2002-03 AUTOMATIC TRANSMISSIONS

VT25-E Diagnosis

APPLICATION

WARNING: Vehicle is equipped with Supplemental Inflatable Restraint (SIR) system. When servicing vehicle, use care to avoid accidental air bag deployment. SIR system-related components are located in various locations throughout interior and exterior of vehicle, depending on application. Do not use electrical test equipment on or near these circuits. If necessary, deactivate SIR system before servicing components. See AIR BAG DEACTIVATION PROCEDURES article in GENERAL INFORMATION.

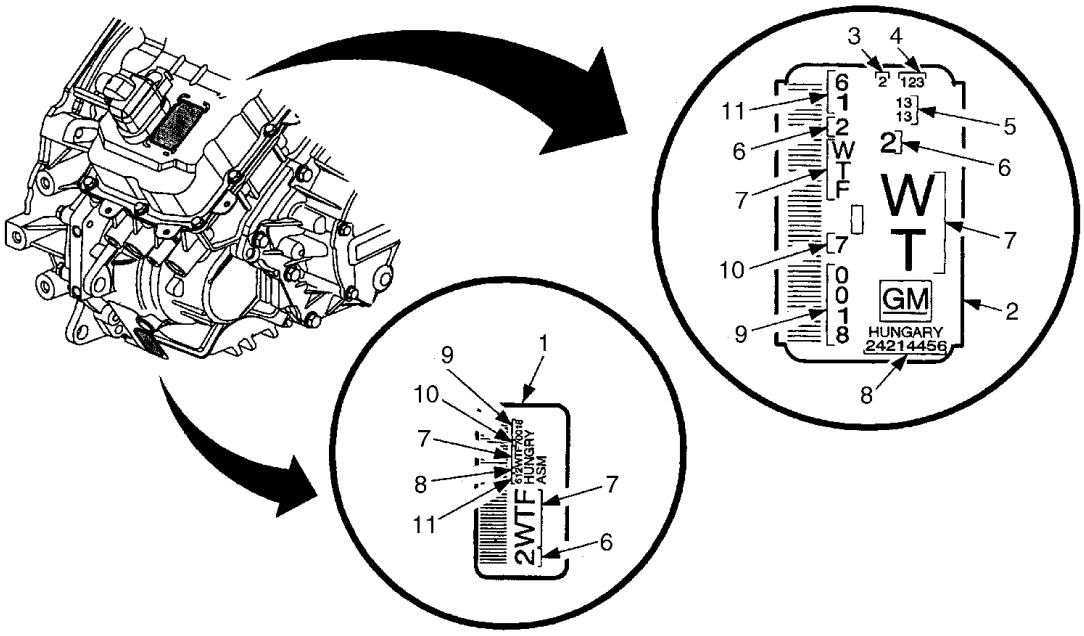
TRANSAXLE APPLICATION

Application	Transaxle Model (RPO Code)
Saturn Vue 2.2L	
AWD	VT25-E (M75)
FWD	VT25-E (M16)

IDENTIFICATION

TRANSAXLE

For transaxle identification, see **Fig. 1** .



1. Transaxle ID Location-Sticker
2. Transaxle ID Location-Metal Tag
3. Calendar Year
4. Julian Date
5. Shift & Line Number
6. Model Year
7. Model
8. Transaxle Part Number
9. Serial Number
10. Hungary Plant
11. Transaxle

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Fig. 1: Locating Transaxle Identification Information
Courtesy of GENERAL MOTORS CORP.

DESCRIPTION & OPERATION

INTRODUCTION

The VT25-E is a fully automatic, continually variable front wheel drive transaxle. It consists primarily of a four-element torque converter, one planetary gear set, a hydraulic pressurization and control system, two variable drive pulleys, two friction clutches and a differential assembly.

The four-element torque converter contains a pump, a turbine, a pressure plate splined to the turbine, and a stator assembly. The torque converter acts as a fluid coupling to smoothly transmit power from the engine to the transaxle. It also hydraulically provides additional torque multiplication when required. The pressure plate, when applied, provides a mechanical (direct drive) coupling of the engine to transaxle.

The planetary gear set provides Reverse. Changing gear ratios is fully automatic and is accomplished through the use of a Transaxle Control Module (TCM). The TCM receives and monitors various electronic sensor inputs and uses this information to control the transaxle ratios at the most optimum time.

ELECTRONIC COMPONENTS

NOTE: For transaxle electronic component locations, refer to illustration. See Fig. 2 .

Input & Output Speed Sensor

The Input Speed Sensor (ISS) and Output Speed Sensor (OSS) assembly is mounted inside the transaxle, under the control valve body cover. Both sensors are variable reluctance magnetic pickups and are wired into the same connector, which plugs into the control solenoid valve assembly. The sensors consist of a permanent magnet surrounded by a coil of wire.

Line Pressure Control Solenoid Valve

The line Pressure Control (PC) solenoid valve (normally high, 3-port linear pressure control solenoid) is a precision electronic pressure regulator that controls transaxle line pressure based on current flow through its coil windings. As current flow is increased, the magnetic field produced by the coil moves the solenoid's plunger further away from the exhaust port. Opening the exhaust port decreases the output fluid pressure regulated by the line pressure control solenoid valve, which ultimately decreases line pressure. The TCM controls the line pressure control solenoid valve based on various inputs including throttle position, transmission fluid temperature and gear state.

Torque Converter Clutch Pressure Control Solenoid Valve

The Torque Converter Clutch (TCC) Pressure Control (PC) solenoid valve is a normally low, 3-port linear pressure control solenoid used to control the apply and release of the forward and reverse clutches, and the torque converter clutch. The TCM operates the solenoid with a negative duty cycle at a fixed frequency of 32 Hz to control the rate of clutch apply and release. The solenoid's ability to ramp the clutch apply and release pressures results in a smoother clutch operation.

Torque Converter Clutch Enable Solenoid Valve

The Torque Converter Clutch (TCC) enable solenoid valve is a normally closed, 3-port, ON/OFF solenoid that the TCM controls to apply and release the converter clutch. When de-energized, actuator feed limit fluid pressure is blocked from pressurizing the TCC enable signal fluid circuit. Without TCC enable signal fluid pressure at the end of the TCC control valve, spring force holds the valve in the released position.

Park/Neutral Position Switch

NOTE: Park/Neutral Position (PNP) switch may also be referred to as the Transaxle Range (TR) switch.

The Park/Neutral Position (PNP) switch assembly is a sliding contact switch attached to the manual shift shaft inside the transaxle case. The five inputs to the TCM from the PNP switch assembly indicate which position is selected by the gearshift lever. This information is used for engine controls as well as determining the transaxle ratio control patterns. The state of each input is available for display on the scan tool.

Transmission Fluid Pressure Sensor

The Transmission Fluid Pressure (TFP) sensor is used to monitor line pressure and feedback to the TCM with an analog signal of 0-5 volts. The TFP sensor is fed with tier 2 feed fluid pressure, which nominally ranges from 70-850 psi (4.9-60.0 kg/cm^2).

Ratio Control Motor

The ratio control motor is a linear position device, which changes transaxle ratio by accurately controlling the position of the variable ratio control valve in order to regulate primary feed fluid flow. This component has a total nominal travel of 0.87" (22.0 mm).

Transmission Fluid Temperature Sensor

The Transmission Fluid Temperature (TFT) sensor is part of the leadframe assembly, which is attached to the control solenoid valve assembly. 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 TCM supplies a 5-volt reference signal to the sensor and measures the voltage drop in the circuit. When the transmission fluid is cold, the sensor resistance is high and the TCM detects high signal voltage. As the fluid temperature warms, the resistance becomes less and the signal voltage decreases. The TCM uses this information to maintain shift quality and TCC apply quality over the operating temperature range.

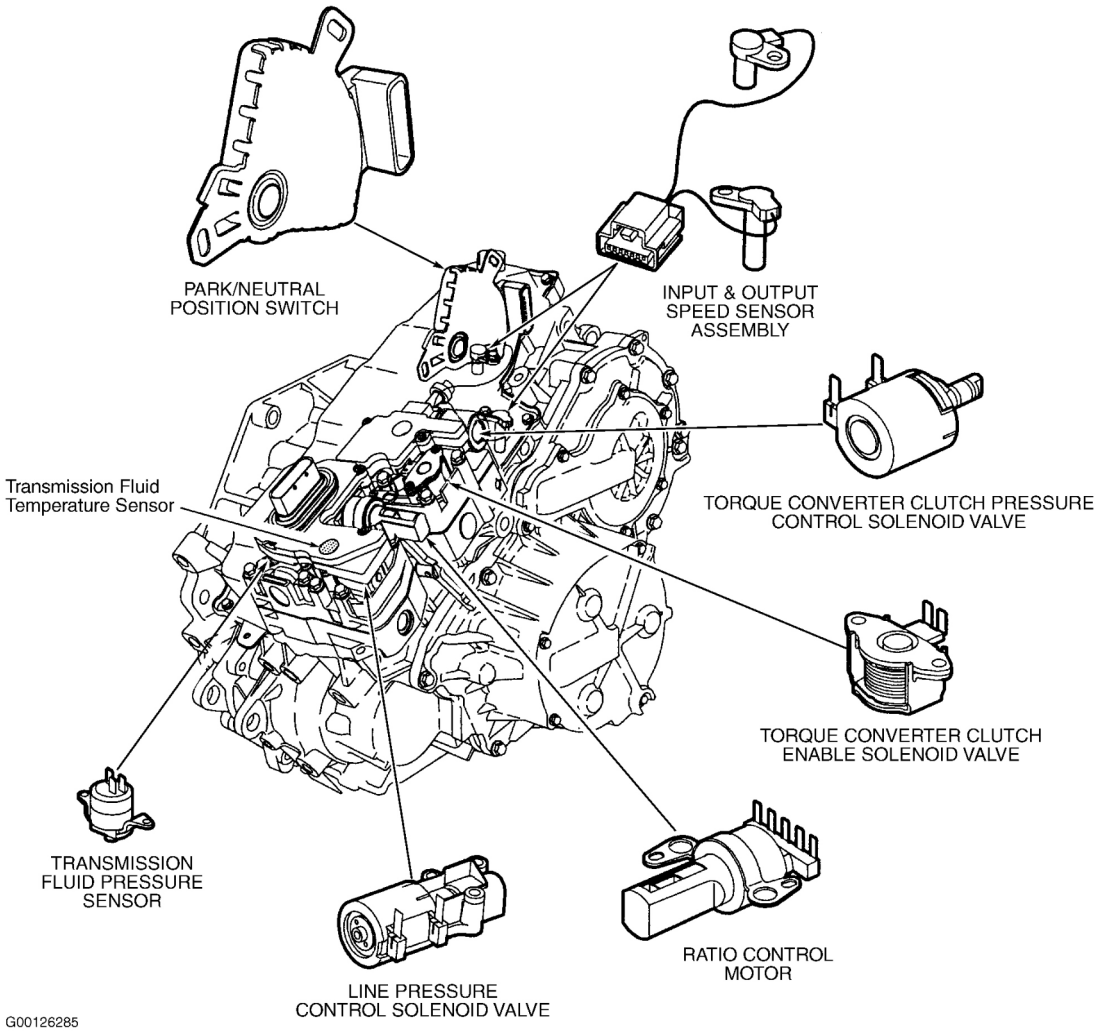

Fig. 2: Locating Transaxle Electronic Components
Courtesy of GENERAL MOTORS CORP.

ECM & TCM

The ECM is mounted to the intake manifold on the front side of the engine beneath the outlet resonator/duct assembly. The TCM is located on left front strut tower. See **Fig. 3** . ECM and TCM control ignition, fuel and emission devices related to engine and transaxle upshifts and downshifts.

The TCM receives electronic signals from sensors and switches. These signals help TCM determine when to operate various relays and solenoids related to engine and transaxle control.

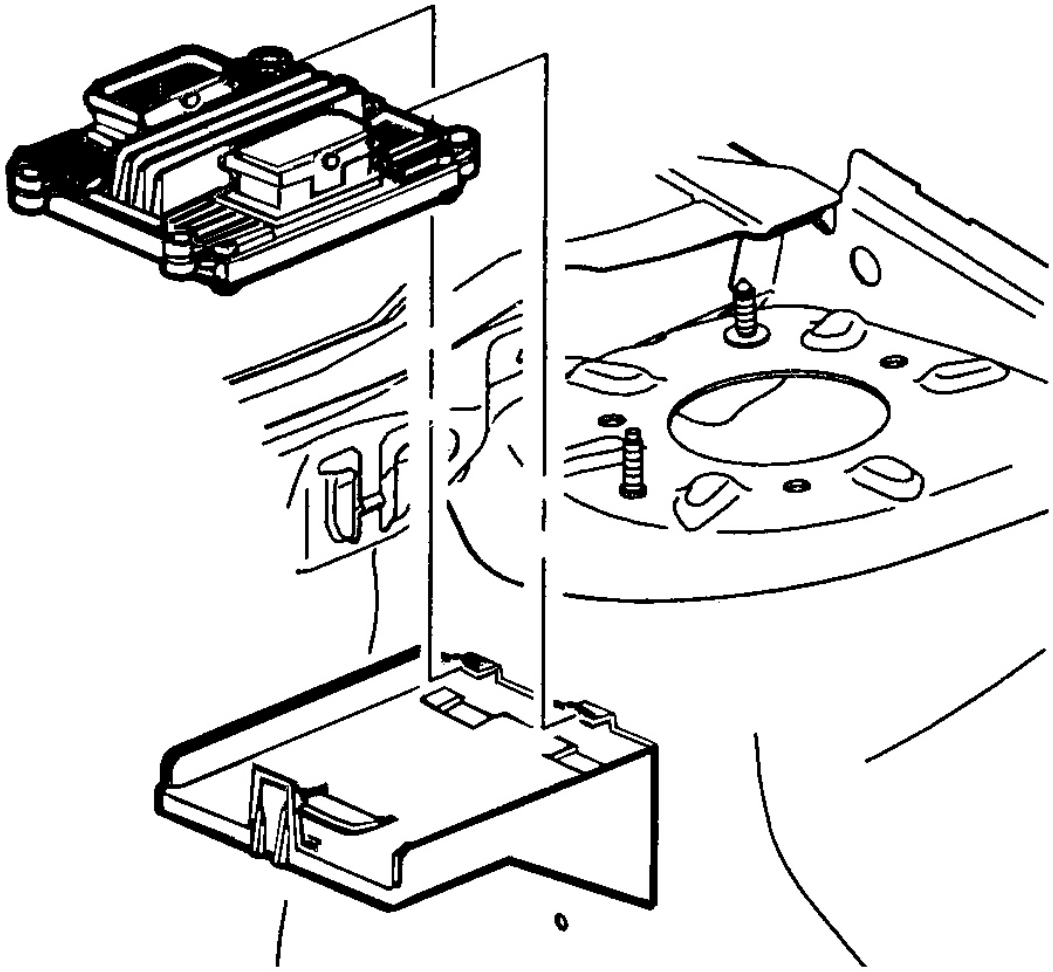

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Fig. 3: Locating Transaxle Control Module
Courtesy of GENERAL MOTORS CORP.

ELECTRONIC CONTROL SYSTEM

The TCM constantly monitors all transaxle electrical circuits. If the TCM detects circuit problems or sensors out of range, it will record a Diagnostic Trouble Code (DTC). If problem continues for a predetermined time, Malfunction Indicator Light (MIL) will light.

If MIL is on all the time, DTC(s) are currently being detected. If MIL is off, but TCM had detected a circuit or sensor problem, DTC(s) will be stored in computer memory.

Stored DTCs may be retrieved from TCM memory using a scan tool. DTCs CANNOT be retrieved by grounding 16-pin Data Link Connector (DLC).

NOTE: Faulty engine sensors and actuators may cause transaxle-related DTCs or driveability problems. Engine faults and related DTCs must be diagnosed and repaired before transaxle DTCs are repaired. For additional information on diagnosing and repairing engine-related DTCs, see appropriate SELF-DIAGNOSTICS article in ENGINE PERFORMANCE.

SHIFT INTERLOCK SYSTEM

NOTE: For system operation, diagnosis and repair, see appropriate SHIFT INTERLOCK SYSTEMS article.

TROUBLE SHOOTING

NOTE: Any diagnosis should begin with confirming the customer's complaint. If possible, road test vehicle first, and note transaxle performance for future reference during diagnosis.

PRELIMINARY INSPECTION

Transaxle malfunctions may be caused by poor engine performance, improper adjustments or failure of hydraulic, mechanical or electronic components. Prior to diagnosing transaxle concerns, always begin by checking fluid level, fluid condition and shift cable adjustment. Ensure engine starts with gearshift lever in Park and Neutral to ensure proper adjustment of park/neutral position switch. Ensure all system-related fuses are okay. Check wire harnesses for proper routing. Verify all harness and component connections are clean and tight. See **WIRING DIAGRAMS** . If area of fault cannot be located or repaired during preliminary inspection, check self-diagnostic system. See **SELF-DIAGNOSTIC SYSTEM** . Repair as necessary.

Perform road test to determine if problem has been corrected. See **ROAD TEST** under PERFORMANCE TESTS. If problem still exists, diagnose by symptom. See **SYMPTOM DIAGNOSIS** .

SYMPTOM DIAGNOSIS

Transaxle Overheats

The following are possible causes and corrections for this condition:

- The fluid filter assembly is clogged, loose or not sealing properly - replace fluid filter assembly.
- The transmission fluid pump assembly is internally damaged, causing low or no pressure at the discharge port and low cooler flow - replace the transmission fluid pump assembly.
- The bolts securing the transmission fluid pump assembly to the case are loose or stripped - tighten/replace bolts.

Line Pressure Instability

The following are possible causes and corrections for this condition:

- The drive sprocket has worn or broken teeth causing the drive link assembly to jump teeth - replace drive sprocket.
- The driven sprocket has worn or broken teeth causing the drive link assembly to jump teeth - replace the driven sprocket.
- The transaxle oil cooler lines and/or transaxle oil cooler line bypass valve is clogged or not functioning correctly - replace transaxle oil cooler lines.
- The variable drive pulley assembly is leaking more than specification - replace variable drive pulley assembly.
- The variable driven pulley assembly is leaking more than specification - replace the variable driven pulley assembly.

Low Line Pressure

The following are possible causes and corrections for this condition:

- The fluid filter assembly is clogged or damaged - replace fluid filter assembly.
- The variable drive pulley assembly is leaking more than specification - replace the variable drive pulley assembly.
- The variable driven pulley assembly is leaking more than specification - replace the variable driven pulley assembly.
- The line "1" pressure regulator valve is worn, sticking or binding - replace the line "1" pressure regulator valve.
- The line "1" pressure regulator valve spring is worn, sticking or damaged - replace line "1" pressure regulator valve spring.
- The bore plug retainer for the line "1" pressure regulator valve is damaged or installed incorrectly - replace bore plug retainer.
- The bore plug seal for the line "1" pressure regulator valve is missing or cut - replace bore plug seal.
- The bore plug for the line "1" pressure regulator valve is worn or damaged - replace bore plug.
- The line "2" pressure regulator valve is worn, sticking or binding - replace line "2" pressure regulator valve.
- The line "2" pressure regulator valve spring is worn, sticking or damaged - replace line "2" pressure regulator valve spring.
- The bore plug seal for the line "2" pressure regulator valve is missing or cut - replace bore plug seal.
- The primary limit valve is worn, sticking or binding - replace primary limit valve.
- The primary limit valve spring is worn, sticking or damaged - replace primary limit valve spring.
- The actuator feed limit valve is worn, sticking or binding - replace actuator feed limit valve.
- The actuator feed limit valve spring is worn, sticking or damaged - replace actuator feed limit valve spring.

High Line Pressure

The following are possible causes and corrections for this condition:

- The line "1" pressure regulator valve is worn, sticking or binding - replace line "1" pressure regulator valve.
- The line "1" pressure regulator valve spring is worn, sticking or damaged - replace line "1" pressure regulator valve spring.
- The line "2" pressure regulator valve is worn, sticking or binding - replace line "2" pressure regulator valve.
- The line "2" pressure regulator valve spring is worn, sticking or damaged - replace line "2" pressure regulator valve spring.
- The actuator feed limit valve is worn, sticking or binding - replace actuator feed limit valve.
- The actuator feed limit valve spring is worn, sticking or damaged - replace actuator feed limit valve spring.

Fluid Leaks At Control Valve Body Cover

The following are possible causes and corrections for this condition:

- The control valve body cover is damaged - replace control valve body cover.
- The control valve body cover bolts/screws are loose, cross-threaded, or missing - tighten/replace the bolts/screws.
- The control valve body cover gasket is damaged or out of position - replace control valve body cover gasket.

Fluid Leaks At Control Valve Body Assembly

The following are possible causes and corrections for this condition:

- The control valve body assembly is porous or damaged - replace control valve body assembly.
- The spacer (with gasket) plate is damaged or not sealing properly - replace spacer (with gasket) plate.
- The control valve body bolts/screws are loose, cross-threaded or missing - tighten/replace the bolts/screws.

Fluid Leaks At Case Assembly

The following are possible causes and corrections for this condition:

- The case assembly is porous or damaged - replace case assembly.
- The anaerobic seal between the case assembly and the torque converter and differential housing is inadequate or too narrow - apply new bead of anaerobic sealant.

Fluid Cooler Pipe Fitting Seal

The following is a possible cause and correction for this condition:

- The fluid cooler pipe fitting seal is loose, damaged or worn - replace fluid cooler pipe fitting seal.

Fluid Leaks At Fluid Pressure Test Hole Plug

The following is a possible cause and correction for this condition:

- The fluid pressure test hole plug is loose, cross-threaded, or damaged - replace fluid pressure test hole plug.

Fluid Leaks At Torque Converter & Differential Housing Assembly

The following are possible causes and corrections for this condition:

- The torque converter and differential housing assembly is porous or damaged - replace torque converter and differential housing assembly.
- The torque converter and differential housing seal assembly is loose or damaged - replace torque converter and differential housing seal assembly.
- The anaerobic seal between the case assembly and the torque converter and differential housing is inadequate or too narrow - apply new bead of anaerobic sealant.

Fluid Leaks At Front Wheel Drive Shaft

The following is a possible cause and correction for this condition:

- The front wheel drive shaft oil seal is loose or damaged - replace front wheel drive shaft oil seal.

Fluid Leaks At Case Cover Assembly

The following are possible causes and corrections for this condition:

- The case cover assembly is porous or damaged - replace case cover assembly.
- The case cover bolts/screws are loose, cross-threaded, or stripped - tighten/replace the required bolts.
- The anaerobic seal between the case cover assembly and the case assembly is inadequate or too narrow - apply a new bead of anaerobic sealant.

Fluid Leaks At Drive Or Driven Pulley Opening Covers

The following are possible causes and corrections for this condition:

- The drive/driven pulley opening covers are porous or damaged - replace drive/driven pulley opening covers.
- The drive/driven pulley opening cover seals are cut or damaged (leaking) - replace drive/driven pulley opening cover seals.

Fluid Leaks At Manual Shift Shaft Seal Assembly

The following is a possible cause and correction for this condition:

- The manual shift shaft seal assembly is loose, cocked or damaged - replace manual shift shaft seal

assembly.

Fluid Leaks At Torque Converter

The following are possible causes and corrections for this condition:

- Torque converter is damaged - replace torque converter.

Noise

The following are possible causes and corrections for this condition:

- The front differential carrier assembly is damaged or the gears are out of position - replace front differential carrier assembly.
- The front differential carrier thrust washer is worn, melted, or extruding - replace front differential carrier thrust washer.
- The bearing assemblies on the front differential carrier assembly are worn or damaged - replace bearing assemblies.
- The splines in the case assembly are damaged - replace case assembly.
- The drive sprocket has worn or broken teeth causing loss of hydraulic power from drive link failure - replace drive sprocket.
- The driven sprocket has worn or broken teeth causing loss of hydraulic power from drive link failure - replace driven sprocket.
- The drive link assembly is stretched or has worn or damaged chain links - replace drive link assembly.
- The pinion gear and/or transfer gear teeth on the front differential drive pinion gear assembly are broken or damaged - replace front differential drive pinion gear assembly.
- The bearing assemblies on front differential drive pinion gear and transfer gear assembly are worn or damaged - replace bearing assemblies.
- The forward clutch backing plate has worn splines - replace forward clutch backing plate.
- The variable drive pulley assembly has worn splines causing excessive backlash - replace variable drive pulley assembly.
- The transmission fluid pump assembly is ingesting air or damaged causing low or no pressure at the discharge port - replace transmission fluid pump assembly.
- The fluid filter assembly is loose or not sealing properly - replace fluid filter assembly.
- The stator shaft assembly has damaged splines - replace transaxle case assembly.
- The sun gear has worn or broken teeth - replace sun gear.
- The lug bolts for the torque converter are loose - tighten lug bolts.
- The bolts securing the transmission fluid pump assembly to the case are loose or stripped - tighten/replace bolts.

Vibration

The following are possible causes and corrections for this condition:

- The lug bolts for the torque converter are loose - tighten lug bolts.
- The bolts securing the transmission fluid pump assembly to the case are loose or stripped - tighten/replace bolts.
- The line "1" pressure regulator valve is worn, sticking or binding - replace line "1" pressure regulator valve.
- The line "1" pressure regulator valve spring is worn, sticking or damaged - replace line "1" pressure regulator valve spring.
- The line "2" pressure regulator valve is worn, sticking or binding - replace line "2" pressure regulator valve.
- The line "2" pressure regulator valve spring is worn, sticking or damaged - replace line "2" pressure regulator valve spring.
- The control valve body is porous damaged or contaminated with debris - replace or flush control valve body.

No Drive

The following are possible causes and corrections for this condition:

- The input shaft assembly is damaged, worn or misaligned in the case - replace the input shaft assembly.
- The input shaft (outer) bearing is damaged, seized or worn - replace input shaft (outer) bearing.
- The input shaft fluid passage sleeve is obstructed or damaged - replace input shaft fluid passage sleeve.
- The sun gear is worn - replace sun gear.
- The sun gear thrust washer is worn - replace sun gear thrust washer.
- The input shaft (inner) bearing is damaged, seized or worn - replace input shaft (inner) bearing.
- The front differential carrier assembly is damaged - replace front differential carrier assembly.
- The front differential side gear has a broken tooth - replace front differential side gear.
- The front differential pinion gear has a broken tooth - replace front differential pinion gear.
- The front differential pinion shaft is damaged or fractured - replace front differential pinion shaft.
- The front differential pinion gear shaft pin is damaged - replace front differential pinion gear shaft pin.
- The fluid pump seals are cut or damaged causing leaking past seal - replace fluid pump seals.
- The control valve body bolts/screws are loose, cross-threaded or stripped - tighten/replace bolts/screws.
- The bearing retainer for the variable drive pulley is damaged or not holding causing drive belt failure - replace bearing retainer.
- The bearing retaining ring for the variable drive pulley is loose, damaged or not holding causing drive belt failure - replace bearing retaining ring.
- The drive sprocket has worn or broken teeth causing loss of hydraulic power from drive link failure - replace drive sprocket.
- The driven sprocket has worn or broken teeth causing loss of hydraulic power from drive link failure - replace driven sprocket.
- The splines on the driven sprocket are worn or damaged - replace driven sprocket.
- The drive link assembly is stretched or has worn or damaged chain links - replace drive link assembly.

- The drive/driven pulley opening covers are leaking internally and/or damaged - replace drive/driven pulley opening covers.
- The drive/driven pulley opening cover seals are cut or damaged (leaking) - replace drive/driven pulley opening cover seals.
- The variable drive belt assembly is damaged or broken - replace variable drive belt assembly.
- The retainer on the variable driven pulley assembly is damaged or not holding causing drive belt failure - replace variable driven pulley assembly.
- The (selective) bearing retainer for the variable driven pulley is damaged or not holding causing drive belt failure - replace (selective) bearing retainer.
- The pinion gear and/or transfer gear teeth on the front differential drive pinion gear assembly are broken or damaged - replace front differential drive pinion gear assembly.
- The forward clutch backing plate is worn, has broken splines or is damaged - replace forward clutch backing plate.
- The retaining ring for the forward clutch backing plate is loose, damaged or not holding - replace retaining ring.
- The forward clutch plate assemblies have worn splines or friction material - replace forward clutch plate assemblies.
- The forward clutch piston assembly is cut or rolled - replace forward clutch piston assembly.
- The variable drive pulley assembly is damaged - replace variable drive pulley assembly.
- The forward clutch piston spring is damaged - replace forward clutch piston spring.
- The transmission fluid pump assembly is internally damaged causing low or no pressure at the discharge port - replace transmission fluid pump assembly.
- The fluid filter assembly is clogged, loose or not sealing properly - replace fluid filter assembly.
- The stator shaft assembly is damaged - replace transaxle case assembly.
- The torque converter has damaged lugs or the lug bolts are sheared - replace torque converter.
- The internal hub splines for the torque converter are worn or damaged - replace torque converter.
- The torque converter is damaged - replace torque converter.
- The shaft splines on the variable drive pulley assembly are worn or damaged - replace variable drive pulley assembly.
- The fixed bearing on the variable driven pulley assembly is worn or damaged - replace variable driven pulley assembly.
- The bolts securing the transmission fluid pump assembly to the case are loose or stripped - tighten/replace bolts.
- The driven sprocket retaining ring is loose, damaged or not holding - replace retaining ring.
- The line "1" pressure regulator valve is worn, sticking or binding - replace line "1" pressure regulator valve.
- The line "1" pressure regulator valve spring is worn, sticking or damaged - replace line "1" pressure regulator valve spring.
- The bore plug retainer for the line "1" pressure regulator valve is damaged or installed incorrectly - replace bore plug retainer.
- The bore plug for the line "1" pressure regulator valve is worn or damaged - replace bore plug.

- The line limit valve is stuck in the exhaust position - replace line limit valve and flush the control valve body.
- The line "2" pressure regulator valve is worn, sticking or binding - replace line "2" pressure regulator valve.
- The line "2" pressure regulator valve spring is worn, sticking or damaged - replace line "2" pressure regulator valve spring.
- The bore plug seal for line "2" pressure regulator valve is missing or cut - replace bore plug seal.
- The manual valve is worn, sticking or binding - replace manual valve.
- The control valve body is porous, damaged or contaminated with debris - replace or flush control valve body.
- The forward and reverse clutch valve is worn, sticking or binding - replace forward and reverse clutch valve.

Slips In Drive

The following are possible causes and corrections for this condition:

- The forward clutch plates are worn causing slow clutch apply - replace forward clutch plates.
- The forward clutch piston assembly is cut or rolled - replace forward clutch piston assembly.
- The transmission fluid pump assembly is internally damaged causing low or no pressure at the discharge port - replace fluid pump assembly.
- The fluid filter assembly is clogged, loose or not sealing properly - replace fluid filter assembly.
- The shaft splines on the variable drive pulley assembly are worn or damaged - replace variable drive pulley assembly.
- The elements on the variable drive belt assembly are worn - replace variable drive belt assembly.
- The bolts securing the transmission fluid pump assembly to the case are loose or stripped - tighten/replace bolts.
- The line "1" pressure regulator valve is worn, sticking or binding - replace line "1" pressure regulator valve.
- The line "1" pressure regulator valve spring is worn, sticking or damaged - replace line "1" pressure regulator valve spring.
- The bore plug seal for the line "1" pressure regulator valve is missing or cut - replace bore plug seal.
- The line "2" pressure regulator valve is worn, sticking or binding - replace line "2" pressure regulator valve.
- The line "2" pressure regulator valve spring is worn, sticking or damaged - replace line "2" pressure regulator valve.
- The bore plug seal for the line "2" pressure regulator valve is missing or cut - replace bore plug seal.
- The control valve body is porous, damaged or contaminated with debris - replace or flush control valve body.

No Reverse

The following are possible causes and corrections for this condition:

- The input shaft assembly pinion pins are damaged or walking - replace input shaft assembly.
- The input shaft assembly pinion gear thrust washer(s) are damaged or worn causing excessive end play and interference with other components - replace input shaft assembly.
- The input shaft assembly has a broken tooth - replace input shaft assembly.
- The reverse clutch hub assembly is damaged - replace reverse clutch hub assembly.
- The reverse clutch hub thrust washer is damaged or worn - replace reverse clutch hub thrust washer.
- The reverse clutch backing plate is damaged or splines are worn - replace reverse clutch backing plate.
- The retaining ring for the reverse clutch backing plate is broken or damaged - replace retaining ring.
- The reverse clutch plate assemblies have worn splines or friction material - replace reverse clutch plate assemblies.
- The retaining ring for the reverse clutch spring assembly is loose, damaged or not holding - replace retaining ring.
- The reverse clutch spring assembly is damaged or worn - replace reverse clutch spring assembly.
- The shaft splines on the variable drive pulley assembly are worn or damaged - replace the variable drive pulley assembly.
- The variable drive belt assembly is damaged or broken - replace variable drive belt assembly.
- The manual valve is worn, sticking or binding - replace manual valve.
- The forward and reverse clutch valve is worn, sticking or binding - replace forward and reverse clutch valve.

Slips In Reverse

The following are possible causes and corrections for this condition:

- The reverse clutch spring assembly is damaged or worn - replace reverse clutch spring assembly.
- The elements on the variable drive belt assembly are worn - replace variable drive belt assembly.

No Drive & Reverse

The following are possible causes and corrections for this condition:

- The variable drive belt assembly is damaged or broken - replace variable drive belt assembly.
- The forward clutch piston spring is bent or damaged - replace forward clutch piston spring.
- The input shaft assembly is damaged or has a broken tooth - replace input shaft assembly.
- The input shaft assembly pinion gear thrust washer(s) are damaged or worn causing excessive end play and interference with other components - replace input shaft assembly.
- The sun gear has worn or broken teeth - replace sun gear.
- The forward and reverse clutch valve is worn or stuck in the exhaust position - replace forward and reverse clutch valve.
- The forward and reverse clutch valve spring is worn, sticking or damaged causing the valve to be stuck in the exhaust position - replace forward and reverse clutch valve spring.
- The bore plug retainer for the forward and reverse clutch valve is damaged or installed incorrectly -

replace bore plug retainer.

- The bore plug for the forward and reverse clutch valve is worn or damaged - replace bore plug.
- The bore plug seal for the forward and reverse clutch valve is missing or cut - replace bore plug seal.
- The manual valve is worn, sticking or binding - replace manual valve.
- The line "1" pressure regulator valve is worn, sticking or binding - replace line "1" pressure regulator valve.
- The line "2" pressure regulator valve is worn, sticking or binding - replace line "2" pressure regulator valve.
- The line "2" pressure regulator valve spring is worn, sticking or damaged - replace line "2" pressure regulator valve spring.
- The bore plug seal for the line "2" pressure regulator valve is missing or cut - replace bore plug seal.
- The line limit valve is worn, sticking or binding - replace line limit valve.
- The line limit valve spring is worn, sticking or damaged - replace line limit valve spring.
- The actuator feed limit valve is worn, sticking or binding - replace actuator feed limit valve.
- The actuator feed limit valve spring is worn, sticking or damaged - replace actuator feed limit valve spring.
- The variable ratio control valve lever assembly is worn, sticking or binding - replace variable ratio control valve lever assembly.
- The variable ratio control valve spring is worn, sticking or damaged - replace variable ratio control valve spring.
- The control valve body spacer plate has worn or plugged fluid passages - replace or flush spacer plate.
- The control valve body is clogged with debris or sediment - replace or flush the control valve body.
- The control solenoid valve assembly is clogged with debris or sediment - inspect control solenoid valve assembly replace as necessary.

No Low Or Reverse

The following are possible causes and corrections for this condition:

- The splines in the case assembly are damaged - replace case assembly.
- The variable drive belt assembly is damaged or broken - replace variable drive belt assembly.

No Park

The following are possible causes and corrections for this condition:

- The front differential carrier assembly is damaged - replace front differential carrier assembly.
- The front differential side gear has a broken tooth - replace front differential side gear.
- The front differential pinion gear has a broken tooth - replace the front differential pinion gear.
- The front differential pinion shaft is fractured - replace front differential pinion shaft.
- The park pawl shaft hole plug and actuator guide pin are missing from case causing actuator guide to become inoperative - install a new park pawl shaft hole plug and actuator guide pin.

- The pinion gear and/or transfer gear teeth on the front differential drive pinion gear assembly are broken or damaged - replace front differential drive pinion gear assembly.
- The manual shaft detent lever is damaged, or has worn or rounded teeth - replace manual shaft detent lever.
- The park pawl actuator assembly is binding, bent or damaged causing unintentional actuator movement - replace park pawl actuator assembly.
- The spring on the park pawl actuator assembly is broken or distorted - replace park pawl actuator assembly.
- The manual shift shaft is damaged - replace manual shift shaft.
- The park pawl reaction pin or spring is damaged - replace park pawl reaction pin or spring.
- The park pawl is stuck or damaged - replace park pawl.
- The manual shift shaft nut is loose or stripped - tighten or replace manual shift shaft nut.
- The manual valve is worn, sticking or binding - replace manual valve.

Stays In Park

The following are possible causes and corrections for this condition:

- The park pawl actuator assembly is bent or damaged causing unintentional actuator movement - replace park pawl actuator assembly.
- The manual shift shaft is damaged - replace manual shift shaft.
- The park pawl is stuck or damaged - replace park pawl.
- Transmission fluid temperature is between -40°F to -13°F (-40°C to -25°C) - allow transmission fluid temperature to warm up.

Stays In Drive

The following are possible causes and corrections for this condition:

- The variable drive pulley follower is worn, binding or damaged - replace case cover assembly.
- The manual valve is worn, sticking or binding - replace manual valve.
- The control solenoid valve assembly is contaminated with debris - replace or flush the control solenoid valve assembly.

Stays In Low

The following are possible causes and corrections for this condition:

- The manual valve is worn, sticking or binding - replace manual valve.
- The control solenoid valve assembly is contaminated with debris - replace or flush the control solenoid valve assembly.
- The primary limit valve is worn, sticking or binding - replace primary limit valve.
- The primary limit valve spring is worn, sticking or damaged - replace primary limit valve spring.

- The valve spring seat for the primary limit valve spring is damaged - replace valve spring seat.
- The variable ratio control valve lever assembly is worn, sticking or binding - replace variable ratio control valve lever assembly.
- The variable drive pulley follower is worn, binding or damaged - replace case cover assembly.
- The variable drive pulley follower spring is worn, sticking or damaged - replace variable drive pulley follower spring.

Stays In Intermediate

The following are possible causes and corrections for this condition:

- The manual valve is worn, sticking or binding - replace manual valve.
- The control solenoid valve assembly is contaminated with debris - replace or flush the control solenoid valve assembly.

Stays In Reverse

The following are possible causes and corrections for this condition:

- The manual valve is worn, sticking or binding - replace manual valve.
- The control solenoid valve assembly is contaminated with debris - replace or flush control solenoid valve assembly.

Gearshift Lever Position Inaccurate

The following is a possible cause and correction for this condition:

- The manual shift shaft nut is loose or stripped - tighten or replace manual shift shaft nut.

Harsh Garage Shifts

The following are possible causes and corrections for this condition:

- The valve spring seat for the line limit valve spring is damaged - replace valve spring seat for the line limit valve spring.
- The forward and reverse clutch valve spring is sticking - replace forward and reverse clutch valve spring.
- The manual valve is worn, sticking or binding - replace manual valve.
- The clutch boost valve is worn, sticking or binding - replace clutch boost valve.

Poor Driveability (Poor Or No Ratio Control)

The following are possible causes and corrections for this condition:

- The primary limit valve is worn, sticking or binding - replace primary limit valve.
- The primary limit valve spring is worn, sticking or damaged - replace primary limit valve spring.

- The variable ratio control valve lever assembly is worn, sticking or binding - replace variable ratio control valve lever assembly.
- The variable ratio control valve spring is worn, sticking or damaged - replace variable ratio control valve spring.
- The pivot link or pivot link retaining pin for the variable ratio control valve lever assembly are damaged or binding - replace variable ratio control valve lever assembly.
- The variable drive pulley follower is worn, binding or damaged - replace case cover assembly.
- The variable drive pulley follower spring is worn, sticking, or damaged - replace variable drive pulley follower spring.
- The line limit valve is worn, sticking or binding - replace line limit valve.
- The line limit valve spring is worn, sticking or damaged - replace line limit valve spring.
- The actuator feed limit valve is worn, sticking or binding - replace actuator feed limit valve.
- The actuator feed limit valve spring is worn, sticking or damaged - replace actuator feed limit valve spring.

TCC Does Not Apply

The following are possible causes and corrections for this condition:

- The stator shaft assembly contains debris or is damaged causing restricted fluid flow and increased fluid temperature - replace transaxle case assembly.
- The torque converter and housing seal assembly is loose or damaged - replace torque converter and housing seal assembly.
- The line limit valve is worn, sticking or binding - replace line limit valve.
- The line limit valve spring is worn, sticking or binding - replace line limit valve spring.
- The control valve body is porous, damaged or contaminated with debris - replace or flush control valve body.
- The TCC control valve is worn, sticking or binding - replace TCC control valve.
- The TCC control valve spring is worn, sticking or damaged - replace TCC control valve spring.
- The TCC regulator valve is worn, sticking or binding - replace TCC regulator valve.
- The TCC regulator apply valve spring is worn, sticking or damaged - replace TCC regulator apply valve spring.

TCC Does Not Release

The following are possible causes and corrections for this condition:

- The line limit valve is worn, sticking or binding - replace line limit valve.
- The line limit valve spring is worn, sticking or damaged - replace line limit valve spring.
- The control valve body is porous, damaged, or contaminated with debris - replace or flush control valve body.
- The TCC control valve is worn, sticking or binding - replace TCC control valve.

- The TCC control valve spring is worn, sticking or damaged - replace TCC control valve spring.
- The TCC regulator valve is worn, sticking or binding - replace TCC regulator valve.
- The TCC regulator apply valve spring is worn, sticking or damaged - replace TCC regulator apply valve spring.

Harsh TCC Apply

The following are possible causes and corrections for this condition:

- The TCC control valve is worn, sticking or binding - replace TCC control valve.
- The TCC control valve spring is worn, sticking or damaged - replace TCC control valve spring.
- The TCC regulator valve is worn, sticking or binding - replace TCC regulator valve.
- The TCC regulator apply valve spring is worn, sticking or damaged - replace TCC regulator apply valve spring.
- The line limit valve is worn, sticking or binding - replace line limit valve.
- The line limit valve spring is worn, sticking or damaged - replace line limit valve spring.
- The actuator feed limit valve is worn, sticking or binding - replace actuator feed limit valve.
- The actuator feed limit valve spring is worn, sticking or damaged - replace actuator feed limit "1" valve spring.
- The primary limit valve is worn, sticking or binding - replace primary limit valve.
- The primary limit valve spring is worn, sticking or damaged - replace primary limit valve spring.

Excessive TCC Slip

The following are possible causes and corrections for this condition:

- The line limit valve is worn, sticking or binding - replace line limit valve.
- The line limit valve spring is worn, sticking or damaged - replace line limit valve spring.
- The actuator feed limit valve is worn, sticking or binding - replace actuator feed limit valve.
- The actuator feed limit valve spring is worn, sticking or damaged - replace actuator feed limit valve spring.
- The primary limit valve is worn, sticking or binding - replace primary limit valve.
- The primary limit valve spring is worn, sticking or damaged - replace primary limit valve spring.
- The TCC control valve is worn, sticking or binding - replace TCC control valve.
- The TCC control valve spring is worn, sticking or damaged - replace TCC control valve spring.
- The TCC regulator valve is worn, sticking or binding - replace TCC regulator valve.
- The TCC regulator apply valve spring is worn, sticking or damaged - replace TCC regulator apply valve spring.

SOLENOID APPLICATIONS

SOLENOIDS							
Range	Controller State	TCC Enable Solenoid	TCC PC	Line Pressure Control	Ratio Motor Control	Forward Clutch	Reverse Clutch
Park	—	Off	Variable	Variable	Variable		
Reverse	R	Off	Variable	Variable	Variable		Applied
Neutral	—	Off	Variable	Variable	Variable		
Drive	TCC Released	Off	Variable	Variable	Variable	Applied	
	TCC Applied	On	Variable	Variable	Variable	Applied	
	Neutral Idle	Off	Variable	Variable	Variable	Applied	

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Fig. 4: Solenoid Range Reference Chart
Courtesy of GENERAL MOTORS CORP.

PERFORMANCE TESTS

ROAD TEST

NOTE: Complete the test in the sequence given. Incomplete testing cannot guarantee an accurate evaluation.

Introduction

The TCM calculates the speed ratio based primarily on Accelerator Pedal Position (APP) angle and transaxle output speed. When the TCM says an increase in the speed ratio should occur, an electrical signal goes to the ratio control motor which in turn moves the ratio control valve. The lever on the variable ratio control valve pulls the valve into a position which allows line "1" fluid to enter the primary feed circuit. The primary feed fluid is routed to the apply piston cavities and the fluid pressure moves the piston side of the pulley towards the stationary half of the pulley. The drive belt reacts to the drive pulley position change by rising between the two sides of the pulley. Ratio changes begin as soon as the drive belt moves higher between the pulley halves.

Road Test Procedure

NOTE: Perform this test when traffic and road conditions permit. Observe all safety regulations.

1. Install scan tool.
2. Start engine.
3. Depress brake pedal.
4. Move gearshift lever as follows:
    - Park to Reverse.
    - Reverse to Neutral.

- Neutral to Drive.

The gear selection should be immediate and not harsh.

5. Set up scan tool to monitor the APP angle, transaxle output speed and speed ratio.
6. With the gearshift lever in "D" position, accelerate to a chosen APP angle and hold accelerator pedal steady. Compare transaxle output speed and speed ratio to the chosen APP angle on the ratio chart from stop. See **Fig. 5** .
7. Repeat step 5 and compare with ratio chart steady. See **Fig. 6** .

SHIFT SPEED SPECIFICATIONS

RATIO CHART FROM STOP

Trans OSS	192.25	384.75	577	769.5	1154.25	1538.75	1923.5	2308.25	2693	3077.75	3462.5	3847.25
APP Angle												
6.25	0.37	0.38	0.39	0.39	0.48	0.58	0.66	0.74	0.80	0.84	0.91	0.97
12.5	0.37	0.38	0.39	0.39	0.48	0.58	0.66	0.75	0.80	0.84	0.91	0.97
18.75	0.37	0.38	0.39	0.39	0.48	0.58	0.68	0.74	0.80	0.84	0.91	0.97
25	0.37	0.38	0.39	0.39	0.48	0.58	0.67	0.74	0.81	0.84	0.91	0.97
31.25	0.37	0.38	0.39	0.39	0.46	0.53	0.62	0.69	0.77	0.84	0.91	0.97
37.5	0.37	0.38	0.39	0.39	0.43	0.47	0.58	0.66	0.74	0.80	0.87	0.93
43.75	0.37	0.38	0.39	0.39	0.43	0.47	0.55	0.64	0.72	0.78	0.84	0.89
50	0.37	0.38	0.39	0.39	0.43	0.47	0.55	0.62	0.69	0.75	0.81	0.86
56.25	0.37	0.38	0.39	0.39	0.43	0.47	0.55	0.61	0.68	0.73	0.79	0.82
62.5	0.37	0.38	0.39	0.39	0.43	0.47	0.55	0.61	0.68	0.74	0.78	0.83
68.75	0.37	0.38	0.39	0.39	0.43	0.47	0.55	0.61	0.68	0.73	0.78	0.83
75	0.37	0.38	0.39	0.39	0.43	0.47	0.55	0.61	0.68	0.73	0.79	0.82
81.25	0.37	0.38	0.39	0.39	0.43	0.47	0.55	0.61	0.66	0.72	0.76	0.80
87.5	0.37	0.38	0.39	0.39	0.43	0.47	0.53	0.57	0.64	0.69	0.74	0.78
93.75	0.37	0.38	0.39	0.39	0.43	0.47	0.53	0.58	0.64	0.69	0.74	0.78
99.99	0.37	0.38	0.39	0.39	0.43	0.47	0.50	0.54	0.58	0.62	0.68	0.75

Fig. 5: Ratio Chart (From Stop)
Courtesy of GENERAL MOTORS CORP.

RATIO CHART STEADY

Trans OSS	192.25	384.75	577	769.5	1154.25	1538.75	1923.5	2308.25	2693	3077.75	3462.5	3847.25
APP Angle												
6.25	0.38	0.38	0.48	0.62	0.91	0.91	0.91	1.60	1.70	1.83	1.82	1.81
12.5	0.38	0.38	0.48	0.62	0.91	0.91	0.91	1.60	1.69	1.82	1.82	1.81
18.75	0.38	0.38	0.48	0.62	0.91	0.91	0.91	1.58	1.65	1.77	1.78	1.81
25	0.38	0.38	0.48	0.56	0.82	0.91	0.91	1.35	1.46	1.59	1.68	1.73
31.25	0.38	0.38	0.38	0.52	0.74	0.91	0.91	1.21	1.33	1.47	1.59	1.64
37.5	0.38	0.38	0.38	0.47	0.671	0.91	0.91	1.13	1.23	1.37	1.48	1.55
43.75	0.38	0.38	0.38	0.44	0.62	0.91	0.91	1.01	1.12	1.25	1.33	1.42
50	0.38	0.38	0.38	0.43	0.57	0.91	0.91	0.94	1.03	1.14	1.21	1.30
56.25	0.38	0.38	0.38	0.42	0.55	0.91	0.77	0.87	0.95	1.05	1.13	1.22
62.5	0.38	0.38	0.38	0.41	0.52	0.91	0.72	0.79	0.87	0.97	1.06	1.14
68.75	0.38	0.38	0.38	0.40	0.50	0.91	0.66	0.73	0.80	0.89	0.98	1.07
75	0.38	0.38	0.38	0.39	0.49	0.91	0.61	0.69	0.76	0.84	0.92	0.99
81.25	0.38	0.38	0.38	0.38	0.48	0.91	0.59	0.66	0.72	0.80	0.86	0.93
87.5	0.38	0.38	0.38	0.38	0.46	0.91	0.56	0.62	0.66	0.71	0.76	0.81
93.75	0.38	0.38	0.38	0.38	0.45	0.91	0.55	0.62	0.65	0.71	0.75	0.81
99.99	0.38	0.38	0.38	0.38	0.42	0.91	0.50	0.54	0.53	0.59	0.65	0.72

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Fig. 6: Ratio Chart (Steady)
Courtesy of GENERAL MOTORS CORP.

HYDRAULIC PRESSURE TESTS

WARNING: Keep the brakes applied at all times to prevent unexpected vehicle motion. Personal injury may result if the vehicle moves unexpectedly.

CAUTION: Transaxle can generate line pressure of about 798 psi (56.1 kg/cm^2). Line pressure should be tested using VT25-E Line Pressure Gauge (J45195) or equivalent.

NOTE: The transaxle must be in Park or Neutral, with the vehicle stopped for the scan tool to be able to command the line pressure lower than normal. This protects transaxle clutches from extremely low pressure in Drive or Reverse.

Line Pressure

1. Install scan tool.
2. Start engine and set parking brake.
3. Check for stored DTCs, including DTCs for the line PC solenoid.

4. Inspect transmission fluid level and manual linkage at transaxle. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.

NOTE: Permatex High Temperature Thread Sealant (P/N 2145278) or equivalent must be applied to the threaded components of the line pressure gauge to ensure that no leakage occurs during testing.

5. Remove the line pressure test hole plug and install VT25-E Line Pressure Gauge (J45195) or equivalent to the transaxle. See **Fig. 7** .
6. Ensure the gearshift lever is in Park and the parking brake is set.
7. Start the engine and allow the engine to warm up at idle.
8. Access the line PC solenoid functional output control on the scan tool.

NOTE: Maximum line pressure developed by the pump is affected by engine speed, to develop the pressure for the high pressure test point the engine speed must be between 1000 and 1500 RPM. A line pressure reading taken at a lower engine speed will be low and may lead to misdiagnosis.

9. With the engine speed at idle, increase/decrease the commanded line PC solenoid amperage to 1.0 amps. Read and record the corresponding line pressure on the pressure gauge.
10. Increase the engine speed to be between 1000-1500 RPM before performing the next step.
11. Decrease the commanded line PC solenoid amperage to 0.2 amps. Read and record the corresponding line pressure on the pressure gauge. Compare the collected readings to the specification. See **LINE PRESSURE SPECIFICATIONS** table.

NOTE: Before reinstalling the line pressure test hole plug, apply Permatex Medium Grade Threadlocker Blue or equivalent to the thread of the plug.

12. Remove the line pressure gauge and install the line pressure test hole plug. Tighten line pressure test hole plug to 80 INCH lbs. (9 N.m).

LINE PRESSURE SPECIFICATIONS

Line PC Solenoid Current (Amp)	Line Pressure - psi (kg/cm^2)
.02 (1)	652-798 (45.8-56.1)
1.0 (2)	152-286 (10.7-20.1)
(1) Engine Speed = 1000-1500 RPM. (2) Engine Speed = Idle.	

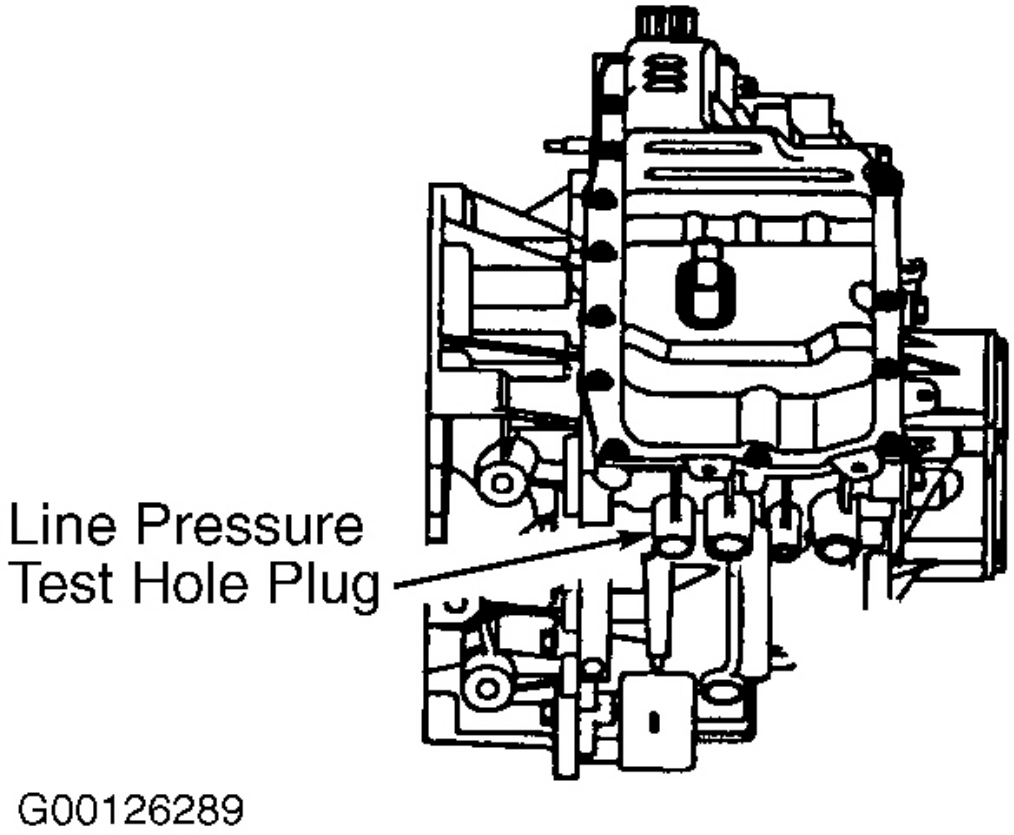

Fig. 7: Locating Fluid Pressure Test Hole Plug
Courtesy of GENERAL MOTORS CORP.

CLUTCH & SERVO AIR CHECKS

NOTE: For additional information, refer to overhaul procedures. See appropriate OVERHAUL article.

SELF-DIAGNOSTIC SYSTEM

DIAGNOSTIC SYSTEM CHECK

After performing a visual and physical underhood inspection, the diagnostic system check is the starting point for all diagnostic procedures or finding the cause of an emissions test failure.

The correct procedure to diagnose a problem is to follow three basic steps:

NOTE: Scan serial data transmitted by the TCM. This involves reading the information available on the serial data stream with one of the scan tools available for that purpose.

1. Are the on-vehicle diagnostics working? If not, see appropriate BODY CONTROL MODULES article in ACCESSORIES & EQUIPMENT. This is determined by performing the diagnostic system check. Since this is the starting point for the diagnostic procedures or finding the cause of an emissions test failure, always begin here. Go to next step.
2. Is there a DTC stored? If a DTC is stored, see **DIAGNOSTIC TROUBLE CODE DEFINITIONS** . This will determine if the fault is still present. If no DTC is stored, see **SYMPTOM DIAGNOSIS** under TROUBLE SHOOTING.

DIAGNOSTIC TROUBLE CODE DEFINITIONS

NOTE: Only transaxle related DTCs are listed. See DIAGNOSTIC TROUBLE CODE DEFINITIONS table. For engine-related DTC definitions and diagnosis, see appropriate SELF-DIAGNOSTICS article in ENGINE PERFORMANCE. These DTCs pertain to engine performance and must be repaired first, as engine performance and related component signals will affect transaxle operation and diagnosis.

There are 4 types of DTC categories:

- **Type "A"** - Emissions related. Illuminates MIL the first time DTC sets.
- **Type "B"** - Emissions related. Illuminates MIL if fault is active for 2 consecutive driving cycles.
- **Type "C"** - Non-emissions related. Does not illuminate MIL, but may illuminate SERVICE light.
- **Type "D"** - Non-emissions related. Does not illuminate MIL or SERVICE light.

DIAGNOSTIC TROUBLE CODE DEFINITIONS

DTC	Circuit & Fault Definitions
P0218	Transmission Fluid Overtemperature
P0562	System Voltage Low
P0563	System Voltage High
P0601	TCM Read Only Memory
P0602	TCM Not Programmed
P0603	TCM Long Term Memory
P0604	TCM Random Access Memory
P0606	TCM Internal Performance
P0705	PNP Switch Circuit
P0711	TFT Sensor Performance
P0712	TFT Sensor Low Voltage
P0713	TFT Sensor High Voltage
P0716	ISS Performance

P0717	ISS Low Voltage
P0719	Stoplamp Switch Circuit Low Voltage
P0722	OSS Low Voltage
P0723	OSS Intermittent
P0724	Stoplamp Switch Circuit High Voltage
P0727	Engine Speed No Signal
P0741	TCC System - Stuck Off
P0742	TCC System - Stuck On
P0841	TFP Sensor Performance
P0842	TFP Sensor Circuit Low Voltage
P0843	TFP Sensor Circuit High Voltage
P0960	Line PC Solenoid Circuit Open
P0961	Line PC Solenoid Performance
P0962	Line PC Solenoid Low Voltage
P0964	TCC PC Solenoid Circuit Open
P0965	TCC PC Solenoid Performance
P0966	TCC PC Solenoid Low Voltage
P1756	PNP Switch Indicates Park Or Neutral With Drive Ratio
P1758	PNP Switch Indicates Drive Without Drive Ratio
P1779	Torque Delivered Signal
P1780	Torque Reduction Signal
P1882	Ratio Control Performance
P1883	Ratio Control Motor Coil "A1" Circuit
P1884	Ratio Control Motor Coil "A2" Circuit
P1885	Ratio Control Motor Coil "B1" Circuit
P1886	Ratio Control Motor Coil "B2" Circuit
P1888	TCC Enable Solenoid Circuit Low Voltage
P1889	TCC Enable Solenoid Circuit High Voltage

CLEARING DIAGNOSTIC TROUBLE CODES

Using scan tool, clear DTCs following scan tool manufacturer's instructions. Do not clear DTCs unless instructed to do so.

SUMMARY

If no hard DTCs are present, and driveability symptoms or intermittent DTCs exist, attempt diagnosis by symptom, or by testing individual components related to system fault. See **TROUBLE SHOOTING** . If no problem is found, verify proper electronic control system circuit operation.

NOTE: Always clear DTCs once repairs are complete. See CLEARING DIAGNOSTIC TROUBLE CODES . Road test vehicle and retrieve DTCs to determine if complaint or DTC is repaired.

DIAGNOSTIC TESTS

INTRODUCTION

Diagnostic Procedures

The following diagnostic procedures are DTC specific. Perform **DIAGNOSTIC SYSTEM CHECK** under SELF-DIAGNOSTIC SYSTEM prior to performing any diagnostic procedure. For engine related DTCs, see appropriate SELF-DIAGNOSTICS article in ENGINE PERFORMANCE.

Repair Verification

After making a repair to the transaxle it is important the repair is verified before returning the vehicle to the customer. The vehicle must be driven so that each upshift and downshift is accomplished at least twice, and then the PCM must be checked for DTCs. Not all faults will illuminate an indicator lamp and the memory must be checked using a scan tool.

Diagnostic Aids

Diagnostic aids, located at end of each diagnostic test, are additional tips used to help diagnose DTCs when diagnostic procedures do not find a problem.

DTC P0218: TRANSMISSION FLUID OVERTEMPERATURE

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

Fluid flows from the fluid pump assembly to the line "1" pressure regulator valve, located in the control valve body. Through this valve, the fluid enters the tier "2" feed circuit. The fluid in the tier "2" feed pressure is then directed to the line "2" pressure regulator valve. The fluid passes through this valve and enters the line "2" circuit. The fluid in the line "2" pressure is then routed to the line limit valve, where it is regulated into the line "2" limit circuit. The fluid is then routed back through the line "2" pressure regulator valve and into the limited converter feed circuit, which leads to the TCC control valve. The fluid then passes through the TCC control valve and enters the TCC release circuit. Once there, the fluid is then routed through the control valve body, the case, and a passage in the input shaft assembly to the release side of the torque converter clutch pressure plate. The fluid then passes around the TCC pressure plate and enters the TCC pressure plate. The fluid from the torque converter assembly is then routed back to the TCC control valve where it passes through the valve and enters the cooler feed circuit. Fluid in the cooler feed circuit is finally routed through the case and the cooler pipe to the transmission oil cooler. Low line pressure, obstructions in the fluid flow to the cooler, and poor air flow to the cooler are all possible causes for the transaxle to overheat. DTC P0218 sets when the transmission fluid temperature is greater than a calibrated temperature (less than a calibrated voltage).

Conditions For Setting DTC

DTC P0218 will set if the transmission fluid temperature is greater than 284°F (140°C) for 3 minutes when P0711, P0712 and P0713 have not set.

DTC P0218 is a type "C" DTC.

Diagnostic Procedure

1. Drive vehicle for 3 minutes. Using scan tool, monitor transmission fluid temperature. Is transmission fluid temperature greater than 284°F (140°C)? If so, go to next step. If not, problem is intermittent. See **DIAGNOSTIC AIDS** .
2. Perform a transmission fluid level checking procedure. See appropriate AUTOMATIC article in TRANSMISSION SERVICING. Was fluid level low? If so, inspect for leaks and repair as necessary. If not, go to next step.
3. Inspect the transaxle cooling system for the following conditions:
   - Air flow restrictions or blockage.
   - Check ECM for cooling fan relay DTCs.
   - Use scan tool cooling fan relay command to check the operation of the cooling fan.

   Was problem found with the cooling system? If so, repair as necessary. If not, go to next step.
4. Inspect the transmission oil cooler system for restrictions, bends in oil cooler lines, leaking seals and restricted transmission oil cooler. Was a problem found with the transmission oil cooler system? If so, repair/replace as necessary. If not, go to next step.
5. Perform a line pressure test. See **HYDRAULIC PRESSURE TESTS** under PERFORMANCE TESTS. Were the pressure readings within the specifications? If so, go to next step. If not, go to step 7 .
6. Inspect the following and repair as necessary:
   - Faulty control solenoid valve assembly.
   - Torque converter for stator damage.
   - Poor connection at the TCM.
   - Inoperative TCM.
7. Inspect for clogged fluid filter assembly. If okay, replace transmission fluid pump assembly. See appropriate OVERHAUL article.

Diagnostic Aids

Ask the customer about vehicle overloading, exceeding trailer-towing limit, or towing in Drive.

DTC P0562: SYSTEM VOLTAGE LOW

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

The TCM samples ignition voltage every 0.1 seconds. The values sampled can be read using scan tool as the data parameter ignition voltage.

Conditions For Setting DTC

DTC P0562 will set if the ignition voltage is 11 volts or less for 42 out of 50 ignition voltage samples when the engine speed is 1500 RPM or greater.

DTC P0562 is a type "C" DTC.

Diagnostic Procedure

1. Operate engine at greater than 1500 RPM. Using scan tool, monitor ignition voltage. What is ignition voltage reading? If the ignition voltage reading is 0-9 volts, go to next step. If the ignition voltage reading is 9-11 volts, go to step 3 . If ignition voltage reading is greater than 11 volts, problem is intermittent. See **DIAGNOSTIC AIDS** .
2. Inspect the following and repair as necessary:
   - Open PWRTRN fuse (10 amp).
   - Open in voltage circuits between underhood fuse block harness connector terminal D1 and TCM harness connector J1 terminal No. 20 or between underhood fuse block harness connector terminal B9 and TCM harness connector J1 terminal No. 19.
   - Open in ground circuit between TCM harness connector J1 terminals No. 17 and 29, and ground.
   - Poor terminal connection or corrosion.
   - Charging system problems.
3. Inspect charging system. See appropriate GENERATORS & REGULATORS article in STARTING & CHARGING SYSTEMS.

Diagnostic Aids

Inspect for the following conditions:

- Poor connections or damaged harness.
- If the harness appears to be okay, monitor ignition voltage using scan tool while moving connectors and wiring related to the TCM, instrument panel harness and engine harness. A change in display will indicate the location of the fault.
- Perform a charging system test. See appropriate GENERATORS & REGULATORS article in STARTING & CHARGING SYSTEMS.
- If DTC P0562 can not be duplicated, reviewing the fail records vehicle mileage since the diagnostic test last failed may help determine how often the condition that caused the DTC to be set occurs. This may assist in diagnosing the condition.

DTC P0563: SYSTEM VOLTAGE HIGH

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

The TCM samples ignition voltage every 0.1 second. The values sampled can be read using scan tool as the data parameter ignition voltage.

Conditions For Setting DTC

DTC P0563 will set if the ignition voltage is 18 volts or greater for 43 out of 50 ignition voltage samples when the engine is running.

DTC P0563 is a type "C" DTC.

Diagnostic Procedure

Using scan tool, monitor ignition voltage. Is ignition voltage greater than 18 volts? If so, see appropriate GENERATORS & REGULATORS article in STARTING & CHARGING SYSTEMS. If not, problem is intermittent. See **DIAGNOSTIC AIDS** .

Diagnostic Aids

Inspect for the following conditions:

- Damaged or crimped harness.
- Jump starting may cause large voltage fluctuations and may set DTC P0563.
- If the harness appears to be okay, monitor the ignition voltage using scan tool while moving connectors and wiring related to the TCM, instrument panel harness, and engine harness. A change in the display will indicate the location of the fault.
- Perform a charging system test. See appropriate GENERATORS & REGULATORS article in STARTING & CHARGING SYSTEMS.
- If DTC P0563 cannot be duplicated, reviewing the fail records vehicle mileage since the diagnostic test last failed may help determine how often the condition that caused the DTC to be set occurs. This may assist in diagnosing the condition.

DTC P0601: TCM READ ONLY MEMORY

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Conditions For Setting DTC

This DTC will set when the TCM determines that TCM ROM checksum failure has occurred. DTC P0601 is a type "A" DTC.

Diagnostic Procedure

Record all TCM DTCs and include with repair information. Replace and reprogram the TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.

Diagnostic Aids

New service TCMs contain DTC P0602. When TCM is reprogrammed with the correct software and calibrations, DTC P0602 will be erased.

DTC P0602: TCM NOT PROGRAMMED

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Conditions For Setting DTC

This DTC will set if the TCM is not programmed, or if the Vehicle Identification Number (VIN) is not stored in the TCM after 255 ignition cycles. DTC P0602 is a type "C" DTC.

Diagnostic Procedure

Record all TCM DTCs and include with repair information. Reprogram the TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.

Diagnostic Aids

New service TCMs contain DTC P0602. When TCM is reprogrammed with the correct software and calibrations, DTC P0602 will be erased.

DTC P0603: TCM LONG TERM MEMORY

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Conditions For Setting DTC

This DTC will set when the TCM determines that a non-volatile memory checksum failure has occurred. DTC P0603 is a type "A" DTC.

Diagnostic Procedure

Power-down the TCM. If DTC sets again, record all TCM DTCs and include with repair information. Replace and reprogram the TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.

Diagnostic Aids

New service TCMs contain DTC P0602. When TCM is reprogrammed with the correct software and calibrations, DTC P0602 will be erased.

DTC P0604: TCM RANDOM ACCESS MEMORY

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Conditions For Setting DTC

This DTC will set when the TCM determines that its random access memory in inoperable. DTC P0604 is a type "A" DTC.

Diagnostic Procedure

Record all TCM DTCs and include with repair information. Replace and reprogram the TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.

Diagnostic Aids

New service TCMs contain DTC P0602. When TCM is reprogrammed with the correct software and calibrations, DTC P0602 will be erased.

DTC P0606: TCM INTERNAL PERFORMANCE

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

The TCM monitors the microprocessor status. When there is a microprocessor reset, the controller software will run a power-up cycle. If there is a power-up cycle without having a power-down, then the controller will interpret this as a running reset.

Conditions For Setting DTC

DTC P0606 will set if 10 power-up cycles occur and 7 of them are interpreted as being running resets when P0601 and P0604 have not set.

DTC P0606 is a type "A" DTC.

Diagnostic Aids

This DTC may be set by an intermittent short or open in the battery circuit to the TCM. Inspect for an intermittent short to ground or open between underhood fuse block harness connector terminal D1 and TCM harness connector J1 terminal No. 20 by connecting a test light. Wiggle the harness while observing the test light to locate the fault. If no circuit problems are found, replace and reprogram the TCM. Also, check loose terminal connections.

DTC P0705: PNP SWITCH CIRCUIT

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

The PNP switch is mounted on the transaxle assembly and is a multi-signal switch that indicates gearshift lever position to the TCM. The PNP switch assembly prevents the engine from cranking while in Drive or Reverse. The PNP switch uses four discrete circuits to pull four TCM inputs high in various combinations to indicate each gear range. DTC P0705 will set when the PNP switch indicates an invalid combination. See **PNP SWITCH LOGIC** table.

PNP SWITCH LOGIC (1)

Gearshift Lever Position	Signal "A"	Signal "B"	Signal "C"	Signal "P"
Park	HI	LOW	LOW	HI
Reverse	HI	HI	LOW	LOW
Neutral	LOW	HI	LOW	HI
Drive	LOW	HI	HI	LOW
Intermediate	HI	HI	HI	HI
Low	HI	LOW	HI	LOW

(1) HI = ignition voltage; LOW = zero volts.

Conditions For Setting DTC

DTC P0705 will set if PNP switch indicates an invalid range for 5 seconds when ignition voltage is 8-18 volts. DTC P0705 runs continuously when the above conditions have been met.

DTC P0705 is a type "B" DTC.

Diagnostic Procedure

1. Turn ignition on, engine off. Using scan tool, monitor PNP switch. Move gearshift lever from "P" through "L" positions, checking each position. Is scan tool reading correct for each position? If so, problem is intermittent. See **DIAGNOSTIC AIDS** . If not, go to next step.
2. Is the reading always invalid? If so, go to step 12 . If not, go to next step.
3. Move gearshift lever to "P" position. Is scan tool displaying PARK? If so, go to next step. If not, go to step 19 .
4. Move gearshift lever to "R" position. Is scan tool displaying REVERSE? If so, go to next step. If not, go to step 27 .
5. Move gearshift lever to "N" position. Is scan tool displaying NEUTRAL? If so, go to next step. If not, go to step 9 .
6. Disconnect PNP switch 12-way harness connector. Jumper PNP switch 12-way connector terminal No. 7 to battery voltage. Using scan tool, monitor PNP switch A/B/C/P position "C". Does it read HI? If so, go to next step. If not, go to step 8 .
7. Inspect PNP switch for loose terminal connections. Repair as necessary. If okay, replace PNP switch. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.
8. Inspect PNP switch position "C" circuit (773) for open and loose terminal connections. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.

9. Disconnect PNP switch 12-way harness connector. Using scan tool, monitor PNP switch A/B/C/P position "A". Does it read LOW? If so, go to next step. If not, go to step 11 .
10. Replace PNP switch. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.
11. Inspect PNP switch position "A" circuit (771) for a short to voltage. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
12. Disconnect PNP switch 12-way harness connector. Measure voltage between PNP switch 12-way harness connector terminal No. 11 and ground. Is battery voltage measured? If so, go to next step. If not, go to step 14 .
13. Inspect PNP switch for loose terminal connections. Repair as necessary. If okay, replace PNP switch. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.
14. Is BACKUP fuse (10-amp) blown? If so, go to next step. If not, go to step 16 .
15. Inspect PNP switch ignition voltage circuit, PNP switch position "A", "P", "C" or "B" circuit and attached components for a short to ground. Repair as necessary.
16. Measure voltage at ignition switch feed side of BACKUP fuse (10-amp). Is battery voltage present? If so, go to next step. If not, go to step 18 .
17. Inspect ignition voltage circuit between underhood fuse block terminal B10 and PNP switch terminal No. 11 for an open or loose terminal connections. Repair as necessary.
18. Inspect for an open and loose terminal connections in ignition voltage circuit between underhood fuse block terminal B10 and ignition switch. Repair as necessary. If okay, replace ignition switch. See appropriate STEERING COLUMN SWITCHES article in ACCESSORIES & EQUIPMENT.
19. Move gearshift lever to "R" position. Is scan tool reading REVERSE? If so, go to step 34 . If not, go to next step.
20. Move gearshift lever to "N" position. Is scan tool reading NEUTRAL? If so, go to next step. If not, go to step 24 .
21. Disconnect PNP switch 12-way harness connector. Using scan tool, monitor PNP switch A/B/C/P position "B". Does it read LOW? If so, go to next step. If not, go to step 23 .
22. Replace PNP switch. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.
23. Inspect PNP switch position "B" circuit (772) for a short to voltage. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
24. Disconnect PNP switch 12-way harness connector. Jumper PNP switch 12-way harness connector terminal No. 10 to battery voltage. Using scan tool, monitor PNP SW A/B/C/P position "P". Does it read HI?
25. Inspect for loose terminal connections. Repair as necessary. If okay, replace PNP switch. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.
26. Inspect PNP switch position "P" circuit (776) for an open and loose terminal connections. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
27. Move gearshift lever to "N" position. Is scan tool reading NEUTRAL? If so, go to next step. If not, go to step 31 .
28. Disconnect PNP switch 12-way harness connector. Using scan tool, monitor PNP switch A/B/C/P position "C". Does it read LOW? If so, go to next step. If not, go to step 30 .
29. Replace PNP switch. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.

30. Inspect PNP switch position "C" circuit (773) for a short to voltage. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
31. Disconnect PNP switch 12-way harness connector. Jumper PNP switch 12-way harness connector terminal No. 8 to battery voltage. Using scan tool, monitor PNP switch A/B/C/P position "B". Does it read HI? If so, go to next step. If not, go to step 33 .
32. Inspect for loose terminal connections. Repair as necessary. If okay, replace PNP switch. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.
33. Inspect PNP switch position "B" circuit (772) for an open and loose terminal connections. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
34. Move gearshift lever to "N" position. Is scan tool reading NEUTRAL? If so, go to next step. If not, go to step 38 .
35. Disconnect PNP switch 12-way harness connector. Jumper PNP switch 12-way harness connector terminal No. 9 to battery voltage. Using scan tool, monitor PNP switch A/B/C/P position "A". Does it read HI? If so, go to next step. If not, go to step 37 .
36. Inspect for loose terminal connections. Repair as necessary. If okay, replace PNP switch. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.
37. Inspect PNP switch position "A" circuit (771) for an open and loose terminal connections. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
38. Disconnect PNP switch 12-way harness connector. Using scan tool, monitor PNP switch A/B/C/P position "C". Does it read LOW? If so, go to next step. If not, go to step 40 .
39. Replace PNP switch. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.
40. Inspect PNP switch position "C" circuit (773) for a short to voltage. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.

Diagnostic Aids

To locate an intermittent problem, monitor PNP switch A/B/C/P while moving the related connectors and wiring harness. If a malfunction occurs, the scan data will change states from HI to LOW or from LOW to HI. Move the gearshift lever slowly through each gear position while monitoring the scan tool to help isolate the problem.

DTC P0711: TFT SENSOR PERFORMANCE

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

The TFT sensor is a thermistor that varies resistance according to changes in transmission fluid temperature. The TCM supplies a 5-volt reference through a pull up resistor to the sensor, which is connected to ground. When the sensor is cold it has high resistance (high signal voltage at TCM). As the sensor temperature increases, its resistance decreases (lower signal voltage at TCM). The TCM uses the signal voltage to determine transmission fluid temperature. The TCM detects for an unrealistic change in transmission temperature or a

temperature that remains constant for a period of time in which a measurable change is expected. DTC P0711 will set when either condition exists for a calibrated amount of time.

Condition No. 1 For Setting DTC

DTC will set if the transmission fluid temperature has changed less than 3.6°F (2°C) 3 minutes after start up when the following conditions have been met:

- Ignition voltage is 8-18 volts.
- Engine coolant temperature signal is valid.
- Engine speed is greater than 500 RPM for at least 5 seconds.
- DTC P0711 has not already passed.
- Start up transmission fluid temperature is between -40°F (-40°C) and -4°F (20°C).
- Engine coolant temperature is 68°F (20°C) or greater.
- Engine coolant temperature has changed greater than 36°F (20°C) since start-up.
- DTC P0716, P0717, P0722, and P0723 have not set.

DTC P0711 is a type "C" DTC.

Condition No. 2 For Setting DTC

DTC will set if within 2 seconds transmission fluid temperature has changed 27°F (15°C) or greater 10 times when the following conditions have been met:

- Ignition voltage is 8-18 volts.
- Engine coolant temperature signal is valid.
- Engine Speed is greater than 500 RPM for at least 5 seconds.
- DTC P0711 has not already passed.
- Start up transmission fluid temperature is -4-284°F (20-140°C).
- Engine coolant temperature is 158°F (70°C) or greater.
- Engine coolant temperature has changed more than 90°F (50°C) since start-up.
- Transaxle output speed is 400 RPM or greater for 5 minutes.
- TCC slip speed is 50 RPM or greater for at least 5 minutes.
- Ignition voltage is 8-18 volts.
- Engine Speed is greater than 500 RPM for at least 5 seconds.

DTC P0711 is a type "C" DTC.

Diagnostic Procedure

1. Allow the vehicle to cool so that the vehicle is not at operating temperature. Drive the vehicle. Using scan tool, monitor transmission fluid temperature. Does transmission fluid temperature change is less than 3.6° F (2°C) in 3 minutes or does transmission fluid temperature change rapidly more than 27°F (15°C)

several times? If transmission fluid temperature change is less than 3.6°F (2°C) in 3 minutes, go to next step. If transmission fluid temperature change rapidly more than 27°F (15°C) several times, go to step 5 . If neither condition occurs, problem is intermittent. See **DIAGNOSTIC AIDS** .

2. Turn ignition on, engine off. Disconnect transaxle 20-way harness connector. Is reading less than 35°F (-37°C)? If so, go to next step. If not, go to step 4 .
3. TFT sensor is faulty. Replace control solenoid valve assembly. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.
4. Replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
5. Turn ignition on, engine off. Disconnect transaxle 20-way harness connector. Connect a fixed resistance between transaxle 20-way harness connector terminals No. 13 and 14. Wiggle the harness while monitoring transmission fluid temperature. Did transmission fluid temperature change rapidly more than 27°F (15°C) several times? If so, go to next step. If not, go to step 7 .
6. Inspect TFT high (585) and low (586) circuits for an intermittent open or short condition. Repair as necessary.
7. TFT sensor is faulty. Replace control solenoid valve assembly. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.

Diagnostic Aids

To locate an intermittent problem, use a scan tool to monitor transmission fluid temperature with ignition on, engine off. Wiggling wires while watching for a change in transmission fluid temperature may locate the area where the open or short to ground in the wiring could lie. In addition, check for loose terminal connections. A short to voltage on the TFT high circuit (585) may damage the TFT sensor. Check for correct resistance vs. temperature after the repair has been made. See **COMPONENT RESISTANCE** under ELECTRONIC COMPONENT SPECIFICATIONS. The TCM uses two internal resistors to identify transmission fluid temperature. When looking for an intermittent failure, both temperature ranges should be checked. The temperature in one range may look normal while the other range does not. Test the low temperature range with the transaxle at room temperature and the high temperature range with the transaxle at normal operating temperature (greater than 158°F (70°C).

DTC P0712: TFT SENSOR LOW VOLTAGE

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

The TFT sensor is a thermistor that varies resistance according to changes in transmission fluid temperature. The TCM supplies a 5-volt reference through a pull up resistor to the sensor, which is connected to ground. When the sensor is cold, it has high resistance (high signal voltage at TCM). As the sensor temperature increases, its resistance decreases (lower signal voltage at TCM). The TCM uses the signal voltage to determine transmission fluid temperature. DTC P0712 sets when the TFT signal voltage at the TCM is below calibrated voltage value (over the calibrated temperature value).

Conditions For Setting DTC

DTC will set if the transmission fluid temperature is 302° F (150°C) or greater for 2 seconds when:

- The ignition voltage is 8-18 volts.
- The engine speed is greater than 500 RPM for at least 5 seconds.

DTC P0712 diagnostic runs continuously once the above conditions have been met. DTC P0712 is a type "C" DTC.

Diagnostic Procedure

1. Turn ignition on, engine off. Using scan tool, monitor transmission fluid temperature. Is transmission fluid temperature reading greater than 302°F (150°C)? If so, go to next step. If not, problem is intermittent. See **DIAGNOSTIC AIDS** .
2. Disconnect transaxle 20-way harness connector. Is transmission fluid temperature reading less than -35°F (-37°C)? If so, go to next step. If not, go to step 4 .
3. Faulty TFT sensor. Replace control solenoid valve assembly. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.
4. Disconnect TCM harness connector J2. Check for continuity between TCM harness connector J2 terminal No. 56 and ground, then between TCM harness connector J2 terminals No. 56 and 20. Does continuity exist? If so, go to next step. If not, go to step 6 .
5. TFT high circuit (585) shorted to ground or shorted to TFT low circuit (586). Repair as necessary.
6. Replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.

Diagnostic Aids

To locate a intermittent problem, use a scan tool to monitor transmission fluid temperature with ignition on, engine off. Wiggling wires while watching for a change in transmission fluid temperature may locate the area where the short to ground in the wiring could lie. The TCM uses two internal resistors to identify transaxle temperature. When looking for an intermittent failure, both temperature ranges should be checked. The temperature in one range may look normal while the other range does not. Test the low temperature range with the transaxle at room temperature and the high temperature range with the transaxle at normal operating temperature (greater than 158°F (70°C).

DTC P0713: TFT SENSOR HIGH VOLTAGE

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

The TFT sensor is a thermistor that varies resistance according to changes in transmission fluid temperature. The TCM supplies 5-volt reference through a pull resistor to the sensor, which is connected to ground. When the sensor is cold it has high resistance. As the sensor temperature increases, its resistance decreases. The TCM uses the signal voltage to determine transmission fluid temperature. DTC P0713 sets when the TFT sensor signal voltage at the TCM is above the calibrated voltage value.

Conditions For Setting DTC

DTC will set if transmission fluid temperature is -40°F (-40°C) or less for 80 seconds when:

- DTC P0716, P0717, P0722, and P0723 have not set.
- Ignition voltage is 8-18 volts.
- Engine speed is greater than 500 RPM for at least 5 seconds.

DTC P0713 diagnostic runs continuously once the above conditions have been met. DTC P0713 is a type "C" DTC.

Diagnostic Procedure

1. Turn ignition on, engine off. Using scan tool, monitor transmission fluid temperature. Is transmission fluid temperature reading less than -35°F (-37°C)? If so, go to next step. If not, problem is intermittent. See **DIAGNOSTIC AIDS** .
2. Disconnect transaxle 20-way harness connector. Measure voltage between transaxle 20-way harness connector terminals No. 13 and 14. What is the voltage value? If the voltage value is less than 4 volts, go to next step. If the voltage value is 4-6 volts, go to step 6 . If the voltage value is greater than 6 volts, go to step 9 .
3. Measure voltage on TFT high circuit (585). Are 4-6 volts present? If so, go to next step. If not, go to step 5 .
4. Inspect TFT low circuit (586) for an open and loose terminal connections. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
5. Inspect TFT high circuit (585) for an open and loose terminal connections. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
6. Jumper transaxle 20-way harness connector terminals No 13 and 14. Is reading above 302°F (150°C)? If so, go to next step. If not, go to step 8 .
7. Inspect for loose terminal connections at the transaxle 20-way harness connector. Repair as necessary. If okay, replace control solenoid valve assembly. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.
8. Replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
9. Inspect TFT high circuit (585) for a short-to-voltage. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.

Diagnostic Aids

To locate a intermittent problem, use a scan tool to monitor transmission fluid temperature with ignition on, engine off. Wiggling wires while watching for a change in transmission fluid temperature may locate the area where an open or a short to voltage in the wiring could lie. In addition, check loose terminal connections. The TCM uses two internal resistors to identify transaxle temperature. If either circuit has failed, the DTC will set. However, the temperature may look normal in the other range. Test the low temperature range with the engine at room temperature and the high temperature range with the engine at normal operating temperature (greater than 158°F (70°C). A short to voltage on the TFT high circuit (585) may damage the TFT sensor. Inspect for correct resistance versus temperature after the repair has been made. See **COMPONENT RESISTANCE**

under ELECTRONIC COMPONENT SPECIFICATIONS.

DTC P0716: ISS PERFORMANCE

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

The ISS provides transaxle input speed to the TCM. The ISS is a permanent magnet generator. The sensor is located near the turbine shaft of the transaxle and produces an AC voltage that increases in frequency as the turbine shaft increases in speed. The frequency produced is directly proportional to the input speed. The TCM then converts this frequency signal into input speed. For this DTC, TCM samples the input speed every 25 milliseconds, and if it finds an unrealistic change in the input speed, DTC will set.

Conditions For Setting DTC

DTC will set if the input speed drops 1000 RPM or greater and it remains for over 0.8 seconds when:

- Ignition voltage is 8-18 volts.
- Engine speed is greater than 500 RPM for at least 5 seconds.
- PNP switch is equal to Drive.
- DTC P0705, P0717, P0722, P0723, P1756, and P1758 have not set.
- Accelerator pedal position angle is at least 15 percent.
- Transaxle output speed is 1350 RPM or greater.
- Transaxle input speed has been 1000 RPM or greater for more than 5 seconds.
- Transaxle input speed does not increase by more than 200 RPM for 3 seconds.

DTC P0716 diagnostic runs continuously when the above conditions have been met. DTC P0716 is a type "A" DTC.

Diagnostic Procedure

1. Start engine. Using scan tool, monitor transaxle input speed. Is there a signal reading on scan tool? If so, problem is intermittent. See **DIAGNOSTIC AIDS** . If not, go to next step.
2. Turn ignition off. Disconnect transaxle 20-way harness connector. Turn ignition on. Measure voltage between transaxle 20-way harness connector terminal No. 2 and ground, and then between transaxle 20-way harness connector terminal No. 3 and ground. What is the voltage measurement? If voltage is less than 1.5 volts, go to next step. If voltage is 1.5-3.5 volts, go to step 6 . If voltage is greater than 3.5 volts, go to step 8 .
3. Turn ignition off. Disconnect TCM harness connector J2. Check continuity between ground and ISS high (1230) and low (1231) circuits. Does continuity exist? If so, go to next step. If not, go to step 5 .
4. Repair short to ground in ISS high (1230) or low (1231) circuits.
5. Inspect ISS high (1230) and low (1231) circuits for an open and loose terminal connections. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL &

INSTALLATION.

6. Turn ignition off. Inspect for corrosion in connectors. Reconnect transaxle 20-way harness connector. Start engine. Wiggle connections between transaxle and TCM while monitoring transaxle input speed on the scan tool. Was problem found? If so, repair as necessary. If not, go to next step.
7. Inspect the following possible causes and repair as necessary:
   - Loose sensor or air gap too large.
   - Leadframe to ISS harness damaged, replace ISS. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.
   - Faulty leadframe has a short or open, replace control solenoid valve. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.
   - Cracked ISS, replace ISS.
   - Check for loose terminal connections at TCM. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
8. ISS high (1230) or low (1231) circuits shorted to voltage. Repair as necessary.

Diagnostic Aids

To locate an intermittent condition, use a scan tool to monitor ISS with the engine running. Wiggling wires while watching for a change in the ISS parameter may locate the area where a fault in the wiring may lie. Also, check loose terminal connections. DTC P0716 can set due to the following:

- Intermittent open anywhere in the ISS circuit.
- Intermittent short to ground or short to voltage on ISS high (1230) or low (1231) circuits.
- Loose sensor.
- Electromagnetic interference caused by high current carrying wiring routed near ISS sensor wiring.
- ISS resistance at 77°F (25°C) = 1000-2000 ohms.

DTC P0717: ISS LOW VOLTAGE

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

The ISS provides transaxle input speed to the TCM. The ISS is a permanent magnet generator. The sensor is located near the turbine shaft of the transaxle and produces an AC voltage that increases in frequency and amplitude as the turbine shaft increases in speed. The frequency produced is directly proportional to the input speed. The TCM then converts this frequency signal into input speed. If a low input speed signal is detected and there is vehicle speed, then DTC P0717 sets.

Conditions For Setting DTC

DTC will set if the transaxle input speed is 100 RPM or less for more than 5 seconds when:

- DTC P0705, P0722, P0723, P1756, P1758 and P1779 have not set.
- Engine torque signal is valid.
- Ignition voltage is 8-18 volts.
- Engine speed is greater than 500 RPM for at least 5 seconds.
- PNP switch is equal to a forward gear range.
- Transaxle output speed is at least 400 RPM.
- Engine torque is between 22-221 ft. lbs. (30-300 N.m).

DTC P0717 diagnostic runs continuously when the above conditions have been met. DTC P0717 is a type "A" DTC.

Diagnostic Procedure

1. Turn ignition on, engine on. Using scan tool, monitor transaxle input speed. Is there a signal reading on scan tool? If so, problem is intermittent. See **DIAGNOSTIC AIDS** . If not, go to next step.
2. Turn ignition off. Disconnect TCM harness connector J2. Measure resistance between TCM harness connector J2 terminals No. 55 and 58. What is resistance value? If resistance is 1000-2000 ohms, go to next step. If resistance is less than 1000 ohms, go to step 8 . If resistance is greater than 2000 ohms, go to step 11 .
3. Disconnect transaxle 20-way harness connector. Check continuity between transaxle 20-way harness connector terminal No. 2 and ground. Does continuity exist? If so, go to next step. If not, go to step 5 .
4. ISS high circuit (1230) shorted to ground. Repair as necessary.
5. Reconnect transaxle 20-way harness connector. Connect DVOM set to AC scale between TCM harness connector J2 terminals No. 55 and 58. Generate an AC signal by cranking engine. Is voltage greater than 500 millivolts? If so, go to next step. If not, go to step 7 .
6. Inspect for loose terminal connections. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
7. Inspect ISS for correct installation. Repair as necessary. If okay, replace ISS. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.
8. Disconnect transaxle 20-way harness connector. Check continuity between transaxle 20-way harness connector terminals No. 2 and 3. Does continuity exist? If so, go to next step. If not, go to step 10 .
9. ISS high (1230) and low (1231) circuits are shorted together. Repair as necessary.
10. Check leadframe. If okay, replace ISS. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.
11. Disconnect transaxle 20-way harness connector. Check for continuity in ISS high (1230) and low (1231) circuits. Does continuity exist in both circuits? If so, go to next step. If not, go to step 13 .
12. Check for loose terminal connections. Repair as necessary. If okay, replace ISS. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.
13. Repair open in ISS high (1230) and/or low (1231) circuit.

Diagnostic Aids

To locate an intermittent problem, use a scan tool to monitor the transaxle input speed with the engine running.

Wiggling wires while watching for a change in the ISS parameter may locate the area where a fault in the wiring may lie. Also, note that the speed sensors have harnesses internal to the transaxle and may be the source of the problem. Check connections for tightness. ISS resistance at 77°F (25°C) = 1000-2000 ohms.

DTC P0719: STOPLAMP SWITCH CIRCUIT LOW VOLTAGE

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

Voltage is supplied to the TCM through the stoplamp switch. When the brake pedal is not applied, the stoplamp switch contacts are open. When the brake pedal is applied, the stoplamp switch contacts close and voltage is applied to the TCM stoplamp switch input. This DTC also monitors vehicle speed using the output speed sensor. When the vehicle is decelerating the stoplamp switch status is monitored. If the stoplamp switch stays open through a set number of deceleration tests for a calibrated amount of time, DTC P0719 sets.

Conditions For Setting DTC

DTC will set when stoplamp switch is released and the following conditions are satisfied 8 times:

- DTC P0722 and P0723 have not set.
- DTC P0719 has not already passed this ignition cycle.
- Ignition voltage is 8-18 volts.
- The vehicle decelerates so that the transaxle output speed signal changes in the following manner: transaxle output speed is greater than 1400 RPM for 6 seconds, then the transaxle output speed is 400-1400 RPM for 3 seconds and finally the transaxle output speed is below 400 RPM.

DTC P0719 diagnostic runs continuously when the above conditions have been met. DTC P0719 is a type "C" DTC.

Diagnostic Procedure

1. Turn ignition on, engine off. Using scan tool, monitor brake switch while pressing and releasing brake pedal. Does scan tool indicate RELEASED when brake pedal is applied? If so, go to next step. If not, problem is intermittent. See **DIAGNOSTIC AIDS** .
2. Inspect BRAKE fuse (15-amp). Replace fuse and retest if open. If fuse is open, inspect voltage circuit between underhood fuse block and stoplamp switch and stoplamp circuit (20) for a short to ground. Repair if a problem is found. Remove left side lower instrument panel closeout panel. Disconnect stoplamp switch. Jumper stoplamp switch harness connector terminals "A" and "B". Does scan tool indicate APPLIED? If so, go to next step. If not, go to step 4 .
3. Check for loose terminal connections. Check stoplamp switch adjustment. See appropriate SHIFT INTERLOCK SYSTEMS article. Adjust as necessary. If okay, replace stoplamp switch.
4. Connect test light between stoplamp switch harness connector terminal "A" and ground. Is test light on? If so, go to next step. If not, repair open in stoplamp switch voltage circuit.
5. Inspect stoplamp switch circuit (20) for an open. Inspect loose terminal connections. Repair as necessary.

If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.

Diagnostic Aids

Inspect the stoplamp switch for proper adjustments. To locate an intermittent problem, use a scan tool to monitor brake switch with the ignition on. Wiggling the harness while the brake is applied may locate the area where a fault may occur. Also, check for loose terminal connections.

DTC P0722: OSS LOW VOLTAGE

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

The OSS provides transaxle output speed to the TCM. The OSS is a permanent magnet generator. The sensor is located near the output pulley of the transaxle and produces an AC voltage that increases in frequency as output pulley increases in speed. The frequency produced is directly proportional to the output speed. The TCM then converts this frequency signal into output speed. If there is high input shaft speed and the transaxle is in a Drive range, but the TCM does not detect that the vehicle is moving, DTC P0722 sets.

Conditions For Setting DTC

DTC will set if output speed is 200 RPM or less for more than 5 seconds when:

- DTCs P0705, P0716, P0717, P0723, P0727, P1756, P1758 and P1779 have not set.
- Engine torque and accelerator pedal position angle signals are valid.
- Ignition voltage is 8-18 volts.
- Engine speed is greater than 500 RPM for at least 5 seconds.
- Engine torque is 22-221 ft. lbs. (30-300 N.m).
- Accelerator pedal position angle is greater than 15 percent.
- PNP switch is not equal to Park or Neutral.
- Transaxle input speed is greater than 750 RPM.

DTC P0722 diagnostic runs continuously when the above condition have been met. DTC P0722 is a type "A" DTC.

Diagnostic Procedure

1. Turn ignition on, engine off. Using scan tool, monitor transaxle output speed. Is there a transaxle output speed signal reading on scan tool? If so, problem is intermittent. See **DIAGNOSTIC AIDS** . If not, go to next step.
2. Turn ignition off. Disconnect TCM harness connector J2. Measure resistance between TCM harness connector J2 terminals No. 6 and 54. What is the resistance value? If resistance is 1000-1400 ohms, go to next step. If resistance is less than 1000 ohms, go to step 8 . If resistance is greater than 1400 ohms, go to

step 11 .

3. Disconnect transaxle 20-way harness connector. Check continuity between transaxle 20-way harness connector terminal No. 4 and ground. Does continuity exist? If so, go to next step. If not, go to step 5 .
4. Repair short to ground in OSS high circuit (400).
5. Reconnect transaxle 20-way harness connector. Connect DVOM set to AC scale between TCM harness connector J2 terminals No. 6 and 54. Generate an AC signal by cranking engine. Is voltage above 500 millivolts? If so, go to next step. If not, go to step 7 .
6. Inspect for loose terminal connections. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
7. Inspect OSS for correct installation. Repair as necessary. If okay, replace OSS. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.
8. Disconnect transaxle 20-way harness connector. Check continuity between transaxle 20-way harness connector terminals No. 4 and 5. Does continuity exist? If so, go to next step. If not, go to step 10 .
9. OSS high (400) and low (401) circuits shorted together. Repair as necessary.
10. Inspect leadframe. Repair as necessary. If okay, replace OSS. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.
11. Disconnect transaxle 20-way harness connector. Check continuity in OSS high (400) and low (401) circuits. Does continuity exist in both circuits? If so, go to next step. If not, go to step 13
12. Inspect for loose terminal connections, leadframe and internal harnesses. Repair as necessary. If okay, replace OSS. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.
13. Repair open in OSS high (400) and/or low (401) circuits.

Diagnostic Aids

To locate an intermittent problem, use a scan tool to monitor OSS with the engine running. Wiggling wires while watching for a change in the OSS may locate the area where a fault in the wiring may lie. In addition, check for loose terminal connections. Also, note that the transaxle speed sensors have harnesses internal to the transaxle and may be the source of the problem. OSS Resistance at 77°F (25°C) = 1000-1400 ohms.

DTC P0723: OSS INTERMITTENT

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

The OSS provides transaxle output speed to the TCM. The OSS is a permanent magnet generator. The sensor is located near the output pulley of the transaxle and produces an AC voltage that increases in frequency as the output pulley increases in speed. The frequency produced is directly proportional to the output speed. The TCM then converts this frequency signal into output speed. For this DTC, the TCM samples the output speed every 25 milliseconds and if it detects an unrealistic drop in output speed, DTC P0723 sets.

Conditions For Setting DTC

DTC will set if the output speed drops more than 500 RPM and remains for more than 0.8 second when:

- DTC P0705, P0716, P0717, P1756 and P1758 have not set.
- Ignition voltage is 8-18 volts.
- Engine speed is greater than 500 RPM for at least 5 seconds.
- Time since PNP switch change more than 6 seconds.
- Transaxle input speed is greater than 200 RPM.
- Transaxle output speed has been 600 RPM or greater for more than 5 seconds.
- Transaxle output speed does not increase by more than 200 RPM within a 25 millisecond period for more than 3 seconds.
- Transaxle input speed does not change more than 100 RPM within a 25 millisecond period for more than 3 seconds.
- PNP switch is not equal to Park or Neutral.

DTC P0723 diagnostic runs continuously when the above conditions have been met. DTC P0723 is a type "A" DTC.

Diagnostic Procedure

1. Drive vehicle or rotate front wheels greater than 3 MPH. Using scan tool, monitor OSS. Is scan tool reading a consistent value? If so, problem is intermittent. See **DIAGNOSTIC AIDS** . If not, go to next step.
2. Turn ignition off. Disconnect transaxle 20-way harness connector. Turn ignition on, engine off. Measure voltage at transaxle 20-way harness connector terminal No. 4, then at terminal No. 5. Is voltage present on either circuit? If so, go to next step. If not, go to step 4 .
3. Repair short to voltage in OSS high (400) and/or low (401) circuit.
4. Turn ignition off. Inspect for corrosion in transaxle 20-way harness connector. Repair as necessary. Reconnect transaxle 20-way harness connector. Start engine. Wiggle connections between transaxle and TCM while monitoring OSS on the scan tool. Was problem found? If so, repair wiring or connection. If not, go to next step.
5. Inspect the following possible causes and repair as necessary:
    - Loose sensor or air gap too large.
    - Leadframe to OSS sensor harness damaged, replace OSS.
    - Faulty leadframe has a short or open, replace control solenoid valve assembly.
    - Cracked OSS, replace OSS.
    - Check for loose terminal connections at TCM. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.

Diagnostic Aids

To locate an intermittent problem, use a scan tool to monitor OSS with the engine running. Wiggling wires while watching for a change in the OSS parameter may locate the area where an open in the wiring may lie. In addition, check for loose terminal connections. DTC P0723 can set due to the following:

- Intermittent open anywhere in the OSS circuit.

- Intermittent short to ground or short to voltage OSS circuit.
- Loose sensor.
- Inoperable sensor.
- Electromagnetic interference caused by high current carrying wiring routed near OSS sensor wiring.

DTC P0724: STOPLAMP SWITCH CIRCUIT HIGH VOLTAGE

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

Voltage is supplied to the TCM through the stoplamp switch. When the brake pedal is not applied, the stoplamp switch contacts are open. When the brake pedal is applied, the stoplamp switch contacts close and voltage is applied to TCM stoplamp switch input. This DTC also monitors vehicle speed using the output speed sensor. When the vehicle is accelerating the stoplamp switch status is monitored. If the stoplamp switch stays closed through a set number of acceleration tests and for a calibrated amount of time, DTC P0724 sets.

Conditions For Setting DTC

DTC will set when the stoplamp switch is applied for more than 15 minutes and the following conditions have been met 8 times within that time period:

- DTC P0722 and P0723 have not set.
- The vehicle accelerates and the transaxle output speed is less than 400 RPM, then is between 400 and 1400 RPM for 3 seconds and finally is greater than 1400 RPM for 6 seconds.

DTC P0724 diagnostic runs continuously when the above condition have been met. DTC P0724 is a type "C" DTC.

Diagnostic Procedure

1. Turn ignition on, engine off. Using scan tool, monitor stoplamp switch while pressing and releasing brake pedal. Does scan tool indicate APPLIED when brake pedal is released? If so, problem is intermittent. See **DIAGNOSTIC AIDS** . If not, go to next step.
2. Remove left side lower instrument panel closeout panel. Disconnect stoplamp switch. Does scan tool consistently indicate RELEASED? If so, go to next step. If not, go to step 4 .
3. Check stoplamp switch adjustment. Adjust as necessary. If okay, replace stoplamp switch. See appropriate SHIFT INTERLOCK SYSTEMS article.
4. Measure voltage between TCM harness connector J1 terminal No. 4 and ground. Is voltage greater than 5-9 volts? If so, go to next step. If not, go to step 6 .
5. Inspect stoplamp circuit (20) for a short to voltage. Repair as necessary.
6. Replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.

Diagnostic Aids

Ask about the customer's driving habits. Ask about unusual traffic conditions that would require the driver to continuously apply the brake. To locate an intermittent problem, use a scan tool to monitor stoplamp switch with the brake pedal depressed while wiggling wires. The scan tool will indicate RELEASED when no voltage is present at the TCM brake input. Wiggling wires while watching for a change from APPLIED to RELEASED may locate the area where an open or a short to ground in the wiring could lie. The stoplamp switch should have fewer than 2 ohms resistance across its terminals when the plunger is all the way out. Inspect the stoplamp switch for proper adjustment.

DTC P0727: ENGINE SPEED NO SIGNAL

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

The ECM sends engine speed information to the TCM via the Controller Area Network (CAN) bus. The ECM also determines if the engine RPM information is reliable or not, and sends that information to the TCM. DTC P0727 sets when the TCM receives an invalid engine speed signal from the ECM.

Conditions For Setting DTC

DTC will set when the engine speed signal is not valid for 2 seconds when:

- DTC U2103 and U2105 have not set.
- Ignition voltage is 8-18 volts.

DTC P0727 diagnostic runs continuously when the above conditions have been met. DTC P0727 is a type "B" DTC.

Diagnostic Aids

This DTC does not indicate a problem with the TCM or transaxle. It does indicate that the ECM is not sending the required information to the TCM. Check for any DTCs stored in the ECM related to the Crank Position (CKP) sensor circuit. Clear DTCs in the TCM after repair is made to the CKP sensor circuit.

DTC P0741: TCC SYSTEM - STUCK OFF

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

The TCC PC solenoid controls the flow of the TCC apply oil to the torque converter. When the TCC PC solenoid is commanded on, it exhausts release oil and allows regulated apply oil to flow to the apply circuit causing the pressure to increase, forcing the pressure plate to engage the converter housing. This causes the turbine shaft to turn at or near the speed of the engine. When the TCC PC solenoid is off, the transaxle and engine turn at different speeds depending on the amount of fluid coupling. A fail counter will be incremented

when excessive slip is occurring and the TCC PC solenoid is commanded on. Excessive slip is defined as any slip greater than a calibrated value for more than a calibrated amount of time. When the fail counter reaches a calibrated value, DTC P0741 sets.

Conditions For Setting DTC

DTC will set if TCC is commanded on 3 times within an ignition cycle, and each time TCC slip speed is 220 RPM or greater for 3 seconds when:

- Ignition voltage is 8-18 volts.
- Engine speed is greater than 500 RPM for at least 5 seconds.
- Accelerator pedal position angle is greater than 5 percent.
- PNP switch is in Drive, Intermediate, or Low and engine torque is 22-221 ft. lbs. (30-300 N.m).
- Speed ratio is greater than 0.38.
- Transmission fluid temperature is 70-266°F (21-130°C).
- DTC P0705, P0716, P0717, P0722, P0723, P0742, P1756, P1758, P1779, P1888, and P1889 have not set.
- Engine torque, throttle position angle, and accelerator pedal position angle signals are valid.
- Time since a PNP switch change is greater than 6 seconds.

DTC P0741 diagnostic runs continuously when the above conditions have been met. DTC P0741 is a type "B" DTC.

Diagnostic Procedure

NOTE: If DTC P0716, P0717, P0964, P0965, P0966, P1888, or P1889 has set, diagnose that DTC first.

1. Record DTCs and failure record information. Clear DTC. Drive vehicle at constant speed greater than 45 MPH. Monitor TCC slip speed. Is TCC slip speed more than 220 RPM? If so, go to next step. If not, problem is intermittent. See **DIAGNOSTIC AIDS** .
2. Using scan tool, monitor ISS. Is ISS signal reading on scan tool? If so, go to next step. If not, see **DTC P0717: ISS LOW VOLTAGE** .
3. Check the transmission fluid level. See appropriate AUTOMATIC article in TRANSMISSION SERVICING. Is level of fluid low? If so, add fluid as necessary. If not, go to next step.
4. Inspect the control valve body for the following:
   - Stuck TCC PC solenoid or damaged "O" ring.
   - Stuck TCC enable solenoid or damaged "O" ring.
   - Line limit valve and spring for damage, sticking or binding.
   - TCC control valve and spring for damage, sticking or binding.
   - TCC regulator valve for damage, sticking or binding.
   - TCC regulator apply valve spring for damage, sticking or binding.
   - Control valve body for damage, porosity or contamination.

Replace control valve body assembly if necessary.

Inspect for the following:

- Torque converter and housing seal for damage or engagement. Replace torque converter and seal as necessary.
- Stator shaft assembly for debris or damage restricting fluid flow. Replace stator shaft assembly if necessary.

Diagnostic Aids

This DTC will set if the ISS suddenly drops out while TCC is applied. Check for an open in ISS circuits.

DTC P0742: TCC SYSTEM - STUCK ON

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

The TCC PC solenoid controls the flow of the TCC apply oil to the torque converter. When the TCC PC solenoid is commanded on, it exhausts release oil and allows regulated apply oil to flow to the apply circuit causing the pressure to increase, forcing the pressure plate to engage the converter housing. This causes the turbine shaft to turn at or near the speed of the engine. When the TCC PC solenoid is off, the transaxle and engine turn at different speeds depending on the amount of fluid coupling. When the vehicle is in Park, the TCC slip speed is sampled. If the TCC slip speed is less than a calibrated amount a fail counter is incremented. If a certain percentage of samples have failed, DTC P0742 sets.

Conditions For Setting DTC

DTC will set if TCC is commanded off and TCC slip speed is less than 3 RPM for 80 percent of the tested values when:

- DTC P0705, P0716, P0717, P0722, P0723, P0741, P1758, P1779, P1888, and P1889 have not set.
- Engine torque, throttle position angle, and accelerator pedal position angle signals are valid.
- Engine speed is 500-2000 RPM.
- Accelerator pedal position angle is 3 percent or less.
- Change in accelerator pedal position angle since start-up is less than 2 percent.

DTC P0742 diagnostic runs at engine start-up when the above conditions have been met. DTC P0742 is a type "B" DTC.

Diagnostic Procedure

NOTE: If DTC P0716, P0717, P0964, P0965, P0966, P1888, or P1889 has set, diagnose that DTC first.

1. Start the engine. Leave gearshift lever in Park. Using scan tool, monitor TCC slip speed. Is TCC slip speed less than 3 RPM? If so, go to next step. If not, problem is intermittent. See **DIAGNOSTIC AIDS** .
2. Inspect the control valve body for the following:
   - Stuck TCC PC solenoid.
   - Stuck TCC enable solenoid.
   - Line limit valve and spring for damage, sticking or binding.
   - TCC control valve and spring for damage, sticking or binding.
   - TCC regulator valve for damage, sticking or binding.
   - TCC regulator apply valve spring for damage, sticking or binding.
   - Control valve body for damage, porosity or contamination.

Diagnostic Aids

If the TCC PC solenoid is stuck on, a loss of Drive and Reverse may be experienced at low vehicle speeds.

DTC P0841: TFP SENSOR PERFORMANCE

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

This test checks for correlation between the commanded pressure and the measured pressure. A problem in these two values can be detected by two diagnostic cases. The first case is instability in the measured signal. For this DTC, the TCM samples the pressure every 0.1 second. If within 2 seconds the commanded change in pressure is small and the measured pressure has changed more than a calibrated value 10 times, DTC P0841 will set. The second case is when the sensor readings are not changing. The measured pressure at start-up is compared to the current measured pressure and if it has changed very little for 2 seconds in comparison to the commanded pressure change, DTC P0841 will set.

Condition No. 1 For Setting DTC

DTC will set if within 2 seconds the absolute value of the change in line pressure actual is 145 psi (10.2 kg/cm^2) or greater 10 times when the following conditions have been met:

- DTC P0727, P0842, P0843, P0960, P0961, P0962, and U2105 have not set.
- Ignition voltage is 8-18 volts.
- Engine speed is greater than 500 RPM for at least 5 seconds.
- Transmission fluid temperature is 70°F (21°C) or greater.
- DTC P0722 and P0723 have not set.
- Engine speed is 1500 RPM or greater.
- Transaxle output speed is 300 RPM or greater.
- The absolute valve of the change in line pressure commanded is 87 psi (6.1 kg/cm^2) or less for 2

seconds.

DTC P0841 diagnostic runs continuously when the above conditions have been met. DTC P0841 is a type "B" DTC.

Condition No. 2 For Setting DTC

DTC P0841 will also set if the difference between line pressure actual and the line pressure actual at start-up is 14.5 psi (1.0 kg/cm^2) or less for 2 seconds when the following conditions have been met:

- DTC P0727, P0842, P0843, P0960, P0961, P0962, and U2105 have not set.
- Ignition voltage is 8-18 volts.
- Engine speed is greater than 500 RPM for at least 5 seconds.
- Transmission fluid temperature is 70°F (21°C) or greater.
- DTC P0841 has not passed this ignition cycle.
- Line pressure commanded has changed more than 29 psi (2.0 kg/cm^2) since key on.

DTC P0841 diagnostic runs continuously when the above conditions have been met. DTC P0841 is a type "B" DTC.

Diagnostic Procedure

NOTE: If DTC P0201-P0204, P0300-P0304, P0842, or P0843 has set, diagnose it first.

1. Drive vehicle at constant speed, so line pressure commanded pressure is greater than 217 psi (15.3 kg/cm^2). Using scan tool, monitor LINE PRESSURE ACTUAL. Did LINE PRESSURE ACTUAL reading change less than 14.5 psi (1.0 kg/cm^2) since start-up or did the LINE PRESSURE ACTUAL reading change rapidly more than 145 psi (10.2 kg/cm^2) several times? If so, go to next step. If not, problem is intermittent. See **DIAGNOSTIC AIDS** .
2. Perform line pressure test. See **HYDRAULIC PRESSURE TESTS** under PERFORMANCE TESTS. If line pressure is not within specifications, see **SYMPTOM DIAGNOSIS** under TROUBLE SHOOTING. If line pressure is within specifications and LINE PRESSURE ACTUAL reading changed less than 14.5 psi (1.0 kg/cm^2) since start-up, go to next step. If line pressure is within specifications and LINE PRESSURE ACTUAL reading changed rapidly more than 145 psi (10.2 kg/cm^2) several times, go to step 6 .
3. Turn ignition on, engine off. Disconnect transaxle 20-way harness connector. Is LINE PRESSURE ACTUAL less than 7 psi (.5 kg/cm^2)? If so, go to next step. If not, go to step 5 .
4. Replace faulty TFP sensor. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.
5. Replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
6. Turn ignition on, engine off. Disconnect transaxle 20-way harness connector. Connect test light between battery voltage and transaxle 20-way harness connector terminal No. 1. Observe test light while wiggling harness. Did test light flicker? If so, go to next step. If not, go to step 8

7. Inspect Pressure sensor ground circuit (452) for loose terminal connections. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
8. Connect a fixed resistance between transaxle 20-way harness connector terminals No. 11 and 12. Using scan tool, wiggle harness while monitoring LINE PRESSURE ACTUAL. Did pressure value change? If so, go to next step. If not, go to step 10 .
9. Inspect TFP sensor signal circuit (657) for intermittent, open or short condition. Repair as necessary. Inspect TFP sensor 5-volt reference circuit (456) for intermittent, open or short condition. Repair as necessary.
10. Replace faulty TFP sensor. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.

Diagnostic Aids

If P0842 or P0843 is also set, diagnose the other failure first. Unsteady engine torque or engine misfires may cause fluctuation in transmission line pressure and set this DTC. Check the for fuel injector DTCs P0201-P0204 and misfire DTCs P0300-P0304. If any of these DTCs are present, repair them first. Clear DTCs and test to verify that engine fluctuations caused this problem. To locate an intermittent problem, use the scan tool to monitor LINE PRESSURE ACTUAL with the engine running. Wiggling wires while watching for a change in the LINE PRESSURE ACTUAL may locate the area where an open or a short to ground in the wiring may lie. Also, check for loose terminal connections.

DTC P0842: TFP SENSOR CIRCUIT LOW VOLTAGE

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

The TFP sensor is a device that outputs a voltage as a function of the pressure acting upon the diaphragm of the device. The measured pressure signal is used to modify the commanded line pressure such that the actual line pressure is equal to the desired line pressure. DTC P0842 sets when the pressure sensor signal is low when a higher output is expected.

Conditions For Setting DTC

DTC will set if the line pressure actual is 7 psi (.5 kg/cm^2) or less for more than 20 seconds when:

- DTC P0960, P0961 and P0962 have not set.
- Ignition voltage is 8-18 volts.
- Engine speed is greater than 500 RPM for at least 5 seconds.
- Line pressure commanded is 319 psi (22.4 kg/cm^2) or greater.

DTC P0842 diagnostic runs continuously when the above conditions have been met. DTC P0842 is a type "A" DTC.

Diagnostic Procedure

1. Turn ignition on, engine running. Engine speed greater than 1500 RPM. Using scan tool, monitor LINE PRESSURE ACTUAL. Is reading less than 7 psi (.5 kg/cm^2)? If so, go to next step. If not, problem is intermittent. See **DIAGNOSTIC AIDS** .
2. Turn ignition on, engine off. Disconnect transaxle 20-way harness connector. Jumper transaxle 20-way harness connector terminals No. 11 and 12. Is reading greater than 653 psi (45.9 kg/cm^2)? If so, go to next step. If not, go to step 4 .
3. Inspect for loose terminal connections at transaxle 20-way harness connector. Repair as necessary. If okay, replace control solenoid valve assembly. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.
4. Remove jumper. Measure voltage between transaxle 20-way harness connector terminal No. 11 and ground. Are 4-6 volts present? If so, go to next step. If not, go to step 8 .
5. Turn ignition off. Disconnect TCM harness connector J2. Check continuity between TCM harness connector J2 terminal No. 2 and transaxle 20-way harness connector terminal No. 12. Does continuity exist? If so, go to next step. If not, repair open in TFP sensor signal circuit (657).
6. Check continuity between transaxle 20-way harness connector terminal No. 12 and ground. Does continuity exist? If so, repair short to ground in TFP sensor signal circuit (657). If not, go to next step.
7. Inspect TFP sensor signal circuit (657) for short to TFP sensor circuit (452) and loose terminal connections at TCM. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
8. Turn ignition off. Disconnect TCM harness connector J2. Check continuity between transaxle 20-way harness connector terminal No. 11 and ground. Does continuity exist? If so, repair short to ground in TFP sensor circuit (596). If not, go to next step.
9. Inspect TFP sensor circuit (596) for an open and loose terminal connections at TCM. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.

Diagnostic Aids

To locate an intermittent problem, use the scan tool to monitor LINE PRESSURE ACTUAL with the engine running. Wiggling the wires while watching for a change in LINE PRESSURE ACTUAL may locate the area where an open or a short to ground in the wiring may lie.

DTC P0843: TFP SENSOR CIRCUIT HIGH VOLTAGE

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

The TFP sensor is a device that outputs a voltage as a function of the pressure acting upon the diaphragm of the device. The measured pressure signal is used to modify the commanded line pressure such that the actual line pressure is equal to the desired line pressure. DTC P0843 sets when the voltage output is high when a lower output is expected.

Conditions For Setting DTC

DTC will set if line pressure actual is 653 psi (45.9 kg/cm^2) or greater for more than 20 seconds when:

- DTC P0960, P0961 and P0962 have not set.
- Ignition voltage is 9-18 volts.
- Engine speed is greater than 500 RPM for at least 5 seconds.
- Line pressure commanded is 580 psi (40.8 kg/cm^2) or less.

DTC P0843 diagnostic runs continuously when the above conditions have been met. DTC P0843 is a type "A" DTC.

Diagnostic Procedure

1. Turn ignition on, engine running. Using scan tool, monitor LINE PRESSURE ACTUAL. Is reading above 653 psi (45.9 kg/cm^2)? If so, go to next step. If not, problem is intermittent. See **DIAGNOSTIC AIDS** .
2. Turn ignition on, engine off. Disconnect transaxle 20-way harness connector. Is reading below 7 psi (.5 kg/cm^2)? If so, go to next step. If not, go to step 6 .
3. Measure voltage between transaxle 20-way harness connector terminals No. 11 and 1. Are 4-6 volts present? If so, go to next step. If not, go to step 5 .
4. Faulty TFP sensor. Replace control solenoid valve assembly. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.
5. Inspect TFP sensor ground circuit (452) for open and loose terminal connections at TCM. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
6. Measure voltage between transaxle 20-way harness connector terminal No. 12 and ground. Are 4-6 volts present? If so, repair short to TFP sensor 5-volt reference circuit (596). If not, see **DIAGNOSTIC AIDS** .

Diagnostic Aids

To locate an intermittent problem, use the scan tool to monitor LINE PRESSURE ACTUAL with the engine running. Wiggling the wires while watching for a change in LINE PRESSURE ACTUAL may locate the area where a short to voltage in the wiring may lie.

DTC P0960: LINE PC SOLENOID CIRCUIT OPEN

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

The TCM uses the line PC solenoid to control the transmission line pressure. The TCM compares various engine and transaxle inputs to determine the line pressure appropriate for a given load. The TCM then regulates the pressure by applying a varying current to the line PC solenoid. The applied current varies from 0.1 amp for maximum pressure to 1.1 amps for minimum pressure. The TCM monitors the current and when a continuous open or short to voltage is detected P0960 sets.

Conditions For Setting DTC

DTC will set if the line PC circuit is open or shorted to voltage when:

- DTC P0961 and P0962 have not set.
- Condition exists for greater than 1.3 seconds on 2002 models and 3.5 seconds on 2003 models.
- Engine speed is greater than 500 RPM for at least 5 seconds.

DTC P0960 diagnostic runs continuously when the above conditions have been met. DTC P0960 is a type "B" DTC.

Diagnostic Procedure

1. With ignition on, engine running. Idle for one minute. Using scan tool, monitor status of DTC P0960. Did last test fail? If so, go to next step. If not, problem is intermittent. See **DIAGNOSTIC AIDS** .
2. Turn ignition off. Disconnect transaxle 20-way harness connector. Connect test light between battery voltage and transaxle 20-way harness connector terminal No. 16. Turn ignition on, engine off. Is test light on? If so, go to next step. If not, go to step 7 .
3. Measure voltage between transaxle 20-way harness connector terminal No. 15 and ground. What is the voltage value? If voltage is 2-6 volts, go to next step. If voltage is less than 2 volts, go to step 5 . If voltage is more than 6 volts, go to step 6 .
4. Check for loose terminal connections at transaxle 20-way harness connector. Repair as necessary. If okay, replace control solenoid valve assembly. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.
5. Inspect line PC solenoid high circuit (1530) for an open or a short to ground and loose terminal connections at TCM. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
6. Inspect line pressure control solenoid high circuit (1530) for a short to voltage. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
7. Connect test light between transaxle 20-way harness connector terminal No. 16 and ground. Is test light on? If so, go to next step. If not, go to step 9 .
8. Inspect line PC solenoid high circuit (1530) for open and loose terminal connections at TCM. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
9. Inspect line PC solenoid high circuit (1530) for a short to voltage. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.

Diagnostic Aids

To locate an intermittent problem, use the scan tool to monitor line PC solenoid actual and reference current for a large difference with the engine running. Wiggling wires while watching for a difference between the two parameters may locate the area where an open or a short to voltage in the wiring may lie. Line PC solenoid resistance at 68°F (20°C) = 3.5-4.1 ohms.

DTC P0961: LINE PC SOLENOID PERFORMANCE

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

The TCM uses the line PC solenoid to control the transmission line pressure. The TCM compares various engine and transaxle inputs to determine the line pressure appropriate for a given load. The TCM then regulates the pressure by applying a varying current to the line PC solenoid. The applied current varies from 0.1 amp for maximum pressure to 1.1 amps for minimum pressure. The TCM monitors the current and when a significant difference between the commanded and actual current is detected P0961 sets.

Conditions For Setting DTC

DTC P0961 will set if the line PC solenoid actual current is outside of a calibrated current threshold for a given duty cycle as given in the following chart when:

- DTC P0960 and P0962 have not set.
- Engine speed is greater than 500 RPM for at least 5 seconds.
- Ignition voltage is 8-18 volts.

DTC P0961 diagnostic runs continuously when the above conditions have been met. DTC P0961 is a type "B" DTC.

Diagnostic Procedure

1. With ignition on, engine running. Idle for one minute. Using scan tool, monitor status of DTC P0961. Did last test fail? If so, go to next step. If not, problem is intermittent. See **DIAGNOSTIC AIDS** .
2. Using scan tool, monitor ignition voltage. Is ignition voltage greater than 11 volts? If so, go to next step. If not, see appropriate GENERATORS & REGULATORS article in STARTING & CHARGING SYSTEMS.
3. Turn ignition off. Disconnect the transaxle 20-way harness connector. Check for continuity between transaxle 20-way harness connector terminal No. 16 and ground. Does continuity exist? If so, go to next step. If not, go to step 5 .
4. Inspect line PC solenoid low circuit (5503) for a short to ground. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
5. Reconnect the transaxle 20-way harness connector. Disconnect TCM harness connector J2. Measure resistance between TCM harness connector J2 terminals No. 50 and 51. If resistance is 2.8-6.8 ohms, go to next step. If resistance is less than 2.8 ohms, go to step 7 . If resistance is greater than 6.8 volts, go to step 8 .
6. Check for loose terminal connections at TCM. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
7. Inspect line PC solenoid high (1530) and low (5503) circuits for a shorted together condition. Repair as necessary. If okay, replace control solenoid valve assembly. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.

8. Inspect line PC solenoid high (1530) and low (5503) circuits for high resistance. Check for loose terminal connections. Repair as necessary. If okay, replace control solenoid valve assembly. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.

Diagnostic Aids

Extended cranking with a weak battery could set DTC P0961. This DTC can be set if the ignition voltage is too low or too high. Review the failure record for high or low ignition voltage. To located an intermittent problem, use the scan tool to monitor line PC solenoid actual and reference current for a large difference with the engine running. Wiggling wires while watching for a difference between the two parameters may locate the area where a wiring problem may lie. Line PC solenoid resistance at 68°F (20°C) = 3.5-4.1 ohms.

DTC P0962: LINE PC SOLENOID LOW CURRENT

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

The TCM uses the line PC solenoid to control the transmission line pressure. The TCM compares various engine and transaxle inputs to determine the line pressure appropriate for a given load. The TCM then regulates the pressure by applying a varying current to the line PC solenoid. The applied current varies from 0.1 amp for maximum pressure to 1.1 amps for minimum pressure. The TCM monitors the current and when a short to ground is detected P0962 sets.

Conditions For Setting DTC

DTC will set if line PC circuit is shorted to ground for more than 1.3 seconds when:

- DTC P0960 and P0961 has not set.
- Engine speed is greater than 500 RPM for at least 5 seconds.
- Ignition voltage is 8-18 volts.

DTC P0962 diagnostic runs continuously when the above conditions have been met. DTC P0962 is a type "B" DTC.

Diagnostic Procedure

1. With ignition on, engine running. Idle for one minute. Using scan tool, monitor status of DTC P0962. Did last test fail? If so, go to next step. If not, problem is intermittent. See **DIAGNOSTIC AIDS** .
2. Turn ignition off. Disconnect transaxle 20-way harness connector. Connect a test light between battery voltage and transaxle 20-way harness connector terminal No. 15. Is test light on? If so, go to next step. If not, go to step 4 .
3. Inspect line PC solenoid high circuit (1530) for a short to ground. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
4. Turn ignition on. Connect test light between transaxle 20-way harness connector terminal No. 51 and

ground. Is the test light on? If so, go to next step. If not, go to step 6 .

5. Inspect line PC solenoid high circuit (1530) for a short to voltage. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
6. Inspect line PC solenoid high (1530) and low (5503) circuits for a shorted together condition. Repair as necessary. If okay, replace control solenoid valve assembly. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.

Diagnostic Aids

To locate an intermittent problem, use the scan tool to monitor line PC solenoid actual and reference current for a large difference with the engine running. Wiggling wires while watching for a difference between the two parameters may locate the area where a short to ground in the wiring may lie. Line PC solenoid resistance at 68° F (20°C) = 3.5-4.1 ohms.

DTC P0964: TCC PC SOLENOID CIRCUIT OPEN

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

The TCM uses the TCC PC solenoid to apply and release the TCC system. The TCM compares various engine and transaxle inputs to determine if TCC should be applied. The TCM then regulates the pressure to the TCC by applying a varying current to the TCC PC solenoid. The TCM monitors this current and when a continuous open or short to voltage is detected DTC P0964 sets.

Conditions For Setting DTC

DTC P0964 will set if the TCC PC solenoid control circuit is open or shorted to voltage when:

- DTC P0965 or P0966 has not set.
- Condition exists for greater than 1.3 seconds on 2002 models and 3.5 seconds on 2003 models.
- Engine speed is greater than 500 RPM for at least 5 seconds.
- Ignition voltage is 8-18 volts.

DTC P0964 diagnostic runs continuously when the above conditions have been met. DTC P0964 is a type "B" DTC.

Diagnostic Procedure

1. Turn ignition on, engine running. Drive for a short distance. Using scan tool, monitor status of DTC P0964. Did last test fail? If so, go to next step. If not, problem is intermittent. See **DIAGNOSTIC AIDS** .
2. Turn ignition off. Disconnect transaxle 20-way harness connector. Connect test light between battery voltage and transaxle 20-way harness connector terminal No. 6. Turn ignition on, engine off. Is test light on? If so, go to next step. If not, go to step 7 .
3. Measure voltage between transaxle 20-way harness connector terminal No. 7 and ground. What is the

voltage value? If voltage is 2-6 volts, go to next step. If voltage is less than 2 volts, go to step 5 . If voltage is greater than 6 volts, go to step 6 .

4. Inspect transaxle 20-way harness connector loose terminal connections. Repair as necessary. If okay, replace control solenoid valve assembly. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.
5. Inspect TCC PC solenoid high circuit (418) for an open, a short to ground and loose terminal connections at TCM. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
6. Inspect TCC PC solenoid high circuit (418) for a short to voltage. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
7. Connect test light between transaxle 20-way harness connector terminal No. 6 and ground. Is test light on? If so, go to next step. If not, go to step 9 .
8. Inspect TCC PC solenoid low circuit (5500) for a short to voltage. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
9. Inspect TCC PC solenoid low circuit (5500) for an open and loose terminal connections at TCM. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.

Diagnostic Aids

To located an intermittent problem, use the scan tool to monitor TCC PC solenoid actual and reference current for a large difference with the engine running. Wiggling wires while watching for a difference between the two parameters may locate the area where an open or a short to voltage in the wiring may lie. TCC PC solenoid resistance at 68°F (20°C) = 3.5-4.1 ohms.

DTC P0965: TCC PC SOLENOID PERFORMANCE

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

The TCM uses the TCC PC solenoid to apply and release the TCC system. The TCM compares various engine and transaxle inputs to determine if TCC should be applied. The TCM then regulates the pressure to the TCC system by applying a varying current to the TCC PC solenoid. The TCM monitors this current and when a significant difference between the commanded and actual current is detected P0965 sets.

Conditions For Setting DTC

DTC will set if for 2 seconds the TCC PC solenoid actual current is outside of a calibrated current threshold for a given duty cycle when:

- Engine speed is greater than 500 RPM for at least 5 seconds.
- Ignition voltage is 8-18 volts.
- DTC P0964 and P0966 have not set.

DTC P0965 diagnostic runs continuously when the above conditions have been met. DTC P0965 is a type "B" DTC.

Diagnostic Procedure

1. Turn ignition on, engine running. Idle for one minute. Using scan tool, monitor status of DTC P0965. Did last test fail? If so, go to next step. If not, problem is intermittent. See **DIAGNOSTIC AIDS** .
2. Using scan tool, monitor ignition voltage. Is ignition voltage greater than 11 volts? If so, go to next step. If not, see appropriate GENERATORS & REGULATORS article in STARTING & CHARGING SYSTEMS.
3. Turn ignition off. Disconnect transaxle 20-way harness connector. Check for continuity between transaxle 20-way harness connector terminal No. 6 and ground. Does continuity exist? If so, go to next step. If not, go to step 5 .
4. Inspect TCC PC solenoid low circuit (5500) for a short to ground. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
5. Reconnect the transaxle 20-way harness connector. Disconnect TCM harness connector J2. Measure the resistance between TCM harness connector J2 terminals No. 44 and 45. If resistance is 2.8-6.8 ohms, go to next step. If resistance is less than 2.8 ohms, go to step 7 . If resistance is more than 6.8 ohms, go to step 8 .
6. Check for loose terminal connections at TCM. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
7. Inspect for TCC PC solenoid high (418) and low (5500) circuits a shorted together condition. Repair as necessary. If okay, replace control solenoid valve assembly. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.
8. Inspect for TCC PC solenoid high (418) and low (5500) circuits for high resistance. Check loose terminal connections. Repair as necessary. If okay, replace control solenoid valve assembly. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.

Diagnostic Aids

Review the failure record for low ignition voltage. To located an intermittent problem, use the scan tool to monitor TCC PC solenoid actual and reference current for a large difference with the engine running. Wiggling wires while watching for a difference between the two parameters may locate the area where a wiring problem may lie. TCC PC solenoid resistance at 68°F (20°C) = 3.5-4.1 ohms.

DTC P0966: TCC PC SOLENOID LOW CURRENT

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

The TCM uses the TCC PC solenoid to apply and release the TCC system. The TCM compares various engine and transaxle inputs to determine if TCC should be applied. The TCM then regulates the pressure to the TCC by applying a varying current to the TCC PC solenoid. The TCM monitors this current and when a short to ground is detected P0966 sets.

Conditions For Setting DTC

DTC P0966 will set if the TCC PC solenoid control circuit is shorted to ground for more than 1.3 seconds when:

- DTC P0964 and P0965 has not set.
- Engine speed is greater than 500 RPM for at least 5 seconds.
- Ignition voltage is 8-18 volts.

DTC P0966 diagnostic runs continuously when the above conditions have been met. DTC P0966 is a type "B" DTC.

Diagnostic Procedure

1. With ignition on, engine running. Drive for a short distance. Using scan tool, monitor status of DTC P0966. Did last test fail? If so, go to next step. If not, problem is intermittent. See **DIAGNOSTIC AIDS** .
2. Disconnect transaxle 20-way harness connector. Connect test light between transaxle 20-way harness connector terminal No. 7 and battery voltage. Is test light on? If so, go to next step. If not, go to step 4
3. Inspect TCC PC solenoid high circuit (418) for a short to ground. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
4. Turn ignition on. Connect test light between transaxle 20-way harness connector terminal No. 7 and ground. Is test light on? If so, go to next step. If not, go to step 6 .
5. Inspect TCC PC solenoid high circuit (418) for a short to voltage. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
6. Inspect TCC PC solenoid high (418) and low (5500) circuits for a shorted together condition. Repair as necessary. If okay, replace TCC PC solenoid. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.

Diagnostic Aids

To locate an intermittent problem, use the scan tool to monitor TCC PC solenoid actual and reference current for a large difference with the engine running. Wiggling wires while watching for a difference between the two parameters may locate the area where a short to ground in the wiring may lie. TCC PC solenoid resistance at 68°F (20°C) = 3.5-4.1 ohms.

DTC P1756: PNP SWITCH INDICATES PARK OR NEUTRAL WITH DRIVE RATIO

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

The PNP switch is mounted on the transaxle assembly and is a multi-signal switch that indicates gearshift lever position to the TCM. The PNP switch assembly prevents the engine from cranking while in Drive or Reverse. The PNP switch uses four discrete circuits to pull four TCM inputs high in various combinations to indicate each gear range. DTC P1756 will set when the PNP switch indicates Park or Neutral and the TCM detects that

the vehicle is moving.

Conditions For Setting DTC

DTC will set if the PNP switch is equal to Park or Neutral for 5 seconds when:

- DTC P0705, P0716, P0717, P0722, P0723, P0742, P1779, P1780, P1791, P1758, P1888, P1889, U2103, U2104 and U2105 have not set.
- Ignition voltage is 8-18 volts.
- Engine speed is greater than 500 RPM for at least 5 seconds.
- Engine torque is greater than 1 ft. lbs. (2 N.m).
- Transaxle output speed is 400 RPM or greater.
- Accelerator pedal position angle is 5 percent or greater.
- Speed ratio is 0.38 or greater.

DTC P1756 diagnostic runs continuously when the above conditions have been met. DTC P1756 is a type "B" DTC.

Diagnostic Procedure

1. With ignition on, engine running. Apply parking brake. Depress brake pedal. With gearshift lever in Park increase engine speed. Move gearshift lever to Neutral and increase engine speed. Did vehicle attempt to move in either gear selection? If so, go to next step. If not, problem is intermittent.
2. Inspect shift cable for proper adjustment. See appropriate AUTOMATIC article in TRANSMISSION SERVICING. Is control cable properly adjusted? If so, go to next step. If not, adjust shift cable and retest.
3. Turn ignition on, engine off. Using scan tool, monitor PNP switch. Move gearshift lever from Park to Low, checking each position. Is scan tool reading correct for each gearshift lever position? If so, go to next step. If not, see **DTC P0705: PNP SWITCH CIRCUIT** .
4. Manual valve link bent or damaged. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.

Diagnostic Aids

Monitor PNP switch A/B/C/P while moving the related connectors and wiring harness. See **PNP SWITCH LOGIC** table under DTC P0705: PNP SWITCH CIRCUIT. If a malfunction occurs, the scan data will change states from HI to LOW or from LOW to HI. Move the gearshift lever slowly through each gear while monitoring the scan tool in order to help isolate the problem.

DTC P1758: PNP SWITCH INDICATES DRIVE WITHOUT DRIVE RATIO

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

The PNP switch is mounted on the transaxle assembly and is a multi-signal switch that indicates gearshift lever position to the TCM. The PNP switch assembly prevents the engine from cranking while in Drive or Reverse. The PNP switch uses four discrete circuits to pull four TCM inputs high in various combinations to indicate each gear range. DTC P1758 will set when the PNP switch indicates a Drive range when Park or Neutral is observed.

Conditions For Setting DTC

DTC will set if PNP switch is equal to Drive, Intermediate, or Low when Park or Neutral is detected for 20 seconds when:

- DTC P0705, P0716, P0717, P0722, P0723, P0742, P1779, P1888 and P1889 have not set.
- Transaxle input speed is 550 RPM or greater for 20 seconds.
- Ignition voltage is 8-18 volts.
- Engine speed is greater than 500 RPM for at least 5 seconds.
- Transaxle output speed is 100 RPM or less.
- Accelerator pedal position angle is less than one percent.
- Speed ratio is 0.35-0.42 on 2002 models and 0.38-0.60 on 2003 models.
- Throttle angle and accelerator pedal position angle signals are valid.

DTC P1758 diagnostic runs continuously when the above conditions have been met. DTC P1758 is a type "B" DTC.

Diagnostic Procedure

1. With ignition on, engine running. Apply parking brake. Depress brake pedal. Move gearshift lever to Drive and increase engine speed. Move gearshift lever to Intermediate and increase engine speed. Move gearshift lever to Low and increase engine speed. Did vehicle attempt to move in all gear selections? If so, go to next step. If not, see **DIAGNOSTIC AIDS** .
2. Inspect shift cable for proper adjustment. See appropriate AUTOMATIC article in TRANSMISSION SERVICING. Is shift cable properly adjusted? If so, go to next step. If not, adjust shift cable and retest.
3. Turn ignition on, engine off. Using scan tool, monitor PNP switch. Move gearshift lever from Park to Low, checking each position. Is scan tool reading correct for each gearshift lever position? If so, go to next step. If not, see **DTC P0705: PNP SWITCH CIRCUIT** .
4. Perform line pressure test. See **HYDRAULIC PRESSURE TESTS** under PERFORMANCE TESTS. Is line pressure within specifications? If so, go to next step. If not, see **SYMPTOM DIAGNOSIS** under TROUBLE SHOOTING.
5. Manual valve link bent or damaged. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.

Diagnostic Aids

Monitor PNP SWITCH A/B/C/P while moving the related connectors and wiring harness. See **PNP SWITCH LOGIC** table under DTC P0705: PNP SWITCH CIRCUIT. If malfunction occurs, the scan data will change states from HI to LOW or from LOW to HI. Move the gearshift lever slowly through each gear while

monitoring the scan tool in order to help isolate the problem.

DTC P1779: TORQUE DELIVERED SIGNAL

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

The ECM sends serial data to the TCM via the Controller Area Network (CAN) bus. DTC 1779 does not indicate a problem with the transaxle or with the TCM. It does indicate that the ECM is not sending the required information to the TCM. Check for any related DTCs stored in the ECM and the Electronic Brake Traction Control Module (EBTCM). Clear DTCs in the TCM after a repair is made to the engine or anti-lock brake system.

Conditions For Setting DTC

DTC will set under the following conditions:

- Ignition voltage is 8-18 volts.
- Engine speed is greater than 500 RPM for more than 5 seconds.
- The signal is invalid for 2 seconds.
- DTC U2103 and U2105 have not set.

Diagnostic Procedure

Check for any DTCs stored in the ECM and EBTCM related to the torque reduction/request circuit. See appropriate SELF-DIAGNOSTICS article in ENGINE PERFORMANCE.

DTC P1780: TORQUE REDUCTION SIGNAL

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

The ECM sends serial data to the TCM via the Controller Area Network (CAN) bus. DTC 1780 does not indicate a problem with the transaxle or with the TCM. It does indicate that the ECM is not sending the required information to the TCM. Check for any related DTCs stored in the ECM and the Electronic Brake Traction Control Module (EBTCM). Clear DTCs in the TCM after a repair is made to the engine or anti-lock brake system.

Conditions For Setting DTC

DTC will set under the following conditions:

- Ignition voltage is 8-18 volts.
- Engine speed is greater than 500 RPM for more than 5 seconds.
- The signal is invalid for 2 seconds.
- DTC U2103 and U2105 have not set.

DTC P1780 is a type "A" DTC.

Diagnostic Procedure

Check for any DTCs stored in the ECM and EBTCM related to the torque reduction/request circuit. See appropriate SELF-DIAGNOSTICS article in ENGINE PERFORMANCE.

DTC P1882: RATIO CONTROL PERFORMANCE

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

The TCM uses the input speed and output speed sensor inputs to calculate the speed ratio. The speed ratio is then compared to the desired speed ratio, and difference between the two values is the speed ratio error. If the ratio control response is slow or jerky, a fail counter is incremented a number of counts depending upon the magnitude of speed ratio error above a calibrated value. Conversely, if the ratio control response is smooth and the speed ratio is close to the desired speed ratio the fail counter will be decremented. DTC P1882 will be set if the fail counter is equal to a calibrated value.

Conditions For Setting DTC

DTC will set if the fail counter is equal to 10,000 when:

- DTC P0705, P0716, P0717, P0722, P0723, P1756, P1779, P1883, P1884, P1885, P1886, P1888, P1889, U2103, U2104 and U2105 have not set.
- Ignition voltage is 8-18 volts.
- Transmission fluid temperature is greater than 70°F (21°C).
- PNP switch is equal to Drive.
- Engine speed is greater than 500 RPM for more than 5 seconds.
- The absolute value of the difference between the speed ratio and the desired speed ratio is greater than 0.1 on 2002 models and 0.45 on 2003 models.
- Speed ratio is 0.38-0.9 on 2002 models and 0.35-1.1 on 2003 models.
- Transaxle input speed is greater than 700 RPM.
- Accelerator pedal position angle is greater than 5 percent.
- Transaxle output speed greater than 400 RPM.
- Time since range change greater than 6 seconds.

DTC P1882 diagnostic runs continuously when the above conditions have been met. DTC P1882 is a type "A" DTC.

Diagnostic Procedure

NOTE: If DTCs P0201-P0204, P0300-P0304, P0716 or P0717 has set diagnose that DTC first.

NOTE: If the TCC enable solenoid is not stuck, the TCC PC solenoid duty cycle may not increase more than 68 percent.

1. Record DTC numbers and failure record information. Clear DTC. Using scan tool, monitor and compare desired speed ratio and speed ratio. Drive the vehicle a short distance at a steady speed. Is desired speed ratio and speed ratio about the same? If so, problem is intermittent. See **DIAGNOSTIC AIDS** . If not, go to next step.
2. Using scan tool, monitor transaxle input speed. Is there a signal reading on scan tool? If so, go to next step. If not, see **DTC P0717: ISS LOW VOLTAGE** .
3. Using scan tool, monitor TCC PC solenoid duty cycle and transaxle component slip. When driving the vehicle greater than 20 MPH and the TCC PC solenoid duty cycle increases above 68 percent, does transaxle component slip suddenly increase and slipping in Drive is felt? If so, go to next step. If not, go to step 5 .
4. TCC enable solenoid is stuck off. Replace control solenoid valve assembly. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.
5. Perform a line pressure test. See **HYDRAULIC PRESSURE TESTS** under PERFORMANCE TESTS. Is the line pressure within specifications? If so, go to next step. If not, see **SYMPTOM DIAGNOSIS** under TROUBLE SHOOTING.
6. Has speed ratio remained constant since start-up and desired speed ratio changed? If so, go to next step. If not, see **SYMPTOM DIAGNOSIS** under TROUBLE SHOOTING.
7. Faulty ratio control motor. Replace control solenoid valve assembly. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.

Diagnostic Aids

Unsteady engine torque or engine misfires may cause fluctuation in ISS which is used in the calculation of the speed ratio and may set this DTC. Check the engine controller for fuel injector DTCs P0201-P0204 and misfire DTCs P0300-P0304. If any of these DTCs are present, repair the problem first. Clear DTCs and test to verify that engine fluctuations caused this problem. Sudden loss of ISS signal will cause the calculated ratio to be wrong and may cause this DTC to set. To locate an intermittent condition, use a scan tool to monitor transaxle input speed with engine running. Wiggling wires while watching for a change in the ISS parameter may locate the area where a fault in the wiring may lie. Also, note that the transaxle speed sensors have harness internal to the transaxle and may be the source of the problem. Check loose terminal connections at the TCM connector, the transaxle 20-way connector, and the speed sensor to leadframe connector.

DTC P1883: RATIO CONTROL MOTOR COIL A1 CIRCUIT

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

The ratio control motor controls the pulley ratio by controlling the flow of the primary feed fluid flow. The ratio control motor consist of five separate circuits, four of these are grounding circuits controlled by the TCM and one power circuit from the underhood fuse block. The TCM monitors the status of the four grounding circuits and can detect a short to power, a short to ground or an open. When either of these two failures is detected, DTC P1883 will set.

Conditions For Setting DTC

DTC P1883 will set if, the TCM has detected either an open, a short to ground, or a short to power on ratio control motor coil A1 control circuit for more than 0.56 seconds when:

- Ignition voltage is 8-18 volts.
- Engine speed is greater than 500 RPM for more than 5 seconds.

DTC P1883 diagnostic runs continuously when the above conditions have been met. DTC P1883 is a type "A" DTC.

Diagnostic Procedure

1. Turn ignition on, engine off. Using scan tool, monitor ratio control motor circuit A1 status. Does scan tool display OK? If so, problem is intermittent. See **DIAGNOSTIC AIDS** . If not, go to next step.
2. If scan tool displays OPEN/SHORT TO GROUND, go to next step. If scan tool displays SHORT TO VOLTS, go to step 9 .
3. Check PWRTRN fuse (10-amp). Replace fuse and retest if blown. Disconnect transaxle 20-way harness connector. Connect test light between transaxle 20-way harness connector terminals No. 17 and 19. Using scan tool, monitor ratio control motor circuit A1 status. Is the test light blinking? If so, go to next step. If not, go to step 5 .
4. Check loose terminal connections. Repair as necessary. If okay, replace control solenoid valve assembly. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.
5. Is test light constantly on? If so, go to next step. If not, go to step 7 .
6. Check ratio control motor A1 circuit (5505) for a short to ground. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
7. Connect test light between transaxle 20-way harness connector terminal No. 19 and ground. Is test light on? If so, go to next step. If not, repair open in ignition voltage circuit.
8. Inspect ratio control motor A1 circuit (5505) for an open and loose terminal connections. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
9. Disconnect transaxle 20-way harness connector. Connect test light between transaxle 20-way harness connector terminals No. 17 and 19. Using scan tool, monitor ratio control motor circuit A1 status. Does scan tool display SHORT TO VOLTS? If so, go to next step. If not, go to step 11 .

10. Inspect ratio control motor A1 circuit (5505) for a short to voltage. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
11. Faulty ratio control motor. Replace control solenoid valve assembly. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.

Diagnostic Aids

To locate an intermittent problem, use a scan tool to monitor ratio control motor circuit A1 status with the engine running. Wiggling wires while watching for a change in the status parameter may locate the area where a fault in the wiring may lie.

DTC P1884: RATIO CONTROL MOTOR COIL A2 CIRCUIT

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

The ratio control motor controls the pulley ratio by controlling the flow of the primary feed fluid flow. The ratio control motor consist of five separate circuits, four of these are grounding circuits controlled by the TCM and one power circuit from the underhood fuse block. The TCM monitors the status of the four grounding circuits and can detect a short to power, a short to ground or an open. When either of these failures is detected, P1884 will set.

Conditions For Setting DTC

DTC will set if, the TCM has detected either an open, a short to ground or a short to power on ratio control motor A2 circuit for more than 0.56 seconds when:

- Ignition voltage is 8-18 volts.
- Engine speed is greater than 500 RPM for more than 5 seconds.

DTC P1884 diagnostic runs continuously when the above conditions have been met. P1884 is a type "A" DTC.

Diagnostic Procedure

1. Turn ignition on, engine off. Using scan tool, monitor ratio control motor circuit A2 status. Does tool display OK? If so, problem is intermittent. See **DIAGNOSTIC AIDS** . If not, go to next step.
2. If tool displays OPEN/SHORT TO GROUND, go to next step. If scan tool displays SHORT TO VOLTS, go to step 9 .
3. Inspect PWRTRN fuse (10-amp). Replace fuse and retest if blown. Disconnect transaxle 20-way harness connector. Connect test light between transaxle 20-way harness connector terminals No. 19 and 20. Using scan tool, monitor ratio control motor circuit A2 status. Is the test light blinking? If so, go to next step. If not, go to step 5 .
4. Inspect loose terminal connections. Repair as necessary. If okay, replace control solenoid valve assembly. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.

5. Is test light constantly on? If so, go to next step. If not, go to step 7 .
6. Inspect ratio control motor A2 circuit (5507) for a short to ground. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
7. Connect test light between transaxle 20-way harness connector terminal No. 19 and ground. Is test light on? If so, go to next step. If not, repair open in ratio control motor ignition voltage circuit.
8. Inspect ratio control motor A2 circuit (5507) for an open and loose terminal connections. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
9. Disconnect transaxle 20-way harness connector. Connect test light between transaxle 20-way harness connector terminals No. 19 and 20. Using scan tool, monitor ratio control motor circuit A2 status. Does scan tool display SHORT TO VOLTS? If so, go to next step. If not, go to step 11 .
10. Inspect ratio control motor circuit A2 circuit (5507) for a short to voltage. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
11. Faulty ratio control motor. Replace control solenoid valve assembly. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.

Diagnostic Aids

To locate an intermittent problem, use a scan tool to monitor ratio control motor circuit A2 status with the engine running. Wiggling wires while watching for a change in the status parameter may locate the area where a fault in the wiring may lie.

DTC P1885: RATIO CONTROL MOTOR COIL B1 CIRCUIT

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

The ratio control motor controls the pulley ratio by controlling the flow of the primary feed fluid flow. The ratio control motor consist of five separate circuits, four of these are grounding circuits controlled by the TCM and one power circuit from the underhood fuse block. The TCM monitors the status of the four grounding circuits and can detect a short to power, a short to ground or an open. When either of these two failures is detected, P1885 will set.

Conditions For Setting DTC

DTC will set if, the TCM has detected either an open, a short to ground, or a short to power on ratio control motor coil B1 control circuit for more than 0.56 seconds when:

- Ignition voltage is 8-18 volts.
- Engine speed is greater than 500 RPM for more than 5 seconds.

DTC P1885 diagnostic runs continuously when the above conditions have been met. DTC P1885 is a type "A" DTC.

Diagnostic Procedure

1. Turn ignition on, engine off. Using scan tool, monitor ratio control motor circuit B1 status. Does scan tool display OK? If so, problem is intermittent. See **DIAGNOSTIC AIDS** . If not, go to next step.
2. If scan tool displays OPEN/SHORT TO GROUND, go to next step. If scan tool displays SHORT TO VOLTS, go to step 9 .
3. Inspect PWRTRN fuse (10-amp). Replace fuse and retest if blown. Disconnect transaxle 20-way harness connector. Connect test light between transaxle 20-way harness connector terminals No. 18 and 19. Using scan tool, monitor ratio control motor circuit B1 status. Is the test light blinking? If so, go to next step. If not, go to step 5 .
4. Check for loose terminal connections at ratio control motor. Repair as necessary. If okay, replace control solenoid valve assembly. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.
5. Is test light constantly on? If so, go to next step. If not, go to step 7 .
6. Inspect ratio control motor B1 circuit (5506) for a short to ground. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
7. Connect test light between transaxle 20-way harness connector terminal No. 19 and ground. Is test light on? If so, go to next step. If not, repair open in ratio control motor ignition voltage circuit.
8. Inspect ratio control motor B1 circuit (5506) for an open and loose terminal connections. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
9. Disconnect transaxle 20-way harness connector. Connect test light between transaxle 20-way harness connector terminals No. 18 and 19. Using scan tool, monitor ratio control motor B1 circuit status. Does scan tool display SHORT TO VOLTS? If so, go to next step. If not, go to step 11 .
10. Inspect ratio control motor B1 circuit (5506) for a short to voltage. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
11. Faulty ratio control motor. Replace control solenoid valve assembly. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.

Diagnostic Aids

To locate an intermittent problem, use a scan tool to monitor ratio control motor circuit B1 status with the engine running. Wiggling wires while watching for a change in the status parameter may locate the area where a fault in the wiring may lie.

DTC P1886: RATIO CONTROL MOTOR COIL B2 CIRCUIT

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

The ratio control motor controls the pulley ratio by controlling the flow of the primary feed fluid flow. The ratio control motor consist of five separate circuits, four of these are grounding circuits controlled by the TCM and one power circuit from the underhood fuse block. The TCM monitors the status of the four grounding circuits and can detect a short to power, a short to ground or an open. When either of these failures is detected, P1886

will set.

Conditions For Setting DTC

DTC will set if, the TCM has detected either an open, a short to ground, or a short to power on ratio control motor B2 control circuit for more than 0.56 seconds when:

- Ignition voltage 8-18 volts.
- Engine speed is greater than 500 RPM for more than 5 seconds.

DTC P1886 diagnostic runs continuously when the above conditions have been met. DTC P1886 is a type "A" DTC.

Diagnostic Procedure

1. Turn ignition on, engine off. Using scan tool, monitor ratio control motor circuit B2 status. Does scan tool display OK? If so, problem is intermittent. See **DIAGNOSTIC AIDS** . If not, go to next step.
2. If scan tool displays OPEN/SHORT TO GROUND, go to next step. If scan tool displays SHORT TO VOLTS, go to step 9 .
3. Inspect PWRTRN fuse (10-amp). Replace fuse and retest if blown. Disconnect transaxle 20-way harness connector. Connect test light between transaxle 20-way harness connector terminals No. 10 and 17. Using scan tool, monitor ratio control motor circuit B2 status. Is the test light blinking? If so, go to next step. If not, go to step 5 .
4. Check for loose terminal connections at ratio control motor. If okay, replace control solenoid valve assembly. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.
5. Is test light constantly on? If so, go to next step. If not, go to step 7 .
6. Inspect ratio control motor B2 circuit (5504) for a short to ground. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
7. Connect test light between transaxle 20-way harness connector terminal No. 19 and ground. Is test light on? If so, go to next step. If not, repair open in ratio control motor ignition voltage circuit.
8. Inspect ratio control motor B2 circuit (5504) for an open and loose terminal connections. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
9. Disconnect transaxle 20-way harness connector. Connect test light between transaxle 20-way harness connector terminals No. 10 and 17. Using scan tool, monitor ratio control motor circuit B2 status. Does scan tool display SHORT TO VOLTS? If so, go to next step. If not, go to step 11 .
10. Inspect ratio control motor B2 circuit (5504) for a short to voltage. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
11. Faulty ratio control motor. Replace control solenoid valve assembly. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.

Diagnostic Aids

To locate an intermittent problem, use a scan tool to monitor ratio control motor circuit B2 status with the engine running. Wiggling wires while watching for a change in the status parameter may locate the area where a

fault in the wiring may lie.

DTC P1888: TCC ENABLE SOLENOID CIRCUIT LOW VOLTAGE

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

When the TCC enable solenoid is commanded on, current flows through the circuit to the TCM. The TCC enable solenoid has a small resistance, allowing the TCM to detect if there is a short to voltage, a short to ground or an open in the circuit. Every 6.25 milliseconds the TCM checks the circuit for a short to voltage, a short to ground or an open. If an open or a short is detected, the TCM increments a counter. DTC P1888 sets when this fail counter reaches a calibrated value.

Conditions For Setting DTC

DTC will set if the TCC enable solenoid control circuit is open or shorted for 0.36 seconds when:

- Ignition voltage is 8-18 volts.
- Engine speed is greater than 500 RPM for at least 5 seconds.
- TCC enable solenoid is disabled.

DTC P1888 diagnostic runs continuously when the above conditions have been met. DTC P1888 is a type "A" DTC.

Diagnostic Procedure

1. With ignition on, engine running. Using scan tool, monitor status of DTC P1888. Did last test fail? If so, go to next step. If not, see **DIAGNOSTIC AIDS** .
2. Disconnect transaxle 20-way harness connector. Connect test light between transaxle 20-way harness connector terminal No. 8 and ground. Is test light on? If so, go to next step. If not, go to step 4 .
3. Inspect TCC enable high circuit (5501) for an open, a short to ground and loose terminal connections. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
4. Connect test light between transaxle 20-way harness connector terminal No. 9 and battery voltage. Is test light on? If so, go to next step. If not, go to step 6 .
5. Inspect TCC enable low circuit (5502) for a short to ground. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
6. Reconnect the transaxle 20-way harness connector. Disconnect TCM harness connector J2. Check continuity between transaxle 20-way harness connector terminals No. 8 and 9. Did continuity exist? If so, go to next step. If not, go to step 8 .
7. Check for loose terminal connections. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
8. Inspect TCC enable low circuit (5502) for an open and loose terminal connections at TCC. Repair as

necessary. If okay, replace control solenoid valve assembly. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.

Diagnostic Aids

If the TCC enable solenoid is stuck off, TCC will not apply and slippage in Drive may be experienced.

DTC P1889: TCC ENABLE SOLENOID CIRCUIT HIGH VOLTAGE

NOTE: For circuit identification, see CONNECTOR IDENTIFICATION and/or WIRING DIAGRAMS .

Circuit Description

When the solenoid is commanded on, current flows through the circuit to the TCM. The TCC enable solenoid has a small resistance, allowing the TCM to detect if there is a short to voltage, a short to ground or an open in the circuit. Every 6.25 milliseconds the TCM checks the circuit for a short or an open. If a short to voltage is detected, the TCM increments a counter. DTC P1889 sets when this fail counter reaches a calibrated value.

Conditions For Setting DTC

DTC will set if the TCC enable solenoid control circuit is shorted to voltage for 0.1 second when:

- Ignition voltage is 8-18 volts.
- Engine speed is greater than 500 RPM for more than 5 seconds.
- TCC enable solenoid is commanded on.

DTC P1889 diagnostic runs continuously when the above conditions have been met. DTC P1889 is a type "A" DTC.

Diagnostic Procedure

1. With ignition on, engine running. Drive for a short distance. Using scan tool, monitor status of DTC P1889. Did last test fail? If so, go to next step. If not, problem is intermittent. See **DIAGNOSTIC AIDS** .
2. Disconnect transaxle 20-way harness connector. Connect test light between transaxle 20-way harness connector terminal No. 9 and ground. Is test light on? If so, go to next step. If not, go to step 4 .
3. Inspect TCC enable low circuit (5502) for a short to voltage. Repair as necessary. If okay, replace TCM. See **TRANSAXLE CONTROL MODULE** under REMOVAL & INSTALLATION.
4. Faulty TCC enable solenoid. Replace control solenoid valve assembly. See appropriate AUTOMATIC article in TRANSMISSION SERVICING.

Diagnostic Aids

If the TCC enable solenoid is stuck on, TCC will be applied and may stall the engine.

REMOVAL & INSTALLATION

WARNING: Vehicle is equipped with Supplemental Inflatable Restraint (SIR) system. When servicing vehicle, use care to avoid accidental air bag deployment. SIR system-related components are located in various locations throughout interior and exterior of vehicle, depending on application. Do not use electrical test equipment on or near these circuits. If necessary, deactivate SIR system before servicing components. See AIR BAG DEACTIVATION PROCEDURES article in GENERAL INFORMATION.

CAUTION: When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. See COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION before disconnecting battery.

TRANSAXLE CONTROL MODULE

NOTE: When replacing TCM with a NEW unit, TCM must be reprogrammed. After replacing TCM or if program needs to be updated, refer to latest Techline information on PCM reprogramming.

Removal

Turn ignition off. Pull retaining tang from the TCM and rotate the TCM up. Remove the TCM from bracket. Disconnect TCM harness connectors. See **Fig. 3** .

Installation

NOTE: DTC P0602 is set with new service TCM. When the TCM is reprogrammed with the correct software and calibrations, DTC P0602 will be erased.

Connect the TCM harness connectors. Install the TCM into bracket. Reprogram the TCM with the correct calibration.

ELECTRONIC COMPONENT SPECIFICATIONS

COMPONENT RESISTANCE

Connect DVOM between specified terminals at transaxle 20-way harness connector. See **Fig. 10** . Measure individual component resistance at specified temperature. See **COMPONENT RESISTANCE SPECIFICATIONS** table. If resistance is not as specified, replace appropriate component.

COMPONENT RESISTANCE SPECIFICATIONS

Component	Pins (1)	(2) Ohms
ISS	2-3	1000-2000
OSS	4-5	1000-2000

Line PC Solenoid	15-16	3.5-4.1
Ratio Control Motor Coil (Coil To Coil)	10, 17, 18, 20	45-55
Ratio Control Motor Coil (Power To Either Coil)	19-(10, 17, 18, 20)	20-30
TCC Enable Solenoid	8-9	18-22
TCC PC Solenoid	6-7	3.5-4.1
TFP Sensor (Power To Signal)	11-12	(3)
TFP Sensor (Ground To Power)	1-11	357-664
TFP Sensor (Ground To Signal)	1-12	6000-10,000
TFT Sensor	13-14	3164-3867

(1) Resistance is measured at transaxle 20-way harness connector.

(2) Resistance is measured at 68°F (20°C).

(3) Greater than 1000 ohms.

TRANSMISSION FLUID TEMPERATURE SENSOR RESISTANCE

Temperature - °F (°C)	Ohms
32 (0)	9423
50 (10)	5671
68 (20)	3515
86 (30)	2237
104 (40)	1459
122 (50)	973
140 (60)	667
158 (70)	467
176 (80)	332
194 (90)	241
212 (100)	177

CONNECTOR IDENTIFICATION

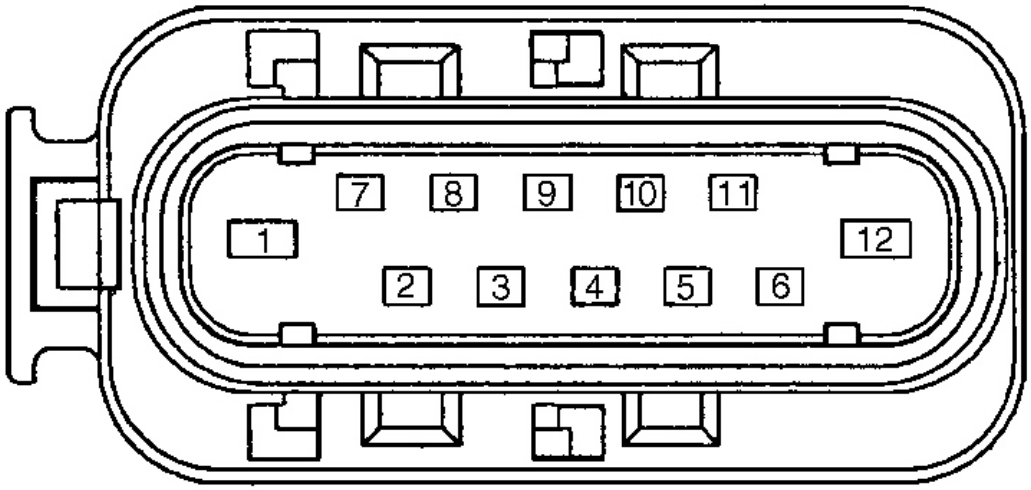

Fig. 8: Identifying PNP Switch 12-Way Harness Connector Terminals
Courtesy of GENERAL MOTORS CORP.

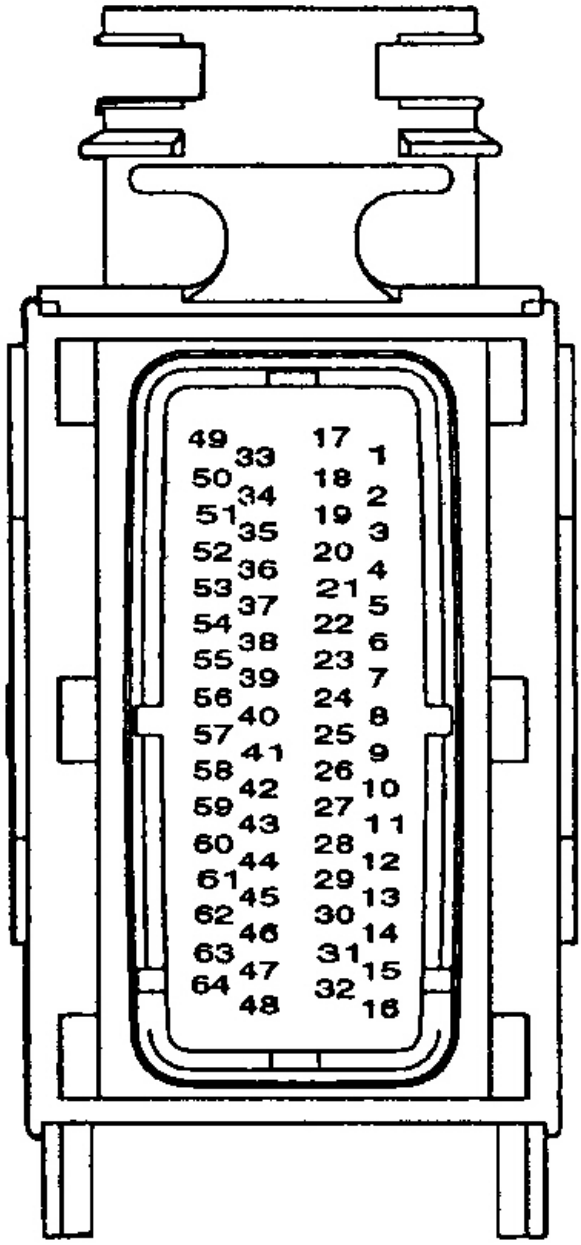

Fig. 9: Identifying TCM J1 & J2 64-Way Harness Connector Terminals
Courtesy of GENERAL MOTORS CORP.

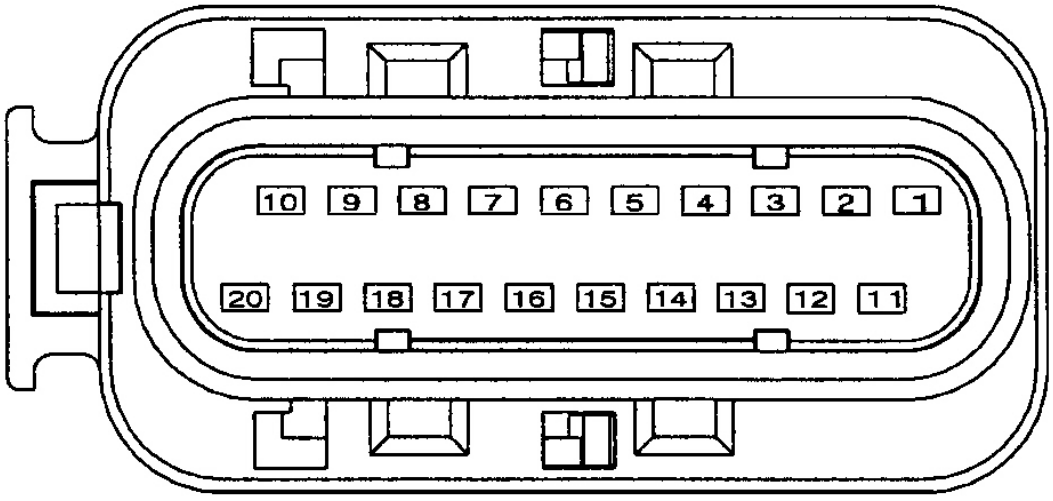

Fig. 10: Identifying Transaxle 20-Way Harness Connector Terminals
Courtesy of GENERAL MOTORS CORP.

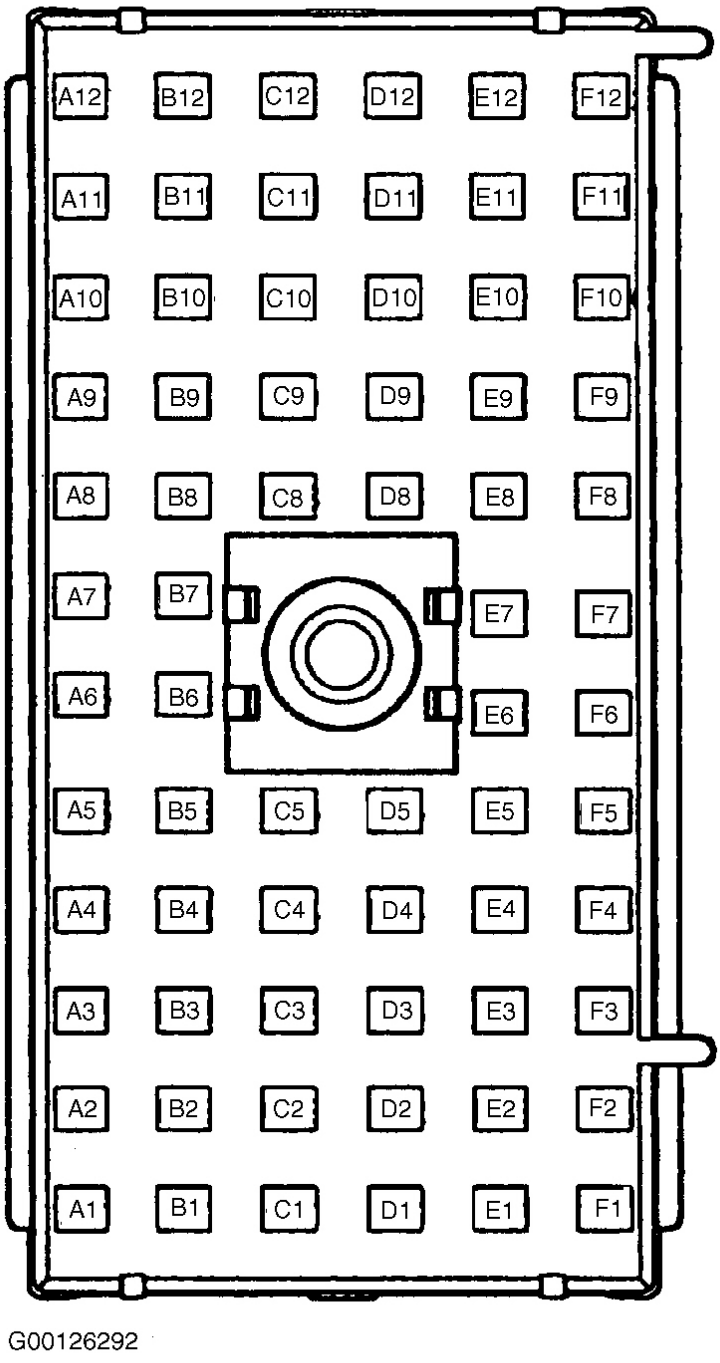

Fig. 11: Identifying Underhood Fuse Block (Black) 68-Way Connector Terminals
Courtesy of GENERAL MOTORS CORP.

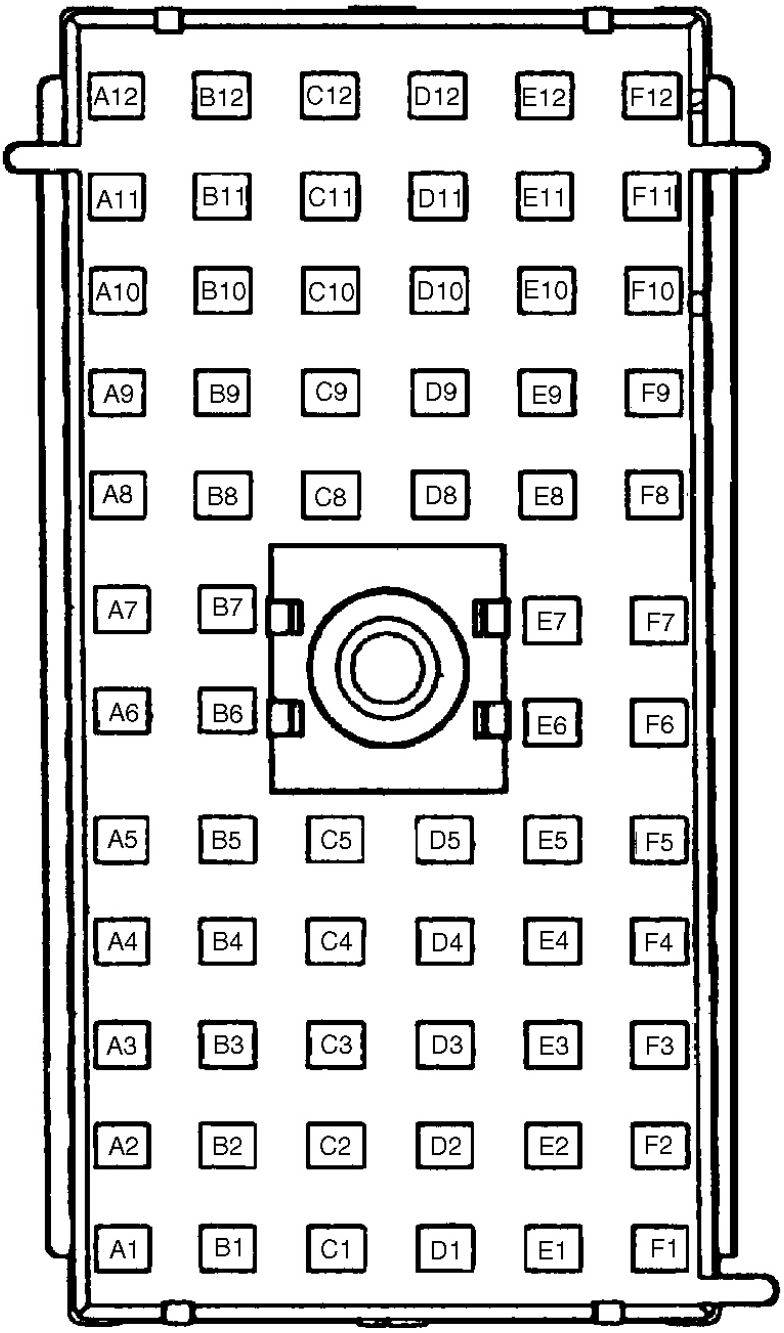

Fig. 12: Identifying Underhood Fuse Block (Gray) 68-Way Connector Terminals
Courtesy of GENERAL MOTORS CORP.

WIRING DIAGRAMS

Fig. 13: Transaxle Electronic Control System Wiring Diagram (Saturn Vue - 2.2L)

2002 AUTOMATIC TRANSMISSIONS

Servicing - Saturn Vue (VT25-E)

APPLICATION

TRANSAXLE APPLICATION

Application	Transaxle Model (RPO Code)
2.2L (FWD)	VT25E (M16)
2.2L (AWD)	VT25E (M75)

LUBRICATION

SERVICE INTERVALS

WARNING: Saturn ATF (P/N 21005966 & 21019223), and DEXRON-III ATF are not compatible with this transaxle. This transaxle uses Saturn Transaxle Fluid (P/N 22688912) only.

Transaxle

It is not necessary to check transmission fluid. A transmission fluid leak is the only reason to check transmission fluid level. Transmission fluid should not be changed under normal operating conditions. Under continuous extreme operating conditions (trailer towing, heavy city traffic with ambient temperature more than 90°F (32°C) or delivery service), replace fluid and filter every 50,000 miles.

Power Transfer Unit

It is not necessary to check power transfer unit fluid. A power transfer unit fluid leak is the only reason for fluid loss. Power transfer unit fluid should not need to be changed.

Rear Drive Module

It is not necessary to check rear drive module fluid. A rear drive module fluid leak is the only reason for fluid loss. Rear drive module fluid should not need to be changed.

CHECKING FLUID LEVELS

WARNING: Make sure vehicle is properly supported and squarely positioned on hoist. To help avoid personal injury when a vehicle is on a hoist, provide additional support for vehicle on opposite end from which components are being removed. Transaxle fluid is hot. Caution must be taken to prevent personal injury in the event transaxle fluid does drain from plug hole after plug is removed.

WARNING: Saturn ATF (P/N 21005966 & 21019223), and DEXRON-III ATF are not

compatible with this transaxle. This transaxle uses Saturn Transaxle Fluid (P/N 22688912) only.

NOTE: The VT25E transaxle is not equipped with a dipstick.

1. Install Scan tool. Start vehicle. Perform the following:
   - Shift transaxle from Park to Reverse for 10 seconds.
   - Shift transaxle from Reverse to Drive for 10 seconds.
   - Shift transaxle back to Park.
2. Set transaxle to the following conditions:
   - Engine speed at idle or 800 RPM.
   - Access line PC solenoid control and increase commanded amperage to maximum to produce minimum line pressure.
   - Shift selector to Park.
3. Raise vehicle. Vehicle must be level, with engine running. Remove lower tube plug and discard. See **Fig. 1** . If oil drains down at a steady stream from opening, wait for it to stop and go to next step. If oil does not drain down from opening, add Saturn Transaxle Fluid (P/N 22688912) to transaxle until it starts to drain at a steady stream, then stop adding immediately.
4. Replace lower tube plug with new lower tube plug and wipe away any excess fluid from transaxle. Tighten transaxle lower tube plug to specification. See **TORQUE SPECIFICATIONS** .
5. On scan tool, record TRANS. FLUID TEMP. If transaxle fluid temperature is 68°F (20°C) or below, fluid level is okay. If transaxle fluid temperature is 86°F (30°C) add 0.1L of oil to transaxle. Do not remove plug. If transaxle fluid temperature is 104°F (400°C) add 0.2L of oil to transaxle. Do not remove plug. If transaxle fluid temperature is 122°F (50°C) or above, add 0.3L of oil to transaxle. Do not remove plug.

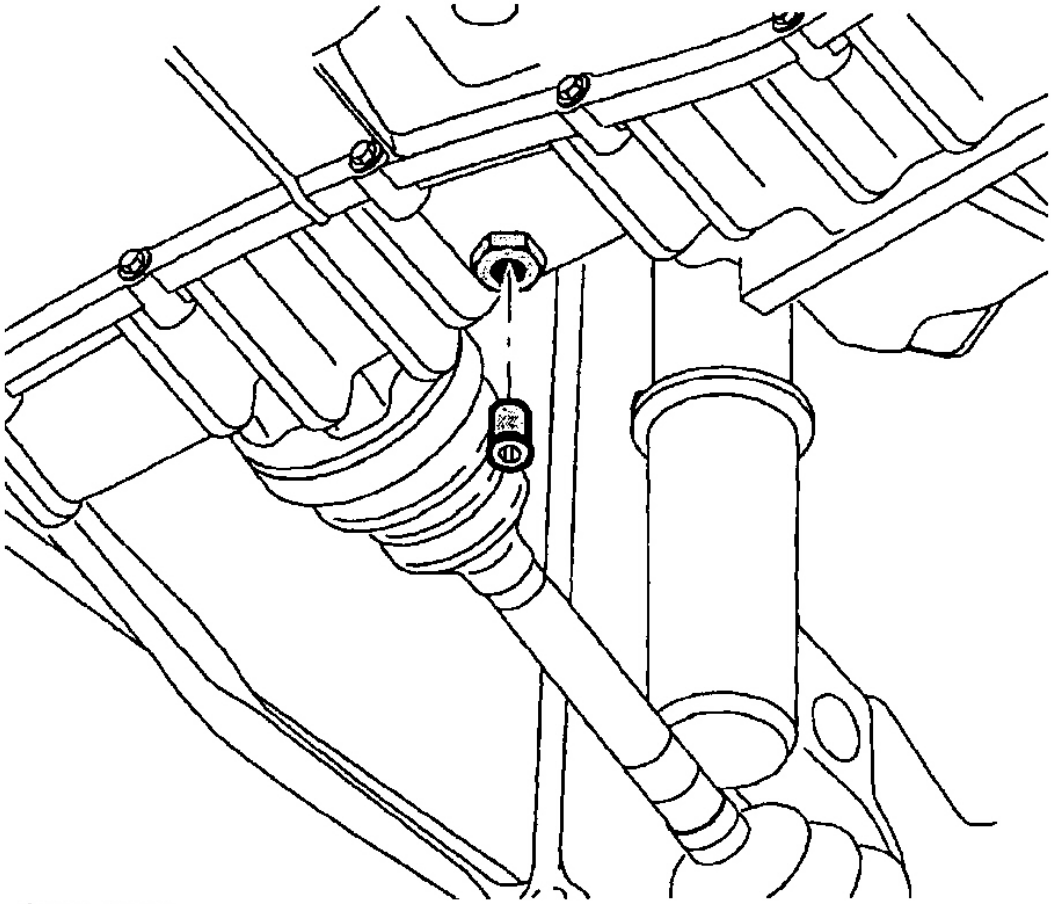

Fig. 1: Removing Lower Tube Plug
Courtesy of GENERAL MOTORS CORP.

FLUID DIAGNOSIS

Red Or Light Brown

Normal color for ATF.

Foaming Fluid

The following could be possible causes of this condition:

- Degraded transmission fluid.
- Contaminated transmission fluid.
- Transaxle is overfilled.

- Transaxle cooler lines plugged.
- Transaxle oil filter clogged or cracked.
- Oil filter seal leaking.
- Side cover seal damaged.
- Oil level control valve damaged or loose
- Engine overheating or vehicle overloading.

Dark Brown

Drain fluid to determine source of possible contamination. If fluid contains metal or other debris, possible transaxle damage may have occurred. If fluid does not contain metal or other debris, fluid may have been overheated.

RECOMMENDED FLUIDS

WARNING: Saturn ATF (P/N 21005966 & 21019223), and DEXRON-III ATF are not compatible with this transaxle. This transaxle uses Saturn Transaxle Fluid (P/N 22688912) only.

Manufacturer recommends Saturn Transaxle Fluid (P/N 22688912) only. Fill transaxle with appropriate quantity. See **FLUID CAPACITIES** .

FLUID CAPACITIES

TRANSAXLE FLUID CAPACITIES

Application	(1) Drain & Refill - Qts. (L)	Overhaul - Qts. (L)
VT25E (2)	7.0 (6.5)	8.1 (7.7)

(1) Drain and refill capacity does not include torque converter.

(2) Transaxle is not equipped with a dipstick. To check transaxle fluid level use lower tube plug. See **CHECKING FLUID LEVELS** .

DRAINING & REFILLING

WARNING: Make sure vehicle is properly supported and squarely positioned on hoist. To help avoid personal injury when a vehicle is on a hoist, provide additional support for vehicle on opposite end from which components are being removed.

WARNING: Saturn ATF (P/N 21005966 & 21019223), and DEXRON-III ATF are not compatible with this transaxle. This transaxle uses Saturn Transaxle Fluid (P/N 22688912) only.

1. Position vehicle on hoist and raise vehicle. Remove lower tube plug. See **Fig. 1** . Remove lower tube

assembly and drain fluid. See **Fig. 2** . Allow at least 5 minutes for fluid to drain completely. Install lower tube assembly. Tighten transaxle lower tube assembly to specification. See **TORQUE SPECIFICATIONS** .

2. Temporarily install original lower tube plug. Do not torque plug. Lower vehicle. Add a range of 6-7 Qts. of Saturn Transaxle Fluid (P/N 22688912) to unit. Install Scan tool. Start vehicle. Vehicle must be level. Perform the following:
   - Shift transaxle from Park to Reverse for 10 seconds.
   - Shift transaxle from Reverse to Drive for 10 seconds.
   - Shift transaxle back to Park (engine should remain running).
3. Raise vehicle. Remove lower tube plug and discard. If oil drains down at a steady stream from opening, wait for it to stop. If oil does not drain down from opening, add oil to transaxle until it starts to drain at a steady stream. Then stop adding immediately. Install new lower tube plug, and wipe away any excess fluid from transaxle. Tighten lower tube pug to specification. See **TORQUE SPECIFICATIONS** . Lower vehicle.
4. Using scan tool, record TRANS FLUID TEMP. If transmission fluid temp is 68°F (20°) or below, fluid level is okay. If transmission fluid temp is 86°F (30°C) add 0.1 liter of oil to transaxle. Do not remove plug. If transmission fluid temp is 104°F (40°C) add 0.2 liter of oil to transaxle. Do not remove plug. If transmission fluid temp is 122°F (50°C) or above, add 0.3 liter of oil to transaxle. Do not remove plug. Turn off vehicle.

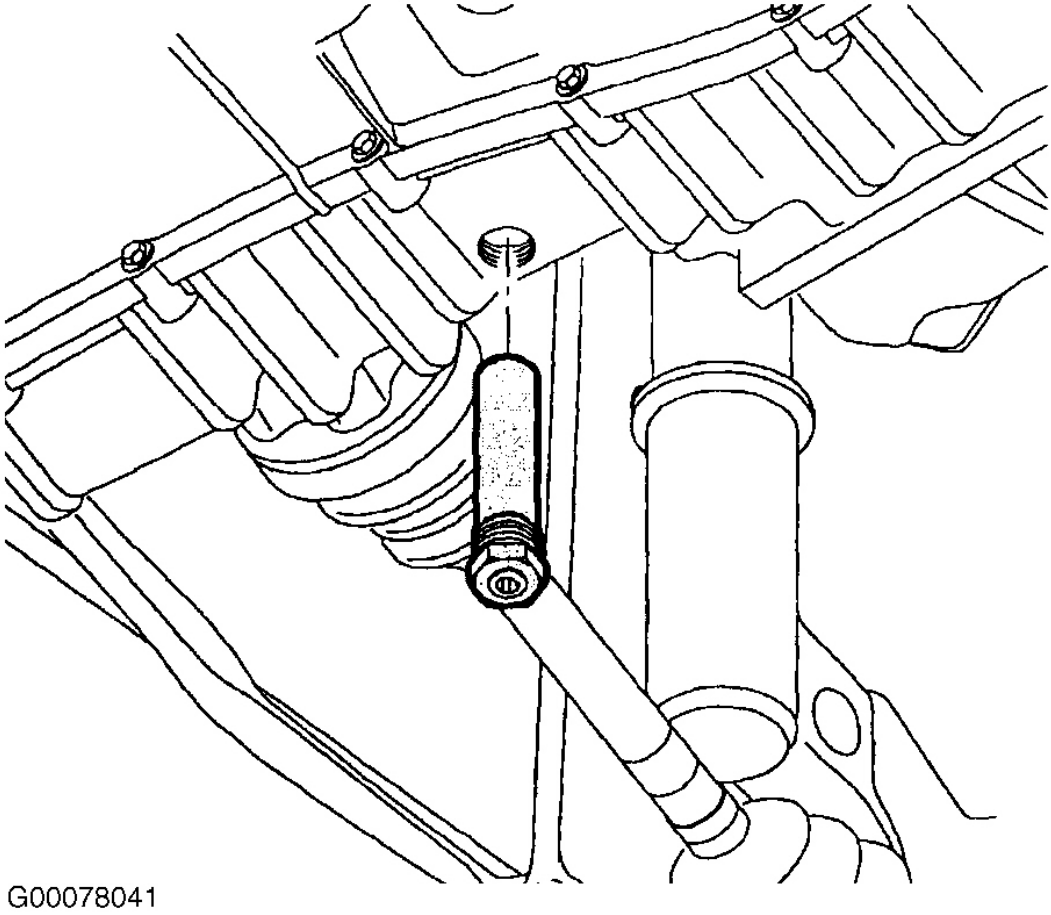

Fig. 2: Removing Lower Tube Assembly
Courtesy of GENERAL MOTORS CORP.

OIL COOLER FLUSHING

1. Oil Line Cooler Flusher (SA9165T) should be used when flushing of transaxle oil cooler in radiator assembly is required. Follow instructions provided with the tool when performing flushing procedure.
2. Cooler Flusher Adapter (J35944-440) is used in combination with oil line cooler flusher and allows you to attach oil line cooler flusher to transaxle oil cooler line assembly and flush cooler and cooler lines at the same time.
3. Transaxle oil cooler and lines should be flushed in any of the following situations:
    - Performing a transaxle replacement.
    - After oil cooler replacement.
    - Any internal transaxle failure that caused debris (such as clutch plate material, metal shavings, etc.) to enter transaxle oil cooler and oil cooler lines.

Debris may still be trapped within the bypass valve of the cooler lines even after performing the cooler flushing procedure. Therefore, it is recommended to replace the cooler lines also during a transaxle replacement.

ON-VEHICLE REPAIRS

NOTE: Various components may be serviced without transaxle removal. For servicing of these components, see appropriate component under ADJUSTMENTS and/or REMOVAL & INSTALLATION . For additional information on servicing electrical-type components, see appropriate DIAGNOSIS article in AUTOMATIC TRANSMISSIONS.

ADJUSTMENTS

WARNING: Vehicles are equipped with Supplemental Inflatable Restraint (SIR) system. When servicing vehicle, use care to avoid accidental air bag deployment. SIR system-related components are located in various locations throughout interior and exterior of vehicle, depending on application. Do not use electrical test equipment on or near these circuits. If necessary, deactivate SIR system before servicing components. See AIR BAG DEACTIVATION PROCEDURES article in GENERAL INFORMATION.

CONTROL CABLE

CAUTION: Control cable must be disconnected from transaxle range switch lever prior to disconnecting it from control cable bracket. Otherwise damage to manual shift shaft may result, requiring transaxle disassembly.

1. Move control assembly into Neutral position. Using Fascia Retainer Remover Tool (J36346), disconnect control cable from transaxle range switch lever.
2. Disconnect control cable from control cable bracket by depressing control cable retainer clip tabs and pulling up. Release control cable assembly adjustment lock. Slide Black tab back. Insert screwdriver into slot under White tab and pull up on White tab. See **Fig. 3** and **Fig. 4** .
3. Install control cable into control cable bracket. Secure with control cable retainer clip. An audible snap will be heard when properly installed. Snap cable end fitting onto ball stud of transaxle range switch lever. An audible snap will be heard when properly installed.
4. Lock control cable adjustment tab. Push down on White tab to secure in place. Slide Black tab over White tab to lock in place. Verify proper operation.

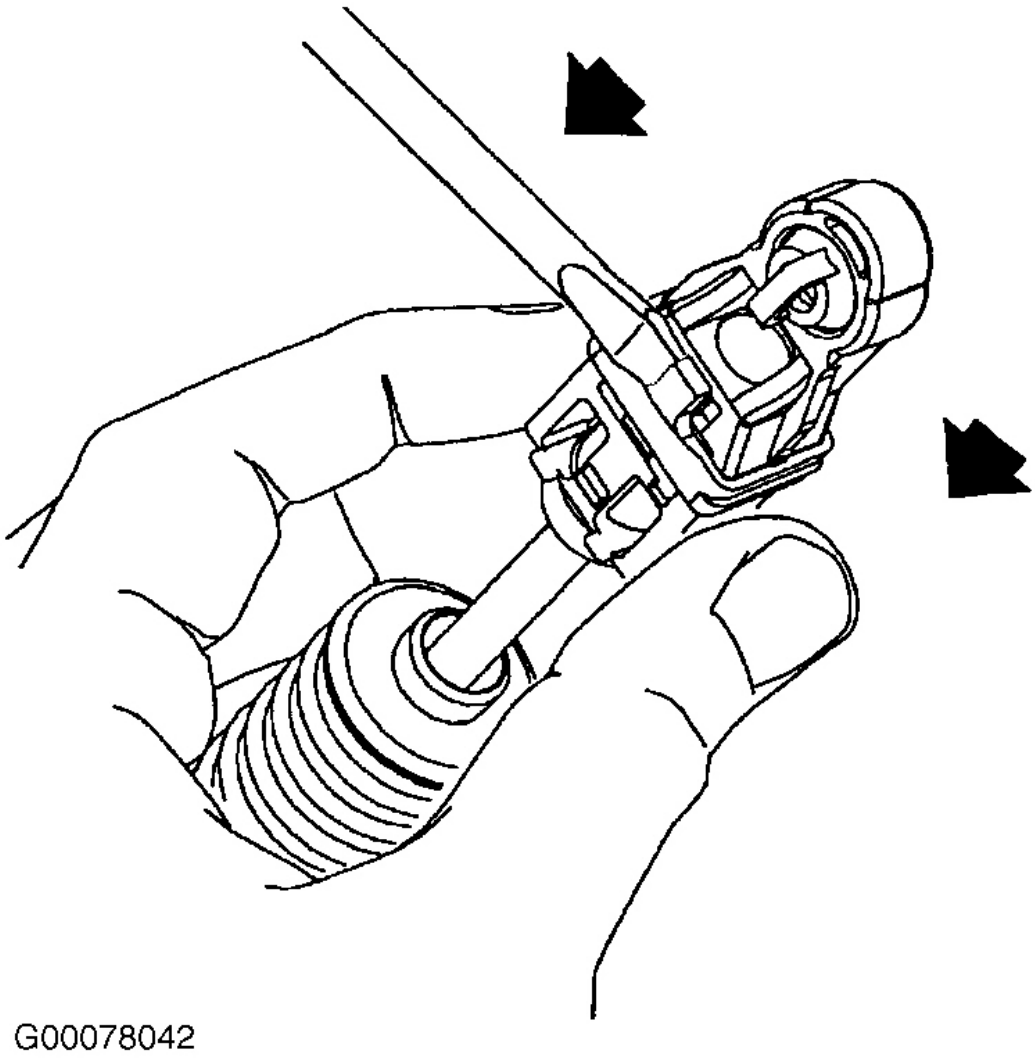

Fig. 3: Releasing Control Cable Adjustment Lock (1 Of 2)
Courtesy of GENERAL MOTORS CORP.

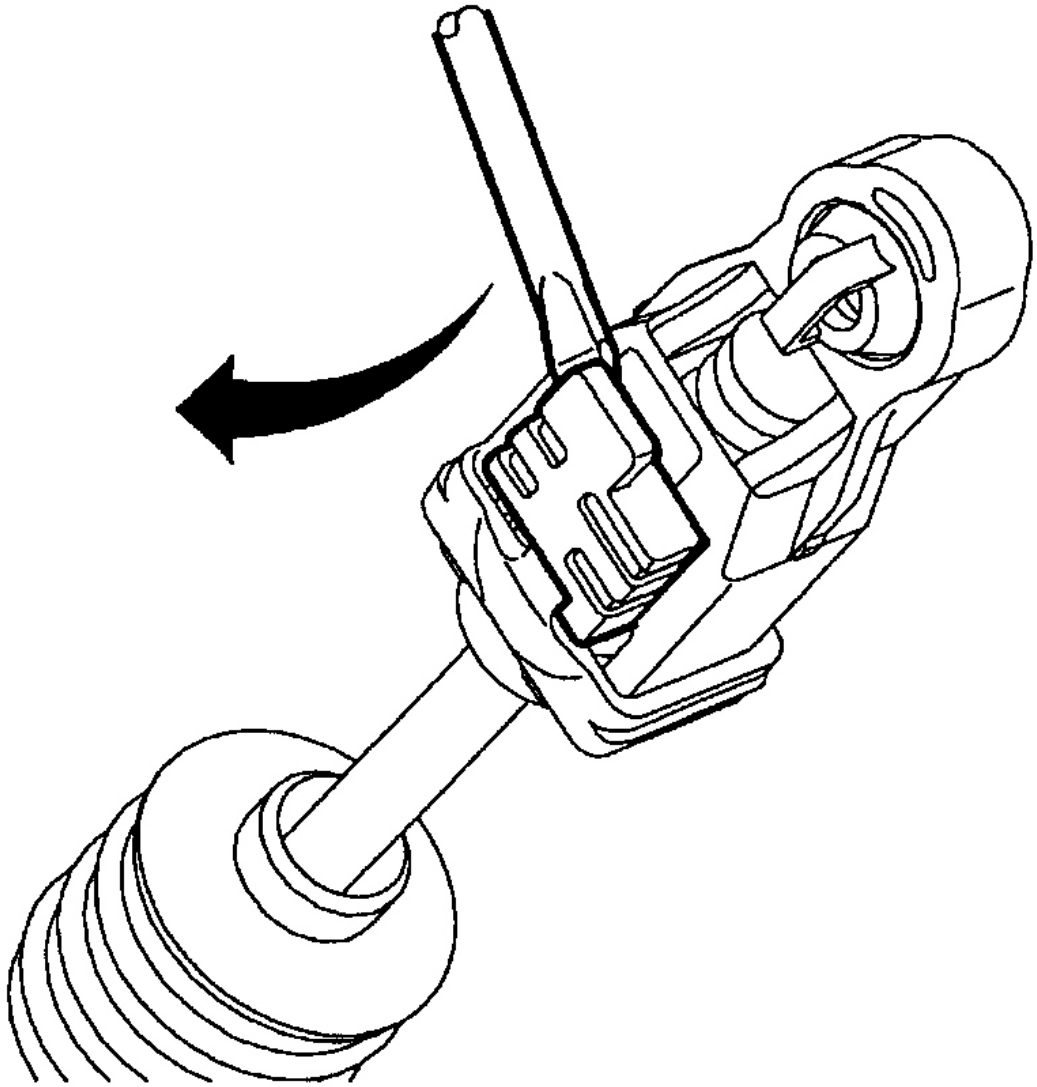

Fig. 4: Releasing Control Cable Adjustment Lock (2 Of 2)
Courtesy of GENERAL MOTORS CORP.

TRANSAXLE RANGE SWITCH

1. Shift transaxle into Neutral position. Using Fascia Retainer Remover (J36346), remove control cable assembly from transaxle range switch lever.
2. Remove transaxle range switch lever nut and lever. Loosen transaxle range switch bolts. Insert Transaxle Range Switch Tool (J44810) as shown and rotate switch until tool drops into position. See **Fig. 5** . Transaxle range switch tool is aligned when pin on tool drops into hole on transaxle range switch. Tighten

transaxle range switch bolts to specification. Remove alignment tool. Install transaxle range switch lever and nut, then tighten to specification. See **TORQUE SPECIFICATIONS** .

3. Install control cable assembly to transaxle range switch lever. After adjusting switch, verify engine starts only in Park or Neutral. If engine starts in any other position, readjust switch.

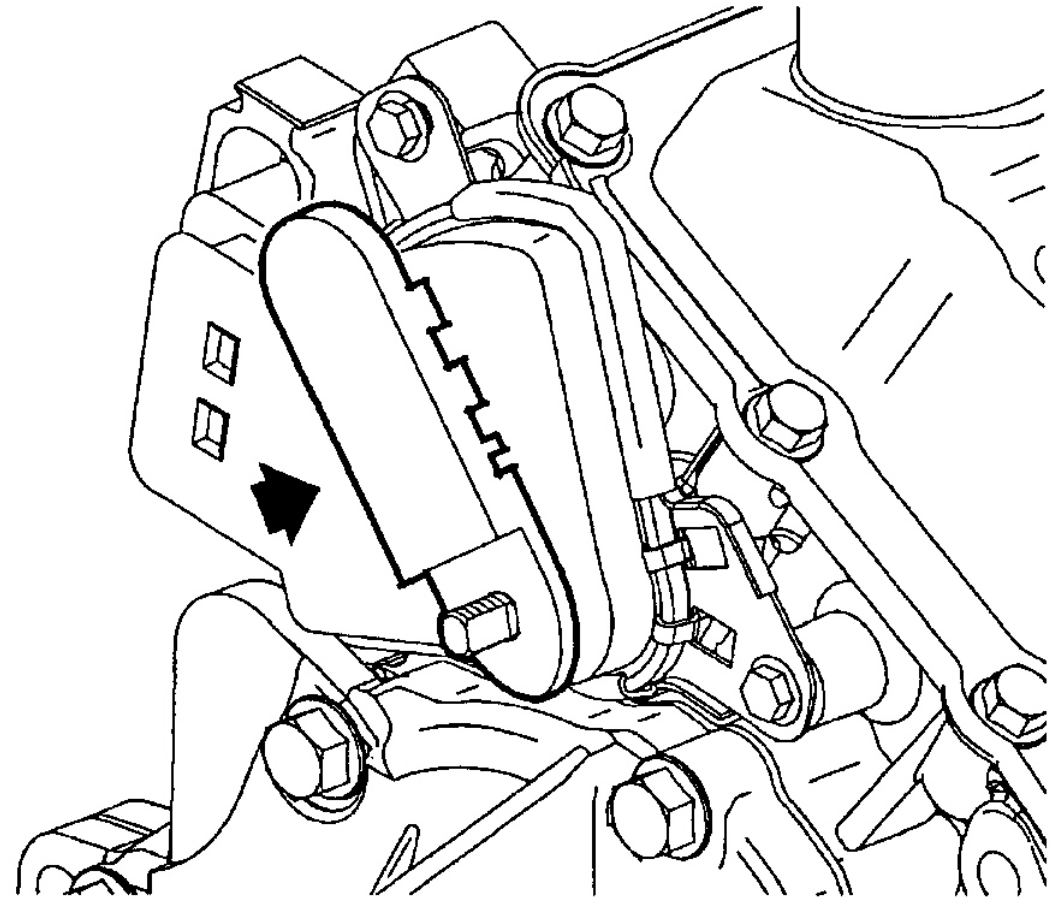

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Fig. 5: Installing Transaxle Range Switch Tool
Courtesy of GENERAL MOTORS CORP.

REMOVAL & INSTALLATION

WARNING: Vehicles are equipped with Supplemental Inflatable Restraint (SIR) system. When servicing vehicle, use care to avoid accidental air bag deployment. SIR system-related components are located in various locations throughout interior and exterior of vehicle, depending on application. Do not use electrical test equipment on or near these circuits.

If necessary, deactivate SIR system before servicing components. See AIR BAG DEACTIVATION PROCEDURES article in GENERAL INFORMATION.

WARNING: Make sure vehicle is properly supported and squarely positioned on hoist. To help avoid personal injury when a vehicle is on a hoist, provide additional support for vehicle on opposite end from which components are being removed.

CAUTION: When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. See COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION before disconnecting battery.

BATTERY COOLING BOX

Removal

CAUTION: DO NOT tip battery over 45 degree angle or acid could spill.

NOTE: Record all pre-set radio stations prior to disconnecting battery and reprogram pre-set stations after repair.

1. Remove battery cover. Disconnect negative battery cable. Disconnect positive battery cable. Loosen battery hold-down screw and remove battery. See **Fig. 6** . Remove underhood fuse box cover. Remove positive battery cable and EPS wire from positive battery terminal at underhood fuse box. Open all retainer clips and remove all cables, lines and harnesses from battery cooling box.

   CAUTION: Protect disconnected harness from contamination during service.

2. Loosen underhood fuse box connector retaining screws. Unfasten underhood fuse box from its housing and disconnect forward lamp harness. See **Fig. 7** . Remove battery cooling box screws. Remove battery cooling box side support screw. Pull inlet duct away from battery cooling box. Rotate underhood fuse box out of way and remove battery cooling box.

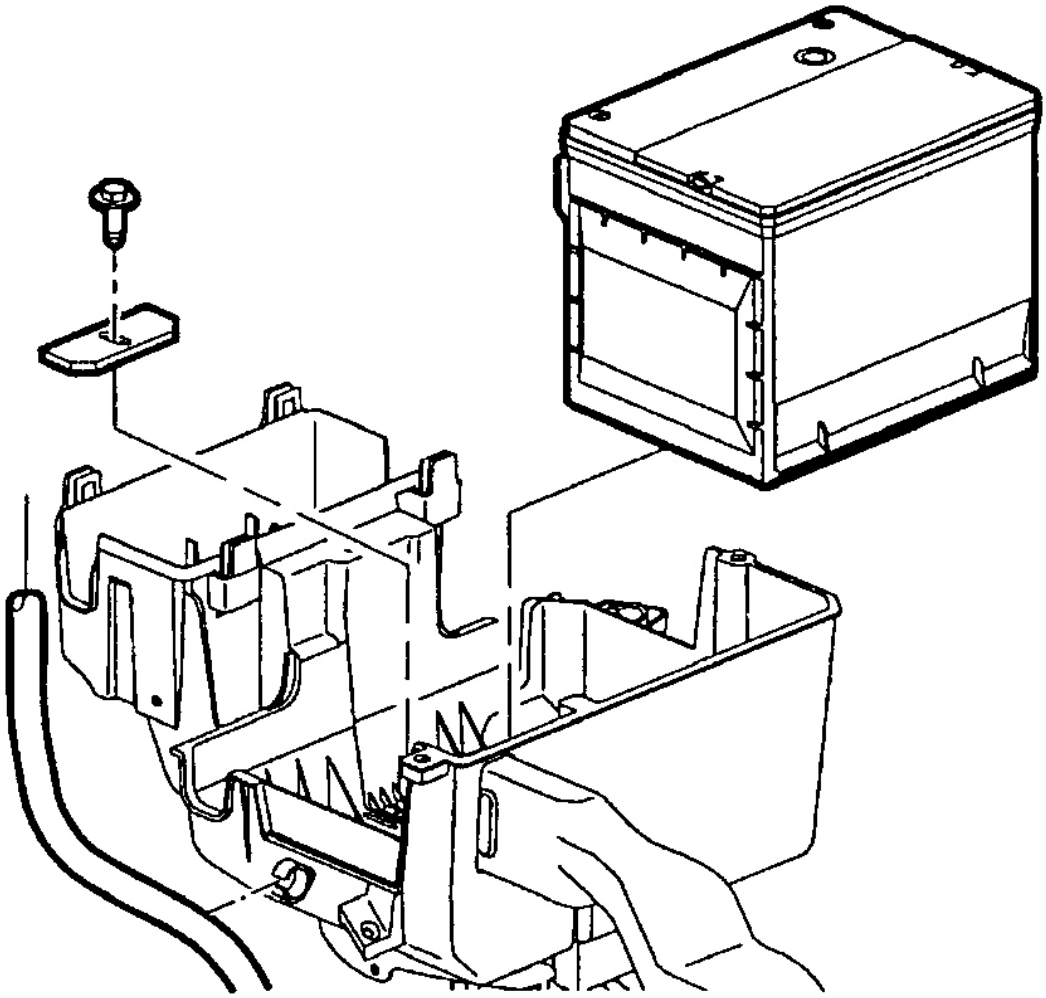

Fig. 6: Removing & Installing Battery Hold Down Screw
Courtesy of GENERAL MOTORS CORP.

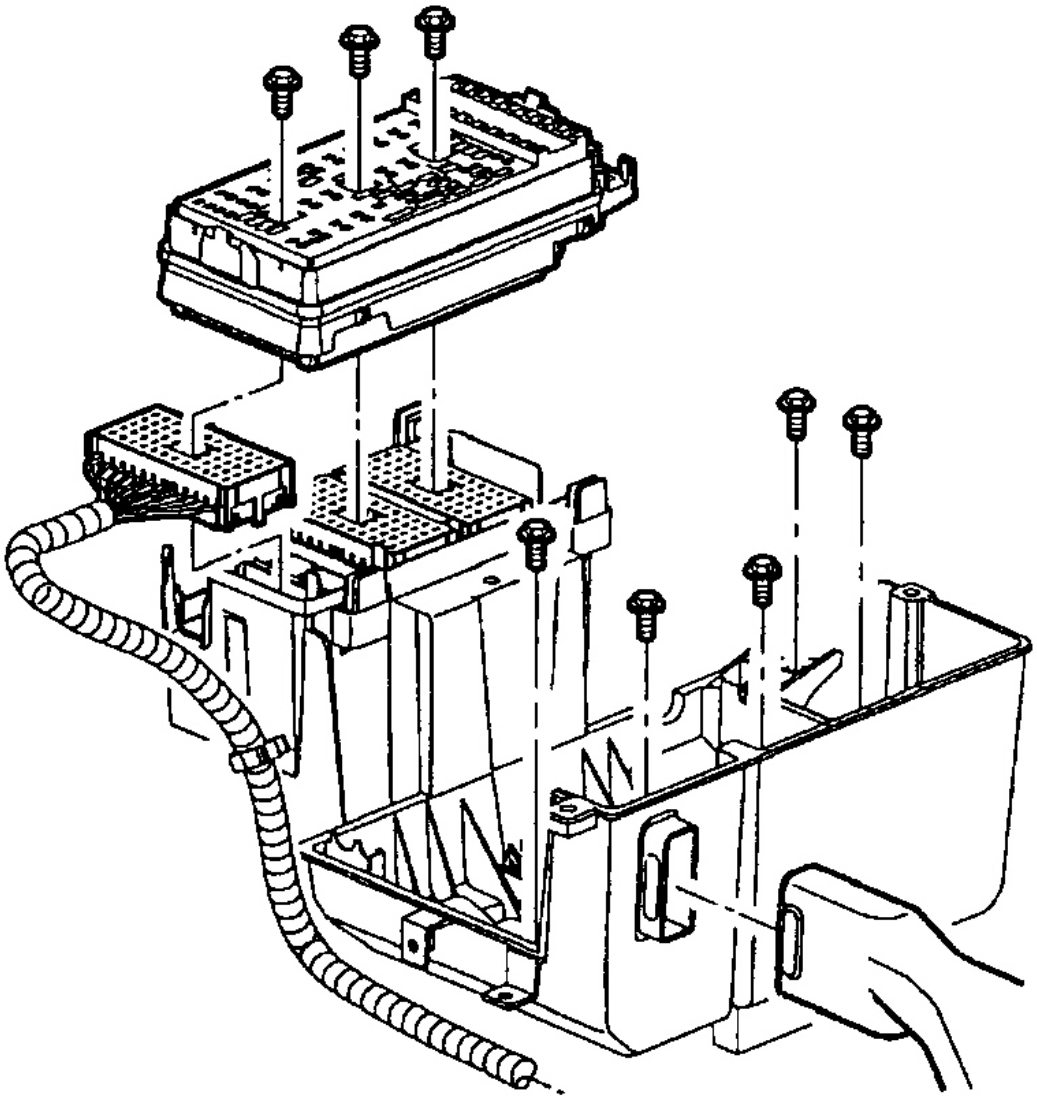

Fig. 7: Removing & Installing Underhood Fuse Box
Courtesy of GENERAL MOTORS CORP.

Installation

NOTE: Alignment of inlet and outlet ducts with battery cooling box is critical to ensure proper airflow to battery.

CAUTION: Over-tightening battery cooling box screws will break/crack plastic.

1. Position battery cooling box on tray so that inlet and outlet ducts are properly aligned. Install battery cooling box screws and tighten to specification. Install battery cooling box side support screw and tighten to specification. See **TORQUE SPECIFICATIONS** .
2. Connect forward lamp harness to underhood fuse box and attach underhood fuse box into housing. See **Fig. 7** . Tighten underhood fuse box connector retaining screws to specification. Secure all cables, lines and harnesses into retaining clips.
3. Attach positive battery cable and EPS wire to positive battery terminal at underhood fuse box and tighten nut to specification. Insert battery and tighten battery hold-down screw to specification. See **Fig. 6** . See **TORQUE SPECIFICATIONS** . Connect positive battery cable to battery and tighten to specification.
4. Connect negative battery cable to battery and tighten to specification. Install fuse box cover. Install battery cooling box cover and tighten screws to specification.

CONSOLE

Removal

1. Disable Supplemental Inflatable Restraint (SIR) system. See AIR BAG DEACTIVATION PROCEDURES article in GENERAL INFORMATION. Move shifter to Neutral position. Pull up at rear edge of shifter bezel, disengaging retention clips. See **Fig. 8** . Disconnect window switches, mirror switch and cigar lighter and remove shifter bezel.
2. Move front seats to forward-most position. Remove front floor console assembly-to-floor pan screws. Lift console from rear and disconnect power outlet harness connector. Move front seats to rearward-most position and put seat backs down. Remove console by pulling up at rear first, then twisting counter-clockwise to remove.
3. Remove screws and pull rearward at clip locations to remove knee bolster. See **Fig. 9** . Open glove box and turn door stops 1/4 turn and remove door stops. See **Fig. 10** . Push center pin portion of glove box door pins toward center of instrument panel compartment and remove glove box assembly.
4. Pull rearward at clip locations to remove center trim panel. See **Fig. 11** . Remove front screws holding left and right console trim panels. Remove panel-to-HVAC module push pins and trim panel-to-instrument panel retainer screws and remove panels. See **Fig. 12** .

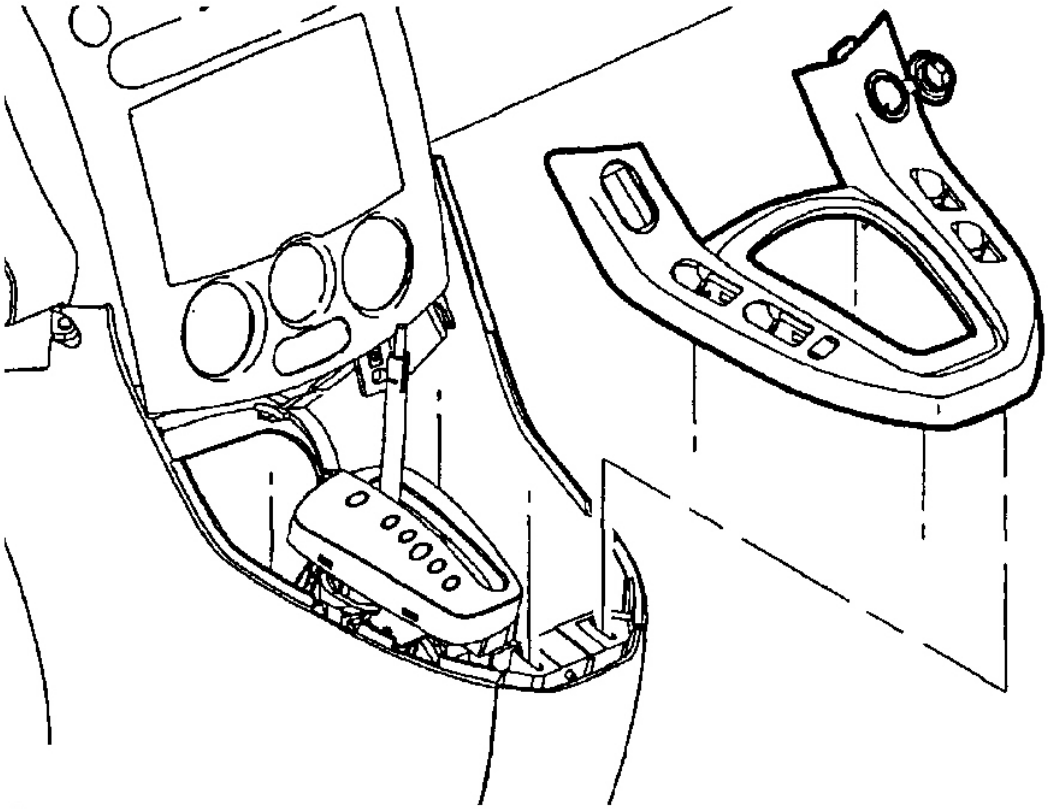

Fig. 8: Removing & Installing Shifter Bezel
Courtesy of GENERAL MOTORS CORP.

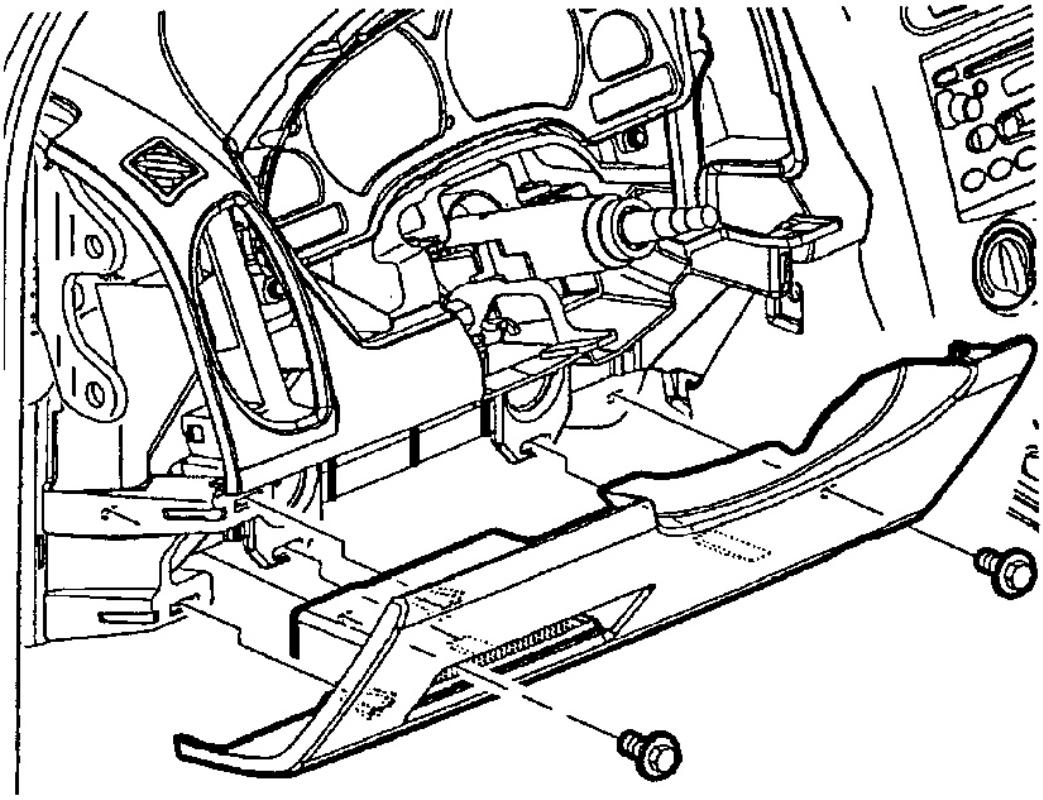
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Fig. 9: Removing & Installing Knee Bolster
Courtesy of GENERAL MOTORS CORP.

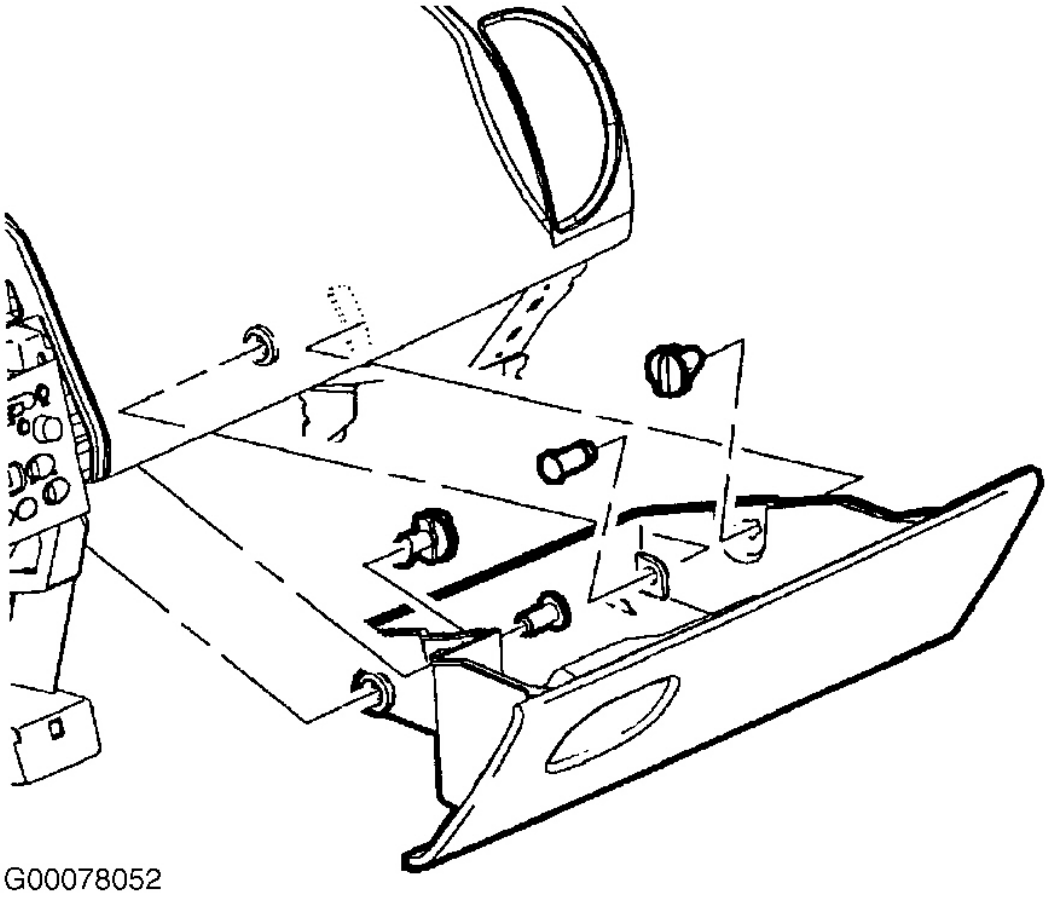

Fig. 10: Removing & Installing Glove Box Door
Courtesy of GENERAL MOTORS CORP.

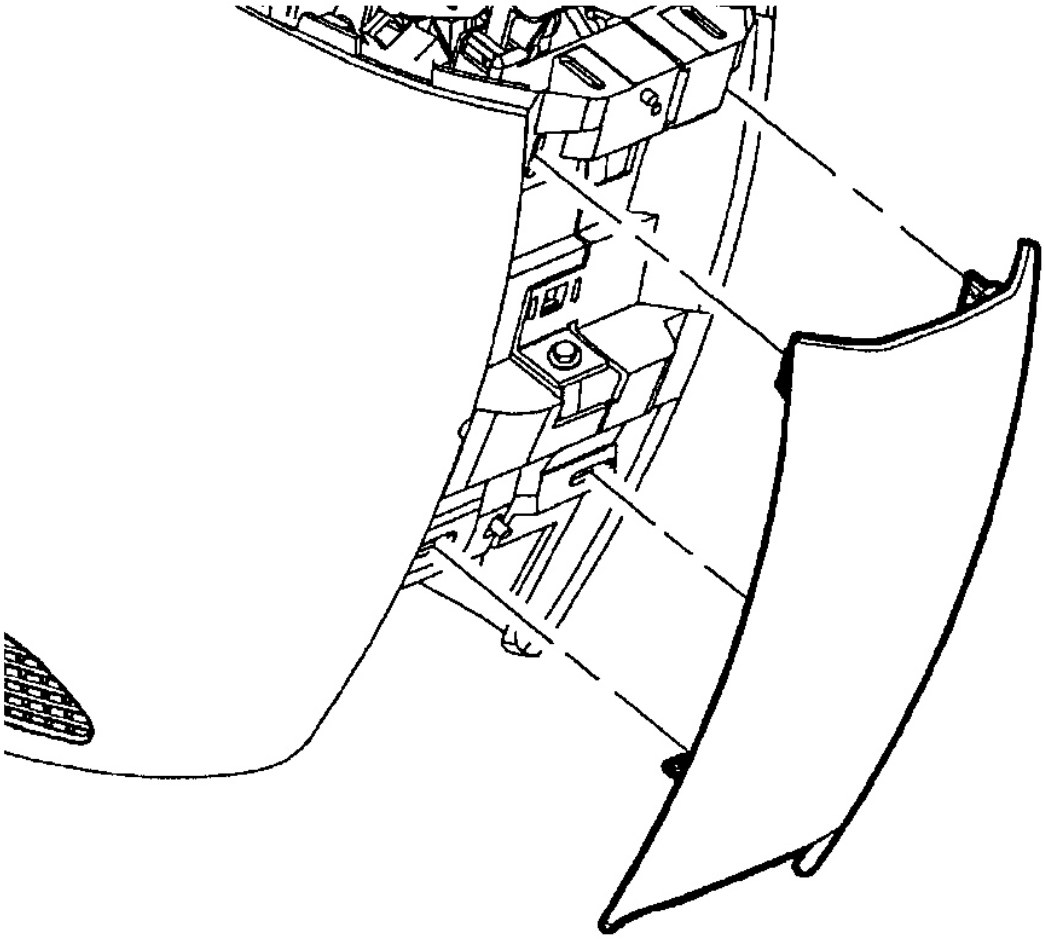

Fig. 11: Removing & Installing Center Trim Panel
Courtesy of GENERAL MOTORS CORP.

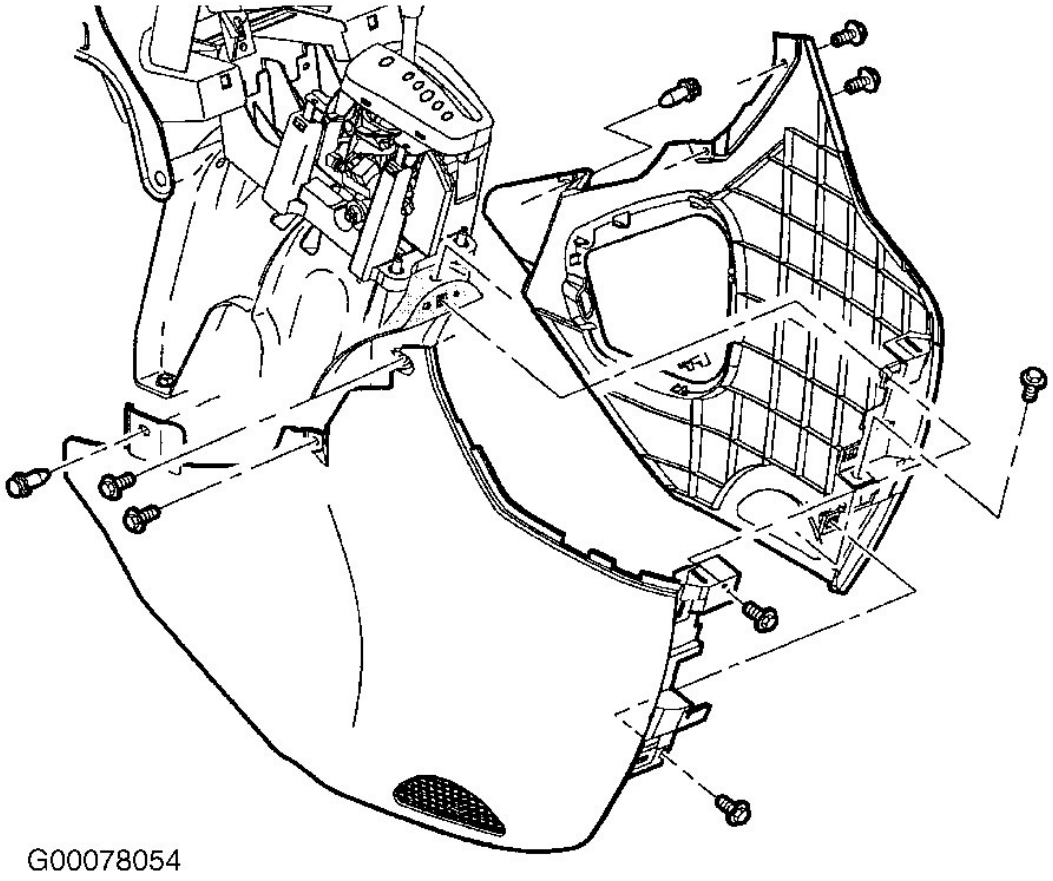

Fig. 12: Removing & Installing Console Trim Panels
Courtesy of GENERAL MOTORS CORP.

Installation

1. Install right trim panel and align left trim panel over alignment pins in right trim panel and install screws. See **Fig. 12** . Install panel-to-HVAC module push pins and trim panel-to-instrument panel retainer screws. Align retention clips with slots in side trim panels and press center trim panel forward at clip locations to snap into place. See Fig. 11 . Position glove box door to instrument panel retainer assembly and install door pins. See **Fig. 10** .
2. Install instrument panel glove box door stops by inserting with 1/4 turn to lock into position. Install instrument panel knee bolster by aligning retention clips with corresponding slots in retainer and snapping into place by applying light force at clip locations. See **Fig. 9** . Install screws and tighten. Connect power outlet harness connector. Connect wiring harnesses to window switches, mirror switch and cigar lighter.
3. Move shifter to Neutral position. Install front edge of horseshoe bezel, making sure to engage alignment pins and front edge tabs with corresponding slots at bottom of radio bezel. Lower back edge by pressing down and snapping into place. Put shifter in Park position. Enable SIR system. See AIR BAG DEACTIVATION PROCEDURES article in GENERAL INFORMATION.

CONTROL CABLE

Removal

CAUTION: DO NOT tip battery over 45 degree angle or acid could spill.

NOTE: Record all pre-set radio stations prior to disconnecting battery and reprogram pre-set stations after repair.

1. Move control assembly into Neutral position. Remove battery cover. Disconnect negative battery cable. Disconnect positive battery cable. Loosen battery hold-down screw and remove battery. See **Fig. 6** . Remove battery cooling box. See **BATTERY COOLING BOX** .
2. Loosen battery tray bracket screws and remove bracket. See **Fig. 13** . Remove console. See **CONSOLE** . Using Fascia Retainer Remover Tool (J36346), disconnect control cable from control assembly lever. Depress control cable retainer clip tabs and remove cable from control assembly. See **Fig. 14** .

CAUTION: Control cable must be disconnected from transaxle range switch lever prior to disconnecting it from control cable bracket. Otherwise damage to manual shift shaft may result, requiring transaxle disassembly.

3. Using Fascia Retainer Remover, disconnect control cable from transaxle range switch lever. Depress control cable retainer clip tabs and remove cable from control cable bracket.
4. Position vehicle on hoist and raise vehicle. Remove control cable from cable-to-steering gear assembly retaining clip. Lower vehicle. Remove control cable grommet from dash panel. See **Fig. 15** . Remove control cable from vehicle.

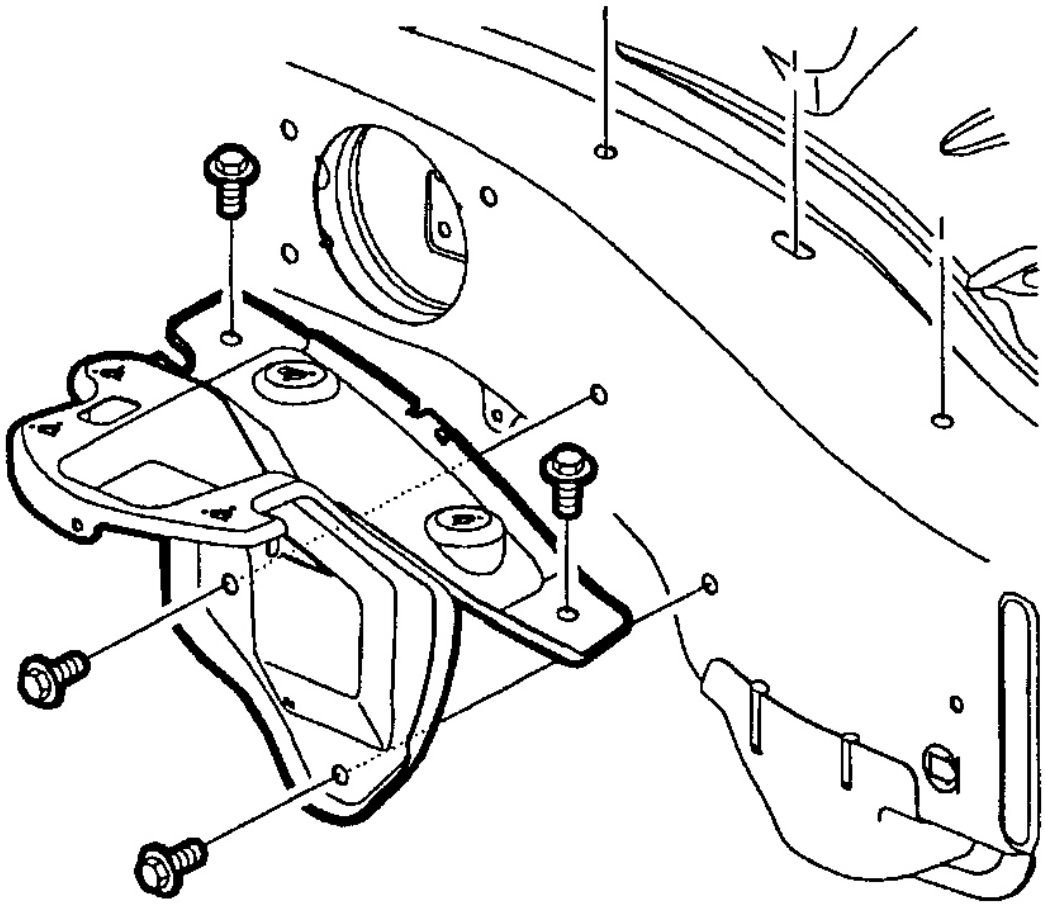

Fig. 13: Removing & Installing Battery Tray Bracket
Courtesy of GENERAL MOTORS CORP.

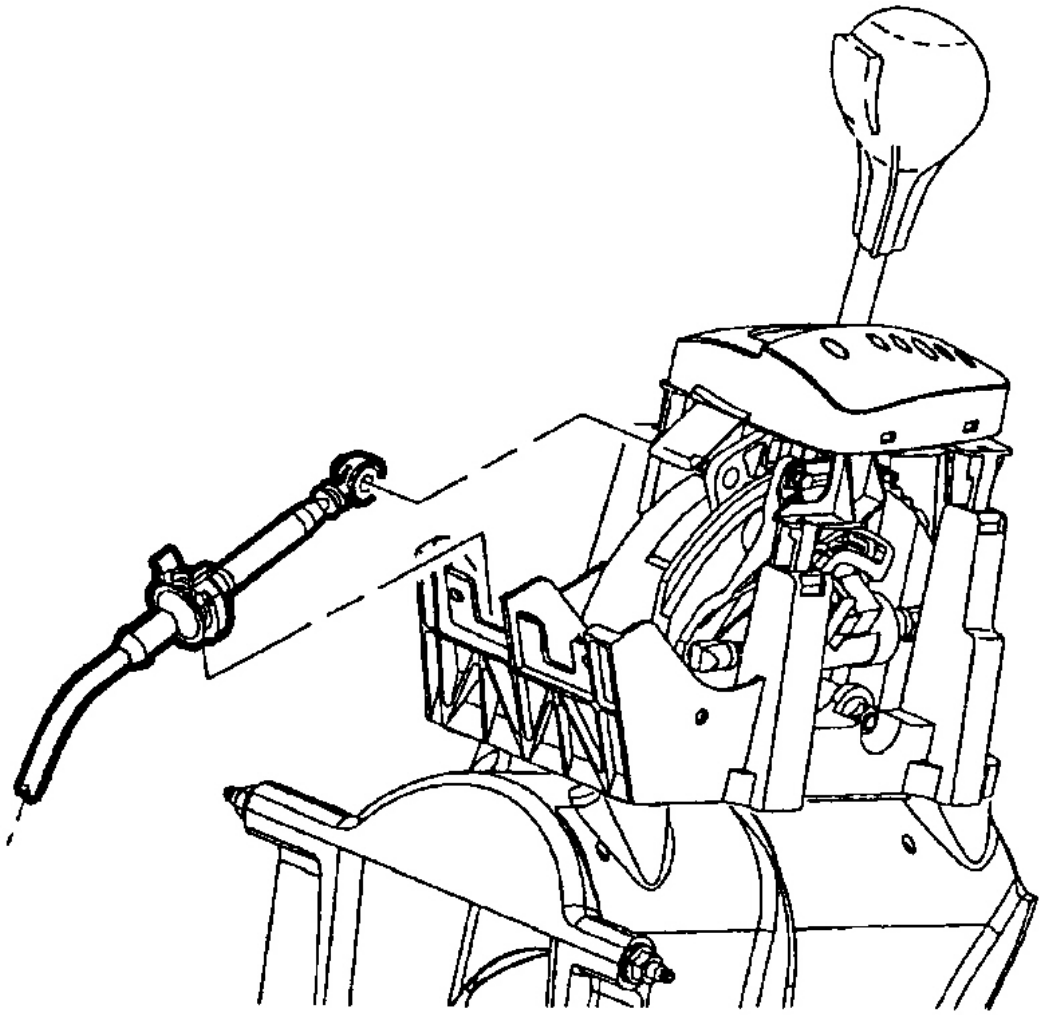

Fig. 14: Removing & Installing Control Cable At Shift Controller
Courtesy of GENERAL MOTORS CORP.

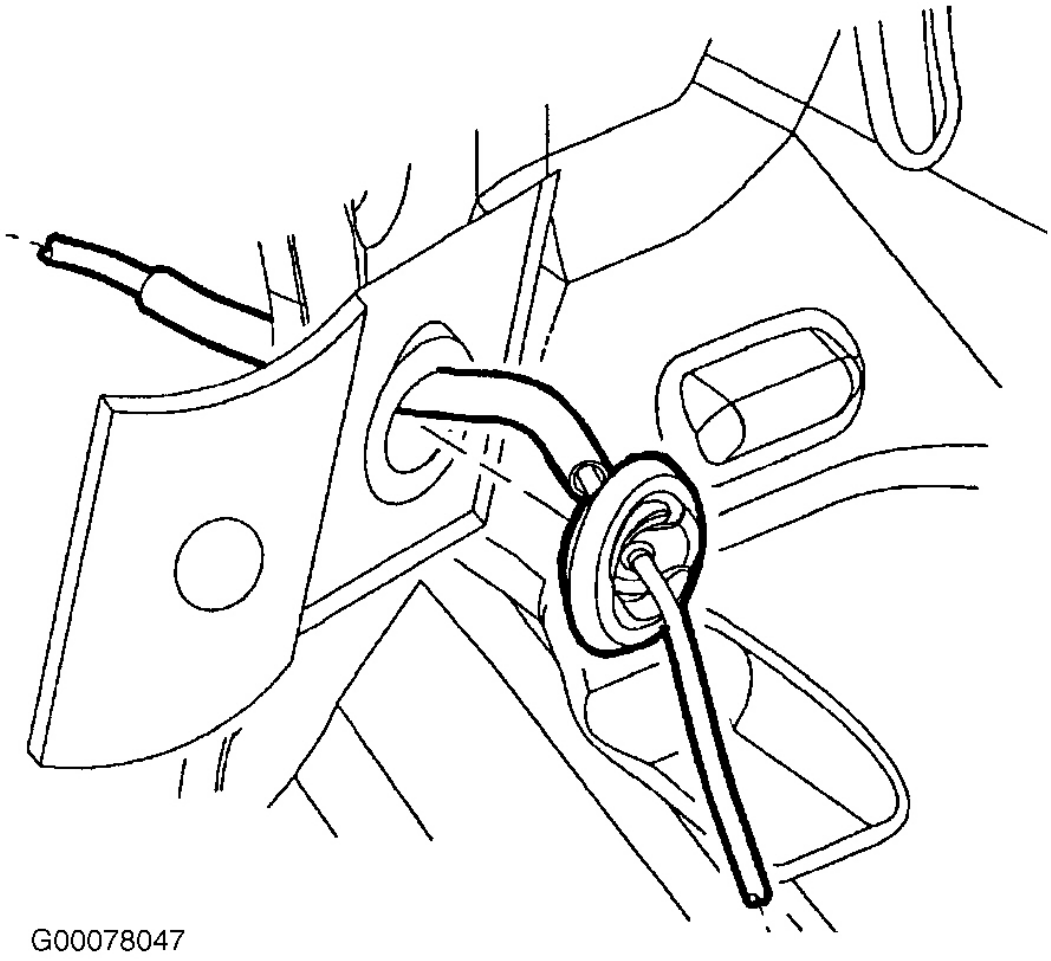

Fig. 15: Removing & Installing Control Cable Grommet
Courtesy of GENERAL MOTORS CORP.

Installation

1. Route control cable through cable bracket. Secure cable to bracket with control cable retainer clip. An audible snap will be heard when properly installed. With transaxle range switch lever located in Neutral, snap cable end fitting onto ball stud of lever. An audible snap will be heard when properly installed.
2. Position vehicle on hoist and raise vehicle. Route cable along steering gear assembly into clip and up into dash panel. Lower vehicle. Secure control cable grommet by pressing cable into pass-through hole in dash panel. See **Fig. 15** . Make sure control assembly is in Neutral position.
3. Connect control cable to control assembly. Secure with control cable retainer clip. Install control cable onto control assembly lever. See **Fig. 14** . Adjust control cable assembly. See **CONTROL CABLE** under ADJUSTMENTS. Install console. See **CONSOLE** .
4. Position battery tray bracket and tighten screws to specification. See **Fig. 13** . See **TORQUE SPECIFICATIONS** . Install battery cooling box. See **BATTERY COOLING BOX** .

5. Insert battery and tighten battery hold-down screw to specification. See **Fig. 6** . Connect positive battery cable to battery and tighten to specification. Connect negative battery cable to battery and tighten to specification. Install battery cooling box cover and tighten screws to specification. See **TORQUE SPECIFICATIONS** .

CONTROL VALVE BODY

Removal

1. Remove valve body cover assembly. See **CONTROL VALVE BODY COVER** . Slide gray locking clip to unlock connector for input and output speed sensor assembly. See **Fig. 16** .
2. Press connector tab and remove connector for input and output speed sensor assembly from control valve body assembly. Remove bolt and manual shaft detent assembly from control valve body assembly. See **Fig. 17** . Disconnect manual valve link assembly from manual valve. See **Fig. 18** .

NOTE: Use care when removing control valve body assembly. The control solenoid valve assembly and control valve body assembly may separate.

3. Remove 3 Silver bolts from control valve body assembly. See **Fig. 19** . Remove 15 Black bolts from control valve body assembly. See **Fig. 20** . Remove control valve body assembly from transaxle case assembly. See **Fig. 21** . Remove spacer plate assembly and discard.

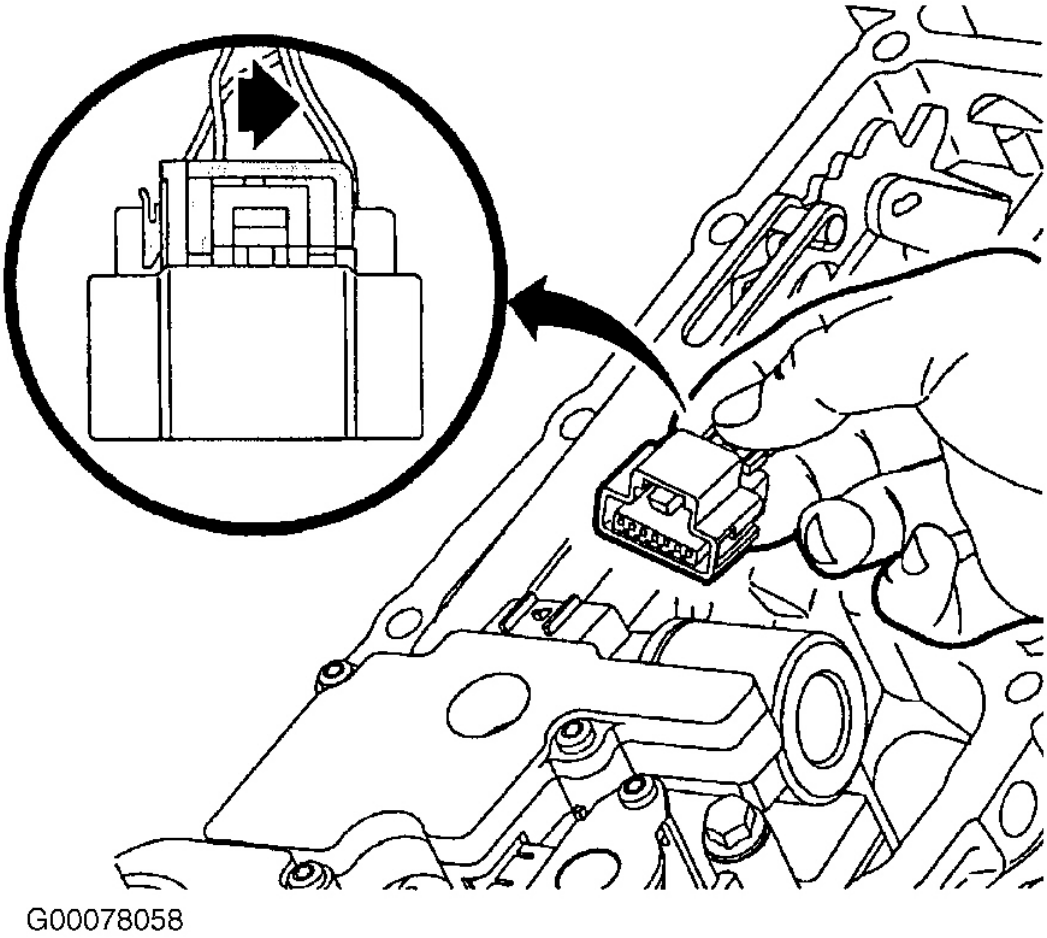

Fig. 16: Disconnecting Input & Output Speed Sensor Harness Connector
Courtesy of GENERAL MOTORS CORP.

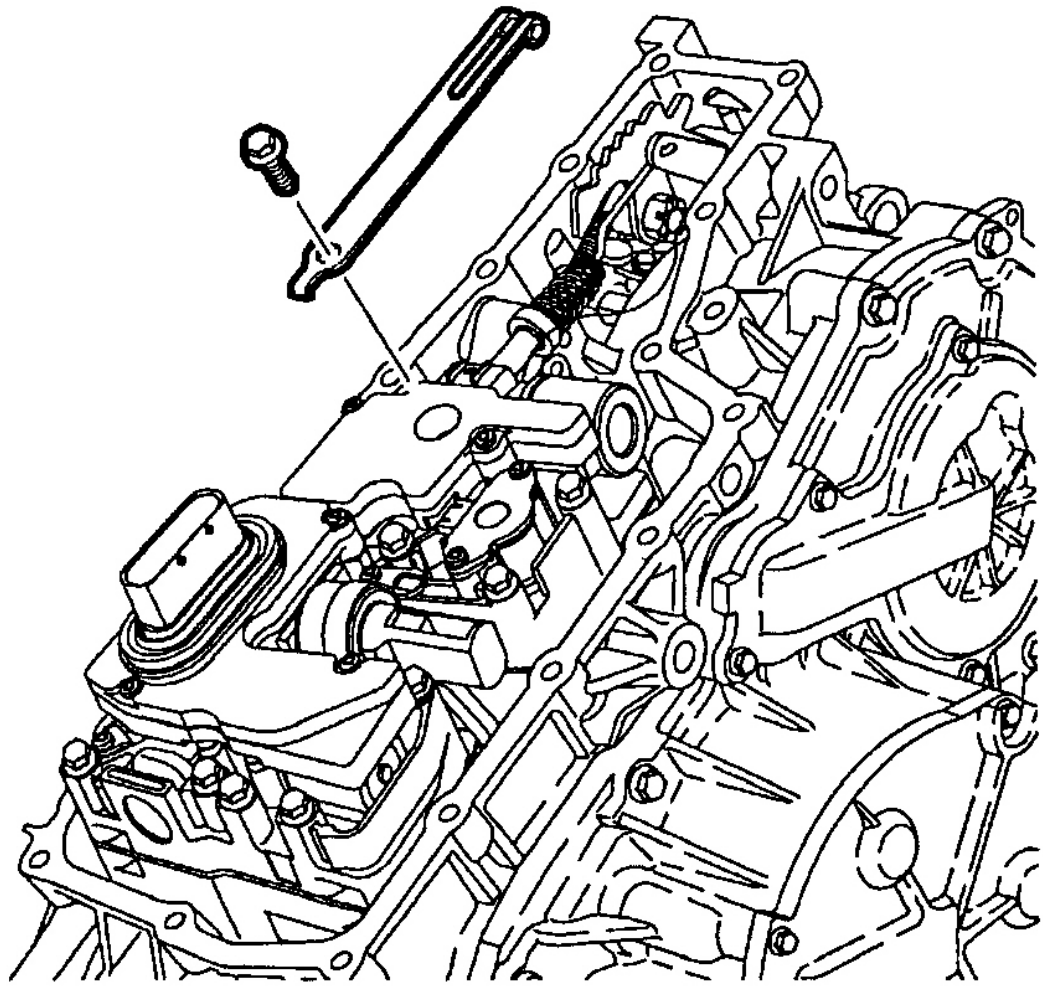

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Fig. 17: Removing & Installing Manual Shaft Detent
Courtesy of GENERAL MOTORS CORP.

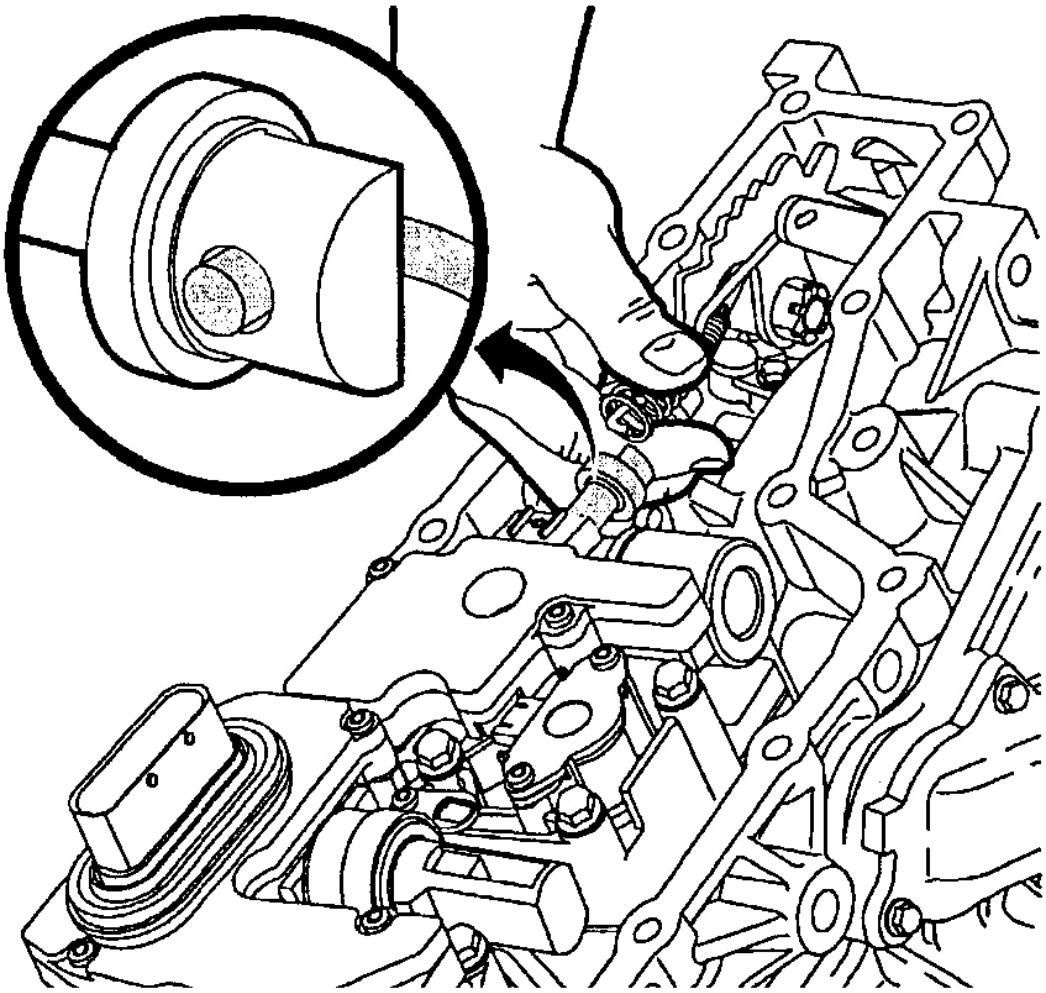

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Fig. 18: Removing & Installing Manual Valve Link
Courtesy of GENERAL MOTORS CORP.

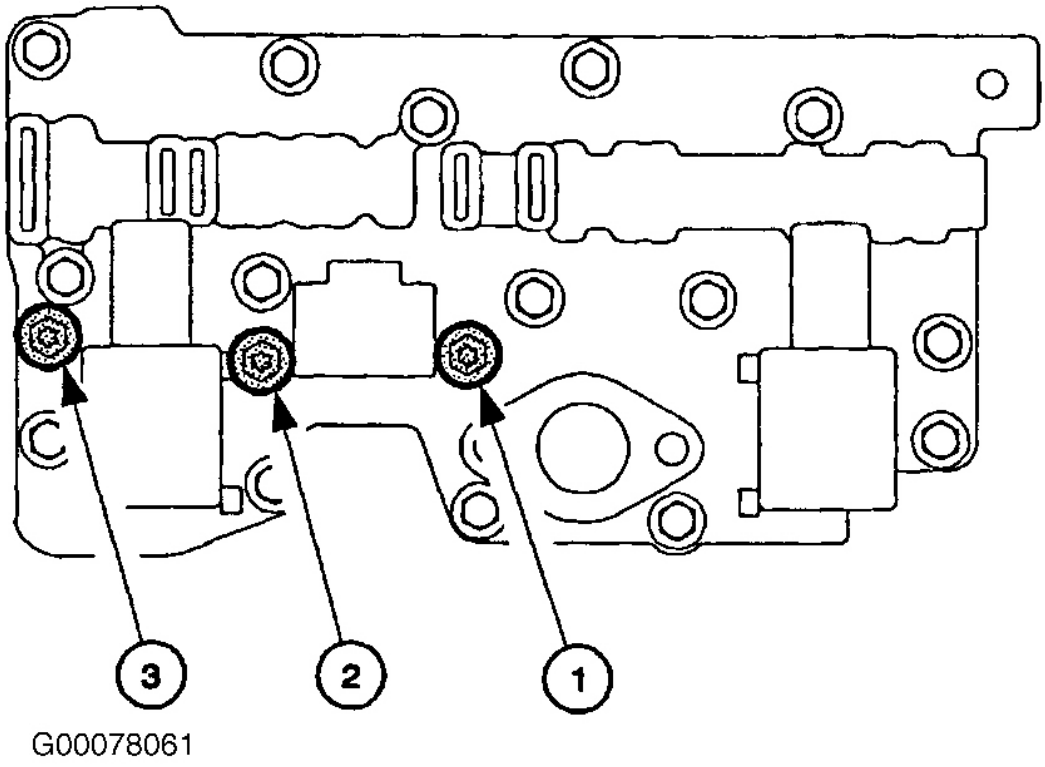

Fig. 19: Identifying Silver Bolts
Courtesy of GENERAL MOTORS CORP.

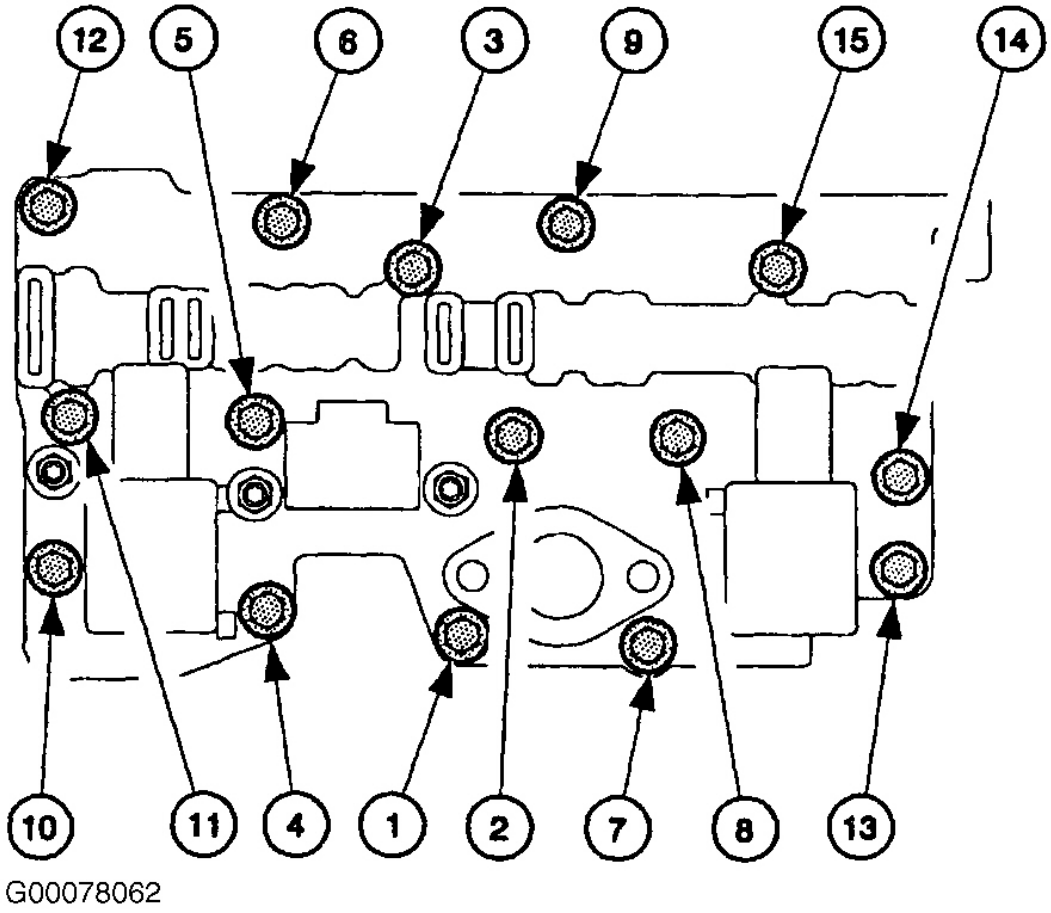

Fig. 20: Identifying Black Bolts
Courtesy of GENERAL MOTORS CORP.

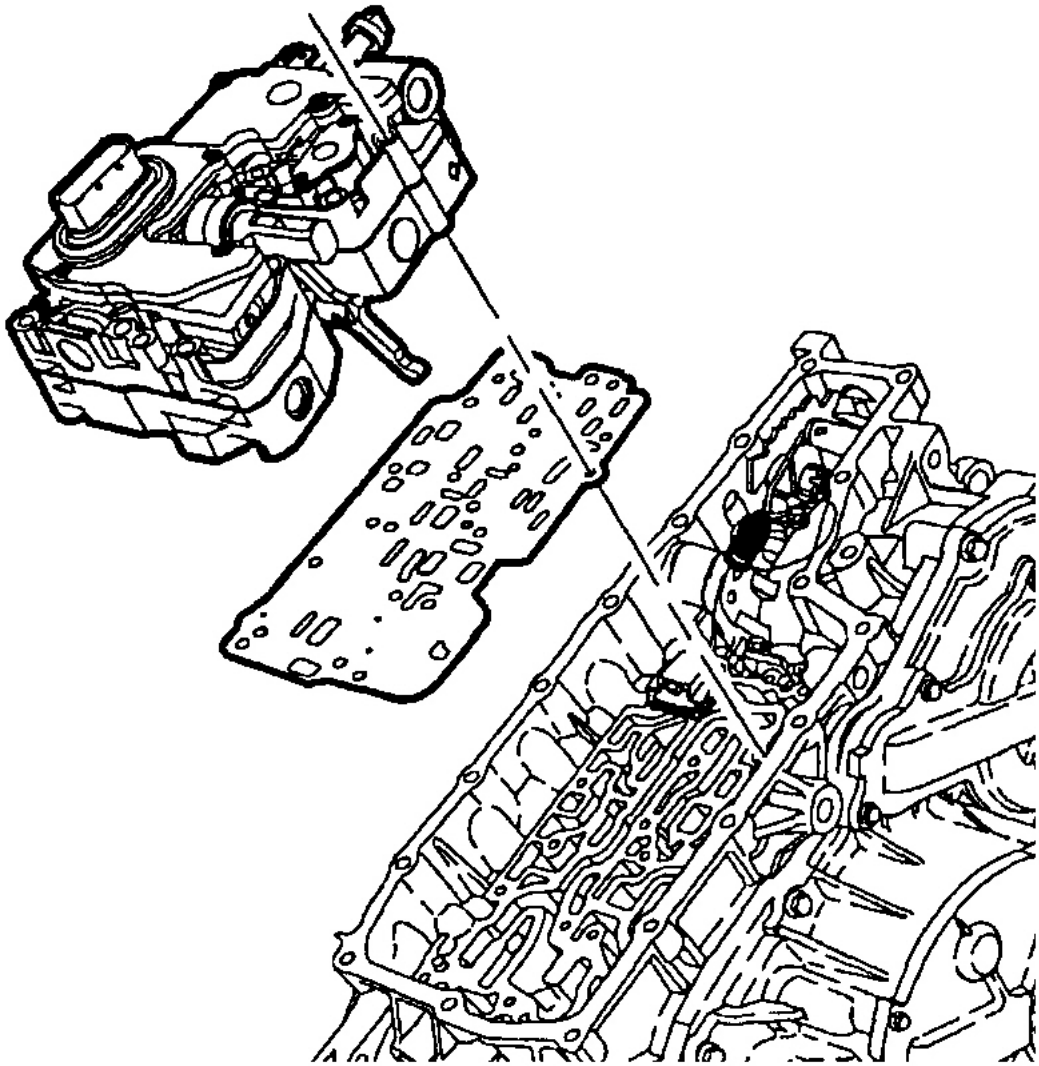

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Fig. 21: Removing & Installing Valve Body
Courtesy of GENERAL MOTORS CORP.

Installation

1. Install new spacer plate assembly on transaxle case assembly. Install control valve body assembly on transaxle case assembly. See **Fig. 21** . Secure control valve body assembly to transaxle case assembly with 3 silver bolts. See **Fig. 19** .
2. Tighten 3 silver bolts in sequence shown to specification. See **TORQUE SPECIFICATIONS** . Secure control valve body assembly to transaxle case assembly with 15 Black bolts. See **Fig. 20** .

NOTE: Note orientation of manual valve before connecting manual valve link assembly.

3. Tighten Black bolts in the following 3 separate steps in sequence shown:
   - Tighten to 44 INCH. lbs. (5 N.m).
   - Tighten to 89 INCH. lbs. (10 N.m).
   - Tighten to 124 INCH. lbs. (14 N.m)

   Connect manual valve link assembly to manual valve. Install valve body cover assembly. See **CONTROL VALVE BODY COVER** .

CONTROL VALVE BODY COVER

Removal

1. Remove battery cover. Disconnect negative battery cable. Disconnect positive battery cable. Loosen battery hold-down screw and remove battery. See **Fig. 6** .
2. Remove battery cooling box. See **BATTERY COOLING BOX** . Loosen battery tray bracket screws and remove bracket. See **Fig. 13** . Remove transaxle vent cap. Disconnect transaxle harness connector. See **Fig. 22** .
3. Remove bolts from control valve body cover. Remove control valve body cover. Remove control valve body cover gasket and discard. See **Fig. 23** .

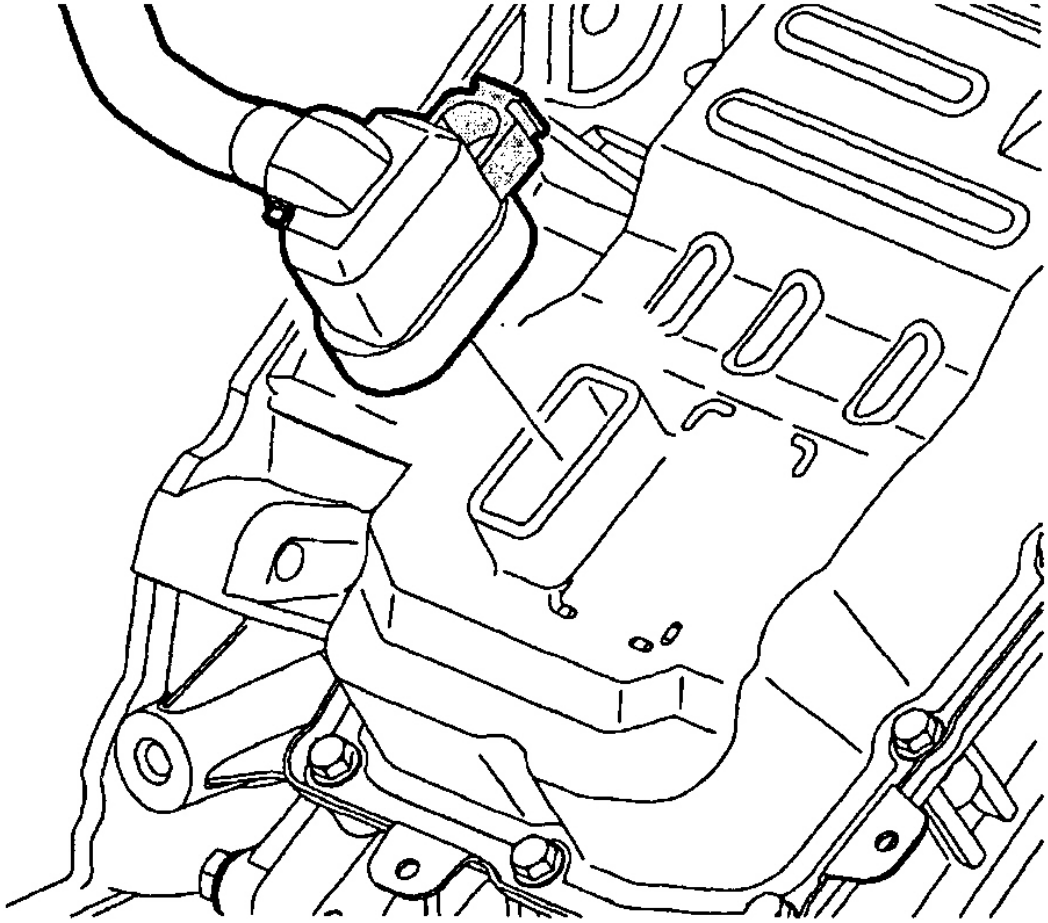

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Fig. 22: Disconnecting Transaxle Harness Connector
Courtesy of GENERAL MOTORS CORP.

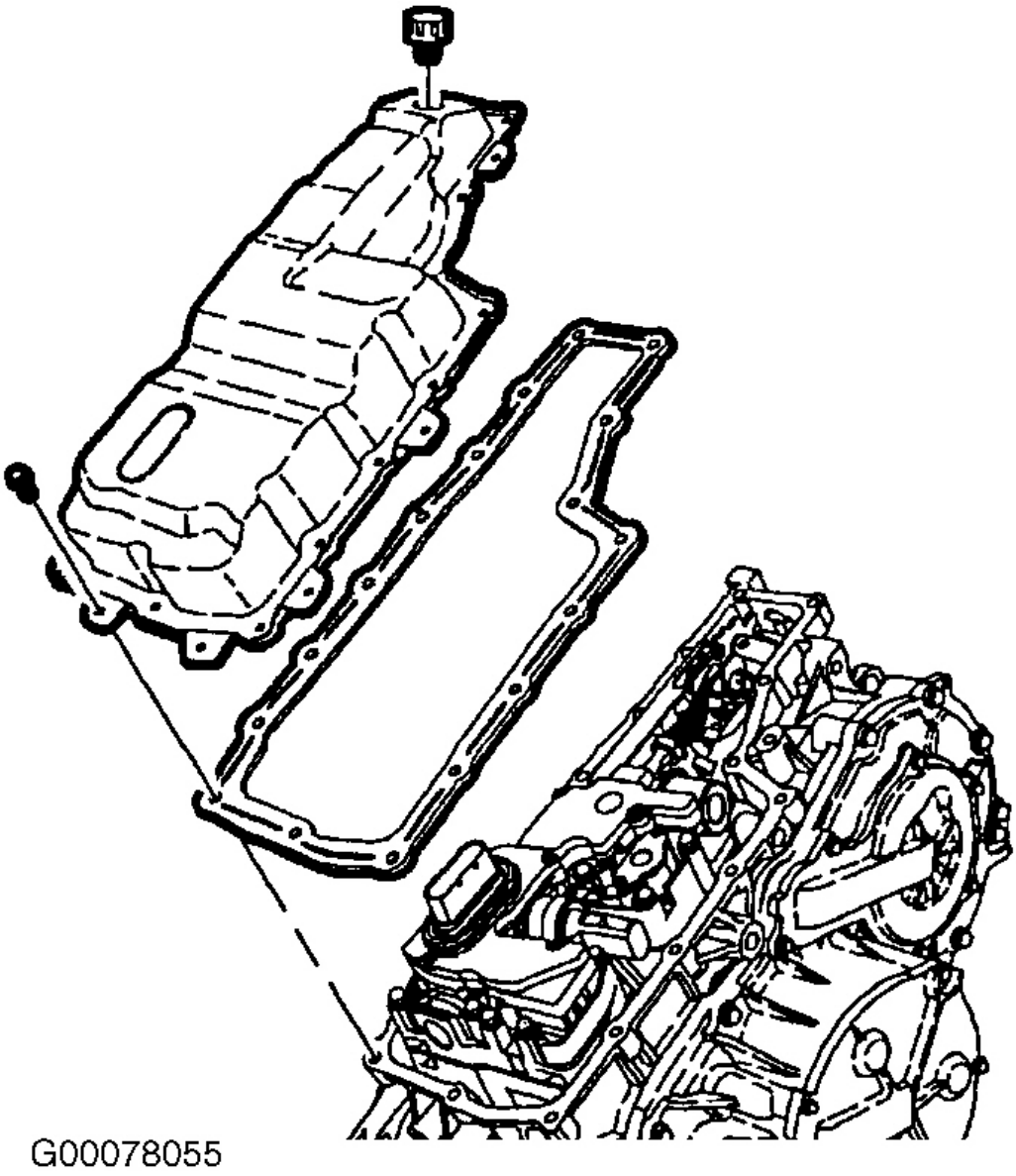

Fig. 23: Removing & Installing Valve Body Cover
Courtesy of GENERAL MOTORS CORP.

Installation

1. Install a new control valve body cover gasket on transaxle case assembly. Inspect control valve body cover for damage. Install transaxle vent cap. Install control valve body cover and bolts on transaxle case assembly. See **Fig. 23** .

2. Connect transaxle harness connector. See **Fig. 22** . Tighten valve body cover bolts to specification in sequence shown. See **Fig. 24** . See **TORQUE SPECIFICATIONS** . Install battery tray bracket. Position battery tray bracket and tighten screws to specification.
3. Install battery cooling box. See **BATTERY COOLING BOX** . Insert battery and tighten battery hold-down screw to specification. Connect positive battery cable to battery and tighten to specification.
4. Connect negative battery cable to battery and tighten to specification. Install battery cooling box cover and tighten to specification.

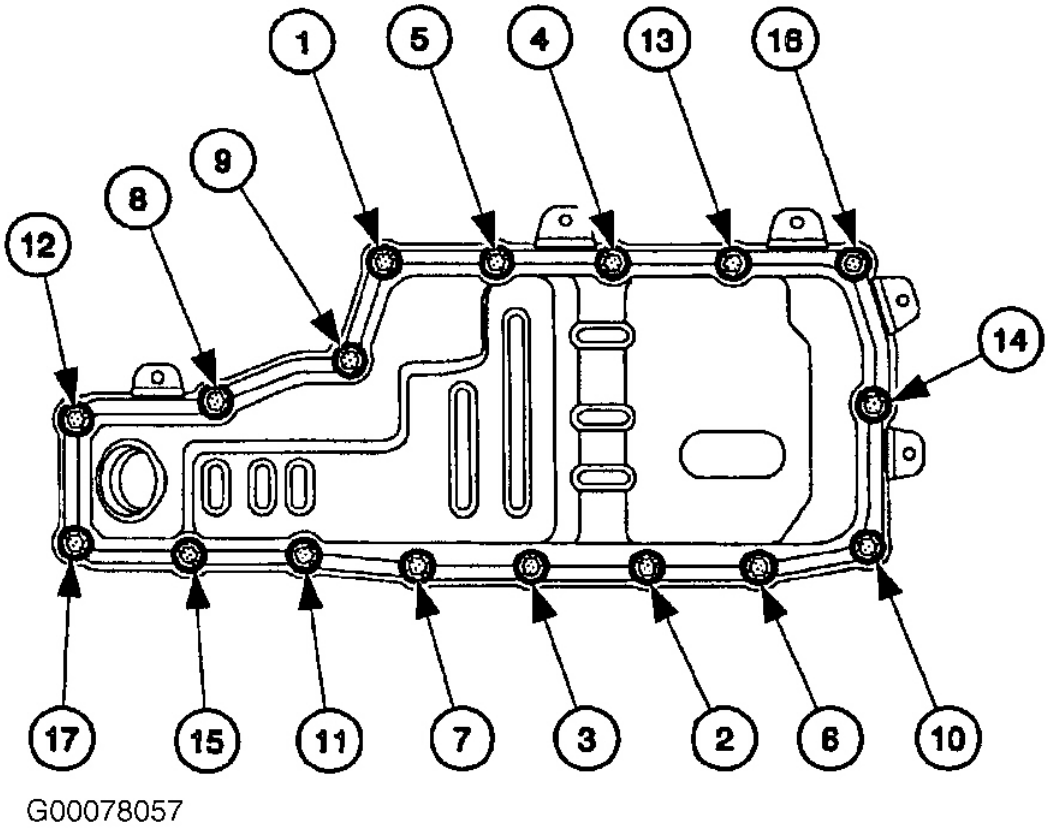

Fig. 24: Valve Body Cover Torque Sequence
Courtesy of GENERAL MOTORS CORP.

FRONT FASCIA

Removal

1. Remove front fascia-to-structure bolt. See **Fig. 25** . Remove sidemarker-to-body pushpin fastener. Lift side marker, up and out of fascia to free lower attaching tabs. Rotate side marker bulb socket and remove socket assembly from housing.
2. Remove headlight bracket-to-structure bolt. Carefully lift headlight assembly up. Rotate headlight bulb

sockets to remove them from housing. Lift headlight out to remove. Disconnect foglight harness connector, (if equipped) by reaching through headlight housing.

3. Remove pushpins from front wheelhouse-liner-to fascia. Remove fascia-to-lower front fender bracket bolt. Remove front air deflector-to-cradle pushpins. See **Fig. 26** . Remove fascia-to-body pushpins. Separate fascia from front fenders. Remove fascia-to-fascia support pushpins. See **Fig. 25** . Remove front fascia.

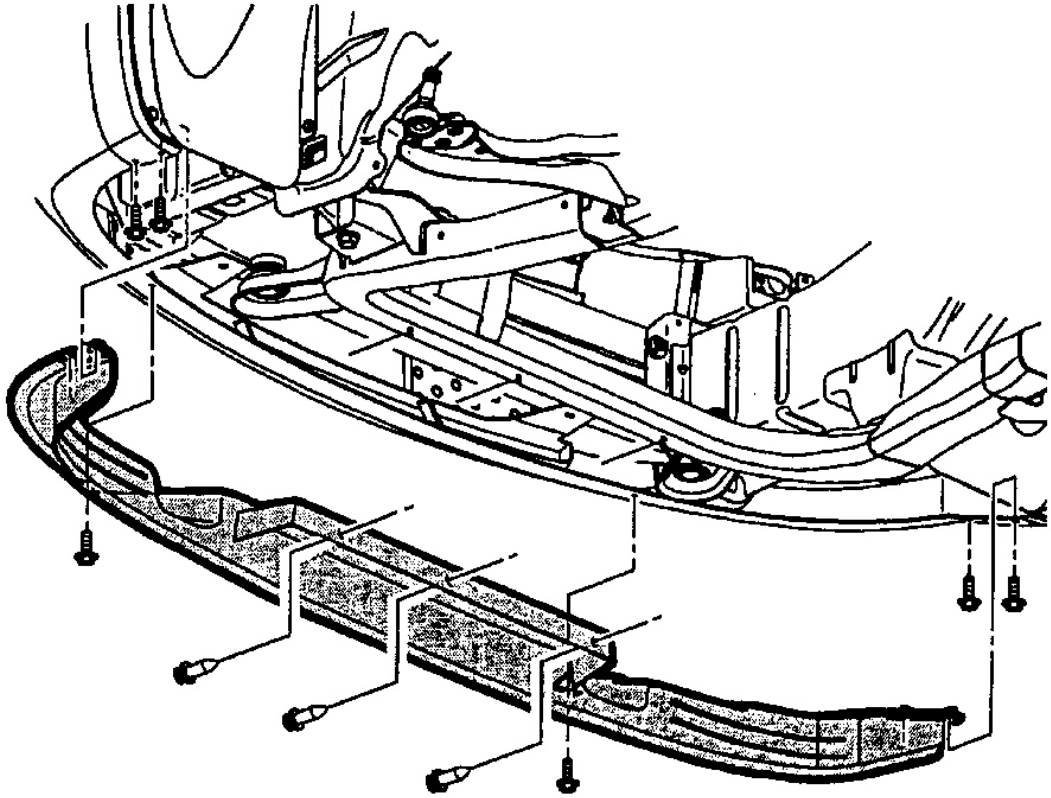

Fig. 25: Removing & Installing Front Fascia
Courtesy of GENERAL MOTORS CORP.

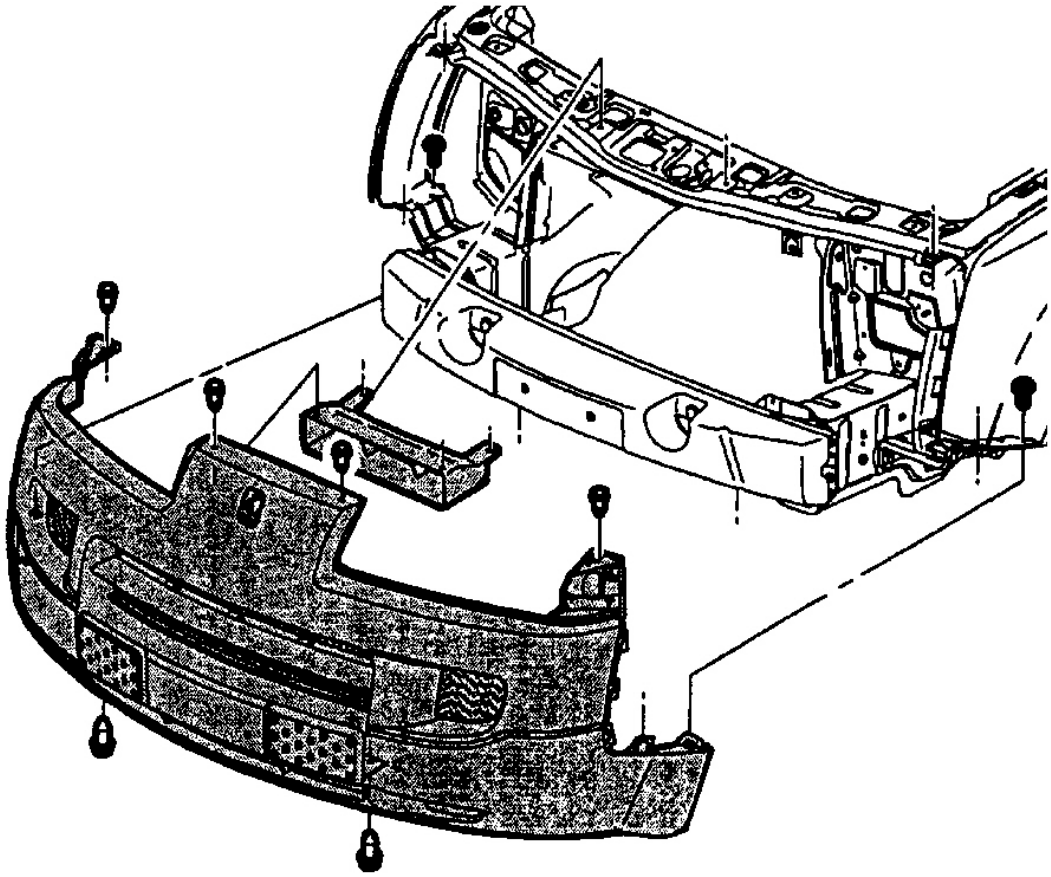

Fig. 26: Removing & Installing Front Air Deflector
Courtesy of GENERAL MOTORS CORP.

Installation

1. Install fascia-to-fascia support pushpins. See **Fig. 25** . Install fascia tabs to front fenders. Install fasica-to-body pushpins. Install front fascia-to-lower front fender bracket bolt and tighten to specification. See **TORQUE SPECIFICATIONS** .
2. Install Wheelhouse liner-to-fascia pushpins. Connect foglight harness connectors (if equipped). Install headlight bulb sockets. Carefully lower headlight into position, making sure headlight housing bracket lower arm fits into bracket located on vehicle structure.
3. Install headlight bracket-to-structure bolt and tighten to specification. See **TORQUE SPECIFICATIONS** . Connect sidemarker bulb socket. Install sidemarker to fascia, making sure lower sidemarker housing tabs are engaging fascia.
4. Install sidemarker-to-body pushpin fastener. Install front fascia-to-structure bolt and tighten to specification. See **TORQUE SPECIFICATIONS** . See **Fig. 25** . Install front air deflector-to-cradle postpone. See **Fig. 26** .

INPUT & OUTPUT SPEED SENSORS

Removal

1. Remove control valve body cover assembly. See **CONTROL VALVE BODY COVER** .
2. Remove control valve body assembly. See **CONTROL VALVE BODY** .
3. Remove bolts and input and output speed sensor assembly from transaxle case assembly. See **Fig. 27** .

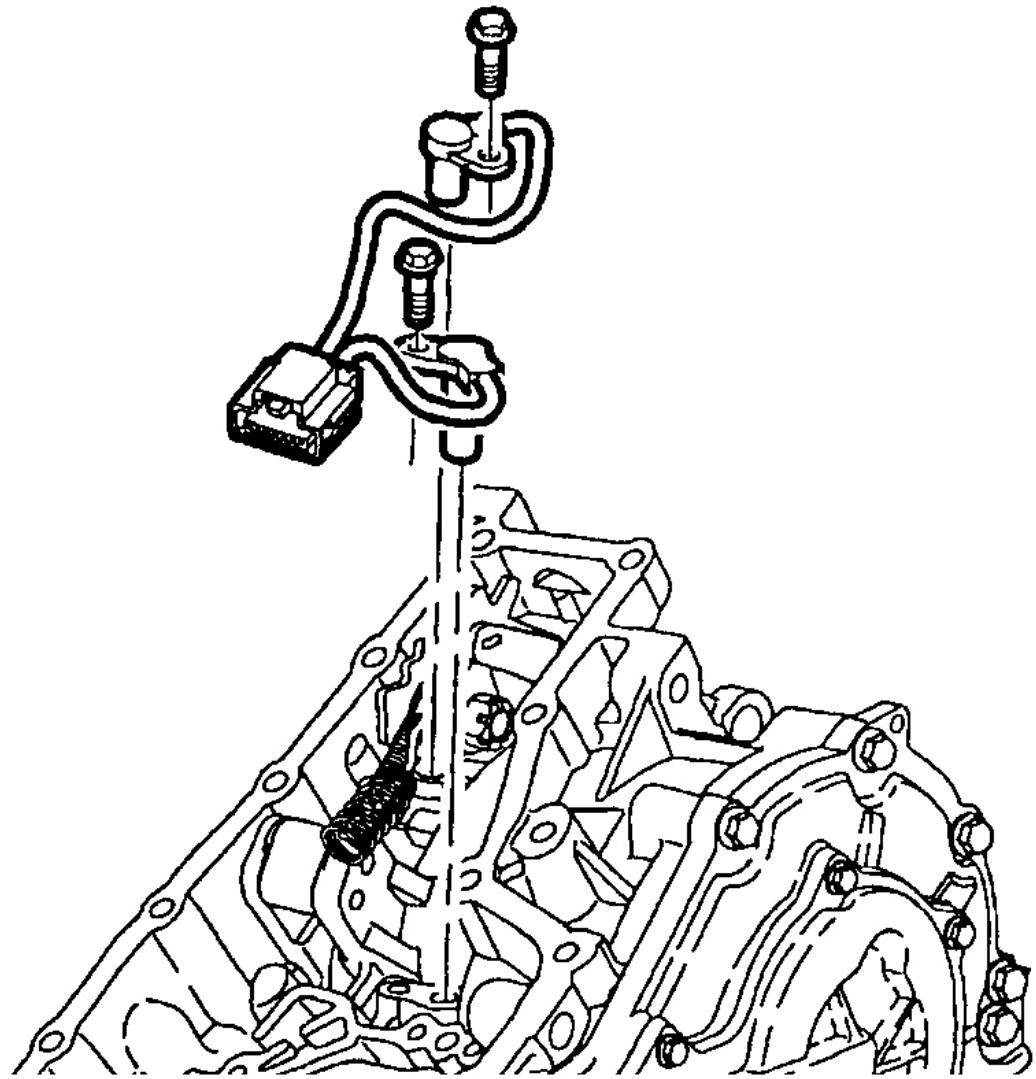

Fig. 27: Removing & Installing Input & Output Speed Sensors
Courtesy of GENERAL MOTORS CORP.

Installation

1. Install input and output speed sensor assembly and bolts on transaxle case assembly. See **Fig. 27** . Tighten input and output speed sensor bolts to specification. See **TORQUE SPECIFICATIONS** .
2. Install control valve body assembly. See **CONTROL VALVE BODY** .
3. Install control valve body cover assembly. See **CONTROL VALVE BODY COVER** .

TRANSAXLE OIL COOLER

Removal

1. Remove front fascia. See **FRONT FASCIA** . Separate transaxle oil cooler lines from radiator. Remove oil cooler line-to-radiator bracket bolt. Remove battery box inlet air duct. See **Fig. 28** .
2. Remove condenser splash shield. See **Fig. 29** . Remove upper Condenser Radiator Fan Module (CRFM) bracket assemblies. See **Fig. 30** . Unclip condenser from radiator. See **Fig. 31** . Unclip transaxle oil cooler from radiator and remove transaxle oil cooler.

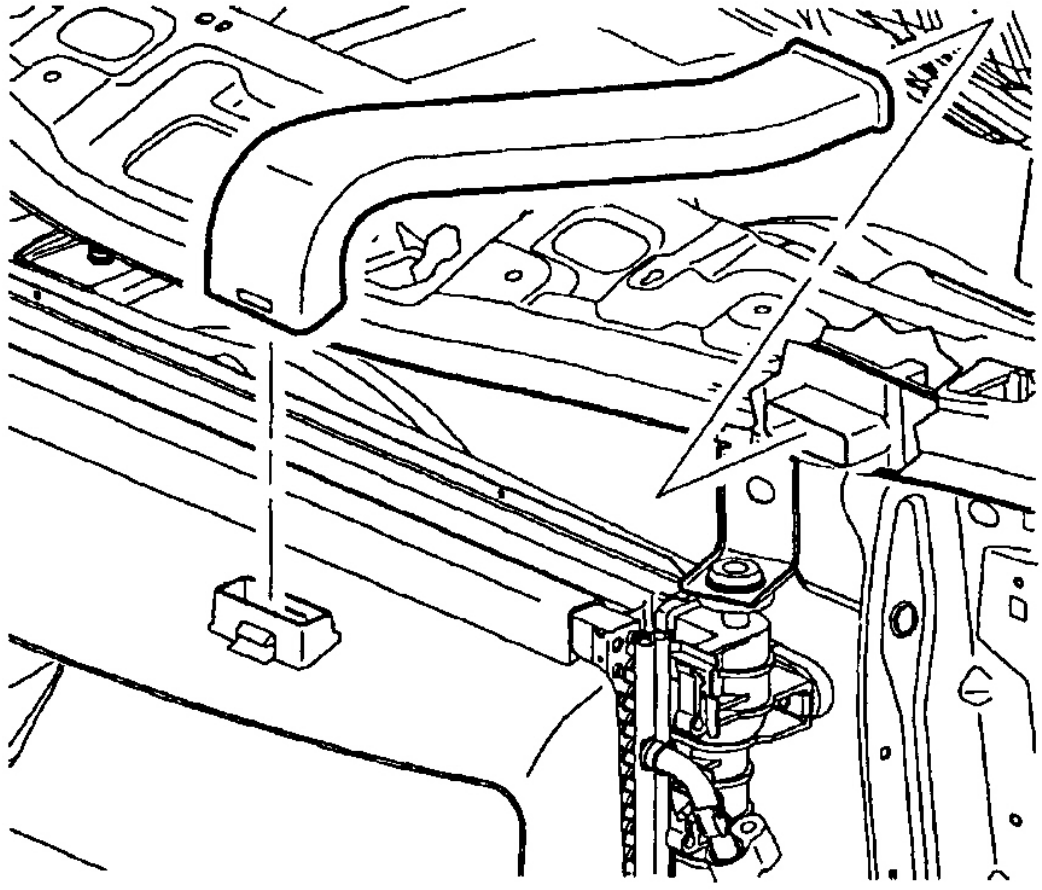

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Fig. 28: Removing & Installing Air Inlet
Courtesy of GENERAL MOTORS CORP.

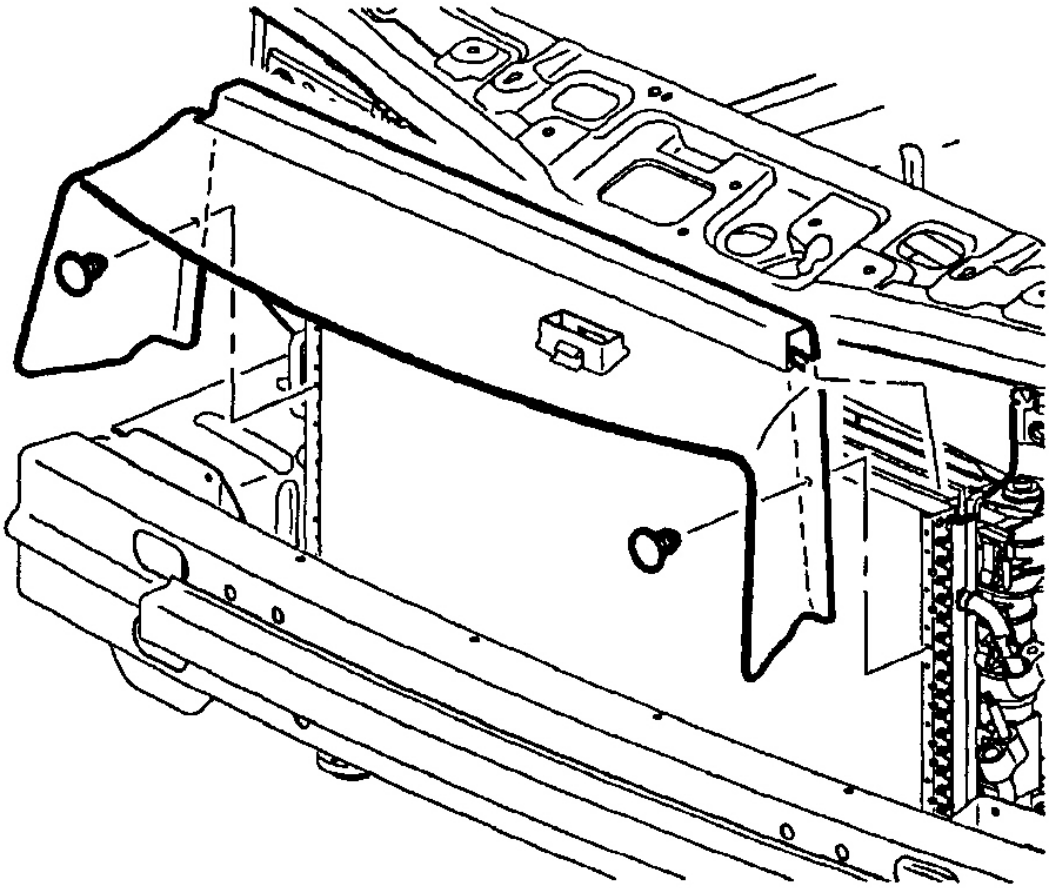

Fig. 29: Removing & Installing Condenser Splash Shield
Courtesy of GENERAL MOTORS CORP.

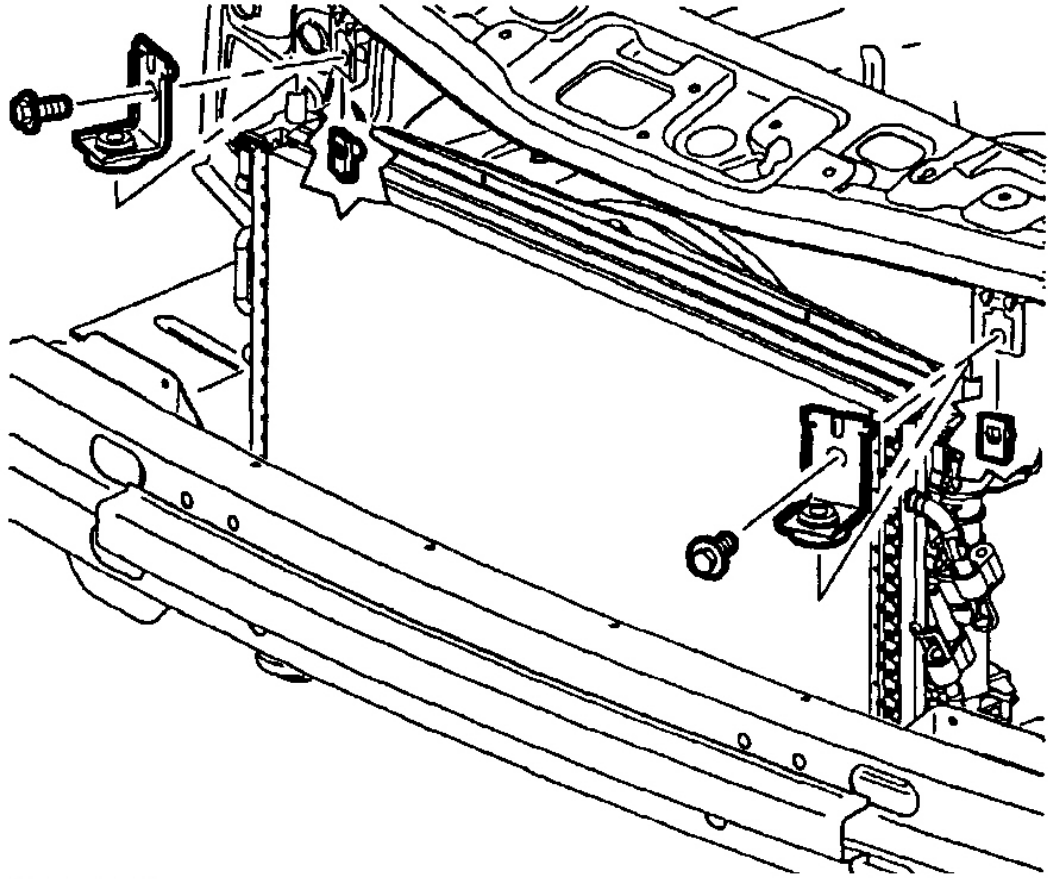

Fig. 30: Removing & Installing Condenser Radiator Fan Module Bracket Assemblies
Courtesy of GENERAL MOTORS CORP.

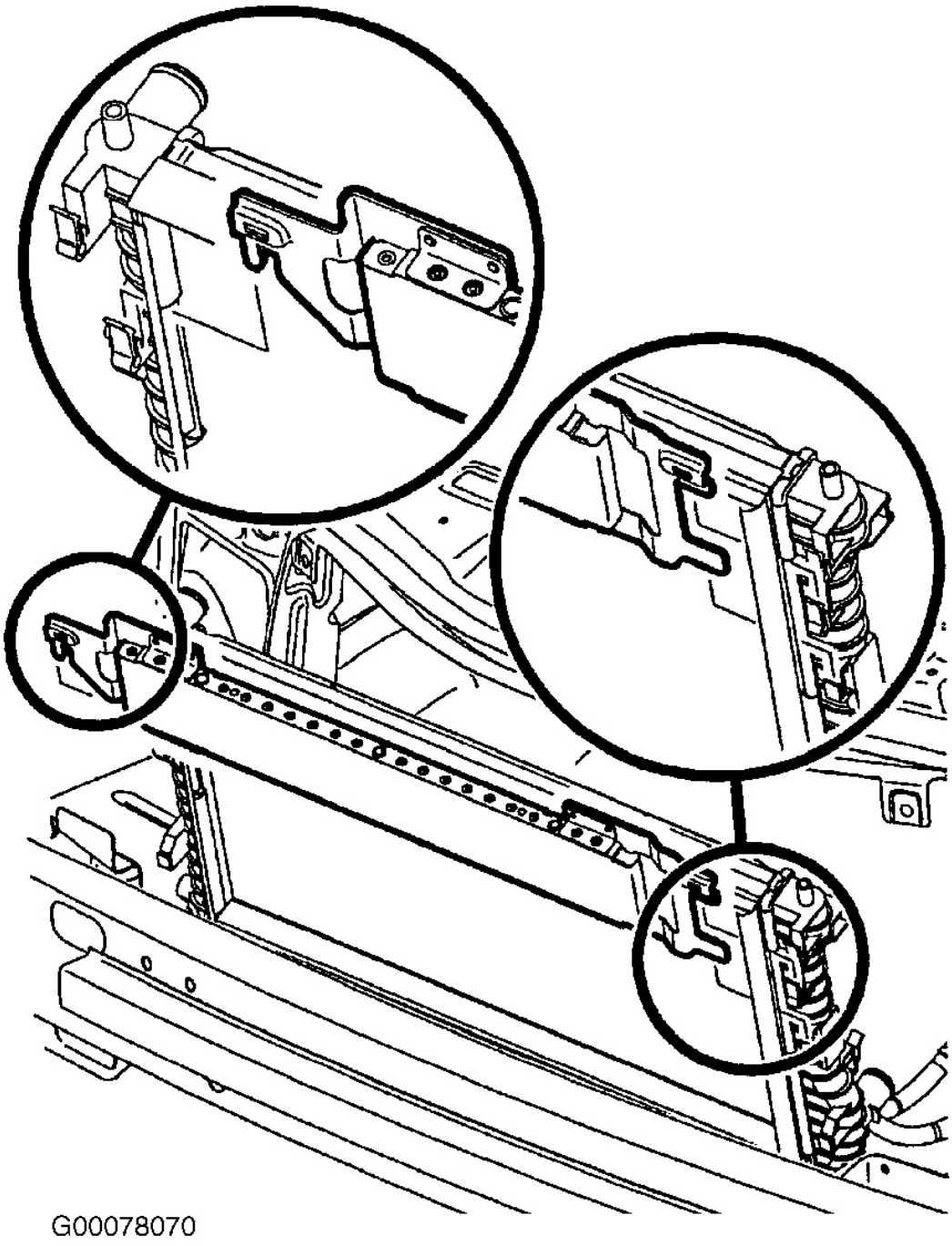

Fig. 31: Identifying Transaxle Oil Cooler Retaining Clips
Courtesy of GENERAL MOTORS CORP.

Installation

1. Clip transaxle oil cooler to radiator. See **Fig. 31** . Clip condenser to radiator. Install upper CRFM bracket assemblies. See **Fig. 30** . Install condenser splash shield. See **Fig. 29** . Install battery box inlet air duct. See **Fig. 28** . Install oil cooler line-to-radiator bracket bolt. Connect transaxle oil cooler lines to radiator.
2. Install front fascia. See **FRONT FASCIA** . Check transaxle fluid level. See **CHECKING FLUID LEVELS** under LUBRICATION. If necessary, fill transaxle to proper level using Saturn Transaxle Fluid (P/N 22688912).

TRANSAXLE OIL COOLER LINE ASSEMBLY

Removal

Place drain pan or suitable container under vehicle. Position vehicle on a hoist. Remove transaxle oil cooler lines from radiator. Raise vehicle. Remove transaxle cooler line assembly nut from transaxle. See **Fig. 32** . Remove transaxle oil cooler lines from vehicle.

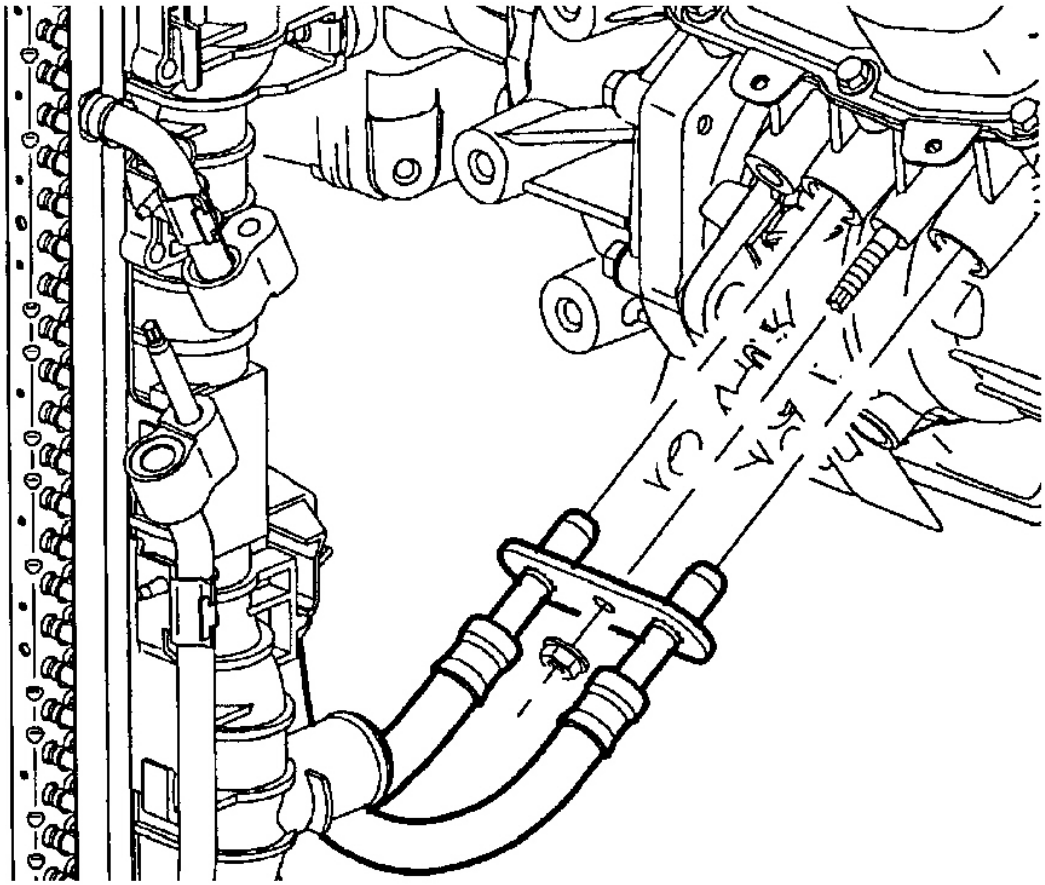

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Fig. 32: Removing & Installing Transaxle Cooler Lines

Courtesy of GENERAL MOTORS CORP.

Installation

Install transaxle oil cooler line assembly to transaxle. Install transaxle oil cooler line nut and tighten to specification. See **TORQUE SPECIFICATIONS** . Lower vehicle. Install transaxle oil cooler lines to radiator and tighten to specification. Add fluid to transaxle. See **CHECKING FLUID LEVELS** under LUBRICATION. Start engine and check for leaks.

TRANSAXLE OIL COOLER LINE SEALS

Removal

CAUTION: Avoid spinning seal in case bore. Damage to case bore may result. Do not collapse seal more than 1/8". Removal tool requires two undeformed opposing edges to work.

1. Place drain pan or suitable container under vehicle. Position vehicle on a hoist. Raise vehicle. Remove transaxle oil cooler line assembly nut from transaxle. Remove transaxle oil cooler lines from transaxle. See **TRANSAXLE OIL COOLER LINE ASSEMBLY** .
2. Use a long chisel with a 1/4" blade to partially collapse seal in one place only. See **Fig. 33** . Clamp Cooler Line Seal Remover/Installer (J41239) onto transaxle cooler line seal on outside of the case bore. See **Fig. 34** . Remove transaxle cooler line seal by prying and rotating seal out of case with attached tool.

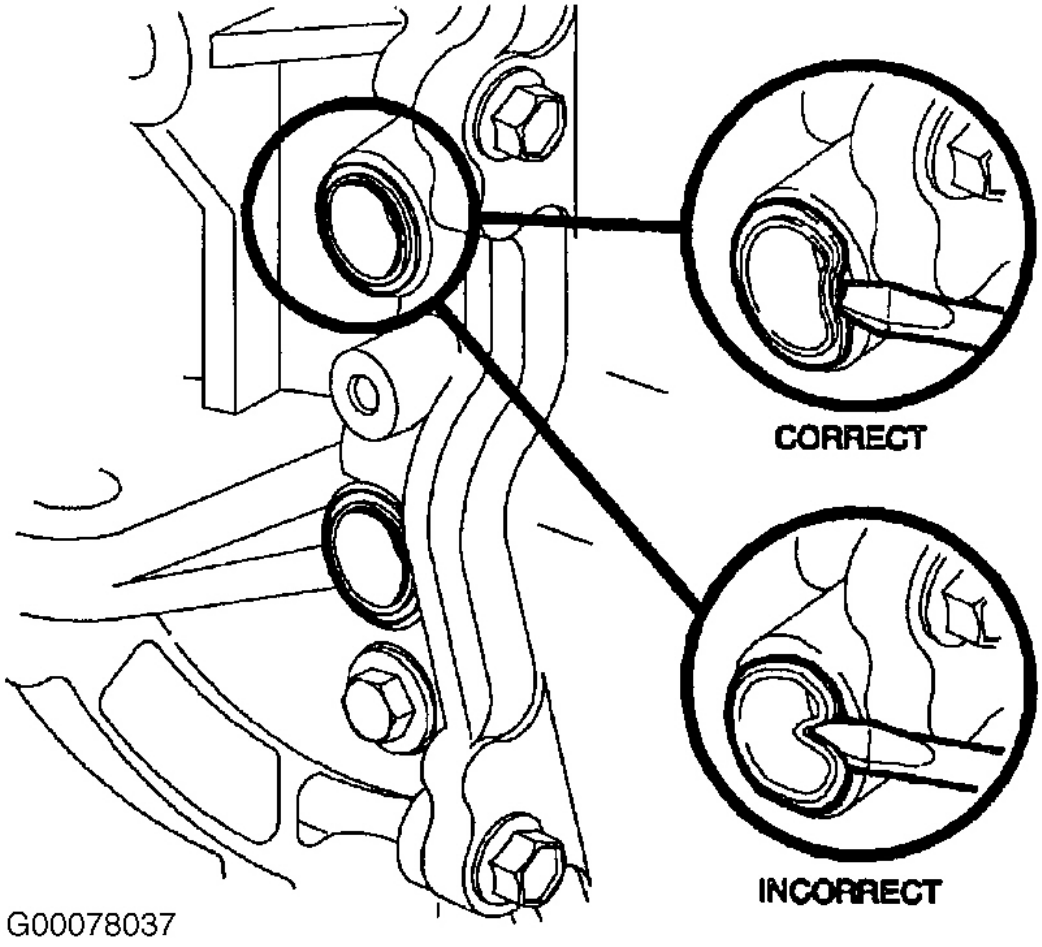

Fig. 33: Removing Transaxle Oil Cooler Seals
Courtesy of GENERAL MOTORS CORP.

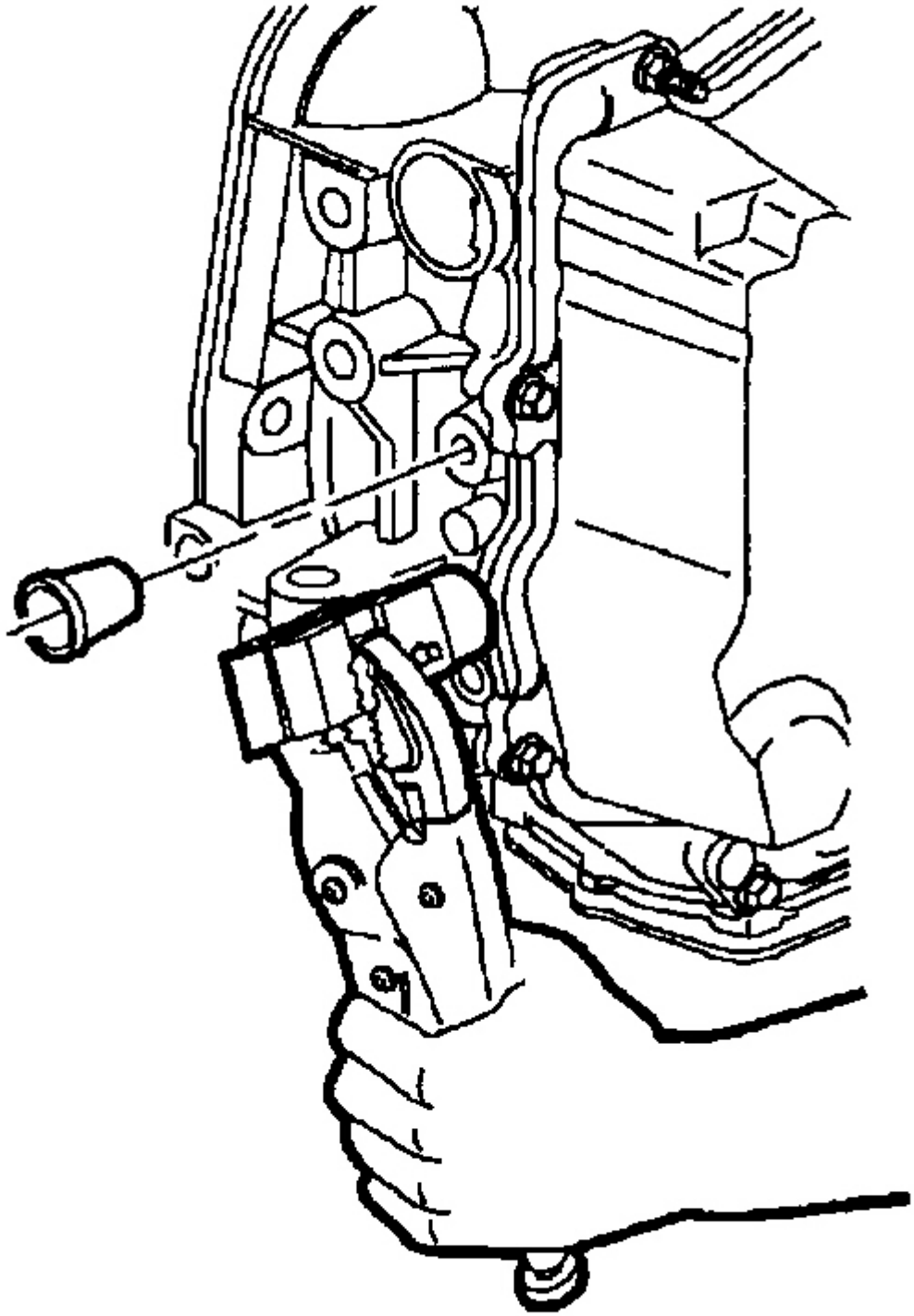

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Fig. 34: Identifying Cooler Line Seal Remover
Courtesy of GENERAL MOTORS CORP.

Installation

1. Place a new transaxle cooler line seal in case bore. Remove nub from Cooler Line Seal Installer (J-41239). Install nub of cooler line seal installer on transaxle cooler line seal. See **Fig. 35** . Tap in a new transaxle cooler line seal into case bore. Install transaxle oil cooler line assembly to transaxle.
2. Install transaxle oil cooler line assembly nut and tighten to specification. See **TORQUE SPECIFICATIONS** . Lower vehicle. Add fluid to transaxle. See **CHECKING FLUID LEVELS** under LUBRICATION. Start engine and check for leaks.

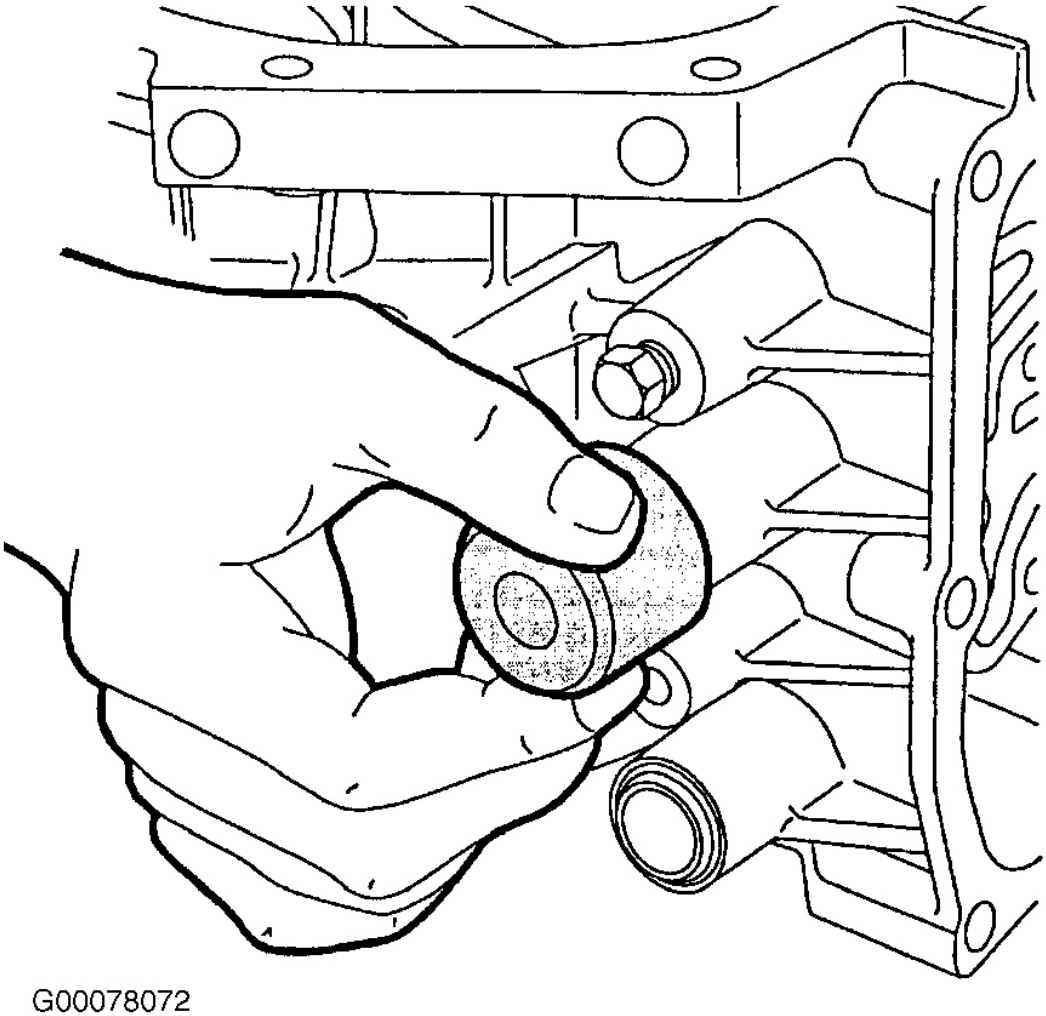

Fig. 35: Installing Transaxle Cooler Line Seal
Courtesy of GENERAL MOTORS CORP.

TRANSAXLE RANGE SWITCH

Removal

CAUTION: DO NOT tip battery over 45° angle or acid could spill.

NOTE: Record all pre-set radio stations prior to disconnecting battery and reprogram pre-set stations after repair.

1. Remove battery cover. Disconnect negative battery cable. Disconnect positive battery cable. Loosen battery hold-down screw and remove battery. See **Fig. 6** .
2. Remove battery cooling box. See **BATTERY COOLING BOX** . Remove battery tray bracket. Loosen battery tray bracket screws and remove bracket. See **Fig. 13** .
3. Apply parking brake and place control shift lever in Neutral position. Using Fascia Retainer Remover (J36346) remove control cable assembly from transaxle range switch lever.
4. Disconnect harness connectors from transaxle range switch. Remove transaxle range switch lever nut and lever. Remove transaxle range switch bolts and remove transaxle switch.

Installation (Using Old Switch)

1. Make sure transaxle manual shaft is in Neutral position. Align flats on transaxle shift shaft with flats on transaxle range switch and install switch. Loosely install transaxle range switch bolts.
2. Insert Transaxle Range Switch Alignment Tool (J44810) as shown and rotate switch until tool drops into position. See **Fig. 5** . Transaxle range switch is aligned when pin on tool drops into hole on transaxle range switch. Tighten transaxle range switch bolts to specification. Remove alignment tool.
3. Install transaxle range switch lever and nut then tighten to specification. See **TORQUE SPECIFICATIONS** . Connect transaxle range switch harness connectors. Install control cable assembly to transaxle range switch lever and verify proper operation.
4. Position battery tray bracket and tighten screws to specification. See **TORQUE SPECIFICATIONS** . Install battery cooling box. See **BATTERY COOLING BOX** .
5. Insert battery and tighten battery hold-down screw to specification. Connect positive battery cable to battery and tighten to specification. Connect negative battery cable to battery and tighten to specification. Install battery cooling box cover and tighten screws to specification. See **TORQUE SPECIFICATIONS** .
6. Reprogram radio stations. Adjust transaxle range switch. See **TRANSAXLE RANGE SWITCH** under ADJUSTMENTS. After adjusting switch, verify engine starts only in Park or Neutral position. If engine starts in any other position, readjust switch.

Installation (Using New Switch)

1. Make sure transaxle manual shaft is in Neutral position. Align flats on transaxle shift shaft with flats on transaxle range switch and install switch. Tighten transaxle range switch bolts to specification. Install transaxle range switch lever and nut then tighten to specification. See **TORQUE SPECIFICATIONS** .
2. Connect transaxle range switch harness connectors. Install control cable assembly to transaxle range

switch lever. Install battery tray bracket. Position battery tray bracket and tighten screws to specification. See **TORQUE SPECIFICATIONS** . Install battery cooling box. See **BATTERY COOLING BOX** .

3. Insert battery and tighten battery hold-down screw to specification. Connect positive battery cable to battery and tighten screws to specification. Connect negative battery cable to battery and tighten screws to specification. Install battery cooling box cover and tighten screws to specification. See **TORQUE SPECIFICATIONS** .
4. Reprogram radio stations. Adjust transaxle range switch. See **TRANSAXLE RANGE SWITCH** under ADJUSTMENTS. After adjusting switch, verify engine starts only in Park or Neutral position. If engine starts in any other position, readjust switch.

VARIABLE DRIVE PULLEY OPENING COVER

Removal

Remove bolts from drive pulley cover. Remove drive pulley cover. Remove variable drive pulley opening cover seal (outer) and discard. Remove variable drive pulley opening cover seal and discard. See **Fig. 36** .

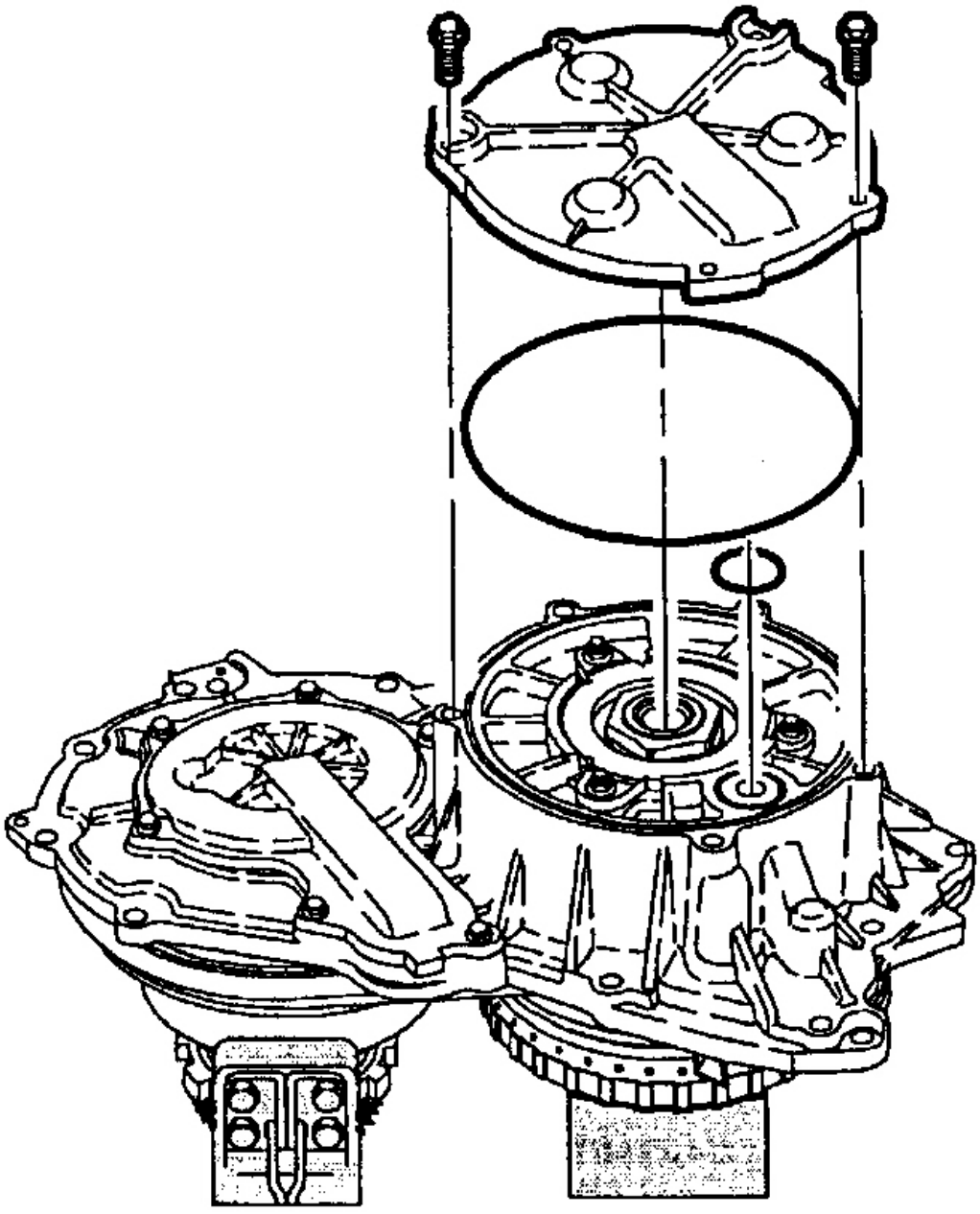

Fig. 36: Removing & Installing Variable Drive Pulley Cover
Courtesy of GENERAL MOTORS CORP.

Installation

Inspect case cover seal on drive pulley cover for damage. See **Fig. 37** . Replace if necessary. Install a new variable drive pulley opening cover seal. Install a new variable drive pulley opening cover seal (outer). Install drive pulley cover and then tighten case cover assembly bolts to specification. See **TORQUE SPECIFICATIONS** .

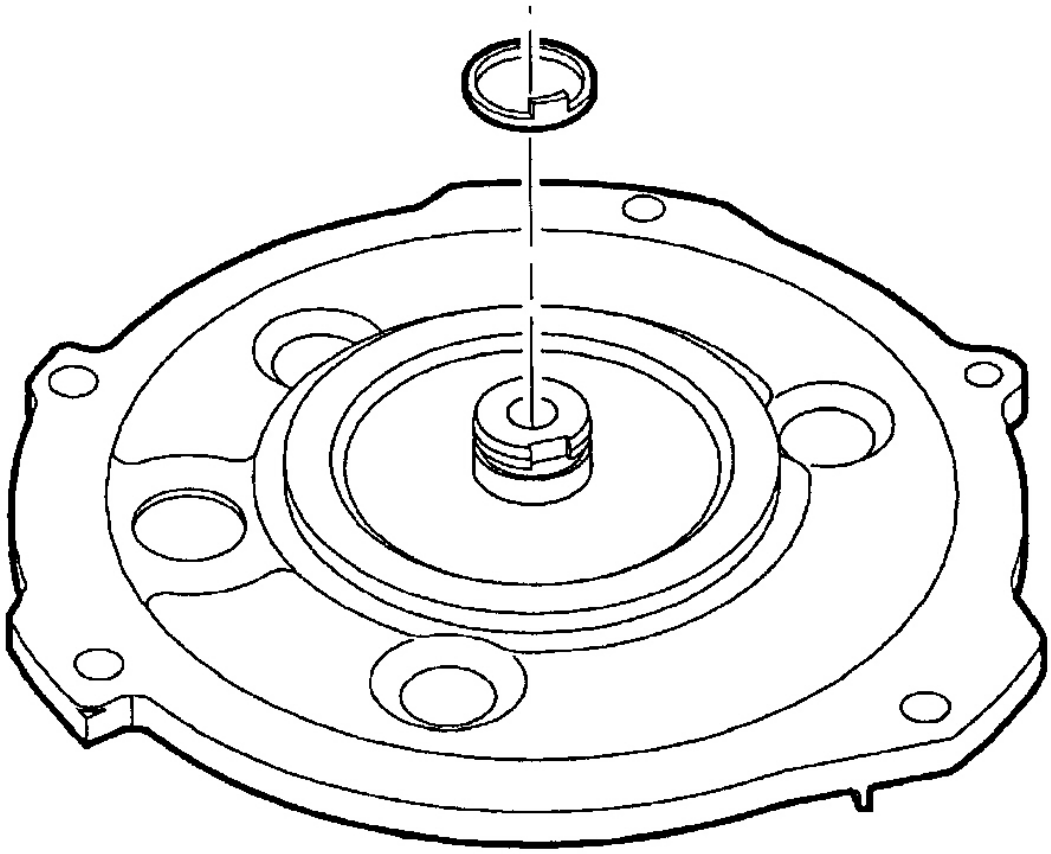

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Fig. 37: Inspecting Case Cover Seal
Courtesy of GENERAL MOTORS CORP.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Battery Hold-Down Screw	11 (15)
Battery Terminal Bolt	13 (17)
Battery Tray Bracket Screw	12 (16)
Transaxle Cooler Line Fitting	12 (16)

Transaxle Lower Tube Assembly	12 (16)
Transaxle Range Switch Lever Nut	12 (16)
	INCH Lbs. (N.m)
Battery Cooling Box Cover Screw	18 (2)
Battery Cooling Box Side Support Screw	89 (10)
Control Valve Body Assembly-To-Transaxle Case Assembly Bolt	71 (8)
Drive Pulley Cover Bolt	97 (11)
Front Fascia-To-Lower Front Fender Bolt	80 (9)
Harness Connector/Retainer Screw	35 (4)
Headlight bracket-To-Structure Bolt	89 (10)
Input and Output Speed Sensor Bolt	97 (11)
Transaxle Oil Cooler Line Nut	71 (8)
Transaxle Lower Tube Plug	97 (11)
Transaxle Range Switch Bolt	97 (11)
Underhood Fuse Box Terminal Nut	89 (10)
Valve Body Cover Bolt	97 (11)