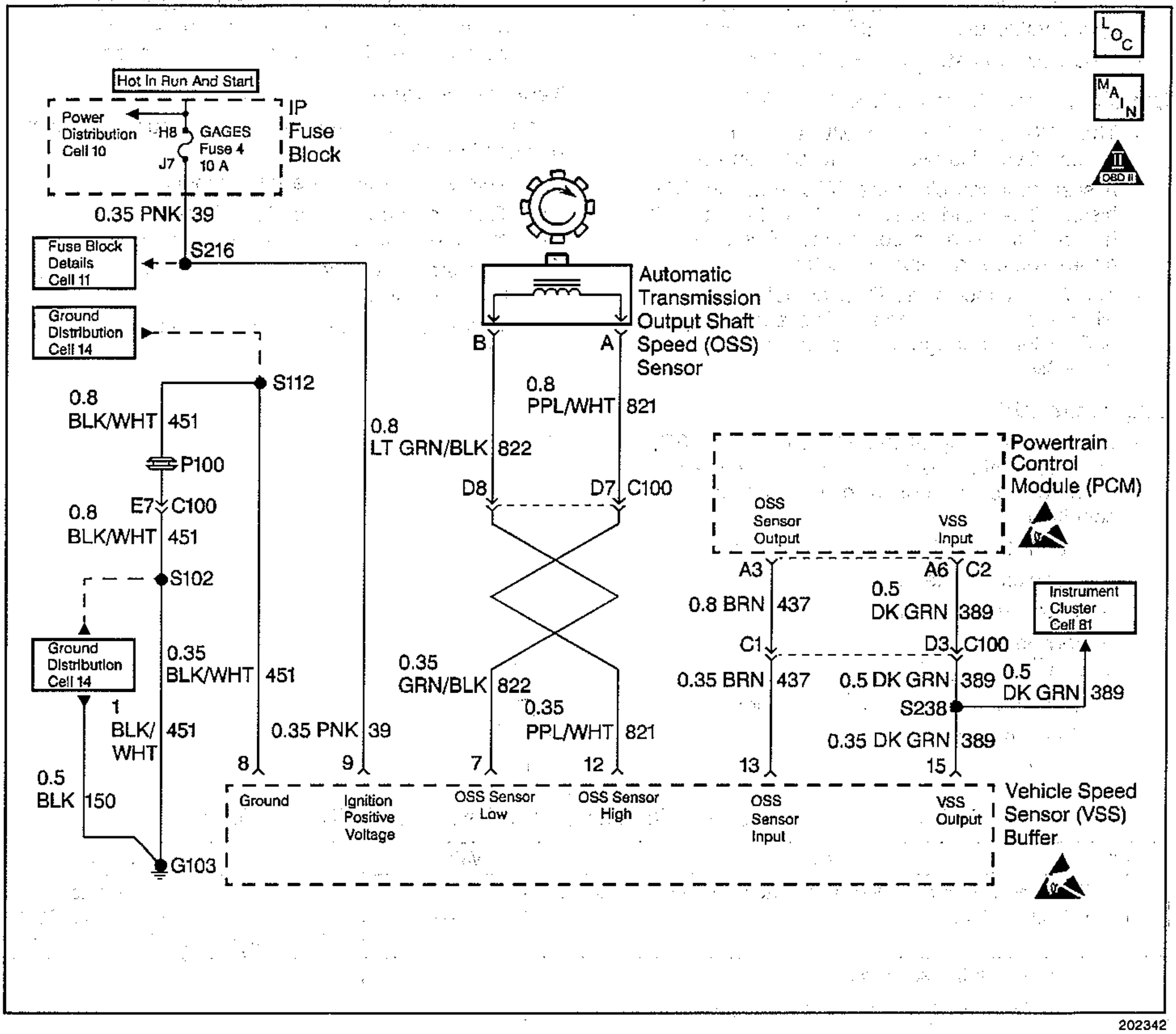
DTC P0722 Output Speed Sensor Circuit Low Input (Diesel Only) (cont'd)

Step	Action	Value(s)	Yes	No
3	1. Turn the ignition OFF. 2. Disconnect the OSS Sensor connector from the OSS Sensor. 3. Connect a *J 39200* DMM on AC Voltage scale between terminals A and B at the OSS Sensor. 4. Start the engine, and place the transmission in D1 range 5. With the wheels turning, slowly accelerate to 2000 engine RPM. Is the voltage greater than the specified value?	2.0 AC volts at 2000 RPM	*Go to Step 4*	*Go to Step 18*
4	1. Reconnect the OSS Sensor connector to the OSS Sensor. 2. Disconnect the VSS Buffer harness from the VSS Buffer. 3. Using the *J 39200* DMM measure the voltage between terminals 7 and 12 of the Speed Buffer Harness Connector. 4. Start the engine, and place the transmission in D1. 5. With the wheels turning, slowly accelerate engine speed to 2000 RPM. Is the voltage greater than the specified value?	2.0 volts AC at 2000 RPM	*Go to Step 7*	*Go to Step 5*
5	1. Inspect circuit 821 for an open. 2. Inspect circuit 822 for an open. Refer to General Electrical Diagnosis Procedures. Did you find the condition?	—	*Go to Step 16*	*Go to Step 6*
6	1. Inspect circuit 821 for a short to ground. 2. Inspect circuit 822 for a short to ground. 3. Inspect circuits 821 and 822 for a short together. Refer to General Electrical Diagnosis Procedures. Did you find the condition?	—	*Go to Step 16*	Refer to Diagnostic Aids
7	1. Turn the ignition to the OFF position. 2. Measure the voltage between terminal 9 of the VSS Buffer connector and a good ground with the *J 39200* DMM on DC volts. 3. Turn the ignition to the RUN position. Is the voltage greater than the specified value?	10.5 volts DC	*Go to Step 9*	*Go to Step 8*
8	Inspect the ignition feed circuit 39 for high resistance or an open. Refer to General Electrical Diagnosis Procedures. Did you find and correct the condition?	—	*Go to Step 21*	—
9	With the key to the RUN position, measure the voltage between terminals 8 and 9 of the VSS Buffer connector. Is the voltage greater than the specified value?	10.5 volts DC	*Go to Step 11*	*Go to Step 10*
10	Inspect the VSS Buffer Module ground circuit 451 for high resistance or an open. Refer to General Electrical Diagnosis Procedures. Was the condition found and corrected?	—	*Go to Step 21*	—

DTC P0722 Output Speed Sensor Circuit Low Input (Diesel Only) (cont'd)

Step	Action	Value(s)	Yes	No
11	With the connector off of the Speed Buffer and the key in the RUN position, measure the voltage between terminal 13 of the VSS Buffer Harness Connector and a good ground. Is the voltage within the specified value?	4.8–5.2 volts DC	*Go to Step 15*	*Go to Step 12*
12	Is the voltage in Step 11 greater than the specified voltage?	5.2 volts DC	*Go to Step 14*	*Go to Step 13*
13	Inspect circuit 437 for continuity or a short to ground. Refer to General Electrical Diagnosis Procedures. Did you find the condition?	—	*Go to Step 21*	*Go to Step 17*
14	Inspect circuit 437 for a short to power. Refer to General Electrical Diagnosis Procedures. Did you find the condition?	—	*Go to Step 21*	*Go to Step 17*
15	1. Reconnect the VSS Buffer Harness Connector to the Speed Buffer Module. 2. With the *J 39200* DMM set on DC volts and on a good ground, back probe terminal 13 of the VSS Buffer Module. 3. Start the engine, and place the transmission in D1. 4. With the wheels turning, slowly accelerate the engine speed to 2000 RPM. Is the voltage within the specified values?	1.5–3.5 volts DC	*Go to Step 17*	*Go to Step 19*
16	1. Repair circuit 821. 2. Repair circuit 822. Refer to Wiring Repairs. Did you correct the condition?	—	*Go to Step 21*	—
17	Inspect the PCM for faulty or intermittent connections. Did you find the condition?	—	*Go to Step 21*	*Go to Step 20*
18	Replace the OSS Sensor. Refer to Speed Sensor Replacement. Is the replacement complete?	—	*Go to Step 21*	—
19	Replace the VSS Buffer Module. Refer to Buffer Module Replacement. Is the replacement complete?	—	*Go to Step 21*	—
20	Replace the PCM. Refer to *PCM Replacement/Programming.* Is the replacement complete?	—	*Go to Step 21*	—
21	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle under the following conditions: • Drive the vehicle under steady acceleration above 10% APP. • The PCM must see an output speed greater than 500 RPM for 1 second. 4. Select Specific DTC. Enter DTC P0722. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0723 Output Speed Sensor Circuit Intermittent (Diesel Only)



Circuit Description

The speed sensor circuit consists of a magnetic induction type sensor, which is the Output Shaft Speed (OSS) Sensor, a Vehicle Speed Sensor (VSS) Buffer Module, and wiring. Gear teeth pressed onto the output shaft carrier assembly induce an alternating voltage into the sensor. This signal transmits to the VSS Buffer Module. The VSS Buffer Module compensates for various final drive ratios. The VSS Buffer Module also converts the alternating current (AC) OSS signal into a 40 pulse per revolution (PPR) 5-volt DC square wave form signal on circuit 437 to indicate transmission output speed.

If the PCM detects an unrealistically large change in the Output Shaft Speed (OSS) Sensor reading, then DTC P0723 sets. DTC P0723 is a type B DTC.

Conditions for Setting the DTC

- No TFP Val. Position Sw. DTC P1810.
- No TFP Val. Position Sw. change for greater than 6 seconds.
- The engine must be running more than 475 RPM for at least 7 seconds.
- System voltage is 9.0–16.0 volts.
- The OSS RPM decrease is greater than 1000 RPM while in a Drive gear for at least 3.5 seconds.

Action Taken When the DTC Sets

- The PCM illuminates the Malfunction Indicator Lamp (MIL).
- The PCM commands to maximum line pressure.

- The PCM freezes shift adapts.
- The PCM defaults to the calculated output speed value using the ISS Sensor values.
- DTC P0723 is stored in PCM history.

Conditions for Clearing the MIL/DTC

- The PCM turns OFF the MIL after three consecutive trips without a failure reported.
- A scan tool can clear the DTC from the PCM history. The PCM clears the DTC from the PCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The PCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the PCM.

Diagnostic Aids

- Inspect the wiring at the PCM, the A/T OSS, the VSS Buffer Module connectors and all other circuit connecting points for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation
  - Moisture intrusion
  - Corrosion
- It may be necessary to drive the vehicle.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2. This step verifies the fault condition.
4. This step verifies the OSS Sensor and circuit output to the VSS Buffer Module.
7. This step tests the voltage supply to the VSS Buffer Module.
9. This step tests the integrity of the ground circuit.

DTC P0723 Output Speed Sensor Circuit Intermittent (Diesel Only)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check*
2	1. Install the *scan tool*. 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Freeze Frame and Failure Records for reference. Using the Clear Info function erases the stored Freeze Frame and Failure Records from the PCM. 3. Record the DTC Freeze Frame and Failure Records, then clear the DTC. 4. Raise the drive wheels and support the axle assembly. 5. Start the engine and place the transmission in D3 range. 6. With the Drive wheels rotating, slowly accelerate to 2000 RPM and hold. Does the Transmission OSS drop or fluctuate more than the specified value?	1000 RPM	*Go to Step 3*	No fault verified at this time. Go to Diagnostic Aids

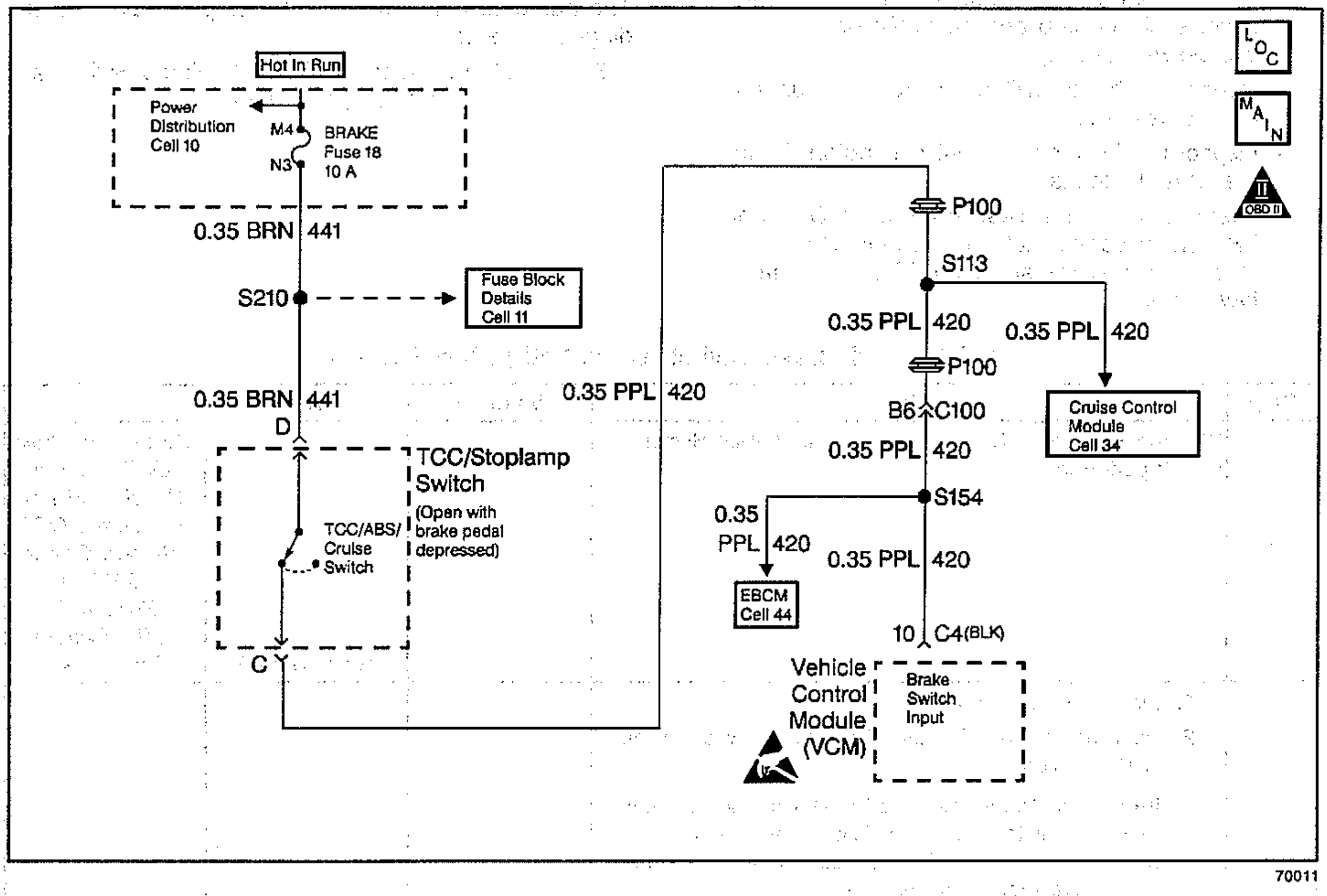
DTC P0723 Output Speed Sensor Circuit Intermittent (Diesel Only) (cont'd)

Step	Action	Value(s)	Yes	No
3	1. Turn the ignition OFF. 2. Disconnect the OSS Sensor connector from the OSS Sensor. 3. Connect a *J 39200* DMM on AC Voltage scale between terminals A and B on the OSS Sensor. 4. Start the engine. 5. Place the transmission in D3 range. 6. With the wheels rotating, slowly accelerate to 2000 engine RPM and hold. Does the voltage drop or fluctuate at 2000 RPM?	—	*Go to Step 17*	*Go to Step 4*
4	1. Turn the ignition OFF. 2. Reconnect the OSS Sensor harness to the sensor. 3. Disconnect the VSS Buffer Module harness connector from the component. 4. Turn the ignition to the RUN position. 5. Set the *J 39200* DMM on AC volts. 6. Connect the *J 39200* DMM between terminals 7 and 12 of the VSS Buffer Module harness connector. 7. Start the engine. 8. Place the transmission in D3 range. 9. With the wheels rotating, slowly accelerate to 2000 engine RPM and hold steady. Does the voltage drop or fluctuate at 2000 RPM?	Greater than 2.0 volts AC	*Go to Step 5*	*Go to Step 7*
5	Inspect circuit 821 and circuit 822 for an intermittent open. Refer to General Electrical Diagnosis Procedures. Did you find the condition?	—	*Go to Step 12*	*Go to Step 6*
6	Inspect circuit 821 and circuit 822 for an intermittent short together or a short to ground. Refer to General Electrical Diagnosis Procedures. Did you find the condition?	—	*Go to Step 12*	—
7	1. With the engine OFF, turn the ignition switch to the RUN position. 2. Select DC volts, and measure ignition voltage at terminal 9 of the VSS Buffer Module harness. Is the voltage greater than the specified value?	10.5 volts DC	*Go to Step 9*	*Go to Step 8*
8	Repair the intermittent open or high resistance in circuit 39. Refer to Wiring Repairs. Is the repair complete?	—	*Go to Step 21*	—
9	1. Connect the *J 39200* DMM between terminals 8 and 9 of the VSS Buffer Module harness connector. Set the *J 39200* DMM on DC volts. 2. Turn the ignition to the Run position. Is the voltage greater than the specified value?	10.5 volts DC	*Go to Step 11*	*Go to Step 10*
10	Repair the open or high resistance in circuit 451 (ground). Refer to Wiring Repairs. Is the repair complete?	—	*Go to Step 21*	—
11	1. With the engine OFF, turn the ignition to the RUN position. 2. Using the *J 39200* DMM, measure the voltage at the VSS Buffer connector terminal 13 Is the voltage steady and within the specified value?	4.8–5.2 volts DC	*Go to Step 13*	*Go to Step 14*

DTC P0723 Output Speed Sensor Circuit Intermittent (Diesel Only) (cont'd)

Step	Action	Value(s)	Yes	No
12	Repair the short in circuit 821 and circuit 822. Refer to Wiring Repairs. Did you correct the condition?	—	*Go to Step 21*	—
13	1. Turn the ignition to the OFF position. 2. Reconnect the VSS Buffer Module harness to the VSS Buffer Module. 3. Set the *J 39200* DMM on the DC volts scale. 4. Back probe terminal 13 of the VSS Buffer Harness connector with the *J 39200* DMM. 5. Start the engine. 6. Place the transmission in a D3 range. 7. With the wheels rotating, slowly accelerate the engine to 2000 RPM and hold. Is the voltage reading steady within the specified value?	1.5–3.5 volts DC	*Go to Step 19*	*Go to Step 18*
14	Is the voltage from step 11 greater than the specified value?	5.2 Volts DC	*Go to Step 15*	*Go to Step 16*
15	Inspect for a short to power in circuit 437. Refer to General Electrical Diagnosis Procedures. Did you find the condition?	—	*Go to Step 21*	*Go to Step 20*
16	Inspect circuit 437 for continuity or short to ground. Refer to General Electrical Diagnosis Procedures. Did you find the condition?	—	*Go to Step 21*	*Go to Step 19*
17	Replace the OSS Sensor. Refer to Speed Sensor Replacement, in On-Vehicle Service. Is the replacement complete?	—	*Go to Step 21*	—
18	Replace the VSS Buffer Module. Is the replacement complete?	—	*Go to Step 21*	—
19	Inspect the PCM terminals and connector for improper tension or corrosion. Did you find the condition?	—	*Go to Step 21*	*Go to Step 20*
20	Replace the PCM. Refer to *PCM Replacement/Programming.* Is the replacement complete?	—	*Go to Step 19*	—
21	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle under the following conditions: • Drive the vehicle in D3. • The PCM must see a Transmission OSS greater than 500 RPM and no change greater than 450 RPM for 1 second. 4. Select Specific DTC. Enter DTC P0723. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0724 Brake Switch Circuit High Input (Gas)



Circuit Description

The TCC/Stoplamp Switch indicates the brake pedal status. The normally closed brake switch supplies a B+ signal on circuit 420 to the Vehicle Control Module (VCM). The signal voltage circuit opens when the brakes are applied.

If the VCM detects a closed TCC/Stoplamp Switch during decelerations, then DTC P0724 sets. DTC P0724 is a type D DTC.

Conditions for Setting the DTC

- No OSS DTC P0502.
- The VCM detects a closed TCC/Stoplamp Switch circuit (12 volts) for 2 seconds during decelerations.
- The following sequence of events occurs 10 consecutive times:
  1. The vehicle speed is greater than 32 km/h (20 mph) for 6 seconds.
  2. Then the vehicle speed is 8–32 km/h (5–20 mph) for 4 seconds.
  3. Then the vehicle speed is less than 8 km/h (5 mph).

Action Taken When the DTC Sets

- The VCM does not illuminate the Malfunction Indicator Lamp (MIL).
- DTC P0724 is stored in VCM history.

Conditions for Clearing the DTC

- A scan tool can clear the DTC from the VCM history. The VCM clears the DTC from the VCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The VCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the VCM.

Diagnostic Aids

- Inspect the wiring at the VCM, the TCC/Stoplamp Switch connector and all other circuit connecting points for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation
  - Moisture intrusion
  - Corrosion
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.

- Ask about the customer's driving habits and any unusual driving conditions he or she might have, such as stop and go traffic or expressway driving.
- Inspect the brake switch for proper mounting and adjustment.
- Inspect for the most current calibration ID and the latest bulletins.
- First diagnose and clear any engine DTCs or TP Sensor codes that are present. Then inspect for any transmission DTCs that may have reset.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

3. This step isolates the TCC/Stoplamp Switch as a source for setting the DTC.

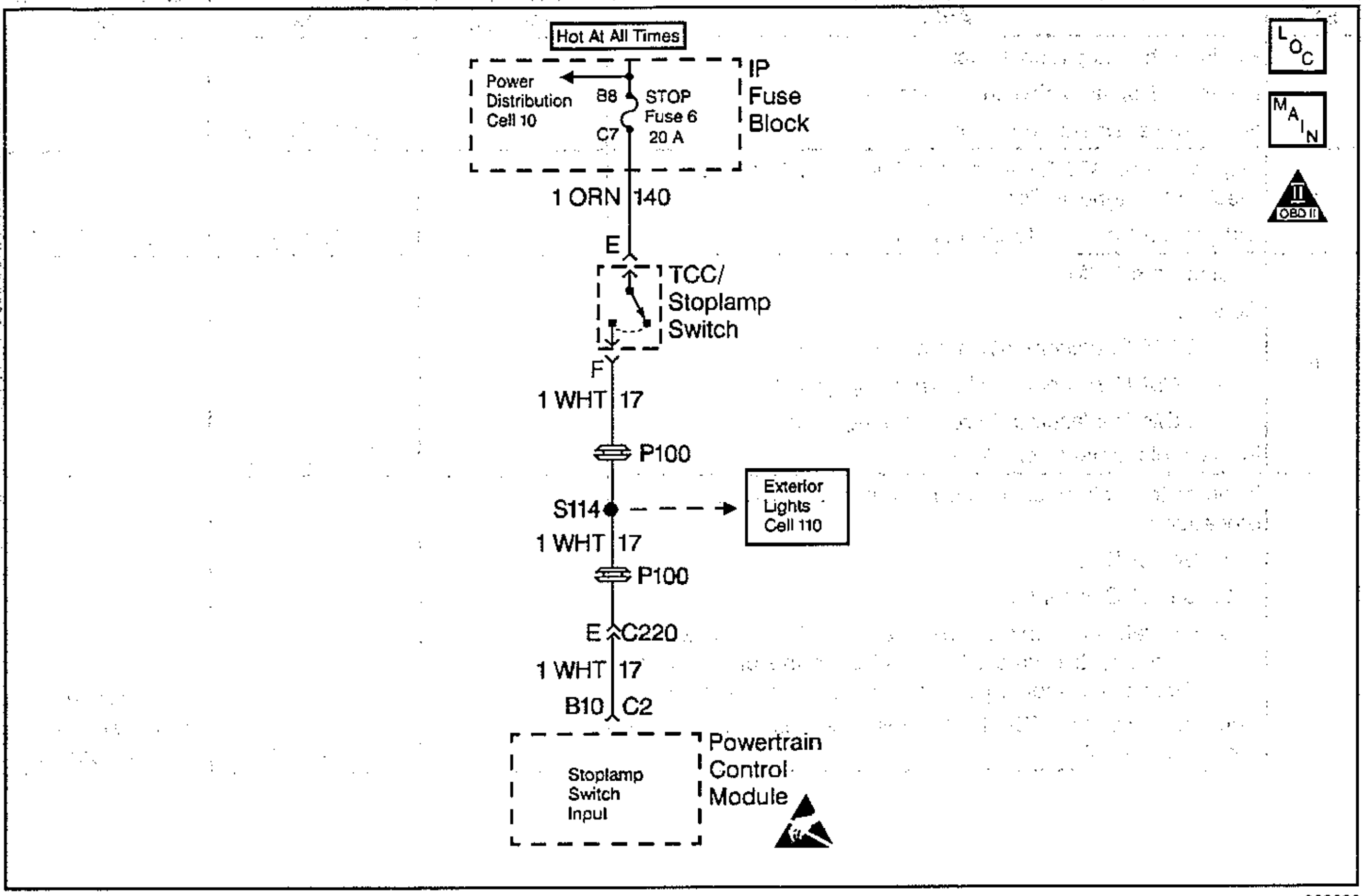
DTC P0724 Brake Switch Circuit High Input (Gas)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check* (4.3L) or *Powertrain OBD System Check* (5.7L) or *Powertrain OBD System Check* (7.4L)
2	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Failure Records for reference. The Clear Info function erases the stored Failure Records from the VCM. 3. Record the DTC Failure Records. 4. Select TCC/Brake Switch on the scan tool. 5. Do not apply the brake pedal. 6. With the brake pedal not applied, note the TCC brake switch status. 7. Apply the brake pedal. Did the scan tool TCC/Brake Switch status change from Closed to Open?	—	*Go to Diagnostic Aids*	*Go to Step 3*
3	1. Turn the ignition switch to the OFF position. 2. Disconnect the TCC/Stoplamp switch connector from the brake switch. 3. Turn the key to the RUN position. Did the scan tool TCC/Brake Switch status change from Closed to Open?	—	*Go to Step 4*	*Go to Step 5*

DTC P0724 Brake Switch Circuit High Input (Gas) (cont'd)

Step	Action	Value(s)	Yes	No
4	Replace the Stoplamp switch. Refer to Stoplamp Switch Replacement. Is the replacement complete?	—	*Go to Step 7*	—
5	Inspect circuit 420 for a short to B+. Refer to General Electrical Diagnosis Procedures. Did you find a short to B+ condition?	—	*Go to Step 7*	*Go to Step 6*
6	Replace the VCM. Refer to: • *VCM Replacement/Programming* (4.3L) • *VCM Replacement/Programming* (5.7L) • *VCM Replacement/Programming* (7.4L) Is the replacement complete?	—	*Go to Step 7*	—
7	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle brake pedal so that for a total of 2 consecutive times, the VCM sees the brake switch Closed and then Open, for greater than two seconds. Does the *scan tool* TCC Brake Switch status change from Closed to Open?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0724 Brake Switch Circuit High Input (Diesel)



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Circuit Description

The normally open TCC/Stoplamp Switch indicates brake pedal status to the Powertrain Control Module (PCM). Applying the brake pedal closes the switch, supplying voltage to the PCM. Releasing the brake pedal interrupts voltage to the PCM.

If the PCM detects a closed TCC/Stoplamp Switch (Stuck ON) during accelerations, then DTC P0724 sets. DTC P0724 is a type D DTC.

Conditions for Setting the DTC

- No OSS Sensor DTCs P0722 or P0723
- The PCM detects a closed TCC/Stoplamp Switch or circuit, and the following sequence of events occur eight consecutive times:
  1. The vehicle speed is less than 8 km/h (5 mph).
  2. The vehicle speed is 8–32 km/h (5–20 mph) for 3.1 seconds.
  3. The vehicle speed is greater than 32 km/h (20 mph) for 7 seconds.
- DTC P0724 has not passed.
- The TCC Stoplamp Switch is closed for 900 seconds (15 minutes).

Action Taken When the DTC Sets

- The PCM does not illuminate the Malfunction Indicator Lamp (MIL).
- For TCC scheduling, the PCM disregards the TCC/Stoplamp Switch state if the APP Sensor is greater than 0.5% and the vehicle speed is greater than 40 Km/h (25 mph).

Conditions for Clearing the DTC

- A scan tool can clear the DTC from the PCM history. The PCM clears the DTC from the PCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The PCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the PCM.

Diagnostic Aids

- Inspect the wiring at the PCM, the TCC/Stoplamp Switch connector and all other circuit connecting points for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal

- Poor terminal tension
- A chafed wire
- A broken wire inside the insulation
- Moisture intrusion
- Corrosion

- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- Ask about the customer's driving habits and any unusual driving conditions he or she might have, such as stop and go traffic or expressway driving.
- Inspect the brake switch for proper mounting and adjustment.
- First diagnose and clear any engine DTCs that are present. Then inspect for any transmission DTCs that may have reset.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2. This step isolates the TCC/Stoplamp Switch as a source for setting the DTC.

DTC P0724 Brake Switch Circuit High Input (Diesel)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check*
2	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Failure Records for reference. Using the Clear Info function erases the stored Failure Records from the PCM. 3. Record the DTC Failure Records, then clear the DTC. 4. Select TCC Brake Switch on the scan tool. 5. Disconnect the TCC/Stoplamp Switch connector. Did the scan tool TCC/Brake Switch status change from Closed to Open?	—	*Go to Step 3*	*Go to Step 4*
3	Replace the TCC/Stoplamp Switch. Refer to TCC/Stoplamp Switch Replacement. Is the replacement complete?	—	*Go to Step 6*	—
4	Inspect circuit 17 for a short to B+. Refer to General Electrical Diagnosis Procedures. Did you find the condition?	—	*Go to Step 6*	*Go to Step 5*
5	Replace the PCM. Refer to *PCM Replacement/Programming.* Is the replacement complete?	—	*Go to Step 6*	—
6	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Select TCC/Brake Switch on the scan tool, and depress the brake pedal. Does the scan tool TCC/Brake Switch state change, when the pedal is depressed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0730 Incorrect Gear Ratio (Gas)

Range	Gear	1-2 Sol	2-3 Sol	Fourth Clutch	Overrun Clutch	O/D Roller Clutch	FWD Clutch	Direct Clutch	Front Band	Interm. Sprag Clutch	Interm Clutch	Lo Roller Clutch	Rear Band
Overdrive	1st	On	Off	—	—	H	A	—	—	*	—	H	—
	2nd	Off	Off	—	—	H	A	—	—	H	A	O	—
	3rd	Off	On	—	—	H	A	A	—	O	A	O	—
	4th	On	On	A	—	O	A	A	—	O	A	O	—

A = Applied
H = Holding
* = Holding but not effective
O = Overrunning

Circuit Description

The Vehicle Control Module (VCM) calculates the gear ratio based on the Automatic Transmission Input Shaft Speed (A/T ISS) and Output Shaft Speed (OSS) Sensor readings. The VCM compares the known transmission gear ratio to the calculated ratio for the selected gear ranges.

If the VCM detects an unknown transmission gear ratio, then DTC P0730 sets. DTC P0730 is a type D DTC.

Conditions for Setting the DTC

The following conditions are met for 10 seconds.

- No Manifold Absolute Pressure (MAP) DTCs P0106, P0107, or P0108.
- No Throttle Position (TP) DTCs P0121, P0122, or P0123.
- No OSS DTC P0502 or P0503.
- No A/T ISS DTCs P0716 or P0717.
- No TFP Val. Position Sw. DTC P1810.
- The Vehicle Speed is greater than 7 km/h (4 mph).
- The TP Angle is greater than 15%.
- The TFT is greater than 20°C (68°F).
- 30 seconds must have elapsed since the last gear range change.
- The engine torque is 110 N·m (80 lb ft) 5.7L and 7.4L or 95 N·m (70 lb ft) 4.3L to the following:
  - 405 N·m (300 lb ft)
  - 542 N·m (400 lb ft) 5.7L
  - 677 N·m (500 lb ft) 7.4L
- The engine is running greater than 475 RPM for 5 seconds.
- The Gear Ratio is one of the following:
  - Greater than 2.50 or less than 2.42
  - Greater than 1.50 or less than 1.44
  - Greater than 1.03 or less than 0.25
  - Greater than 2.12 or less than 2.04

Action Taken When the DTC Sets

- The VCM does not illuminate the Malfunction Indicator Lamp (MIL).
- The VCM commands maximum line pressure.
- The VCM freezes shift adapts.
- DTC P0730 is stored in VCM history.

Conditions for Clearing the DTC

- A scan tool can clear the DTC from the VCM history. The VCM clears the DTC from the VCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The VCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the VCM.

Diagnostic Aids

- First diagnose and clear any engine DTCs or TP Sensor codes that are present. Then inspect for any transmission DTCs that may have reset.
- A false or incorrect A/T OSS or A/T ISS signal can set DTC P0730.
- DTC P1870 detects an incorrect gear ratio in fourth gear with TCC applied.
- Inspect for any improperly installed after-market equipment.
- Sticking or contamination of shift valves may cause intermittent incorrect gear ratios.
- Refer to the *Shift Solenoid Valve State and Gear Ratio* table.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

3. This step tests the indicated range signal to the actual selected range. A faulty TFP Val. Position Sw. could set DTC P1810.
4. This step tests for proper ratios in each commanded gear state.

DTC P0730 Incorrect Gear Ratio (Gas)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check* (4.3L) or *Powertrain OBD System Check* (5.7L) or *Powertrain OBD System Check* (7.4L)
2	Perform the Transmission Fluid Checking Procedure. Refer to *Transmission Fluid Checking Procedure.* Is the procedure complete?	—	*Go to Step 3*	Go to *Transmission Fluid Checking Procedure*
3	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Failure Records for reference. The Clear Info function erases the stored Failure Records from the VCM. 3. Record the DTC Failure Records. 4. Record the DTCs. 5. Start the engine. 6. Apply the parking brake, and select each transmission range: D1, D2, D3, D4, N, R, and P. Does the scan tool TFP Switch A/B/C display match each selected gear range? (Refer to the *Range Signal* table).	—	*Go to Step 4*	Go to *DTC P1810 TFP Valve Position Sw CKT Malfunction (Gas)*
4	1. Drive the vehicle in D3 with greater than 15% TP. 2. Drive the vehicle above 7 mph for greater than 2 seconds in each specified gear range. 3. Use the scan tool snapshot mode to record the transmission gear ratio for each commanded gear range: Reverse, 1st, 2nd, and 3rd. Are the commanded gear ratios within the values for each specified gear range?	Rev 2.04-2.12 1st 2.42-2.50 2nd 1.44-1.50 3rd 0.25-1.03	Refer to Diagnostic Aids	*Go to Step 5*
5	1. Connect the *J 21867* Pressure Gauge to the transmission line pressure tap. 2. Perform the Line Pressure test. Refer to the *Line Pressure Check Procedure.* Is the line pressure within specifications for each selected gear range?	—	*Go to Step 6*	*Go to Step 8*
6	1. Remove the transmission oil pan. Refer to Changing the Fluid and Filter, in On-Vehicle Service. 2. Inspect the oil pan and the fluid for contamination. Did you find excessive contamination?	—	Go to A Transmission Overhaul Procedure, in Unit Repair	*Go to Step 7*

DTC P0730 Incorrect Gear Ratio (Gas) (cont'd)

Step	Action	Value(s)	Yes	No
7	Inspect the transmission for the following problems: • Sticking shift valves • Stuck apply pistons Did you find the condition?	—	*Go to Step 10*	Go to A Transmission Overhaul Procedure, in Unit Repair
8	Is the system line pressure low only in the specific gear which indicated an incorrect gear ratio?	—	*Go to Step 9*	Go to System Diagnosis Table; *Low Line Pressure*
9	Inspect for fluid pressure loss in the following areas: • 1-2 SS Valve seal • 2-3 SS Valve seal • Valve body passages • Valve body gaskets • Band apply pistons and seals • Clutch apply pistons and seals. Did you find the condition?	—	*Go to Step 10*	Go to A Transmission Overhaul Procedure, in Unit Repair
10	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle under the following conditions: • Key ON, the engine is running. • Drive the vehicle in Reverse, 1st, 2nd, and 3rd gear. • The VCM must see a valid gear ratio range versus the commanded gear ratio. 4. Select Specific DTC. Enter DTC P0730. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0730 Incorrect Gear Ratio (Diesel)

Range	Gear	1-2 Sol	2-3 Sol	Fourth Clutch	Overrun Clutch	O/D Roller Clutch	FWD Clutch	Direct Clutch	Front Band	Interm. Sprag Clutch	Interm Clutch	Lo Roller Clutch	Rear Band
Overdrive	1st	On	Off	—	—	H	A	—	—	*	—	H	—
	2nd	Off	Off	—	—	H	A	—	—	H	A	O	—
	3rd	Off	On	—	—	H	A	A	—	O	A	O	—
	4th	On	On	A	—	O	A	A	—	O	A	O	—

A = Applied
H = Holding
* = Holding but not effective
O = Overrunning

Circuit Description

The Powertrain Control Module (PCM) calculates a ratio based on the Automatic Transmission Input Shaft Speed (A/T ISS) Sensor and Output Shaft Speed (OSS) Sensor readings. The PCM compares the known transmission gear ratio to the calculated ratio, for the selected gear range.

If the PCM detects an incorrect gear ratio, then DTC P0730 sets. DTC P0730 is a type D DTC.

Conditions for Setting the DTC

The following conditions are met for 7 seconds.

- No MAP DTCs P0106, P0107, P0108.
- No A/T ISS Sensor DTCs P0716 or P0717.
- No OSS Sensor DTCs P0722 or P0723.
- No TFP Val. Position Sw. DTC P1810.
- The Vehicle Speed is greater than 6.4 km/h (5 mph).
- The APP Angle is greater than 25%.
- The TFT is greater than 20°C (68°F).
- System voltage is 9.0–16.0 volts.
- 10 seconds must have elapsed since the last gear range change.
- The engine speed is greater than 475 RPM for at least 7 seconds.
- The engine speed is less than 3750 RPM.
- The engine torque is 100–642 N.m (80–475 lb ft).
- The Gear Ratio is one of the following:
  - Greater than 2.52 or less than 2.42
  - Greater than 1.50 or less than 1.45
  - Greater than 1.02 or less than 0.98
  - Greater than 0.77 or less than 0.73
  - Greater than 2.12 or less than 2.04

Action Taken When the DTC Sets

- The PCM does not illuminate the Malfunction Indicator Lamp (MIL).
- The PCM commands maximum line pressure.
- The PCM freezes shift adapts.
- DTC P0730 is stored in PCM history.

Conditions for Clearing the DTC

- A scan tool can clear the DTC from the PCM history. The PCM clears the DTC from the PCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The PCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the PCM.

Diagnostic Aids

- Sticking or contaminated shift valves may cause an undefined gear ratio.
- Refer to the *Shift Solenoid Valve State and Gear Ratio* table.
- First diagnose and clear any engine DTCs that are present. Then inspect for any transmission DTCs that may have reset. If a *DTC P0717 Input Speed Sensor Circuit Low Input (Diesel)* and a DTC P0730 are both present, diagnose DTC P0717 first.
- DTC P1870 detects an incorrect gear ratio in fourth gear with TCC applied.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

3. This step tests the indicated range signal to the actual selected range. A faulty TFP Val. Position Sw. could set DTC P0730.
4. This step tests for proper ratios in each commanded gear state.

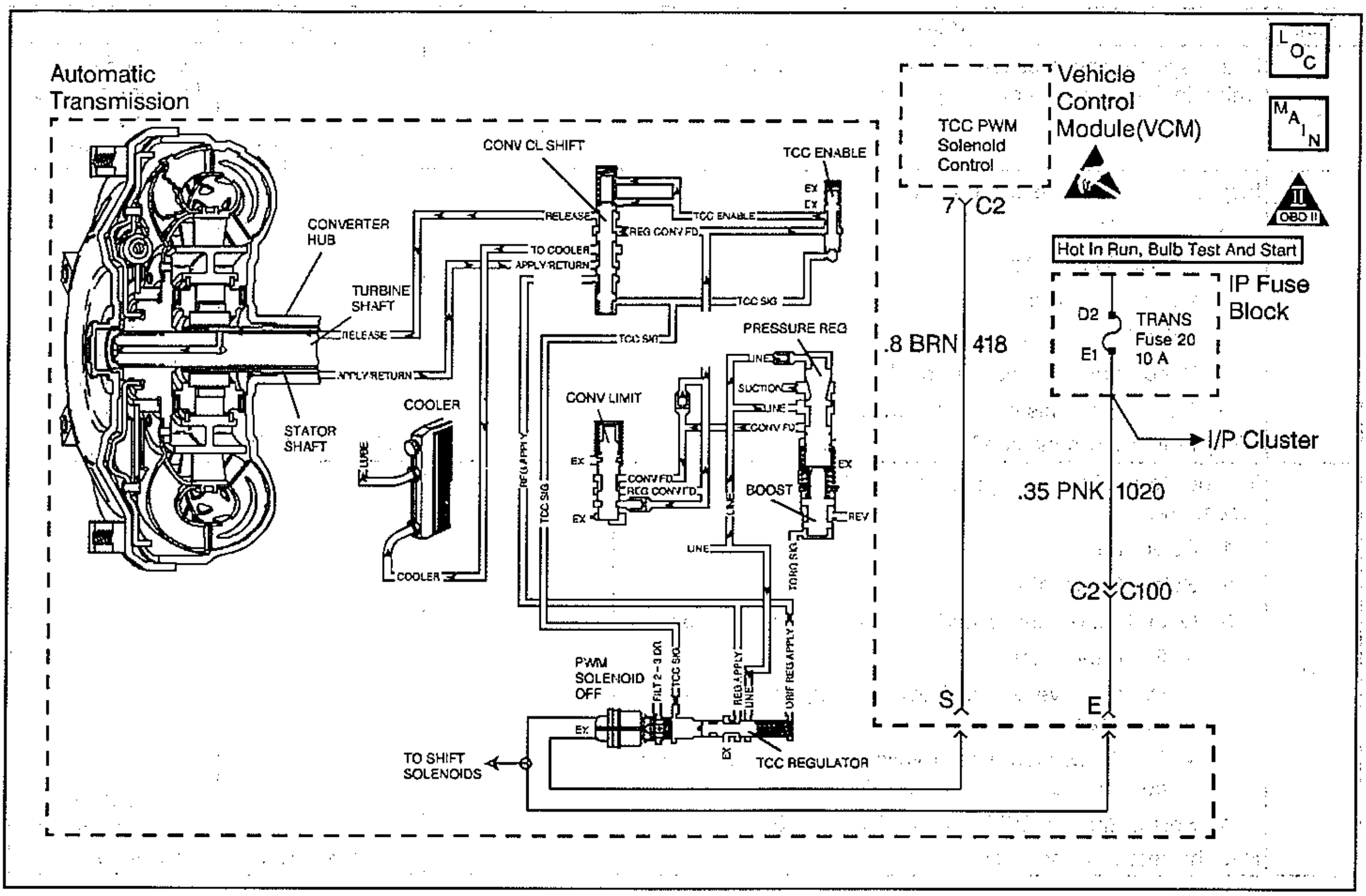
DTC P0730 Incorrect Gear Ratio (Diesel)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check*
2	Perform the Transmission Fluid Checking Procedure. Refer to *Transmission Fluid Checking Procedure.* Is the procedure complete?	—	*Go to Step 3*	Go to *Transmission Fluid Checking Procedure*
3	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Failure Records for reference. Using the Clear Info function erases the stored Failure Records from the PCM. 3. Record the DTC Freeze Frame and Failure Records, then clear the DTCs. 4. Start the engine. 5. Apply the parking brake, and select each transmission range: D1, D2, D3, D4, N, R, and P. Does the scan tool TFP Switch A/B/C display match each selected gear range? (Refer to the *Range Signal* table).	—	*Go to Step 4*	Refer to *DTC P1810 TFP Valve Position Sw CKT Malfunction (Diesel)*, in this section
4	1. Drive the vehicle in Reverse and D4. 2. Hold the vehicle speed above 8 km/h (65 mph) for greater than 2 seconds in the specified gear range. 3. Use the scan tool snapshot mode in order to record the transmission gear ratio for each commanded gear range: Reverse, 1st, 2nd, 3rd and 4th. Are the gear ratios within the parameters for each specified gear range?	Rev-2.04-2.12 1st-2.52-2.42 2nd-1.45-1.50 3rd-0.98-1.02 4th-0.73-0.77	Refer to Diagnostic Aids	*Go to Step 5*
5	1. Connect the *J 21867* Pressure Gauge to the transmission line pressure tap. 2. Perform the Line Pressure Checking Procedure. Refer to *Line Pressure Check Procedure.* Is the line pressure within specifications for each selected gear range?	—	*Go to Step 6*	*Go to Step 8*
6	1. Remove the transmission oil pan. Refer to Changing the Fluid and Filter, in On-Vehicle Service. 2. Inspect the oil pan and the fluid for contamination. Did you find excessive contamination?	—	Go to Transmission Overhaul Procedure, in Unit Repair.	*Go to Step 7*
7	Inspect the transmission for the following problems: • Sticking shift valves • Stuck apply pistons Did you find the condition?	—	*Go to Step 10*	Go to Transmission Overhaul Procedure, in Unit Repair.

DTC P0730 Incorrect Gear Ratio (Diesel) (cont'd)

Step	Action	Value(s)	Yes	No
8	Is the system line pressure low only in the specific gear which indicated an incorrect gear ratio?	—	*Go to Step 9*	Go to System Diagnosis Table; *Low Line Pressure*
9	Inspect for fluid pressure loss in the following areas: • 1-2 SS Valve seal • 2-3 SS Valve seal • Valve body passages • Valve body gaskets • Band apply pistons and seals • Clutch apply pistons and seals. Did you find the condition?	—	*Go to Step 10*	Go to Transmission Overhaul Procedure, in Unit Repair.
10	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle under the following conditions: • Start, the engine. • Drive the vehicle in Reverse, 1st, 2nd, 3rd and 4th gear. • The PCM must see a valid gear ratio versus the commanded gear ratio for 7 seconds. 4. Select Specific DTC. Enter DTC P0730. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0741 TCC System Stuck Off (Gas)



241359

Circuit Description

Important: DTC P0741 inspects for high Torque Converter Clutch (TCC) slip in 2nd and 3rd gear only. The transmission must be in hot mode or experiencing a wide open throttle maneuver in order for the TCC to be commanded ON in 2nd and 3rd gear.

The Vehicle Control Module (VCM) energizes the Torque Converter Clutch Pulse Width Modulated Solenoid Valve (TCC PWM Sol. Valve) by grounding circuit 418. This blocks the exhaust for TCC signal fluid and allows filtered 2–3 drive fluid to feed the TCC signal circuit. When the vehicle's operating conditions are appropriate for TCC application, the VCM begins the TCC duty cycle to approximately 30%. This allows TCC signal fluid pressure to move the converter clutch shift valve into the apply position and direct regulated apply fluid to the torque converter. The VCM then increases (ramps) the duty cycle to approximately 60%, where regulated apply fluid pressure, applies the converter clutch. The vehicle application determines the TCC apply rate. Once the TCC applies, the duty cycle immediately increases to approximately 70% to achieve full apply pressure, in the regulated apply fluid circuit.

The TCC PWM Sol. Valve is de-energized by the VCM opening circuit 418. This action allows the TCC signal fluid to exhaust through the solenoid and blocks filtered 2–3 drive fluid from entering the TCC signal circuit. The loss of fluid pressure in the TCC signal circuit releases the TCC.

If the VCM detects high TCC slip when the TCC is commanded ON, then DTC P0741 sets. DTC P0741 is a type D DTC. For California emissions vehicles DTC P0741 is a type B DTC.

Conditions for Setting the DTC

- No Throttle Position (TP) Sensor DTCs P0121, P0122, or P0123.
- No OSS DTC P0502, or P0503.
- No A/T ISS Sensor DTCs P0716 or P0717.
- No TCC DTCs P0742 or P1860.
- No TFP Val. Position Sw. DTC P1810.
- The engine must be running greater than 475 RPM for at least 7 seconds.
- The gear ratio must indicate 2nd, 3rd, or 4th gear.
- The Throttle Position (TP) is 10–100%.

- The TFP Val. Position Sw. must be in D4, D3, or D2 and has not changed in 5 seconds.
- Gear ratio is equal to 2nd, 3rd or 4th.
- The transmission fluid temperature (TFT) is +20°to +150°C (68° to +302°F).
- TCC duty cycle greater than 70%.
- The TCC Slip Speed is greater than 140 RPM, (105 RPM, 4.3L) for 3 seconds.
- All conditions must be met for 4 seconds and for a total of 5 occurrences.

Action Taken When the DTC Sets

- The VCM illuminates the Malfunction Indicator Lamp (MIL) for California emissions vehicles.
- The VCM inhibits the TCC.
- The VCM increases line pressure.
- The VCM inhibits 4th gear.
- DTC P0741 is stored in VCM history.

Conditions for Clearing the DTC

- For California emissions, the VCM turns OFF the MIL after three consecutive trips without a failure reported.
- A scan tool can clear the DTC from the VCM history. The VCM clears the DTC from the VCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The VCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the VCM.

Diagnostic Aids

- Residue or contamination may cause shift valves to stick intermittently.
- First diagnose and clear any engine DTCs or TP Sensor codes that are present. Then inspect for any transmission DTCs that may have reset.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2. This step tests for excessive TCC slip when TCC is commanded on.
3. This step inspects for possible causes of no TCC apply.

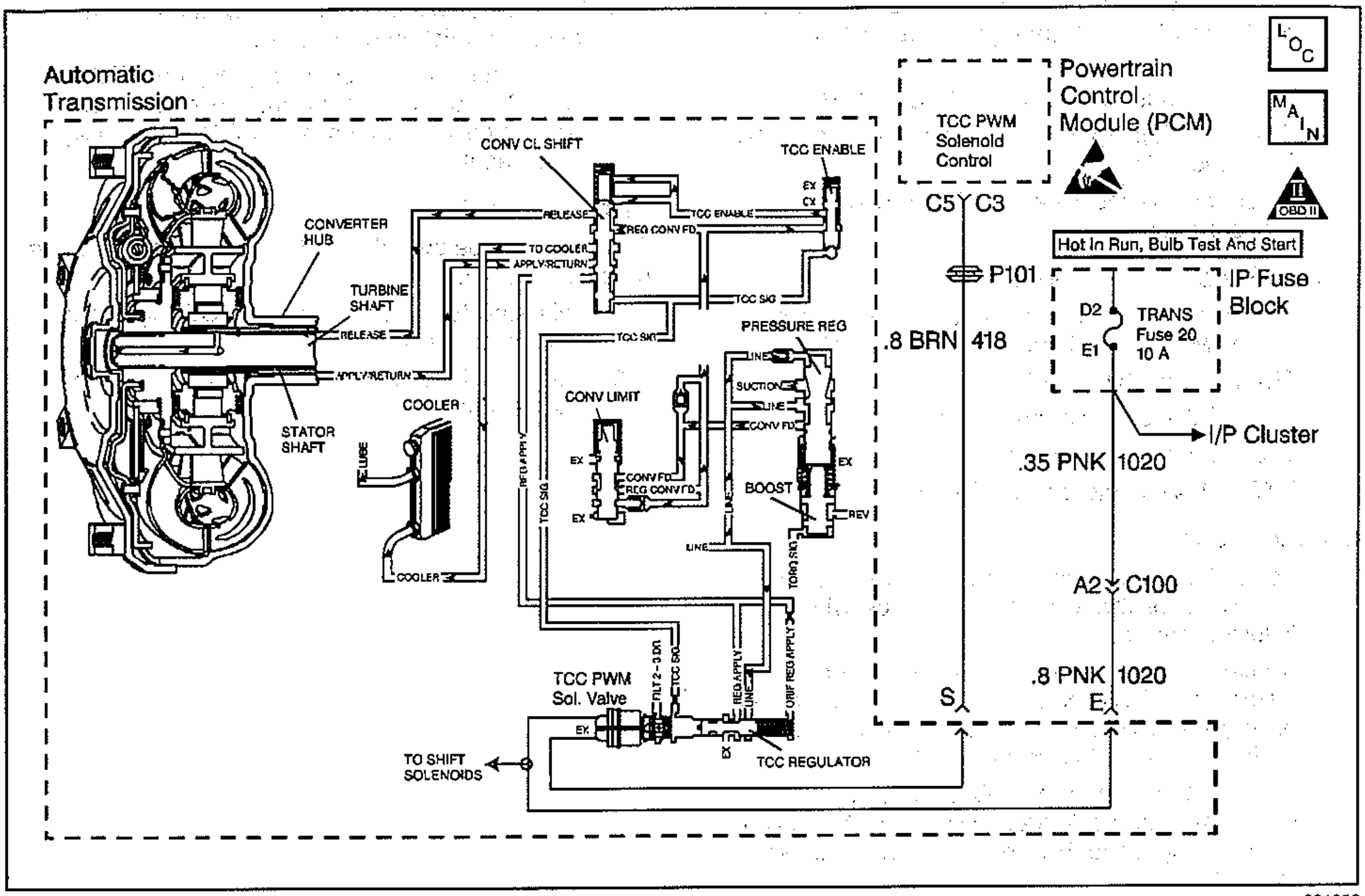
DTC P0741 TCC System Stuck Off (Gas)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check* (4.3L) or *Powertrain OBD System Check* (5.7L) or *Powertrain OBD System Check* (7.4L)
2	1. Install the *scan tool.* **Important:** Before clearing the DTCs, use the scan tool in order to record the Freeze Frame and Failure Records for reference. The Clear Info function erases the stored Freeze Frame and Failure Records from the VCM. 2. Drive the vehicle in D3. 3. Record the data using snapshot mode. Is the TCC slip speed snapshot data greater than the specified value when the TCC Duty Cycle is commanded greater than 70% for greater than 3 seconds?	140 RPM	*Go to Step 3*	Go to Diagnostic Aids

DTC P0741 TCC System Stuck Off (Gas) (cont'd)

Step	Action	Value(s)	Yes	No
3	Inspect the TCC PWM Sol. Valve for being mechanically stuck OFF. Refer to *Torque Converter Clutch Diagnosis* in this section. Did you find the condition?	—	*Go to Step 5*	*Go to Step 4*
4	1. Inspect the TCC PWM Sol. valve for a damaged exhaust orifice. 2. Inspect for the converter regulated apply valve being stuck in the off (release) position. 3. Inspect the converter clutch shift valve for a stuck condition. 4. Inspect for a misaligned or damaged valve body gasket. 5. Inspect for a restricted apply or release passage. 6. Inspect for the Torque Converter for being mechanically stuck OFF. 7. Refer to *No TCC Apply.* Did you find and correct the condition?	—	*Go to Step 5*	—
5	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle under the following conditions: • Drive the vehicle in D3 with steady acceleration and TP over 12%. • TCC duty cycle is greater than 70%. • The VCM must see a TCC slip of less than 20 RPM for 3 seconds. • Select Specific DTC. 4. Enter DTC P0741. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0741 TCC System Stuck Off (Diesel)



201056

Circuit Description

Important: DTC P0741 inspects for high Torque Converter Clutch (TCC) slip in 2nd and 3rd gear only. The transmission must be in hot mode or experiencing a wide open throttle maneuver in order for the TCC to be commanded ON in 2nd and 3rd gear.

The Powertrain Control Module (PCM) energizes the Torque Converter Clutch Pulse Width Modulated Solenoid Valve (TCC PWM Sol. Valve) by grounding circuit 418. This blocks the exhaust for TCC signal fluid and allows filtered 2–3 drive fluid to feed the TCC signal circuit. When the vehicle's operating conditions are appropriate for TCC application, the PCM begins the TCC duty cycle to approximately 30%. This allows TCC signal fluid pressure to move the converter clutch shift valve into the apply position and direct regulated apply fluid to the torque converter. The PCM then increases (ramps) the duty cycle to approximately 60%, where regulated apply fluid pressure, applies the converter clutch. The vehicle application determines the TCC apply rate. Once the TCC applies, the duty cycle immediately increases to approximately 70% to achieve full apply pressure, in the regulated apply fluid circuit.

The TCC PWM Sol. Valve is de-energized by the PCM opening circuit 418. This action allows the TCC signal fluid to exhaust through the solenoid and blocks filtered 2–3 drive fluid from entering the TCC signal circuit. The loss of fluid pressure in the TCC signal circuit releases the TCC.

If the PCM detects high TCC slip when the TCC is commanded ON, then DTC P0741 sets. DTC P0741 is a type D DTC. For California emissions vehicles DTC P0741 is a type B DTC.

Conditions for Setting the DTC

- No A/T ISS Sensor DTCs P0716 or P0717.
- No OSS DTCs P0722, or P0723.
- No TCC Stuck ON DTC P0742.
- No TCC PWM Sol. Valve DTC P1860.
- No TFP Val. Position Sw. DTC P1810.
- The TCC PWM Sol. Valve is commanded in 2nd or 3rd gear for greater than 0.6 seconds.
- The engine must be running greater than 475 RPM for at least 7 seconds.
- The TCC Duty Cycle is greater than 70% for 1.0 seconds.
- The gear ratio must indicate 2nd or 3rd gear.

- The APP angle is 15–99%.
- The TFP Val. Position Sw. must be in D4, D3, or D2 and has not changed state within 4 seconds.
- The TFT must be 20 to +150°C (68–302°F).
- The TCC Slip Speed is greater than 175 RPM for 3 seconds.
- All conditions must be met for a total of 4 occurrences.

Action Taken When the DTC Sets

- The PCM illuminates the Malfunction Indicator Lamp (MIL) for California emissions vehicles.
- The PCM inhibits the TCC.
- The PCM increases line pressure.
- The PCM inhibits 4th gear.
- DTC P0741 is stored in PCM history.

Conditions for Clearing the DTC

- For California emissions, the PCM turns OFF the MIL after three consecutive trips without a failure reported.
- A scan tool can clear the DTC from the PCM history. The PCM clears the DTC from the PCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The PCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the PCM.

Diagnostic Aids

- Residue or contamination may cause shift valves to stick intermittently.
- First diagnose and clear any engine DTCs or APP Sensor codes that are present. Then inspect for any transmission DTCs that may have reset.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2. This step tests for excessive TCC slip when TCC is commanded on.
3. This step inspects for possible causes of no TCC apply.

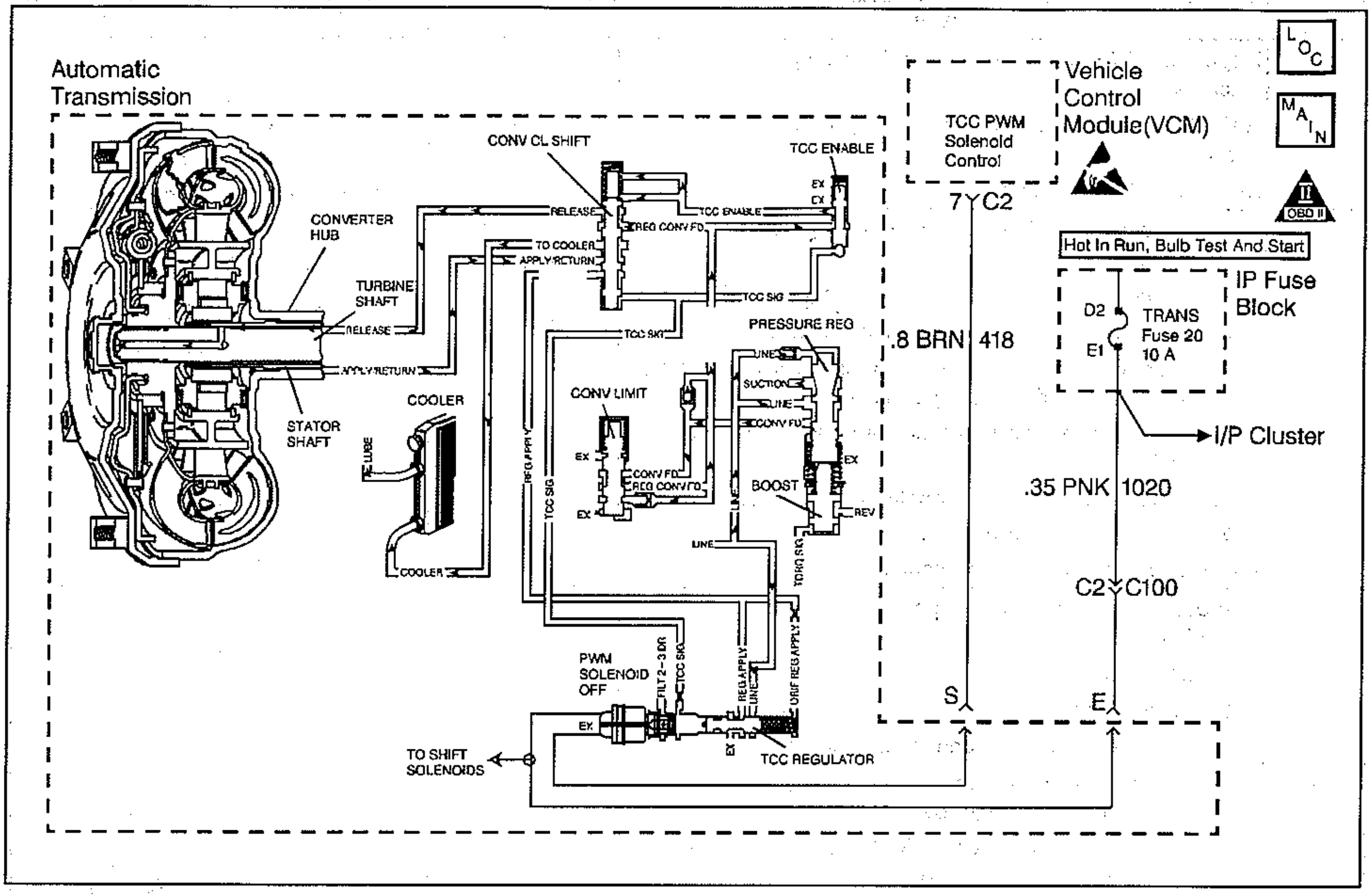
DTC P0741 TCC System Stuck Off (Diesel)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check*
2	1. Install the *scan tool.* **Important:** Before clearing the DTCs, use the scan tool in order to record the Freeze Frame and Failure Records for reference. Using the Clear Info function erases the stored Freeze Frame and Failure Records from the PCM. 2. Record the Freeze Frame and Failure records, then clear the DTC. 3. Drive the vehicle in D3 with the TCC commanded ON. 4. Record the data using snapshot mode. Is the TCC slipspeed greater than the specified value when the TCC PWM Sol. Valve is commanded ON (greater than 70%)?	175 RPM	*Go to Step 3*	Go to Diagnostic Aids

DTC P0741 TCC System Stuck Off (Diesel) (cont'd)

Step	Action	Value(s)	Yes	No
3	Inspect the TCC PWM Sol. Valve for being mechanically stuck OFF. Refer to *Torque Converter Clutch Diagnosis* in this section. Did you find the condition?	—	*Go to Step 5*	*Go to Step 4*
4	1. Inspect for the Torque Converter for being mechanically stuck OFF 2. Inspect the TCC for a damaged exhaust orifice. 3. Inspect the Torque Converter for possible damage. 4. Inspect for the converter apply shift valve for being stuck in the off (release) position. 5. Inspect for a misaligned or damaged valve body gasket. 6. Inspect for a restricted apply or release passage. 7. Refer to On-Vehicle Service. Did you find and correct the condition?	—	*Go to Step 5*	—
5	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle under the following conditions: • Drive the vehicle in D4 with steady acceleration and the APP Angle over 15%. • The PCM must see a TCC slip of less than 175 RPM for 3 seconds. 4. Select Specific DTC. Enter DTC P0741. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0742 Torque Converter Clutch System Stuck On (Gas)



241359

Circuit Description

The Vehicle Control Module (VCM) energizes the Torque Converter Clutch Pulse Width Modulated Solenoid Valve (TCC PWM Sol. Valve) by grounding circuit 418. This blocks the exhaust for TCC signal fluid and allows filtered 2–3 drive fluid to feed the TCC signal circuit. When the vehicle's operating conditions are appropriate for TCC application, the VCM begins the TCC duty cycle to approximately 30%. This allows TCC signal fluid pressure to move the converter clutch shift valve into the apply position and direct regulated apply fluid to the torque converter. The VCM then increases (ramps) the duty cycle to approximately 60%, where regulated apply fluid pressure, applies the converter clutch. The vehicle application determines the TCC apply rate. Once the TCC applies, the duty cycle immediately increases to approximately 70% to achieve full apply pressure, in the regulated apply fluid circuit.

The TCC PWM Sol. Valve is de-energized by the VCM opening circuit 418. This action allows the TCC signal fluid to exhaust through the solenoid and blocks filtered 2–3 drive fluid from entering the TCC signal circuit. The loss of fluid pressure in the TCC signal circuit releases the TCC.

If the VCM detects low TCC slip when the TCC is commanded OFF, then DTC P0742 sets. DTC P0742 is a type D DTC. For California emissions vehicles DTC P0742 is a type B DTC.

Conditions for Setting the DTC

- No Manifold Absolute Air (MAP) Sensor DTCs P0106, P0107, or P0108.
- No Throttle Position (TP) Sensor DTCs P0121, P0122 or P0123.
- No OSS DTCs P0502 or P0503.
- No A/T ISS Sensor DTCs P0716 or P0717.
- No TCC DTCs P0741 or P1860.
- No TFP Valve Position Sw. DTC P1810.
- Engine speed is 900–4700 RPM.
- The engine torque must be 75 N·m (60 lb ft) to:
  - 375 N·m (300 lb ft) 4.3L
  - 500 N·m (400 lb ft) 5.7L
  - 625 N·m (500 lb ft) 7.4L
- No TFP Val. Position Sw. change within 5.0 seconds.
- The TFP Val. Position Sw. must indicate D4, for at least 10 seconds.
- The commanded gear must be 2nd, 3rd, or 4th.
- Engine speed is 900–4700 RPM.
- The Throttle Position 12%.-100%.
- Vehicle speed is 7–75 MPH.
- The TCC slip speed must be -10 to +10 RPM for at least 4.0 seconds.
- All conditions met for 7 occurrences. (7.4L, 4 occurrences).

Action Taken When the DTC Sets

- The VCM illuminates the Malfunction Indicator Lamp (MIL) for California emissions vehicles.
- The VCM commands maximum line pressure.
- The VCM freezes shift adapts.
- DTC P0742 is stored in VCM history.

Conditions for Clearing the DTC

- The VCM turns OFF the MIL after three consecutive trips without a failure reported.
- A scan tool can clear the DTC from the VCM history. The VCM clears the DTC from the VCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The VCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the VCM.

Diagnostic Aids

- If the TCC is mechanically stuck On with the parking brake applied and any gear range selected, the TCC fluid mechanically applies the TCC. TCC fluid mechanically applying the TCC can cause an engine stall.
- A stuck TP Sensor may set a DTC P0742.
- First diagnose and clear any engine DTCs or TP Sensor codes that are present. Then inspect for any transmission DTCs that may have reset.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

3. This step tests the mechanical state of the TCC. When the VCM commands the TCC solenoid OFF, the slip speed should increase.

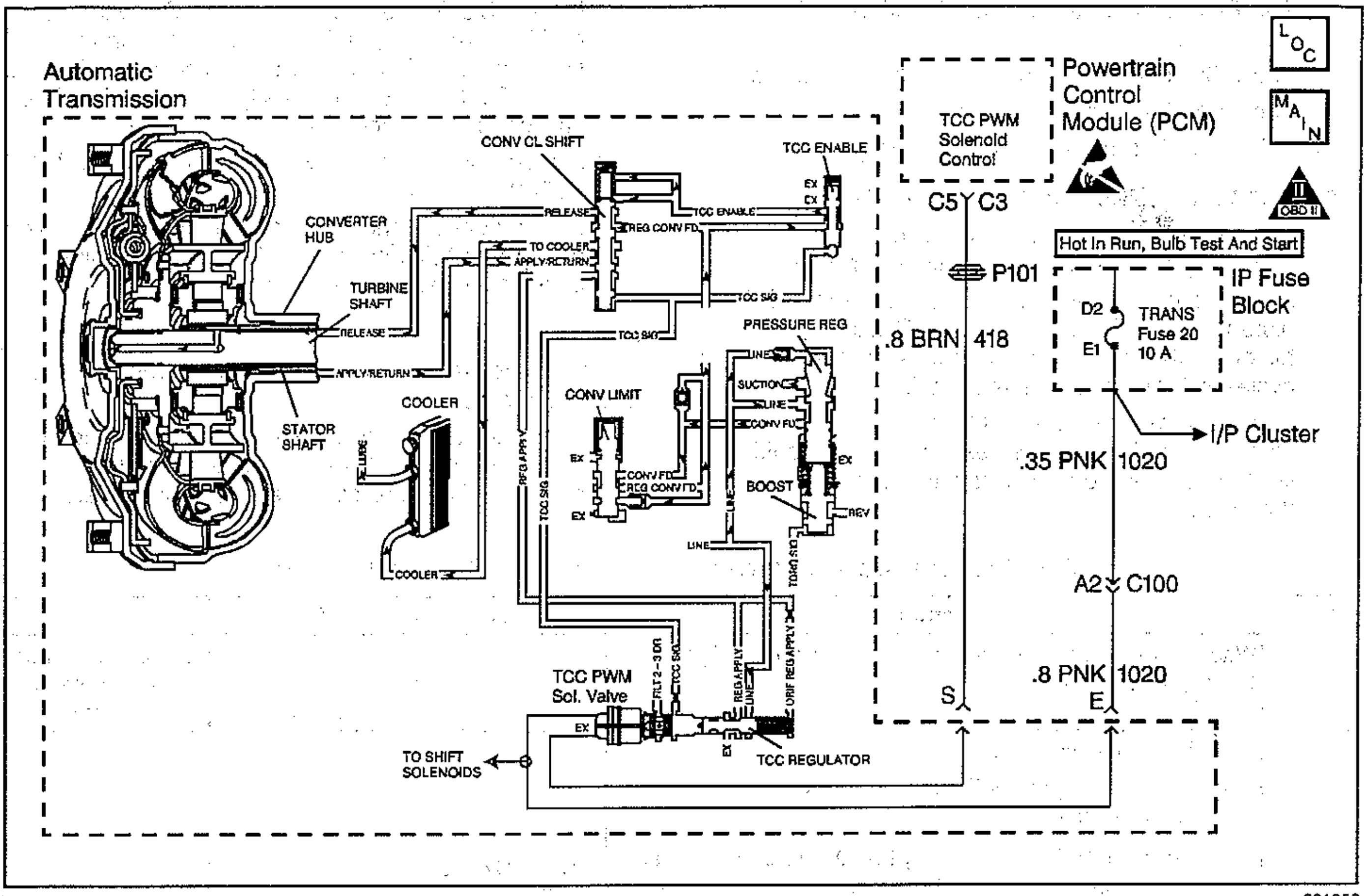
DTC P0742 Torque Converter Clutch System Stuck On (Gas)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check* (4.3L) or *Powertrain OBD System Check* (5.7L) or *Powertrain OBD System Check* (7.4L)
2	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Freeze Frame and Failure Records for reference. The Clear Info function erases the stored Freeze Frame and/or the Failure Records from the VCM. 3. Record the DTC Freeze Frame and Failure Records. 4. Select scan tool TP Angle and TP Sensor. 5. Apply the accelerator pedal. Are the TP Sensor values within the specified range?	0.2-0.9 volts at 0% to 4.5 volts at 100%	*Go to Step 3*	Go to Diagnostic Aids

DTC P0742 Torque Converter Clutch System Stuck On (Gas) (cont'd)

Step	Action	Value(s)	Yes	No
3	Drive the vehicle in the D4 drive range in fourth gear under steady acceleration with a TP Sensor angle greater than 12%. Does the scan tool display a TCC Slip Speed of -10 to +10 RPM while the displayed TCC Duty Cycle is 0%?	—	*Go to Step 4*	Go to Diagnostic Aids
4	The TCC is mechanically stuck ON. Perform the following inspections: 1. Inspect the exhaust orifice in the TCC PWM Sol. Valve for any clogging. 2. Inspect the converter clutch apply valve for the possibility of being stuck in the apply position. 3. Inspect the valve body gasket for misalignment or damage. 4. Inspect for a restricted release or apply passage. 5. Inspect for restricted transmission cooler line. 6. Refer to *TCC Stuck On.* Did you find and correct the condition?	—	*Go to Step 5*	—
5	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle under the following conditions: • Operate the vehicle in D4 with the TCC Duty Cycle 0% and throttle above 12%. • Ensure that the TCC slip speed is greater than 175 RPM for 6 seconds. 4. Select Specific DTC. Enter DTC P0742. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0742 Torque Converter Clutch System Stuck On (Diesel)



201056

Circuit Description

The Powertrain Control Module (PCM) energizes the Torque Converter Clutch Pulse Width Modulated Solenoid Valve (TCC PWM Sol. Valve) by grounding circuit 418. This blocks the exhaust for TCC signal fluid and allows filtered 2–3 drive fluid to feed the TCC signal circuit. When the vehicle's operating conditions are appropriate for TCC application, the PCM begins the TCC duty cycle to approximately 30 %. This allows TCC signal fluid pressure to move the converter clutch shift valve into the apply position and direct regulated apply fluid to the torque converter. The PCM then increases (ramps) the duty cycle to approximately 60 %, where regulated apply fluid pressure, applies the converter clutch. The vehicle application determines the TCC apply rate. Once the TCC applies, the duty cycle immediately increases to approximately 70 % to achieve full apply pressure, in the regulated apply fluid circuit.

The TCC PWM Sol. Valve is de-energized by the PCM opening circuit 418. This action allows the TCC signal fluid to exhaust through the solenoid and blocks filtered 2–3 drive fluid from entering the TCC signal circuit. The loss of fluid pressure in the TCC signal circuit releases the TCC.

If the PCM detects LOW TCC slip when the TCC is commanded OFF, then DTC P0742 sets. DTC P0742 is a type B DTC.

Conditions for Setting the DTC

The following conditions occur once per TCC cycle two consecutive times:

- No MAP Sensor DTCs P0106, P0107, or P0108.
- No A/T ISS Sensor DTCs P0716 or P0717.
- No TCC stuck on DTC P0741.
- No OSS Sensor DTCs P0722 or P0723.
- No TFP Valve Position Sw. DTC P1810
- No TCC PWM Sol. Valve DTC P1860.
- The engine speed is less than 3300 RPM.
- The engine must run more than 475 RPM for greater than 7 seconds.
- System voltage is 9.0–16.0 volts.
- The engine torque must be 176–645 N.m (130–475 lb ft).
- The gear range is D4.
- The commanded gear must be 2nd, 3rd, or 4th.
- The APP Angle must be greater than 15%.
- The TCC slip speed must be -10 to +10 RPM for at least 3 seconds.
- All conditions met for 4 occurrences.

Action Taken When the DTC Sets

- The PCM illuminates the Malfunction Indicator Lamp (MIL).
- The PCM commands maximum line pressure.
- The PCM freezes shift adapts.
- DTC P0742 is stored in PCM history.

Conditions for Clearing the MIL/DTC

- The PCM turns OFF the MIL after three consecutive trips without a failure reported.
- A scan tool can clear the DTC from the PCM history. The PCM clears the DTC from the PCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The PCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the PCM.

Diagnostic Aids

- If the TCC is mechanically stuck On with the parking brake applied and any gear range selected, the TCC fluid mechanically applies the TCC. TCC fluid mechanically applying the TCC can cause an engine stall.
- A stuck or skewed APP Sensor may set DTC P0742.
- First diagnose and clear any engine DTCs that are present. Then inspect for any transmission DTCs that may have reset.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

3. This step tests the mechanical state of the TCC. When the PCM commands the TCC solenoid OFF, the slip speed should increase.

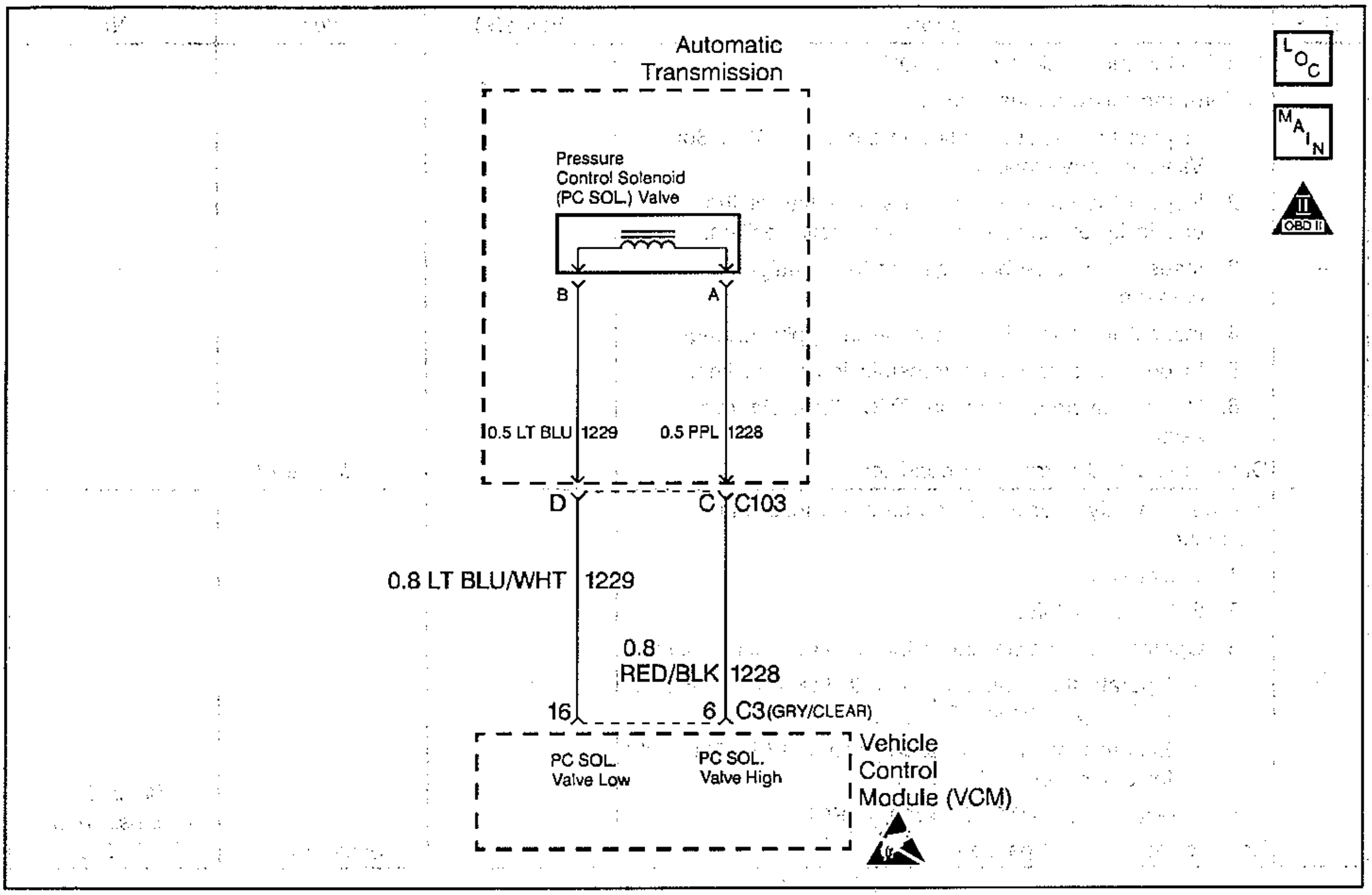
DTC P0742 Torque Converter Clutch System Stuck On (Diesel)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check*
2	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Freeze Frame and Failure Records for reference. Using the Clear Info function erases the stored Freeze Frame and Failure Records from the PCM. 3. Record the DTC Freeze Frame and Failure Records, then clear the DTC. 4. Verify the APP Sensor Operation. Use the scan tool. Are the APP Angle values within the specified range?	0% at Closed Throttle 100% at Wide Open Throttle (WOT)	*Go to Step 3*	Refer to Diagnostic Aids
3	Drive the vehicle in the D4 drive range in fourth gear under steady acceleration with a APP Angle greater than 15%. Does the scan tool display a TCC Slip Speed of -10 to +10 RPM while the displayed TCC Duty Cycle is 0%?	—	*Go to Step 4*	Go to Diagnostic Aids

DTC P0742 Torque Converter Clutch System Stuck On (Diesel) (cont'd)

Step	Action	Value(s)	Yes	No
4	The TCC is mechanically stuck ON. Perform the following inspections: 1. Inspect the exhaust orifice in the TCC PWM Sol. Valve for any clogging. 2. Inspect the converter clutch shift valve for the possibility of being stuck in the apply position. 3. Inspect the valve body gasket for misalignment or damage. 4. Inspect for a restricted release or apply passage. 5. Inspect for a restricted transmission cooler line. 6. Refer to system diagnosis *TCC Stuck On*, this section. Did you find and correct the condition?	—	*Go to Step 5*	—
5	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle under the following conditions: • Operate the vehicle in D4 with the TCC OFF and APP Angle above 15%. • Ensure that the TCC slip speed is 175–1500 RPM for 3 seconds. 4. Select Specific DTC. Enter DTC P0742. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0748 Pressure Control Solenoid CKT Electrical (Gas)



69990

Circuit Description

The Pressure Control Solenoid Valve (PC Sol. Valve) is a Vehicle Control Module (VCM) controlled device that regulates the transmission line pressure. The VCM compares Throttle Position (TP) Sensor voltage, engine RPM, and other inputs in order to determine the appropriate line pressure for a given load. The VCM regulates the pressure by applying a varying amperage to the PC Sol. Valve. The applied amperage varies from 0.1 amps for maximum line pressure to 1.1 amps for minimum line pressure. The VCM monitors the applied amperage.

If the VCM detects a PC duty cycle that exceeds 95% or less than 1.9%, then DTC P0748 sets. DTC P0748 is a type D DTC.

Conditions for Setting the DTC

- The system voltage is greater than 10 volts at -40°C TFT or 12.5 volts at 150°C TFT.
- The engine must be running more than 475 RPM for at least 7 seconds.
- The PC Duty Cycle exceeds 95%, or is less than 1.9%.
- All conditions met for 200 milliseconds (0.2 seconds).

Action Taken When the DTC Sets

- The VCM does not illuminate the Malfunction Indicator Lamp (MIL).
- The VCM disables the PC Sol. Valve, defaulting the transmission to maximum line pressure.
- The VCM freezes shift adapts.
- DTC P0748 is stored in VCM history.

Conditions for Clearing the DTC

- A scan tool can clear the DTC from the VCM history. The VCM clears the DTC from the VCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The VCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the VCM.

Diagnostic Aids

- Inspect the wiring at the VCM, the transmission connector and all other circuit connecting points for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation
  - Moisture intrusion
  - Corrosion
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- First diagnose and clear any engine DTCs or TP Sensor codes that are present. Then inspect for any transmission DTCs that may have reset.
- Inspect for improperly wired after-market equipment.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2. This step tests the ability of the VCM to command the PC Sol. Valve.
3. This step tests the PC Sol. Valve and the A/T wiring harness Assy. for incorrect resistance.
6. This step tests the PC Sol. Valve and the internal wiring harness for a short to ground.
8. When performing this step refer to Product Service Bulletin #9474L80E-07 for PC Sol. Valve Application.
9. This step tests the entire PC Sol. Valve circuit up to the VCM for continuity.
10. This step tests for a short to ground in circuits 1228 and 1229, of the engine harness.

DTC P0748 Pressure Control Solenoid CKT Electrical (Gas)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check* (4.3L) or *Powertrain OBD System Check* (5.7L) or *Powertrain OBD System Check* (7.4L)
2	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Failure Records for reference. The Clear Info function erases the stored Failure Records from the VCM. 3. Record the DTC Failure Records. 4. With the transmission in Park, start the engine. 5. Using the transmission output control function on the scan tool, apply 0.1–1.0 amps while observing the PC Ref. Current and the PC Act. Current. Is the PC Act. Current reading always within the specified value of the PC Ref. Current? (Refer to the *Line Pressure* specification table.)	0.16 amp	Go to Diagnostic Aids	*Go to Step 3*

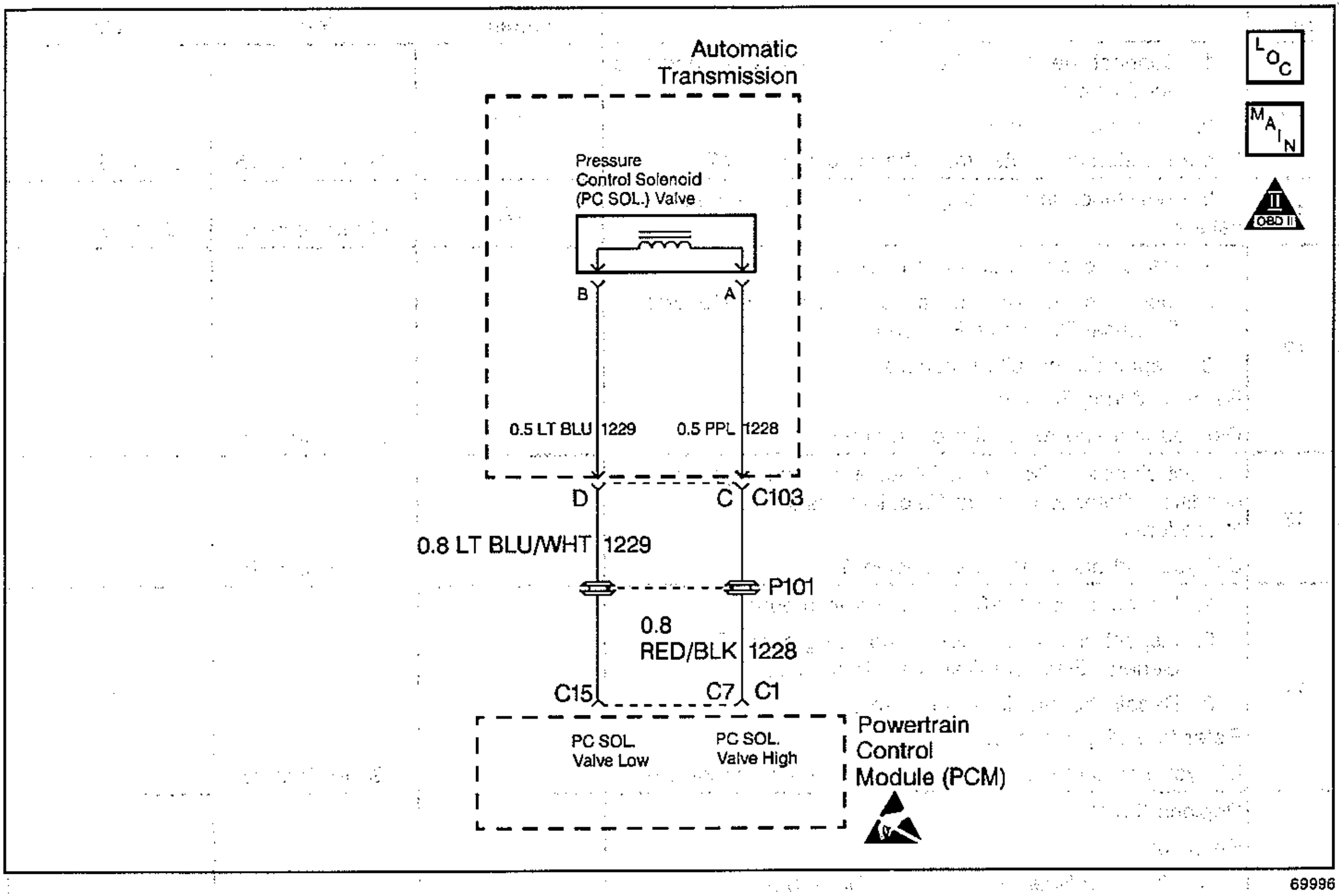
DTC P0748 Pressure Control Solenoid CKT Electrical (Gas) (cont'd)

Step	Action	Value(s)	Yes	No
3	1. Turn the ignition OFF. 2. Disconnect the transmission 20-way connector (additional DTCs will set). 3. Install the *J 39775* Jumper Harness on the transmission side of the 20-way connector (Automatic Transmission Connector End View). 4. Using the *J 39200* DMM and the *J 35616-A* Connector Test Adapter Kit, measure the resistance between terminals C and D. Is the resistance within the specified value?	3–7Ω	*Go to Step 6*	*Go to Step 4*
4	1. Disconnect the Automatic Transmission Wiring Harness Assembly at the PC Sol. Valve. 2. Measure the resistance of the PC Sol. Valve. Is the resistance within the specified range?	3–7Ω	*Go to Step 5*	*Go to Step 8*
5	Replace the Automatic Transmission Wiring Harness Assembly. Refer to Interior Wiring Harness Replacement, in On-Vehicle Service. Is the replacement complete?	—	*Go to Step 16*	—
6	Measure the resistance from terminal C on the jumper harness, to the transmission case. Is the resistance less than the specified value?	9Ω	*Go to Step 7*	*Go to Step 9*
7	1. Inspect the Automatic Transmission Wiring Harness Assembly (circuits 1228 and 1229) for a short to ground condition. Refer to General Electrical Diagnosis Procedures. 2. Replace the harness if necessary. Refer to Interior Wiring Harness Replacement, in On-Vehicle Service. Did you find a shorted condition?	—	*Go to Step 16*	*Go to Step 8*
8	Replace the PC Sol. Valve. Refer to Pressure Regulator Valve Replacement, in On-Vehicle Service. **Important:** Refer to the *Test Description* for information on component replacement. Is the replacement complete?	—	*Go to Step 16*	—
9	1. Disconnect the *J 39775* Jumper Harness from the transmission side of the 20-way connector (Automatic Transmission Connector End View). 2. Reconnect the transmission 20-way connector. 3. Disconnect the C3 (grey/clear) VCM connector. 4. Measure the resistance between terminals C3–6 and C3-16. Is the resistance within the specified range?	3-7Ω	*Go to Step 10*	*Go to Step 11*

DTC P0748 Pressure Control Solenoid CKT Electrical (Gas) (cont'd)

Step	Action	Value(s)	Yes	No
10	1. Connect the *J 39200* DMM to terminal C3-6 and to a good ground. 2. Measure the resistance. Is the resistance greater than the specified value?	7Ω	*Go to Step 15*	*Go to Step 14*
11	Is the resistance in step 9 greater than the specified value?	7Ω	*Go to Step 12*	*Go to Step 13*
12	1. Inspect circuit 1228 for an open. 2. Inspect circuit 1229 for an open. Refer to General Electrical Diagnosis Procedures. 3. Repair the circuits if necessary. Refer to Wiring Repairs. Did you find and repair the open condition?	—	*Go to Step 16*	—
13	Inspect circuits 1228 and 1229 for a shorted together condition. Refer to General Electrical Diagnosis Procedures. Did you find and repair the condition?	—	*Go to Step 16*	—
14	1. Inspect circuit 1228 for a short to ground. 2. Inspect circuit 1229 for a short to ground. Refer to General Electrical Diagnosis Procedures. 3. Repair the circuits if necessary. Refer to Wiring Repairs. Did you find and repair the shorted to ground condition?	—	*Go to Step 16*	—
15	Replace the VCM. Refer to: • *VCM Replacement/Programming* (4.3L) • *VCM Replacement/Programming* (5.7L) • *VCM Replacement/Programming* (7.4L) Is the replacement complete?	—	*Go to Step 13*	—
16	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Ensure the following conditions are met: • The engine is running. • The PC Duty Cycle is 2-95%. 4. Select Specific DTC. Enter DTC P0748. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0748 Pressure Control Solenoid CKT Electrical (Diesel)



Circuit Description

The Pressure Control Solenoid Valve (PC Sol. Valve) is a Powertrain Control Module (PCM) controlled device that regulates the transmission line pressure. The PCM compares the Accelerator Pedal Position (APP) Sensor voltage, engine RPM, and other inputs in order to determine the appropriate line pressure for a given load. The PCM regulates the pressure by applying a varying amperage to the PC Sol. Valve. The applied amperage varies from 0.1 amps for maximum line pressure to 1.1 amps for minimum line pressure. The PCM monitors the circuit amperage.

If the PCM detects a PC duty cycle that exceeds 95% or is less than 1.9%, then DTC P0748 sets. DTC P0748 is a type D DTC.

Conditions for Setting the DTC

- The system voltage is 9.0–16.0 volts.
- The engine must be running greater than 475 RPM for at least 7 seconds.
- The PC duty cycle exceeds 95% or is less than 1.9%.
- All conditions met for 200 milliseconds (0.2 seconds).

Action Taken When the DTC Sets

- The PCM does not illuminate the Malfunction Indicator Lamp (MIL).
- The PCM disables the PC Sol. Valve, defaulting the transmission to maximum line pressure.
- The PCM freezes shift adapts.
- DTC P0748 is stored in PCM history.

Conditions for Clearing the DTC

- A scan tool can clear the DTC from the PCM history. The PCM clears the DTC from the PCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The PCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the PCM.

Diagnostic Aids

- Inspect the wiring at the PCM, the transmission connector and all other circuit connecting points for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation
  - Moisture intrusion
  - Corrosion
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- Inspect for any transmission DTCs that may have reset.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2. This step tests the ability of the PCM to command the PC Sol. Valve.
3. This step tests the PC Sol. Valve and the Automatic Transmission Wiring Harness Assembly for incorrect resistance.
6. This step tests the PC sol. valve and the internal wiring harness for a short to ground.
8. When performing this step refer to Product Service Bulletin #9474L80E-07 for PC Sol. Valve Application.
9. This step tests the entire PC sol. valve circuit for proper resistance.
10. This step tests for a short to ground in circuits 1228 and 1229 of the engine harness.

DTC P0748 Pressure Control Solenoid CKT Electrical (Diesel)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check*
2	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Failure Records for reference. Using the Clear Info function erases the stored Failure Records from the PCM. 3. Record the DTC Failure Records, then clear the DTC. 4. With the engine running, put the transmission in Park. 5. Using the scan tool transmission output control function, apply 0.1–1.0 amps while observing the PC Ref. Current and the PC Act. Current. Is the PC Act. Current reading always within the specified value of the PC Ref. Current?	0.16	Go to Diagnostic Aids	*Go to Step 3*
3	1. Turn the ignition OFF. 2. Disconnect the transmission 20-way connector (additional DTC's may set). 3. Install the *J 39775* Jumper Harness on the transmission side of the 20-way connector. 4. Measure the resistance between terminals C and D. Use the *J 39200* DMM and the *J 35616-A* Connector Test Adapter Kit. Is the resistance within the specified value?	3–7Ω	*Go to Step 6*	*Go to Step 4*

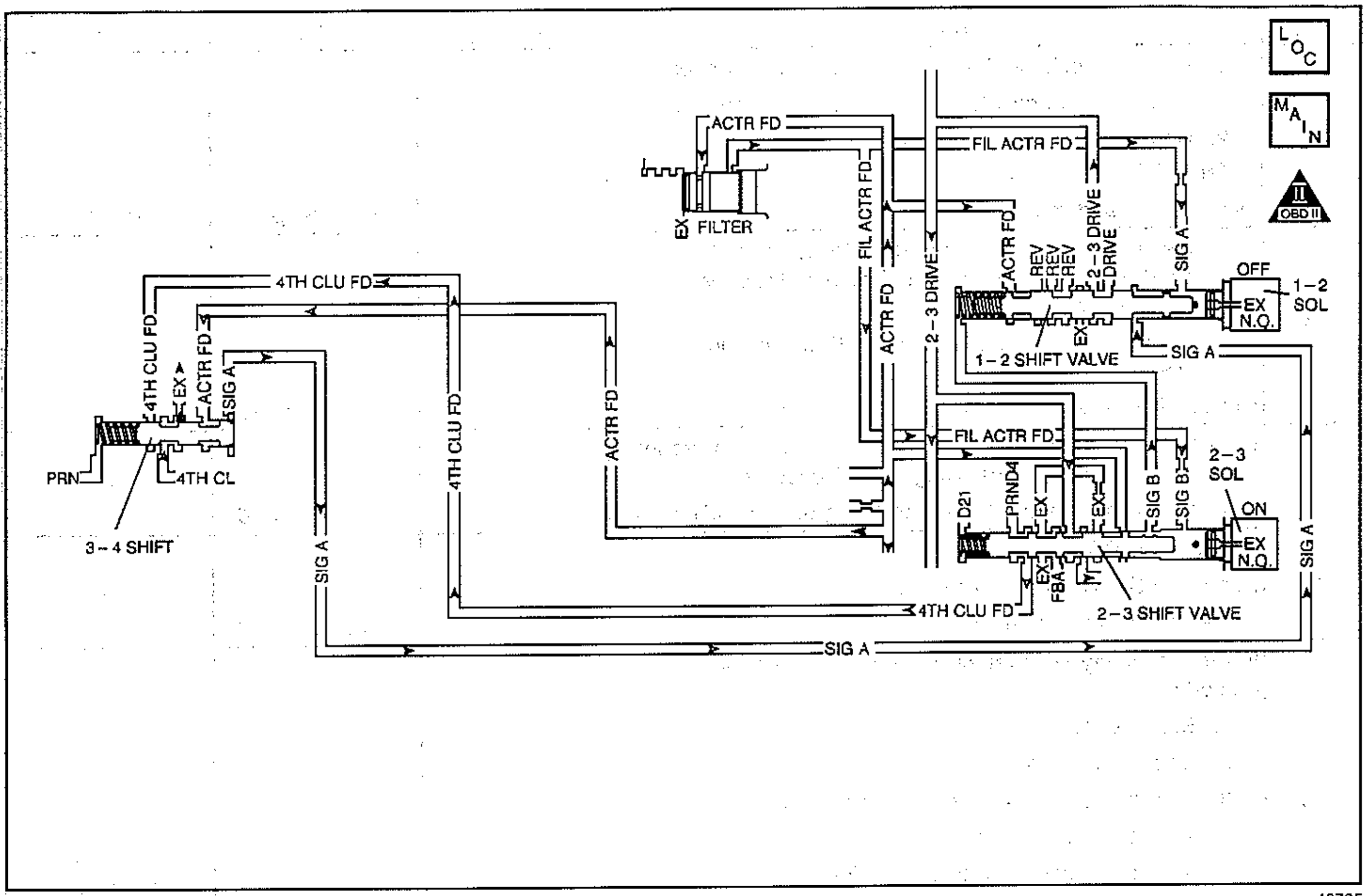
DTC P0748 Pressure Control Solenoid CKT Electrical (Diesel) (cont'd)

Step	Action	Value(s)	Yes	No
4	1. Disconnect the Automatic Transmission Wiring Harness Assembly at the PC Sol. Valve. 2. Measure the resistance of the PC Sol. Valve. Is the resistance within the specified range?	3–7Ω	*Go to Step 5*	*Go to Step 8*
5	Replace the Automatic Transmission Wiring Harness Assembly. Refer to Interior Wiring Harness Replacement, in On-vehicle Service. Is the replacement complete?	—	*Go to Step 16*	—
6	Measure the resistance from terminal C in the jumper harness to the transmission case. Is the resistance less than the specified value?	9Ω	*Go to Step 7*	*Go to Step 9*
7	1. Inspect the Automatic Transmission Wiring Harness Assembly (circuits 1228 and 1229), for a short to ground condition. Refer to General Electrical Diagnosis Procedures. 2. Replace the harness if necessary. Refer to Interior Wiring Harness Replacement. Did you find the condition?	—	*Go to Step 16*	*Go to Step 8*
8	**Important:** Refer to *test description Step 8* for information on component replacement. Replace the PC Sol. Valve. Refer to Pressure Regulator Replacement, in On-Vehicle Service. Is the replacement complete?	—	*Go to Step 16*	—
9	1. Disconnect the *J 39775* Jumper Harness from the transmission side of the 20-way connector. 2. Reconnect the transmission 20-way connector. 3. Disconnect the C1 (32 Pin/Brown) PCM connector. 4. Measure the resistance between terminals C1–C7 and C1–C15. Is the resistance within the specified range?	3-7 Ω	*Go to Step 10*	*Go to Step 11*
10	Measure the resistance between terminal C1-C7 and a good ground. Is the resistance greater than the specified value?	7 Ω	*Go to Step 15*	*Go to Step 14*
11	Is the resistance in step 9 greater than the specified value?	7 Ω	*Go to Step 12*	*Go to Step 13*

DTC P0748 Pressure Control Solenoid CKT Electrical (Diesel) (cont'd)

Step	Action	Value(s)	Yes	No
12	1. Inspect circuit 1228 and circuit 1229 for an open. Refer to General Electrical Diagnosis Procedures. 2. Repair the circuits if necessary. Refer to Wiring Repairs. Did you find and repair the open condition?	—	*Go to Step 16*	*Go to Step 12*
13	1. Inspect circuits 1228 and 1229 for a shorted condition. Refer to General Electrical Diagnosis Procedures. 2. Repair the circuits if necessary. Refer to Wiring Repairs. Did you find and repair a shorted condition?	—	*Go to Step 16*	—
14	Inspect circuit 1228 and circuit 1229 for a short to ground. Refer to General Electrical Diagnosis Procedures. Did you find and repair the shorted to ground condition?	—	*Go to Step 16*	—
15	Replace the PCM. Refer to *PCM Replacement/Programming.* Is the replacement complete?	—	*Go to Step 16*	—
16	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Ensure the following conditions are met: • The engine is running. • The PC sol. duty cycle is 2-95%. 4. Select Specific DTC. Enter DTC P0748. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0751 1-2 Shift Solenoid Valve Performance (Gas)



40795

Circuit Description

The 1-2 Shift Solenoid Valve (1-2 SS Valve) controls the fluid flow action on the 1-2 and the 3-4 shift valves. The 1-2 SS Valve is a normally-open exhaust valve that is used with the 2-3 Shift Solenoid Valve (2-3 SS Valve) in order to allow four different shifting combinations.

When the Vehicle Control Module (VCM) detects a 2–2–3–3 gear Ratio or a 1–1–4–4 gear ratio, then DTC P0751 sets. DTC P0751 is a type D DTC. For California emissions vehicles DTC P0751 is a type B DTC.

Conditions for Setting the DTC

- No MAF DTCs P0101, P0102 or P0103.
- No MAP Sensor DTCs P0106, P0107, or P0108.
- No TP Sensor DTCs P0121, P0122, or P0123.
- No OSS DTCs P0502 or P0503.
- No A/T ISS Sensor DTCs P0716 or P0717.
- No 1-2 SS Valve DTC P0753.
- No 2-3 SS Valve DTC P0758.
- No TFP Val. Position Sw. DTC P1810.
- No TCC PWM Sol. Valve DTC P1860.
- The engine must be running more than 475 RPM for 7 seconds.
- The vehicle speed is greater than 3 km/h (2.0 mph).
- The TP Sensor is greater than 10%. (5.7L), 12% (4.3L).
- The Engine Torque is 95 N.m (70 lb ft) 4.3L, 108 N.m (80 lb ft) 5.7L, 7.4L to the following:
  - 405 N.m (300 lb ft) 4.3L
  - 540 N.m (400 lb ft) 5.7L
  - 675 N.m (500 lb ft) 7.4L.
- The transmission fluid temperature (TFT) is greater than 20°C (68°F).
- All the above conditions are met and one of the following conditions occur:

Stuck Off (after two occurrences)

When the 1-2 SS Valve is stuck OFF, first gear is commanded and the ratio is equal to second gear for greater than 2.0 seconds, and 4th gear is commanded with the TCC locked and the ratio equals 3rd gear for greater than 3 seconds.

Stuck On (after five occurrences 5.7L, 7.4L) (seven occurrences 4.3L)

When the 1-2 SS Valve is stuck ON, second gear is commanded and the ratio is equal to first gear for greater than 3 seconds.

Action Taken When the DTC Sets

- The VCM illuminates the Malfunction Indicator Lamp (MIL) for California emissions vehicles.
- The VCM commands maximum line pressure.
- The VCM inhibits 3–2 downshifts above 25 mph.
- The VCM freezes shift adapts.
- DTC P0751 is stored in VCM history.

Conditions for Clearing the DTC

- For California emissions only, the VCM turns OFF the MIL after three consecutive trips without a failure reported.
- A scan tool can clear the DTC from the VCM history. The VCM clears the DTC from the VCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The VCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the VCM.

Diagnostic Aids

- Verify that the transmission meets the specifications in the *Shift Speed* table.
- Other internal transmission failures can cause more than one shift to occur.
- First diagnose and clear any engine DTCs or TP Sensor codes that are present. Then inspect for any transmission DTCs that may have reset.
- Refer to *Shift Solenoid Valve State and Gear Ratio* table.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2. This step tests the function of the TFP Val. Position Sw.
3. This step tests whether the scan tool commanded all the shifts, or whether all the shift solenoids responded correctly but all of the correct shifts did not occur.

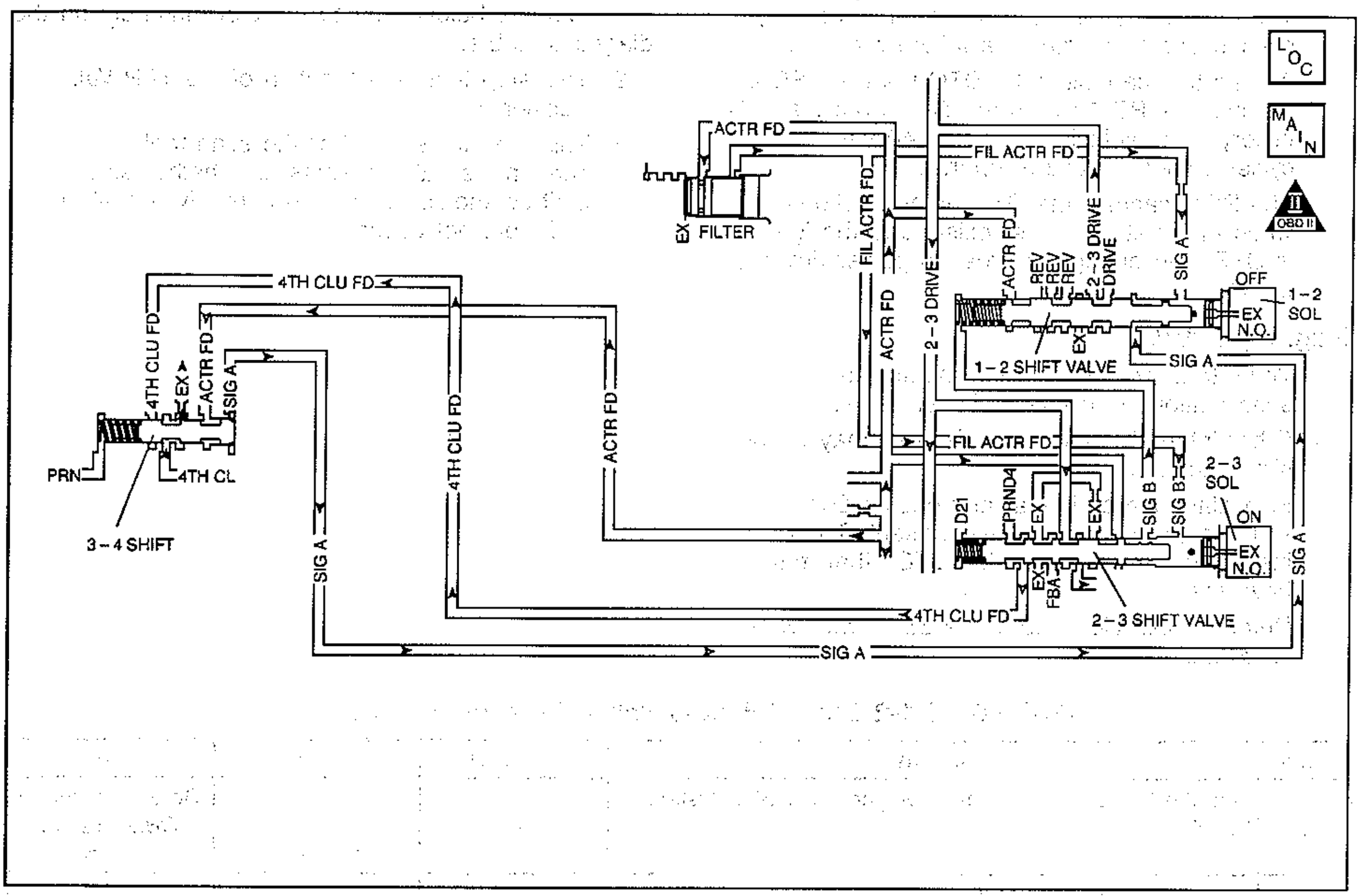
DTC P0751 1-2 Shift Solenoid Valve Performance (Gas)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	Go to *Step 2*	Go to *Powertrain OBD System Check* (4.3L) or *Powertrain OBD System Check* (5.7L) or *Powertrain OBD System Check* (7.4L)
2	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Freeze Frame and Failure Records for reference. The Clear Info function erases the stored Freeze Frame and Failure Records from the VCM. 3. Record the DTC Freeze Frame and Failure Records. 4. Select TFP Sw. A/B/C on the scan tool. 5. With the engine operating, apply the brake pedal, and select each transmission range: D1, D2, D3, D4, N, R, and P. Does each selected transmission range match the scan tool TFP Switch display? (Refer to the *Range Signal* table.)	—	Go to *Step 3*	Go to *DTC P1810 TFP Valve Position Sw CKT Malfunction (Gas)*

DTC P0751 1-2 Shift Solenoid Valve Performance (Gas) (cont'd)

Step	Action	Value(s)	Yes	No
3	1. Raise and support the drive axle assembly. 2. Start the engine. 3. With the transmission in D4 range, use the scan tool in order to command first, second, third, and fourth gears while accelerating the vehicle. Did you detect a 2-2-3-3 or 1-1-4-4 shift pattern only? (You may need to road test the vehicle).	—	*Go to Step 4*	Go to Diagnostic Aids
4	1. Inspect the shift solenoid/hydraulic circuit for a 1-2 SS Valve internal malfunction. 2. Inspect the shift solenoid/hydraulic circuit for a stuck 1-2 shift valve. 3. Inspect the shift solenoid/hydraulic circuit for damaged seals on one or both of the shift solenoids. The shift solenoids can leak oil into the second gear clutch pack. 4. Refer to the diagnosis tables. Did you find and correct the condition?	—	*Go to Step 5*	Go to Diagnostic Aids
5	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle under the following conditions (If traffic and road conditions permit): • Accelerate the vehicle with the TP angle greater than 12% up to 55 mph. • The VCM must see the proper ratio for each commanded gear for greater than one second in D1, D2, D3, and D4 (wait for the TCC Lock-up in 4th gear). 4. Select Specific DTC. Enter DTC P0751. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0751 1-2 Shift Solenoid Valve Performance (Diesel)



40795

Circuit Description

The 1-2 Shift Solenoid Valve (1-2 SS Valve) controls the fluid flow action on the 1-2 and the 3-4 shift valves. The 1-2 SS Valve is a normally-open exhaust valve that is used with the 2-3 Shift Solenoid Valve (2-3 SS Valve) to allow four different shifting combinations.

When the Powertrain Control Module (PCM) detects a 2-2-3-3 or a 1-1-4-4 gear ratio, then DTC P0751 sets. DTC P0751 is a type B DTC.

Conditions for Setting the DTC

- No MAP Sensor DTCs P0106, P0107, or P0108.
- No OSS DTCs P0722 or P0723.
- No A/T ISS Sensor DTCs P0716 or P0717.
- No TCC DTCs P0741 or P0742.
- No 1-2 SS Valve DTC P0753.
- No 2-3 SS Valve DTC P0758.
- No TFP Val. Position Sw. DTC P1810.
- The engine must be running greater than 475 RPM for at least 7 seconds.
- The vehicle speed is greater than 3.2 km/h (2 mph).
- The APP Angle is greater than 10%.
- System voltage is 9.0–16.0 volts.
- The Engine Torque is 108–644 N.m (80–475 lb ft).
- The transmission fluid temperature is greater than 20°C (68°F) and less than 130°C (255°F).
- The engine speed is less than 3750 RPM.
- All the above conditions are met and one of the following conditions occur:

Stuck Off (for two occurrences)

- First gear is commanded and the gear ratio is equal to second gear for greater than 1.5 seconds.
- Fourth gear is commanded (with TCC locked) and the gear ratio equals third gear for greater than 3 seconds.

Stuck On (for five occurrences)

Second gear is commanded and the gear ratio equals first gear for greater than 2.2 seconds.

Action Taken When the DTC Sets

- The PCM illuminates the Malfunction Indicator Lamp (MIL).
- The PCM commands maximum line pressure.
- The PCM freezes shift adapts.
- DTC P0751 is stored in the PCM history.

Conditions for Clearing the MIL/DTC

- The PCM turns OFF the MIL after three consecutive trips without a failure reported.
- A scan tool can clear the DTC from the PCM history. The PCM clears the DTC from the PCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The PCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the PCM.

Diagnostic Aids

- Verify that the transmission meets the specifications in the *Shift Speed* table.
- Other internal transmission failures may cause similar shift patterns.
- First diagnose and clear any engine DTCs or APP Sensor codes that are present. Then inspect for any transmission DTCs that may have reset.
- Refer to *Shift Solenoid Valve State and Gear Ratio* table.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2. This step tests the function of the TFP Val. Position Sw.
3. This step tests whether the scan tool commanded all the shifts, or whether all the shift solenoids responded correctly but all the shifts did not occur.

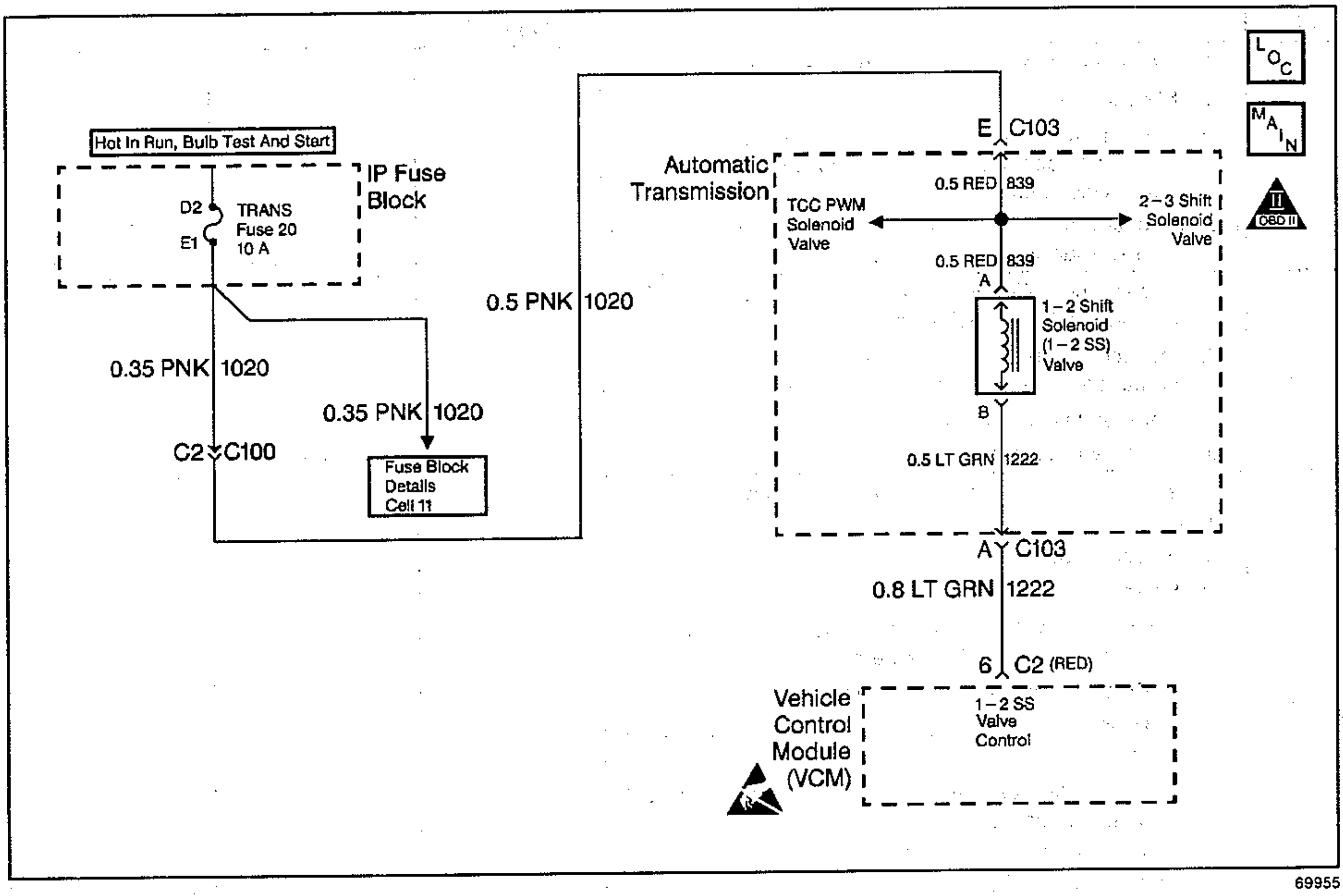
DTC P0751 1-2 Shift Solenoid Valve Performance (Diesel)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check*
2	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Freeze Frame and Failure Records for reference. Using the Clear Info function erases the stored Freeze Frame and Failure Records from the PCM. 3. Record the DTC Freeze Frame and Failure Records, then clear the DTC. 4. Select TFP Sw. A/B/C on the scan tool. 5. With the engine operating, apply the brake pedal, and select each transmission range: D1, D2, D3, D4, N, R, and P. Does each selected transmission range match the scan tool TFP Switch A/B/C display? (Refer to the *Range Signal* table.)	—	*Go to Step 3*	Go to *DTC P1810 TFP Valve Position Sw CKT Malfunction (Diesel)*

DTC P0751 1-2 Shift Solenoid Valve Performance (Diesel) (cont'd)

Step	Action	Value(s)	Yes	No
3	1. Raise and support the drive axle assembly. 2. Start the engine. 3. With the transmission in D4 range, use the scan tool in order to command first, second, third, and fourth gears while accelerating the vehicle. Did you detect a 2-2-3-3 or 1-1-4-4 shift pattern only? (You may need to road test the vehicle).	—	*Go to Step 4*	Go to Diagnostic Aids
4	1. Inspect the shift solenoid/hydraulic circuit for a 1-2 SS valve internal malfunction. 2. Inspect the shift solenoid/hydraulic circuit for damaged seals on one or both of the shift solenoids. 3. Refer to the diagnosis tables. Did you find and correct the condition?	—	*Go to Step 5*	—
5	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle under the following conditions (If traffic and road conditions permit): • Place the transmission in D4. • Hold the throttle greater than 10%, and accelerate to 55 mph. • The PCM must see the proper gear ratio for each commanded gear for greater than one second in D1, D2, D3, and D4 with TCC locked. 4. Select Specific DTC. Enter DTC P0751. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0753 1-2 Shift Solenoid Circuit Electrical (Gas)



Circuit Description

The 1-2 Shift Solenoid Valve (1-2 SS Valve) controls the fluid flow action on the 1-2 and the 3-4 shift valves. The 1-2 SS Valve is a normally-open exhaust valve that is used with the 2-3 Shift Solenoid Valve (2-3 SS Valve) to allow for four different shifting combinations. The 1-2 SS Valve attaches to the control valve body within the transmission. The ignition voltage goes directly to the 1-2 SS Valve. The VCM controls the 1-2 SS Valve by providing the ground path through circuit 1222.

When the Vehicle Control Module (VCM) detects a continuous open or short in the 1-2 SS Valve circuit or the 1-2 SS Valve, then DTC P0753 sets. DTC P0753 is a type D DTC. For California emissions vehicles, DTC P0753 is a type A DTC.

Conditions for Setting the DTC

- The system voltage is 10–16 volts.
- The ignition is ON.
- The engine runs more than 475 RPM for greater than 7 seconds.
- The above conditions are met, and either of the following conditions occur for 4.3 out of 5 seconds.
  - The VCM commands the solenoid on, and the voltage input remains high (B+), or
  - The VCM commands the solenoid off and the voltage input remains low.

Action Taken When the DTC Sets

- The VCM illuminates the Malfunction Indicator Lamp (MIL) for California Emissions vehicles.
- The VCM commands maximum line pressure.
- The VCM freezes shift adapts.
- The VCM inhibits 3–2 downshifts above 25 MPH.
- DTC P0753 is stored in VCM history.

Conditions for Clearing the DTC

1. For California emissions, the VCM turns OFF the MIL after three consecutive trips without a failure reported.
2. A scan tool can clear the DTC from the VCM history. The VCM clears the DTC from the VCM history if the vehicle completes 40 warm-up cycles without a failure reported.
3. The VCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the VCM.

Diagnostic Aids

- Inspect the wiring at the VCM, the transmission connector and all other circuit connecting points for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation
  - Moisture intrusion
  - Corrosion
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- An open ignition feed on circuit 1020 can cause multiple DTCs to set.
- First diagnose and clear any engine DTCs or TP Sensor codes that are present. Then inspect for any transmission DTCs that may have reset.
- Refer to *Shift Solenoid Valve State and Gear Ratio* table.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

4. This step tests the function of the 1-2 SS Valve and the internal wiring harness.
5. This step tests the power to the 1-2 SS Valve from the ignition through the fuse.
7. This step tests the ability of the VCM and the wiring to control the ground circuit.
10. This step measures the resistance of the Automatic Transmission Wiring Harness Assembly and the 1-2 SS Valve.

DTC P0753 1-2 Shift Solenoid Circuit Electrical (Gas)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check* (4.3L) or *Powertrain OBD System Check* (5.7L) or *Powertrain OBD System Check* (7.4L)
2	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Freeze Frame and Failure Records for reference. The Clear Info function erases the stored Freeze Frame and Failure Records from the VCM. 3. Record the DTC Freeze Frame and Failure Records. Were DTCs P0753, P0758, or P1860 also set?	—	*Go to Step 3*	*Go to Step 4*

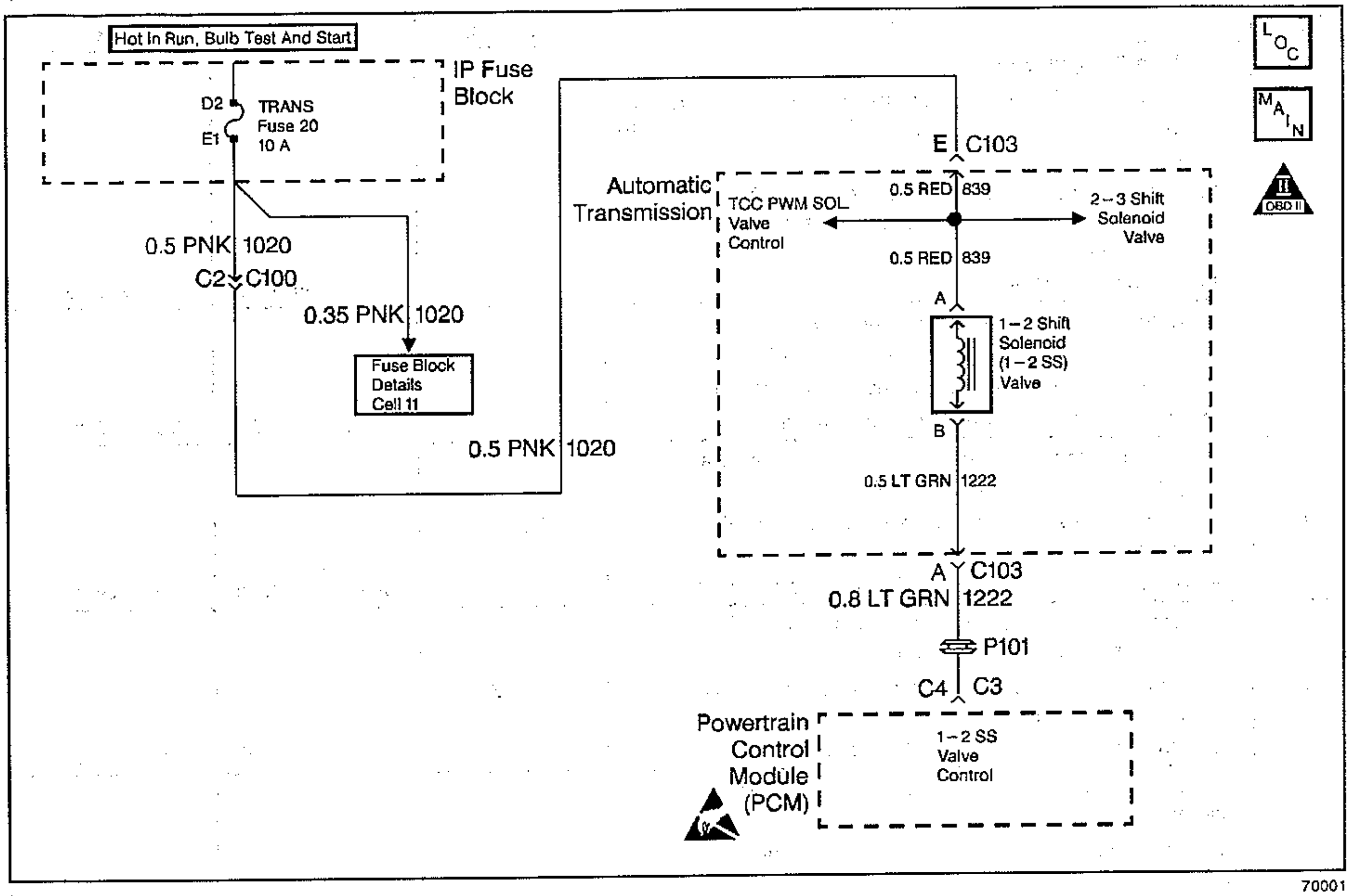
DTC P0753 1-2 Shift Solenoid Circuit Electrical (Gas) (cont'd)

Step	Action	Value(s)	Yes	No
3	1. Inspect the trans. fuse. 2. If you find an open fuse, inspect the following components for a short to ground: • Circuit 1020 • The 3 solenoids • The Automatic Transmission Wiring Harness Assembly. Refer to General Electrical Diagnosis Procedures. 3. Repair the circuit, the solenoid, or replace the harness if necessary. Refer to Wiring Repairs. Did you find and correct the condition?	—	*Go to Step 16*	*Go to Step 4*
4	Using the scan tool output control function, command the 1-2 SS Valve ON and OFF three times while listening to the bottom of the transmission pan (use a stethoscope if needed). Does the solenoid click when commanded?	—	Go to Diagnostic Aids	*Go to Step 5*
5	1. Turn the ignition OFF. 2. Disconnect the transmission 20-way connector Additional DTCs will set. 3. Install the *J 39775* Jumper Harness on the engine harness connector. 4. With the engine OFF, turn the ignition switch to the RUN position. 5. Connect a 12 volt test lamp from the Jumper Harness cavity E to ground. Is the test lamp on?	—	*Go to Step 7*	*Go to Step 6*
6	Repair the open, or high resistance, in ignition feed circuit 1020 to the 1-2 SS Valve. Refer to Wiring Repairs. Did you find and correct the condition?	—	*Go to Step 16*	—
7	1. Install a 12 volt test lamp between cavities E and A of the *J 39775* Jumper Harness. 2. Using the transmission output control function on the scan tool, command the 1-2 SS Valve On and Off three times. Does the test lamp illuminate when you command the shift solenoid ON and turn off when you command the shift solenoid OFF?	—	*Go to Step 10*	*Go to Step 8*
8	Inspect circuit 1222 for an open or short to ground. Refer to General Electrical Diagnosis Procedures. Did you find the condition?	—	*Go to Step 16*	*Go to Step 9*
9	Replace the VCM. Refer to: • *VCM Replacement/Programming* (4.3L) • *VCM Replacement/Programming* (5.7L) • *VCM Replacement/Programming* (7.4L) Is the replacement complete?	—	*Go to Step 16*	—

DTC P0753 1-2 Shift Solenoid Circuit Electrical (Gas) (cont'd)

Step	Action	Value(s)	Yes	No
10	1. Turn the ignition OFF. 2. Install *J 39775* Jumper Harness on the transmission 20-way connector (Automatic Transmission Connector End View). 3. With the *J 39200* DMM and the *J 35616-A* Connector Test Adapter Kit, measure the resistance between terminals A and E. Is the resistance within the specified values?	19–31Ω	*Go to Step 12*	*Go to Step 11*
11	1. Disconnect the Automatic Transmission Wiring Harness Assembly from the 1-2 SS Valve. 2. Measure the resistance of the 1-2 SS Valve. Is the resistance within the specified values?	19–31Ω	*Go to Step 14*	*Go to Step 15*
12	1. Measure the resistance between terminal A and ground. Use the *J 39200* DMM. 2. Measure the resistance between terminal E and ground. Are both readings greater than the specified value?	250kΩ	Go to Diagnostic Aids	*Go to Step 13*
13	1. Disconnect the Automatic Transmission Wiring Harness Assembly from the 1-2 SS Valve. 2. Measure the resistance from the component's terminals to ground. Are both readings greater than the specified value?	250kΩ	*Go to Step 14*	*Go to Step 15*
14	Replace the Automatic Transmission Wiring Harness Assembly. Refer to Interior Wiring Harness Replacement, in On-Vehicle Service. Is the replacement complete?	—	*Go to Step 16*	—
15	Replace the 1-2 SS Valve. Refer to Control Valve Body Removal and Disassembly, in On-Vehicle Service. Is the replacement complete?	—	*Go to Step 16*	—
16	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Select the parameters 1-2 Sol. and 1-2 Sol. Open/Shorted to GRND, and 1-2 Sol. Shorted to Voltage. 4. Operate the vehicle under the following conditions: • The VCM commands the 1-2 SS Valve On, and the 1-2 Sol. Shorted to Voltage is No. • The VCM commands the 1-2 SS Valve OFF, and the 1-2 Sol. Open/Shorted to Ground is No. • All conditions met for 5 seconds. 5. Select Specific DTC. Enter DTC P0753. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0753 1-2 Shift Solenoid Circuit Electrical (Diesel)



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Circuit Description

The 1-2 Shift Solenoid Valve (1-2 SS Valve) controls the fluid flow acting on the 1-2 and the 3-4 shift valves. The 1-2 SS Valve is a normally-open exhaust valve that is used with the 2-3 Shift Solenoid Valve (2-3 SS Valve) in order to allow four different shifting combinations. The 1-2 SS Valve attaches to the control valve body within the transmission. The ignition voltage goes directly to the 1-2 SS Valve. The Powertrain Control Module (PCM) controls the 1-2 SS Valve by providing the ground path through circuit 1222.

If the PCM detects a continuous open or short to ground in the 1-2 SS Valve circuit or the 1-2 SS Valve, then DTC P0753 sets. DTC P0753 is a type A DTC.

Conditions for Setting the DTC

- The engine runs more than 475 RPM for greater than 7 seconds.
- System voltage is 9.0–16.0 volts.
- The above conditions are met and either of the following conditions occur for 4.3 out of 5 seconds:
  - The PCM commands the Solenoid ON and the voltage input remains high (B+).
  - The PCM commands the Solenoid OFF and the voltage input remains low (0 volts).

Action Taken When the DTC Sets

- The PCM illuminates the Malfunction Indicator Lamp (MIL).
- The PCM commands maximum line pressure.
- The PCM freezes shift adapts.
- DTC P0753 is stored in PCM history.

Conditions for Clearing the MIL/DTC

- The PCM turns OFF the MIL after three consecutive trips without a failure reported.
- A scan tool can clear the DTC from the PCM history. The PCM clears the DTC from the PCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The PCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the PCM.

Diagnostic Aids

- Inspect the wiring at the PCM, the transmission connector and all other connecting points for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation
  - Moisture intrusion
  - Corrosion
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- An open ignition feed circuit can cause multiple DTCs to set.
- First diagnose and clear any engine DTCs that are present. Then inspect for any transmission DTCs that may have reset.
- Refer to *Shift Solenoid Valve State and Gear Ratio* table.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

4. This step tests the function of the 1-2 SS Valve and the Automatic Transmission Wiring Harness Assembly.
5. This step tests the power to the 1-2 SS Valve from the ignition through the fuse.
7. This step tests the ability of the PCM and the wiring to control the ground circuit.
10. This step measures the resistance of the Automatic Transmission Wiring Harness Assembly and the 1-2 SS Valve.

DTC P0753 1-2 Shift Solenoid Circuit Electrical (Diesel)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check*
2	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Freeze Frame and Failure Records for reference. Using the Clear Info function erases the stored Freeze Frame and Failure Records from the PCM. 3. Record the DTC Freeze Frame and Failure Records, then clear the DTC. Are DTCs P0758 or P1860 also set?	—	*Go to Step 3*	*Go to Step 4*
3	1. Inspect the trans. fuse for an open. 2. If you found an open fuse, inspect circuit 1020, the three solenoids, and the Automatic Transmission Wiring Harness Assembly for a short to ground. Refer to General Electrical Diagnosis Procedures. Did you find and correct the condition?	—	*Go to Step 16*	*Go to Step 5*

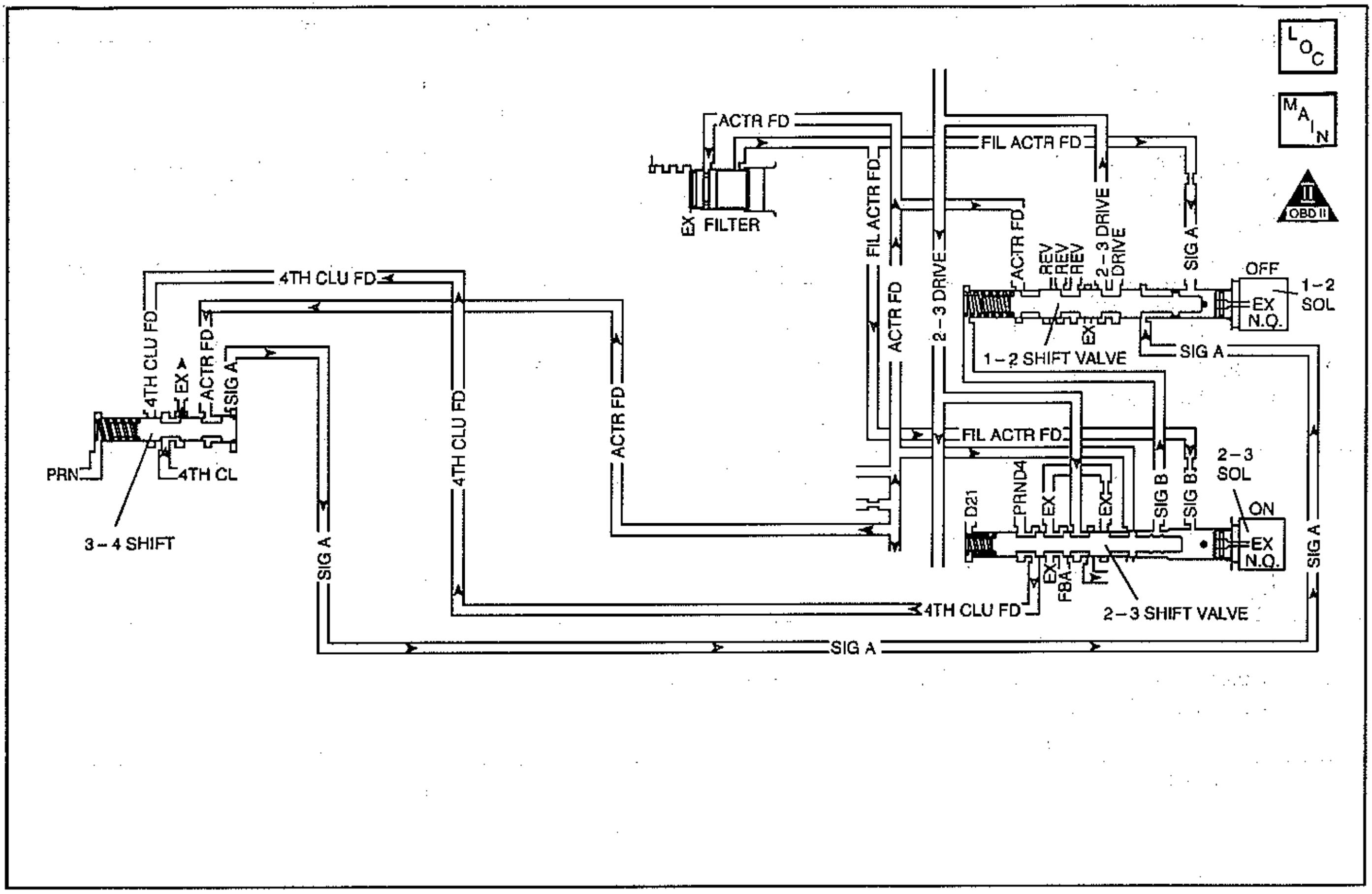
DTC P0753 1-2 Shift Solenoid Circuit Electrical (Diesel) (cont'd)

Step	Action	Value(s)	Yes	No
4	Using the transmission output control function on the scan tool, command the 1-2 SS Valve ON and OFF three times while listening to the bottom of the transmission pan (use a stethoscope if needed). Does the solenoid click when commanded?	—	Go to Diagnostic Aids	*Go to Step 5*
5	1. Turn the ignition OFF. 2. Disconnect the transmission 20-way connector (additional DTCs will set). 3. Install the *J 39775* Jumper Harness on the engine side of the 20-way connector. 4. With the engine OFF, turn the ignition switch to the RUN position. 5. Connect a test lamp from the *J 39775* Jumper Harness cavity E to a good ground. Is the test lamp on?	—	*Go to Step 7*	*Go to Step 6*
6	Repair the open or short to ground in ignition feed circuit 1020 to the 1-2 SS Valve. Refer to Wiring Repairs. Did you find and correct the condition?	—	*Go to Step 16*	—
7	1. Install a test lamp between cavity E and cavity A of the *J 39775* Jumper Harness. 2. Using the transmission output control function on the scan tool, command the 1-2 SS Valve On and Off three times. Does the test lamp illuminate when the shift solenoid is commanded ON and turn off when the shift solenoid is commanded OFF?	—	*Go to Step 10*	*Go to Step 8*
8	Inspect circuit 1222 for an open or short to ground. Refer to General Electrical Diagnosis Procedures. Did you find the condition?	—	*Go to Step 16*	*Go to Step 9*
9	Replace the PCM. Refer to *PCM Replacement/Programming.* Is the replacement complete?	—	*Go to Step 16*	—
10	1. Turn the ignition OFF. 2. Install *J 39775* Jumper Harness on the transmission 20-way connector. 3. With the *J 39200* DMM and the *J 35616-A* Connector Test Adapter Kit, measure the resistance between terminals A and E. Is the resistance within the specified value?	19–31Ω	*Go to Step 12*	*Go to Step 11*

DTC P0753 1-2 Shift Solenoid Circuit Electrical (Diesel) (cont'd)

Step	Action	Value(s)	Yes	No
11	1. Disconnect the Automatic Transmission Wiring Harness Assembly from the 1-2 SS Valve. 2. Measure the resistance of the 1-2 SS Valve. Is the resistance within the specified values?	19–31Ω	*Go to Step 14*	*Go to Step 15*
12	Measure the resistance between terminals A and E and a good ground. Are both reading greater than the specified value?	250kΩ	Go to Diagnostic Aids	*Go to Step 13*
13	1. Disconnect the Automatic Transmission Wiring Harness Assembly from the 1-2 SS Valve. 2. Measure the resistance from the 1-2 SS Valve terminals to a good ground. Are both readings greater than the specified value?	250kΩ	*Go to Step 14*	*Go to Step 15*
14	Replace the Automatic Transmission Wiring Harness Assembly. Refer to Interior Wiring Harness Replacement, in On-vehicle Service. Is the replacement complete?	—	*Go to Step 16*	—
15	Replace the 1-2 SS Valve. Refer to Control Valve Body Removal and Disassembly, in On-Vehicle Service. Is the replacement complete?	—	*Go to Step 16*	—
16	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Select the parameters 1-2 Sol. and 1-2 Sol. Open/Shorted to GRND, and 1-2 Sol. Shorted to Voltage. 4. Operate the vehicle under the following conditions: • The PCM commands the 1-2 SS Valve ON, and the 1-2 Sol. Shorted to Voltage is No. • The PCM commands the 1-2 SS Valve OFF, and the 1-2 Sol. Open/Shorted to GRND is No. • All conditions are met for 5 seconds. 5. Select Specific DTC. Enter DTC P0753. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0756 2-3 Shift Solenoid Valve Performance (Gas)



40795

Circuit Description

The 2-3 Shift Solenoid Valve (2-3 SS Valve) controls fluid flow acting on the 2-3 shift valves. The 2-3 SS Valve is a normally-open exhaust valve used with the 1-2 Shift Solenoid Valve (1-2 SS Valve) in order to allow for four different shift combinations.

If the VCM detects a non first gear ratio while first gear is commanded or a first gear ratio while fourth gear is commanded, then DTC P0756 sets. DTC P0756 is a type D DTC. For California emissions vehicles, DTC P0756 is a type A DTC.

Conditions for Setting the DTC

- No MAF DTCs P0101, P0102 or P0103.
- No MAP DTCs P0106, P0107, or P0108.
- No TP Sensor DTCs P0121, P0122, or P0123.
- No OSS DTCs P0502 or P0503.
- No A/T ISS Sensor DTCs P0716 or P0717.
- No TFP Val. Position Sw. DTC P1810.
- No shift solenoid electrical DTCs P0753 or P0758.
- The engine runs more than 475 RPM for 7 seconds.
- The vehicle speed is greater than 4 km/h (2.5 mph).
- The TP Angle is greater than 12.5%. (4.3L).
- The transmission fluid temperature (TFT) is greater than 20°C (68°F).
- The engine torque is 108 N·m (80 lb ft) to the following:
  - 405 N·m (300 lb ft) 4.3L
  - 540 N·m (400 lb ft) 5.7L
  - 675 N·m (500 lb ft) 7.4L.
- All of the above conditions are met and either of the two following conditions occur:

Stuck On (for 7 occurrences)
when the 2-3 SS Valve is stuck on, the commanded gear equals 1st and the ratio equals 4th for greater than 2 seconds, and the commanded gear equals 2nd and the ratio equals 3rd for greater than 3 seconds.

Stuck Off (for 7 occurrences)
when the 2-3 SS Valve is stuck off, the commanded gear equals 3rd and the ratio equals 2nd for greater than 4 seconds.

Action Taken When the DTC Sets

- The VCM illuminates the Malfunction Indicator Lamp (MIL) for California emissions vehicles.
- The VCM commands 2nd gear.
- The VCM commands maximum line pressure.
- The VCM freezes shift adapts.
- DTC P0756 is stored in VCM history.

Conditions for Clearing the MIL/DTC

- For California emissions vehicles, the VCM turns OFF the MIL after three consecutive trips without a failure reported.
- A scan tool can clear the DTC from the VCM history. The VCM clears the DTC from the VCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The VCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the VCM.

Diagnostic Aids

- Verify that the transmission meets the specifications in the *Shift Speed* table.
- Other internal transmission failures may cause more than one shift to occur.
- The customer may complain of an engine over-rev condition or neutral condition in 4th gear.
- First diagnose and clear any engine DTCs or TP Sensor codes that are present. Then inspect for any transmission DTCs that may have reset.
- Refer to *Shift Solenoid Valve State and Gear Ratio* table.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2. This step tests the function of the TFP Val. Position Sw.
3. This step tests for a selected gear ratio versus a ratio not obtainable under normal operating conditions.

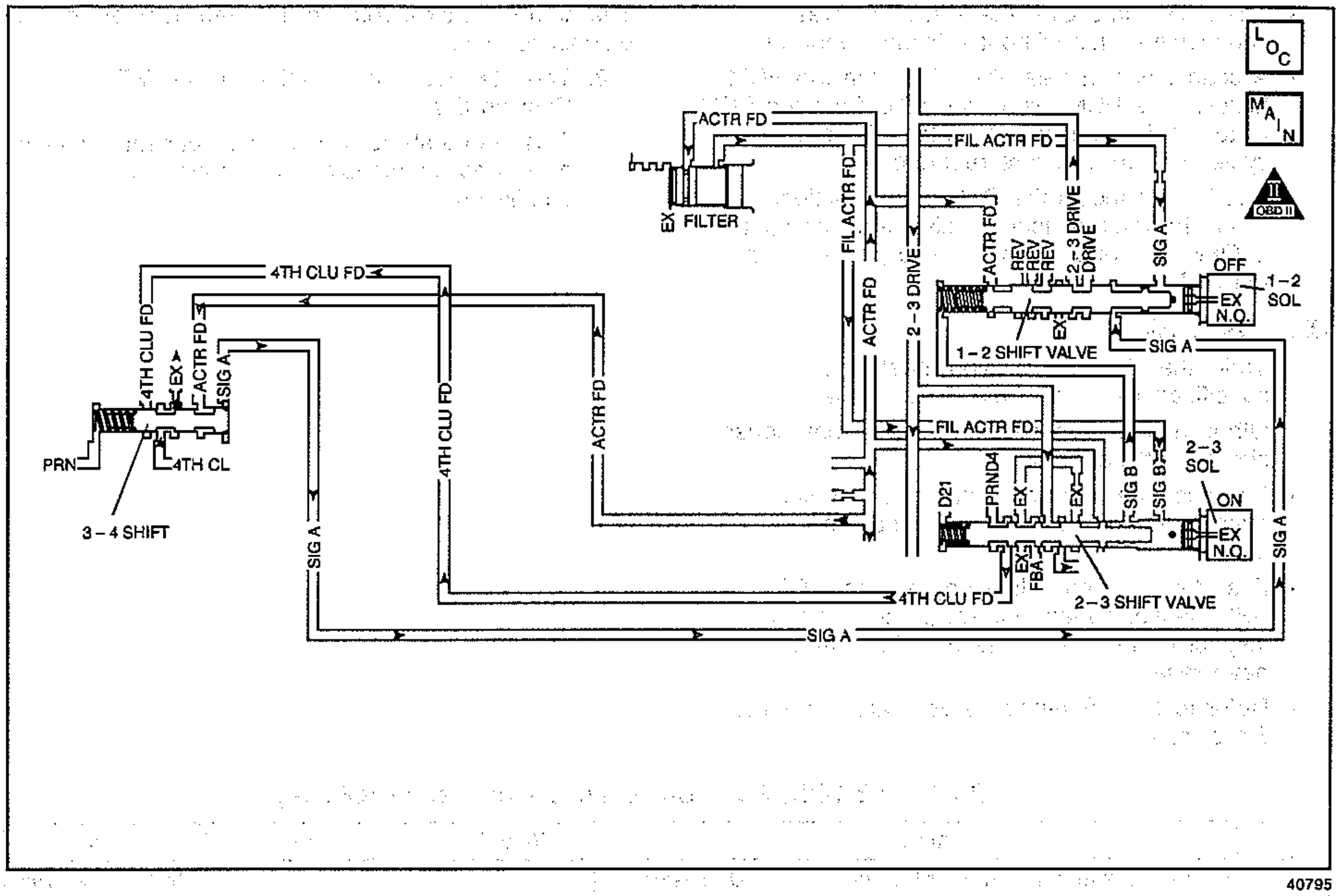
DTC P0756 2-3 Shift Solenoid Valve Performance (Gas)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check* (4.3L) or *Powertrain OBD System Check* (5.7L) or *Powertrain OBD System Check* (7.4L)
2	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Freeze Frame and Failure Records for reference. The Clear Info function erases the stored Freeze Frame and Failure Records from the VCM. 3. Record the DTC Freeze Frame and Failure Records. 4. Select TFP Sw. A/B/C on the scan tool. 5. With the engine running, apply the brake pedal and select each transmission range: D1, D2, D3, D4, N, R, and P. Does each selected transmission range match the scan tool TFP Switch A/B/C display? (Refer to the *Range Signal* table.)	—	*Go to Step 3*	Go to *DTC P1810 TFP Valve Position Sw CKT Malfunction (Gas)*

DTC P0756 2-3 Shift Solenoid Valve Performance (Gas) (cont'd)

Step	Action	Value(s)	Yes	No
3	1. Raise and support the axle assembly. 2. Start the engine. 3. With the transmission in the D4 range, use the scan tool in order to command 1st, 2nd, 3rd, and 4th gears while accelerating the vehicle. Was 1st gear commanded and not achieved, or 4th gear commanded and another gear occurred? (You may need to road test the vehicle).	—	*Go to Step 4*	Go to Diagnostic Aids
4	1. Inspect the shift solenoid/hydraulic for an internal malfunction at one or both of the shift solenoids. 2. Inspect the shift solenoid/hydraulic for damaged seals on one or both of the shift solenoids. 3. Refer to the diagnosis tables. Did you find and correct the condition?	—	*Go to Step 5*	—
5	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle under the following conditions only if traffic conditions permit: • The VCM must see the proper gear ratio for each gear for greater than one second in D1, D2, D3, and D4. • Accelerate the vehicle with the TP angle greater than 8% (4.3L, 12.5%) up to 55 mph. The TCC must be locked in fourth gear. 4. Select Specific DTC. Enter DTC P0756. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0756 2-3 Shift Solenoid Valve Performance (Diesel)



Circuit Description

The 2-3 Shift Solenoid Valve (2-3 SS Valve) controls fluid flow acting on the 2-3 shift valve. The 2-3 SS Valve is a normally-open exhaust valve that is used with the 1-2 Shift Solenoid Valve (1-2 SS Valve) to allow four different shift combinations.

When the Powertrain Control Module (PCM) detects a non first gear ratio while first gear is commanded or a first gear ratio while fourth gear is commanded, then DTC P0756 sets. DTC P0756 is a type A DTC.

Conditions for Setting the DTC

- No TFT Sensor DTCs P0712 or P0713.
- No A/T ISS Sensor DTCs P0716 or P0717.
- No OSS Sensor DTCs P0722 or P0723.
- No shift solenoid electrical DTCs P0753 or P0758.
- No TFP Val. Position Sw. DTC P1810.
- System voltage is 9.0–16.0 volts.
- The vehicle speed is greater than 3.2 km/h (2 mph).
- The APP Angle is greater than 10%.
- The Transmission Fluid Temperature (TFT) is 20°–130°C (68°–266°F).
- The engine torque is 100–644 N·m (80–475 lb ft).
- The engine speed is 475–3750 RPM for at least 7 seconds.
- All of the above conditions are met and either of the two following conditions occur:

Stuck On (after 2 occurrences)

- First gear is commanded and the ratio equals 4th gear for greater than 2.75 seconds.
- Second gear is commanded and the gear ratio equals 3rd for greater than 2.75 seconds.

Stuck Off (after 7 Occurrences)

Third gear is commanded and the gear ratio equals 2nd for greater than 3.25 seconds.

Action Taken When the DTC Sets

- The PCM illuminates the Malfunction Indicator Lamp (MIL).
- The PCM commands 2nd gear.
- The PCM commands maximum line pressure.
- The PCM freezes shift adapts.
- DTC P0756 is stored in PCM history.

Conditions for Clearing the MIL/DTC

- The PCM turns OFF the MIL after three consecutive trips without a failure reported.
- A scan tool can clear the DTC from the PCM history. The PCM clears the DTC from the PCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The PCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the PCM.

Diagnostic Aids

- Verify that the transmission meets the specifications in the *Shift Speed* table.
- Other internal transmission failures may cause similar shift patterns.
- The customer may complain of an engine over-rev condition or neutral condition in 4th gear.
- First diagnose and clear any engine DTCs or APP Sensor codes that are present. Then inspect for any transmission DTCs that may have reset.
- Refer to *Shift Solenoid Valve State and Gear Ratio* table.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2. This step tests the function of the TFP Val. Position Sw.
3. This step tests for a selected gear ratio versus a ratio not obtainable under normal driving conditions.

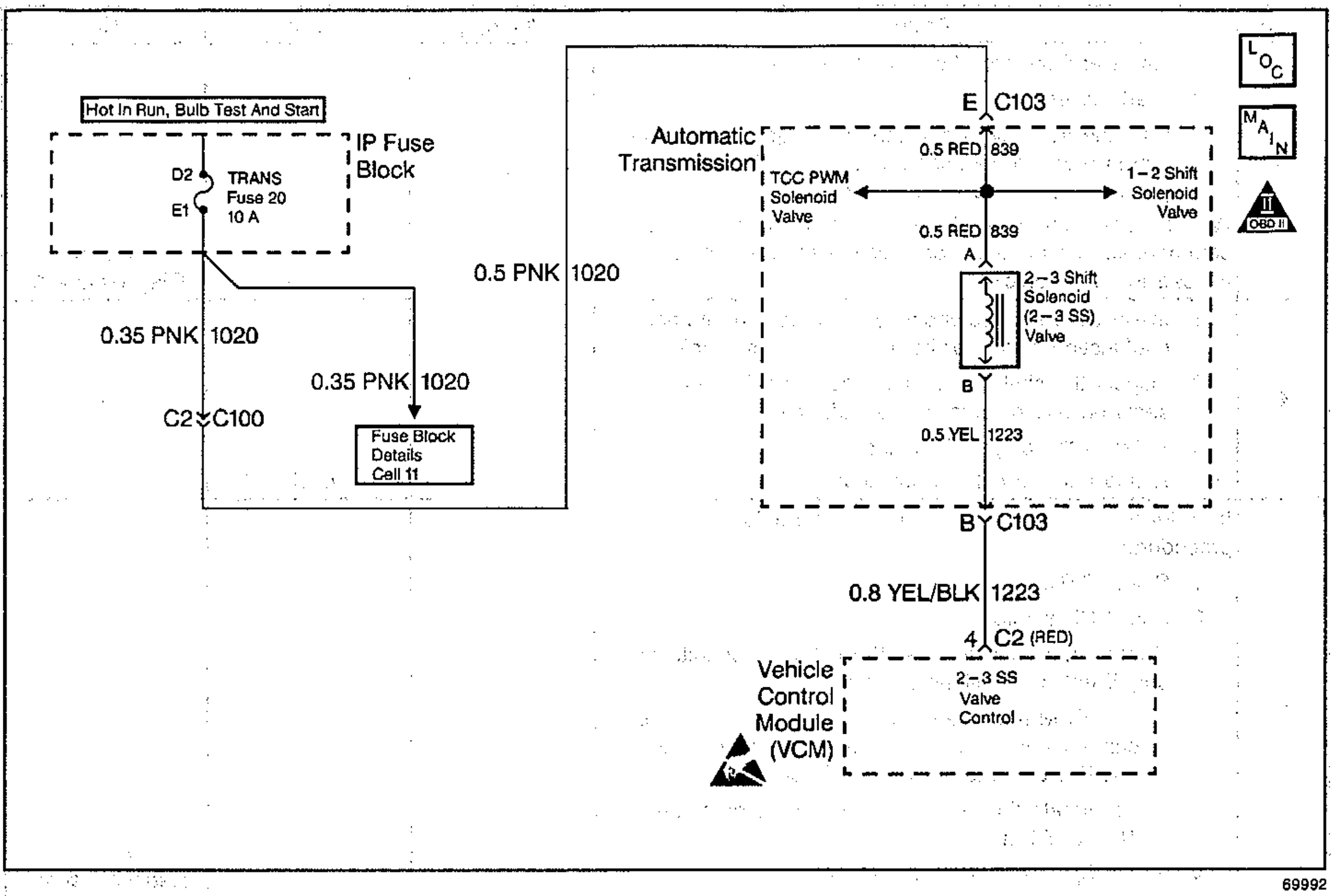
DTC P0756 2-3 Shift Solenoid Valve Performance (Diesel)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check*
2	1. Install the *scan tool*. 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Freeze Frame and Failure Records for reference. Using the Clear Info function erases the stored Freeze Frame and Failure Records from the PCM. 3. Record the DTC Freeze Frame and Failure Records, then clear the DTC. 4. Select TFP Sw. A/B/C on the scan tool. 5. With the engine running, apply the brake pedal and select each transmission range: D1, D2, D3, D4, N, R, and P. Does each selected transmission range match the scan tool TFP Switch A/B/C display? (Refer to the *Range Signal* table.)	—	*Go to Step 3*	Go to *DTC P1810 TFP Valve Position Sw CKT Malfunction (Diesel)*

DTC P0756 2-3 Shift Solenoid Valve Performance (Diesel) (cont'd)

Step	Action	Value(s)	Yes	No
3	1. Raise and support the drive axle assembly. 2. Start the engine. 3. With the transmission in the D4 range, use the scan tool in order to command 1st, 2nd, 3rd, and 4th gears while accelerating the vehicle. Was 1st gear commanded and not achieved, or 4th gear commanded and another gear occurred? (You may need to road test the vehicle).	—	*Go to Step 4*	Go to Diagnostic Aids
4	1. Inspect the shift solenoid/hydraulic for an internal malfunction at one or both of the shift solenoids. 2. Inspect the shift solenoid/hydraulic for damaged seals on one or both of the shift solenoids. 3. Refer to the diagnosis tables. Did you find and correct the condition?	—	*Go to Step 5*	—
5	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle under the following conditions only if traffic conditions permit: • The PCM must see the proper gear ratio for each commanded gear for greater than one second in D1, D2, D3, and D4 with TCC locked. • Accelerate the vehicle with the TP greater than 10% to 55 mph. 4. Select Specific DTC. Enter DTC P0756. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0758 2-3 Shift Solenoid Circuit Electrical (Gas)



Circuit Description

The 2-3 Shift Solenoid Valve (2-3 SS Valve) controls fluid acting on the 2-3 shift valve. The 2-3 SS Valve is a normally-open exhaust valve used with the 1-2 Shift Solenoid Valve (1-2 SS Valve) in order to allow four different shifting combinations. The 2-3 SS Valve attaches to the control valve body within the transmission. The ignition voltage goes directly to the 2-3 SS Valve. The Vehicle Control Module (VCM) controls the 2-3 SS Valve by providing the ground path through circuit 1223.

If the VCM detects a continuous open or short in the 2-3 SS Valve circuit or the 2-3 SS Valve, then DTC P0758 sets. DTC P0758 is a type D DTC. For California emissions vehicles, DTC P0758 is a type A DTC.

Conditions for Setting the DTC

- The system voltage is 10–16 volts.
- The engine is running more than 475 RPM for more than 7 seconds.
- The above conditions are met, and either of the following conditions occur for 4.3 out of 5 seconds:
  - The VCM commands the 2-3 SS Valve On, and the voltage input remains high (B+), or
  - The VCM commands the 2-3 SS Valve Off, and the voltage input remains low (0 volts).

Action Taken When the DTC Sets

- The VCM illuminates the Malfunction Indicator Lamp (MIL) for California emission vehicles.
- The VCM commands an immediate landing to second gear.
- The VCM commands maximum line pressure.
- The VCM freezes shift adapts form being updated.
- DTC P0758 is stored in VCM history.

Conditions for Clearing the DTC

- For California emissions vehicles, the VCM turns OFF the MIL after three consecutive trips without a failure reported.
- A scan tool can clear the DTC from the VCM history. The VCM clears the DTC from the VCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The VCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the VCM.

Diagnostic Aids

- Inspect the wiring at the VCM, the transmission connector and all other circuit connecting points for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation
  - Moisture intrusion
  - Corrosion
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- First diagnose and clear any engine DTCs or TP Sensor codes that are present. Then inspect for any transmission DTCs that may have reset.
- Refer to *Shift Solenoid Valve State and Gear Ratio* table.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

4. This step tests the function of the 2-3 SS Valve and the internal wiring harness.
5. This step tests the power to the 2-3 SS Valve from the ignition through the fuse.
7. This step tests the ability of the VCM and the wiring to control the ground circuit.
10. This step measures the resistance of the Automatic Transmission Wiring Harness Assembly (A/T Wiring Harness Assy.) and the 2-3 SS valve.

DTC P0758 2-3 Shift Solenoid Circuit Electrical (Gas)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check* (4.3L) or *Powertrain OBD System Check* (5.7L) or *Powertrain OBD System Check* (7.4L)
2	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Freeze Frame and Failure Records for reference. The Clear Info function erases the stored Freeze Frame and Failure Records from the VCM. 3. Record the DTC Freeze Frame and Failure Records. Were DTCs P0753 or P1860 also set?	—	*Go to Step 3*	*Go to Step 4*
3	1. Inspect the trans. fuse. 2. If you find an open fuse, inspect the following components for a short to ground. • Circuit 1020 • The 3 solenoids. • The Automatic Transmission Wiring Harness Assembly 3. Repair the circuit, the solenoid, or replace the harness if necessary. Refer to Wiring Repairs. Did you find and correct the condition?	—	*Go to Step 16*	*Go to Step 4*

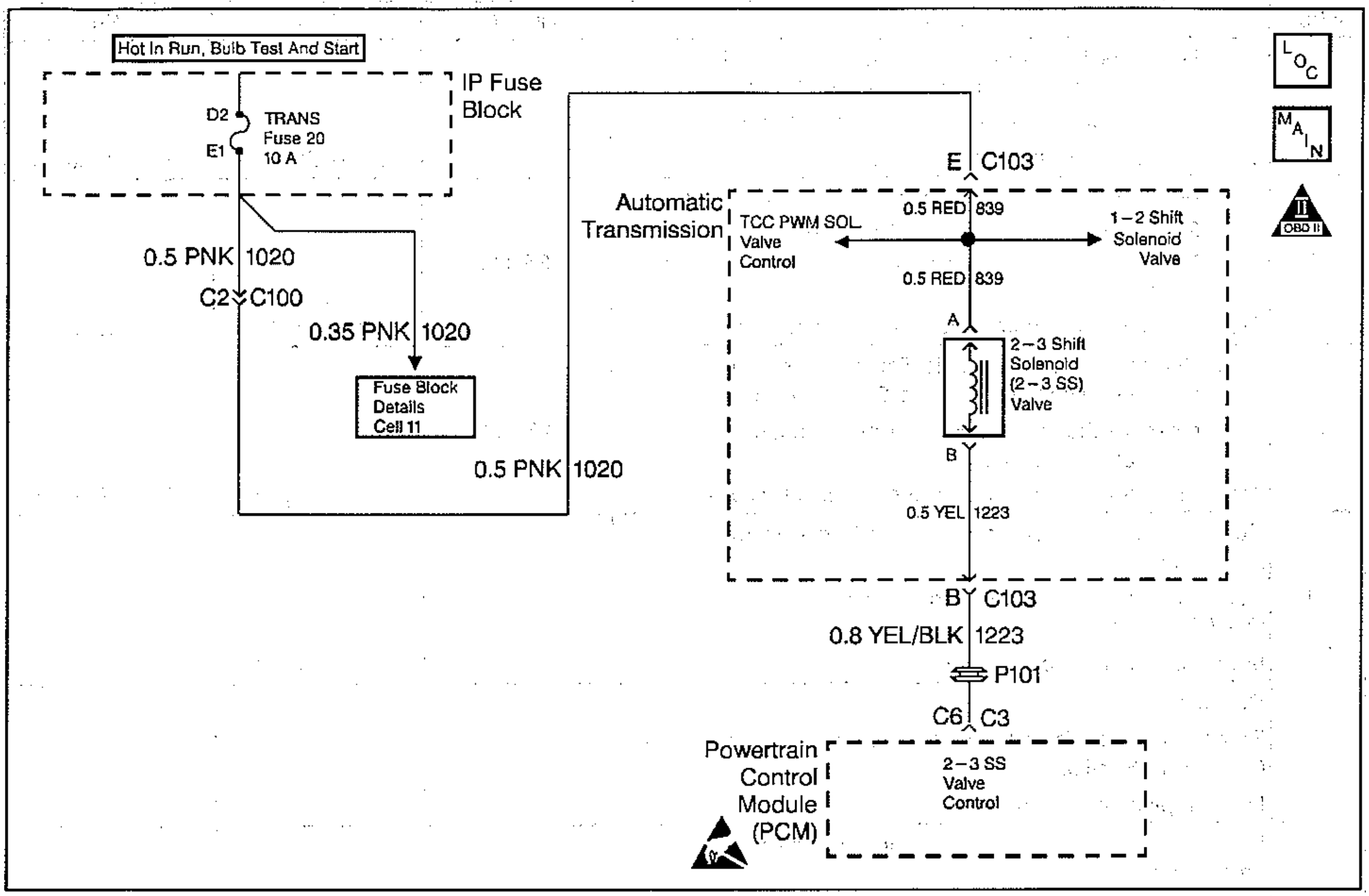
DTC P0758 2-3 Shift Solenoid Circuit Electrical (Gas) (cont'd)

Step	Action	Value(s)	Yes	No
4	Using the scan tool output control function, command the 2-3 SS Valve ON and OFF three times while listening to the bottom of the transmission pan (use a stethoscope if needed). Does the solenoid click when commanded?	—	Go to Diagnostic Aids	*Go to Step 5*
5	1. Turn the ignition OFF. 2. Disconnect the transmission 20-way connector (additional DTCs will set). 3. Install the *J 39775* Jumper Harness on the engine harness connector. 4. With the engine OFF, turn the ignition switch to the RUN position. 5. Connect a 12 volt test lamp from the Jumper Harness cavity E to ground. Is the test lamp on?	—	*Go to Step 7*	*Go to Step 6*
6	Repair the open or high resistance in ignition feed circuit 1020 to the 2-3 SS Valve. Refer to Wiring Repairs. Did you find and correct the condition?	—	*Go to Step 16*	—
7	1. Install the test lamp between cavities E and B of the *J 39775* Jumper Harness. 2. Using the transmission output control function, command the 2-3 SS Valve On and Off three times. Does the test lamp illuminate when you command the shift solenoid ON and turn off when you command the shift solenoid OFF?	—	*Go to Step 10*	*Go to Step 8*
8	Inspect circuit 1223 for an open or short to ground. Refer to General Electrical Diagnosis Procedures. Did you find the condition?	—	*Go to Step 16*	*Go to Step 9*
9	Replace the VCM. Refer to: • *VCM Replacement/Programming* (4.3L) • *VCM Replacement/Programming* (5.7L) • *VCM Replacement/Programming* (7.4L) Is the replacement complete?	—	*Go to Step 16*	—
10	1. Turn the ignition OFF. 2. Install *J 39775* Jumper Harness on the transmission 20-way connector (Automatic Transmission Connector End View). 3. With the *J 39200* DMM and the *J 35616-A* Connector Test Adapter Kit, measure the resistance between terminals B and E. Is the resistance within the specified values?	19–31Ω	*Go to Step 12*	*Go to Step 11*

DTC P0758 2-3 Shift Solenoid Circuit Electrical (Gas) (cont'd)

Step	Action	Value(s)	Yes	No
11	1. Disconnect the Automatic Transmission Wiring Harness Assembly from the 2-3 SS Valve. 2. Measure the resistance of the 2-3 SS Valve. Is the resistance within the specified values?	19–31Ω	*Go to Step 14*	*Go to Step 15*
12	1. Measure the resistance between terminal B and a good ground. Use the *J 39200* DMM. 2. Measure the resistance between terminal E and a good ground. Are both readings greater than the specified value?	250kΩ	Go to Diagnostic Aids	*Go to Step 13*
13	1. Disconnect the Automatic Transmission Wiring Harness Assembly from the 2-3 SS Valve. 2. Measure the resistance from the component's terminals to ground. Are both readings greater than the specified value?	250kΩ	*Go to Step 14*	*Go to Step 15*
14	Replace the Automatic Transmission Wiring Harness Assembly. Refer to Interior Wiring Harness Replacement, in On-Vehicle Service. Is the replacement complete?	—	*Go to Step 16*	—
15	Replace the 2-3 SS Valve. Refer to Control Valve Body Removal and Disassembly, in On-Vehicle Service. Is the replacement complete?	—	*Go to Step 16*	—
16	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Select the parameters, 2-3 Sol., 2-3 Sol. Open/Shorted to GRND, and 2-3 Sol. Shorted to Voltage. 4. Operate the vehicle under the following conditions: • The VCM commands the 2-3 SS Valve On, and the 2-3 Sol. Shorted to Voltage is No. • The VCM commands the 2-3 SS Valve OFF, and the 2-3 Sol. Open/Shorted to GRND is No. • All conditions met for 5 seconds. 5. Select Specific DTC. Enter DTC P0758. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P0758 2-3 Shift Solenoid Circuit Electrical (Diesel)



Circuit Description

The 2-3 Shift Solenoid Valve (2–3 SS Valve) controls the fluid flow acting on the 2-3 shift valve. The 2-3 SS Valve is a normally-open exhaust valve used with the 1-2 Shift Solenoid Valve (1-2 SS Valve) in order to allow four different shifting combinations. The 2-3 SS Valve attaches to the control valve body within the transmission. The ignition voltage goes directly to the 2-3 SS Valve. The Powertrain Control Module (PCM) controls the 2-3 SS Valve by providing the ground path through circuit 1223.

If the PCM detects a continuous open or short to ground in the 2-3 SS Valve circuit or the 2-3 SS Valve, then DTC P0758 sets. DTC P0758 is a type A DTC.

Conditions for Setting the DTC

- The engine is running greater than 475 RPM for greater than 7 seconds.
- The system voltage is 10–16.0 volts.
- The PCM detects either of the following fail conditions for 4.3 out of 5 seconds.
  - The PCM commands the solenoid ON and voltage input remains high (B+).
  - The PCM commands the solenoid OFF and voltage input remains low (0 volts).

Action Taken When the DTC Sets

- The PCM illuminates the Malfunction Indicator Lamp (MIL).
- The PCM commands an immediate landing to second gear.
- The PCM commands maximum line pressure.
- The PCM freezes shift adapts.
- DTC P0758 is stored in PCM history.

Conditions for Clearing the MIL/DTC

- The PCM turns OFF the MIL after three consecutive trips without a failure reported.
- A scan tool can clear the DTC from the PCM history. The PCM clears the DTC from the PCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The PCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the PCM.

Diagnostic Aids

- Inspect the wiring at the PCM, the transmission connector and all other circuit connecting points for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation
  - Moisture intrusion
  - Corrosion
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- An open ignition feed circuit can cause multiple DTCs to set.
- First diagnose and clear any engine DTCs that are present. Then inspect for any transmission DTCs that may have reset.
- Refer to *Shift Solenoid Valve State and Gear Ratio* table.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

4. This step tests the function of the 2-3 SS Valve and the Automatic Transmission Wiring Harness Assembly.
5. This step tests the power to the 2-3 SS Valve from the ignition through the fuse.
7. This step tests the ability of the PCM and the wiring to control the ground circuit.
10. This step measures the resistance of the Automatic Transmission Wiring Harness Assembly and the 2-3 SS Valve.

DTC P0758 2-3 Shift Solenoid Circuit Electrical (Diesel)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check*
2	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Freeze Frame and Failure Records for reference. Using the Clear Info function erases the stored Freeze Frame and Failure Records from the PCM. 3. Record the DTC Freeze Frame and Failure Records, then clear the DTC. Are DTCs P0753, or P1860 also set?	—	*Go to Step 3*	*Go to Step 4*
3	1. Inspect the Trans. fuse for an open. 2. If you found an open fuse, inspect circuit 1020, the three solenoids, and the Automatic Transmission Wiring Harness Assembly for a short to ground. Refer to General Electrical Diagnosis Procedures. Did you find and correct the condition?	—	*Go to Step 16*	*Go to Step 5*
4	Using the transmission output control function on the scan tool command the 2-3 SS Valve ON and OFF three times while listening to the bottom of the transmission pan (use a stethoscope if needed). Does the solenoid click when commanded?	—	Go to Diagnostic Aids	*Go to Step 5*

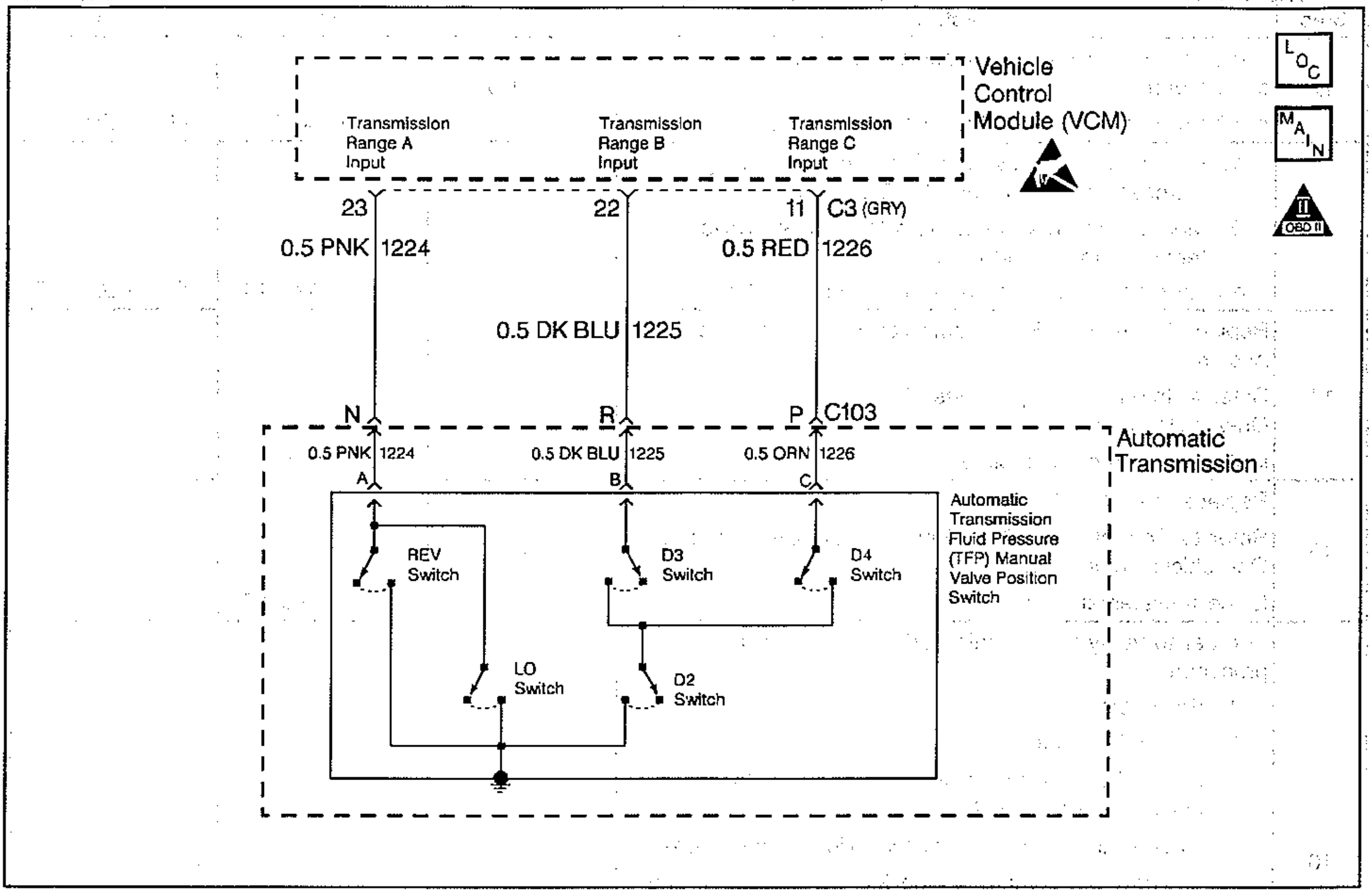
DTC P0758 2-3 Shift Solenoid Circuit Electrical (Diesel) (cont'd)

Step	Action	Value(s)	Yes	No
5	1. Turn the ignition OFF. 2. Disconnect the transmission 20-way connector (additional DTCs will set). 3. Install the *J 39775* Jumper Harness on the engine side of the 20-way connector. 4. With the engine OFF, turn the ignition switch to the RUN position. 5. Connect a test lamp from *J 39775* Jumper Harness cavity E to a good ground. Is the test lamp on?	—	*Go to Step 7*	*Go to Step 6*
6	Repair the open or high resistance in ignition feed circuit 1020 to the 2-3 SS Valve. Refer to Wiring Repairs. Did you find and correct an open or high resistance condition?	—	*Go to Step 16*	—
7	1. Install a test lamp between cavity E and cavity B of the *J 39775* Jumper Harness. 2. Using the transmission output control function on the scan tool, command the 2-3 SS Valve On and Off three times. Does the test lamp illuminate when the shift solenoid is commanded ON and turn off when the shift solenoid is commanded OFF?	—	*Go to Step 10*	*Go to Step 8*
8	Inspect circuit 1223 for an open or short to ground. Refer to General Electrical Diagnosis Procedures. Did you find an open or short to ground condition?	—	*Go to Step 16*	*Go to Step 9*
9	Replace the PCM. Refer to *PCM Replacement/Programming.* Is the replacement complete?	—	*Go to Step 16*	—
10	1. Turn the ignition OFF. 2. Install the *J 39775* Jumper Harness on the transmission 20-way connector. 3. With the *J 39200* DMM and the *J 35616-A* Connector Test Adapter Kit, measure the resistance between terminals B and E. Is the resistance within the specified value?	19–31Ω	*Go to Step 12*	*Go to Step 11*
11	1. Disconnect the Automatic Transmission Wiring Harness Assembly from the 2-3 SS Valve. 2. Measure the resistance of the 2-3 SS Valve. Is the resistance within the specified values?	19–31Ω	*Go to Step 14*	*Go to Step 15*

DTC P0758 2-3 Shift Solenoid Circuit Electrical (Diesel) (cont'd)

Step	Action	Value(s)	Yes	No
12	Measure the resistance between terminals B and E to a good ground. Are both reading greater than the specified value?	250kΩ	Go to Diagnostic Aids	*Go to Step 13*
13	1. Disconnect the Automatic Transmission Wiring Harness Assembly from the 2-3 SS Valve. 2. Measure the resistance from the 2-3 SS Valve terminals to a good ground. Are both readings greater than the specified value?	250kΩ	*Go to Step 14*	*Go to Step 15*
14	Replace the Automatic Transmission Wiring Harness Assembly. Refer to Interior Wiring Harness Replacement, in On-vehicle Service. Is the replacement complete?	—	*Go to Step 16*	—
15	Replace the 2-3 SS Valve. Refer to Control Valve Body Removal and Disassembly, in On-Vehicle Service. Is the replacement complete?	—	*Go to Step 16*	—
16	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Select the parameters, 2-3 Sol. and 2-3 Sol. Open/Shorted to GRND. 4. Operate the vehicle under the following conditions: • The PCM commands the 2-3 SS Valve ON, and the 2-3 Sol. Open/Shorted to Voltage is No. • The PCM commands the 2-3 SS Valve OFF, and the 2-3 Sol. Open/Shorted to GRND is No. • All conditions are met for 5 seconds. 5. Select Specific DTC. Enter DTC P0758. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P1810 TFP Valve Position Sw CKT Malfunction (Gas)



Circuit Description

The Automatic Transmission Fluid Pressure Manual Valve Position Switch (TFP Val. Position Sw.) consists of five normally-open pressure switches. The Vehicle Control Module (VCM) supplies battery voltage to each range signal. By grounding one or more of these circuits through various combinations of the pressure switches, the VCM detects what manual valve position has been selected and compares the actual voltage combination of the switches to a TFP Val. Position Sw. combination table stored in memory.

The TFP Val. Position Sw. assembly cannot distinguish between Park and Neutral because the monitored valve body pressures are identical in both cases. With the ignition On and the engine Off, D2 is indicated. When the transmission 20-way connector is disconnected, the ground potential for the three range signals to the VCM is removed, and with the ignition On, D2 is indicated.

If the VCM detects an invalid state of the TFP Val. Position Sw. circuit by deciphering the TFP Val. Position Sw. inputs, then DTC P1810 sets. DTC P1810 is a type D DTC. For California emissions vehicles DTC P1810 is a type B DTC.

Conditions for Setting the DTC

DTC P1810 sets if any of the following conditions occur:

Condition 1

- The system voltage is 10–16 volts.
- The engine is more than 475 RPM for at least 7 seconds.
- The VCM detects an illegal TFP Val. Position Sw. combination for greater than 60 seconds.

Condition 2

- The system voltage is 10–16 volts.
- No OSS DTC P0502 or P0503.
- The engine speed is less than 50 RPM for 0.3 seconds, 50–550 RPM for greater than 0.02 seconds and then greater than 550 RPM and the vehicle speed is less than 4 km/h (2.5 mph).
- The VCM detects the gear range as D2 before and after start up.
- The condition exists for greater than 7 seconds. The VCM looks for a condition change only at start-up.

Condition 3

- No MAP DTCs P0106, P0107 or P0108.
- No TP Sensor DTCs P0121, P0122, or P0123.
- No OSS DTCs P0502 or P0503.
- No A/T ISS Sensor DTCs P0716 or P0717.
- No 1-2 SS Valve DTCs P0751 or P0753.
- No 2-3 SS Valve DTCs P0756 or P0758.
- The vehicle speed is greater than 8 km/h (5 mph).
- The TP Sensor is:
  - 108–405 N.m (80–300 lb ft) 4.3L.
  - 108–540 N.m (80–400 lb ft) 5.7L.
  - 108–675 N.m (80–500 lb ft) 7.4L.
- The engine torque is greater than 100 N.m (80 lb ft).
- The engine is running more than 475 RPM for more than 7 seconds.
- The TFP Val. Position Sw. indicates the following:
  - P/N when the ratio indicates less than 1.05:1 for greater than 15 seconds (4.3L, 20 seconds).
  - Reverse when the ratio indicates D4, D3, D2, and D1 for greater than 5 seconds.
  - D4, D3, D2, and D1 when the ratio indicates reverse for greater than 7 seconds.

Action Taken When the DTC Sets

- The VCM illuminates the Malfunction Indicator Lamp for California Emission Vehicles.
- The VCM commands maximum line pressure.
- The VCM assumes D4 for the PRNDL shift pattern.
- The VCM freezes shift adapts.
- The VCM commands the TCC on, in commanded fourth gear.
- DTC P1810 is stored in VCM history.

Conditions for Clearing the DTC

- For California emissions vehicles, the VCM turns OFF the MIL after three consecutive trips without a failure reported.
- A scan tool can clear the DTC from the VCM history. The VCM clears the DTC from the VCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The VCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the VCM.

Diagnostic Aids

- Refer to the accompanying table for the normal range signals and the illegal combinations.
- Inspect the wiring at the VCM, the transmission connector and all other circuit connecting points for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation
  - Moisture intrusion
  - Corrosion
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- DTC P1810 can be falsely set during a fluid fill procedure. After refilling the fluid, cycle key down then start and run the vehicle for 20 seconds. Key down and allow the VCM to power down, and then restart the vehicle.
- DTC P1810 can be set falsely by low pump pressure or a stuck pressure regulator.
- DTC P1810 can be set by a rolled forward clutch piston seal. It may allow the VCM to see a 2.08:1 ratio (reverse) when the manual valve position is indicated as D4.
- First diagnose and clear any engine DTCs or TP Sensor codes that are present. Then inspect for any transmission DTCs that may have reset.
- Refer to the *Range Signal* table.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

3. This step tests the indicated range signal to the manual valve that is actually selected.
4. This step tests the voltage from the VCM to the transmission 20-way connector.

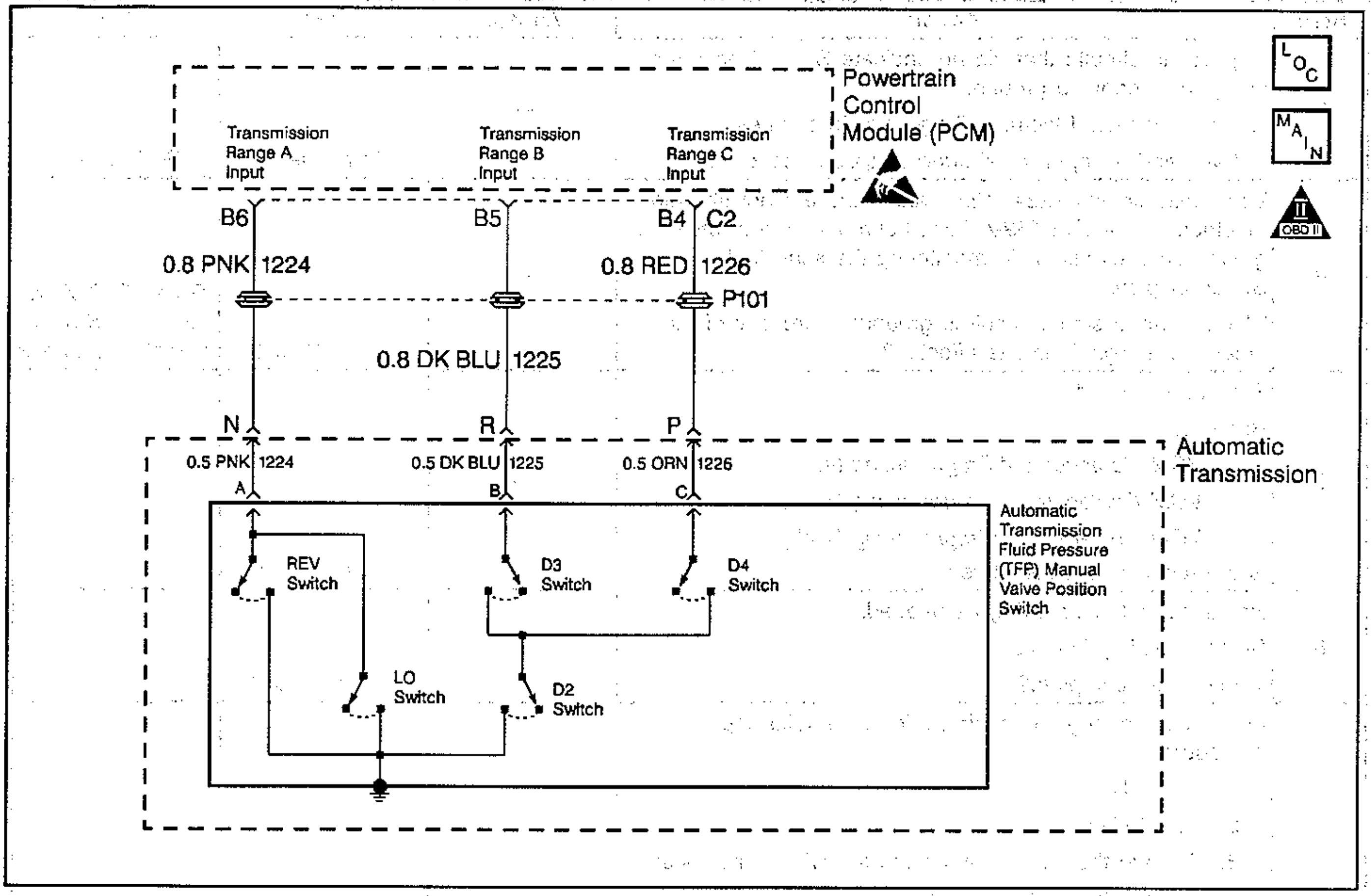
DTC P1810 TFP Valve Position Sw CKT Malfunction (Gas)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check* (4.3L) or *Powertrain OBD System Check* (5.7L) or *Powertrain OBD System Check* (7.4L)
2	1. Inspect for proper adjustment of the transmission linkage from the select lever to the manual valve. 2. Inspect the transmission fluid. Did you perform the inspections?	—	*Go to Step 3*	Go to *Transmission Fluid Checking Procedure*
3	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Freeze Frame and Failure Records for reference. The Clear Info function erases the stored Freeze Frame and Failure Records from the VCM. 3. Record the DTC Freeze Frame and Failure Records. 4. While the engine idles at normal operating temperature, apply the parking brake. 5. Select each transmission range: D1, D2, D3, D4, N, R, and P. Does each selected transmission range match the scan tool TFP Switch A/B/C display? (Refer to the *Range Signal* table.)	—	Go to Diagnostic Aids	*Go to Step 4*
4	1. Turn the ignition OFF. 2. Disconnect the transmission 20-way connector (additional DTCs may set). 3. Install the *J 39775* Jumper Harness on the engine side of the transmission 20-way connector. 4. With the engine OFF, turn the ignition to the RUN position. 5. Using the *J 39200* DMM and the *J 35616-A* Connector Test Adapter Kit check the voltage at the harness connector terminals N, R, and P. Is B+ displayed on all three circuits?	—	*Go to Step 6*	*Go to Step 5*

DTC P1810 TFP Valve Position Sw CKT Malfunction (Gas) (cont'd)

Step	Action	Value(s)	Yes	No
5	Inspect the circuits that did not indicate B+ in Step 4 for an open or short to ground. Refer to General Electrical Diagnosis Procedures. Did you find an open or shorted to ground condition?	—	*Go to Step 9*	*Go to Step 7*
6	Verify that circuits 1224, 1225, and 1226 are not shorted together. Use a *J 36169-A* Fused Jumper Wire in order to ground each circuit while monitoring the scan tool TFP Switch display. When a range signal circuit is grounded, are any of the other range signal circuits affected?	—	*Go to Step 8*	Go to *TFP Valve Position Switch Resistance Check*
7	Replace the VCM. Refer to: • *VCM Replacement/Programming* (4.3L) • *VCM Replacement/Programming* (5.7L) • *VCM Replacement/Programming* (7.4L) Is the replacement complete?	—	*Go to Step 9*	—
8	Repair the affected wiring as needed. Refer to Wiring Repairs. Is the repair complete?	—	*Go to Step 9*	—
9	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle under the following conditions: • Turn the ignition switch to the RUN position for at least 2 seconds. • Start the vehicle. • Idle the vehicle in Park above 600 RPM for 7 seconds. • Drive the vehicle in D4 with the throttle at least 10% and the TCC locked for 60 seconds. 4. Select Specific DTC. Enter DTC P1810. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P1810 TFP Valve Position Sw CKT Malfunction (Diesel)



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Circuit Description

The Automatic Transmission Fluid Pressure Manual Valve Position Switch (TFP Val. Position Sw.) consists of five normally-open pressure switches. The Powertrain Control Module (PCM) supplies battery voltage to each range signal. By grounding one or more of these circuits through various combinations of the pressure switches, the PCM detects what manual valve position has been selected and compares the actual voltage combination of the switches to a TFP Val. Position Sw. combination chart stored in memory.

The TFP Val. Position Sw. cannot distinguish between Park and Neutral because the monitored valve body pressures are identical in both cases. With the ignition On and the engine Off, D2 is indicated. When the transmission 20-way connector is disconnected, the ground potential for the three range signals to the PCM is removed, and with the ignition On, D2 is indicated.

If the PCM detects an invalid state of the TFP Val. Position Sw. circuit by deciphering the TFP Val. Position Sw. inputs, then DTC P1810 sets. DTC P1810 is a type B DTC.

Conditions for Setting the DTC

DTC P1810 sets if either of the following conditions occur:

Condition 1

- System voltage is 9.0–16.0 volts.
- The engine is running greater than 475 RPM for greater than 7 seconds.
- The PCM detects an illegal TFP Val. Position Sw. combination for greater than 25 seconds.

Condition 2

- The system voltage is 9.0–16.0 volts.
- No OSS Sensor DTCs P0722 or P0723.
- The engine speed is less than 50 RPM for 1.5 seconds, 50–525 RPM for greater than 0.1 seconds and then the engine speed is greater than 575 RPM and the vehicle speed is less than 4 km/h (2.5 mph).
- Vehicle speed is less than 4 Km/h (2.5 mph).
- The PCM detects the gear range as D2 before and after start up.
- The condition exists for greater than 7.5 seconds. The PCM looks for a condition change only at start-up.

Condition 3

- No MAP DTCs P0106, P0107 or P0108.
- No A/T ISS Sensor DTCs P0716 or P0717.
- No OSS DTCs P0722 or P0723.
- No 1-2 SS Valve DTCs P0751 or P0753.
- No 2-3 SS Valve DTCs P0756 or P0758.
- The engine speed is less than 3750 RPM.
- System voltage is 9.0–16.0 volts.
- The vehicle speed is greater than 8 km/h (5 mph).
- The APP Angle is greater than 12%.
- The engine torque is 100–644 N.m (80–475 lb ft).
- The engine is running for more than 7 seconds.
- The TFP Val. Position Sw. indicates the following:
  - P/N when the ratio indicates less than 1.05:1 for greater than 15 seconds.
  - Reverse, when the ratio is not 2.04–2.12 for greater than 15 seconds.
  - D4, D3, D2, or D1 when the ratio indicates reverse (2.04–2.12) for greater than 5 seconds.

Action Taken When the DTC Sets

- The PCM illuminates the Malfunction Indicator Lamp (MIL).
- The PCM commands maximum line pressure.
- The PCM assumes D4 for the PRNDL shift pattern.
- The PCM freezes shift adapts.
- DTC P1810 is stored in PCM history.

Conditions for Clearing the MIL/DTC

- The PCM turns OFF the MIL after three consecutive trips without a failure reported.
- A scan tool can clear the DTC from the PCM history. The PCM clears the DTC from the PCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The PCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the PCM.

Diagnostic Aids

- Refer to the accompanying chart for the normal range signals and the illegal combinations.
- Inspect the wiring at the PCM, the transmission connector and all other circuit connecting points for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation
  - Moisture intrusion
  - Corrosion
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- DTC P1810 can be falsely set during a fluid fill procedure. After refilling the fluid, cycle key down then start and run the vehicle for 20 seconds. Key down and allow the PCM to power down, and then restart the vehicle.
- DTC P1810 can be set falsely by low pump pressure or a stuck pressure regulator.
- DTC P1810 can be set by a rolled forward clutch piston seal. It may allow the PCM to see a 2.08:1 ratio (reverse) when the manual valve position is indicated as D4.
- First diagnose and clear any engine DTCs that are present. Then inspect for any transmission DTCs that may have reset.
- Refer to the *Range Signal* table.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

3. This step tests the indicated range signal to the manual valve that is actually selected.
4. This step tests the voltage from the PCM to the transmission 20-way connector.

DTC P1810 TFP Valve Position Sw CKT Malfunction (Diesel)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check*
2	1. Inspect for proper adjustment of the transmission linkage from the select lever to the manual valve. 2. Inspect the fluid. Did you perform the inspections?	—	*Go to Step 3*	Go to *Transmission Fluid Checking Procedure*
3	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Freeze Frame and Failure Records for reference. Using the Clear Info function erases the stored Freeze Frame and Failure Records from the PCM. 3. Record the DTC Freeze Frame and Failure Records, then clear the DTC. 4. While the engine idles at normal operating temperature, apply the parking brake. 5. Select each transmission range: D1, D2, D3, D4, N, R, and P. Does each selected transmission range match the scan tool TFP Switch A/B/C display? (Refer to the *Range Signal* table.)	—	Go to Diagnostic Aids	*Go to Step 4*
4	1. Turn the ignition OFF. 2. Disconnect the transmission 20-way connector (additional DTCs may set). 3. Install the *J 39775* Jumper Harness on the engine side of the transmission 20-way connector. 4. With the engine OFF, turn the ignition to the RUN position. 5. Using the *J 39200* DMM and the *J 35616-A* Connector Test Adapter Kit, check the voltage at the harness connector terminals N, R, and P. Do all three circuits display B+?	—	*Go to Step 6*	*Go to Step 5*
5	Inspect the circuits that did not indicate B+ in Step 4 for an open or short to ground condition. Refer to General Electrical Diagnosis Procedures. Did you find the condition?	—	*Go to Step 8*	*Go to Step 7*

DTC P1810 TFP Valve Position Sw CKT Malfunction (Diesel) (cont'd)

Step	Action	Value(s)	Yes	No
6	To verify that circuits 1224, 1225, and 1226 are not shorted together, use a fused jumper to ground on each circuit while monitoring the scan tool TFP Switch display. When a range signal circuit is grounded, are any of the other range signal circuits affected?	—	*Go to Step 8*	Refer to *TFP Valve Position Switch Resistance Check*
7	Replace the PCM. Refer to *PCM Replacement/Programming.* Is the replacement complete?	—	*Go to Step 9*	—
8	Repair the affected wiring as needed. Refer to Wiring Repairs. Is the repair complete?	—	*Go to Step 9*	—
9	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle under the following conditions: • Turn the ignition switch to the RUN position for at least 2 seconds. • Start the vehicle. • Idle the vehicle in Park above 600 RPM for 8.5 seconds. • Drive the vehicle in D4 with throttle more than 12% and obtain TCC lock up. 4. Select Specific DTC. Enter DTC P1810. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P1811 Maximum Adapt and Long Shift (Diesel Only)

Range	Gear	1-2 Sol	2-3 Sol	Fourth Clutch	Overrun Clutch	O/D Roller Clutch	FWD Clutch	Direct Clutch	Front Band	Interm. Sprag Clutch	Interm Clutch	Lo Roller Clutch	Rear Band
Overdrive	1st	On	Off	—	—	H	A	—	—	*	—	H	—
	2nd	Off	Off	—	—	H	A	—	—	H	A	O	—
	3rd	Off	On	—	—	H	A	A	—	O	A	O	—
	4th	On	On	A	—	O	A	A	—	O	A	O	—

A = Applied
H = Holding
* = Holding but not effective
O = Overrunning

Circuit Description

The Powertrain Control Module (PCM) compares the measured gear ratio to the known actual value. This allows the PCM to determine the actual gear range of the transmission. When an upshift is commanded, the PCM measures the interval during which the gear ratio leaves the current range and changes to reflect the commanded upshift. This interval is expressed on the scan tool as Shift Time. When this interval has exceeded a predetermined limit, the PCM utilizes the shift adapts in order to attempt to shorten the shift time.

If the PCM detects that the maximum allowable shift time has been exceeded, and that the upshift adapts have reached their upper limit, then DTC P1811 sets. DTC P1811 is a type D DTC.

Conditions for Setting the DTC

- The engine must be running at greater than 475 RPM for more than 7 seconds.
- One of the following conditions exists, with the adapt cells at the maximum pressure allowed for 5 consecutive occurrences of one shift.
  - The 1-2 or the 2-3 upshifts are greater than 1.25 seconds.
  - The 3-4 upshifts are greater than 6.37 seconds.

Action Taken When the DTC Sets

- The PCM does not illuminate the Malfunction Indicator Lamp (MIL).
- The PCM freezes shift adapts.
- The PCM commands maximum line pressure.
- DTC P1811 is stored in PCM history.

Conditions for Clearing the DTC

- A scan tool can clear the DTC from the PCM history. The PCM clears the DTC from the PCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The PCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the PCM.

Diagnostic Aids

- DTC P1811 can be caused by a faulty turbocharger or wastegate assembly. If no other symptoms are present, check the turbocharger system for proper operation.
- Ask the customer about overloading the vehicle, exceeding the trailer-towing limit, or towing in Overdrive.
- If, after several unsuccessful attempts to gain accurate shift times, and an adapt can be made, reset adapts and operate the vehicle, in order to assure proper shifting.
- While driving the vehicle, inspect for loss of power, misfire, or other engine-related driving problems.

Test Description

2. This step tests for low fluid level, which can cause delayed shifts.
3. This step compares the indicated range signal from the *Range Signal* table to the Automatic Transmission Fluid Pressure Manual Valve Position Switch (TFP Val. Position Sw.) selected gear range.
5. This step tests for low line pressure, which can cause delayed and long shifts.

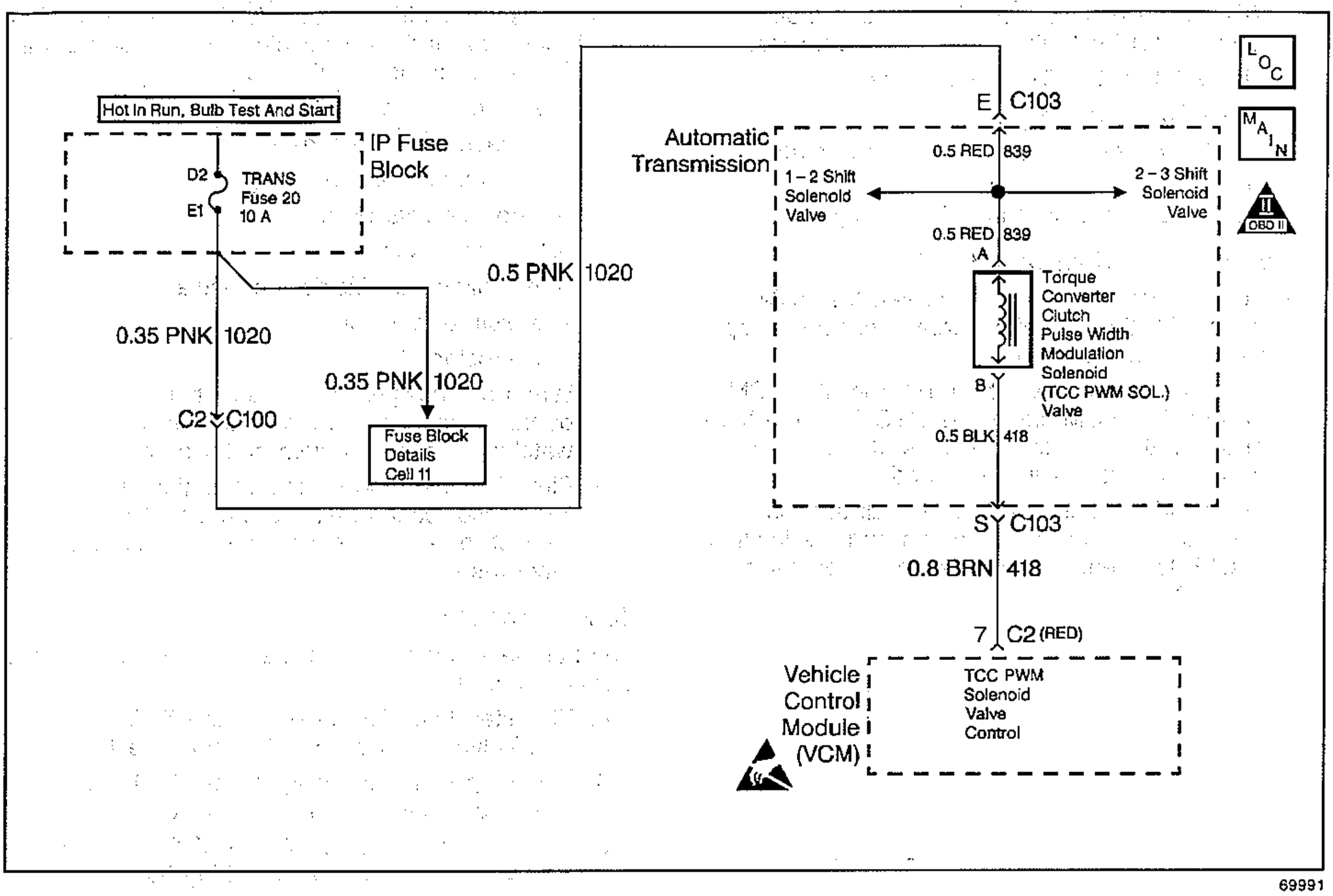
DTC P1811 Maximum Adapt and Long Shift (Diesel Only)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check*
2	Perform the Transmission Fluid Checking Procedure. Refer to *Transmission Fluid Checking Procedure.* Have you performed the transmission fluid checking procedure?	—	*Go to Step 3*	Go to *Transmission Fluid Checking Procedure*
3	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Freeze Frame and Failure Records for reference. Using the Clear Info function erases the stored Failure Records from the PCM. 3. Record the DTC Freeze Frame, then clear the DTC. **Important:** If any other engine or transmission DTCs are set, refer to their respective diagnostic tables first. 4. Select TFP Sw. A/B/C on the scan tool. 5. Start the engine and apply the brake pedal. 6. Select each gear range: D1, D2, D3, D4, N, R, and P. Does each selected transmission range match the TFP Sw. A/B/C display on the scan tool? (Refer to the *Range Signal* table.)	—	*Go to Step 4*	Go to *DTC P1810 TFP Valve Position Sw CKT Malfunction (Diesel)*
4	1. Drive the vehicle in D4 in order to obtain a 1-2, a 2-3, and a 3-4 shift time. Use the scan tool snapshot mode in order to record the shift times. 2. Using the scan tool, review the shift time information for 1-2, 2-3, and 3-4 shift times. Were all of the shift times greater than the specified value?	1-2 or 2-3 upshifts: 1.25 seconds 3-4 upshifts: 6.37 seconds.	*Go to Step 5*	*Go to Step 8*
5	Perform the line pressure test. Refer to *Line Pressure Check Procedure.* Is the line pressure within specifications?	—	*Go to Step 6*	Go to Symptom Diagnosis table, *Low Line Pressure*
6	1. Remove the transmission oil pan. Refer to Changing the Fluid and Filter, in On-Vehicle Service. 2. Inspect the pan and the fluid for contamination. Is there excessive contamination in the transmission oil pan?	—	Go to Transmission Overhaul Procedure, in Unit Repair.	*Go to Step 7*

DTC P1811 Maximum Adapt and Long Shift (Diesel Only) (cont'd)

Step	Action	Value(s)	Yes	No
7	Inspect the transmission for fluid pressure loss in one of the following areas: • Valve Body Gasket • Forward Clutch Seals • Turbine Shaft Seals Refer to Transmission Overhaul Procedure, in Unit Repair. Did you find and correct the condition?	—	*Go to Step 15*	—
8	Select the 1-2, 2-3, and the 3-4 Transmission Adaptive Pressure (TAP) cells on the scan tool. Were any of the upshift TAP cells greater than the specified value?	16.0 psi	*Go to Step 9*	Go to Diagnostic Aids
9	Did the 3-4 shift time exceed the specified value?	6.37 seconds	*Go to Step 12*	*Go to Step 10*
10	Did the 2-3 shift time exceed the specified value?	1.25 seconds	*Go to Step 13*	*Go to Step 11*
11	Did the 1-2 shift time exceed the specified value?	1.25 seconds	*Go to Step 14*	—
12	Inspect the following 3-4 shift circuit components: • 4th Gear Clutch Plates • 4th Gear Clutch Seals • A sticking 3-4 Shift Valve. Refer to Transmission Overhaul Procedure, in Unit Repair. Did you find and correct the condition?	—	*Go to Step 15*	—
13	Inspect the following 2-3 shift circuit components: • Turbine Shaft Seals • Forward Clutch Plates • Forward Clutch Seals • Direct Clutch Plates • Direct Clutch Seals • Center Support Seals • Improperly tightened Center Support Bolt Refer to Transmission Overhaul Procedure, in Unit Repair. Did you find and correct the condition?	—	*Go to Step 15*	—
14	Inspect the following 1-2 shift circuit components: • Low Roller Clutch • Intermediate Clutch Plates • Intermediate Clutch Seals • Intermediate Sprag Clutch • Overdrive Roller Clutch • Improperly tightened Center Support Bolt Refer to Transmission Overhaul Procedure, in Unit Repair. Did you find and correct the condition?	—	*Go to Step 15*	—
15	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Drive the vehicle in D4 range. 4. Operate the vehicle through several 1,2,3,4 usphifts. 5. Review the scan tool 1-2, 2-3 and 3-4 shift times. Are the 1-2, 2-3, or 3-4 shift times less than the specified value?	1-2 and 2-3 upshifts 1.25 seconds 3-4 upshifts 6.37 seconds	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P1860 TCC PWM Solenoid Circuit Electrical (Gas)



Circuit Description

The Torque Converter Clutch Width Modulation Solenoid Valve (TCC PWM Solenoid Valve) controls fluid acting on the converter clutch valve, which then controls TCC apply and release. The TCC PWM Sol. Valve attaches to the control valve body within the transmission. Ignition voltage goes directly to the TCC PWM Sol. Valve. The Vehicle Control Modulator (VCM) controls the TCC PWM Sol. Valve by providing a ground path on circuit 418. The current flows through the TCC PWM Sol. Valve coil according to the duty cycle (percentage of ON time). The TCC PWM Sol. Valve provides a smooth engagement of the torque converter clutch by operating on a duty cycle percent of ON time.

If the VCM detects a continuous open or short in the TCC PWM Sol. Valve circuit or the TCC PWM Sol. Valve, then DTC P1860 sets. DTC P1860 is a type D DTC. For California emission vehicles DTC P1860 is a type A DTC.

Conditions for Setting the DTC

- The system voltage is 10–16.0 volts.
- The engine is running greater than 475 RPM.
- No shift solenoid DTCs P0751, P0753, P0756, or P0758.
- Command gear is first gear.
- All of the above conditions are met and either of the following conditions occur for 4.3 out of 5 seconds:
  - The VCM commands the TCC PWM Sol. Valve to OFF (0%) and the voltage input remains low (zero volts), or
  - The VCM commands the TCC PWM Sol. Valve to ON (100%) and the voltage input remains high (B+).

Action Taken When the DTC Sets

- The VCM illuminates the Malfunction Indicator Lamp (MIL) for California emission vehicles.
- The VCM inhibits TCC engagement.
- The VCM inhibits 4th gear.
- The VCM freezes shift adapts from being updated.
- DTC P1860 is stored in VCM history.

Conditions for Clearing the DTC

- For California emissions vehicles, the VCM turns OFF the MIL after three consecutive trips without a failure reported.
- A scan tool can clear the DTC from the VCM history. The VCM clears the DTC from the VCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The VCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the VCM.

Diagnostic Aids

- Inspect the wiring at the VCM, the transmission connector and all other circuit connecting points for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation
  - Moisture intrusion
  - Corrosion
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- First diagnose and clear any engine DTCs or TP Sensor codes that are present. Then inspect for any transmission DTCs that may have reset.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

4. This step tests for voltage to the TCC PWM Sol. Valve circuit at the 20-way connector.
6. This step tests the ability of the VCM and wiring to control the ground circuit.
8. This step tests the resistance of the TCC PWM Sol. Valve and the internal wiring harness.

DTC P1860 TCC PWM Solenoid Circuit Electrical (Gas)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check* (4.3L) or *Powertrain OBD System Check* (5.7L) or *Powertrain OBD System Check* (7.4L)
2	1. Install the *scan tool*. 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Freeze Frame and Failure Records for reference. The Clear Info function erases the stored Freeze Frame and Failure Records from the VCM. 3. Record the DTC Freeze Frame and Failure Records, then clear the DTCs. 4. If DTCs P0753 or P0758 are also set, inspect the trans. fuse. Is the fuse open?	—	*Go to Step 3*	*Go to Step 4*

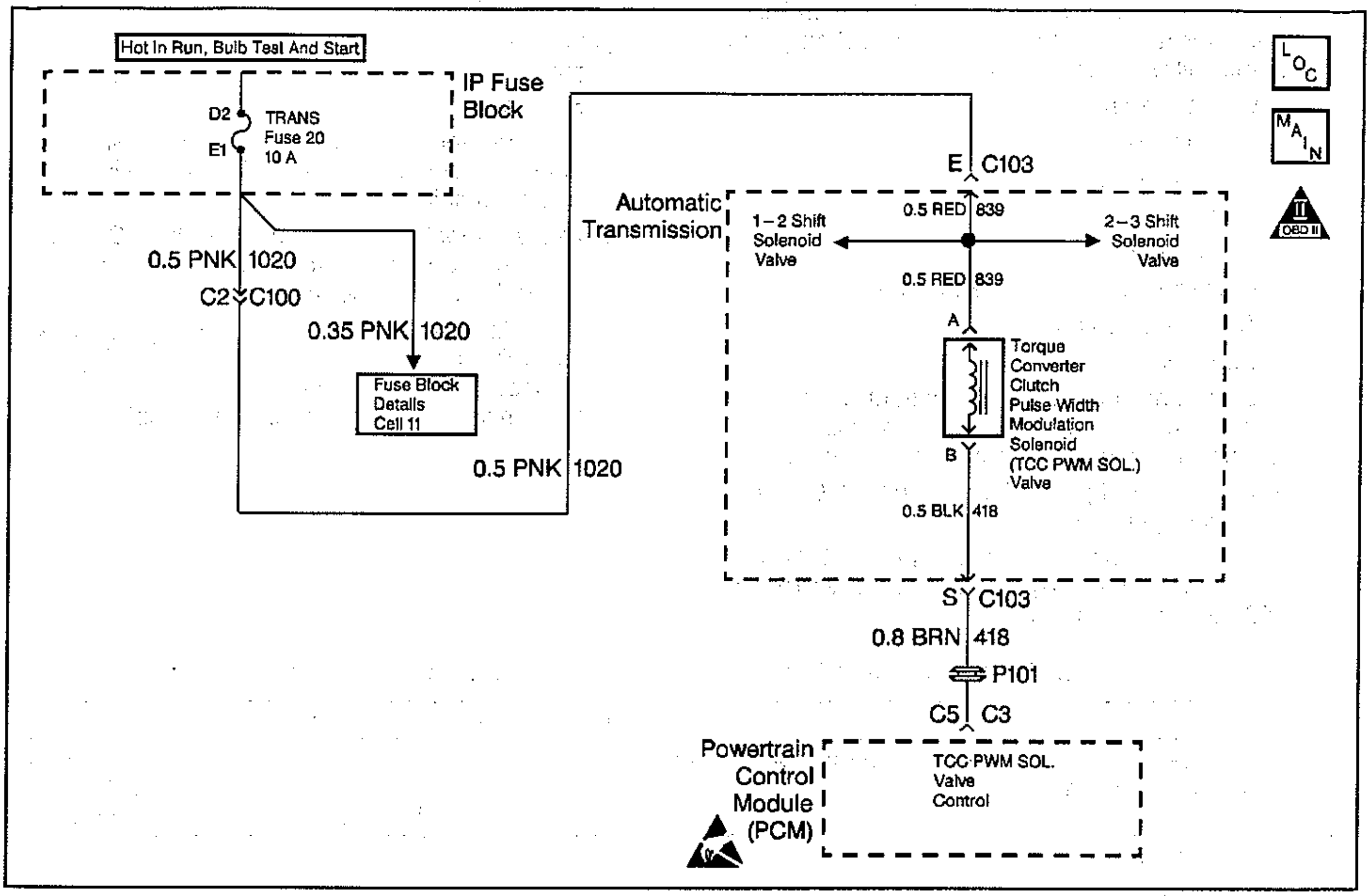
DTC P1860 TCC PWM Solenoid Circuit Electrical (Gas) (cont'd)

Step	Action	Value(s)	Yes	No
3	Inspect the following components for a short to ground: • Circuit 1020 • The 3 Solenoids • The Automatic Transmission Wiring Harness Assembly Refer to General Electrical Diagnosis Procedures. Did you find and correct the condition?	—	*Go to Step 17*	Go to Diagnostic Aids
4	1. Turn the ignition OFF. 2. Disconnect the transmission 20-way connector (additional DTCs may set). 3. Install the *J 39775* Jumper Harness on the engine harness connector. 4. With the engine off, turn the ignition to the RUN position. 5. Connect a test lamp from the Jumper Harness cavity E to ground. Is the test lamp ON?	—	*Go to Step 6*	*Go to Step 5*
5	Repair the open or high resistance in ignition voltage feed circuit 1020 to the TCC PWM Sol. Valve. Refer to Wiring Repairs. Is the repair complete?	—	*Go to Step 17*	—
6	1. Install the test lamp from cavities E to S of the *J 39775* Jumper Harness. 2. Command the TCC PWM Sol. Valve ON and OFF three times. Does the test lamp turn ON when you command the TCC PWM Sol. Valve ON, and does the lamp turn OFF when you command the TCC PWM Sol. Valve OFF?	—	*Go to Step 8*	*Go to Step 7*
7	1. Inspect circuit 418 for an open or short to ground. Refer to General Electrical Diagnosis Procedures. 2. Repair the circuit if necessary. Refer to Wiring Repairs. Did you find the condition?	—	*Go to Step 17*	*Go to Step 9*
8	1. Install the *J 39775* Jumper Harness on the transmission 20-way connector (Automatic Transmission Connector End View). 2. Using the *J 39200* DMM and the *J 35616-A* Connector Test Adapter Kit, measure the resistance between terminals E and S. Is the resistance within the specified values?	10–15Ω	*Go to Step 11*	*Go to Step 10*
9	Replace the VCM. Refer to: • *VCM Replacement/Programming* (4.3L) • *VCM Replacement/Programming* (5.7L) • *VCM Replacement/Programming* (7.4L) Is the replacement complete?	—	*Go to Step 17*	—
10	1. Disconnect the Automatic Transmission Wiring Harness Assembly at the TCC PWM Sol. Valve. 2. Measure the resistance of the TCC PWM Sol. Valve. Is the resistance within the specified values?	10–15Ω	*Go to Step 12*	*Go to Step 15*

DTC P1860 TCC PWM Solenoid Circuit Electrical (Gas) (cont'd)

Step	Action	Value(s)	Yes	No
11	1. Measure the resistance between terminal E and ground. 2. Measure the resistance between terminal S and ground. Are both readings greater than the specified value?	250kΩ	Go to Diagnostic Aids	*Go to Step 13*
12	Inspect the A/T Wiring Harness Assembly for an open circuit. Refer to General Electrical Diagnosis Procedures. Did you find the condition?	—	*Go to Step 16*	—
13	1. Disconnect the Automatic Transmission Wiring Harness Assembly at the TCC PWM Sol. Valve. 2. Measure the resistance between each of the component terminals and ground. Are both readings greater than the specified value?	250kΩ	*Go to Step 14*	*Go to Step 15*
14	Inspect the A/T Wiring Harness Assembly for a short to ground. Refer to General Electrical Diagnosis Procedures. Did you find the condition?	—	*Go to Step 16*	—
15	Replace the TCC PWM Sol. Valve. Refer to Control Valve Body Removal and Disassembly, in On-Vehicle Service. Is the replacement complete?	—	*Go to Step 17*	—
16	Replace the Automatic Transmission Wiring Harness Assembly. Refer to Interior Wiring Harness Replacement, in On-Vehicle Service. Is the replacement complete?	—	*Go to Step 17*	—
17	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Select the parameters, TCC Duty Cycle, TCC Duty Cycle Open/Shorted to Ground and TCC Duty Cycle Shorted to Voltage. 4. Operate the vehicle under the following conditions: • The TCC PWM Sol. Valve is commanded ON, and the TCC Duty Cycle Shorted to Voltage is No. • The TCC PWM Sol. Valve is commanded OFF, and the TCC Duty Cycle, TCC Duty Cycle Open/Shorted to Ground is No. • Each condition is met for 5 seconds. 5. Select Specific DTC. Enter DTC P1860. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P1860 TCC PWM Solenoid Circuit Electrical (Diesel)



Circuit Description

The Torque Converter Clutch Pulse Width Modulation Solenoid Valve (TCC PWM Sol. Valve) controls fluid acting on the converter clutch valve, which then controls TCC apply and release. The TCC PWM Sol. Valve attaches to the control valve body within the transmission. Ignition voltage goes directly to the TCC PWM Sol. Valve. The Powertrain Control Module (PCM) controls the TCC PWM Sol. Valve by providing a ground path on circuit 418. The current flows through the TCC PWM Sol. Valve coil according to the duty cycle (percentage of ON and OFF time). The TCC PWM Sol. Valve provides a smooth engagement of the torque converter clutch by operating on a duty cycle percent of ON time.

If the PCM detects a continuous open or short to ground in the TCC PWM Sol. Valve circuit or the TCC PWM Sol. Valve, then DTC P1860 sets. DTC P1860 is a type A DTC.

Conditions for Setting the DTC

- System voltage is 9.0–16.0 volts.
- The engine is running more than 475 RPM for greater than 7 seconds.
- Commanded gear is 1st.
- All of the above conditions are met, and either of the following conditions occur for 4.3 seconds out of 5 seconds.
  - The PCM commands the solenoid OFF, and the voltage input remains low (zero volts).
  - The PCM commands the solenoid to ON (100%) and the voltage input remains high (B+).

Action Taken When the DTC Sets

- The PCM illuminates the Malfunction Indicator Lamp (MIL).
- The PCM inhibits TCC engagement.
- The PCM inhibits 4th gear.
- DTC P1860 is stored in PCM history.

Conditions for Clearing the MIL/DTC

- The PCM turns OFF the MIL after three consecutive trips without a failure reported.
- A scan tool can clear the DTC from the PCM history. The PCM clears the DTC from the PCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The PCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the PCM.

Diagnostic Aids

- Inspect the wiring at the PCM, the transmission connector and all other circuit connecting points for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation
  - Moisture intrusion
  - Corrosion
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- An open in the ignition feed circuit 1020, will cause multiple DTCs to set.
- First diagnose and clear any engine DTCs that are present. Then inspect for any transmission DTCs that may have reset.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

4. This step tests for voltage to the TCC PWM Sol. Valve.
6. This step tests the ability of the PCM and wiring to control the TCC PWM sol. valve ground circuit.
8. This step tests the resistance of the TCC PWM Sol. Valve and the Automatic Transmission Wiring Harness Assembly.
12. If the Automatic Transmission Wiring Harness Assembly is open, do not repair the wiring harness. You must replace the Automatic Transmission Wiring Harness Assembly.

DTC P1860 TCC PWM Solenoid Circuit Electrical (Diesel)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check*
2	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Freeze Frame and Failure Records for reference. Using the Clear Info function erases the stored Freeze Frame and Failure Records from the PCM. 3. Record the DTC Freeze Frame and Failure Records, then clear the DTCs. 4. If DTCs P0753, or P0758, are also set, inspect the fuse. Is the fuse open?	—	*Go to Step 3*	*Go to Step 4*
3	Inspect circuit 1020, the three solenoids, and the Automatic Transmission Wiring Harness Assembly for a short to ground. Refer to General Electrical Diagnosis Procedures. Did you find and correct the shorted condition?	—	*Go to Step 17*	Refer to Diagnostic Aids

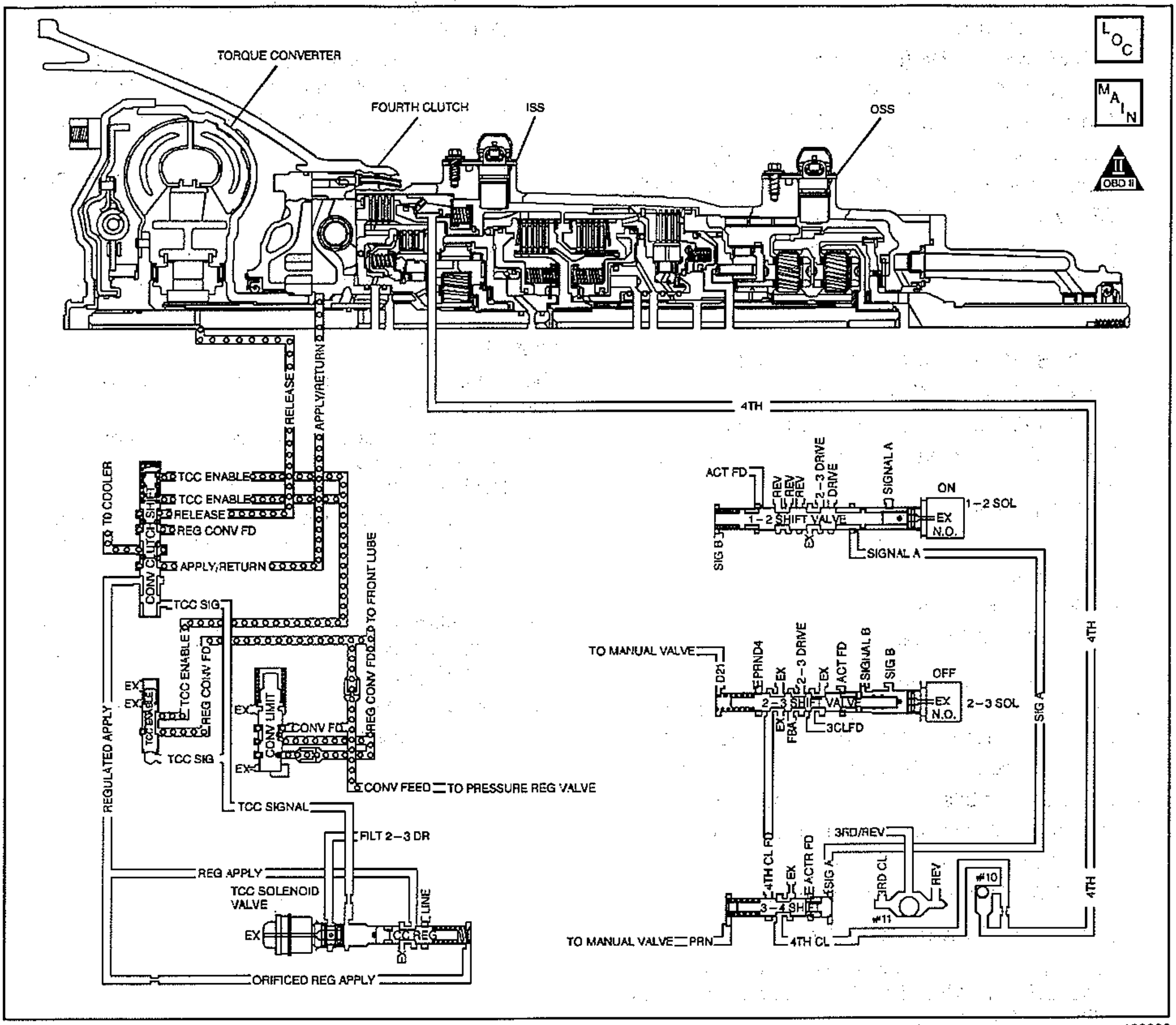
DTC P1860 TCC PWM Solenoid Circuit Electrical (Diesel) (cont'd)

Step	Action	Value(s)	Yes	No
4	1. Turn the ignition OFF. 2. Disconnect the transmission 20-way connector (additional DTCs may set). 3. Install the *J 39775* Jumper Harness on the engine side of the 20-way connector. 4. With the engine off, turn the ignition to the RUN position. 5. Connect a test lamp from *J 39775* Jumper Harness cavity E to a good ground. Is the test lamp ON?	—	*Go to Step 6*	*Go to Step 5*
5	Repair the open or high resistance in ignition feed circuit 1020 to the TCC PWM Sol. Valve. Refer to Wiring Repairs. Is the repair complete?	—	*Go to Step 17*	—
6	1. Install the test lamp from cavity E to cavity S of the *J 39775* Jumper Harness. 2. Use the scan tool output control function in order to command the TCC PWM Sol. Valve ON and OFF three times. Does the test lamp illuminate when you command the TCC PWM Sol. Valve ON, and does the lamp turn OFF when you command the TCC PWM Sol. Valve OFF?	—	*Go to Step 8*	*Go to Step 7*
7	1. Inspect circuit 418 for an open or short to ground. Refer to General Electrical Diagnosis Procedures. 2. Repair the circuit if necessary. Refer to Wiring Repairs. Did you find an open or short to ground condition?	—	*Go to Step 17*	*Go to Step 9*
8	1. Install the *J 39775* Jumper Harness on the transmission side of the 20-way connector. 2. Measure the resistance between terminals E and S. Use the *J 39200* DMM and the *J 35616-A* Connector Test Adapter Kit. Is the resistance within the specified value?	10–15Ω	*Go to Step 11*	*Go to Step 10*
9	Replace the PCM. Refer to *PCM Replacement/Programming.* Is the replacement complete?	—	*Go to Step 17*	—
10	1. Disconnect the Automatic Transmission Wiring Harness Assembly at the TCC PWM Sol. Valve. 2. Measure the resistance of the TCC PWM Sol. Valve. Is the resistance within the specified value?	10–15Ω	*Go to Step 12*	*Go to Step 15*

DTC P1860 TCC PWM Solenoid Circuit Electrical (Diesel) (cont'd)

Step	Action	Value(s)	Yes	No
11	1. Measure the resistance between terminal E and ground. 2. Measure the resistance between terminal S and a good ground. Are both readings greater than the specified value?	250kΩ	Go to Diagnostic Aids	*Go to Step 13*
12	Inspect the Automatic Transmission Wiring Harness Assembly for an open circuit. Refer to General Electrical Diagnosis Procedures. Did you find an open condition?	—	*Go to Step 16*	—
13	1. Disconnect the Automatic Transmission Wiring Harness Assembly at the TCC PWM Sol. Valve. 2. Measure the resistance between each of the component terminals and a good ground. Are both readings greater than the specified value?	250kΩ	*Go to Step 14*	*Go to Step 15*
14	Inspect the Automatic Transmission Wiring Harness Assembly for a short to ground. Refer to General Electrical Diagnosis Procedures. Did you find a short to ground condition?	—	*Go to Step 16*	—
15	Replace the TCC PWM Sol. Valve. Refer to Control Valve Body Removal and Disassembly, in On-Vehicle Service. Is the replacement Complete?	—	*Go to Step 17*	—
16	Replace the Automatic Transmission Wiring Harness Assembly (A/T Wiring Harness Assy). Refer to Interior Wiring Harness Replacement, in On-vehicle Service. Is the replacement complete?	—	*Go to Step 17*	—
17	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Select the parametrers, TCC Duty Cycle, TCC Duty Cycle Open/Shorted to GRND and TCC Duty Cycle Shorted to Voltage. 4. Operate the vehicle under the following conditions: • The TCC PWM Sol. Valve is commanded ON and TCC Duty Cycle Shorted to Voltage is No. • The TCC PWM Sol. Valve is commanded OFF and TCC Duty Cycle Open/Shorted to GRND is No. • Each condition is met for 5 seconds. 5. Select Specific DTC. Enter DTC P1860. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P1870 Transmission Component Slipping (Gas)



199389

Circuit Description

The Vehicle Control Module (VCM) monitors the engine speed, and the transmission output shaft speed. The VCM calculates turbine shaft speed and Torque Converter Clutch (TCC) slip speed by using inputs from the transmission Input Shaft Speed (ISS) Sensor, Transmission Output Shaft Speed (OSS) Sensor and other transmission components. The forward clutch housing is used as the ISS Sensor rotor. Whenever the TCC is engaged, engine speed and turbine speed will closely match, indicating low TCC slip speed. In D3 with the TCC engaged, calculated transmission component slip can only occur in the torque converter. In D4 Overdrive with the TCC engaged, transmission component slip can occur in the TCC or the fourth clutch assembly.

If the VCM detects an excessive TCC slip speed in D4 Overdrive, when the TCC should be engaged, then DTC P1870 sets. DTC P1870 is a type D DTC. For California emissions vehicles, DTC P1870 is a type B DTC.

Conditions for Setting the DTC

The following conditions occur 3 times for 10 seconds:

- No MAP DTCs P0101, P0102 or P0103.
- No MAF DTCs P0106, P0107 or P0108.
- No engine speed DTCs P0335, P0336, P0337, or P0338.
- No TP Sensor DTCs P0121, P0122, or P0123.
- No OSS DTC P0502 or P0503.
- No A/T ISS sensor DTCs P0716 or P0717.
- No TCC PWM Sol. Valve DTCs P0741, P0742 or P1860.
- No 1-2 SS Valve DTCs P0751 or P0753.
- No 2-3 SS Valve DTCs P0756 or P0758.
- No TFP Val. Position Sw. DTCs P1810.
- The engine speed is greater than 475 RPM for 7 seconds and not in fuel cutoff mode.

- The TP Sensor is 7–80% for 5.7L and 7.4L, or 10–80% for 4.3L.
- Engine speed is:
  - 1250–5500 RPM (5.7L, 7.4L) or
  - 1250–5000 RPM (4.3L).
- The engine vacuum is 0–105 kPa.
- The TFT is 20° to 130°C (68°–266°F).
- Vehicle speed is 56.3–177 Kp/h (35–110 MPH).
- TFP Val. Position Sw. indicates D4.
- Speed ratio is 1.30–0.70 for 5.7L and 7.4L, or 1.69–0.70 for 4.3L.
- The engine torque is 100 N·m (80 lb ft) to the following:
  - 101.6–406.5 N·m (75–300 lb ft) 4.3L.
  - 94.8–542 N·m (70–400 lb ft) 5.7L.
  - 108.4–677.5 N·m (80–500 lb ft) 7.4L.
- The TCC is commanded ON for 5 seconds or more.
- TCC duty cycle is greater than 95%.
- The VCM detects a slip speed of:
  - 140–550 RPM 4.3L
  - 120–550 RPM. 5.7L
  - 110–550 RPM. 7.4L

Action Taken When the MIL/DTC Sets

- The VCM illuminates the Malfunction Indicator Lamp (MIL) for California emissions vehicles.
- The VCM commands maximum line capacity.
- The VCM inhibits the TCC engagement.
- The VCM inhibits 4th gear if in hot mode.
- The VCM freezes shift adapts.
- DTC 1870 is stored in VCM history.

Conditions for Clearing the DTC

- For California emissions vehicles, the VCM turns OFF the MIL after three consecutive trips without a failure reported.
- A scan tool can clear the DTC from the VCM history. The VCM clears the DTC from the VCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The VCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the VCM.

Diagnostic Aids

- A TFP Val. Position Sw. malfunction can set DTC P1870.
- A mechanical failure of the shift solenoids or TCC PWM Sol. Valve can set DTC P1870.
- Internal transmission failures can result in a DTC P1870.
- Sticking or contaminated shift valves may cause intermittent slipping in D4.
- First diagnose and clear any engine DTCs or TP Sensor codes that are present. Then inspect for any transmission DTCs that may have reset.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

3. This step tests the indicated range signal to the actual selected range. A faulty TFP Valve Position Switch can set a DTC P1870.
4. This step tests for excessive TCC slip speed while in a commanded TCC lock-up state and in fourth gear; and confirms that the fault is present.
5. This step tests for excessive TCC slip speed while in a commanded TCC lock-up state and in third gear.
6. This step tests for a sticking TCC shift valve.
8. This step tests for proper transmission line pressure.

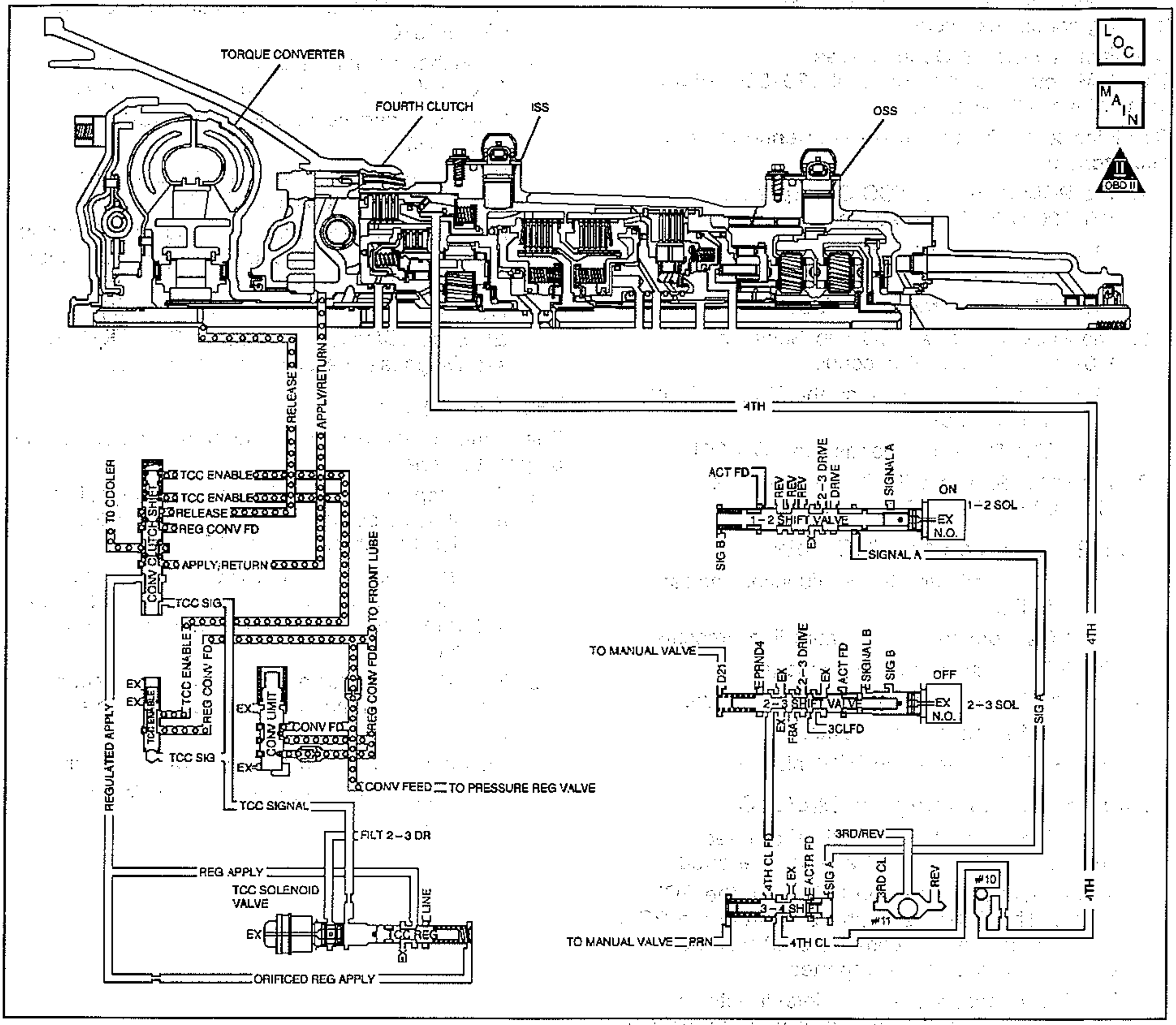
DTC P1870 Transmission Component Slipping (Gas)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check* (4.3L) or *Powertrain OBD System Check* (5.7L) or *Powertrain OBD System Check* (7.4L)
2	Perform the Transmission Fluid Checking Procedure. Refer to *Transmission Fluid Checking Procedure.* Did you perform the Transmission Fluid Checking Procedure?	—	*Go to Step 3*	Go to *Transmission Fluid Checking Procedure*
3	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Freeze Frame and Failure Records for reference. The Clear Info function erases the stored Freeze Frame and Failure Records from the VCM. 3. Record the DTC Freeze Frame and Failure Records, then clear the DTC. 4. With the engine idling and at normal operating temperature, apply the brake pedal. 5. Select each transmission range: D1, D2, D3, D4, N, R, and P. Does each selected transmission range match the scan tool TFP Switch A/B/C display? (Refer to the *Range Signal* table.)	—	*Go to Step 4*	Go to *DTC P1810 TFP Valve Position Sw CKT Malfunction (Gas)*
4	Drive the vehicle under the following conditions: • The TFT is +20°-130°C (50°-266°F) • The transmission is in D4. • The TCC is duty cycle is greater than 80%. • The TP angle is 10–80%. At any time is the TCC Slip Speed greater than the specified value for 10 seconds?	140 RPM (4.3L) 120 RPM (5.7L) 110 (7.4L)	*Go to Step 5*	Go to Diagnostic Aids
5	Drive the vehicle under the following conditions: • The transmission is in D3. • Command the TCC ON with the scan tool. • The TP angle is 10–80%. At any time is the TCC Slip Speed greater than the specified value for 10 seconds?	140 RPM (4.3L) 120 RPM (5.7L) 110 (7.4L)	*Go to Step 7*	*Go to Step 6*

DTC P1870 Transmission Component Slipping (Gas) (cont'd)

Step	Action	Value(s)	Yes	No
6	Repeat the procedure in step 4. Drive the vehicle under the following conditions: • The transmission is in D4. • The TCC duty cycle is greater than 80%. • The TP angle is 10–80%. Is the TCC slip speed greater than the specified value?	140 RPM (4.3L) 120 RPM (5.7L) 110 (7.4L)	*Go to Step 8*	*Go to Step 11*
7	Refer to *Slipping TCC.* Did you find and correct the condition?	—	*Go to Step 12*	—
8	1. Connect the *J 21867* Pressure Gauge to the transmission line pressure tap. 2. Perform the Line Pressure Check. Refer to *Line Pressure Check Procedure.* Is the line pressure within specifications?	—	*Go to Step 9*	Go to *Low Line Pressure*
9	1. Remove the transmission oil pan. Refer to Changing the Fluid and Filter, in On-Vehicle Service. 2. Inspect for contaminated fluid and excessive material in the pan. Is the fluid or the pan contaminated?	—	Go to A Transmission Overhaul Procedure, in Unit Repair	*Go to Step 10*
10	1. Inspect the 1-2 SS Valve for contamination or damaged seals. 2. Inspect the 2-3 SS Valve for contamination or damaged seals. Did you find the condition?	—	*Go to Step 12*	*Go to Step 11*
11	Inspect the following components for contamination or sticking: • The 2-3 shift valve • The 3-4 shift valve Did you find the condition?	—	*Go to Step 12*	Go to A Transmission Overhaul Procedure, in Unit Repair
12	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle under the following conditions: • Ensure that TFT is +20° to +130°C (50°-266°F). • Drive the vehicle in 4th gear, with the TCC commanded ON. • The TP Angle is 7–80%. • The VCM must see a slip of -20 to +20 RPM for greater than 10 seconds. 4. Select Specific DTC. Enter DTC P1870. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

DTC P1870 Transmission Component Slipping (Diesel)



199389

Circuit Description

The Powertrain Control Module (PCM) monitors the engine speed, and the transmission output shaft speed. The PCM calculates turbine shaft speed and Torque Converter Clutch (TCC) slip speed by using inputs from the transmission Input Shaft Speed (ISS) Sensor, Transmission Output Shaft Speed (OSS) Sensor and other transmission components. The forward clutch housing is used as the ISS Sensor rotor. Whenever the TCC is engaged, engine speed and turbine speed will closely match, indicating low TCC slip speed. In D3 with the TCC engaged, calculated transmission component slip can only occur in the torque converter. In D4 Overdrive with the TCC engaged, transmission component slip can occur in the TCC or the fourth clutch assembly.

If the PCM detects an excessive TCC slip speed in D4 Overdrive, when the TCC should be engaged, then DTC P1870 sets. DTC P1870 is a type D DTC. For California emissions vehicles, DTC P1870 is a type B DTC.

Conditions for Setting the DTC

- No MAP DTCs P0106, P0107 or P0108.
- No Engine Speed DTC P0335.
- No A/T ISS Sensor DTCs P0716 or P0717.
- No OSS Sensor DTCs P0722 or P0723.
- No TCC PWM Sol. Valve DTCs P0741, P0742, or P1860.
- No 1-2 SS Valve DTCs P0751 or P0753.
- No 2-3 SS Valve DTCs P0756 or P0758.
- No TFP Val. Position Sw. DTCs P1810.
- The gear range is D4.
- The APP Angle is 12–80%.
- The TFT is +20° to +130°C (68°–266°F).
- The engine speed is 1200–3750 RPM.
- System voltage is 9.0–16.0 volts.
- The vehicle speed is 48–176 km/h (30–110 mph).
- The engine torque is 75–352 N.m (60–265 lb ft).

The above conditions are met, with 4th gear commanded and the TCC ON and one of the following conditions occur:

Condition 1 (after 3 Occurrences)
The PCM detects a slip speed of 120–525 RPM for greater than 5.0 seconds.

Condition 2 (In the following sequence for one occurrence)

1. The PCM detects a TCC Slip Speed of 110–500 RPM for 10 seconds.
   1.1. The PCM commands maximum line pressure.
   1.2. The PCM freezes shift adapts.
2. The PCM detects a TCC Slip Speed of 110–500 RPM for 10 seconds.
   2.1. The PCM commands the TCC OFF for 1.5 seconds.
   2.2. The PCM commands the TCC ON.
3. The PCM detects a TCC Slip Speed of 110–500 RPM for 10 seconds.

Action Taken When the DTC Sets

- The PCM illuminates the Malfunction Indicator Lamp (MIL).
- The PCM commands maximum line pressure.
- The PCM inhibits the TCC engagement.
- The PCM inhibits 4th gear if in hot mode.
- The PCM freezes shift adapts.
- DTC P8170 is stored in PCM history.

Conditions for Clearing the MIL/DTC

- The PCM turns OFF the MIL after three consecutive trips without a failure reported.
- A scan tool can clear the DTC from the PCM history. The PCM clears the DTC from the PCM history if the vehicle completes 40 warm-up cycles without a failure reported.
- The PCM cancels the DTC default actions when the fault no longer exists and the ignition is OFF long enough in order to power down the PCM.

Diagnostic Aids

- A TFP Val. Position Sw. malfunction can set DTC P1870.
- A mechanical failure of the shift solenoids or TCC PWM Sol. Valve can set DTC P1870.
- Internal transmission failures can result in a DTC P1870.
- Sticking shift valves or contamination may cause intermittent slipping in D4.
- First diagnose and clear any engine DTCs that are present. Then inspect for any transmission DTCs that may have reset.
- *DTC P1860 TCC PWM Solenoid Circuit Electrical (Diesel)* can cause a DTC 1870 to set. Diagnose the electrical codes first.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

3. This step tests the indicated range signal to the actual selected range. A faulty TFP Valve Position Switch can set a DTC P1870.
4. This step tests for excessive TCC slip speed while in a commanded TCC lock-up state and in fourth gear; and confirms that the fault is present.
5. This step tests for excessive TCC slip speed while in a commanded TCC lock-up state and in third gear.
6. This step tests for a sticking TCC shift valve.
8. This step tests for proper transmission line pressure.

DTC P1870 Transmission Component Slipping (Diesel)

Step	Action	Value(s)	Yes	No
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	*Go to Step 2*	Go to *Powertrain OBD System Check*
2	Perform the Transmission Fluid Checking Procedure. Refer to *Transmission Fluid Checking Procedure.* Did you perform the procedure?	—	*Go to Step 3*	Go to *Transmission Fluid Checking Procedure*
3	1. Install the *scan tool.* 2. With the engine OFF, turn the ignition switch to the RUN position. **Important:** Before clearing the DTCs, use the scan tool in order to record the Freeze Frame and Failure Records for reference. Using the Clear Info function erases the stored Freeze Frame and Failure Records from the PCM. 3. Record the DTC Freeze Frame and Failure Records, then clear the DTC. 4. With the engine idling and at normal operating temperature, apply the brake pedal. 5. Select each transmission range: D1, D2, D3, D4, N, R, and P. Does each selected transmission range match the scan tool TFP Switch A/B/C display? (Refer to the *Range Signal* table.)	—	*Go to Step 4*	Go to *DTC P1810 TFP Valve Position Sw CKT Malfunction (Diesel)*
4	Drive the vehicle under the following conditions: • The TFT is +20°-130°C (68°-266°F) • The transmission is in D4. • The TCC is duty cycle is greater than 70%. • The APP angle is 12–80%. At any time is the TCC Slip Speed greater than the specified value for 6 seconds?	120 RPM	*Go to Step 5*	Go to Diagnostic Aids
5	Drive the vehicle under the following conditions: • The transmission is in D3. • Command the TCC ON with the scan tool. • The APP angle is 12–80%. At any time is the TCC Slip Speed greater than the specified value for 6 seconds?	110 RPM	*Go to Step 7*	*Go to Step 6*

DTC P1870 Transmission Component Slipping (Diesel) (cont'd)

Step	Action	Value(s)	Yes	No
6	Repeat the procedure in step 4. Drive the vehicle under the following conditions: • The transmission is in D4. • The TCC duty cycle is greater than 70%. • The APP angle is 12–80%. Is the TCC slip speed greater than the specified value?	120 RPM	*Go to Step 8*	*Go to Step 11*
7	Refer to the System Diagnosis table: *Slipping TCC.* Did you find and correct the condition?	—	*Go to Step 12*	—
8	1. Connect the *J 21867* Pressure Gauge to the transmission line pressure tap. 2. Perform the Line Pressure Check. Refer to *Line Pressure Check Procedure.* Is the line pressure within specifications?	—	*Go to Step 9*	Go to *Low Line Pressure*
9	1. Remove the transmission oil pan. Refer to Changing the Fluid and Filter, in On-Vehicle Service. 2. Inspect for contaminated fluid and excessive material in the pan. Is the fluid or the pan contaminated?	—	Go to Transmission Overhaul Procedure, in Unit Repair	*Go to Step 10*
10	1. Inspect the 1-2 SS Valve for contamination or damaged seals. 2. Inspect the 2-3 SS Valve for contamination or damaged seals. Did you find the condition?	—	*Go to Step 12*	*Go to Step 11*
11	Inspect the following components for contamination or sticking. • The 2-3 shift valve • The 3-4 shift valve Did you find the condition?	—	*Go to Step 12*	Go to Transmission Overhaul Procedure, in Unit Repair
12	In order to verify your repair, perform the following procedure: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle under the following conditions: • Ensure that TFT is 20°-+130°C (68°-266°F). • Drive the vehicle in 4th gear, with the TCC commanded ON. • The APP Angle is 12–80%. • The PCM must see a slip of -20 to +20 RPM for greater than 7 seconds. 4. Select Specific DTC. Enter DTC P1870. Has the test run and passed?	—	System OK	*Begin the diagnosis again. Go to Step 1*

Transmission Fluid Checking Procedure

Step	Action	Value(s)	Yes	No
DEFINITION: Diagnose transmission fluid conditions by color				
1	Check the fluid color. Is the fluid color red?	—	*Go to Step 2*	*Go to Step 11*
2	Is the fluid level satisfactory?	—	*Go to Step 21*	*Go to Step 3*
3	Check the fluid. Is the fluid foamy?	—	*Go to Step 8*	*Go to Step 4*
4	Check the fluid level. The proper fluid level should be in the middle of the X-hatch. Is the level high?	—	*Go to Step 9*	*Go to Step 5*
5	Fluid will be low. Add fluid to the proper fluid level. Is the fluid level satisfactory?	—	*Go to Step 6*	—
6	Check for external leaks. Refer *Fluid Leak Diagnosis and Repair.* Did you find any leaks?	—	*Go to Step 7*	*Go to Step 21*
7	Correct the leak condition. Did you correct the leak condition?	—	*Go to Step 21*	—
8	Is the fluid level too high?	—	*Go to Step 9*	*Go to Step 10*
9	Remove excess fluid to the proper fluid level. Refer to Fluid Changing Procedure in On-Vehicle service section. Is the fluid level satisfactory?	—	*Go to Step 21*	—
10	Check for contaminants in the fluid. Drain the fluid to determine the source of the contamination. Did you drain the fluid?	—	*Go to Step 15*	—
11	Is the fluid color non-transparent pink?	—	*Go to Step 12*	*Go to Step 13*
12	Replace the cooler. Is the replacement complete?	—	*Go to Step 15*	—
13	The fluid color should be light brown. Transmission fluid may turn dark with normal use. This does not always indicate oxidation or contamination. Is the fluid color light brown?	—	*Go to Step 14*	—
14	Drain the fluid to determine if the fluid is contaminated. A very small amount of material in the bottom pan is a normal condition, but large pieces of metal or other material in the bottom pan require a transmission overhaul. Was the fluid contaminated?	—	*Go to Step 15*	*Go to Step 18*

Transmission Fluid Checking Procedure (cont'd)

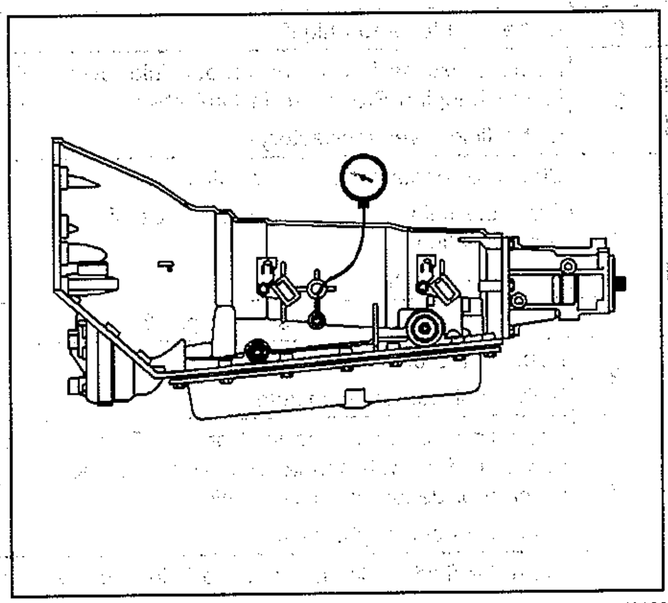
Step	Action	Value(s)	Yes	No
15	Overhaul the transmission. Refer to the Unit Repair Section. Is the overhaul complete?	—	Go to Step 16	—
16	Clear TRANS ADAPT. Reset the oil life monitor to 100%. Are the reset procedures complete?	—	Go to Step 17	—
17	Add new fluid. Is the procedure complete?	—	Go to Step 20	—
18	Change the fluid and the filter. Is this procedure complete?	—	Go to Step 19	—
19	Reset the oil life monitor to 100%. Are the reset procedures complete?	—	Go to Step 20	—
20	Is the fluid level satisfactory? If not, correct as needed.	—	Go to Step 21	—
21	Perform the *Functional Test Procedure.* Is the Functional Test completed?	—	System OK	—

Transmission Fluid Checking Procedure

Notice: Applying the brake pedal during this procedure will affect the fluid level reading.

1. Start the engine and operate the vehicle for 15 minutes or until the transmission fluid reaches an operating temperature of 82°–93°C (180°–200°F).
2. Park the vehicle on a level surface.
3. With your foot on the brake, move the shift lever through each gear range. Pause for about three seconds in each range, ending in Park.
4. Apply the parking brake and let the engine idle for three minutes.
5. Remove the transmission fluid level indicator, wipe the indicator clean, and reinsert the indicator. Give the indicator a full twist to close.
6. Wait three seconds and remove the indicator.
7. Read both sides of the indicator. The fluid must be within the hot cross-hatched area using the lowest level reading.

Line Pressure Check Procedure



40720

Line pressures are calibrated for two sets of gear ranges–Drive-Park-Neutral, and Reverse. This allows the transmission line pressure to be appropriate for different pressure needs in different gear ranges:

Gear Range	Line Pressure Range
Drive, Park, or Neutral	35–171 psi
Reverse	67–324 psi

Before performing a line pressure check, verify that the pressure control solenoid for the transmission is receiving the correct electrical signal from the vehicle computer:

1. Install a tech 1® scan tool

   Notice: The transmission may experience harsh, soft or mushy shifts for up to two days later.

   Caution: Keep the brakes applied at all times in order to prevent unexpected vehicle motion.

2. Start the engine and set the parking brake
3. Check for diagnostic trouble codes, including the diagnostic code for a stored pressure control solenoid
4. Repair the vehicle if necessary. Include the following areas:
   - Inspect the fluid level
   - Inspect the manual linkage at the transmission
   - Install or connect the tech 1® scan tool
   - Install or connect the oil pressure gage at the line pressure tap
5. Put the gear selector in Park and set the parking brake
6. Start the engine and allow the engine to warm up at idle
7. Access the Override Pressure Control Solenoid test on the tech 1® scan tool
8. Increase the Pressure Control Solenoid Current in 0.1-amp increments. Read the corresponding line pressure on the pressure gage. Allow the pressure to stabilize for 5 seconds after each current charge
9. Compare your data to the Drive-Park-Neutral *Line Pressure.*

Line pressure will pulse either high or low every ten seconds in order to keep the pressure control solenoid plunger free. This is a normal condition and will not harm the transmission.

If your pressure readings differ greatly from the line pressure chart, refer to the Diagnosis Charts.

The tech 1® scan tool is only able to control the pressure control solenoid in Park and Neutral with the vehicle stopped at idle. This protects the clutches from extremely high or low pressures in Drive or Reverse ranges.

Road Test Procedure

- Perform the road test using the Scan Tool.
- Perform this test only when traffic and road conditions permit.
- Observe all traffic safety regulations.

Conduct the test according to the following steps:

1. Start the engine.
2. Depress the brake pedal.
3. Move the gear selector between the following positions:

Important: Transmission shifts should be immediate and not harsh.

- Park to Reverse
- Reverse to Neutral
- Neutral to D4

Use the scan tool in order to see if any transmission malfunction codes have been set. If so, refer to *Functional Test Procedure.* After repairing the vehicle, perform the road test and verify that no codes have been set again.

If no codes have been set and the condition remains, refer to the Diagnostic Tables.

If the transmission is not performing well and no trouble codes have been set, check for an intermittent condition. Check all electrical connections for damage or a loose fit. Some scan tools have a snapshot test which can help to catch an intermittent condition that does not occur long enough in order to set a code.

If the condition is suspected to originate in the torque converter, refer to *Torque Converter Clutch Diagnosis.*

Electrical/Garage Shift Test

Perform this test before a road test in order to make sure that electronic control inputs are connected and operating. If you do not check the inputs before operating the transmission, you could misdiagnose a simple electrical condition as a major transmission condition.

A scan tool provides valuable information. Use the scan tool on the Hydra-Matic 4L80-E transmission for accurate diagnosis.

1. Move the gear selector to Park (P) and set the parking brake
2. Connect the scan tool to the DLC terminal
3. Start the engine
4. Connect power to the scan tool
5. Verify that the following signals are present on the scan tool:
   - Transmission Input (Shaft) Speed Sensor (A/T ISS)
   - Transmission Output (Shaft) Speed Sensor (A/T OSS)
   - Automatic Transmission Fluid Pressure Manual Valve (TFP Val.) Position Switch
   - Vehicle speed (MILES/HOUR)
   - Current Gear

- Reference Transmission Pressure Control Solenoid Amperage (REF CURRENT)
- Actual Transmission Pressure Control Solenoid Amperage (ACT CURRENT)
- Engine Coolant Temperature (ECT)
- Automatic Transmission Fluid Temperature (TFT) Sensor
- TP Angle
- TCC Duty Cycle (TCC DC)
- System Voltage
- TCC Brake Switch

6. Monitor the TCC BRAKE signal with the scan tool while tapping the brake pedal with your foot. The brake switch signal should be:

   VCM
   - CLOSED – when the brake pedal is released
   - OPEN – when the brake pedal is depressed

   PCM
   - OPEN – when the brake pedal is released
   - CLOSED – when the brake pedal is depressed
7. Monitor the Automatic Transmission Fluid Pressure Manual Valve Position Switch (TFP Switch) signal by moving the gear selector through all of the ranges. Verify that the TFP Switch state matches the gear range which is indicated on the instrument panel or on the console. Gear selections should be immediate and not harsh.
8. Move the gear selector to Neutral and monitor the Throttle Position Angle while increasing and decreasing engine RPM with the accelerator pedal. The Throttle Position Angle should increase with the engine RPM.

Upshift Control and Torque Converter Clutch (TCC) Apply

The vehicle computer calculates the upshift points based primarily upon two inputs:

- Throttle Position Angle
- Vehicle speed

When the VCM/PCM indicates that a shift should occur, an electrical signal is sent to the shift solenoids, which in turn move the valves to perform the upshift.

The shift speed charts refer to THROTTLE POSITION ANGLE instead of MIN THROTTLE or WOT in order to make shift speed measurement more uniform and accurate. Monitor THROTTLE POSITION ANGLE by using the scan tool.

Some scan tools have been programmed in order to measure and record shift point information. Check the instruction manual in order to see if this test is available.

With gear selector in D4, perform the following steps:

1. Refer to *Shift Speed* and choose a throttle position of either 15% or 20%.
2. Monitor the throttle position with the scan tool.
3. Accelerate to the chosen throttle position. Hold the throttle steady.

Important: Shift speeds may vary due to slight hydraulic delays in responding to electronic controls. A change from the original equipment tire size also affects shift speeds.

4. As the transmission upshifts, note the shift speed for each of the following gears:
   - 2nd gear
   - 3rd gear
   - 4th gear
5. The Torque Converter Clutch (TCC) should apply in Third or Fourth gear. The TCC will not apply unless the engine coolant has reached a minimum operating temperature of approximately 54°C (130°F). Note when the TCC applies. If you do not notice the apply by an RPM drop, refer to *Torque Converter Clutch Diagnosis.*
6. Repeat steps 1–5 using several different throttle angles.

Part Throttle Detent Downshift

At vehicle speeds of 64–88 km/h (40–55 mph) in Fourth gear, quickly increase the throttle angle. Verify the following results:

- The TCC releases.
- The transmission downshifts to 3rd gear immediately.
- The 1-2 Shift Solenoid valve turns OFF.

Full Throttle Detent Downshift

At vehicle speeds of 64–88 km/h (40–55 mph) in Fourth gear, quickly increase the throttle angle to its maximum position. Verify the following results:

- The TCC releases.
- The transmission downshifts to 2nd gear immediately.
- The 1-2 and 2-3 Shift Solenoid valves turn OFF.

Manual Downshifts

The shift solenoid valves do not control the initial downshift during manual downshifts. All manual downshifts are hydraulic. The solenoid states will change during, or shortly after, a manual downshift is selected.

1. At vehicle speeds of 64–88 km/h (40–55 mph) in Fourth gear, release the accelerator pedal while moving the gear selector to D3. Observe the following results:
   - The TCC releases
   - The transmission downshifts to Third gear immediately
   - The engine slows the vehicle down

2. Move the gear selector back to D4 and accelerate to 64–72 km/h (40–45 mph). Release the accelerator while moving the gear selector to D2 and observe the following results:
   - The TCC releases
   - The transmission immediately downshifts to Second gear
   - The engine slows the vehicle down
3. Move the gear selector back to D4 and accelerate to 48 km/h (30 mph). Release the accelerator pedal while moving the gear selector to D1 and observe the following results:
   - The TCC releases
   - The transmission immediately downshifts to First gear immediately
   - The engine slows the vehicle down

Coasting Downshifts

1. With the gear selector in D4, accelerate to Fourth gear with the TCC applied.
2. Release the accelerator pedal and lightly apply the brakes. Observe the following results:
   - The TCC releases.
   - Downshifts occur at speeds shown on the Shift Speed Chart. Refer to *Shift Speed.*

Manual Gear Range Selection

The shift solenoids control the upshifts in the manual gear ranges.

Perform the following tests by accelerating at 10–15 degrees TPS.

Manual Third (D3)

With the vehicle stopped, move the gear selector to D3 and accelerate in order to observe the following conditions:

- The 1–2 shift
- The 2–3 shift
- The TCC does not apply

Manual Second (D2)

- With the vehicle stopped, move the gear selector to D2 and accelerate in order to observe the 1–2 shift.
- Accelerate to 56 km/h (35 mph) and observe the following conditions:
  - The 2–3 shift does not occur.
  - The TCC does not apply.

Manual First (D1)

With the vehicle stopped, move the gear selector to D1. Accelerate to 32 km/h (20 mph) and observe the following conditions:

- No upshifts occur.
- The TCC does not apply.

Reverse (R)

With the vehicle stopped, move the gear selector to R and slowly accelerate in order to observe that the 1–2 Shift Solenoid valve is ON.

Torque Converter Clutch Diagnosis

The Torque Converter Clutch (TCC) is applied by fluid pressure, which is controlled by a PWM solenoid valve. This solenoid valve is located inside of the automatic transmission assembly. The solenoid valve energizes or de-energizes by making or breaking an electrical circuit through a combination of switches and sensors.

Torque Converter Stator

The torque converter stator roller clutch can have two different malfunctions.

- The stator assembly freewheels in both directions.
- The stator assembly remains locked up at all times.

Poor Acceleration at Low Speed

If the stator is freewheeling at all times, the car tends to have poor acceleration from a standstill. At speeds above 50–55 km/h (30–35 mph), the car may act normally. For poor acceleration, you should first determine that the exhaust system is not blocked, and the transmission is in First gear when starting out.

If the engine freely accelerates to high RPM in Neutral, you can assume that the engine and the exhaust system are normal. Check for poor performance in Drive and Reverse to help determine if the stator is freewheeling at all times.

Poor Acceleration at High Speed

If the stator is locked up at all times, performance is normal when accelerating from a standstill. Engine RPM and car speed are limited or restricted at high speeds. Visual examination of the converter may reveal a blue color from overheating.

If the converter has been removed, you can check the stator roller clutch by inserting a finger into the splined inner race of the roller clutch and trying to turn the race in both directions. You should be able to freely turn the inner race clockwise, but you should have difficulty in moving the inner race counterclockwise or you may be unable to move the race at all.

Noise

Important: Do not confuse this noise with pump whine noise, which is usually noticeable in Park, Neutral, and all other gear ranges. Pump whine will vary with line pressure.

You may notice a torque converter whine when the vehicle is stopped and the transmission is in Drive or Reverse. This noise will increase as you increase the engine RPM. The noise will stop when the vehicle is moving or when you apply the torque converter clutch, because both halves of the converter are turning at the same speed.

Perform a stall test to make sure the noise is actually coming from the converter:

1. Place your foot on the brake.

2. Put the gear selector in Drive.

   Notice: You may damage the transmission if you depress the accelerator for more than six seconds.

3. Depress the accelerator to approximately 1200 RPM for no more than six seconds.

A torque converter noise will increase under this load.

Torque Converter Evaluation and Diagnosis

Replace the torque converter under any of the following conditions:

- External leaks appear in the hub weld area.
- The converter hub is scored or damaged.
- The converter pilot is broken, damaged, or fits poorly into the crankshaft.
- You discover steel particles after flushing the cooler and the cooler lines.
- The pump is damaged, or you discover steel particles in the converter.
- The vehicle has TCC shudder and/or no TCC apply. Replace the torque converter only after all hydraulic and electrical diagnoses have been made. The converter clutch material may be glazed.
- The converter has an imbalance which cannot be corrected. Refer to *Flywheel/Torque Converter Vibration Test.*
- The converter is contaminated with engine coolant which contains antifreeze.
- An internal failure occurs in the stator roller clutch.
- You notice excessive end play.
- Overheating produces heavy debris in the clutch.
- You discover steel particles or clutch lining material in the fluid filter or on the magnet, when no internal parts in the unit are worn or damaged. This condition indicates that lining material came from the converter.

Do Not Replace the Torque Converter

Do not replace the torque converter if you discover any of the following symptoms:

- The oil has an odor or the fluid is discolored, even though metal or clutch facing particles are not present.
- The threads in one or more of the converter bolt holes are damaged. Correct the condition with a new J-nut.
- Transmission failure did not display evidence of damaged or worn internal parts, steel particles or clutch plate lining material in the unit and inside the fluid filter.
- The vehicle has been exposed to high mileage only. An exception may exist where the lining of the torque converter clutch dampener plate has seen excess wear by vehicles operated in heavy and/or constant traffic, such as taxi, delivery, or police use.

Torque Converter Clutch Shudder

The key to diagnosing Torque Converter Clutch (TCC) shudder is to note when it happens and under what conditions.

TCC shudder which is caused by the transmission should only occur during the apply or the release of the converter clutch. Shudder should never occur after the TCC plate is fully applied.

If the shudder occurs while the TCC is applying, the problem can be within the transmission or the torque converter. Something is causing one of the following conditions to occur:

- Something is not allowing the clutch to become fully engaged.
- Something is not allowing the clutch to release.
- The clutch is releasing and applying at the same time.

One of the following conditions may be causing the problem to occur:

- Leaking turbine shaft seals
- A restricted release orifice
- A distorted clutch or housing surface due to long converter bolts
- Defective friction material on the TCC plate

If Shudder Occurs After TCC has Applied

If shudder occurs after the TCC has applied, most of the time there is nothing wrong with the transmission!

As mentioned above, the TCC is not likely to slip after the TCC has been applied. Engine problems may go unnoticed under light throttle and load, but they become noticeable after the TCC apply when going up a hill or accelerating. This is due to the mechanical coupling between the engine and the transmission.

Once TCC is applied, there is no torque converter (fluid coupling) assistance. Engine or driveline vibrations could be unnoticeable before TCC engagement.

Inspect the following components in order to avoid misdiagnosis of TCC shudder. An inspection will also avoid the unnecessary disassembly of a transmission or the unnecessary replacement of a converter.

- Spark plugs – Inspect for cracks, high resistance or a broken insulator.
- Plug wires – Look in each end. If there is red dust (ozone) or a black substance (carbon) present, then the wires are bad. Also look for a white discoloration of the wire. This indicates arcing during hard acceleration.

- Coil – Look for a black discoloration on the bottom of the coil. This indicates arcing while the engine is misfiring.
- Fuel injector – The filter may be plugged.
- Vacuum leak – The engine will not get a correct amount of fuel. The mixture may run rich or lean depending on where the leak occurs.
- EGR valve – The valve may let in too much or too little unburnable exhaust gas and could cause the engine to run rich or lean.
- MAP/MAF sensor – Like a vacuum leak, the engine will not get the correct amount of fuel for proper engine operation.
- Carbon on the intake valves – Carbon restricts the proper flow of air/fuel mixture into the cylinders.
- Flat cam – Valves do not open enough to let the proper fuel/air mixture into the cylinders.
- Oxygen sensor – This sensor may command the engine too rich or too lean for too long.
- Fuel pressure – This may be too low.
- Engine mounts – Vibration of the mounts can be multiplied by TCC engagement.
- Axle joints – Check for vibration.
- TP Sensor – The TCC apply and release depends on the TP Sensor in many engines. If the TP Sensor is out of specification, TCC may remain applied during initial engine loading.
- Cylinder balance – Bad piston rings or poorly sealing valves can cause low power in a cylinder.
- Fuel contamination – This causes poor engine performance.

Flywheel/Torque Converter Vibration Test

1. Start the engine.
2. With the engine at idle speed and the transmission in Park or Neutral, observe the vibration.
3. Turn the key off.

Removal Procedure

1. Remove the bolts attaching the flexplate shield.
2. Remove the bolts attaching the flexplate to the torque converter.
3. Rotate the torque converter 120 degrees.

Installation Procedure

1. Install the flexplate to the torque converter. Secure with the attaching bolts.

   Tighten

   Tighten the bolts to 44 N·m (33 lb ft).

   Refer to *Fastener Notice.*
2. Install the flexplate shield. Secure with attaching bolts.

   Tighten

   Tighten the bolts to 7 N·m (60 lb in).

Start the engine and check for vibration. Repeat the procedure until you obtain the best possible balance.

TFP Valve Position Switch Resistance Check

Important: Whenever the transmission 20-way connector is disconnected and the engine is running, multiple DTCs will set. Clear any DTC codes after finishing the procedure.

TFP Valve Position Switch Resistance Check

Step	Action	Value(s)	Yes	No
1	1. Install the J 39775 Jumper Harness on the transmission side of the 20-way connector. 2. Using the J 39200 DVOM and the J 35616 Connector Test Adapter Kit, measure the resistance from terminal N to the transmission case. Is the resistance greater than the value indicated?	50 kΩ	*Go to Step 3*	*Go to Step 2*
2	1. Disconnect the Automatic Transmission Wiring Harness Assembly from the TFP Val. Position Sw. 2. Measure the resistance from terminal A of the TFP Val. Position Sw. to the switch housing. Is the resistance greater than the value indicated?	50 kΩ	*Go to Step 15*	*Go to Step 16*
3	Measure the resistance from terminal R to the transmission case. Is the resistance greater than the indicated value?	50 kΩ	*Go to Step 5*	*Go to Step 4*

TFP Valve Position Switch Resistance Check (cont'd)

Step	Action	Value(s)	Yes	No
4	1. Disconnect the Automatic Transmission Wiring Harness Assembly from the TFP Val. Position Sw. 2. Measure the resistance from terminal B of the TFP Val. Position Sw. to the switch housing. Is the resistance greater than the value indicated?	50 kΩ	*Go to Step 15*	*Go to Step 16*
5	Measure the resistance from terminal P to the transmission case. Is the resistance greater than the value indicated?	50 kΩ	*Go to Step 7*	*Go to Step 6*
6	1. Disconnect the Automatic Transmission Wiring Harness Assembly from the TFP Val. Position Sw. 2. Measure the resistance from terminal C of the TFP Val. Position Sw. to the switch housing. Is the resistance greater than the value indicated?	50 kΩ	*Go to Step 15*	*Go to Step 16*
7	1. Start the engine, and let the engine idle. 2. Set the parking brake. 3. Place the gear selector in Drive (D4). 4. Measure the resistance from terminal R to the transmission case. Is the resistance less than the indicated value?	200Ω	*Go to Step 8*	*Go to Step 14*
8	1. Place the gear selector in Drive (D4). 2. Measure the resistance from terminal P to the transmission case. Is the resistance less than the value indicated?	200Ω	*Go to Step 9*	*Go to Step 14*
9	1. Place the selector in Low (D1). 2. Measure the resistance from terminal N to the transmission case. Is the resistance less than the value indicated?	200Ω	*Go to Step 10*	*Go to Step 14*
10	1. Place the gear selector in Low (D1). 2. Measure the resistance from terminal P to the transmission case. Is the resistance greater than the value indicated?	50 kΩ	*Go to Step 11*	*Go to Step 16*
11	1. Place the gear selector in Reverse (R). 2. Measure the resistance from terminal N to the transmission case. Is the resistance less than the value indicated?	200Ω	*Go to Step 12*	*Go to Step 16*
12	1. Place the transmission in Reverse (R). 2. Measure the resistance from terminal P to the transmission case. Is the resistance greater than the value indicated?	50 kΩ	*Go to Step 13*	*Go to Step 16*

TFP Valve Position Switch Resistance Check (cont'd)

Step	Action	Value(s)	Yes	No
13	1. Place the gear selector in Manual Third (D3). 2. Measure the resistance from terminal R to the transmission case. Is the resistance greater than the value indicated?	50 kΩ	No problem found. Exit table.	*Go to Step 16*
14	1. Disconnect the Automatic Transmission Wiring Harness from the TFP Val. Position Sw. 2. Inspect circuits 1224, 1225, and 1226 of the Automatic Transmission Wiring Harness Assembly for an open circuit. Did you find a problem?	—	*Go to Step 15*	*Go to Step 16*
15	Replace the Automatic Transmission Wiring Harness Assembly. Refer to 4L80-E Automatic Transmission On-Vehicle Service. Is the replacement complete?	—	*Verify repair and go to Step 1*	—
16	1. Replace the TFP Val. Position Sw. 2. Refer to 4L80-E Automatic Transmission On-Vehicle Service. 3. Inspect the Automatic Transmission Wiring Harness Assembly. Is the replacement of the TFP Val. Position Sw. complete?	—	*Verify repair and go to Step 1*	—

Automatic Transmission Wiring Harness Check

Automatic Transmission Wiring Harness Check

Step	Action	Value(s)	Yes	No
Important: The Automatic Transmission Wiring Harness Assembly Check cannot be used for checking the Automatic Transmission Fluid Pressure Manual Valve Position Switch (TFP Val. Position Sw.) circuit. Refer to Automatic Transmission Fluid Pressure Manual Valve Position Switch Resistance Check for those circuits.				
1	1. Install the *J 39775* on the transmission 20-way connector. 2. Using the *J 39200* DVOM and a J Connector Test Adapter Kit *J 35616*, measure the resistance between terminals A and E (1-2 Shift Solenoid Valve). Is the resistance within the values indicated?	19-24Ω @ 20°C (68°F) 24–31Ω @ 100°C (212°F)	*Go to Step 3*	*Go to Step 2*
2	1. Disconnect the 1-2 Shift Solenoid Valve (1-2 SS Valve) from the Automatic Transmission Wiring Harness Assembly (A/T Wiring Harness Assy.). 2. Using the DVOM, measure the resistance of the 1-2 SS Valve. Is the resistance within the values indicated?	19-24Ω @ 20°C (68°F) 24–31Ω @ 100°C (212°F)	*Go to Step 12*	*Go to Step 14*

Automatic Transmission Wiring Harness Check (cont'd)

Step	Action	Value(s)	Yes	No
3	Measure the resistance between terminals B and E (2-3 Shift Solenoid Valve). Is the resistance within the values indicated?	19-24Ω @ 20°C (68°F) 24–31Ω @ 100°C (212°F)	*Go to Step 5*	*Go to Step 4*
4	1. Disconnect the 2-3 Shift Solenoid Valve (2-3 SS Valve) from the A/T Wiring Harness Assy. 2. Using the DVOM, measure the resistance of the 2-3 SS Valve. Is the resistance within the values indicated?	19-24Ω @ 20°C (68°F) 24–31Ω @ 100°C (212°F)	*Go to Step 12*	*Go to Step 14*
5	Measure the resistance between terminals S and E (Torque Converter Clutch Pulse Width Modulation Solenoid Valve). Is the resistance within the values indicated?	10–11Ω @ 20°C (68°F) 13-15Ω @ 100°C (212°F)	*Go to Step 7*	*Go to Step 6*
6	1. Disconnect the Torque Converter Clutch Pulse Width Modulation Solenoid Valve (TCC PWM Sol. Valve) from the A/T Wiring Harness Assy. 2. Using the DVOM, measure the resistance of the TCC PWM Sol. Valve. Is the resistance within the values indicated?	10–11Ω @ 20°C (68°F) 13-15Ω @ 100°C (212°F)	*Go to Step 12*	*Go to Step 14*
7	Measure the resistance between terminals C and D (Pressure Control Solenoid Valve). Is the resistance within the values indicated?	3–5Ω @ 20°C (68°F) 4-7Ω @ 100°C (212°F)	*Go to Step 9*	*Go to Step 8*
8	1. Disconnect the Pressure Control Solenoid Valve (PC Sol. Valve) from the A/T Wiring Harness Assy. 2. Using the DVOM, measure the resistance of the PC Sol. Valve. Is the resistance within the values indicated?	3–5Ω @ 20°C (68°F) 4-7Ω @ 100°C (212°F)	*Go to Step 12*	*Go to Step 14*
9	Measure the resistance between terminals L and M (Transmission Fluid Temperature Sensor). Is the resistance within the values indicated?	3333–3689Ω @ 20°C (68°F) 167-189Ω @ 100°C (212°F)	*Go to Step 10*	*Go to Step 12*
10	Measure the resistance from terminals A, B, C, D, E, L, M,, N, P, R and S of the A/T Wiring Harness Assy. at the transmission 20-way connector to the transmission case. Is the resistance measured greater than the value indicated?	250kΩ	No problem found. Exit table	*Go to Step 11*
11	1. Disconnect the A/T Wiring Harness Assy. from all the components. 2. Measure the resistance from all the components terminals to the transmission case. Is the resistance measured greater than the value indicated?	250kΩ	*Go to Step 12*	*Go to Step 14*

Automatic Transmission Wiring Harness Check (cont'd)

Step	Action	Value(s)	Yes	No
12	Inspect for high resistance or a shorted condition: • Inspect the A/T Wiring Harness Assy. for poor electrical connections at the transmission 20-way connector and at the component connectors. • Look for possible bent, backed out, deformed, or damaged terminals. • Inspect for weak terminal tension. • Inspect for chafed wire that could short to bare metal or other wiring. • If diagnosing for a possible intermittent condition, move or massage the A/T Wiring Harness Assy. while observing the test equipment for a change. Was high resistance or a shorted condition found?	—	*Verify the repair and go to Step 1*	*Go to Step 13*
13	Replace the A/T Wiring Harness Assy. Is the replacement complete?	—	*Verify the repair and go to step 1*	—
14	Replace the faulty component. Is the replacement complete?	—	*Verify the repair go to step 1*	—

Clutch Plate Diagnosis

Composition Plates

Dry the plates and inspect the plates for the following conditions:

- Pitting
- Flaking
- Wear
- Glazing
- Cracking
- Charring
- Chips or metal particles embedded in the lining

Replace a composition plate which shows any of these conditions.

Steel Plates

Important: If the clutch shows evidence of extreme heat or burning, replace the springs.

Wipe the plates dry and check the plates for heat discoloration. If the surfaces are smooth, even if color smear is indicated, you can reuse the plate. If the plate is discolored with heat spots or if the surface is scuffed, replace the plate.

Causes of Burned Clutch Plates

The following conditions can result in a burned clutch plate:

- Incorrect usage of clutch plates
- Engine coolant in the transmission fluid
- A cracked clutch piston
- Damaged or missing seals
- Low line pressure
- Valve conditions
  - The valve body face is not flat
  - Porosity between channels
  - The valve bushing clips are improperly installed
  - The checkballs are misplaced
- The Teflon® seal rings are worn or damaged

Engine Coolant in Transmission

Notice: Antifreeze will deteriorate the Viton O-ring seals and the glue used to bond the clutch material to the pressure plate. Both conditions may cause transaxle damage.

Perform the following steps if the transmission oil cooler has developed a leak, allowing engine coolant to enter the transmission:

1. Because the coolant will attack the seal material causing leakage, disassemble the transmission and replace all rubber type seals.
2. Because the facing material may become separated from the steel center portion, replace the composition-faced clutch plate assemblies.
3. Replace all nylon parts including washers.
4. Replace the torque converter.
5. Thoroughly clean and rebuild the transmission, using new gaskets and oil filter.
6. Flush the cooler lines after you have properly repaired or replaced the transmission cooler.

AT Oil Cooler Flow Test

Flushing Procedure

Tools Required

- *J 35944-A* Oil Cooler and Line Flusher
- *J 35944-20* Flushing Solution

1. Remove the fill cap on the *J 35944-A* and fill with 0.6 liter (20 oz) of the *J 35944-20.*

   Do not overfill.

   Follow the manufacturer's suggested procedures for handling the solution.
2. Install the cap on the *J 35944-A* and pressurize it to 550–700 kPa (80–100 psi).
3. Connect the *J 35944-A* to the transmission end of the oil cooler pipe that feeds the bottom fitting of the oil cooler.
4. Connect the discharge hose to the top oil cooler pipe.
5. Clip the discharge hose to the oil drain container.
6. With the water valve on the *J 35944-A* in the OFF position, connect the water supply to the tool.
7. Turn on the water supply.

   Notice: If water does not flow through the oil cooler (system is completely plugged), do not continue the flushing procedure, or damage to the tool or components could result. Turn the water OFF immediately. Inspect the pipes and the cooler for restrictions. Replace the oil pipe(s) and/or the oil cooler.
8. Flush the transmission fluid by opening the water valve to the ON position for 10 seconds.
9. Close the water valve and clip the discharge hose to a 5 gallon pail.
10. Cover the pail with a shop towel in order to prevent splash.
11. Turn the water valve to the ON position and depress the trigger in order to mix the flushing solution into the water flow.
12. Use the bale clip provided in order to hold the trigger down.
13. Flush the cooler with water and the solution for 2 minutes. During this flush, attach an air supply to the air valve located on the tool for 3 to 5 seconds every 15 to 20 seconds. This will create a surging action to ensure complete cleaning.
14. Release the trigger and turn off the water valve.
15. Disconnect both hoses from the oil cooler pipes in order to perform an initial flush.
16. Reconnect the hoses to the pipes opposite the initial flush to do a backflush.
17. Turn the water valve to the ON position and depress the trigger in order to mix the flushing solution into the water flow.
18. Use the bale clip provided in order to hold the trigger down.
19. Flush the cooler with water and the solution for 2 minutes. During this flush, attach an air supply to the air valve located on the tool for 3 to 5 seconds every 15 to 20 seconds. This will create a surging action to ensure complete cleaning.
20. Release the trigger. Rinse with water for one minute.
21. Turn off the water valve.
22. Attach the air supply to the air valve.
23. Dry the system with air until no moisture is seen leaving the discharge hose.
24. Connect the cooler feed pipe to the transmission.

    The cooler feed is the TOP connector at the transmission.
25. Clip the discharge hose to the oil drain container.
26. After filling the transmission with fluid, start the engine.
27. Run the engine for 30 seconds to remove the residual moisture from the oil cooler.

    At least two quarts of the fluid should flow during the 30 second period.

    If the fluid flow is sufficient, check it by disconnecting the feed line at the cooler and observing the flow with the engine running.
28. Check for the following conditions:
    - Insufficient Flow — Inspect the transmission for causes.
    - Sufficient Flow — Inspect the cooler pipes, fittings and repeat the cooler flushing procedure. If the flow is still insufficient, replace the cooler.
29. Remove the discharge hose and reconnect the cooler pipes.

    Adjust the fluid level.

Fluid Leak Diagnosis and Repair

Methods for Locating Leaks

You can generally locate and repair the cause of most external leaks with the transmission in the vehicle. Use any one of the following methods for locating leaks:

General Method

1. Verify that the leak is transmission fluid.
2. Thoroughly clean the suspected leak area.
3. Operate the vehicle for about 15 miles or until you have reached normal operating temperatures.
4. Park the vehicle over clean paper or cardboard.
5. Shut the engine off and look for fluid spots on the paper.
6. Make necessary repairs.

Powder Method

1. Thoroughly clean the suspected leak area with a solvent.
2. Apply an aerosol type powder such as foot powder to the suspected leak area.
3. Operate the vehicle for about 15 miles or until you have reached normal operating temperatures.
4. Shut the engine off.
5. Inspect the suspected leak area and trace the leak path through the powder to find the source.
6. Make necessary repairs.

Dye and Black Light Method

1. Follow the manufacturer's recommendation for the amount of dye to be used.
2. Find the leak with a black light.
3. Make the necessary repairs.

Repairing the Leak

Once you have found the leak point, you must next determine the source of the leak. A new gasket will not repair the leak if the sealing flange is bent. You must also repair the bent flange. Before you attempt to repair a leak, check the following conditions:

Gaskets

- The fluid level or pressure is too high
- Plugged vent or drain-back holes
- Improperly torqued fasteners or threads that are dirty or damaged
- Warped flanges or sealing surface
- Scratches, burrs, or other damage to the sealing surface
- A damaged or worn gasket
- Cracking or porosity of the component
- Improper sealant
- Porosity

Seals

- The fluid level or pressure is too high
- Plugged vent or drain-back holes
- Scratches, burrs, nicks, or other damage to the seal bore
- A damaged or worn seal
- Improper installation
- Cracks in the component
- A scratched or nicked shaft surface
- A loose or worn bearing, which causes excess seal wear

Possible Points of Oil Leaks

- Oil may leak from the transmission bottom oil pan or side cover for the following reasons:
  - The attaching bolts are not torqued correctly.
  - The gasket is damaged or improperly installed.
  - The oil pan or the mounting face is not flat.
- Oil may leak from the case for the following reasons:
  - The multi-lip seal on the filler tube is damaged or missing.
  - The filler tube bracket is misaligned.
  - The speed sensor seal is damaged.
  - The manual shaft seal is damaged.
  - The connector fittings on the oil cooler are loose or damaged.
  - The propeller shaft oil seal is worn or damaged.
  - The plug from the line pressure pipe is loose.
  - The casting is porous.
- Oil may leak from the converter end for the following reasons:
  - The converter seal is damaged.
    - The seal lip is cut (check the converter hub for damage).
    - The bushing has been moved forward and is damaged.
    - A garter spring is missing from the seal.
  - The converter is leaking from a weld area.
  - A casting is porous in the case or the pump.
- Fluid may come out from the vent pipe or the fill tube under the following conditions:
  - Overfilled
  - If the fluid appears milky, water or coolant may be in the fluid.
  - The case is porous.
  - The fluid level indicator registers incorrectly.
  - A vent is plugged.
  - The drain back holes are plugged.
  - The oil pump is misaligned to the case gasket, if equipped.

Case Porosity Repair Procedure

1. Shut off the engine and thoroughly clean the area to be repaired with a cleaning solvent. Air dry.

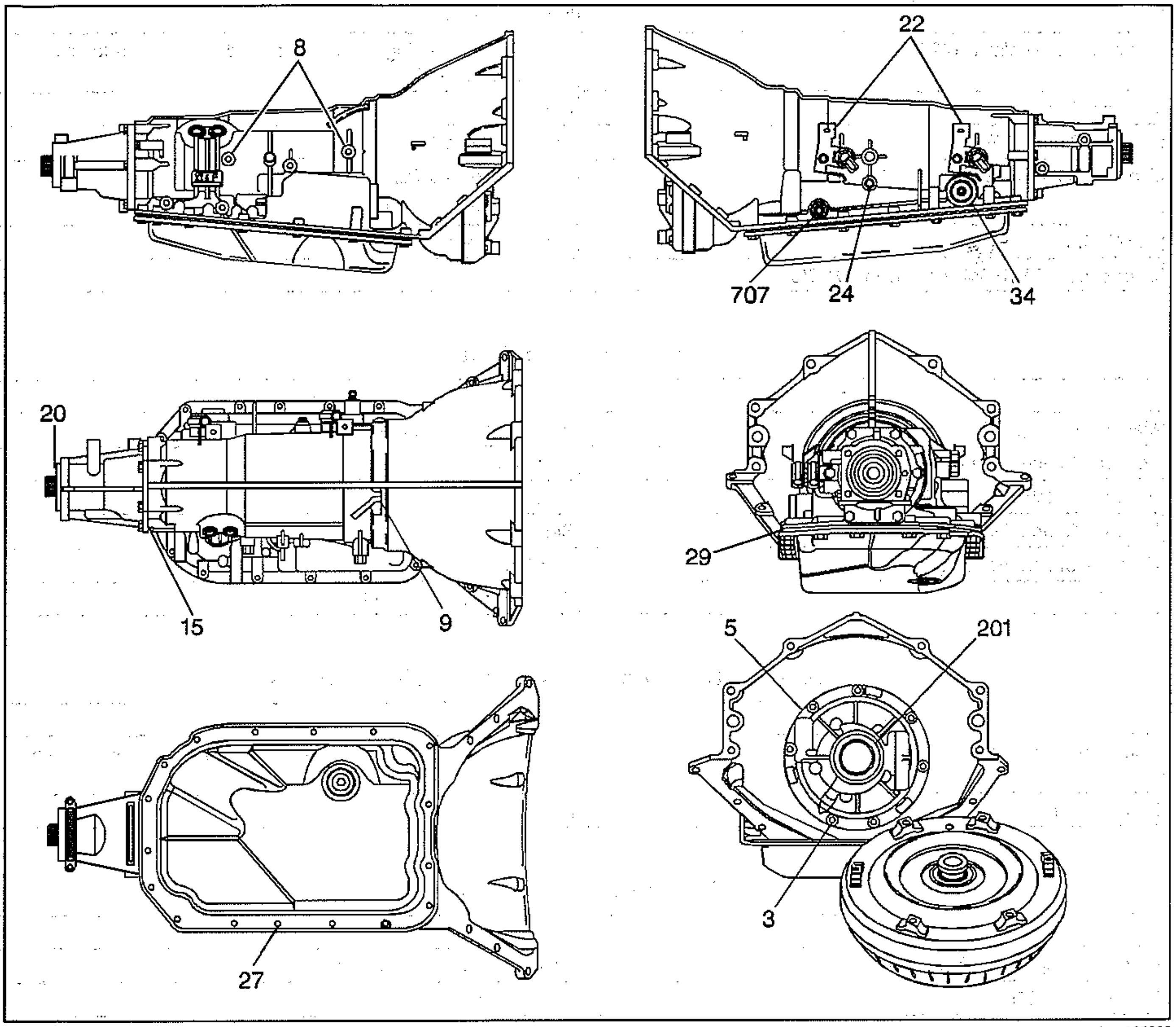
   Caution: Epoxy adhesive may cause skin irritations and eye damage. Read and follow all information on the container label as provided by the manufacturer.
2. Using instructions from the manufacturer, mix a sufficient amount of epoxy, GM P/N 1052533 or equivalent, in order to make the repair.
3. While the transmission case is still hot, apply the epoxy. You can use a clean, dry soldering acid brush to clean the area and also to apply the epoxy cement. Make certain that the area to be repaired is fully covered.
4. Allow the epoxy cement to cure for three hours before starting the engine.
5. Repeat the fluid leak diagnosis procedures.

Electronic Component Malfunctions

Component/System	Can Effect
• Throttle Position Sensor (TP Sensor) • Accelerator Pedal Position Sensor	• Erratic shift pattern • High or low line pressure • Rough engine
Engine Speed Sensor	TCC apply at the wrong time, or no apply
Automatic Transmission Input(Shaft) Speed Sensor Assembly	No TCC Apply
Automatic Transmission Output(Shaft) Speed Sensor Assembly (Vehicle Speed Sensor)	• Erratic shift pattern • TCC apply at the wrong time
Pressure Control Solenoid Valve	• High or low line pressure • Harsh or soft shift quality
Torque Converter Clutch Pulse Width Modulation (TCC PWM) Solenoid Valve	• TCC apply at the wrong time • TCC apply is harsh or soft
Automatic Transmission Fluid Pressure Manual Valve Position Switch Assembly	• TCC will not apply • Will not shift into fourth gear • Harsh shift quality • High line pressure
Automatic Transmission Fluid Temperature Sensor Assembly	TCC control (on or off)
Engine Temperature Sensor	No TCC apply
Shift Solenoid Valves	Erratic gear applications: • Wrong gear • Only two gears • Does not shift
Four Wheel Drive Low Switch	Erratic shift pattern
Cruise Engaged	• Delays in shifting into fourth gear • Delays in applying TCC
Torque Converter Clutch (TCC) Brake Switch	TCC does not apply

Transmission Component Fluid Leak Diagnosis

Possible Fluid Leak Points



Legend

- (3) Bolt and Seal Assembly, Pump to Case
- (5) Seal, Oil Pump to Case
- (8) Connector, Transmission Oil Cooler Pipe
- (9) Pipe, Vent
- (15) Seal, Extension to Case
- (20) Seal, Prop Shaft Front Slip Yoke Oil
- (22) Sensor Assembly, A/T Input Speed and Output Speed
- (24) Plug, Oil Test Hole
- (27) Bolt, Oil Pan to Case
- (29) Seal, Transmission Oil Pan
- (34) Harness Assembly, Electrical Wiring
- (201) Seal, Torque Converter Oil
- (707) Seal Assembly, Manual Shaft

High Line Pressure

Checks	Cause
Pressure Regulator Valve (231)	Valve is stuck at high torque signal due to an undersized bore or sediment
Reverse Boost Valve (228)	Valve is stuck at high torque signal due to an undersized bore or sediment
Retainer Pin (211)	Pin is broken
Orificed Plug (210)	Plug is blocked
Pressure Control Solenoid Valve (320)	• Valve has failed Off • Loose connector
VCM/PCM	Loose connector
Check the VCM/PCM for current DTC(s)	

Forward Motion in Neutral

Checks	Cause
Manual Valve (319)	Valve is mispositioned or stuck
Forward Clutch Springs (607)	Jammed
Forward clutch Piston (606)	Jammed
Forward Clutch Plates (610, 611)	Seized or jammed
Forward Clutch Housing (602)	The hole is plugged
Hub (613)	The holes are plugged

Inadequate Lubrication at Low Line or Heavy Loads

Checks	Cause
Converter Limit Valve (214)	Valve is stuck closed by sediment or by a collapsed valve bore
Retainer Pin (211)	Broken

Inadequate Lubrication

Checks	Cause
Pressure Regulator Valve (231)	Valve is stuck in a high demand position
Pump Body (206)	Cross channel leakage
Gasket (6)	Damaged
Oil Transfer Hole Cup Plug	Plug is leaking

Engine Stall in Neutral

Checks	Cause
TCC System	TCC is stuck On or TCC is dragging

Loss of Power

Checks	Cause
Transmission	• Low oil • Not starting in first gear
TCC System	TCC is stuck On, or TCC is dragging
Torque Converter (1)	Debris is in the converter
Stator Shaft (235)	Shaft is broken
Turbine Shaft (502)	The bushing is worn
Main Shaft (662)	The bushing is worn
Output Shaft (671)	The bushing is worn
Bearing (668)	The bearing is worn

No Torque in Reverse and Third

Checks	Cause
Forward Clutch Hub (613)	The hub is broken
Snap Ring (616a)	The ring is not seated
Forward Clutch Housing (602)	The housing is broken

Transmission Overheats

Checks	Cause
TCC Circuit	Blockage during apply or release
TCC Valve Spring (224)	The spring is broken
Pump Cover (206)	Cross channel leakage
Pressure Regulator Valve (231)	The valve is stuck in a high demand position
Oil Cooler	The cooler or the cooler lines are blocked
Gasket (6)	The gasket is damaged
Retainer Pin (211)	The pin is broken
Turbine Shaft O-ring (2)	The O-ring is damaged
Turbine Shaft Seals (503)	The seals are damaged
Stator Shaft Bushing (233)	The bushing is worn or damaged
Oil Transfer Hole Cup Plug	The plug is leaking
Fluid	The fluid level is low
Radiator	Air flow is restricted

Transmission Overheats at WOT

Checks	Cause
Converter Limit Valve Bypass Orificed Cup Plug	The plug is blocked, therefore the converter limit valve is stuck closed

Low Line Pressure

Checks	Cause
Pump (203)	Cross channel air leak at body to cover, or cross channel air leak at body to case gasket
Pressure Regulator Valve (231)	Valve is stuck at a low torque signal, due to an undersized bore or to sediment.
Reverse Boost Valve (228)	Valve is stuck at a low torque signal, due to an undersized bore or to sediment.
Pump Valve Bores	Excessive valve clearance due to wear.
Spring (230)	The spring is broken
Retainer Pin (211)	The pin is broken
Valve Body (301)	• Cross channel leaks • Cross valve land leaks
Gasket/Spacer Plate	Plate is damaged or missing
Pressure Control Solenoid Valve (320)	• Valve is stuck On • Broken clip causes leakage • Wire is pinched to ground • A screen is missing
VCM/PCM	Failed
Check the VCM/PCM for current DTC(s)	

Engine Starts in Gear

Checks	Cause
Manual Valve (319)	• Valve is not engaged to the detent lever • Valve is stuck in the wrong position
Neutral Safety Switch	The switch is not working

Shift Lever Indicates Wrong Gear

Checks	Cause
Manual Valve (319)	Not engaged to detent lever
Detent Pin (711)	Misaligned or broken
Manual Shaft (708)	The flats are not parallel
Indicator Linkage	Misadjusted

No Gear Selection

Checks	Cause
Detent Lever (711)	The nut is loose or missing
Manual Valve (319)	The valve is stuck
Spacer Plate (46)	The holes are blocked
Valve Body/Case (301, 7)	The channels are blocked

Loss of Drive

Checks	Cause
Torque Converter (1)	• Broken lug or failed lug welds • Sheared lug bolts • Worn turbine shaft splines • Low oil • Pump hub is cracked, scored, or broken • Internal failure • Failure of the closure weld • The cover is cracked at a lug weld
Pump (203)	• The pump is seized • The pump gears are broken
Case Extension Seal (20)	The seal is missing, damaged, or displaced
Orifice Plate	The plate is missing or leaking around the edge
Gasket (6)	Damaged
Oil Transfer Hole Cup Plug	The plug is leaking or missing
Seals (503)	The seals are damaged or missing
Housing (504)	The housing is broken
Roller Clutch (512)	The clutch is worn, broken, or locked
Carrier (514)	Broken
Pinions (518)	• Broken free from the pilot • Spalled pins or pinions • Plugged pinion pin holes • Worn thrust washers • Lack of lube
Bearing (513)	The bearing is broken
Roller Clutch (644)	• Clutch is worn, broken, or locked • Lack of lube
Turbine Shaft (502)	The shaft or the splines are broken
(Forward Clutch Components)	
Seals (603, 604, 605)	Nicked or cut
Checkball	Leaking
Piston (606)	Cracked or jammed
Housing (602)	Cracked
Friction Plates (611)	The plates are burned or the splines are worn
Reaction Plates (610)	The plates are worn or the splines are worn
Spring Assembly (607)	Jammed
Driving Hub (615)	Broken
Retainer Ring (616)	The ring is not seated
Driven Hub (613)	The gear teeth are worn
(Rear Gear set)	
Pinions (655)	Broken or spalled
Pinion Pins (656)	Broken or spalled
Needle Bearings (654)	Broken or spalled
Sun Gear (649)	Broken or spalled

Loss of Drive (cont'd)

Checks	Cause
Pinion Thrust Washers (652)	Worn
Rear Internal Gear (666)	Broken or spalled
Front Internal Gear (661)	Broken or spalled
Turbine Shaft Ball Seal	Ineffective
Main Shaft (662)	The shaft or the splines are broken
Fluid Pressure	Too low

No Park

Checks	Cause
Detent Lever (711)	• Incomplete travel • Lever is misaligned
Actuator Rod (710)	The rabbit ears are bent, disconnected, or broken
Detent Spring (41)	Mispositioned
Parking Pawl (703)	Broken
Pawl Shaft (702)	Broken
Park Bracket (713)	Bent or broken
Bolt (714)	Loose or broken
Front Internal Gear (661)	The splines are broken
Manual Shaft (708)	The flats are not parallel

Remains in Park

Checks	Cause
Actuator Rod Assembly (710)	Stretched

Difficult to Shift Out of Park

Checks	Cause
Pawl Return Spring (705)	Weak or broken
Vehicle	Parked on a hill

Does Not Stay in Park

Checks	Cause
Detent Spring (41)	Weak or broken

No Reverse

Checks	Cause
Case (7)	The rear band anchor pin is broken or the pin is not positioned
Center Support (640)	Leaking at the case, or the support is broken
Center Support Seal (639)	Leaking
Center Support Bolt (25)	• The bolt is loose or broken • The feed hole is blocked

No Reverse (cont'd)

Checks	Cause
Rear Band (657)	Broken, worn, or not anchored
Rear Band Apply Pin (73)	The pin is too short, or the pin is binding in the case
Piston (65)	Binding in the case
Seal (66)	Leaking, damaged, or worn
Gasket (63)	Damaged or displaced
Cover (62)	Damaged
Bolts (61)	Broken, loose, or missing
Checkball	Missing
Fluid Pressure	Too low
(Direct Clutch Components)	
Reaction Plates (618)	The splines are worn
Friction Plates (611)	The splines or the friction are worn
Spring Assembly (607)	Jammed
Housing (623)	Cracked
Piston (619)	Leaking
Seal (620, 621, 622)	Leaking
Ball Check	Leaking

No First Gear - D1

Checks	Cause
(Refer to *No First Gear - D4*)	
Housing (504)	Broken
Case (7)	The rear band anchor pin is broken or the pin is not positioned
Detent Lever (711)	Misaligned

No Second Gear - D1

Checks	Cause
(Refer to *No Second Gear - D4*)	

No Overrun Braking - D1

Checks	Cause
(Refer to *No Overrun Braking - D3*)	
Check the VCM/PCM for current DTC(s)	
Automatic Transmission Fluid Pressure Manual Valve Position Switch Assembly	• Pinched wire • Loose connector • Loose bolt causing leakage • No signal to the VCM/PCM

No Engine Braking - D1

Checks	Cause
Rear Band (657)	Damaged, worn, or not anchored
Rear Band Apply Pin (73)	The pin is too short or is binding in the case
Piston (65)	The piston is binding in the case
Seal (66)	Worn or damaged
Cover (62)	Damaged
Gasket (63)	Damaged or missing
Bolt (61)	Loose, broken, or missing
Checkball	• Missing • Damaged • Not sealing • Incorrect size
Fluid Pressure	Too low
Output Shaft (671)	The shaft or the splines are broken
Main Shaft (662)	The shaft or the splines are broken
Thrust Washer (218)	Worn or damaged
Bushing (234)	Worn or damaged

No First Gear - D2

Checks	Cause
(Refer to *No First Gear - D4*)	
Front Band (628)	Stuck On

No Second Gear - D2

Checks	Cause
(Refer to *No Second Gear - D4*)	
Case (7)	• The front band anchor pin is broken or the pin is not properly positioned • The intermediate clutch feed cup plug is missing or the plug is not seated.

No Overrun Braking - D2

Checks	Cause
(Refer to *No Overrun Braking - D3*)	

No Engine Braking - D2

Checks	Cause
Bushing (234)	Worn or damaged
Thrust Washer (218)	Worn or damaged
Rear Gear set	Spalled or broken
Reaction Drum and Carrier (651)	Broken
Main Shaft (662)	The shaft or the splines are broken
Output Shaft (671)	The shaft or the splines are broken
Sun Gear Shaft (649)	The shaft or the splines are broken

No Second Gear Engine Braking - D2

Checks	Cause
Fluid Pressure	Too low
Direct Clutch Housing (623)	• The internal diameter of the splines are worn • The outer band surface is worn
Front Band (628)	Broken, worn, or not anchored
Apply Pin (55)	Too short or binding in the case
Apply Clip (56)	Broken or missing
Piston (58)	Cracked, broken, or binding
Seal (57)	Damaged or worn
Case (7)	Cracked or damaged
Spacer Plate (46)	Damaged
Gasket (48)	Torn or pinched
Valve Body Bolts (35)	Loose, broken, or missing

No First Gear - D3

Checks	Cause
(Refer to *No First Gear - D4*)	
Front Band (628)	Stuck On

No Second Gear - D3

Checks	Cause
(Refer to *No Second Gear - D4*)	

No Third Gear - D3

Checks	Cause
(Refer to *No Third Gear - D4*)	
Front Band (628)	Stuck On

No Overrun Braking - D3

Checks	Cause
Clutch Plates (508, 509)	The splines or the plate are worn
Thrust Washer (218)	Damaged or worn
Output Shaft (671)	The shaft or the splines are broken
Seals	Cut or nicked
Checkball	Leaking
Piston (505)	Jammed, cracked, or damaged
Housing (504)	Cracked or damaged
Sun Gear (650)	Worn
Spring Assembly (506)	Jammed
Oil Feed	Plugged

No Engine Braking - D3

Checks	Cause
Main Shaft (662)	The shaft or the splines are broken
Bushing (234)	Damaged or worn

No First Gear - D4

Checks	Cause
Low Roller Assembly (644)	• Assembly is not attached • Broken race
Center Support (640)	Broken support or broken splines
Case (7)	Check damage near the center support
Retainer Rings (633, 643)	Rings are not seated

First Gear Only - D4

Checks	Cause
Sun Gear Shaft (649)	Broken shaft or broken splines
A/T Output Speed Sensor Assembly (22)	Reads zero
A/T Input Speed Sensor Assembly (22)	Reads zero

First and Second Gear Only - D4

Checks	Cause
2–3 Solenoid (311)	• Stuck Off • Loose connector • No voltage to the solenoid • Solenoid O-ring failure • No PCM signal to the solenoid
2–3 Shift Valve (312)	Stuck
Quad Driver Module	Failed
Check the VCM/PCM for current DTCs	

Second Gear Only - D4

Checks	Cause
Check the VCM/PCM for current DTCs	

Second and Third Gear Only - D4

Checks	Cause
1–2 Solenoid (313)	• Stuck Off • Loose connector • No voltage to the solenoid • Solenoid O-ring failure • No PCM signal to the solenoid
1–2 Shift Valve (314)	Stuck
Quad Driver Module	Failed
Check the VCM/PCM for current DTCs	

First and Fourth Gear Only - D4

Checks	Cause
1–2 Solenoid (313)	• Stuck Off • Pinched wire to ground
1–2 Shift Valve (314)	Stuck
Quad Driver Module	Failed
Check the VCM/PCM for current DTCs	

Third and Fourth Gear Only - D4

Checks	Cause
2–3 Solenoid (311)	• Stuck Off • Pinched wire to ground
2–3 Shift Valve (312)	Stuck
Quad Driver Module	Failed
Check the VCM/PCM for current DTCs	

No Second Gear - D4

Checks	Cause
Case (7)	The intermediate clutch feed cup plug is missing or the cup plug is not seated
Intermediate Clutch Components	
Backing Plate (630)	Broken
Retainer Ring (633)	Missing or not seated
Friction Plates (631)	Worn
Outer Race (625)	Worn Splines
Center Support (640)	The support is cracked or the feed hole is blocked
Center Support Bolt (25)	• The bolt is broken or loose • The oil hole is blocked
Seals (637, 638)	Worn
Piston (636)	Cracked or jammed
Springs (635)	Jammed
Transmission Fluid	• Improper fluid • Additive package
Intermediate Sprag (624)	• The outer race splines are worn • The outer race is broken • The splines or the inner race is worn
Direct Clutch Housing (623)	Broken
Retainer Ring (627)	Missing or not seated

No Third Gear - D4

Checks	Cause
(Direct Clutch Components)	
Seal (620, 621, 622)	Leaking
Ball Check	Leaking
Piston (619)	Cracked or jammed
Housing (623)	Cracked

No Third Gear - D4 (cont'd)

Checks	Cause
Reaction Plates (618)	Worn splines
Friction Plates (611)	Worn splines or worn friction
Spring Assembly (607)	Jammed
Center Support Seal (639)	The seal is leaking at the case
Center Support (640)	The support is broken or leaking at the case
Center Support Bolt (25)	• Loose or broken • Blocked hole
2–3 Solenoid (311)	• Stuck Off • Pinched wire • O-ring failure • No voltage to the solenoid
VCM/PCM	No signal to the solenoid
2–3 Shift Valve (312)	Stuck
Quad Driver Module	Failed
Check the VCM/PCM for current DTCs	

No Fourth Gear - D4

Checks	Cause
(Fourth Clutch Components)	
Seals (527, 631)	Nicked or cut
Cup Plug (530)	Missing
Bolt (26)	Loose, broken, or missing
Piston (528)	Jammed
Spring Assembly	Jammed
Retainer Ring (523)	Not seated
Friction Plates (525)	Worn or burned
Reaction Plates (526)	Worn splices
Housing (529)	Damaged or cracked
(Overrun Clutch Components)	
Housing (504)	Broken
Reaction Plates (508)	Worn splines
Sun Gear (650)	Worn
2–3 Solenoid (311)	• Stuck Off • Pinched wire • O-ring failure • No voltage to the solenoid
VCM/PCM	No signal to the solenoid
2–3 Shift Valve (312)	Stuck
Quad Driver Module	Failed
Check the VCM/PCM for current DTCs	

No TCC Apply

Checks	Cause
TCC Shift Solenoid Valve (323)	• Stuck Off • O-ring failed • No voltage to the solenoid • Poor connection
Quad Driver Module	Failed
VCM/PCM	No signal to the solenoid
Brake Switch	• The contact is corroded • Poor connection • Pinched wire • Misadjusted • No supply voltage
TCC Valve (223)	The valve is stuck Off due to sediment or to an undersized bore
Retainer Pin (211)	Broken
Torque Converter (1)	Ballooning
Turbine Shaft (502)	Plugged oil holes
Turbine Shaft Seals (501)	Ineffective
Pump Body Bushing (202)	Worn
O-ring (2)	Heat set
Oil Transfer Hole Cup Plug	Leaking
Regulated Apply Valve (324)	Stuck
TCC Valve Release Exhaust Orificed Cup Plug	Blocked
Check VCM/PCM for the current DTCs	
(Refer to *Incorrect TCC Apply or Release*)	

Soft TCC Apply

Checks	Cause
Turbine Shaft Seals (501)	Ineffective
Pump Body Bushing (202)	Worn
O-ring (2)	Heat set
Oil Transfer Hole Cup Plug	Leaking
TCC Solenoid (323)	Malfunction
Fluid	Low pressure

Slipping TCC

Checks	Cause
TCC Valve Release Exhaust Orificed Cup Plug	Blocked
Turbine Shaft Seal	Cut

TCC Stuck On

Checks	Cause
Gasket (6)	Damaged
TCC Shift Solenoid Valve (323)	• Stuck On • Pinched wire to ground

TCC Stuck On (cont'd)

Checks	Cause
TCC Apply Valve (324)	Stuck
Quad Driver Module	Failed
Check VCM/PCM for current DTCs	
(Refer to *Incorrect TCC Apply or Release*)	

Incorrect TCC Apply or Release

Checks	Cause
A/T Output(Shaft) Speed Sensor Assembly (22)	• Poor connection • Pinched wire • A broken coil wire • Incorrect air gap • Inadequate signal
Throttle Position Sensor	• Poor connection • Pinched wire • Incorrect resistance
VCM/PCM	Failed
Automatic Transmission Fluid Pressure Manual Valve Position Switch (40)	• Poor Connection • No signal to the VCM/PCM • Pinched wire
A/T Fluid Temperature Sensor Assembly (332)	• Poor Connection • No signal to the VCM/PCM • Incorrect Resistance • Pinched wire
Engine Coolant (Gas only)	No signal to the VCM/PCM
A/T Fluid Temperature Sensor Assembly (Diesel only)	No signal to the PCM
Brake Switch	• Poor connection • Pinched wire • No voltage supply • Misadjusted
Engine Ignition Module	Loss of signal or intermittent
Engine Tachometer (Diesel only)	Loss of signal or intermittent
Check the VCM/PCM for current DTCs	
(only 2WD)	
Digital Ratio Adapter (DRAC)	• Malfunction • Incorrect

Converter Ballooning

Checks	Cause
Converter Limit Valve (214)	Stuck open due to sediment or undersized bore
At High Speeds: Converter Limit Valve Feedback Orificed Cup Plug	Blocked

No Torque Multiplication

Checks	Cause
Stator Shaft (235)	Broken or detached from the pump cover

Fluid Foaming

Checks	Cause
Fluid	• Contaminated antifreeze • Overfilled transmission
Engine	Overheated
Filter (31)	Cracked or not seated
Seal (32)	Damaged or not seated
Vehicle	Overloaded

Noise

Checks	Cause
Torque Converter (1)	• Loose lug bolts • Out of balance • Internal failure
Transmission/Engine	Misaligned
Case Extension (19)	Output shaft support bushing is worn

Engine Stall

Checks	Cause
Forward Clutch Housing (602)	A seized bearing, if the holes are plugged
(Fourth Clutch Components)	
Plates (525, 526)	Seized or jammed
Piston (528)	Jammed
Spring Assembly (532)	Jammed
(Overrun Clutch Components)	
Plates (508, 509)	Seized or jammed
Piston (505)	Jammed
Spring Assembly (506)	Jammed

Vibration

Checks	Cause
Torque Converter (1)	• Out of balance • Internal failure
Transmission/Engine	Misaligned
Case Extension (19)	Output shaft support bushing is worn
Turbine Shaft (502)	Worn surface of the stator shaft bushing
Main Shaft (662)	Worn Bushing
Output Shaft (671)	Worn Bushing
Bearing (668)	Worn

Oil Out the Vent Tube

Checks	Cause
Pump Cover (206)	Cross channel leakage can pressurize the vent area
Fluid	• Foaming and filling the pump vent ports • Transmission is overfilled
Transmission	Overheated

No Torque in Second Gear

Checks	Cause
Intermediate Sprag (624)	• Worn • Excessive eccentricity • The sprag is rolled over or the sprag is damaged

Second Gear Starts

Checks	Cause
Intermediate Clutch Plates (631, 632)	Seized
Direct Clutch Lube Feed	Blocked
Center Support Springs (635)	Jammed
Center Support Piston (636)	Jammed
1–2 Shift Solenoid Valve (313)	• Stuck Off • O-ring failed • No voltage to the solenoid • Poor connection
VCM/PCM	No VCM/PCM signal to the solenoid
Quad Driver Module	Failed
1–2 Shift Valve (314)	Stuck
Check the VCM/PCM for current DTCs	

Third Gear Starts

Checks	Cause
Forward Clutch Components	
Driving Hub (615)	Plugged holes
Plates (610, 611)	Seized
Direct Clutch Components	
Plates (611, 618)	Seized
Piston (619)	Jammed
Spring Assembly (607)	Jammed
Lube Feed Hole	Blocked

Fourth Gear Starts

Checks	Cause
2–3 Shift Solenoid Valve	• Stuck On • Pinched wire to ground
Check the VCM/PCM for current DTCs	

Erratic Shift Quality

Checks	Cause
Gasket (6)	Damaged
Oil Transfer Hole Cup Plug	Leaking
Oil Seal Rings (219)	Damaged

Transmission Slips

Checks	Cause
Fluid Level	Too high or too low

Transmission Seized

Checks	Cause
(Rear Lube Components)	
Cooler Circuit	Blocked or leaking
Spacer Plate/Gasket	A hole is missing
Lube Pipe (39)	• Poor seal • Damaged • Missing clips
Valve Body (301)	Loose, broken, or missing bolts
Inline Filter	Blocked
Output Shaft Seal (20)	• Missing or damaged • Lube holes are missing or the holes are blocked.
Main Shaft (662)	Lube holes are missing or the holes are blocked
Center Support (640)	• Lube holes are missing or the holes are blocked • Not held
Apply Pin (55)	• Too long • Binding in the case
Piston (58)	Binding in the case
Snap Ring (642)	Not seated.
Sun Gear Shaft (649)	• Bearing surface is worn • Blocked lube hole
Rear Gear set	The bearing surface is worn
Main Shaft (662)	The lube holes are plugged
(In 2nd, 3rd, and 4th)	
Rear Band (657)	Locked On
Rear Servo Pin (73)	Too long or binding in the case
Piston (65)	Binding in the case

Case Extension Bearing/Seal Failed

Checks	Cause
Orifice Plate	The hole is blocked or the hole is missing
Case Extension (19)	The lube passages are blocked or missing

Inaccurate Shift Points

Checks	Cause
A/T Output(Shaft) Speed Sensor Assembly (22)	• Pinched or broken wire • Loose connector • Incorrect air gap • Inadequate signal • Damaged coil • Damaged rotor teeth • Loose connection
Throttle Position Sensor	• Pinched or damaged wire • Incorrect resistance • Loose connector • VCM/PCM malfunction
A/T Fluid Pressure Manual Valve Position Switch Assembly (40)	• Loose connector • Loose bolts causing leakage • A pinched wire • No signal to the PCM/VCM
Axle Ratio	Ratio is incorrect or ratio has been changed from its original value
Tire Size	Tire size is incorrect or the size has been changed from its original value
Check VCM/PCM for current DTCs	
(only 2WD)	
Digital Ratio Adapter (DRAC)	• Incorrect • Malfunction

Harsh Shifts

Checks	Cause
Line Pressure	• Too high • Too low
Pressure Control Solenoid Valve (320)	• Failed Off • Loose connector
VCM/PCM	Loose connector
Accumulator Piston	• Leaking • Stuck
Accumulator Spring	Incorrect
Checkballs	Missing
Calibration PROM	Incorrect
Check the VCM/PCM for current DTCs	

Harsh Shift D to R

Checks	Cause
Direct Lube Exhaust	Blocked
Forward Clutch Spring (607)	Not acting
Retainer Ring (616)	Not seated
Checkball	Plugged

Harsh Shift 3 to 4

Checks	Cause
Spring Assembly (532)	Not compressing evenly
Air Bleed	Plugged
Bolt (26)	The oil feed hole is plugged

Harsh Shift 4 to 3

Checks	Cause
Retainer Ring (533)	Not seated
Spring Assembly (532)	Not acting
Bolt (26)	The oil feed hole is plugged
Cup Plug (530)	Plugged
Direct Lube Exhaust	Blocked

Harsh Shift D4 to D3, D2, or D1

Checks	Cause
Spring Assembly (506)	Not functioning
Checkball	Plugged
Snap Ring (511)	Not seated

Soft Shifts

Checks	Cause
Line Pressure	Too low
Pressure Control Solenoid Valve (320)	• Stuck On • A broken clip is causing leakage • Pinched wire to ground
VCM/PCM	Failed
Accumulator Piston	• Leaking • Stuck
Accumulator Spring	Incorrect
Calibration PROM	Incorrect
Check the VCM/PCM for current DTCs	

Soft Shift into R

Checks	Cause
Direct Clutch Oil Feed	Plugged
Direct Lube Exhaust	Blocked

Soft Shift R to D

Checks	Cause
Direct Clutch Spring (607)	Not Acting
Retainer Ring (616)	Not engaged or missing
Ball Check	Plugged

Soft Shift 2 to 1

Checks	Cause
Center Support Springs (635)	Not acting
Retainer Ring (634)	Not seated
Center Support (640)	Blocked air bleed

Soft Shift 2 to 3

Checks	Cause
Direct Clutch Oil Feed	Plugged
Direct Lube Exhaust	Blocked

Soft Shift 3 to 2

Checks	Cause
Direct Spring Assembly (607)	Not acting
Retainer Ring (608)	Not engaged or missing
Ball Check	Plugged

Soft Shift D3 to D2

Checks	Cause
Ball Check	Missing
Orifices	Incorrect sizes

Delayed Shift 1 to 2

Checks	Cause
A/T Output(Shaft) Speed Sensor Assembly (22)	• A pinched or broken wire • A loose connector • An incorrect air gap • An inadequate signal • Coil damage
A/T Input (Shaft) Speed Sensor Assembly (22)	• A pinched or damaged wire • Coil damage • An inadequate signal
A/T Fluid Pressure Manual Valve Position Switch Assembly (40)	• A loose connector • A pinched wire • No signal to the VCM/PCM • Loose bolts causing leakage
Calibration PROM	Incorrect
Check the VCM/PCM for current DTCs	
(only 2WD)	
Digital Ratio Adapter (DRAC)	• Malfunction • Loose connector

No D2 to D1

Checks	Cause
Rear Band (657)	Broken, worn, or not anchored
Detent Lever (711)	Incomplete travel

No D3 to D2

Checks	Cause
Front Band (628)	Broken, worn, or not anchored

Oil Pan Fluid Leak

Checks	Cause
Oil Pan (28)	The pan is damaged or the pan is not flat
Gasket (29)	Damaged
Case (7)	Porosity or cracked
Bolt (27)	• The flange is inside out • High or low torque

Fill Tube Fluid Leak

Checks	Cause
Seal	• Cut or nicked • Missing
Case (7)	Porosity
Fill Tube	• Damaged at the case end • Not seated in the case
Brackets	Out of position, causing tension on the fill tube

Electrical Connector Fluid Leak

Checks	Cause
Electrical Connector	Damaged, or not seated
O-ring Seal	• Cut or nicked • Missing
Case (7)	Porosity or cracked

Cooler Connector Fluid Leaks

Checks	Cause
Cooler Connectors (8)	• Stripped threads • Damaged flare • High or low torque
Case (7)	• Stripped threads • Porosity • Debris in the threads

Case Extension Fluid Leak

Checks	Cause
Case Extension (19)	Porosity or cracked
Case (7)	Porosity or cracked
Seal (15)	• Cut or nicked • Missing
Bolt (21)	• Low torque • Missing

Manual Shaft Fluid Leak

Checks	Cause
Seal (707)	• Cut or nicked • Not seated
Linkage	Misadjusted

Pump Body Seal Fluid Leak

Checks	Cause
Seal (201)	• Cut, nicked, or worn • Missing garter spring
Torque Converter (1)	Damaged hub
Bolt	Low Torque

Vehicle Speed Sensor Fluid Leak

Checks	Cause
Seal	Cut, missing, or nicked
Vehicle Speed Sensor Assembly (22)	• Damaged • Not seated • Damaged bracket
Bolt (23)	• Low torque • Missing • Damaged threads
Case (7)	Porosity or cracked

Output Shaft Seal Fluid Leak

Checks	Cause
Seal (20)	Cut or nicked
Case (7)	Porosity or cracked

Line Pressure Plug Fluid Leak

Checks	Cause
Plug (24)	• Stripped threads • Low or high torque
Case (7)	• Porosity or cracked • Damaged threads

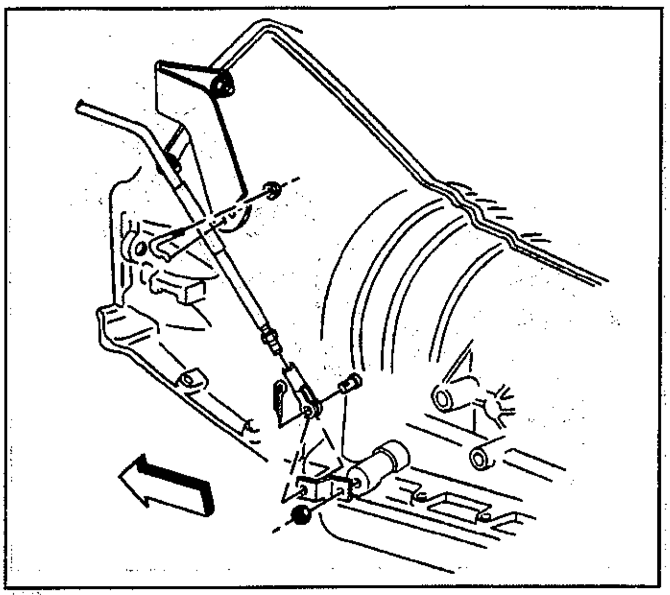
Repair Instructions

Shift Cable Adjustment

1. Apply the parking brake.
2. Place the selector lever in the P (park) position.
3. Place the transmission in the mechanical park position.

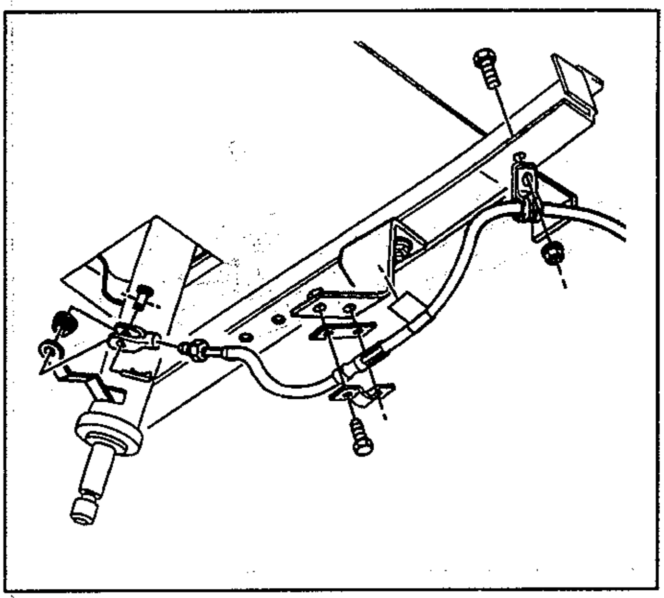
   Important: The transmission control lever can be positioned to mechanical park by rotating the control lever clockwise until it reaches its full clockwise stop position.

   Position each clevis to about the center of travel on the adjusting stud. Make sure that the cotter pin and retainer pin are removed from both ends of the shift cable.



178876

4. Secure the shift cable to the steering column lever with the retainer pin in order to hold the cable to the clevis. Rotate the clevis at the end of the shift cable until the clevis pin hole aligns with the transmission shift lever.
   - Adjust the clevis on the column lever until the transmission end of the shift cable aligns with the shift lever, if the clevis cannot be adjusted to the transmission shift lever,
   - Replace the shift cable if full adjusting travel is reached on both ends of the shift cable and the alignment to the shift lever cannot be made. Refer to *Shift Cable Replacement.*
5. Install the sleeve, cotter pins, and the retainer pins that secure the shift cable ends to the transmission and the steering column lever.
6. Check the alignment of the following:
   - The column selector lever must go into all positions.
   - The engine must start in the P (park) or N (neutral) positions only.
   - Ensure that the parking pawl engages and prevents the vehicle from rolling when the selector lever is positioned to park.
7. Start the engine and check the transmission for normal shift operation.



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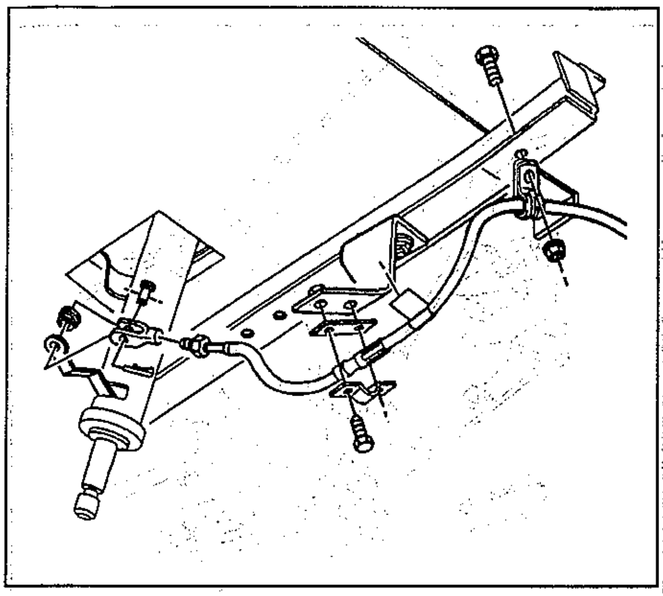

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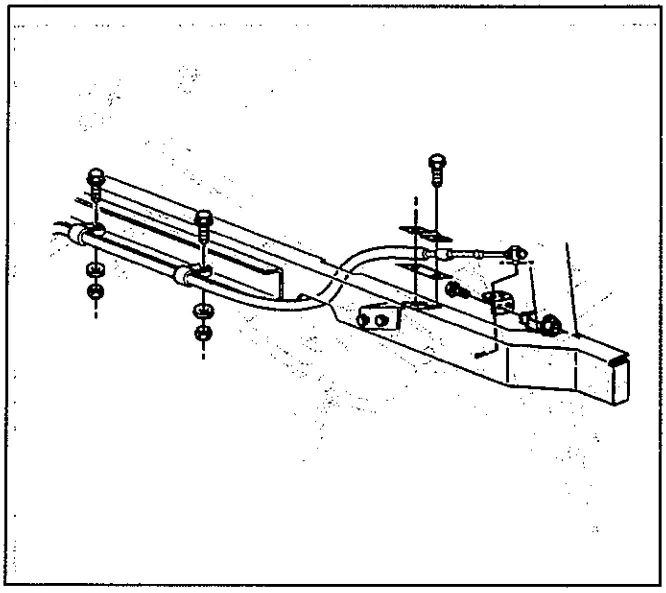
Shift Cable Replacement

Removal Procedure

1. Apply the parking brake.
2. Position the steering column shift lever to park.
3. Remove the following from the steering column lever:
   3.1. The cotter pin
   3.2. The retainer pin
   3.3. The sleeve that secures the shift cable to the steering column lever



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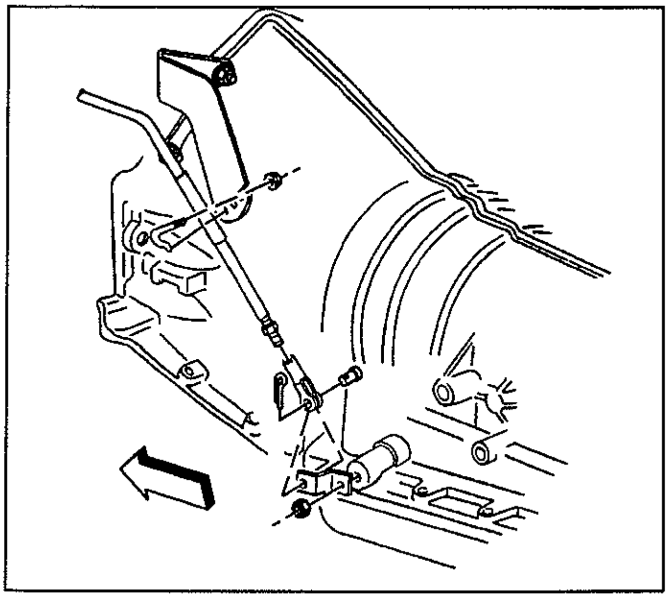
Important: Ensure that the transmission is in the mechanical park position prior to removing the shift cable from the vehicle. The transmission control lever can be positioned to mechanical park by rotating the control lever clockwise until it reaches its full clockwise stop position.

4. Remove the bolts and nuts that secure the shift cable to the frame rail.



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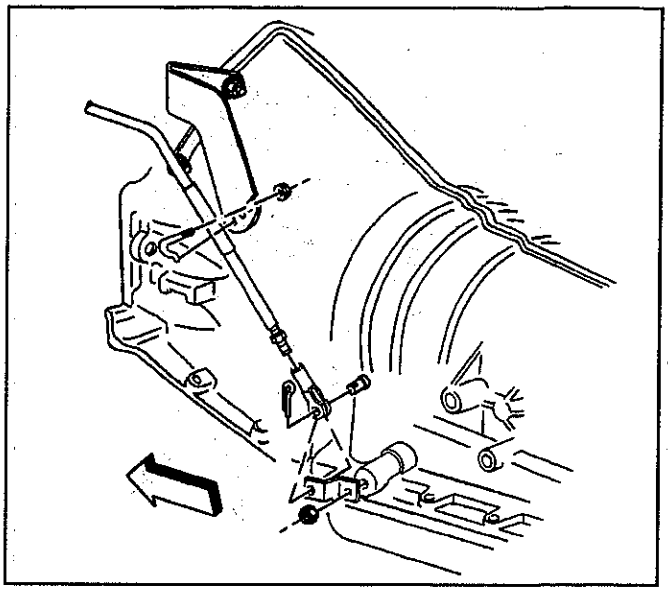
5. Remove the nut that secures the shift cable and clip to the transmission cable bracket.
6. Remove the cotter pin and retainer pin that secures the shift cable to the transmission.
7. Remove the shift cable from the vehicle.

Installation Procedure



178876

Important: Ensure that the column shift lever and the transmission control lever are in the mechanical park position prior to installing the shift cable to the vehicle. The transmission control lever can be positioned to the mechanical park position by rotating the control lever clockwise until it reaches its full clockwise stop position.

1. Install the shift cable to the vehicle.
2. Install the cotter pin and the retaining pin that secures the shift cable to the transmission.

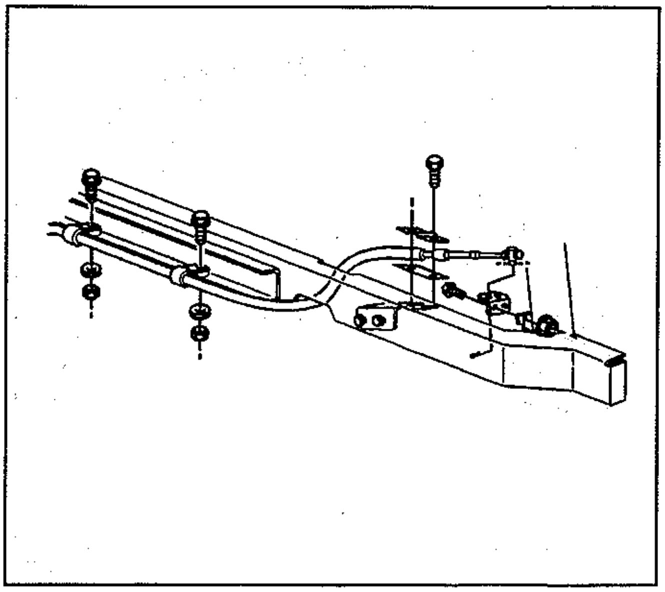
   Notice: Refer to *Fastener Notice* in Cautions and Notices.
3. Install the nut that secures the shift cable and clip to the transmission cable bracket.

   Tighten

   Tighten the nut that secures the shift cable and clip to the transmission cable bracket to 6 N.m 53 lb in).
4. Install the bolts and nuts that secure the shift cable to the frame rail.

   Tighten

   Tighten the bolts and nuts that secure the shift cable to the frame rail to 10 N.m 53 lb in).



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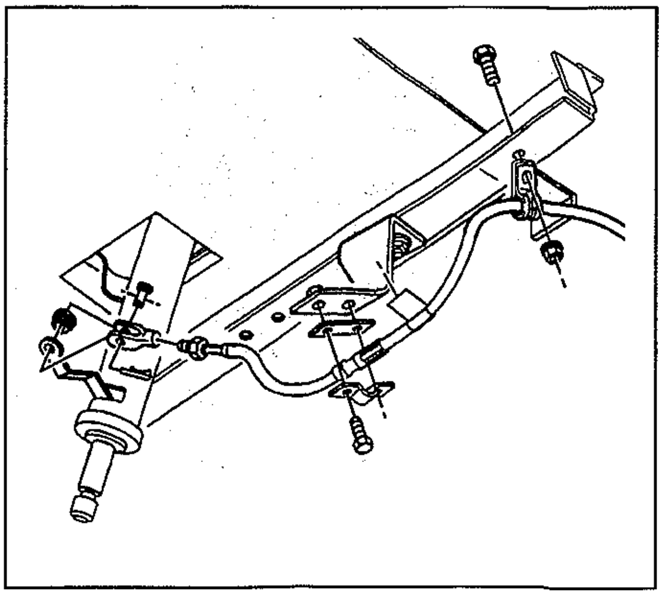
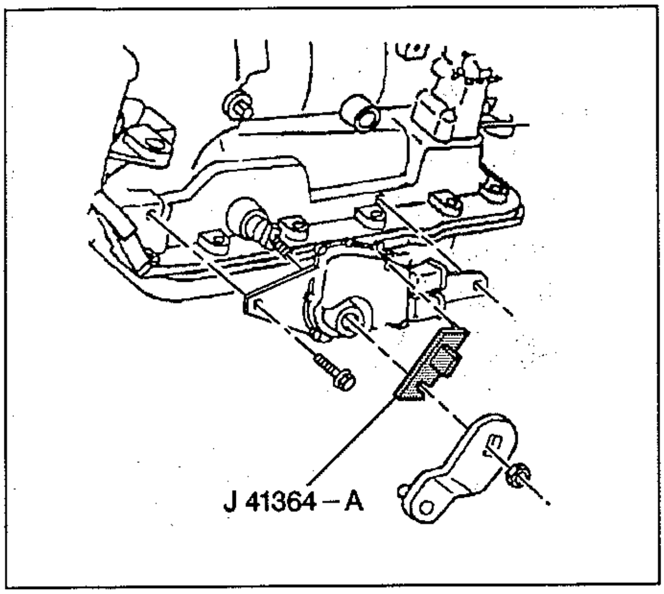


178865

5. Install the following to the steering column lever:
   - The cotter pin
   - The retainer pin
   - The sleeve that secures the shift cable to the steering column lever
6. Adjust the shift cable if required. Refer to *Shift Cable Adjustment.*
7. Start the engine and check the transmission for normal shift operation.

Park/Neutral Position Switch Replacement

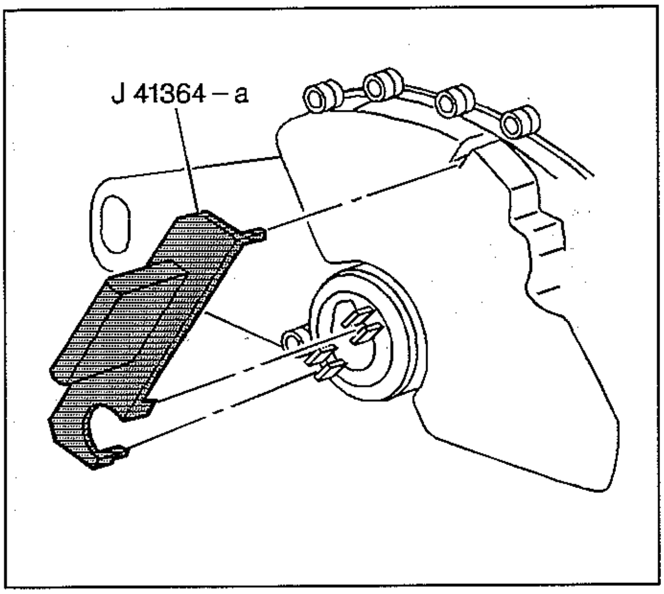
Removal Procedure



32650

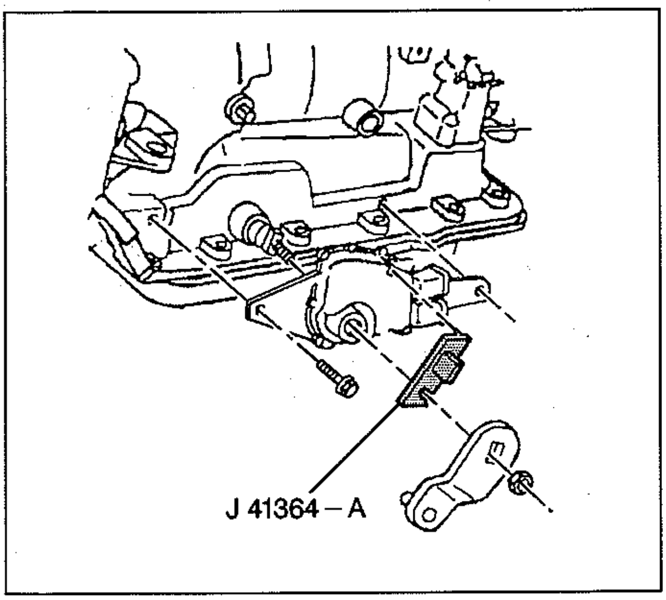
1. Apply the parking brake.
2. Shift the transmission into neutral.
3. Disconnect the negative battery cable.
4. Remove the nut securing the transmission control lever to the manual shaft.
5. Remove the transmission control lever from the manual shaft.
6. Disconnect the wiring harness connector from the park/neutral position switch.
7. Remove two bolts securing the park/neutral position switch to the transmission.
8. Remove the park/neutral position switch from the manual shaft.

Installation Procedure



102270

1. Position the tool J 41364–A onto the park/neutral position switch. Ensure that the two slots on the switch where the manual shaft is inserted are lined up with the lower two tabs on the tool.
2. Rotate the tool until the upper locator pin on the tool is lined up with the slot on the top of the switch.



32650

3. If the park/neutral position switch did not slide off the manual shaft, file the outer edge of the manual shaft in order to remove any burrs.
4. Install the switch to the transmission manual shaft by aligning the switch hub flats with the manual shaft flats.
5. Slide the switch onto the transmission manual shaft until the switch mounting bracket contacts the mounting bosses on the transmission.
6. Install the switch to the transmission with two bolts.

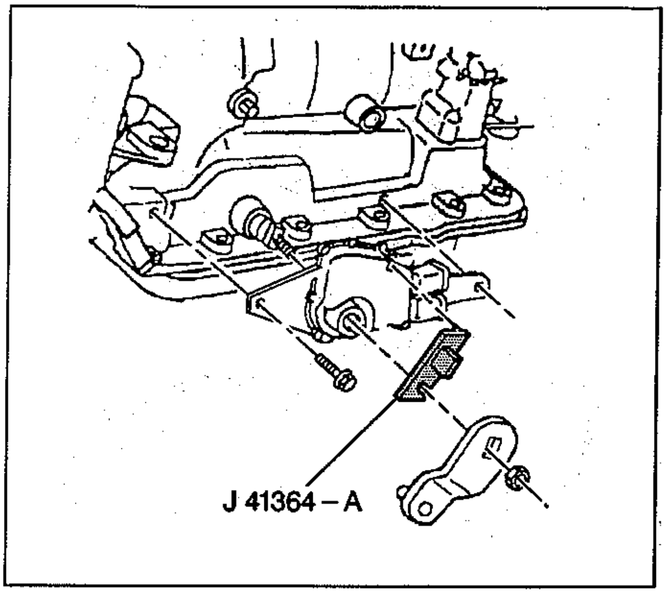
   Tighten

   Tighten the bolts securing the switch to 28 N.m (21 lb ft).
7. Remove J 41364–A from the switch.
8. Install the wiring harness connector to the switch.

9. Install the transmission control lever to the manual shaft with the nut.

   Tighten

   Tighten the control lever nut to 28 N.m (21 lb ft).
10. Lower the vehicle.
11. Connect the negative battery cable.
12. Check the switch for proper operation. The engine must start in the P (Park) or N (Neutral) positions only. If adjustment is required, refer to *Park/Neutral Position Switch Adjustment*

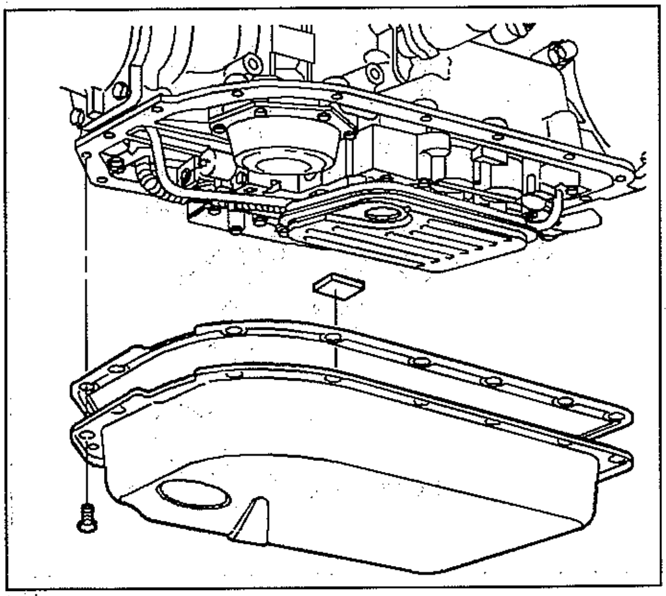


32650

Park/Neutral Position Switch Adjustment

Adjustment Procedure

- Check the switch for proper operation.
- The engine must be in the P (Park) or N (Neutral) positions only. If adjustment is required, loosen the switch retaining bolts and rotate the switch slightly.
- Tighten the bolts and check the switch for proper operation.
- Repeat the switch adjustment procedure until the engine starts when the shift lever is positioned in park and neutral.



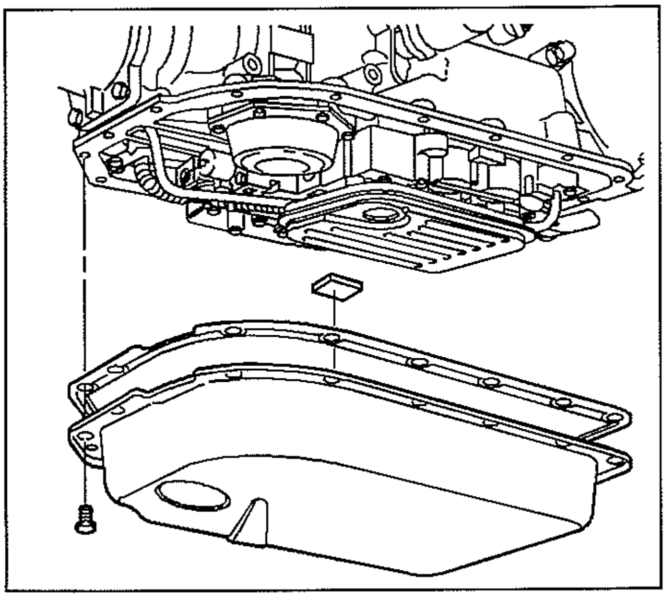
102505

AT Fluid/Filter Changing

Removal Procedure

1. Raise and support the vehicle.
2. Place a drain pan under the transmission oil pan.
3. Remove all of the oil pan bolts except for the rear bolts.
4. Loosen the rear oil pan bolts approximately 4 turns.

   Important: Do not damage the transmission case at the oil pan sealing surfaces.
5. Lightly pry down the front of the oil pan and allow the oil to drain.
6. Remove the remaining oil pan bolts.
7. Remove the oil pan.
8. Remove the gasket.
9. Remove the magnet.
10. Remove the oil filter.
11. Remove the filter neck seal.
12. Remove all of the old gasket material from the gasket surface.
13. Clean the transmission case and the oil pan gasket surfaces with solvent.
14. Air dry the transmission case and surfaces.



102505

Installation Procedure

1. Install the filter neck seal.
2. Install the oil filter.
3. Install the oil pan gasket to the pan.
4. Install the magnet into the bottom of the pan.

   Notice: Refer to *Fastener Notice* in Cautions and Notices.
5. Install the oil pan using all seventeen oil pan bolts.

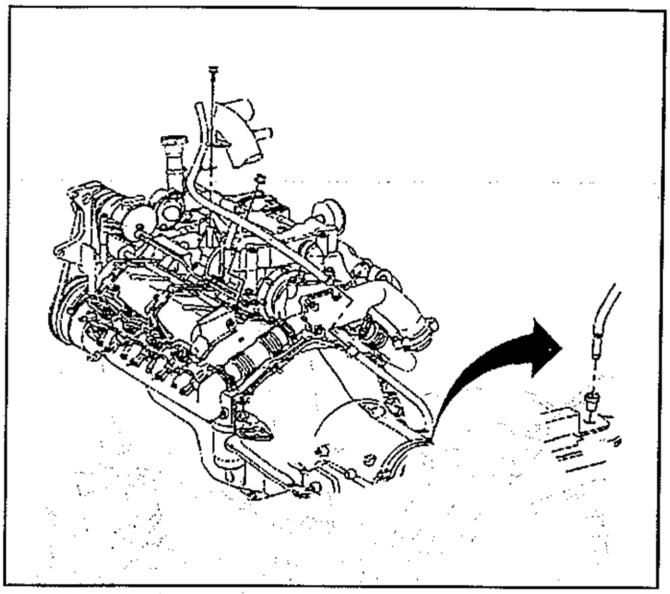
   Tighten

   Tighten the oil pan bolts to 24 N·m (18 lb ft).
6. Install Dexron® III Automatic Transmission Fluid. Refer to *Fluid Capacity Specifications.*
7. Lower the vehicle.
8. Check the oil pan gasket for leaks.

Filler Tube and Seal Replacement

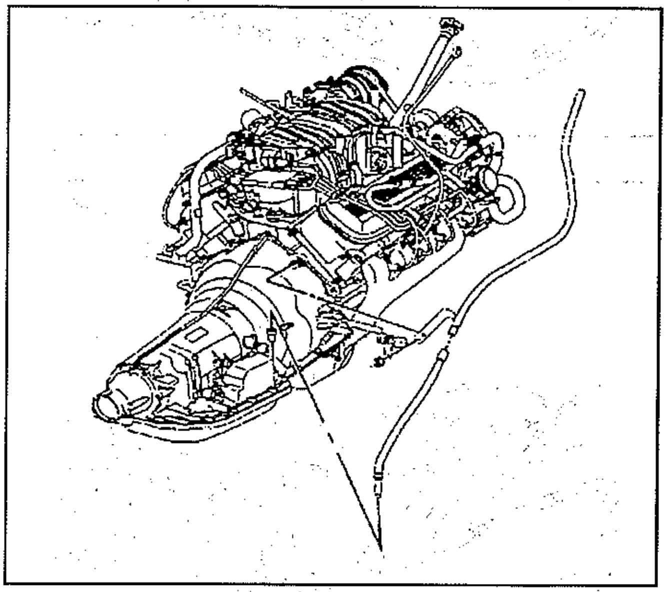
Removal Procedure

1. Remove the engine air cleaner. Refer to Drivability, Emission, and Electrical Diagnosis.
2. Remove the transmission fluid level indicator from the fluid fill tube.
3. 6.5L Diesel Engine: Remove the bolt and the nut securing the transmission fluid fill tube to the engine.



104973

4. 7.4L Engine: Remove the nut securing the transmission fluid fill tube to the transmission stud.
5. Raise the vehicle. Refer to Vehicle Lifting and Jacking in General Information.
6. Support the vehicle with safety stands.
7. Remove any dirt from the transmission where the fluid fill tube enters the transmission case.
8. Remove the transmission fluid fill tube from the transmission. Pull the tube upward from the transmission.
9. Remove the transmission fill tube seal.
10. Clean the metal parts using solvent. Do not allow the solvent to enter the transmission.
11. Air dry the parts.



104974

Installation Procedure

1. Install a new oil level indicator tube seal into the transmission case.
2. Install the bottom of oil level indicator tube into the seal.
3. Remove the safety stands.
4. Lower the vehicle.
5. For the 6.5L diesel engine, install the bolt and the nut securing the oil level indicator tube brackets to the engine.

   Tighten

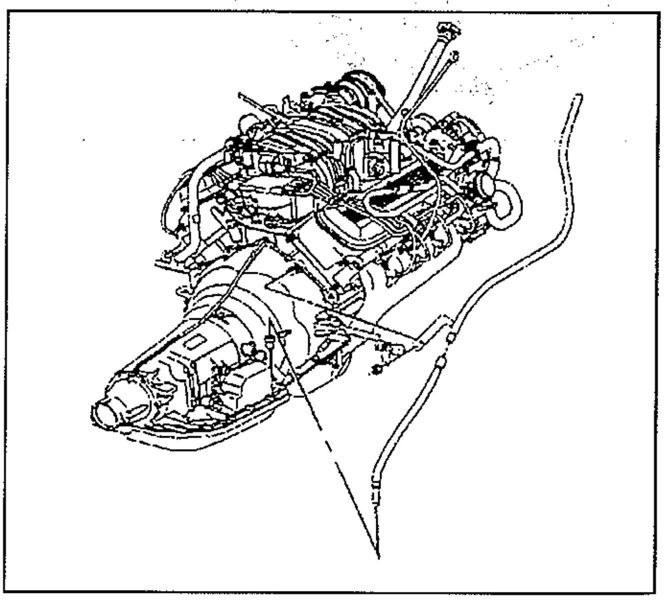
   - Tighten the bolt to 47 N.m (35 lb ft).
   - Tighten the nut to 25 N.m (18 lb ft).

   Notice: Refer to *Fastener Notice*

6. For the 7.4L gasoline engine, install the nut securing the oil level indicator tube to the transmission stud.

   Tighten

   Tighten the nut to 25 N.m (18 lb ft).

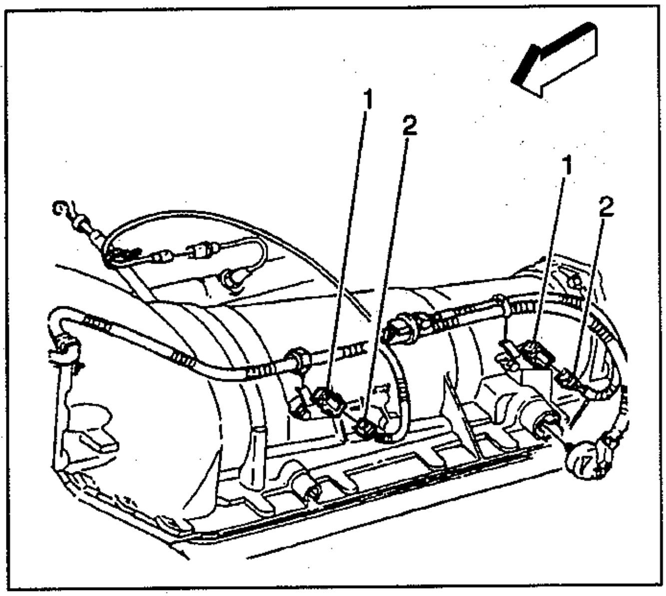


104974

7. Install the air cleaner. Refer to Drivability, Emissions, and Electrical Diagnosis.
8. Install the oil level indicator.
9. Check the transmission fluid level. Refer to *Transmission Fluid Checking Procedure*

Vehicle Speed Sensor Replacement

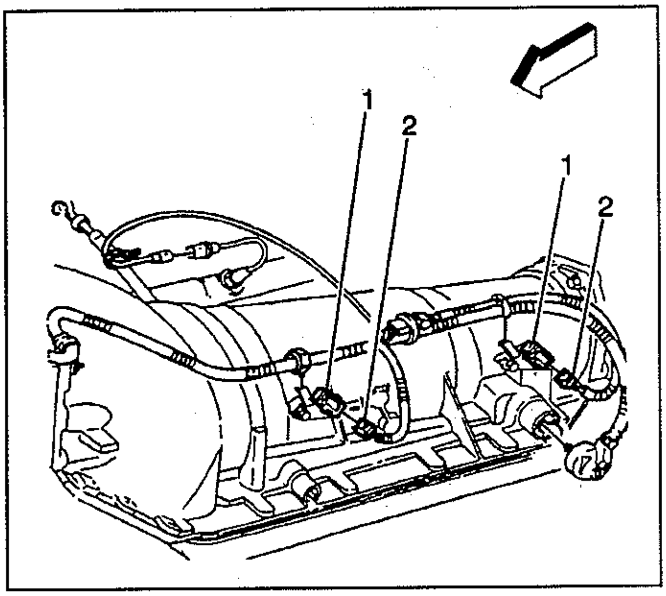
Removal Procedure



178875

1. Disconnect the speed sensor connectors (2).
2. Remove the vehicle speed sensor bolts.
3. Remove the vehicle speed sensors (1) and the bracket assemblies from the case.
4. Inspect the vehicle speed sensor assemblies (1) for any evidence of damage.

Installation Procedure



178875

1. Install the vehicle speed sensors (1) and the bracket assemblies on the case.

   Notice: Refer to *Fastener Notice* in Cautions and Notices.
2. Install the bolts using an 8 mm socket.

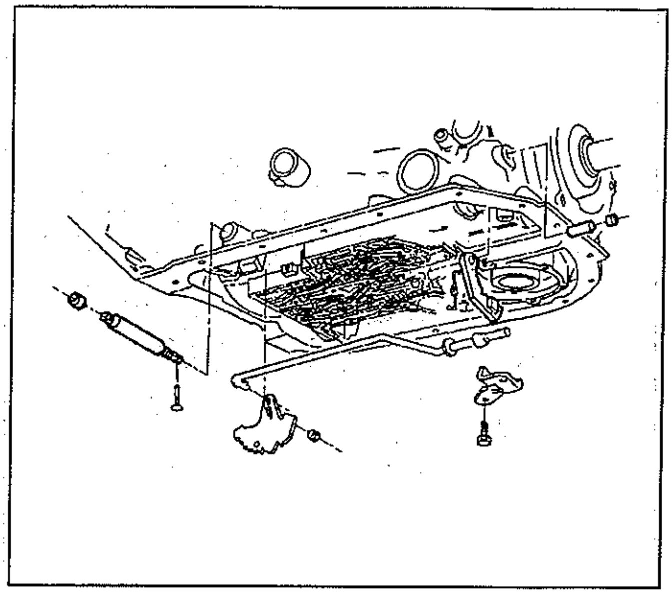
   Tighten

   Tighten the bolts to 11 N.m (96 lb in).
3. Connect the speed sensor connectors (2).

Park Lock Pawl and Actuator Replacement

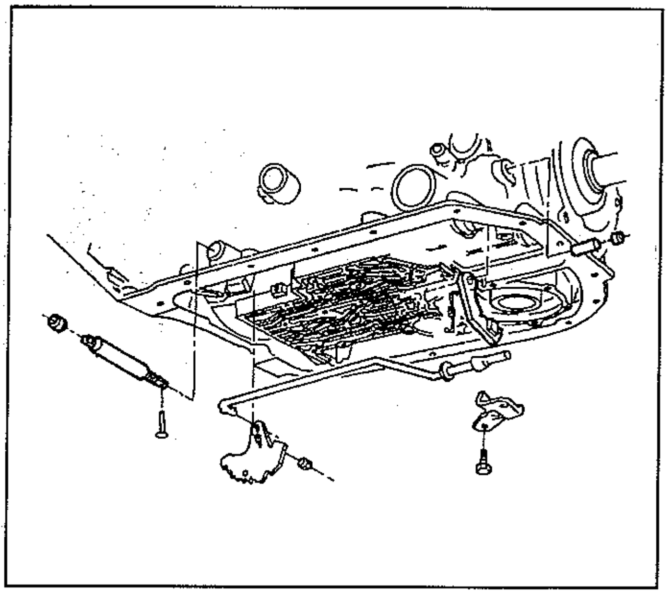
Removal Procedure

1. Remove the oil pan and filter. Refer to *AT Fluid/Filter Changing.*
2. Remove the nut and the pin.
3. Remove the detent lever and the actuator assembly.
4. Remove the bolts and the parking pawl bracket.
5. Remove the parking pawl return spring.



43309

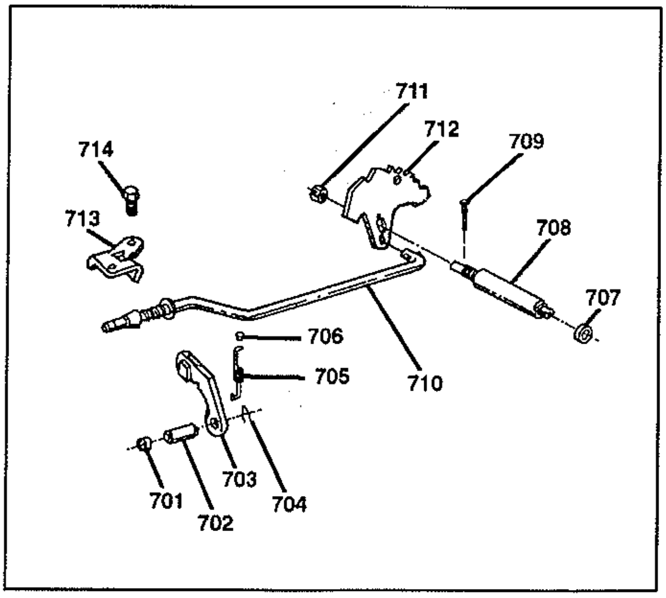
6. Use the modified screw extractor in order to remove the plug.
7. Remove the parking pawl shaft retainer, the shaft and the pawl.
8. Remove the seal and the manual shaft.



43307

Inspection Procedure

- Inspect the following components.
- The parking pawl
- The parking pawl shaft
- The parking pawl return spring
- The manual shaft
- The detent lever
- The actuator
  - Inspect the above components for the following items.
    Damage
  - Damaged flats or threads
  - Distortion
  - Proper fit
  - Cracks
  - Burrs



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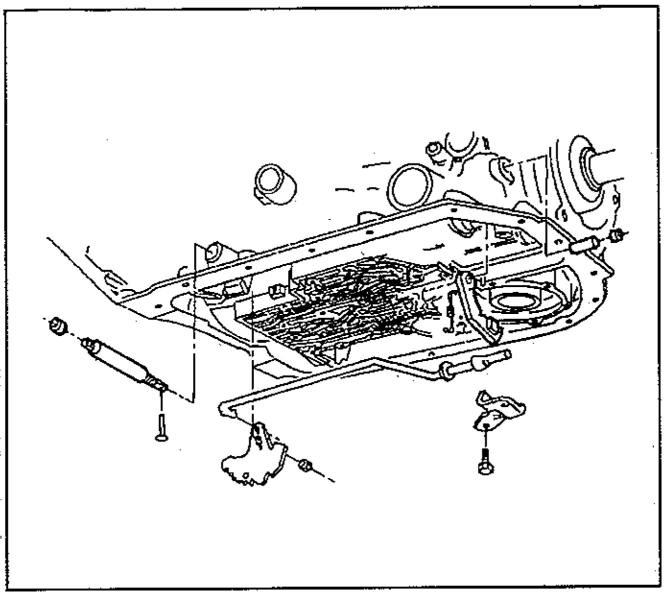
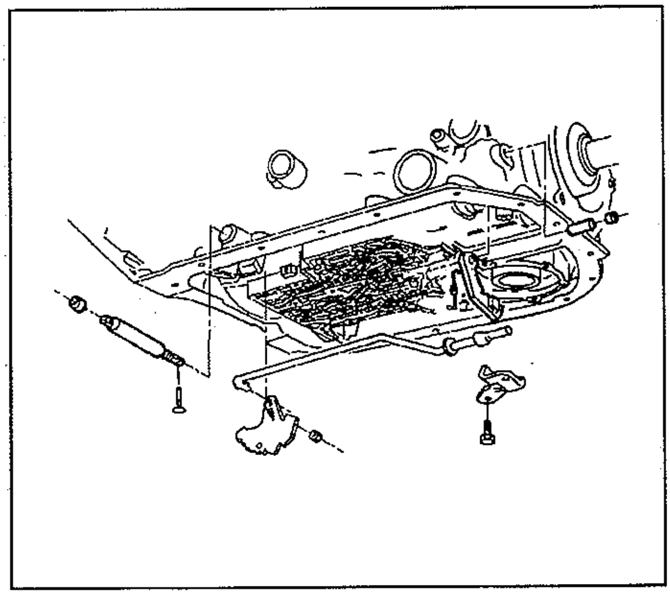


43307

Installation Procedure

1. Install the pawl shaft.
2. Install the parking pawl.
3. Install the plug using a 5/16 inch rod with Loctite® or the equivalent.
4. Install the retainer.



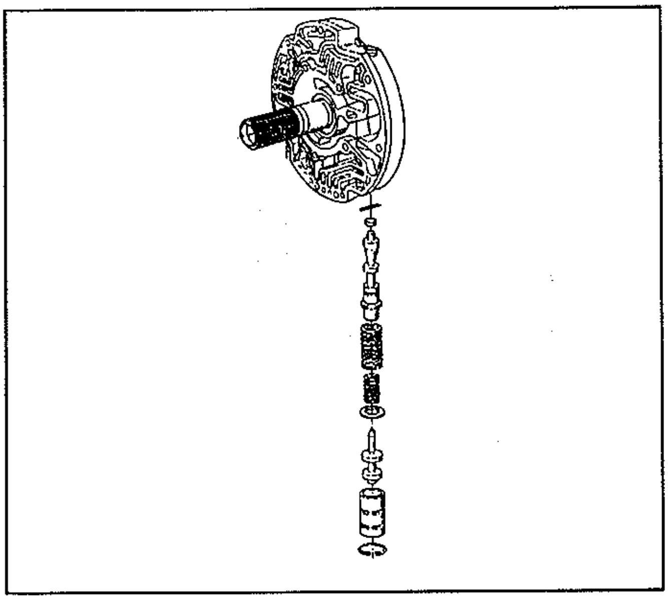
43309

5. Install the pawl return spring.
6. Install the detent lever to the actuator assembly.
7. Install actuator assembly over the parking pawl.
8. Install the seal and the manual shaft.
9. Install the nut on the shaft.
10. Install the roll pin.
11. Install the parking lock bracket with the two bolts.

    Tighten

    Tighten the bolts to 24 N.m (18 lb ft).

    Notice: Refer to *Fastener Notice* in Cautions and Notices.
12. Install the oil pan and filter. Refer to *AT Fluid/Filter Changing.*



43318

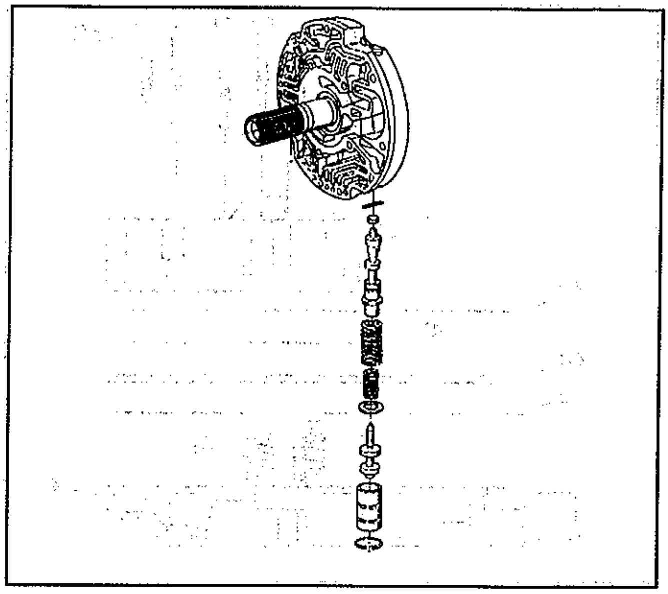
Pressure Regulator Replacement

Removal Procedure

1. Raise the vehicle.
2. Remove the oil pan and the filter. Refer to *AT Fluid/Filter Changing.*
3. Remove the retainer ring.
4. Remove the reverse boost bushing.
5. Remove the reverse boost valve.
6. Remove the pressure regulator spring retainer.
7. Remove the pressure regulator spring.
8. Remove the pressure regulator valve.

Installation Procedure

1. Install the pressure regulator valve.
2. Install the pre-assembled reverse boost valve bushing.
3. Install the new reverse boost valve.
4. Install the new pressure regulator spring retainer.
5. Install an added isolator spring to the pressure regulator spring.
6. Install the pressure regulator spring.
7. Install the pre-assembled parts into the pump bore.
8. Install the retainer ring while holding the reverse boost valve bushing in place.
   Make sure the retainer is in the groove.
9. Install the oil pan and filter. Refer to *AT Fluid/Filter Changing*.
10. Lower the vehicle.

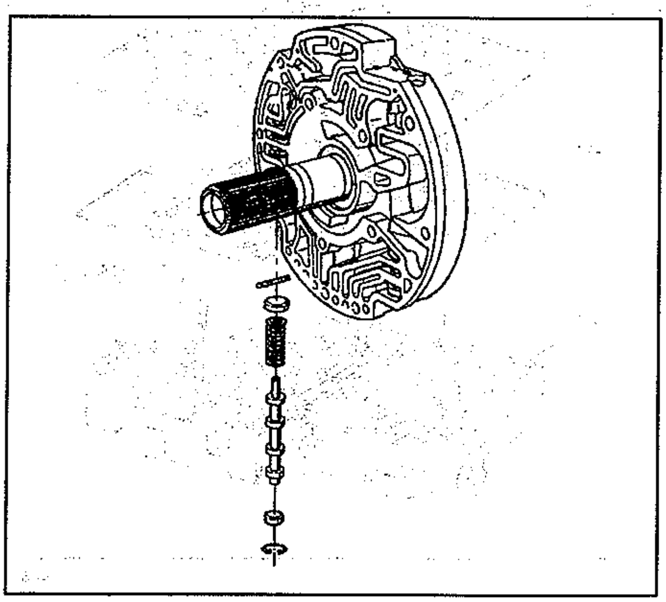


43318

TCC Valve and Spring Replacement

Removal Procedure

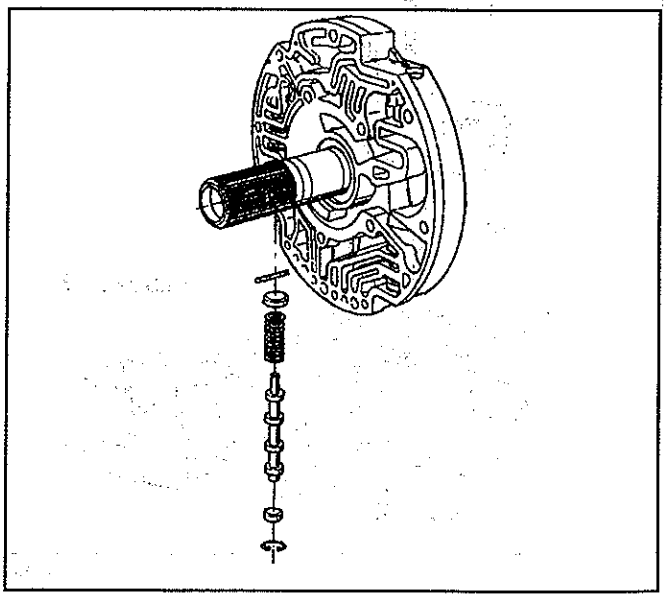
1. Raise the vehicle.
2. Remove the oil pan and the filter. Refer to *AT Fluid/Filter Changing*.
3. Disconnect the wiring harness if necessary.
4. Remove the snap ring.
5. Remove the plug.
6. Remove the valve.
7. Remove the spring.



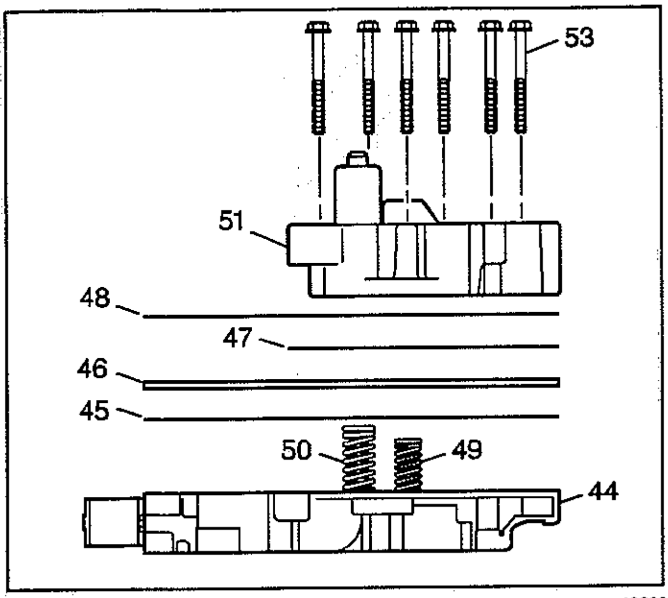
43320

Installation Procedure

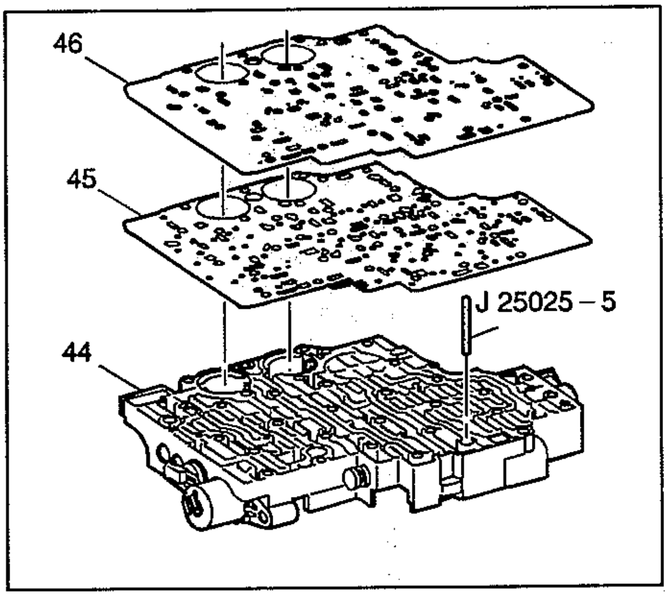
1. Install the spring.
2. Install the valve.
3. Install the plug.
4. Install the snap ring.
5. Connect the wiring harness if necessary.
6. Install the filter, the oil pan and the fluid. Refer to *AT Fluid/Filter Changing*.
7. Lower the vehicle.



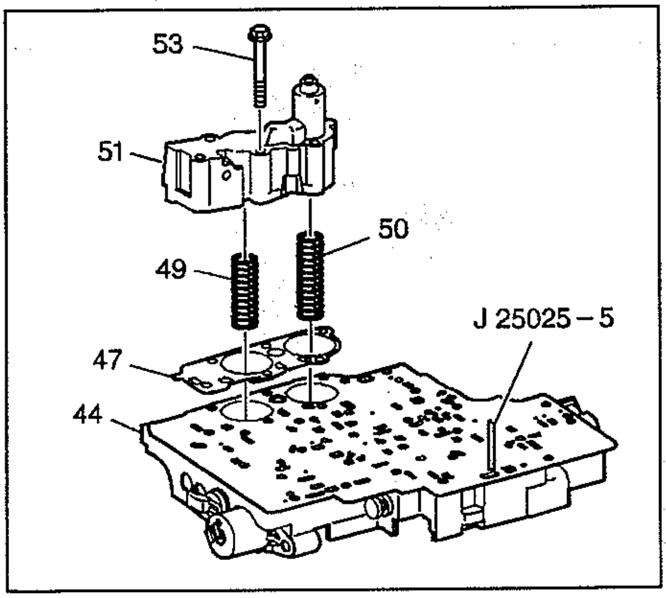
43320



40608



40634



40635

Accumulator Housing Replacement

Removal Procedure

1. Remove the 3rd and 4th clutch accumulator housing bolts (53).
2. Remove the 3rd and 4th clutch accumulator housing (51).
3. Remove the accumulator housing gasket (47). The accumulator housing gasket may be stuck to the spacer plate (46).
4. Remove the 3rd clutch accumulator piston spring (50).
5. Remove the 4th clutch accumulator piston spring (49).
6. Remove the control valve body spacer plate (46).
7. Remove the control valve assembly to spacer plate gasket (45) from the spacer plate (46).

Installation Procedure

Tools Required

J 25025–5 Guide Pin

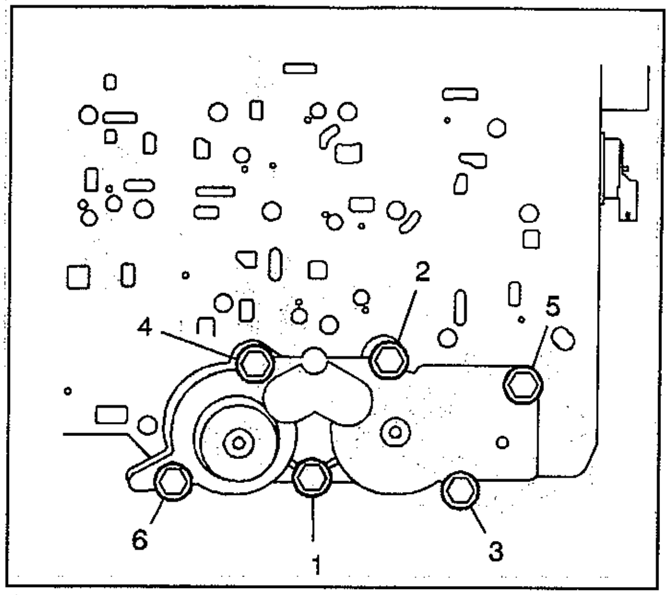
1. Install the *J 25025* into the control valve body bolt hole where the manual shaft detent roller and spring assembly is mounted.
2. Install the control valve body gasket (45).
3. Install the control valve body spacer plate (46).
4. Install the third and fourth clutch accumulator housing gasket (47).
5. Install the third clutch accumulator piston spring (50). This spring is the longer of the two springs.
6. Install the fourth clutch accumulator piston spring (49).
7. Install the third and fourth clutch accumulator housing assembly (51) onto the control valve body assembly (44).
8. Install the six accumulator housing bolts (53). Start the bolts finger tight and work towards the opposite end.

Notice: Refer to *Fastener Notice* in Cautions and Notices.

9. Tighten the accumulator housing bolts sequentially.

   Tighten

   Tighten the accumulator housing bolts sequentially to 11 N·m (97 lb in).
10. Remove the *J 25025*-5.

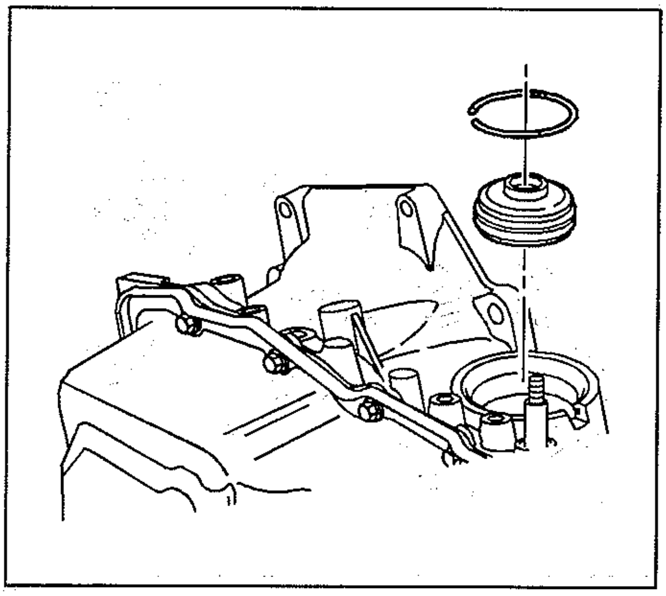


54703

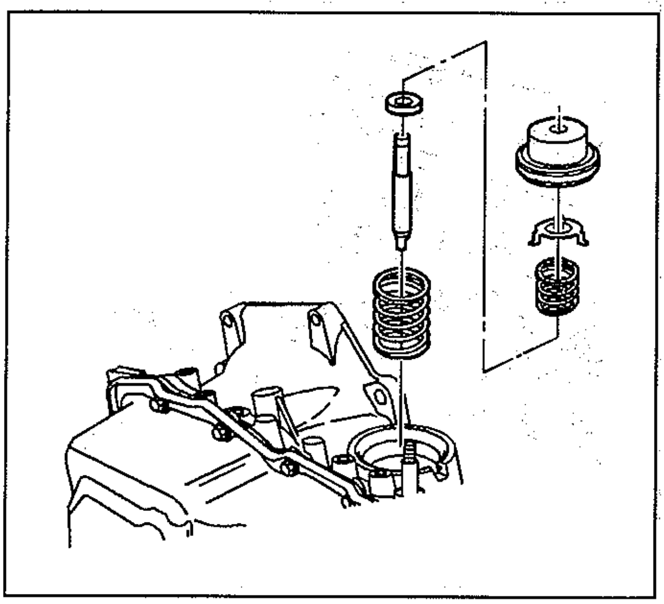
Reverse Servo Replacement

Removal Procedure

1. Lift and properly support the vehicle.
2. Depress the servo cover.
3. Remove the snap ring and the servo cover from the transmission case.


97337

4. Remove the piston assembly.
5. Remove the piston assembly.
6. Remove the sealing ring.
7. Remove the servo ring.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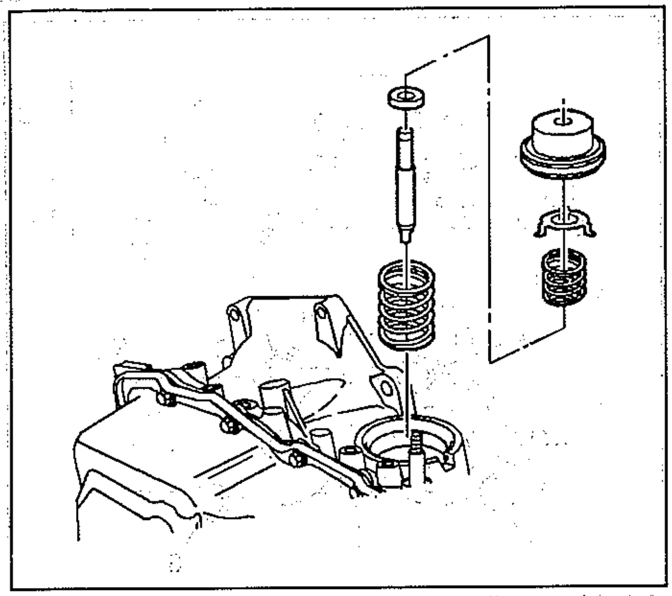
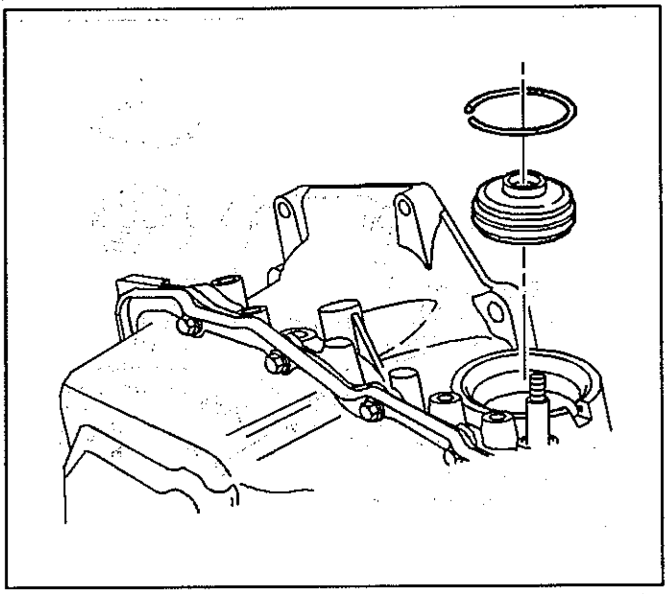


97341

Installation Procedure

1. Install the servo spring.
2. Install the sealing ring.
3. Install the piston assembly.



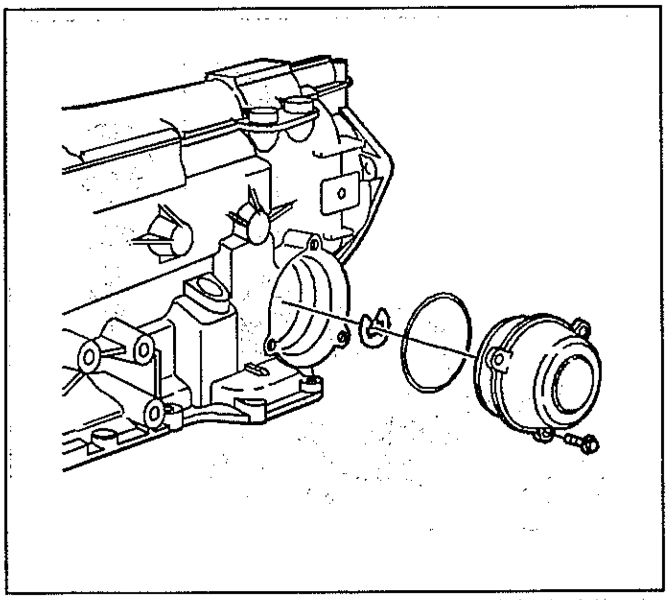
97337

4. Install the servo cover and the snap ring onto the transmission case.
5. Lower the vehicle.
6. Check the transmission for normal operation.

Forward Servo Replacement

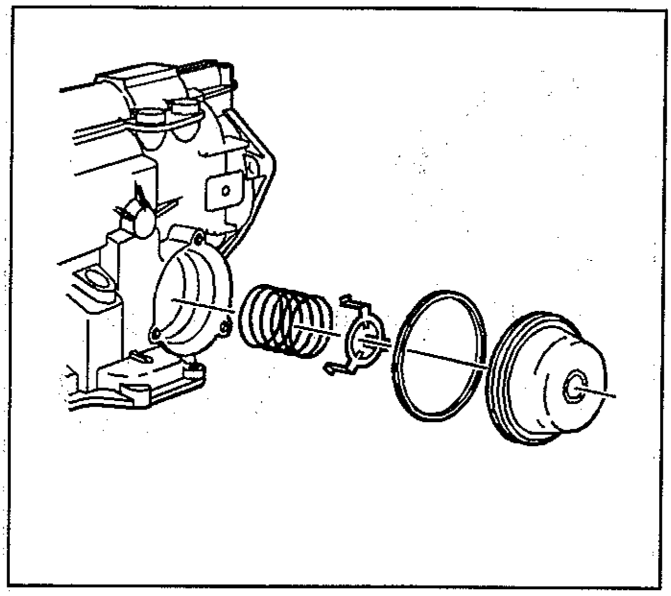
Removal Procedure

1. Lift and properly support the vehicle.
2. Remove the forward servo attaching bolts.
3. Remove the servo cover.

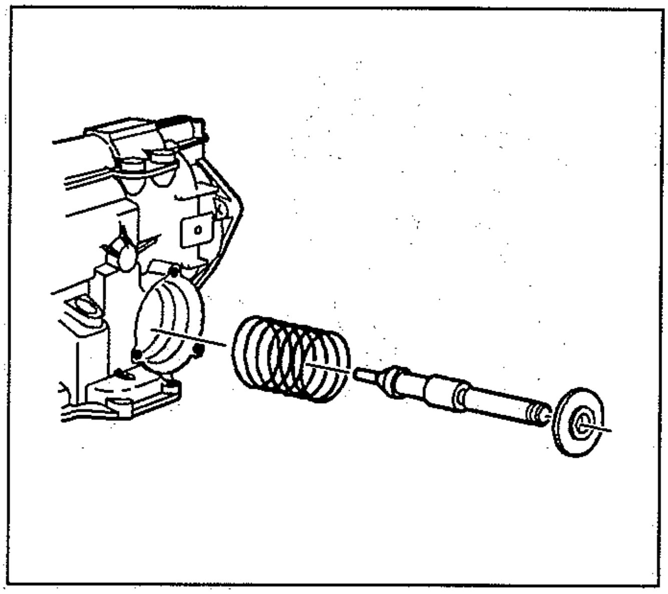


97342

4. Remove the servo piston assembly.

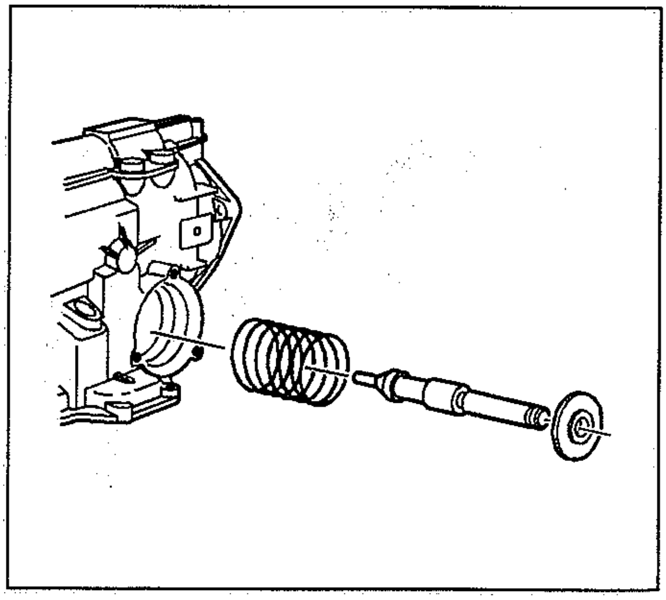

97344

5. Remove the sealing ring.
6. Remove the servo spring.


97346

Installation Procedure

1. Install the servo spring.
2. Remove the sealing ring.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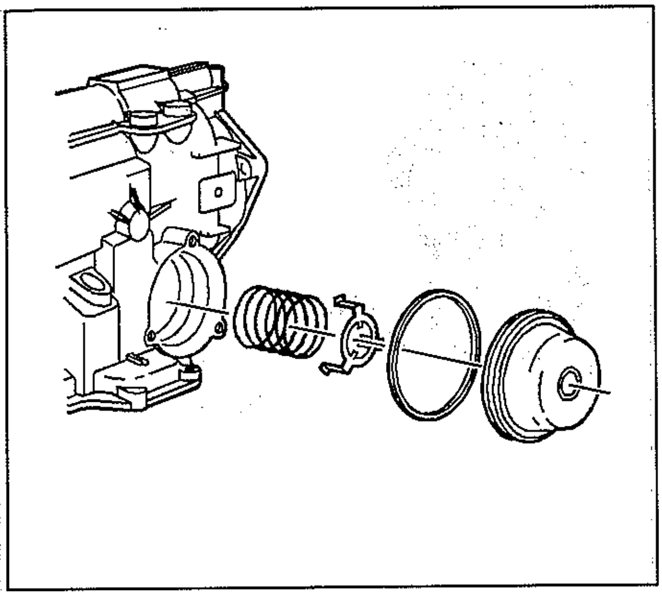
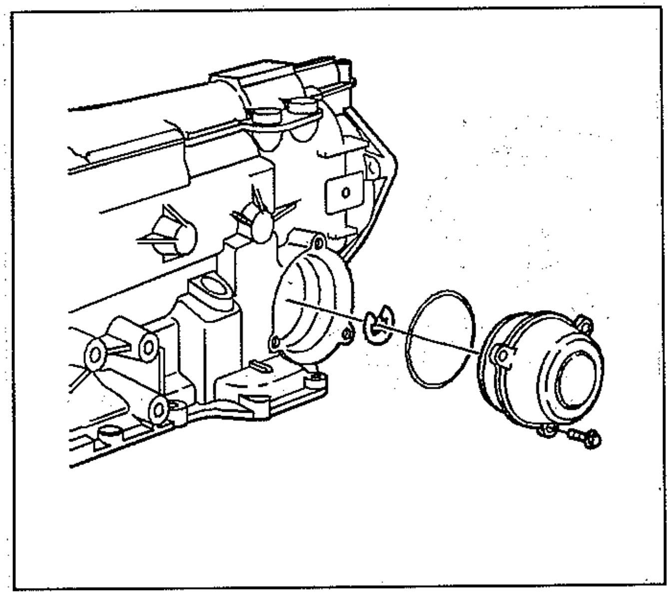


97344

3. Install the servo piston assembly.

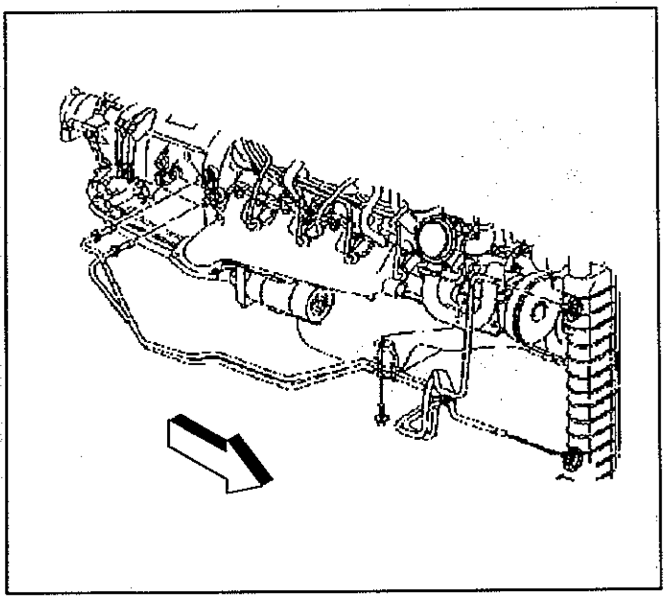


97342

4. Install the servo cover.
5. Install the forward servo attaching bolts.

   Tighten

   Tighten the servo attaching bolts to 24 N.m (18 lb ft).
6. Lower the vehicle.
7. Check the operation of the transmission.



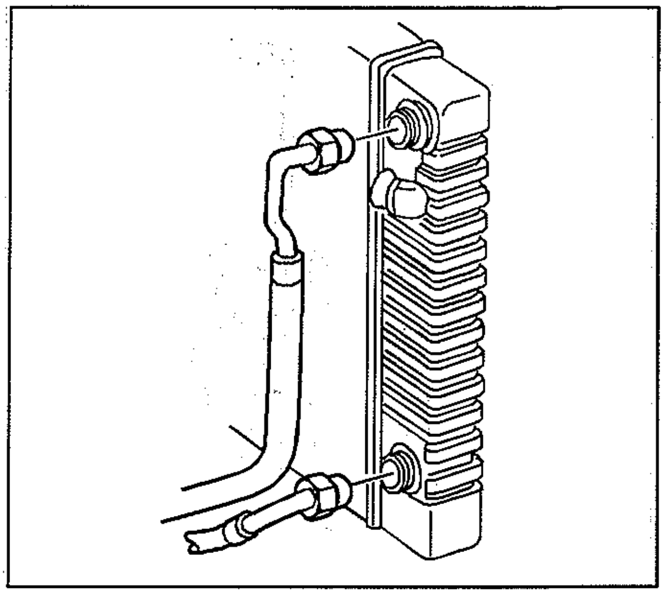
104975

Oil Cooler Line Replacement

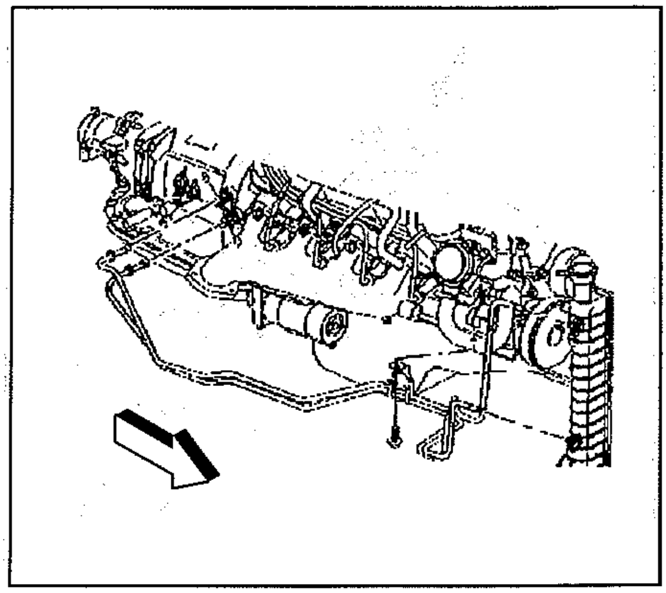
Removal Procedure

1. Raise the vehicle. Refer to Vehicle Lifting and Jacking in General Information.
2. Support the vehicle with safety stands.
3. Remove the two oil cooler lines from the radiator.

4. Disconnect the oil cooler pipe from the connector at the radiator.

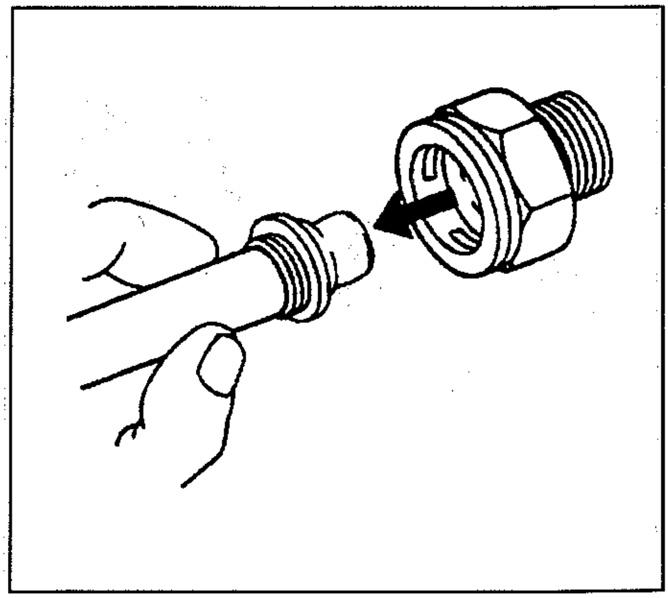

106047

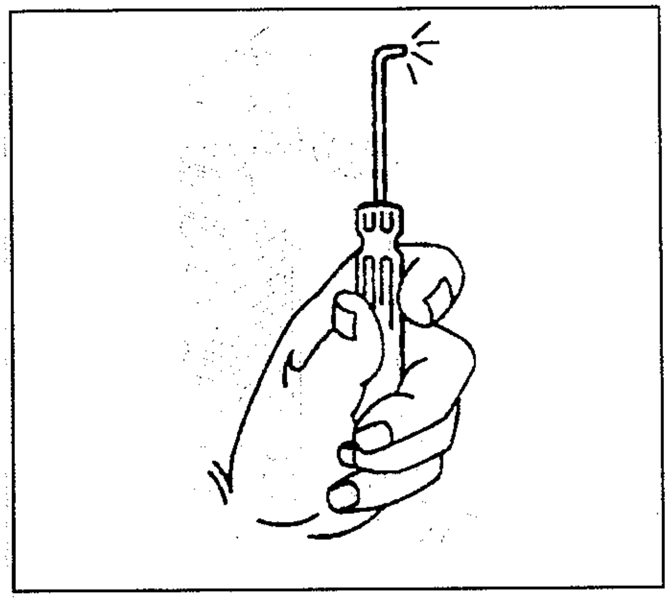
5. Disconnect the two oil cooler pipes from the connectors at the radiator. (6.5L diesel engine)


104976

Important: Perform the following procedures when removing the retaining ring and cooler line from the quick connect fitting on the transmission.

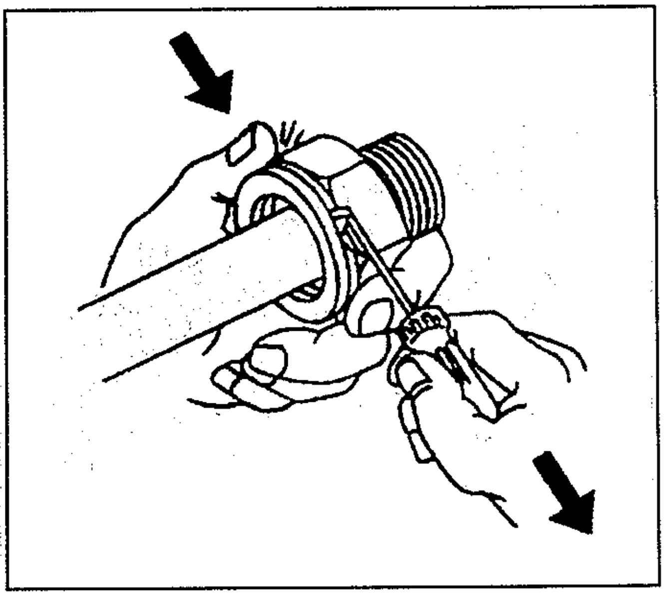
6. Pull the plastic cap back from the quick connect fitting and down along the cooler line about two inches.


104740



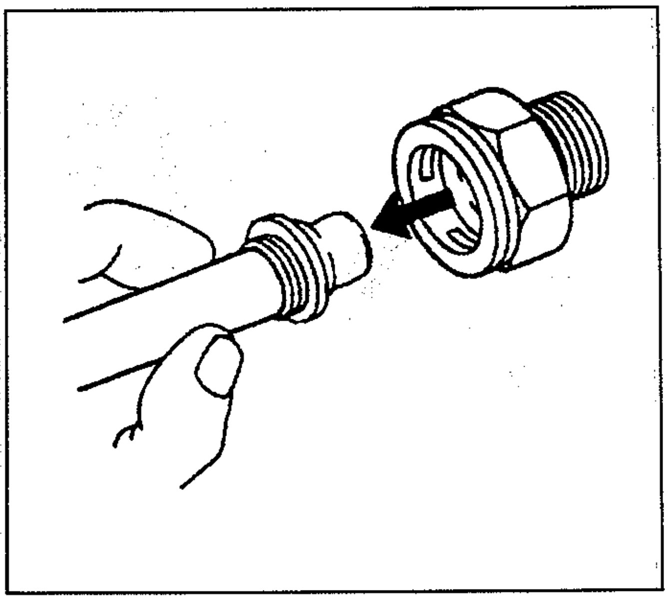
104737

7. Using a bent-tip screwdriver, pull on one of the open ends of the retaining ring in order to rotate the retaining ring around the quick connect fitting until the retaining ring is out of position and can be completely removed.



104739

8. Remove the retaining ring from the quick connect fitting.
9. Discard the retaining ring.

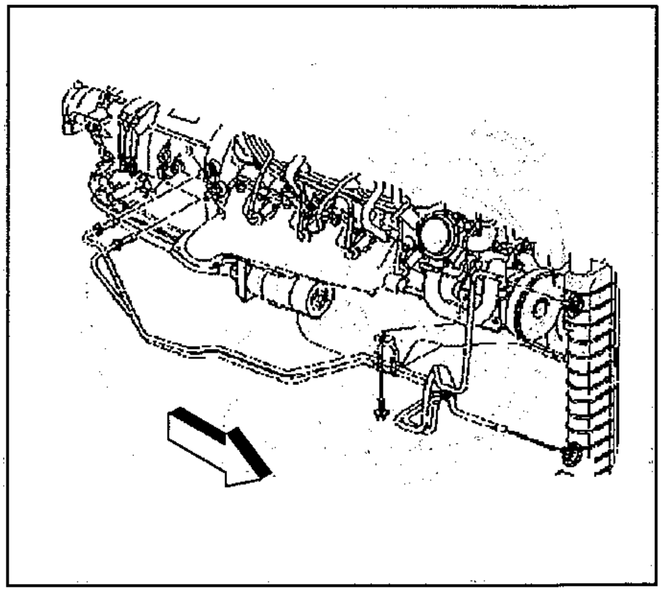


104740

10. Pull the cooler line straight out from the quick connect fitting.
11. Remove the retaining ring (E-clips) securing the cooler line to the quick connect in order to remove the remaining cooler lines from the remaining quick connect fittings.
12. Remove the cooler lines from the vehicle.

Installation Procedure

1. Install the transmission oil cooler line to the vehicle. (7.4L engine)

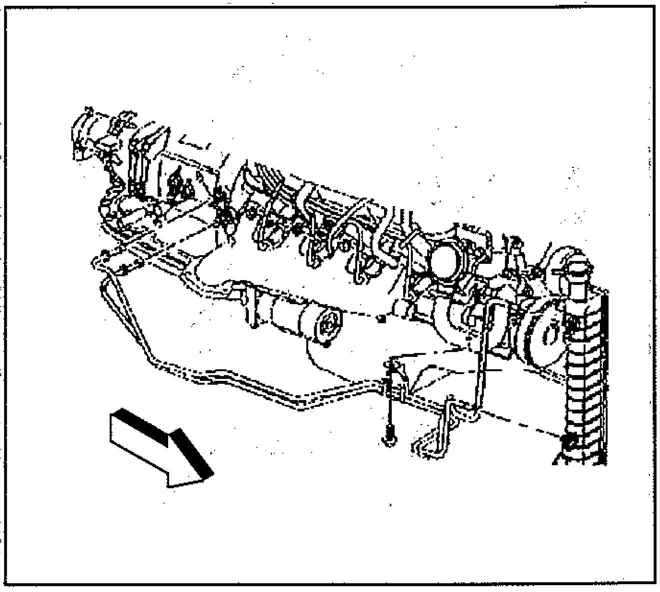


104975

2. Install the transmission oil cooler line to the vehicle. (6.5L diesel engine)

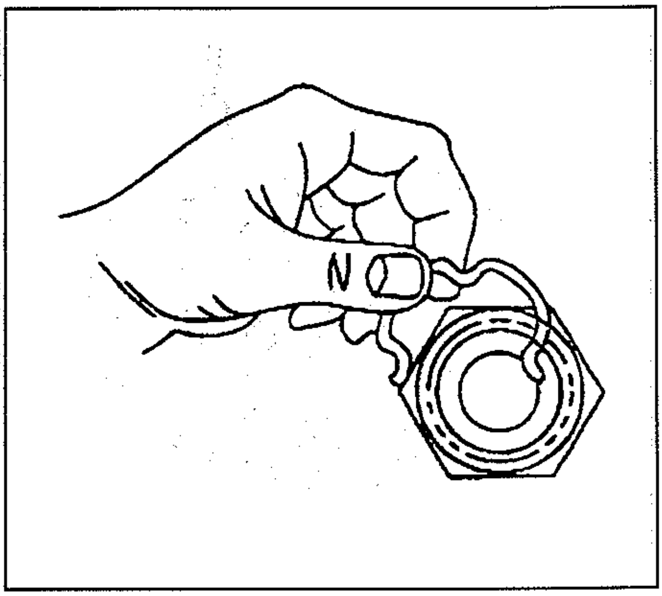
   Important: Do not reuse any of the existing retaining rings that were removed from the existing quick connect fittings. All retaining rings being installed must be New.

3. Install the new retaining ring (E-clip) into the quick connect fitting.



104976

4. Hook one of the open ends of the retaining ring in one of the slots in the quick connect fitting.



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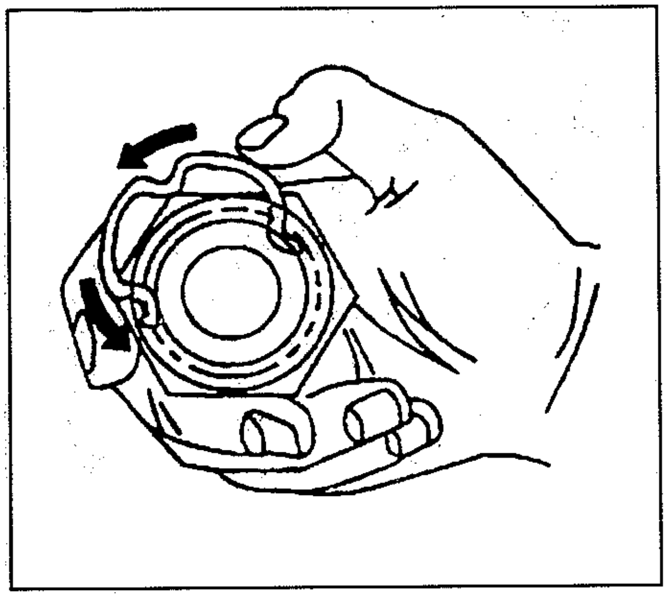
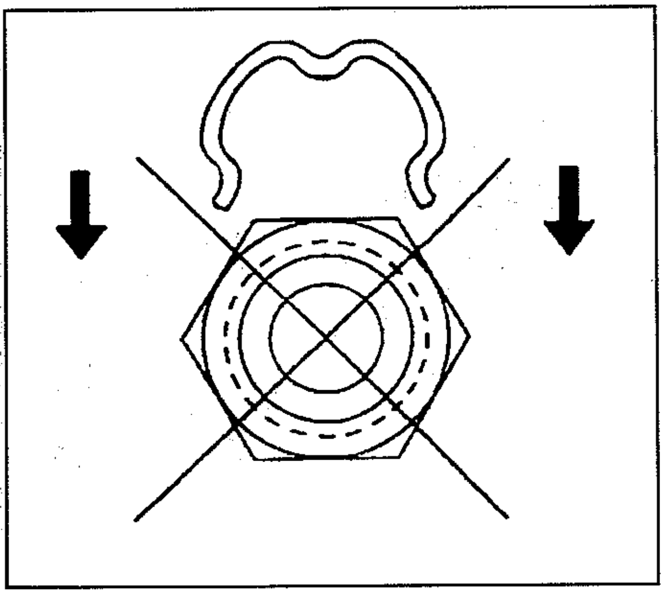


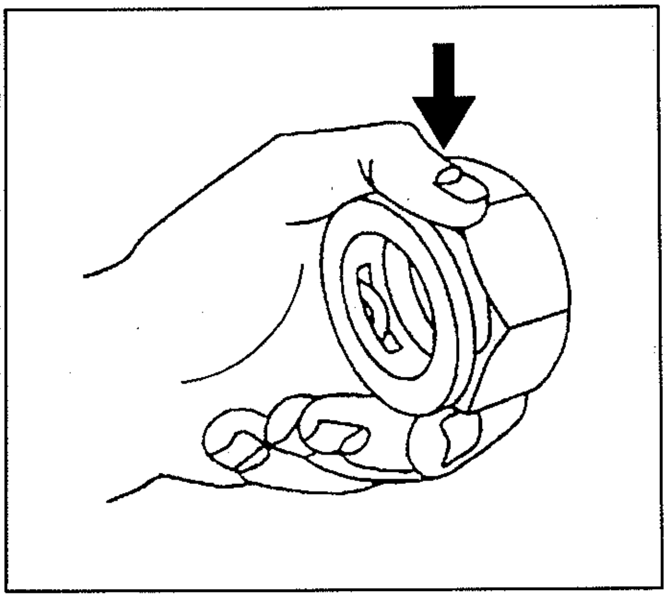
104746

5. Rotate the retaining ring around the fitting until the retaining ring is positioned with all three ears through the three slots on the fitting.



104741

6. Do not install the new retaining ring onto the fitting by pushing the retaining ring down over the fitting.

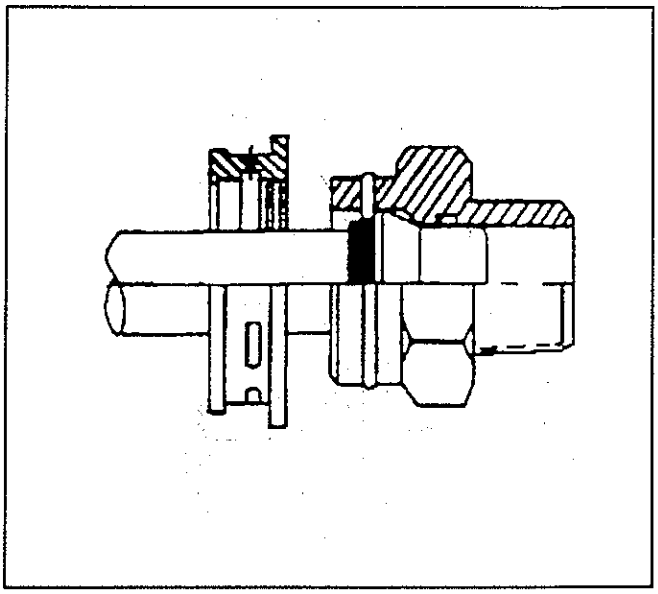


104664

7. Ensure that the three retaining ring ears are seen from inside the fitting and that the retaining ring moves freely in the fitting slots.
8. Install the new retaining ring (E-clip) into the remaining quick connect fittings.

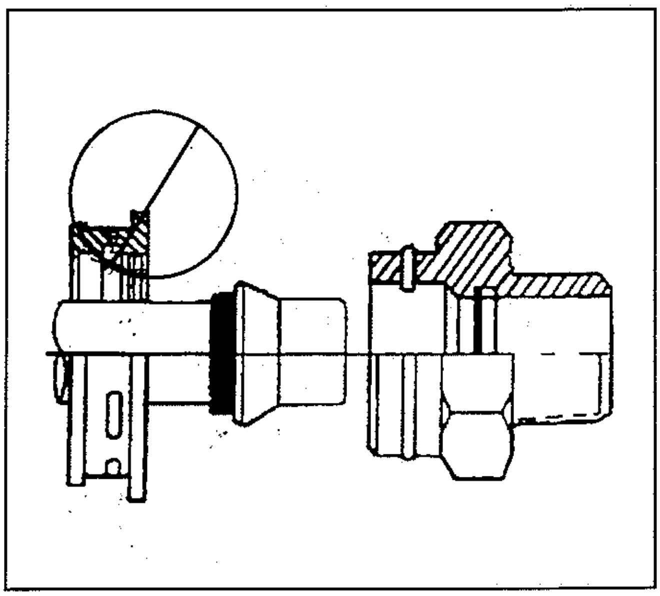
   Notice: Ensure that the cooler line being installed has a plastic cap on each end that connects to a quick connect fitting. If no plastic cap exists, or the plastic cap is damaged, obtain a new plastic cap and position on to the cooler line prior to the cooler line installation.
9. Install the cooler lines to the vehicle.

10. Install the cooler line into the quick connect fitting.
11. Insert the cooler line end into the quick connect fitting until a click is either heard or felt.



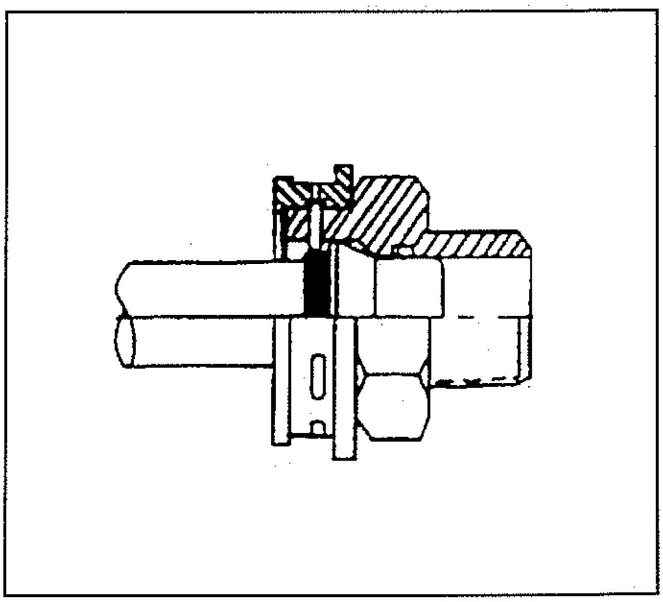
104752

12. Do not use the plastic cap on the cooler line in order to install the cooler line into the fitting.
13. Pull back sharply on the cooler line in order to ensure that the cooler line is fastened into the quick connect fitting.

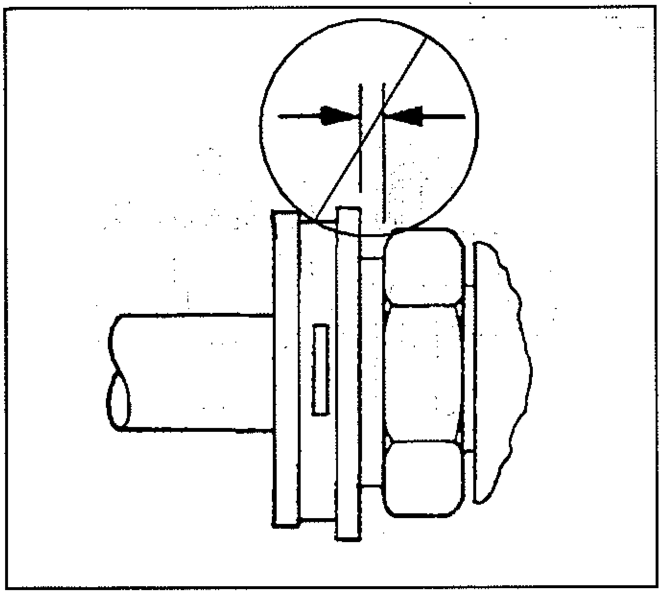


104750

14. Position (snap) the plastic cap onto the fitting. Do not manually depress the retaining ring when installing the plastic cap onto the quick connect fitting.
15. Ensure that the plastic cap is fully seated against the fitting.

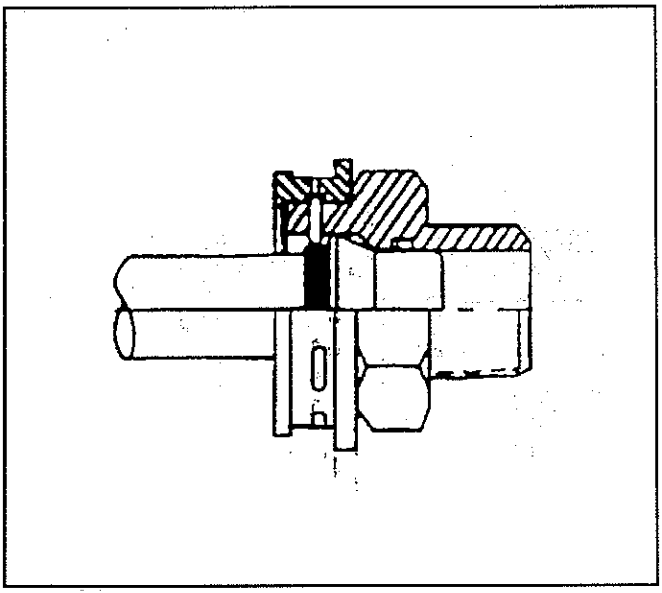


104753



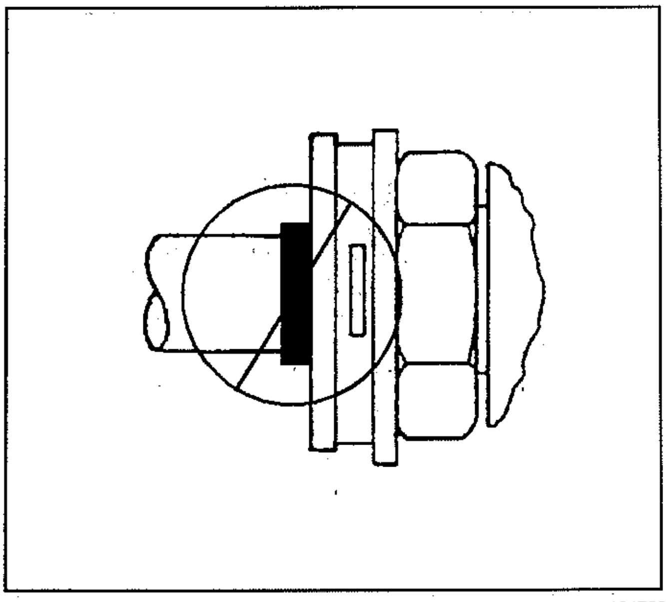
104754

16. Ensure that no gap is present between the cap and the fitting.



104753

17. Ensure that the yellow identification band on the tube is hidden within the quick connect fitting. A hidden yellow identification band indicates proper joint seating.



104755

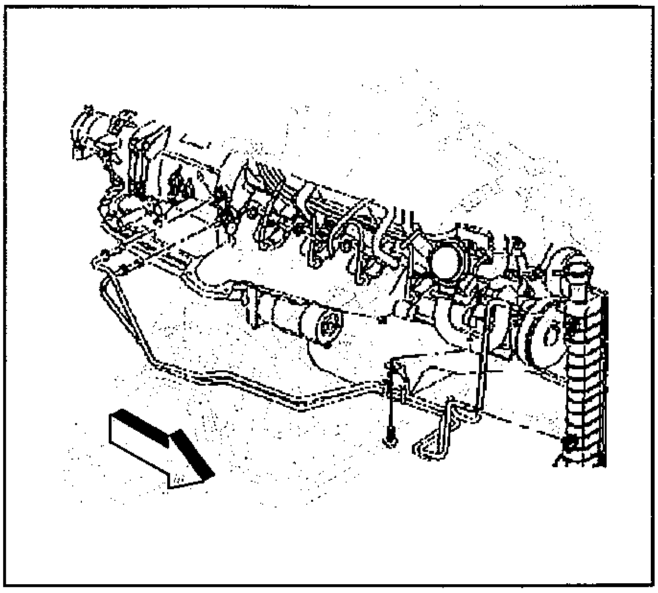
18. Do not install the cooler line into the fitting incorrectly.
19. If you cannot position the plastic cap against the fitting, remove the retaining ring from the quick connect fitting per step 3 of the cooler line removal procedure. Check the retaining ring and the tube end in order to ensure neither is bent. Replace the cooler line or the retaining ring if necessary, and reinstall per Step 1 of the cooler line installation procedure.
20. Install the cooler line into the quick connect fitting again in order to install the remaining cooler lines into the remaining quick connect fittings.
21. Install the flair nuts securing the oil cooler lines to the radiator.

    Tighten

    Tighten the flair nuts to 45 N.m (33 lb ft).

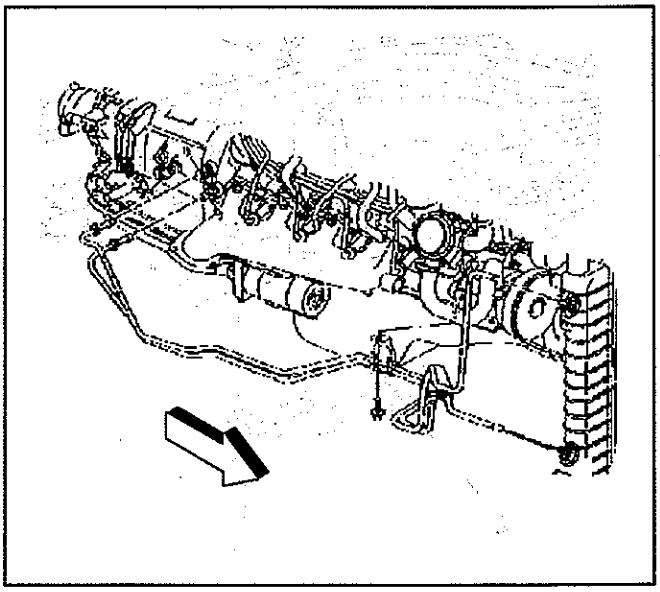
    Notice: Refer to *Fastener Notice* in Cautions and Notices.

22. Install the engine or transmission cooler lines to the frame. (6.5L engine)



104976

23. Install the engine or transmission cooler lines to the frame. (7.4L engine)

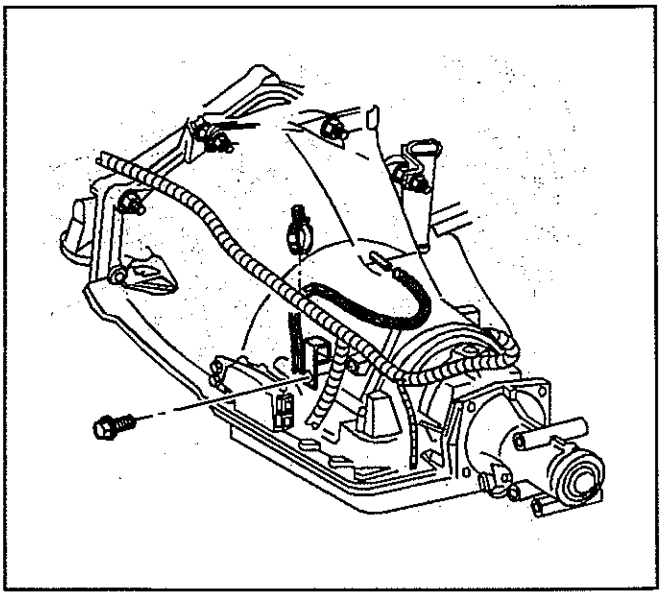


104975

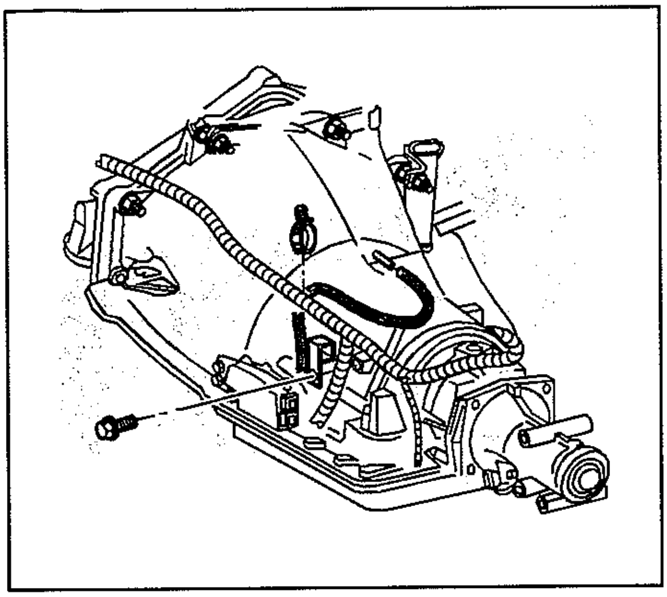
Vent Hose

Removal Procedure

1. Remove the vent hose bolt and the clamp.
2. Remove the strap securing the vent hose to the transmission and the wiring harness.
3. Remove the vent hose from the transmission vent.



102339



102339

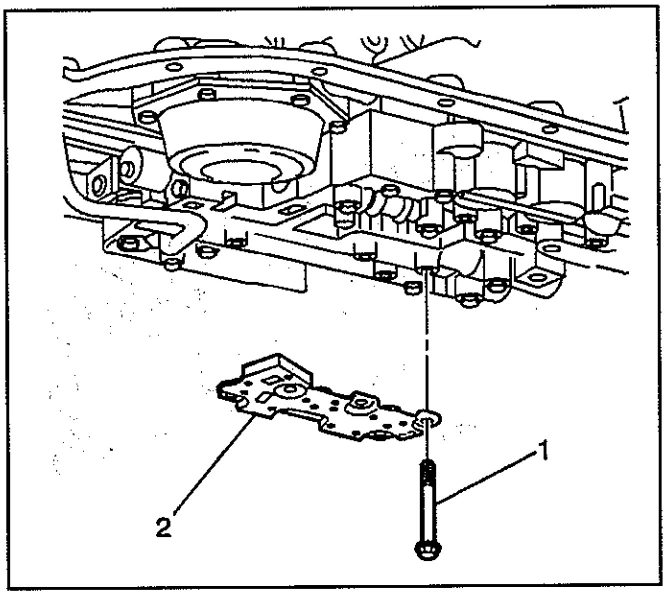
Installation Procedure

1. Install the vent hose to the transmission.
2. Install the strap that secures the vent hose and the wiring harness to the transmission.

   Notice: Refer to *Fastener Notice* in Cautions and Notices.
3. Install the bolt and the clamp.

   Tighten

   Tighten the bolt to 10 N.m (89 lb in).



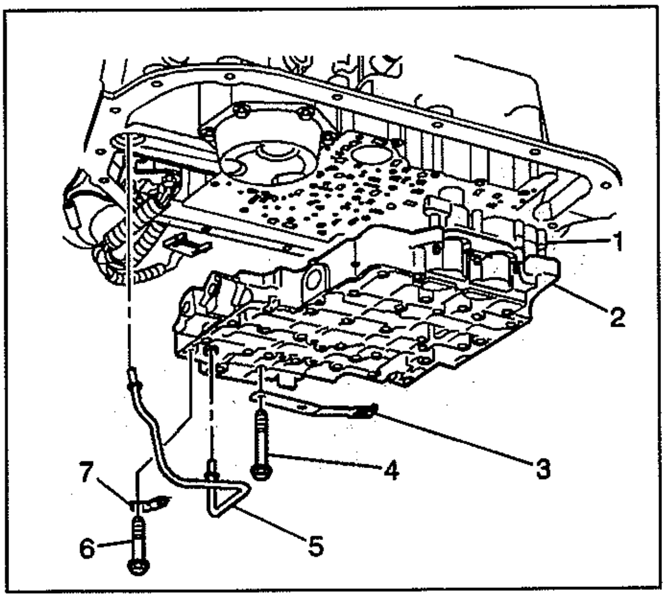
237246

Control Valve Body Replacement

Removal Procedure

1. Remove the transmission fluid pressure (TFP) manual valve position switch bolts (1) and the TFP valve position switch (2).

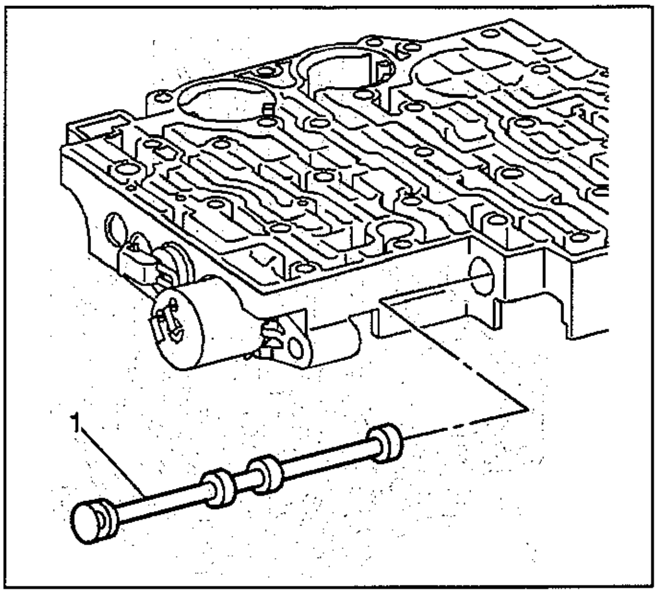
   Important: The five o-rings should remain attached to the TFP valve position switch (2).



237254

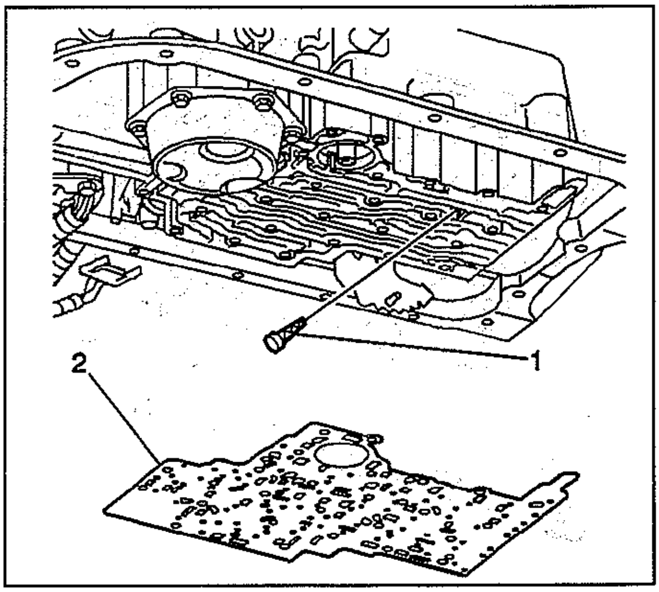
2. Remove the control valve assembly bolts (4).
3. Remove the fluid level indicator stop bracket.
4. Remove the lube oil pipe retainer (7) and the clamp.
5. Remove the lube oil pipe (5).
6. Remove the manual shaft detent spring assembly (3).
7. Remove the control valve assembly (2) which includes the following:
   - The accumulator housing assembly (1)
   - The control valve assembly to the spacer plate gasket
   - The spacer plate
   - The accumulator gasket

8. Remove the manual valve (1) from the control valve body to prevent any damage.
9. Inspect the manual valve for nicks and burrs.



237271

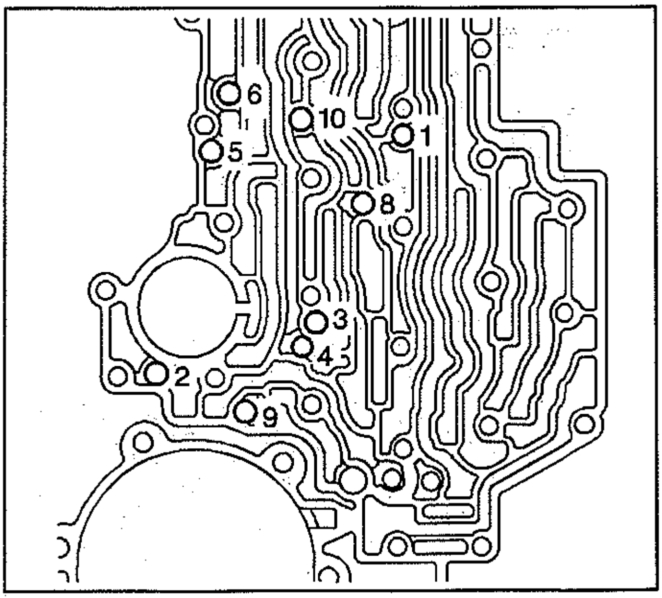
10. Remove the spacer plate to case gasket (2) from the case. The gasket may stick to the spacer plate.
11. Remove the PWM screen (1) from the case passages.
12. Inspect the PWM screen for debris and damage.



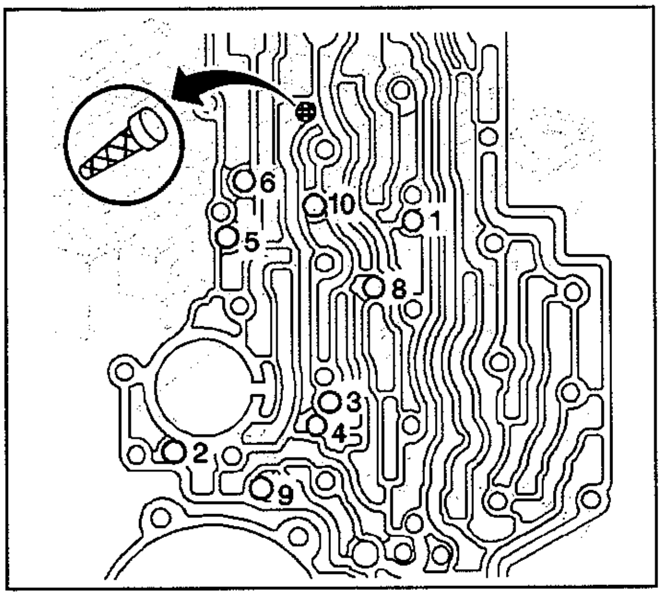
237276

Important: Do not use a magnet in order to remove the checkballs. Using a magnet to remove the checkballs may magnetize the checkballs, causing metal particles to stick.

13. Remove the eight checkballs (nine checkballs for some models).



28386



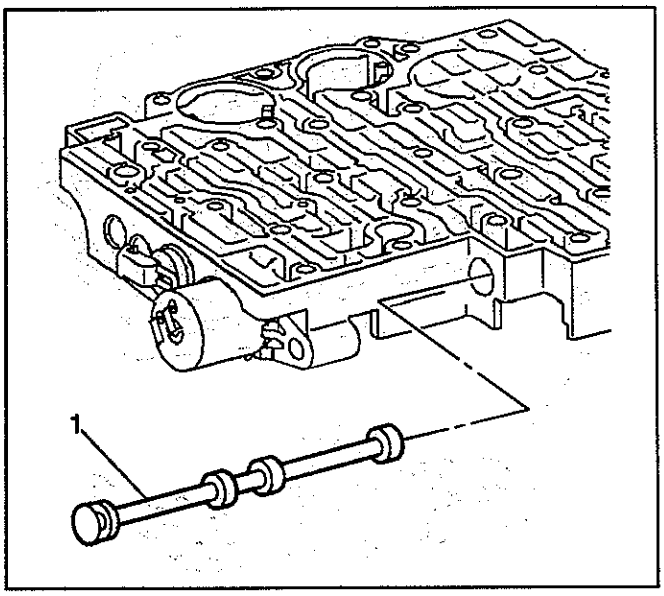
237284

Installation Procedure

Tools Required

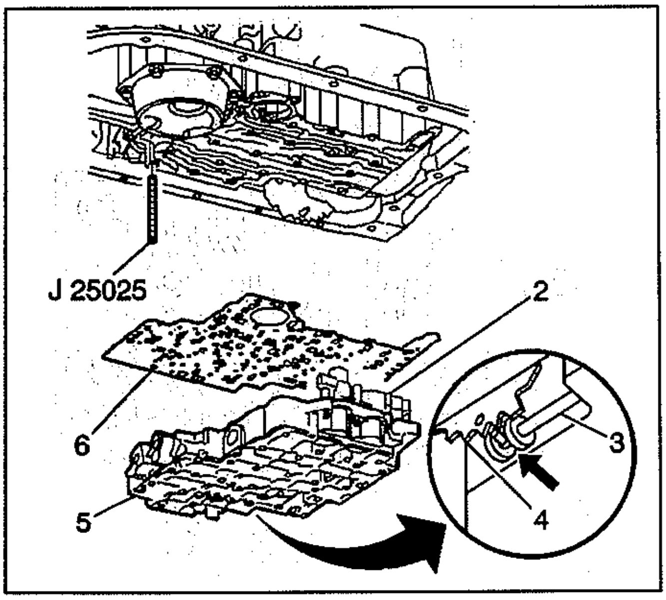
- *J 25025*
- *J 36850*

1. Install the 8 checkballs (9 Checkballs for some models) into the control valve body.
   - The checkball marked as number 2, is used on RCP, RDP, ZJP and ZLP models only
   - To hold the checkballs in place, use tool *J 36850*
2. Install the PWM screen into the control valve body.



237271

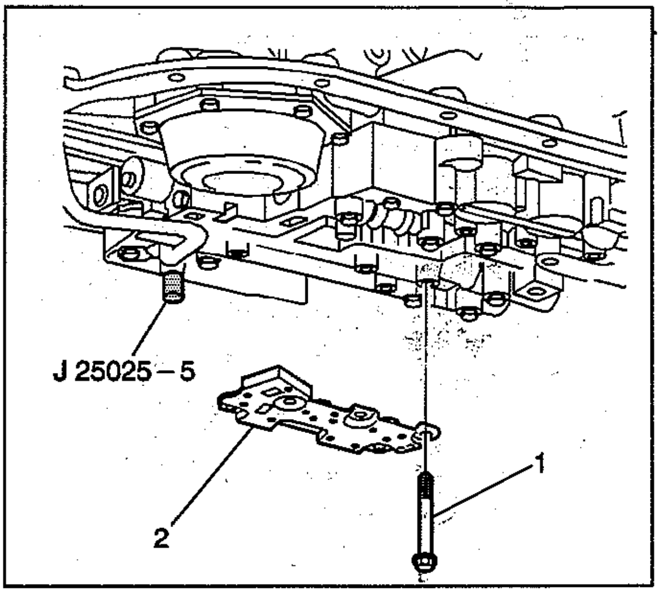
3. Install the manual valve (1) into the control valve body.



237299

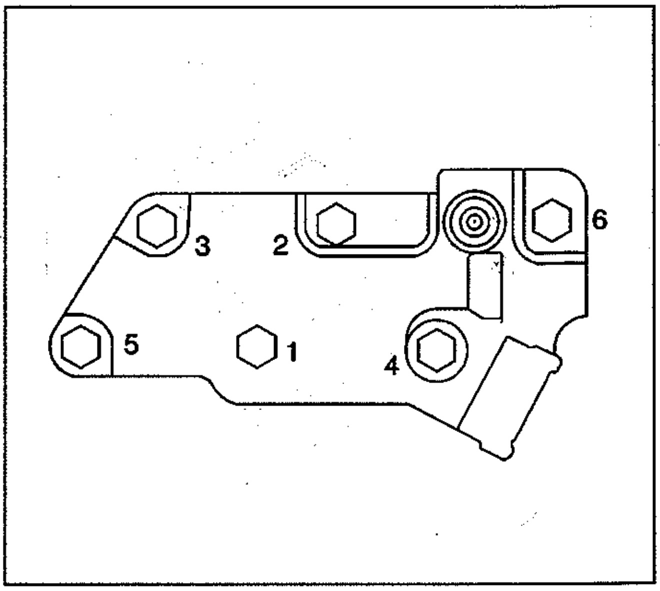
4. To add in alignment and assembly, install tool *J 25025*.
5. Install the control valve body gasket (6).
6. Install the control valve body assembly (5). Attach the manual valve to the detent lever while installing the control valve body assembly.

7. Install the transmission fluid pressure manual valve position switch (2).
8. Install the transmission fluid pressure manual valve position switch bolts (1) finger tight.



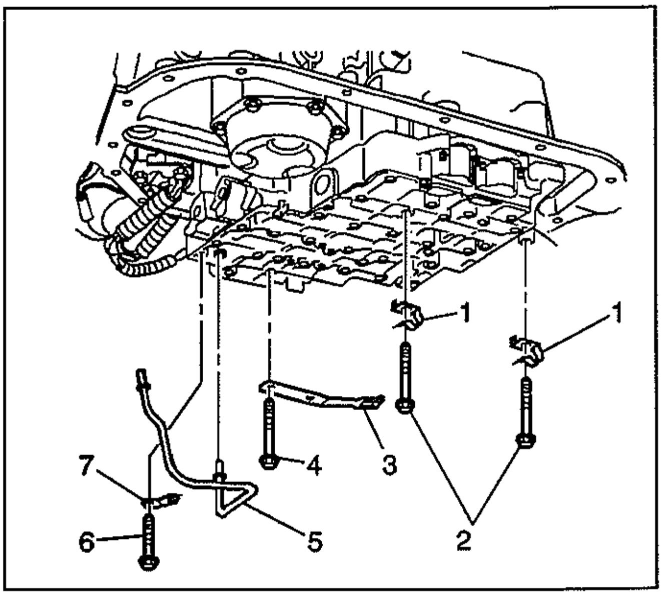
237322

9. Tighten the bolts in sequence to 11 N·m (97 lb in).
10. Remove *J 25025.*



237341

11. Install the manual shaft detent roller and spring assembly (3) and bolts (2 and 4).
12. Install the two wiring harness clips (1) and bolts (2).
13. Install the wiring harness clip (1) and bolts (2).
14. Install the lube oil pipe (5) with the short end into the control valve body.
15. Install the lube oil pipe retainer (7) and the bolt (6).



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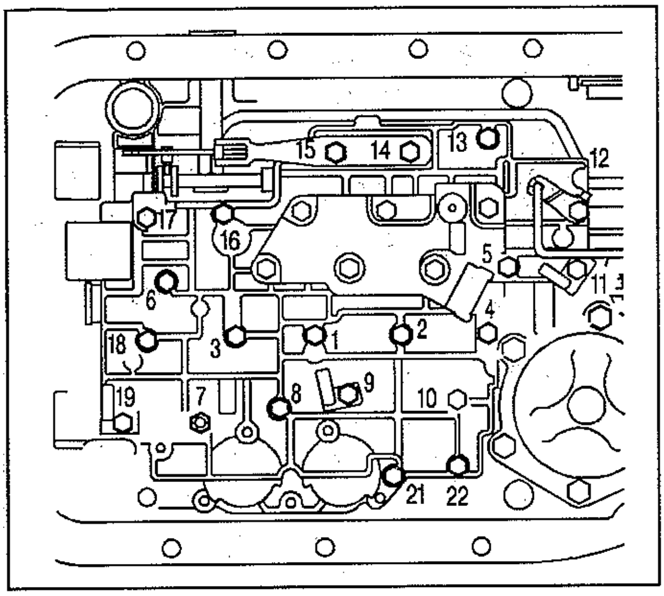

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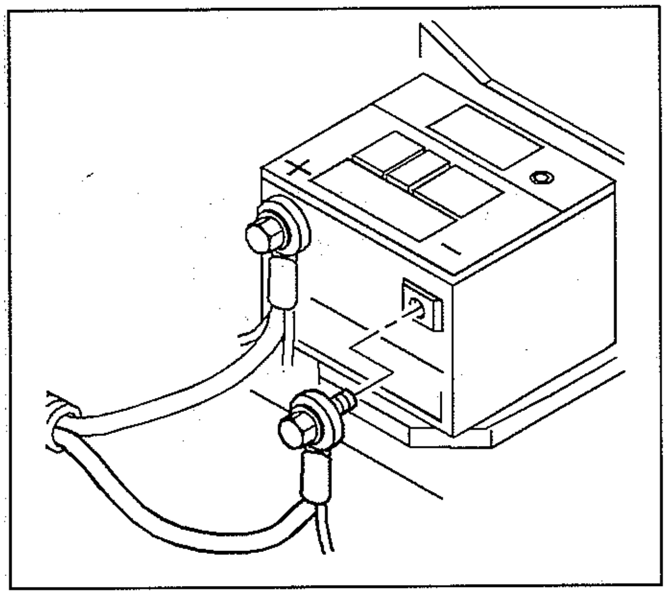


38205

16. **Tighten**

    Tighten the bolts sequentially to 11 N·m (97 lb in).
17. Install the remaining control valve body bolts.

Transmission Replacement

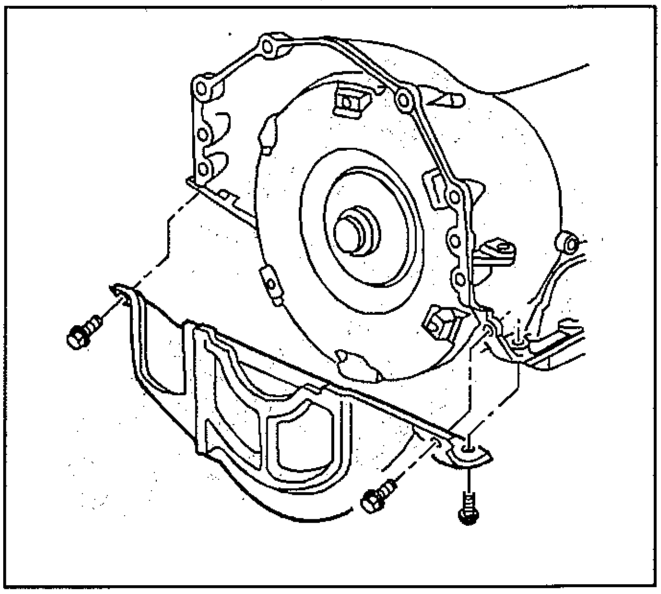
Removal Procedure

Tools Required

J 21366 Torque Converter Retaining Tool

1. Disconnect the battery negative cable assembly from the battery negative terminal. Refer to *Battery Disconnect Caution* in Cautions and Notices.
2. Raise the vehicle. Refer to General Vehicle Jacking and Lifting in General Information.
3. Support the vehicle with safety stands.
4. Disconnect the range selector cable from the transmission bracket and from the range selector lever.
5. Remove the rear propeller shaft. Refer to Propeller Shaft Replacement in Propeller Shaft.
6. Support the transmission with a transmission jack.
7. Remove the transmission rear mount. Refer to Engine Mounting in Engine Mechanical.
8. Remove the bolts securing the crossmember to the frame. Refer to Crossmember Replacement in Frame and Body Mounts.
9. Remove the exhaust pipe from the exhaust manifolds and the muffler assembly from the exhaust pipe. Refer to Removing Exhaust Parts in Exhaust System.
10. Remove the starter motor. Refer to Starter Motor in Cranking Systems.

11. Remove the bolts securing the converter cover to the transmission.
12. Mark the flywheel and the torque converter alignment.



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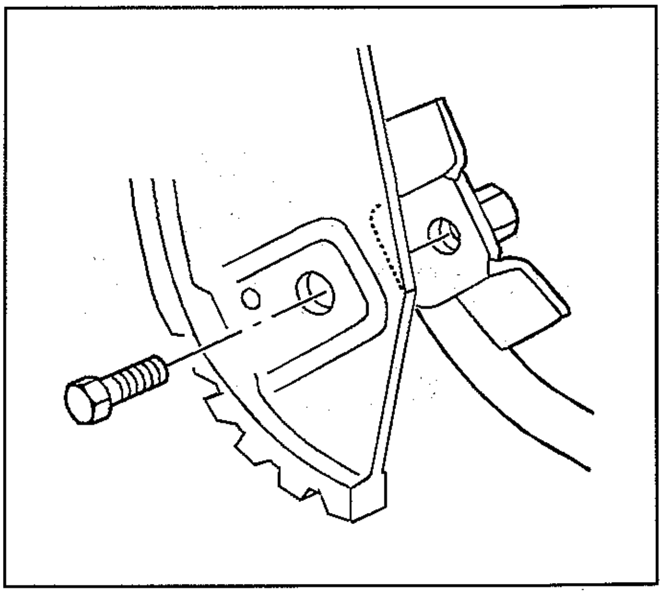
13. Remove the bolts that attach the torque converter to the engine flywheel.



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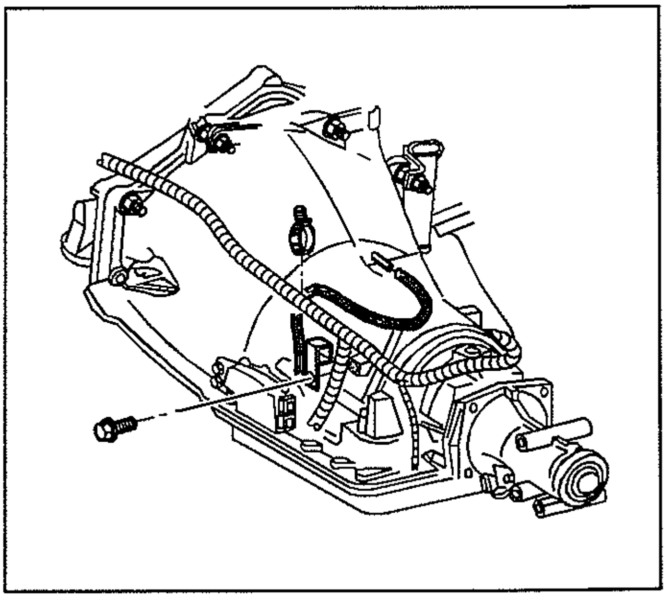
14. Remove the transmission vent hose and the wiring harness from the transmission. Refer to *Vent Hose.*
15. Remove the transmission fluid fill tube and the fill tube seal from the transmission. Refer to *Filler Tube Replacement.*
16. Plug the fluid fill tube opening in the transmission.
17. Disconnect the transmission oil cooler pipes from the transmission. Refer to *Oil Cooler Line Replacement.*
18. Plug the transmission oil cooler pipe connectors in the transmission case.



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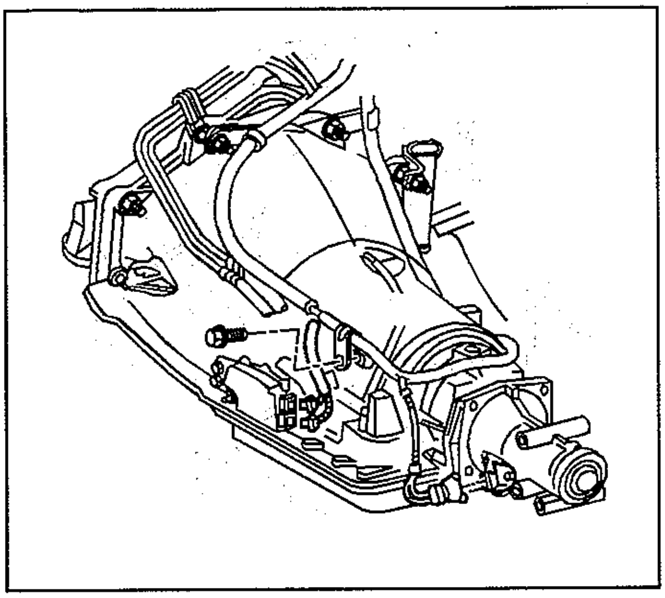

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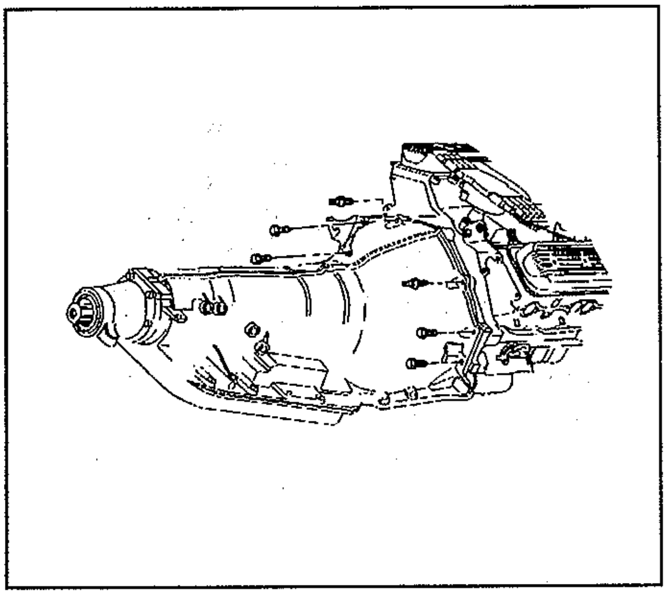
19. Disconnect the wiring harness connectors from the transmission vehicle speed sensor and the park/neutral position switch.
20. Remove all vehicle harness wires, harness clips, tubes, brackets, and lines that may interfere with the removal of the transmission from the vehicle.



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21. Remove the studs and the bolts securing the transmission to the engine.
22. Install the *J 21366.*
23. Pull the transmission straight back.
24. Remove the transmission from the vehicle.
25. Flush the transmission oil cooler and the pipes whenever you remove the transmission for overhaul, or replacement of the torque converter, the pump, or the transmission case. Refer to *AT Oil Cooler Flushing.*
26. Clean the transmission case using a solvent dampened cloth. Do not allow solvent to enter the transmission.
27. Air dry the transmission.
28. Clean all hardware and the flywheel cover using solvent. Air dry all the parts.
29. Inspect all the components for wear and damage.
30. Inspect all the seals and the fittings for signs of wear.
31. Inspect the torque converter for stripped or broken weld nuts.
32. Inspect the transmission case for cracks.

Installation Procedure

Tools Required

J 21366 Torque Converter Retaining Tool

1. Install the *J 21366*.
2. Support the transmission with a transmission jack.
3. Raise the transmission into place and remove the *J 21366*.
4. Slide the transmission straight onto the locating pins while lining up the marks on the flywheel and the torque converter.

   Important:

   - The torque converter must be flush onto the flywheel and rotate freely by hand.
   - All the brackets, clips, and harnesses must be positioned in the same position before removal.
   - Do not install the transmission fluid fill tube.

   Notice: Refer to *Fastener Notice* in Cautions and Notices.

5. Install the bolts that secure the transmission to the engine.

   Tighten

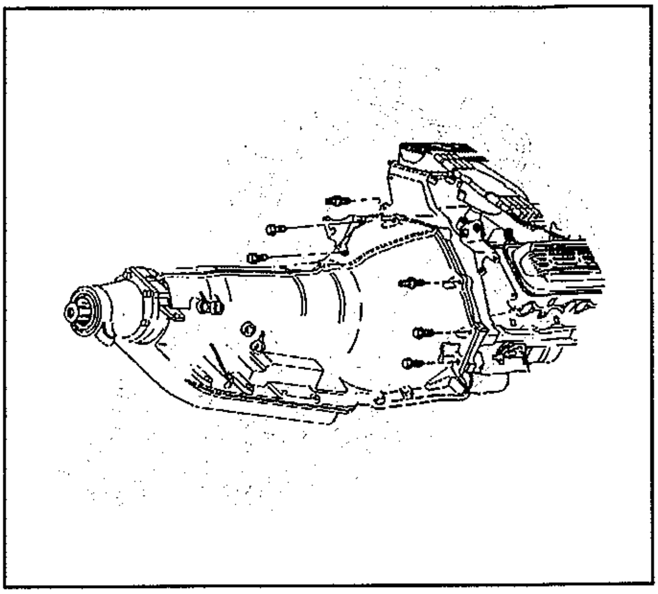
   Tighten the studs and the bolts to 47 N·m (34 lb ft).

6. Install the bolts securing the torque converter to the engine flywheel.

   Tighten

   6.1. First tighten all the bolts finger tight in order to insure proper converter seating.

   6.2. Tighten the bolts to 63 N·m (46 lb ft).



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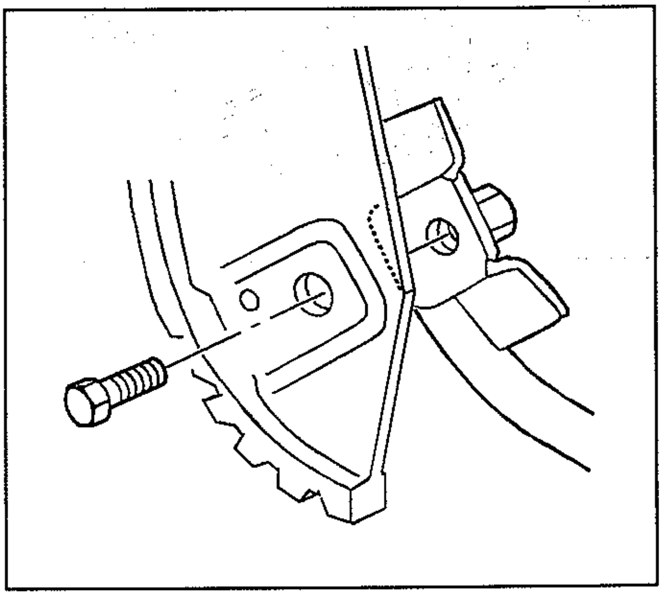

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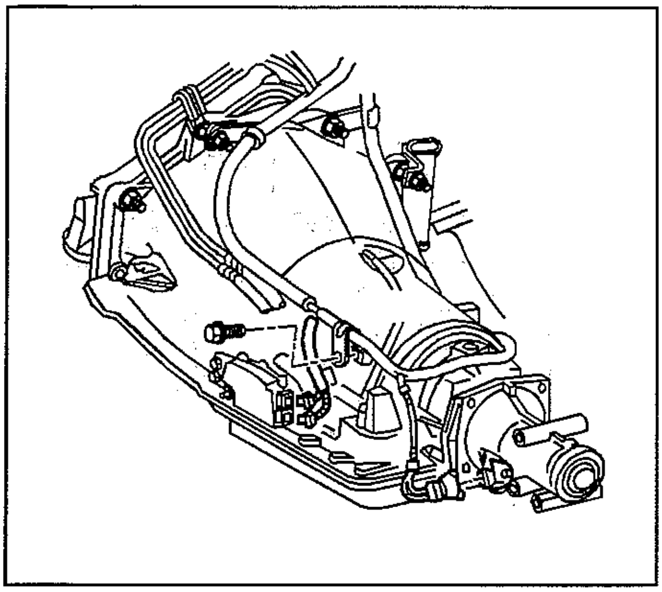

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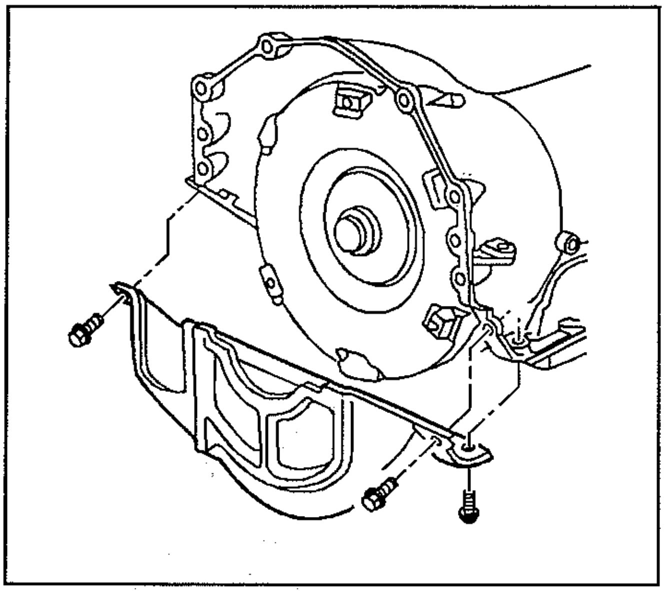
7. Install the wiring harness connectors to the vehicle speed sensor and the park neutral position switch.
8. Position and install all vehicle harness wires, harness clips, tubes, brackets, and lines that were removed or moved prior to the transmission removal.
9. Remove the two plugs from the transmission case cooling line connectors.
10. Install the transmission oil cooler pipes. Refer to *Oil Cooler Line Replacement*.
11. Install the transmission fluid fill tube and the fill tube seal. Refer to *Filler Tube Replacement.*
12. Install the transmission vent hose and the wiring harness to the transmission. Refer to *Vent Hose.*



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13. Install the converter cover to the transmission if equipped.

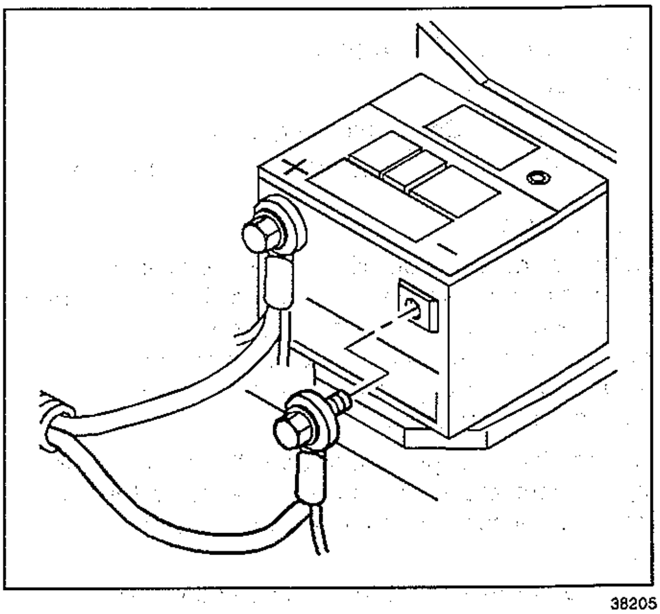
    Tighten

    Tighten bolts to 33 N.m (24 lb ft).
14. Install the starter motor. Refer to Starter Motor in Cranking Systems.
15. Install the exhaust pipe to the exhaust manifolds and the muffler assembly to the exhaust pipe. Refer to Removing Exhaust Parts in Exhaust System.
16. Install the bolts securing the crossmember to the frame.
17. Install the rear transmission mount. Refer to Engine Mounting in Engine Mechanical.
18. Remove the transmission jack and the engine support stands.
19. Install the rear propeller shaft. Refer to Propeller Shaft in Driveline/Axle.
20. Install the transmission range select cable to the transmission range select lever and the bracket.
21. Remove the safety stands.
22. Lower the vehicle.
23. Install new automatic transmission fluid. Refer to *Fluid Capacity* and to *AT Fluid/Filter Changing.*

24. Connect the battery negative cable assembly to the battery negative terminal.

Tighten

Tighten the terminal bolt to 15 N·m (11 lb ft).



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AT Oil Cooler Flushing

Tools Required

- *J 35944-A* Cooler Flushing Tool
- *J 35944-20* Biodegradable Flushing Solution

Preparation

Flush the transmission oil cooler whenever the transmission is removed for service. It is essential to flush the oil cooler after transmission installation, after a major overhaul, if oil contamination is suspected, or in any case of pump or torque converter replacement.

Perform the flush procedure after the overhaul or replacement assembly has been reinstalled in the vehicle to ensure the complete transmission system service.

1. Do not reconnect the oil cooler lines after installing the overhauled or service replacement transmission.
2. Remove the fill cap on *J 35944-A*.

   Notice: Do not substitute with any other solution. The flushing tool is designed to use only this concentrate. Use of any other solution can result in damage to the tool, cooler components, or improper flushing of the cooler.
3. Fill the can with 0.6L (20–21 ounces) of flushing solution. Do not overfill the tool or the tool will need to be recharged with air before the backflush. Follow the manufacturer's suggested procedures for proper handling of the solution.
4. Secure the fill cap.

   Caution: Air supply must be equipped with a water and oil filter. This air supply must not exceed 825 kPa (120 psi). Excess air pressure may rupture the flushing cooler, causing personal injury.
5. Pressurize the flusher can with shop air to 550–700 kPa (80–100 psi).
6. Connect the discharge hose to the transmission end of the oil cooler lines that goes to the top fitting at the radiator.
7. Clip the discharge hose onto the oil drain container.
8. Secure the flushing tool to the undercarriage of the vehicle with the hook provided.
9. Connect the hose from the flushing tool to the remaining oil cooler lines.
10. Switch the water valve on the tool to the OFF position.
11. Connect the water hose from the water supply to the tool.
12. Turn on the water supply at the faucet.

Initial Flush

Caution: If water does not flow through the oil cooler (system is completely plugged), do not continue flushing procedure. Turn the water off immediately and inspect the lines and cooler for restrictions and repair, or personal injury could result.

1. Switch the water valve on the tool to the ON position.
2. Allow the water to flow through the oil cooler for 10 seconds in order to remove the supply of transmission fluid in the system.
3. Switch the water valve on the tool to the OFF position.
4. Clip the discharge hose onto a 5 gallon pail.
5. Secure a lid on the pail or position a shop towel over the end of the discharge hose in order to prevent a splash. The discharge will foam vigorously when the solution is introduced in the water stream.
6. Switch the water valve on the tool to the ON position.
7. Depress the trigger to mix the flushing solution in the water flow. Use the bale clip provided on the handle to hold the trigger down.
8. Attach the air supply to the air valve located on the plumbing of the tool for 3–5 seconds at the end of every 15–20 second interval, in order to create a surging action.
9. Flush the oil cooler with water and solution for 2 minutes.
10. Release the trigger.
11. Switch the water valve on the tool to the OFF position.
12. Disconnect both hoses from the oil cooler lines.

Backflush

1. Connect the hoses to the oil cooler lines in the opposite order from the initial flush procedures to perform a backflush.
2. Switch the water valve on the tool to the ON position.
3. Depress the trigger to mix the flushing solution in the water flow. Use the bale clip provided on the handle to hold the trigger down.
4. Attach the air supply to the air valve located on the plumbing of the tool for 3– 5 seconds at the end of every 15–20 second interval, in order to create a surging action.
5. Flush the oil cooler with water and solution for 2 minutes.
6. Release the trigger and allow only water to rinse the oil cooler for 1 minute.
7. Switch the water valve on the tool to the OFF position.
8. Turn the water supply off at the faucet.
9. Attach the air supply to the air valve located on the plumbing of the tool.

Notice: Excessive residual moisture can cause corrosion in the oil cooler or cooler lines and can damage the transmission. If steps 9–15 cannot be completed at this time, rinse the oil cooler and cooler lines with transmission fluid. Complete steps 9–15 after reinstallation of the transmission.

10. Dry the system out with air for at least 2 minutes.
11. Continue drying out the system if moisture is visibly exiting from the oil cooler line discharge hose. Use an air chuck clip in order to secure the air chuck onto the air valve for ease of operation.
12. Connect the cooler feed line to the transmission bottom connector.
13. Attach the discharge hose to the cooler return line (top connector), if not already connected.
14. Place the other end of the discharge hose into an appropriate drain container.
15. Fill the transmission with automatic transmission fluid.
16. Start the engine and let it run for 30 seconds.

    The procedure mentioned above will ensure the following:
    - Removal of any residual moisture from the oil cooler and cooler lines
    - Protection of all components from corrosion
17. Check the flow rate through the cooler. A minimum of 2.0 L (2 quarts) must be obtained during this 30 second run.
18. Check the fluid flow out of the transmission if fluid flow is insufficient by using the following procedure:

    18.1. Disconnect the oil cooler feed line at the radiator

    18.2. Restart the engine
19. Perform the following procedures according to the flow rate:
    - Inspect the transmission for the cause of insufficient feed flow.
    - For sufficient feed flow, perform the following:

      19.2.1. Inspect the oil cooler pipes and fittings for restrictions or leaks.

      19.2.2. Repeat the check of fluid flow out of the return line.

      19.2.3. Replace the oil cooler if the flow is still inhibited.
20. Remove the discharge hose.
21. Reconnect the cooler return line to the transmission.
22. Refill the transmission with fluid to the proper level.

Cleaning Procedure

The tools should be cleaned after every third use.

1. Disconnect the water supply hose from the tool.
2. Bleed the air pressure from the can.
3. Remove the fill cap.
4. Return any unused solution to the container.
5. Rinse the can out with water. Do not store the tool with the solution in the tank.
6. Loosen the large coupling nut in order to remove the plumbing from the tank.
7. Remove the screen from the plumbing.
8. Wash the screen with water.
9. Remove any material in the solution orifice by using the cleaning pin.

   The orifice is located in the plumbing below the screen.
10. Reconnect the plumbing.
11. Fill half of the can with water.
12. Secure the fill cap.
13. Pressurize the can to 550–700 kPa (80–100 psi).
14. Aim the tool into the 5 gallon pail or floor drain.
15. Depress the trigger for 30 seconds in order to allow the water from the can to flow through the solution orifice. This will ensure proper cleaning.
16. Bleed the air pressure from the can.
17. Remove the fill cap.
18. Empty the can.
19. Reconnect the fill cap to the flushing tool.

Description and Operation

General Service Information

How to Use This Section

This section provides the following information:

- General diagnosis information on transmissions
- A detailed description of the Hydra-matic transmission operation
- Procedures for diagnosing the Hydra-matic transmission

When you diagnose any condition of the Hydra-matic transmission, begin with the Functional Test Procedure. This procedure indicates the proper path of diagnosing the transmission by describing the basic checks. This procedure will then refer you to the locations of specific checks. After you have determined the cause of a condition, refer to On-Vehicle Service for repair procedures. If the faulty component is not serviceable without removing the transmission from the vehicle, refer to Unit Repair for repair information.

Basic Knowledge

Notice: Do not, under any circumstances, attempt to diagnose a powertrain condition without basic knowledge of this powertrain. If you perform diagnostic procedures without this basic knowledge, you may incorrectly diagnose the condition or damage the powertrain components.

You must be familiar with some basic electronics in order to use this section of the service manual. You should also be able to use the following special tools:

- A Digital Multimeter (DMM)
- A circuit tester
- Jumper wires or leads
- A line pressure gage set

The Functional Test Procedures verify the correct operation of electronic components in the transmission. These procedures will eliminate the unnecessary removal of transmission components.

Diagnosis

Notice: If you probe a wire with a sharp instrument and do not properly seal the wire afterward, the wire will corrode and an open circuit will result.

Diagnostic test probes are now available that allow you to probe individual wires without leaving the wire open to the environment. These probe devices are inexpensive and easy to install, and they permanently seal the wire from corrosion.

Abbreviations and Their Meanings

Throttle Positions

Minimum Throttle: The least amount of throttle opening required for an upshift.

Light Throttle: Approximately 1/4 of accelerator pedal travel.

Medium Throttle: Approximately 1/2 of accelerator pedal travel.

Heavy Throttle: Approximately 3/4 of accelerator pedal travel.

Wide Open Throttle (WOT): Full travel of the accelerator pedal.

Full Throttle Detent Downshift: A quick apply of the accelerator pedal to its full travel, forcing a downshift.

Zero Throttle Coastdown: A full release of the accelerator pedal while the car is in motion and in drive range.

Engine Braking: A condition where the engine is used to slow the car by manually downshifting during a zero throttle coastdown.

Shift Conditions

Bump: A sudden and forceful apply of a clutch or a band.

Chuggle: A bucking or jerking. This condition may be most noticeable when the converter clutch is engaged. It is similar to the feel of towing a trailer.

Delayed: A condition where a shift is expected but does not occur for a period of time. This could be described as a clutch or band engagement that does not occur as quickly as expected during a part throttle or wide open throttle apply of the accelerator, or during manual downshifting to a lower range. This term is also defined as LATE or EXTENDED.

Double Bump (Double Feel): Two sudden and forceful applies of a clutch or a band.

Early: A condition where the shift occurs before the car has reached proper speed. This condition tends to labor the engine after the upshift.

End Bump: A firmer feel at the end of a shift than at the start of the shift. This is also defined as END FEEL or SLIP BUMP.

Firm: A noticeably quick apply of a clutch or band that is considered normal with a medium to heavy throttle. This apply should not be confused with HARSH or ROUGH.

Flare: A quick increase in engine RPM along with a momentary loss of torque. This most generally occurs during a shift. This condition is also defined as SLIPPING.

Harsh (Rough): A more noticeable apply of a clutch or band than FIRM. This condition is considered undesirable at any throttle position.

Hunting: A repeating quick series of upshifts and downshifts that causes a noticeable change in engine RPM, such as a 4-3-4 shift pattern. This condition is also defined as BUSYNESS.

Initial Feel: A distinctly firmer feel at the start of a shift than at the finish of the shift.

Late: A shift that occurs when the engine's RPM is higher than normal for a given amount of throttle.

Shudder: A repeating jerking condition similar to CHUGGLE but more severe and rapid. This condition may be most noticeable during certain ranges of car speed.

Slipping: A noticeable increase in engine RPM without a car speed increase. A slip usually occurs during or after initial clutch or band apply.

Soft: A slow, almost unnoticeable clutch or band apply with very little shift feel.

Surge: A repeating engine related condition of acceleration and deceleration that is less intense than CHUGGLE.

Tie-Up: A condition where two opposing clutch and/or bands are attempting to apply at the same time causing the engine to labor with a noticeable loss of engine RPM.

Noise Conditions

Planetary Gear Noise: a whine related to car speed. This noise is most noticeable in First gear, Second gear, Fourth gear, or Reverse. The condition becomes less noticeable after an upshift.

Pump Noise: a high pitched whine that increases with engine RPM and may be affected by modulated line pressure boost.

Transmission Abbreviations

PCM: Powertrain Control Module

VCM: Vehicle Control Module

TCC: Torque Converter Clutch

TP Sensor: Throttle Position Sensor

ECT Sensor: Engine Coolant Temperature Sensor

VSS Sensor: Vehicle Speed Sensor

RWD: Rear Wheel Drive

2WD: 2 Wheel Drive

4WD: 4 Wheel Drive

TFT: Automatic Transmission Fluid Temperature

TFP Val. Position Sw. Assy.: Automatic Transmission Fluid Pressure Manual Valve Position Switch Assembly

A/T ISS Sensor: Automatic Transmission Input Shaft Speed Sensor

OSS Sensor: Automatic Transmission Output Shaft Speed Sensor

A/T Wiring Harness Assy.: Automatic Transmission Wiring Harness Assembly

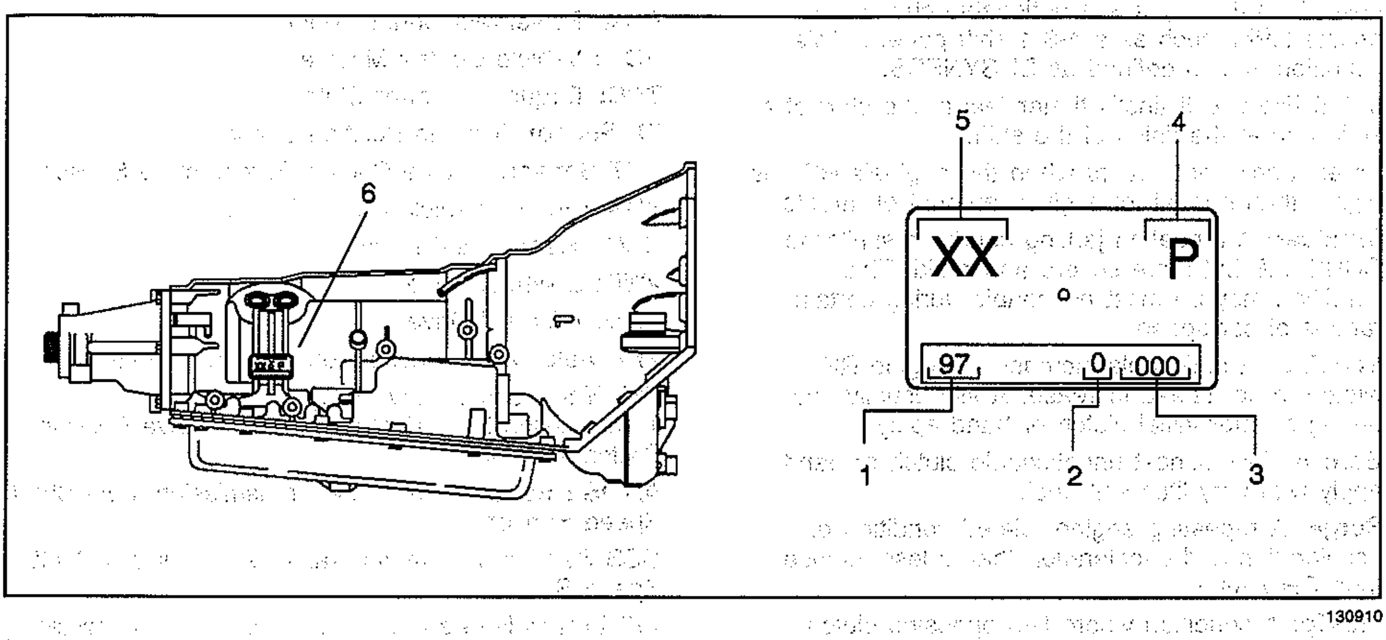
PC Sol. Valve: Pressure Control Solenoid Valve

1–2 SS Valve: 1–2 Shift Solenoid Valve

2–3 SS Valve: 2–3 Shift Solenoid Valve

TCC PWM Sol. Valve: Torque Converter Clutch Pulse Width Modulation Solenoid Valve

Transmission Identification Information



Legend

(1) Model Year
(2) Calendar Year
(3) Julian Date
(4) Hydra-Matic 4L80-E
(5) Model
(6) Transmission ID Location

General Description

The 4L80-E is a fully automatic rear wheel drive electronically controlled transmission. The 4L80-E provides four forward ranges including overdrive and reverse. A gear type of oil pump controls shift points. The VCM/PCM and the Pressure Control Solenoid (force motor) regulate these shift points. The VCM/PCM also controls shift schedules and TCC apply rates. Transmission temperature also influences shift schedules and TCC apply rates.

You can operate the transmission in any one of the following seven modes:

- P – Park position prevents the vehicle from rolling either forward or backward on vehicles less than 15,000 G.V.W. For safety reasons, use the parking brake in addition to the park position.
- R – Reverse allows the vehicle to be operated in a rearward direction.
- N – Neutral allows the engine to be started and operated while driving the vehicle. If necessary, you may select this position in order to restart the engine with the vehicle moving.
- OD – Overdrive is used for all normal driving conditions. Overdrive provides four gear ratios plus a converter clutch operation. Depress the accelerator in order to downshift for safe passing.
- D – Drive position is used for city traffic, and hilly terrain. Drive provides three gear ranges. Depress the accelerator in order to downshift.
- 2 – Manual Second provides acceleration and engine braking or greater traction from a stop. When you choose Manual Second, the vehicle will start out in first gear and upshift to second gear. You may select this gear at a vehicle speed of up to 22 km/h (35 mph).
- 1 – Manual Low provides maximum engine braking. You may select this gear at a vehicle speed of up to 13 km/h (20 mph).

Component and System Description

The mechanical components of this unit are as follows:

- A torque converter with a Torque Converter Clutch (TCC)
- A gear type oil pump
- Five multiple disk clutches
- Two band assemblies
- Three planetary gear sets
- One sprag clutch
- Two roller clutches
- A control valve body assembly

The electrical components of this unit are as follows:

- Two shift solenoid valves, 1-2 and 2-3
- A Torque Converter Clutch Solenoid valve
- A transmission Pressure Control Solenoid valve (PC Sol. Valve)
- An Automatic Transmission Fluid Temperature sensor (TFT)
- An Automatic Transmission Fluid Pressure Manual Valve Position switch (TFP Val Position Sw) assembly
- An Output Speed Sensor (OSS)
- An Input Speed Sensor (ISS)

Adapt Function

The 4L80-E transmission uses a line pressure control system, which has the ability to continuously adapt the system's line pressure. This compensates for normal wear and break in of the following parts:

- The clutch fiber plates
- The seals
- The springs

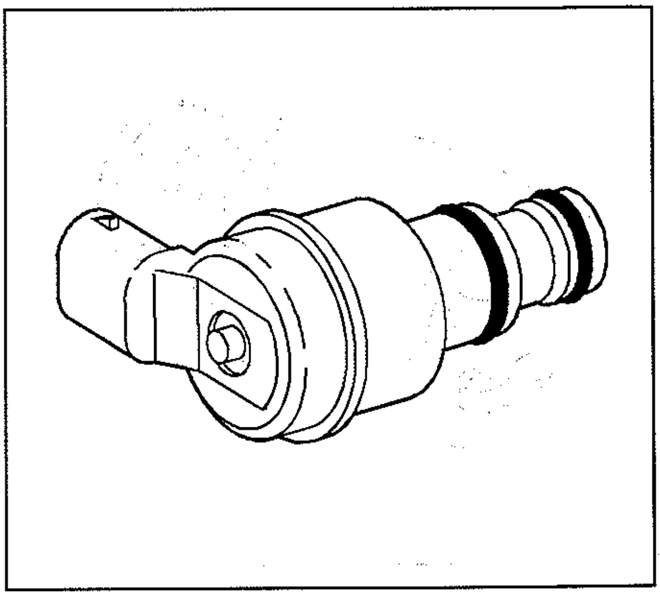
The VCM/PCM maintains the following adapt parameters for the transmission:

- Upshift Adapt – The VCM/PCM monitors the Automatic Transmission Input(Shaft) Speed Sensor (A/T ISS) and the Output Speed Sensor (OSS) during commanded shifts in order to determine if a shift is occurring too fast or too slow. The VCM/PCM adjusts the signal to the transmission pressure control solenoid valve in order to maintain a set shift feel.
- Steady State Adapt (Diesel only) – The VCM/PCM monitors the Automatic Transmission Input(Shaft) Speed Sensor (A/T ISS) and the Output Speed Sensor (OSS) after a shift in order to calculate the amount of slippage in that gear. The VCM/PCM then adjusts the signal to the Transmission Pressure Control Solenoid signal in order to maintain slippage below a set amount.

Reset the Transmission Adapt functions when the transmission is overhauled or replaced. To reset the Transmission Adapt functions, use the Scan Data tool.

Electronic Component Description

Torque Converter Clutch Solenoid Valve



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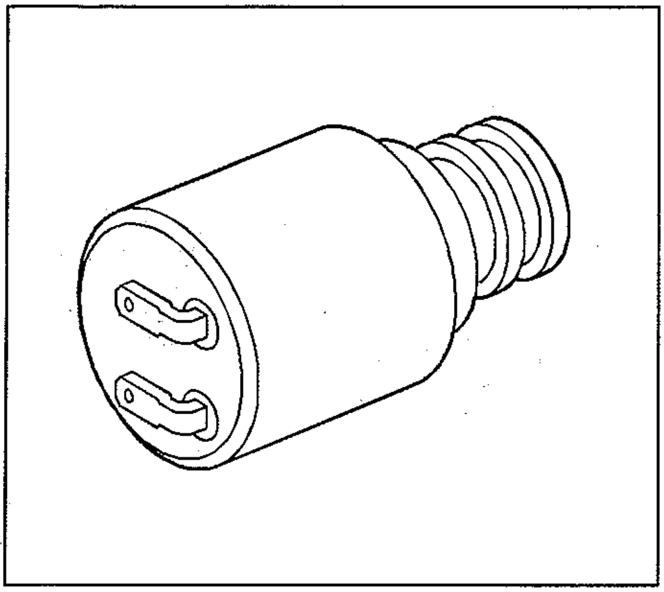
The VCM/PCM energizes the Torque Converter Clutch Pulse Width Modulated Solenoid Valve (TCC PWM Sol. Valve), which is located on the transmission valve body. The TCC PWM Sol. Valve acts on the TCC apply valve in order to control the torque converter clutch application.

The TCC PWM Sol. Valve is pulse width modulated by the VCM/PCM. This means that the VCM/PCM pulses the solenoid so that the hydraulic pressure against the torque converter clutch modulates. This modulated pressure allows the TCC to slip slightly, thus keeping the TCC balanced just at the point of engagement.

One diagnostic code is associated with the TCC PWM Sol. Valve. Code P1860, TCC Solenoid Circuit – Electrical, will detect a fault in the TCC circuit. While Code P1860 is set, both fourth gear in hot mode and the TCC are inhibited. Shift adapt will not update and the MIL will illuminate. Recovery can occur on the next ignition cycle.

Transmission Pressure Control Solenoid Valve (Force Motor)



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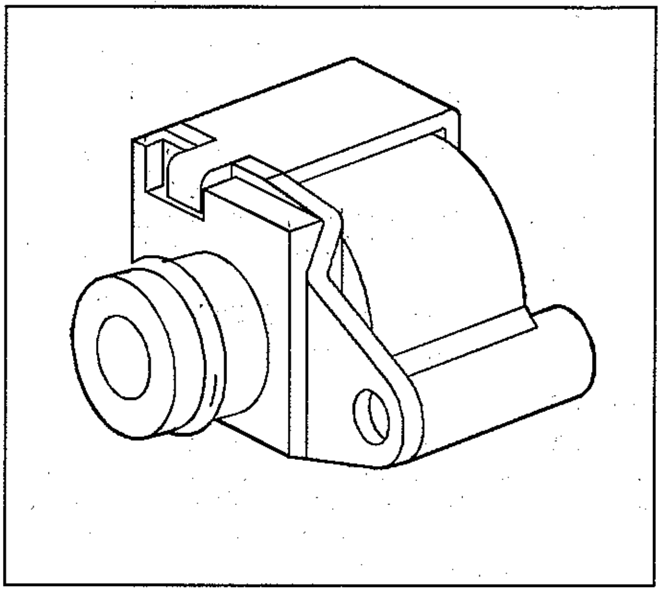
The Pressure Control Solenoid valve is attached to the valve body. The valve controls line pressure by moving a pressure regulator valve against spring pressure. The Pressure Control Solenoid valve takes the place of the throttle valve or the vacuum modulator, which was used on past model transmissions.

The VCM/PCM varies line pressure based on engine load. Engine load is calculated from various inputs, especially the TP Sensor switch. Line pressure is actually varied by changing the amperage applied to the Pressure Control Solenoid valve from 0 amps (high pressure) to 1.1 amps (low pressure). The Pressure Control Solenoid valve current is periodically pulsed in order to prevent contamination from sticking the pressure regulator valve.

One diagnostic code is associated with the Pressure Control Solenoid valve. Code P0748 will set when the VCM/PCM detects a difference of.16 amp or more between the amperage commanded and actual amperage. While the code is set, the Pressure Control Solenoid valve will be turned OFF. Recovery can occur after the next ignition cycle. Code P0748 will not sense a hydraulic problem such as a stuck valve.

1-2 Shift Solenoid Valve



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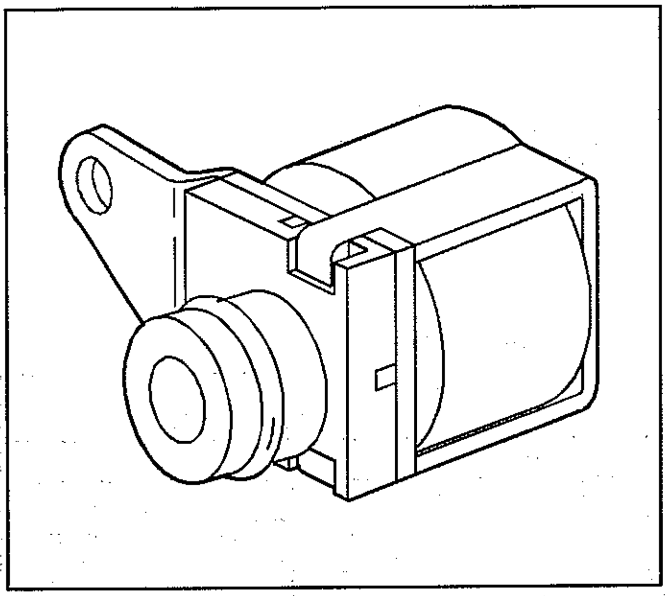
The 1-2 Shift Solenoid valve is attached to the valve body and is a normally open exhaust valve. The VCM/PCM activates the solenoid by grounding the solenoid through an internal quad driver. The 1-2 Shift Solenoid valve is ON in First and Fourth gear, but OFF in Second and Third gears. When ON, the valve redirects fluid to act on the shift valve. The 1-2 Shift Solenoid valve is usually black in color.

Two diagnostic codes are associated with the 1-2 Shift Solenoid valve: P0753 and P0751.

The first code is Code P0753 (1-2 Shift Solenoid Valve – electrical). The VCM/PCM continually monitors the 1-2 Shift Solenoid circuit for expected voltage. If the voltage reading is not what is expected, Code P0753 will be set. While Code P0753 is present, the VCM/PCM will default to maximum line pressure, freeze shift adapts from being updated and the MIL will not illuminate. Recovery can occur on the next ignition cycle.

Code P0751 (1-2 Shift Solenoid Valve – Performance) is set when the VCM/PCM detects First or Second gear at high speed. The VCM/PCM default action is Second gear only.

2-3 Shift Solenoid Valve



40713

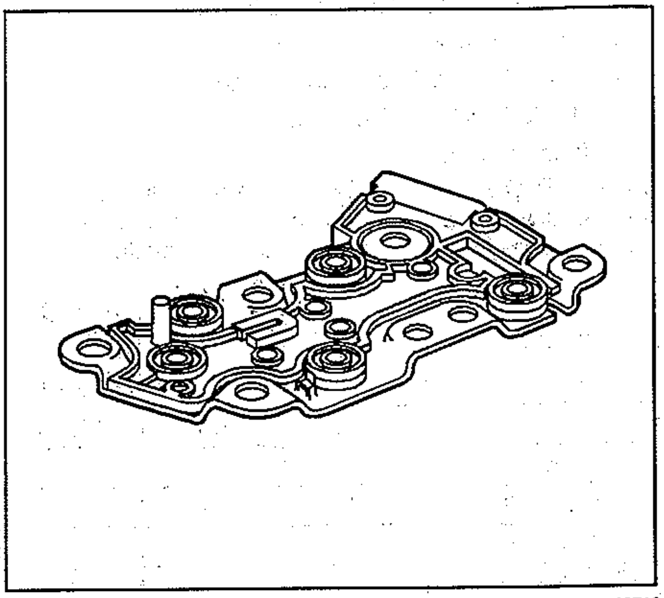
The 2-3 Shift Solenoid valve is attached to the valve body and is a normally open exhaust valve. The VCM/PCM activates the valve by grounding the valve through an internal quad driver. The 2-3 Shift Solenoid is ON in third and Fourth gear and OFF in First and Second gear. When ON, the valve redirects fluid to act on the shift valve. The 2-3 Shift Solenoid valve is usually white.

Two diagnostic codes are associated with the 2-3 Shift Solenoid Valve: P0758 and P0756.

The first code is Code P0758 (2-3 Shift Solenoid Valve – electrical). The VCM/PCM continually monitors the 2-3 Shift Solenoid circuit for expected voltage. If the voltage reading is not what is expected, Code P0758 will set. While Code P0758 is present, TCC operation will be inhibited, line pressure will be set to maximum, and the transmission will default to Second gear only. Recovery can occur at the next ignition cycle.

Code P0756 (2-3 Shift Solenoid Valve – performance) will set when the calculated gear ratio is numerically higher than the gear commanded, which must be either Third or Fourth gear. The VCM/PCM default action is Second gear only.

Automatic Transmission Fluid Pressure Manual Valve Position Switch Assembly



40718

A gear range sensing device call an Automatic Transmission Fluid Pressure Switch (TFP Val. Position Sw.) Assembly is used by the VCM/PCM in order to sense what gear range has been selected by the vehicle operator. The TFP Val. Position Sw. Assembly is located on the valve body and consists of five pressure switches combined into one unit. The VCM/PCM applies system voltage to the TFP Val. Position Sw. Assembly on three separate wires. These three circuits are either grounded or open, depending on which gear range has been selected, and on which combination of the five switches have pressure applied to them.

When the vehicle is in PARK, with the key ON and the engine OFF, the normal state of the TFP Val. Position Sw. Assembly will be Drive2. When the key is ON and the engine is running, the normal state of the TFP Val. Position Sw. Assembly will be in PARK/NEUTRAL.

There are two possible combinations of the switches within the pressure switch manifold that do not represent an actual gear range. If the VCM/PCM detects either of these combinations for more that 0.5 seconds, Code P1810 will set. Code P1810 will not set, however, if a valid gear range combination appears at the wrong time.

While Code P1810 is present, the VCM/PCM will take the following actions:

- Assume Drive4 for shift pattern control
- Maximize the line pressure
- The VCM will freeze shift adapts
- The MIL will not illuminate
- Type B code

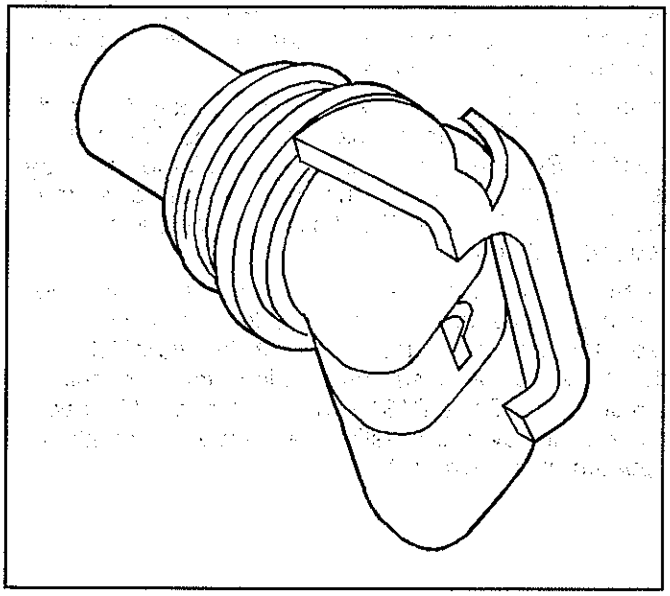
If the TFP Val. Position Sw. Assembly resumes normal functioning, the transmission will resume normal operation after the next ignition cycle

Oil Pressure and Circuit Combination Table

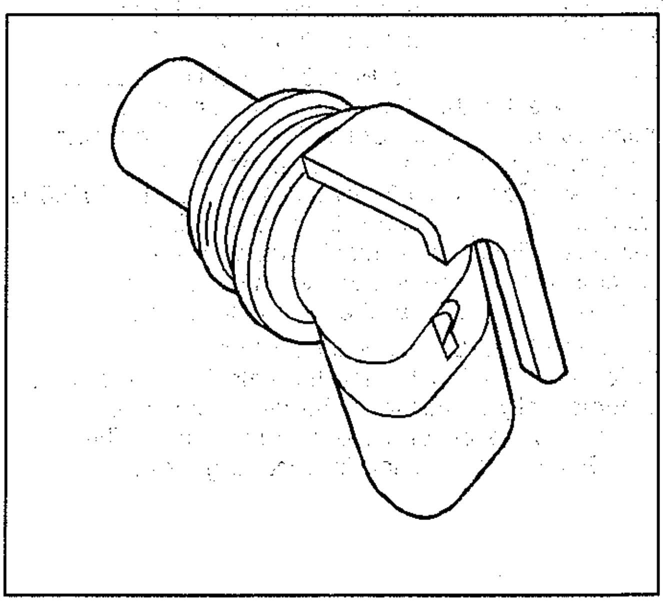
RANGE INDICATOR	OIL PRESSURE PRESENT					CIRCUIT/MODE		
	REV	LO	PRND4	PRND43	Drive	A	B	C
PARK	—	—	X	X	—	OFF	ON	OFF
REVERSE	X	—	X	X	—	ON	ON	OFF
NEUTRAL	—	—	X	X	—	OFF	ON	OFF
Overdrive	—	—	X	X	X	OFF	ON	ON
D	—	—	—	X	X	OFF	OFF	ON
2	—	—	—	—	X	OFF	OFF	OFF
1	—	X	—	—	X	ON	OFF	OFF

Seven valid combinations and two invalid combinations are available from the TR. Valid combinations for Circuits A, B, and C are shown in the figure. The invalid combinations displayed on the scan tool are A = ON, B = ON, C = ON or A = ON, B = OFF, C = ON. ON means that the switch is closed; OFF means that the switch is open.

Automatic Transmission Input(Shaft) Speed, Output(Shaft) Speed Sensors



40712



40715

Both of the Automatic Transmission Input(Shaft) Speed (A/T ISS) and the Automatic Transmission Output(Shaft) Speed (A/T OSS) Sensors are magnetic induction sensors. The input and the output sensors are accessible from the left hand side of the transmission. The A/T ISS Sensor is located just forward of center and the A/T OSS Sensor is located near the rear. A voltage signal is induced in the A/T ISS Sensor by serrations which are cut in the outside diameter of the forward clutch housing.

Voltage is induced in the output sensor by gear teeth which are pressed on the outside diameter of the rear carrier assembly.

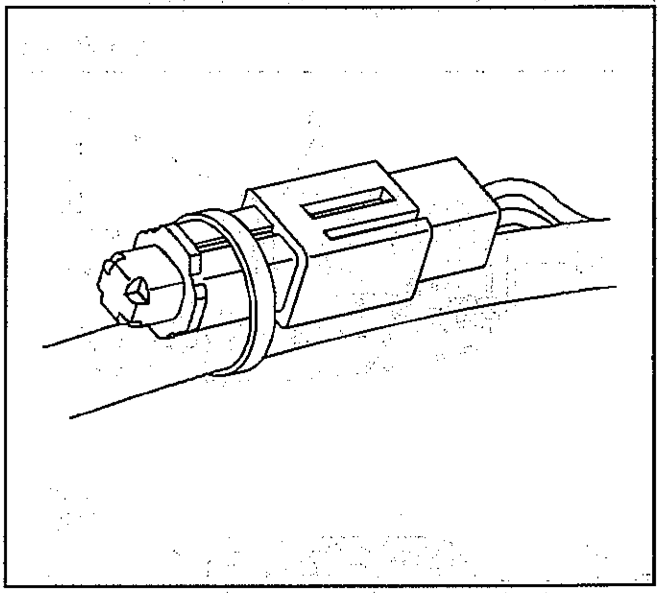
The VCM/PCM used speed information from these sensors in order to determine the following:

- Whether the engine is running
- Vehicle speed
- Calculation of the gear ratio
- Calculation of TCC slip
- Calculation of turbine speed

Type D code(s) P0502 (VCM) or P0722, P0723 (PCM) will set if a fault exists in the A/T OSS Sensor circuit, and the VCM/PCM will calculate a default value using the A/T ISS Sensor values. As long as the fault remains and the code is set, the VCM/PCM will also command maximum line pressure, freeze shift adapts, and the MIL will illuminate. If the fault is removed, normal operation will resume after the next ignition cycle.

For diesel engines, type B fault codes P0723 and P0724 will set.

Automatic Transmission Fluid Temperature Sensor Assembly



71423

The Automatic Transmission Fluid Temperature (TFT) Sensor Assembly is a thermistor which is mounted in the wiring harness assembly. Low transmission temperature produces high resistance, while high temperature produces low resistance. The VCM/PCM supplies a 5-volt signal to the TFT Sensor Assembly through an internal resistor. Then the VCM/PCM measures the voltage drop in the circuit. Voltage will be high when the transmission is cold and low when the transmission is hot.

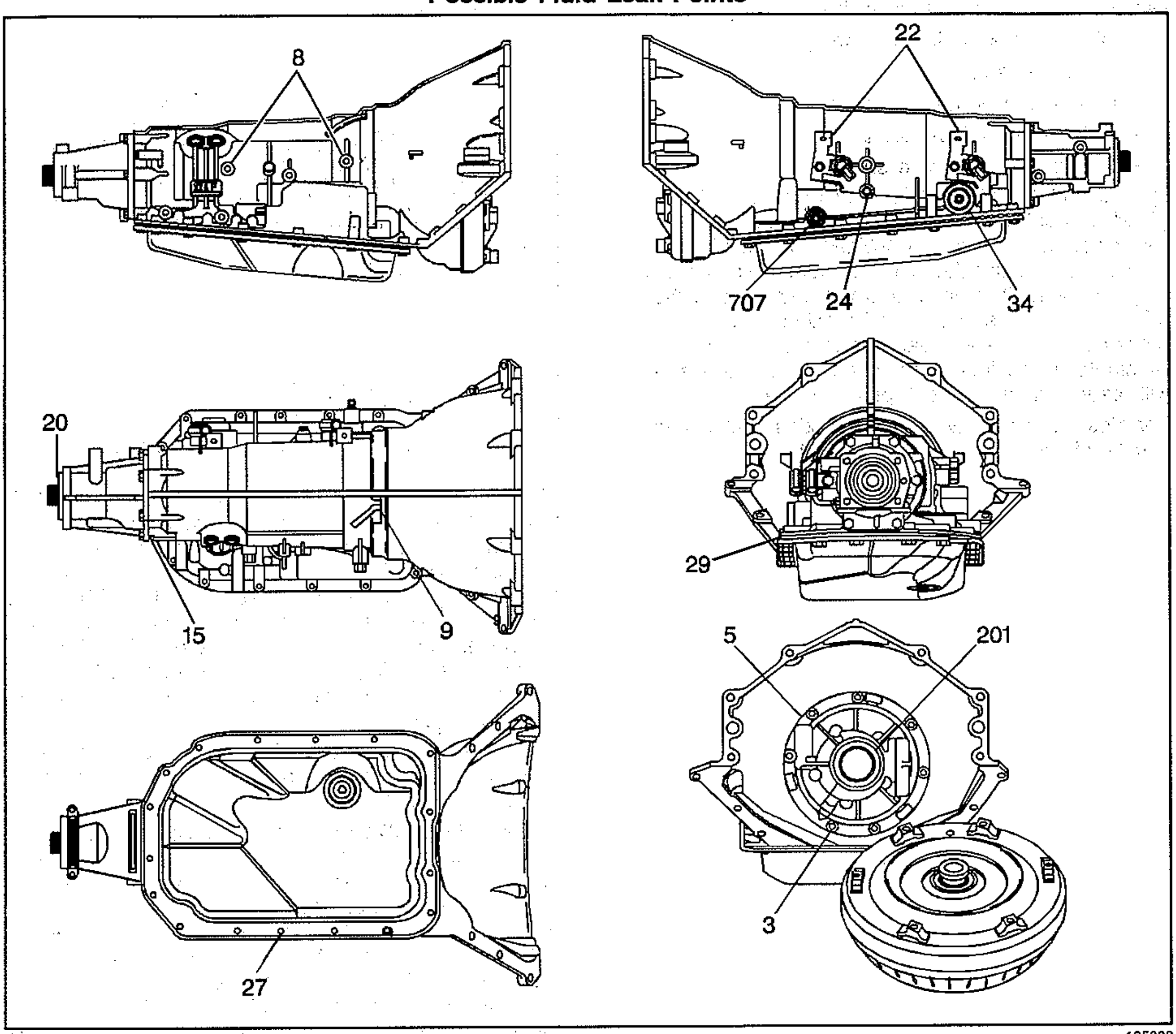
The VCM/PCM uses the TFT Sensor Assembly in order to regulate torque converter clutch apply, as well as shift quality.

DTCs P0711, P0712 and P0713 indicate a fault in the TFT Sensor Assembly circuit. After the vehicle has been started, transmission temperature should rise steadily and stabilize between 90°–115°C, depending on load. All three DTCs will cause the VCM/PCM to use a default value of 140°C, thus reacting as if the transmission were hot in either case. When DTCs P0711, P0712 or P0713 are set, the VCM/PCM will freeze the shift adapts from being updated, and the MIL illuminates. Some driveability symptoms will be noticed, especially when cold.

Component Locator

Transmission Component Location

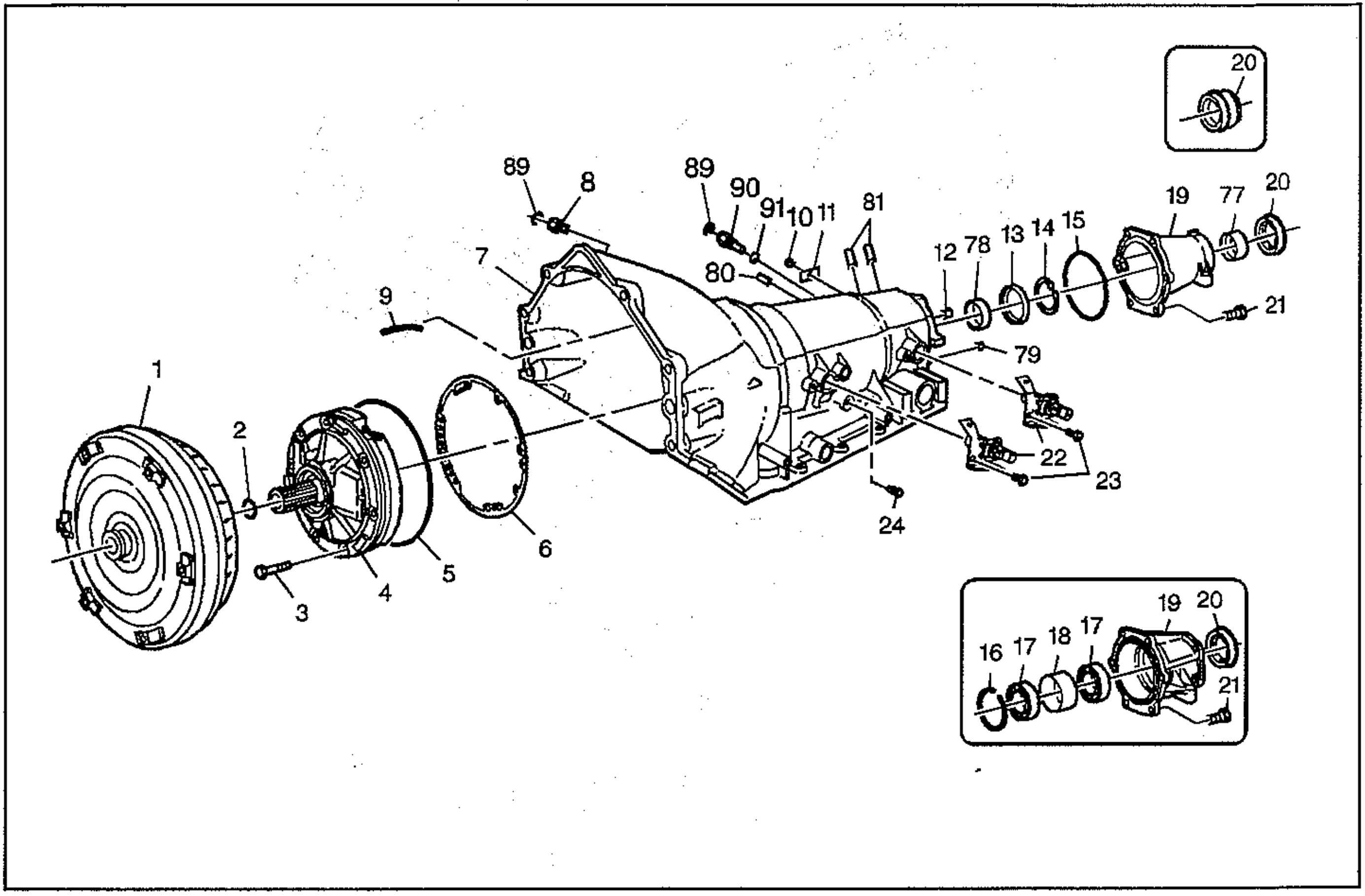
Possible Fluid Leak Points



Legend

(3) Bolt and Seal Assembly, Pump to Case
(5) Seal, Oil Pump to Case
(8) Connector, Transmission Oil Cooler Pipe
(9) Pipe, Vent
(15) Seal, Extension to Case
(20) Seal, Prop Shaft Front Slip Yoke Oil
(22) Sensor Assembly, A/T Input Speed and Output Speed
(24) Plug, Oil Test Hole
(27) Bolt, Oil Pan to Case
(29) Seal, Transmission Oil Pan
(34) Harness Assembly, Electrical Wiring
(201) Seal, Torque Converter Oil
(707) Seal Assembly, Manual Shaft

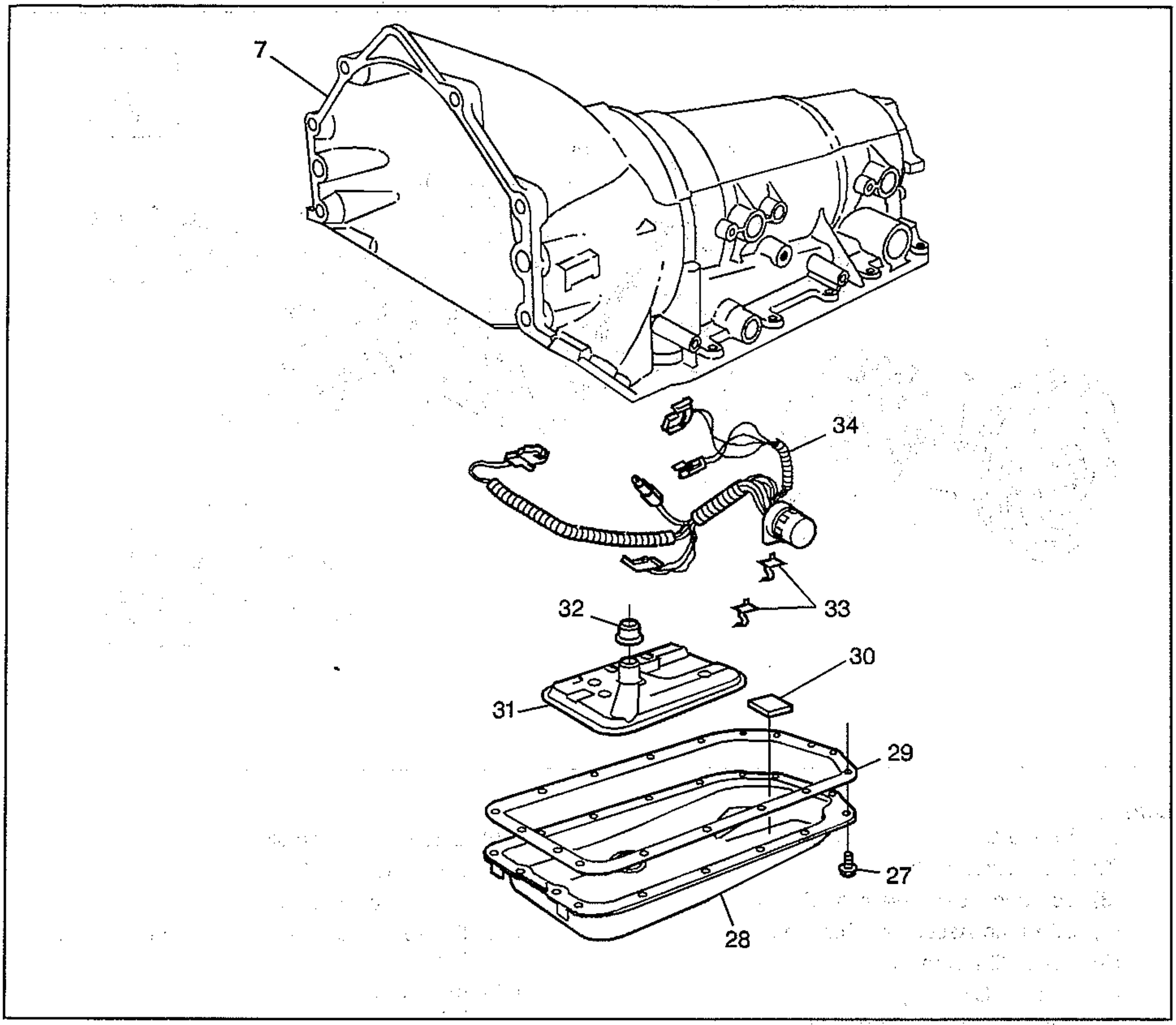
Case and Associated Parts (1 of 3)



Legend

(1) Torque Converter Assembly
(2) Seal, Turbine Shaft Oil
(3) Bolt and Seal Assembly, Pump to Case
(4) Oil Pump Assembly, Complete
(5) Seal, Oil Pump to Case
(6) Gasket, Oil Pump Cover to Case
(7) Case Assembly, Complete
(8) Connector, Transmission Oil Cooler Pipe
(9) Pipe, Vent
(10) Screw, Nameplate
(11) Nameplate
(12) Cup, Orifice with Seal, Plug, Rear Lube (4WD)
(13) Seal Assembly, Output Shaft
(14) Ring, Output Shaft Seal Retainer
(15) Seal, Extension to Case
(16) Ring, Bearing Retaining
(17) Bearing Assembly, Ball
(18) Spacer, Bearing
(19) Extension Assembly, Case
(20) Seal, Prop Shaft Front Slip Yoke Oil
(21) Bolt, Extension To Case
(22) Sensor Assembly, A/T Input Speed and Output Speed
(23) Bolt, Input Speed and Output Speed Sensor
(24) Plug, Oil Test Hole
(77) Bushing, Case Extension
(78) Bushing, Transmission Rear Case
(79) Plug, Direct Oil Gal – 0.25 Diameter Cup
(80) Pin, Manual 2-1 Band Anchor
(81) Pin, Low and Reverse Band Anchor
(89) Retainer, Transmission Oil Cooler Pipe (Some Models)
(90) Connector, Transmission Rear Oil Cooler Pipe
(91) Seal, Transmission Rear Oil Cooler Pipe Connector

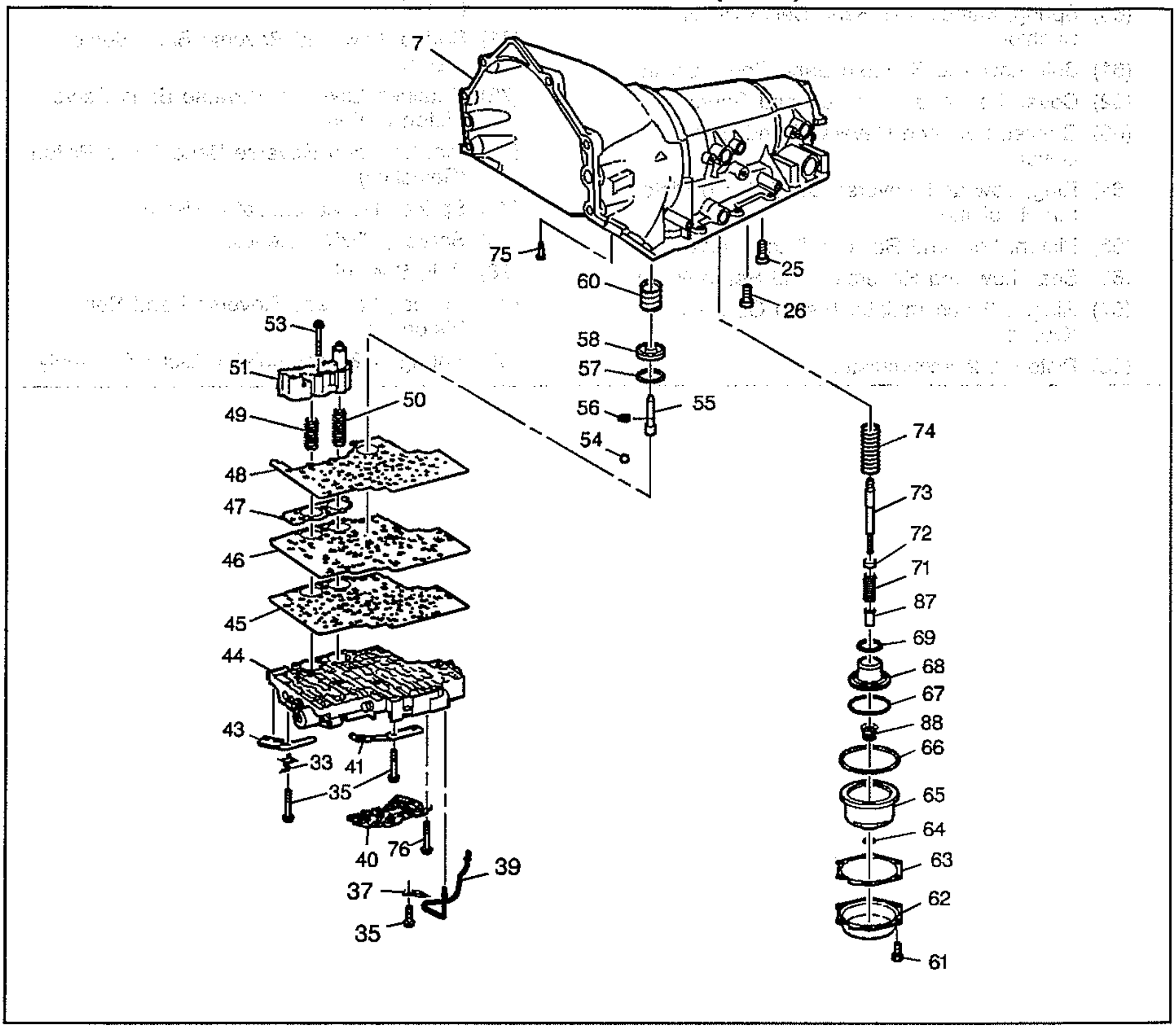
Case and Associated Parts (2 of 3)



Legend

(7) Case Assembly, Complete
(27) Bolt, Transmission Oil Pan
(28) Pan, Transmission Oil
(29) Seal, Transmission Oil Pan
(30) Magnet, Chip Collector
(31) Filter Assembly, Transmission Oil
(32) Seal Assembly, Filter Neck
(33) Clamp, Electrical Cable
(34) Harness Assembly, Electrical Wiring

Case and Associated Parts (3 of 3)

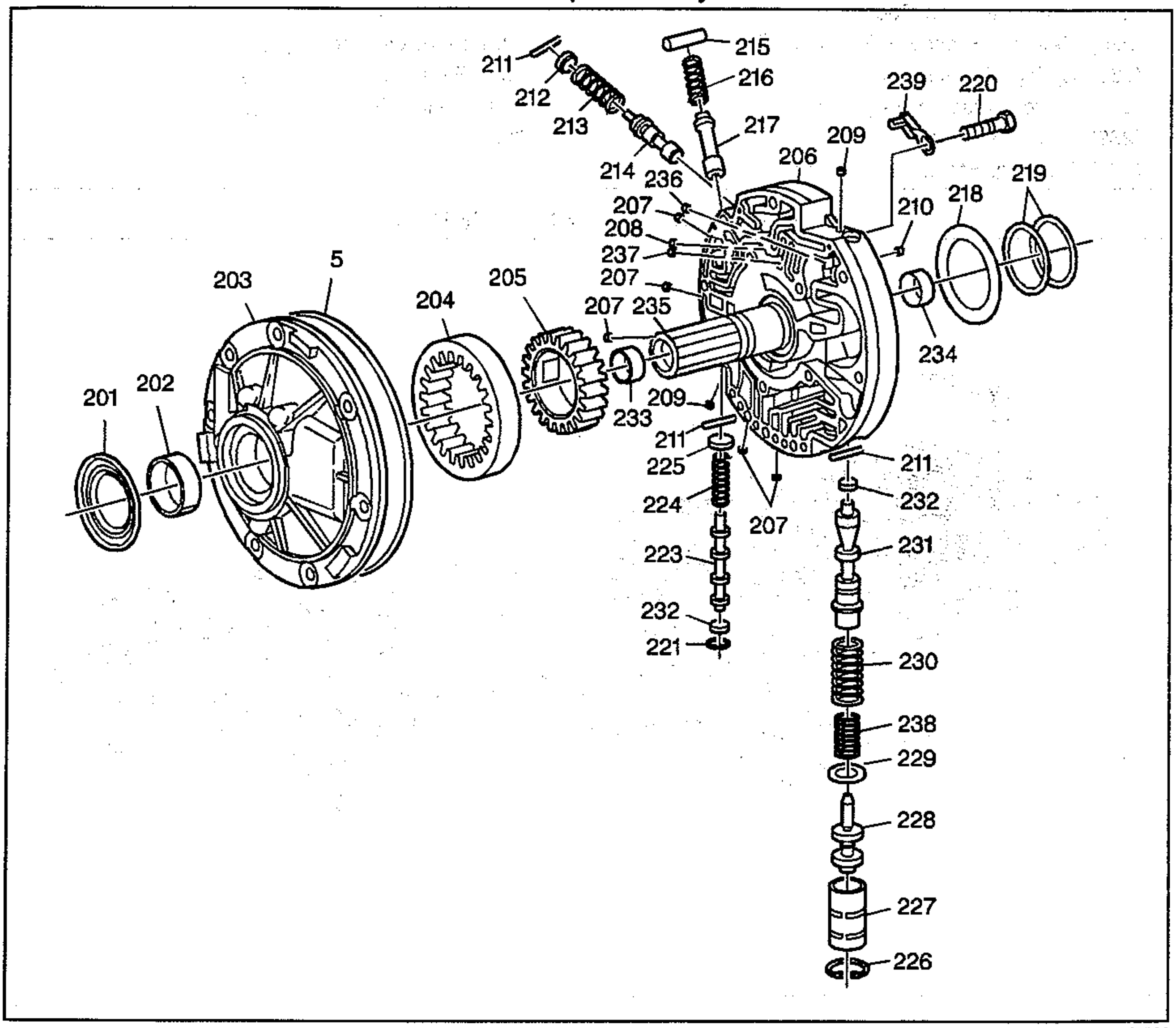


Legend

- (7) Case Assembly, Complete
- (25) Bolt, Case to Center Support
- (26) Bolt, Case (Fourth Clutch)
- (35) Bolt, Control Valve Body Assembly
- (37) Retainer, Lube Pipe
- (39) Pipe, Lube
- (40) Switch, A/T Fluid Pressure Manual Valve Position
- (41) Spring Assembly, Detent
- (44) Body Assembly, Control Valve
- (45) Gasket, Control Valve Body to Spacer Plate
- (46) Plate, Control Valve Body Spacer
- (47) Gasket, Accumulator Housing to Spacer Plate
- (48) Gasket, Spacer Plate to Case
- (49) Spring, Fourth Clutch Accumulator Piston
- (50) Spring, Third Clutch Accumulator Piston
- (51) Housing, Accumulator
- (53) Bolt, Accumulator Housing to Control Valve Body
- (54) Checkball
- (55) Pin, Manual 2-1 Band Servo Piston
- (56) Ring, Manual 2-1 Band Servo Piston Pin Retainer
- (57) Seal, Manual 2-1 Band Servo Piston

(58) Piston, Manual 2-1 Band Servo
(60) Spring, Manual 2-1 Band Servo Piston Cushion
(61) Bolt, Low and Reverse Band Servo Cover
(62) Cover, Low and Reverse Band Servo
(63) Gasket, Low and Reverse Band Servo Cover
(64) Ring, Low and Reverse Band Servo Piston Pin Retaining
(65) Piston, Low and Reverse Band Servo
(66) Seal, Low and Reverse Band Servo Piston
(67) Ring, 1-2 Accumulator Piston Oil Seal (Outer)
(68) Piston, 1-2 Accumulator
(69) Ring, 1-2 Accumulator Piston Oil Seal (Inner)
(71) Spring, Low and Reverse Band Servo Piston
(72) Retainer, Low and Reverse Band Servo Piston Spring
(73) Pin, Low and Reverse Band Servo Piston (Selective)
(74) Spring, 1-2 Accumulator Piston
(75) Screen, PWM Solenoid
(76) Bolt, Special
(87) Spacer, Low and Reverse Band Servo Piston Pin
(88) Spring, 1-2 Accumulator Assist Assembly

Oil Pump Assembly



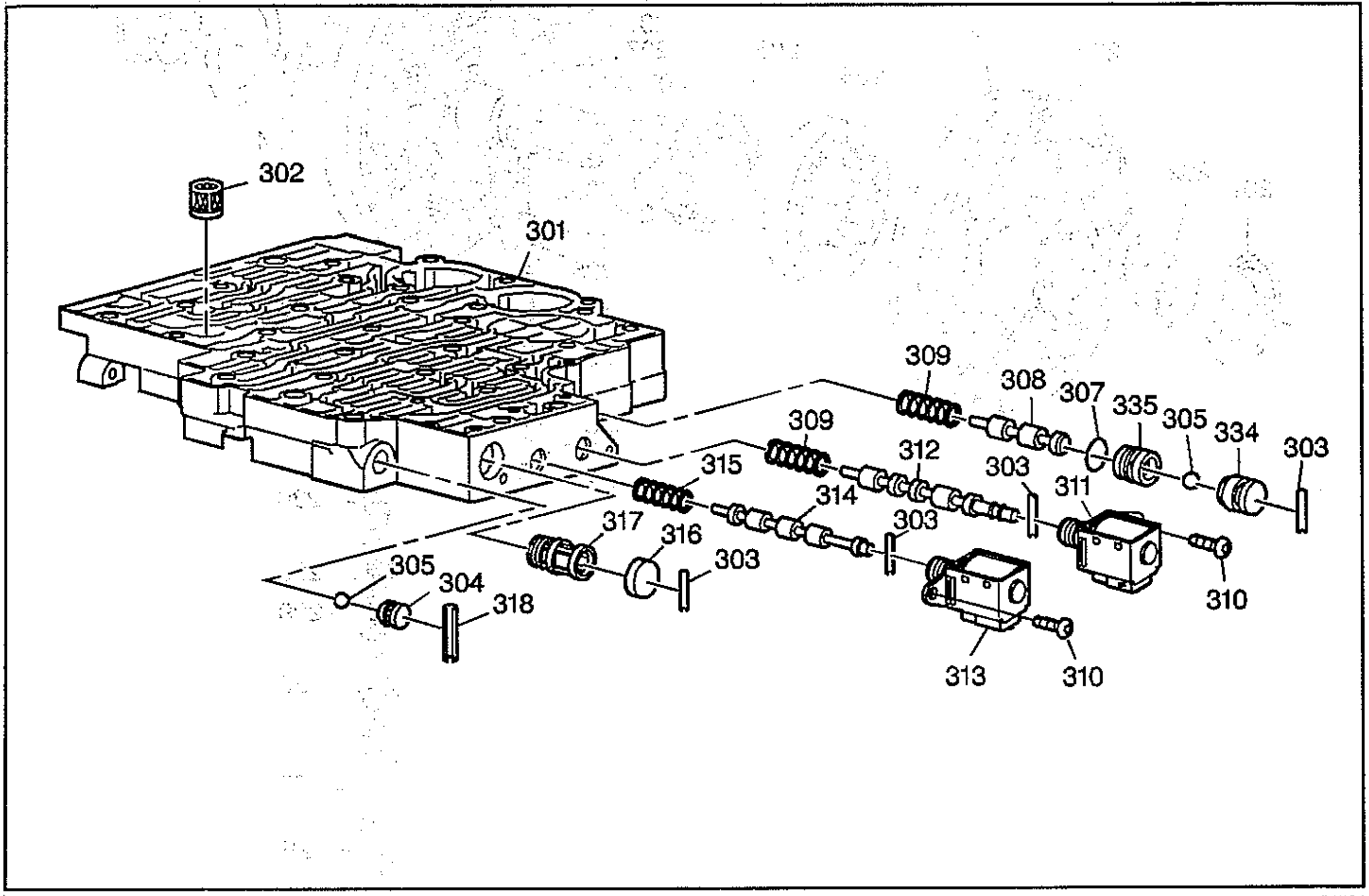
181739

Legend

(5) Seal, Oil Pump to Case
(201) Seal, Torque Converter Oil
(202) Bushing, Pump Body
(203) Body, Oil Pump
(204) Gear, Pump Driven
(205) Gear, Pump Drive
(206) Cover, Pump
(207) Plug, Cup (5)
(208) Plug, Orificed Cup (1)
(209) Plug, Cup (2)
(210) Plug, Orificed Cup (1)
(211) Pin, Coiled Spring (3)
(212) Plug, Converter Limit Valve Bore
(213) Spring, Converter Limit Valve
(214) Valve, Converter Limit
(215) Sleeve, Spring Retainer
(216) Spring, TCC Enable Valve
(217) Valve, TCC Enable
(218) Washer, Thrust Selective
(219) Ring, Oil Seal
(220) Bolt, Oil Pump Cover (5)
(221) Ring, TCC Valve Bore Plug Retainer
(223) Valve, TCC
(224) Spring, TCC Valve
(225) Plug, TCC Valve Bore
(226) Ring, Retainer (Reverse Boost Valve Bushing)

(227) Bushing, Reverse Boost Valve
(228) Valve, Reverse Boost
(229) Retainer, Pressure Regulator Spring
(230) Spring, Pressure Regulator
(231) Valve, Pressure Regulator
(232) Plug, Valve Bore
(233) Bushing, Stator Shaft (Front)
(234) Bushing, Stator Shaft (Rear)
(235) Shaft, Stator
(236) Plug, Orificed Cup (1)
(237) Plug, Orificed Cup (1)
(238) Spring, Pressure Regulator
(239) Shield, Vent

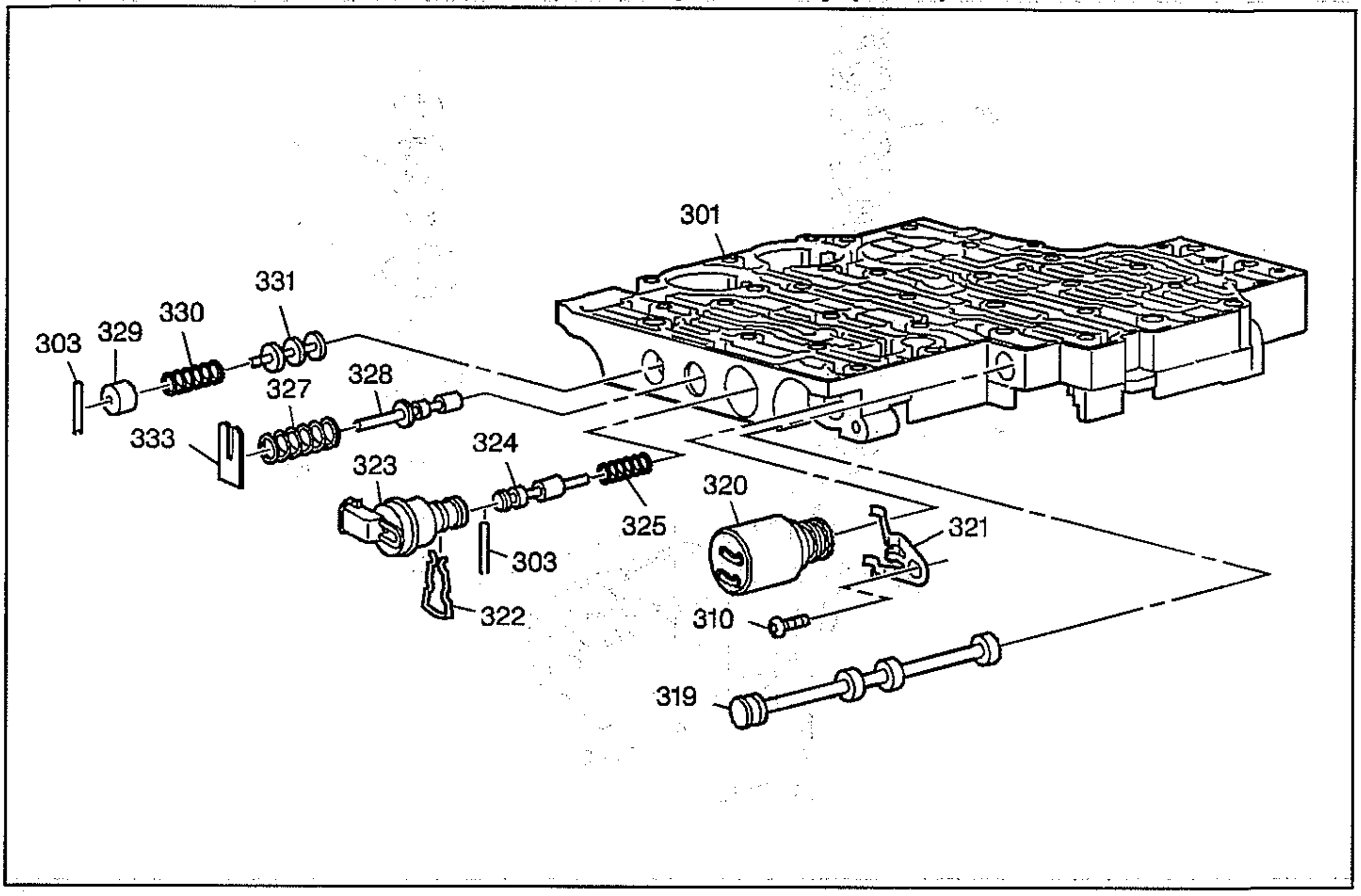
Control Valve Body Assembly (1 of 2)



Legend

(301) Body, Control Valve
(302) Screen Filter, Pressure Control Solenoid Feed
(303) Pin, Coiled Spring
(304) Plug, Checkball
(305) Checkball
(307) Seal, 3rd Ball Valve Bushing
(308) Valve, 3-4 Shift
(309) Spring, Shift Valve Return (2-3 and 3-4)
(310) Bolt, Solenoid (1-2 and 2-3 Shift, Pressure Control Solenoid)
(311) 2-3 Shift Solenoid and O-Ring Assembly
(312) Valve, 2-3 Shift
(313) 1-2 Shift Solenoid and O-Ring Assembly
(314) Valve, 1-2 Shift
(315) Spring, 1-2 Shift Valve Return
(316) Plug, Shift Solenoid Feed Filter
(317) Filter, Shift Solenoid Feed
(318) Sleeve, Low/Reverse Checkball
(334) Bushing, Reverse Ball Valve
(335) Bushing, 3rd Ball Valve

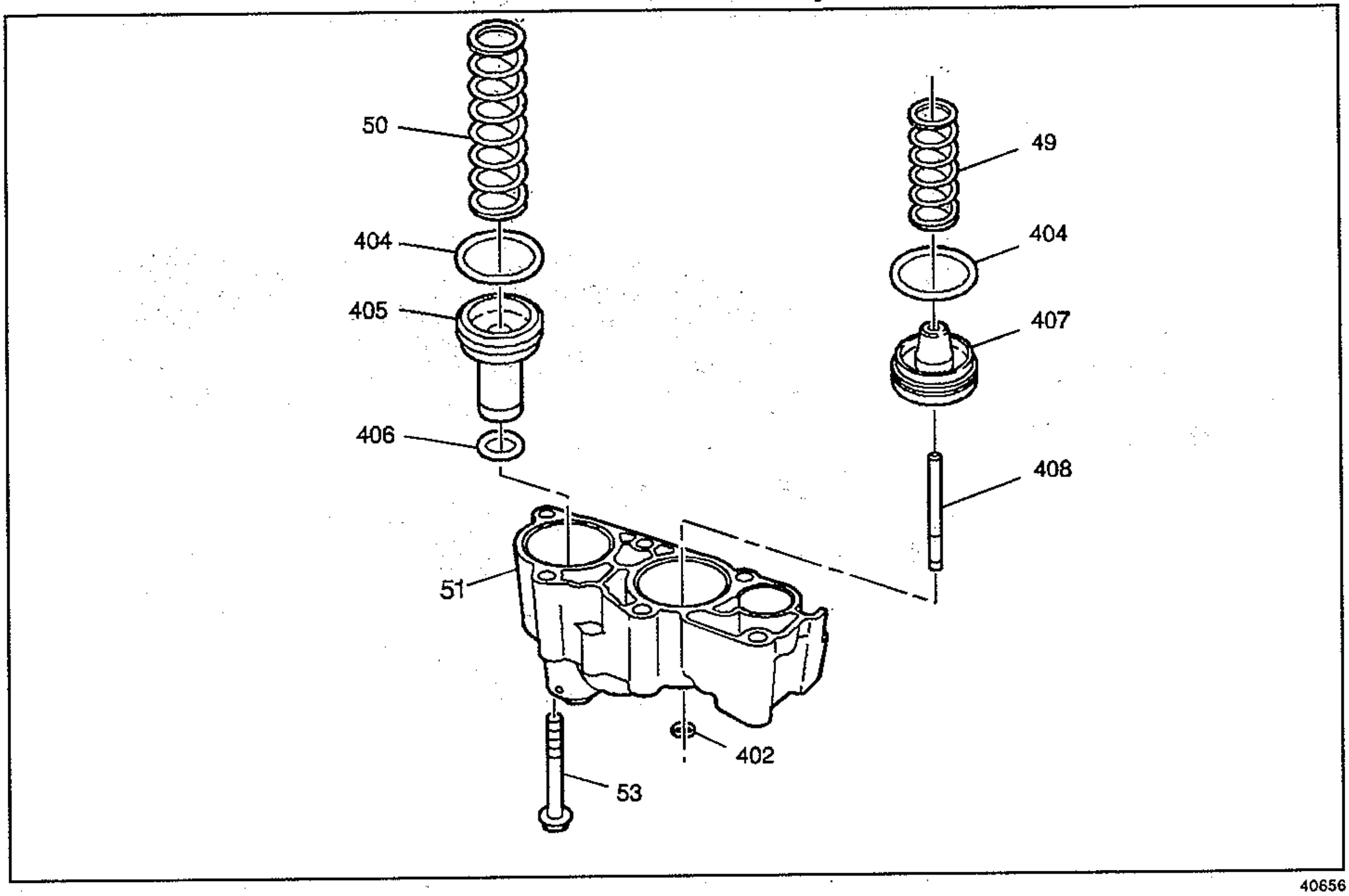
Control Valve Body Assembly (2 of 2)



Legend

(301) Body, Control Valve
(303) Pin, Coiled Spring
(310) Bolt, Solenoid (1-2 and 2-3 Shift, Pressure Control Solenoid)
(319) Valve, Manual
(320) Pressure Control Solenoid
(321) Clamp, Pressure Control Solenoid Retaining
(322) Clip, PWM Solenoid Retaining
(323) Solenoid Assembly, PWM
(324) Valve, TCC Regulator Apply Valve
(325) Spring, TCC Regulator Apply Valve
(327) Spring Actuator Feed Limit Valve
(328) Valve, Actuator Feed Limit
(329) Plug, Accumulator Valve Bore
(330) Spring, Accumulator Valve
(331) Valve, Accumulator
(333) Plate, Spring Retainer

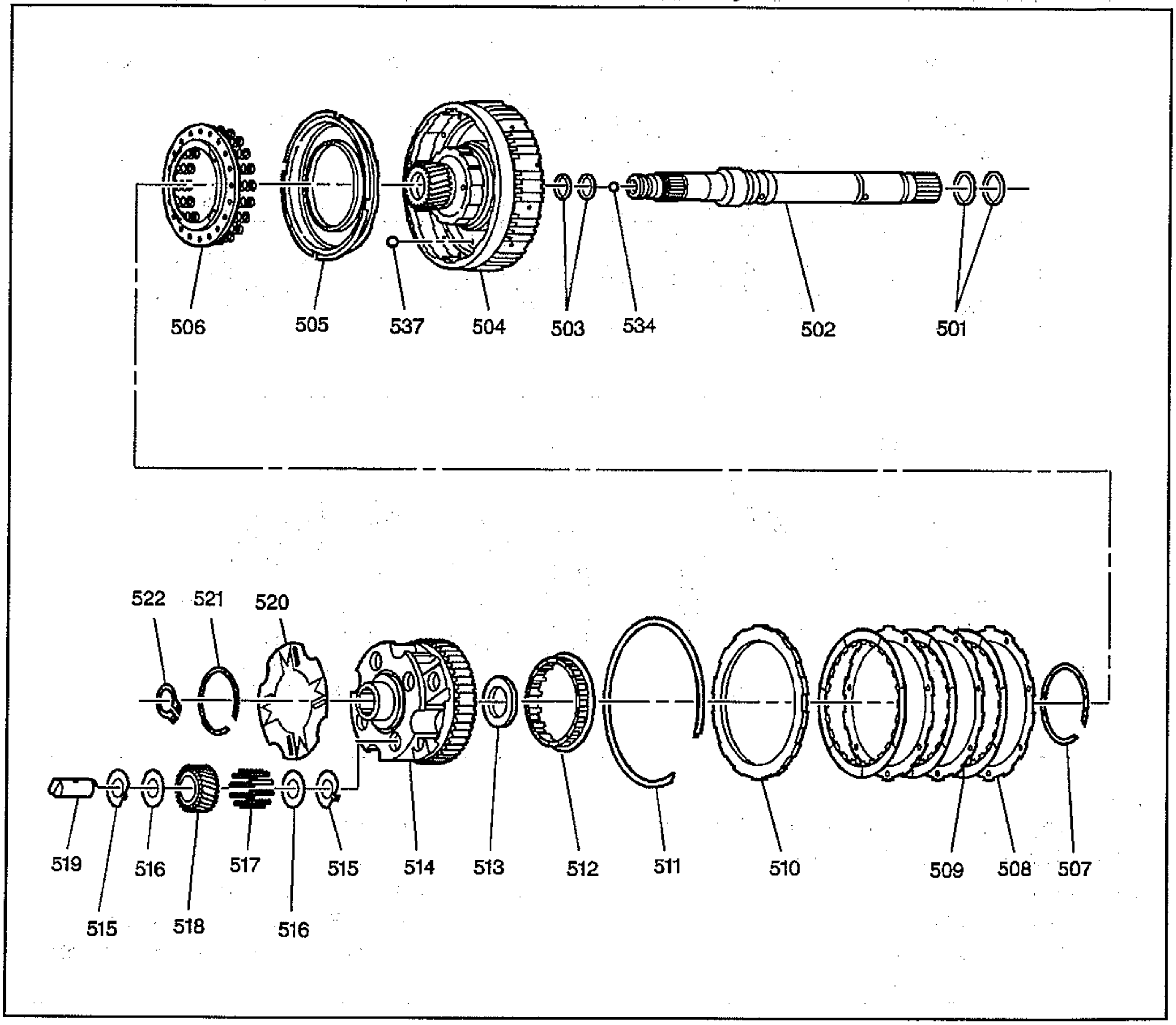
Accumulator Assembly



Legend

(49) Spring, 4th Clutch Accumulator Piston
(50) Spring, 3rd Clutch Accumulator Piston
(51) Housing, Accumulator
(53) Bolt, Accumulator Housing to Valve Body
(402) Ring, Accumulator Piston Pin Retainer
(404) Seal, 3rd and 4th Clutch Accumulator Piston
(405) Piston, 3rd Clutch Accumulator
(406) Seal, 3rd Clutch Accumulator Piston Inner
(407) Piston, 4th Clutch Accumulator
(408) Pin, 4th Clutch Accumulator Piston

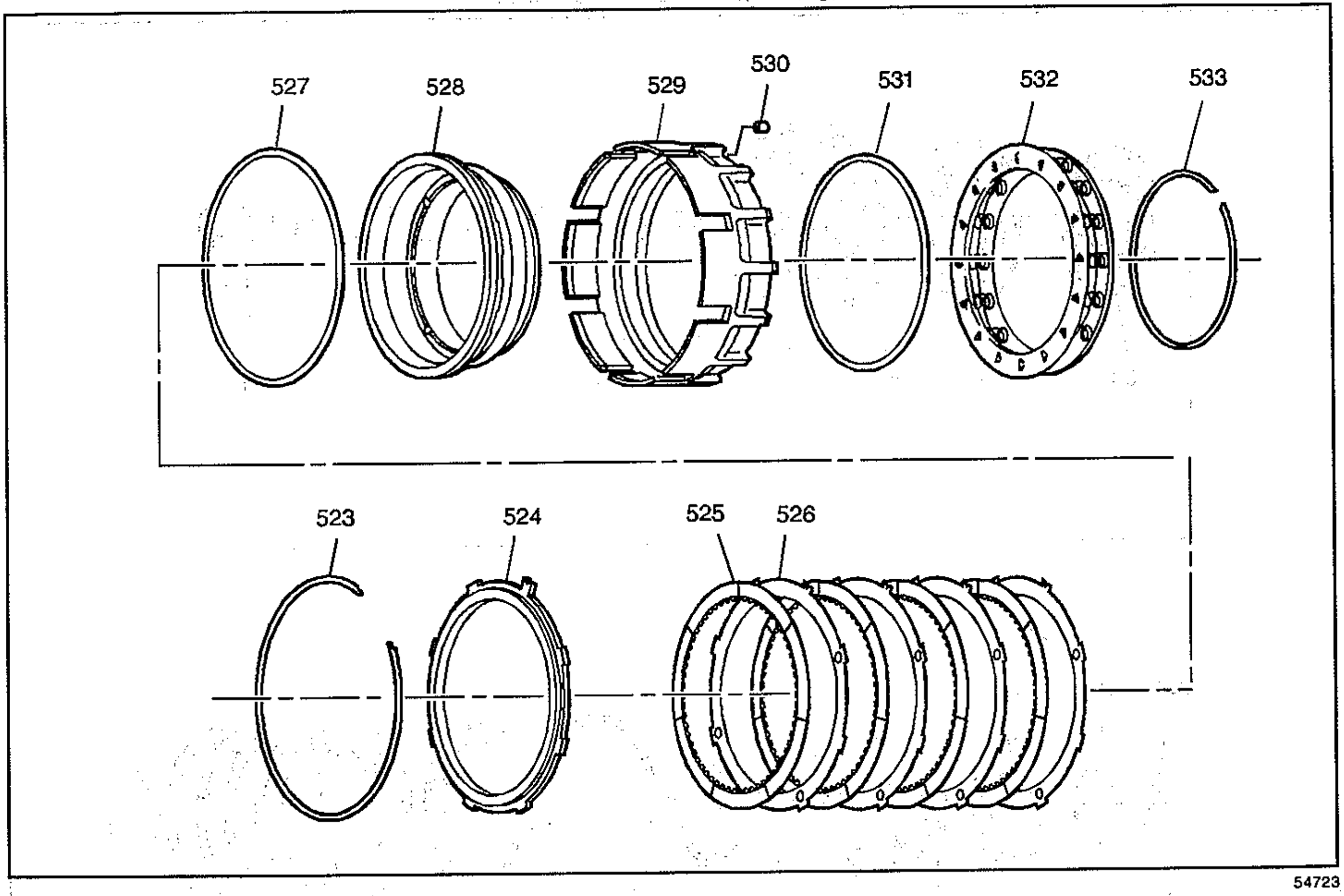
Overrun Clutch Assembly



Legend

(501) Seal, Turbine Shaft Front Oil
(502) Shaft, Turbine
(503) Seal, Turbine Shaft Rear Oil
(504) Housing Assembly, Overrun Clutch
(505) Piston Assembly, Overrun Clutch
(506) Spring and Retainer Assembly
(507) Ring, Overrun Clutch Spring Retainer
(508) Plate, Overrun Clutch
(509) Plate Assembly, Overrun Clutch
(510) Plate, Overrun Clutch Backing
(511) Ring, Overrun Clutch Backing Plate Retainer
(512) Roller Clutch Assembly, Overdrive
(513) Bearing Assembly, Thrust Carrier/Overrun Clutch
(514) Carrier Assembly, Overdrive
(515) Washer, Pinion Thrust
(516) Washer, Pinion Thrust (Steel)
(517) Roller, Needle Bearing
(518) Pinion Gear, Overdrive Planetary
(519) Pin, Overdrive Pinion
(520) Retainer, Pinion Pin
(521) Retaining Ring, Pinion Pin Retainer
(522) Ring, Turbine Shaft Retainer
(534) Checkball, Turbine Shaft
(537) Checkball, Overrun Clutch Housing

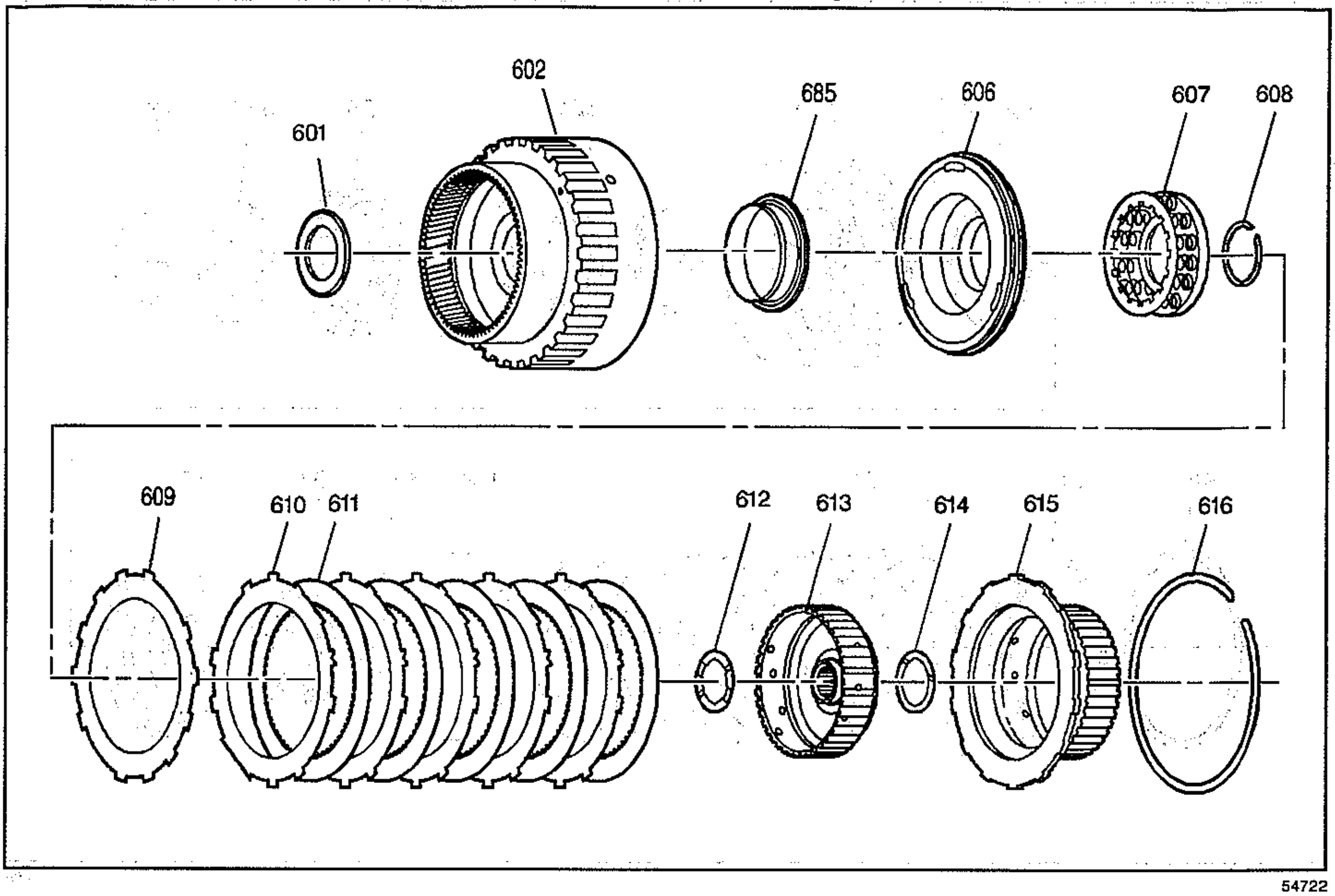
Fourth Clutch Assembly



Legend

- (523) Ring, 4th Clutch Backing Plate Retainer
- (524) Plate, 4th Clutch Backing
- (525) Plate Assembly, 4th Clutch
- (526) Plate, 4th Clutch
- (527) Seal, 4th Clutch (Inner)
- (528) Piston, 4th Clutch
- (529) Housing, 4th Clutch
- (530) Plug, Orifice
- (531) Seal, 4th Clutch (Outer)
- (532) Spring and Retainer Assembly, 4th Clutch
- (533) Ring, 4th Clutch Piston Spring and Retainer Assembly Retainer

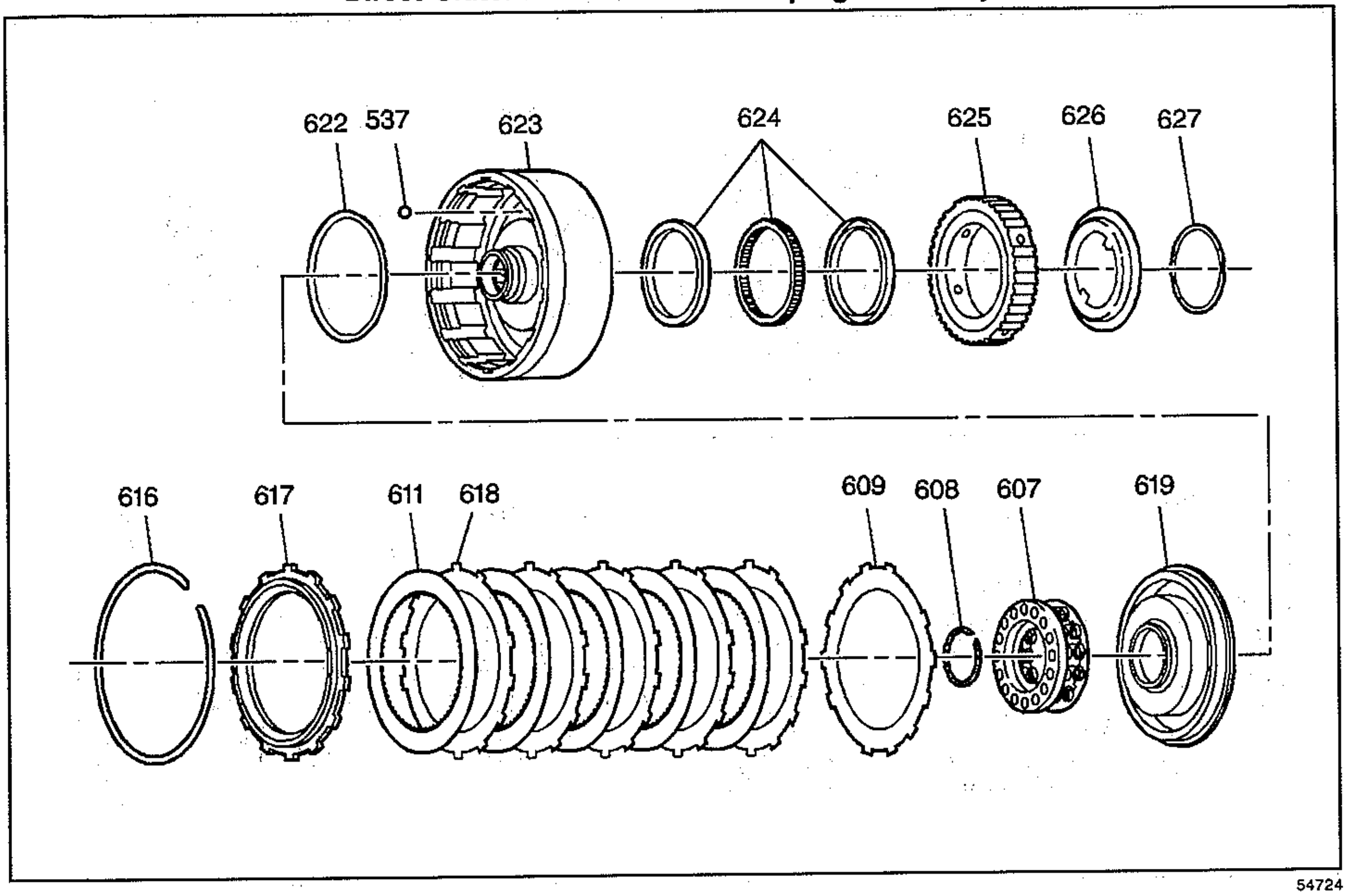
Forward Clutch Assembly



Legend

(601) Bearing Assembly, Thrust Carrier/Forward Clutch
(602) Housing Assembly, Forward Clutch
(606) Piston and Seal Assembly, Forward Clutch
(607) Spring and Retainer Assembly
(608) Ring, Retainer
(609) Plate, Forward Clutch Apply (Waved)
(610) Plate, Forward Clutch (Steel)
(611) Plate, Forward Clutch (Composite)
(612) Washer, Thrust (Forward Clutch Hub/Forward Clutch Housing)
(613) Hub, Forward Clutch Driven
(614) Washer, Thrust (Forward Clutch Hub)
(615) Hub, Direct Clutch Driving
(616) Ring, Direct Clutch Hub Retaining
(685) Sleeve and Seal Assembly, Forward Clutch Piston Inner

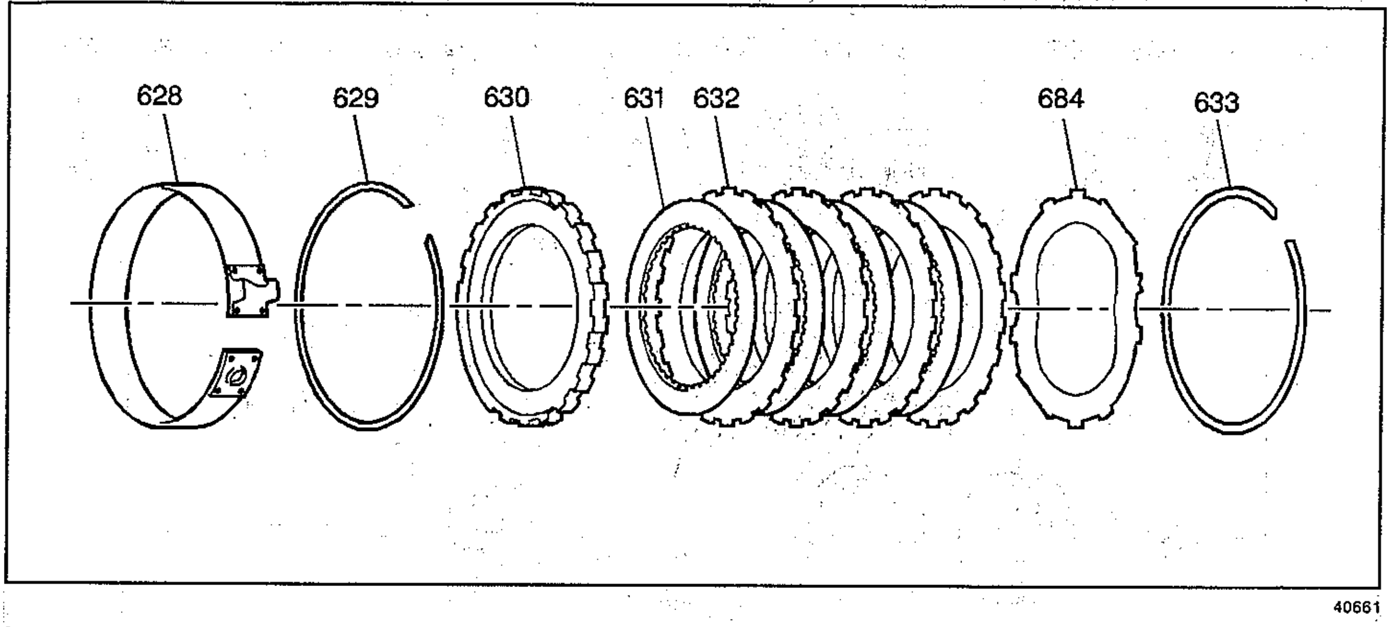
Direct Clutch and Intermediate Sprag Assembly



Legend

- (537) Checkball
- (607) Spring and Retainer Assembly
- (608) Ring, Direct Clutch Spring Retainer
- (609) Plate, Direct Clutch Apply (Waved)
- (611) Plate, Direct Clutch (Composite)
- (616) Ring, Direct Clutch Backing Plate Retaining
- (617) Plate, Direct Clutch Backing
- (618) Plate, Direct Clutch (Steel)
- (619) Piston and Seal Assembly, Direct Clutch
- (622) Seal, Direct Clutch Piston Center
- (623) Housing, Direct Clutch
- (624) Sprag Assembly, Intermediate Clutch
- (625) Race, Intermediate Clutch Sprag (Outer)
- (626) Retainer, Intermediate Clutch Sprag
- (627) Ring, External Locking

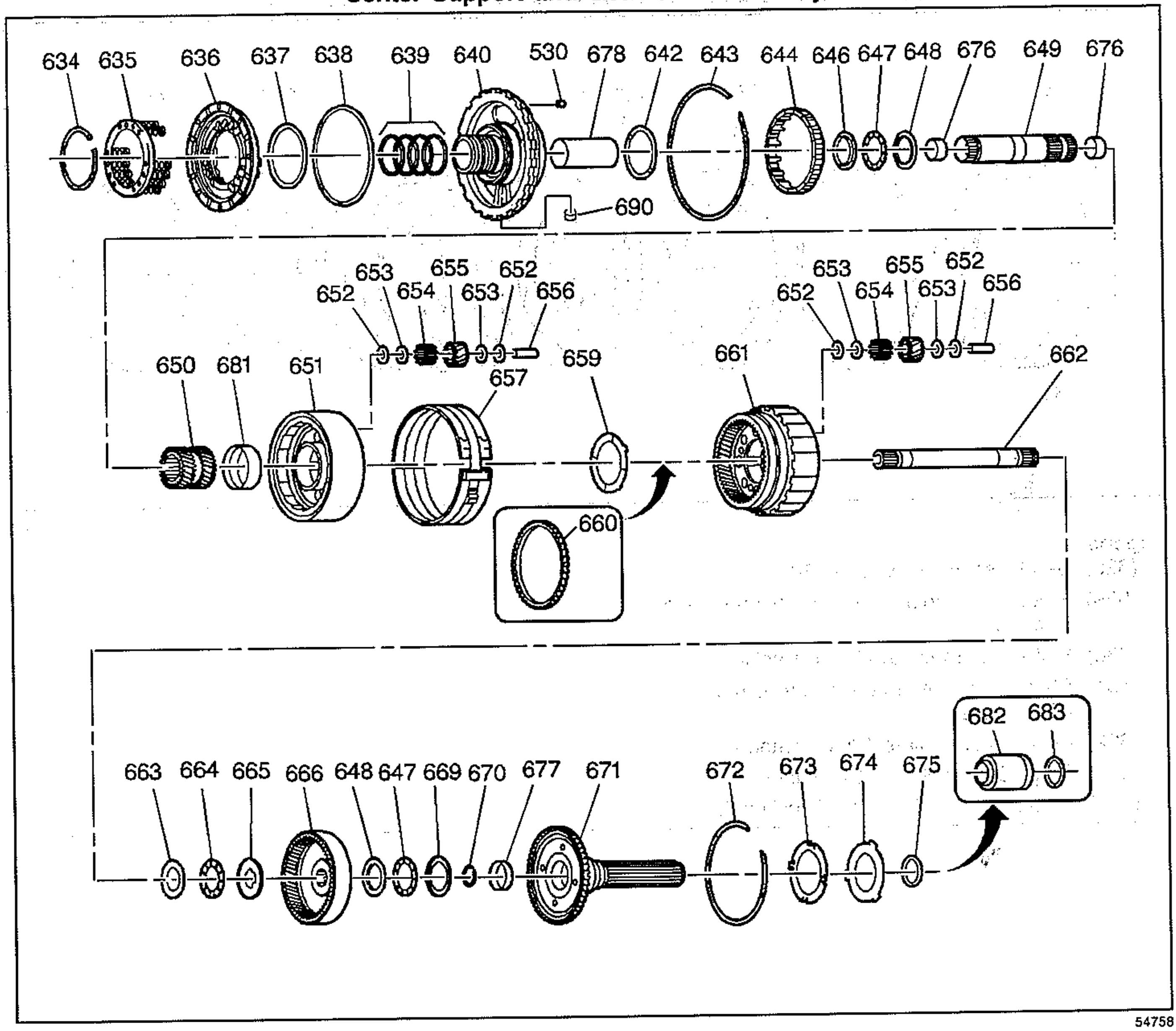
Intermediate Clutch Plates and Manual 2-1 Band Assembly



Legend

(628) Band Assembly, Manual 2-1
(629) Ring, Intermediate Clutch Backing Plate Retainer
(630) Plate, Intermediate Clutch Backing
(631) Plate Assembly, Intermediate Clutch (Composite)
(632) Plate, Intermediate Clutch (Steel)
(633) Ring, Center Support Retaining
(684) Plate, Intermediate Clutch (Waved)

Center Support and Gear Unit Assembly

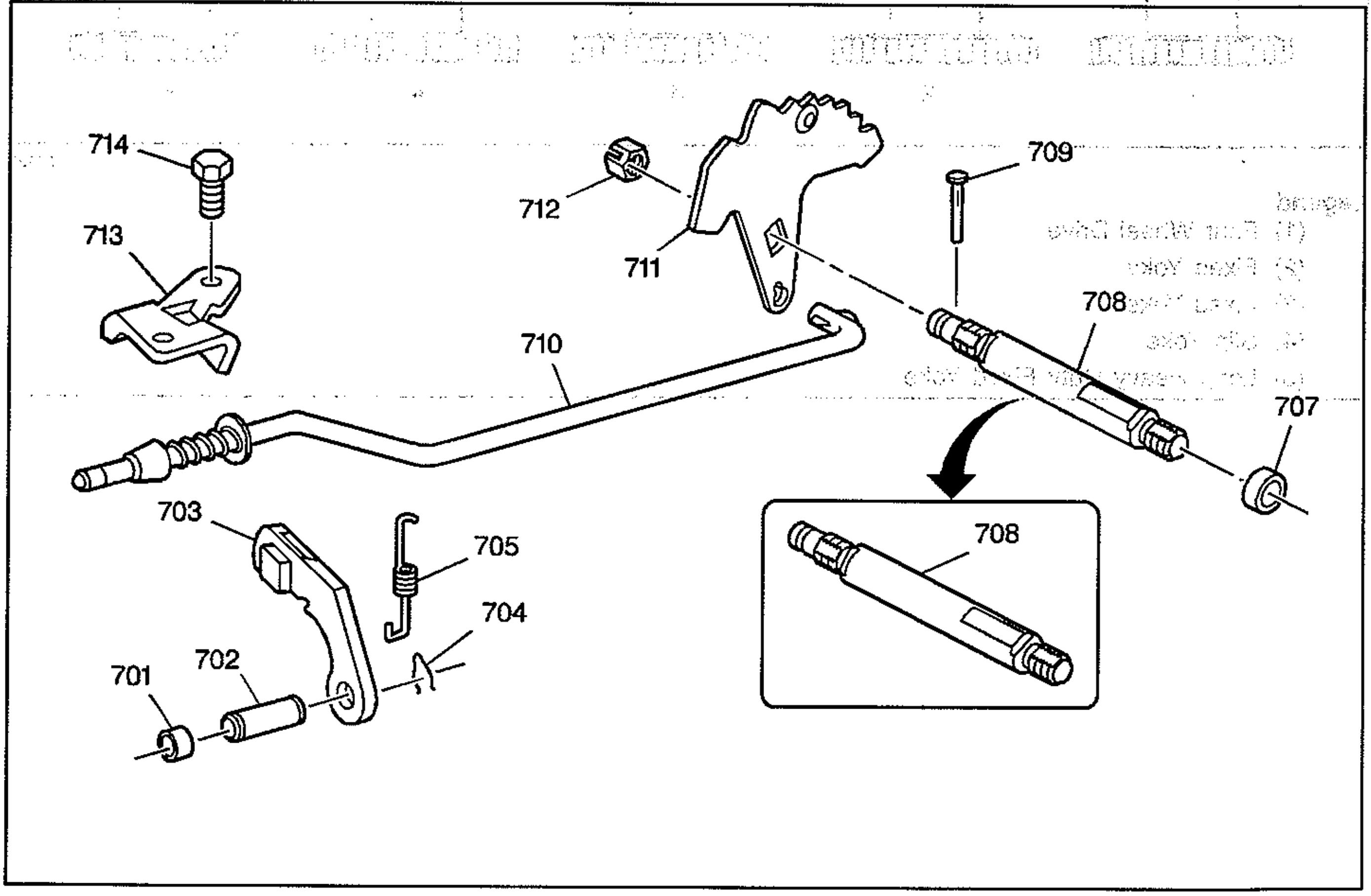


Legend

(530) Plug, Orifice Center Support
(634) Ring, Intermediate Clutch Retainer
(635) Spring and Retainer Assembly, Intermediate Clutch
(636) Piston, Intermediate Clutch
(637) Seal, Intermediate Clutch (Inner)
(638) Seal, Intermediate Clutch (Outer)
(639) Seal, Direct Clutch Housing Oil
(640) Support and Race Assembly, Center
(642) Washer, Thrust Support/Reaction Drum
(643) Spacer, Center Support
(644) Roller Clutch Assembly
(646) Race, Thrust Bearing to Center Support
(647) Bearing, Needle Thrust
(648) Race, Thrust Bearing
(649) Shaft Assembly, Sun Gear
(650) Gear, Sun
(651) Drum and Carrier Assembly, Reaction
(652) Washer, Pinion Thrust (Bronze)
(653) Washer, Pinion Thrust (Steel)
(654) Roller, Needle Bearing
(655) Pinion Gear, Planetary
(656) Pin, Planetary Pinion Gear
(657) Band Assembly, Low and Reverse
(659) Washer, Front Internal/Reaction Carrier
(660) Ring, Output Speed Sensor

(661) Carrier Assembly, Output
(662) Shaft, Transmission Main
(663) Race, Thrust Bearing to Sun Gear
(664) Bearing, Needle Thrust Rear Internal Gear
(665) Race, Thrust Bearing to Rear Internal Gear
(666) Gear, Rear Internal
(669) Race, Thrust Bearing to Output Shaft
(670) Ring, Mainshaft Retainer
(671) Shaft and Bushing Assembly, Output
(672) Ring, Output Shaft Retainer
(673) Washer, Output Shaft Thrust
(674) Washer, Thrust Selective
(675) Seal, Output Shaft
(676) Bushing, Sun Gear Shaft
(677) Bushing, Output Shaft
(678) Bushing
(681) Bushing, Reaction Drum
(682) Sleeve, Transmission Output Shaft Yoke Seal
(683) Seal, Output Shaft
(690) Seal, Center Support Cooler Pipe Connector

Parking Lock and Actuator Assembly

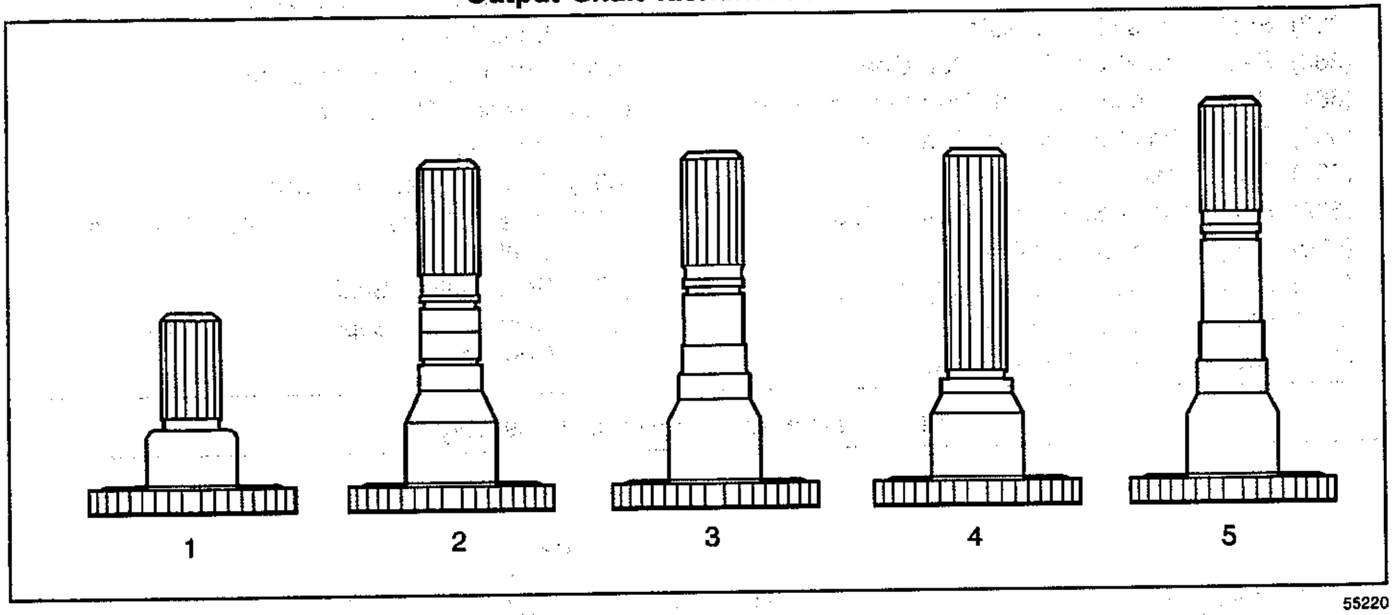


40663

Legend

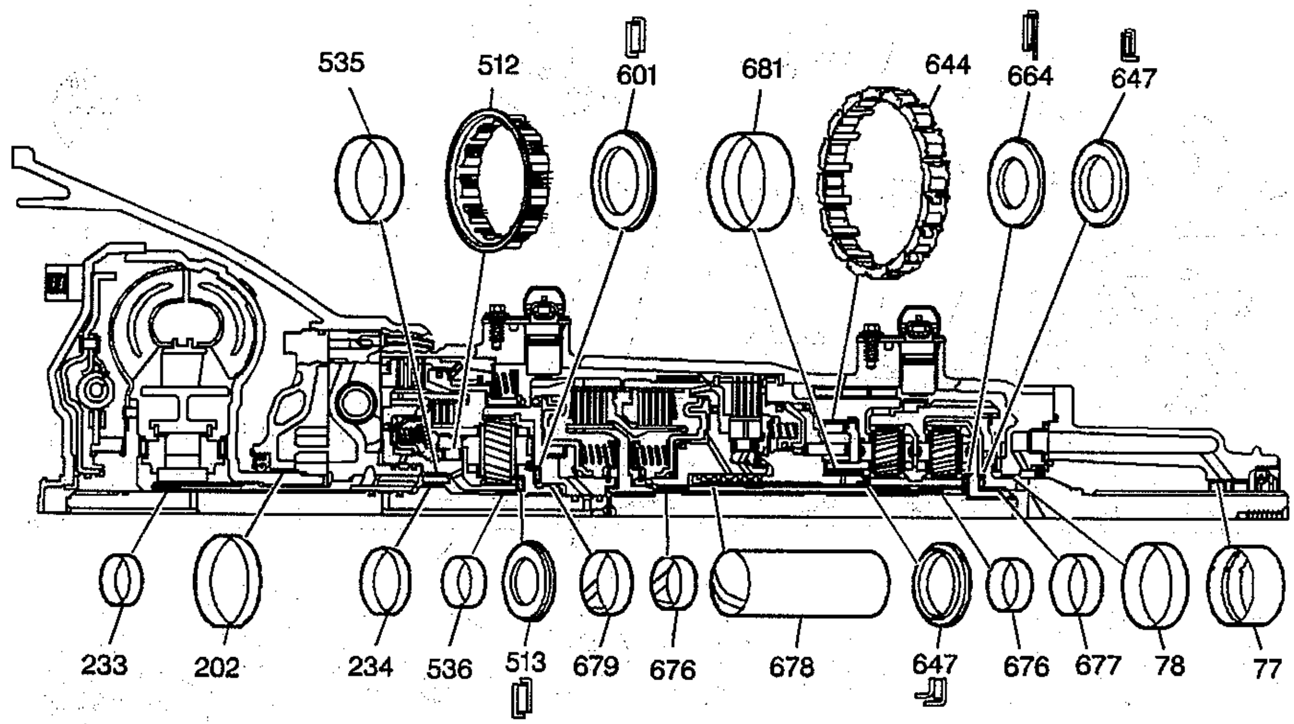
(701) Plug, Parking Pawl Shaft Hole
(702) Shaft, Parking Lock Pawl
(703) Pawl, Parking Lock
(704) Retainer, Parking Pawl Shaft
(705) Spring, Parking Pawl Return
(707) Seal Assembly, Manual Shaft
(708) Shaft, Manual
(709) Pin, Manual Shaft Retaining
(710) Actuator Assembly, Parking Lock
(711) Lever and Pin Assembly, Detent
(712) Nut, Manual Shaft
(713) Bracket, Parking Lock
(714) Bolt, Parking Lock Bracket

Output Shaft Identification Chart



Legend
(1) Four Wheel Drive
(2) Fixed Yoke
(3) Fixed Yoke
(4) Slip Yoke
(5) Long Heavy Duty Fixed Yoke

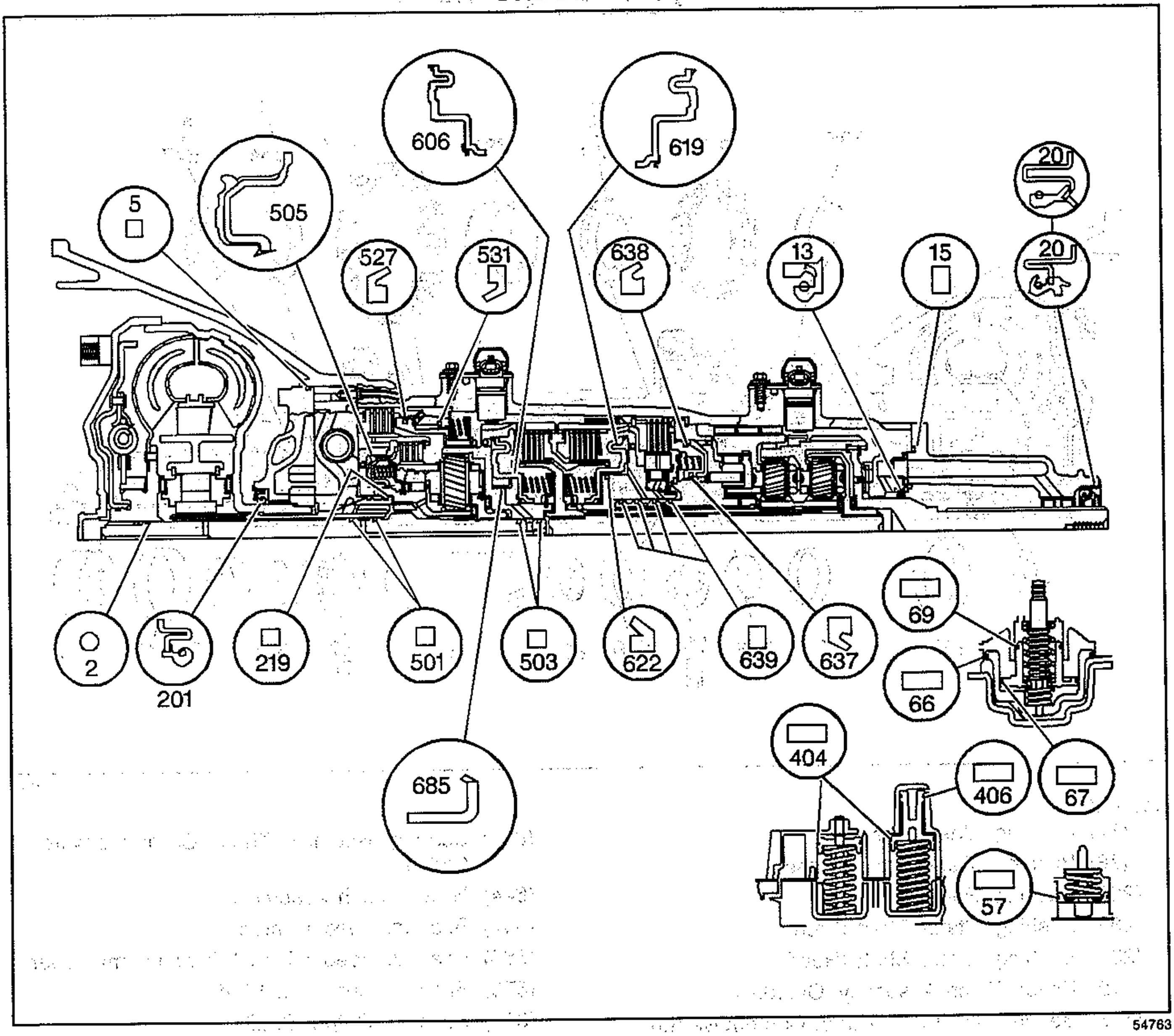
Bushing and Bearing Locations



Legend

(77) Bushing, Case Extension
(78) Bushing, Transmission Case
(202) Bushing, Pump Body
(233) Bushing, Stator Shaft (Front)
(234) Bushing, Stator Shaft (Rear)
(512) Roller Clutch Assembly, Overdrive
(513) Bearing Assembly, Thrust Carrier/Overrun Clutch
(535) Bushing, Overrun Clutch Housing
(536) Bushing, 1.12″ Outside Diameter x 0.50″
(601) Bearing Assembly, Thrust Carrier/Forward Clutch
(644) Roller Clutch Assembly
(647) Bearing, Needle Thrust
(664) Bearing, Needle Thrust Rear Internal Gear
(676) Bushing, Sun Gear Shaft
(677) Bushing, Output Shaft
(678) Bushing
(679) Bushing, 1.536″ Diameter x 3.52
(681) Bushing, Reaction Drum

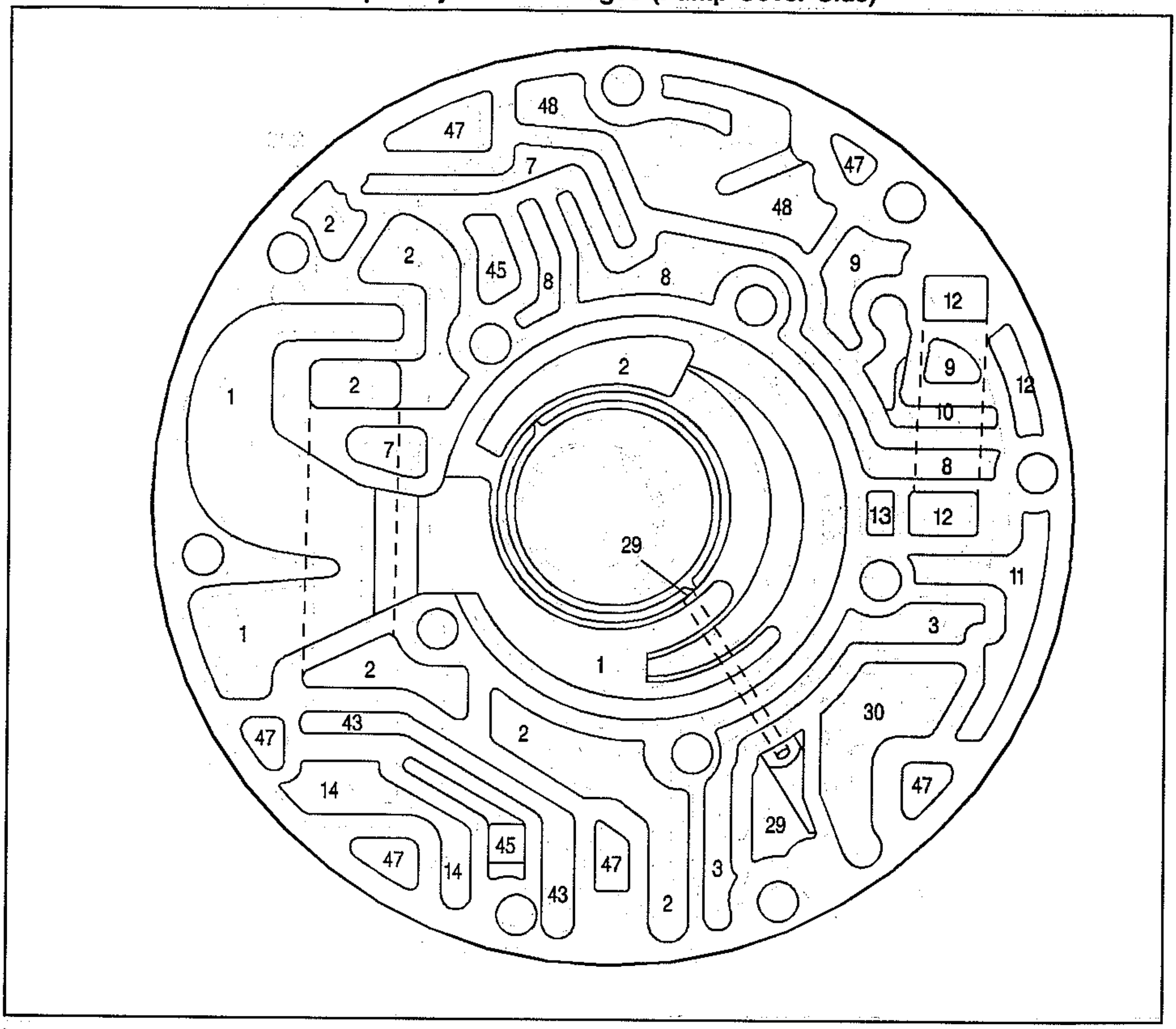
Seal Locations



Legend

(2) Seal, Turbine Shaft Oil
(5) Seal, Oil Pump to Case
(13) Seal Assembly, Rear Lube
(15) Seal, Extension to Case
(20) Seal, Prop Shaft Front Slip Yoke Oil
(57) Seal, Manual 2–1 Band Servo Piston
(66) Seal, Low and Reverse Servo Piston
(67) Seal, 1–2 Accumulator Piston Oil (Outer)
(69) Seal, 1–2 Accumulator Piston Oil (Inner)
(201) Seal, Torque Converter Oil
(219) Ring, Oil Seal
(404) Seal, 3rd and 4th Clutch Accumulator Piston
(406) Seal, 3rd Clutch Accumulator Piston Inner
(501) Seal, Turbine Shaft Front Oil
(503) Seal, Turbine Shaft Rear Oil
(505) Piston Assembly, Overrun Clutch
(527) Seal, Fourth Clutch (Inner)
(531) Seal, Fourth Clutch (Outer)
(606) Piston and Seal Assembly, Forward Clutch
(619) Piston and Seal Assembly, Direct Clutch
(622) Seal, Direct Clutch Center
(637) Seal, Intermediate Clutch (Inner)
(638) Seal, Intermediate Clutch (Outer)
(639) Ring, Oil Seal
(685) Sleeve and Seal Assembly, Forward Clutch Piston Inner

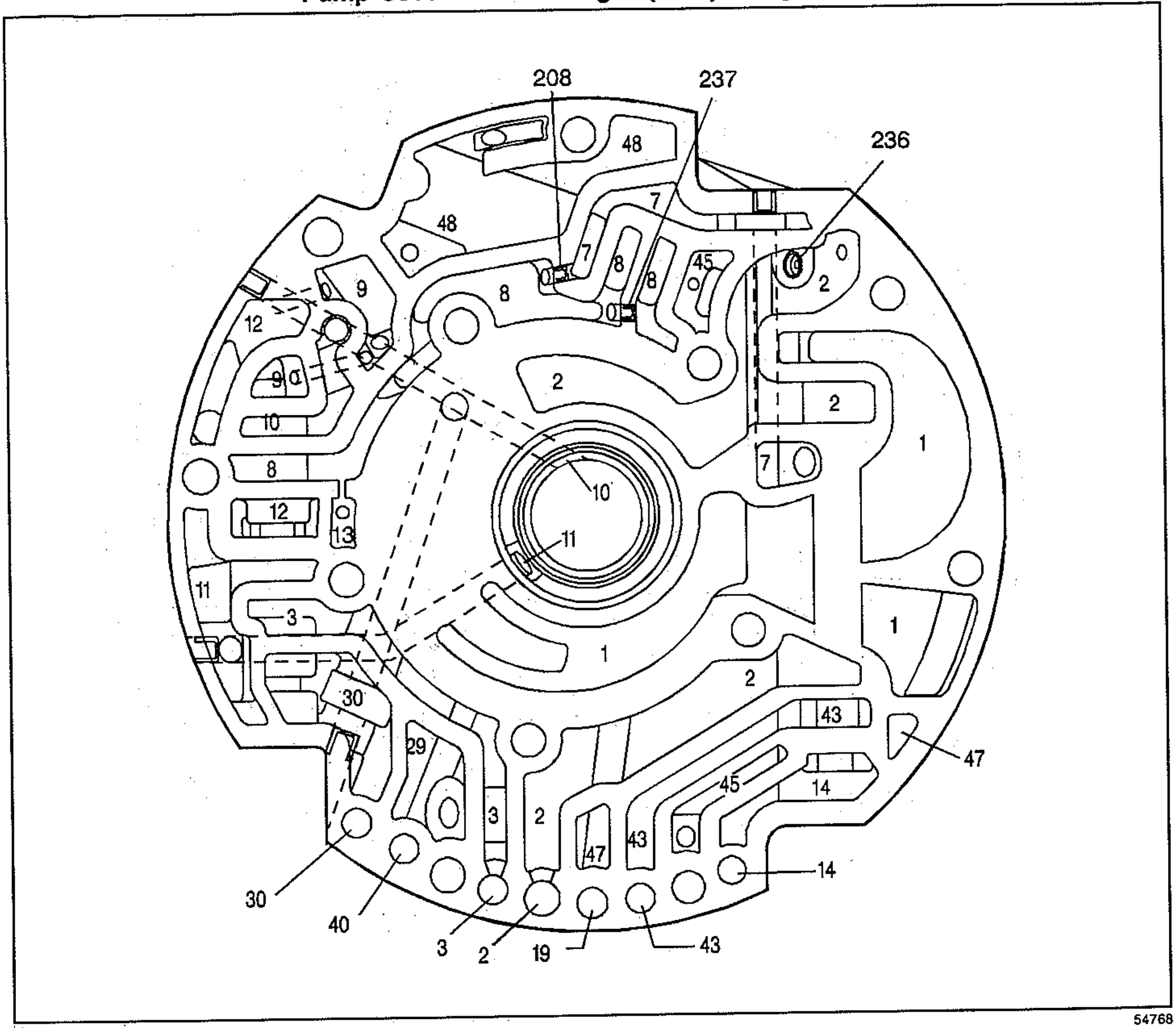
Pump Body Fluid Passages (Pump Cover Side)



Legend

(1) Suction
(2) Line
(3) Regulated Apply
(7) Converter Feed
(8) Regulated Converter Feed
(9) TCC Enable
(10) Converter Release
(11) Converter Apply/Return
(12) Cooler
(13) Lube
(14) Torque Signal
(29) Pump Seal Drainback
(30) TCC Signal
(43) Reverse
(45) Exhaust
(47) Void
(48) Vent

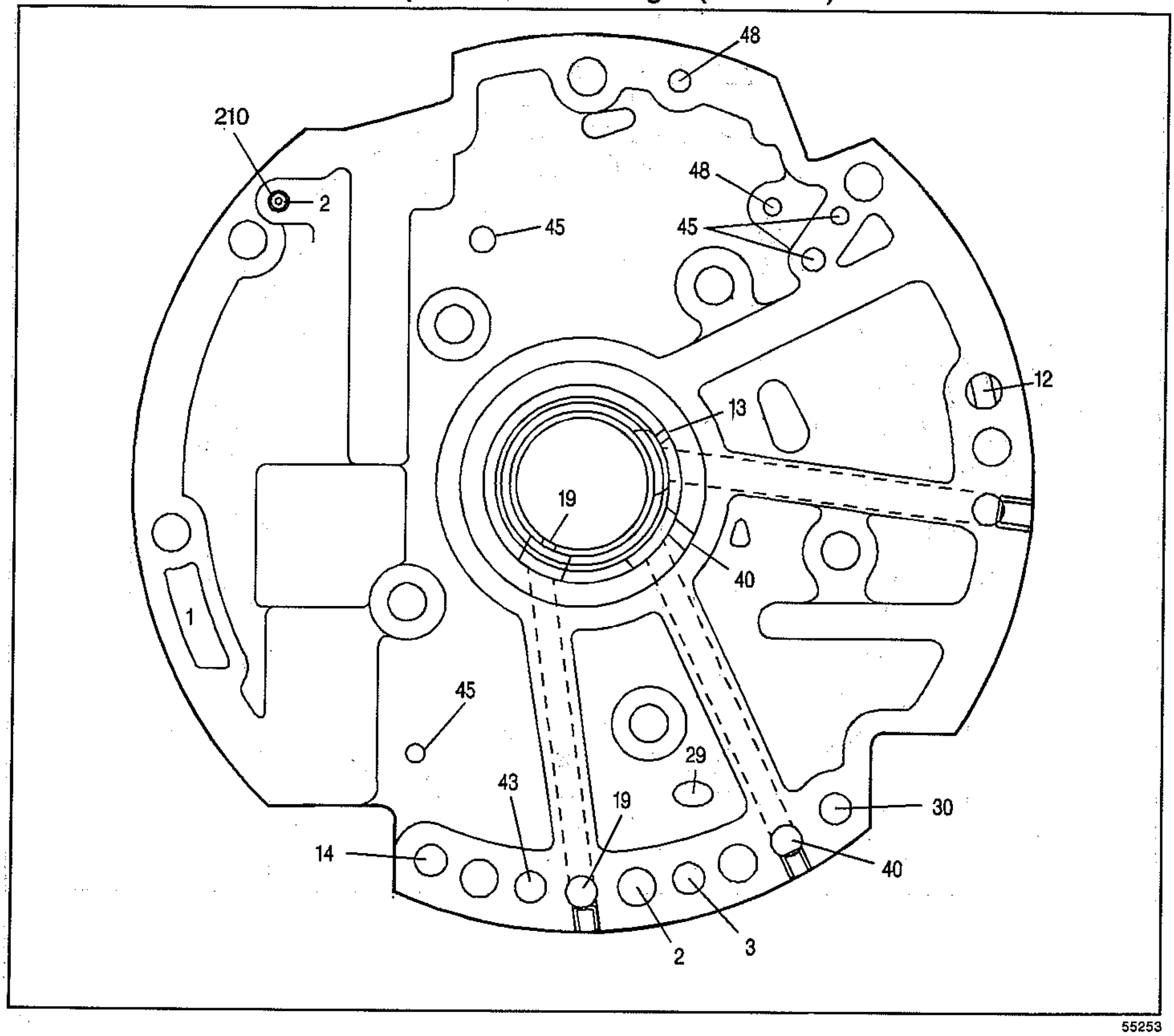
Pump Cover Fluid Passages (Pump Body Side)



Legend

- (1) Suction
- (2) Line
- (3) Regulated Apply
- (7) Converter Feed
- (8) Regulated Converter Feed
- (9) TCC Enable
- (10) Converter Release
- (11) Converter Apply/Return
- (12) Cooler
- (13) Lube
- (14) Torque Signal
- (19) Drive
- (29) Pump Seal Drainback
- (30) TCC Signal
- (40) Overrun Clutch
- (43) Reverse
- (45) Exhaust
- (47) Void
- (48) Vent
- (208) Plug, Orificed Cup
- (236) Plug, Orificed Cup
- (237) Plug, Orificed Cup

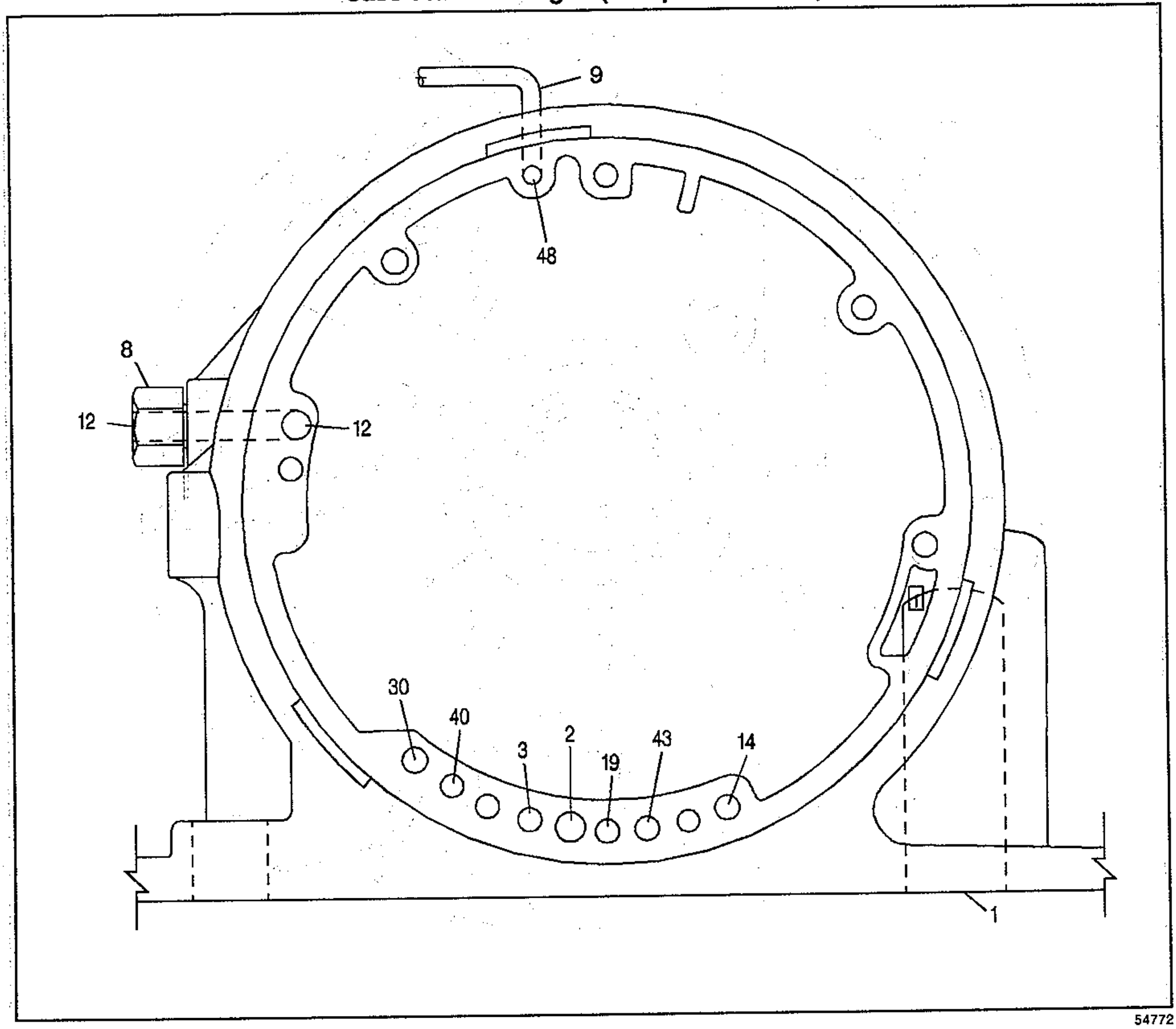
Pump Cover Fluid Passages (Case Side)



Legend

(1) Suction
(2) Line
(3) Regulated Apply
(12) Cooler
(13) Lube
(14) Torque Signal
(19) Drive
(29) Pump Seal Drainback
(30) TCC Signal
(40) Overrun Clutch
(43) Reverse
(45) Exhaust
(48) Vent
(210) Plug, Orificed Cup

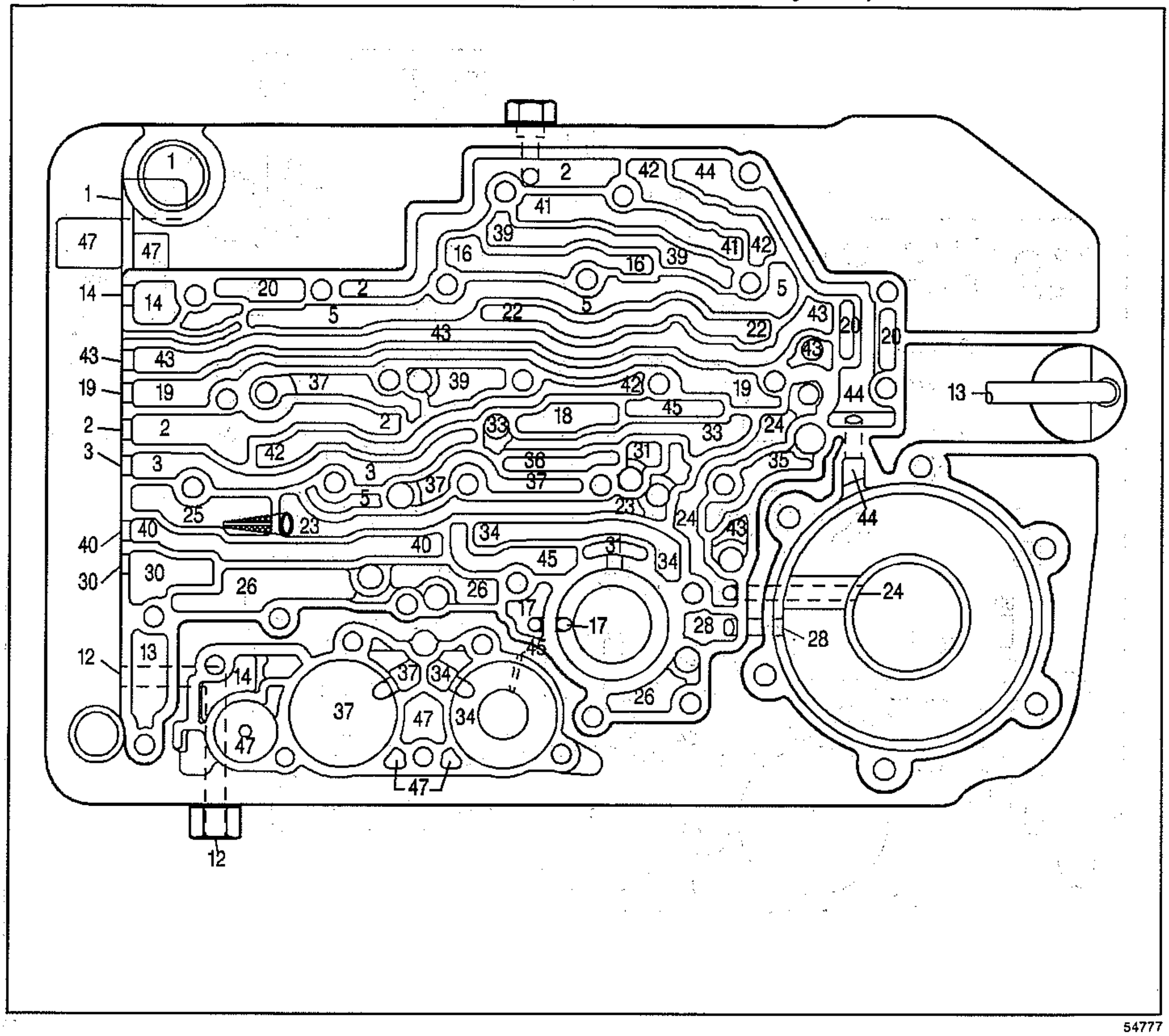
Case Fluid Passages (Pump Cover Side)



Legend

- (1) Suction
- (2) Line
- (3) Regulated Apply
- (8) Connector, Transmission Oil Cooler Pipe
- (9) Pipe, Vent
- (12) Cooler
- (14) Torque Signal
- (19) Drive
- (30) TCC Signal
- (40) Overrun Clutch
- (43) Reverse
- (48) Vent

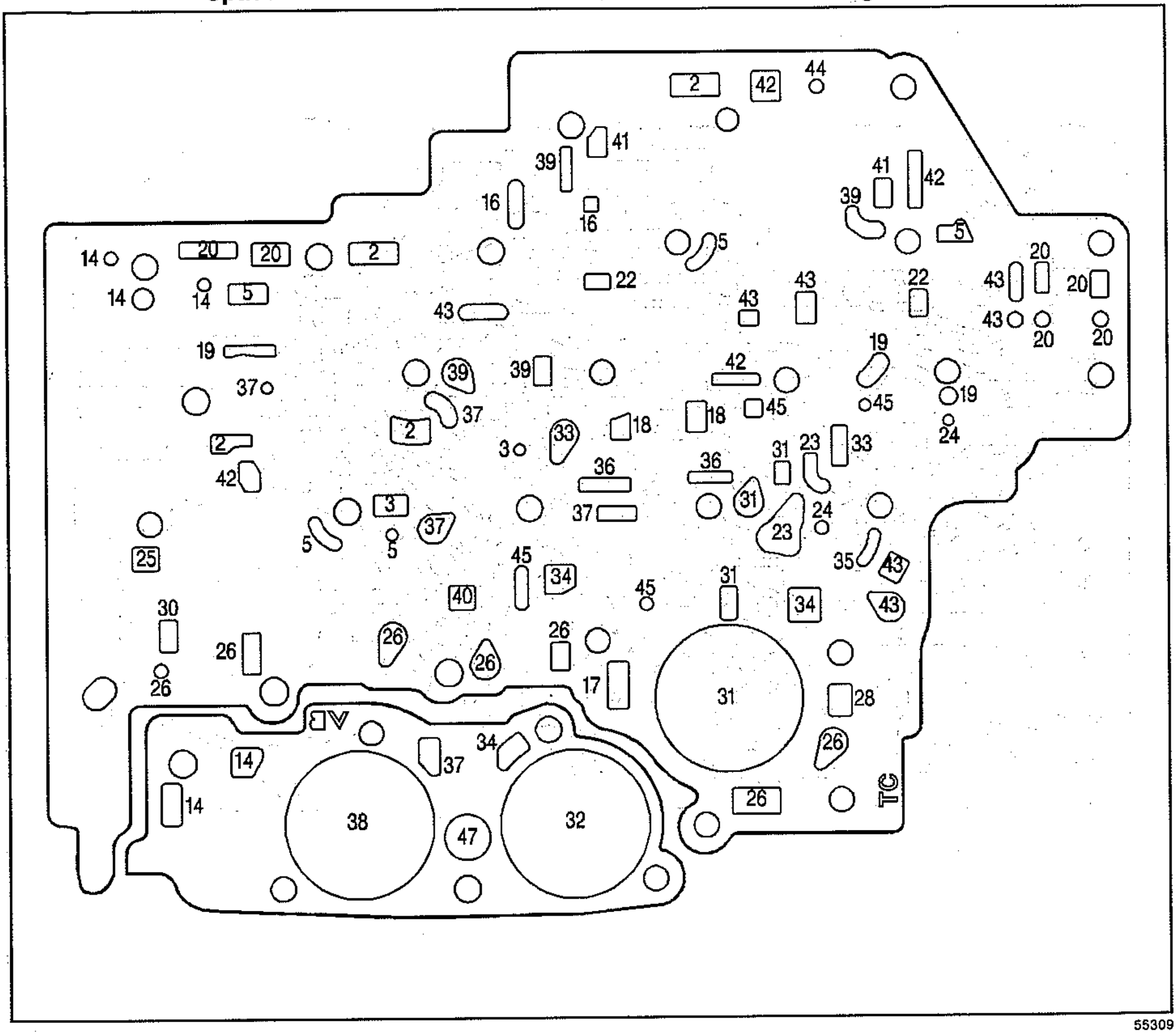
Case Fluid Passages (Control Valve Body Side)



Legend

(1) Suction
(2) Line
(3) Regulated Apply
(5) Actuator Feed
(12) Cooler
(13) Lube
(14) Torque Signal
(16) PRN (Park Reverse Neutral)
(17) PRND43
(18) PRND4
(19) Drive
(20) Filtered Actuator Feed
(21) Signal A
(22) Signal B
(23) 2-3 Drive
(24) 2nd Clutch
(25) Filtered 2-3 Drive
(26) Accumulator
(28) 2nd Accumulator
(30) TCC Signal
(31) FBA (Front Band Apply)
(32) 3rd Accumulator
(33) 3rd Clutch Feed
(34) 3rd Clutch
(35) 3rd/Reverse
(36) 4th Clutch Feed
(37) 4th Clutch
(39) D321
(40) Overrun Clutch
(41) D21
(42) Lo
(43) Reverse
(44) RBA (Rear Band Apply)
(45) Exhaust
(47) Void

Spacer Plate to Case Gasket with Accumulator Housing Gasket

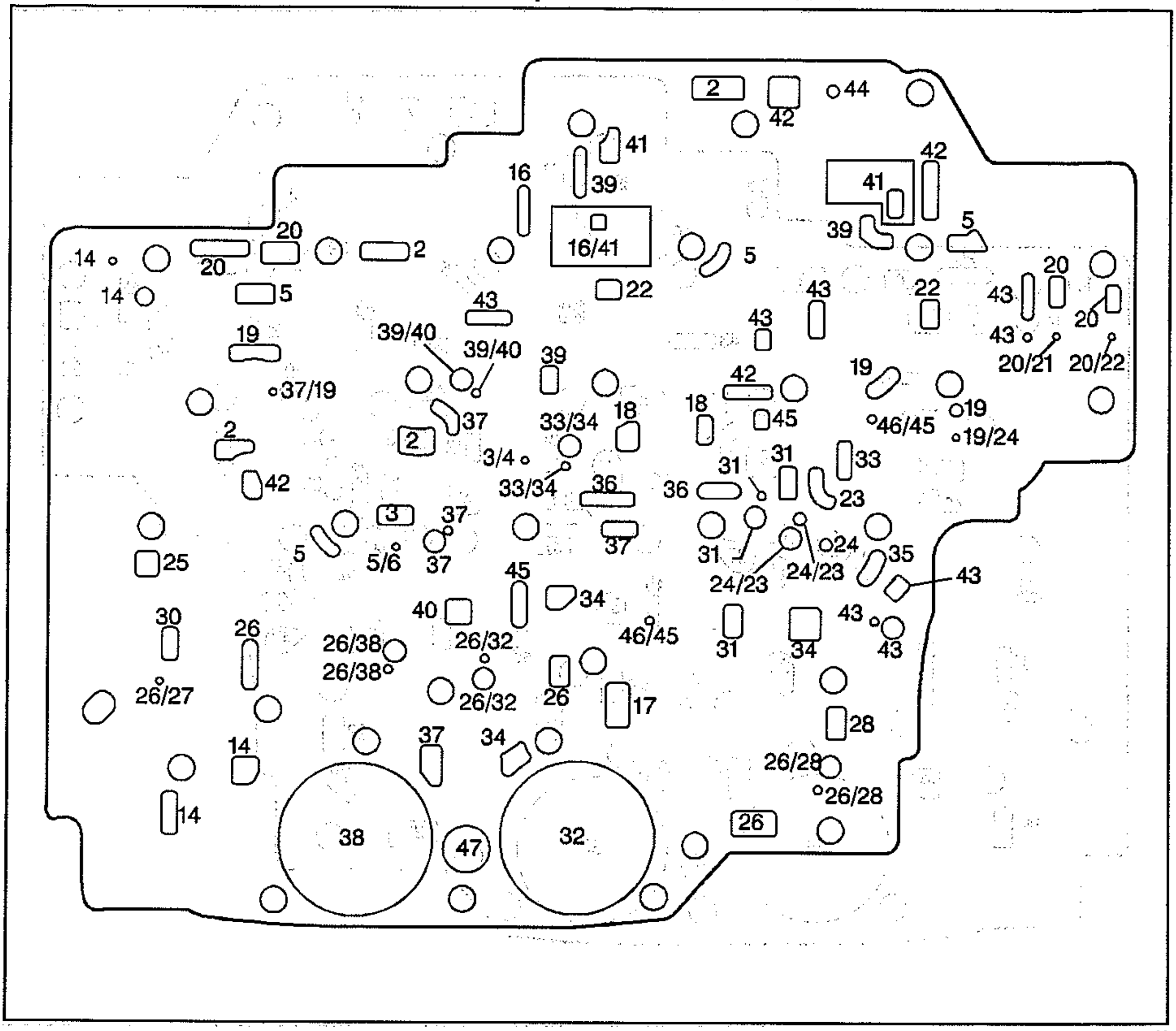


55309

Legend

- (2) Line
- (3) Regulated Apply
- (5) Actuator Feed
- (14) Torque Signal
- (16) PRN (Park Reverse Neutral)
- (17) PRND43
- (18) PRND4
- (19) Drive
- (20) Filtered Actuator Feed
- (22) Signal B
- (23) 2-3 Drive
- (24) 2nd Clutch
- (25) Filtered 2-3 Drive
- (26) Accumulator
- (28) 2nd Accumulator
- (30) TCC Signal
- (31) FBA (Front Band Apply)
- (32) 3rd Accumulator
- (33) 3rd Clutch Feed
- (34) 3rd Clutch
- (35) 3rd/Reverse
- (36) 4th Clutch Feed
- (37) 4th Clutch
- (38) 4th Accumulator
- (39) D321
- (40) Overrun Clutch
- (41) D21
- (42) Lo
- (43) Reverse
- (44) RBA (Rear Band Apply)
- (45) Exhaust
- (47) Void

Spacer Plate

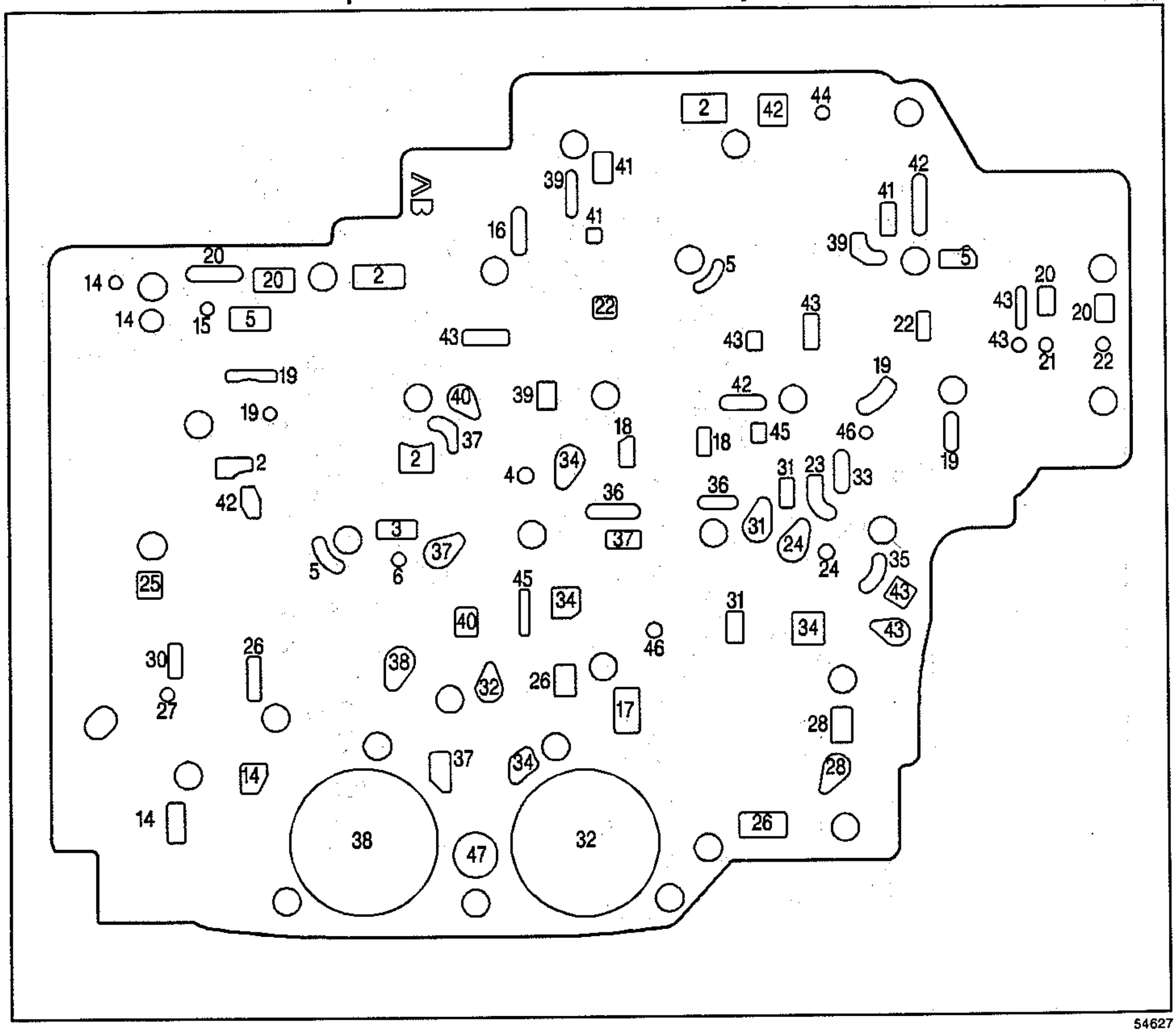


54780

Legend

(2) Line
(3) Regulated Apply
(4) Orificed Regulator Apply
(5) Actuator Feed
(6) Orificed Actuator Feed
(14) Torque Signal
(16) PRN (Park Reverse Neutral)
(17) PRND43
(18) PRND4
(19) Drive
(20) Filtered Actuator Feed
(21) Signal A
(22) Signal B
(23) 2-3 Drive
(24) 2nd Clutch
(25) Filtered 2-3 Drive
(26) Accumulator
(27) Orificed Accumulator
(28) 2nd Accumulator
(30) TCC Signal
(31) FBA (Front Band Apply)
(32) 3rd Accumulator
(33) 3rd Clutch Feed
(34) 3rd Clutch
(35) 3rd/Reverse
(36) 4th Clutch Feed
(37) 4th Clutch
(38) 4th Accumulator
(39) D321
(40) Overrun Clutch
(41) D21
(42) Lo
(43) Reverse
(44) RBA (Rear Band Apply)
(45) Exhaust
(46) Orificed Exhaust
(47) Void

Spacer Plate to Control Valve Body Gasket

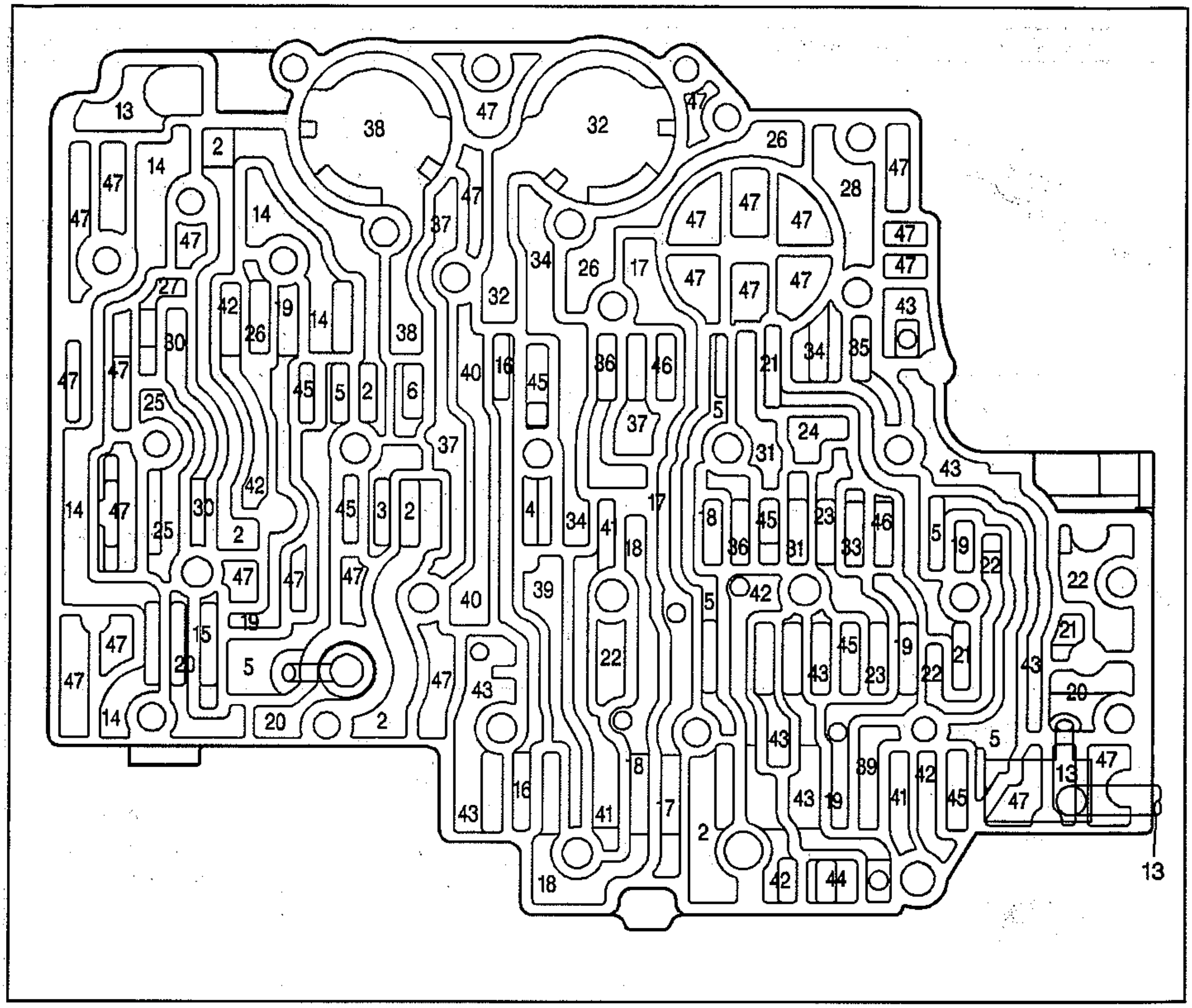


54627

Legend

(2) Line
(3) Regulated Apply
(4) Orificed Regulator Apply
(5) Actuator Feed
(6) Orificed Actuator Feed
(14) Torque Signal
(15) Orificed Torque Signal
(16) PRN (Park Reverse Neutral)
(17) PRND43
(18) PRND4
(19) Drive
(20) Filtered Actuator Feed
(21) Signal A
(22) Signal B
(23) 2-3 Drive
(24) 2nd Clutch
(25) Filtered 2-3 Drive
(26) Accumulator
(27) Orificed Accumulator
(28) 2nd Accumulator
(30) TCC Signal
(31) FBA (Front Band Apply)
(32) 3rd Accumulator
(33) 3rd Clutch Feed
(34) 3rd Clutch
(35) 3rd/Reverse
(36) 4th Clutch Feed
(37) 4th Clutch
(38) 4th Accumulator
(39) D321
(40) Overrun Clutch
(41) D21
(42) Lo
(43) Reverse
(44) RBA (Rear Band Apply)
(45) Exhaust
(46) Orificed Exhaust
(47) Void

Control Valve Body Fluid Passages (Case Side)



54783

Legend

(2) Line
(3) Regulated Apply
(4) Orificed Regulator Apply
(5) Actuator Feed
(6) Orificed Actuator Feed
(13) Lube
(14) Torque Signal
(15) Orificed Torque Signal
(16) PRN (Park Reverse Neutral)
(17) PRND43
(18) PRND4
(19) Drive
(20) Filtered Actuator Feed
(21) Signal A
(22) Signal B
(23) 2-3 Drive
(24) 2nd Clutch
(25) Filtered 2-3 Drive
(26) Accumulator
(27) Orificed Accumulator
(28) 2nd Accumulator
(30) TCC Signal
(31) FBA (Front Band Apply)
(32) 3rd Accumulator
(33) 3rd Clutch Feed
(34) 3rd Clutch
(35) 3rd/Reverse
(36) 4th Clutch Feed
(37) 4th Clutch
(38) 4th Accumulator
(39) D321
(40) Overrun Clutch
(41) D21
(42) Lo
(43) Reverse
(44) RBA (Rear Band Apply)
(45) Exhaust
(46) Orificed Exhaust
(47) Void

Special Tools and Equipment

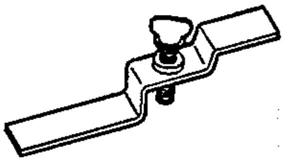
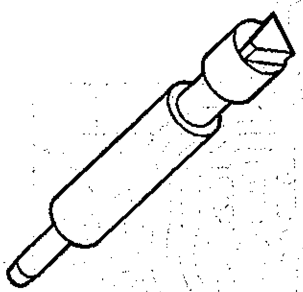
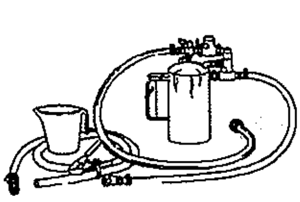
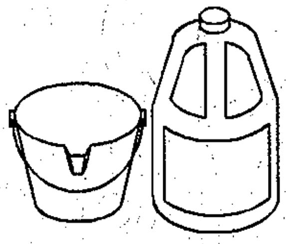
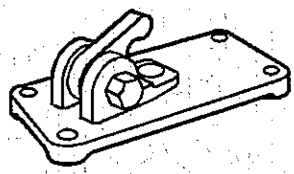
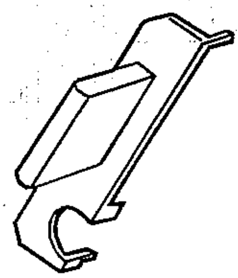
Illustration	Tool Number/Description
 9353	J 21366 Converter Holding Strap
 40674	J 21370-10 Gauge Pin
 13128	J 36850 TRANSJEL®
 9210	J 35944 Cooler Flushing Tool
 15015	J 3944-20 Biodegradable Flushing Solution
 40677	J 38787 Band Apply Pin Checking Tool
 102613	J 41364-A Neutral Position Adjustment Tool

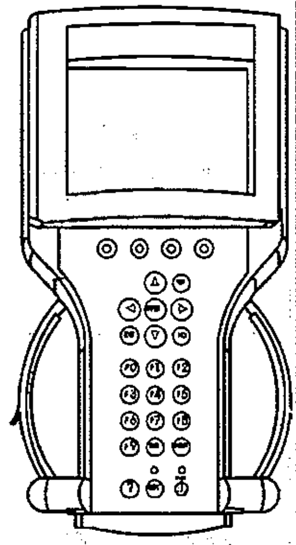
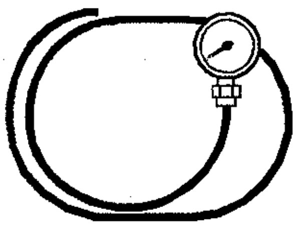
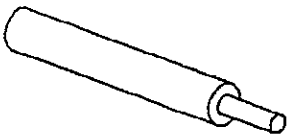
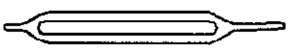
Illustration	Tool Number/Description
 59260	Scan Tool
 29339	J 21867 Universal Pressure Gauge Set
 5396	J 28742-A Weather Pack Terminal Remover
 5397	J 33095 Control Module Connector Terminal Remover

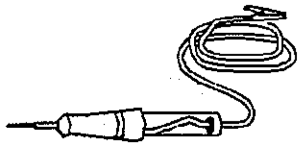
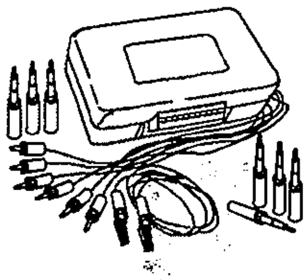
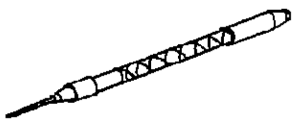
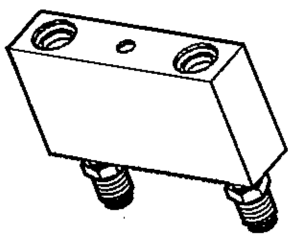
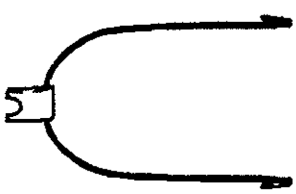
Illustration	Tool Number/Description
 5382	J 34142-B Unpowered Test Lamp
 8917	J 35616 Connector Test Adapter Kit
 5395	J 35689-A Metri-pack Terminal Remover
 227917	J 35944-440 Cooler Flush Adaptor
 20896	J 36169-A Fused Jumper Wire

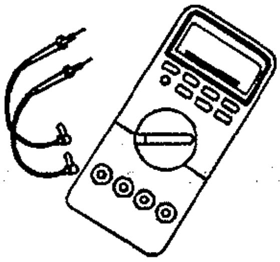
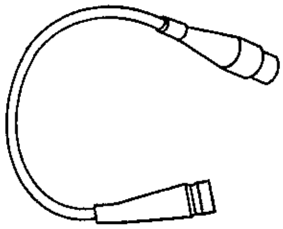
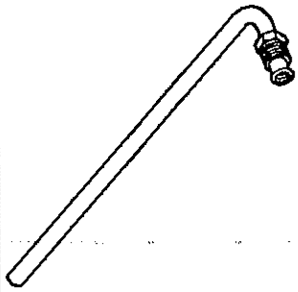
Illustration	Tool Number/Description
 9081	J 38125-4 Terminal Repair Kit
 3430	J 39200 Digital Multimeter (DMM)

Illustration	Tool Number/Description
 13538	J 39775 Jumper Harness
 227923	J 42776 Cooler Flow Adaptor