1998-99 ENGINES

3.8L V6

MODEL IDENTIFICATION

MODEL IDENTIFICATION - CARS

Body Code (1)	Model
"C"	Park Avenue
"F"	Camaro & Firebird
"G"	Riviera
"H"	Bonneville, Eighty Eight, LeSabre, LSS & Regency
"W"	Grand Prix, Intrigue, Lumina, Monte Carlo & Regal
(1) Vehicle body code is fourth character of Vehicle Identification Number (VIN).	

ENGINE IDENTIFICATION

Engine can be identified by eighth character of Vehicle Identification Number (VIN) which is stamped on a metal pad located near lower left corner of windshield. See **ENGINE IDENTIFICATION CODES** table. "W" in the tenth character of the VIN indicates 1998 model year, and "X" indicates 1999 model year.

Engine can also be identified by a 3-character engine code (RPO code). See **ENGINE IDENTIFICATION CODES** table. This code may be stamped on engine. See **Fig. 1** .

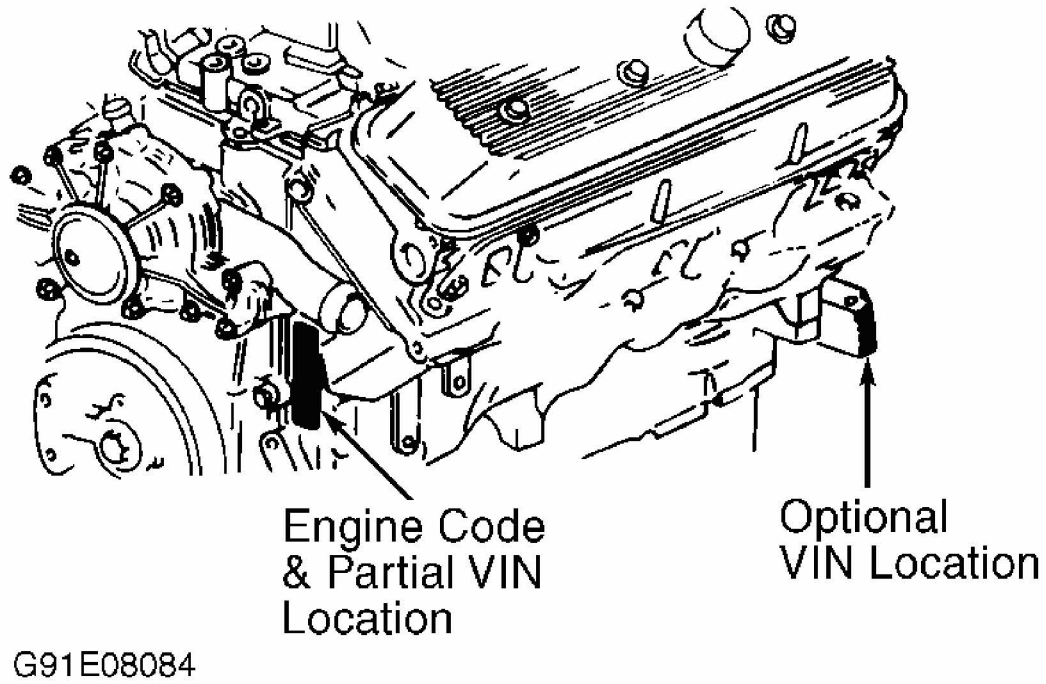


Fig. 1: Locating Engine Codes
Courtesy of GENERAL MOTORS CORP.

ENGINE IDENTIFICATION CODES

Engine	Code
3.8L SFI	
8th Character Of Dash VIN	K
Engine Code (RPO Code)	L36
3.8L SFI Supercharged	
8th Character Of Dash VIN	1
Engine Code (RPO Code)	L67

ADJUSTMENTS

VALVE CLEARANCE ADJUSTMENT

Hydraulic valve lifters are used. No valve adjustment is required.

TROUBLE SHOOTING

NOTE: To trouble shoot mechanical engine components, see appropriate table in TROUBLE SHOOTING - BASIC PROCEDURES article in

GENERAL INFORMATION.

REMOVAL & INSTALLATION

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. For 1998 models, see COMPUTER RELEARN PROCEDURES - GENERAL MOTORS article in GENERAL INFORMATION before disconnecting battery. For 1999 models, see COMPUTER RELEARN PROCEDURES - GENERAL MOTORS article in GENERAL INFORMATION before disconnecting battery.

NOTE: For reassembly reference, label all electrical connectors, vacuum hoses and fuel lines before removal. Also place mating marks on engine hood and other major assemblies before removal.

FUEL PRESSURE RELEASE

Disconnect negative battery cable. Loosen fuel tank filler cap. Connect Fuel Pressure Gauge (J-34730-1) to fuel line fitting (wrap shop towel around fitting to absorb leakage). Place gauge bleed hose into container. Open bleed valve to release pressure.

COOLING SYSTEM BLEEDING

Except "W" Body

1. Fill radiator to base of filler neck. Start engine. Place A/C-heater control in any position except MAX. Select highest temperature setting. Idle engine until lower radiator hose is hot.
2. Increase engine speed to 3000 RPM and then back to idle. Do this 5 times to expel any air trapped in system. Fill radiator as necessary. Install radiator cap. Allow engine to cool. Fill coolant recovery reservoir as necessary.

"W" Body

Open air bleed valve on thermostat housing. Fill radiator until coolant level is even with filler neck and no air bubbles are coming out of air bleed valve. Close air bleed valve. Install radiator cap. Fill coolant reservoir. Warm engine. Allow engine to cool. Fill radiator and coolant reservoir.

POWER STEERING BLEEDING

CAUTION: If air was introduced into hydraulic system during

servicing, bleed system. Aerated fluid, which appears Light Tan in color, results in poor steering performance and will cause pump damage.

1. Turn ignition off. Raise and support vehicle with front wheels off ground. Turn wheels fully to left. Add power steering fluid to FULL COLD mark on dipstick. Turn wheels from side to side at least 20 times, but DO NOT touch steering stops. Add fluid as necessary to maintain level at FULL COLD mark.
2. Start engine. With engine idling, check fluid level. Add fluid as necessary to bring fluid level to FULL COLD mark. Return wheels to center position. Lower vehicle. Continue to run engine for 2 to 3 minutes to raise temperature of fluid and eliminate trapped air. Turn steering wheel in both directions.
3. Road test vehicle. Check for leaks. Ensure fluid level is at FULL HOT mark when fluid is stabilized at operating temperature.

ENGINE

Removal & Installation (Except "W" & "F" Bodies)

1. Remove hood. Disconnect battery cables. Release fuel pressure. See **FUEL PRESSURE RELEASE** . Drain cooling system. Drain engine oil. Remove strut tower cross brace (if equipped). Remove windshield washer, radiator and heater supply hoses.
2. Disconnect electrical connectors as necessary. Remove serpentine belt. Remove power steering pump (leave hoses attached). Remove airflow duct and air cleaner. Disconnect cables and hoses from throttle body. Remove ignition coil ground strap.
3. Disconnect fuel lines and vacuum hoses. Disconnect upper engine strut. Raise and support vehicle. Disconnect exhaust pipe. Disconnect engine mount bolts. Attach a suitable lifting hook and chain to engine lifting brackets. Raise engine slightly to take weight off mounts.
4. Remove A/C compressor (leave hoses attached). Disconnect engine oil cooler lines (if equipped). Remove front engine mount and right front engine-to-transaxle bracket. Support transaxle. Remove bolts securing transaxle to engine.
5. Remove flexplate cover. Mark flexplate in relation to torque converter for reassembly reference. Remove torque converter bolts. Remove starter. Separate transaxle from engine. Lift engine out of vehicle.
6. To install, reverse removal procedure. Fill and bleed cooling system. See **COOLING SYSTEM BLEEDING** . Fill and bleed power steering system. See **POWER STEERING BLEEDING** . Tighten bolts to specification. See **TORQUE SPECIFICATIONS** table.

Removal & Installation ("F" Body)

1. Disconnect negative and positive battery cables. Discharge A/C system using approved

refrigerant recovery/recycling equipment. Relieve fuel pressure. See **FUEL PRESSURE RELEASE** . Disconnect A/C compressor and condenser hose from accumulator. Plug openings. Raise and support vehicle. Remove front tires. Drain coolant and engine oil.

2. Remove heated oxygen sensors. Remove catalytic converter bolts. Remove exhaust pipe clamp bolt at catalytic converter and remove catalytic converter. Remove front fascia lower deflectors and stabilizer bar bushing bolts. Remove radiator inlet hose.
3. On A/T models, remove torque converter bolts. Disconnect transmission fluid oil cooler lines. Disconnect transmission range selector lever cable from transmission. Remove left and right transmission support brackets.
4. On M/T models, disconnect transmission control lever handle. Remove clutch actuator cylinder line from actuator. On all models, remove driveshaft. Remove torque arm from transmission.
5. Remove steering gear coupling shaft from rack and pinion. Remove ground strap. Remove starter. Disconnect A/C compressor and condenser hose from compressor and condenser. Remove negative battery cable from rear compressor bracket mounting stud.
6. Lower vehicle. Remove heater hoses from drive belt tensioner. Remove air cleaner. Disconnect fuel lines at fuel rail. disconnect cruise control cable from throttle body. Disconnect accelerator control cable from throttle body. Remove radiator outlet hose from thermostat housing.

WARNING: To avoid personal injury, gear tension relief function of scan tool must be performed prior to disconnecting ABS hydraulic modulator. See appropriate ANTI-LOCK article in BRAKES.

7. Disconnect brake booster vacuum hose. Using scan tool, perform gear tension relief sequence. See appropriate ANTI-LOCK article in BRAKES. Disconnect BRAKELINES and clips from ABS hydraulic modulator. Remove right-hand body hinge pillar trim panel. Disconnect engine wiring harness connectors. Disconnect forward lamp wiring harness connectors.
8. Disconnect Powertrain Control Module (PCM) and harness, and place on top of engine. Pull engine wiring harness through front dash. Place harness on top of engine. Disconnect positive lead at generator. Remove lower shock attachment nuts and bolts from lower control arms. Remove upper control arm ball stud from steering knuckle. Use upper control arm to secure struts.
9. Disconnect electrical connectors to wheel speed sensors at engine frame. Position engine support under engine frame. Remove engine frame and transmission support bolts. Lower engine, transmission and engine frame. Remove transmission. On M/T models, remove clutch housing and clutch. On all models, remove engine mount through-bolts. Remove engine from engine frame.

10. To install, reverse removal procedure. Fill and bleed cooling system. See **COOLING SYSTEM BLEEDING** . Tighten bolts to specification. See **TORQUE SPECIFICATIONS** table.

Removal & Installation ("W" Body)

1. Remove hood. Disconnect negative battery cable. Release fuel pressure. See **FUEL PRESSURE RELEASE** . Remove air cleaner. Disconnect fuel lines from fuel rail. Remove coolant recovery bottle, inner fender electrical cover, and fuel injector cover. Disconnect throttle cables.
2. Remove heat shield from exhaust crossover pipe. Remove throttle cable bracket and vacuum line as an assembly. Remove exhaust crossover pipe. Remove engine torque strut from between engine and top of radiator panel. Drain cooling system. Disconnect oil cooler hoses from radiator.
3. Remove serpentine belt. Remove power steering pump. Where necessary to gain clearance, remove washer reservoir, diagonal braces, cooling fans, generator and generator support bracket with ignition coil pack. Raise and support vehicle. Remove flexplate cover. Mark flexplate in relation to torque converter for reassembly reference. Remove torque converter bolts. Remove A/C compressor (leave hoses attached). Remove starter.
4. Remove bolts securing transaxle mount to engine. Remove nuts securing engine mount to frame. Disconnect oil cooler pipes. Disconnect exhaust pipe from manifold. Lower vehicle. Remove bolts securing transaxle to engine. Separate transaxle from engine. Lift engine out of vehicle.
5. To install, reverse removal procedure. Fill and bleed cooling system. See **COOLING SYSTEM BLEEDING** . Fill and bleed power steering system. See **POWER STEERING BLEEDING** . Tighten bolts to specification. See **TORQUE SPECIFICATIONS** table.

INTAKE MANIFOLD (UPPER)

NOTE: On supercharged engine VIN 1), supercharger acts as an upper intake manifold. See SUPERCHARGER .

Removal (All Except "F" Body)

1. Release fuel pressure. See **FUEL PRESSURE RELEASE** . Disconnect negative battery cable. Drain cooling system. Remove throttle body air intake duct.
2. Remove fuel injector sight shield. Disconnect right bank spark plug wires and set aside. Disconnect evaporative emissions canister purge solenoid valve harness connector. Remove fuel rail. Disconnect brake booster vacuum hose. Remove EGR heat shield.
3. Remove throttle cable bracket as necessary and set aside. Remove throttle body support bracket. Disconnect MAP sensor harness connector. Remove upper intake manifold

bolts, upper intake manifold and gasket.

Removal ("F" Body)

1. Release fuel pressure. See **FUEL PRESSURE RELEASE** . Disconnect negative battery cable. Drain cooling system. Disconnect the Intake Air Temperature (IAT) sensor harness connector. Remove throttle body air intake duct.
2. Remove serpentine belt. Disconnect wiring at generator. Disconnect and remove evaporative canister purge solenoid. Remove generator bolts and generator.

CAUTION: The drive belt tensioner must be rotated, if it is difficult to remove. Pulling the tensioner from top may damage the engine front cover. If necessary, break the plastic thermostat bypass upper pipe to allow rotation of the drive belt tensioner and replace the pipe during installation.

3. Remove heater hoses from drive belt tensioner. Remove drive belt tensioner bolts. Remove drive belt tensioner. Disconnect vacuum hoses and electrical connectors as necessary. Remove evaporative emissions canister purge solenoid valve. Remove intake manifold vacuum source fitting from upper intake manifold, just above fuel rail.
4. Remove Idle Air Control (IAC) valve. Disconnect fuel feed and return pipes from fuel rail. Disconnect EVAP pipe at engine. Disconnect cruise control and accelerator cables from throttle body. Remove cruise control and accelerator cables from throttle body cable bracket as necessary. Remove throttle body cable bracket bolts and throttle body cable bracket.
5. Disconnect ignition control module harness connector. Reference mark spark plug wires at ignition coils. Disconnect spark plug wires at ignition coils and set aside. Remove ignition control module/coil assembly mounting bolts/nuts. Remove ignition control module/coil assembly.
6. Remove generator brace-to-lower intake manifold bolts. Remove generator brace from lower intake manifold. Remove throttle body-to-upper intake manifold bolts. Remove throttle body from upper intake manifold.
7. Remove EGR valve outlet pipe retaining bolt and nut. Remove EGR valve outlet pipe. Disconnect upper radiator hose at thermostat housing. Remove thermostat housing bolts, thermostat housing and thermostat.
8. Disconnect fuel injector harness connectors. Using compressed air, clean dirt from injector bores, near bottom of injectors. Remove fuel rail retaining nuts. Remove fuel rail and set aside. Remove upper intake manifold bolts, upper intake manifold and gasket.

Installation

1. Ensure sealing surfaces, bolt threads and bolt holes are clean. Install upper intake manifold and NEW gasket.
2. Coat bolt threads with thread locking compound. Tighten upper intake manifold bolts in sequence to specification. See **Fig. 2** or **Fig. 3** . See **TORQUE SPECIFICATIONS** .
3. Lubricate fuel rail "O" rings with clean engine oil. To complete installation, reverse removal procedure. Fill and bleed cooling system. See **COOLING SYSTEM BLEEDING** .

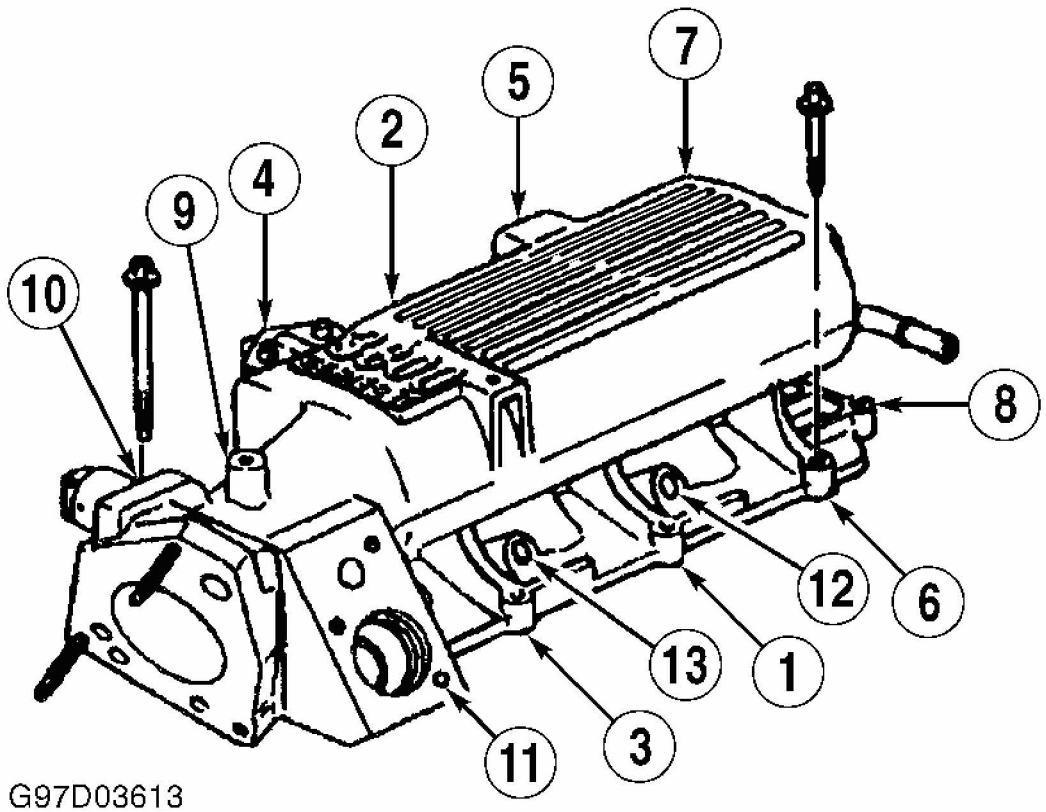


Fig. 2: Upper Intake Manifold Bolt Tightening Sequence VIN "K" ("F" Body)
Courtesy of GENERAL MOTORS CORP.

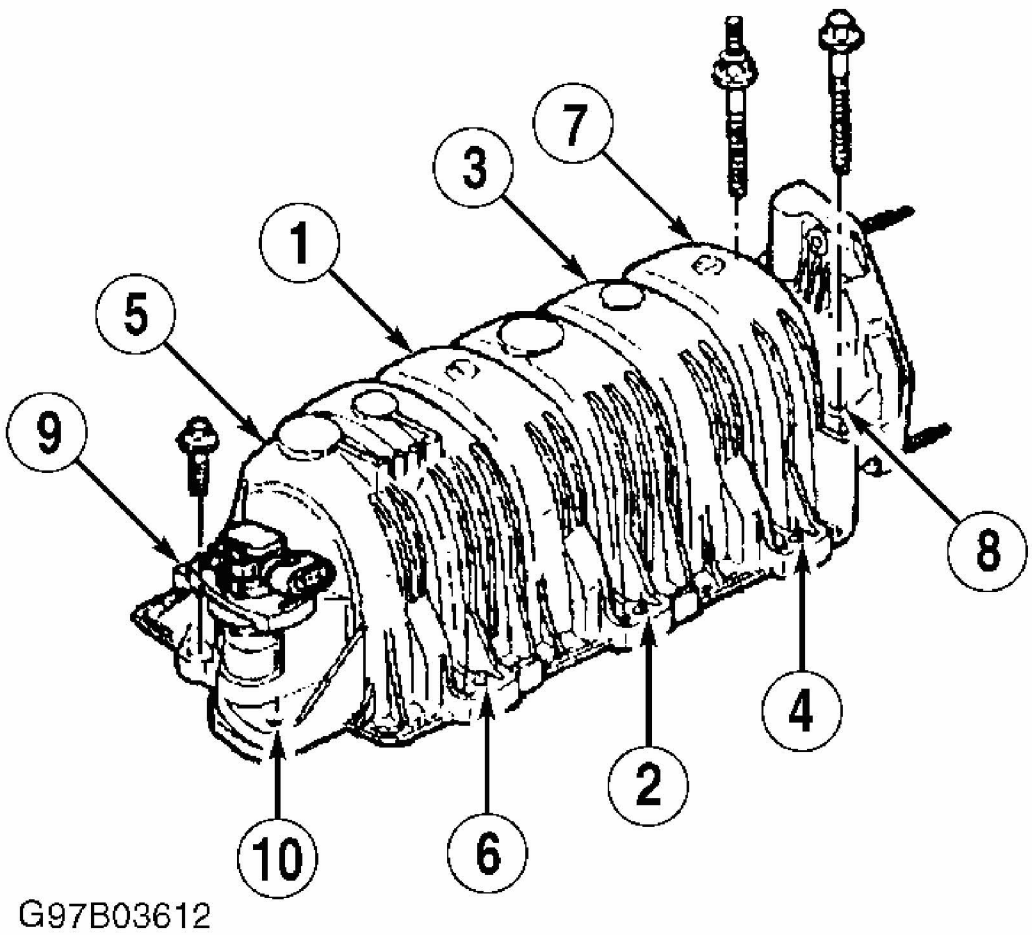


Fig. 3: Upper Intake Manifold Bolt Tightening Sequence VIN "K" (Except "F" Body) Courtesy of GENERAL MOTORS CORP.

INTAKE MANIFOLD (LOWER)

Removal

1. On VIN "K", remove upper intake manifold. See **INTAKE MANIFOLD (UPPER)** . On VIN "1", remove supercharger. See **SUPERCHARGER** .
2. On all models, remove spark plug wires and fuel rail (if not previously removed). Remove exhaust crossover heat shield and power steering pump bracket. Remove serpentine belt, generator and generator bracket (if not previously removed). Remove cable bracket, heater pipes and by-pass hose.
3. Remove lower intake manifold bolts. On VIN "K", 2 bolts are hidden in right front and left rear corners of lower intake manifold. On all models, remove lower intake manifold, gaskets and seals.

Installation

1. Ensure sealing surfaces and bolt threads and holes are clean. Apply GM Sealant (12345336) at end of seals on cylinder block. Install manifold and gaskets. Coat bolt threads with thread locking compound.
2. Tighten the intake manifold bolts in sequence to specification. See **Fig. 4** or **Fig. 5** . See **TORQUE SPECIFICATIONS** . Lubricate fuel rail "O" rings with engine oil. To complete installation, reverse removal procedure. Fill and bleed engine cooling system. See **COOLING SYSTEM BLEEDING** .

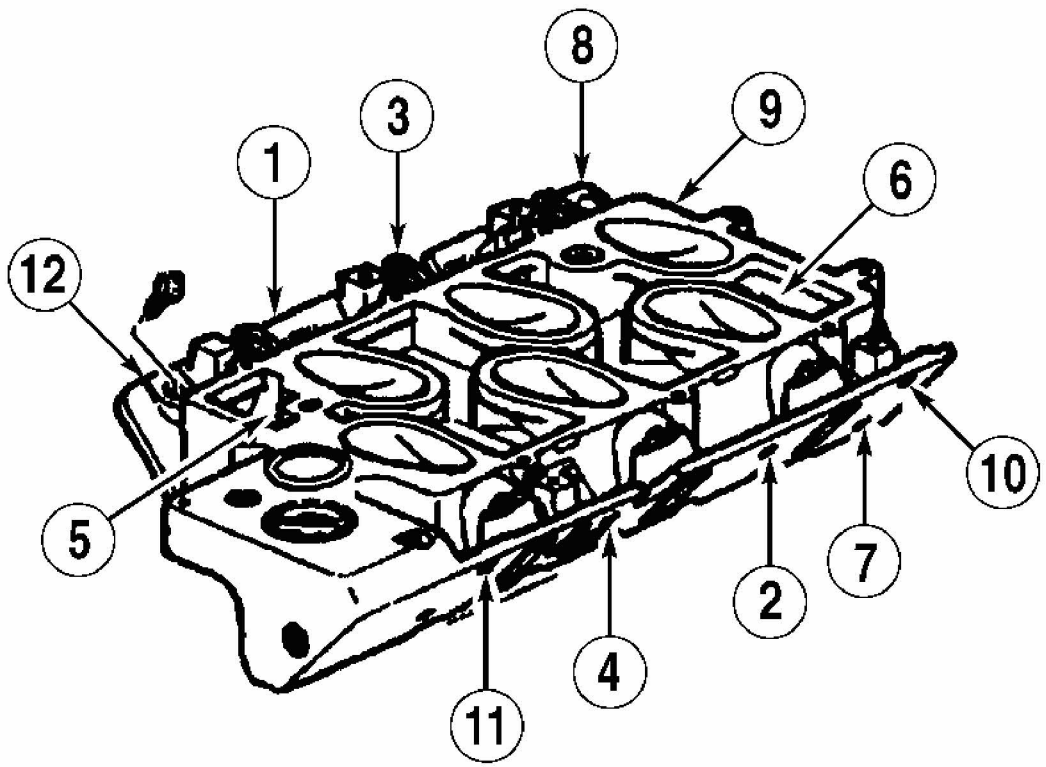


Fig. 4: Lower Intake Manifold Bolt Tightening Sequence - "F" Body
Courtesy of GENERAL MOTORS CORP.

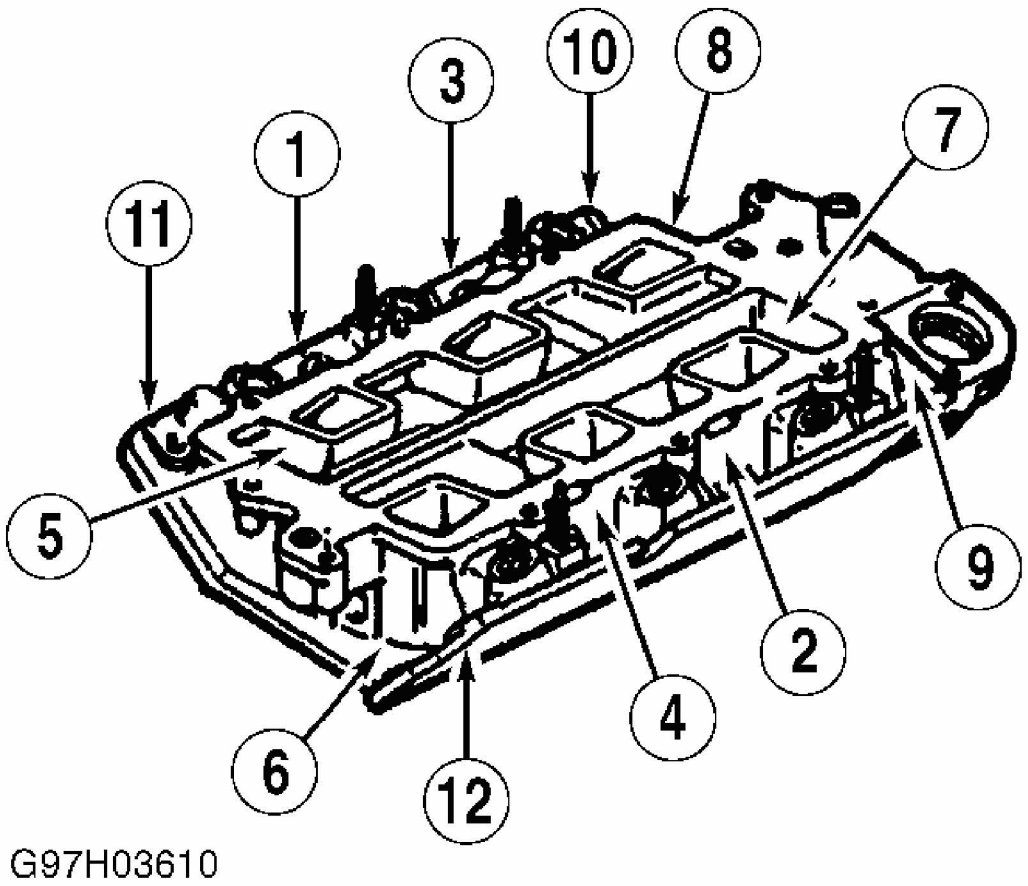


Fig. 5: Lower Intake Manifold Bolt Tightening Sequence - Except "F" Body (VIN "K" Shown, VIN "1" Is Similar)
Courtesy of GENERAL MOTORS CORP.

EXHAUST MANIFOLDS

NOTE: Not all components need to be removed on all models. Remove as necessary for access and clearance.

Removal & Installation (Left - All Except "F" Body)

1. Disconnect negative battery cable. Remove air inlet duct. Disconnect spark plug wires. Remove crossover pipe from manifold. On some models, it may be necessary to remove cooling fan and/or radiator hose for clearance.
2. On all models, remove engine lift hook and manifold heat shield (if equipped). Remove oil dipstick tube and oil dipstick. Remove exhaust manifold bolts, exhaust manifold and gasket. To install, reverse removal procedure using NEW gasket. Tighten fasteners to

specification. See **TORQUE SPECIFICATIONS** .

Removal & Installation (Left - "F" Body)

1. Raise and support vehicle. Disconnect the left heated oxygen sensor electrical connector from the wire support bracket. Remove the left heated oxygen sensor. Remove the exhaust pipe-to-exhaust manifold bolts.
2. Disconnect left bank spark plug wires at the spark plugs and move aside. Remove spark plugs from cylinders No. 3 and 5. Remove the two rear exhaust manifold-to-cylinder head nuts/bolts. Lower vehicle.

CAUTION: When removing the EGR inlet tube from the left exhaust manifold, inspect the pipe for leaks during installation. Replace the EGR adapter if the pipe leaks.

3. Remove the EGR inlet pipe bolt and nuts. Remove the EGR inlet pipe from the exhaust manifold.
4. Remove spark plug from cylinder No. 1. Remove the exhaust manifold heat shield nuts. Remove the exhaust manifold heat shields. Remove the remaining exhaust manifold-to-cylinder head nuts/bolts. Remove the exhaust manifold. Remove the exhaust manifold gasket.
5. To install, reverse removal procedure using NEW gasket. Tighten fasteners to specification. See **TORQUE SPECIFICATIONS** .

Removal & Installation (Right - All Except "F" Body)

NOTE: Whenever right exhaust manifold pipe is removed, inspect EGR outlet pipe for leaks. If any leaks exist, replace EGR adapter.

1. Disconnect negative battery cable. Remove air inlet duct. Remove throttle cable from throttle body. Remove brake booster hose. Remove serpentine belt and power steering pump bracket with hoses attached, and position aside.
2. Drain cooling system. Disconnect spark plug wires and oxygen sensor. Disconnect crossover pipe and exhaust pipe from manifold. Remove transaxle dipstick tube and dipstick.
3. Remove manifold heat shield (if equipped). Remove catalytic converter heat shield and pipe hanger. Remove exhaust pipe-to-exhaust manifold nuts/bolts. Remove engine lift bracket. Remove exhaust manifold bolts, exhaust manifold and gasket.
4. To install, reverse removal procedure using NEW gasket. Tighten fasteners to specification. See **TORQUE SPECIFICATIONS** .

Removal & Installation (Right - "F" Body)

1. Raise and support vehicle. Remove the right heated oxygen sensor electrical connector

from the lift bracket. Remove the right heated oxygen sensor. Remove the exhaust pipe-to-exhaust manifold bolts.

2. Disconnect spark plug wires at cylinders No. 4 and 6 and move aside. Remove cylinder No. 6 spark plug. Remove the two rear exhaust manifold-to-cylinder head nuts/bolts. Lower vehicle.
3. Disconnect spark plug wire at cylinder No. 2. Remove spark plugs from cylinders No. 2 and 4. Remove the exhaust manifold heat shield nuts. Remove the exhaust manifold heat shields.
4. Remove the remaining exhaust manifold-to-cylinder head nuts/bolts. Remove the exhaust manifold. Remove the exhaust manifold gasket.
5. To install, reverse removal procedure using NEW gasket. Tighten fasteners to specification. See **TORQUE SPECIFICATIONS** .

SUPERCHARGER

Removal

1. Release fuel pressure. See **FUEL PRESSURE RELEASE** . Disconnect negative battery cable. Partially drain cooling system. Remove accessory drive belt from supercharger pulley. Remove fuel injector shield. Disconnect fuel lines from fuel rail. Disconnect vacuum hoses as necessary.
2. Disconnect electrical connectors from fuel injectors. Remove electrical harness shield. Disconnect electrical harness from front of supercharger. Remove fuel rail and injectors as an assembly. Disconnect electrical connectors as necessary. Remove air intake duct. Disconnect EGR pipe, throttle cable, and cruise control cable from supercharger. Remove boost pressure/vacuum hose block. Remove cable bracket.
3. Remove stud securing tensioner bracket to supercharger (use a stud remover or jam-nut procedure, if necessary). This stud must be removed to allow supercharger to clear lower intake locator pins. Remove throttle body from supercharger. Remove supercharger bolts, supercharger and gasket.

Installation

Install NEW supercharger gasket. DO NOT use sealant on supercharger gasket. Install supercharger. Tighten bolts to specification. See **TORQUE SPECIFICATIONS** table. To complete installation, reverse removal procedure.

CYLINDER HEAD

NOTE: Not all components need to be removed on all models. Remove as necessary for access and clearance.

Removal (All Except "F" Body)

1. Remove the upper and lower intake manifold. See **INTAKE MANIFOLD (UPPER)** and **INTAKE MANIFOLD (LOWER)** . Remove exhaust manifold. See **EXHAUST MANIFOLDS** .
2. On front cylinder head applications, disconnect spark plug wires. Remove engine lift bracket and rocker arm cover. Remove exhaust crossover pipe and cooling fan. Remove generator. Remove ignition coil and bracket. Remove A/C compressor bracket bolt.
3. On rear cylinder head, disconnect spark plug wires. Remove exhaust crossover pipe. Remove power steering pump with hoses attached, and position aside. Remove heater pipe from front cover housing. Remove transaxle dipstick tube and dipstick.
4. Remove rocker arms, push rods and guide plates. See **ROCKER ARMS & PUSH RODS** . Remove cylinder head bolts, and discard. Remove cylinder head and gasket.

Removal ("F" Body)

1. Remove the upper and lower intake manifold. See **INTAKE MANIFOLD (UPPER)** and **INTAKE MANIFOLD (LOWER)** . Remove exhaust manifold. See **EXHAUST MANIFOLDS** .
2. Unbolt any accessories attached to ends of cylinder head. Remove rocker arm covers, rocker arms & push rods. See **ROCKER ARMS & PUSH RODS** .
3. Remove cylinder head bolts. Remove cylinder head and gasket.

Inspection

Inspect cylinder head for warpage. See **CYLINDER HEAD** under OVERHAUL.

Installation

1. Ensure cylinder head bolt threads and cylinder block holes are clean. Ensure all gasket holes align with cylinder block and arrow on gasket is pointing to front of engine. Apply GM Sealant (1052080) to cylinder head bolt threads.
2. Install NEW cylinder head gasket. Tighten bolts to specification in sequence. See **TORQUE SPECIFICATIONS** table. See **Fig. 6** . To complete installation, reverse removal procedure.

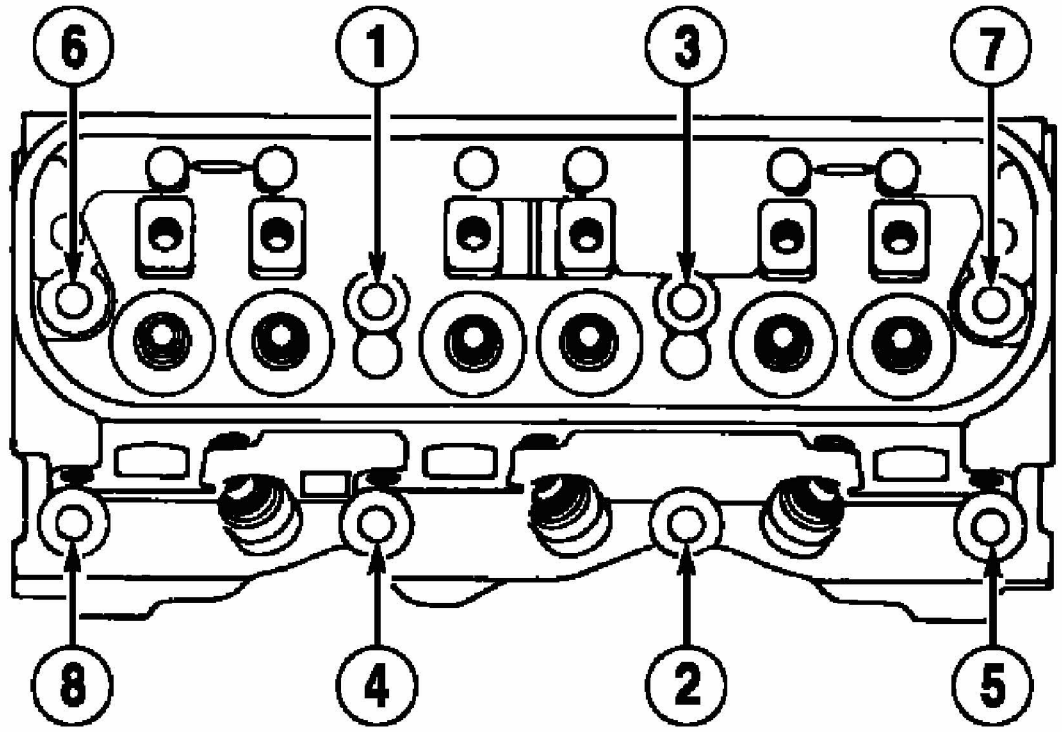


Fig. 6: Cylinder Head Bolt Tightening Sequence
Courtesy of GENERAL MOTORS CORP.

FRONT COVER SEAL

Removal

Disconnect negative battery cable. Remove serpentine belt. Raise and support vehicle. On all models except "F" body, remove right front wheel and inner splash shield. On all models, remove crankshaft pulley/balancer bolt and crankshaft pulley/balancer. Pry seal from front cover and discard seal.

Installation

Coat seal with oil. Using Seal Installer (J-35354) and crankshaft pulley/balancer bolt, install seal. Remove seal installer. Coat sealing surface of crankshaft pulley/balancer with oil. To complete installation, reverse removal procedure. Tighten fasteners to specification. See **TORQUE SPECIFICATIONS** .

FRONT COVER

Removal

1. Disconnect negative battery cable. Drain cooling system and crankcase oil. Remove serpentine belt. Remove water pump pulley. Disconnect heater pipes. Disconnect coolant hoses from front cover.
2. Raise and support vehicle. On all models except "F" Body, remove right front wheel and inner splash shield. On all models, remove crankshaft balancer bolt. Remove crankshaft balancer. Disconnect electrical connections at oil pressure sender, camshaft sensor and crankshaft sensor.
3. Remove bolts securing front cover to oil pan. Remove power steering pump (leave hoses attached). Remove remaining bolts, front cover and gasket. See **Fig. 7** .

Installation

1. Replace timing chain and sprockets if worn. See **TIMING CHAIN & SPROCKETS** . Install NEW front cover gasket. Coat front cover bolt threads with Sealant (1052080). Install NEW crankshaft balancer bolt. To install, reverse removal procedure. Install crankshaft sensor and shield.
2. Install Crankshaft Sensor Gauge (J-37089) onto rear of crankshaft balancer. See **Fig. 8** . If gauge contacts balancer at any point, replace crankshaft balancer. To complete installation, reverse removal procedure. Coat sealing surface of crankshaft balancer and seal with oil. Tighten fasteners to specification. See **TORQUE SPECIFICATIONS** .

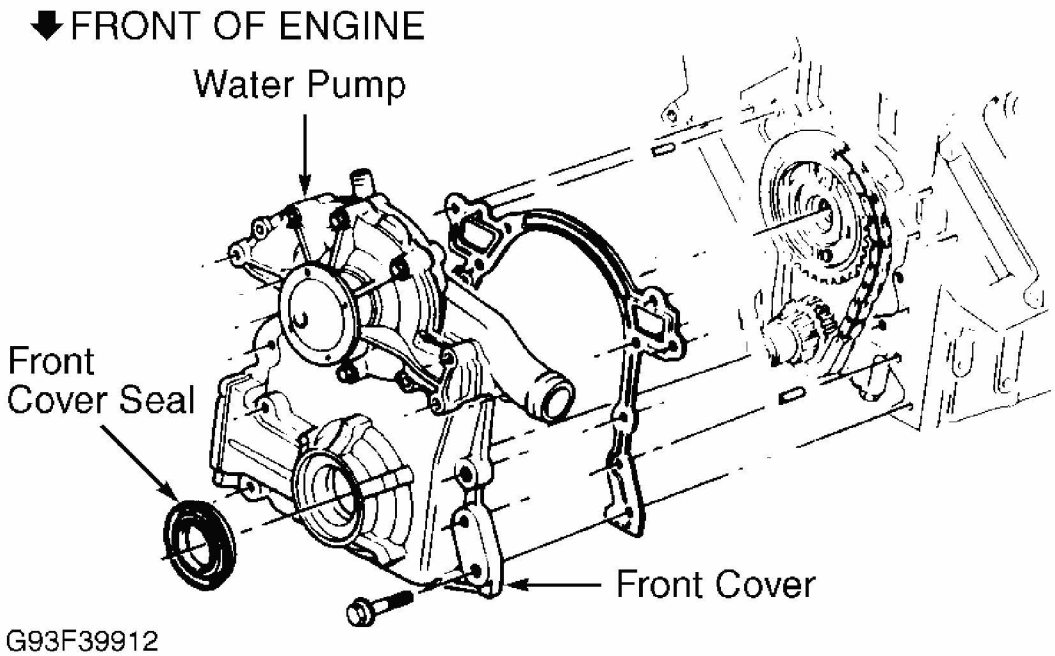


Fig. 7: Removing Front Cover
Courtesy of GENERAL MOTORS CORP.

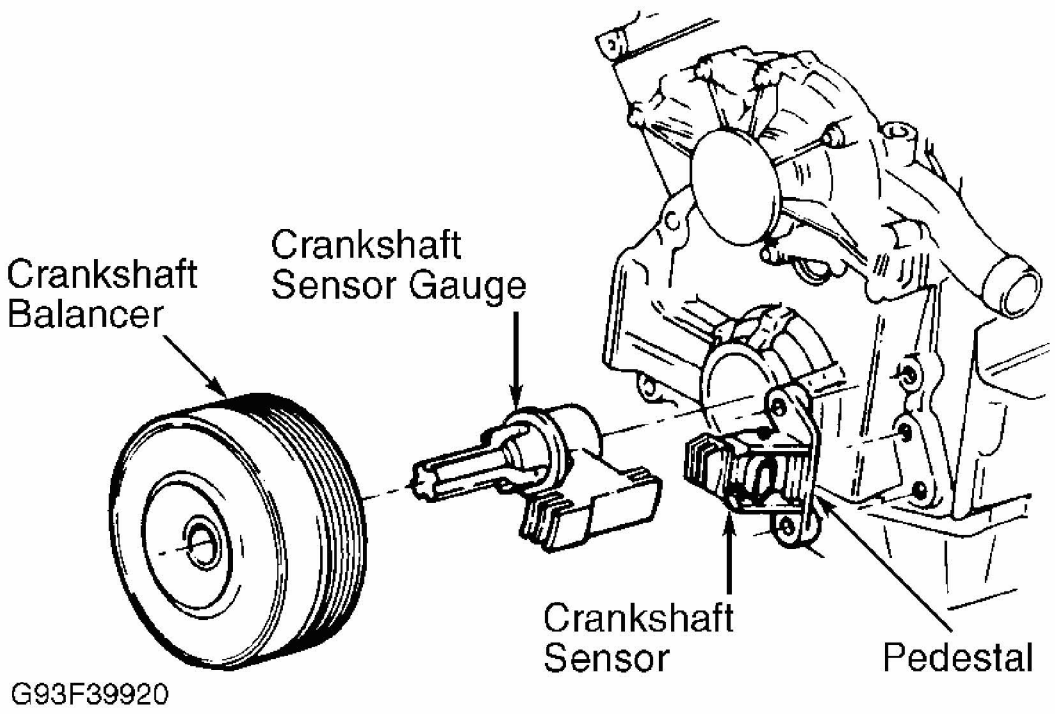


Fig. 8: Checking Crankshaft Balancer Clearance
Courtesy of GENERAL MOTORS CORP.

TIMING CHAIN & SPROCKETS

Removal

1. Remove front cover. See **FRONT COVER** . Inspect timing chain and sprockets for wear. Timing chain in-and-out movement should not exceed 1" (25.4 mm). Replace components as necessary.
2. Rotate crankshaft to align timing marks on camshaft and crankshaft sprockets. See **Fig. 9** . Remove timing chain damper assembly. Remove camshaft sprocket bolts, and discard. Remove camshaft sprocket and timing chain. Remove crankshaft sprocket.

NOTE: If balance shaft has been moved, ensure alignment is correct before installing timing chain and sprockets. See BALANCE SHAFT .

Installation

1. If engine has been rotated, rotate the crankshaft so No. 1 cylinder is at TDC. Temporarily install camshaft sprocket. Rotate camshaft sprocket so timing mark points downward.

2. Install timing chain on camshaft and crankshaft sprockets. Align timing marks. See **Fig. 9** . Install NEW camshaft sprocket bolts. Install timing chain damper. Rotate engine 2 revolutions. Ensure timing marks are aligned. To complete installation, reverse removal procedure.

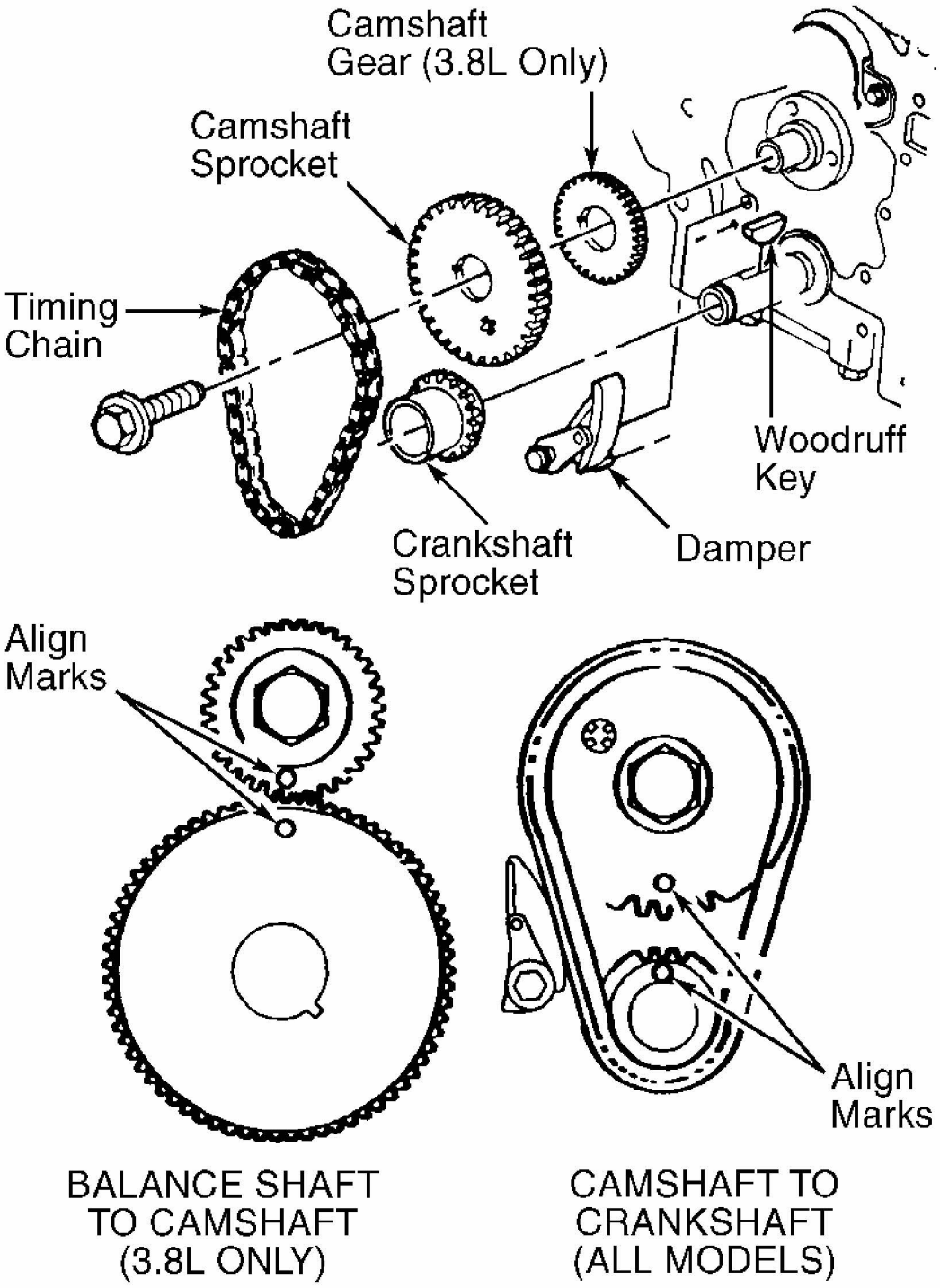


Fig. 9: Exploded View Of Timing Chain & Sprockets
Courtesy of GENERAL MOTORS CORP.

ROCKER ARMS & PUSH RODS

NOTE: Not all components need to be removed on all models. Remove as necessary for access and clearance.

Removal

1. Disconnect negative battery cable. Remove serpentine belt. To remove left rocker arm cover, remove generator bracket and spark plug wires. On all models except "F" body, disconnect torque strut (if equipped) at radiator support. Remove torque strut bracket bolts at manifolds. Remove engine lift bracket.
2. On all models, to remove right rocker arm cover, loosen power steering pump bolts, and move pump forward with hoses still attached. Remove power steering pump brackets. Remove spark plug wires.
3. On either side, remove rocker arm cover. Remove and discard rocker arm pivot bolts. Mark rocker arm component locations for reassembly reference. Remove rocker arms and components. See **Fig. 10** .

Installation

To install, reverse removal procedure. Apply Prelube (GM P/N 12345501) or equivalent, to any bearings and friction surfaces. Using NEW bolts, coat rocker arm bolt threads with thread Threadlock (12345493). Apply thread sealant to rocker arm cover bolt threads. Tighten fasteners to specification. See **TORQUE SPECIFICATIONS** .

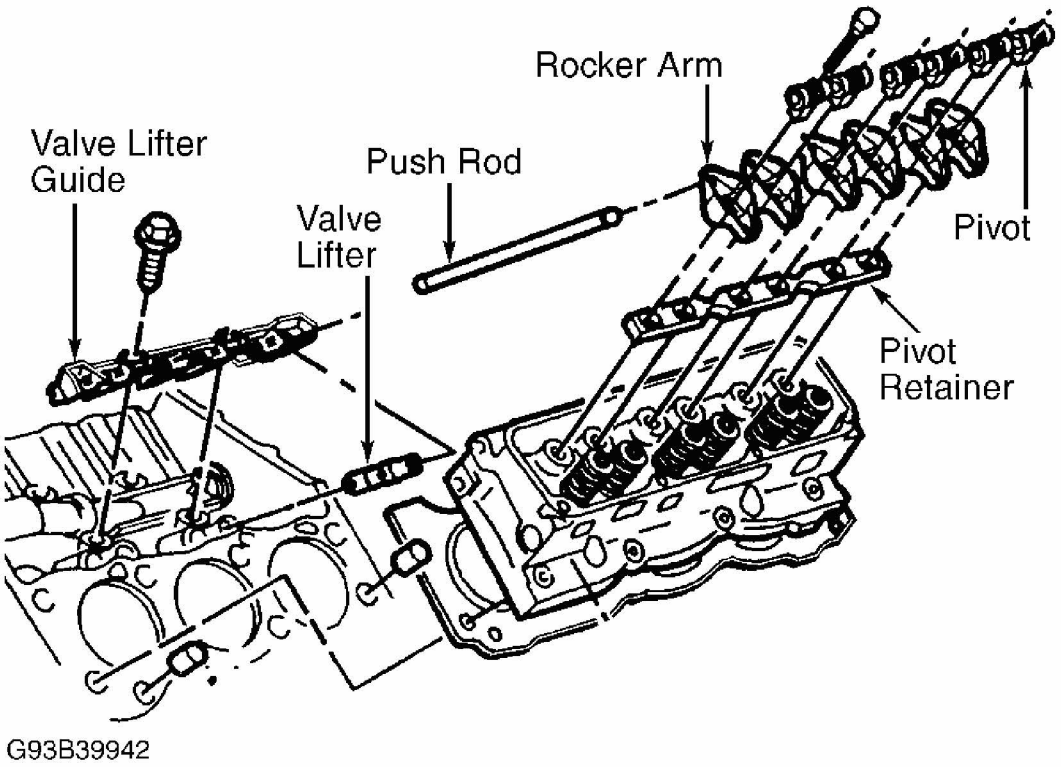


Fig. 10: Exploded View Of Rocker Arm & Components
Courtesy of GENERAL MOTORS CORP.

VALVE LIFTERS

Removal

Remove upper and lower intake manifold. See **INTAKE MANIFOLD (UPPER)** and **INTAKE MANIFOLD (LOWER)** . Remove rocker arm covers, rocker arms and push rods. See **ROCKER ARMS & PUSH RODS** . Remove valve lifter guide and valve lifters. See **Fig. 10** . Mark component locations for reassembly reference.

Installation

Coat valve lifters with Engine Oil Supplement (1052365). Install components in original location. To complete installation, reverse removal procedure. Tighten fasteners to specification. See **TORQUE SPECIFICATIONS** .

CAMSHAFT

Removal

1. Disconnect negative battery cable. On all models except "F" body, remove engine. See **ENGINE** .

2. On "F" body, Remove air cleaner assembly. Drain cooling system into suitable container. Recover refrigerant using approved refrigerant recovery/recycling equipment. Disconnect upper and lower hoses at radiator. Remove evaporator tube bolt near condenser. Disconnect and cap evaporator tube at condenser. Disconnect upper oil cooler line at radiator (if equipped).
3. Raise and support vehicle. Disconnect lower oil cooler line at radiator (if equipped). Remove condenser tube nut. Remove condenser tube from condenser. Lower vehicle. Remove the coolant recovery reservoir hose from the radiator. Remove electric fan assembly. Remove radiator and condenser as an assembly.
4. On all models, remove upper and lower intake manifold. See **INTAKE MANIFOLD (UPPER)** and **INTAKE MANIFOLD (LOWER)** . Remove rocker arms and push rods. See **ROCKER ARMS & PUSH RODS** .
5. Remove valve lifters. Remove timing chain and sprockets. See **TIMING CHAIN & SPROCKETS** . Remove camshaft thrust plate and camshaft. Using Remover/Installer (J-33049), remove camshaft bearings (if necessary).

Inspection

Measure camshaft journal diameter, lobe lift and oil clearance. Replace components if not within specification. See **CAMSHAFT** table under ENGINE SPECIFICATIONS.

Installation

Install camshaft bearings (if removed). Ensure oil holes are aligned. Coat camshaft journals and lobes with Lubricant (1052365). Install camshaft. Install components in original locations. Apply Sealant (1052914) to camshaft rear plug. To complete installation, reverse removal procedure. Ensure timing marks are aligned. Tighten fasteners to specification. See **TORQUE SPECIFICATIONS** .

BALANCE SHAFT

NOTE: Balance shaft removal procedure provided by manufacturer is with engine removed from vehicle. It may not be necessary to remove engine on some models for balance shaft removal.

Removal

1. Disconnect negative battery cable. Remove engine. See **ENGINE** . Remove flexplate/flywheel. Remove upper and lower intake manifolds. See **INTAKE MANIFOLD (UPPER)** and **INTAKE MANIFOLD (LOWER)** . Remove lifter guide. See **Fig. 10** .
2. Remove front cover. See **FRONT COVER** . Remove and discard balance shaft gear bolt. See **Fig. 11** . Remove camshaft sprocket and timing chain. See **TIMING CHAIN & SPROCKETS** . Remove balance shaft retainer and gear. See **Fig. 11** . Using Slide

Hammer (J-6125-1B), remove balance shaft from front of engine.

NOTE: Balance shaft and bearings are serviced as a complete assembly only. Use specified installation tools to prevent balance shaft damage.

3. Remove balance shaft plug from rear of cylinder block. Note direction of rear bearing installation. Using Balance Shaft Bearing Remover/Installer (J-36995), remove bearings from block. See **Fig. 12** .

Inspection

Replace components if damaged or not within specification. See **BALANCE SHAFT SPECIFICATIONS** table.

Installation

1. Lubricate balance shaft bearings with engine oil. Install NEW front and rear bearings using Balance Shaft Bearing Remover/Installer. On rear bearing, be sure rolled edge faces inward, toward engine, and manufacturer's marking faces flywheel side of engine. See **Fig. 12** .
2. Using Balance Shaft Installer (J-36996), install balance shaft. Temporarily install balance shaft retainer and bolts. Install balance shaft gear. Apply GM Threadlock (12345493) to NEW gear bolt, and install bolt. Tighten gear bolt to specification. See **TORQUE SPECIFICATIONS** table.
3. Install balance shaft rear plug. Using dial indicator, measure balance shaft end play and radial clearance at front and rear of balance shaft. See **Fig. 13** . Replace components if measurements are not within specification. See **BALANCE SHAFT SPECIFICATIONS** table.
4. Rotate camshaft so timing mark is pointing downward when sprocket is installed. With camshaft sprocket and gear removed, rotate balance shaft so timing mark on gear is pointing downward.
5. Rotate balance shaft to align timing marks on camshaft gear and balance shaft gear, and install camshaft gear. See **Fig. 9** . Rotate crankshaft so No. 1 piston is at TDC. Install timing chain and sprocket. Ensure timing marks are aligned. See **Fig. 9** .
6. Using dial indicator, measure gear lash at 4 places, every 1/4 turn. Gear lash should be within specification. See **BALANCE SHAFT SPECIFICATIONS** table.
7. If measurements are within specification, tighten balance shaft retainer bolts to specification. See **TORQUE SPECIFICATIONS** table. To complete installation, reverse removal procedure.

BALANCE SHAFT SPECIFICATIONS

Application	In. (mm)

Bearing Bore I.D.	
Front	2.0462-2.0472 (51.973-51.999)
Rear	1.8735-1.8745 (47.584-47.612)
End Play	0-.0067 (0-.171)
Gear Lash	.002-.005 (.05-.13)
Radial Clearance	
Front	0-.0010 (0-.026)
Rear	.0005-.0043 (.013-.109)

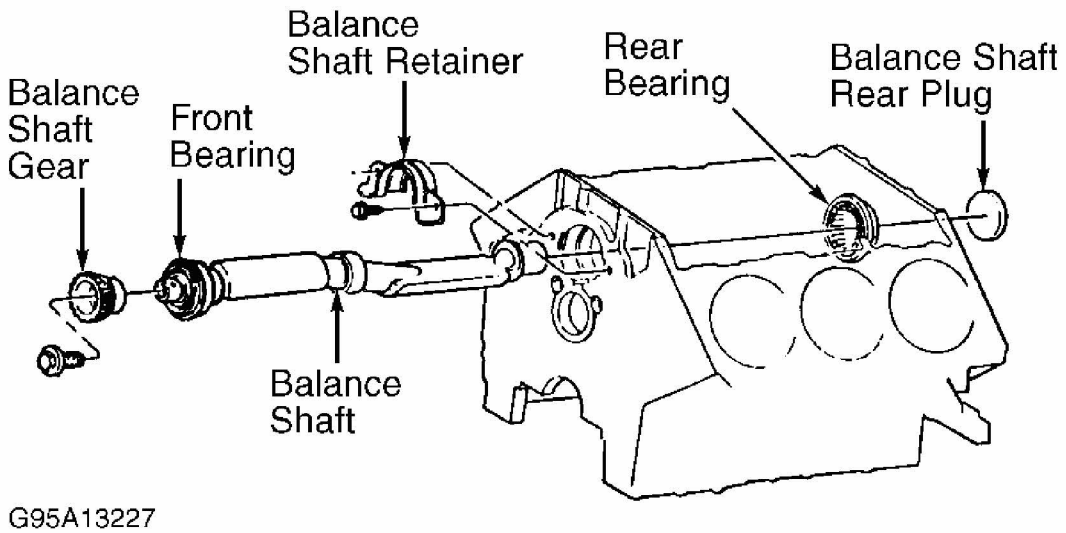


Fig. 11: Identifying Balance Shaft & Components
Courtesy of GENERAL MOTORS CORP.

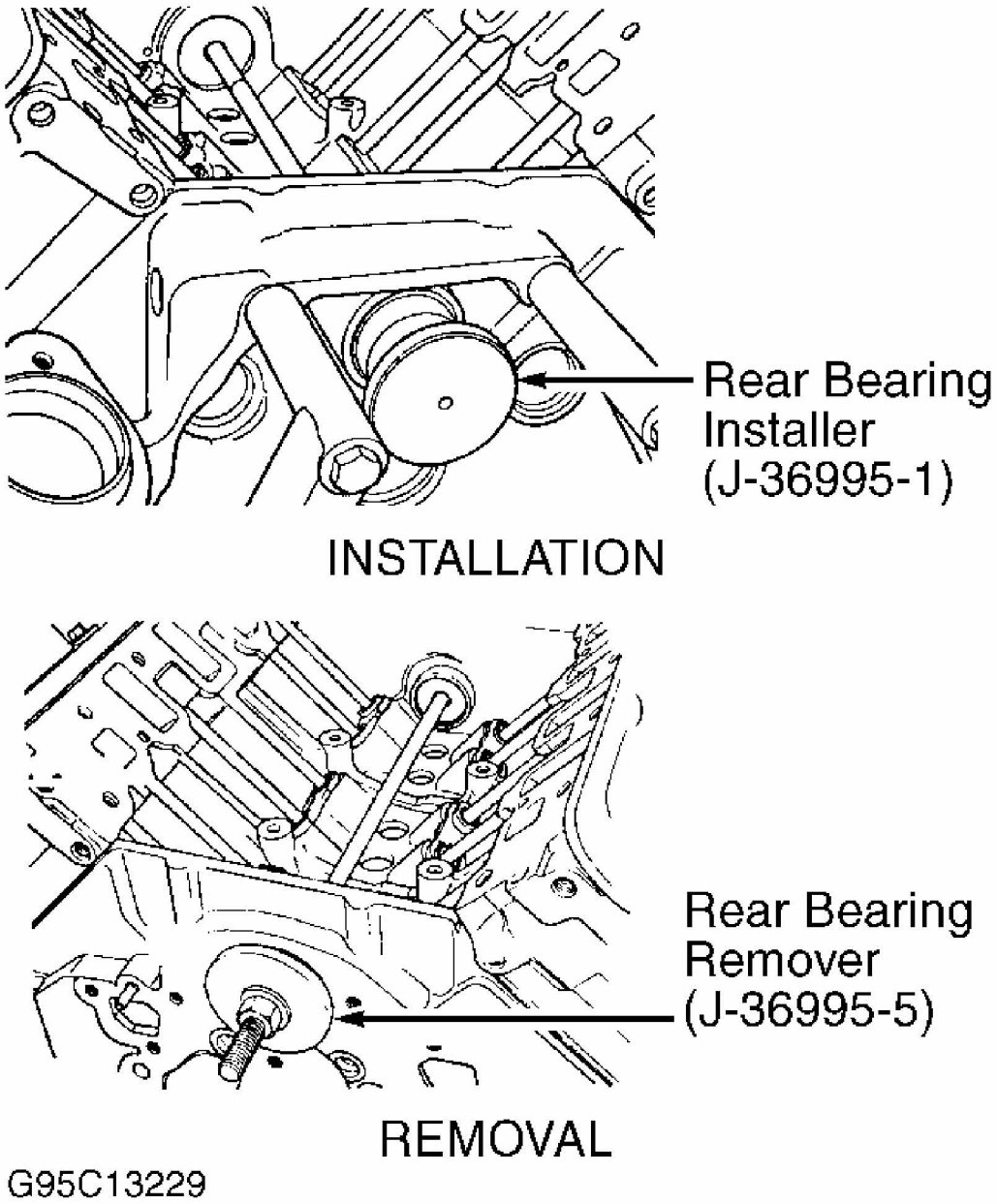


Fig. 12: Replacing Balance Shaft Rear Bearing
Courtesy of GENERAL MOTORS CORP.

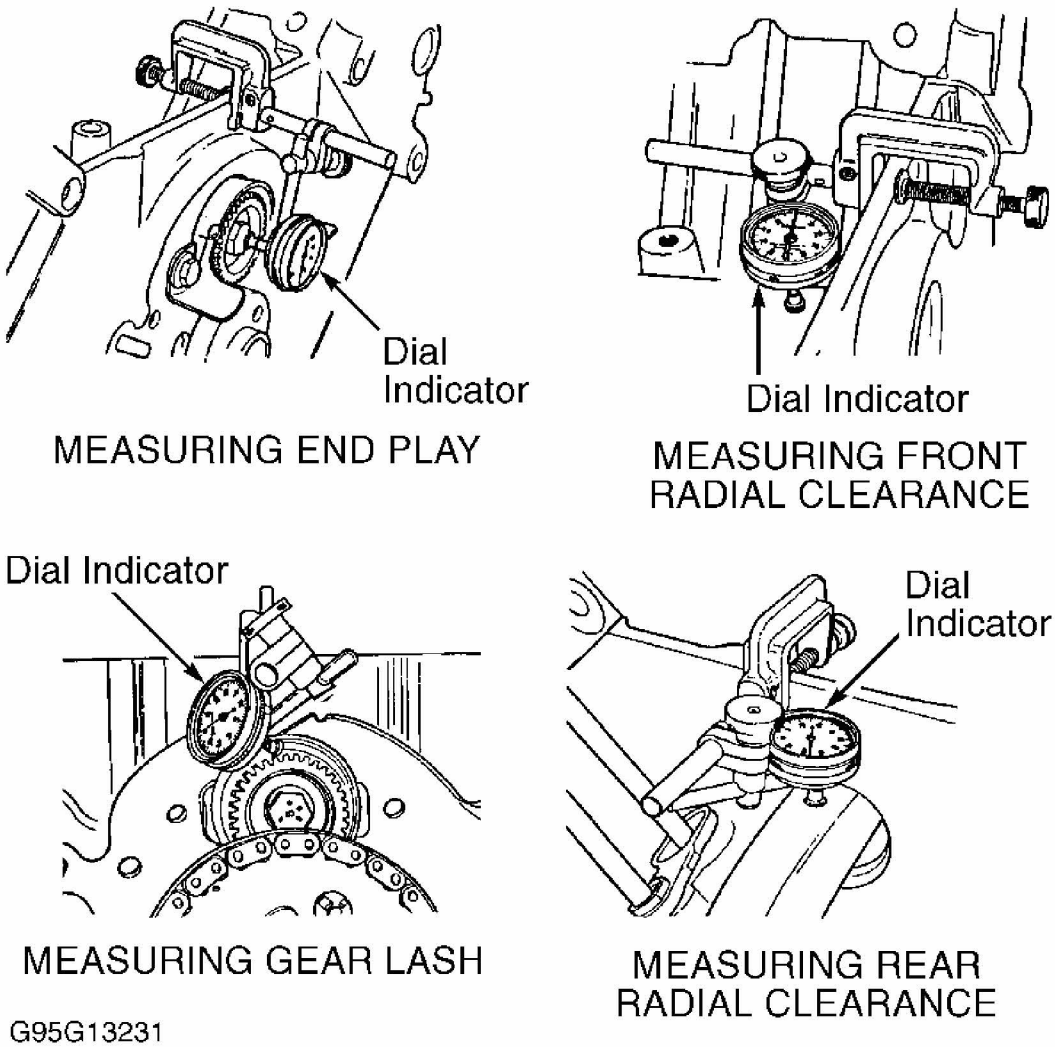


Fig. 13: Measuring Balance Shaft Clearances
Courtesy of GENERAL MOTORS CORP.

CRANKSHAFT REAR OIL SEAL

NOTE: If rear oil seal housing has been removed, see CRANKSHAFT REAR OIL SEAL HOUSING before installing new seal.

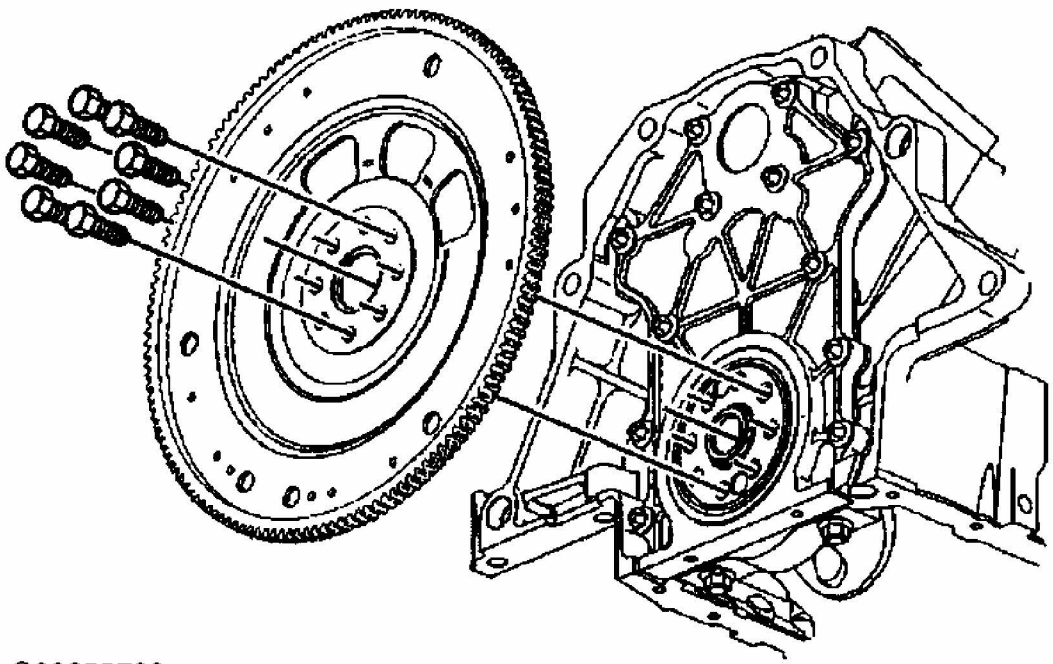
Removal

1. Remove transaxle. For A/T, see **REMOVAL & INSTALLATION - CARS - EXCEPT METRO & PRIZM** article in AUTOMATIC TRANSMISSIONS. For M/T, see appropriate article in CLUTCHES.
2. Use Flywheel Holding Tool (J-37096) to prevent crankshaft rotation. Remove the eight bolts attaching the engine flywheel to the crankshaft flange and discard them. See **Fig.**

14 . Remove the flywheel.

CAUTION: DO NOT damage the crankshaft OD surface or chamfer with any tool.

3. Confirm the crankshaft rear oil seal leak. Insert a flat-bladed tool through the dust lip at an angle. Pry out the crankshaft rear oil seal by moving the handle of the tool towards the end of the crankshaft. Repeat as necessary around the crankshaft rear oil seal.
4. Inspect the ID of the bore. Correct or replace the crankshaft rear oil seal housing as required. Inspect the crankshaft for nicks or burrs on the surface that contacts the crankshaft rear oil seal. Repair or replace the crankshaft as required.



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Fig. 14: Removing/Installing Flywheel
Courtesy of GENERAL MOTORS CORP.

Installation

NOTE: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. DO NOT use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These

coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

1. Apply engine oil to the inside and the outside diameter of the new crankshaft rear oil seal. Slide the new crankshaft rear oil seal over the mandrel until the back of the crankshaft rear oil seal bottoms squarely against the collar of the Rear Crankshaft Seal Installer (J-38196). See **Fig. 15** .
2. Install the crankshaft rear oil seal using the following steps:
   - Attach the Rear Crankshaft Seal Installer (J-38196) to the crankshaft by hand, or tighten the attaching screws. Tighten the screws to 54 INCH lbs. (5 N.m).
   - Turn the T-handle of the Rear Crankshaft Seal Installer (J-38196) so that the collar pushes the seal into the bore. Turn the handle until the collar is tight against the case. This will ensure that the crankshaft rear oil seal is seated properly between the crankshaft and the crankshaft rear oil seal housing.
   - Loosen the T-handle of the Rear Crankshaft Seal Installer (J- 38196) until the handle comes to a stop. This will make sure that the collar will be in the proper position for installing another new crankshaft rear oil seal.
   - Remove the attaching screws.
3. To install the engine flywheel, use the Flywheel Holding Tool (J-37096) in order to prevent the crankshaft from rotating. Use NEW engine flywheel bolts. Tighten to specification. See **TORQUE SPECIFICATIONS**
4. Use the Torque Angle Meter (J-36660-A) in order to rotate the engine flywheel bolts an additional 50 degrees. Install the transaxle.

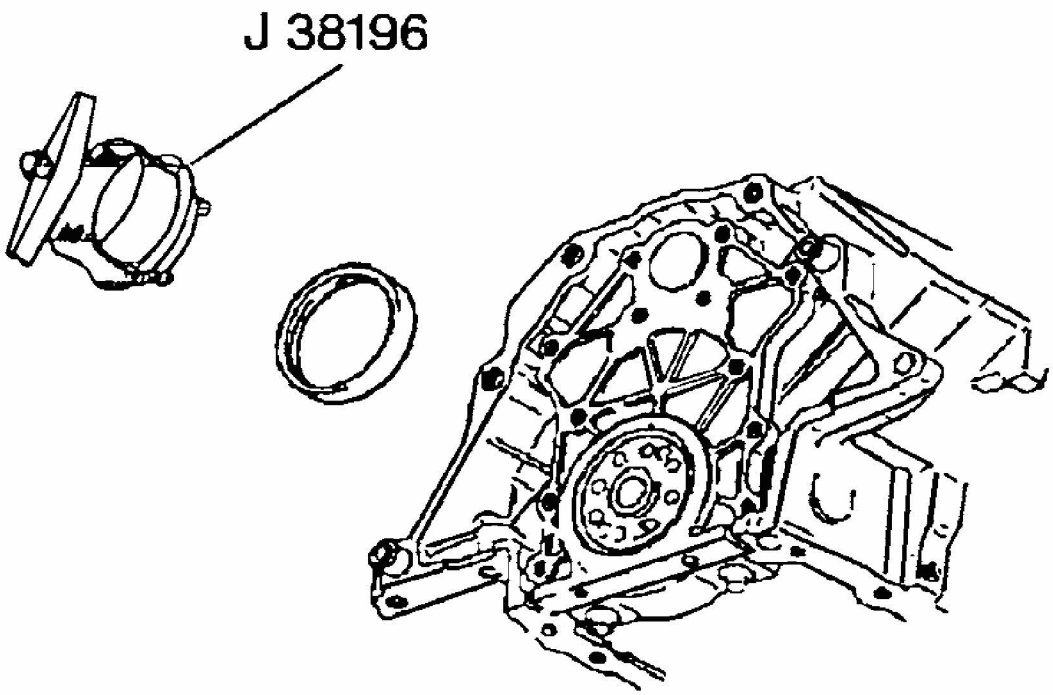


Fig. 15: Installing Crankshaft Rear Oil Seal
Courtesy of GENERAL MOTORS CORP.

CRANKSHAFT REAR OIL SEAL HOUSING

CAUTION: If seal housing bore is not centered in relation to crankshaft flange, seal may leak.

Removal

Remove transaxle. For A/T, see appropriate REMOVAL & INSTALLATION article in TRANSMISSION SERVICING. For M/T, see appropriate article in CLUTCHES. Remove flexplate/flywheel. Remove oil pan. See **OIL PAN** . Loosen seal housing bolts (bolts should stay with housing). Remove seal housing. Remove seal from housing.

Installation

1. DO NOT install seal into housing at this time. Clean gasket surfaces of housing and block. Install NEW gasket onto housing bolts to hold it in place. Install seal housing. Finger-tighten bolts so housing can be aligned (centered). Ensure gasket does not protrude beyond oil pan gasket surface.
2. Apply a thin film of engine oil to inner and outer surfaces of Seal Housing Aligner (J-41349). Install seal housing aligner onto crankshaft, twisting and turning it as necessary

to aid installation.

3. Lay a straightedge across cylinder block oil pan flange and seal housing flange. Using a feeler gauge, ensure there is no more than .004" (.10 mm) step (high or low) on either side. Rotate housing if necessary. If specification cannot be met, replace housing.
4. Apply engine oil to NEW seal. Using Seal Installer (J-38196), press seal into bore. To complete installation, reverse removal procedure.

WATER PUMP

NOTE: Not all components need to be removed on all models. Remove as necessary for access and clearance.

Removal & Installation ("F" & "W" Bodies)

1. Disconnect negative battery cable. Drain cooling system. Remove accessory electrical junction block, and position aside. Loosen water pump pulley bolts. Remove drive belt. Remove water pump pulley bolts and pulley.
2. Remove power steering pump mounting bolts, and position aside. Remove water pump bolts, water pump and gasket. To install, reverse removal procedure using NEW gasket. Fill and bleed cooling system. See **COOLING SYSTEM BLEEDING** .

Removal & Installation ("C", "G" & "H" Bodies - VIN "1")

1. Disconnect negative battery cable. Remove A/C compressor splash shield. Loosen water pump pulley bolts. Drain cooling system. Remove drive belts. Remove coil pack. Remove supercharger belt tensioner.
2. Remove engine mount. Remove power steering pump. Remove engine mount bracket. Remove idler pulley. Remove water pump pulley. Remove water pump and gasket. To install, reverse removal procedure using NEW gasket. Fill and bleed the engine cooling system. See **COOLING SYSTEM BLEEDING** .

Removal & Installation ("C" & "H" Bodies - VIN "K")

Drain cooling system. Loosen water pump pulley bolts. Remove drive belt. Remove water pump pulley bolts and pulley. Remove water pump and gasket. To install, reverse removal procedure using NEW gasket. Fill and bleed cooling system. See **COOLING SYSTEM BLEEDING** .

Removal & Installation ("G" Body - VIN "K")

1. Drain cooling system. Remove air cleaner assembly. Remove water pump belt cover. Remove water pump drive belt. Remove by-pass hose. Remove lower radiator hose from thermostat housing.
2. Remove bolts from water pump cover. Remove water pump cover. Remove water pump, pump seal, and gasket from housing using Water Pump Remover (J-38816-1A).

Turn tool clockwise in order to remove water pump. Remove water pump. To install, reverse removal procedure using NEW gasket. Fill and bleed cooling system. See **COOLING SYSTEM BLEEDING** .

OIL PAN

NOTE: Not all components may need to be removed on all models. Remove as necessary for access and clearance.

Removal & Installation ("C", "G" & "H" Bodies)

1. Raise and support vehicle. Drain the engine oil. Remove the flywheel cover bolts and flywheel cover. Disconnect oil level sensor harness connector. Remove the oil level sensor. Remove the oil filter. Remove the oil pan bolts, oil pan and gasket.
2. To install, reverse removal procedure. Install oil level sensor after oil pan is installed. Tighten all fasteners to specification. See **TORQUE SPECIFICATIONS** table. Fill crankcase to proper level with appropriate oil.

Removal & Installation ("F" Body)

1. Raise and support vehicle. Drain the engine oil. On A/T models, remove the torque converter cover. On all models, remove the engine mount through bolts. Remove the engine mount nuts.
2. Raise the engine using Engine Support Adapters (J-28467-A) and Universal Support Fixture (J-41044). Disconnect oil level sensor electrical connector. Remove oil level sensor.
3. Remove the oil pan retaining bolts. Lower the rear of the oil pan while rotating outward. Remove the oil pan.
4. To install, reverse removal procedure. Install oil level sensor after oil pan is installed. Tighten all fasteners to specification. See **TORQUE SPECIFICATIONS** table. Fill crankcase to proper level with appropriate oil.

Removal & Installation ("W" Body)

1. Disconnect negative battery cable. Carefully disconnect the throttle body air inlet duct. Remove upper engine torque struts. Remove serpentine belt. Install the Engine Support Fixture (J-28467-B, J-28467-90A and J-36462-A).
2. Raise and support vehicle. Disconnect the catalytic converter pipe from the right exhaust manifold. Remove the right front tire and wheel assembly. Remove the right engine splash shield. Drain crankcase. Remove oil filter.
3. Disconnect A/C compressor electrical connector. Remove A/C compressor bolts, and position aside. Disconnect the power steering oil cooler pipe brackets from the frame. Disconnect engine mount bracket bolts from engine. Remove the engine mount lower nuts.

4. Remove torque converter cover bolts and torque converter cover. Disconnect oil level sensor electrical connector. Remove oil level sensor.
5. Lower vehicle. Using engine support fixture, raise engine to allow access for oil pan removal. Raise and support vehicle. Suitably support the frame. Loosen the left side frame bolts. Remove the right side frame bolts. Lower the frame for access.
6. Remove the engine mount and the engine mount bracket. Remove the oil pan retaining bolts. Lower and remove the oil pan.
7. To install, reverse removal procedure. Install oil level sensor after oil pan is installed. Tighten all fasteners to specification. See **TORQUE SPECIFICATIONS** table. Fill crankcase to proper level with appropriate oil. Check and adjust wheel alignment as necessary. See appropriate article in WHEEL ALIGNMENT.

OVERHAUL

CYLINDER HEAD

Inspection

1. Inspect cylinder head for warpage at deck and manifold surfaces. Resurface cylinder head if warpage exceeds specification. See **CYLINDER HEAD** table under ENGINE SPECIFICATIONS.
2. After resurfacing, use a depth micrometer to measure distance from deck surface to 3 cast pads. See **Fig. 16** . Replace cylinder head if dimension is less than .044" (1.12 mm). New cylinder head dimension should be .054-.066" (1.37-1.68 mm).

Valve Seats

No replacement procedure is given by manufacturer.

Valve Guides

If valve stem oil clearance is not within specification, ream valve guides for oversize valve stem. See **CYLINDER HEAD** table under ENGINE SPECIFICATIONS.

Valve Seat Correction Angles

After grinding, if seat width is too wide, use 20-degree or 70-degree stone to reduce seat width. A 20-degree stone will lower seat. A 70-degree stone will raise seat.

Valve Spring Installed Height

1. Install valve, valve retainer and keepers. Pull upward on valve, and measure height from top of spring seat to spring side of valve retainer. See **Fig. 17** .
2. Ensure spring installed height is within specification. See **VALVES & VALVE SPRINGS** table under ENGINE SPECIFICATIONS. If measurement exceeds

specification, add shims under valve spring to obtain correct height.

Valve Stem Height

With valve installed in cylinder head (closed position), use steel ruler to measure distance from spring seat to valve tip. Distance should be 1.935-1.975" (49.15-50.17 mm).

Valve Stem Oil Seals

Oversize valve stem oil seals are used for valves with oversize stems. Intake and exhaust valve stem oil seals are different. Install oil seal according to part number and package instructions.

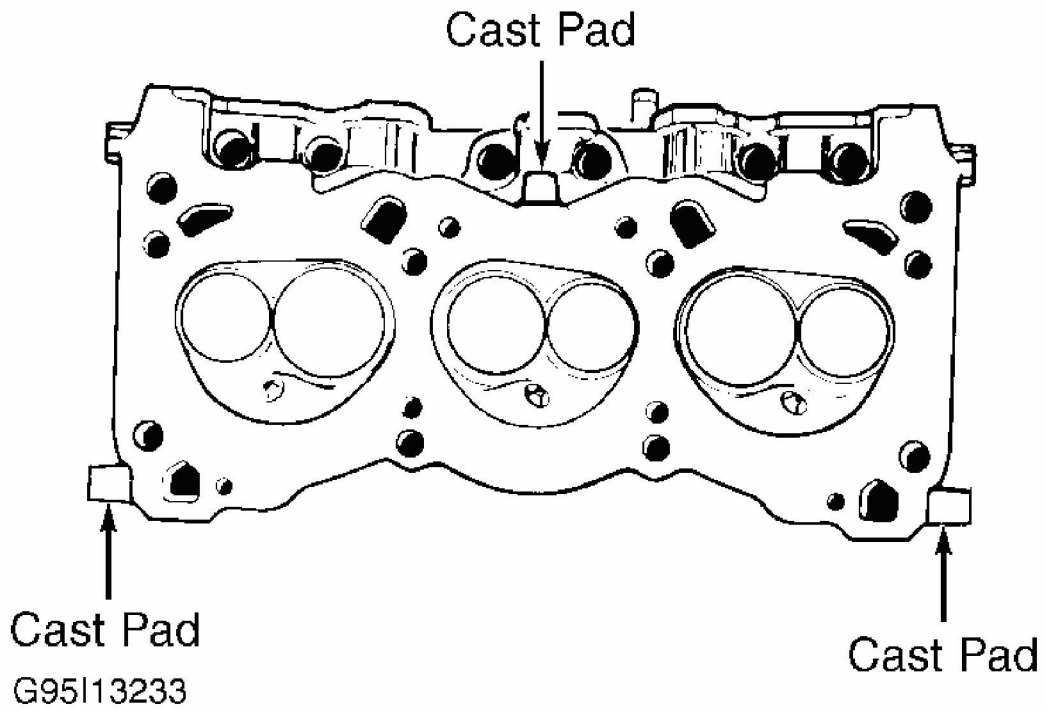


Fig. 16: Measuring Cylinder Head Thickness
Courtesy of GENERAL MOTORS CORP.

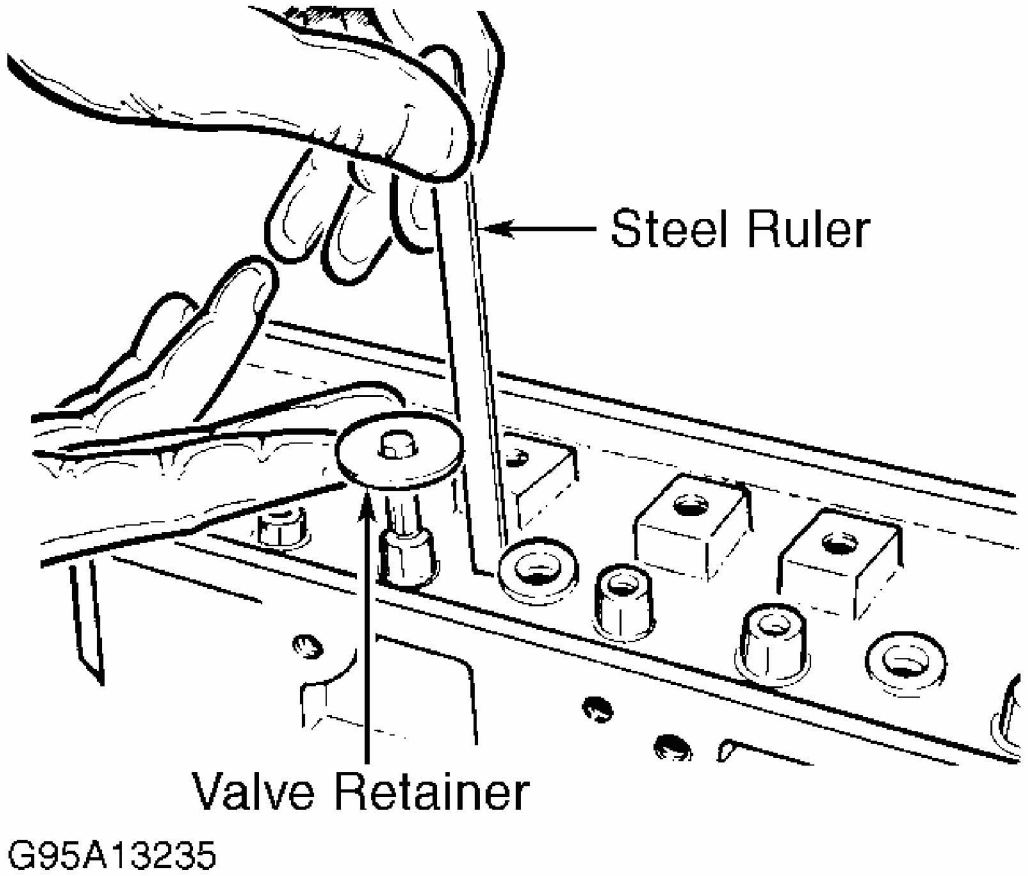


Fig. 17: Measuring Valve Spring Installed Height
Courtesy of GENERAL MOTORS CORP.

CYLINDER BLOCK ASSEMBLY

Cylinder Block

Using feeler gauge and straightedge, inspect deck surface for warpage. Replace cylinder block if more than .010" (.25 mm) material is removed from deck surface.

Cylinder Block Flange Runout

1. With engine removed and crankshaft installed, measure cylinder block flange runout. Mount dial indicator gauge plate flat against crankshaft flange. Place dial indicator stem on lower left transmission bolt boss (flat area around bolt hole). Adjust dial indicator to zero.
2. Observe and record readings obtained on all bolt hole bosses. Measurements should not vary more than .010" (.25 mm). If readings exceed specification, check crankshaft

flange runout. See **CRANKSHAFT FLANGE RUNOUT** .

Piston Ring Installation

Install piston rings with identification mark toward top of piston, and ring gaps properly spaced. See **Fig. 18** .

Piston & Rod Assembly

Piston can be installed on connecting rod in either direction. Install piston and connecting rod onto crankshaft, with arrow on top of piston and/or ridge(s) on bottom of pin boss facing toward front of engine.

Fitting Pistons

NOTE: DO NOT machine oversize pistons, or engine balance will be affected.

Piston diameter should be measured 1.73" (44 mm) from top of piston.

Crankshaft & Main Bearings

1. Main bearing caps are a press fit. All main caps incorporate side bolts except the rear. Remove side bolts. Remove main cap bolts. Using Slide Hammer (J-6125-B) and Main Bearing Cap Puller (J-41348), carefully remove caps for service. Install main bearings and main caps. Tap bearing caps into cylinder block cavity using a brass, lead or leather mallet before installing attaching bolts.

   NOTE: Misalignment of No. 4 main bearing cap toward transaxle can cause interference with the flywheel-to-converter bolts.

2. DO NOT use cap bolts to pull crankshaft bearing caps into seats. Tighten NEW main cap bolts evenly. Loosen main cap bolts one turn. Retighten bolts to 26 ft. lbs. (35 N.m). Ensure No. 4 rear main bearing cap is installed flush with rear of block.

   NOTE: DO NOT shim, scrape or file bearing inserts. DO NOT touch bearing surface with fingers.

3. Using Torque Angle Meter (J-36660), tighten bolts an additional 50 degrees. Using wooden mallet, carefully tap crankshaft forward and then backward to seat thrust bearing.

Rod Bearings

1. Ensure bearing cap bolt holes and mating surfaces are clean and dry. Use connecting rod stud protector on rod cap bolts. Install bearing inserts in connecting rod and cap.

Lubricate bearings and crank pin.

2. Replace both upper and lower bearings as a set. Install bearing cap. Tighten NEW rod bearing cap bolts to 20 ft. lbs. (27 N.m). Tighten bolts an additional 50 degrees using Torque Angle Meter (J-36660).

Crankshaft Flange Runout

1. With engine removed and crankshaft installed, or with crankshaft mounted on "V" blocks, measure crankshaft flange runout. Mount dial indicator and place dial indicator stem on crankshaft flange. Adjust dial indicator to zero.
2. Mark reference point on crankshaft flange. Ensure crankshaft is thrust forward so end float will not affect readings. Turn crankshaft 360 degrees.
3. Observe and record readings. Reading should not vary more than .002" (.05 mm). Replace crankshaft if runout exceeds specification.

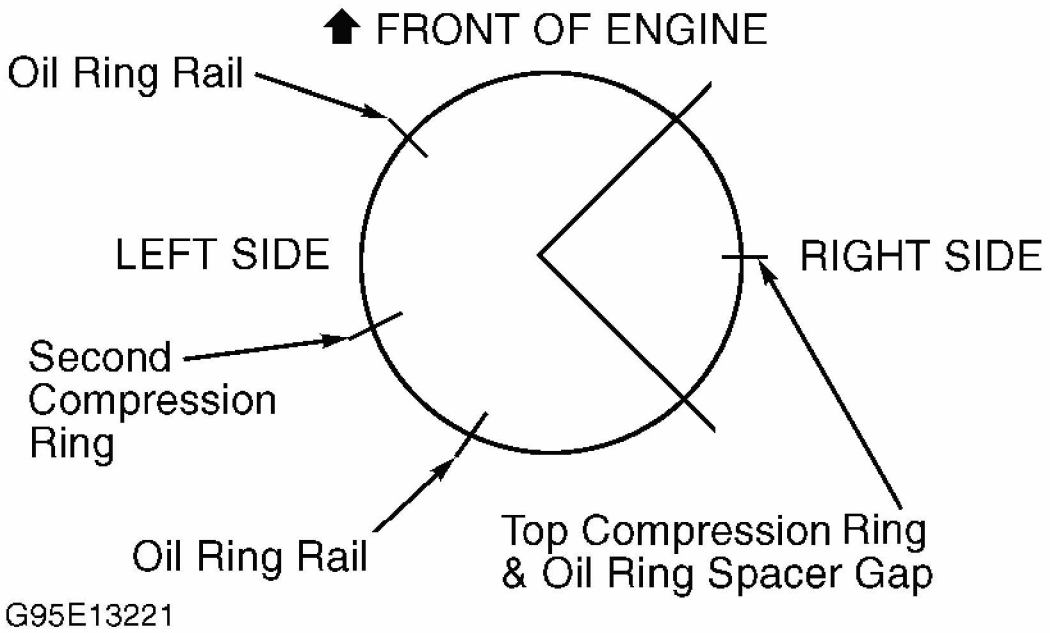


Fig. 18: Positioning Piston Ring Gaps
Courtesy of GENERAL MOTORS CORP.

ENGINE OILING

LUBRICATION SYSTEM

The crankshaft driven, gear-type oil pump provides pressurized lubrication to the main gallery. See **Fig. 19** . Oil pump and pressure regulator valve are located in front cover.

Crankcase Capacity

Engine oil capacity is approximately 4 qts. (3.7L) without filter change. After changing filter, recheck oil level and add oil as necessary.

Normal Oil Pressure

With engine at normal operating temperature, oil pressure (with 5W-30 or 10W-30 engine oil) should be 60 psi (4.2 kg/cm^2) at 1850 RPM.

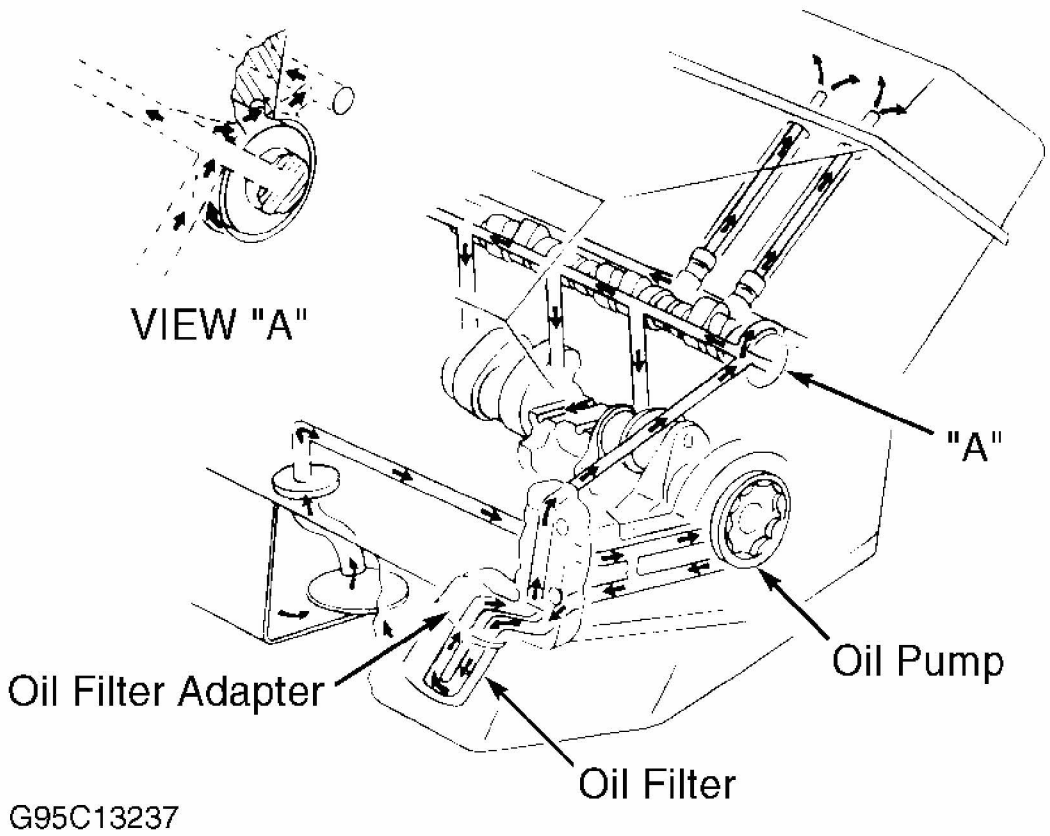


Fig. 19: Cross-Sectional View Of Engine Oiling System
Courtesy of GENERAL MOTORS CORP.

OIL PUMP

Removal & Disassembly

Remove front cover. See **FRONT COVER** under REMOVAL & INSTALLATION. Remove oil filter adapter, gasket, pressure regulator and valve from front cover. Remove pump cover bolts, cover and gears from front cover.

Inspection

1. Inspect components for damage. Measure gear end clearance. Measure housing gear pocket depth and diameter. Measure tip clearance between gears. Measure outer gear-to-housing clearance.
2. Check clearance between pressure regulator valve and bore. Replace components or pump assembly if measurements are not within specification. See **OIL PUMP SPECIFICATIONS** table.

Reassembly & Installation

To reassemble, reverse disassembly procedure. Lubricate gears, and fill cavities with petroleum jelly. Install pump cover. To install, reverse removal procedure. Tighten bolts to specification. See **TORQUE SPECIFICATIONS** table.

OIL PUMP SPECIFICATIONS

Application	In. (mm)
Gear End Clearance	.0010-.0035 (.025-.089)
Gear Tip Clearance	.006 (.15)
Housing Gear Pocket	
Depth	.4610-.4625 (11.71-11.75)
Diameter	3.508-3.512 (89.10-89.20)
Outer Gear-To-Housing Clearance	.008-.015 (.20-.38)
Pressure Regulator Valve-To-Bore Clearance	.0015-.0030 (.038-.076)

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Accelerator Control Cable Bracket Bolt	12 (16)
Balance Shaft Gear Bolt (1)	
Step 1	16 (22)
Step 2	(2) Additional 70 Degrees
Balance Shaft Retainer Bolt	22 (30)
Camshaft Sprocket Bolt	
Step 1	74 (100)
Step 2	(2) Additional 90 Degrees

Condenser Tube Nut ("F" Body)	12 (16)
Connecting Rod Bolt	
Step 1	20 (27)
Step 2	(2) Additional 50 Degrees
Crankshaft Pulley/Balancer Bolt	
Step 1	110 (150)
Step 2	(2) Additional 76 Degrees
Cylinder Head Bolts (3)	
Step 1	37 (50)
Step 2	(2) Additional 120 Degrees
Step 3 (4 Center Bolts)	(2) Additional 30 Degrees
Drive Belt Tensioner Bolts	37 (50)
EGR Valve Adapter Bolt	18 (25)
EGR Valve Adapter Nut	37 (50)
EGR Valve Heat Shield	(4)
EGR Valve Inlet Pipe Bolt ("C" & "H" Bodies)	21 (29)
EGR Valve Outlet Pipe	
Bolt	
All Except "F" Body	21 (29)
"F" Body	18 (25)
Nut	21 (29)
Engine Lift Bracket-To-Ignition Control Module Bolt ("F" Body)	18 (25)
Engine Mount Bracket Bolt ("F" Body)	75 (102)
Engine Mount Nuts	
All Except "F" Body	58 (78)
"F" Body	
Lower	32 (43)
Upper	35 (47)
Evaporator Tube Bolt ("F" Body)	12 (16)
Exhaust Manifold Heat Shield Bolts/Nuts	
All Except "W" Body	(5)
"W" Body	15 (20)

Exhaust Manifold-To-Cylinder Head Bolts/Studs	
"C", "G" & "H" Bodies	
Inner Studs/Bolts	22 (30)
Outer Studs	(5)
"F" Body	11 (15)
"W" Body	22 (30)
Exhaust Manifold-To-Cylinder Head Nuts	
All Except "F" Body	22 (30)
"F" Body	13 (18)
Exhaust Pipe-To-Exhaust Manifold Bolts/Studs	
Bolts/Studs	
"F" Body	26 (35)
"C", "G", "H" & "W" Bodies	18 (25)
Nuts	
"W" Body	26 (35)
Flywheel Bolt	
Step 1	11 (15)
Step 2	(2) Additional 50 Degrees
Frame-To-Body Bolts ("W" Body)	133 (180)
Front Cover Bolt	
Step 1	(6) 15 (20)
Step 2	(2) Additional 40 Degrees
Fuel Feed & Return Line Fitting	22 (30)
Generator Bolts	
"C" Body	37 (50)
"F" Body	
Front Inboard Bolt & Rear Bolt	22 (30)
Front Outboard Bolt	37 (50)
"G" Body	
Except Rear Brace Bolts (VIN "1") & Lower Bracket-To-Block Bolts (VIN "K")	37 (50)
Lower Bracket-To-Block Bolts (VIN "K")	28 (38)
Rear Brace Bolts (VIN "1")	22 (30)
"H" Body	
Except Rear Brace Bolts	37 (50)
Rear Brace Bolts	22 (30)

"W" Body	(7)
Generator Brace-To-Intake Manifold Bolts ("F" Body)	18 (25)
Generator Positive Cable Nut	15 (20)
Heated Oxygen Sensor	31 (42)
Ignition Control Module Nuts	
All Except "F" Body	(8)
"F" Body	22 (30)
Intake Manifold Bolts	
VIN "1"	
Lower	(1) (9) 11 (15)
Upper (Supercharger)	17 (23)
VIN "K"	
Lower	(1) (10) 11 (15)
Upper ("C", "G", "H" & "W" Bodies)	(11)
Upper ("F" Body)	(12)
Main Bearing Cap Bolt	
Step 1	30 (40)
Step 2	(2) Additional 110 Degrees
Oil Cooler Adapter Connector	37 (50)
Oil Cooler Line-To-Radiator ("F" Body)	20 (27)
Oil Filter Adapter-To-Front Cover Bolt	
"C", "G" & "H" Bodies	22 (30)
"F" & "W" Bodies	
Step 1	11 (15)
Step 2	(2) Additional 50 Degrees
Oil Level Sensor	15 (20)
Oil Pan Bolt	(1) 10 (14)
Oil Screen-To-Block Bolt	11 (15)
Power Steering Pump Mounting Nuts	23 (30)
Rocker Arm Bolt (1)	
Step 1	11 (15)
Step 2	(2) Additional 90 Degrees
Side Main Bearing Cap Bolt	

Step 1	11 (15)
Step 2	(2) Additional 45 Degrees
Spark Plugs	20 (27)
Supercharger-To-Intake Manifold Bolt (VIN 1)	17 (23)
Thermostat Housing Bolts	
All Except "F" Body	15 (20)
"F" Body	20 (27)
Timing Chain Damper Bolt (Special Bolt)	16 (22)
Valve Lifter Guide Bolt	22 (30)
Water Pump Bolt	
Step 1	11 (15)
Step 2	(2) Additional 80 Degrees
Wheel Lug Nuts	104 (140)
	INCH Lbs. (N.m)
Fuel Rail Retaining Bolts/Nuts	
All Except "F" Body	
VIN "K"	89 (10)
VIN "1"	(13)
"F" Body	75 (8.5)
Idle Air Control Valve Screws	27 (3.0)
Ignition Coil-To-Control Module Screws	40 (4.5)
Ignition Control Module Harness Connector Bolt	22 (2.5)
Intake Manifold Vacuum Source Fitting Screws ("F" Body)	89 (10)
Oil Pump Cover Screw	97 (11)
Rocker Arm Cover Bolt	(1) 88 (10)
Throttle Body Nuts/Bolts	89 (10)
Throttle Body Support Bracket Bolts	89 (10)
Torque Converter Cover Bolts	
"C", "G" & "H" Bodies	115 (13)
"F" Body	75 (8.5)
"W" Body	89 (10)

(1) Apply thread locking compound to bolt(s).

(2) See **Fig. 20** .

(3) Tighten bolts in sequence. See **Fig. 6** .

(4) Information is not available from manufacturer.

(5) Tighten to 89 INCH lbs. (10 N.m).

(6) Apply thread sealant to bolt(s).

(7) Tighten bolts in sequence to 37 ft. lbs. (50 N.m). First, tighten the inboard generator bolt. Second, tighten the generator stud. Last, tighten the generator rear bracket bolt.

(8) Tighten nuts to 70 INCH lbs. (8 N.m).

(9) Tighten bolts in sequence. See **Fig. 5** .

(10) Tighten bolts in sequence. See **Fig. 4** or **Fig. 5** .

(11) Tighten bolts in sequence to 89 INCH lbs. (10 N.m). See **Fig. 3** .

(12) Tighten bolts No. 1-10 in sequence to 11 ft. lbs. (15 N.m). See **Fig. 2** . Tighten side bolts No. 12 and 13 to 22 ft. lbs. (30 N.m).

(13) Tighten fuel rail retaining bolts to 89 INCH lbs. (10 N.m). Tighten fuel rail retaining stud to 18 ft. lbs. (25 N.m).

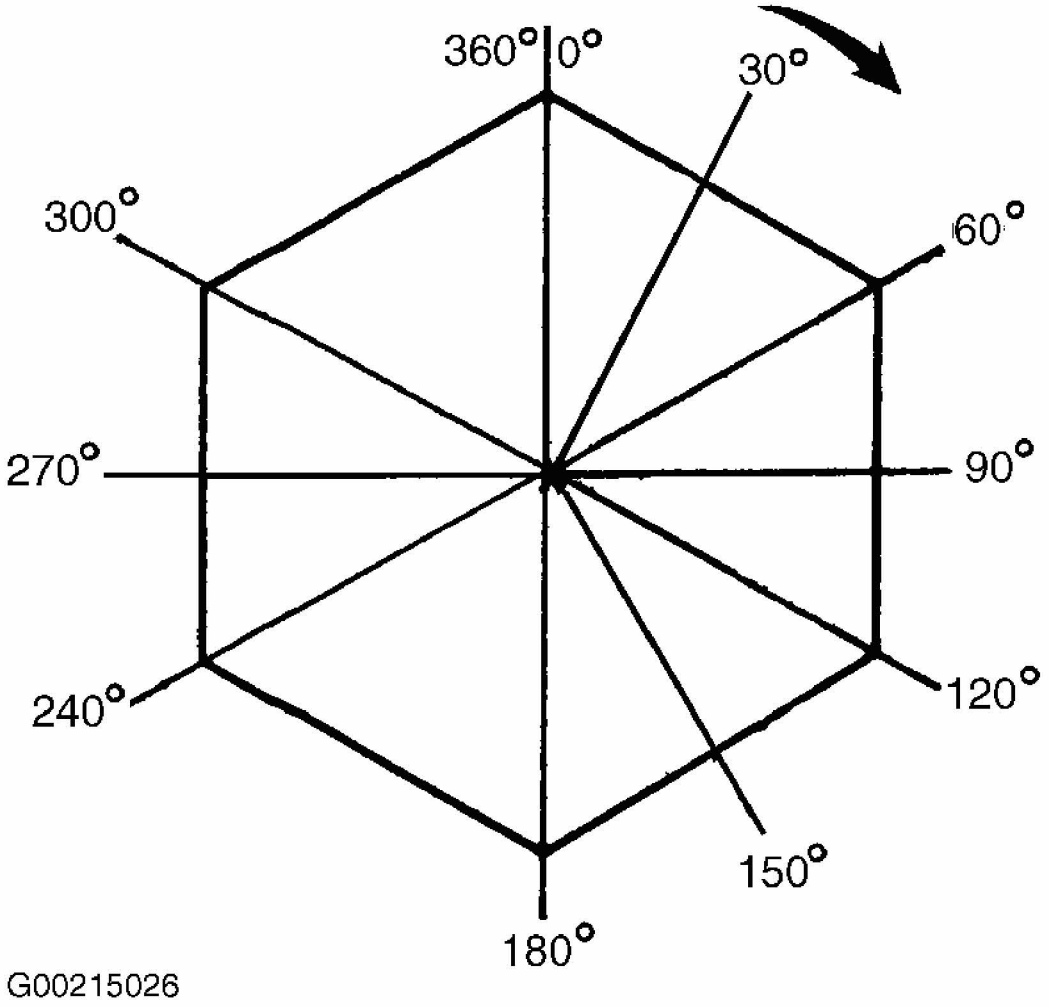


Fig. 20: View Of Torque Angles
Courtesy of GENERAL MOTORS CORP.

ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS

Application	Specification
Displacement	231 Cu. In. (3.8L)
Bore	3.80" (96.5 mm)
Stroke	3.40" (86.4 mm)
Compression Ratio (VIN K)	9.4:1
Compression Ratio (VIN 1)	8.5:1
Fuel System	SFI

CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS

Application	In. (mm)
Crankshaft End Play	.003-.011 (.08-.28)
Main Bearings	
Journal Diameter	2.4988-2.4998 (63.470-63.495)
Journal Out-Of-Round	
1998	.0003 (.008)
1999	.0025(.0066)
Journal Taper	.0003 (.008)
Oil Clearance (1998)	
Journal No. 1	.0007-.0016 (.0178-.0406)
Journals No. 2 & 3	.0010-.0020 (.0254-.0508)
Journal No. 4	.0009-.0018 (.0229-.0457)
Oil Clearance (1999)	
Journal No. 1	.0007-.0016 (.0178-.0406)
Journals No. 2, 3 & 4	.0009-.0018 (.0229-.0457)
Connecting Rod Bearings	
Journal Diameter	2.2487-2.2499 (57.117-57.147)
Journal Out-Of-Round	
1998	.0003(.0076)
1999	.0002 (.005)
Journal Taper	
1998	.00030 (.0076)
1999	.00035 (.0089)
Oil Clearance	.0005-.0026 (.0127-.0660)

CONNECTING RODS

Application	In. (mm)
Maximum Bend	(1) .005 (.13)
Maximum Twist	(1) .005 (.13)
Side Play	.0040-.0200 (.102-.508)
(1) Bend or twist measured over total length.	

(1)

PISTONS, PINS & RINGS

Application	In. (mm)
Piston Clearance (1)	
Used Piston (1999)	
VIN 1	.0008-.0039 (.0193-.0997)
All Others	.0020-.0036 (.050-.091)
New Piston	
VIN 1 (1999)	.0008-.0039 (.0193-.0997)
All Others	.0004-.0020 (.010-.051)
Pins	
Diameter	
VIN 1 (1999)	.9053-.9055 (22.995-23.000)
All Others	.8659-.8661 (21.995-22.000)
Piston Fit	
VIN 1 (1999)	.00026-.00061 (.0065-.0155)
All Others	.00008-.00051 (.0020-.0130)
Rod Fit	
VIN 1 (1999)	.00029-.00089 (.0073-.0225)
All Others	.00030-.00090 (.0066-.0217)
Rings	
No. 1	
End Gap	.010-.018 (.25-.46)
Side Clearance	.0013-.0031 (.033-.079)
No. 2	
End Gap	.023-.033 (.58-.84)
Side Clearance	.0013-.0031 (.033-.079)
No. 3 (Oil)	
End Gap	.010-.030 (.25-.76)
Side Clearance	.0009-.0079 (.023-.201)

(1) Measure 1.5" (39 mm) form top of engine block.

CYLINDER BLOCK

Application	In. (mm)
Cylinder Bore	
Diameter	3.80 (96.5)

Maximum Taper	.001 (.0254)
Maximum Out-Of-Round	.001 (.0254)

VALVES & VALVE SPRINGS

Application	Specification
Valves	
Face Angle	45°
Minimum Margin	.025" (.64 mm)
Installed Height	1.935-1.975" (49.15-50.17 mm)
Valve Springs	
Free Length	1.960" (49.78 mm)
Installed Height	1.690-1.720" (42.93-44.45 mm)
	Lbs. @ In. (kg @ mm)
Pressure	
Valve Closed	75 @ 1.72 (34 @ 43.7)
Valve Open	228 @ 1.277 (104 @ 32.4)

CYLINDER HEAD

Application	Specification
Maximum Warpage	.010" (.25 mm)
Valve Seats	
Intake Valve	
Seat Angle	45°
Seat Width	.060-.080" (1.52-2.03 mm)
Seat Runout (Maximum)	.002" (.05 mm)
Exhaust Valve	
Seat Angle	45°
Seat Width	.090-.110" (2.29-2.79 mm)
Seat Runout (Maximum)	.002" (.05 mm)
Valve Guide Oil Clearance	.0015-.0035" (.038-.089 mm)

CAMSHAFT

Application	In. (mm)
Journal Diameter	1.8448-1.8762 (46.858-47.655)
Lobe Lift	
Intake	.2580 (6.55)

Exhaust	.255 (6.48)
Oil Clearance	.0016-.0047 (.041-.119)

1998-99 TRANSMISSION SERVICING

Automatic Transmission - Cars - Except Metro & Prizm

APPLICATION & IDENTIFICATION

BODY CODE IDENTIFICATION

Body Code	Model
"C"	Park Avenue
"E"	Eldorado
"F"	Camaro & Firebird
"G"	Aurora & Riviera
"H"	Bonneville, Eighty Eight, LeSabre, LSS & Regency
"J"	Cavalier & Sunfire
"K"	DeVille & Seville
"N"	Achieva, Alero, Cutlass, Grand Am, Malibu & Skylark
"V"	Catera
"W"	Century, Grand Prix, Intrigue, Lumina, Monte Carlo & Regal
"Y"	Corvette
"Z"	Saturn

AUTOMATIC TRANSMISSION & TRANSAXLE IDENTIFICATION

Vehicle Application	Trans. Model (RPO Code)
Buick	
Century	4T60E (M13)
LeSabre	4T65E (MN3 Or M15)
Park Avenue	4T65E (MN3 Or MN7)
Regal	4T65E (M15 Or MN7)
Riviera	4T65E (MN7)
Skylark	4T60E (MN13)
Cadillac	
Catera	4L30E (ML4)
DeVille	4T80E (MH1)
Eldorado	4T80E (MH1)
Seville	4T80E (MH1)
Chevrolet	
Camaro	4L60E (M30)
Cavalier	3T40 (MD9) Or 4T40E (MN4)
Corvette	4L60E (M30)

Lumina	
3.1L	4T60E (M13)
3.8L	4T65E (M15)
Malibu	4T40E (MN4)
Monte Carlo	
3.1L	4T60E (M13)
3.8L	4T65E (M15)
Oldsmobile	
Achieva	4T40E (MN4) Or 4T60E (M13)
Alero	
2.4L	4T40E (MN4)
3.4L	4T45E (MN5)
Aurora	4T80E (MH1)
Cutlass	4T40E (MN4)
Eighty Eight	4T65E (M15 Or MN3)
Intrigue	
3.5L	4T65E (MN3)
3.8L	4T65E (M15)
LSS	4T65E (MN7 Or MN3)
Regency	4T65E (M15)
Pontiac	
Bonneville	4T65E (MN3, MN7 Or M15)
Firebird	4L60E (M30)
Grand Am	
2.4L	4T40E (MN4) Or 4T60E (M13)
3.1L	4T60E (M13)
3.4L	4T45E (MN5)
Grand Prix	
3.1L	4T60E (M13)
3.8L	4T65E (MN7 Or M15)
Sunfire	
2.2L	3T40 (MD9) Or 4T40E (MN4)
2.4L	4T40E (MN4)
Saturn	MP6 & MP7

OIL PAN GASKET IDENTIFICATION

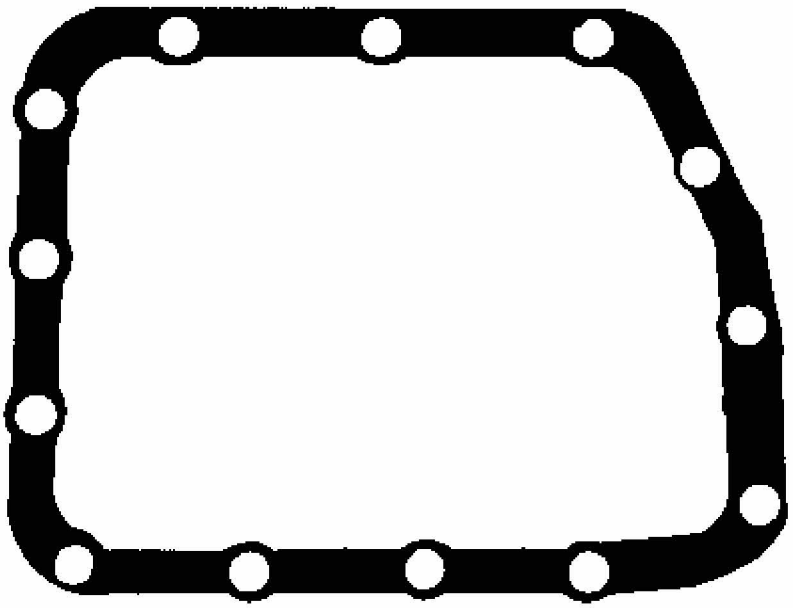


Fig. 1: Identifying Saturn MP6/MP7 Oil Pan Gasket

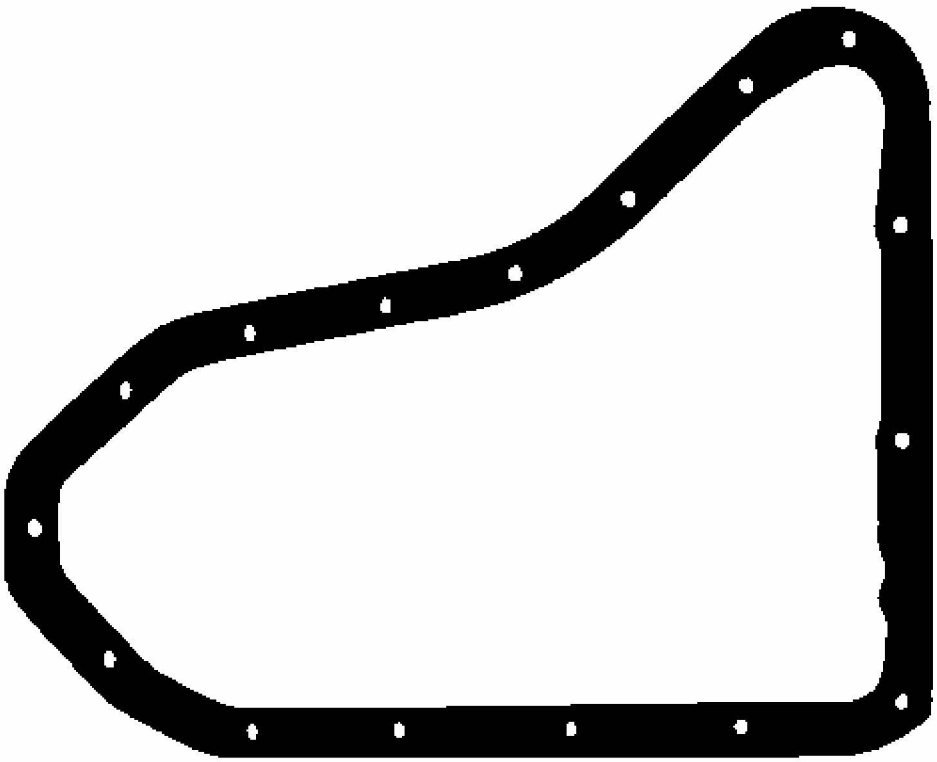


Fig. 2: Identifying Hydra-Matic 3T40 Oil Pan Gasket

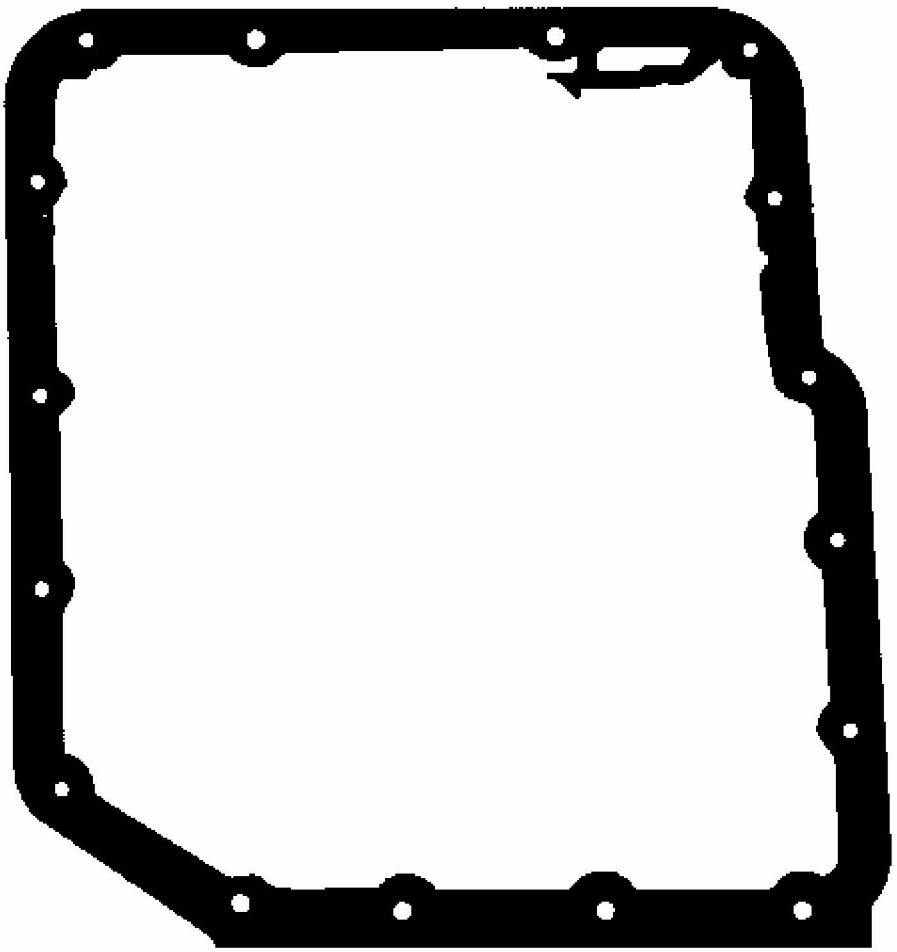


Fig. 3: Identifying Hydra-Matic 4L30-E Oil Pan Gasket

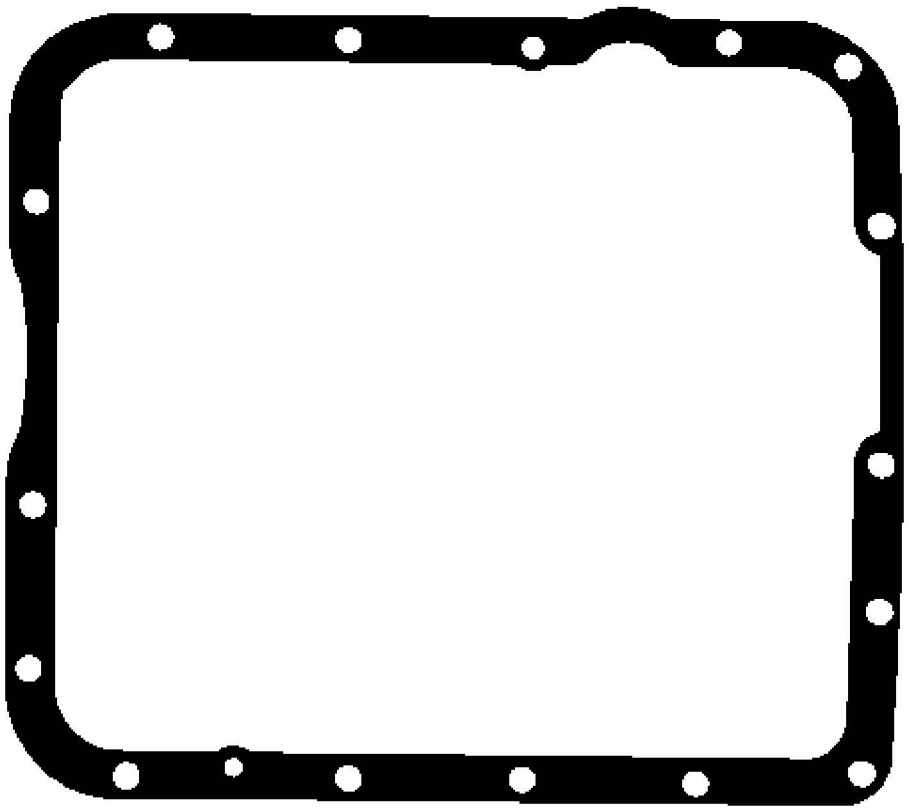


Fig. 4: Identifying Hydra-Matic 4L60-E Oil Pan Gasket

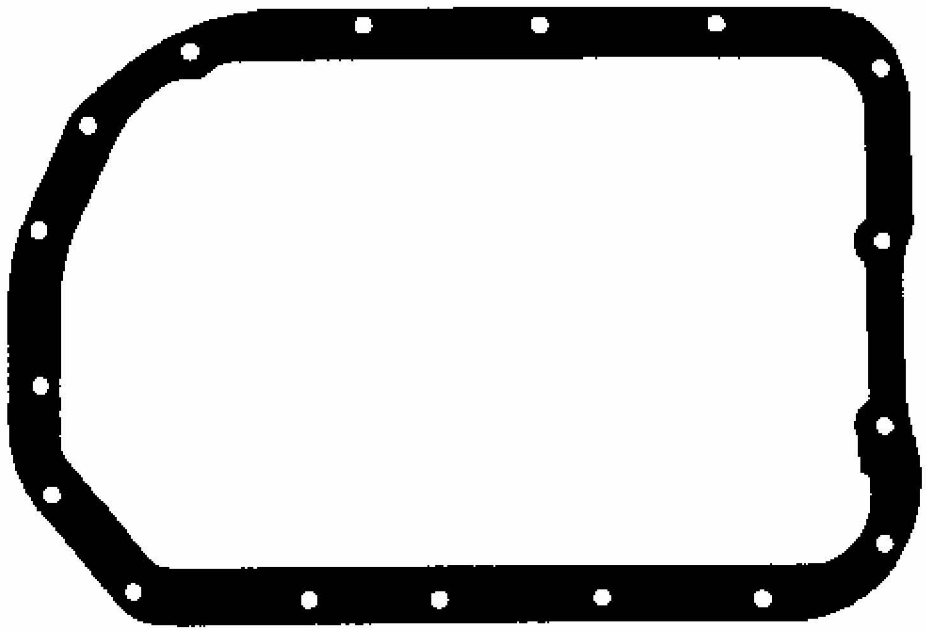


Fig. 5: Identifying Hydra-Matic 4L80-E Oil Pan Gasket

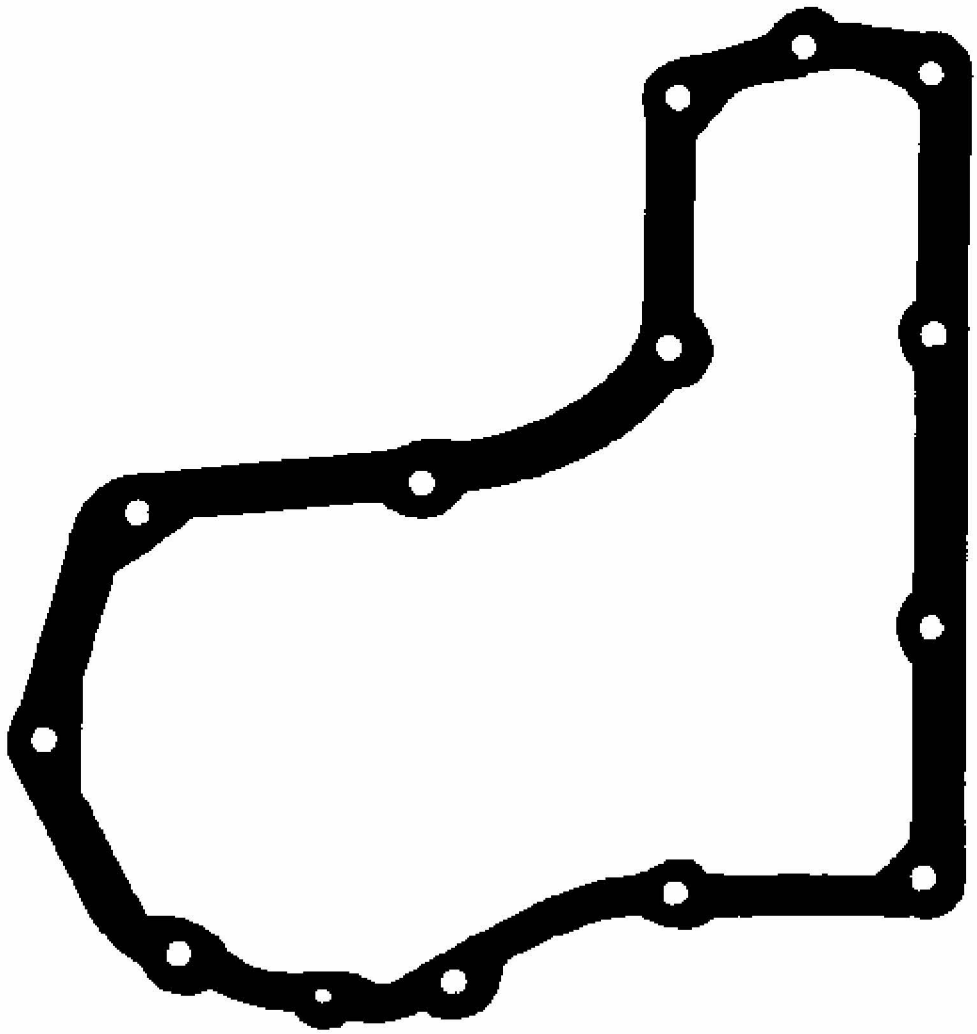


Fig. 6: Identifying Hydra-Matic 4T40-E & 4T45-E Oil Pan Gasket

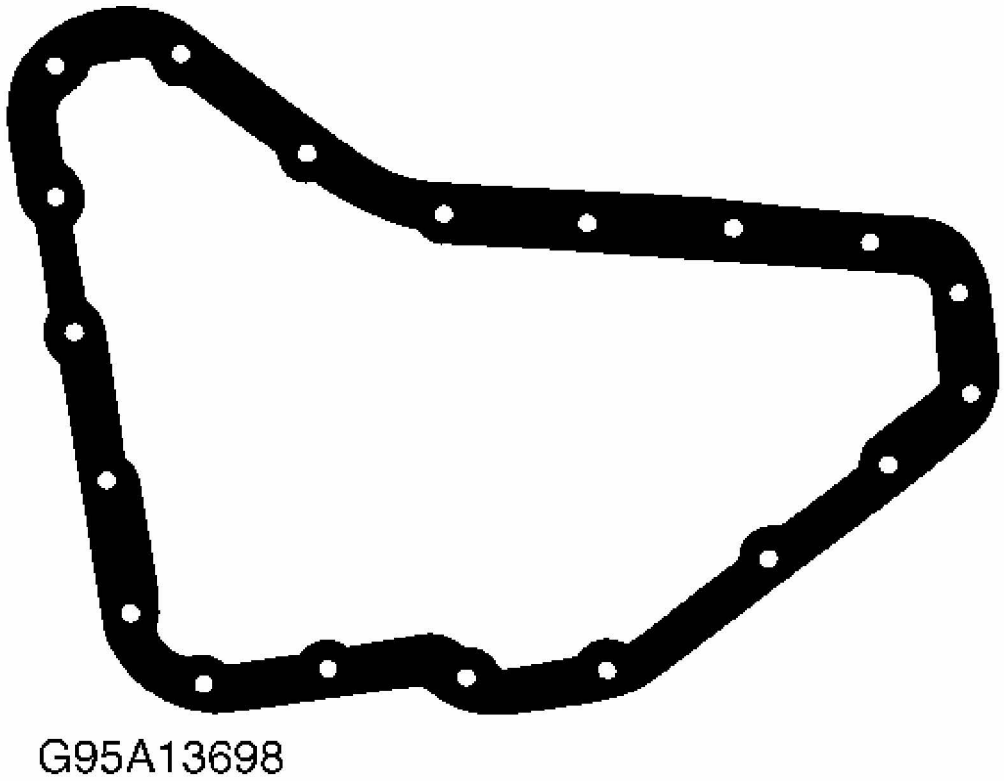


Fig. 7: Identifying Hydra-Matic 4T60-E & 4T65-E Oil Pan Gasket

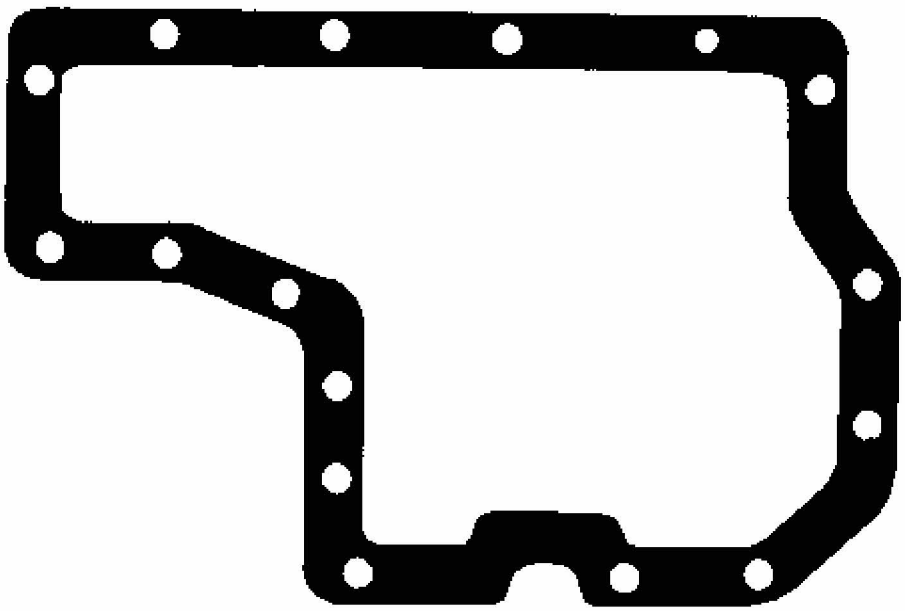


Fig. 8: Identifying Hydra-Matic 4T80-E Oil Pan Gasket

LUBRICATION

SERVICE INTERVALS

NOTE: Driver Information Display CHANGE TRANS FLUID message may be displayed on some models. If CHANGE TRANS FLUID message is displayed, see DRAINING & REFILLING procedure. To reset message, press and hold OFF and REAR DEFOG buttons until TRANS FLUID RESET appears in Information Center (5-20 seconds).

Except Saturn

Check transmission fluid level at every engine oil change. 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), fluid and filter should be changed every 50,000 miles.

Saturn

Check fluid at every engine oil change. Under normal conditions, replace fluid and filter every 30,000 miles.

CHECKING FLUID LEVEL

4L30-E & 4L60-E (RWD)

1. Fluid level must be check at temperature of 113-185°F (45-85°C). Start engine and place gear selector in Park. Raise vehicle on hoist. With engine running at idle, remove fill plug from side of transmission pan and check fluid level.
2. Fluid should be at lower level of fill plug. Adjust fluid as necessary. Use an oil suction gun to add fluid. If fluid level is low add fluid in one pint increments. Install filler plug and tighten to specification. Lower vehicle.

4T40-E & 4T45-E

1. Fluid level must be checked at temperature of 104°F (40°C). To obtain proper temperature, perform the following:
   - Idle vehicle for 3-5 minutes.
   - Shift into each gear position, holding in each position for 3 seconds.
2. Place gear selector in Park. Raise and support vehicle. Place oil drain pan below oil check plug. Oil check plug is located in center of transaxle above pan rail, on torque converter side. See **Fig. 9**. Remove oil check plug.

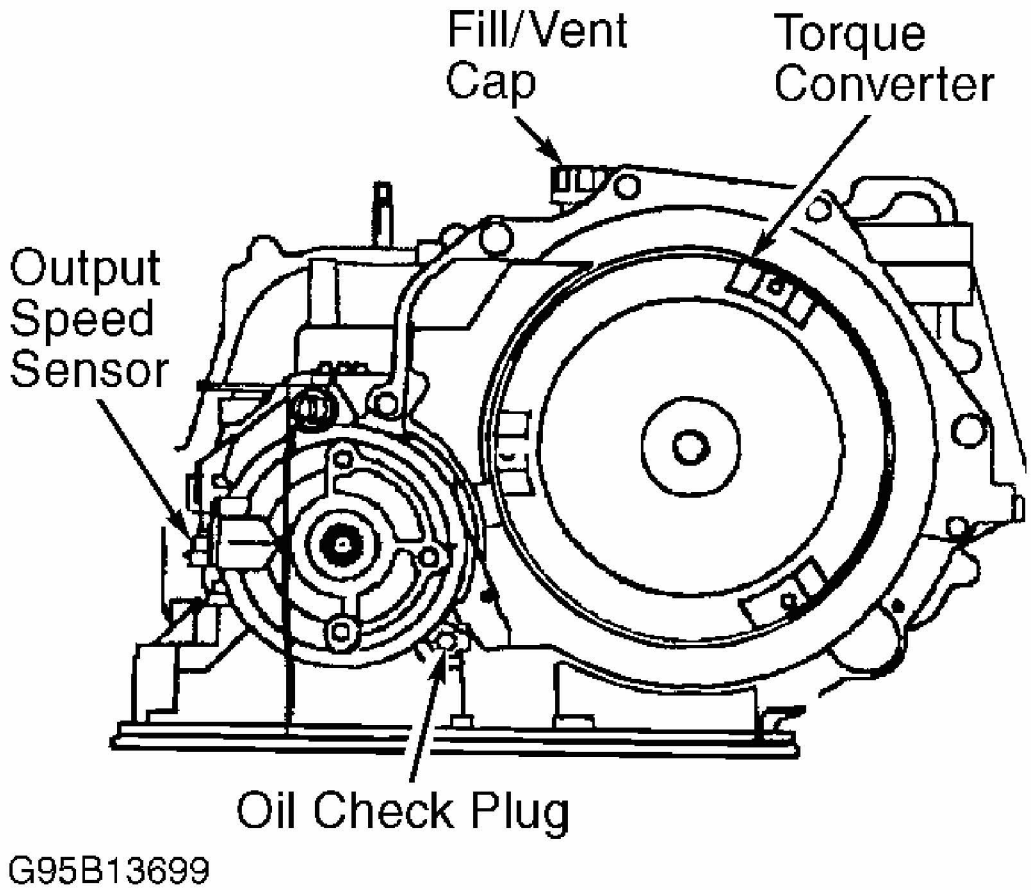


Fig. 9: Locating 4T40-E & 4T45-E Oil Check Plug
Courtesy of GENERAL MOTORS CORP.

3. Oil level should be at bottom of oil check plug hole. If fluid does not drain from hole, add fluid until fluid starts to pour from hole. Tighten oil check plug to 10 ft. lbs. (14 N.m).

CAUTION: DO NOT overfill transmission. When transmission is hot, one pint of fluid will raise fluid level from ADD 1 PT. or .5L mark to FULL HOT mark on dipstick.

All Others

1. Start engine. Operate vehicle for at least 15 minutes or until operating temperature is reached. With engine at curb idle and vehicle on level ground, move gear selector lever through all ranges, ending in Park.
2. Remove transmission dipstick, wipe clean and fully reinsert into filler tube. Remove

dipstick again, and inspect fluid level. Fluid level should be between ADD 1 PT. or .5L mark and FULL HOT mark on dipstick.

CAUTION: If vehicle has been driven for an extended period of time at high speeds, in city traffic, in hot weather or if vehicle has been pulling a trailer, an accurate fluid level reading cannot be made until vehicle has been parked and ATF is allowed to cool about 30 minutes.

RECOMMENDED FLUID

Use only Dexron-III Automatic Transmission Fluid (ATF).

FLUID CAPACITIES

FLUID CAPACITIES (1)

Application	Drain & Refill(2) Qts. (L)	Overhaul Qts. (L)
3T40	4.0 (3.8)	7.0 (6.6)
4L30-E	7.0 (6.6)	(3)
4L60-E		
Corvette	5.0 (4.7)	10.8 (10.2)
Except Corvette	5.0 (4.7)	11.0 (10.6)
4T40-E & 4T45-E	7.4 (7.0)	12.9 (12.2)
4T60-E & 4T65-E	7.4 (7.0)	10.0 (9.5)
4T80-E	11.0 (10.6)	15.0 (14.2)
Saturn	4.2 (4.0)	7.4 (7.0)

(1) Fluid capacities listed are approximate. Always fill to FULL mark.

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

(3) Transmission does not have a dipstick. Fill to bottom of fill plug.

DRAINING & REFILLING

NOTE: If oil pan bolts are equipped with conical washers, DO NOT reuse bolts if conical washers have become reversed. See Fig. 10.

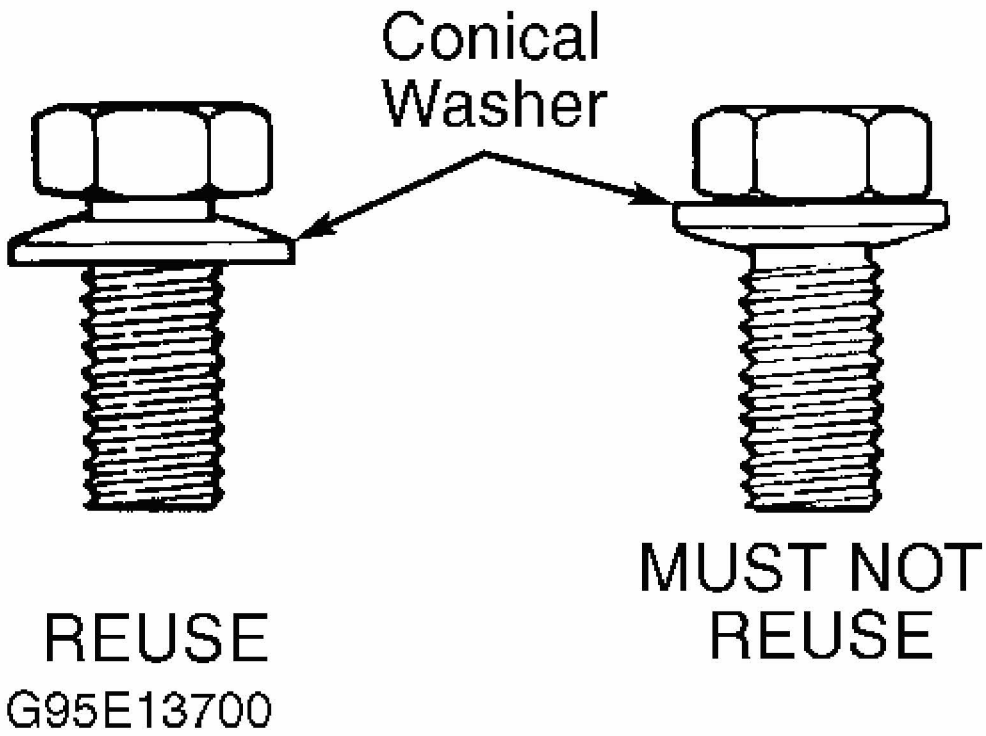


Fig. 10: Identifying Conical Washers
Courtesy of GENERAL MOTORS CORP.

1. Raise vehicle, and place large drain pan under transmission oil pan. Remove transmission oil pan front and side bolts only. Loosen rear bolts about 4 turns each.
2. Carefully pry pan loose using screwdriver. Allow fluid to drain. Remove remaining bolts, and remove oil pan. Discard old pan gasket. Remove filter and "O" ring or sleeve-type seal. Remove any remaining gasket material on transmission case.
3. Thoroughly clean pan, magnet and screen (if metal) with solvent, and then dry using compressed air. Replace paper filter (if equipped). Install NEW "O" ring on pick-up tube or NEW sleeve into pick-up tube recess. Lubricate with clean oil before installation.
4. Install filter assembly into pick-up tube recess. Install oil pan using NEW gasket, and tighten pan bolts to specification. See **TORQUE SPECIFICATIONS**. Add required amount of fluid to transmission through filler tube.
5. Start engine with gear selector lever in Park and parking brake applied. Check fluid level. See **CHECKING FLUID LEVEL**. Add fluid if necessary. DO NOT overfill.

ADJUSTMENTS

PARK LOCK CABLE (FLOOR SHIFT)

WARNING: 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.

NOTE: Vehicles with column shift do not use a park/lock control cable. On all vehicles, with transmission range selector lever in Park position and ignition switch in LOCK position, ensure transmission range selector cannot be moved to any other position. Ignition key should be removable.

"F" & "N" Bodies

1. With gear selector lever in Park and ignition switch in LOCK position, gear selector lever should not be able to be moved to other gear positions and ignition key should be removable from lock cylinder.
2. With ignition switch in RUN position and gear selector lever in Neutral, ensure ignition switch cannot be turned to LOCK position. If system does not perform as described, unlock park lock cable adjuster (button up). See **Fig. 11**. Move cable connector nose rearward until key can be removed from ignition. Lock cable adjuster (button down).

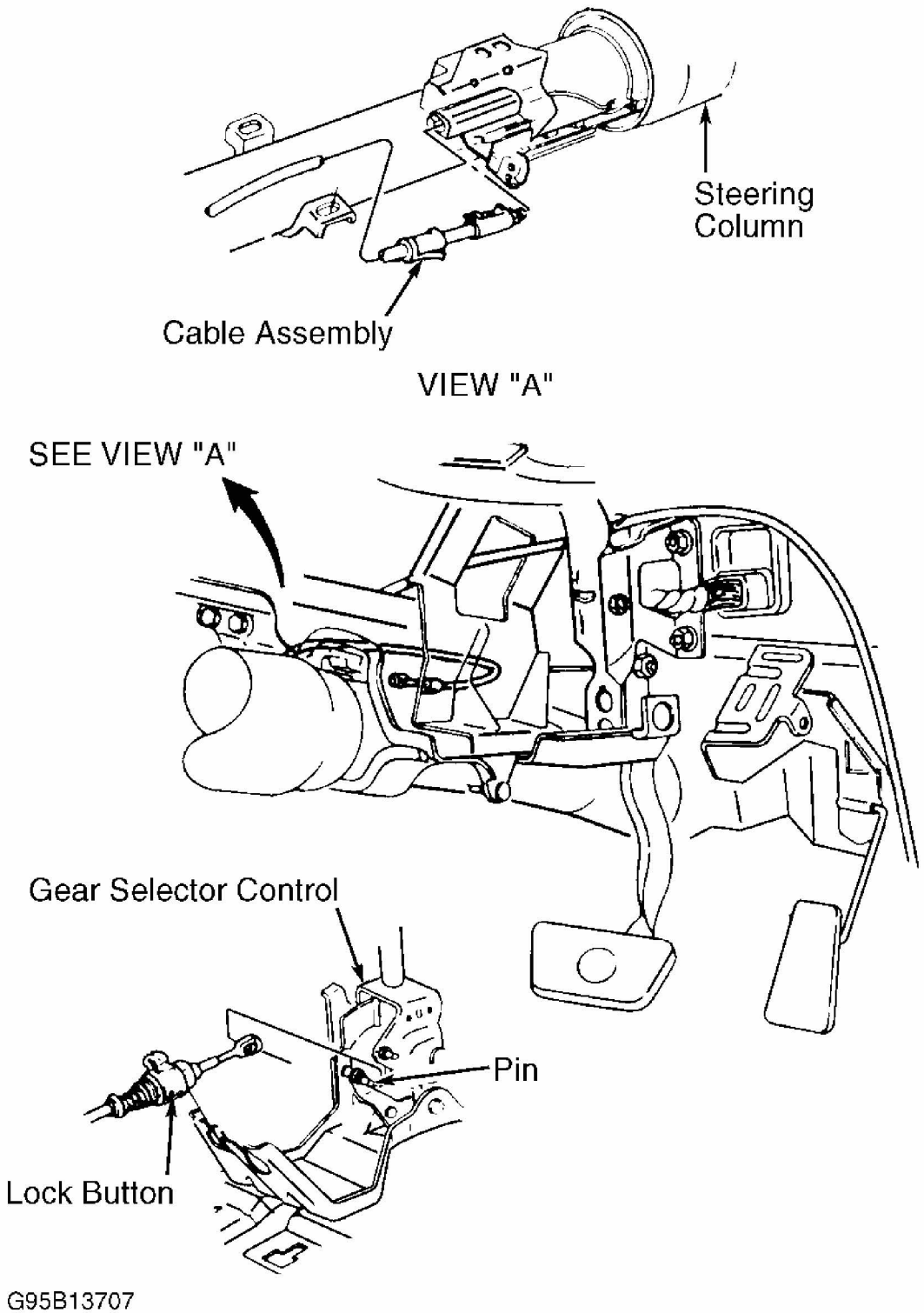


Fig. 11: Adjusting Park Lock Cable ("F" & "N" Bodies - Floor Shift)
Courtesy of GENERAL MOTORS CORP.

"J" Body

1. With ignition switch in RUN position and gear selector lever in Neutral, ensure ignition switch cannot be turned to LOCK position.
2. With gear selector lever in Park and ignition switch in LOCK position, gear selector lever should not be able to be moved to other gear positions and ignition key should be removable from lock cylinder.
3. If system does not perform as described, dislodge park/lock cable housing lock at ignition switch. Adjust outer cable housing to position White plastic collar in park/lock housing. See **Fig. 12**.
4. Ensure no gap is present between metal terminal stop at end of cable and White plastic collar. White plastic collar should be flush or less than .040" (1.0 mm) recessed in park/lock housing. Hold cable in position, and seat park/lock cable housing lock. Retest park/lock cable operation.

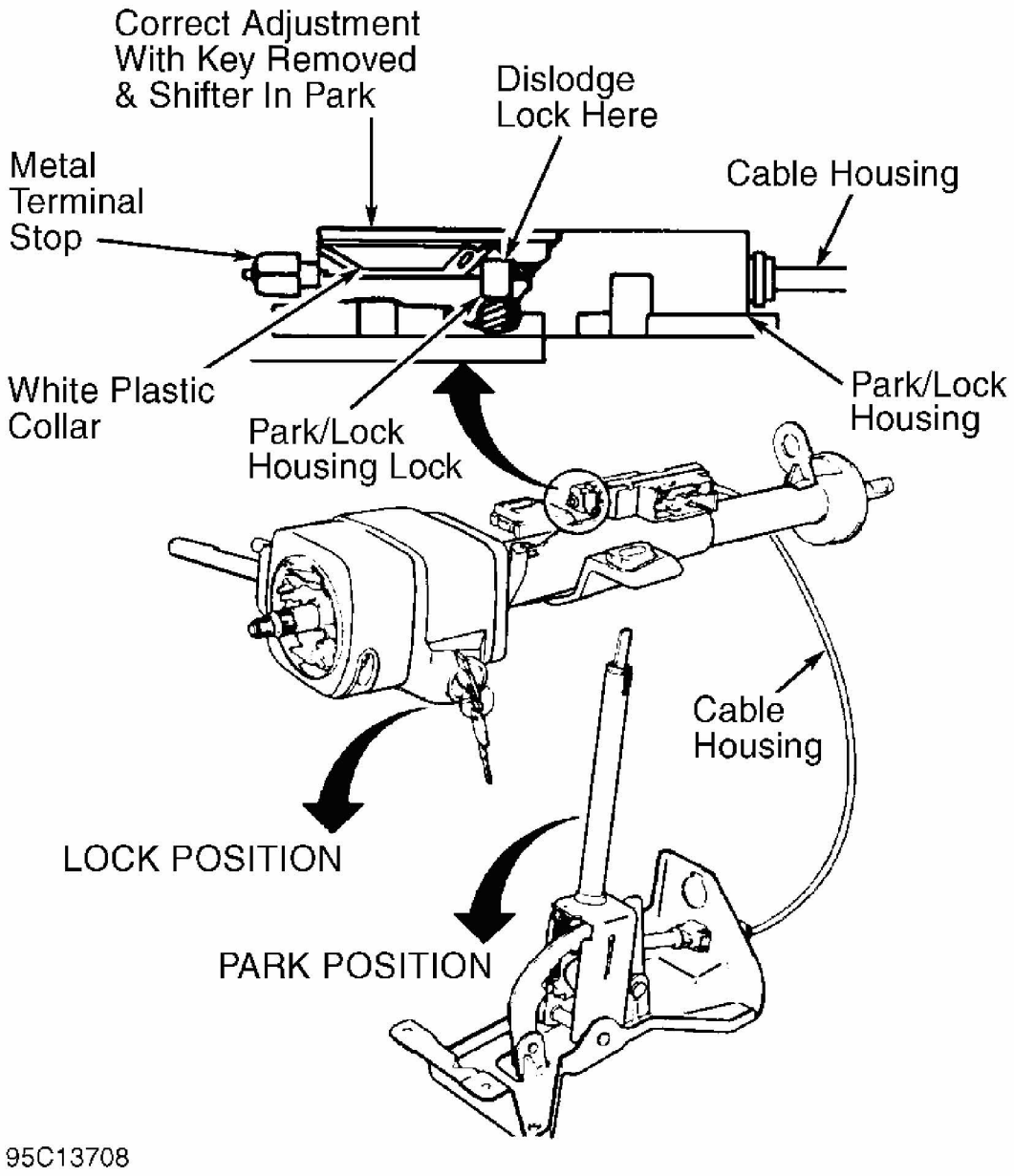


Fig. 12: Adjusting Park Lock Cable ("J" Body - Floor Shift)
Courtesy of GENERAL MOTORS CORP.

Saturn

1. Place gear selector in Park, and remove key. Remove cup holder/ashtray assembly. Lift lock tab on park lock cable end. See **Fig. 13**. Depress gear selector shift knob button quickly 3 times to set starting position of cable. Using a sharp pencil, mark starting position on slider. See **Fig. 13**.

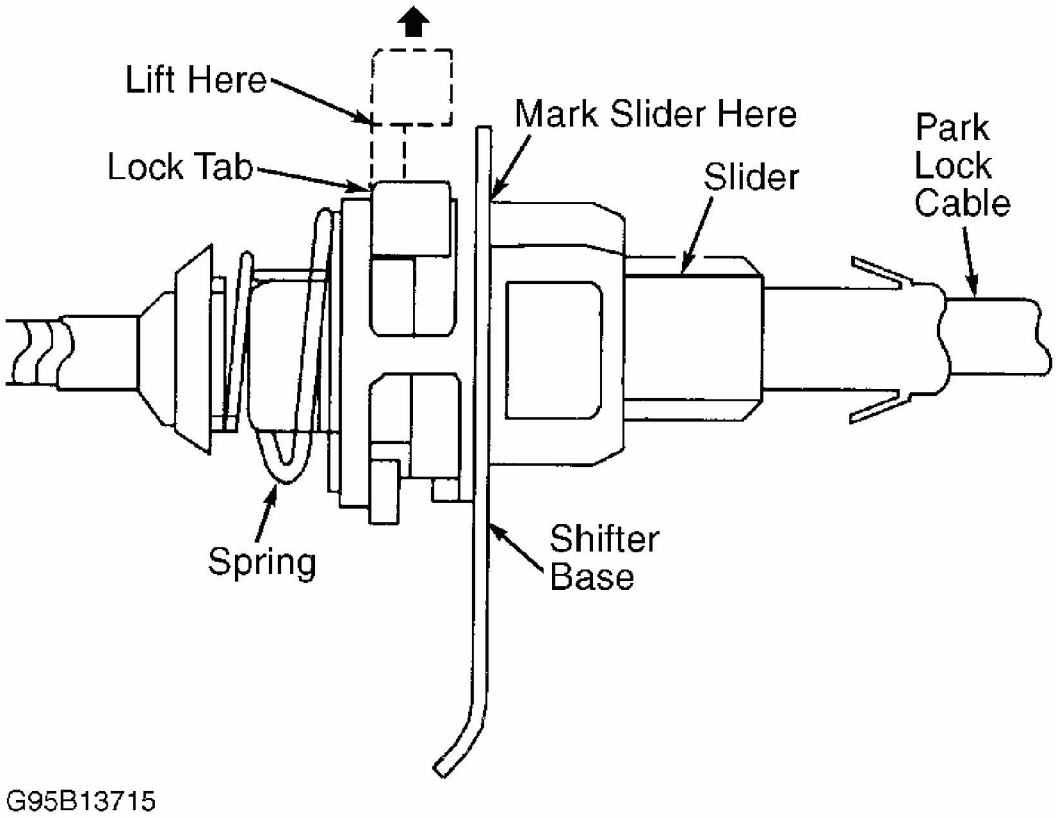


Fig. 13: Locating Park Lock Cable Components (Saturn)
Courtesy of GENERAL MOTORS CORP.

NOTE: Adjustment may move when lock tab is pushed. Proper operation must be verified prior to reassembly.

2. Using a feeler gauge for adjustment, move park lock cable towards shifter base .049" (1.25 mm). Push lock tab of shift lock cable end to set position.
3. With ignition off and shifter in Park, attempt to shift lever out of Park. Lever should not move. Turn ignition on. Shift lever should be allowed out of Park. Place shift lever in any position except Park and turn ignition off. Ignition key should not be removable. Attempt to place shift lever in Park. Lever should go into Park, and ignition key should be able to be removed.
4. If park lock cable fails any test, readjust cable. Check gearshift cable adjustment. See **SHIFT CABLE (FWD)**. Install cup holder/ashtray assembly.

PARK NEUTRAL POSITION (PNP) SWITCH

NOTE: PNP switch may also be called Transmission Range (TR) switch, and was also previously known as neutral safety switch. Adjust

switch so engine will start in Park or Neutral only.

FWD (Saturn)

Place gear selector in Drive. Using an ohmmeter, check for continuity across switch terminals. If continuity does not exist, loosen switch retaining bolts and rotate switch to obtain continuity. Tighten switch retaining bolts to 12 ft. lbs. (16 N.m) and recheck continuity.

FWD (Except Saturn)

1. Neutral safety switches come in 2 different types. See **Fig. 14**. Ensure shift cable is adjusted. To adjust switch, place gear selector lever in Neutral.
2. Place transaxle lever in Neutral detent. Loosen switch attaching screws. Rotate switch on shifter assembly to align adjustment hole with carrier tang hole.
3. Insert a .094" (2.4 mm) wire gauge about 5/8" (16 mm) into switch holes. Tighten attaching screws. Remove wire gauge. New switches may have a plastic pin installed in hole. Plastic pin is designed to shear off during initial shift lever operation.

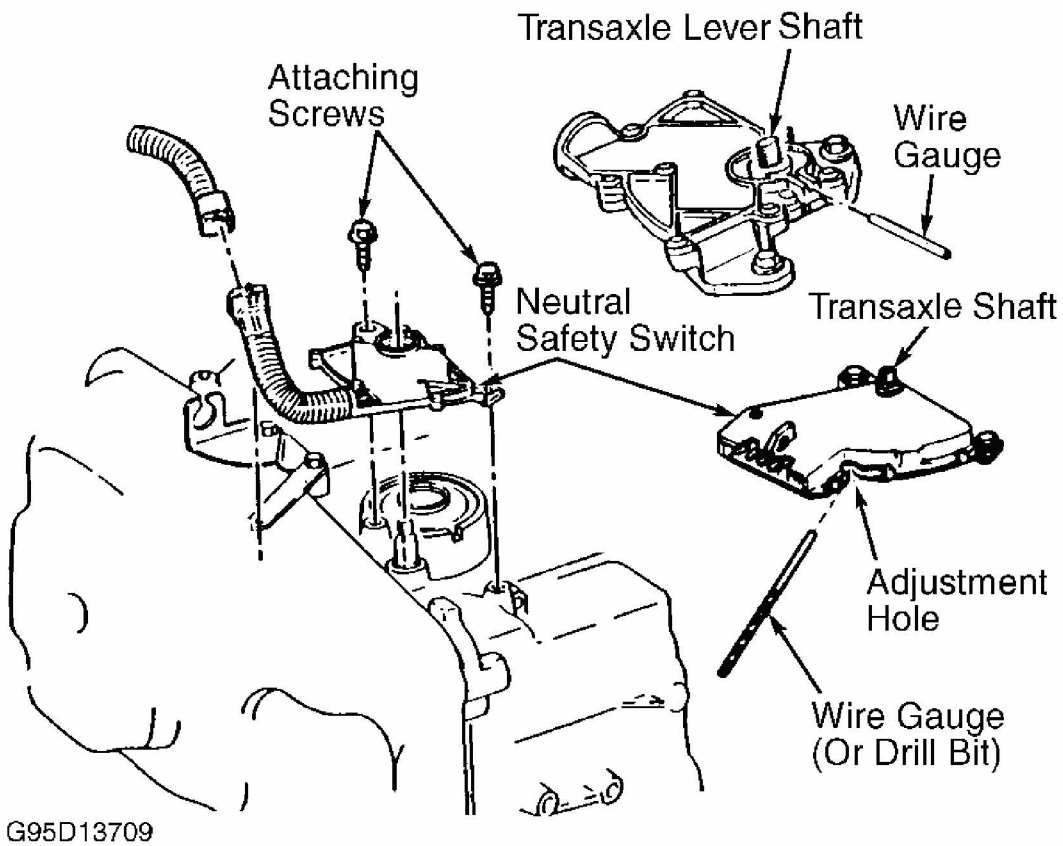


Fig. 14: Adjusting Park Neutral Position (PNP) Switches (FWD)

Courtesy of GENERAL MOTORS CORP.

RWD (Camaro, Corvette & Firebird)

1. Disconnect negative battery cable. Remove gear selector knob and center console cover. Place gear selector lever in Neutral. If old switch is being adjusted, go to next step. If NEW switch is being installed, go to step 4.
2. Align tang on switch with tang slot on shift control. See **Fig. 15**. Loosen switch mounting nuts. Rotate switch to align service adjustment hole with carrier tang hole.
3. Insert a .092" (2.34 mm) wire gauge into adjustment hole in top of switch. Rotate switch until pin drops to depth of .59" (15 mm). Tighten mounting nuts to 27 INCH lbs. (3 N.m). Vehicle should only start in Park or Neutral.
4. If NEW switch if being installed, insert switch tang in slot on shift control. Tighten mounting nuts to 27 INCH lbs. (3 N.m).
5. Ensure gear selector lever is in Neutral if holes DO NOT align with shift control. DO NOT rotate switch. Switch is pinned in Neutral.

NOTE: If NEW switch is rotated and pin breaks during installation, use adjustment procedure in step 2.

6. If holes align with shift control, move gear selector lever out of Neutral to shear plastic pin.

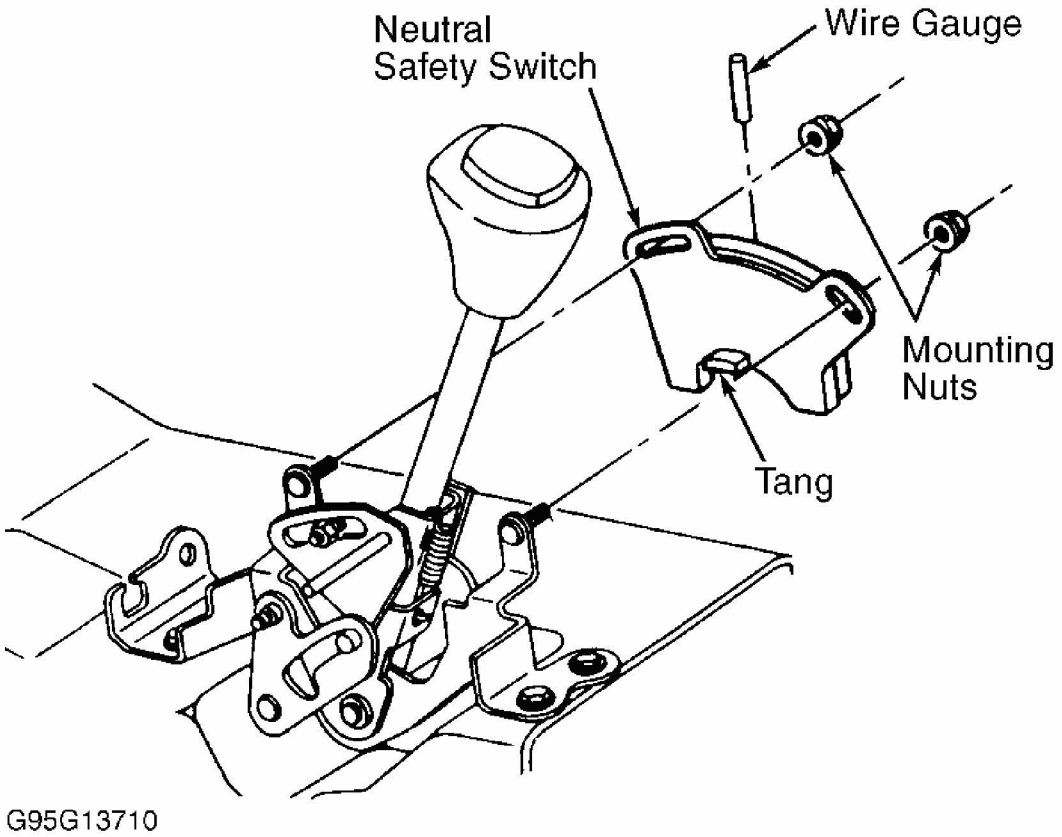


Fig. 15: Adjusting Park Neutral Position (PNP) Switches ("Y" Body Shown; "F" Body Is Similar)
Courtesy of GENERAL MOTORS CORP.

RWD (Catera)

1. Apply parking brake. Place gear selector to Neutral. Raise and support vehicle. Remove cover from selector lever position switch. Remove selector lever from switch. Disconnect harness connector from switch.
2. Connect ohmmeter between switch terminals "E" and "H". Loosen selector switch-to-transmission bolts. Rotate switch slightly in both directions to determine range of electrical contact (about 5 degrees).
3. Position switch in middle of contact range. Tighten hold-down bolts to 106 INCH lbs. (12 N.m). Install linkages and wiring harness. Tighten selector lever shaft nut to 71 INCH lbs. (71 N.m).

SHIFT CABLE (FWD)

WARNING: Adjust shift cable so engine will start in Park or Neutral only. Misadjusted shift linkage could cause clutch and/or

band failure in transmission.

NOTE: Most FWD vehicles are equipped with a self-adjusting shift cable.

Saturn

1. Place gear selector in Park. Raise and support vehicle. Disconnect cable assembly at transaxle control lever. Ensure transaxle control lever is turned fully clockwise, in Park.
2. Using a small screwdriver, pry up cable adjuster lock tab. See **Fig. 16**. Reconnect cable assembly to transaxle control lever. Ensure cable housing moves freely inside adjuster housing. Move cable housing back and forth, and note amount of end play.
3. Adjust cable by moving cable housing 1/2 the amount of total end play. Press lock tab down and ensure cable housing is secure. Check park lock cable adjustment. See **PARK LOCK CABLE (FLOOR SHIFT)**.

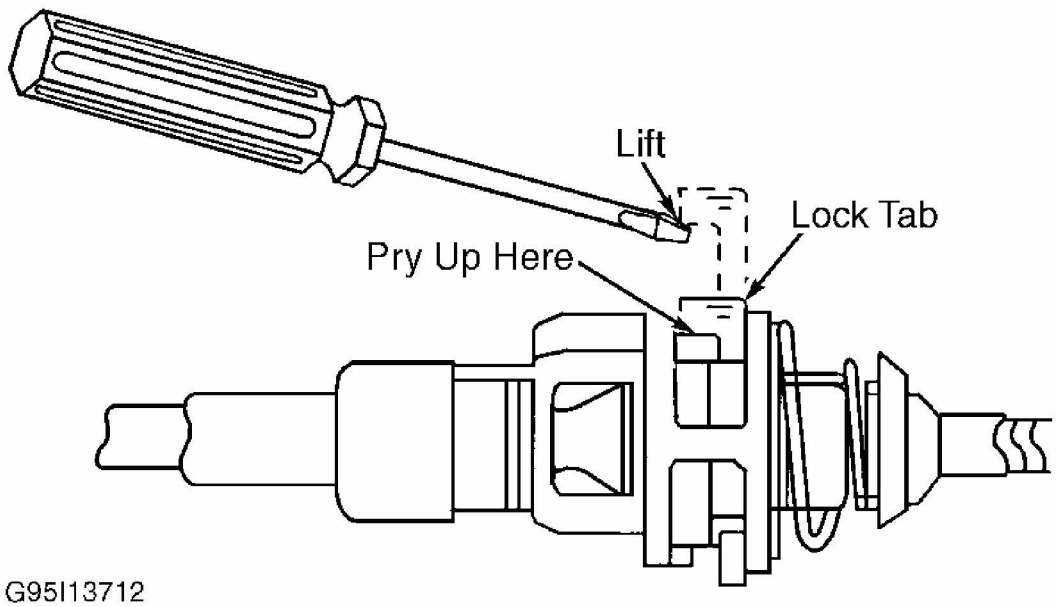


Fig. 16: Locating Gearshift Cable Lock Tab (Saturn)
Courtesy of GENERAL MOTORS CORP.

Except Saturn

Place gear selector lever in Neutral. Lift or press lock button on cable adjuster at transaxle mounting bracket. See **Fig. 17** and **Fig. 18** . Place transaxle lever in Neutral detent. Push down or release lock button.

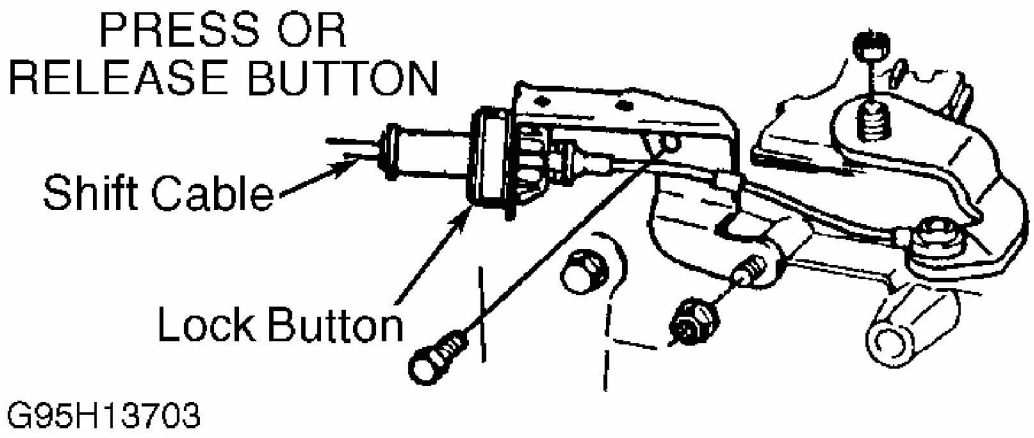


Fig. 17: Adjusting Shift Cable ("J" & "N" Bodies)
Courtesy of GENERAL MOTORS CORP.

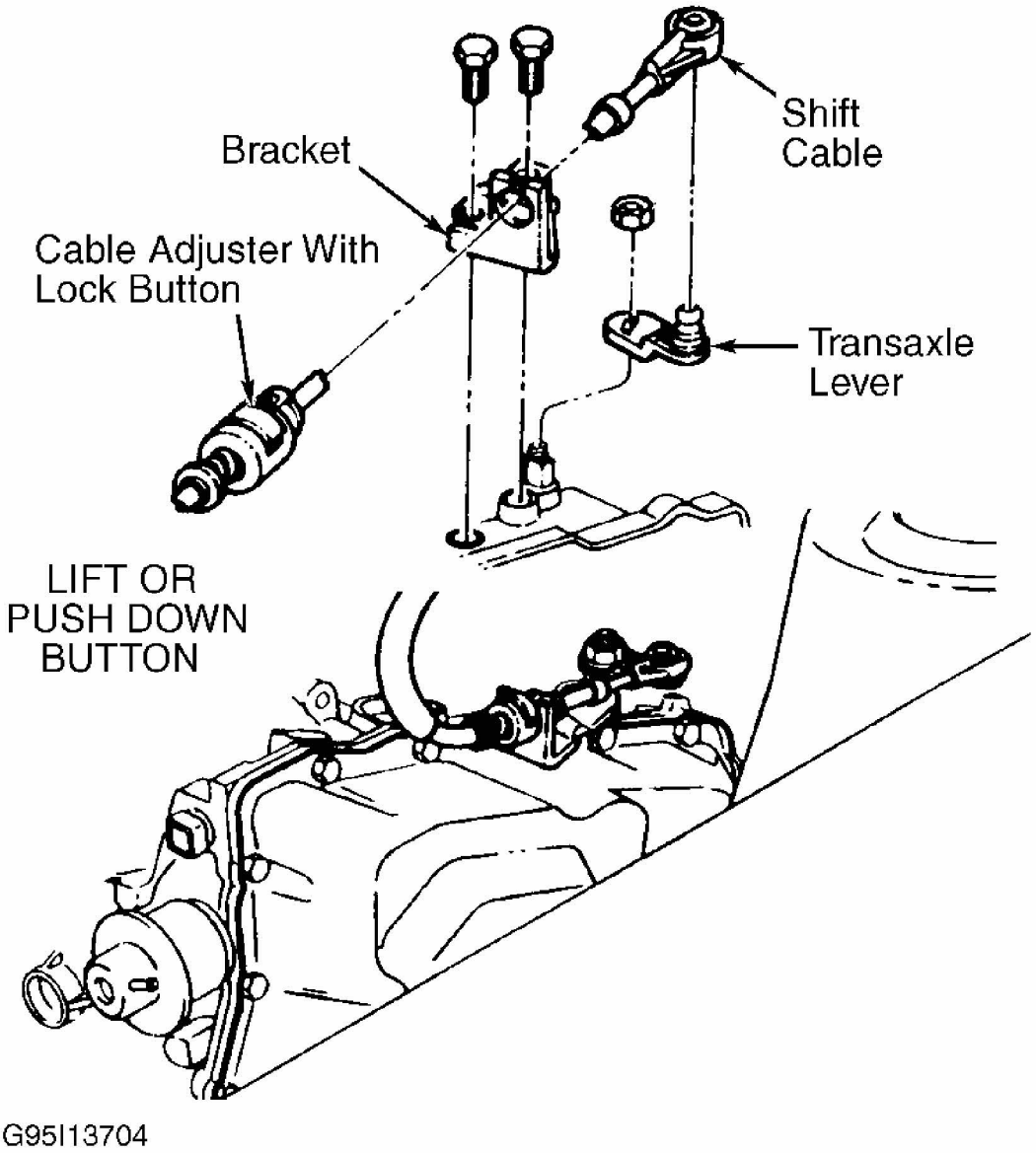


Fig. 18: Adjusting Shift Cable (Except "J" & "N" Bodies)
Courtesy of GENERAL MOTORS CORP.

SHIFT CABLE (RWD)

WARNING: Adjust shift cable so engine will start in Park or Neutral only. Misadjusted shift linkage could cause clutch and/or band failure in transmission.

CAUTION: To prevent transaxle damage on Camaro, Corvette and Firebird, hold lever out of Park when tightening cable

adjusting nut.

Camaro & Firebird

Place gear selector lever in Neutral. Raise and support vehicle. Loosen cable adjusting nut at transmission lever. See **Fig. 19**. Ensure shift shaft lever is in Neutral by rotating lever clockwise to Park detent, and then counterclockwise 2 detents to Neutral. Tighten nut (DO NOT tighten nut with lever in Park).

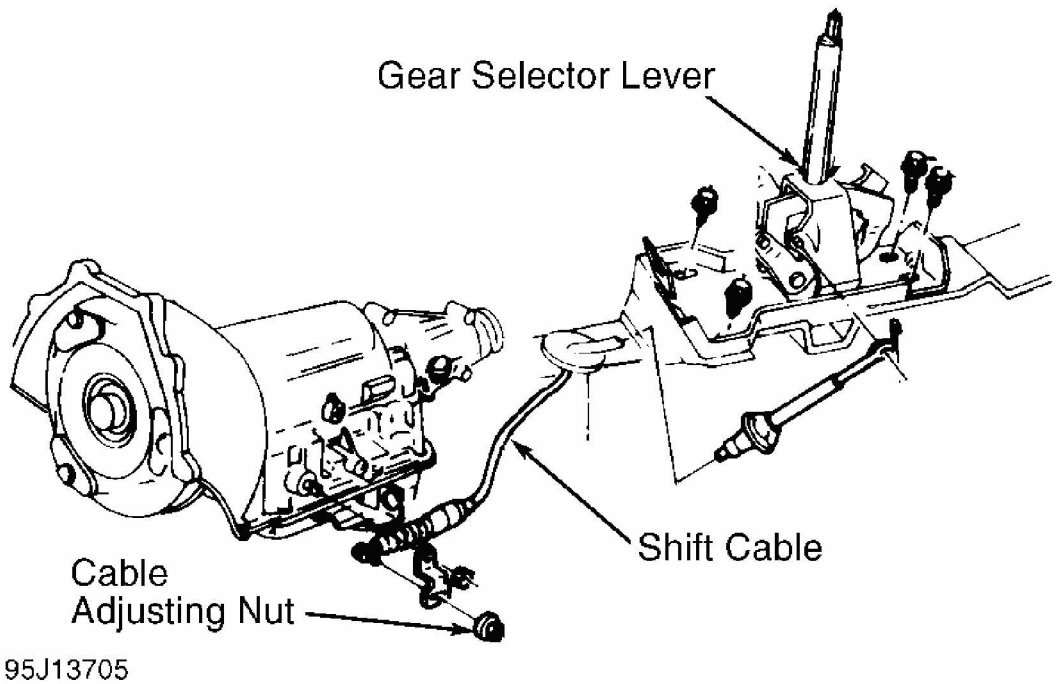


Fig. 19: Adjusting Shift Cable (Camaro & Firebird)
Courtesy of GENERAL MOTORS CORP.

Corvette

1. Place gear selector lever in Neutral. Raise and support vehicle. Using a flat-blade screwdriver, pry up to release shift cable adjustment lock. See **Fig. 20**.
2. Ensure gear selector lever and transmission shift lever are in Neutral. Press on shift cable lock to secure cable adjustment in place. Lower vehicle and check gearshift lever operation.

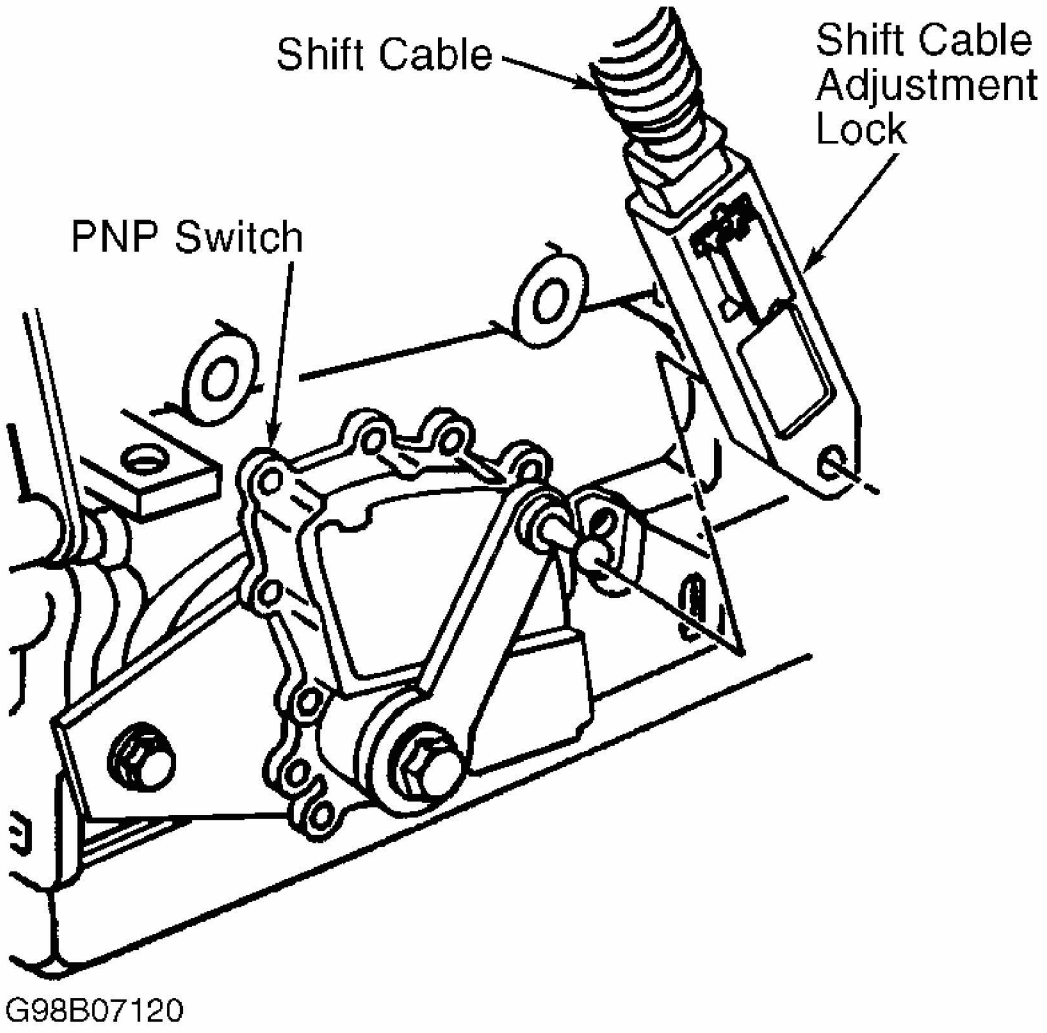


Fig. 20: Adjusting Shift Cable (Corvette)
Courtesy of GENERAL MOTORS CORP.

SHIFT LINKAGE ROD (RWD)

WARNING: Adjust shift linkage so engine will start in Park or Neutral only. Misadjusted shift linkage could cause clutch and/or band failure in transmission.

Catera

1. Position shift control lever in Park. Raise and support vehicle. Loosen shift linkage adjuster bolt from underneath vehicle.
2. Hold selector lever on transmission against rear stop to eliminate play. Tighten shift lever rod adjustment bolt to 71 INCH lbs. (8 N.m).

STOPLIGHT SWITCH

Except Saturn

Ensure brake pedal is fully released. Adjust switch until switch plunger just touches brake pedal lever.

Saturn

1. Loosen stoplight switch mounting nut enough to allow switch to move in adjustment slot. Install Adjustment Gauge (SA9303BR) between switch and actuator pad on brake pedal arm, ensuring switch plunger protrudes through slot in gauge.
2. Pull up on brake pedal with moderate force while pushing switch forward against gauge.

NOTE: It is important to hold switch perpendicular to actuator pad (maintaining alignment) while tightening mounting nut.

3. Tighten switch mounting nut. Release brake pedal. With pedal released and adjustment gauge still in position, ensure gauge will swing freely. If gauge does not swing freely, repeat steps 1-3 .
4. With gauge still in position, pull up on brake pedal with very light force and tap gauge side to side. If gauge swings freely, repeat steps 1-4 .
5. Inspect switch plunger. If .040" (1.0 mm) or less of plunger is visible between switch and switch actuator pad, switch is correctly adjusted. Height of rounded crown of plunger is equivalent to .040" (1.0 mm). If more than .040" (1.0 mm) of plunger is visible, repeat steps 1-5 .

THROTTLE VALVE (T.V.) CABLE

NOTE: T.V. cable is not used on electronically controlled models.

All Models (If Equipped)

1. Turn ignition off. Press and hold metal readjust tab on cable adjuster at cable support bracket on engine. See **Fig. 21**. Pull cable housing away from throttle lever until housing stops and is completely against adjuster. Release readjust tab.
2. Manually rotate throttle lever to its full throttle position. Ensure slider moves (ratchets) toward lever when lever is rotated to its full throttle position. Check cable for sticking and binding.

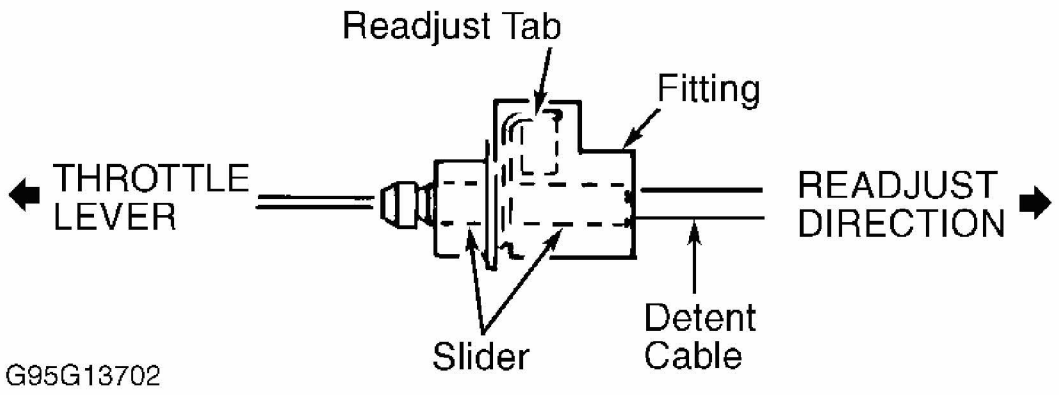


Fig. 21: Adjusting TV Cable
Courtesy of GENERAL MOTORS CORP.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

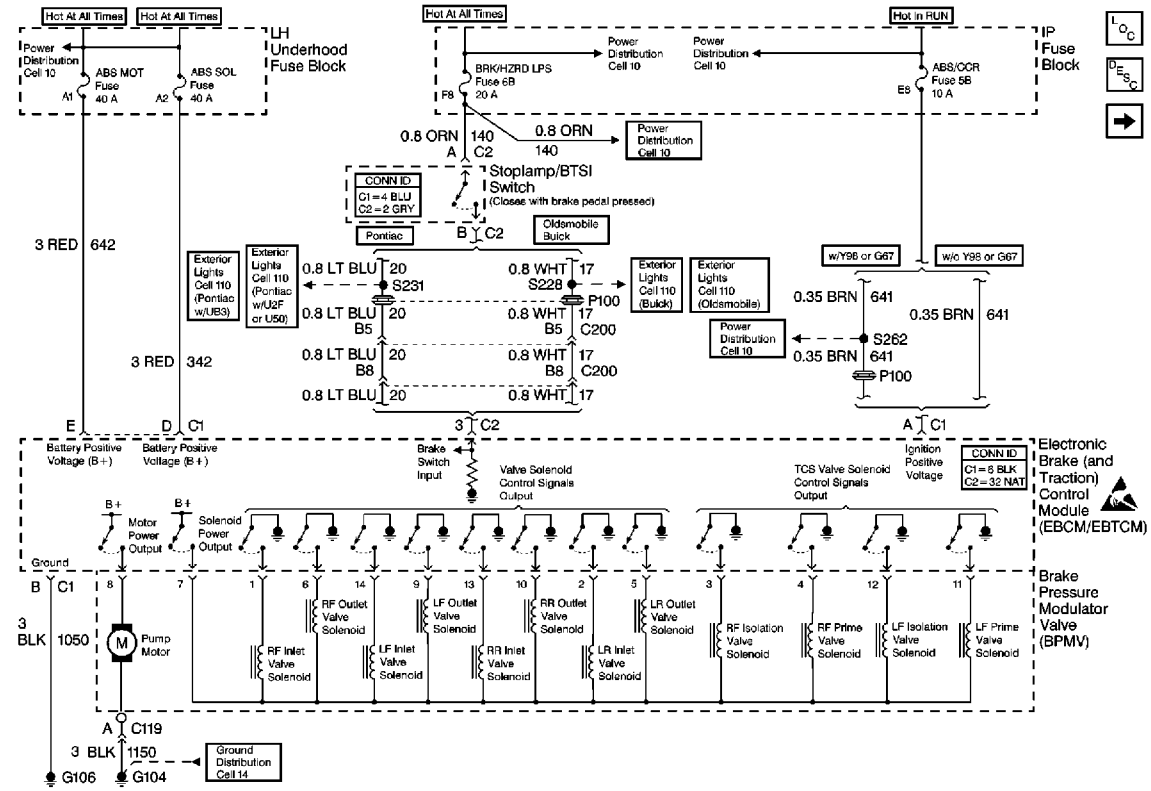
Transmission	INCH Lbs. (N.m)
Oil Pan Bolts	
3T40, 4T40-E & 4T45-E	106 (12)
4L30-E	92 (11)
4L60-E	
Corvette	97 (11)
Except Corvette	144 (16)
4T60-E	98 (11)
4T65-E	97 (11)
4T80-E	106 (12)
Saturn	88 (10)
Oil Fill Plug	
4L30-E (Catera)	33 (45)
4L60-E (Corvette)	22 (30)

Fastener Tightening Specifications

Application	Specification	
	Metric	English
BPMV Bracket to frame Bolt/Screw	24 N·m	18 lb ft
Brake Pipe Fittings At BPMV	16 N·m	12 lb ft
EBCM/EBTCM to BPMV Bolts	6 N·m	53 lb in
EBCM/EBTCM to BPMV Center Bracket Bolt	14 N·m	10 lb ft
EBCM/EBTCM Insulator Bracket Nuts	10 N·m	89 lb in

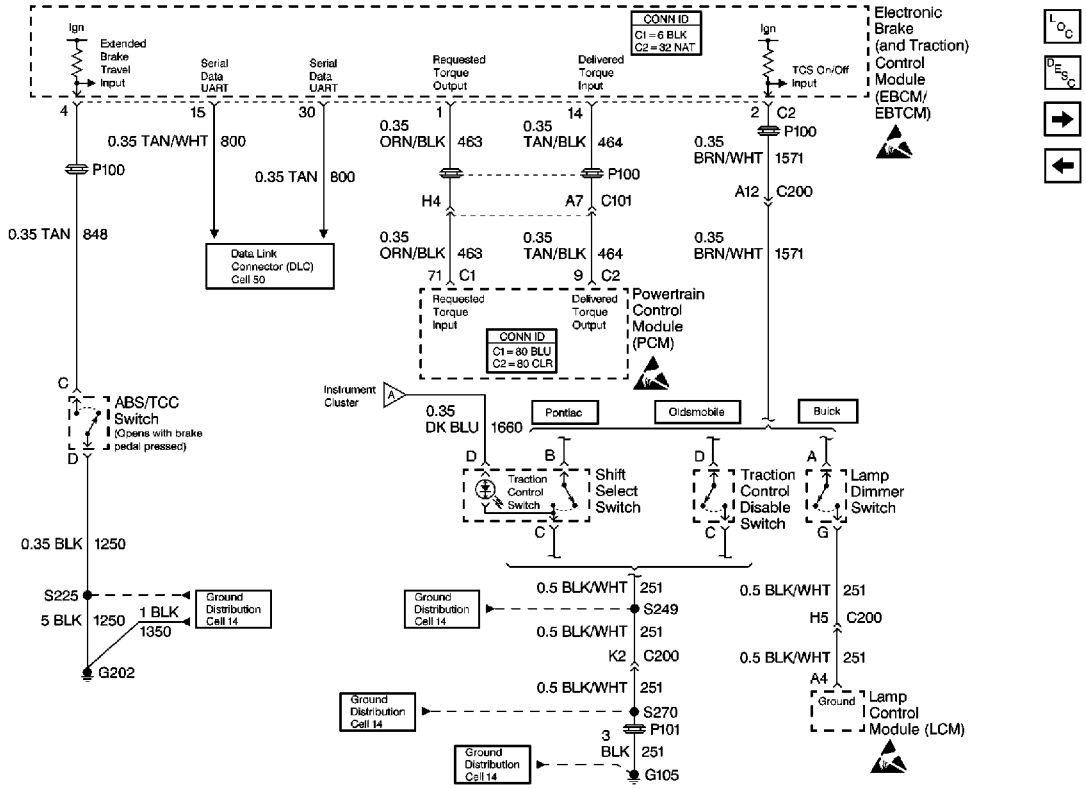
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Cell 44: PWR, GND, and Stoplamp/BTSI Switch



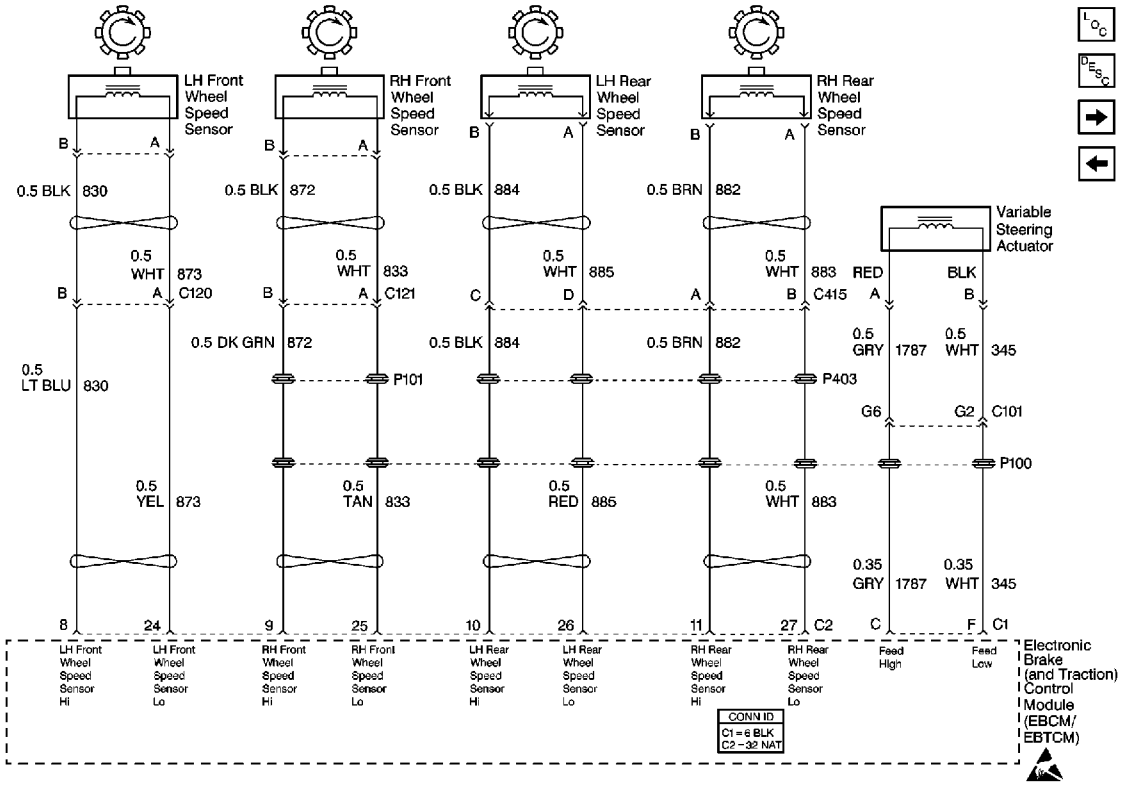
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Cell 44: ABS/TCS Switch, UART, PCM, and Traction Control Switch



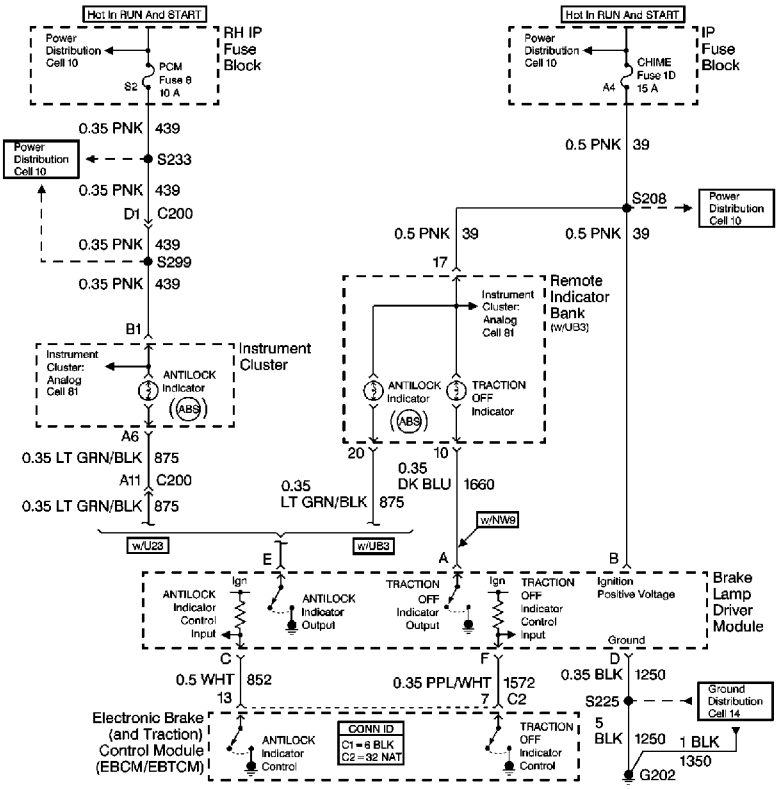
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Cell 44: Wheel Speed Sensors and Variable Power Steering Actuator



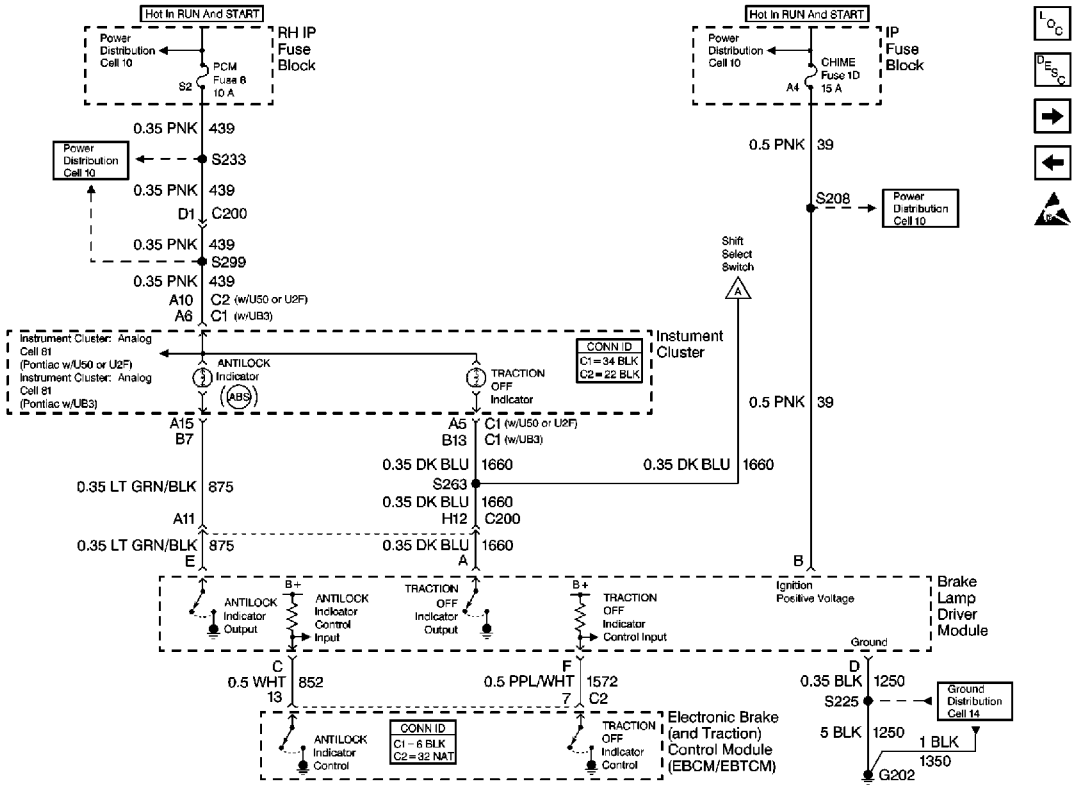
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Cell 44: Buick Indicators



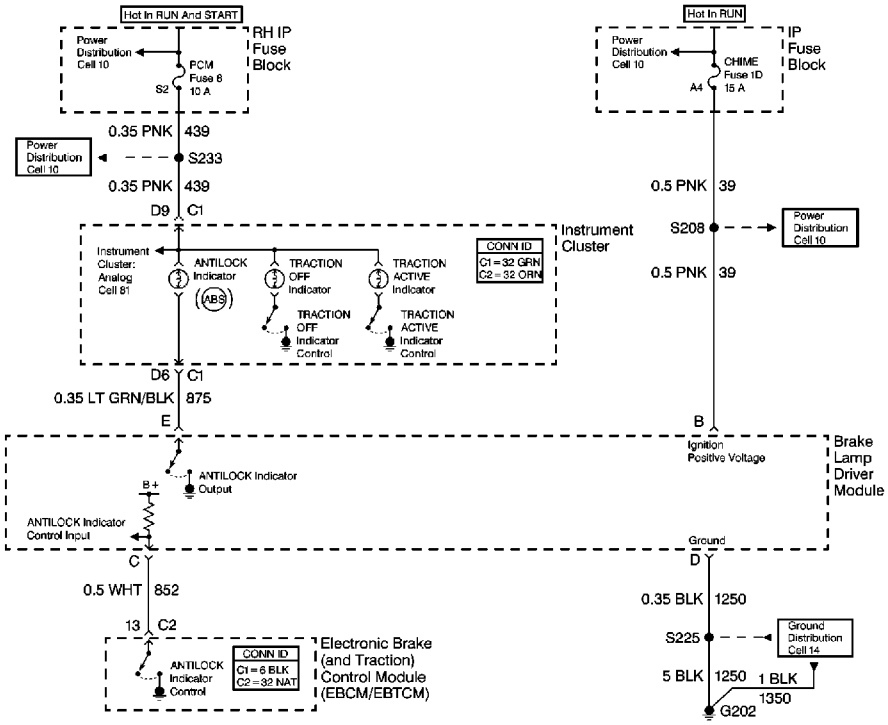
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Cell 44: Pontiac Indicators



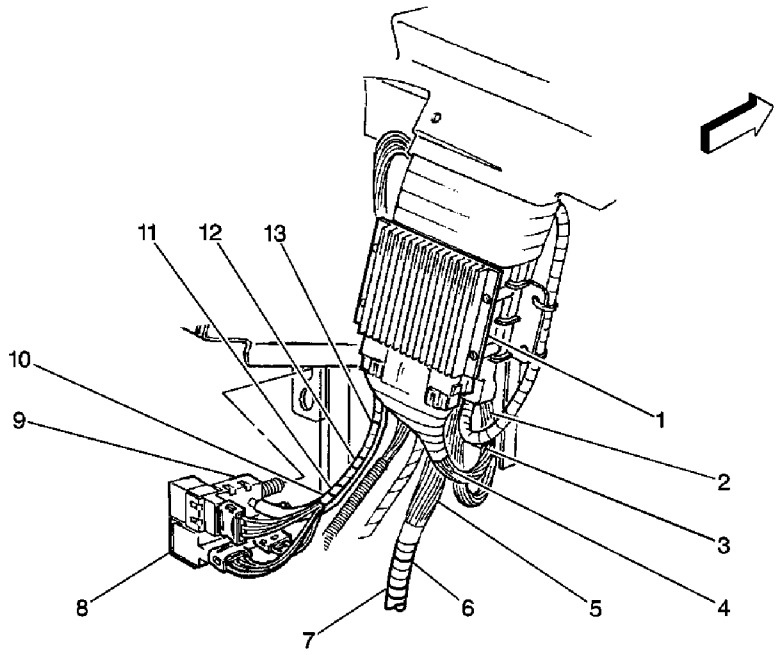
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Cell 44: Oldsmobile Indicators



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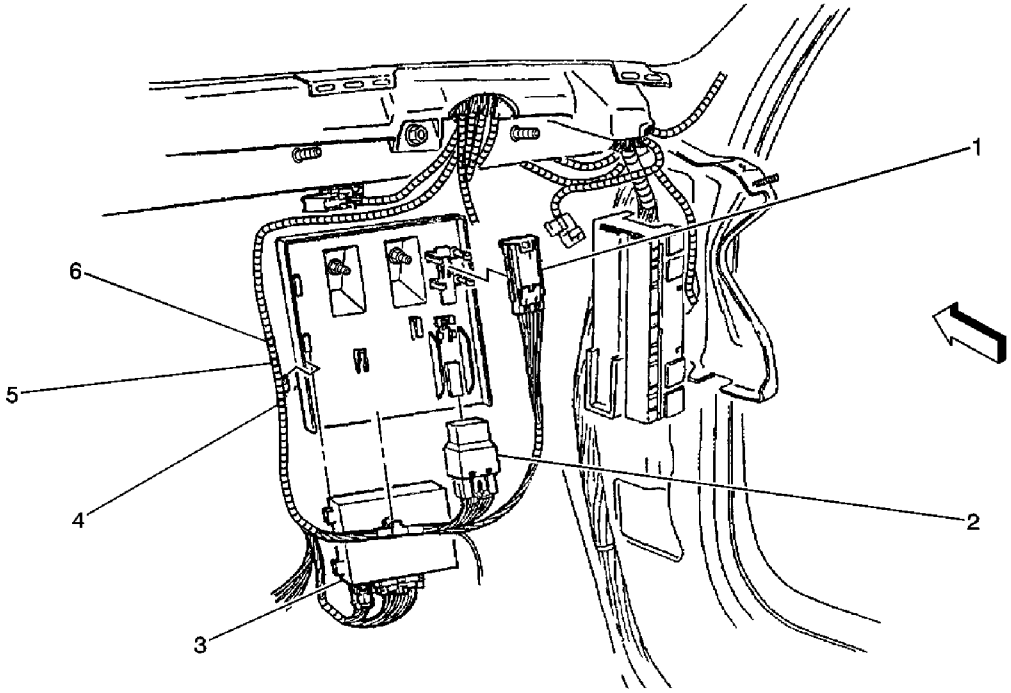
Passenger Compartment, Below the Center of the Instrument Panel



(1) Lamp Monitor Control Module
(2) S259
(3) S258
(4) S236
(5) S232
(6) S235
(7) To C200
(8) Stoplamp/BTSI Switch
(9) ABS/TCC Switch
(10) S231
(11) S228
(12) S230
(13) S296
(2)

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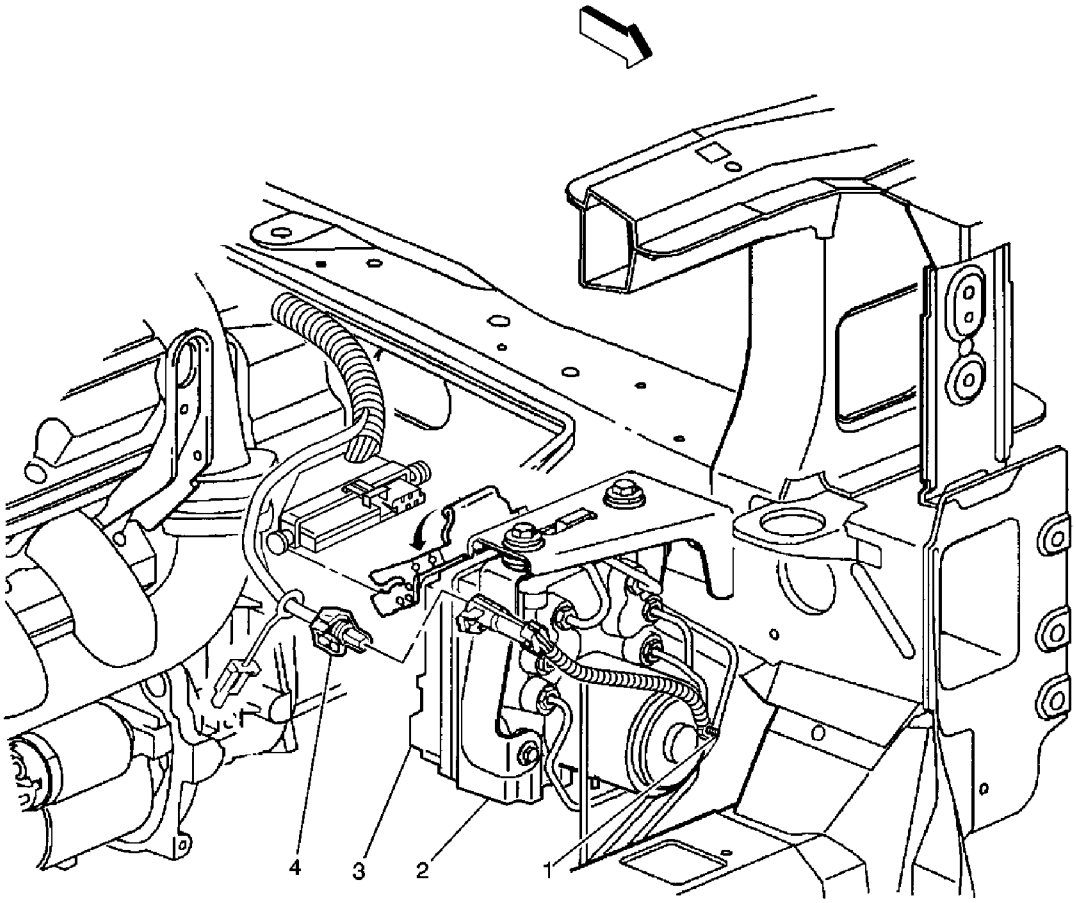
Passenger Compartment, Below the Right Corner of the IP



(1) Brake Lamp Driver Module
(2) Perimeter Lighting Relay
(3) Body Control Module (MALL)
(4) S274
(5) S247
(6) S267

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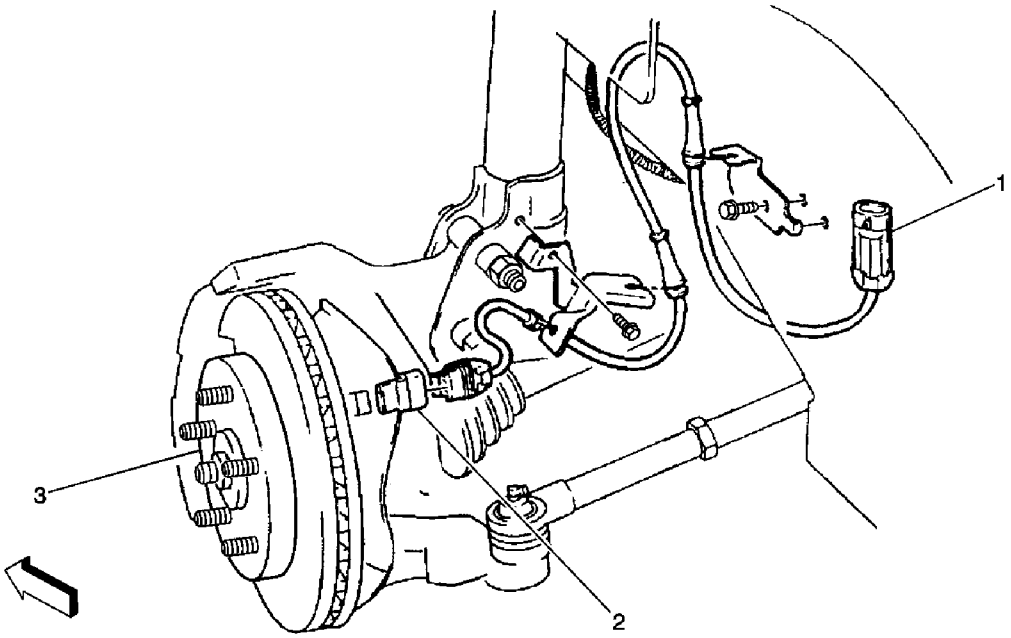
Engine Compartment, Lower Left Corner



(1) Brake Pressure Modulator Valve (BPMV) Ground
(2) Brake Pressure Modulator Valve (BPMV)
(3) Electronic Brake And Traction Control Module (EBCM/EBTCM)
(4) C119

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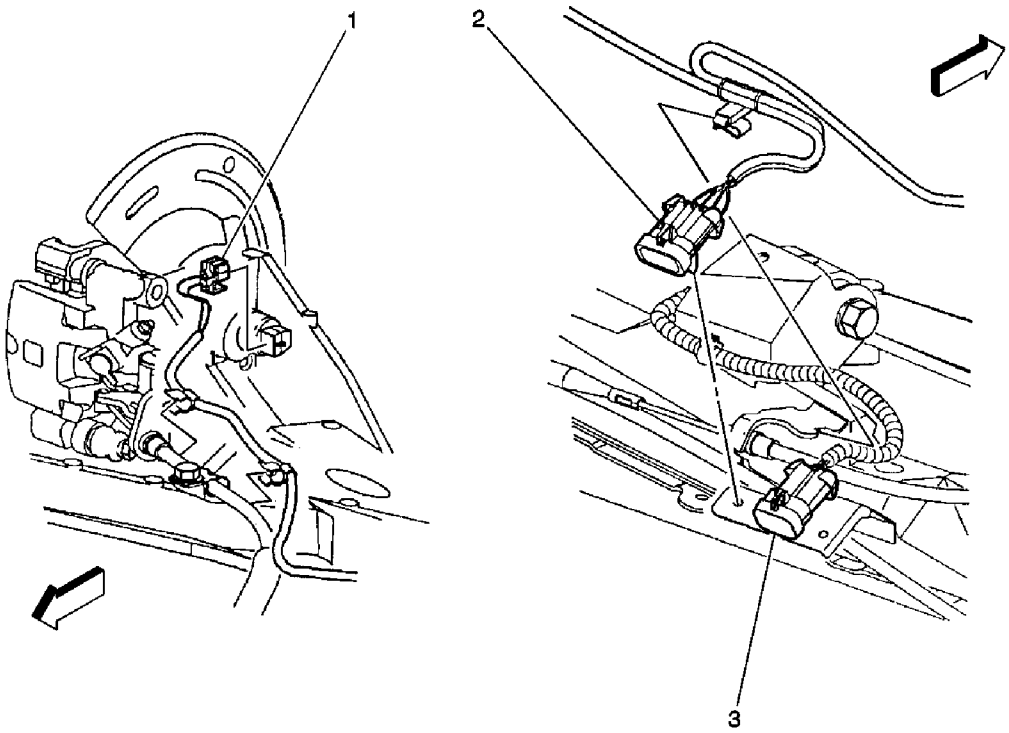
Wheel Opening, Left Front



(1) C120 (LH) C121 (RH)
(2) LH Front Wheel Speed Sensor (RH Similar)
(3) LH Front Disc Brake Rotor (RH Similar)

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Under the Rear of the Vehicle



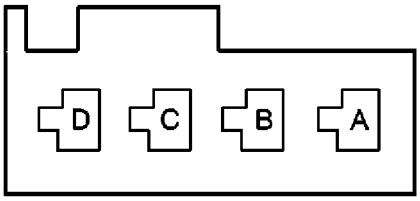
(1) RH Rear Wheel Speed Sensor (LH Similar)
(2) C415
(3) Automatic Level Control Sensor

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Antilock Brake System Connector End Views

Table 1: Brake Lamp Driver Module
Table 2: Electronic Brake (and Traction) Control Module (EBCM/EBTCM) Connector
Table 3: LH Front Wheel Speed Sensor
Table 4: LH Rear Wheel Speed Sensor
Table 5: RH Front Wheel Speed Sensor
Table 6: RH Rear Wheel Speed Sensor
Table 7: Traction Control Disable Switch

ABS / TCC Switch



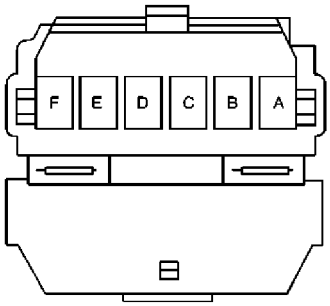


Connector Part Information	• 12033704 • 4-Way F Metri-Pack 280 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	BRN	241	Fused Output - IGN3
B	PPL	420	Brake Pedal Switch Output - TCC
C	TAN	848	Brake Pedal Switch Output - ABS
D	BLK	1250	Ground

Brake Lamp Driver Module

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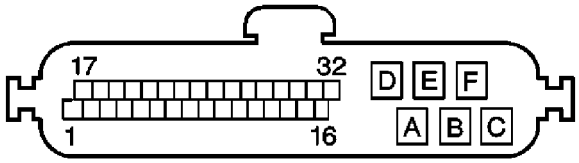




Connector Part Information	• 12015410 • 6-Way PC Edgeboard - STD (GRN)

Pin	Wire Color	Circuit No.	Function
A	DK BLU	1660	Traction Controls System Active Indicator Lamp Output
B	PNK	39	Fuse Output - Ign 1
C	WHT	852	ABS Signal - ABS Failure
D	BLK	1250	Ground
E	LT GRN/BLK	875	ABS Indicator Lamp Driver Module Output
F	PPL/WHT	1572	Traction Control System Indicator Lamp Output - Failure

Electronic Brake (and Traction) Control Module (EBCM/EBTCM) Connector

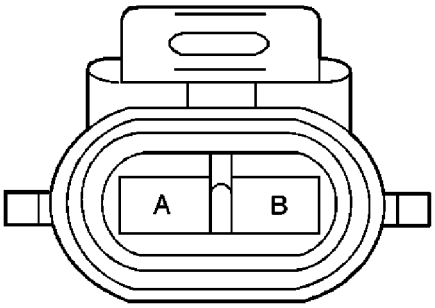




Connector Part Information	• 12160529 (C1) • 6 Way Metri-Pack 280 Series (BLK) • 12129228 (C2)

		• 32 Way Micro-Pack 100 Series (NAT)	
Pin	**Wire Color**	**Circuit No.**	**Function**
A	BRN	641	Fused Output - IGN
B	BLK	1050	Ground
C	GRY	1787	Feed Motor (High Effort)
D	RED	342	Fused Output (Bat)
E	RED	642	Fused Output (Bat)
F	WHT	345	Feed Motor (Low Effort)
1	ORN/BLK	463	Traction Control System Signal (Torque Desired)
2	BRN/WHT	1571	Traction Control System Switch Signal
3	WHT	17	Stoplamp Switch Output (Oldsmobile, Buick)
3	LT BLU	20	Stoplamp Feed (Pontiac)
4	TAN	848	Brake Pedal Switch Signal (ABS)
5-6	--	--	Not Used
7	PPL/WHT	1572	Traction Control System Lamp Output (Failure)
8	LT BLU	830	LF Speed Sensor Signal
9	DK GRN	872	RF Speed Sensor Signal
10	BLK	884	LR Speed Sensor Signal
11	BRN	882	RR Speed Sensor Signal
12	--	--	Not Used
13	WHT	852	ABS Signal (Failure)
14	TAN/BLK	464	Traction Control System Signal (Torque Delivered)
15	TAN	800	UART Serial Data Signal
16	BLK	--	Vent Tube
17-23	--	--	Not Used
24	YEL	873	LF Speed Sensor Return
25	TAN	833	RF Speed Sensor Return
26	RED	885	LR Speed Sensor Return
27	WHT	883	RR Speed Sensor Return
28-29	--	--	Not Used
30	TAN	800	UART Serial Data Signal
31-32	--	--	Not Used

LH Front Wheel Speed Sensor

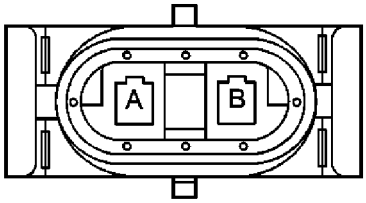




Connector Part Information	• 12052638 • 2-Way F Metri-Pak 150 Series (LT GRY)

Pin	Wire Color	Circuit No.	Function
A	WHT	873	Wheel Speed Sensor Return Left Front
B	BLK	830	Wheel Speed Sensor Signal Left Front

LH Rear Wheel Speed Sensor

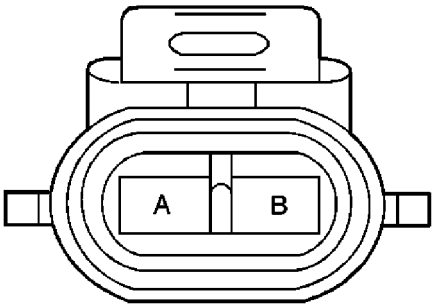




Connector Part Information	• 12124823 • 2-Way F Metri-Pak 150 Series (MD GRY)

Pin	Wire Color	Circuit No.	Function
A	WHT	885	Wheel Speed Sensor Return Left Rear
B	BLK	884	Wheel Speed Sensor Signal Left Rear

RH Front Wheel Speed Sensor

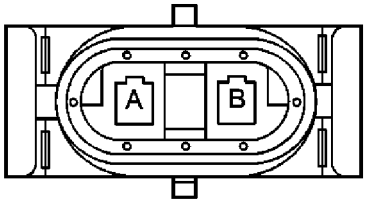




Connector Part Information	• 12052638 • 2 Way F Metri-Pack 150 Series (LT GRY)

Pin	Wire Color	Circuit No.	Function
A	WHT	833	Wheel Speed Sensor Return - Right Front
B	BLK	872	Wheel Speed Sensor Signal - Right Front

RH Rear Wheel Speed Sensor

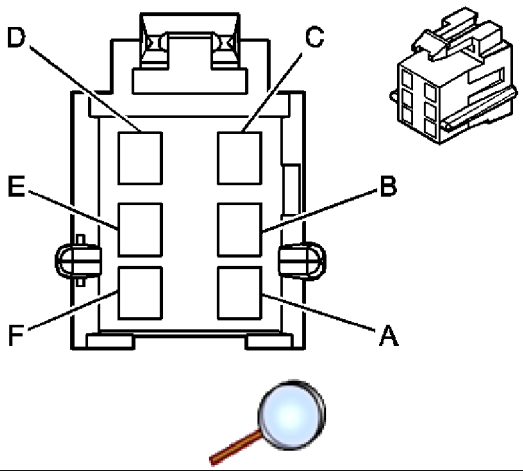




Connector Part Information	• 12124823 • 2-Way F Metri-Pack 150 Series (MD GRY)

Pin	Wire Color	Circuit No.	Function
A	WHT	883	Wheel Speed Sensor Return - Right Rear
B	BLK	882	Wheel Speed Sensor Signal - Right Rear

Traction Control Disable Switch



Connector Part Information	• 12064752 • 6-Way F Metric Pack 280 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	--	--	Not Used
B	BLK	1250	Ground
C	BLK/ WHT	251	Ground
D	BRN/ WHT	1571	Traction Control System Switch Signal
E	GRY	8	Instrument Panel Lamp Feed
F	--	--	Not Used

Antilock Brake System Automated Bleed Procedure

The following procedure provides a complete Delco Bosch 5 brake system bleed. The procedure cycles the system valves and runs the pump in order to purge air from the secondary circuits. The secondary circuits are normally closed Off during non-ABS/TCS mode operation and bleeding. Use this procedure when it is suspected that air has been ingested into the secondary circuits, or after BPMV replacement.

Bleed Instructions

1. Raise the vehicle on a suitable support. Refer to Lifting and Jacking the Vehicle in General Information.
2. Remove all four tire and wheel assemblies. Refer to Tire and Wheel Removal and Installation in Tires and Wheels.
3. Inspect the brake system for leaks and visual damage.
4. Inspect the battery state of charge. Refer to Battery Check in Engine Electrical.
5. Connect the Scan Tool to the DLC.
6. Turn the ignition to RUN. Do not start the engine.
7. Establish communications with the scan tool.
8. Select the ABS/TCS system features.
9. Select Special Functions.
10. Select Auto Bleed Procedure.
11. Bleed the base brake system. Refer to Hydraulic Brake System Bleeding in Hydraulic Brakes.
12. Follow the scan tool driven instructions until the proper brake pedal height is achieved.
13. If any malfunctions are detected, the bleed procedure will be aborted:
    - If DTCs are present, the scan tool will display DTCs Present or will list the DTCs, depending on when the DTCs were set.
    - DTCs can be cleared in the Trouble Codes mode. Refer to the appropriate DTC in order to clear the DTC.
    - If the test is aborted but no DTCs are listed, refer to Diagnostic System Check - ABS .
    - Correct all system malfunctions before attempting the bleed procedure again.
    - If a road test is required for diagnosis, and the brake pedal is spongy, perform a conventional brake bleed. Refer to Hydraulic Brake System Bleeding . Achieve a firm pedal before driving the vehicle.
14. When the auto bleed procedure is complete, perform the following steps:
    - Press the brake pedal. The brake pedal should be high and firm.
    - If the pedal is not firm, inspect the brake system for conditions that might cause the condition. Refer to Brake System Testing in Hydraulic Brakes.
    - If the brake system is OK, and excess pedal travel persists, repeat the bleed procedure.
15. Disconnect the scan tool.
16. Install the tire and wheel assemblies. Refer to Tire and Wheel Removal and Installation in Tires and Wheels.
17. Inspect the brake fluid level and fill as necessary. Refer to Master Cylinder Reservoir Filling in Hydraulic Brakes.
18. Road test the vehicle while making several ABS/TCS actuations in a suitable area. The brake pedal should remain high and firm throughout the test.

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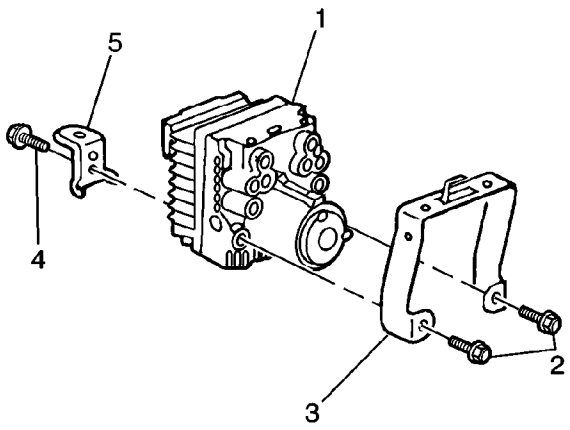
Electronic Brake Control Module Replacement

Removal Procedure

Caution: Do not pry EBCM/EBTCM. Be careful not to damage seal (if reusing module). If seal is damaged during removal, repair damaged area using GM P/N 123456739 silicone sealer or replace EBCM/EBTCM.

Important: You may not repair the EBCM/EBTCM. If the assembly is faulty, replace the EBCM/EBTCM as an assembly.

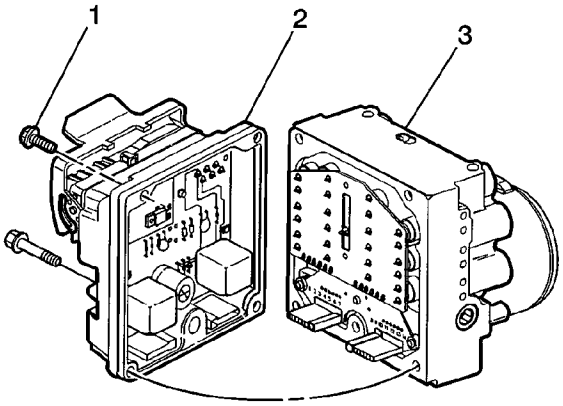
1. Turn the ignition switch to the OFF position.
2. Remove the air cleaner assembly and the PCM cover. Refer to Air Cleaner Assembly Replacement in Engine Controls - 3.8L.
3. Disconnect the EBCM/EBTCM harness connector.





4. Remove the front EBCM/EBTCM bracket from the vehicle (5).
5. Remove the EBCM/EBTCM center bracket mounting bolt (4).

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6. Remove the 4 EBCM/EBTCM to the BPMV bolts (1).

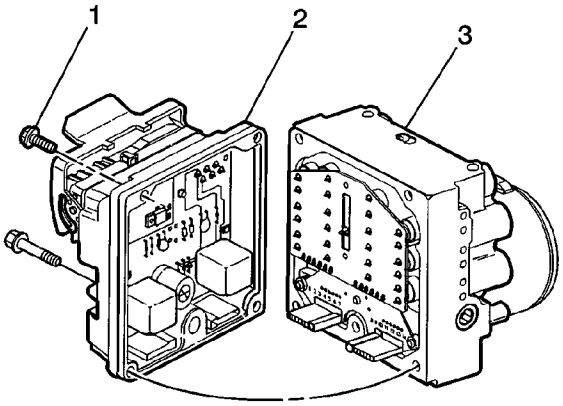
   Important: Do not twist the assembly.

7. Remove the EBCM/EBTCM by pulling rearward until the internal connector disengages.

Installation Procedure

Notice: Be sure to reconnect all harness retaining clips that may have been disconnected during the removal procedure in their original positions. Then perform a visual inspections of the entire harness checking to make sure all retaining clips are properly connected.

Important: When replacing the EBCM/EBTCM, you must recalibrate the Magnasteer®. Refer to Variable Effort Steering Programming in Variable Effort Steering.

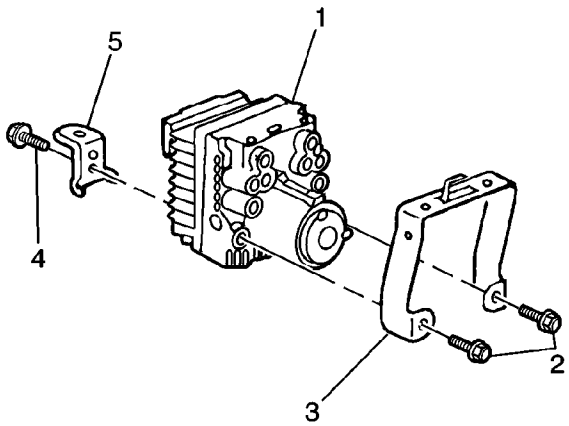


1. Clean the EBCM/EBTCM seal and the BPMV gasket surface using alcohol.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the EBCM/EBTCM to the BPMV.

Tighten
Tighten the 4 EBCM/EBTCM to BPMV bolts (1) to 6 N·m (53 lb in).





3. Install the front EBCM/EBTCM bracket (5).

   Tighten
   Tighten the EBCM/EBTCM center bracket mounting bolt (4) to 14 N·m (10 lb ft).

4. Connect the EBCM/EBTCM harness connector.
5. Install the air cleaner assembly and the PCM cover. Refer to Air Cleaner Assembly Replacement in Engine Controls - 3.8L.
6. Turn the ignition switch to the RUN position. Ensure that the engine is off.
7. Perform the ABS Diagnostic System Check. Refer to Diagnostic System Check - ABS .

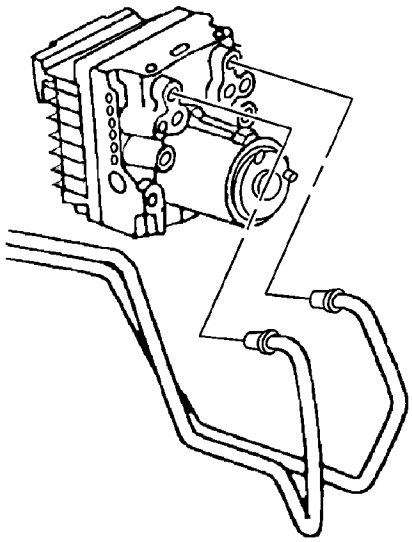
Brake Pressure Modulator Valve Replacement

Removal Procedure

Caution: For safety reasons, the Brake Pressure Modulator Valve (BPMV) must not be repaired; the complete unit must be replaced. With the exception of the EBCM/EBTCM, no screws may be loosened. If screws are loosened, it will not be possible to get the brake circuits leak-tight and personal injury may result.

1. Turn the ignition switch to the OFF position.
2. Remove the air cleaner assembly and the PCM cover. Refer to Air Cleaner Assembly Replacement in Engine Controls - 3.8L.
3. Disconnect the following connectors:
   - The EBCM/EBTCM harness connector
   - The BPMV motor ground cable connector

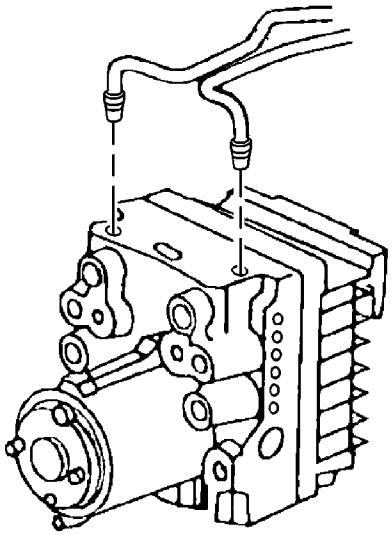
Important: Note the locations of the brake pipes in order to aid in installation.



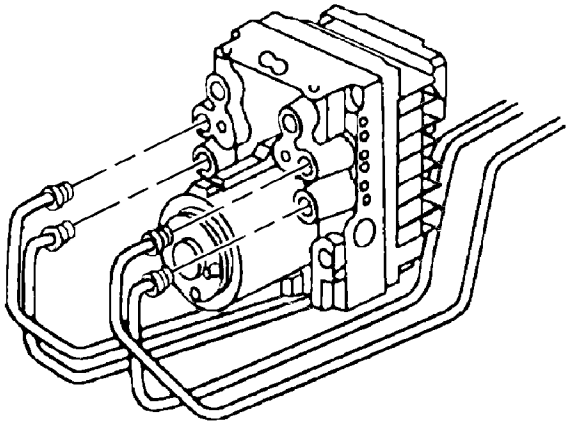


4. Remove the front master cylinder brake pipe fittings from the BPMV.

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5. Remove the top master cylinder brake pipe fittings from the BPMV.

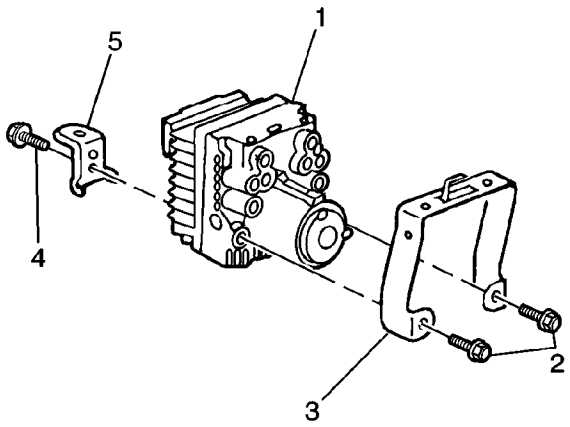


6. Remove the wheel brake pipe fittings from the BPMV.

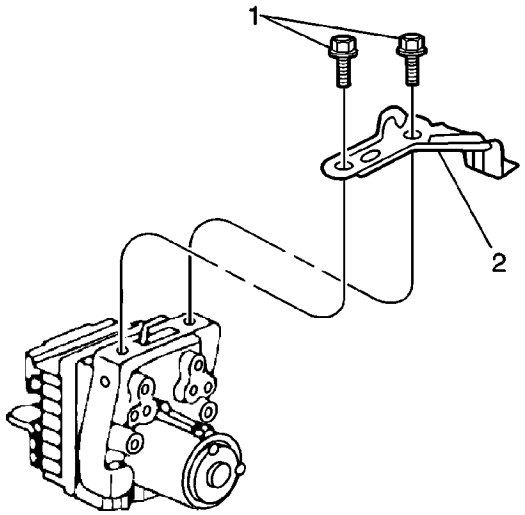
Notice: When removing the brake pressure modulator valve, protect the vehicle exterior from possible brake fluid spillage. Brake fluid can cause damage to painted surfaces.

Notice: Excessive bending of brake pipes during BPMV removal or installation may cause permanent damage that will require replacement.

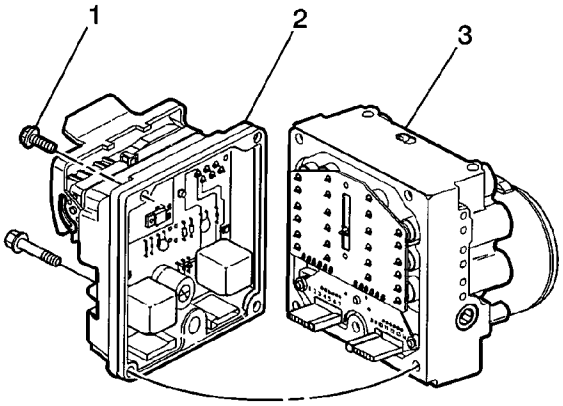
7. Clean any brake fluid spillage from the BPMV.



8. Remove the front EBCM/EBTCM bracket mounting bolt (4).
9. Remove the front EBCM/EBTCM bracket from the vehicle (5).



10. Remove the upper BPMV bracket from the frame rail (2).
11. Remove the 2 upper bracket to BPMV bolts (1).
12. Remove the EBCM/BPMV as an assembly.



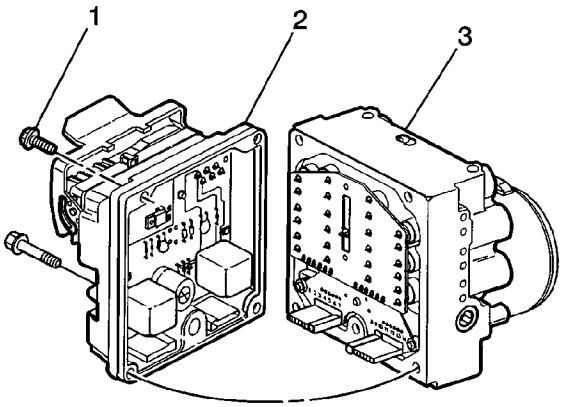
13. Remove the 4 EBCM/EBTCM to BPMV bolts (1).

Caution: Do not pry EBCM/EBTCM. Be careful not to damage seal (if reusing module). If seal is damaged during removal, repair damaged area using GM P/N 123456739 silicone sealer or replace EBCM/EBTCM.

14. Pull rearward in order to separate the EBCM/EBTCM from the BPMV.

Installation Procedure

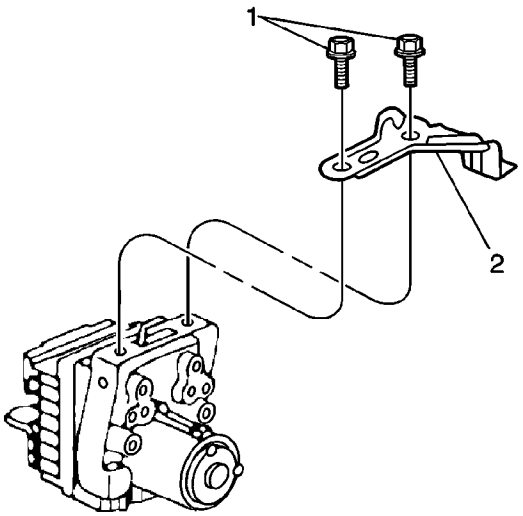
1. Clean the EBCM/EBTCM seal and the BPMV gasket surface using alcohol.



Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the EBCM/EBTCM to the BPMV.

Tighten
Tighten the 4 EBCM/EBTCM to BPMV bolts (1) to 4.5 N·m (40 lb in).

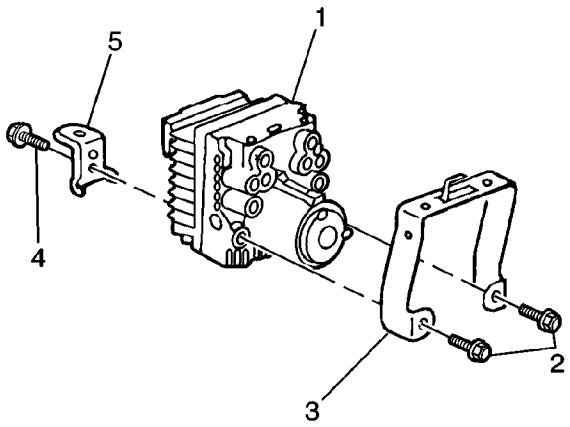




Important: If a new BPMV is being installed, remove the shipping plugs from the valve openings.

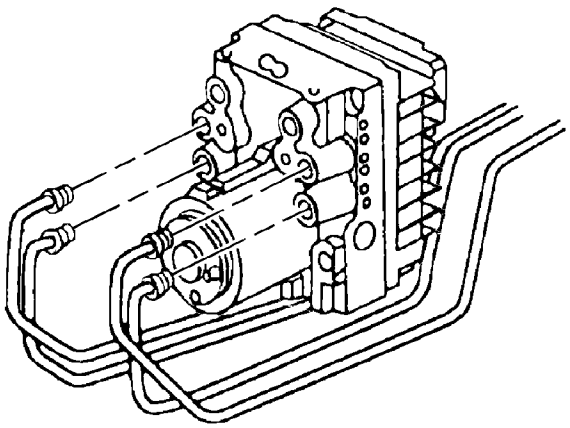
3. Install the upper BPMV bracket to the BPMV (2).
4. Install the EBCM/EBTCM and BPMV into the vehicle.
5. Install the 2 BPMV frame rail bolts.

Tighten
Tighten the bolts to 12 N·m (106 lb in).



6. Install the front EBCM/EBTCM bracket (5).
7. Install the EBCM/EBTCM to BPMV center bolt (4).

Tighten
Tighten the bolt to 14 N·m (10 lb ft).

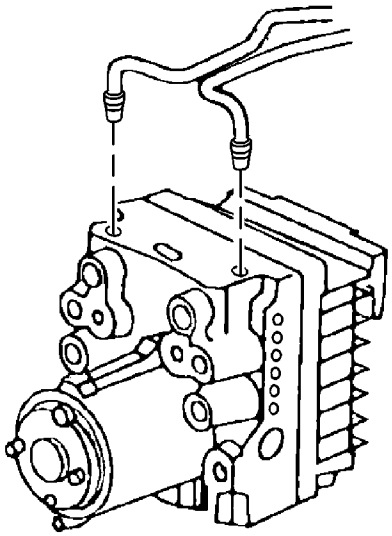


Caution: Make sure brake pipes are correctly connected to BPMV. If brake pipes are switched by mistake Inlet vs. Outlet, wheel lockup will occur and personal injury may result.

Important: Use the locations noted during removal.

8. Install the wheel brake pipe fittings to the BPMV.

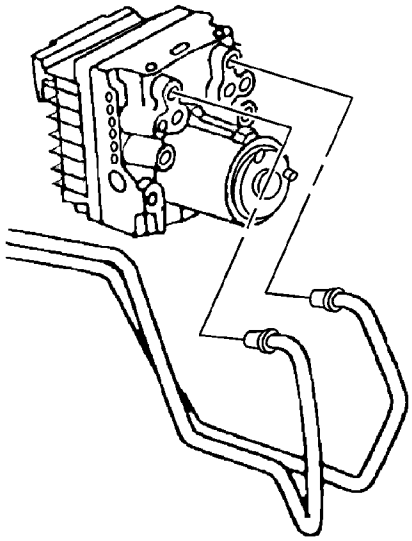
Tighten
Tighten the brake pipe fitting at the BPMV to 16 N·m (12 lb ft).



Important: Use the locations noted during removal.

9. Install the top master cylinder brake pipe fittings to the BPMV.

Tighten
Tighten the brake pipe fitting at the BPMV to 16 N·m (12 lb ft).





Important: Use the locations noted during removal.

10. Install the front master cylinder brake pipe fittings to the BPMV.

    Tighten
    Tighten the brake pipe fitting at the BPMV to 16 N·m (12 lb ft).

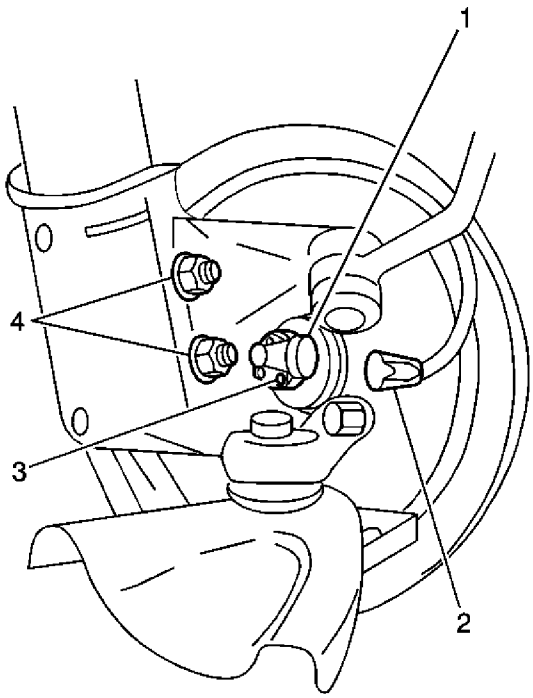
11. Connect the following connectors:
    - The EBCM/EBTCM harness connector
    - The BPMV motor ground cable connector
12. Install the air cleaner assembly and the PCM cover. Refer to Air Cleaner Assembly Replacement in Engine Controls - 3.8L.
13. Fill and bleed the hydraulic brake system. Refer to Master Cylinder Reservoir Filling and Hydraulic Brake System Bleeding in Hydraulic Brakes.
14. Turn the ignition switch to the RUN position. Ensure that the engine is off.
15. Perform the auto bleed procedure. Refer to Antilock Brake System Automated Bleed Procedure .

    Notice: Be sure to reconnect all harness retaining clips that may have been disconnected during the removal procedure in their original positions. Then perform a visual inspections of the entire harness checking to make sure all retaining clips are properly connected.

16. Perform the ABS Diagnostic System Check. Refer to Diagnostic System Check - ABS .

Rear Wheel Speed Sensor Replacement

Removal Procedure



1. Disconnect the wheel speed sensor connector (2).
2. Remove the lower strut attaching fasteners (4).
3. Clean all dirt and debris from sensor housing/sensor interface area.
4. Remove the mounting fasteners (3).

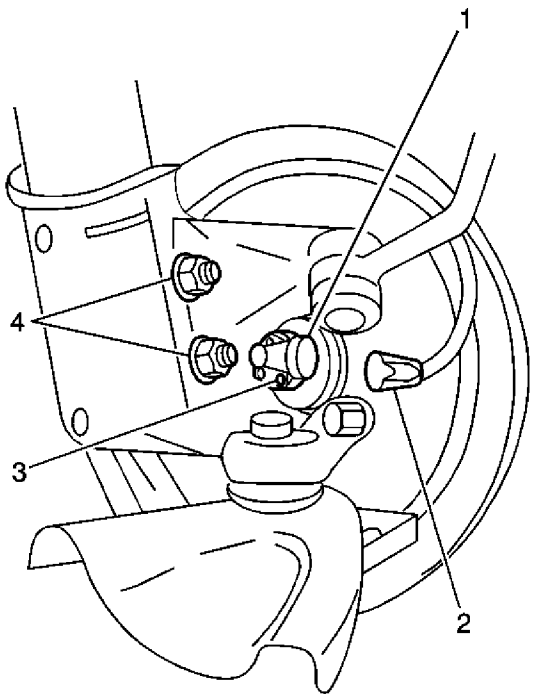
Important:

- Do not allow debris to enter the bearing when the sensor is removed.
- Do not add lubricant to the bearing through the sensor housing opening. The bearing is lubricated for the life of the vehicle.
- Do not clean grease from tooted sensor ring. Grease does not affect the sensor operation.

5. Remove the sensor.

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Installation Procedure



1. Lubricate new sensor O-ring.
2. Install the sensor to the housing.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the mounting fasteners (3) in a spiral pattern.

Tighten
Tighten the mounting fasteners to 2.8 N·m (25 lb in).

4. Install the lower strut attaching fasteners (4).

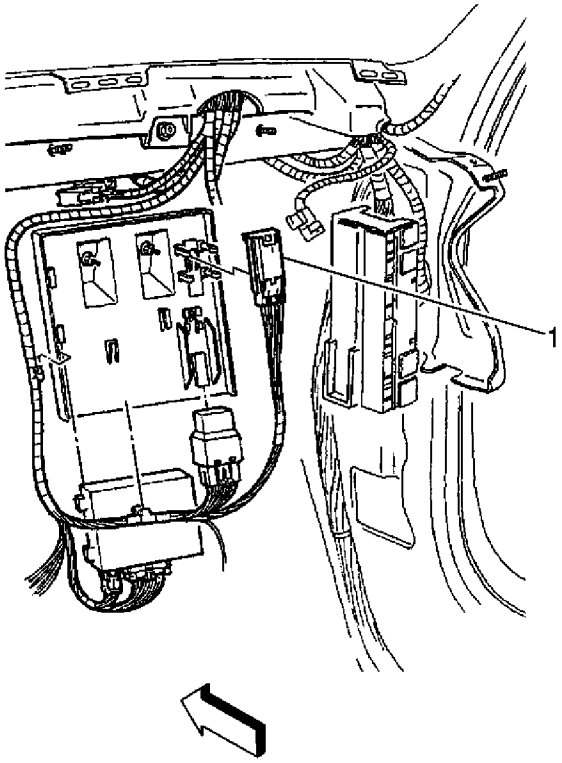
Tighten
Tighten the lower strut attaching fasteners to 190 N·m (140 lb ft).

5. Connect the wheel speed sensor connector (2).

Lamp Driver Module Replacement

Removal Procedure

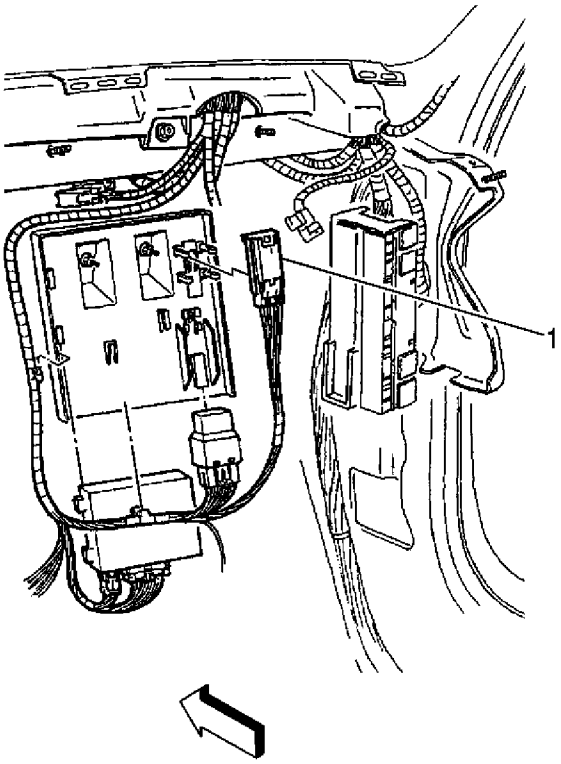
Important: The internal circuit board is replaceable. The terminals and housing are part of the wiring harness.



1. Remove the right sound insulator. Refer to Instrument Panel Insulator Panel Replacement - Right Side in Instrument Panel, Gauges and Console.
2. Unsnap the brake lamp driver module from the MALL bracket.
3. Open the brake lamp driver module endcap (1) and remove the circuit board by pulling straight out.

Installation Procedure

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1. Carefully install the circuit board into the brake lamp driver module case and close the endcap (1).
2. Snap the brake lamp driver module into the MALL bracket clip.
3. Install the right sound insulator. Refer to Instrument Panel Insulator Panel Replacement - Right Side in Instrument Panel, Gauges and Console.

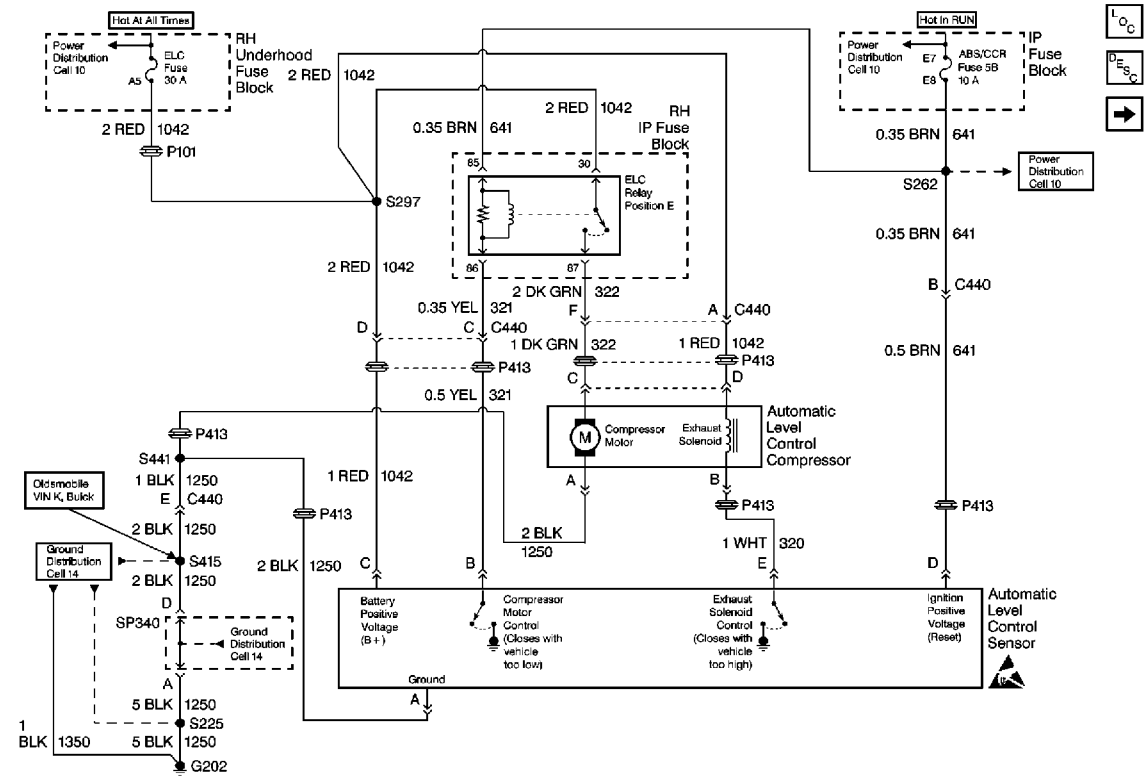
Fastener Tightening Specifications

Application	Specification	
	Metric	English
Air Compressor to Bracket Bolts	4 N·m	36 lb in
Air Compressor Bracket to Vehicle Nuts	10 N·m	88 lb in
Air Compressor Head to Air Compressor Bolts	6 N·m	53 lb in
Air Compressor Relay Screw	3 N·m	27 lb in
Brackets to Air Compressor Screws	7 N·m	62 lb in
Harness Tie to Air Compressor Head Bolt	3 N·m	26 lb in
Height Sensor to Bracket Nuts	2.5 N·m	22 lb in
Height Sensor to Vehicle Bolts	5 N·m	44 lb in
Upper and Lower Height Sensor Link Nuts	7 N·m	62 lb in

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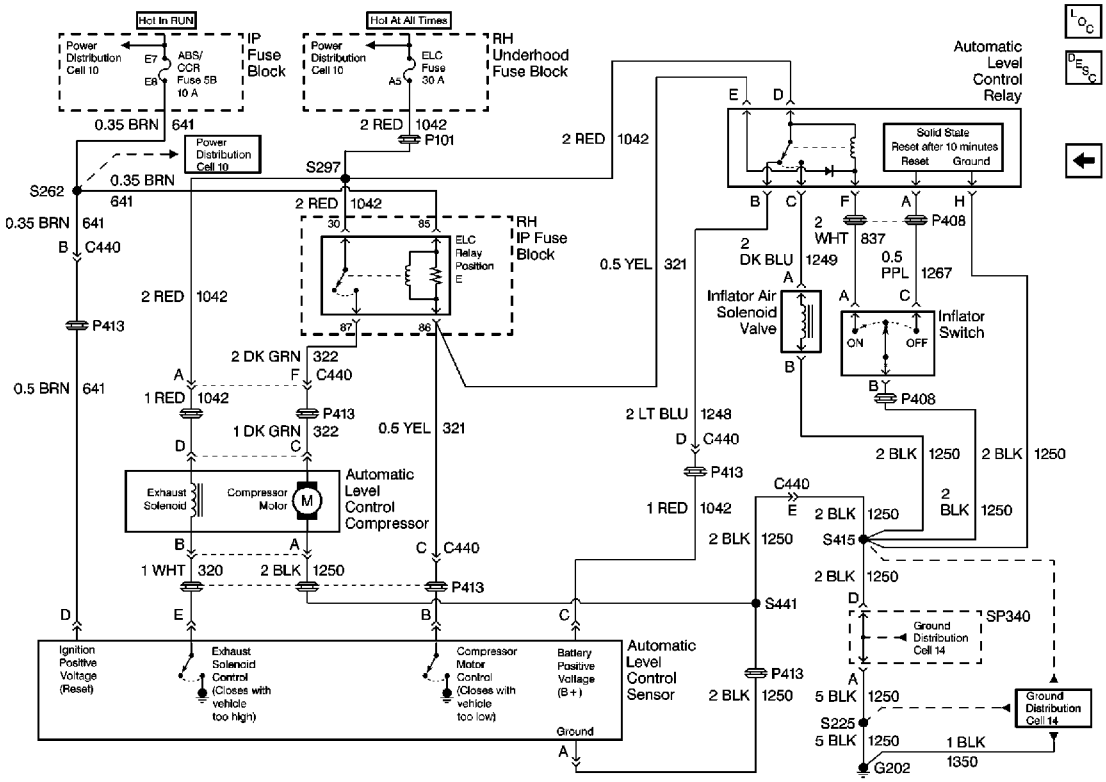
Cell 42: Buick/Oldsmobile



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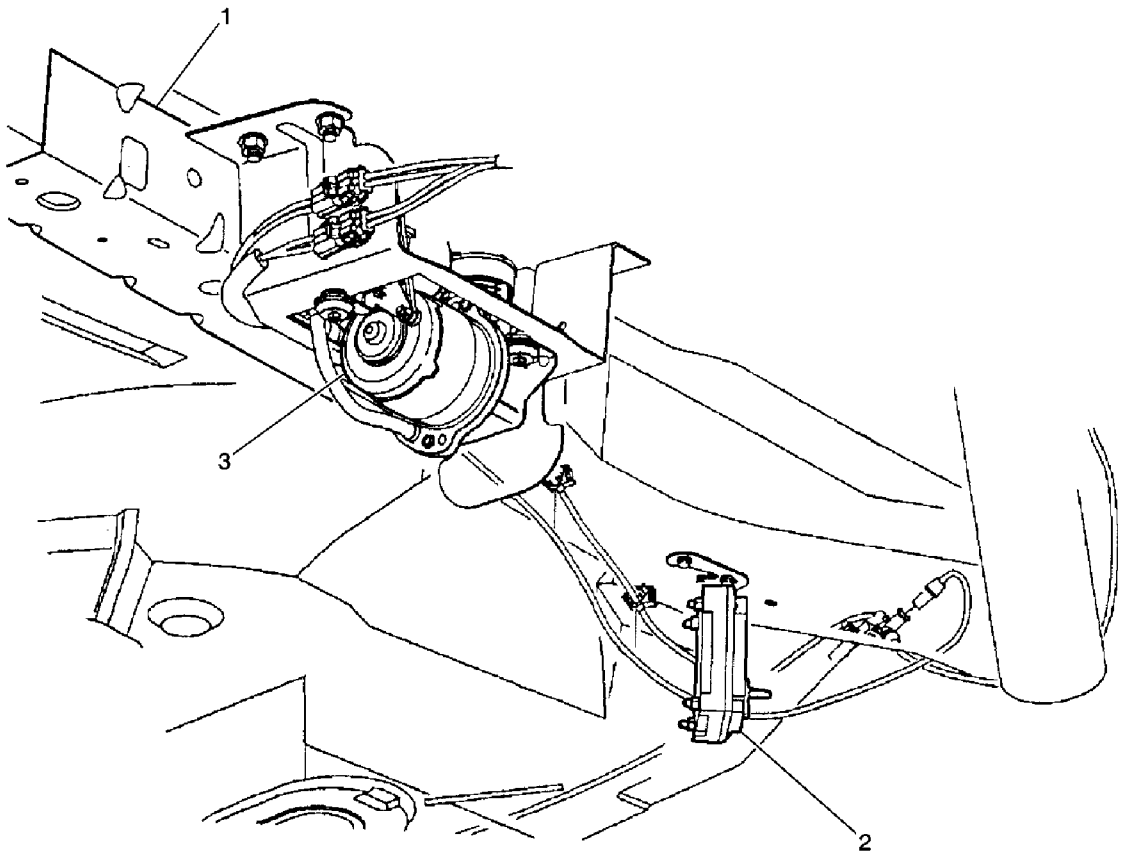
Cell 42: Pontiac



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Below RH Rear of Vehicle

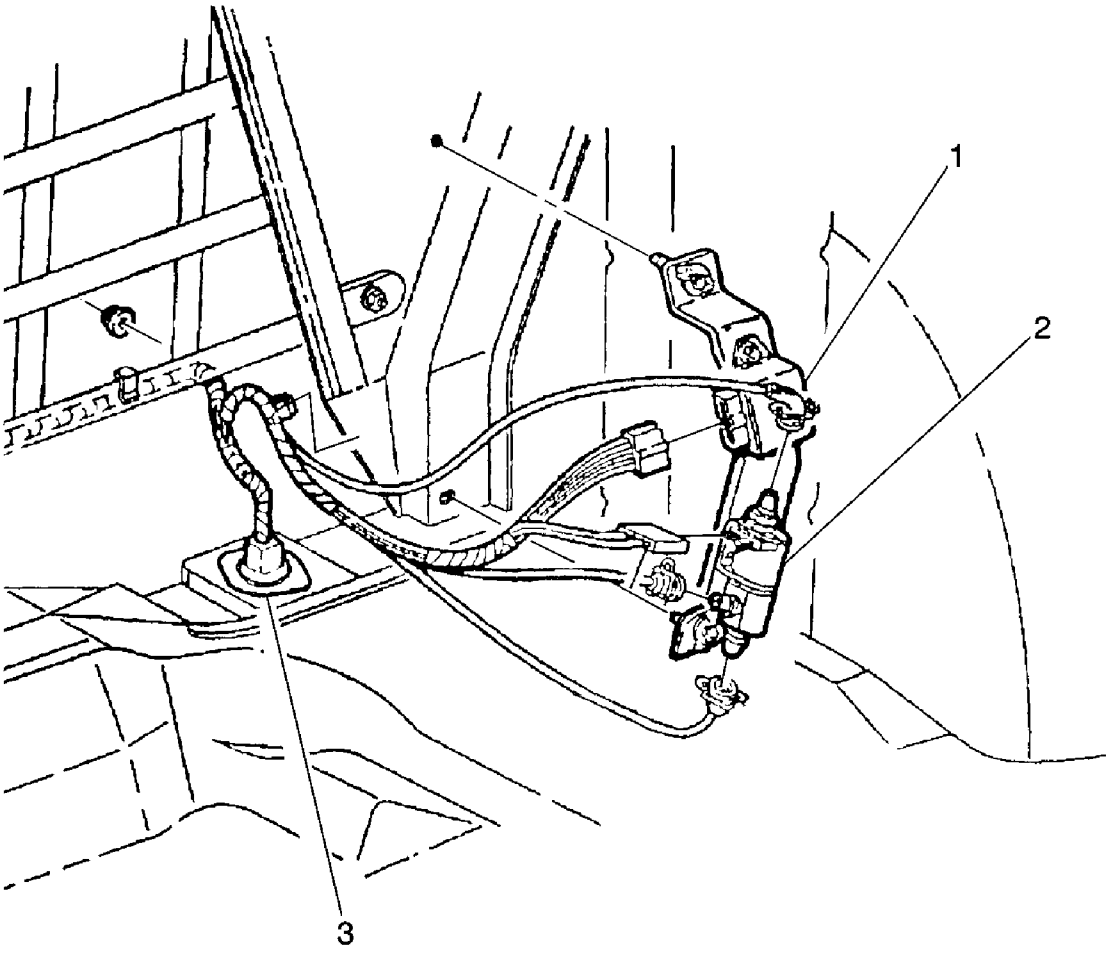


(1) RH Rear Rail
(2) Automatic Level Control Sensor
(3) Automatic Level Control Compressor

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Rear Compartment, Right Side (Pontiac)



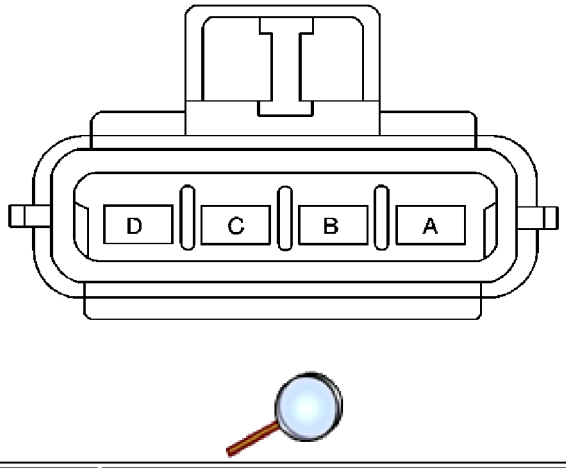
(1) Automatic Level Control Relay
(2) Inflator Air Solenoid Valve
(3) P403

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Automatic Level Control Connector End Views

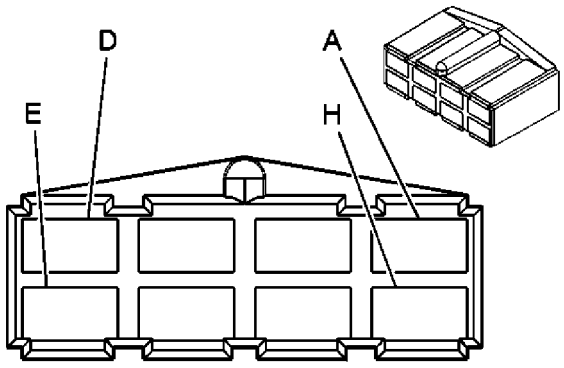
Automatic Level Control Compressor



Connector Part Information	• 12129565 • 4-Way F Metri-Pack 280 Series, Sealed (GRY)

Pin	Wire Color	Circuit No.	Function
A	BLK	1250	Ground
B	WHT	320	ALC Exhaust Solenoid Output
C	DK GRN	322	ALC Compressor Motor Feed
D	RED	1042	Fused Output - Battery

Automatic Level Control Relay (Pontiac)



Connector Part Information	• 02965977 • 8-Way F 56 Series (BLK)

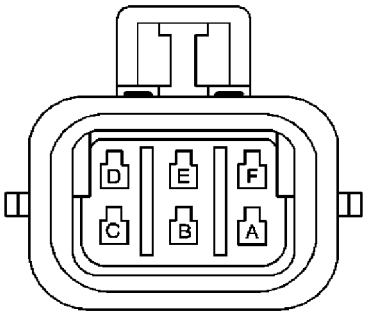
Pin	Wire Color	Circuit No.	Function

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A	PPL	1267	ALC Reset Signal
B	LT BLU	1248	ALC Height Sensor Signal
C	DK BLU	1249	ALC Inflator Solenoid Valve Feed
D	RED	1042	Fused Output - Battery
E	YEL	321	ALC Relay Output - Coil
F	WHT	837	ALC - Inflator Relay Output - Coil
G	-	-	Not Used
H	BLK	1250	Ground

Automatic Level Control Sensor



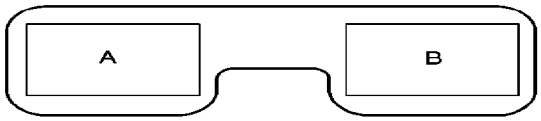


Connector Part Information	• 12052848 • 6-Way F Metri-Pack 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	BLK	1250	Ground
B	YEL	321	ALC Relay Output - Coil
C	RED	1042	Fused Output - Battery
D	BRN	641	Fused Output - IGN3
E	WHT	320	ALC Exhaust Solenoid Output
F	-	-	Not Used

Inflator Air Solenoid Valve (Pontiac)

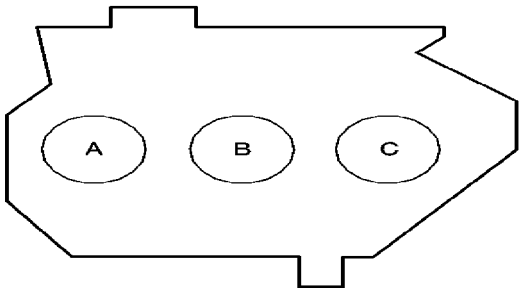
tomsn048@gmail.com



Connector Part Information	• 02984951 • 2-Way F 56 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	DK BLU	1249	ALC Inflator Solenoid Valve Feed
B	BLK	1250	Ground

Inflator Switch (Pontiac)



Connector Part Information	• 12015683 • 3-Way F Pin Grip Connector (BLK)

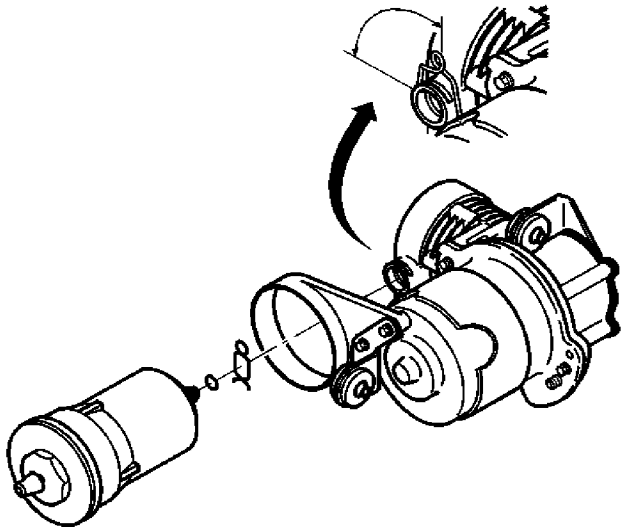
Pin	Wire Color	Circuit No.	Function
A	WHT	837	ALC Inflator Relay Output - Coil
B	BLK	1250	Ground
C	PPL	1267	ALC Reset Signal

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Automatic Level Control Air Dryer Replacement

Removal Procedure

1. Remove the air compressor assembly with the bracket from the vehicle. Refer to Air Compressor Replacement .
2. Remove the air compressor bracket from the air compressor.





3. Rotate the spring clip 90 degrees out of the slot.
4. Remove the air dryer from the air compressor assembly.
5. Remove the seal from the air compressor, if the seal did not come off with the air dryer.

Installation Procedure

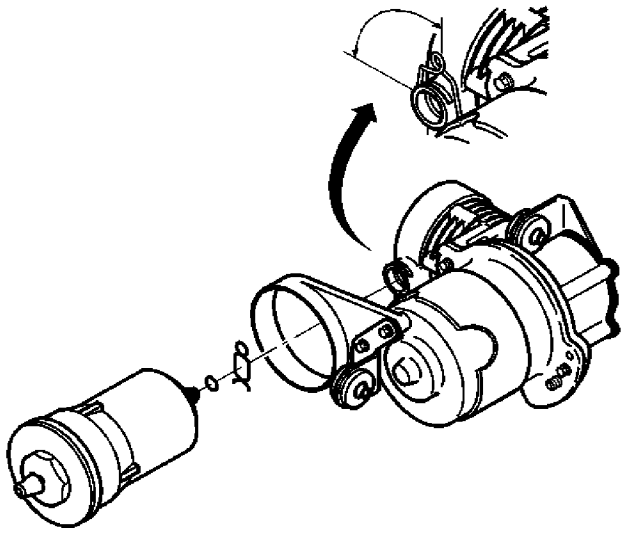
Important:

- Lubricate the seal with silicone lubricant.
- Spring clip must not be in slots of the air compressor.

1. Install a new seal onto the air dryer.

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2. Install the air dryer with the seal in the air compressor.
3. Rotate the spring clip 90 degrees to lock the air dryer in place.
4. Install the air compressor bracket on the air compressor.

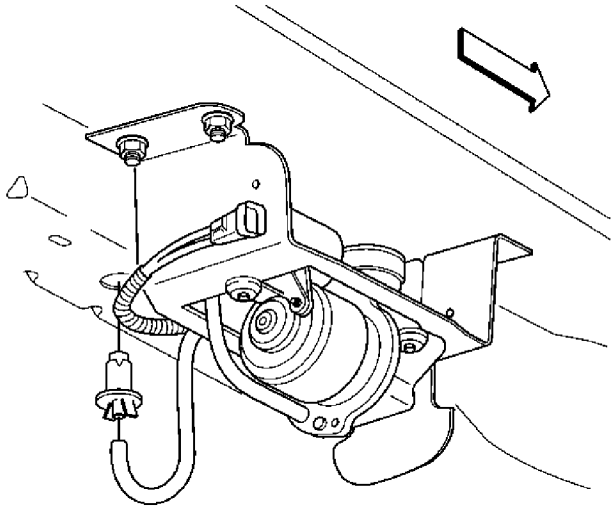
Important: Before driving the vehicle, turn the ignition on and wait approximately 45 seconds. This will permit the ELC system to execute the ARC, ensuring that the air adjustable struts are filled with residual pressure.

5. Install the air compressor assembly with the bracket onto the vehicle. Refer to Air Compressor Replacement .

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Automatic Level Control Air Compressor Air Filter Replacement

Removal Procedure



1. Raise the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.

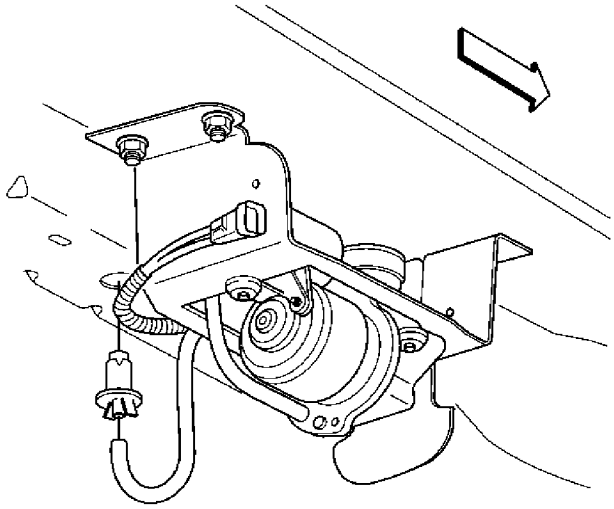
   Important: Before disconnecting the air hose from the intake air filter or the air compressor, clean the components and the surrounding area to prevent dirt and other foreign material from entering the air compressor.

2. Disconnect the intake air filter from the body rail and the air hose.

Installation Procedure

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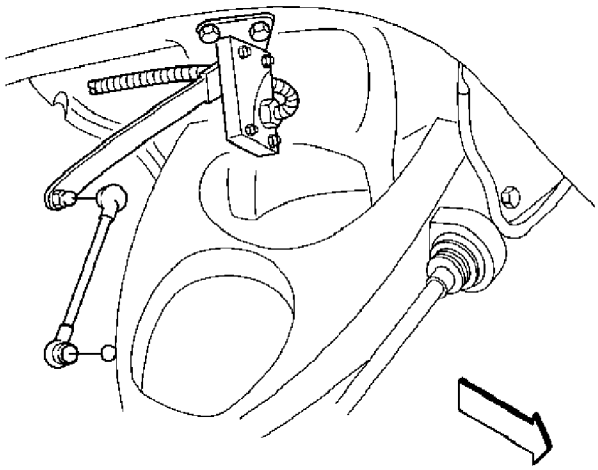
1. Connect the intake air filter to the air hose and the body rail.
2. Lower the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.

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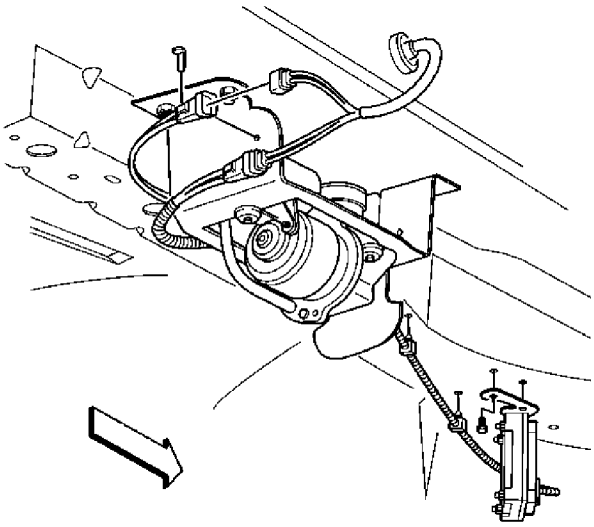
Automatic Level Control Sensor and Bracket Replacement

Removal Procedure

1. Raise the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.



2. Disconnect the link from the height sensor actuating arm and the suspension control arm.



3. Remove the height sensor connector from the vehicle harness connector.
4. Remove the height sensor harness clip and the connector from the vehicle.

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5. Remove the two bolts and the height sensor with the bracket from the vehicle.
6. Remove the four nuts and the bracket from the height sensor.

Installation Procedure

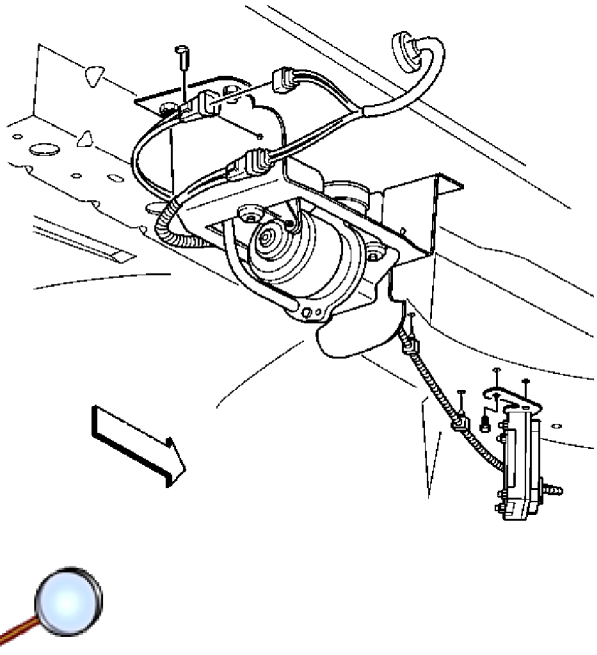
1. Install the bracket on the height sensor with four nuts.

   Tighten
   Tighten four nuts to 3 N·m (26 lb in).

2. Install the height sensor with the bracket on the vehicle with two bolts.

   Tighten
   Tighten two bolts to 5 N·m (44 lb in).

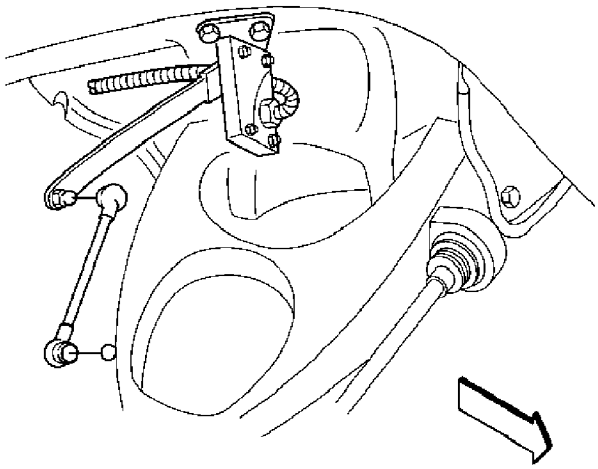
3. Connect the height sensor harness clip and the connector to the vehicle.





4. Connect the height sensor connector to the vehicle harness connector.

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5. Connect the link to the height sensor actuating arm and the suspension control arm.
6. Lower the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.
7. Adjust the height sensor. Refer to Automatic Level Control Sensor Adjustment .

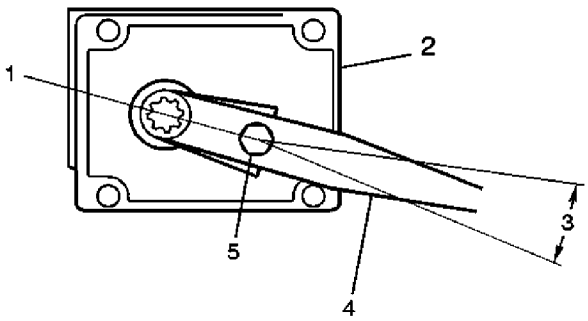
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Automatic Level Control Sensor Adjustment

The link must be attached to the height sensor arm and the suspension control arm during the adjustment.

1. Park the vehicle on a level floor.
2. Check the following:
   - Check the tire inflation pressures and adjust if necessary.
   - Check the fuel level in the tank; the tank should be full or adjust the rear suspension loading to simulate a full fuel load: 3.75 liters (1 gal) weighs about 3.2 kg (7 lb).
   - No other load is in the vehicle.
3. Place the front seat in rear position.
4. Turn the ignition to ON to activate the system.
5. Bounce the rear of the vehicle three times to normalize the suspension.
6. Measure the trim height at the rear underbody points on both sides of the vehicle. Refer to Trim Height in Suspension General Diagnostics.
7. If the trim heights vary from side to side more than 19 mm (0.75 in), and BOTH trim heights are lower than 236 mm (9.281 in), then there is a problem with the rear springs or suspension.

   Important: DO NOT continue this procedure until the above suspension problem is corrected.





8. Loosen the lock bolt (5) that clamps the metal actuating arm (4) to the plastic actuating arm. To increase the trim height, move the plastic arm up in relation to the metal arm; to decrease the trim height, move the plastic arm down in relation to the metal arm.
9. Tighten the lock bolt.
10. Bounce the rear of the vehicle three times to normalize the rear suspension.
11. Measure the trim height at the rear underbody points on both sides of the vehicle. Refer to

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Trim Height in Suspension General Diagnostics.

Optional Sensor Adjustment Method

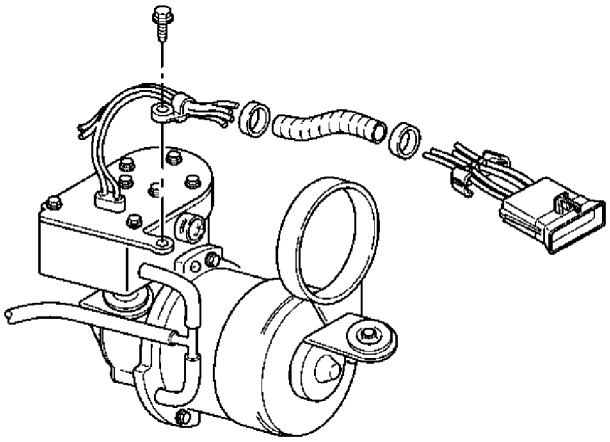
Special Tool J 34825 may be used for sensor adjustment. Instructions are provided with the tool.

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Automatic Level Control Air Compressor Head Replacement

Disassembly Procedure

1. Remove the air compressor from the vehicle. Refer to Air Compressor Replacement .



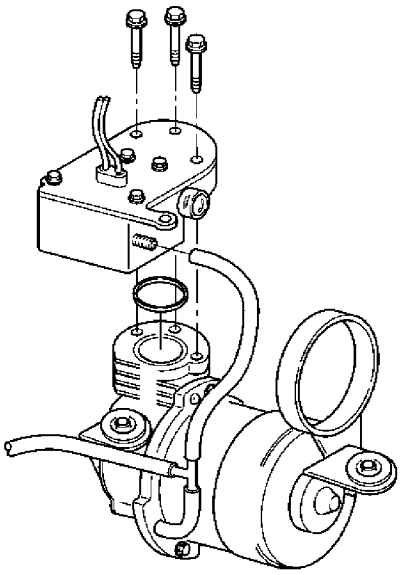
2. Remove the air compressor harness from the air compressor bracket.
3. Remove the air dryer. Refer to Automatic Level Control Air Dryer Replacement .
4. Cut the harness tie.
5. Remove the bolt and the harness tie.

Important: Note the wire colors and the terminal numbers to ensure correct assembly.

6. Remove the two harness ties and the wrap from the wires.
7. Remove two wire terminals from the air compressor connector.

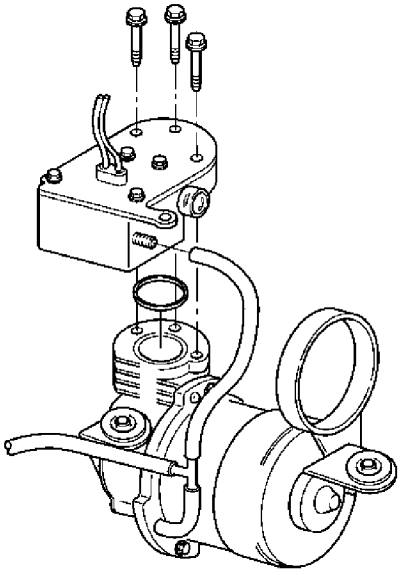
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8. Remove the air hose from the air compressor head.
9. Remove three head bolts and the air compressor head from the air compressor assembly.
10. Remove the gasket from the air compressor head or the air compressor assembly.

Assembly Procedure



1. Install the new gasket on the air compressor assembly.
2. Install the air compressor head on the air compressor assembly with three bolts.

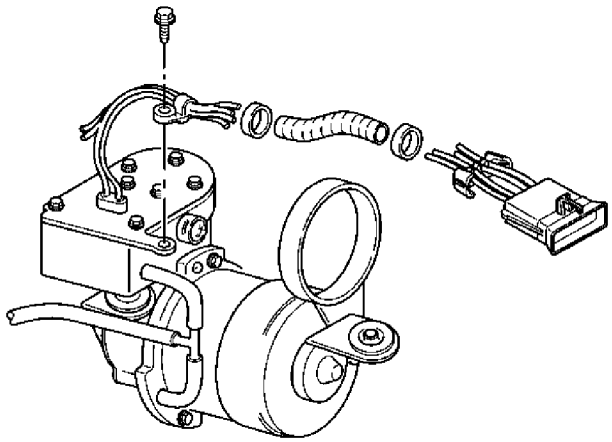
Tighten
Tighten three bolts to 6 N·m (53 lb in).

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3. Connect the air hose to the air compressor head.
4. Install the two wire terminals in the air compressor connector.
5. Install the wrap around four wires and secure with two harness ties.
6. Install four wires in the harness tie and install the harness tie on the air compressor head with the bolt.

Tighten
Tighten the bolt to 3 N·m (26 lb in).

7. Install the air dryer. Refer to Automatic Level Control Air Dryer Replacement .

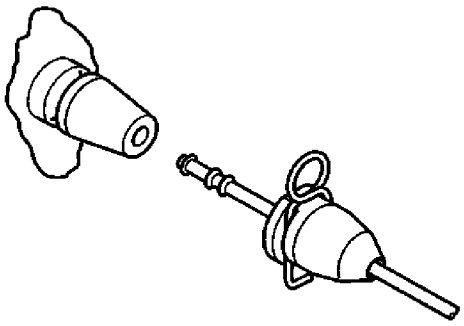




8. Connect the air compressor harness on the air compressor bracket.
9. Install the air compressor on the vehicle. Refer to Air Compressor Replacement .

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Air Tube Replacement





At the rear struts and at the pressure limiter valve, the air tube connectors are held on with spring clips which snap into the grooves of the struts air fittings or pressure limiter valve. Air tube connectors are sealed using two O-rings.

Important: Before disconnecting any air tube, clean the connector and the surrounding area to prevent dirt and other foreign material from entering the ALC system.

To disconnect an air tube from a strut or from the pressure limiter valve, rotate the spring clip 90 degrees out of the slots, and pull the connector off.

Important: Ensure that the air tube is routed correctly and all fasteners are used.

To connect an air tube to a strut or to the pressure limiter valve, use the following instructions:

1. Lubricate the two O-rings using silicone lubricant.
2. Rotate the spring clip 90 degrees into the slots.
3. Push the air tube connector on the strut fitting or pressure limiter valve until the spring clip snaps into the groove.

Removal Procedure

1. Raise the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.

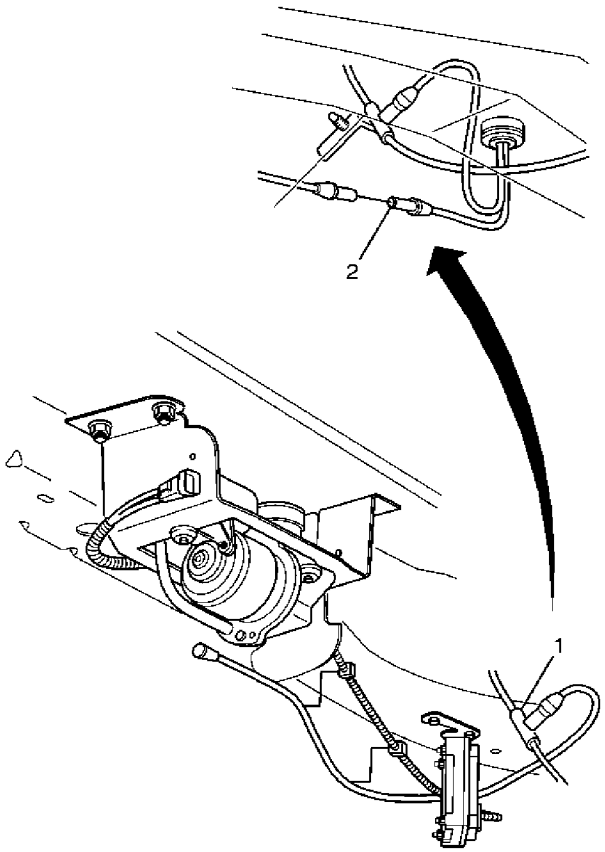
   Important: Steps 2 through 4 apply to the air tube that is routed from the air compressor to the crossover air tube. Step 5 through 8 apply to the crossover air tube (routed between the

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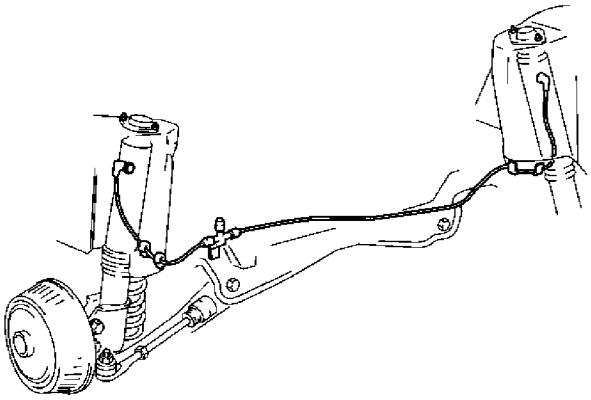
struts).

2. Disconnect the air tube from the pressure limiter valve.



3. Remove the air tube from the height sensor harness clips.
4. Disconnect the air tube from the crossover air tube tee (1) or the inflator valve air tube (2) (vehicles with optional inflator valve only).
5. Remove both rear wheels. Refer to Tire and Wheel Removal and Installation in Tires and Wheels.

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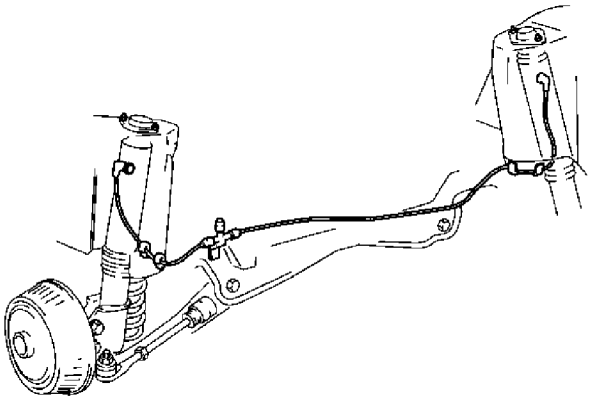


6. Disconnect the crossover air tube from the right strut and two clips.
7. Disconnect the crossover air tube from the left strut and two clips.
8. Disconnect the air tube (coming from the air compressor) from the crossover air tube tee.
9. Remove the crossover air tube tee from the vehicle.

Installation Procedure

Important: Steps 1 through 5 and 8 apply to the crossover air tube (routed between the struts). Steps 5 through 8 apply to the air tube that is routed from the air compressor to the crossover air tube.

1. Install the crossover air tube tee on the vehicle.

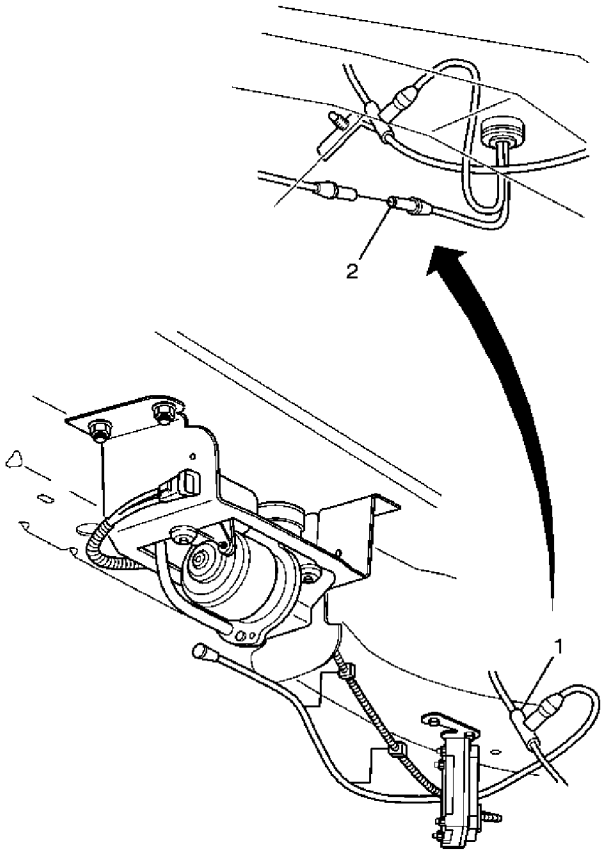




2. Connect the air tube to the right rear strut and install the air tube in two clips.

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3. Connect the air tube to the left rear strut and install the air tube in two clips.
4. Install both rear wheels. Refer to Tire and Wheel Removal and Installation in Tires and Wheels.
5. Connect the air tube (from the air compressor) to the crossover air tube tee (1) or the inflator valve air tube (2) (vehicles with optional inflator valve only).



6. Install the air tube in the height sensor harness clips.
7. Connect the air tube to the pressure limiter valve.

Important: Before driving the vehicle, turn the ignition on and wait approximately 45 seconds. This will permit the ELC system to execute the ARC, ensuring that the air adjustable struts are filled with residual pressure.

8. Lower the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.

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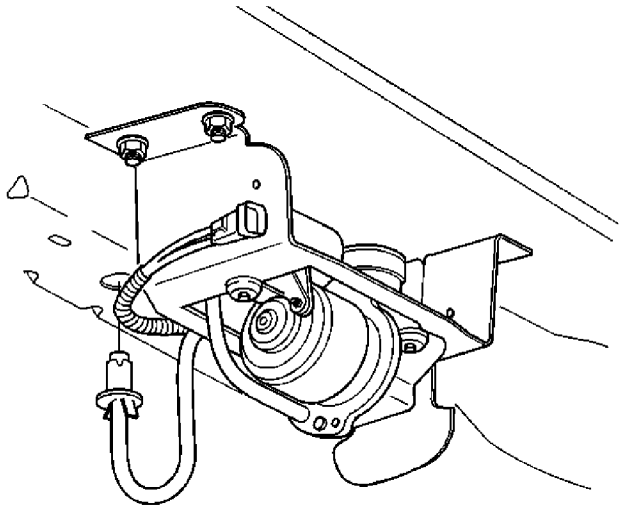
Air Compressor Replacement

Removal Procedure

1. Raise the vehicle and suitably support. Refer to Lifting and Jacking the Vehicle in General Information.

   Important: Before disconnecting any air hose or air tube, clean the components and the surrounding area to prevent dirt and other foreign material from entering the ELC system.

2. Disconnect the air tube from the pressure limiter valve.
3. Remove the air tube from the air compressor bracket.

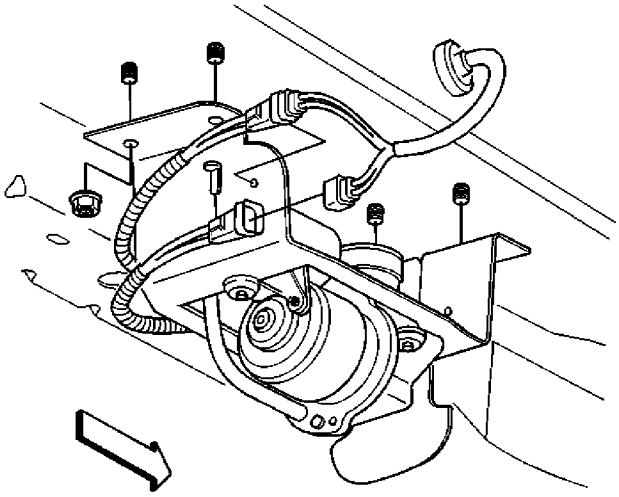




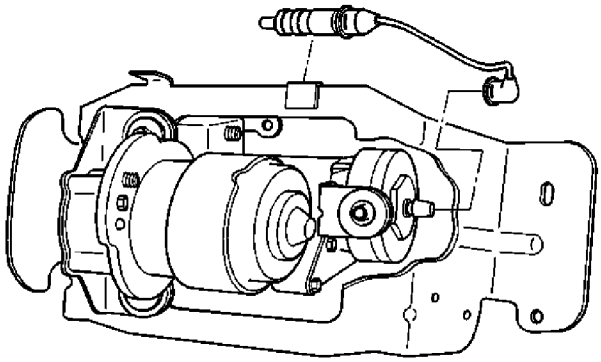
4. Remove the intake air filter from the vehicle.

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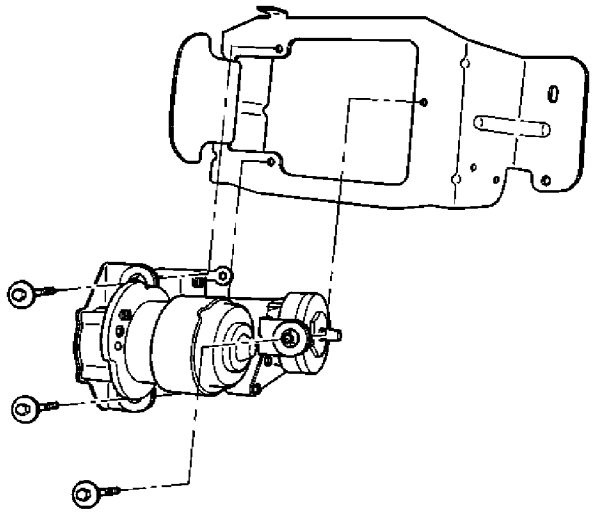


5. Remove the height sensor harness from the air compressor bracket.
6. Disconnect the vehicle harness connector from the air compressor connector.
7. Remove the four nuts and the air compressor assembly from the vehicle.

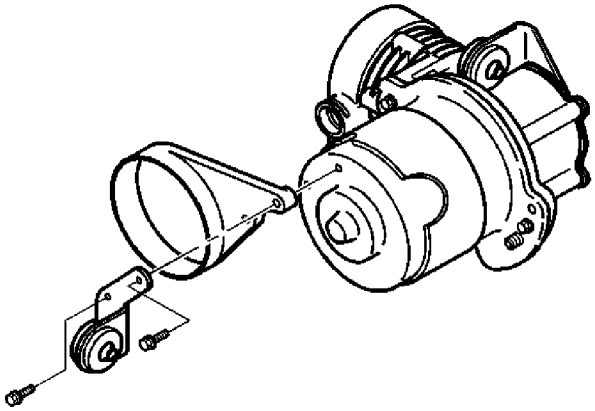


8. Disconnect the pressure limiter valve air tube from the air dryer.
9. Remove the pressure limiter valve from the clip.
10. Remove the air compressor harness from the air compressor bracket.

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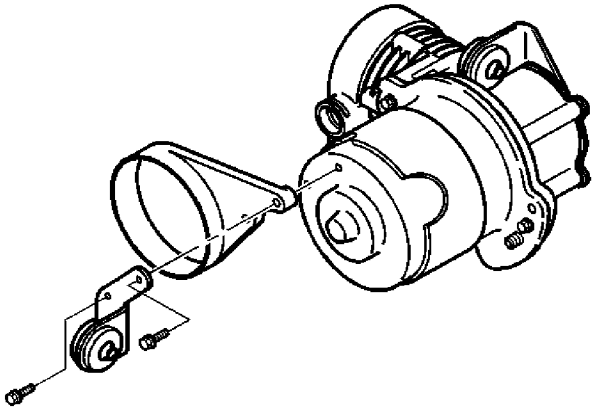
11. Remove three bolts and the air compressor assembly from the bracket.
12. Remove the air dryer from the air compressor. Refer to Automatic Level Control Air Dryer Replacement .
13. Remove the air hose from the air compressor at two places.



14. Remove the two screws and the two brackets from the air compressor.

Installation Procedure

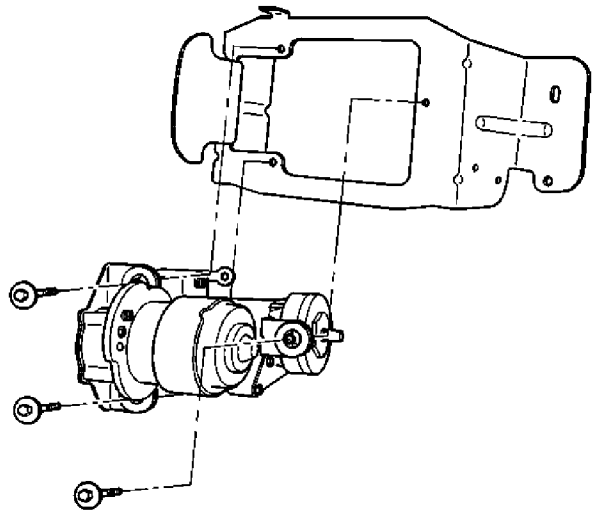
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1. Install the two brackets on the air compressor with two screws.

   Tighten
   Tighten two screws to 7 N·m (62 lb in).

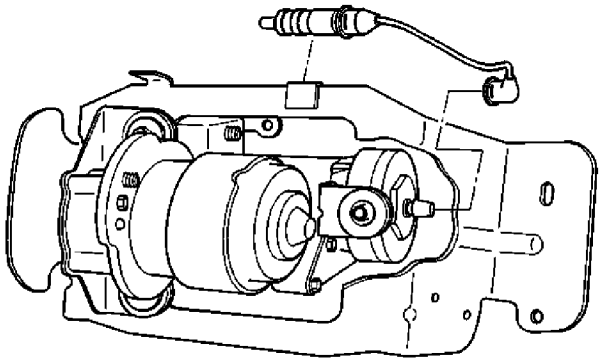
2. Connect the air hose to the air compressor at two places.
3. Install the air dryer on the air compressor. Refer to Automatic Level Control Air Dryer Replacement .



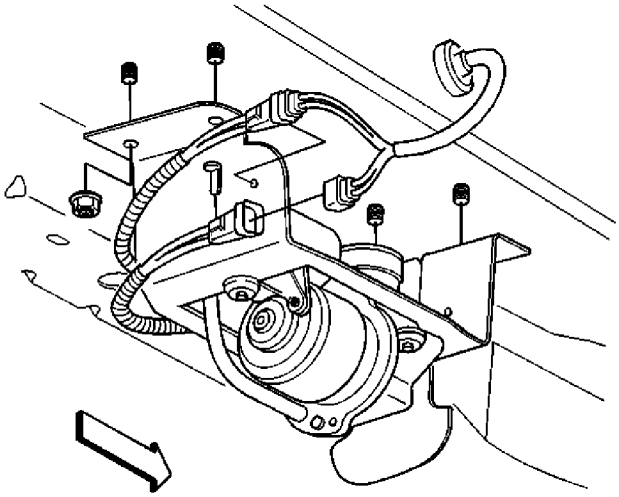
4. Install the air compressor assembly onto the bracket with three bolts.

   Tighten
   Tighten three bolts to 4 N·m (36 lb in).

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5. Connect the pressure limiter valve air tube to the air dryer.
6. Install the pressure limiter valve in the clip.
7. Install the air compressor harness onto the air compressor bracket.

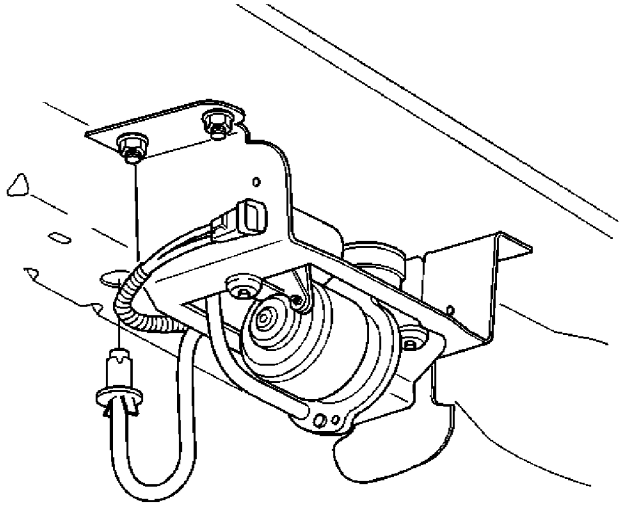


8. Install the air compressor assembly on the vehicle with four nuts.

   Tighten
   Tight four nuts to 10 N·m (88 lb in).

9. Connect the vehicle harness connector to the air compressor connector.
10. Install the height sensor harness on the air compressor bracket.

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11. Install the intake air filter on the vehicle.
12. Connect the air tube to the pressure limiter valve.
13. Install the air tube on the air compressor bracket.

Important: Before driving the vehicle, turn the ignition on and wait approximately 45 seconds. This will permit the ELC system to execute the ARC, ensuring that the air adjustable struts are filled with residual pressure.

14. Lower the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.

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Fastener Tightening Specifications

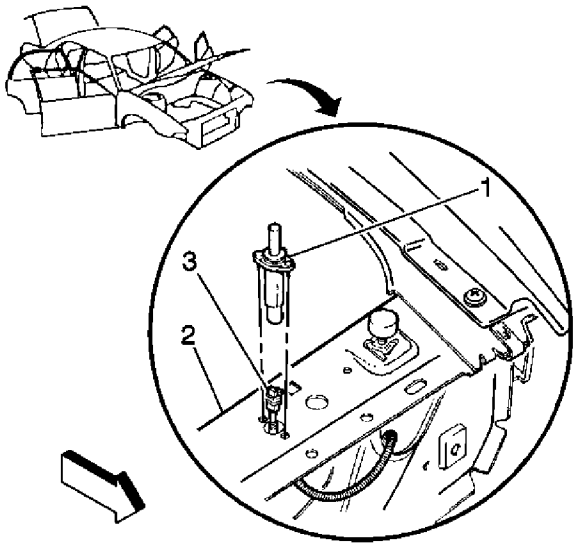
Application	Specification	
	Metric	English
Air Inlet Grille Panel Screws	1.9 N·m	17 lb in
Center Brace to Radiator Support Bolts	13 N·m	115 lb in
Fender Sound Insulator Bolts	1.7 N·m	17 lb in
Fender to Body Bolts	9.5 N·m	84 lb in
Front End Panel to Body Bolts	5 N·m	44 lb in
Grille Bolts - Eighty Eight/LSS	4 N·m	35 lb in
Grille Bolts - Regency	1.9 N·m	17 lb in
Grille to Hood Bolts - Pontiac	1.9 N·m	17 lb in
Grille to Hood Nuts - Buick	1.9 N·m	17 lb in
Hood Hinges to Upper Rail Bolts	29 N·m	21 lb ft
Hood Latch Release Handle Bolts	7 N·m	62 lb in
Hood Panel to Hinge Bolts	29 N·m	21 lb ft
Lower Air Deflector Bolts	7.5 N·m	66 lb in
Primary Latch Bolts	9.5 N·m	84 lb in
Secondary Latch to Hood Bolts	9.5 N·m	84 lb in
Side Brace to Center Brace on Radiator Support Bolts	9.5 N·m	84 lb in
Wheel Opening Molding Screws - Buick	1.9 N·m	17 lb in
Wheel Opening Molding Screws - Eighty Eight/LSS	2.1 N·m	18 lb in
Wheelhouse Assembly Bolts	1.9 N·m	17 lb in

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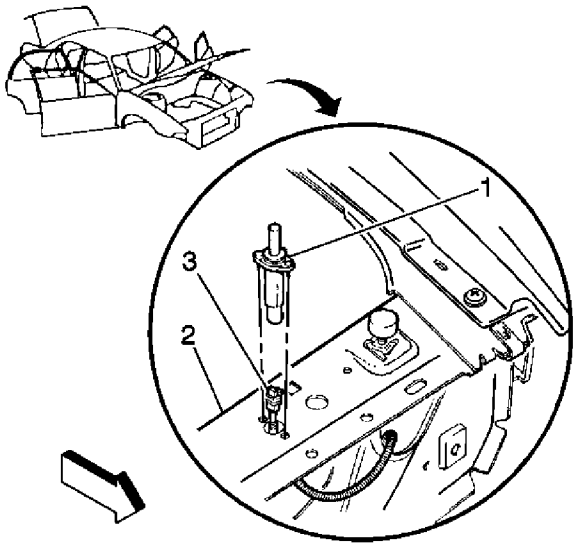
Hood Ajar Indicator Switch Replacement

Removal Procedure



1. Gently pry the hood ajar switch (1) from the radiator support (2).
2. Disconnect the electrical connector (3) from the switch.

Installation Procedure



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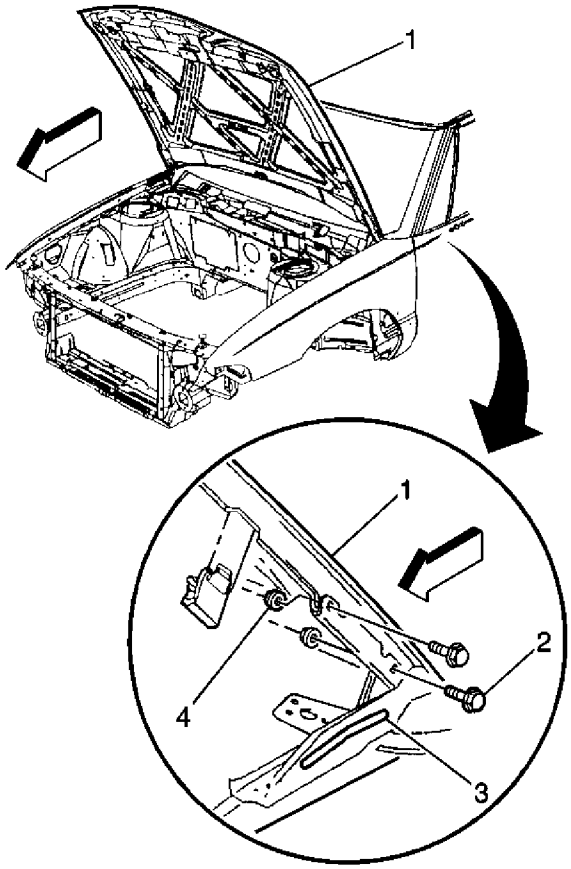
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1. Connect the electrical connector (3) to the switch.
2. Press the hood ajar switch (1) to the radiator support (2).

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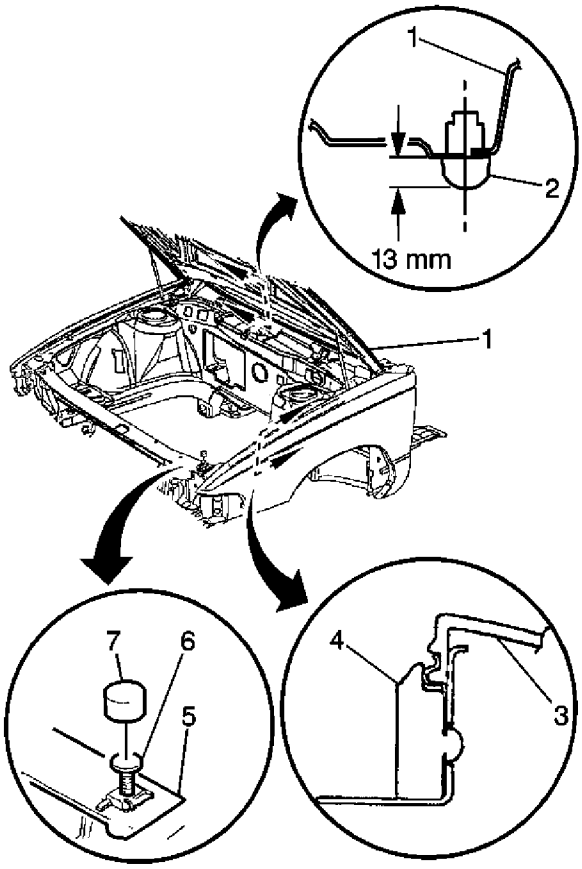
Hood Adjustment



1. Open the hood (1).
2. Remove the hood primary latch. Refer to Hood Primary and Secondary Latch Replacement .
3. Remove the hood pop up spring. Refer to Hood Pop-Up Spring Replacement .
4. With the hood (1) in the closed position, verify the adjustment of the rear portion of the hood panel. Ensure that the following conditions exist:
   - Ensure that the hood panel is flush (up/down) with the fenders.
   - Perform up/down adjustments at the hood to hinge bolts (2), as needed.
   - Ensure that there are even gaps (side-to-side) between the hood panel and the fenders.
   - Perform side-to-side adjustments at the hinge to body bolts as needed.

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5. With the hood (1) in the closed position, verify the flushness (up/down) of the front portion of the hood panel to the fenders.

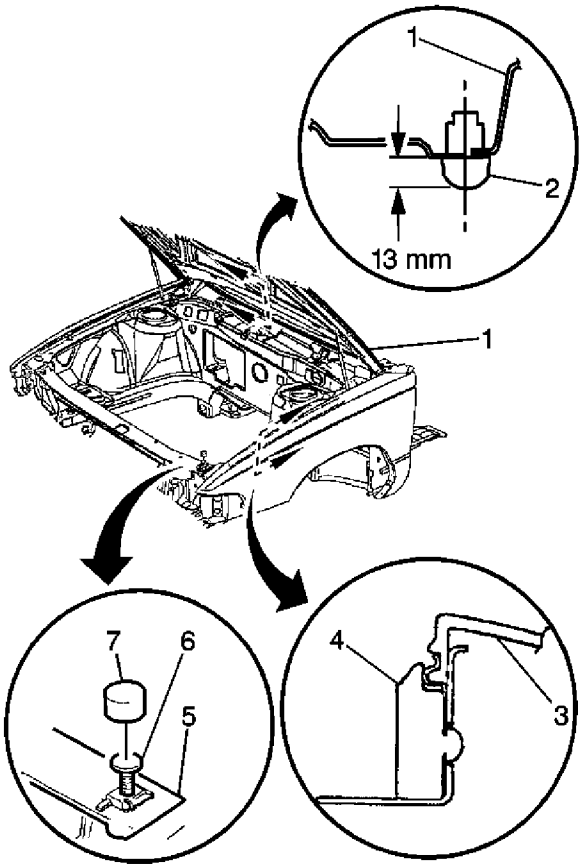
   Perform up/down adjustments at the front hood bumpers (2) as needed.

6. Install the hood pop up spring. Refer to Hood Pop-Up Spring Replacement .
7. Install the hood primary latch. Refer to Hood Primary and Secondary Latch Replacement .
8. Adjust the hood primary latch. Refer to Hood Latch Adjustment .

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Hood Bumper Replacement

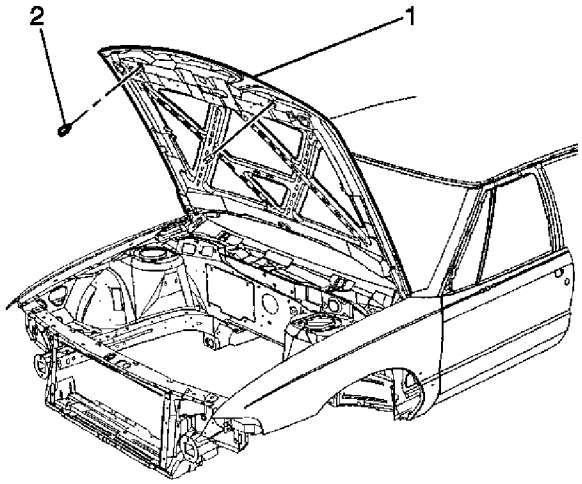
Removal Procedure



1. Remove the front bumpers (2) using the following procedure:
   1.1. Peel the bumper (7) from the bumper adjuster (6).
   1.2. Use a flat bladed tool in order to pry the bumper adjuster (6) from the radiator support (5).
2. Peel the side bumper (4) from the fender in order to remove the side bumper (4).
3. Twist the rear bumper in order to remove from the hood (1).

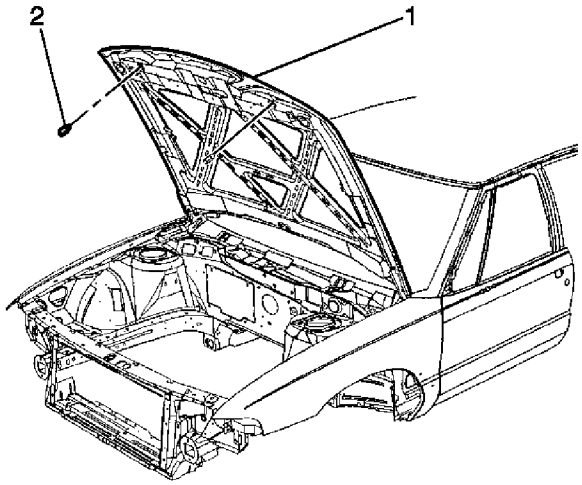
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4. Twist the front overslam bumpers (2) in order to remove from the hood (1).

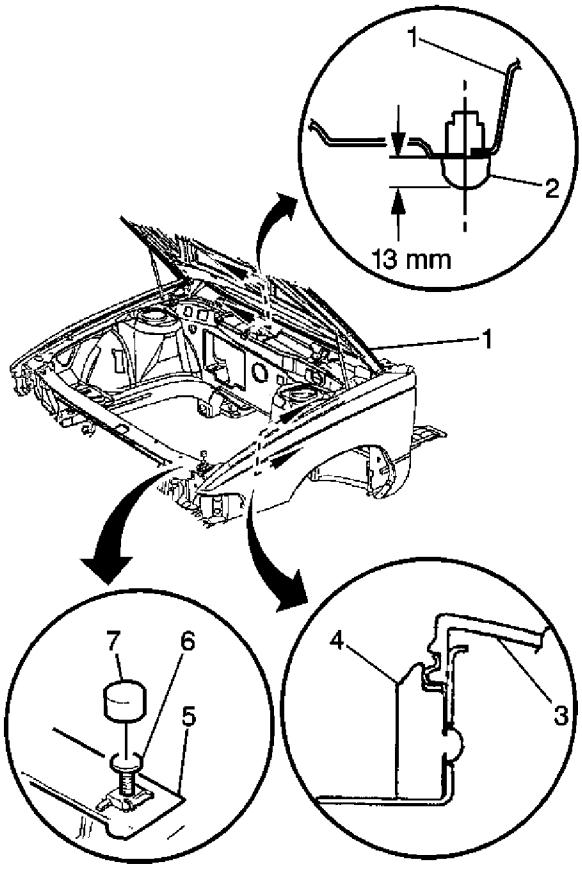
Installation Procedure



Important: Do not use the front overslam bumpers (2) for adjustment.

1. Twist the front overslam bumpers (2) in order to install into the hood.

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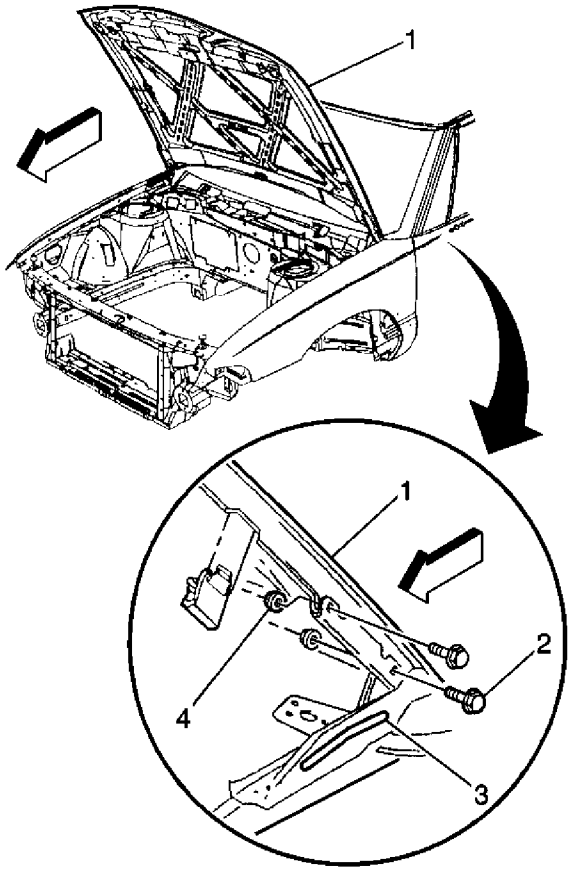


2. Use the following procedures in order to install the rear bumper (2) :
   2.1. Twist the rear bumper (2).
   2.2. Ensure that the rear bumper is 13 mm (½ in) from the hood (1).
3. Press the side bumpers (4) to the fender in order to engage.
4. Use the following procedure in order to install the front bumpers (6):
   4.1. Press the front bumper (6) into the radiator support (5).
   4.2. Connect the front bumper (7) to the front bumper adjuster (6).
   4.3. Adjust the hood panel. Refer to Hood Adjustment .

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Hood Replacement

Removal Procedure



Important: Install protective coverings over the fenders in order to prevent damage to the paint and the moldings when removing or installing the hood (1).

1. Raise the hood (1).
2. Disconnect the underhood lamp wire (if applicable).
3. Mark the position of the hinge (3) on the hood (1) in order to aid in the alignment when the hood is reinstalled.
4. Complete the following steps:
   4.1. Support the hood (1).
   4.2. Loosen the ball socket retainers.
   4.3. Pry off the assist rods.
5. Remove the following components that retain the hood (1) to the hinges:
   - The bolts (2)

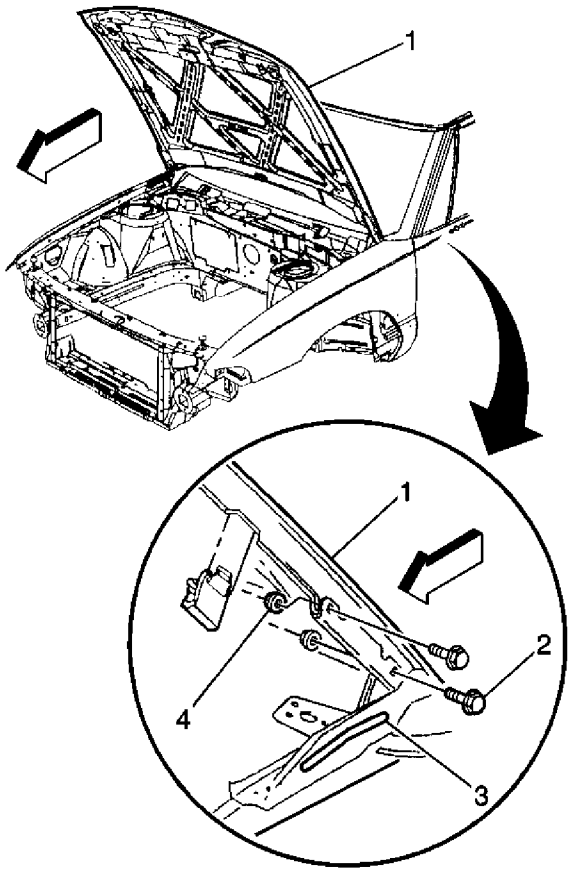
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- The nuts (4)

6. Remove the hood (1).

Installation Procedure



1. Position the hood (1) in the location marked during the removal.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the following components in order to retain the hood (1) to the hinges:
   - The bolts (2)
   - The nuts (4)

Tighten
Tighten the bolts and the nuts to 29 N·m (21 lb ft).

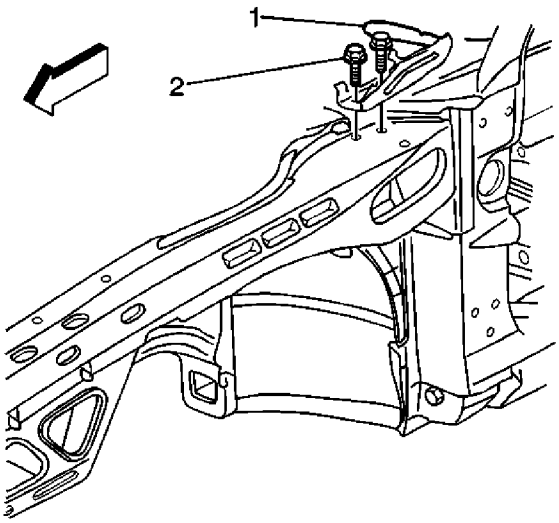
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3. Install the open-assist rods.
4. Reconnect the underhood lamp (if applicable).

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Hood Hinge Replacement

Removal Procedure

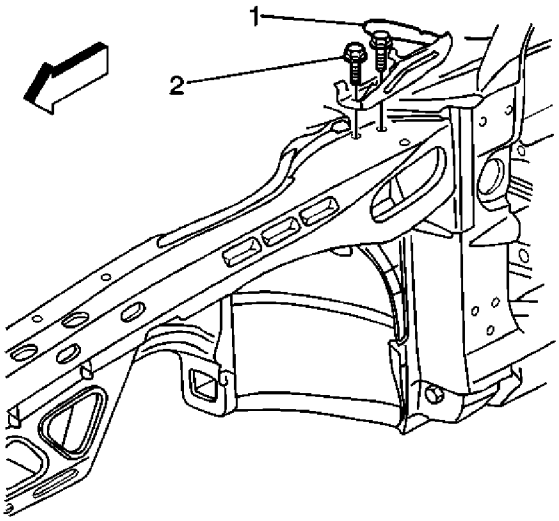


1. Remove the hood panel. Refer to Hood Replacement .
2. Remove the wheelhouse panel. Refer to Wheelhouse Panel Replacement .
3. Loosen the fender. Refer to Front Fender Replacement .
4. Remove the bolts (2) that retain the hood hinge (1) to the upper rail.
5. Remove the hinge (1) .

Installation Procedure

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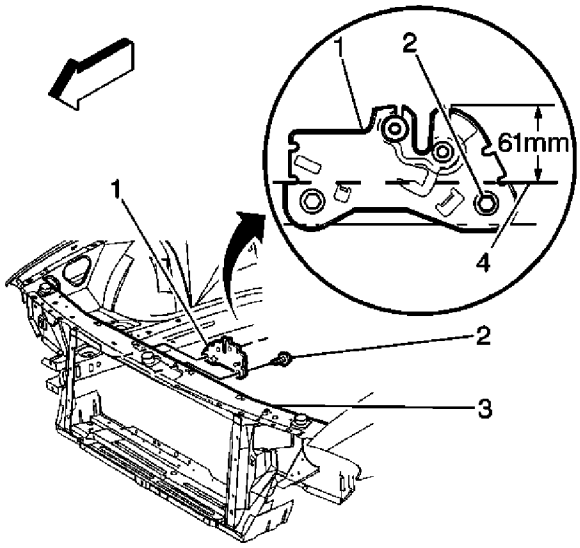
1. Install the hood hinge (1) .
2. Install the bolts (2) in order to retain the hinge (1) to the upper rail.

Tighten
Tighten the bolts to 29 N·m (21 lb ft).

3. Install the fender. Refer to Front Fender Replacement .
4. Install the wheelhouse panel. Refer to Wheelhouse Panel Replacement .
5. Install the hood.
6. Inspect the hood for proper alignment.

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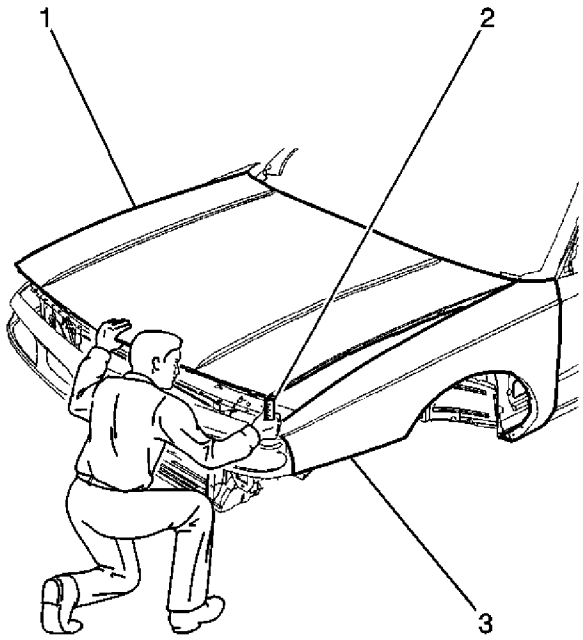
Hood Latch Adjustment



1. Loosen the bolts (2).
2. Ensure that the top edge of the hood primary latch (1) is 61 mm (2.4 in) from the top of the radiator support (4). This is the starting point for the up/down latch adjustment.
3. Snug the bolts (2) in order to hold the latch in position.

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4. Lower the hood (1). Ensure that the striker does not engage with the latch.
5. Verify the side-to-side adjustment of the latch to the striker.
6. Raise the hood (1).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

7. Tighten the primary latch bolts.

Tighten
Tighten the bolts to 9.5 N·m (84 lb in).

8. Perform a hood drop test in order to determine the need for up/down latch adjustment. The hood drop test determines the amount of drop force required in order to fully engage the striker with the latch.
9. Complete the following steps in order to perform the hood drop test:
   9.1. Place a ruler (2) capable of measuring millimeters, between the hood (1) and the fender (3).

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9.2. Raise the hood (1).

9.3. Ensure that the front upper edge of the hood is 80 mm (3 1/8 in) above the top surface of the fender (3). This determines if the latch is set to high.

9.4. Drop the hood (1). The striker should not engage with the latch.

10. Increase the measurement to 95 mm in order to repeat the test. If the striker engages with the latch below 110 mm (4 1/4 in) test height, the latch is too high.
11. Repeat the test at the following heights. Ensure that the striker engages in this range:
    - 110 mm (4 1/4 in)
    - 160 mm (6 3/8 in)
12. If the striker does not engage at 160 mm (6 3/8 in) the latch is too low.
13. Adjust the latch as needed.
14. Tighten the bolts.

Tighten
Tighten the bolts to 9.5 N·m (84 lb in).

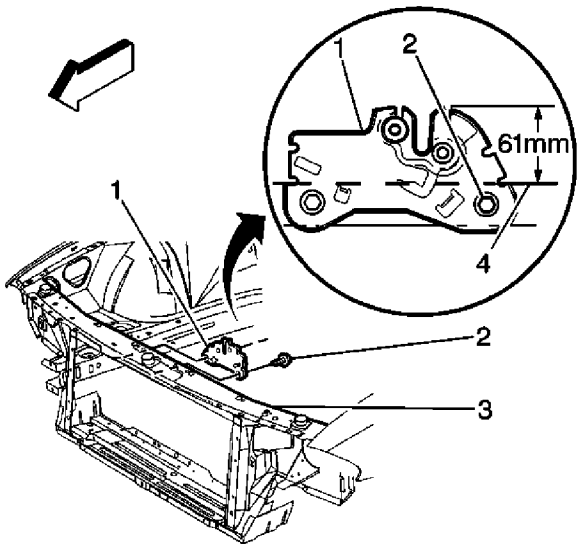
15. Verify that the latch operates properly.

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Hood Primary and Secondary Latch Replacement

Removal Procedure

The hood latch is attached to the radiator support. The bolts are elongated in order to help in adjustment. Lubricate the hood latch as recommended. Refer to Fluid and Lubricant Recommendations in General Information.

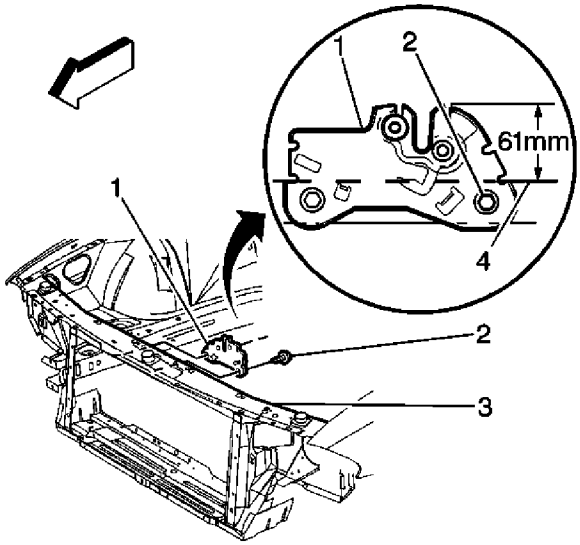


1. Remove the upper radiator support (3).
2. Disconnect the hood release cable from the hood latch (1).
3. Remove the bolts (2) that retain the hood latch.
4. Remove the hood latch (1).

Installation Procedure

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1. Install the hood latch (1).

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the bolts (2) in order to retain the hood latch.

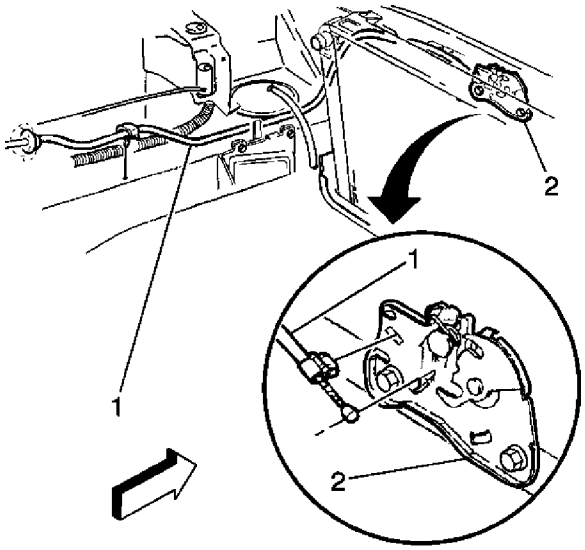
   Tighten
   Tighten the bolts to 9.5 N·m (84 lb in).

3. Connect the hood release cable to the hood latch.
4. Install the upper radiator support (3).
5. Adjust the hood primary latch (1). Refer to Hood Latch Adjustment .

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Hood Primary Latch Release Cable Replacement

Removal Procedure



1. Open the hood.
2. Disconnect the release cable (1) from the latch assembly (2).
3. Route the cable along the body rail towards the rear of the vehicle.

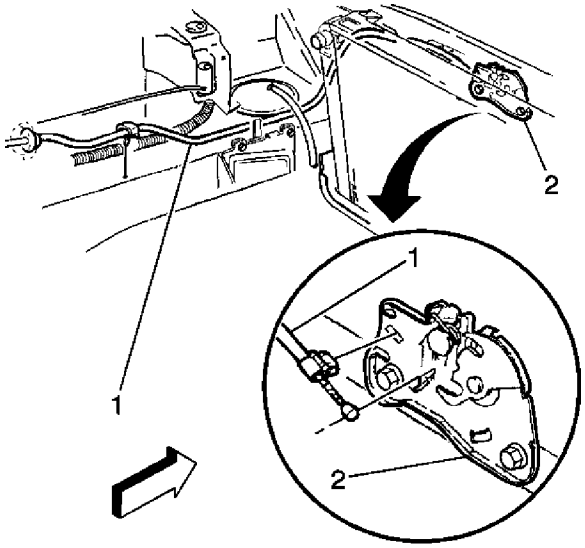
Important: Tie a string around the cable before removing the cable from the vehicle. This will ensure the proper routing and ease of installation of the release cable.

4. Remove the 2 bolts that retain the hood latch release handle .
5. Remove the grommet through the cowl opening.
6. Remove the cable through the passenger compartment.
7. Disconnect the cable from the release handle.

Installation Procedure

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1. Connect the cable to the release handle .
2. Install the cable through the passenger compartment.

Important: Apply a mild soap in order to ease installation.

3. Install the grommet through the cowl opening.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

4. Install the 2 bolts in order to retain the hood latch release handle .

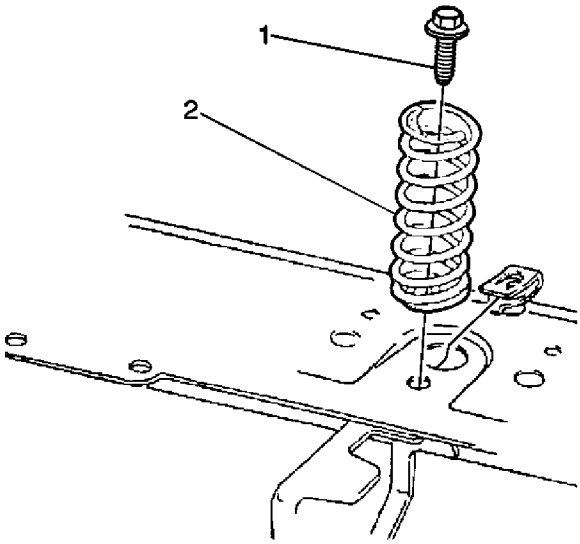
Tighten
Tighten the bolts to 7 N·m (62 lb in).

5. Route the cable along the body rail toward the front of the vehicle.
6. Connect the release cable (1) to the latch assembly (2).
7. Close the hood.

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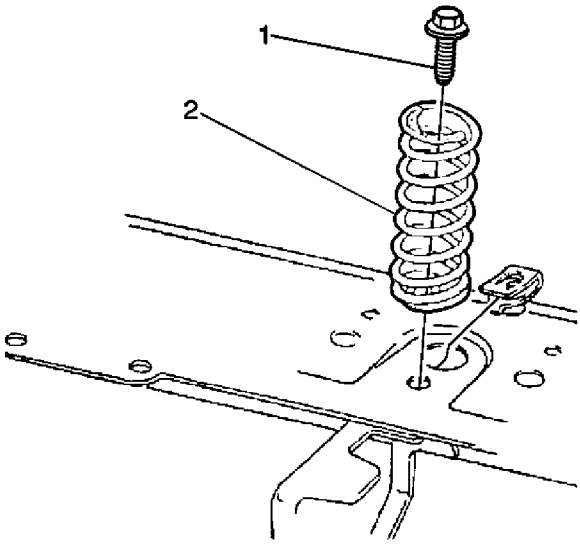
Hood Pop-Up Spring Replacement

Removal Procedure



1. Remove the pop-up spring cover.
2. Remove the bolt (1) retaining the pop-up spring (2).
3. Remove the pop-up spring (2).

Installation Procedure



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1. Install the pop-up spring (2).

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the bolt (1) in order to retain the pop-up spring (2).

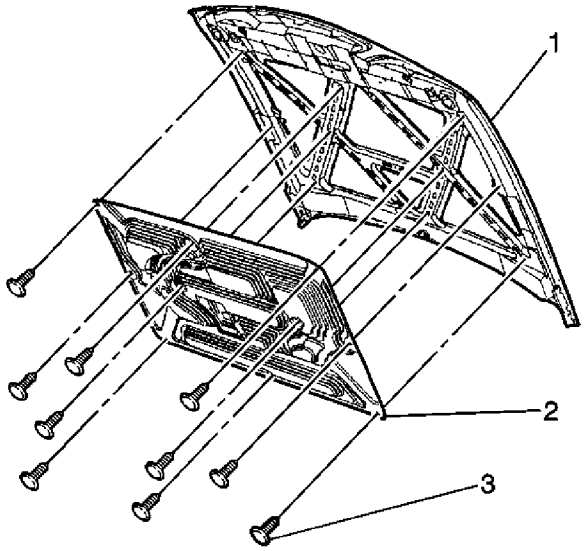
   Tighten
   Tighten the bolt to 9.5 N·m (84 lb in).

3. Install the pop-up spring cover.

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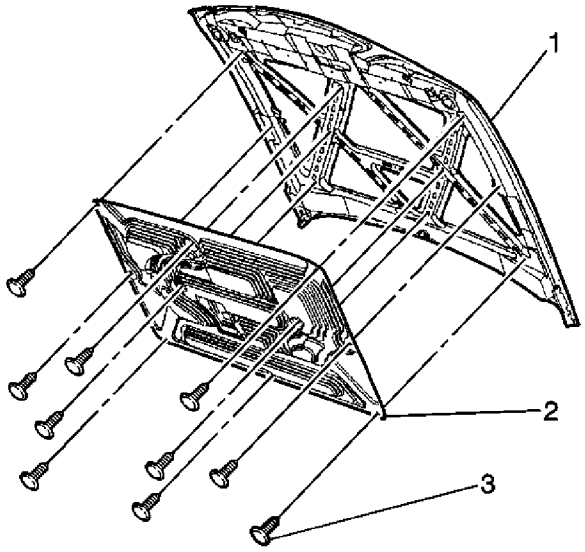
Hood Insulator Replacement

Removal Procedure



1. Remove the push-in retainers (3) from the hood (1).
2. Remove the hood insulator (2).

Installation Procedure



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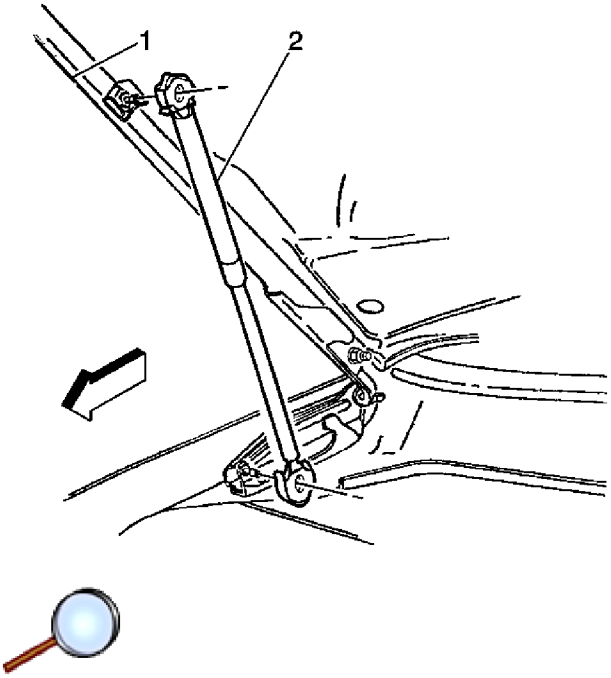


1. Install the hood insulator (2).
2. Install the push-in retainers (3) to the hood (1).

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Hood Open Assist Rod Replacement

Removal Procedure



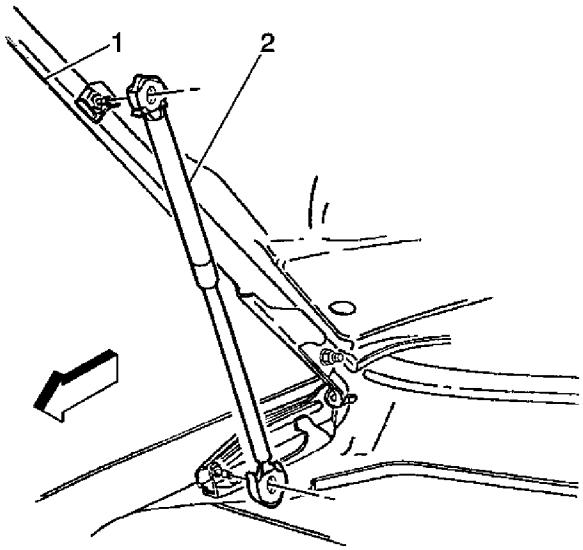
Caution: When a hood hold open device is being removed or installed, provide alternate support to avoid the possibility of damage to the vehicle or personal injury.

1. Open the hood (1).
2. Prop up the hood (1).
3. Loosen the ball socket retainers.
4. Pry off the assist rod (2).

Installation Procedure

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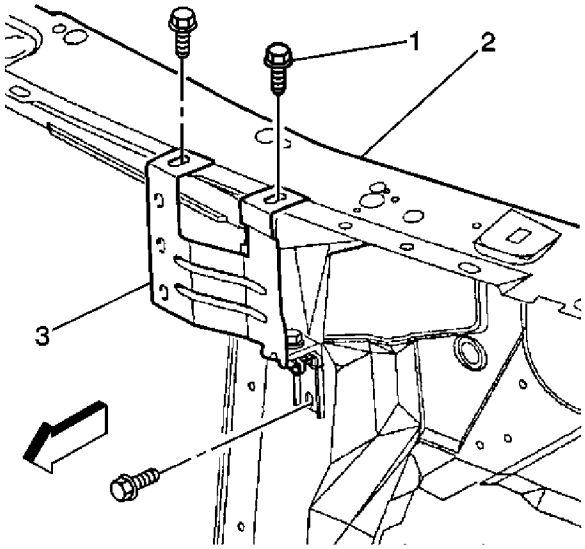
1. Install the assist rod (2).
2. Tighten the ball socket retainers.
3. Remove the hood prop.
4. Lower the hood (1).

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Headlamp Bracket Replacement (Buick/Pontiac)

Removal Procedure

1. Remove the headlamp. Refer to Headlamp Replacement or Headlamp Replacement in Lighting Systems.



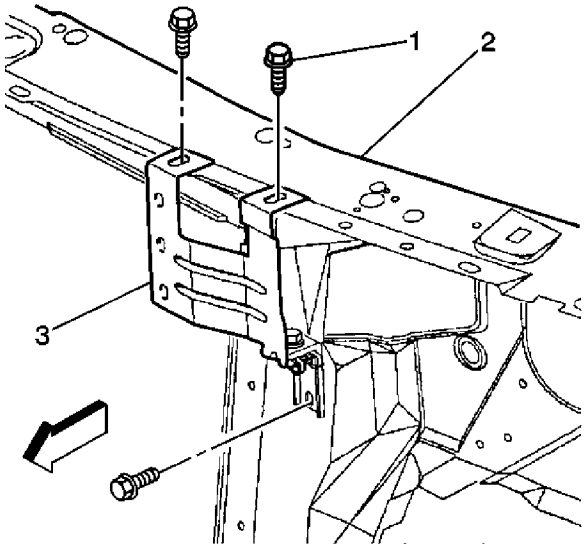


2. Remove the bolts (1) that retain the headlamp mounting bracket (3) to the radiator support (2).
3. Remove the headlamp mounting bracket (3).

Installation Procedure

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1. Install the headlamp mounting bracket (3).
2. Install the bolts (1) in order to retain the headlamp mounting bracket (3).

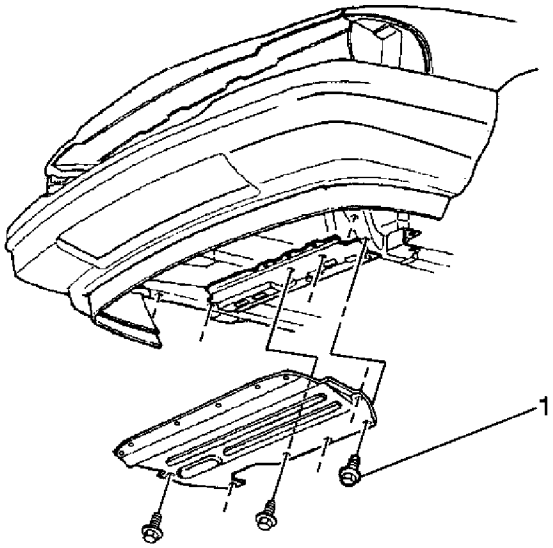
   Tighten
   Tighten the bolts to 9.5 N·m (84 lb in).

3. Install the headlamp. Refer to Headlamp Replacement or Headlamp Replacement in Lighting Systems.

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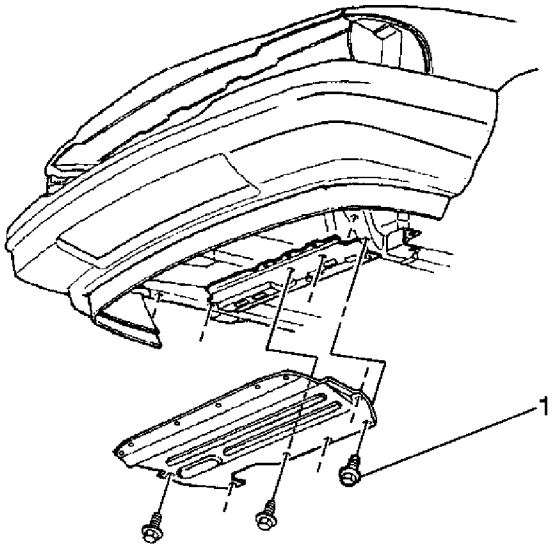
Front Air Deflector Replacement

Removal Procedure



1. Remove the bolts (2) retaining the air deflector (1) to the frame.
2. Remove the air deflector (1).

Installation Procedure



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1. Install the air deflector (1).

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the bolts (2).

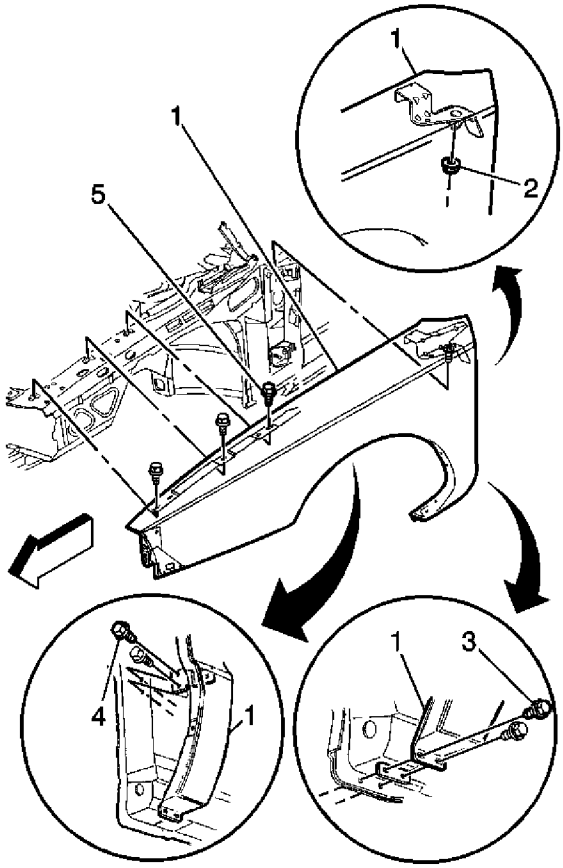
   Tighten
   Tighten the bolts to 7.5 N·m (66 lb in).

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Front Fender Replacement (88/LSS)

Removal Procedure

1. Remove the headlamp. Refer to Headlamp Replacement in Lighting Systems.
2. Remove the hood panel. Refer to Hood Replacement .
3. Remove the wheel opening molding, if equipped. Refer to Front Fender Wheel Opening Molding Replacement in Exterior Trim.
4. Remove the wheelhouse panel. Refer to Wheelhouse Panel Replacement .
5. Remove the rocker panel molding. Refer to Rocker Panel Molding Replacement .

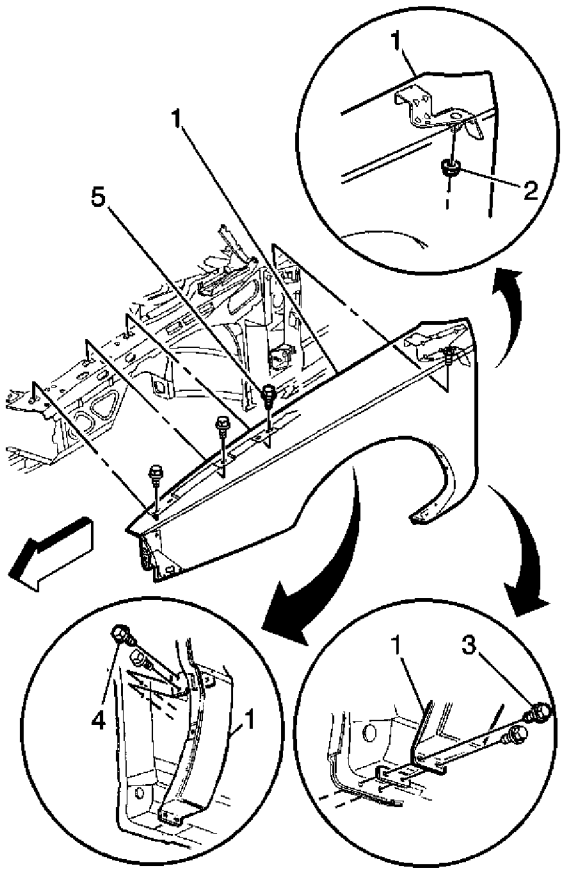


6. Remove the bolts (3) retaining the fender (1) at the rocker panel.
7. From inside the wheel opening, remove the bolts and nuts (4) retaining the rear of the fender (1).
8. Remove the bolts retaining the fender (1) at the headlamp opening.
9. Remove the bolts (5) retaining the upper edge of the fender (1).
10. Remove the fender (1).

Installation Procedure

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1. Install the fender (1).

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the bolts (5) in order to retain the upper edge of the fender (1).

   Tighten
   Tighten the bolts to 9.5 N·m (84 lb in).

3. Install the bolts in order to retain the fender at the headlamp opening.

   Tighten
   Tighten the bolts to 9.5 N·m (84 lb in).

4. From inside the wheel opening, install the bolts and nuts (4) in order to retain the rear of the fender (1).

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Tighten
Tighten the bolts to 9.5 N·m (84 lb in).

5. Install the bolts (3) in order to retain the fender (1) at the rocker panel.

Tighten
Tighten the bolts to 9.5 N·m (84 lb in).

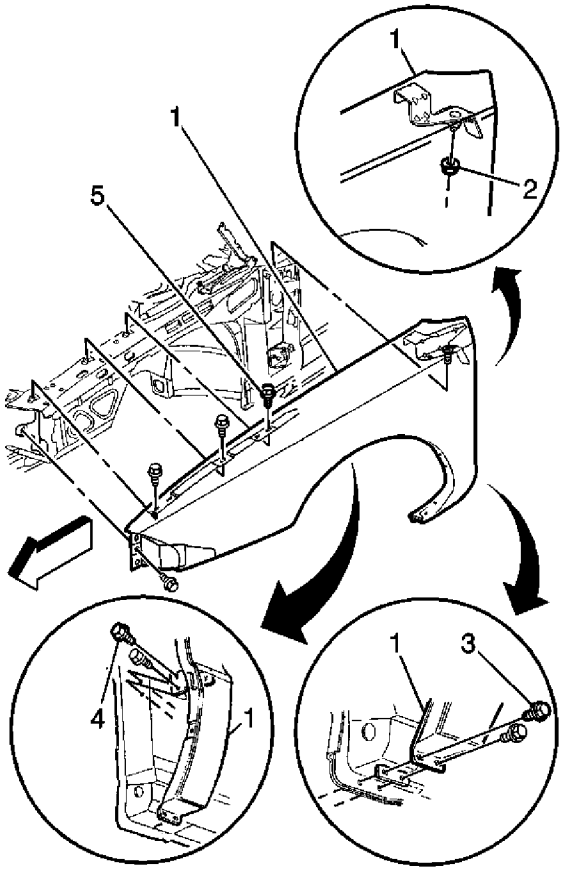
6. Install the rocker panel molding. Refer to Rocker Panel Molding Replacement .
7. Install the wheelhouse panel. Refer to Wheelhouse Panel Replacement .
8. Install the wheel opening molding, if equipped. Refer to Front Fender Wheel Opening Molding Replacement in Exterior Trim.
9. Install the hood panel. Refer to Hood Replacement .
10. Install the headlamp assembly. Refer to Headlamp Replacement in Lighting Systems.

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Front Fender Replacement (Pontiac)

Removal Procedure

1. Remove the headlamp. Refer to Headlamp Replacement in Lighting Systems.
2. Remove the hood panel. Refer to Hood Replacement .
3. Remove the wheelhouse panel. Refer to Wheelhouse Panel Replacement .
4. Remove the rocker panel molding. Refer to Rocker Panel Molding Replacement in Exterior Trim.

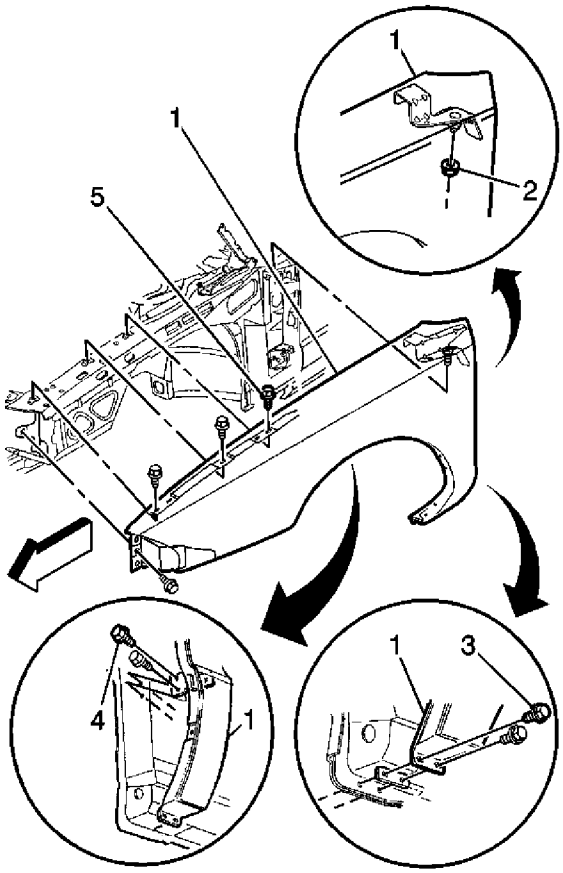


5. Remove the bolts (3) retaining the fender (1) at the rocker panel.
6. From inside the wheel opening, remove the bolts (4) retaining the rear of the fender (1).
7. Remove the bolts retaining the fender (1) at the headlamp opening.
8. Remove the bolts (5) retaining the upper edge of the fender (1).
9. Remove the fender (1).

Installation Procedure

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1. Install the fender (1) .

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the bolts (5) in order to retain the upper edge of the fender (1) .

   Tighten
   Tighten the bolts to 9.5 N·m (84 lb in).

3. Install the bolts in order to retain the fender (1) at the headlamp opening.

   Tighten
   Tighten the bolts to 9.5 N·m (84 lb in).

4. From inside the wheel opening, install the bolts (4) in order to retain the rear of the fender (1).

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Tighten
Tighten the bolts to 9.5 N·m (84 lb in).

5. Install the bolts (3) in order to retain the fender (1) at the rocker panel.

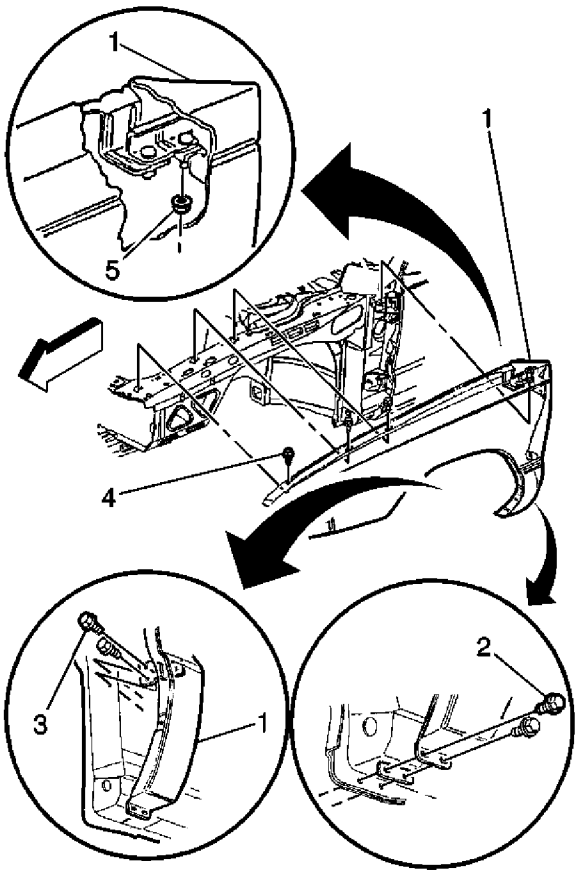
Tighten
Tighten the bolts to 9.5 N·m (84 lb in).

6. Install the rocker panel molding. Refer to Rocker Panel Molding Replacement in Exterior Trim.
7. Install the wheelhouse panel. Refer to Wheelhouse Panel Replacement .
8. Install the hood panel. Refer to Hood Replacement .
9. Install the headlamp assembly. Refer to Headlamp Replacement in Lighting Systems.

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Front Fender Replacement (Buick)

Removal Procedure

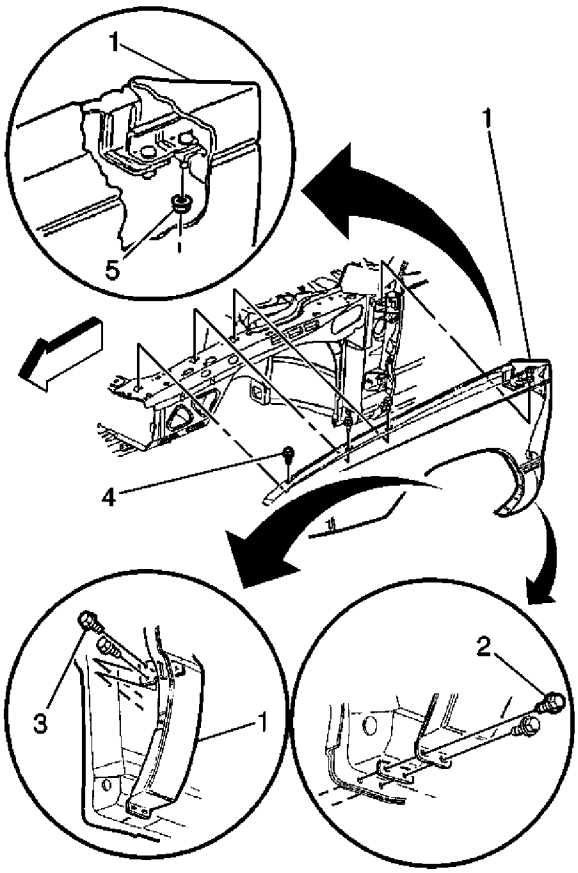


1. Remove the headlamp. Refer to Headlamp Replacement in Lighting.
2. Remove the hood panel. Refer to Hood Replacement .
3. Remove the wheel opening molding. Refer to Front Fender Wheel Opening Molding Replacement in Exterior Trim.
4. Remove the wheelhouse panel. Refer to Wheelhouse Panel Replacement .
5. Remove the rocker panel molding. Refer to Rocker Panel Molding Replacement in Exterior Trim.
6. Remove the bolts retaining the fender (1) at the rocker panel.
7. From inside the wheel opening, remove the bolts and the nuts (3) retaining the rear of the fender (1).
8. Remove the bolts and the nuts retaining the upper edge of the fender.
9. Remove the fender.

Installation Procedure

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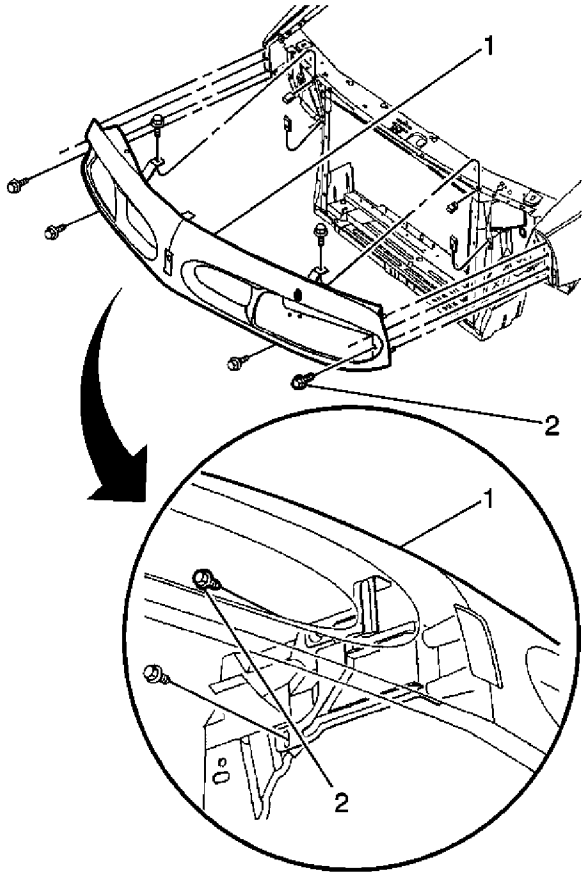
1. Install the fender.
2. Install the bolts and the nuts in order to retain the upper edge of the fender.
3. From inside the wheel opening, install the bolts and the nuts (3) in order to retain the rear of the fender (1).
4. Install the bolts in order to retain the fender (1) at the rocker panel.
5. Install the rocker panel molding. Refer to Rocker Panel Molding Replacement in Exterior Trim.
6. Install the wheelhouse panel. Refer to Wheelhouse Panel Replacement .
7. Install the hood panel. Refer to Hood Replacement .
8. Install the wheel opening molding. Refer to Front Fender Wheel Opening Molding Replacement in Exterior Trim.
9. Install the headlamp. Refer to Headlamp Replacement in Lighting.

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Front End Panel Replacement

Removal Procedure

1. Remove the upper filler panel. Refer to Filler Panel Replacement - Upper .
2. Remove the headlamp assemblies. Refer to Headlamp Replacement in Lighting Systems.

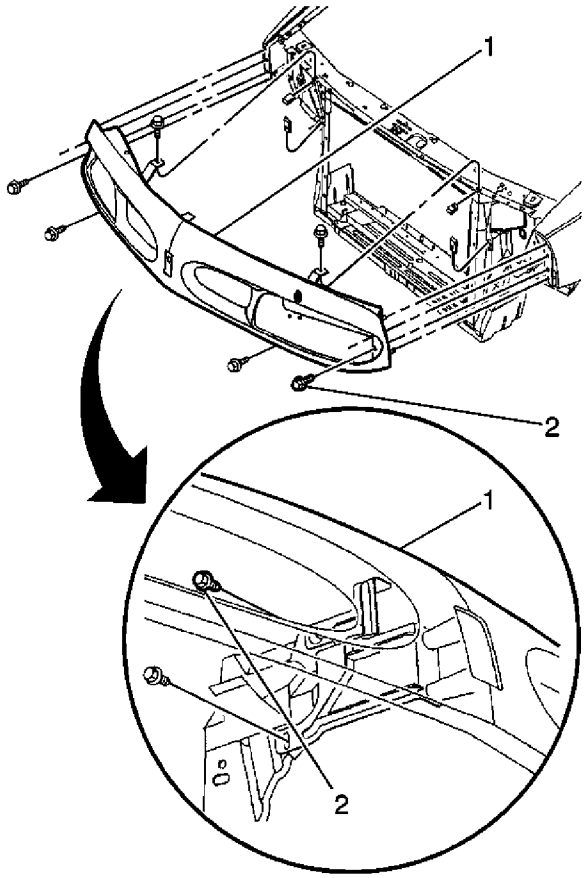


3. Remove the bolts (2) retaining the front end panel (1) through the headlamp openings.
4. Remove the bolts (2) retaining the front end panel (1) to the center support.
5. Remove the front end panel (1).

Installation Procedure

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1. Install the front end panel (1).

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the bolts (2) in order to retain the front end panel (1) to the center support.

   Tighten
   Tighten the bolts to 5 N·m (44 lb in).

3. Install the bolts (2) in order to retain the front end panel (1) through the headlamp openings.

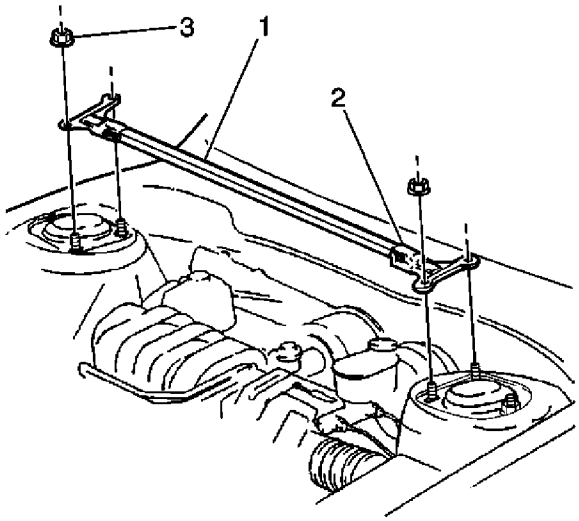
   Tighten
   Tighten the bolts to 5 N·m (44 lb in).

4. Install the headlamp assemblies. Refer to Headlamp Replacement in Lighting Systems.
5. Install the upper filler panel. Refer to Filler Panel Replacement - Upper .

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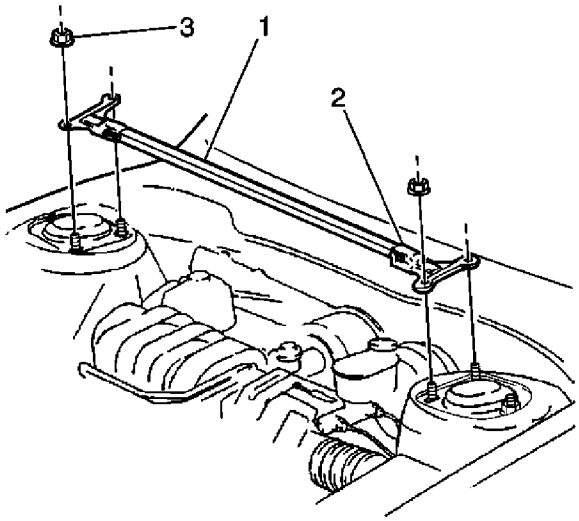
Cross Vehicle Brace Replacement

Removal Procedure



1. Remove the nuts (3) retaining the cross vehicle brace (1) to the strut towers.
2. Remove the cross vehicle brace (1).

Installation Procedure



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1. Install the cross vehicle brace (1).
2. Loosen the through bolts (2).
3. Adjust the cross vehicle brace (1), as needed.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

4. Install the nuts (3) in order to retain the cross vehicle brace (1).

   Tighten
   Tighten the nuts to 24 N·m (18 lb ft).

5. Tighten the through bolts (2), if previously loosened.

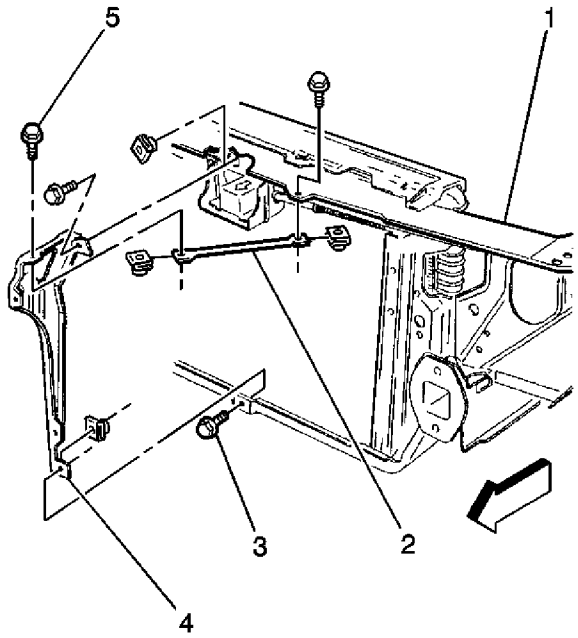
   Tighten
   Tighten the bolts to 37 N·m (27 lb ft).

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Support Replacement - Sheet Metal

Removal Procedure

1. Remove the lower air deflector. Refer to Front Air Deflector Replacement .
2. Remove the grille (Regency). Refer to Grille Replacement - Regency.
3. Remove the front end panel. Refer to Front End Panel Replacement .

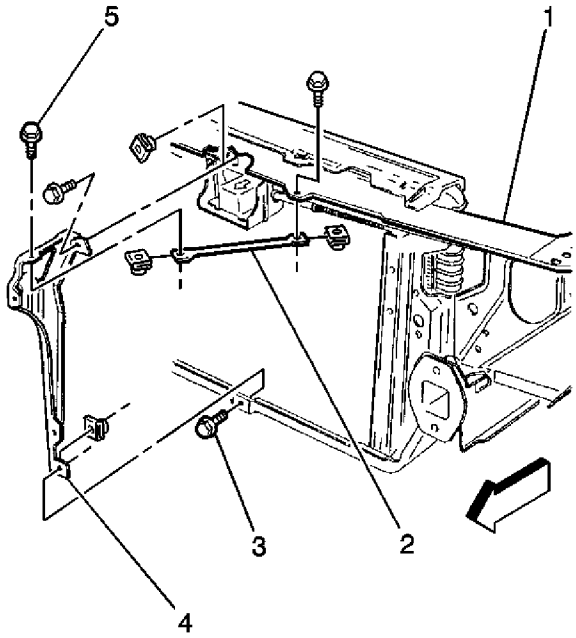


4. Remove the bolts (5) that retains the side brace (2) at the radiator support (1) to the center brace (4).
5. Remove the side brace (2).
6. Remove the bolts (3) retaining the center brace (4) to the radiator support (1).
7. Remove the center brace (4).

Installation Procedure

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1. Install the center brace (4).

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the bolts (5) in order to retain the center brace (4) to the radiator support (1).

   Tighten
   Tighten the bolts to 13 N·m (115 lb in).

3. Install the side brace (2).
4. Install the bolts (3) in order to retain the side brace at the radiator support (1) to the center brace (4).

   Tighten
   Tighten the bolts to 9.5 N·m (84 lb in).

5. Install the front end panel. Refer to Front End Panel Replacement .
6. Install the grille assembly. Refer to Grille Replacement - Regency.

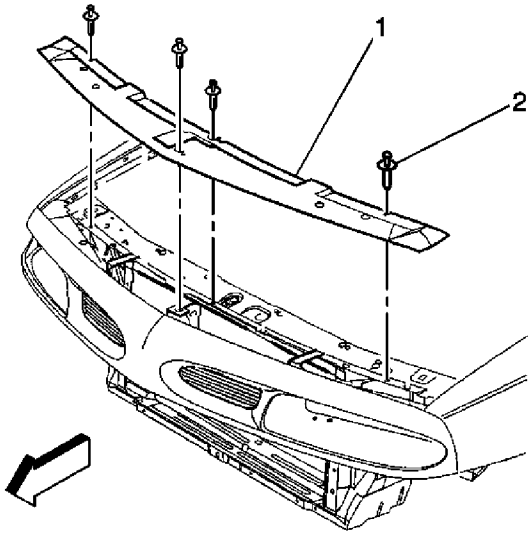
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7. Install the lower air deflector. Refer to Front Air Deflector Replacement .

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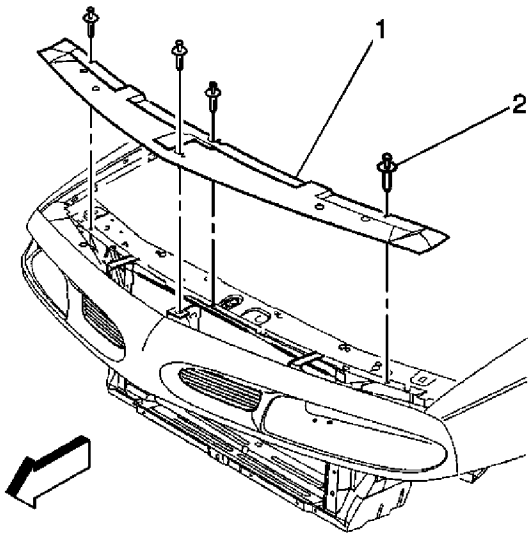
Filler Panel Replacement - Upper (88/LSS)

Removal Procedure



1. Remove the push-in retainers (2) from the filler panel (1).
2. Remove the upper filler panel (1).

Installation Procedure



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1. Install the upper filler panel (1).
2. Install the push-in retainers (2) .

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Air Inlet Grille Panel Replacement

Removal Procedure

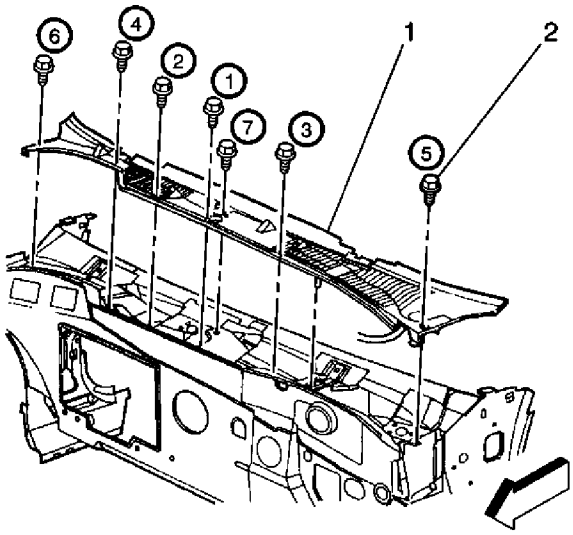
Air ventilation is supplied through the following components:

- A grille panel
- A heater/air conditioning module

The heater/air conditioning module is located in the plenum chamber.

Air passes through the body and exits through the pressure relief valves. The pressure relief valves are located on the rear body lock pillars. Refer to Pressure Relief Valve Replacement in Body Rear End.

1. Raise the hood.
2. Remove the wiper arm assemblies. Refer to Windshield Wiper Arm Replacement in Wipers/Washers.



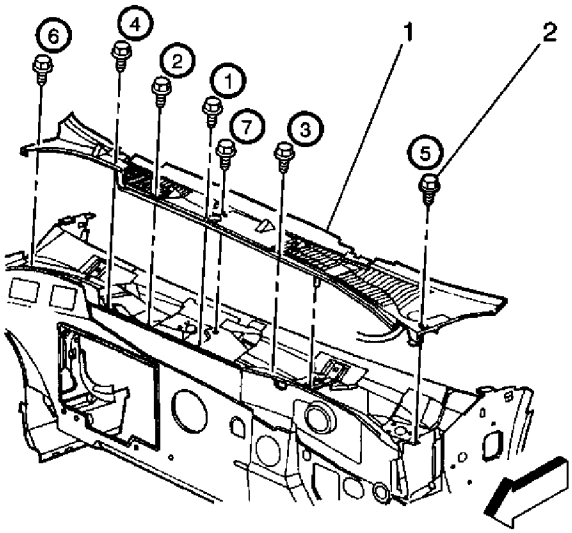


3. Remove the rear hood seal.
4. Remove the push in/screw retainers.
5. Remove the right hand wiper transmission bolts under the panel.
6. Lower the right hand wiper transmission drive shaft.
7. Disconnect the washer hoses.
8. Remove the air inlet grille panel.

Installation Procedure

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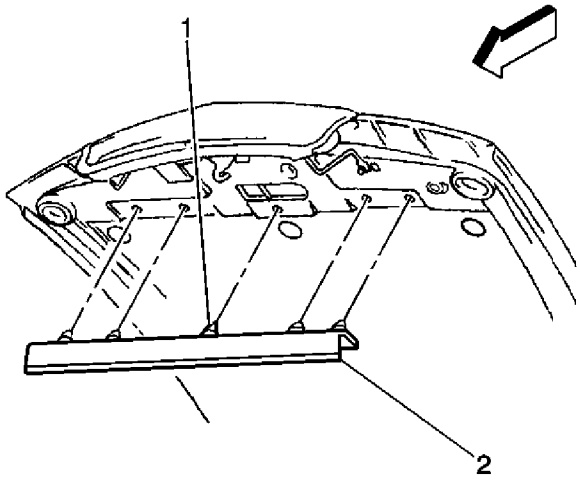


1. Install the washer hoses.
2. Partially install the air inlet grille panel (1).
3. Install the wiper transmission bolt under the panel.
4. Install the wiper transmission bolts through the grille panel.
5. Install the air inlet grille panel.
6. Install the wiper transmission bolts through the grille panel.
7. Install the push in/screw retainers.
8. Install the rear hood seal.
9. Install the wiper arm assemblies. Refer to Windshield Wiper Arm Replacement in Wipers/Washers.
10. Lower the hood.

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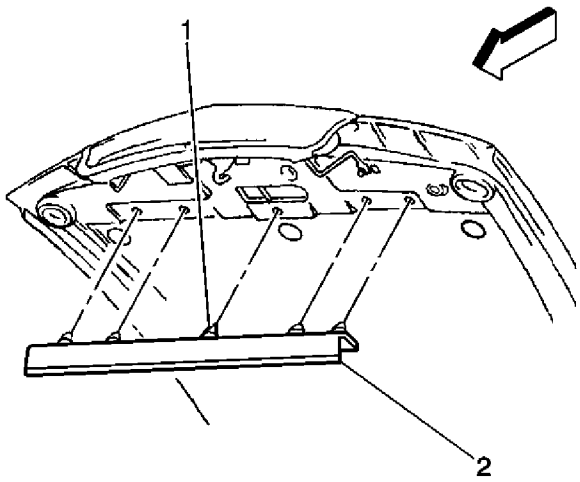
Hood Front Seal Replacement

Removal Procedure



1. Remove the push-in retainers (1).
2. Remove the front hood seal (2).

Installation Procedure



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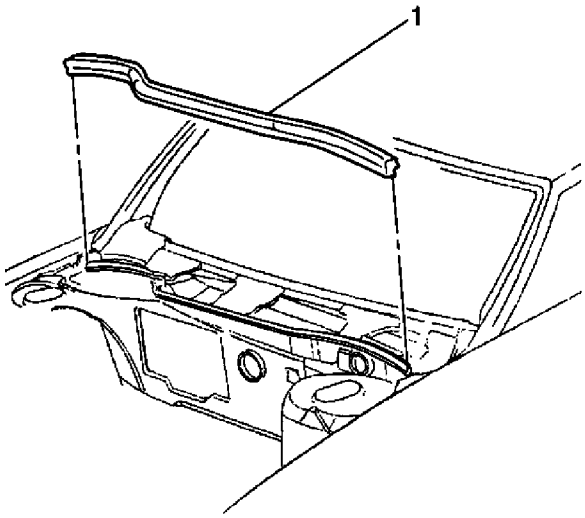


1. Install the front hood seal (2).
2. Install the push-in retainers (1).

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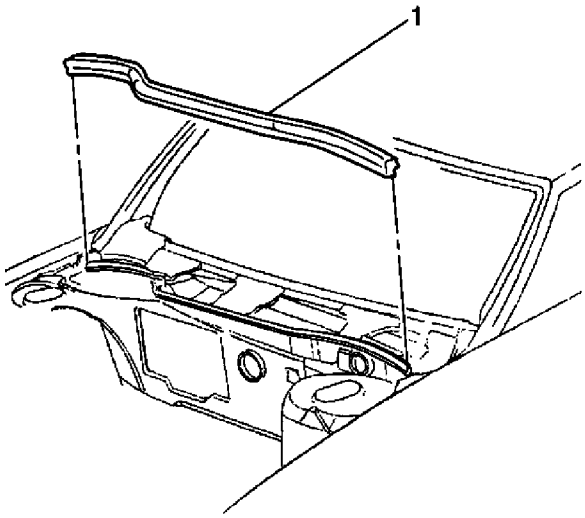
Hood Rear Seal Replacement

Removal Procedure



Remove the rear hood seal (1) from the flange.

Installation Procedure



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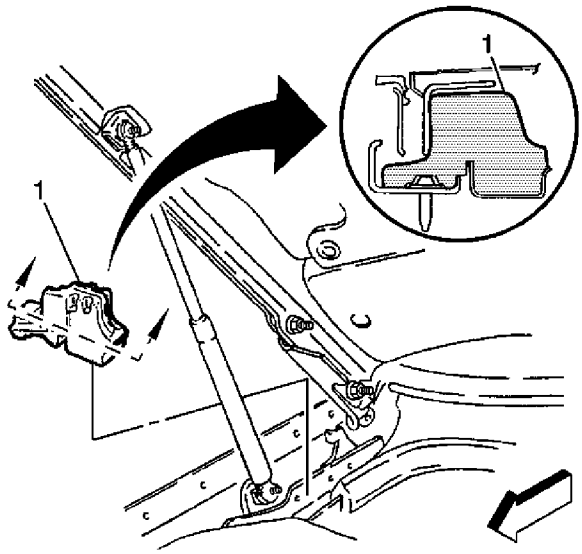


1. Apply the weather-strip adhesive GM P/N 12345097 or the equivalent to the seal (1).
2. Press the seal (1) to the flange.

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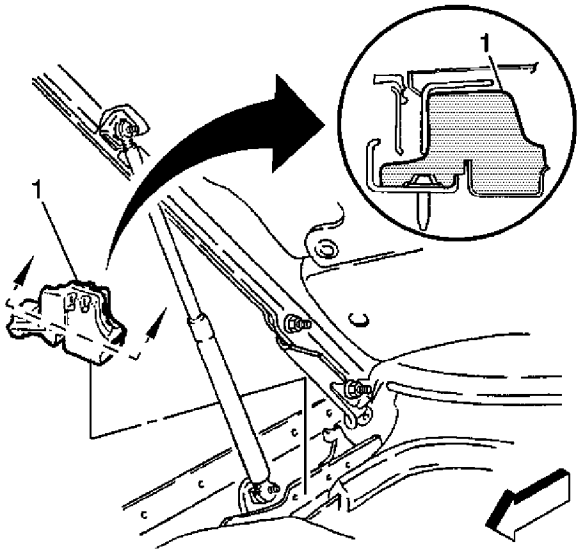
Hood Rear Outer Seal Replacement

Removal Procedure



Remove the rear hood seal (1) from the flange.

Installation Procedure



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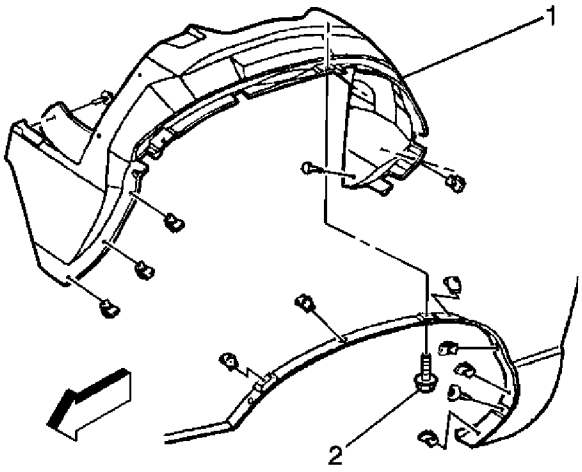
1. Apply the weather-strip adhesive GM P/N 12345097 or the equivalent to the seal (1).
2. Press the seal (1) to the flange.

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Wheelhouse Panel Replacement (Buick)

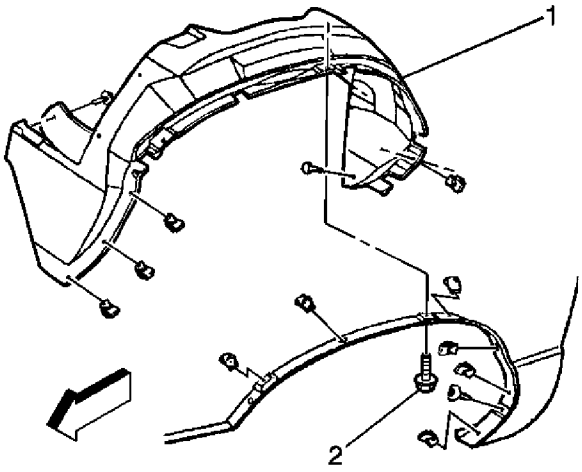
Removal Procedure

1. Remove the wheel opening molding.



2. Remove the bolts (2).
3. Remove the wheelhouse assembly (1).

Installation Procedure



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1. Install the wheelhouse assembly (1).

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the bolts (2).

   Tighten
   Tighten the bolts to 1.9 N·m (17 lb in).

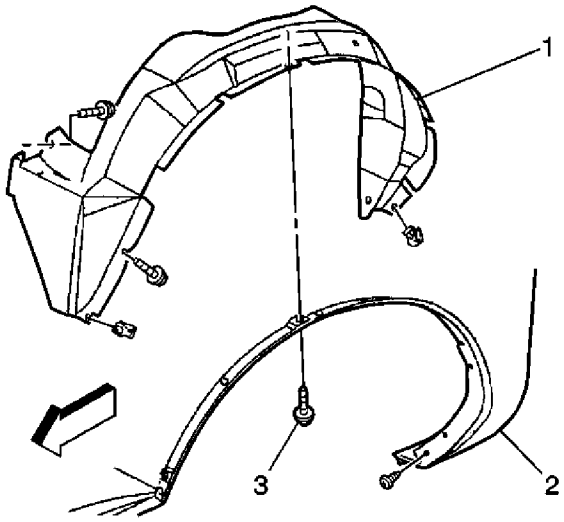
3. Install the wheel opening molding.

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Wheelhouse Panel Replacement (88/LSS)

Removal Procedure

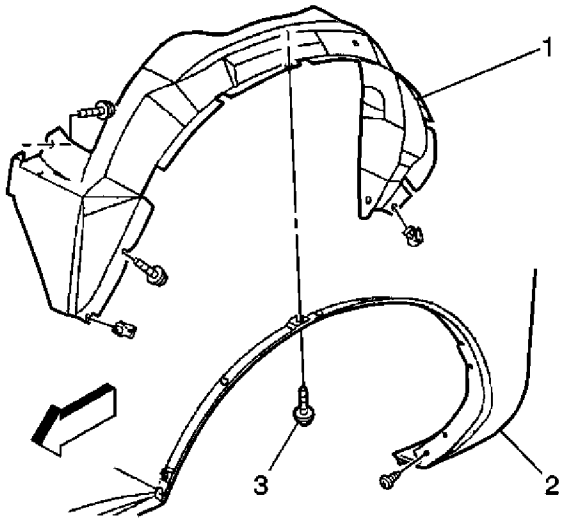
1. Remove the wheel opening molding.





2. Remove the bolts (3).
3. Remove the wheelhouse assembly (1).

Installation Procedure



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1. Install the wheelhouse assembly (1).

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the bolts (3).

   Tighten
   Tighten the bolts to 1.9 N·m (17 lb in).

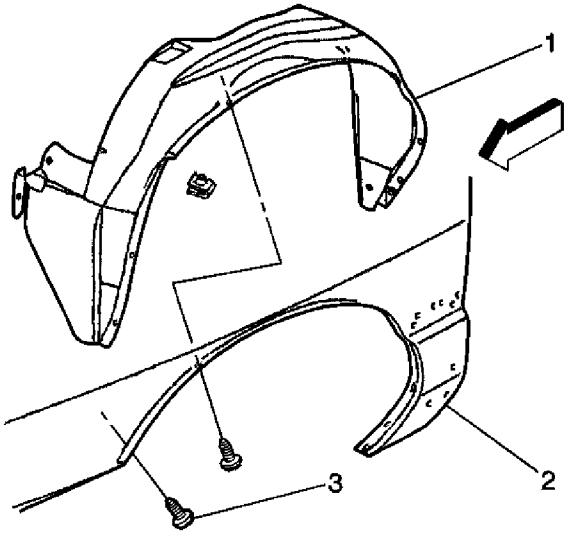
3. Install the wheel opening molding.

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Wheelhouse Panel Replacement (Pontiac)

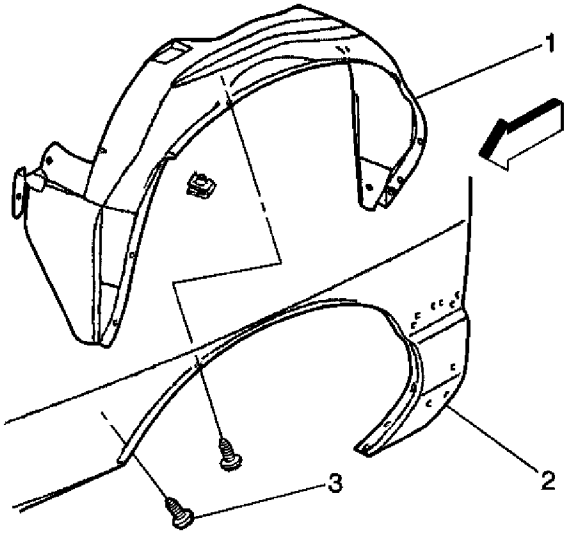
Removal Procedure

1. Remove the wheel opening molding.



2. Remove the bolts (3).
3. Remove the wheelhouse assembly (1).

Installation Procedure



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1. Install the wheelhouse assembly (1).

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the bolts (3).

   Tighten
   Tighten the bolts to 1.9 N·m (17 lb in).

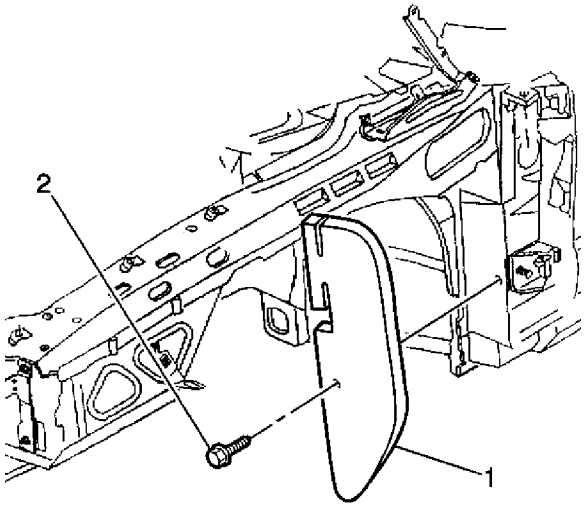
3. Install the wheel opening molding.

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Front Fender Insulator Replacement

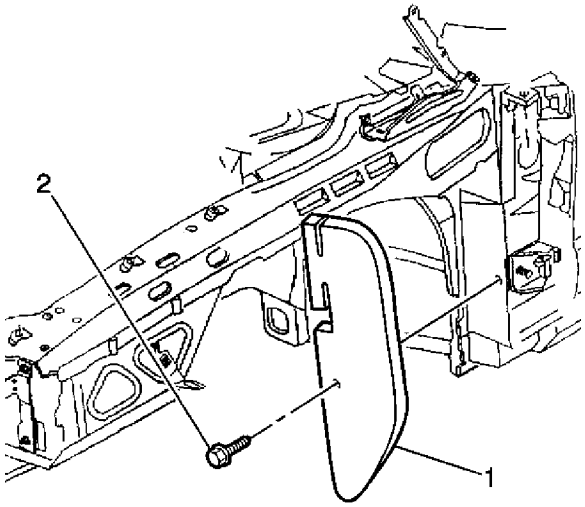
Removal Procedure

1. Remove the wheelhouse assembly. Refer to Wheelhouse Panel Replacement .



2. Remove the bolts (2) retaining the sound insulator (1).
3. Remove the fender sound insulator (1).

Installation Procedure



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1. Install the fender sound insulator (1).

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the bolts (2) in order to retain the sound insulator (1).

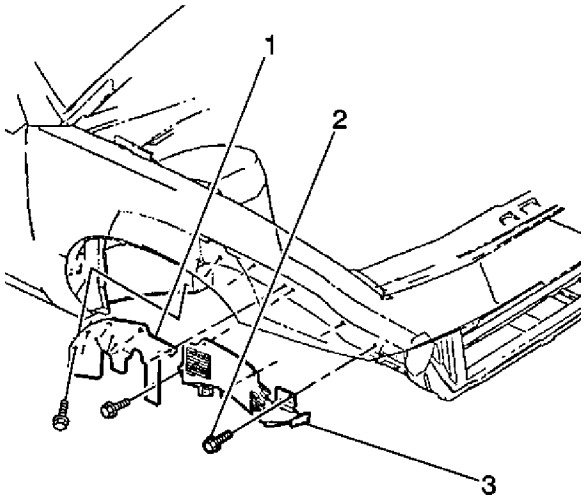
   Tighten
   Tighten the bolts to 1.7 N·m (17 lb in).

3. Install the wheelhouse assembly. Refer to Wheelhouse Panel Replacement .

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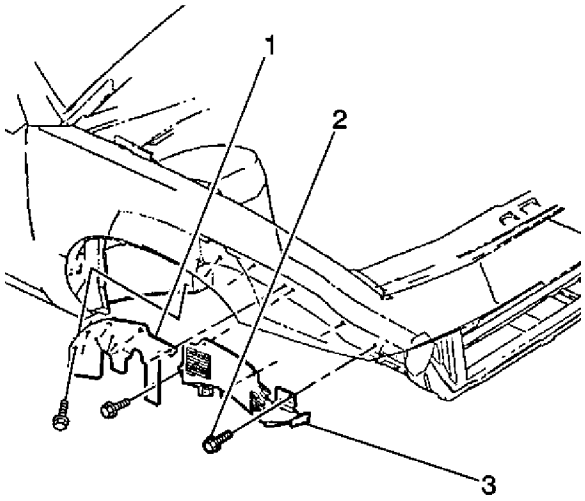
Engine Splash Shield Replacement

Removal Procedure



1. Remove the push-in retainers (2) from the splash shields (1,3).
2. Remove the engine splash shields (1,3).

Installation Procedure



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1. Install the engine splash shields (1,3).
2. Install the push-in retainers (2).

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Fastener Tightening Specifications

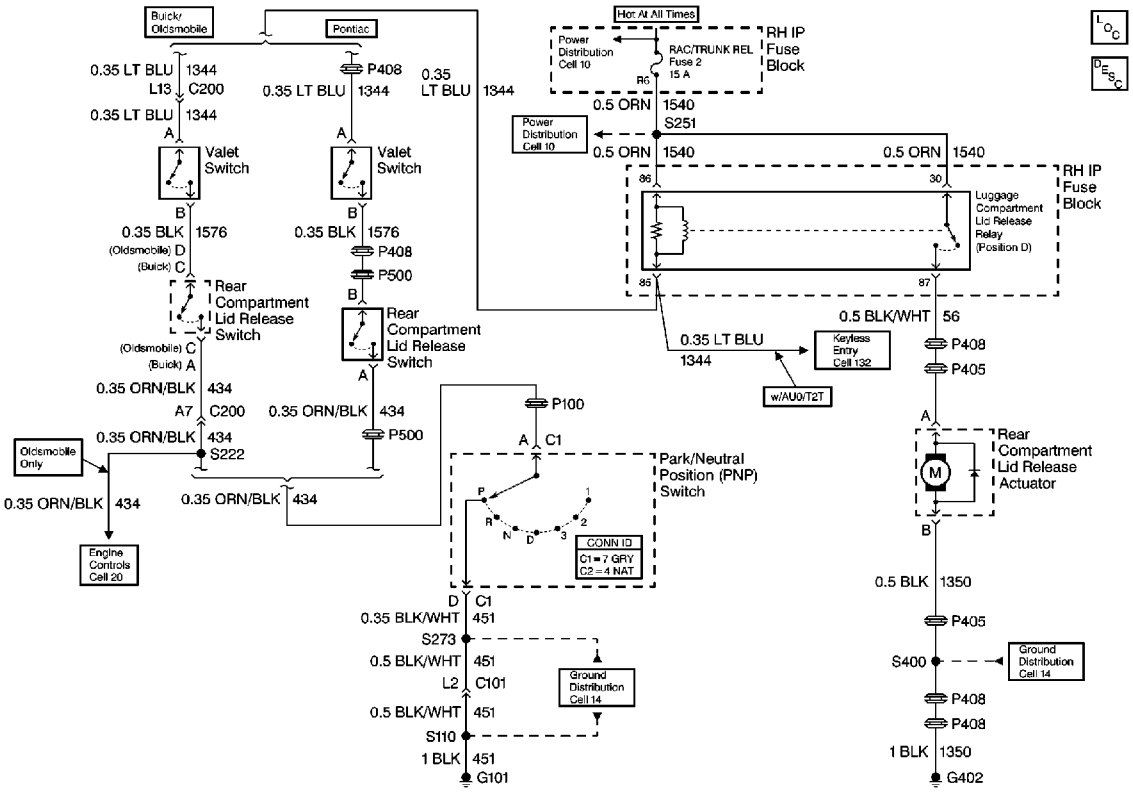
Application	Specification	
	Metric	English
Fuel Filler Door Retaining Nuts	9 N·m	80 lb in
Latch Striker to Body Bolts	9 N·m	80 lb in
Lid Latch to Rear Compartment Bolts	10.5 N·m	93 lb in
Jack Storage Container	13.5 N·m	119 lb in
Rear Compartment Lid Hinges to Body Bolts	18 N·m	13 lb ft
Rear Compartment Lid to Hinge Bolts	25 N·m	18 lb ft
Spoiler to Rear Compartment Lid Bolts - Pontiac	7.5 N·m	66 lb in

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Release Systems Schematics

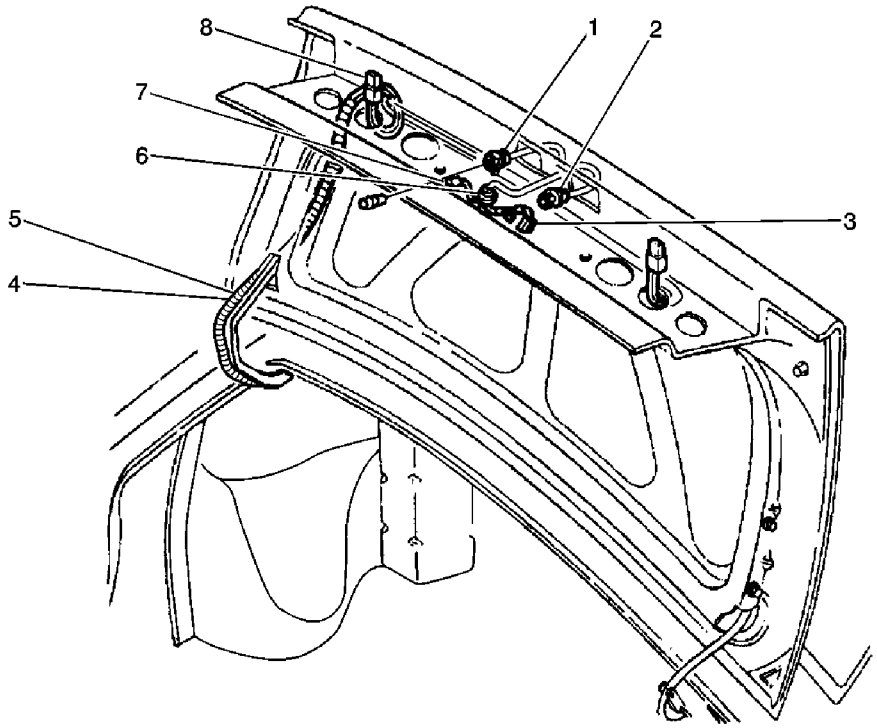
Cell 134



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Rear Compartment Lid (Buick)



(1) LH License Lamp
(2) RH License Lamp
(3) Rear Compartment Lid Release Solenoid
(4) S400
(5) S414
(6) P405
(7) Rear Compartment Lid Latch Switch
(8) C430

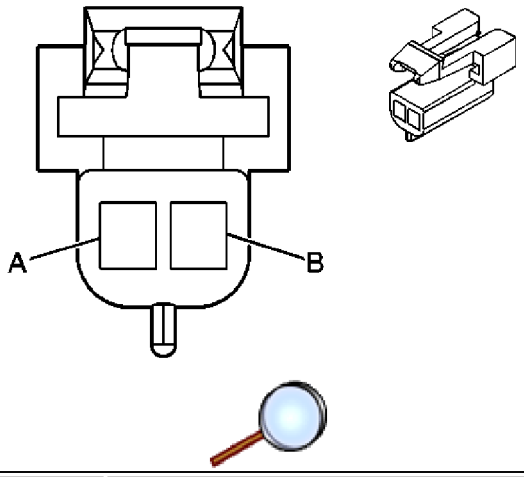
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Body Rear End Connector End Views

Table 1: Rear Compartment Lid Release Actuator
Table 2: Rear Compartment Lid Release Switch
Table 3: Rear Compartment Lid Tamper Switch
Table 4: Valet Switch -- Buick
Table 5: Valet Switch -- Oldsmobile
Table 6: Valet Switch -- Pontiac

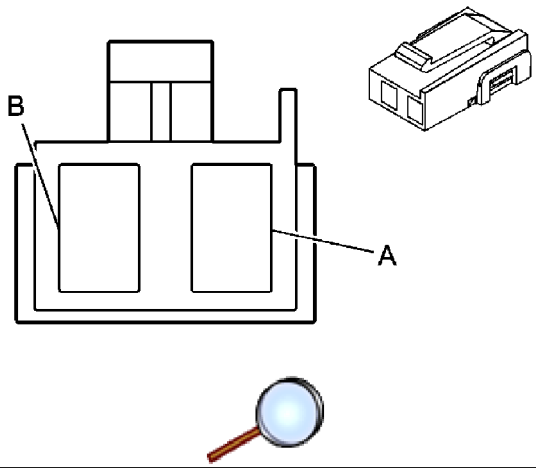
Rear Compartment Lid Release Actuator



Connector Part Information	• 12052832 • 2 Way Metri-Pack 140 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	BLK/WHT	56	Rear Compartment Lid Release Actuator
B	BLK	1350	Ground

Rear Compartment Lid Release Switch

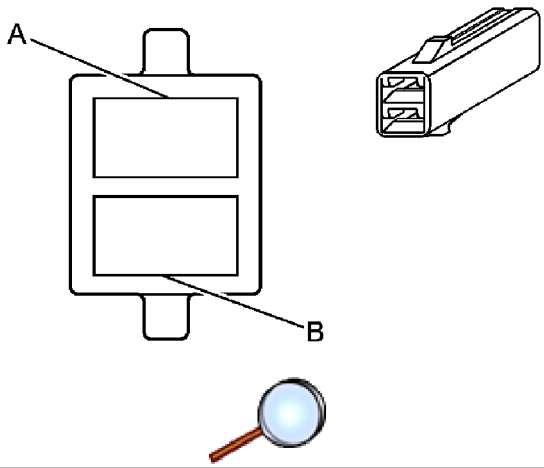


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Connector Part Information	• 12015197 • 2 Way F Metri-Pack 280 Series (BLU)

Pin	Wire Color	Circuit No.	Function
A	LT BLU	434	Transmission Mounted Neutral Safety Switch Signal
B	BLK	1576	Trunk Release Switch Output

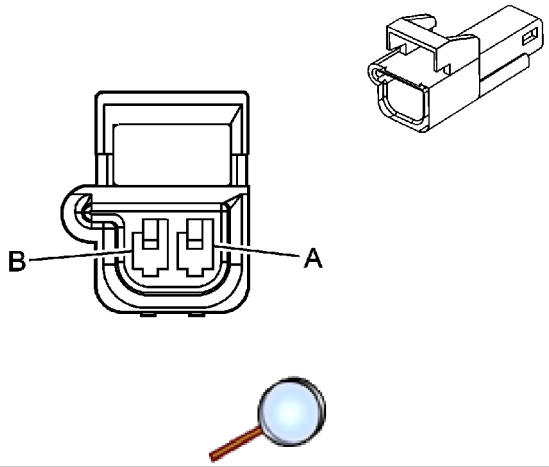
Rear Compartment Lid Tamper Switch



Connector Part Information	• 08900863 • 2-Way F 56 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	LT BLU	263	Tamper Switch Signal
B	BLK	1250	Ground

Valet Switch -- Buick

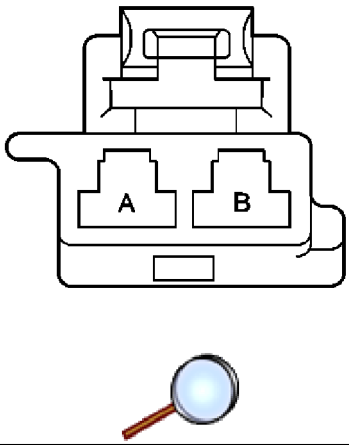


Connector Part Information	• 12064868 • 2-Way M Metric Pack 150 Series

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Pin	Wire Color	Circuit No.	Function
A	LT BLU	1344	Trunk Release Relay Output
B	BLK	1576	Trunk Release Switch Output

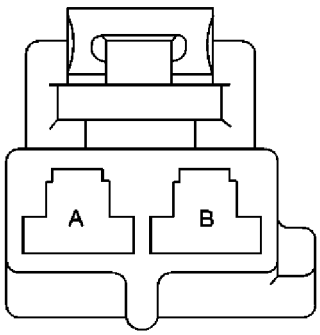
Valet Switch -- Oldsmobile



Connector Part Information	• 12066510 • 2-Way F Metric Pack 480 Series (BLU)

Pin	Wire Color	Circuit No.	Function
A	LT BLU	1344	Trunk Release Relay Output Coil
B	BLK	1576	Trunk Release Switch Output

Valet Switch -- Pontiac



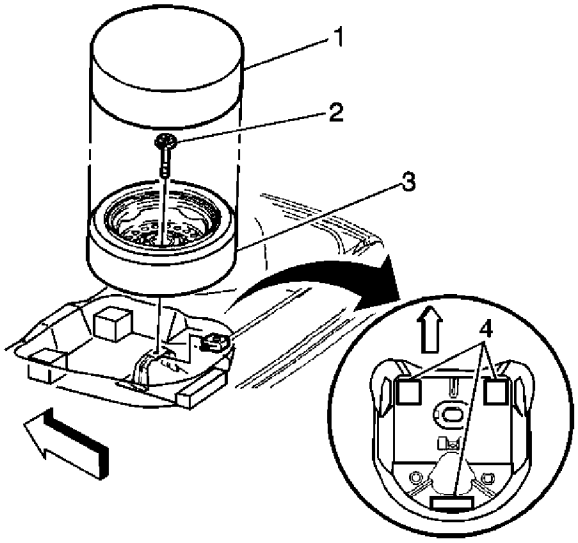
Connector Part Information	• 12064749 • 2-Way F Metric Pack 480 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	LT BLU	1344	Trunk Release Relay Output Coil
B	BLK	1576	Trunk Release Switch Output

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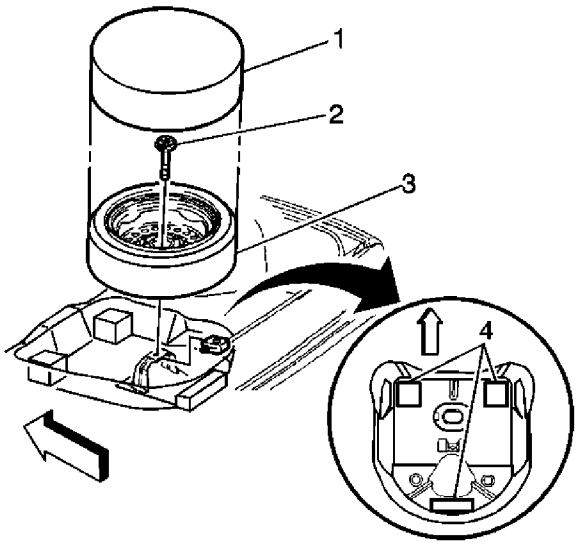
Spare Tire Replacement

Removal Procedure



1. Remove the spare tire cover (1).
2. Remove the spare tire hold-down (2).
3. Remove the spare tire (3).

Installation Procedure



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1. Properly position the spacer blocks (4) in the spare tire well.
2. Install the spare tire (3).

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the spare tire hold-down (2).

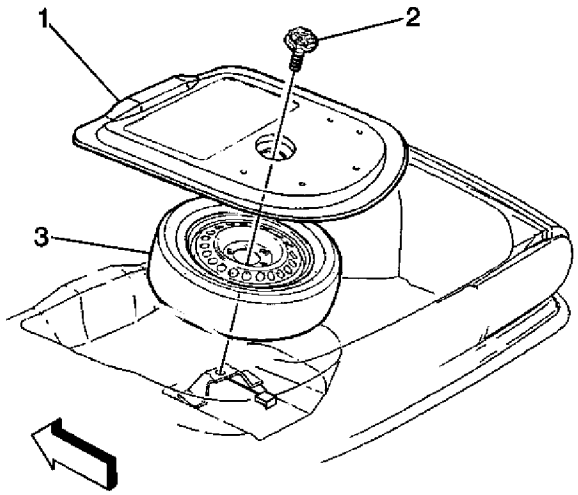
   Tighten
   Tighten the spare tire hold-down to 5.5 N·m (49 lb in).

4. Install the spare tire cover (1).

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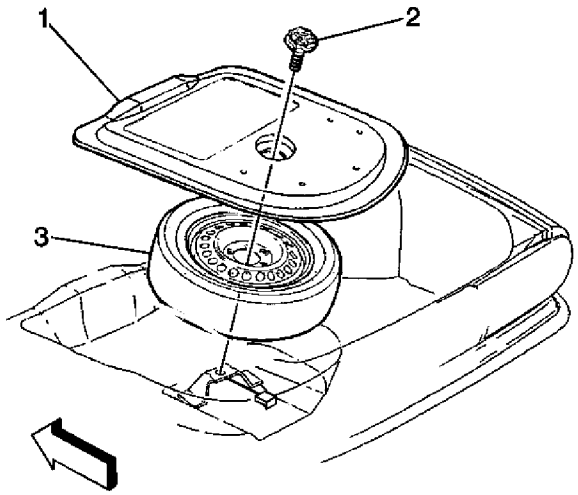
Spare Wheel and Hold-Down Replacement

Removal Procedure



1. Remove the spare tire hold-down (2).
2. Remove the spare tire cover (1).
3. Remove the spare tire (3).

Installation Procedure



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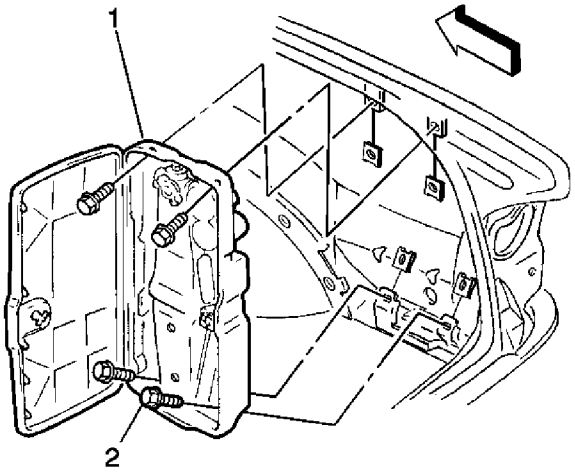


1. Install the spare tire (3).
2. Install the spare tire cover (1).
3. Install the spare tire hold-down (2).

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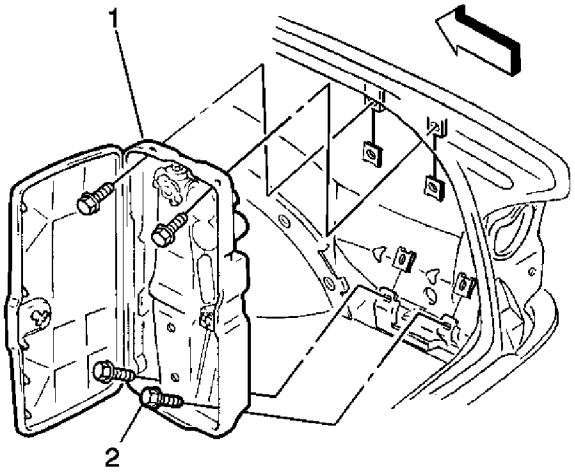
Jack and Tool Stowage Replacement

Removal Procedure



1. Open the jack storage container (1).
2. Remove the bolts (2) that retain the container to the body.
3. Remove the jack storage container (1).

Installation Procedure



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1. Install the jack storage container (1).

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the bolts (2) in order to retain the container (1) to the body.

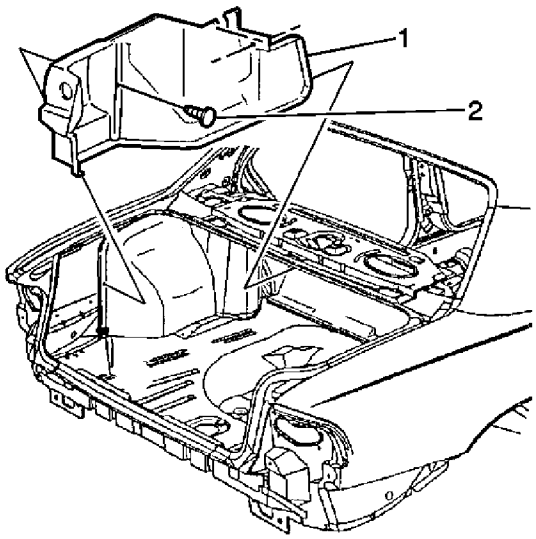
   Tighten
   Tighten the bolts to 13.5 N·m (119 lb in).

3. Close the jack storage container (1).

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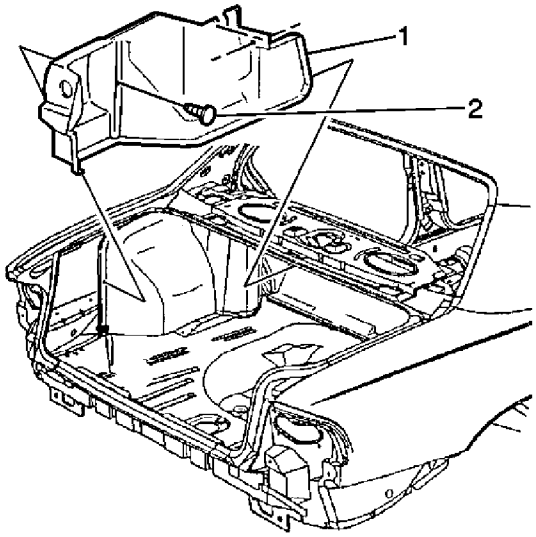
Rear Compartment Side Trim Replacement - Left Side

Removal Procedure



1. Remove the push-in retainers (2).
2. Remove the convenience net retainers.
3. Remove the rear compartment side trim (1).

Installation Procedure



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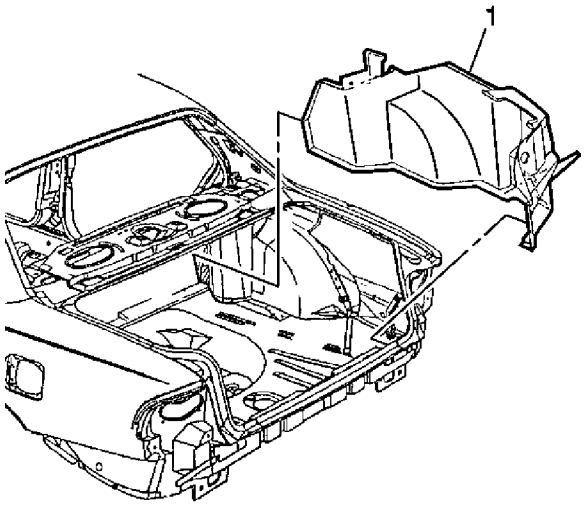


1. Install the rear compartment side trim (1).
2. Install the convenience net retainers.
3. Install the push-in retainers (2).

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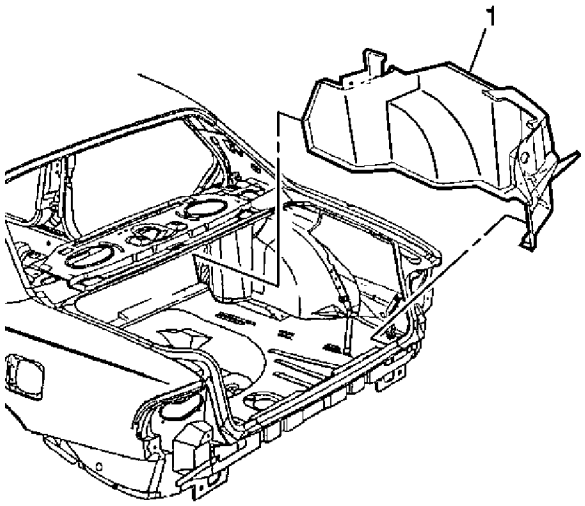
Rear Compartment Side Trim Replacement - Right Side

Removal Procedure



1. Remove the push-in retainers.
2. Remove the convenience net retainers.
3. Remove the rear compartment side trim (1).

Installation Procedure



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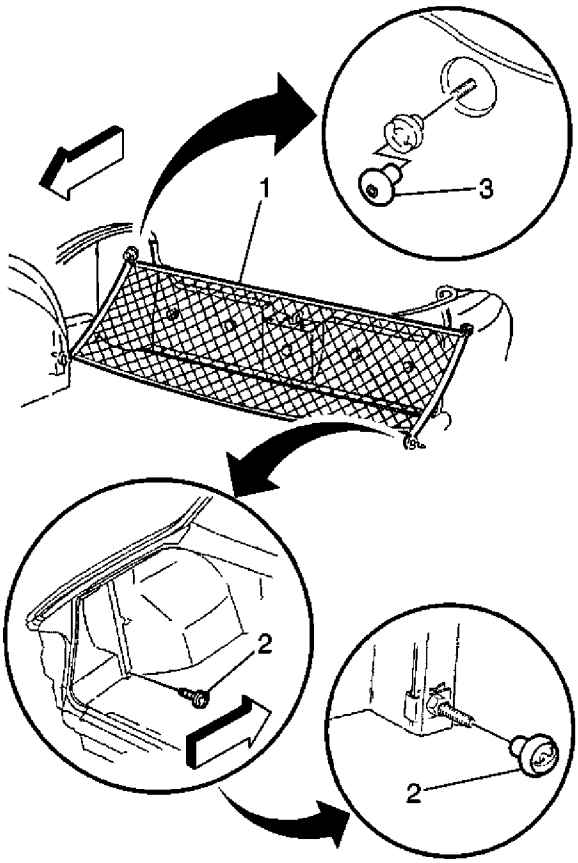


1. Install the rear compartment side trim (1).
2. Install the convenience net retainers.
3. Install the push-in retainers.

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Convenience Net Replacement - Rear Compartment

Removal Procedure

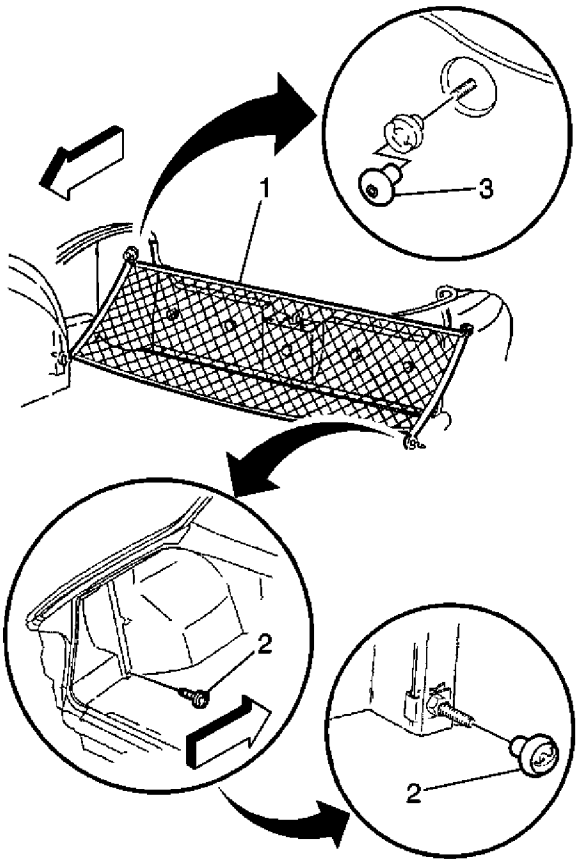


1. Remove the retainers (2,3).
2. Remove the convenience net (1).

Installation Procedure

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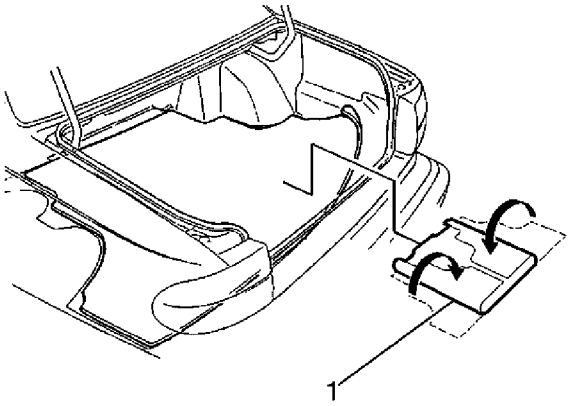


1. Install the convenience net (1).
2. Install the retainers (2,3).

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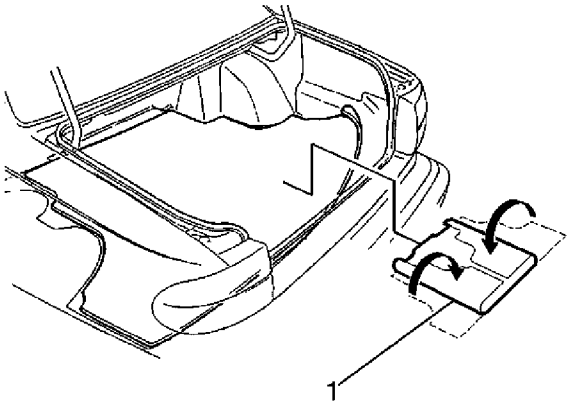
Rear Floor Trim Plate Replacement

Removal Procedure



1. Fold the trim assembly (1) until the bottom edges meet in the center, as shown in the illustration.
2. Lift and remove the trim (1) from the rear compartment.

Installation Procedure



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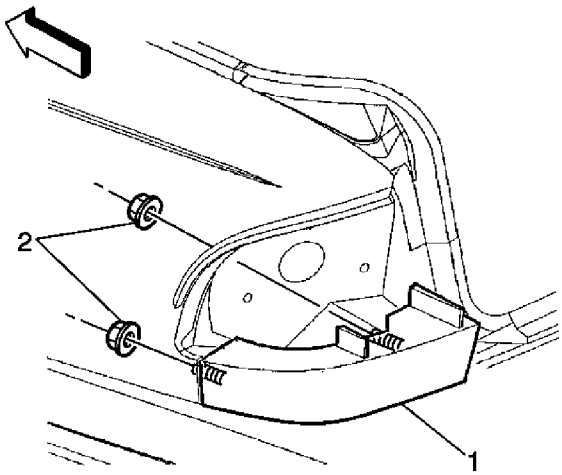
1. Install the still-folded trim (1) into the rear compartment.
2. Smooth the trim out in order to fit the rear compartment in the following sequence:
   - 2.1. Contour at the rear end of the panel
   - 2.2. Contour at the quarter panel
   - 2.3. Contour at the front of the panel

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Body Tail Lamp Filler Panel Replacement (Buick)

Removal Procedure

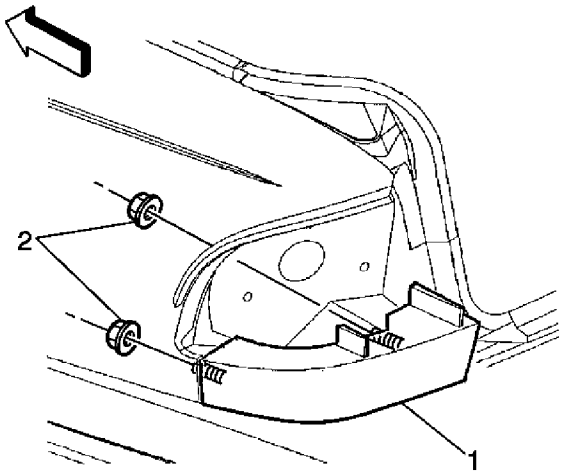
1. Remove the rear compartment sill plate.
2. Remove the tail lamp. Refer to Tail Lamp Replacement in Lighting Systems.





3. Remove the nuts (2) that retain the filler panel (1).
4. Remove the tail lamp filler panel (1).

Installation Procedure



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1. Install the tail lamp filler panel (1).

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the nuts (2) in order to retain the filler panel (1).

   Tighten
   Tighten the nuts to 6 N·m (53 lb in).

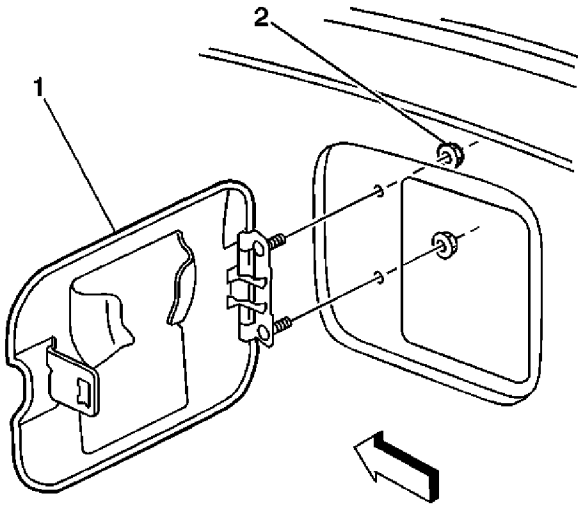
3. Install the tail lamp. Refer to Tail Lamp Replacement in Lighting Systems.
4. Install the rear compartment sill plate.

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Fuel Tank Filler Door Replacement

Removal Procedure

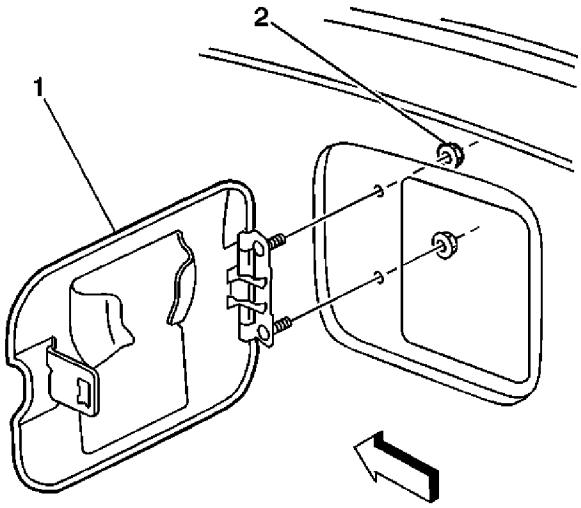
1. Remove the fuel filler pocket. Refer to Fuel Tank Filler Pipe Housing Replacement .





2. Remove the 2 nuts (2).
3. Remove the fuel filler door (1).

Installation Procedure



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1. Install the fuel filler door (1).

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the 2 nuts (2).

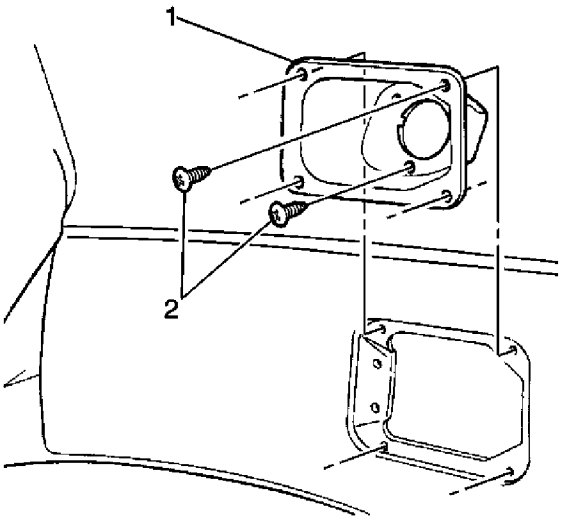
   Tighten
   Tighten the nuts to 9 N·m (80 lb in).

3. Install the fuel filler pocket. Refer to Fuel Tank Filler Pipe Housing Replacement .

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Fuel Tank Filler Pipe Housing Replacement

Removal Procedure

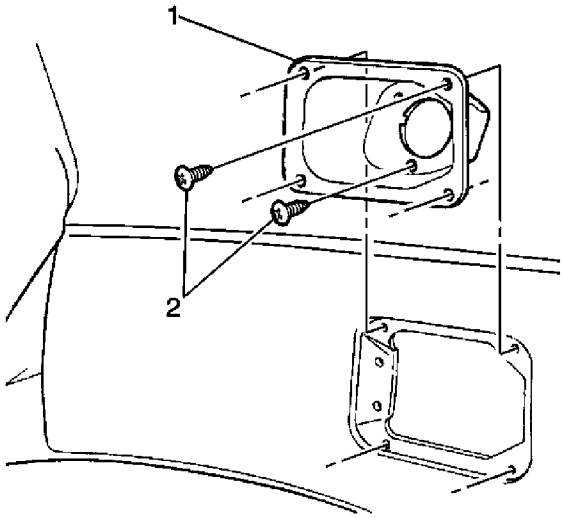


1. Remove the fuel cap.
2. Remove the screw from the latch, if equipped.
3. Remove the screws retaining the filler pipe to the filler pocket (1).
4. Remove the screws (2) retaining the filler pocket (1) to the body.
5. Remove the filler pocket (1) from the body.

Installation Procedure

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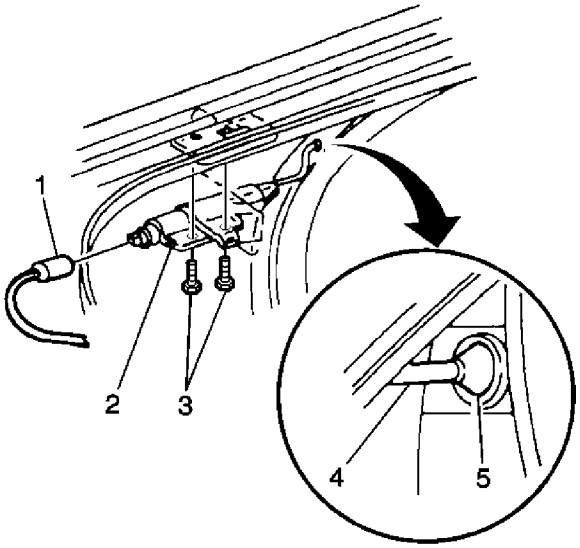
1. Install the filler pocket (1) to the body.
2. Install the screws (2) retaining the filler pocket (1) to the body.
3. Install the screws retaining the filler pipe to the filler pocket (1).
4. Install the screw to the latch, as needed.
5. Install the fuel cap.

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Fuel Tank Filler Door Lock Actuator Replacement

Removal Procedure

1. Remove the fuel filler door. Refer to Fuel Tank Filler Door Replacement .
2. Remove the fuel filler door latch. Refer to Fuel Filler Door Release Replacement.



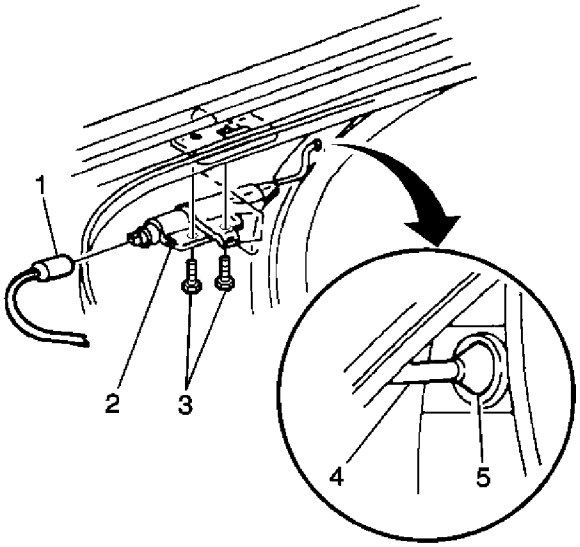


3. Disconnect the electrical connector (1).
4. Remove the bolts (3).
5. Remove the fuel filler door latch actuator (2) by pulling the cable (4) and the grommet (5) through the hole in the body.

Installation Procedure

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1. Install the fuel filler door latch actuator (2) by feeding the cable (4) through the hole in the body. Ensure that the cable is in the fuel filler pocket area.

   Important: Fully seat the grommet.

2. Press the grommet (5) into the hole in the body.
3. Connect the electrical connector (1).
4. Install the bolts (3).
5. Install the fuel filler door latch. Refer to Fuel Filler Door Release Replacement.
6. Install the fuel filler door. Refer to Fuel Tank Filler Door Replacement .

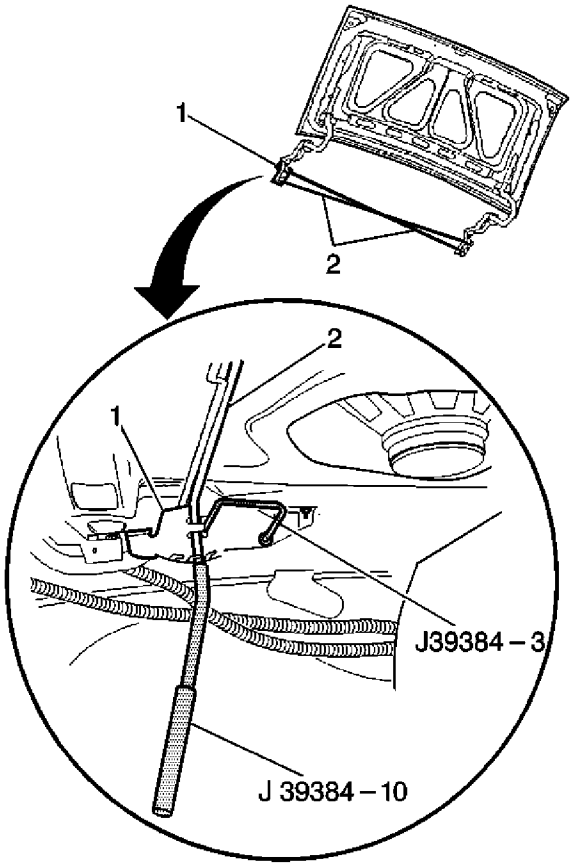
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Rear Compartment Lid Adjustment

Torque Rod Adjustment

Tools Required

- J 39384-3 Torque Rod Retaining Pin
- J 39384-10 Torque Rod Adjustment Bar

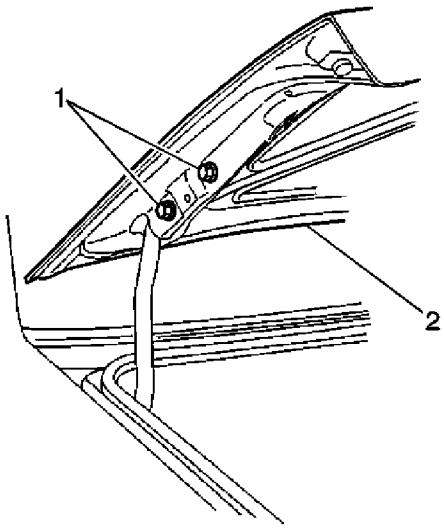


1. Support the rear compartment lid.
2. Insert the J 39384-3 (3) into the hinge (1).
3. Insert the J 39384-10 (4) over the end of the torque rod (2).
4. Adjust the torque rod to 1 of 3 positions for desired tension. In order to decrease the amount of effort needed to raise the lid, reposition the end of the torque rod in a notch closer to the rear of the vehicle.

Fore / Aft Adjustment and Flushness

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Important: Verify that the rubber overslam bumpers are completely installed into the rear compartment lid. Do NOT use the overslam bumpers for adjustment.

1. With the lid (2) in the closed position, verify the fore/aft adjustment of the rear compartment lid at the rear corners of the lid. Verify the flushness of the lid to the quarters.

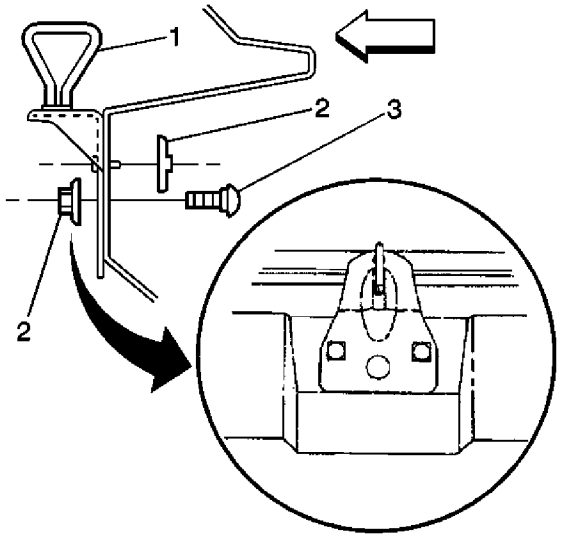
   If adjustment is necessary, loosen the bolts (1) that connect the rear compartment lid to the hinge. Adjust the lid.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Tighten the hinge bolts (1).

   Tighten
   Tighten the bolts to 25 N·m (18 lb ft).

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3. If the rear compartment lid is not flush at the rear, loosen the inner latch striker mounting nut (2). Close the rear compartment lid.
4. From beneath the rear bumper fascia, mark the vertical location of the outer latch striker mounting nuts (2).
5. Loosen the outer latch striker mounting nuts.
   5.1. The latch striker (1) should move upward.
   5.2. If the latch striker does not move, the striker is probably at the top of its adjustment range. Make an adjustment to the latch assembly.
6. Verify that the rear compartment lid remains flush to the quarter panels. Tighten the outer latch striker mounting nuts (2).

   Tighten
   Tighten the nuts to 9 N·m (80 lb in).

7. Tighten the inner latch striker mounting nut.

   Tighten
   Tighten the nut to 9 N·m (80 lb in).

Lid to Quarter Gaps

1. With the lid in the closed position, inspect the gaps between the rear compartment lid and the quarter panel. The gaps should be 3-4 mm (3/32-1/8 in), at the front and at the rear corners of the lid.
   - If the proper gaps are present, you may need to adjust the latch striker or the latch.
   - If the proper gaps are not present, complete the following steps in order to adjust the rear compartment lid.
     1. Remove the rear shelf speaker covers.
     2. Loosen the lid hinge to the rear shelf attachments.
     3. Position the rear compartment lid in the opening in order to obtain the proper gaps.
2. Loosen the latch mounting bolts.

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3. With an assistant in the rear compartment, gently close the lid until the latch contacts the latch striker. While holding the lid down, have the assistant snug the latch mounting bolts.
4. Raise the rear compartment lid.
5. Tighten the latch mounting bolts.

   Tighten
   Tighten the bolts to 10.5 N·m (93 lb in).

6. Tighten the bolts that connect the hinge to the shelf.

   Tighten
   Tighten the bolts to 18 N·m (13 lb ft).

7. Verify the proper operation of the rear compartment lid.
8. Verify the gaps between the rear compartment lid and the quarter panel.

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Rear Compartment Lid Replacement

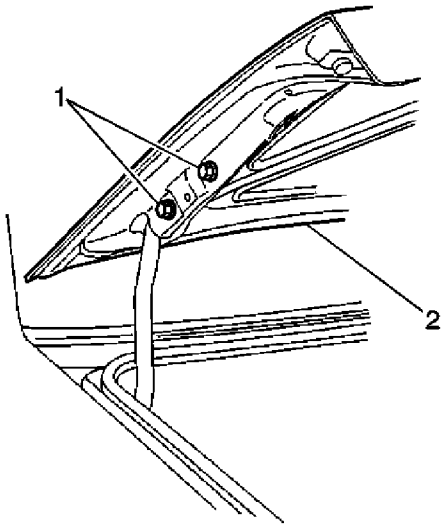
Removal Procedure

The rear compartment lid consists of the following components:

- An inner panel
- An outer panel

These panels are hemmed around the perimeter and bonded together with structural adhesive. The rear compartment lid hinges are bolted to the rear shelf panel and to the lid.

1. Place protective coverings along adjacent body panels.
2. Remove the rear compartment lid trim, if equipped. Refer to Rear Compartment Lid Inner Panel Trim Replacement .
3. Disconnect the electrical connectors from the following rear compartment components:
   - The lid latch assembly
   - The lamp
4. Tie a string to the wiring harness. Pull the harness from the rear compartment lid, leaving the string routed through the rear compartment lid and hanging out.
5. Remove the wiring harness from the rear compartment lid.



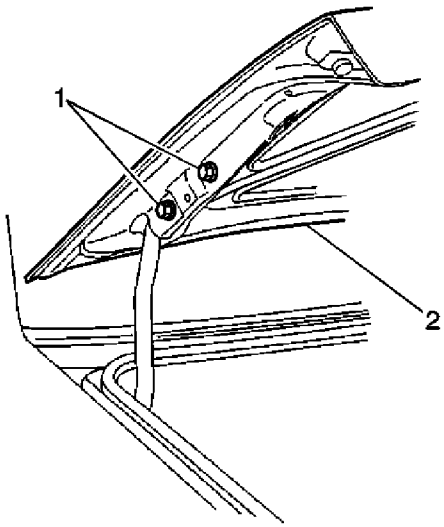


6. Remove the bolts (1) that retain the rear compartment lid to the hinges.
7. With the aid of a helper, remove the rear compartment lid (2).

Installation Procedure

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1. Install the rear compartment lid (2) to the hinges.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the bolts in order to retain the rear compartment lid to the hinges.

   Tighten
   Tighten the bolts to 25 N·m (18 lb ft).

3. Pull the wiring harness through the rear compartment lid.

   Connect the electrical connectors.

4. Install the rear compartment lid trim, if equipped. Refer to Rear Compartment Lid Inner Panel Trim Replacement .
5. Remove the protective coverings.

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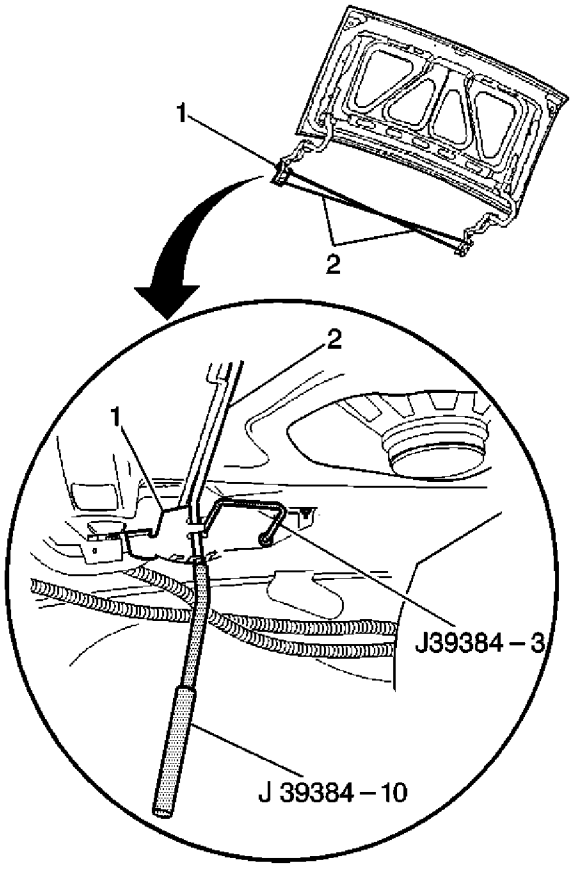
Rear Compartment Lid Hinge Replacement

Removal Procedure

Tools Required

- J 39384-3 Torque Rod Retaining Pin
- J 39384-10 Torque Rod Adjustment Bar

1. Remove the rear compartment lid. Refer to Rear Compartment Lid Replacement .
2. Remove the rear seat cushion. Refer to Rear Seat Cushion Replacement .
3. Remove the rear seatback. Refer to Rear Seat Back Replacement .
4. Remove the rear shelf trim panel. Refer to Rear Window Shelf Trim Panel Replacement in Interior Trim.

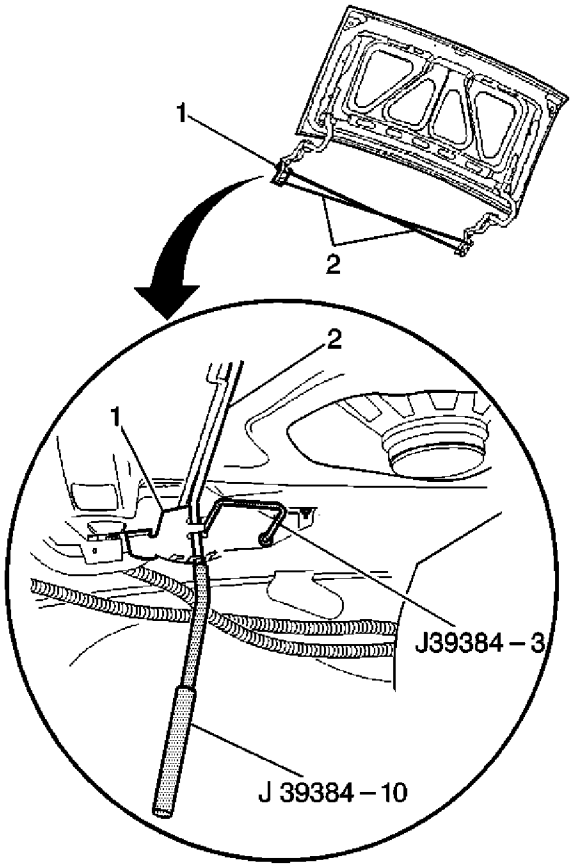


5. Remove the noise control sealer on the trim panel that connects the rear seat to the rear window. This will expose the bolts holding the hinge (1) to the body.
6. Complete the following steps in order to relieve the tension on the torque rods (2):
   6.1. Insert the J 39384-3 into the hinge.
   6.2. Insert the J 39384-10 over the end of the torque rod.

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7. Remove the torque rod from the adjusting notches.
8. From inside the vehicle, remove the 2 bolts retaining the hinge to the body.
9. Remove the hinge (1).

Installation Procedure



Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

1. Install the hinge (1) to the body by installing the 2 bolts through the rear seat to the rear window panel. Have an assistant hold the hinge to the body.

   Tighten
   Tighten the hinge bolts to 18 N·m (13 lb ft).

Important: Properly seat the torque rod in the hinge between the rear shelf and the hinge.

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assembly.

2. Install the torque rods (2).
3. Install the rear compartment lid.
4. Adjust the rear compartment lid as needed. Refer to Rear Compartment Lid Adjustment .
5. Install the noise control material.
6. Install the rear shelf trim panel. Refer to Rear Window Shelf Trim Panel Replacement in Interior Trim.
7. Install the rear seatback. Refer to Rear Seat Back Replacement .
8. Install the rear seat cushion. Refer to Rear Seat Cushion Replacement .
9. Install the rear compartment lid. Refer to Rear Compartment Lid Replacement .

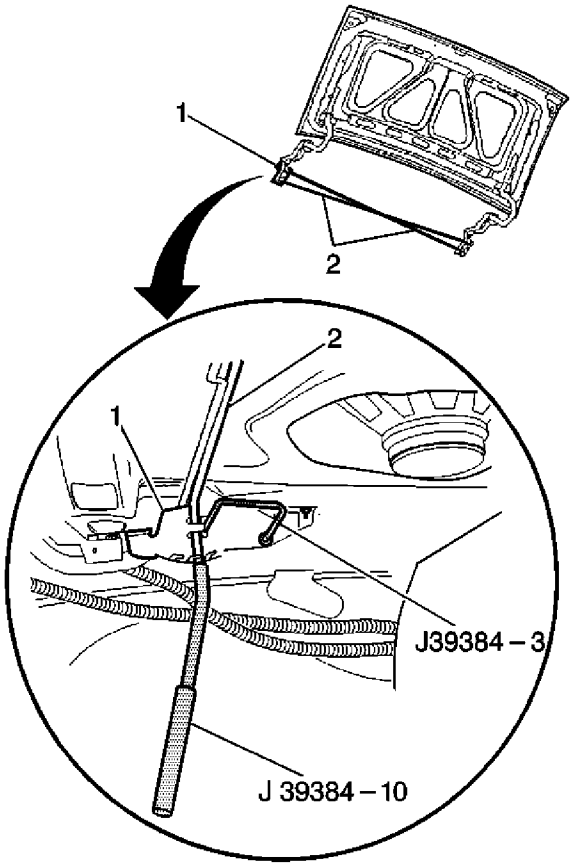
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Rear Compartment Lid Hinge Torque Rod Replacement

Removal Procedure

Tools Required

- J 39384-3 Torque Rod Retaining Pin
- J 39384-10 Torque Rod Adjustment Bar



1. Remove the rear shelf trim panel. Refer to Rear Window Shelf Trim Panel Replacement
2. Remove the retainer clip from the torque rod (2) at the hinge (1).
3. From inside the vehicle, loosen, but do NOT remove, the 2 hinge retaining bolts.
4. Support the rear compartment lid.
5. Complete the following steps in order to relieve the tension on the torque rod (2):
   5.1. Insert the J 39384-3 in the hinge (1).
   5.2. Insert the J 39384-10 over the end of the torque rod (2).
6. Remove the torque rod (2) from the adjusting notches.

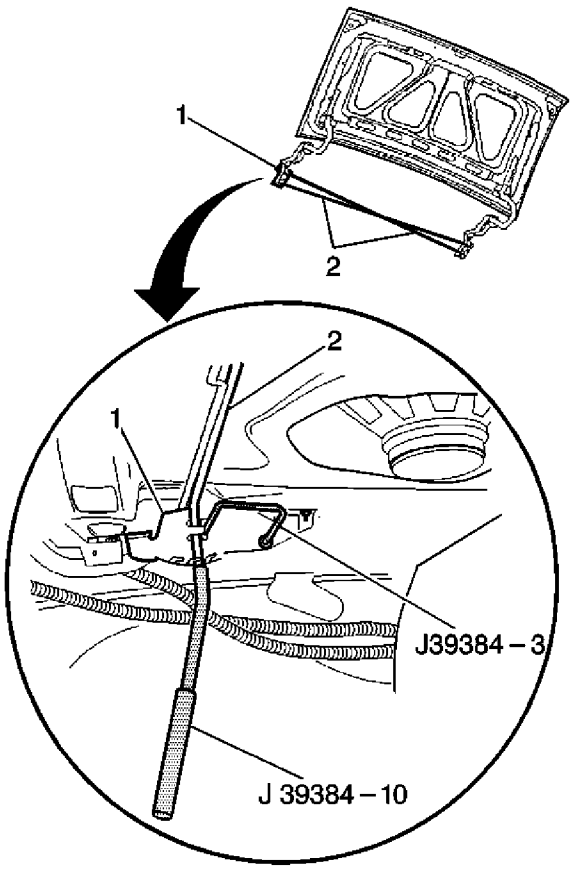
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Installation Procedure

Tools Required

- J 39384-3 Torque Rod Retaining Pin
- J 39384-10 Torque Rod Adjustment Bar



1. Install the torque rod (2) between the hinge (1) and the shelf.

   Important: Properly seat the torque rod between the rear shelf and the hinge assembly.

2. Slide the torque rod (2) into the hinge (1). Secure the rod with the retainer.
3. Open and close the rear compartment lid in order to confirm that the torque rod (2) is seated properly.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when

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installing fasteners in order to avoid damage to parts and systems.

4. Install the hinge retaining bolts.

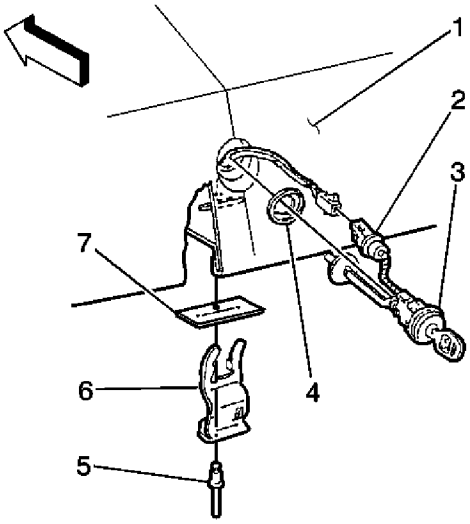
   Tighten
   Tighten the bolts to 18 N·m (13 lb ft).

5. Insert the torque rod into the adjustment notch:
   5.1. Insert the J 39384-3 in the hinge.
   5.2. Insert the J 39384-10 over the end of the torque rod.
6. Adjust the rear compartment lid to the desired tension. Refer to Rear Compartment Lid Adjustment .
7. Install the rear shelf trim panel. Refer to Rear Window Shelf Trim Panel Replacement

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Lock System Replacement - Rear Compartment (Buick)

Removal Procedure

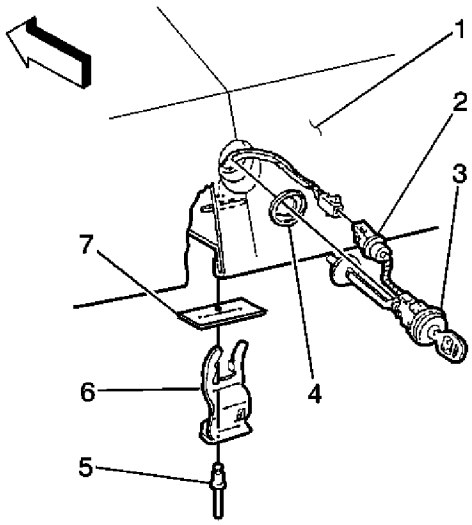


1. Open the lid (1).
2. Remove the lock cylinder emblem.
3. Remove the retainer rivets (5) by drilling the rivets out using a 4 mm (5/32 in) drill bit.
4. Remove the lock cylinder (3).
5. Disconnect the theft deterrent connector (2).
6. Remove the gasket (4).

Installation Procedure

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1. Install the gasket (4) on the lock cylinder body (3).
2. Connect the theft deterrent connector (2).
3. Install the lock cylinder. Engage the lock cylinder shaft with the latch.
4. Install the retainer to the rear compartment lid by installing a 4x11 mm (5/32x7/16 in) rivet (5) through the retainer (6) and the lid.
5. Install the emblem.
6. Close the lid.

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Fastener Tightening Specifications

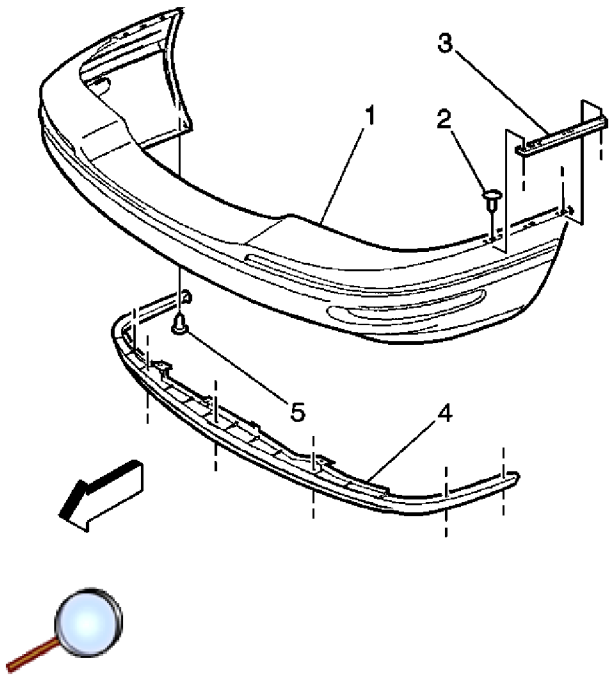
Application	Specification	
	Metric	English
Front Fascia to Fenders Nuts	9.5 N·m	84 lb in
Front/Rear Energy Absorbers to Body Bolts and Nuts	27 N·m	20 lb ft
Front/Rear Energy Absorbers to Body Side Rail Bolt	4 N·m	35 lb in
Impact Bar to Energy Absorbers Nuts	27 N·m	20 lb ft
Lower Air Deflector Bolts	2.8 N·m	25 lb in
Rear Fascia to Quarter Nuts	9.5 N·m	84 lb in

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Front Bumper Fascia Air Deflector Replacement (Buick)

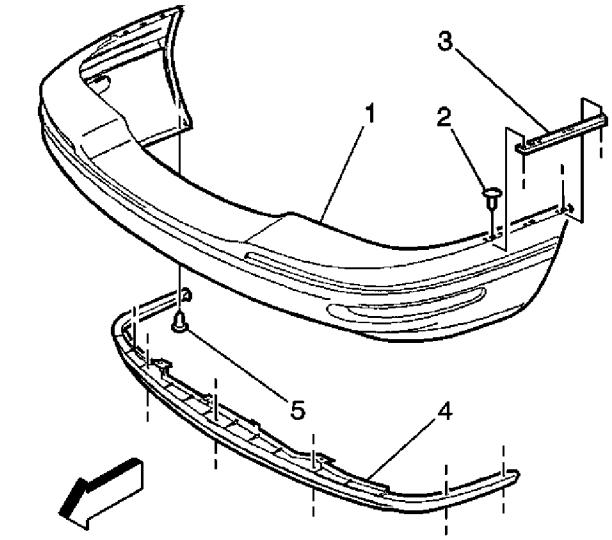
Removal Procedure

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.



2. Remove the screws that retain the lower air deflector (4) to the front bumper fascia (1).
3. Remove the lower air deflector (4).

Installation Procedure



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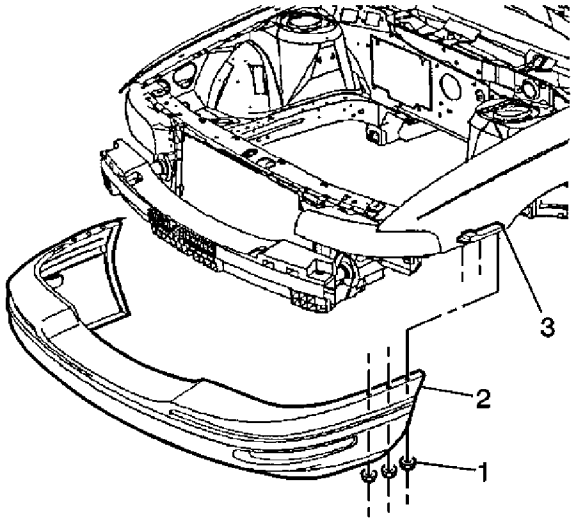


1. Install the lower air deflector (4).
2. Install the screws in order to retain the lower air deflector (4) to the front bumper fascia (1).
3. Lower the vehicle.

Front Bumper Fascia Replacement (Buick)

Removal Procedure

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.
2. Remove the lower air deflector. Refer to Front Bumper Fascia Air Deflector Replacement .

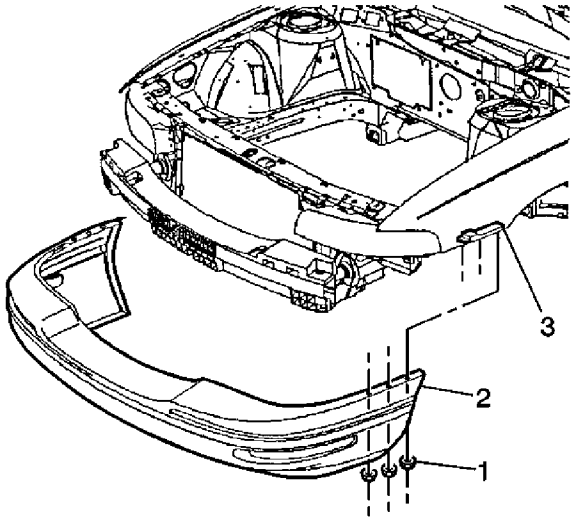




3. Remove the screws (1) that retain the front bumper fascia (2) at each front wheel opening.
4. Remove the screws (1) that retain the front bumper fascia to the bottom surface of the fender (3).
5. Remove the push-in retainers from the radiator splash shield.
6. Disconnect the electrical connectors.
7. Remove the front bumper fascia (2) from the vehicle.

Installation Procedure

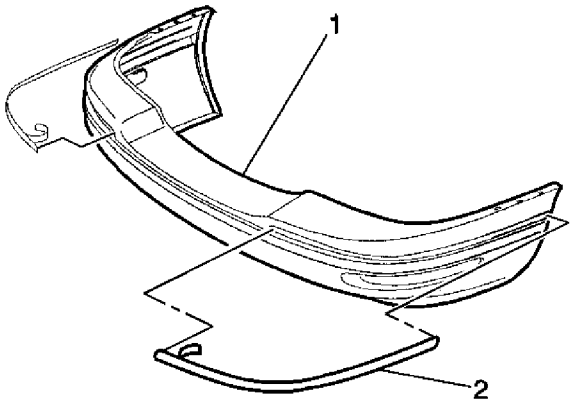
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1. Install the front bumper fascia (2) on the vehicle.
2. Connect the electrical connectors.
3. Install the push-in retainers on the radiator splash shield.
4. Install the screws (1) in order to retain the front bumper fascia (2) to the bottom surface of the fender (3).
5. Install the screws in order to retain the front bumper fascia at each front wheel opening.
6. Install the lower air deflector. Refer to Front Bumper Fascia Air Deflector Replacement .
7. Lower the vehicle.

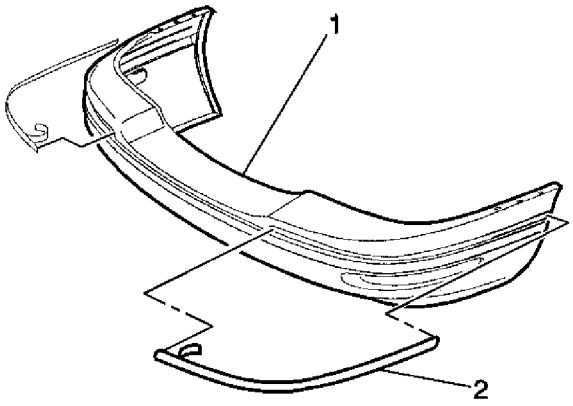
Front Bumper Fascia Molding Replacement (Buick)

Removal Procedure



1. Gently peel the molding (2) away from the fascia (1).
2. Clean the attaching surface with a general adhesive remover.

Installation Procedure



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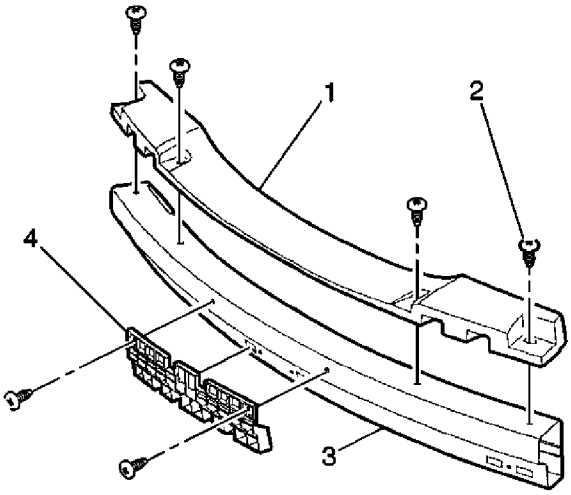


1. Peel the backing away from the adhesive tape on the new molding (2).
2. Apply the molding to the fascia (1).

Front Bumper Impact Bar Replacement (Buick)

Removal Procedure

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.
2. Remove the front bumper fascia. Refer to Front Bumper Fascia Replacement .

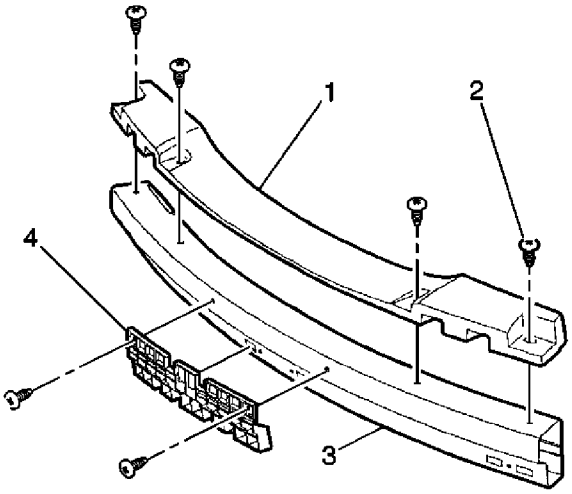




3. Remove the nuts that retain the front impact bar (3) to the energy absorbers.
4. Remember the number and the location of the shims.
5. Remove the front impact bar (3).

Installation Procedure

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1. Install the front impact bar (3).
2. Loosely install the nuts in order to retain the impact bar (3).
3. Install the shims at the original locations.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

4. Install the nuts that retain the impact bar.

   Tighten
   Tighten the nuts to 27 N·m (20 lb ft).

5. Install the front bumper fascia. Refer to Front Bumper Fascia Replacement .
6. Lower the vehicle.

Front Bumper Fascia Energy Absorber Replacement

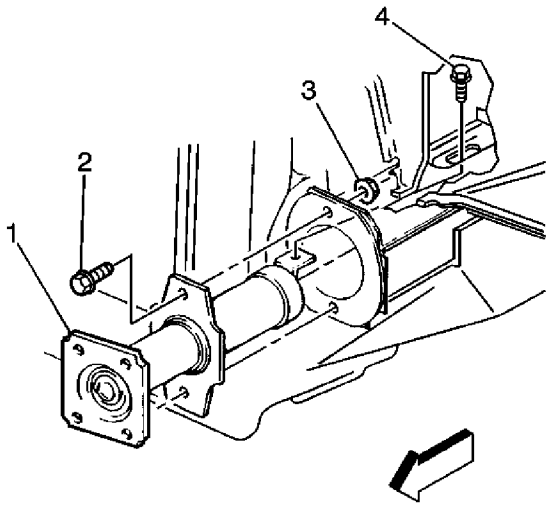
Removal Procedure

Caution: Failure to observe the following procedure when handling energy absorbers could cause personal injury.

- Do not apply heat to an energy absorber.
- Do not weld in the area of an energy absorber.
- Do not attempt to repair a damaged energy absorber. Always replace the damaged energy absorber with a new part.
- If an energy absorber is bound-up as a result of a collision such that it cannot extend, take precautions to avoid spring-back when bending sheet metal. Provide a positive restraint, such as a chain or cable to hold the bumper in the position it is in. Wear approved safety glasses and using a 3mm (1/8 inch) drill bit, drill a small hole in the piston tube near the bumper bracket to relieve gas pressure. Remove the energy absorber after gas pressure has been relieved.
- If an energy absorber is to be scrapped, relieve the gas pressure prior to disposal of the part. Make an indentation with a center punch in the small cylinder section of the energy absorber.

Notice: An energy absorber that has a dislodged blowout plug (due to an above 8 km/h (5 mph) impact) could have insufficient absorber action in impacts below 8 km/h (5 mph). Complete diagnosis procedures must be followed after a collision to prevent excessive vehicle damage in any future low speed impacts.

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.
2. Remove the bumper assembly. Refer to or Front Bumper Replacement .





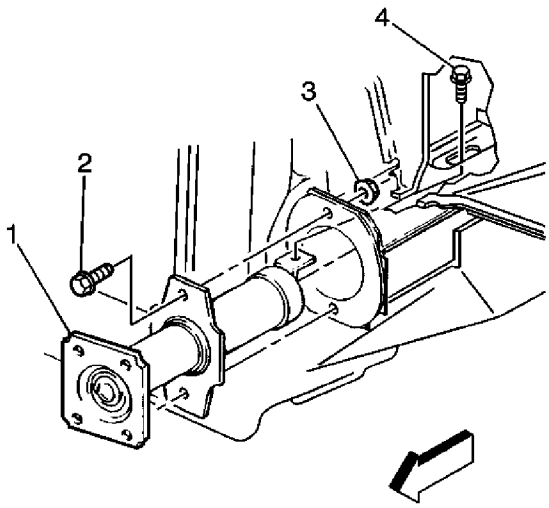
3. Remove the side rail bolt (4).
4. Remove the following components:

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- The 2 bolts (2)
- The 2 nuts (3)

5. Remove the energy absorber (1).
6. For the Pontiac, remove the attached fog lamp bracket (5).

Installation Procedure



1. Install the energy absorber (1).

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the side rail bolt (4).

   Tighten
   Tighten the side rail bolt to 4 N·m (35 lb in).

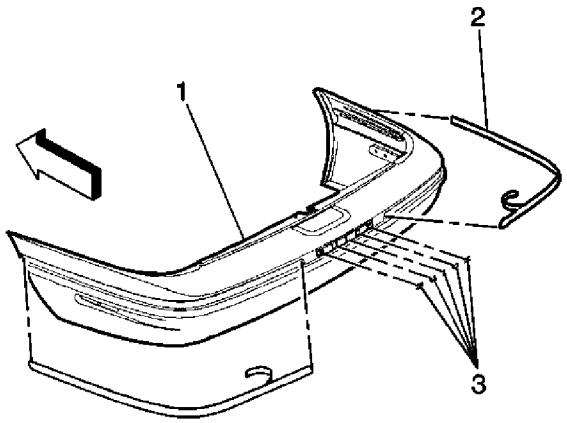
3. Install the following components:
   - The 2 bolts (2)
   - The 2 nuts (3)

   Tighten
   Tighten the 2 bolts and the 2 nuts to 27 N·m (20 lb ft).

4. Install the bumper assembly. Refer to or to Front Bumper Replacement .

Rear Bumper Fascia Molding Replacement (Buick)

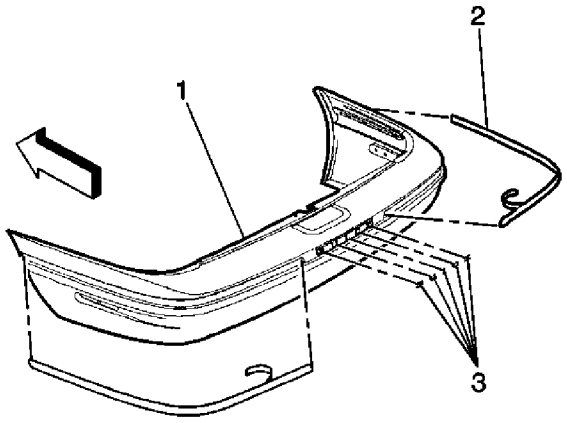
Removal Procedure



1. Gently peel the following components away from the fascia (1):
   - The molding (2)
   - The nameplate (3)
2. Clean the attaching surface with a general adhesive remover.

Installation Procedure

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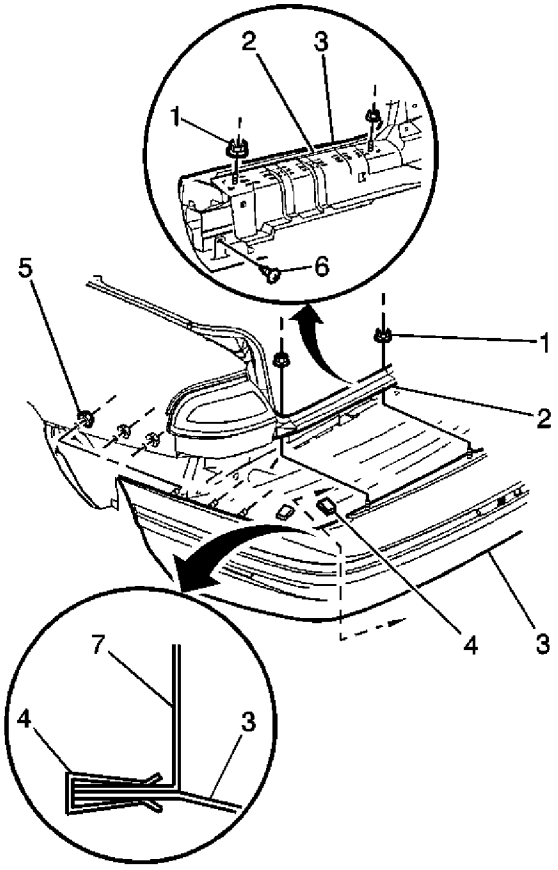


1. Peel the backing away from the adhesive tape on the new molding (2) and on the nameplate (3).
2. Apply the following components to the fascia (1):
   - The molding (2)
   - The nameplate (3)

Rear Bumper Replacement (Buick)

Removal Procedure

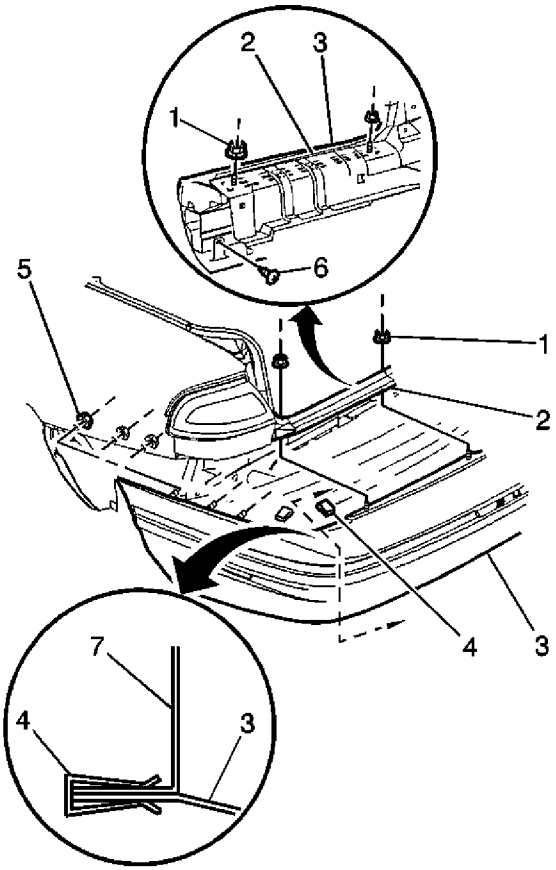
1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.
2. Remove the rear compartment sill plate. Refer to Rear Compartment Sill Trim Plate Replacement .
3. Remove the rear compartment side trim. Refer to Rear Compartment Side Trim Replacement - Left Side and to Rear Compartment Side Trim Replacement - Right Side .



4. Remove the nuts (5) that retain the fascia (3) to the quarter panels.
5. Remove the nuts (1) that retain the fascia to the rear end panel (2).
6. Remove the screws that retain the wheelhouse extensions to the fascia.
7. Remove the clips (4) that retain the fascia to the taillamp filler panels (7).
8. Remove the nuts that retain the impact bar to the energy absorbers.
9. Remove the bumper.

Installation Procedure

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Important: Remember the location and the number of shims.

1. Install the nuts in order to retain the bumper to both sides of the energy absorber.
2. Install the clips (4) in order to retain the fascia (3) to the taillamp filler panels (7).
3. Install the nuts (1) in order to retain the fascia to the rear end panel (2).
4. Install the nuts that retain the fascia to the quarter panels.
5. Install the screws that retain the wheelhouse extensions to the fascia.
6. Install the rear compartment side trim. Refer to Rear Compartment Side Trim Replacement - Left Side and to Rear Compartment Side Trim Replacement - Right Side .
7. Install the rear compartment sill plate. Refer to Rear Compartment Sill Trim Plate Replacement .
8. Lower the vehicle.

Rear Energy Absorber Replacement

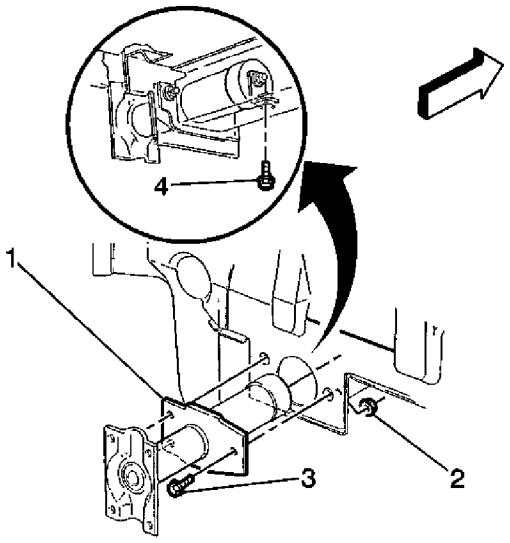
Removal Procedure

Caution: Failure to observe the following procedure when handling energy absorbers could cause personal injury.

- Do not apply heat to an energy absorber.
- Do not weld in the area of an energy absorber.
- Do not attempt to repair a damaged energy absorber. Always replace the damaged energy absorber with a new part.
- If an energy absorber is bound-up as a result of a collision such that it cannot extend, take precautions to avoid spring-back when bending sheet metal. Provide a positive restraint, such as a chain or cable to hold the bumper in the position it is in. Wear approved safety glasses and using a 3mm (1/8 inch) drill bit, drill a small hole in the piston tube near the bumper bracket to relieve gas pressure. Remove the energy absorber after gas pressure has been relieved.
- If an energy absorber is to be scrapped, relieve the gas pressure prior to disposal of the part. Make an indentation with a center punch in the small cylinder section of the energy absorber.

Notice: An energy absorber that has a dislodged blowout plug (due to an above 8 km/h (5 mph) impact) could have insufficient absorber action in impacts below 8 km/h (5 mph). Complete diagnosis procedures must be followed after a collision to prevent excessive vehicle damage in any future low speed impacts.

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.
2. Remove the bumper assembly. Refer to Rear Bumper Replacement .



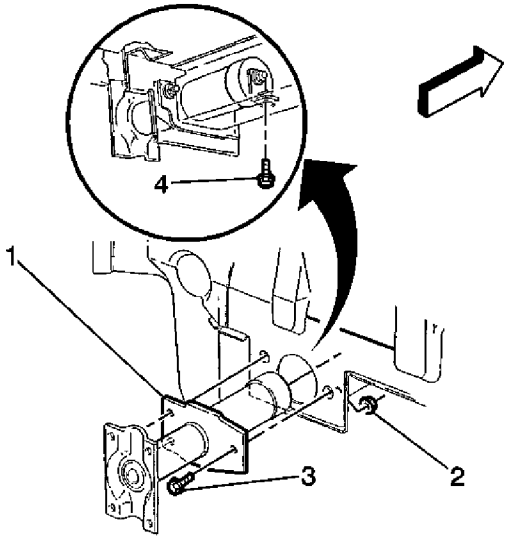
3. Remove the side rail bolt (4).
4. Remove the following components:

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- The bolts (3)
- The nuts (2)

5. Remove the energy absorber (1).

Installation Procedure



1. Install the energy absorber (1).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the side rail bolt (4).

Tighten
Tighten the side rail bolt to 4 N·m (35 lb in).

3. Install the following components:
   - The bolts (3)
   - The nuts (2)

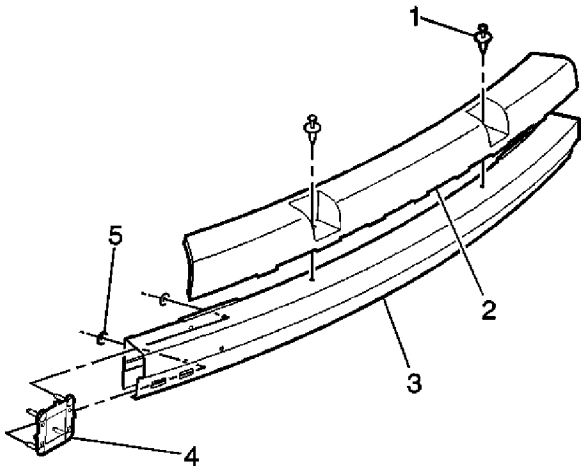
Tighten
Tighten the bolts and the nuts to 27 N·m (20 lb ft).

4. Install the bumper assembly. Refer to Rear Bumper Replacement .

Rear Bumper Impact Bar Replacement (Buick)

Removal Procedure

1. Remove the rear bumper. Refer to Rear Bumper Replacement .

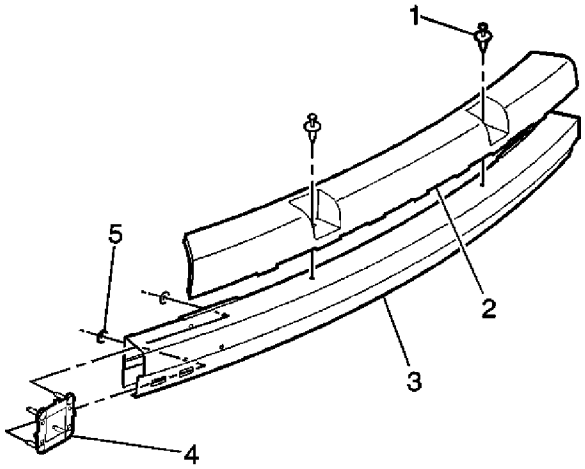




2. Remove the push-in retainers (1) that connect the upper fascia support (2) to the rear impact bar (3).
3. Remove the nuts (5) that retain the fascia stud plates (4).
4. Remove the fascia stud plates (4).

Installation Procedure

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1. Install the fascia stud plates (4).
2. Install the nuts that retain the fascia stud plates (4).
3. Install the push-in retainers (1) in order to connect the upper fascia support (2) to the rear impact bar (3).
4. Install the rear bumper. Refer to Rear Bumper Replacement .

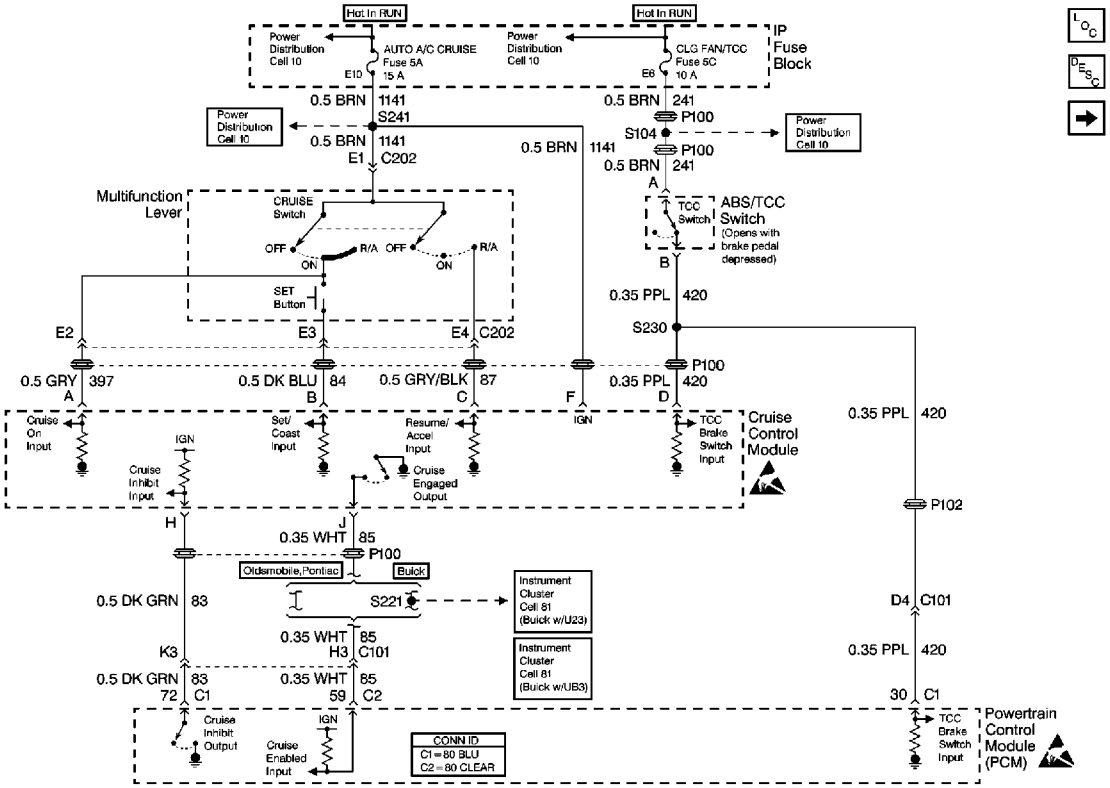
Fastener Tightening Specifications

Application	Specification	
	Metric	English
Cruise Control Module Assembly Nuts	9 N·m	80 lb in
Cruise Control Module to Mounting Bracket Fasteners	7 N·m	62 lb in

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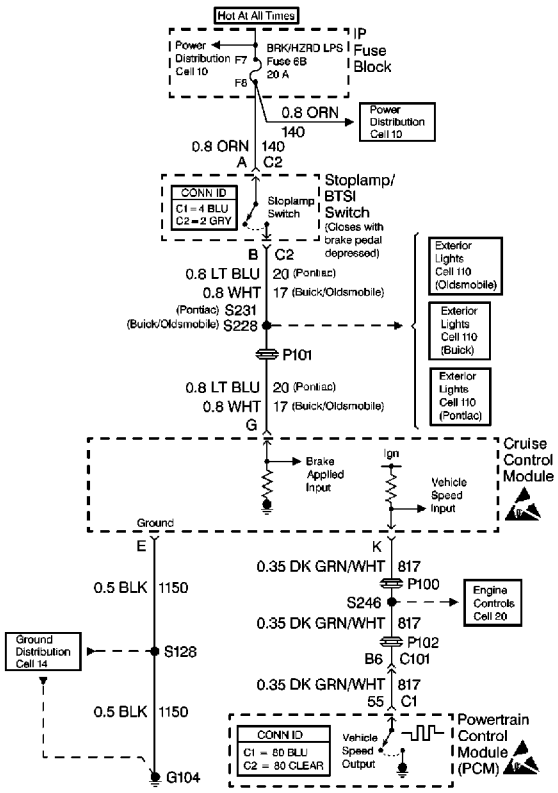
Cell 34: Multifunction Lever



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Cell 34: VSS and Stoplamp Switch

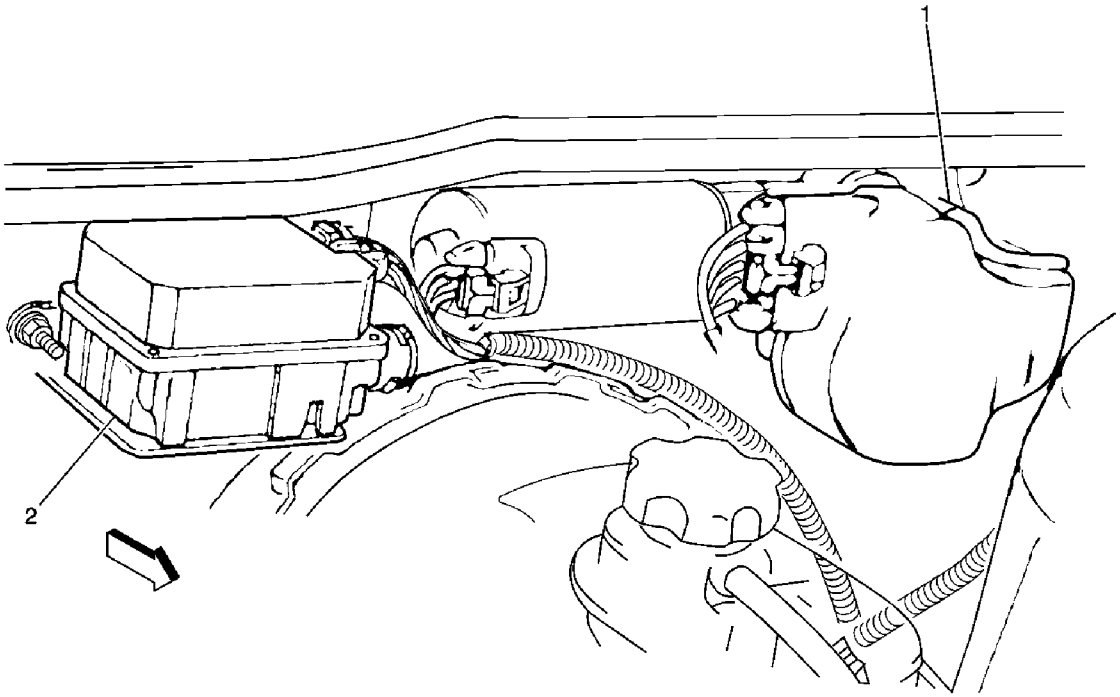


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Cruise Control Component Views

Left Hand Rear of the Engine Compartment



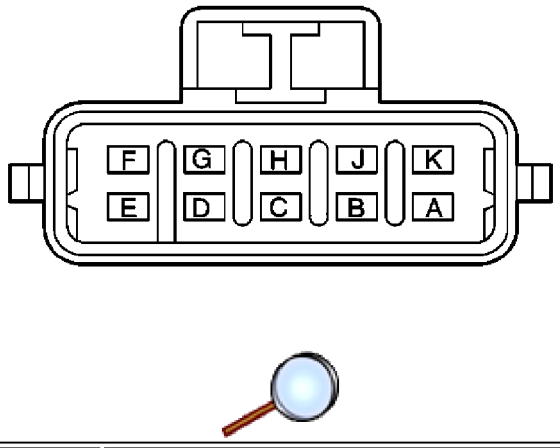
(1) Windshield Wiper/Washer Module
(2) Cruise Control Module

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Cruise Control Connector End Views

Cruise Control Module



Connector Part Information	• 12065425 • 10-Way F Metri-Pack 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	GRY	397	Cruise Control ON Switch Output
B	DK BLU	84	Cruise Control Set/Coast Switch Signal
C	GRY/BLK	87	Cruise Control Resume/Accel Switch Signal
D	PPL	420	Brake Pedal Switch Output - TCC
E	BLK	1150	Ground
F	BRN	1141	Fused Output - IGN3
G	LT BLU	20	Stoplamp Feed (Pontiac)
G	WHT	17	Stoplamp Feed (Oldsmobile, Buick)
H	DK GRN	83	Cruise Control Signal - Disengage
J	WHT	85	Cruise Control Indicator Lamp Output
K	DK GRN/WHT	817	Vehicle Speed Signal

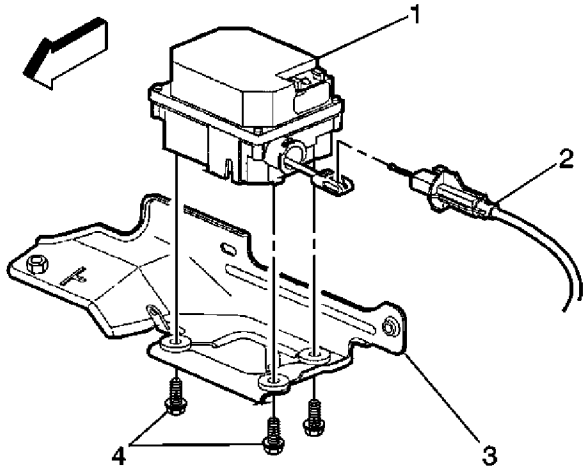
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Cruise Control Module Replacement

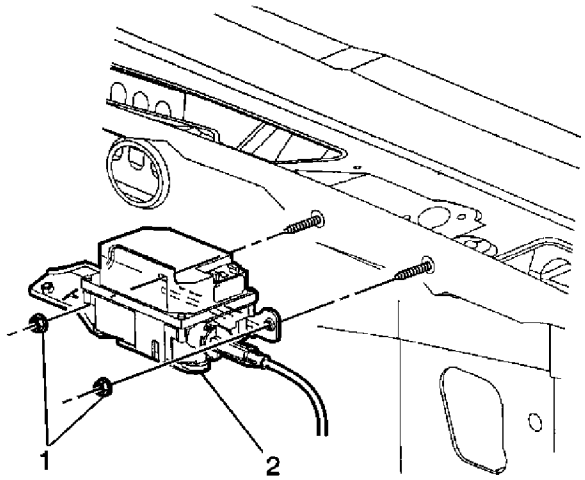
Removal Procedure

1. Remove the injector sight shield. Refer to Fuel Injector Sight Shield Replacement in Engine Mechanical.





2. Disconnect the cruise control cable (2) from the following components:
   - The engine bracket
   - The TBI cam
3. Disconnect the cruise control cable from the module assembly (1).
4. Disconnect the electrical connector from the module assembly.



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5. Remove the 2 nuts (1) from the mounting studs.
6. Remove the module assembly.
7. Remove the fasteners retaining the module to the mounting bracket.

   Remove the module.

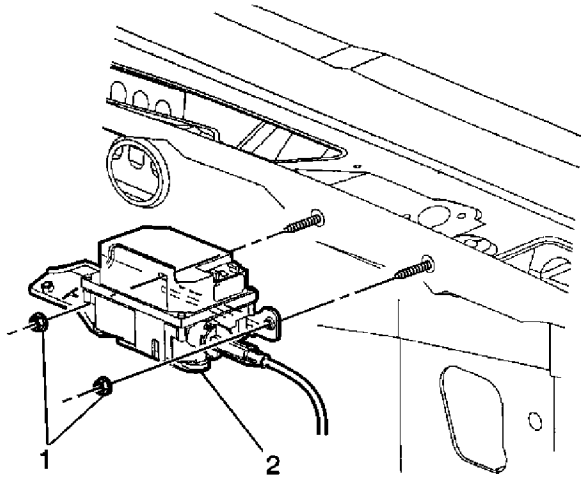
Installation Procedure

1. Install the cruise control module to the mounting bracket.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the module fasteners.

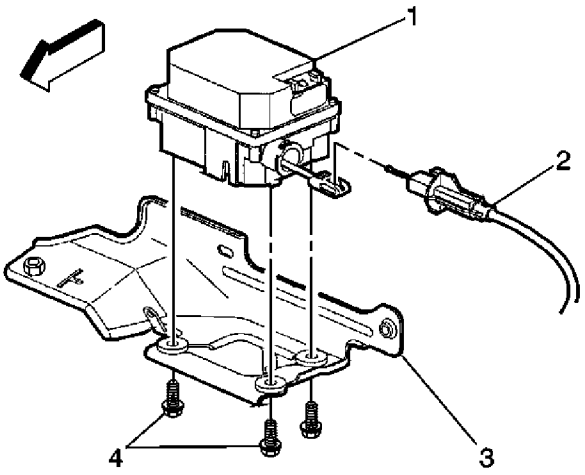
   Tighten
   Tighten the fasteners to 7 N·m (62 lb in).



3. Install the module assembly on the mounting studs.
4. Install the 2 nuts (1).

   Tighten
   Tighten the nuts to 9 N·m (80 lb ft).

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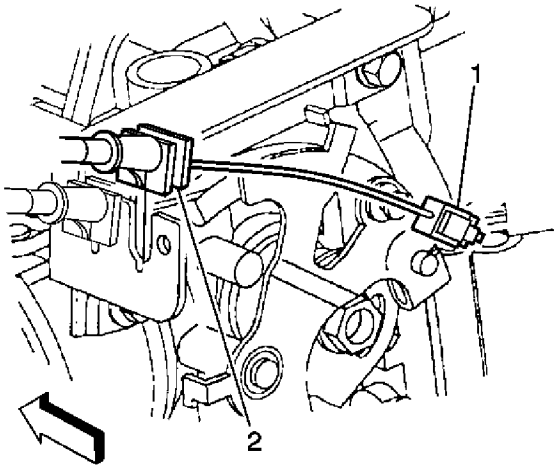


5. Connect the electrical connector to the module (1).
6. Connect the cruise control cable (2) to the module assembly (1).
7. Connect the cruise control cable to the following components:
   - The engine bracket
   - The TBI cam
8. Adjust the cruise control cable. Refer to Cruise Control Cable Adjustment .
9. Install the injector sight shield. Refer to Fuel Injector Sight Shield Replacement in Engine Mechanical.

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Cruise Control Cable Replacement

Removal Procedure

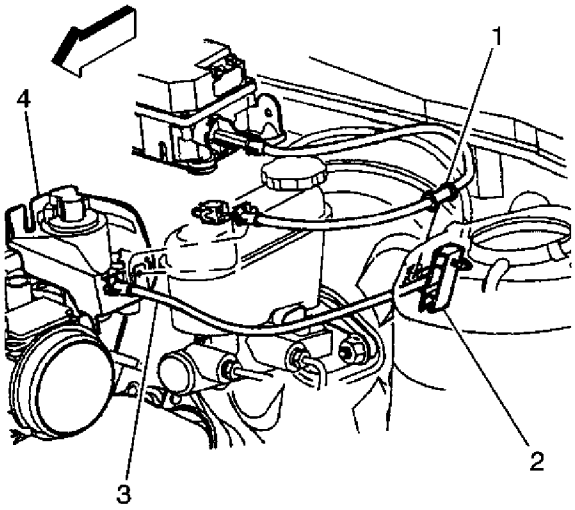


Important: Note the cable routing for replacement.

1. Remove the fuel injector sight shield. Refer to Fuel Injector Sight Shield Replacement in Engine.
2. Disconnect the cruise control cable from the following components:
   - The TBI cam (1)
   - The throttle body bracket (2)
3. Disconnect the cruise control cable from the cruise control module.

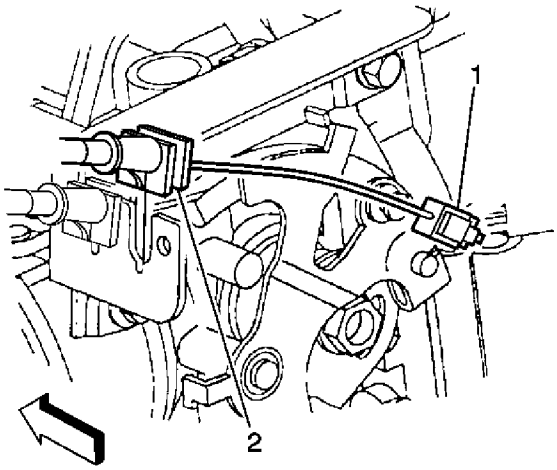
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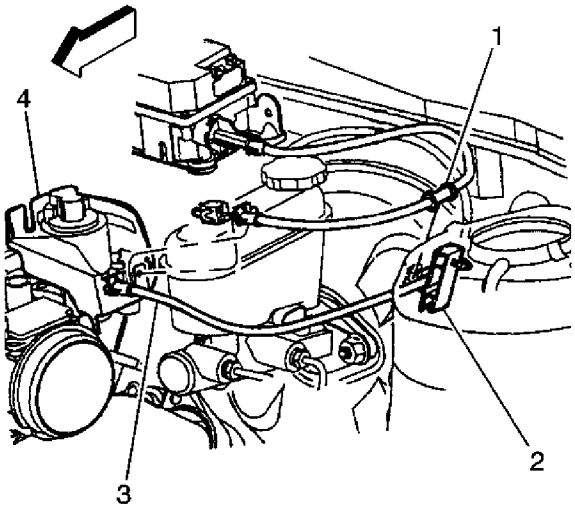
4. Disconnect the cable from the retainers (2).

Installation Procedure



1. Connect the cruise control cable to the cruise control module.
2. Install the cruise control cable slug TBI cam (1). Ensure that the cable is under the hook.
3. Snap the cable to the throttle body bracket (2).

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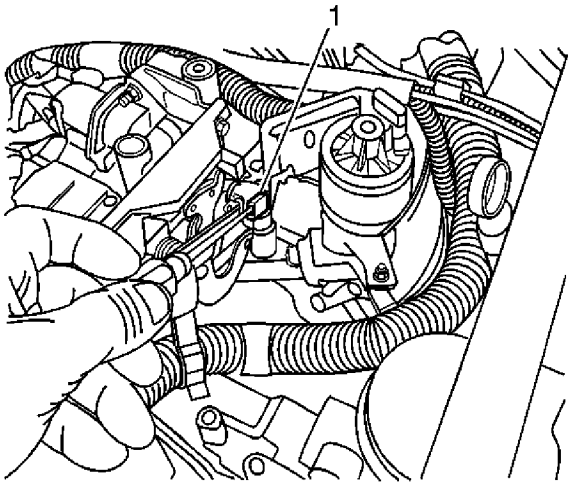


4. Connect the cable to the retainers (2).
5. Adjust the cruise control cable. Refer to Cruise Control Cable Adjustment .
6. Install the fuel injector sight shield. Refer to Fuel Injector Sight Shield Replacement in Engine.

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Cruise Control Cable Adjustment

1. Remove the fuel injector sight shield. Refer to Fuel Injector Sight Shield Replacement in Engine Mechanical.





Important: The adjustment lock (1) is located on the TBI end of the cable.

2. Disengage the adjustment lock (1) on the cruise control cable.

   When the adjustment lock is disengaged, the cable will move freely in and out of the adjuster.

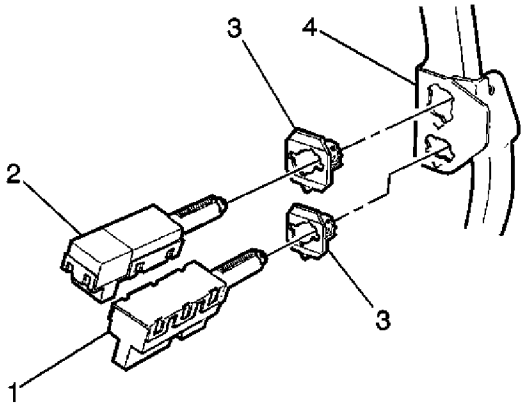
3. Hold the TBI at the closed position.
4. Complete the following steps in order to eliminate slack in the cable:
   4.1. Pull the cable.
   4.2. Engage the adjustment lock.
5. Install the fuel injector sight shield. Refer to Fuel Injector Sight Shield Replacement in Engine Mechanical.

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Cruise Control Release Switch Replacement

Removal Procedure



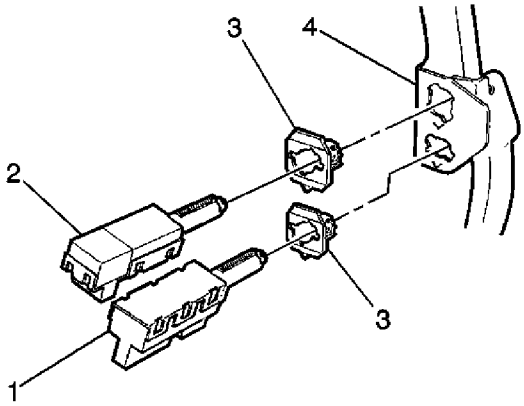
Notice: Proper stoplamp switch adjustment is essential. Improper stoplamp switch adjustment could cause brake drag and excessive brake lining wear.

1. Remove the left insulator panel. Refer to Instrument Panel Insulator Panel Replacement - Left Side in Instrument Panel, Gauges and Console.
2. Disconnect the electrical connector.
3. Remove the release switch assembly (1).

Installation Procedure

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1. Install the release switch assembly (1).
2. Connect the electrical connector.

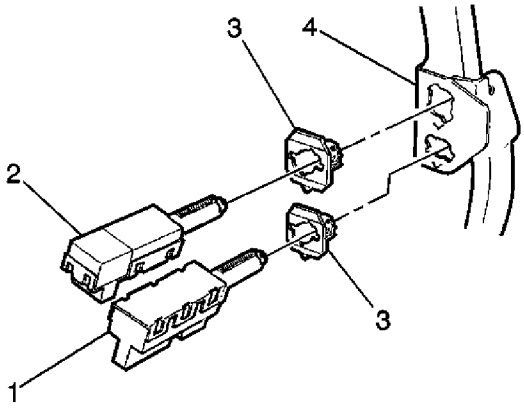
Important: An incorrect adjustment may cause the cruise control system to work improperly.

3. Adjust the switch. Refer to Cruise Release Switch Adjustment .
4. Install the left insulator panel. Refer to Instrument Panel Insulator Panel Replacement - Left Side in Instrument Panel, Gauges and Console:

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Cruise Release Switch Adjustment

Connect the brake booster pushrod to the brake pedal assembly before attempting to adjust the release switch assembly and the stoplamp switch assembly.



Notice: Proper stoplamp switch adjustment is essential. Improper stoplamp switch adjustment could cause brake drag and excessive brake lining wear.

1. Press the brake pedal assembly.
2. Insert the following components into the retainers until fully seated against the brake pedal bracket:
   - The release switch assembly (1)
   - The stoplamp switch assembly (2)
3. Twist the switch in order to lock into the desired position.
4. In order to ensure a properly adjusted release switch assembly and a properly adjusted stoplamp switch assembly, use the following brake pedal assembly travel distances:
   - The release switch assembly and the stoplamp switch assembly contacts must be open at a brake pedal travel range of 3.5-12.5 mm (0.125-0.5 in).
   - The brake pedal assembly travel is measured at the centerline of the brake pedal assembly pad.
   - The nominal actuation of the stoplamp switch assembly contacts is about 4.5 mm (0.188 in) after the cruise control switch assembly contacts close.

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Fastener Tightening Specifications

Application	Specification	
	Metric	English
Bleeder Valve	13 N·m	110 lb in
Inlet Fitting	45 N·m	33 lb ft
Mounting Bolt	51 N·m	38 lb ft

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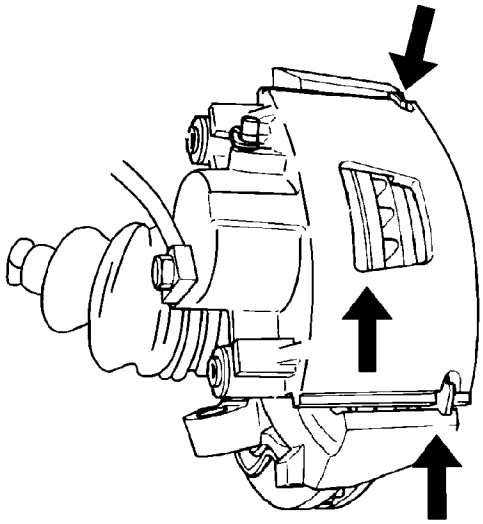
Component Specifications

Application	Specification	
	Metric	English
Caliper Bore Diameter	64 mm	2.52 in
Discard Thickness. All brake drums and rotors have a discard dimension cast into them. This is a wear dimension and not a refinish dimension. Any drum or rotor which does not meet the specification should be replaced.	30.70 mm	1.209 in
Lateral Runout	0.060 mm	0.002 in
Mimimum Thickness after Refinish	31.08 mm	1.224 in
Rotor Diameter	278.00 mm	10.945 in
Rotor Thickness (Maximum)	32.00 mm	1.260 in
Thickness Variation	0.025 mm	0.001 in

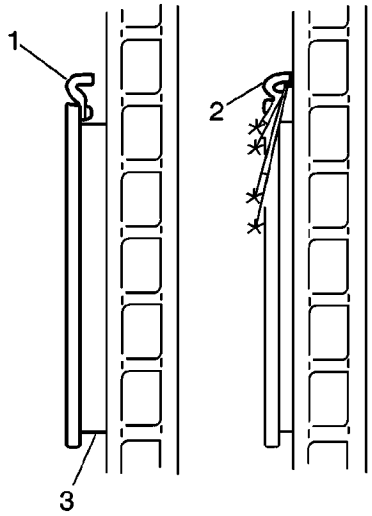
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Brake Pad Inspection



Inspect the brake linings at regular intervals, and any time the wheels are removed (tire rotation, etc.) The outer shoe has a wear sensor which makes noise when the linings wear to the point of requiring lining replacement.



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When any lining thickness (3) is worn to within 0.76 mm (1/32 in) of the shoe or rivet, replace the shoe and lining assemblies in axle sets.

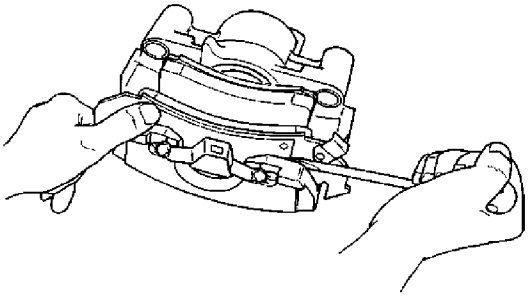
When inspecting the disc brakes, check both ends of the outer shoe and lining by looking in at each end of the caliper. These points are where the highest rate of wear normally occurs. Also, check the inner shoe lining to make sure that it has not worn prematurely. Look down through the hole in the top of the caliper to view the inner shoe. Some inboard shoe and linings have a thermal layer against the shoe, integrally molded with the lining. Do not confuse this extra layer with uneven inboard-outboard lining wear.

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Brake Pads Replacement

Removal Procedure

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.
2. Remove tire and wheel assembly. Refer to Tire and Wheel Removal and Installation in Tire and Wheel.





3. Remove the caliper (1).
4. Remove the outboard shoe and lining (3). Use a screwdriver to disengage the buttons on the shoe from the holes in the caliper housing.
5. Remove the inboard shoe and lining (2).

Installation Procedure

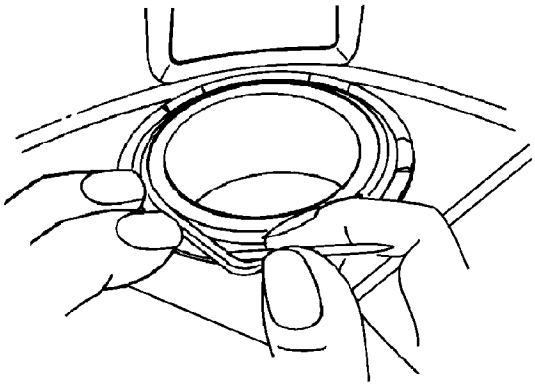
1. Before installing new shoes and linings, clean the outside surface of the boot. Use clean, denatured alcohol.
2. Bottom the piston into the caliper bore. Use a C-clamp over the caliper and piston, tightening it slowly to press the piston into the bore. Be careful not to damage the piston or the boot.

Important:

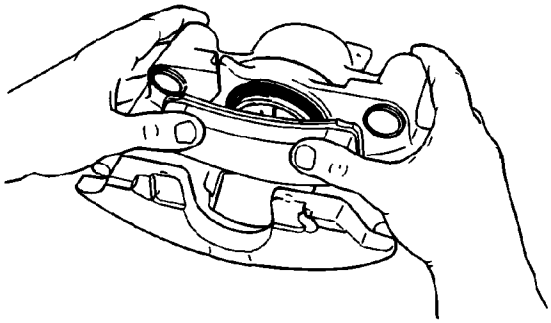
- The boot must lay flat.
- Ensure the convolutions are tucked back into place.

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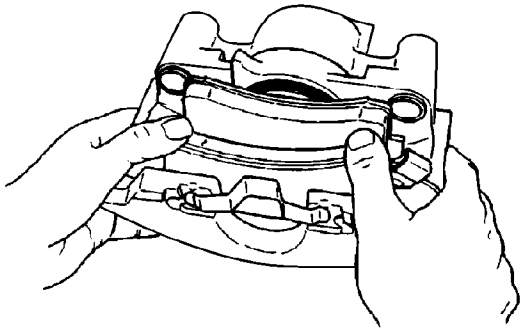


3. After bottoming the piston, use a small plastic or wood tool to lift the inner edge of the boot next to the piston, and press out any trapped air.



4. Connect the inboard shoe and lining by snapping the shoe retainer spring into the piston. The shoe must lay flat against the piston. After installing the shoe and lining, check that the boot is not touching the shoe. If it is, remove the shoe and lining and re-seat or re-position the boot.

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5. Connect the outboard shoe and lining with the wear sensor at the trailing edge of the shoe during forward wheel rotation. The back of the show must lay flat against the caliper.
6. Install the caliper.
7. Replace tire and wheel assembly. Refer to Tire and Wheel Removal and Installation in Tire and Wheel.
8. Lower the vehicle.
9. Apply approximately 778 N (175 lb) force three times to the brake pedal to seat lining.

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Brake Pad and Rotor Burnishing

After brake pads have been replaced and/or rotors have been refinished, it is recommended that the new braking surface be broken in, or burnished. This can be accomplished by making 20 stops from 48 km/h (30 mph), using medium to firm pedal pressure. Take care to avoid overheating the brakes.

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Brake Caliper/Knuckle Maintenance Inspection

Visually check the caliper for fluid leakage through the housing. If the housing is craked or the casing is leaking, replace the caliper. Also, check for fluid leakage around the pistion area, past the seal and boot, and service the caliper as needed.

When parts are to be replaced in the caliper, follow the inspection procedures. Refer to Brake Caliper Overhaul .

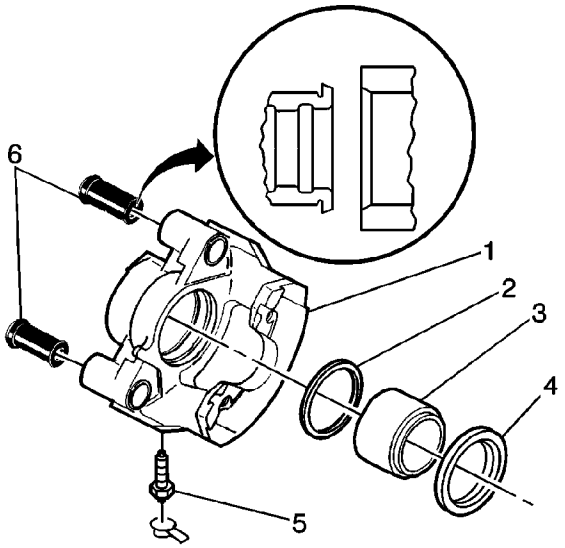
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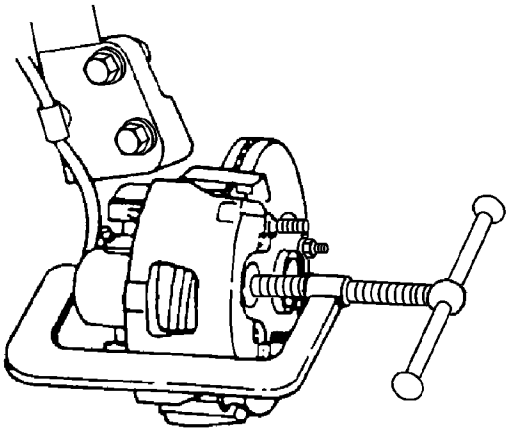
Brake Caliper Replacement

Removal Procedure

1. Remove two-thirds of the brake fluid from the master cylinder.
2. Raise the vehicle and suitably support. Refer to Raising and Supporting the Vehicle in General Information.
3. Mark the relationship of the wheel to the axle flange.
4. Remove the wheel and the tire.
5. Re-install two wheel nuts to retain the rotor.



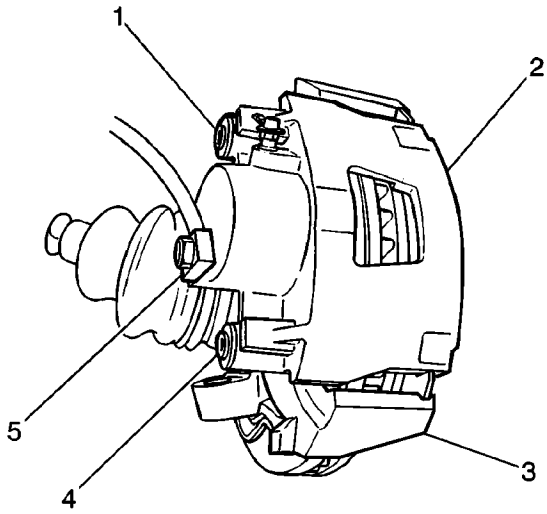
6. If the caliper is to be removed for unit repair, remove the bolt attaching inlet fitting (1), and plug the opening in the caliper and/or pipe to prevent fluid loss and contamination.



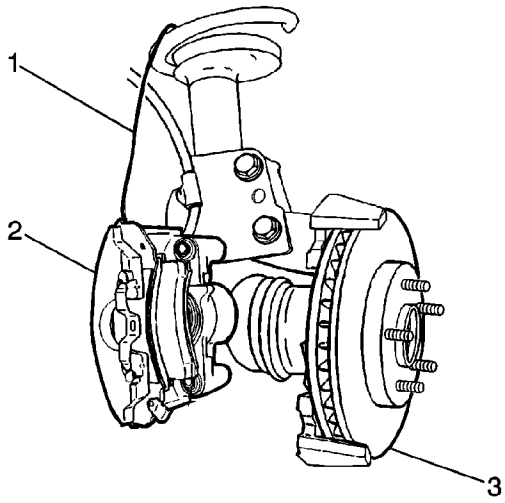
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7. Push the piston into the caliper bore to provide clearance between linings and rotor.
   - Install a large C-clamp over the top of the caliper housing and against the back of the outboard shoe.
   - Slowly tighten the C-clamp until the piston is pushed into the caliper bore far enough to slide the caliper off the rotor.



8. Remove the caliper mounting bolts (1) and sleeves.



9. Remove the caliper. If only the shoes and linings are being replaced, suspend the caliper (2) with a wire hook (1) from the strut.
10. Inspect the mounting bolts and sleeves for corrosion.

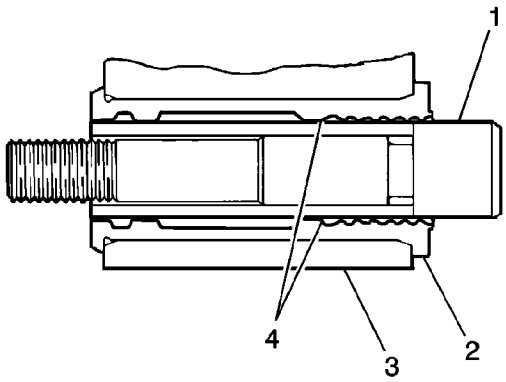
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11. Inspect the bushings for cuts and nicks.
12. If damage is found use new parts when installing the caliper.
13. Do not attempt to polish away corrosion.

Installation Procedure

Important: Mounting bolts and sleeves should slide through bushings with only hand pressure applied. If greater force is required, or mechanical assistance is needed, complete the following steps:

1. Remove the bolts and sleeves along the bushings.
2. Inspect the mounting bores for corrosion. If the bore shows signs of corrosion, remove the corrosion by using a 1-inch wheel cylinder honing brush.
3. Clean the bores with clean, denatured alcohol.
4. Install bushings and lubricate. Refer to Brake Caliper Overhaul .



1. Liberally coat ID of bushings with silicone grease.
2. Install the caliper.
3. Install the mounting bolts and sleeves.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

4. Install the inlet fitting, if removed.

Tighten

- Tighten the mounting bolts to 51 N·m (38 lb ft)

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- Tighten the Inlet fitting to 45 N·m (33 lb ft).

5. Install the wheel and the tire, aligning the previous mark.
   - Install the wheel nuts securing the wheel to the hub.
   - Lower the vehicle.
   - Torque the wheel nuts per specification in Tires and Wheels.

   Tighten
   Tighten the wheel nuts to 140 N·m (100 lb ft).

6. Fill the master cylinder to the proper level with clean brake fluid.
   - Bleed the caliper if the inlet fitting was removed.
   - Recheck the fluid level.

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Brake Caliper Inspection

Visually check the caliper for fluid leakage through the housing. If the housing is cracked or the casing is leaking, replace the caliper. Also, check for fluid leakage around the pistion area, past the seal and boot, and service the caliper as needed.

When parts are to be replaced in the caliper, follow the inspection procedures. Refer to Brake Caliper Overhaul .

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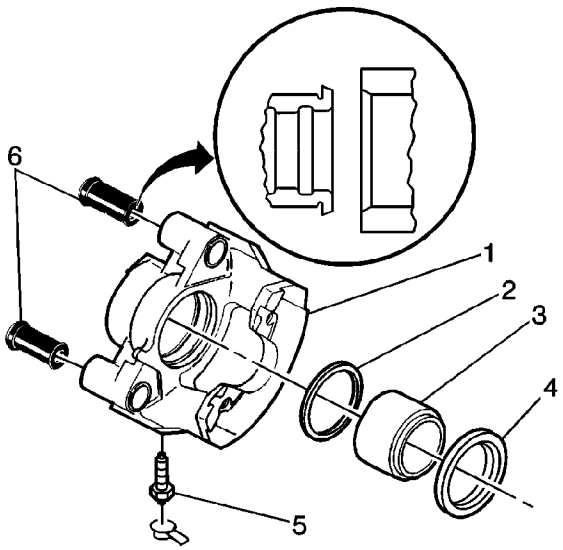
Brake Caliper Overhaul

Removal Procedure

Tools Required

J 35777 Caliper Piston Seal Installer.

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.
2. Remove tire and wheel assembly. Refer to Tire and Wheel Removal and Installation in Tire and Wheel.





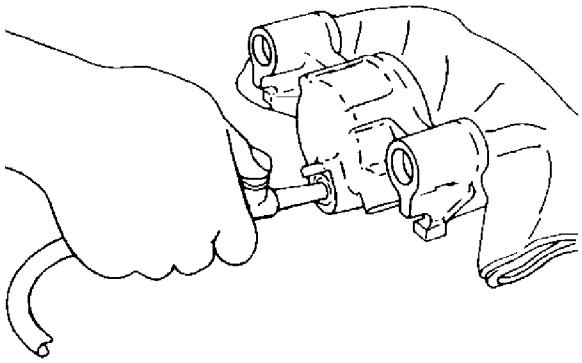
3. Remove the caliper (1) from the vehicle.
4. Remove the bushings (6).

Caution: Do not place fingers in front of the caliper piston(s) in an attempt to catch or protect it when applying compressed air. The piston(s) can fly out with force and could result in serious bodily injury.

5. Inspect the bushings for nicks and cuts. Replace the bushings if damaged.
6. Use clean shop towels to pad the interior of the caliper during piston removal.

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7. Remove the piston using compressed air into the caliper inlet hole.
8. Inspect the piston for scoring, nicks, corrosion, and worn or damaged chrome plating. Replace the piston if any of these are found.
9. Remove the boot. Be careful not to scratch the housing bore.
10. Remove the piston seal from the seal groove in the caliper bore using a small plastic or wood tool. Do not use a metal tool because this may damage the caliper bore or seal groove.
11. Inspect the caliber bore and seal groove for scoring, nicks, corrosion and wear.
12. Use a crocus cloth to polish out light corrosion. Replace the caliper housing if corrosion in and around the seal groove will not clean off with a crocus cloth.
13. Remove the bleeder valve cap.
14. Remove the bleeder valve from the caliper.
15. Clean all parts in clean, denatured alcohol.
16. Dry the parts with unlubricated compressed air.
17. Blow out all passages in the caliper housing and bleeder valve.

Installation Procedure

1. Install the bleeder valve.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

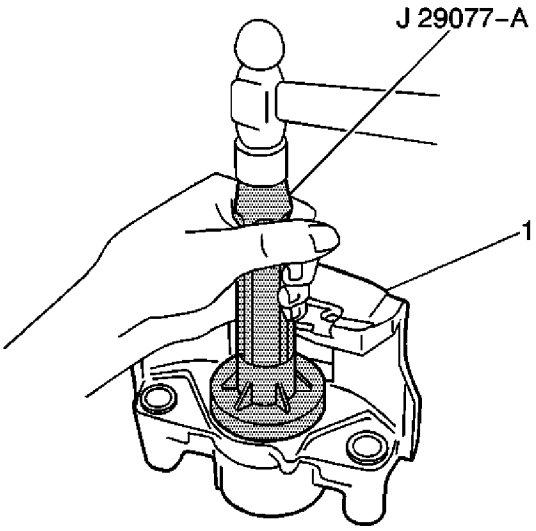
2. Install the bleeder valve cap.

   Tighten
   Bleeder valve cap to 13 N·m (110 lb in)

3. Install the lubricated new piston seal into the caliper bore groove. Make sure the seal is not

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twisted.



4. Install the lubricated boot into the bore of the caliper. Push the piston to the bottom of the bore.
5. Using the J 35777 , seat the boot in the caliper housing.
6. Install the bushings.
   6.1. Lubricate the beveled end of the bushing with silicone grease.
   6.2. Pinch the bushing and install the beveled end first.
   6.3. Push the bushing through the housing mounting bore.
7. Install the caliper into the vehicle.
8. Install tire and wheel assembly.
9. Lower the vehicle.

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Brake Rotor Replacement

Removal Procedure

When installing new rotors, do not refinish the new rotors' surface because the rotors are already at the correct level of finish.

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.
2. Remove tire and wheel assembly. Refer to Tire and Wheel Removal and Installation in Tire and Wheel.
3. Remove the caliper. Refer to Brake Caliper Replacement .
4. Disconnect the rotor from the hub and bearing assembly.

Installation Procedure

1. Position the rotor on the hub and bearing assembly.
2. Install the caliper. Refer to Brake Caliper Replacement .
3. Install tire and wheel assembly.
4. Lower the vehicle.

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Brake Rotor Refinishing

Refinishing Rotors

Do not refinish brake rotors when doing routine maintenance, such as replacing worn disc brake pads. Refinish a rotor only under the following circumstances:

1. There is a complaint of brake pulsation.
2. There is scoring greater than 1.5 mm (0.060 in)

All brake rotors have a minimum thickness dimension cast into them. This dimension is the minimum wear dimension and not a refinish dimension. Do not use a brake rotor that, after refinishing, will not meet the specifications shown on the rotor. Always replace it with a new rotor.

Accurate control of rotor tolerance is necessary for proper performance of the disc brakes. Machining of the rotor should be done only with precision equipment. Machining equipment should be serviced on a regular basis following the manufacturer's recommended maintenance procedures.

When refinishing rotors, the attaching adapters, tool holders, vibration dampeners and tool bits must be in good condition. Always use sharp cutting tools or bits, and use only replacement cutting bits recommended by the equipment manufacturer. Dull or worn tools leave a poor surface finish which will affect braking performance.

Vibration dampening attachments should always be used when refinishing braking surfaces. These attachments eliminate tool chatter and will result in better surface finish. Make sure these adapters are clean and free of nicks.

Brake Lathe

It is recommended that an on-vehicle brake lathe be used in cases where rotors are being refinished to correct a problem with brake pulsation. Follow the equipment manufacturer's recommended specifications and procedures.

The following are two recommended procedures for using two different off-vehicle drum/disc brake lathes (if any other lathe is used, follow that lathe's instructions and recommendations.)

When using the AMMCO Brake Lathe:

- Spindle Speed:
  - Rough cut, 150 rpm
  - Finish cut, 150 rpm
- Depth of Cut (per side):
  - Rough cut, 0.1524--0.6350 mm (0.006--0.025 in).
  - Finish cut, 0.1016--0.1524 mm (0.004--0.006 in).
- Cross Feed (per rev):
  - Rough cut, 0.254 mm (0.010 in).

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  - Finish cut, 0.0508 mm (0.002 in).
- Vibration Damper:
  - Rough cut-Yes.
  - Finish cut-Yes.

When using the ACCU*TURN® Brake Lathe, GM Dealer Equipment (one-cut refinishing procedure), locate the deepest score and turn the rotor micrometer knob until the tool bit bottoms out at the deepest point of the score. Zero the scale and back out the tool bit (repeat for the opposite side of the rotor). Advance the cutter handwheel until the bits have cleared the inner edge of the rotor face. Adjust the micrometer knobs for about 0.127 mm (0.005 inch) more than the first reading. This will ensure resurfacing of the rotor in one cut.

- Spindle Speed: 105 rpm.
- Depth of Cut: As necessary.
- Cross Feed (per rev): 0.0762 mm (0.003 in).
- Tool Bit Nose Radius: 1/64.
- Vibration Damper: Yes.

It is very important that the rotor surface be made non-directional by dressing the rotor surfaces with a sanding disc tool, such as an AMMCO Model 8750 Safe Swirl Disc Rotor Grinder, Accuturn 433179 Non-directional Swirl Finisher, or equivalent, using a 120 grit aluminum oxide sandpaper. Sand each rotor surface with moderate pressure for a minimum of 60 seconds.

If the brake lathe is not equipped with an adequate non-directional finishing tool, an alternate method is to use a sanding block with 150 grit aluminum oxide sandpaper. With the rotor turning at the equipment manufacturer's highest recommended cutting speed, sand each rotor surface for a minimum of 60 seconds, using moderate pressure.

After the rotor has been sanded, clean each surface with denatured alcohol or a suitable brake cleaner.

The finished rotor surface should be as close as possible to that of a new rotor. Failure to obtain the best possible rotor finish may affect braking performance.

After replacing pads and/or refinishing rotors, break in or burnish the new braking surfaces. This can be done by making 20 stops from 48 km/h (30 mph), using medium to firm pedal pressure. Take care to not overheat the brakes.

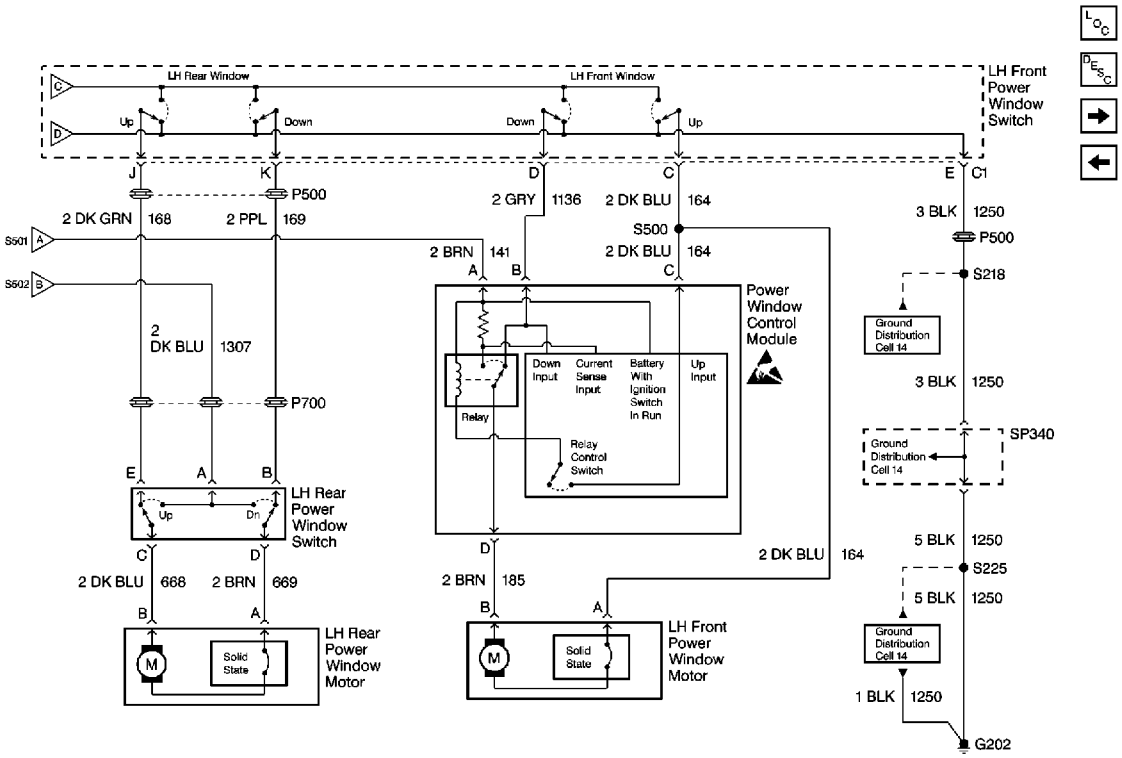
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Fastener Tightening Specifications

Fastener Tightening Specifications	Specification	
	Metric	English
Door Hinge Nuts	47 N·m	35 lb ft
Mirror Assembly Retainer Nuts	6 N·m	54 lb in
Striker Bolts	24 N·m	18 lb ft
Window Run Channel Retaining Bolts	12 N·m	106 lb in

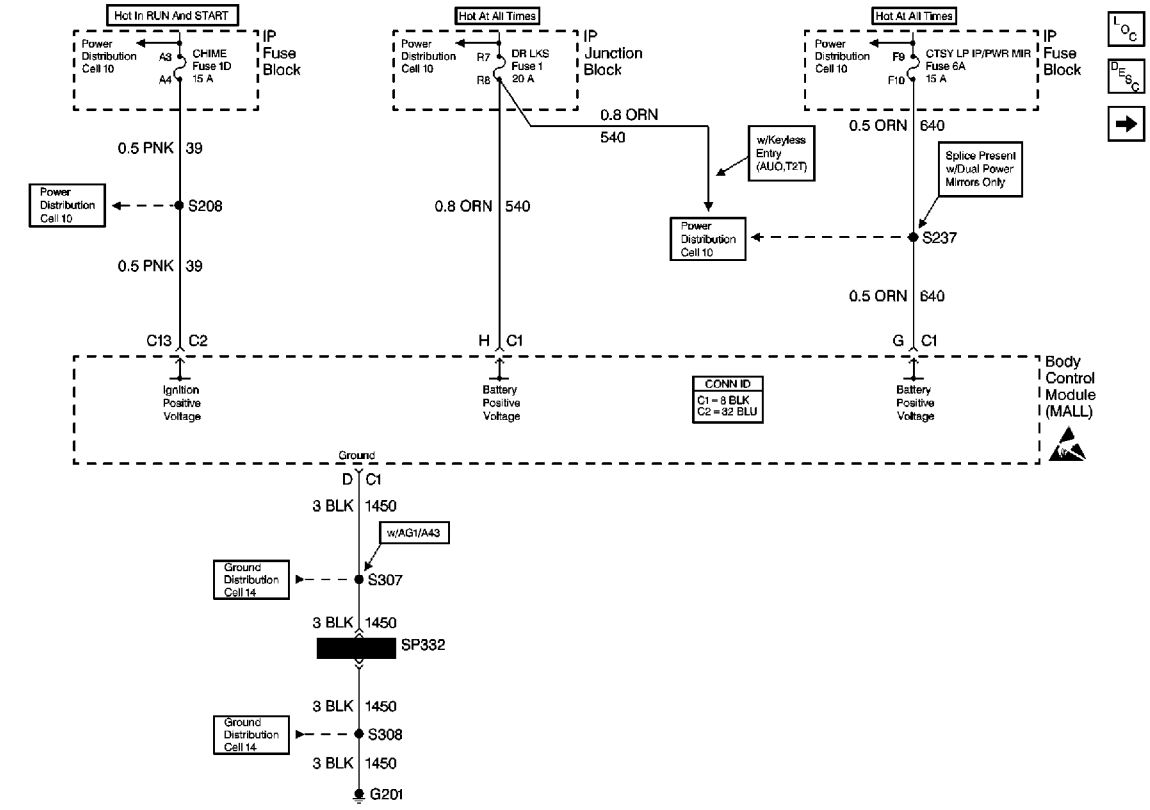
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Cell 120: Left Power Window Motors - Oldsmobile/Buick



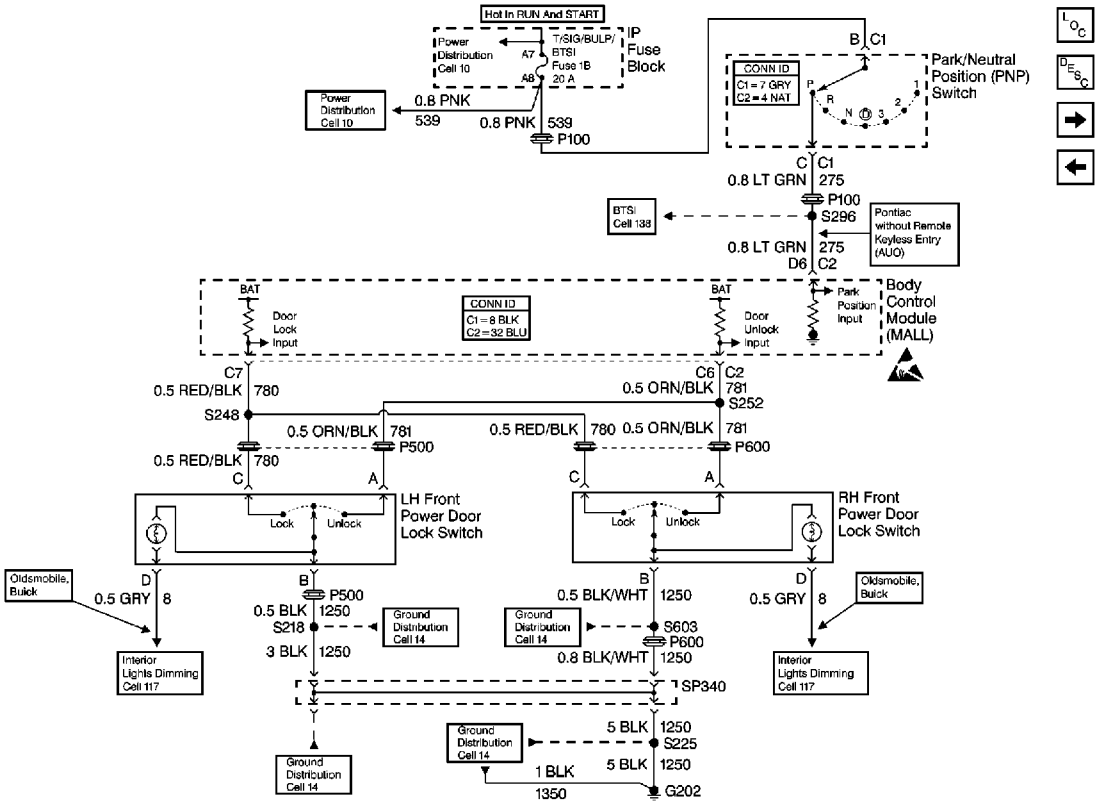
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Cell 130: Door Locks without Keyless Entry, Power Distribution



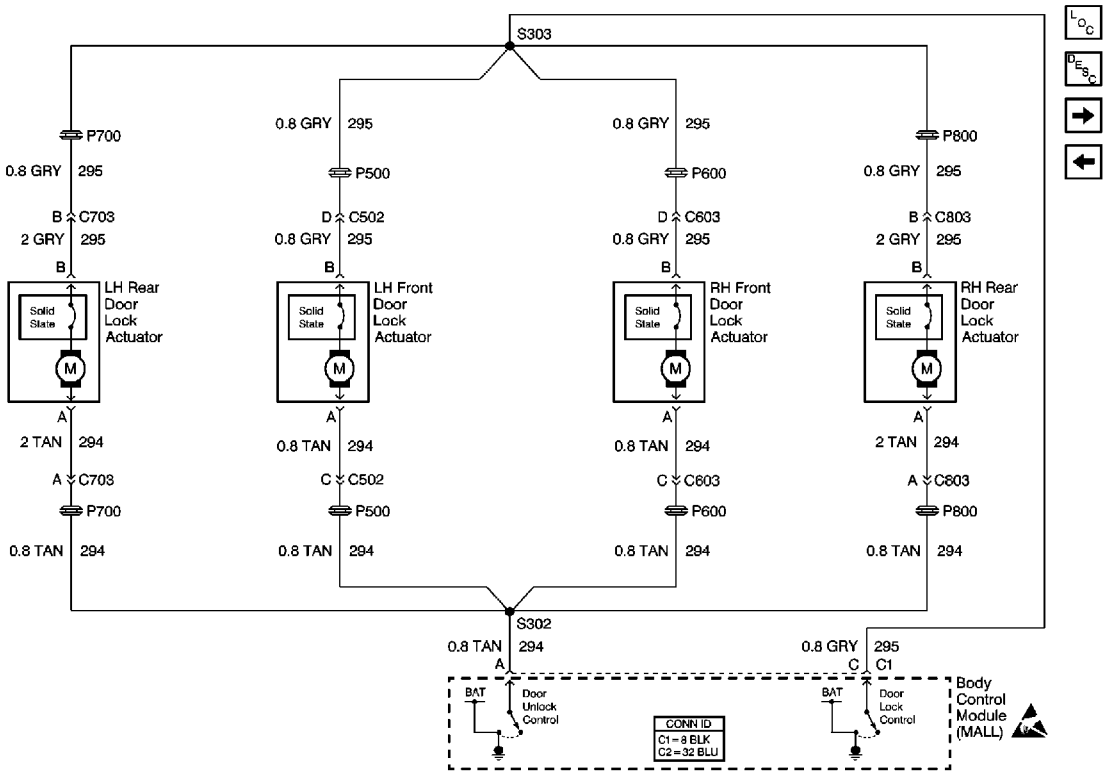
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Cell 130: Door Locks Without Keyless Entry, Door Lock Switches



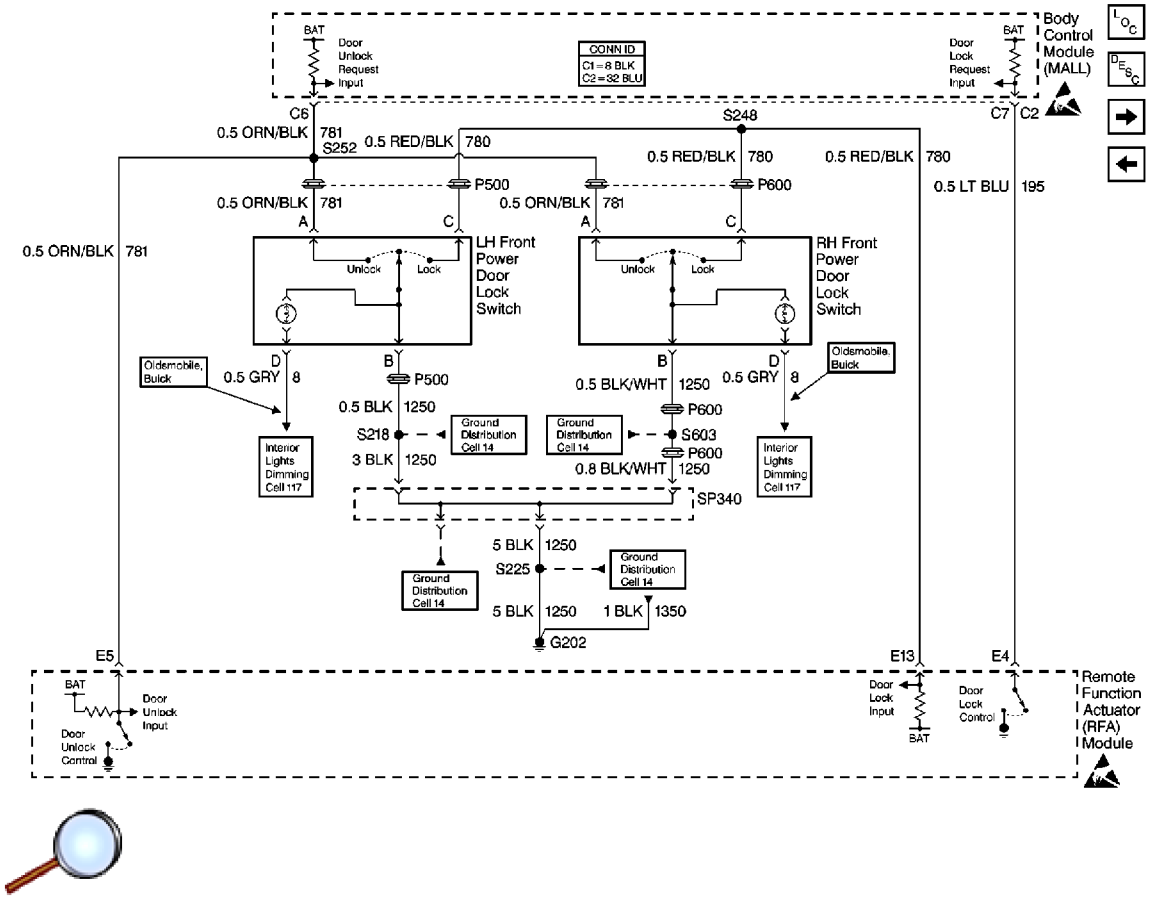
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Cell 130: Door Locks Without Keyless Entry, Door Lock Actuators



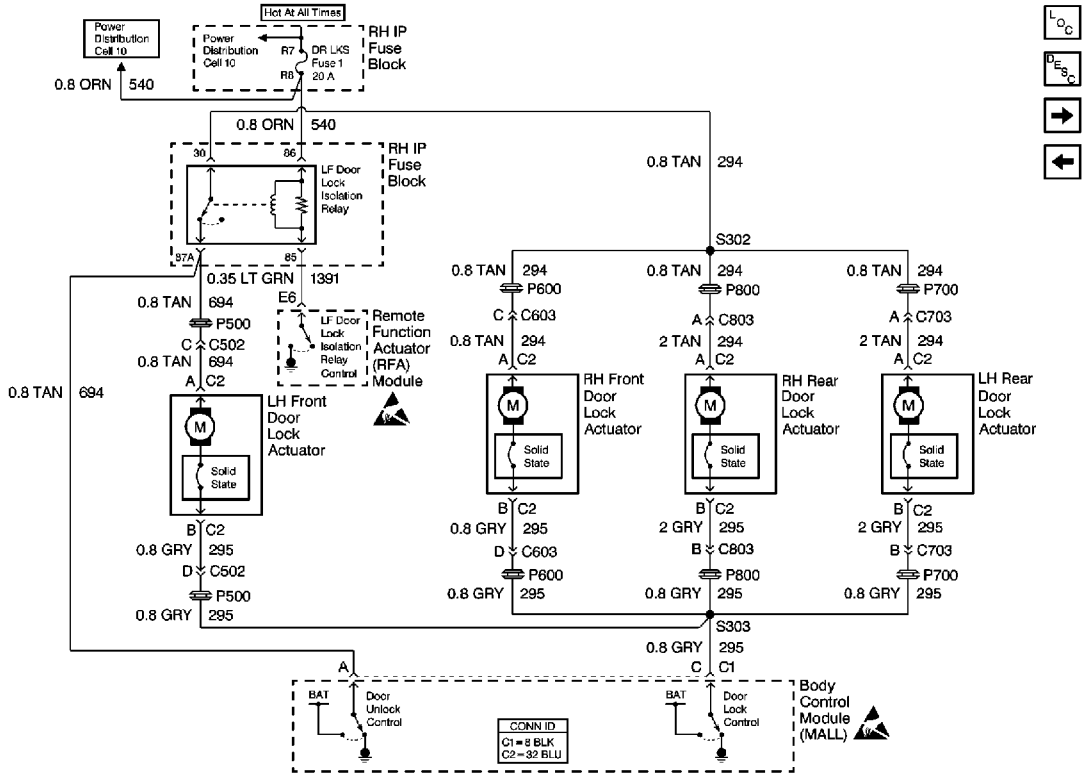
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Cell 130: Door Locks With Keyless Entry - Buick, Oldsmobile



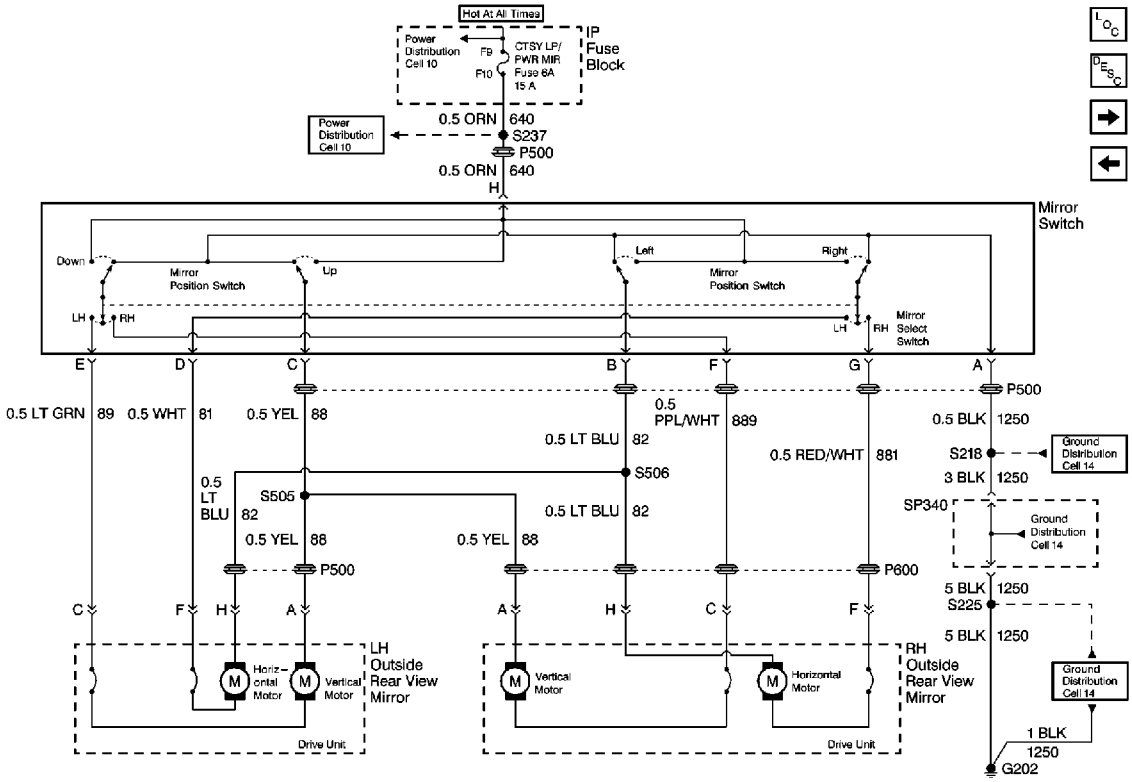
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Cell 130: Door Locks With Keyless Entry - Buick, Oldsmobile, Pontiac Without UA6



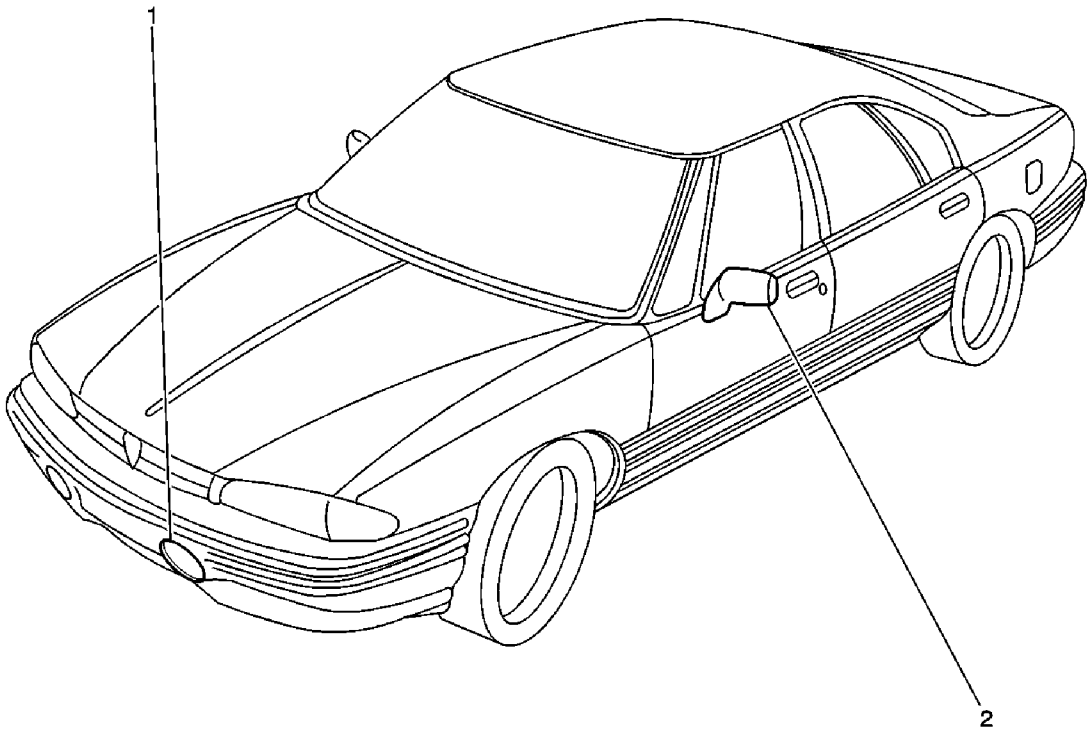
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Cell 147: Buick



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Front Left Side of the Vehicle (Pontiac Shown, Others Similar)

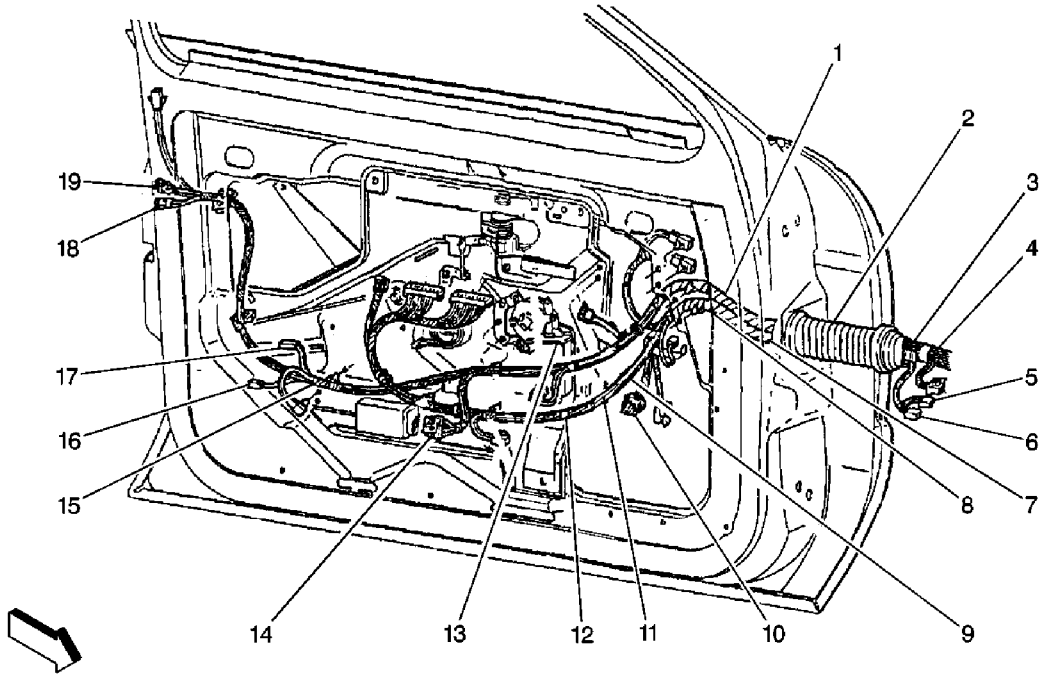




(1) LH Fog Lamp
(2) LH Outside Rear View Mirror

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Left Front Door, Behind the Door Trim

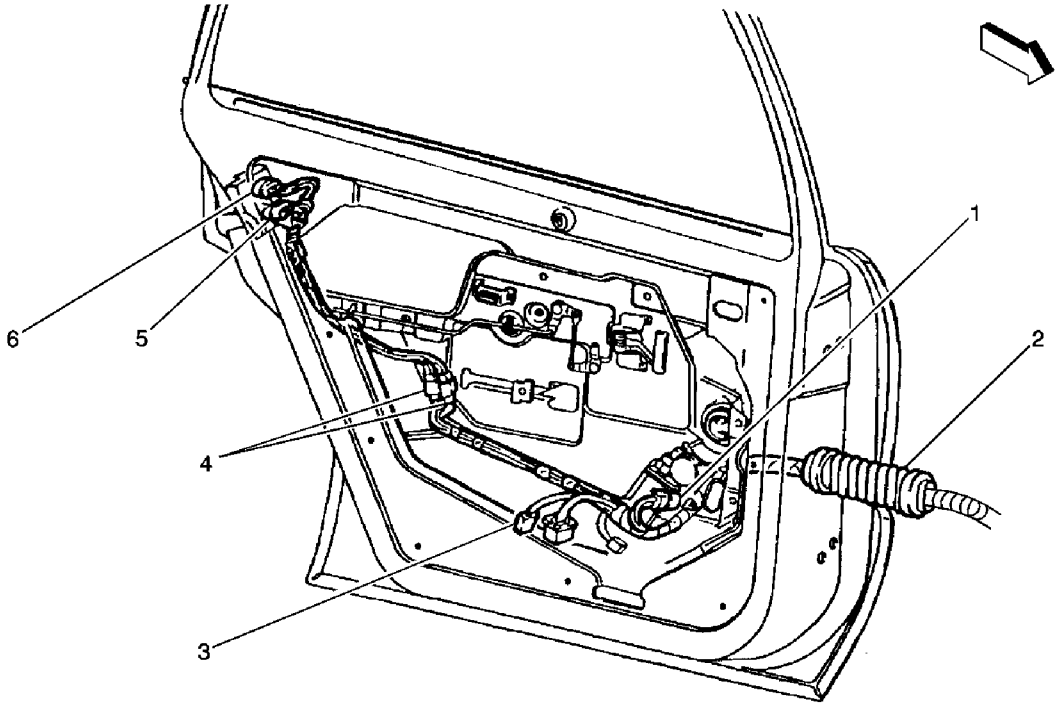


(1) S510
(2) P500
(3) S505
(4) S506
(5) C210
(6) C212
(7) S504
(8) S503
(9) S502
(10) Traction Control Switch(if Equipped)
(11) S501
(12) S500
(13) LH Front Power Window Motor (RH Similar)
(14) Power Window Control Module
(15) C502 (LH) C603 (RH)
(16) C503 (LH) C602 (RH)
(17) C501 (LH) C601 (RH)
(18) LH Front Door Lock Actuator C2 (RH Similar)

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(19) LH Front Door Lock Actuator C1 (RH Similar)

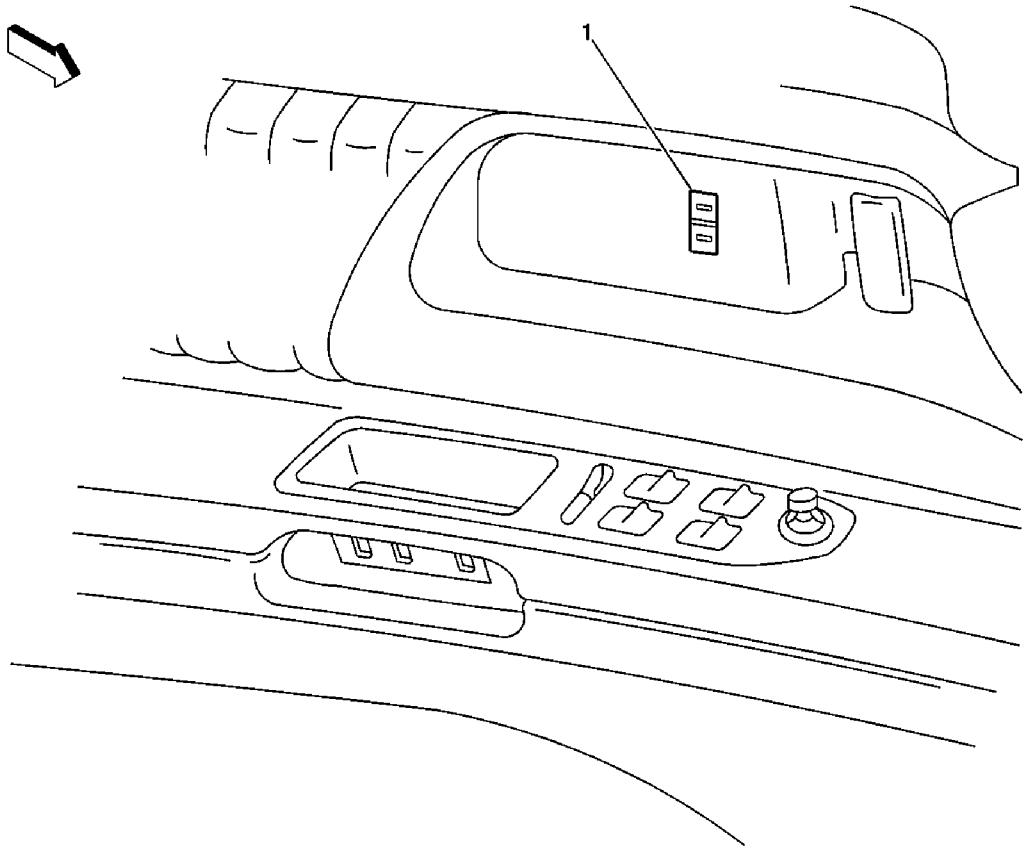
Left Hand Rear Door, Behind the Door Trim



(1) LH Rear Power Window Motor (RH Similar)
(2) P700 (LH) P800 (RH)
(3) C 701 (LH) C801 (RH)
(4) C702 (LH) C703 (LH) C802 (RH) C803 (RH)
(5) LH Rear Door Lock Actuator C2 (RH Similar)
(6) LH Rear Door Lock Actuator C1 (RH Similar)

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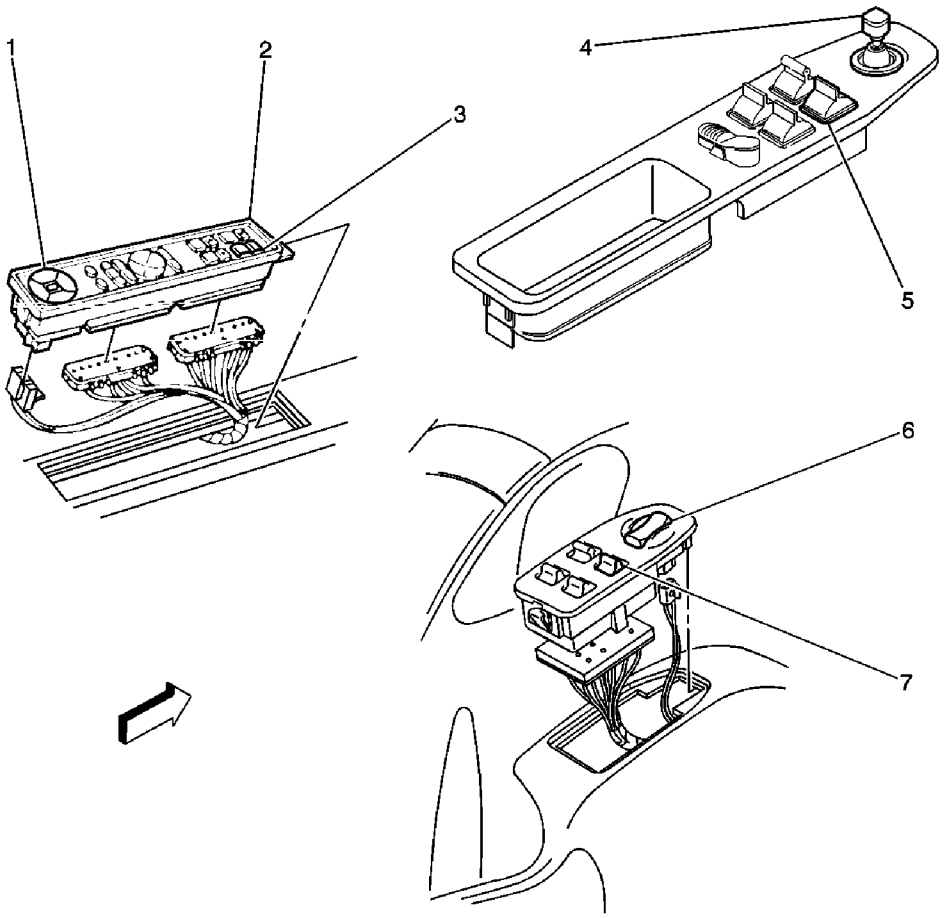
Passenger Compartment, LH Front Door (Buick/Oldsmobile)



(1) LH Power Door Lock Switch (RH Similar)

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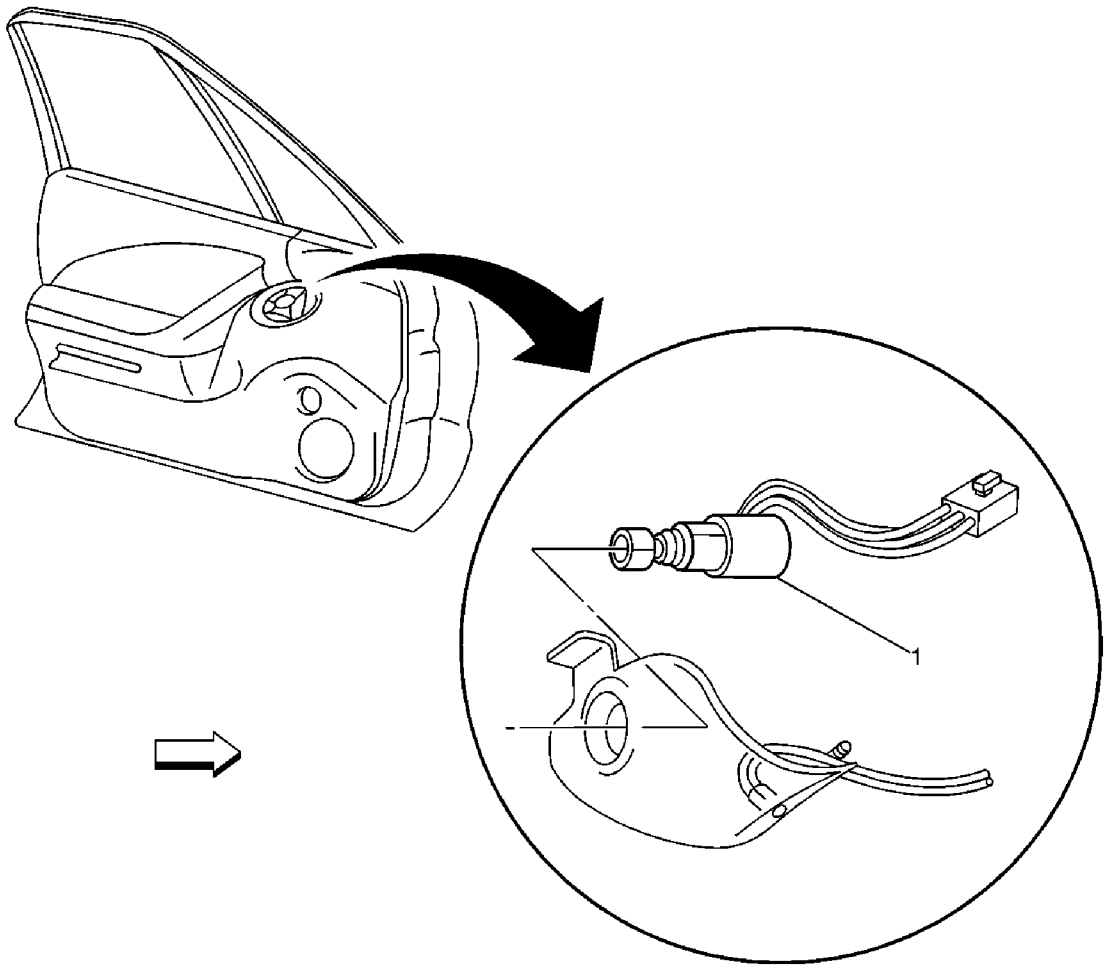
Passenger Compartment, On the Door Armrest



(1) Mirror Switch (Buick)
(2) LH Seat Switch -- RH Similar (Buick)
(3) LH Front Power Window Switch -- RH Similar (Buick)
(4) Mirror Switch (Oldsmobile)
(5) LH Front Power Window Switch -- RH Similar (Oldsmobile)
(6) LH Power Door Lock Switch -- RH Similar (Pontiac)
(7) LH Front Power Window Switch -- RH Similar (Pontiac)

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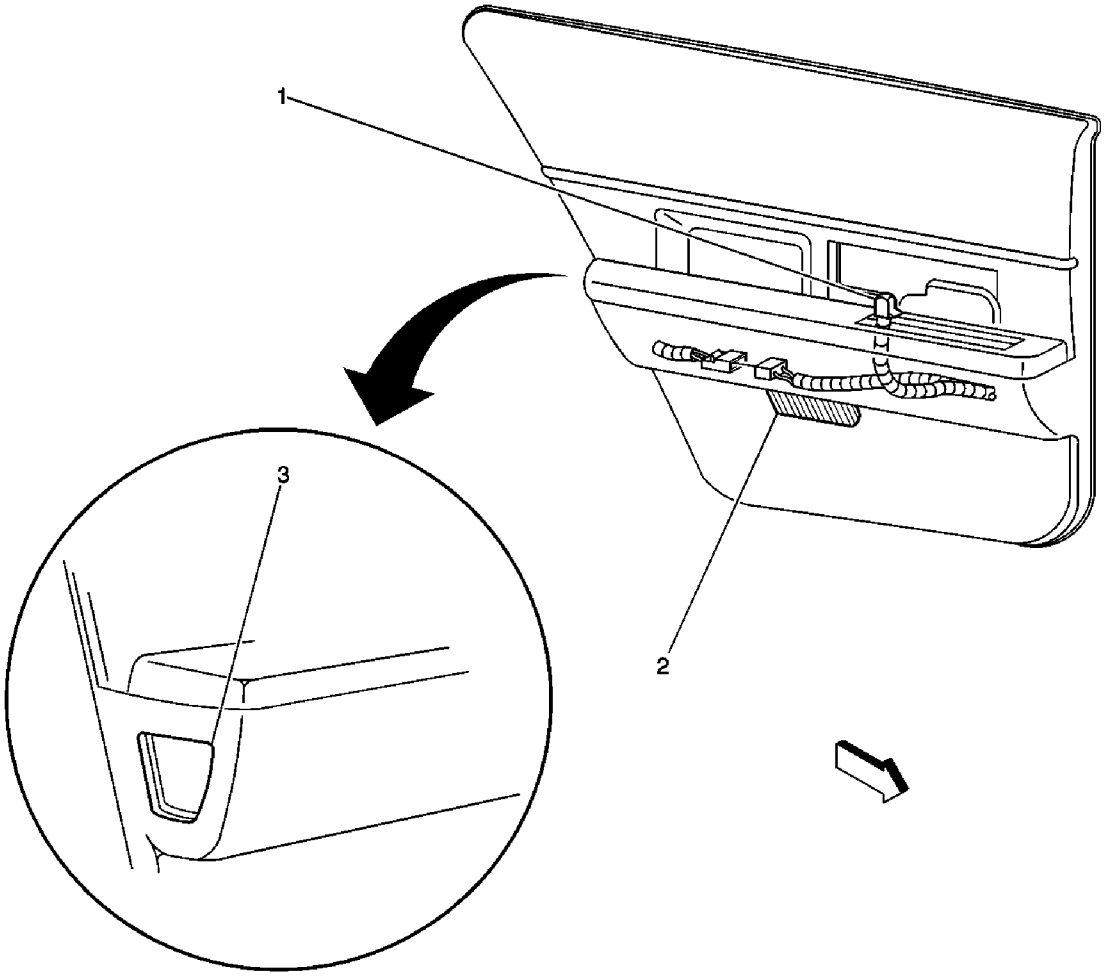
Passenger Compartment, On the Left Front Door



(1) RH Power Mirror Switch (Pontiac))

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Passenger Compartment, On the Rear Door



(1) LH Rear Power Window Switch (RH Similar)
(2) LH Rear Door Courtesy Lamp (RH Similar)
(3) LH Rear Door Warning Lamp (RH Similar)

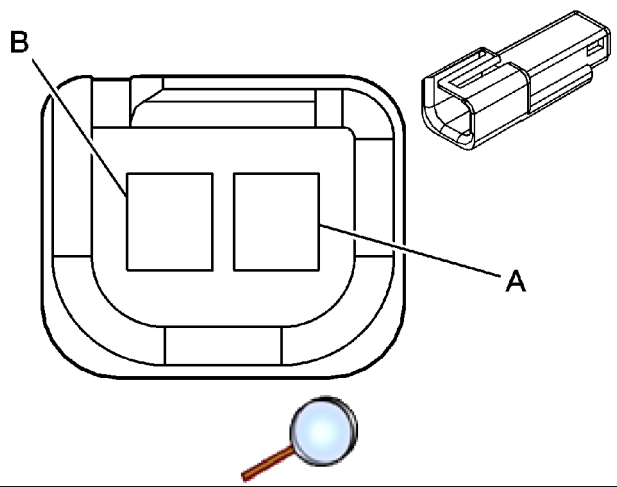
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Power Door Systems Connector End Views

Table 1: LH Front Door Handle Switch (Oldsmobile/Pontiac w/ C97/T2T)
Table 2: LH Front Door Lock Actuator C1
Table 3: LH Front Door Lock Actuator C2
Table 4: LH Front Power Door Lock Switch (Oldsmobile, Buick)
Table 5: LH Front Power Door Lock Switch (Pontiac)
Table 6: LH Front Power Window Motor
Table 7: LH Front Power Window Switch (Pontiac)
Table 8: LH Front Power Window Switch C1 (Buick, Oldsmobile)
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Table 10: LH Outside Rearview Mirror C1
Table 11: LH Outside Rearview Mirror C2
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Table 13: LH Rear Door Lock Actuator C2
Table 14: LH Rear Power Window Motor
Table 15: LH Rear Power Window Switch
Table 16: Mirror Switch (Buick)
Table 17: Mirror Switch (Oldsmobile)
Table 18: Mirror Switch (Pontiac)
Table 19: Power Window Control Module
Table 20: RH Front Door Handle Switch (Oldsmobile/Pontiac w/ C97/T2T)
Table 21: RH Front Door Lock Actuator C1
Table 22: RH Front Door Lock Actuator C2
Table 23: RH Front Power Door Lock Switch (Buick/Oldsmobile)
Table 24: RH Front Power Door Lock Switch (Pontiac)
Table 25: RH Front Power Window Motor
Table 26: RH Front Power Window Switch
Table 27: RH Outside Rear View Mirror -- C1
Table 28: RH Outside Rear View Mirror -- C2
Table 29: RH Rear Door Lock Actuator C1
Table 30: RH Rear Door Lock Actuator -- C2
Table 31: RH Rear Power Window Motor
Table 32: RH Rear Power Window Switch

LH Front Door Handle Switch (Oldsmobile/Pontiac w/ C97/T2T)

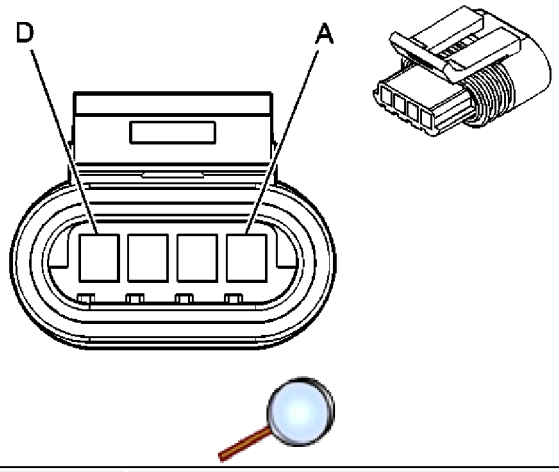
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Connector Part Information	• 12047663 • 2 Way M Metri-Pack 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	LT GRN/BLK	394	Door Handle Switch Signal - Left Front
B	BLK/WHT	1250	Ground

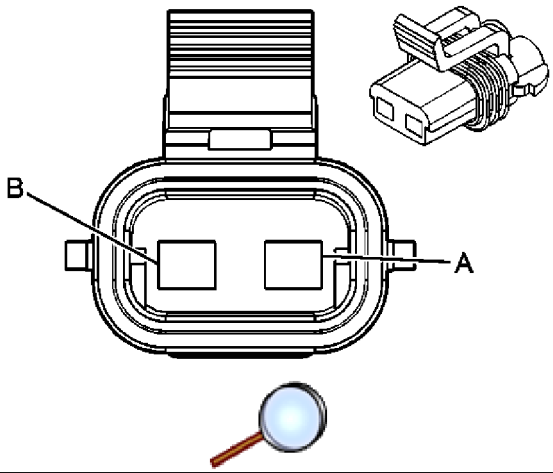
LH Front Door Lock Actuator C1



Connector Part Information	• 12162187 • 4-Way F Metri-Pak 150.2 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	TAN	126	Door Latch Switch Signal - Left Front
B	YEL	804	Door Ajar Indicator Lamp Output
C	DK BLU/WHT	727	Door Latch Switch Signal - Secondary
D	BLK	1250	Ground

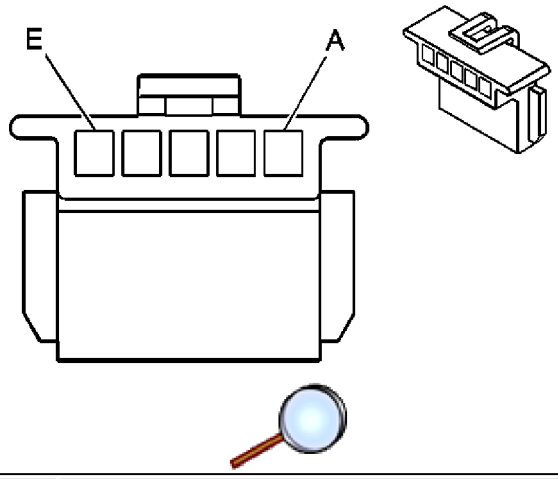
LH Front Door Lock Actuator C2



Connector Part Information	• 15300008 • 2-Way F Metri-Pak 280 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	TAN	294	Power Door Lock Motor Feed - Unlock
B	GRA	295	Power Door Lock Motor Feed - Lock

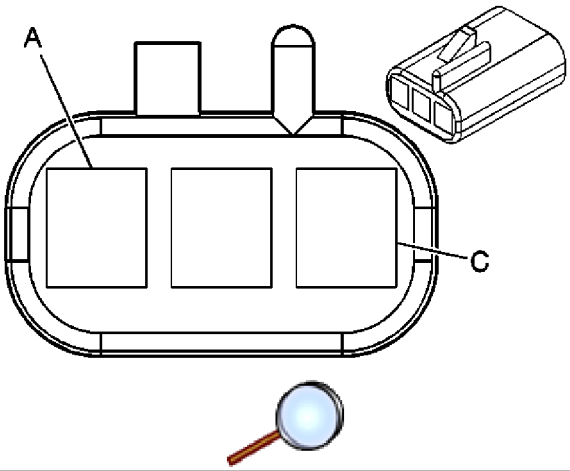
LH Front Power Door Lock Switch (Oldsmobile, Buick)



Connector Part Information	12124997

Pin	Wire Color	Circuit No.	Function
A	ORN/BLK	781	Power Door Lock Switch Output - Driver Door - Unlock
B	BLK/WHT	1250	Ground
C	RED/BLK	780	Power Door Lock Switch Output - Driver Switch - Lock
D	GRA	8	Instrument Panel Lamp Feed
E	--	--	Not Used

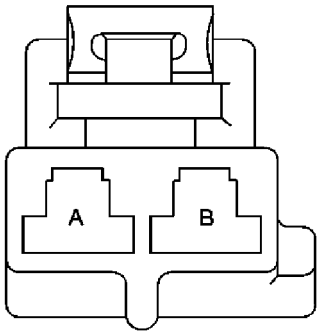
LH Front Power Door Lock Switch (Pontiac)



Connector Part Information	• 12047781 • 3-Way F Metri-Pak 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	ORN/BLK	781	Power Door Lock Switch Output - Driver Switch - Unlock
B	BLK/WHT	1250	Ground
C	RED/BLK	780	Power Door Lock Switch Output - Driver Switch - Lock

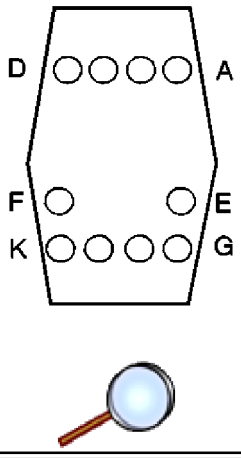
LH Front Power Window Motor



Connector Part Information	• 12064749 • 2 Way F Metri-Pack 480 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	DK BLU	164	Power Window Motor Feed - Left Front Window - Up
B	BRN	185	Power Window Motor Feed - Left Front Window - Down

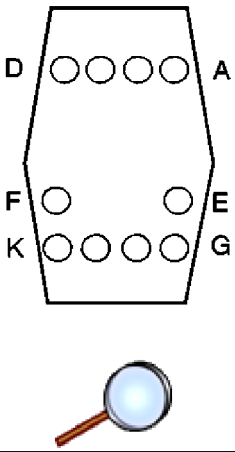
LH Front Power Window Switch (Pontiac)



Connector Part Information	• 12010550 • 10 Way F Pin Grip (BLK)

Pin	Wire Color	Circuit No.	Function
A	LT BLU	166	Power Window Master Switch Output - Right Front Window - Up
B	TAN	167	Power Window Master Switch Output - Right Front Window - Down
C	DK BLU	164	Power Window Motor Feed - Left Front Window - Up
D	GRY	1136	Power Window Master Switch Output - Left Front Window - Down
E	BLK/WHT	1250	Ground
F	BRN	141	Fuse Output - Ign 3
G	LT GRN	170	Power Window Master Switch Output - Right Rear Window - Up
H	PPL	171	Power Window Master Switch Output - Right Rear Window - Down
J	DK GRN	168	Power Window Master Switch Output - Left Rear Window - Up
K	PPL	169	Power Window Master Switch Output - Left Rear Window - Down

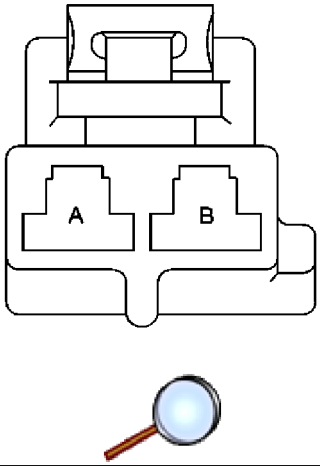
LH Front Power Window Switch C1 (Buick, Oldsmobile)



Connector Part Information	• 12010567 • 10-Way F Pin Grip Connector (BLK)

Pin	Wire Color	Circuit No.	Function
A	LT BLU	166	Power Window Master Switch Output - Right Front Window - Up
B	TAN	167	Power Window Master Switch Output - Right Front Window - Down
C	DK BLU	164	Power Window Motor Feed - Left Front Window - Up
D	GRA	1136	Power Window Master Switch Outout - Left Front Window - Down
E	BLK/WHT	1250	Ground
F	BRN	141	Fuse Output Ignition 3 Type III Fuse
G	LT GRN	170	Power Window Master Switch Output - Right Rear Window - Up
H	PPL	171	Power Window Master Switch Output - Right Rear Window - Down
J	DK GRN	168	Power Window Master Switch Output - Left Rear Window - Up
K	PPL	169	Power Window Master Switch Output - Left Rear Window - Down

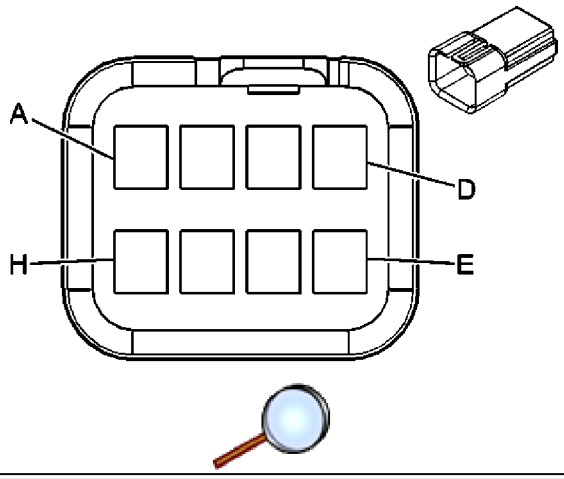
LH Front Power Window Switch C2 (Buick, Oldsmobile)



Connector Part Information	• 12064749 • 2 Way F Metri-Pack 480 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	BRN	141	Fuse Output - Ign 3
B	DK BLU	1307	Power Window Master Switch Output - Lockout

LH Outside Rearview Mirror C1

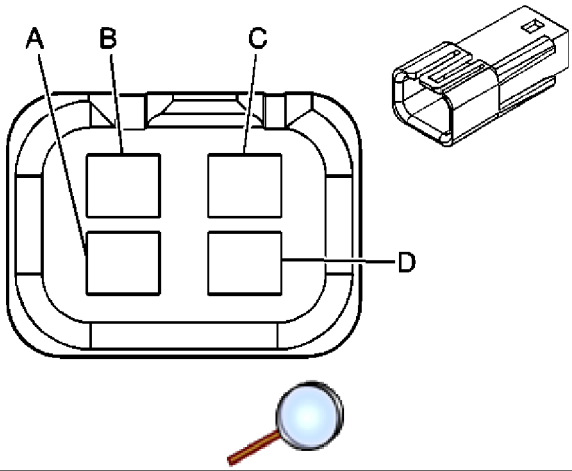


Connector Part Information	• 12045688 • 8 Way M Metri-Pack 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	YEL	88	Power Mirror Motor Feed Left Vertical Motor Down Direction
B	BLK	1250	Ground
C	LT GRN	89	Power Mirror Motor Feed Left Vertical Motor Down Direction (Buick)
C	LT BLU	82	Power Mirror Motor Feed Left Horizontal Motor Left Direction (Oldsmobile)
D	GRA	1690	Automatic Day/Night Mirror Signal

E	BRN	541	Fused Output Ign 3
F	WHT	81	Power Mirror Motor Feed Left Horizontal Motor Right Direction
G	PNK	1691	Automatic Day/Night Mirror Return
H	LT BLU	82	Power Mirror Motor Feed Left Horizontal Motor Left Direction

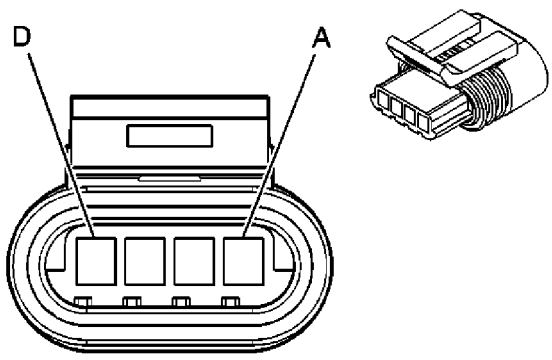
LH Outside Rearview Mirror C2



Connector Part Information	• 12047786 • 4-Way M Metri-Pak 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	GRA	788	Memory Mirror Position Sensor Feed 5 Volt Ref.
B	DK GRN	784	Memory Mirror Position Sensor Signal Left Vertical Motor
C	BLK	782	Sensor Return Memory Seat/Mirror
D	GRA/BLK	786	Memory Mirror Position Sensor Signal Left Horizontal Motor

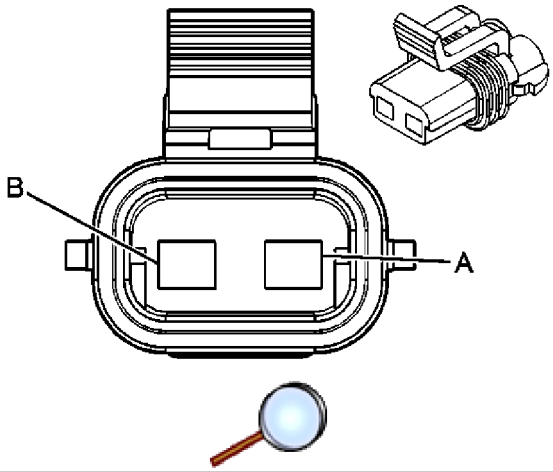
LH Rear Door Lock Actuator C1





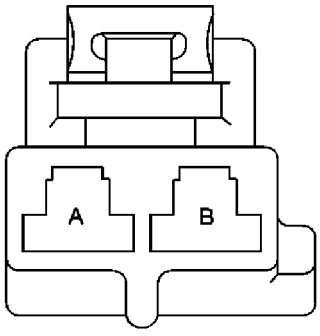
Connector Part Information	• 12162187 • 4-Way Metri-Pak F 150.2 Series (BLK)		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	WHT	156	Courtesy Lamp Output
B	BLK/YEL	745	Door Ajar Swicth Signal Left Front
C	LT BLU	263	Tamper Signal Switch
D	BLK	150	Ground

LH Rear Door Lock Actuator C2



Connector Part Information	• 15300008 • 2-Way F Metri-Pak 280 Series (BLK)		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	TAN	294	Power Door Lock Motor Feed - Unlock
B	GRA	295	Power Door Lock Motor Feed - Lock

LH Rear Power Window Motor

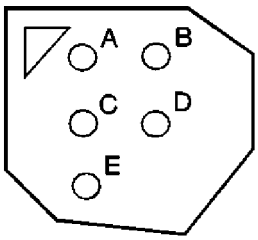




Connector Part Information	• 12064749 • 2-Way F Metri-Pak 480 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	BRN	669	Power Window Motor Feed Left Rear Window Down
B	DK BLU	668	Power Window Motor Feed Left Rear Window Up

LH Rear Power Window Switch

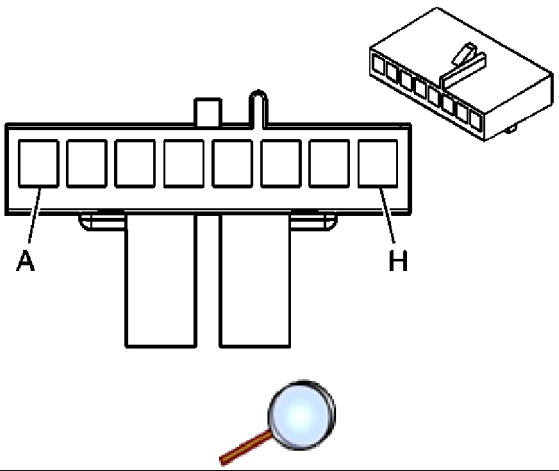




Connector Part Information	• 12004879 • 5 Way F Pin Grip (NAT)

Pin	Wire Color	Circuit No.	Function
A	DK BLU	1307	Power Window Master Switch Output - Lock Out (Buick/Oldsmobile)
A	BRN	141	Fused Output - Ign 3 (Pontiac)
B	PPL	169	Power Window Master Switch Output - Left Rear Window - Down
C	DK BLU	668	Power Window Motor Feed - Left Rear Window - Up
D	BRN	669	Power Window Motor Feed - Left Rear Window - Down
E	DK GRN	168	Power Window Master Switch Output - Left Rear Window - Up

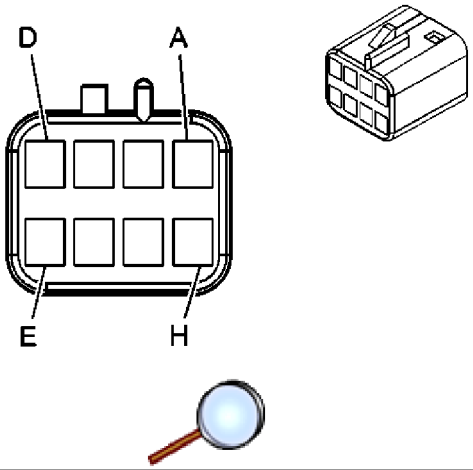
Mirror Switch (Buick)



Connector Part Information	• 12064862 • 8-Way F Metri-Pack 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	BLK	1250	Ground
B	LT BLU	82	Power Mirror Motor Feed Left Horizontal Motor Left Direction
C	YEL	88	Power Mirror Motor Feed Left Vertical Motor Up Direction
D	WHT	81	Power Mirror Motor Feed Left Horizontal Motor Right Direction
E	LT GRN	89	Power Mirror Motor Feed Left Vertical Motor Down Direction
F	PPL/ WHT	889	Power Mirror Motor Feed Right Vertical Motor Down Direction
G	RED/ WHT	881	Power Mirror Motor Feed Right Horizontal Motor Right Direction
H	ORN	640	Fuse Output Battery

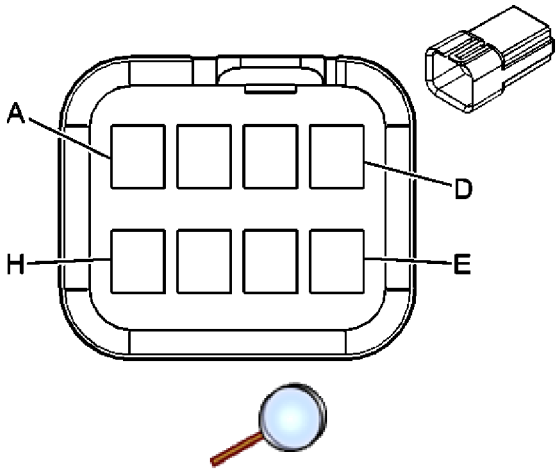
Mirror Switch (Oldsmobile)



Connector Part Information	• 12047886 • 8 Way F Metri-Pack 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	BRN	1498	Power Mirror Feed Right Vertical Motor Up Direction (w/o A43)
A	BRN/WHT	1832	Power Mirror Switch Signal Right Vertical Motor Up Position (w/ A43)
B	RED/WHT	881	Power Mirror Motor Feed - Right Horizontal Motor Right Direction (w/o A43)
B	RED/WHT	1513	Power Mirror Switch Signal Right Horizintal W/ A43
C	GRY	90	Power Mirror Motor Feed Right Horizontal Motor Left Direction (w/o A43)
C	GRY	1831	Power Mirror Switch Signal Right Horizontal Motor Left Direction (w/ A43)
D	BLK	1250	Ground
E	ORN	640	Fused Output - Bat
F	WHT	81	Power Mirror Feed Left Horizintal Motor Right Direction (w/o A43)
F	WHT	1512	Power Mirror Switch Signal Left Horizontal Motor Right Direction (w/ A43)
G	YEL	88	Power Mirror Mootr Feed Left Vertical Motor Up Direction (w/o A43)
G	YEL	1517	Power Mirror Switch Signal Left Vertical Motor Up Direction (w/ A43)
H	LT BLU	82	Power Mirror Motor Feed Left Horizontal Motor Left Direction (w/o A43)
H	LT BLU	1516	Power Mirror Switch Signal Left Horizontal Motor Left Direction (w/ A43)

Mirror Switch (Pontiac)

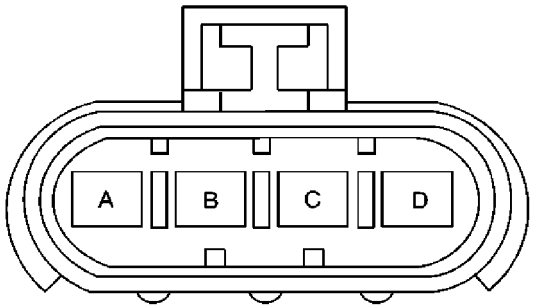


Connector Part	• 12045688

Information	• 8-Way M Metri-Pak 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	ORN	640	Fuse Output Battery
B	WHT	81	Power Mirror Motor Feed Left Horizontal Motor Right Direction
C	LT BLU	82	Power Mirror Motor Feed Left Horizontal Motor Up Direction
D	YEL	88	Power Mirror Motor Feed Right Vertical Motor Up Direction
E	BRN/WHT	1498	Power Mirror Motor Feed Right Vertical Motor Up Direction
F	GRA	90	Power Mirror Motor Feed Right Horizontal Motor Left Direction
G	RED/WHT	881	Powr Mirror Motor Feed Right Horizintal Motor Right Direction
H	BLK	1250	Ground

Power Window Control Module

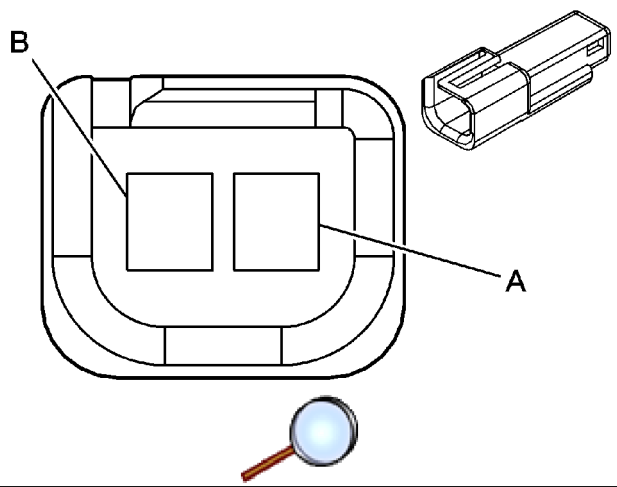




Connector Part Information	• 12048412 • 4 Way F Metri - Pack 480 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	BRN	141	Fused Output - IGN 3
B	GRY	1136	Power Window Master Switch Output
C	DK BLU	164	Power Window Motor Feed - Up
D	BRN	185	Power Window Motor Feed - Down

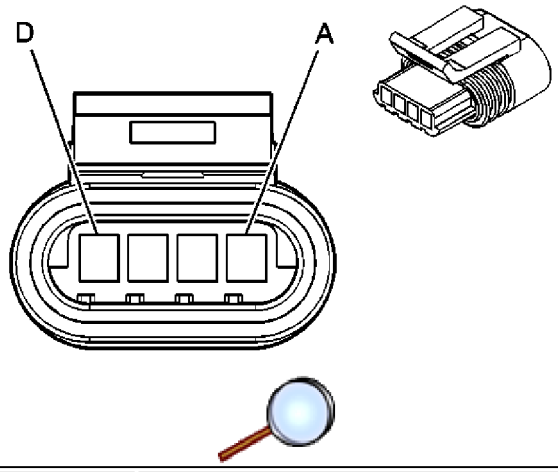
RH Front Door Handle Switch (Oldsmobile/Pontiac w/ C97/T2T)



Connector Part Information	• 12047663 • 2 Way M Metri-Pack 150 Series (GRY)

Pin	Wire Color	Circuit No.	Function
A	LT GRN	394	Door Handle Switch Signal-Left Front
B	BLK	1250	Ground

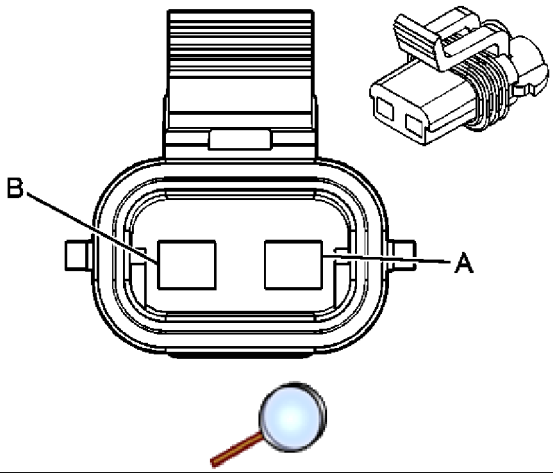
RH Front Door Lock Actuator C1



Connector Part Information	• 12162187 • 4-Way F Metri-Pack 150.2 (BLK)

Pin	Wire Color	Circuit No.	Function
A	TAN	126	Door Latch Switch Signal Left Front
B	YEL	804	Door Ajar Indicator Lamp Output
C	DK BLU/WHT	727	Door Latch Switch Signal Secondary
D	BLK	1250	Ground

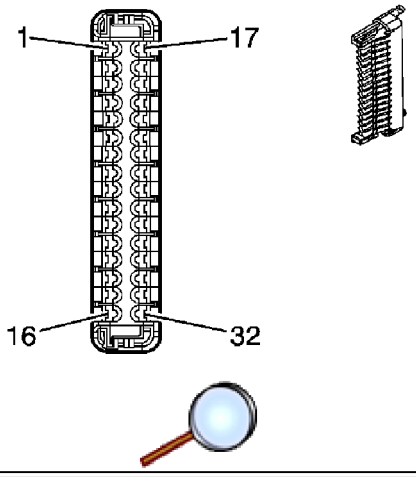
RH Front Door Lock Actuator C2



Connector Part Information	• 15300008 • 2-Way F Metri-Pack 280 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	TAN	294	Power Door Lock Motor Feed Unlock
B	GRA	295	Power Door Lock Motor Feed Lock

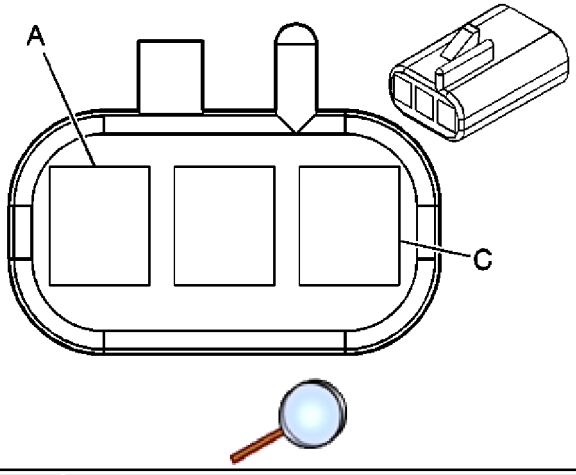
RH Front Power Door Lock Switch (Buick/Oldsmobile)



Connector Part Information	• 12124997 • 5 Way (BLK)

Pin	Wire Color	Circuit No.	Function
A	ORN/ BLK	781	Power Door Lock Switch Output Driver Switch Unlock
B	BLK	1250	Ground
C	RED/ BLK	780	Power Door Lock Switch Output Driver Switch Lock
D	GRY	8	Instrument Panel Lamp Feed
E	--	--	Not Used

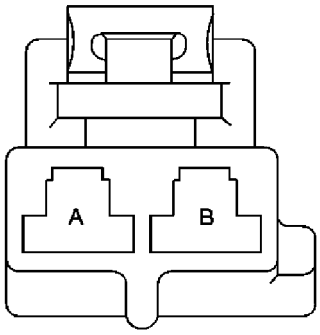
RH Front Power Door Lock Switch (Pontiac)



Connector Part Information	• 12047781 • 3 Way F Metri-Pack 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	ORN/ BLK	781	Power Door Lock Switch Output Driver Switch Unlock
B	BLK	1250	Ground
C	RED/BLK	780	Power Door Lock Switch Output Driver Switch Lock

RH Front Power Window Motor

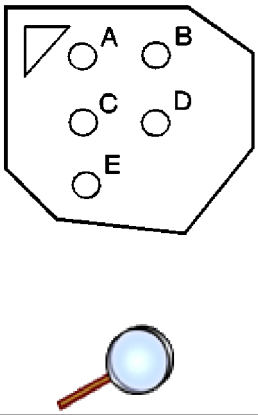


Connector Part Information	• 12064749 • 2-Way Metri-Pack 480 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	DK BLU	666	Power Window Motor Feed - Right Front Window Up

B	BRN	667	Power Window Motor Feed - Right Front Window Down

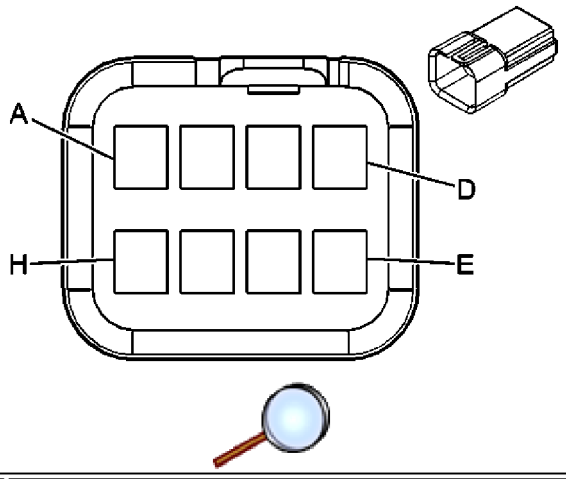
RH Front Power Window Switch



Connector Part Information	• 12004679 • 5-Way F Pin Grip (NAT)

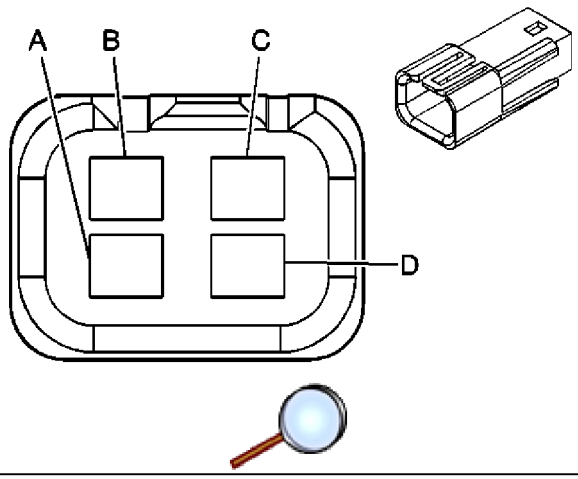
Pin	Wire Color	Circuit No.	Function
A	DK BLU	1307	Power Window Master Switch Output Lockout (Olds & Buick)
A	BRN	141	Fuse Output Ignition 3 (Pont)
B	TAN	167	Power Window Master Switch Output - Right Front Window Down
C	DK BLU	666	Power Window Motor Feed - Right Front Window Up
D	BRN	667	Power Window Motor Feed - Right Front Window Down
E	LT BLU	166	Power Window Master Switch Output - Right Front Window Up

RH Outside Rear View Mirror -- C1



Connector Part Information	• 12045688 • 8 Way M Metri-Pack 150 Series (GRY)		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	YEL	88	Power Mirror Motor Feed-Left Vertical Motor-Up Direction
A	BRN/ WHT	1498	Power Mirror Motor Feed-Right Vertical Motor-Up Direction
B	BLK	1450	Ground
C	PPL/ WHT	889	Power Mirror Motor Feed-Right Vertical Motor-Down Direction
C	GRY	90	Power Mirror Motor Feed-Right Horizontal Motor-Left Direction
D	--	--	Not Used
E	BRN	541	Fused Output - Ign 3
F	RED/ WHT	881	Power Mirror Motor Feed-Right Horizontal Motor-Right Direction
G	--	--	Not Used
H	LT BLU	82	Power Mirror Motor Feed-Left Horizontal Motor-Left Direction
H	GRY	90	Power Mirror Motor Feed-Right Horizontal Motor-Left Direction

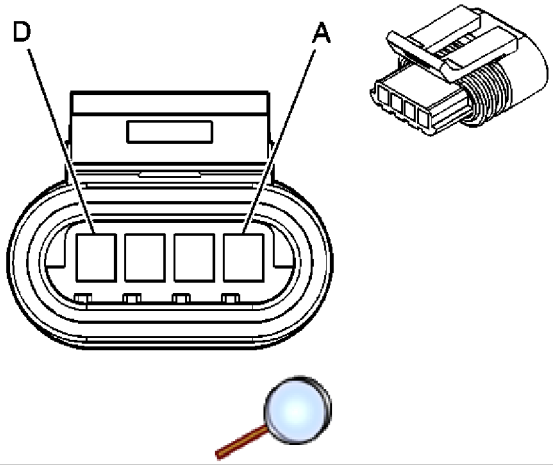
RH Outside Rear View Mirror -- C2



Connector Part Information	• 12047786 • 4-Way M Metric Pack Series 150 (GRY)		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	GRA	788	Memory Mirror Position Sensor Feed-5 Volt Reference
B	BRN	787	Memory Mirror Position Sensor Signal - Right Vertical Motor

C	BLK	782	Sensor Return Memory Seat Mirror
D	LT BLU/BLK	785	Memory Mirror Position Sensor Signal - Right Horizontal Motor

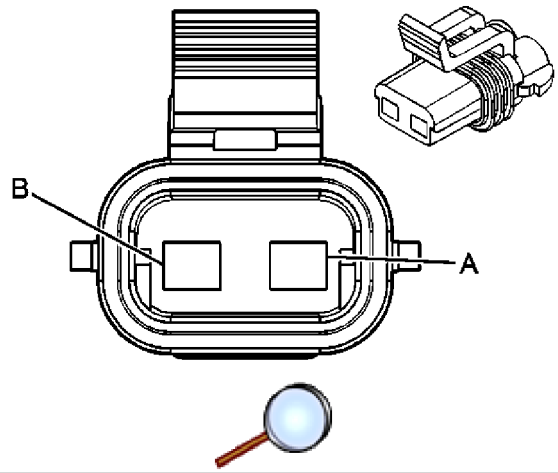
RH Rear Door Lock Actuator C1



Connector Part Information	• 12162187 • 4-Way F Metri-Pack 150.2 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	WHT	156	Courtesy Lamp Output
B	GRY/ BLK	745	Door Ajar Switch Signal - Left Front
C	LT BLU	263	Tamper Switch Signal
D	BLK	150	Ground

RH Rear Door Lock Actuator -- C2

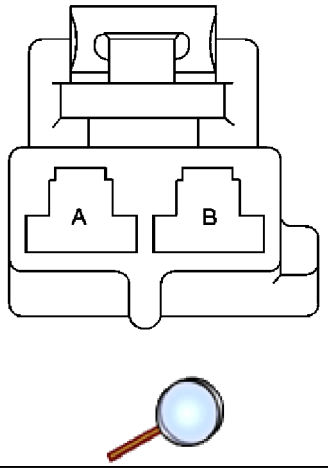


Connector Part Information	• 15300008 • 2-Way F Metri-Pack 280 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	TAN	294	Power Door Lock Motor Feed - Unlock

B	GRY	295	Power Door Lock Motor Feed - Lock

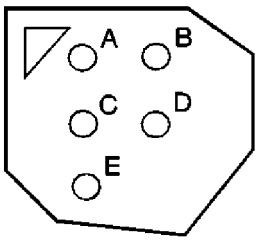
RH Rear Power Window Motor



Connector Part Information	• 12064749 • 2-Way F Metric-Pack Series 480 (BLK)

Pin	Wire Color	Circuit No.	Function
A	BRN	671	Power Window Motor Feed - Right Rear Window Down
B	DK BLU	670	Power Window Motor Feed - Right Rear Window Up

RH Rear Power Window Switch



Connector Part Information	• 12004679 • 5 Way F Pin Grip (NAT)

Pin	Wire Color	Circuit No.	Function
A	DK BLU	1307	Power Window Master Switch Output - Lock Out (Buick/Oldsmobile)
A	BRN	141	Fuse Output - Ign 3 (Pontiac)

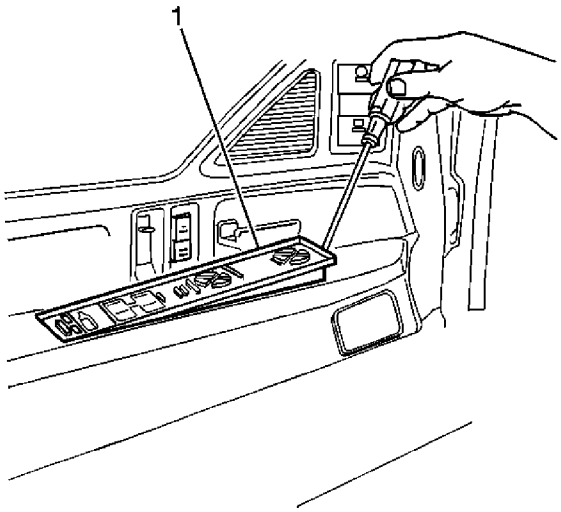
B	PPL	171	Power Window Master Switch Output - Right Rear Window Down
C	DK BLU	670	Power Window Motor Feed - Right Rear Window Up
D	BRN	671	Power Window Motor Feed - Right Rear Window Down
E	LT GRN	170	Power Window Master Switch Output - Right Rear Window Up

Front Side Door Window Switch Replacement (Buick)

Removal Procedure

Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

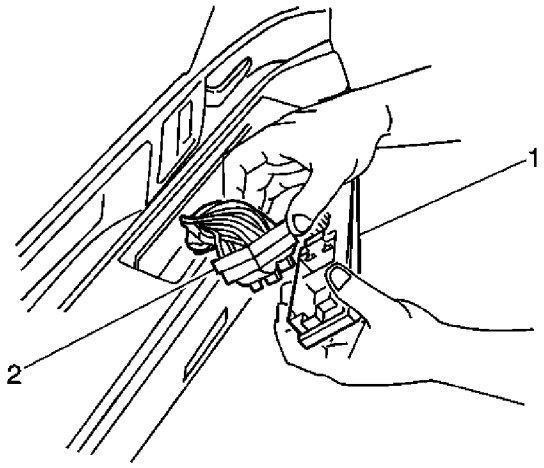
1. Disconnect the negative battery cable.
2. Remove the two trim panel retaining screw (Oldsmobile).
3. Pull out on the lower pull-handle insert to disengage it from the switch plate (Oldsmobile).





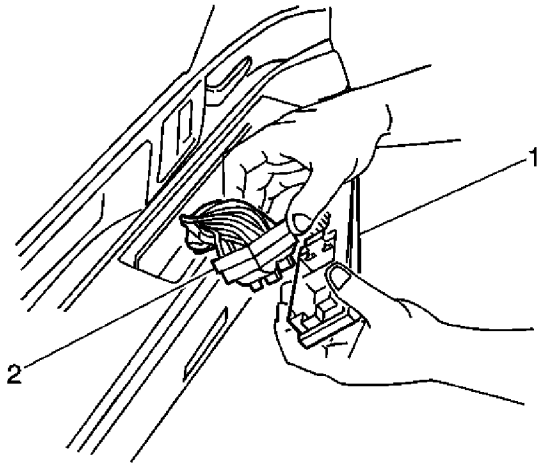
4. Insert a small, flat-blade tool between the switch plate and the trim panel at either the forward or rearward edge in order to disengage the retainer clips from the trim panel (Oldsmobile).
5. Remove the switch plate by inserting a small flat-bladed tool between the switch plate and the trim panel at the forward retaining clip (Buick and Pontiac).
6. Lift the switch plate (1).

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7. Disconnect the electrical connectors (2).
8. Remove the setscrew from the remote mirror control, if applicable.
9. Remove the window switch (1).

Installation Procedure



1. Install the window switch (2) to the switch plate (1).
2. Install the remote mirror control.

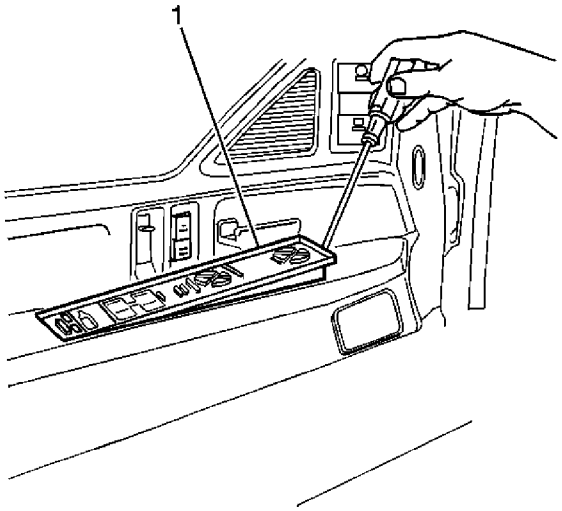
Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service

procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the remote mirror set screw.

   Tighten
   Tighten the setscrew to .8 N·m (7 lb in).

4. Connect the electrical connectors.





5. Install the switch plate (1) in the trim panel.

   Push inward the switch plate in order to secure.

6. Connect the negative battery cable.

Door Lock Switch Replacement (Buick)

Removal Procedure

Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

1. Disconnect the negative battery cable.
2. Remove the fastener retaining the switch plate escutcheon to the trim panel.
3. Use a thin flat-bladed tool to partially remove the switch plate.
4. Disengage the switch plate retainer clips.

   Insert a small, flat-bladed tool between the switch plate and the trim panel.

5. Disconnect the electrical connectors.
6. Remove the door lock switch.

Installation Procedure

1. Install the door lock switch to the switch plate.
2. Connect the electrical connectors.
3. Carefully guide the switch plate in the trim panel.
4. Ensure the lock rod is aligned properly to the lock rod knob on the switch plate.
5. Push inward the switch plate in order to secure.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

6. Install the retaining fastener.

   Tighten
   Tighten the fastener to 1.2 N·m (11 lb in).

7. Connect the negative battery cable.

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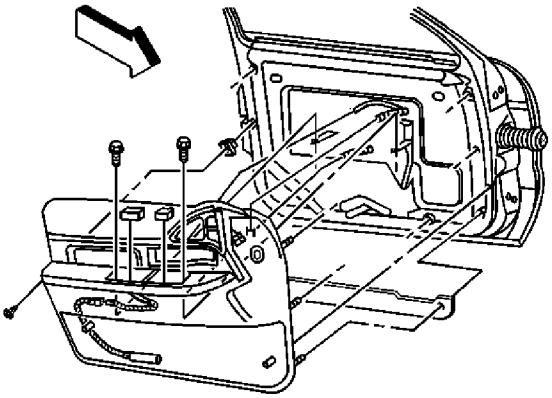
Front Side Door Trim Panel Replacement (Buick)

Removal Procedure

Tools Required

J 38778 Door Trim Pad and Garnish Clip Remover

1. Remove the arm rest bezel switch plate. Refer to Front Side Door Window Switch Replacement .
2. Use a small, flat-bladed tool.
3. Release the retaining tab on the courtesy lamp.
4. Remove the courtesy lamp. Refer to Door Lamp Replacement
5. Disconnect the electrical connector.





6. Remove the retaining fastener from the rear of the trim panel.
7. Remove the door lock switch bezel. Refer to Door Lock Switch Replacement .
8. Release the trim panel retainers.

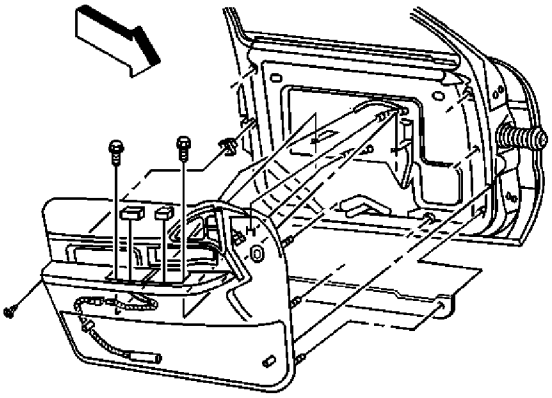
   Insert the J 38778 between the outer edges of the door trim panel and the door.

9. Lift upward the trim panel.
10. Disconnect the wiring harness from the trim panel.
11. Disconnect the speaker connector, (as necessary).

Installation Procedure

1. Connect the speaker connector, (as necessary).

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2. Install the wiring harness to the trim panel.
3. Install the trim panel to the door.

   Push on the outer edges of the trim panel.

4. Install the door lock switch bezel. Refer to Door Lock Switch Replacement .

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

5. Install the retaining fastener to the rear of the trim panel.

   Tighten
   Tighten the fastener to .8 N·m (7 lb in).

6. Connect the courtesy lamp connector.
7. Install the courtesy lamp to the trim panel.
8. Install the 2 retaining fasteners through the switch plate opening.

   Tighten
   Tighten the two fasteners to 1.8 N·m (16 lb in).

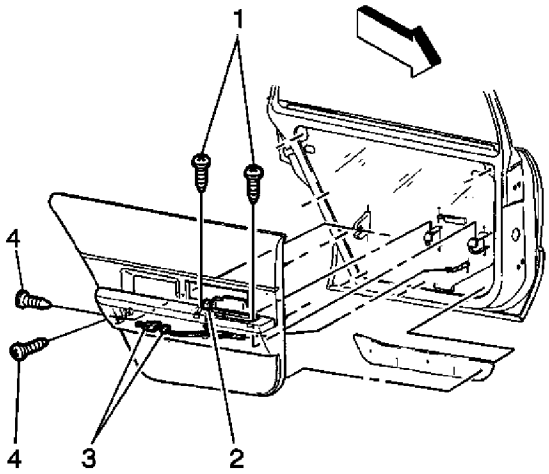
9. Install the switch plate. Refer to Front Side Door Window Switch Replacement .

Rear Side Door Trim Panel Replacement (Buick)

Removal Procedure

Tools Required

J 38778 Door Trim Pad and Garnish Clip Remover





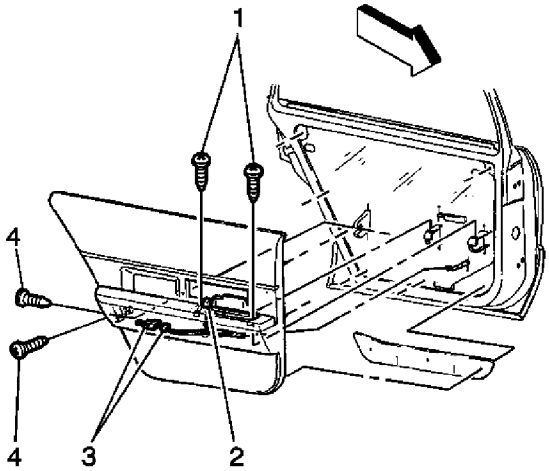
1. Remove the switch plate. Refer to Front Side Door Window Switch Replacement .
2. Remove the retaining fasteners (1) from the switch plate opening.
3. Disconnect the electrical connectors.
4. Use a small, flat-bladed tool.
5. Release the retaining tab on the courtesy lamp.
6. Partially remove the courtesy lamp.
7. Disconnect the electrical connector (if equipped).
8. Remove the retaining fasteners (4) through the courtesy lamp opening.
9. Remove the door lock switch bezel. Refer to Door Lock Switch Replacement .
10. Release the trim panel retainers.

    Insert the J 38778 between the outer edges of the trim panel and the door.

11. Partially remove the door trim panel.
12. Remove the wiring harness from the trim panel.
13. Remove the door trim panel.

Installation Procedure

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1. Install the wiring harness to the trim panel.
2. Align the trim panel to the door.
3. Install the door trim panel to the door.

   Push inward on the outer edges of the trim panel in order to secure.

4. Install the door lock switch bezel. Refer to Door Lock Switch Replacement .

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

5. Install the retaining fasteners (4) through the courtesy lamp opening.

   Tighten
   Tighten the fasteners to 1.8 N·m (16 lb in) in order to secure the rear of the door trim to the inner panel.

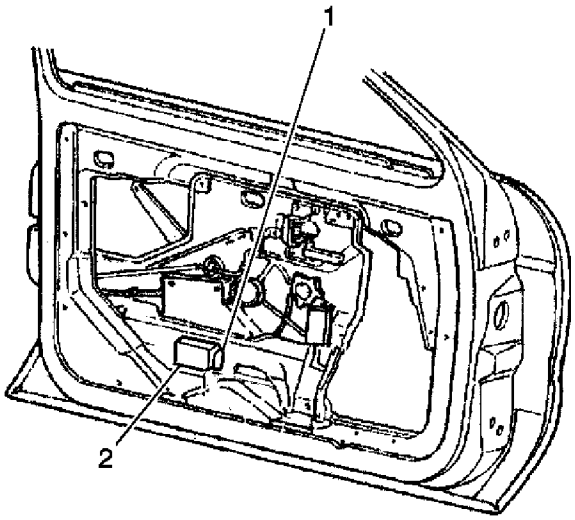
6. Connect the courtesy lamp electrical connector.
7. Install the courtesy lamp to the door trim panel.
8. Push inward on the armrest prior to securing the door trim panel.
9. Install the retaining fasteners (1) through the switch plate opening.

   Tighten
   Tighten the fasteners to 1.8 N·m (16 lb in).

10. Install the switch plate. Refer to Front Side Door Window Switch Replacement .

Door Control Module Replacement

Removal Procedure



Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

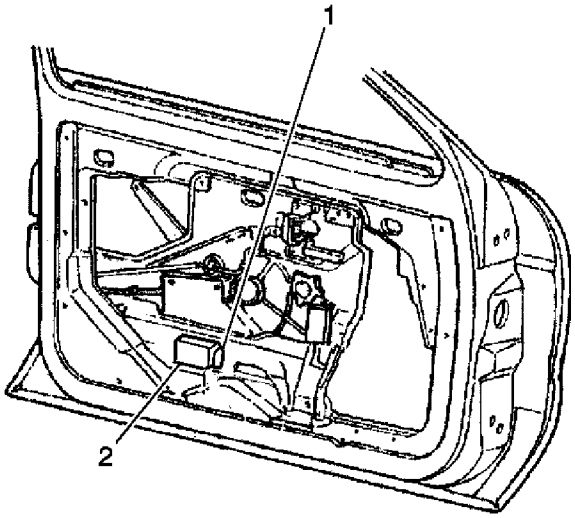
1. Disconnect the negative battery cable.
2. Remove the trim panel. Refer to Front Side Door Trim Panel Replacement

.

3. Remove the water deflector. Refer to Door Water Deflector Replacement .
4. Disconnect the electrical connector (1).
5. Insert a thin flat-bladed tool between the express down module and the retaining clip.
6. Remove the express down module (2).

Installation Procedure

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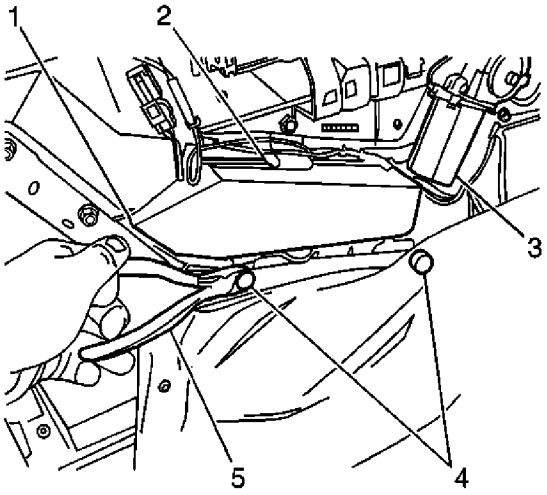
1. Install the express down module (2).
2. Connect the electrical connector (1).
3. Install the water deflector. Refer to Door Water Deflector Replacement .
4. Install the trim panel. Refer to Front Side Door Trim Panel Replacement .
5. Connect the negative battery cable.

Rear Door Energy Absorber Pad Replacement

Removal Procedure

Caution: This vehicle has energy-absorbing foam blocks for side impact protection. To help avoid personal injury in a collision, foam blocks that are damaged, or removed during repairs must be replaced. Failure to replace foam blocks that are removed can violate federal law.

1. Remove the door trim panel. Refer to Rear Side Door Trim Panel Replacement .
2. Remove the water deflector. Refer to Rear Side Door Water Deflector Replacement .

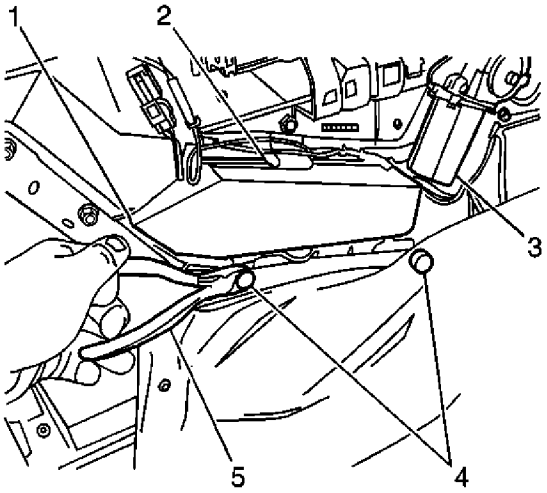




3. Note the wiring harness routing (2) on top of the energy absorbing foam block (1) for re-installation.
4. Cut (5) the two push pins (4) holding the foam block to the inner door panel.
5. Disconnect the two locking tabs holding the foam block assembly to the door.
6. Move the bottom of the energy absorbing foam block assembly (1) inward and lift upward in order to remove the foam absorber block.

Installation Procedure

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1. Install the foam block (1) into the slot in the door module.
2. Push the foam block forward in order to secure the two locking tabs into the inner door panel.
3. Ensure the tabs are in the lower slot.

Important: New push pins (4) should always be used when installing the foam block assembly.

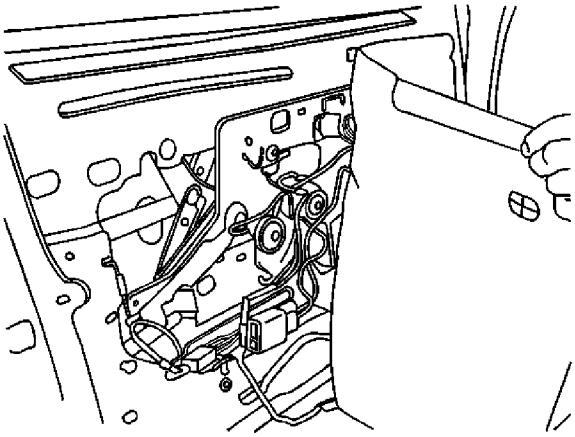
4. Install two new push pins (4) in order to secure the foam block (1) to the door.
5. Ensure the new push pins are fully seated.

Important: Ensure that the wiring harness is properly routed and secured to the wiring harness clip (2) located on top of the energy-absorbing foam block (1).

6. Secure the wiring harness on top of the foam block.
7. Install the water deflector. Refer to Rear Side Door Water Deflector Replacement .
8. Install the door trim panel. Refer to Rear Side Door Trim Panel Replacement

Door Water Deflector Replacement (Front)

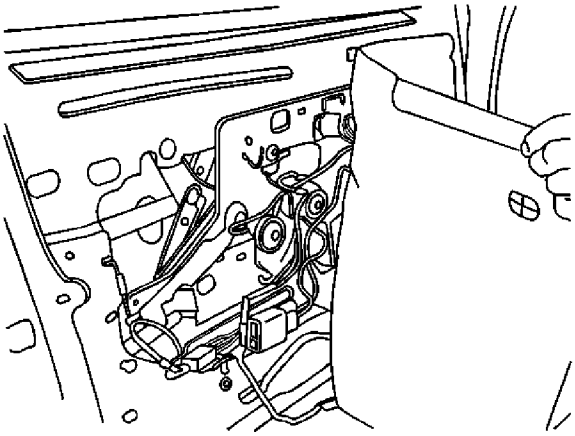
Removal Procedure



1. Remove the door trim panel. Refer to Front Side Door Trim Panel Replacement
2. Remove the fasteners from the armrest hanger plates, (if equipped).
3. Remove the front door armrest hanger plates (if equipped).
4. Remove the door speakers (if equipped). Refer to Radio Front Side Door Speaker Replacement in Entertainment.
5. Carefully peel the water deflector off of the inner door panel.
6. Carefully guide the electrical wiring through the slits in the water deflector.
7. Remove the water deflector.

Installation Procedure

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Notice: Proper sealing is necessary in order to prevent water entry into the door and possible damage to inner door components.

1. Align the water deflector to the door.
2. Carefully guide the electrical wiring through the slits in the water deflector.
3. Attach the water deflector to the door.
4. Smooth out the wrinkles in the water deflector beginning with the bottom of the door, then the sides, then the top.
5. Press the outer edges of the water deflector in order to fasten the water deflector to the door.
6. Install the armrest hanger plates to the door (if equipped).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

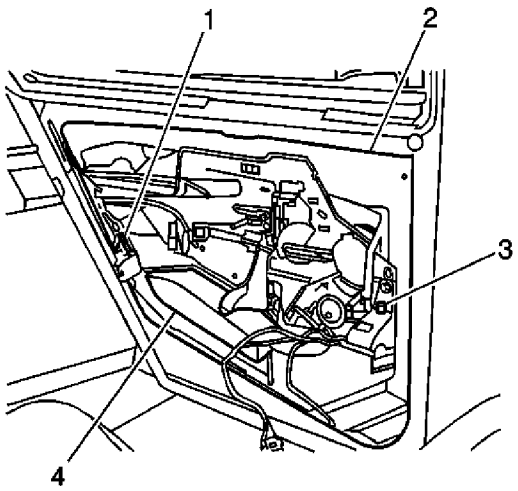
7. Install and tighten the fasteners to the hanger plates as follows.

   Tighten
   1. Buick--Tighten the fasteners to 1.6 N·m (14 lb in).
   2. Buick--Tighten the nuts to 8.0 N·m (71 lb in).
   3. Pontiac--Tighten the fasteners to 1.8 N·m (16 lb in).
8. Install the door speakers (if equipped). Refer to Radio Front Side Door Speaker Replacement in Entertainment.
9. Install the door trim panel. Refer to Front Side Door Trim Panel Replacement .

Rear Side Door Water Deflector Replacement

Removal Procedure

1. Remove the door trim panel. Refer to Rear Side Door Trim Panel Replacement .



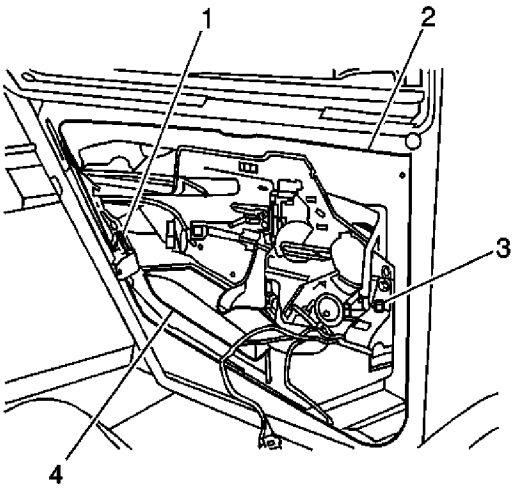
2. Remove the hanger brackets (1,3) (if equipped).
3. Partially remove the speaker (if equipped).
4. Disconnect the electrical connectors.
5. Remove the two retainers securing the top of the water deflector (2) to the door.
6. Carefully peel the water deflector away from the door.
7. Remove the water deflector (2).

Installation Procedure

Notice: Proper sealing is necessary in order to prevent water entry into the door and possible damage to inner door components.

1. Align the water deflector to the door.
2. Ensure the electrical wiring is guided through the slits in the deflector.

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3. Smooth out the wrinkles in the water deflector.
4. Ensure that the outer sealing edges of the water deflector are tightly secured to the door.
5. Install the two retainers at each of the top corners of the water deflector.
6. Connect the electrical connections to the speaker (if equipped).
7. Install the speaker (if equipped).
8. Secure the speaker to the door.
9. Install the hanger brackets (1,3) to the door (if equipped).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

10. Install the hanger bracket fasteners to the door.

Tighten

1. Tighten the fasteners as follows:
2. Buick--Tighten the nuts to 8.0 N·m (71 lb in)
3. Pontiac--Tighten the screws to 1.8 N·m (16 lb in)
4. Pontiac--Tighten the nuts to 8.0 N·m (71 lb in)

11. Install the door trim panel. Refer to Rear Side Door Trim Panel Replacement .

Door Replacement

Adjustment Procedure

1. Adjust the door fore-aft or up-down as follows:
   1.1. Ream the stud holes in the pillar side of the hinges with the door and the hinges removed from the vehicle.
   1.2. Reinstall the hinges to the pillar and the door.

   Leave the nuts on the pillar side of the hinge loose.

   1.3. Reposition the door as needed.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Adjust the door in and out by loosening the door mounting fasteners and repositioning the door as needed.

   Tighten
   Tighten the nuts to 47 N·m (35 lb ft).

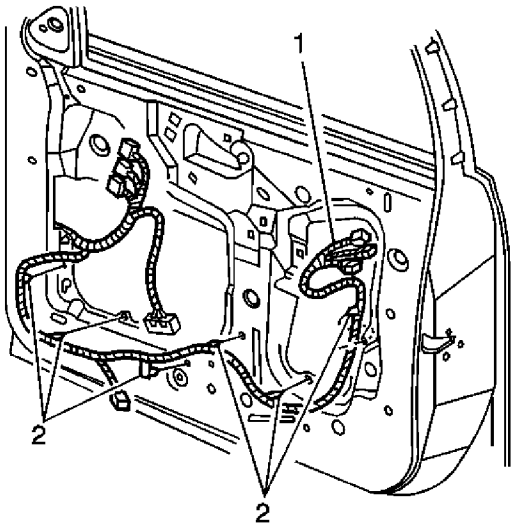
Removal Procedure

1. Mark the location of the upper and lower door hinges (Oldsmobile).

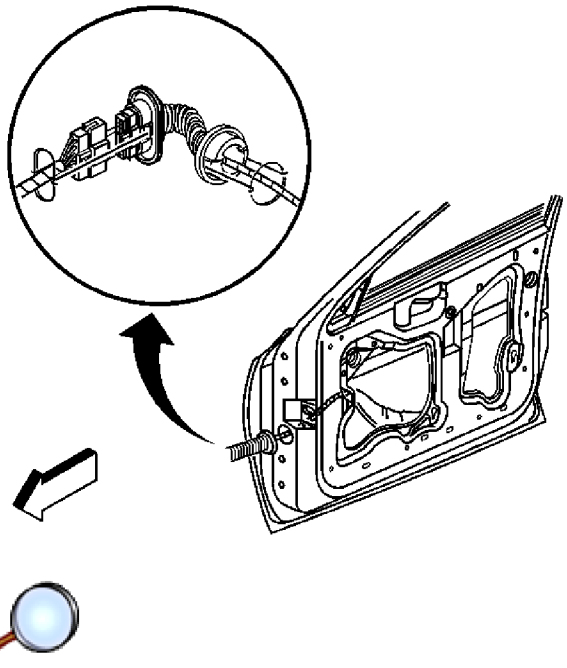
   Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

2. Disconnect the negative battery cable.
3. Remove the trim panel. Refer to the following procedures:
   - Front Side Door Trim Panel Replacement
   - Rear Side Door Trim Panel Replacement
4. Remove the water deflector. Refer to Door Water Deflector Replacement or Rear Side Door Water Deflector Replacement .

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5. Disconnect all of the electrical connections (2) from the door electrical components.
6. Remove the rubber conduit from the door.



7. Remove the wire harness (2) from the door.
8. Support the door and remove the door mounted nuts.
9. Remove the door, with the aid of an assistant.

Installation Procedure

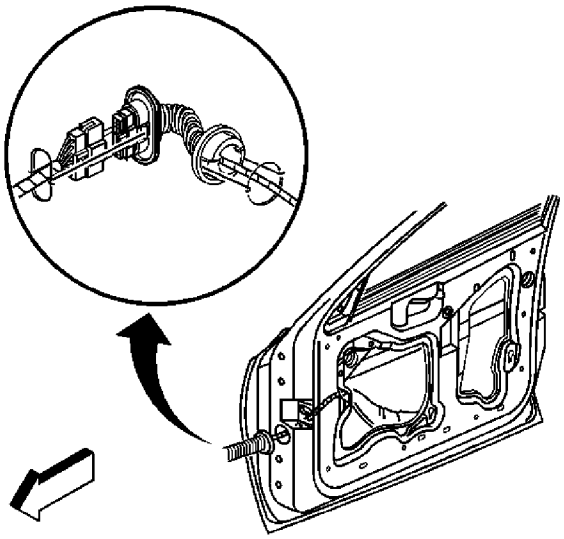
1. Install the door to the body, with the aid of an assistant.
2. Inspect the door for proper alignment of the door to the body and the lock-to-striker engagement.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the

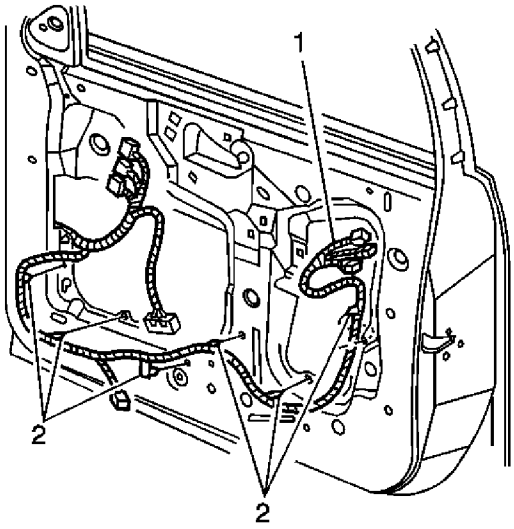
correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Adjust the door as needed by loosening the door mounting fasteners and positioning the door to the desired location.

Tighten
Tighten the nuts to 47 N·m (35 lb ft).



4. Install the wire harness to the door.
5. Install the rubber conduit to the door.

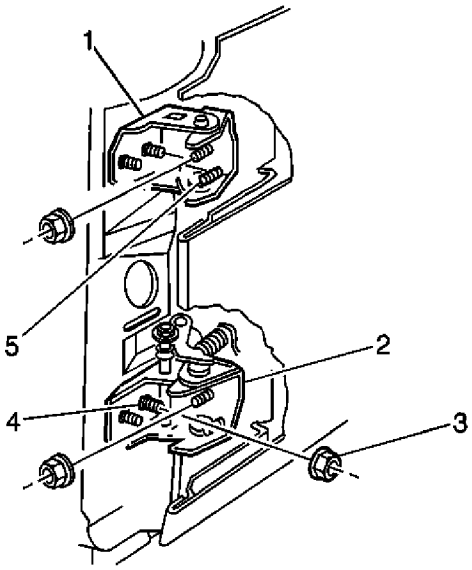




6. Connect all of the electrical connections (2) to the door electrical components.
7. Install the water deflector. Refer to Door Water Deflector Replacement .
8. Install the trim panel. Refer to the following procedures:
   - Front Side Door Trim Panel Replacement
   - Rear Side Door Trim Panel Replacement
9. Connect the negative battery cable.

Door Hinge Replacement

Removal Procedure



1. Remove the door. Refer to Door Replacement .
2. Mark the position of the hinges (1) on the body pillar.
3. Mark the position of the hinge on the door (2).
4. Remove the fasteners (3) from the pillar side of the hinge.
5. Remove the hinge half from the pillar (1).

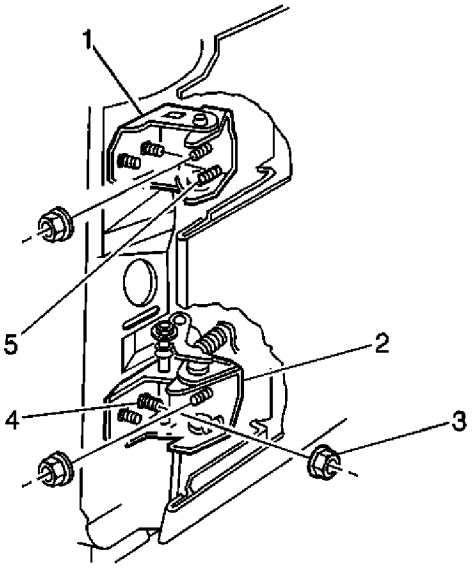
Important: Be careful to secure the studplate within the door, when removing the hinge half from the door. The studplate is not attached to the door and could fall into the door.

6. Check for the location of the studplate.
7. Remove the door trim panel. Refer to Front Side Door Trim Panel Replacement .
8. Remove the hinge fasteners (3) from the door.
9. Remove the hinge half from the door.

Installation Procedure

1. Align the hinge half (1) to the body.

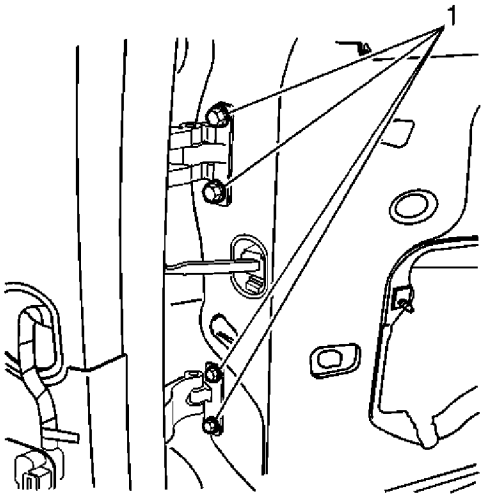
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Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the hinge to the body fasteners (3).

Tighten
Tighten the fasteners to 47 N·m (35 lb ft).





3. Align the door half of the hinge with the marks made on the door during removal.
4. Install the hinge to door fasteners.

   Tighten
   Tighten the fasteners to 47 N·m (35 lb ft).

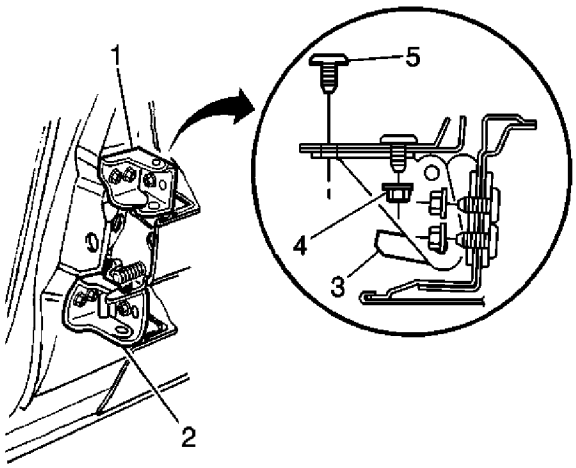
5. Install the door. Refer to Door Replacement .
6. Install the door trim panel. Refer to Front Side Door Trim Panel Replacement .

   Notice: Striker alignment is a crucial part of door latch operation. Do not use the door striker to adjust the door to the vehicle. Failure to properly adjust the striker can result in damage to the door latch and the striker.

7. Inspect the door for proper alignment. Adjust the door as needed.
8. Touch up any paint damage to the hinge fasteners with body color paint.
9. Inspect the door alignment.

Rear Side Door Upper Hinge and Lower Hinge Replacement

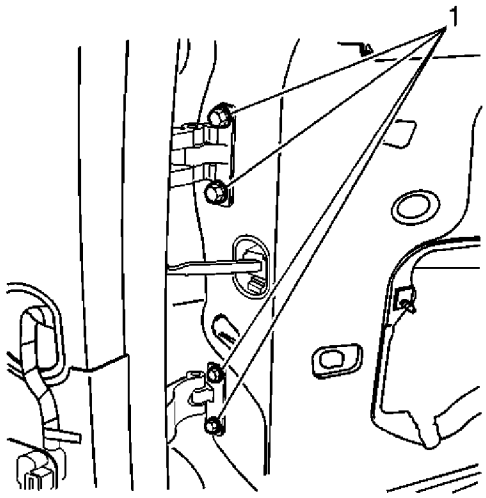
Removal Procedure



1. Remove the door. Refer to Door Replacement .
2. Mark the position of the hinge (1,2) on the body.
3. Remove the hinge to body fasteners.

Important: Be careful to secure the studplate within the door, when removing the hinge half from the door . The studplate is not attached to the door and could fall into the door.

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4. Remove the door trim panel. Refer to one of the following procedures:

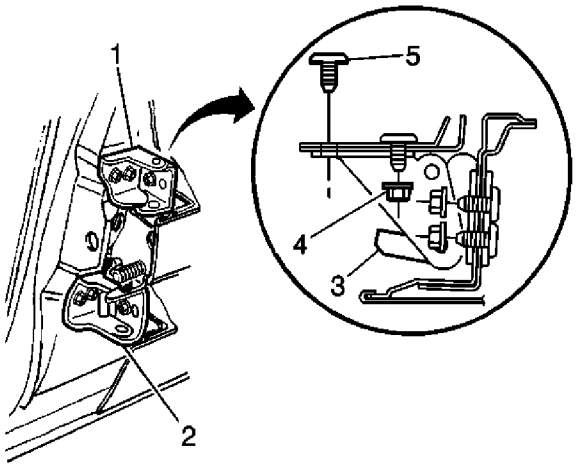
   Rear Side Door Trim Panel Replacement

   Rear Side Door Trim Panel Replacement

   Rear Side Door Trim Panel Replacement

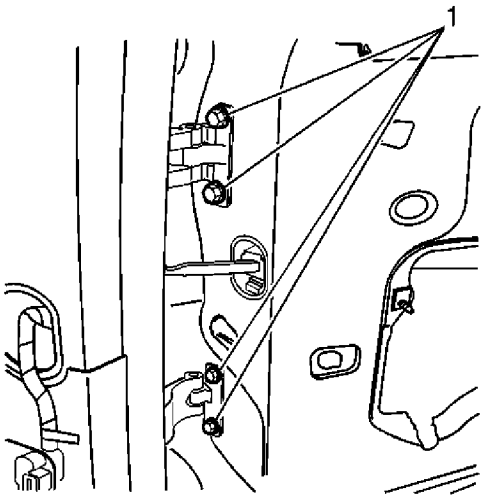
5. Mark the position of the hinge on the door.
6. Remove the hinge to door fasteners (1).

Installation Procedure



1. Align the body side half of the hinge (1,2) to the marks made on the pillar during removal.
2. Install the hinge half to the body.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.



3. Install the fasteners.

Tighten
Tighten the hinge to body fasteners to 35 N·m (26 lb ft).

4. Align the door half of the hinge to the marks made on the door during removal.
5. Install the fasteners (1).

Tighten
Tighten the hinge to door fasteners to 34 N·m (24 lb ft).

6. Touch up any damage to the hinge fasteners (1) with body color paint.
7. Install the door. Refer to Door Replacement .
8. Install the door trim panel. Refer to one of the following procedures:

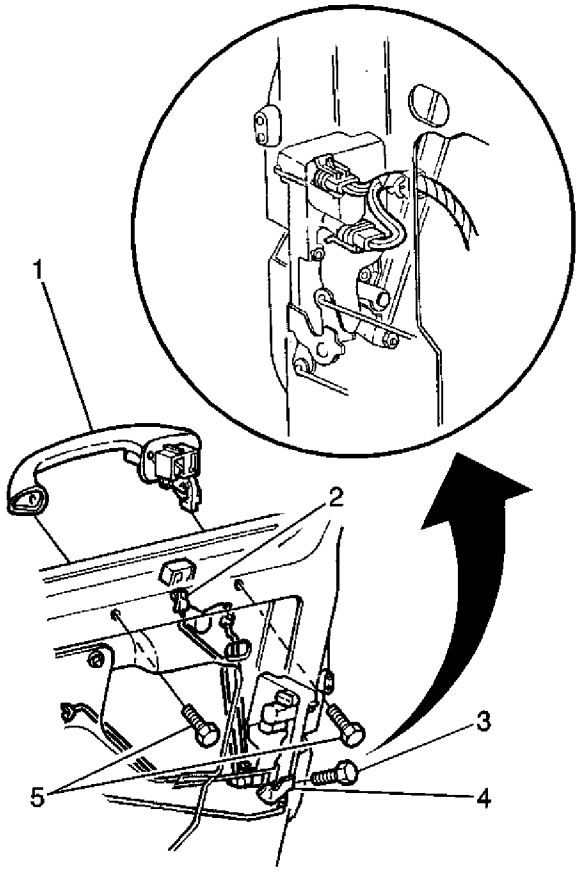
Rear Side Door Trim Panel Replacement

Rear Side Door Trim Panel Replacement

Rear Side Door Trim Panel Replacement

Door Outside Handle Replacement (Buick)

Removal Procedure



Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

1. Disconnect the negative battery cable.

   Important: Ensure that the window is in the full up position.

2. Remove the door trim panel. Refer to one of the following procedures:
   - Front Side Door Trim Panel Replacement
   - Rear Side Door Trim Panel Replacement

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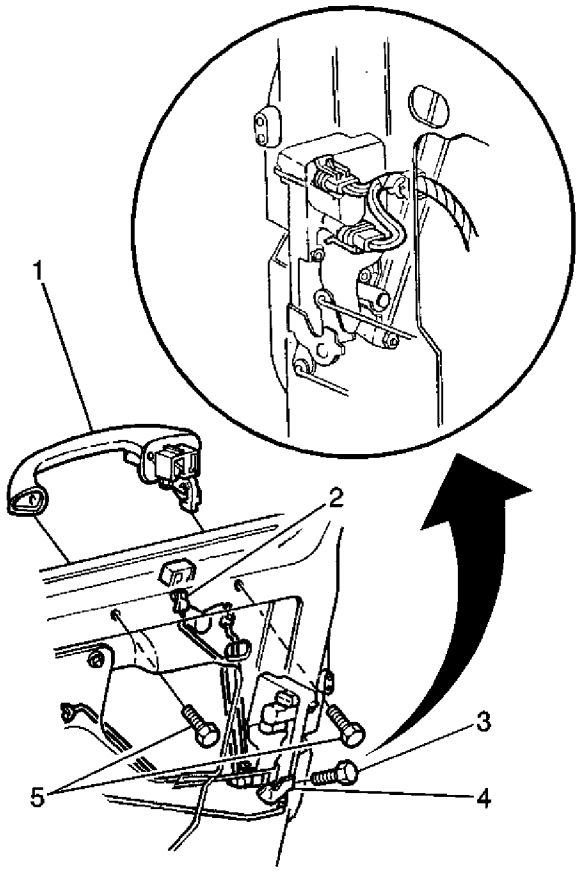
3. Remove the water deflector. Refer to Door Water Deflector Replacement or Rear Side Door Water Deflector Replacement .
4. Loosen the two bolts from the door handle.

Important: Be careful when removing the door handle.

5. Cover the exterior painted surface to avoid scratching the painted surface.
6. Note the amount of threads showing above the lock rod clips.
7. Remove the linkage (2).
8. Discard the lock rod clips.
9. Remove the fasteners (5).
10. Remove the door handle (1).

Installation Procedure

1. Install the fasteners (5).
2. If necessary, thread the lock rod into or out of the barrel on the lock rod clip at the lock assembly in order to ensure the correct amount of threaded area is visible.
3. Install the lock rods to the handle.



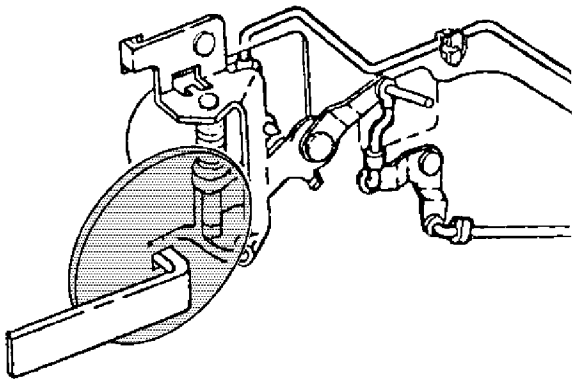
4. Install the handle (1).
5. Install the two door handle bolts (5).
6. Apply slight downward pressure on the lock lever. Apply upward pressure on the lock rod.
7. Hold the lever up. Rotate the barrel nut until the end of the nut aligns with the hole in the

attaching clip.

8. Install the water deflector. Refer to Door Water Deflector Replacement or Rear Side Door Water Deflector Replacement .
9. Install the door trim panel. Refer to one of the following procedures:
   - Front Side Door Trim Panel Replacement
   - Rear Side Door Trim Panel Replacement
10. Connect the negative battery cable.

Door Inside Handle Replacement

Removal Procedure



Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

1. Disconnect the negative battery cable.
2. Remove the trim panel. Refer to the following procedures:
   - Front Side Door Trim Panel Replacement
   - Rear Side Door Trim Panel Replacement
3. Remove the water deflector. Refer to Door Water Deflector Replacement or Rear Side Door Water Deflector Replacement .
4. Remove the door handle rivets.
   4.1. Center punch a depression in the head of the rivet.
   4.2. Drill out the rivet with a 4 mm (3/16 in) drill bit.
5. Remove the inside remote handle.

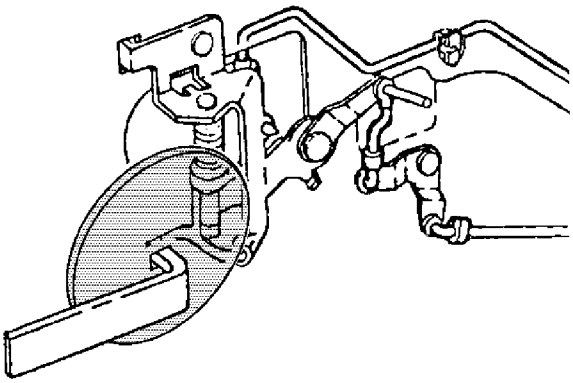
   Slide the handle rearward in order to disengage the tabs on the handle from the slots in the door.

6. Remove the handle to the lock rod and the short lock rod from the bellcrank (if equipped).

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Installation Procedure

1. Install the handle to the lock rod and the short lock rod (if equipped).





2. Install the inside remote handle.

   Place the tabs on the handle into the slots in the door and slide the handle forward.

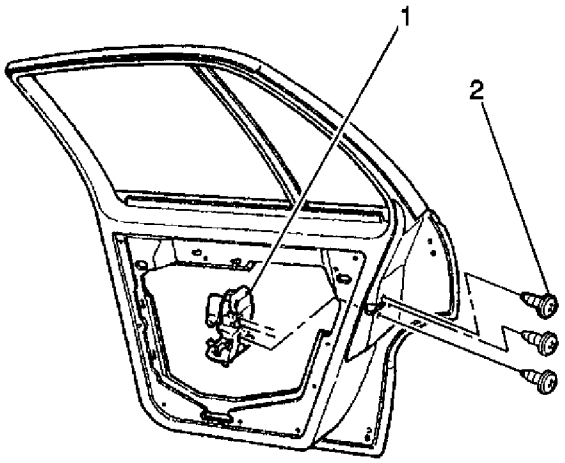
3. Secure the rivets.

   Use 4 mm (3/16 in) peel type rivets.

4. Install the water deflector. Refer to Door Water Deflector Replacement or Rear Side Door Water Deflector Replacement .
5. Install the trim panel. Refer to the following procedures:
   - Front Side Door Trim Panel Replacement
   - Rear Side Door Trim Panel Replacement
6. Connect the negative battery cable.

Door Lock Replacement (Buick)

Removal Procedure

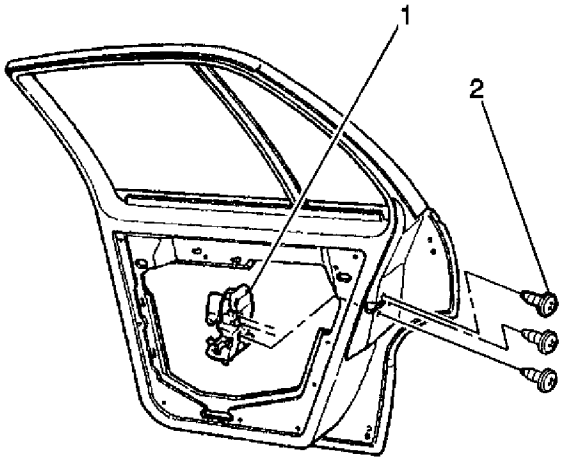


Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

1. Disconnect the negative battery cable.
2. Remove the trim panel. Refer to the following procedures:
   - Front Side Door Trim Panel Replacement
   - Rear Side Door Trim Panel Replacement
3. Remove the water deflector. Refer to Door Water Deflector Replacement or Rear Side Door Water Deflector Replacement .
4. Remove the lock rods.
5. Cut out the lock rod clips. Discard the lock rod clips.
6. Disconnect the electrical connectors.
7. Remove the door lock fasteners (2).
8. Remove the lock mechanism (1).

Installation Procedure

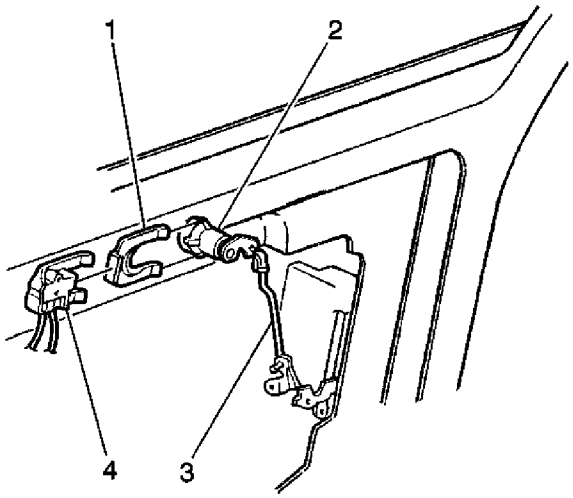
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1. Install the new lock rod clips to the lock rods.
2. Install the lock mechanism (1).
3. Install the door lock fasteners (2).
4. Connect the electrical connectors.
5. Install the lock rods.
6. Install the water deflector. Refer to Door Water Deflector Replacement or Rear Side Door Water Deflector Replacement .
7. Install the trim panel. Refer to the following procedures:
   - Front Side Door Trim Panel Replacement
   - Rear Side Door Trim Panel Replacement
8. Connect the negative battery cable.

Door Lock Cylinder Replacement (Buick)

Removal Procedure



Important: Ensure that the window is in the full up position.

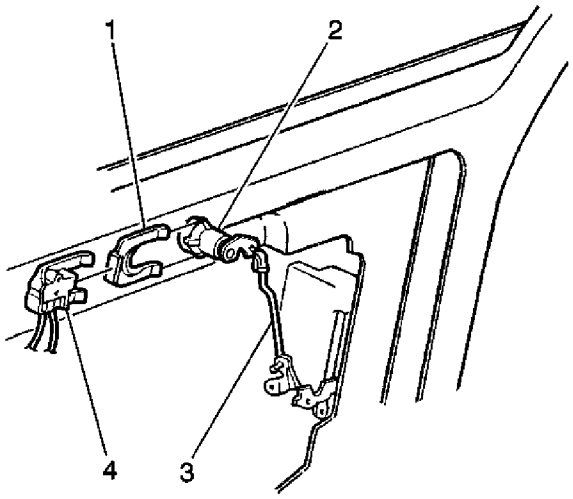
1. Remove the door trim panel. Refer to Front Side Door Trim Panel Replacement .
2. Remove the water deflector. Refer to Door Water Deflector Replacement .
3. Tape the window to the header.
4. Remove the window sash nuts.
5. Remove the window from the regulator.
6. Carefully lower the regulator to allow access to the outside door handle.

Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

7. Disconnect the negative battery cable.
8. Disconnect any wire harness (4) that is present.
9. Remove the three screws from the lock assembly (if applicable).
10. Disconnect the locking rod retainer.
11. Remove the locking rod (3).
12. Remove the lock nut or the retainer (1).
13. Remove the cylinder (2).

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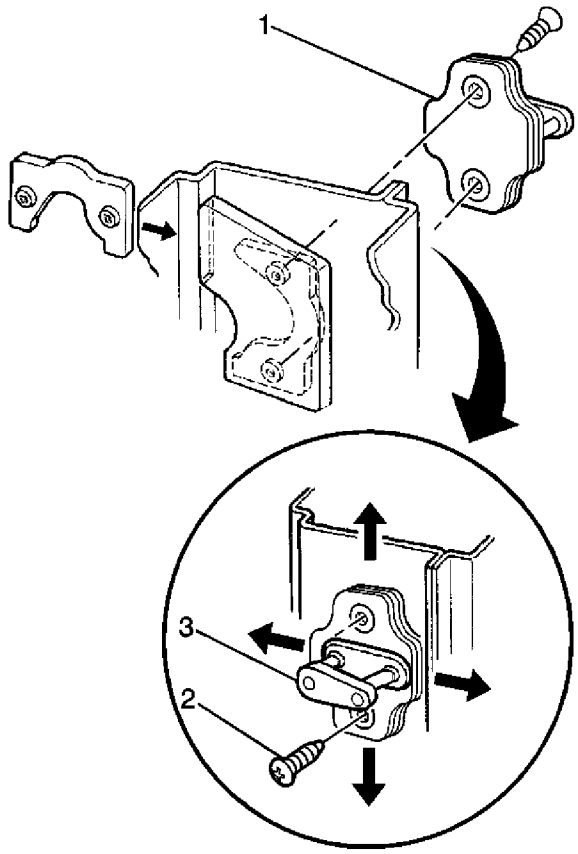
Installation Procedure



1. Install the gasket over the cylinder (2), (if supplied).
2. Install the cylinder (2), including any wire harnesses (4) that may be attached.
3. Install the lock cylinder nut or retainer (1).
4. Connect any wire harness (4), if disconnected.
5. Install the lock rod (3) to the lock assembly.
6. Install a new lock rod retainer clip if the original clip was damaged or broken.
7. Install the three screws to the lock assembly (if applicable).
8. Connect the negative battery cable.
9. Raise the window regulator in order to install the window.
10. Install the window to the regulator.
11. Install the window sash nuts.
12. Remove the tape that is securing the window.
13. Adjust the window. Refer to Front Side Door Window Adjustment .
14. Install the water deflector. Refer to Door Water Deflector Replacement .
15. Install the door trim panel. Refer to Front Side Door Trim Panel Replacement .
16. Verify the door lock operation.

Door Striker Replacement

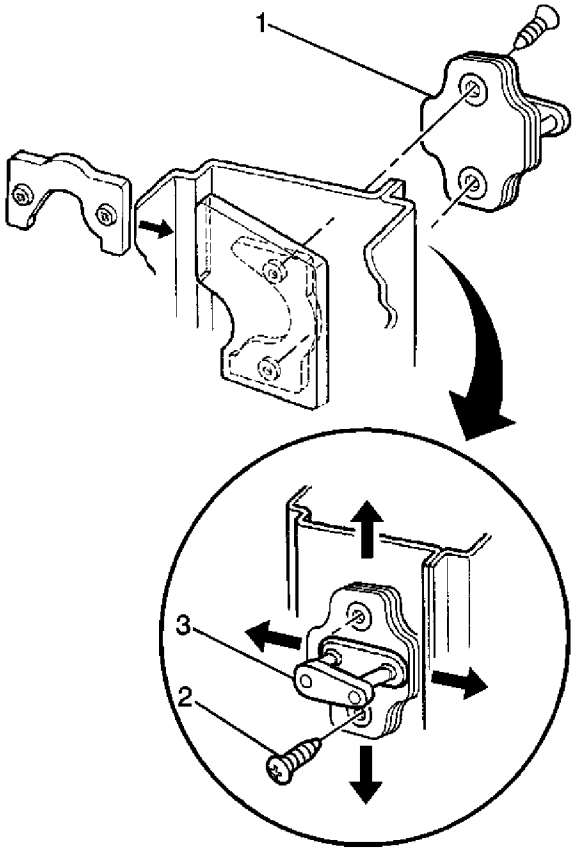
Removal Procedure



1. Loosen the striker fasteners (2).
2. Remove the striker (3).

Installation Procedure

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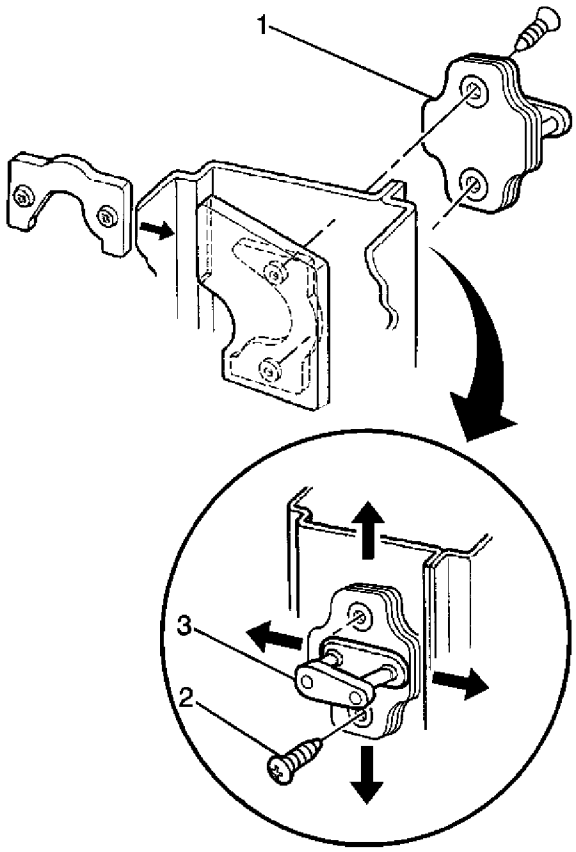
Caution: Striker alignment is crucial for proper operation of the door systems. Do not hit the striker with a hammer or force alignment in any other way. Failure to properly adjust striker will result in excessive door efforts or extensive damage to door system operation which could result in personal injury.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

Align the striker. Refer to Door Lock Striker Adjustment .

Tighten
Tighten the 2 striker bolts (2) to 24 N·m (18 lb ft).

Door Lock Striker Adjustment



Notice: Striker alignment is a crucial part of door latch operation. Do not use the door striker to adjust the door to the vehicle. Failure to properly adjust the striker can result in damage to the door latch and the striker.

Important: Add or remove the spacers (1) as necessary in order to ensure that the fastener (2) of the door latch fork is centered on the striker (3) post.

1. Loosen the fasteners (2) from the striker (3).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

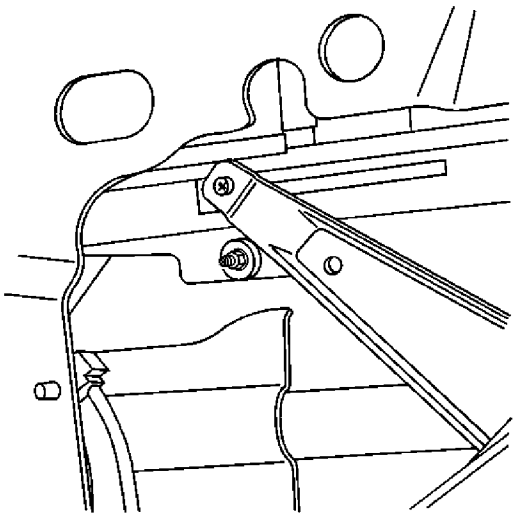
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2. Tighten the 2 bolts (2) of the striker (3) finger tight. Ensure that the striker (3) moves with light force.

   Tighten
   Tighten the bolts of the striker to 24 N·m (18 lb ft).

3. Hold the outside handle out and gently push the door against the body in order to ensure a flush fit.
4. Unlatch and slowly open the door.
5. Inspect the door for the following conditions:
   - Fit
   - Opening effort
   - Closing effort
6. Repeat steps 1-6 if required.
7. Touch up any exposed or unpainted surface on the lock pillar.

Front Side Door Window Adjustment



1. Ensure that the window is in the full up position.
2. Remove the trim panel. Refer to Front Side Door Trim Panel Replacement .
3. Remove the water deflector. Refer to Door Water Deflector Replacement .
4. Tighten the front run channel bolt in the center of the slot.
5. Loosen the fasteners that retain the window to the module sash.
6. Lower the glass 9 cm (3 in).
7. Slide the glass rearward in the sash fasteners.
8. Raise the glass.
9. Tighten the fasteners that retain the window to the module sash.
10. Cycle the window up and down in order to inspect operation.
11. Install the water deflector. Refer to Door Water Deflector Replacement .
12. Install the trim panel. Refer to Front Side Door Trim Panel Replacement .

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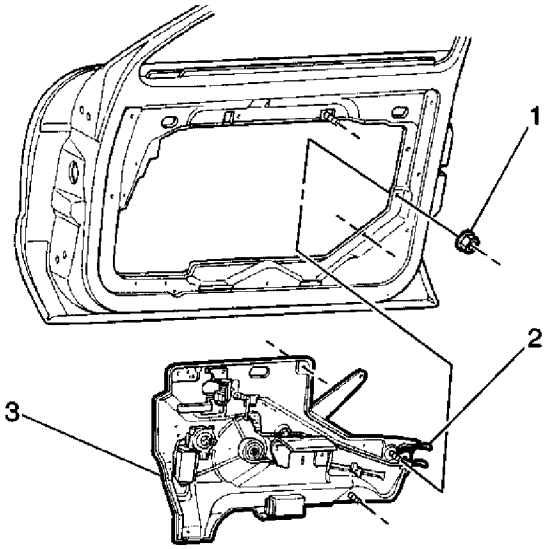
Rear Side Door Window Adjustment

1. Ensure that the window is in the full up position.
2. Remove the door trim panel. Refer to Rear Side Door Trim Panel Replacement .
3. Remove the water deflector. Refer to Door Water Deflector Replacement .
4. Loosen the front run channel fasteners.
5. Loosen the fasteners that retain the window to the module sash.
6. Lower the glass 9 cm (3 in).
7. Slide the glass forward in the sash slots.
8. Raise the glass.
9. Tighten the fasteners that retain the window to the module sash.
10. Tighten the front run channel fasteners.
11. Cycle the window up and down in order to inspect the operation.
12. Install the water deflector. Refer to Door Water Deflector Replacement .
13. Install the trim panel. Refer to Rear Side Door Trim Panel Replacement .

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Front Side Door Window Module Replacement

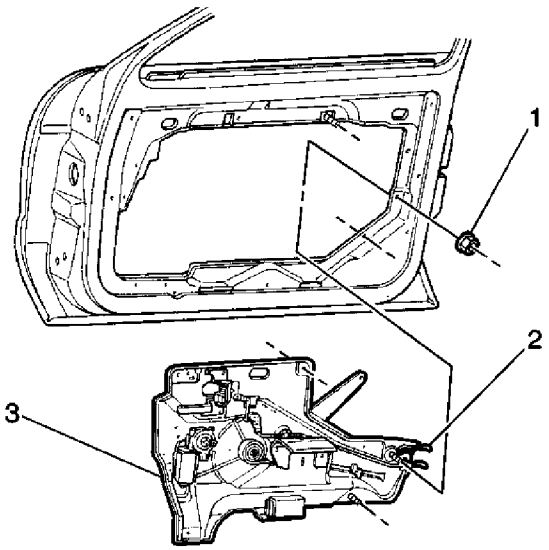
Removal Procedure



1. Remove the door trim panel. Refer to Front Side Door Trim Panel Replacement .
2. Remove the water deflector. Refer to Door Water Deflector Replacement .
3. Lower the glass 3 cm (1 in).
4. Disconnect the electrical connectors.
5. Remove the speaker panel.
6. Remove the wiring harness retainers.
7. Tape the glass to the header.
8. Remove the nuts from the window sash.
9. Remove the front window channel. Refer to Front Side Door Window Channel Replacement .
10. Disconnect the rod from the outside door handle.
11. Disconnect the rod from the lock cylinder.
12. Remove the three door lock fasteners.
13. Remove the fasteners from the door module.
14. Remove the door module (3) with the lock attached.

Installation Procedure

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1. Install the door module (3) with the lock attached.
2. Install the fasteners to the door module in order to secure.
3. Instal the fasteners to the door lock.
4. Connect the rod to the lock cylinder.
5. Connect the rod to the outside door handle.
6. Install the fasteners to the window sash.
7. Install the front window channel. Refer to Front Side Door Window Channel Replacement .
8. Remove the tape from the glass.
9. Install the wiring harness retainers.
10. Install the speaker panel.
11. Connect the electrical connectors.
12. Adjust the window. Refer to Front Side Door Window Adjustment .
13. Install the water deflector. Refer to Door Water Deflector Replacement .
14. Install the door trim panel. Refer to Front Side Door Trim Panel Replacement .

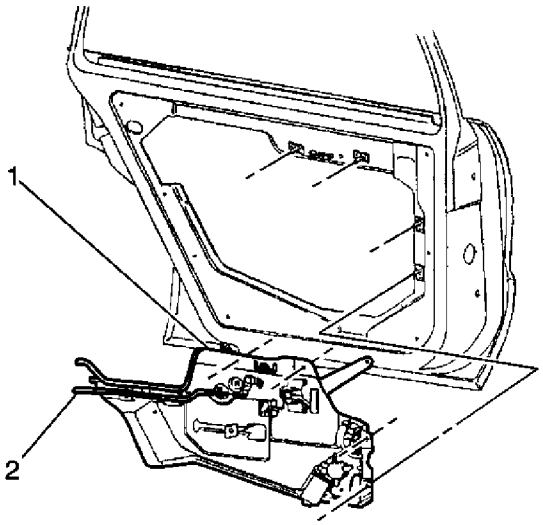
Rear Side Door Window Module Replacement

Removal Procedure

1. Lower the glass 3 cm (1 in).
2. Disconnect the negative battery cable. Refer to

Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

in Engine Electrical.

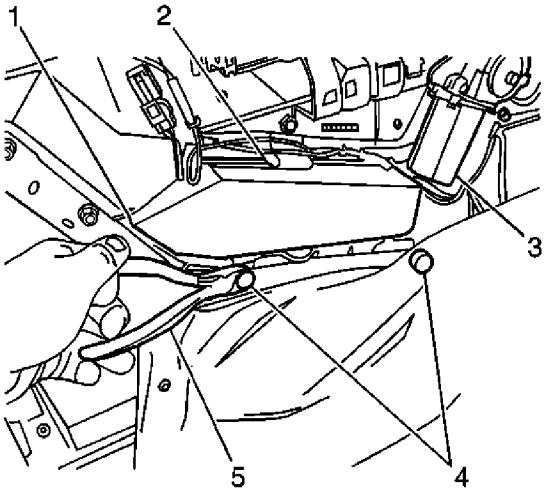


3. Remove the trim panel. Refer to Rear Side Door Trim Panel Replacement .
4. Remove the hanger plate fasteners (if equipped).
5. Remove the hanger plates (if equipped).
6. Remove the water deflector. Refer to Rear Side Door Water Deflector Replacement .
7. Tape the glass to the header.
8. Remove the glass sash fasteners.
9. Remove the outside door handle and lock rod in order to gain better access.
10. Remove the electrical connectors from the lock.
11. Remove the trim bracket (if equipped).

Caution: This vehicle has energy-absorbing foam blocks for side impact protection. To help avoid personal injury in a collision, foam blocks that are damaged, or removed during repairs must be replaced. Failure to replace foam blocks that are removed can violate federal law.

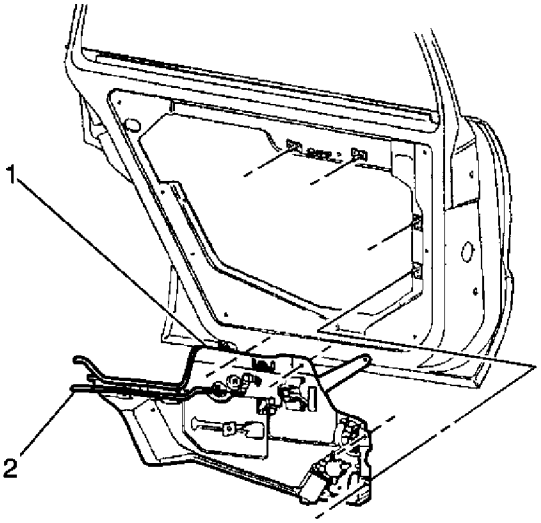
12. Cut the push pins (4) securing the energy-absorbing foam block to the inner door panel.

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13. Remove the energy-absorbing foam block.
14. Remove the rear door module fasteners.
15. Remove the rear door module.

Installation Procedure

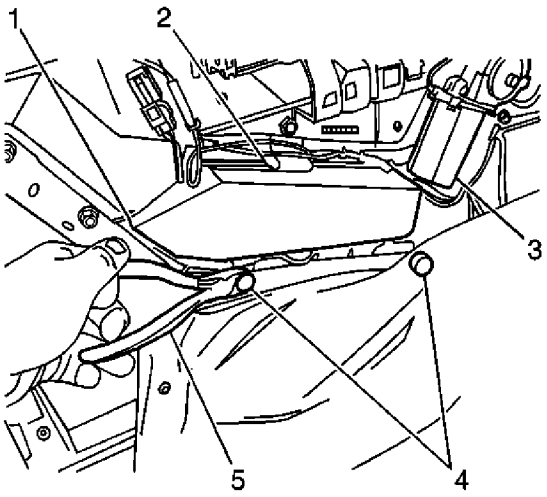


1. Install the rear door module (1) through the access hole.
2. Install the rear door module fasteners.
3. Tighten the fasteners finger tight, in order to hold the module in place.
4. Install the upper trim bracket (if equipped).

Caution: This vehicle has energy-absorbing foam blocks for side impact protection. To help

avoid personal injury in a collision, foam blocks that are damaged, or removed during repairs must be replaced. Failure to replace foam blocks that are removed can violate federal law.

5. Install the energy-absorbing foam block (1).





6. Install new push pin retainers (4) in order to secure the energy-absorbing foam block to the lower inner door panel.

Important: If the lock rod retainer clips were damaged upon lock rod removal, install new retainer clips.

7. Install the lock rods to the lock assembly.
8. Connect the electrical connectors.
9. Tighten the fasteners.
10. Install the outside door handle and lock rod.
11. Install the glass sash fasteners.
12. Remove the tape from the door glass and header.
13. Adjust the window. Refer to Rear Side Door Window Adjustment .
14. Install the water deflector. Refer to Rear Side Door Water Deflector Replacement .
15. Install the rear door hanger plates.
16. Install the hanger plate fasteners.
17. Install the trim panel. Refer to Rear Side Door Trim Panel Replacement .
18. Connect the negative battery cable.

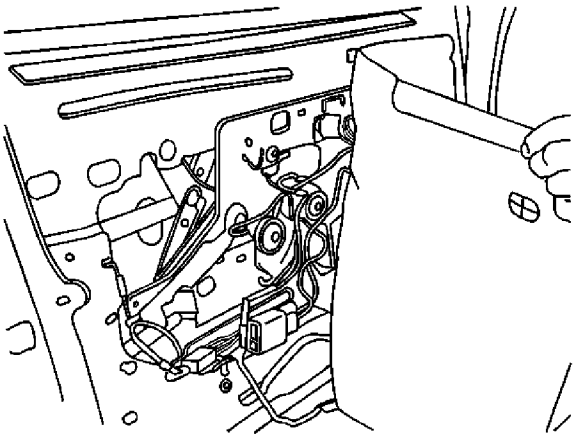
Power Window Motor Replacement

Removal Procedure

1. Ensure that the window is 3 cm (1 in) below the full up position.

   Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

2. Disconnect the negative battery cable.
3. Remove the trim panel. Refer to the following procedures:
   - Front Side Door Trim Panel Replacement
   - Rear Side Door Trim Panel Replacement



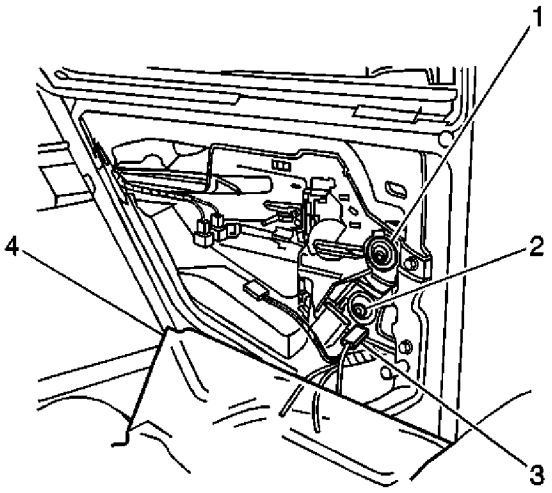


4. Remove the water deflector. Refer to Door Water Deflector Replacement or Rear Side Door Water Deflector Replacement .

   Caution: If this procedure must be done with the regulator out of the vehicle, the counterbalance spring must be removed first. The regulator lift arms are under tension from the counterbalance spring and can cause serious injury if the motor is removed without removing the spring.

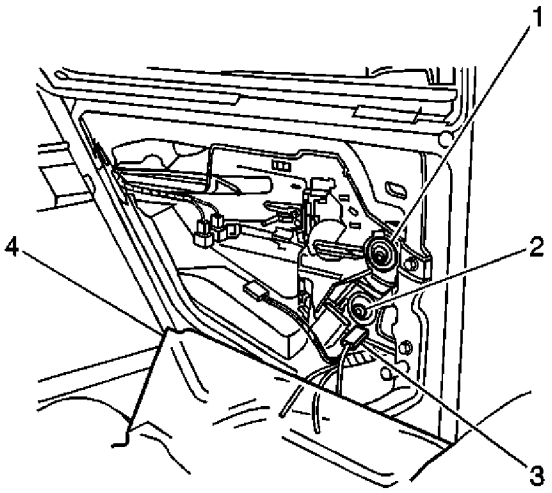
5. Disconnect the electrical connector (3).

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6. Remove the nuts.
7. Remove the actuator (2).

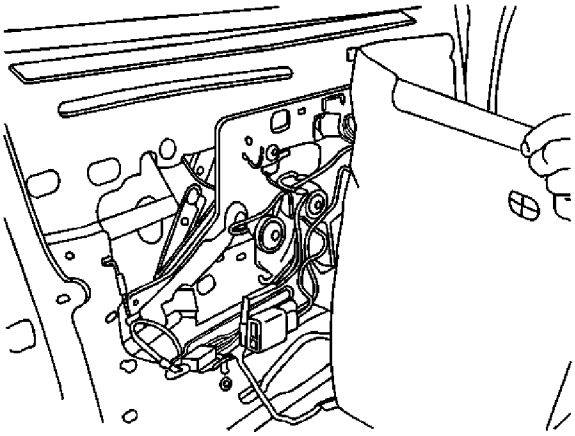
Installation Procedure



1. Install the actuator (2).

   Install the nuts.

2. Connect the electrical connector (3).



3. Install the water deflector. Refer to Door Water Deflector Replacement or Rear Side Door Water Deflector Replacement .
4. Install the trim panel. Refer to the following procedures:
   - Front Side Door Trim Panel Replacement
   - Rear Side Door Trim Panel Replacement
5. Connect the negative battery cable.

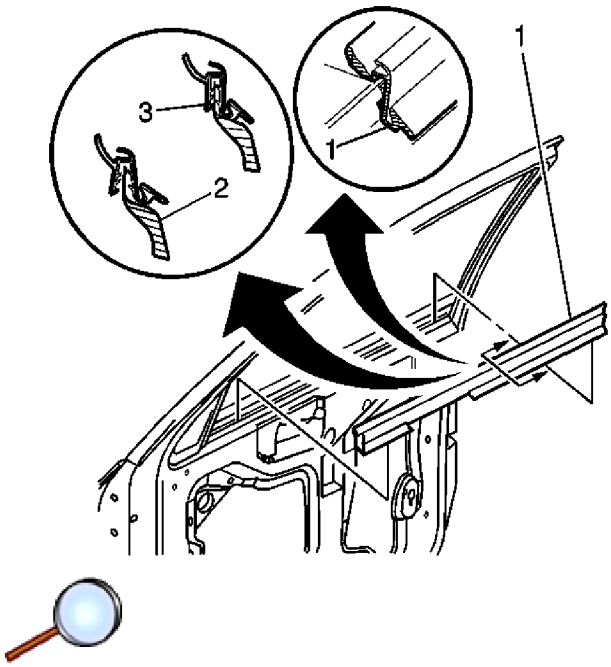
Door Window Replacement (Front Stationary)

Removal Procedure

1. Lower the window.

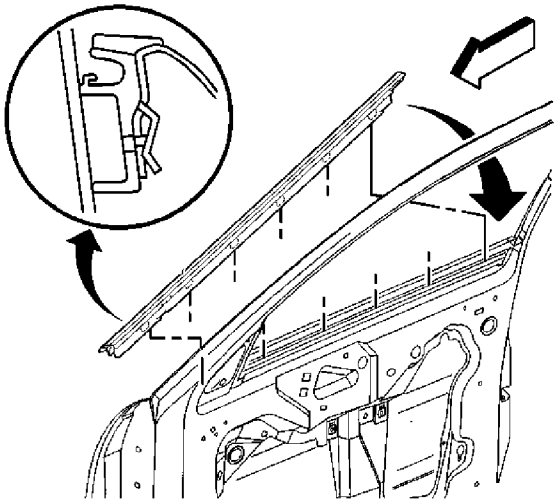
   Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

2. Disconnect the negative battery cable.
3. Remove the door trim panel. Refer to Front Side Door Trim Panel Replacement .



4. Remove the inner door sealing strip. Refer to Front Side Door Window Belt Inner Sealing Strip Replacement .

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5. Remove the outer door sealing strip. Refer to Front Side Door Window Belt Outer Sealing Strip Replacement .
6. In order to remove the outer sealing strip, reach over the door and pull upward on the sealing strip at the securing clip locations.
7. Remove the division post garnish molding.
8. Remove the three retaining screws from the division post.
9. Remove the retainer from the upper rear corner of the glass run channel.
10. Peel the glass run channel from the top edge and the rear (vertical) edge of the door.
11. Pull upward on the forward edge of the glass run channel to disengage the two locator clips.
12. Remove the glass channel from the door.

Installation Procedure

1. Beginning with the forward edge, install the glass run channel onto the door.
2. Secure the locator clips into the slots on the forward edge of the door.
3. Firmly secure the rest of the glass channel into place, starting at the lower rear corner.
4. Work your way up the rear (vertical) edge and across the top edge.
5. Secure the vertical edge first, and then move across the top edge.
6. Secure the retainer to the upper rear corner of the glass run channel.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

7. Install the three retaining screws to the division post.

Tighten
Tighten the three retaining screws in the following sequence to 3 N·m (27 lb in).

Install the middle screw first.

Tighten
Tighten the middle screw to 3 N·m (27 lb in).

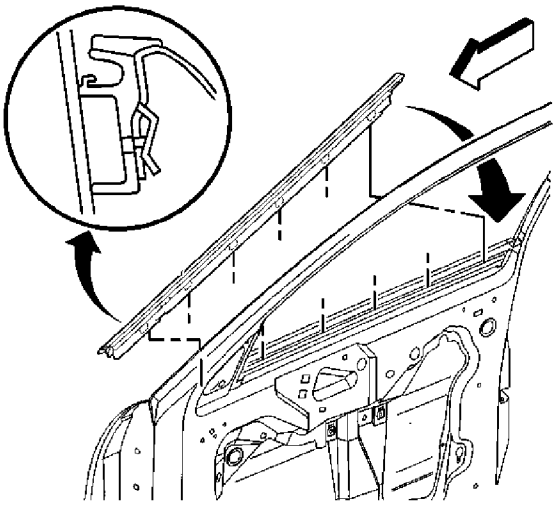
8. Install the top screw second.

   Tighten
   Tighten the top screw to 3 N·m (27 lb in).

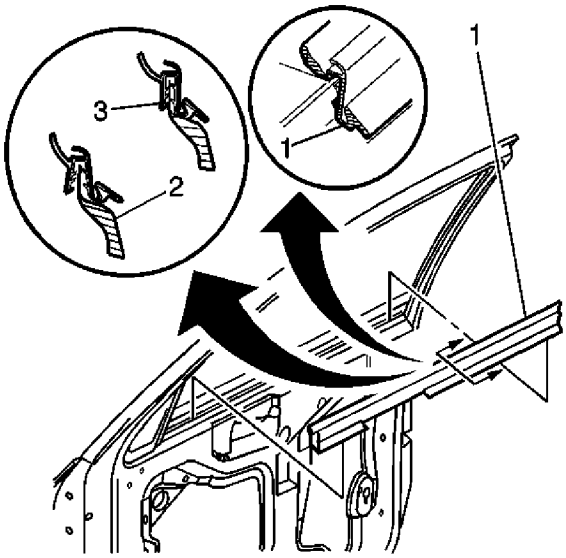
9. Install the bottom screw last.

   Tighten
   Tighten the bottom screw to 3 N·m (27 lb in).

10. Install the division post garnish molding.



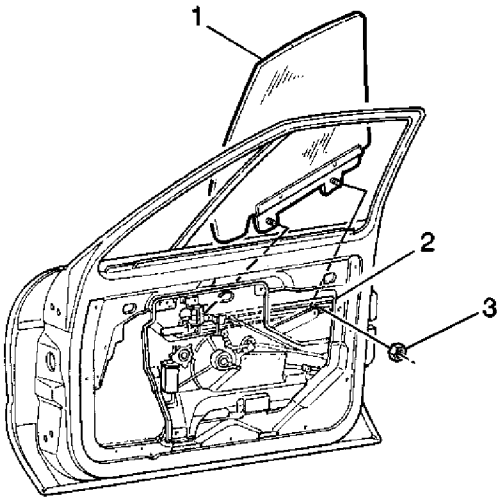
11. Install the outer door sealing strip. Refer to Front Side Door Window Belt Outer Sealing Strip Replacement .



12. Install the inner door sealing strip. Refer to Front Side Door Window Belt Inner Sealing Strip Replacement .
13. Install the door trim panel. Refer to Front Side Door Trim Panel Replacement .
14. Connect the negative battery cable.
15. Power up the window.

Front Side Door Window Replacement

Removal Procedure

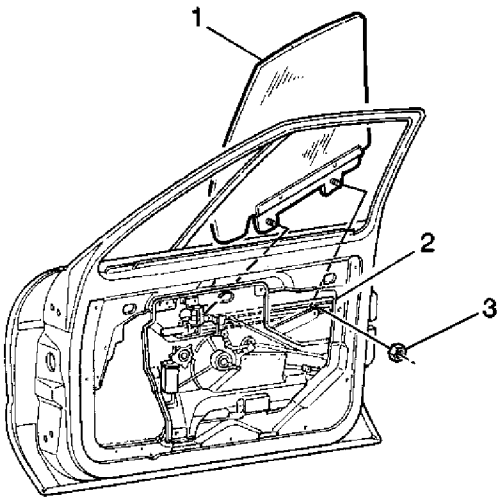


Caution: When working with any type of glass or sheet metal with exposed or rough edges, wear approved safety glasses and gloves in order to reduce the chance of personal injury.

1. Remove the trim panel. Refer to Front Side Door Trim Panel Replacement .
2. Remove the water deflector. Refer to Door Water Deflector Replacement .
3. Remove the inner and the outer sealing strips.
4. Remove the sash fasteners (3).
5. Remove the window (1) from the outboard side.

Installation Procedure

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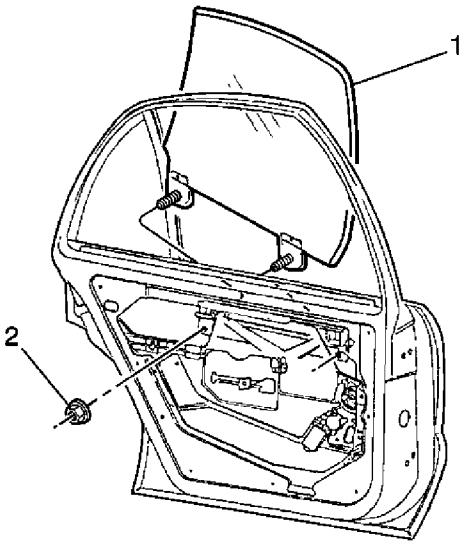


Caution: When working with any type of glass or sheet metal with exposed or rough edges, wear approved safety glasses and gloves in order to reduce the chance of personal injury.

1. Install the window from the outboard side (1).
2. Install the sash fasteners (3).
3. Install the inner and the outer sealing strips.
4. Adjust the window. Refer to Front Side Door Window Adjustment .
5. Install the water deflector. Refer to Door Water Deflector Replacement .
6. Install the trim panel. Refer to Front Side Door Trim Panel Replacement .

Rear Side Door Window Replacement

Removal Procedure

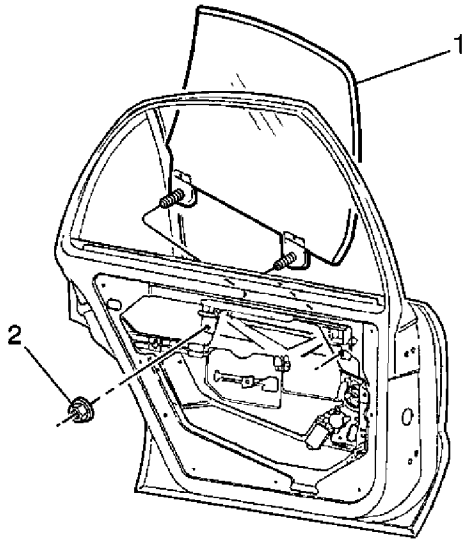


Caution: When working with any type of glass or sheet metal with exposed or rough edges, wear approved safety glasses and gloves in order to reduce the chance of personal injury.

1. Lower the glass 3 cm (1 in).
2. Remove the trim panel. Refer to Rear Side Door Trim Panel Replacement .
3. Remove the water deflector. Refer to Rear Side Door Water Deflector Replacement .
4. Remove the inner and the outer sealing strips.
5. Loosen the front channel assembly bolts.
6. Remove the sash fasteners (2).
7. Remove the window (1) from the outboard side of the door.

Installation Procedure

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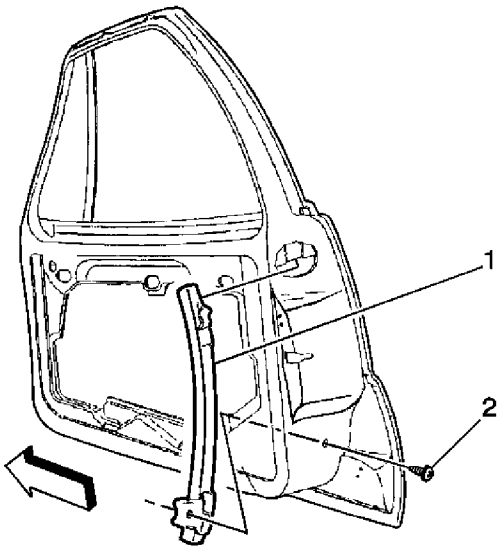


Caution: When working with any type of glass or sheet metal with exposed or rough edges, wear approved safety glasses and gloves in order to reduce the chance of personal injury.

1. Install the window (1) from the outboard side of the door.
2. Install the sash fasteners (2).
3. Install the inner and the outer sealing strips.
4. Adjust the window. Refer to Rear Side Door Window Adjustment .
5. Tighten the front channel assembly upper bolts.
6. Install the water deflector. Refer to Rear Side Door Water Deflector Replacement .
7. Install the trim panel. Refer to Rear Side Door Trim Panel Replacement .

Rear Side Door Window Channel Replacement

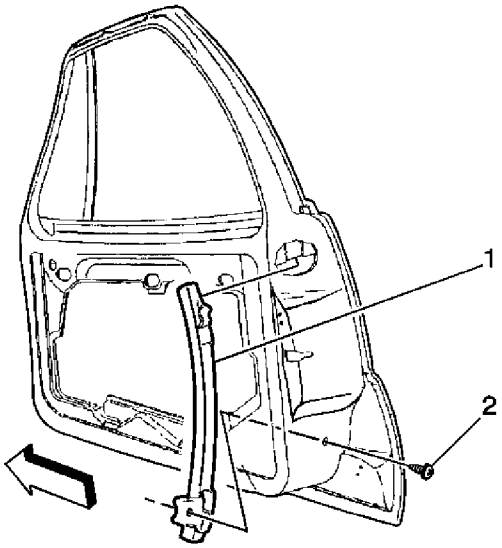
Removal Procedure



1. Remove the trim panel. Refer to Rear Side Door Trim Panel Replacement
2. Remove the water deflector. Refer to Rear Side Door Water Deflector Replacement .
3. Remove the two fasteners (2).
4. Lower the window channel (1) to the bottom of the door.
5. Remove the window channel through the opening below the door module.

Installation Procedure

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1. Install the window channel (1).

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

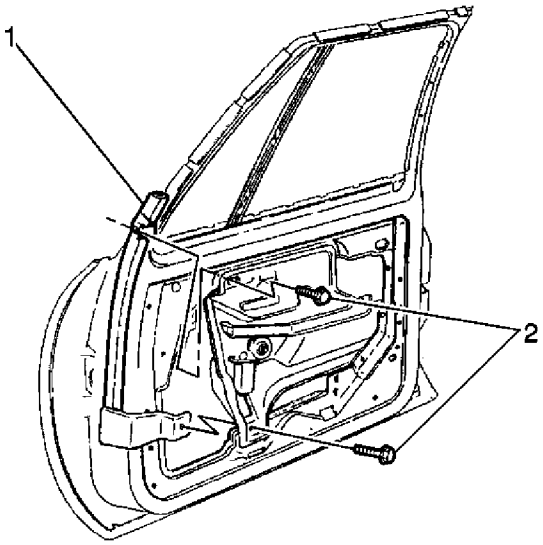
2. Install the fasteners (2).

   Tighten
   Tighten the bolts to 12 N·m (106 lb in).

3. Install the water deflector. Refer to Rear Side Door Water Deflector Replacement .
4. Install the trim panel. Refer to Rear Side Door Trim Panel Replacement .

Front Side Door Window Channel Replacement

Removal Procedure

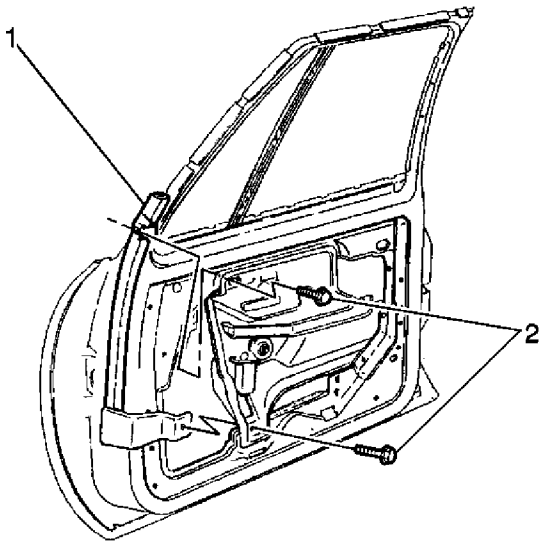


Caution: Disconnect the power window switch when working inside the driver door. When operated, the Express Up/Down Feature allows the door window to move very quickly, without stopping, which could cause personal injury.

1. Remove the trim panel. Refer to Front Side Door Trim Panel Replacement .
2. Remove the trim panel brackets (if applicable).
3. Remove the water deflector. Refer to Door Water Deflector Replacement .
4. Remove the plastic wiring harness shield.
5. Remove the window channel fasteners (2).
6. Move the lower run channel down and to the rear in order to clear the module.
7. Remove the front window channel.

Installation Procedure

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1. Install the front window channel.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

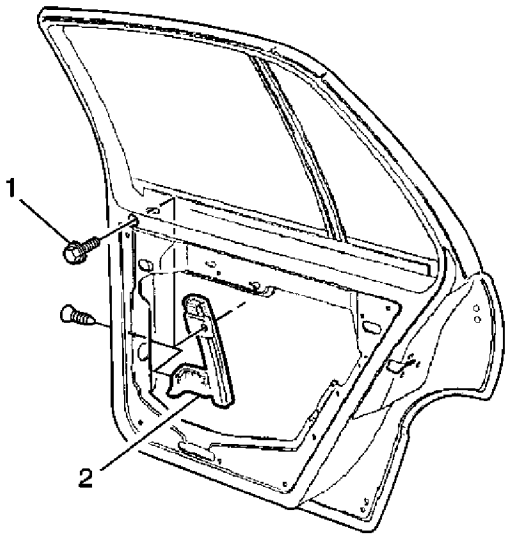
2. Install the window channel fasteners (2).

   Tighten
   Tighten the fasteners to 12 N·m (106 lb in).

3. Install the plastic wiring harness shield.
4. Secure the shield.
5. Install the water deflector. Refer to Door Water Deflector Replacement .
6. Install the trim panel. Refer to Front Side Door Trim Panel Replacement .

Front Side Door Window Rear Channel Replacement

Removal Procedure

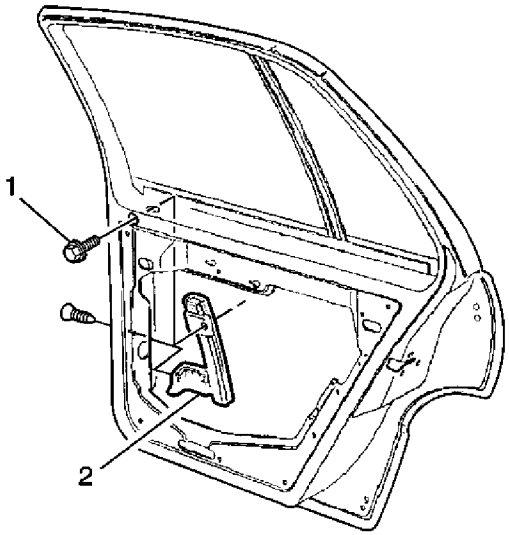


Caution: Disconnect the power window switch when working inside the driver door. When operated, the Express Up/Down Feature allows the door window to move very quickly, without stopping, which could cause personal injury.

1. Remove the door trim panel. Refer to Front Side Door Trim Panel Replacement .
2. Remove the water deflector. Refer to Door Water Deflector Replacement .
3. Remove the fasteners.
4. Move the lower window channel (2) downward and to the front.
5. Remove the window channel (2) through the opening at the front of the door module.

Installation Procedure

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1. Install the front window channel (2).
2. Place the window channel into approximate position with the wire harness behind the channel.
3. Line up the window channel on the window and slide the window channel (2) upward in order to engage the retainer.
4. Push upward and align the lower bracket with the screw hole.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

5. Install the fastener.

Tighten
Tighten the fastener to 10 N·m (88 lb in).

6. Install the water deflector. Refer to Door Water Deflector Replacement .
7. Install the door trim panel. Refer to Front Side Door Trim Panel Replacement .

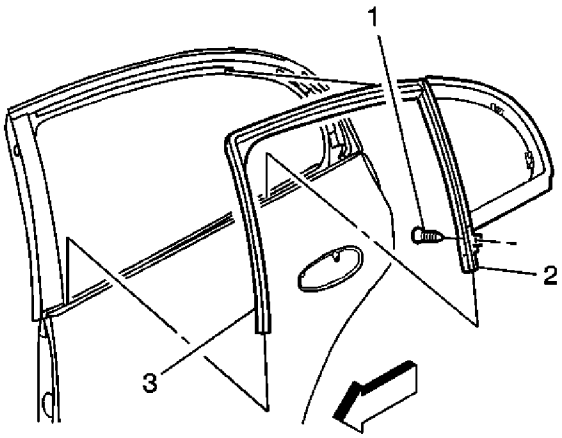
Rear Side Door Stationary Window Replacement

Removal Procedure

1. Lower the window.

   Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

2. Disconnect the negative battery cable.
3. Remove the rear door trim panel. Refer to Rear Side Door Trim Panel Replacement .
4. Remove the inner and outer sealing strips. Refer to Rear Door Window Belt Outer Sealing Strip Replacement or Rear Door Window Belt Inner Sealing Strip Replacement .
5. Pay close attention not to scratch the painted surface of the door.
6. In order to remove the outer sealing strip, reach over the door and carefully pull upward on the lower edge of the sealing strip from the front to the rear.



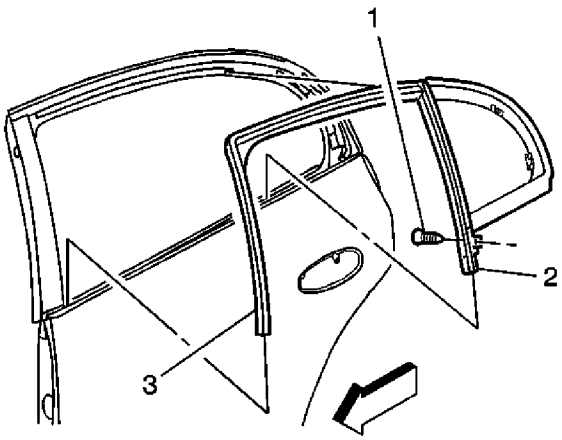


7. Remove the three retaining screws (1) from the division post (2).
8. Remove the division post garnish molding (2).
9. Remove the retainer from the upper forward corner of the glass run channel.
10. Carefully peel the glass run channel from the forward (vertical) edge from top to the bottom.
11. Peel the glass run channel from the top edge rearward to the division post.
12. Push upward and outward at the lower edge of the glass run channel in order to disengage the locator clips.
13. Remove the glass run channel from the door.

Installation Procedure

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1. Install the glass run channel onto the door.
2. Install the locator clips to the rear edge of the door.
3. Secure the rest of the glass run channel into place beginning with the lower forward corner.
4. Work your way up the forward (vertical) edge and across the top edge of the door.
5. Install the retainer to the upper forward corner of the glass run channel.





6. Install the division post garnish molding (2).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

7. Install the three retaining screws to the division post.
8. Install the middle screw first.

Tighten
Tighten the middle screw to 3 N·m (27 lb in).

9. Install the top screw second.

Tighten
Tighten the top screw to 3 N·m (27 lb in).

10. Install the bottom screw third.

Tighten
Tighten the bottom screw to 3 N·m (27 lb in).

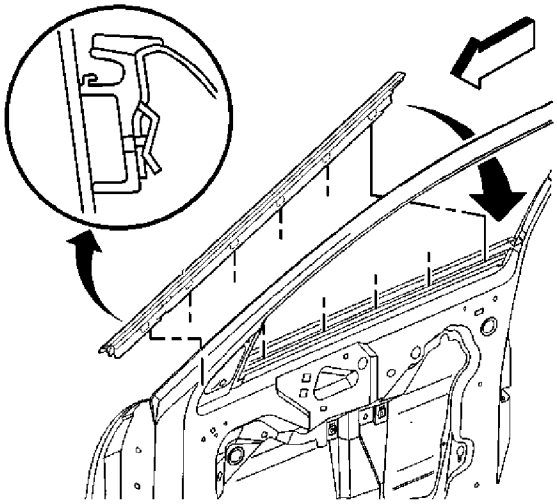
11. Install the inner and outer sealing strips. Refer to Rear Door Window Belt Outer Sealing Strip Replacement or Rear Door Window Belt Inner Sealing Strip Replacement .

12. Install the rear door trim panel. Refer to Rear Side Door Trim Panel Replacement .
13. Connect the negative battery cable.

Front Side Door Window Belt Outer Sealing Strip Replacement

Removal Procedure

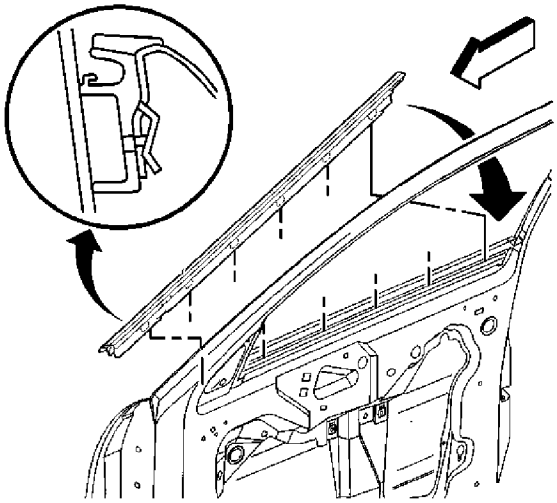
1. Remove the outside rearview mirror. Refer to Power Mirror Replacement .
2. Lower the front door window.



3. Remove the front door outer belt sealing strip from the door pinchweld flange.
   3.1. Lift upwards, starting at the rear, to disengage sealing strip clips.
   3.2. Slide sealing strip rearward to clear the upper auxiliary molding.

Installation Procedure

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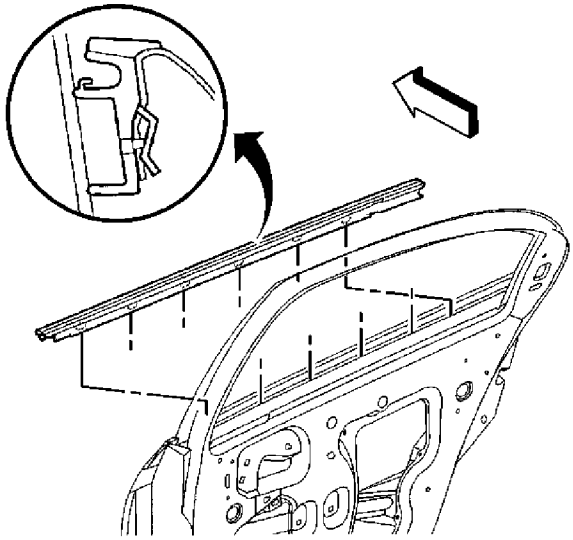


1. Install the front door outer belt sealing strip to the pinchweld flange.
   1.1. Align sealing strip to door.
   1.2. Slide the strip forward and under upper auxiliary molding.
   1.3. Ensure the end cap is flush to door cut line.
   1.4. Rotate the sealing strip downward.
   1.5. Align sealing strip clips to slots in the door pinchweld flange.
   1.6. Push the sealing strip down to fully seat and secure to the door pinchweld flange.
2. Install the outside rearview mirror. Refer to Power Mirror Replacement .
3. Raise the front door window.

Rear Side Door Window Outer Sealing Strip Replacement

Removal Procedure

1. Lower the rear door window.

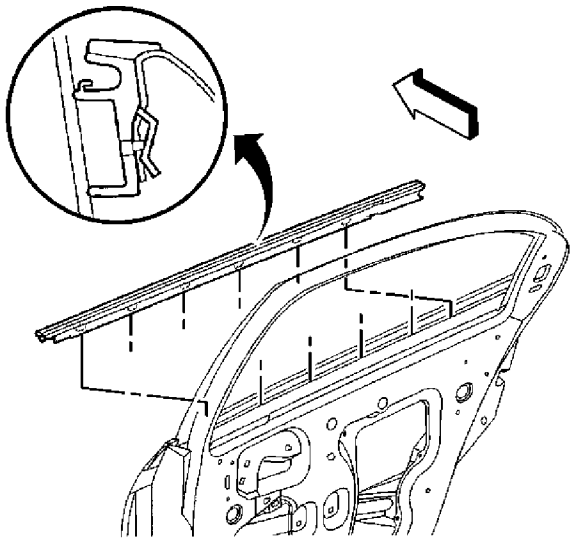




2. Remove rear door outer belt sealing strip from the rear door pinchweld flange, by gently pulling up, being careful not to distort the strip.

Installation Procedure

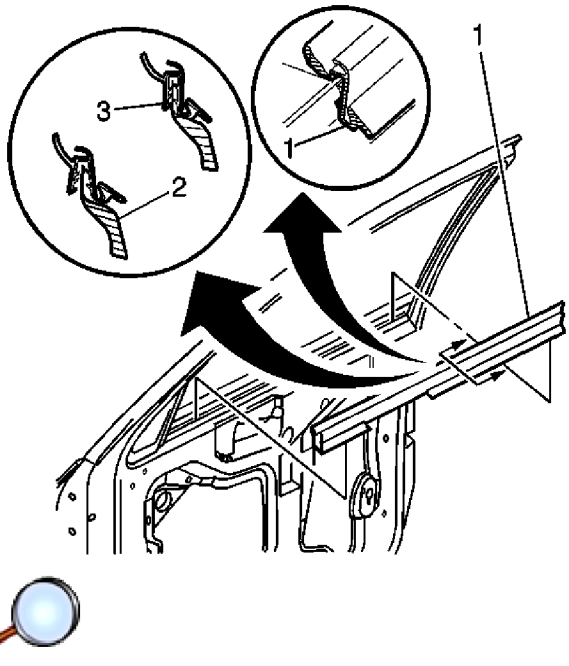
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1. Install the rear door outer belt sealing strip to the rear door pinchweld flange .
   1.1. Align the sealing strip clips to the slots in the pinchweld flange of the door.
   1.2. Push the sealing strip down to fully seat and secure the strip to the door.
2. Raise the rear door window.

Front Side Door Window Belt Inner Sealing Strip Replacement

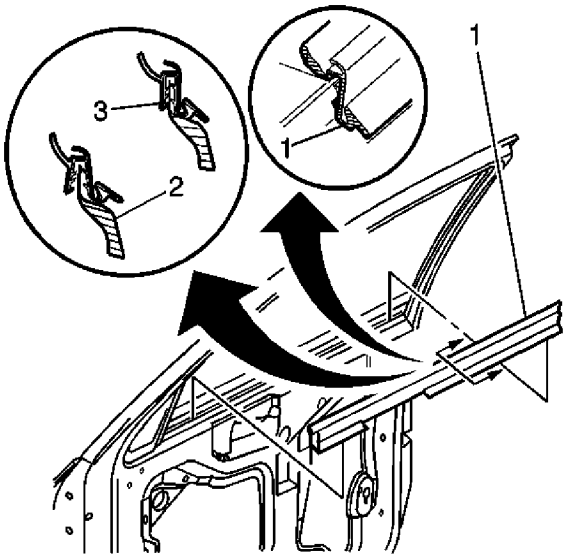
Removal Procedure



1. Lower the window all the way down.
2. Remove the door trim panel. Refer to Front Side Door Trim Panel Replacement .
3. Starting at one end of the window inner belt molding, pull upward to release the molding.

Installation Procedure

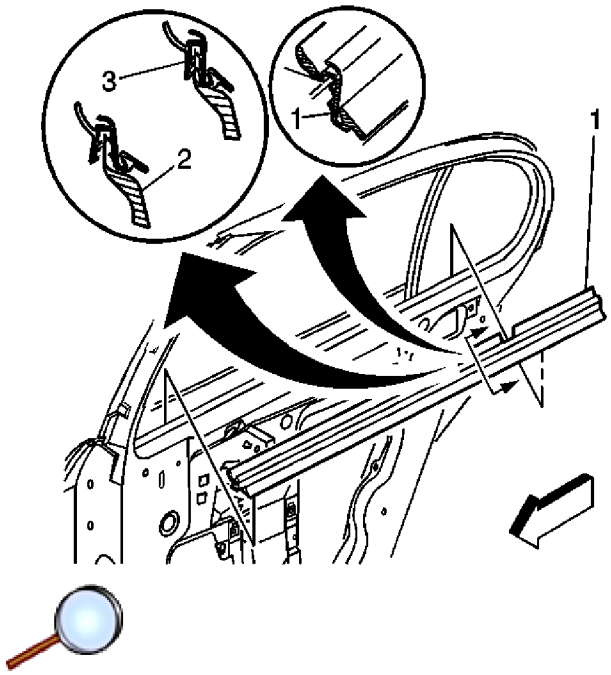
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1. Position the door window inner belt molding over the flange of the door inner panel.
2. Press down, being careful not to distort the molding, in order to engage the door window inner belt molding the entire length of the door.
3. Install the door trim panel. Refer to Front Side Door Trim Panel Replacement .

Rear Side Door Window Inner Sealing Strip Replacement

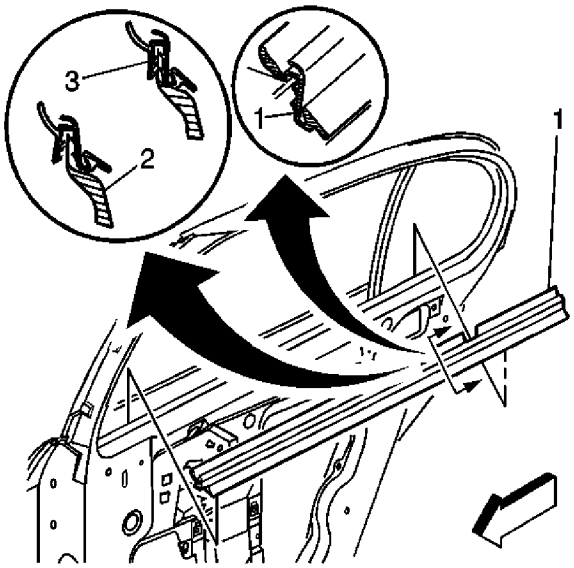
Removal Procedure



1. Lower the window.
2. Remove the door trim panel. Refer to Rear Side Door Trim Panel Replacement .
3. Starting at one end of the door window inner belt molding pull upward in order to release the molding.

Installation Procedure

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1. Position the door window belt molding over the flange of the door inner panel.
2. Position the notch in the belt molding to the rear stationary window frame.
3. Press down in order engage the door window inner belt molding the entire length, being careful not to distort the belt molding.
4. Install the door trim panel. Refer to Rear Side Door Trim Panel Replacement .

Door Weatherstrip Replacement

Removal Procedure

1. Open the door either front or rear.
2. Peel the weatherstrip from the flange.
3. Remove the screws from the auxiliary (dogleg) weatherstrip (rear door only).
4. Remove the auxiliary weatherstrip.

Installation Procedure

1. Align the weatherstrip to the door and press the weatherstrip to the flange in all directions.
2. Install the auxiliary weatherstrip (rear door only).
3. Install the screws to the rear door auxiliary weatherstrip in order to secure.
4. Close the doors.

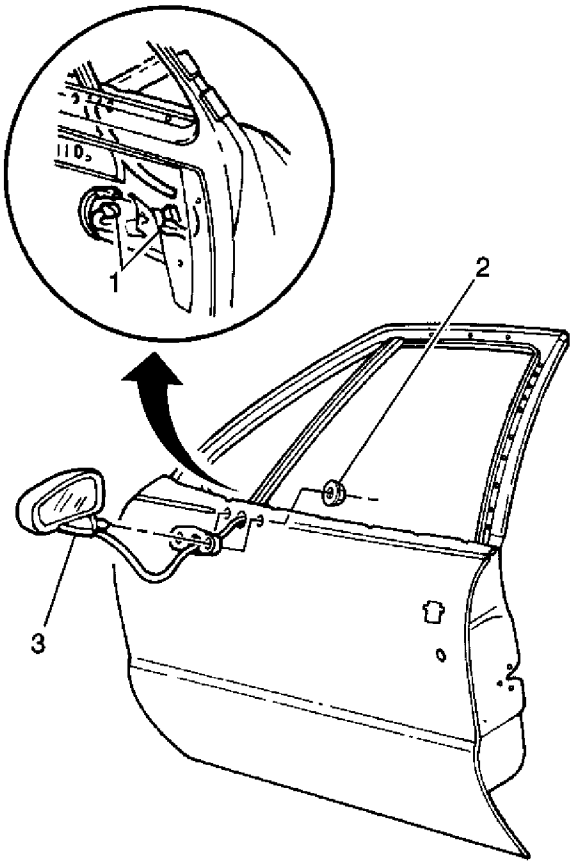
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Power Mirror Replacement

Removal Procedure

Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

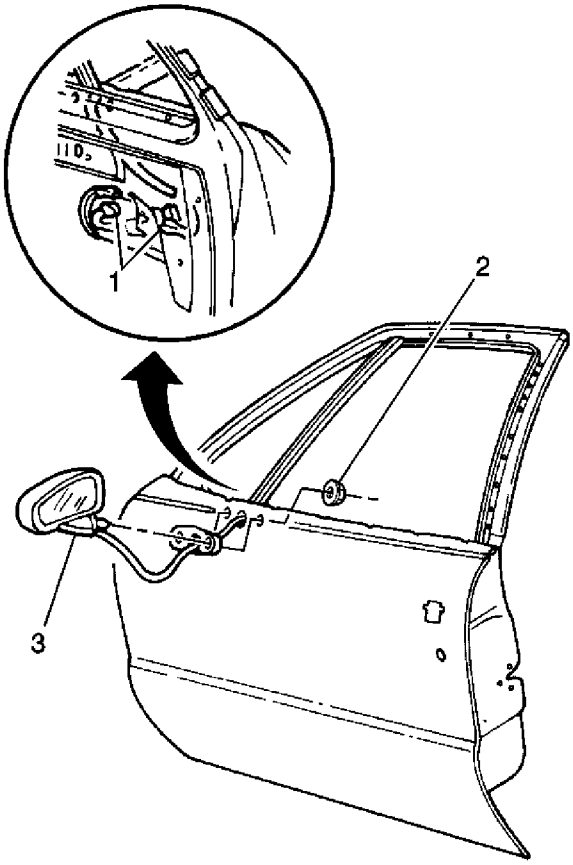
1. Disconnect the negative battery cable.
2. Remove the trim panel. Refer to Front Side Door Trim Panel Replacement .
3. Remove the water deflector. Refer to Door Water Deflector Replacement .



4. Disconnect the wire connectors (1).
5. Remove the fasteners (2).
6. Remove the mirror assembly (3).

Installation Procedure

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1. Install the mirror assembly (3) to the door.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

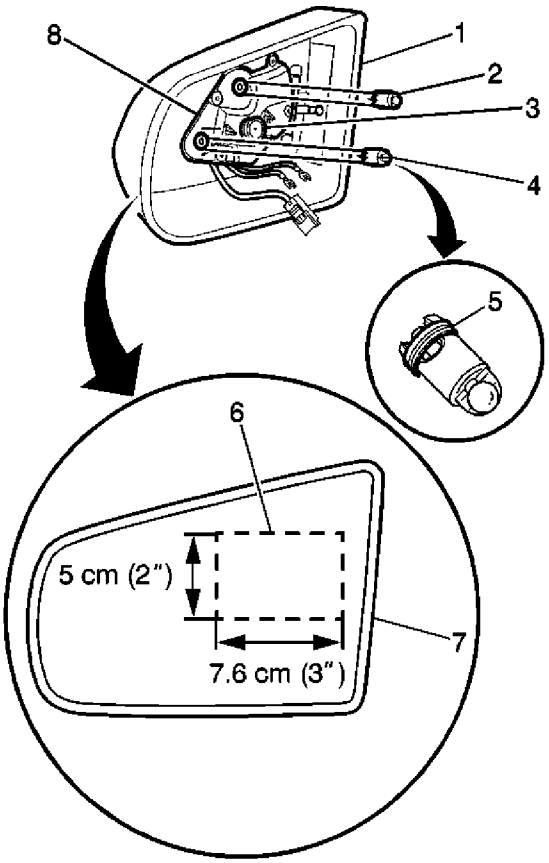
2. Install the fasteners (2).

Tighten
Tighten the fasteners to 6 N·m (54 lb in).

3. Connect the wire connectors (1).
4. Install the water deflector. Refer to Door Water Deflector Replacement .
5. Install the trim panel. Refer to Front Side Door Trim Panel Replacement .
6. Connect the negative battery cable.

Mirror Face Replacement - Outside Electrochromatic

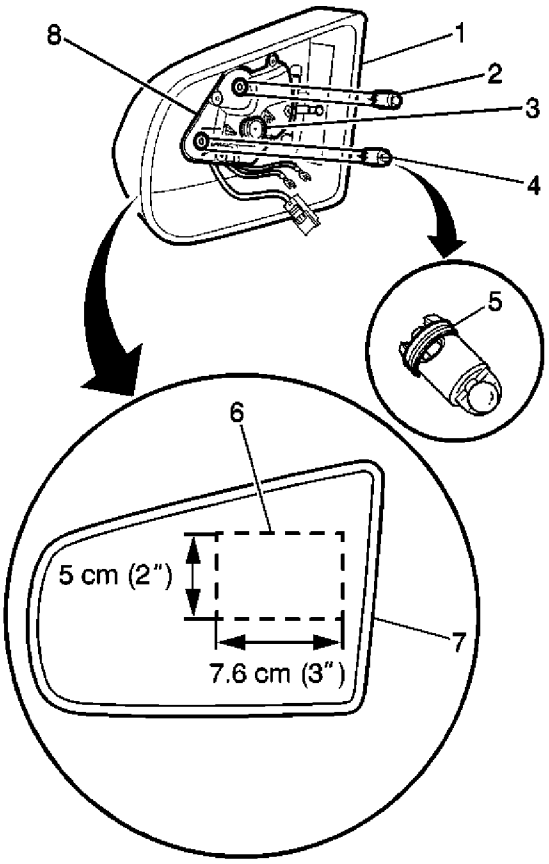
Removal Procedure



1. Remove the mirror and plastic backing plate (7) by pulling the assembly out of the mirror housing (1).
2. Verify that the springs (5) on the actuator shafts are not pushed down on the shafts.
3. Ensure that the springs (5) are seated in the grooves.
4. Disconnect the electrical connectors.

Installation Procedure

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1. Snap the actuator shafts into the power drive unit (8).
2. Connect the electrical connectors.
3. Rotate the actuator shafts in order to align the ears with the corresponding slots in the back side of the mirror face (7).
4. Align the swivel (3) on the power drive unit (8) to the pivot points on the mirror backing plate.

Notice: To avoid damaging electrochromic mirrors, yellowing and/or silver delamination, pressure must not be applied to the center of the mirror. Place a 6 x 9 cm (2 x 3 in) block of wood in the indicated target area. This will distribute pressure evenly.

5. Hold a block against the mirror face while you perform the following procedure:
   5.1. Push in on the block (6) until you hear an audible click.
   5.2. Tilt the mirror (7) toward the upper actuator shaft (2).

   Apply pressure on the block until the ratchet sound stops.

   5.3. Tilt the mirror (7) toward the outside actuator shaft (4).

   Apply pressure on the block until the ratchet sound stops.

6. Inspect the mirror for proper operation.

If the mirror is not operating properly, inspect the actuator shaft alignments again.

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Bleeder Valve	10 N·m	88 lb in
Brake Pipe to Wheel Cylinder	15 N·m	11 lb ft
Hub and Bearing Bolt	70 N·m	52 lb ft
Wheel Cylinder to Backing Plate Bolt	12 N·m	106 lb in
Wheel Nuts	140 N·m	100 lb in

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Component Specifications

Application	Specification	
	Metric	English
Discard Diameter	226.30 mm	8.909 in
Inside Diameter	225.12 mm	8.863 in
Maximum Refinish Diameter	225.54 mm	8.879 in
Runout	0.15 mm	0.006 in
Wheel Cylinder Bore	23.80 mm	0.937 in
All brake drums and rotors have a discard dimension cast into them. This is a wear dimension and not a refinish dimension. Replace any drum or rotor which does not meet the specification.		

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Brake Drum Inspection

Pulsations in the brake pedal can usually be corrected by servicing the front disc brakes. Service the rear drum brakes only if the problem persists.

In order to determine if the front or rear brakes are at fault, test drive the vehicle at a low speed in an area away from people and moving traffic, such as a large parking lot. Apply the parking brake and feel for pulsation. The park brake is a push to release style, it may be necessary to push the park brake twice while performing this procedure if the latching mechanism is reached. If a pulsation is not noticed, the fault is probably in the front brakes.

When the brake drums are removed, thoroughly clean and inspect the brake drums for cracks, scores, deep grooves, being out-of-round and taper. Replace a cracked drum; it is unsafe for further use. Do not weld a cracked drum.

Surface Finish

Normal, light scoring of drum surfaces less than 1.5 mm (1/16 in) deep is not detrimental to brake operation. Smooth out any light scores. Heavy or extensive scoring will cause excessive lining wear, and resurfacing the drum braking surface might be necessary.

If the linings are slightly worn (but still usable) and the drum is grooved, polish the drum with a fine emery cloth; do not refinish it. Eliminating all drum grooves and smoothing the lining ridges would require removing too much metal and lining. If left alone, the grooves and ridges match and satisfactory service can be obtained. If brake linings are to be replaced, refinish a grooved drum. If a grooved drum is used with new lining, it will wear the lining, making proper brake performance difficult to obtain.

Inside Diameter Check

The inside diameter should be checked for conformance to the following specifications, and to determine if refinishing is possible. The drum has a discard dimension cast into it, which is a wear dimension and not a refinish dimension. If the drum does not meet specifications, it should be replaced. Refer to Component Specifications .

Taper Check

An out-of-round or tapered drum prevents accurate brake shoe adjustment, and is likely to cause excessive wear of other brake parts due to its eccentric action. An out-of-round drum can also cause severe and irregular tire tread wear, as well as causing the brake pedal to pulsate.

When a drum exceeds specification limits in taper and/or out-of-round, refinish the drum to true up the braking surface. Out-of-round, as well as taper and wear, can be accurately measured with an inside micrometer and extension rods. When measuring the drum, take measurements at the open and closed edges of the machined surface and at right angles to each other.

Runout Check

A runout check can be done along with taper/out-of-round checks. It can also be done on a brake

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lathe, using a dial indicator to check the inside of the drum. Runout specifications are 0.15 mm (0.006 in).

Balance

During manufacturing, weights are used to balance brake drums; do not remove these weights. After refinishing drums, or when maintaining wheel balance is difficult, check the drums for balance. They can be checked on most off-vehicle balancers. If found to be out of balance, replace the drum.

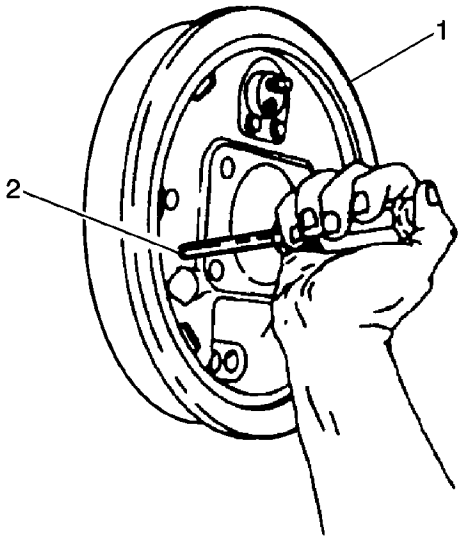
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Brake Drum Replacement

Removal Procedure

Important: While installing a new brake drum, do not refinish the braking surface, as it is already at the correct level of finish.

1. Raise and suitably support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.
2. Mark the relationship of the wheel to the wheel studs in the bearing flange.
3. Remove the wheel and the tire.
4. Mark the relationship of the drum to the wheel studs in the bearing flange.





Notice: Do not pry against the splash shield which surrounds the backing plate in an attempt to free the drum. This will bend the splash shield.

5. Remove the brake drum (1). If the drum is difficult to remove, use the following procedure:
   - 5.1. Make sure the parking brake is released.
   - 5.2. Back off the parking brake cable adjustment.
   - 5.3. Use a hammer and a small metal punch to bend in the backing plate knockout slug to provide access to the park brake lever.
   - 5.4. Insert the metal punch or a screwdriver through the hole and press in to push the park brake lever off its stop. This lets the shoe and linings retract slightly.
   - 5.5. Apply a small amount of penetrating oil around the drum pilot hole.

Important: After the drum has been removed from the vehicle, be sure to remove the knockout slug, using pliers or vise grips. Then insert a rubber access hole plug (service part) into the hole to prevent dirt or contamination from entering the drum brake assembly.

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6. Before installing brake drum and wheel, adjust the following items:
   - The service brakes.
   - Refer to Drum Brake Adjustment .
   - The parking brake.
   - Refer to Park Brake Cable Service/Adjustment .

Installation Procedure

1. Install the brake drum, aligning the marks made at the removal.
2. Install the wheel and the tire, aligning the marks made at the removal.
3. Lower the vehicle.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

4. Tighten the wheel nuts.

   Tighten
   Tighten the wheel nuts to 140 N·m (100 lb ft).

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Brake Drum Refinishing

When refinishing the drum, remove only enough metal to obtain a true, smooth braking surface. Replace the drum if it does not clean up when refinished to a maximum refinish diameter, as directed in the Specifications. Removal of more metal will affect the heat dissipation and may cause a drum distortion.

The brake drums have a maximum diameter cast into them. This is the maximum wear diameter not a refinish diameter. Do not refinish a drum which does not meet the Specifications. Replace the drum if this occurs.

When refinishing a brake drum, resurface the drum to a dimension no more than 0.76 mm (0.030 in) less than the discard diameter. The refinish diameter is the maximum diameter to which the drum may be refinished and still provide safe braking. If the dimension is exceeded, the drum will wear beyond the discard diameter during normal brake wear.

Always use sharp cutting tools or bits. Use only replacement cutting bits recommended by the equipment manufacturer. Dull or worn tools leave a poor surface finish which will affect the initial braking performance.

Always use vibration dampening attachments to prevent tool chatter and a better surface can be obtained.

When refinishing a brake drum, the following is recommended:

- Optimum spindle speed: 200 rpm.
- Cross feed (per rev):
  - Rough cut, 0.25 to 0.15 mm (0.010 to 0.006 in).
  - Finish cuts 0.05 mm (0.002 in), maximum.

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Brake Shoe Inspection

Inspect the rear brake shoes every 6,000 miles and any time the wheels are removed (tire rotation, etc.). Inspect the rear brake shoes for wear by removing the rear brake drum. Replace the rear brake shoes when the thickness is worn to within 0.76 mm (0.030 in) of the shoe or rivet head. Always replace the rear brake shoes as a complete axle set.

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Brake Shoe Replacement

Removal Procedure

Tools Required

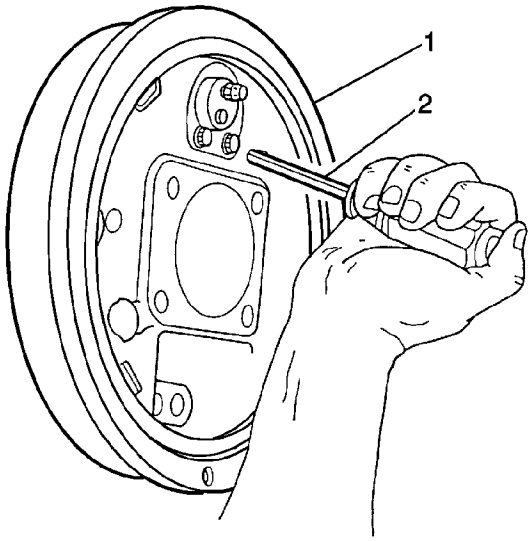
J 38400 Brake Shoe Spanner and Spring Remover

Caution: Keep fingers away from rear brake shoe springs to prevent fingers from being pinched between spring and shoe web or spring and backing plate.

Notice: Do not pry against the splash shield or backing plate in attempt to free the drum. This will bend the splash shield or backing plate. A bent backing plate may cause brake chatter and/or pulsation.

Notice: Do not over stretch the adjuster spring. Damage can occur if the spring is over stretched.

1. Raise and suitably support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.
2. Mark the relationship of the wheel to the axle flange.
3. Remove the tire and the wheel. Refer to Tire and Wheel Removal and Installation in Tires and Wheels.
4. Mark the relationship of the drum to the axle flange.





5. Remove the brake drum. If difficulty is encountered in removing the brake drum, the following steps may be of assistance:
   5.1. Remove the retainer clip
   5.2. Verify that the parking brake is released
   5.3. Back off the parking brake cable adjustment

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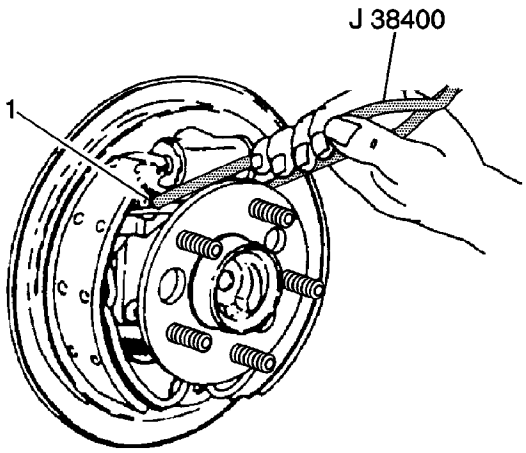
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5.4. Remove the access hole plug from the backing plate (1)

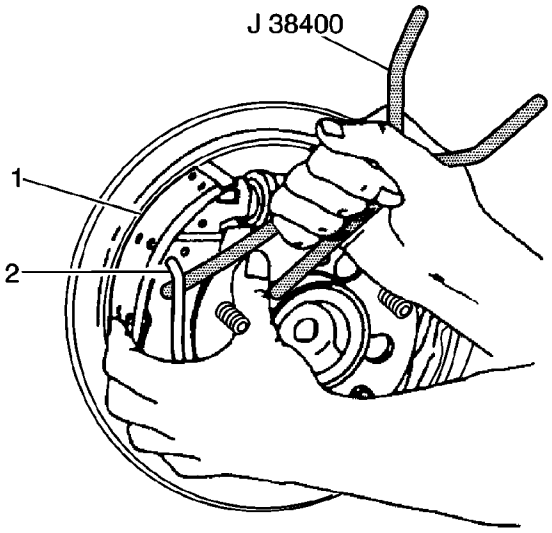
5.5. Use a flat bladed tool (2) in order to back off the adjusting screw

5.6. Reinstall the access hole plug in order to prevent dirt or contamination from entering the drum brake

5.7. Apply a small amount of penetrating oil around the drum pilot hole

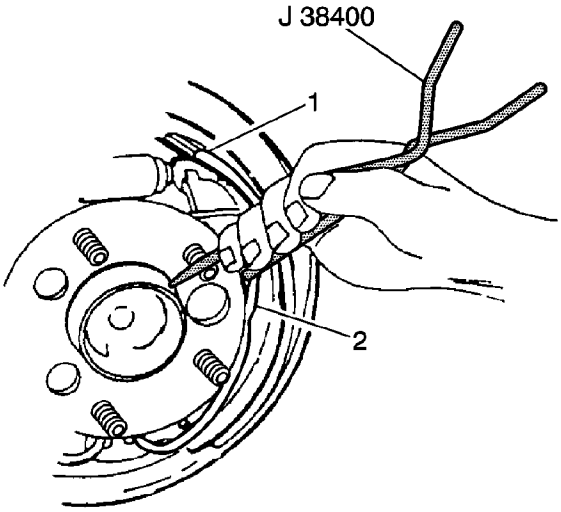


6. Remove the adjuster spring (1). Use the J 38400 in order to pry the loop end of the adjuster spring from the adjuster actuator. Then disengage the adjuster spring from the web of the parking brake shoe.

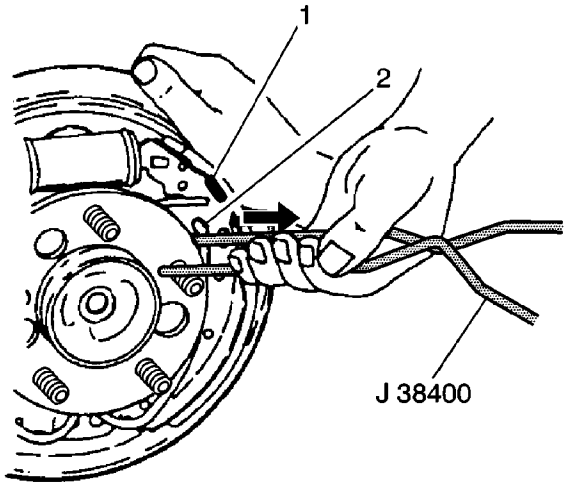


7. Remove the lift end of the return spring (2) from the adjuster shoe and the lining (1).
8. Insert the hook end of the J 38400 between the return spring and the adjuster shoe web.

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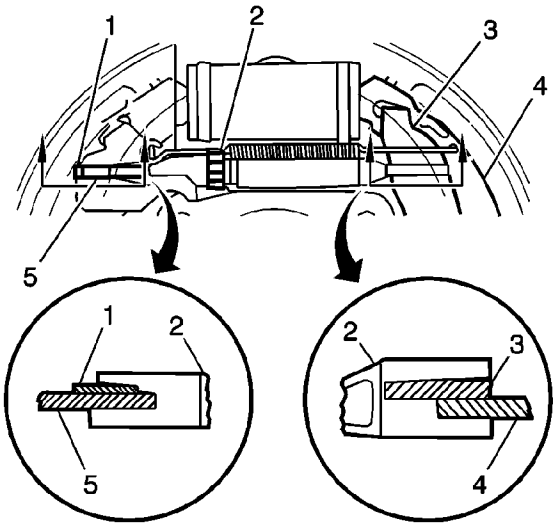


9. Pry or twist the J 38400 in order to lift the end of the spring (2) out of the shoe web hole.

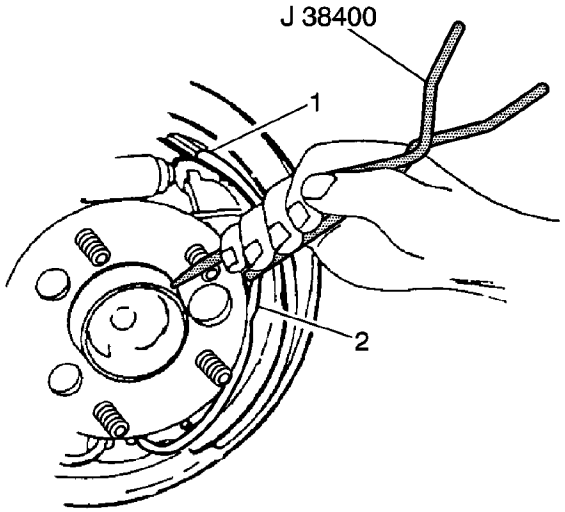


10. Pry the end of the return spring (2) toward the axle with the flat edge of the J 38400 until the return spring snaps down off the shoe web onto the backing plate.

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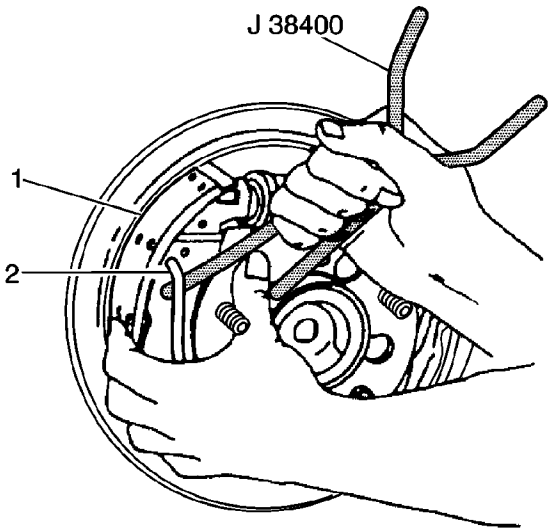


11. Remove the adjuster actuator (1) from the following components:
    - The brake shoe
    - The brake lining (4, 5)
    - The adjusting screw (2)
12. Remove the parking brake lever (3) from the parking brake shoe and the parking brake lining. Do not remove the parking brake cable from the parking brake lever unless the parking brake lever is to be replaced.



13. Lift the end of the return spring (2) from the parking brake shoe and the parking brake lining (1). Insert the hook end of the J 38400 between the return spring and the parking brake shoe web. Pry or twist the J 38400 in order to lift the end of the spring out of the shoe web hole.

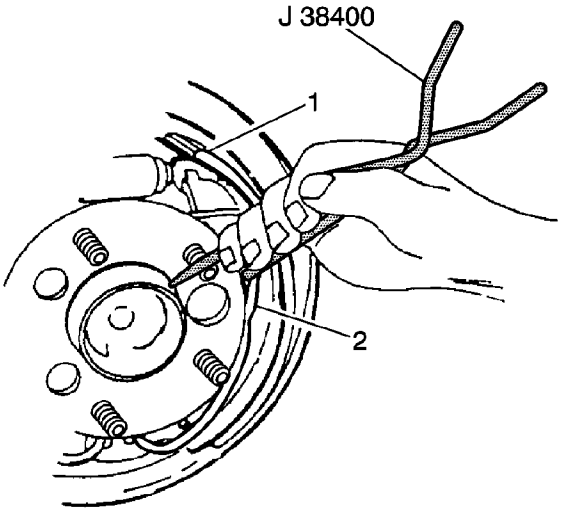
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14. Pry the end of the return spring (2) toward the axle with the flat edge of the J 38400 until it snaps down off the shoe web onto the backing plate.
15. Remove the parking brake shoe and the parking brake lining.
16. Remove the return spring from the backing plate. If only the shoes and linings are being replaced, do not remove the return spring.
17. Clean all parts in clean denatured alcohol.
18. Inspect and replace any parts that are of doubtful strength or quality due to the following conditions:
    - Discoloration from heat
    - Over stress
    - The parts are worn
19. Inspect the wheel cylinder for the following conditions:
    - Leakage
    - Cut or damaged boots
20. Do not attempt to repair the wheel cylinder. Replace the wheel cylinder, refer to Wheel Cylinder Replacement .

Installation Procedure

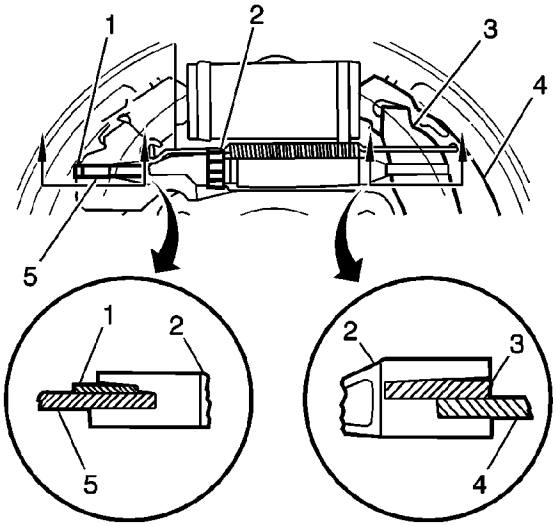
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Important: Lubricate the following components with GM P/N 1052196 or equivalent brake lubricant:

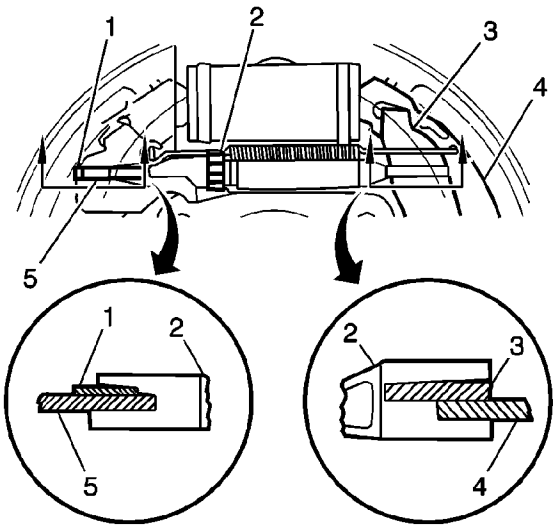
- The six raised shoe pads on the backing plate
- The anchor surfaces on the backing plate. The anchor surfaces contact the lower ends of the brake shoes.

1. Reinstall the hooking center spring section under the tab on the anchor, if the return spring was removed.
2. Install the parking brake shoe and lining. Position the shoe and the lining on the backing plate.
3. Use the J 38400 in order to pull up the end of the return spring (2), resting the return spring on the web of the brake shoe (1).
4. Use the J 38400 in order to pull the end of the return spring over until the return spring snaps in the slot in the brake shoe.



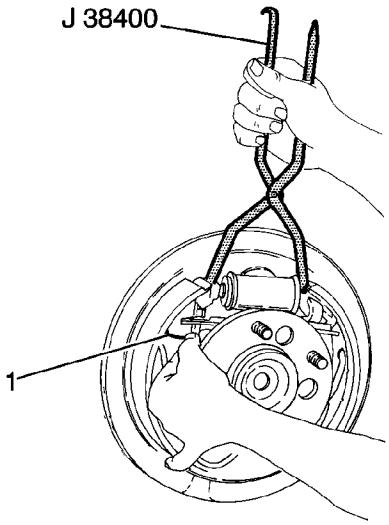
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5. Connect the parking brake lever (3) to the parking brake shoe and lining (4).
6. Connect the parking brake cable to the parking brake lever, if disconnected.
7. Before reinstallation, disassemble, thoroughly clean and lubricate the adjusting screw (2) in the following manner:
   - Clean the adjuster screw threads with a wire brush.
   - Wash all components in clean denatured alcohol.
   - Apply GM P/N 1052196 or equivalent brake lubricant to the following areas:
     - The adjuster screw threads
     - The inside the diameter of the adjuster socket
     - The socket face
     - Adequate lubrication is achieved when a continuous bead of lubricant is on the end of the adjuster nut and the socket when the threads are fully engaged
8. Inspect the threads of the adjuster screw for smooth rotation over the full length.

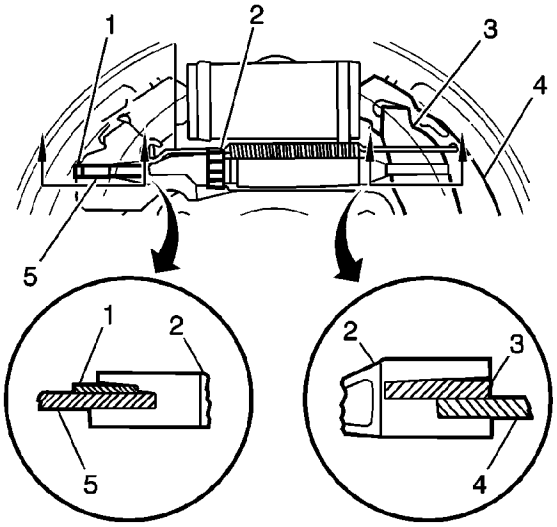


9. Install the following components:
   - The adjusting screw (2)
   - The adjuster shoe
   - The adjuster shoe lining
   - Engage the adjuster nut end of the adjusting screw (2) with the web of the parking brake shoe and lining and the parking brake lever (3)
   - Position the adjuster shoe and lining so that the shoe web engages the deep slot in the socket end of the adjusting screw
10. Install the return spring into the adjuster shoe and lining.
    10.1. Use the J 38400 in order to pull up the end of the return spring, resting the return spring on the web of the brake shoe.
    10.2. Use the J 38400 in order to pull the end of the return spring over until the return spring snaps in the slot in the brake shoe.

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11. Install the adjuster actuator.
    11.1. Lubricate the tab and the pivot point on the adjuster lever with GM P/N 1052196 or equivalent brake lubricant.
    11.2. Use the J 38400 in order to spread the brake shoes while working the adjuster actuator (1) into position.
12. Install the adjuster spring.
    12.1. Engage the U-shaped end of the spring in the hole in the web of the parking brake shoe.
    12.2. Use the J 38400 in order to stretch the spring and engage the loop end over the tab on the adjuster actuator.



13. Note the following items in order to ensure the proper positioning and function of the

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adjuster actuator:

- The adjuster actuator (8) pivots in the shoe web slot
- The notch in the adjuster actuator rests on the step in the adjusting screw (2) notch
- The arm of the adjuster actuator rests freely on the star wheel teeth of the adjuster screw, not trapped under the teeth in a downward angle
- Use the J 38400 between the upper ends of the shoe and lining assemblies. Spread the shoes apart and watch for proper rotation of the star wheel

14. Adjust the brakes. Refer to Drum Brake Adjustment .
15. Adjust the parking brake.

    For the drum brakes, refer to Park Brake Cable Service/Adjustment in Park Brake.

16. Install the brake drums. Align the marks made during removal.
17. Install the tires and the wheels. Align the marks made during removal. Refer to Tire and Wheel Removal and Installation in Tires and Wheels.
18. Lower the vehicle.

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Brake Backing Plate Replacement

Removal Procedure

1. Raise and suitably support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.
2. Remove the brake drum and components. Refer to Brake Drum Replacement .
3. Disconnect the brake pipe from the wheel cylinder.
4. Disconnect the park brake cable from the backing plate.
5. Remove the hub and bearing bolts. Refer to Rear Wheel Bearing and Hub Replacement in Rear Suspension.
6. Remove the backing plate.

Installation Procedure

1. Install the backing plate.
2. Install the hub and bearing with bolts. Refer to Rear Wheel Bearing and Hub Replacement in Rear Suspension.
3. Connect the park brake cable to the backing plate.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

4. Connect the brake pipe to the wheel cylinder. Tighten the brake pipe fitting (tube nut).

   Tighten
   Tighten the brake pipe fitting to 15 N·m (11 lb ft).

5. Install the brake drum and components. Refer to Brake Drum Replacement .
6. Bleed the brake hydraulic system. Refer to Hydraulic Brake System Bleeding in Hydraulic Brakes.
7. Adjust the service brakes. Refer to Brake Drum Replacement .
8. Adjust the parking brake. Refer to Park Brake Cable Service/Adjustment in Park Brakes.
9. Lower the vehicle.
10. Check for proper brake operation.

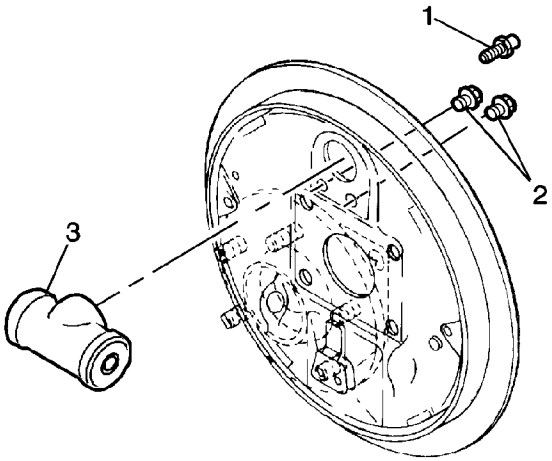
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Wheel Cylinder Replacement

Removal Procedure

1. Clean the area around the wheel cylinder inlet, the pilot and the bleeder valve.
2. Remove the brake drum. Refer to Brake Drum Replacement .
3. Remove the brake components, as needed for access.



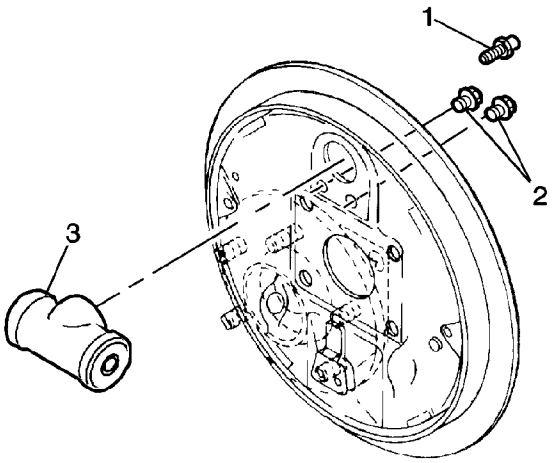


4. Remove the bleeder valve (1).
5. Disconnect the brake pipe from the wheel cylinder. Plug the opening in the pipe to prevent fluid loss and contamination.
6. Remove the bolts (2).
7. Remove the wheel cylinder (3).
8. Clean the old sealant from the backing plate where the wheel cylinder was removed.
9. Clean the sealant from the wheel cylinder (if the wheel cylinder is to be reinstalled).

Installation Procedure

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1. Apply Loctite® Master Gasket or equivalent to the wheel cylinder shoulder face that contacts the backing plate.
2. Position the wheel cylinder and hold it in place.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the bolts.

Tighten
Tighten the attaching bolts to 12 N·m (106 lb in).

4. Connect the brake pipe to the wheel cylinder.

Tighten
Tighten the brake pipe fitting (tube nut) to 15 N·m (11 lb ft).

5. Install the bleeder valve.

Tighten
Tighten the bleeder valve to 10 N·m (88 lb in).

6. Install the brake components.
7. Install the brake drum. Refer to Brake Drum Replacement .
8. Bleed the wheel cylinder. Refer to Hydraulic Brake System Bleeding in Hydraulic Brakes.

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Drum Brake Adjustment

Tools Required

J 21177-A Drum to Brake Shoe Clearance Gauge

1. Raise and suitably support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.
2. Mark the relationship of the wheel to the wheel studs in the bearing flange.
3. Remove the rear wheels and tires. Refer to Tire and Wheel Removal and Installation in Tires and Wheels.
4. Mark the relationship of the drum to the wheel studs in the bearing flange.
5. Remove the brake drum. Refer to Brake Drum Replacement .
6. Ensure the lever stops on both park brake levers are against the edges of the shoe webs on the park brake shoes. If the park brake cable is holding the stops off of the edge of the shoe web, loosen the park brake cable adjustment.
7. Measure the inside diameter (ID) of the drum using the J 21177-A .
8. Turning the star wheel on the adjusting screw assembly, adjust the shoe and lining diameter to 1.27 mm (0.050 in) less than the drum ID.
9. Install the drum and wheel, aligning the marks that were made during the removal.
10. Repeat steps 2 through 9 in order to adjust the other rear brake position.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

11. Torque the wheel nuts.

    Tighten
    Tighten the wheel nuts to 140 N·m (100 lb in).

12. Lower the vehicle.
13. Apply and release the service brake pedal 30 to 35 times with normal pedal force. Pause about one second between pedal applications.

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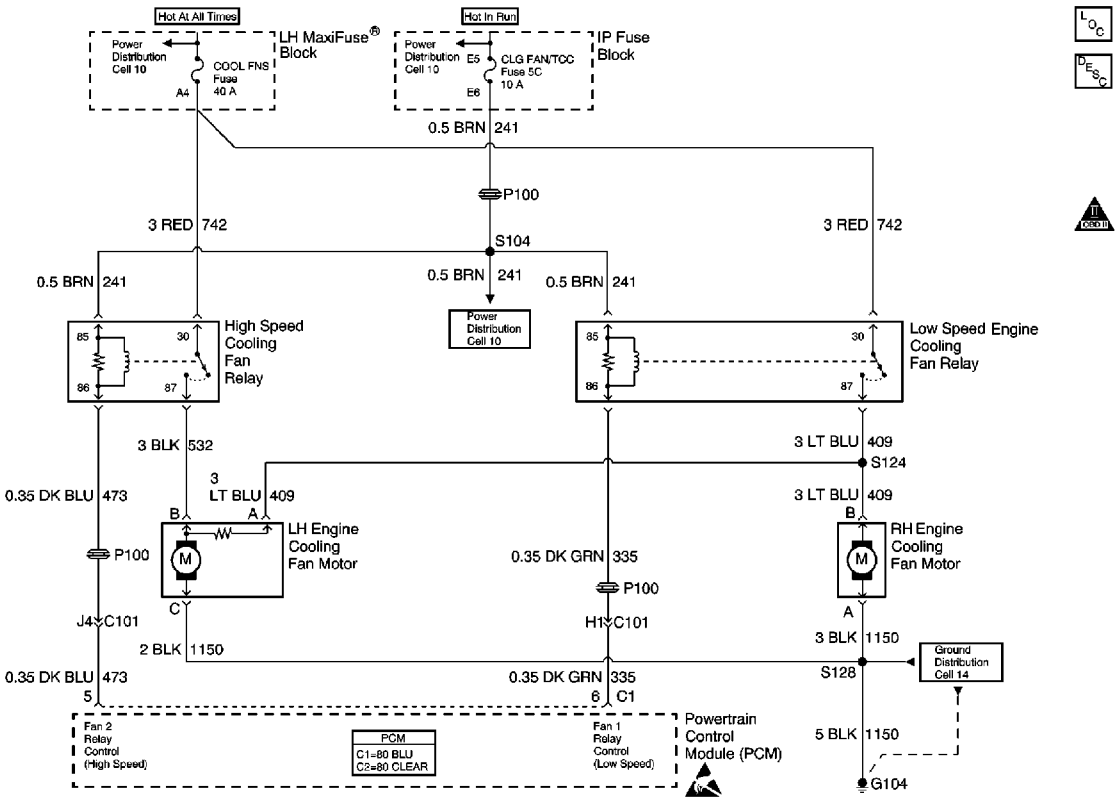
Fastener Tightening Specifications

Application	Specification	
	Metric	English
Coolant Recovery Reservoir	13 N·m	10 lb ft
Fan Attaching Bolts	10 N·m	89 lb in
Radiator Upper Tie Bar Bolt	10 N·m	89 lb in
Water Pump Mounting Long Bolts	30 N·m	22 lb ft
Water Pump Mounting Short Bolts	15 N·m	11 lb ft

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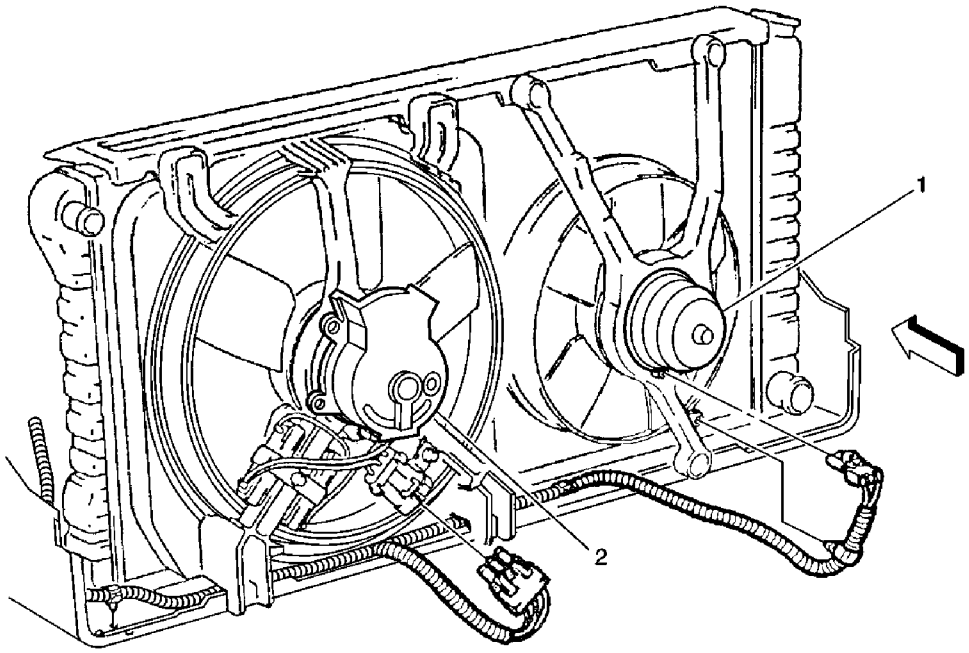
Cooling Fan Schematics

Cell 31: Cooling System



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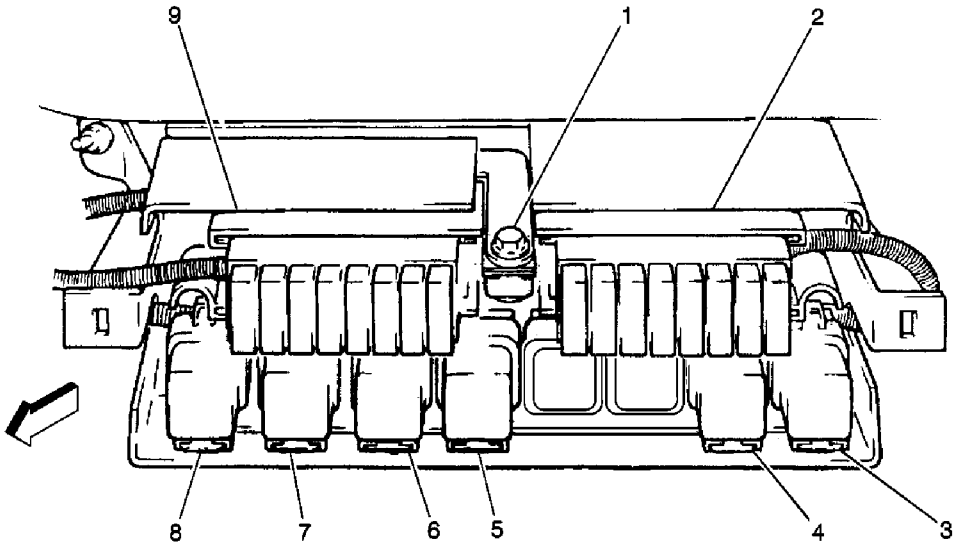
Front of Engine Compartment



(1) RH Engine Cooling Fan Motor
(2) LH Engine Cooling Fan Motor

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Rear of the Engine Compartment

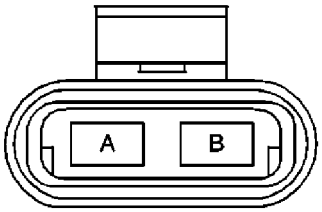


(1) Battery Positive Cable Connection
(2) LH Underhood Fuse Block
(3) Low Speed Engine Cooling Fan Relay
(4) High Speed Engine Cooling Fan Relay
(5) High Blower Relay
(6) Blower Motor Relay
(7) Horn Relay
(8) A/C Clutch Relay
(9) RH Underhood Fuse Block

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Cooling System Connector End Views

LH Engine Cooling Fan Motor

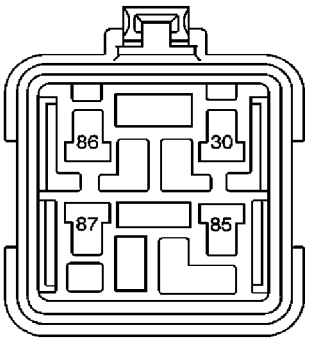




Connector Part Information	• 12085030 • 2-Way F Metri-Pack 630 Series, Sealed (BLK)

Pin	Wire Color	Circuit No.	Function
A	LT BLU	409	Cooling Fan Motor Feed
B	GRY	532	Cooling Fan Motor Feed - Secondary
C	BLK	1150	Ground

High Speed Engine Cooling Fan Relay





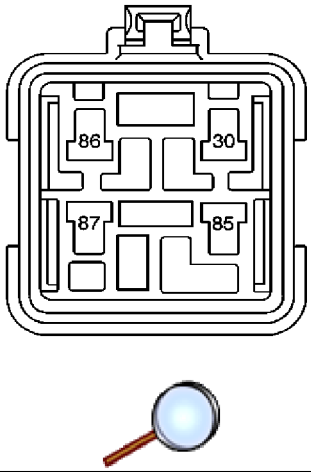
Connector Part Information	• 12129716 • 4-Way F Metri-Pack, Flex-Lock, Sealed (GRY)

Pin	Wire Color	Circuit No.	Function
30	RED	742	Fused Output - Battery

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85	BRN	241	Fused Output IGN3
86	DK BLU	473	Cooling Fan Relay Output - Coil - Secondary
87	GRY	532	Cooling Fan Motor Feed - Secondary

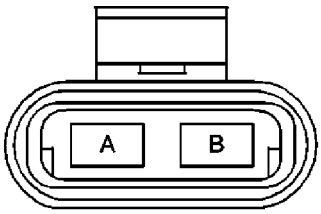
Low Speed Engine Cooling Fan Relay



Connector Part Information	• 12129716 • 4-Way F Metri-Pack 280 Series, Flex Lock, Sealed (GRY)

Pin	Wire Color	Circuit No.	Function
30	RED	742	Fused Output - Battery
85	BRN	241	Fused Output - IGN3
86	DK GRN	335	Cooling Fan Relay Output - Coil
87	LT BLU	409	Cooling Fan Motor Feed

RH Engine Cooling Fan Motor



Connector Part Information	• 12103172 • 2-Way F Metri-Pack 630 Series, Sealed (GRY)

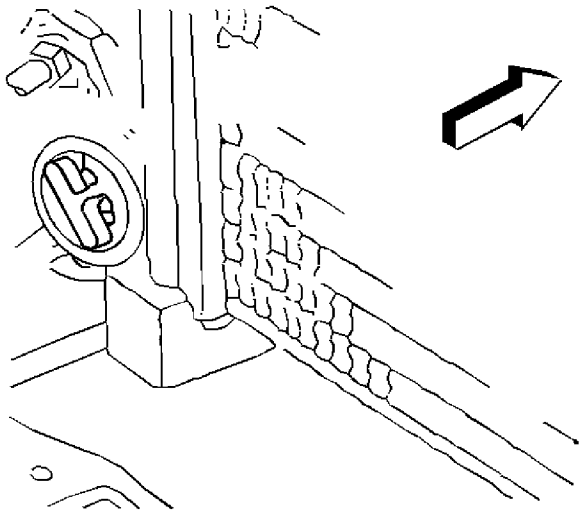
Pin	Wire Color	Circuit No.	Function

A	BLK	1150	Ground
B	LT BLU	409	Cooling Fan Motor Feed

Cooling System Draining and Filling

Draining Procedure

Caution: As long as there is pressure in the cooling system, the temperature can be considerably higher than the boiling temperature of the solution in the radiator without causing the solution to boil. Removal of the pressure cap while the engine is hot and pressure is high will cause the solution to boil instantaneously -- possibly with explosive force -- spewing the solution over the engine, fenders and the person removing the cap.



1. Completely drain the cooling system by opening the radiator drain cock at the bottom of the radiator.
2. If the coolant is dirty, or if there are deposits in the radiator, flush the cooling system before refilling. Refer to Flushing .
3. Remove the radiator pressure cap.
   - 3.1. Clean the cap.
   - 3.2. Test the cap. Refer to Pressure Cap Testing
   - 3.3. If necessary, replace the cap.
   - 3.4. Clean the radiator filler neck. Inspect the filler neck.
4. Disconnect the hose from the coolant recovery reservoir. Remove the reservoir. Refer to Coolant Recovery Reservoir Replacement .
   - 4.1. Clean the outside of the coolant recovery reservoir.
   - 4.2. Pour out any fluid.
   - 4.3. Thoroughly clean the inside of the reservoir using soap and water.
   - 4.4. Thoroughly flush the reservoir with clean water. Drain the reservoir.
5. Install the reservoir. Connect the reservoir hose. Refer to Coolant Recovery Reservoir Replacement .

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Filling Procedure

1. Refill the cooling system with GM Goodwrench® DEX-COOL® or Havoline® DEX-COOL®. To ensure sufficient engine cooling, freezing and corrosion protection, maintain the protection level at -37°C (-34°F) lower. Use a solution that is no more than 70 percent antifreeze.
2. Place the heater and A/C control in any A/C mode except Max and the temperature in the highest setting.
3. Allow the engine to continue idling until the lower radiator to coolant pump hose is hot.
4. Cycle the engine speed up to about 3000 rpm and back to idle five times. Slowly open the bleed valve on the rear of the thermostat housing for approximately 15 seconds to expel any trapped air in the cooling system.
5. After the air has been expelled, fill the radiator. Install the radiator pressure cap, making sure the arrows on the cap line up with the coolant recovery tube.
6. Allow the engine to cool to outside temperature. Check the coolant level in the reservoir.

Flushing

Various methods and equipment may be used to flush the system. If using special equipment such as a back flusher, follow the manufacturer's instructions. However, the thermostat should be removed before flushing the system.

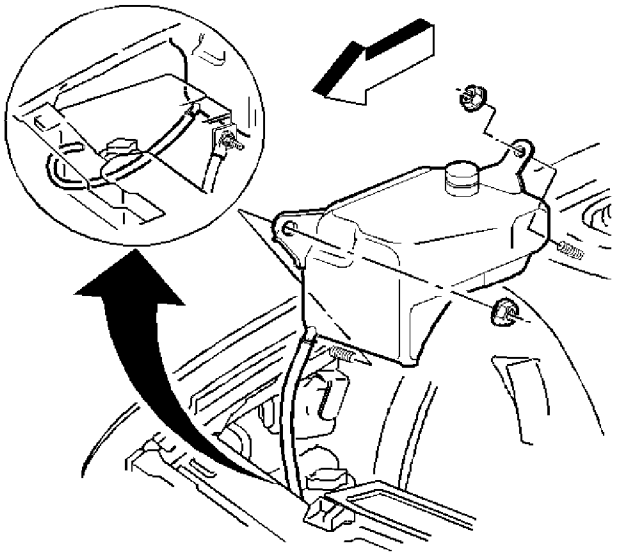
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Coolant Recovery Reservoir Replacement

Removal Procedure

Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

1. Disconnect the negative battery cable.
2. Disconnect the positive battery cable.
3. Remove the battery.
4. Drain the coolant. Refer to Cooling System Draining and Filling .

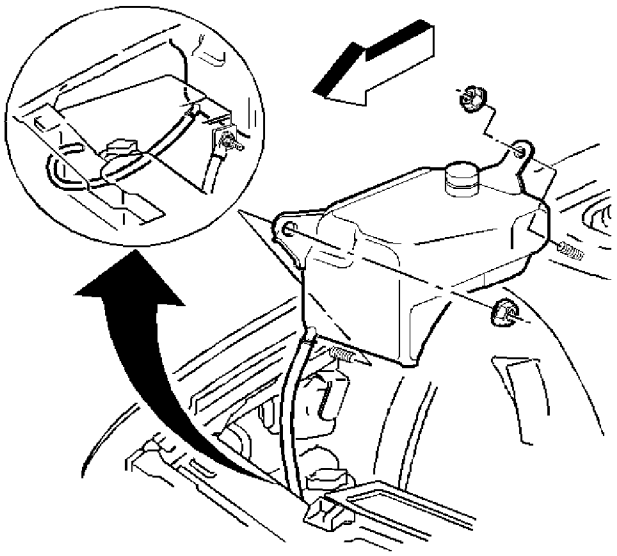




5. Remove the reservoir mounting bolts.
6. Disconnect the coolant hose.
7. Remove the coolant recovery reservoir.

Installation Procedure

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1. Connect the coolant hose to the coolant recovery reservoir.
2. Install the coolant recovery reservoir.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the mounting bolts.

Tighten
Tighten the recovery reservoir mounting bolts to 13 N·m (10 lb ft).

4. Install the battery.
5. Connect the positive battery cable.
6. Connect the negative battery cable.
7. Refill the cooling system. Refer to Cooling System Draining and Filling .

Radiator Inlet Hose Replacement

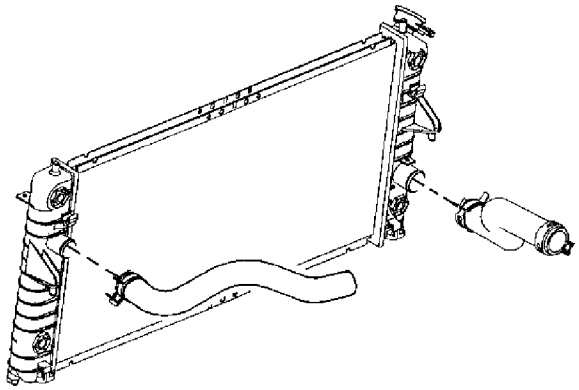
Removal Procedure

Tools Required

J 37097-A Hose Clamp Remover/Installer

Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

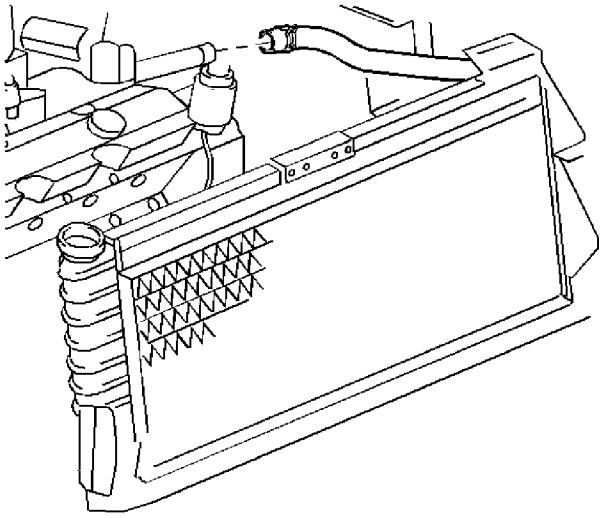
1. Disconnect the negative battery cable.
2. Drain the coolant. Refer to Cooling System Draining and Filling .





3. Remove the inlet radiator hose clamp from the radiator.
4. Remove the inlet raditor hose from the radiator.

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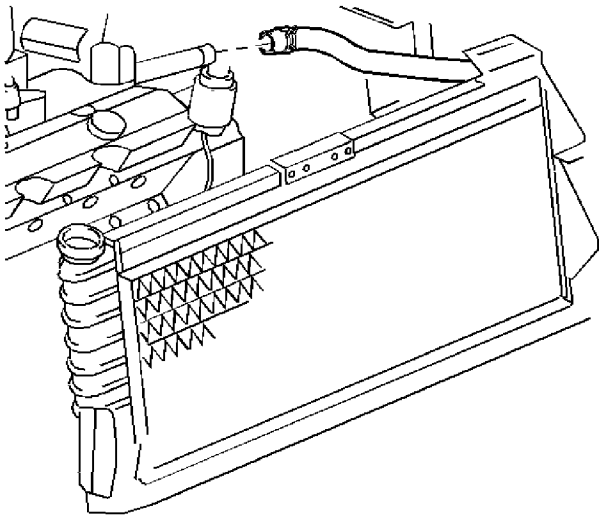


5. Remove the inlet radiator hose clamp from the engine.
6. Remove the inlet radiator hose from the engine.

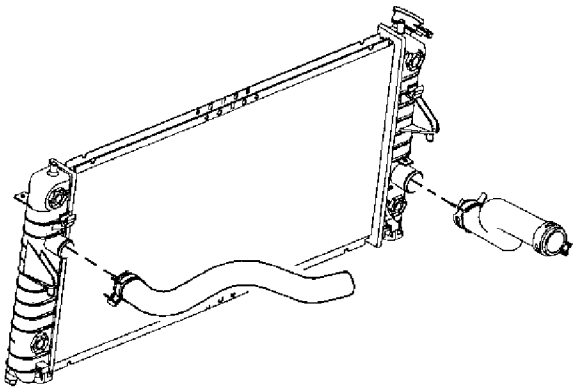
Installation Procedure

Tools Required

J 37097-A Hose Clamp Remover/Installer



1. Install the inlet radiator hose to the engine.
2. Install the inlet radiator hose clamp to the engine.



3. Install the inlet radiator hose to the radiator.
4. Install the inlet raditor hose clamp to the radiator.
5. Fill the cooling system. Refer to Cooling System Draining and Filling .
6. Start the engine and checks for leaks.

Radiator Outlet Hose Replacement

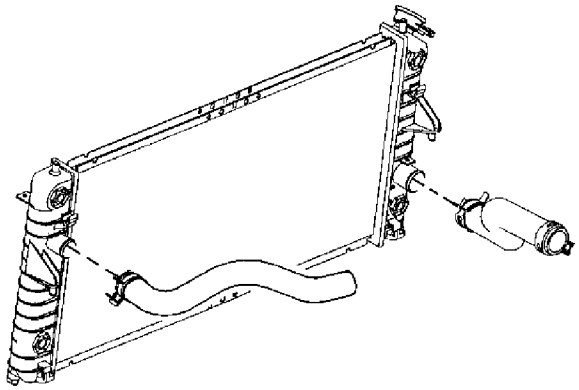
Removal Procedure

Tools Required

J 37097-A Hose Clamp Remover/Installer

Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

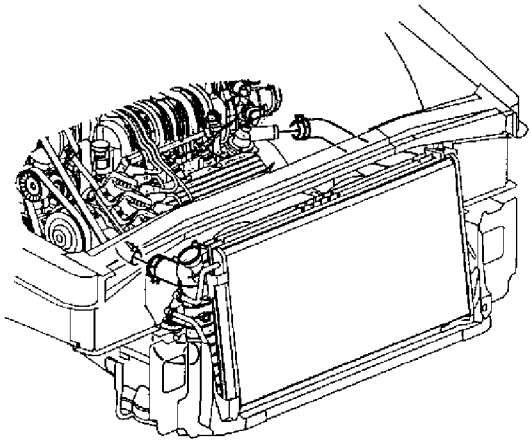
1. Disconnect the negative battery cable.
2. Drain the coolant. Refer to Cooling System Draining and Filling .





3. Remove the outlet radiator hose clamp from the engine.
4. Remove the outlet radiator hose from the engine.

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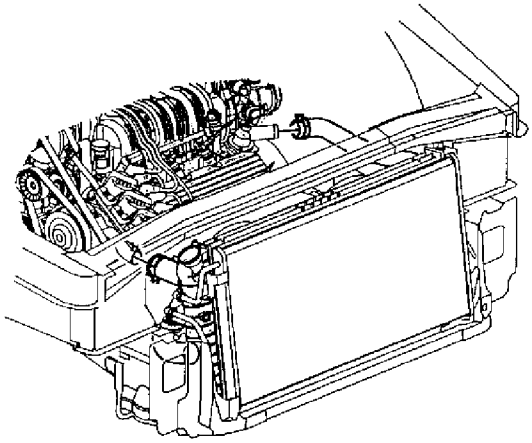


5. Remove the outlet radiator hose clamp from the radiator.
6. Remove the outlet radiator hose from the radiator.

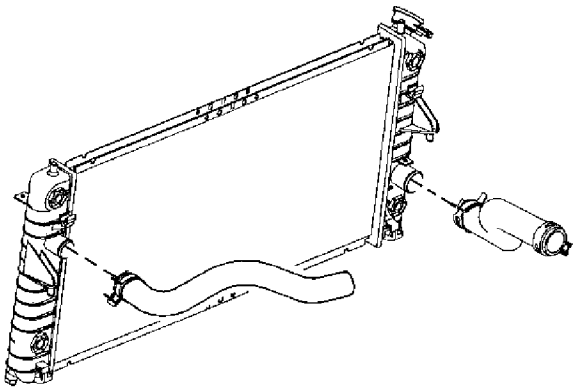
Installation Procedure

Tools Required

J 37097-A Hose Clamp Remover/Installer



1. Install the outlet radiator hose to the radiator.
2. Install the outlet radiator hose clamp to the radiator.



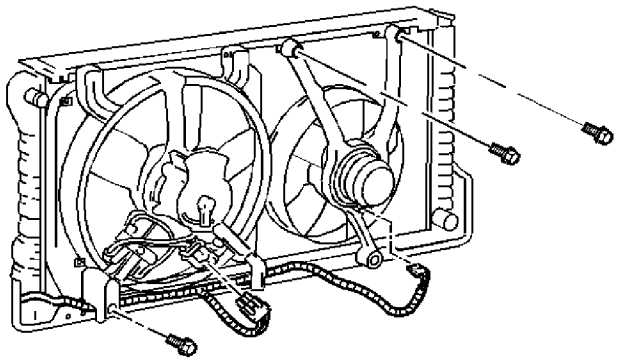
3. Install the outlet radiator hose to the engine.
4. Install the outlet radiator hose clamp to the engine.
5. Fill the cooling system. Refer to Cooling System Draining and Filling .
6. Start the engine and checks for leaks.

Engine Coolant Fan Replacement

Removal Procedure

Caution: To help avoid personal injury or damage to the vehicle, a bent, cracked, or damaged fan blade or housing should always be replaced.

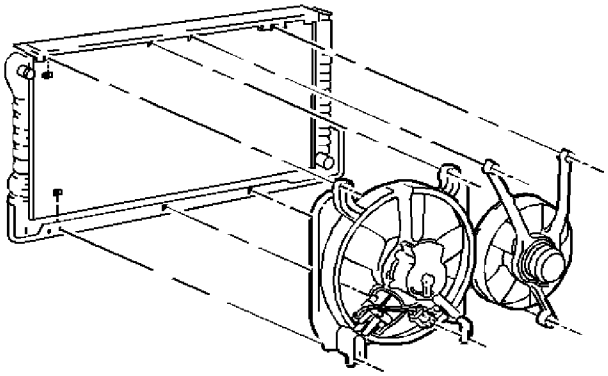
Caution: An electric fan under the hood can start up even when the engine is not running and can injure you. Keep hands, clothing and tools away from any underhood electric fan.



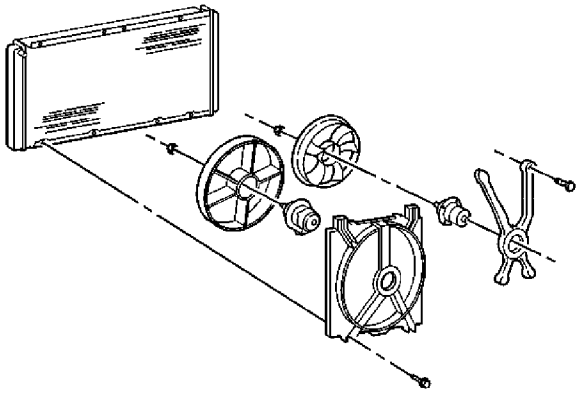
Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

1. Disconnect the negative battery cable.
2. Disconnect the electrical connector from the electric fan motor and fan bracket.
3. Remove the mounting bolts from the fan shroud.

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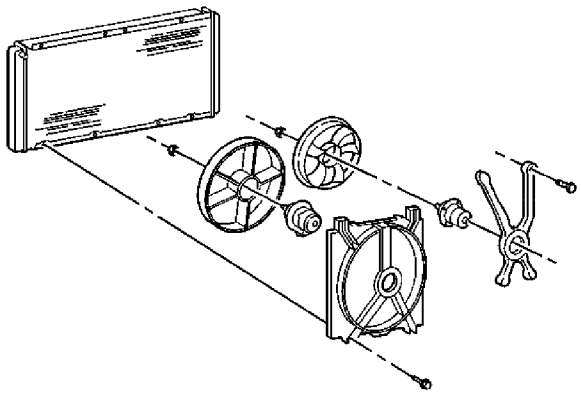


4. Remove the fan assembly from the radiator support.

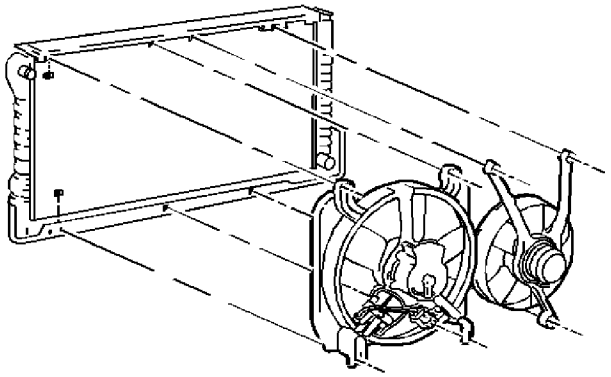


5. Remove the fan blade from the electric fan motor.

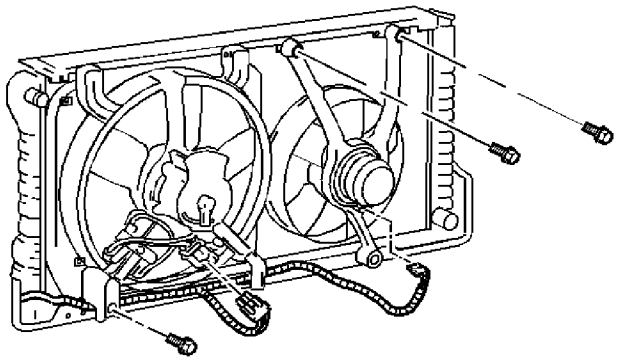
Installation Procedure



1. Install the fan blade to the electric fan motor.



2. Install the fan assembly to the radiator support.



Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the mounting bolts to the fan shroud.

   Tighten
   Tighten the mounting bolts to 10 N·m (89 lb in).

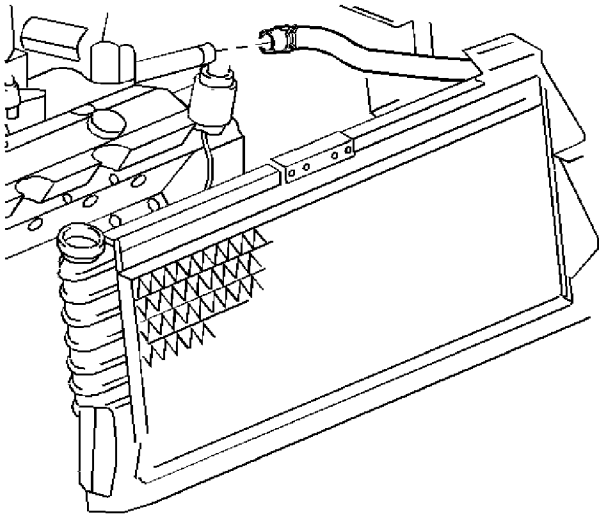
4. Connect the electrical connector to the electric fan motor and fan bracket.
5. Connect the negative battery cable.

Engine Coolant Thermostat Replacement

Removal Procedure

Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

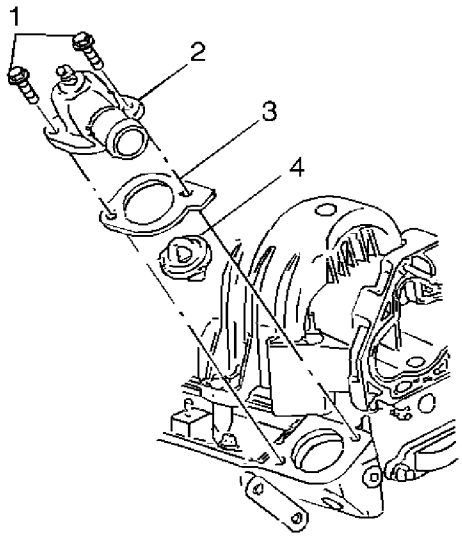
1. Disconnect the negative battery cable.
2. Remove the engine cover.
3. Drain the cooling system. Refer to Cooling System Draining and Filling .





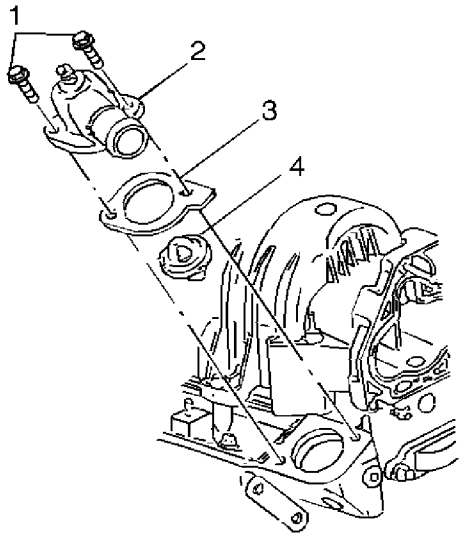
4. Disconnect the inlet radiator hose.

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5. Remove the thermostat housing.
6. Remove the thermostat (4).
7. Clean the gasket mating surfaces.

Installation Procedure



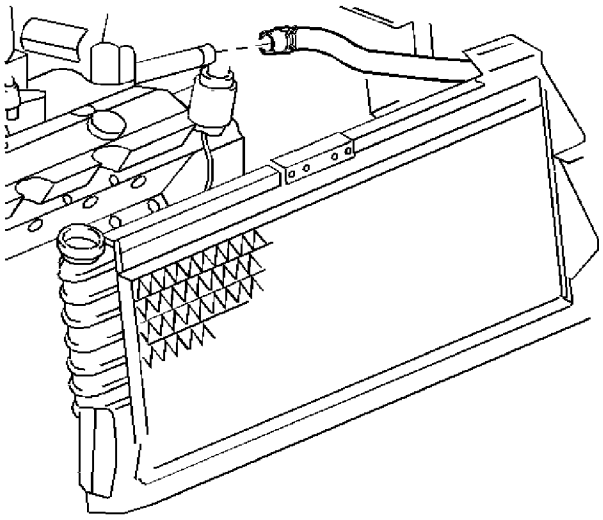
1. Install the thermostat (4).
2. Install the thermostat housing (2).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service

procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the thermostat housing bolts (1).

Tighten
Tighten the thermostat housing bolts to 20 N·m (15 lb ft).



4. Install the inlet radiator hose.
5. Refill the cooling system. Refer to Cooling System Draining and Filling .
6. Install the engine cover.
7. Connect the negative battery cable.

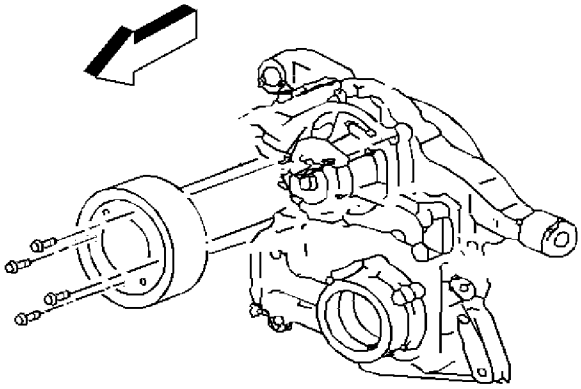
Tighten
Tighten the negative battery cable bolt to 15 N·m (11 lb ft).

Water Pump Replacement (VIN K)

Removal Procedure

Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

1. Disconnect the negative battery cable.
2. Drain the coolant. Refer to Cooling System Draining and Filling .
3. Remove the drive belt. Refer to Drive Belt Replacement in Engine Mechincal.

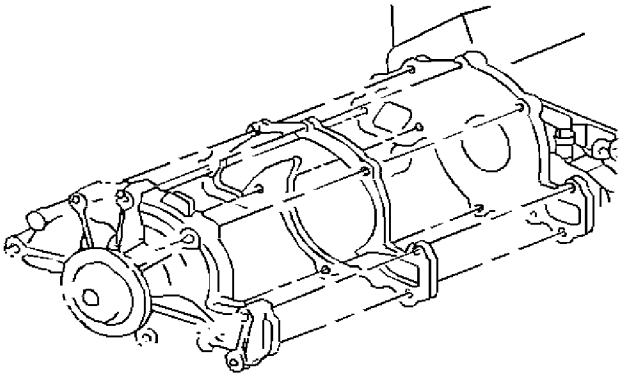




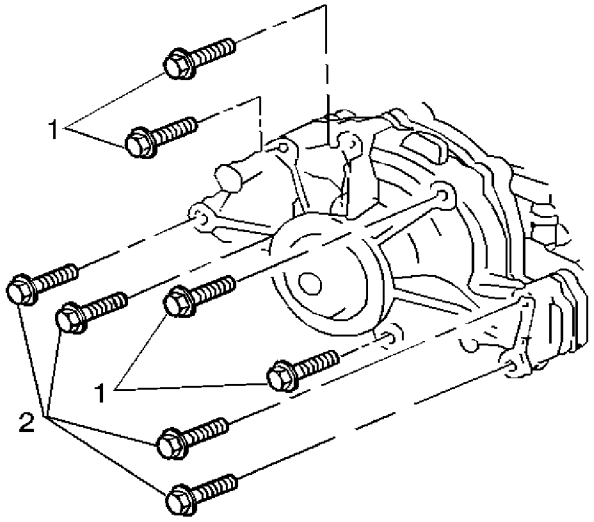
4. Remove the water pump pulley bolts.
5. Remove the water pump pulley.
6. Clean the gasket mating surfaces.

Installation Procedure

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1. Using a new gasket, install the water pump on the engine.



Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the water pump bolts.

Tighten

- Tighten the bolts (1) to 15 N·m (11 lb ft).
- Tighten the bolts (2) to 30 N·m (22 lb ft).

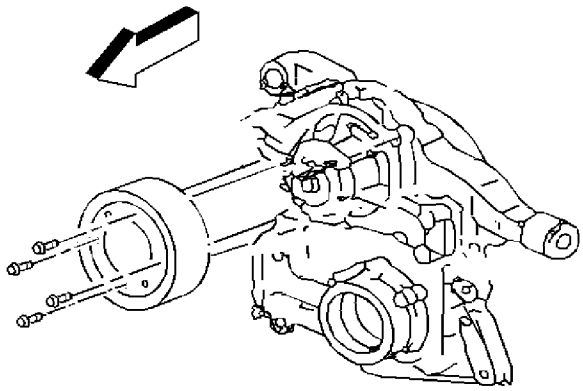
3. Install the drive belt. Refer to Drive Belt Replacement in Engine Mechincal.
4. Fill the coolant. Refer to Cooling System Draining and Filling .
5. Connect the negative battery cable.
6. Check for coolant leaks.

Water Pump Replacement (VIN 1)

Removal Procedure

Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

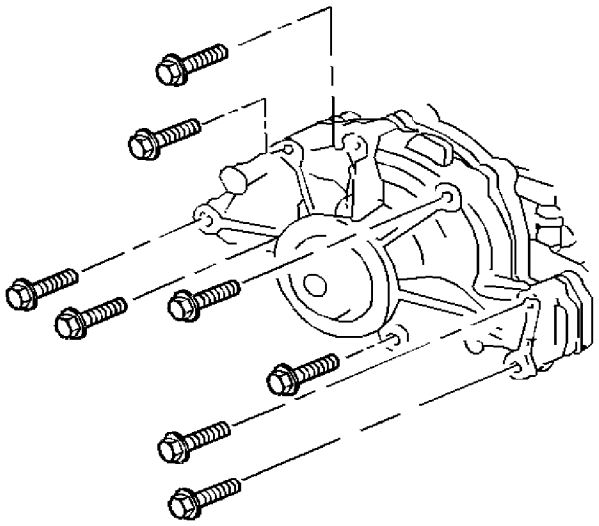
1. Disconnect the negative battery cable.
2. Remove the bolts from the A/C compressor splash shield.
3. Remove the splash shield.
4. Drain the coolant. Refer to Cooling System Draining and Filling .
5. Remove the supercharger drive belt. Refer to Drive Belt Replacement in Engine Mechincal.
6. Remove the drive belt. Refer to Drive Belt Replacement in Engine Mechincal.
7. Remove the coil pack. Position the coil pack out of the way.
8. Remove the supercharger belt tensioner. Refer to Drive Belt Tensioner Replacement in Engine Mechincal.
9. Remove the engine mount. Refer to Engine Mount Replacement in Engine Mechincal.
10. Remove the power steering pump.
11. Remove the engine mount bracket.
12. Remove the idler pulley.





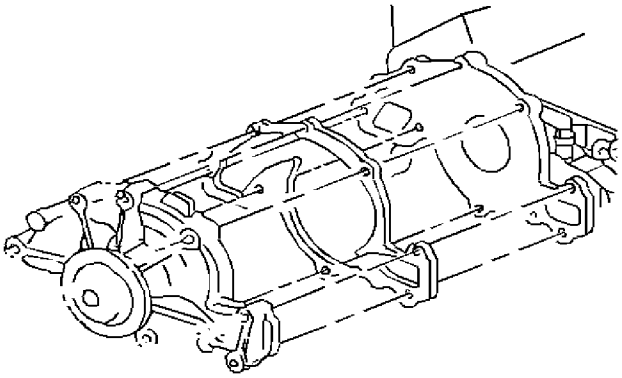
13. Remove the water pump pulley.

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14. Remove the water pump.
15. Clean all of the gasket mating surfaces.

Installation Procedure



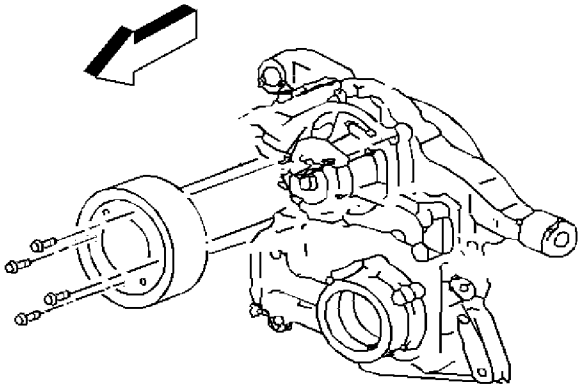
1. Using a new gasket, install the water pump on the engine.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and

may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the water pump bolts.

   Tighten
   - Tighten the bolts (1) to 15 N·m (11 lb ft).
   - Tighten the bolts (2) to 30 N·m (22 lb ft).





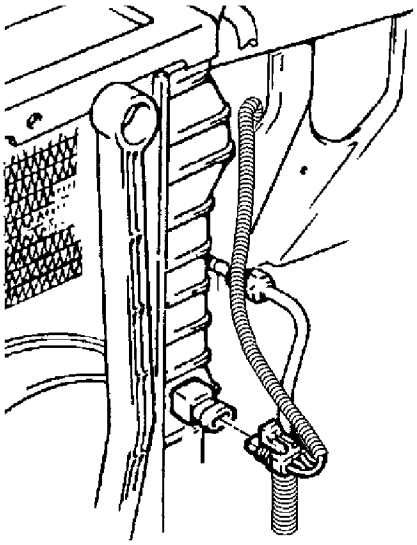
3. Install the water pump pulley.

   Tighten
   Tighten the bolts to 13 N·m (115 lb in).

4. Install the idler pulley.
5. Install the engine mount bracket.
6. Install the power steering pump.
7. Install the engine mount. Refer to Engine Mount Replacement in Engine Mechincal.
8. Install the supercharger belt tensioner. Refer to Drive Belt Tensioner Replacement in Engine Mechincal.
9. Install the coil pack.
10. Install the accessory drive belt. Refer to Drive Belt Replacement in Engine Mechincal.
11. Install the supercharger drive belt. Refer to Drive Belt Replacement in Engine Mechincal.
12. Refill the coolant. Refer to Cooling System Draining and Filling .
13. Install the A/C compressor splash shield.
14. Connect the negative battery cable.
15. Check for coolant leaks.

Coolant Level Sensor Replacement

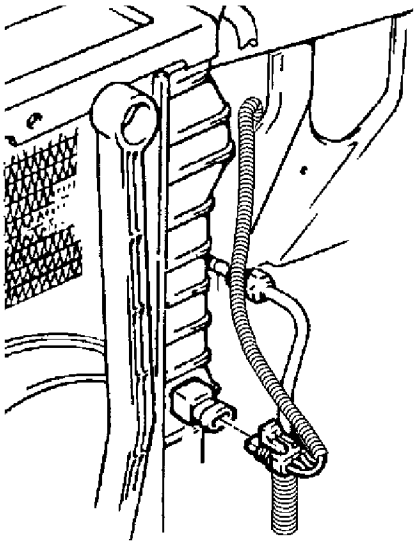
Removal Procedure



1. Remove the coolant level sensor electrical connector.
2. Remove the coolant level sensor.

Installation Procedure

1. Install the coolant level sensor.



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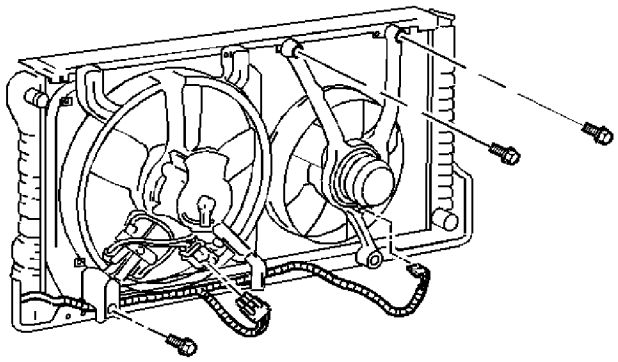
2. Install the coolant level sensor electrical connector.
3. Check the coolant level.

Radiator Replacement

Removal Procedure

Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

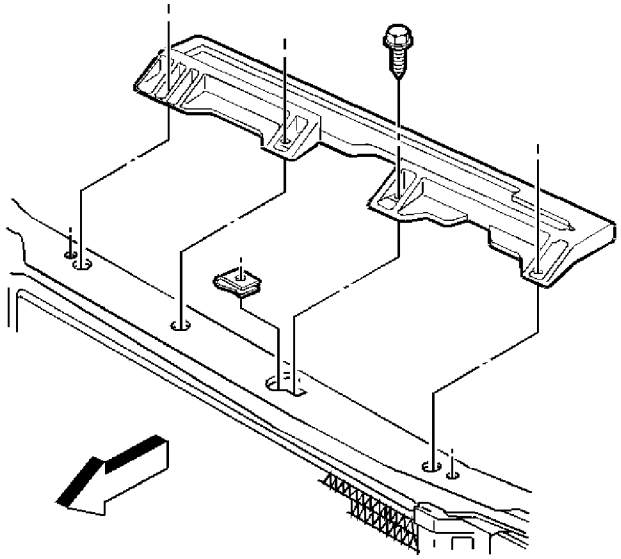
1. Disconnect the negative battery cable.
2. Drain the engine coolant. Refer to Cooling System Draining and Filling .



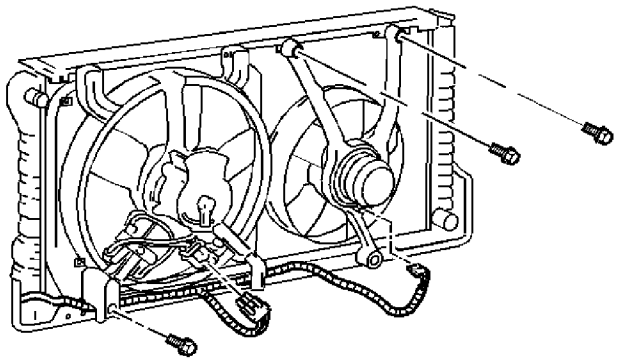


3. Remove the upper fan mounting bolts.

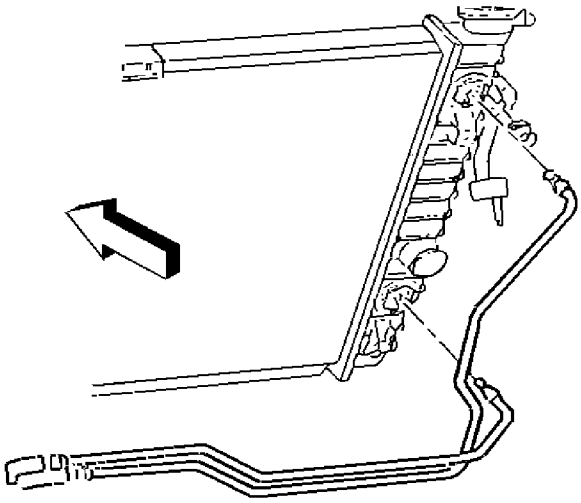
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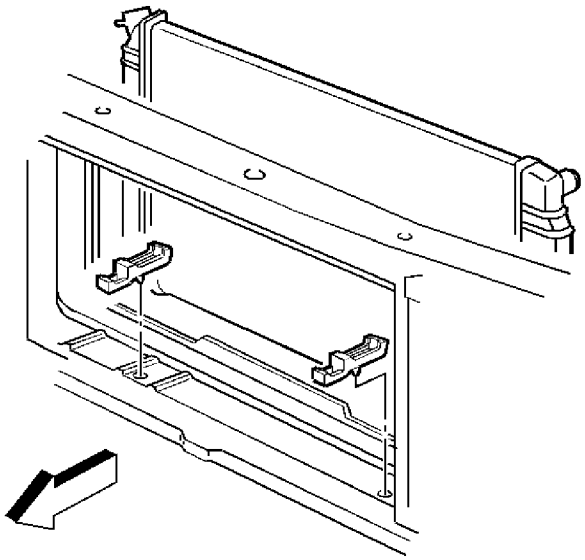
4. Remove the upper radiator panel.



5. Disconnect the radiator hoses from the radiator.
6. Disconnect the coolant recovery hose from the radiator neck.
7. Disconnect the electric cooling fan electric connector.

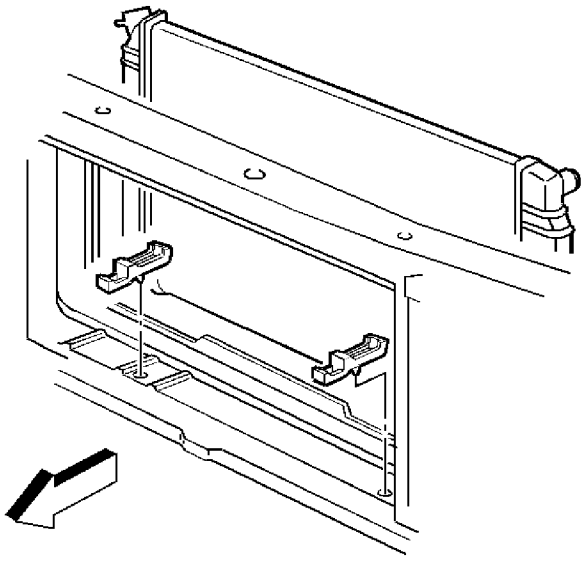


8. Disconnect the transaxle oil cooler lines from the radiator side tank.

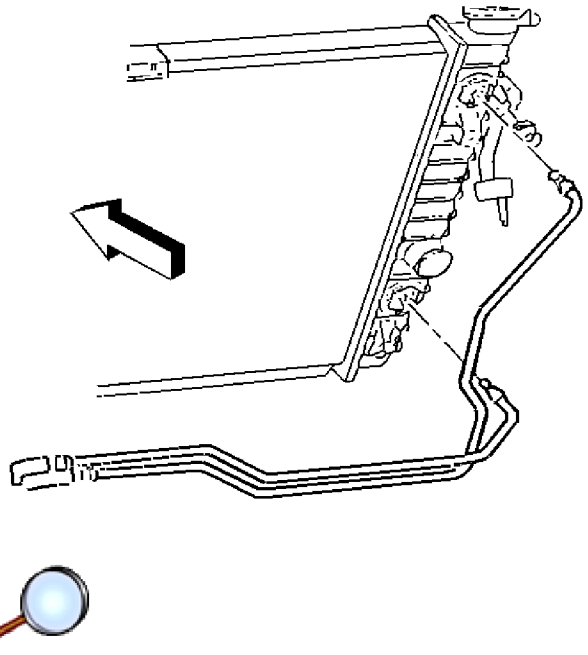


9. Remove the radiator from the vehicle.

Installation Procedure



1. Install the radiator to the vehicle. Place the bottom of the radiator in the lower pads.

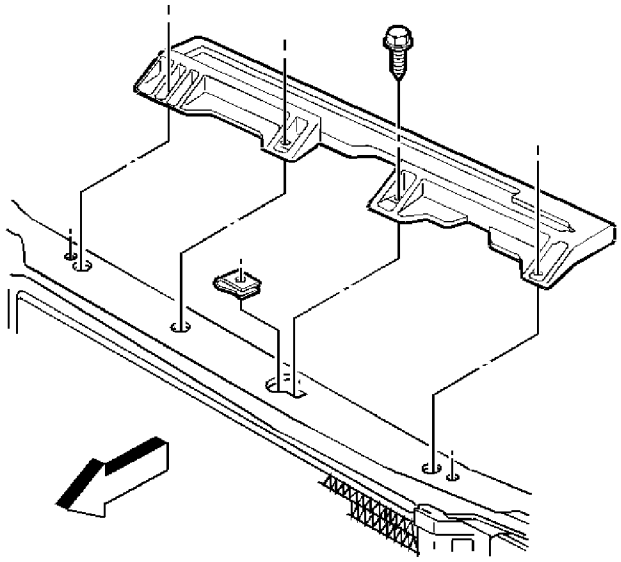


2. Connect the transaxle oil cooler lines to the radiator.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Tighten the transaxle oil cooler lines to the radiator.

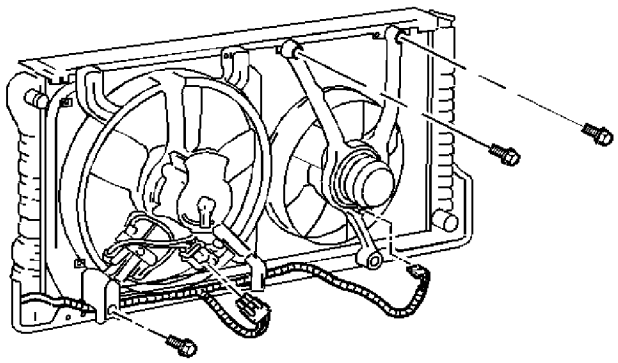
Tighten
Tighten the transaxle oil cooler line fittings to 27 N·m (20 lb ft).



4. Install the upper radiator panel.

Tighten
Tighten the upper radiator panel mounting bolts to 10 N·m (89 lb in).

5. Connect the radiator hoses to the radiator.
6. Connect the coolant recovery hose to the radiator neck.



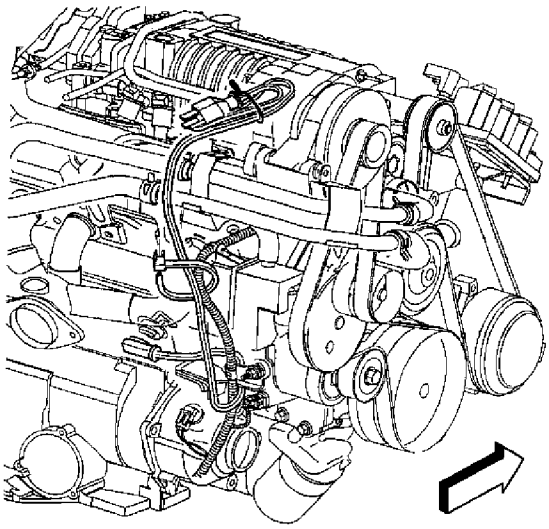
7. Install the cooling fan assembly and the fan attaching bolts.

Tighten
Tighten the cooling fan bolts to 10 N·m (89 lb in).

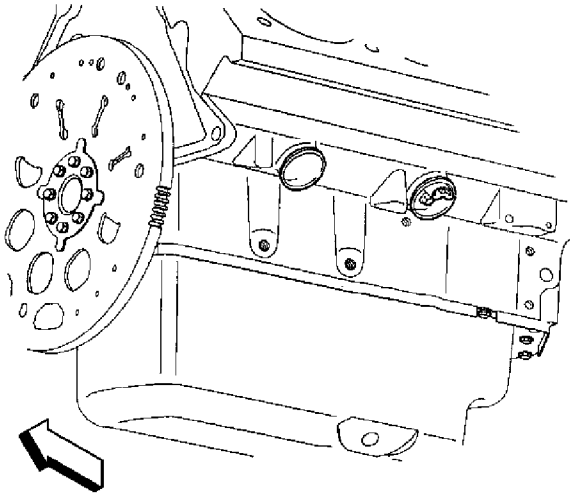
8. Connect the fan connector.
9. Refill the engine coolant. Refer to Cooling System Draining and Filling .
10. Connect the negative battery cable.
11. Check for leaks.

Coolant Heater Replacement

Removal Procedure



1. Drain the engine coolant. Refer to Cooling System Draining and Filling .
2. Remove the transaxle brace to the engine assembly. Refer to Transmission Brace Replacement .
3. Remove the cord from the engine coolant heater.

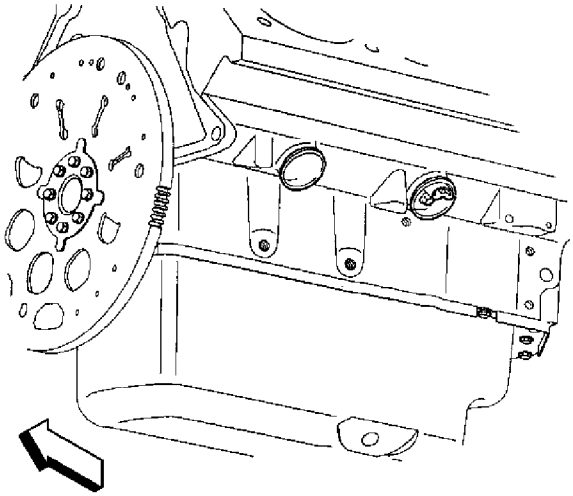


4. Loosen the bolt at the engine coolant heater but do not remove.

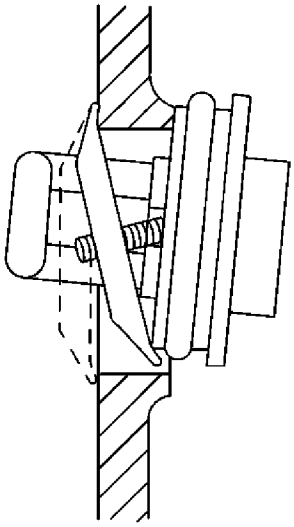
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5. Remove the engine coolant heater.
6. Remove and clean any burrs, compound, paint, or rough spots from the core plug hole.

Installation Procedure



1. Apply a coat of Permatex® Thread Sealant with Teflon to the O-ring and clean the surface of the plug opening.
2. Install the coolant heater by pushing tight to the block.
3. Install the coolant heater so the element is positioned as shown.

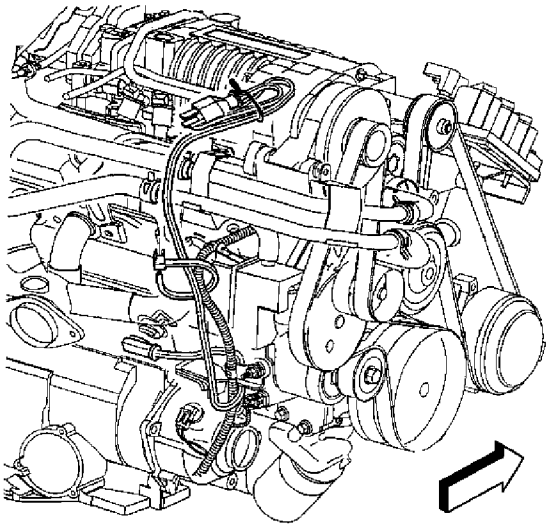


Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners

requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

4. Tighten the bolt until both locking wings draw tight against the inner wall of the engine block.

   Tighten
   Tighten the bolt to 2 N·m (17 lb in).



Notice: The heater cord must not touch the engine, hot pipes, manifold, or any moving parts. Route the cord to the left front of the engine compartment securing with tie straps as necessary to prevent damage.

5. Install the heater cord to the engine coolant heater.
6. Fill the engine cooling system. Refer to Cooling System Draining and Filling .

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Front Exhaust Pipe-to-Manifold Bolt (L36 & L67)	25 N·m	18 lb ft
U-Bolt Clamp Nuts	40 N·m	30 lb ft

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Exhaust System Clearances

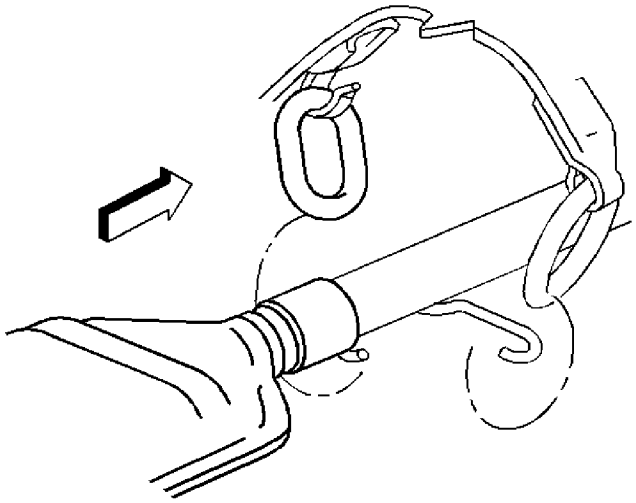
Application	Specification	
	Metric	English
Front Exhaust Pipe to the Front Stabilizer Bar	37 mm	1.45 in
Heatshield to the Converter	31 mm	1.22 in
Intermediate Pipe/Resonator and the Splash Shield to the Fuel Tank facing the RH of the vehicle	37 mm	1.45 in
Intermediate Pipe/Resonator and the Splash Shield at 55 degrees to the heat shield toward facing to the rear of the vehicle	48 mm	1.89 in
Intermediate Pipe/Resonator and the Splash Shield at 80 degrees to the heat shield toward facing to the rear of the vehicle	24 mm	0.94 in
Intermediate Pipe/Resonator and the Splash Shield at 225 degrees to the heat shield facing to the front of the vehicle	43 mm	1.69 in
Intermediate Pipe/Resonator and the Splash Shield at 165 degrees to the heat shield facing to the front of the vehicle	29 mm	1.14 in
Intermediate Pipe/Resonator and the Splash Shield at 45 degrees to RH of the of the Rear Stabilizer Bar	23 mm	0.90 in
Tailpipe to the Muffler	13 mm	0.5 in
Tailpipe to the Rear Fascia (Pontiac)	49 mm	1.9 in
Tailpipe to the Rear Fascia (Oldsmobile Eighty-Eight)	24 mm	0.94 in
Tailpipe to the Rear Fascia (Buick LeSabre)	29 mm	1.14 in

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Exhaust System Alignment

1. The exhaust system hangers minimize noise transfer. Vibration and noise can be transmitted into the vehicle under the following conditions:
   - System contact with the body
   - A restricted hanger





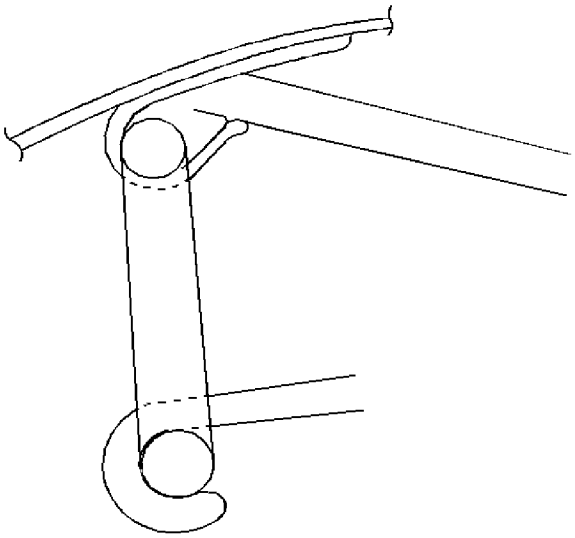
2. Position the clamps and the insulator so that the hanger is vertical, when the exhaust system is at operating temperature.
3. Inspect that the brackets are horizontal.

Important: Allow the pipes to cool before touching them.

4. Use heat in front of the rear suspension, in order to reposition the pipes if necessary.
5. Do not use an acetylene torch near the fuel tank.

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6. Inspect that the support brackets are horizontal.
7. Inspect that the clearance between the frame members and the floor pan is a minimum of 15 mm (5/8 in) after the following procedures:
   - Hanger adjustment
   - Pipe positioning
8. Tighten all clamps according to the specified torques. Refer to Fastener Tightening Specifications .
9. Clearance is needed in order to avoid the following conditions:
   - Overheating of the floor pan
   - Damage to the passenger compartment carpets
10. Inspect that the weight of the system is evenly distributed according to the equal deflection at each hanger on the following components:
    - The brackets
    - The hangers
11. Ensure that the exhaust system has the proper clearances. Refer to Exhaust System Clearances .

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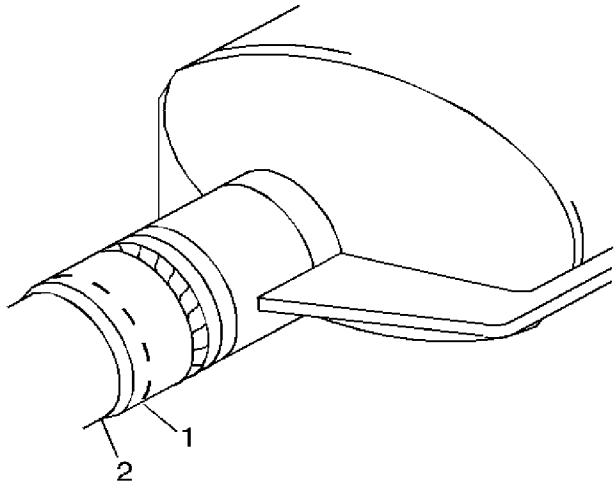
Intermediate Pipe Replacement

Tools Required

J 29800 Cut-Off Tool

Removal Procedure

A service muffler is required when replacing the intermediate pipe/resonator on an originally equipped welded system.

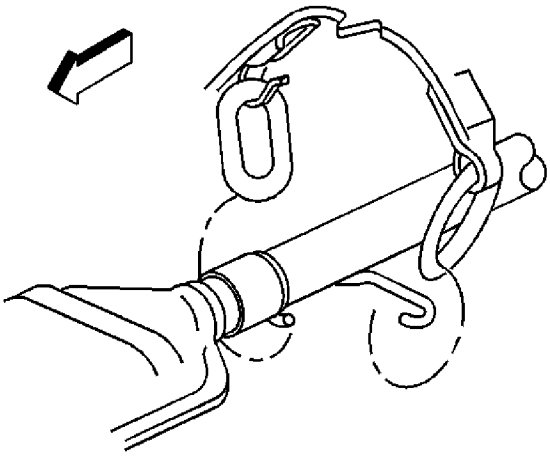


Important: The NEW intermediate pipe/resonator will slide over the remaining portion of the intermediate pipe/resonator.

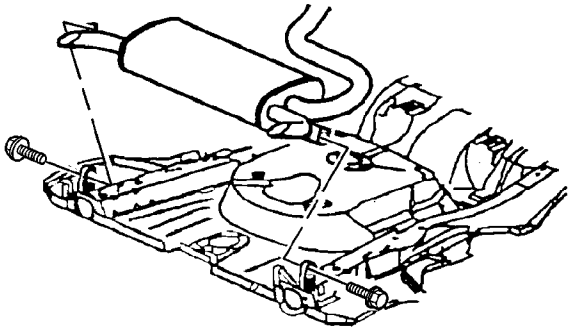
1. Cut (1) near the edge of the expanded portion of the intermediate pipe/resonator (2) using the J 29800 .

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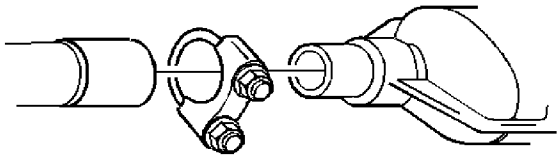
2. Remove the hangers from the intermediate pipe/resonator.
3. Support the following:
   - The intermediate pipe/resonator
   - The catalytic converter



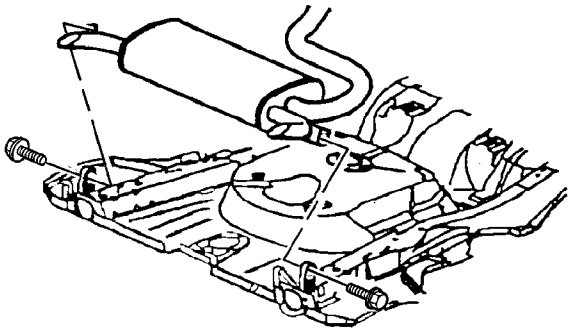
4. Remove the hanger bolts from the tail pipes.
5. With the aid of an assistant, lower the intermediate pipe/resonator and muffler assembly from the vehicle.

Installation Procedure

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1. Loosely install the muffler with a U bolt type clamp to the intermediate pipe/resonator.



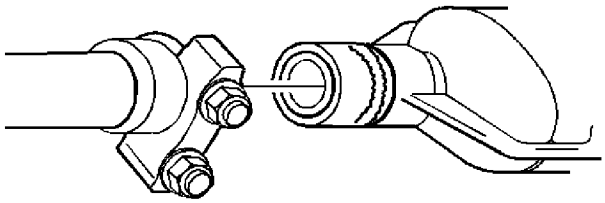
2. With the aid of an assistant, raise the intermediate pipe/resonator and muffler assembly into position under the vehicle.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the hanger bolts to the tail pipes.

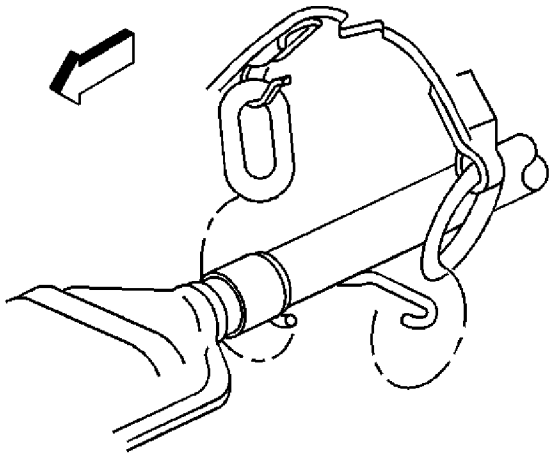
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Tighten
Tighten the rear exhaust hanger bolts to 20 N·m (15 lb ft).





4. Slide the intermediate pipe/resonator over the catalytic converter outlet.
5. Loosely install a U bolt type clamp to the intermediate pipe/resonator.





6. Install the hangers to the intermediate pipe/resonator.
7. Align the system for proper clearances to the underbody. Refer to Exhaust System Alignment .
8. Tighten the U bolt type clamps previously installed in steps 1 and 5.

Tighten
Tighten the U bolt clamp nuts to 40 N·m (30 lb ft).

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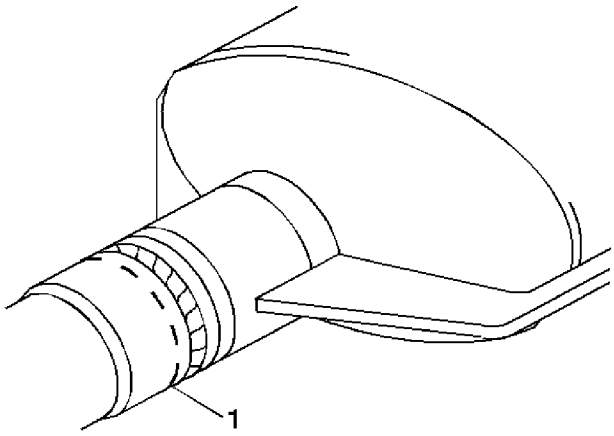
Catalytic Converter Replacement

Tools Required

J 29800 Cut-Off Tool

Removal Procedure

1. Remove the oxygen sensor. Refer to Heated Oxygen Sensor Replacement in Engine Controls.

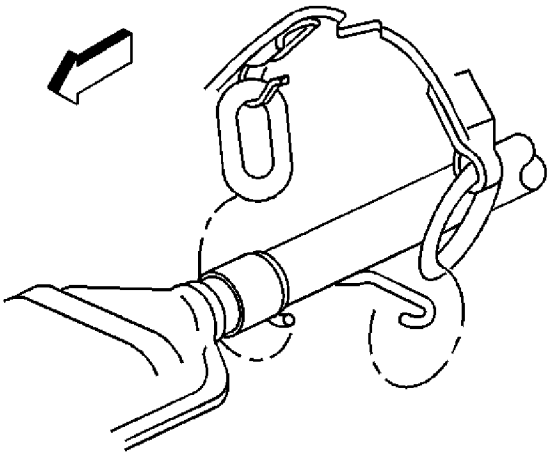


Important: Ensure a minimum of 38 mm (1.5 inches) of the expanded portion of the intermediate pipe/resonator remains for installation.

2. Cut the intermediate pipe/resonator (1) at the converter weld using the J 29800 . Cut the pipe as close to the weld as possible.

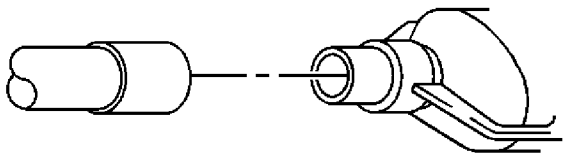
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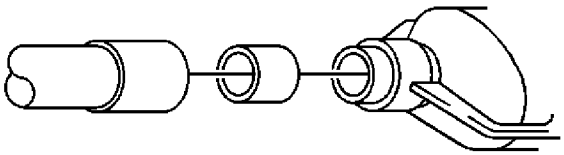
3. Remove the hangers from the intermediate pipe/resonator.
4. Support the following:
   - The intermediate pipe/resonator
   - The catalytic converter





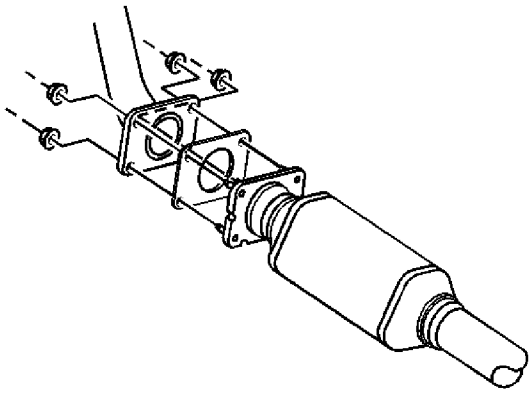
5. Separate the intermediate pipe/resonator from the catalytic converter.

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6. If both pipes were cut through in step 2, remove the remainder of the catalytic converter pipe from the intermediate pipe/resonator.

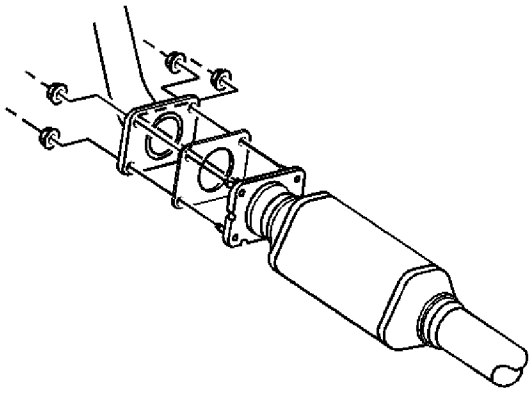




7. Remove the 4 nuts securing the catalytic converter to the exhaust manifold pipe.
8. Remove the catalytic converter from the exhaust manifold pipe.
9. Remove the catalytic converter gasket. Do not reuse the gasket.

Installation Procedure

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1. Place a NEW catalytic converter gasket over the catalytic converter studs.
2. Position the catalytic converter to the exhaust manifold pipe.

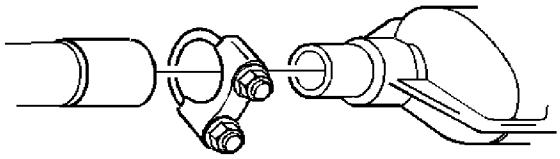
Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the 4 nuts securing the catalytic converter to the exhaust manifold pipe.

   Tighten
   Tighten the catalytic converter nuts to 25 N·m (18 lb ft).

4. Support the catalytic converter.

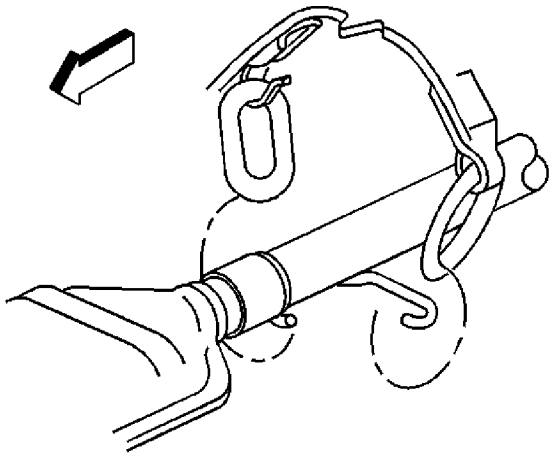
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5. Slide the intermediate pipe/resonator over the catalytic converter outlet.
6. Align the system for proper clearances to the underbody. Refer to Exhaust System Alignment .
7. Install the U bolt type clamp.

Tighten
Tighten the U bolt clamp nuts to 40 N·m (30 lb ft).





8. Install the hangers to the intermediate pipe/resonator.
9. Remove the supports from the following:
   - The intermediate pipe/resonator
   - The catalytic converter

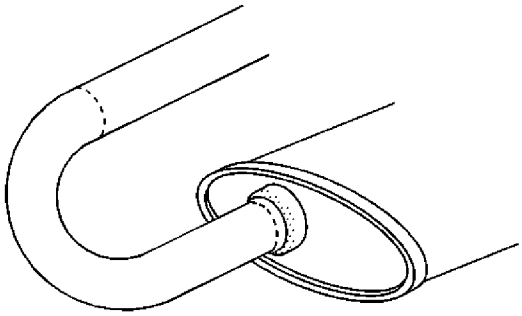
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10. Install the oxygen sensor. Refer to Heated Oxygen Sensor Replacement in Engine Controls.

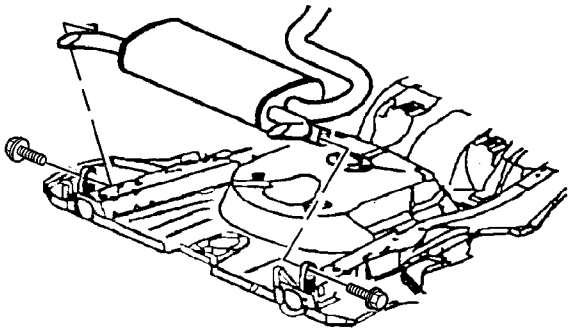
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Exhaust Muffler Replacement

Removal Procedure



1. Support the intermediate pipe/resonator assembly.
2. Cut the intermediate pipe/resonator.

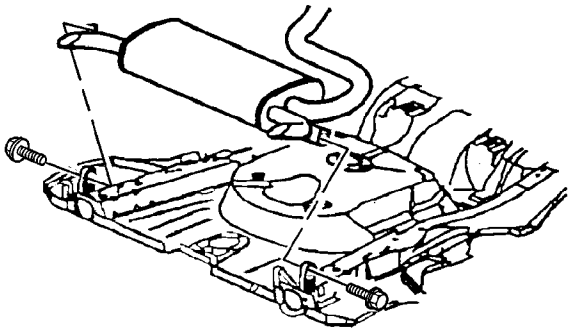


3. Remove the muffler hangers.
4. Remove the muffler.

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Installation Procedure



1. Install the muffler.
2. Install the muffler hangers.
3. Install the intermediate pipe/resonator assebly to the muffler.
4. Align the muffler and the intermediate pipe/resonator to the proper clearance. Refer to Exhaust System Alignment .

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

5. Install the U bolt type clamp.

   Tighten
   Tighten the clamp nuts to 40 N·m (30 lb ft).

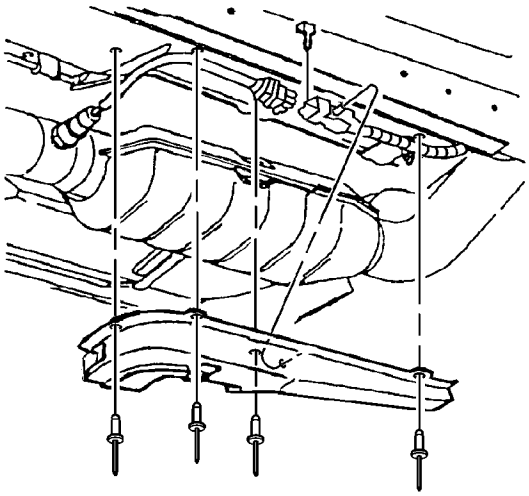
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Converter Heat Shield Replacement

Removal Procedure

1. Remove the oxygen sensor. Refer to Heated Oxygen Sensor Replacement in Engine Controls.

   Notice: The Heated Oxygen Sensor (HO2S) uses a permanently attached pigtail and connector. Do not remove this pigtail from the Heated Oxygen Sensor. Damage or the removal of the pigtail or the connector could affect the proper operation of the sensor.



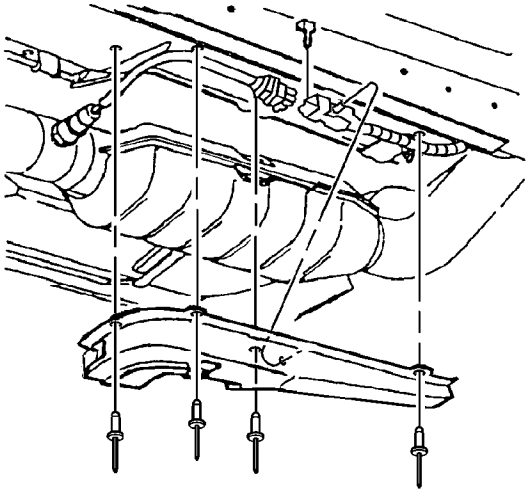


2. Remove the heat shield retaining bolts.
3. Remove the oxygen sensor connector from the shield.

Installation Procedure

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1. Install the oxygen sensor connector on the shield.
2. Install the heat shield retaining bolts on the vehicle.

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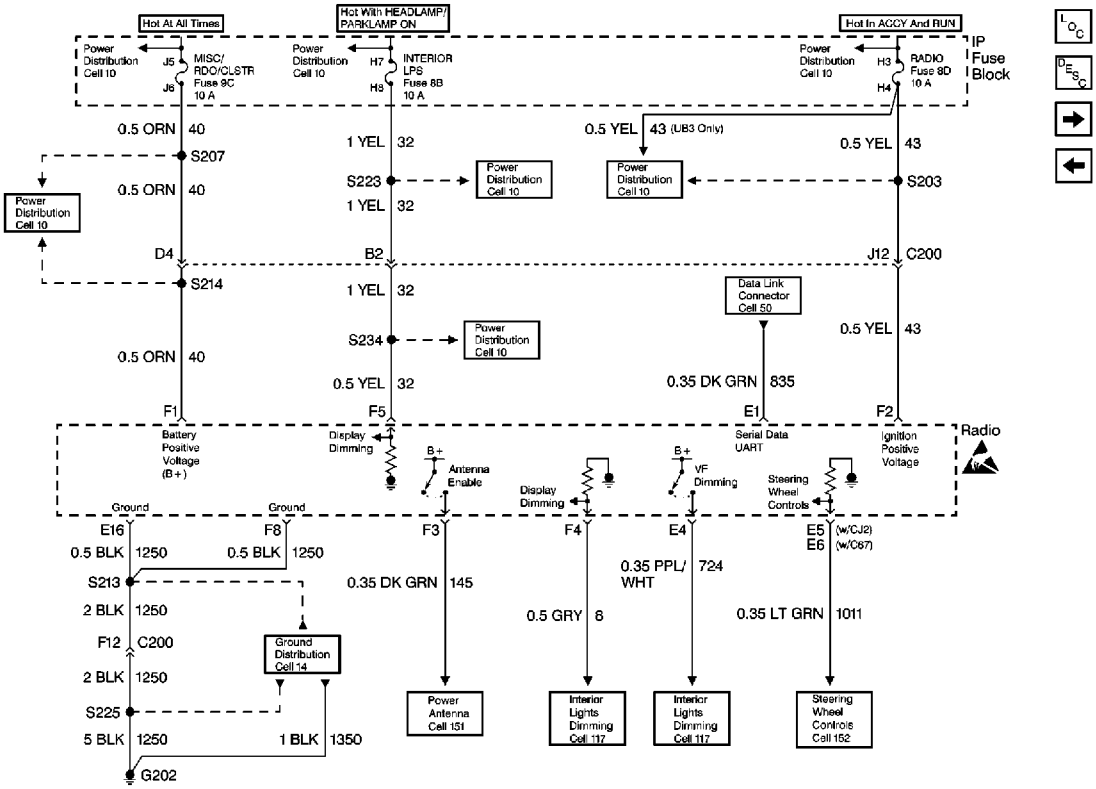
Fastener Tightening Specifications

Application	Specification	
	Metric	English
Antenna Mast	5 N·m	44 lb in
Antenna Module Fastener	7.5 N·m	66 lb in
Antenna to Bracket Fastener	7.5 N·m	66 lb in
BOSE® Amplifier Fasteners	2 N·m	18 lb in
Extended Range Rear Package Shelf Speaker Fasteners	1.9 N·m	17 lb in
Fixed Antenna Ground Lead Fastener	7.5 N·m	66 lb in
Front Door Speaker Fasteners	1.4 N·m	17 lb in
Front Door Tweeter Speaker Fasteners	1.4 N·m	12 lb in
Front Extended Range IP Speaker Fasteners	1.9 N·m	12 lb in
Power Antenna Ground Lead Fastener	4 N·m	35 lb in
Radio Fasteners	1.9 N·m	17 lb in

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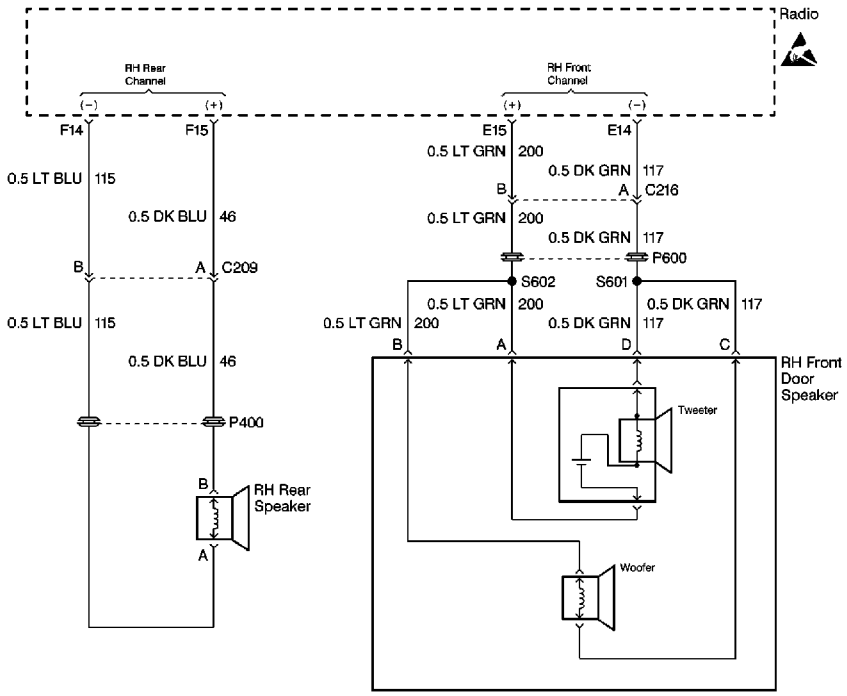
Cell 150: Radio Power and Ground (Buick)



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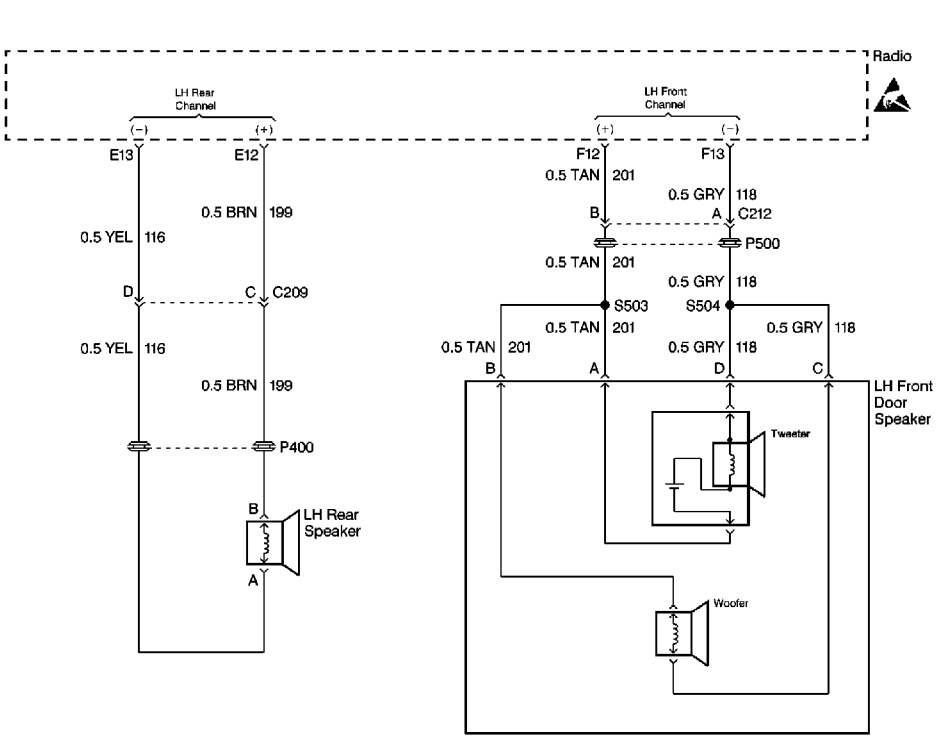
Cell 150: RH Speakers (Buick w/UW6)



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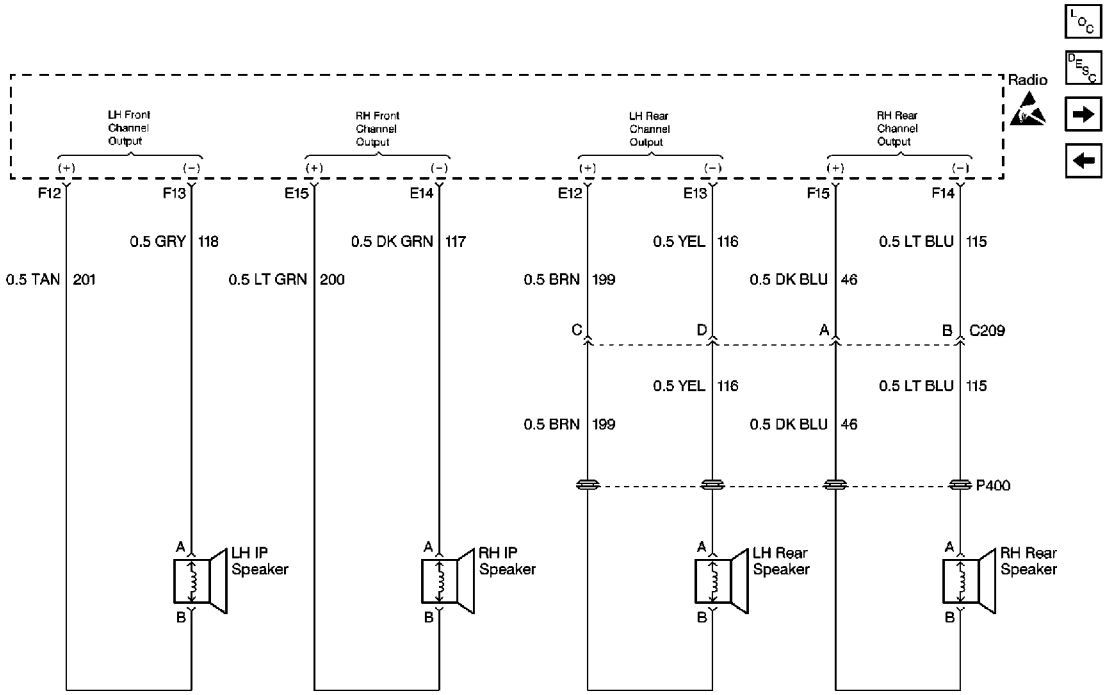
Cell 150: LH Speakers (Buick w/UW6)



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Cell 150: Speakers (Buick w/UQ8)

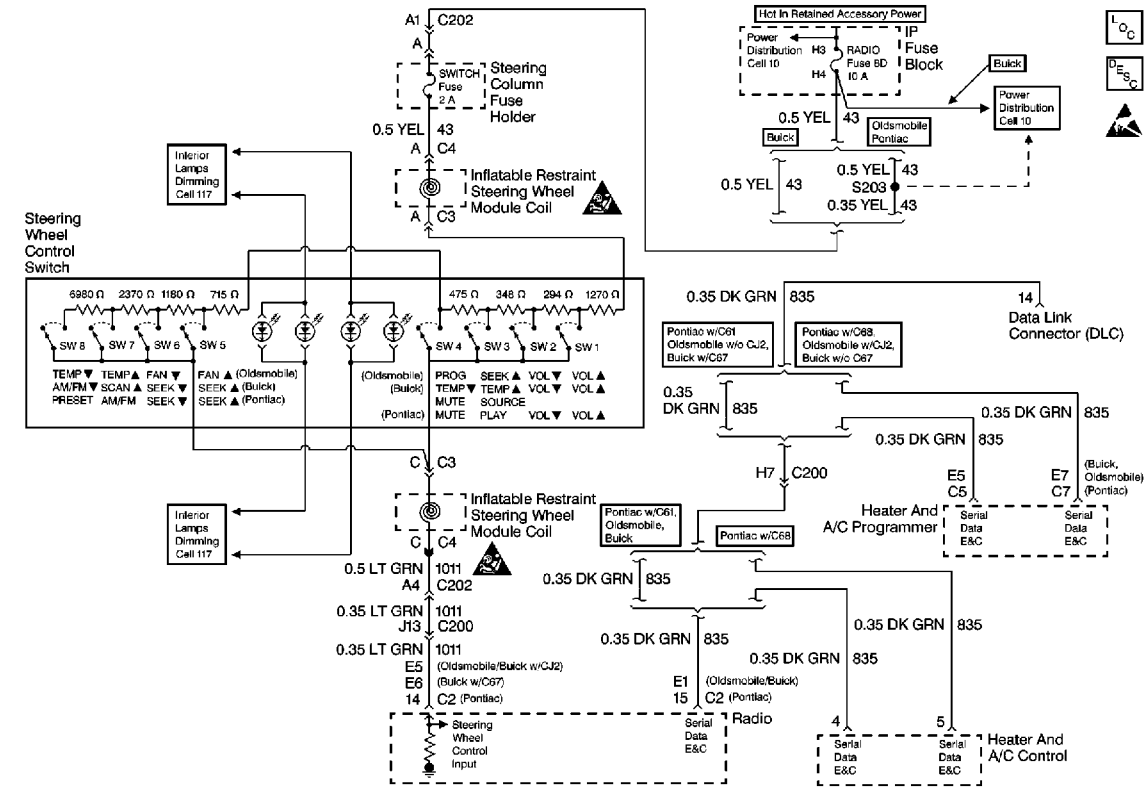


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Steering Wheel Controls Schematics

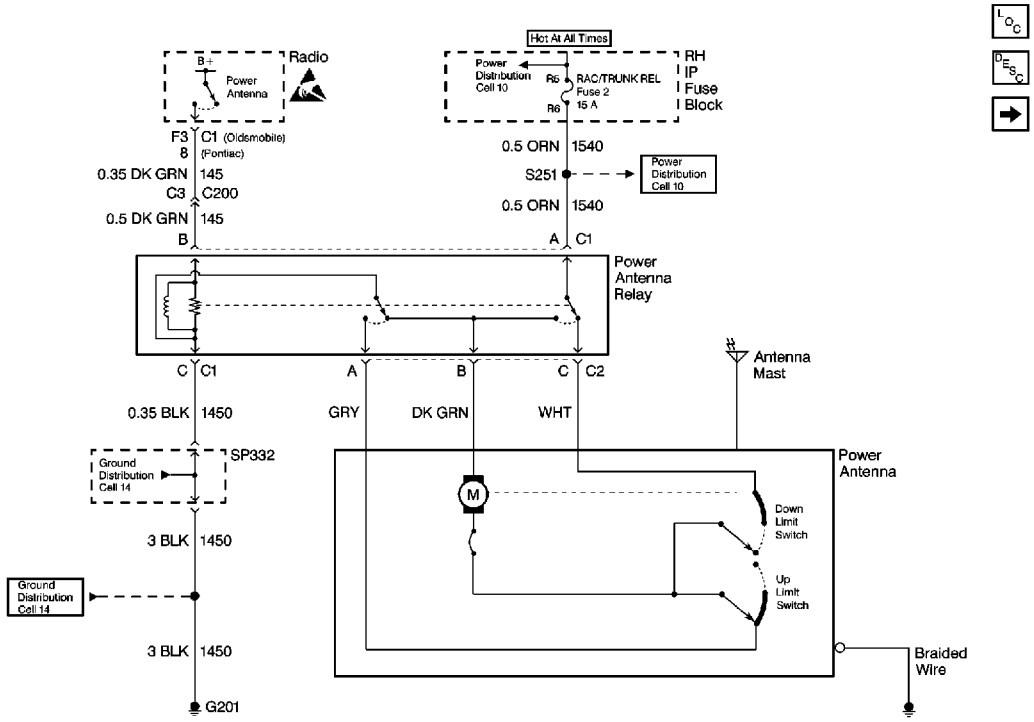
Cell 152



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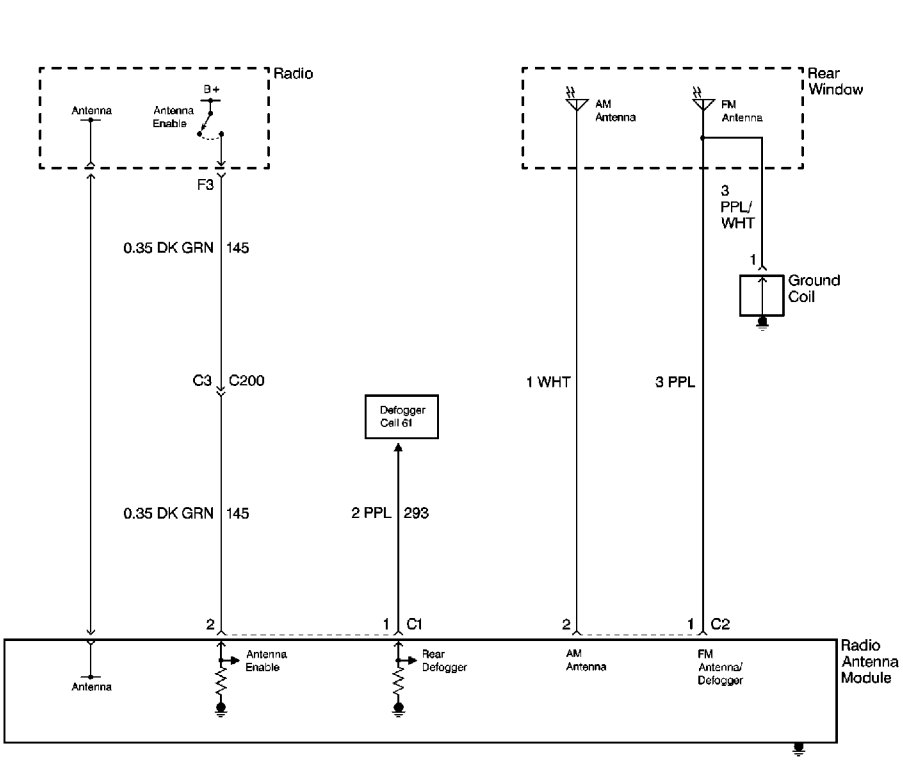
Cell 151: Power Antenna



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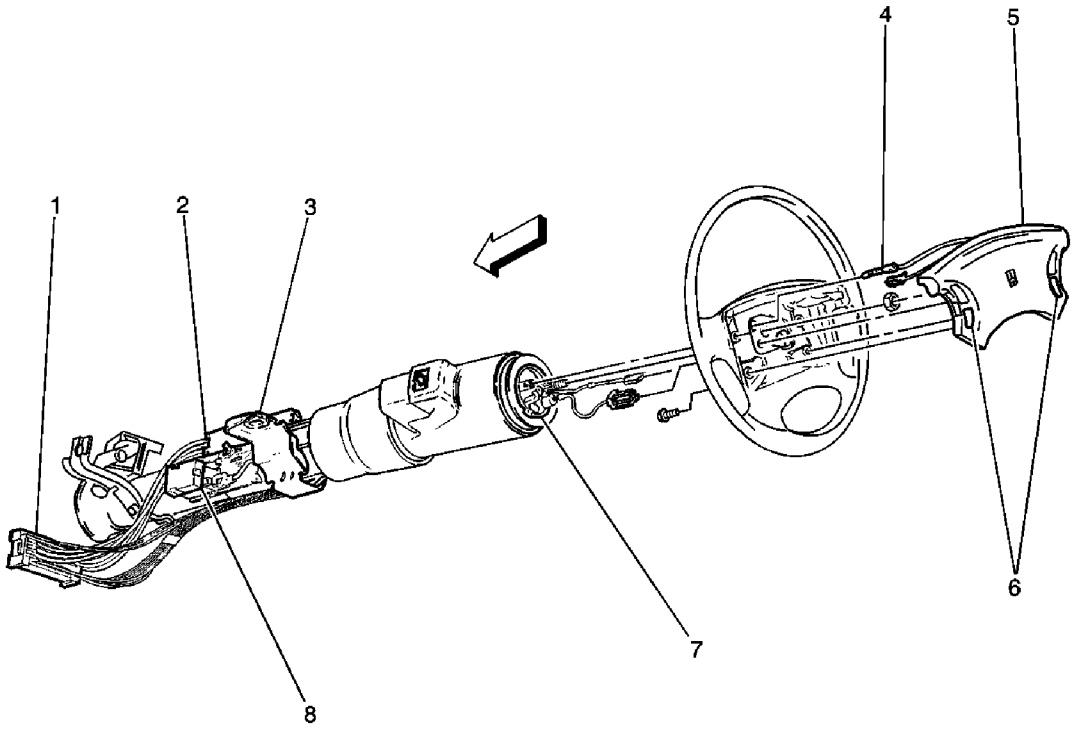
Cell 151: Rear Window Antenna



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Passenger Compartment, Steering Column

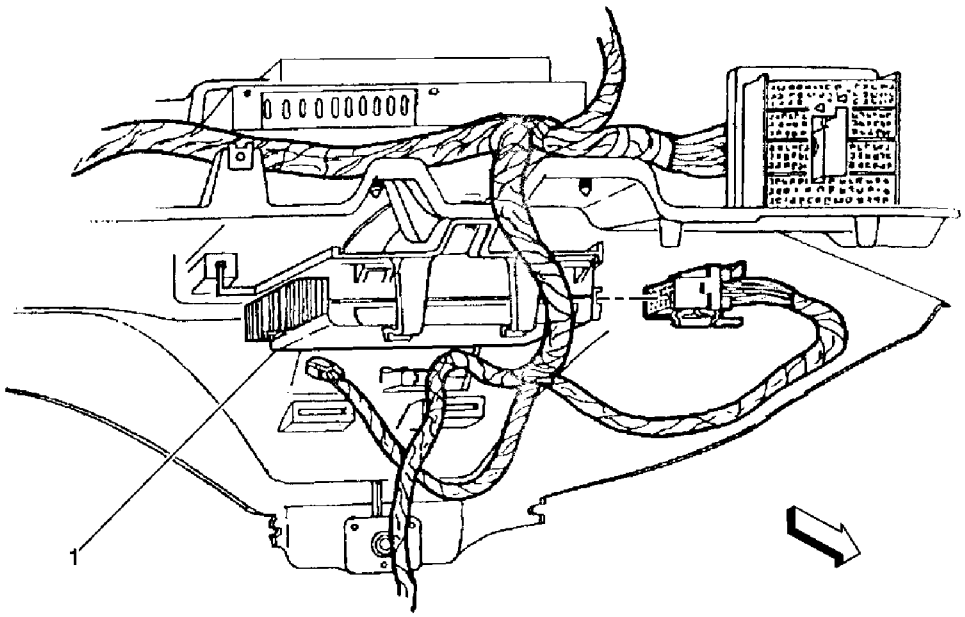


(1) C202
(2) Ignition Switch
(3) Shift Interlock Actuator (Hidden)
(4) Horn Switch
(5) Inflatable Restraint Steering Wheel Module
(6) Steering Wheel Controls LH and RH
(7) Inflatable Restraint Steering Wheel Module Coil
(8) Headlamp Dimmer Switch

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Instrument Panel, Under the Center

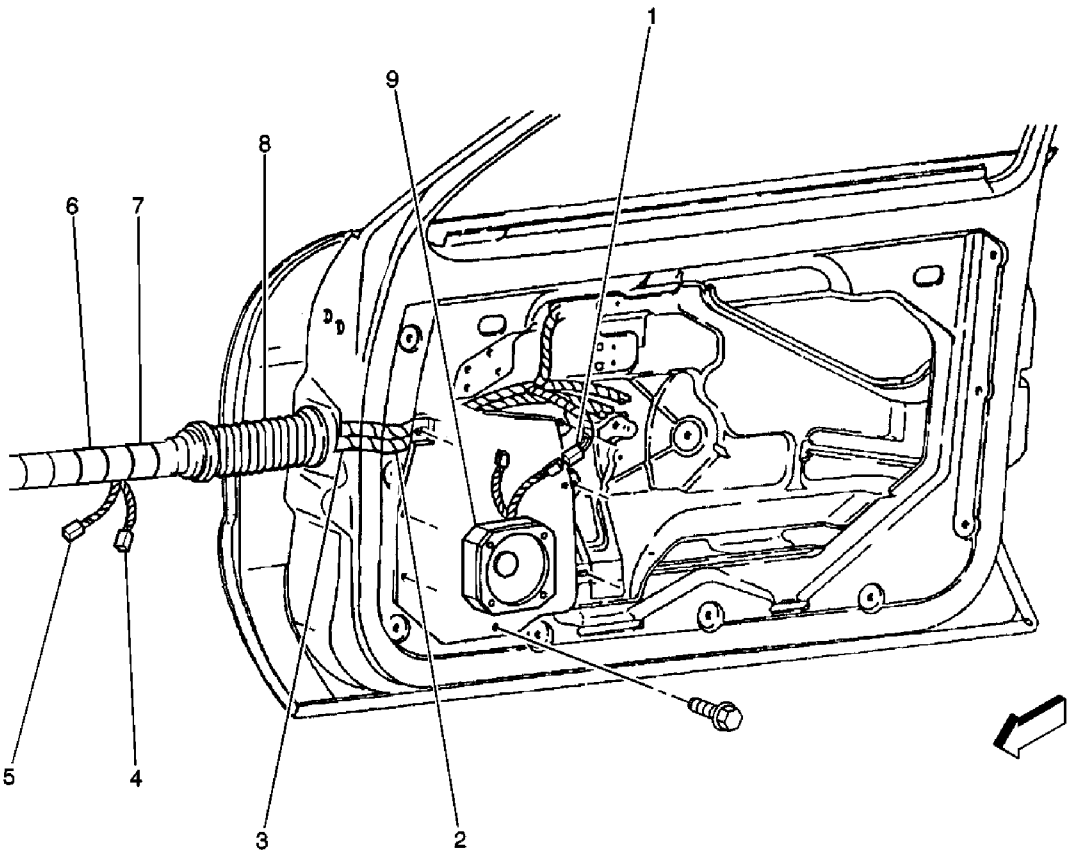


(1) Audio Amplifier (BOSE®)

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Right Front Door, Behind the Door Trim

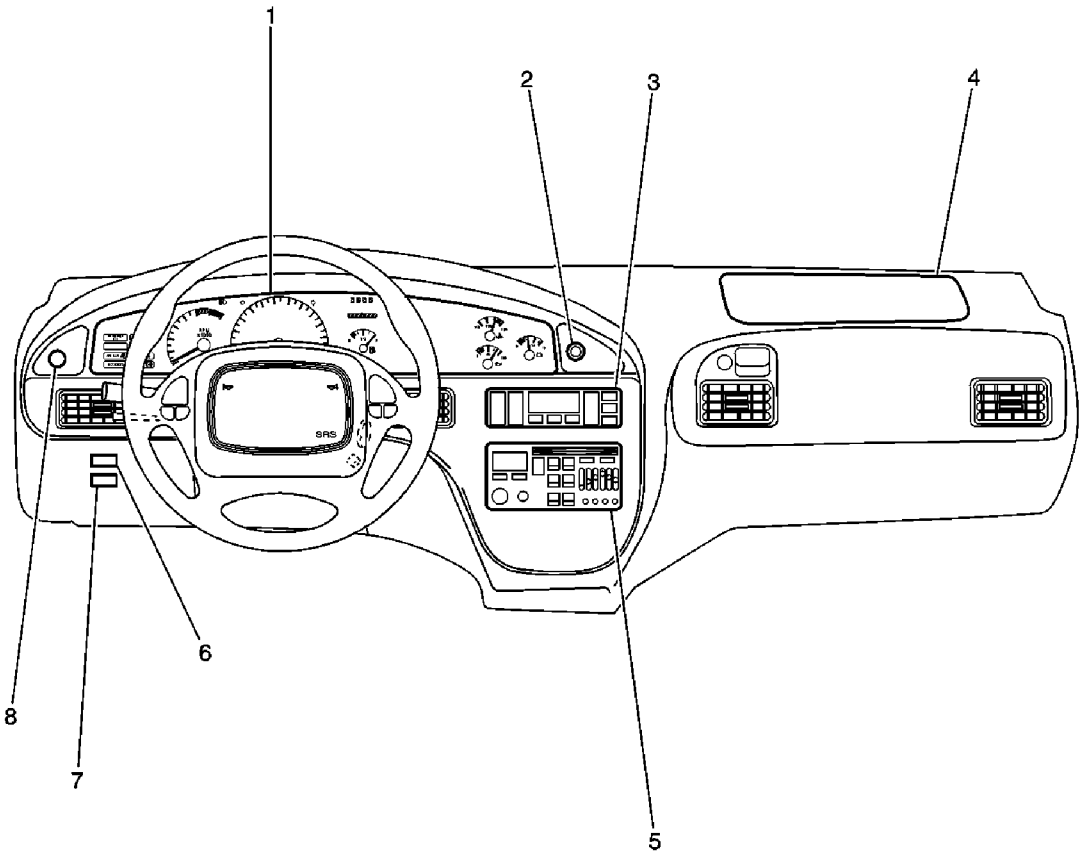


(1) RH Front Door Speaker Connector (LH Similar)
(2) C602
(3) S601
(4) C216
(5) C209
(6) S600
(7) S603
(8) P600
(9) RH Front Door Speaker (LH Similar)

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Passenger Compartment, Pontiac Instrument Panel Shown, Others Similar

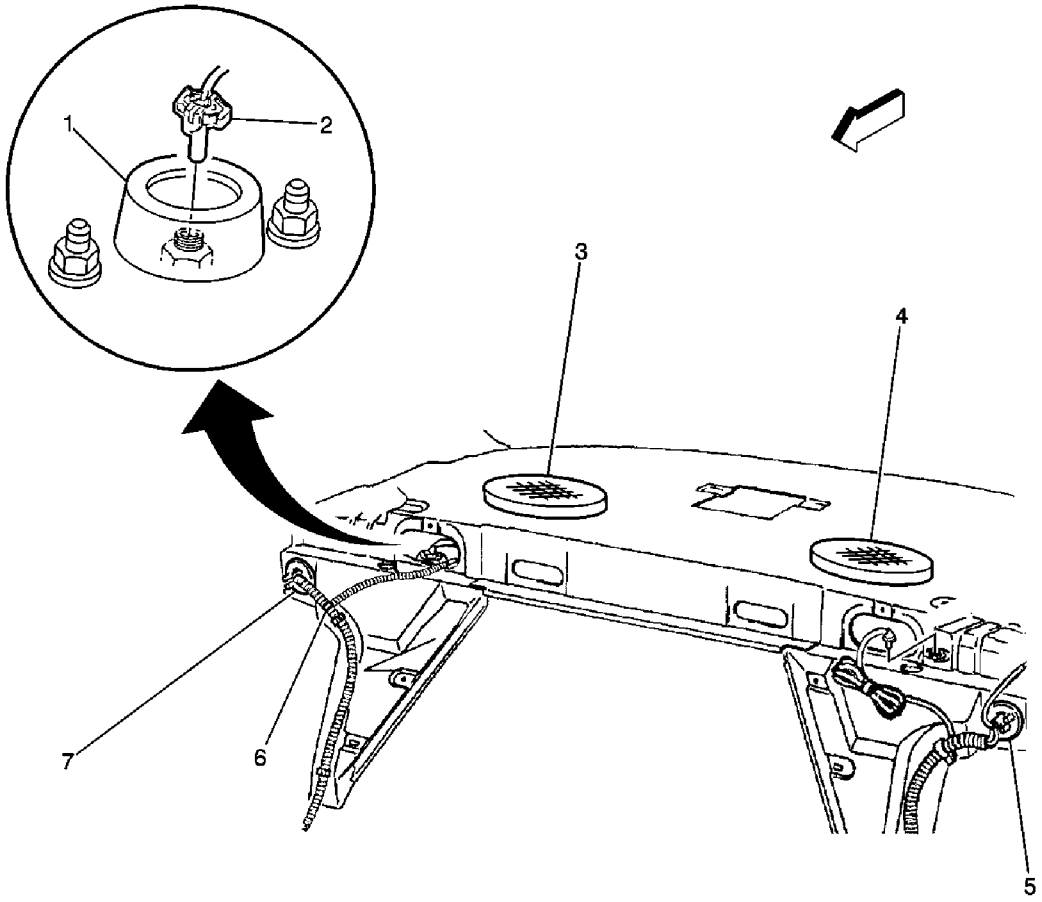


(1) Instrument Cluster
(2) Cigar Lighter
(3) Heater and A/C Control
(4) Inflatable Restraint IP Module
(5) Radio
(6) Rear Compartment Lid Latch Switch
(7) Fog Lamp Switch
(8) Lamp Dimmer Switch

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Passenger Compartment, Rear Package Shelf Area

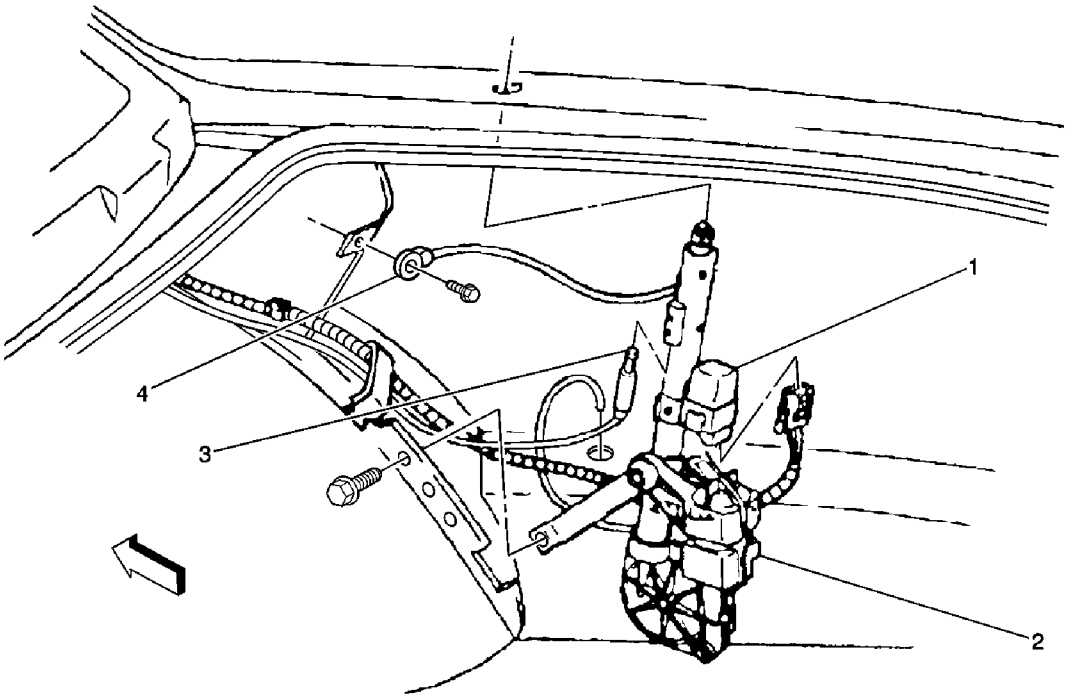


(1) RH Rear Strut Tower -- LH Similar
(2) RH Rear Strut Actuator -- LH Similar (Pontiac w/FW1)
(3) RH Rear Speaker
(4) LH Rear Speaker
(5) P408
(6) S301
(7) P400

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Right Hand of the Rear Compartment



(1) Power Antenna Relay
(2) Power Antenna
(3) Antenna Coaxial Cable
(4) Power Antenna Mast Ground

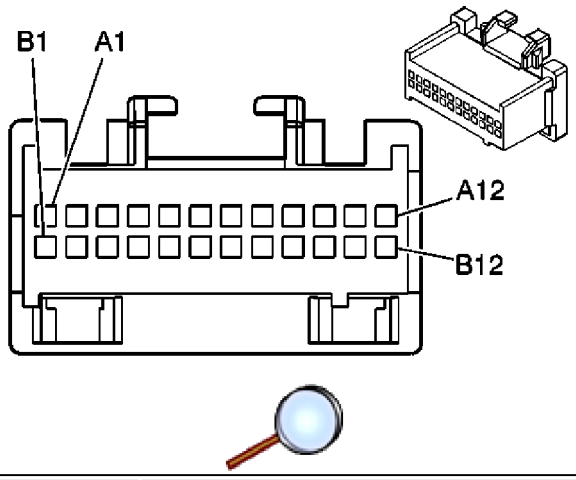
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Entertainment Connector End Views

Table 1: Audio Amplifier (w/ UZ8)
Table 2: Radio (Oldsmobile/Buick)
Table 3: Radio C1 (Pontiac)
Table 4: Radio C2 (Pontiac)
Table 5: Radio C3 (Pontiac)
Table 6: RH Front Door Speaker (Oldsmobile/Pontiac)
Table 7: RH Front Door Speaker (Buick)
Table 8: RH IP Speaker (UQ8)
Table 9: RH Rear Speaker (Tweeter)
Table 10: RH Rear Speaker (Woofer)
Table 11: RH Rear Speaker (Buick)
Table 12: LH Front Door Speaker (Pontiac/Oldsmobile)
Table 13: LH Front Door Speaker (Buick)
Table 14: LH IP Speaker (UQ8)
Table 15: LH Rear Speaker (Woofer)
Table 16: LH Rear Speaker (Buick)
Table 17: LH Rear Speaker
Table 18: LH Rear Speaker

Audio Amplifier (w/ UZ8)



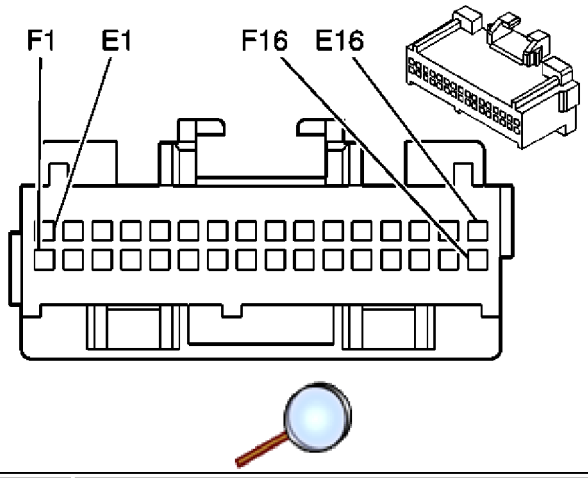
Connector Part Information	• 12110088 • 24 Way F Micro-Pack 100 Series (GRY)

Pin	Wire Color	Circuit No.	Function
A1	BRN	199	Speaker Feed-Left Rear
A2	YEL	116	Speaker Return - Left Rear
A3	--	--	Not Used
A4	DK GRN	1947	Audio Signal - Left Front

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A5	BRN	1999	Audio Signal - Left Rear
A6	LT GRN	1948	Audio Signal - Right Front
A7	BLK	1946	Audio Signal - Right Rear
A8	ORN	360	Switch Battery Power
A9-A10	--	--	Not Used
A11	DK GRN	117	Speaker Return - Right Front
A12	ORN	40	Fused Output-Battery
B1	BLK	1250	Ground
B2	TAN	201	Speaker Feed - Left Front
B3	GRY	118	Speaker Return - Left Front
B4	--	--	Not Used
B5	TAN	511	Audio Input - Left Front
B6	BRN	599	Audio Input - Left Rear
B7	LT GRN	512	Audio Input - Right Front
B8	DK BLU	546	Speaker Return - Right Rear
B9	--	--	Not Used
B10	LT BLU	115	Speaker Return - Right Rear
B11	DK BLU	46	Speaker Feed - Right Rear
B12	LT GRN	200	Speaker Feed - Right Front

Radio (Oldsmobile/Buick)



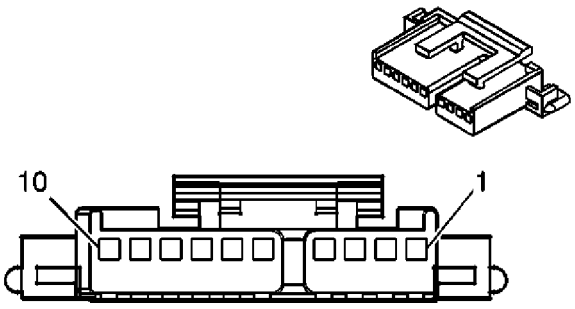
Connector Part Information	• 12110115 • 32 Way F Micro-Pack 100 Series (BLU)

Pin	Wire Color	Circuit No.	Function
E1	DK GRN	835	Diagnostic Signal - E & C
E2- E3	--	--	Not Used
E4	PPL/WHT	724	Vacuum Fluorescent Dimming Signal
E5	LT GRN	1011	Remote Radio Control Signal

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E6	LT GRN	1011	Remote Control Signal (Buick with C67/U23 or UB3)
E7-E11	--	--	Not Used
E12	BRN	199	Left Rear Speaker Feed
E13	YEL	116	Left Rear Speaker Return
E14	DK GRN	117	Right Front Speaker Return
E15	LT GRN	200	Right Front Speaker Feed
E16	BLK	1250	Ground
F1	ORN	40	Fused Output - Battery
F2	YEL	43	Fused Output - Accessory
F3	DK GRN	145	Power Antenna Relay Feed Coil
F4	GRY	8	Instrument Panel Lamp Feed
F5	YEL	32	Fused Output - Instrument Panel Lamps
F6-F7	--	--	Not Used
F8	BLK	1250	Ground (Buick)
F9-F11	--	--	Not Used
F12	TAN	201	Left Front Speaker Feed
F13	GRY	118	Left Front Speaker Return
F14	LT BLU	115	Right Rear Speaker Return
F15	DK BLU	46	Right Rear Speaker Feed
F16	--	--	Not Used

Radio C1 (Pontiac)



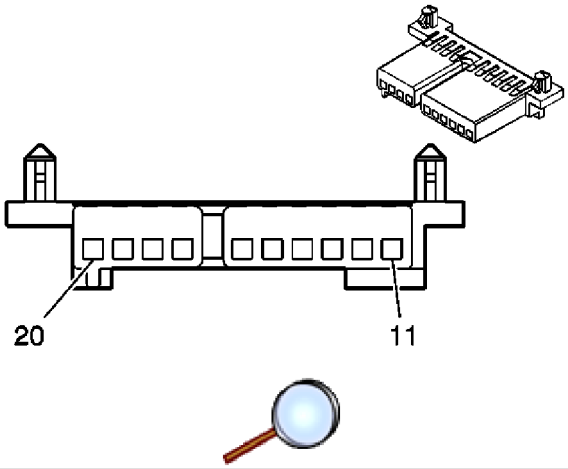
Connector Part Information	• 12047531 • F Micro - Pack 100 Series (BLK)

Pin	Wire Color	Circuit No.	Function
1	GRY	118	Left Front Speaker Return
2	TAN	201	Left Front Speaker Feed
3	DK GRN	117	Right Front Speaker Return

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4	LT GRN	200	Right Front Speaker Feed
5	BLK	1250	Ground
6	YEL	32	Fused Output - Instrument Panel Lamps
7	GRY	8	instrument Panel Lamps Feed
8	DK GRN	145	Power Antenna Relay Feed - Coil
9	YEL	43	Fused Output - Accessory
10	ORN	40	Fused Output - Battery

Radio C2 (Pontiac)

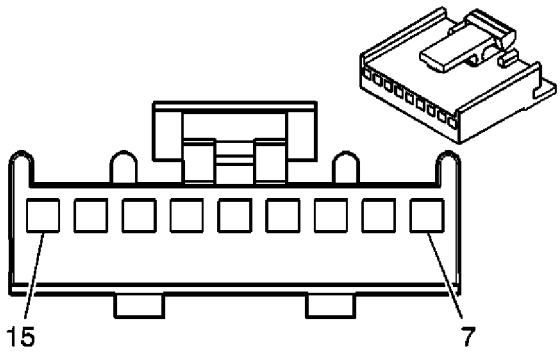


Connector Part Information	• 12065785 • 10-Way F Micro - Pack 100 Series (GRY)

Pin	Wire Color	Circuit No.	Function
11	BLK	1250	Ground (with UZ8)
12-13	--	--	Not Used
14	LT GRN	1011	Remote Radio Control Signal
15	DK GRN	835	Diagnostic Signal - E&C
16	--	--	Not Used
17	LT BLU	115	Right Rear Speaker Return
18	DK BLU	46	Right Rear Speaker Feed
19	YEL	116	Left Rear Speaker Return
20	BRN	199	Left Rear Speaker Feed

Radio C3 (Pontiac)

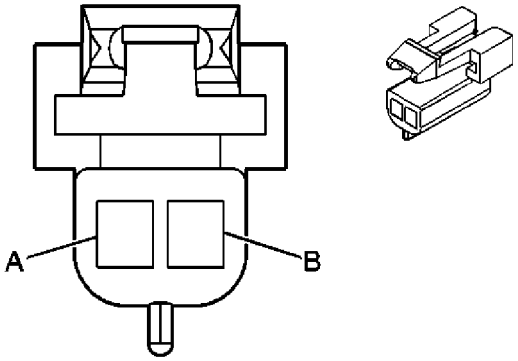
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Connector Part Information	• 12064980 • 9 Way F Micro-Pack 100 Series (BLK)

Pin	Wire Color	Circuit No.	Function
7	ORN	360	Amplifier Feed
8-15	--	--	Not Used

RH Front Door Speaker (Oldsmobile/Pontiac)

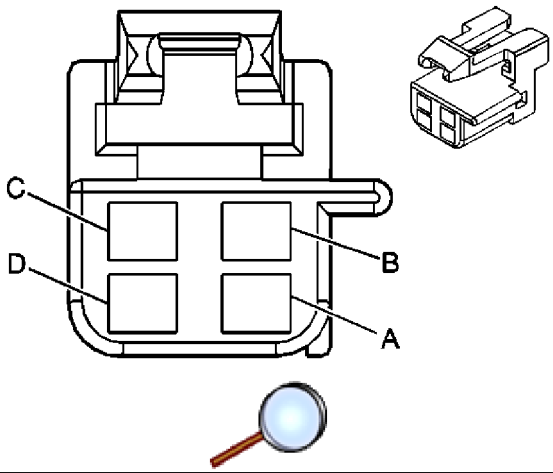


Connector Part Information	• 12052832 • 2-Way F Metri-Pack 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	DK GRN	117	Speaker Return -Right Front
B	LT GRN	200	Speaker Feed -Right Front

RH Front Door Speaker (Buick)

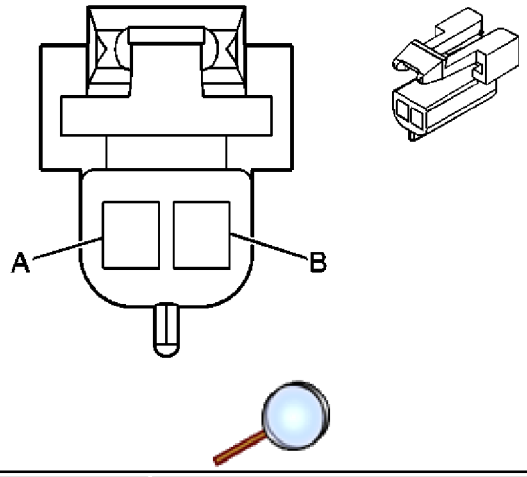
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Connector Part Information	• 12064760 • 4 Way F Metri-Pack 150 Series

Pin	Wire Color	Circuit No.	Function
A	LT GRN	200	Speaker Feed - Right Front
B	LT GRN	200	Speaker Feed - Right Front
C	DK GRN	117	Speaker Return - Right Front
D	DK GRN	117	Speaker Return - Right Front

RH IP Speaker (UQ8)

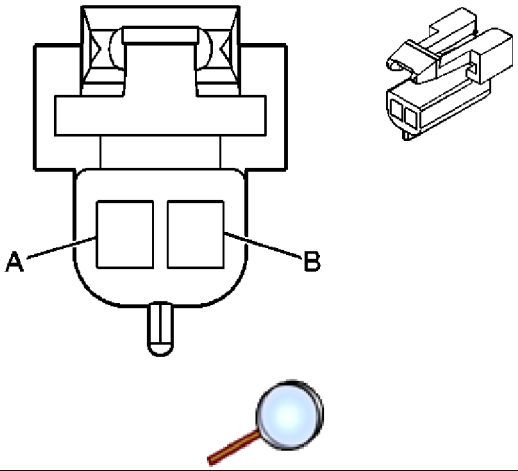


Connector Part Information	• 12052832 • 2-Way Metri-Pack 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	DK GRN	117	Speaker Return - Right Front
B	LT GRN	200	Speaker Feed - Right Front

RH Rear Speaker (Tweeter)

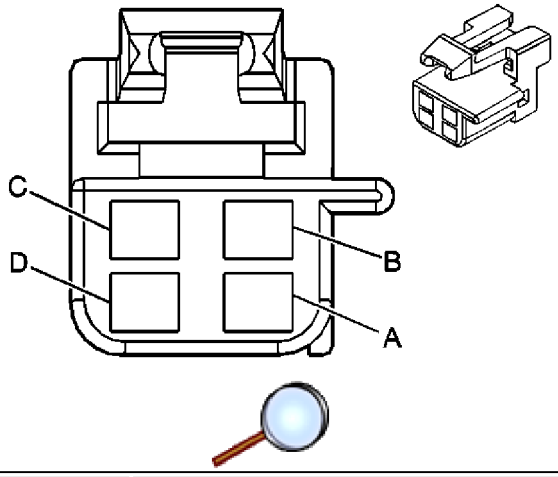
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Connector Part Information	• 12052832 • 2 Way F Metric-Pack Series 150 (BLK)

Pin	Wire Color	Circuit No.	Function
A	LT BLU	115	Speaker Return - Right Rear
B	DK BLU	46	Speaker Feed - Right Rear

RH Rear Speaker (Woofer)

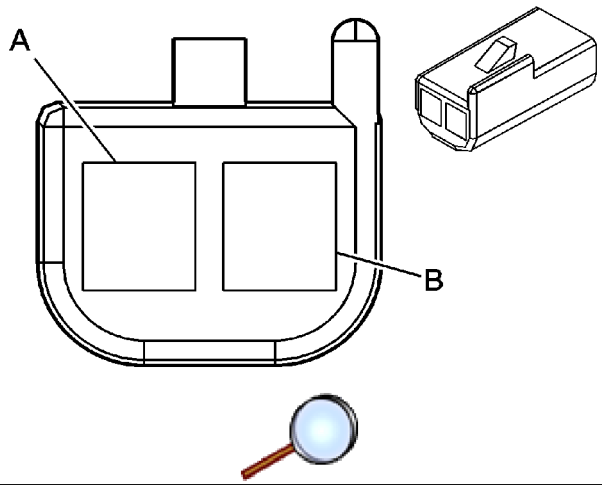


Connector Part Information	• 12064760 • 2 Way F Metric-Pack 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	LT BLU	115	Speaker Return - Right Rear
B	DK BLU	46	Speaker Feed - Right Rear
C - D	--	--	Not Used

RH Rear Speaker (Buick)

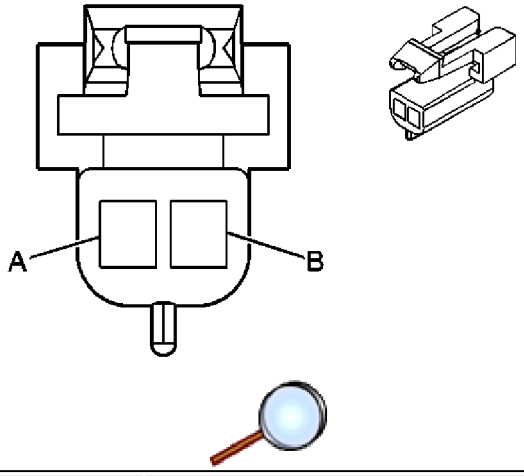
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Connector Part Information	• 12047662 • 2-Way F Metri-Pack Series 150 (BLK)

Pin	Wire Color	Circuit No.	Function
A	LT BLU	115	Speaker Return - Right Rear
B	DK BLU	46	Speaker Feed - Right Rear

LH Front Door Speaker (Pontiac/Oldsmobile)

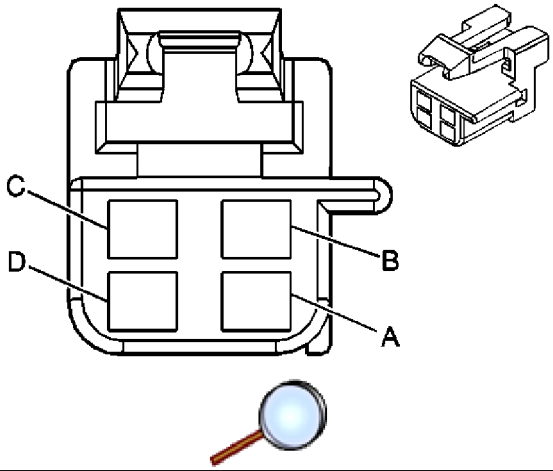


Connector Part Information	• 12052832 • 2 Way F Metri-Pak 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	GRA	118	Speaker Return - Left Front
B	TAN	201	Speaker Feed - Left Front

LH Front Door Speaker (Buick)

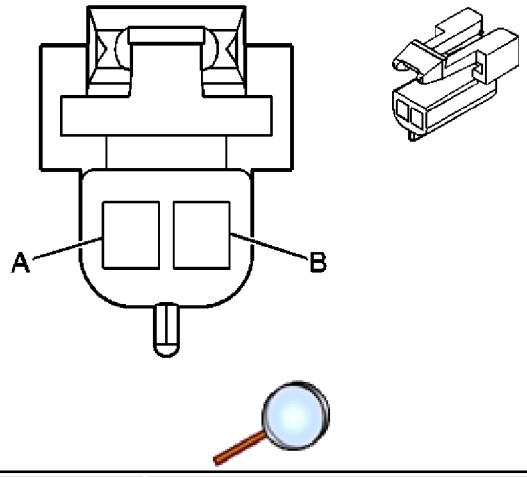
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Connector Part Information	• 12064760 • 4-Way F Metri-Pak 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	TAN	201	Speaker Feed Left Front
B	TAN	201	Speaker Feed Left Front
C	GRA	118	Speaker Return Left Front
D	GRA	118	Speaker Return Left Front

LH IP Speaker (UQ8)

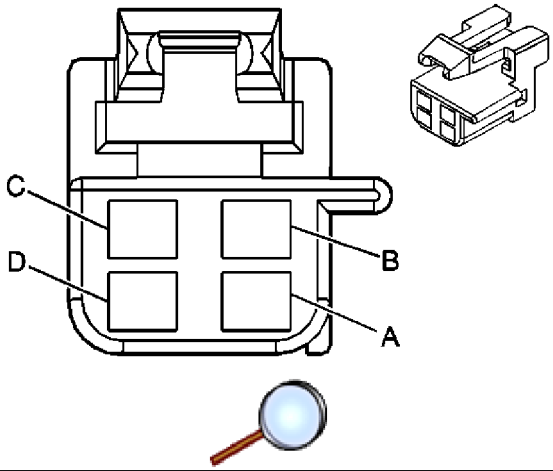


Connector Part Information	• 12052832 • 2-Way F Metri-Pak 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	GRA	118	Speaker Return Left Front
B	TAN	201	Speaker Feed Left Front

LH Rear Speaker (Woofer)

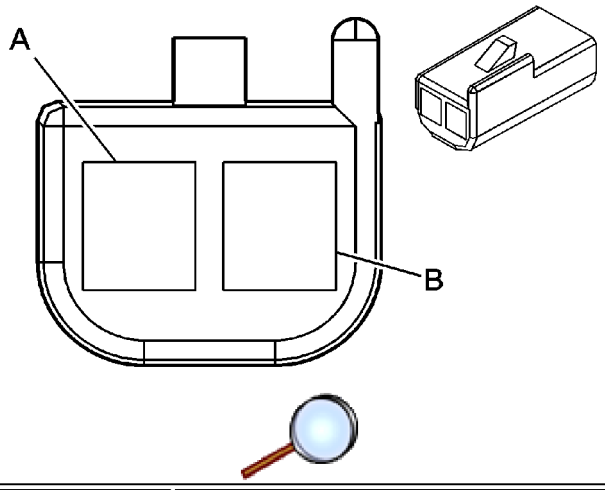
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Connector Part Information	• 12064760 • 2-Way F Metri-Pak 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	YEL	116	Speaker Return Left Rear
B	BRN	199	Speaker Feed Left Rear
C - D	--	--	Not Used

LH Rear Speaker (Buick)

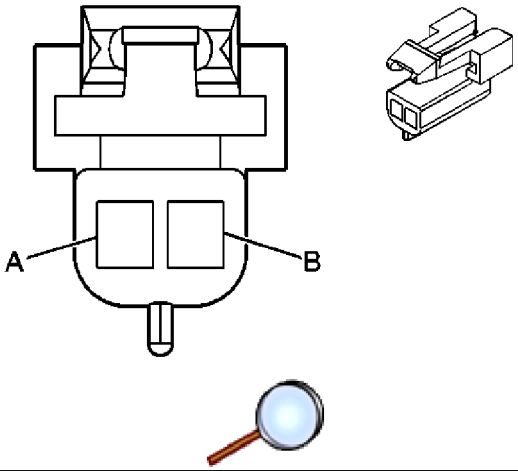


Connector Part Information	• 12047662 • 2-Way F Metri-Pak 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	YEL	116	Speaker Return Left Rear
B	BRN	199	Speaker Feed Left Rear

LH Rear Speaker

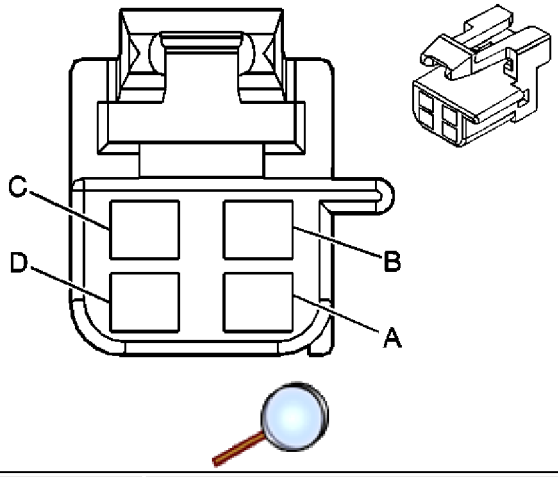
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Connector Part Information	• 12052832 • 2-Way F Metri-Pak 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	YEL	116	Speaker Return Left Rear
B	BRN	199	Speaker Feed Left Rear

LH Rear Speaker



Connector Part Information	• 12064760 • 4-Way F Metri-Pak 150 Series (BLK)

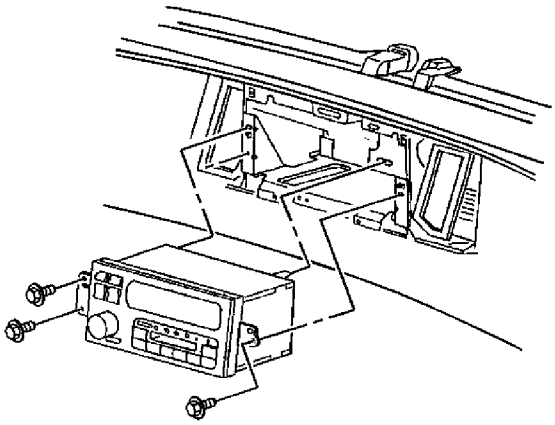
Pin	Wire Color	Circuit No.	Function
A	YEL	116	Speaker Return Left Rear
B	BRN	199	Speaker Feed Left Rear
C-D	--	--	Not Used

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Radio Replacement (Buick)

Removal Procedure

1. Remove the IP cluster trim panel. Refer to Instrument Cluster Trim Panel Replacement in Instrument Panel, Gauges and Console.





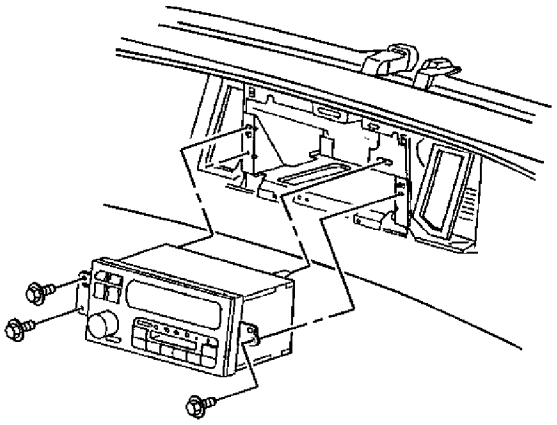
2. Remove the fasteners that secure the radio.
3. Pull rearward the radio.
4. Disconnect the electrical connector(s).
5. Disconnect the antenna lead.
6. If you replace the radio, remove the mounting bracket from the radio.

Installation Procedure

1. If the radio was replaced, install the old mounting bracket.
2. Connect the antenna lead.
3. Connect the electrical connector(s).

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4. Install the radio.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

5. Install the radio fasteners.

   Tighten
   Tighten the fasteners to 1.9 N·m (17 lb in).

6. Install the IP cluster trim panel. Refer to Instrument Cluster Trim Panel Replacement in Instrument Panel, Gauges and Console.

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Cassette Player Care and Cleaning

Tools Required

J 39916-A Audio System Diagnostic Kit

If you do not regularly clean the tape player, the tape player is subject to the following conditions:

- Reduced sound quality
- Ruined cassettes
- A damaged tape mechanism

Cassette tapes may not operate properly if they are not stored in their cases away from the following conditions:

- Contaminants
- Direct sunlight
- Extreme heat

Cleaning Intervals

Clean the cassette tape player every 15 hours of operation for optimum performance.

Clean the cassette tape player at a maximum of every 50 hours of playing time. This will prevent damage to the cassette tape player mechanism. The radio may display CLN, CLEAN or CLEAN TAPE (depending on the family of radio being used), if equipped with the Clean Tape Indicator Feature. This indicates that you have used the tape player for 50 hours without resetting the tape clean timer. If this message appears on the display, clean the cassette tape player. The player will still play tapes, however the player should be cleaned as soon as possible in order to prevent damage to the tapes and/or the player.

Cassettes are subject to wear and the sound quality may degrade over time. If you notice a reduction in sound quality, play a different cassette. A new cassette will indicate whether the tape or the tape player is at fault.

If the sound quality does not improve when the second tape is played, clean the cassette player. Perform this step regardless of when you last cleaned the cassette player.

If a noticeable improvement is not achieved after cleaning the player, remove the radio assembly for repair.

Head and Capstan Cleaning

The following two components are cleaned on a tape player:

- The head

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- The capstan

Important: Do not contact the tape head with magnetized tools. If the head becomes magnetized, every cassette played in the player will be degraded.

In order to properly clean a tape player, the preferred method would be to use the cleaning cassette in J 39916-A in order to clean the head and the capstan. The cleaning cassette is a scrubbing action, non abrasive cassette with pads which scrub the tape head as the hubs of the cleaner cassette turn. When using a scrubbing action, non abrasive cleaning cassette, it is normal for the cassette to eject. The unit is equipped with a cut tape detection feature and the cleaning cassette may appear as a broken tape.

To prevent the cleaning cassette from being ejected, perform the following steps:

1. Turn the ignition switch to one of the following positions (depending on the vehicle line):
   - ON
   - RUN
   - ACC
   - ACCESSORY
2. Turn the radio off.
3. Press and hold the TAPE button for five seconds. The tape symbol on the display will flash for two seconds.
4. Insert the scrubbing action cleaning cassette.
5. Eject the cleaning cassette after the manufacturer's recommended cleaning time. When the cleaning cassette has been ejected, the Cut Tape Detection Feature is active again.

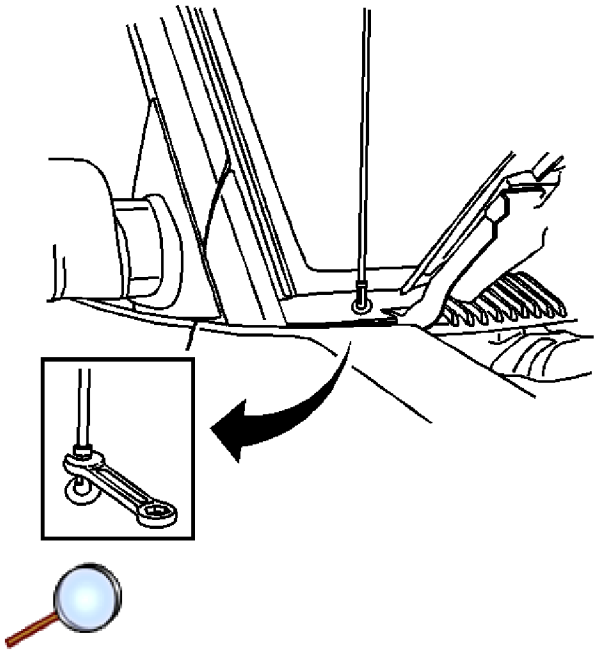
The alternative method would be to use a non scrubbing action, wet type cleaning cassette. This cassette uses a fabric belt to clean the tape head. This type of cleaning cassette will not eject on its own. A non scrubbing action cassette may not clean as thoroughly as the scrubbing type cleaning cassette. The use of this cassette is not recommended.

After you clean the player, press and hold the EJECT button for five seconds to reset the CLEAN indicator. The radio will display --- to show that the indicator has been reset.

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Fixed Antenna Mast Replacement

Removal Procedure



Notice: Use tape on the tool surface so that you do not damage the paint on the antenna mast.

1. Unscrew the antenna mast.
2. Remove the antenna mast from the antenna base.

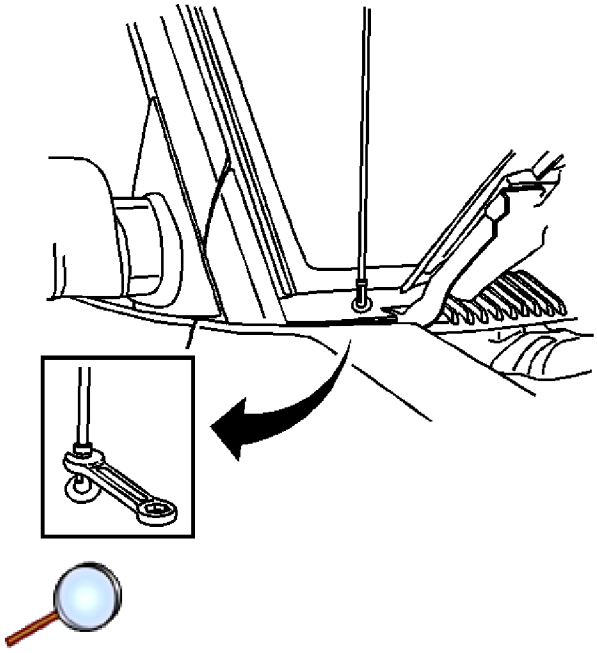
Installation Procedure

Notice: Use tape on the tool surface so that you do not damage the paint on the antenna mast.

1. Install the antenna mast to the antenna base.

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Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Secure the antenna mast to the antenna base.

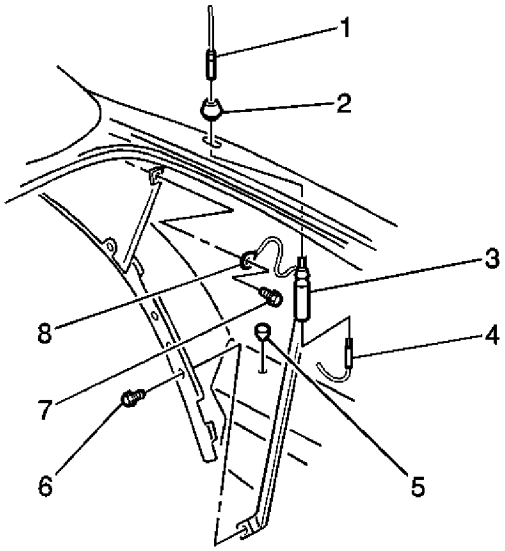
Tighten
Tighten the antenna mast to 5.5 N·m (49 lb in).

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Radio Antenna Replacement

Removal Procedure

1. Remove the rear compartment trim. Refer to Rear Compartment Side Trim Replacement - Right Side in Body Rear End.
2. Remove the antenna mast. Refer to Fixed Antenna Mast Replacement .

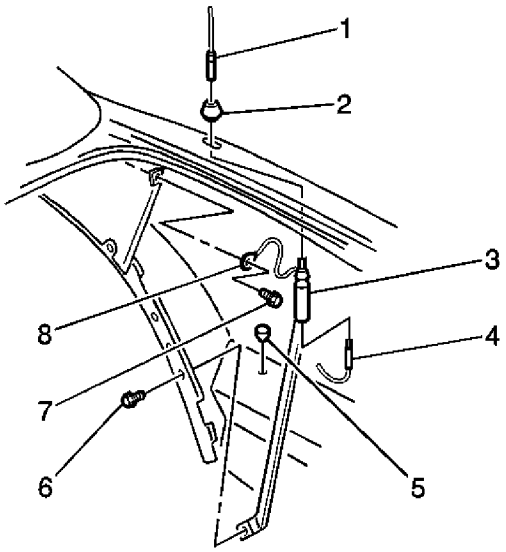


3. Disconnect the coaxial lead (4) from the antenna assembly (3).
4. Remove the antenna ground lead bolt (7).
5. Remove the antenna bracket bolt (6).
6. Remove the antenna assembly (3).
7. Remove the bezel (2) from the quarter panel.

Installation Procedure

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1. Apply a lubricant to the bezel (2).
2. Install the bezel to the quarter panel.
3. Install the antenna assembly (3).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

4. Install the antenna bracket bolt (6).

   Tighten
   Tighten the bolt to 7.5 N·m (66 lb in).

5. Install the antenna ground lead bolt (7).

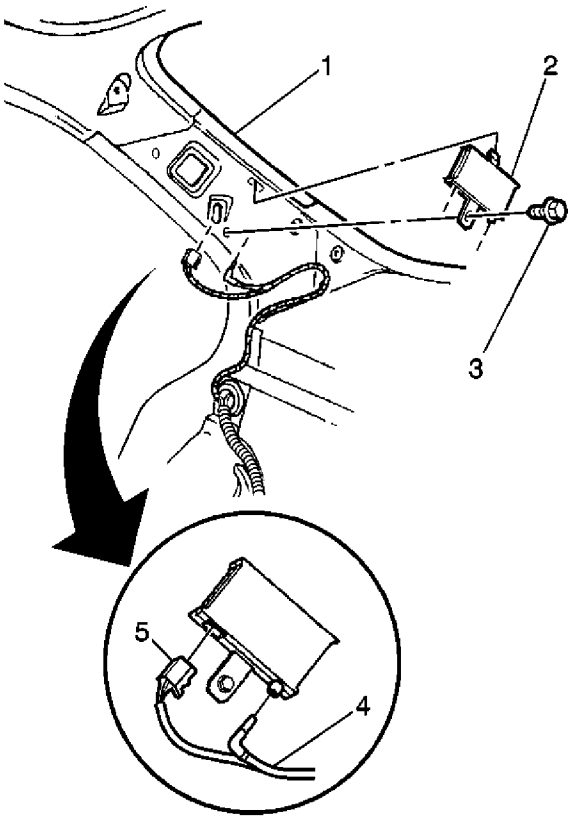
   Tighten
   Tighten the bolt to 7.5 N·m (66 lb in).

6. Connect the coaxial lead (4) to the antenna assembly.
7. Install the antenna mast. Refer to Fixed Antenna Mast Replacement .
8. Install the rear compartment trim. Refer to Rear Compartment Side Trim Replacement - Right Side in Body Rear End.

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Radio Antenna Module Replacement

Removal Procedure



Important: The antenna is located in the rear window. For window replacement, refer to Rear Window Replacement in Stationary Windows.

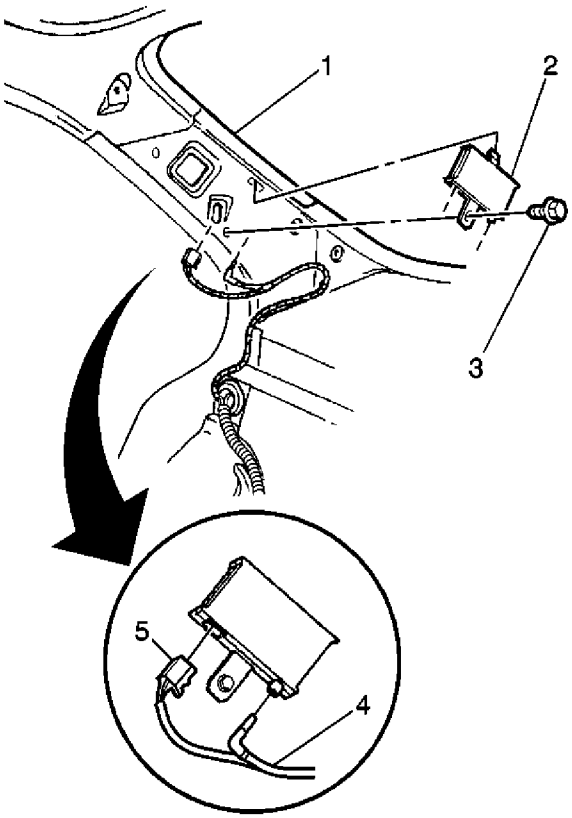
1. Remove the right sail panel trim (1). Refer to Rear Quarter Trim Panel Replacement in Interior Trim.
2. Remove the body harness (5).

   Remove the antenna coaxial cable (4) from the antenna module (2).

3. Remove the bolt (3).
4. Disengage the tab on the module (2) from the slot in the sail panel (1).

Installation Procedure

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1. Engage the module tab in the slot in the sail panel (1).
2. Rotate the module down in order to align the hole for the bolt (3).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the fastener (3).

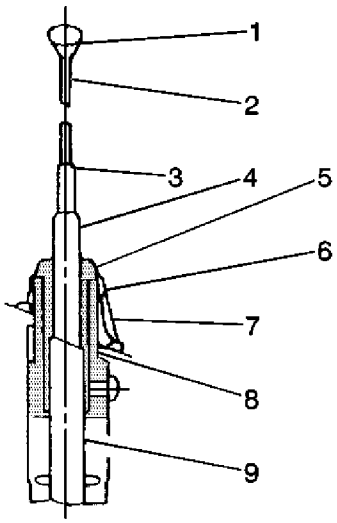
Tighten
Tighten the fastener to 7.5 N·m (66 lb in).

4. Insert the body harness (5).
5. Insert the antenna coaxial cable (4) to the antenna module (2).
6. Install the right sail panel trim (1). Refer to Rear Quarter Trim Panel Replacement in Interior Trim.

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Power Antenna Mast Replacement

Removal Procedure

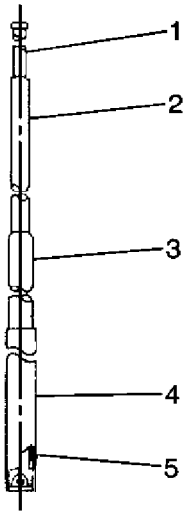


1. Position the antenna mast (2).
   - If the antenna mast is completely down, perform the following steps:
     1. With the ignition key in ACCY position, ask a helper to turn the radio to the ON position.
     2. When the mast tip (1) extends approximately 25.4 mm (1 in), remove the power by pulling the fuse.
   - If the antenna mast is above the fender, remove power by pulling the fuse.
2. Remove the insulator stop (5), using a 14 mm deep well 12 point socket.
3. Use a wrench or a suitable tool on the flat portions of the mast tip in order to remove the mast tip (1).
   - Grip the rod assembly (2) with pliers which are padded with cloth or rubber. This will prevent the rod assembly from turning.
   - Do not bend the rod (2).
4. Slide over the rod assembly using long nose pliers or your fingers.
5. Remove the inner tube assembly (3).
6. Remove the outer tube assembly (4).

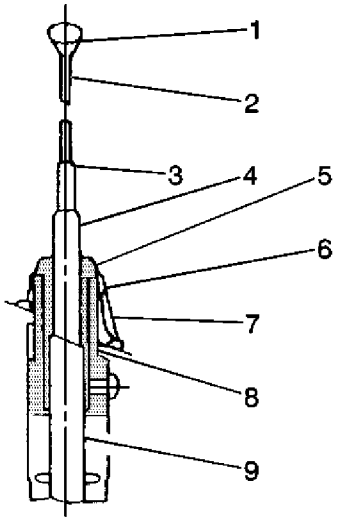
Installation Procedure

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1. Lubricate the contractor (5) with supplied lubricant before you assembly a new mast.
2. Slide the assembly tool (4) over the contractor (5) in order to compress the fingers. The assembly tool is included in the replacement parts package.



3. Slide the mast assembly over the rod assembly (2) and into the stationary tube (9) past the contractor fingers.
4. Remove the assembly tool.
5. Install the bottom mast into the stationary tube (9).

   The threaded top of the rod assembly (2) must be above the top of the inner rod assembly (3).

6. Install the insulator stop (5).
7. Install the mast tip (1).

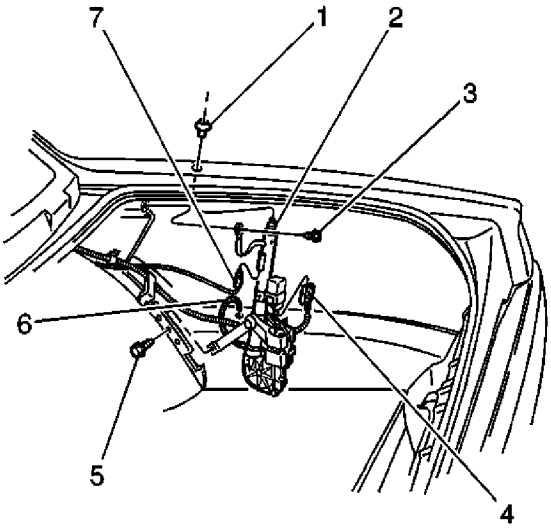
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8. Return the fuse.

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Power Antenna Assembly Replacement

Removal Procedure



1. Pull back the rear compartment trim. Refer to Rear Compartment Side Trim Replacement - Right Side in Body Rear End.
2. Remove the antenna ground lead bolt (3).
3. Remove the drain hose (6) from the drain hole.
4. Remove the antenna bracket bolt (5).

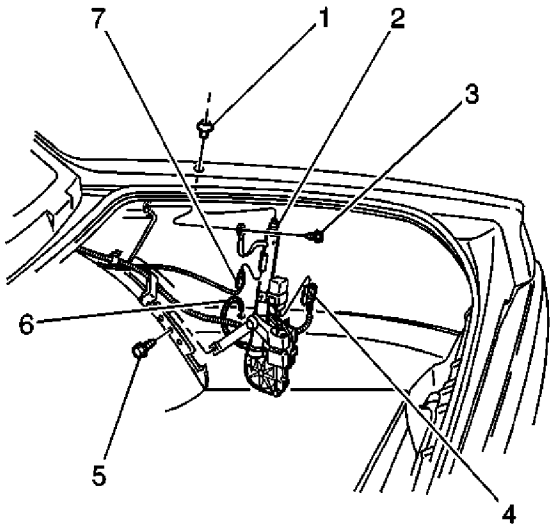
   Make note of fastener position before removal.

5. Partially remove the antenna assembly (2).
6. Disconnect the coaxial lead (7).
7. Disconnect the relay connector (4).
8. Remove the antenna assembly.
9. Remove the bezel (1) from the quarter panel.

Installation Procedure

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Important: Do not use a petroleum based lubricant.

1. Apply lubricant to the bezel (1).
2. Install the bezel to the rear quarter panel.
3. Partially install the antenna assembly (2).
4. Connect the relay connector (4).
5. Connect the coaxial lead (7) to the antenna.
6. Insert antenna tip into antenna bezel to seat.

Hold antenna bezel from the top to keep it from popping out.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

7. Install the antenna bracket bolt (5).

Tighten
Tighten the antenna bracket bolt to 7.5 N·m (66 lb in).

8. Install the drain hose (6) through the drain hole.
9. Install the antenna ground lead bolt (3).

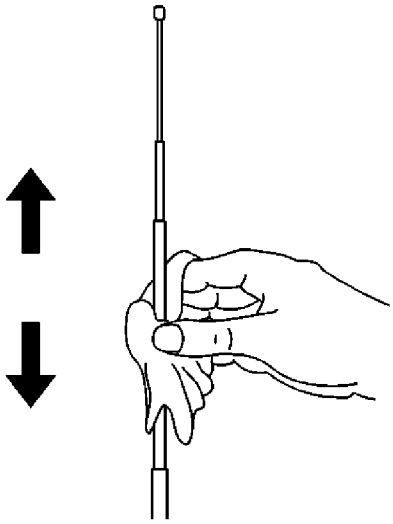
Tighten
Tighten the antenna ground lead bolt to 4 N·m (35 lb in).

10. Install the rear compartment trim. Refer to Rear Compartment Side Trim Replacement - Right Side in Body Rear End.

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Antenna Mast Cleaning

Important: Clean the antenna periodically in order to assure proper operation of the radio and the power antenna.



1. Turn the ignition to one of the following positions, depending on the vehicle line:
   - ON
   - RUN
   - ACC
   - ACCESSORY
2. Turn the radio ON in order to raise the antenna mast to the full extension.
3. Dampen a soft cloth using a grease cleaning solvent such as one of the following materials:
   - Mineral spirits
   - Rubbing alcohol
   - Tar remover
4. Wipe the cloth over the mast sections, removing any dirt, particularly at the mast section joints.
5. Turn the radio OFF and ON in order to retract and extend the antenna. Repeat Steps 2 through Step 4 at least 2 more times.

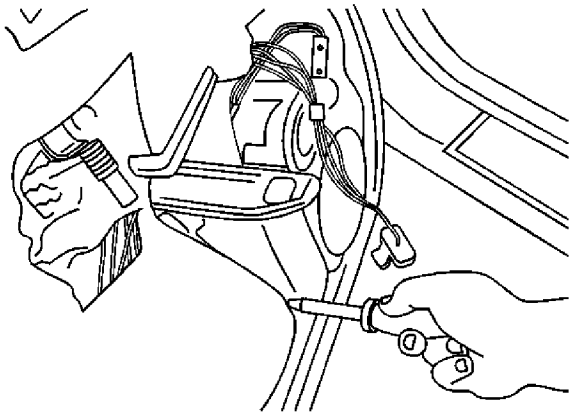
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Radio Front Side Door Speaker Replacement (Buick/Oldsmobile)

Removal Procedure

1. Remove the door trim panel. Refer to Front Side Door Trim Panel Replacement in Doors.
2. Note the location of the speaker electrical connector.



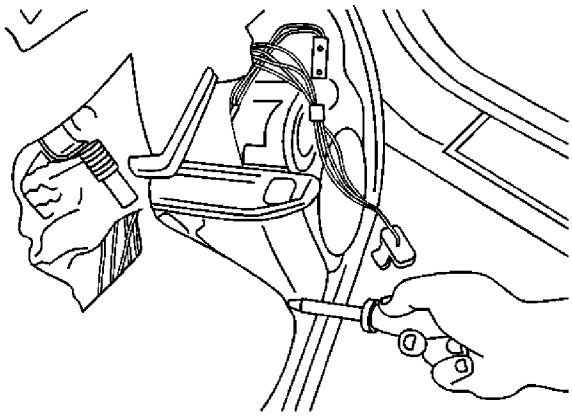


3. Disconnect the electrical connectors.
4. Remove the fasteners.
5. Remove the speaker.

Installation Procedure

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1. Install the speaker into the door with the electrical connector located as noted during removal.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the speaker fasteners.

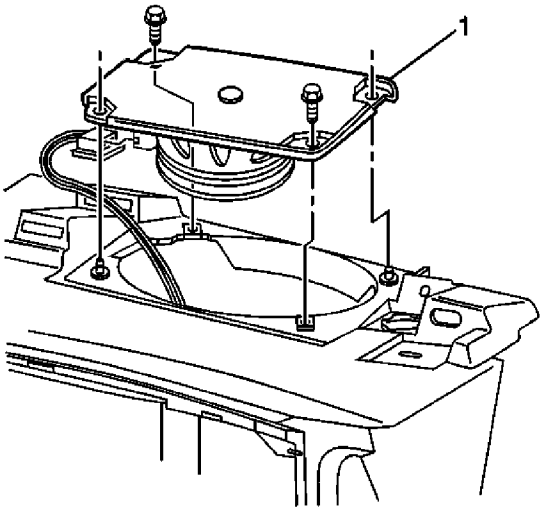
   Tighten
   Tighten the fasteners to 1.4 N·m (12 lb in).

3. Connect the electrical connectors.
4. Install the door trim panel. Refer to Front Side Door Trim Panel Replacement in Doors.

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Radio Front Speaker Replacement (Buick with UQ8)

Removal Procedure

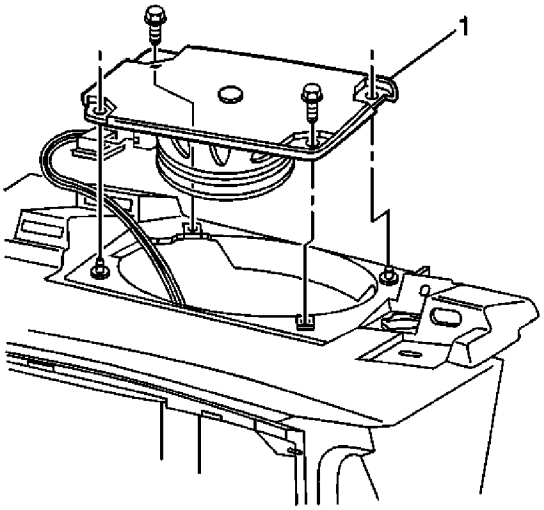


1. Remove the IP upper trim pad. Refer Instrument Panel Upper Trim Pad Replacement in Instrument Panel, Gauges and Console.
2. Remove the fasteners.
3. Raise the speaker (1).
4. Disconnect the electrical connector(s).

Installation Procedure

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1. Connect the electrical connector(s).
2. Install the speaker (1).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the speaker fasteners.

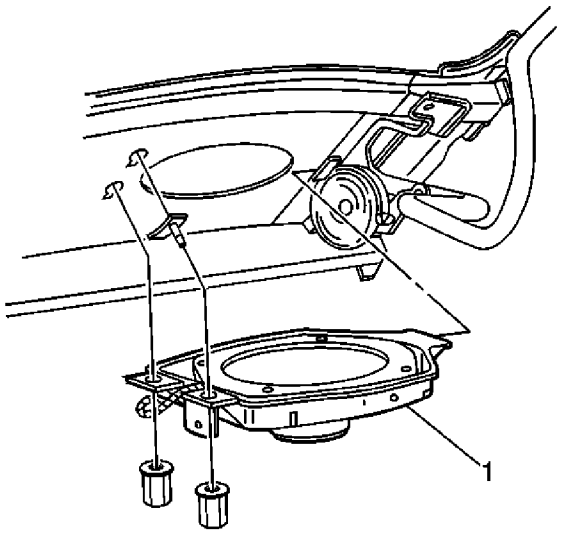
   Tighten
   Tighten the fasteners to 1.9 N·m (17 lb in).

4. Install the IP upper trim pad. Refer Instrument Panel Upper Trim Pad Replacement in Instrument Panel, Gauges and Console.

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Radio Rear Speaker Replacement (Buick)

Removal Procedure



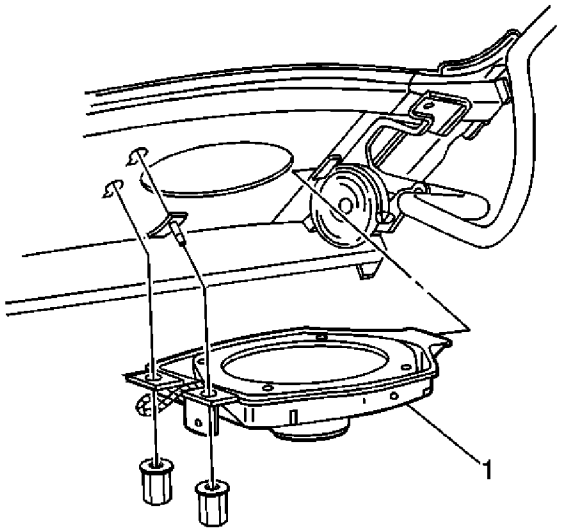


1. Disconnect the electrical connector.
2. Remove the speaker bracket mounting fasteners.
3. Lower the speaker bracket.
4. Remove the speaker from the bracket (1).

Installation Procedure

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1. Install the speaker to the bracket (1).
2. Raise the speaker bracket up to rear shelf.
3. Install the speaker bracket mounting fasteners.
4. Connect the electrical connector.

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Fastener Tightening Specifications

Application	Specification	
	Metric	English
Front Fascia to Fender Nuts	2.8 N·m	25 lb in
Rear Fascia to Quarter Nuts	9.5 N·m	84 lb in
Wheel Opening Molding Screws - Buick	1.9 N·m	17 lb in
Wheel Opening Molding Screws - 88/LSS	2.1 N·m	18 lb in

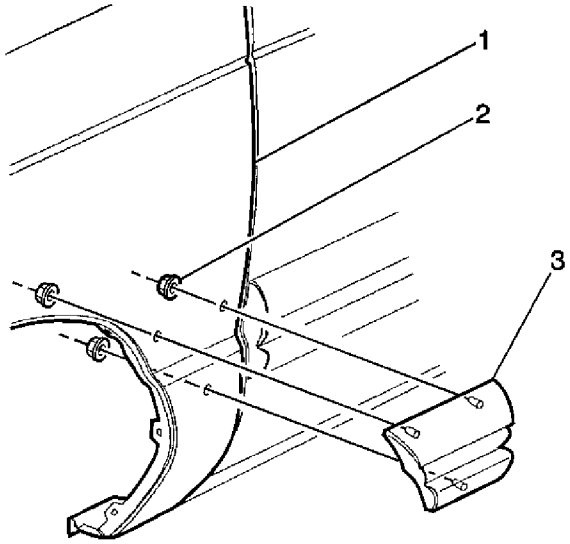
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Front Fender Body Side Molding Replacement (Buick)

Removal Procedure

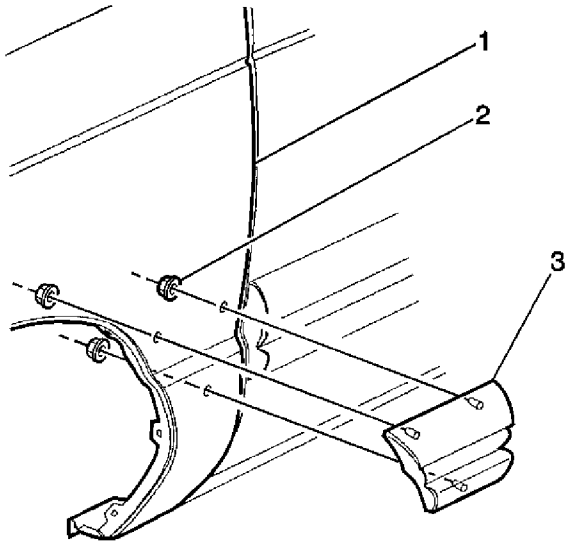
1. Remove the front wheelhouse panel. Refer to Wheelhouse Panel Replacement in Body Front End.





2. Remove the 2 nuts (2).
3. Remove the molding.

Installation Procedure



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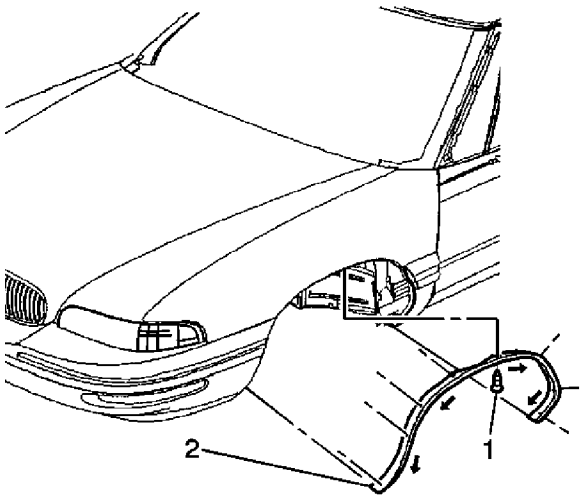


1. Install the following components:
   - The molding (3)
   - The 2 nuts (2
2. Install the front wheelhouse panel. Refer to Wheelhouse Panel Replacement in Body Front End.

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Front Fender Wheel Opening Molding Replacement (Buick)

Removal Procedure

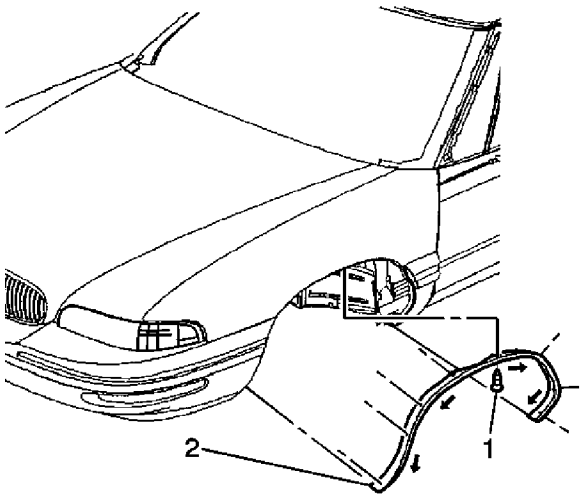


1. Remove the screws (1) that retain the wheel opening molding (2).
2. Remove the wheel opening molding (2).

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1. Install the wheel opening molding (2).

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

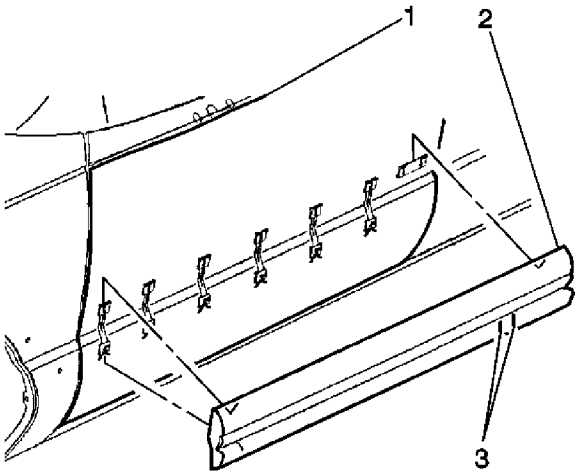
2. Install the screws (1) in order to retain the wheel opening molding (2).

   Tighten
   Tighten the screws (1) to 1.9 N·m (17 lb in).

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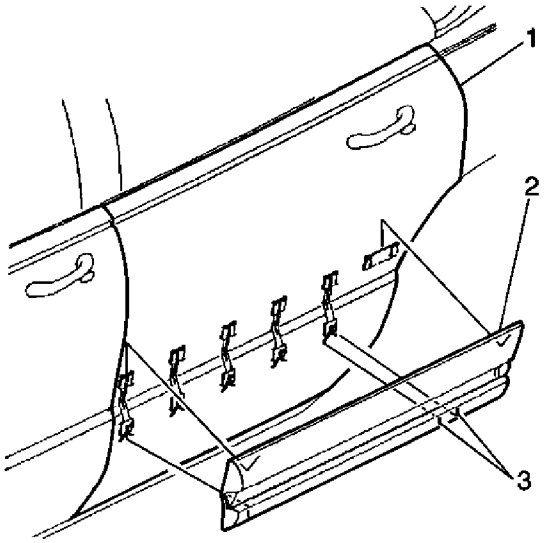
Door Body Side Molding Replacement (Buick)

Removal Procedure



1. Remove the retaining screw.
2. Pull the molding (2) upward and gently pry the molding off along the top edge.
3. Slide the molding down off of the lower clips.

Installation Procedure



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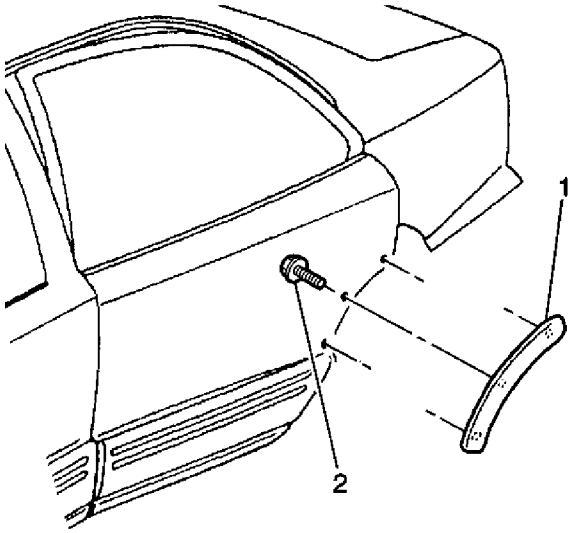


1. Install the molding (2).
2. Install the retaining screw.

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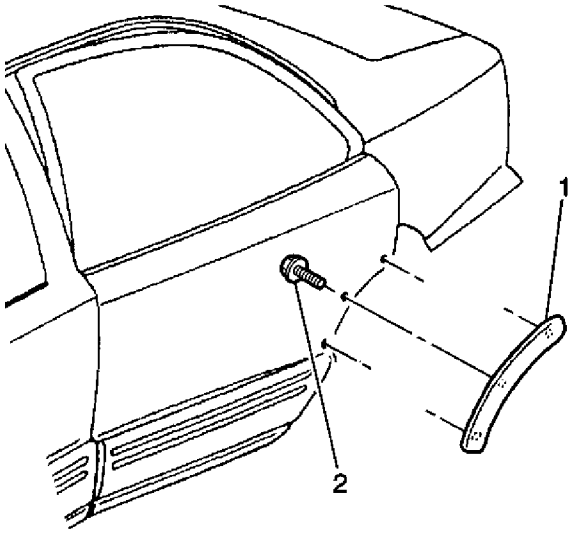
Rear Side Door Molding Replacement

Removal Procedure



1. Remove the screws (2) that retain the molding to the door.
2. Remove the molding (1) from the door.

Installation Procedure



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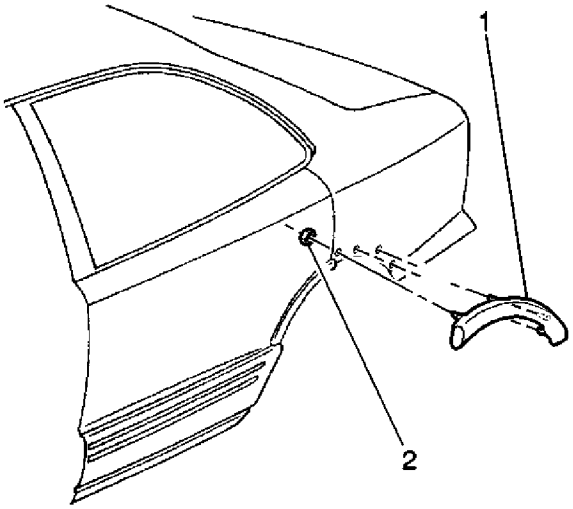


1. Install the molding (1) to the door.
2. Install the retaining screws (2).

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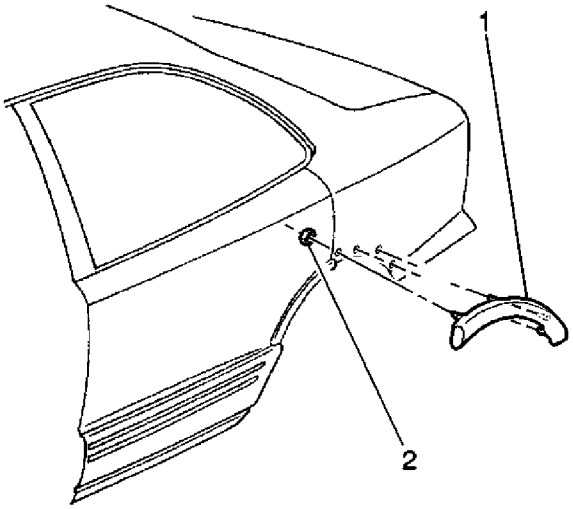
Rear Quarter Molding Replacement

Removal Procedure



1. Remove the nuts (2) that retain the molding to the rear quarter.
2. Remove the molding (1) from the rear quarter.

Installation Procedure



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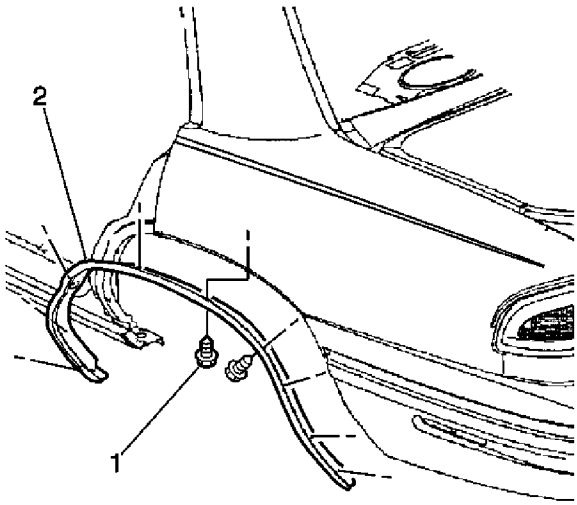


1. Install the molding (1) to the rear quarter.
2. Install the retaining nuts (2).

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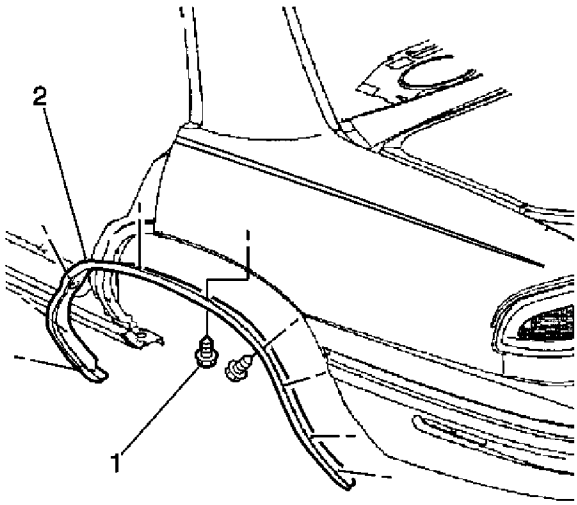
Rear Wheel Opening Molding Replacement

Removal Procedure



1. Remove the screws (1) that retain the wheel opening molding (2).
2. Remove the wheel opening molding (2).

Installation Procedure



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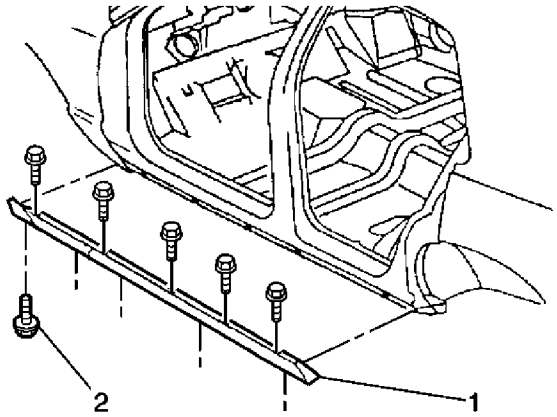


1. Align the wheel opening molding (2) with the feature line on the body.
2. Install the top center screw (1) in order to hold the molding (2) in position.
3. Install the screws (1) to the center of the molding (2) rearward.
4. Install the screws (1) to the center of the molding (2) forward.

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Rocker Panel Molding Replacement (Buick)

Removal Procedure



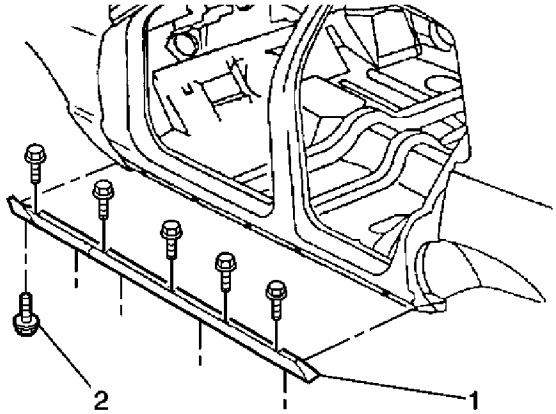


1. Remove the screws (2).
2. Slide the molding (1) toward the rear of the vehicle in order to disengage the fasteners, if equipped.
3. Remove the rocker panel molding (1).

Installation Procedure

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1. Position the rocker panel molding (1).
2. Secure the molding (1) by striking firmly at each clip location, if equipped.
3. Install the screws (2).

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Weld Stud Replacement

If a weld stud becomes damaged during a repair procedure, use the following procedure in order to replace the weld stud:

1. Drill a hole into the same location as the damaged weld stud.
2. Drive a new screw into the drilled hole.
3. Use a screw in order to retain the clips, molding, etc. in the same manner used with the weld studs.
4. If the surface becomes marred, repair and/or paint the surface in order to provide a smooth surface. Refer to Clearcoat Repair without Repainting in Paint/Coatings.

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Molding Clip Replacement

Use the following procedure if a weld stud on an outer panel becomes damaged or broken off:

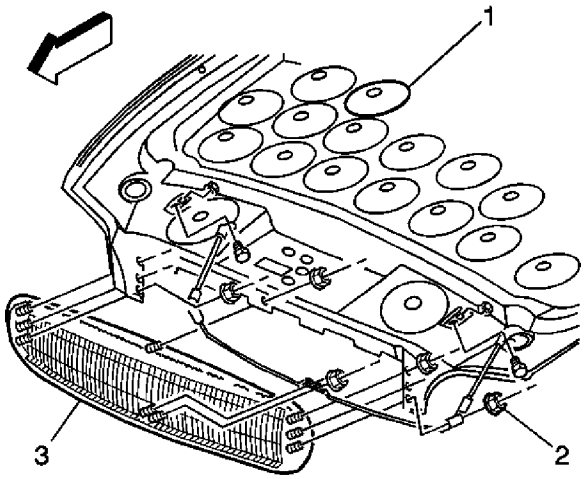
1. Drill a small hole in the panel next to the original weld stud location.
2. Complete one of the following steps:
   - Insert a self-sealing screw through the original clip and into the outer panel.
   - Replace the damaged weld stud with a self-sealing, screw-type weld stud.

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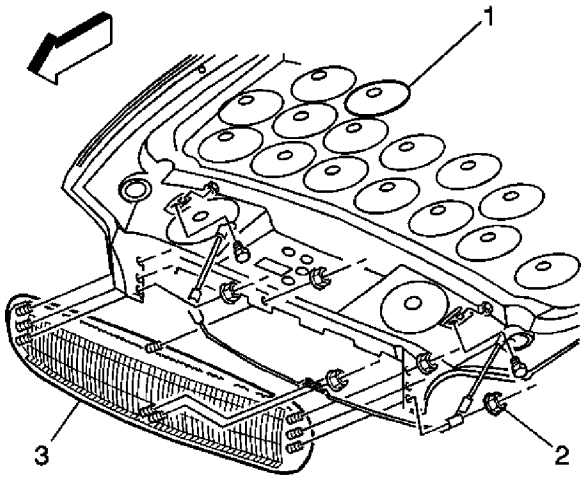
Grille Replacement (LeSabre)

Removal Procedure



1. Open the hood (1).
2. Remove the nuts (2) that retain the grille (3) to the hood (1).
3. Remove the grille (3).

Installation Procedure



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1. Install the grille (3).

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the nuts (2) in order to retain the grille (3) to the hood (1).

   Tighten
   Tighten the nuts (2) to 5 N·m (44 lb in).

3. Close the hood (1).

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Decal or Stripe Replacement

Stripe and Decal Application

Apply decals in a clean environment where dust and fibers will not interfere with proper adhesion. Perform the following steps in order to apply the decals:

1. Clean the area where you will mount the decal.

   Use a suitable solvent such as flash naphtha or a mixture of 50 percent isopropyl alcohol and 50 percent water.

2. Dry the area thoroughly.
3. If there is a chip in the paint area, refinish the area and feather the area in.
4. Warm the body surface and the decal to 27-38°C (80-100°F).
5. You can apply most stripes and decals dry as long as this results in a bubble-free application.
6. Use the Wet Method when the following apply:
   - When the stripe or decal wraps into the body openings.
   - When you mount the stripe or decal on a flexible surface.

Wet Method

1. Use a wetting agent such as Dupont Duponal® WA or equivalent.

   Do not use a soap solution.

   Spray a mist of the solution onto the body area.

2. Remove the backing from the decal by peeling the backing away.

   In hot, humid weather, spray the adhesive back of the decal with a mist of the wetting solution.

3. Using a squeegee, start at the center of the decal and squeegee the decal onto the body. This removes any air bubbles and the wetting solution.
4. Remove the premask from the decal by pulling the premask back.

   Do not lift the premask straight up.

5. Go over the decal again with the squeegee.
6. If air bubbles are still present, prick the air bubbles with a pin.

   Use the squeegee in order to remove air from the bubble.

Adhesive Retained Items

1. Clean the area where you will mount the replacement item.

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Use a suitable solvent such as flash naphtha or a mixture of 50 percent isopropyl alcohol and 50 percent water.

2. Dry the area thoroughly with a clean cloth.
3. If there is a chip in the paint in the area, refinish the area and feather the area in.
4. The body area, and the temperature of the item to be applied, must be at a temperature of 27°C (80°F) or 6°C (10°F) above the air temperature in the application area, whichever is higher.

   Do not install adhesive backed items at temperatures above 41°C (105°F).

   You may use infrared heat in order to warm the body panels to the specified temperature.

5. Remove the backing by peeling the backing away from the item.
6. Mount the item. Apply 155 N·m (35 lb) of even pressure for three seconds to the item in order to wet out at least 75 percent of the adhesive.
7. If an emblem or name plate has a premask, remove the premask by pulling the premask back.

   Do not lift the premask straight up.

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Fastener Tightening Specifications

Application	Specification	
	Metric	English
Brake Caliper to Knuckle	51 N·m	38 lb ft
Brake Bracket to Strut	17 N·m	13 lb ft
Control Arm Front Nut	190 N·m	140 lb ft
Control Arm Rear Nut	123 N·m	91 lb ft
Drive Axle Nut	145 N·m	107 lb ft
Front Wheel Speed Sensor Bracket to Strut	17 N·m	13 lb ft
Hub and Bearing to Knuckle	95 N·m	70 lb ft
Service Ball Joint to Knuckle	68 N·m	50 lb ft
Stabilizer Shaft Link Nut	17 N·m	13 lb ft
Stabilizer Shaft Bracket Bolt	47 N·m	35 lb ft
Strut Housing Tie Bar Through-Bolts	37 N·m	27 lb ft
Strut Mount Nut	75 N·m	55 lb ft
Strut Mount to Body Nuts	24 N·m	18 lb ft
Strut to Knuckle Nuts	190 N·m	140 lb ft
Tie Rod to Knuckle (Do not exceed 70 (52 lb ft) to align cotter pin)	47 N·m	35 lb ft

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GM SPO Group Numbers

Application	GM SPO Group Number
Stabilizer Shaft	7.241
Stabilizer Shaft Insulator	7.243
Stabilizer Shaft Link	7.244
Steering Knuckle	6.020
Wheel Bearing & Wheel Hub	5.819
Wheel Hub Bolt	5.821

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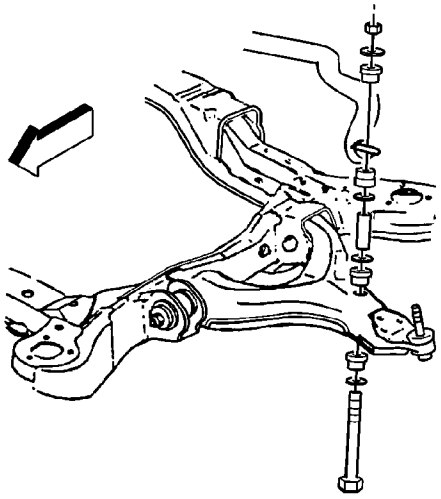
Stabilizer Shaft Replacement

Removal Procedure

Tools Required

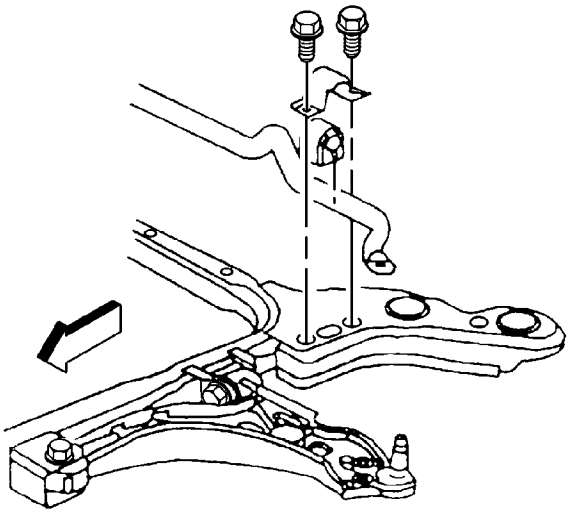
J 24319-B Universal Steering Linkage Puller

1. Raise the vehicle and support the vehicle by the frame. Allow the control arms to hang free. Refer to Lifting and Jacking the Vehicle in General Information.
2. Remove the front wheels and tires.





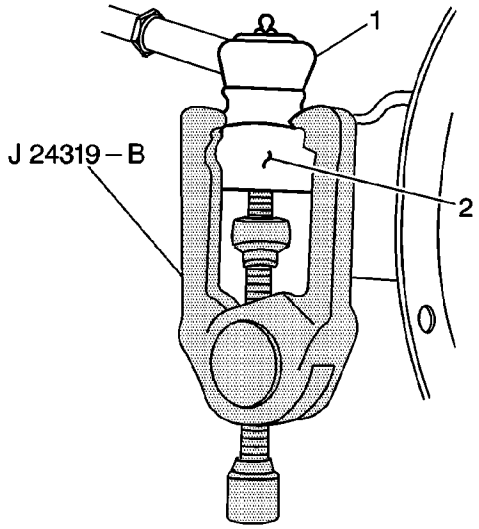
3. Remove the left and right stabilizer link bolts.



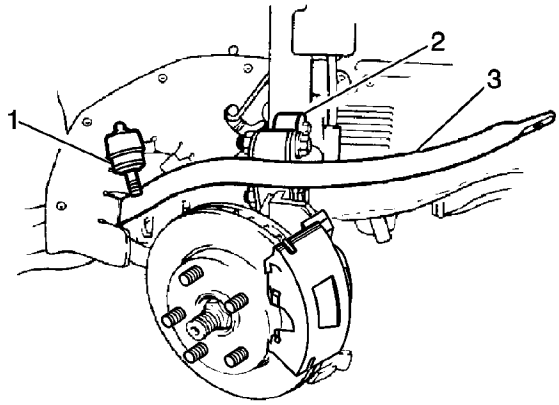
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4. Remove the left and right stabilizer shaft brackets.



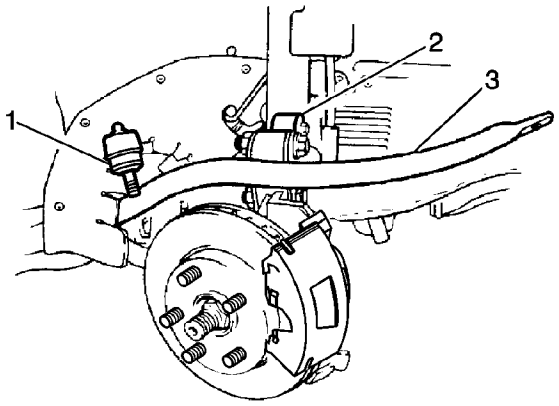
5. Use the J 24319-B (1) in order to remove the tie rod ends from the steering knuckle.
6. Disconnect the exhaust pipe from the exhaust manifold.



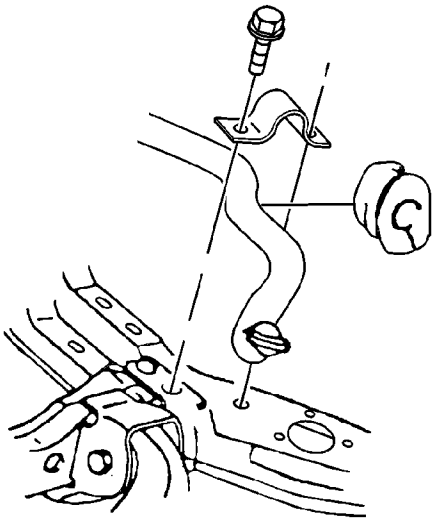
7. Turn the right strut completely to the right. Slide the stabilizer shaft over the steering knuckle. Pull down until the stabilizer shaft (3) clears the frame.
8. Remove the stabilizer shaft.

Installation Procedure

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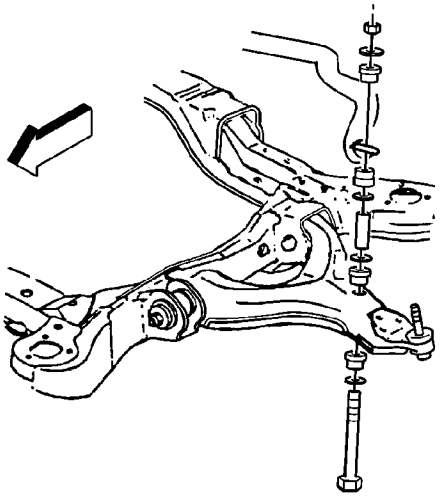


1. Install the stabilizer shaft (3) into position.



2. Loosely install the following components:
   2.1. The left and right stabilizer shaft insulators
   2.2. The brackets
   2.3. The bolts

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3. Loosely install the stabilizer link components.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

4. Install the tie rod ends to the knuckles.

Tighten

- Tighten the bracket bolts to 47 N·m (35 lb ft).
- Tighten the stabilizer link nut to 17 N·m (13 lb ft).
- Tighten the tie rod end to knuckle.
- Tighten the nuts to 48 N·m (35 lb ft).

  The maximum torque for cotter pin alignment is 70 N·m (52 lb ft). Do NOT back off of the nut in order to insert the cotter pin.

5. Install the cotter pins into the tie rod ends.
6. Install the exhaust pipe to the manifold.

Tighten
Tighten the manifold bolts to 25 N·m (18 lb ft).

7. Install the front wheels and tires.

Tighten
Tighten the wheel nuts to 140 N·m (100 lb ft).

8. Lower the vehicle.

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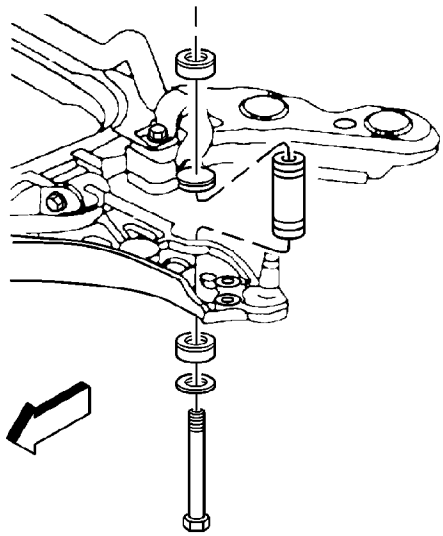
Stabilizer Shaft Link Replacement

Removal Procedure

Tools Required

J 24319-B Universal Steering Linkage

1. Raise the vehicle and support the vehicle by the frame. Allow the control arms to hang free. Refer to Lifting and Jacking the Vehicle in General Information.
2. Remove the front wheels and tires.



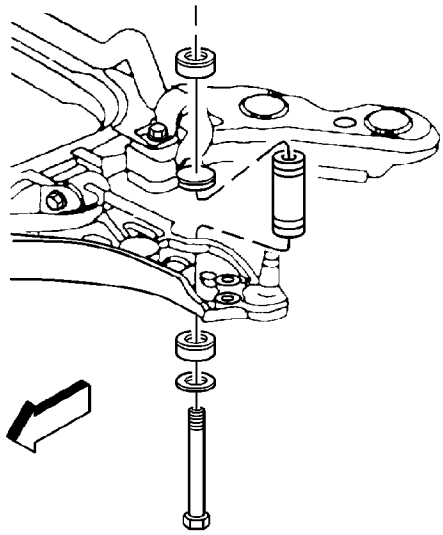


3. Remove the left and the right stabilizer link bolts.

Installation Procedure

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1. Loosely install the stabilizer link components.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the tie rod ends to the knuckles.

   Tighten
   - Tighten the stabilizer link to 17 N·m (13 lb ft).
   - Tighten the nuts to 48 N·m (35 lb ft).

3. Install the front wheels and tires.

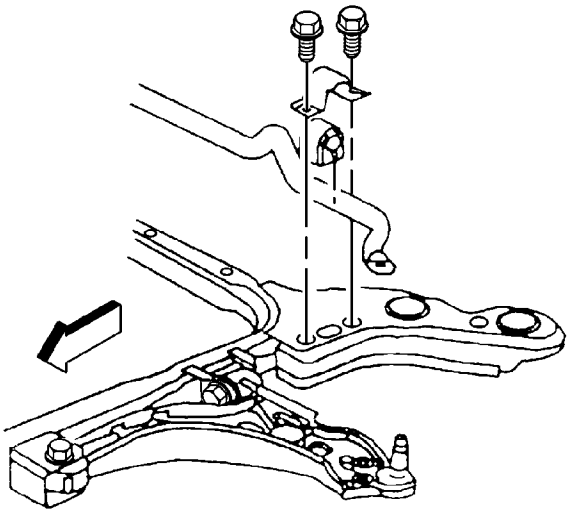
   Tighten
   Tighten the wheel nuts to 140 N·m (100 lb ft).

4. Lower the vehicle.

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Stabilizer Shaft Insulator Replacement

Removal Procedure

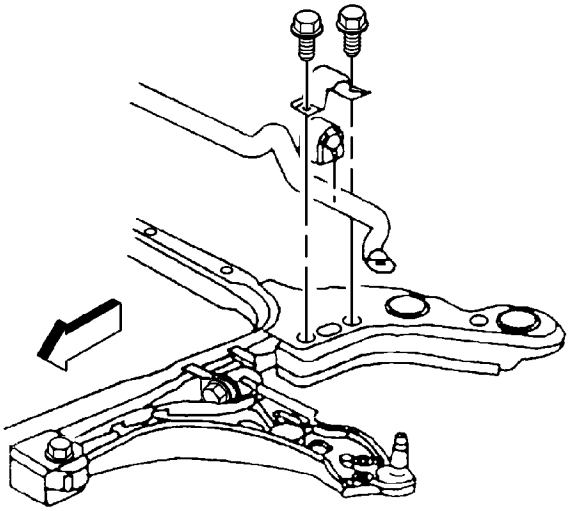


1. Raise the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.
2. Remove the stabilizer shaft clamp bolts.
3. Remove the stabilizer shaft clamp.
4. Remove the stabilizer shaft rubber insulator.

Installation Procedure

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1. Install the stabilizer shaft rubber insulator.
2. Install the stabilizer shaft clamp.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the stabilizer clamp bolts.

Tighten
Tighten the stabilizer clamp bolts to 47 N·m (35 lb ft).

4. Lower the vehicle.

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Lower Control Arm Ball Joint Replacement

Removal Procedure

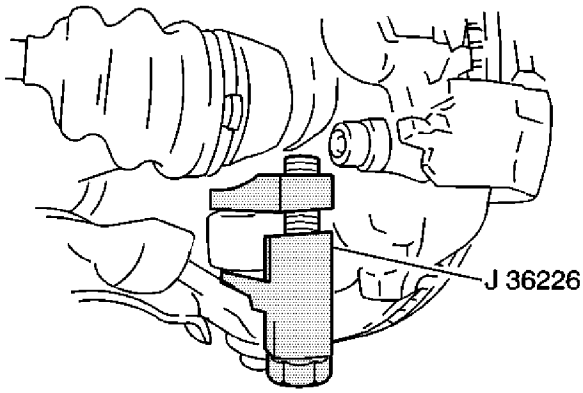
Tools Required

J 36226 Ball Joint Separator

Notice: Use only the recommended tools for separating the ball joint from the knuckle. Failure to use recommended tools may cause damage to the ball joint and seal.

Important: If the ball joint is separated for related suspension/driveline service, the ball joint seal should be inspected for damage. A damaged seal will cause joint failure. The ball joint should be replaced if seal damage is found.

1. Raise and support the vehicle by the frame, allowing the control arms to hang free. Refer to Lifting and Jacking the Vehicle in General Information.
2. Remove the wheel and tire. Refer to Tire and Wheel Removal and Installation in Wheels and Tires.
3. Remove the cotter pin from the ball joint and loosen the nut.





4. Using the J 36226 , remove the ball joint from the steering knuckle.
5. Loosen the stabilizer shaft link nut.

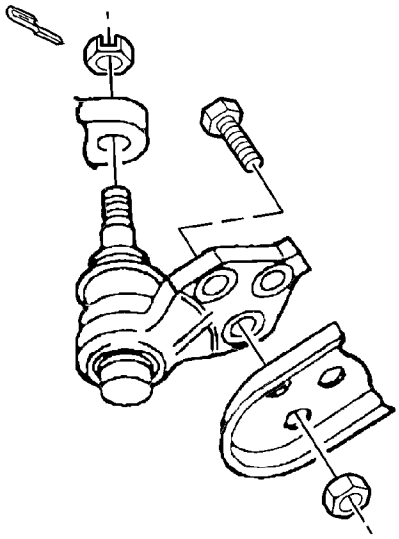
Important: Do not damage the drive axle seals when drilling out the ball joint rivets.

6. Drill out three rivets retaining the ball joint.
7. Remove the ball joint from the knuckle and control arm.

Installation Procedure

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1. Install the ball joint to the knuckle and align with the holes in the control arm.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install three ball joint bolts facing down, and the nuts.
3. Install the ball joint nut.

   Tighten

   - Tighten the ball joint to control arm nuts to 68 N·m(50 lb ft).
   - Tighten the stabilizer shaft link nut to 17 N·m (13 lb ft).
   - Tighten the ball joint nut to 10 N·m (88 lb in). Then tighten an additional 120 degrees (2 flats on the nut) during which a torque of 55 N·m (41 lb ft) must be obtained.

4. Install the cotter pin. In order to align the slot, tighten the nut up to one more flat.
5. Install the wheel and tire.

   Tighten
   Tighten the wheel nuts to 140 N·m (100 lb ft).

6. Lower the vehicle.

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Front Wheel Bearing and Hub Replacement

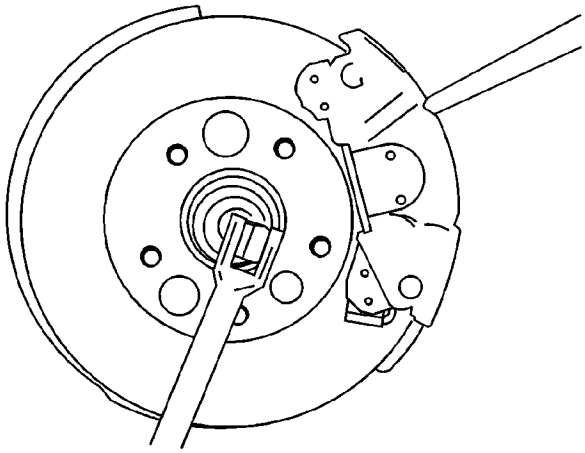
Removal Procedure

Tools Required

J 28733-B Front Hub Spindle Remover

1. Raise and support the vehicle by the frame, allowing the control arms to hang free. Refer to Lifting and Jacking the Vehicle in General Information.
2. Remove the wheel and tire. Refer to Tire and Wheel Removal and Installation in General Information.

   Clean the drive axle threads of all dirt and lubricate.

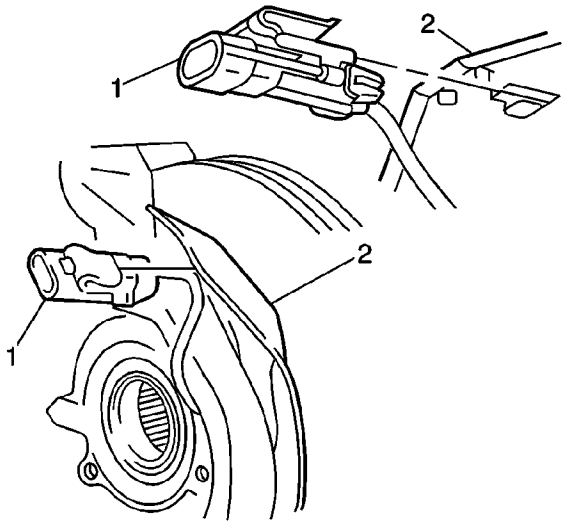




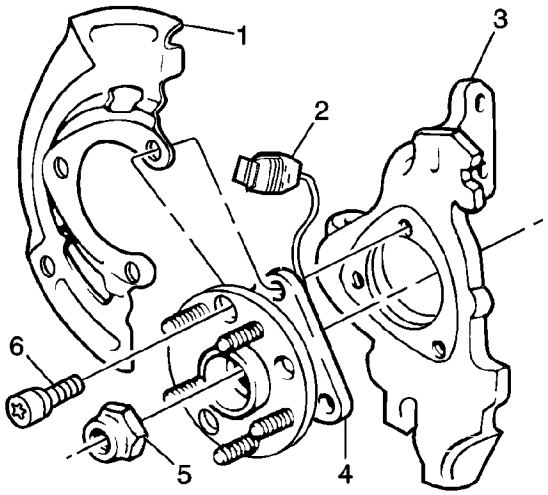
3. Remove the drive axle nut. Insert the drift punch or screwdriver into caliper and rotor to prevent rotor from turning.
4. Remove the brake rotor. Refer to Brake Rotor Replacement in Disc Brakes.

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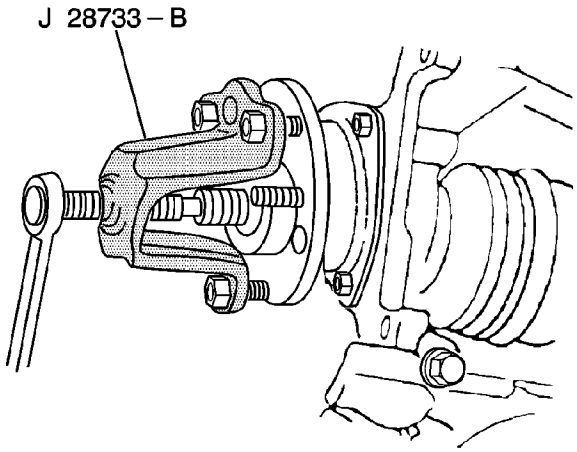


5. Remove the ABS front wheel speed sensor connector (1), and unclip from the dust shield.



6. Remove the hub and bearing retaining bolts (6) and the dust shield (1).
7. Place the transmission in Park.

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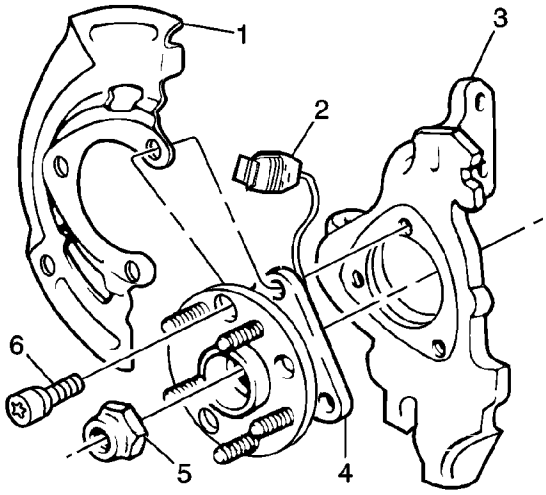


Important: The hub and bearing are replaced only as an assembly.

8. Using the J 28733-B , separate the hub and bearing from the drive axle. Clean rust and foreign material from the knuckle mounting face, bore and chamfer to allow proper seating of the bearing into the knuckle.

Installation Procedure

1. Install the hub and bearing to the drive axle. Apply a light coating of grease to the knuckle bore. If the new hub and bearing has a protective plastic cover, remove it before installation. Also, do not handle the knuckle or hub assembly by the ABS sensor wire.



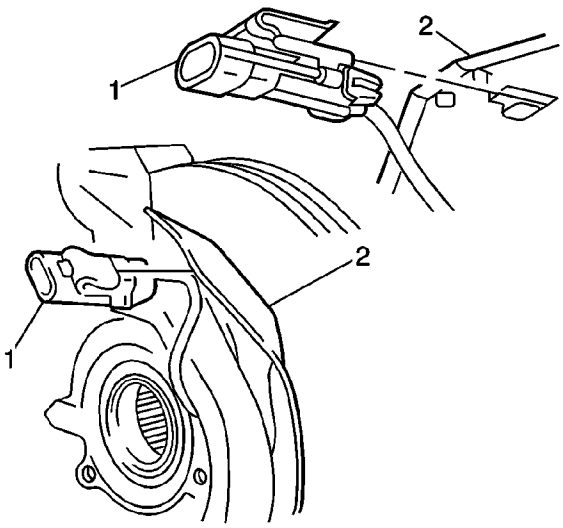
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2. Install the new drive axle nut (5) and draw the hub and bearing (4) onto the axle.
3. Place the transmission in Neutral.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

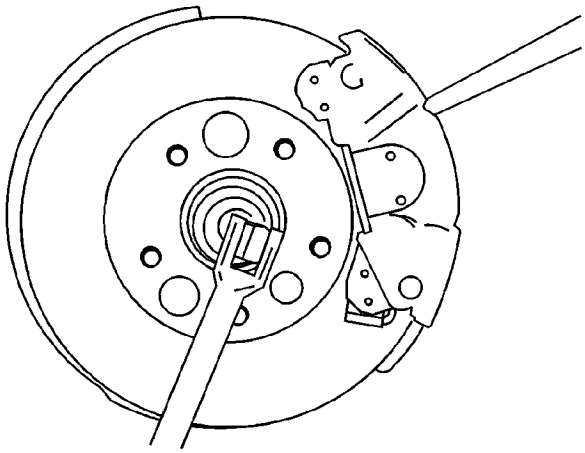
4. Install the dust shield (1), bearing bolts (6) and hub. Take care not to damage the bearing outboard lip seal.

Tighten
Tighten the hub and bearing bolts to 95 N·m (70 lb ft).



5. Install the ABS front wheel speed sensor connector (1) and clip to the dust shield.

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6. Install the rotor. Refer to Brake Rotor Replacement in Disc Brakes.
7. Install the caliper.

   Tighten
   Tighten the caliper bolts to 51 N·m (38 lb ft).

8. Insert drift punch or screwdriver into the caliper and rotor to prevent the rotor from turning.

   Tighten
   Tighten the drive axle nut to 145 N·m (107 lb ft).

9. Install the wheel and tire.

   Tighten
   Tighten the wheel nuts to 140 N·m (100 lb ft).

10. Lower the vehicle.

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Steering Knuckle Replacement

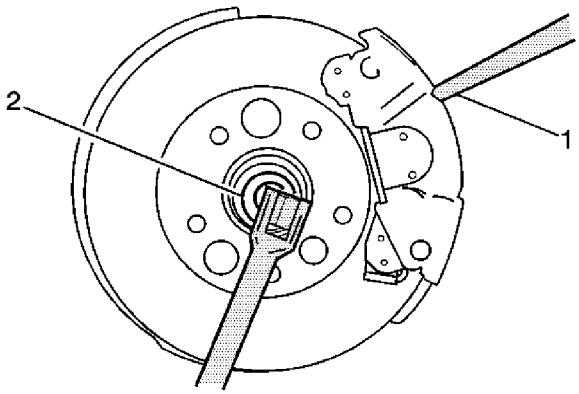
Removal Procedure

Tools Required

J 36226 Ball Joint Separator.

J 24319-B Steering Linkage and Tie Rod Puller

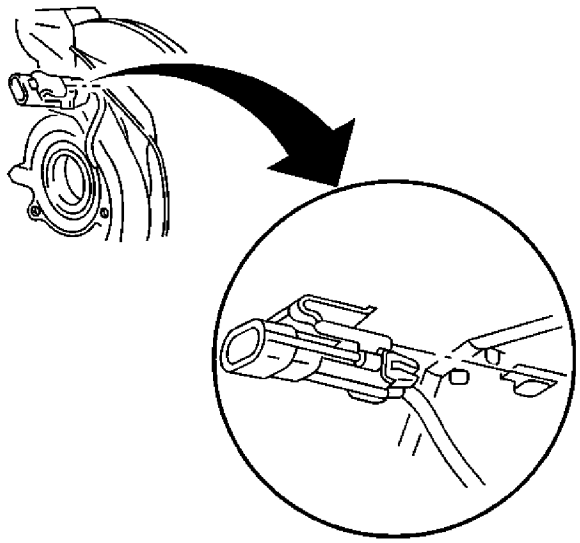
J 28733-B Hub and Bearing Puller



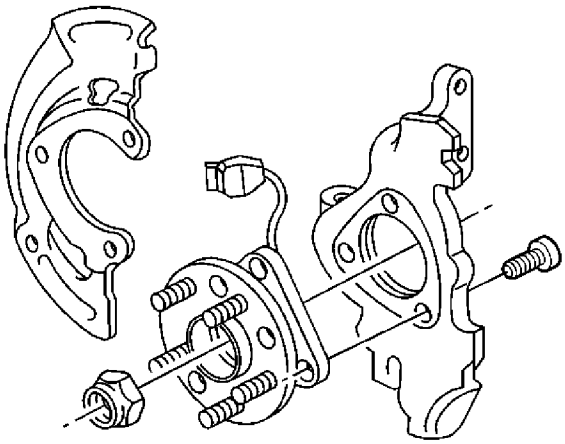
1. Raise the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.
2. Remove the wheel and tire. Refer to Tire and Wheel Removal and Installation in Tire and Wheel.
3. Remove the drive axle nut (2).
4. Remove the brake caliper bolts. Refer to Brake Caliper Replacement in Brakes.
5. Support and hang the caliper away from the brake rotor.
6. Remove the rotor. Refer to Brake Rotor Replacement in Brakes.

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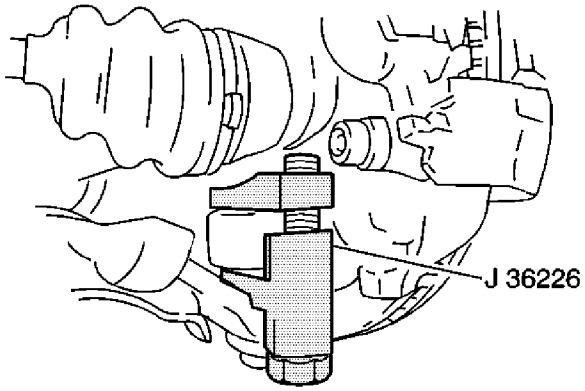


7. Disconnect the wheel speed sensor connector.



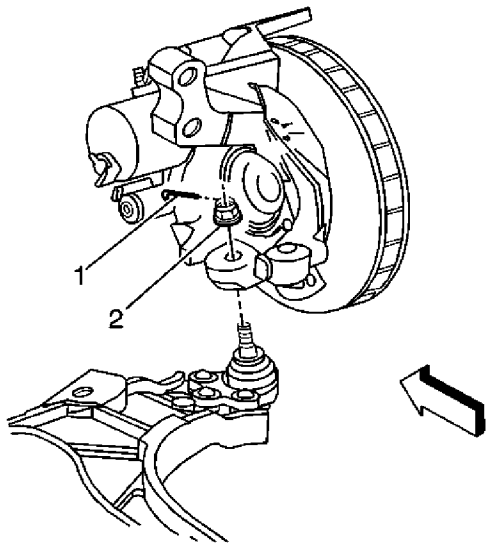
8. Remove the hub and bearing retaining bolts.
9. Use J 28733-B in order to remove the hub and drive axle.
10. Use J 24319-B in order to separate the tie rod from the steering knuckle.

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11. Using J 36226 separate the ball joint from the steering knuckle.
12. Remove the steering knuckle.

Installation Procedure



1. Install the steering knuckle.
2. Install the lower ball joint. Refer to Lower Control Arm Ball Joint Replacement .

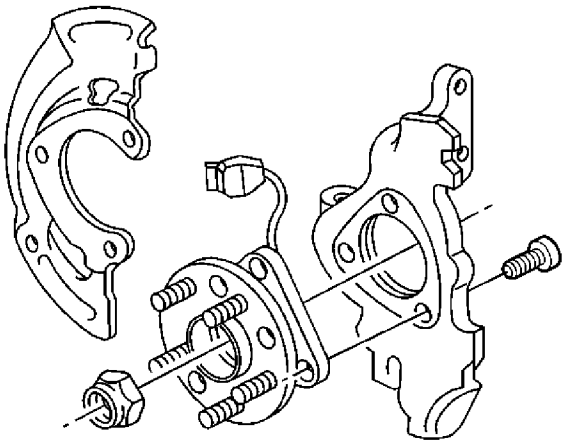
Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint

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surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the tie rod.

Tighten
Tighten the tie rod end to knuckle nut to 10 N·m (88 lb in) plus an additional 180 degrees--300 degrees (3--5 flats). For cotter pin alignment, tighten the nut up to, but do not exceed 60 degrees additional rotation. Do not back off nut (2) for cotter pin (1) alignment.

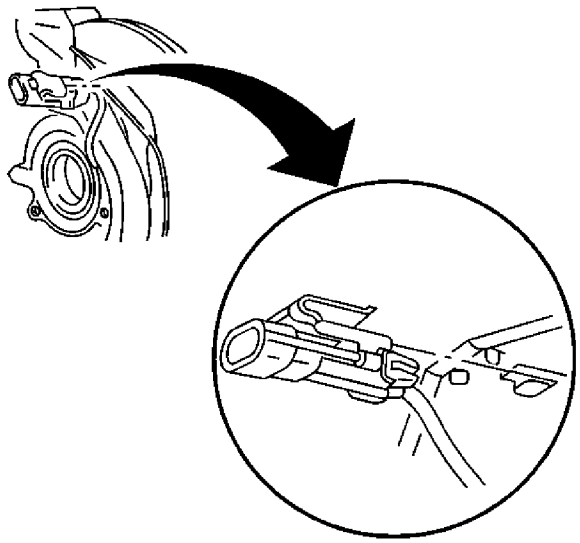




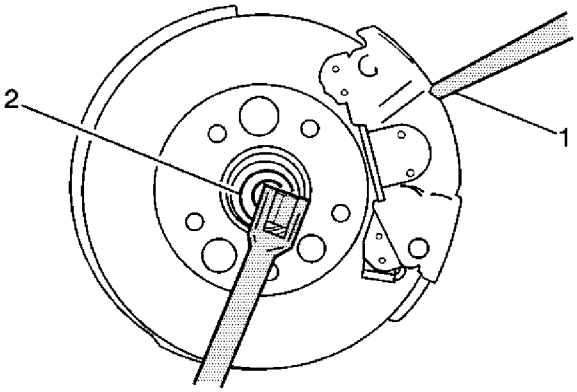
4. Install the hub and bearing to the steering knuckle/drive axle.
5. Install the hub and bearing retaining bolts.

Tighten
Tighten the hub and bearing bolts to 95 N·m (70 lb ft).

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6. Connect the wheel speed sensor connector to the wheel speed sensor.



7. Install the rotor. Refer to Brake Rotor Replacement in Brakes.
8. Install the caliper. Refer to Brake Caliper Replacement in Brakes.
9. Install the drive axle nut (2).

Tighten
Tighten the drive axle nut to 145 N·m (107 lb ft).

10. Install the wheel and tire.

Tighten
Tighten the wheel and tire 140 N·m (100 lb ft).

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Lower Control Arm Replacement

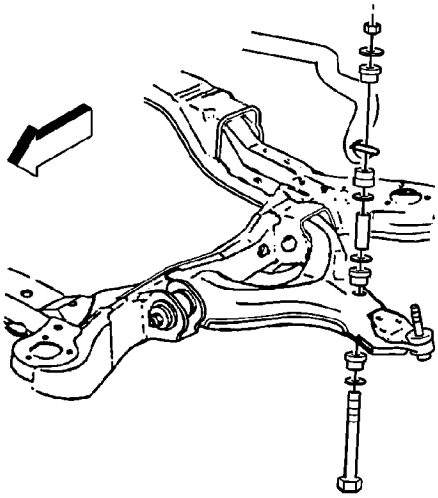
Removal Procedure

Tools Required

J 36226 Ball Joint Separator

Notice: Use only the recommended tools for separating the ball joint from the knuckle. Failure to use recommended tools may cause damage to the ball joint and seal.

1. Raise the vehicle and suitably support the frame allowing the control arms to hang free. Refer to Lifting and Jacking the Vehicle in General Information.
2. Remove the wheel and tire. Refer to Tire and Wheel Removal and Installation in Tires and Wheels.

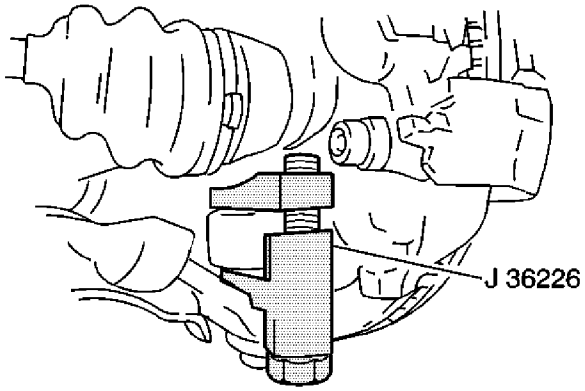




3. Remove the stabilizer shaft to control arm bolt.
4. Remove the cotter pin and loosen the nut from the ball stud.

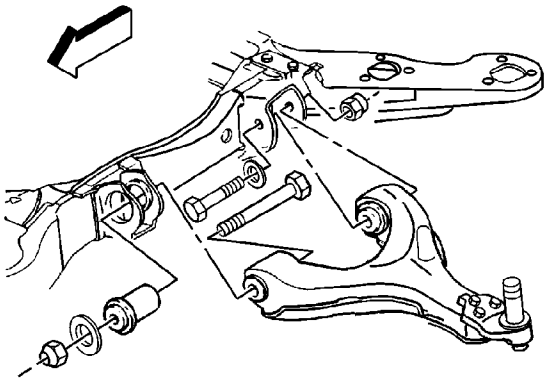
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Notice: Care must be taken not to overextend tri-pot joints. Over extension of the joint could result in separation of internal components which could go undetected and result in failure of the joint.

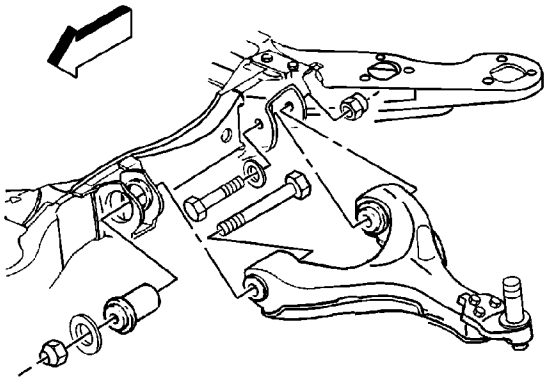
5. Using the J 36226 , remove the ball joint from the steering knuckle.



6. Remove the control arm mounting bolts.
7. Remove the control arm from the frame.

Installation Procedure

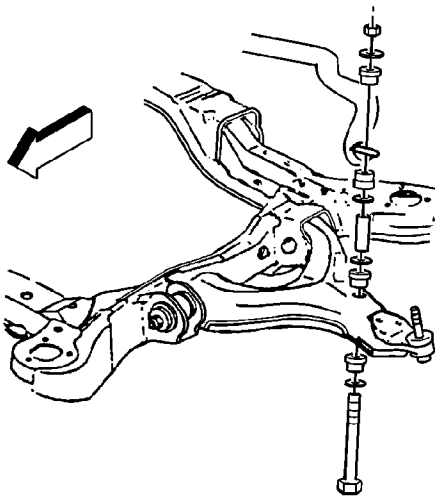
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1. Install the control arm to the frame.
2. Install the control arm mounting bolts, washers, and nuts.

Important: Do not tighten the control arm nuts at this time. The weight of the vehicle must be supported by the control arms such that the vehicle design trim heights are obtained before tightening control arm mounting nuts.

3. Install the stabilizer shaft to control arm.



Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint

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surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

4. Install the ball joint to the steering knuckle.

   Tighten
   - Tighten the stabilizer shaft link assembly to 17 N·m (13 lb ft).
   - Tighten the joint nut to 10 N·m (88 lb in). Then tighten an additional 120 degrees (2 flats on nut) during which a torque of 55 N·m (41 lb ft) must be obtained.
5. Install the cotter pin. In order to align the slot, tighten the nut up to one more flat.
6. Install the wheel and the tire. Refer to Tire and Wheel Removal and Installation in Tires and Wheels.

   Tighten
   Tighten the wheel nuts to 140 N·m (100 lb ft).

7. Lower the vehicle.
8. Check the trim height.

   Tighten
   Tighten the control arm nuts in the following sequence:

   - Front mounting nut to 190 N·m (140 lb ft).
   - Rear mounting nut to 123 N·m (91 lb ft).

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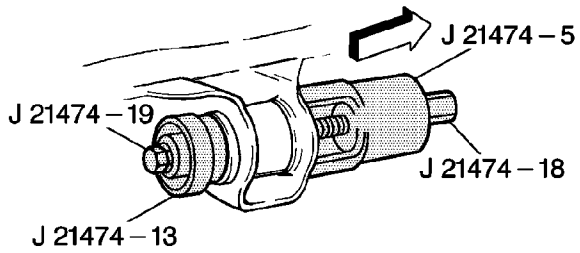
Lower Control Arm Bushings Replacement - Front

Removal Procedure

Tools Required

- J 21474-18 Nut
- J 21474-5 Bushing Receiver
- J 21474-13 Bushing Driver
- J 21474-19 Bolt Assembly

1. Remove the control arm from the vehicle. Refer to Lower Control Arm Replacement in Front Suspension.

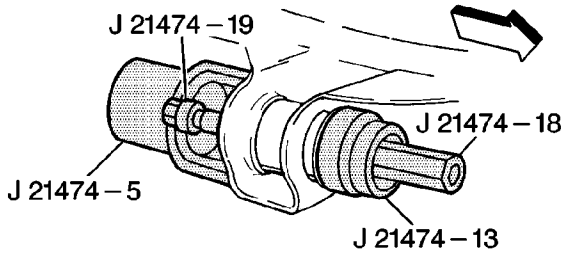


2. Assemble the bushing tool as follows:
   2.1. Assemble the J 21474-19 through the J 21474-13 with the small end facing the bushing.
   2.2. Assemble J 21474-5 on the front of the bushing.
3. Tighten the bolt until the bushing is driven out of the frame.
4. Remove the bushing driver tool.

Installation Procedure

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1. Install the bushing to the frame as follows:
   1.1. Assemble the J 21474-19 through J 21474-5 with the large end facing the bushing.
   1.2. Assemble the large end of the J 21474-13 facing the bushing.
   1.3. Connect the J 21474-18 to the threads.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the J 21474-19 .

   Tighten
   Tighten bolt J 21474-19 until the bushing is fully seated.

3. Remove the bushing driver tool.
4. Install the control arm to the frame. Refer to Lower Control Arm Replacement in Front Suspension.

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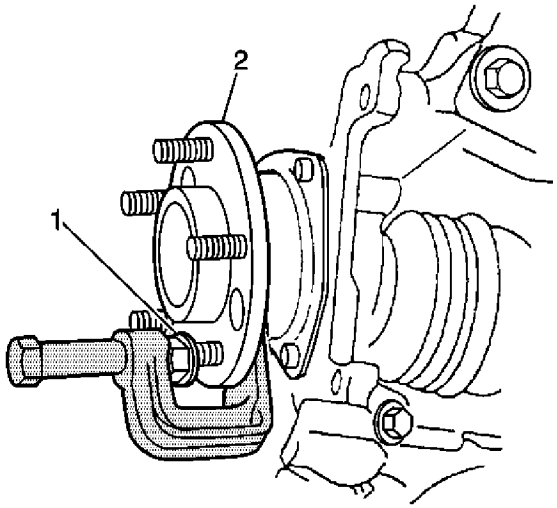
Wheel Stud Replacement

Removal Procedure

Tools Required

J 6627-A Stud Remover

1. Raise the vehicle. Support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.
2. Remove the wheel and tire. Refer to Tire and Wheel Removal and Installation in Tires and Wheels.



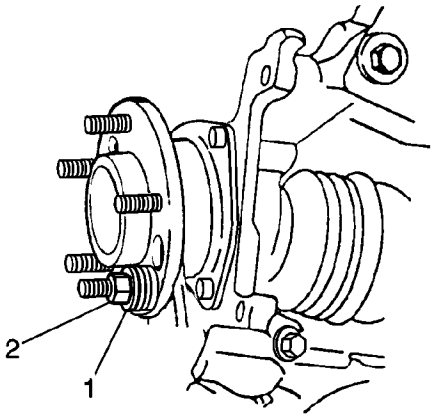


3. Remove the brake caliper. Support the caliper.
4. Remove the rotor. Refer to Brake Rotor Replacement in Brakes.
5. Use the J 6627-A in order to press out the stud (1).
6. Remove the stud at the innermost notch in the knuckle, on the caliper side of the knuckle.

Installation Procedure

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1. Install a new stud. Use washers (1) and wheel nuts (2).
2. Install the rotor.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the caliper.

   Tighten
   Tighten the caliper bolts to 51 N·m (38 lb ft).

4. Install the wheel and tire.

   Tighten
   Tighten the wheel nuts to 140 N·m (100 lb ft).

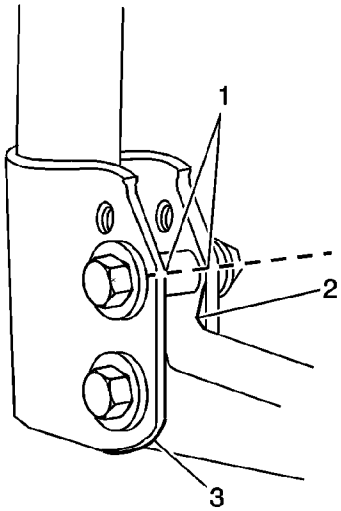
5. Lower the vehicle.

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Strut and Knuckle Scribing

Important:

- Before servicing the following items, use the scribing procedure:
  - The strut mount
  - The strut bumper
  - The strut shield
  - The spring seat
  - The spring insulator
  - After completing the service, you will be able to return to the original camber setting. Then, inspect and adjust the toe.
- Do not use the scribing procedure when servicing the following components:
  - Front Spring
  - Strut
  - Knuckle
  - Control Arm
  - Inspect or adjust the camber and the toe after completing the service. Refer to Wheel Alignment Specifications in Wheel Alignment.



1. Use a chisel in order to place a mark across the strut/knuckle interface (1).
2. Scribe the strut flange on the inboard side along the curve of the knuckle (2).
3. Using a sharp tool, scribe the knuckle along the lower outboard strut radius (3).
4. During reassembly, carefully match the marks to the components.

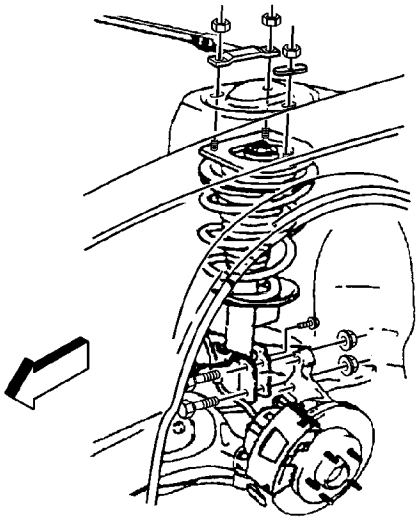
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Strut Assembly Replacement

Removal Procedure

1. Loosen the strut housing tie bar through-bolts on both ends of the tie bar.
2. If CCR equipped, disconnect the CCR electrical connector.
3. Remove the three strut mounts, strut to body.





4. Raise and suitably support the vehicle by the frame, allowing the control arms to hang free. Refer to Lifting and Jacking the Vehicle in General Information.
5. Remove the wheel and tire.
6. Remove the ABS front wheel speed sensor connector.
7. Remove the speed sensor bracket from the strut.
8. Remove the brake line bracket from the strut.

Notice: The knuckle must be retained after the strut-to-knuckle bolts have been removed. Failure to observe this may cause ball joint and/or wheel drive shaft damage.

9. Remove the strut to knuckle bolts.

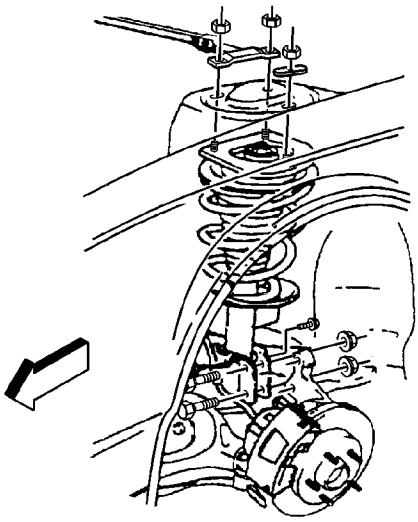
Notice: Care should be taken to avoid chipping or cracking the spring coating when handling the front suspension coil spring.

10. Remove the strut from the vehicle.

Installation Procedure

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1. Install the strut into place
2. Install the washer and tie bar.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the three strut mount nuts.

Tighten

- Tighten the strut mount nuts to 24 N·m (18 lb ft).
- Tighten the tie bar through-bolts (outboard first) to 37 (27 lb ft).

4. If CCR equipped, connect the CCR electrical connector.
5. Install the strut to knuckle bolts.
6. Install the brake line bracket to the strut.
7. Install the speed sensor bracket to the strut.
8. Install the speed sensor connector.

Tighten

- Tighten the strut to knuckle bolts to 190 N·m (140 lb ft).
- Tighten the brake line and speed sensor bracket bolts to 17 N·m (13 lb ft).

9. Install the wheel and tire.

Tighten
Tighten the wheel nuts to 140 N·m (100 lb ft).

10. Lower the vehicle.

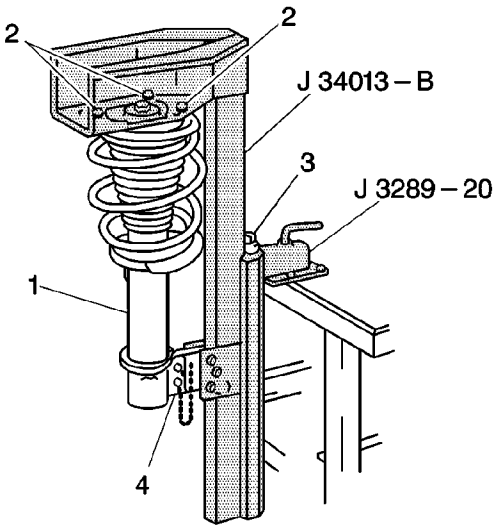
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Strut, Strut Component, and Spring Replacement

Removal Procedure

Tools Required

- J 3289-20 Holding Fixture
- J 34013-B Strut Compressor
- J 34013-38 Alignment Rod



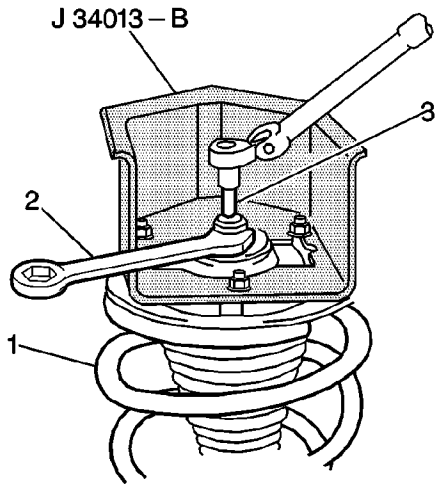
Notice: Care should be taken to avoid chipping or cracking the spring coating when handling the front suspension coil spring. Failure to observe this notice may result in spring breakage.

Important: Remove the strut from the vehicle in order to perform this procedure. Refer to Strut Assembly Replacement in Front Suspension.

1. Install the strut (1) into the J 34013-B .
   - Tighten the nuts (2) flush with the strut compressor.
   - Install the locking pins (4) through the strut.
2. Turn the compressor forcing screw (3) until the spring compresses slightly.

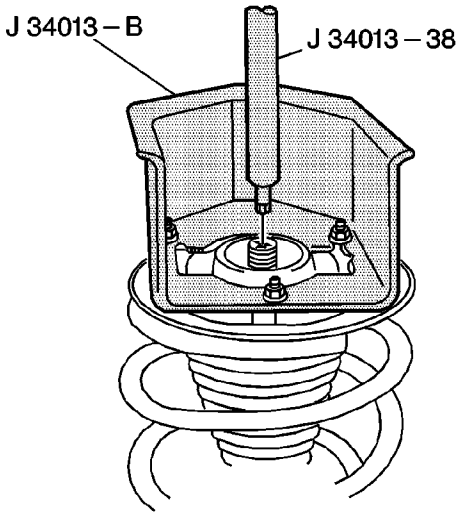
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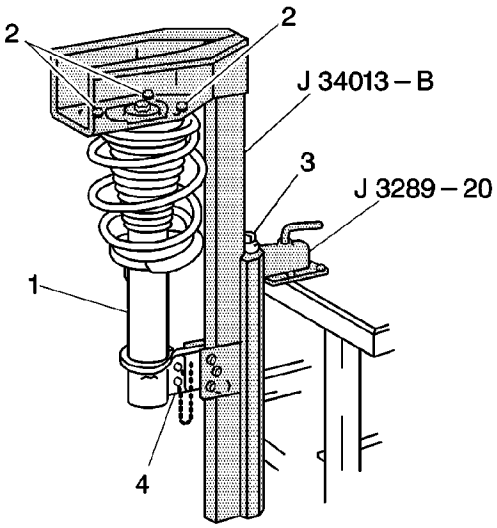
3. Use a socket (3) in order to hold the strut shaft from turning.

   Remove the 24 mm strut shaft nut using a 24 mm wrench (2).



4. Install the J 34013-38 in order to help guide the strut shaft out of the assembly.

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Notice: Care should be taken to avoid chipping or cracking the spring coating when handling the front suspension coil spring. Failure to observe this notice may result in spring breakage.

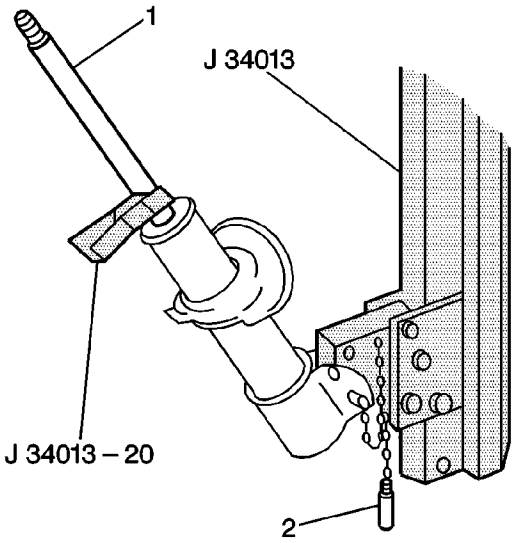
5. Loosen the compressor screw (3) while guiding the strut shaft (1) out of the assembly. Continue loosening the compressor screw until the strut and the spring may be removed.

Installation Procedure

Tools Required

- J 34013-B Strut Compressor
- J 34013-20 Damper Rod Clamp
- J 34013-38 Alignment Rod

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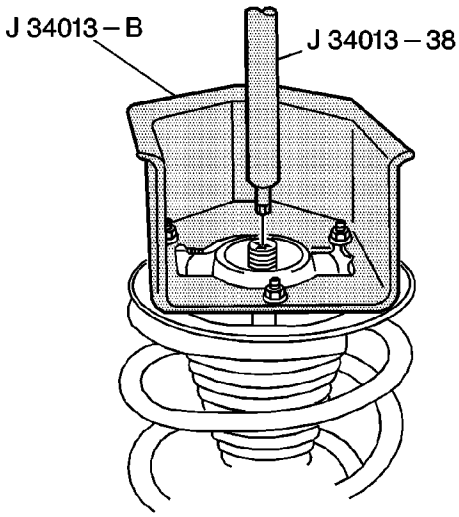


1. Install the strut in the J 34013-B with the J 34013-20 clamped on the strut shaft (1) in the strut compressor.

Important:

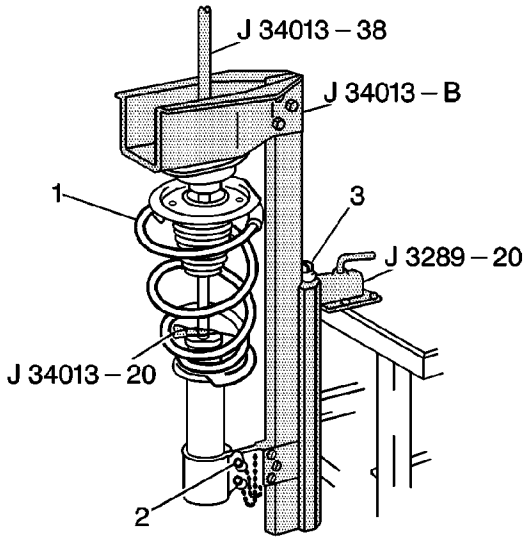
- Ensure that the flat on the upper spring seat faces out from the centerline of the vehicle. When you mount the spring seat in the strut compressor, ensure that the spring seat faces in the same direction as the steering knuckle mounting flange.
- If the bearing had been removed from the upper spring seat, install the bearing into the upper spring seat in the same orientation as it had been. Also, install the bearing in the spring seat before attaching to the strut mount.

2. Install the spring over the strut in the correct position.
3. Move the assembly upright in the strut compressor.
4. Install the upper locking pin (2).



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5. Install the rod J 34013-38 into the strut guide strut shaft.
6. Start turning the compressor screw clockwise on the J 34013-B , while guiding the J 34013-38 to the center strut shaft in the assembly.



7. Continue to turn the compressor forcing screw (3) on the strut compressor until the strut shaft threads are visible through the top of the strut assembly.
8. Install the washer and the nut.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

9. Remove the clamp J 34013-20 from the strut shaft.

Tighten
Tighten the strut mount nut to 75 N·m (55 lb ft) while holding the strut shaft with the socket.

10. Remove the strut from the strut compressor.

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GENERIC OBD-II TROUBLE CODES

DTC CODES P0001 to P0099

P0010....'A' Camshaft Position Actuator Circuit (Bank 1)

P0011....'A' Camshaft Position - Timing Over-Advanced or System Performance (Bank 1)

P0012....'A' Camshaft Position - Timing Over-Retarded (Bank 1)

P0013....'B' Camshaft Position - Actuator Circuit (Bank 1)

P0014....'B' Camshaft Position - Timing Over-Advanced or System Performance (Bank 1)

P0015....'B' Camshaft Position -Timing Over-Retarded (Bank 1)

P0020....'A' Camshaft Position Actuator Circuit (Bank 2)

P0021....'A' Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)

P0022....'A' Camshaft Position - Timing Over-Retarded (Bank 2)

P0023....'B' Camshaft Position - Actuator Circuit (Bank 2)

P0024....'B' Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)

P0025....'B' Camshaft Position - Timing Over-Retarded (Bank 2)

P0030....HO2S Heater Control Circuit (Bank 1 Sensor 1)

P0031....HO2S Heater Control Circuit Low (Bank 1 Sensor 1)

P0032....HO2S Heater Control Circuit High (Bank 1 Sensor 1)

P0033....Turbo Charger Bypass Valve Control Circuit

P0034....Turbo Charger Bypass Valve Control Circuit Low

P0035....Turbo Charger Bypass Valve Control Circuit High

P0036....HO2S Heater Control Circuit (Bank 1 Sensor 2)

P0037....HO2S Heater Control Circuit Low (Bank 1 Sensor 2)

P0038....HO2S Heater Control Circuit High (Bank 1 Sensor 2)

P0042....HO2S Heater Control Circuit (Bank 1 Sensor 3)

P0043....HO2S Heater Control Circuit Low (Bank 1 Sensor 3)

P0044....HO2S Heater Control Circuit High (Bank 1 Sensor 3)

P0050....HO2S Heater Control Circuit (Bank 2....Sensor 1)

P0051....HO2S Heater Control Circuit Low (Bank 2 Sensor 1)

P0052....HO2S Heater Control Circuit High (Bank 2 Sensor 1)

P0056....HO2S Heater Control Circuit (Bank 2 Sensor 2)

P0057....HO2S Heater Control Circuit Low (Bank 2 Sensor 2)

P0058....HO2S Heater Control Circuit High (Bank 2 Sensor 2)

P0062....HO2S Heater Control Circuit (Bank 2 Sensor 3)

P0063....HO2S Heater Control Circuit Low (Bank 2 Sensor 3)

P0064....HO2S Heater Control Circuit High (Bank 2 Sensor 3)

P0065....Air Assisted Injector Control Range/Performance

P0066....Air Assisted Injector Control Circuit or Circuit Low

P0067....Air Assisted Injector Control Circuit High

P0070....Ambient Air Temperature Sensor Circuit

P0071....Ambient Air Temperature Sensor Range/Performance

P0072....Ambient Air Temperature Sensor Circuit Low Input

P0073....Ambient Air Temperature Sensor Circuit High Input

P0074....Ambient Air Temperature Sensor Circuit Intermittent

P0075....Intake Valve Control Solenoid Circuit (Bank 1)

P0076....Intake Valve Control Solenoid Circuit Low (Bank 1)

P0077....Intake Valve Control Solenoid Circuit High (Bank 1)

P0078....Exhaust Valve Control Solenoid Circuit (Bank 1)

P0079....Exhaust Valve Control Solenoid Circuit Low (Bank 1)

P0080....Exhaust Valve Control Solenoid Circuit High (Bank 1)

P0081....Intake valve Control Solenoid Circuit (Bank 2)

P0082....Intake Valve Control Solenoid Circuit Low (Bank 2)

P0083....Intake Valve Control Solenoid Circuit High (Bank 2)

P0084....Exhaust Valve Control Solenoid Circuit (Bank 2)

P0085....Exhaust Valve Control Solenoid Circuit Low (Bank 2)

P0086....Exhaust Valve Control Solenoid Circuit High (Bank 2)

P0100....Mass or Volume Air Flow Circuit

P0101....Mass or Volume Air Flow Circuit Range/Performance Problem

P0102....Mass or Volume Air Flow Circuit Low Input

P0103....Mass or Volume Air Flow Circuit High Input

P0104....Mass or Volume Air Flow Circuit Intermittent

P0105....Manifold Absolute Pressure/Barometric Pressure Circuit

P0106....Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance Problem

P0107....Manifold Absolute Pressure/Barometric Pressure Circuit Low Input

P0108....Manifold Absolute Pressure/Barometric Pressure Circuit High Input

P0109....Manifold Absolute Pressure/Barometric Pressure Circuit Intermittent

P0110....Intake Air Temperature Circuit

P0111....Intake Air Temperature Circuit Range/Performance Problem

P0112....Intake Air Temperature Circuit Low Input

P0113....Intake Air Temperature Circuit High Input

P0114....Intake Air Temperature Circuit Intermittent

P0115....Engine Coolant Temperature Circuit

P0116....Engine Coolant Temperature Circuit Range/Performance Problem

P0117....Engine Coolant Temperature Circuit Low Input

P0118....Engine Coolant Temperature Circuit High Input

P0119....Engine Coolant Temperature Circuit Intermittent

P0120....Throttle/Pedal Position Sensor/Switch A Circuit

P0121....Throttle/Pedal Position Sensor/Switch A Circuit Range/Performance Problem

P0122....Throttle/Pedal Position Sensor/Switch A Circuit Low Input

P0123....Throttle/Pedal Position Sensor/Switch A Circuit High Input

P0124....Throttle/Pedal Position Sensor/Switch A Circuit Intermittent

P0125....Insufficient Coolant Temperature for Closed Loop Fuel Control

P0126....Insufficient Coolant Temperature for Stable Operation

P0127....Intake Air Temperature Too High

P0128....Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)

P0130....O2 Sensor Circuit (Bank 1 Sensor 1)

P0131....O2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)

P0132....O2 Sensor Circuit High Voltage (Bank 1 Sensor 1)

P0133....O2 Sensor Circuit Slow Response (Bank 1 Sensor 1)

P0134....O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)

P0135....O2 Sensor Heater Circuit (Bank 1 Sensor 1)

P0136....O2 Sensor Circuit Malfunction (Bank 1 Sensor 2)

P0137....O2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)

P0138....O2 Sensor Circuit High Voltage (Bank 1 Sensor 2)

P0139....O2 Sensor Circuit Slow Response (Bank 1 Sensor 2)

P0140....O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 2)

P0141....O2 Sensor Heater Circuit (Bank 1 Sensor 2)

P0142....O2 Sensor Circuit Malfunction (Bank 1 Sensor 3)

P0143....O2 Sensor Circuit Low Voltage (Bank 1 Sensor 3)

P0144....O2 Sensor Circuit High Voltage (Bank 1 Sensor 3)

P0145....O2 Sensor Circuit Slow Response (Bank 1 Sensor 3)

P0146....O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 3)

P0147....O2 Sensor Heater Circuit (Bank 1 Sensor 3)

P0148....Fuel Delivery Error

P0149....Fuel Timing Error

P0150....O2 Sensor Circuit (Bank 2 Sensor 1)

P0151....O2 Sensor Circuit Low Voltage (Bank 2 Sensor 1)

P0152....O2 Sensor Circuit High Voltage (Bank 2 Sensor 1)

P0153....O2 Sensor Circuit Slow Response (Bank 2 Sensor 1)

P0154....O2 Sensor Circuit No Activity Detected (Bank 2 Sensor 1)

P0155....O2 Sensor Heater Circuit (Bank 2 Sensor 1)

P0156....O2 Sensor Circuit Malfunction (Bank 2 Sensor 2)

P0157....O2 Sensor Circuit Low Voltage (Bank 2 Sensor 2)

P0158....O2 Sensor Circuit High Voltage (Bank 2 Sensor 2)

P0159....O2 Sensor Circuit Slow Response (Bank 2 Sensor 2)

P0160....O2 Sensor Circuit No Activity Detected (Bank 2 Sensor 2)

P0161....O2 Sensor Heater Circuit (Bank 2 Sensor 2)

P0162....O2 Sensor Circuit Malfunction (Bank 2 Sensor 3)

P0163....O2 Sensor Circuit Low Voltage (Bank 2 Sensor 3)

P0164....O2 Sensor Circuit High Voltage (Bank 2 Sensor 3)

P0165....O2 Sensor Circuit Slow Response (Bank 2 Sensor 3)

P0166....O2 Sensor Circuit No Activity Detected (Bank 2 Sensor 3)

P0167....O2 Sensor Heater Circuit (Bank 2 Sensor 3)

P0168....Fuel Temperature Too High

P0169....Incorrect Fuel Composition

P0170....Fuel Trim (Bank 1)

P0171....System too Lean (Bank 1)

P0172....System too Rich (Bank 1)

P0173....Fuel Trim Malfunction (Bank 2)

P0174....System too Lean (Bank 2)

P0175....System too Rich (Bank 2)

P0176....Fuel Composition Sensor Circuit

P0177....Fuel Composition Sensor Circuit Range/Performance

P0178....Fuel Composition Sensor Circuit Low Input

P0179....Fuel Composition Sensor Circuit High Input

P0180....Fuel Temperature Sensor A Circuit

P0181....Fuel Temperature Sensor A Circuit Range/Performance

P0182....Fuel Temperature Sensor A Circuit Low Input

P0183....Fuel Temperature Sensor A Circuit High Input

P0184....Fuel Temperature Sensor A Circuit Intermittent

P0185....Fuel Temperature Sensor B Circuit

P0186....Fuel Temperature Sensor B Circuit Range/Performance

P0187....Fuel Temperature Sensor B Circuit Low Input

P0188....Fuel Temperature Sensor B Circuit High Input

P0189....Fuel Temperature Sensor B Circuit Intermittent

P0190....Fuel Rail Pressure Sensor Circuit

P0191....Fuel Rail Pressure Sensor Circuit Range/Performance

P0192....Fuel Rail Pressure Sensor Circuit Low In put

P0193....Fuel Rail Pressure Sensor Circuit High Input

P0194....Fuel Rail Pressure Sensor Circuit Intermittent

P0195....Engine Oil Temperature Sensor

P0196....Engine Oil Temperature Sensor Range/Performance

P0197....Engine Oil Temperature Sensor Low

P0198....Engine Oil Temperature Sensor High

P0199....Engine Oil Temperature Sensor Intermittent

P0200....Injector Circuit

P0201....Injector Circuit - Cylinder 1

P0202....Injector Circuit - Cylinder 2

P0203....Injector Circuit - Cylinder 3

P0204....Injector Circuit - Cylinder 4

P0205....Injector Circuit - Cylinder 5

P0206....Injector Circuit - Cylinder 6

P0207....Injector Circuit - Cylinder 7

P0208....Injector Circuit - Cylinder 8

P0209....Injector Circuit - Cylinder 9

P0210....Injector Circuit - Cylinder 1

P0211....Injector Circuit - Cylinder 11

P0212....Injector Circuit - Cylinder 12

P0213....Cold Start Injector 1

P0214....Cold Start Injector 2

P0215....Engine Shutoff Solenoid

P0216....Injector/Injection Timing Control Circuit

P0217....Engine Coolant Over Temperature Condition

P0218....Transmission Fluid Over Temperature Condition

P0219....Engine Over Speed Condition

P0220....Throttle/Pedal Position Sensor/Switch 'B' Circuit

P0221....Throttle/Pedal Position Sensor/Switch 'B' Circuit Range/Performance Problem

P0222....Throttle/Pedal Position Sensor/Switch 'B' Circuit Low Input

P0223....Throttle/Pedal Position Sensor/Switch 'B' Circuit High Input

P0224....Throttle/Pedal Position Sensor/Switch 'B' Circuit Intermittent

P0225....Throttle/Pedal Position Sensor/Switch 'C' Circuit

P0226....Throttle/Pedal Position Sensor/Switch 'C' Circuit Range/Performance Problem

P0227....Throttle/Pedal Position Sensor/Switch 'C' Circuit Low Input

P0228....Throttle/Pedal Position Sensor/Switch 'C' Circuit High Input

P0229....Throttle/Pedal Position Sensor/Switch 'C' Circuit Intermittent

P0230....Fuel Pump Primary Circuit

P0231....Fuel Pump Secondary Circuit Low

P0232....Fuel Pump Secondary Circuit High

P0233....Fuel Pump Secondary Circuit Intermittent

P0234....Turbo/Super Charger Overboost Condition

P0235....Turbo/Super Charger Boost Sensor 'A' Circuit

P0236....Turbo/Super Charger Boost Sensor 'A' Circuit Range/Performance

P0237....Turbo/Super Charger Boost Sensor 'A' Circuit Low

P0238....Turbo/Super Charger Boost Sensor 'A' Circuit High

P0239....Turbo/Super Charger Boost Sensor 'B' Circuit

P0240....Turbo/Super Charger Boost Sensor 'B' Circuit Range/Performance

P0241....Turbo/Super Charger Boost Sensor 'B' Circuit Low

P0242....Turbo/Super Charger Boost Sensor 'B' Circuit High

P0243....Turbo/Super Charger Wastegate Solenoid 'A'

P0244....Turbo/Super Charger Wastegate Solenoid 'A' Range/Performance

P0245....Turbo/Super Charger Wastegate Solenoid 'A' Low

P0246....Turbo/Super Charger Wastegate Solenoid 'A' High

P0247....Turbo/Super Charger Wastegate Solenoid 'B'

P0248....Turbo/Super Charger Wastegate Solenoid 'B' Range/Performance

P0249....Turbo/Super Charger Wastegate Solenoid 'B' Low

P0250....Turbo/Super Charger Wastegate Solenoid 'B' High

P0251....Injection Pump Fuel Metering Control 'A' (Cam/rotor/Injector)

P0252....Injection Pump Fuel Metering Control 'A' Range/Performance (Cam/Rotor/Injector)

P0253....Injection Pump Fuel Metering Control 'A' Low (Cam/Rotor/Injector)

P0254....Injection Pump Fuel Metering Control 'A' High (Cam/Rotor/Injector)

P0255....Injection Pump Fuel Metering Control 'A' Intermittent (Cam/Rotor/Injector)

P0256....Injection Pump Fuel Metering Control 'B' (Cam/Rotor/Injector)

P0257....Injection Pump Fuel Metering Control 'B' Range/Performance (Cam/Rotor/Injector)

P0258....Injection Pump Fuel Metering Control 'B' Low (Cam/Rotor/Injector)

P0259....Injection Pump Fuel Metering Control 'B' High (Cam/Rotor/Injector)

P0260....Injection Pump Fuel Metering Control 'B' Intermittent (Cam/Rotor/Injector)

P0261....Cylinder 1 Injector Circuit Low

P0262....Cylinder 1 Injector Circuit High

P0263....Cylinder 1 Contribution/Balance

P0264....Cylinder 2 Injector Circuit Low

P0265....Cylinder 2 Injector Circuit High

P0266....Cylinder 2 Contribution/Balance

P0267....Cylinder 3 Injector Circuit Low

P0268....Cylinder 3 Injector Circuit High

P0269....Cylinder 4....Contribution/Balance

P0270....Cylinder 4 Injector Circuit Low

P0271....Cylinder 4 Injector Circuit High

P0272....Cylinder 4 Contribution/Balance

P0273....Cylinder 5 Injector Circuit Low

P0274....Cylinder 5 Injector Circuit High

P0275....Cylinder 5 Contribution/Balance

P0276....Cylinder 6....Injector Circuit Low

P0277....Cylinder 6....Injector Circuit High

P0278....Cylinder 6 Contribution/Balance

P0279....Cylinder 7 Injector Circuit Low

P0280....Cylinder 7 Injector Circuit High

P0281....Cylinder 7 Contribution/Balance

P0282....Cylinder 8 Injector Circuit Low

P0283....Cylinder 8 Injector Circuit High

P0284....Cylinder 8 Contribution/Balance

P0285....Cylinder 9 Injector Circuit Low

P0286....Cylinder 9 Injector Circuit High

P0287....Cylinder 9 Contribution/Balance

P0288....Cylinder 10....Injector Circuit Low

P0289....Cylinder 10....Injector Circuit High

P0290....Cylinder 10....Contribution/Balance

P0291....Cylinder 11 Injector Circuit Low

P0292....Cylinder 11 Injector Circuit High

P0293....Cylinder 11 Contribution/Balance

P0294....Cylinder 12 Injector Circuit Low

P0295....Cylinder 12 Injector Circuit High

P0296....Cylinder 12 Contribution/Balance

P0298....Engine Oil Over Temperature

P0300....Random/Multiple Cylinder Misfire Detected

P0301....Cylinder 1 Misfire Detected

P0302....Cylinder 2 Misfire Detected

P0303....Cylinder 3 Misfire Detected

P0304....Cylinder 4 Misfire Detected

P0305....Cylinder 5 Misfire Detected

P0306....Cylinder 6 Misfire Detected

P0307....Cylinder 7 Misfire Detected

P0308....Cylinder 8 Misfire Detected

P0309....Cylinder 9 Misfire Detected

P0310....Cylinder 10....Misfire Detected

P0311....Cylinder 11 Misfire Detected

P0312....Cylinder 12 Misfire Detected

P0313....Misfire Detected with Low Fuel

P0314....Single Cylinder Misfire (Cylinder not Specified)

P0320....Ignition/Distributor Engine Speed Input Circuit

P0321....Ignition/Distributor Engine Speed Input Circuit Range/Performance

P0322....Ignition/Distributor Engine Speed Input Circuit No Signal

P0323....Ignition/Distributor Engine Speed Input Circuit Intermittent

P0324....Knock Control System Error

P0325....Knock Sensor 1 Circuit (Bank 1 or Single Sensor)

P0326....Knock Sensor 1 Circuit Range/Performance (Bank 1 or Single Sensor)

P0327....Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)

P0328....Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)

P0329....Knock Sensor 1 Circuit Input Intermittent (Bank 1 or Single Sensor)

P0330....Knock Sensor 2 Circuit (Bank 2)

P0331....Knock Sensor 2 Circuit Range/Performance (Bank 2)

P0332....Knock Sensor 2 Circuit Low Input (Bank 2)

P0333....Knock Sensor 2 Circuit High Input (Bank 2)

P0334....Knock Sensor 2 Circuit Input Intermittent (Bank 2)

P0335....Crankshaft Position Sensor A Circuit

P0336....Crankshaft Position Sensor A Circuit Range/Performance

P0337....Crankshaft Position Sensor A Circuit Low Input

P0338....Crankshaft Position Sensor A Circuit High Input

P0339....Crankshaft Position Sensor A Circuit Intermittent

P0340....Camshaft Position Sensor 'A' Circuit (Bank 1 or Single Sensor)

P0341 Camshaft Position Sensor 'A' Circuit Range/Performance (Bank 1 or Single Sensor)

P0342....Camshaft Position Sensor 'A' Circuit Low Input (Bank 1 or Single Sensor)

P0343....Camshaft Position Sensor 'A' Circuit High Input (Bank 1 or Single Sensor)

P0344....Camshaft Position Sensor 'A' Circuit Intermittent (Bank 1 or Single Sensor)

P0345....Camshaft Position Sensor 'A' Circuit (Bank 2)

P0346....Camshaft Position Sensor 'A' Circuit Range/Performance (Bank 2)

P0347....Camshaft Position Sensor 'A' Circuit Low Input (Bank 2)

P0348....Camshaft Position Sensor 'A' Circuit High Input (Bank 2)

P0349....Camshaft Position Sensor 'A' Circuit Intermittent (Bank 2)

P0350....Ignition Coil Primary/Secondary Circuit

P0351....Ignition Coil 'A' Primary/Secondary Circuit

P0352....Ignition Coil 'B' Primary/Secondary Circuit

P0353....Ignition Coil 'C' Primary/Secondary Circuit

P0354....Ignition Coil 'D' Primary/Secondary Circuit

P0355....Ignition Coil 'F' Primary/Secondary Circuit

P0356....Ignition Coil 'F' Primary/Secondary Circuit

P0357....Ignition Coil 'G' Primary/Secondary Circuit

P0358....Ignition Coil 'H' Primary/Secondary Circuit

P0359....Ignition Coil 'I' Primary/Secondary Circuit

P0360....Ignition Coil 'J' Primary/Secondary Circuit

P0361....Ignition Coil 'K Primary/Secondary Circuit

P0362....Ignition Coil 'L' Primary/Secondary Circuit

P0365....Camshaft Position Sensor 'B' Circuit (Bank 1)

P0366....Camshaft Position Sensor 'B' Circuit Range/Performance (Bank 1)

P0367....Camshaft Position Sensor 'B' Circuit Low Input (Bank 1)

P0368....Camshaft Position Sensor 'B' Circuit High Input (Bank 1)

P0369....Camshaft Position Sensor 'B' Circuit Intermittent (Bank 1)

P0370....Timing Reference High Resolution Signal 'A'

P0371....Timing Reference High Resolution Signal 'A' Too Many Pulses

P0372....Timing Reference High Resolution Signal 'A' Too Few Pulses

P0373....Timing Reference High Resolution Signal 'A' Intermittent/Erratic Pulses

P0374....Timing Reference High Resolution Signal 'A' No Pulse

P0375....Timing Reference High Resolution Signal 'B'

P0376....Timing Reference High Resolution Signal 'B' Too Many Pulses

P0377....Timing Reference High Resolution Signal 'B' Too Few Pulses

P0378....Timing Reference High Resolution Signal 'B' Intermittent/Erratic Pulses

P0379....Timing Reference High Resolution Signal 'B' No Pulses

P0380....Glow Plug/Heater Circuit 'A'

P0381....Glow Plug/Heater Indicator Circuit

P0382....Glow Plug/Heater Circuit 'B'

P0385....Crankshaft Position Sensor 'B' Circuit

P0386....Crankshaft Position Sensor 'B' Circuit Range/Performance

P0387....Crankshaft Position Sensor 'B' Circuit Low Input

P0388....Crankshaft Position Sensor 'B' Circuit High Input

P0389....Crankshaft Position Sensor 'B' Circuit Intermittent

P0390....camshaft Position Sensor 'B' Circuit

P0391....Camshaft Position Sensor 'B' circuit Range/Performance (Bank 2)

P0392....Camshaft Position Sensor 'B' Circuit Low Input (Bank 2)

P0393....Camshaft Position Sensor 'B' Circuit High Input (Bank 2)

P0394....Camshaft Position Sensor 'B' Circuit Intermittent (Bank 2)

P0400....Exhaust Gas Recirculation Flow

P0401....Exhaust Gas Recirculation Flow Insufficient Detected

P0402....Exhaust Gas Recirculation Flow Excessive Detected

P0403....Exhaust Gas Recirculation Control Circuit

P0404....Exhaust Gas Recirculation Control Circuit Range/Performance

P0405....Exhaust Gas Recirculation Sensor 'A' Circuit Low

P0406....Exhaust Gas Recirculation Sensor 'A' Circuit High

P0407....Exhaust Gas Recirculation Sensor 'B' Circuit Low

P0408....Exhaust Gas Recirculation Sensor 'B' Circuit High

P0409....Exhaust Gas Recirculation Sensor 'A' Circuit

P0410....Secondary Air Injection System

P0411....Secondary Air Injection System Incorrect Flow Detected

P0412....Secondary Air Injection System Switching Valve 'A' Circuit

P0413....Secondary Air Injection System Switching Valve 'A' Circuit Open

P0414....Secondary Air Injection System Switching Valve 'A' Circuit Shorted

P0415....Secondary Air Injection System Switching Valve 'B' Circuit

P0416....secondary Air Injection System Switching Valve 'B' Circuit Open

P0417....secondary Air Injection System Switching Valve 'B' Circuit Shorted

P0416....Secondary Air Injection System Relay 'A' Circuit

P0419....Secondary Air injection System Relay 'B' Circuit

P0420....Catalyst System Efficiency Below Threshold (Bank 1)

P0421....Warm Up Catalyst Efficiency Below Threshold (Bank 1)

P0422....Main Catalyst Efficiency Below Threshold (Bank 1)

P0423....Heated Catalyst Efficiency Below Threshold (Bank 1)

P0424....Heated Catalyst Temperature Below Threshold (Bank 1)

P0425....Catalyst Temperature Sensor (Bank 1)

P0426....Catalyst Temperature Sensor Range/Performance (Bank 1)

P0427....Catalyst Temperature Sensor Low Input (Bank 1)

P0428....Catalyst Temperature Sensor High Input (Bank 1)

P0429....Catalyst Heater Control Circuit (Bank 1)

P0430....Catalyst System Efficiency Below Threshold (Bank 2)

P0431....Warm Up Catalyst Efficiency Below Threshold (Bank 2)

P0432....Main Catalyst Efficiency Below Threshold (Bank 2)

P0433....Heated Catalyst Efficiency Below Threshold (Bank 2)

P0434....Heated Catalyst Temperature Below Threshold (Bank 2)

P0435....Catalyst Temperature Sensor (Bank 2)

P0436....Catalyst Temperature Sensor Range/Performance (Bank 2)

P0437....Catalyst Temperature Sensor Low Input (Bank 2)

P0438....Catalyst Temperature Sensor High Input (Bank 2)

P0439....Catalyst Heater Control Circuit (Bank 2)

P0440....Evaporative Emission Control System

P0441....Evaporative Emission Control System Incorrect Purge Flow

P0442....Evaporative Emission Control System Leak Detected (small leak)

P0443....Evaporative Emission Control System Purge Control Valve Circuit

P0444....Evaporative Emission Control System Purge Control Valve Circuit Open

P0445....Evaporative Emission Control System Purge Control Valve Circuit Shorted

P0446....Evaporative Emission Control System Vent Control Circuit

P0447....Evaporative Emission Control System Vent Control Circuit Open

P0448....Evaporative Emission Control System Vent Control Circuit Shorted

P0449....Evaporative Emission Control System Vent Valve/Solenoid Circuit

P0450....Evaporative Emission Control System Pressure Sensor

P0451....Evaporative Emission Control System Pressure Sensor Range/Performance

P0452....Evaporative Emission Control System Pressure Sensor Low Input

P0453....Evaporative Emission Control System Pressure Sensor High input

P0454....Evaporative Emission Control System Pressure Sensor Intermittent

P0455....Evaporative Emission Control System Leak Detected (gross leak)

P0456....Evaporative Emission Control System Leak Detected (very small leak)

P0457....Evaporative Emission Control System Leak Detected (fuel cap loose/off)

P0460....Fuel Level Sensor Circuit

P0461....Fuel Level Sensor Circuit Range/Performance

P0462....Fuel Level Sensor Circuit Low Input

P0463....Fuel Level Sensor Circuit High Input

P0464....Fuel Level Sensor Circuit Intermittent

P0465....EVAP Purge Flow Sensor Circuit

P0466....EVAP Purge Flow Sensor Circuit Range/Performance

P0467....EVAP Purge Flow Sensor Circuit Low Input

P0468....EVAP Purge Flow Sensor Circuit High Input

P0469....EVAP Purge Flow Sensor Circuit Intermittent

P0470....Exhaust Pressure Sensor

P0471....Exhaust Pressure Sensor Range/Performance

P0472....Exhaust Pressure Sensor Low

P0473....Exhaust Pressure Sensor High

P0474....Exhaust Pressure Sensor Intermittent

P0475....Exhaust Pressure Control Valve

P0476....Exhaust Pressure Control Valve Range/Performance

P0477....Exhaust Pressure Control Valve Low

P0478....Exhaust Pressure Control Valve High

P0479....Exhaust Pressure Control Valve Intermittent

P0480....Cooling Fan 1 Control Circuit

P0481....Cooling Fan 2 Control Circuit

P0482....Cooling Fan 3 Control Circuit

P0483....Cooling Fan Rationality Check

P0484....Cooling Fan Circuit Over Current

P0485....Cooling Fan Power/Ground Circuit

P0486....Exhaust Gas Recirculation Sensor 'B' Circuit

P0487....Exhaust Gas Recirculation Throttle Position Control Circuit

P0488....Exhaust Gas Recirculation Throttle Position Control Range/Performance

P0491....Secondary Air Injection System (Bank 1)

P0492....Secondary Air Injection System (Bank

P0500....Vehicle Speed Sensor

P0501....Vehicle Speed Sensor Range/Performance

P0502....Vehicle Speed Sensor Circuit Low Input

P0503....Vehicle Speed Sensor Intermittent/Erratic/High

P0505....Idle Control System

P0506....Idle Control System RPM Lower Than Expected

P0507....Idle Control System RPM Higher Than Expected

P0508....Idle Control System Circuit Low

P0509....Idle Control System Circuit High

P0510....Closed Throttle Position Switch

P0512....Starter Request Circuit

P0513....Incorrect Immobilizer Key

P0515....Battery Temperature Sensor Circuit

P0516....Battery Temperature Sensor Circuit Low

P0517....Battery Temperature Sensor Circuit High

P0520....Engine Oil Pressure Sensor/Switch Circuit

P0521....Engine Oil Pressure Sensor/Switch Range/Performance

P0522....Engine Oil Pressure Sensor/Switch Low Voltage

P0523....Engine Oil Pressure Sensor/Switch High Voltage

P0524....Engine Oil Pressure Too Low

P0530....A/C Refrigerant Pressure Sensor Circuit

P0531....A/C Refrigerant Pressure Sensor Circuit Range/Performance

P0532....A/C Refrigerant Pressure Sensor Circuit Low Input

P0533....A/C Refrigerant Pressure Sensor Circuit High Input

P0534....Air Conditioner Refrigerant Charge Loss

P0540....Intake Air Heater Circuit

P0541....Intake Air Heater Circuit Low

P0542....Intake Air Heater Circuit High

P0544....Exhaust Gas Temperature Sensor Circuit (Bank 1)

P0545....Exhaust Gas Temperature Sensor Circuit Low (Bank 1)

P0546....Exhaust Gas Temperature Sensor Circuit High (Bank 1)

P0547....Exhaust Gas Temperature Sensor Circuit (Bank 2)

P0548....Exhaust Gas Temperature Sensor Circuit Low (Bank 2)

P0549....Exhaust Gas Temperature Sensor Circuit High (Bank 2)

P0550....Power Steering Pressure Sensor Circuit

P0551....Power Steering Pressure Sensor Circuit Range/Performance

P0552....Power Steering Pressure Sensor Circuit Low Input

P0553....Power Steering Pressure Sensor Circuit High Input

P0554....Power Steering Pressure Sensor Circuit Intermittent

P0560....System Voltage

P0561....System Voltage Unstable

P0562....System Voltage Low

P0563....System Voltage High

P0564....Cruise Control Multi-Function Input Signal

P0565....Cruise Control On Signal

P0566....Cruise Control Off Signal

P0567....Cruise Control Resume Signal

P0568....Cruise Control Set Signal

P0569....Cruise Control Coast Signal

P0570....Cruise Control Accel Signal

P0571....Cruise Control/Brake Switch A Circuit

P0572....Cruise Control/Brake Switch A Circuit Low

P0573....Cruise Control/Brake Switch A Circuit High

P0574....Cruise Control System - Vehicle Speed Too High

P0575....Cruise Control Input Circuit

P0576....Cruise Control Input Circuit Low

P0577....Cruise Control input Circuit High

P0600....Serial Communication Link

P0601....Internal Control Module Memory Check Sum Error

P0602....Control Module Programming Error

P0603....Internal Control Module Keep Alive Memory (KAM) Error

P0604....Internal Control Module Random Access Memory (RAM) Error

P0605....Internal Control Module Read Only Memory (ROM) Error

P0606....ECM/PCM Processor

P0607....Control Module Performance

P0608....Control Module VSS Output 'A'

P0609....Control Module VSS Output 'B'

P0610....Control Module Vehicle Options Error

P0615....Starter Relay Circuit

P0616....Starter Relay Circuit Low

P0617....Starter Relay Circuit High

P0618....Alternative Fuel Control Module KAM Error

P0619....Alternative Fuel Control Module RAM/ROM Error

P0620....Generator Control Circuit

P0621....Generator Lamp 'L' Terminal Control Circuit

P0622....Generator Field 'F' Terminal Control Circuit

P0623....Generator Lamp Control Circuit

P0624....Fuel Cap Lamp Control Circuit

P0630....VIN Not Programmed or Mismatch - ECM/PCM

P0631....VIN Not Programmed or Mismatch - TCM

P0635....Power Steering Control Circuit

P0836....Power Steering Control Circuit Low

P0637....Power Steering Control Circuit High

P0638....Throttle Actuator Control Range/Performance (Bank 1)

P0639....Throttle Actuator Control Range/Performance (Bank 2)

P0640....Intake Air Heater Control Circuit

P0645....A/C Clutch Relay Control Circuit

P0646....A/C Clutch Relay Control Circuit Low

P0647....A/C Clutch Relay Control Circuit High

P0648....Immobilizer Lamp Control Circuit

P0649....Speed Control Lamp Control Circuit

P0650....Malfunction Indicator Lamp (ML) Control Circuit

P0654....Engine RPM Output Circuit

P0655....Engine Hot Lamp Output Control Circuit

P0656....Fuel Level Output Circuit

P0660....Intake Manifold Tuning Valve Control Circuit (Bank 1)

P0661....Intake Manifold Tuning Valve Control Circuit Low (Bank 1)

P0662....Intake Manifold Tuning Valve Control Circuit High (Bank 1)

P0663....Intake Manifold Tuning Valve Control Circuit (Bank 2)

P0664....Intake Manifold Tuning Valve Control Circuit Low (Bank 2)

P0665....Intake Manifold Tuning Valve Control Circuit High (Bank 2)

P0700....Transmission Control System (MIL Request)

P0701....Transmission Control System Range/Performance

P0702....Transmission Control System Electrical

P0703....Torque Converter/Brake Switch B Circuit

P0704....Clutch Switch In put Circuit Malfunction

P0705....Transmission Range Sensor Circuit Malfunction (PRNDL Input)

P0706....Transmission Range Sensor Circuit Range/Performance

P0707....Transmission Range Sensor Circuit Low Input

P0708....Transmission Range Sensor Circuit High Input

P0709....Transmission Range Sensor Circuit intermittent

P0710....Transmission Fluid Temperature Sensor Circuit

P0711....Transmission Fluid Temperature Sensor Circuit Range/Performance

P0712....Transmission Fluid Temperature Sensor Circuit Low Input

P0713....Transmission Fluid Temperature Sensor Circuit High Input

P0714....Transmission Fluid Temperature Sensor Circuit Intermittent

P0715....Input/Turbine Speed Sensor Circuit

P0716....Input/Turbine Speed Sensor Circuit Range/Performance

P0717....Input/Turbine Speed Sensor Circuit No Signal

P0718....Input/Turbine Speed Sensor Circuit Intermittent

P0719....Torque Converter/Brake Switch B Circuit Low

P0720....Output Speed Sensor Circuit

P0721....Output Speed Sensor Circuit Range/Performance

P0722....Output Speed Sensor Circuit No Signal

P0723....Output Speed Sensor Circuit Intermittent

P0724....Torque Converter/Brake Switch B Circuit High

P0725....Engine Speed Input Circuit

P0726....Engine Speed Input Circuit Range/Performance

P0727....Engine Speed Input Circuit No Signal

P0728....Engine Speed Input Circuit Intermittent

P0730....Incorrect Gear Ratio

P0731....Gear 1 Incorrect Ratio

P0732....Gear 2 Incorrect Ratio

P0733....Gear 3 Incorrect Ratio

P0734....Gear 4 Incorrect Ratio

P0735....Gear 5 Incorrect Ratio

P0736....Reverse Incorrect Ratio

P0737....TCM Engine Speed Output Circuit

P0739....TCM Engine Speed Output Circuit Low

P0739....TCM Engine Speed Output Circuit High

P0740....Torque Converter Clutch Circuit

P0741....Torque Converter Clutch Circuit Performance or Stuck Off

P0742....Torque Converter Clutch Circuit Stuck On

P0743....Torque Converter Clutch Circuit Electrical

P0744....Torque Converter Clutch Circuit Intermittent

P0745....Pressure Control Solenoid 'A'

P0746....Pressure Control Solenoid 'A' Performance or Stuck Off

P0747....Pressure Control Solenoid 'A' Stuck On

P0748....Pressure Control Solenoid 'A' Electrical

P0749....Pressure Control Solenoid 'A' Intermittent

P0750....Shift Solenoid 'A'

P0751....Shift Solenoid 'A' Performance or Stuck Off

P0752....Shift Solenoid 'A' Stuck On

P0753....Shift Solenoid 'A' Electrical

P0754....Shift Solenoid 'A' Intermittent

P0765....Shift Solenoid 'B'

P0756....Shift Solenoid 'B' Performance or Stuck Off

P0757....Shift Solenoid 'B' Stuck On

P0758....Shift Solenoid 'B' Electrical

P0759....Shift Solenoid 'B' Intermittent

P0760....Shift Solenoid 'C'

P0761....Shift Solenoid 'C' Performance or Stuck Off

P0762....Shift Solenoid 'C' Stuck On

P0763....Shift Solenoid 'C' Electrical

P0764....Shift Solenoid 'C' Intermittent

P0765....Shift Solenoid 'C'

P0766....Shift Solenoid 'D' Performance or Stuck Off

P0767....Shift Solenoid 'D' Stuck On

P0768....Shift Solenoid 'D' Electrical

P0769....Shift Solenoid 'D' Intermittent

P0770....Shift Solenoid 'E'

P0771....Shift Solenoid 'E' Performance or Stuck Off

P0772....Shift Solenoid 'E' Stuck On

P0773....Shift Solenoid 'E' Electrical

P0774....Shift Solenoid 'E' Intermittent

P0775....Pressure Control Solenoid 'B'

P0776....Pressure Control Solenoid 'B' Performance or Stuck Off

P0777....Pressure Control Solenoid 'B' Stuck On

P0778....Pressure Control Solenoid 'B' Electrical

P0779....Pressure Control Solenoid 'B' Intermittent

P0780....Shift

P0781....1-2 Shift

P0782....2-3 Shift

P0783....3-4 Shift

P0784....4-5 Shift

P0785....Shift/Timing Solenoid

P0786....Shift/Timing Solenoid Range/Performance

P0787....Shift/Timing Solenoid Low

P0788....Shift/Timing Solenoid High

P0789....Shift/Timing Solenoid Intermittent

P0790....Normal/Performance Switch Circuit

P0791....Intermediate Shaft Speed Sensor Circuit

P0792....Intermediate Shaft Speed Sensor Circuit Range/Performance

P0793....Intermediate Shaft Speed Sensor Circuit No Signal

P0794....Intermediate Shaft Speed Sensor Circuit Intermittent

P0795....Pressure Control Solenoid 'C'

P0796....Pressure Control Solenoid 'C' Performance or Stuck off

P0797....Pressure Control Solenoid 'C' Stuck On

P0798....Pressure Control Solenoid 'C' Electrical

P0799....Pressure Control Solenoid 'C' Intermittent

P0801....Reverse Inhibit Control Circuit

P0803....1-4 Upshift (Skip Shift) Solenoid Control Circuit

P0804....1-4 Upshift (Skip Shift) Lamp Control Circuit

P0805....Clutch Position Sensor Circuit

P0806....Clutch Position Sensor Circuit Range/Performance

P0807....Clutch Position Sensor Circuit Low

P0808....Clutch Position Sensor Circuit High

P0809....Clutch Position Sensor Circuit Intermittent

P0810....Clutch Position Control Error

P0811....Excessive Clutch Slippage

P0812....Reverse Input Circuit

P0813....Reverse Output Circuit

P0814....Transmission Range Display Circuit

P0815....Upshift Switch Circuit

P0816....Downshift Switch Circuit

P0817....Starter Disable Circuit

P0818....Driveline Disconnect Switch Input Circuit

P0820....Gear Lever X-Y Position Sensor Circuit

P0821....Gear Lever X Position Circuit

P0822....Gear Lever Y Position Circuit

P0823....Gear Lever X Position Circuit Intermittent

P0824....Gear Lever Y Position Circuit Intermittent

P0825....Gear Lever Push-Pull Switch (Shift Anticipate)

P0830....Clutch Pedal Switch 'A' Circuit

P0831....Clutch Pedal Switch 'A' Circuit Low

P0832....Clutch Pedal Switch 'A' Circuit High

P0833....Clutch Pedal Switch 'B' Circuit

P0834....Clutch Pedal Switch 'B' Circuit Low

P0835....Clutch Pedal Switch 'B' Circuit High

P0836....Four Wheel Drive (4WD) Switch Circuit

P0837....Four Wheel Drive (4WD) Switch Circuit Range/Performance

P0838....Four Wheel Drive (4WD) Switch Circuit Low

P0839....Four Wheel Drive (4WD) Switch Circuit High

P0840....Transmission Fluid Pressure Sensor/Switch 'A' Circuit

P0841....Transmission Fluid Pressure Sensor/Switch 'A' Circuit Range/Performance

P0842....Transmission Fluid Pressure Sensor/Switch 'A' Circuit Low

P0843....Transmission Fluid Pressure Sensor/Switch 'A' Circuit High

P0844....Transmission Fluid Pressure Sensor/Switch 'A' Circuit Intermittent

P0845....Transmission Fluid Pressure Sensor/Switch 'B' Circuit

P0846....Transmission Fluid Pressure Sensor/Switch 'B' Circuit Range/Performance

P0847....Transmission Fluid Pressure Sensor/Switch 'B' Circuit Low

P0848....Transmission Fluid Pressure Sensor/Switch 'B' Circuit High

P0849....Transmission Fluid Pressure Sensor/Switch 'B' Circuit Intermittent

P0850....Park/Neutral Switch Input Circuit

P0851....Park/Neutral Switch Input Circuit Low

P0852....Park/Neutral Switch Input Circuit High

P0853....Drive Switch Input Circuit

P0854....Drive Switch Input C ircuit Low

P0855....Drive Switch Input Circuit High

P0856....Traction Control Input Signal

P0857....Traction Control Input Signal Range/Performance

P0858....Traction Control Input Signal Low

P0859....Traction Control Input Signal High

P0860....Gear Shift Module Communication Circuit

P0861....Gear Shift Module Communication Circuit Low

P0862....Gear Shift Module Communication Circuit High

P0863....TCM Communication Circuit

P0864....TCM Communication Circuit Range/Performance

P0865....TCM Communication Circuit Low

P0866....TCM Communication Circuit High

P0867....Transmission Fluid Pressure

P0868....Transmission Fluid Pressure Low

P0869....Transmission Fluid Pressure High

P0870....Transmission Fluid Pressure Sensor/Switch "C" circuit

P0871....Transmission Fluid Pressure Sensor/Switch "C" Circuit Range/Performance

P0872....Transmission Fluid Pressure Sensor/Switch "C" circuit Low

P0873....Transmission Fluid Pressure Sensor/Switch "C" circuit High

P0874....Transmission Fluid Pressure Sensor/Switch "C" circuit Intermittent

P0875....Transmission Fluid Pressure Sensor/Switch "D" circuit

P0876....Transmission Fluid Pressure Sensor/Switch "D" Circuit Range/Performance

P0877....Transmission Fluid Pressure Sensor/Switch "D" circuit Low

P0878....Transmission Fluid Pressure Sensor/Switch "D" circuit High

P0879....Transmission Fluid Pressure Sensor/Switch "D" circuit Intermittent

P0880....TCM Power Input Signal

P0881....TCM Power Input Signal Range/Performance

P0882....TCM Power Input Signal Low

P0883....TCM Power Input Signal High

P0884....TCM Power Input Signal Intermittent

P0885....TCM Power Relay Control Circuit/Open

P0886....TCM Power Relay Control Circuit Low

P0887....TCM Power Relay Control Circuit High

P0888....TCM Power Relay Sense Circuit

P0889....TCM Power Relay Sense Circuit Range/Performance

P0890....TCM Power Relay Sense Circuit Low

P0891....TCM Power Relay Sense Circuit High

P0892....TCM Power Relay Sense C ircuit Intermittent

P0893....Multiple Gears Engaged

P0894....Transmission Component Slipping

P0895....Shift Time Too Short

P0896....Shift Time Too Long

P0897....Transmission Fluid Deteriorated

P0898....Transmission Control System MIL Request Circuit Low

P0899....Transmission Control System MIL Request Circuit High

P0900....Clutch Actuator Circuit/Open

P0901....Clutch Actuator Circuit Range/Performance

P0902....Clutch Actuator Circuit Low

P0903....Clutch Actuator Circuit High

P0904....Gate Select Position Circuit

P0905....Gate Select Position Circuit Range/Performance

P0906....Gate Select Position Circuit Low

P0907....Gate Select Position Circuit High

P0908....Gate Select Position Circuit Intermittent

P0909....Gate Select Control Error

P0910....Gate Select Actuator Circuit/Open

P0911....Gate Select Actuator Circuit Range/Performance

P0912....Gate Select Actuator Circuit Low

P0913....Gate Select Actuator Circuit High

P0914....Gear Shift Position Circuit

P0915....Gear Shift Position Circuit Range/Performance

P0916....Gear Shift Position Circuit Low

P0917....Gear Shift Position Circuit High

P0918....Gear Shift Position Circuit Intermittent

P0919....Gear Shift Position Control Error

P0920....Gear Shift Forward Actuator Circuit/Open

P0921....Gear Shift Forward Actuator Circuit Range/Performance

P0922....Gear Shift Forward Actuator Circuit Low

P0923....Gear Shift Forward Actuator Circuit High

P0924....Gear Shift Reverse Actuator Circuit/Open

P0925....Gear Shift Reverse Actuator Circuit Range/Performance

P0926....Gear Shift Reverse Actuator Circuit Low

P0927....Gear Shift Reverse Actuator Circuit High

P0928....Gear Shift Lock Solenoid Control Circuit/Open

P0929....Gear Shift Lock Solenoid Control Circuit Range/Performance

P0930....Gear Shift Lock Solenoid Control Circuit Low

P0931....Gear Shift Lock Solenoid Control Circuit High

P0932....Hydraulic Pressure Sensor Circuit

P0933....Hydraulic Pressure Sensor Range/Performance

P0934....Hydraulic Pressure Sensor Circuit Low

P0935....Hydraulic Pressure Sensor Circuit High

P0936....Hydraulic Pressure Sensor Circuit Intermittent

P0937....Hydraulic Oil Temperature Sensor Circuit

P0938....Hydraulic Oil Temperature Sensor Range/Performance

P0939....Hydraulic Oil Temperature Sensor Circuit Low

P0940....Hydraulic Oil Temperature Sensor Circuit High

P0941....Hydraulic Oil Temperature Sensor Circuit Intermittent

P0942....Hydraulic Pressure Unit

P0943....Hydraulic Pressure Unit Cycling Period Too Short

P0944....Hydraulic Pressure Unit Loss of Pressure

P0945....Hydraulic Pump Relay C ircuit/Open

P0946....Hydraulic Pump Relay C ircuit Range/Performance

P0947....Hydraulic Pump Relay C ircuit Low

P0948....Hydraulic Pump Relay C ircuit High

P0949....Auto Shift Manual Adaptive Learning Not Complete

P0950....Auto Shift Manual Control Circuit

P0951....Auto Shift Manual Control Circuit Range/Performance

P0952....Auto Shift Manual Control Circuit Low

P0953....Auto Shift Manual Control Circuit High

P0954....Auto Shift Manual Control Circuit Intermittent

P0955....Auto Shift Manual Mode Circuit

P0956....Auto Shift Manual Mode Circuit Range/Performance

P0957....Auto Shift Manual Mode Circuit Low

P0958....Auto Shift Manual Mode Circuit High

P0959....Auto Shift Manual Mode Circuit Intermittent

P0960....Pressure Control Solenoid "A" Control Circuit/Open

P0961....Pressure Control Solenoid "A" Control Circuit Range/Performance

P0962....Pressure Control Solenoid "A" Control Circuit Low

P0963....Pressure Control Solenoid "A" Control Circuit High

P0964....Pressure Control Solenoid "B" Control Circuit/Open

P0965....Pressure Control Solenoid "B" Control Circuit Range/Performance

P0966....Pressure Control Solenoid "B" Control Circuit Low

P0967....Pressure Control Solenoid "B" Control Circuit High

P0968....Pressure Control Solenoid "C" Control Circuit/Open

P0969....Pressure Control Solenoid "C" Control Circuit Range/Performance

P0970....Pressure Control Solenoid "C" Control Circuit Low

P0971....Pressure Control Solenoid "C" Control Circuit High

P0972....Shift Solenoid "A" Control Circuit Range/Performance

P0973....Shift Solenoid "A" Control Circuit Low

P0974....Shift Solenoid "A" Control Circuit High

P0975....Shift Solenoid "B" Control Circuit Range/Performance

P0976....Shift Solenoid "B" Control Circuit Low

P0977....Shift Solenoid "B" Control Circuit High

P0978....Shift Solenoid "C" Control Circuit Range/Performance

P0979....Shift Solenoid "C" Control Circuit Low

P0980....Shift Solenoid "C" Control Circuit High

P0981....Shift Solenoid "D" Control Circuit Range/Performance

P0982....Shift Solenoid "D" Control Circuit Low

P0983....Shift Solenoid "D" Control Circuit High

P0984....Shift Solenoid "E" Control Circuit Range/Performance

P0985....Shift Solenoid "E" Control Circuit Low

P0986....Shift Solenoid "E" Control Circuit High

P0987....Transmission Fluid Pressure Sensor/Switch "E" Circuit

P0988....Transmission Fluid Pressure Sensor/Switch "E" Circuit Range/Performance

P0989....Transmission Fluid Pressure Sensor/Switch "E" Circuit Low

P0990....Transmission Fluid Pressure Sensor/Switch "E" Circuit High

P0991....Transmission Fluid Pressure Sensor/Switch "E" Circuit Intermittent

P0992....Transmission Fluid Pressure Sensor/Switch "F" Circuit

P0993....Transmission Fluid Pressure Sensor/Switch "F" Circuit Range/Performance

P0994....Transmission Fluid Pressure Sensor/Switch "F" Circuit Low

P0995....Transmission Fluid Pressure Sensor/Switch "F" Circuit High

P0996....Transmission Fluid Pressure Sensor/Switch "F" Circuit Intermittent

P0997....Shift Solenoid "F" Control Circuit Range/Performance

P0998....Shift Solenoid "F" Control Circuit Low

GM CODES

GM Code List P1000-P1299

NOTE: *For some code numbers, there may be more than one definition because the same number may be used for different faults on different model years or models.*

P1031....O2 Sensor heater control circuit problem

P1105....Secondary Vacuum Sensor circuit

P1106....MAP sensor circuit voltage intermittent high or low

P1107....MAP sensor voltage intermittent low

P1108....BARO to MAP sensor circuit comparison too high

P1109....Secondary port throttle system

P1111....Intake Air Temperature Sensor circuit intermittent high voltage

P1112....Intake Air Temperature Sensor circuit intermittent low voltage

P1113....Intake Resonance Switchover Valve Control

P1114....Engine Coolant Temperature intermittent high or low

P1115....Engine Coolant Temperature intermittent high or low

P1116....Engine Coolant Temperature erratic

P1117....Engine coolant temperature below minimum voltage/254 F

P1118....Engine coolant temperature above maximum voltage/-40 F

P1119....Engine coolant temperature out of range

P1120....Throttle position sensor 1 circuit

P1121....Ignition control module 4X circuit, or TPS out of range

P1122....Ignition control module 4X circuit, or TPS out of range

P1125....Average Pump Period system, or pedal position system

P1133....A/C pressure sensor high voltage, or O2 sensor bank 1 sensor 1 sluggish

P1134.... 5 volt reference 2 voltage low, or O2 sensor bank 1 sensor 1

P1135....O2 Sensor 1 bank 1 reading lean, or 4/5 shift solenoid stuck on

P1136....5 volt reference 2 circuit, or O2 sensor bank 1 sensor 1 rich

P1137....O2 Sensor low voltage during power enrichment

P1138....O2 Sensor high voltage during decel fuel cutoff

P1139....Brake booster vacuum sensor (low vacuum)

P1139. . O2 Sensor insufficient switching (Bank 1 Sensor 2)

P1140....O2 Sensor Sluggish (Bank 1 Sensor 2)

P1141....O2 Sensor Heater Control circuit (Bank 1 Sensor 2)

P1143....O2 Sensor reading lean or low voltage (Bank 1 Sensor 3)

P1144....O2 Sensor reading rich or high voltage (Bank 1 Sensor 3)

P1145....O2 Sensor sluggish (slow crosscounts) (Bank 1 Sensor 3)

P1153....A/C pressure sensor low voltage

P1153…. . O2 Sensor low switching (Bank 2 Sensor 1)

P1154....O2 Sensor low transition time (Bank 2 Sensor 1)

P1155....A/C evap temperature switch high voltage

P1155. . O2 Sensor reading lean (Bank 2 Sensor 1)

P1156....A/C high pressure switch high voltage

P1156. . O2 Sensor reading rich (Bank 2 Sensor 1)

P1157....O2 Sensor rich or high voltage (Bank 2 Sensor 2)

P1158....O2 Sensor rich or high voltage (Bank 2 Sensor 2)

P1158. . .Engine overtemperature protection fault

P1159....O2 Sensor crosscounts (Bank 2 Sensor 2)

P1161....O2 Sensor heater control circuit (Bank 2 Sensor 2)

P1163....O2 Sensor reading lean or low voltage (Bank 2 Sensor 3)

P1164....O2 Sensor reading rich or high voltage (Bank 2 Sensor 3)

P1165....O2 Sensor crosscounts (Bank 2 Sensor 3)

P1170....Bank to bank fuel trim offset

P1171....Fuel system lean during acceleration

P1185....Engine Temperature Sensor circuit

P1186....Engine Oil Temperature circuit performance

P1187....Engine Oil Pressure Sensor circuit low voltage,

P1188....Engine Oil Pressure Sensor circuit voltage high

P1189....Engine Oil Pressure Switch circuit

P1190....Vacuum leak

P1191....Intake air duct leak

P1200....Injector control circuit

P1211....Mass Airflow circuit intermittent high

P1212....Mass Airflow circuit intermittent low

P1214....Injection Pump Timing Offset

P1215....Ground fault detection indicated (generator driver circuit)

P1216....Fuel Solenoid response time too short

P1217....Fuel Solenoid response time too long

P1218....Injection Pump calibration circuit

P1219....Throttle Position Sensor reference voltage

P1220....Throttle Position Sensor circuit fault

P1221....Fuel pump second circuit low

P1121. . Throttle position sensor circuit performance

P1222....Injector circuit cylinder 1 intermittent

P1225....Injector circuit cylinder 2 intermittent

P1228....Injector circuit cylinder 3 intermittent

P1231....Injector circuit cylinder 4 intermittent

P1234....Injector circuit cylinder 5 intermittent

P1237....Injector circuit cylinder 6 intermittent

P1240....Injector circuit cylinder 7 intermittent

P1243....Injector circuit cylinder 8 intermittent

P1250....Early fuel evaporation heater circuit

P1257....Boost Control fault, or supercharger overboost

P1258....Engine overtemperature protection, or low coolant fuel disable

P1260....Fuel Pump Speed Relay control circuit, or last test failed speed control circuit

P1271....Accelerator Pedal Position Sensor 1-2 correlation

P1272....Accelerator Pedal Postion Sensor 2-3 correlation

P1273....Accelerator Pedal Position Sensor 1-3 correlation

P1274....Injection wiring incorrect

P1275....Acceleration position sensor 2 circuit, or boost control

P1276....Accelerator Pedal Positioning Sensor 1 circuit

P1280....Accelerator Pedal Positioning Sensor 2 circuit

P1281....Accelerator Pedal Positioning Sensor 2 circuit out of range

P1285....Accelerator Pedal Positioning Sensor 2 circuit

P1286....Accelerator Pedal Positioning Sensor 2 circuit out of range

GM Code List P1300-P1499

NOTE: *For some code numbers, there may be more than one definition because the same number may be used for different faults on different model years or models.*

P1300....Ignition coil 1 primary feedback circuit

P1305....Ignition Coil 2 primary feedback circuit

P1310....Ignition Coil 3 primary feedback circuit

P1315....Ignition Coil 4 primary feedback circuit

P1320....Distributorless ignition 4X signal intermittent

P1321....Electronic ignition system fault

P1322....Electronic ignition system control missing

P1323....Loss of high resolution rpm signal

P1324....Crank rpm too low

P1335....Crankshaft positioning sensing circuit

P1336....Crankshaft position system variation not learned

P1345....Camshaft to crankshaft position correlation fault

P1346....Crankshaft sensor system variation not learned, or intake camshaft position out of range

P1349....Intake Camshaft position system

P1350....Ignition control system

P1351....Ignition controlcircuit voltage high

P1351....Ignition control circuit open

P1352....Bypass circuit open or voltage high

P1353....Ignition control output high/pulse detected when ground cylinder #3

P1354....Ignition control output high/pulse detected when ground cylinder #4

P1355....Ignition control output high/pulse detected when ground cylinder #5

P1356....Ignition control output high/pulse detected when ground cylinder #6

P1357....Ignition control output high/pulse detected when ground cylinder #7

P1358....Ignition control output high/pulse detected when ground cylinder #8

P1359....Ignition Coil group 1 control circuit

P1360....Ignitiion Coil group 2 control circuit

P1361....Ignition control cylinder #1 not toggling after enable,or low voltage

P1362....Ignition control cylinder #2 not toggling after enable,or low voltage, or bypass circuit shorted or low voltage

P1363....Ignition control cylinder #3 not toggling after enable,or low voltage

P1364....Ignition control cylinder #4 not toggling after enable,or low voltage

P1365....Ignition control cylinder #5 not toggling after enable,or low voltage

P1366....Ignition control cylinder #6 not toggling after enable,or low voltage

P1367....Ignition control cylinder #7 not toggling after enable,or low voltage

P1368....Ignition control cylinder #8 not toggling after enable, or low voltage

P1370....Too many ignition reference pulses

P1371....Too few ignition reference pulses

P1372....Crankshaft Position Sensor A-B correlation

P1374....Crankshaft position sensor, 3X Reference circuit

P1375....24X Reference circuit voltage too high

P1376....Reference voltage low, or ignition ground circuit

P1377....Ignition control module CAM pulse to 4X reference pulse comparison

P1380....ABS rough road/misfire diagnosis prevented

P1381....Misfire detected, no EBCM/PCM serial data

P1401....Exhaust Gas Recirculation flow test fault

P1403....Exhaust Gas Recirculation Solenoid 1 error

P1404....Exhaust Gas Recirculation Solenoid 2 error

P1405....Exhaust Gas Rrecirculation Solenoid 3 error

P1406....Exhaust Gas Recirculation pintle position error

P1407....EGR valve air leak

P1408....EGR valve vacuum failure

P1409....EGR valve vacuum leak

P1410....EGR valve vacuum restriction, or fuel tank pressure system

P1415....AIR system Bank 1

P1416....AIR system Bank 2

P1431....Fuel Level Sensor 2 circuit

P1432....Fuel Level Sensor 2 circuit low voltage

P1433....Fuel Level Sensor 2 circuit voltage high

P1441....EVAP Canister continuous open purge flow,or high voltage during non-purge

P1442....EVAP monitor circuit/vacuum switch high voltage

P1450....Barometric Pressure Sensor (BARO) circuit

P1451....Barometric Pressure Sensor performance

P1460....Cooling Fan control system, or misfire detected (Catera only)

P1483....Engine cooling system performance

GM Code List P1500-P1699

NOTE: *For some code numbers, there may be more than one definition because the same number may be used for different faults on different model years or models.*

P1500....Starter signal circuit

P1501....Vehicle speed sensor circuit intermittent, or Theft deterrent system

P1502....Theft deterrent system no password received

P1503....Theft deterrent system password improper

P1508....Idle Air Control system -- idle too low

P1509....Idle Air Control system -- idle too high

P1510....Backup power supply

P1511....Throttle Control System - backup system performance

P1514....Airflow to throttle position sensor too high

P1515....Electronic throttle module throttle position

P1516....Electronic throttle module throttle postion

P1517....Electronic throttle module, or TAC module fault

P1518....No communication between electronic throttle module and PCM

P1519....Throttle Actuator Control Module

P1520....Park/Neutral Switch circuit, gear indicator system

P1523....Electronic throttle control throttle return

P1524....Throttle Position Sensor out of range or misadjusted

P1525....Throttle Body Service required

P1526....Throttle position learn process not complete

P1527....Transmission range/pressure switch comparison

P1528....Governor control system

P1530....Ignition timing adjustment switch circuit, or A/C Refrigerant Pressure Sensor error

P1531....A/C low refrigerant

P1532....Engine coolant temperature sensor intermittent, or A/C Evaporator Temperature circuit low voltage

P1533....A/C Low Side Temperature Sensor circuit

P1535....A/C High Side Temperature Sensor circuit

P1536....A/C system ECT overtemperature

P1537....A/C request circuit voltage low

P1538....A/C request circuit voltage high

P1539....A/C High Pressure Switch circuit voltage high

P1540....A/C system high pressure

P1542....A/C system high pressure or high temperature

P1543...A/C system performance out of range

P1545....A/C Clutch Relay Control circuit

P1546....A/C Clutch Relay control circuit voltage low

P1550....Cruise control, motor actuator circuit

P1554....Speed Control status circuit

P1555....Elecrtric Variable Orifice fault (Saturn)

P1558....Speed Control (SPS low)

P1560....Speed Control System/Transaxle not in Drive

P1561....Speed Control Vent Solenoid

P1562....Speed Control Vacuum Solenoid

P1564....ECM battery voltage loss (Catera only), or speed control system/vehicle acceleration too high

P1565....Speed Control Servo Position Sensor

P1566....Speed Control System/Engine RPM too high

P1567....Speed Control Master Switch

P1568....Speed Control (SPS high)

P1570....Speed Control System/Traction Control active

P1571....Traction Control System desired torque circuit

P1572....Traction Control System active circuit voltage low too long

P1573....PCM/EBTCM serial data circuit communication malfunction

P1574....EBTCM system/stop lamp circuit voltage high

P1575....Stop lamp control circuit (97-98 Corvette only), or extended travel brake switch circuit voltage high

P1576....Brake Booster Vacuum Sensor circuit voltage high

P1577....Brake Booster Vacuum Sensor circuit voltage low

P1578....Brake Booster Vacuum Sensor circuit low vacuum

P1579....Park/Neutral to Drive/Reverse at high throttle angle

P1580....Cruise Control Module move circuit, low voltage

P1581....Cruise Control Module move circuit, high voltage

P1582....Cruise Control Module direction circuit, low voltage

P1583....Cruise Control Module direction circuit, high voltage

P1584....Cruise control disabled

P1585....Cruise Control inhibit output circuit

P1586....Cruise Control Brake Switch 2 circuit

P1599....Engine stall detected

P1600....Powertrain control module battery, or loss of communication between PCM and TCM

P1601....ECM overtemperature

P1602....PCM to ABS module communication problem

P1603....Serial data communicatiion problem

P1604....IPC Serial data communication problem

P1605....Serial data communication problem with HVAC module

P1607....Engine Oil Level Switch circuit

P1610....Loss of PZM serial data, or failure of body function controller (1997 Cutlass & Malibu only)

P1611....Loss of CVRTD serial data

P1617....Engine Oil Level Switch circuit

P1619....Engine Oil Life Monitor reset circuit, or oil life error

P1620....Engine coolant low (Saturn)

P1621....Powertrain control module memory error, or VCM EEPROM performance (1998 5.7L only)

P1623....PCM Prom error, or Transaxle Temperature Sensor fault (Saturn)

P1624....Powertrain conrol module software reset, or customer snapshot data avaialable (Saturn)

P1625....Powertrain control module system reset, or TCM flash checksum fault (Saturn)

P1626....Anti-theft system fuel enable circuit (Passkey error)

P1627....A/D performance, or Powertrain Control Module fault

P1628....PCM Engine Control Temperature Pull-up Resistor, or Engine Coolant Temperature Sensor circuit resistor fault

P1629....Anti-theft devide cranking signal or Passkey cranking error

P1630....System voltage too high/too low, or ECM immobilizer learning mode (Cavalier & Monte Carlo only)

P1631....Oxygen sensor #1 slow response, or anti-theft password incorrect

P1632....Anti-theft fuel disable signal received

P1633....Ignition power circuit low voltage

P1634....Ignition power circuit low voltage

P1635....5 volt reference voltage to sensors low

P1636....Powertrain control module fault

P1637....Alternator warning lamp control signal "L" terminal problem

P1638....Alternator Field (F) terminal circuit

P1639....Powertrain Control Module 5 volt reference voltage low

P1640....Powertrain control module fault

P1641....EVAP fuel tank pressure sensor circuit voltage high, or fan 1 relay control circuit, or MIL light circuit, or A/C compressor clutch relay circuit

P1642....Fan control relay, or vehicle speed sensor output, or secondary air injection relay fault (96 Lumina/Monte 3.4L)

P1643....Powertrain control module fault

P1644....Throttle position sensor circuit, or traction control fault

P1645....Boost control solenoid circuit, or EVAP solenoid output circuit

P1646....Powertrain control module fault (quad driver 1)

P1647....Powertrain control module fault (quad driver 1)

P1650....Powertrain control module fault (quad driver 2)

P1651....Powertrain control module fault (quad driver 2), or cooling fan relay 1

P1652....Cooling fan relay 2, or suspension control module (Cadillac only)

P1653....Traction control circuit (Pontiac), or fuel gauge control circuit (Chevy except Caprice), or engine oil level warning lamp (Caprice & 99 Olds Silhouette only)

P1654....A/C relay circuit, or cruise control disable output circuit

P1655....Powertrain control module fault (quad driver 2), or EVAP canister purge valve

P1656....Powertrain control module fault (quad driver 2), or wastegate solenodi control circuit (turbo models only)

P1657....Powertrain control module fault (quad driver 2), or skip shift solenodi control circuit

P1660....Cooling fan circuit,or powertrain control module fault

P1661....EVAP fuel tank pressure sensor circuit, or Check Engine Light circuit, or PCM quad driver fault

P1662....PCM quad driver fault, or cruise control circuit

P1663....Alternator warning lamp circuit, or oil change warning lamp circuit

P1664....Powertrain control modeul fault (quad driver 3), or fuel cutoff solenoid

P1665....Powertrain control module fault (quad driver 3), or EVAP canister vent valve

P1667....Powertrain control module fault (quad driver 3), or reverse inhibit solenoid control circuit

P1670....Powertrain control module fault (quad driver 4)

P1671....Malfunction Indicator Lamp (MIL) circuit fault

P1672....Powertrain control module fault (quad driver 4), or low engine oil level lamp control circuit

P1673....Powertrain control module fault (quad driver 4), or engine hot lamp control circuit

P1674....Powertrain control module fault (quad driver 4), or tachometer control circuit

P1675....EVAP vent solenoid controlcircuit

P1676....Powertrain control module fault (quad driver 4), or EVAP canister vent valve

P1677....Powertrain control module fault (quad driver 4)

P1680....Powertrain control module fault

P1681....Powertrain control module fault

P1682....Powertrain control module fault

P1683....Powertrain control module fault

P1684....Powertrain control module fault

P1685....Powertrain control module fault

P1686....Powertrain control module fault

P1687....Powertrain control module fault

P1689....Traction Control System delivered torque control circuit

P1690....Powertrain control module loop overrun

P1691....Coolant gauge circuit voltage low

P1692....Coolant gauge circuit voltage high

P1693....Tachometer circuit voltage low

P1694....Tachometer circuit voltage high

P1695....Remote keyless entry circuit

P1696....Remote keyless entry circuit

GM Code List P1700-P1899

NOTE: *For some code numbers, there may be more than one definition because the same number may be used for different faults on different model years or models.*

P1700....Malfunction Indicator Lamp requested by trans control module

P1701....Malfunction Indicator Lamp request circuit

P1740....Torque control/management request circuit

P1760....Transmission Control Module supply voltage interrupted

P1780....Park/Neutral Position Switch circuit

P1781....Engine torque signal circuit

P1792....ECM to Transmission Control Module engine coolant signal

P1800....ECM to Transmission Control Module engine coolant signal

P1810....ATF pressure manual valve powition switch malfunction

P1811....Long shift and maximum adaptation limit reached

P1812....TOT condition

P1814....Torque converter clutch (TCC) overstress

P1819....Transmission range switch out of range, possible no start

P1820....Transmission range switch A voltage low

P1822....Transmission range switch B voltage high

P1823....Transmission range switch P voltage low

P1825....Transmission range switch A, B, C & P signals invalid

P1826....Transmission range switch C voltage high

P1835....Kickdown Switch circuit

P1842....1-2 Shift Solenoid circuit low input

P1843....1-2 Shift Solenoid circuit high input

P1845....2-3 Shift Solenoid circuit low input

P1847....2-3Shift Solenoid circuit high input

P1850....Brake Band Aply Solenoid

P1860....Torque Converter Clutch (TCC) PWM Solenoid circuit

P1864....TCC Enable Solenoid circuit

P1868....Transmission Fluid life

P1870....Transmission component slipping

P1873....Oxygen sensor bank 2 sensor 2 crosscounts

P1874....Oxygen sensor bank 1 sensor 3 crosscounts

P1875....4WD Low Switch circuit electrical

P1886....Transaxle Shift, Timing Solenoid performance

P1887....TCC Release Switch malfunction

P1890....Throttle Position signal input

P1891....Throttle position sensor circuit signal low

P1892....Throttle position sensor circuit signal high

P1895....Engine torque delivered circuit

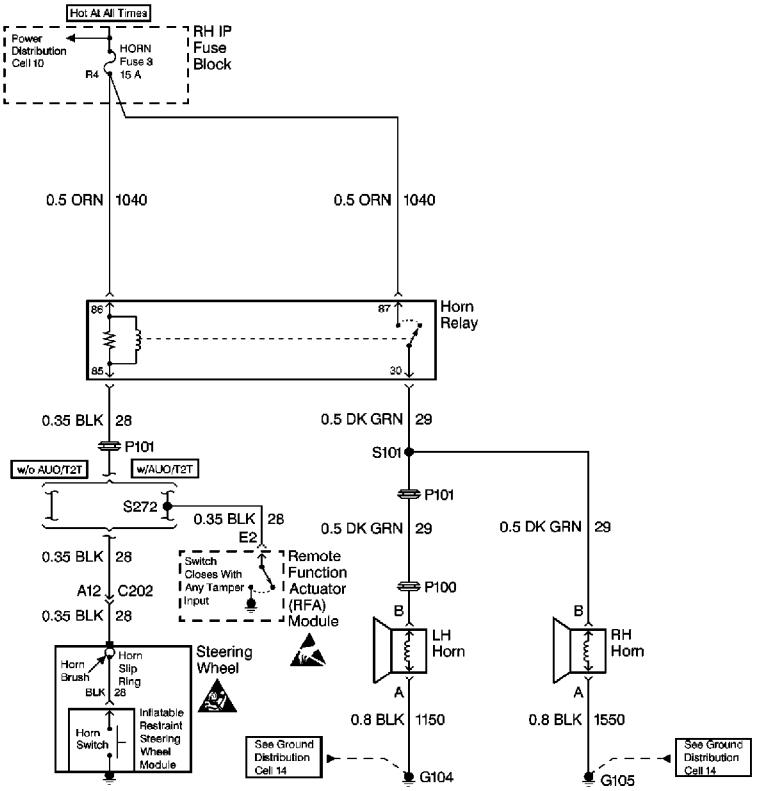
Fastener Tightening Specifications

Application	Specification	
	Metric	English
Backup Lamp to Rear Compartment Lid	9 N·m	80 lb in
Daytime Running Lamp Resistor to Body	7 N·m	62 lb in
Headlamp Bracket to Body	9 N·m	80 lb in
Horns to Body	15 N·m	11 lb ft
Taillamp to Quarter	9 N·m	80 lb in

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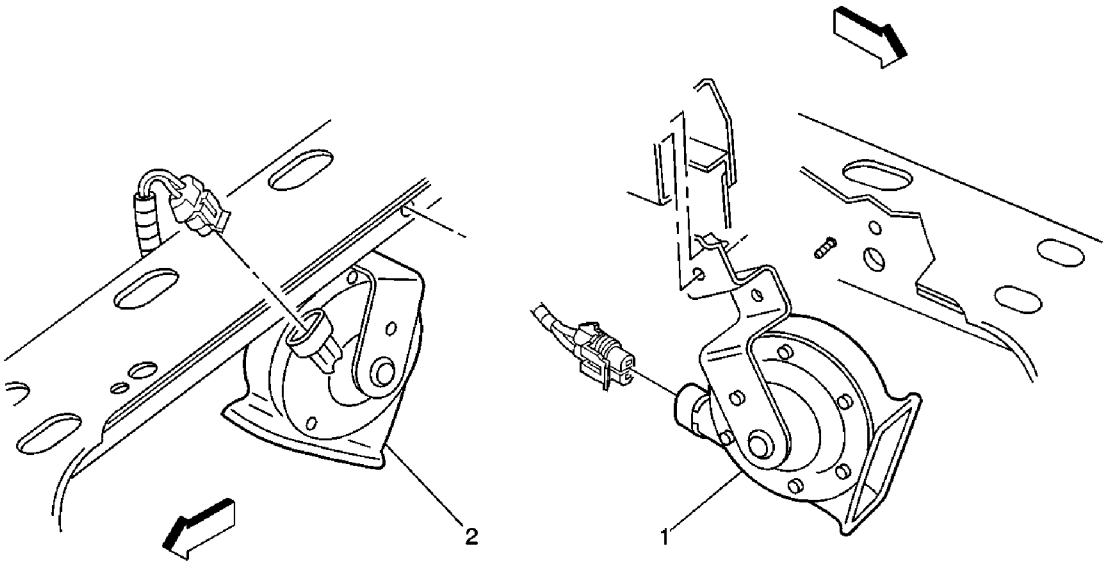
Horn Schematics

Cell 40: Horns



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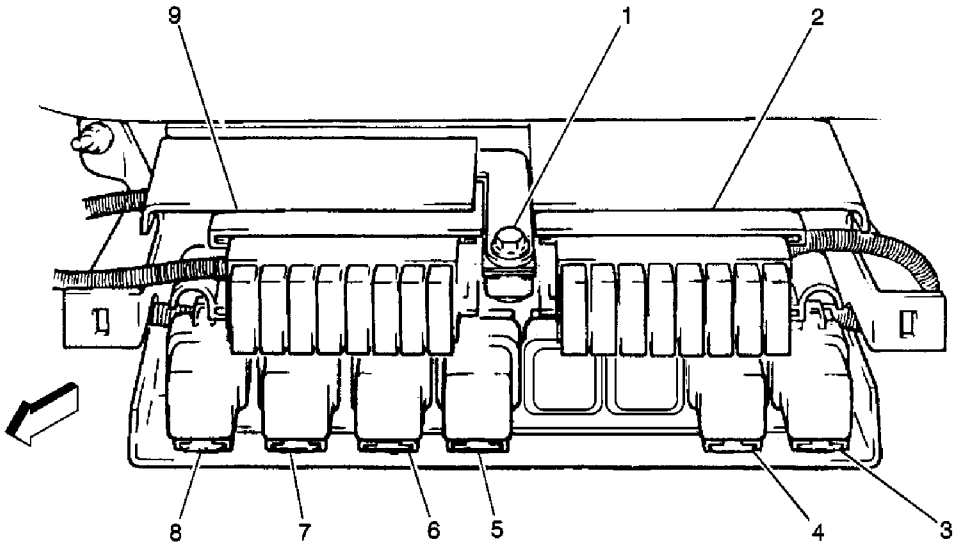
Front of the Engine Compartment



(1) LH Horn F Note
(2) RH Horn A Note

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Rear of the Engine Compartment



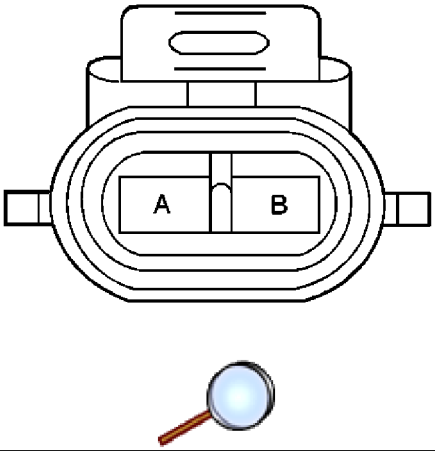
(1) Battery Positive Cable Connection
(2) LH Underhood Fuse Block
(3) Low Speed Engine Cooling Fan Relay
(4) High Speed Engine Cooling Fan Relay
(5) High Blower Relay
(6) Blower Motor Relay
(7) Horn Relay
(8) A/C Clutch Relay
(9) RH Underhood Fuse Block

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Horn Connector End Views

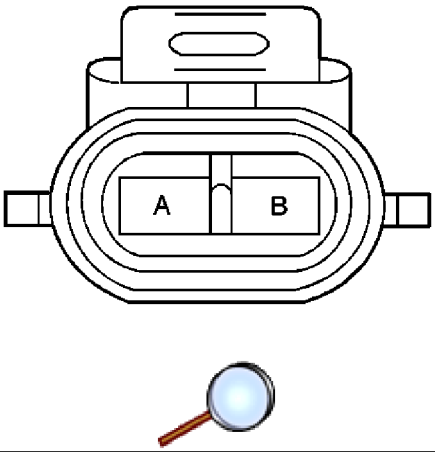
Table 1: LH Horn
Table 2: RH Horn

LH Horn



Connector Part Information	• 12052638 • 2 Way F Metri-Pak 150 Series (LT GRA)		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	BLK	1150	Ground
B	DK GRN	29	Horn Feed

RH Horn



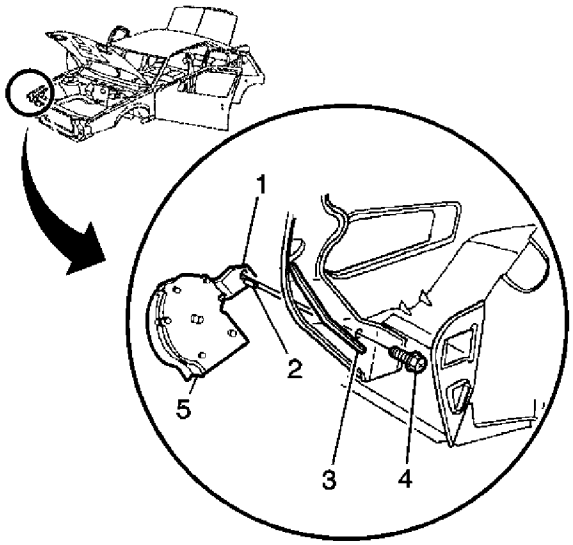
Connector Part Information	• 12052638 • 2-Way F Metri-Pack 150 Series (LT GRA)		
Pin	**Wire Color**	**Circuit No.**	**Function**

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A	BLK	1550	Ground
B	DK GRN	29	Horn Feed

Horn Replacement (A Note)

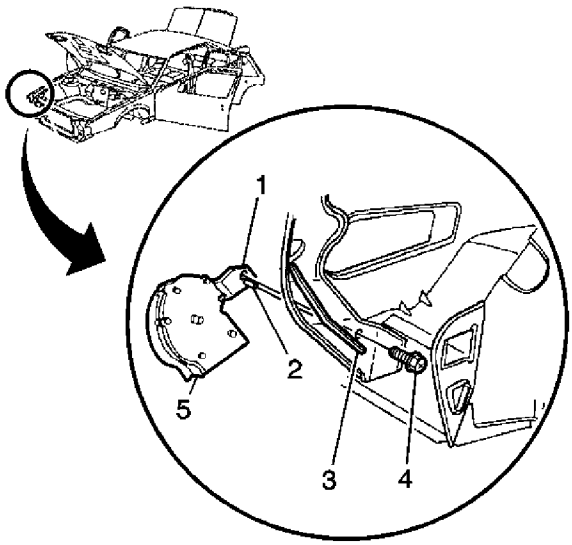
Removal Procedure



1. Remove the coolant recovery reservoir. Refer to Coolant Recovery Reservoir Replacement .
2. Remove the horn stud from the right front fender.
3. Remove the horn.
4. Disconnect the connector from the horn.

Installation Procedure

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1. Install the horn connector to the horn.
2. Install the horn to the front fender.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the horn stud to the front fender.

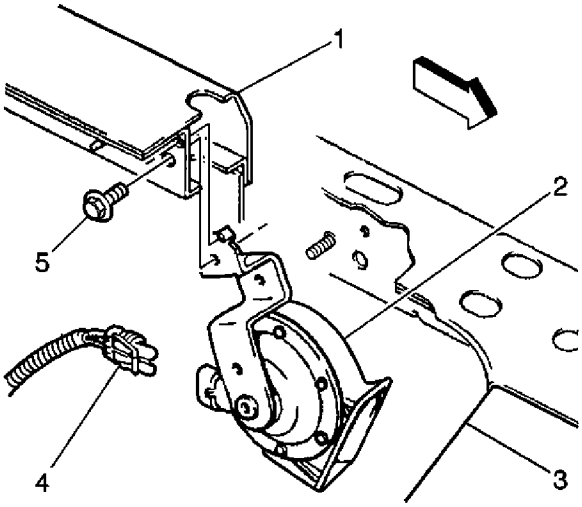
   Tighten
   Tighten the horn stud to 15 N·m (11 lb ft).

4. Install the coolant recovery container. Refer to Coolant Recovery Reservoir Replacement .

Horn Replacement (F Note)

Removal Procedure

1. Remove the air cleaner assembly.
2. Remove the PCM.

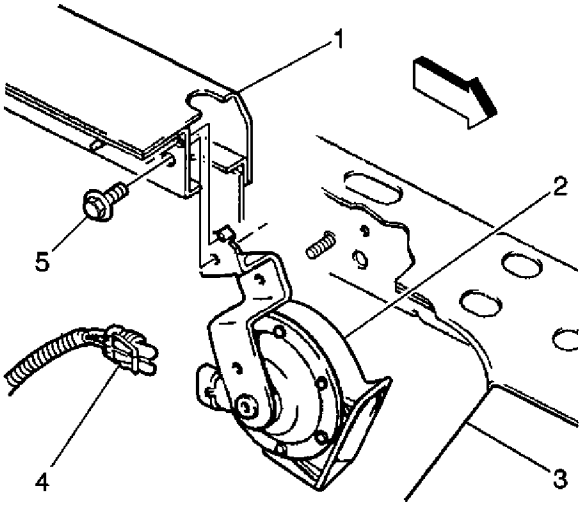




3. Remove the horn bolt from the left front fender.
4. Remove the horn.
5. Disconnect the connector from the horn.

Installation Procedure

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1. Connect the horn connector to the horn.
2. Install the horn to the front fender.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the horn bolt to the front fender.

Tighten
Tighten the horn bolt to 15 N·m (11 lb ft).

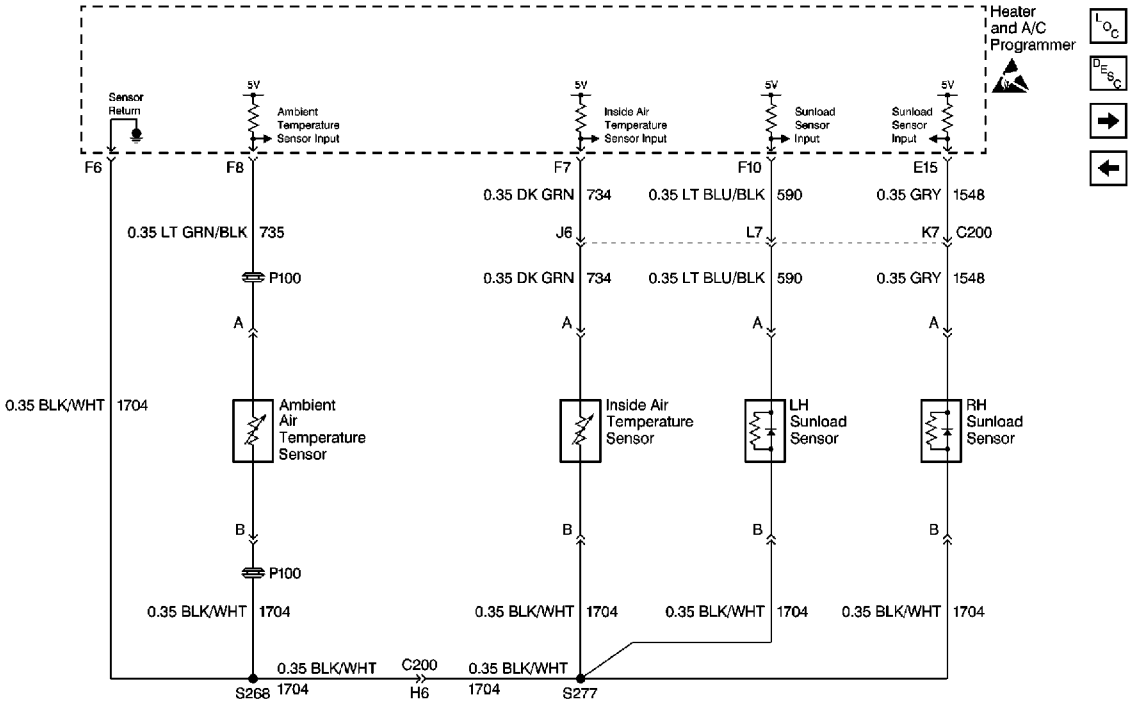
Fastener Tightening Specifications

Application	Specification	
	Metric	English
Accumulator Retaining Bolt	6 N·m	53 lb in
Air Inlet Retaining Screws	5 N·m	44 lb in
Air Mix Valve Actuator Screws	1.4 N·m	12 lb in
Ambient Air Temperature Sensor Bolt	12 N·m	106 lb in
A/C Compressor Hose Assembly Bolt	30 N·m	22 lb ft
A/C Module Cover Retaining Screws	3 N·m	27 lb in
Compressor Mounting Bracket Rear Bolt	50 N·m	37 lb ft
Compressor Mounting Bracket Side Bolts	100 N·m	74 lb ft
Condenser Mounting Brackets	12 N·m	106 lb in
Front Compressor Mounting Nuts	50 N·m	37 lb ft
Heater and A/C Programmer Screws	1.4 N·m	12 lb in
Heater Core Cover Screws	1.4 N·m	12 lb in
Inside Air Temperature Sensor Screws	1.4 N·m	12 lb in
Rear Compressor Mounting Bolt	50 N·m	37 lb ft
Service Fitting	12 N·m	9 lb in
Tighten All Dual O-ring Fittings	24 N·m	18 lb ft

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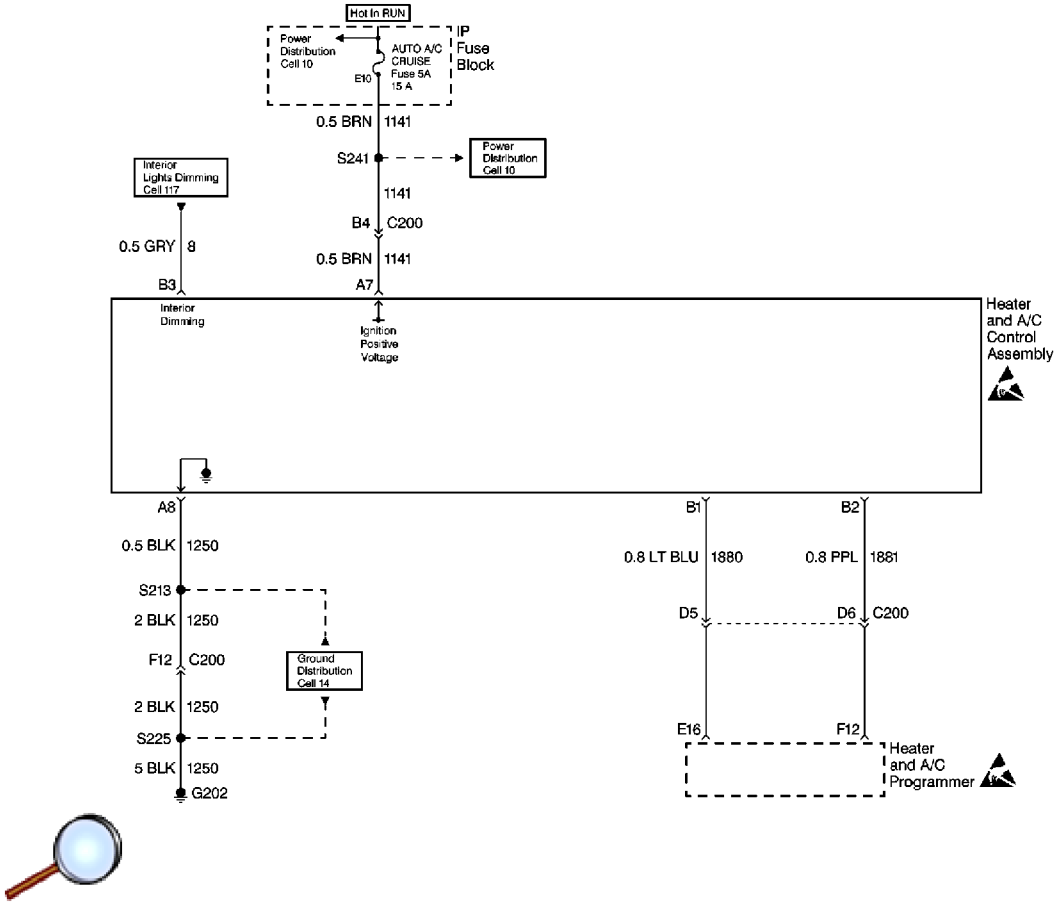
Cell 68: Heater and A/C Programmer -- Buick



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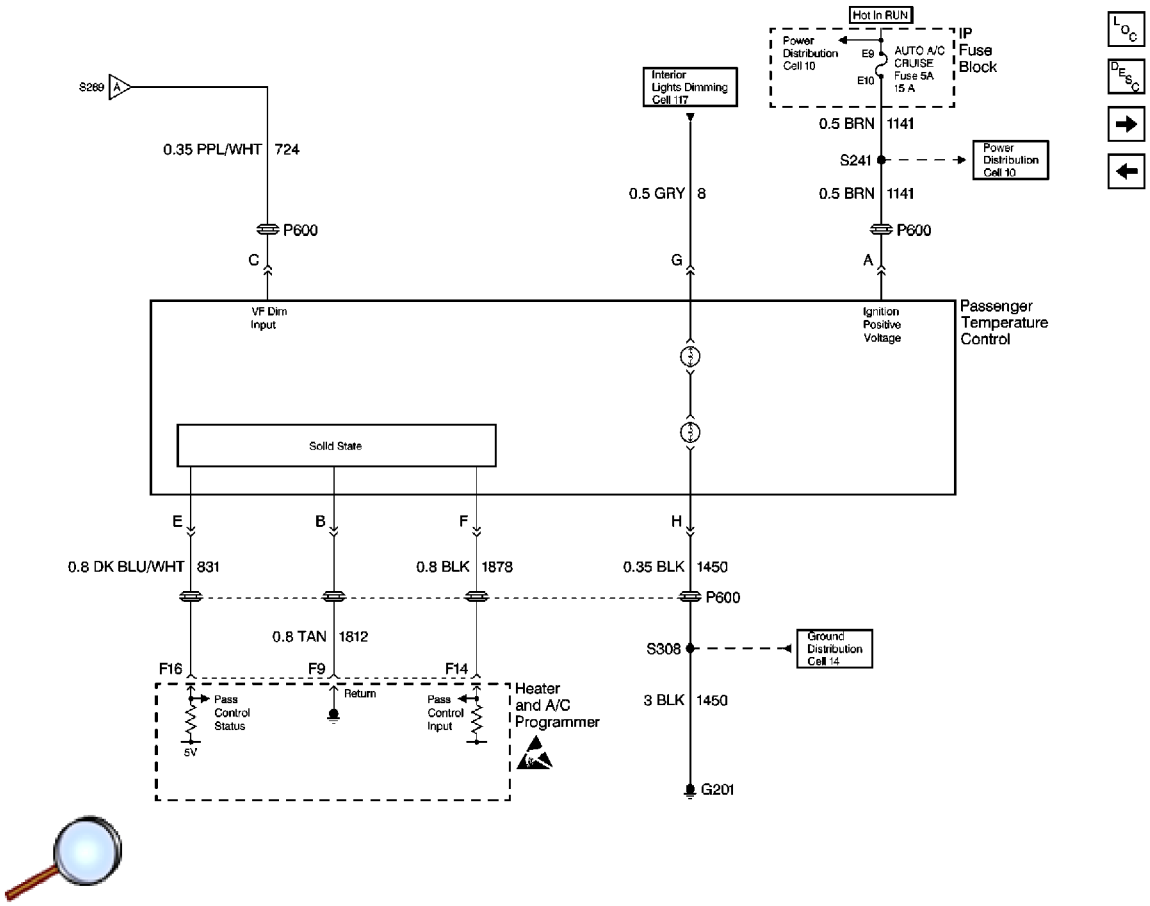
Cell 68: IP Fuse Block, Heater and A/C Control Assembly -- Buick



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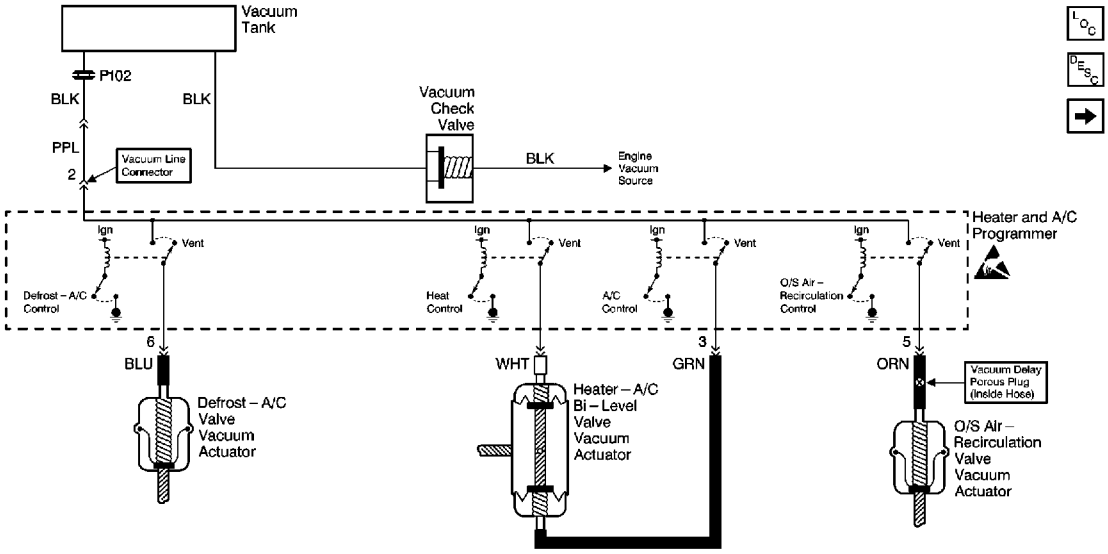
Cell 68: Passenger Temperature Control -- Buick



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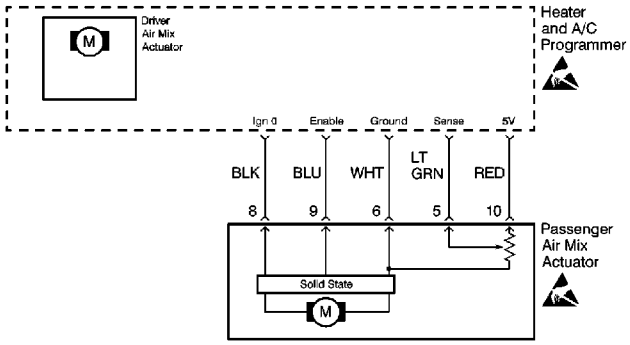
Cell 68: Vacuum Tank -- Oldsmobile, Buick



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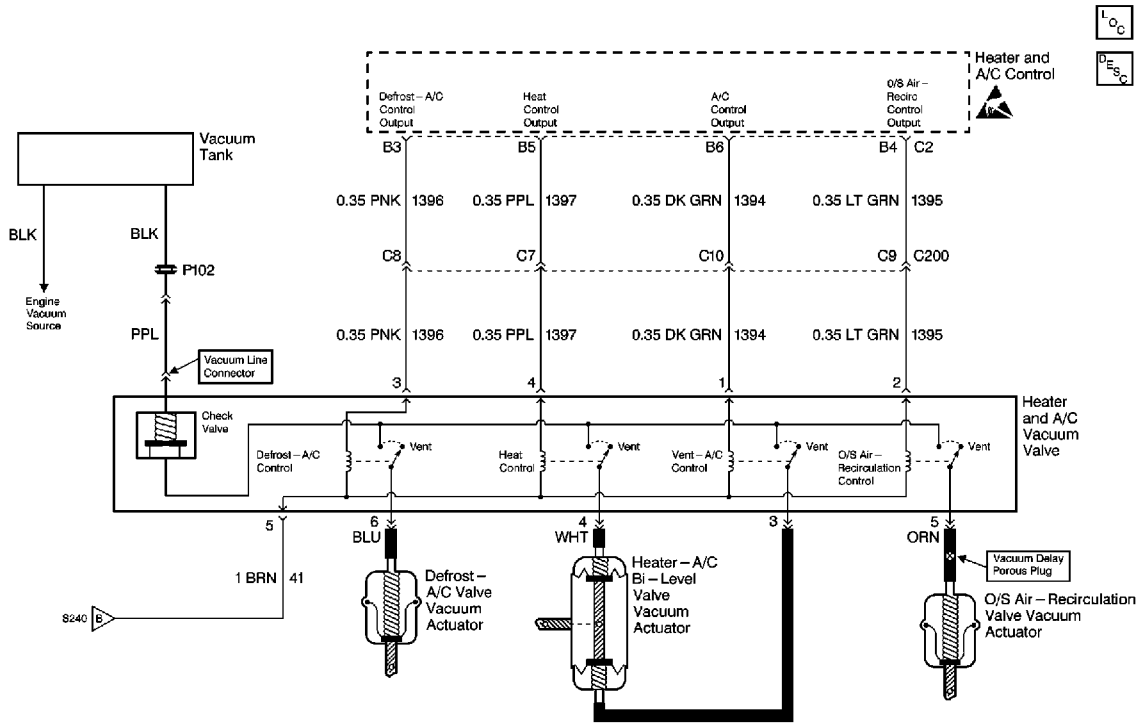
Cell 68: Passenger Air Mix Actuator -- Oldsmobile, Buick



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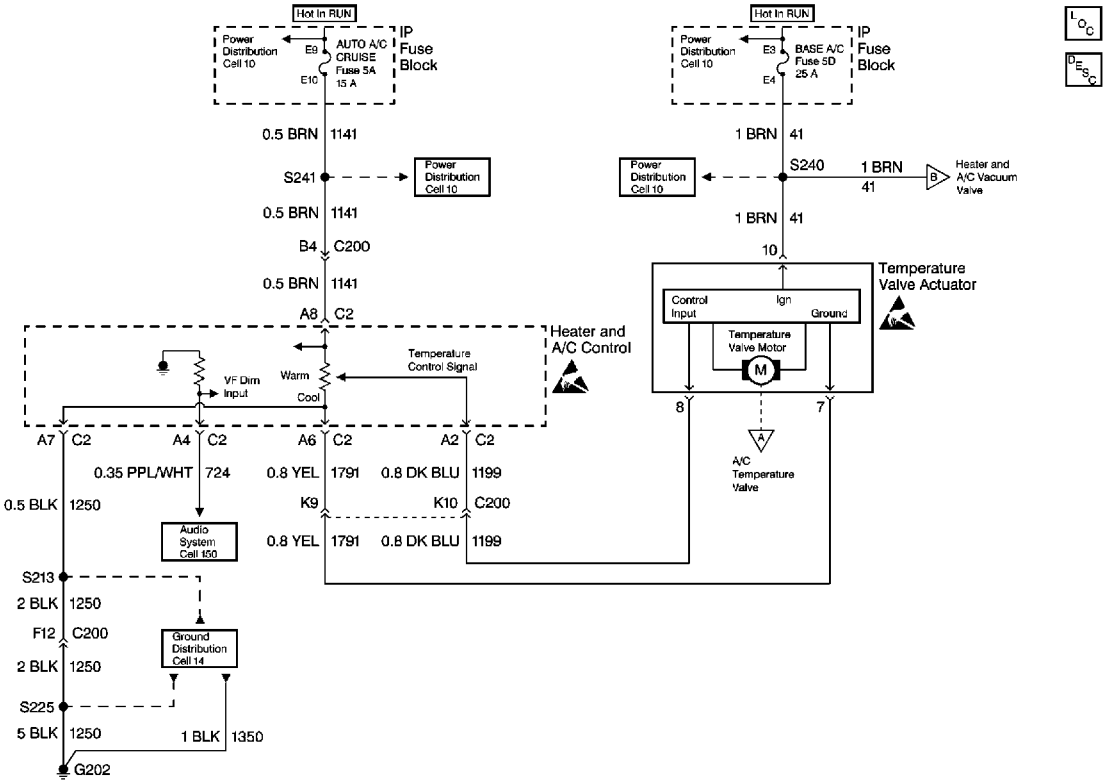
HVAC Air Delivery Schematics (Cell 65: A/C Mode Selector -- Buick)



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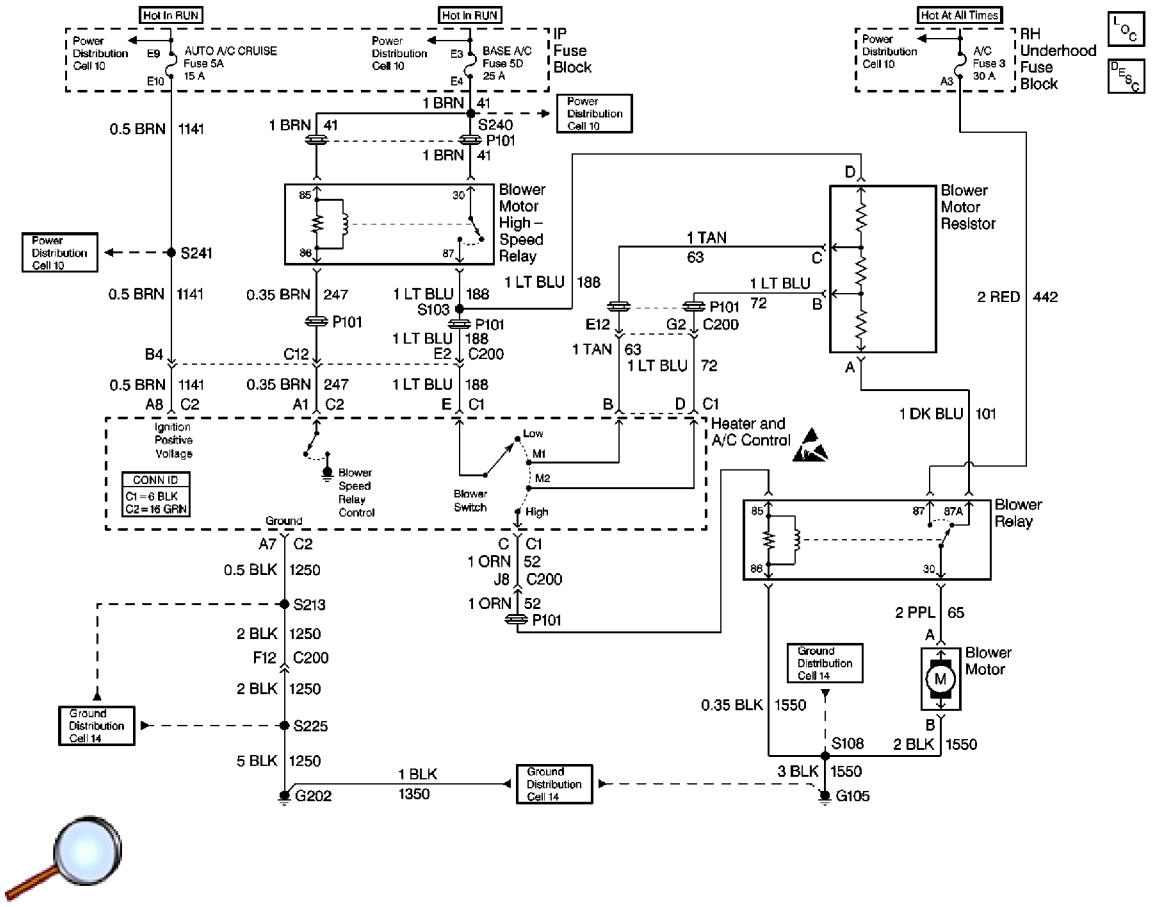
Cell 65: Fuse Box, Actuator -- Buick



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Cell 63: Buick

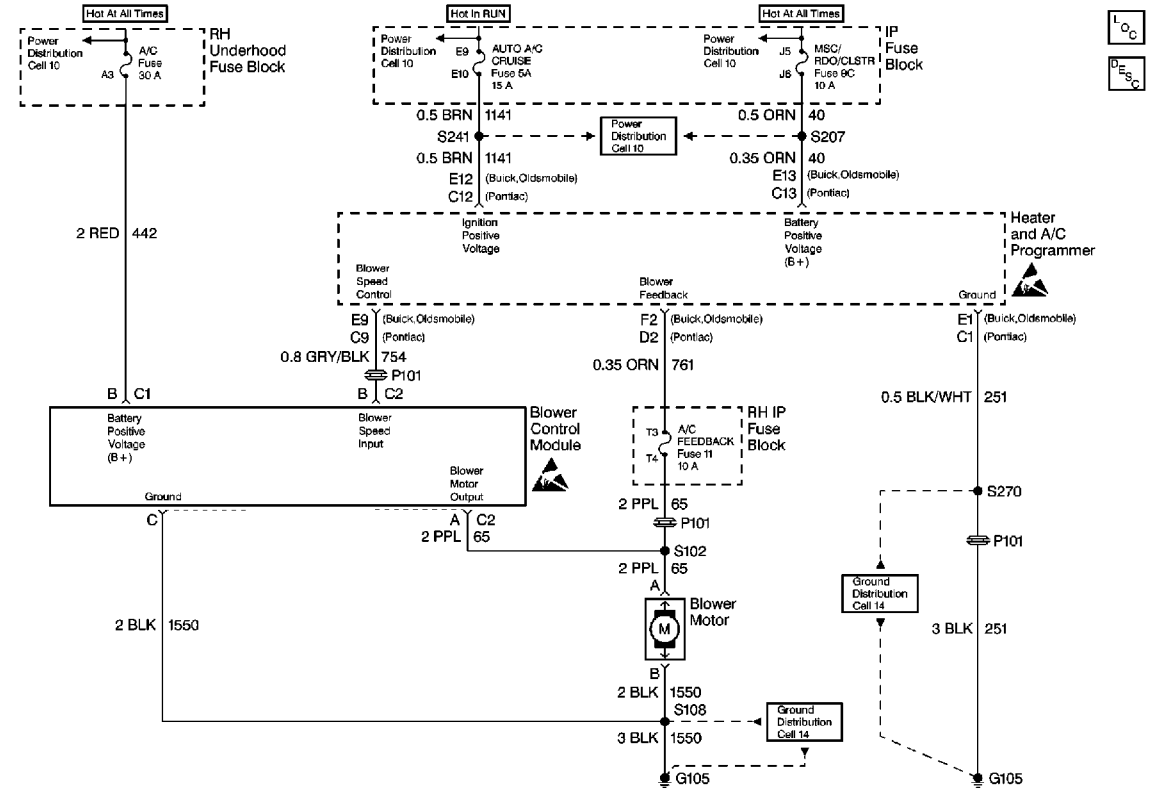


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HVAC Blower Control Schematics

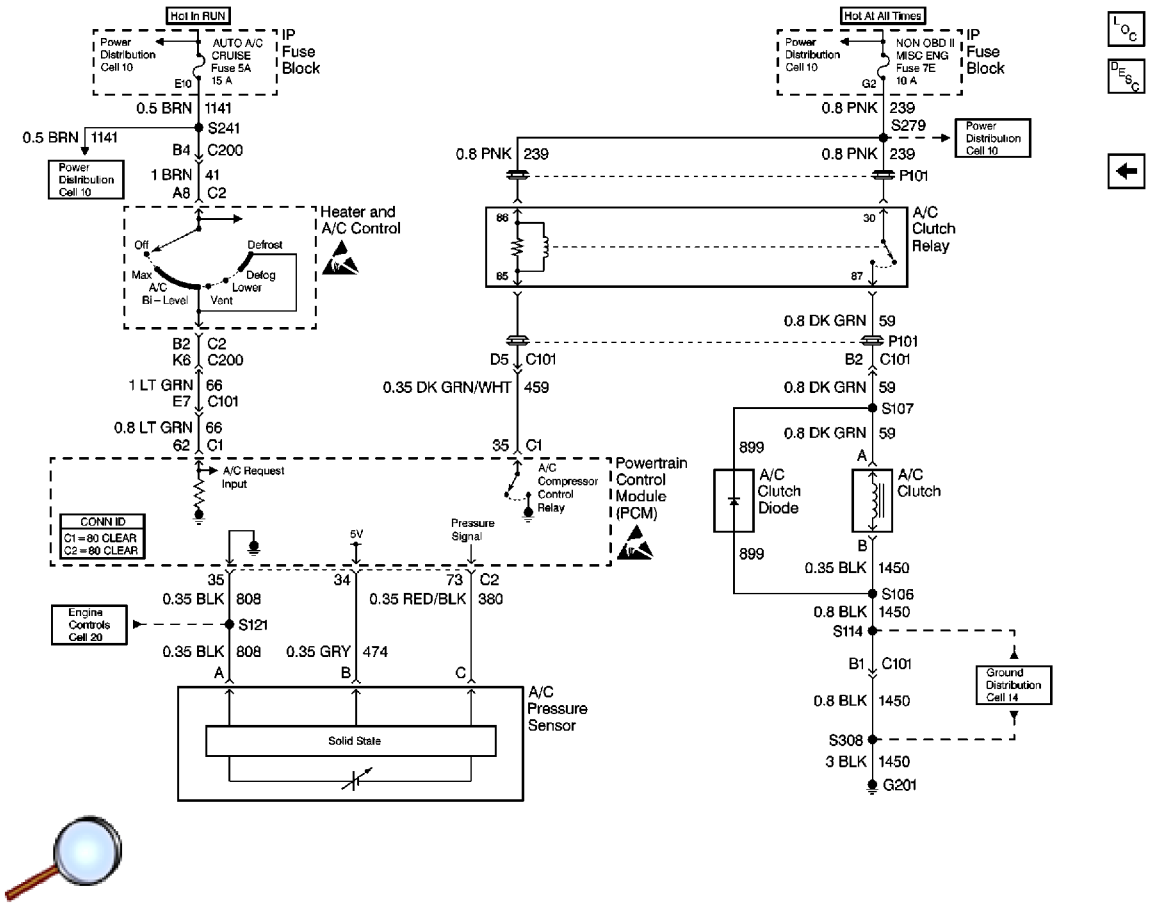
HVAC Blower Control Schematics (Cell 66)



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Cell 64: Buick

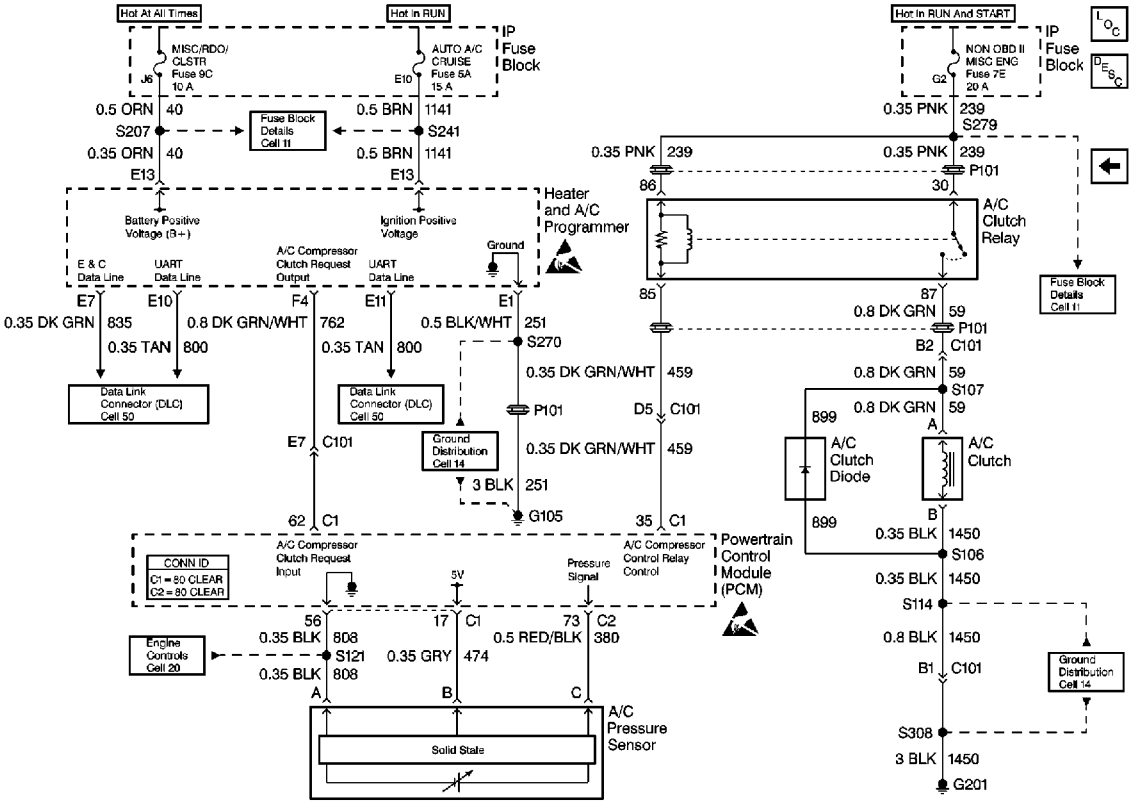


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HVAC Compressor Control Schematics

HVAC Compressor Control Schematics (Cell 67)



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System Capacities

Application	Specification	
	Metric	English
Refrigerant Capacity	0.91 kg	2.0 lb

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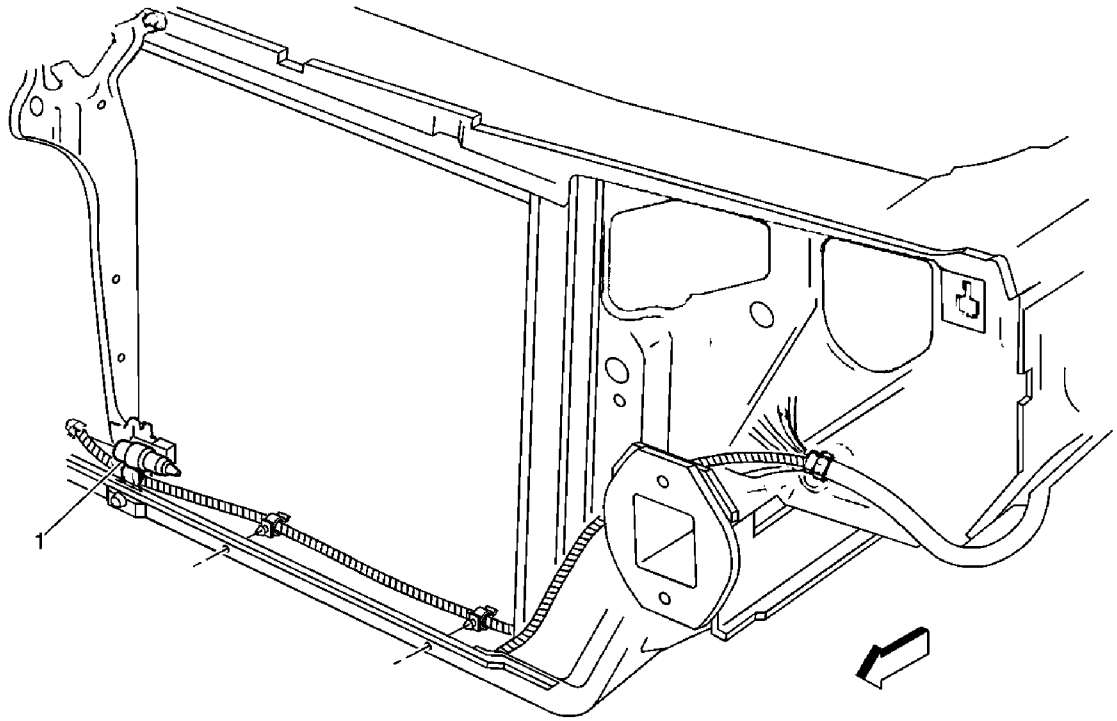
Refrigerant Oil Distribution Specifications

Application	Specification	
	Metric	English
Accumulator	90 ml	3 oz
Compressor	60 ml	2 oz
Condenser	30 ml	1 oz
Evaporator	90 ml	3 oz

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Center Front of the Vehicle

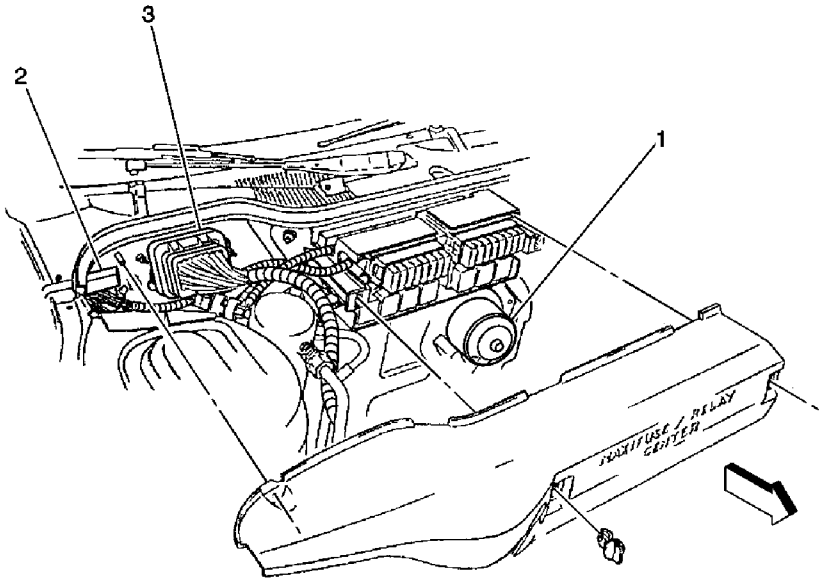


(1) Ambient Air Temperature Sensor

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Engine Compartment, Rear

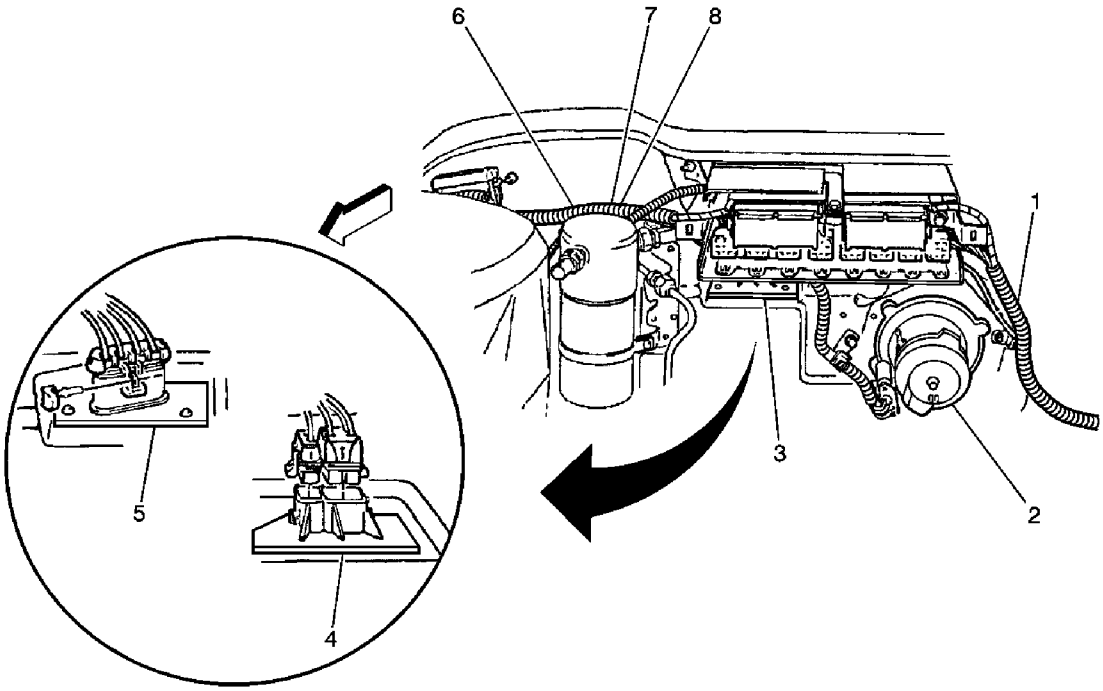


(1) Blower Motor
(2) P101
(3) C101

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Engine Compartment, Right Rear Corner

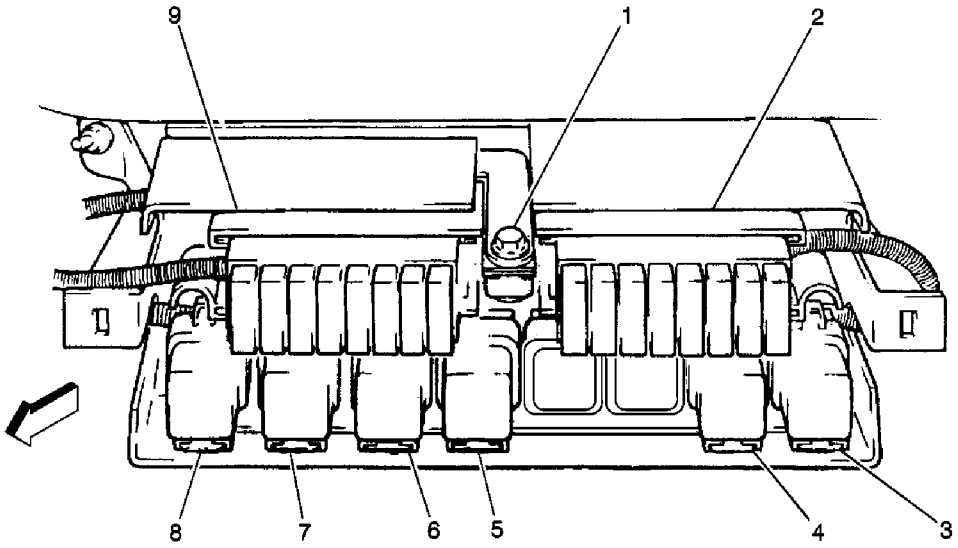


(1) S104
(2) Blower Motor
(3) Blower Motor Resistor, Blower Control Module (Hidden)
(4) Blower Control Module
(5) Blower Motor Resistor
(6) S101
(7) S103
(8) S102

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Rear of the Engine Compartment

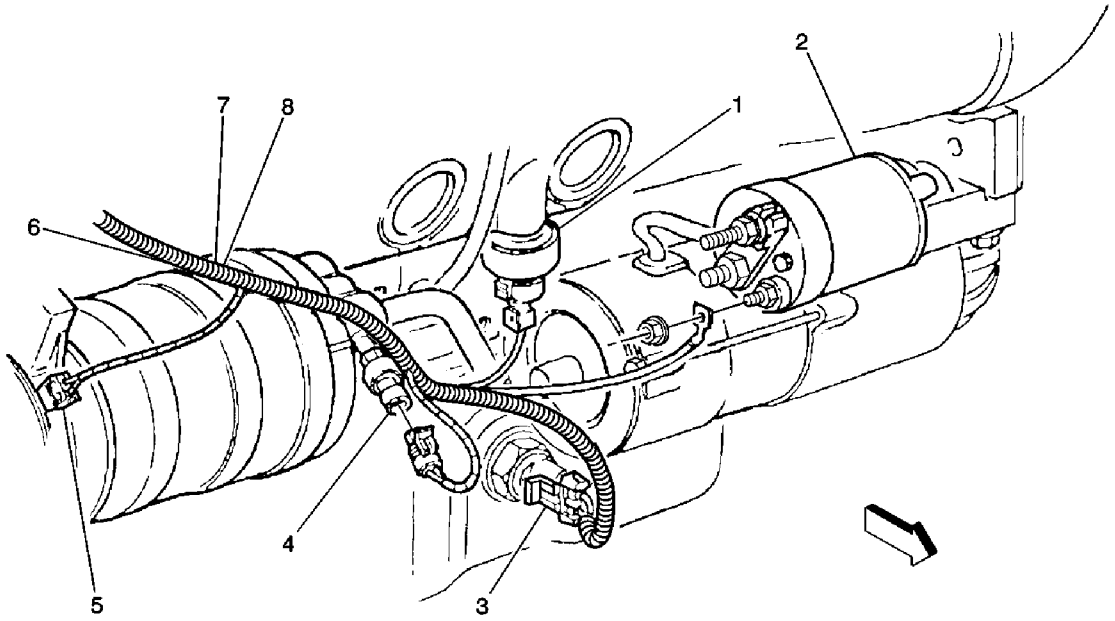


(1) Battery Positive Cable Connection
(2) LH Underhood Fuse Block
(3) Low Speed Engine Cooling Fan Relay
(4) High Speed Engine Cooling Fan Relay
(5) High Blower Relay
(6) Blower Motor Relay
(7) Horn Relay
(8) A/C Clutch Relay
(9) RH Underhood Fuse Block

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Engine, Front Side

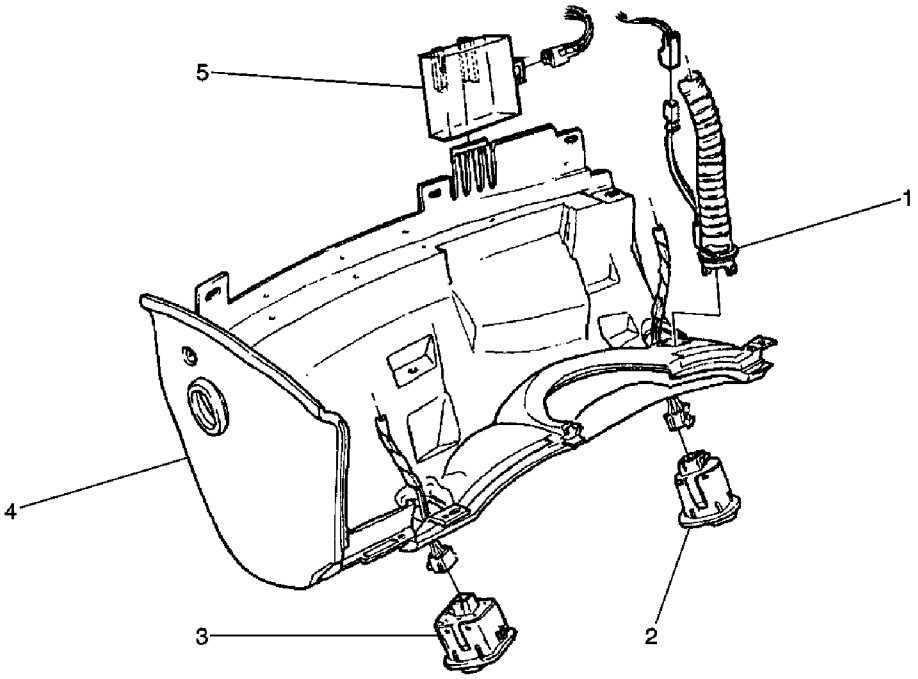


(1) Knock Sensor Bank 1
(2) Starter Solenoid
(3) Engine Oil Level Switch
(4) A/C Pressure Sensor
(5) A/C Clutch
(6) A/C Clutch Diode
(7) S107
(8) S106

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Passenger Compartment, Under the Steering Column

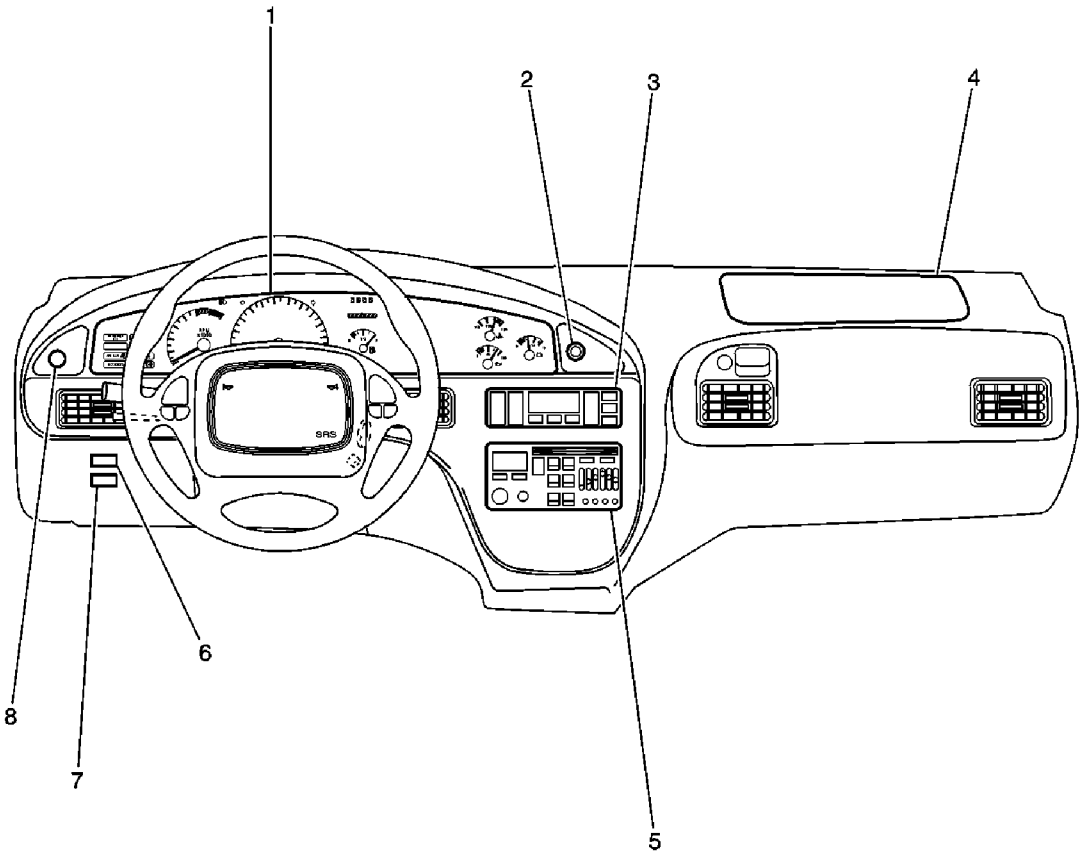


(1) Inside Air Temperature Sensor
(2) Traction Control Disable Switch (Buick)
(3) Rear Compartment Lid Release Switch (Pontiac)
(4) LH Knee Bolster
(5) Interior Lamp Control Module

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Passenger Compartment, Pontiac Instrument Panel Shown, Others Similar

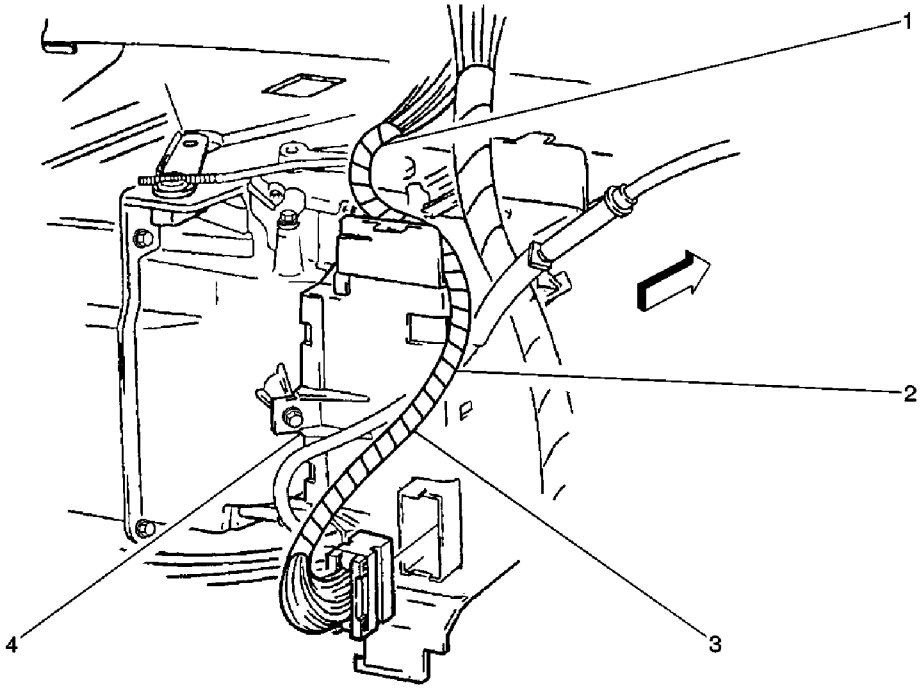


(1) Instrument Cluster
(2) Cigar Lighter
(3) Heater and A/C Control
(4) Inflatable Restraint IP Module
(5) Radio
(6) Rear Compartment Lid Latch Switch
(7) Fog Lamp Switch
(8) Lamp Dimmer Switch

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Passenger Compartment, Below the Right Corner of the IP

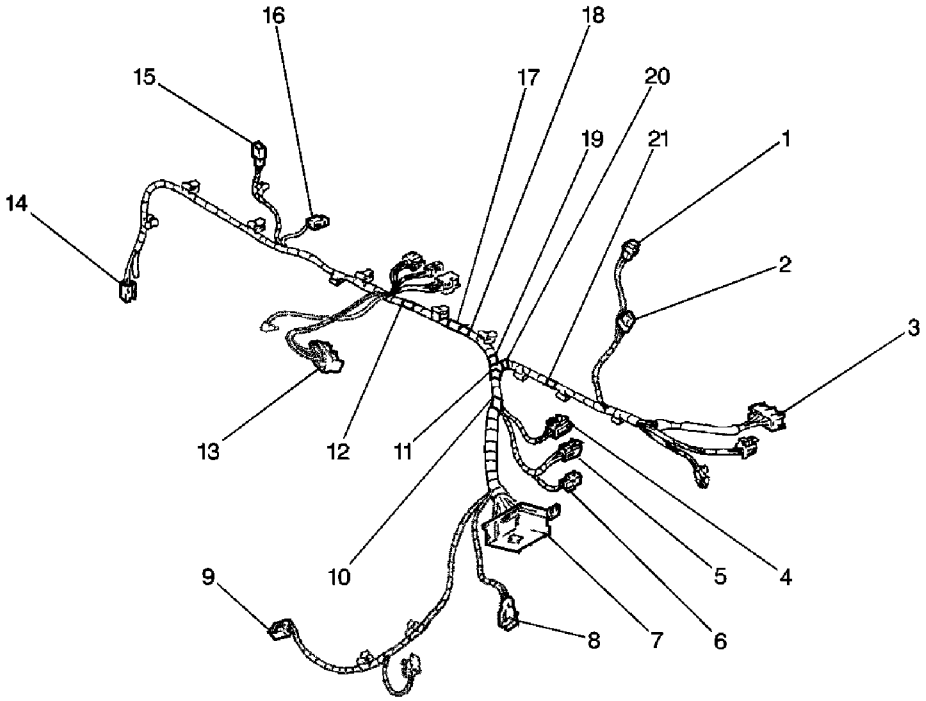


(1) S240
(2) S269
(3) S268
(4) Heater and A/C Programmer

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Passenger Compartment, Behind the Instrument Panel (Oldsmobile)



(1) LH Sunload Temperature Sensor
(2) Twilight Sentinel
(3) Headlamp Switch Connector
(4) Traction Control Disable Switch
(5) Interior Lamp Control Module
(6) Ambient Air Temperature Sensor
(7) C200
(8) C304
(9) Valet Switch
(10) S209
(11) S249
(12) S216
(13) Radio
(14) C207
(15) RH Sun Load Temperature Sensor
(16) IP Compartment Switch
(17) S214

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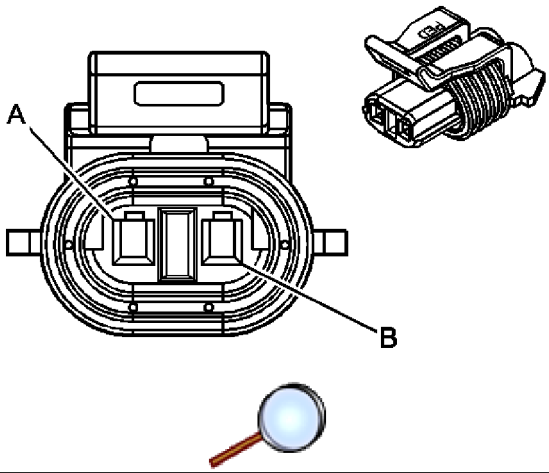
(18) S213
(19) S291
(20) S264
(21) S260

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HVAC Connector End Views

Table 1: A/C Clutch
Table 2: A/C Clutch Relay
Table 3: A/C Pressure Sensor
Table 4: Blower Control Module C1
Table 5: Blower Control Module C2
Table 6: Heater and A/C Control (Buick / Oldsmobile with CJ2)
Table 7: Heater and A/C Control (Pontiac With C68)
Table 8: Heater and A/C Programmer (Pontiac)
Table 9: Heater and A/C Programmer (Buick with CJ2)
Table 10: Heater and A/C Programmer (Oldsmobile with CJ2)
Table 11: Inside Air Temperature Sensor
Table 12: LH Sunload Temperature Sensor (Buick)
Table 13: LH Sunload Temperature Sensor (Oldsmobile)
Table 14: Passenger Temperature Control (Buick with CJ2)
Table 15: Passenger Temperature Control (Oldsmobile with CJ2)
Table 16: RH Sunload Temperature Sensor (Buick)
Table 17: RH Sunload Temperature Sensor (Oldsmobile)
Table 18: Sunload Temperature Sensor (Pontiac)

A/C Clutch



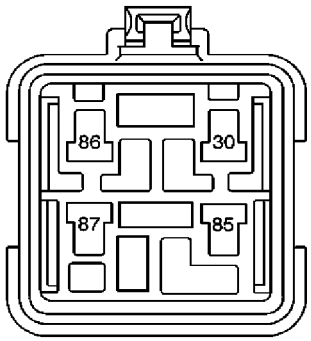
Connector Part Information	• 12162017 • 2-Way F Metri-Pack 150 Series, Sealed (GRY)

Pin	Wire Color	Circuit No.	Function
A	DK GRN	59	A/C Compressor Clutch Solenoid Feed
B	BLK	1450	Ground

A/C Clutch Relay

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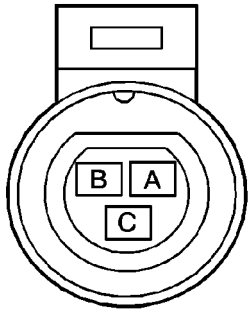




Connector Part Information	• 12110787 • 4-Way F Metri-Pack 280 Series (MD GRY)

Pin	Wire Color	Circuit No.	Function
30	PNK	239	Fused Output - Ignition 1
85	DK GRN/WHT	459	Air Conditioning Compressor Control Relay Output - Ignition 1
86	PNK	239	Fused Output - Ignition 1
87	DK GRN	59	Air Conditioning Compressor Clutch Solenoid Feed

A/C Pressure Sensor



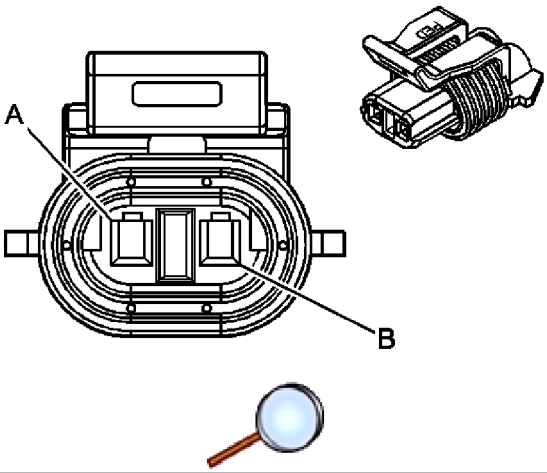


Connector Part Information	• 12110192 • 3-Way F Metri-Pack 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	BLK	808	Sensor Return
B	GRY/BLK	474	5 Volt Reference Feed
C	RED/BLK	380	A/C Refrigerant Pressure Sensor Signal

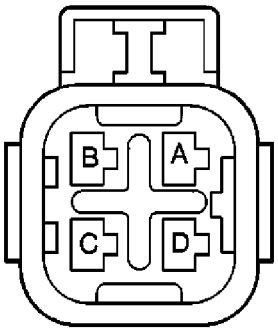
Blower Control Module C1

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Connector Part Information	• 12059405 • 2-Way F Metri-Pack 480 Series (MD GRY)		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	--	--	Not Used
B	RED	442	Fused Output - Battery

Blower Control Module C2

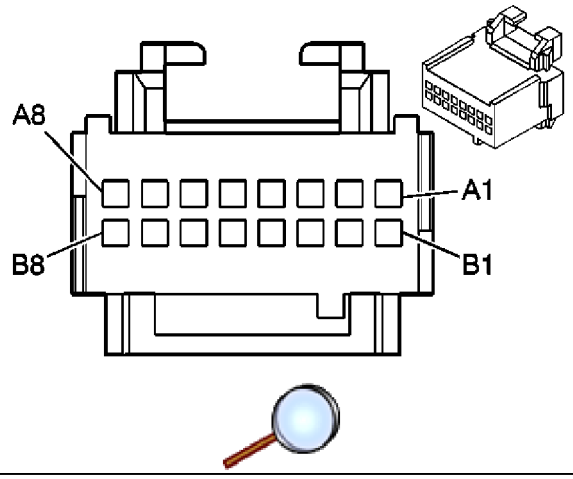


Connector Part Information	• 12059407 • 4-Way F Metri-Pack 480 Series (MD GRY)		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	PPL	65	Blower Motor Feed
B	GRY/BLK	754	Blower Speed Signal - Speed Control (Pontiac)
B	GRY/BLK	754	Blower Speed Signal - Speed Control (Oldsmobile)
B	GRY/BLK	754	Blower Speed Signal - Speed Control (Buick)
C	BLK	1550	Ground

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D	--	--	Not Used

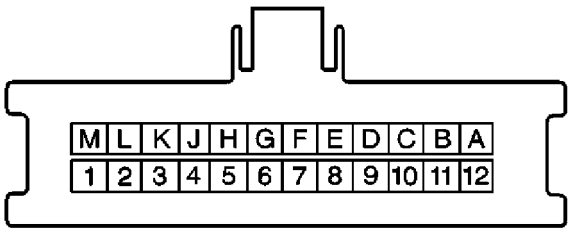
Heater and A/C Control (Buick / Oldsmobile with CJ2)



Connector Part Information	• 12110259 • 16-Way F Micro-Pack 100 Series (GRN)

Pin	Wire Color	Circuit No.	Function
A1-A6	--	--	Not Used
A7	BRN	1141	Fused Output - Ignition
A8	BLK	1250	Ground
B1	LT BLU	1880	HVAC Control Assembly Signal - Driver
B2	PPL	1881	HVAC Control Assembly Signal - Clock - Driver
B3	GRY	8	Instrument Panel Lamp Feed
B4-B7	--	--	Not Used
B8	BLK	1250	Ground (Oldsmobile)

Heater and A/C Control (Pontiac With C68)

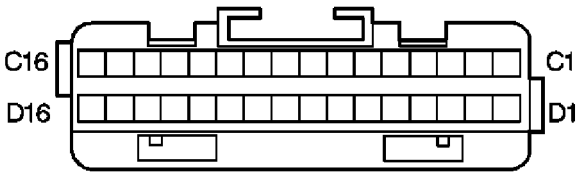


Connector Part Information	• 12004702 • Printed Circuit Component (BLK)

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Pin	Wire Color	Circuit No.	Function
1	GRY	8	I/P Lamp Feed
2-3	--	--	Not Used
4	DK GRN	835	Diagnostic Signal - E & C
5	DK GRN	835	Diagnostic Signal - E & C
6-8	--	--	Not Used
9	BLK	1250	Ground
10	YEL	32	Fused Output - I/P Lamps
11	BRN	1141	Fused Output - Ignition
12	--	--	Not Used
A-H	--	--	Not Used
J-M	--	--	Not Used

Heater and A/C Programmer (Pontiac)





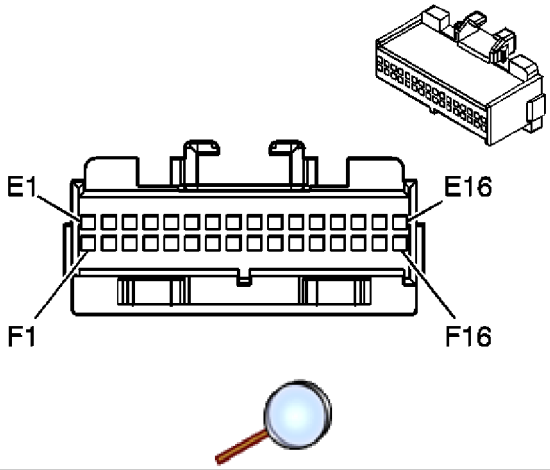
Connector Part Information	• 12045469 • 32-Way F Micro-Pack 100 Series (RED)

Pin	Wire Color	Circuit No.	Function
C1	BLK/WHT	251	Ground-Clean
C2-C4	--	--	Not Used
C5	DK GRN	835	Diagnostic Signal - E & C
C6	BLK	1450	Ground
C7	DK GRN	835	Diagnostic Signal - E & C
C8	--	--	Not Used
C9	GRY/BLK	754	Blower Speed Signal - Speed Control
C10	TAN	800	UART Serial Data Signal
C11	TAN	800	UART Serial Data Signal
C12	BRN	1141	Fused Output - Ignition
C13	ORN	40	Fused Output - Battery
C14-C16	--	--	Not Used

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D1	--	--	Not Used
D2	ORN	761	Blower Speed Signal - Speed Feedback
D3	--	--	Not Used
D4	DK GRN/ WHT	762	A/C Request Signal
D5	WHT	193	Rear Defogger Relay Output - Coil
D6	BLK/WHT	1704	Sensor Return
D7	DK GRN	734	Inside Temperature Sensor Signal
D8	LT GRN/BLK	735	Outside Ambient Temperature Sensor Signal
D9	--	--	Not Used
D10	LT BLU/BLK	590	Solar Sensor Signal - Driver
D11-D16	--	--	Not Used

Heater and A/C Programmer (Buick with CJ2)



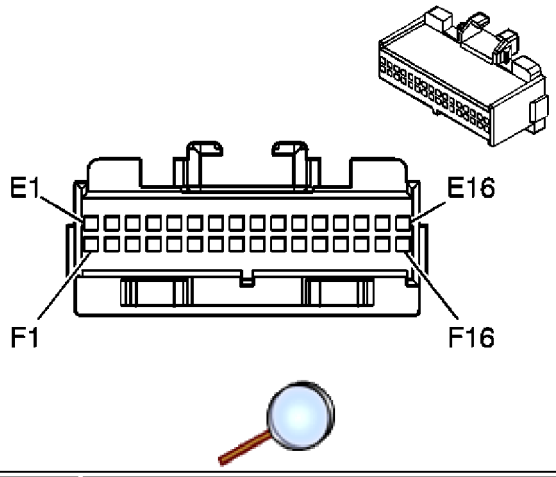
Connector Part Information	• 12052107 • 32 Way F Micro-Pack 100 Series (ORN)

Pin	Wire Color	Circuit No.	Function
E1	BLK/WHT	251	Ground
E2-E4	--	--	Not Used
E5	DK GRN	835	Diagnostic Signal - E & C
E6	BLK	1450	Ground
E7	DK GRN	835	Diagnostic Signal - E & C
E8	--	--	Not Used
E9	GRY/BLK	754	Blower Speed Signal - Speed Control
E10	TAN	800	UART Serial Data Signal
E11	TAN	800	UART Serial Data Signal
E12	BRN	1141	Fused Output - Ignition
E13	ORN	40	Fused Output - Battery
E14	PPL/WHT	724	Vacuum Fluorescent Dimming Signal

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E15	GRY	1548	Passenger Solar Sensor Signal
E16	LT BLU	1880	HVAC Control Assembly Signal - Driver
F1	--	--	Not Used
F2	ORN	761	Blower Speed Signal - Speed Feedback
F3	--	--	Not Used
F4	DK GRN/WHT	762	A/C Request Signal
F5	WHT	193	Rear Defogger Relay Output - Coil
F6	BLK/WHT	1704	Sensor Return
F7	DK GRN	734	Inside Temperature Sensor Signal
F8	LT GRN/BLK	735	Outside Ambient Temperature Sensor Signal
F9	TAN	1812	HVAC Control Assembly Return - Passenger
F10	LT BLU/BLK	590	Solar Sensor Signal - Driver
F11	--	--	Not Used
F12	PPL	1881	HVAC Control Assembly Signal - Clock - Driver
F13	--	--	Not Used
F14	BLK	1878	HVAC Control Assembly Signal - Clock - Passenger
F15	--	--	Not Used
F16	DK BLU/WHT	831	HVAC Control Assembly Signal - Passenger

Heater and A/C Programmer (Oldsmobile with CJ2)



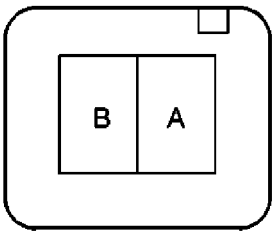
Connector Part Information	• 12089591 • 32 Way F Micro-Pack 100 Series

Pin	Wire Color	Circuit No.	Function
E1	BLK/WHT	251	Ground
E2-E4	--	--	Not Used
E5	DK GRN	835	Diagnostic Signal - E & C
E6	--	--	Not Used
E7	DK GRN	835	Diagnostic Signal - E & C

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E8	--	--	Not Used
E9	GRY/BLK	754	Blower Speed Signal - Speed Control
E10	TAN	800	UART Serial Data Signal
E11	TAN	800	UART Serial Data Signal
E12	BRN	1141	Fused Output - IGN
E13	ORN	40	Fused Output - Battery
E14	PPL/WHT	724	Vacuum Fluorescent Dimming Signal
E15	GRY	1548	Passenger Solar Sensor Signal
E16	LT BLU	1880	HVAC Control Assembly Signal - Driver
F1	--	--	Not Used
F2	ORN	761	Blower Speed Signal - Speed Feedback
F3	--	--	Not Used
F4	DK GRN/WHT	762	A/C Request Signal
F5	WHT	193	Rear Defogger Relay Output - Coil
F6	BLK/WHT	1704	Sensor Return
F7	DK GRN	734	Inside Temperature Sensor Signal
F8	LT GRN/BLK	735	Outside Ambient Temperature Sensor Signal
F9	--	--	Not Used
F10	LT BLU/BLK	590	Solar Sensor Signal - Driver
F11	--	--	Not Used
F12	PPL	1881	HVAC Control Assembly Signal - Clock - Driver
F13-F15	--	--	Not Used
F16	DK BLU/WHT	831	HVAC Control Assembly Signal - Passenger

Inside Air Temperature Sensor





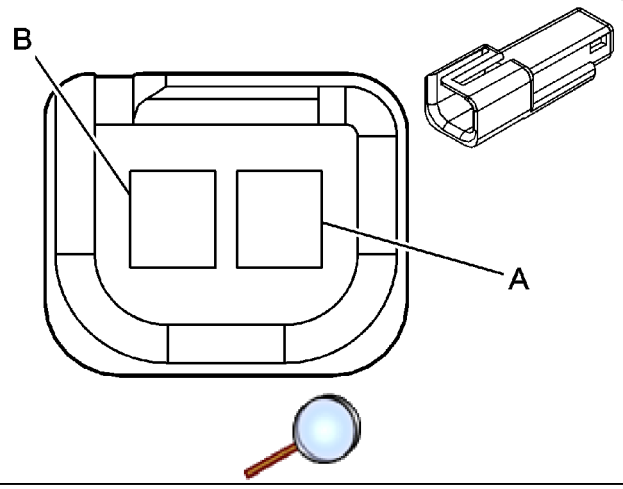
Connector Part Information	• 12059252 • 2-Way M Metri-Pack 150 Series (RED)

Pin	Wire Color	Circuit No.	Function
A	DK GRN	734	Inside Temperature Sensor Signal

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B	BLK/WHT	1704	Sensor Return

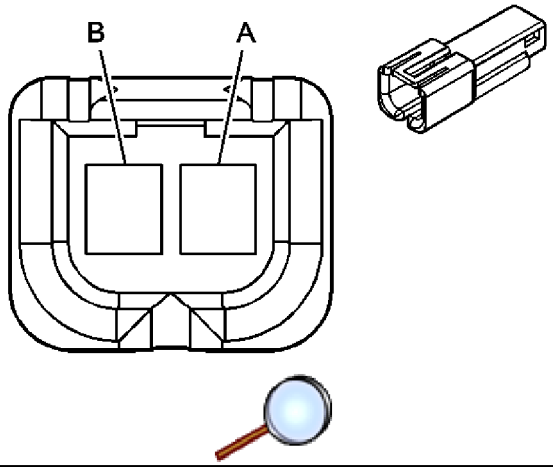
LH Sunload Temperature Sensor (Buick)



Connector Part Information	• 12047663 • 2-Way M Metri-Pack 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	LT BLU/BLK	590	Solar Sensor Signal - Driver
B	BLK/WHT	1704	Sensor Return

LH Sunload Temperature Sensor (Oldsmobile)

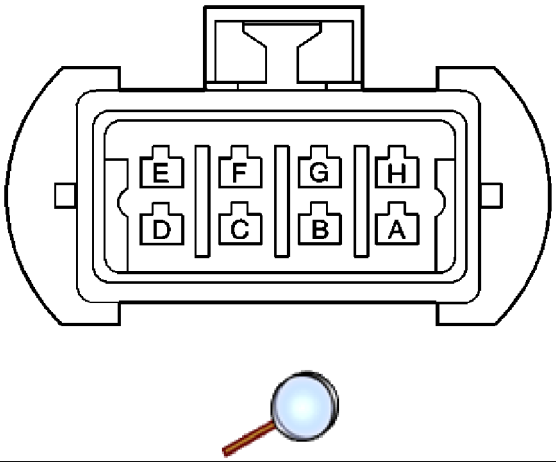


Connector Part Information	• 12059254 • 2-Way M Metri-Pack 150 Series (GRN)

Pin	Wire Color	Circuit No.	Function
A	LT BLU/BLK	590	Solar Sensor Signal - Driver
B	BLK/WHT	1704	Sensor Return

Passenger Temperature Control (Buick with CJ2)

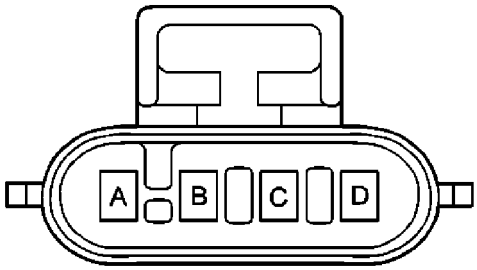
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Connector Part Information	• 12047934 • 8-Way F Metri-Pack 150 Series (LT GRY)

Pin	Wire Color	Circuit No.	Function
A	BRN	1141	Fused Output - Ignition 3
B	TAN	1812	HVAC Control Assembly Return - Passenger
C	PPL/WHT	724	Vacuum Flourescent Dimming Signal
D	--	--	Not Used
E	DK BLU/WHT	831	HVAC Control Assembly Signal - Passenger
F	BLK	1878	HVAC Control Assembly Signal - Clock - Passenger
G	GRY	8	Instrument Panel Lamp Feed
H	BLK	1450	Ground

Passenger Temperature Control (Oldsmobile with CJ2)



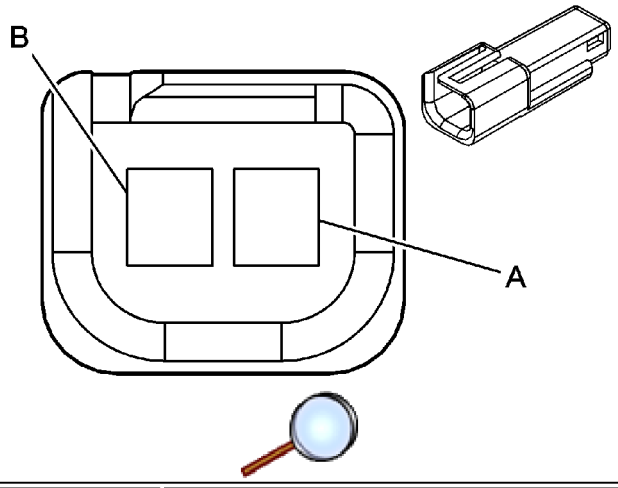
Connector Part Information	• 12162143 • 4-Way F Metri-Pack 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function

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A	DK BLU/WHT	831	HVAC Control Assembly Signal - Passenger
B	BLK/WHT	1704	Sensor Return
C	GRY	8	Instrument Panel Lamp Feed
D	BLK	1450	Ground

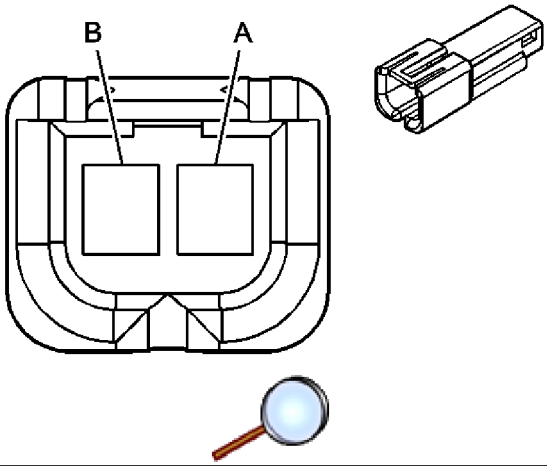
RH Sunload Temperature Sensor (Buick)



Connector Part Information	• 12047663 • 2-Way M Metri-Pack 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	GRY	1548	Solar Sensor Signal - Passenger
B	BLK/WHT	1704	Sensor Return

RH Sunload Temperature Sensor (Oldsmobile)

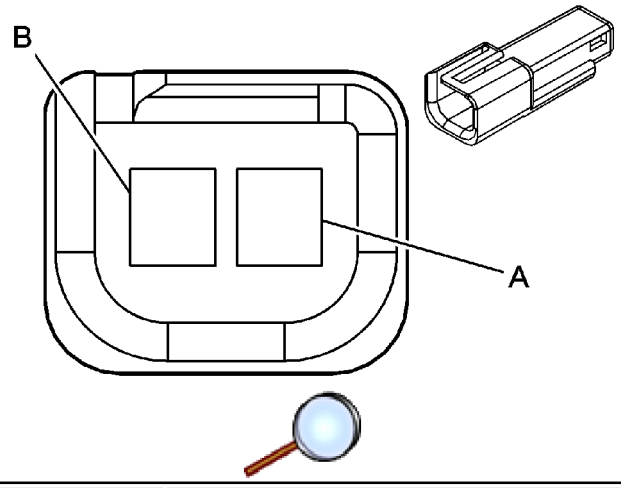


Connector Part Information	• 12059254 • 2-Way M Metri-Pack 150 Series (GRN)

Pin	Wire Color	Circuit No.	Function
A	GRY/BLK	1548	Solar Sensor Signal - Passenger
B	BLK/WHT	1704	Sensor Return

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Sunload Temperature Sensor (Pontiac)



Connector Part Information	• 12047663 • 2-Way M Metri-Pack 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	LT BLU/BLK	590	Solar Sensor Signal - Driver
B	BLK/WHT	1704	Sensor Return

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Refrigerant Recovery and Recharging

Tools Required

- J 39500-B Air Conditioning Refrigerant Recovery, Recycling and Recharging (ACR4) System
- J 41810 Pure Guard 2
- J 41810-100A Active Flow Control

Caution: Avoid breathing the A/C Refrigerant 134a (R-134a) and the lubricant vapor or the mist. Exposure may irritate the eyes, nose, and throat. Work in a well ventilated area. In order to remove R-134a from the A/C system, use service equipment that is certified to meet the requirements of SAE J 2210 (R-134a recycling equipment). If an accidental system discharge occurs, ventilate the work area before continuing service. Additional health and safety information may be obtained from the refrigerant and lubricant manufacturers.

Caution: For personal protection, goggles and lint-free gloves should be worn and a clean cloth wrapped around fittings, valves, and connections when doing work that includes opening the refrigerant system. If refrigerant comes in contact with any part of the body severe frostbite and personal injury can result. The exposed area should be flushed immediately with cold water and prompt medical help should be obtained.

Notice: R-134a is the only approved refrigerant for use in this vehicle. The use of any other refrigerant may result in poor system performance or component failure.

Notice: To avoid system damage use only R-134a dedicated tools when servicing the A/C system.

Notice: Use only Polyalkylene Glycol Synthetic Refrigerant Oil (PAG) for internal circulation through the R-134a A/C system and only 525 viscosity mineral oil on fitting threads and O-rings. If lubricants other than those specified are used, compressor failure and/or fitting seizure may result.

Notice: R-12 refrigerant and R-134a refrigerant must never be mixed, even in the smallest of amounts, as they are incompatible with each other. If the refrigerants are mixed, compressor failure is likely to occur. Refer to the manufacturer instructions included with the service equipment before servicing.

The J 39500-B removes the Refrigerant-134a from the vehicle's A/C system. The recovery procedure uses one filtering cycle. The evacuation procedure uses an automatic multiple pass filtering cycle. The filtering cycles ensure a constant supply of clean and dry refrigerant for the A/C system charging.

Refer to the J 39500-B ACR4 manual for operation and setup instructions.

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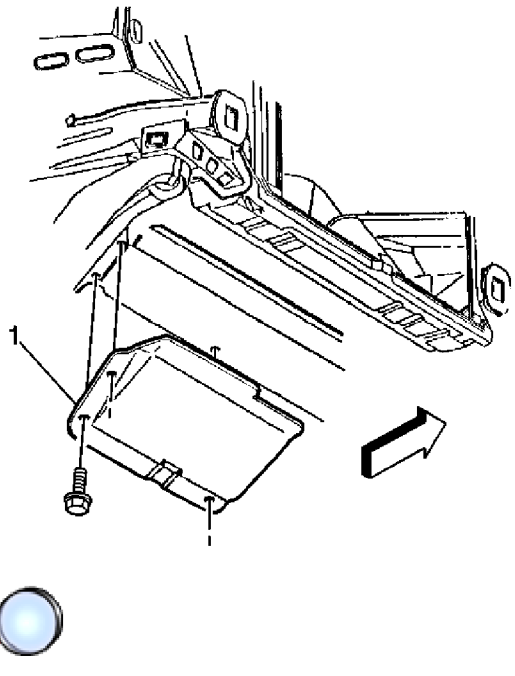
Air Conditioning Compressor Replacement

Removal Procedure

Tools Required

J 39500-B A/C Refrigerant Recovery, Recycling, and Recharging (ACR4) System

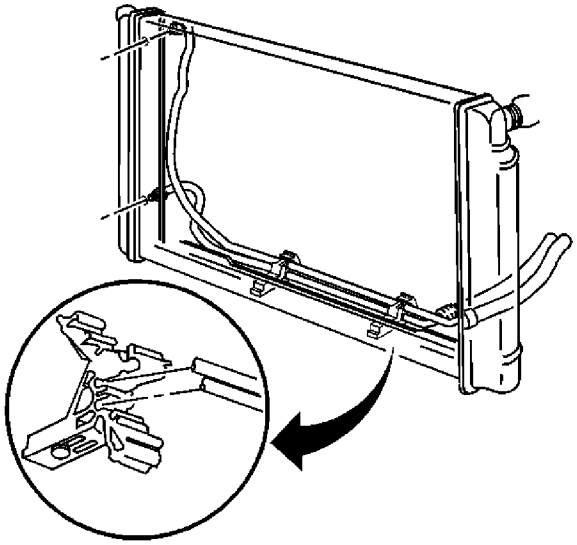
1. Recover the refrigerant. Refer to *Refrigerant Recovery and Recharging* .
2. Remove the accessory drive belt. Refer to Drive Belt Replacement in Engine Mechanical.
3. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.



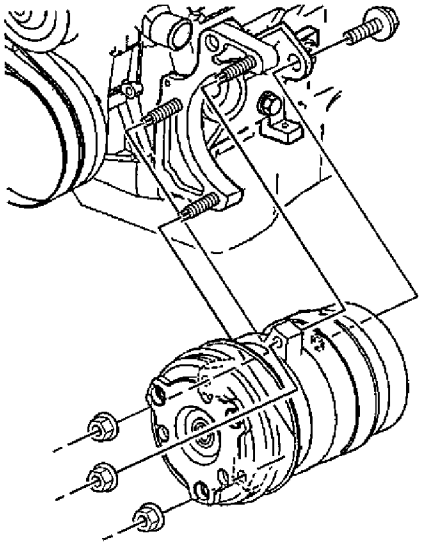
4. Remove the A/C compressor splash shield (1).

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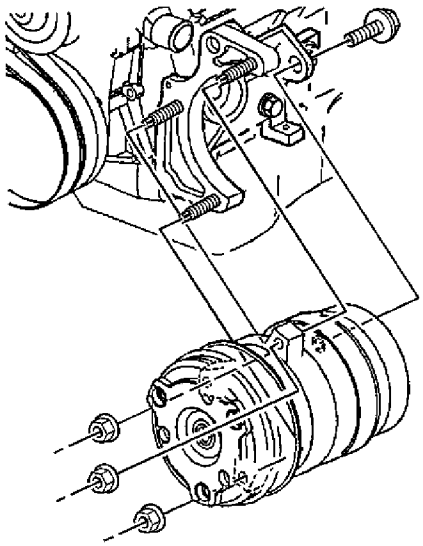
5. Remove the transmission oil cooler line from the brackets.



6. Remove the retaining bolt from the A/C compressor hose.
7. Remove the wiring harness clip and reposistion.
8. Remove the front mounting nuts and the rear mounting bolt from the A/C compressor.
9. Remove the A/C compressor.

Installation Procedure

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1. Install the A/C compressor.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the mounting nuts to the A/C compressor.

   Tighten
   Tighten the nuts to 50 N·m (37 lb ft).

3. Install the mounting bolt to the A/C compressor.

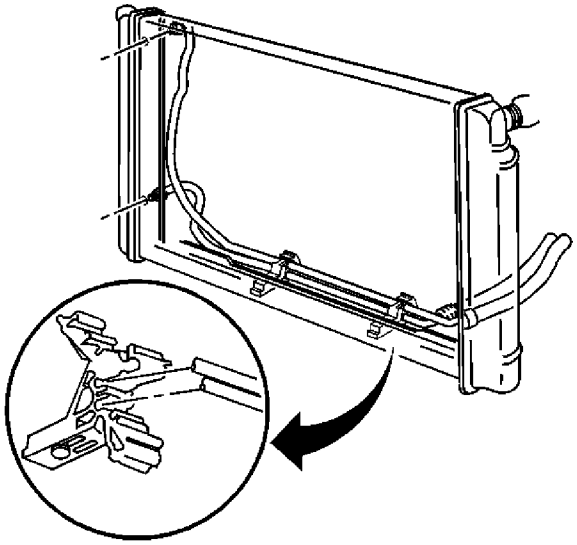
   Tighten
   Tighten the bolt to 100 N·m (74 lb ft).

4. Install the retaining bolt to the A/C compressor hose.

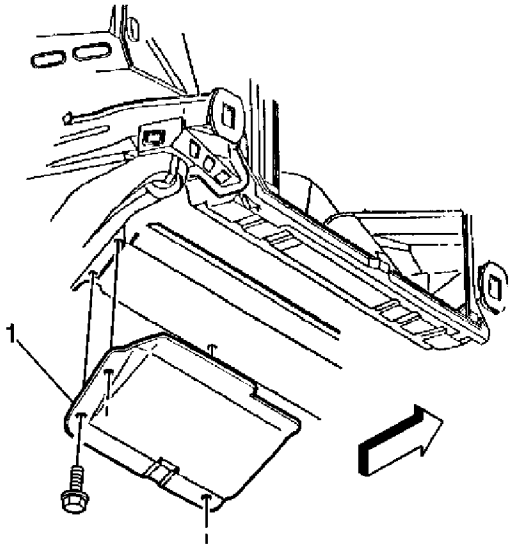
   Tighten
   Tighten the bolt to 30 N·m (22 lb ft).

5. Install the wiring harness clip.

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6. Install the transmission oil cooler line into the brackets.



7. Install the A/C compressor splash shield (1).
8. Install the bolt.

Tighten
Tighten the bolt to 10 N·m (89 lb in).

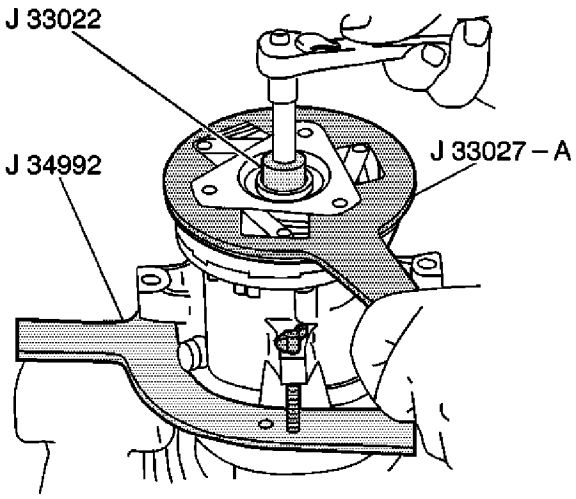
9. Lower the vehicle.
10. Install the accessory drive belt. Refer to Drive Belt Replacement in Engine Mechanical.
11. Recharge the A/C system. Refer to *Refrigerant Recovery and Recharging* .
12. Leak test the system. Refer to *Leak Testing* .

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Compressor Clutch Plate and Hub Assembly Removal (V5 - Conventional Mount)

Tools Required

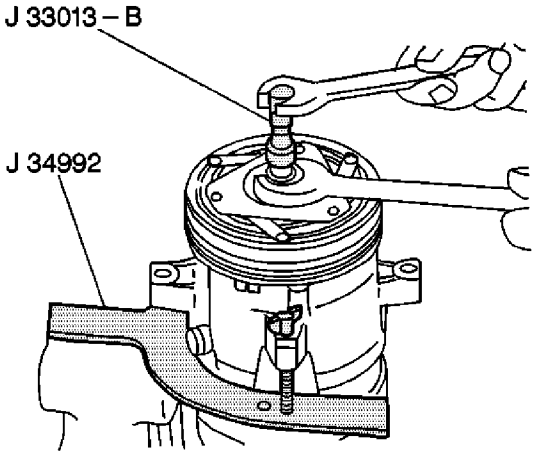
- J 33022 6-Point 13 mm Socket
- J 33027-A Clutch Hub Holding Tool
- J 33013-B Hub And Drive Plate Remover/Installer
- J 34992 Compressor Holding Fixture



1. Clamp the J 34992 in a vise.
2. Attach the A/C compressor to the holding fixture using the thumb screws.
3. Use the J 33027-A in order to prevent the clutch hub and drive plate assembly from turning.
4. Use the J 33022 in order to remove the shaft nut.

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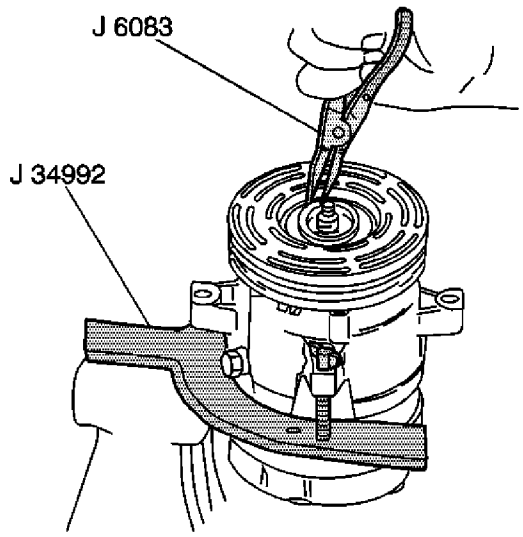
5. Thread the J 33013-B into the hub.
6. Use a wrench in order to hold the body of the J 33013-B .
7. Turn the center screw into the body of the J 33013-B in order to remove the clutch plate and hub assembly.
8. Remove the shaft key. Retain the shaft key for reassembly.

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Clutch Rotor and Bearing Removal (V5 - Conventional Mount)

Tools Required

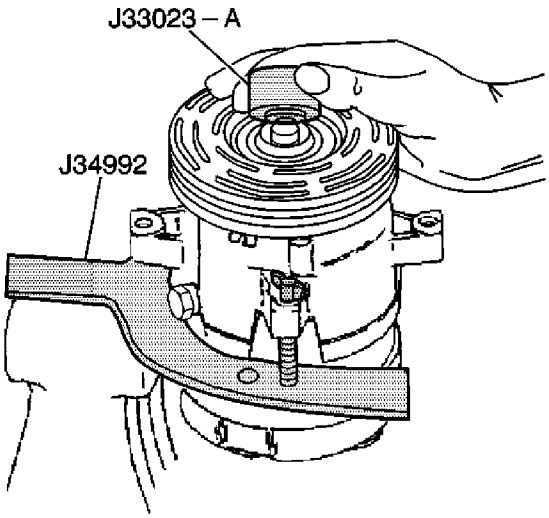
- J 6083 External Snap Ring Pliers
- J 9398 Rotor Bearing Remover
- J 8092 Driver Handle
- J 33020 Pulley Puller
- J 33023-A Puller Pilot



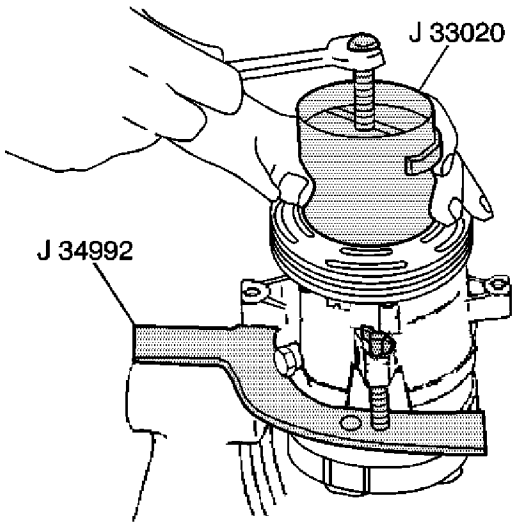
1. Remove the clutch plate and hub assembly. Refer to *Compressor Clutch Plate and Hub Assembly Removal (V5 - Conventional Mount)* .
2. Use the J 6083 in order to remove the rotor and bearing assembly retaining ring.

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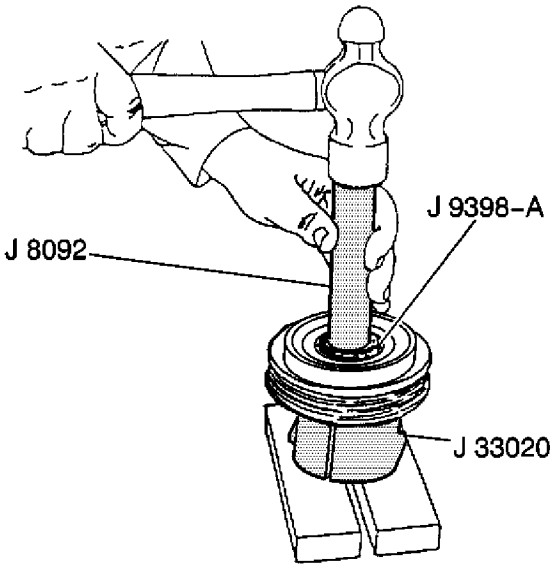


3. Install the J 33023-A to the front head.



4. Install the J 33020 into the inner circle of slots in the rotor.
5. Turn the J 33020 clockwise in the slots in order to engage the tangs of the puller with the segments between the slots in the rotor.
6. Hold the J 33020 in place. Tighten the puller screw against the puller guide in order to remove the puller rotor and bearing assembly.

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7. Support the rotor hub in order to prevent damage to the pulley rotor during bearing removal.
   7.1. Remove the forcing screw from the J 33020 .
   7.2. With the tangs of the J 33020 still engaged in the rotor slots, invert the assembly onto a solid, flat surface or blocks.

Notice: It is not necessary to remove the staking in front of the bearing to remove the bearing, however, it will be necessary to file away the old stake metal for proper clearance for the new bearing to be installed into the rotor bore or the bearing may be damaged.

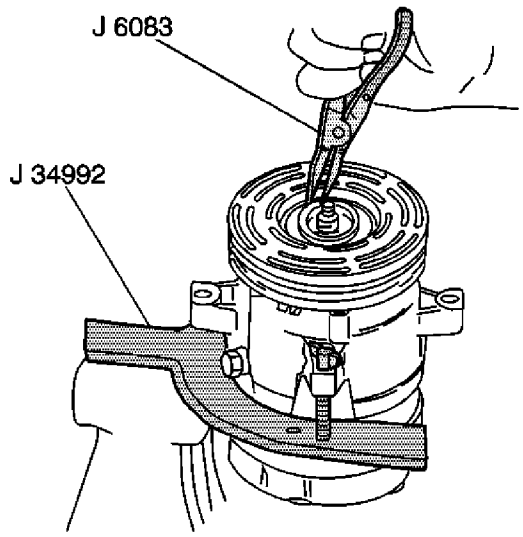
8. Use a J 9398 with the J 8092 in order to drive the bearing out of the rotor hub.

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Air Conditioning Clutch Coil Removal (V5 - Conventional Mount)

Tools Required

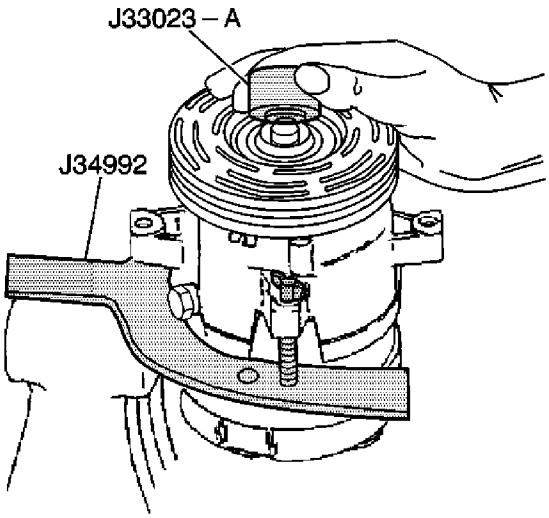
- J 6083 Snap Ring Pliers #24 External
- J 8433-1 Puller Bar
- J 8433-3 Forcing Screw
- J 33020 Pulley Puller
- J 33023-A Puller Pilot
- J 33025 Clutch Coil Puller Legs



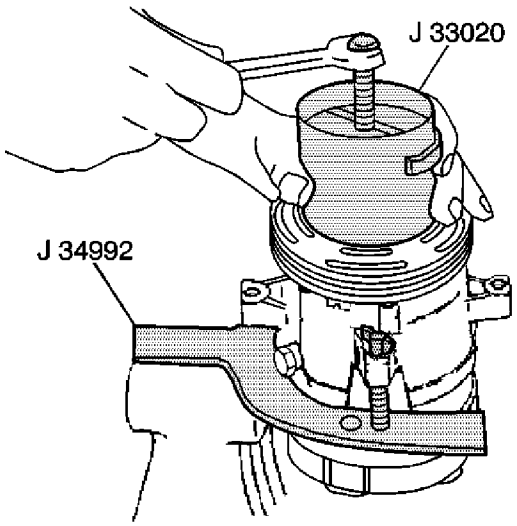
1. Remove the clutch plate and hub assembly. Refer to *Compressor Clutch Plate and Hub Assembly Removal (V5 -- Conventional Mount)* .
2. Use the J 6083 in order to remove the rotor and bearing assembly retaining ring.

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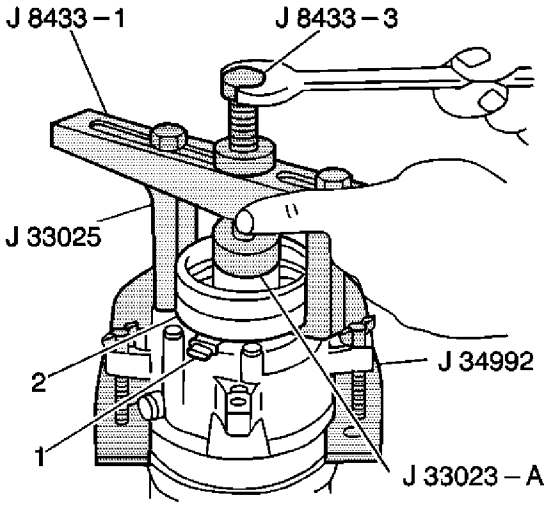


3. Install the J 33023-A to the front head.



4. Install the J 33020 into the inner circle of slots in the rotor.
5. Turn the J 33020 clockwise in the slots in order to engage the tangs of the puller with the segments between the slots in the rotor.
6. Hold the J 33020 in place. Tighten the puller screw against the puller guide in order to remove the puller rotor and bearing assembly.

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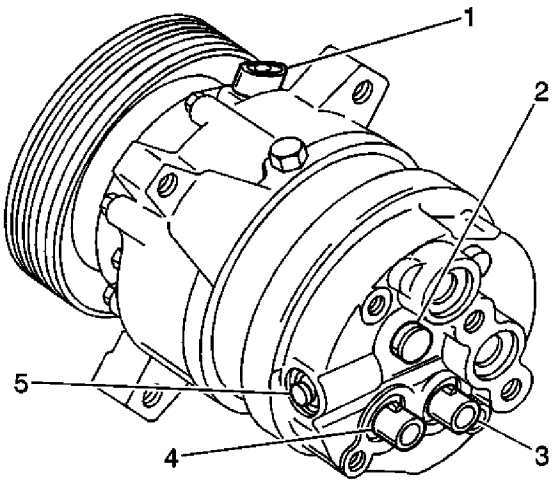
7. Mark the location of the clutch coil terminal (1) on the compressor front head.
8. Install the J 33023-A on the front head of the compressor.
9. Install the J 8433-1 and theJ 8433-3 with the J 33025 on the front head of the compressor.
10. Tighten the J 8433-3 against the J 33023-A in order to remove the clutch coil (2).

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Compressor Control Valve Assembly Removal (V5 - Conventional Mount)

Tools Required

J 5403 Snap Ring Pliers



1. Remove the control valve retaining ring using the J 5403 .
2. Remove the control valve assembly (5).

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Compressor Shaft Seal Removal (V5 - Conventional Mount)

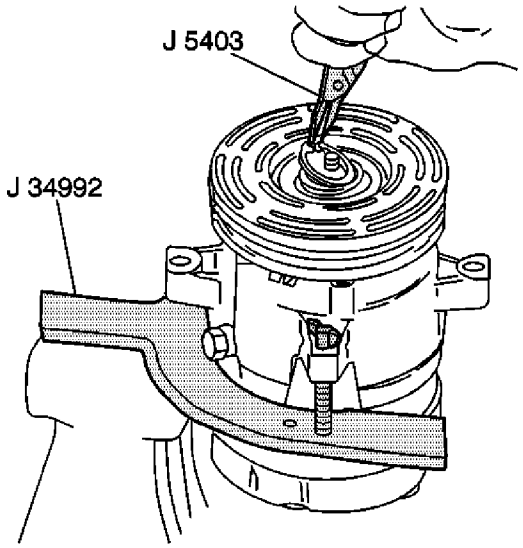
Tools Required

- J 34992 Compressor Holding Fixture
- J 39400-A Electronic Halogen Leak Detector
- J 9553-01 O-Ring Remover
- J 5403 Snap Ring Pliers
- J 23128-A Seal Seat Installer and Remover

Important: Do not change a shaft seal because of small amounts of oil found on an adjacent surface. The seal allows some oil to pass for lubrication purposes. Change the shaft seal when the following conditions exist:

- A large amount of sprayed oil is found.
- Actual refrigerant leak is found, using a J 39400-A or equivalent.

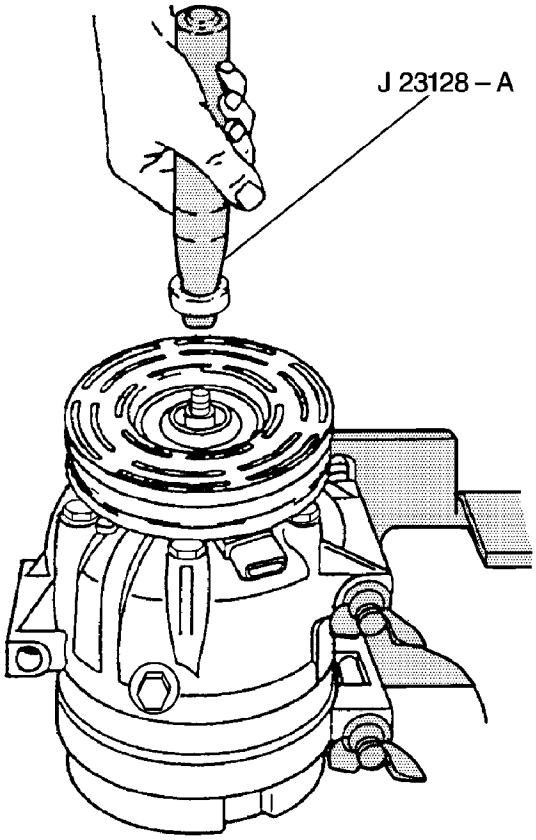
1. Install the compressor into the J 34992 .
2. Remove the clutch plate and hub assembly. Refer to *Compressor Clutch Plate and Hub Asssembly Removal (V5 -- Conventional Mount).* .



3. Remove the shaft seal retaining ring using the J 5403 .
4. In order to prevent dirt or foreign material from damaging the compressor, thoroughly clean the following parts:
   - The inside of the compressor neck area surrounding the shaft
   - The exposed portion of the seal
   - The compressor shaft

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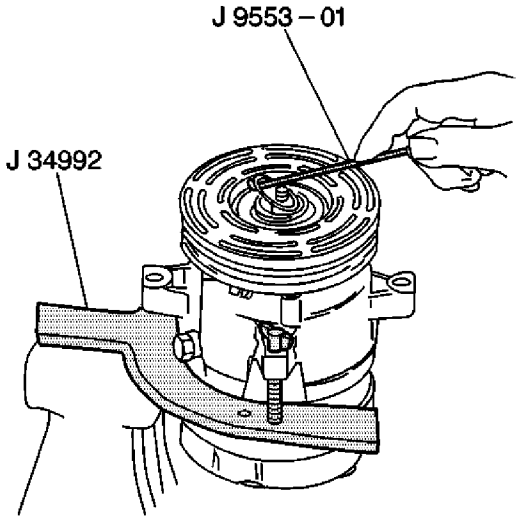
- The O-ring groove



Important: Securely hand-tighten the handle of the J 23128-A . Do not use a wrench or pliers.

5. Fully engage the knurled tangs of the J 23128-A into the recessed portion of the seal by turning the handle clockwise.
6. Remove the seal from the compressor using a rotary-pulling motion. Discard the seal.

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7. Remove the seal O-ring from the compressor neck using the J 9553-01 . Discard the seal O-ring.
8. Inspect the shaft and the inside of the compressor neck again for dirt and foreign material.
9. Ensure that the shaft and the inside of the compressor neck are perfectly clean prior to installing new parts.

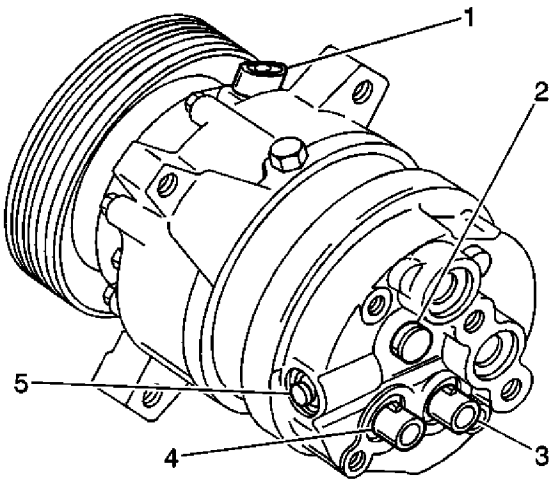
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Compressor Pressure Relief Valve Removal (V5 - Conventional Mount)

Tools Required

J 41790-A Compressor Holding Fixture

1. Install the compressor into the J 41790-A .



2. Remove the pressure relief valve (2) from the rear head of the compressor.

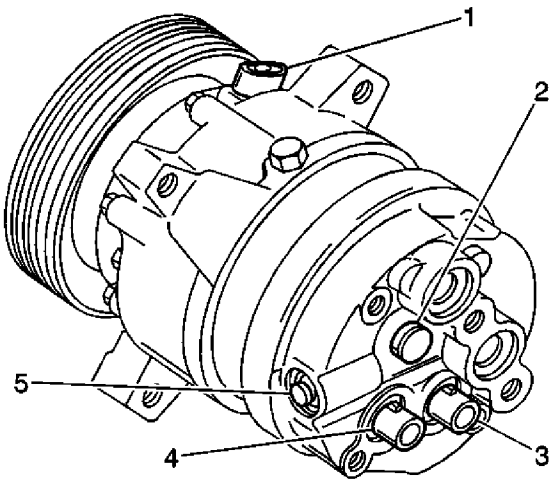
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Compressor Control Valve Assembly Install (V5 - Conventional Mount)

Tools Required

J 5403 Snap Ring Pliers





1. Coat the O-rings with 525 viscosity refrigeration oil.
2. Using thumb pressure, push the O-rings in place.
3. Install the valve into the case.

Important: Ensure that the retaining ring is properly seated in the ring groove.

4. Using the J 5403 , install the valve retaining ring (5) with the high point of the curved sides against the valve housing.
5. Perform a leak test. Refer to *Compressor Leak Testing* .

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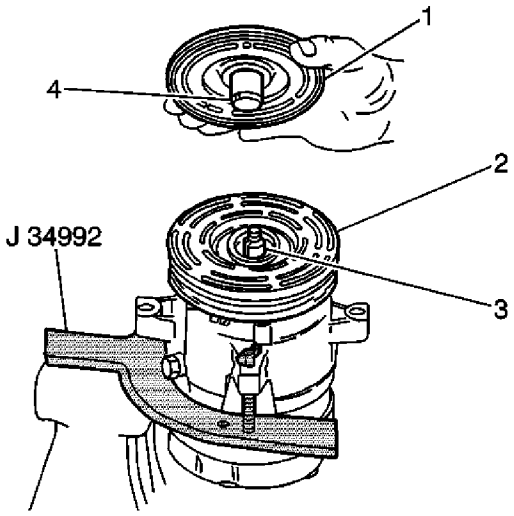
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Compressor Clutch Plate/Hub Assembly Install (V5 - Conventional Mount)

Tools Required

- J 33013-B Hub and Drive Plate Remover/Installer
- J 33022 6-Shaft Nut Socket - 13mm
- J 33027-A Clutch Hub Holding Tool
- J 34992 Compressor Holding Fixture

1. Install the compressor into the J 34992 .



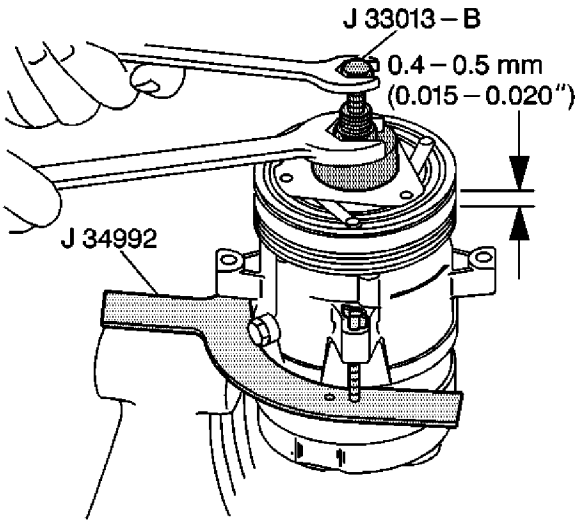
2. Install the shaft key (4) into the key groove of the clutch plate and hub (1).
   - Allow the key to project 3.2 mm (0.126 in) out of the key groove.
   - The shaft key is curved slightly in order to provide an interference fit in the key groove of the hub.
3. Clean the frictional surfaces of the clutch plate and hub and the clutch pulley rotor (2).
4. Align the shaft key with the shaft keyway (3).

   Notice: Do not drive or pound on the clutch hub or the shaft. Internal damage to the compressor may result.

5. Place the clutch plate and hub assembly onto the compressor shaft.

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6. Remove the center screw from the J 33013-B .
7. Reverse the body direction of the center screw of the J 33013-B .
8. Install the J 33013-B with the bearing.
9. Back off the body of the J 33013-B in order to allow the center screw to be threaded onto the end of the compressor shaft.
10. Hold the center screw of the J 33013-B with a wrench.

Notice: If the center screw is threaded fully onto the end of the compressor shaft, or if the body of the installer is held and the center screw is rotated, the key will wedge and will break the clutch hub.

11. Tighten the hex portion of the body of the J 33013-B in order to press the hub onto the shaft.
12. Tighten the body of the J 33013-B several turns.
13. Remove the J 33013-B .
14. Verify that the shaft key remains in the keyway before installing the clutch plate and hub assembly to the final position.
15. Ensure that the gap between the frictional surfaces of the clutch plate and the clutch rotor is within 0.40-0.50 mm (0.016-0.020 in).
16. Remove the J 33013-B .
17. Verify that the shaft key is even with or slightly above the clutch hub.
18. Install the shaft nut.
19. Hold the clutch plate and hub assembly with the J 33027-A .

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

20. Tighten the shaft nut against the crankshaft shoulder, using a 17.5 N·m (12.5 lb ft) torque wrench and the J 33022 .

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Tighten
Tighten the nut to 16.5 N·m (12 lb ft).

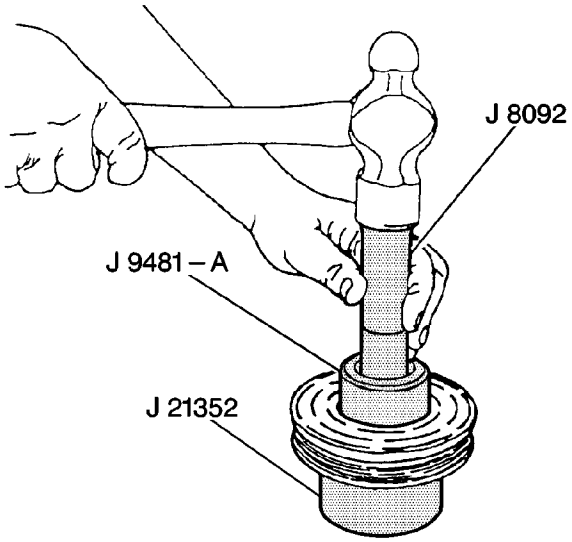
21. Spin the pulley rotor by hand in order to verify that the rotor does not rub the clutch drive plate.

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Clutch Rotor and/or Bearing Install (V5 - Conventional Mount)

Tools Required

- J 6083 #24 External Snap Ring Pliers
- J 8092 Driver Handle
- J 8433-1 Puller Bar
- J 8433-3 Forcing Screw
- J 9481-A Bearing Installer
- J 21352-A Support Block
- J 33017 Pulley And Bearing Assembly Installer
- J 33019 Bearing Staking Tool
- J 33023-A Puller Pilot
- J 34992 Compressor Holding Fixture



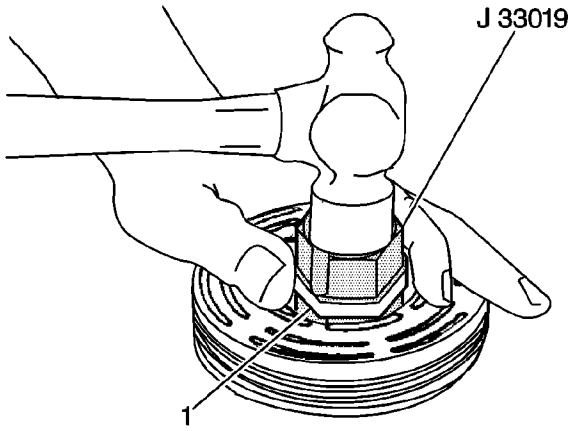
Notice: Do not support the rotor by resting the pulley rim on a flat surface during the bearing installation or the rotor face will be bent.

1. Place the pulley rotor on the J 21352-A in order to fully support the rotor hub during the bearing installation.
2. Align the new bearing with the hub bore.
3. Using the J 9481-A and the J 8092 , drive the bearing into the hub.

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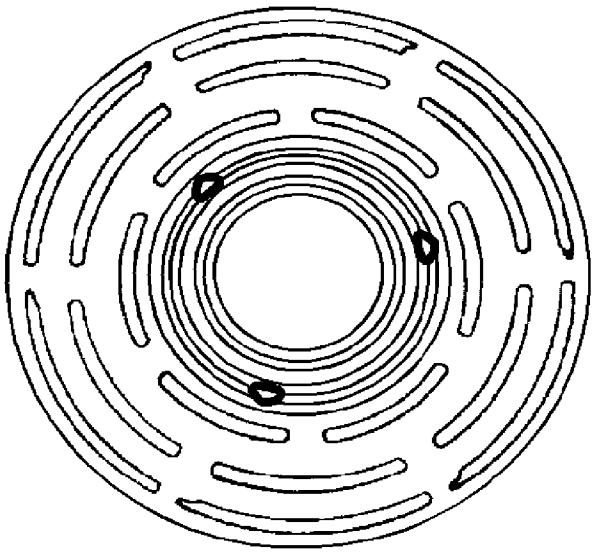
The J 9481-A applies force to the outer race of the bearing.



4. Place the J 33019 and the staking pin in the hub bore.
5. Shift the rotor and bearing assembly on the J 21352-A in order to fully support the hub under the location of the staking pin.
6. Use a heavy-duty rubber band (1) in order to hold the stake pin in the guide of the J 33019 .

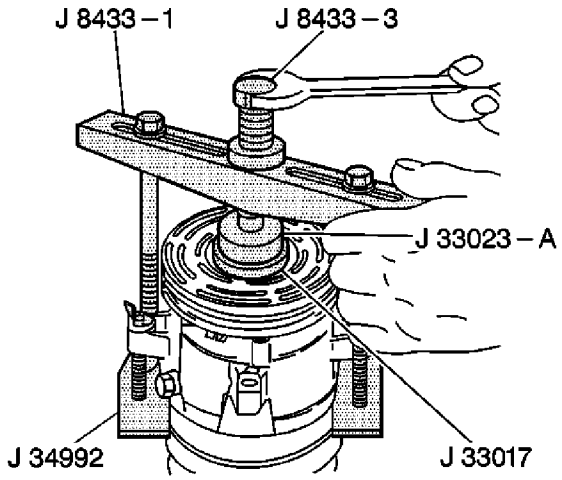
Important: Do not allow a metal stake to contact the outer face of the bearing in order to prevent distortion of the outer race.

7. Using care in order to prevent injury, strike the staking pin of the J 33019 . Properly position the stake pin in the guide after each impact on the pin.
8. Continue to strike the pin of the J 33019 until a stake, similar to the original stake, is formed down to, but not touching, the bearing.



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9. Stake 3 places 120 degrees apart.

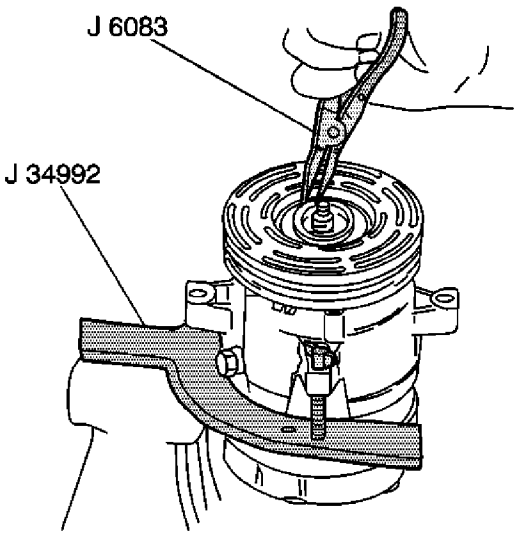


10. With the compressor mounted to the J 34992 , position the rotor and bearing assembly on the front head.
11. Position the J 33017 and the J 33023-A directly over the inner race of the bearing.
12. Position the J 8433-1 on the J 33023-A .
13. Assemble the 2 through bolts and the washers of the J 34992 through the slots of the J 8433-1 .
14. Thread the 2 through bolts into the J 34992 .

    Ensure that the thread of the through bolts engages the full thickness of the J 34992 .

15. Tighten the J 8433-3 in the J 8433-1 in order to force the pulley rotor and bearing assembly onto the front head of the compressor.
16. If the J 33017 slips off direct, in-line contact with inner face of the bearing, use the following steps:
    16.1. Loosen the J 8433-3 .
    16.2. Realign the J 33017 and the J 33023-A in order to ensure that the installer clears the front head.

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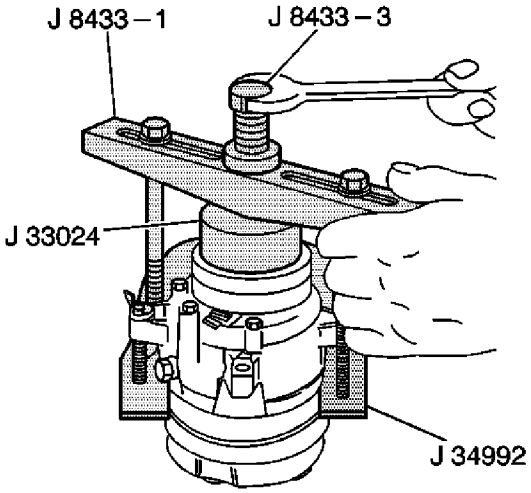
17. Install the rotor and bearing assembly retainer ring using the J 6083 .
18. Install the clutch plate and hub assembly. Refer to *Compressor Clutch Plate and Hub Assembly Removal (V5 -- Conventional Mount)* .

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Air Conditioning Clutch Coil Installation (V5 - Conventional Mount)

Tools Required

- J 8433-1 Puller Bar
- J 8433-3 Forcing Screw
- J 33024 Clutch Coil Installer Adapter
- J 34992 Compressor Holding Fixture
- J 33025 Clutch Coil Puller Legs



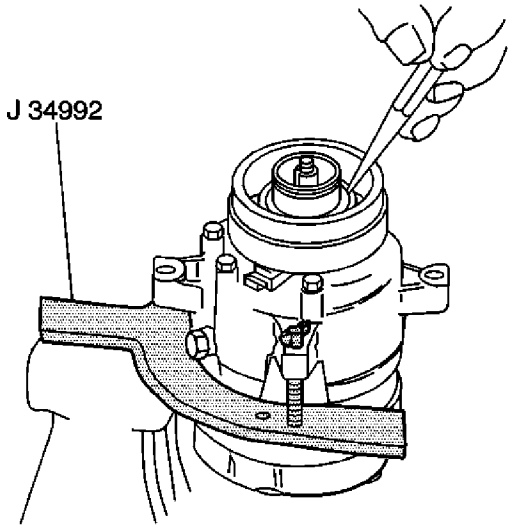
1. Place the clutch coil assembly on the front head with the terminals positioned at the marked location.
2. Place the J 33024 over the internal opening of the clutch coil housing.
3. Align the J 33024 with the compressor front head.
4. Center the J 8433-1 on the countersunk center hole of the J 33024 .
5. Install the through bolts and the washers of the J 34992 through the slots in the J 8433-1 .
6. Thread the through bolts into the J 33025 in order to achieve full fixture thickness.

Important: Ensure that the clutch coil and the J 33024 stay in-line during the installation.

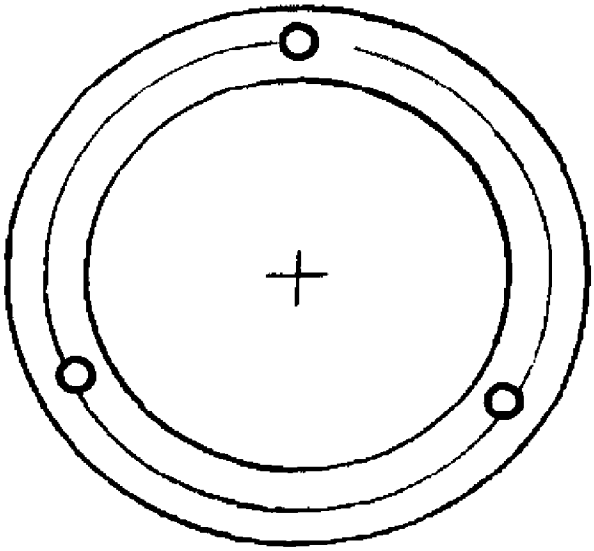
7. Turn the J 8433-3 of the J 8433-1 in order to force the clutch coil onto the head.

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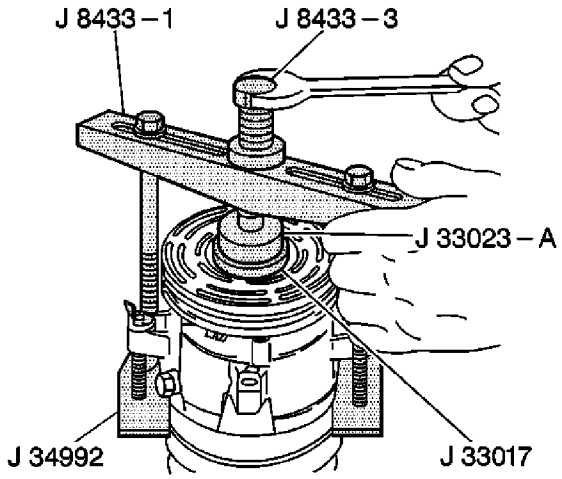


8. With the compressor still mounted to the J 34992 and the coil seated on the front head, stake the front head using a drift punch with a diameter of 3.175 mm (0.125 in).



9. Stake the front head at 3 places 120 degrees apart in order to ensure that the clutch coil remains in position.
10. Ensure that the stake size is only one half of the area of the punch tip and only 0.28-0.35 mm (0.010-0.015 in) in depth.

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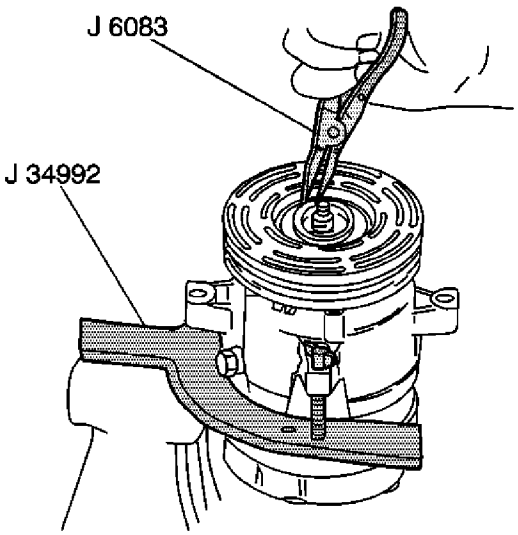


11. With the compressor mounted to the J 34992 , position the rotor and bearing assembly on the front head.
12. Position the J 33017 and the J 33023-A directly over the inner race of the bearing.
13. Position the J 8433-1 on the J 33023-A .
14. Assemble the 2 through bolts and the washers of the J 34992 through the slots of the J 8433-1 .
15. Thread the 2 through bolts into the J 34992 .

    Ensure that the thread of the through bolts engages the full thickness of the J 34992 .

16. Tighten the J 8433-3 in the J 8433-1 in order to force the pulley rotor and bearing assembly onto the front head of the compressor.
17. If the J 33017 slips off direct, in-line contact with inner face of the bearing, use the following steps:
    17.1. Loosen the J 8433-3 .
    17.2. Realign the J 33017 and the J 33023-A in order to ensure that the installer clears the front head.

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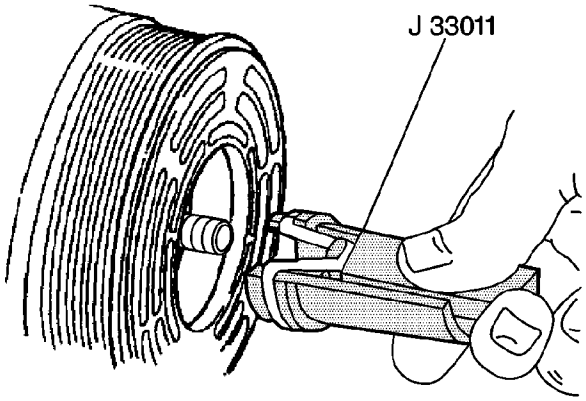
18. Install the rotor and bearing assembly retainer ring using the J 6083 .
19. Install the clutch plate and hub assembly. Refer to *Compressor Clutch Plate and Hub Assembly Removal (V5 -- Conventional Mount)* .
20. Install the shaft nut.

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Compressor Shaft Seal Install (V5 - Conventional Mount)

Tools Required

- J 5403 Snap Ring Pliers
- J 23128-A Seal Seat Installer And Remover
- J 33011 O-Ring Installer
- J 34614 Shaft Seal Protector



Notice: Seals should not be re-used. Always use a new specification service seal kit. Be sure that the seal to be installed is not scratched or damaged in any way. Make sure that the seal is free of lint and dirt that could damage the seal surface or prevent sealing.

1. Thoroughly clean the seal O-ring groove in the front head.
2. Dip the new seal O-ring in clean 525 viscosity refrigerant oil.

Notice: Any attempt to use makeshift or inadequate service tools or equipment may result in damage and/or improper compressor operation.

3. Assemble the O-ring onto the J 33011 .
4. Install the O-ring.
   4.1. Insert the J 33011 into the compressor neck until the installer bottoms out.

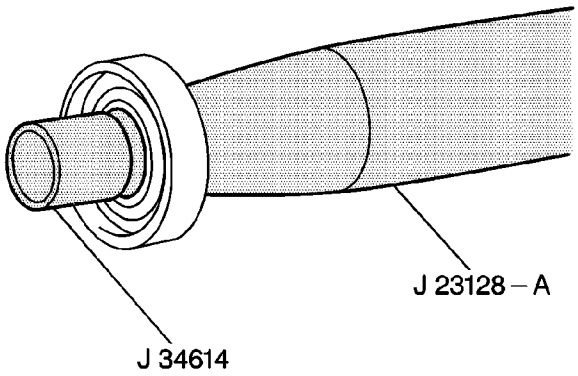
Important: The top groove in the compressor neck is for the shaft seal retainer ring.

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4.2. Lower the moveable slide of the J 33011 in order to release the O-ring into the seal O-ring lower grove.

4.3. Rotate the J 33011 in order to seat the O-ring.

4.4. Remove the installer.



5. Dip the new shaft seal in clean 525 viscosity refrigerant oil.
6. Assemble the seal to the J 23128-A by turning the handle clockwise.
   6.1. Ensure that the stamped steel case side of the lip seal engages with the knurled tangs of the J 23128-A .
   6.2. Ensure that the flared-out side of the lip seal faces toward the compressor.

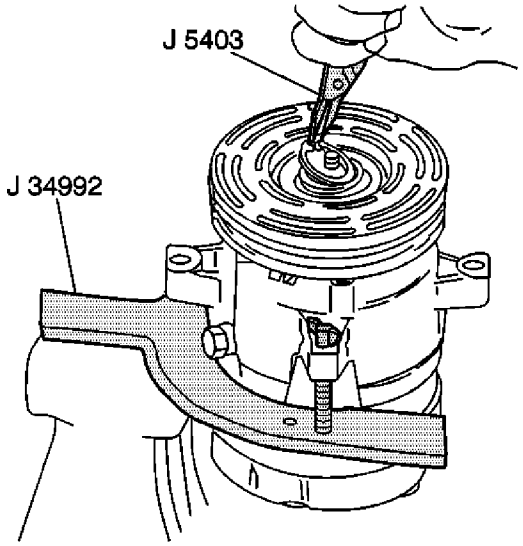
Notice: Use care when handling the seal protector. Do not nick the seal protector. This may damage the seal during installation. Ensure that the bottom of the seal protector is not flared. This may damage the seal during installation.

7. Install the J 34614 on the lip seal.
8. Install the lip seal onto the shaft.
   8.1. Place the J 34614 over the end of the compressor shaft.
   8.2. Slide the new seal onto the shaft using a rotary motion of the J 23128-A .
   8.3. Ensure that the seal makes good contact with the O-ring.

Do not dislodge the O-ring.

   8.4. Disengage the J 23128-A from the seal.
   8.5. Remove the J 23128-A and the J 34614 from the compressor.

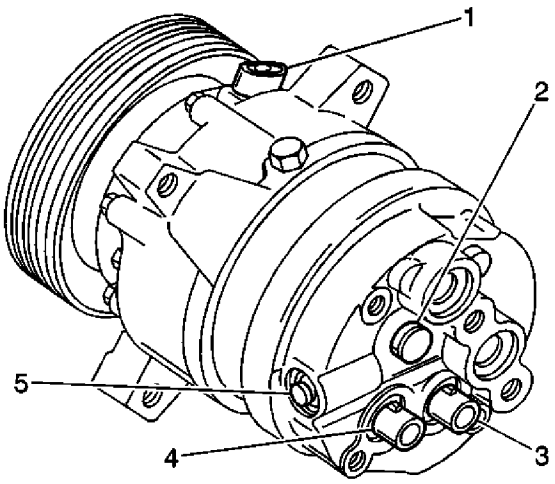
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9. Use the J 5403 in order to install the new seal retainer ring with the flat side against the seal.
10. Use the sleeve of theJ 33011 in order to press in the seal retainer ring. Ensure that the ring snaps into the groove.
11. Leak test the compressor. Refer to *Compressor Leak Testing (V5 -- Conventional Mount).*
12. Remove any excess oil from the shaft and the inside of the compressor neck.
13. Install the clutch plate and hub assembly. Refer to *Compressor Leak Testing (V5 -- Conventional Mount).*
14. Install the compressor and the compressor belt. Tighten the bracket.
15. Evacuate and charge the refrigerant system using the J 39500-B .

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Compressor Pressure Relief Valve Installation (V5 - Conventional Mount)



1. Clean the valve seat area on the rear head.
2. Lubricate the O-ring of the new pressure relief valve and the O-ring assembly using new 525 viscosity refrigerant oil.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the new pressure relief valve (2).

   Tighten
   Tighten the valve to 9 N·m (80 lb in).

4. Perform a leak test. Refer to*Compressor Leak Testing (V5 -- Conventional Mount)* .

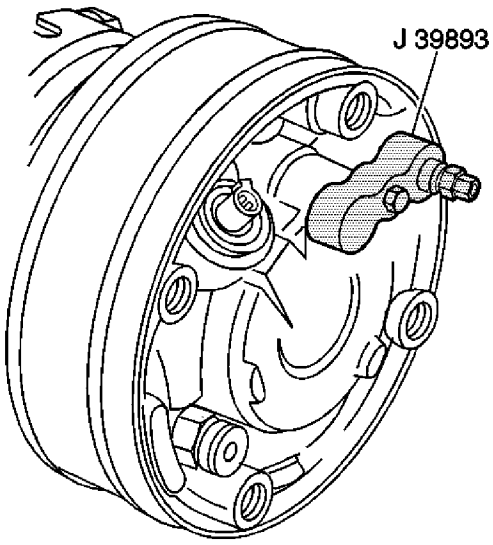
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Compressor Leak Testing (V5 - Conventional Mount)

Tools Required

- J 39400 Electronic Halogen Leak Detector
- J 39500-B A/C Refrigerant Recovery, Recycling and Recharging (ACR4) System
- J 39893 Pressure Testing Connector



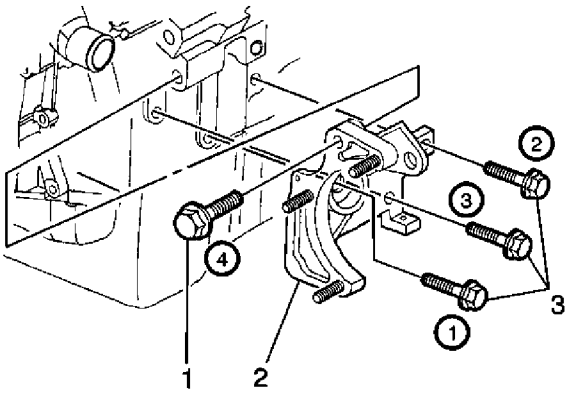
1. With the sealing washers in place, install the J 39893 on the rear head of the compressor.
2. Connect the gage charging lines and the J 39500-B .
3. Pressurize the suction and the high-side of the compressor using R-134a refrigerant.
4. With the compressor in a horizontal position, rotate the compressor shaft several turns by hand in the operating direction.
5. Using the J 39400 , inspect for leaks at the following locations:
   - The pressure relief valve
   - The rear head switch
   - The front head seal
   - The rear head seal
   - The through bolt head gaskets
   - The compressor shaft seal
6. Perform the measures necessary to correct any external leaks found.
7. Inspect for leaks again following any repair.
8. Recover the refrigerant.
9. Disconnect the hoses from the J 39893 .
10. Remove the J 39893 .

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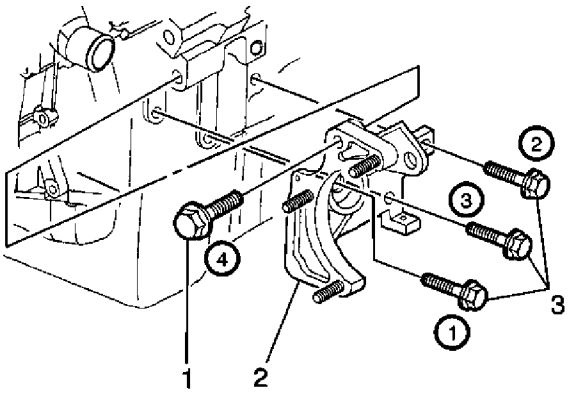
Air Conditioning Compressor Bracket Replacement

Removal Procedure



1. Remove the A/C compressor. Refer to *Compressor Replacement* .
2. Remove the retaining bolts (1,3) from the A/C compressor mounting bracket.
3. Remove the A/C compressor mounting bracket.

Installation Procedure



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1. Install the A/C compressor mounting bracket.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the retaining bolts (1,3) to the A/C compressor mounting bracket.

   Tighten

   - Tighten the side bracket bolts to 100 N·m (74 lb ft).
   - Tighten the front bracket bolt to 50 N·m (37 lb ft).

3. Install the A/C compressor. Refer to *Compressor Replacement*

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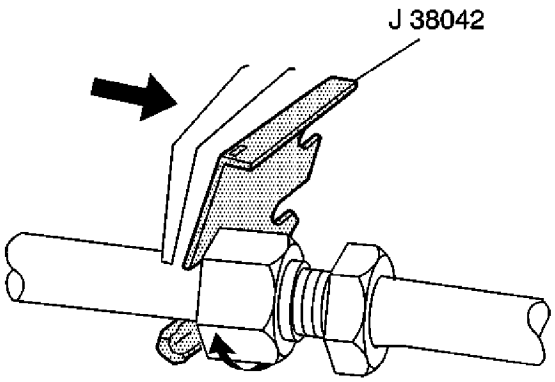
O-Ring Replacement

Removal Procedure

Tools Required

- J 38042 Dual O-Ring Joint Separator
- J 39500-B A/C Refrigerant Recovery, Recycling, and Recharging (ACR4) System

1. Recover the refrigerant. Refer to *Refrigerant Recovery and Recharging* .





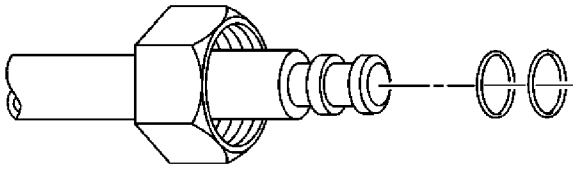
2. Place the J 38042 on the refrigerant line directly behind the female nut of the dual O-ring joint.

   Hold pressure against the nut.

3. Loosen the female nut until the seal of the dual O-ring joint is broken. This procedure aids in the seal separation.
4. After the seal is broken, slightly tighten the female nut to facilitate the J 38042 removal.
5. Remove the female nut. Separate the connection.

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6. Use a non-metallic tool to remove the O-rings.

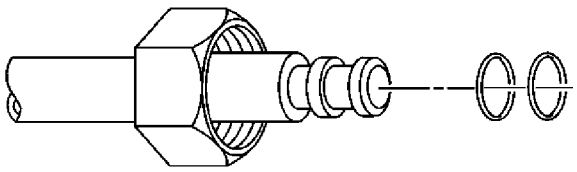
   The use of a non-metallic tool minimizes the chance of impairing the seal surfaces.

7. Inspect the line for kinks and dents.
8. Inspect the connection for the burrs and nicks.

Installation Procedure

Tools Required

J 39400 Electronic Halogen Leak Detector



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1. Lubricate the O-rings using 525 oil or mineral oil before installation.
2. Install the O-rings.
3. Oil the bore using a small amount of refrigerant oil before assembly.
4. Align the end forms for pilot-to-bore insertion.
5. Push the pilot and the bore together completely.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

6. Install the female nut.

   Tighten
   Tighten the nut to 24 N·m (18 lb ft).

7. Recharge the A/C system. Refer to *Refrigerant Recovery and Recharging* .
8. Leak test the system. Refer to *Leak Testing* .

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Air Conditioning Compressor Hose Replacement

Removal Procedure

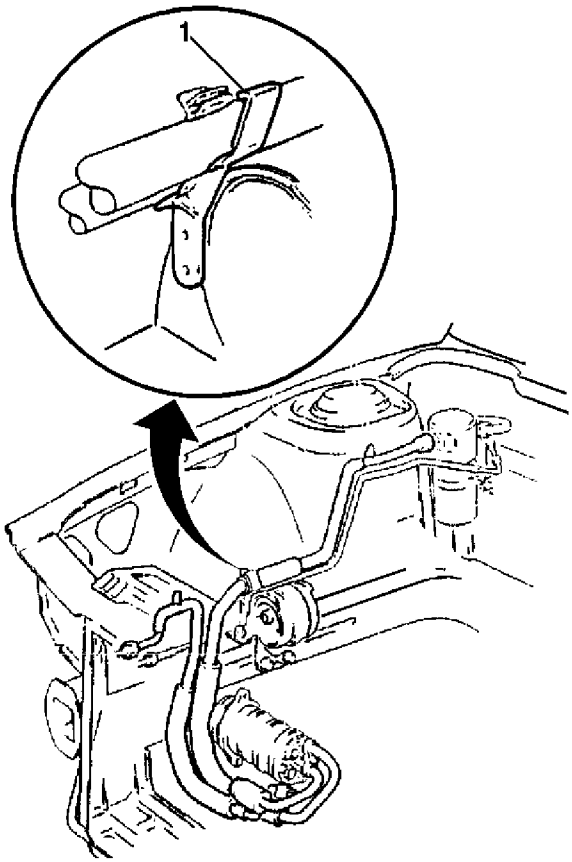
Tools Required

- J 38042 Dual O-Ring Joint Separator
- J 39500-B A/C Refrigerant Recovery, Recycling, and Recharging (ACR4) System

1. Recover the refrigerant. Refer to *Refrigerant Recovery and Recharging* .

   Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

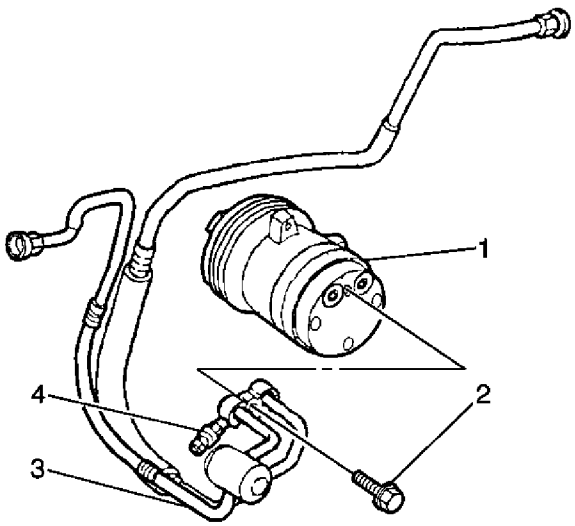
2. Disconnect the negative battery cable.



3. Remove the upper A/C line clip (1).

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4. Disconnect the A/C line connection from the accumulator outlet using the J 38042 .
5. Disconnect the A/C line connection from the condenser inlet using the J 38042 .
6. Remove the A/C compressor splash shield.



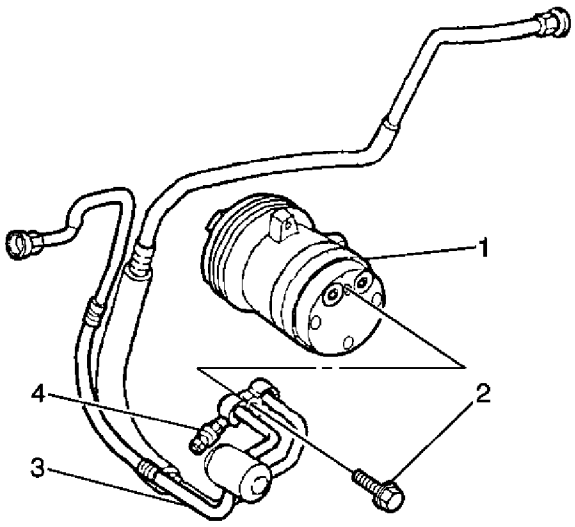


7. Disconnect the electrical connector from the A/C pressure switch (4).
8. Remove the bolt (2) that attaches the A/C compressor hose assembly (3), from the rear of the A/C compressor (1).
9. Remove the A/C compressor hose assembly (3) from the vehicle.

Installation Procedure

Tools Required

J 39400 Electronic Halogen Leak Detector



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1. Install the A/C compressor hose assembly (3) into the vehicle.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the bolt (2) in order to attach the A/C compressor hose assembly (3) to the rear of the A/C compressor (1).

   Tighten
   Tighten the bolt to 30 N·m (22 lb ft).

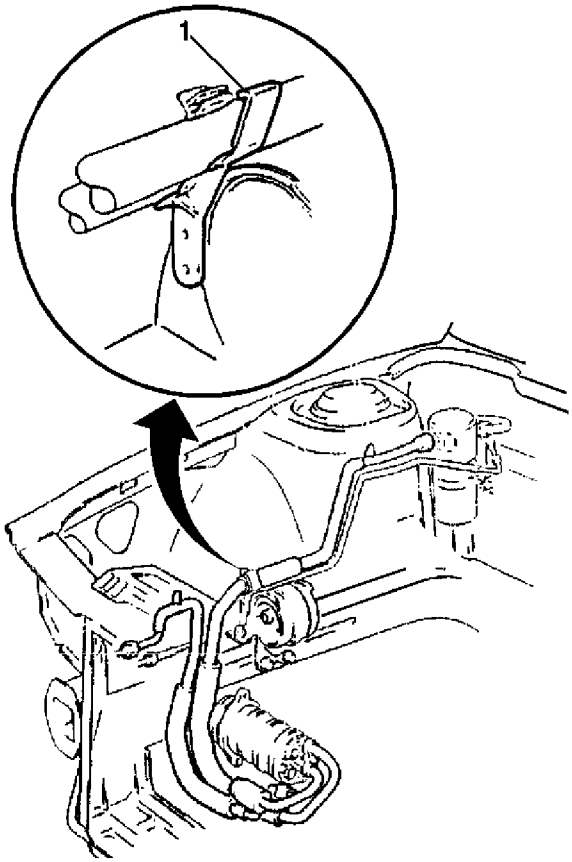
3. Connect the electrical connector to the A/C pressure switch (4).
4. Connect the A/C line connection to the condenser inlet.

   Tighten
   Tighten the condenser inlet connection to 24 N·m (18 lb ft).

5. Connect the A/C line connection to the accumulator outlet.

   Tighten
   Tighten the accumulator outlet connection to 24 N·m (18 lb ft).

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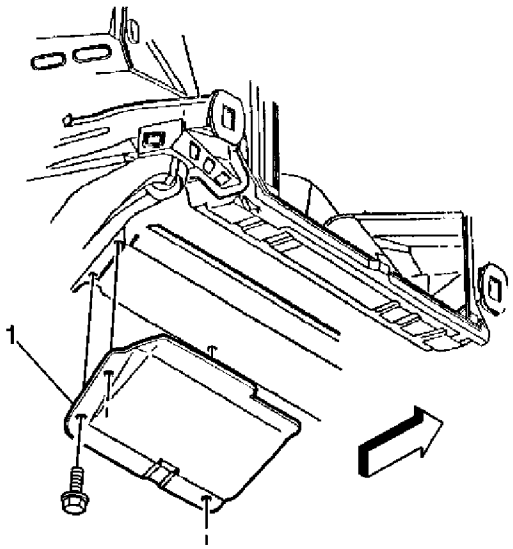


6. Install the upper A/C line clip (1).
7. Connect the negative battery cable.

Tighten
Tighten the negative battery cable to 15 N·m (11 lb ft).

8. Recharge the A/C system. Refer to *Refrigerant Recovery and Recharging* .
9. Test the A/C system for leaks. Refer to *Leak Testing* .

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10. Install the A/C compressor splash shield (1).

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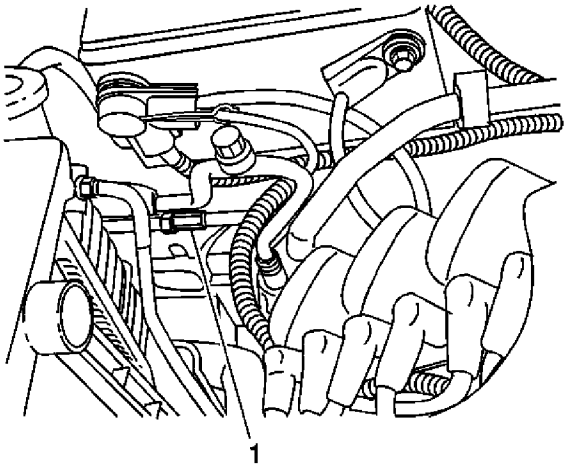
Expansion (Orifice) Tube Replacement

Removal Procedure

Tools Required

- J 26549-E Expansion Tube Remover
- J 38042 Dual O-Ring Joint Separator
- J 39500-B A/C Refrigerant Recovery, Recycling, and Recharging (ACR4) System

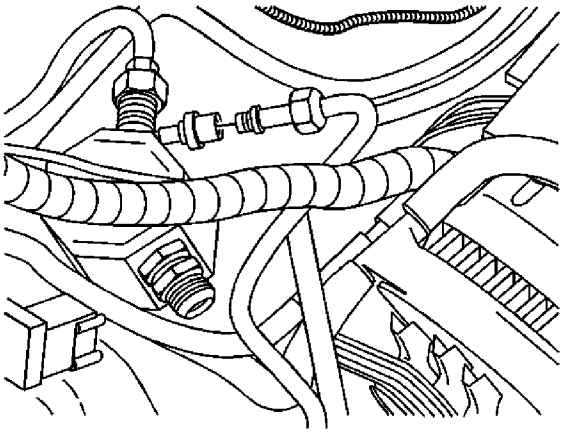
1. Recover the refrigerant. Refer to *Refrigerant Recovery and Recharging* .



2. Remove the dual O-ring joint (1) of the condenser outlet using the J 38042 .

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3. Remove the dual O-ring joint of the evaporator inlet using the J 38042 .
4. Remove the A/C line clips.

Object Number: 247323 Size: SH

5. Remove the expansion tube from the line using the J 26549-E .

Installation Procedure

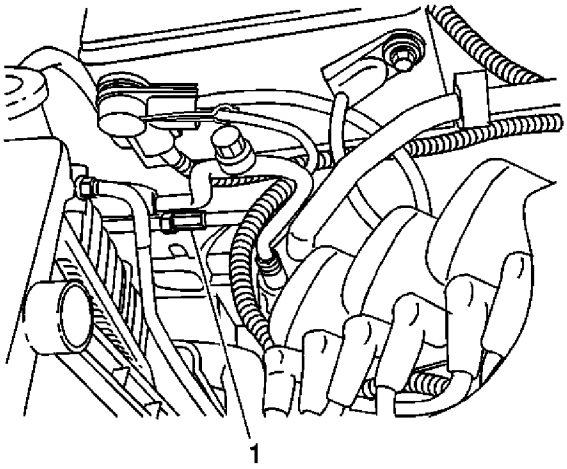
Tools Required

J 39400 Electronic Halogen Leak Detector

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Object Number: 247323 Size: SH

1. With the short screen toward the evaporator, install the expansion tube.
2. Position the line and install the A/C line clips.



3. Assemble the dual O-ring joints of the evaporator inlet and the condenser outlet (1).
4. Hand tighten the dual O-ring joints in order to assure correct line orientation.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

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5. Tighten the dual O-ring connections.

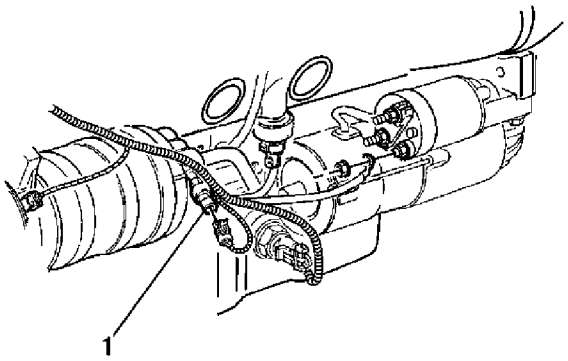
   Tighten
   Tighten the dual O-ring connections to 24 N·m (18 lb ft).

6. Recharge the A/C system. Refer to *Refrigerant Recovery and Recharging* .
7. Test the A/C system for leaks. Refer to *Leak Testing* .

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Air Conditioning (A/C) Refrigerant Pressure Sensor Replacement

Removal Procedure



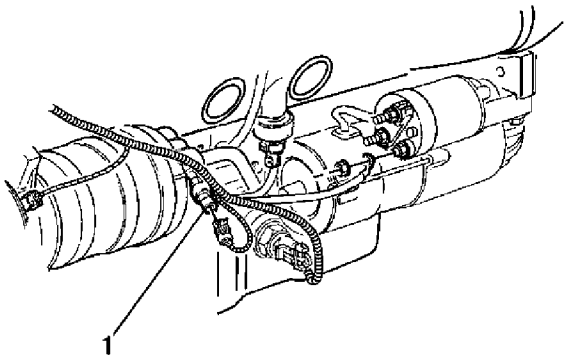
1. Disconnect the electrical connection from the switch (1).
2. Remove the following components:
   - The switch
   - The O-ring seal

Installation Procedure

1. Lubricate the O-ring using clean 525 oil or mineral oil.

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2. Install the O-ring seal.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the switch (1).

Tighten
Tighten the switch to 5 N·m (44 lb in).

4. Connect the electrical connection to the switch (1).

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Air Conditioning Condenser Replacement

Removal Procedure

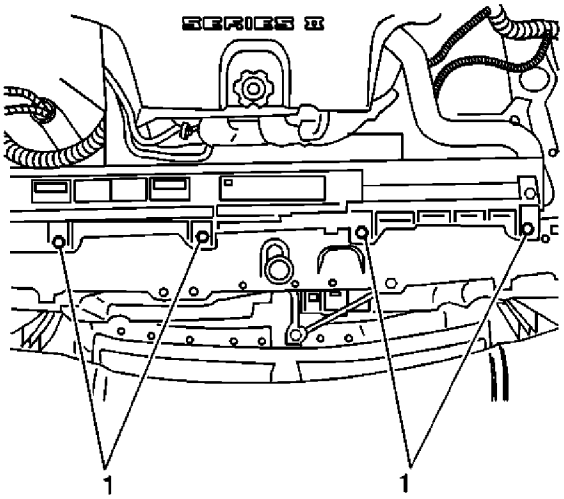
Tools Required

- J 39500-B A/C Refrigerant Recovery, Recycling, and Recharging (ACR4) System
- J 38042 Dual O-Ring Joint Separator

1. Recover the refrigerant. Refer to *Refrigerant Recovery and Recharging* .

   Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

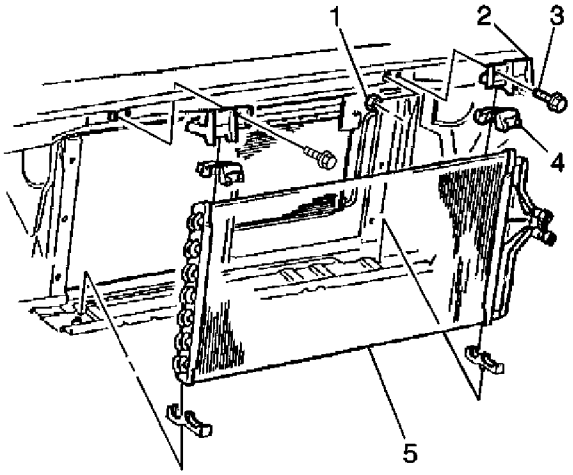
2. Disconnect the negative battery cable.
3. Remove the air cleaner assembly. Refer to Air Cleaner Assembly Replacement in Engine Controls.



4. Remove the bolts (1) from the upper radiator panel.
5. Remove the upper radiator panel.

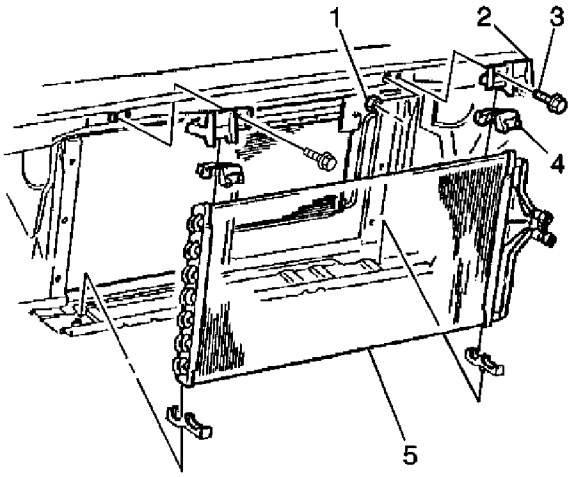
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6. Remove the inlet line from the condenser (5).
7. Remove the outlet line from the condenser (5).
8. Remove the nuts (1) and the bolts (3) from the mounting brackets (2).
9. Remove the upper insulators (4).
10. Remove the condenser (5) by tilting the radiator toward the engine.

Installation Procedure



1. Install the condenser (5) into position by tilting the radiator toward the engine.
2. Install the upper insulators (4).

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Notice: Use the correct fastener in the correct location. Replacement fasteners must be the

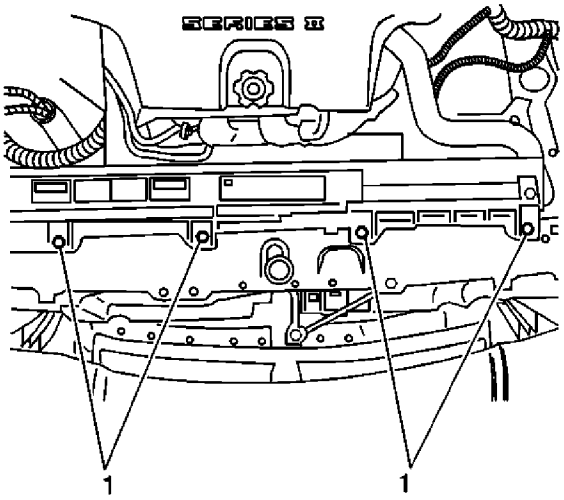
correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the nuts (1) and the bolts (3) to the mounting brackets (2).

Tighten
Tighten the bolts to 12 N·m (106 lb in).

4. Install the outline line to the condenser (5).
5. Install the inlet line to the condenser.

Tighten
Tighten the condenser connections to 24 N·m (18 lb ft).





6. Install the upper radiator panel.
7. Install the upper radiator panel bolts (1).

Tighten
Tighten the bolts to 12 N·m (106 lb in).

8. Install the air cleaner assembly. Refer to Air Cleaner Assembly Replacement in Engine Controls.
9. Recharge the A/C system. Refer to *Refrigerant Recovery and Recharging*
10. Leak test the system. Refer to *Leak Testing* .

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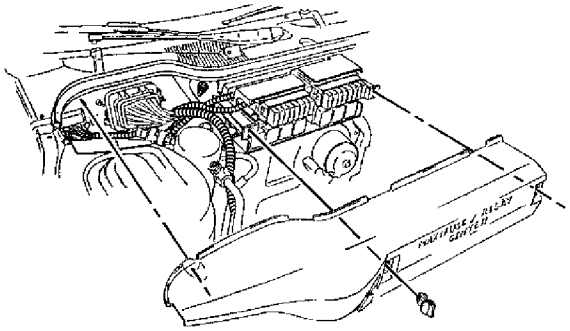
Air Conditioning Accumulator Replacement

Removal Procedure

Tools Required

- J 39500-B A/C Refrigerant Recovery, Recycling, and Recharging (ACR4) System
- J 38042 Dual O-Ring Joint Separator

1. Recover the refrigerant. Refer to *Refrigerant Recovery and Recharging* .
2. Remove the cross car support brace. Refer to Cross Vehicle Brace Replacement in Body Front End.

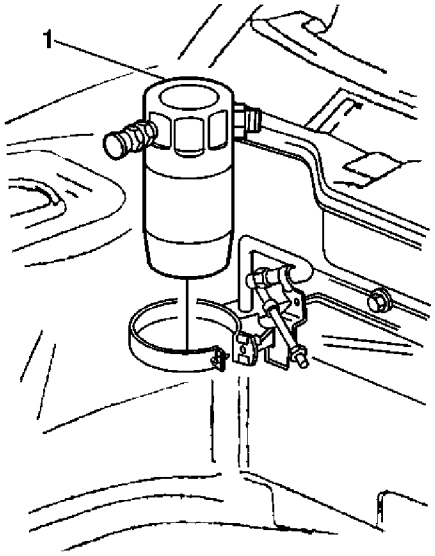




3. Remove the sight shield of the rear engine.
4. Loosen the retaining clamp screw.
5. Use the J 38042 to disconnect the accumulator inlet and outlet connections.
6. Remove the retaining clamp screw.

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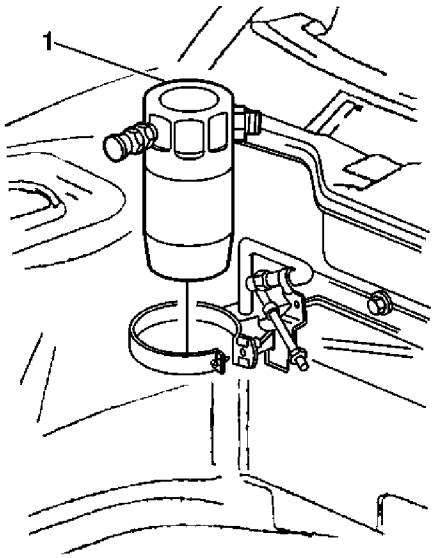


7. Remove the accumulator (1).

Installation Procedure

Tools Required

J 39400 Electronic Halogen Leak Detector



1. Install the accumulator (1).

tomsn048@gmai**Notice:** Use the correct fastener in the correct location. Replacement fasteners must be the

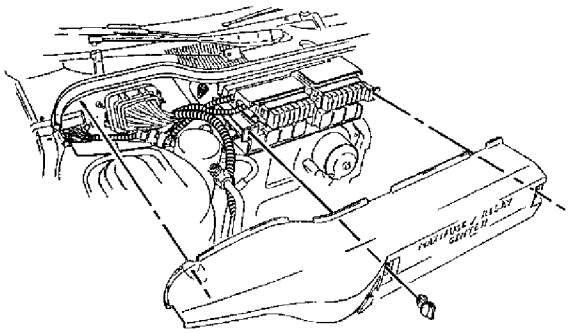
correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the retaining clamp screw.

   Tighten
   Tighten the screw to 6 N·m (53 lb in).

3. Connect and torque the accumulator inlet and outlet connections.

   Tighten
   Tighten the accumulator connections to 34 N·m (25 lb ft).





4. Install the sight shield of the rear engine.
5. Install the cross car brace. Refer to Cross Vehicle Brace Replacement in Body Front End.
6. Recharge the A/C system. Refer to *Refrigerant Recovery and Recharging* .
7. Leak test the system. Refer to *Leak Testing* .

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Blower Motor Control Module Replacement

Removal Procedure

Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

1. Disconnect the negative battery cable.
2. Remove the rear engine sight shield.
3. Disconnect the positive booster cable from the multi-use relay center.
4. Move the underhood fuse block out of the way.
5. Disconnect the electrical connectors from the blower control module.
6. Remove the blower control module from the blower module.

Installation Procedure

1. Install the blower control module to the blower module.
2. Connect the electrical connectors to the blower control module.
3. Move the underhood fuse block to the original position before removal.
4. Connect the positive booster cable to the multi-use relay center.
5. Install the rear engine sight shield.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

6. Connect the negative battery cable.

Tighten
Tighten the negative battery cable to 15 N·m (11 lb ft).

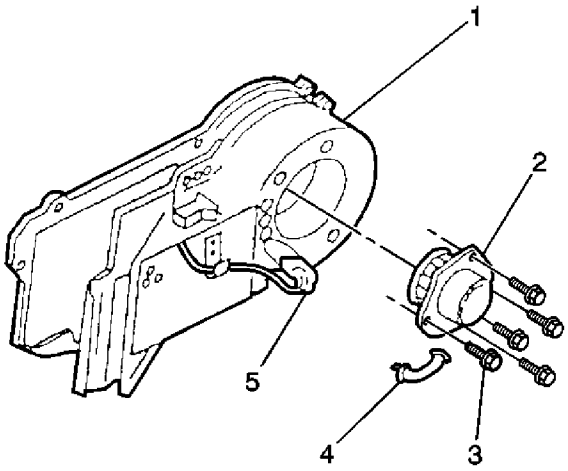
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Blower Motor and Fan Replacement

Removal Procedure

1. Remove the cross car support brace. Refer to Cross Vehicle Brace Replacement in Body Front End.
2. Remove the rear spark plug wires and bracket and set aside.

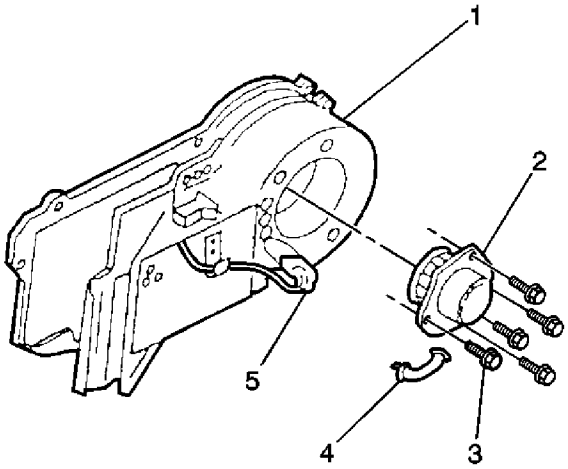


3. Disconnect the electrical connector (5) from the blower motor (2).
4. Remove the cooling tube (4) from the blower motor (2).
5. Remove the screws (3) that attach the blower motor (2) to the blower module assembly (1).
6. Remove the blower motor (2).

Installation Procedure

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1. Install the blower motor (2).

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the screws (3) to the blower motor (2).

   Tighten
   Tighten the screws to 6 N·m (55 lb in).

3. Install the cooling tube (4) to the blower motor (2).
4. Connect the electrical connector (5) to the blower motor (2).
5. Install the rear spark plug wires and bracket.
6. Install the cross car support brace. Refer to Cross Vehicle Brace Replacement in Body Front End.

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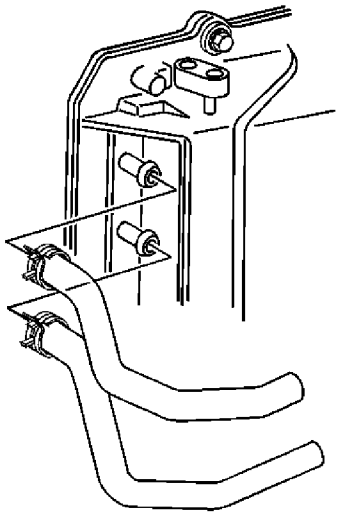
HVAC Module Assembly Replacement

Removal Procedure

Tools Required

- J 38042 Dual O-Ring Joint Separator
- J 37097-A MUBEA Hose Clamp Pliers
- J 39500-B A/C Refrigerant Recovery, Recycling, and Recharging (ACR4) System
- J 39400 Electronic Halogen Leak Detector

1. Recover the refrigerant. Refer to *Refrigerant Recovery and Recharging* .
2. Remove the cross car support brace. Refer to Cross Vehicle Brace Replacement in Body Front End.
3. Remove the IP assembly. Refer to Instrument Panel Assembly Removal in Instrument Panel, Gauges and Console.
4. Drain the cooling system. Refer to Cooling System Draining and Filling .
5. Disconnect the right bank spark plug wires and bracket. Refer to Spark Plug Wire Harness Replacement in Engine Electrical.
6. Remove the evaporator. Refer to *Evaporator Core Replacement* .

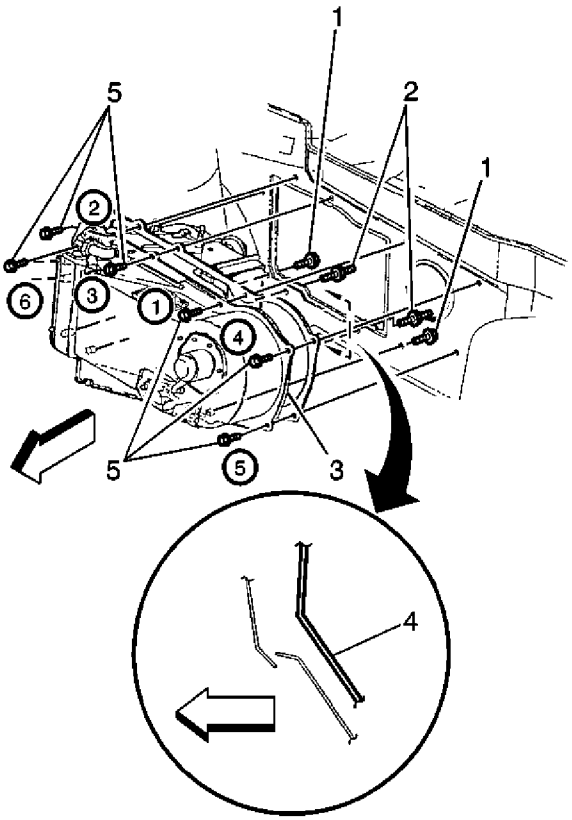




7. Remove the heater hoses from the heater core using the J 37097-A .
8. Remove the power steering pump. Refer to Power Steering Pump Replacement in Power Steering Systems.
9. Remove the air distributor. Refer to *Air Distributor Duct Replacement* .
10. Remove the aspirator adapter (C68 and CJ2).
11. Remove the heater and A/C programmer (C68 and CJ2). Refer to Programmer Replacement .

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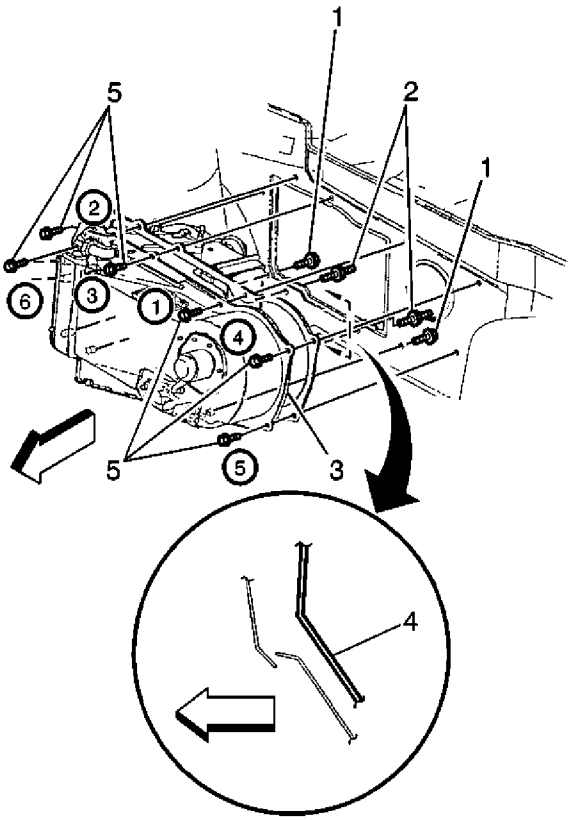
12. Remove the bolts (5) that attach the heater and A/C module assembly (3) to the front of the dash (4).
13. Remove the bolts (1) and the studs (2) that attach the heater and A/C assembly (3) to the front of the dash (4).
14. Reposition the insulation as needed.
15. Remove the remainder of the heater and A/C module assembly (3).

    Rotate the assembly (3) as needed to clear the right rear corner of the engine.

16. If replacing the heater and A/C module assembly (3), transfer the heater core to a new module assembly (3).

Installation Procedure

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1. Install the heater and A/C module assembly (3) (partial).

   Rotate the assembly (3) as needed to clear the right rear corner of the engine.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the bolts (1) and the studs (2) to attach the heater and A/C module assembly (3) to the rear of the dash (4).

   Reposition the insulation as needed.

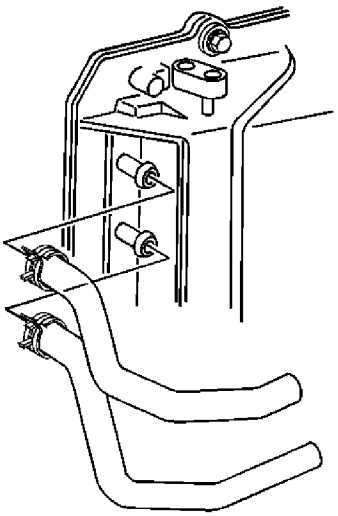
   Tighten
   Tighten the bolts and the studs to 5 N·m (44 lb in).

3. Install the bolts (5) to attach the heater and A/C module assembly (3) to the front of the dash (4).

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Tighten
Tighten the bolts to 5 N·m (44 lb in).

4. Install the heater and A/C programmer (C68 and CJ2). Refer to Programmer Replacement .
5. Install the aspirator adapter (C68 and CJ2).
6. Install the air distributor. Refer to *Air Distributor Duct Replacement* .
7. Install the vacuum source input to the right side of the air distributor.
8. Install the power steering pump. Refer to Power Steering Pump Replacement in Power Steering Systems.



9. Install the heater hoses to the heater core using the J 37097-A .
10. Install the evaporator. Refer to *Evaporator Core Replacement* .
11. Connect the right bank spark plug wires and bracket. Refer to Spark Plug Wire Harness Replacement in Engine Electrical.
12. Install the IP assembly. Refer to Instrument Panel Assembly Removal in Instrument Panel, Gauges and Console.
13. Install the cross car brace support. Refer to Cross Vehicle Brace Replacement in Body Front End.
14. Fill the cooling system. Refer to Cooling System Draining and Filling .
15. Recharge the A/C system. Refer to *Refrigerant Recovery and Recharging*
16. Leak test the system. Refer to *Leak Testing* .

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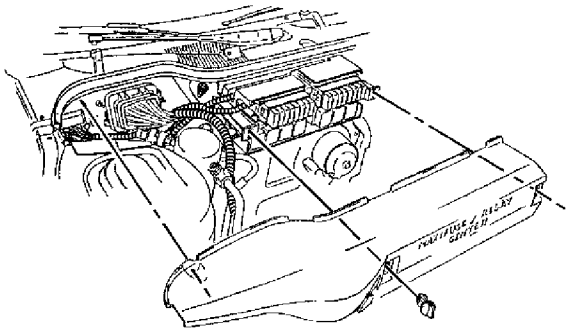
Air Conditioning Evaporator Core Replacement

Removal Procedure

Tools Required

- J 38042 Dual O-Ring Joint Separator
- J 39500-B A/C Refrigerant Recovery, Recycling, and Recharging (ACR4) System
- J 39400 Electronic Halogen Leak Detector

1. Recover the refrigerant. Refer to *Refrigerant Recovery and Recharging* .
2. Remove the cross car support brace. Refer to Cross Vehicle Brace Replacement in Body Front End.

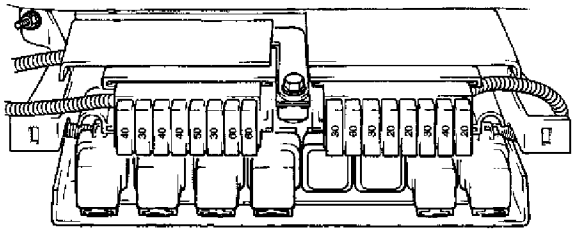




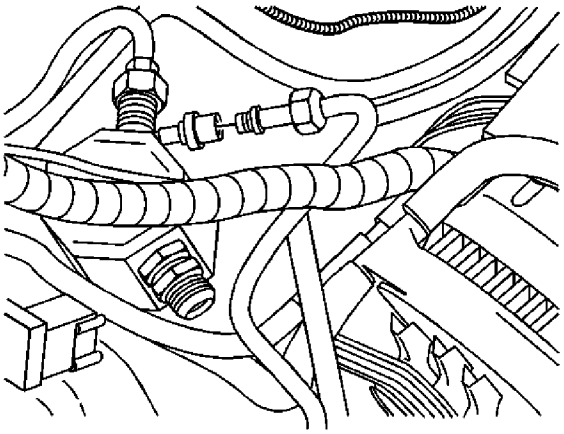
3. Remove the fuse block cover.
4. Remove the accumulator. Refer to *Accumulator Replacement* .

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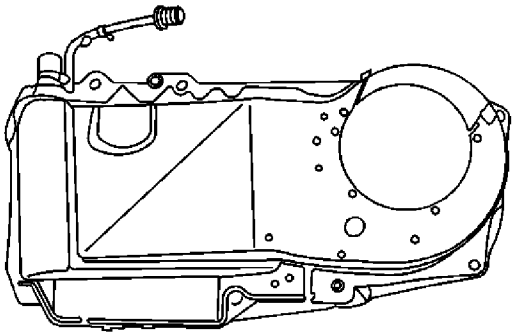


5. Remove the positive booster cable from the multi-use relay center.
6. Position the under hood fuse block out of the way.



7. Remove the evaporator tube from the evaporator.
8. Remove the wire harness clip from the HVAC module.
9. Remove the accumulator bracket.
10. Remove the heat shield of the HVAC module.
11. Following the cut line, cut the top side of the HVAC module cover.
12. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.

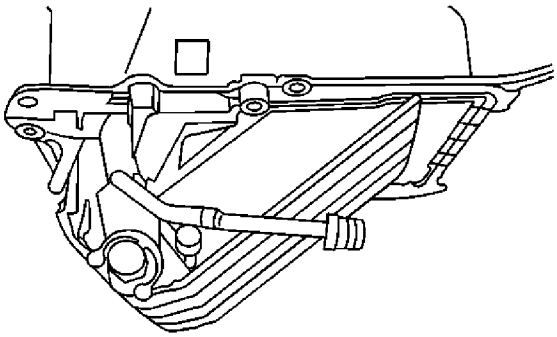
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13. Following the cut line, cut the bottom side of the HVAC module cover.
14. Lower the vehicle.
15. Remove the fuel line clip from the HVAC module.
16. Remove the insulator from the module.
17. Remove the bolt that attaches the heater and A/C module assembly to the inside of the vehicle.

    Remove the blower module from the HVAC module assembly.

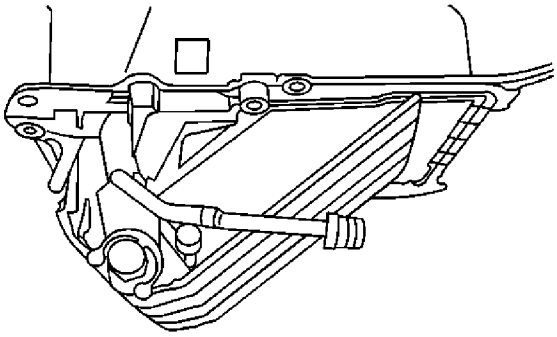




18. Remove the evaporator core.

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Installation Procedure



1. Install the evaporator core.
2. Install the blower module to the HVAC module assembly.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the bolts.

   Tighten
   Tighten the bolts to 5 N·m (44 lb in).

4. Install the bolt to attach the heater and A/C module assembly to the inside of the vehicle.

   Tighten
   Tighten the bolt to 5 N·m (44 lb in).

5. Install the insulator to the module.
6. Install the fuel line clip to the HVAC module.
7. Install the HVAC module heat shield.
8. Install the bolts.

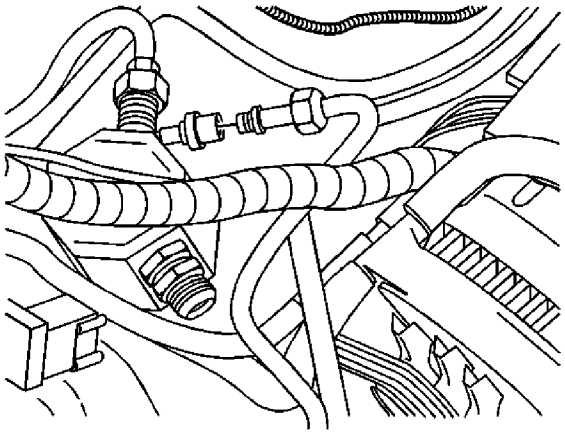
   Tighten
   Tighten the bolts to 5 N·m (44 lb in).

9. Install the accumulator bracket.
10. Install the screws.

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Tighten
Tighten the screws to 6 N·m (53 lb in).

11. Install the wire harness clip to the HVAC module.

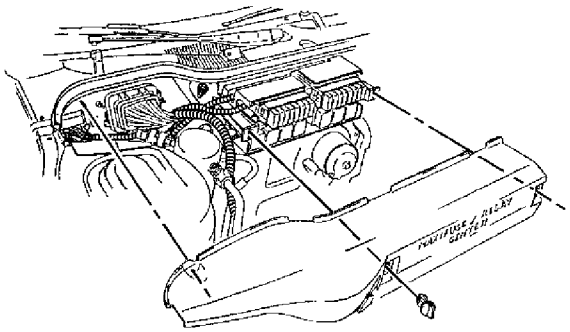




12. Install the evaporator tube to the evaporator.

Tighten
Tighten the evaporator tube connection to 24 N·m (18 lb ft).

13. Reposition the under hood fuse block to the original position.
14. Install the booster cable from the multi-use relay center.
15. Install the accumulator. Refer to *Accumulator Replacement* .





16. Install the fuse block cover.

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17. Install the cross car support. Refer to Cross Vehicle Brace Replacement in Body Front End.
18. Recharge the A/C system. Refer to *Refrigerant Recovery and Recharging* .
19. Leak test the system. Refer to *Leak Testing* .

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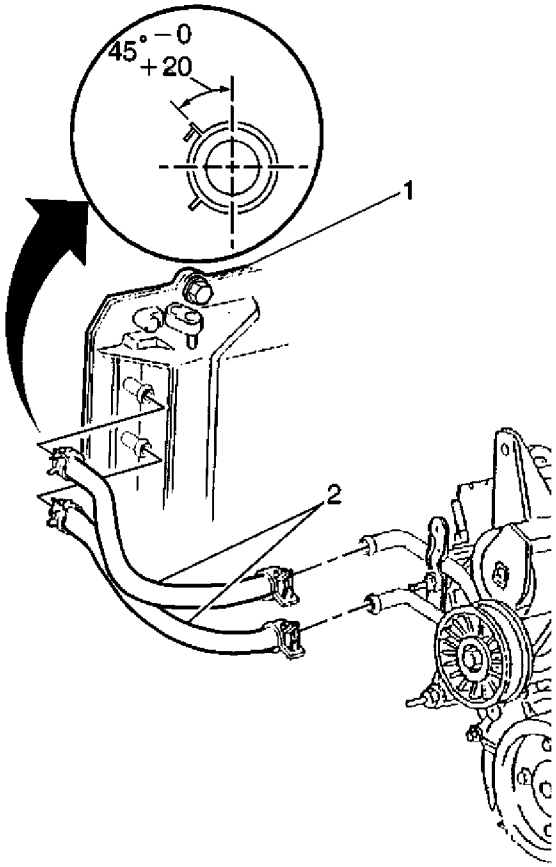
Heater Core Replacement

Removal Procedure

Tools Required

J 37097-A Hose Clamp Pliers

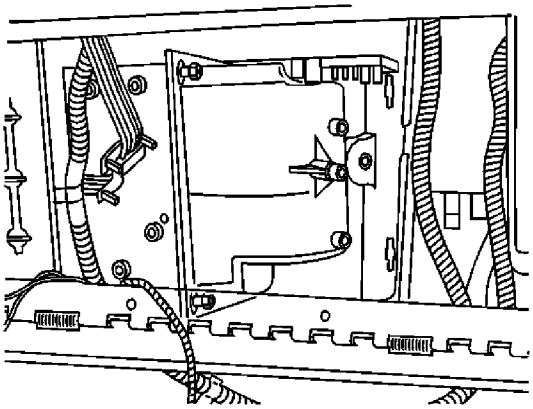
1. Drain the cooling system. Refer to Cooling System Draining and Filling in Engine Cooling.



2. Remove the heater hoses (2) from the heater core using the J 37097-A .
3. Remove the right sound insulator. Refer to Instrument Panel Insulator Panel Replacement - Right Side in Instrument Panel, Gauges and Console.
4. Remove the I/P compartment. Refer to Instrument Panel Storage Compartment Replacement in Instrument Panel, Gauges and Console.
5. Remove the temperature valve actuator. Refer to Temperature Actuator Replacement .
6. Remove the HVAC programmer (C68). Refer to Programmer Replacement

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7. Remove the heater core cover retaining screws.
8. Remove the heater core cover.
9. Remove the heater core retaining screws.
10. Remove the heater core.

Installation Procedure

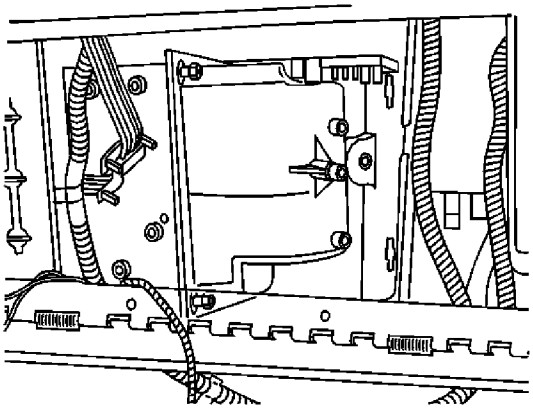
1. Install the heater core into the vehicle.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the attaching screws.

   Tighten
   Tighten the screws to 1.4 N·m (12 lb in).

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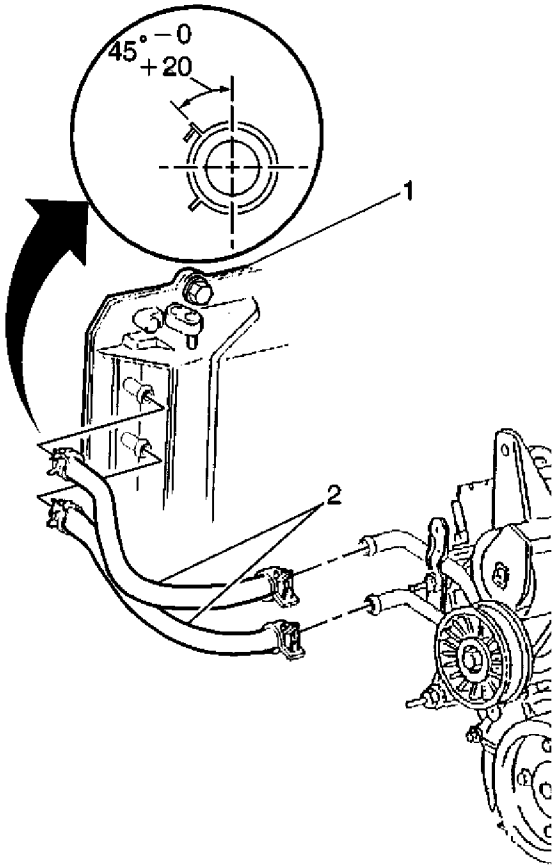


3. Install the heater core cover.
4. Install the attaching screws.

Tighten
Tighten the screws to 1.4 N·m (12 lb in).

5. Install the HVAC programmer (C68). Refer to Programmer Replacement
6. Install the temperature valve actuator. Refer to Temperature Actuator Replacement .
7. Install the right sound insulator. Refer to Instrument Panel Insulator Panel Replacement - Right Side in Instrument Panel, Gauges and Console.
8. Install the I/P compartment. Refer to Instrument Panel Storage Compartment Replacement in Instrument Panel, Gauges and Console.

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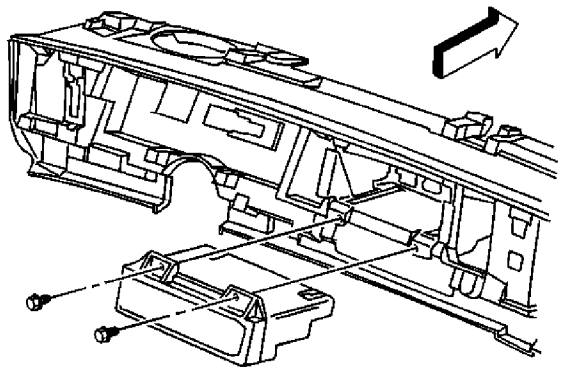
9. Install the heater hoses (2) to the heater core using the J 37097-A .
10. Fill the cooling system. Refer to Cooling System Draining and Filling in Engine Cooling.

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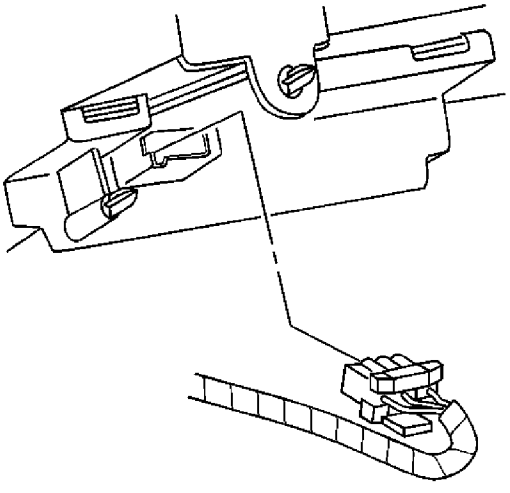
Control Assembly Replacement (Buick)

Removal Procedure

1. Remove the I/P cluster trim plate. Refer to Instrument Cluster Trim Panel Replacement in Instrument Panel, Guages and Console.



2. Remove the retaining screws from the HVAC control assembly.
3. Pull the assembly out from the instrument panel.

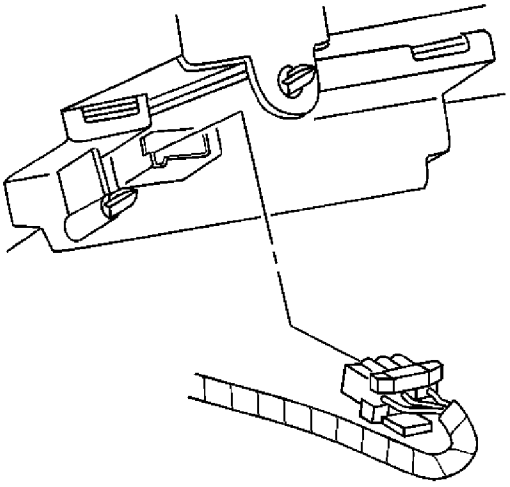


4. Disconnect the electrical connector and remove the HVAC control assembly.

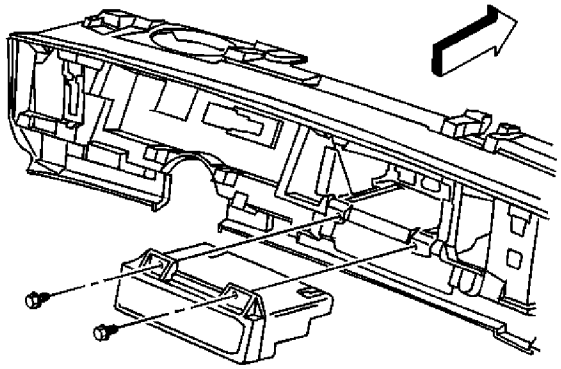
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Installation Procedure



1. Connect the electrical connector to the HVAC control assembly.



2. Install the HVAC control assembly into the instrument panel.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

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3. Install the retaining screws to secure the HVAC control assembly.

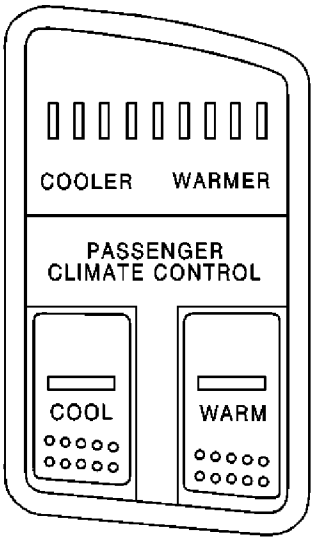
   Tighten
   Tighten the fasteners to 1.8 N·m (16 lb in).

4. Install the I/P cluster trim plate. Refer to Instrument Cluster Trim Panel Replacement in Instrument Panel, Guages and Console.

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Control Assembly Replacement - Passenger (Buick)

Removal Procedure

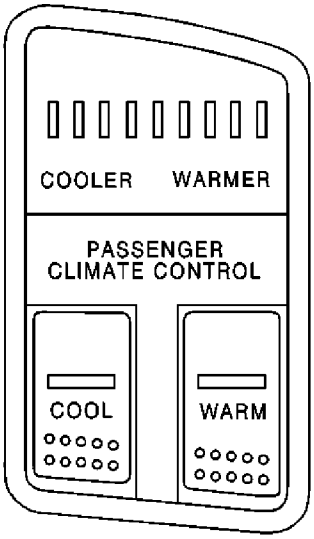


1. Remove the door handle insert. Refer to Front Side Door Trim Panel Insert Replacement in Doors.
2. Remove the right door pad. Refer to Front Side Door Trim Panel Replacement in Doors.
3. Remove the 2 retaining screws.
4. Remove the passenger climate control.

Installation Procedure

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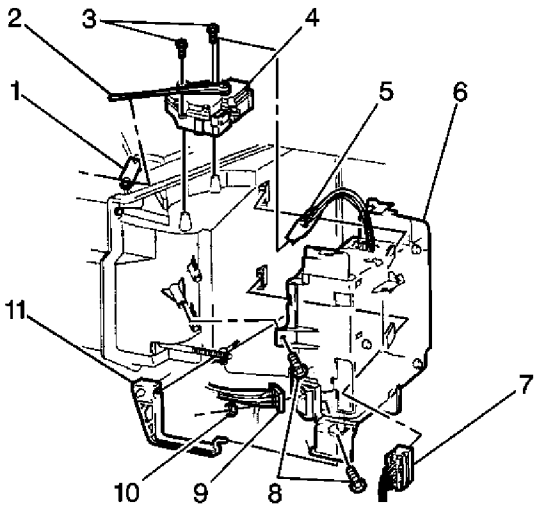
1. Install the passenger climate control.
2. Install the 2 retaining screws.
3. Install the right door pad. Refer to Front Side Door Trim Panel Replacement in Doors.
4. Install the door handle insert. Refer to Front Side Door Trim Panel Insert Replacement in Doors.

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Programmer Replacement (Buick, Oldsmobile)

Removal Procedure

1. Remove the I/P compartment. Refer to Instrument Panel Storage Compartment Replacement in Instrument Panel, Guages and Console.
2. Remove the right sound insulator. Refer to Instrument Panel Insulator Panel Replacement - Right Side in Instrument Panel, Guages and Console.

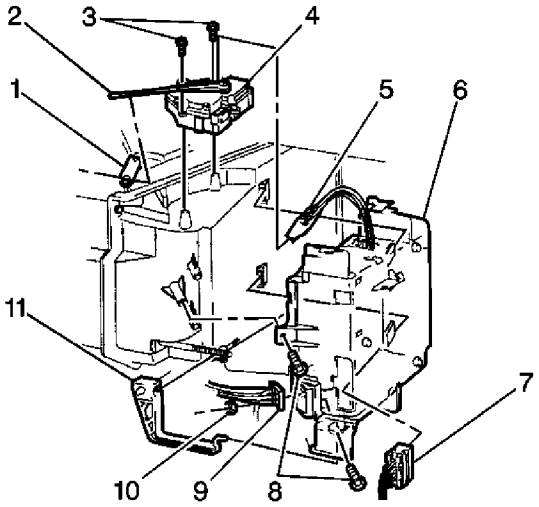


3. Disconnect the electrical connectors (7).
4. Disconnect the vacuum connectors (9).
5. Remove the rod from the driver temperature valve link (11).
6. Remove the screws (8) that mount the programmer (6) to the vehicle.
7. Remove the programmer (6).

Installation Procedure

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1. Install the programmer (6) into position.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the screws (8) in order to secure the programmer (6).

   Tighten
   Tighten the screws to 1.4 N·m (12 lb in).

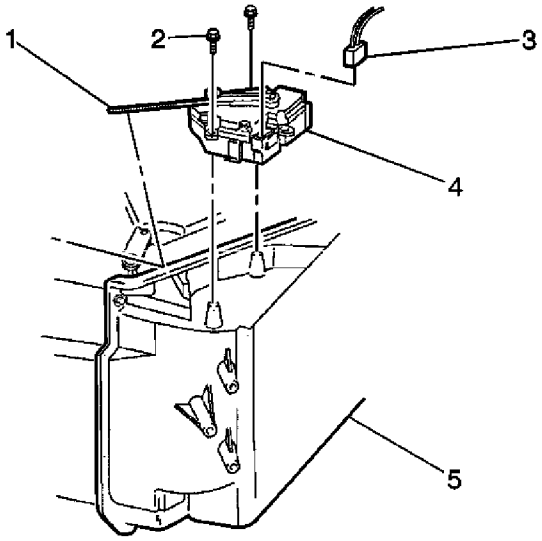
3. Connect the electrical connectors (7).
4. Connect the vacuum connectors (9).
5. Install the rod to the driver temperature valve link (11).
6. Adjust the rod to the temperature valve link. Refer to Temperature Valve Link Adjustment .
7. Install the right sound insulator. Refer to Instrument Panel Insulator Panel Replacement - Right Side in Instrument Panel, Guages and Console.
8. Install the I/P compartment. Refer to Instrument Panel Storage Compartment Replacement in Instrument Panel, Guages and Console.

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Temperature Actuator Replacement

Removal Procedure

1. Remove the instrument panel assembly. Refer to Instrument Panel Assembly Removal in Instrument Panel, Guages and Console.

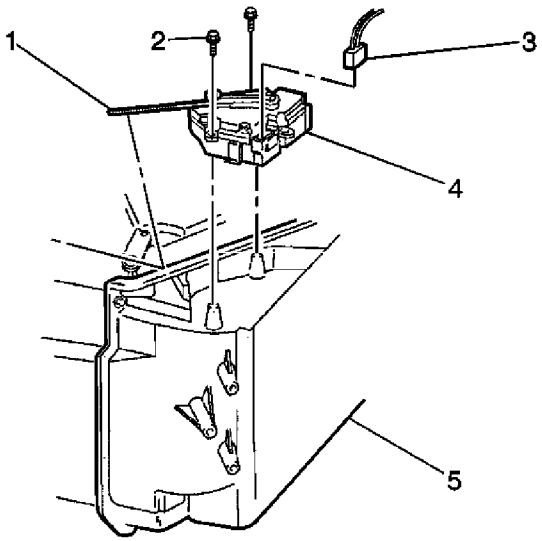


2. Remove the temperature valve link rod (1) from the temperature valve by snapping the rod out of the valve.
3. Disconnect the electrical connector (3) from the A/C temperature valve actuator (4).
4. Remove the screws (2) which retain the actuator to the heater and A/C module (5).
5. Remove the actuator.

Installation Procedure

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1. Install the A/C temperature and valve actuator (4) to the heater and A/C module (5).

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the screws (2).

   Tighten
   Tighten the screws to 1.4 N·m (12 lb in).

3. Connect the electrical connector (3) to the A/C temperature valve actuator.

   Important: Adjust the temperature valve link rod prior to installation. Refer to Temperature Valve Link Adjustment

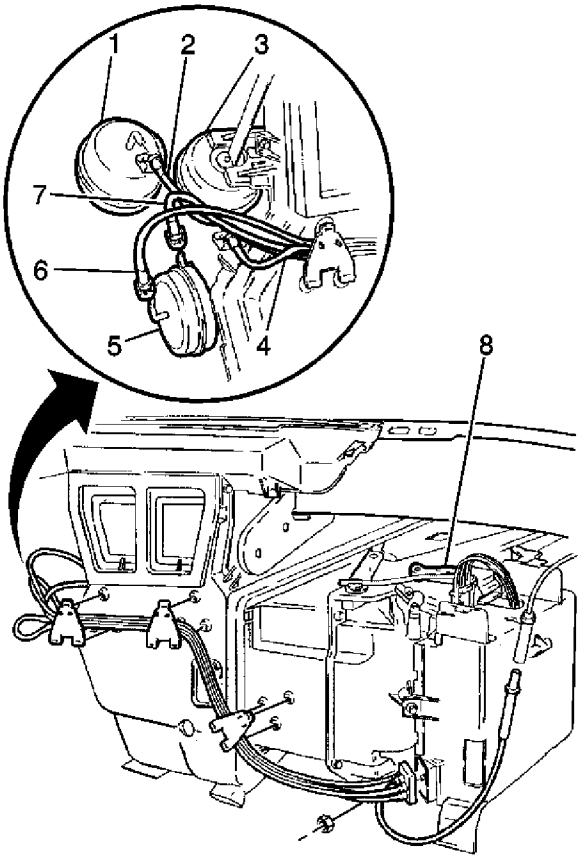
4. Install the temperature valve link rod (1) to the temperature valve, by snapping the rod into place.
5. Install the instrument panel assembly. Refer to Instrument Panel Assembly Removal in Instrument Panel, Guages and Console.

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Heater/Bi-Level Actuator Replacement

Removal Procedure

1. Remove the air distributor assembly. Refer to *Air Distributor Duct Replacement* .
2. Remove the clip and the screws that fasten the 2 halves of the air distributor assembly:

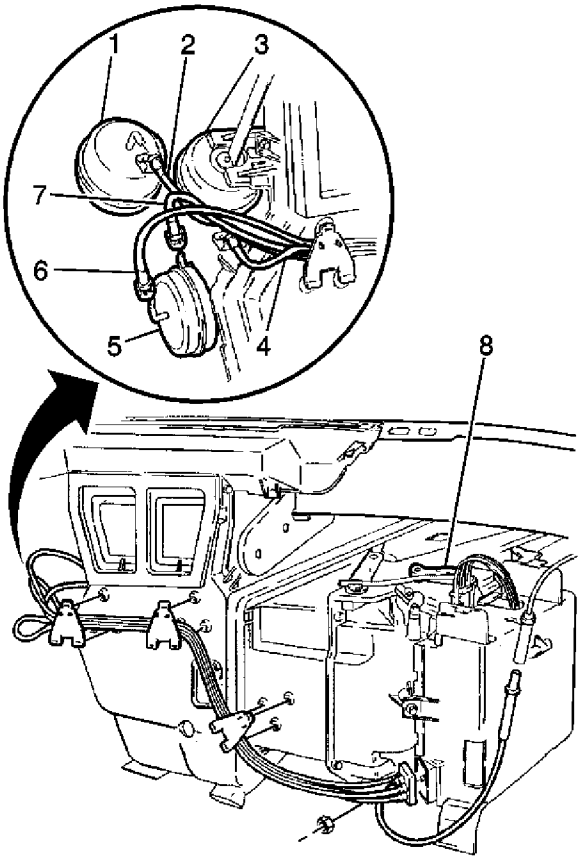


- Separate the air distributor assembly.
- In order to disconnect the vacuum actuator (5) from the air distributor assembly, unclip and disengage the vacuum actuator (5) from the valve.

Installation Procedure

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1. In order to connect the vacuum actuator (5) to the air distributor assembly, clip and engage the vacuum actuator to the valve.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Fasten the 2 halves of the air distributor assembly.

   Tighten
   Tighten the screws to 1.5 N·m (13 lb in).

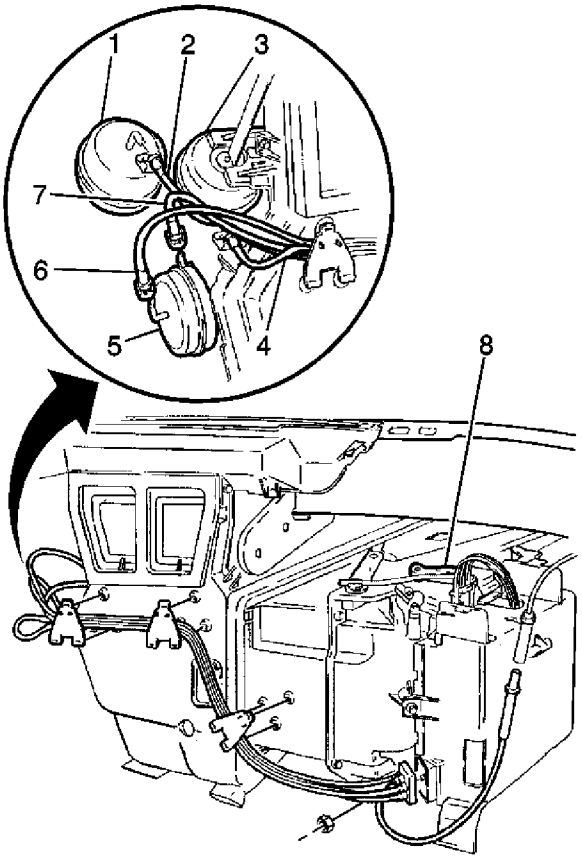
3. Install the air distributor assembly. Refer to *Air Distributor Duct Replacement* .

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Air Inlet Actuator Replacement

Removal Procedure

1. Remove the left sound insulator. Refer to Instrument Panel Insulator Panel Replacement - Left Side in Instrument Panel, Guages and Console.

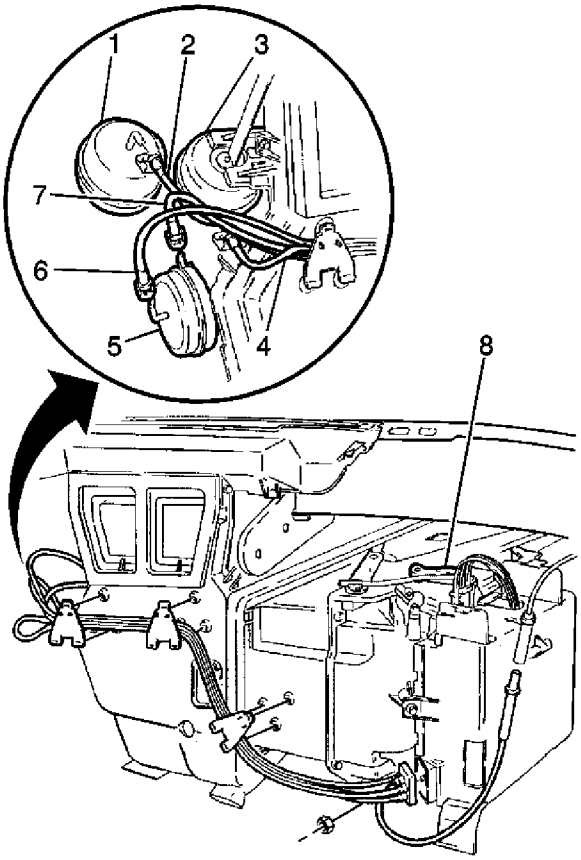


2. Disconnect the vacuum hose from the outside air/recirculation actuator (1).
3. Unclip the outside air/recirculation actuator (1) from the air inlet.
4. Disengage the outside air/recirculation actuator (1) from the valve.

Installation Procedure

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1. Engage the outside air/recirculation actuator (1) to the valve.
2. Clip the outside air/recirculation actuator (1) to the air inlet.
3. Connect the vacuum hose to the outside air/recirculation actuator (1).

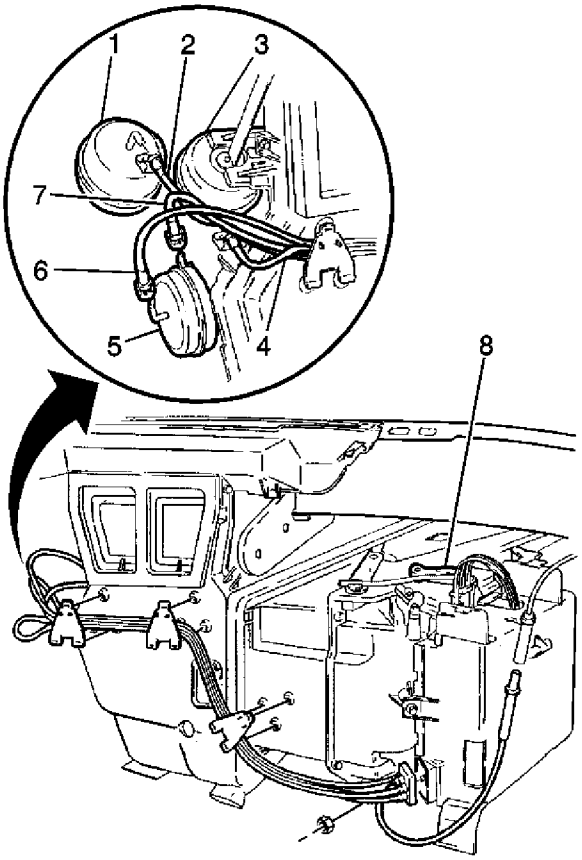
Install the left sound insulator. Refer to Instrument Panel Insulator Panel Replacement - Left Side in Instrument Panel, Guages and Console.

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Defroster Valve Actuator Replacement

Removal Procedure

1. Remove the air distributor assembly. Refer to *Air Distributor Duct Replacement*

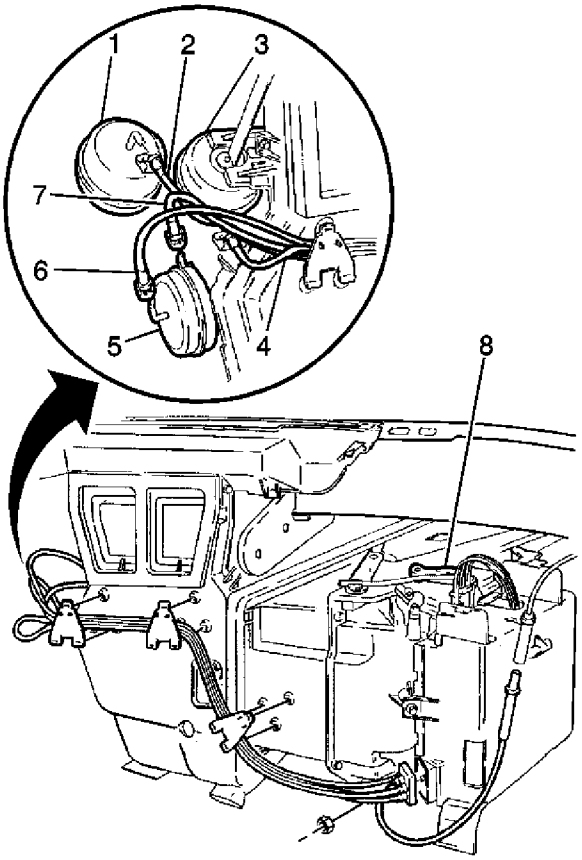


2. Unclip the defrost-A/C actuator (3) from the air inlet.
3. Disengage the defrost-A/C actuator (3) from the valve.

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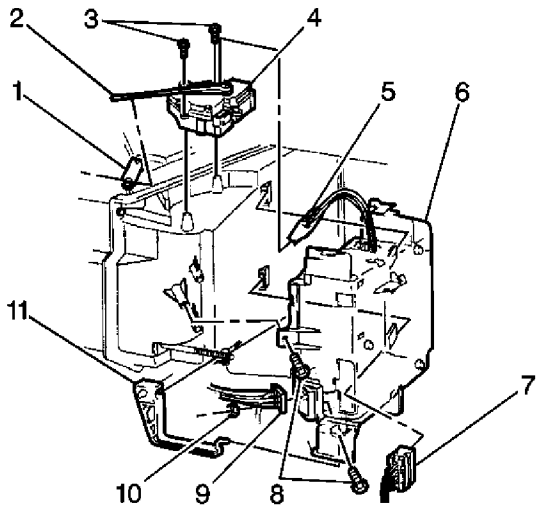
1. Engage the defrost-A/C actuator (3) to the valve.
2. Clip the defrost-A/C actuator to the air inlet.
3. Install the air distributor assembly. Refer to *Air Distributor Duct Replacement*

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Air Mix Actuator Replacement - Passenger

Removal Procedure

1. Remove the instrument panel compartment. Refer to Instrument Panel Storage Compartment Replacement in Instrument Panel, Guages and Console.

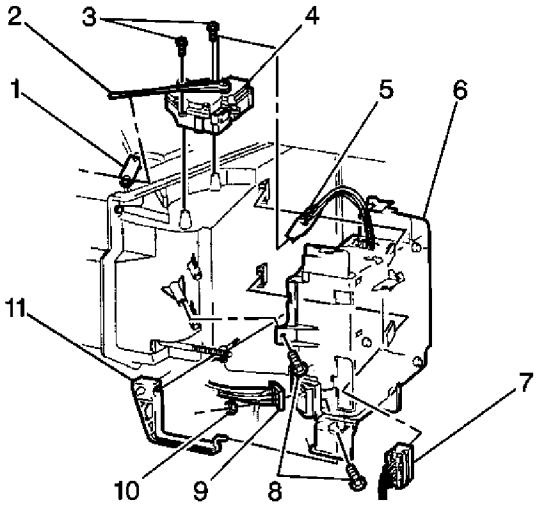


2. Remove the temperature valve link rod (2) from the plastic retainer on the temperature valve.
3. Disconnect the electrical connector (5).
4. Remove the following components:
   4.1. The screws (3) that mount the passenger air mix valve actuator (4) to the vehicle.
   4.2. The passenger air mix valve actuator (4).

Installation Procedure

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1. Install the passenger air mix valve actuator (4) to the vehicle.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the screws (3) in order to secure the passenger air mix valve actuator (4) to the vehicle.

   Tighten
   Tighten the screws to 1.4 N·m (12 lb in).

3. Connect the electrical connector (5).
4. Install the temperature valve link rod (2).
5. Adjust the passenger temperature valve link rod. Refer to Temperature Valve Link Adjustment - Passenger .
6. Install the instrument panel compartment. Refer to Instrument Panel Storage Compartment Replacement in Instrument Panel, Guages and Console.

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Temperature Valve Link Adjustment

1. If you have not already disassembled the valve link, pull the valve link from the retainer on the programmer output crank.
2. Start the vehicle.

   Set the temperature to 32°C (90°F).

3. Allow a minimum of 45 seconds in order for the programmer motor to move the output crank to the full hot position.
4. Move the temperature valve to the full hot position.
5. Snap the valve link into the retainer on the output crank.

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Temperature Valve Link Adjustment - Driver

1. Start the vehicle.
2. Set the temperature to 32°C (90°F) at the heater and A/C control.
3. Set the passenger temperature control to full warm.

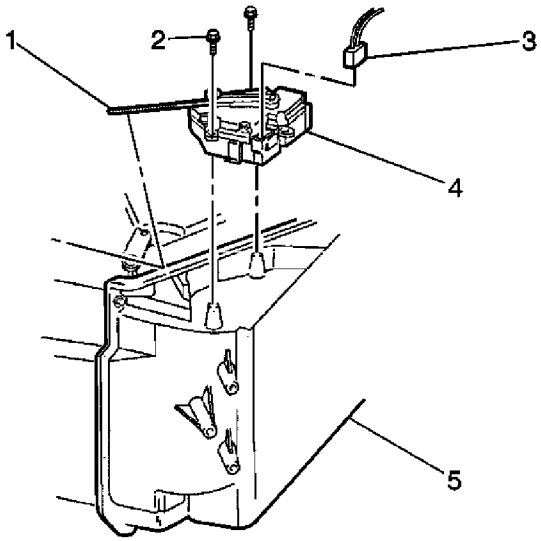
   Refer to the following list:

   - If the outside temperature is above 32°C (90°F), disconnect the inside temperature sensor.
   - Allow 45 seconds in order for the air mix valve actuators to move to the warm position.
4. Gently pull the driver temperature valve link (11) toward the programmer (6) until the valve hits the stop.
5. Push the threaded portion of the link into the slot of the driver temperature valve crank.

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Temperature Valve Link Adjustment - Passenger



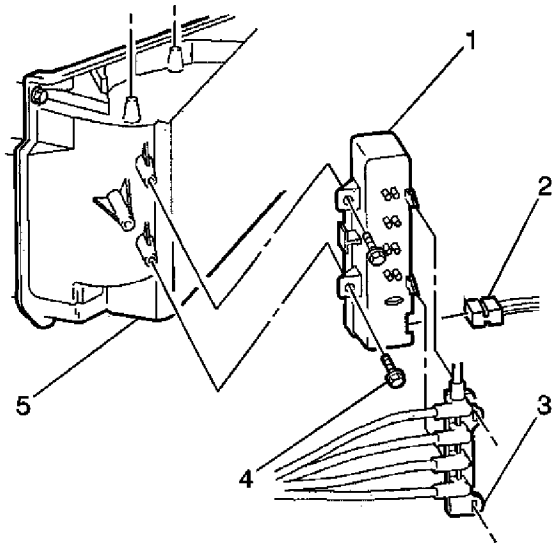
1. Remove the temperature valve link rod (1) from the temperature valve by snapping the rod out of the valve.
2. Start the vehicle. Make the following settings:
   - Set the fan to position IIII (HIGH).
   - Set the temperature to full hot.
3. Allow 45 seconds minimum for the A/C temperature valve actuator (4) to move to the full hot position.
4. Move the temperature valve to the full hot position.
5. Snap the temperature valve link rod into the temperature valve.

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Vacuum Electrical Solenoid Replacement

Removal Procedure

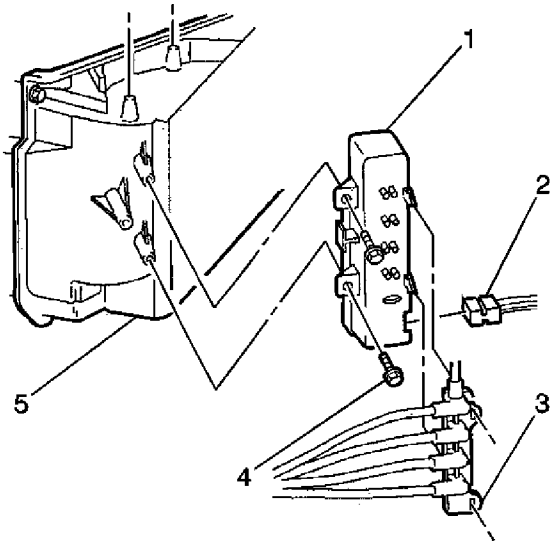


1. Perform the following steps in order to swing down the IP compartment:
   1.1. Pull the IP compartment rearward.
   1.2. Disengage the swing stops.
2. Disconnect the vacuum harness connector (3) from the solenoid (1).
3. Disconnect the electrical connector (2) from the solenoid (1).
4. Remove the screws (4) from the solenoid (1).
5. Remove the solenoid (1) from the heater and A/C module (5).

Installation Procedure

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1. Install the solenoid (1) to the heater and A/C module (5).

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the screws (4) to the solenoid (1).

   Tighten
   Tighten the screws to 1.4 N·m (12 lb in).

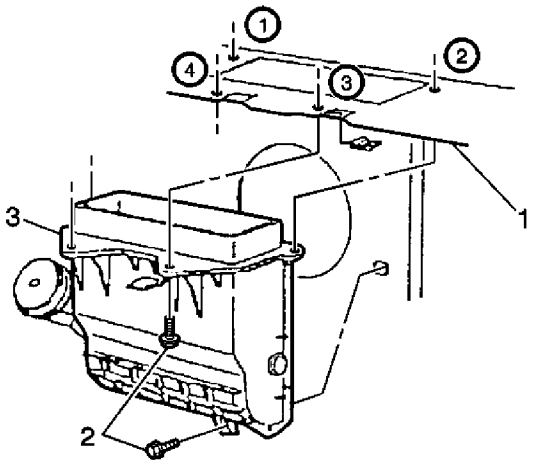
3. Connect the electrical connector (2) to the solenoid (1).
4. Connect the vacuum harness connector (3) to the solenoid (1).
5. Push forward on the IP compartment in order to install the IP compartment.

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Air Inlet Assembly Replacement

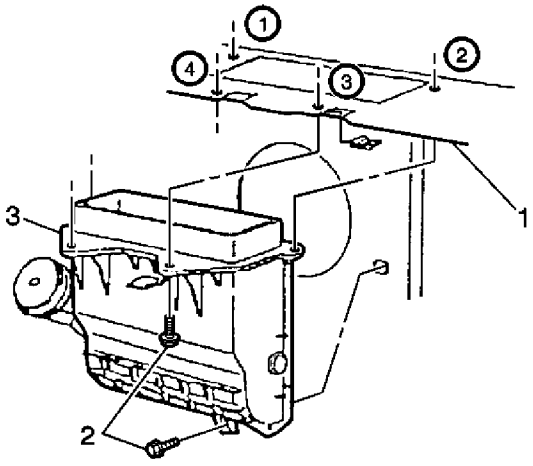
Removal Procedure

1. Remove the air distributor assembly. Refer to *Air Distributor Duct Replacement*



2. Remove the bolts (2) that attach the air inlet (3) to the dash panel (1) and to the front of the dash.
3. Reposition the insulation as needed to remove the air inlet assembly (3).

Installation Procedure



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1. Position the air inlet (3) in the vehicle.
2. Reposition the insulation as needed.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the bolts (2) to attach the air inlet (3) to the dash panel (1) and to the front of the dash.

   Refer to the illustration for the proper tightening sequence.

   Tighten
   Tighten the bolts to 5 N·m (44 lb in).

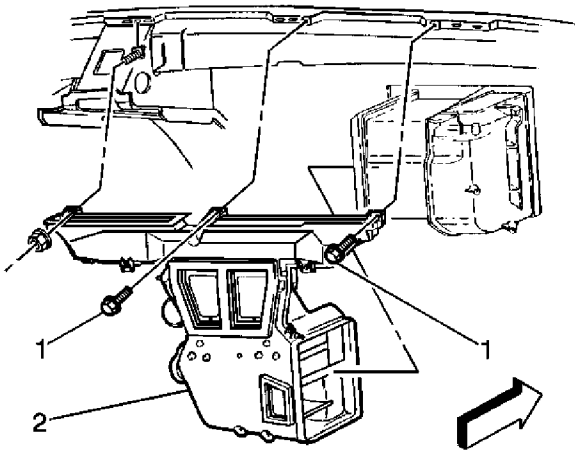
4. Install the air distributor assembly. Refer to *Air Distributor Duct Replacement*

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Air Distributor Duct Replacement

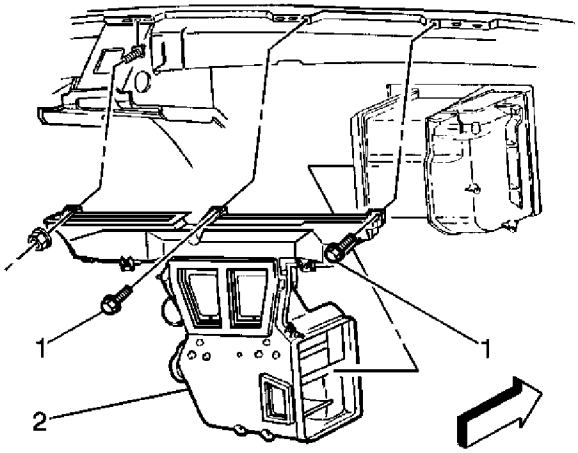
Removal Procedure

1. Remove the IP assembly. Refer to Instrument Panel Assembly Removal in Instrument Panel, Guages and Console.



2. Remove the screws (1) from the center air distributor (2).
3. Remove the center air distributor (2).

Installation Procedure



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1. Install the center air distributor (2).

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the screws (1).

   Tighten
   Tighten the screws to 1.5 N·m (13 lb in).

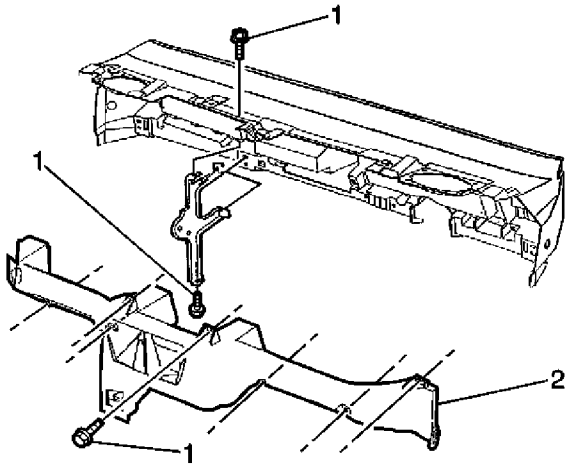
3. Install the IP assembly. Refer to Instrument Panel Assembly Removal in Instrument Panel, Guages and Console.

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Crosscar Air Outlet Replacement

Removal Procedure

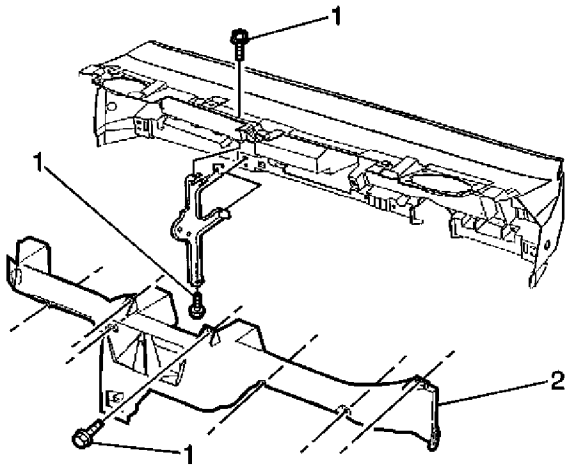
1. Remove the IP assembly. Refer to Instrument Panel Assembly Removal in Instrument Panel, Gauges and Console.





2. Remove the duct mounting screws (1).
3. Remove the duct (2).

Installation Procedure



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1. Install the duct (2).

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the duct mounting screws (1).

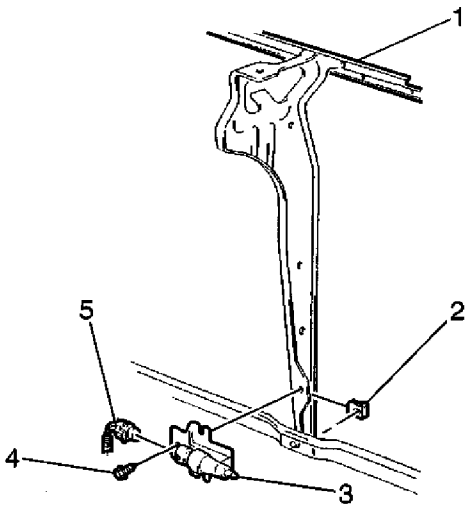
   Tighten
   Tighten the screws to 2 N·m (18 lb in).

3. Install the side window defogger adapters.
4. Install the IP assembly. Refer to Instrument Panel Assembly Removal in Instrument Panel, Gauges and Console.

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Ambient Temperature Sensor Replacement

Removal Procedure

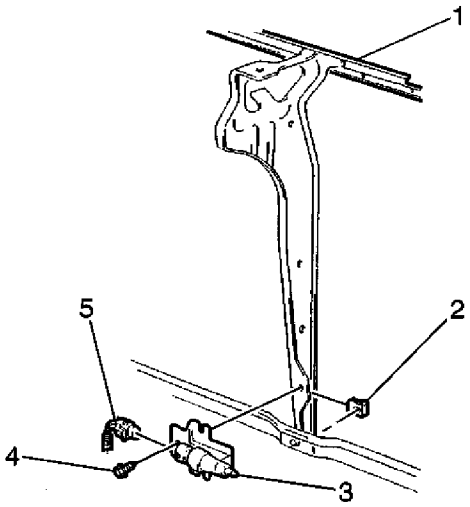


1. Disconnect the electrical connector (5) from the ambient air temperature sensor (3).
2. Remove the bolt (4) that retains the ambient air temperature sensor (3) to the upper radiator tie bar (1).
3. Remove the ambient air temperature sensor (3).

Installation Procedure

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Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

1. Install the bolt (4) to retain the ambient air temperature sensor (3) to the upper radiator tie bar (1).

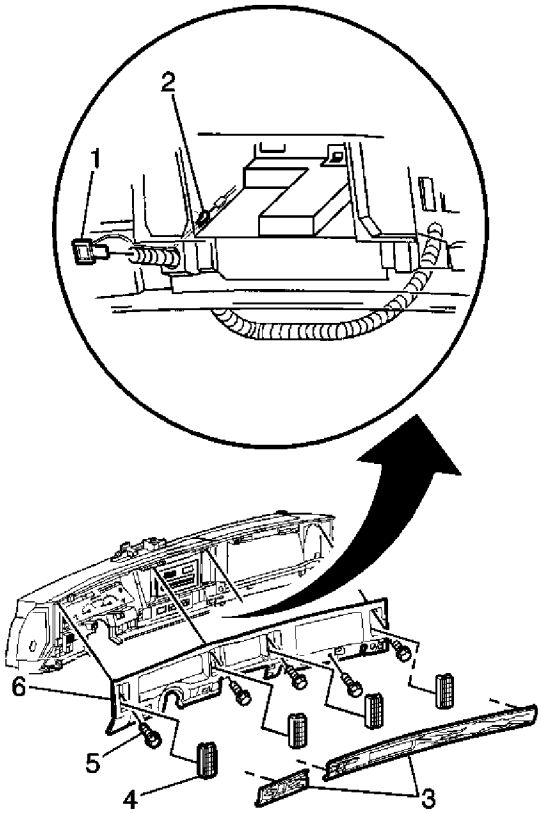
   Tighten
   Tighten the bolt to 12 N·m (106 lb in).

2. Connect the electrical connector (5) to the sensor (3).

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Inside Air Temperature Sensor Replacement (Buick)

Removal Procedure

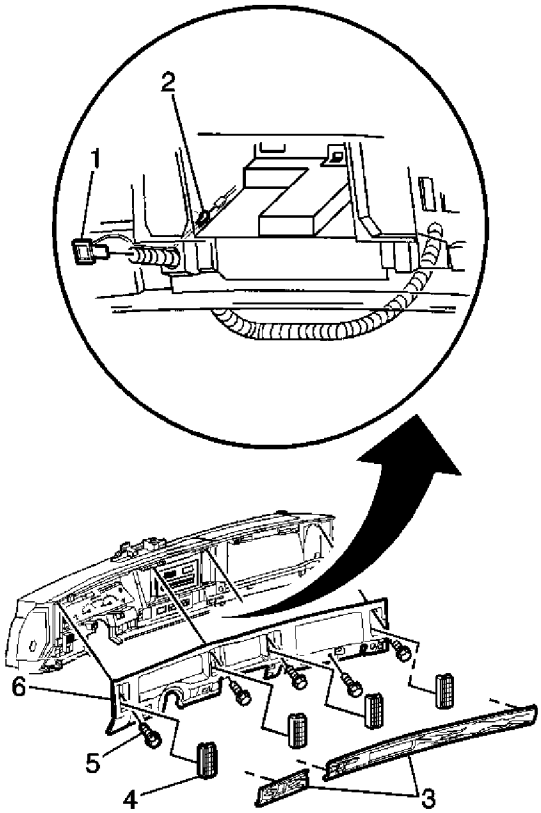


1. Remove the accessory panel trim plate. Refer to Instrument Cluster Trim Panel Replacement in Instrument Panel, Guages and Console.
2. Remove the aspirator hose and sensor assembly.
3. Remove the inside temperature sensor (1).
4. Disconnect the electrical connector (2).

Installation Procedure

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1. Connect the electrical connector (2).
2. Connect the inside temperature sensor (1) to the aspirator hose.

Important: Do not crimp or bend the hose during installation.

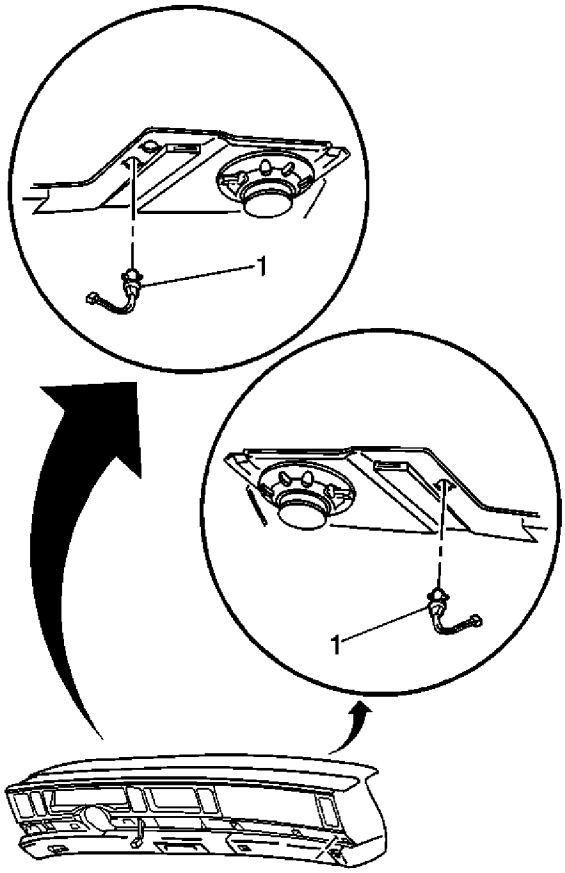
3. Connect the aspirator hose and sensor assembly to the instrument panel.
4. Install the accessory panel trim plate. Refer to Instrument Cluster Trim Panel Replacement in Instrument Panel, Guages and Console.

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Sun Load Temperature Sensor Replacement (Buick)

Removal Procedure

1. Remove the defroster grille by prying up on the grille.



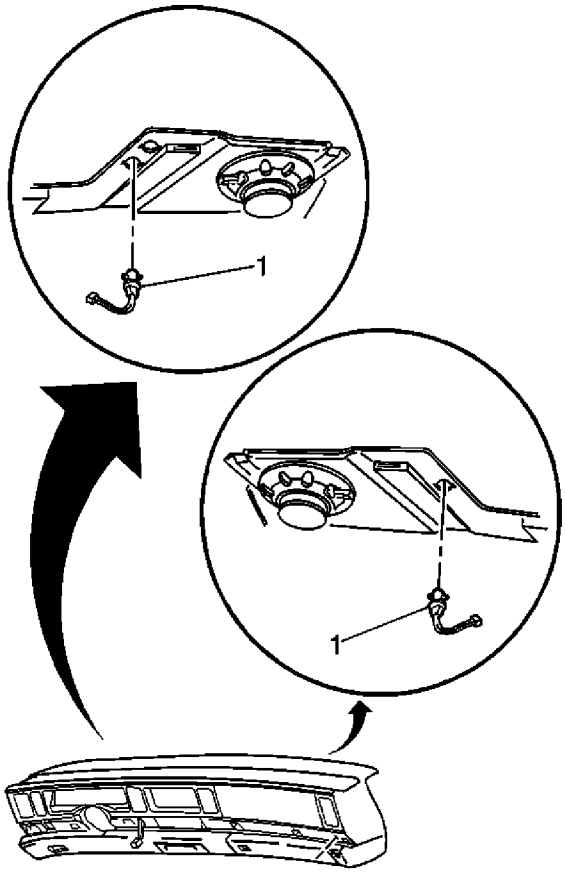


2. Remove the sun load sensor (1) from the defroster grille by twisting the sensor ¼ turn.
3. Disconnect the sun load sensor electrical connector.
4. Remove the sun load sensor (1).

Installation Procedure

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1. Connect the sun load sensor electrical connector.
2. Install the sun load sensor (1) to the defroster grille by twisting the sensor ¼ turn.
3. Install the defroster grille by snapping the grille into place.

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Fastener Tightening Specifications

Application	Specification	
	Metric	English
Accumulator Retaining Bolt	6 N·m	53 lb in
Air Inlet Retaining Screws	5 N·m	44 lb in
A/C Compressor Hose Assembly Bolt	30 N·m	22 lb ft
A/C Module Cover Retaining Screws	3 N·m	27 lb in
Blower Resistance Assembly Screws	1.4 N·m	12 lb in
Compressor Mounting Bracket Front Bolt	50 N·m	37 lb ft
Compressor Mounting Bracket Side Bolts	100 N·m	74 lb ft
Condenser Mounting Brackets	12 N·m	106 lb in
Front Compressor Mounting Nuts	50 N·m	37 lb ft
Heater and A/C Vacuum Solenoid Screws	1.4 N·m	12 lb in
Heater Core Cover Screws	1.4 N·m	12 lb in
Rear Compressor Mounting Bolt	50 N·m	37 lb ft
Service Fitting	12 N·m	9 lb in
Temperature Valve Actuator Screws	1.4 N·m	12 lb in
Tighten All Dual O-ring Fittings	24 N·m	18 lb ft

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System Capacities

Application	Specification	
	Metric	English
Refrigerant Capacity	0.91 kg	2.0 lb

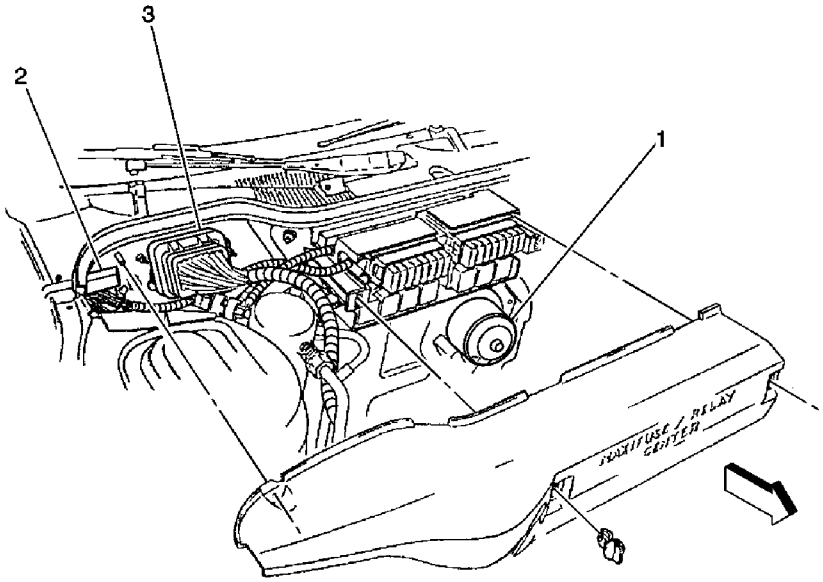
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Refrigerant Oil Distribution Specifications

Application	Specification	
	Metric	English
Accumulator	90 ml	3 oz
Compressor	60 ml	2 oz
Condenser	30 ml	1 oz
Evaporator	90 ml	3 oz

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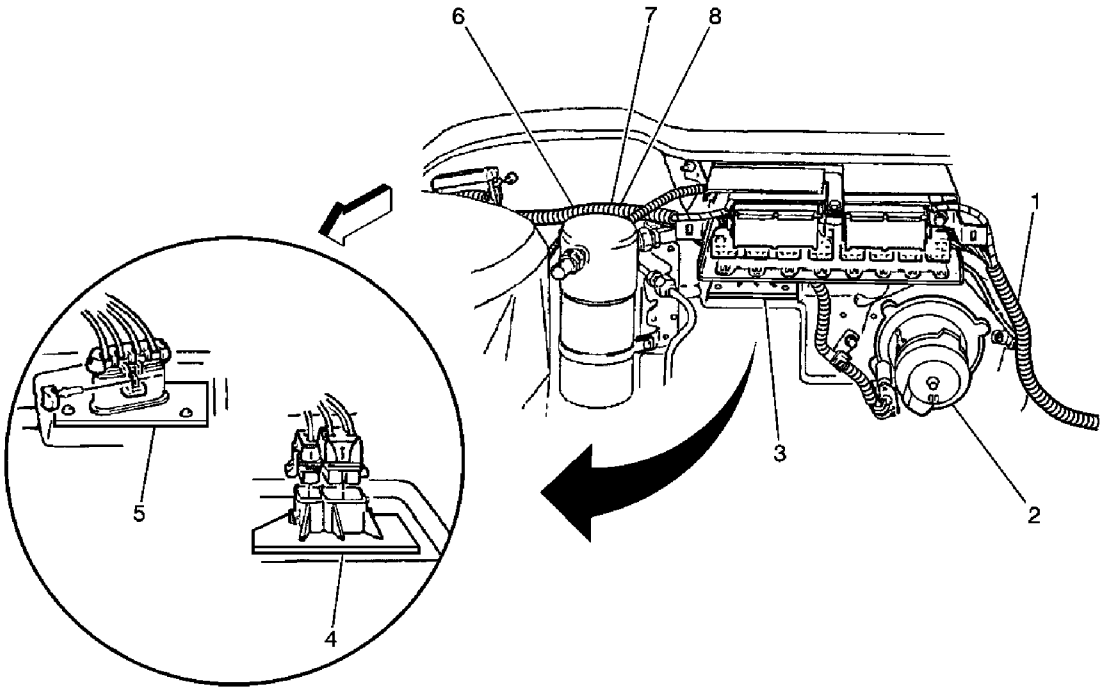
Engine Compartment, Rear



(1) Blower Motor
(2) P101
(3) C101

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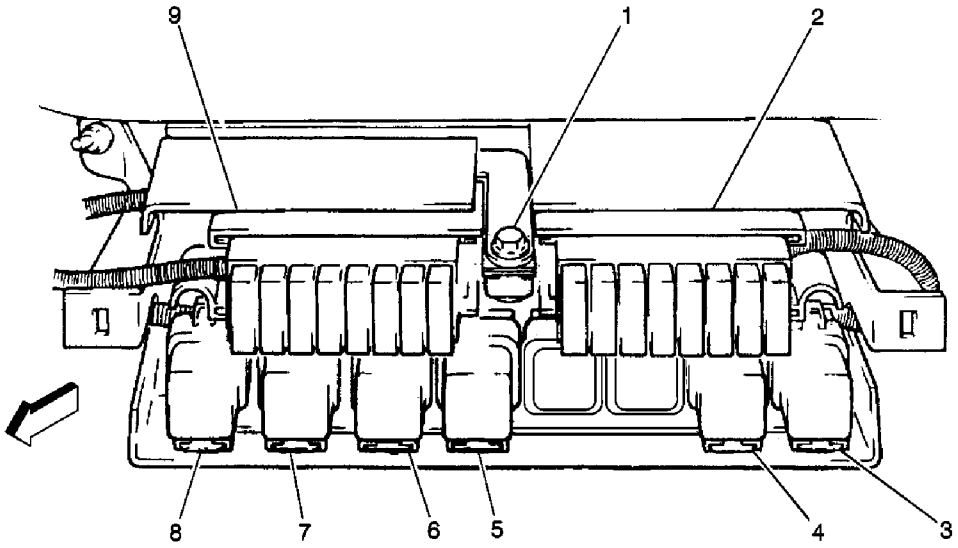
Engine Compartment, Right Rear Corner



(1) S104
(2) Blower Motor
(3) Blower Motor Resistor, Blower Control Module (Hidden)
(4) Blower Control Module
(5) Blower Motor Resistor
(6) S101
(7) S103
(8) S102

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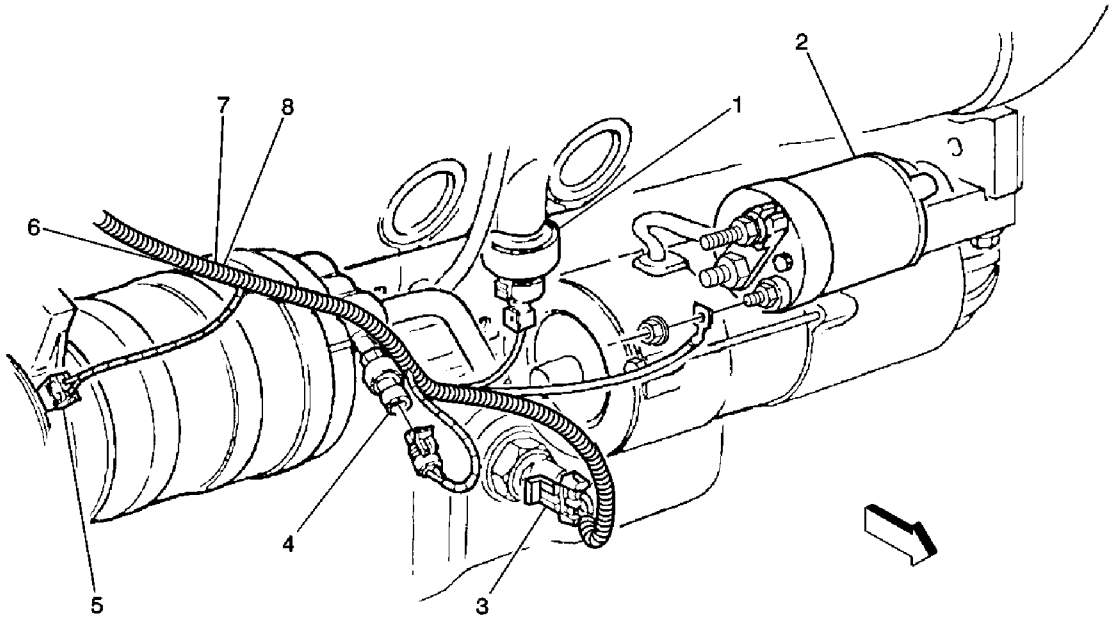
Rear of the Engine Compartment



(1) Battery Positive Cable Connection
(2) LH Underhood Fuse Block
(3) Low Speed Engine Cooling Fan Relay
(4) High Speed Engine Cooling Fan Relay
(5) High Blower Relay
(6) Blower Motor Relay
(7) Horn Relay
(8) A/C Clutch Relay
(9) RH Underhood Fuse Block

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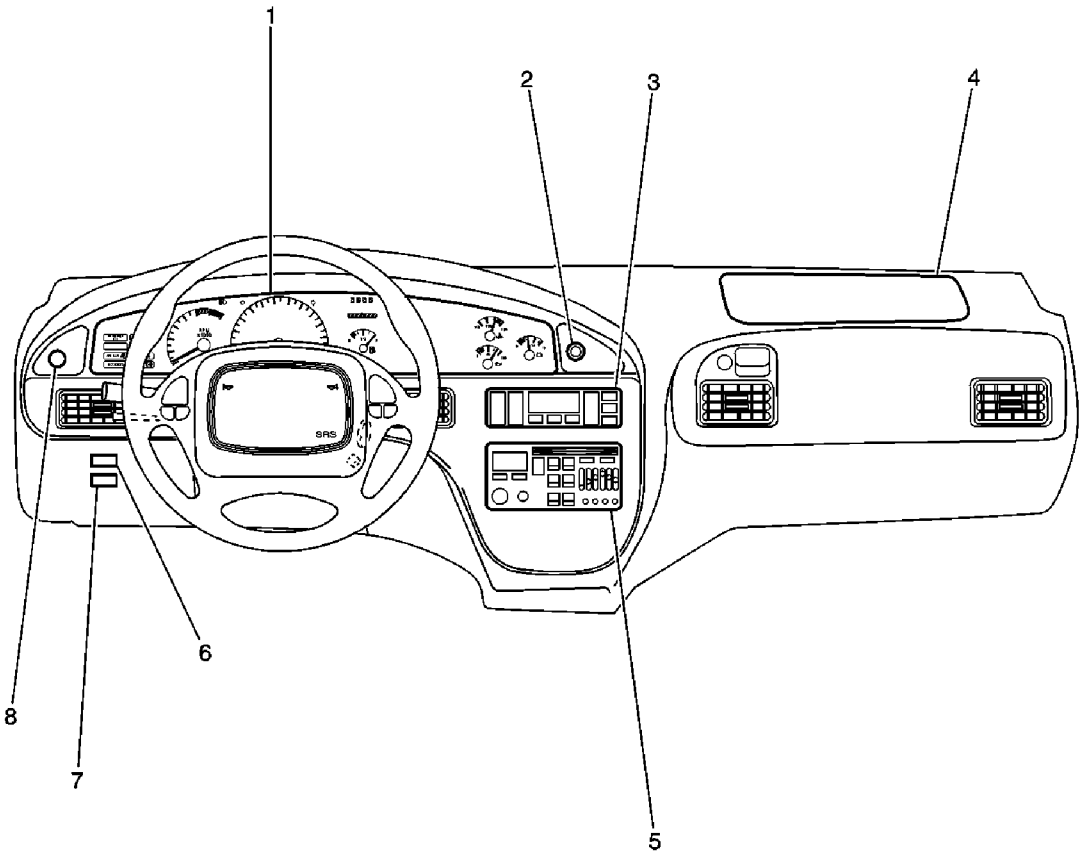
Engine, Front Side



(1) Knock Sensor Bank 1
(2) Starter Solenoid
(3) Engine Oil Level Switch
(4) A/C Pressure Sensor
(5) A/C Clutch
(6) A/C Clutch Diode
(7) S107
(8) S106

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Passenger Compartment, Pontiac Instrument Panel Shown, Others Similar



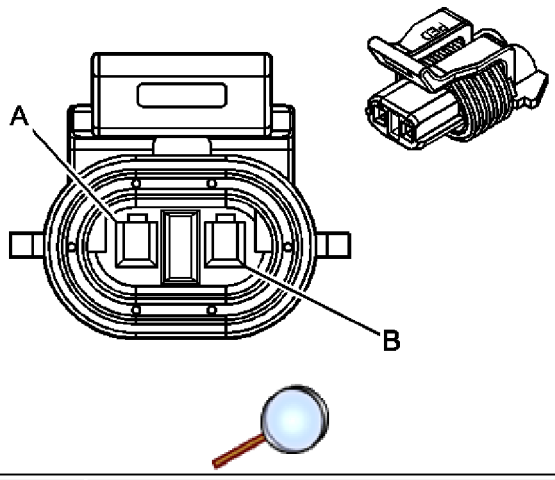
(1) Instrument Cluster
(2) Cigar Lighter
(3) Heater and A/C Control
(4) Inflatable Restraint IP Module
(5) Radio
(6) Rear Compartment Lid Latch Switch
(7) Fog Lamp Switch
(8) Lamp Dimmer Switch

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HVAC Connector End Views

Table 1: A/C Clutch
Table 2: A/C Clutch Relay
Table 3: A/C Pressure Sensor
Table 4: Blower Motor High-Speed Relay
Table 5: Blower Motor Relay
Table 6: Blower Motor Resistor
Table 7: Heater and A/C Control C1 (Buick with C67)
Table 8: Heater and A/C Control C2 (Buick with C67)
Table 9: Heater and A/C Control C1 (Oldsmobile with C61)
Table 10: Heater and A/C Control C2 (Oldmobile with C61)
Table 11: Heater and A/C Control C3 (Oldsmobile with C61)
Table 12: Heater and A/C Control C1 (Pontiac with C61)
Table 13: Heater and A/C Control C2 (Pontiac with C61)
Table 14: Heater and A/C Vacuum Valve (Buick with C67)
Table 15: Temperature Valve Actuator

A/C Clutch

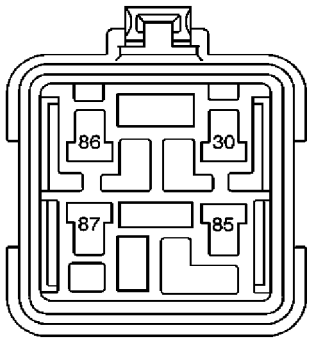


Connector Part Information	• 12162017 • 2-Way F Metri-Pack 150 Series, Sealed (GRY)

Pin	Wire Color	Circuit No.	Function
A	DK GRN	59	A/C Compressor Clutch Solenoid Feed
B	BLK	1450	Ground

A/C Clutch Relay

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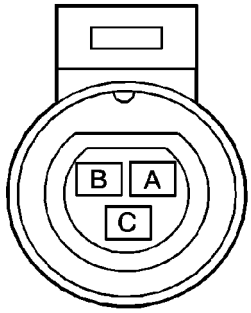




Connector Part Information	• 12110787 • 4-Way F Metri-Pack 280 Series (MD GRA)

Pin	Wire Color	Circuit No.	Function
30	PNK	239	Fused Output - Ignition 1
85	DK GRN/WHT	459	Air Conditioning Compressor Control Relay Output - Ignition 1
86	PNK	239	Fused Output - Ignition 1
87	DK GRN	59	Air Conditioning Compressor Clutch Solenoid Feed

A/C Pressure Sensor

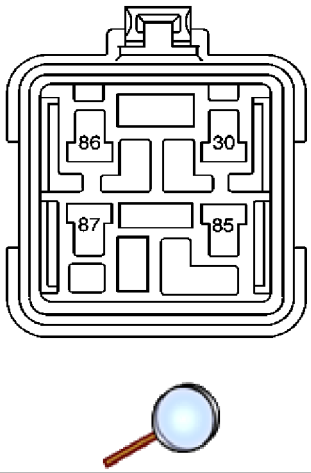




Connector Part Information	• 12110192 • 3-Way F Metri-Pack 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	BLK	808	Sensor Return
B	GRY	474	5 Volt Reference Feed
C	RED/BLK	380	A/C Refrigerant Pressure Sensor Signal

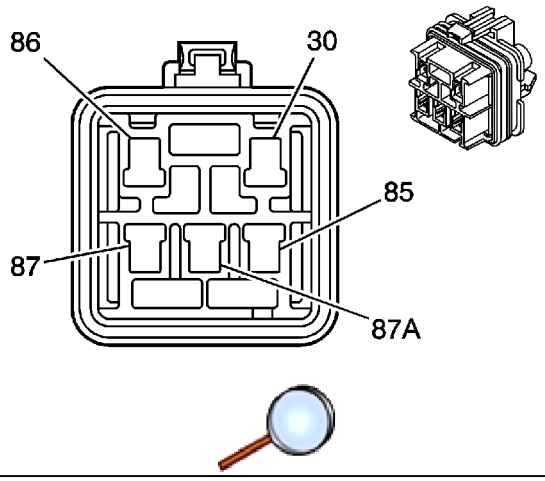
Blower Motor High-Speed Relay



Connector Part Information	• 12110787 • 4-Way F Metri-Pack 280 Series (MD GRA)

Pin	Wire Color	Circuit No.	Function
30	BRN	41	Fused Output - Ignition 3
85	BRN	41	Fused Output - Ignition 3
86	BRN	247	Blower Enable Relay Output - Coil
87	LT BLU	1888	Cruise Control Servo Clutch Output

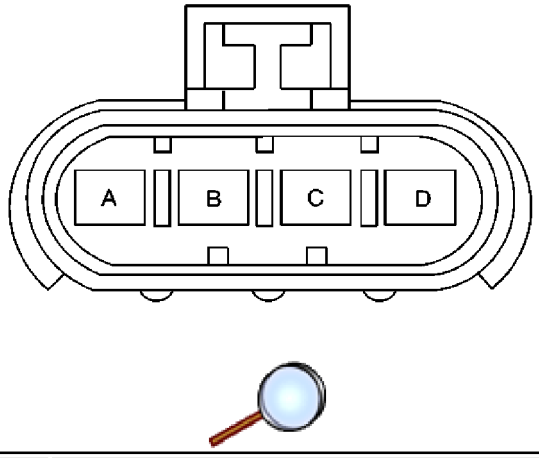
Blower Motor Relay



Connector Part Information	• 12110538 • 5-Way F Metri-Pack 280 Series (BLK)

Pin	Wire Color	Circuit No.	Function
30	PPL	65	Blower Motor Feed
85	ORN	52	Blower Switch Output - High
86	BLK	1550	Ground
87	RED	442	Fused Output - Battery
87	DK BLU	101	Blower Resistor Output

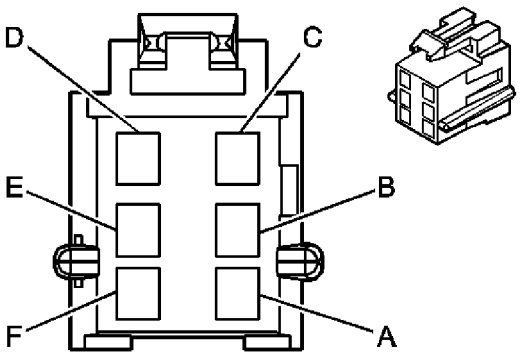
Blower Motor Resistor



Connector Part Information	• 12048415 • 4-Way F Metri-Pack 480 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	DK BLU	101	Blower Resistor Output
B	LT BLU	72	Blower Switch Output - Medium 2
C	TAN	63	Blower Switch Output - Medium 1
D	LT BLU	188	Blower Enable Relay Output - N.O. Contact (Buick)
D	YEL	60	Blower Switch Output - Low (Oldsmobile) (Pontiac)

Heater and A/C Control C1 (Buick with C67)

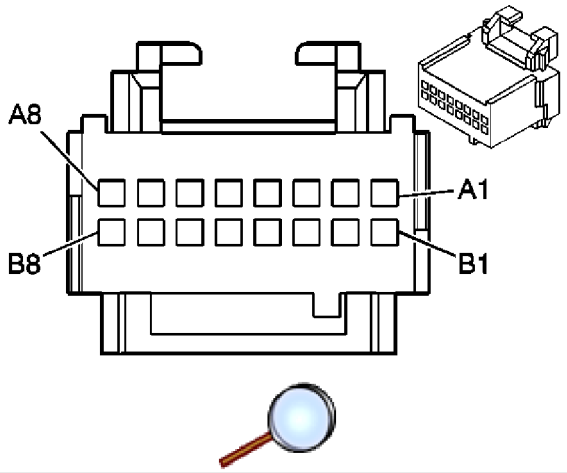


Connector Part Information	• 12064752 • 6-Way F Metri-Pack 280 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	--	--	Not Used

B	TAN	63	Blower Switch Output - Medium 1
C	ORN	52	Blower Switch Output - High
D	LT BLU	72	Blower Switch Output - Medium 2
E	LT BLU	188	Blower Enable Relay - N.O. Contact
F	--	--	Not Used

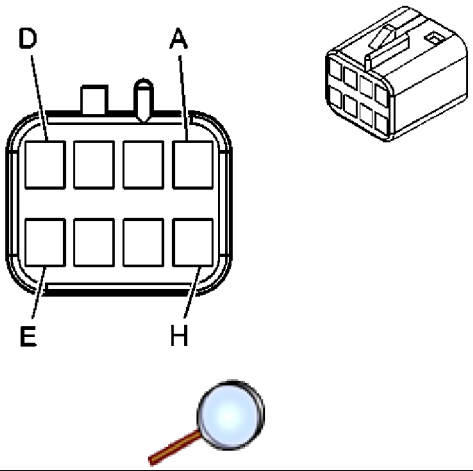
Heater and A/C Control C2 (Buick with C67)



Connector Part Information	• 12110259 • 16 Way F Micro-Pack 100 Series (GRN)

Pin	Wire Color	Circuit No.	Function
A1	BRN	247	Blower Enable Relay Output-Coil
A2	DK BLU	1199	Air Temperature Valve Motor Feed
A3	GRY	8	Instrument Panel Lamp Feed
A4	PPL/WHT	724	Vacuum Fluorescent Dimming Signal
A5	--	--	Not Used
A6	YEL	1791	Air Temperature Valve Motor Return
A7	BLK	1250	Ground
A8	BRN	1141	Fused Output-IGN
B1	WHT	193	Rear Defogger Relay Output-Coil
B2	LT GRN	66	A/C Switch Output
B3	PNK	1396	A/C Switch Signal-Defroster Solenoid Control
B4	LT GRN	1395	A/C Switch Signal-Vent Solenoid Control
B5	PPL	1397	A/C Switch Signal-Heat Solenoid Control
B6	DK GRN	1394	A/C Switch Signal-A/C Solenoid Control
B7-B8	--	--	Not Used

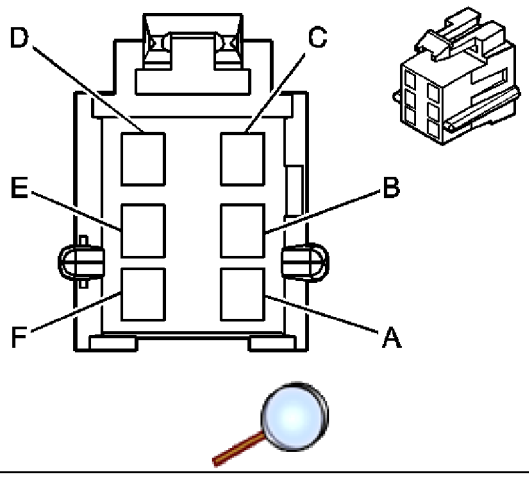
Heater and A/C Control C1 (Oldsmobile with C61)



Connector Part Information	• 12047886 • 8-Way F Metri-Pack 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	LT GRN	66	Air Conditioning Switch Output
B	BLK	1250	Ground
C	ORN	40	Fuse Output - Battery - Type III Fuse
D	GRA	8	Instrument Panel Lamp Feed
E	YEL	1791	Air Temperature Valve Motor Return
F-G	--	--	Not Used
H	DK BLU	1199	Air Temperature Valve Motor Feed

Heater and A/C Control C2 (Oldmobile with C61)

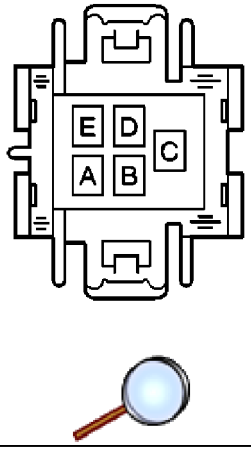


Connector Part Information	• 12064752 • 6-Way F Metri-Pack 280 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	WHT	193	Rear Defogger Relay Output - Coil
B	BRN	41	Fuse Output - Ignition
C	ORN	60	Blower Switch Output - Low

D-F	--	--	Not Used

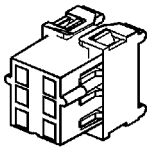
Heater and A/C Control C3 (Oldsmobile with C61)

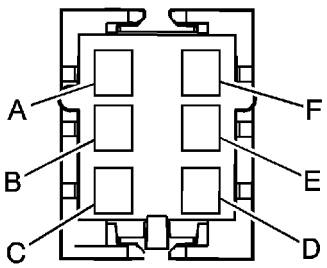


Connector Part Information	• 12020813 • 5-Way F Metri-Pack 630 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	--	--	Not Used
B	ORN	52	Blower Switch Output - High
C	TAN	63	Blower Switch Output - Medium 1
D	LT BLU	72	Blower Switch Output - Medium 2
E	YEL	60	Blower Switch Output - Low

Heater and A/C Control C1 (Pontiac with C61)





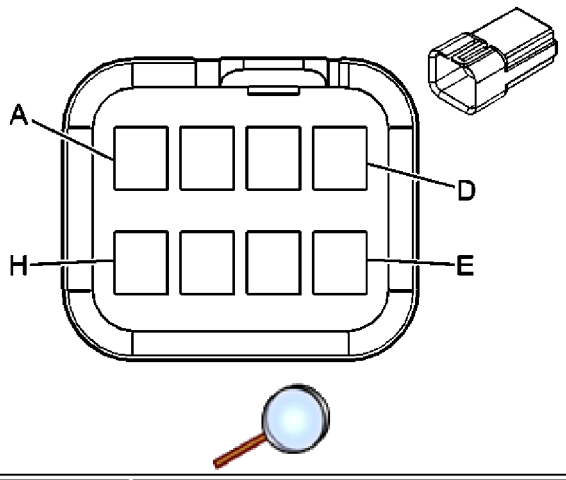


Connector Part Information	• 12015344 • 6-Way F Metri-Pack 280 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	TAN	63	Blower Switch Output - Medium 1
B	LT BLU	72	Blower Switch Output - Medium 2

C	ORN	1140	Rear Defrost Blower Output - Medium 2
D	PPL	293	Rear Defrost Blower Output - Medium 1
E	BRN	41	Fuse Output - IGN - 3
F	YEL	60	Blower Switch Output - Low

Heater and A/C Control C2 (Pontiac with C61)



Connector Part Information	• 12065398 • 8-Way F Metri-Pack 150 Series (NAT)

Pin	Wire Color	Circuit No.	Function
A	LT GRN	66	Air Conditioning Switch Output
B	BLK	1250	Ground
C	ORN	52	Blower Switch Output - High
D	GRA	8	Instrument Panel Lamp Feed
E	YEL	1791	Air Temperature Valve Motor Return
F	BLK	1250	Ground
G	DK BLU	1199	Air Temperture Valve Motor Feed
H	BRN	41	Fuse Output - Ignition

Heater and A/C Vacuum Valve (Buick with C67)

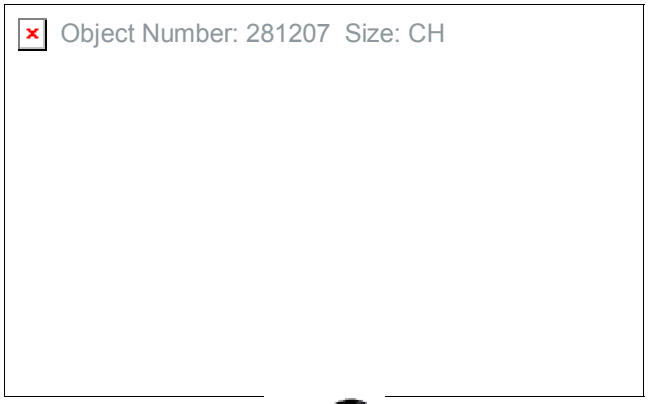
Object Number: 40427 Size: CH



Connector Part Information	• 12064978 • 6-Way F Micro-Pack 100 Series (GRA)

Pin	Wire Color	Circuit No.	Function
1	DK GRN	1394	Air Conditioning Switch Signal - Air Conditioning Solenoid Control
2	LT GRN	1395	Air Conditioning Switch Signal - Vent Solenoid Control
3	PNK	1396	Air Conditioning Switch Signal - Defrost Solenoid Control
4	PPL	1397	Air Conditioning Switch Signal - Heat Solenoid Control
5	BRN	41	Fused Output - Ignition 3
6	--	--	Not Used

Temperature Valve Actuator





Connector Part Information	• 12040953 • 6-Way F Micro-Pack 100 Series (BLK)

Pin	Wire Color	Circuit No.	Function
5-6	--	--	Not Used
7	YEL	1791	Air Temperature Valve Motor Return
8	DK BLU	1199	Air Temperature Valve Motor Feed
9	--	--	Not Used
10	BRN	41	Fused Output - Ignition 3 (Buick)
10	BRN	41	Fused Output - Ignition 3 (Oldsmobile)

Refrigerant Recovery and Recharging

Tools Required

- J 39500-B Air Conditioning Refrigerant Recovery, Recycling and Recharging (ACR4) System
- J 41810 Pure Guard 2
- J 41810-100A Active Flow Control

Caution: Avoid breathing the A/C Refrigerant 134a (R-134a) and the lubricant vapor or the mist. Exposure may irritate the eyes, nose, and throat. Work in a well ventilated area. In order to remove R-134a from the A/C system, use service equipment that is certified to meet the requirements of SAE J 2210 (R-134a recycling equipment). If an accidental system discharge occurs, ventilate the work area before continuing service. Additional health and safety information may be obtained from the refrigerant and lubricant manufacturers.

Caution: For personal protection, goggles and lint-free gloves should be worn and a clean cloth wrapped around fittings, valves, and connections when doing work that includes opening the refrigerant system. If refrigerant comes in contact with any part of the body severe frostbite and personal injury can result. The exposed area should be flushed immediately with cold water and prompt medical help should be obtained.

Notice: R-134a is the only approved refrigerant for use in this vehicle. The use of any other refrigerant may result in poor system performance or component failure.

Notice: To avoid system damage use only R-134a dedicated tools when servicing the A/C system.

Notice: Use only Polyalkylene Glycol Synthetic Refrigerant Oil (PAG) for internal circulation through the R-134a A/C system and only 525 viscosity mineral oil on fitting threads and O-rings. If lubricants other than those specified are used, compressor failure and/or fitting seizure may result.

Notice: R-12 refrigerant and R-134a refrigerant must never be mixed, even in the smallest of amounts, as they are incompatible with each other. If the refrigerants are mixed, compressor failure is likely to occur. Refer to the manufacturer instructions included with the service equipment before servicing.

The J 39500-B removes the Refrigerant-134a from the vehicle's A/C system. The recovery procedure uses one filtering cycle. The evacuation procedure uses an automatic multiple pass filtering cycle. The filtering cycles ensure a constant supply of clean and dry refrigerant for the A/C system charging.

Refer to the J 39500-B ACR4 manual for operation and setup instructions.

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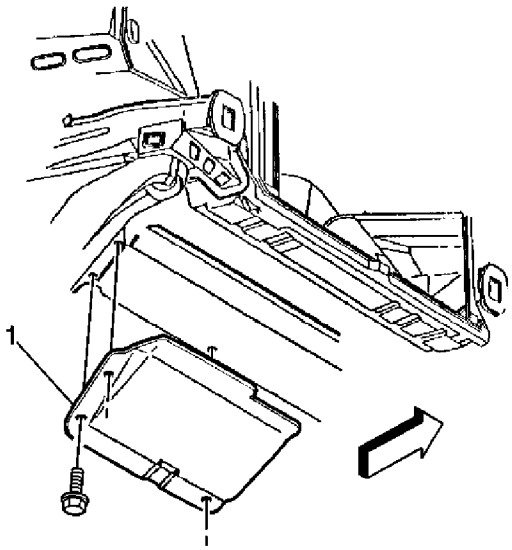
Air Conditioning Compressor Replacement

Removal Procedure

Tools Required

J 39500-B A/C Refrigerant Recovery, Recycling, and Recharging (ACR4) System

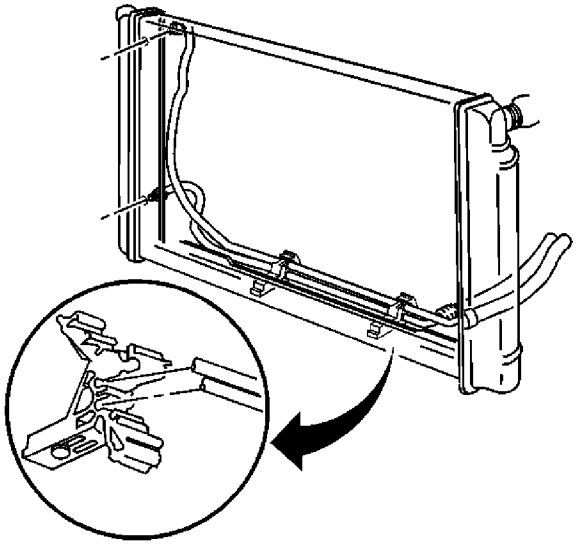
1. Recover the refrigerant. Refer to *Refrigerant Recovery and Recharging* .
2. Remove the accessory drive belt. Refer to Drive Belt Replacement in Engine Mechanical.
3. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.



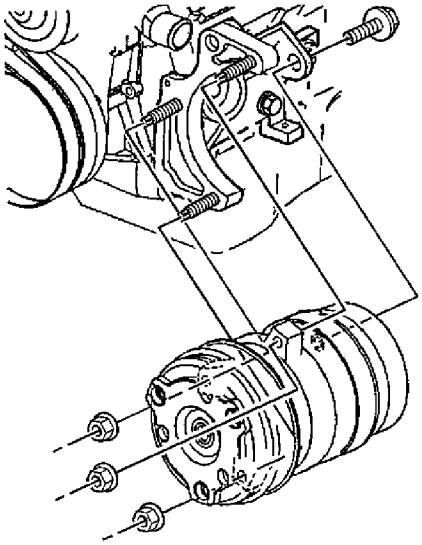


4. Remove the A/C compressor splash shield (1).

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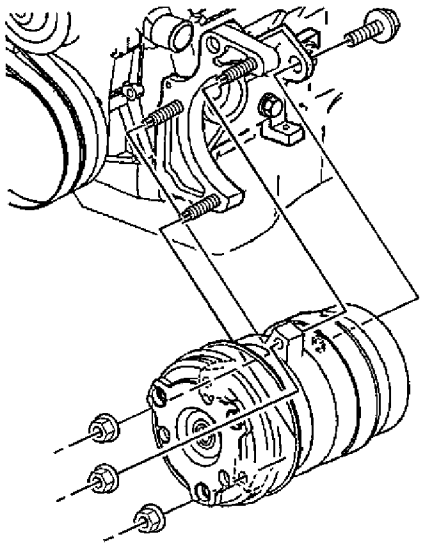


5. Remove the transmission oil cooler line from the brackets.



6. Remove the retaining bolt from the A/C compressor hose.
7. Remove the wiring harness clip and reposistion.
8. Remove the front mounting nuts and the rear mounting bolt from the A/C compressor.
9. Remove the A/C compressor.

Installation Procedure



1. Install the A/C compressor.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the mounting nuts to the A/C compressor.

   Tighten
   Tighten the nuts to 50 N·m (37 lb ft).

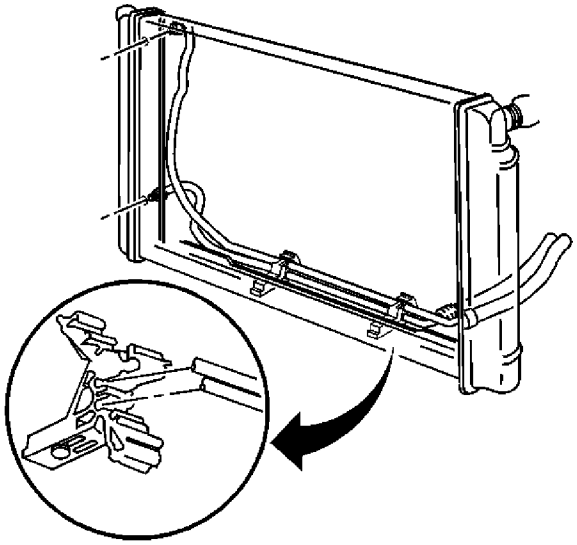
3. Install the mounting bolt to the A/C compressor.

   Tighten
   Tighten the bolt to 100 N·m (74 lb ft).

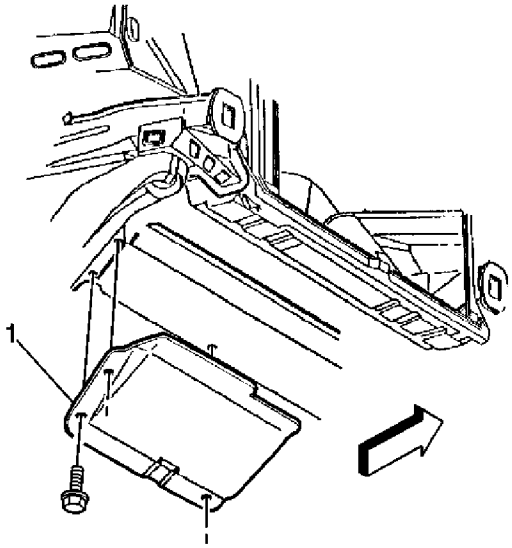
4. Install the retaining bolt to the A/C compressor hose.

   Tighten
   Tighten the bolt to 30 N·m (22 lb ft).

5. Install the wiring harness clip.



6. Install the transmission oil cooler line into the brackets.



7. Install the A/C compressor splash shield (1).
8. Install the bolt.

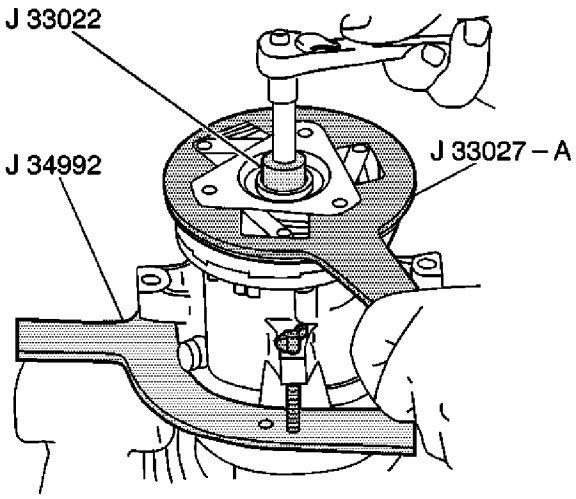
Tighten
Tighten the bolt to 10 N·m (89 lb in).

9. Lower the vehicle.
10. Install the accessory drive belt. Refer to Drive Belt Replacement in Engine Mechanical.
11. Recharge the A/C system. Refer to *Refrigerant Recovery and Recharging* .
12. Leak test the system. Refer to *Leak Testing* .

Compressor Clutch Plate and Hub Assembly Removal (V5 - Conventional Mount)

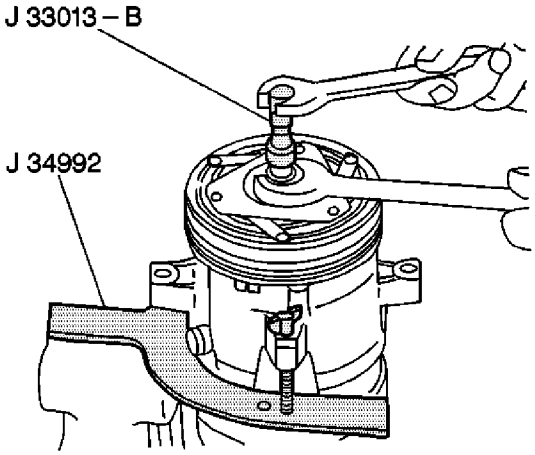
Tools Required

- J 33022 6-Point 13 mm Socket
- J 33027-A Clutch Hub Holding Tool
- J 33013-B Hub And Drive Plate Remover/Installer
- J 34992 Compressor Holding Fixture



1. Clamp the J 34992 in a vise.
2. Attach the A/C compressor to the holding fixture using the thumb screws.
3. Use the J 33027-A in order to prevent the clutch hub and drive plate assembly from turning.
4. Use the J 33022 in order to remove the shaft nut.

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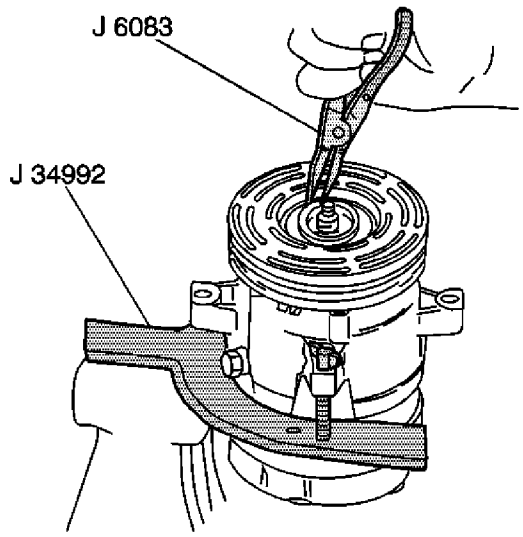


5. Thread the J 33013-B into the hub.
6. Use a wrench in order to hold the body of the J 33013-B .
7. Turn the center screw into the body of the J 33013-B in order to remove the clutch plate and hub assembly.
8. Remove the shaft key. Retain the shaft key for reassembly.

Clutch Rotor and Bearing Removal (V5 - Conventional Mount)

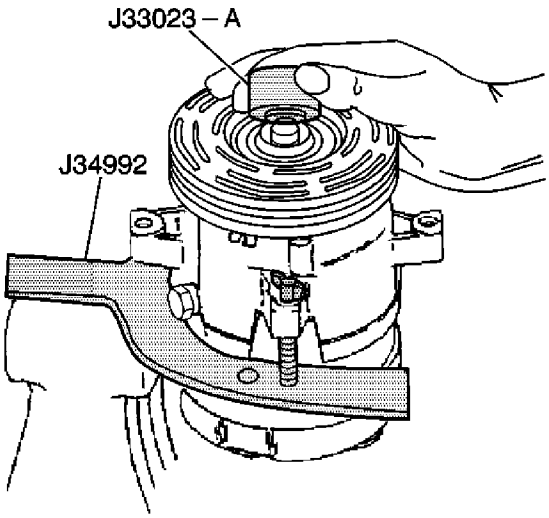
Tools Required

- J 6083 External Snap Ring Pliers
- J 9398 Rotor Bearing Remover
- J 8092 Driver Handle
- J 33020 Pulley Puller
- J 33023-A Puller Pilot

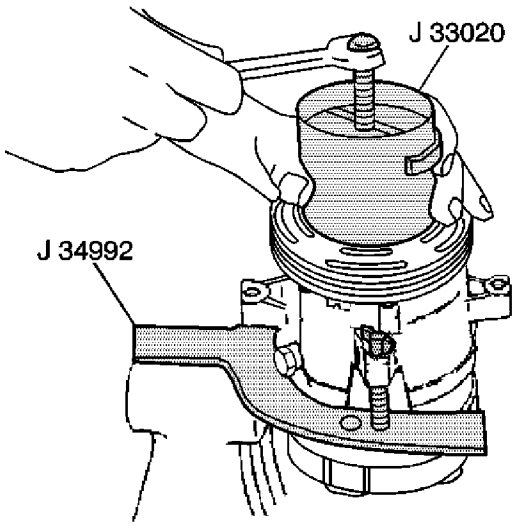


1. Remove the clutch plate and hub assembly. Refer to *Compressor Clutch Plate and Hub Assembly Removal (V5 - Conventional Mount)* .
2. Use the J 6083 in order to remove the rotor and bearing assembly retaining ring.

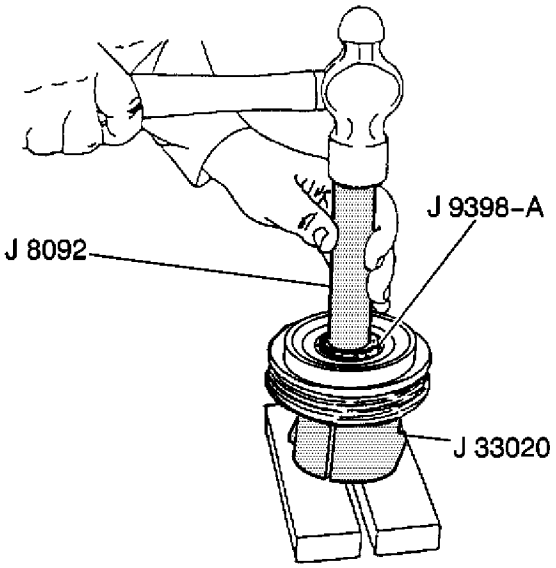
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3. Install the J 33023-A to the front head.



4. Install the J 33020 into the inner circle of slots in the rotor.
5. Turn the J 33020 clockwise in the slots in order to engage the tangs of the puller with the segments between the slots in the rotor.
6. Hold the J 33020 in place. Tighten the puller screw against the puller guide in order to remove the puller rotor and bearing assembly.



7. Support the rotor hub in order to prevent damage to the pulley rotor during bearing removal.
   7.1. Remove the forcing screw from the J 33020 .
   7.2. With the tangs of the J 33020 still engaged in the rotor slots, invert the assembly onto a solid, flat surface or blocks.

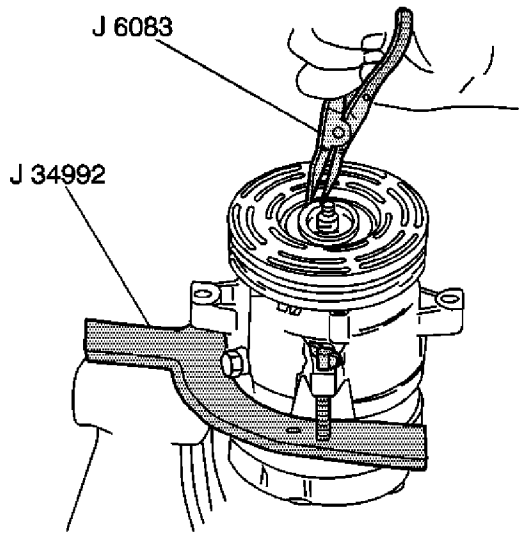
Notice: It is not necessary to remove the staking in front of the bearing to remove the bearing, however, it will be necessary to file away the old stake metal for proper clearance for the new bearing to be installed into the rotor bore or the bearing may be damaged.

8. Use a J 9398 with the J 8092 in order to drive the bearing out of the rotor hub.

Air Conditioning Clutch Coil Removal (V5 - Conventional Mount)

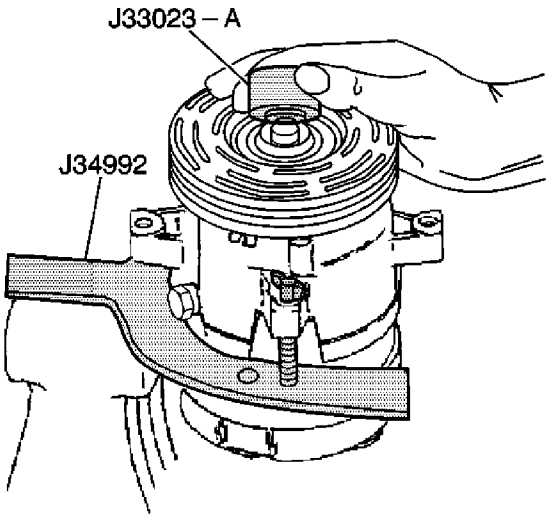
Tools Required

- J 6083 Snap Ring Pliers #24 External
- J 8433-1 Puller Bar
- J 8433-3 Forcing Screw
- J 33020 Pulley Puller
- J 33023-A Puller Pilot
- J 33025 Clutch Coil Puller Legs

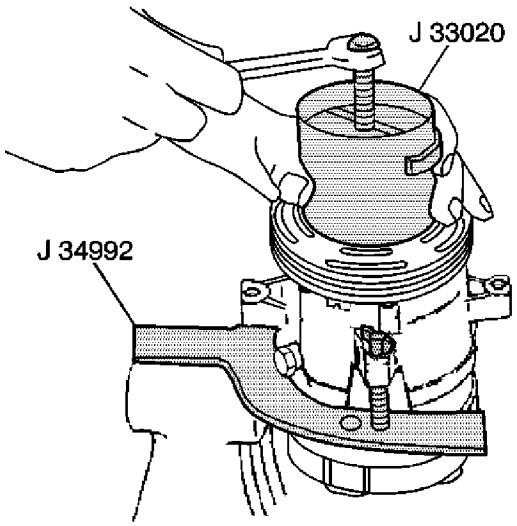


1. Remove the clutch plate and hub assembly. Refer to *Compressor Clutch Plate and Hub Assembly Removal (V5 -- Conventional Mount)* .
2. Use the J 6083 in order to remove the rotor and bearing assembly retaining ring.

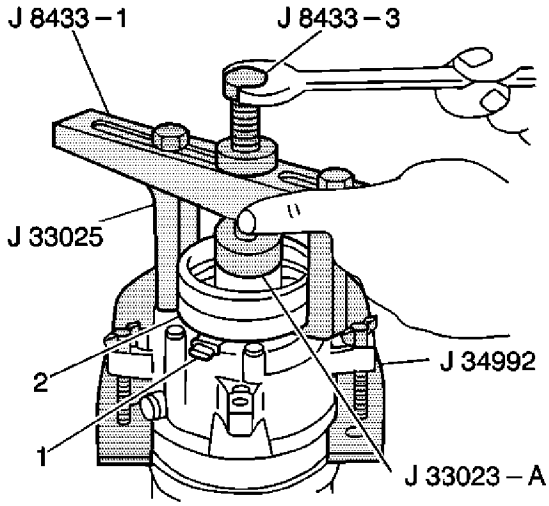
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3. Install the J 33023-A to the front head.



4. Install the J 33020 into the inner circle of slots in the rotor.
5. Turn the J 33020 clockwise in the slots in order to engage the tangs of the puller with the segments between the slots in the rotor.
6. Hold the J 33020 in place. Tighten the puller screw against the puller guide in order to remove the puller rotor and bearing assembly.

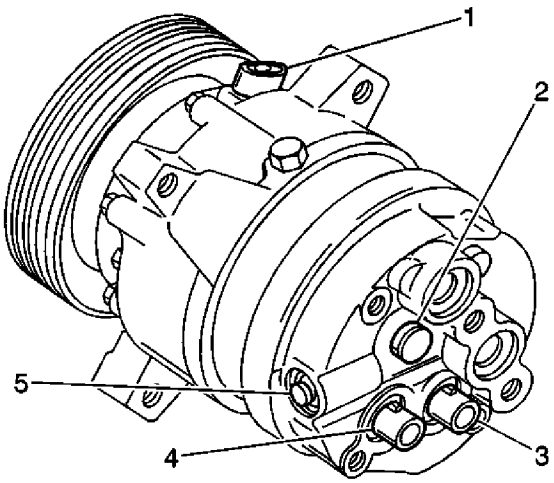


7. Mark the location of the clutch coil terminal (1) on the compressor front head.
8. Install the J 33023-A on the front head of the compressor.
9. Install the J 8433-1 and theJ 8433-3 with the J 33025 on the front head of the compressor.
10. Tighten the J 8433-3 against the J 33023-A in order to remove the clutch coil (2).

Compressor Control Valve Assembly Removal (V5 - Conventional Mount)

Tools Required

J 5403 Snap Ring Pliers



1. Remove the control valve retaining ring using the J 5403 .
2. Remove the control valve assembly (5).

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Compressor Shaft Seal Removal (V5 - Conventional Mount)

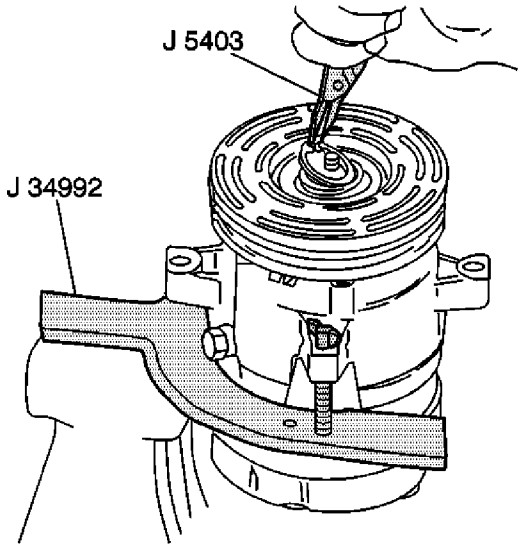
Tools Required

- J 34992 Compressor Holding Fixture
- J 39400-A Electronic Halogen Leak Detector
- J 9553-01 O-Ring Remover
- J 5403 Snap Ring Pliers
- J 23128-A Seal Seat Installer and Remover

Important: Do not change a shaft seal because of small amounts of oil found on an adjacent surface. The seal allows some oil to pass for lubrication purposes. Change the shaft seal when the following conditions exist:

- A large amount of sprayed oil is found.
- Actual refrigerant leak is found, using a J 39400-A or equivalent.

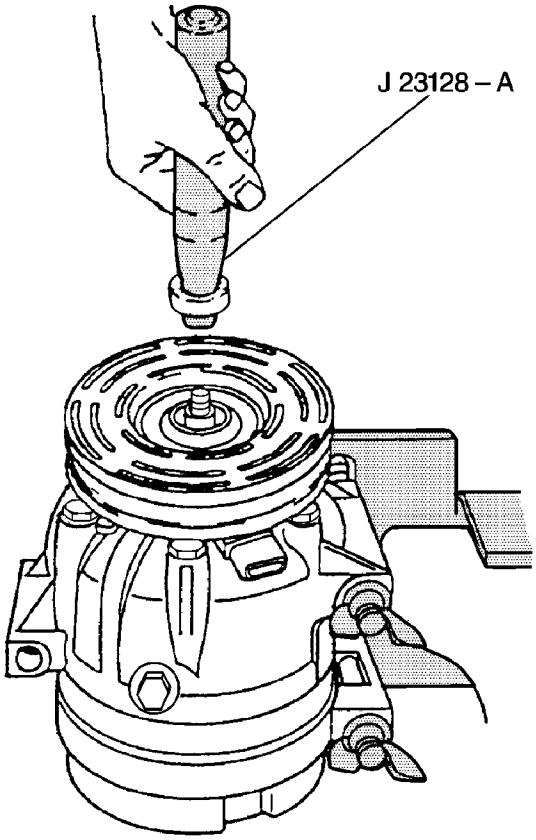
1. Install the compressor into the J 34992 .
2. Remove the clutch plate and hub assembly. Refer to *Compressor Clutch Plate and Hub Asssembly Removal (V5 -- Conventional Mount)*. .



3. Remove the shaft seal retaining ring using the J 5403 .
4. In order to prevent dirt or foreign material from damaging the compressor, thoroughly clean the following parts:
   - The inside of the compressor neck area surrounding the shaft
   - The exposed portion of the seal
   - The compressor shaft

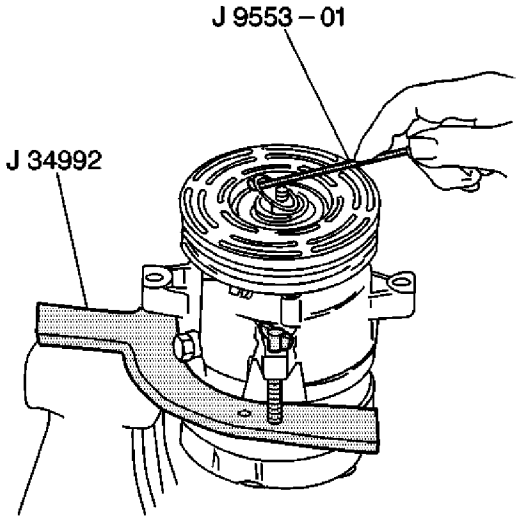
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- The O-ring groove



Important: Securely hand-tighten the handle of the J 23128-A . Do not use a wrench or pliers.

5. Fully engage the knurled tangs of the J 23128-A into the recessed portion of the seal by turning the handle clockwise.
6. Remove the seal from the compressor using a rotary-pulling motion. Discard the seal.



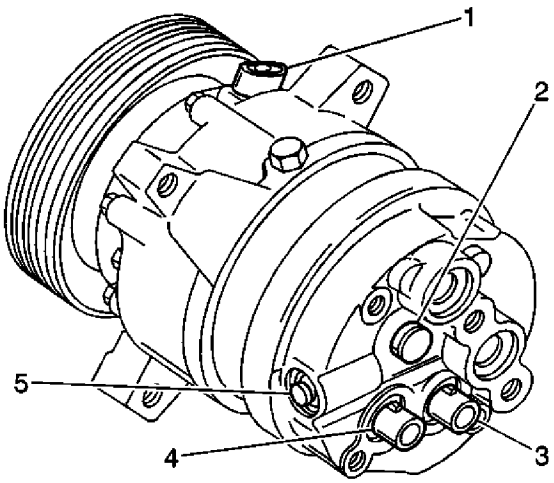
7. Remove the seal O-ring from the compressor neck using the J 9553-01 . Discard the seal O-ring.
8. Inspect the shaft and the inside of the compressor neck again for dirt and foreign material.
9. Ensure that the shaft and the inside of the compressor neck are perfectly clean prior to installing new parts.

Compressor Pressure Relief Valve Removal (V5 - Conventional Mount)

Tools Required

J 41790-A Compressor Holding Fixture

1. Install the compressor into the J 41790-A .



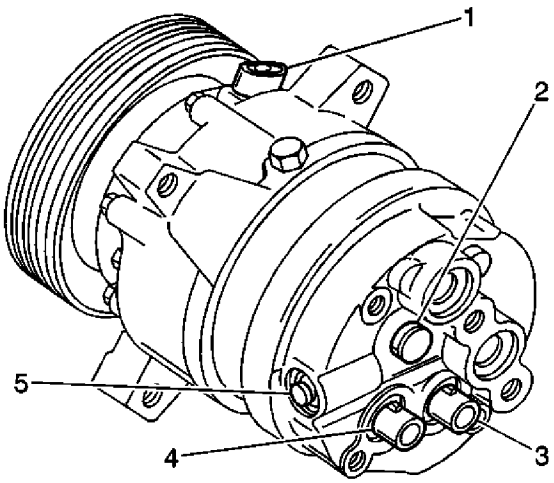
2. Remove the pressure relief valve (2) from the rear head of the compressor.

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Compressor Control Valve Assembly Install (V5 - Conventional Mount)

Tools Required

J 5403 Snap Ring Pliers



1. Coat the O-rings with 525 viscosity refrigeration oil.
2. Using thumb pressure, push the O-rings in place.
3. Install the valve into the case.

Important: Ensure that the retaining ring is properly seated in the ring groove.

4. Using the J 5403 , install the valve retaining ring (5) with the high point of the curved sides against the valve housing.
5. Perform a leak test. Refer to *Compressor Leak Testing* .

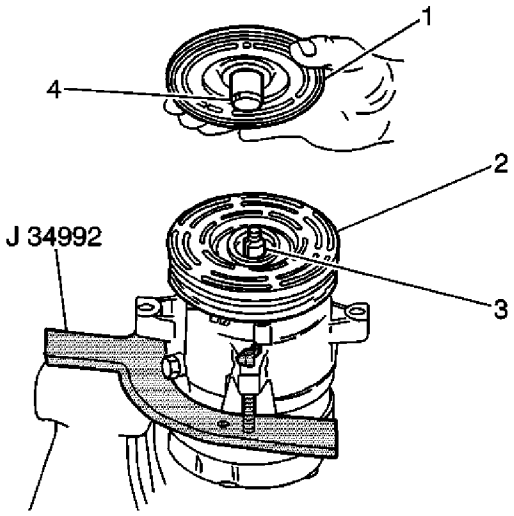
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Compressor Clutch Plate/Hub Assembly Install (V5 - Conventional Mount)

Tools Required

- J 33013-B Hub and Drive Plate Remover/Installer
- J 33022 6-Shaft Nut Socket - 13mm
- J 33027-A Clutch Hub Holding Tool
- J 34992 Compressor Holding Fixture

1. Install the compressor into the J 34992 .

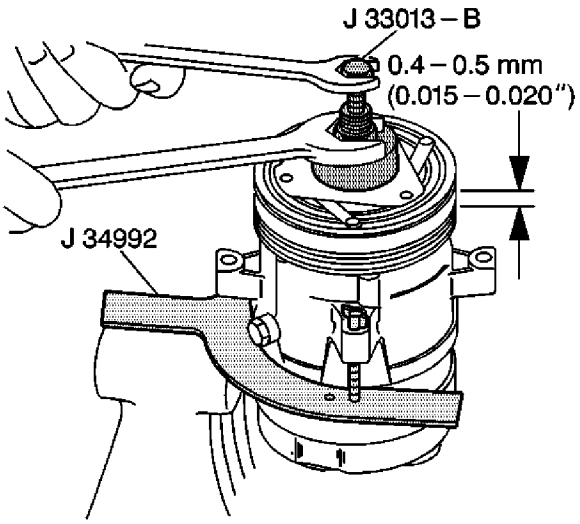


2. Install the shaft key (4) into the key groove of the clutch plate and hub (1).
   - Allow the key to project 3.2 mm (0.126 in) out of the key groove.
   - The shaft key is curved slightly in order to provide an interference fit in the key groove of the hub.
3. Clean the frictional surfaces of the clutch plate and hub and the clutch pulley rotor (2).
4. Align the shaft key with the shaft keyway (3).

Notice: Do not drive or pound on the clutch hub or the shaft. Internal damage to the compressor may result.

5. Place the clutch plate and hub assembly onto the compressor shaft.

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6. Remove the center screw from the J 33013-B .
7. Reverse the body direction of the center screw of the J 33013-B .
8. Install the J 33013-B with the bearing.
9. Back off the body of the J 33013-B in order to allow the center screw to be threaded onto the end of the compressor shaft.
10. Hold the center screw of the J 33013-B with a wrench.

Notice: If the center screw is threaded fully onto the end of the compressor shaft, or if the body of the installer is held and the center screw is rotated, the key will wedge and will break the clutch hub.

11. Tighten the hex portion of the body of the J 33013-B in order to press the hub onto the shaft.
12. Tighten the body of the J 33013-B several turns.
13. Remove the J 33013-B .
14. Verify that the shaft key remains in the keyway before installing the clutch plate and hub assembly to the final position.
15. Ensure that the gap between the frictional surfaces of the clutch plate and the clutch rotor is within 0.40-0.50 mm (0.016-0.020 in).
16. Remove the J 33013-B .
17. Verify that the shaft key is even with or slightly above the clutch hub.
18. Install the shaft nut.
19. Hold the clutch plate and hub assembly with the J 33027-A .

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

20. Tighten the shaft nut against the crankshaft shoulder, using a 17.5 N·m (12.5 lb ft) torque wrench and the J 33022 .

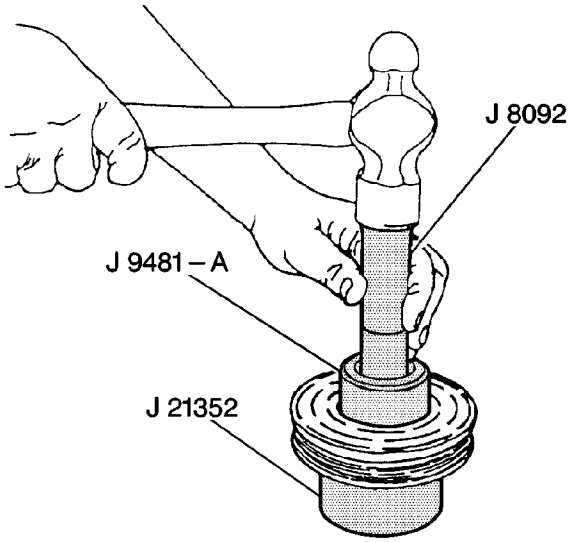
Tighten
Tighten the nut to 16.5 N·m (12 lb ft).

21. Spin the pulley rotor by hand in order to verify that the rotor does not rub the clutch drive plate.

Clutch Rotor and/or Bearing Install (V5 - Conventional Mount)

Tools Required

- J 6083 #24 External Snap Ring Pliers
- J 8092 Driver Handle
- J 8433-1 Puller Bar
- J 8433-3 Forcing Screw
- J 9481-A Bearing Installer
- J 21352-A Support Block
- J 33017 Pulley And Bearing Assembly Installer
- J 33019 Bearing Staking Tool
- J 33023-A Puller Pilot
- J 34992 Compressor Holding Fixture

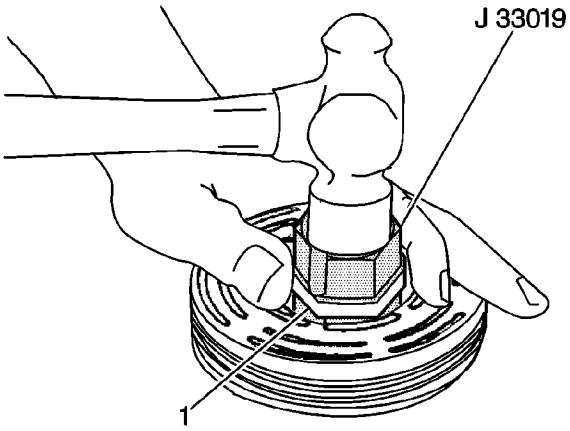


Notice: Do not support the rotor by resting the pulley rim on a flat surface during the bearing installation or the rotor face will be bent.

1. Place the pulley rotor on the J 21352-A in order to fully support the rotor hub during the bearing installation.
2. Align the new bearing with the hub bore.
3. Using the J 9481-A and the J 8092 , drive the bearing into the hub.

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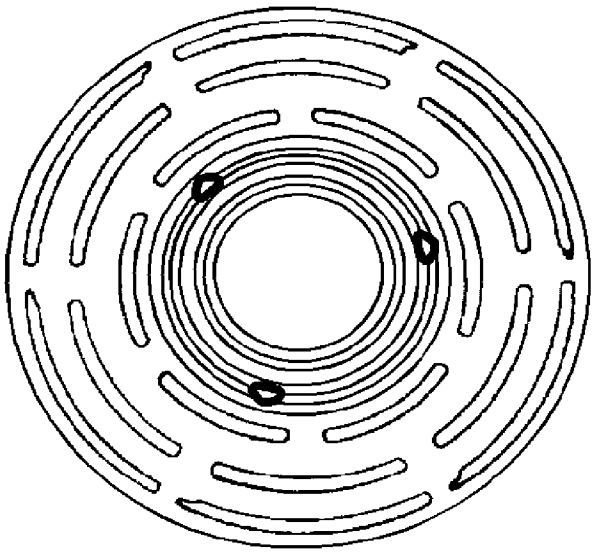
The J 9481-A applies force to the outer race of the bearing.



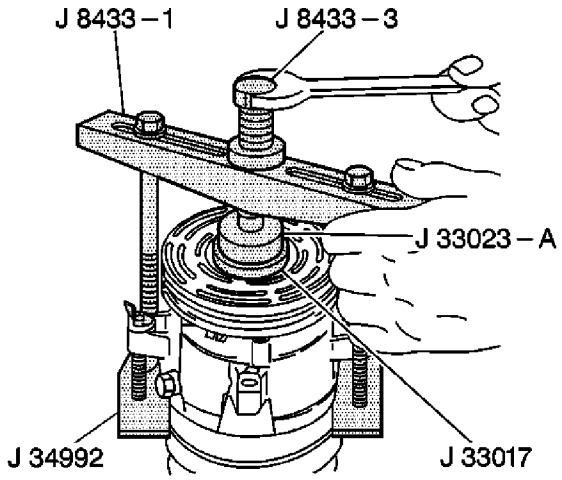
4. Place the J 33019 and the staking pin in the hub bore.
5. Shift the rotor and bearing assembly on the J 21352-A in order to fully support the hub under the location of the staking pin.
6. Use a heavy-duty rubber band (1) in order to hold the stake pin in the guide of the J 33019 .

Important: Do not allow a metal stake to contact the outer face of the bearing in order to prevent distortion of the outer race.

7. Using care in order to prevent injury, strike the staking pin of the J 33019 . Properly position the stake pin in the guide after each impact on the pin.
8. Continue to strike the pin of the J 33019 until a stake, similar to the original stake, is formed down to, but not touching, the bearing.



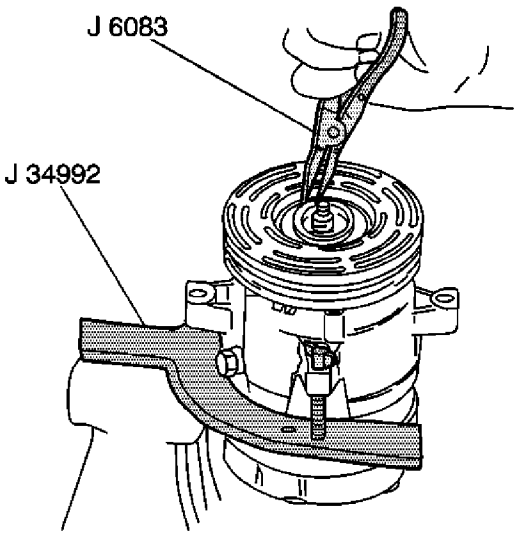
9. Stake 3 places 120 degrees apart.



10. With the compressor mounted to the J 34992 , position the rotor and bearing assembly on the front head.
11. Position the J 33017 and the J 33023-A directly over the inner race of the bearing.
12. Position the J 8433-1 on the J 33023-A .
13. Assemble the 2 through bolts and the washers of the J 34992 through the slots of the J 8433-1 .
14. Thread the 2 through bolts into the J 34992 .

    Ensure that the thread of the through bolts engages the full thickness of the J 34992 .

15. Tighten the J 8433-3 in the J 8433-1 in order to force the pulley rotor and bearing assembly onto the front head of the compressor.
16. If the J 33017 slips off direct, in-line contact with inner face of the bearing, use the following steps:
    16.1. Loosen the J 8433-3 .
    16.2. Realign the J 33017 and the J 33023-A in order to ensure that the installer clears the front head.

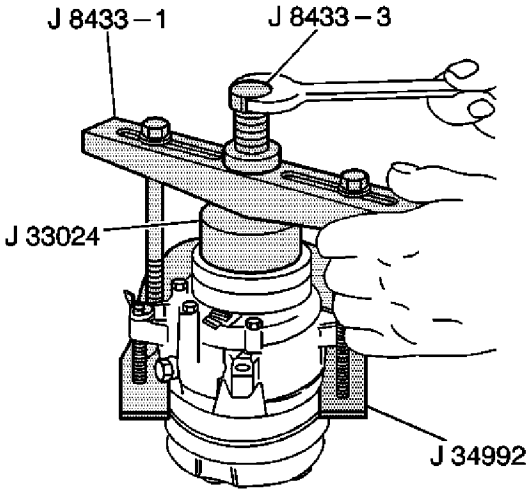


17. Install the rotor and bearing assembly retainer ring using the J 6083 .
18. Install the clutch plate and hub assembly. Refer to *Compressor Clutch Plate and Hub Assembly Removal (V5 -- Conventional Mount)* .

Air Conditioning Clutch Coil Installation (V5 - Conventional Mount)

Tools Required

- J 8433-1 Puller Bar
- J 8433-3 Forcing Screw
- J 33024 Clutch Coil Installer Adapter
- J 34992 Compressor Holding Fixture
- J 33025 Clutch Coil Puller Legs

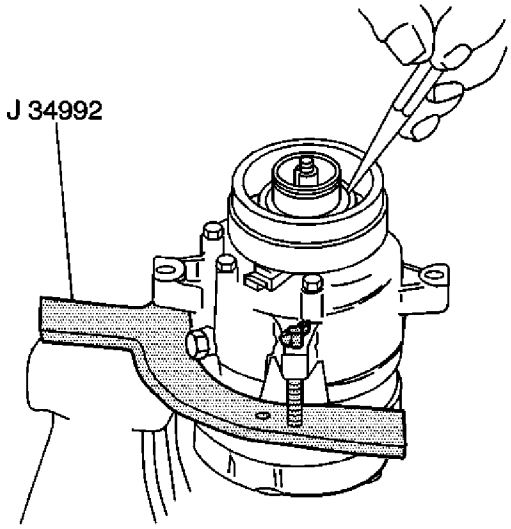


1. Place the clutch coil assembly on the front head with the terminals positioned at the marked location.
2. Place the J 33024 over the internal opening of the clutch coil housing.
3. Align the J 33024 with the compressor front head.
4. Center the J 8433-1 on the countersunk center hole of the J 33024 .
5. Install the through bolts and the washers of the J 34992 through the slots in the J 8433-1 .
6. Thread the through bolts into the J 33025 in order to achieve full fixture thickness.

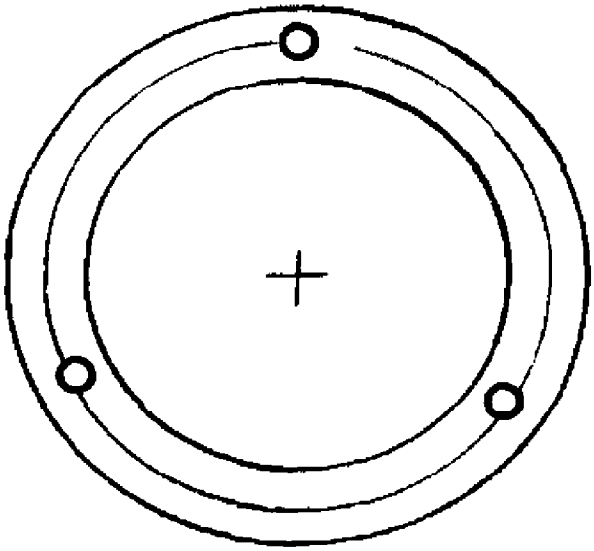
Important: Ensure that the clutch coil and the J 33024 stay in-line during the installation.

7. Turn the J 8433-3 of the J 8433-1 in order to force the clutch coil onto the head.

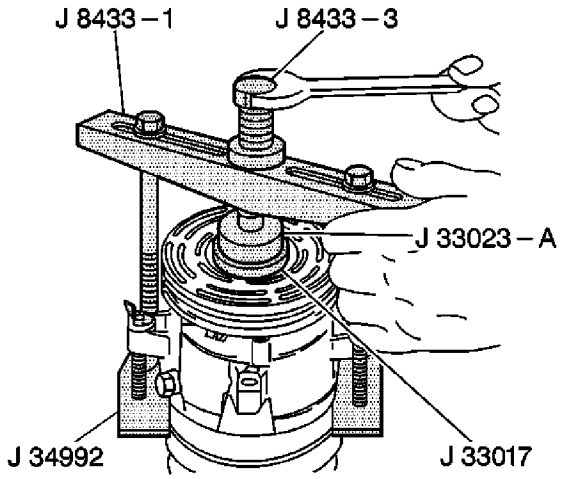
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8. With the compressor still mounted to the J 34992 and the coil seated on the front head, stake the front head using a drift punch with a diameter of 3.175 mm (0.125 in).



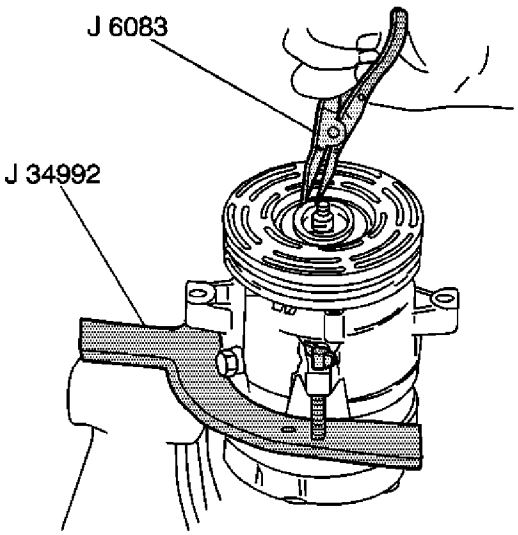
9. Stake the front head at 3 places 120 degrees apart in order to ensure that the clutch coil remains in position.
10. Ensure that the stake size is only one half of the area of the punch tip and only 0.28-0.35 mm (0.010-0.015 in) in depth.



11. With the compressor mounted to the J 34992 , position the rotor and bearing assembly on the front head.
12. Position the J 33017 and the J 33023-A directly over the inner race of the bearing.
13. Position the J 8433-1 on the J 33023-A .
14. Assemble the 2 through bolts and the washers of the J 34992 through the slots of the J 8433-1 .
15. Thread the 2 through bolts into the J 34992 .

    Ensure that the thread of the through bolts engages the full thickness of the J 34992 .

16. Tighten the J 8433-3 in the J 8433-1 in order to force the pulley rotor and bearing assembly onto the front head of the compressor.
17. If the J 33017 slips off direct, in-line contact with inner face of the bearing, use the following steps:
    17.1. Loosen the J 8433-3 .
    17.2. Realign the J 33017 and the J 33023-A in order to ensure that the installer clears the front head.

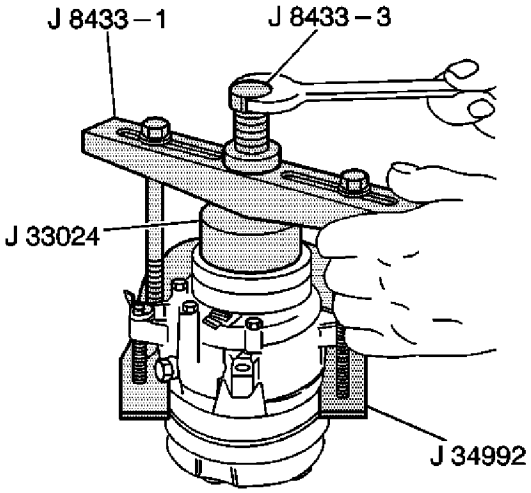


18. Install the rotor and bearing assembly retainer ring using the J 6083 .
19. Install the clutch plate and hub assembly. Refer to *Compressor Clutch Plate and Hub Assembly Removal (V5 -- Conventional Mount)* .
20. Install the shaft nut.

Air Conditioning Clutch Coil Installation (V5 - Conventional Mount)

Tools Required

- J 8433-1 Puller Bar
- J 8433-3 Forcing Screw
- J 33024 Clutch Coil Installer Adapter
- J 34992 Compressor Holding Fixture
- J 33025 Clutch Coil Puller Legs

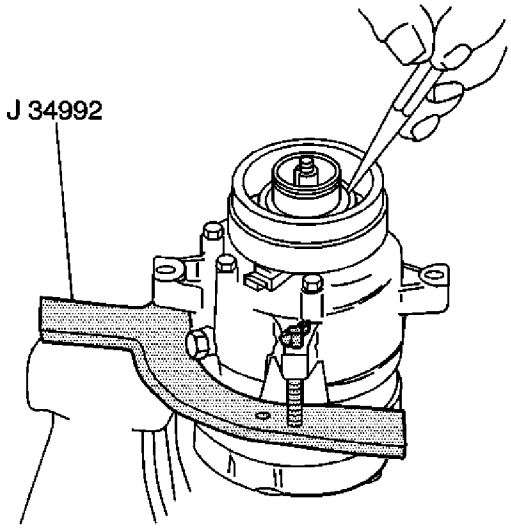


1. Place the clutch coil assembly on the front head with the terminals positioned at the marked location.
2. Place the J 33024 over the internal opening of the clutch coil housing.
3. Align the J 33024 with the compressor front head.
4. Center the J 8433-1 on the countersunk center hole of the J 33024 .
5. Install the through bolts and the washers of the J 34992 through the slots in the J 8433-1 .
6. Thread the through bolts into the J 33025 in order to achieve full fixture thickness.

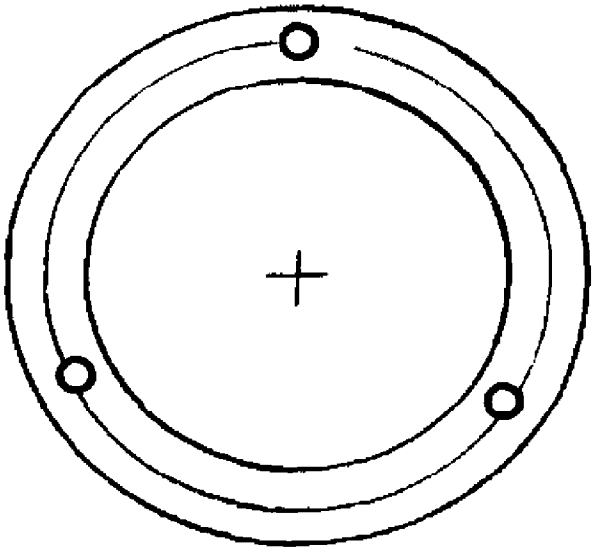
Important: Ensure that the clutch coil and the J 33024 stay in-line during the installation.

7. Turn the J 8433-3 of the J 8433-1 in order to force the clutch coil onto the head.

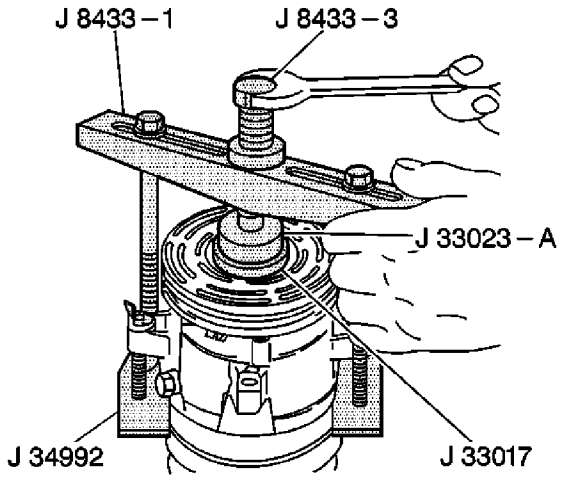
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8. With the compressor still mounted to the J 34992 and the coil seated on the front head, stake the front head using a drift punch with a diameter of 3.175 mm (0.125 in).



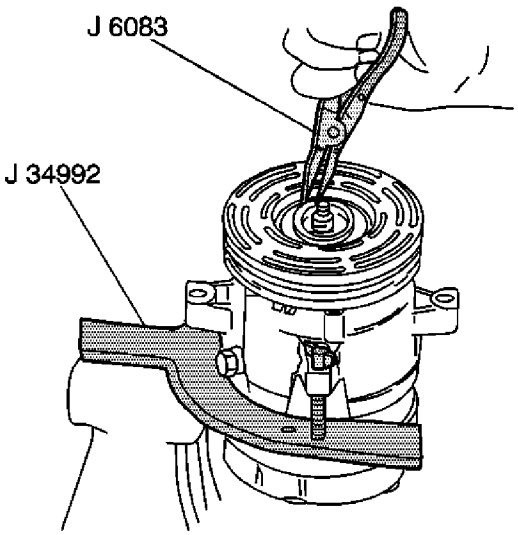
9. Stake the front head at 3 places 120 degrees apart in order to ensure that the clutch coil remains in position.
10. Ensure that the stake size is only one half of the area of the punch tip and only 0.28-0.35 mm (0.010-0.015 in) in depth.



11. With the compressor mounted to the J 34992 , position the rotor and bearing assembly on the front head.
12. Position the J 33017 and the J 33023-A directly over the inner race of the bearing.
13. Position the J 8433-1 on the J 33023-A .
14. Assemble the 2 through bolts and the washers of the J 34992 through the slots of the J 8433-1 .
15. Thread the 2 through bolts into the J 34992 .

    Ensure that the thread of the through bolts engages the full thickness of the J 34992 .

16. Tighten the J 8433-3 in the J 8433-1 in order to force the pulley rotor and bearing assembly onto the front head of the compressor.
17. If the J 33017 slips off direct, in-line contact with inner face of the bearing, use the following steps:
    17.1. Loosen the J 8433-3 .
    17.2. Realign the J 33017 and the J 33023-A in order to ensure that the installer clears the front head.

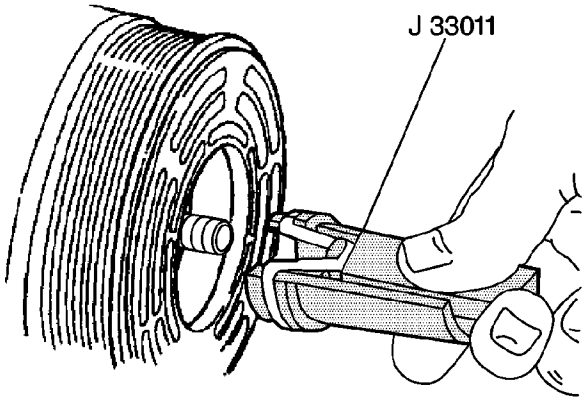


18. Install the rotor and bearing assembly retainer ring using the J 6083 .
19. Install the clutch plate and hub assembly. Refer to *Compressor Clutch Plate and Hub Assembly Removal (V5 -- Conventional Mount)* .
20. Install the shaft nut.

Compressor Shaft Seal Install (V5 - Conventional Mount)

Tools Required

- J 5403 Snap Ring Pliers
- J 23128-A Seal Seat Installer And Remover
- J 33011 O-Ring Installer
- J 34614 Shaft Seal Protector



Notice: Seals should not be re-used. Always use a new specification service seal kit. Be sure that the seal to be installed is not scratched or damaged in any way. Make sure that the seal is free of lint and dirt that could damage the seal surface or prevent sealing.

1. Thoroughly clean the seal O-ring groove in the front head.
2. Dip the new seal O-ring in clean 525 viscosity refrigerant oil.

Notice: Any attempt to use makeshift or inadequate service tools or equipment may result in damage and/or improper compressor operation.

3. Assemble the O-ring onto the J 33011 .
4. Install the O-ring.
   4.1. Insert the J 33011 into the compressor neck until the installer bottoms out.

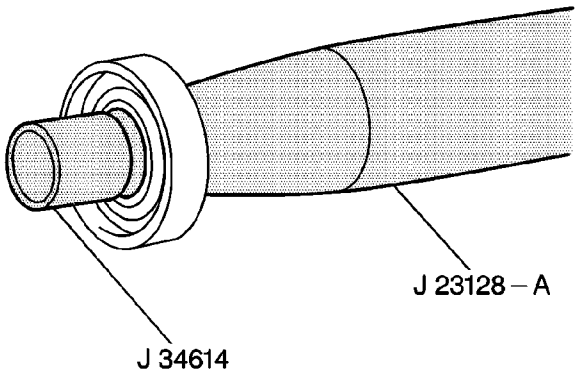
Important: The top groove in the compressor neck is for the shaft seal retainer ring.

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4.2. Lower the moveable slide of the J 33011 in order to release the O-ring into the seal O-ring lower grove.

4.3. Rotate the J 33011 in order to seat the O-ring.

4.4. Remove the installer.



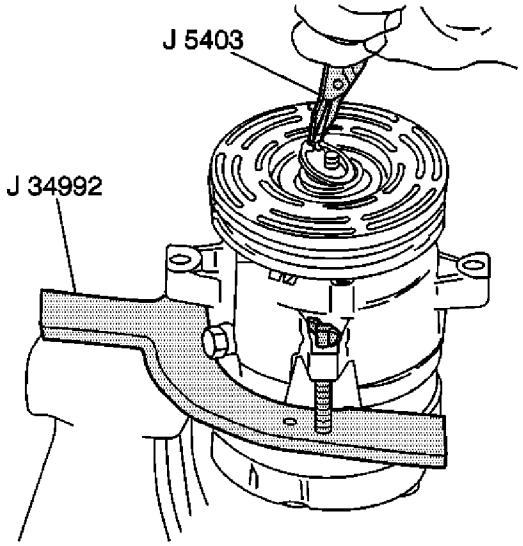
5. Dip the new shaft seal in clean 525 viscosity refrigerant oil.
6. Assemble the seal to the J 23128-A by turning the handle clockwise.
   6.1. Ensure that the stamped steel case side of the lip seal engages with the knurled tangs of the J 23128-A .
   6.2. Ensure that the flared-out side of the lip seal faces toward the compressor.

Notice: Use care when handling the seal protector. Do not nick the seal protector. This may damage the seal during installation. Ensure that the bottom of the seal protector is not flared. This may damage the seal during installation.

7. Install the J 34614 on the lip seal.
8. Install the lip seal onto the shaft.
   8.1. Place the J 34614 over the end of the compressor shaft.
   8.2. Slide the new seal onto the shaft using a rotary motion of the J 23128-A .
   8.3. Ensure that the seal makes good contact with the O-ring.

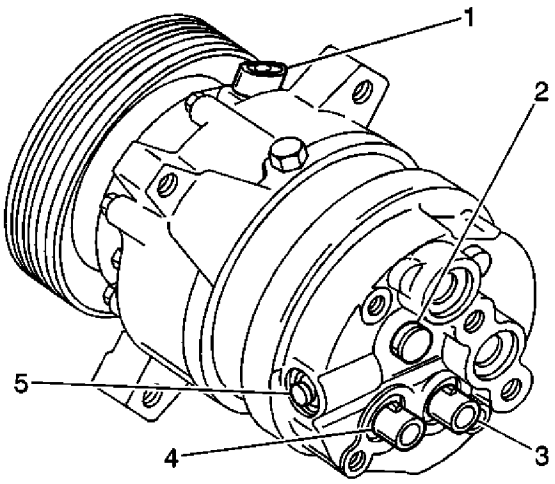
Do not dislodge the O-ring.

   8.4. Disengage the J 23128-A from the seal.
   8.5. Remove the J 23128-A and the J 34614 from the compressor.



9. Use the J 5403 in order to install the new seal retainer ring with the flat side against the seal.
10. Use the sleeve of theJ 33011 in order to press in the seal retainer ring. Ensure that the ring snaps into the groove.
11. Leak test the compressor. Refer to *Compressor Leak Testing (V5 -- Conventional Mount).*
12. Remove any excess oil from the shaft and the inside of the compressor neck.
13. Install the clutch plate and hub assembly. Refer to *Compressor Leak Testing (V5 -- Conventional Mount).*
14. Install the compressor and the compressor belt. Tighten the bracket.
15. Evacuate and charge the refrigerant system using the J 39500-B .

Compressor Pressure Relief Valve Installation (V5 - Conventional Mount)



1. Clean the valve seat area on the rear head.
2. Lubricate the O-ring of the new pressure relief valve and the O-ring assembly using new 525 viscosity refrigerant oil.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the new pressure relief valve (2).

   Tighten
   Tighten the valve to 9 N·m (80 lb in).

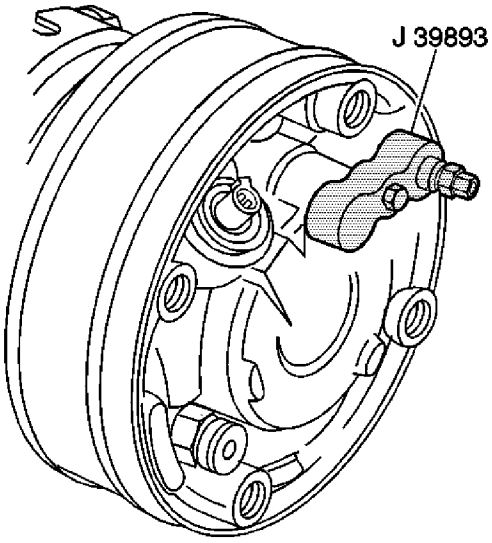
4. Perform a leak test. Refer to*Compressor Leak Testing (V5 -- Conventional Mount)* .

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Compressor Leak Testing (V5 - Conventional Mount)

Tools Required

- J 39400 Electronic Halogen Leak Detector
- J 39500-B A/C Refrigerant Recovery, Recycling and Recharging (ACR4) System
- J 39893 Pressure Testing Connector



1. With the sealing washers in place, install the J 39893 on the rear head of the compressor.
2. Connect the gage charging lines and the J 39500-B .
3. Pressurize the suction and the high-side of the compressor using R-134a refrigerant.
4. With the compressor in a horizontal position, rotate the compressor shaft several turns by hand in the operating direction.
5. Using the J 39400 , inspect for leaks at the following locations:
   - The pressure relief valve
   - The rear head switch
   - The front head seal
   - The rear head seal
   - The through bolt head gaskets
   - The compressor shaft seal
6. Perform the measures necessary to correct any external leaks found.
7. Inspect for leaks again following any repair.
8. Recover the refrigerant.
9. Disconnect the hoses from the J 39893 .
10. Remove the J 39893 .

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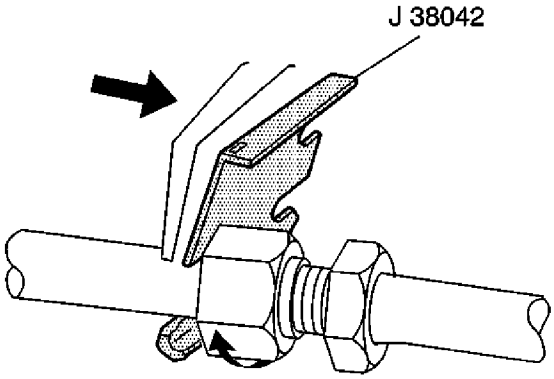
O-Ring Replacement

Removal Procedure

Tools Required

- J 38042 Dual O-Ring Joint Separator
- J 39500-B A/C Refrigerant Recovery, Recycling, and Recharging (ACR4) System

1. Recover the refrigerant. Refer to *Refrigerant Recovery and Recharging* .



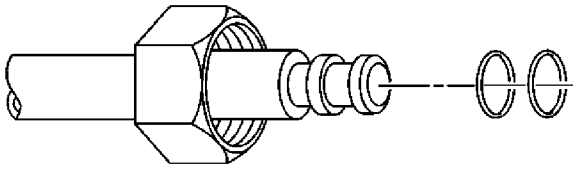


2. Place the J 38042 on the refrigerant line directly behind the female nut of the dual O-ring joint.

   Hold pressure against the nut.

3. Loosen the female nut until the seal of the dual O-ring joint is broken. This procedure aids in the seal separation.
4. After the seal is broken, slightly tighten the female nut to facilitate the J 38042 removal.
5. Remove the female nut. Separate the connection.

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6. Use a non-metallic tool to remove the O-rings.

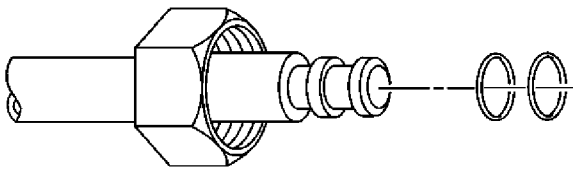
   The use of a non-metallic tool minimizes the chance of impairing the seal surfaces.

7. Inspect the line for kinks and dents.
8. Inspect the connection for the burrs and nicks.

Installation Procedure

Tools Required

J 39400 Electronic Halogen Leak Detector





1. Lubricate the O-rings using 525 oil or mineral oil before installation.
2. Install the O-rings.
3. Oil the bore using a small amount of refrigerant oil before assembly.
4. Align the end forms for pilot-to-bore insertion.
5. Push the pilot and the bore together completely.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

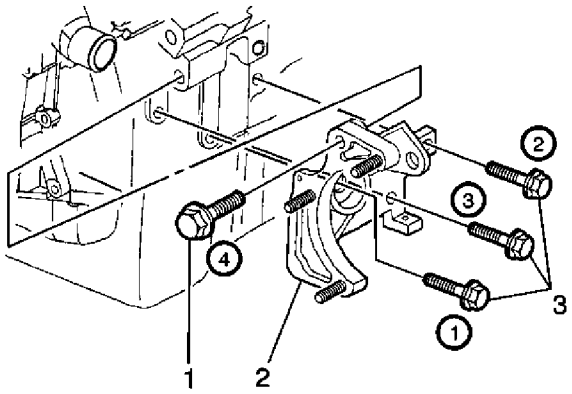
6. Install the female nut.

   Tighten
   Tighten the nut to 24 N·m (18 lb ft).

7. Recharge the A/C system. Refer to *Refrigerant Recovery and Recharging* .
8. Leak test the system. Refer to *Leak Testing* .

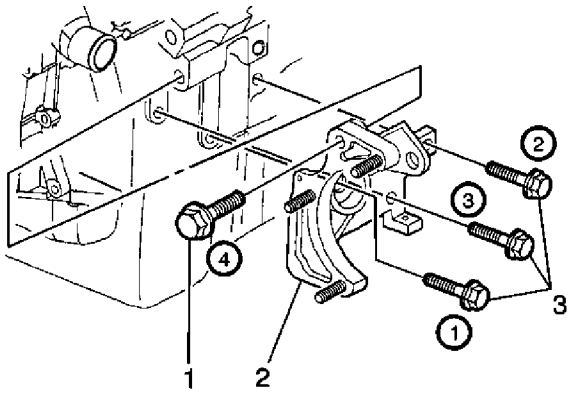
Air Conditioning Compressor Bracket Replacement

Removal Procedure



1. Remove the A/C compressor. Refer to *Compressor Replacement* .
2. Remove the retaining bolts (1,3) from the A/C compressor mounting bracket.
3. Remove the A/C compressor mounting bracket.

Installation Procedure



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1. Install the A/C compressor mounting bracket.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the retaining bolts (1,3) to the A/C compressor mounting bracket.

   Tighten

   - Tighten the side bracket bolts to 100 N·m (74 lb ft).
   - Tighten the front bracket bolt to 50 N·m (37 lb ft).

3. Install the A/C compressor. Refer to *Compressor Replacement*

Air Conditioning Compressor Hose Replacement

Removal Procedure

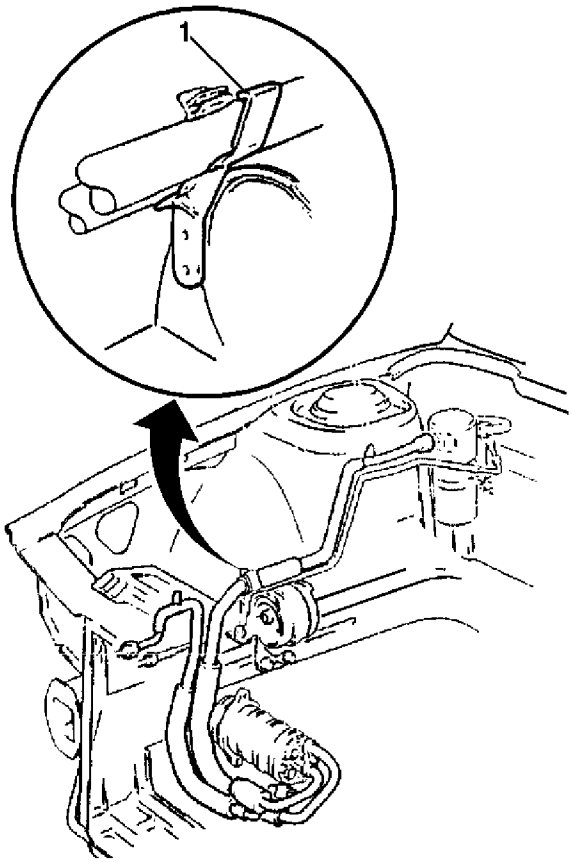
Tools Required

- J 38042 Dual O-Ring Joint Separator
- J 39500-B A/C Refrigerant Recovery, Recycling, and Recharging (ACR4) System

1. Recover the refrigerant. Refer to *Refrigerant Recovery and Recharging* .

   Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

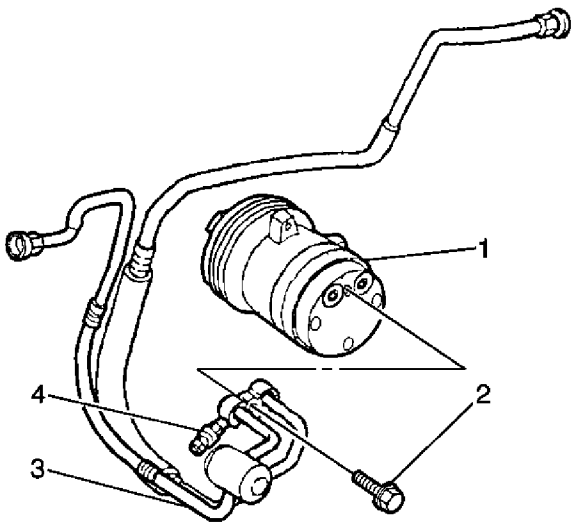
2. Disconnect the negative battery cable.



3. Remove the upper A/C line clip (1).

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4. Disconnect the A/C line connection from the accumulator outlet using the J 38042 .
5. Disconnect the A/C line connection from the condenser inlet using the J 38042 .
6. Remove the A/C compressor splash shield.



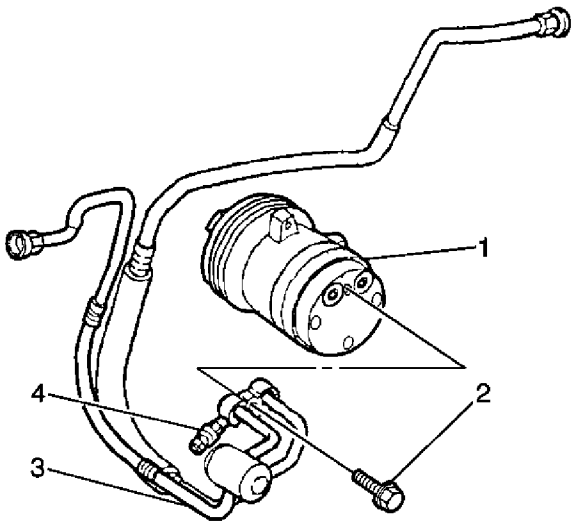


7. Disconnect the electrical connector from the A/C pressure switch (4).
8. Remove the bolt (2) that attaches the A/C compressor hose assembly (3), from the rear of the A/C compressor (1).
9. Remove the A/C compressor hose assembly (3) from the vehicle.

Installation Procedure

Tools Required

J 39400 Electronic Halogen Leak Detector





1. Install the A/C compressor hose assembly (3) into the vehicle.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the bolt (2) in order to attach the A/C compressor hose assembly (3) to the rear of the A/C compressor (1).

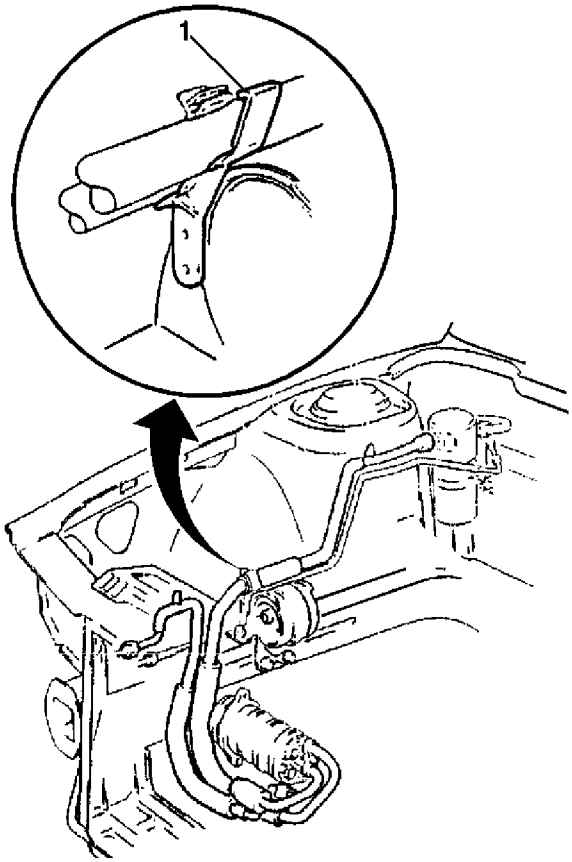
   Tighten
   Tighten the bolt to 30 N·m (22 lb ft).

3. Connect the electrical connector to the A/C pressure switch (4).
4. Connect the A/C line connection to the condenser inlet.

   Tighten
   Tighten the condenser inlet connection to 24 N·m (18 lb ft).

5. Connect the A/C line connection to the accumulator outlet.

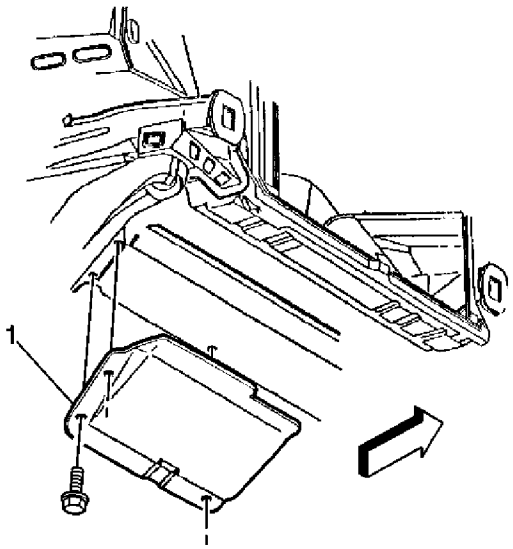
   Tighten
   Tighten the accumulator outlet connection to 24 N·m (18 lb ft).



6. Install the upper A/C line clip (1).
7. Connect the negative battery cable.

Tighten
Tighten the negative battery cable to 15 N·m (11 lb ft).

8. Recharge the A/C system. Refer to *Refrigerant Recovery and Recharging* .
9. Test the A/C system for leaks. Refer to *Leak Testing* .



10. Install the A/C compressor splash shield (1).

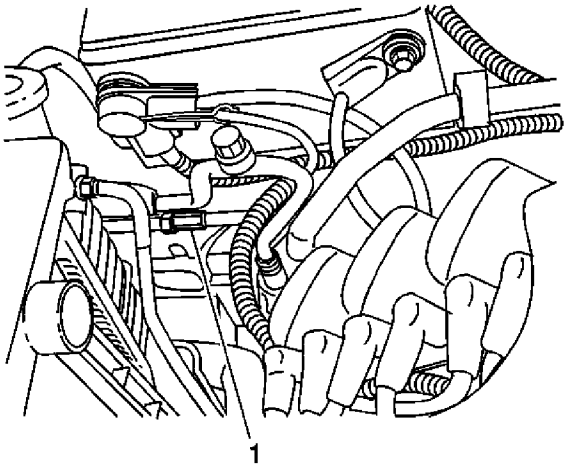
Expansion (Orifice) Tube Replacement

Removal Procedure

Tools Required

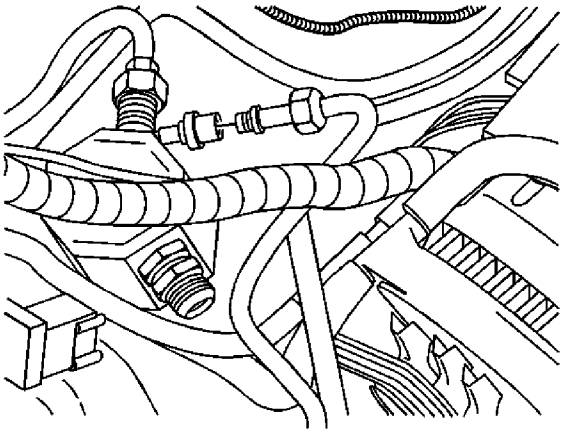
- J 26549-E Expansion Tube Remover
- J 38042 Dual O-Ring Joint Separator
- J 39500-B A/C Refrigerant Recovery, Recycling, and Recharging (ACR4) System

1. Recover the refrigerant. Refer to *Refrigerant Recovery and Recharging* .

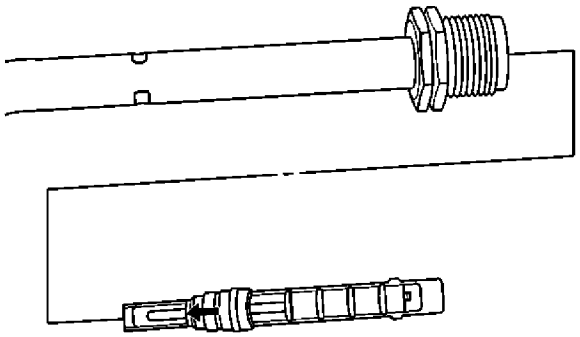


2. Remove the dual O-ring joint (1) of the condenser outlet using the J 38042 .

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3. Remove the dual O-ring joint of the evaporator inlet using the J 38042 .
4. Remove the A/C line clips.

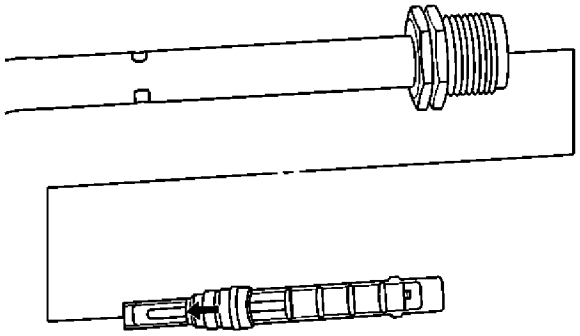


5. Remove the expansion tube from the line using the J 26549-E .

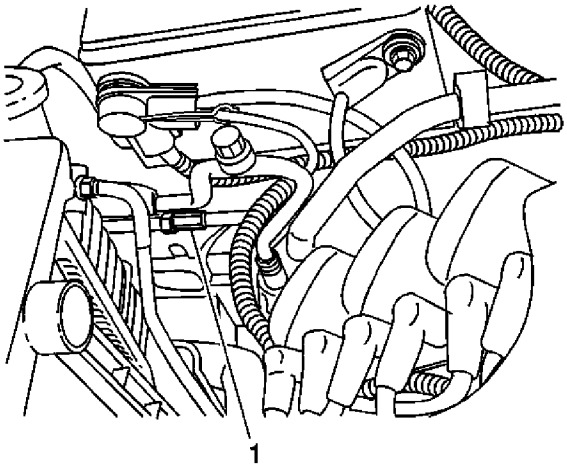
Installation Procedure

Tools Required

J 39400 Electronic Halogen Leak Detector



1. With the short screen toward the evaporator, install the expansion tube.
2. Position the line and install the A/C line clips.



3. Assemble the dual O-ring joints of the evaporator inlet and the condenser outlet (1).
4. Hand tighten the dual O-ring joints in order to assure correct line orientation.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

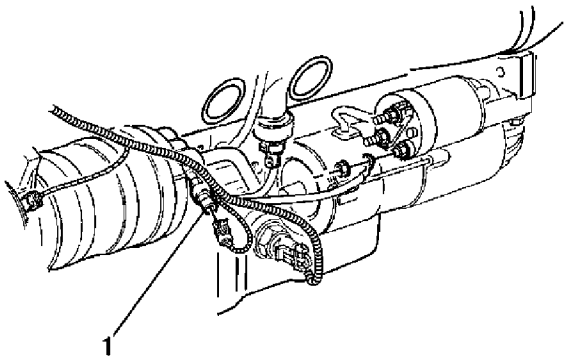
5. Tighten the dual O-ring connections.

   Tighten
   Tighten the dual O-ring connections to 24 N·m (18 lb ft).

6. Recharge the A/C system. Refer to *Refrigerant Recovery and Recharging* .
7. Test the A/C system for leaks. Refer to *Leak Testing* .

Air Conditioning (A/C) Refrigerant Pressure Sensor Replacement

Removal Procedure

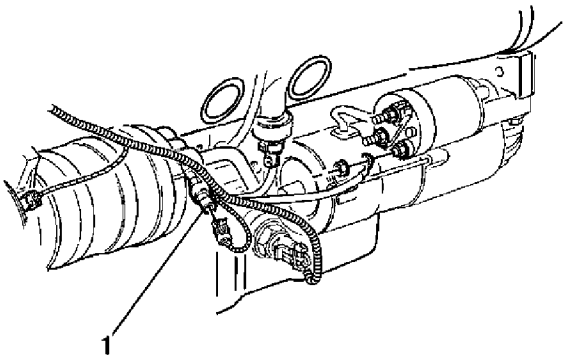


1. Disconnect the electrical connection from the switch (1).
2. Remove the following components:
   - The switch
   - The O-ring seal

Installation Procedure

1. Lubricate the O-ring using clean 525 oil or mineral oil.

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2. Install the O-ring seal.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the switch (1).

   Tighten
   Tighten the switch to 5 N·m (44 lb in).

4. Connect the electrical connection to the switch (1).

Air Conditioning Condenser Replacement

Removal Procedure

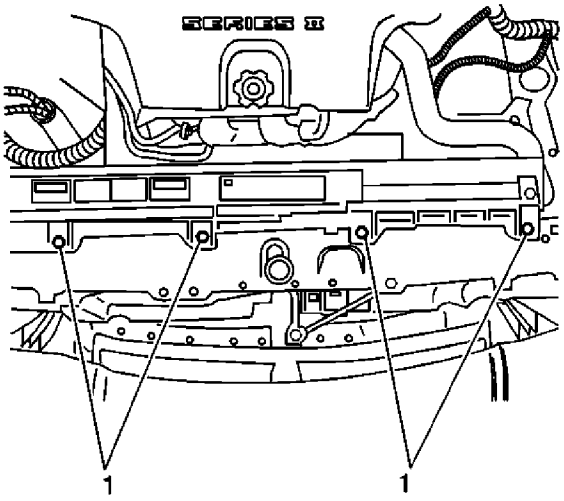
Tools Required

- J 39500-B A/C Refrigerant Recovery, Recycling, and Recharging (ACR4) System
- J 38042 Dual O-Ring Joint Separator

1. Recover the refrigerant. Refer to *Refrigerant Recovery and Recharging* .

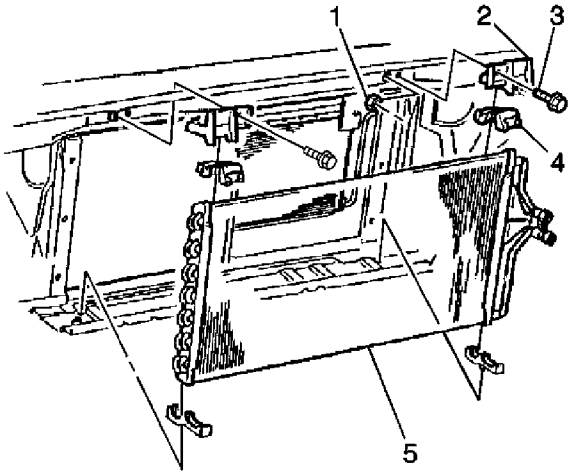
   Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

2. Disconnect the negative battery cable.
3. Remove the air cleaner assembly. Refer to Air Cleaner Assembly Replacement in Engine Controls.



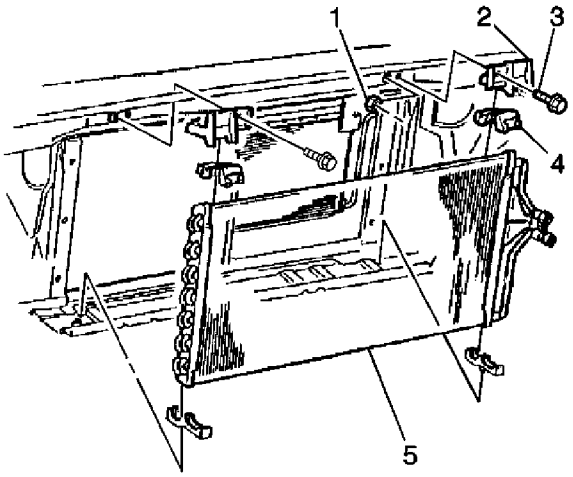
4. Remove the bolts (1) from the upper radiator panel.
5. Remove the upper radiator panel.

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6. Remove the inlet line from the condenser (5).
7. Remove the outlet line from the condenser (5).
8. Remove the nuts (1) and the bolts (3) from the mounting brackets (2).
9. Remove the upper insulators (4).
10. Remove the condenser (5) by tilting the radiator toward the engine.

Installation Procedure



1. Install the condenser (5) into position by tilting the radiator toward the engine.
2. Install the upper insulators (4).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the

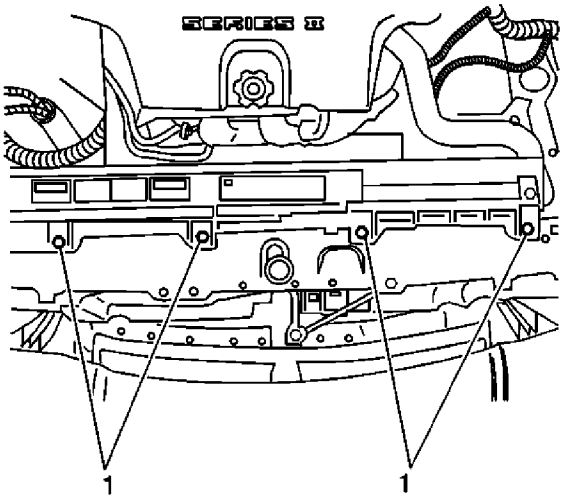
correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the nuts (1) and the bolts (3) to the mounting brackets (2).

Tighten
Tighten the bolts to 12 N·m (106 lb in).

4. Install the outline line to the condenser (5).
5. Install the inlet line to the condenser.

Tighten
Tighten the condenser connections to 24 N·m (18 lb ft).



6. Install the upper radiator panel.
7. Install the upper radiator panel bolts (1).

Tighten
Tighten the bolts to 12 N·m (106 lb in).

8. Install the air cleaner assembly. Refer to Air Cleaner Assembly Replacement in Engine Controls.
9. Recharge the A/C system. Refer to *Refrigerant Recovery and Recharging*
10. Leak test the system. Refer to *Leak Testing* .

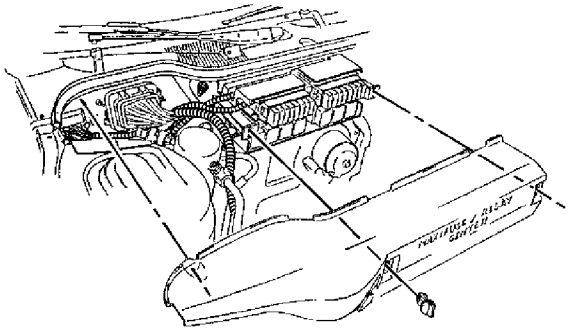
Air Conditioning Accumulator Replacement

Removal Procedure

Tools Required

- J 39500-B A/C Refrigerant Recovery, Recycling, and Recharging (ACR4) System
- J 38042 Dual O-Ring Joint Separator

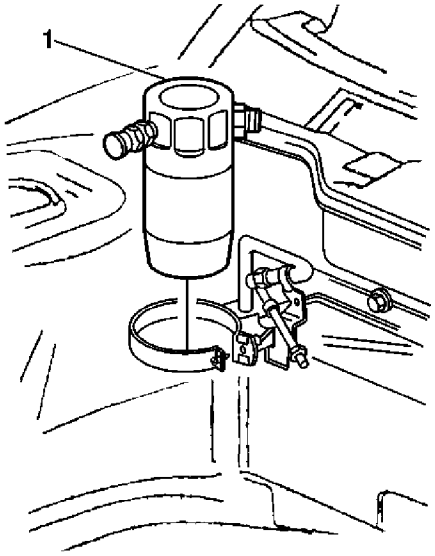
1. Recover the refrigerant. Refer to *Refrigerant Recovery and Recharging* .
2. Remove the cross car support brace. Refer to Cross Vehicle Brace Replacement in Body Front End.





3. Remove the sight shield of the rear engine.
4. Loosen the retaining clamp screw.
5. Use the J 38042 to disconnect the accumulator inlet and outlet connections.
6. Remove the retaining clamp screw.

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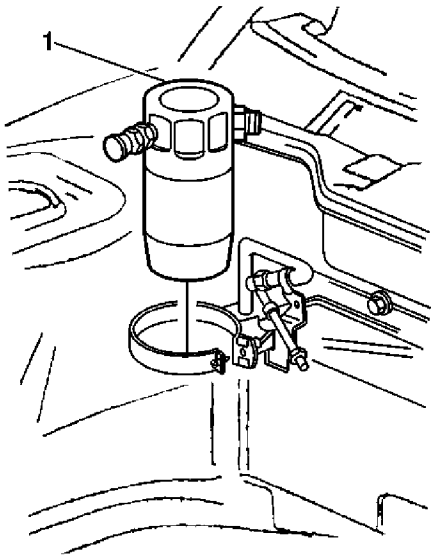


7. Remove the accumulator (1).

Installation Procedure

Tools Required

J 39400 Electronic Halogen Leak Detector



1. Install the accumulator (1).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the

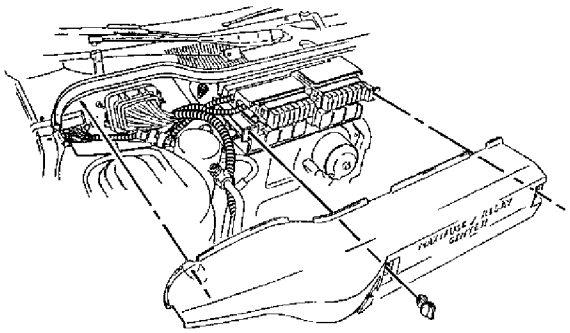
correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the retaining clamp screw.

   Tighten
   Tighten the screw to 6 N·m (53 lb in).

3. Connect and torque the accumulator inlet and outlet connections.

   Tighten
   Tighten the accumulator connections to 34 N·m (25 lb ft).





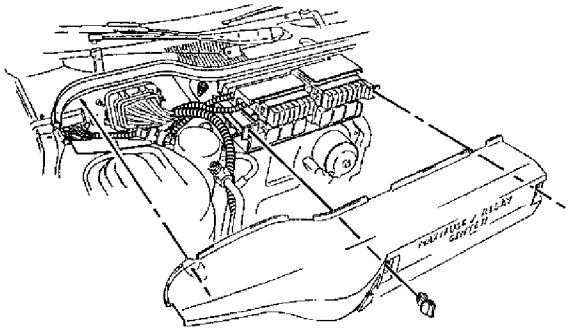
4. Install the sight shield of the rear engine.
5. Install the cross car brace. Refer to Cross Vehicle Brace Replacement in Body Front End.
6. Recharge the A/C system. Refer to *Refrigerant Recovery and Recharging* .
7. Leak test the system. Refer to *Leak Testing* .

Blower Motor Resistor Replacement

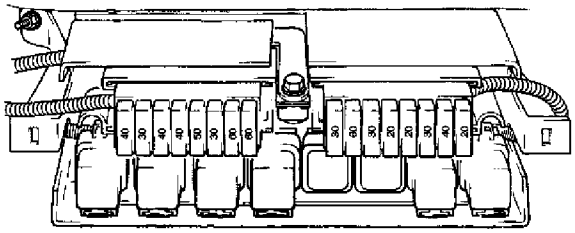
Removal Procedure

Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

1. Disconnect the negative battery cable.

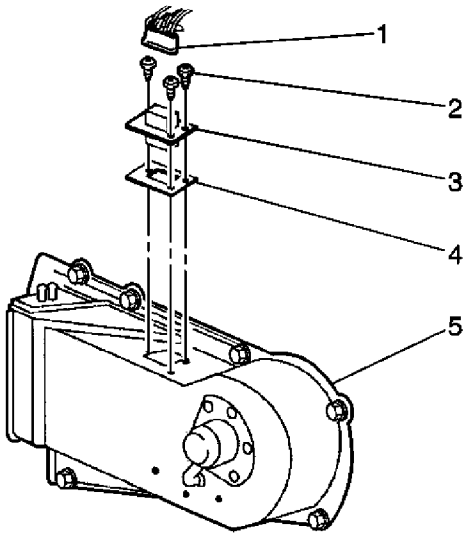


2. Remove the fuse block cover.



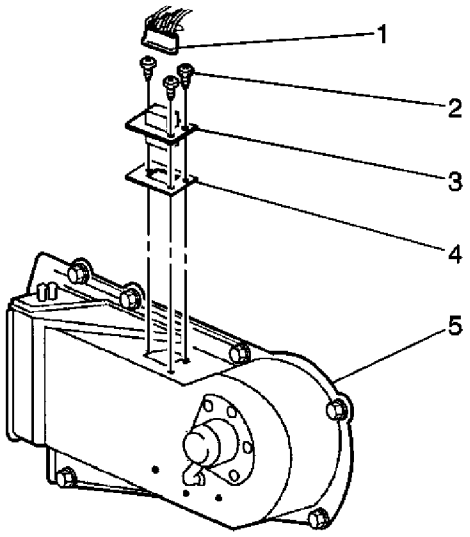
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3. Remove the center bolt from the multi use relay and fuse bracket.
4. Remove the positive booster cable.
5. Disconnect the underhood fuse blocks from the bracket.
6. Disconnect the relays from the bracket.
7. Remove the nuts which attach the multi-use relay and fuse bracket to the front of the dash.
8. Remove the fuse bracket.



9. Disconnect the connector (1) from the blower resistor assembly (3).
10. Remove the screws (2) which retain the blower resistor to the heater and A/C module (5).
11. Remove the blower resistor and gasket.

Installation Procedure



1. Install the blower resistor and gasket.

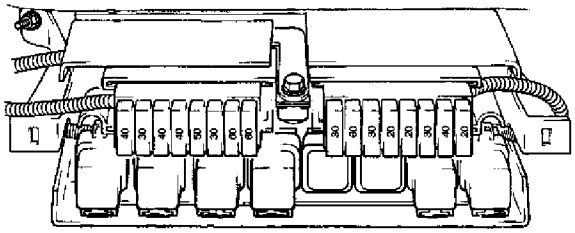
Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the screws (2) which retain the blower resistor to the heater and A/C module.

Tighten
Tighten the screws to 1.4 N·m (12 lb in).

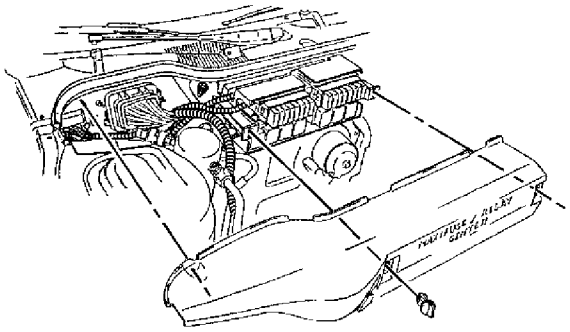
3. Connect the wiring connector (1) to the blower resistor.
4. Install the nuts which attach the multi-use relay and fuse bracket to the front of the dash.

Tighten
Tighten the nuts to 3.8 N·m (34 lb in).



5. Move the fuse blocks and the relay into position. Snap the fuse blocks and the relay to the bracket.
6. Connect the positive booster cable to the multi-use relay and fuse bracket using the center bolt.

Tighten
Tighten the bolt to 10 N·m (89 lb in).



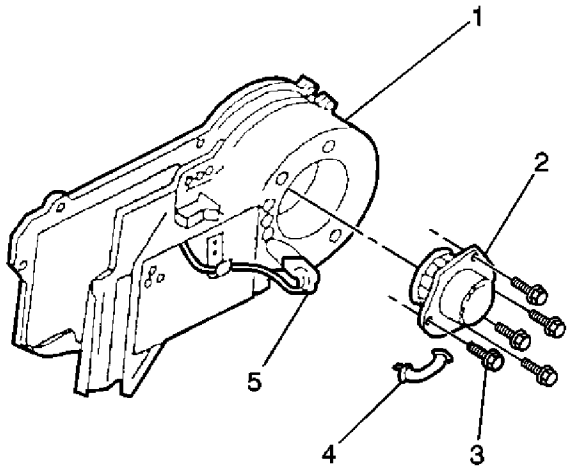
7. Install the fuse block cover.
8. Connect the negative battery cable.

Tighten
Tighten the negative battery cable to 15 N·m (11 lb ft).

Blower Motor and Fan Replacement

Removal Procedure

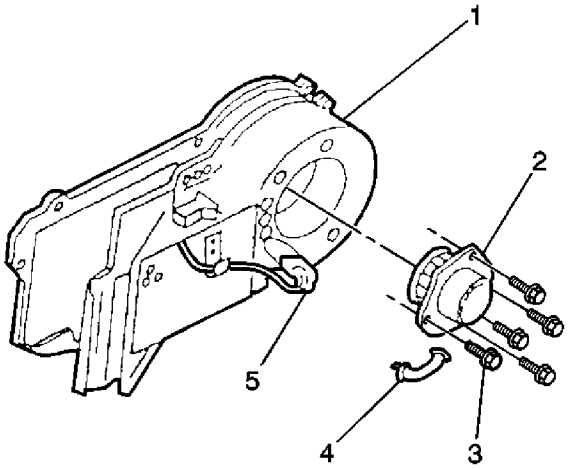
1. Remove the cross car support brace. Refer to Cross Vehicle Brace Replacement in Body Front End.
2. Remove the rear spark plug wires and bracket and set aside.



3. Disconnect the electrical connector (5) from the blower motor (2).
4. Remove the cooling tube (4) from the blower motor (2).
5. Remove the screws (3) that attach the blower motor (2) to the blower module assembly (1).
6. Remove the blower motor (2).

Installation Procedure

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1. Install the blower motor (2).

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the screws (3) to the blower motor (2).

   Tighten
   Tighten the screws to 6 N·m (55 lb in).

3. Install the cooling tube (4) to the blower motor (2).
4. Connect the electrical connector (5) to the blower motor (2).
5. Install the rear spark plug wires and bracket.
6. Install the cross car support brace. Refer to Cross Vehicle Brace Replacement in Body Front End.

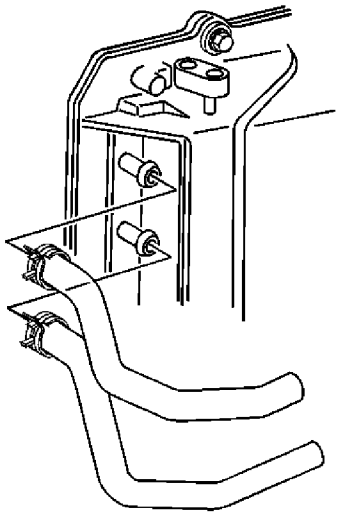
HVAC Module Assembly Replacement

Removal Procedure

Tools Required

- J 38042 Dual O-Ring Joint Separator
- J 37097-A MUBEA Hose Clamp Pliers
- J 39500-B A/C Refrigerant Recovery, Recycling, and Recharging (ACR4) System
- J 39400 Electronic Halogen Leak Detector

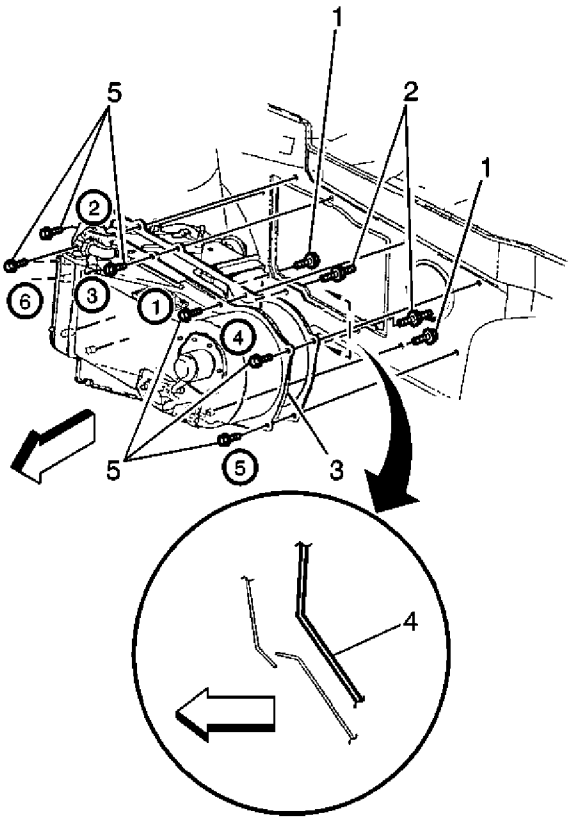
1. Recover the refrigerant. Refer to *Refrigerant Recovery and Recharging* .
2. Remove the cross car support brace. Refer to Cross Vehicle Brace Replacement in Body Front End.
3. Remove the IP assembly. Refer to Instrument Panel Assembly Removal in Instrument Panel, Gauges and Console.
4. Drain the cooling system. Refer to Cooling System Draining and Filling .
5. Disconnect the right bank spark plug wires and bracket. Refer to Spark Plug Wire Harness Replacement in Engine Electrical.
6. Remove the evaporator. Refer to *Evaporator Core Replacement* .





7. Remove the heater hoses from the heater core using the J 37097-A .
8. Remove the power steering pump. Refer to Power Steering Pump Replacement in Power Steering Systems.
9. Remove the air distributor. Refer to *Air Distributor Duct Replacement* .
10. Remove the aspirator adapter (C68 and CJ2).
11. Remove the heater and A/C programmer (C68 and CJ2). Refer to Programmer Replacement .

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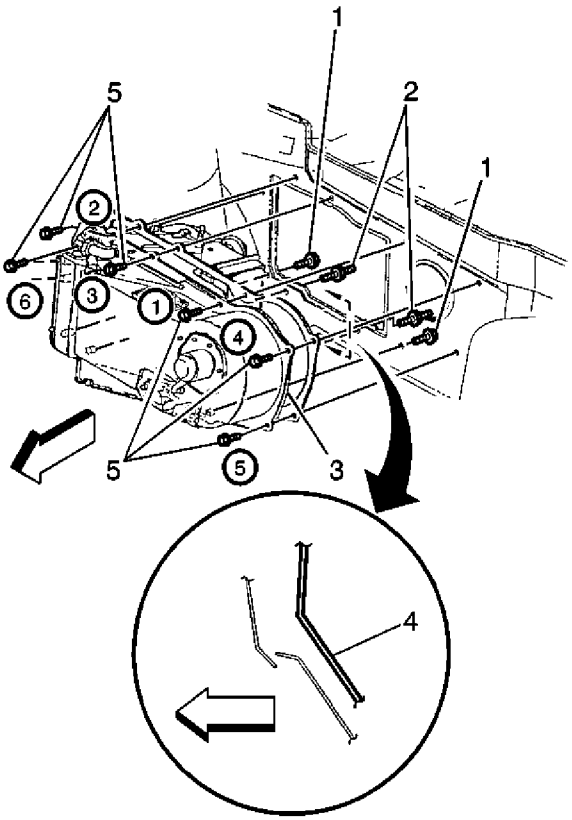


12. Remove the bolts (5) that attach the heater and A/C module assembly (3) to the front of the dash (4).
13. Remove the bolts (1) and the studs (2) that attach the heater and A/C assembly (3) to the front of the dash (4).
14. Reposition the insulation as needed.
15. Remove the remainder of the heater and A/C module assembly (3).

    Rotate the assembly (3) as needed to clear the right rear corner of the engine.

16. If replacing the heater and A/C module assembly (3), transfer the heater core to a new module assembly (3).

Installation Procedure



1. Install the heater and A/C module assembly (3) (partial).

   Rotate the assembly (3) as needed to clear the right rear corner of the engine.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the bolts (1) and the studs (2) to attach the heater and A/C module assembly (3) to the rear of the dash (4).

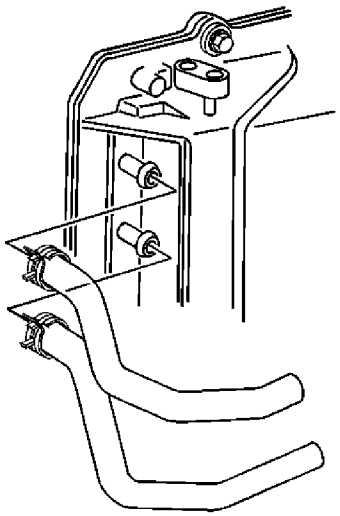
   Reposition the insulation as needed.

   Tighten
   Tighten the bolts and the studs to 5 N·m (44 lb in).

3. Install the bolts (5) to attach the heater and A/C module assembly (3) to the front of the dash (4).

Tighten
Tighten the bolts to 5 N·m (44 lb in).

4. Install the heater and A/C programmer (C68 and CJ2). Refer to Programmer Replacement .
5. Install the aspirator adapter (C68 and CJ2).
6. Install the air distributor. Refer to *Air Distributor Duct Replacement* .
7. Install the vacuum source input to the right side of the air distributor.
8. Install the power steering pump. Refer to Power Steering Pump Replacement in Power Steering Systems.





9. Install the heater hoses to the heater core using the J 37097-A .
10. Install the evaporator. Refer to *Evaporator Core Replacement* .
11. Connect the right bank spark plug wires and bracket. Refer to Spark Plug Wire Harness Replacement in Engine Electrical.
12. Install the IP assembly. Refer to Instrument Panel Assembly Removal in Instrument Panel, Gauges and Console.
13. Install the cross car brace support. Refer to Cross Vehicle Brace Replacement in Body Front End.
14. Fill the cooling system. Refer to Cooling System Draining and Filling .
15. Recharge the A/C system. Refer to *Refrigerant Recovery and Recharging*
16. Leak test the system. Refer to *Leak Testing* .

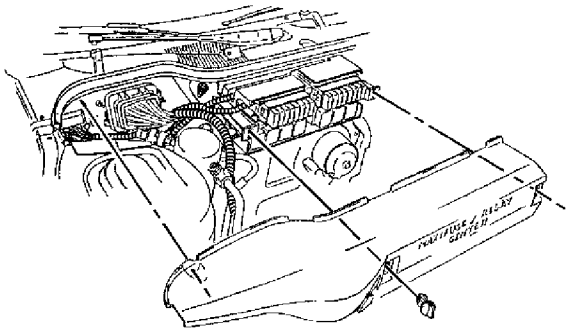
Air Conditioning Evaporator Core Replacement

Removal Procedure

Tools Required

- J 38042 Dual O-Ring Joint Separator
- J 39500-B A/C Refrigerant Recovery, Recycling, and Recharging (ACR4) System
- J 39400 Electronic Halogen Leak Detector

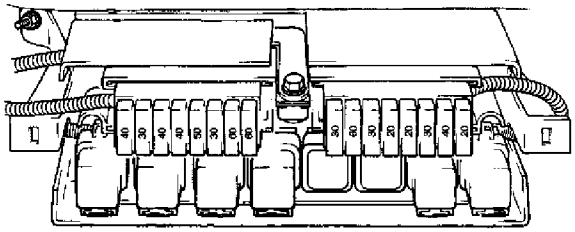
1. Recover the refrigerant. Refer to *Refrigerant Recovery and Recharging* .
2. Remove the cross car support brace. Refer to Cross Vehicle Brace Replacement in Body Front End.



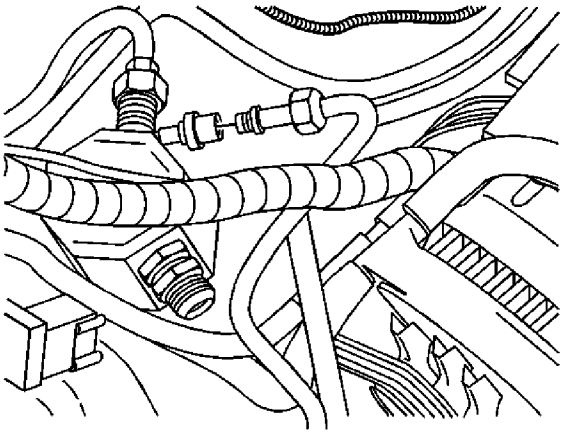


3. Remove the fuse block cover.
4. Remove the accumulator. Refer to *Accumulator Replacement* .

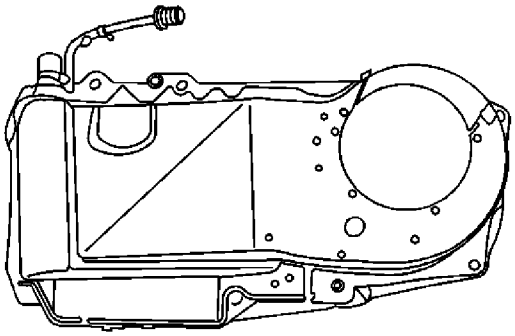
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5. Remove the positive booster cable from the multi-use relay center.
6. Position the under hood fuse block out of the way.

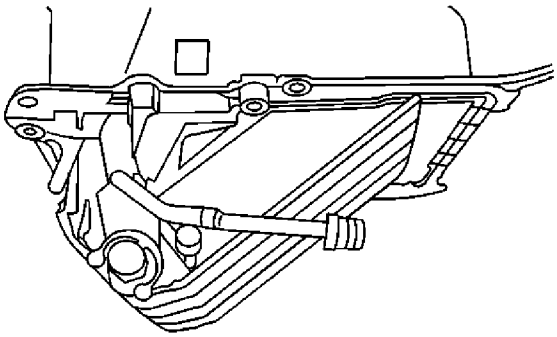


7. Remove the evaporator tube from the evaporator.
8. Remove the wire harness clip from the HVAC module.
9. Remove the accumulator bracket.
10. Remove the heat shield of the HVAC module.
11. Following the cut line, cut the top side of the HVAC module cover.
12. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.



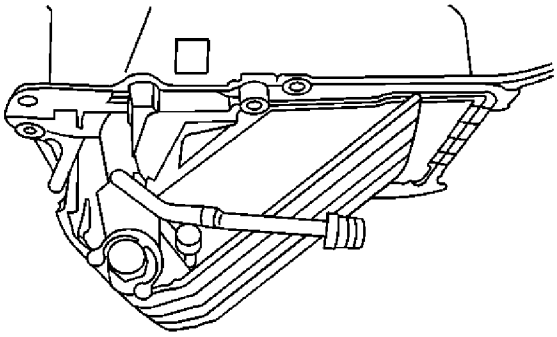
13. Following the cut line, cut the bottom side of the HVAC module cover.
14. Lower the vehicle.
15. Remove the fuel line clip from the HVAC module.
16. Remove the insulator from the module.
17. Remove the bolt that attaches the heater and A/C module assembly to the inside of the vehicle.

    Remove the blower module from the HVAC module assembly.



18. Remove the evaporator core.

Installation Procedure



1. Install the evaporator core.
2. Install the blower module to the HVAC module assembly.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the bolts.

Tighten
Tighten the bolts to 5 N·m (44 lb in).

4. Install the bolt to attach the heater and A/C module assembly to the inside of the vehicle.

Tighten
Tighten the bolt to 5 N·m (44 lb in).

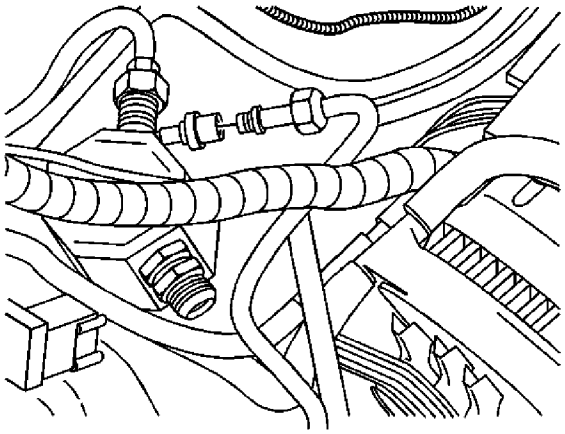
5. Install the insulator to the module.
6. Install the fuel line clip to the HVAC module.
7. Install the HVAC module heat shield.
8. Install the bolts.

Tighten
Tighten the bolts to 5 N·m (44 lb in).

9. Install the accumulator bracket.
10. Install the screws.

Tighten
Tighten the screws to 6 N·m (53 lb in).

11. Install the wire harness clip to the HVAC module.

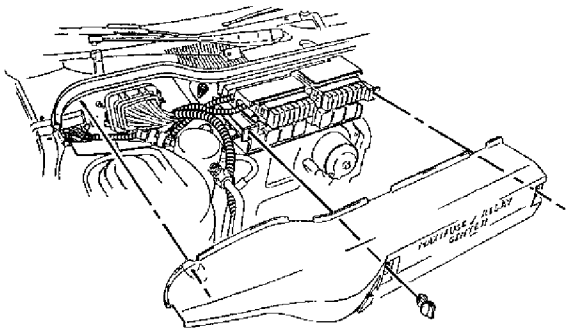




12. Install the evaporator tube to the evaporator.

Tighten
Tighten the evaporator tube connection to 24 N·m (18 lb ft).

13. Reposition the under hood fuse block to the original position.
14. Install the booster cable from the multi-use relay center.
15. Install the accumulator. Refer to *Accumulator Replacement* .





16. Install the fuse block cover.

17. Install the cross car support. Refer to Cross Vehicle Brace Replacement in Body Front End.
18. Recharge the A/C system. Refer to *Refrigerant Recovery and Recharging* .
19. Leak test the system. Refer to *Leak Testing* .

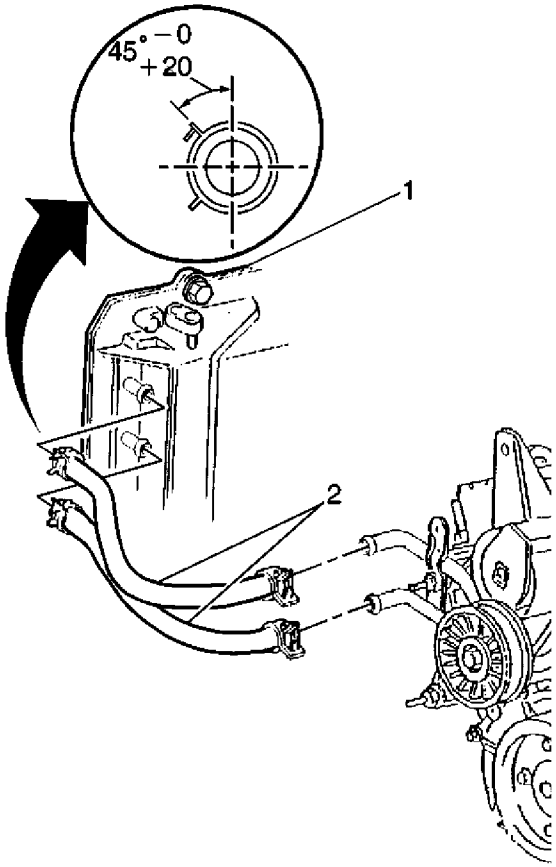
Heater Core Replacement

Removal Procedure

Tools Required

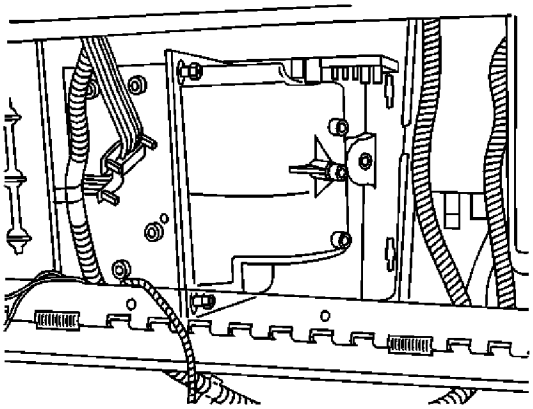
J 37097-A Hose Clamp Pliers

1. Drain the cooling system. Refer to Cooling System Draining and Filling in Engine Cooling.



2. Remove the heater hoses (2) from the heater core using the J 37097-A .
3. Remove the right sound insulator. Refer to Instrument Panel Insulator Panel Replacement - Right Side in Instrument Panel, Gauges and Console.
4. Remove the I/P compartment. Refer to Instrument Panel Storage Compartment Replacement in Instrument Panel, Gauges and Console.
5. Remove the temperature valve actuator. Refer to Temperature Actuator Replacement .
6. Remove the HVAC programmer (C68). Refer to Programmer Replacement

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7. Remove the heater core cover retaining screws.
8. Remove the heater core cover.
9. Remove the heater core retaining screws.
10. Remove the heater core.

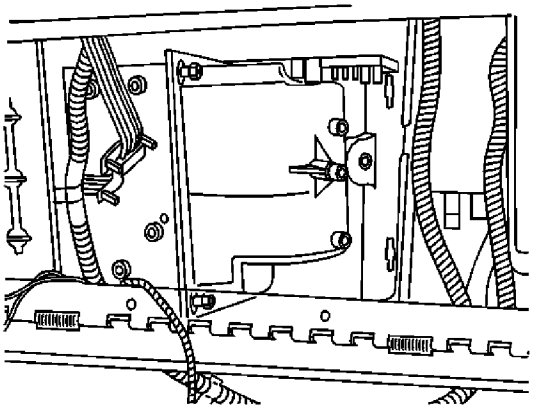
Installation Procedure

1. Install the heater core into the vehicle.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the attaching screws.

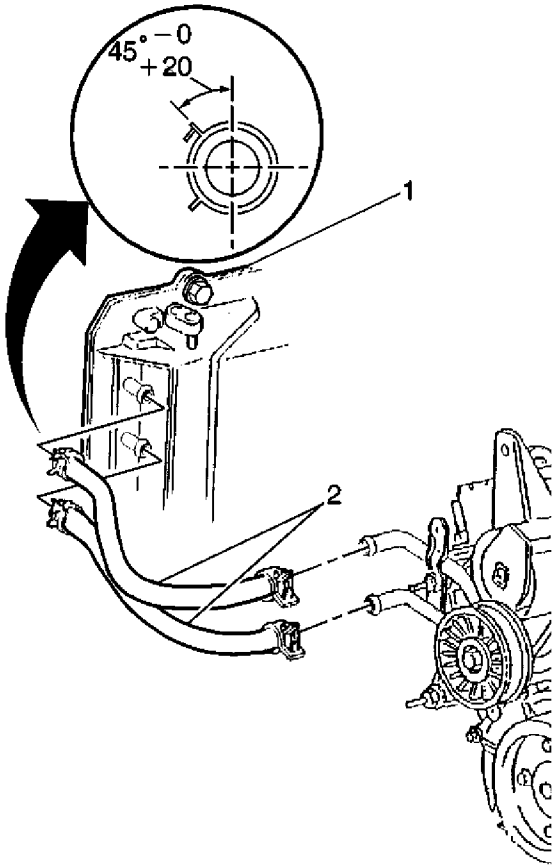
   Tighten
   Tighten the screws to 1.4 N·m (12 lb in).



3. Install the heater core cover.
4. Install the attaching screws.

Tighten
Tighten the screws to 1.4 N·m (12 lb in).

5. Install the HVAC programmer (C68). Refer to Programmer Replacement
6. Install the temperature valve actuator. Refer to Temperature Actuator Replacement .
7. Install the right sound insulator. Refer to Instrument Panel Insulator Panel Replacement - Right Side in Instrument Panel, Gauges and Console.
8. Install the I/P compartment. Refer to Instrument Panel Storage Compartment Replacement in Instrument Panel, Gauges and Console.

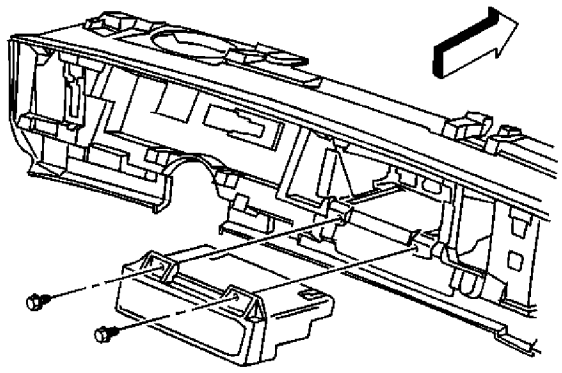


9. Install the heater hoses (2) to the heater core using the J 37097-A .
10. Fill the cooling system. Refer to Cooling System Draining and Filling in Engine Cooling.

Control Assembly Replacement (Buick)

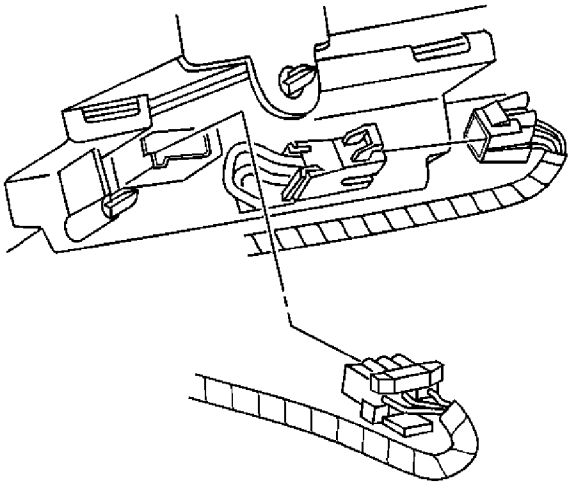
Removal Procedure

1. Remove the IP cluster trim panel. Refer to Instrument Cluster Trim Panel Replacement in Instrument Panel, Gauges and Console.





2. Remove the retaining screws from the HVAC control assembly.
3. Pull the assembly out from the instrument panel.

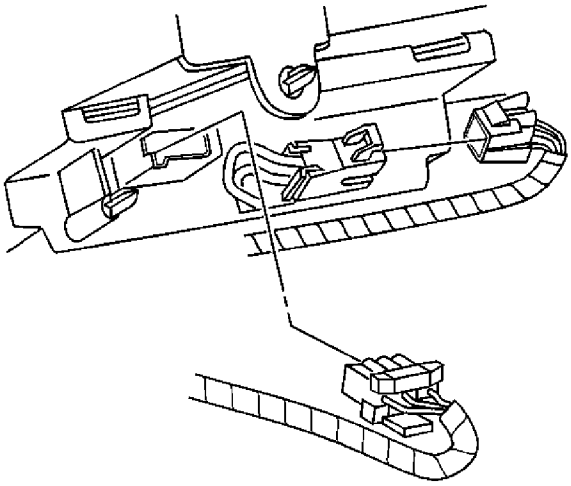




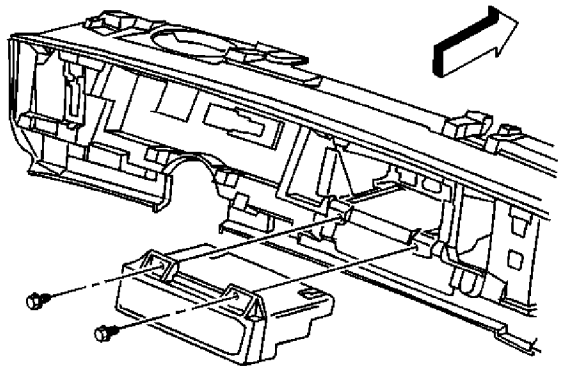
4. Disconnect the electrical connectors and remove the HVAC control assembly.

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Installation Procedure



1. Connect the electrical connectors to the HVAC control assembly.



2. Install the HVAC control assembly into the instrument panel.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the retaining screws to secure the HVAC control assembly.

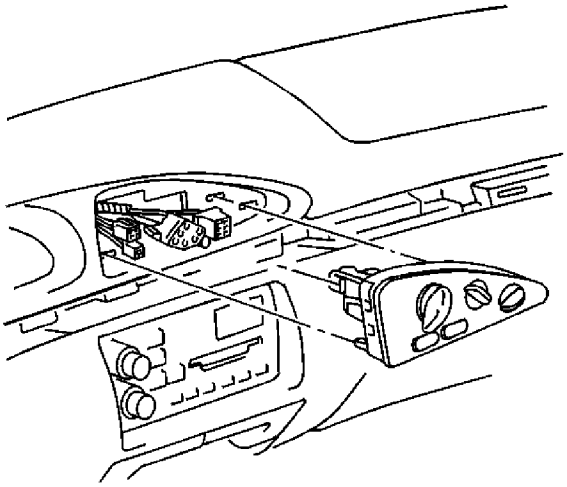
   Tighten
   Tighten the fasteners to 1.8 N·m (16 lb in).

4. Install the IP cluster trim panel. Refer to Instrument Cluster Trim Panel Replacement in Instrument Panel, Gauges and Console.

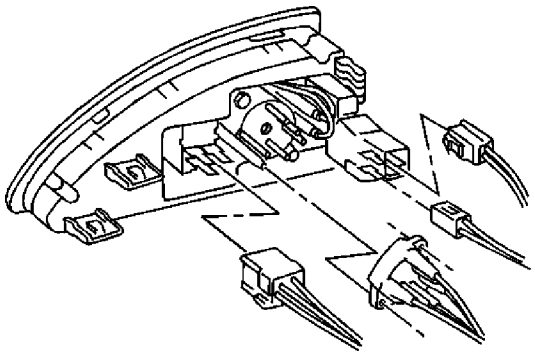
Control Assembly Replacement (Oldsmobile)

Removal Procedure

1. Remove the I/P cluster trim plate. Refer to Instrument Panel Accessory Trim Plate Replacement in Instrument Panel, Guages and Console.



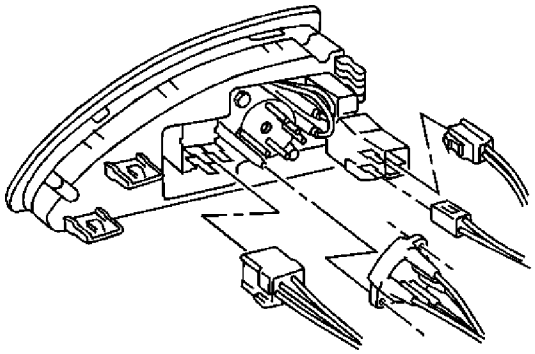
2. Gently pry the assembly out from the instrument panel.



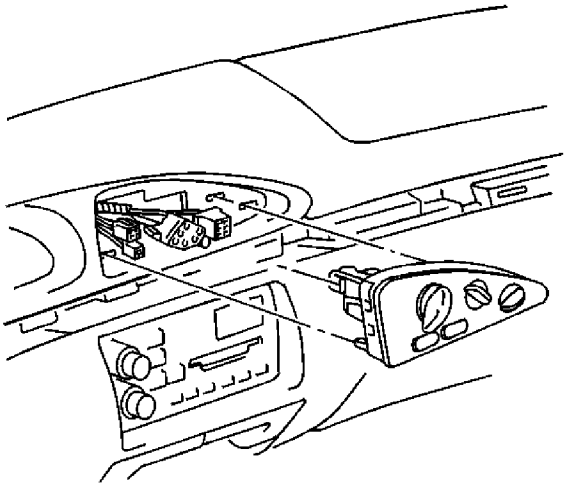
3. Disconnect the electrical and vacuum connectors.
4. Remove the HVAC control assembly.

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Installation Procedure



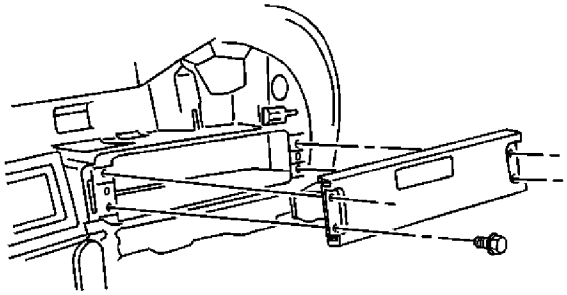
1. Connect the vacuum and electrical connectors to the HVAC control assembly.



2. Install the HVAC control assembly into the instrument panel by snapping into place.
3. Install the I/P cluster trim plate. Refer to Instrument Panel Accessory Trim Plate Replacement in Instrument Panel, Guages and Console.

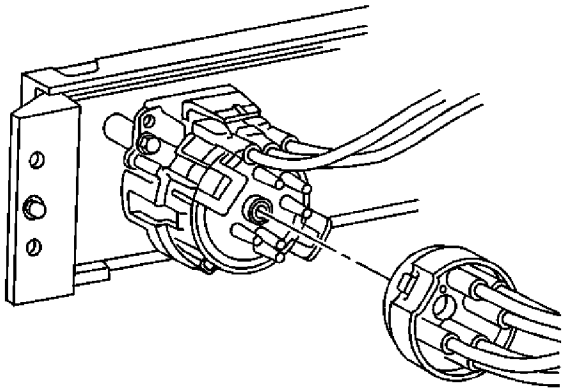
Control Assembly Replacement (Pontiac)

1. Remove the I/P accessory trim plate. Refer to Instrument Cluster Trim Panel Replacement in Instrument Panel, Gauges and Console.





2. Remove the retaining screws from the HVAC control assembly.
3. Pull the assembly out from the instrument panel.

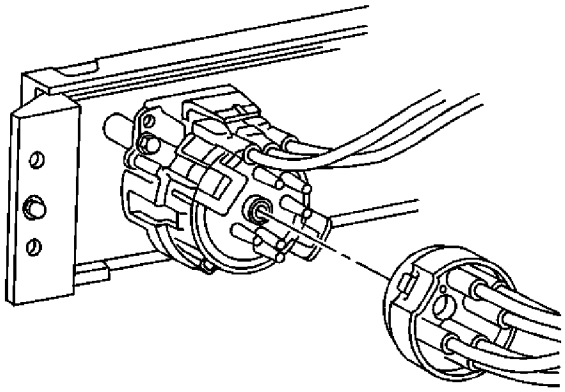




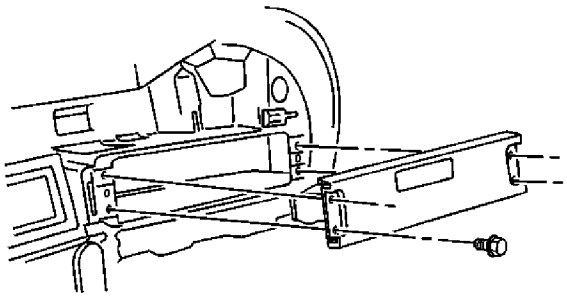
4. Disconnect the electrical and vacuum connectors.
5. Remove the HVAC control assembly.

Installation Procedure

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1. Connect the electrical and vacuum connectors to the HVAC control assembly.



2. Install the HVAC control assembly into the instrument panel by snapping into place.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the retaining screws to secure the HVAC control assembly.

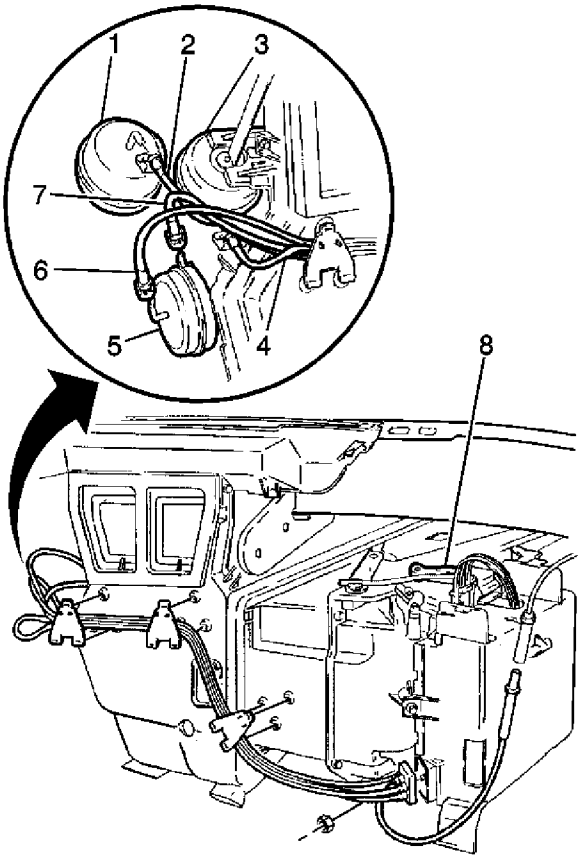
Tighten
Tighten the fasteners to 1.8 N·m (16 lb in).

4. Install the I/P accessory trim plate. Refer to Instrument Cluster Trim Panel Replacement in Instrument Panel, Gauges and Console.

Air Inlet Actuator Replacement

Removal Procedure

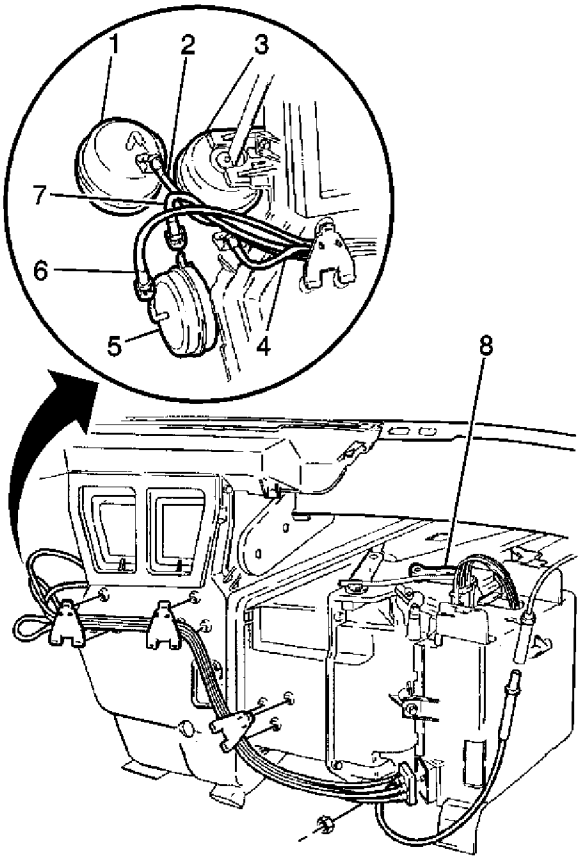
1. Remove the left sound insulator. Refer to Instrument Panel Insulator Panel Replacement - Left Side in Instrument Panel, Gauges and Console.



2. Disconnect the vacuum hose from the outside air/recirculation actuator (1).
3. Unclip the outside air/recirculation actuator (1) from the air inlet.
4. Disengage the outside air/recirculation actuator (1) from the valve.

Installation Procedure

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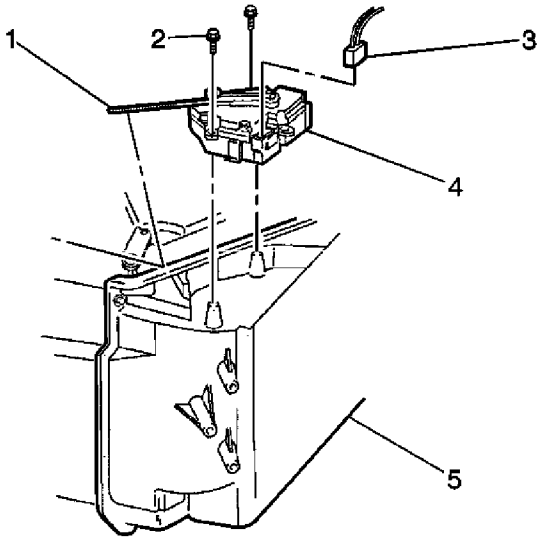


1. Engage the outside air/recirculation actuator (1) to the valve.
2. Clip the outside air/recirculation actuator (1) to the air inlet.
3. Connect the vacuum hose to the outside air/recirculation actuator (1).
4. Install the left sound insulator. Refer to Instrument Panel Insulator Panel Replacement - Left Side in Instrument Panel, Gauges and Console.

Temperature Actuator Replacement

Removal Procedure

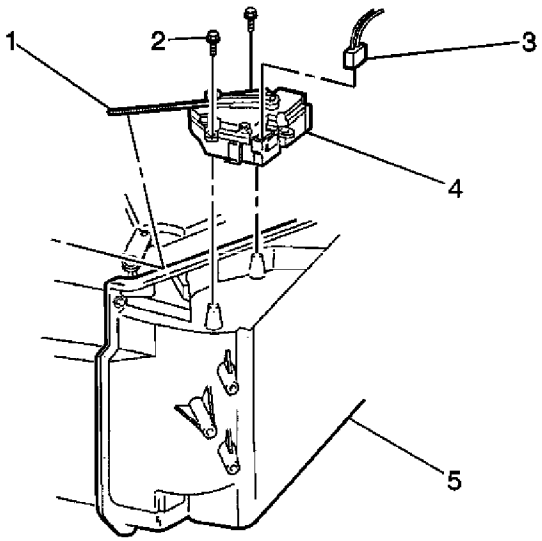
1. Remove the instrument panel assembly. Refer to Instrument Panel Assembly Removal in Instrument Panel, Gauges and Console.



2. Remove the temperature valve link rod (1) from the temperature valve by snapping the rod out of the valve.
3. Disconnect the electrical connector (3) from the A/C temperature valve actuator (4).
4. Remove the screws (2) which retain the actuator to the heater and A/C module (5).
5. Remove the actuator.

Installation Procedure

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1. Install the A/C temperature and valve actuator (4) to the heater and A/C module (5).

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the screws (2).

   Tighten
   Tighten the screws to 1.4 N·m (12 lb in).

3. Connect the electrical connector (3) to the A/C temperature valve actuator.

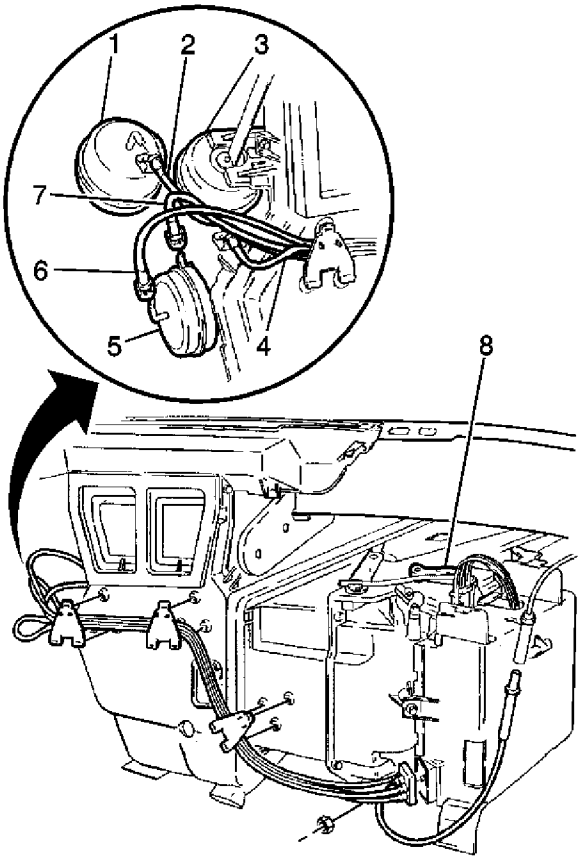
   Important: Adjust the temperature valve link rod prior to installation. Refer to Temperature Valve Link Adjustment .

4. Install the temperature valve link rod (1) to the temperature valve, by snapping the rod into place.
5. Install the instrument panel assembly. Refer to Instrument Panel Assembly Removal in Instrument Panel, Gauges and Console.

Defroster Valve Actuator Replacement

Removal Procedure

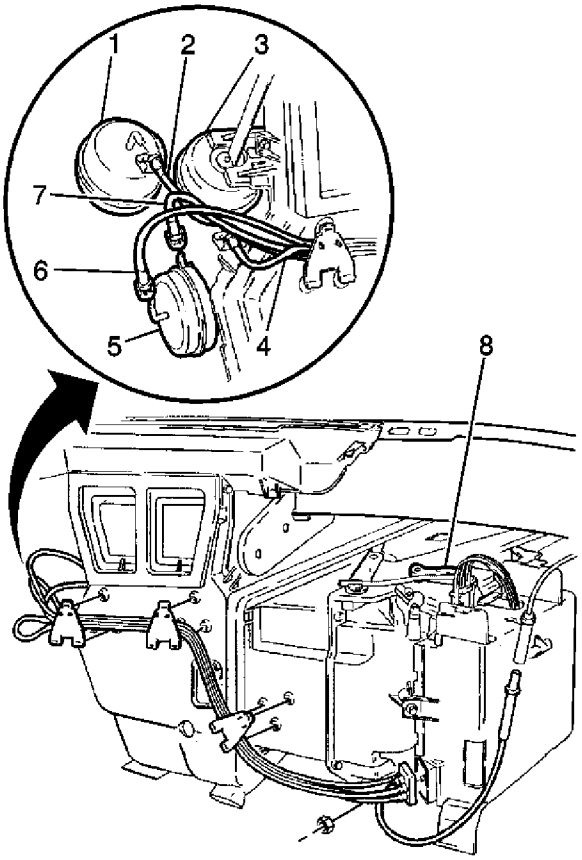
1. Remove the air distributor assembly. Refer to *Air Distributor Duct Replacement*



2. Unclip the defrost-A/C actuator (3) from the air inlet.
3. Disengage the defrost-A/C actuator (3) from the valve.

Installation Procedure

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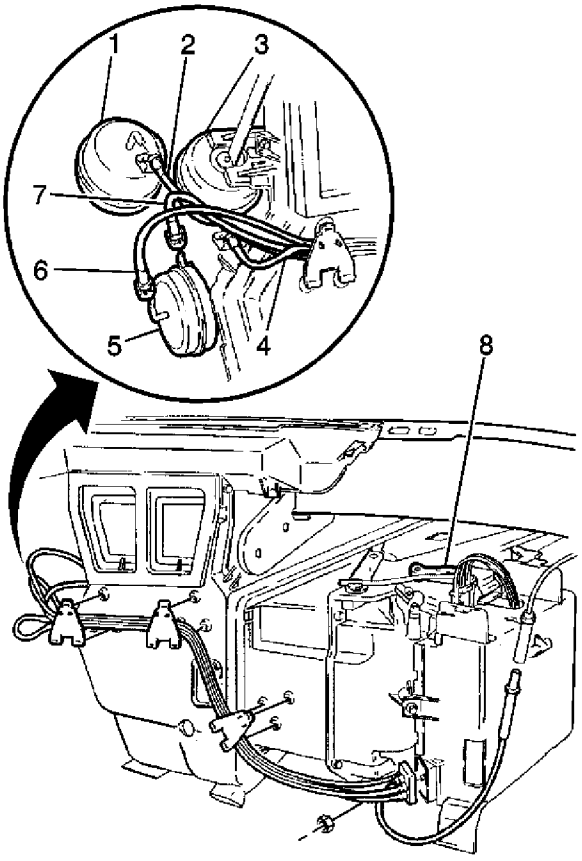


1. Engage the defrost-A/C actuator (3) to the valve.
2. Clip the defrost-A/C actuator (3) to the air inlet.
3. Install the air distributor assembly. Refer to *Air Distributor Duct Replacement* .

Heater/Bi-Level Actuator Replacement

Removal Procedure

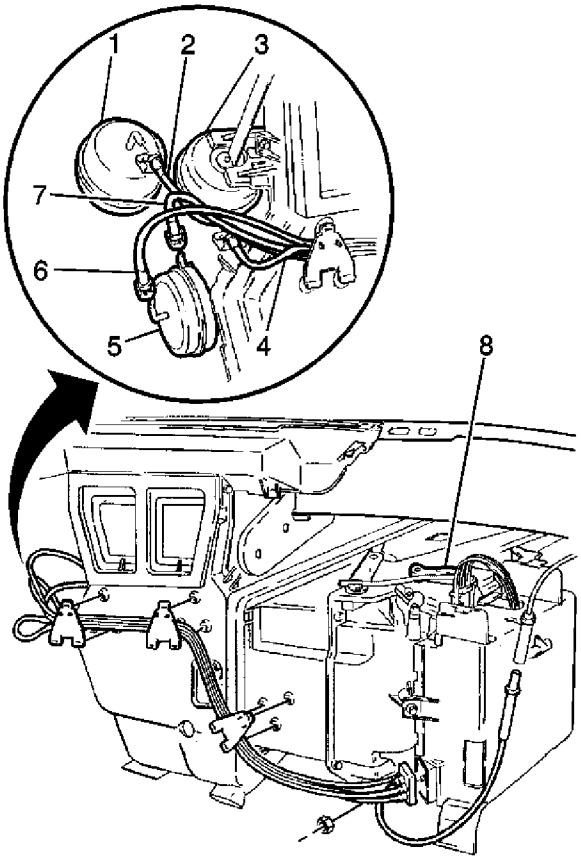
1. Remove the air distributor assembly. Refer to *Air Distributor Duct Replacement* .
2. Remove the clip and the screws that fasten the 2 halves of the air distributor assembly:



- Separate the air distributor assembly.
- In order to disconnect the vacuum actuator (5) from the air distributor assembly, unclip and disengage the vacuum actuator (5) from the valve.

Installation Procedure

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1. In order to connect the vacuum actuator (5) to the air distributor assembly, clip and engage the vacuum actuator to the valve.

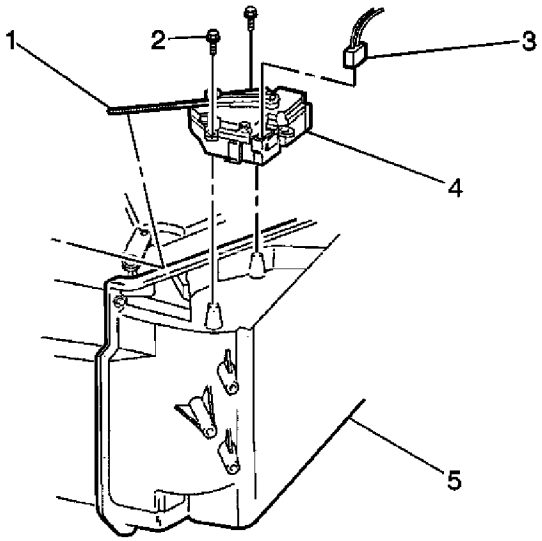
   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Fasten the 2 halves of the air distributor assembly.

   Tighten
   Tighten the screws to 1.5 N·m (13 lb in).

3. Install the air distributor assembly. Refer to *Air Distributor Duct Replacement* .

Temperature Valve Link Adjustment



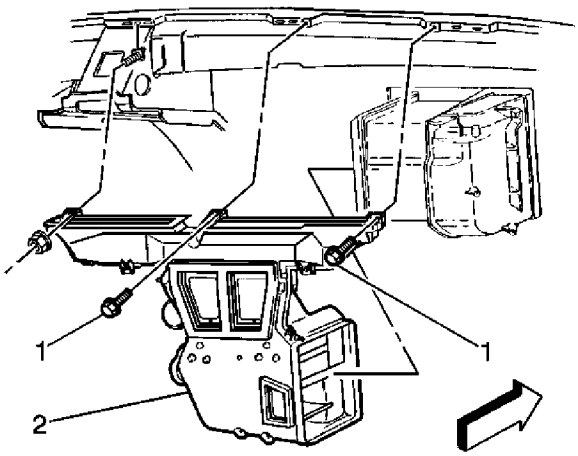
1. Remove the temperature valve link rod (1) from the temperature valve by snapping the rod out of the valve.
2. Start the vehicle. Make the following settings:
   - Set the fan to position IIII (HIGH).
   - Set the temperature to full hot.
3. Allow 45 seconds minimum for the A/C temperature valve actuator (4) to move to the full hot position.
4. Move the temperature valve to the full hot position.
5. Snap the temperature valve link rod into the temperature valve.

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Air Distributor Duct Replacement

Removal Procedure

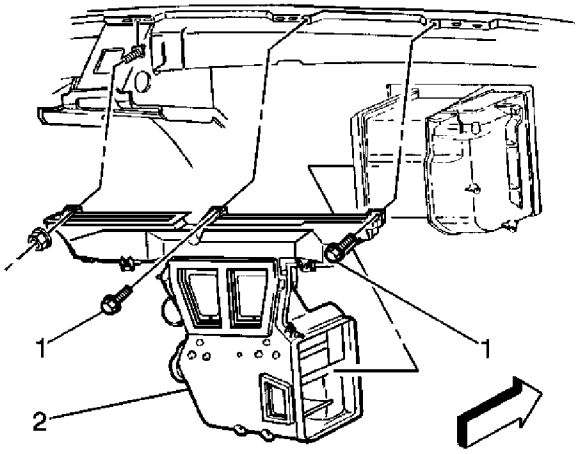
1. Remove the IP assembly. Refer to Instrument Panel Assembly Removal in Instrument Panel, Guages and Console.





2. Remove the screws (1) from the center air distributor (2).
3. Remove the center air distributor (2).

Installation Procedure



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1. Install the center air distributor (2).

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the screws (1).

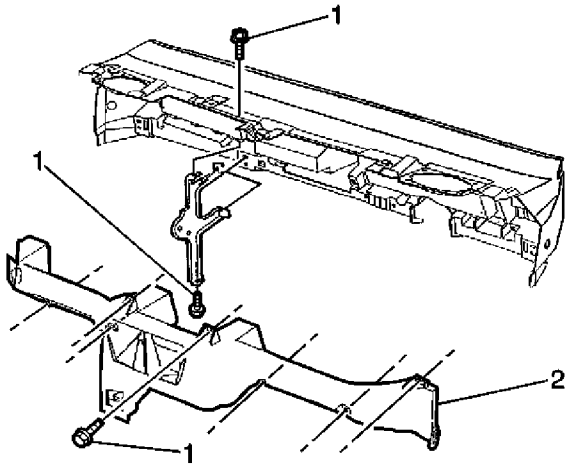
   Tighten
   Tighten the screws to 1.5 N·m (13 lb in).

3. Install the IP assembly. Refer to Instrument Panel Assembly Removal in Instrument Panel, Guages and Console.

Crosscar Air Outlet Replacement

Removal Procedure

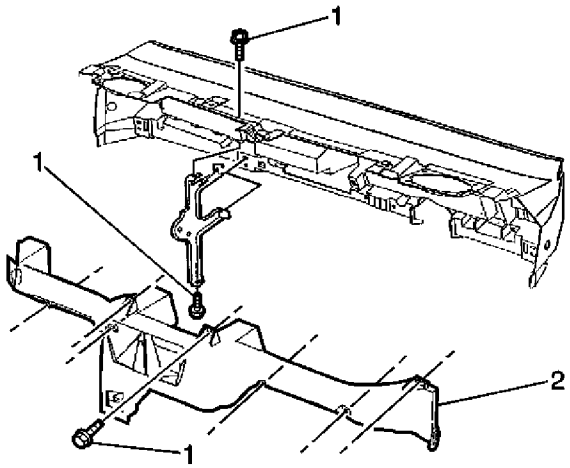
1. Remove the IP assembly. Refer to Instrument Panel Assembly Removal in Instrument Panel, Gauges and Console.





2. Remove the duct mounting screws (1).
3. Remove the duct (2).

Installation Procedure



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1. Install the duct (2).

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the duct mounting screws (1).

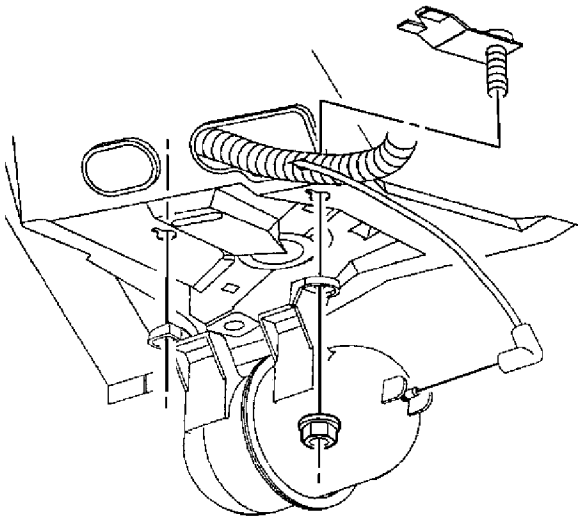
   Tighten
   Tighten the screws to 2 N·m (18 lb in).

3. Install the side window defogger adapters.
4. Install the IP assembly. Refer to Instrument Panel Assembly Removal in Instrument Panel, Gauges and Console.

Vacuum Tank Replacement

Removal Procedure

1. Turn the front wheels to the right.
2. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.

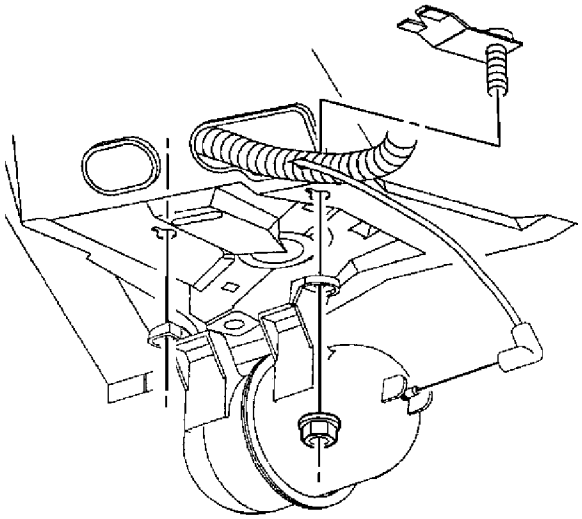




3. Remove 2 vacuum tank mounting screws.
4. Remove the vacuum hose from the tank.
5. Remove the vacuum tank from the vehicle.

Installation Procedure

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1. Install the vacuum tank.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

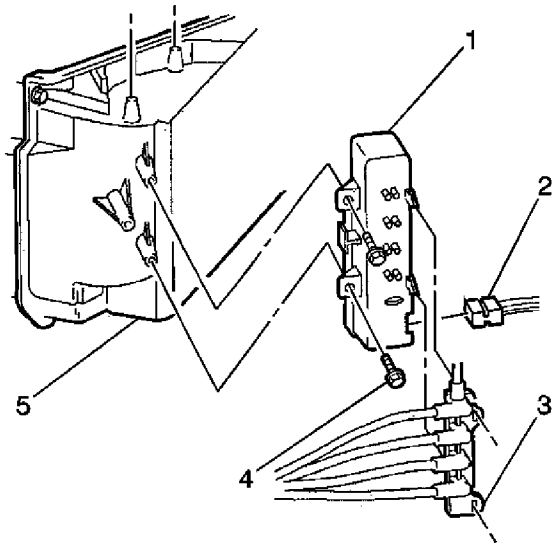
2. Install the 2 screws to secure the vacuum tank.

   Tighten
   Tighten the screws to 6 N·m (53 lb in).

3. Install the vacuum hose to the tank.
4. Lower the vehicle.

Vacuum Electrical Solenoid Replacement

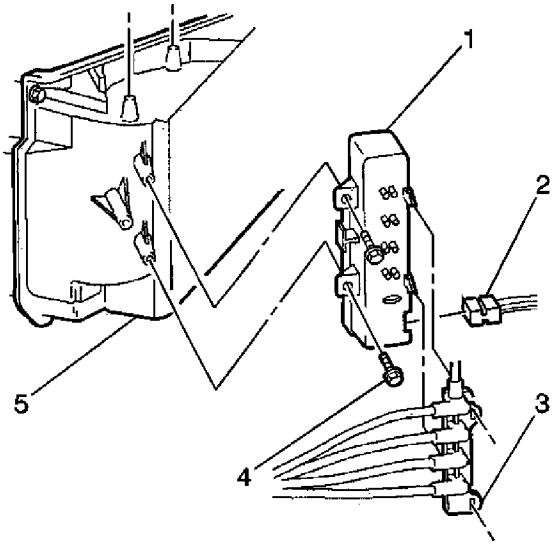
Removal Procedure



1. Perform the following steps in order to swing down the IP compartment:
   1.1. Pull the IP compartment rearward.
   1.2. Disengage the swing stops.
2. Disconnect the vacuum harness connector (3) from the solenoid (1).
3. Disconnect the electrical connector (2) from the solenoid (1).
4. Remove the screws (4) from the solenoid (1).
5. Remove the solenoid (1) from the heater and A/C module (5).

Installation Procedure

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1. Install the solenoid (1) to the heater and A/C module (5).

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the screws (4) to the solenoid (1).

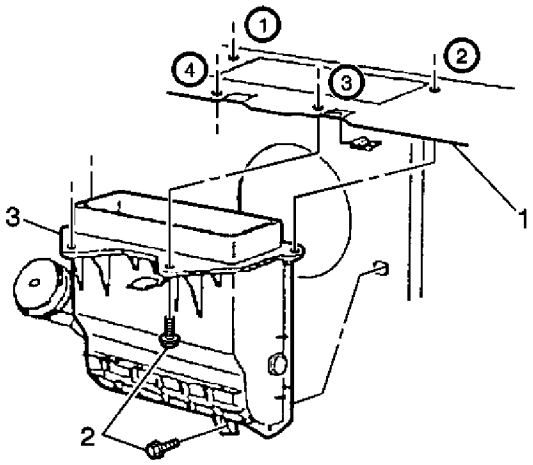
   Tighten
   Tighten the screws to 1.4 N·m (12 lb in).

3. Connect the electrical connector (2) to the solenoid (1).
4. Connect the vacuum harness connector (3) to the solenoid (1).
5. Push forward on the IP compartment in order to install the IP compartment.

Air Inlet Assembly Replacement

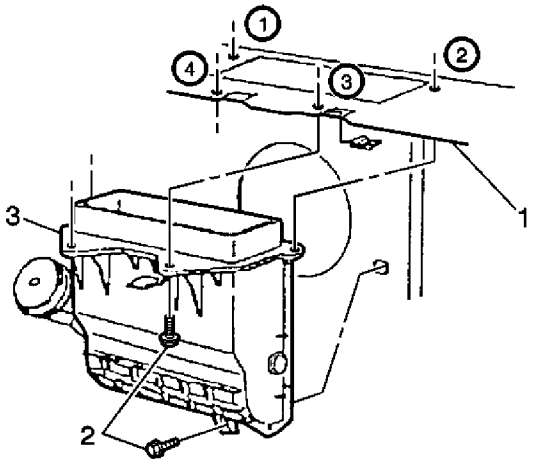
Removal Procedure

1. Remove the air distributor assembly. Refer to *Air Distributor Duct Replacement*



2. Remove the bolts (2) that attach the air inlet (3) to the dash panel (1) and to the front of the dash.
3. Reposition the insulation as needed to remove the air inlet assembly (3).

Installation Procedure



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1. Position the air inlet (3) in the vehicle.
2. Reposition the insulation as needed.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the bolts (2) to attach the air inlet (3) to the dash panel (1) and to the front of the dash.

   Refer to the illustration for the proper tightening sequence.

   Tighten
   Tighten the bolts to 5 N·m (44 lb in).

4. Install the air distributor assembly. Refer to *Air Distributor Duct Replacement*

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Booster to Pedal Bracket Nuts	21 N·m	15 lb ft
Bracket to Rear Drum Plate Bolt	9 N·m	80 lb in
Brake Hose to Caliper	45 N·m	33 lb ft
Brake Pedal Bracket Attaching Bolt	24 N·m	18 lb ft
Brake Pipe Fitting (Tube Nut)	15 N·m	11 lb ft
Brake Pipe to Proportioner	15 N·m	11 lb ft
Caliper Bleeder Valve	13 N·m	115 lb in
Master Cylinder attaching Nuts	27 N·m	20 lb ft
Proportioner Valve to Brake Pipe Fitting	15 N·m	11 lb ft
Wheel Cylinder Bleeder Valve	10 N·m	88 lb in

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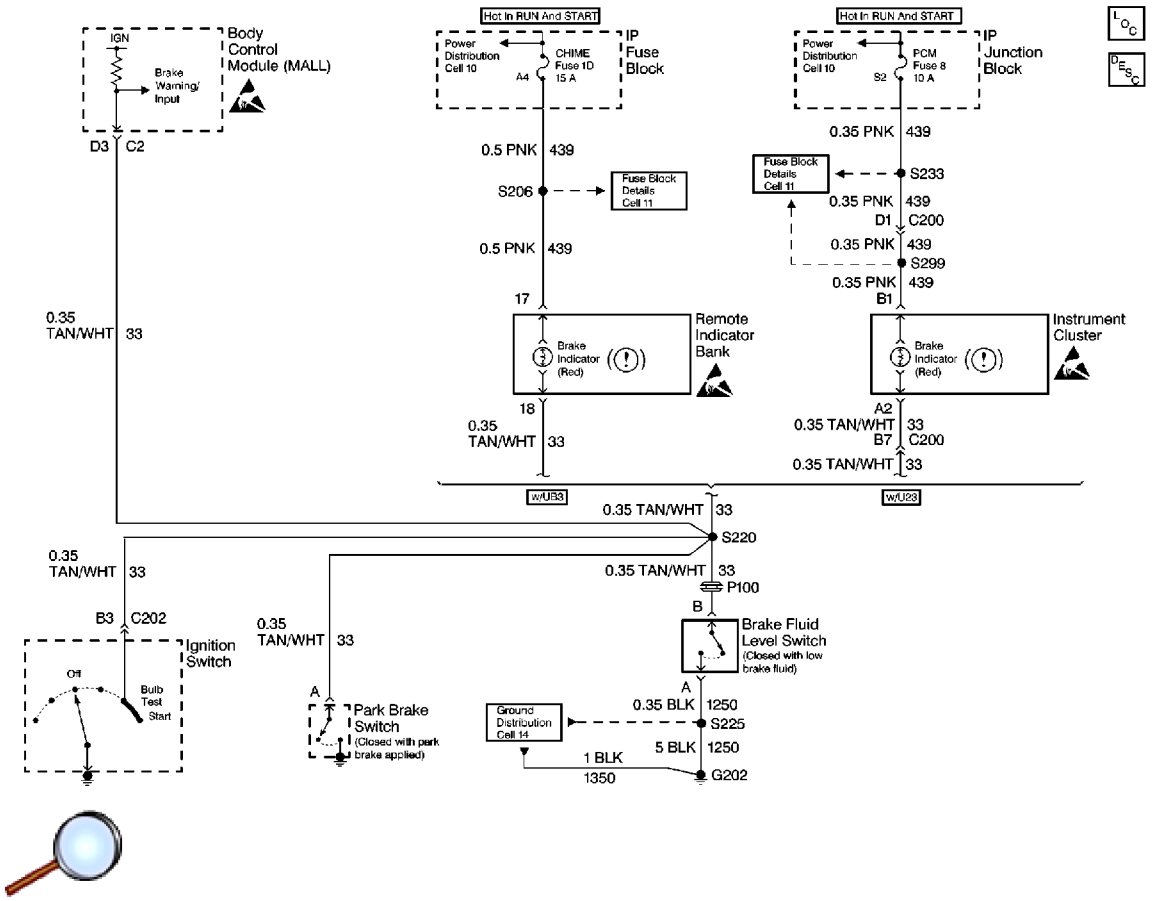
Component Specifications

Application	Specification	
	Metric	English
Brake Pedal Travel Brake pedal travel maximum with 445 N (100 lb) force applied to the pedal with ignition OFF and vacuum or hydraulic assist depleded.	57.00 mm	2.25 in
Brake Drums		
- Discard Diameter*(See note at the bottom).	226.30 mm	8.909 in
- Inside Diameter	225.12 mm	8.863 in
- Maximum Refinish Diameter	226.57 mm	8.920 in
- Runout	0.15 mm	0.006 in
Brake Rotors		
- Discard Thickness*(See Note at the bottom)	30.70 mm	1.209 in
- Front Caliper Bore Diameter	63.50 mm	2.50 in
- Lateral Runout	0.060 mm	0.002 in
- Master Cylinder Bore Diameter	25.40 mm	1.000 in
- Minimum Thickness After Refinish	31.08 mm	1.224 in
- Minimum Vacuum at Power Booster	--	14 in Hg
- Rotor Thickness (Maximum)	32.00 mm	1.260 in
- Thickness Variation	0.013 mm	0.0005 in
- Wheel Cylinder Bore Diameter	23.80 mm	0.937 in
All brake drums and rotors have a discard dimension cast into them. This is a wear dimension and not a refinish dimension. any drum or rotor which does not meet the specification should be replaced.		

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Brake Warning System Schematics (Buick)

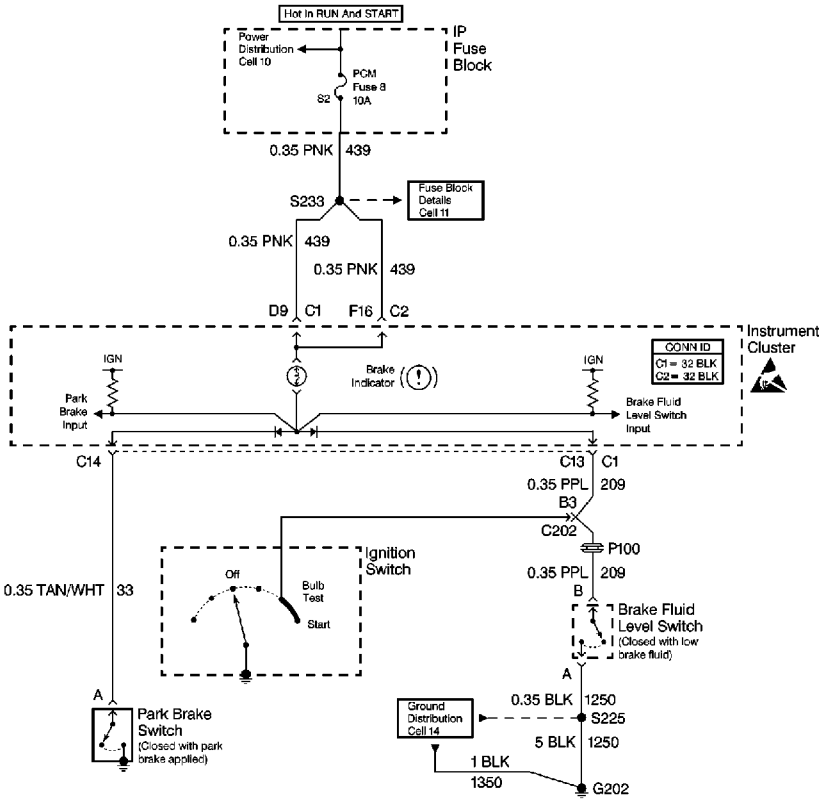
Cell 41



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Brake Warning System Schematics (Oldsmobile)

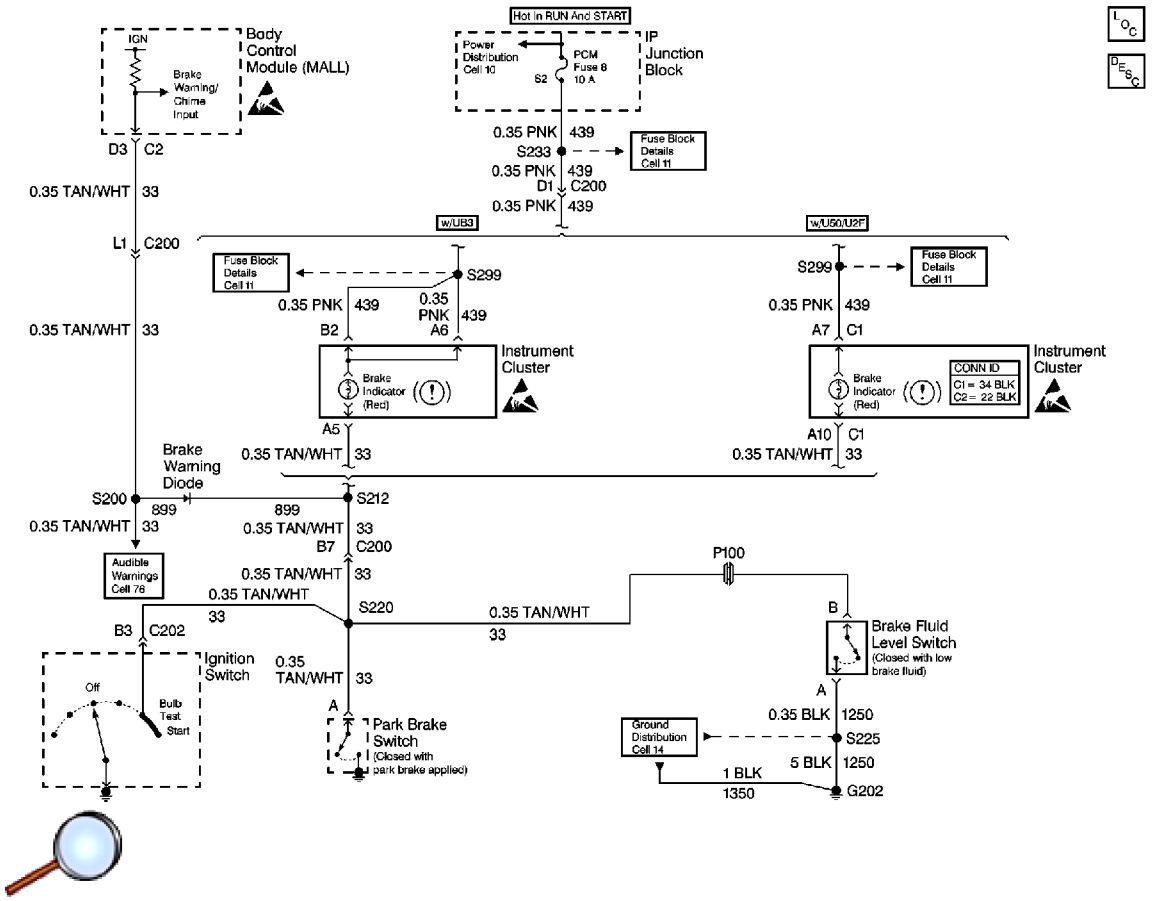
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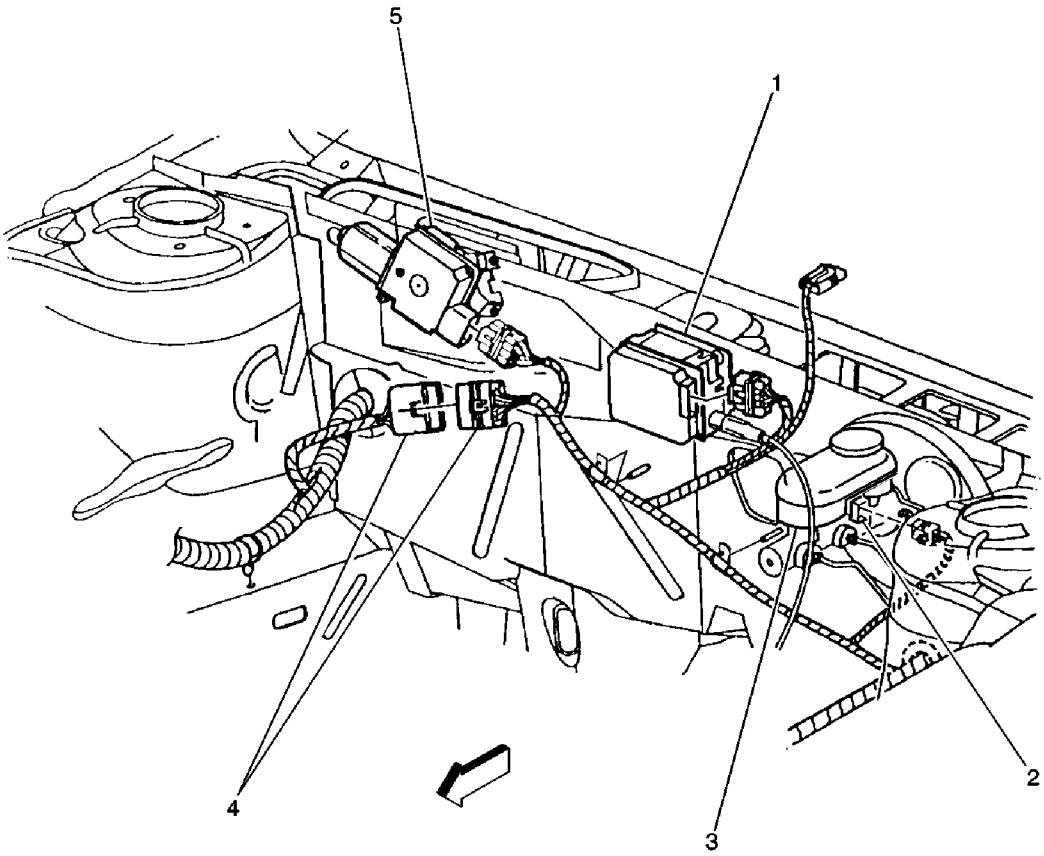
Brake Warning System Schematics (Pontiac)

Cell 41



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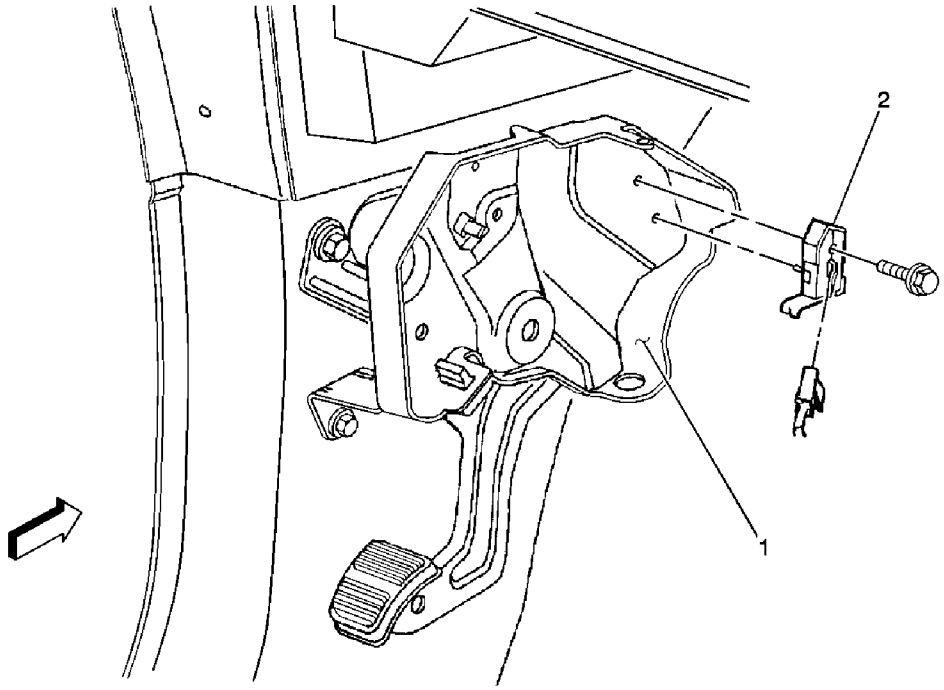
Brake Warning System Components



(1) Cruise Control Module
(2) Brake Fluid Level Switch
(3) Master Cylinder Reservoir
(4) Not present
(5) Windshield Wiper Motor

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Brake Warning System Components

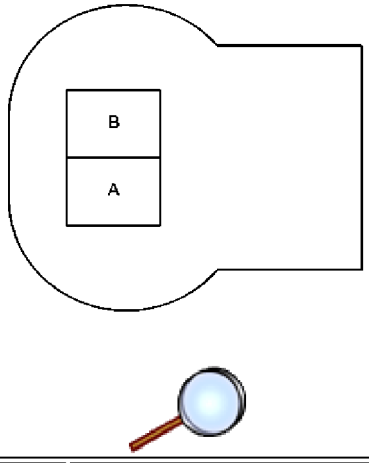


(1) Park Brake Assembly
(2) Park Brake Switch

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Hydraulic Brake Connector End Views

Brake Fluid Level Switch



Connector Part Information	• 12162195 • 2 Way Metri-Pack 150 Series (BLK)		
Pin	**Wire Color**	**Circuit No.**	**Function**
B	TAN/WHT	33	Brake Fluid Level Signal
A	BLK	1250	Ground

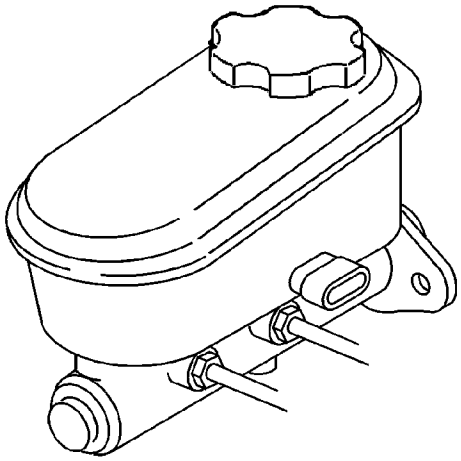
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Master Cylinder Reservoir Filling

Notice: When filling the master cylinder, use only Delco Supreme 11, GM P/N 12377967 (Canadian P/N 992667), or equivalent DOT 3 brake fluid. Do not use a container which has been used for petroleum based fluids, or a container which is wet with water. Petroleum based fluids will cause swelling and distortion of rubber parts in the hydraulic brake system, and water will mix with brake fluid, lowering the boiling point. Keep all fluid containers capped to prevent contamination.

Keep the master cylinder brake fluid reservoir properly filled to ensure adequate reserve and to prevent air and moisture from entering the hydraulic system. However, adding brake fluid is not usually necessary unless the brake system has a leak, indicated by the BRAKE warning lamp coming on due to low brake fluid, or the system is being serviced. Because of fluid expansion due to heat absorbed from the brakes and the engine, the reservoir must not be overfilled.

The brake fluid level will become lower with brake lining wear, and should return to about the full level when new linings are installed. If brake fluid has been added to the reservoir prior to lining change, the resultant level may be over full.





To top up or fill the reservoir, thoroughly clean around the reservoir cap before removing it to avoid getting dirt into the reservoir. Then, remove the cap with a diaphragm.

Add fluid as needed to bring the level to the full mark.

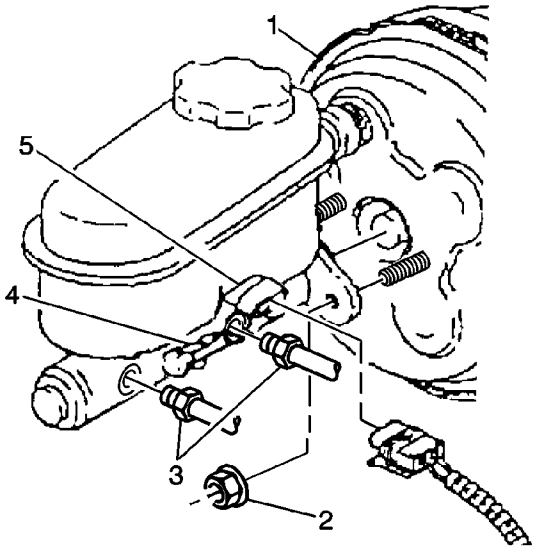
Use only Delco Supreme 11 (GM P/N 12377967) Brake Fluid, or equivalent DOT-3 brake fluid.

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Master Cylinder Replacement

Removal Procedure

1. Disconnect the electrical connector from the fluid level sensor (2).
2. Drain the brake fluid from the master cylinder reservoir.
3. Remove the brake pipes from the master cylinder (4).
4. Plug the open pipes to prevent fluid loss and contamination.
5. Remove the two attaching nuts (3).



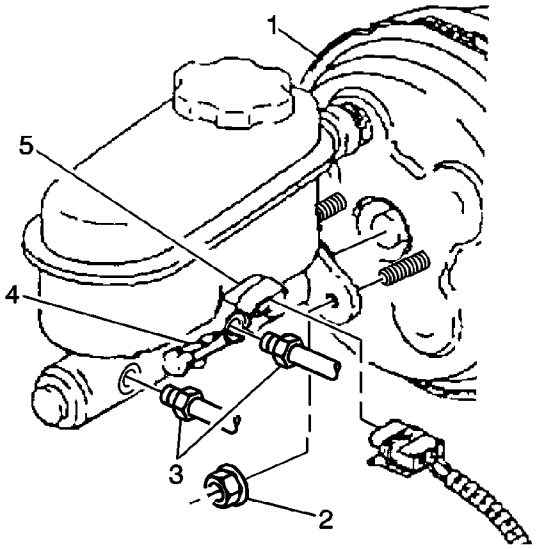


6. Remove the master cylinder (5).
7. Remove the reservoir, if it is to be used on the replacement master cylinder. Refer to Master Cylinder Reservoir Replacement .

Installation Procedure

1. Install the reservoir onto the master cylinder, as needed. Refer to Master Cylinder Reservoir Replacement .

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2. Install the master cylinder (5) onto the power booster (1).
3. Install the attaching nuts (3).

Tighten
Tighten the nuts to 27 N·m (20 lb ft).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

4. Install the brake pipes (4).

Tighten
Tighten the brake pipe fittings to 15 N·m (11 lb ft).

5. Fill the master cylinder reservoir to the full level mark using only Delco Supreme II (GM P/N 12377967) Brake Fluid, or equivalent DOT-3 brake fluid.
6. Connect the electrical connector to the fluid level sensor (2).
7. Bleed the hydraulic system. Refer to Hydraulic Brake System Bleeding .
8. Recheck the fluid level in the reservoir.

Master Cylinder Bench Bleeding

Bench bleed the master cylinder before installation on the vehicle. Bench bleeding removes air from the master cylinder. Bench bleeding reduces the time required in order to bleed the brake hydraulic system after installation.

1. Plug the outlet ports. Mount the master cylinder in a vise with the front end slightly down.
2. Fill the master cylinder reservoir with clean brake fluid.
3. Stroke the primary piston about 25 mm (1 in) several times using a smooth round-end tool. The primary piston will not travel the full 25 mm (1 in) stroke as air bleeds from the master cylinder.
4. Reposition the master cylinder in the vise with the front end tilted slightly up.
5. Stroke the primary piston about 25 mm (1 in) several times again.
6. Reposition the master cylinder in the vise. The master cylinder should be level.
7. Loosen the plugs in the outlet ports one at a time. Then push the piston into the bore in order to force the air from the cylinder.
8. Tighten the plug(s) before allowing the piston to return to its original position. This prevents air from being drawn back into the cylinder.
9. Fill the master cylinder reservoir with clean brake fluid.
10. Follow normal bleeding procedures after installing the master cylinder. Refer to Hydraulic Brake System Bleeding .

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Brake Fluid Level Indicator Switch Replacement

Removal Procedure

1. Remove the electrical connector from the fluid level sensor switch.
2. Drain the brake fluid.
3. Disconnect the fluid level sensor switch. Use the needle nose pliers to compress the switch locking tabs and pull out of the fluid reservoir.

Installation Procedure

1. Snap the fluid level sensor switch into place.
2. Install the electrical connector.
3. Refill the brake fluid. Refer to Master Cylinder Reservoir Filling .

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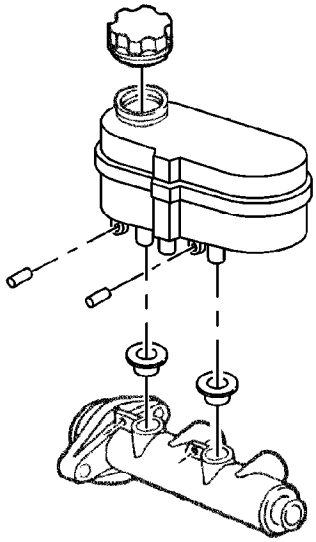
Master Cylinder Reservoir Replacement

Removing and installing the cap is straightforward. Be sure to thoroughly clean around the reservoir cap before removing it to avoid getting dirt into the reservoir. Then remove the cap with a diaphragm.

The fluid level sensor is serviced only by replacing the reservoir.

Removal Procedure

1. Disconnect the electrical connector from the fluid level sensor.
2. Drain the brake fluid from the master cylinder reservoir.



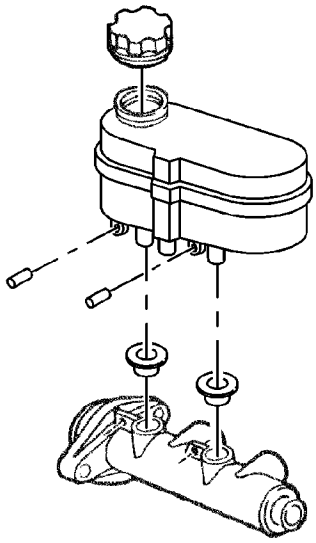


3. Tap back pins until clear of reservoir. Be careful not to damage the reservoir or the master cylinder. If needed, loosen or remove the strut cross bar for access.
4. Remove the reservoir.
5. Remove the seals.
6. Inspect the reservoir for cracks or deformities. If found, replace the reservoir.
7. Clean the reservoir with clean denatured alcohol. Dry with unlubricated compressed air.

Installation Procedure

1. Lubricate the new seals and reservoir bayonets with clean brake fluid.
2. Install the seals, making sure they are fully seated.

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3. Install the reservoir onto the master cylinder by pressing straight down by hand until the pin holes are aligned.
4. Tap in the pins to retain the reservoir. Be careful not to damage the reservoir or master cylinder. If the strut cross bar had been loosened or removed, reinstall it.
5. Fill the master cylinder reservoir to the full level mark using only Delco Supreme II (GM P/N 12377967) Brake Fluid, or equivalent DOT-3 brake fluid, as specified in Maintenance and Lubrication.
6. Connect the electrical connector to the fluid level sensor.
7. Bleed the hydraulic system. Refer to Hydraulic Brake System Bleeding .
8. Recheck the fluid level in the reservoir.

Master Cylinder Cover / Caps Replacement

Removing and installing the cap is straightforward. Be sure to thoroughly clean around the reservoir cap before removing it to avoid getting dirt into the reservoir. Then, remove the cap with diaphragm.

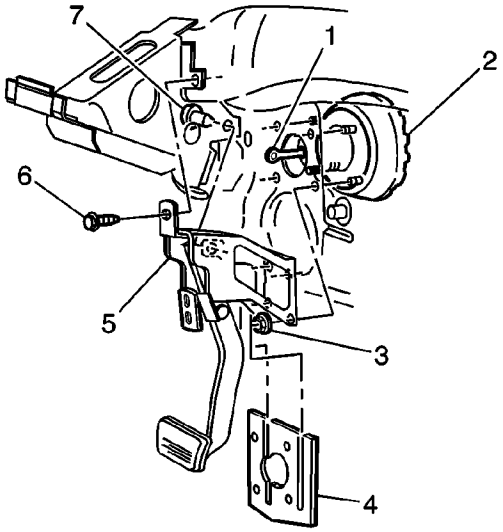
The fluid level sensor is serviced only by replacing the reservoir.

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Brake Pedal Replacement

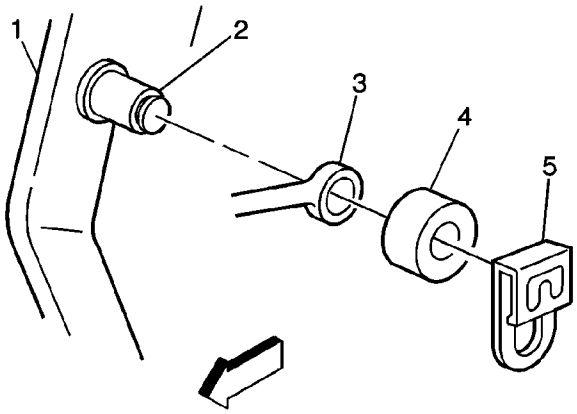
Removal Procedure

1. Disable the SIR system. Refer to Disabling the SIR System in (SIR) System.
2. Remove the instrument panel assembly. Refer to Knee Bolster Replacement in Instrumental Panel, Gauges and Console.
3. Disconnect the electrical connectors from the switch.





4. Remove the two bolts (7 and 6).



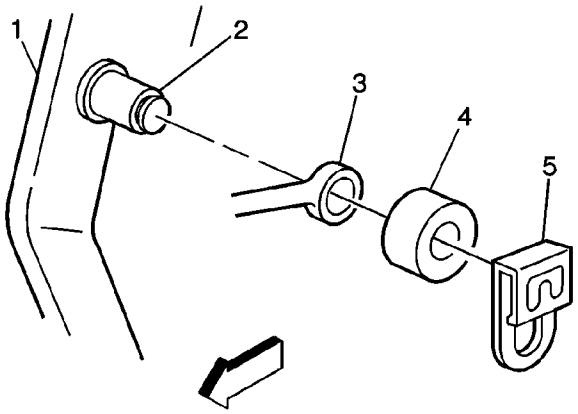


5. Remove the pushrod (3) from the pushrod pin (2).

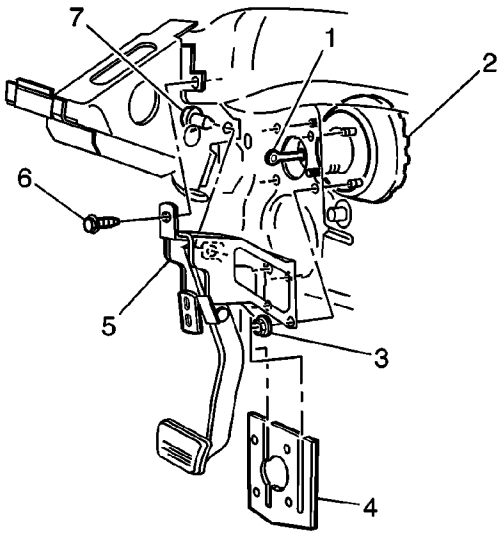
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6. Remove the barrier.
7. Remove the four nuts from the booster studs.
8. Remove the brake pedal assembly (5).

Installation Procedure



1. Install the brake pedal assembly (5) onto the booster studs.
2. Apply lubricant, GM P/N 9985146 or equivalent, to the pushrod pin (2).



3. Hand start the two bolts (7 and 6) through the brake pedal assembly into the cowl bar and steering column support.
4. Install the pushrod (3) onto the pushrod pin (8).
5. Secure the pushrod with a spacer and a retainer.

6. Install the four nuts onto the booster studs.

   Tighten
   Tighten the nuts to 21 N·m(15 lb ft).

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

7. Install the barrier (4) onto the brake pedal assembly.
8. Align with the booster studs.
9. Tighten the bolt (6) first, and then bolt (7).

   Tighten
   Tighten the bolts to 24 N·m(18 lb ft).

10. Connect the electrical connectors to the switch.
11. Install the instrument panel assembly. Refer to Knee Bolster Replacement in Instrumental Panel, Gauges and Console.
12. Enable the SIR system. Refer to Enabling the SIR System in (SIR).

Brake Pipe Replacement

Caution: Always use double walled steel brake pipe when replacing brake pipes. The use of any other pipe is not recommended and may cause brake system failure. Carefully route and retain replacement brake pipes. Always use the correct fasteners and the original location for replacement brake pipes. Failure to properly route and retain brake pipes may cause damage to the brake pipes and cause brake system failure.

Tools Required

J 29803-A ISO Flaring Tool

Important: This vehicle uses only ISO flares on the brake pipe connections. Do not attempt to use single or double lap flares when replacing the brake pipes.

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ISO Flares Replacement

1. Obtain the recommended tubing and steel fitting nuts of correct size. (Outside diameter of the tubing is used to specify size.)
2. Cut the tubing to length. You can determine the length needed by measuring the old pipe using a string and adding 3.2 mm (1/8 in) for each ISO flare.
3. Install the fittings on the tubing before starting flare.
4. Chamfer the inside and the outside diameter of tubing with the deburring tool. Then flare the tubing ends using an ISO flaring tool, such as J 29803-A ISO Flaring Kit. Follow the instructions included with the tool.
5. Carefully bend the tubing to match the old pipe. Clearance of 19 mm (3/4 in) must be maintained between the pipe and all moving or vibrating parts.

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Brake Hose Inspection

Hydraulic brake hoses should be inspected at least twice a year. Check the brake hoses for the following:

- Road hazard damage
- Cracks and chafing of outer cover
- Leaks and blisters
- Proper routing and mounting

If you find any of these conditions, adjust or replace the hose. A brake hose which rubs on other components will wear and eventually fail.

A light and mirror can be helpful for thorough inspections.

Important: Never allow the brake components, such as calipers, to hang from the flexible hoses, as damage to the hoses may occur. Some brake hoses have protective rings or covers to prevent direct contact with other chassis parts. Besides causing possible structural damage to the hose, excessive tension could cause the hose rings to move out of their proper locations.

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Hydraulic Brake System Bleeding

Caution: Do not move the vehicle until a firm brake pedal is obtained. Air in the brake system can cause the loss of brakes with possible personal injury.

Whenever air gets into the brake hydraulic system, you must bleed the system to remove it. You might have to bleed the hydraulic system at all four wheel positions if air has entered the system due to low fluid level, or from brake pipes having been disconnected at the master cylinder. If a brake pipe is disconnected at one wheel, only that wheel cylinder/caliper needs to be bled. If pipes are disconnected at any fitting located between the master cylinder and the wheels, then the brake system served by the disconnected pipe must be bled. Refer to hydraulic system bleeding.

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Hydraulic Brake System Flushing

The entire hydraulic system should be thoroughly flushed with clean brake fluid if there is any doubt as to the grade of fluid in the system, or if fluid has been used that contains the slightest trace of mineral oil.

All rubber parts which have been subjected to the contaminated fluid must be replaced before flushing the system.

Flushing is performed at each wheel in the same way that bleeding is done, except that new fluid must be forced through the system until it emerges clear in color. About one quart of new fluid is needed to flush the system.

After completing the flushing operation at all bleeder valves, check that the master cylinder is filled to the correct level. Refer to hydraulic system flushing.

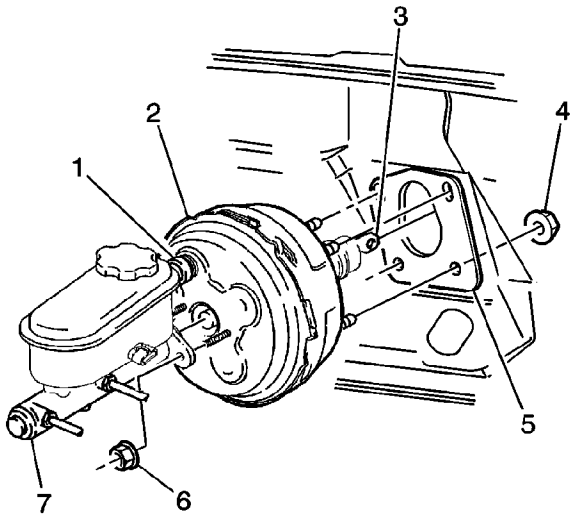
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Power Vacuum Brake Booster Replacement

Removal Procedure

Important: The booster can be removed from the vehicle without removing or disconnecting the master cylinder. However, if both the booster and master cylinder are to be removed, remove the master cylinder first; refer to Master Cylinder Replacement in Hydraulic Brakes.

Disconnect the booster vacuum hose (1) from the vacuum check valve (2).

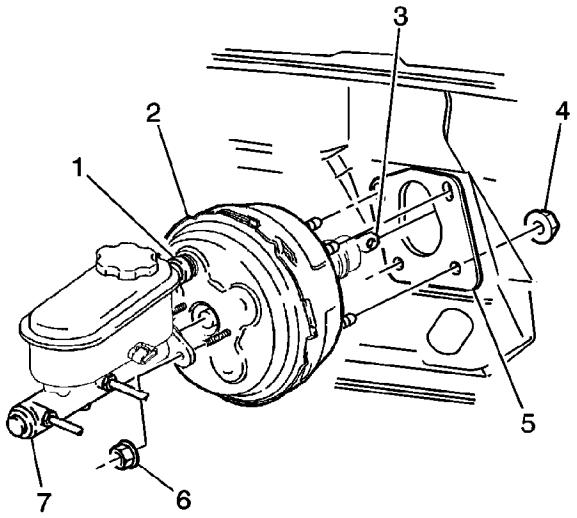


1. Remove the master cylinder attaching nuts (6).
2. Remove the master cylinder (7) from the booster (2).
3. Move the master cylinder (7) forward just enough to clear the studs on the booster. This will flex the brake pipes slightly, it's important to be careful not to bend or distort the pipes.
4. Remove the acoustical barrier from the booster studs (under I/P).
5. Remove the booster attaching nuts (4).
6. Remove the booster pushrod from the brake pedal.
7. Tilt the entire booster slightly to work the pushrod off the pedal clevis pin without putting undue side pressure on the pushrod.
8. Remove the booster from the vehicle.
9. Remove the gasket.

Installation Procedure

1. Connect the gasket to the booster.

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2. Connect the booster (2) to the vehicle.
3. Connect the booster pushrod to the brake pedal.
4. Tilt the entire booster slightly to work the pushrod onto the pedal clevis pin without putting undue side pressure on the pushrod.

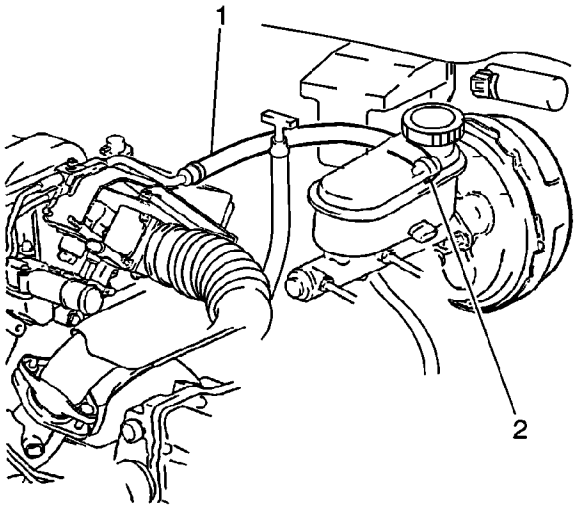
Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

5. Install the booster attaching nuts (4).

Tighten
Tighten the attaching nuts to 21 N·m 15 lb ft).

6. Install the acoustical barrier onto the booster studs (under I/P).
7. Connect the master cylinder (7) to the booster (2).
8. Install the master cylinder attaching nuts (6).

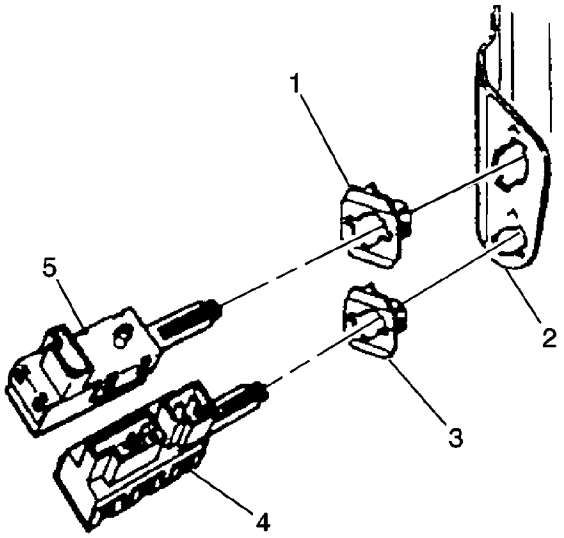
Tighten
Tighten the attaching nuts to 27 N·m 20 lb ft).



9. Connect the booster vacuum hose (1) to the vacuum check valve (2).

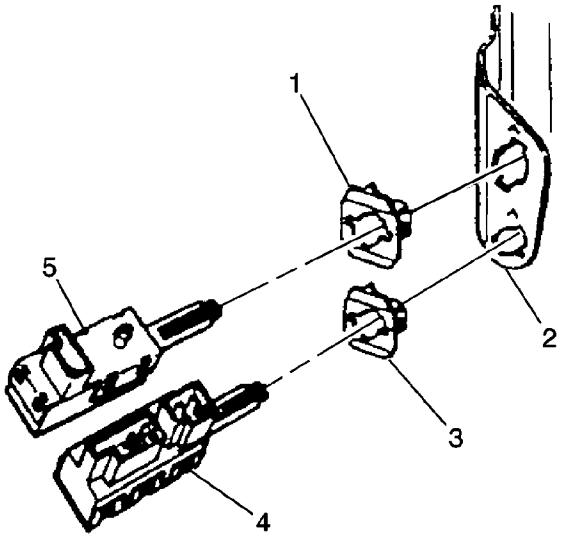
Stop Lamp Switch Replacement

Removal Procedure



1. Remove the I/P sound insulators, as needed for access.
2. Remove the lower switch, twist counterclockwise to unlock and pull out of the retainer.
3. Remove the electrical connectors from the switch.

Installation Procedure



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1. Slide the switch (with all the connections made) into the retainer.
2. Press the switch in until the switch plunger is fully depressed into the switch barrel.
3. Twist the switch clockwise until the travel stop has been reached (approximately 60 degrees). With the switch fully locked, the electrical connector will face the 3 o'clock position.

Stop Lamp Switch Adjustment

The Brake pedal switches are self adjusting when installed properly in the fully locked position. The twist lock type switches do not need any further adjustment.

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Fastener Tightening Specifications (Buick)

Application	Specification	
	Metric	English
Cluster Lens To Cluster Assembly Fasteners	1.9 N·m	17 lb in
Instrument Panel Cluster to IP Assemlby Fasteners	1.5 N·m	14 lb in
Instrument Panel Assembly Center Bracket Fasteners	10 N·m	89 lb in
Instrument Panel Assembly Lower Front Fasteners	2 N·m	18 lb in
Instrument Panel Assembly Upper Fasteners	2 N·m	18 lb in
Instrument Panel Compartment to Instrument Panel Fasteners	1.9 N·m	17 lb in
Instrument Panel Trim Plate Fasteners	1.9 N·m	17 lb in
Instrument Panel Wiring Interconnect Fasteners	10 N·m	89 lb in
Knee Bolster Fasteners	10 N·m	89 lb in
Sound Insulator to Dash Panel Fasteners	1.9 N·m	17 lb in
Steering Column Support Bracket Brace Fasteners	8.5 N·m	75 lb in
Upper Trim Plate Fasteners	1.9 N·m	17 lb in

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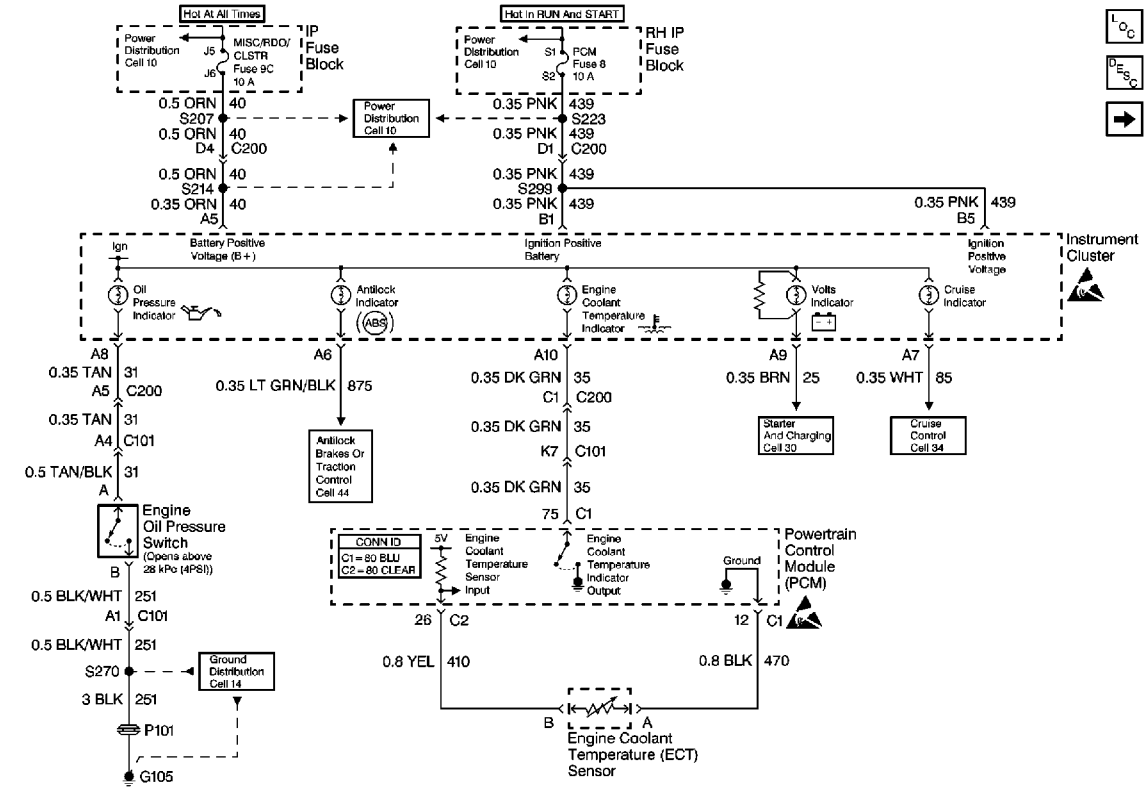
Scan Tool Data List

Scan Tool Parameter	Data List	Units Displayed	Typical Data Value
Engine Idling/Radiator Hose Hot/Closed Throttle/Park or Neutral/Closed Loop			
Brake Fluid Level	Inputs	OK/Low	OK
Right Turn Signal Switch	Inputs	On/Off	Off
Left Turn Signal Switch	Inputs	On/Off	Off
Park Brake Switch	Inputs	On/Off	Off
Washer Fluid Level	Inputs	OK/Low	OK
Oil Level	Inputs	OK/Low	OK
Trans Range A	Inputs	LO/HI	LO
Trans Range B	Inputs	LO/HI	HI
Trans Range C	Inputs	LO/HI	HI
Trans Range P	Inputs	LO/HI	LO
Oil Pressure Switch	Inputs	Open/Closed	Open
Low Coolant Level	Inputs	OK/Low	OK
DIM Level	Gauges	Volts	--
DIM Reference	Gauges	Volts	--
Vehicle Speed	Gauges	km/h/MPH	0
Engine Speed	Gauges	RPM	0
Battery Voltage	Gauges	Volts	13.0
Fuel Level	Gauges	liter/gal	--

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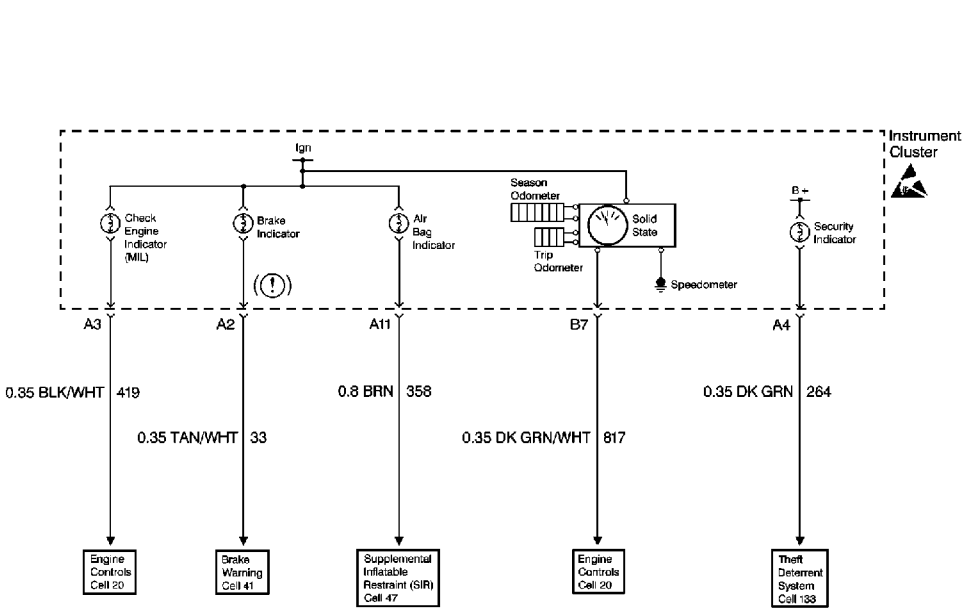
Cell 80: IP Fuse Block



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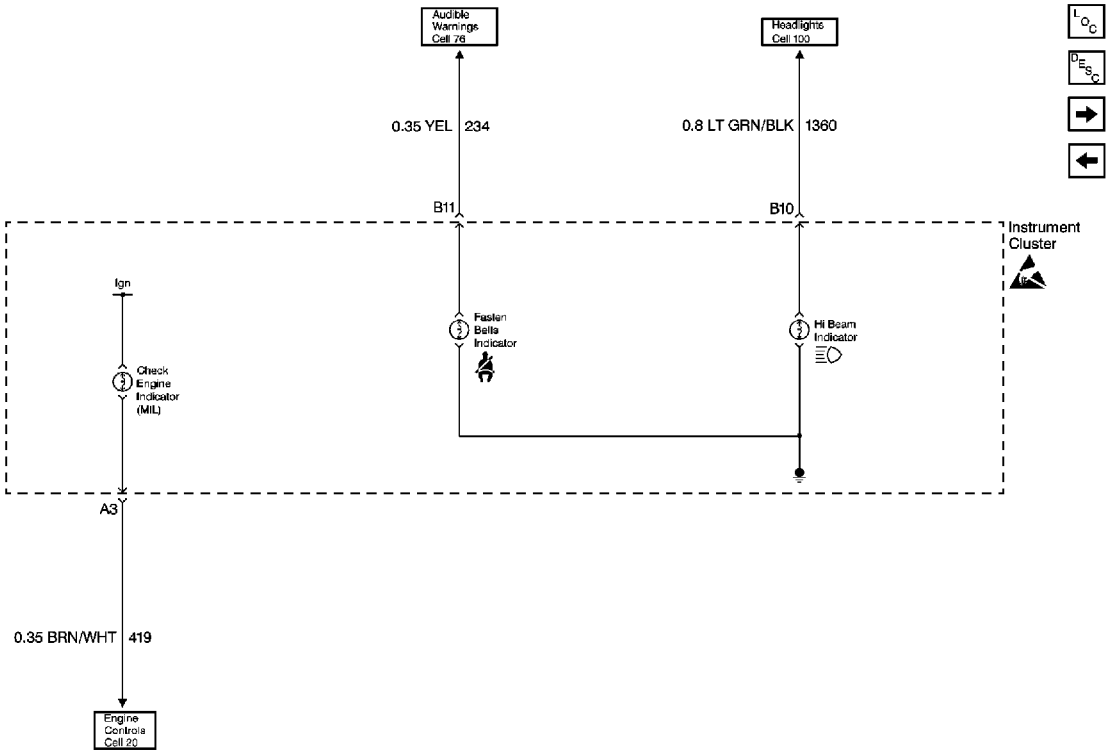
Cell 80: Instrument Cluster



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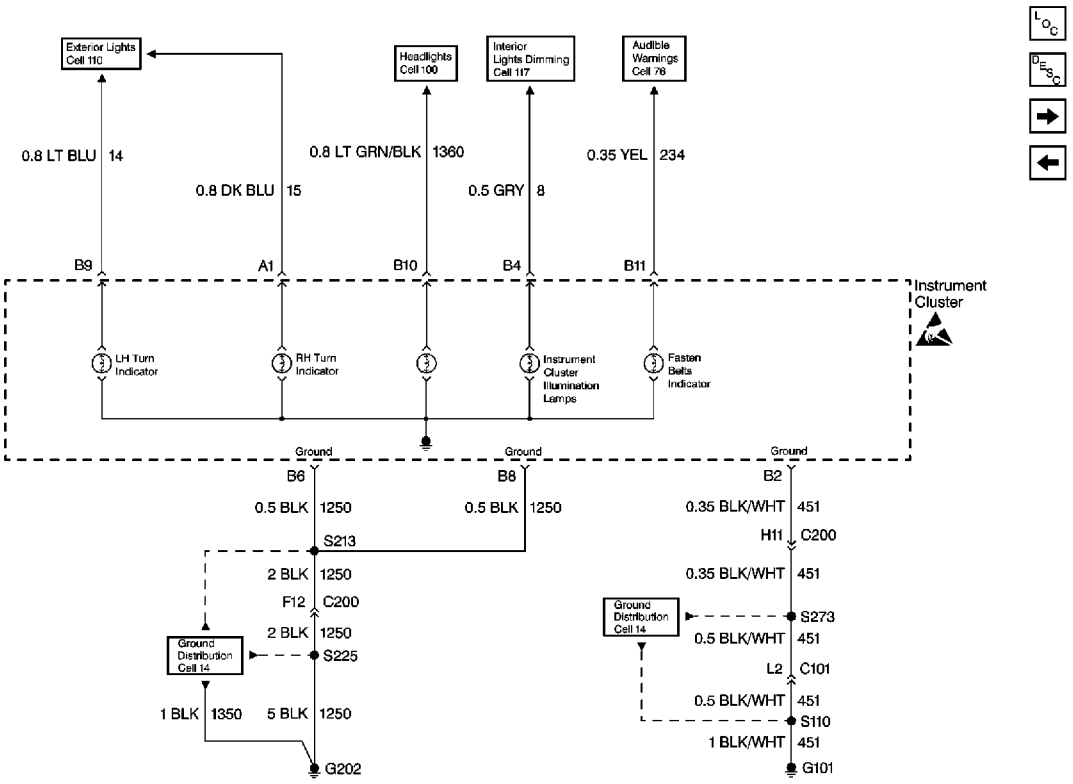
Cell 80: Indicators



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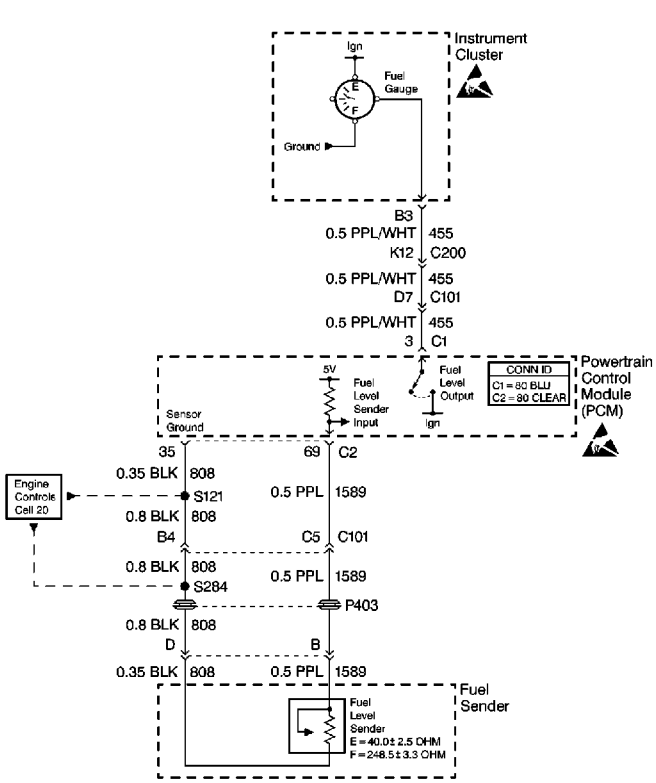
Cell 80: Indicators # 2



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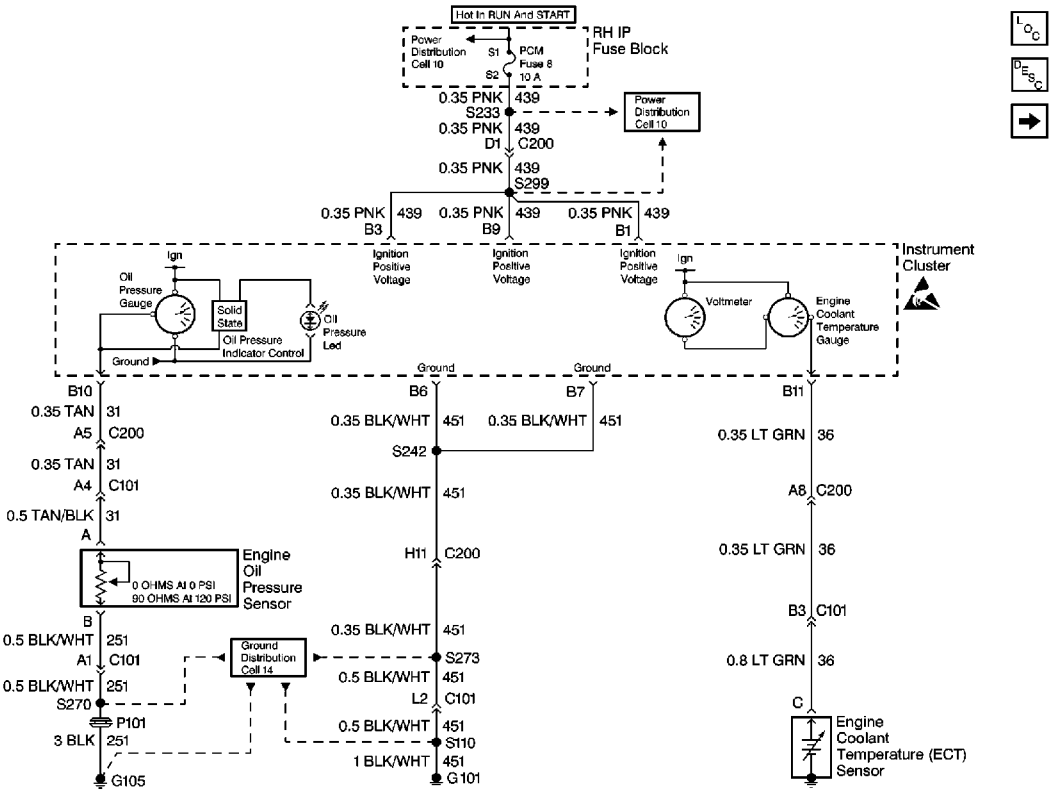
Cell 80: Fuel Sender



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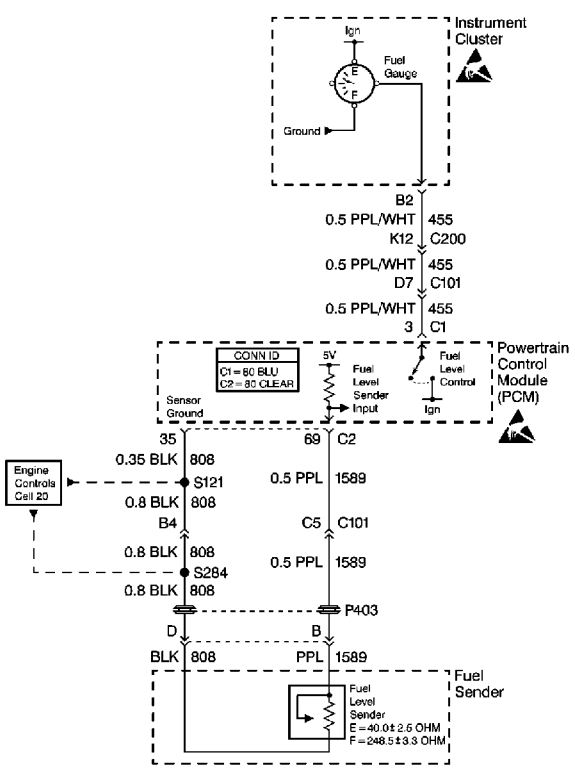
Cell 81:Gauges



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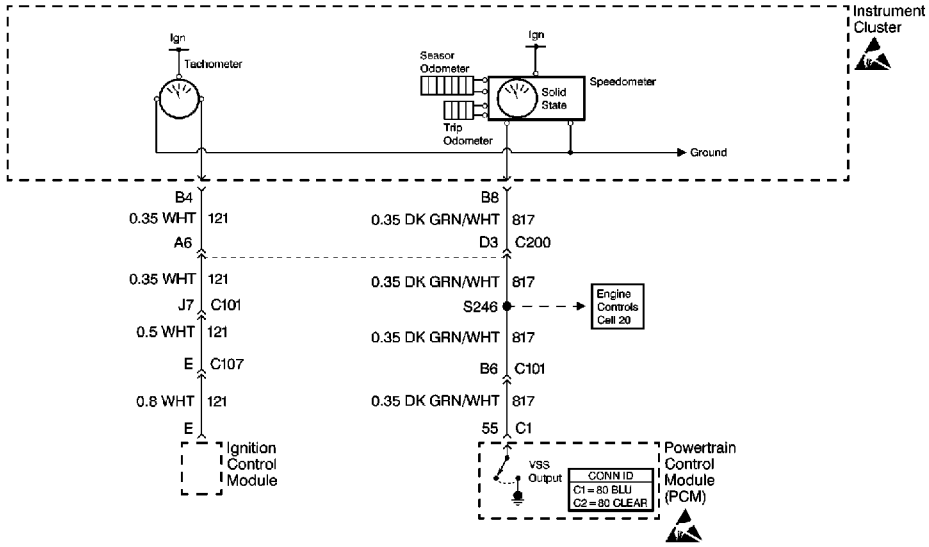
Cell 81: Fuel Tank Unit



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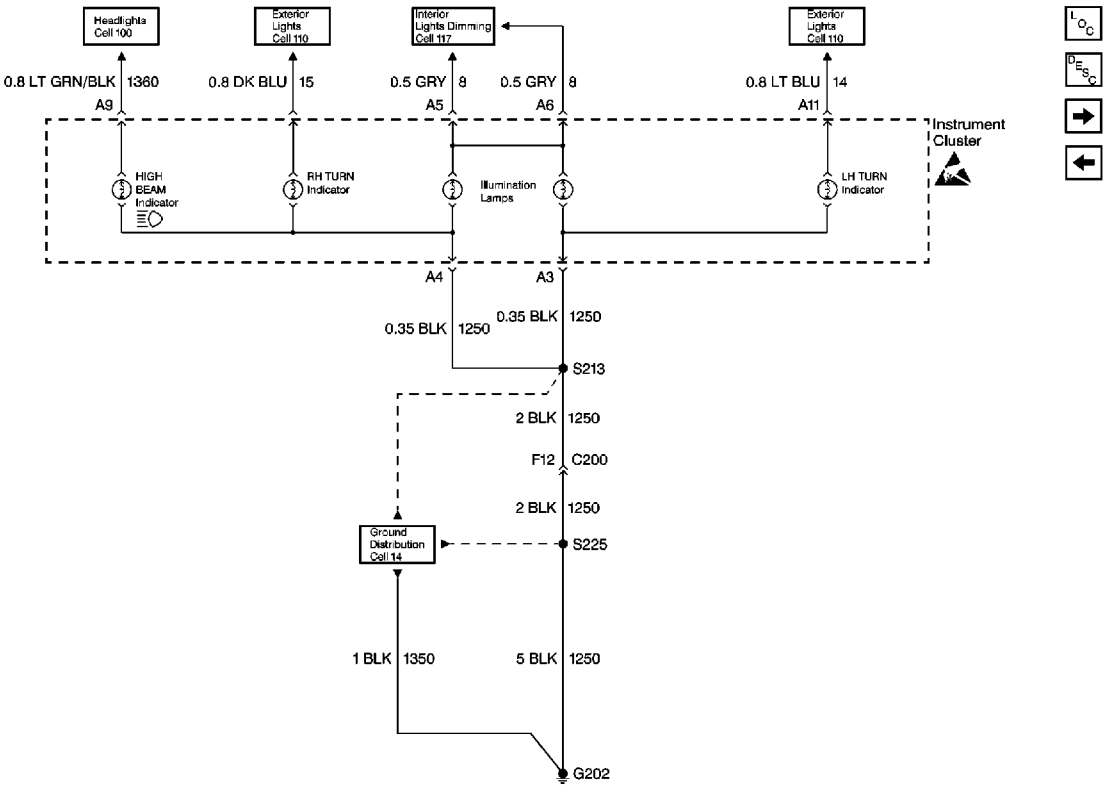
Cell 81: Instrument Cluster



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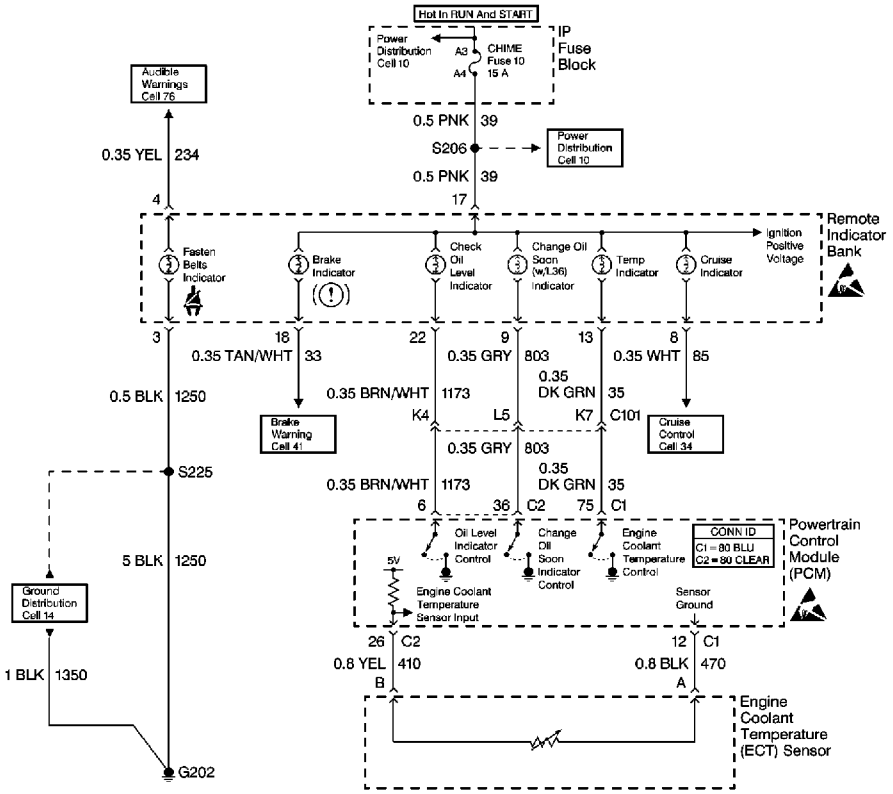
Cell 81: Instrument Cluster



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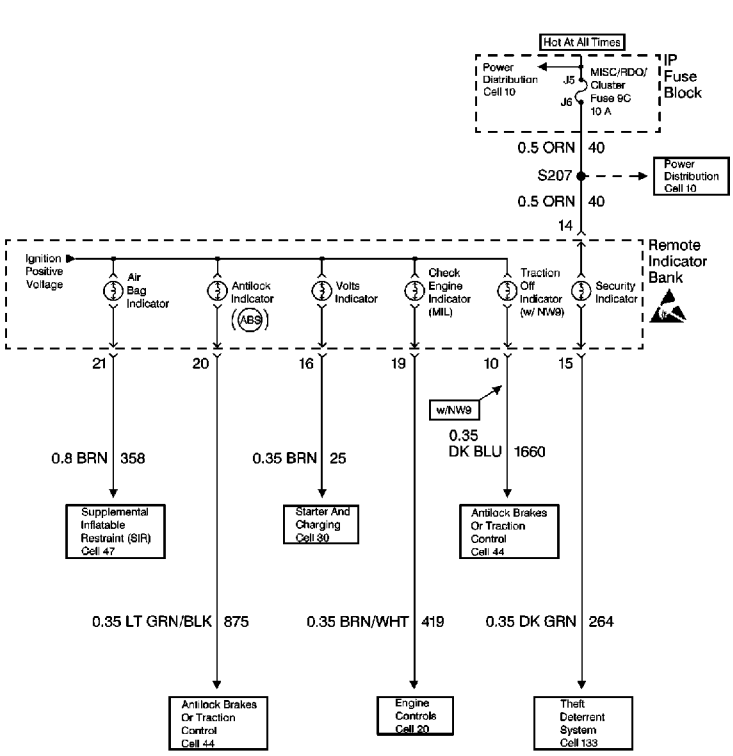
Cell 81: Remote Indicator Bank



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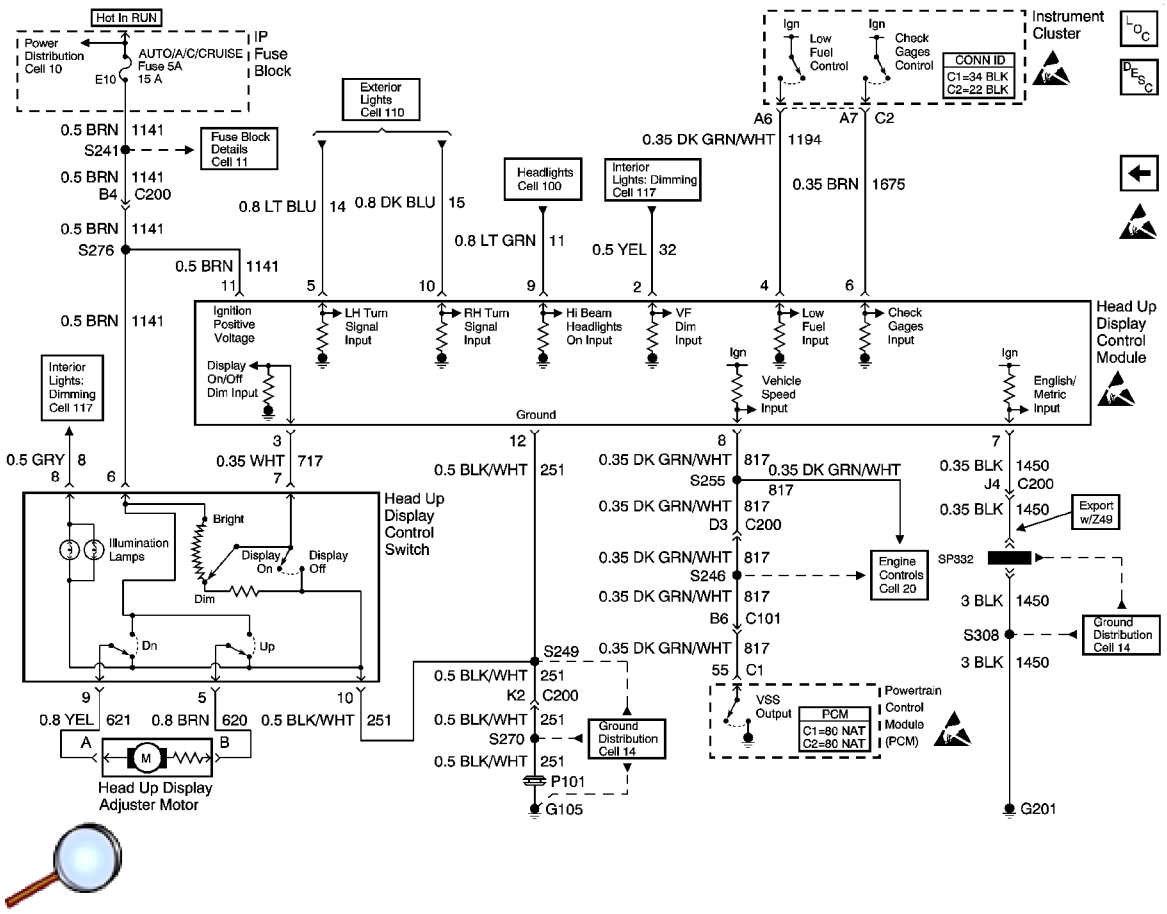
Cell 81: IP Fuse Block



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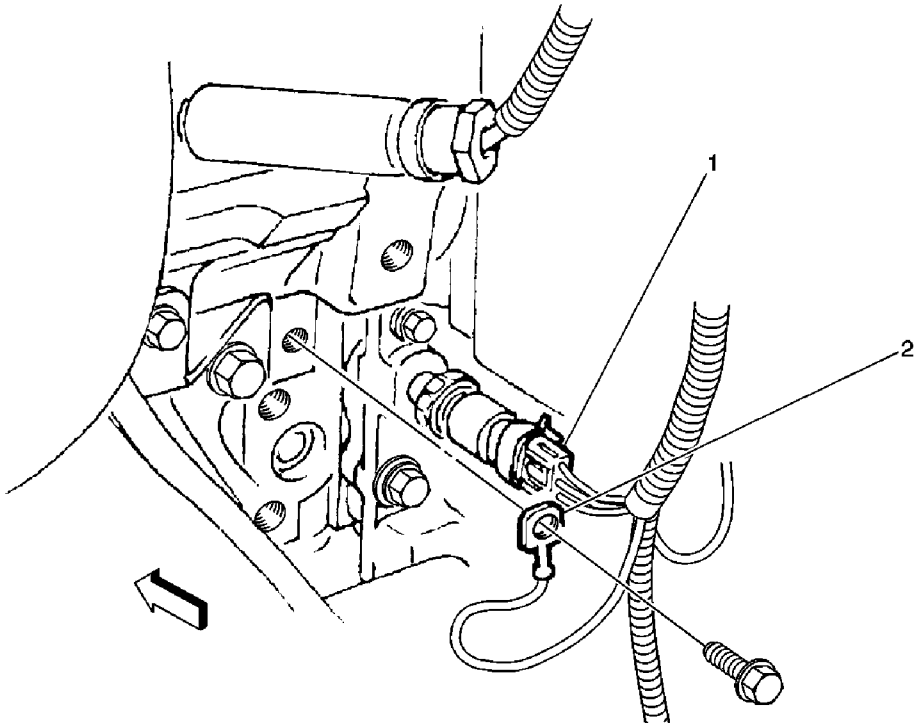
HUD Schematic



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Right Hand Rear of the Engine

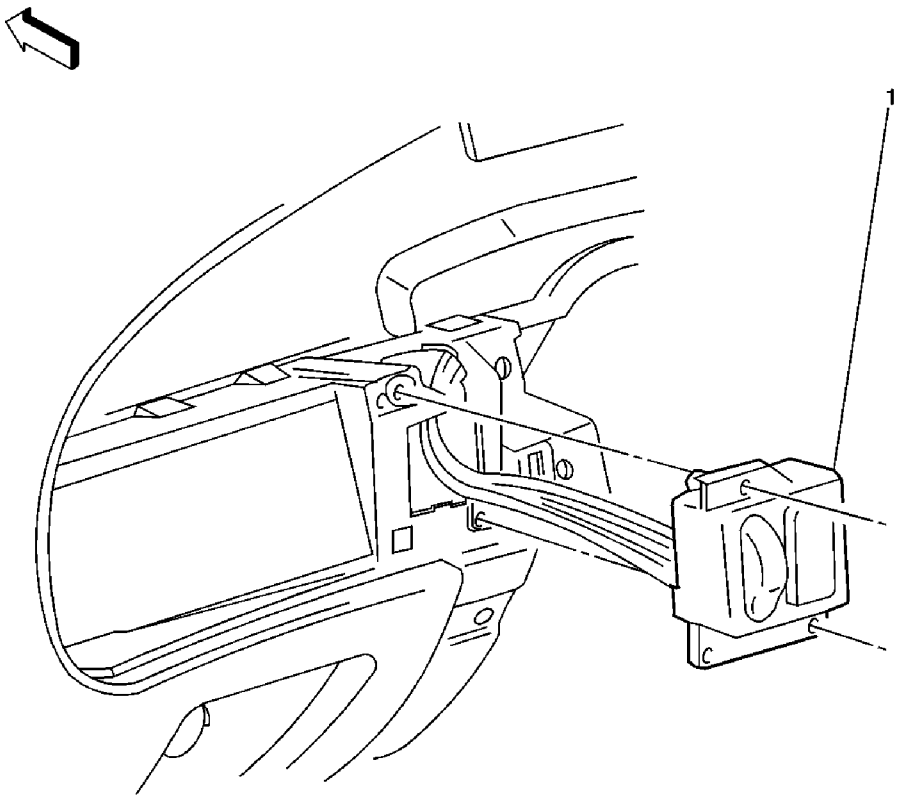


(1) Engine Oil Pressure Switch
(2) G101

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Passenger Compartment, Below the Instrument Cluster

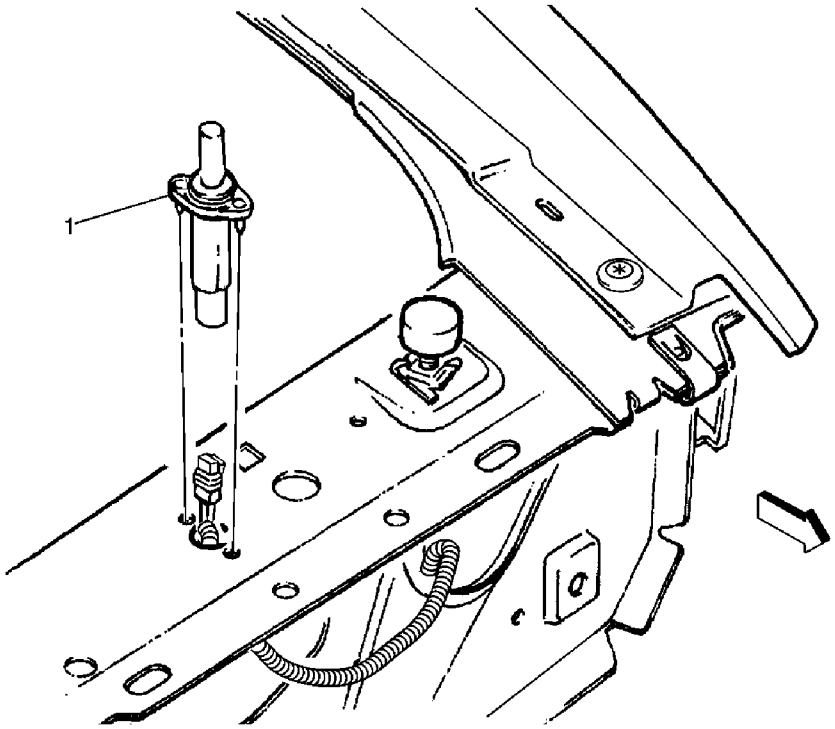


(1) Head-Up Display (HUD) Control (Pontiac w/UV6)

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Left Hand Front of the Engine Compartment

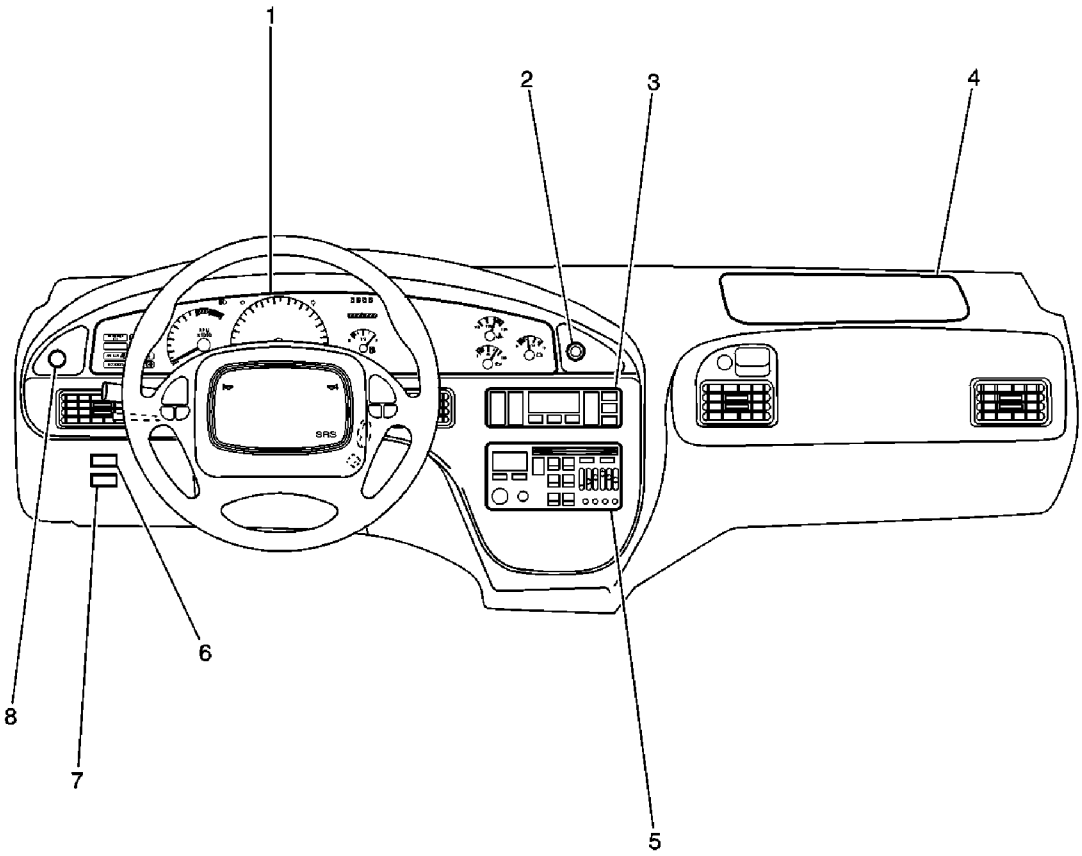


(1) Hood Ajar Switch

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Passenger Compartment, Pontiac Instrument Panel Shown, Others Similar

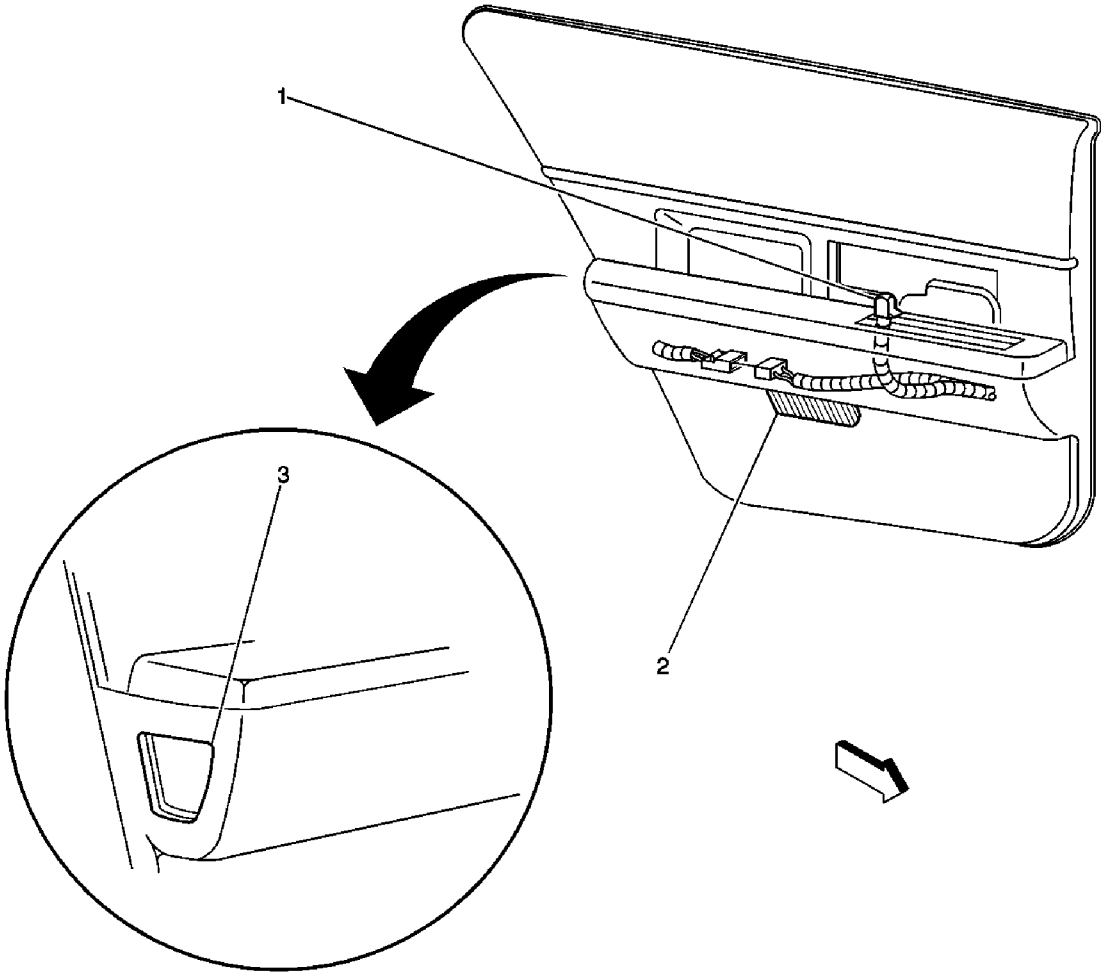


(1) Instrument Cluster
(2) Cigar Lighter
(3) Heater and A/C Control
(4) Inflatable Restraint IP Module
(5) Radio
(6) Rear Compartment Lid Latch Switch
(7) Fog Lamp Switch
(8) Lamp Dimmer Switch

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Passenger Compartment, On the Rear Door

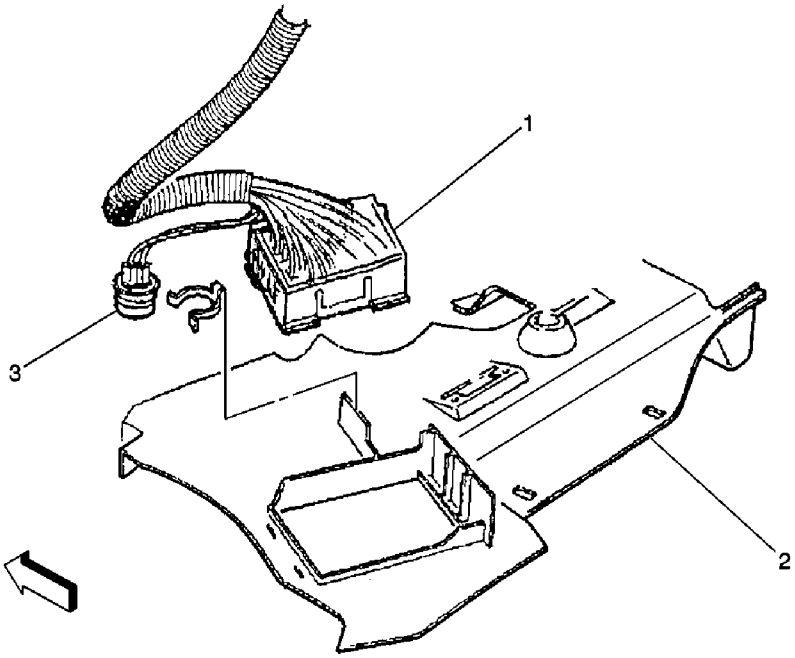


(1) LH Rear Power Window Switch (RH Similar)
(2) LH Rear Door Courtesy Lamp (RH Similar)
(3) LH Rear Door Warning Lamp (RH Similar)

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Under the Left Hand of the Instrument Panel

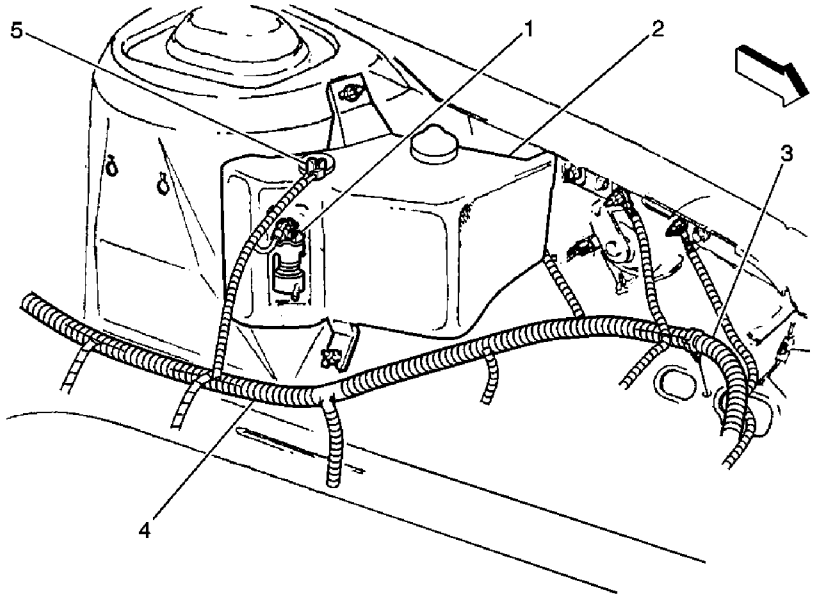


(1) IP Fuse Block
(2) LH IP Sound Insulator
(3) Turn Signal Flasher

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Engine Compartment, Near the Left Strut Tower

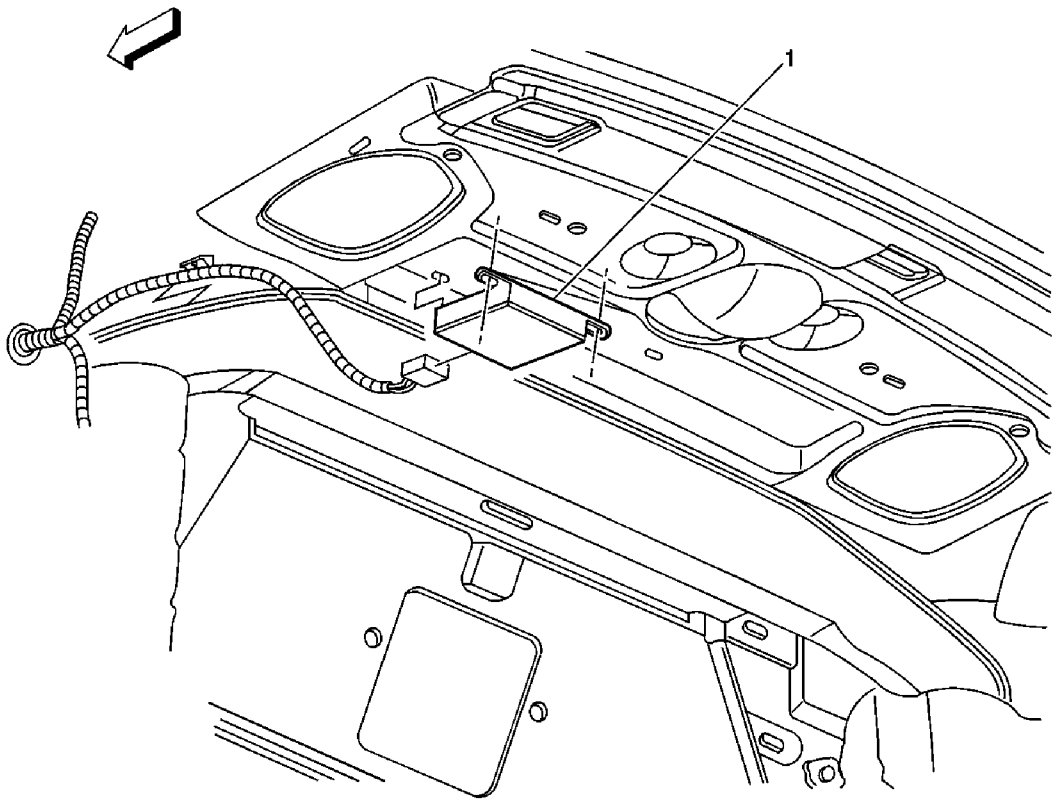


(1) Windshield Washer Pump
(2) Windshield Washer Solvent Reservoir
(3) S128
(4) S124
(5) Windshield Washer Solvent Level Switch

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Rear Compartment, Under the Rear Package Shelf



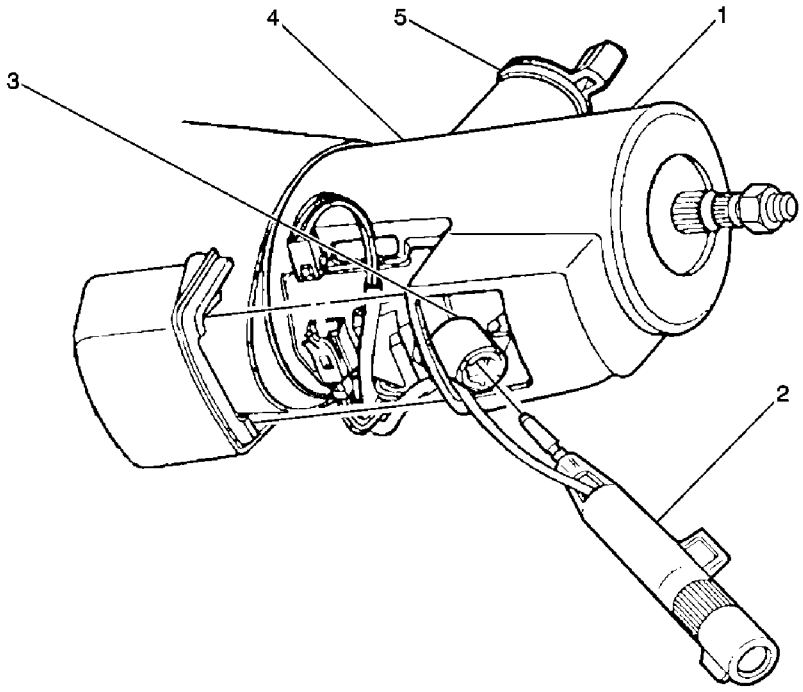
(1) Electronic Compass Module

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Audible Warnings Component Views

Top of the Steering Column



(1) Turn Hazard Switch (Hidden)
(2) Multifuntion Lever
(3) Windshield Wiper Switch
(4) Ignition Switch (Hidden)
(5) Ignition Lock Cylinder

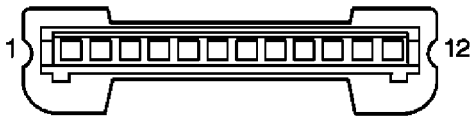
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Instrument Cluster and HUD Connector End Views

Table 1: Head Up Display Module (Pontiac)
Table 2: Instrument Cluster Connector - Buick with U23
Table 3: Instrument Panel Gauges Connector - Buick with UB3
Table 4: Remote Indicator Back Connector - Buick with UB3
Table 5: Instrument Cluster C1 (Oldsmobile w/ UH8)
Table 6: Instrument Cluster Connector C2 - Oldsmobile with UH8
Table 7: Instrument Cluster Connector - Pontiac with UB3
Table 8: Instrument Cluster Connector C1 - Pontiac with U50/U2F
Table 9: Instrument Cluster Connector C2 - Pontiac with U50/U2F
Table 10: Transmission Position Decoder Module -- Pontiac
Table 11: Transmission Position Decoder Module -- Oldsmobile
Table 12: Windshield Washer Solvent Level Switch
Table 13: Electronic Compass Module
Table 14: Engine Oil Pressure Switch
Table 15: Head-up Display (HUD) Control
Table 16: Head-up Display (HUD) Adjuster Motor
Table 17: Hood Ajar Switch
Table 18: LH Front Seat Belt Switch

Head Up Display Module (Pontiac)



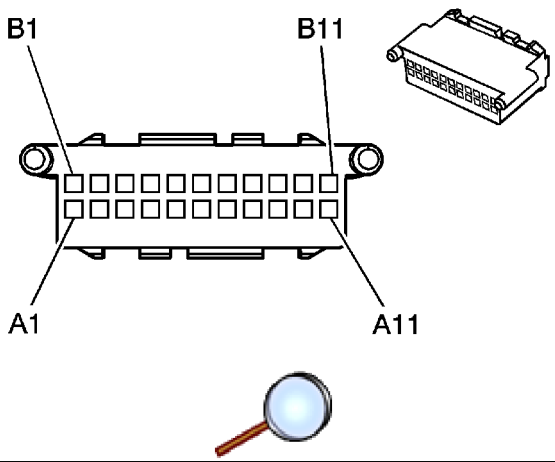


Connector Part Information	• 12059197 • F Micro - Pack 100 Series(LT GRY)		
Pin	**Wire Color**	**Circuit No.**	**Function**
1	--	--	Not Used
2	YEL	32	Fused Output-Instrument Panel Lamp
3	WHT	717	Illuminated Display Signal
4	DK GRN/WHT	1194	Low Fuel Level Signal

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5	LT BLU	14	Turn Signal Lamp Feed-Left Front
6	BRN	1675	Check Gages Signal
7	BLK	1450	Ground
8	DK GRN/WHT	817	Vehicle Speed Signal
9	LT GRN	11	High Beam Headlamp Feed
10	DK BLU	15	Turn Signal Lamp Feed-Right Front
11	BRN	1141	Fused Output-IGN
12	BLK/WHT	251	Ground

Instrument Cluster Connector - Buick with U23



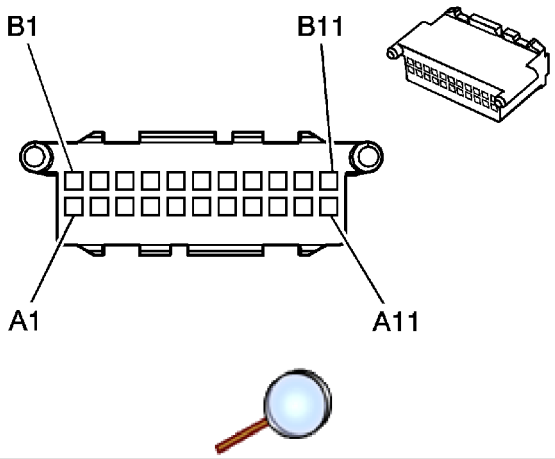
Connector Part Information	• 12065804 • 22-Way F Micro-Pack 100 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A1	DK BLU	15	Turn Signal Lamp Feed - RH Front
A2	TAN/WHT	33	Brake Warning Indicator Lamp Output
A3	BRN/WHT	419	Check Engine Indicator Lamp Output
A4	DK GRN	264	Security Indicator Lamp Feed
A5	ORN	40	Battery Feed
A6	LT GRN/BLK	875	ABS Indicator Lamp Driver Module Output
A7	WHT	85	Cruise Indicator Lamp Output
A8	TAN	31	Oil Pressure Indicator Lamp Output
A9	BRN	25	Volts Indicator Lamp Output
A10	DK GRN	35	Coolant Temperature (TEMP) Indicator Lamp Output
A11	BRN	358	Air Bag Indicator Lamp Output
B1	PNK	439	Ignition 1
B2	BLK/WHT	451	Ground
B3	PPL/WHT	455	Fuel Level PWM Output Signal From PCM
B4	GRY	8	Instrument Panel Lamp Feed

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B5	PNK	439	Ignition 1
B6	BLK	1250	Ground
B7	DK GRN/WHT	817	Vehicle Speed Signal
B8	BLK	1250	Ground
B9	LT BLU	14	Turn Signal Lamp Feed - LH Front
B10	LT GRN/BLK	1360	High-Beam Headlamp Feed
B11	YEL	234	Fasten Seat Belts Indicator Lamp Output

Instrument Panel Gauges Connector - Buick with UB3



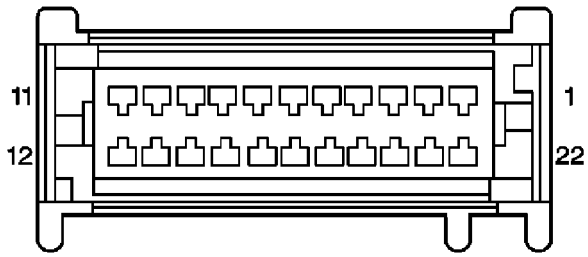
Connector Part Information	• 12065804 • 22-Way F Micro-Pack 100 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A1	DK BLU	15	Turn Signal Lamp Feed - RH Front
A2	--	--	Not Used
A3	BLK	1250	Ground
A4	BLK	1250	Ground
A5-A6	GRY	8	Instrument Panel Lamp Feed
A7-A8	--	--	Not Used
A9	LT GRN/BLK	1360	High-Beam Headlamp Feed
A10	--	--	Not Used
A11	LT BLU	14	Turn Signal Lamp Feed - LH Front
B1	PNK	439	Ignition 1
B2	PPL/WHT	455	Fuel Level PWM Output Signal From PCM
B3	PNK	439	Ignition 1
B4	WHT	121	Tachometer Signal
B5	--	--	Not Used
B6	BLK/WHT	451	PCM Ground
B7	BLK/WHT	451	PCM Ground
B8	DK GRN/WHT	817	Vehicle Speed Signal - 4000 Pulses Per Mile

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B9	PNK	439	Ignition 1
B10	TAN	31	Oil Pressure Indicator Lamp Output
B11	LT GRN	36	Coolant Temperature Signal

Remote Indicator Back Connector - Buick with UB3



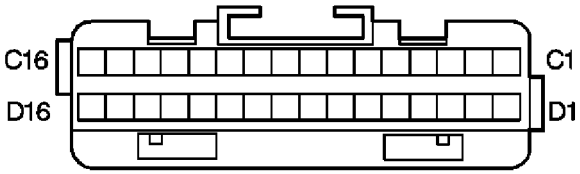


Connector Part Information	• 12191334 • 22-Way F Micro-Pack 100 Series (BLK)

Pin	Wire Color	Circuit No.	Function
1-2	--	--	Not Used
3	BLK	1250	Ground
4	YEL	234	Fasten Belts Indicator Lamp Output
5-7	--	--	Not Used
8	WHT	85	Cruise Indicator Lamp Output
9	GRY	803	Change Oil Indicator Lamp Output
10	DK BLU	1660	Traction Control Indicator Lamp Driver Module Output
11-12	--	--	Not Used
13	DK GRN	35	Coolant Temperature Indicator Lamp Output
14	ORN	40	Battery Power
15	DK GRN	264	Security Indicator Lamp Feed
16	BRN	25	Volts Indicator Lamp Output
17	PNK	39	Fuse Output - Ignition 1
18	TAN/WHT	33	Brake Warning Indicator Lamp Output
19	BRN/WHT	419	Check Engine Indicator Lamp Output
20	LT GRN/BLK	875	ABS Indicator Lamp Driver Module Output
21	BRN	358	Air Bag Indicator Lamp Output
22	BRN/WHT	1173	Low Oil Level Indicator Lamp Output

Instrument Cluster C1 (Oldsmobile w/ UH8)

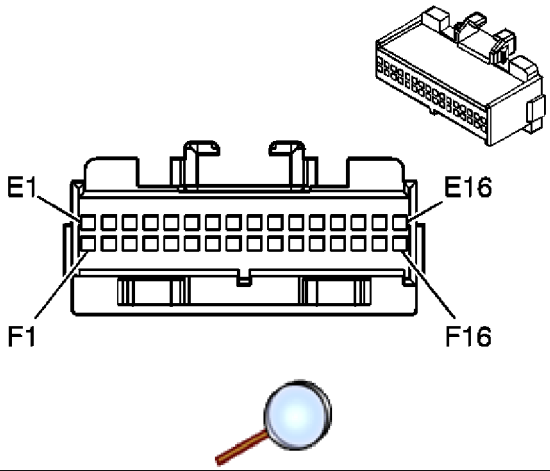
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Connector Part Information	• 12045471 • 32 Way F Micro-Pack 100 Series (GRN)		
Pin	**Wire Color**	**Circuit No.**	**Function**
C1	GRN LT	11	High-Beam Headlamp Feed
C2-C4	--	--	Not Used
C5	WHT	776	Transmission Position Switch Signal - Parity Bit
C6	GRY	773	Transmission Position Switch Signal - Bit 3
C7	YEL	772	Transmission Position Switch Signal - Bit 2
C8	BLK/WHT	771	Transmission Position Switch Signal - Bit 1
C9-C12	--	--	Not Used
C13	PPL	209	Brake Fluid Level Indicator Lamp Output
C14	TAN/WHT	33	Brake Warning Indicator Lamp Output
C15	--	--	Not Used
C16	DK BLU	15	Turn Signal Lamp Feed - RH Front
D1-D5	--	--	Not Used
D6	LT GRN/BLK	875	ABS Indicator Lamp Driver Module Output
D7	BRN	358	Air Bag Indicator Lamp Output
D8	--	--	Not Used
D9	PNK	439	Ignition 1
D10	--	--	Not Used
D11	BLK/WHT	99	Windshield Washer Fluid Level Sensor Signal
D12-D13	--	--	Not Used
D14	YEL/BLK	68	Low Coolant Level Indicator Lamp Output
D15	BRN/WHT	1173	Low Oil Level Indicator Lamp Output
D16	LT BLU	14	Turn Signal Lamp Feed - LH Front

Instrument Cluster Connector C2 - Oldsmobile with UH8

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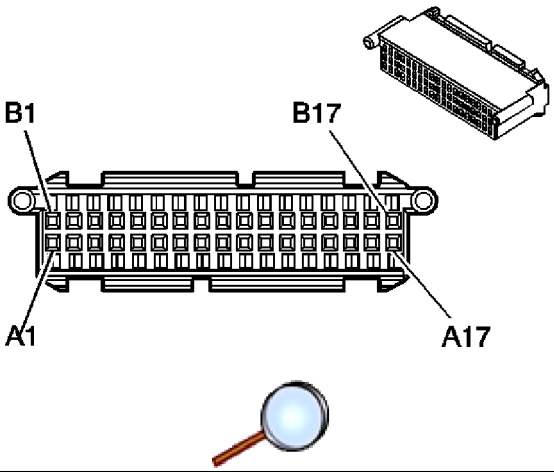
Connector Part Information	• 12052107 • 32-Way F Micro-Pack 100 Series (ORN)

Pin	Wire Color	Circuit No.	Function
E1	GRY	8	Instrument Panel Lamp Feed
E2	TAN	31	Oil Pressure Indicator Lamp Output
E3	PPL	30	Fuel Gauge Sensor Signal
E4	YEL	32	Fuse Output - Instrument Panel Lamps
E5	TAN	800	Serial Data Signal - UART (8192 Baud)
E6	TAN	800	Serial Data Signal - UART (8192 Baud)
E7	--	--	Not Used
E8	WHT	121	Tachometer Signal
E9	--	--	Not Used
E10	DK GRN/WHT	817	Vehicle Speed Signal - 4000 Pulses Per Mile
E11	BLK	1250	Ground
E12	BLK	1250	Ground
E13	YEL	234	Fasten Belts Indicator Lamp Output
E14-E15	--	--	Not Used
E16	LT GRN	1845	Auxiliary Chime Control Signal
F1	--	--	Not Used
F2	PPL	806	Crank
F3	ORN	40	Battery Feed
F4	LT GRN	147	Ignition 0 (OFF/RUN)
F5	PNK	439	Ignition 1
F6	--	--	Not Used
F7	BLK/WHT	451	PCM Ground
F8	BLK/WHT	451	PCM Ground
F9	BLK	552	Sensor Return
F10-F12	--	--	Not Used
F13	BRN/WHT	419	Check Engine Indicator Lamp Output

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F14	GRN DK	264	Security Indicator Lamp Feed
F15	--	--	Not Used
F16	PNK	439	Ignition 1

Instrument Cluster Connector - Pontiac with UB3



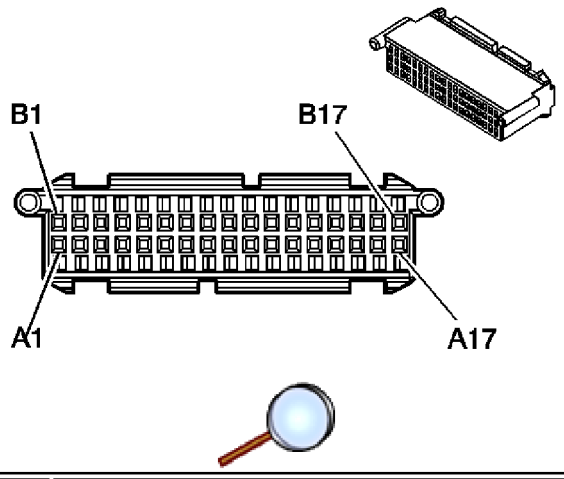
Connector Part Information	• 12162670 • 34-Way F Micro-Pack 100 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A1	DK GRN	35	Coolant Temperature Indicator Lamp Output
A2	TAN	31	Oil Pressure Indicator Lamp Output
A3	BLK	1250	Ground
A4	GRY	8	Instrument Panel Lamp Feed
A5	TAN/WHT	33	Brake Warning Indicator Lamp Output
A6	PNK	439	Ignition 1
A7	LT GRN	1845	Auxiliary Chime Control Signal
A8	BLK/WHT	451	PCM Ground
A9	LT GRN	36	Coolant Temperature Sensor
A10	DK GRN/WHT	817	Vehicle Speed Signal - 4000 Pulses Per Mile
A11	BLK/WHT	99	Windshield Washer Fluid level Sensor Signal
A12	BRN/WHT	1173	Low Oil Level Indicator Lamp Output
A13	BRN	25	Volts Indicator Lamp Output
A14	PPL/WHT	455	Fuel Level PWM Output Signal From PCM
A15	PNK	439	Ignition 1
A16	DK BLU	15	Turn Signal Feed - RH Front
A17	BLK/WHT	451	PCM Ground
B1	DK GRN/WHT	817	Vehicle Speed Signal - 4000 Pulses Per Minute
B2	PNK	439	Ignition 1
B3	BLK	1250	Ground

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B4	PNK	439	Ignition 1
B5	BLK	1250	Ground
B6	GRY	8	Instrument Panel Lamp Feed
B7	LT GRN/BLK	875	ABS Indicator - Lamp Driver Module Output
B8	YEL	234	Fasten Belts Indicator Lamp Output
B9	ORN	40	Battery
B10	DK GRN	264	Security Indicator Lamp Feed
B11	BRN/WHT	419	Check Engine Indicator Lamp Output
B12	BRN	358	Air Bag Indicator Lamp Output
B13	DK BLU	1660	Traction Control Indicator Lamp Driver Module Output (with NW9)
B14	--	--	Not Used
B15	WHT	121	Tachometer Signal
B16	LT GRN	11	High-Beam Headlamp Feed
B17	LT BLU	14	Turn Signal Feed - LH Front

Instrument Cluster Connector C1 - Pontiac with U50/U2F



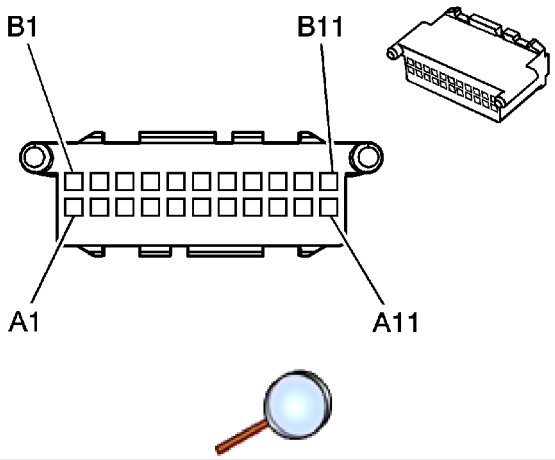
Connector Part Information	• 12162670 • 34-Way F Micro-Pack 100 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A1	ORN	40	Battery
A2	DK GRN	264	Security Indicator Lamp Feed
A3-A4	--	--	Not Used
A5	DK BLU	1660	Traction Control Indicator Lamp Driver Module Output
A6	BRN	358	Air Bag Indicator Lamp Output
A7	PNK	439	Ignition 1
A8-A9	--	--	Not Used
A10	TAN/WHT	33	Brake Warning Indicator Lamp Output

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A11	BRN/WHT	419	Check Engine Indicator Lamp Output
A12	YEL	234	Fasten Belts Indicator Lamp Output
A13	DK BLU	15	Turn Signal Feed - RH Front
A14	BLK	1250	Ground
A15	LT GRN/BLK	875	ABS Indicator - Lamp Driver Module Output
A16	BLK/WHT	99	Windshield Washer Fluid Level Sensor Signal
B1	ORN	40	Battery
B2	GRY/BLK	745	Door Ajar Switch Signal - LH Front
B3	RED/BLK	744	Trunk Lid Ajar Switch Signal
B4	PNK/BLK	109	Hood Ajar Switch Signal
B5	YEL/BLK	68	Low Coolant Level Indicator Lamp Output
B6	LT BLU/BLK	747	Door Ajar Switch Signal - LH Rear
B7	GRY	705	Reference Voltage Feed - 5 Volt Reference
B8	BLK/WHT	451	PCM Ground
B9	BLK/WHT	451	PCM Ground
B10	BLK/WHT	746	Door Ajar Switch Signal - RH Front
B11	LT GRN/BLK	748	Door Ajar Switch Signal - RH Rear
B12	YEL	32	Fuse Output - Instrument Panel Lamps
B13	BRN	25	Volts Indicator Lamp Output
B14	LT GRN	11	High-Beam Headlamp Feed
B15	BLK	1250	Ground
B16	GRY	8	Instrument Panel Lamp Feed
B17	LT BLU	14	Turn Signal Feed - LH Front

Instrument Cluster Connector C2 - Pontiac with U50/U2F



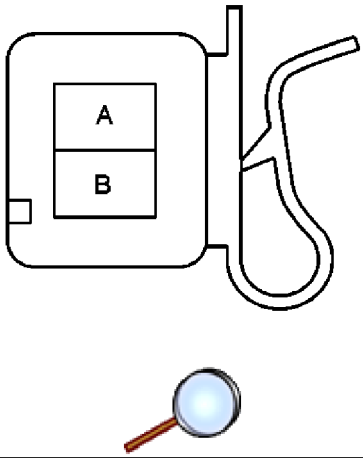
Connector Part Information	• 12065804 • 22-Way F Micro-Pack 100 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A1	BRN	1141	Ignition 3

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A2	PPL/WHT	455	Fuel Level PWM Output Signal From PCM
A3	BRN/WHT	1173	Low Oil Level Indicator Lamp Output
A4-A5	--	--	Not Used
A6	DK GRN/WHT	1194	Low Fuel Level Signal with UV6
A7	BRN	1675	Check Gauges signal with UV6
A8	LT GRN	1845	Chime Control Signal
A9	DK GRN	35	Coolant Temperature Indicator Lamp Output
A10	PNK	439	Ignition 1
A11	DK GRN	135	Coolant Temperature Sensor Signal
B1	TAN	31	Oil Pressure Indicator Lamp Output
B2	BLK	1250	Ground
B3	GRY	8	Instrument Panel Lamp Feed
B4	--	--	Not Used
B5	TAN/WHT	337	Compass Clock Signal
B6	TAN	1278	Lamp Monitor Data Request Signal
B7	PPL/WHT	336	Compass Data Signal
B8	WHT	1279	Lamp Monitor Data Signal
B9	WHT	121	Tachometer Signal
B10	DK GRN/WHT	817	Vehicle Speed Signal - 4000 Pulses Per Mile
B11	BLK	891	Boost Gauge Signal

Transmission Position Decoder Module -- Pontiac

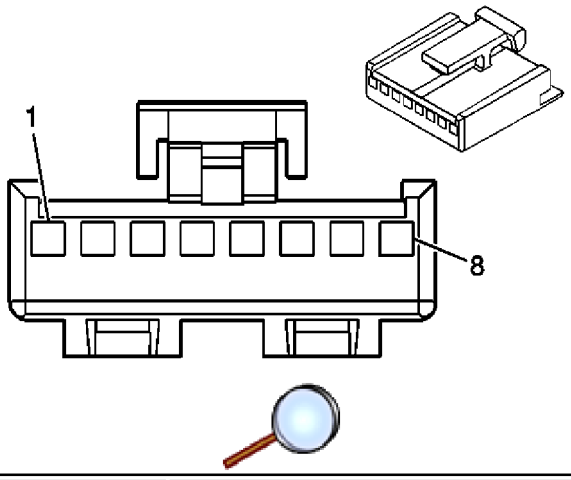


Connector Part Information	• 12052856 • 4-Way F Metric Pack 280 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	PNK	439	Fuse Output - Ignition
B	BLK/ WHT	451	Engine Control Module - Ground
C	TAN	800	Serial Data Signal
D	GRY	8	Instrument Panel Lamp Feed

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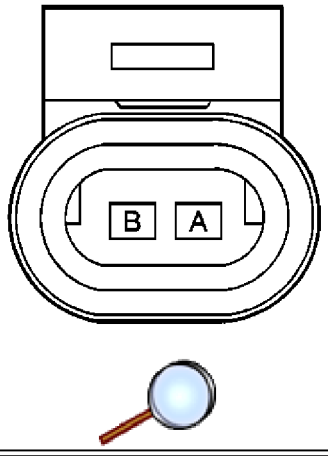
Transmission Position Decoder Module -- Oldsmobile



Connector Part Information	• 12052444 • 8-Way F Micro Pack 100 (BLK)

Pin	Wire Color	Circuit No.	Function
1	--	--	Not Used
2	TAN	800	Serial Data Signal
3	--	--	Not Used
4	GRY	8	Instrument Panel Lamp Feed
5	--	--	Not Used
6	BLK/ WHT	451	Engine Control Module - Ground
7	--	--	Not Used
8	PNK	439	Fuse Output - Ignition

Windshield Washer Solvent Level Switch



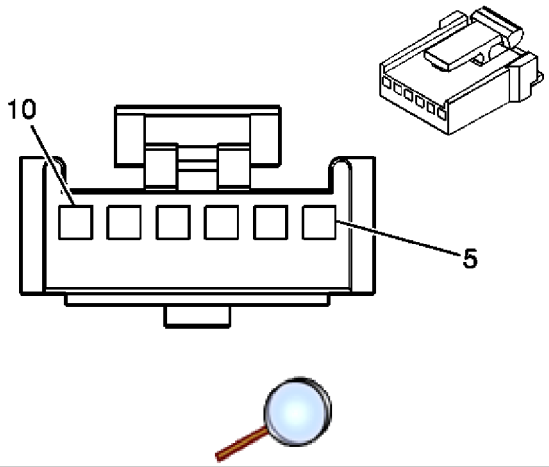
Connector Part Information	• 12162192 • 2-Way Metric Pack 150.2 Series (BLK)

Pin	Wire Color	Circuit No.	Function

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A	BLK	1150	Ground
B	BLK/ WHT	99	Windshield Washer Fluid Level Sensor Signal

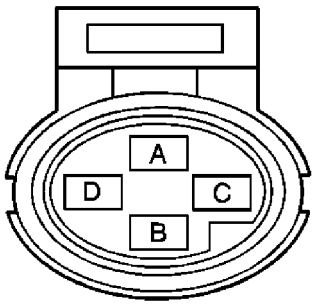
Electronic Compass Module



Connector Part Information	• 12064993 • 6-Way F Micro-Pack 100 Series (BLK)

Pin	Wire Color	Circuit No.	Function
5	BRN	541	Fuse Output Battery
6	--	--	Not Used
7	PPL/WHT	336	Compass Signal Data
8	TAN/WHT	337	Compass Clock Signal
9	BRN	1141	Fuse output Ignition 3
10	BLK/WHT	251	Ground

Engine Oil Pressure Switch



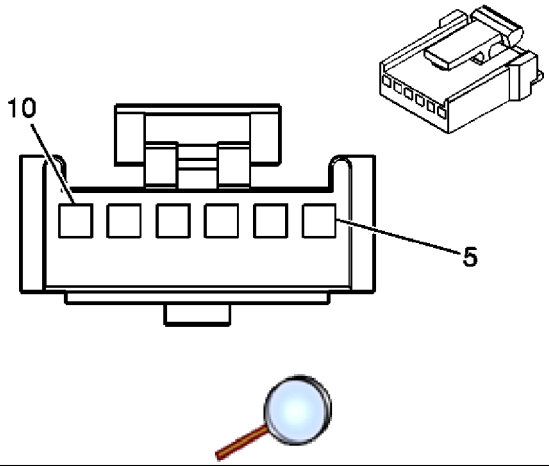
Connector Part Information	• 12048076 • 4-Way F Metri-Pak 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function

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A	TAN/BLK	31	Oil Pressure Indicator Lamp Output
B	BLK/WHT	251	Ground
C-D	--	--	Not Used

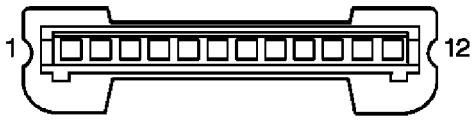
Head-up Display (HUD) Control



Connector Part Information	• 12064993 • 6-Way F Micro-Pak Series 100 (BLK)

Pin	Wire Color	Circuit No.	Function
5	BRN	620	Head-up Display Motor Feed - Down
6	BRN	1141	Fuse Output - Ignition 3
7	WHT	717	Illuminated Display Signal
8	GRY	8	Instrument Panel Lamp Feed
9	YEL	621	Head-up Display Motor Feed - Up
10	BLK/WHT	251	Ground

Head-up Display (HUD) Adjuster Motor

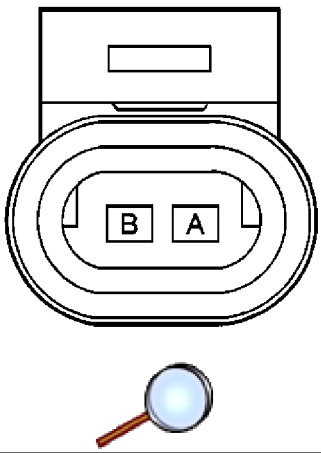


Connector Part Information	• 12059197 • 12-Way F Micro-Pak Series 100 (LT GRY)

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Pin	Wire Color	Circuit No.	Function
1	--	--	Not Used
2	YEL	32	Fuse Output - Instrument Panel Lamps
3	WHT	717	Illuninated Display Signal
4	DK GRN	1194	Low Level Signal
5	LT BLU	14	Turn Signal Lamp Feed - Left Front
6	BRN	1675	Check Gauge Signal
7	BLK	1450	Ground
8	DK GRN/WHT	817	Vehicle Speed Signal - 4000 Pulses Per Mile - Secondary
9	LT GRN	11	High Beam Headlamp Switch
10	DK BLU	15	Turn Signal Lamp Feed - Right Front
11	BRN	1141	Fuse Output - Ignition 3
12	BLK/WHT	251	Ground

Hood Ajar Switch

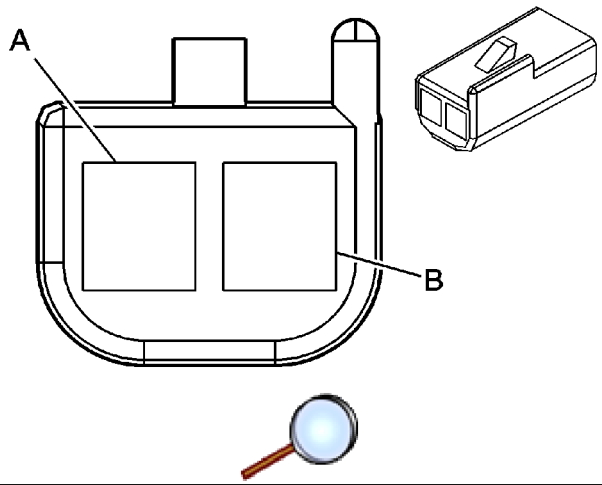


Connector Part Information	• 12132192 • 2-Way F Metric-Pak Series 150.2 (BLK)

Pin	Wire Color	Circuit No.	Function
A	PNK/BLK	109	Hood Ajar Switch Signal
B	BLK	1150	Ground

LH Front Seat Belt Switch

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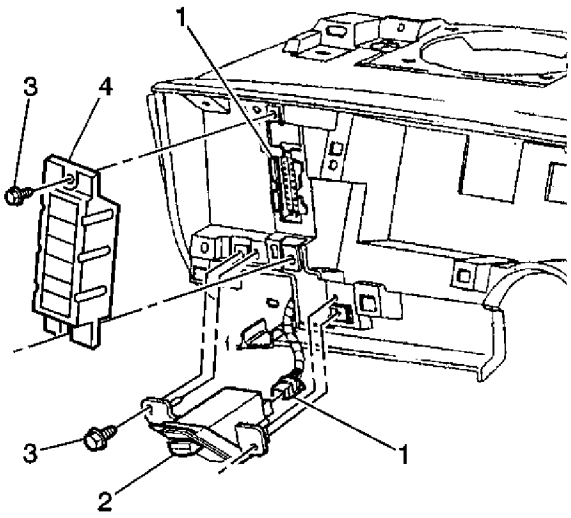
Connector Part Information	• 12047662 • 2-Way F Metri-Pak 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	BLK/WHT	238	Seat Belt Switch Signal
B	BLK	1250	Ground

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Rear Compartment Switch Replacement (Buick)

Removal Procedure



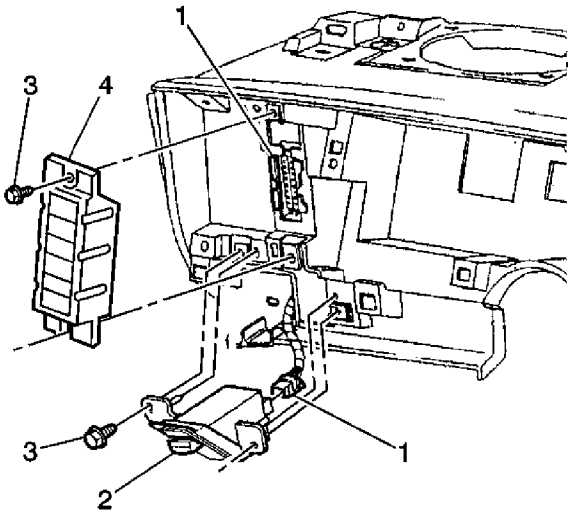
1. Remove the instrument panel trim plate. Refer to Instrument Cluster Trim Panel Replacement .
2. Remove the rear compartment release switch (2) fasteners.
3. Partially remove the switch (2).
4. Disconnect the electrical connector.

Remove the switch (2).

Installation Procedure

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1. Partially install the rear compartment release switch (2).
2. Connect the electrical connector.
3. Install the switch (2).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

4. Install the switch fasteners.

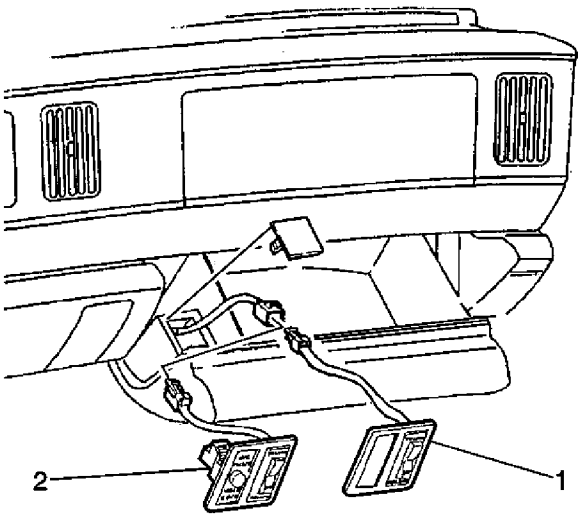
   Tighten
   Tighten the fasteners to 1.9 N·m (17 lb in).

5. Install the instrument panel trim plate. Refer to Instrument Cluster Trim Panel Replacement .

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Rear Compartment Lid Valet Lock Out Switch Replacement (Buick)

Removal Procedure



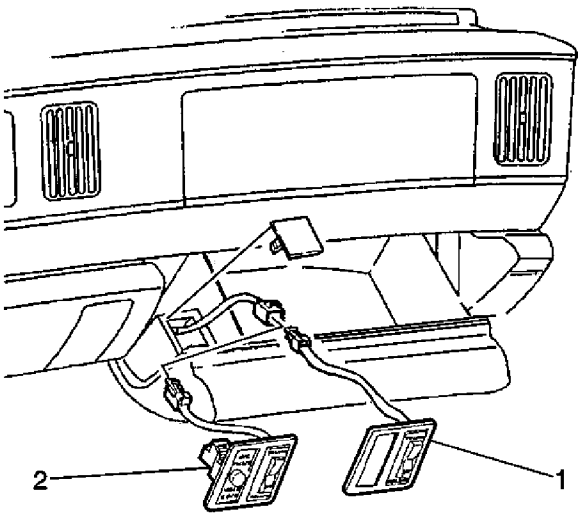
1. Open the IP compartment.
2. Carefully pry up the rear compartment release enable switch (1) or the rear compartment release enable switch/oil reset switch (2).
3. Disconnect the electrical connector.

Remove the switch.

Installation Procedure

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1. Connect the electrical connector.
2. Align the switch (1 or 2) to the IP compartment.

   Push downward to fasten the switch.

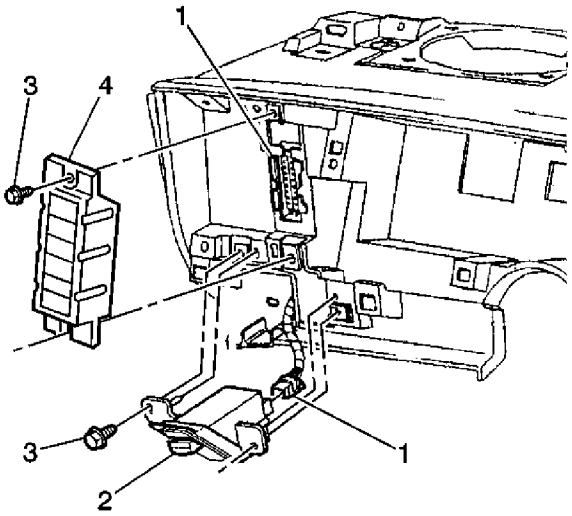
3. Close the IP compartment.

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Instrument Panel Multifunction Switch Replacement (Buick)

Removal Procedure

1. Remove the IP cluster trim panel. Refer to Instrument Cluster Trim Panel Replacement .

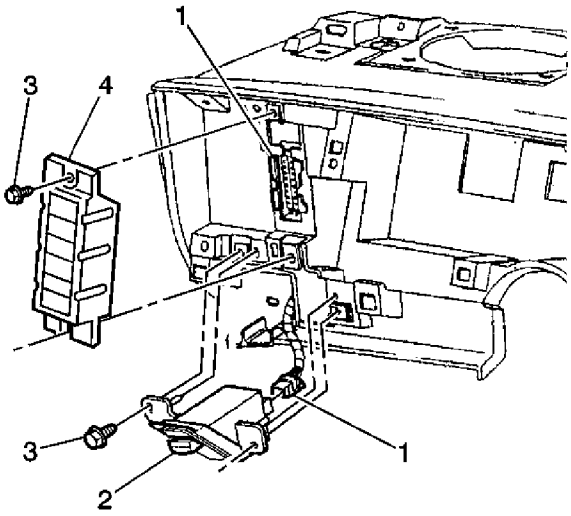


2. Remove the panel lights/twilight sentinel/traction control switch (4) fasteners.
3. Pull rearward on the switch in order to remove the switch.

Installation Procedure

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1. Install the panel lights/twilight sentinel/traction control switch (4).

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the switch fasteners.

   Tighten
   Tighten the fasteners to 1.9 N·m (17 lb in).

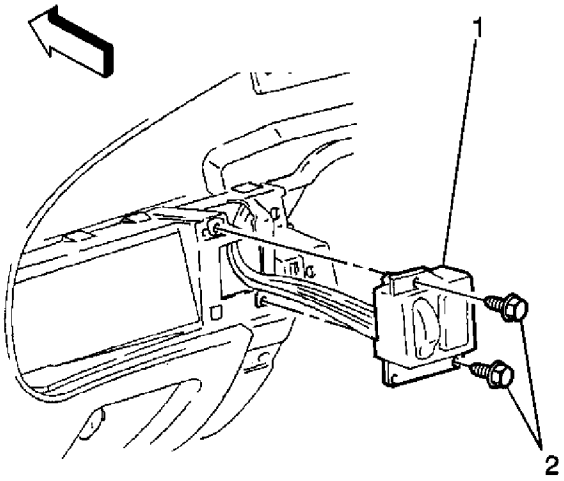
3. Install the IP cluster trim panel. Refer to Instrument Cluster Trim Panel Replacement .

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Head Up Display Switch Replacement

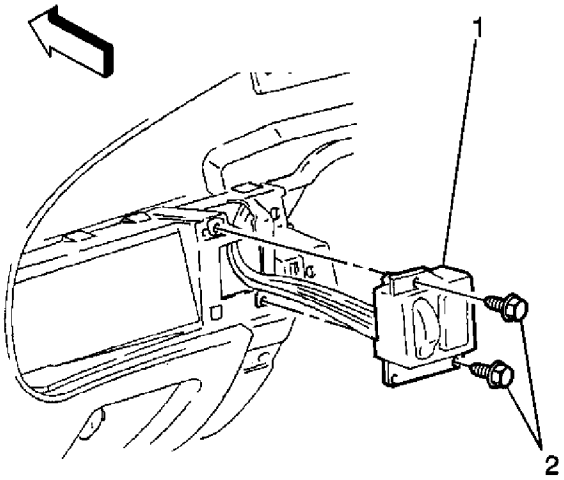
Removal Procedure

1. Remove the IP cluster trim panel. Refer to Instrument Cluster Trim Panel Replacement .



2. Remove the screws (2).
3. Remove the HUD switch (1) from the IP.
4. Disconnect the electrical connector.

Installation Procedure



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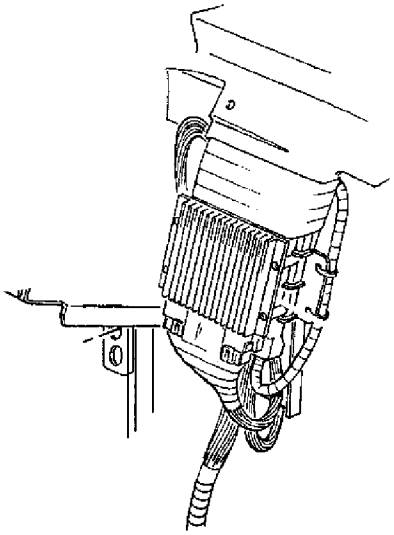


1. Connect the electrical connector.
2. Install the HUD switch (1) to the IP.
3. Install the screws (2) to the IP.
4. Install the IP cluster trim panel. Refer to Instrument Cluster Trim Panel Replacement .

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Instrument Panel Lamp Dimmer Replacement

Removal Procedure



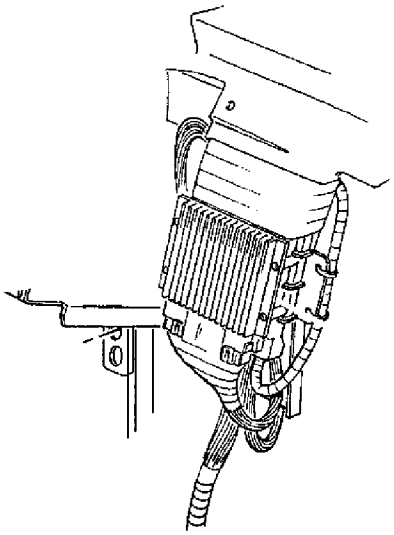
1. Remove the instrument panel assembly. Refer to Instrument Panel Assembly Removal .
2. Remove the lamp monitor module (1) from mounting bracket.
3. Disconnect the electrical connectors.

   Remove the module (1).

Installation Procedure

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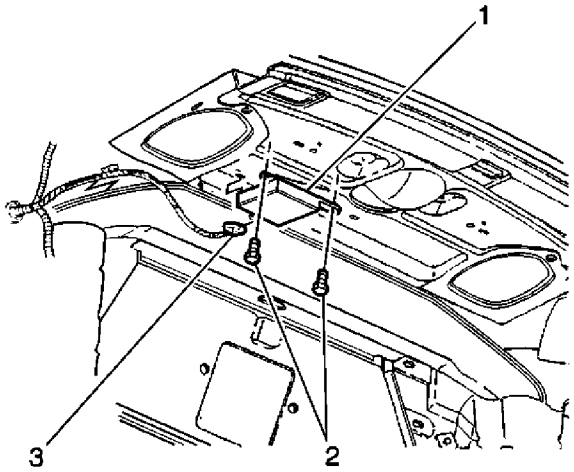


1. Install the module (1).
2. Connect the electrical connectors.
3. Install the module (1) to the mounting bracket.
4. Install the instrument panel assembly. Refer to Instrument Panel Assembly Removal .

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Electronic Compass Module Replacement

Removal Procedure

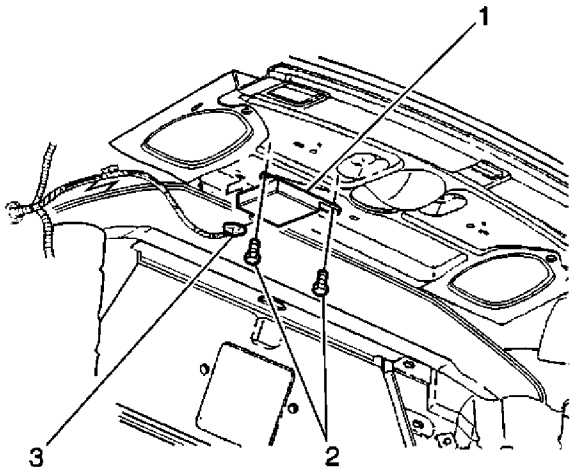


1. Open the rear compartment lid.
2. Remove the push-in fasteners (2) retaining the compass module to the rear shelf in the rear compartment.
3. Slide the module (1) from the mounting slot.
4. Disconnect the connector (3).

Installation Procedure

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1. Connect the connector (3) to the module (1).
2. Install the module into the mounting slot.
3. Install the push-in fasteners (2).

   Press the push-in fasteners until firmly seated.

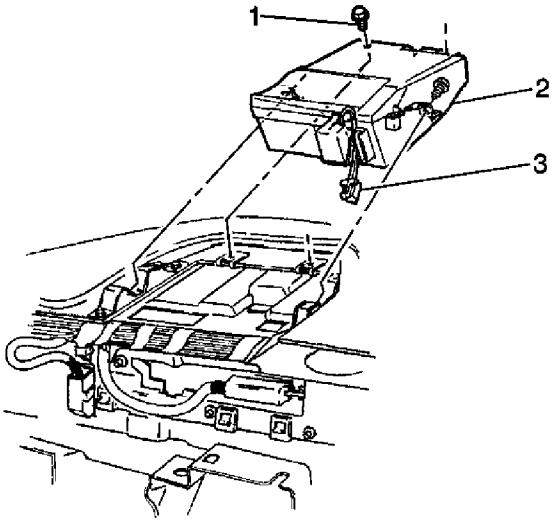
4. Close the rear compartment lid.

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Head Up Display Module Replacement

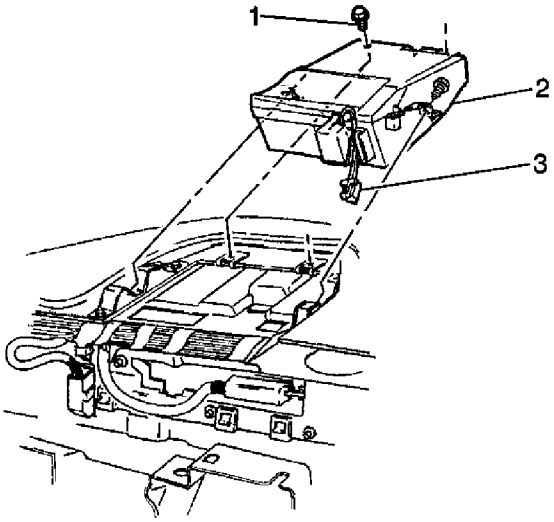
Removal Procedure

1. Remove the windshield defroster grille. Refer to Defroster Grille Replacement .



2. Remove the screws (1) from the HUD module (2) to IP.
3. Lift the HUD module (2) from the IP.
4. Disconnect the electrical connector (3).

Installation Procedure



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1. Connect the electrical connector (3).
2. Install the lower HUD module (2) into the IP.
3. Install the screws (1) retaining the HUD module to the IP.
4. Install the windshield defroster grille. Refer to Defroster Grille Replacement .

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Instrument Panel Insulator Panel Replacement - Right Side (Buick)

Removal Procedure

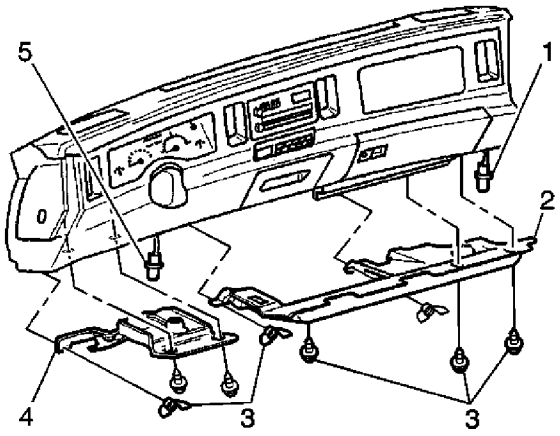
Caution: This vehicle is equipped with a Supplemental Inflatable Restraint (SIR) System. Failure to follow the correct procedure could cause the following conditions:

- Air bag deployment
- Personal injury
- Unnecessary SIR system repairs

In order to avoid the above conditions, observe the following guidelines:

- Refer to SIR Component Views in order to determine if you are performing service on or near the SIR components or the SIR wiring.
- If you are performing service on or near the SIR components or the SIR wiring, disable the SIR system. Refer to Disabling the SIR System.

1. Disable the SIR. Refer to Disabling the SIR System in SIR.



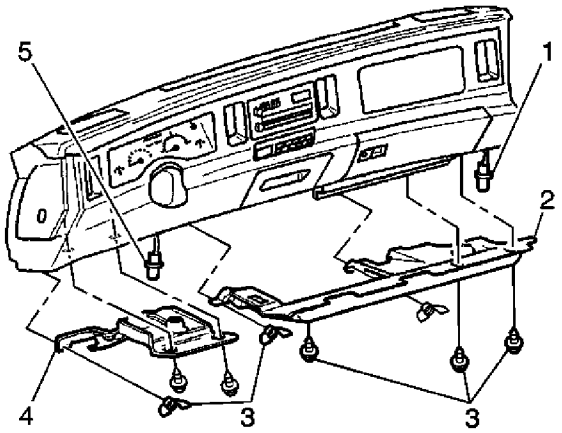


2. Remove the sound insulator screws (3) from the IP.
3. Remove the sound insulator wing nuts from the studs on the cowl.
4. Pull the sound insulator (2) down and rearward.
5. Remove the courtesy lamp (1).
6. Remove the sound insulator.

Installation Procedure

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1. Install the courtesy lamp (1). Perform the following steps:
   1.1. Position the sound insulator (2) under the dash.
   1.2. Insert the cowl studs through the holes in front of the insulator.
   1.3. Route the passenger inflator module pigtail around the courtesy light.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the sound insulator screws (3) to the IP.

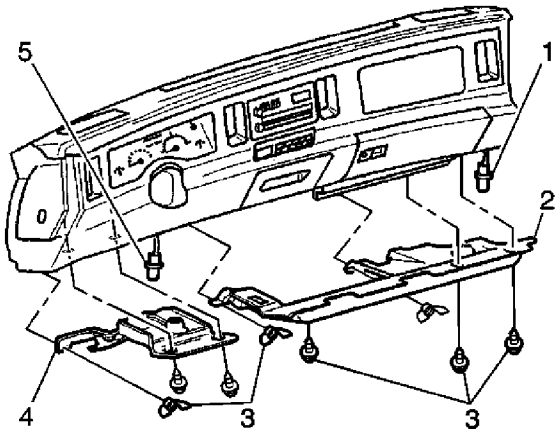
   Tighten
   Tighten the fasteners to 1.9 N·m (17 lb in).

3. Install the wing nuts to the studs.
4. Enable the SIR. Refer to Enabling the SIR System in SIR.

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Instrument Panel Insulator Panel Replacement - Left Side (Buick)

Removal Procedure



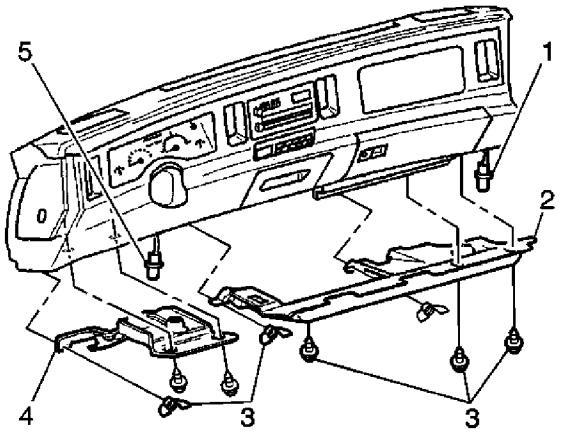
Important: Note the position of the fasteners prior to removal. Install the fasteners in the same locations. Vehicles vary in the locations of the fasteners and in the quantity of fasteners

1. Remove the sound insulator screws (3) from the IP.
2. Remove the wing nuts from the studs on the cowl.
3. Remove the data link connector (DLC).
4. Remove the courtesy lamp (5).
5. Remove the fuse panel.
6. Remove the turn signal flasher.
7. Remove the left sound insulator (4).

Installation Procedure

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1. Install the data link connector (DLC) to the sound insulator (4).
2. Install the turn signal flasher.
3. Install the fuse panel.

Important: In order to avoid binding of the accelerator or brake pedals, ensure that the sound insulator has proper clearance.

4. Install the courtesy lamp (5). Perform the following steps:
   4.1. Position the sound insulator under the dash.
   4.2. Insert the cowl studs through the holes in the front of the insulator.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

5. Install the sound insulator screws to the IP.

   Tighten
   Tighten the fasteners to 1.9 N·m (17 lb in).

6. Install the wing nuts to the studs.

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Knee Bolster Replacement (Buick)

Removal Procedure

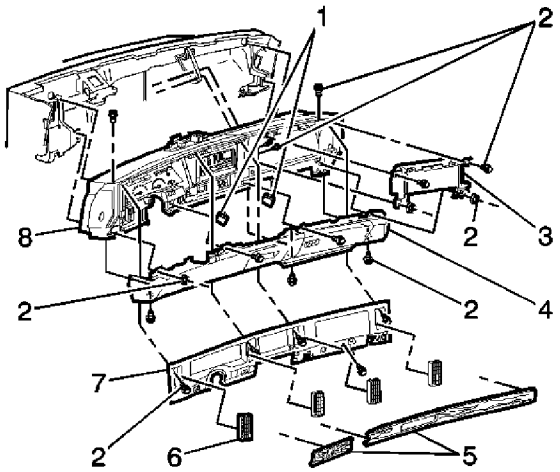
Caution: This vehicle is equipped with a Supplemental Inflatable Restraint (SIR) System. Failure to follow the correct procedure could cause the following conditions:

- Air bag deployment
- Personal injury
- Unnecessary SIR system repairs

In order to avoid the above conditions, observe the following guidelines:

- Refer to SIR Component Views in order to determine if you are performing service on or near the SIR components or the SIR wiring.
- If you are performing service on or near the SIR components or the SIR wiring, disable the SIR system. Refer to Disabling the SIR System.

1. Disable the SIR system. Refer to Disabling the SIR System in SIR.
2. Remove the right insulator panel. Refer to Instrument Panel Insulator Panel Replacement - Right Side .
3. Remove the IP cluster trim panel. Refer to Instrument Cluster Trim Panel Replacement .
4. Remove the passenger side inflator module. Refer to Inflatable Restraint Instrument Panel Module Replacement in SIR.

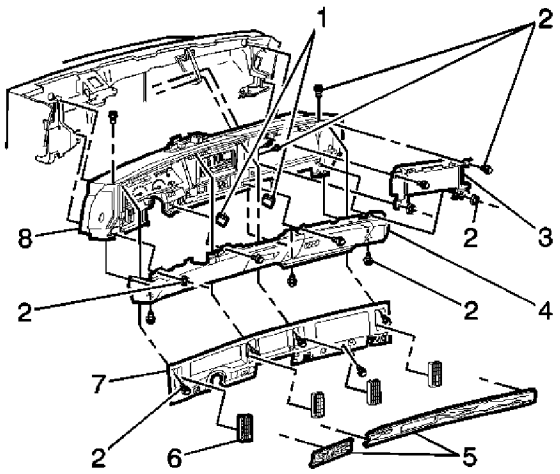


5. Remove the IP lower trim pad fasteners.
6. Partially remove the IP lower trim pad.
7. Disconnect the ashtray electrical connector.
8. Disconnect the IP storage compartment light switch electrical connector.
9. Disconnect the wiring harness retaining fastener.
10. Remove the IP lower trim pad (4).

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Installation Procedure



1. Partially install the IP lower trim pad (4).
2. Connect the wiring harness retaining fastener.
3. Connect the IP storage compartment light switch electrical connector.
4. Connect the ashtray electrical connector.
5. Align the IP lower trim pad.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

6. Install the fasteners.

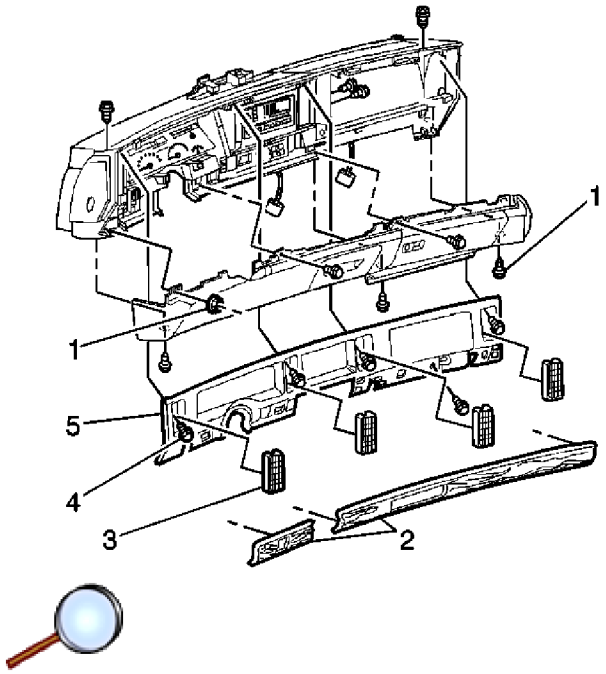
   Tighten
   Tighten the fasteners to 10 N·m (89 lb in).

7. Install the passenger inflator module. Refer to Inflatable Restraint Instrument Panel Module Replacement in SIR.
8. Install the IP cluster trim panel. Refer to Instrument Cluster Trim Panel Replacement .
9. Install the right insulator panel. Refer to Instrument Panel Insulator Panel Replacement - Right Side .
10. Enable the SIR system. Refer to Enabling the SIR System in SIR.

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Instrument Cluster Trim Panel Replacement (Buick)

Removal Procedure



1. Carefully pry out the instrument panel (IP) lower trim plate (2) in order to remove.
2. Carefully pry out the air deflectors (3) in order to remove.

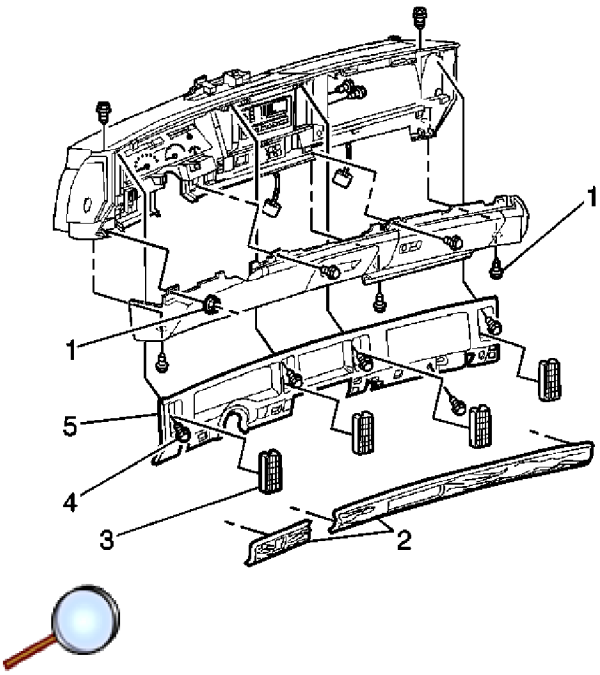
Important: When removing the fasteners from the air duct openings be careful not to drop the fasteners down the openings.

3. Remove the IP trim plate fasteners (4).
4. Disengage the retaining clips at the top of the trim plate.
5. Remove the IP trim plate (5).

Installation Procedure

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1. Align the IP trim plate (5) retaining clips to the IP.

   Push inward to fasten the trim plate.

   Important: When installing the fasteners to the air duct openings be careful not to drop the fasteners down the openings.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the IP trim plate fasteners (4).

   Tighten
   Tighten the fasteners to 1.9 N·m (17 lb in).

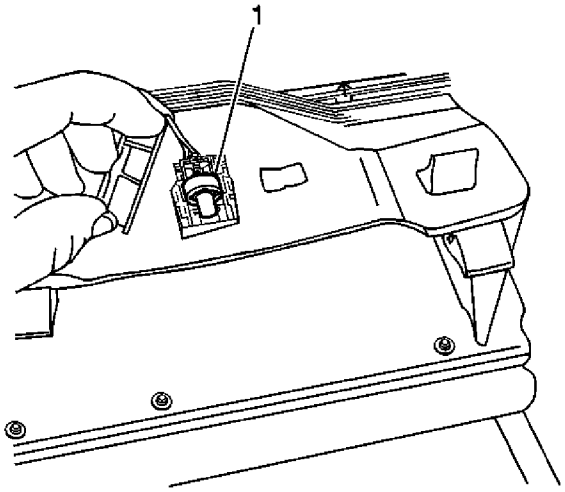
3. Snap in the air deflectors (3).
4. Install the IP lower trim plate (2).

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Instrument Panel Storage Compartment Replacement (Buick)

Removal Procedure

1. Open the instrument panel (IP) compartment.
2. Pull down the IP compartment stops. Allow the compartment to travel past the stops.
3. Remove the rear compartment release enable switch/oil reset switch, if equipped. Refer to Rear Compartment Lid Valet Lock Out Switch Replacement .
4. Disengage the electrical connector retainer fastening the electrical connector to the rear of the IP compartment.

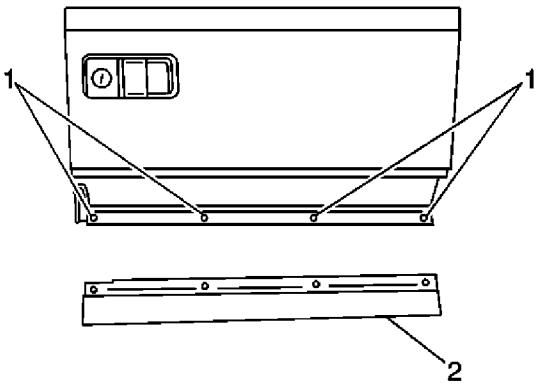




5. Remove the IP compartment light (1) from the IP compartment assembly.
6. Close the IP compartment.

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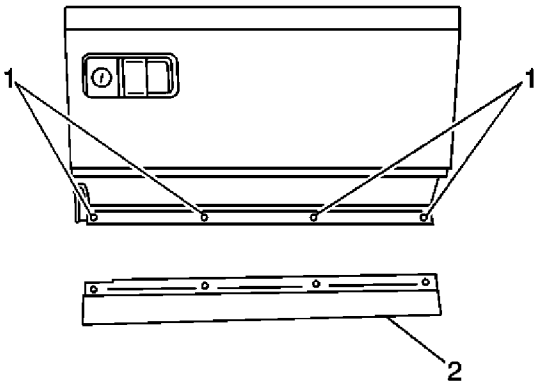


7. Remove the fasteners (1) securing the IP compartment to the IP.

   Remove the IP storage compartment hinge trim (2).

8. Open the IP compartment in order to remove the IP compartment.

Installation Procedure



1. Install the IP compartment to the IP.

   Place the IP compartment in the closed position.

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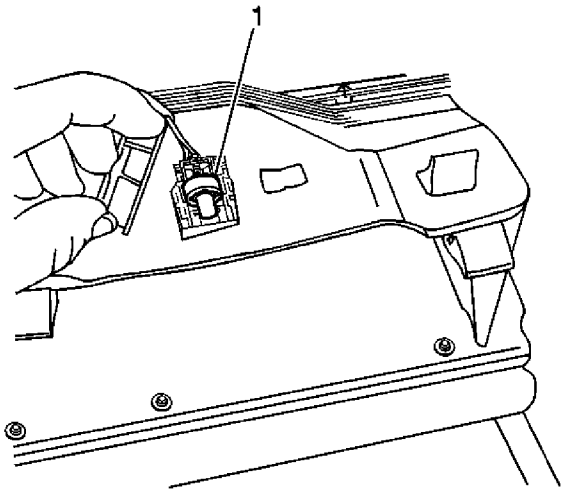
2. Install the hinge trim (2) to the hinge.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the fasteners (1) in order to secure the IP compartment to the IP.

Tighten
Tighten the fasteners to 1.9 N·m (17 lb in).

4. Open the IP compartment.
5. Pull down the IP compartment stops. Allow the compartment to travel past the stops.





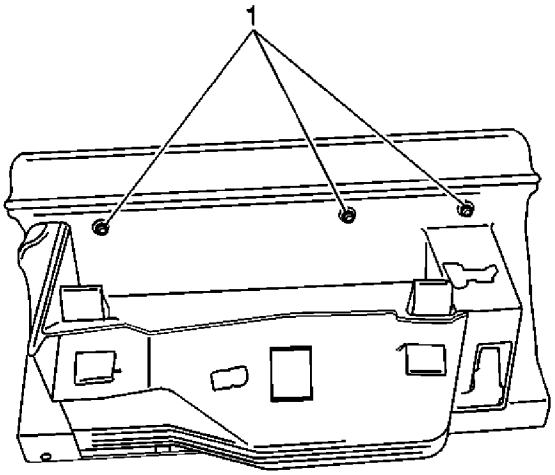
6. Install the IP compartment light (1) to the IP compartment.
7. Connect the electrical connector retainer to the rear of the IP compartment.
8. Install the rear compartment release enable switch/oil reset switch, if equipped. Refer to Rear Compartment Lid Valet Lock Out Switch Replacement .
9. Close the IP compartment.

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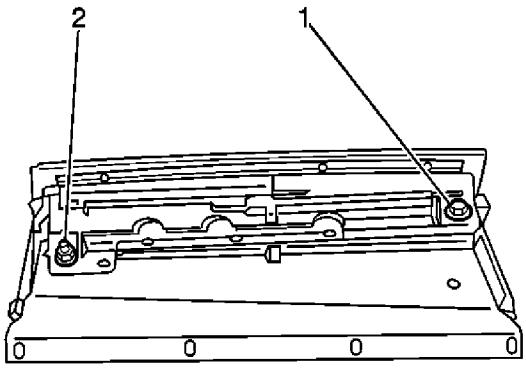
Instrument Panel Compartment Door Lock Cylinder Replacement (Buick)

Removal Procedure

1. Remove the IP compartment. Refer to Instrument Panel Storage Compartment Replacement .



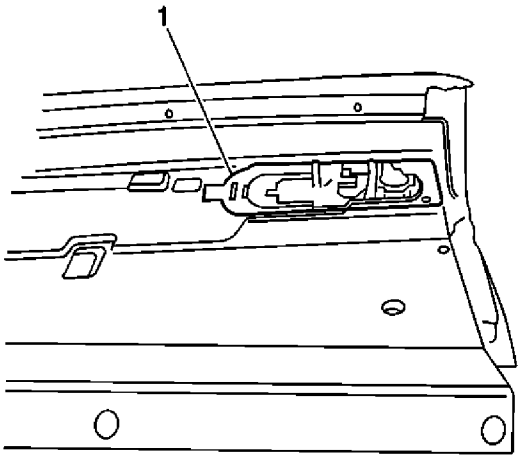
2. Remove the fasteners (1) retaining the IP compartment to the door.
3. Remove the door from the IP compartment.



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4. Remove the latch assembly fasteners (1, 2).
5. Remove the latch assembly.



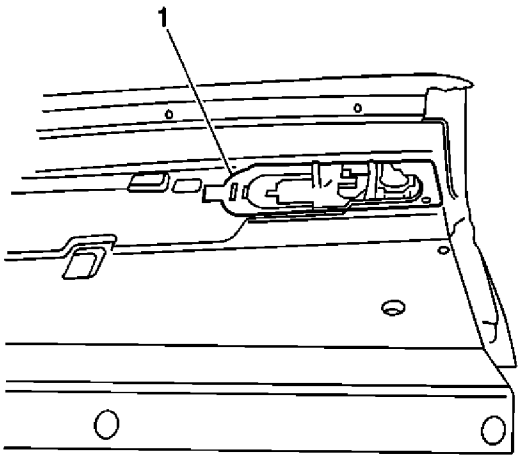


6. Remove the retainer clip (1) from the lock assembly.
7. Remove the lock assembly.
8. Push a paper clip through the hole in the back of the latch in order to hold down the silver tumbler on the lock cylinder.
9. While holding down the tumbler, insert the key.
10. Rotate the cylinder ¼ turn counter-clockwise.
11. Remove the lock cylinder.

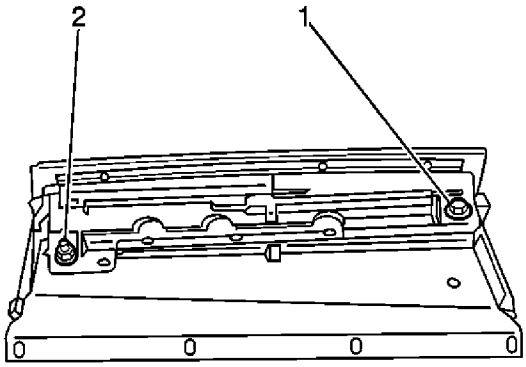
Installation Procedure

1. While pushing down the silver tumbler on the lock cylinder, insert the key into the lock cylinder keyhole.
2. Install the lock cylinder to the lock assembly.
3. Turn the key ¼ turn clockwise. Remove the key.
4. Install the lock assembly to the door.

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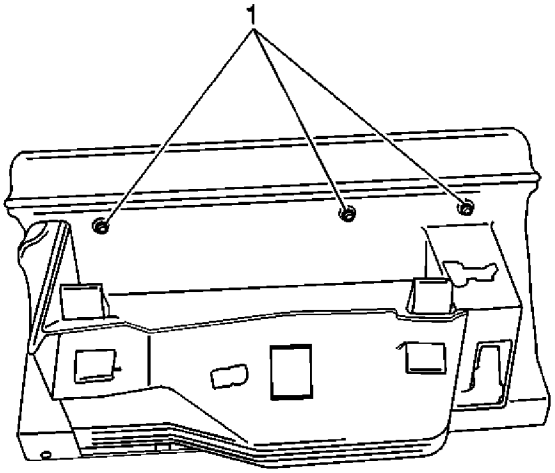


5. Install the lock assembly retainer (1).



6. Install the latch assembly.
7. Install the latch assembly fasteners (1, 2).
8. Install the door to the IP compartment.

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9. Install the door assembly fasteners (1).
10. Install the IP compartment to the IP. Refer to Instrument Panel Storage Compartment Replacement .

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Defroster Grille Replacement (Buick)

The defroster grille is part of the IP upper trim panel to service the defroster grille Refer to Instrument Panel Upper Trim Pad Replacement .

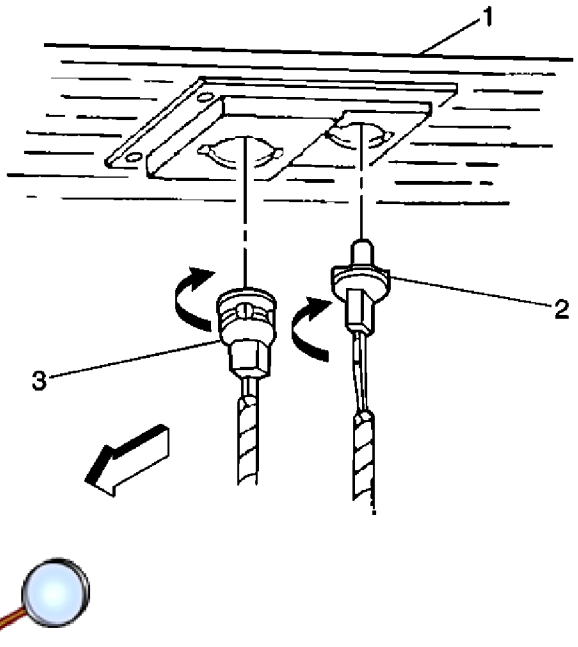
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Sunload and Twilight Sentinel Sensor Replacement

Removal Procedure

1. Remove the IP upper trim panel. Refer to Instrument Panel Upper Trim Pad Replacement or Defroster Grille Replacement .



2. Disconnect the sunload (2) and the twilight sentinel (3) sensors from the IP upper trim panel by turning a quarter turn.

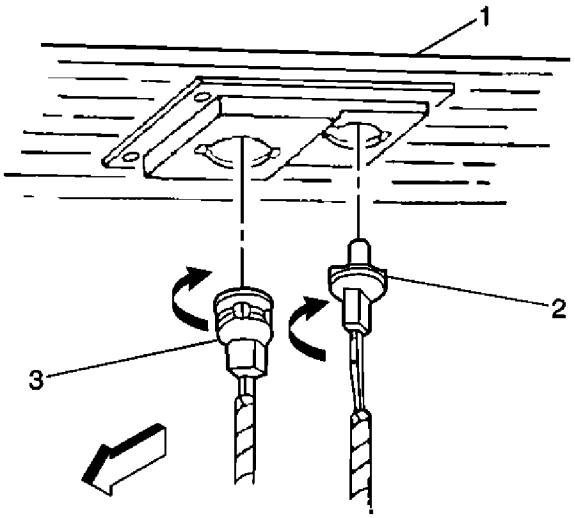
   Remove the sensors from the trim panel.

3. Remove the sensors.

Installation Procedure

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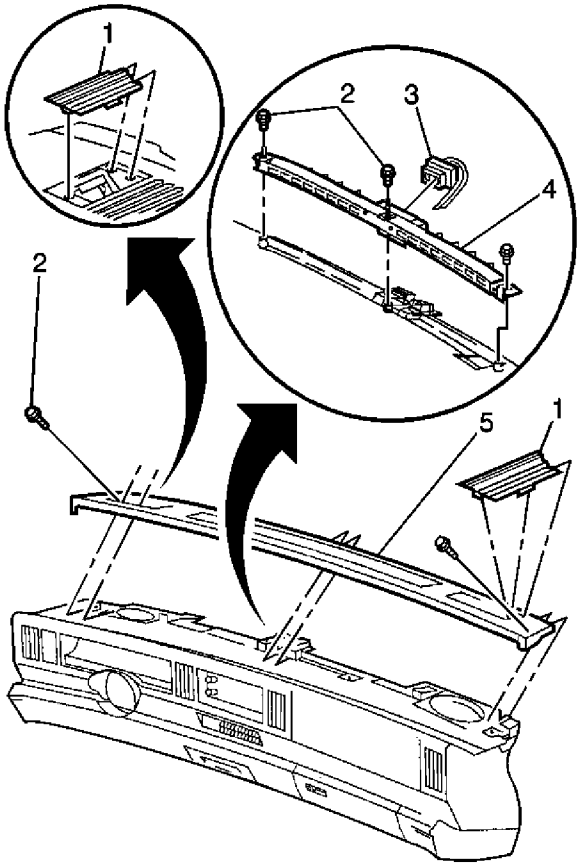


1. Install the sensors.
2. Install the sensors (2, 3) to the upper trim panel.
3. Turn the sensors a quarter turn to secure the sensors.
4. Install the upper trim panel. Refer to Instrument Panel Upper Trim Pad Replacement or Defroster Grille Replacement .

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Instrument Panel Upper Trim Pad Replacement (Buick)

Removal Procedure

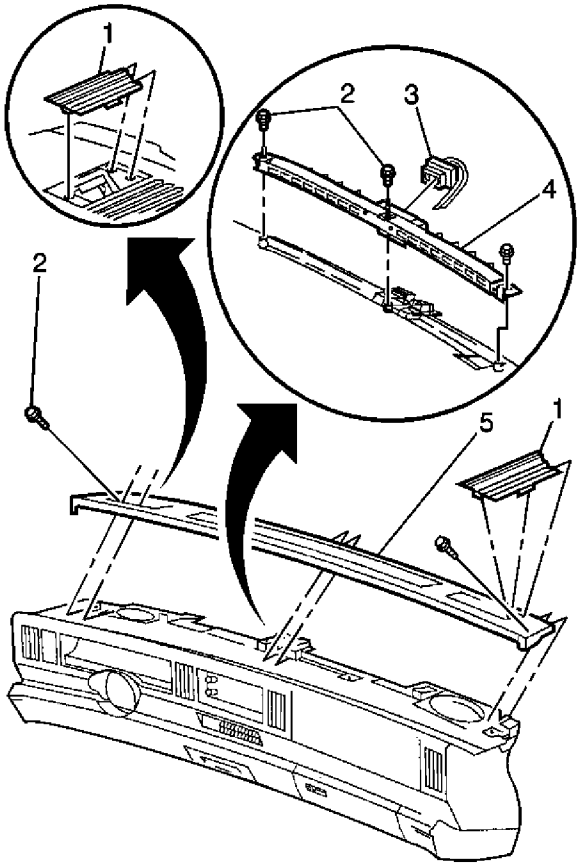


1. Perform the following steps in order to remove the reveal covers (1):
   1.1. Pry the covers up.
   1.2. Carefully pull forward on the covers.
2. Remove the fasteners (2):
3. Carefully pull up the upper trim panel (5).
4. Remove the sunload and the twilight sentinel sensors. Refer to Sunload and Twilight Sentinel Sensor Replacement .
5. Remove the upper trim panel.

Installation Procedure

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1. Partially install the IP upper trim panel (5).
2. Insert the sensors. Refer to Sunload and Twilight Sentinel Sensor Replacement .
3. Install the upper trim panel.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

4. Install the fasteners.

Tighten
Tighten the fasteners to 1.9 N·m (17 lb in).

5. Install the reveal covers (1).

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Instrument Panel Assembly Removal (Buick)

Removal Procedure

After a non-deployment accident, visually inspect the IP assembly for damage or deformation. Any visible damage indicate structural damage and therefore mandates IP assembly replacement.

Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

1. Disconnect the negative battery cable. Refer to Battery Negative Cable Disconnection and Connection in Engine Electrical.

   Caution: This vehicle is equipped with a Supplemental Inflatable Restraint (SIR) System. Failure to follow the correct procedure could cause the following conditions:
   - Air bag deployment
   - Personal injury
   - Unnecessary SIR system repairs

   In order to avoid the above conditions, observe the following guidelines:
   - Refer to SIR Component Views in order to determine if you are performing service on or near the SIR components or the SIR wiring.
   - If you are performing service on or near the SIR components or the SIR wiring, disable the SIR system. Refer to Disabling the SIR System.

2. Disable the SIR system. Refer to Disabling the SIR System in SIR.
3. Remove the upper trim panel. Refer to Instrument Panel Upper Trim Pad Replacement .
4. Remove the information center telltale. Refer to Driver Information Center Replacement .
5. Remove the IP trim plates. Refer to Instrument Cluster Trim Panel Replacement .

   Caution: This vehicle is equipped with a Supplemental Inflatable Restraint (SIR) System. Failure to follow the correct procedure could cause the following conditions:
   - Air bag deployment
   - Personal injury
   - Unnecessary SIR system repairs

   In order to avoid the above conditions, observe the following guidelines:
   - Refer to SIR Component Views in order to determine if you are performing service on or near the SIR components or the SIR wiring.
   - If you are performing service on or near the SIR components or the SIR wiring, disable the SIR system. Refer to Disabling the SIR System.

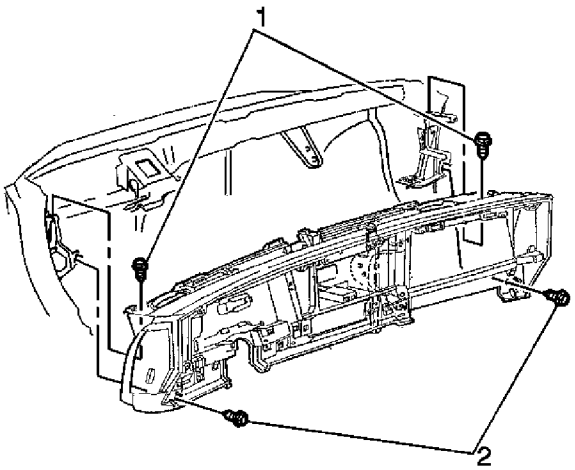
6. Remove the passenger inflator module. Refer to Inflatable Restraint Instrument Panel Module Replacement in SIR.
7. Remove the rear compartment lid release enable/oil reset switch. Refer to Rear Compartment Lid Valet Lock Out Switch Replacement .

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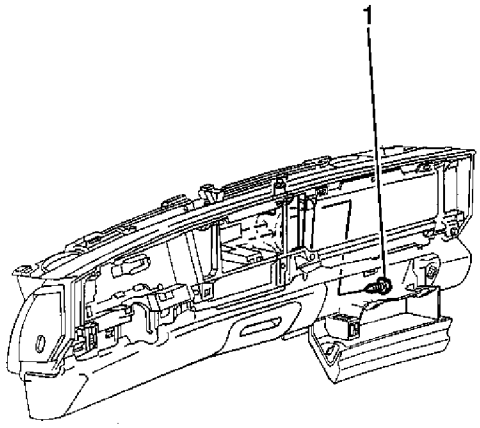
8. Remove the ashtray. Refer to Ashtray Replacement .
9. Remove the IP lower trim pad. Refer to Knee Bolster Replacement .

Important: Remove the steering column lower mounting bolts prior to removing the upper mounting bolts or damage to the lower steering column bearing may occur. Place a protective cloth on the steering column in order to protect the column from scratches.

10. Lower the steering column. Refer to Steering Column Replacement in Steering Wheel and column tilt.



11. Remove the IP assembly upper fasteners (1).
12. Remove the IP lower fasteners (2).



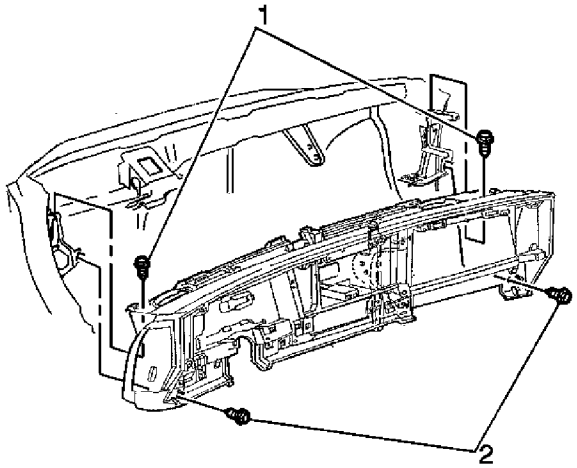
13. Remove the fasteners (1) from the IP center support.
14. Pull the IP assembly rearward slightly.

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15. Disconnect the electrical connectors, including the antenna coax cable.
16. Disconnect the aspirator hose.
17. Remove the IP assembly.
18. Transfer all necessary components.

Installation Procedure

1. Partially install the IP assembly.
2. Connect the electrical connectors, including the antenna coax cable.
3. Connect the aspirator hose.



Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

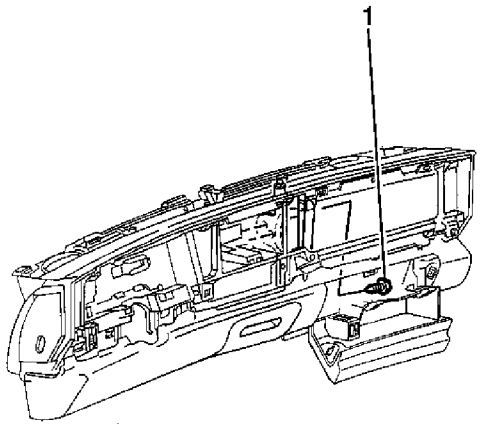
4. Install the IP assembly top fasteners (1) to the outer brackets.

   Tighten
   Tighten the fasteners to 2 N·m (18 lb in).

5. Install the fasteners (2) to the left and right lower front of the IP.

   Tighten
   Tighten the fasteners to 2 N·m (18 lb in).

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6. Install the fasteners (1) to the IP center support.

   Tighten
   Tighten the fasteners to 10 N·m (89 lb in).

7. Raise the steering column. Refer to Steering Column Replacement in Steering Wheel and column tilt.
8. Install the IP lower trim pad. Refer to Knee Bolster Replacement .
9. Install the ashtray. Refer to Ashtray Replacement .
10. Install the rear compartment lid release enable/oil reset switch. Refer to Rear Compartment Lid Valet Lock Out Switch Replacement .
11. Install the passenger inflator module. Refer to Inflatable Restraint Instrument Panel Module Replacement in SIR.
12. Install the instrument panel trim plates. Refer to Instrument Cluster Trim Panel Replacement .
13. Install the information center telltale . Refer to Driver Information Center Replacement .
14. Install the upper trim panel . Refer to Instrument Panel Upper Trim Pad Replacement .
15. Enable the SIR system. Refer to Enabling the SIR System in SIR.
16. Connect the negative battery cable. Refer to Battery Negative Cable Disconnection and Connection in Engine Electrical.

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Steering Column Bracket Replacement

Removal Procedure

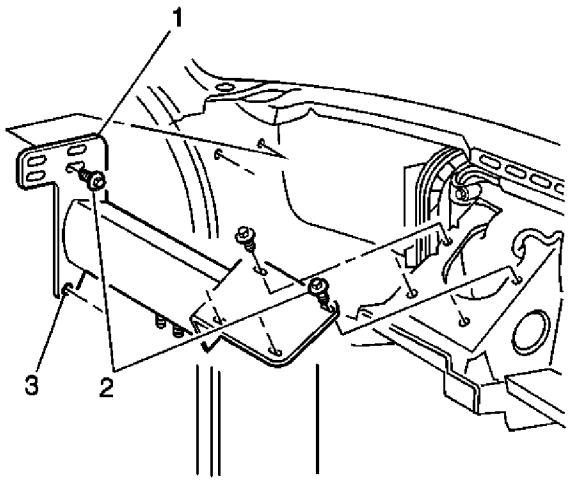
Caution: This vehicle is equipped with a Supplemental Inflatable Restraint (SIR) System. Failure to follow the correct procedure could cause the following conditions:

- Air bag deployment
- Personal injury
- Unnecessary SIR system repairs

In order to avoid the above conditions, observe the following guidelines:

- Refer to SIR Component Views in order to determine if you are performing service on or near the SIR components or the SIR wiring.
- If you are performing service on or near the SIR components or the SIR wiring, disable the SIR system. Refer to Disabling the SIR System.

1. Disable the SIR system. Refer to Disabling the SIR System in SIR.
2. Remove the IP assembly. Refer to Instrument Panel Assembly Removal .

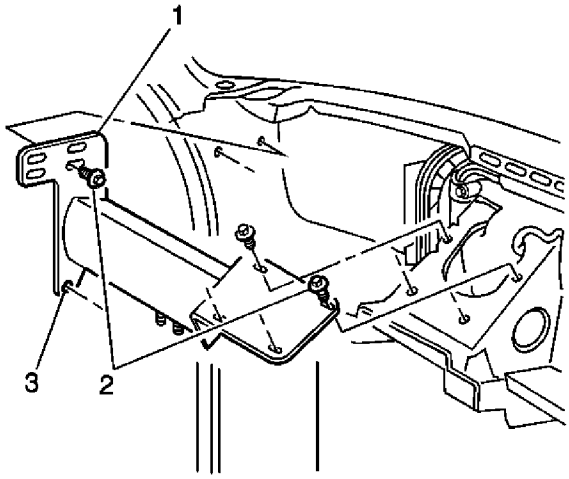


3. Remove the fasteners attaching the steering column support bracket brace to the inner panel.
4. Remove the fasteners retaining the steering column support brackets to the steering column support bracket brace.
5. Remove the fasteners attaching the steering column support bracket brace (1) to the steering column support bracket.
6. Remove the steering column support bracket brace (1) from the vehicle.

Installation Procedure

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1. Install the steering column support bracket brace (1) to the vehicle.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the fasteners attaching the steering column support bracket brace to the steering column support bracket.

   Tighten
   Tighten the bolts to 7.5 N·m (53 lb in).

3. Install the fasteners attaching the steering column support bracket brace to the inner panel.

   Tighten
   Tighten the bolts to 8.5 N·m (75 lb in).

4. Install the fasteners retaining the steering column support brackets to the steering column support bracket brace.

   Tighten
   Tighten the bolts to 9.5 N·m (84 lb in).

5. Install the IP assembly. Refer to Instrument Panel Assembly Removal .
6. Enable the SIR system. Refer to Enabling the SIR System in SIR.

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Instrument Cluster Replacement (Buick)

Removal Procedure

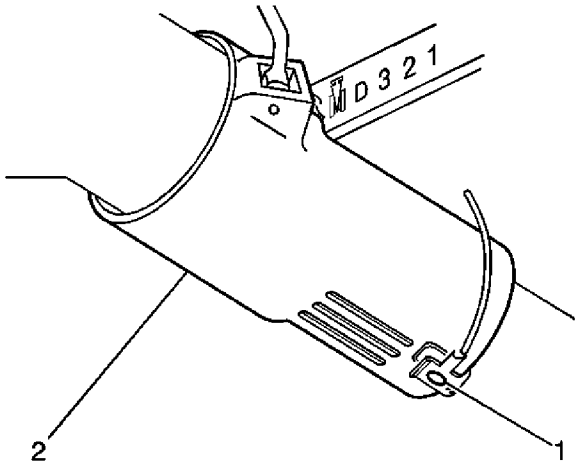
Caution: This vehicle is equipped with a Supplemental Inflatable Restraint (SIR) System. Failure to follow the correct procedure could cause the following conditions:

- Air bag deployment
- Personal injury
- Unnecessary SIR system repairs

In order to avoid the above conditions, observe the following guidelines:

- Refer to SIR Component Views in order to determine if you are performing service on or near the SIR components or the SIR wiring.
- If you are performing service on or near the SIR components or the SIR wiring, disable the SIR system. Refer to Disabling the SIR System.

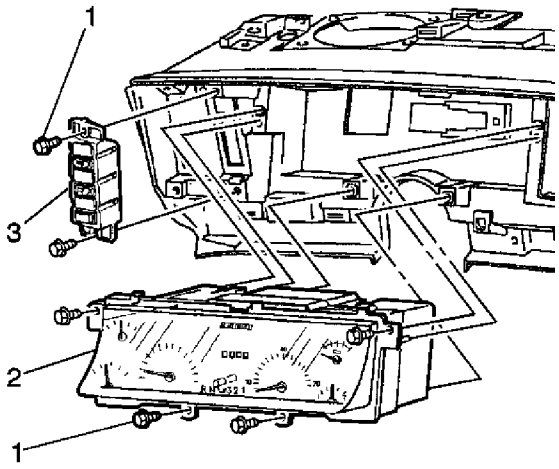
1. Disable the SIR system. Refer to Disabling the SIR System in SIR.
2. Remove the IP trim plate. Refer to Instrument Cluster Trim Panel Replacement .



3. Remove the PRNDL cable (1).
4. Remove the panel lights twilight sentinel/traction control switch. Refer to Instrument Panel Multifunction Switch Assembly Replacement .

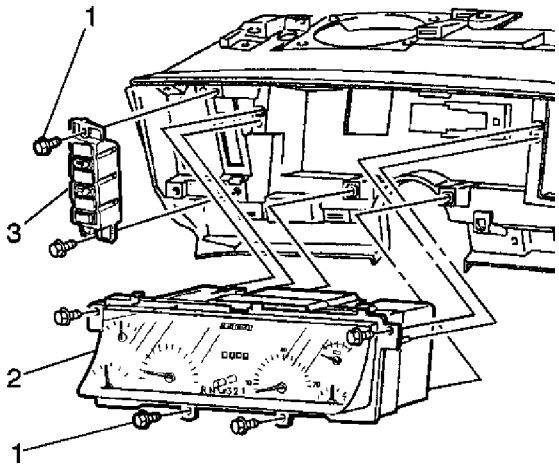
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5. Remove the cluster fasteners (1).
6. Remove the instrument cluster (2).

Installation Procedure



Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when

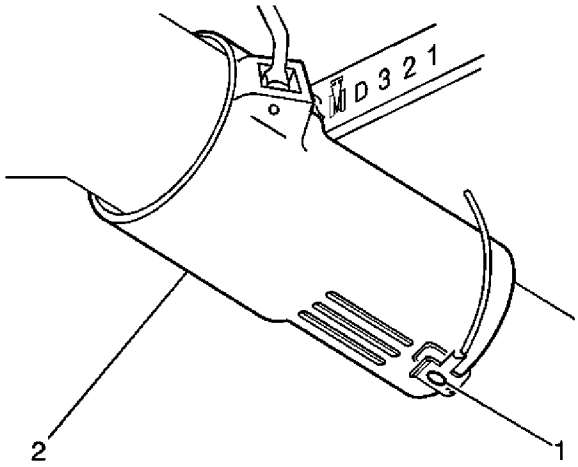
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installing fasteners in order to avoid damage to parts and systems.

1. Install the instrument cluster (2) and the fasteners (1).

   Tighten
   Tighten the fasteners to 1.5 N·m (14 lb in).

2. Install the panel lights twilight sentinel/traction control switch. Refer to Instrument Panel Multifunction Switch Assembly Replacement .





3. Install the PRNDL cable (1).
4. Install the IP trim plate. Refer to Instrument Cluster Trim Panel Replacement .
5. Enable the SIR system. Refer to Enabling the SIR System in SIR.

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Instrument Cluster Lens Replacement

Removal Procedure

1. Remove the IP cluster trim plate. Refer to Instrument Cluster Trim Panel Replacement .
2. Remove the instrument cluster lens fasteners to the instrument cluster , if necessary.
3. Release the instrument cluster lens retainers, if necessary.
4. Remove the instrument cluster lens.

Installation Procedure

Ensure the instrument cluster lens surface is completely clean before assembly.

1. Install the instrument cluster lens to the instrument cluster.
2. Carefully push inward on the outside of the lens in order to fasten the lens retainers, if necessary.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the instrument cluster lens fasteners to the instrument cluster, if necessary.

   Tighten
   Tighten the fasteners to 1.9 N·m (17 lb in).

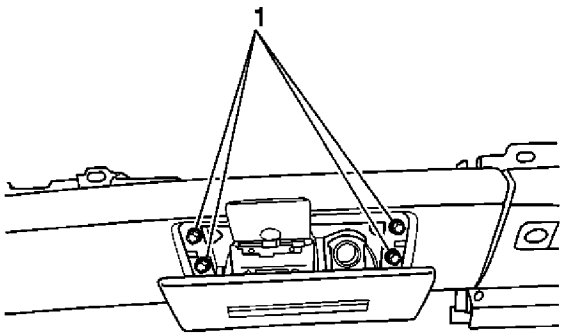
4. Install the IP cluster trim plate. Refer to Instrument Cluster Trim Panel Replacement .

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Ashtray Replacement (Buick)

Removal Procedure



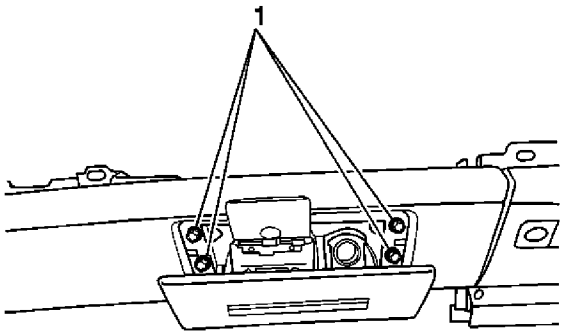
1. Open the ashtray.
2. Remove the fasteners (1) retaining the ashtray.
3. Remove the ashtray partway.
4. Disconnect the electrical connector.

Remove the ashtray.

Installation Procedure

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1. Connect the electrical connector.
2. Align the ashtray with the lower trim pad.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the ashtray fasteners (1).

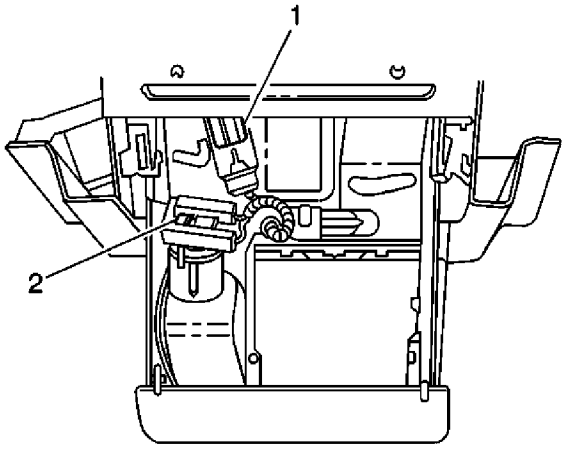
   Tighten
   Tighten the fasteners to 1.9 N·m (17 lb in).

4. Close the ashtray.

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Cigar Lighter Housing Replacement (Buick/Oldsmobile)

Removal Procedure

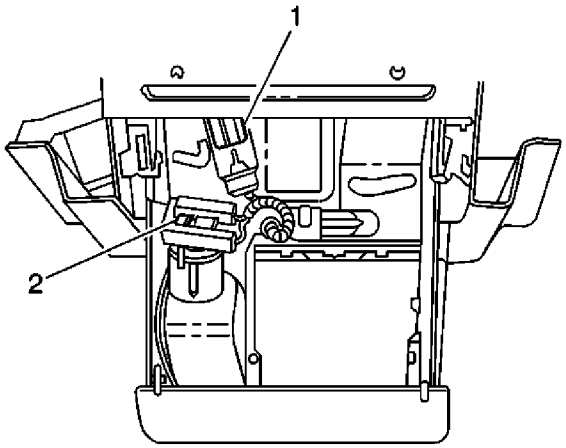


1. Pull rearward the ashtray.
2. Disconnect electrical connector (2).
3. Remove the cigar lighter socket retainer.
4. Remove the cigar lighter socket.

Installation Procedure

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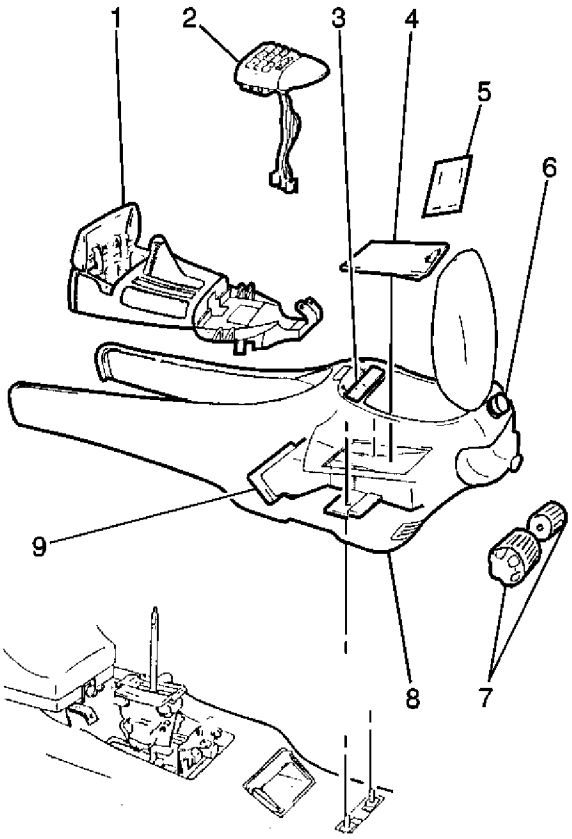


1. Install the cigar lighter socket.
2. Install the cigar lighter socket retainer.
3. Connect the electrical connector (2).
4. Push forward the ashtray.

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Front Floor Console Trim Plate Replacement

Removal Procedure



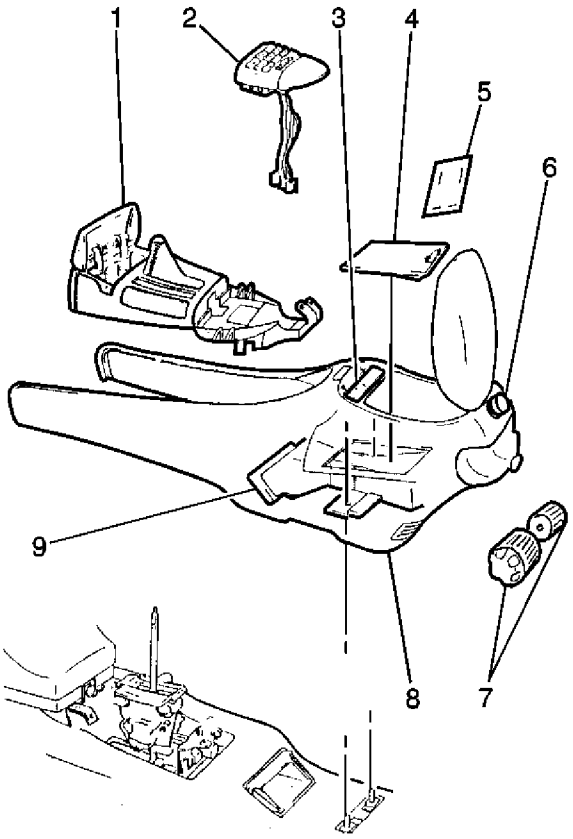
1. Open the armrest bin lid.
2. Lift on the tab to disengage the armrest bin lower trim plate.

   Remove the armrest bin lower trim plate (4).

Installation Procedure

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1. Align the forward tabs on the trim plate (4) with the console duct.
2. Rotate the trim plate down.

   Press the trim plate (4) into place.

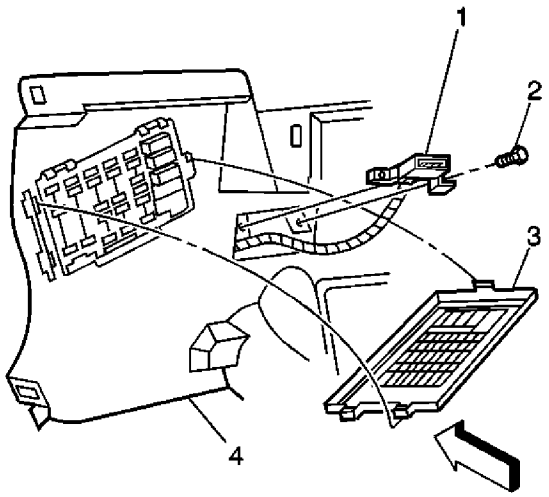
3. Close the armrest bin lid.

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Fuse Block Access Cover Replacement

Several fuses are also located in the relay center.

Removal Procedure

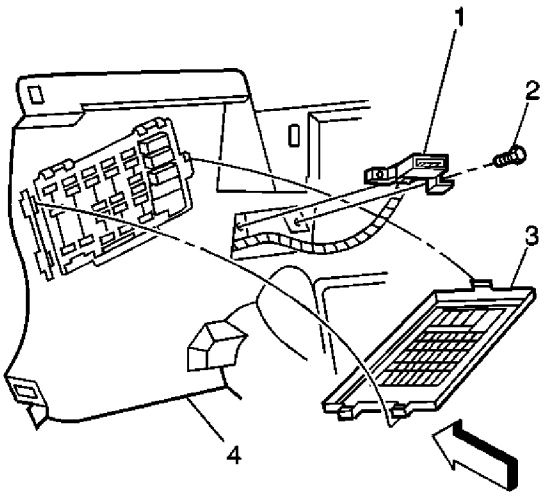


1. Depress the release tab.
2. Pull down on the cover (3).

Installation Procedure

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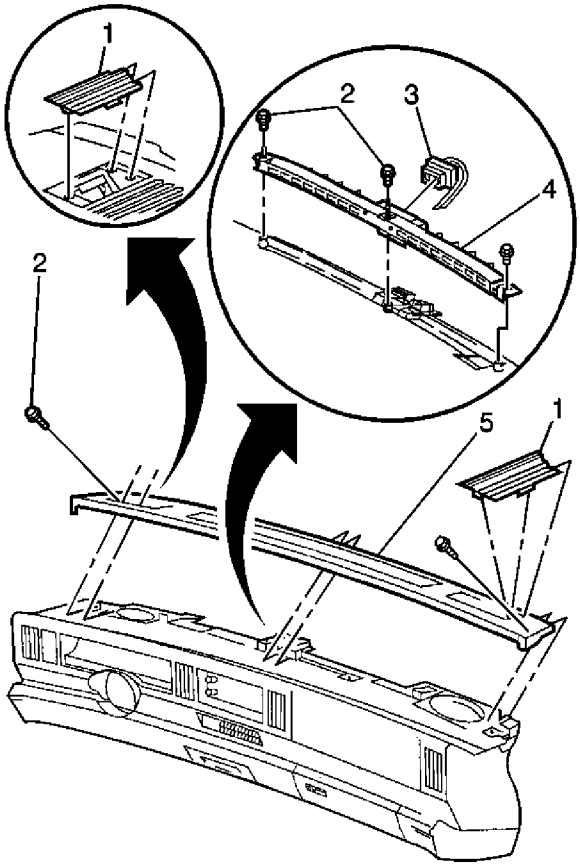


1. Insert tabs on the fuse block cover (3) into the sound insulator.
2. Push upward to fasten the fuse block cover.

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Driver Information Center Replacement (Buick)

Removal Procedure

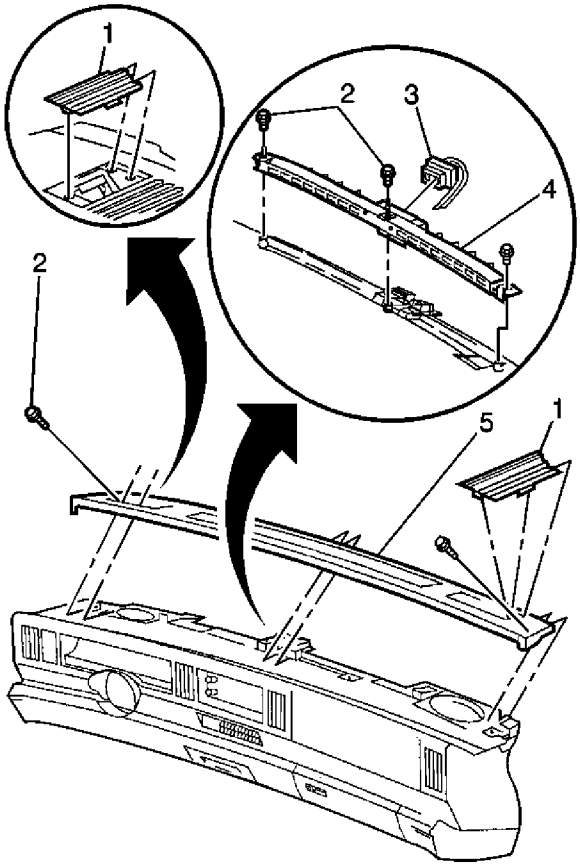


1. Remove the upper trim plate. Refer to Instrument Panel Upper Trim Pad Replacement .
2. Remove the information center fasteners (2).
3. Remove the information center (4).
4. Disconnect the information center connector (3).

Installation Procedure

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1. Connect the connector (3).
2. Install the information center (4).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the fasteners.

   Tighten
   Tighten the fasteners to 1.5 N·m (14 lb in).

4. Install the upper trim plate. Refer to Instrument Panel Upper Trim Pad Replacement .

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Instrument Cluster Head Up Display Window Cleaning

Notice: Do not spray the window cleaner directly on the Head-Up Display (HUD) window, because this may cause damage to the HUD internal components.

1. Spray glass cleaner on a soft, clean cloth.
2. Gently wipe the HUD window using the cloth.
3. Dry the window.

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Fastener Tightening Specifications

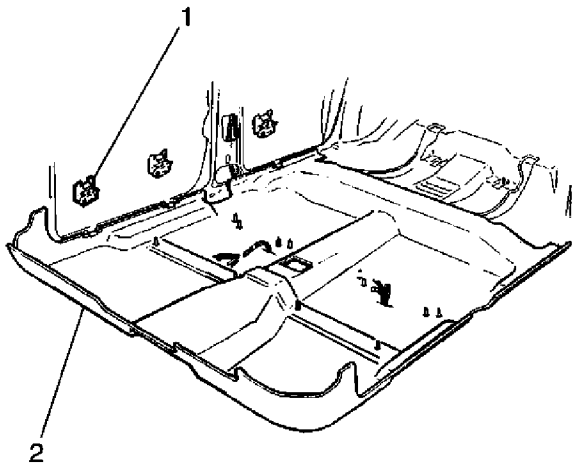
Application	Specification	
	Metric	English
Load Bar Bolt	42 N·m	31 lb ft
Rear Seat Lap Belt Nut	35 N·m	25 lb ft
Seat Adjuster to Floor Pan Nut	34 N·m	25 lb ft
Seat Adjuster to Seat Cushion Frame Bolts	24 N·m	17 lb ft

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Front Floor Mat/Carpet Replacement

Removal Procedure

Caution: In order to avoid personal injury or vehicle damage when you repair or replace the carpet, use the same thickness and material size as the original installation. Always return the carpet to the original location.

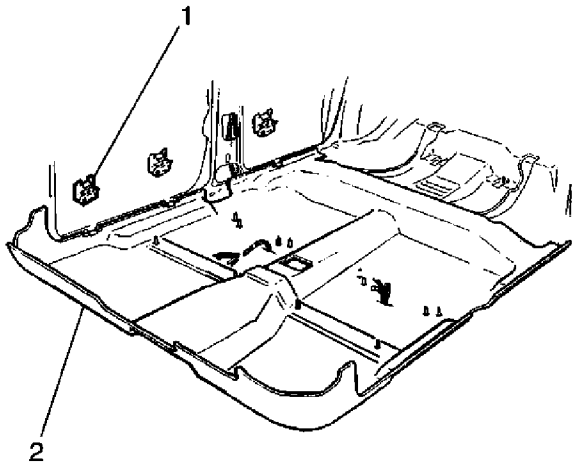


1. Remove the front seats. Refer to Seat Replacement in Seats.
2. Remove the inboard seat belt buckles (as needed). Refer to Seat Belt Buckle Replacement - Left Front or Seat Belt Buckle Replacement - Right Front in Seat Belts.
3. Remove the seat belt retractor covers. Refer to Seat Belt Retractor Replacement - Left Front or Seat Belt Retractor Replacement - Right Front in Seat Belts.
4. Remove the rear seat cushion. Refer to Rear Seat Cushion Replacement in Seats.
5. Remove the center console (as applicable). Refer to Console Replacement in Instrument Panel, Gauges and Console.
6. Remove the carpet retainers. Refer to Carpet Retainer Replacement .
7. Remove the following components from under the instrument panel:
   - The closeout / insulator panel-right. Refer to Instrument Panel Insulator Panel Replacement - Right Side in Instrument Panel, Gauges and Console.
   - The closeout / insulator panel-left. Refer to Instrument Panel Insulator Panel Replacement - Left Side in Instrument Panel, Gauges and Console.
8. Ensure care is taken when carpeting is removed that seat wiring is pushed through the opening in the carpet.
9. Remove the floor carpet (2).

Installation Procedure

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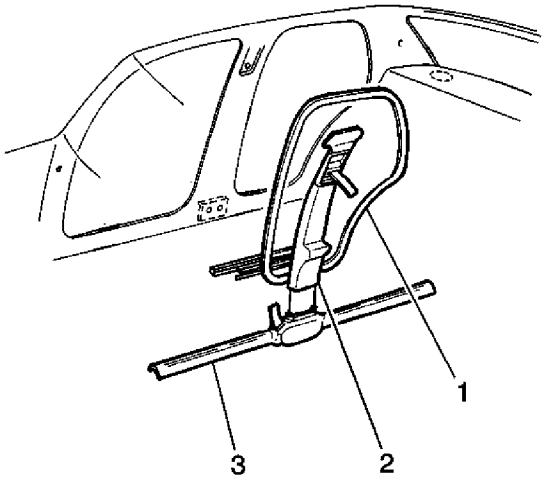
Caution: In order to avoid personal injury or vehicle damage when you repair or replace the carpet, use the same thickness and material size as the original installation. Always return the carpet to the original location.



1. Position the floor carpet (2).
2. Pull the seat wiring through the opening in the carpet.
3. Install the following components under the instrument panel:
   - The closeout / insulator panel-left. Refer to Instrument Panel Insulator Panel Replacement - Left Side in Instrument Panel, Gauges and Console.
   - The closeout / insulator panel-right. Refer to Instrument Panel Insulator Panel Replacement - Right Side in Instrument Panel, Gauges and Console.
4. Install the carpet retainers. Refer to Carpet Retainer Replacement .
5. Install the center console (as applicable). Refer to Console Replacement in Instrument Panel, Gauges and Console.
6. Install the rear seat cushion. Refer to Rear Seat Cushion Replacement in Seats.
7. Install the seat belt retractor covers. Refer to Seat Belt Retractor Replacement - Left Front or Seat Belt Retractor Replacement - Right Front in Restraints.
8. Install the inboard seat belt buckles (as applicable). Refer to Seat Belt Buckle Replacement - Left Front or Seat Belt Buckle Replacement - Right Front in Restraints.
9. Install the front seats. Refer to Seat Replacement in Seats.

Carpet Retainer Replacement

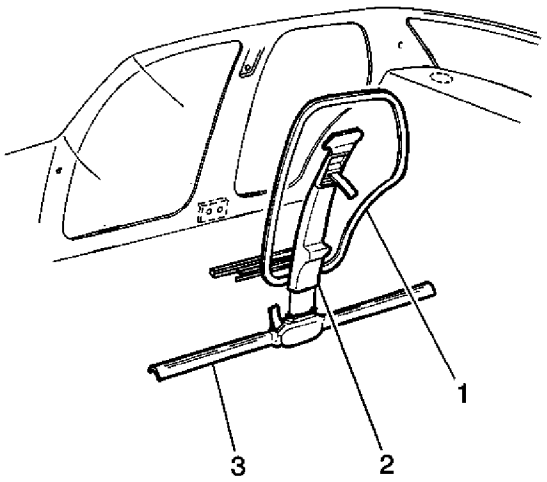
Removal Procedure



1. Pull downward the front and rear door weatherstrips (1) in order to remove the center pillar garnish moldings.
2. Pull outward the center pillar garnish molding (2) in order to release the retainers securing the center trim to the body.
3. Remove the rear seat cushion. Refer to Rear Seat Cushion Replacement in Seats.
4. Remove the rear finish shrouds.
5. Pull upward the carpet retainer (3) in order to release the retainer from the floor support clips.
6. Carefully slide the shoulder belt through the opening in the carpet retainer.
7. Remover the carpet retainer (3).

Installation Procedure

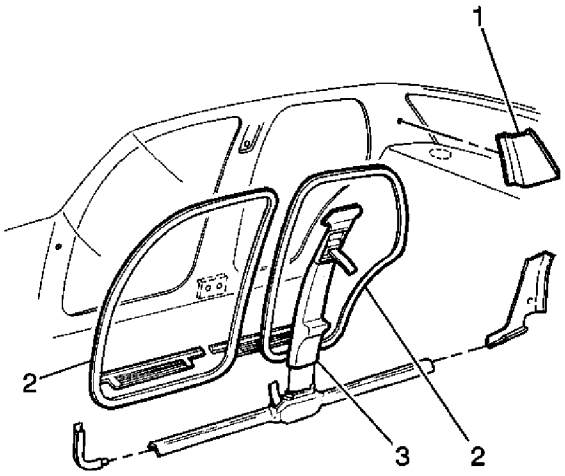
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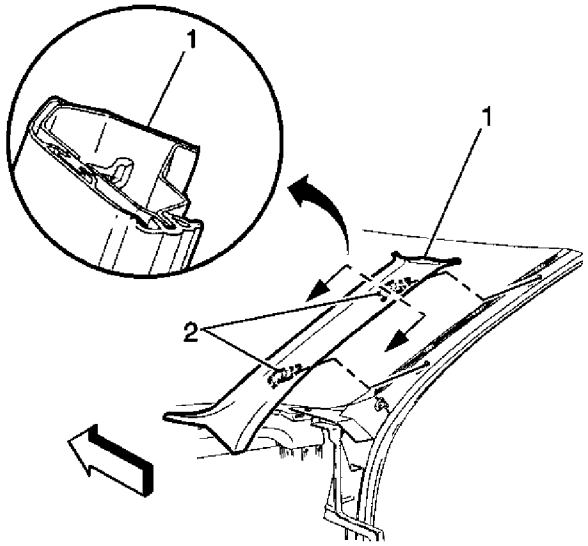
1. Slide the shoulder belt through the opening in the carpet retainer.
2. Align the carpet retainer (3) to the floor support clips.
3. Apply downward pressure to the carpet retainer in order to secure the retainer to the support clips.
4. Install the rear finish shrouds.
5. Install the rear seat cushion. Refer to Rear Seat Cushion Replacement in Seats.
6. If the retainer clips on the center pillar garnish molding are damaged or broken, replace, do not reuse.
7. Install the center pillar garnish molding (2).
8. Push inward at the top and bottom in order to secure.
9. Install the front and rear door weatherstrips (1) while applying pressure to the strips in order to secure.

Headlining Trim Panel Replacement (Buick)

Removal Procedure



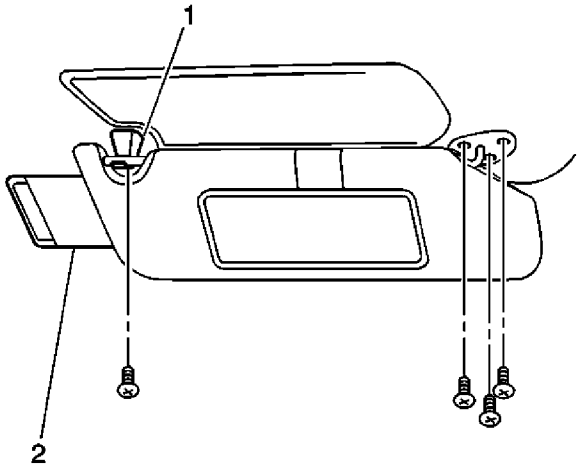
1. Remove the front door weather-strips.
2. Remove the rear door weather-strips (3).
3. Remove the center pillar trim (4).
4. Remove the upper rear quarter panel trim (1).



5. Remove the windshield garnish molding (1).

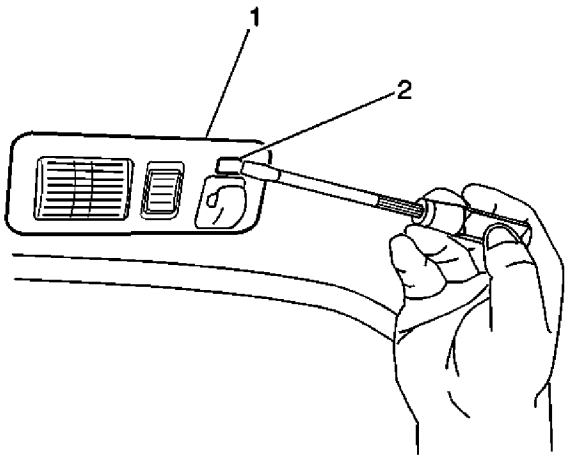
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6. Remove the sunroof opening closeout lace, if equipped.



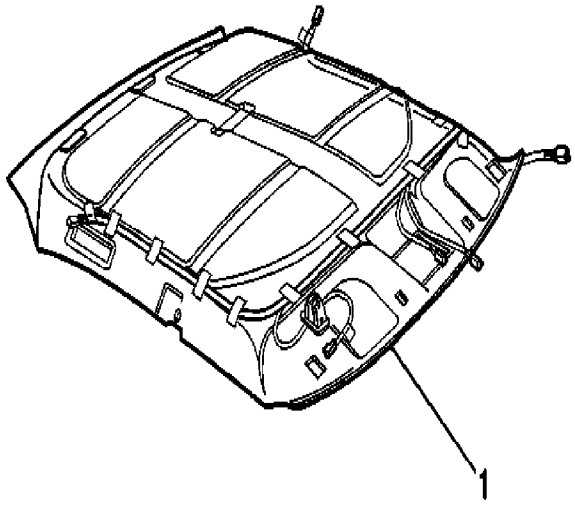


7. Remove the sunshades (1). Refer to Sunshade Replacement .
8. Remove the assist handles, if equipped. Refer to Assist Handle Replacement .





9. Remove the coat hooks, if equipped.
10. Remove the interior lamps (1).
11. Remove the fiber optic cover, if equipped.



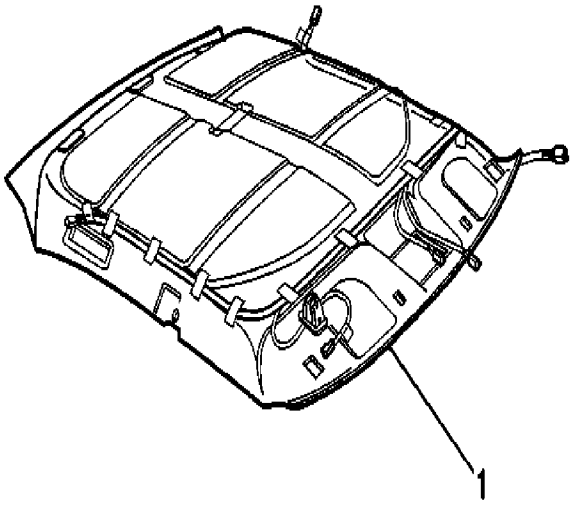
Notice: Use care when removing and installing the headliner. If reusing the headliner lay the headliner down flat on a clean surface. Excessive bending will damage the headliner.

Important: Five to six patches of hook and loop material secure the headliner to the roof. In order to avoid tearing the fiberglass substrate, carefully separate them. Recline the seat back and position the seat as far rearward as possible.

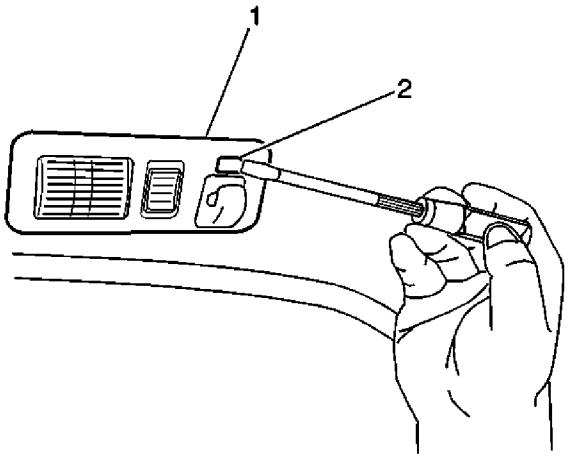
12. Remove the headliner (1) through the right front door.

Installation Procedure

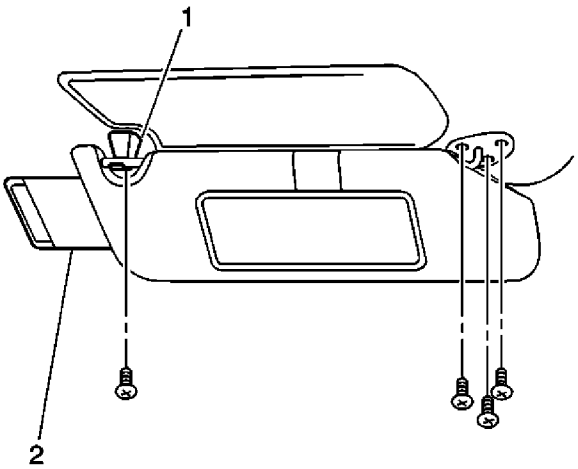
Notice: Use care when removing and installing the headliner. If reusing the headliner lay the headliner down flat on a clean surface. Excessive bending will damage the headliner.



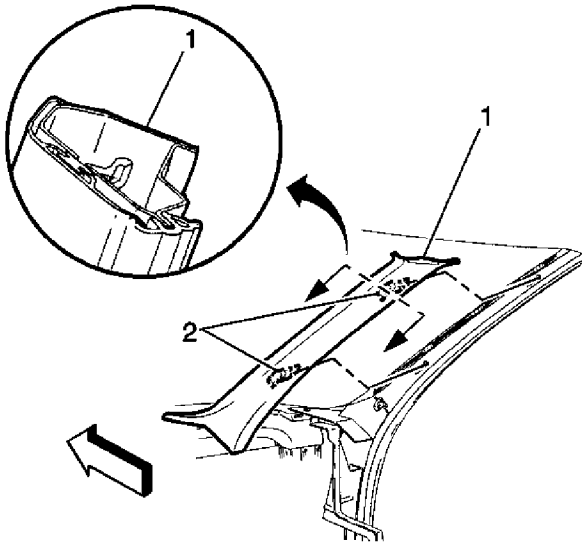
1. Install the headliner (1) through the right front door, with the aid from an assistant.



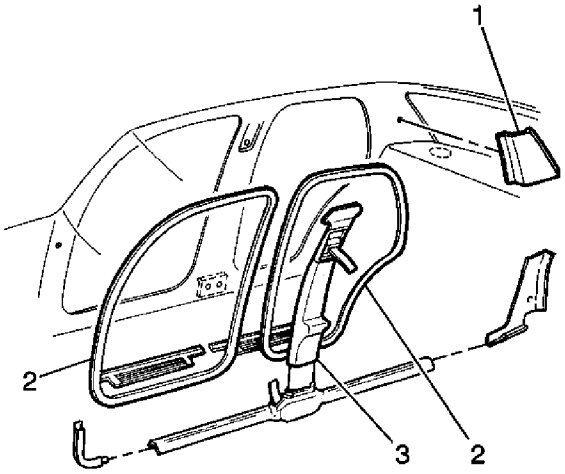
2. Install the coat hooks (1), if equipped.
3. Install the assist handles, if equipped. Refer to Assist Handle Replacement .



4. Install the sunshades (1). Refer to Sunshade Replacement .
5. Install the interior lamps.
6. Install the fiber optic cover, if equipped.



7. Install the windshield garnish molding (1).
8. Install the sunroof opening closeout lace, if equipped.

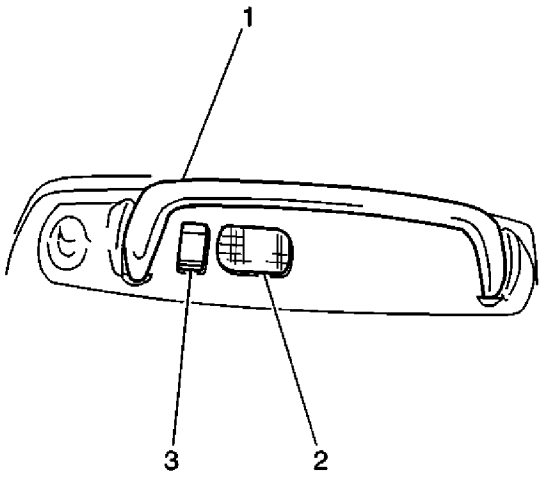




9. Install the upper rear quarter panel trim (1).
10. Install the center pillar molding (3).
11. Install the rear door weather-strips (2).
12. Install the front door weather-strips.

Assist Handle Replacement

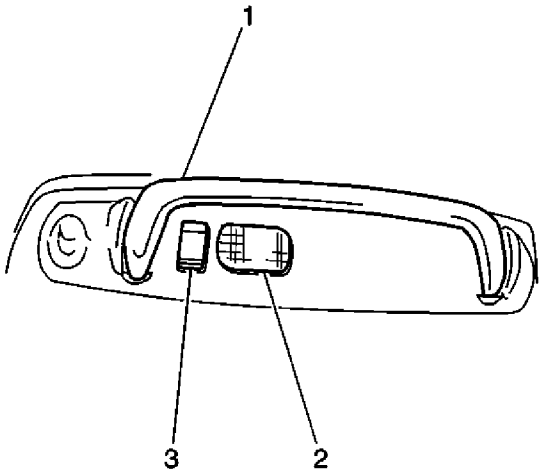
Removal Procedure



1. Remove the push-pin (3) from the rail mounted assist handle.
2. Remove the fasteners from under the assist handle (1).
3. Carefully lower the assist handle from the headliner.
4. Disconnect the wiring harness connector, if equipped.
5. Remove the assist handle.

Installation Procedure

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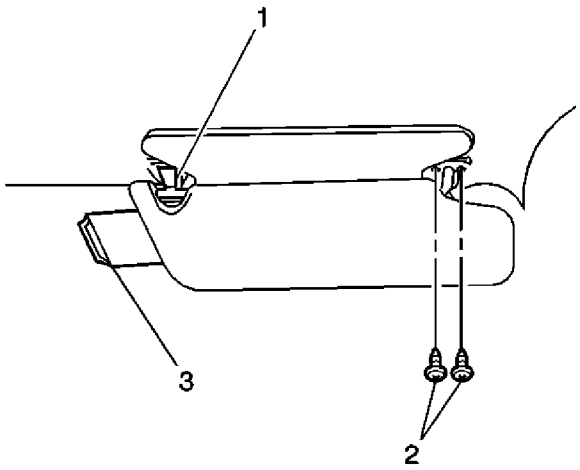




1. Connect the wiring harness connector, if equipped.
2. Align the following components:
   - The retainer behind the headliner
   - The headliner opening
   - The assist handle
3. Install the push-pins.
4. Press the push-pin (3) into place in order to secure the assist handle to the roof.

Sunshade Replacement

Removal Procedure



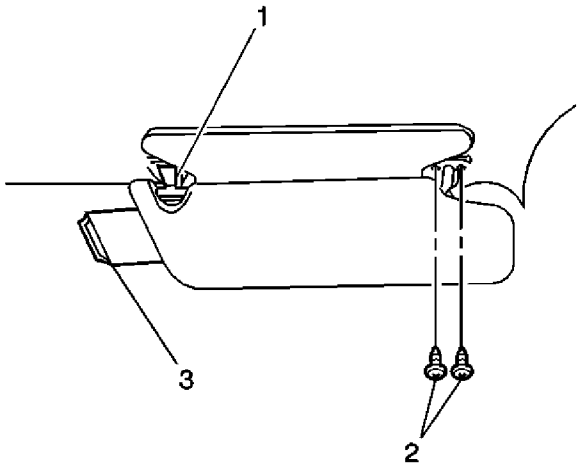


1. Remove the push-pin from the center support (1).
2. Remove the fasteners (2) from the socket side of the sunshade.
3. Detach the sunshade from the center support (1).
4. Partially pull downward on the sunshade in order to remove the sunshade from the headliner.
5. Partially lower the headliner in order to disconnect the wiring harness connector (if the vehicle is equipped with a lighted vanity mirror). Refer to Headlining Trim Panel Replacement .

Installation Procedure

1. Install the headliner, (if the vehicle was equipped with a lighted vanity mirror). Refer to Headlining Trim Panel Replacement .
2. Carefully guide the electrical harness through the headliner opening, if equipped with a lighted vanity mirror.

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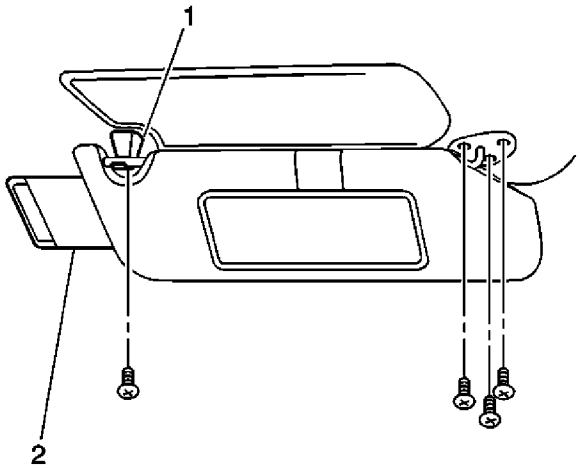




3. Connect the wiring harness connector.
4. Install the sunshade through the openings in the headliner.
5. Snap the retainer behind the headliner into place.
6. Install the fasteners (2) in order to secure the sunshade to the roof.
7. Install the push-pins to the center support (1).
8. Check the operation of the lighted vanity mirror (if equipped).

Vanity Mirror Replacement

Removal Procedure





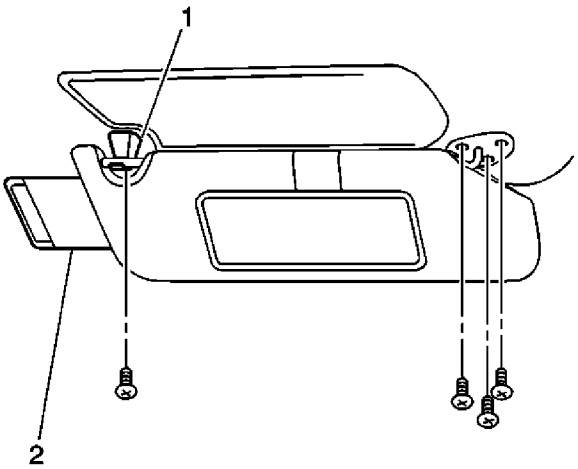
1. Open the vanity cover.
2. Use a thin-bladed tool in order to disengage the 2 front snap legs at the lower edge of the sunshade.
3. Pull the vanity out and downward in order to access the electrical connections.

   Important: Note the wire routing for installation.

4. Disconnect the wire connectors from the vanity, if equipped.
5. Remove the vanity mirror.

Installation Procedure

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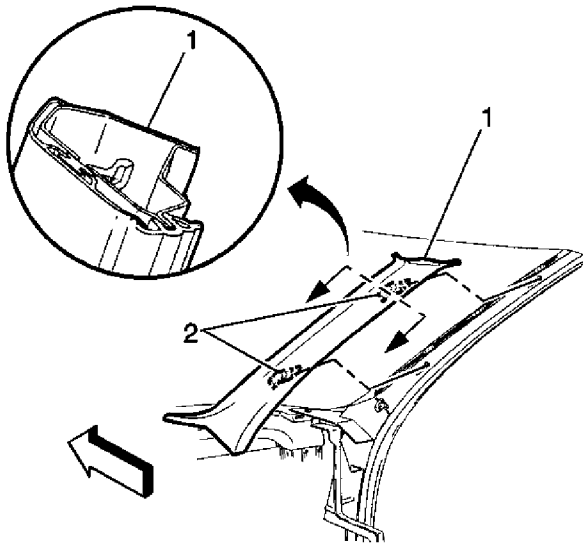




1. Connect the wire connectors, if equipped.
2. Insert the top end of the vanity into the sunshade.
3. Firmly apply pressure to engage the snap legs.
4. Close the vanity mirror cover.

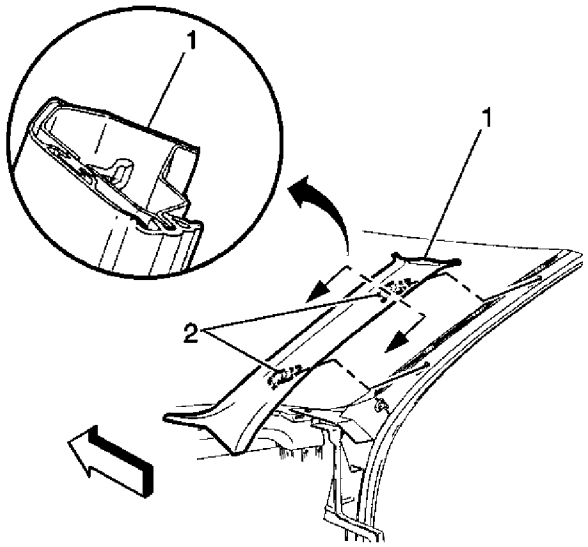
Windshield Pillar Garnish Molding Replacement

Removal Procedure



1. Carefully disengage the retainers on the back side of the molding (1).
2. Pull outward on the garnish molding.
3. Remove the windshield pillar garnish molding (1).

Installation Procedure



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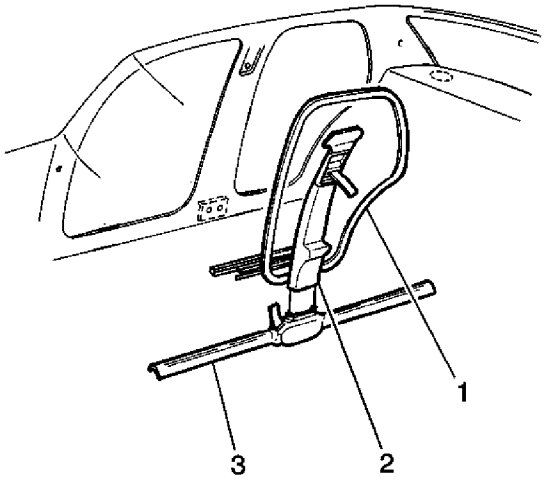


1. Connect the new retainers (2) to the windshield pillar garnish molding (1) if they are broken or damaged.
2. Align the retainers (2) to the holes in the windshield pillar.
3. Press the windshield pillar garnish molding (1) in order to secure.

Center Pillar Garnish Molding Replacement

Removal Procedure

1. Pull the door weatherstrip moldings downward to the top of the carpet retainer.

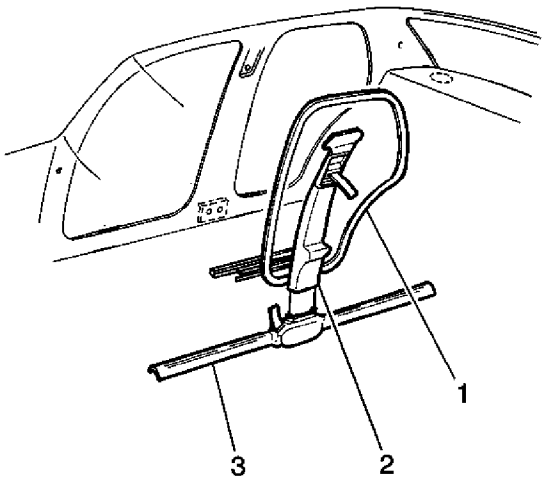




2. Pull the trim panel (2) straight away from the vehicle at the following positions:
   - The middle
   - The bottom
3. Pull the trim panel down at the top.
4. Slide the shoulder belt through the opening at the top of the trim panel.
5. Remove the trim panel from the vehicle at the following attached locations:
   - The top
   - The middle
   - The bottom

Installation Procedure

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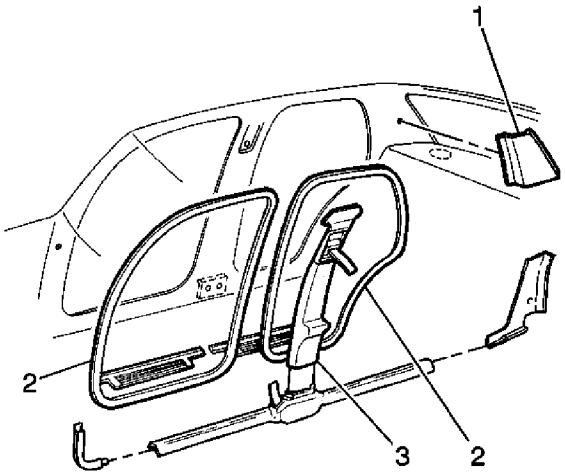
1. Slide the shoulder belt through the opening at the top of the trim panel (2).
2. Slide the trim panel into the retainers at the top of the vehicle.
3. Push the trim panel into place at the following locations:
   - The top
   - The middle
   - The bottom
4. Install the door weatherstrip moldings.
5. Press the weatherstrips firmly into place.

Rear Quarter Trim Panel Replacement

Removal Procedure

Tools Required

J 38778 Door Trim Pad Clip Remover

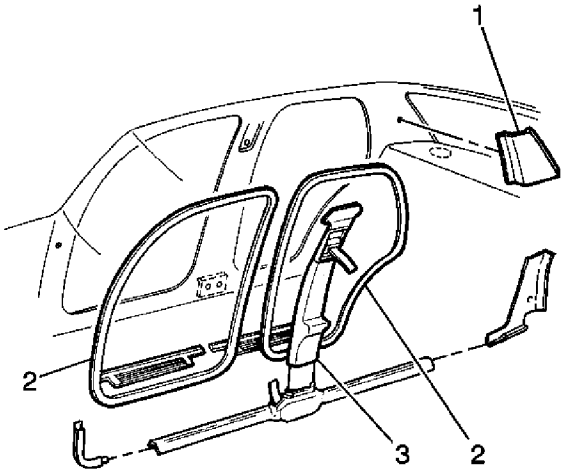




1. Grasp the roof inner side rear finish molding next to the upper quarter trim panel.
2. Pull the molding toward the front of the vehicle in order to loosen the molding from the body.
3. Disengage the retainers on the backside of the upper quarter trim panel (1).
4. Pull the panel toward the inside of the vehicle.
5. Remove the upper quarter trim panel (1).

Installation Procedure

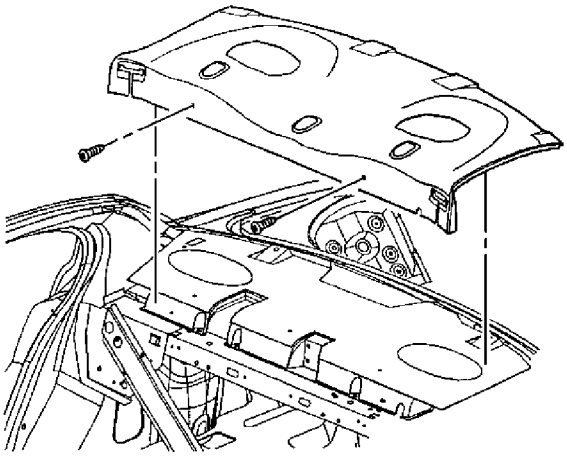
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1. Install new retainers to the upper quarter trim panel (1) if the retainers are broken or damaged.
2. Align the upper trim panel retainers to the holes in the body panel.
3. Press the trim panel (1) into place.
4. Align the inner side rear finish molding to the body.
5. Press the molding into place in order to secure.

Rear Window Shelf Trim Panel Replacement

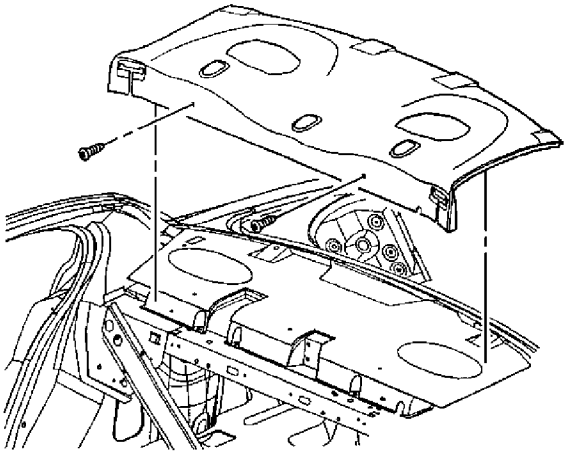
Removal Procedure



1. Remove the rear seat back. Refer to Rear Seat Back Replacement in Seats.
2. Remove the rear quarter trim panels. Refer to Rear Quarter Trim Panel Replacement .
3. Remove the push-in retainers at the front of the rear window trim panel.
4. Lift upward the rear window trim panel.
5. Carefully guide the rear shoulder belts from the opening in the rear window trim panel.
6. Pull upward the rear window trim panel.
7. Remove the rear window trim panel.

Installation Procedure

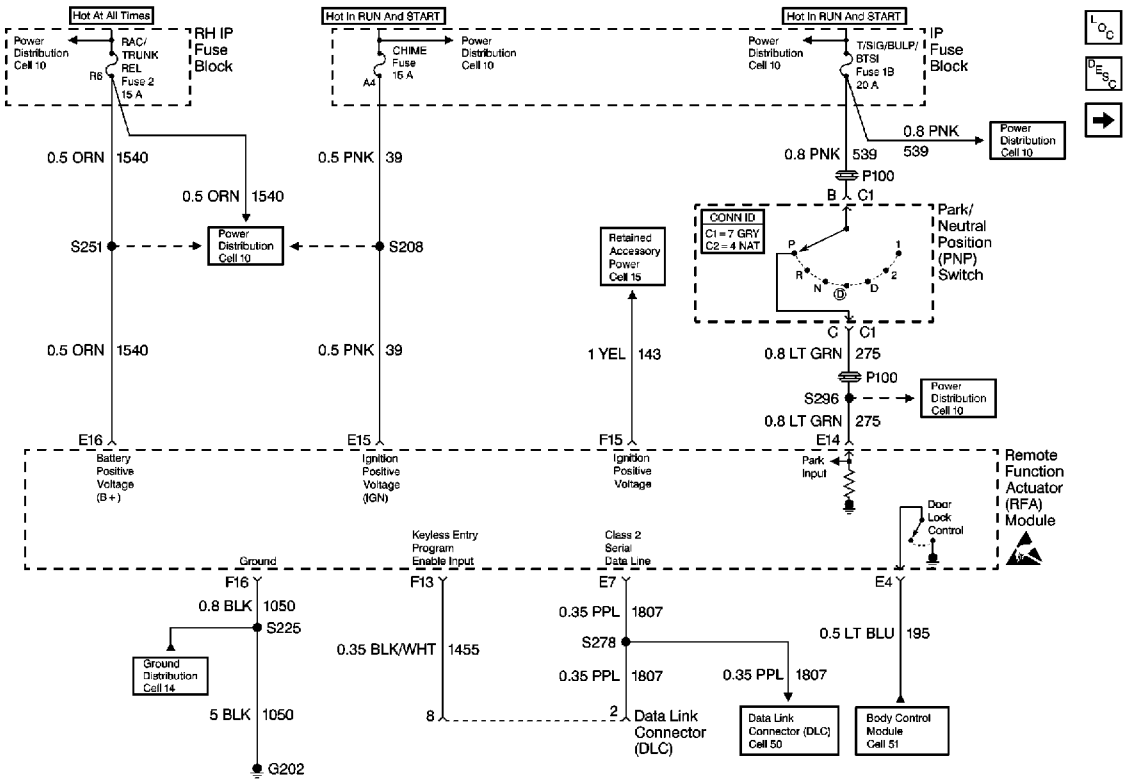
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1. Install the rear window trim panel.
2. Carefully guide the rear shoulder belts through the opening in the rear window trim panel.
3. Install the push-in retainers at the front of the rear window trim panel.
4. Install the quarter trim panels. Refer to Rear Quarter Trim Panel Replacement .
5. Install the rear seat back. Refer to Rear Seat Back Replacement in Seats.

Keyless Entry Schematics

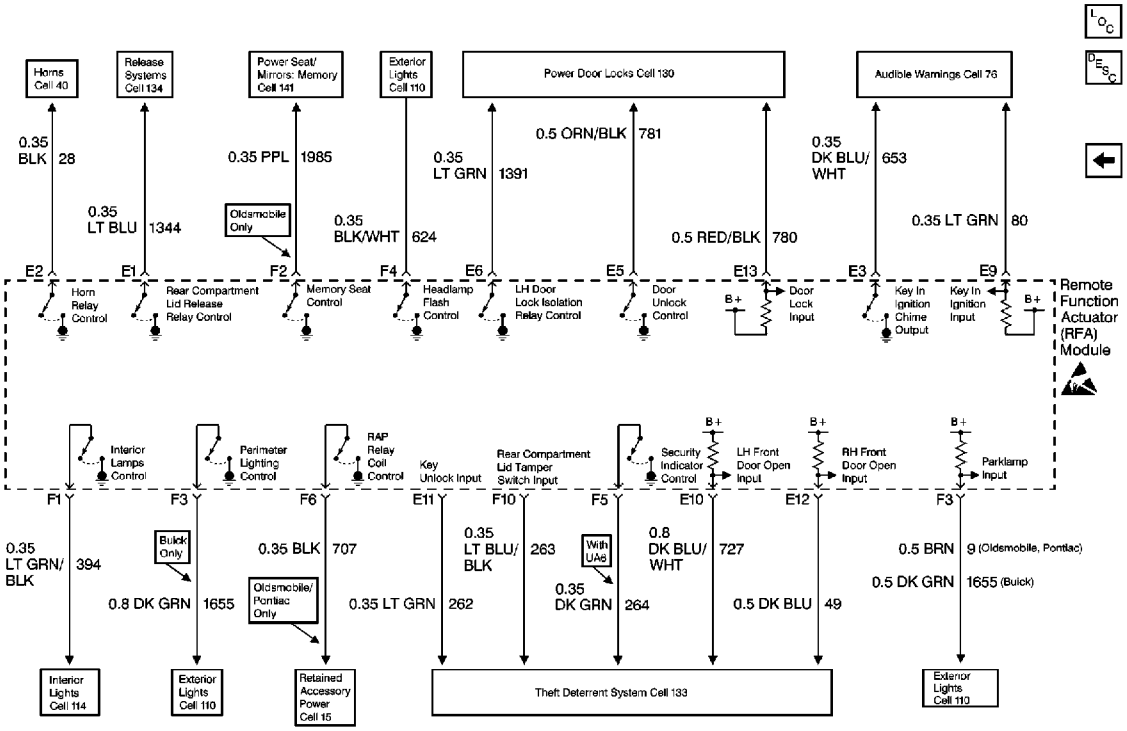
Cell 132: RFA Power, Ground and DLC



Cell 132: RFA Inputs and Outputs

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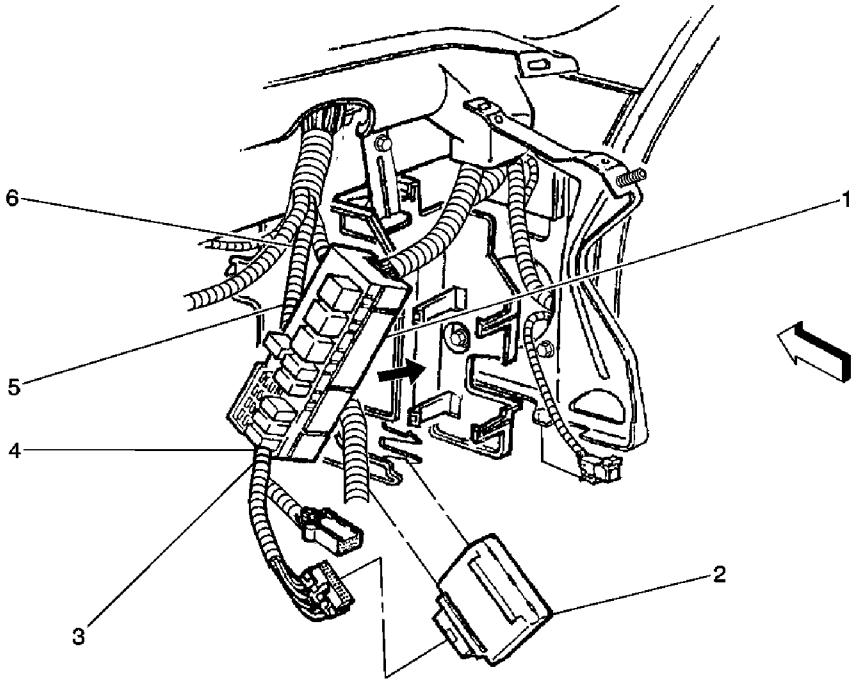
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Keyless Entry Component Views

Passenger Compartment, Below the Right Corner of the IP



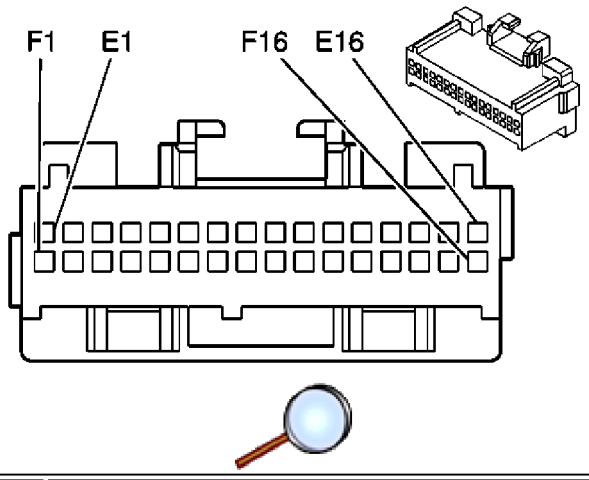
(1) RH IP Fuse Block
(2) Remote Function Actuator (RFA) Module
(3) S261
(4) S266
(5) S278
(6) S272

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Keyless Entry Connector End Views

Remote Function Actuator



Connector Part Information	• 12110115 • 32-Way F Micro-Pack 100 Series (BLU)

Pin	Wire Color	Circuit No.	Function
E1	LT BLU	1344	Rear Compartment Release Output - Coil
E2	BLK	28	Horn Relay Output - Coil
E3	DK BLU/WHT	653	Key In Ignition Chime Output
E4	LT BLU	195	Door Lock Request Output
E5	ORN/BLK	781	Door Unlock Request Output/Door Unlock Input From Switch
E6	LT GRN	1391	LH Front Door Lock Isolation Relay Control
E7	PPL	1807	Serial Data Signal - Class 2 (10400 BAUD)
E8	--	--	Not Used
E9	LT GRN	80	Key In Ignition Switch Signal
E10	DK BLU/WHT	727	Door Open Signal - LH Front
E11	LT GRN	262	Door Lock Cylinder Switch Signal - Key Unlock Input
E12	DK BLU	49	Door Open Input Signal
E13	RED/BLK	780	Power Door Lock Input Signal From Switch
E14	LT GRN	275	Park/Neutral Position Switch Output - Park
E15	PNK	39	Fuse Output - Ignition 1
E16	ORN	1540	Fuse Output - Battery
F1	LT GRN/BLK	394	Interior Light Control
F2	PPL	1985	Memory Seat/Mirror Module Signal - Personalization Bus

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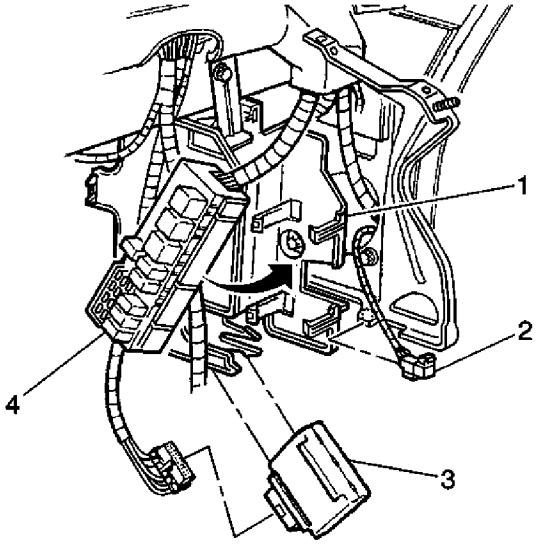
F3	DK GRN	1655	Perimeter Lighting Relay Control
F4	BLK/WHT	624	Headlamp Flash Control
F5	DK GRN	264	Security Indicator Lamp Feed
F6	BLK	707	Delayed Accessory Bus Relay Feed - Accessory Relay
F7-F9	--	--	Not Used
F10	LT BLU	263	Tamper Switch Signal
F11-F12	--	--	Not Used
F13	BLK/WHT	1455	Keyless Entry Program Enable Signal
F14	--	--	Not Used
F15	YEL	143	Fuse Output - Accessory
F16	BLK	1050	Gound

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Remote Control Door Lock Receiver Replacement

Removal Procedure

1. Remove the right sound insulator. Refer to Instrument Panel Insulator Panel Replacement - Right Side in Instrument Panel Gauges and Console.

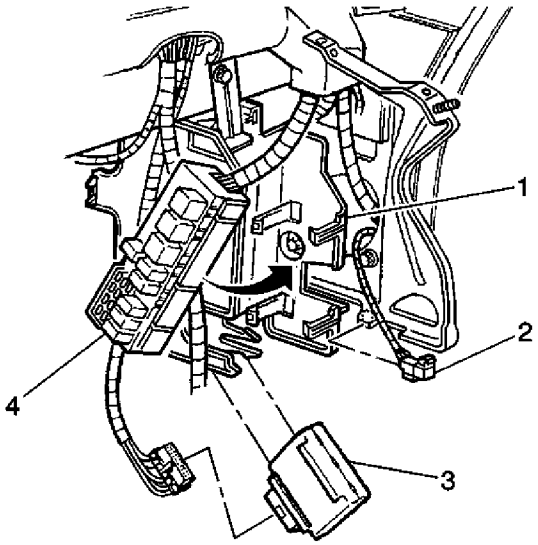


2. Disconnect the lower electrical connector.
   2.1. Press down on the center tab of the multi-use bracket (1).
   2.2. Slide the module (3) downward until the mounting rails are disengaged.
3. Disconnect the upper electrical connector.

Installation Procedure

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Important: Carefully follow the installation procedure when replacing the RFA module in order to avoid malfunctions or inoperative options. If the RPO options are improperly set, the RFA system may become inoperative.

1. Connect the upper electrical connector.
   1.1. Align the mounting rails on the module (3) with the mounting rails on the multi-use bracket (1).
   1.2. Slide the module (3) upward into place until the mounting rails align and the locking tab engages.
2. Connect the lower electrical connector.
3. Install the right sound insulator. Refer to Instrument Panel Insulator Panel Replacement - Right Side in Instrument Panel Gauges and Console.
4. Program the RFA module. Refer to Remote Control Door Lock Reprogramming .
5. Program the transmitters. Refer to Transmitter Programming .

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Remote Control Door Lock Reprogramming

Important: Before entering the programming mode, verify possession of all the transmitters you will be using on the vehicle. Once you program the transmitter, the memory erases. The other transmitters will not be functional until you program the transmitters again. You may program up to 4 transmitters.

Accessing RFA Programming

1. Enter Diagnostics.
2. Enter Body.
3. Enter all vehicle information that is requested, such as, make/model/year.
4. Enter Remote Function Actuator.

Scan Tool Displays

Use the scan tool to set the programming options for the vehicle. The following information explains the different option screens on the scan tool.

Module Information

RFA module software ID

Inputs

- Ignition 1
- Accessory 1
- Door lock switch
- Door key cylinder lock switch
- Passenger door ajar switch
- Perimeter lights
- Theft tamper switch
- Park switch

Outputs

- Trunk release
- Exterior lamps
- Horn
- Door lock
- Door unlock
- Driver unlock
- Security lamp

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- Courtesy lamp
- Awarn - Alarm Warning
- Perimeter lights
- RAP

Special Functions

Output Control

- Alarm warning
- Horn
- Courtesy lamps
- Security telltale
- PBUS - Personalization bus
- Trunk release
- Driver door relay
- Retained accessory power
- Perimeter lighting
- Door lock
- Door unlock

Set Options

Choose Activate or Deactivate to select each option. Use the RPO list and the vehicle option tag to verify the correct options to turn on.

Option # 0

- Activation verification
- Automatic door locks
- Theft
- Delayed locking
- Perimeter lights
- Panic button
- Central locking

Option # 1

- Options
- Turn off RF for export
- Vehicle type (Inactive =Olds/Buick)
- Personalization message

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The following lists are for setting specific modifications. Each transmitter can be programmed for a specific driver's preference.

Fob #1 Option # 1

- Perimeter lighting
- Delayed locking

Fob #1 Option # 2

Important: Pontiac Bonnevilles ADL feature is different than the Buick and Oldsmobile. The Bonneville will lock the doors when the shifter is moved out of park and only unlock the doors when the ignition key is moved to the off position.

- Automatic door locks Mode 0 - No automatic door lock or unlock.
- Automatic door locks Mode 1 - Automatically locks all doors when the transmission is shifted out of park. But doors do not unlock automatically.
- Automatic door locks Mode 2 - Automatically locks all doors when the transmission is shifted out of park and automatically unlocks the driver's door when shifted into park or for the Bonneville by moving the ignition key to the off position.
- Automatic door locks Mode 3 - Automatically locks all doors when the transmission is shifted out of park and automatically unlocks all doors when shifted into park or for the Bonneville by moving the ignition key to the off position.

Fob #1 Option # 3

- Activation verification Mode 0 Remote Activation Verification (RAV) Customization .
- Activation verification Mode 1 Remote Activation Verification (RAV) Customization .
- Activation verification Mode 2 Remote Activation Verification (RAV) Customization .
- Activation verification Mode 3 Remote Activation Verification (RAV) Customization .
- Activation verification Mode 4 Remote Activation Verification (RAV) Customization .
- Activation verification Mode 5 Remote Activation Verification (RAV) Customization .

Option # 0

- Activation verification
- Automatic door locks
- Theft
- Delayed locking
- Perimeter lights
- Panic button
- Central locking

Option # 1

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- Options
- Turn off RF for export
- Vehicle type (Inactive =Olds/Buick)
- Personalization message

Fob # 2 Option # 1

- Perimeter lighting
- Delayed locking

Fob # 2 Option # 2

- Automatic door locks Mode 0
- Automatic door locks Mode 1
- Automatic door locks Mode 2
- Automatic door locks Mode 3

Fob # 2 Option # 3

- Activation verification Mode 0
- Activation verification Mode 1
- Activation verification Mode 2
- Activation verification Mode 3
- Activation verification Mode 4
- Activation verification Mode 5

Feature	Buick	Pontiac	Oldsmobile
This list details the possible option codes for the vehicles. This information is to be used to program a RFA module that has been replaced. If the RFA module is not programmed properly, certain options or functions will not operate properly.			
Delayed Illumination	STD	STD	STD
Theatre Dimming	STD	STD	STD
Load Protection	STD	STD	STD
Lock-Out Prevention	STD	STD	STD
Delayed Locking	STD	STD	STD
Programmable Auto Door Locks	AU4	AU4	AU4
Keyless Entry	AU0	AU0	T2T
Panic	AU0	AU0	AU0
Retained Accessory Power	N/A	C97	T2T
Personalization	AU0	AU0	T2T
Transmitter Chirp	AU0	AU0	T2T
Perimeter Lighting	AU0	AU0	T2T
Illuminated Entry	N/A	C97	T2T

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Theft Deterrent System	UA6	UA6	N/A
Central Unlocking	UA6	UA6	N/A

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Remote Activation Verification (RAV) Customization

The Remote Activation Verification (RAV) provides feedback to the driver that the vehicle has received as the command from the transmitter.

The driver may select the following modes:

Mode	Unlock Vehicle	Lock Vehicle
0	Turn the feature off	
1	Single flash exterior lamps	No feedback
2	No feedback	Single flash exterior lamps
3	Single flash exterior lamps	Single flash exterior lamps
4	No feedback	Single flash exterior lamps and chirp horn
5	Single flash exterior lamps	Single flash exterior lamps and chirp horn

Customize the activation feature to each transmitter using the following procedure:

1. Hold the power door lock switch down.

   The doors lock.

2. Press the TRUNK button on the transmitter.

   The RAV mode stays in the current mode. The horn chirps.

3. Press the TRUNK button on the transmitter.

   The RAV mode changes to the next mode. The horn chirps.

4. Release the power door lock switch.

   The customization mode terminates.

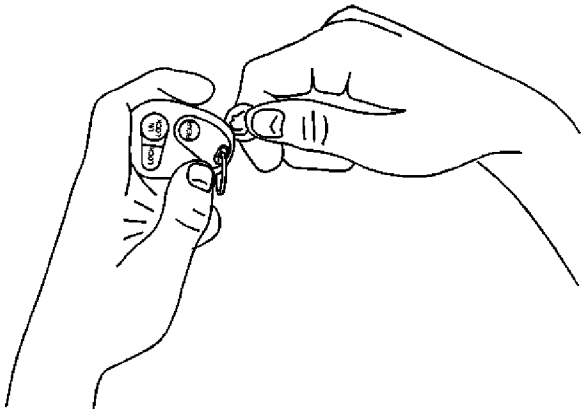
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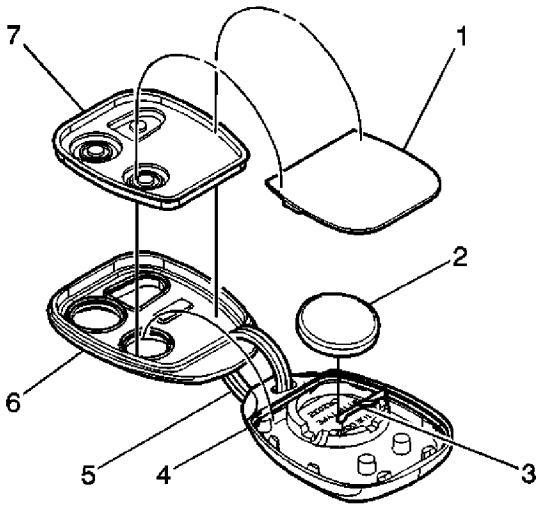
Transmitter Battery Replacement

Removal Procedure

1. Replace the batteries when the range of the transmitter decreases to less than 7 m (23 ft).



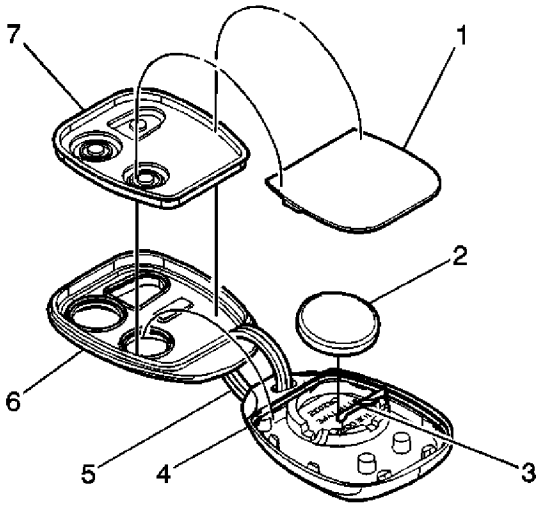
2. Insert a small coin between the two halves of the transmitter case at the slot provided near the key ring hole.
3. Twist the coin in order to open the case.
4. Open the transmitter case.



5. Remove the battery (2).

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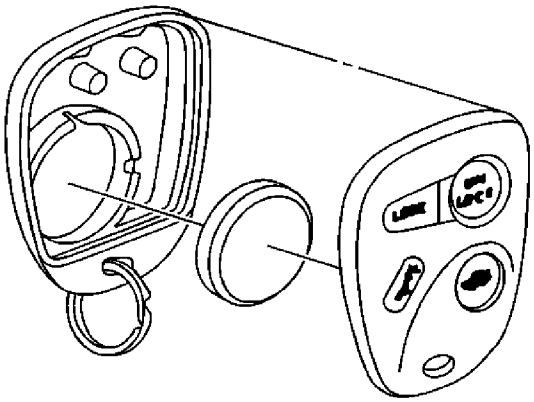
Installation Procedure



1. Install the battery (2) with the positive (+) side down.

   Use one 3 V CR2032 battery (or the equivalent).

2. Close the transmitter case (6, 4).



3. Ensure that the seal is in position. Align the two halves of the case and snap the two halves together.
4. Reprogram the transmitter. Refer to Transmitter Programming .

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Transmitter Synchronization

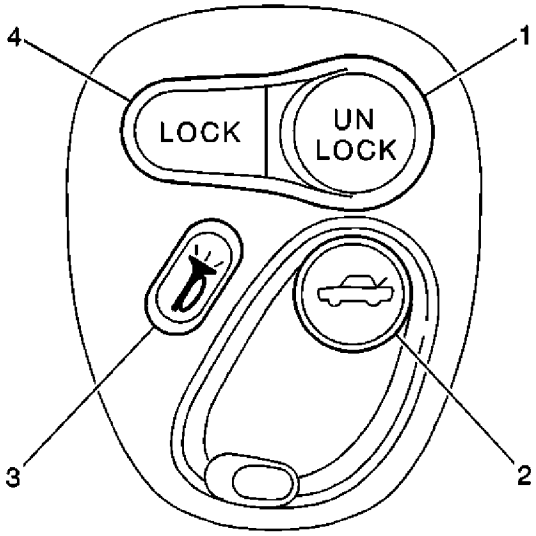
The keyless entry transmitters may become out of synchronization with the remote function actuator (RFA) module under the following conditions:

- When changing the transmitter battery.
- Excessively pressing the transmitter buttons while out of the vehicles range.

When a transmitter becomes out of synchronization, only the panic feature will operate from the transmitter.

To resynchronize the transmitter, perform the following steps:

1. Hold the transmitter within the range of the vehicle.



2. Press and hold the transmitter LOCK (4) and UNLOCK (1) buttons simultaneously for 8 seconds.

   When the transmitter is synchronized with the vehicle, the door locks will cycle. The horn will chirp and the exterior lights will flash if programed to do these functions.

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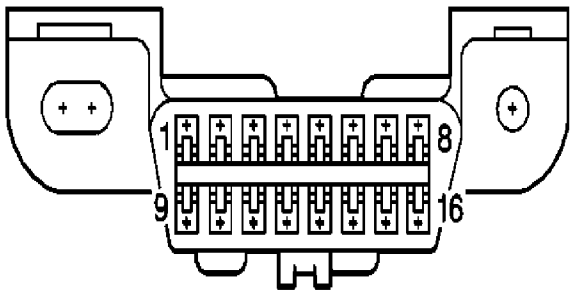
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Transmitter Programming

Important: Before entering the programming mode, verify possession of all the transmitters you will be using on the vehicle. Once you program the transmitter, the memory erases. The other transmitters will not be functional until you program the transmitters again. You may program up to 4 transmitters.

Perform the following procedure when adding new transmitters or replacing failed transmitters:

1. Turn the ignition switch OFF.





2. Use a fused jumper wire in order to jumper the DLC terminal 8 (BLK/WHT) to terminal 4 (BLK).
3. Close all of the doors.
4. Turn the ignition switch ON.

   The doors will cycle to lock.

5. Press and hold the LOCK button and the UNLOCK button on one transmitter.

   After a 30 second delay the doors will lock and unlock.

   Important: Do not turn the ignition OFF or the first transmitter will become inoperative.

6. In order to program extra transmitters, repeat step 5.
7. Disconnect the fused jumper wire from the DLC.

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Fastener Tightening Specifications

Application	Specification	
	Metric	English
Backup Lamp to Rear Compartment Lid	9 N·m	80 lb in
Daytime Running Lamp Resistor to Body	7 N·m	62 lb in
Headlamp Bracket to Body	9 N·m	80 lb in
Taillamp to Quarter	9 N·m	80 lb in

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Bulb Usage

Indicator	Bulbs to Check
Important: When replacing a bulb, ensure that you replace the bulb with the same type. If you use the incorrect bulb, the driver information center (DIC) will continue to display a bulb outage. If the driver information center (DIC) displays bulb indicator outages, use the following chart before proceeding with the diagnosis in order to determine if a bulb is burnt out. Verify the proper bulb type.	
The high beam indicator lights.	The 2 high beam bulbs
The low beam indicator lights.	The 2 low beam bulbs
The park lamp lights.	• The LH park/turn bulb • The LH side marker bulb • The RH park/turn bulb • The RH side marker bulb
The turn lamp lights.	• The LH front turn signal bulb. • The RH front turn signal bulb. • The LH rear turn signal bulb. • The RH rear turn signal bulb.
The taillamp indicator lights.	• The 2 left tail bulbs • The 2 right tail bulbs • The 2 licence bulbs • The 4 tail/turn/stop bulbs • The LH rear side marker bulb • The RH rear side marker bulb
The backup indicator lights.	The 2 backup bulbs
The brake lamp indicator comes on	• The 4 stop/turn tail bulbs • The 1 CHMSL bulb
The taillamp indicator and the brake indicator light at the same time.	• The 2 LH stop/turn/tail bulbs • The 2 right stop/turn/tail/bulbs

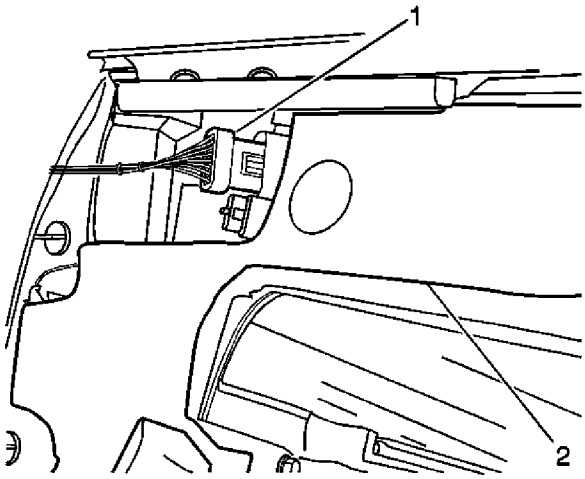
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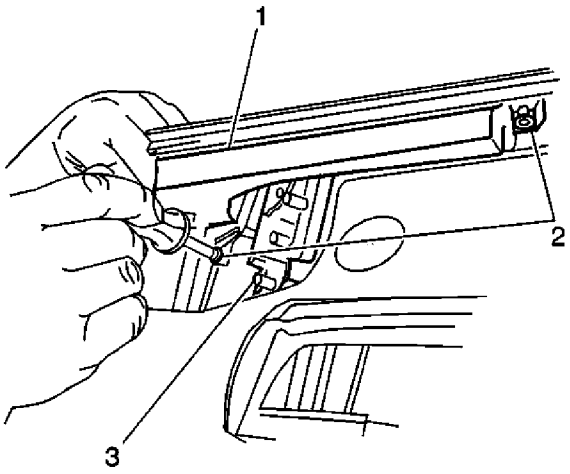
Headlamp Switch Replacement (Buick)

Removal Procedure

1. Remove the door trim panel. Refer to Front Side Door Trim Panel Replacement



2. Disconnect the electrical connector (1).



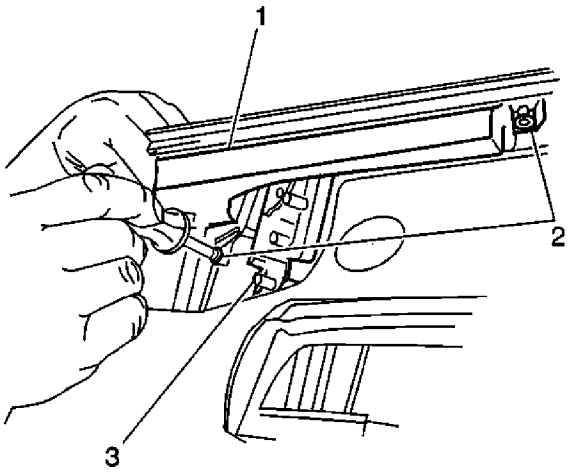
3. Remove the fasteners (2) that retain the cover (1) to the inner side of the trim panel.
4. Remove the fasteners (3) that retain the switch to the trim panel.
5. Remove the switch.

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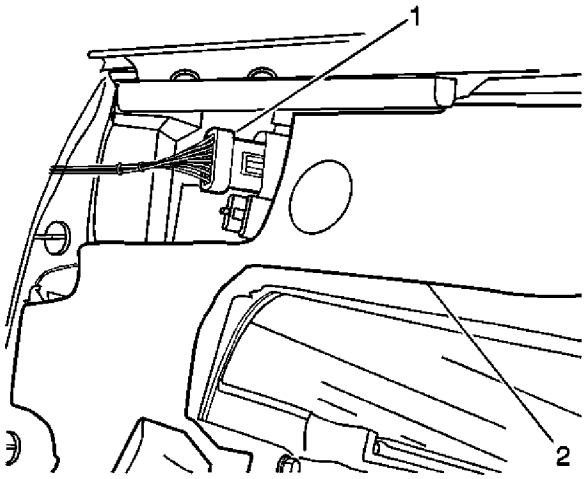
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Installation Procedure

1. Install the switch.
2. Install the fasteners (3) that retain the switch to the trim panel.



3. Install the fasteners (2) that retain the cover (1) to the inner side of the trim panel.



4. Connect the electrical connector (1).
5. Install the door trim panel. Refer to Front Side Door Trim Panel Replacement

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Lamp Control Module Replacement

Removal Procedure

1. Remove the right closeout/insulator panel. Refer to Instrument Panel Insulator Panel Replacement - Right Side .
2. Remove the left closeout/insulator panel. Refer to Instrument Panel Insulator Panel Replacement - Left Side .
3. Slide the LCM to the left from the retainer while holding onto the lock tab.
4. Disconnect the electrical connectors.

Installation Procedure

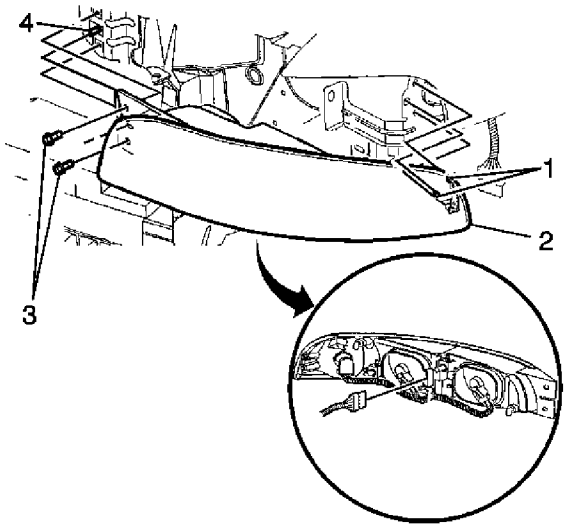
1. Electrical connectors to the LCM.
2. Slide the LCM into the retainer, push to the right to engage.
3. Install the left closeout/insulator panel. Refer to Instrument Panel Insulator Panel Replacement - Left Side .
4. Install the right closeout/insulator panel. Refer to Instrument Panel Insulator Panel Replacement - Right Side .

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Headlamp Replacement (Buick)

Removal Procedure

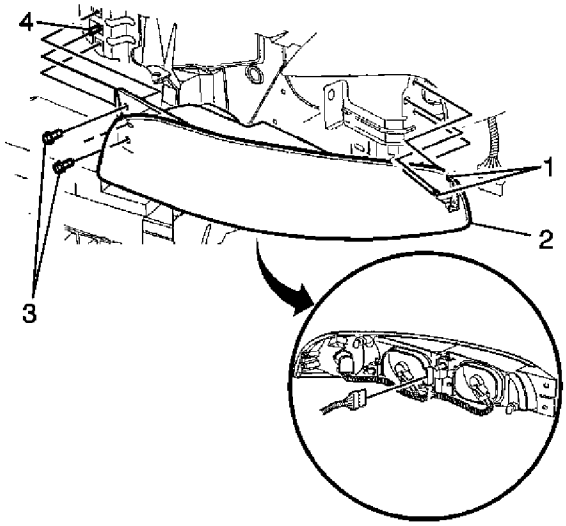


1. Remove the 2 bolts (3) at the inboard edge of the headlamp (2).
2. Position the headlamp outboard in order to disengage the pins (1) at the rear of the headlamp (2).
3. Remove the electrical connectors from the headlamp (2).
4. Remove the bulbs from the headlamp (2).

Installation Procedure

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1. Install the bulb to the headlamp (2).
2. Install the electrical connectors.
3. Position the headlamp inboard in order to engage the pins at the rear of the headlamp (2).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

4. Install the 2 bolts (3) to the inboard edge of the headlamp (2).

   Tighten
   Tighten the bolts (3) to 5 N·m (44 lb in).

5. If you are installing a new headlamp (2), remove the horizontal aim adjuster restrictor from the headlamp (2). Discard the horizontal aim adjuster restrictor.
6. Inspect the headlamp aim. Refer to Headlamp Aiming .

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Headlamp Aiming (Buick)

Properly aim the headlamps in order to obtain the maximum road illumination and safety built into the headlamp system. Proper aiming is important with composite headlamps. Composite headlamps increase the range and the power of the headlamps. Slight variations from the recommended aiming may be hazardous to approaching motorists. Aiming after the bulb has been replaced is not required with composite headlamps.

Ensure that the vehicle is at the normal weight regarding the following items when you inspect the headlamp aim:

- The fuel
- The oil
- The water
- The spare tire

Inflate the tires uniformly to the specified pressure.

If the vehicle carries an unusual load in the rear compartment or a trailer, ensure that the load is on the vehicle when you inspect the headlamps.

Follow all of the individual state requirements for headlamp aiming.

Inspect the headlamp aim when installing a new headlamp assembly. Inspect the headlamp aim if service or repairs to the front end area may have disturbed the headlamps or the mountings.

The headlamp focus is set during the construction of the unit. Do not attempt to readjust the focus.

Follow all of the state laws and local laws for the proper requirements for the headlamp aim.

Adjust the horizontal aim using an adjusting screw on the outer side of the headlamp assembly. Adjust the vertical aim using an adjusting screw in the top center of the assembly.

Perform the following steps in order to prepare the vehicle for aiming the headlamps:

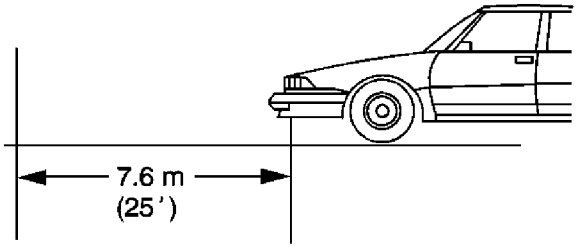
1. Completely assemble all of the components.
2. Place the vehicle on a level pad or surface.
3. Stop all unnecessary operations or work on the vehicle that affects the vehicle trim.
4. Close the doors.
5. Stabilize the suspension.
6. Ensure that the fuel level is at a 1/2 tank or less.
7. Ensure that the tires are inflated to the proper pressure.

Adjustment Procedure

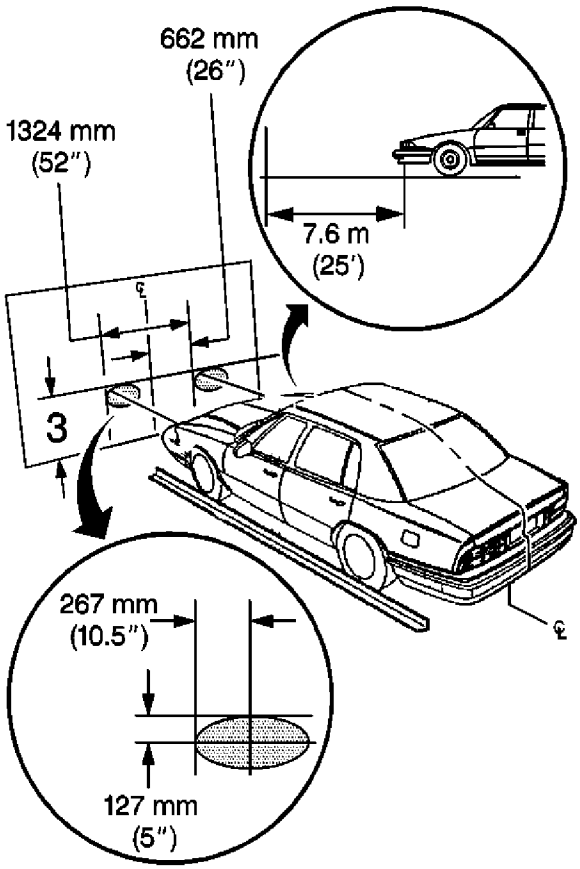
Complete the following steps and refer to the accompanying illustrations in order to adjust the headlamp aim:

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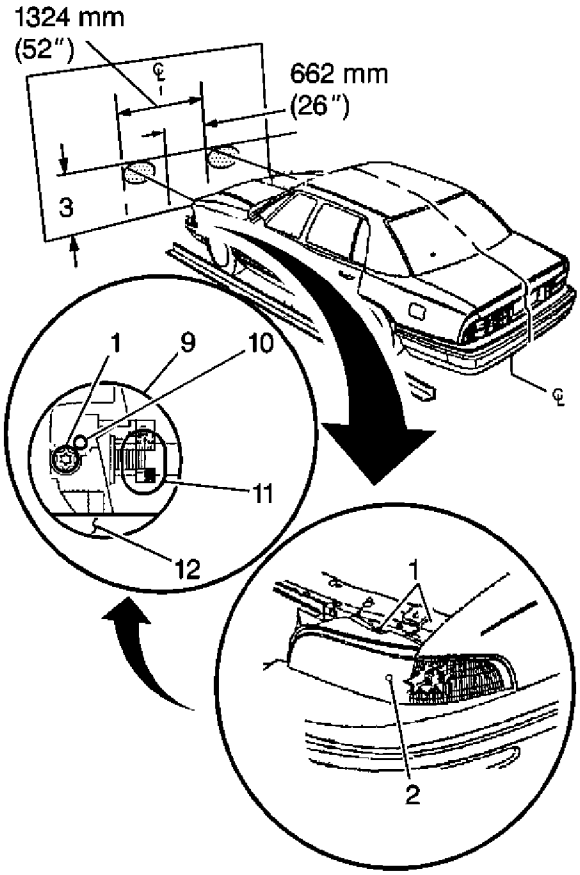
1. Ensure that the headlamps are a distance of 7.6 m (25 ft) away from the wall.



2. Mark a vertical line on the wall. Align the vertical line with the center line of the vehicle.
3. Mark a horizontal line on the wall. Ensure that the distance of the line to the floor is equal to

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the distance from the center of the headlamp aim dot to the floor.



4. Using the following components, ensure that the following specifications match the specifications in the illustrations:
   - The headlamp aim adjusters (1).
   - The zero set access hole (10).
   - The zero set meter (11).

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Fog Lamp Aiming

In order to prepare the vehicle for aiming the fog lamps, perform the following procedures:

1. Completely assemble all of the components on the vehicle.
2. Position the vehicle on a level surface.
3. Stop all unnecessary operations or work on the vehicle that affects the vehicle trim.
4. Close the doors.
5. Stabilize the suspension.
6. Ensure that the fuel level is at a 1/2 tank or less.
7. Ensure that the tires are inflated to the proper pressure.

Vehicle Aim

Record the specification readings a distance of 7.6 m (25 ft) from the fog lamp lens in order to perform the fog lamp vertical aim. Ensure that the top of the fog lamp beam is 50-150 mm (2-6 in) below the fog lamp horizontal centerline.

Adjust the vertical aim by turning the vertical adjusting nut. The vertical adjusting nut is located on the rear of the fog lamp assembly.

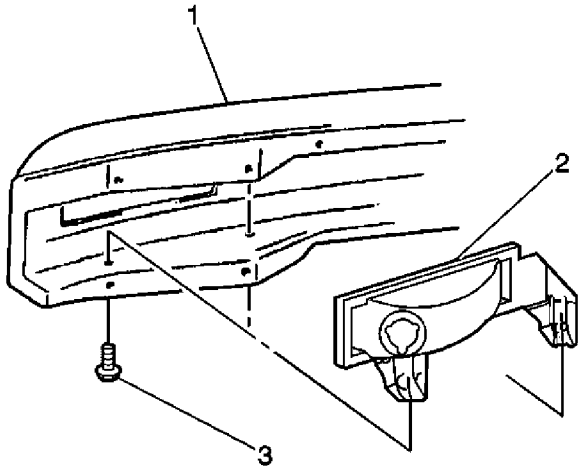
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Parking and Turn Signal Lamp Replacement

Removal Procedure

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.



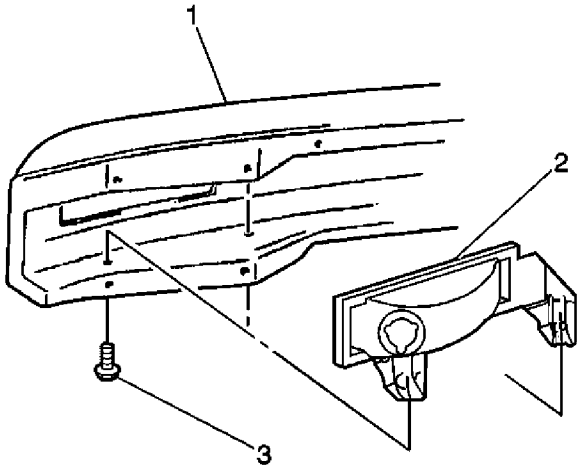


2. Remove the bolts (3) that retain the park/turn signal lamp (2) to the impact bar (1).
3. Remove the electrical bulb/socket from the park/turn signal lamp (2).
4. Remove the park/turn signal lamp (2).

Installation Procedure

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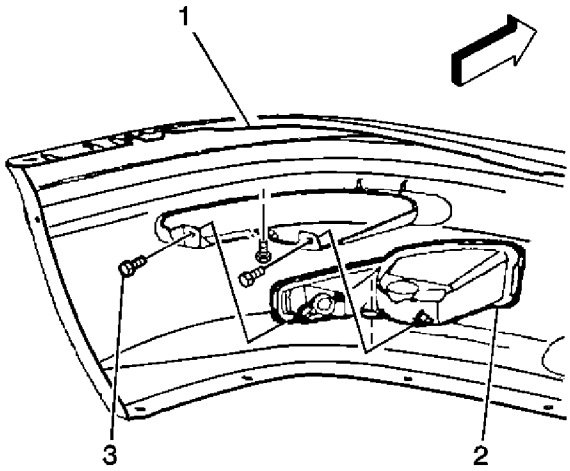
1. Install the electrical bulb/socket into the park/turn signal lamp (2).
2. Install the park/turn signal lamp (2).
3. Install the bolts (3) in order to retain the park/turn signal lamp (2) to the impact bar (1).
4. Lower the vehicle.

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Park/Turn Signal/Side Marker Lamp Replacement

Removal Procedure

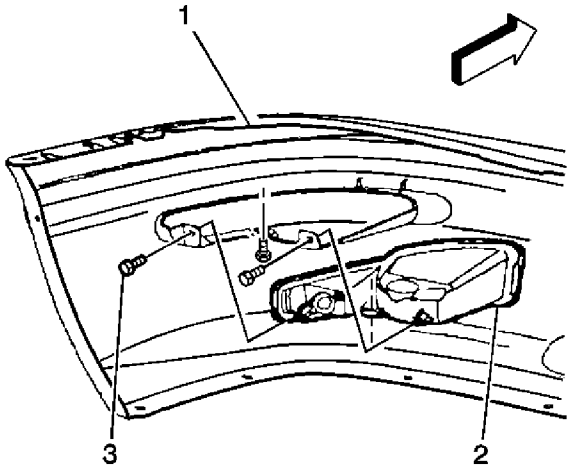
1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.
2. Remove the bulb/sockets from the lamp.





3. Remove the screws (3) that retain the lamp to the front bumper fascia (1).
4. Remove the front park/side marker lamp (2) from the fascia (1).

Installation Procedure



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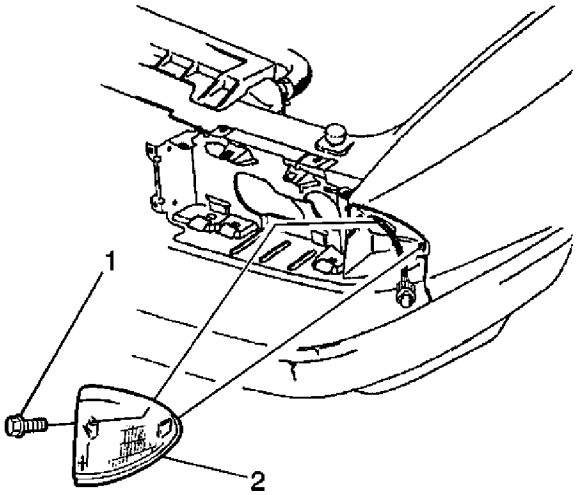
1. Install the front park/side marker lamp (2) to the front bumper fascia (1).
2. Install the screws (3) in order to retain the lamp to the fascia (1).
3. Install the bulb/sockets to the lamp.
4. Lower the vehicle.

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Cornering Lamp Replacement

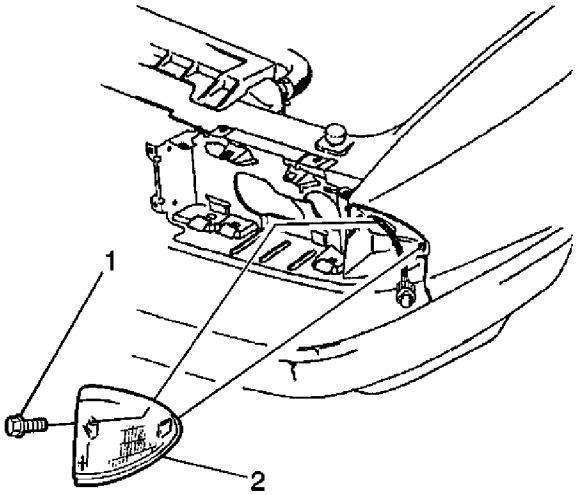
Removal Procedure

1. Remove the headlamp. Refer to Headlamp Replacement .



2. Remove the screw (1) that retains the cornering lamp (2) to the fender.
3. Turn the socket counterclockwise in order to remove the socket from the cornering lamp (2).
4. Remove the cornering lamp (2).

Installation Procedure



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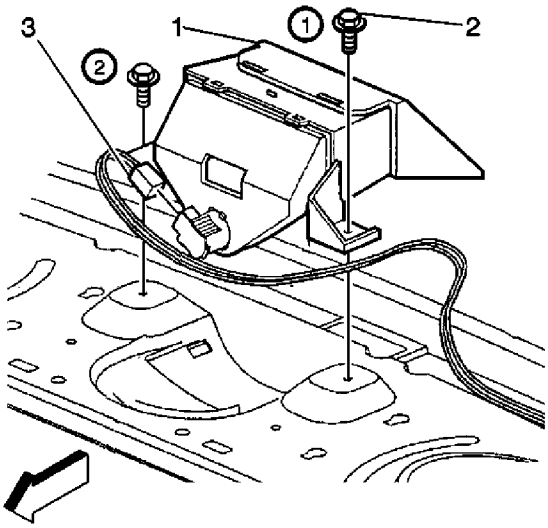
1. Install the socket to the cornering lamp (2).
2. Install the cornering lamp (2) assembly.
3. Install the screw (1) in order to retain the cornering lamp (2) to the fender.
4. Install the headlamp. Refer to Headlamp Replacement .

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High Mount Stop Lamp Replacement

Removal Procedure

1. Remove the rear seat. Refer to Rear Seat Back Replacement in Seats.



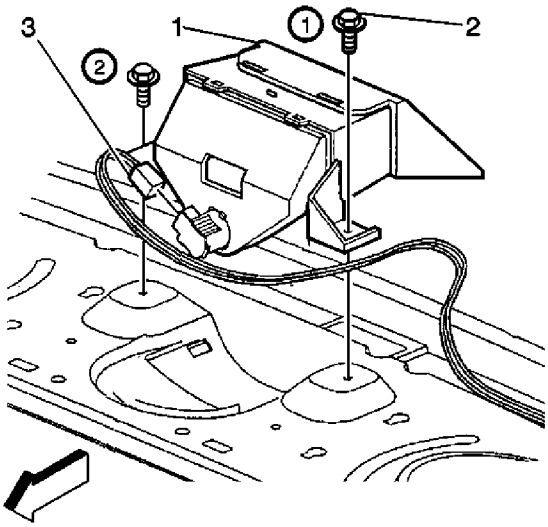


2. Remove the rear seat to window trim panel.
3. Remove the bolts (2) that retain the stoplamp to the trim panel.
4. Remove the electrical connector (3).
5. Remove the center high mounted stoplamp (1).

Installation Procedure

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1. Install the electrical connector (3) to the center high mounted stoplamp (1).
2. Install the stoplamp to the trim panel by sliding the lamp assembly rearward against the rear window.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the bolts (2) in order to retain the stoplamp to the trim panel.

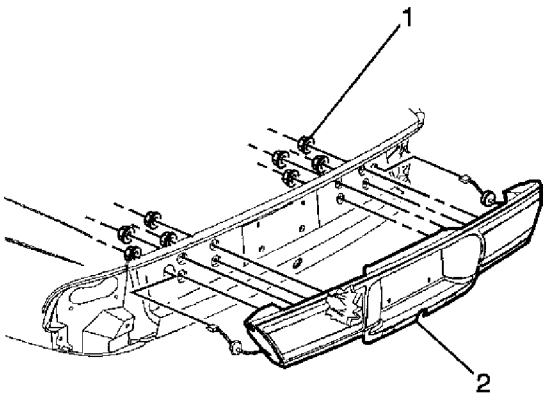
Tighten
Tighten the bolts (2) to 5 N·m (44 lb in). Tighten the bolts in the sequence shown in the illustration.

4. Install the rear seat to rear window trim panel.
5. Install the rear seat. Refer to Rear Seat Back Replacement in Seats.

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Backup Lamp Replacement (LeSabre)

Removal Procedure

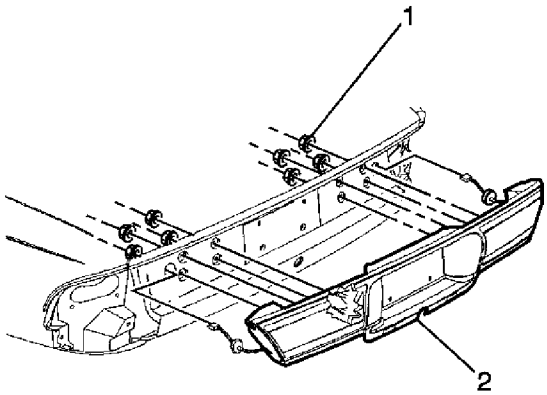


1. Remove the caps covering the backup lamp retaining studs.
2. Remove the screws at the outer ends of the backup lamp assembly (2).
3. Remove the screws from the license plate pocket.
4. Remove the screws that retain the license plate lamps.
5. Remove the nuts (1) that retain the backup lamp assembly (2).

Installation Procedure

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Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

1. Install the nuts (1) in order to retain the backup lamp assembly.

   Tighten
   Tighten the nuts (1) to 5 N·m (44 lb in).

2. Install the screws in order to retain the license plate lamps.
3. Install the screws in the license plate pocket.

   Tighten
   Tighten the screws to 3.5 N·m (31 lb in).

4. Install the screws to the outer ends of the backup lamp assembly (2).

   Tighten
   Tighten the screws to 5 N·m (44 lb in).

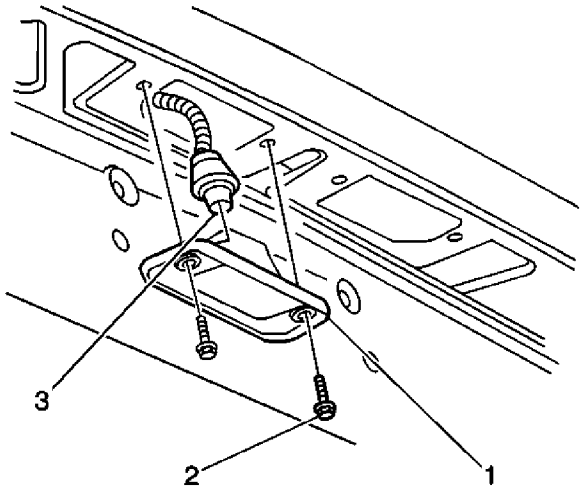
   Important: Do not rework or alter the reflective surface of the taillamps.

5. Install the caps to the backup lamp retaining studs.

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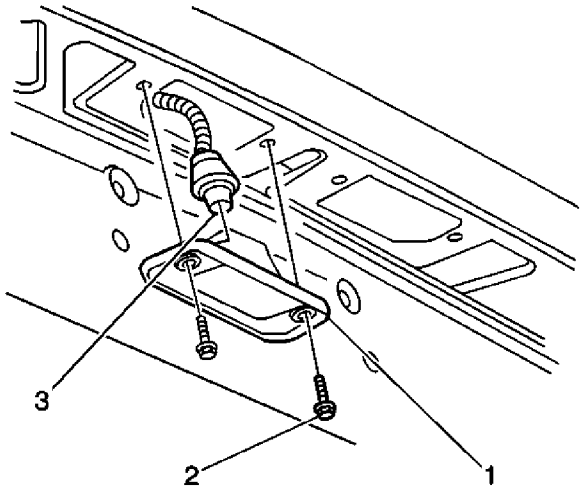
Rear License Plate Lamp Replacement (LeSabre)

Removal Procedure



1. Remove the screws (2) that retain the license plate lamp (1).
2. Remove the bulb/socket (3) from the license lamp (1).

Installation Procedure



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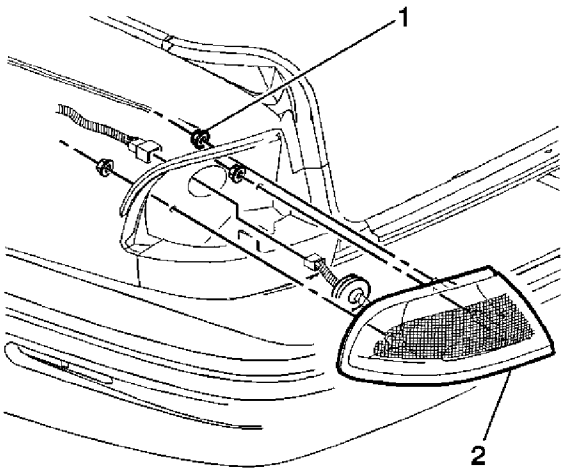
1. Install the bulb/socket (3) to the license lamp (1).
2. Install the screws (2) in order to retain license plate lamp (1).

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Tail Lamp Replacement (LeSabre)

Removal Procedure

1. Remove the rear compartment sill panel trim. Refer to Rear Compartment Sill Trim Plate Replacement .



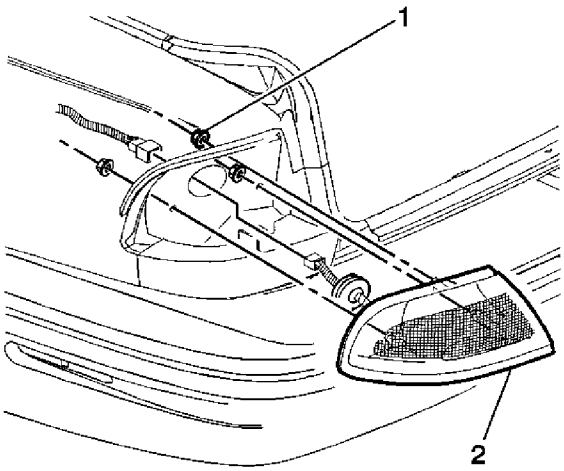


2. Remove the nuts (1) that retain the taillamp (2).
3. Disconnect the lamp harness electrical connector.
4. Remove the taillamp (2).

Installation Procedure

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1. Install the taillamp (2).
2. Connect the lamp harness electrical connector.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

Important: Do not rework or alter the reflective surface of the taillamps (2).

3. Install the nuts (1) in order to retain the taillamp (2).

Tighten
Tighten the nuts (1) to 6 N·m (53 lb in).

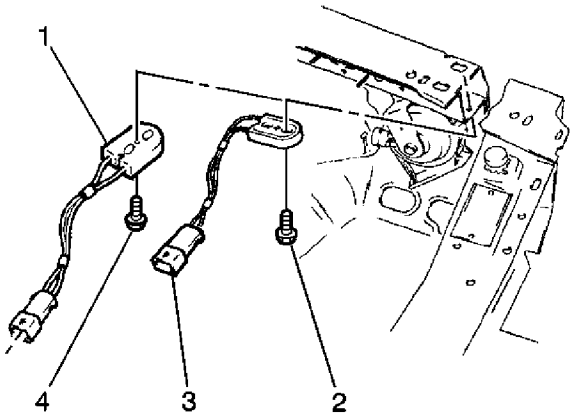
4. Install the rear compartment sill panel trim. Refer to Rear Compartment Sill Trim Plate Replacement .

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Daytime Running Lamps (DRL) Resistor Replacement

Removal Procedure

1. Remove the air cleaner assembly.
2. Remove the PCM cover.



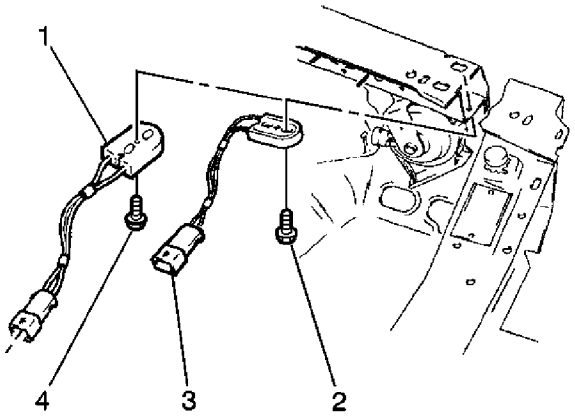


3. Remove the resistor screw (2-Buick,4-Pontiac/Oldsmobile) from the front fender.
4. Disconnect the connector.
5. Remove the daytime running lamp resistor (1-Pontiac/Oldsmobile,3-Buick).

Installation Procedure

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1. Connect the connector to the daytime running lamp resistor (1-Pontiac/Oldsmobile,3-Buick).
2. Connect the daytime running lamp resistor (1-Pontiac/Oldsmobile,3-Buick) to the front fender.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the resistor screw (2-Buick,4-Pontiac/Oldsmobile) to the front fender.

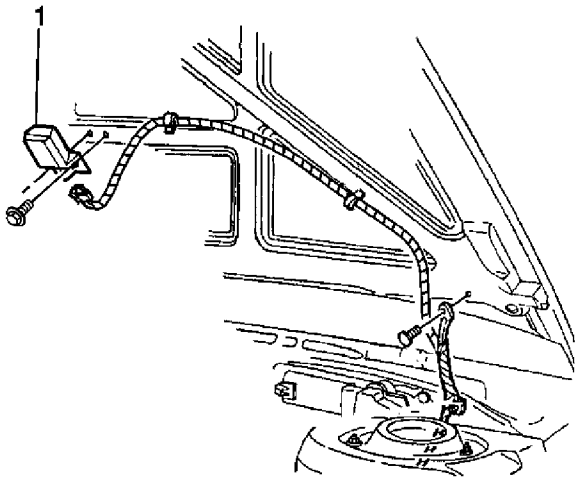
   Tighten
   Tighten the screw (2-Buick,4-Pontiac/Oldsmobile) to 7 N·m (62 lb in).

4. Install the PCM cover.
5. Install the air cleaner assembly.

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Underhood Lamp Replacement

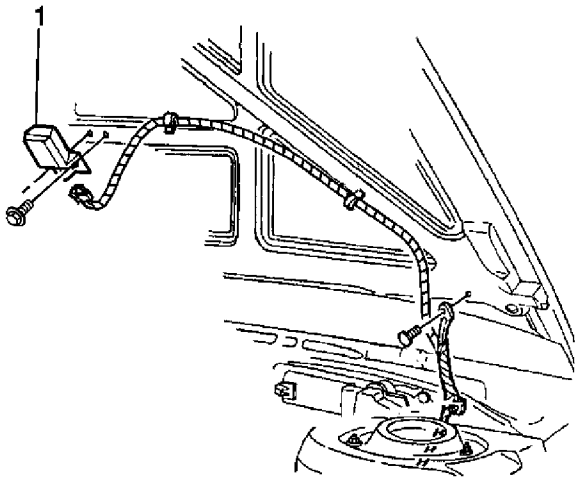
Removal Procedure





1. Disconnect the underhood lamp connector.
2. Remove the bolts that retain the underhood lamp (1) to the hood.
3. Remove the underhood lamp (1).

Installation Procedure



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1. Connect the connector to the underhood lamp (1).
2. Install the underhood lamp (1).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the bolts in order to retain the underhood lamp (1) to the hood.

Tighten
Tighten the bolts to 3 N·m (27 lb in).

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Ashtray Lamp Bulb Replacement

Removal Procedure

1. Pull the ashtray up and out in order to remove the ashtray
2. Squeeze the tangs on each side of the bulb cover in order to remove the bulb cover.

   Pull the bulb sideways in order to release the bulb.

   Twist and pull the bulb cover in order to remove the bulb cover.

3. Pull outward on the bulb in order to remove the bulb.

Installation Procedure

1. Push the bulb into the socket.
2. Squeeze the tangs on both side of the bulb cover in order to install the cover.

   Push the cover in order to secure the cover.

3. Push in and down on the ashtray in order to install the ashtray.

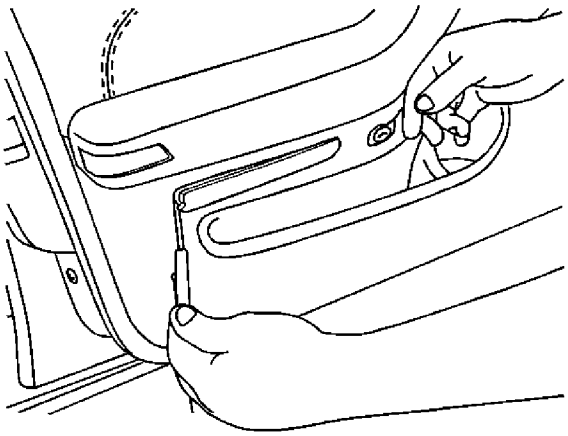
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Door Lamp Replacement

Removal Procedure

Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

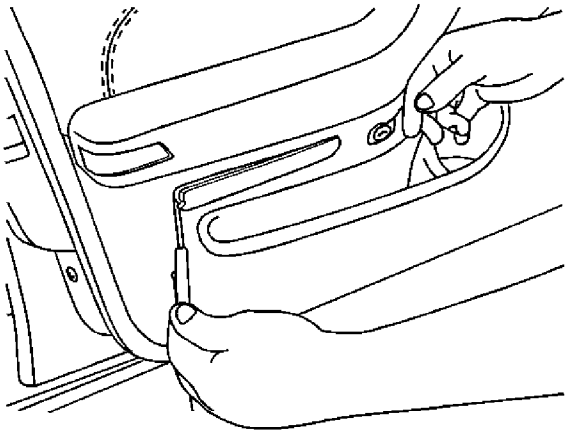


1. Disconnect the negative battery cable.
2. Remove the lamp housing. Insert a flat bladed tool under the forward edge of the housing to depress the retaining clip.
3. Disconnect the electrical connector.
4. Remove the bulbs as necessary. Pliers may be needed in order to rotate the bulbs out of the housing.

Installation Procedure

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1. Install the bulb holders and/or bulbs.
2. Connect the electrical connector.
3. Snap the door lamp housing into the trim panel.
4. Connect the negative battery cable.

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Instrument Panel Courtesy Lamp Bulb Replacement

Removal Procedure

1. Pry the tangs outward at each end of the lens in order to remove the lens.
2. Pull the bulb outward in order to remove the bulb.

Installation Procedure

1. Push the bulb into the socket.
2. Press the lens into place.

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Instrument Panel Compartment Lamp Replacement

Removal Procedure

1. Open the instrument panel compartment door.
2. Remove the lens by prying outward on the ends.
3. Pull the bulb rearward in order to remove the bulb.

Installation Procedure

1. Install the bulb by pushing the bulb into the socket.
2. Install the lens by pressing the corners of the lens into position.
3. Close the instrument panel compartment door.

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Ashtray Lamp Replacement

Removal Procedure

1. Pull the ashtray up and out in order to remove the ashtray.
2. Use the following procedures in order to remove the bulb cover:
   2.1. Squeeze the tangs on each side of the bulb cover.
   2.2. Pull the bulb cover sideways in order to release the bulb cover.
   2.3. Twist and pull the bulb cover.
3. Pull outward in order to remove the bulb.

Installation Procedure

1. Install the bulb by pushing the bulb into the socket.
2. Twist and push the bulb cover in order to install the bulb cover.
3. Squeeze the tangs on each side of the bulb cover.
4. Push the bulb cover in order secure the bulb cover.
5. Install the ashtray by pushing the ashtray in and down.

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Roof Rail Rear Courtesy Lamp Replacement

Removal Procedure

1. Remove the lens by prying outward on the ends.
2. Remove the bulb.

Installation Procedure

1. Install the bulb.
2. Install the lens by pressing on the ends in order to secure the lens.

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Vanity Mirror Lamp Replacement

Removal Procedure

1. Pull the sunshade downward.
2. Remove the lens by prying outward on the ends.
3. Remove the lens.
4. Remove the bulb from the vanity.

Installation Procedure

1. Install the bulb to the vanity.
2. Install the lens to the vanity by pressing the corners of the lens into position.

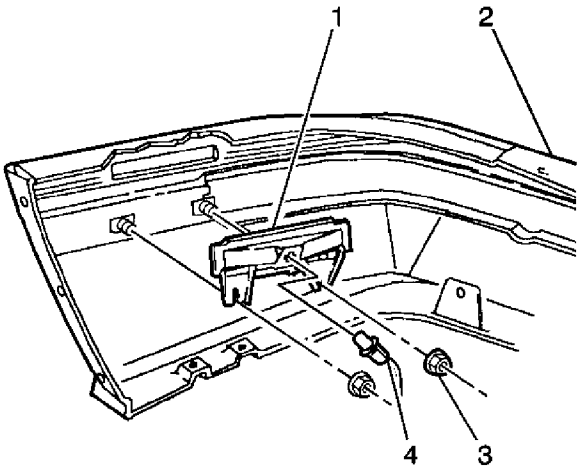
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Side Marker Lamp Replacement (Buick)

Removal Procedure

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.



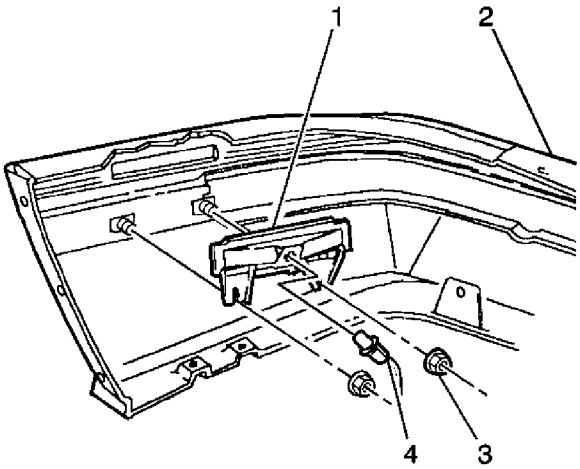


2. Turn the bulb/socket (4) counterclockwise in order to remove the socket from the side marker lamp (1).
3. Remove the nuts (3) that retain the side marker lamp (1) to the rear bumper fascia (2).
4. Remove the side marker lamp (1).

Installation Procedure

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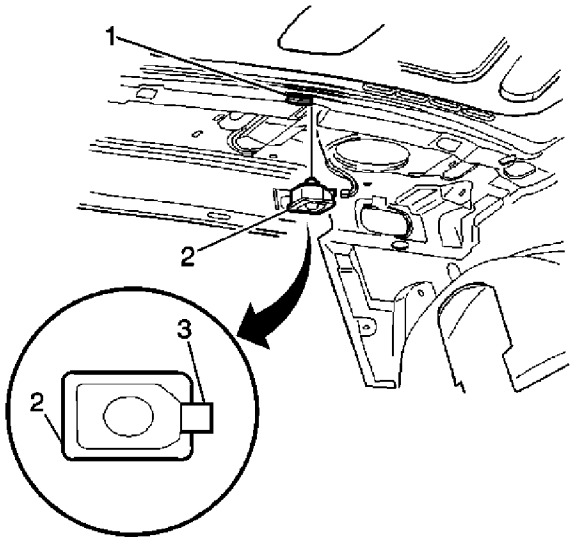


1. Turn the bulb/socket (4) clockwise in order to install the socket to the side marker lamp (1).
2. Install the side marker lamp (1).
3. Install the nuts (3) in order to retain the side marker lamp (1) to the rear bumper fasica (2).
4. Lower the vehicle.

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Rear Compartment Courtesy Lamp Replacement

Removal Procedure



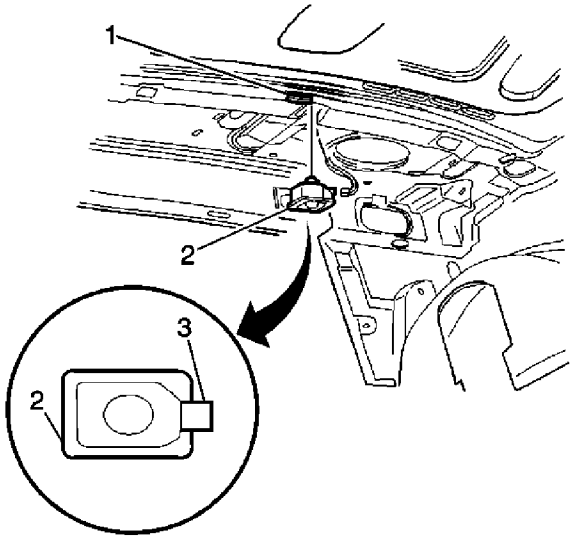


1. Remove the rear compartment courtesy lamp (2) from the rear compartment lid by using the following procedure:
   1.1. Compress the tangs.
   1.2. Pull the lamp through the cutout (1).
2. Disconnect the electrical connector (3).

Installation Procedure

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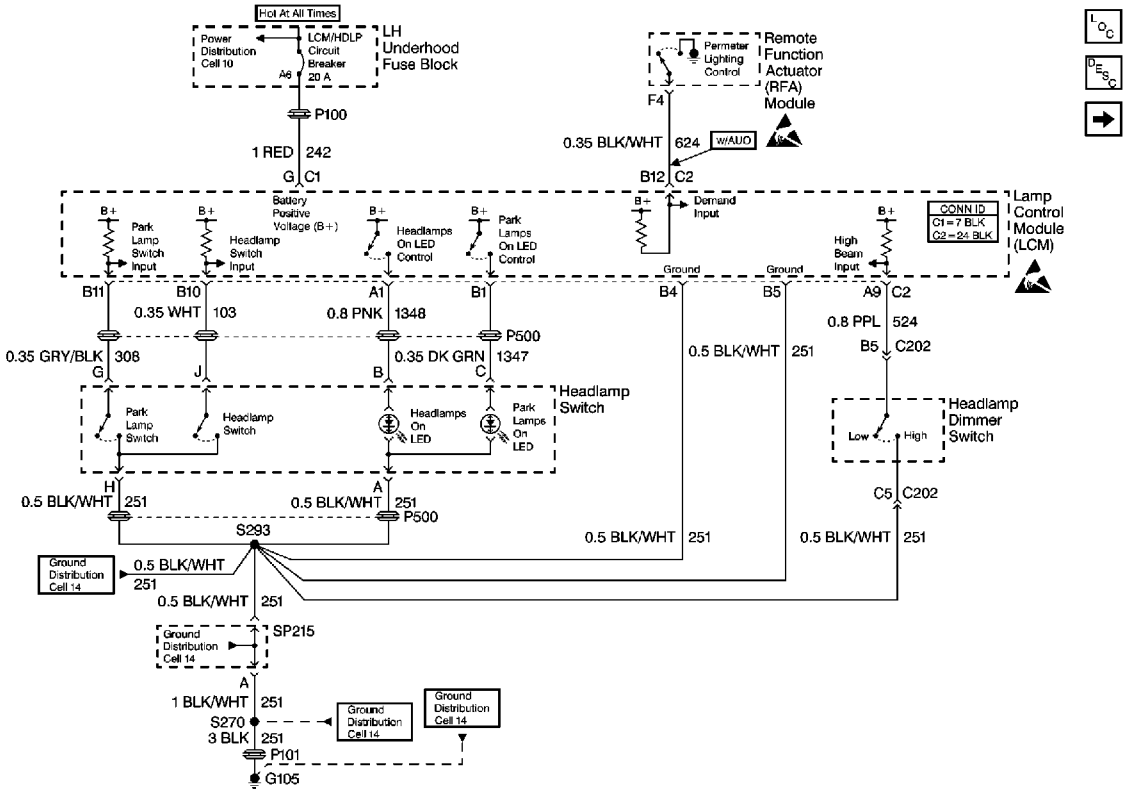


1. Connect the electrical connector (3) to the rear compartment lid courtesy lamp (2).
2. Install the rear compartment courtesy lamp (2) by positioning the lamp assembly into the cutout (1).

   Apply pressure in order to secure the lamp.

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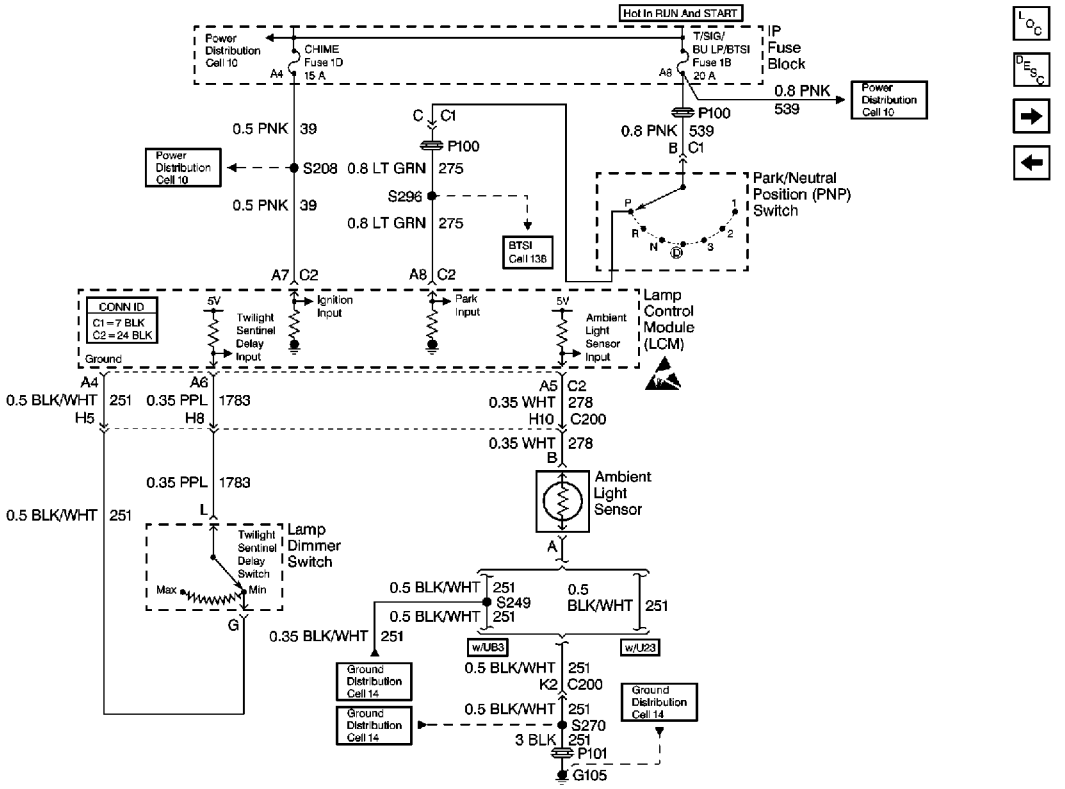
Cell 100: PWR, GND, RFA, Headlamp Switch and Headlamp Dimmer Switch



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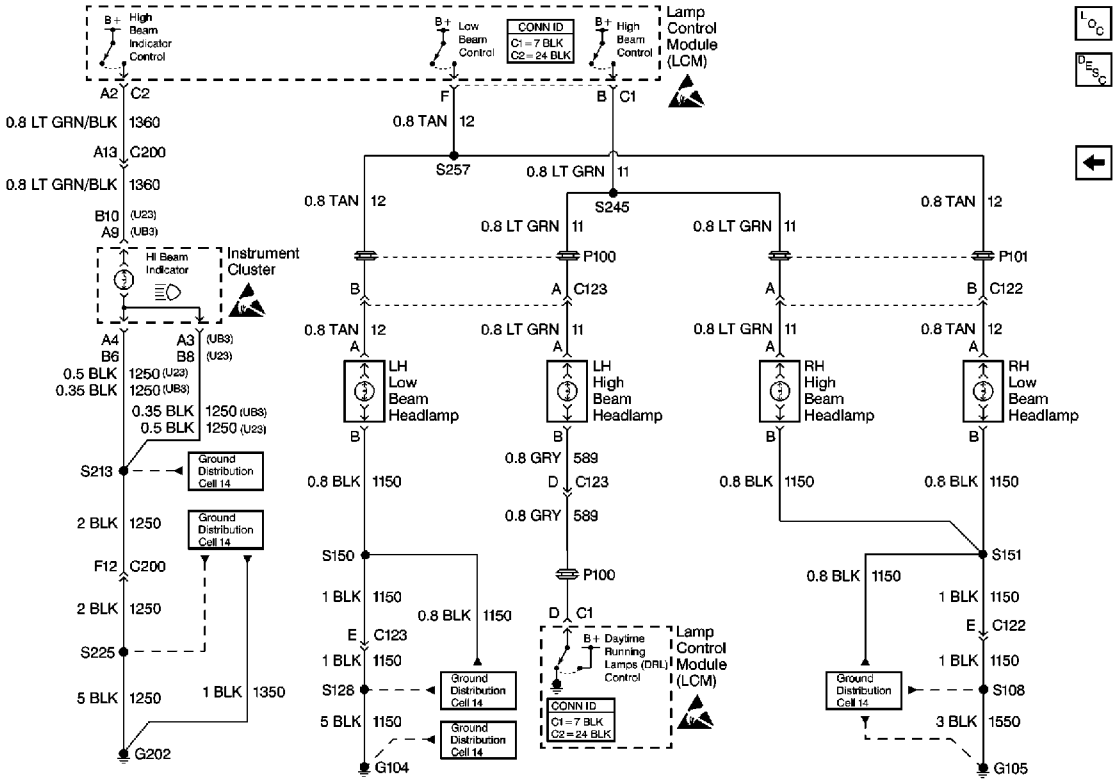
Cell 100: PNP Switch, Twilight Sentinal and Ambient Light Sensor



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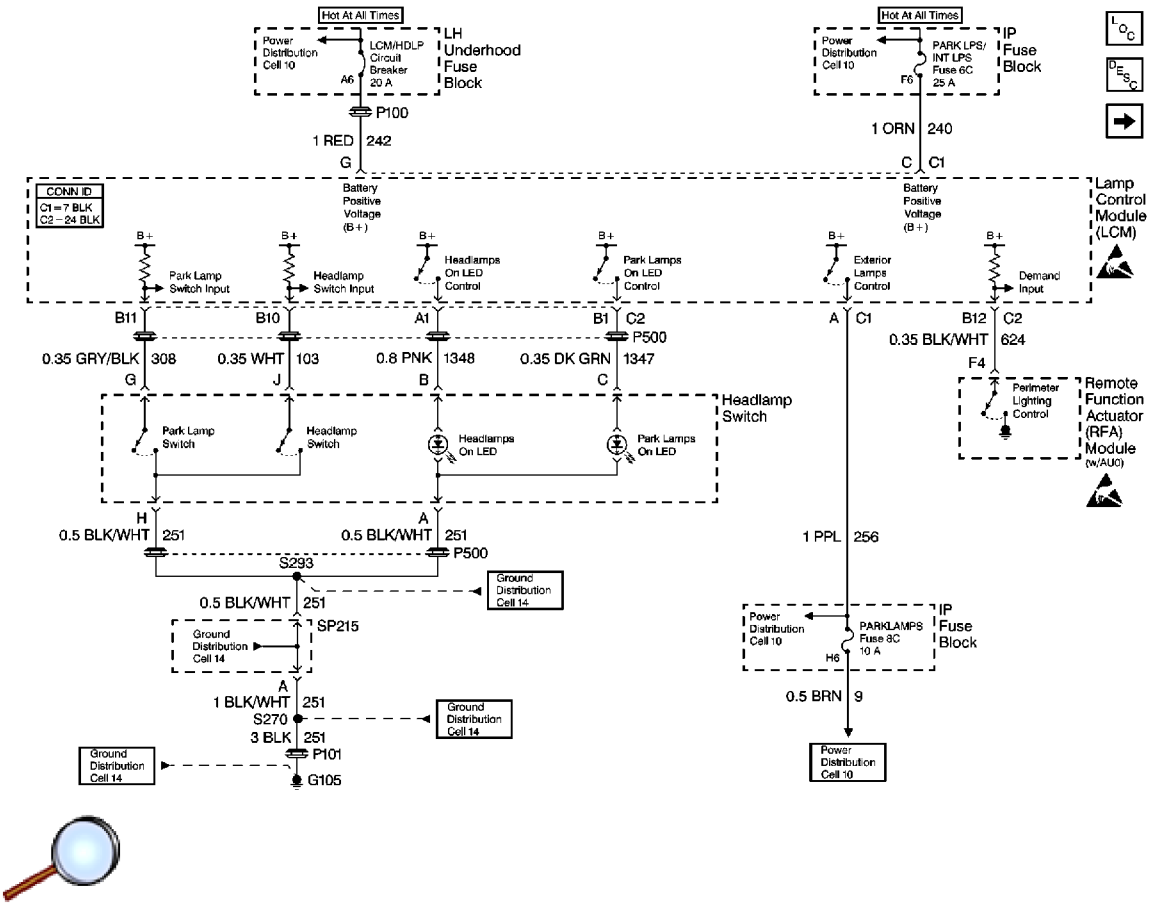
Cell 100: Headlamps and High Beam Indicator



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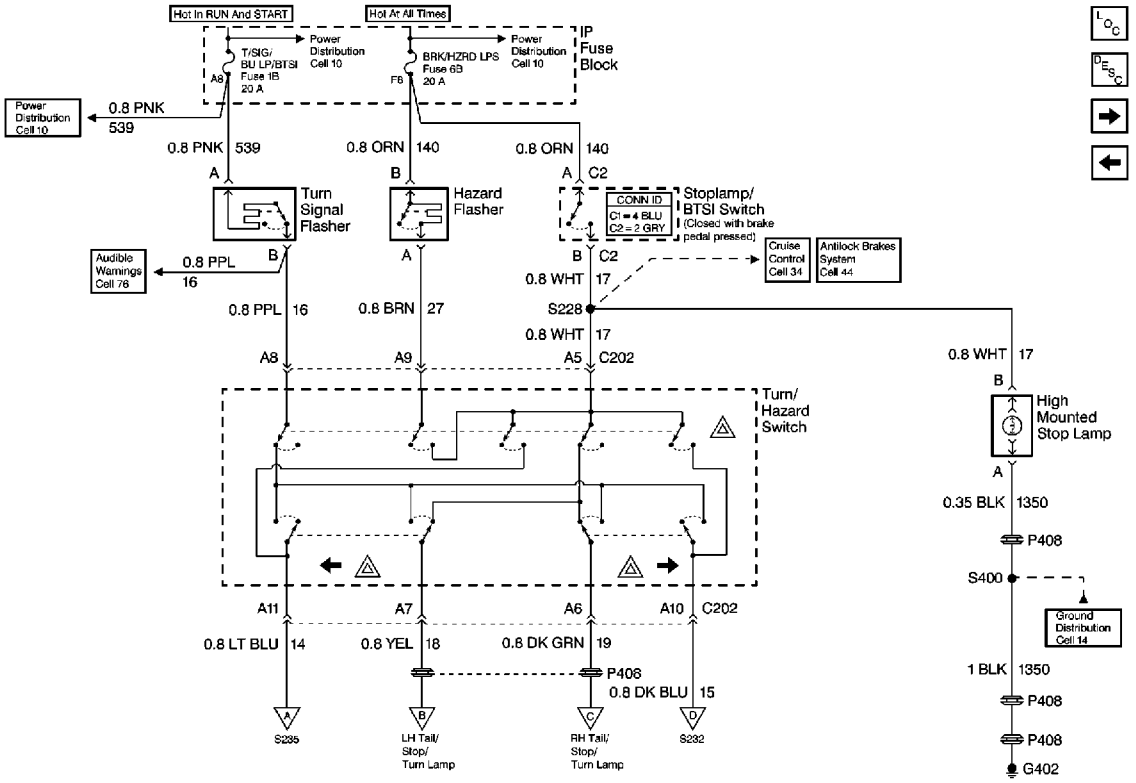
Cell 110: Headlamp Switch, RFA, and Park Lamp Control



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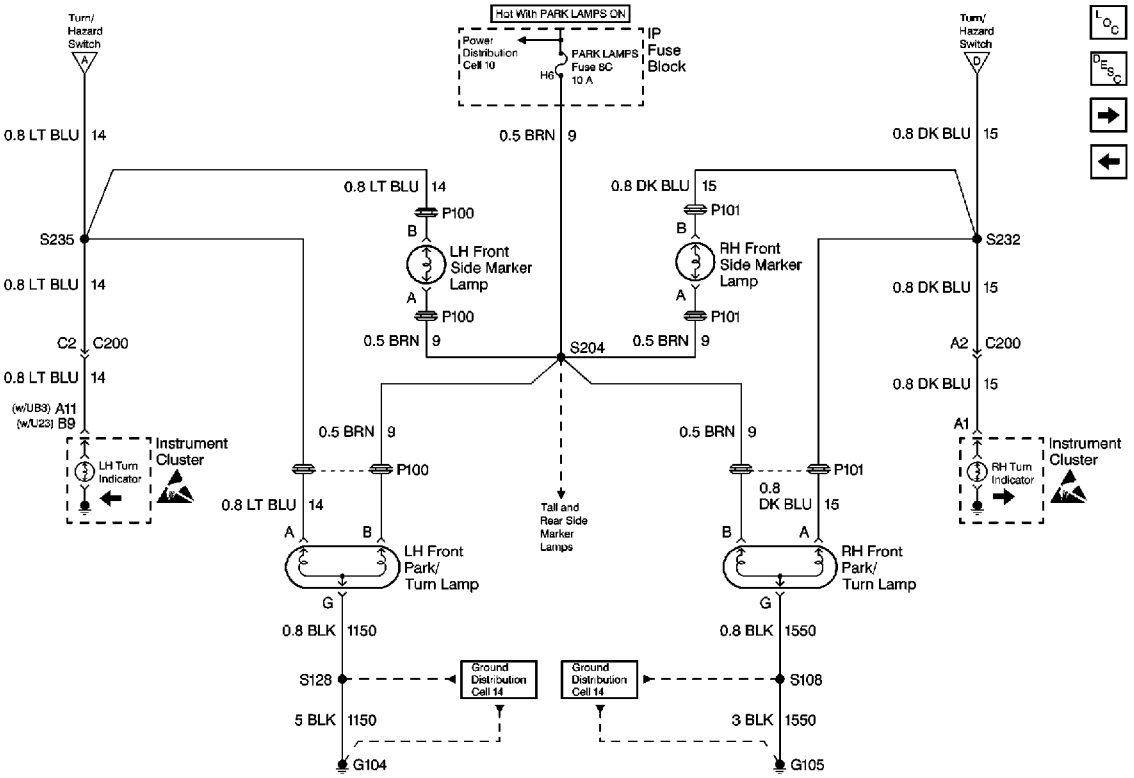
Cell 110: Turn/Hazard Switch and Stoplamp/BTSI Switch



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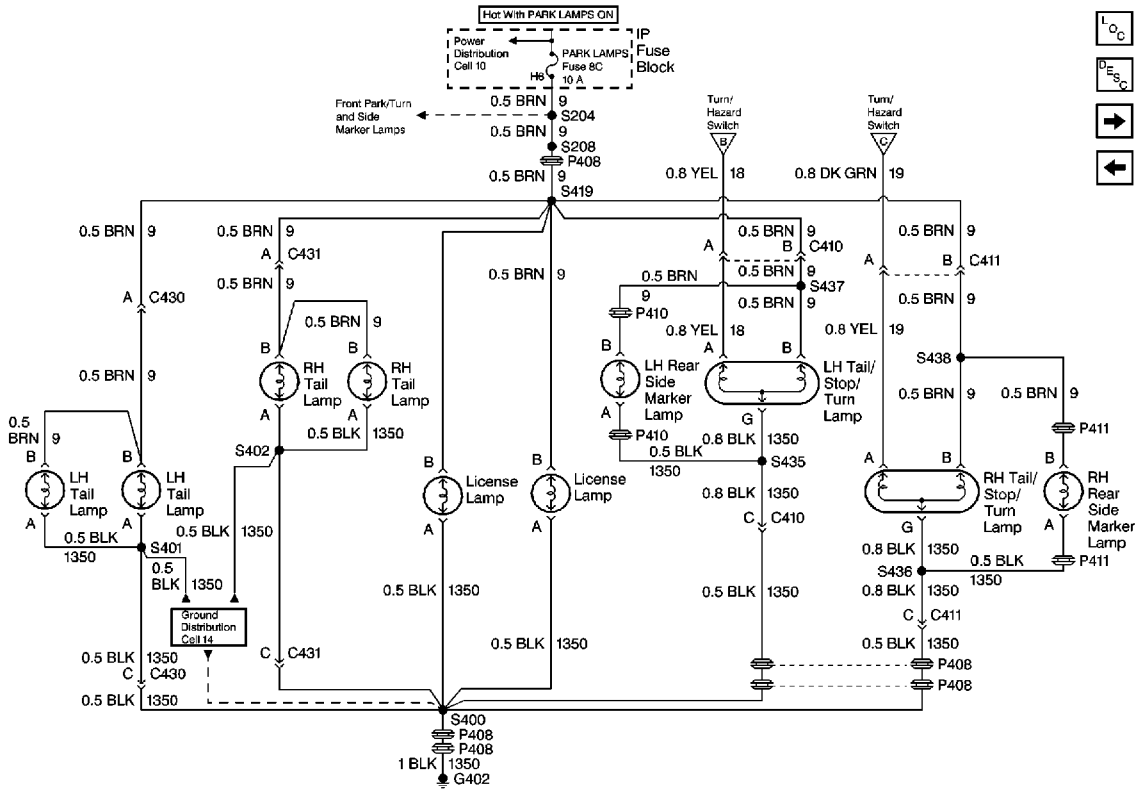
Cell 110: Front Park/Turn and Side Marker Lamps, Turn Indicators



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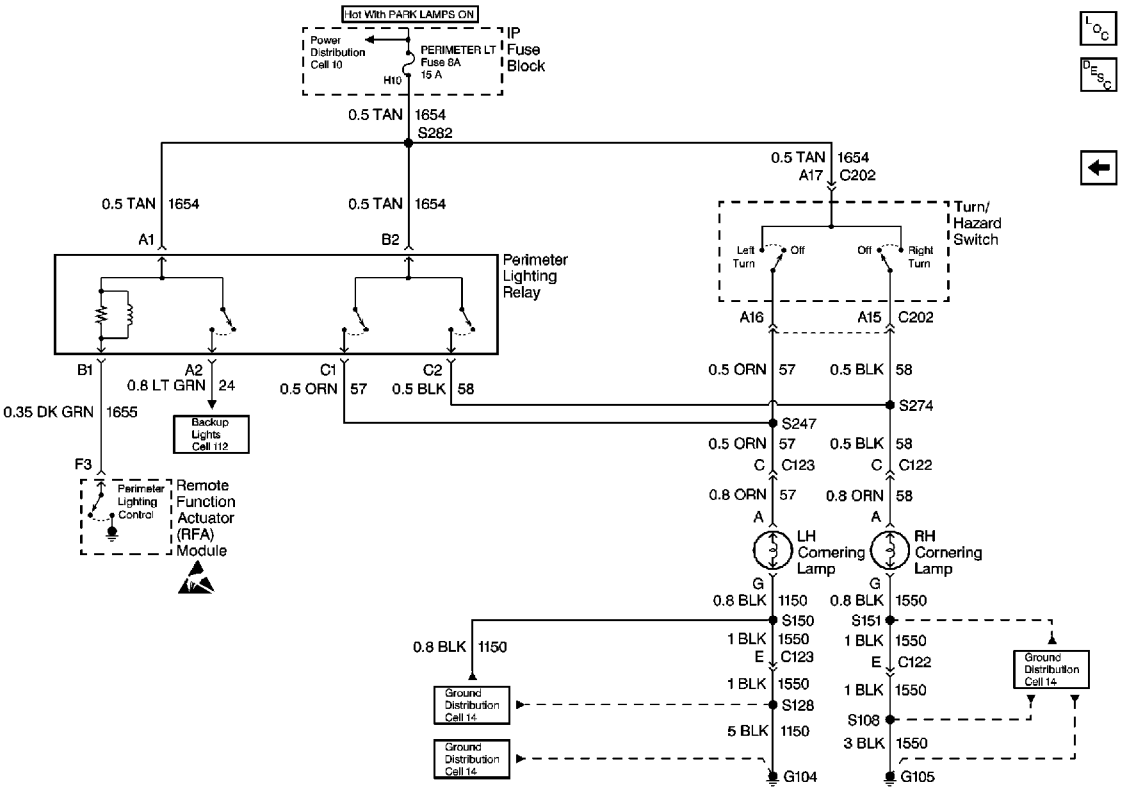
Cell 110: Tail/Stop/Turn, Tail, and Rear Side Marker Lamps



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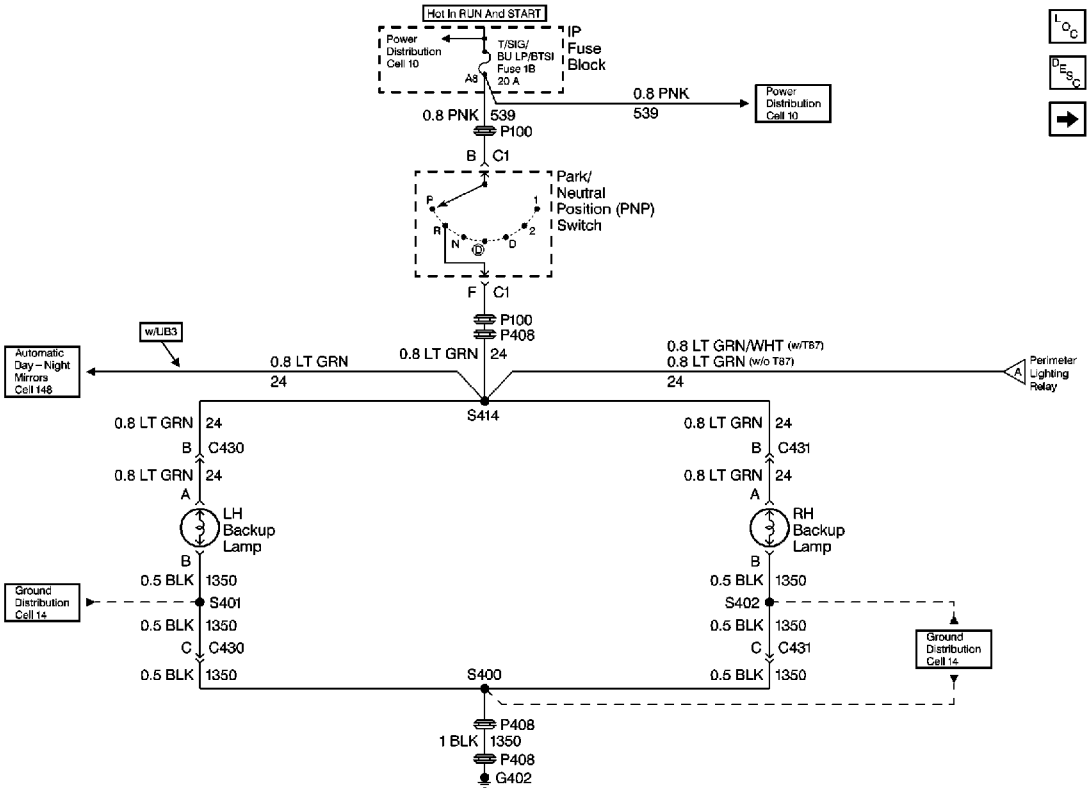
Cell 110: Cornering Lamps w/ T87



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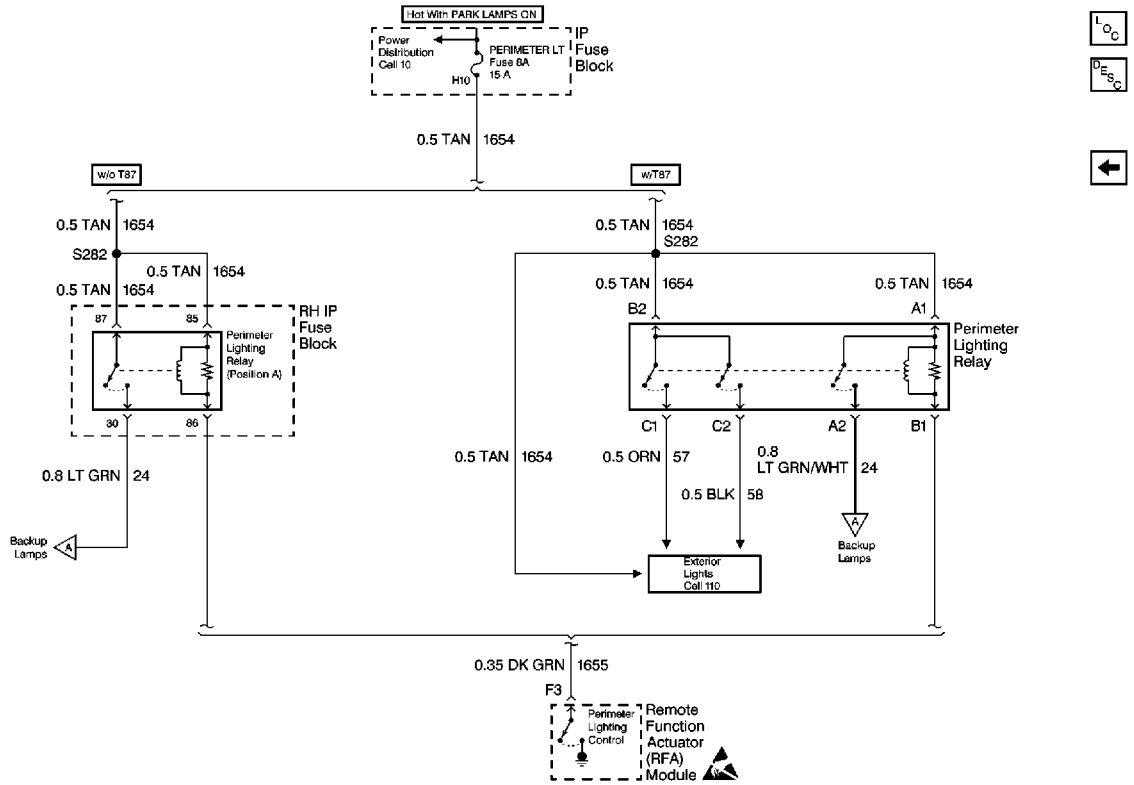
Cell 112: PNP Switch, Backup Lamps, Perimeter Lighting Relay



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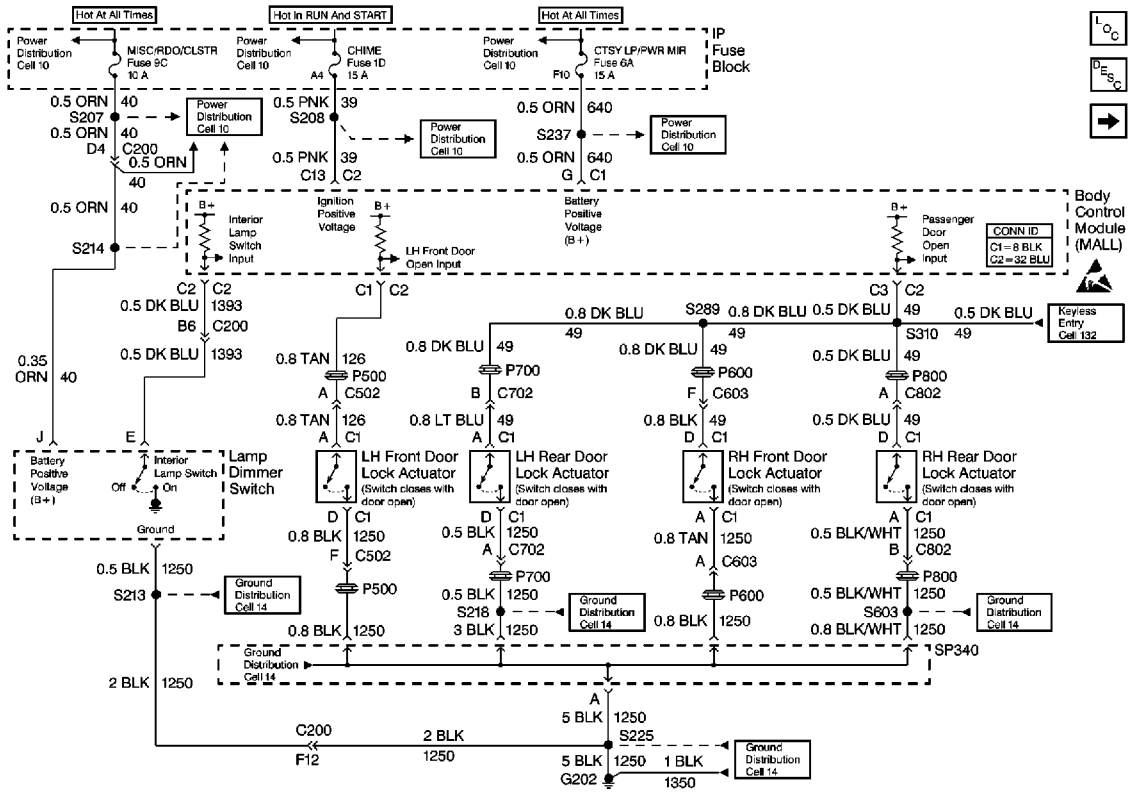
Cell 112: Perimeter Lighting Relay, RFA Module



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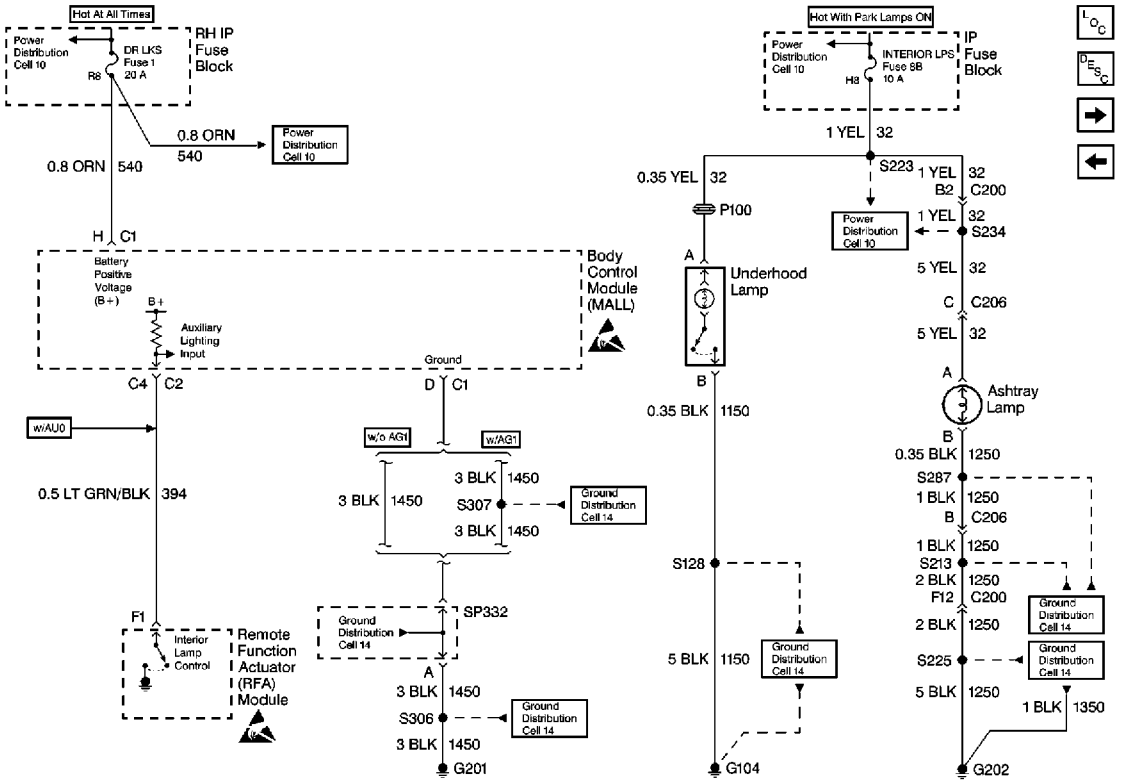
Cell 114: Interior Lamp Switch and Door Open Inputs



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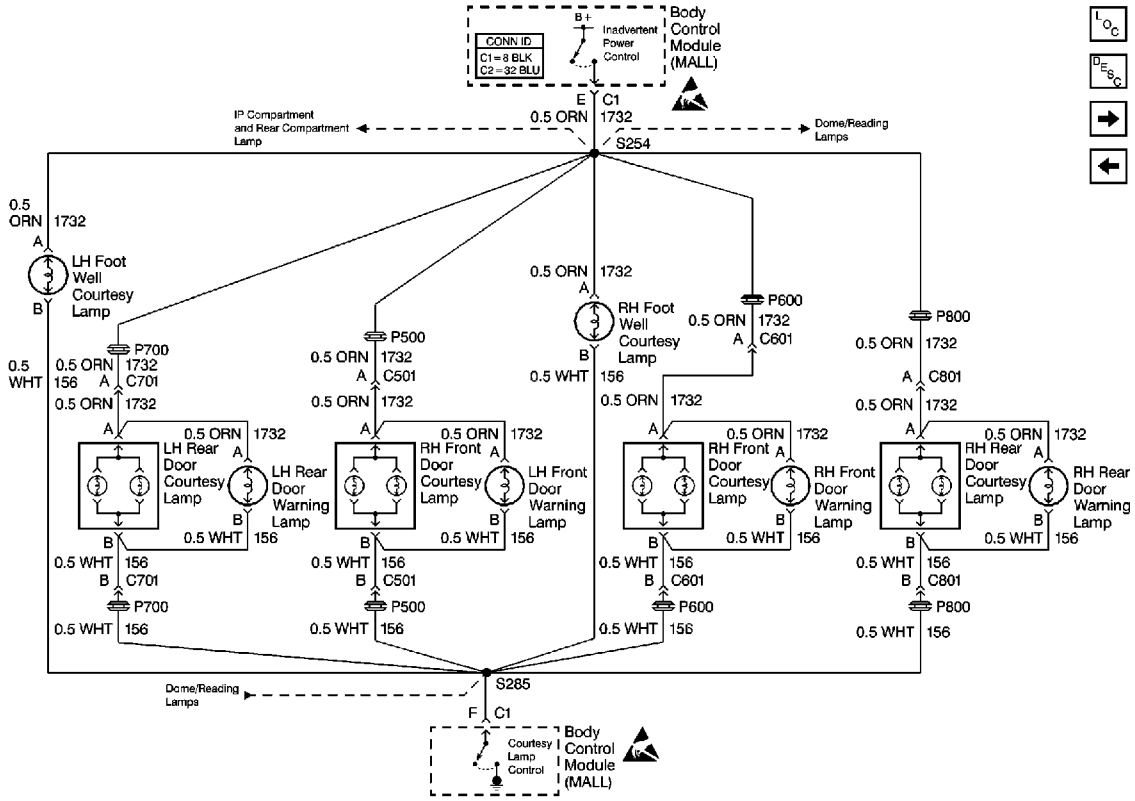
Cell 114: Auxiliary Lighting Input, Underhood Lamp and Ashtray Lamp



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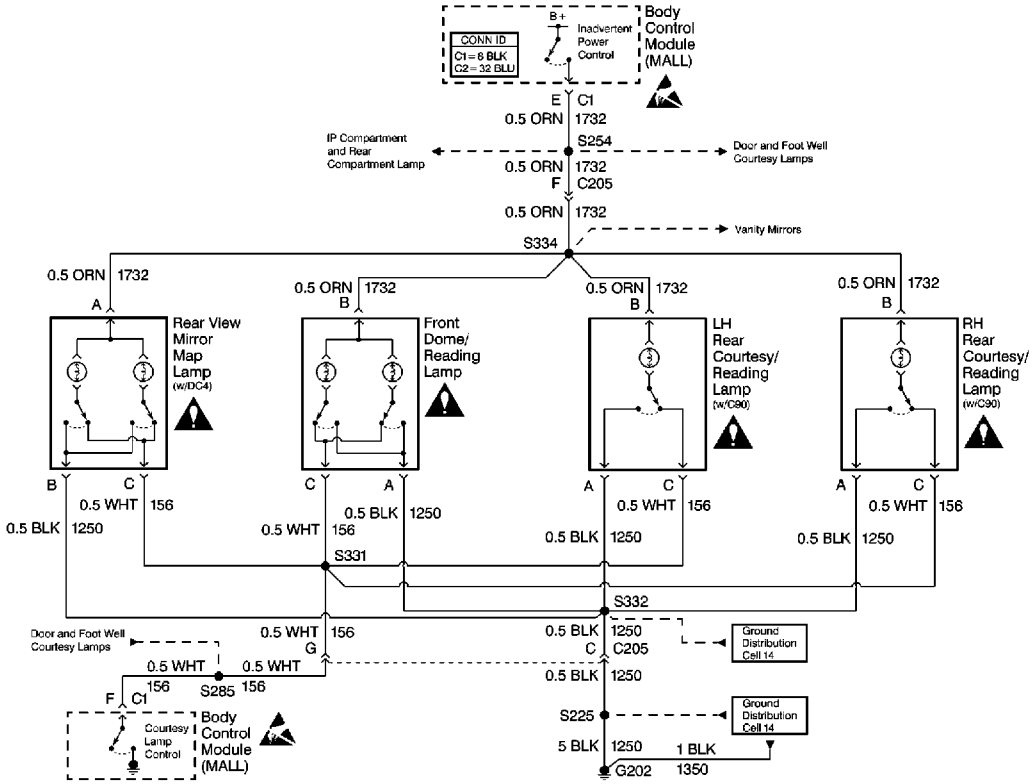
Cell 114: Door and Foot Well Courtesy Lamps



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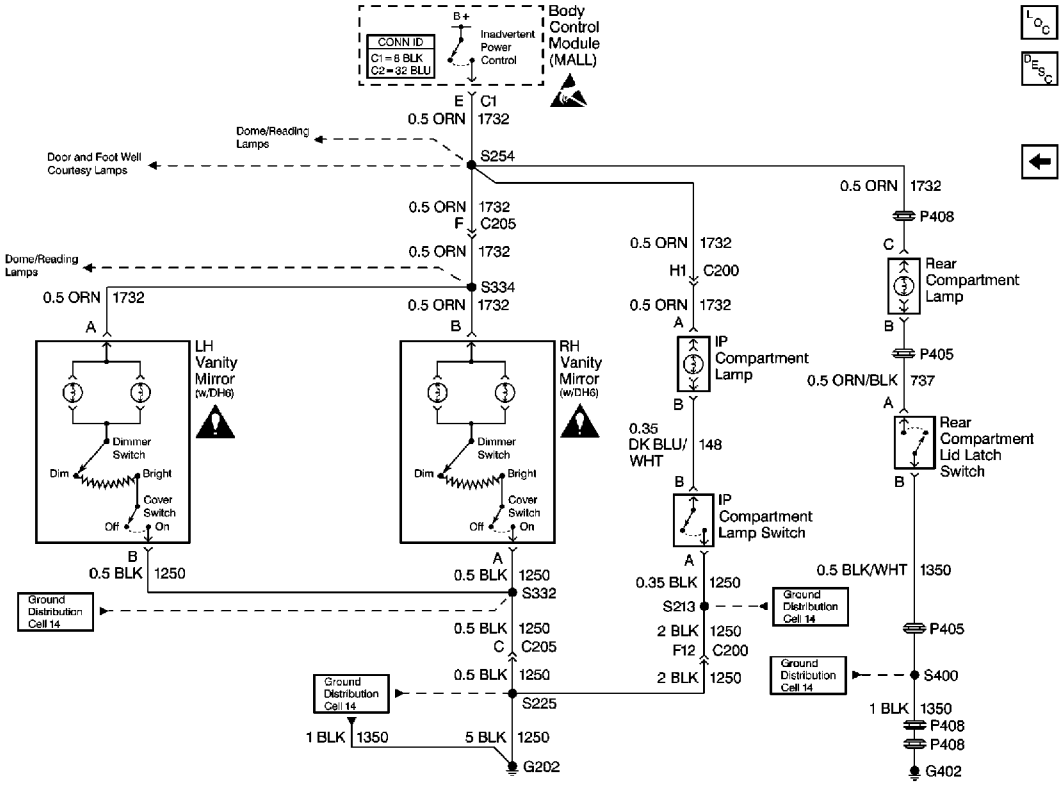
Cell 114: Dome/Reading Lamps



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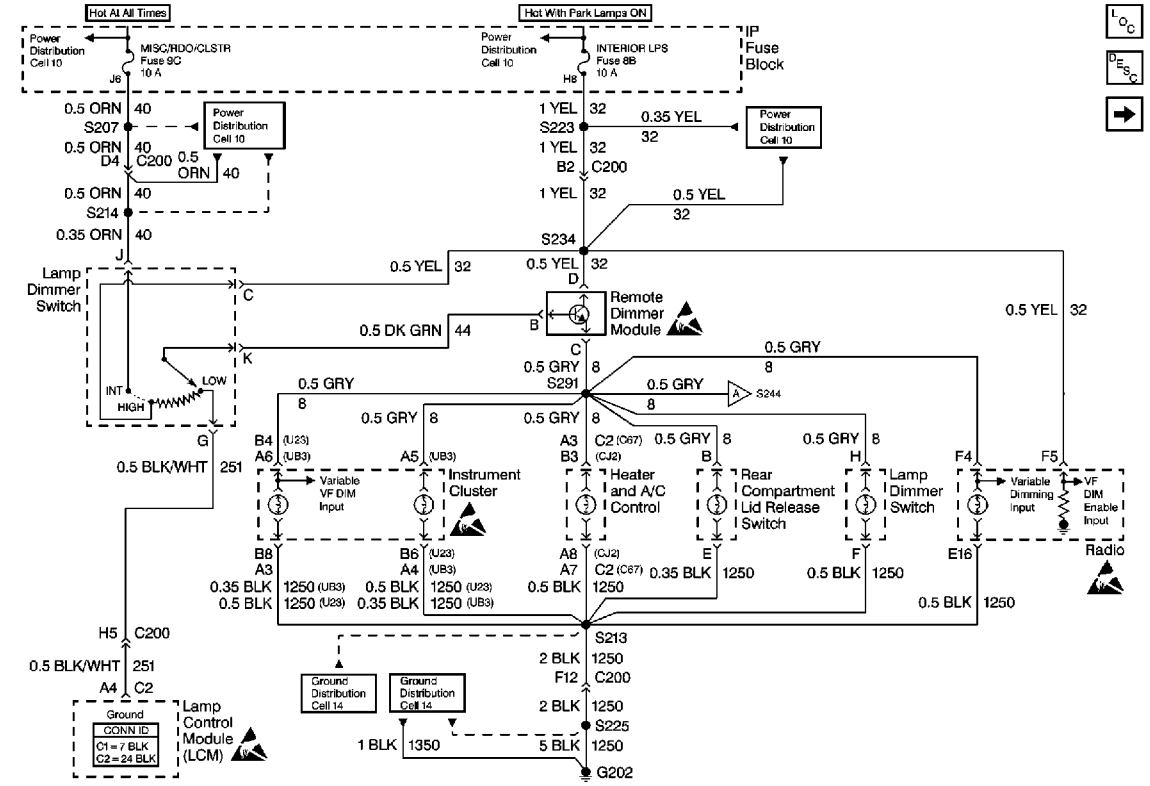
Cell 114: Vanity Mirrors, IP Compartment Lamp and Console Compartment Lamp



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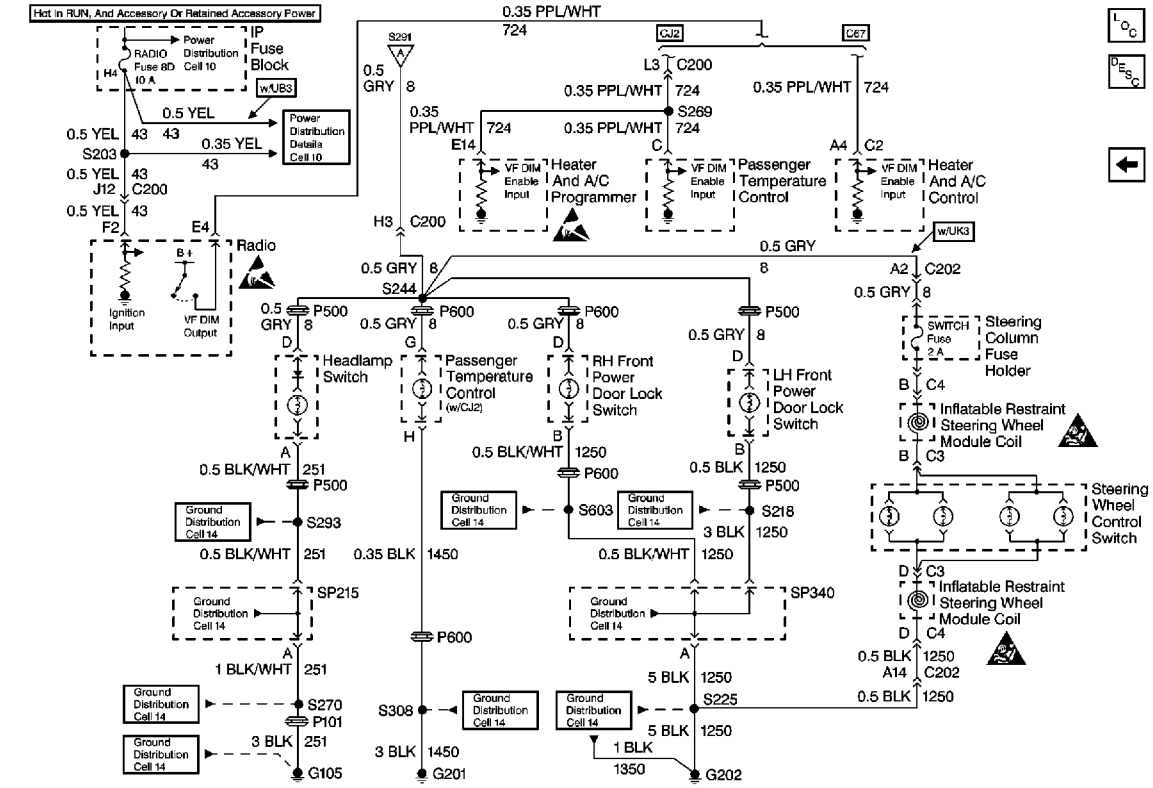
Cell 117: Dimming Control and Incandescent Dimming



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Cell 117: VF Control, Incandescent Dimming (continued)



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Fastener Tightening Specifications

Application	Specification	
	Metric	English
Front Cable: Clip Bolt to Brake Pipe Retainer	6.0 N·m	53 lb in
Intermediate Cable: Retaining Nut at Underbody	22 N·m	16 lb ft
Parking Brake Lever Assembly Attaching Nut	27 N·m	20 lb ft
Parking Brake Switch Bolt	1.9 N·m	17 lb in

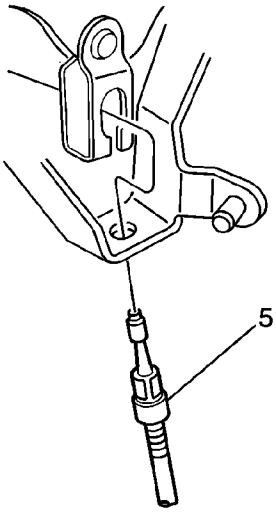
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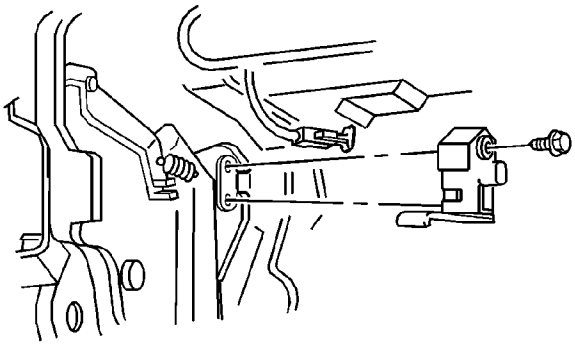
Parking Brake Lever Pedal Assembly Replacement

Removal Procedure

1. Remove the lower I/P trim or the sound insulator panel as needed for access to the lever assembly. Refer to Knee Bolster Replacement in Instrument Panel.
2. Disable the SIR system. Refer to Disabling the SIR System in (SIR) Restraints.



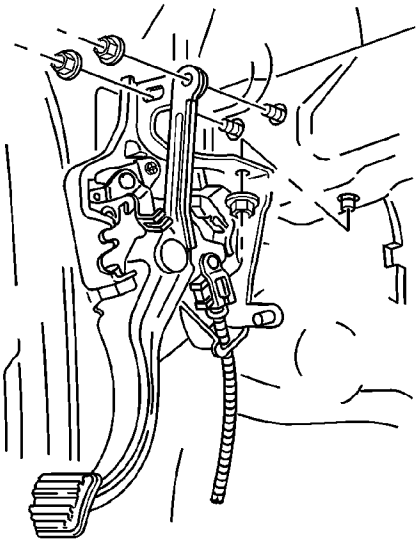
3. Remove the front parking brake cable (5) from the lever assembly after removing the retaining clip.



4. Remove the electrical connector from the parking brake switch.

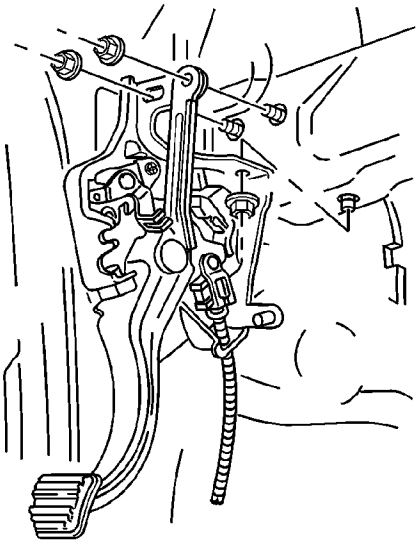
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5. Remove the lever assembly attaching nuts.
6. Remove the lever assembly.

Installation Procedure



1. Install the lever assembly onto the dash panel studs.

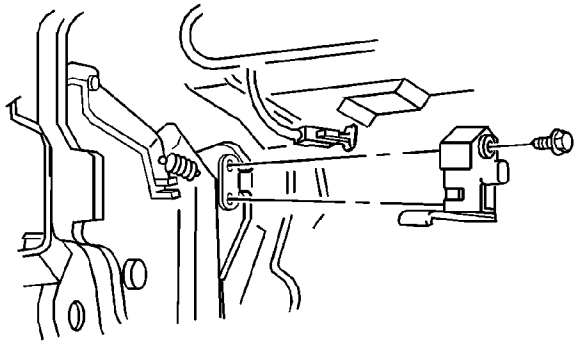
Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and

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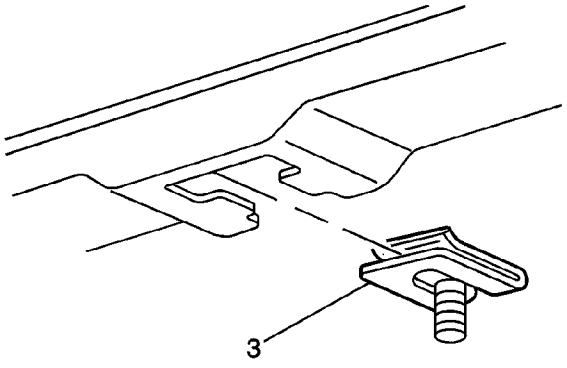
may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the two nuts at the upper rear locations and the nut at lower front location.

Tighten
Tighten the nuts to 27 N·m (20 lb ft).



3. Install the electrical connector to the parking brake switch.



4. Install the front parking brake cable at the lever assembly
5. Install the cable retaining clip (3).
6. Enable the SIR system. Refer to Enabling the SIR System in (SIR) Restraints.

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7. Install the I/P lower trim or the sound insulator panel. Refer to Knee Bolster Replacement in Instrument Panel.
8. Adjust the parking brake cable. Refer to Park Brake Cable Service/Adjustment .

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Parking Brake Cable Inspection

1. If the parking brake is malfunctioning, check for the following conditions:
   - Parking brake cable sticking
   - Parking brake out of adjustment
   - Worn brake linings. Refer to Brake Shoe Inspection .
   - Grease or oil on linings. Refer to Brake Shoe Inspection .
   - Auto-adjuster malfunction. Refer to Brake Shoe Inspection .
2. Inspect the brake linings at regular intervals, and any time the wheels are removed (tire rotation, etc.).
3. Replace the shoe and lining assemblies in the axle sets if the lining thickness is worn to within 0.76 mm (1/32 in) of the shoe or rivet.

GM replacement brake lining material is recommended in order to maintain the balance between front and rear brake performance. Installation of the brake lining material having characteristics different from those of the recommended GM replacement parts can change the intended brake balance of the vehicle.

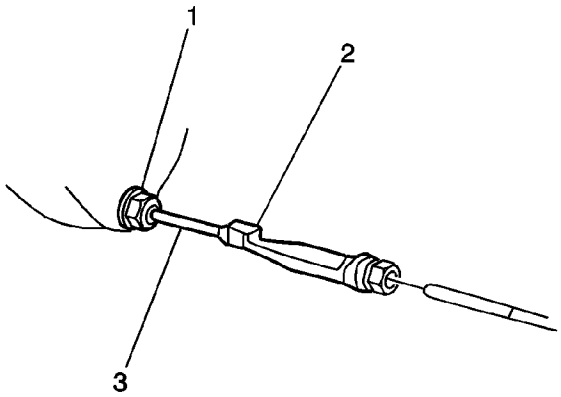
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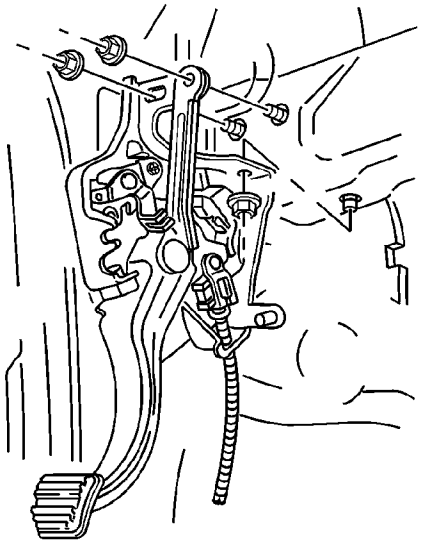
Parking Brake Front Cable Replacement

Removal Procedure

1. Raise the vehicle and suitably support. Refer to Lifting and Jacking the Vehicle in General Information.



2. Loosen the adjuster (2).
3. Disconnect the front cable (3) from the adjuster (2).
4. Disconnect the cable retaining nut (1) at the underbody.



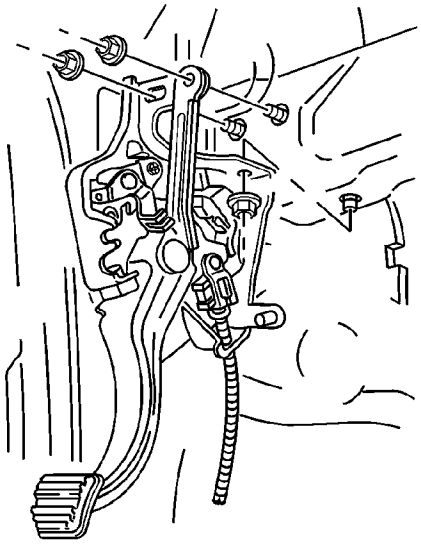
5. Lower the vehicle.

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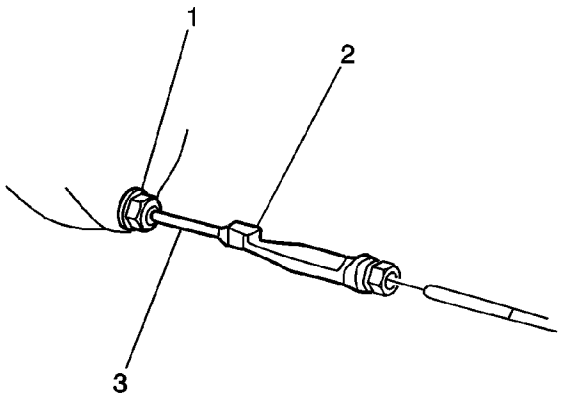
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6. Remove the cable (1) from the lever assembly.

Installation Procedure



1. Connect the cable to the lever assembly.
2. Raise and suitably support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.



Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint

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surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Connect the cable retaining nut (1) at the underbody.

   Tighten
   Tighten nut to 22 N·m (16 lb ft).

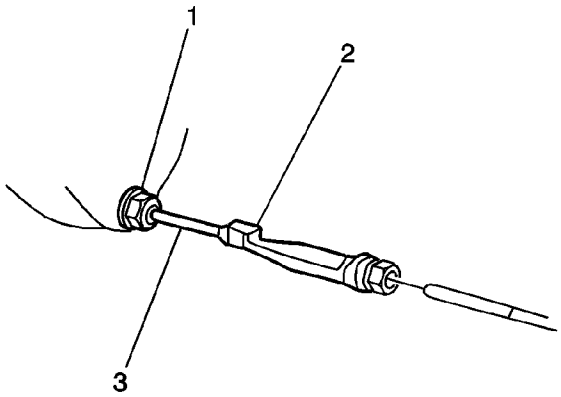
4. Connect the front cable (3) to the adjuster (2).
5. Adjust the parking brake cable. Refer to Brake Shoe Inspection .

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Parking Brake Rear Cable Replacement

Removal Procedure

1. Raise and suitably support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.

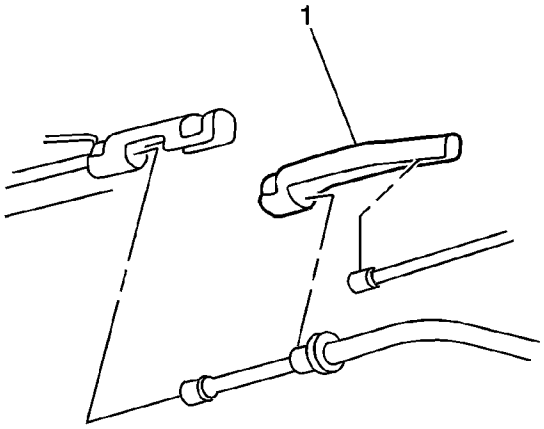




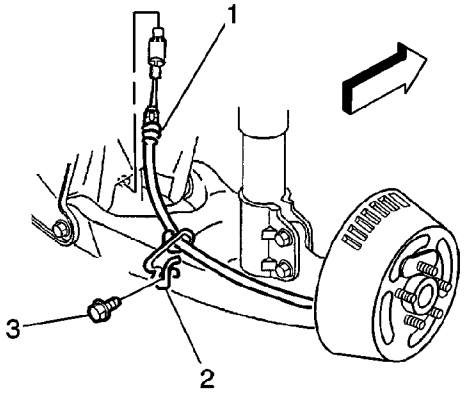
2. Loosen the adjuster nut (1) to release cable tension.
3. Mark the position of the wheel to the wheel studs in the bearing flange.
4. Remove the tire and the wheel. Mark the position of the brake drum to the wheel studs in the bearing flange.
5. Remove the brake drum. Refer to Brake Drum Replacement in Drum Brakes..
6. Disconnect the parking brake cable from the parking brake lever. Refer to Parking Brake Lever Pedal Assembly Replacement .
7. Depress the conduit fitting retaining tangs and remove the conduit fitting from the backing plate.

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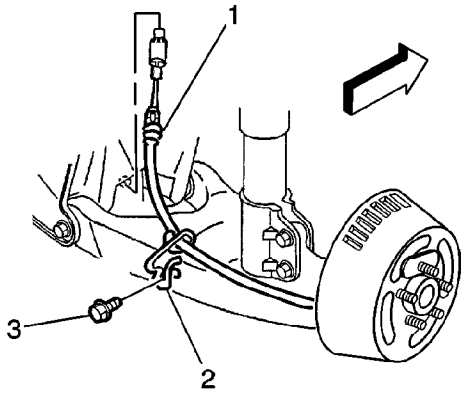
8. Disconnect the cable (1) from the equalizer (2).



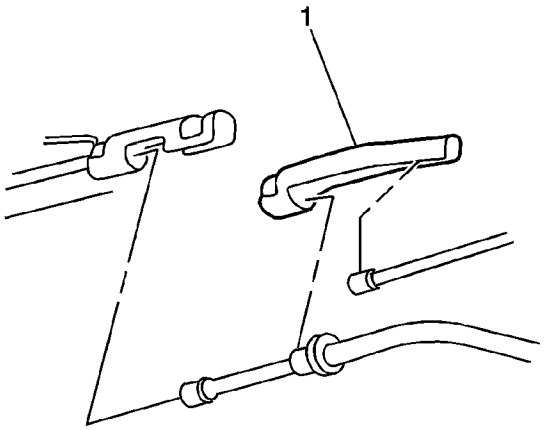
9. Disconnect the cable (3) from the frame retaining hole (1).
10. Disconnect the cable from the rear park brake guide (2).

Installation Procedure

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1. Connect the cable through the rear park brake guide.
2. Install the cable (1) into the retaining hole and snap the cable into place.



3. Connect the cable (1) to the equalizer.
4. Install the conduit fitting into the backing plate.
5. Connect the parking brake cable to the parking brake lever. Refer to Parking Brake Lever Pedal Assembly Replacement .

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

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6. Install the brake drum, the tire and the wheel.

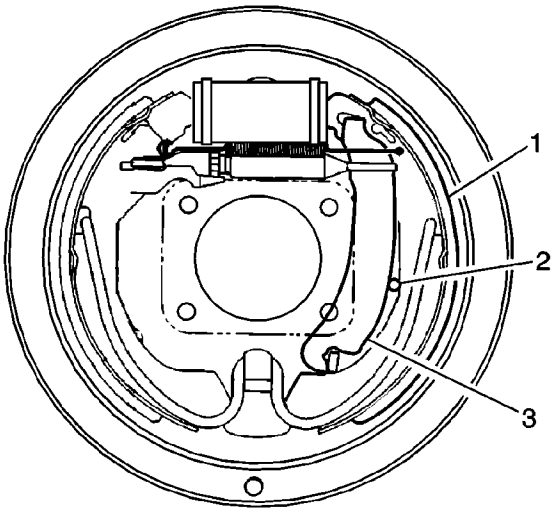
   Tighten
   Tighten wheel nuts to 140 N·m (100 lb ft).

7. Adjust the parking brake cable. Refer to Park Brake Cable Inspection .

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Park Brake Cable Service / Adjustment

1. Adjust the rear brakes. Refer to Drum Brake Adjustment in Drum Brakes.
2. Apply the parking brake to six clicks and release. Repeat this apply/release step five times.
3. Check the parking brake pedal for full release by turning the ignition to ON and checking the BRAKE warning lamp. The lamp should be off. If the lamp is on, verify that the pedal is in the fully released position and pull downward on the front parking brake cable to remove the slack.
4. Raise the vehicle and suitably support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.
5. Remove the access hole plug in the rear brake backing plates.





6. Adjust the parking brake cable until a 1/8-inch drill bit (2) can be inserted through the access hole into the space between the show web and the park brake lever (3). Satisfactory cable adjustment is achieved when a 1/8-inch bit will fit into the space, but a 1/4-inch bit will not.
7. Apply the parking brake one click and check rear wheel rotation. When you try to rotate the wheels by hand in a forward direction, the wheels should not move; in a rearward direction, the wheels should drag or not move.
8. Release the parking brake and check for free wheel rotation.
9. Reinstall the access hole plugs.
10. Lower the vehicle.

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Fastener Tightening Specifications

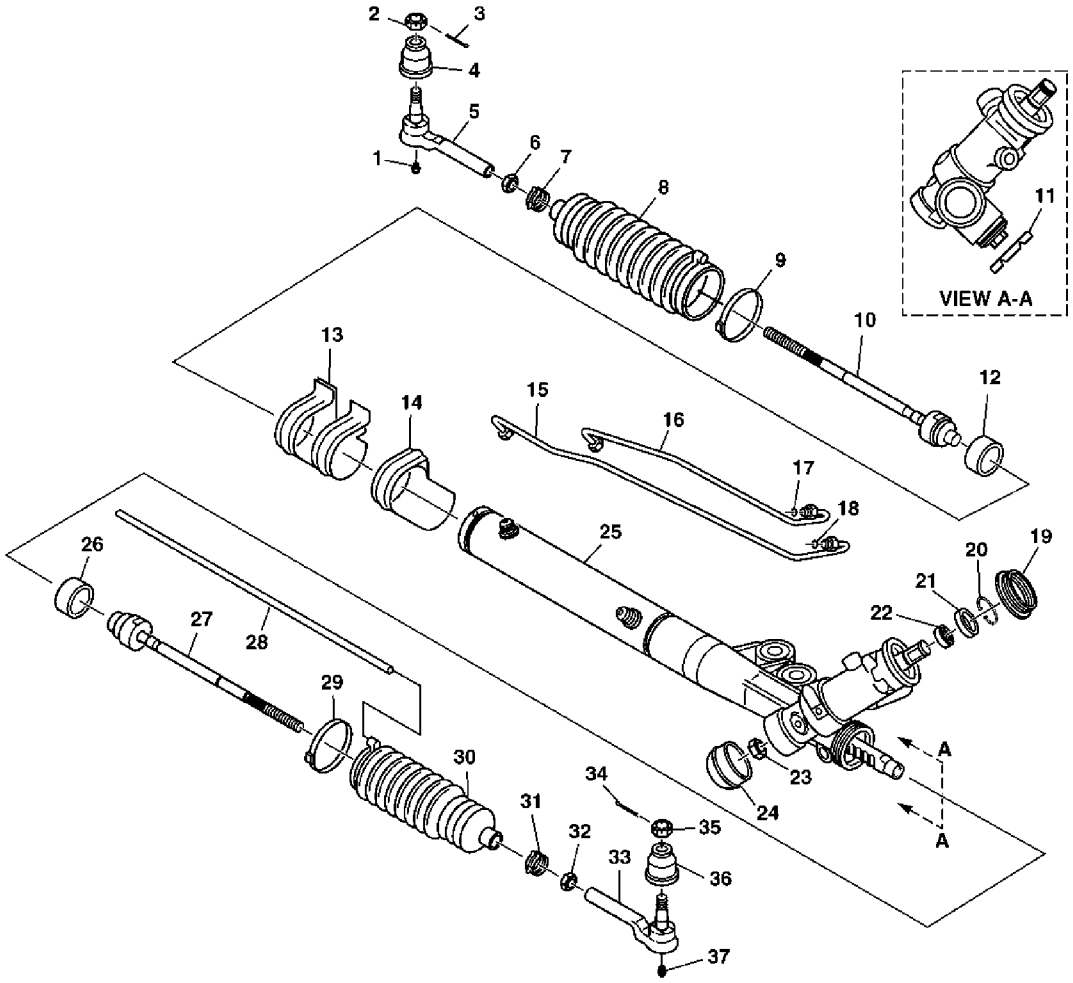
Application	Specification	
	Metric	English
Adjuster Plug Nut	70 N·m	50 lb ft
Cylinder End Fittings	27 N·m	20 lb ft
Frame to Underbody Bolts	191 N·m	141 lb ft
Hexagon Jam Nut	68 N·m	50 lb ft
Hexagon Slotted Nut	47 N·m	35 lb ft
Inlet/Outlet Hose Retainer Bolts	6 N·m	53 lb in
Inner Tie Rod	100 N·m	74 lb ft
Intermediate Steering Shaft Pinch Bolt	47 N·m	lb ft
Outer Hose Retaining Clamp Nuts	21 N·m	15 lb ft
Pinion Preload	1.8 N·m	16 lb ft
Power Steering Gear Hose Fittings to Pump and Steering Gear	27 N·m	20 lb ft
Power Steering Pump Mounting Bolts	27 N·m	20 lb ft
Steering Gear Mounting Bolts	65 N·m	48 lb ft
Valve End Fitting	16.9 N·m	12.6 lb ft

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Power Steering Gear Disassembled View (Quiet Valve)

Quiet Valve Power Steering Gear



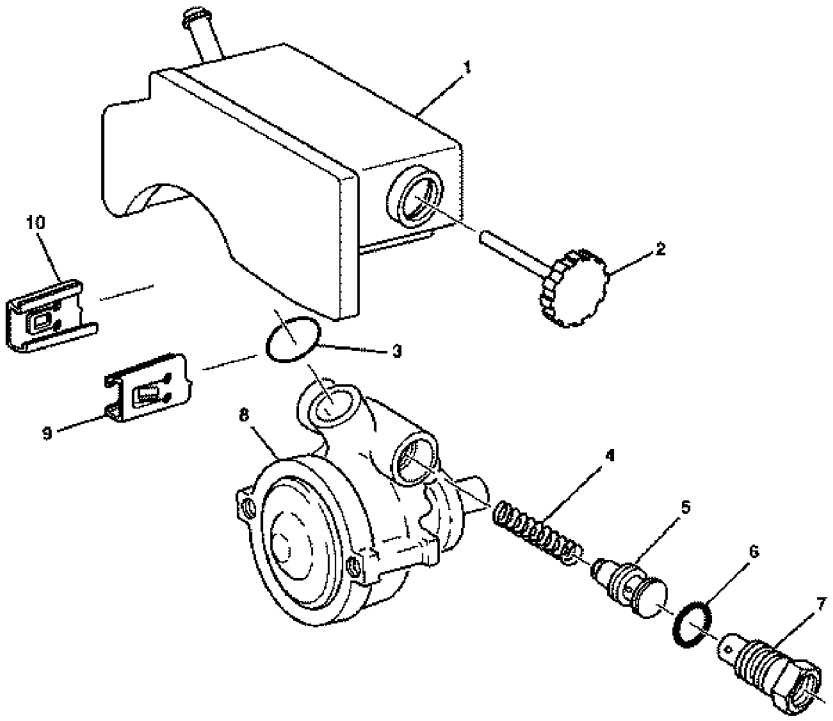
(1) Lubrication Fitting
(2) Hexagon Slotted Nut
(3) Cotter Pin
(4) Tie Rod Seal
(5) Outer Tie Rod
(6) Hexagon Jam Nut
(7) Tie Rod End Clamp
(8) Rack and Pinion Boot
(9) Large Boot Retaining Clamp
(10) Inner Tie Rod

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(11) Adjuster Plug Lock Nut
(12) Shock Dampener Ring
(13) Mounting Bracket Assembly
(14) Mounting Grommet
(15) Cylinder Line (LH)
(16) Cylinder Line (RH)
(17) O-ring Seal
(18) O-ring Seal
(19) Seal Adapter
(20) Retaining Ring
(21) Stub Shaft Seal
(22) Bearing Annulus Assembly
(23) Hexagon Lock Nut
(24) Dust Cover
(25) Rack and Pinion Gear Assembly (Partial)
(26) Shock Dampener Ring
(27) Inner Tie Rod
(28) Breather Tube
(29) Large Retaining Clamp
(30) Rack and Pinion Boot
(31) Tie Rod End Clamp
(32) Hexagon Jam Nut
(33) Outer Tie Rod
(34) Cotter Pin
(35) Hexagon Slotted Nut
(36) Tie Rod Seal
(37) Lubrication Fitting

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Power Steering Pump Disassembled View (CB Series Pump)



(1) Hydraulic Pump Reservoir Assembly (Typical)
(2) Reservoir Capstick Assembly
(3) O-Ring Seal
(4) Flow Control Spring
(5) Control Valve Assembly
(6) O-Ring Seal
(7) O-Ring Union Fitting
(8) Hydraulic Pump Housing Assembly
(9) Reservoir Retaining Clip (RH)
(10) Reservoir Retaining Clip (LH)

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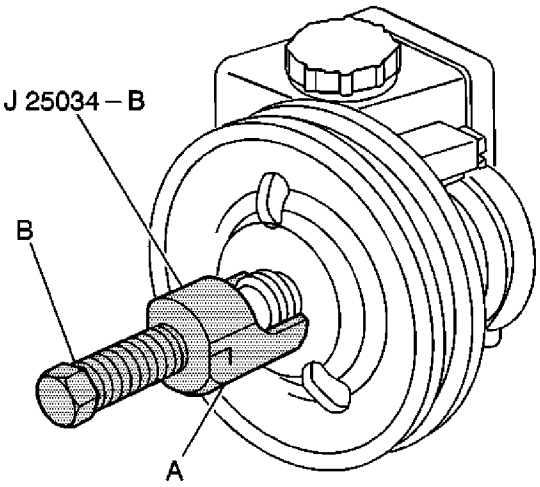
Power Steering Pump Pulley Replacement

Removal Procedure

Tools Required

J 25034-C Pulley Remover

1. Remove the pump drive belts. Refer to Drive Belt Replacement in Engine Mechanical.
2. Remove the pump from the engine. Refer to Power Steering Pump Replacement .



3. Use the J 25034-C in order to remove the pulley from the pump.

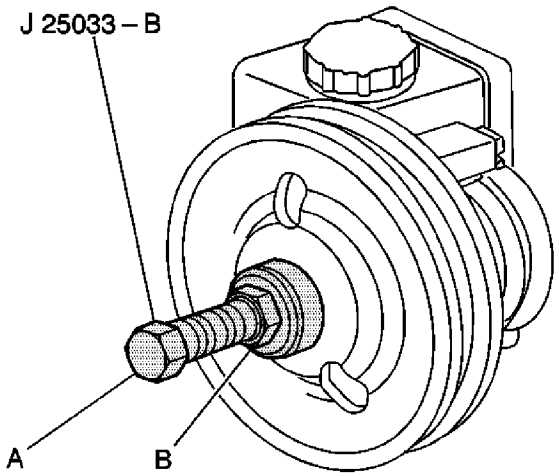
Installation Procedure

Tools Required

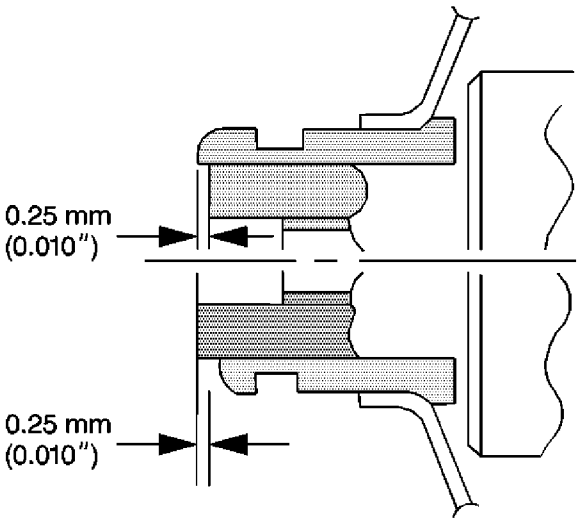
J 25033-C Pulley Installer

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1. Use the J 25033-C in order to install the pulley onto the pump.

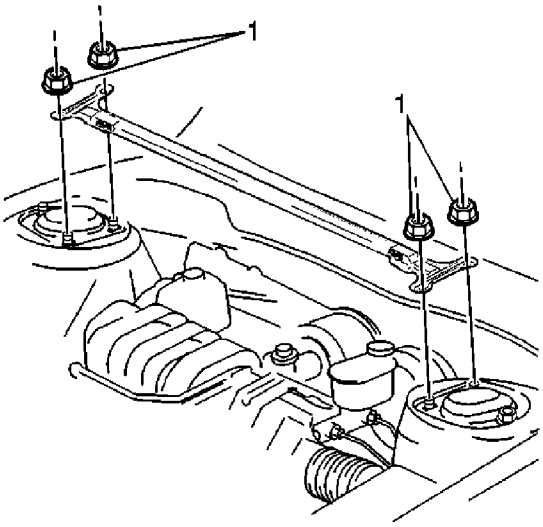


2. Axial tolerance of the pulley on the pump shaft is -0.25 mm to 0.25 mm (-0.010 in to 0.010 in).
3. Install the pump to the engine. Refer to Power Steering Pump Replacement .
4. Install the pump drive belt. Refer to Drive Belt Replacement in Engine Mechanical.
5. Bleed the power steering system.
6. Inspect the system for leaks.

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Power Steering Pump Replacement

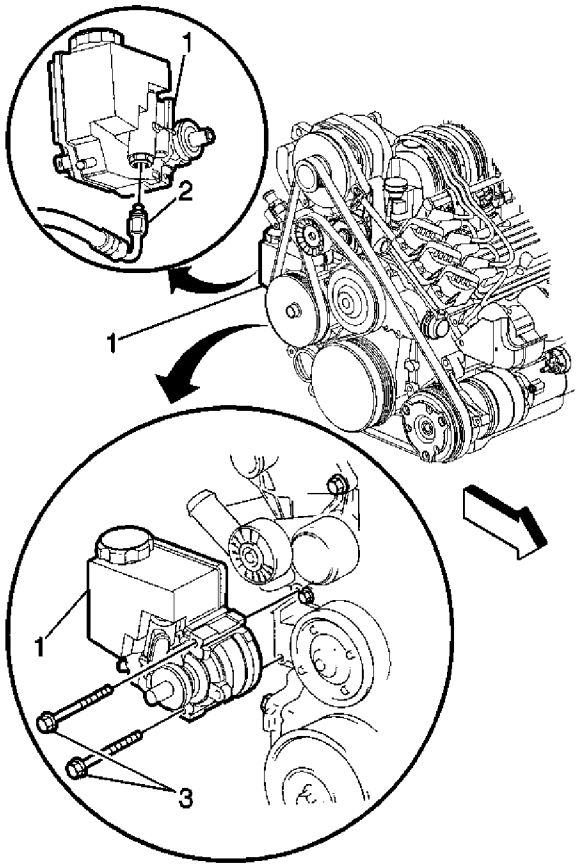
Removal Procedure



1. Remove the following components as needed:
   - The strut housing upper tie bar nuts (1)
   - The strut housing upper tie bar
2. Remove the pump drive belt(s). Refer to Drive Belt Replacement in Engine Mechanical.

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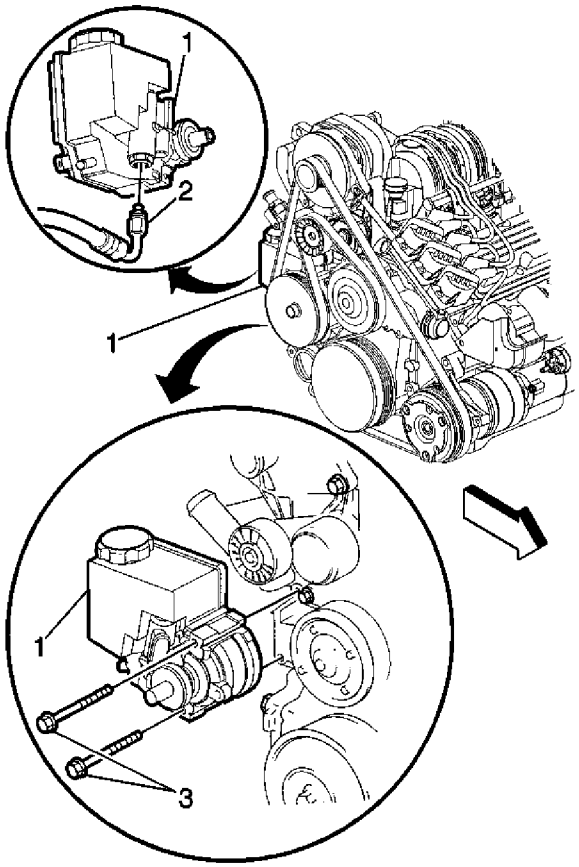
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3. Remove the lower bolt (3) from the mounting bracket.
4. Remove the following hoses (2) from the pump (1):
   - The power steering gear outlet hose
   - The power steering gear inlet hose
5. Remove the pump (1). On L36 and L67 engines, access the pump area from beneath the engine.
6. Remove the transfer pulley, as needed.

Installation Procedure

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1. Hand-start the power steering gear inlet hose connection to the pump (1).
2. Install the lower bolt (3).

   Hand tighten the lower bolt (3).

   Important: Provide a clearance of 2-5 mm (0.080-0.200 in) between the hose and the heater pipes. Contact may cause noise after the installation.

3. Connect the pump (1) with the pulley.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

   Important: Route the hose outboard and to the following places:
   - Under the engine harness
   - Under the heater hoses

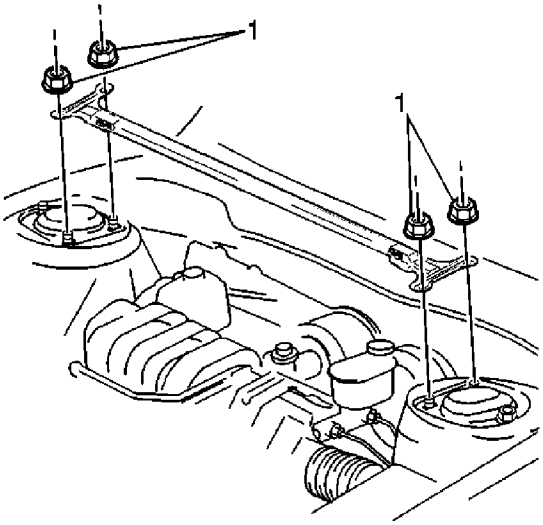
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4. Connect the power steering gear outlet hose (2) to the pump.

Tighten

- Tighten the power steering gear inlet hose (2) to pump, to 27 N·m (20 lb ft).
- Tighten the hose clamp at the pump to 1.7 N·m (15 lb in).
- Tighten the pump mounting bolts (3) to 30 N·m (22 lb ft).

5. Install the pump drive belt(s). Refer to Drive Belt Replacement in Engine Mechanical.



6. Install the following components, as needed:
   - The strut housing upper tie bar
   - The strut housing upper tie bar nuts (1)

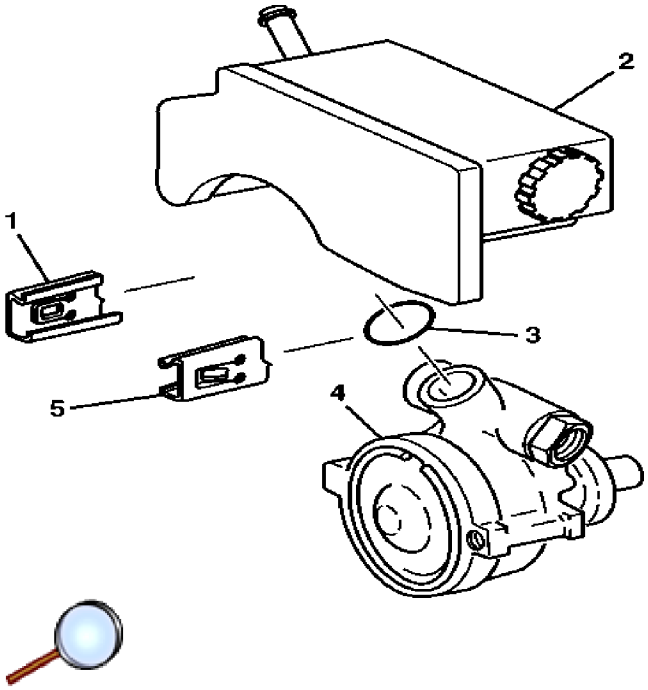
Tighten
Tighten the nuts (1) to 25 N·m (18 lb ft).

7. Fill the system.
8. Bleed the system. Refer to Power Steering System Bleeding .
9. Inspect the system for leaks.

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Power Steering Fluid Reservoir Replacement - Off Vehicle

Disassembly Procedure

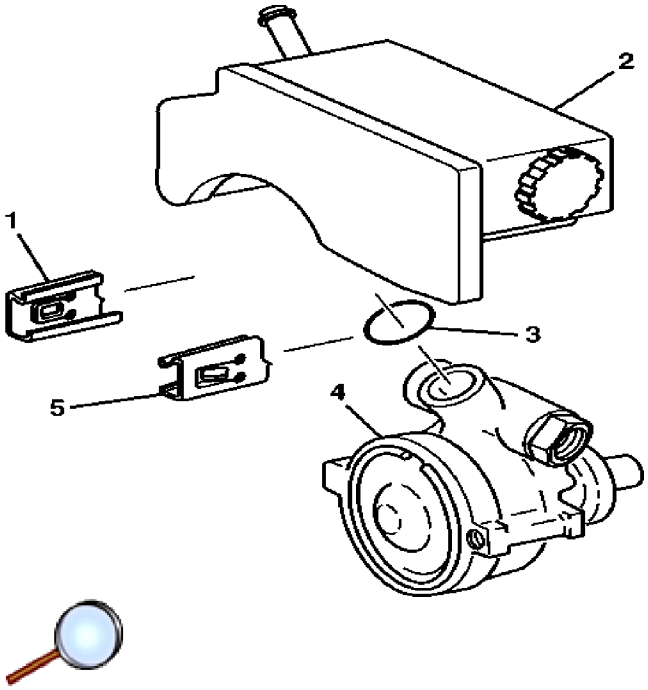


1. Remove the retaining clips (1, 5) from the reservoir assembly (2) and the hydraulic pump housing assembly (4).
2. Remove the reservoir (2) from the hydraulic pump housing assembly (4)
3. Remove the O-ring seal (3) from the hydraulic pump housing assembly (4).
4. Discard the O-ring seal (3).

Assembly Procedure

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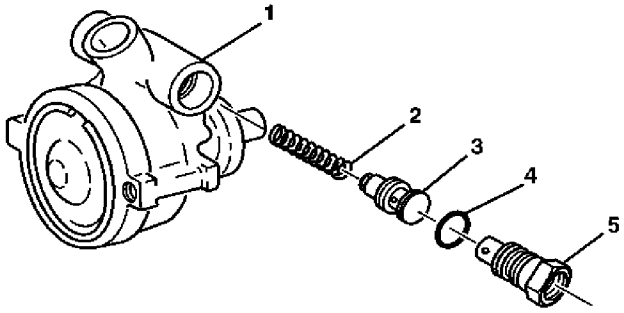


1. Lubricate the new O-ring seal (3) with power steering fluid.
2. Install the O-ring seal (3) to the reservoir (2).
3. Install the reservoir assembly (2) to the hydraulic pump housing assembly (4).
4. Install the retaining clips (1, 5) to the reservoir (2) and to the hydraulic pump housing assembly (4).

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Power Steering Pump Flow Control Valve Replacement - Off Vehicle (CB Series)

Disassembly Procedure

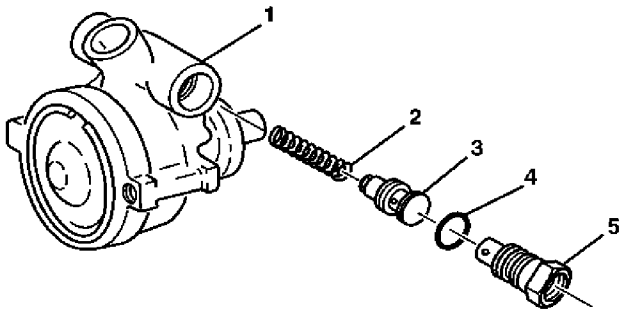


1. Remove the O-ring union fitting (5) from the hydraulic pump housing assembly (1).
2. Remove the O-ring seal (4) from the O-ring union fitting (5).
3. Remove the control valve assembly (3).
4. Remove the flow control spring (2).

Assembly Procedure

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1. Install the flow control spring (2) to the hydraulic pump housing assembly (1).
2. Install the control valve assembly (3).
3. Lubricate the O-ring seal (4) with power steering fluid.
4. Install the O-ring seal (4) onto the O-ring union fitting (5).

   Notice: Refer to Fastener Notice in the Preface section.

5. Install the O-ring union fitting (5) into the hydraulic pump housing assembly (1).

   Tighten
   Tighten the fitting (5) to 75 N·m (55 lb ft).

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Checking and Adding Power Steering Fluid

Notice: When adding fluid or making a complete fluid change, always use a power steering fluid meeting GM Spec. No. 9985010 or equivalent. Fluid for cold climates is also available through GM Dealerships; refer to Specifications for further information. Failure to use the proper power steering fluid can cause power steering hose and seal damage, fluid leaks and pump failure.

The power steering fluid level is indicated by marks on a fluid level indicator. The fluid level indicator is located on the fluid reservoir capstick. Inspect the fluid level when the engine compartment is cool. Ensure that the fluid level is at the FULL COLD mark. When the engine compartment is hot, ensure that the level is at the HOT mark. Loosening or removing the capstick when the engine compartment is hot relieves pressure in the power steering system. Pressure contributes to a quiet system.

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Power Steering System Bleeding

Important:

- Use clean, new power steering fluid type only. See the Maintenance and Lubrication subsection for fluid specifications. Refer to Fluid and Lubricant Recommendations .
- Hoses touching the frame, body or engine may cause system noise. Verify that the hoses do not touch any other part of the vehicle.
- Loose connections may not leak, but could allow air into the steering system. Verify that all hose connections are tight.

Important: Power steering fluid level must be maintained throughout bleed procedure.

1. Fill pump reservoir with fluid to minimum system level, FULL COLD level, or middle of hash mark on cap stick fluid level indicator.

   Important: With hydro-boost only, the oil level will appear falsely high if the hydro-boost accumulator is not fully charged. Do not apply the brake pedal with the engine OFF. This will discharge the hydro-boost accumulator.

2. If equipped with hydro-boost, fully charge the hydro-boost accumulator using the following procedure:
   2.1. Start the engine.
   2.2. Firmly apply the brake pedal 10-15 times.
   2.3. Turn the engine OFF.
3. Raise the vehicle until the front wheels are off the ground. Refer to Lifting and Jacking the Vehicle in General Information.
4. Key on engine OFF, turn the steering wheel from stop to stop 12 times.

   Vehicles equipped with hydro-boost systems or longer length power steering hoses may require turns up to 15 to 20 stop to stops.

5. Verify power steering fluid level per operating specification. Refer to Checking and Adding Power Steering Fluid .
6. Start the engine. Rotate steering wheel from left to right. Check for sign of cavitation or fluid aeration (pump noise/whining).
7. Verify the fluid level. Repeat the bleed procedure if necessary.

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Power Steering System Flushing

1. Raise the front end of the vehicle until the wheels are free to turn. Refer to Lifting and Jacking the Vehicle in General Information.
2. Remove the power steering gear outlet hose from the pump reservoir inlet connector. Remove the plug inlet connector port on the reservoir. Refer to Power Steering Hoses Replacement .
3. Place the end of the return line into a large container in order to catch the fluid that drains from the system.
4. Ask an assistant to fill the reservoir with new power steering fluid.

   Maintain the level at the FULL COLD mark while flushing the system.

5. Start the engine.
6. Run the engine at idle speed.

   Notice: Do not hold the steering wheel against the stops while flushing the power steering system. Holding the steering wheel against the wheel stops will cause high system pressure, overheating, and damage to the power steering pump and/or gear.

7. Turn the steering wheel from stop to stop.

   Important: Do NOT re-use any drained power steering fluid.

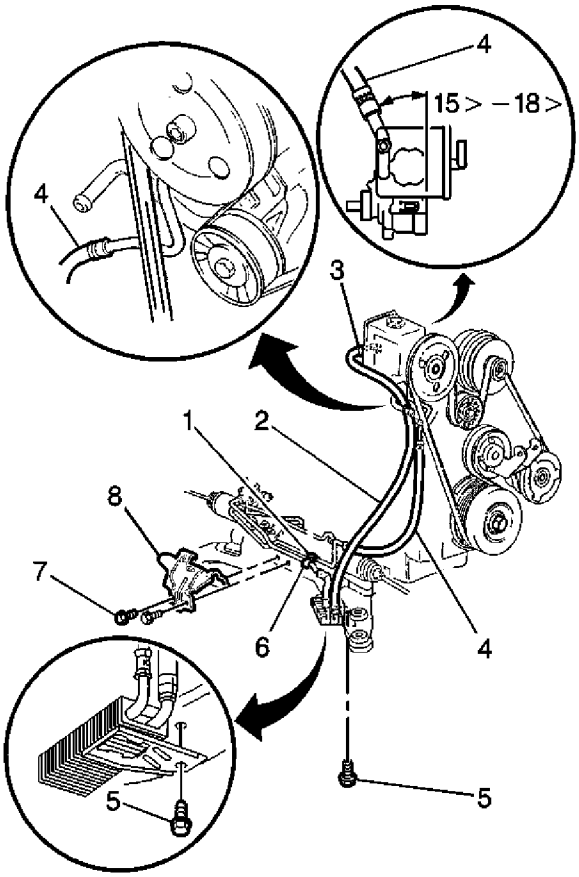
8. Continue to drain and flush the system until all of the old fluid is cleared from the system. Add approximately 0.9 liter (1 quart) of new fluid in order to complete the flushing procedure.
9. When you have completed the flushing procedure, perform the following additional steps:
   9.1. Stop the engine.
   9.2. Unplug the reservoir inlet port.
   9.3. Reconnect the return line.
10. Fill the reservoir to the FULL COLD level.
11. Bleed the power steering system. Refer to Power Steering System Bleeding .

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Power Steering Hoses Replacement

Removal Procedure

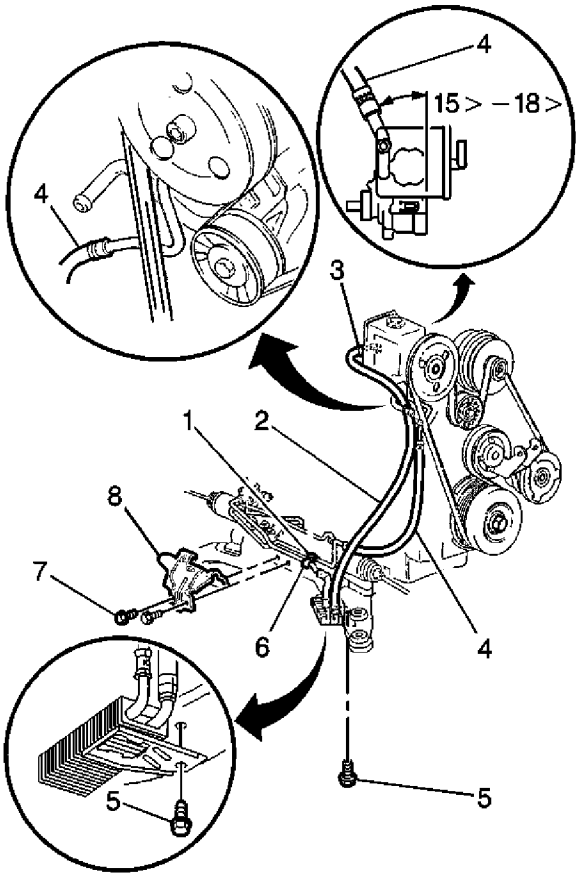


1. Remove the following components:
   - The retainer (6)
   - The shield (8)
2. Remove the clamps (3) or connections at the gear.
3. Remove the clamps (3) or connections at the pump.
4. Remove the hoses (2,4).

Installation Procedure

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1. Install the hoses (2,4).
2. Install the clamps (3) or connections at the gear.
3. Install the clamps (3) or connections at the pump.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

4. Install the following components:
   - The retainer (6)
   - The shield (8)

Tighten

- Tighten the retainer (6) and the shield (8) mounting bolts (7) to 8 N·m (71 lb in).
- Tighten the power steering gear inlet hose (4) to pump to 27 N·m (20 lb ft).
- Tighten the hose clamp (3) at the pump to 1.7 N·m (15 lb in).
- Tighten the power steering gear outlet (2) and the power steering inlet hose (4) to steering gear, to 8 N·m (70 lb in).

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5. Fill the system.
6. Bleed the system. Refer to Power Steering System Bleeding .
7. Inspect the system for leaks.

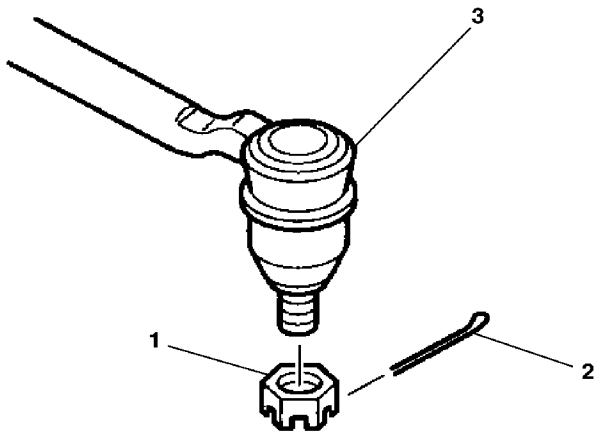
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Steering Linkage Outer Tie Rod Replacement

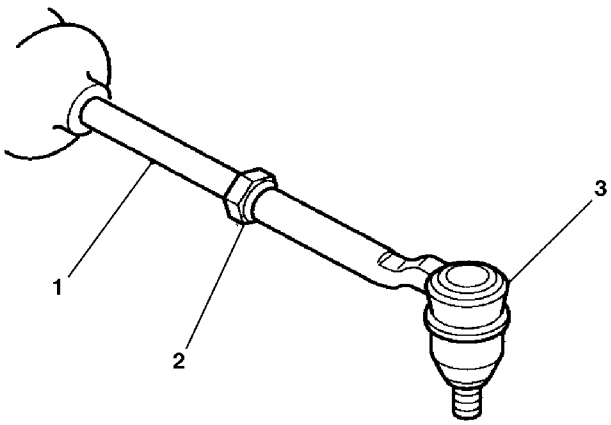
Removal Procedure

Tools Required

J 24319-01 Universal Steering Linkage Puller



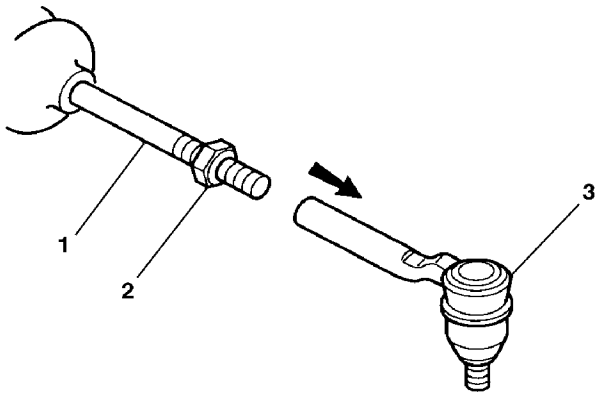
1. Remove the cotter pin (2) and the hex slotted nut (1) from the outer tie rod assembly.



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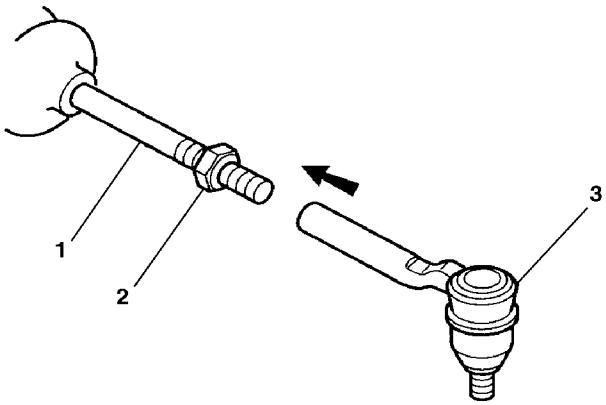
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2. Loosen the jam nut (2) on the inner tie rod assembly (1).
3. Remove the outer tie rod assembly (2) from the steering knuckle (1) using J 24319-01 .



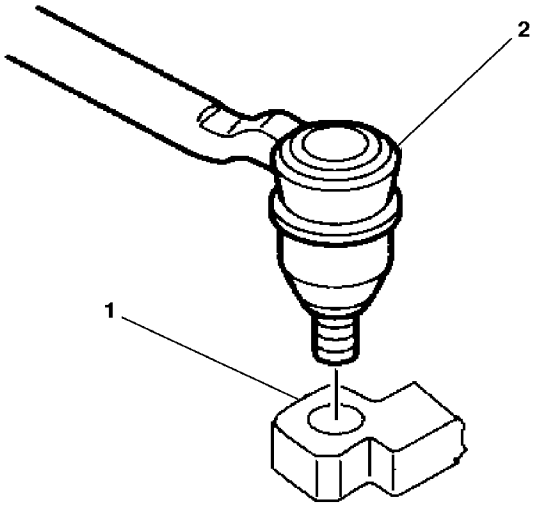
4. Remove the outer tie rod assembly (3) from the inner tie rod assembly (1).

Installation Procedure



1. Connect the outer tie rod assembly (3) to the inner tie rod (1). Do not tighten the jam nut (2).

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2. Connect the outer tie rod assembly (2) to the steering knuckle (1).

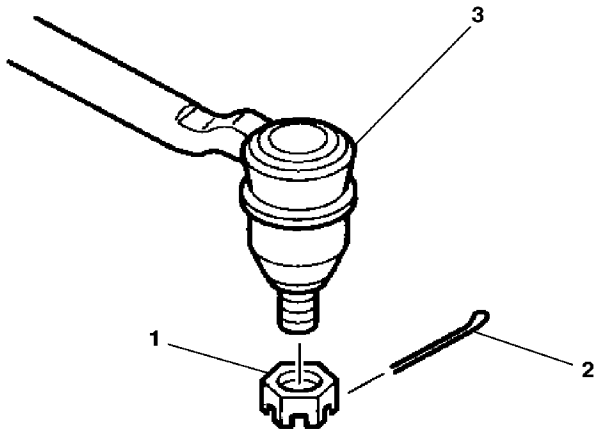
Important: Align the cotter pin slot by tightening the hex slotted nut (1) up to 1/6 additional turn, or 70 N·m (52 lb ft) maximum. Do not back off the hex slotted nut (1) for the cotter pin insertion.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Connect the hex slotted nut (1) to the outer tie rod stud (3).

Tighten
Tighten the hex slotted nut (1) to 47 N·m (35 lb ft).

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4. Install the cotter pin (2) into the hole in the tie rod stud.

Important: Be sure the rack and pinion boot is not twisted or puckered during toe adjustment.

5. Adjust the toe alignment. Refer to Front Toe Adjustment in Wheel Alignment.

Tighten
Tighten the jam nut against the outer tie rod to 68 N·m (50 lb ft).

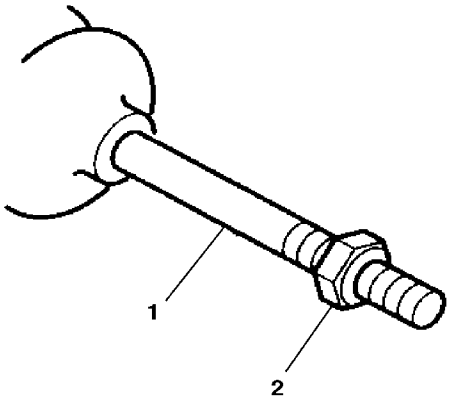
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Steering Gear Boot Replacement - Off Vehicle

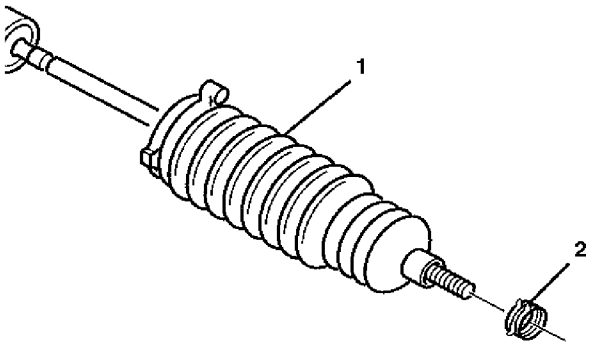
Disassembly Procedure

Tools Required

J 22610 Service Boot Clamp Installer



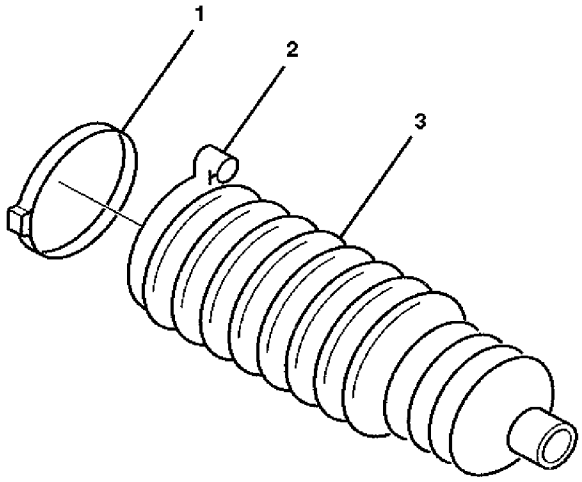
1. To remove the outer tie rod; refer to Rack and Pinion Outer Tie Rod End Replacement .
2. Remove the hex jam nut (2) from the inner tie rod assembly (1).



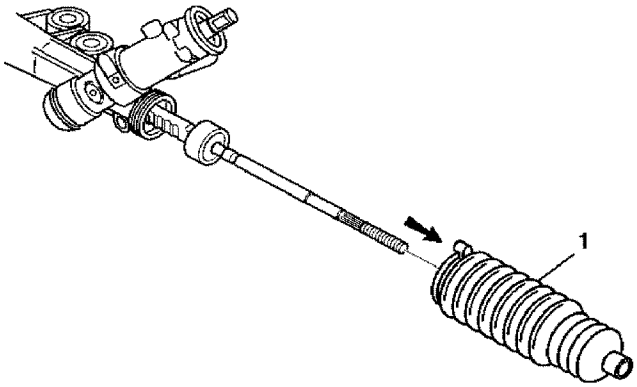
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3. Remove the tie rod end clamp (2) from the rack and pinion boot (1).



4. Remove the boot clamp (1) from the rack and pinion boot with side cutters.
5. Discard the boot clamp (1).



Important: Prior to removing the breather tube or the rack and pinion boot, mark the location of the breather tube on the gear assembly.

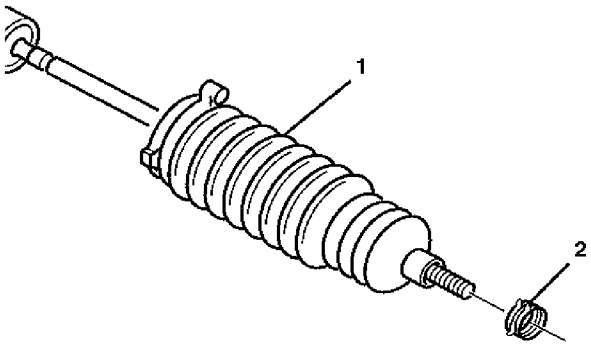
6. Remove the rack and pinion boot (1) and the breather tube from the rack and pinion gear assembly.

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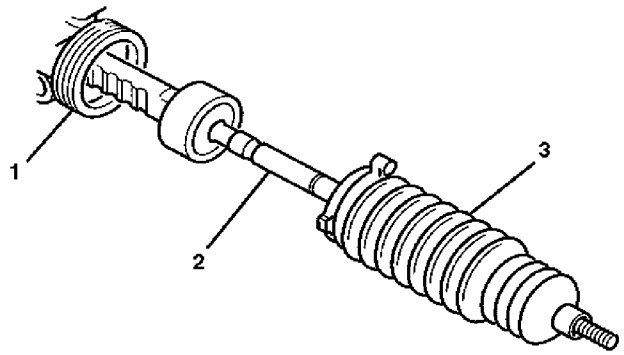
Assembly Procedure

Tools Required

J 22610 Service Boot Clamp Installer



1. Install the new boot clamp (2) onto the rack and pinion boot (1).



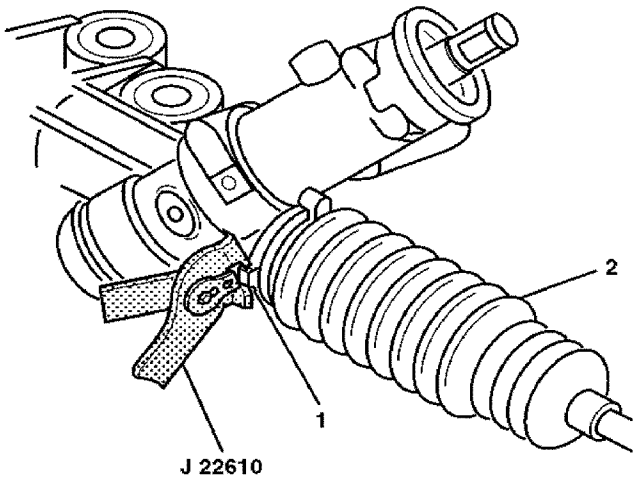
2. Prior to rack and pinion boot installation, apply grease to the inner tie rod assembly (2) and the rack and pinion gear assembly (1).
3. Install the rack and pinion boot (3) onto the inner tie rod assembly (2).
4. Install the breather tube while aligning the breather tube with the mark made during removal

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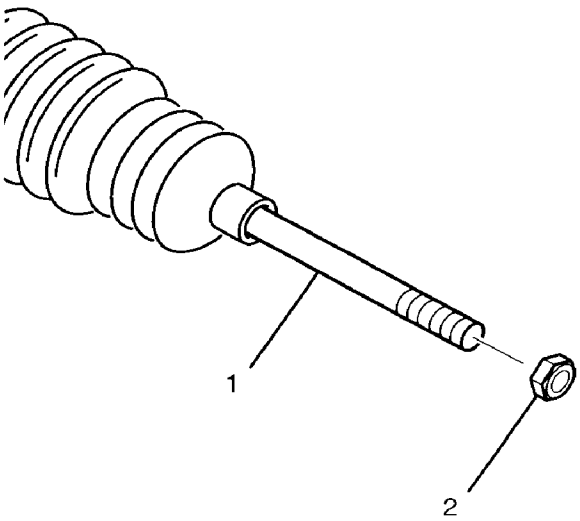
and the molded nipple of the rack and pinion boot.

Important: The rack and pinion boot (3) must not be twisted, puckered or out of shape in any way. If the rack and pinion boot (3) is not shaped properly, adjust the rack and pinion boot (3) by hand before installing the boot clamp.

5. Install the rack and pinion boot onto the gear assembly (1) until the rack and pinion boot (3) is seated in the gear assembly groove.



6. Install the boot clamp (1) on the rack and pinion boot (2) with J 22610 .
7. Crimp the boot clamp (1).
8. Pinch the pliers together on the rack and pinion boot (2) in order to install the tie rod end clamp.



9. Install the hex jam nut (2) to the inner tie rod assembly (1).

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10. To assemble the outer tie rod assembly; refer to Rack and Pinion Outer Tie Rod End Replacement .

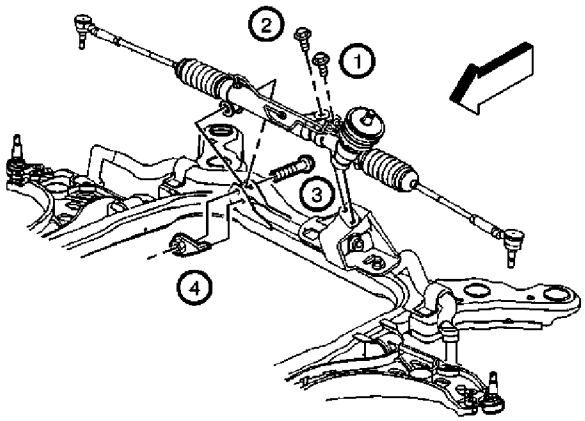
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Steering Gear Replacement

Removal Procedure

Tools Required

J 24319-B Puller



1. Raise and support the vehicle with a suspension contact hoist. Refer to Lifting and Jacking the Vehicle in General Information.
2. Remove both front tires and wheels.

Caution: Failure to disconnect the intermediate shaft from the rack and pinion stub shaft can result in damage to the steering gear and/or intermediate shaft. This damage can cause loss of steering control which could result in personal injury.

Notice: The wheels of the vehicle must be straight ahead and the steering column in the LOCK position before disconnecting the steering column or intermediate shaft from the steering gear. Failure to do so will cause the coil assembly in the steering column to become uncentered which will cause damage to the coil assembly.

3. Remove the intermediate shaft lower connection.
4. Use the J 24319-B in order to remove the tie rod ends from the steering knuckles.
5. Remove the power steering gear outlet and inlet hoses from the steering gear. Refer to Power Steering Hoses Replacement .
6. Remove the steering gear mounting bolts.

Notice: Do not lower the rear of the frame too far as damage to the engine components

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nearest to the cowl may result.

7. Remove the steering gear through the wheel opening.

Installation Procedure

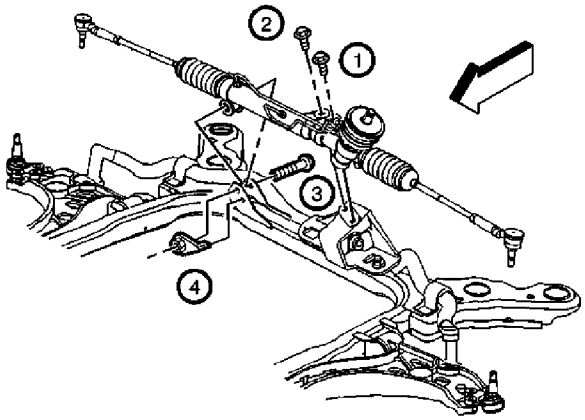
1. Install the steering gear through the wheel opening.
2. Raise the rear of the frame.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the frame bolts. Refer to Frame in Body Front End.

Tighten
Tighten the frame bolts to 103 N·m (76 lb ft).

4. Remove the stands.



5. Install the following components:
   - The 5 steering gear mounting bolts
   - The 2 washers

Tighten
1. Tighten the bolts in the sequence shown in the illustration.
2. Tighten the bolts to 68 N·m (50 lb ft). Use Loctite® Tread Locking Kit No. 105264, or the equivalent.

6. Install the power steering gear outlet and inlet hoses. Refer to Power Steering Hoses

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Replacement .

Tighten
Tighten the hose connections to 27 N·m (20 lb ft).

7. Install the retainer.
8. Connect the tie rod ends to the steering knuckles.

Tighten
Tighten the tie rod end nuts to 47 N·m (35 lb ft).

9. Install the cotter pin.

Tighten
Tighten the nut up to an additional 1/6 turn, or to a maximum of 70 N·m (52 lb ft) in order to align the cotter pin slot. Do not back off the nut for the cotter pin insertion.

10. Install the intermediate steering shaft pinch bolt.

Tighten
Tighten the intermediate steering shaft pinch bolt to 47 N·m (35 lb ft).

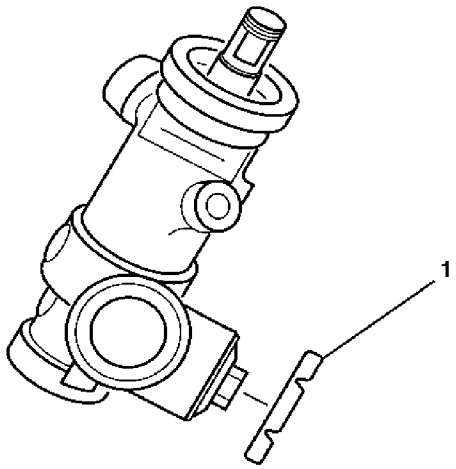
11. Install the tires and wheels.

Tighten
Tighten the wheel nuts to 140 N·m (100 lb ft).

12. Lower the vehicle.
13. Fill the system.
14. Bleed the system. Refer to Power Steering System Bleeding .
15. Inspect the system for leaks.

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Steering Gear Rack Bearing Preload Adjustment - Off Vehicle (Quiet Valve)



1. Loosen the adjuster plug lock nut (1).
2. Turn the adjuster plug clockwise until the adjuster plug bottoms in the gear assembly.
3. Turn the adjuster plug back 50 degrees to 70 degrees (approximately one flat).
4. Install the adjuster plug lock nut (1) to the adjuster plug.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

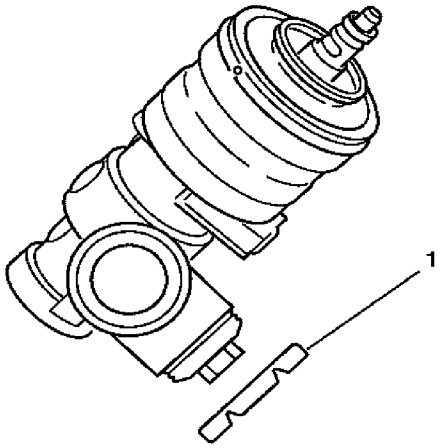
Tighten

Hold the adjuster plug stationary while tightening the adjuster plug lock nut (1) 68 N·m (50 lb ft).

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Steering Gear Rack Bearing Preload Adjustment - Off Vehicle (Adjust Magna Valve)





1. Loosen the adjuster plug lock nut (1).
2. Turn the adjuster plug clockwise until the adjuster plug bottoms in the gear assembly.
3. Turn the adjuster plug back 50 degrees to 70 degrees (approximately one flat).
4. Install the adjuster plug lock nut (1) to the adjuster plug.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

Tighten

Hold the adjuster plug stationary while tightening the adjuster plug lock nut (1) 68 N·m (50 lb ft).

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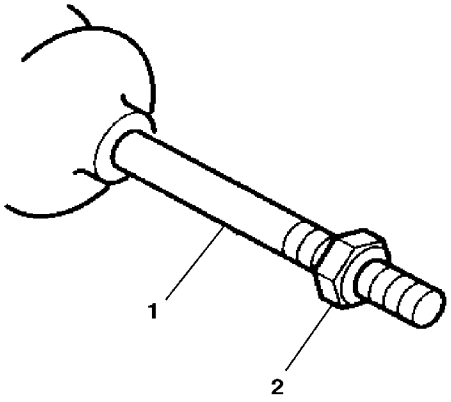
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Steering Gear Boot and Breather Tube Replacement - Off Vehicle (Quiet Valve)

Disassembly Procedure

Tools Required

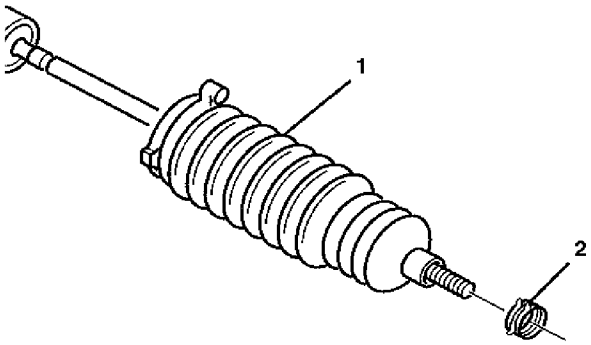
J 22610 Service Boot Clamp Installer



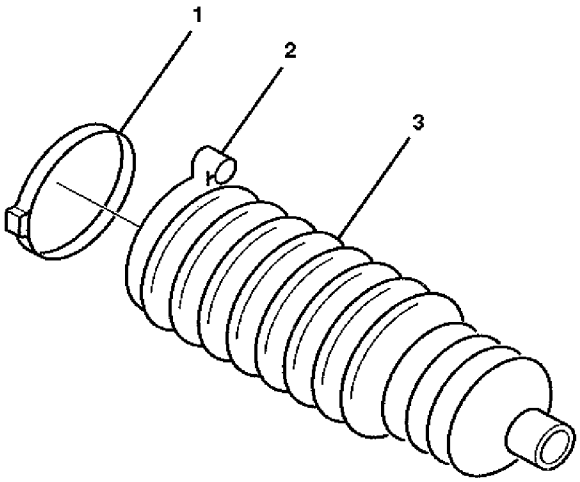
1. To remove the outer tie rod; refer to Rack and Pinion Outer Tie Rod End Replacement .
2. Remove the hex jam nut (2) from the inner tie rod assembly (1).

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3. Remove the tie rod end clamp (2) from the rack and pinion boot (1).



4. Remove the boot clamp (1) from the rack and pinion boot (3) with side cutters.
5. Discard the boot clamp (1).

Important: Prior to removing the breather tube (2) or the rack and pinion boot (3), mark the location of the breather tube (2) on the gear assembly.

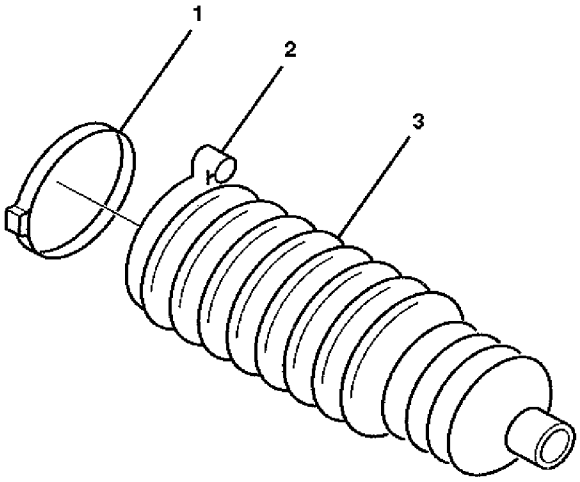
6. Remove the rack and pinion boot (3) and the breather tube (2).

Assembly Procedure

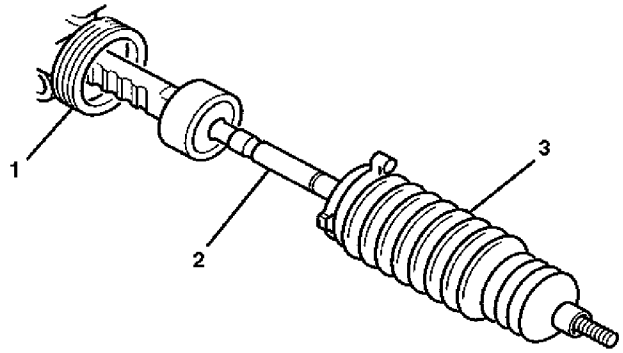
Tools Required

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J 22610 Service Boot Clamp Installer



1. Install the new boot clamp (1) onto the rack and pinion boot (3).



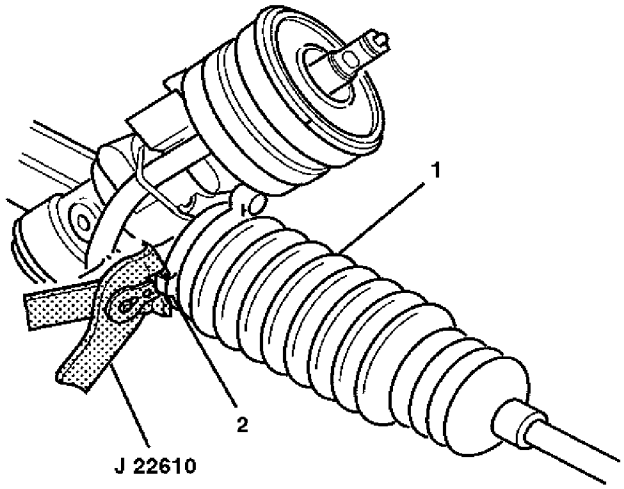
2. Prior to rack and pinion boot installation, apply grease to the inner tie rod assembly (2) and the rack and pinion gear assembly (1).
3. Install the rack and pinion boot (3) onto the inner tie rod assembly (2).
4. Align the breather tube with the mark made during removal and the molded nipple of the rack and pinion boot.
5. Install the rack and pinion boot (3) onto the gear assembly until the rack and pinion boot (3) is seated in the gear assembly groove.

Important: The rack and pinion boot (3) must not be twisted, puckered or out of shape in

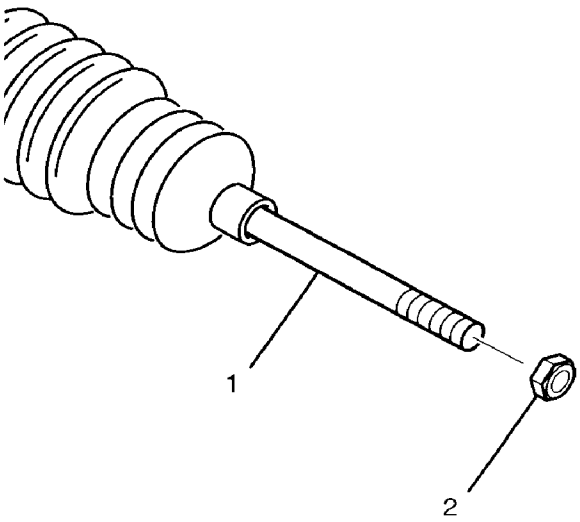
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any way. If the rack and pinion boot (3) is not shaped properly, adjust the rack and pinion boot (3) by hand before installing the boot clamp.

6. Install the rack and pinion boot (3) onto the inner tie rod assembly (2).



7. Install the boot clamp (2) on the rack and pinion boot (1) with J 22610 .
8. Crimp the boot clamp (2).
9. Pinch the pliers together on the rack and pinion boot (1) in order to install the tie rod end clamp.



10. Install the hex jam nut (2) to the inner tie rod assembly (1).
11. To assemble the outer tie rod assembly; refer to Rack and Pinion Outer Tie Rod End Replacement .

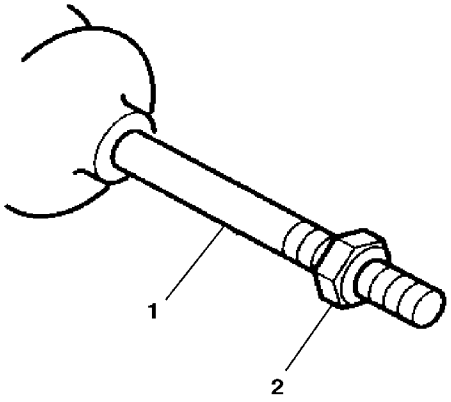
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Steering Gear Boot and Breather Tube Replacement - Off Vehicle (Magnasteer)

Disassembly Procedure

Tools Required

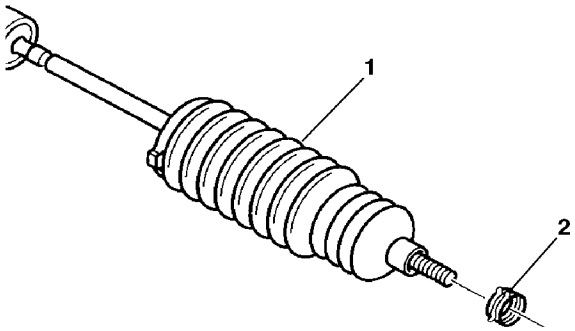
J 22610 Service Boot Clamp Installer



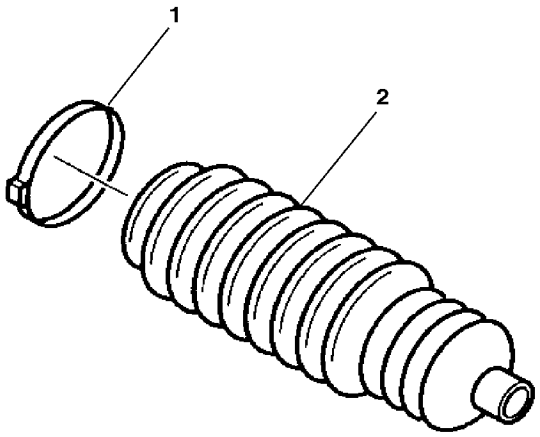
1. To remove the outer tie rod; refer to Rack and Pinion Outer Tie Rod End Replacement .
2. Remove the hex jam nut (2) from the inner tie rod assembly (1).

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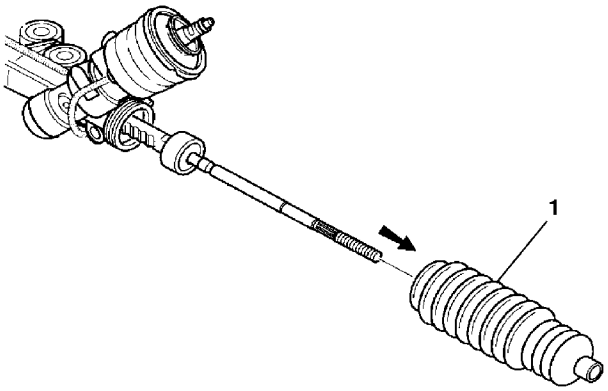


3. Remove the tie rod end clamp (2) from the rack and pinion boot (1).



4. Remove the boot clamp (1) from the rack and pinion boot with side cutters.

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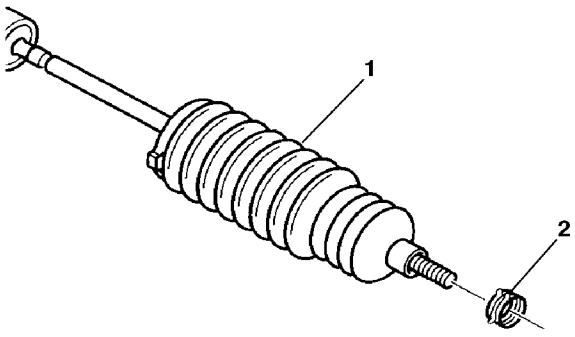


5. Remove the rack and pinion boot (1) from the rack and pinion gear assembly.
6. Discard the boot clamp.
7. Inspect the rack and pinion boot (1) for damage.
8. Look for gear oil leakage inside the rack and pinion boot (1).
9. Drain the oil.
10. Clean the rack and pinion boot (1) with solvent.

Assembly Procedure

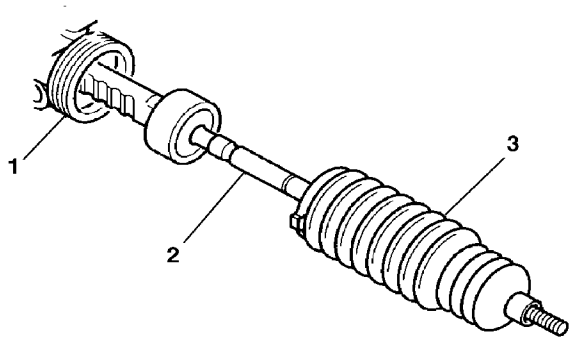
Tools Required

J 22610 Service Boot Clamp Installer



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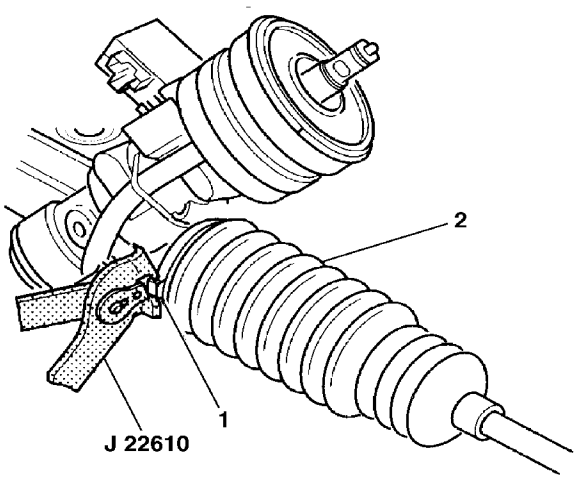
1. Install the new boot clamp (2) onto the rack and pinion boot (1).



2. Prior to rack and pinion boot installation, apply grease to the inner tie rod assembly (2) and the rack and pinion gear assembly (1).
3. Install the rack and pinion boot (3) onto the inner tie rod assembly (2).

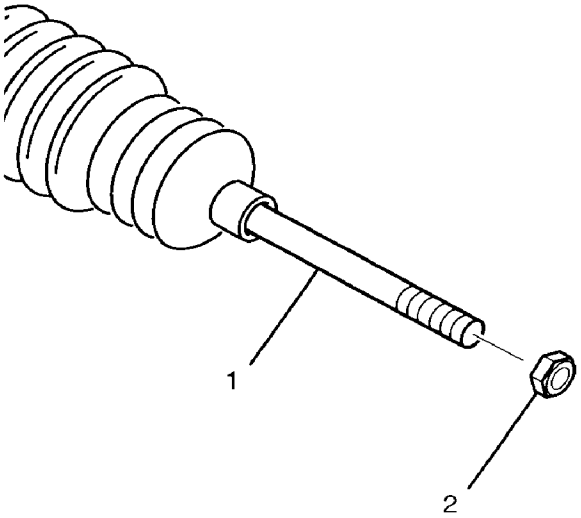
Important: The rack and pinion boot (3) must not be twisted, puckered or out of shape in any way. If the rack and pinion boot (3) is not shaped properly, adjust the rack and pinion boot by hand before installing the boot clamp.

4. Install the rack and pinion boot onto the gear assembly (1) until the rack and pinion boot (3) is seated in the gear assembly groove.



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5. Install the boot clamp (1) on the rack and pinion boot (2) with J 22610 .
6. Crimp the boot clamp (1).
7. Pinch the pliers together on the rack and pinion boot (2) in order to install the tie rod end clamp.



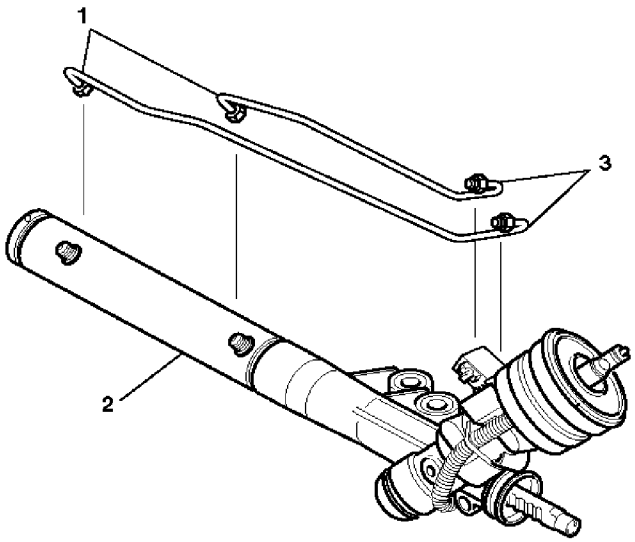


8. Install the hex jam nut (2) to the inner tie rod assembly (1).
9. To assemble the outer tie rod assembly; refer to Rack and Pinion Outer Tie Rod End Replacement .

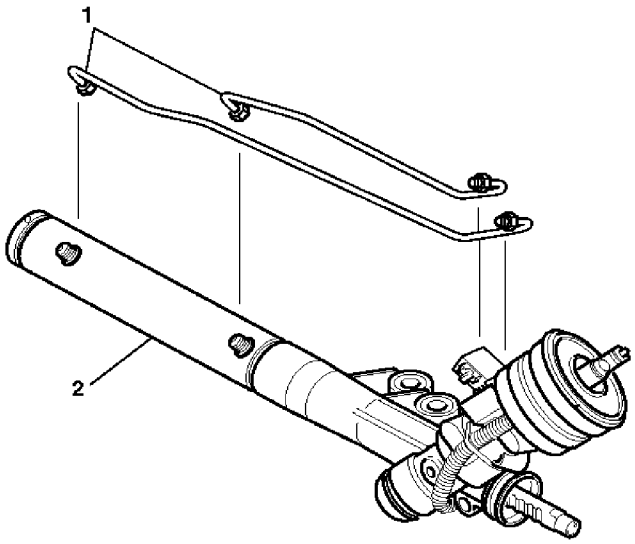
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Steering Gear Cylinder Pipe Assembly and Seals Replacement - Off Vehicle (Magna Valve)

Disassembly Procedure



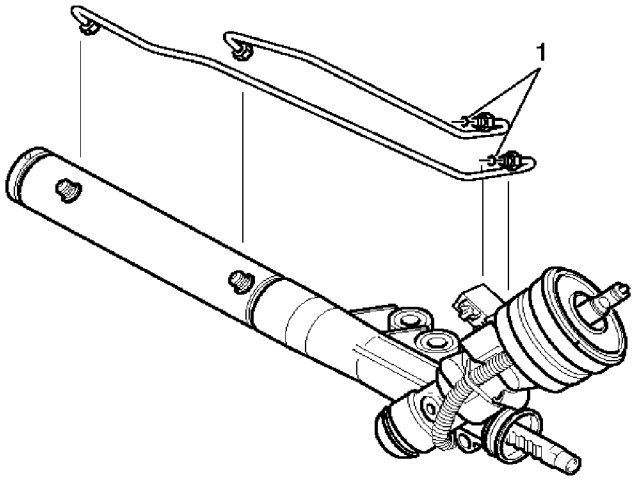
1. Loosen both cylinder line fittings (1) on the cylinder end of the gear assembly.
2. Loosen both fittings on the cylinder line assemblies (3) at the valve end of the gear assembly.



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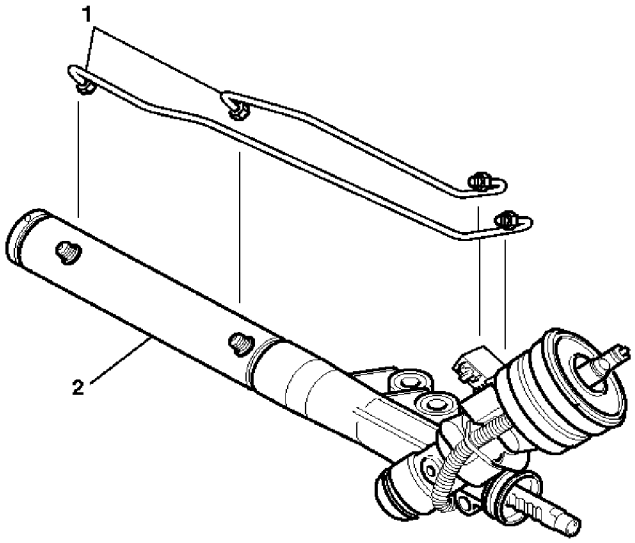
3. Remove both cylinder line assemblies (1) from the rack and pinion gear assembly (2).





4. Remove the O-ring seals (1) from the valve end of line.
5. Discard the O-ring seals (1).

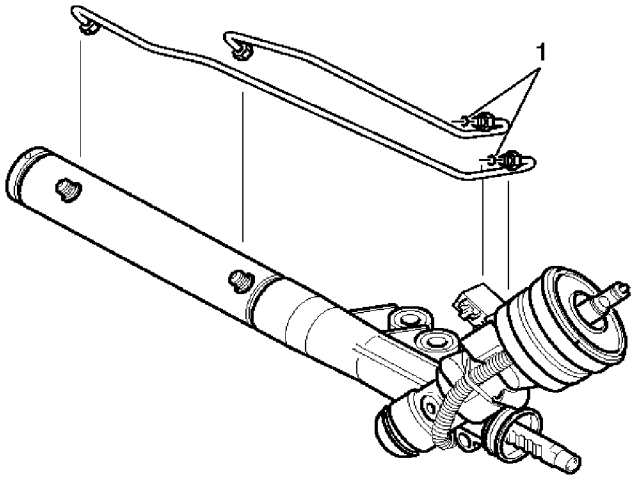
Assembly Procedure



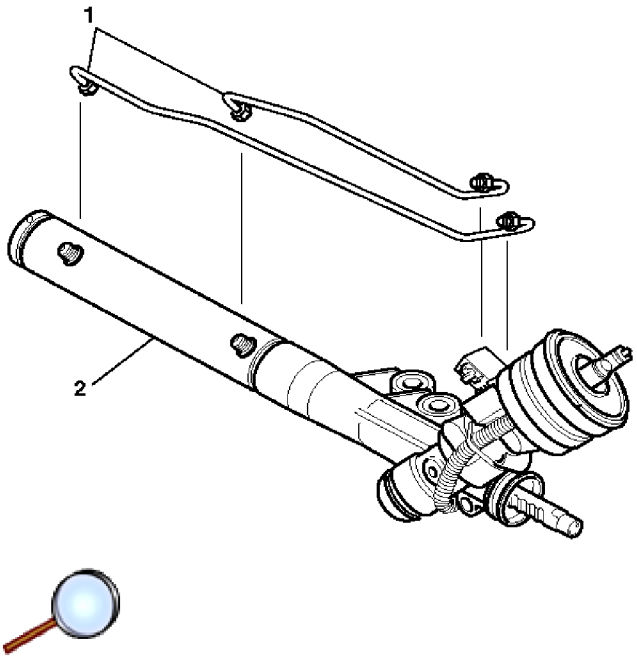


1. Inspect the cylinder lines (1) for the following items:
   - Cracks
   - Dents
   - Damage to the threads
2. Replace the parts as needed.

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3. Install the new O-ring seals (1) to the valve end of the cylinder lines.



4. Install the cylinder line assemblies (1) to the gear assembly (2).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

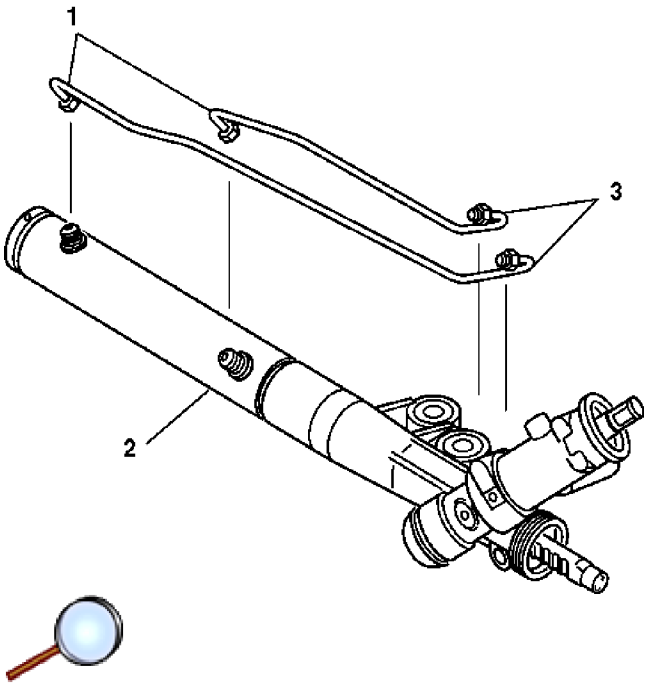
Tighten

Valve end fittings to 16.9 N·m (12.6 lb ft). Cylinder end fittings to 27 N·m (20 lb ft).

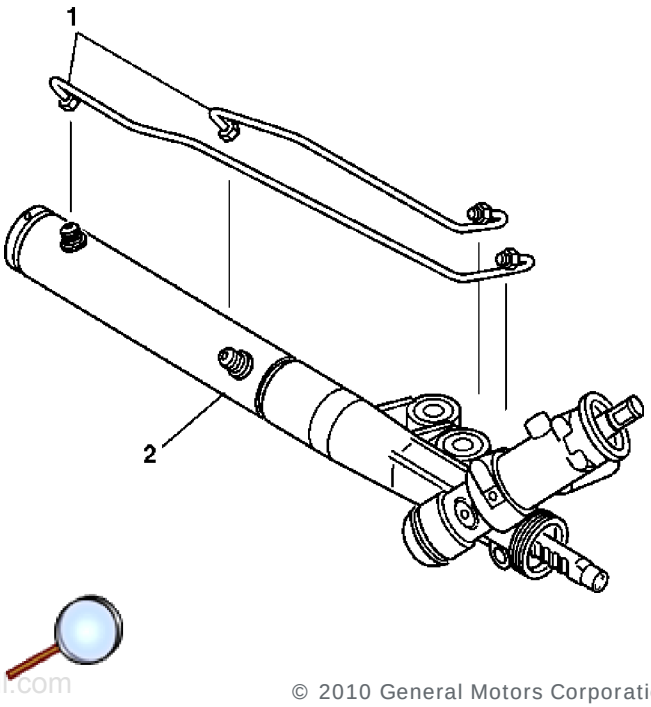
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Steering Gear Cylinder Pipe Assembly and Seals Replacement - Off Vehicle (Quiet Valve)

Disassembly Procedure



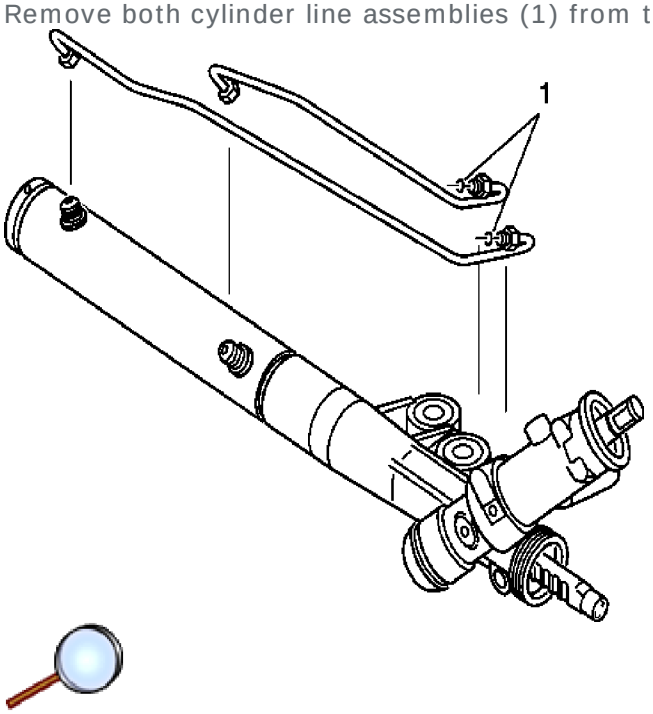
1. Loosen both cylinder line fittings (1) on the cylinder end of the gear assembly.
2. Loosen both fittings on the cylinder line assemblies (3) at the valve end of the gear assembly.



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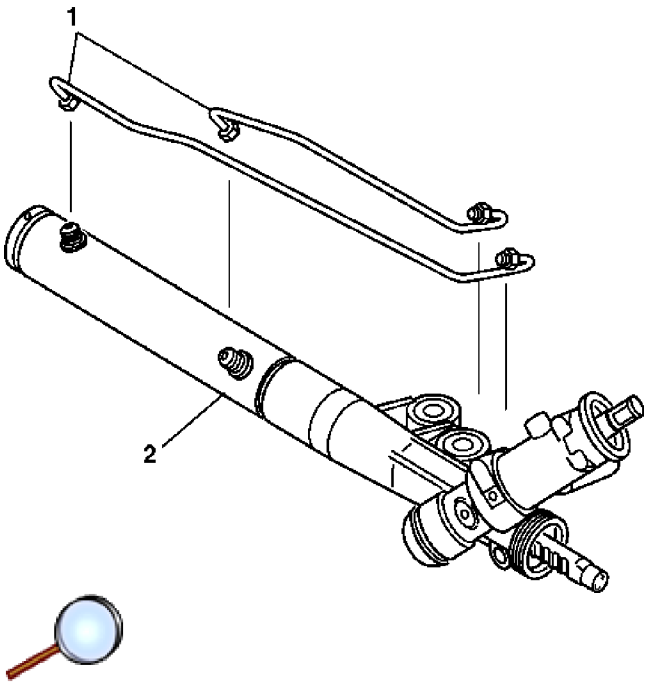
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3. Remove both cylinder line assemblies (1) from the rack and pinion gear assembly (2).



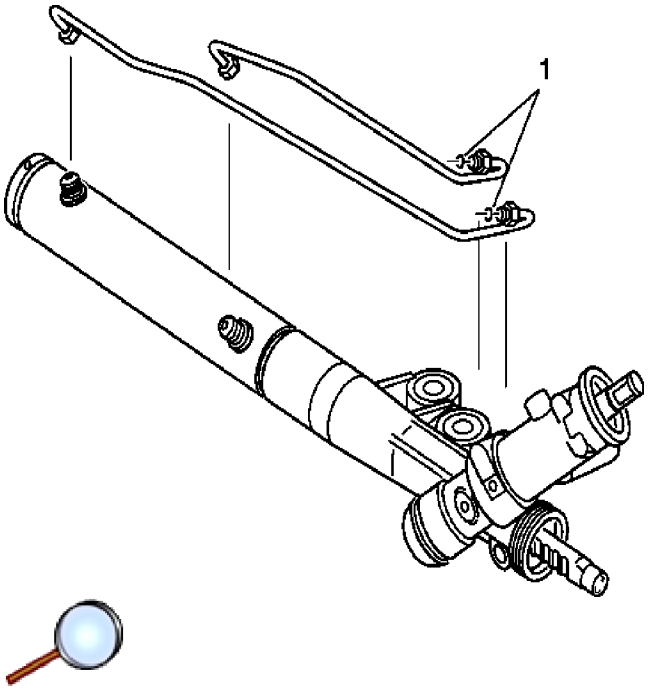
4. Remove the O-ring seals (1) from the valve end of line.
5. Discard the O-ring seals (1).

Assembly Procedure

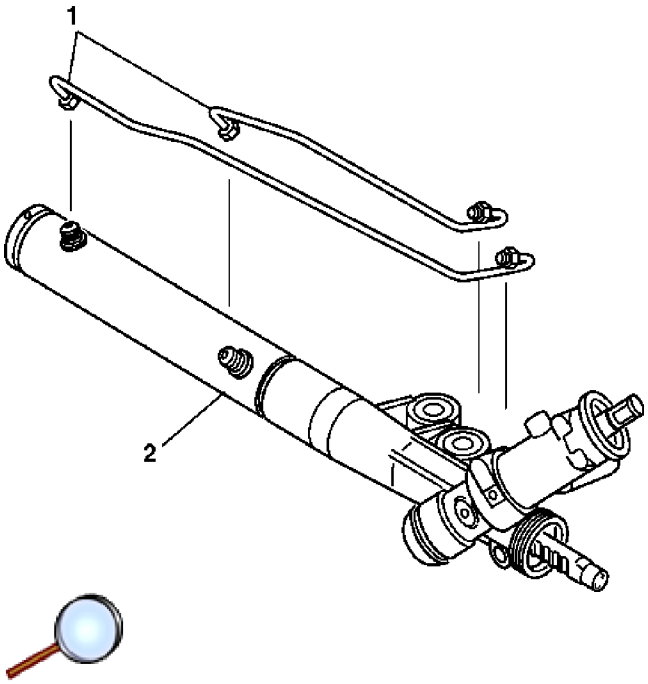


1. Inspect the cylinder lines (1) for the following items:
   - Cracks
   - Dents
   - Damage to the threads
2. Replace the parts as needed.

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3. Install the new O-ring seals (1) to the valve end of the cylinder lines.



4. Install the cylinder line assemblies (1) to the gear assembly (2).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

Tighten

Valve end fittings to 16.9 N·m (12.6 lb ft). Cylinder end fittings to 27 N·m (20 lb ft).

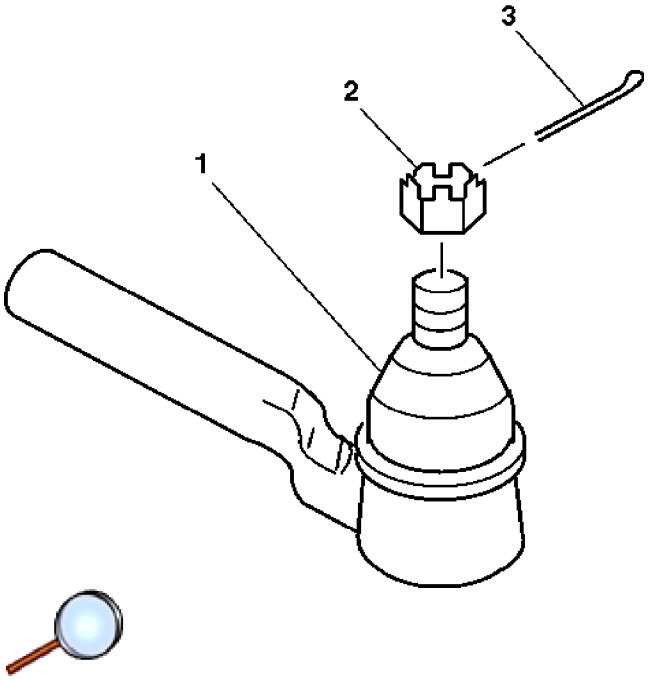
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Steering Linkage Outer Tie Rod Replacement

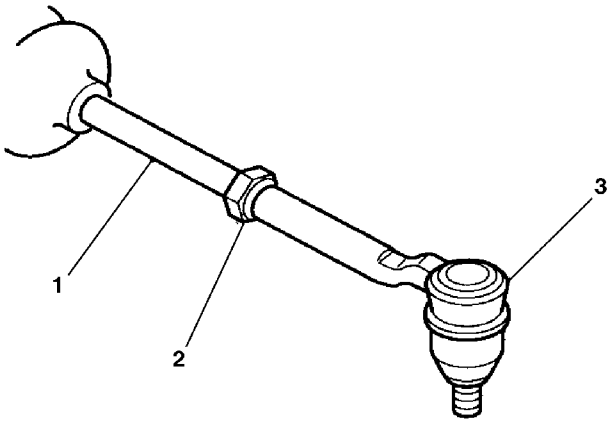
Disassembly Procedure

Tools Required

J 24319-01 Universal Steering Linkage Puller



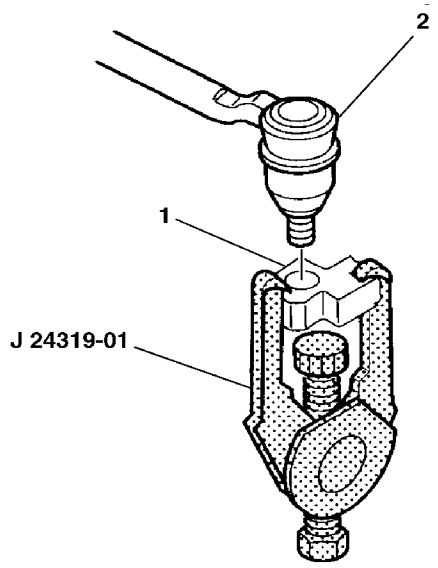
1. Pull the cotter pin (3) and the hex slotted nut (2) from outer tie rod assembly (1).



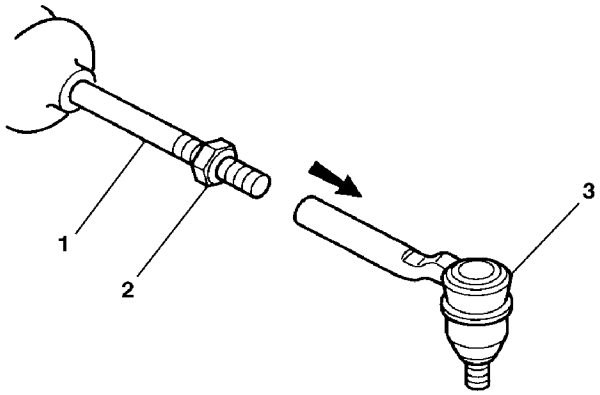
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2. Loosen the jam nut (2) on the inner tie rod assembly (1).



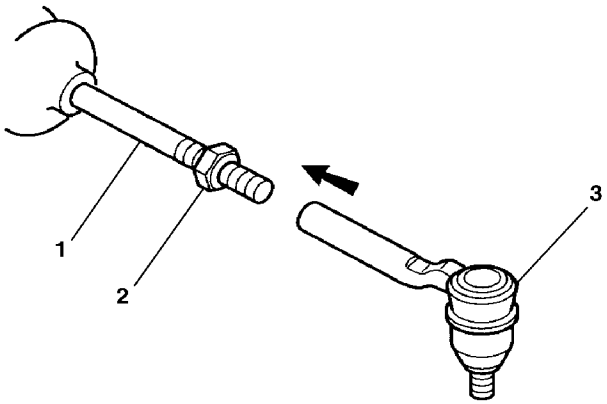
3. Remove the outer tie rod assembly (2) from the steering knuckle (1) using J 24319-01 .



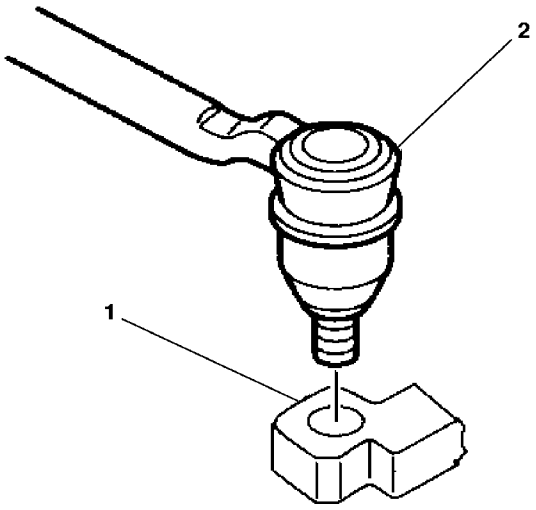
4. Remove the outer tie rod assembly (3) from the inner tie rod assembly (1).

Assembly Procedure

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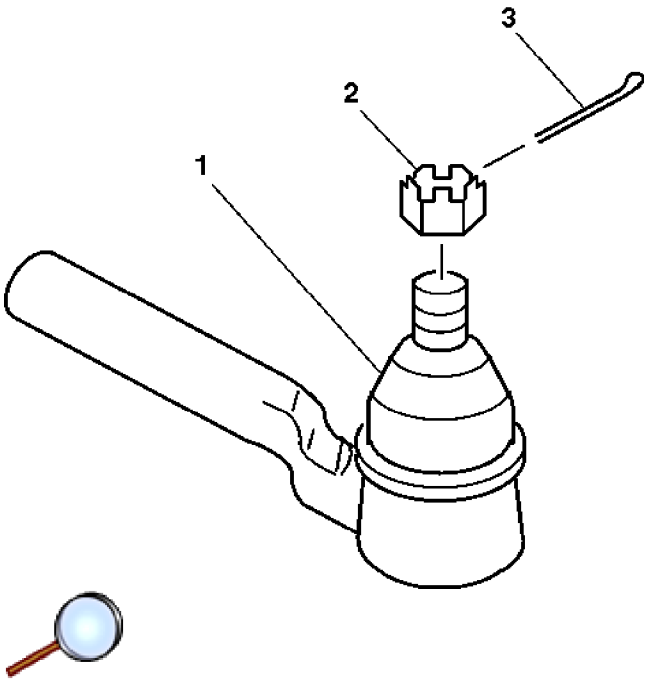


1. Connect the outer tie rod assembly (3) to the inner tie rod (1). Do not tighten the jam nut (2).



2. Connect the outer tie rod assembly (2) to the steering knuckle (1).

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3. Connect the hex slotted nut (2) to the outer tie rod stud (1).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

Tighten
Tighten the hex slotted nut (2) to 47 N·m (35 lb ft). Align the cotter pin slot by tightening the hex slotted nut (2) up to 1/6 additional turn, or 70 N·m (52 lb ft) maximum. Do not back off the hex slotted nut (2) for the cotter pin (3) insertion.

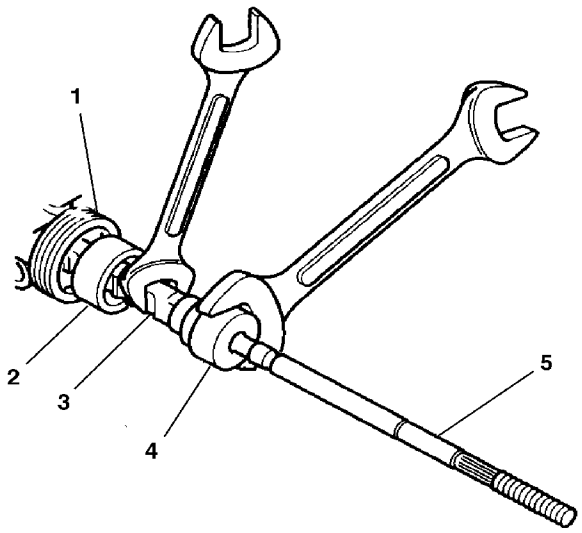
4. Install the cotter pin (3) into the hole in the tie rod stud.

Tighten
Tighten the hex jam nut against the outer tie rod to 68 N·m (50 lb ft).

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Steering Linkage Inner Tie Rod Replacement (Quiet Valve)

Disassembly Procedure

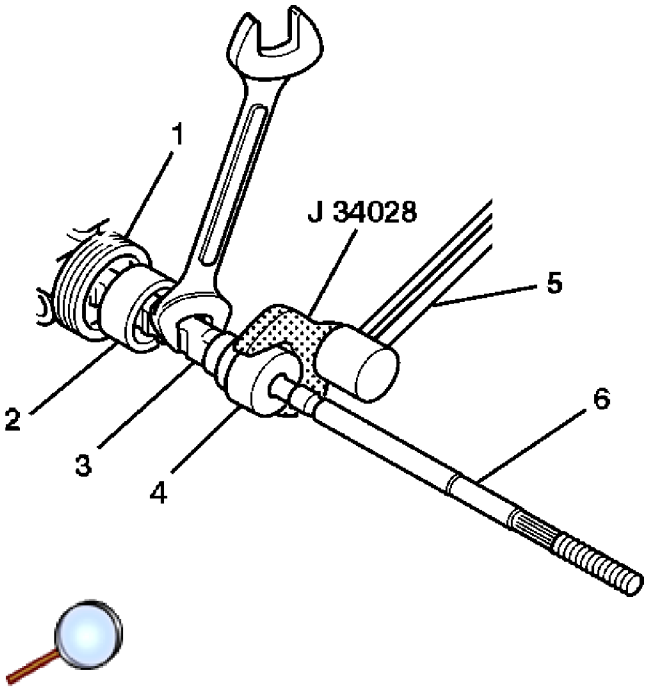


1. To remove the rack and pinion boot and the breather tube; refer to Steering Gear Boot and Breather Tube Replacement - Off Vehicle .
2. Remove the shock dampener (2) from the inner tie rod assembly (5).
3. Slide the shock dampener (2) back on the rack (1).
4. Remove the inner tie rod assembly (5) from the rack assembly (1) as follows:
   - 3.1. Place a wrench on flats of rack assembly (3).
   - 3.2. Place another wrench on the flats of the inner tie rod housing (4).
   - 3.3. Rotate the inner tie rod housing (4) counterclockwise until the inner tie rod (5) separates from the rack (1).

Assembly Procedure

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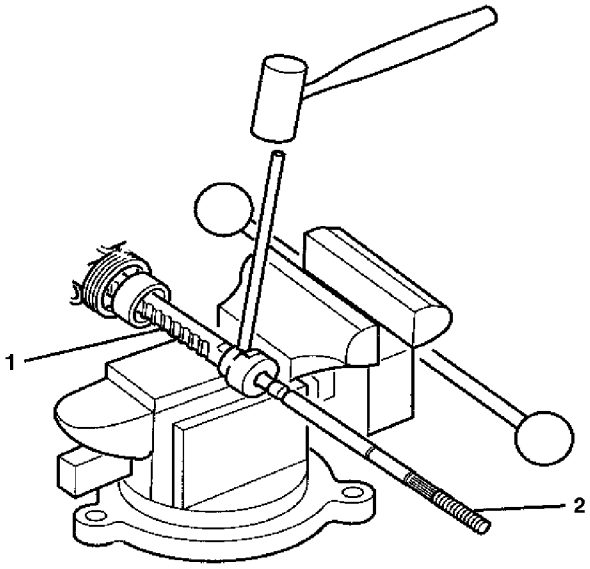


1. Slide the shock dampener (2) forward onto the rack (1).
2. Attach the inner tie rod (6) on the rack (1) as follows:
   2.1. Place a wrench on the flats of the rack assembly (3).
   2.2. Place a torque wrench (5) on the flats of the inner tie rod housing (4).

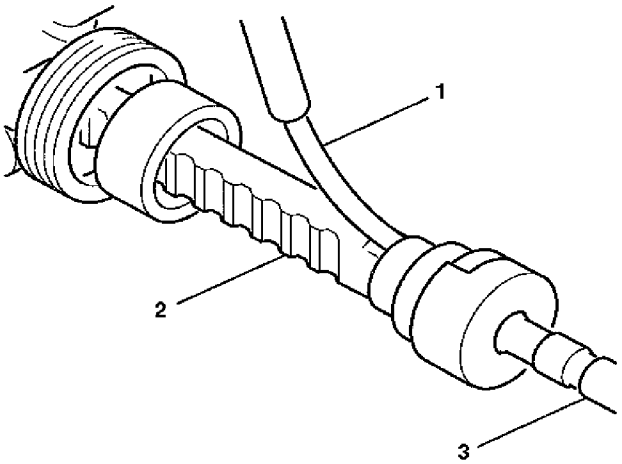
Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

Tighten
Inner tie rod to 100 N·m (74 lb ft).

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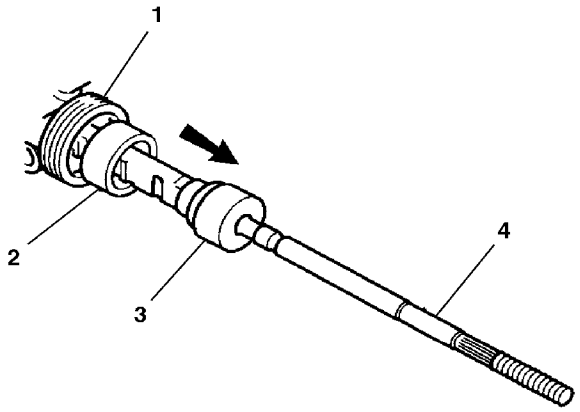


3. Place the inner tie rod assembly (2) in a vise.
4. Stake both sides of the inner tie rod assembly to the flats on the rack (1).



5. Insert a 0.25 mm gauge (1) between the rack (2) and the inner tie rod housing (3) in order to check both stakes. The feeler gauge (1) must not pass between the rack and the housing stake.

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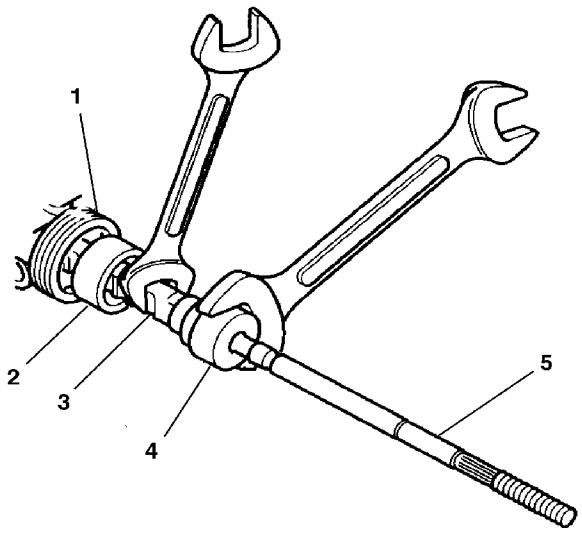


6. Slide the shock dampener (2) over the inner tie rod housing (3) until the front lip of the shock dampener (2) bottoms against the inner tie rod housing (3).
7. To assemble the rack and pinion boot and the breather tube; refer to Steering Gear Boot and Breather Tube Replacement - Off Vehicle .

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Steering Linkage Inner Tie Rod Replacement (Magnasteer With Breather Tube)

Disassembly Procedure

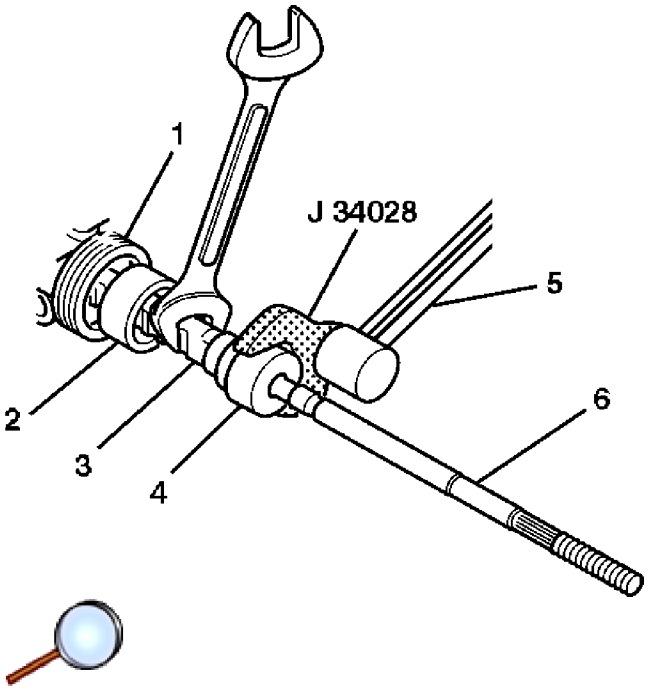


1. To remove the rack and pinion boot and the breather tube; refer to Steering Gear Boot and Breather Tube Replacement - Off Vehicle .
2. Remove the shock dampener (2) from the inner tie rod assembly (5).
3. Slide the shock dampener (2) back on the rack (1).
4. Remove the inner tie rod assembly (5) from the rack assembly (1) as follows:
   - 3.1. Place a wrench on flats of rack assembly (3).
   - 3.2. Place another wrench on the flats of the inner tie rod housing (4).
   - 3.3. Rotate the inner tie rod housing (4) counterclockwise until the inner tie rod (5) separates from the rack (1).

Assembly Procedure

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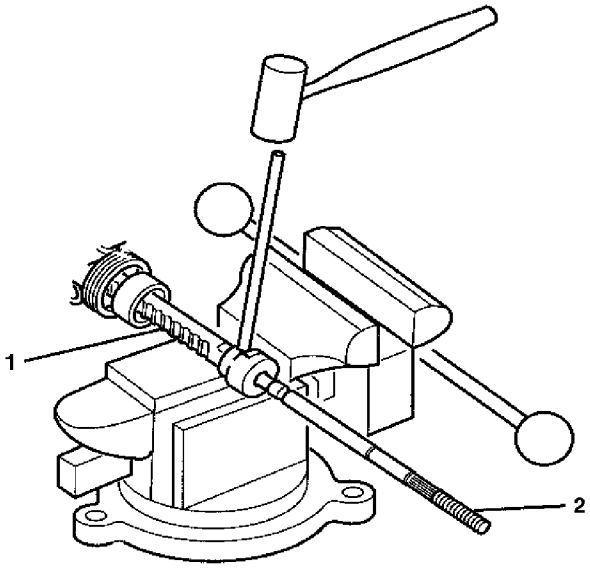


1. Slide the shock dampener (2) forward onto the rack (1).
2. Attach the inner tie rod (6) on the rack (1) as follows:
   2.1. Place a wrench on the flats of the rack assembly (3).
   2.2. Place a torque wrench (5) on the flats of the inner tie rod housing (4).

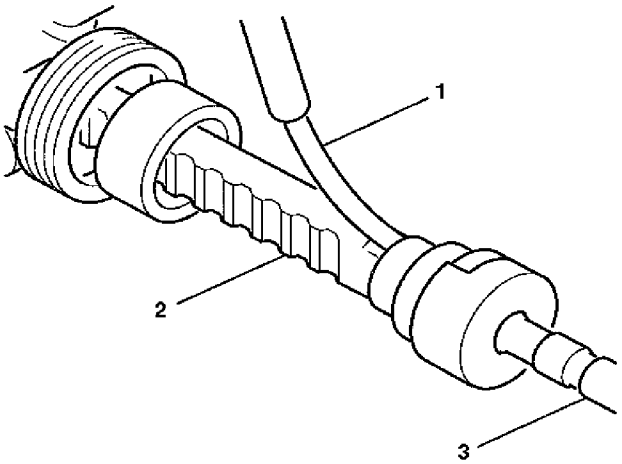
Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

Tighten
Inner tie rod to 100 N·m (74 lb ft).

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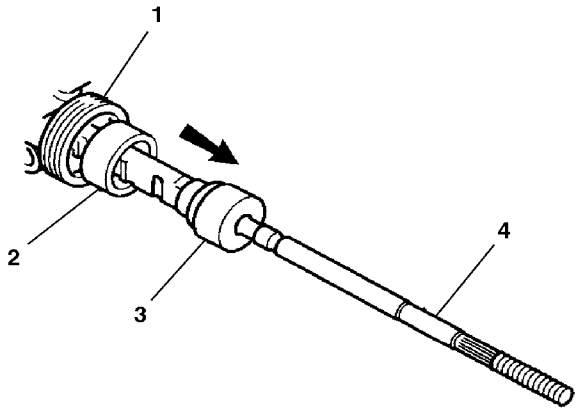


3. Place the inner tie rod assembly (2) in a vise.
4. Stake both sides of the inner tie rod assembly to the flats on the rack (1).



5. Insert a 0.25 mm gauge (1) between the rack (2) and the inner tie rod housing (3) in order to check both stakes. The feeler gauge (1) must not pass between the rack and the housing stake.

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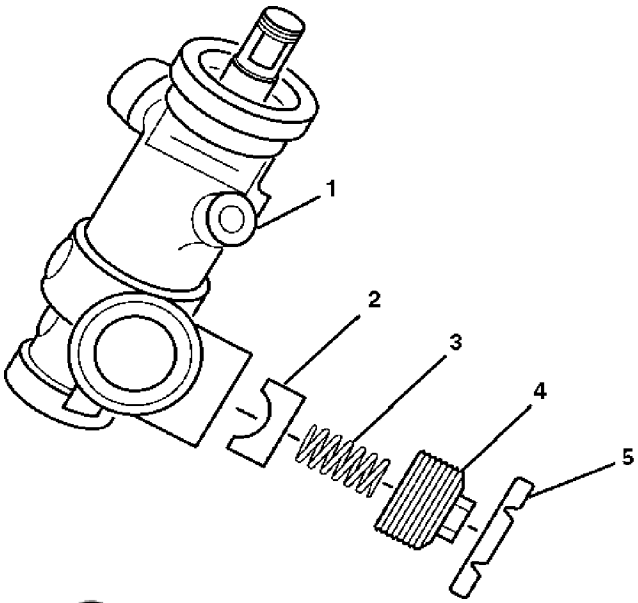


6. Slide the shock dampener (2) over the inner tie rod housing (3) until the front lip of the shock dampener (2) bottoms against the inner tie rod housing (3).
7. To assemble the rack and pinion boot and the breather tube; refer to Steering Gear Boot and Breather Tube Replacement - Off Vehicle .

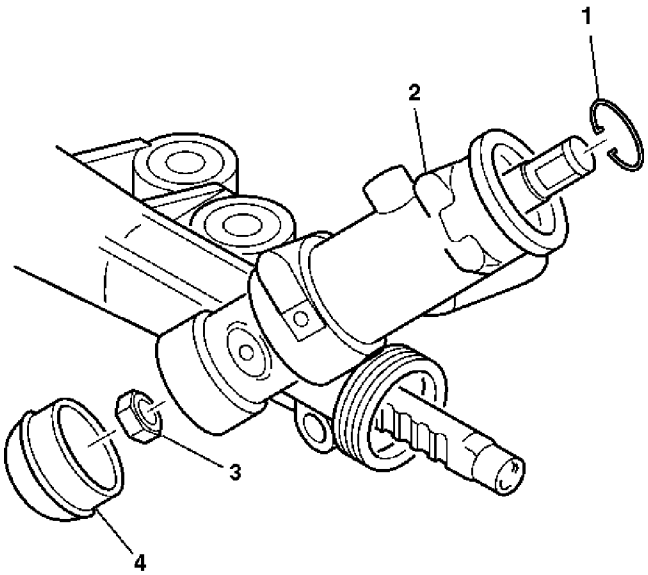
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Steering Gear Stub Shaft Seal and Bearing Replacement

Disassembly Procedure



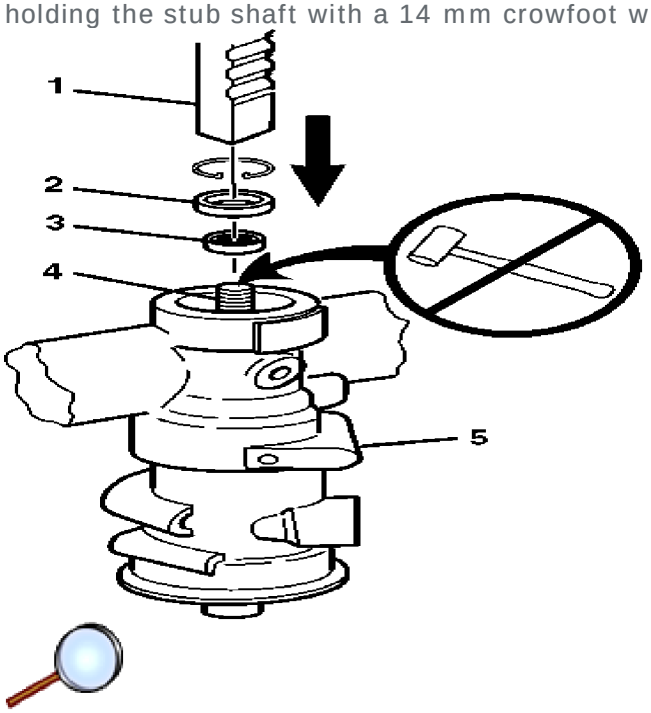
1. Remove the adjuster plug lock nut (5) from the adjuster plug (4).
2. Remove the adjuster plug (4) from the gear assembly (1).
3. Remove the adjuster spring (3) and the rack bearing (2).



4. Remove the retaining ring (1) from the valve bore of the rack and pinion gear assembly (2).
5. Remove the dust cover (4) from the bottom of the rack and pinion gear assembly (2).

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6. Remove the hex lock nut (3) from the lower end of the pinion and valve assembly while holding the stub shaft with a 14 mm crowfoot wrench.



Important: When performing the following procedure, do not remove pinion and valve assembly from the rack and pinion gear assembly (5). Press the pinion and valve assembly only far enough to allow removal of the stub shaft bearing annulus (3) and the stub shaft seal (2).

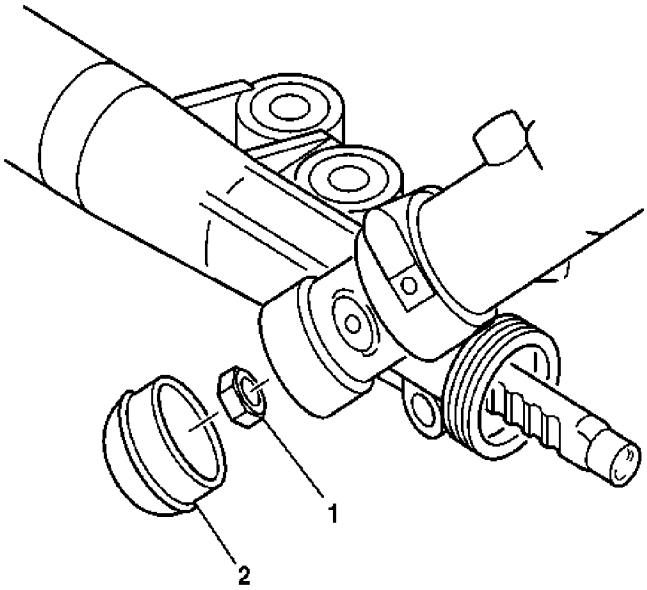
7. Using an arbor press (1), press on the threaded end of the pinion until removal of the following items is possible:
   7.1. The stub shaft (4)
   7.2. The stub shaft seal (2)
   7.3. The stub shaft bearing annulus assembly (3)

Assembly Procedure

Tools Required

J 6222-A Stub Shaft Seal Protector

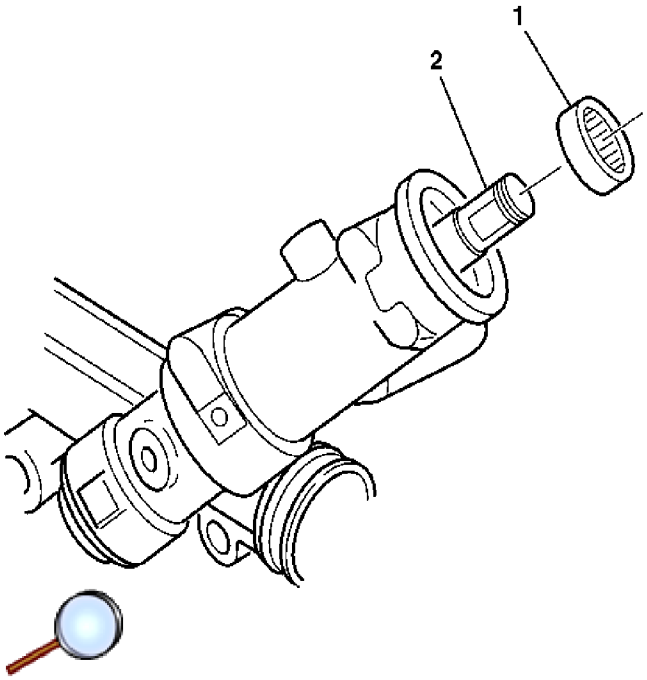
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1. Install the hex lock nut (1) onto the pinion while holding the valve stub shaft.

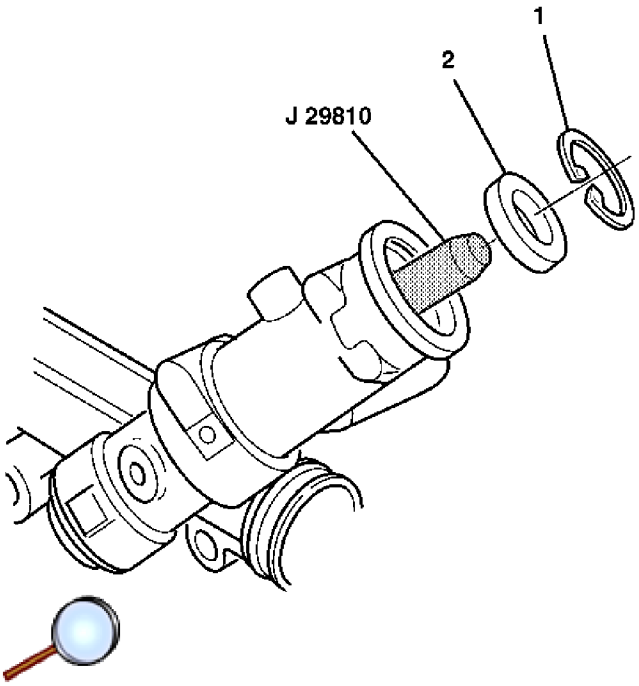
   Tighten
   Tighten the hex lock nut (1) to 30 N·m (22 lb ft).

2. Install the dust cover (2) to the rack and pinion gear assembly.

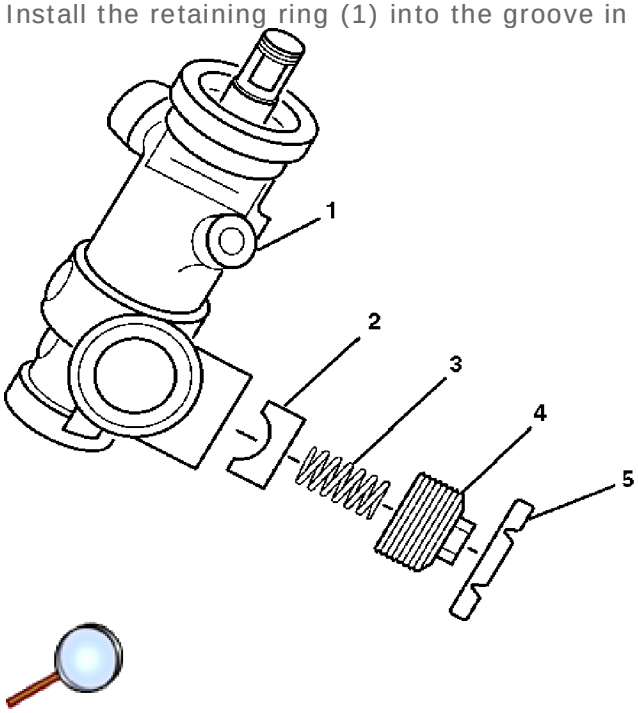


3. Install the stub shaft bearing annulus assembly (1) onto the valve stub shaft (2).

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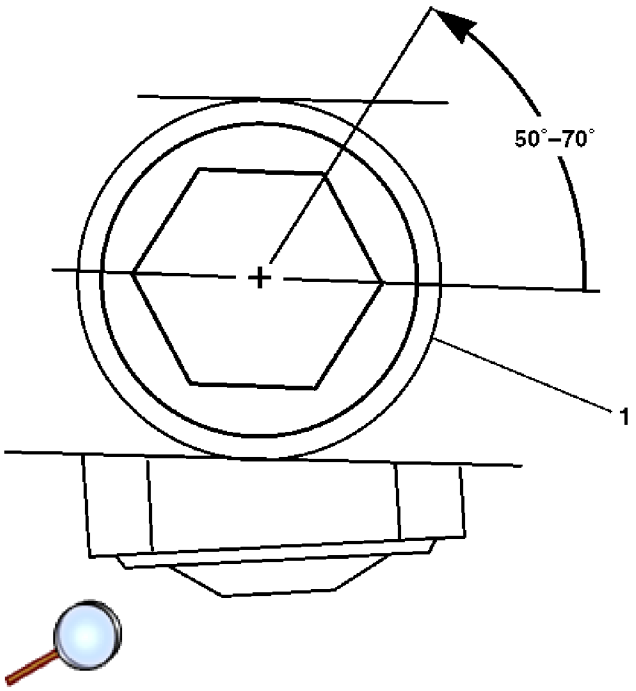
4. Install J 6222-A onto the valve stub shaft.
5. Lubricate the stub shaft seal (2) with grease.
6. Install the stub shaft seal (2) into the rack and pinion gear assembly.
7. Install the retaining ring (1) into the groove in the rack and pinion gear assembly.



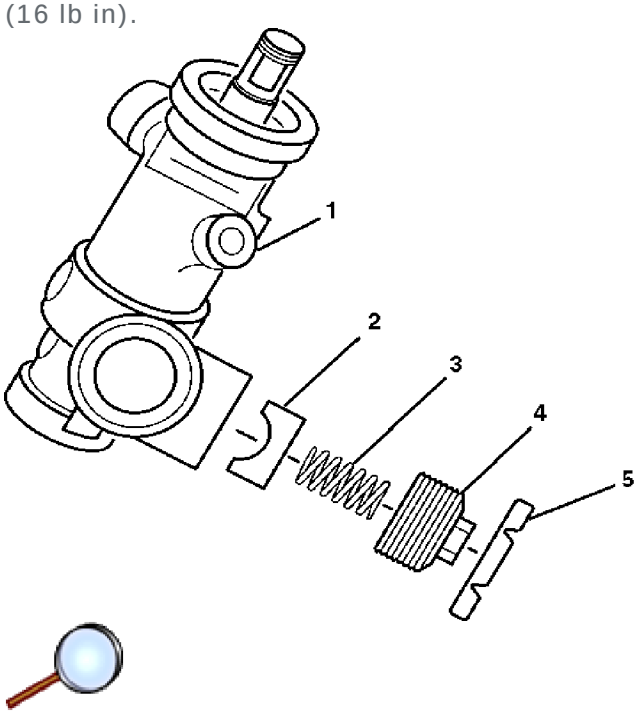
8. Lubricate the following items with lithium base grease:
   8.1. The rack bearing (2)
   8.2. The adjuster spring (3)
   8.3. The adjuster plug (4)
9. Install the following items into the gear assembly:
   9.1. The rack bearing (2)
   9.2. The adjuster spring (3)

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9.3. The adjuster plug (4)



10. Turn the adjuster plug (1) clockwise onto the rack and pinion gear assembly until the adjuster plug (1) bottoms in the rack and pinion gear assembly, then turn the adjuster plug (1) back 50 degrees to 70 degrees.
11. Check the rotational torque on the pinion. The maximum pinion preload torque is 1.8 N·m (16 lb in).



12. Install the adjuster plug lock nut (5) to the adjuster plug (4).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint

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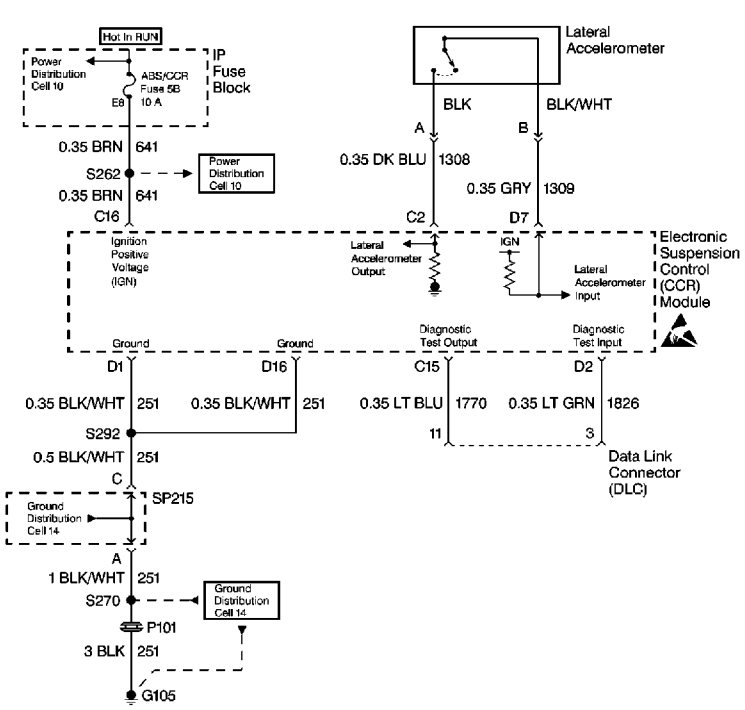
surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

Tighten

Finger tighten the adjuster plug lock nut (5) while holding the adjuster plug (4) stationary.

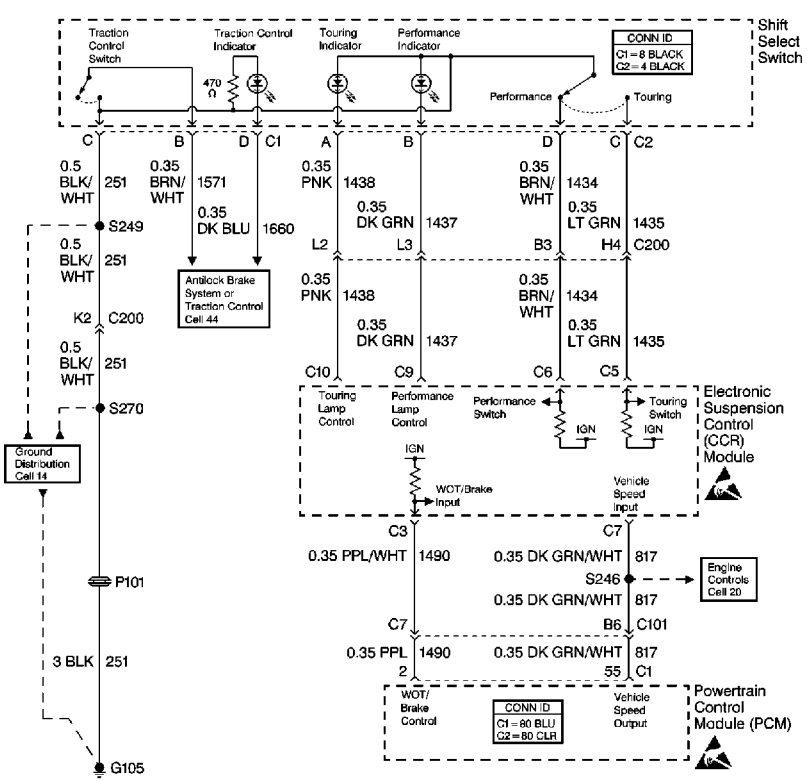
tomsn048@gmail.com

Cell 43: CCR Power and Grounds



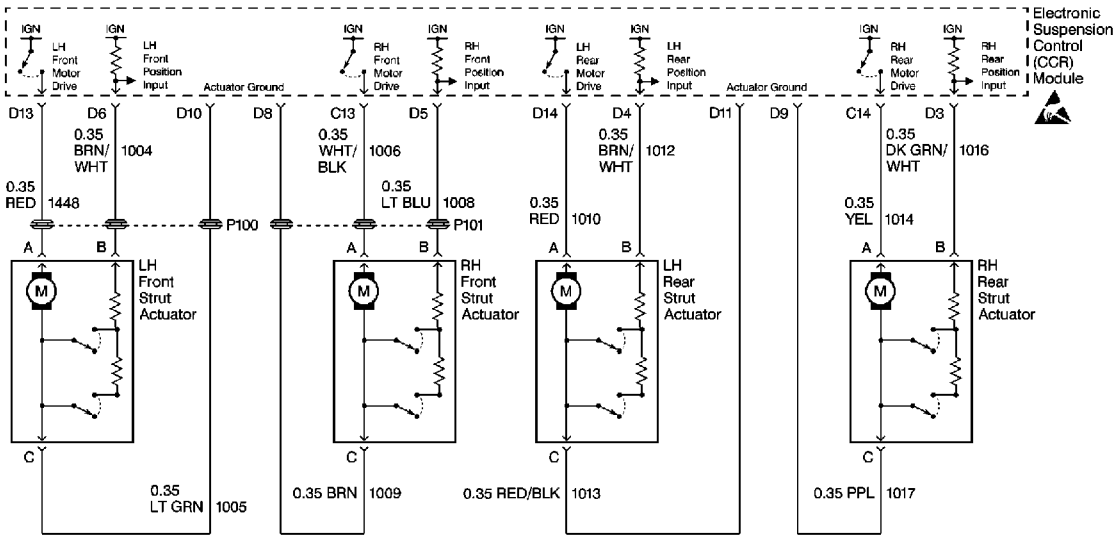
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Cell 43: Shift Select Switch



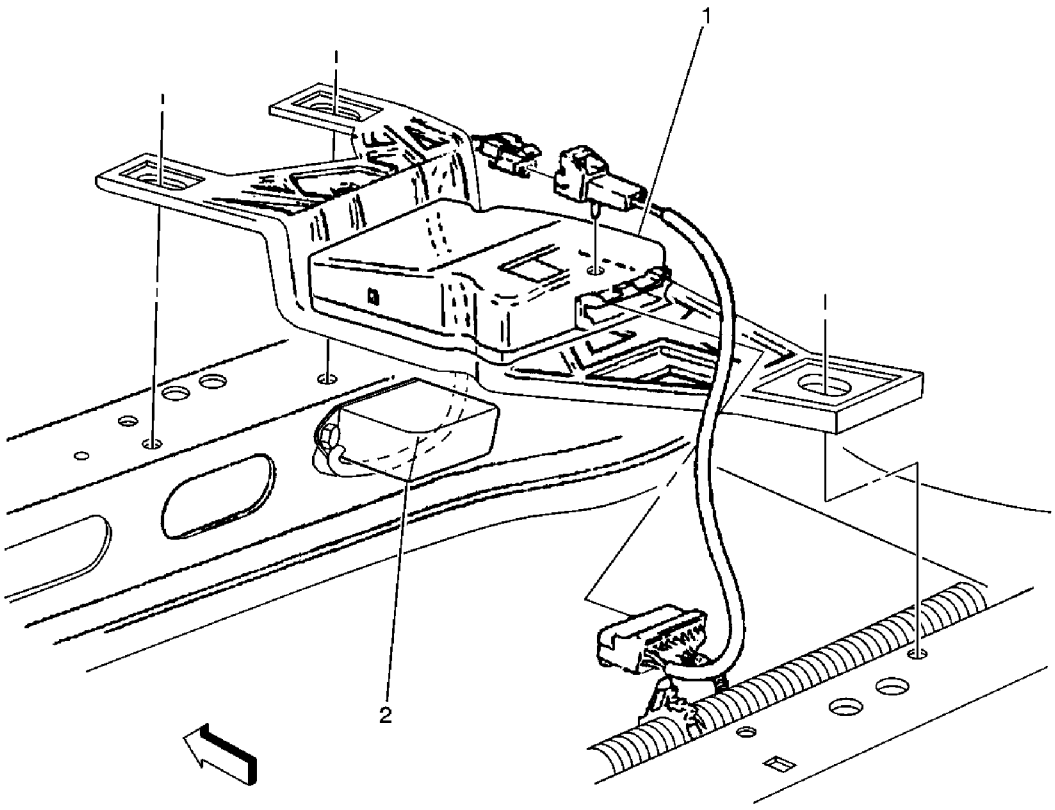
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Cell 43: Strut Actuators



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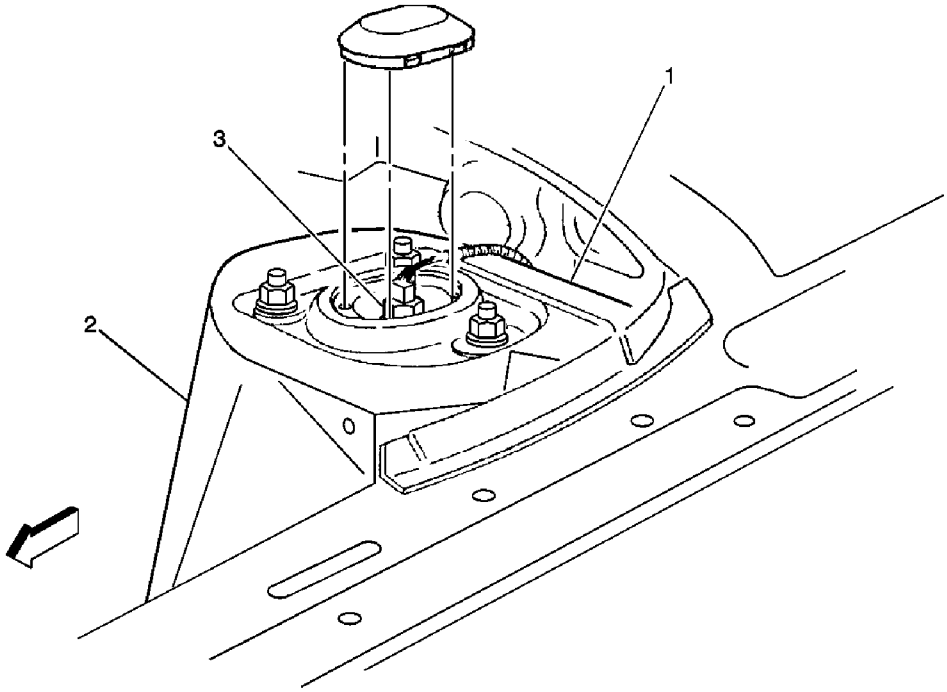
Passenger Compartment, Under LH Seat



(1) Computer Command Ride (CCR) Control Module
(2) Lateral Accelerometer

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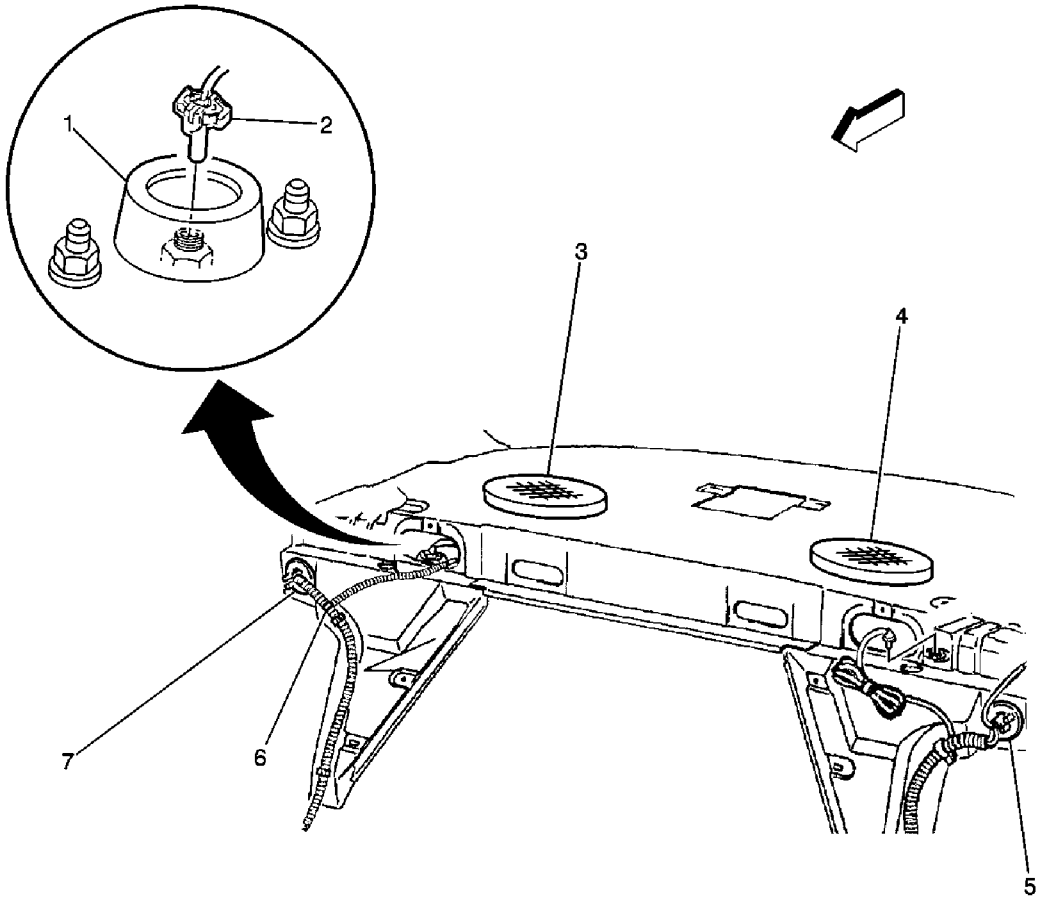
Engine Compartment, Left Rear Corner



(1) P100 (Hidden)
(2) LH Front Strut Tower
(3) LH Front Strut Actuator (RH Similar)

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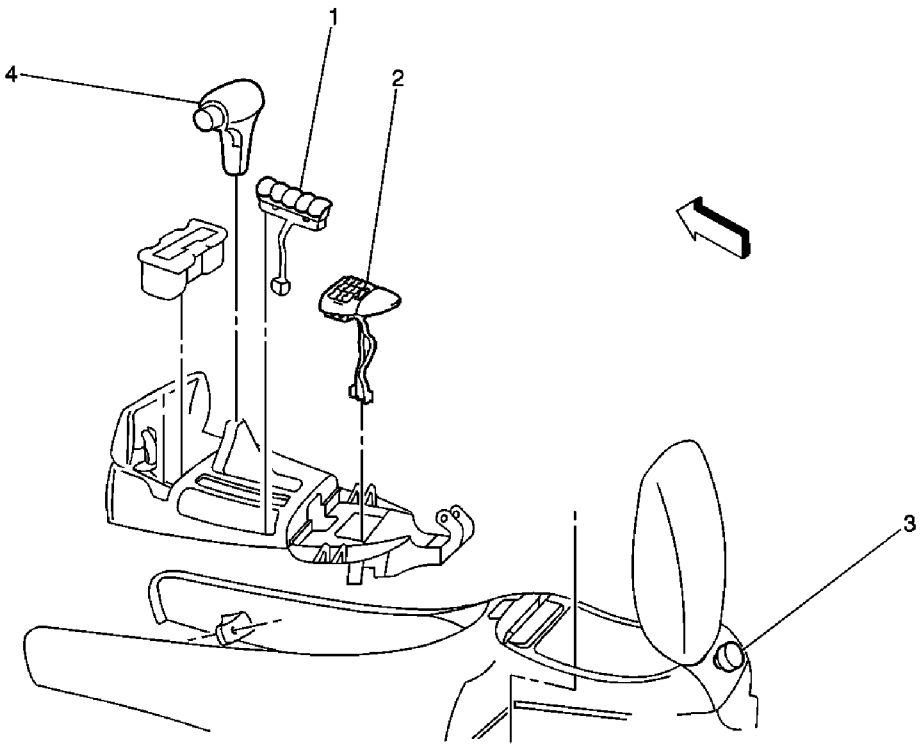
Passenger Compartment, Rear Package Shelf Area



(1) RH Rear Strut Tower -- LH Similar
(2) RH Rear Strut Actuator -- LH Similar (Pontiac w/FW1)
(3) RH Rear Speaker
(4) LH Rear Speaker
(5) P408
(6) S301
(7) P400

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Passenger Compartment, In the Console (Pontiac)



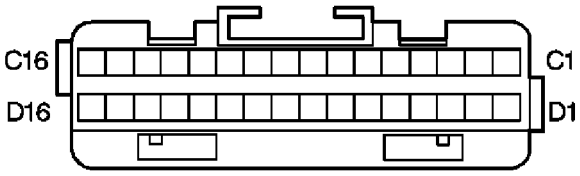
(1) Shift Select Switch
(2) Seat Switches
(3) Rear Console Cigar Lighter
(4) Shifter

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Suspension Controls Connector End Views

Table 1: Lateral Accelerometer
Table 2: LH Front Strut Actuator
Table 3: LH Rear Strut Actuator
Table 4: RH Front Strut Actuator
Table 5: RH Rear Strut Actuator
Table 6: Shift Select Switch C2 (Pontiac)

Electronic Suspension Control (CCR) Module





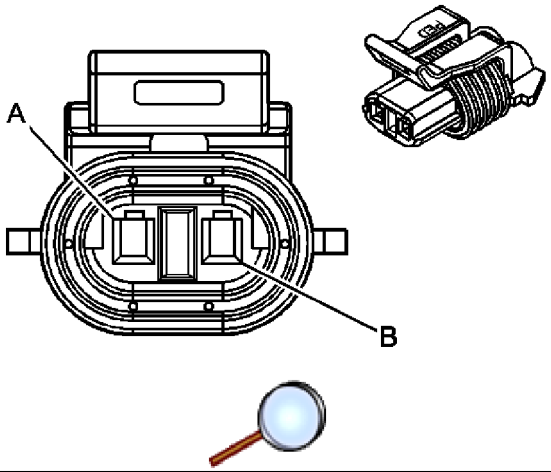
Connector Part Information	• 12045537 • 32 Way F Micro-Pack 100 Series (GRY)

Pin	Wire Color	Circuit No.	Function
C1	-	-	Not Used
C2	DK BLU	1308	CCR Module Lateral Acceleration Signal Output
C3	PPL/WHT	1490	CCR Module Signal - WOT
C4	-	-	Not Used
C5	LT GRN	1435	CCR Switch Signal (Normal)
C6	BRN/WHT	1434	CCR Signal Switch (Firm)
C7	DK GRN/WHT	817	Vehicle Speed Signal
C8	-	-	Not Used
C9	DK GRN	1437	CCR LED Feed (Firm)
C10	PNK	1438	CCR LED Feed (Normal)
C11- C12	-	-	Not Used
C13	WHT/BLK	1006	RH Front Ride Control Strut Motor Feed (Increase)
C14	YEL	1014	RH Rear Ride Control Strut Motor Feed (Increase)
C15	LT BLU	1770	Ride Control Diagnostic Signal

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C16	BRN	641	Fused Output (Ign)
D1	BLK/WHT	251	Ground
D2	LT GRN	1826	Ride Control Diagnostic Enable Signal
D3	DK GRN/WHT	1016	RH Rear CCR Strut Position Signal
D4	BRN/WHT	1012	LH Rear CCR Strut Position Signal
D5	LT BLU	1008	RH Front CCR Strut Position Signal
D6	BRN/WHT	1004	LH Front CCR Strut Position Signal
D7	GRY	1309	CCR Module Lateral Acceleration Signal Input
D8	BRN	1009	RH Front Ride Control Strut Motor Feed (Decrease)
D9	PPL	1017	RH Rear Ride Control Strut Motor Feed (Decrease)
D10	LT GRN	1005	LH Front Ride Control Strut Motor Feed (Decrease)
D11	RED/BLK	1013	LH Rear Ride Control Strut Motor Feed (Decrease)
D12	-	-	Not Used
D13	RED	1448	LH Front Ride Control Strut Motor Feed (Increase)
D14	RED	1010	LH Rear Ride Control Strut Motor Feed (Increase)
D15	-	-	Not Used
D16	BLK/WHT	251	Ground

Lateral Accelerometer

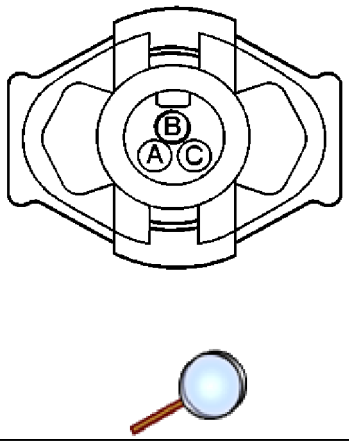


Connector Part Information	• 12052635 • 2-Way F Metri-Pak 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	DK BLU	13018	Computer Command Ride Module Lateral Acceleration Signal - Output
B	GRA	1309	Computer Command Ride Module Lateral Acceleration

			Signal - Input

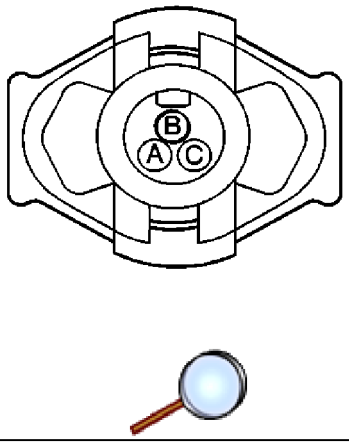
LH Front Strut Actuator



Connector Part Information	• 12129129 • 3-Way F P25 (MD GRA)

Pin	Wire Color	Circuit No.	Function
A	RED	1448	Ride Control Strut Motor Feed - Left Front Increase Damping
B	BRN/WHT	1004	Computer Command Ride Strut Position Signal - Left Front
C	LT GRN	1005	Ride Control Strut Motor Feed - Left Front Decrease Damping

LH Rear Strut Actuator

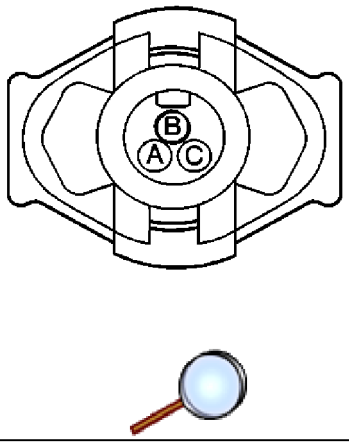


Connector Part Information	• 12129129 • 3-Way F P25 (MD GRA)

Pin	Wire Color	Circuit No.	Function

A	RED	1010	Ride Control Strut Motor Feed - Left Rear Increase Damping
B	BRN/WHT	1012	Computer Command Ride Strut Position Signal - Left Rear
C	RED/BLK	1013	Ride Control Strut Motor Feed - Left Rear Decrease Damping

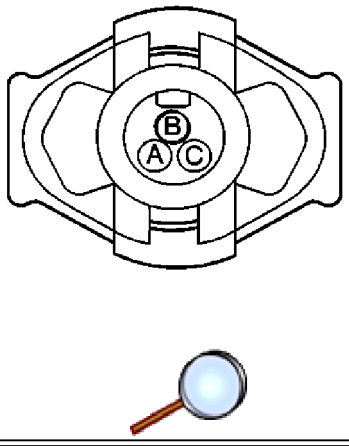
RH Front Strut Actuator



Connector Part Information	
	• 12129129 • 3-Way F P25 (MD GRA)

Pin	Wire Color	Circuit No.	Function
A	WHT/ BLK	1006	Ride Control Strut Motor Feed - Right Front Increase Damping
B	LT BLU	1008	Computer Command Ride Strut Position Signal - Right Front
C	BRN	1009	Ride Control Strut Motor Feed - Right Front Decrease Damping

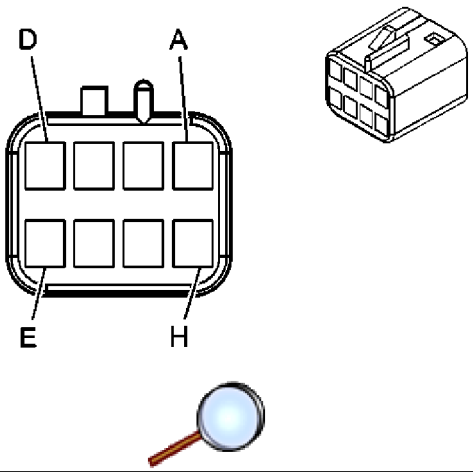
RH Rear Strut Actuator



Connector Part Information	• 12129129 • 3-Way F P25 (MD GRA)

Pin	Wire Color	Circuit No.	Function
A	YEL	1014	Ride Control Strut Motor Feed - Right Rear Increase Damping
B	DK GRN/WHT	1016	Computer Command Ride Strut Position Signal - Right Rear
C	PPL	1017	Ride Control Strut Motor Feed - Right Rear Decrease Damping

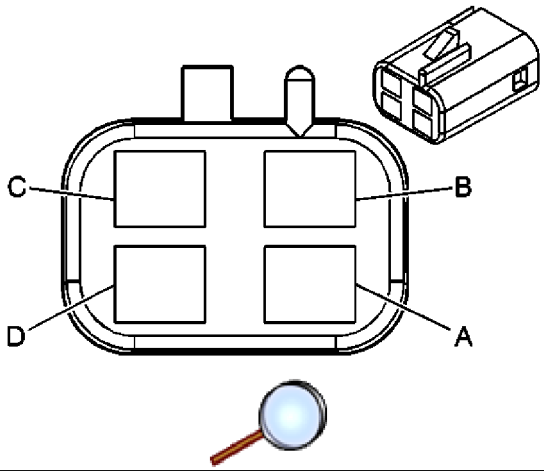
Shift Select Switch Connector C1 (Pontiac)



Connector Part Information	• 12047886 • 7-Way F Metri-Pack 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	BRN	1141	Fused Output - IGN3
B	BRN/WHT	1571	Traction Control Switch Signal
C	BLK/WHT	251	Ground
D	DK BLU	1660	Tracton Control Indicator Lamp Driver Module Output
E	GRY	8	Instrument Panel Lamp Feed
F	BLK	1250	Ground
G	LT BLU	553	Transmission Shift Select Switch Output - Performance
H	BLK	808	Sensor Ground

Shift Select Switch C2 (Pontiac)

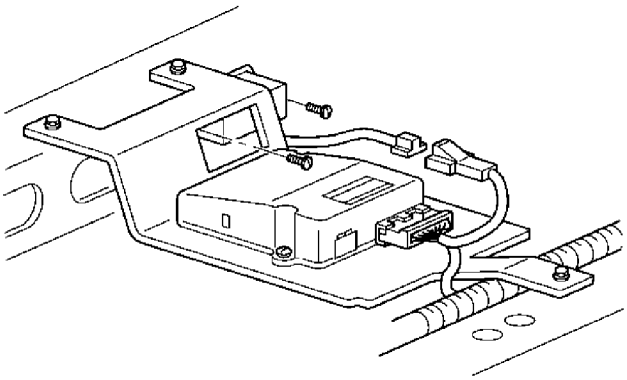


Connector Part Information	• 12047785 • 4-Way F Metri-Pack 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	PNK	1438	Computer Command Ride LED Feed - Normal
B	DK GRN	1437	Computer Command Ride LED Feed - Firm
C	LT GRN	1435	Computer Command Ride Switch Signal - Normal
D	BRN/WHT	1434	Computer Command Ride Switch Signal - Firm

Vehicle Lateral Accelerometer Replacement

Removal Procedure



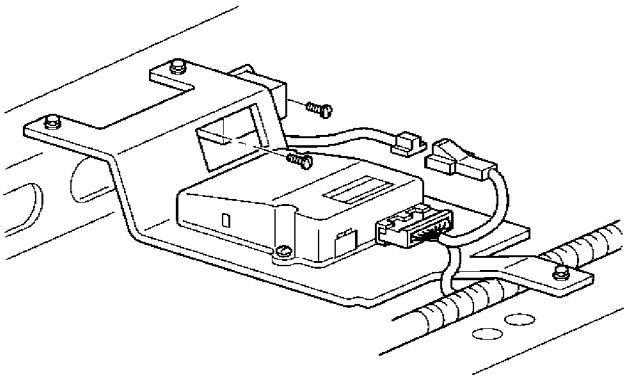
1. Remove the driver's seat. Refer to Seat Replacement .
2. Pull the carpet back to expose the lateral accelerator switch.
3. Disconnect the electrical connector from the lateral accelerator switch.
4. Remove the two screws and the lateral accelerator switch.

Installation Procedure

1. Install the lateral accelerator switch with two screws.

   Tighten
   Tighten the screws to 2 N·m (18 lb in)

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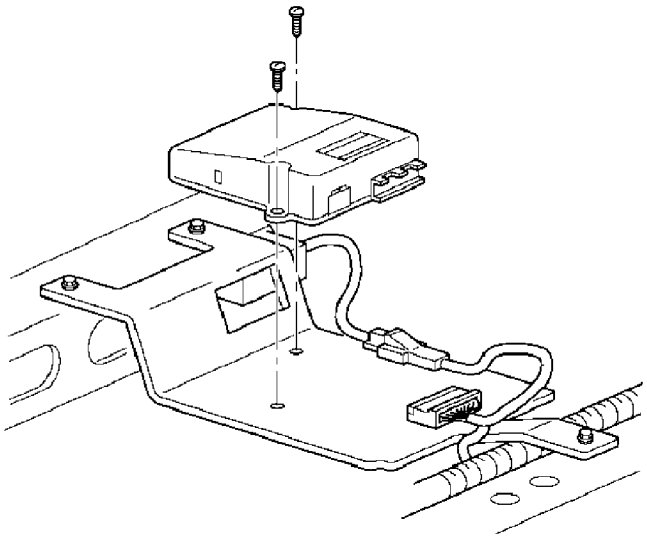


2. Connect the electrical connector to the module.
3. Install the carpet.
4. Install the driver's seat. Refer to Seat Replacement .

Electronic Suspension Control Module Replacement

Removal Procedure

1. Remove the driver's seat. Refer to Seat Replacement .
2. Pull the carpet back to expose the control module.





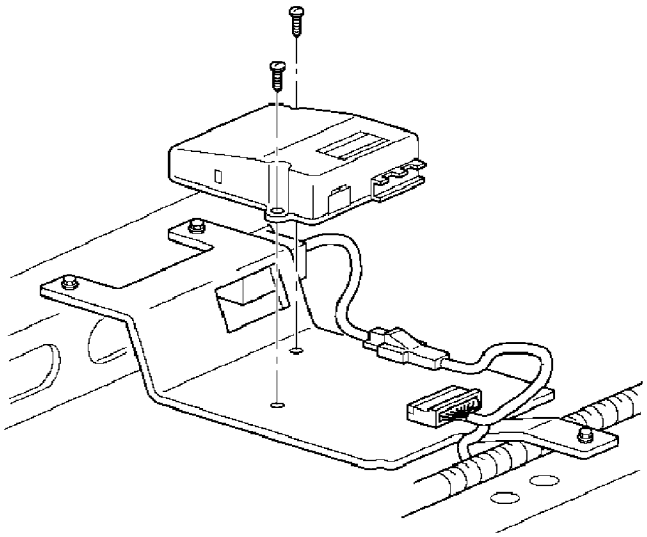
3. Disconnect the electrical connector from the control module.
4. Remove the two screws and the control module.

Installation Procedure

1. Install the control module with two screws.

   Tighten
   Tighten the screws to 2 N·m (18 lb in)

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2. Connect the electrical connector to the module.
3. Install the carpet.
4. Install the driver's seat. Refer to Seat Replacement .

Fastener Tightening Specifications

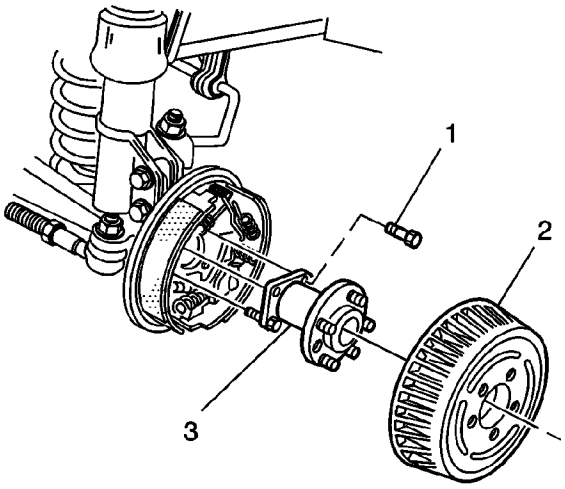
Application	Specification	
	Metric	English
Adjustment Link Lock Nut	65 N·m	48 lb ft
Adjustment Link to Control Arm	85 N·m	63 lb ft
Adjustment Link to Knuckle	45 N·m	33 lb ft
Ball Joint	55 N·m	40 lb ft
Control Arms Nuts (Optional Torque)	182 N·m	134 lb ft
Control Arms Nuts	115 N·m	85 lb ft
Hub and Bearing Bolts	70 N·m	52 lb ft
Stabalizer Shaft Insulator Link Bolt	23 N·m	17 lb ft
Stabalizer Shaft Link Nut (at Bracket)	17 N·m	13 lb ft
Stabalizer Shaft Link Assembly	47 N·m	35 lb ft
Stabalizer Shaft Mounting Bracket to Body	18 N·m	14 lb ft
Strut to Knuckle	190 N·m	140 lb ft
Strut (Tower) Mounting Nut	47 N·m	35 lb ft

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Rear Wheel Bearing and Hub Replacement

Removal Procedure

1. Raise and suitably support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.
2. Remove the wheel and the tire.



Notice: Do not hammer on brake drum as damage to the bearing could result.

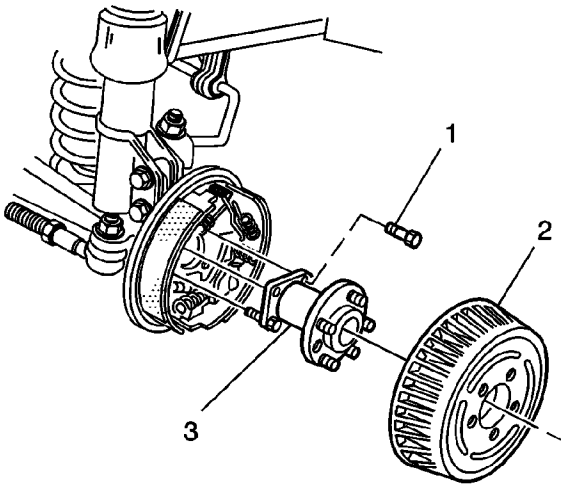
3. Remove the brake drum (2). Refer to Brake Drum Replacement in Drum Brakes.
4. Remove the ABS sensor wire connector.

Important: The bolts which attach the hub and the bearing also support the brake assembly. When removing these bolts, support the brake assembly with a wire or by other means. Do not let the brake line or the ABS electrical wire support the brake assembly.

5. Remove the four bolts (1), the hub (3), and the bearing from the axle.
6. Clean the knuckle face and the bore before installing the hub and the bearing.

Installation

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1. Install the hub and the bearing (3) to the rear knuckle with four bolts (1). Be careful not to drop the hub and the bearing, as it could cause damage.
2. Reconnect the ABS sensor.

Tighten
Tighten the hub and the bearing bolts to 70 N·m (52 lb ft).

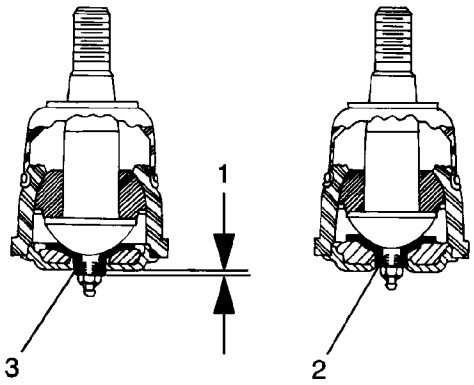
Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the brake drum (2). Refer to Brake Drum Replacement in Drum Brakes.
4. Install the wheel and the tire.

Tighten
Tighten the wheel nuts to 140 N·m (100 lb ft).

5. Lower the vehicle.

Ball Joint Inspection



When checking the condition of the ball joint, be sure to follow the inspection procedure closely to prevent unnecessary ball joint replacement. During the inspection, have the vehicle supported by the wheels to insure that its weight is the loading ball joints.

The ball joint has a visual wear indicator. Wear is indicated by a 13 mm (0.50 in) diameter nipple retracting into the ball joint cover (the ball joint grease fitting is threaded into this nipple). The nipple protrudes 1.27 mm (0.050 in) (1) beyond the ball joint cover surface (3) on a new, unworn joint. Replace the ball joint if the nipple is flush or below the cover surface (2).

As part of the inspection, check the ball stud tightness in the knuckle boss. Check it by shaking the wheel and feeling for movement of the stud end or castellated nut at the knuckle boss. Checking the fastener tightness at the castellated nut is an alternative method of inspecting. A loose nut can indicate a bent stud or an opened-up hole in the knuckle boss. If worn, replace the ball joint and the knuckle.

If the ball joint is separated from the knuckle for suspension service, inspect the ball joint seal for damage. A damaged seal will cause joint failure. If seal damage is found, replace the ball joint.

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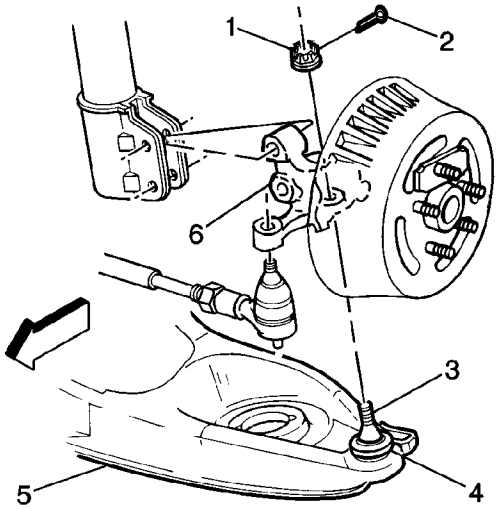
Lower Control Arm Ball Joint Replacement

Removal Procedure

Tools Required

- J 34505 Ball Joint Separator
- J 9519-7 Remover
- J 9519-16 Installer
- J 9519-17 Spacer Tube
- J 9519-18 Screw
- J 9519-23 Clamp
- J 24319-01 Universal Steering Linkage Puller

1. Remove the wheel and tire. Refer to Tire and Wheel Removal and Installation in Tires and Wheels.
2. If Electronic Level Control equipped, remove the height sensor link from the right control arm.
3. Remove the parking brake cable retaining clip at the left control arm.

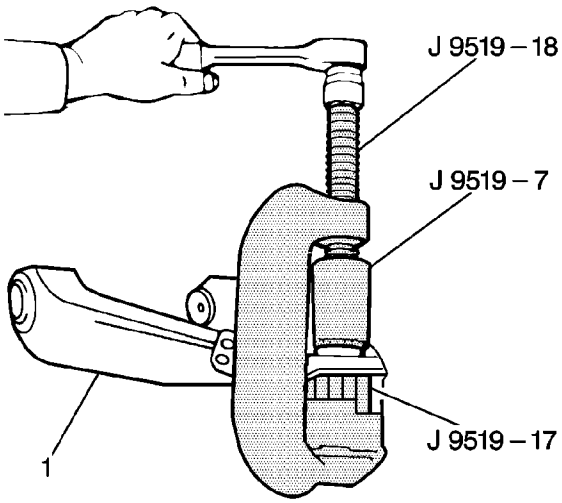


4. Using the J 24319-01 , separate the adjustment link from the knuckle (6).
5. Support the control arm (5) with a suitable jack. The control arm must be supported to prevent the spring from forcing it downward.
6. Remove the cotter pin (2) and the slotted hex nut from the ball joint (4). Turn the nut over and install with the flat portion facing upward. Do not tighten the nut.

Notice: Use only the recommended tools for separating the ball joint from the knuckle. Failure to use the recommended tools may cause damage to the ball joint and seal.

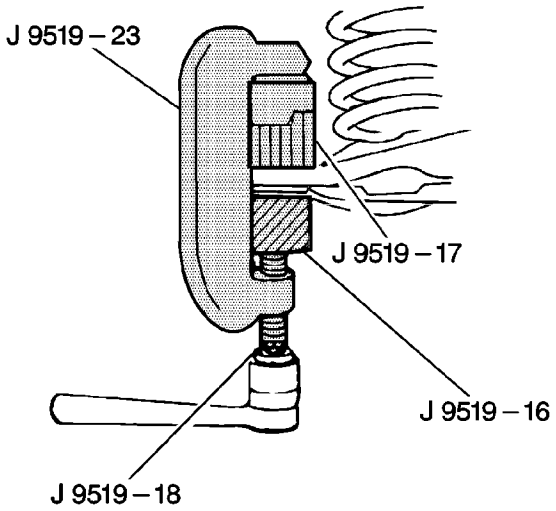
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7. Using the J 34505 , separate the knuckle from the ball stud (3).
8. Remove the slotted hex nut (1).

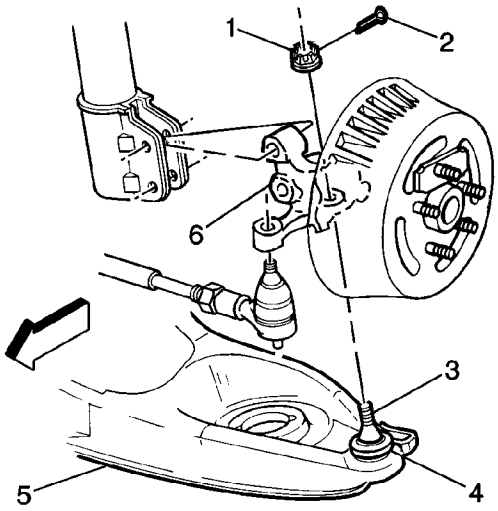


9. Install the tools on the ball joint and on the control arm.
10. Press the ball joint out of the control arm (1).

Installation Procedure



1. Install the tools on the ball joint and on the control arm.
2. Press the new ball joint into the control arm.



3. Install the knuckle (6) on the ball joint stud (3) using the new slotted hex nut (1).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

Tighten

1. Tighten the nut to 10 N·m (88 lb in).
2. Tighten the nut an additional four flats. The torque should be 55 N·m (40 lb ft) minimum.
3. Tighten the nut up to one more flat to align the slot with the cotter pin hole.

4. Install the cotter pin (2).
5. Install the adjustment link to the knuckle. Position the boot toward the front of the vehicle.

Tighten

Tighten the slotted hex nut to 45 N·m (33 lb in).

Important: After tightening the slotted hex nut to specification, align the slot in the nut to cotter pin hole by tightening only. Do not loosen the nut to install the cotter pin.

6. Lubricate the ball joint and the adjustment link.
7. If ELC-equipped, install the height sensor link to the right control arms.
8. Install the parking brake cable retaining clip at the left control arm.
9. Install the wheel and the tire.

Tighten

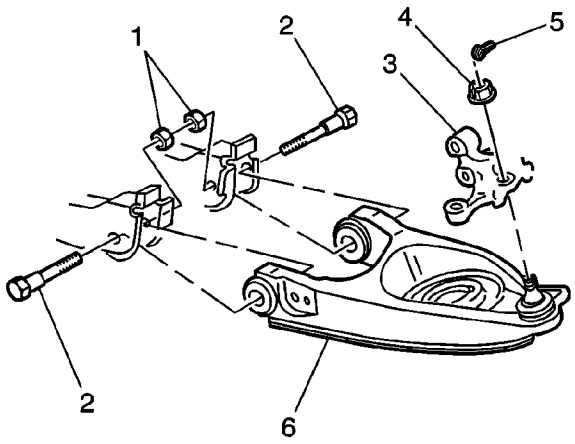
Tighten the wheel nuts to 140 N·m (100 lb ft).

Rear Axle Lower Control Arm Replacement

Removal Procedure

Tools Required

- J 23028-A Rear Coil Spring Remover and Installer
- J 34505 Ball Joint Separator



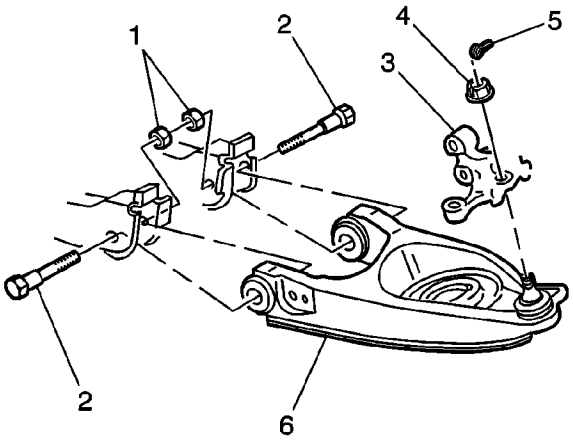
1. Remove the adjustment link retaining nut (1) and the link from the control arm (6).
2. Remove the spring. Refer to Coil Spring Replacement .
3. Remove the cotter pin (5) and the slotted hex nut (4) from the ball joint. Turn the nut over and install the nut with the flat portion facing upward. Do not tighten the nut.

   Notice: Use only the recommended tools for separating the ball joint from the knuckle. Failure to use the recommended tools may cause damage to the ball joint and seal.

4. Using the J 34505 , separate the knuckle (3) from the ball stud. Remove the slotted hex nut (4).
5. Remove the control arm (6).

Installation Procedure

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1. Position the control arm ball joint stud (6) in the knuckle boss (3).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install a new slotted hex nut (4).

Tighten

1. Tighten the nut to 10 N·m (88 lb in).
2. Tighten the nut an additional four flats; torque should be 55 N·m (40 lb ft) minimum. It may be necessary to partially load the joint to keep the ball stud from rotating while the nut is being tightened.
3. Tighten the nut up to one more flat to align the slot with the cotter pin hole.

3. Install the cotter pin (5).
4. Install the spring. Refer to Coil Spring Replacement .
5. Connect the adjustment link to the control arm (6) with the retaining nut (1).

Tighten

Tighten the link retaining nut to 85 N·m (63 lb ft).

Important: The control arm nuts (1) should be tightened with the vehicle unsupported and resting on its wheels at the normal trim height. Failure to follow this procedure may adversely affect the ride and handling of the vehicle.

Tighten

- Tighten the control arm nuts (1) to 115 N·m (85 lb ft). Optional torque: Tighten the control arm bolts (2) to 182 N·m (134 lb ft).
- Tighten the stabilizer shaft link bolt to 17 N·m (13 lb ft).

6. Lubricate the ball joint and the adjustment link.

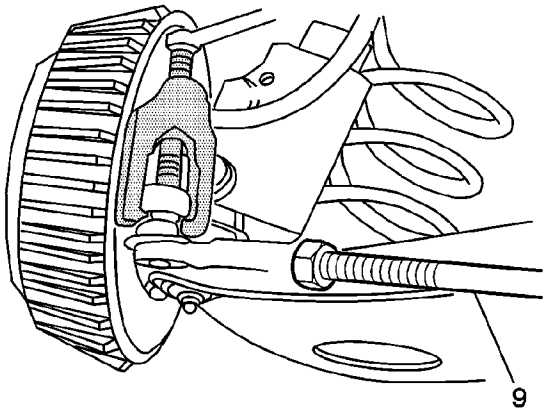
Tie Rod Replacement

Removal Procedure

Tools Required

J 24319-01 Universal Steering Linkage Puller.

1. Remove the wheel and the tire. Refer to Tire and Wheel Removal and Installation in Tires and Wheels.



2. Remove the cotter pin and the slotted hex nut.
3. Remove the brake line.
4. Remove the wheel speed sensor harness and bracket in order to install linkage puller.
5. Use J 24319-01 to separate the adjustment link (9) from the knuckle.

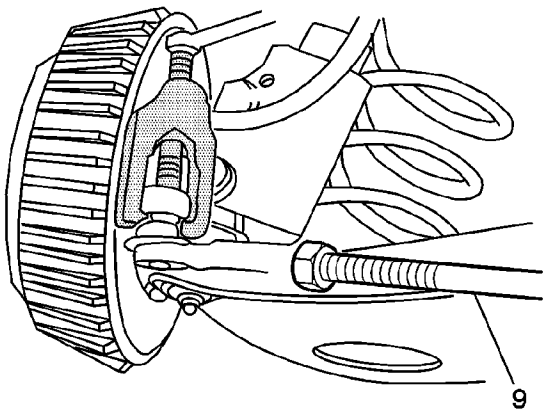
   Notice: When separating a linkage joint, do not try to disengage the joint by driving a wedge between the joint and the attached part. Seal damage may result.

6. Remove the link retaining nut and the link from the control arm.

Installation Procedure

1. Install the brake line.
2. Install the wheel speed sensor harness and bracket.

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3. Install the link (9) to the control arm with the retaining nut.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

4. Install the link to the knuckle. Position the boot toward the front of the vehicle

Tighten

- Tighten the retaining nut to 85 N·m (63 lb ft).
- Tighten the slotted hex nut to 45 N·m (33 lb ft).

Important: After tightening the slotted hex nut to specification, align the slot in the nut to the cotter pin hole by tightening only. Do not loosen the nut to install the cotter pin.

5. Install the cotter pin.
6. Lubricate the adjustment link joint.
7. Install the wheel and the tire.

Tighten

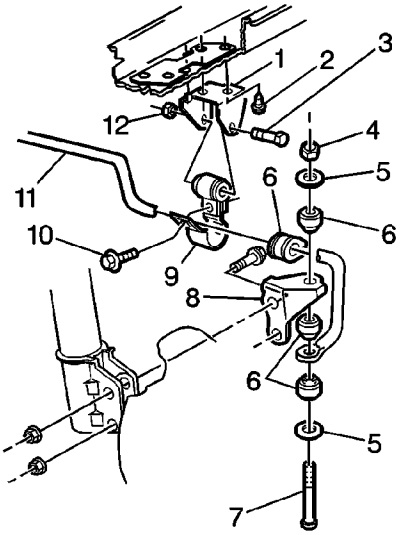
Tighten the wheel nuts to 140 N·m (100 lb ft).

Check and set the rear wheel alignment after installing the adjustment link. Refer to Wheel Alignment Specifications in Wheel Alignment.

Stabilizer Shaft Replacement

Removal Procedure

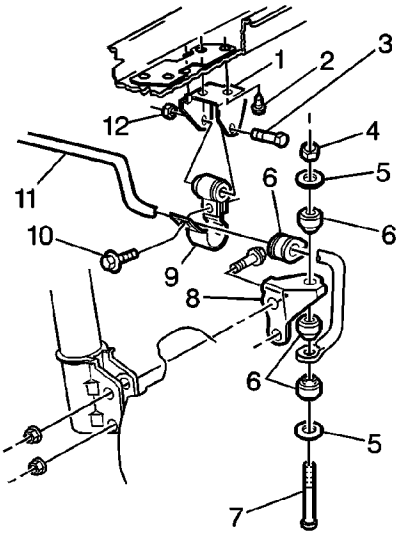
1. Remove the rear wheels and the tires.



2. Remove the stabilizer shaft link assembly bolt (7) and the nut (4). Remove the retainer (5) and the insulators (6) from the stabilizer shaft bracket (8).
3. Remove the link bolt (10), and bend the open end of the link (9) downward.
4. Remove the stabilizer shaft (11) and the insulators (6).

Installation Procedure

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1. Install the stabilizer shaft (11) and the insulators (6). Install the insulator (6) into the link (9) with the slit rearward.
2. Bend the link upward to close around the insulator, and install the link bolt (10).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the link assembly insulators(6), the retainers(5), the support bolt (7) and the nut (4).

Tighten

- Tighten the link assembly nut to 17 N·m (13 lb ft).
- Tighten the link bolt to 23 N·m (17 lb ft).

4. Install the wheels and the tires.

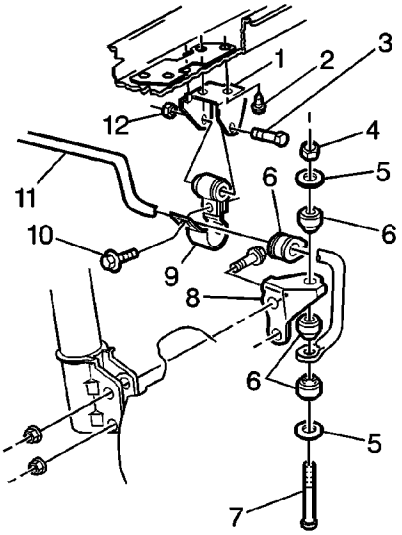
Tighten

Tighten the wheel nuts to 140 N·m (100 lb ft).

Stabilizer Shaft Insulator Replacement

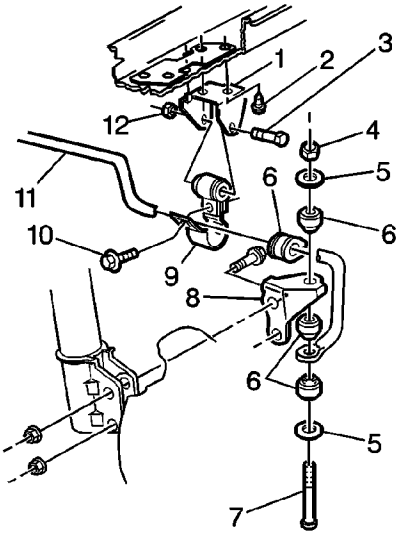
Removal Procedure

1. Remove the rear wheels and the tires.



2. Bend the link bolt, and bend the open end of the link (10) downward.
3. Remove the stabilizer shaft insulators (6).

Installation Procedure



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1. Install the stabilizer shaft and the insulators (6). Install the insulator into the link with the slit rearward.
2. Bend the link (9) upward to close around the insulator, and install the link bolt (10).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the link assembly insulators, the retainers, the support bolt and nut.

   Tighten
   - Tighten the link assembly nut to 17 N·m (13 lb ft).
   - Tighten the link bolt to 23 N·m (17 lb ft).
4. Install the wheels and the tires.

   Tighten
   Tighten the wheel nuts to 140 N·m (100 lb ft).

Coil Spring Replacement

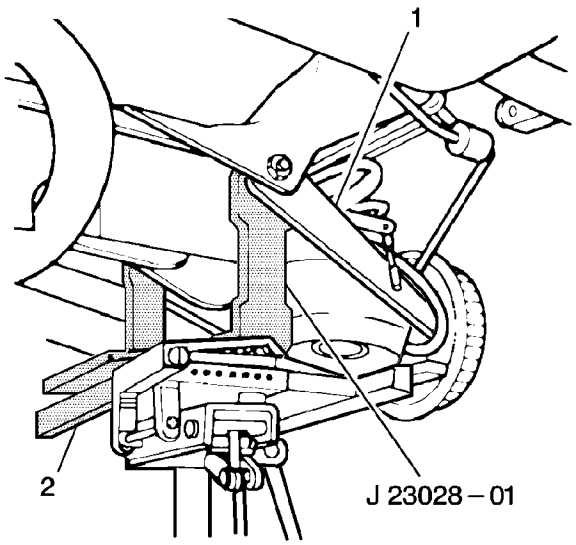
Removal Procedure

Tools Required

J 23028-A Rear Coil Spring Remover and Installer

Important: Support the vehicle so that the control arm hangs free. Refer to Lifting and Jacking the Vehicle in General Information.

1. Remove the rear wheel and the tire.
2. If Electronic Level Control (ELC) -equipped, remove the height sensor link from the right control arm.
3. Remove the parking brake cable retaining clip from the left control arm.
4. Remove the rear stabilizer shaft from the bracket on the knuckle.



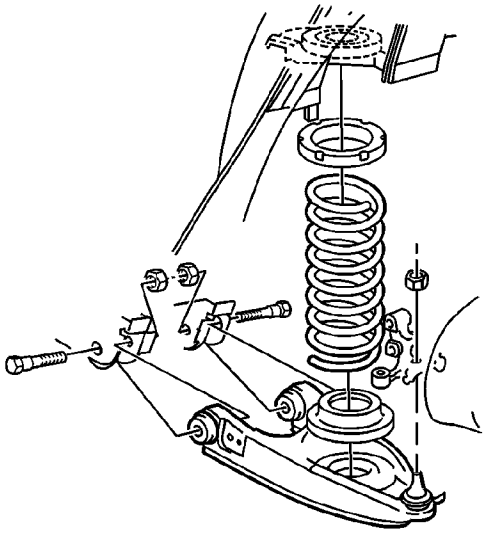
5. Mount the J 23028-A on the transmission jack (2) and position to cradle the control arm bushings.

   Caution: Tool J 23028-01 should be secured to a suitable jack or personal injury could result.

   Important: Place a chain around the spring and through the control arm pivot bolts.

6. Raise the jack to remove the tension from the control arm pivot bolts.

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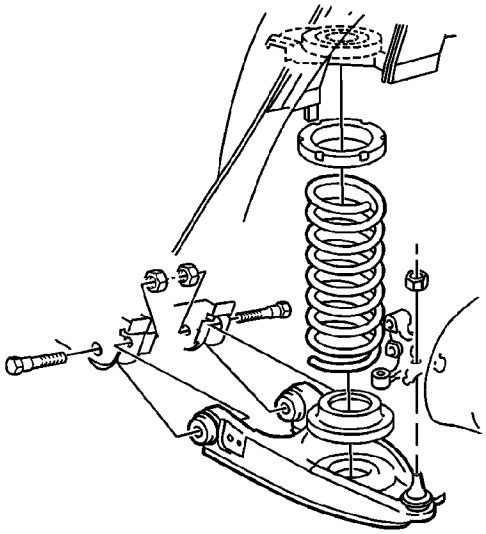


7. Remove the rear bolt and the nut from the rear control arm.
8. Slowly maneuver the jack to relieve the tension from the front control arm bolt.
9. Remove the front bolt and nut from the rear control arm.

Important: Do not apply force to the control arm and/or ball joint to remove the spring. Proper maneuvering of the spring will allow for easy removal.

10. Lower the jack to pivot the control arm downward. When all the compression is removed from the spring, remove the safety change, the spring, and the insulators.
11. Inspect the insulators carefully and replace if cut or torn. Replace the insulators if the vehicle has over 80,450 km (50,000 miles).

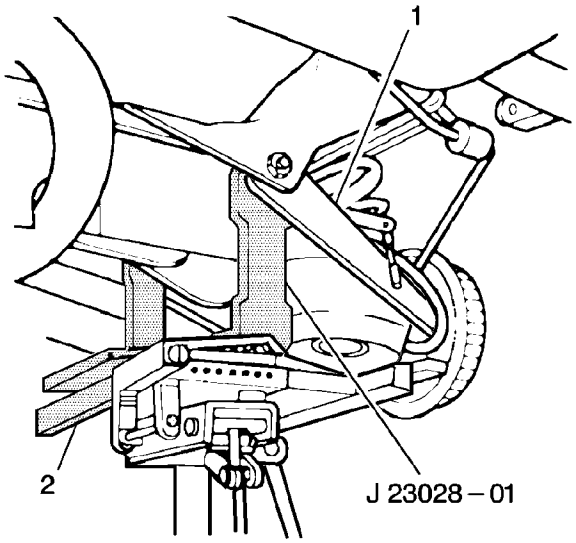
Installation Procedure



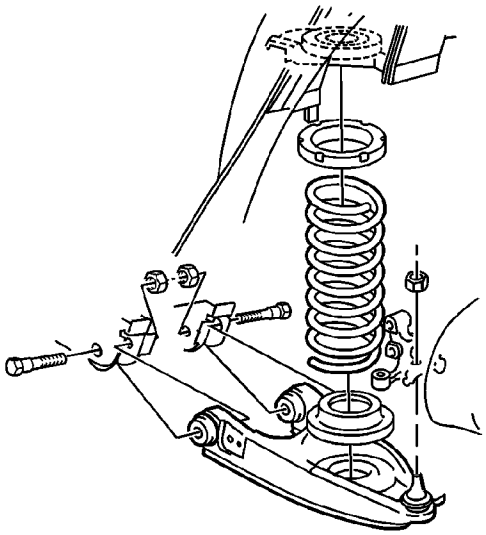
1. Snap the upper insulator onto the spring before installation.

Important: Install the coil springs so the upper ends are positioned as shown in the above figure.

2. Position the lower insulator and the spring in the vehicle.



3. Using the J 23028-A mounted on the transmission jack (2), raise the control arm into position.



4. Slowly maneuver the jack to permit the installation of the control arm bolts and the nuts.
5. Install the rear stabilizer shaft to the knuckle bracket with the link assembly.
6. If ELC-equipped, install the height sensor link from the right control arm.

7. Install the parking brake cable retaining clip at the left control arm.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

Important: The control arm nuts should be tightened with the vehicle unsupported and resting on its wheels at the normal trim height. Failure to do so may adversely affect ride and handling.

8. Install the rear wheel and the tire.

Tighten

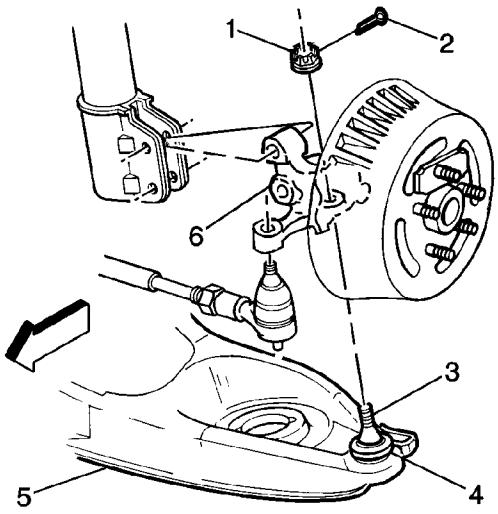
- Tighten wheel nuts to 140 N·m (100 lb ft).
- Tighten the control arm nuts to 115 N·m (85 lb ft). Optional Torque: Tighten the control arm bolts to 182 N·m (134 lb ft).
- Tighten the stabilizer shaft link bolts to 17 N·m (13 lb ft).

Outer Adjustment Link Replacement

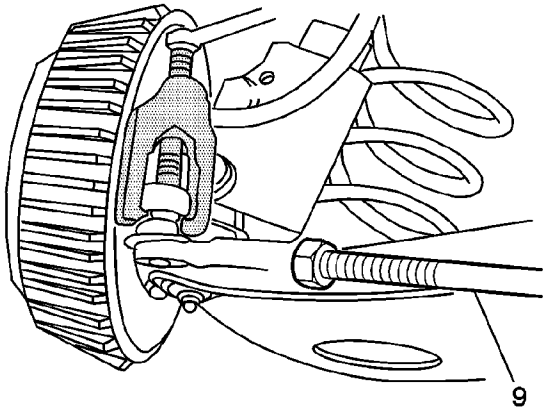
Removal Procedure

Tools Required

J 24319-01 Universal Steering Linkage Puller



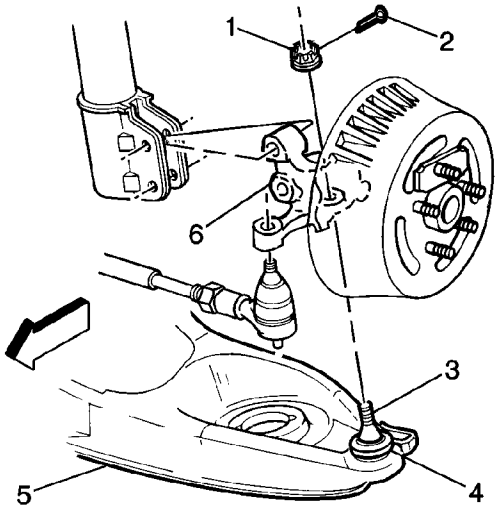
1. Remove the wheel and tire.
2. Remove the cotter pin (2) and slotted hex nut (1).



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3. Using J 24319-B, separate the adjustment link from the knuckle.
4. Loosen the adjustment link retaining nut.
5. Remove the adjustment link.

Installation Procedure



Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

1. Install the adjustment link with retaining nut.

   Tighten
   Tighten the retaining nut to 85 N·m (63 lb ft).

2. Install the link to the knuckle and position the boot toward the front of the vehicle.
3. Install the slotted hex nut.

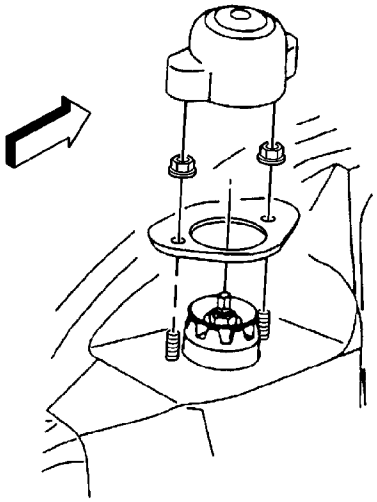
   Tighten
   Tighten the nut to 45 N·m (33 lb ft).

4. After tightening the slotted hex nut to specification, align the slot in the nut to cotter pin hole by tightening only, do not loosen the nut to align for the cotter pin (2).
5. Install the wheel and tire.

Tighten
Tighten the nut to 140 N·m (100 lb ft).

Strut Assembly Replacement

Removal Procedure

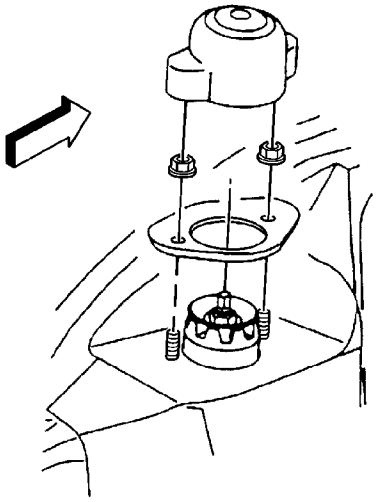


Caution: Floor jack must remain under the lower control arm during removal and installation to retain the lower control arm in position. Failure to do so could result in personal injury.

1. Remove the rear seat cushion and seatback to gain access to the strut tower mounting nuts.
2. Remove the wheel and tire.
3. If ELC equipped, remove the air tube from the strut.
4. Support the control arm with a suitable jack stand.
5. Remove the strut to knuckle nuts and bolts.
6. Remove the upper nuts from the strut.
7. Remove the strut from the knuckle.
8. Remove the strut.

Installation Procedure

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1. Install the strut.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the strut to tower nuts.

   Tighten
   Tighten the nuts to 47 N·m (35 lb ft).

3. Install the strut to knuckle bolts and nuts.

   Tighten
   Tighten the strut to knuckle bolts to 190 N·m (140 lb ft).

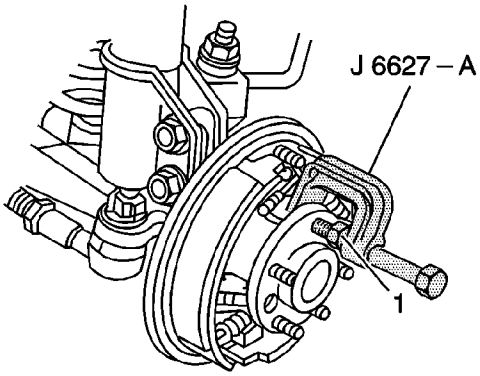
4. Connect the air tube to the strut.
5. Install the rear seatback and seat cushion. Refer to Seatback and Seat Cushion in Seats.
6. Install the wheel and tire.

   Tighten
   Tighten the wheel nuts to 140 N·m (100 lb ft).

7. Check and reset alignment. Refer to Wheel Alignment Specifications .

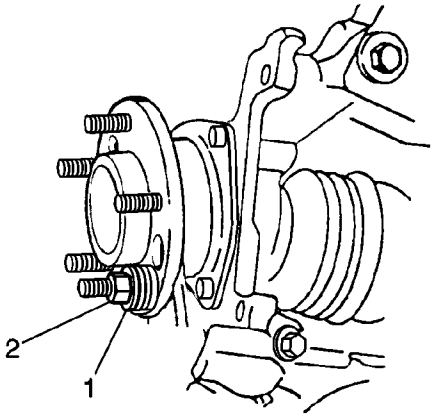
Wheel Stud Replacement

Removal Procedure



1. Remove the wheel and the tire.
2. Remove the brake drum. Refer to Brake Drum Replacement in Brakes .
3. Remove the wheel stud using the J 6627-A .

Installation Procedure



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1. Install the new stud from the back side of the hub.
2. Install the four flat washers on the stud.
3. Install the wheel nut (2) with the flat side toward washers.
4. Tighten the nut until the stud head is properly seated in the hub flange.
5. Install the brake drum. Brake Drum Replacement in Brakes.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

6. Install the wheel and the tire.

Tighten
Tighten the wheel nuts to 140 N·m (100 lb ft).

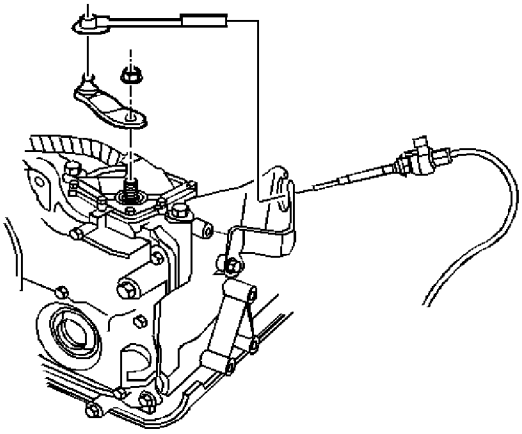
Range Selector Lever Cable Replacement

Removal Procedure

1. Disconnect the negative battery cable. Refer to

   Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

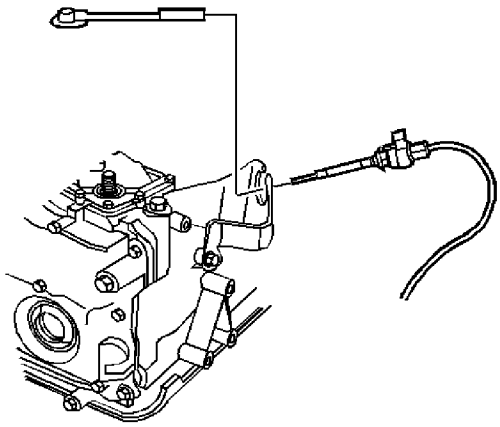
   in General Information.



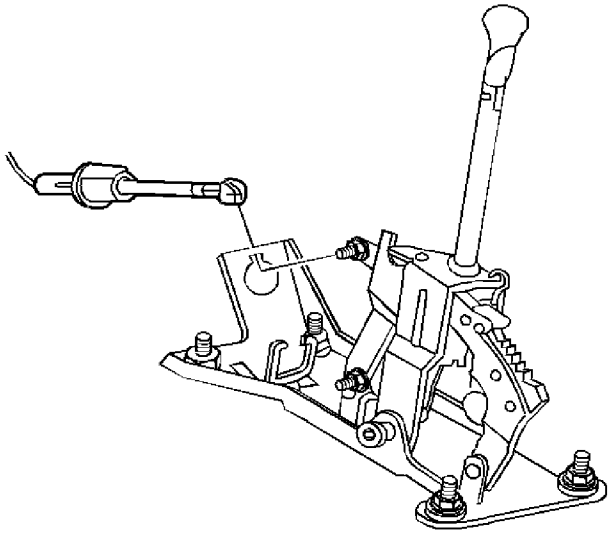
2. Remove the automatic transmission range select lever cable from the selector lever.

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3. Remove the range select lever cable from the cable bracket.
4. Remove the center console.



5. Remove the range select lever cable from the automatic transmission control.
6. Remove the cable grommet at the cowl.
7. Remove the cable from the vehicle.

Installation Procedure

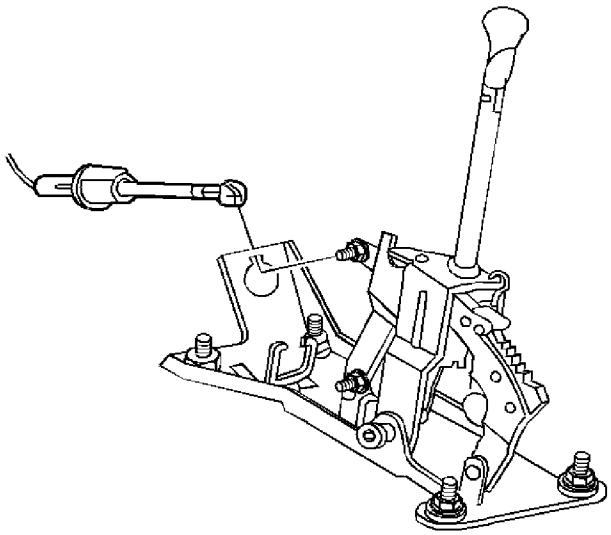
1. Install the cable to the vehicle through the cowl and the carpet.
2. Install the cable grommet in the cowl.
3. Install the cable grommet bolts in the cowl.

Tighten

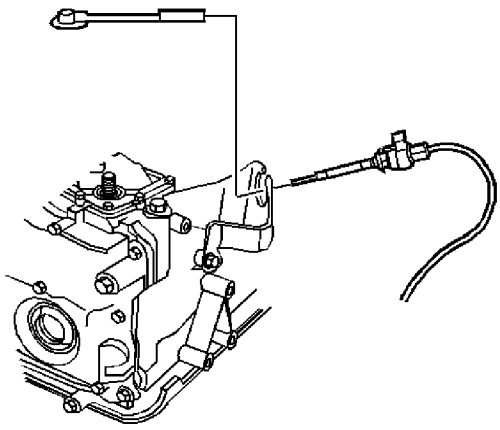
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Tighten the bolts to 1.9 N·m (17 lb in).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

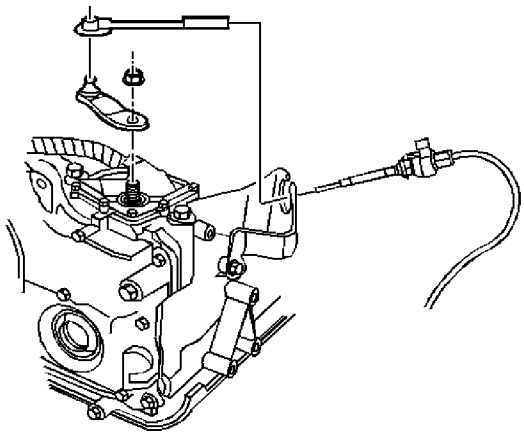


4. Install the range select lever cable at the automatic transmission control.
5. Install the center console.



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6. Install the range select lever cable to the cable bracket.





7. Install the range select lever cable to the selector lever.
8. Connect the negative battery cable.
9. Adjust the cable.
   9.1. Place the shift lever in N (Neutral). Rotate the selector shaft clockwise from P (Park) through R (Reverse) into N (Neutral).
   9.2. Place the shift control assembly in N (Neutral).
   9.3. Push the tab on the cable adjuster in order to adjust the cable in the cable mounting bracket.

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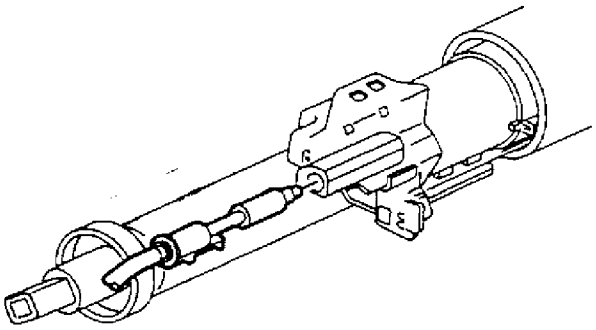
Park Lock Cable Replacement (Oldsmobile)

Removal Procedure

1. Disconnect the negative battery cable. Refer to

   Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

2. Remove the console as necessary.
3. Place the shift lever in (P) Park.
4. Turn the ignition key to the RUN position.
5. Remove the left sound insulator and the knee bolster as necessary.



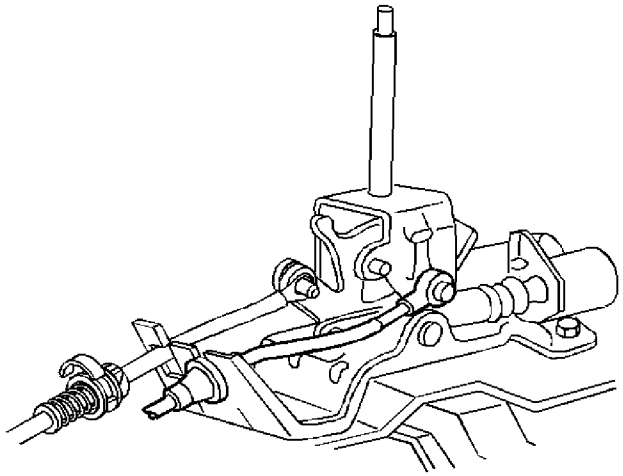


Important: Do not attempt to perform the following steps with the key in any other position.

6. Slip a screwdriver blade into the slot provided in the ignition switch inhibitor.
7. Depress the cable latch.
8. Pull the cable from the inhibitor.
9. Pull the cable adjuster locking button at the shift control bracket to the UP position.

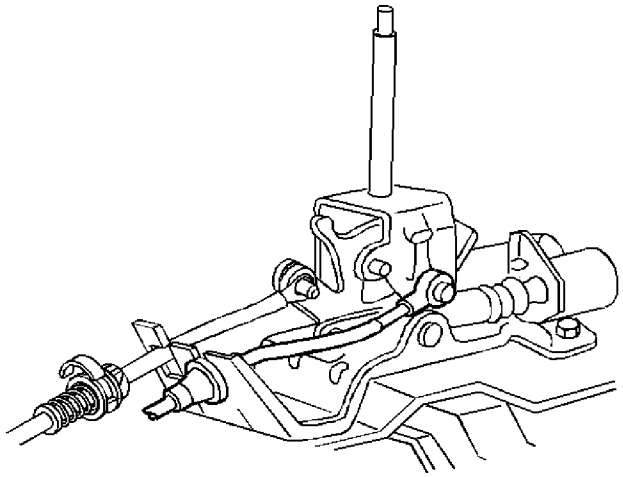
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10. Pull rearward on the cable end in order to unsnap the cable from the park lock lever pin on the shift control assembly.
11. Depress the two cable adjuster tangs and remove from the shifter control assembly.
12. Remove the cable clips.

Installation Procedure

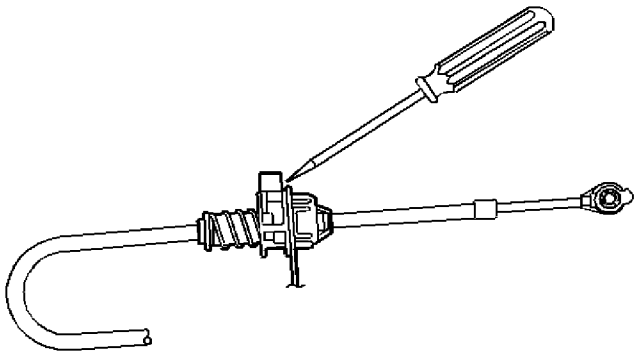


1. With the cable adjuster locking button in the UP position and the shift lever in the (P) Park position, snap the cable connector into the shifter control bracket. Ensure that the two cable adjuster tangs are fully engaged.
2. With the ignition in the RUN position, snap the cable into the inhibitor housing.

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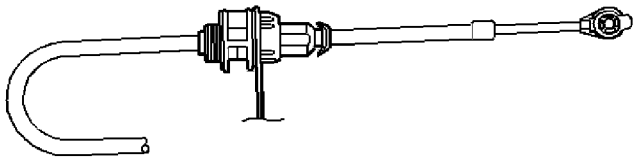
Important: Do not insert the cable with the key in any other position except RUN.

3. Turn the ignition key to LOCK.
4. Snap the cable end onto the park lock lever pin on the shift control assembly.
5. Complete the following steps in order to adjust the assembly:
6. Ensure that the ignition key is in the LOCK position. If the key can not be rotated to the LOCK position, lift the adjuster locking button and slide the adjuster rearward in the car compressing the spring and hold. Rotate the key in order to lock.





7. Ensure that the cable adjuster locking button is in the UP position.
8. Grasp the park lock cable near the forward end of the adjuster spring. Push the cable toward the front of the vehicle in order to remove the slack and release.
9. Move the cable adjuster rearward in the vehicle 1.5 mm (1/16 in) from the position established in the previous step.





10. While holding this position, push the adjuster locking button down flush with the adjuster

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body.

11. Install the left sound insulator and the knee bolster.
12. Install the console.
13. Connect the negative battery cable.
14. In order to verify correct functional operation of the park lock system, perform the following steps:
    - 14.1. Turn the ignition key to the OFF/LOCK position.
    - 14.2. If you can shift out of (P) Park, readjust the park lock cable.
    - 14.3. Turn the ignition key to the RUN position.
    - 14.4. Shift to (N) Neutral.
    - 14.5. If you can turn the ignition key to the OFF/LOCK position and are able to remove the key, readjust the park lock cable.
    - 14.6. Return the shifter to (P) Park.
    - 14.7. Turn the ignition key to OFF/LOCK.
    - 14.8. If you can not remove the key, readjust the park lock cable.

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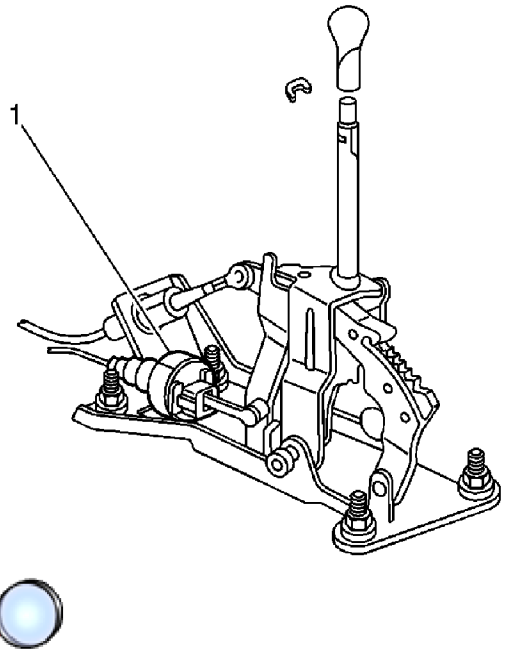
Transmission Control Replacement

Removal Procedure

1. Disconnect the negative battery cable. Refer to

   Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

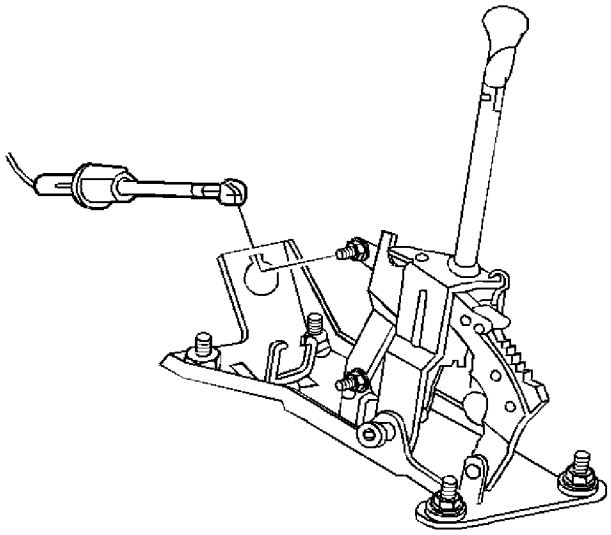
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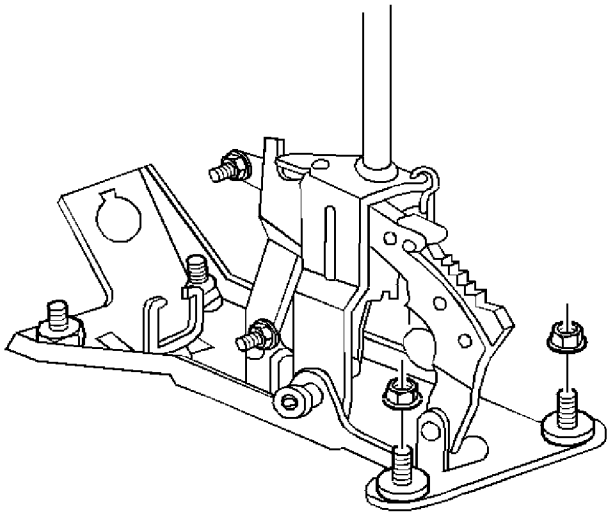
2. Remove the automatic transmission control lever handle.
3. Remove the console.

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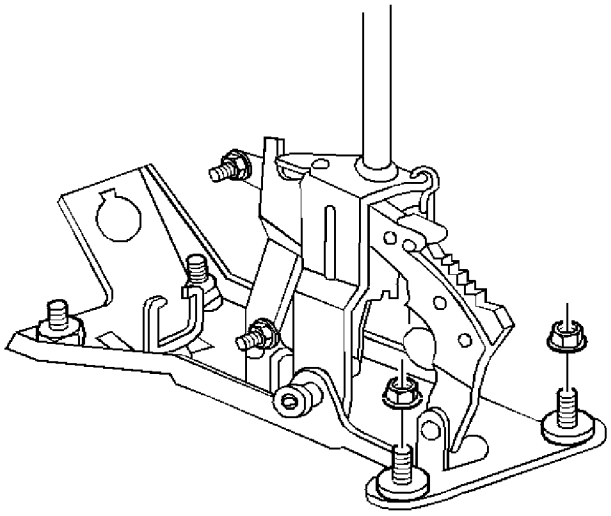
4. Remove the range select lever cable from the automatic transmission control.
5. Remove the electrical connector.



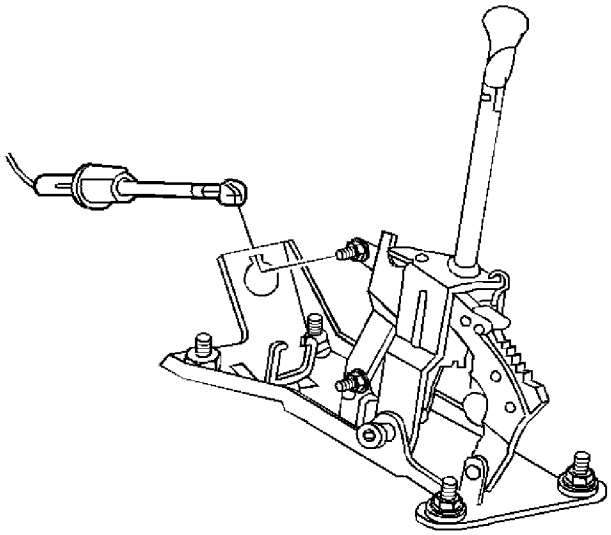
6. Remove the automatic transmission control bolts.
7. Remove the automatic transmission control.

Installation Procedure

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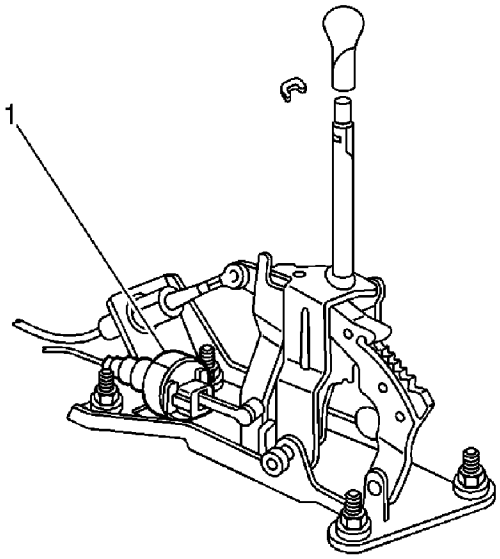


1. Install the automatic transmission control.
2. Install the automatic transmission control bolts.
3. Install the electrical connector.



4. Install the range select lever cable to the automatic transmission control.
5. Install the console. Refer to Console in Instrument Panel, Gauges and Console.

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6. Install the automatic transmission control lever handle.
7. Connect the negative battery cable.

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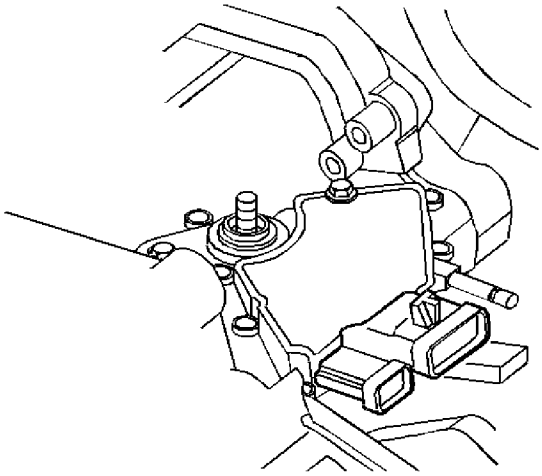
Park/Neutral Position Switch Replacement

Removal Procedure

1. Disconnect the negative battery cable. Refer to

   Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

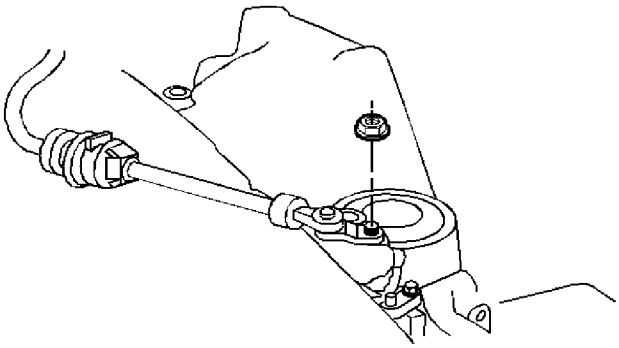
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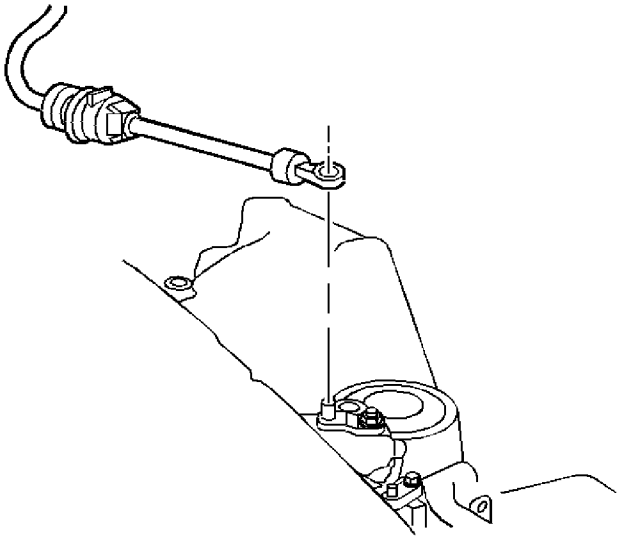
2. Disconnect the electrical connector.

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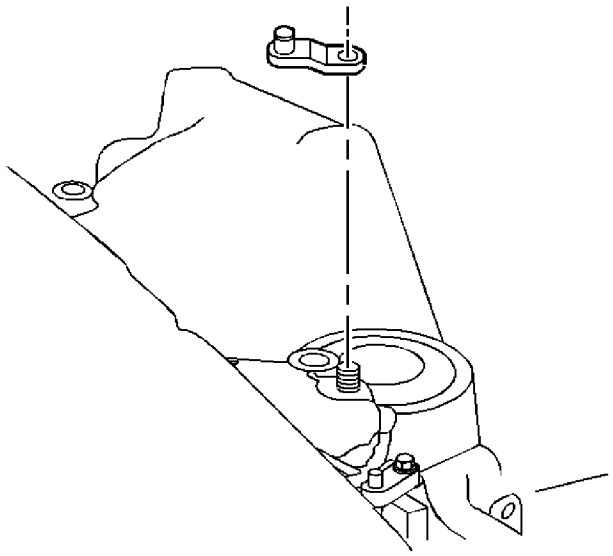


3. Remove the shift linkage retaining nut.

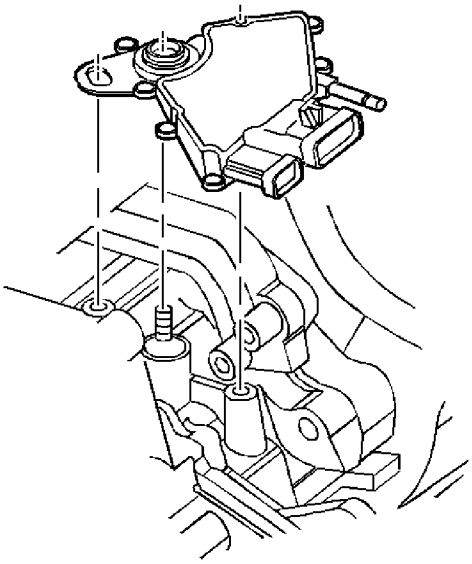


4. Remove the shift linkage.

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5. Remove the lever.



6. Remove the park/neutral position switch mounting bolts.
7. Remove the park/neutral position switch assembly.

Installation Procedure

Using Old Switch

1. Place the shift shaft in N (Neutral).
2. Align the flats of the shift shaft with the switch.
3. Loosely install the park/neutral position switch mounting bolts.
4. Insert the gauge pin in the service adjustment hole. Rotate the switch until the pin drops in to a depth of 9 mm (9/64 in).

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Tighten
Tighten the bolts to 24 N·m (18 lb ft).

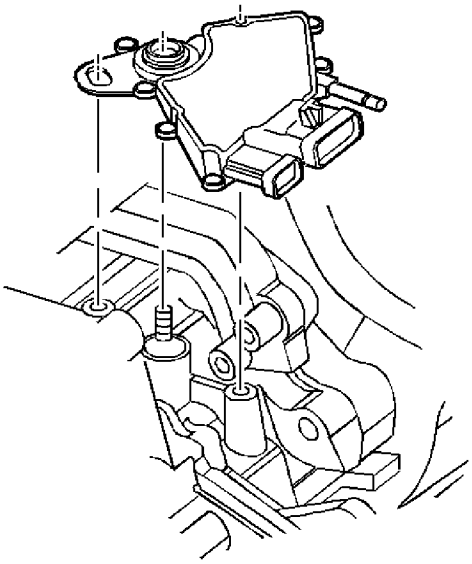
Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

Important: Ensure that the engine will only start in the P (Park) or the N (Neutral) position. Readjust the switch if the engine will start in any other position.

5. Remove the gauge pin.
6. Connect the negative battery cable.

Using New Switch

1. Place the shift shaft in the N (Neutral) position.
2. Align the flats of the shift shaft to the flats in the switch.





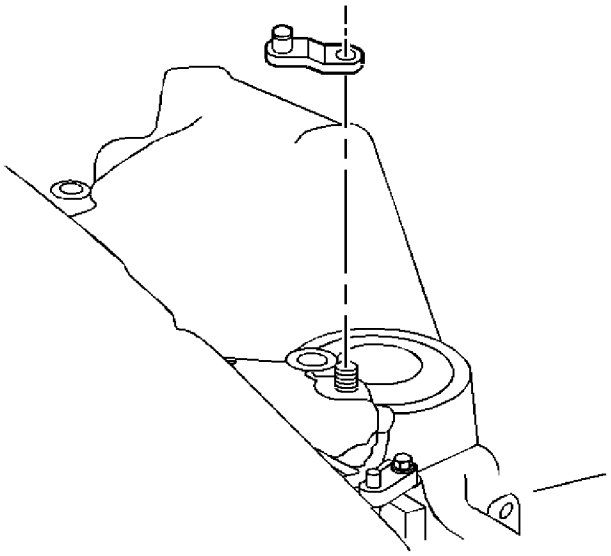
3. Install the park/neutral position switch assembly.
4. Install the park/neutral position switch mounting bolts.

Tighten
Tighten the bolts to 24 N·m (18 lb ft).

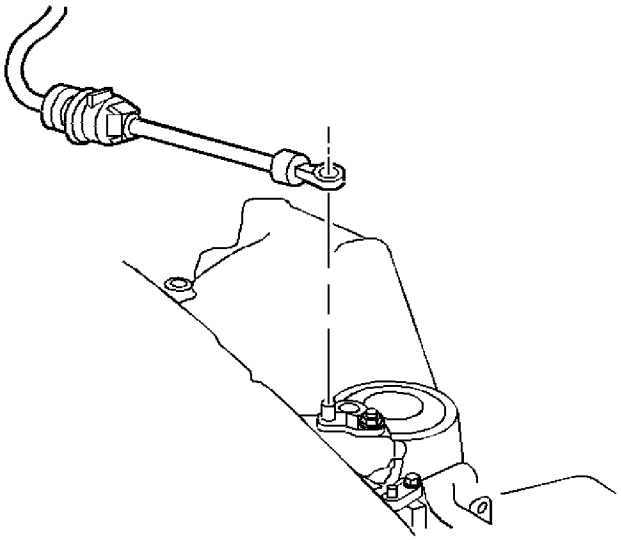
Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when

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installing fasteners in order to avoid damage to parts and systems.

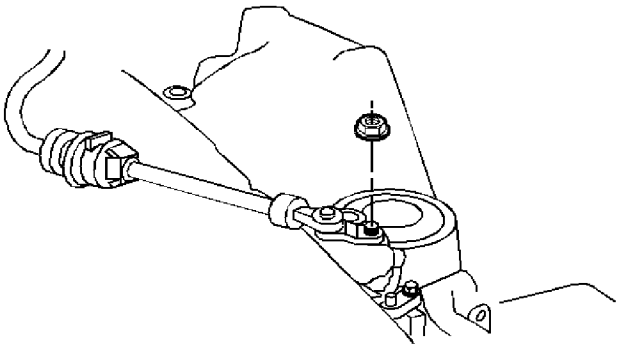


5. Install the lever.



6. Install the shift linkage.

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7. Install the shift linkage retaining nut.
8. Align the holes with the mounting boss on the transmission. Place the shift control lever in the N (Neutral) position. Do not rotate the switch. The switch is pinned in the N (Neutral) position. If the switch has been rotated and the pin is broken, adjust the switch. Refer to the using old switch installation procedures.
9. If the switch has been rotated and the pin is broken, adjust the switch by using the Old Switch procedure.

   Important: Ensure that the engine will only start in P (Park) or N (Neutral). Readjust the switch if the engine will start in any other position. Refer to the old switch installation procedures.

10. Connect the negative battery cable.
11. Place the transmission control shifter assembly in the N (Neutral) notch in the detent plate.
12. Loosen the park/neutral position switch attaching bolts.
13. Rotate the switch on the shifter assembly in order to align the service adjustment hole with the carrier tang hole.
14. Insert a 2.34 mm (3/32 in) maximum diameter gauge pin to a depth of 9.0 mm (9/64 in).

    Tighten
    Tighten the bolts to 24 N·m (18 lb ft).

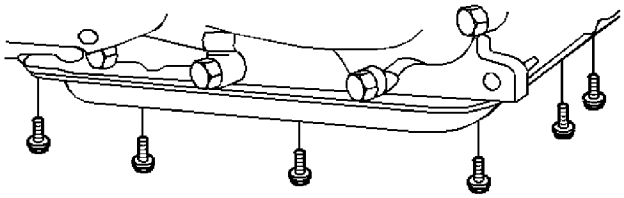
15. Remove the gauge pin.

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Automatic Transmission Fluid and Filter Replacement

Removal Procedure

1. Raise the vehicle. Support the vehicle. Refer to General Vehicle Lifting and Jacking in General Information.
2. Place a drain pan under the transmission oil pan.





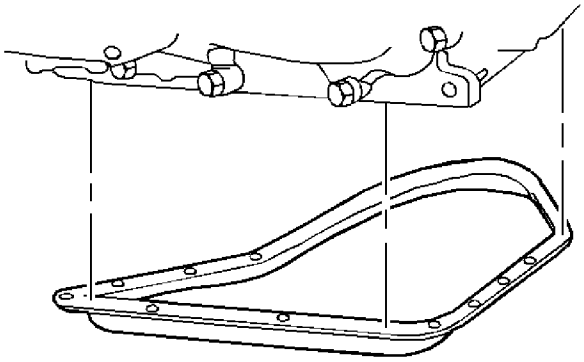
3. Remove the oil pan bolts from the front and the sides only.
4. Loosen the rear oil pan bolts approximately 4 turns.

Notice: Pry the oil pan down carefully in order to prevent damage to the transmission case or the oil pan sealing surfaces.

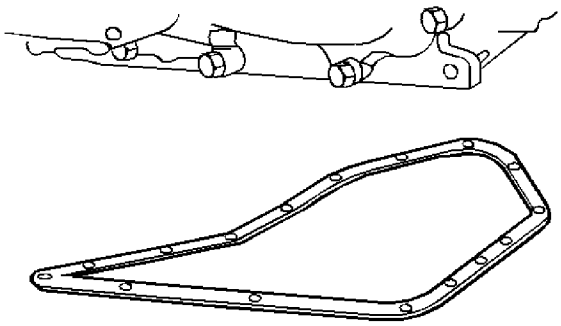
5. Lightly tap the oil pan with a rubber mallet or pry in order to allow the oil to drain.
6. Inspect the oil color. Refer to *Transmission Fluid Checking Procedure* .
7. Remove the remaining oil pan bolts.

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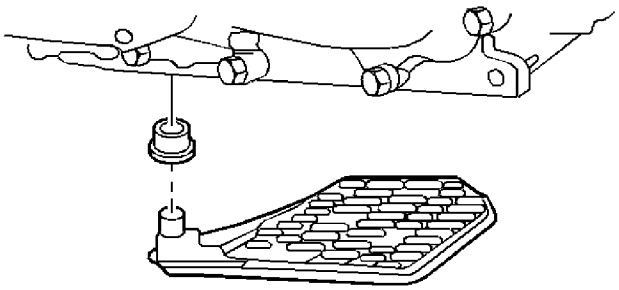


8. Remove the oil pan.



9. Remove the oil pan gasket.

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10. Remove the oil filter.
11. Remove the oil filter O-ring seal.
12. Inspect the O-ring seal. The O-ring seal may be stuck in the case.
13. Remove all traces of old gasket material. Clean the transmission case and the oil pan gasket surfaces with solvent, and allow to air dry.

Installation Procedure

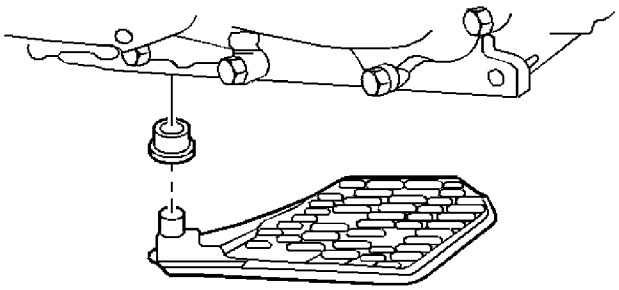
Tools Required

J 36850 Transjel™ Transmission Assembly Lubricant

Notice: Use J 36850 or equivalent during assembly in order to retain checkballs or to lubricate components. Lubricants other than the recommended assembly lube changes the transmission fluid characteristics and causes undesirable shift conditions or filter clogging.

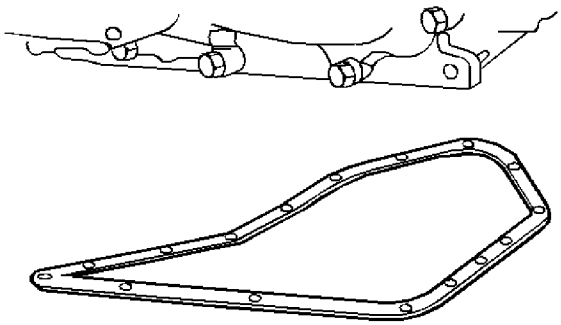
1. Coat the seal with a small amount of J 36850 , or equivalent.

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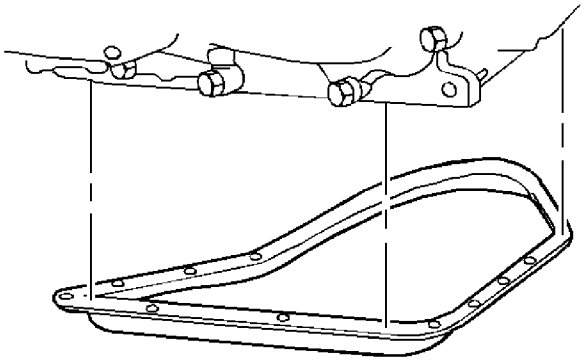
2. Install a new seal into the case.
3. Install a new filter into the case.



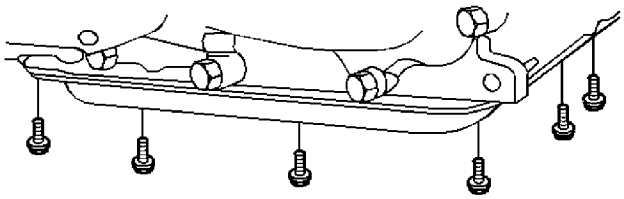


4. Install a new oil pan gasket.

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5. Install the oil pan.

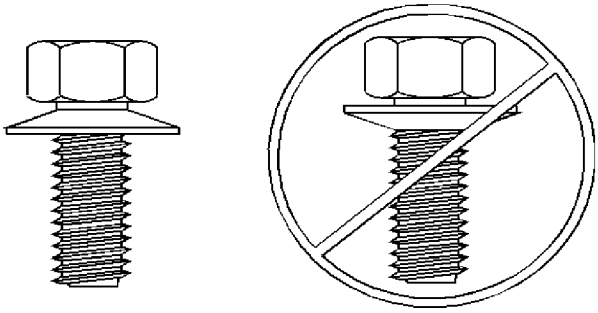


6. Install the oil pan bolts.

Tighten
Tighten the bolts to 10 N·m (89 lb ft).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

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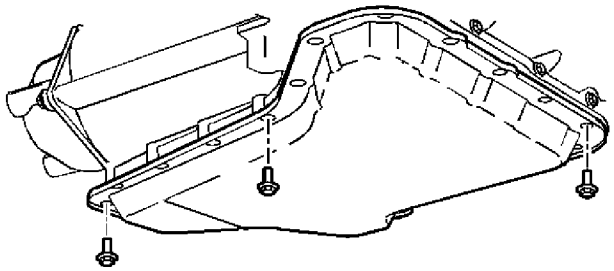
7. Inspect the oil pan bolts and the washers.
8. Use adhesive and sealant compound GM P/N 12345382, or equivalent.
9. Lower the vehicle.
10. Fill the transmission to the proper level with DEXRON®--III oil.
11. Adjust the cold oil level reading for the initial fill. Do not overfill.
12. Inspect the oil pan gasket for leaks.

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Oil Pan Replacement

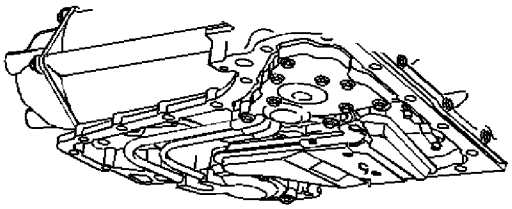
Removal Procedure

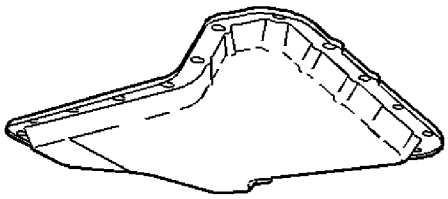
1. Raise the vehicle. Support the vehicle. Refer to General Vehicle Lifting and Jacking in General Information.
2. Loosen the oil pan bolts.
3. Drain the oil.





4. Remove the oil pan attaching bolts.

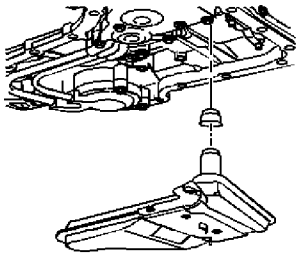


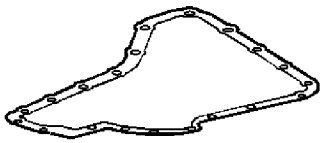




5. Remove the oil pan.

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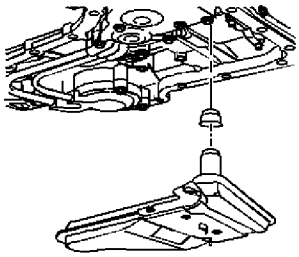


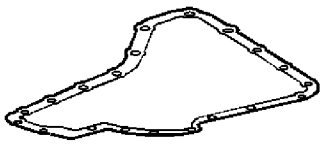




6. Remove the oil pan gasket.

Installation Procedure

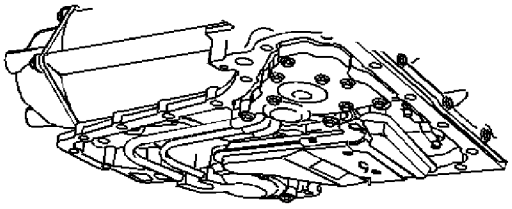






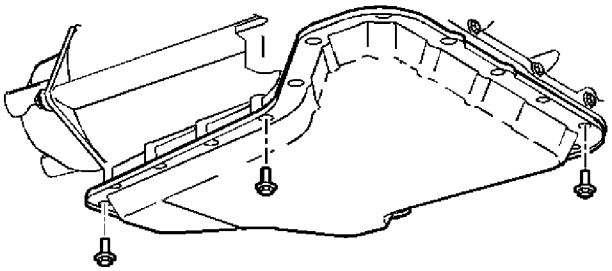
1. Install the oil pan gasket. If the sealing ribs are damaged, use a new gasket.

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2. Install the oil pan.



3. Install the oil pan attaching bolts.

Tighten
Tighten the oil pan bolts to 14 N·m (124 lb in).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

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4. Lower the vehicle.
5. Refill the transmission to the proper level with DEXRON® III oil.
6. Inspect the oil pan gasket for leaks.

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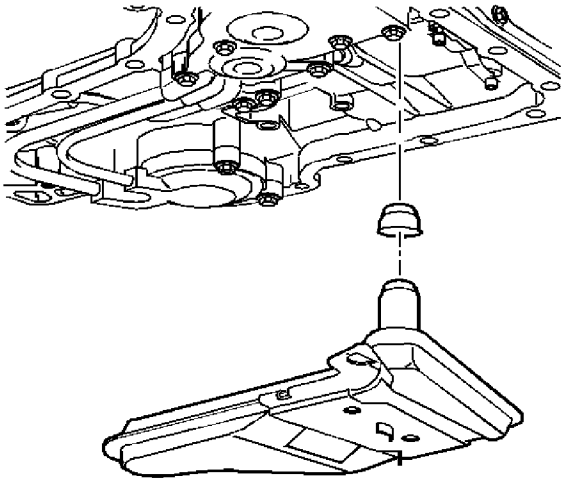
Automatic Transmission Fluid Filter and Seal Replacement

Removal Procedure

Tools Required

- J 6125-1B Slide Hammer
- J 23129 Axle Boot Remover

1. Raise the vehicle. Support the vehicle. Refer to General Vehicle Lifting and Jacking in General Information.
2. Drain the oil.
3. Remove the oil pan attaching bolts, oil pan, and the gasket. Refer to *Oil Pan Replacement* .



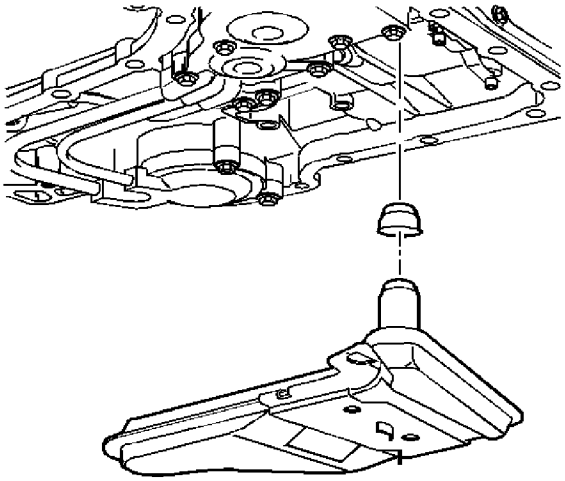


4. Remove the oil filter. Use a long screwdriver in order to pry the filter neck out of the seal.
5. Remove the seal. Use the J 6125-1B and the J 23129 .
6. Check the oil filter seal for damage or wear.

Installation Procedure

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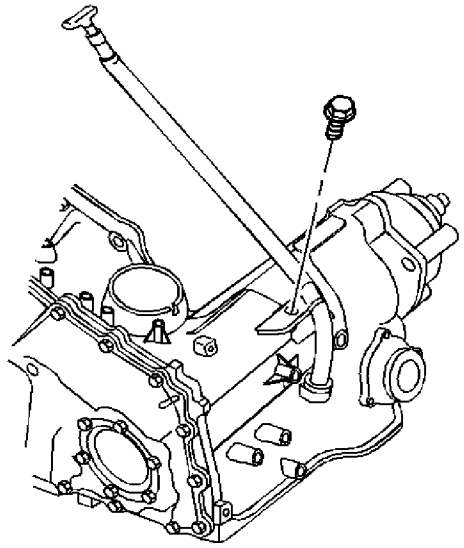


1. Install the new oil filter and the seal.
2. Install the oil pan gasket, oil pan and the attaching bolts. Refer to *Oil Pan Replacement* .
3. Lower the vehicle.
4. Fill the transmission to the proper level with DEXRON® III oil.
5. Inspect the oil pan gasket for leaks.

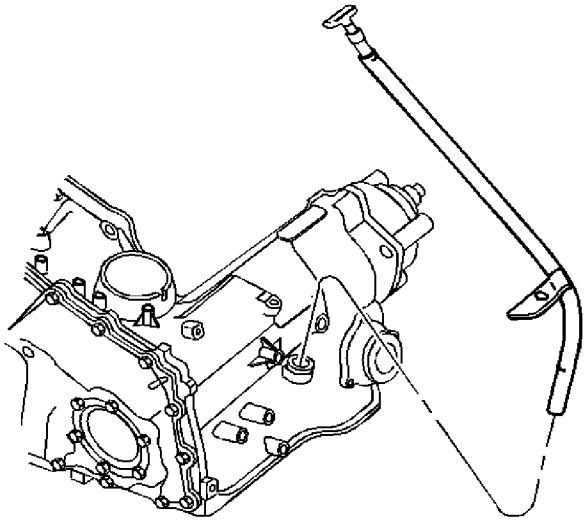
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Filler Tube Replacement

Removal Procedure

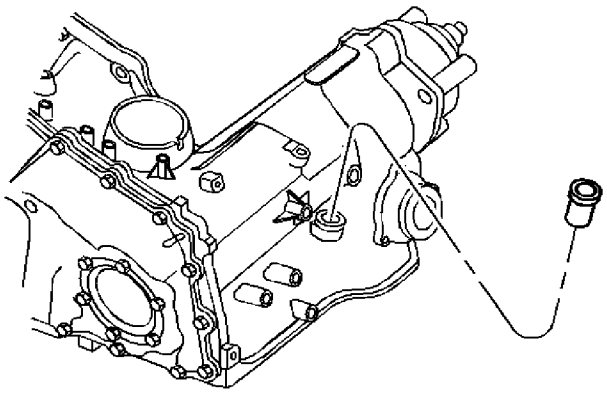


1. Remove the bolt from the tube to transmission case.
2. Raise the vehicle. Support the vehicle. Refer to General Vehicle Lifting and Jacking in General Information.
3. Place a drain pan under the transmission.



4. Remove the filler tube.

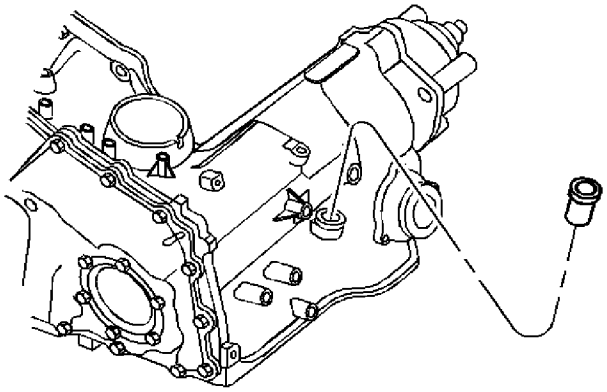
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5. Remove the seal from the transmission.

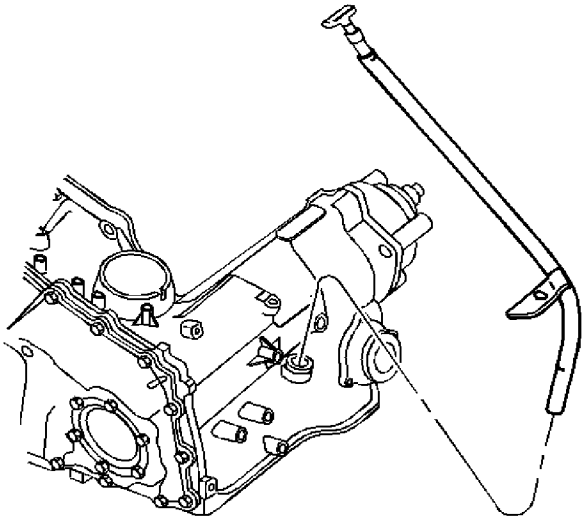
Installation Procedure



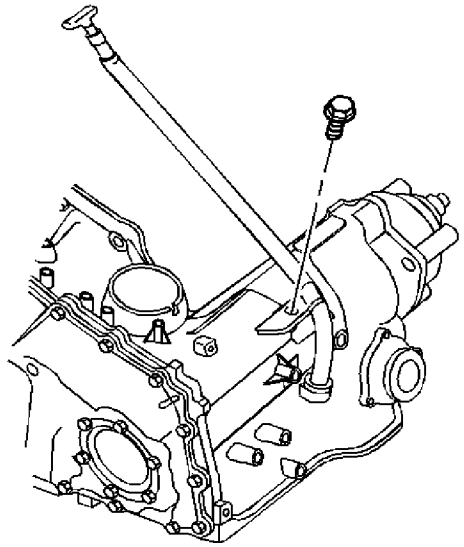


1. Install the new seal into the transmission.

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2. Install the tube into the transmission. Do not damage the seal.
3. Lower the vehicle.



4. Install the bolt through the tube bracket into the transmission case.

Tighten
Tighten the bolts to 9 to 13 N·m (80 to 115 lb in).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when

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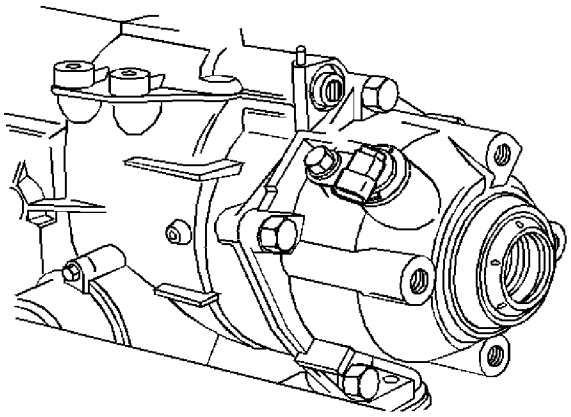
installing fasteners in order to avoid damage to parts and systems.

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Vehicle Speed Sensor Replacement

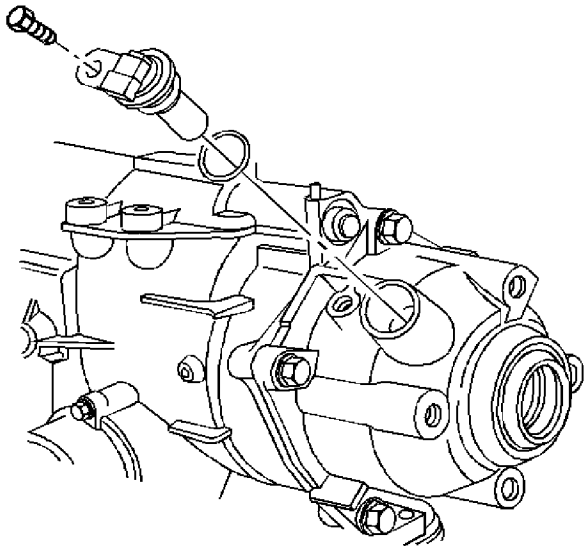
Removal Procedure

1. Raise the vehicle. Support the vehicle. Refer to General Vehicle Lifting and Jacking in General Information.





2. Disconnect the speed sensor electrical connector.

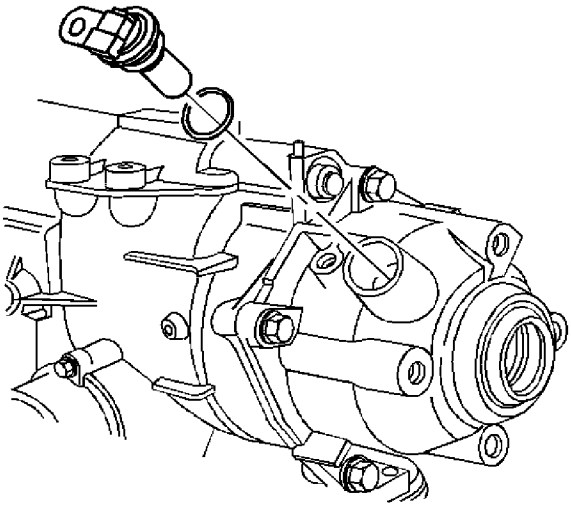




3. Remove the speed sensor bolt.

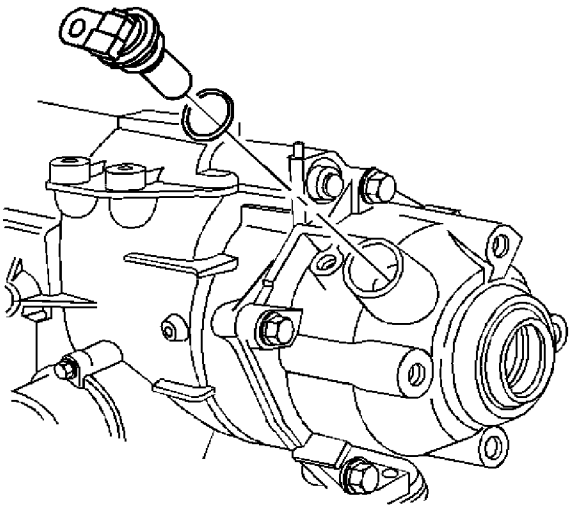
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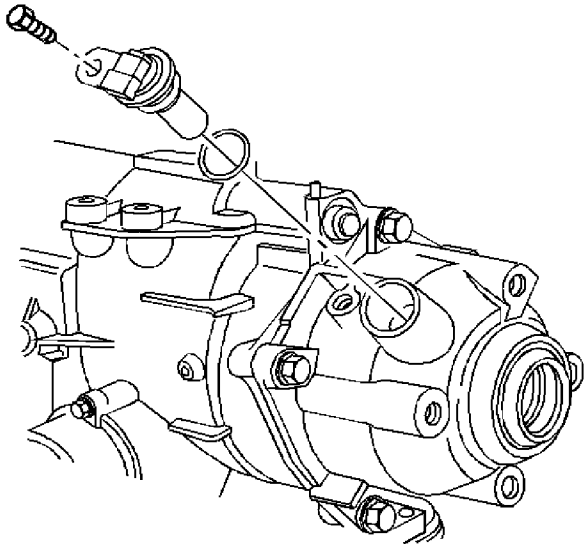
4. Remove the vehicle speed sensor from the case extension.
5. Remove the O-ring from vehicle speed sensor.

Installation Procedure



1. Install the O-ring onto the vehicle speed sensor.
2. Install the vehicle speed sensor into the case extension.

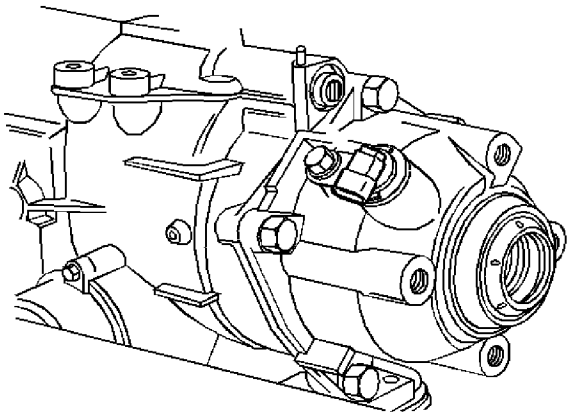
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3. Install the speed sensor bolt.

Tighten
Tighten the bolt to 11 N·m (97 lb in).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.



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4. Connect the electrical connector.
5. Lower the vehicle.

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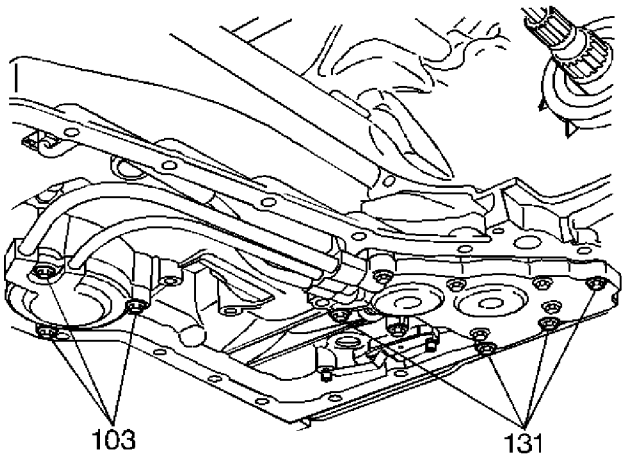
Accumulator and 2-1 Manual Servo Replacement

Removal Procedure

Tools Required

- J 6125-1B Slide Hammer
- J 23129 Axle Boot Remover

1. Raise the vehicle. Support the vehicle. Refer to General Vehicle Lifting and Jacking in General Information.
2. Drain the oil.
3. Remove the oil pan bolts, the oil pan and the gasket. Refer to *Oil Pan Replacement* .
4. Remove the oil filter. Refer to *Oil Filter and Seal Replacement* .
5. Check the oil filter seal for damage or wear.
6. Remove the oil seal. Use the J 6125-1B and the J 23129 , if needed.

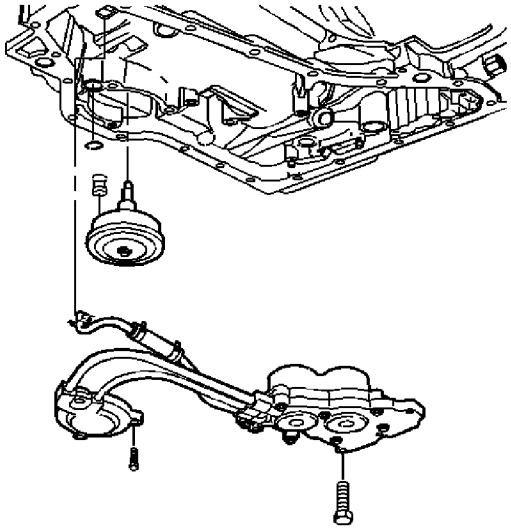




7. Remove the attaching bolts.
8. Remove the accumulator assembly.

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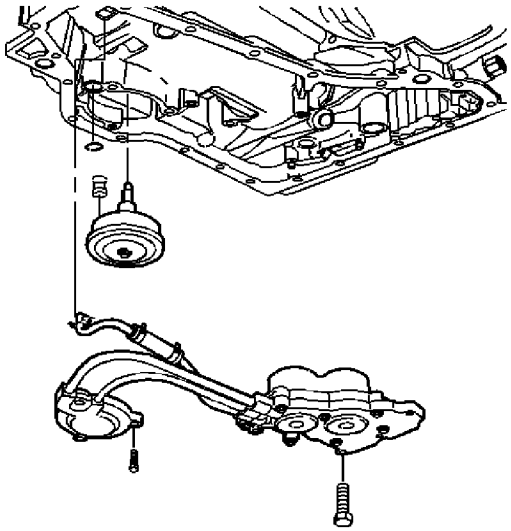




9. Remove the 2-1 manual servo piston assembly and the filter.
10. Remove the seal.
11. To disassemble and inspect the accumulator and 2-1 manual servo assemblies, refer to the unit repair manual.

Installation Procedure

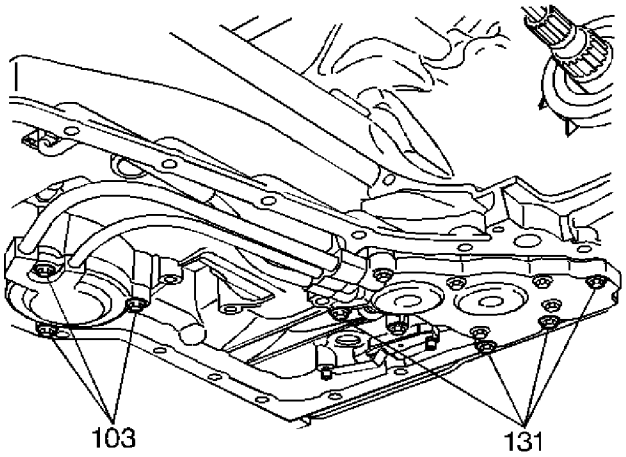
Important: Ensure that the seal is installed in the correct location. If the seal is not installed or is installed in the wrong location, the transmission will operate only in R (Reverse).





1. Install the 2-1 manual piston assembly, filter and seal.

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2. Install the accumulator assembly.
3. Install the attaching bolts.

Tighten
Tighten the accumulator assembly bolts to 27 N·m 20 lb ft).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

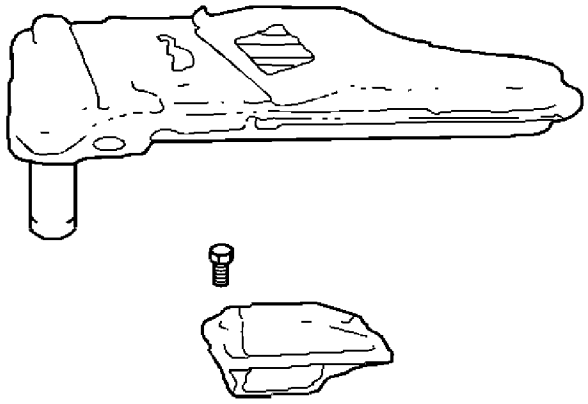
4. Install the oil filter. Refer to *Oil Filter and Seal Replacement* .
5. Install the oil pan, the oil pan bolts and the gasket. Do not reuse the gasket if the sealing ribs are damaged. Refer to *Oil Pan Replacement* .
6. Lower the vehicle.
7. Fill the transmission oil to the proper level.
8. Inspect the oil pan gasket for leaks.

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Scavenger Oil Scoop Replacement

Removal Procedure

1. Raise the vehicle. Refer to General Vehicle Lifting and Jacking in General Information.
2. Support the vehicle on a suitable stand.
3. Remove the pan. Refer to Oil Pan Replacement .



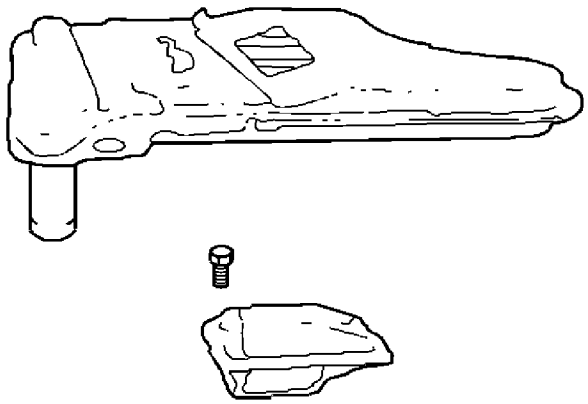


4. Remove the oil scoop retaining bolt.
5. Remove the oil scoop.

Installation Procedure

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1. Install the oil scoop.
2. Install the retaining bolt.

Tighten
Tighten the bolt to 8 N·m (71 lb in).

Refer to

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

in General Information.

3. Install the pan. Refer to Oil Pan Replacement .
4. Lower the vehicle.
5. Adjust the fluid level.

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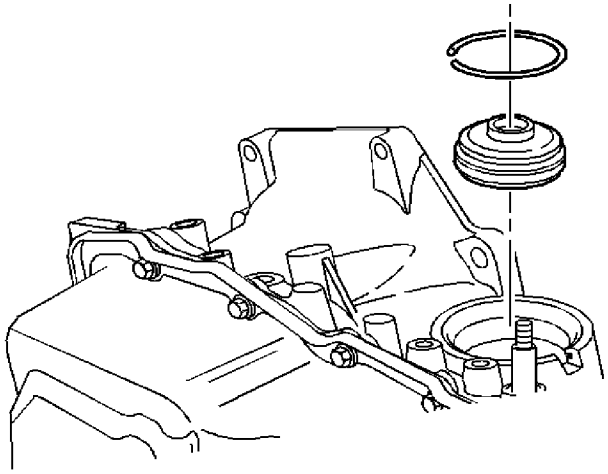
Reverse Servo Replacement (2.2L and 2.4L Engines)

Removal Procedure

1. Disconnect the negative battery cable. Refer to

   Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

   in General Information.
2. Raise the vehicle and suitably support the vehicle. Refer to General Vehicle Lifting and Jacking in General Information.

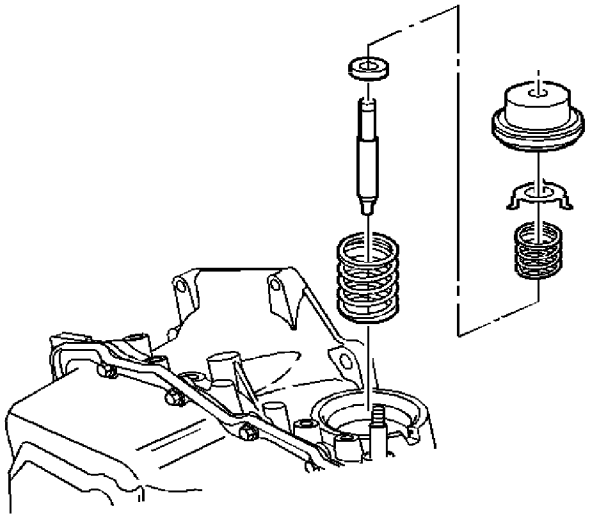




3. Depress the servo cover.
4. Remove the snap ring and the servo cover.

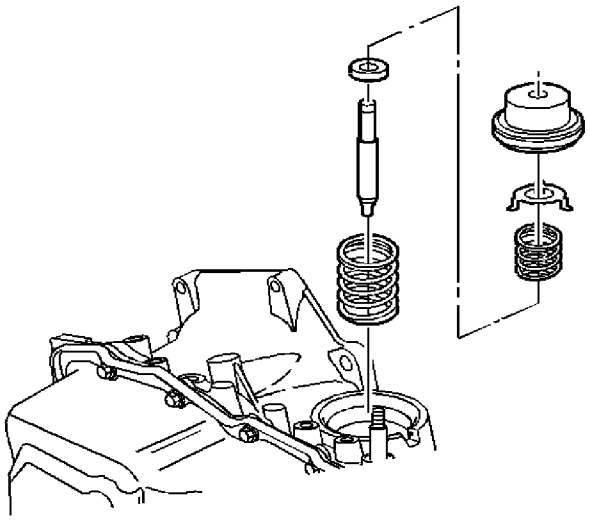
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5. Remove the following parts:
   - The piston assembly
   - The sealing ring
   - The servo spring
6. For the disassembly of the servo piston assembly, refer to Reverse Servo Disassemble .

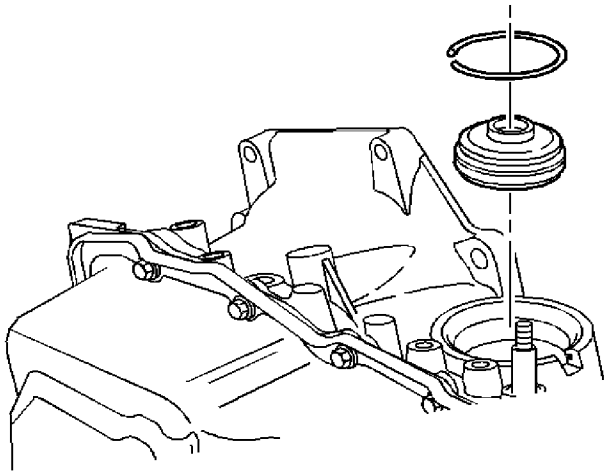
Installation Procedure



1. Install the following parts:
   - The servo spring

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- The sealing ring
- The piston assembly





2. Install the servo cover and the snap ring.
3. Lower the vehicle.
4. Connect the negative battery cable.

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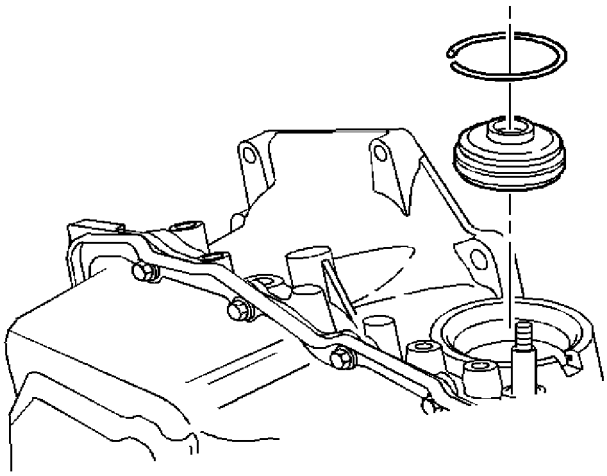
Reverse Servo Replacement (L82)

Removal Procedure

- Disconnect the negative battery cable. Refer to

  Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

  in General Information.
- Remove the EGR pipe from the exhaust manifold.
- Remove the exhaust crossover pipe. Refer to 3100 (VIN M) Exhaust Crossover Pipe in Exhaust.
-

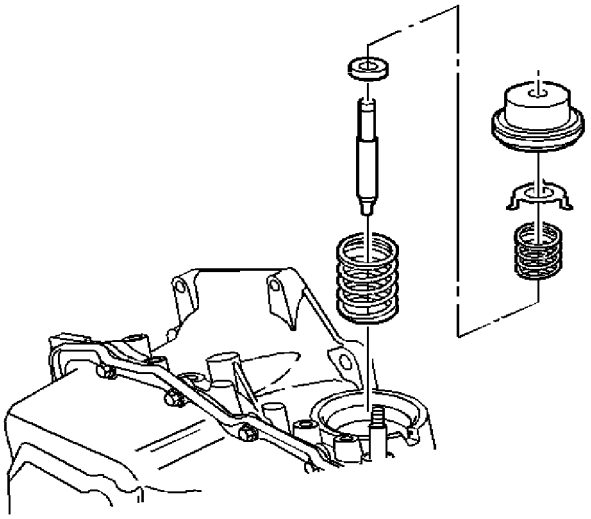




- Depress the servo cover.
- Remove the snap ring and the servo cover.
-

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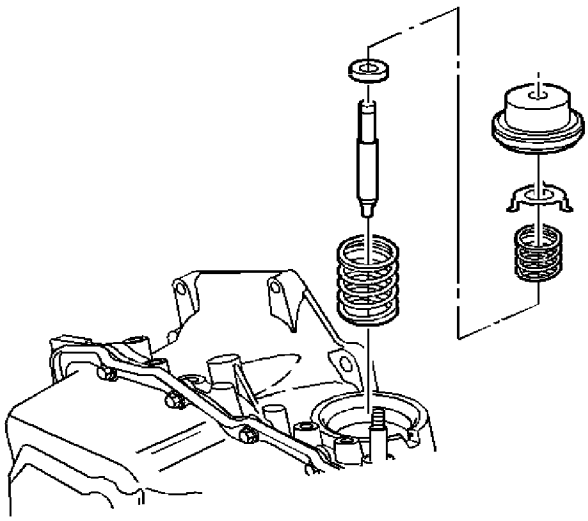
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- Remove the following parts:

- The piston assembly
- The sealing ring
- The servo spring
  - For the disassembly of the servo piston assembly, refer to Reverse Servo Disassemble .

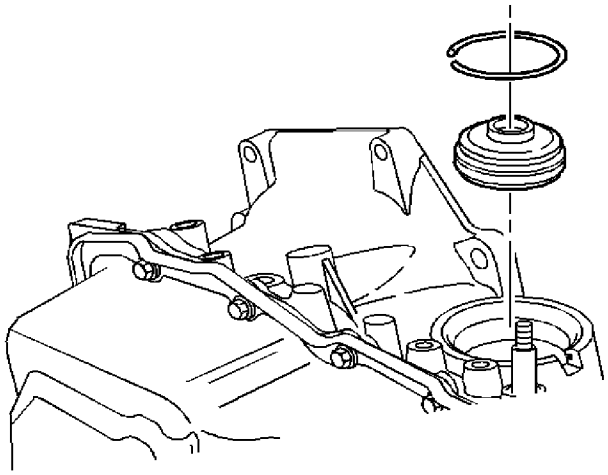
Installation Procedure



1. Install the following parts:

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- The servo spring
- The sealing ring
- The piston assembly



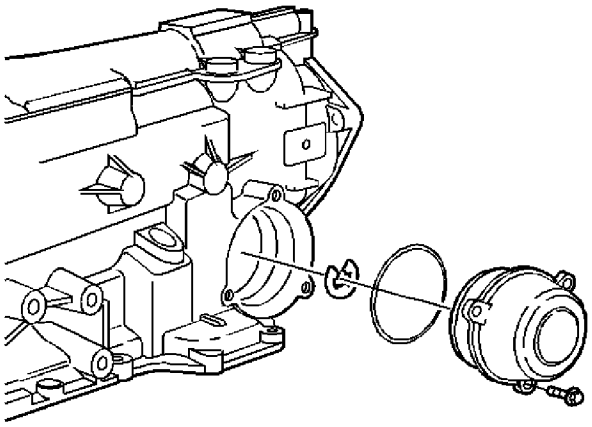


2. Install the servo cover and the snap ring.
3. Install the exhaust crossover pipe. Refer to 3100 (VIN M) Exhaust Crossover Pipe in Exhaust.
4. Install the EGR pipe to the exhaust manifold.
5. Connect the negative battery cable.

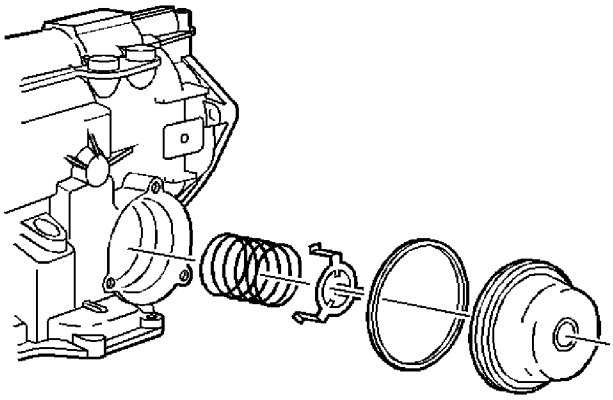
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Forward Servo Replacement

Removal Procedure



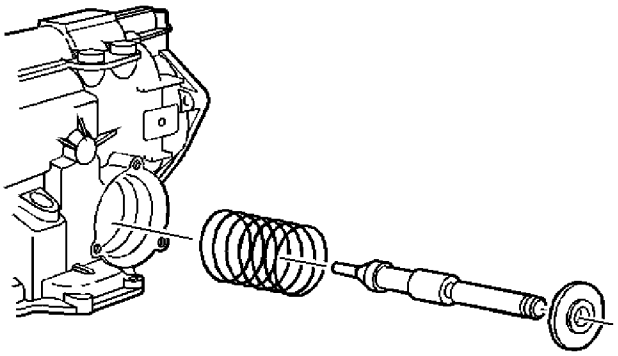
1. Remove the forward servo attaching bolts.
2. Remove the servo cover.



3. Remove the servo piston assembly.

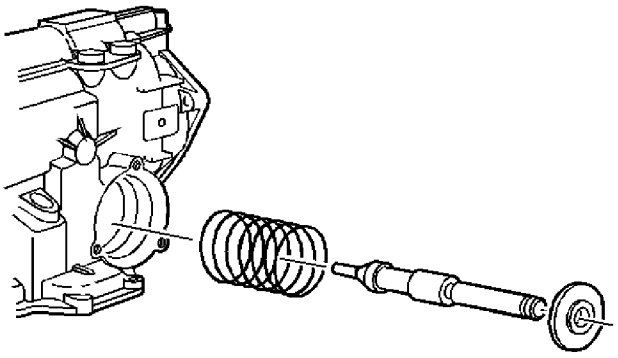
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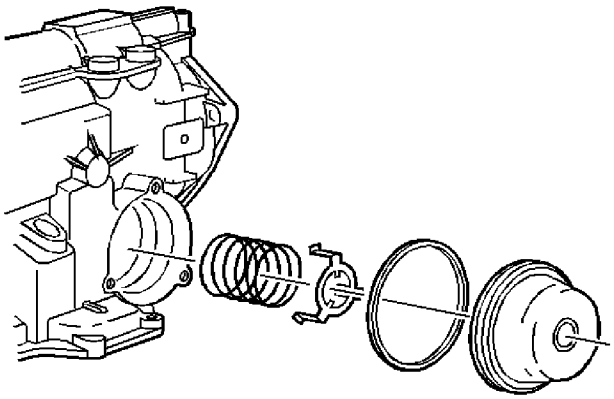
4. Remove the following items:
   - Sealing ring
   - Servo spring
5. For disassembly of the forward servo piston assembly, refer to Forward Servo Disassemble .

Installation Procedure

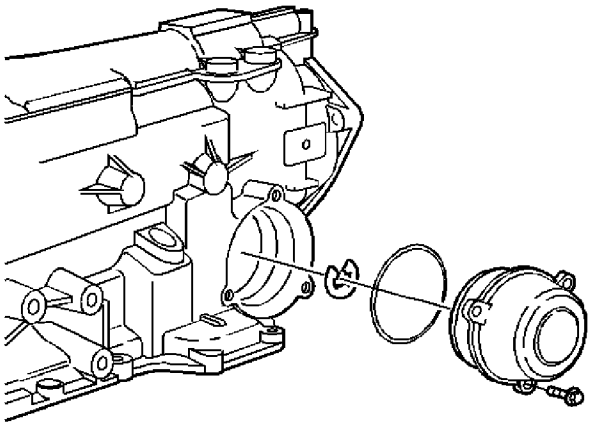


1. Install the following items:
   - Servo spring
   - Sealing ring

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2. Install the servo piston assembly.



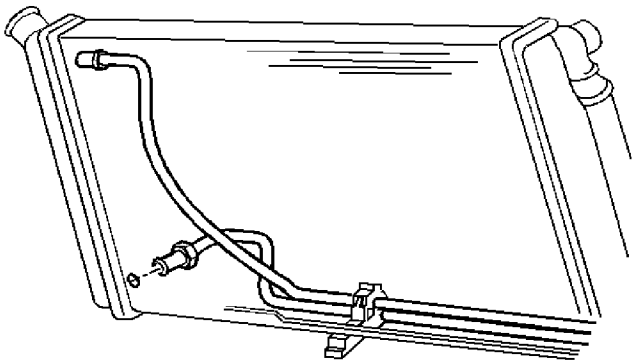
3. Install the servo cover.
4. Install the forward servo attaching bolts.
5. For disassembly of the servo piston assembly, refer to Transmission Unit Repair Manual.

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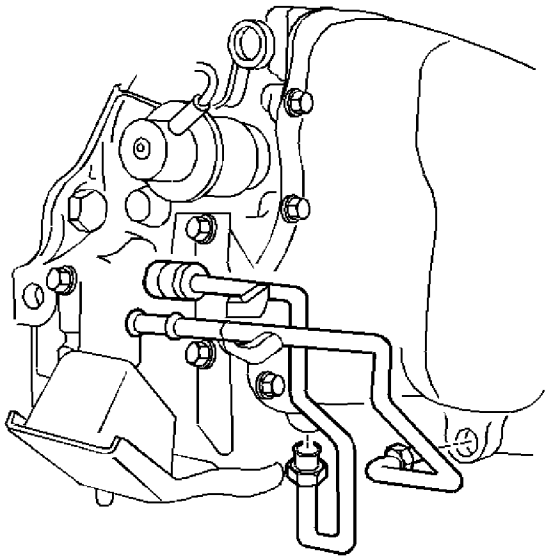
Transmission Fluid Cooler Hose Replacement

Removal Procedure

1. Raise the vehicle. Support the vehicle. Refer to General Information.



2. Remove the transmission oil cooler lines from the radiator.

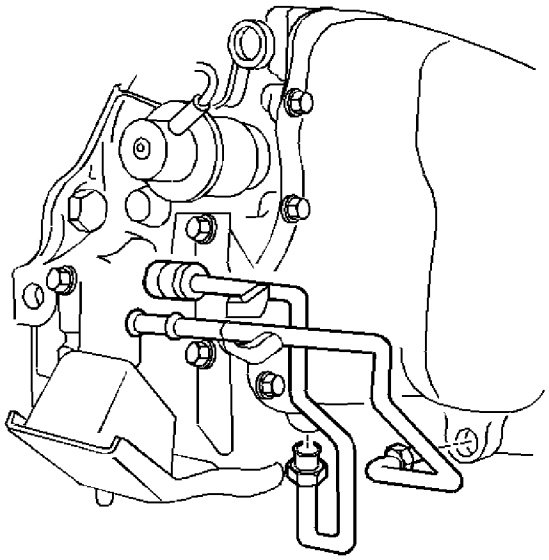


3. Remove the transmission oil cooler lines from the transmission.

Installation Procedure

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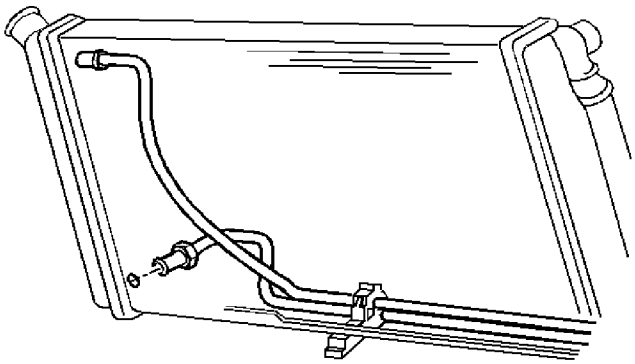
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1. Install the transmission oil cooler lines to the transmission.

Tighten
Tighten the pipe fitting 32 to 44 N·m (24 to 33 lb ft).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.



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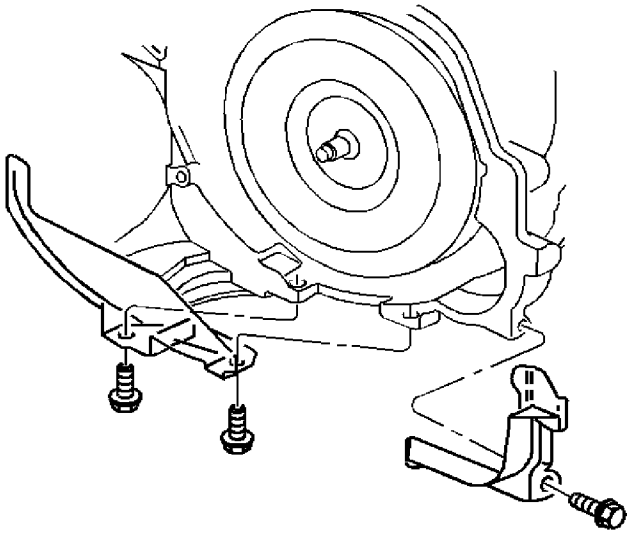
2. Install the transmission oil cooler lines to the radiator.

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Flywheel to Torque Converter Bolt Replacement

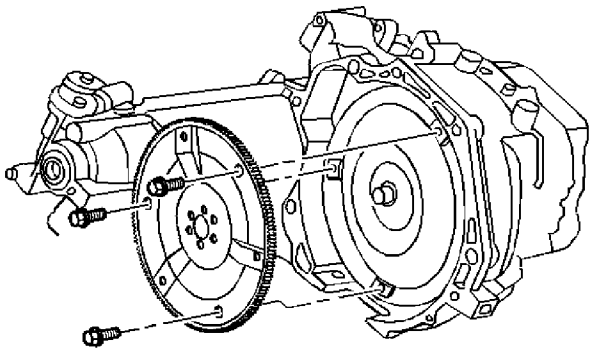
Removal Procedure

1. Raise the vehicle. Support the vehicle. Refer to General Information.





2. Remove the transmission converter cover bolts.
3. Remove the transmission converter cover.
4. Mark the relationship of the converter to the flywheel.



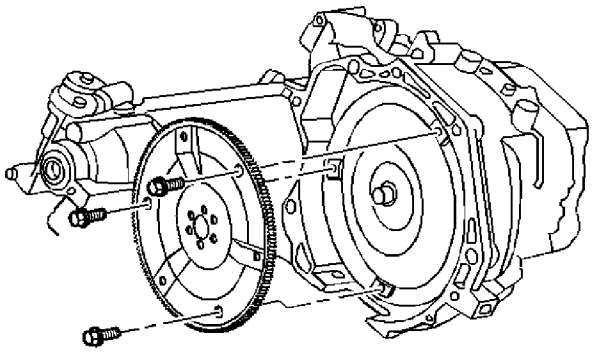


5. Remove the three bolts that attach the converter to the flywheel.

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Installation Procedure

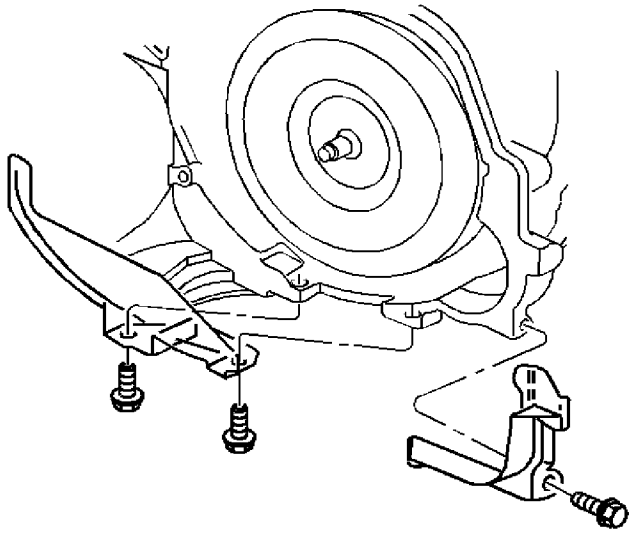


1. Install the bolts that attach the converter to the flywheel.

   Tighten
   Tighten all of the bolts to 62 N·m (46 lb ft). Re-torque the first bolt after all three have been tightened.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

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2. Install the converter cover.
3. Install the converter cover bolts.

   Tighten
   Tighten the converter cover bolts to 13 N·m (115 lb in).

4. Lower the vehicle.

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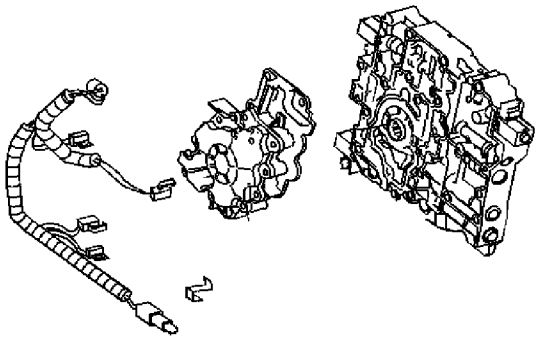
Control Valve Body Replacement

Removal Procedure

1. Disconnect the negative battery cable. Refer to

   Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

   in General Information.
2. Remove the case side cover. Refer to *Case Side Cover Replacement (W/ Gasket)* .

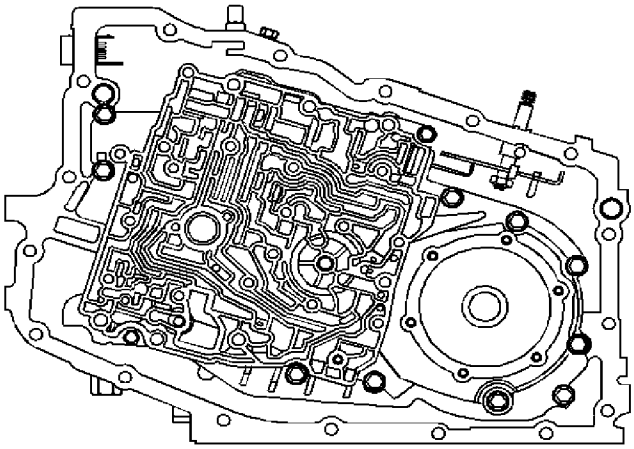




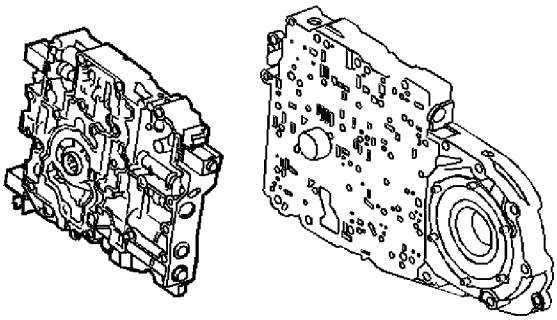
3. Remove the wiring harness as necessary.
4. Remove the oil pump. Refer to *Oil Pump Replacement*

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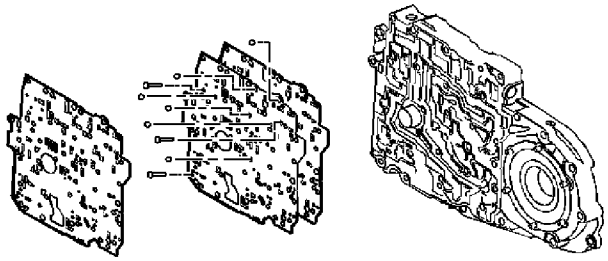


5. Remove the valve body to channel plate bolts.



6. Remove the valve body. Leave the spacer plate with the transmission.

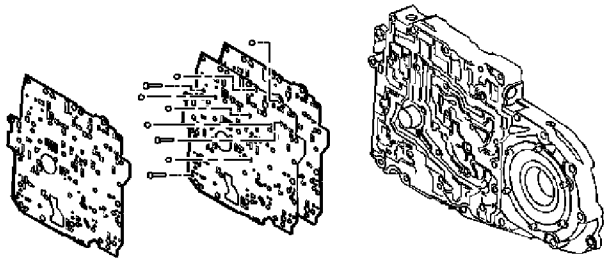
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7. Remove the spacer plate and the spacer plate gasket, as necessary.
8. Remove the solenoid screens.

Installation Procedure

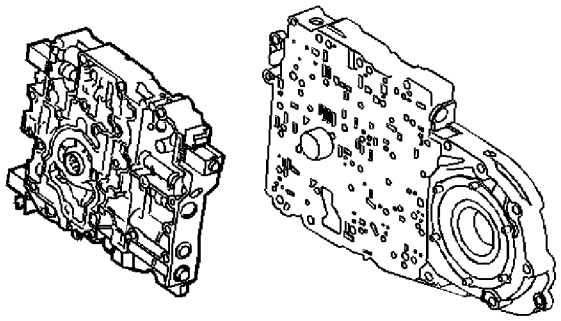
Notice: The assembly of some components will require the use of an assembly lube. Always use J 36850 Transjel™ or petroleum jelly during assembly. Greases other than the recommended assembly lube will change the transmission fluid characteristics and cause undesirable shift conditions and/or filter clogging.



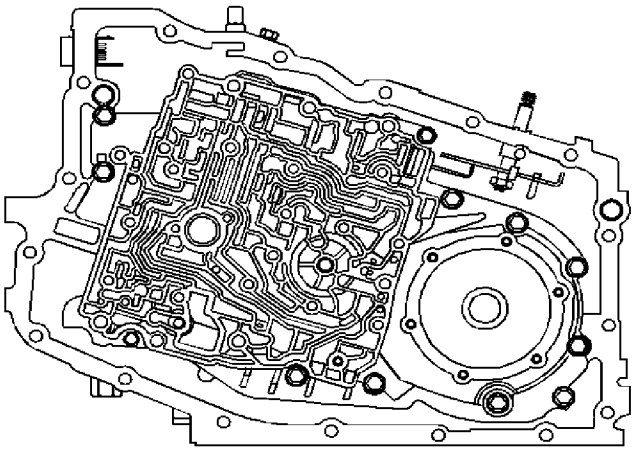
1. In order to retain the checkballs in their proper locations, use the J 36850 or equivalent petroleum jelly.

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2. Install the solenoid screens, if necessary.
3. Install the spacer plate and the spacer plate gasket, as necessary.



4. Install the valve body and the valve body gasket.



5. Install the valve body to channel plate bolts to specifications.

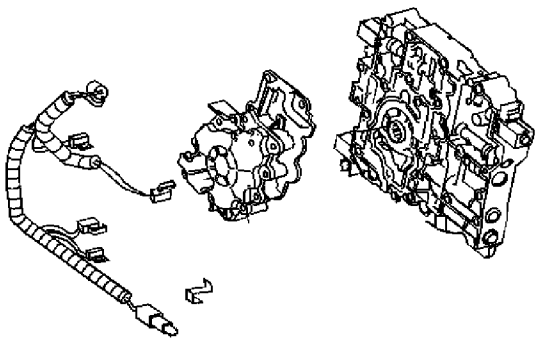
Notice: Use a torque wrench to tighten the pump to valve body bolts. Do not exceed the torque specifications.

Notice: Install all the valve body bolts, then torque the bolts in a spiral pattern starting from the center, as shown. If you torque the bolts at random, you may distort the valve bores. This will inhibit valve operation.

Important: Do not use impact type tools on the valve body or the pump assembly.

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6. Install the oil pump. Refer to *Oil Pump Replacement* .





7. Install the wiring harness.
8. Install the case side cover. Refer to *Case Side Cover Replacement (W/ Gasket)* .
9. Connect the negative battery cable.
10. Adjust the oil level.

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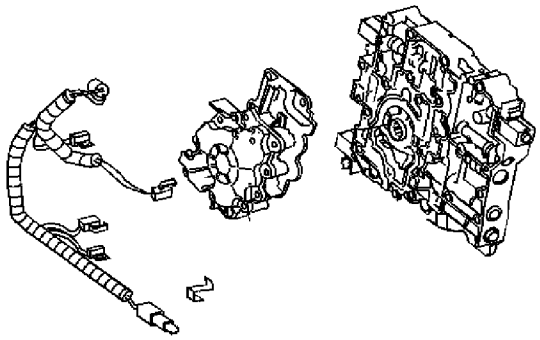
Oil Pump Replacement

Removal Procedure

1. Disconnect the negative battery cable. Refer to

   Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

   in General Information.
2. Raise the vehicle. Support the vehicle. Refer to General Vehicle Lifting and Jacking in General Information.
3. Remove the case side cover. Refer to *Case Side Cover Replacement (W/ Gasket)* .

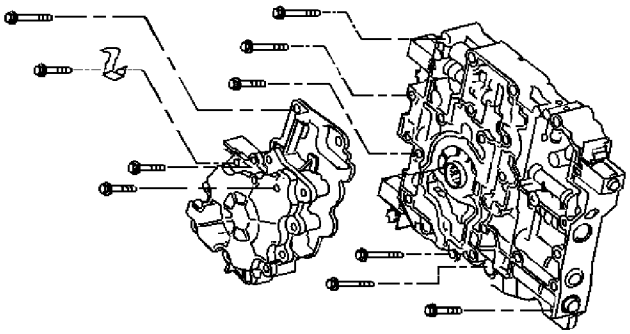




4. Remove the wiring harness as necessary.

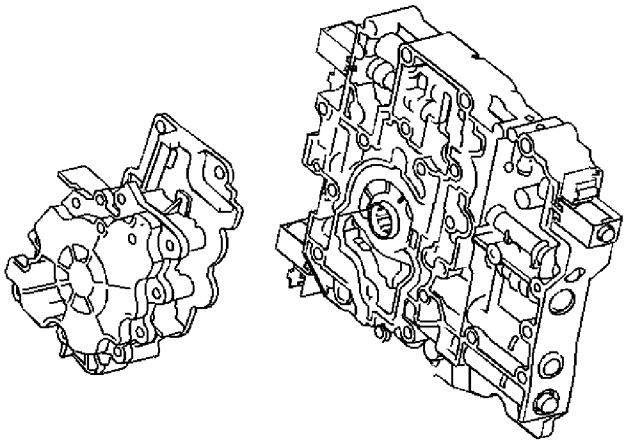
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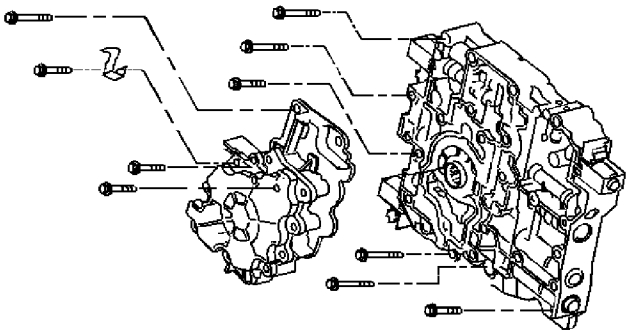
5. Remove the oil pump to valve body bolts.
6. Inspect the oil pump. Refer to Oil Pump Disassemble .

Installation Procedure



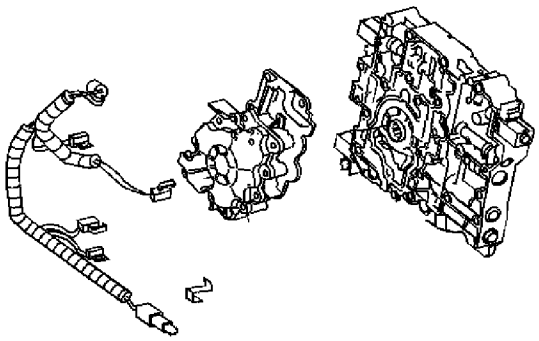
1. Install the oil pump to the valve body.

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Notice: Use a torque wrench to tighten the pump to valve body bolts. Do not exceed the torque specifications.

2. Install the oil pump to valve body bolts.



3. Install the wiring harness, if removed.
4. Install the case side cover. Refer to *Case Side Cover Replacement (W/ Gasket)* .
5. Lower the vehicle.
6. Connect the negative battery cable.

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Control Valve Body Cover Replacement (W/ Gasket)

Removal Procedure

1. Disconnect the negative battery cable. Refer to

   Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

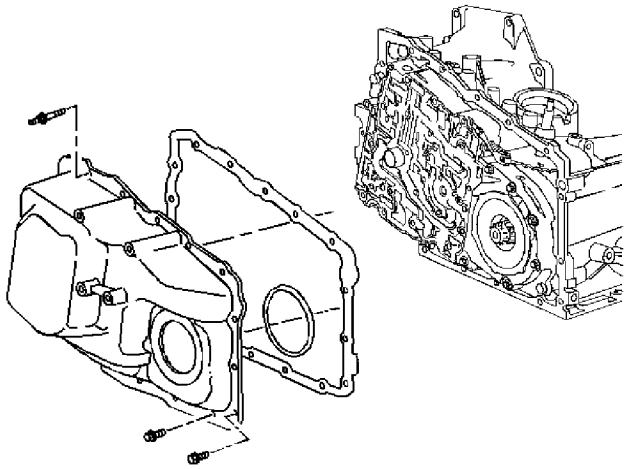
   in General Information.
2. Remove the park/neutral position switch. Refer to Park/Neutral Position Switch Replacement .
3. Raise the vehicle. Support the vehicle. Refer to General Vehicle Lifting and Jacking in General Information.
4. Remove the left front tire and wheel assembly. Refer to Wheel Removal in Tires and Wheels.
5. Remove the inner splash shield.
6. Remove the tie rod end from the knuckle assembly. Refer to Stabilizer Shaft and Link in Front Suspension.
7. Remove the stabilizer shaft link from the lower control arm. Refer to Stabilizer Shaft and Link in Front Suspension.
8. Remove the ball joint from the steering knuckle. Refer to Ball Joint in Front Suspension.
9. Remove the drive axle from the transmission. Refer to Drive Axle in Drive Axle On-Vehicle Service.
10. Remove the pinch bolt from the steering gear intermediate shaft.

    Caution: Failure to disconnect the intermediate shaft from the rack and pinion steering gear stub shaft can result in damage to the steering gear or to the intermediate shaft. This damage may cause loss of steering control, which could result in an accident and possible personal injury.

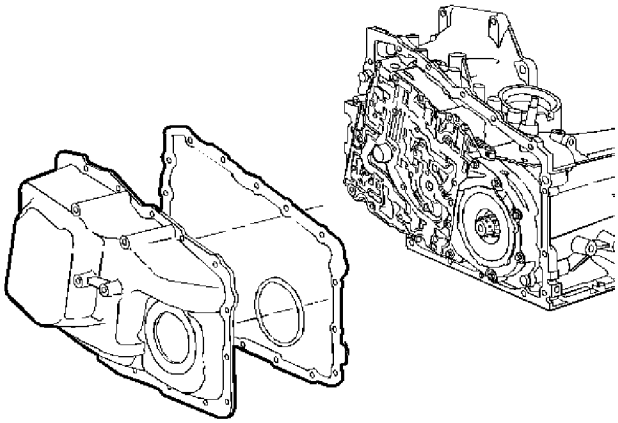
11. Remove the intermediate shaft from the steering gear.
12. Position a transmission jack under the transmission oil pan. Raise the jack until the jack supports the transmission.
13. Remove the three frame-to-body bolts on the left side.
14. Lower the transmission jack and the transmission in order to gain access to the case side cover.
15. Remove the oil cooler pipes at the case. Refer to Automatic Transmission Oil Cooler Pipes Replacement .

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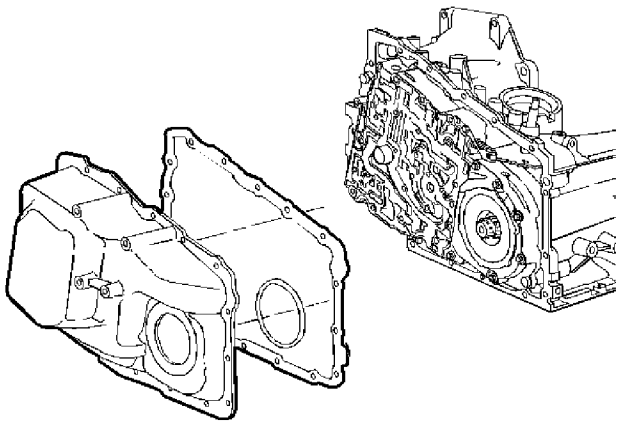
16. Remove the case side cover bolts.



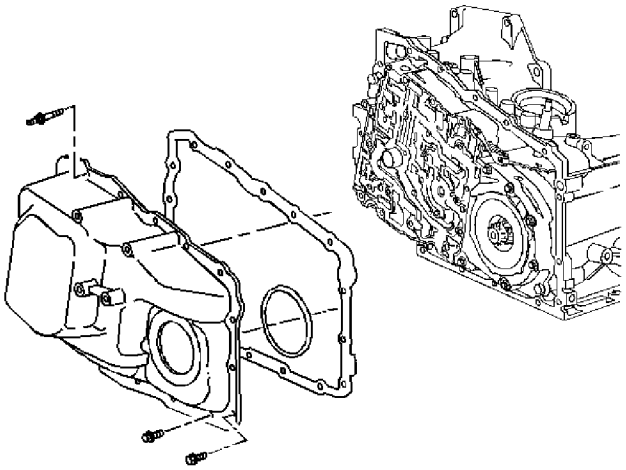
17. Remove the case side cover.
18. Clean the case and side cover gasket surfaces.

Installation Procedure

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1. Install the new gaskets on the case.
2. Install the case side cover.



3. Install the new side cover bolts.

Tighten
Tighten the side cover bolts to 11 N·m (98 lb in).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when

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installing fasteners in order to avoid damage to parts and systems.

4. Install the oil cooler pipes to the transmission. Refer to Automatic Transmission Oil Cooler Pipes Replacement .
5. Raise the transmission so that the frame bolts can be installed.
6. Install the three frame-to-body bolts.

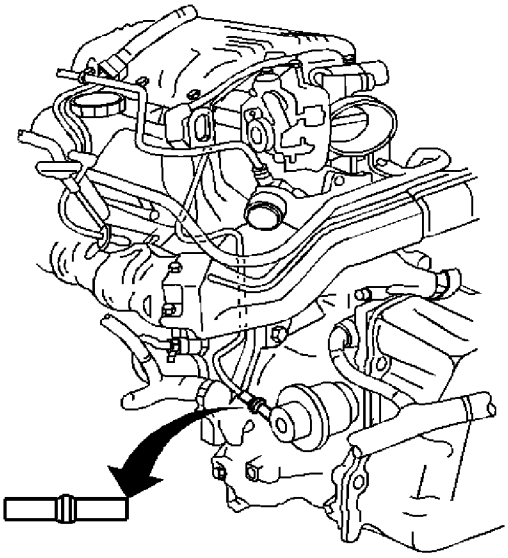
   Tighten
   Tighten the bolts to 112 N·m (83 lb ft).

7. Remove the transmission jack.
8. Install the intermediate shaft to the steering gear.
9. Install the pinch bolt at the intermediate shaft.
10. Install the drive axle to the transmission. Refer to Drive Axle in Drive Axle On-Vehicle Service.
11. Install the ball joint to the steering knuckle. Refer to Ball Joint in Front Suspension.
12. Remove the drive axle seal protectors.
13. Install the stabilizer shaft link to the lower control arm. Refer to Stabilizer Shaft and Link in Front Suspension.
14. Install the tie rod end to the knuckle. Refer to Stabilizer Shaft and Link in Front Suspension.
15. Install the inner splash shield.
16. Install the left front tire and the wheel assembly. Refer to Wheel Installation in Tires and Wheels.
17. Lower the vehicle.
18. Install the park/neutral position switch. Refer to Park/Neutral Position Switch Replacement .
19. Connect the negative battery cable.
20. Inspect for leaks.
21. Check the fluid level.

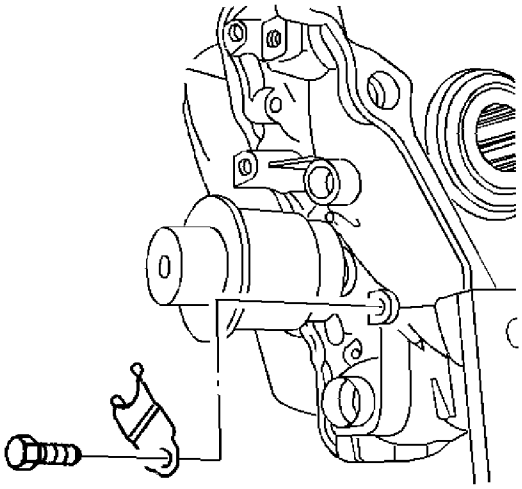
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Vacuum Modulator Replacement

Removal Procedure



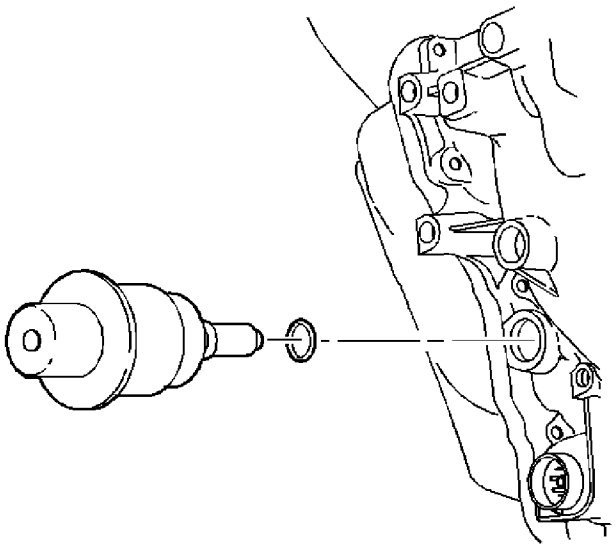
1. Remove the vacuum line at the modulator.



2. Remove the modulator bolt and the retainer.

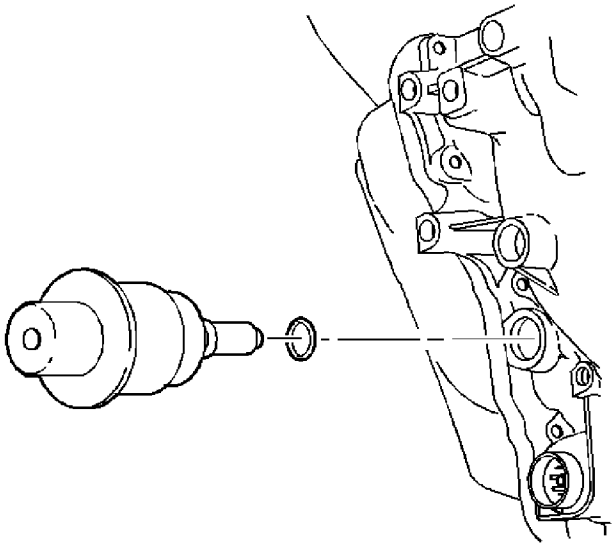
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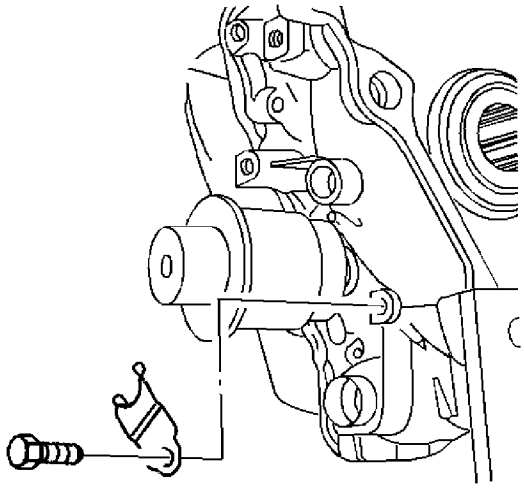
3. Remove the vacuum modulator and the O-ring.

Installation Procedure



1. Install the modulator and a new O-ring.

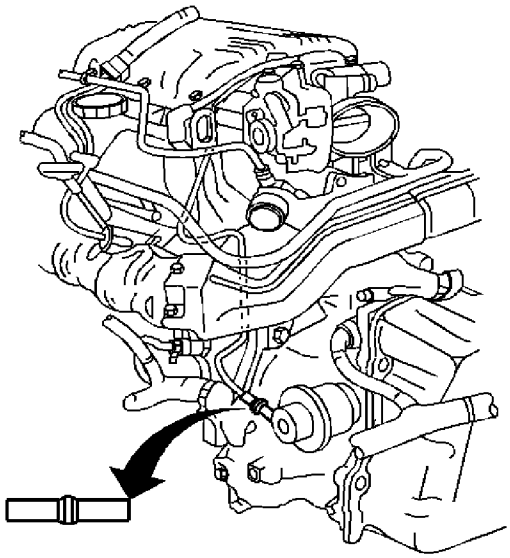
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2. Install the modulator retainer and the bolt.

Tighten
Tighten the bolt to 24 N·m (18 lb ft).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.



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3. Install the vacuum line at the modulator.

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Case Extension Replacement (W/ Final Drive)

Removal Procedure

Tools Required

J 34757 Output Shaft C-Ring Remover and Installer

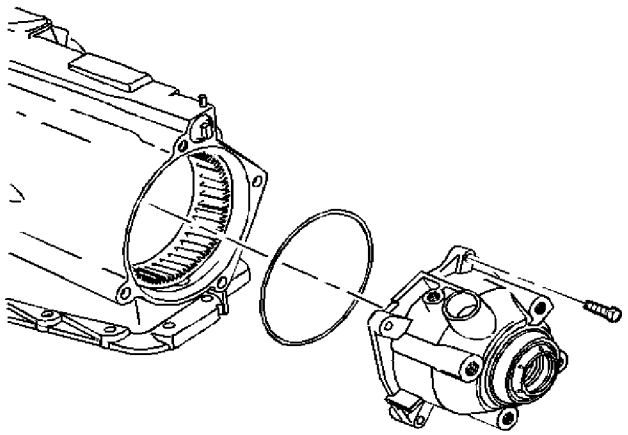
1. Disconnect the negative battery cable. Refer to

   Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

   in General Information.
2. Raise the vehicle. Support the vehicle. Refer to Vehicle Lifting and Jacking in General Information.
3. Remove the vehicle speed sensor. Refer to *Vehicle Speed Sensor Replacement* .
4. Remove the right front tire and the wheel assembly. Refer to Wheel Removal in Suspension.

   Important: Carefully guide the right drive axle output shaft past the lip seal. Do not allow the shaft splines to contact any portion of the lip seal surface; otherwise, damage to the seal will occur.

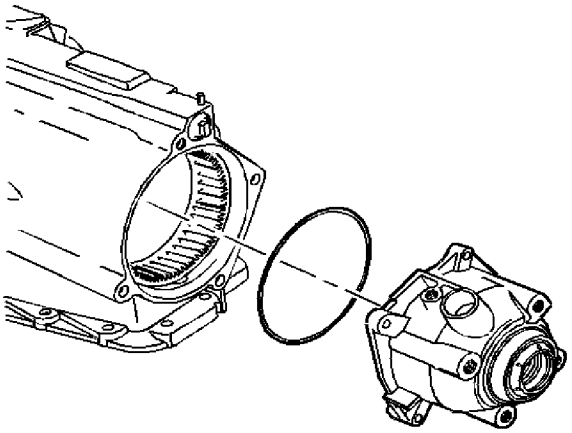
5. Remove the right drive axle from the transmission. Refer to Drive Axle in Driveline/Axle.
6. Remove the torque strut bracket from the transmission.
7. Loosen the torque strut to bracket bolt as needed.
8. Swing the bracket out of the way.
9. Remove the transmission brace from the engine bracket.



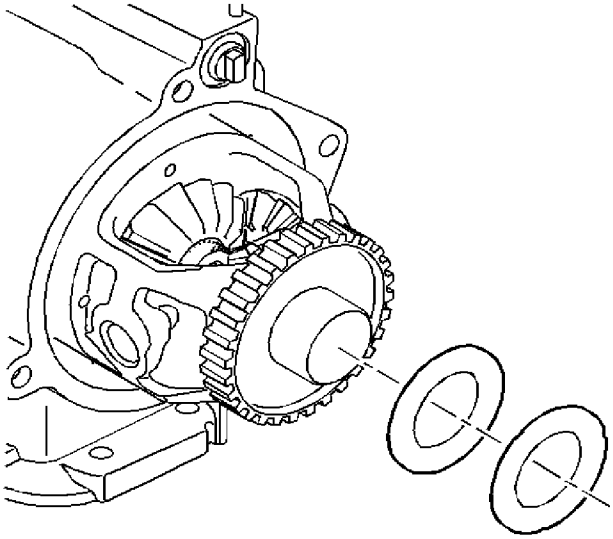
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10. Remove the case extension bolts.

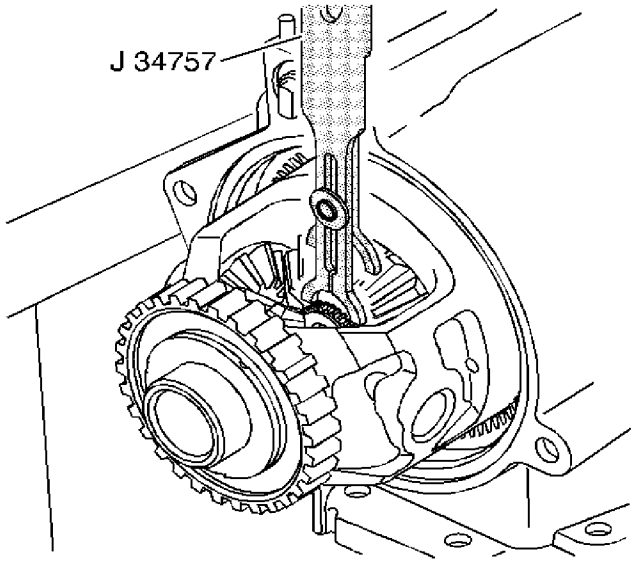


11. Remove the case extension assembly and the seal.

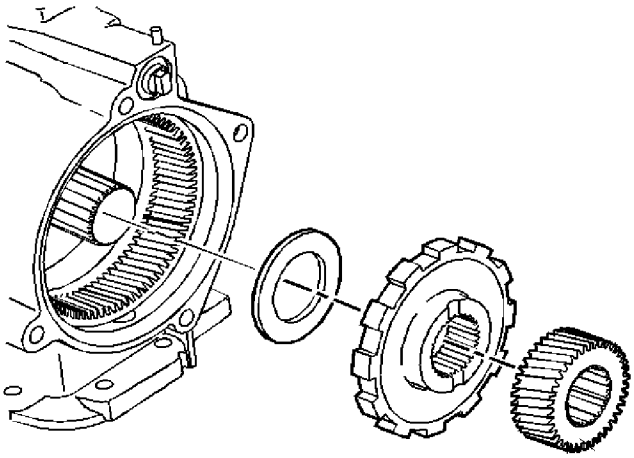


12. Remove the thrust bearing and the thrust bearing washer.

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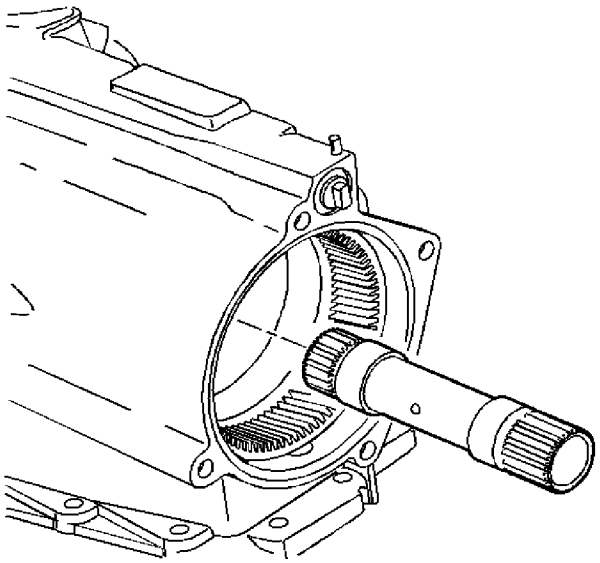
13. Rotate the final drive assembly until the opening in the snap ring is visible. Use the J 34757 to push the snap ring partially off the output shaft.



14. Remove the final drive sun gear.
15. Remove the parking gear.
16. Remove the thrust bearing.

Important: Refer to Transmission Unit Repair Manual if further service is needed on the final drive assembly.

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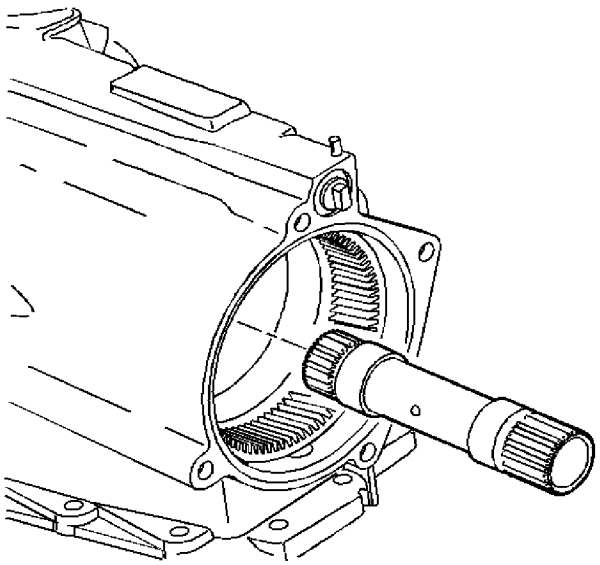


17. Remove the final drive sun gear shaft.

Installation Procedure

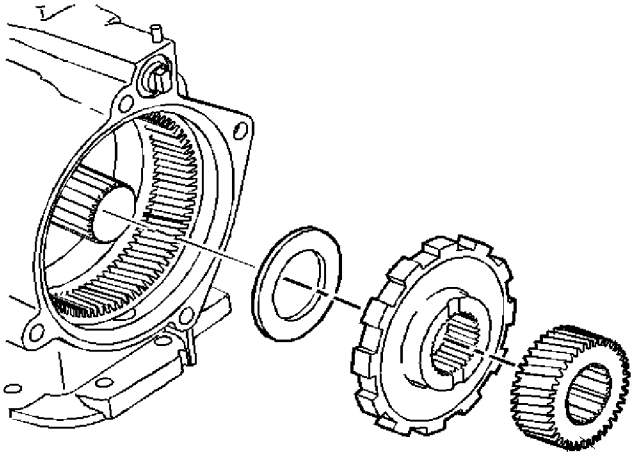
Tools Required

- J 36850 Transjel
- J 34757 Output Shaft C-Ring Remover and Installer
- J 37292-B Axle Seal Protector

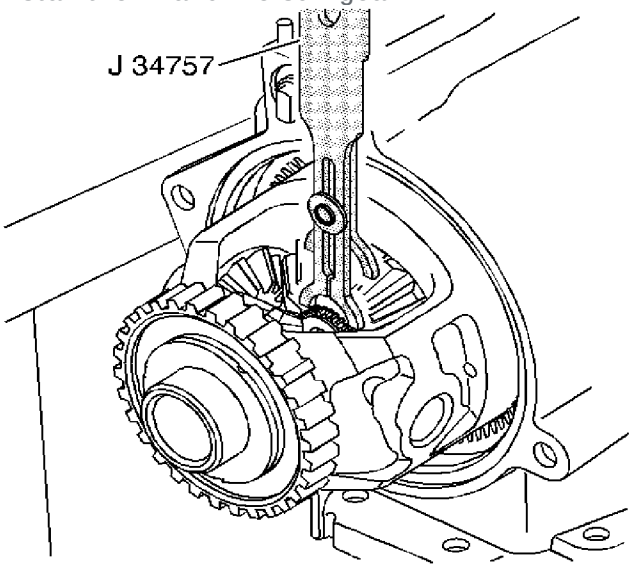


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1. Install the final drive sun gear shaft.

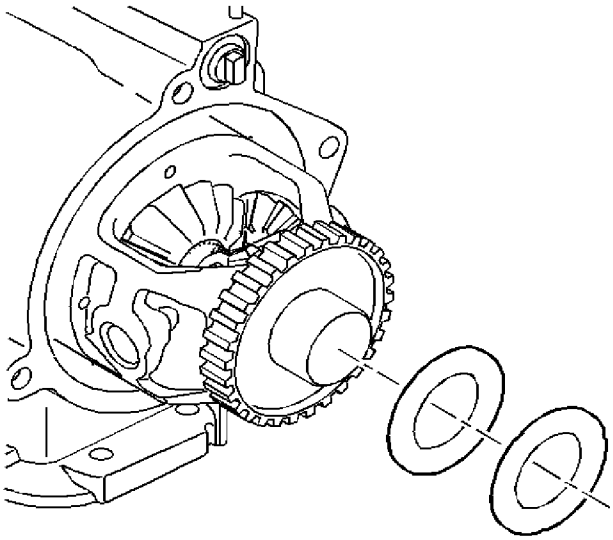


2. Install the thrust bearing.
3. Install the parking gear.
4. Install the final drive sun gear.

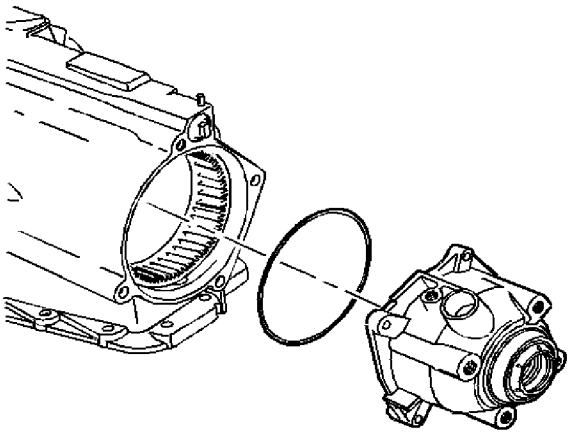


5. Install the final drive assembly onto the output shaft. Use the J 34757 in order to install the snap ring onto the output shaft.

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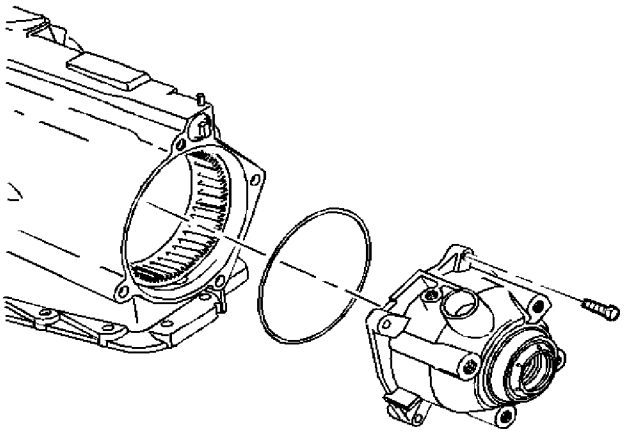


6. Install the washer and the thrust bearing onto the final drive assembly. Use the J 36850 or the equivalent (petroleum jelly), in order to retain the washer and the bearing.



7. Install the seal and the case extension.

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8. Install the case extension bolts.

   Tighten
   Tighten the bolts to 36 N·m (27 lb ft).

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

9. Install the transmission brace to the engine bracket.
10. Install the torque strut bracket to the transmission.

    Important: Before installing the right side drive axle, install the J 37292-B . Install the tool in a position so that it can be pulled out after the drive axle is installed (T-handle between 5 and 7 o'clock).

11. Install the right drive axle to the transmission. Refer to Drive Axle in Driveline/Axle.
12. Install the right front tire and wheel assembly. Refer to Wheel Installation in Suspension.
13. Remove the J 37292-B . Pull in line with the handle. Ensure that the tool is completely removed, and no pieces remain inside the transmission.
14. Install the vehicle speed sensor. Refer to *Vehicle Speed Sensor Replacement* .
15. Lower the vehicle.
16. Connect the negative battery cable.

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Thermo Element Replacement

Removal Procedure

1. Disconnect the negative battery cable. Refer to

   Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

   in General Information.
2. Raise the vehicle. Support the vehicle. Refer to General Vehicle Lifting and Jacking in General Information.
3. Remove the oil and the oil filter. Refer to *Oil Filter and Seal Replacement* .
4. Disassemble the following parts:
   - The washers
   - The pins
   - The thermo element
   - The plate

Installation Procedure

Tools Required

J 34094-A Thermo Element Height Gauge

1. Set the middle thermo pin height with the J 34094-A .
2. Install the element plate.
3. Install the pin and the washer assemblies. Use the J 34094-A in order to set the height of both washers. Complete the following steps:
   3.1. Set the pin that is furthest from the accumulators.
   3.2. Set the other pin. This will ensure that both pins are set correctly.
4. Install the thermo element between the two pins without bending the element too much.

   The V in the Thermo element must contact the element plate.

5. Install the oil filter, the oil pan and the gasket. Refer to *Oil Pan Replacement* and *Oil Filter and Seal Replacement* .
6. Connect the negative battery cable.
7. Adjust the oil level.

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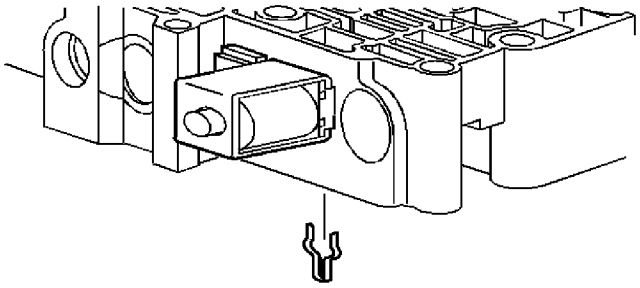
Solenoids and Wiring Harness Replacement

Removal Procedure

1. Disconnect the negative battery cable. Refer to

   Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

   in General Information.
2. Raise the vehicle. Support the vehicle. Refer to General Vehicle Lifting and Jacking in General Information.
3. Remove the case side cover. Refer to *Case Side Cover Replacement (W/ Gasket)* .

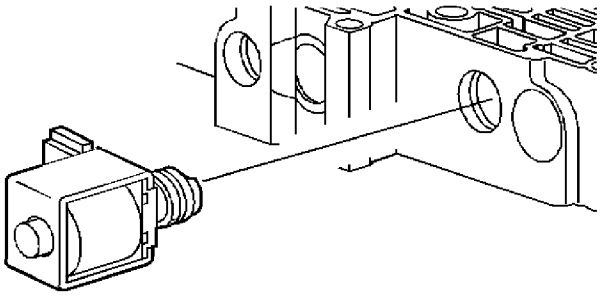




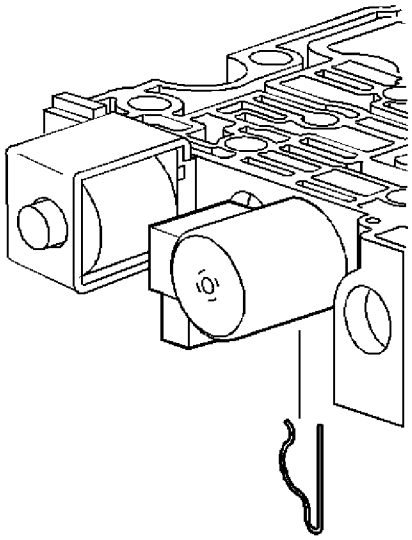
4. Remove the 1-2 shift solenoid retainer.

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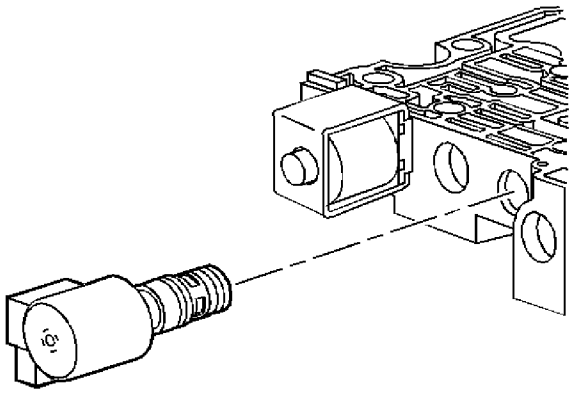


5. Remove the 1-2 shift solenoid.

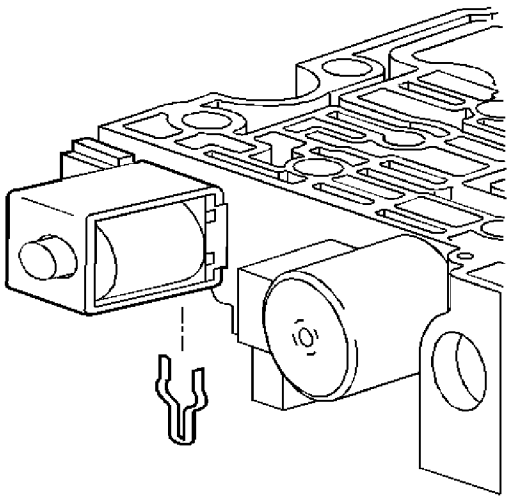


6. Remove the PWM solenoid retainer.

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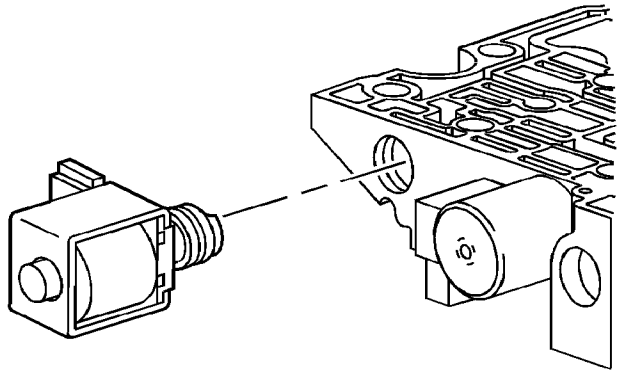


7. Remove the PWM solenoid.

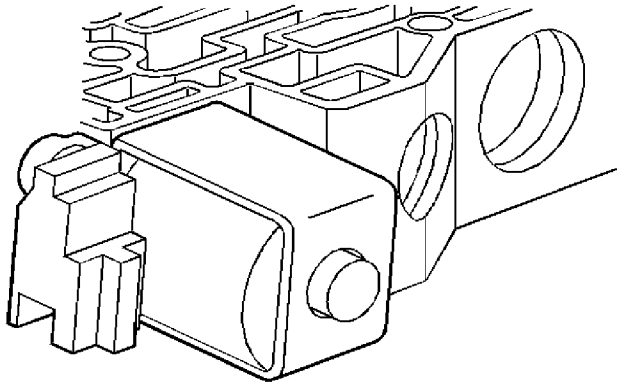


8. Remove the TCC solenoid retainer.

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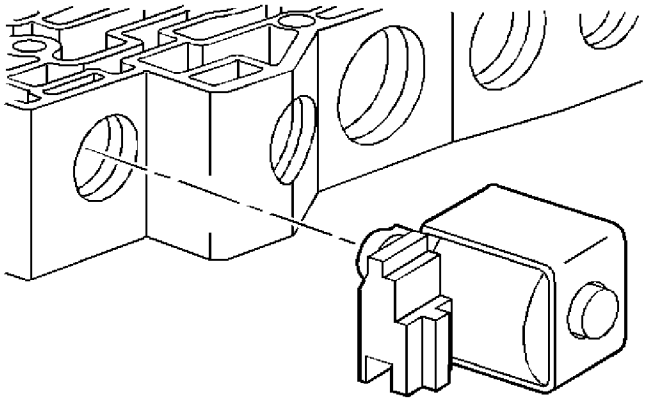


9. Remove the TCC solenoid.



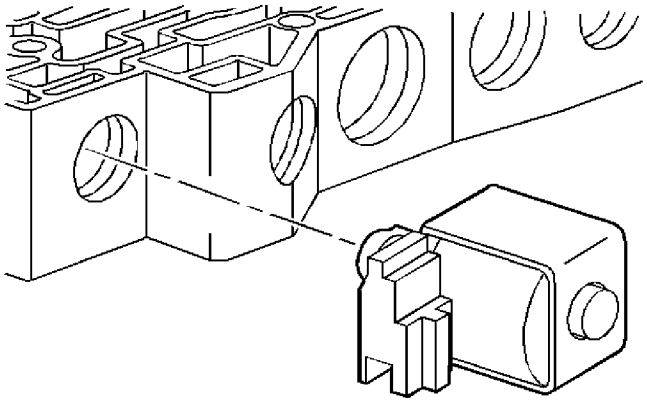
10. Remove the 3-4 shift solenoid retainer.

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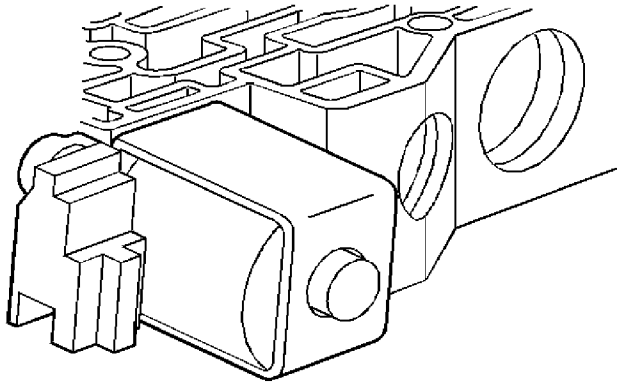
11. Remove the 3-4 shift solenoid.

Installation Procedure

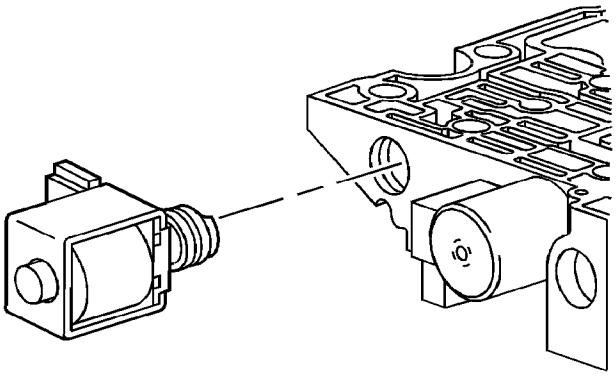


1. Install the 3-4 shift solenoid.

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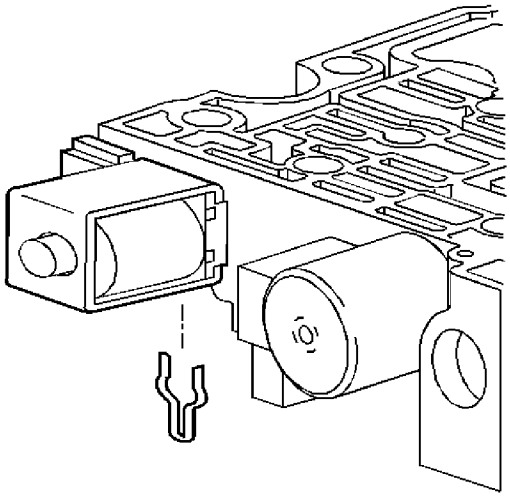


2. Install the 3-4 shift solenoid retainer.

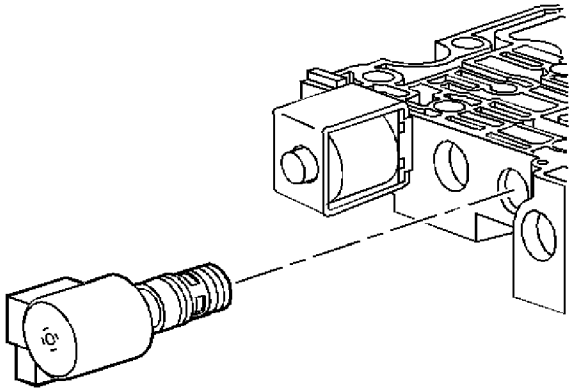


3. Install the TCC solenoid.

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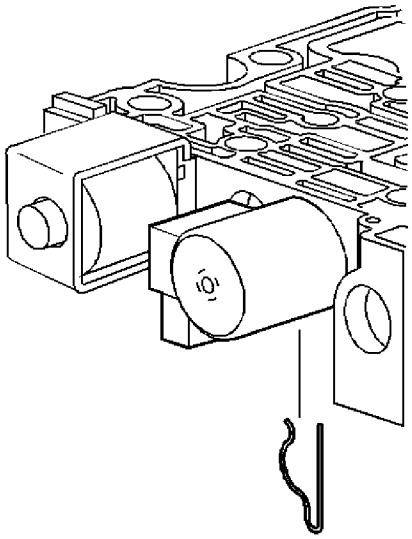


4. Install the TCC solenoid retainer.

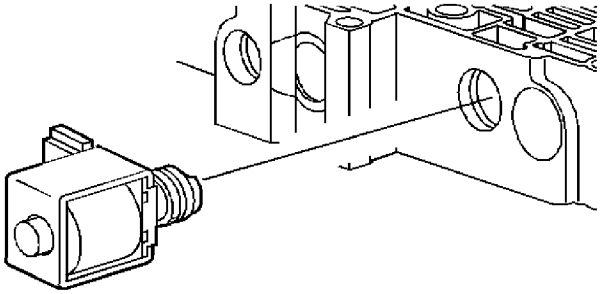


5. Install the PWM solenoid.

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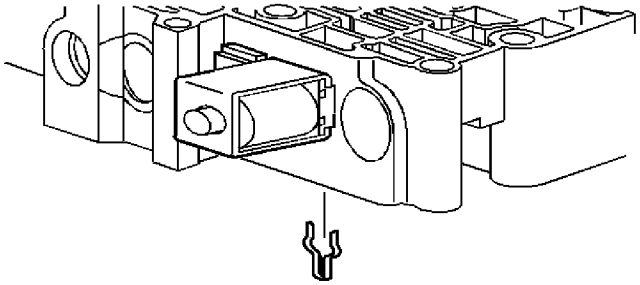


6. Install the PWM solenoid retainer.



7. Install the 1-2 shift solenoid.

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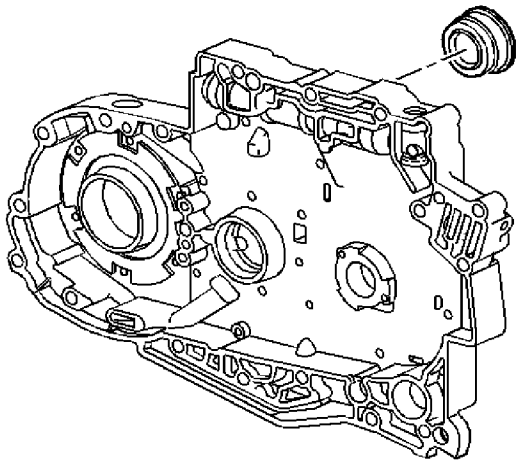
8. Install the 1-2 shift solenoid retainer.
9. Install the case side cover, new gaskets and attaching bolts. Refer to *Case Side Cover Replacement (W/ Gasket)* .
10. Connect the negative battery cable.
11. Lower the vehicle.
12. Adjust the fluid level.

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Drive Axle Oil Seal Replacement

Removal Procedure

1. Raise the vehicle. Support the vehicle. Refer to General Vehicle Lifting and Jacking in General Information.
2. Remove the drive axle. Refer to Drive Axle On-Vehicle Service.





3. Pry out the seal with a screwdriver or other suitable tool. Do not damage the seal bore.

Installation Procedure

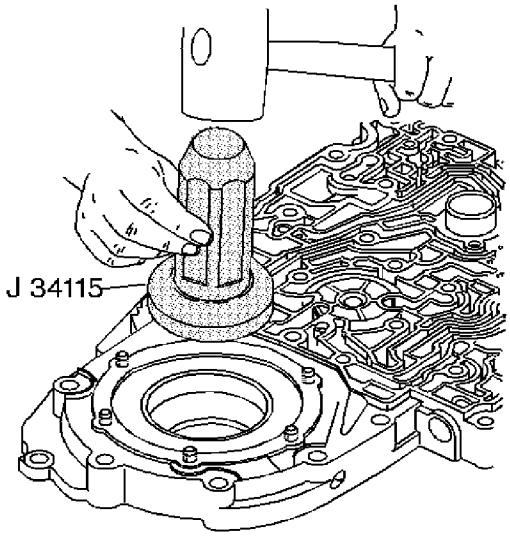
Tools Required

- J 34115 Drive Boot Installer
- J 37292-B Tear-Away Axle Seal Protector

1. Lubricate the seal lip with a light wipe of transmission fluid.

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2. Install a new seal, using the J 34115 .
3. For the right side axle seal, install the J 37292-B . Install the J 37292-B in a position so that the tool can be pulled out after drive axle installation (T-handle between the 5 and 7 o'clock position).

Important: Carefully guide the axle shaft past the lip seal. In order to avoid damage to the seal, do not let shaft splines contact any part of the lip-seal surface.

4. Install the drive axle. Refer to Drive Axle in Drive Axle On-Vehicle Service.
5. On the right side, remove the J 37292-B by pulling in line with the handle. Make sure that the J 37292-B is removed completely and that no pieces remain inside the transmission.
6. Inspect for leaks.
7. Inspect the fluid level.
8. Adjust the fluid level.

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Transmission Mount Replacement

Removal Procedure

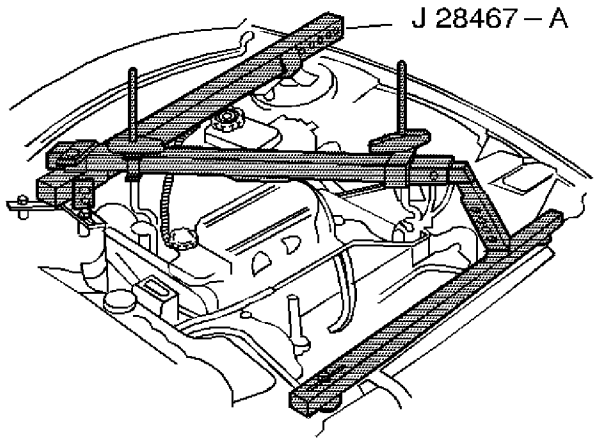
Tools Required

J 28467-360

1. Disconnect the negative battery cable. Refer to

   Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

   in General Information.

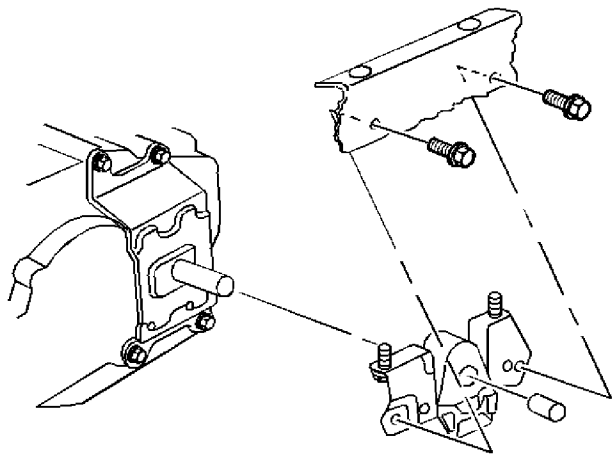




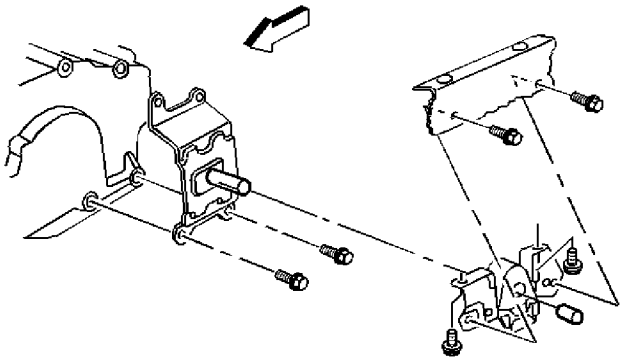
2. Install the J 28467-360 to the transmission.

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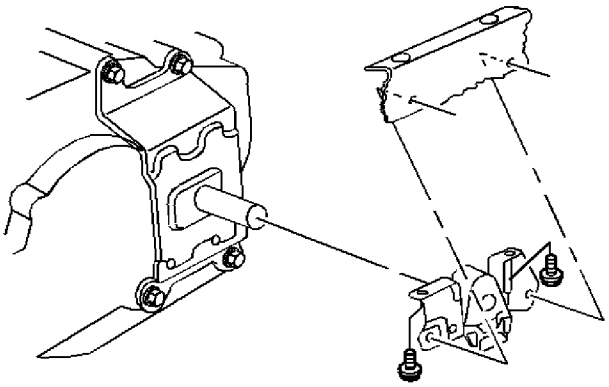


3. Remove the upper transmission mount assembly bolts.
4. Raise the vehicle. Support the vehicle. Refer to General Vehicle Lifting and Jacking in General Information.
5. Remove the left front tire and the wheel assembly. Refer to Wheel Removal in Tires and Wheels.
6. Remove the left front splash shield.

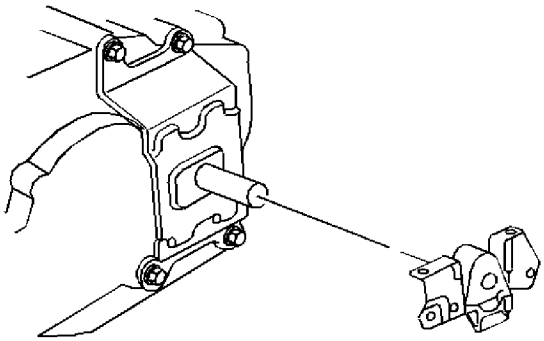


7. Remove the transmission mount expansion pipe bolt.

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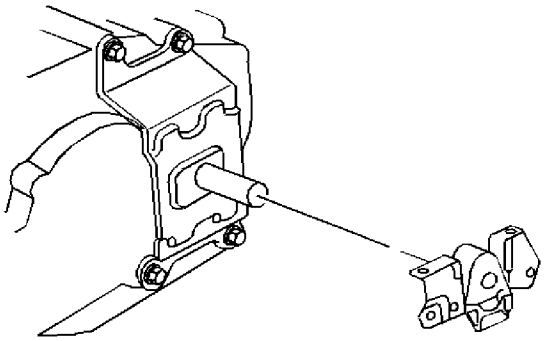
8. Remove the lower transmission mount assembly bolts.



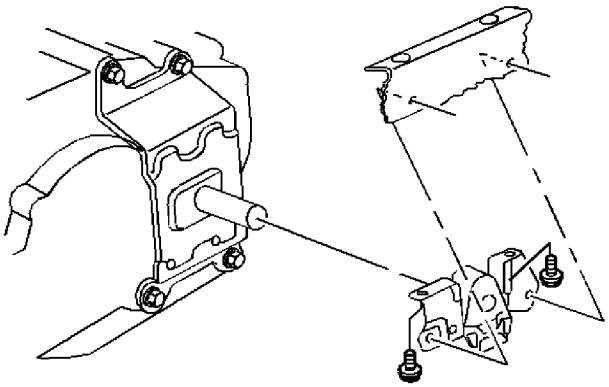
9. Remove the transmission mount.

Installation Procedure

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1. Install the transmission mount.

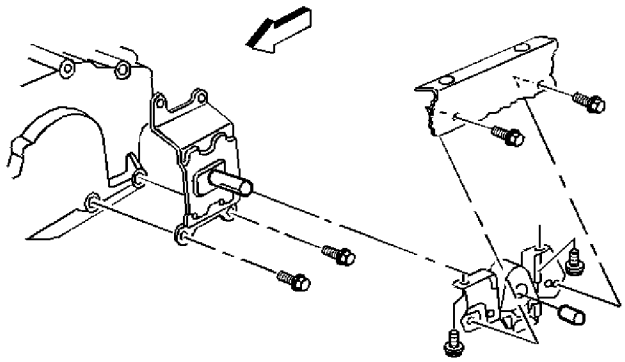


2. Install the lower transmission mount bolts.

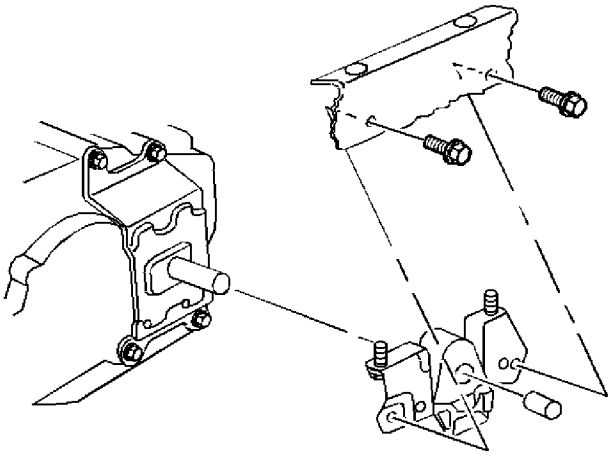
Tighten
Tighten the bolts to 90 N·m (66 lb ft).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

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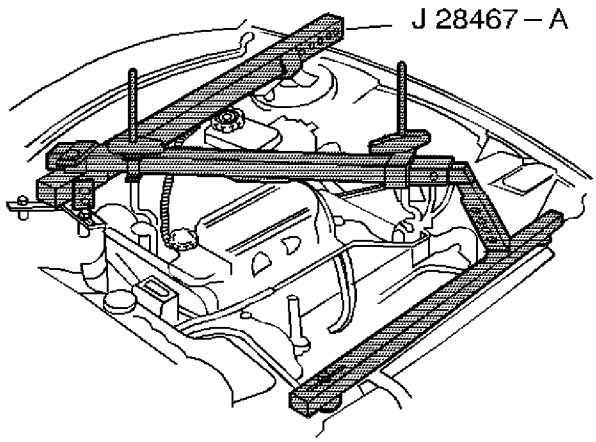
3. Install the transmission mount expansion plug.
4. Install the left front splash shield.
5. Install the left front tire and the wheel assembly. Refer to Wheel Installation in Tires and Wheels.
6. Lower the vehicle.



7. Install the upper transmission mount bolts.

Tighten
Tighten the bolts to 90 N·m (66 lb ft).

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8. Remove the engine support fixture.
9. Connect the negative battery cable.

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Transmission Replacement (3100 VIN M)

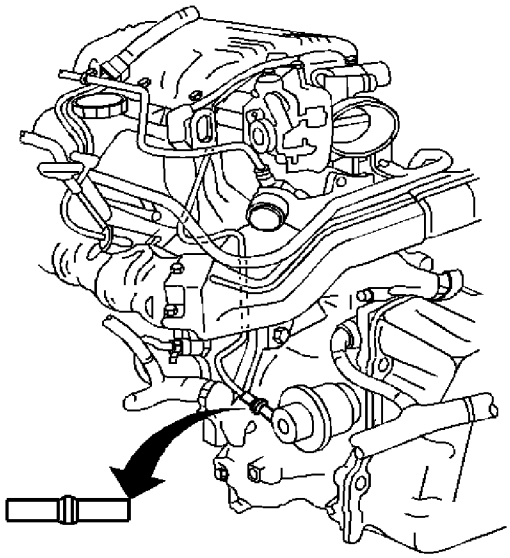
Removal Procedure

- J 28467-360 Engine Support Fixture
- J 35944 Oil Cooler Flushing Tool

1. Disconnect the negative battery cable. Refer to

   Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

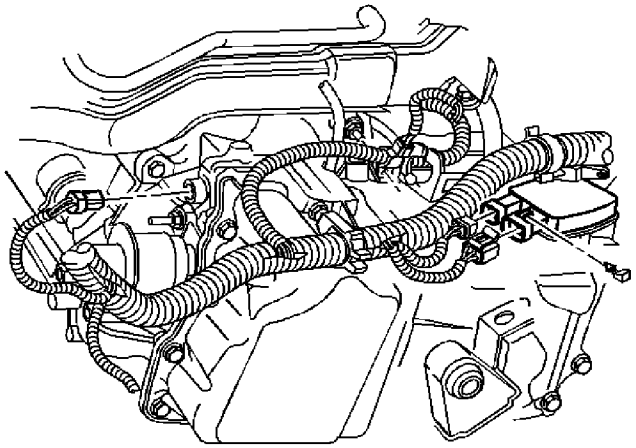
   in General Information.
2. Remove the air intake duct. Refer to Engine Controls.
3. Remove the shift linkage from the transmission.



4. Remove the vacuum modulator vacuum line at the modulator.

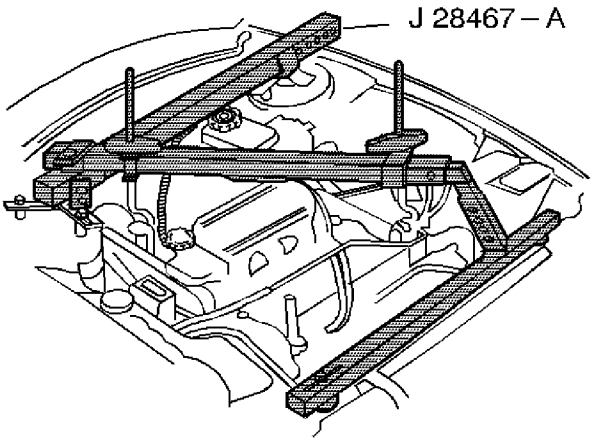
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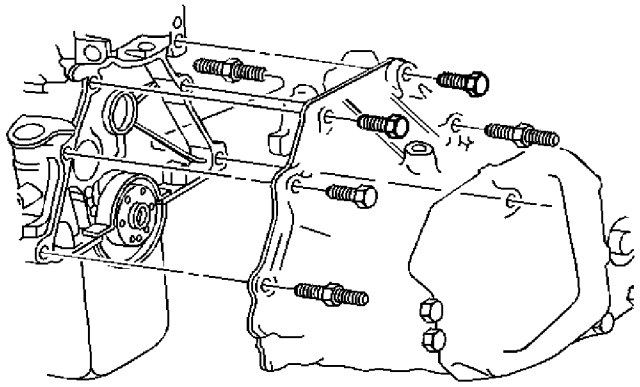
Important: When servicing requires that the T latch type wiring connector be disconnected from the switch, care must be taken in order to ensure proper reassembly of both the connector and the T latch. Failure to do so may result in intermittent loss of switch functions.

5. Remove the following wiring connectors:
   - The TCC connector
   - The Park/Neutral position switch
   - The shift solenoid connector

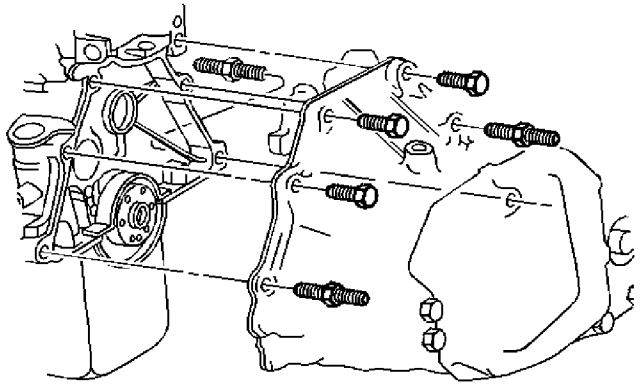


6. Install the J 28467-360 .

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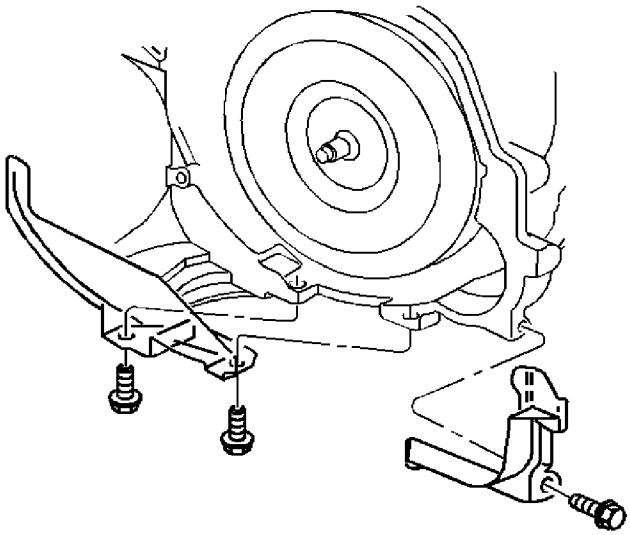
7. Remove the top two transmission to engine bolts.
8. Remove the rubber hose from the transmission to vent pipe.



9. Remove the remaining upper engine to transmission bolts.
10. Raise the vehicle. Support the vehicle. Refer to General Vehicle Lifting and Jacking in General Information.
11. Remove both the tire and the wire assemblies. Refer to Wheel Removal in Tires and Wheels.
12. Remove the right and the left splash shields.
13. Remove both the front ABS wheel speed sensors and the harness from the left side suspension support. Refer to Front Wheel Speed Sensor in Antilock Brake System and Enhanced Traction System.
14. Remove both of the ball joints from the control arms. Refer to Ball Joint in Front Suspension.
15. Remove the left stabilizer shaft link pin bolt. Refer to Stabilizer Link in Front Suspension.
16. Remove the left stabilizer shaft frame bushing clamp nuts. Refer to Stabilizer Shaft in Front Suspension.

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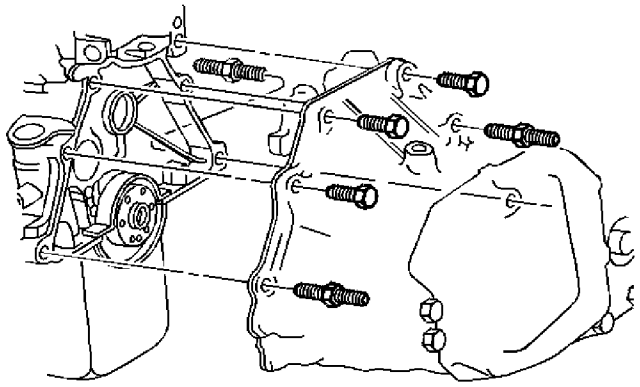
17. Remove the left suspension support assembly. Refer to Control Arm and/or Suspension Support in Front Suspension.
18. Remove both of the drive axles. Refer to Drive Axle in Drive Axle On-Vehicle Service.
19. Remove the engine to transmission brace.
20. Remove the starter. Refer to Starter Motor Replacement in Engine Electrical.





21. Remove the transmission converter cover.
22. Remove the heater core hose pipe brace to transmission nut and bolt.
23. Remove the torque converter to flywheel bolts. Using a scribe, mark the flywheel to torque converter relationship in order to assure the proper reassembly. Refer to Flywheel to Torque Converter Bolt Replacement .
24. Remove the oil level indicator and the fill tube. Refer to *Filler Tube Replacement* .
25. Remove the transmission cooler pipes. Plug the pipes in order to prevent leakage. Refer to Automatic Transmission Oil Cooler Pipes Replacement .
26. Remove the vehicle speed sensor. Refer to *Vehicle Speed Sensor Replacement*
27. Remove the vacuum reserve tank.
28. Remove the position transmission jack.
29. Remove the transmission mount to the body bolts. Refer to Transmission Mount Replacement .

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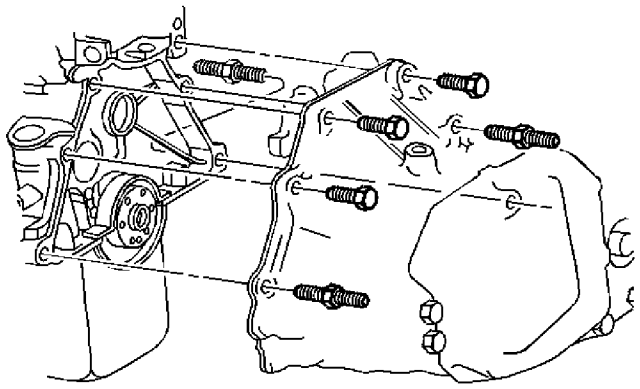
30. Remove the remaining engine to transmission bolts.
31. Remove the transmission.
32. Flush the transmission cooler and the lines with J 35944 , or equivalent, whenever the transmission, the pump, the torque converter, or the case has been removed for overhaul or replacement.

Installation Procedure

1. Place a thin film of chassis grease GM P/N 1051344 or the equivalent on the torque converter pilot hub.

   Properly seat the torque converter in the oil pump.

2. Position the transmission in the vehicle.



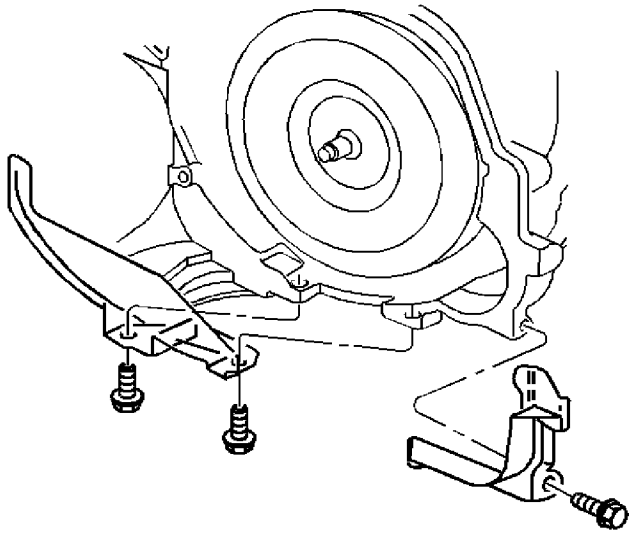
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3. Install the lower engine to transmission bolts.
4. Install the transmission mount to body bolts. Remove the transmission jack.
5. Install the transmission cooler pipes. Refer to Automatic Transmission Oil Cooler Pipes Replacement .
6. Install the torque converter to flywheel bolts. Refer to Flywheel to Torque Converter Bolt Replacement .

Tighten
Tighten all of the bolts to 62 N·m (46 lb ft). Hand start and tighten the net slot bolt first. Hand start and tighten the two remaining bolts.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

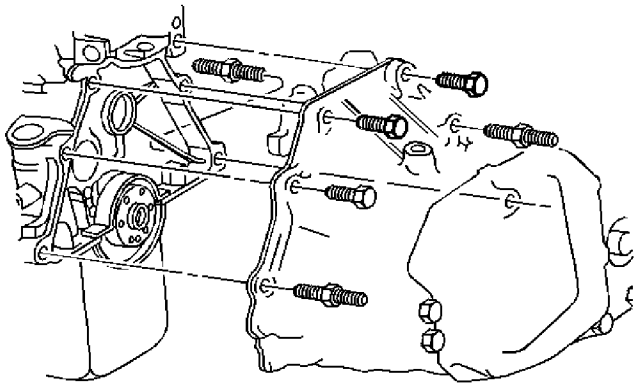
7. Install the oil level indicator and the fill tube. Refer to *Filler Tube Replacement* .
8. Install the vacuum reserve tank.
9. Install the starter. Refer to Starter Motor Replacement in Engine Electrical.



10. Install the transmission converter cover.
11. Install the vehicle speed sensor. Refer to *Vehicle Speed Sensor Replacement* .
12. Install the drive axles. Refer to Drive Axle in Drive Axle On-Vehicle Service.
13. Install the left suspension support assembly. Refer to Control Arm and/or Suspension Support in Front Suspension.
14. Install the left stabilizer shaft frame bushing nuts. Refer to Stabilizer Shaft in Front Suspension.
15. Install the stabilizer shaft link pin bolt. Refer to Stabilizer Link in Front Suspension.
16. Install the engine to the transmission brace.

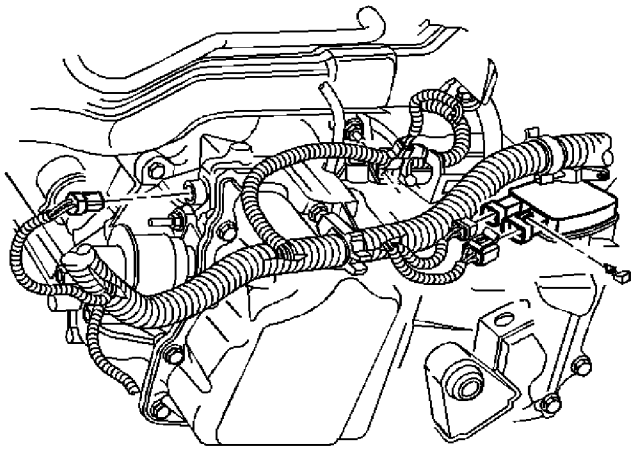
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17. Install both of the ball joints to the control arms. Refer to Ball Joint in Front Suspension.
18. Connect the ABS wheel speed sensor harnesses. Refer to Front Wheel Speed Sensor in Antilock Brake System and Enhanced Traction System.
19. Install the right and the left side splash shields.
20. Install the heater core pipe brace to the transmission nut and the bolt.
21. Install both of the tire and the wheel assemblies. Refer to Wheel Installation in Tires and Wheels.
22. Lower the vehicle.





23. Install the upper engine to transmission bolts.
24. Install the shift linkage to the transmission.

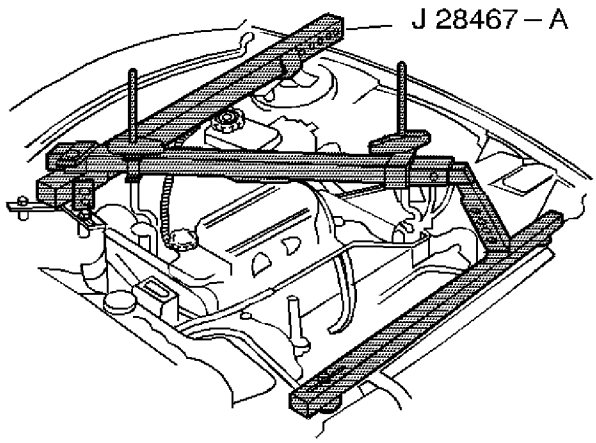




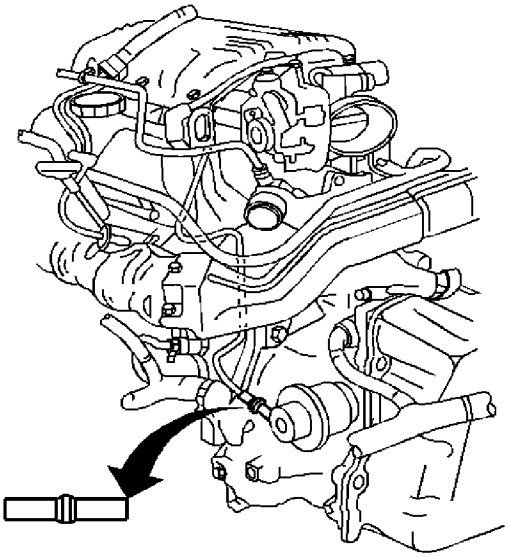
25. Install the following wire connectors:
    - The TCC connector
    - The Park/Neutral start and back-up lamp switch

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26. Install the wiring harness and the nut securing the harness to the transmission.



27. Remove the J 28467-360 .
28. Install the rubber hose to the transmission vent pipe.



29. Install the vacuum modulator vacuum line.
30. Install the air intake duct. Refer to Engine Controls.
31. Connect the negative battery cable.
32. Refill the transmission with the proper fluid.
33. Adjust the shift linkage.
34. Inspect the oil level.
35. Ensure that there are no oil leaks.

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Transmission Replacement (LD9)

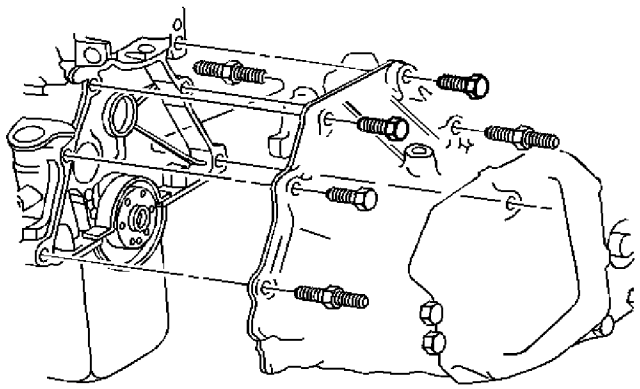
Removal Procedure

- J 28467-360 Engine Support Fixture
- J 35944 Cooler Flushing Tool

1. Disconnect the negative battery cable. Refer to

   Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

   in General Information.
2. Remove the intake air duct. Refer to Engine Controls.
3. Remove the cable control cover.
4. Remove the throttle cable.
5. Remove the shift cable and the bracket.
6. Remove the throttle cable from the throttle body.
7. Remove the vacuum lines.
8. Remove the electrical connections.
9. Remove the power steering pump and set aside. Refer to Power Steering Pump Assembly (2.4L) in Power Steering Gear and Pump.
10. Remove the oil fill tube. Refer to *Filler Tube Replacement* .
11. Install the J 28467-360 .

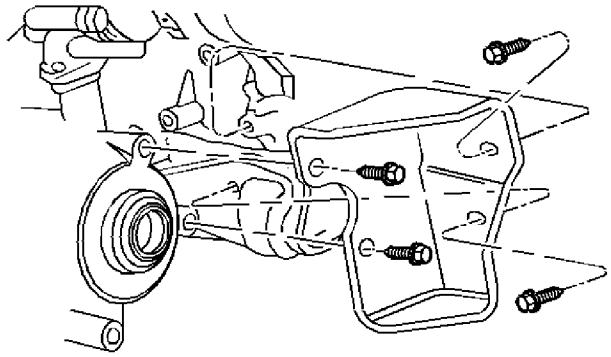




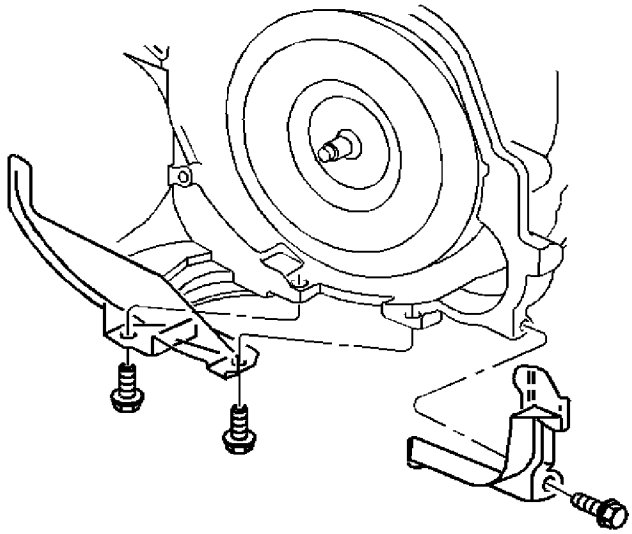
12. Remove the top engine to transmission bolts.
13. Raise the vehicle. Support the vehicle. Refer to General Vehicle Lifting and Jacking in General Information.

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14. Remove the front tire and wheel assemblies. Refer to Wheel Removal in Tires and Wheels.
15. Remove the left splash shield.
16. Remove both of the front ABS wheel speed sensors and the harness from the left suspension support. Refer to Front Wheel Speed Sensor in Antilock Brake System and Enhanced Traction System.
17. Remove both of the lower ball joints. Refer to Ball Joint in Front Suspension.
18. Remove the stabilizer shaft links. Refer to Stabilizer Link in Front Suspension.
19. Remove the front air deflector.
20. Remove the left suspension support. Refer to Control Arm and/or Suspension Support in Front Suspension.
21. Remove both of the drive axles. Refer to Drive Axle in Drive Axle On-Vehicle Service.



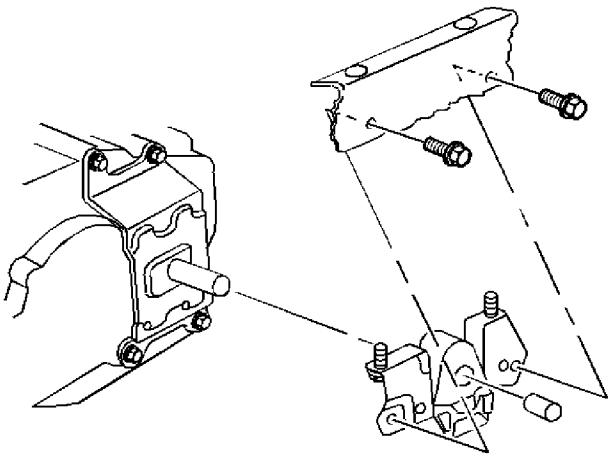
22. Remove the engine to transmission brace.



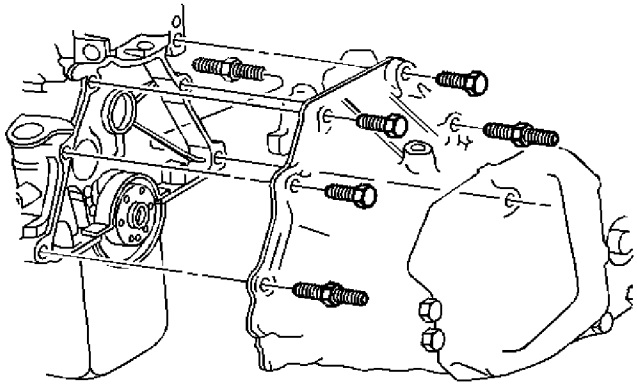
23. Remove the transmission converter cover.
24. Remove the starter. Refer to Starter Motor Replacement in Engine Electrical.

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25. Remove the flywheel to torque converter bolts. Refer to Flywheel to Torque Converter Bolt Replacement .
26. Remove the transmission cooler pipes. Refer to Automatic Transmission Oil Cooler Pipes Replacement .
27. Remove the ground wires from the engine to the transmission bolt.
28. Remove the cooler pipe brace.
29. Remove the exhaust brace.



30. Remove the bolts from the engine and the transmission mount.
31. Support the transmission with a jack.
32. Remove the transmission mount to body bolts.
33. Remove the heater core hose pipe brace to transmission nut and bolt.



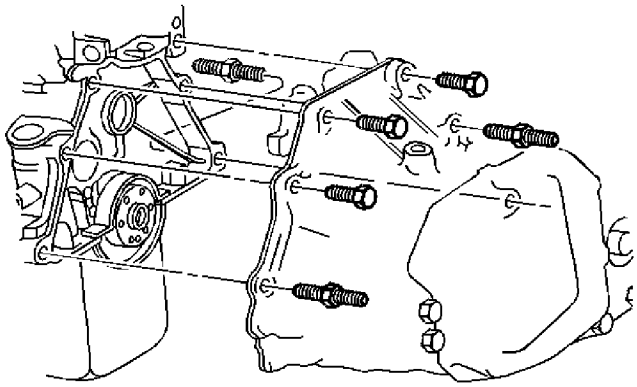
34. Remove the remaining engine to transmission bolts.
35. Remove the transmission assembly.
36. The transmission cooler and the lines should be flushed with J 35944 , or equivalent,

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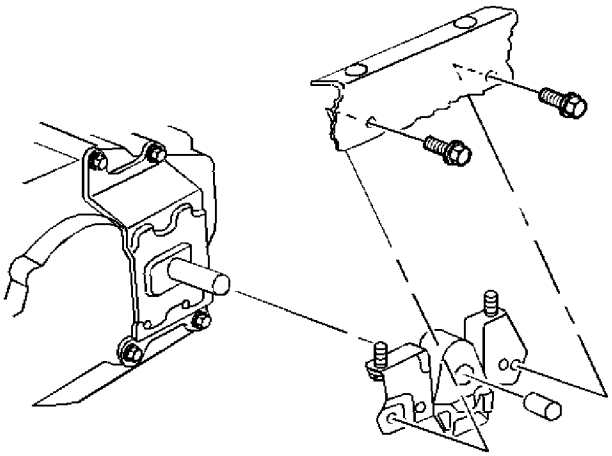
whenever the transmission has been removed for overhaul or replacement of the torque converter, the pump, or the case.

Installation Procedure

1. Place a thin film of grease GM P/N 1051344 or the equivalent on the torque converter pilot knob. Properly seat the torque converter in the oil pump.
2. Install the transmission assembly into position with the jack while installing the right drive axle.



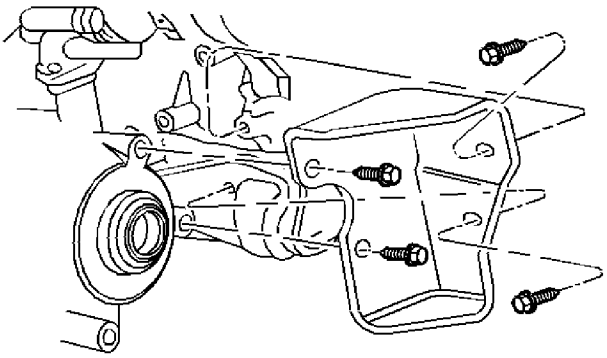
3. Install the lower engine to transmission bolts in the proper location.



4. Install the transmission mount to body bolts.
5. Install the engine and the transmission mount bolts.
6. Install the exhaust brace.

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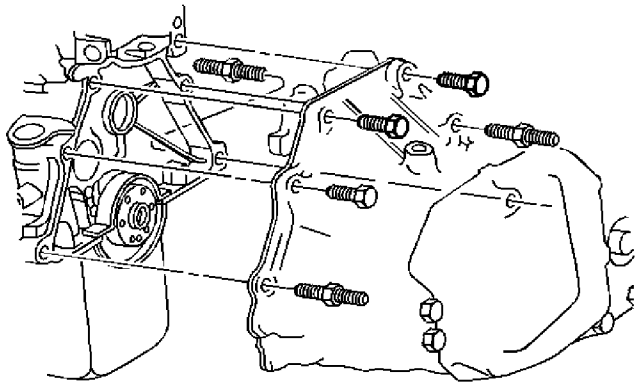
7. Install the cooler pipe brace.
8. Install the ground wires at the engine to transmission bolt.
9. Install the transmission cooler pipes. Refer to Automatic Transmission Oil Cooler Pipes Replacement .
10. Apply adhesive/sealant compound GM P/N 12345493 or the equivalent on the flywheel to torque converter bolts.
11. Install the flywheel to torque converter bolts. Refer to Flywheel to Torque Converter Bolt Replacement .
12. Install the flywheel cover.
13. Install the starter. Refer to Starter Motor Replacement in Engine Electrical.





14. Install the engine to transmission brace.
15. Install the drive axles. Refer to Drive Axle in Drive Axle On-Vehicle Service.
16. Install the left suspension support. Refer to Control Arm and/or Suspension Support in Front Suspension.
17. Install the front air deflector.
18. Install the stabilizer shaft links. Refer to Stabilizer Link in Front Suspension.
19. Install the lower ball joints. Refer to Ball Joint in Front Suspension.
20. Connect both the ABS wheel speed sensors. Refer to Front Wheel Speed Sensor in Antilock Brake System and Enhanced Traction System.
21. Install the left splash shield.
22. Install the heater core pipe brace nut and the bolt.
23. Install both of the tire and the wheel assemblies. Refer to Wheel Installation in Tires and Wheels.
24. Lower the vehicle.

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Important: Install the bolts in the proper location.

25. Install the top engine to transmission bolts in the proper location.
26. Remove the engine support fixture.
27. Install the oil fill tube. Refer to *Filler Tube Replacement* .
28. Install the power steering pump assembly and adjust the belt. Refer to Power Steering Pump Assembly (2.4L) in Power Steering Gear and Pump.
29. Connect the electrical connections.
30. Install the vacuum lines.
31. Install the throttle cable to throttle body.
32. Install the shift cable and the bracket.
33. Install the throttle cable.
34. Install the cable control cover.
35. Install the intake air duct. Refer to Engine Controls.
36. Connect the negative battery cable.
37. Fill the transmission with the proper fluid.
38. Adjust the shift linkage.
39. Inspect for oil leaks. Check the oil level.

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Transmission Overhaul

In order to overhaul, follow the sequence below.

1. Torque Converter Disassemble
2. Transmission Holding Fixture Assemble
3. Vacuum Modulator and Valve Disassemble
4. Reverse Servo Disassemble
5. Forward Servo Disassemble
6. *Bottom Pan and Filter Disassemble*
7. *Oil Filter Inspection*
8. *Accumulator Assembly, 2-1 Band Servo Disassemble*
9. Control Valve Body Cover and Gasket Disassemble
10. Wiring Harness Disassemble
11. Oil Pump Disassemble
12. Control Valve Body and Spacer Plate Disassemble
13. Oil Pump Drive Shaft Removal
14. *Vehicle Speed Sensor Disassemble*
15. *Output Shaft Disassemble*
16. Front Differential Carrier End Play Check
17. Manual Valve Link and Fluid Dam Removal
18. Case Cover and Gaskets Disassemble
19. 4th Clutch Components Disassemble
20. Drive Link Stretch Check
21. Drive Sprocket, Driven Sprocket, and Drive Link Disassemble
22. *Driven Sprocket Support Disassemble*
23. 2nd Clutch and Input Clutch Removal
24. *Reverse Band Disassemble*
25. Reverse Reaction Drum Removal
26. *Input Clutch Housing End Play Check*
27. *Case Extension Housing Disassemble*
28. *Differential Carrier Components Disassemble*
29. Input and Reaction Carrier Disassemble
30. *Reaction Sun Gear and Manual 2-1 Band Disassemble*
31. *1-2 Support Drum and Forward Band Disassemble*
32. *Differential Carrier Internal Gear Disassemble*
33. *Park System Components Disassemble*
34. Case Assembly Inspection
35. Case Components Disassemble
36. Case Components Assemble
37. Torque Converter Fluid Seal Removal
38. *Drive Sprocket Support Disassemble*
39. *Drive Sprocket Support Assemble*
40. *Torque Converter Oil Seal Assemble*
41. *Park System Components Assemble*
42. *Differential Carrier Internal Gear Assemble*
43. *Differential Carrier Inspection*
44. *Differential Carrier Disassemble*
45. *Differential Carrier Assemble*
46. *Vehicle Speed Sensor Reluctor Wheel Disassemble*
47. *Vehicle Speed Sensor Reluctor Wheel Assemble*
48. *Differential Carrier Components Assemble*
49. *Case Extension Assemble*

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50. *Input Clutch Housing End Play Tool Assemble*
51. *Forward Band Assemble*
52. *1-2 Support Roller Clutch Disassemble*
53. *1-2 Support Roller Clutch Assemble*
54. *1-2 Support Roller Clutch Functional Check*
55. *1-2 Support Drum Assemble*
56. *2-1 Manual Band Assemble*
57. *Reaction Sun Gear and Drum Assemble*
58. Input and Reaction Carrier Pinion End Play Check
59. Input and Reaction Carrier Assemble
60. Reverse Reaction Drum Assemble
61. *Input and Third Sprag Clutches Disassemble*
62. Input and Third Sprag Clutches Assemble
63. *Input and Third Sprag Clutches Functional Check*
64. *Input Clutch and Third Clutch Disassemble*
65. *Input Clutch Housing Assembly Inspection*
66. Input Clutch Housing Retainer and Ball Disassemble
67. Input Clutch Housing Retainer and Ball Assemble
68. *Input Clutch and Third Clutch Assemble*
69. *Input Clutch and Third Clutch Functional Air Check*
70. *Input Clutch Housing Oil Seal Rings Assemble*
71. *Input Clutch Housing and Sprag Clutches Assemble*
72. *Input Clutch Housing End Play Check*
73. 2nd Clutch Disassemble
74. 2nd Clutch Housing Assembly Inspection
75. Second Clutch Housing Retainer/Ball Disassemble
76. Second Clutch Housing Retainer/Ball Assemble
77. 2nd Clutch Assemble
78. *Reverse Band Assemble*
79. *Driven Sprocket Support Components Disassemble*
80. *Driven Sprocket Support Components Inspection*
81. *Driven Sprocket Support Bearing Disassemble*
82. *Driven Sprocket Support Bearing Assemble*
83. Driven Sprocket Support Components Assemble
84. 4th and 2nd Clutch Functional Air Check
85. Second, Input, and Sprag Clutches Assemble
86. Driven Sprocket Support Assemble
87. Drive Sprocket and Turbine Shaft Disassemble
88. Drive Sprocket and Turbine Shaft Assemble
89. Drive and Driven Sprocket Components Assemble
90. 4th Clutch Components Assemble
91. Case Cover Components Disassemble
92. Case Cover Components Inspection
93. Case Cover Bearing Disassemble
94. Case Cover Bearing Assemble
95. Drive Axle Oil Seal Removal - Left Side
96. Drive Shaft Oil Seal Assemble - Left Side
97. Case Cover Components Assemble
98. Case Cover and Gaskets Assemble
99. Manual Valve Link and Fluid Dam Assemble
100. Differential Carrier End Play Check
101. Output Shaft Bearing Disassemble
102. Output Shaft Assemble
103. *Right Drive Shaft Oil Seal Disassemble*
104. *Right Drive Shaft Oil Seal Assemble*
105. *Vehicle Speed Sensor Assemble*

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106. *Control Valve Body Clean*
107. Control Valve Body Inspection
108. Control Valve Body Disassemble
109. Control Valve Body Assemble
110. Oil Pump Shaft Bearing Disassemble
111. Oil Pump Shaft Bearing Assemble
112. Oil Pump Drive Shaft Assemble
113. Control Valve Body and Spacer Plate Assemble
114. Transmission Fluid Pump Disassemble
115. Transmission Fluid Pump Assemble
116. Wiring Harness Assemble
117. Control Valve Body and Gasket Assemble
118. *Thermo Element Adjustment*
119. *2-1 Manual Band Servo Disassemble*
120. *2-1 Manual Band Servo Assemble*
121. Accumulator Components Disassemble
122. Accumulator Components Assemble
123. *Accumulator Assembly, 2-1 Band Servo Assemble*
124. *Oil Pan and Filter Assemble*
125. Forward Band Servo Components Disassemble
126. Forward Band Servo Assemble
127. Reverse Band Servo Components Disassemble
128. Reverse Band Servo Assemble
129. Vacuum Modulator Inspection
130. Vacuum Modulator and Valve Assemble
131. Transmission Holding Fixture Disassemble
132. *Torque Converter Inspection*
133. Torque Converter Assemble

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Parts Cleaning and Inspection

Service Precautions

1. Use the following safety equipment as appropriate:
   - Safety glasses
   - Safety shoes
   - Gloves
2. Keep the work area clean.
3. Keep the tools clean.
4. Clean the exterior of the transmission before removing parts.
5. Do not use wipe cloths or rags.
6. Do not use solvents on rubber seals or plastic/Teflon® thrust washers.
7. Blow out all of the passages with compressed air.
8. Clean out the small passages with a fine wire.
9. Handle the parts carefully in order to prevent damage.

   Notice: The assembly of some components will require the use of an assembly lube. Always use J 36850 Transjel™ or petroleum jelly during assembly. Greases other than the recommended assembly lube will change the transmission fluid characteristics and cause undesirable shift conditions and/or filter clogging.

10. When installing screws, bolts or studs into aluminum, always dip the threads into transmission fluid.

    Lubricate all of the internal parts with transmission fluid during assembly.

11. Always use a torque wrench for the proper torque.
12. Recondition damaged or stripped aluminum threads with thread inserts.
13. Replace all of the gaskets and O-ring seals. Do not use gasket cement or sealers.
14. Replace the Teflon® and the rubber lip seals only when necessary. Always use the appropriate seal installers.

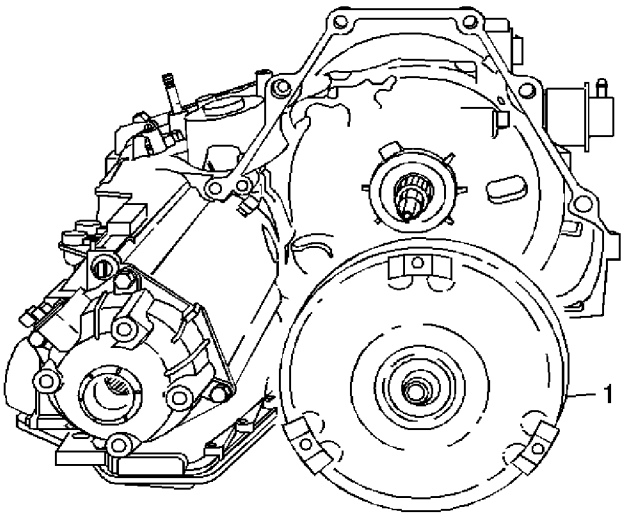
Inspection Procedure

1. Inspect the manual linkage for wear at the pivoting points and bent or broken links and rods.
2. Inspect the following items:
   - Seals
   - Gasket
   - O-rings
3. Check the mating surfaces for the following defects:
   - Nicks
   - Cuts
   - Damage
4. Inspect the snap rings for expansion or compression, distortion, nicks, and proper ring to groove fit.
5. Inspect the bearings and thrusts surfaces for wear, scoring, and pitting.

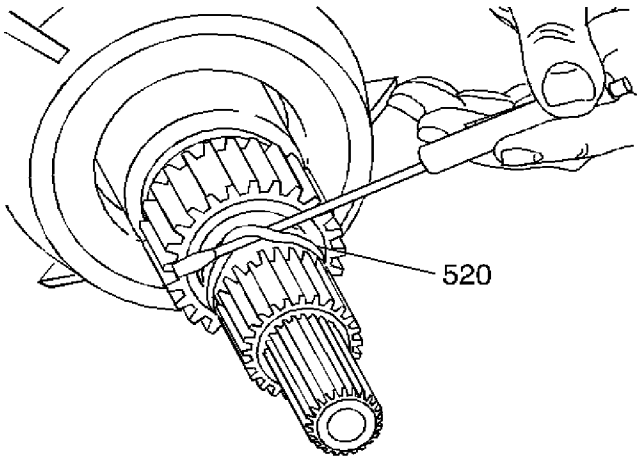
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Torque Converter Disassemble

Caution: The torque converter weighs approximately 65 lbs. Personal injury may result if you lift the torque converter improperly.



1. Remove the torque converter assembly (1).



2. Remove the turbine shaft O-ring seal (520).

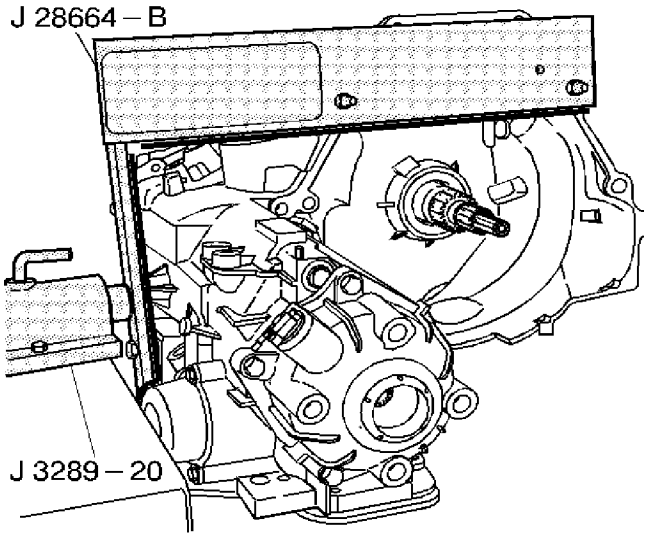
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Transmission Holding Fixture Assemble

Tools Required

- J 3289-20 Holding Fixture Base
- J 28664-B Transmission Holding Fixture

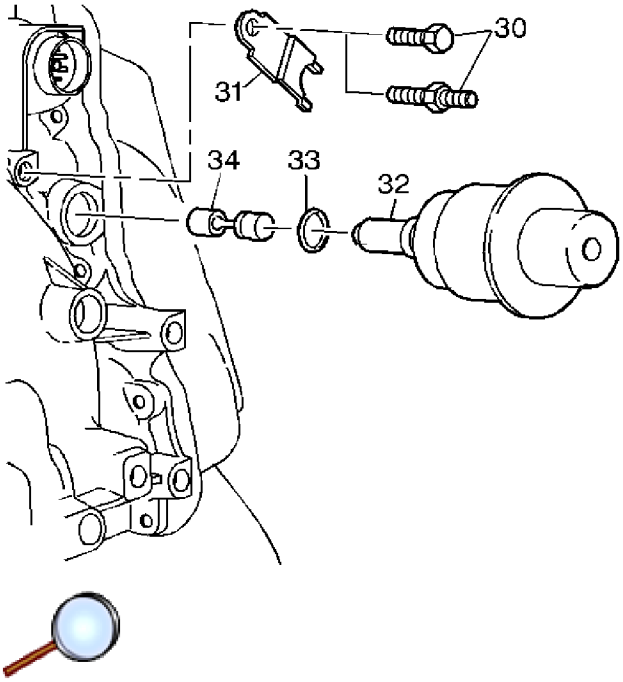


1. Install J 28664-B onto the transmission.
2. Install the transmission and holding fixture into J 3289-20 .
3. Insert the pin into J 3289-20 in order to hold the transmission in the desired position.

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Vacuum Modulator and Valve Disassemble

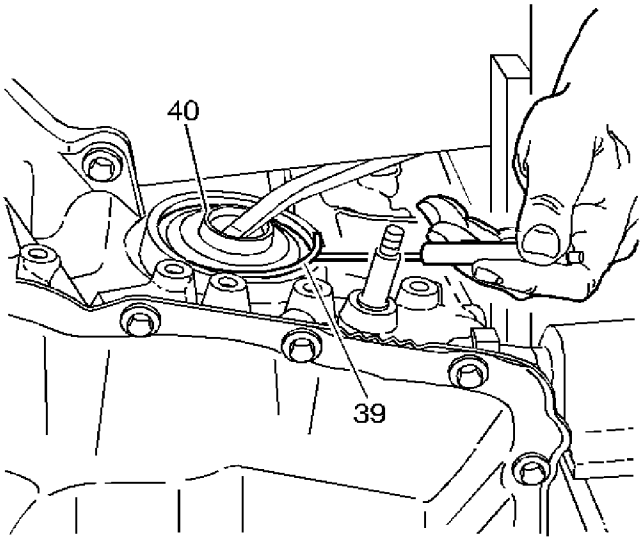


1. Remove the modulator retainer bolt (30).
2. Remove the modulator retainer (31).
3. Remove the modulator assembly (32) by pulling the assembly straight out.
4. Use a small magnet tool in order to remove the modulator valve (34) by pulling the valve straight out.

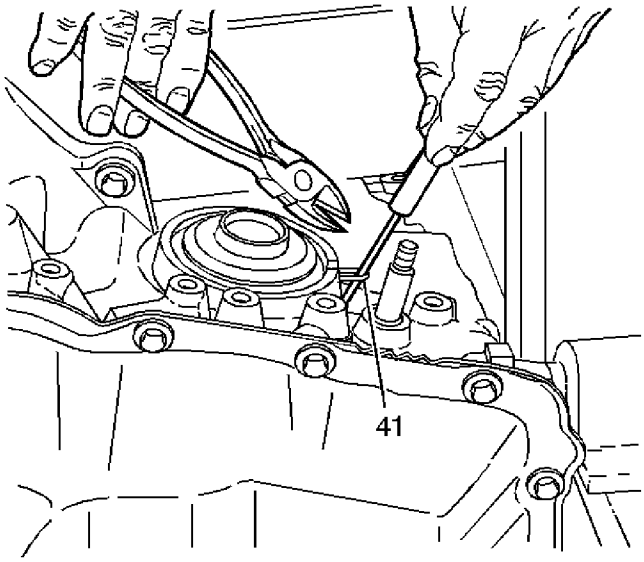
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Reverse Servo Disassemble



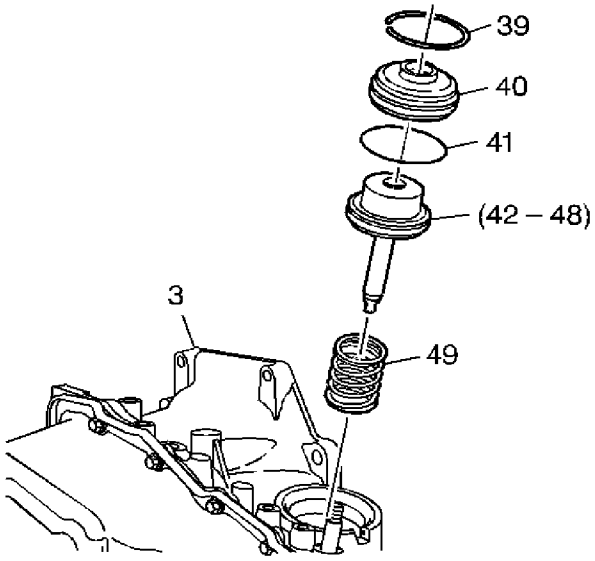
1. Use a long screwdriver in order to depress the reverse band servo cover (40) by prying against the transmission holding fixture.
2. Use a small screwdriver in order to pry out the retaining ring (39) from the reverse band servo cover.



3. Remove the long screwdriver. The servo assembly will push the servo cover (40) up.
4. Use a small screwdriver in order to pull the servo cover O-ring seal (41) out through the slot in the case.
5. Use side cutting pliers in order to cut the servo cover O-ring seal (41).

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6. Grasp one end of the cut seal (41) and pull it out of the servo cover.

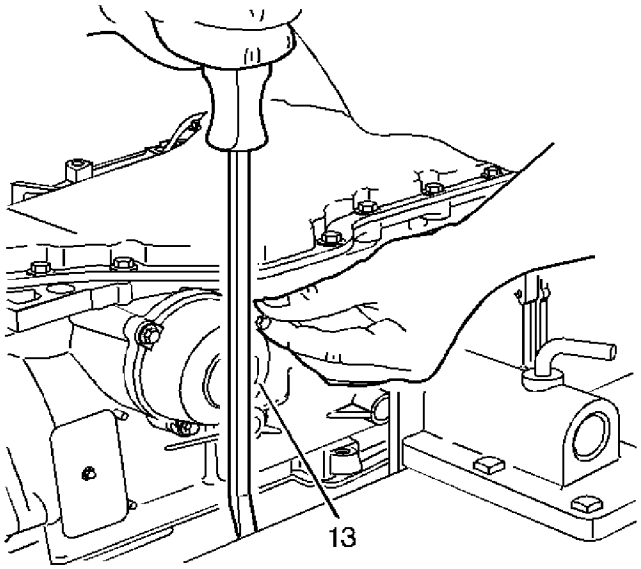




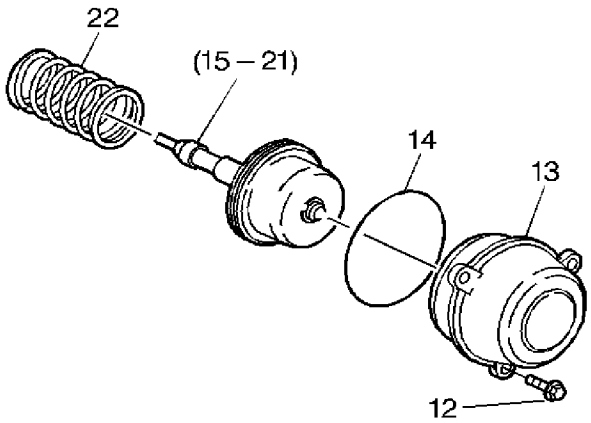
7. Remove the servo cover (40).
8. Remove the reverse band servo o-ring seal (41).
9. Remove the reverse band servo assembly (42-48).
10. Remove the reverse band servo piston spring (49).

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Forward Servo Disassemble



1. Position the transmission so that the oil pan is facing up.
2. Use a long screwdriver in order to compress the forward band servo assembly cover (13) by prying against the work bench.
3. Hold the servo assembly compressed.



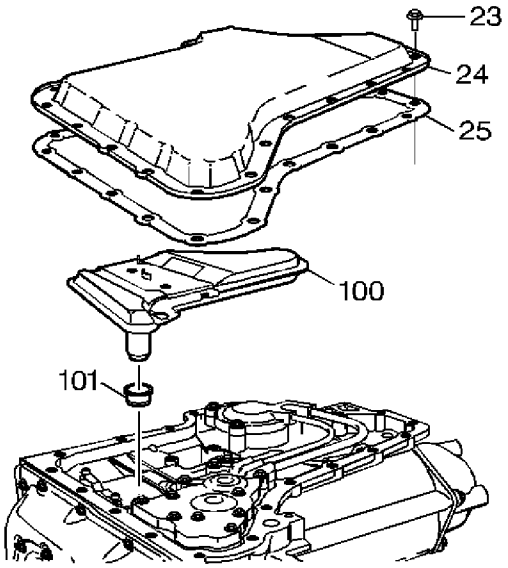
4. Remove the three forward band servo cover bolts (12).
5. Remove the long screwdriver. The servo assembly will push the servo cover out. If the servo cover does not push out, tap it with a rubber mallet.
6. Remove the servo cover (13) and remove the cover seal (14).

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7. Remove the servo assembly (15-21).
8. Remove the piston spring (22) from the forward band servo.

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Bottom Pan and Filter Disassemble

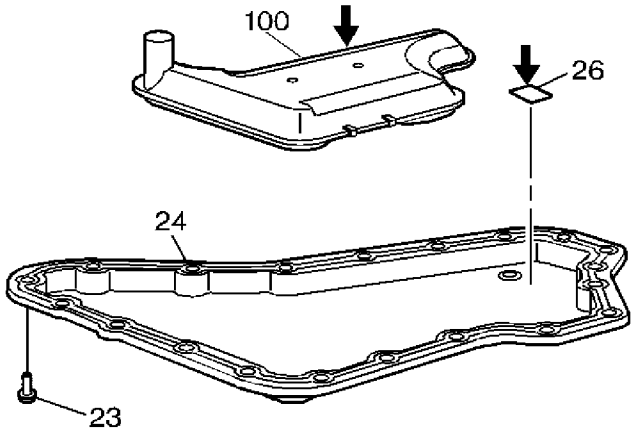


1. Remove the 20 oil pan bolts (23).
2. Remove the oil pan (24).
3. Remove the oil pan gasket (25).
4. Use a screwdriver in order to pry the oil filter assembly (100) out of the case. Do not damage the case sealing surface.
5. Use a small screwdriver in order to pry the oil filter seal assembly (101) out of the case. Do not damage the case sealing surface.

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Transmission Fluid Filter Inspection



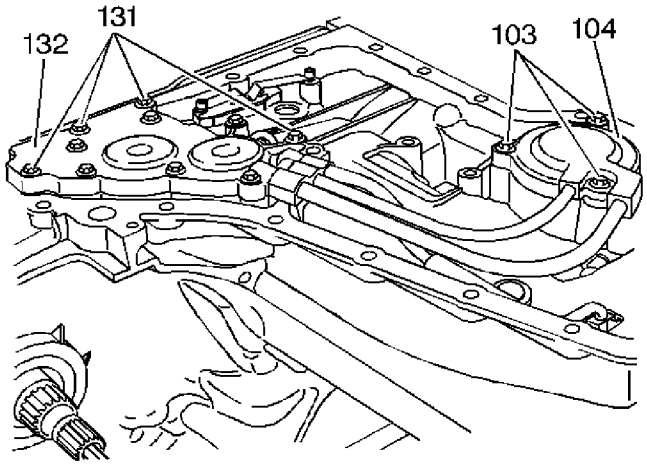


1. Inspect the oil pan magnet (26) for steel particles. Excessive amounts of steel shavings indicate internal transmission damage.
2. Use a screwdriver or side cutters in order to open the oil filter assembly (100), by cutting or prying the metal crimping away from the top of the filter and by pulling the filter apart.
3. Inspect the filter (100) for excessive amounts of the following:
   - Clutch plate assembly fiber material, indicating clutch distress
   - Bronze slivers, indicating bushing wear
   - Steel particles, indicating internal transmission damage

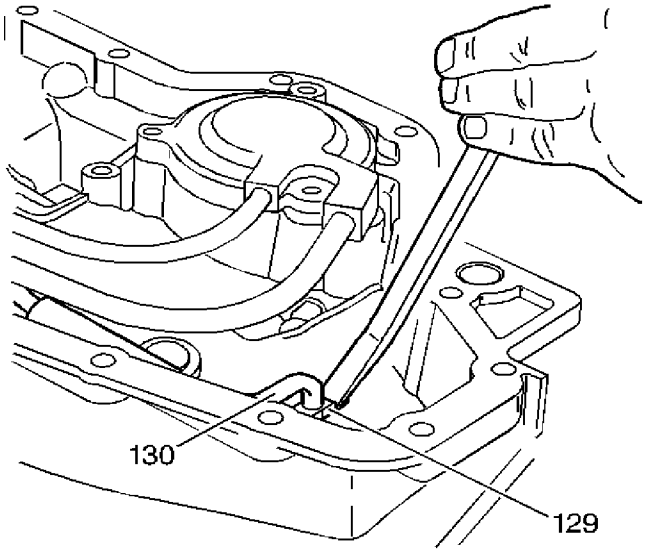
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Accumulator Assembly and 2-1 Band Servo Removal



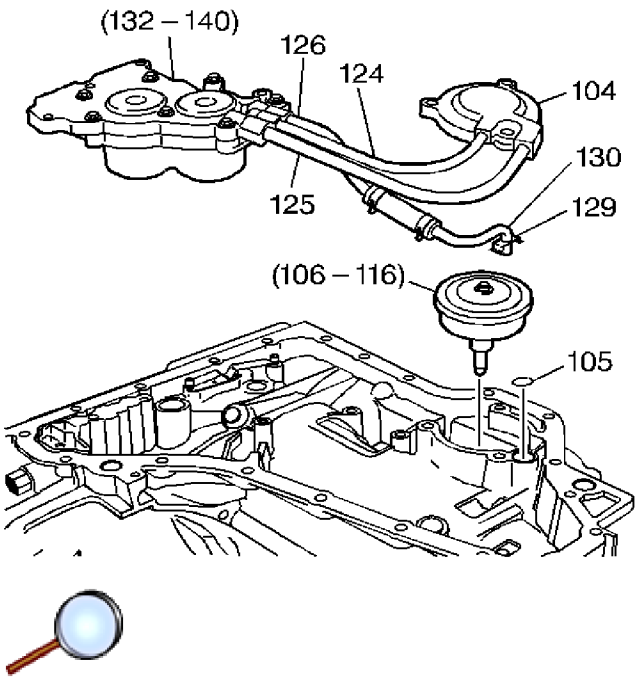
1. Remove the four indicated accumulator cover bolts (131) from the 1-2 and 2-3 accumulator cover (132).
2. Remove the three indicated bolts (103) from the manual 2-1 band servo cover (104).



3. Use a large screwdriver in order to gently pry the lube oil pipe retainer (129) from the case.
4. Remove the lube oil pipe (130) from the front differential carrier internal gear lube hole.

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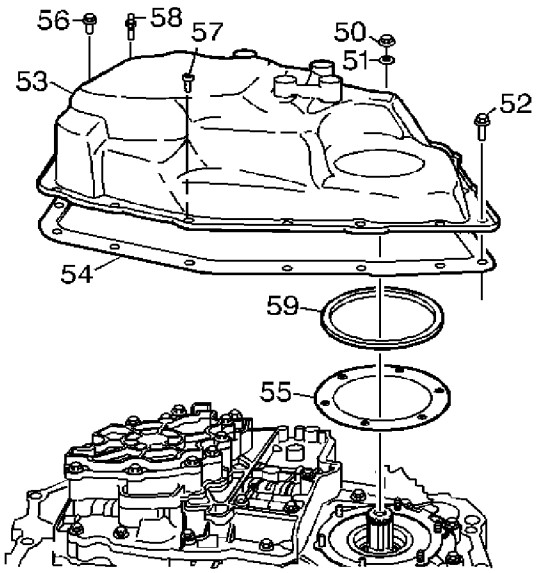


Notice: Do not twist or damage the pipe assembly when removing the pipe assembly.

5. Remove the 1-2 and 2-3 accumulator assembly (132-140), the pipe assembly (124-126) and the manual 2-1 band servo cover (104).
6. Remove the manual 2-1 band servo assembly (106-116) out of the case at the same time.
7. Remove the cover seal (105) from the manual 2-1 band servo assembly.

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Control Valve Body Cover and Gasket Disassemble

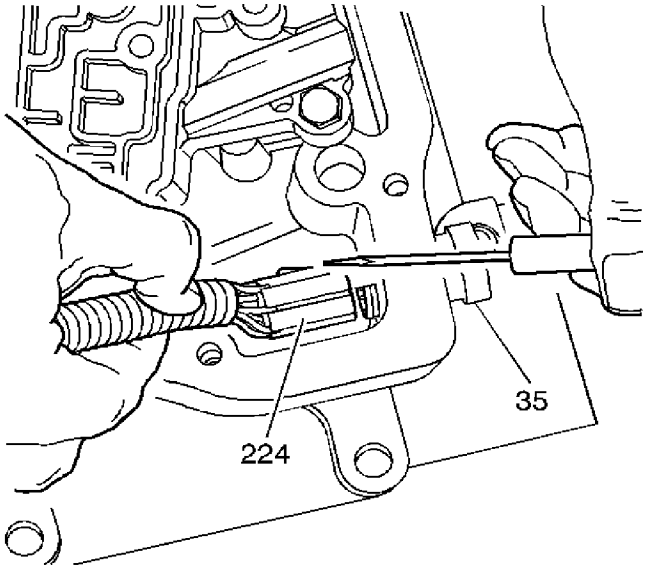


1. Position the transmission so that the cover of the control valve body is facing upward.
2. Remove the following parts:
   - On transmissions with a cast aluminum cover:
     - 11 flanged bolts (52)
     - 2 stud bolts (58)
     - 4 TORX® bolts (57)
   - On transmissions with a stamped steel cover:
     - 15 flanged bolts (52)
     - 2 stud bolts (58)
     - 6 nuts and washers (50 & 51)
3. Remove the control valve body cover (53).
4. Remove the inner (55) and the outer (54) gaskets from the control valve body cover. In some models, remove the seal (59).

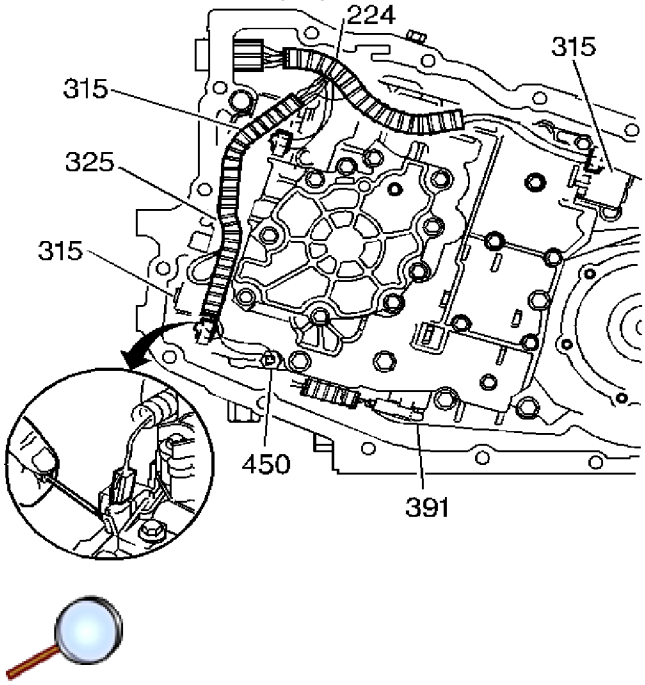
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Wiring Harness Disassemble



1. Use a small screwdriver in order to disconnect the wiring harness assembly (224) from the electrical connector (35) in the case.



2. Use a small screwdriver in order to disconnect the wiring harness assembly at the following locations:
   - The 1-2 and 3-4 shift solenoid valve (315)
   - The 2-3 shift solenoid valve (315)
   - The TCC PWM solenoid valve (325)

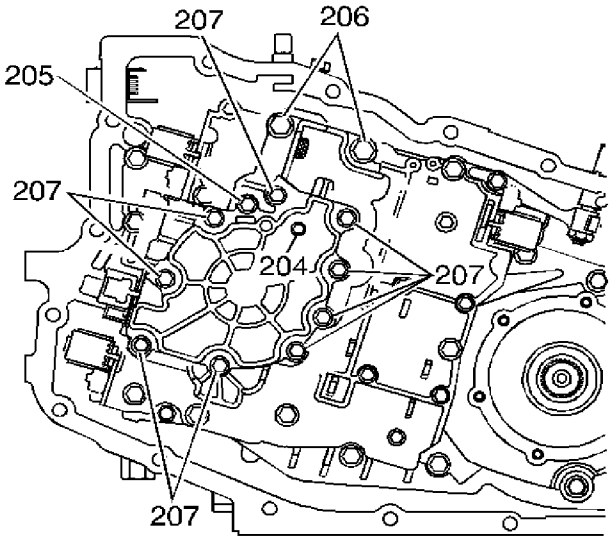
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- The TCC apply solenoid valve (315)
- The TFT sensor (391) located on the case cover or on the spacer plate
- The wiring harness clip

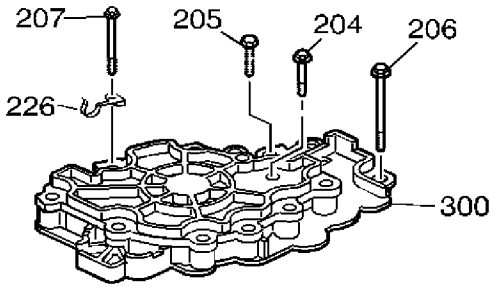
3. Remove the wiring harness assembly (224).

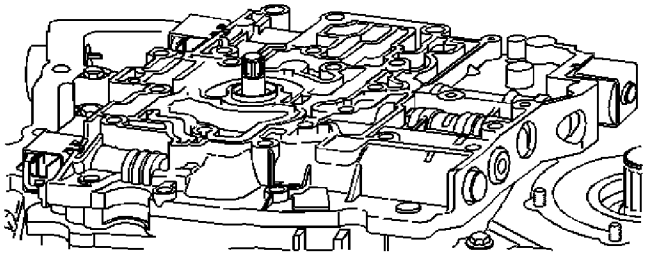
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Oil Pump Disassemble



1. Remove the 13 indicated oil pump bolts (204-207).



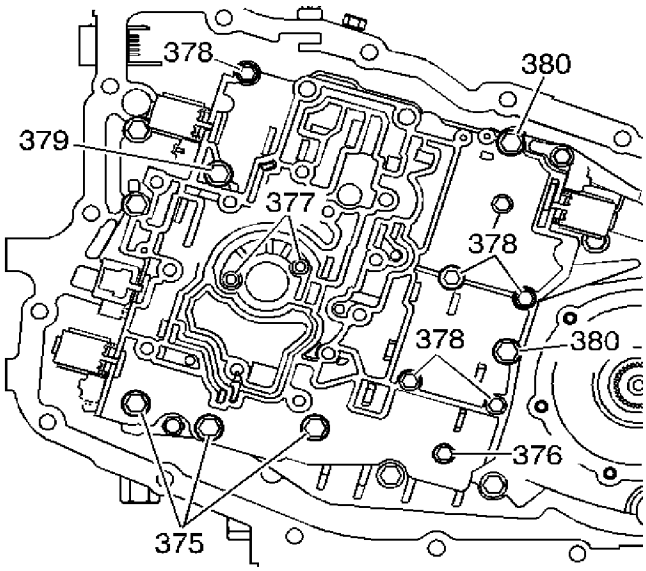


2. Remove the wiring harness clip (226).
3. Lift the oil pump assembly (300) off of the control valve body.
4. Set the pump assembly upside down on its cover. The pump will be fully disassembled later.

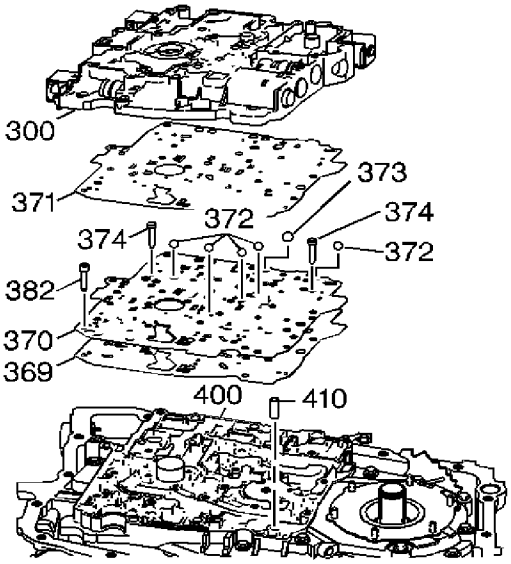
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Control Valve Body and Spacer Plate Disassemble



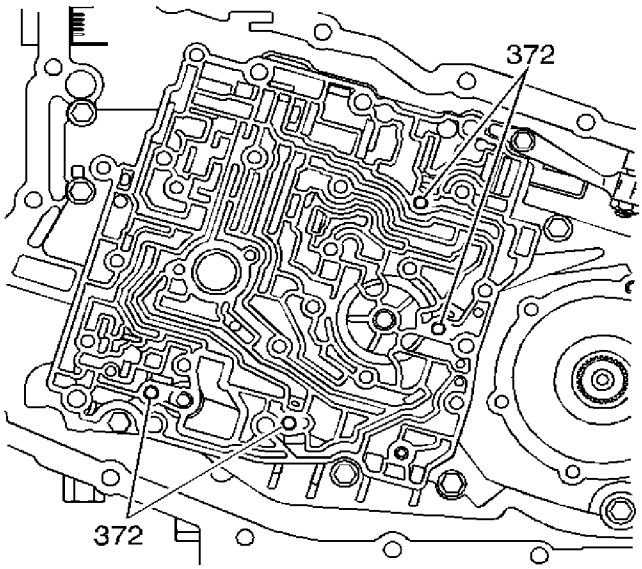
1. Remove the indicated control valve body bolts (375-380).



2. Remove the control valve body assembly (300).
3. Remove the six ball check valves (372, 373) from the top of the spacer plate (370).
4. Remove the spacer plate (370), remove the gaskets (369, 371), and remove the screens (374).
5. Remove the case cover pin (410).

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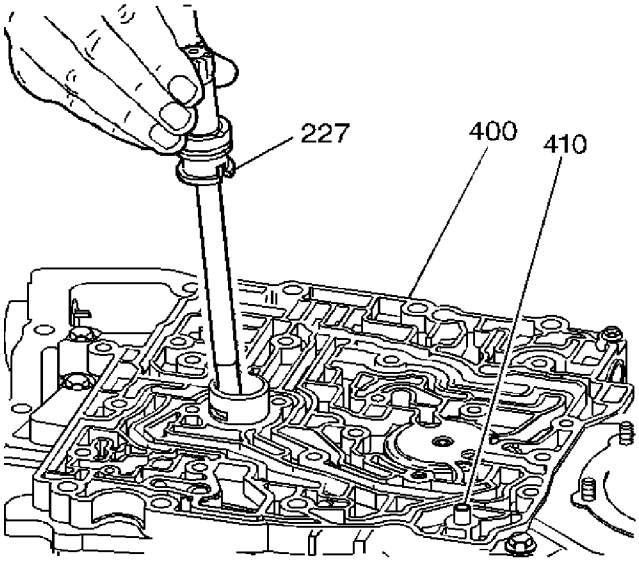
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6. Remove the four ball check valves (372) from the case cover.

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Oil Pump Drive Shaft Removal

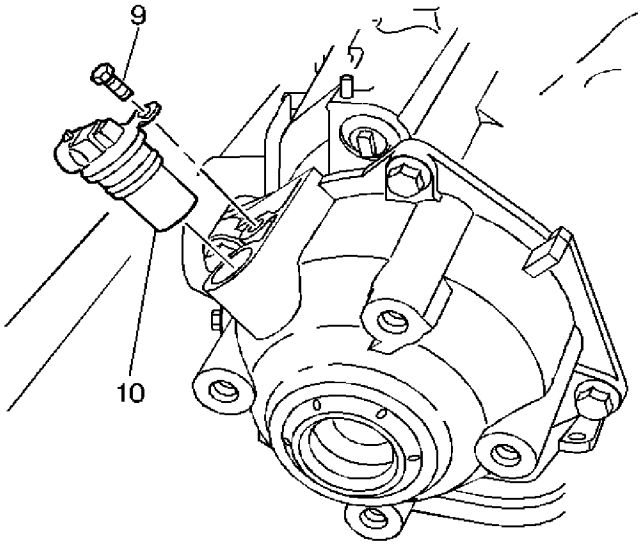


Remove the oil pump drive shaft assembly (227) from the case cover (400).

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Vehicle Speed Sensor Disassemble



1. Position the transmission so that the vehicle speed sensor (10) is facing up.
2. Remove the vehicle speed sensor bolt (9).

Important: Handle the speed sensor carefully.

3. Remove the vehicle speed sensor (10).

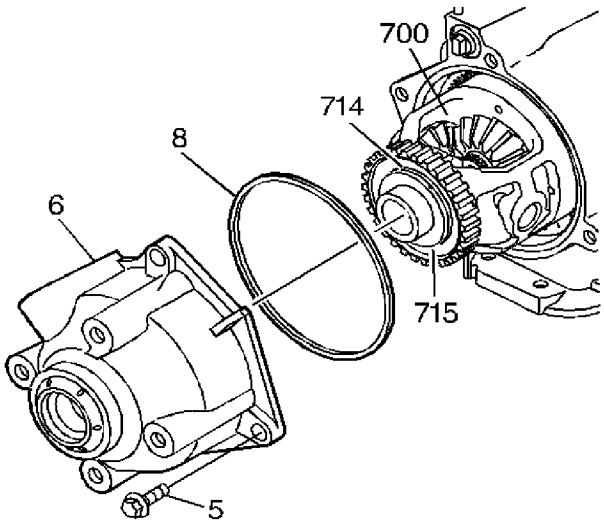
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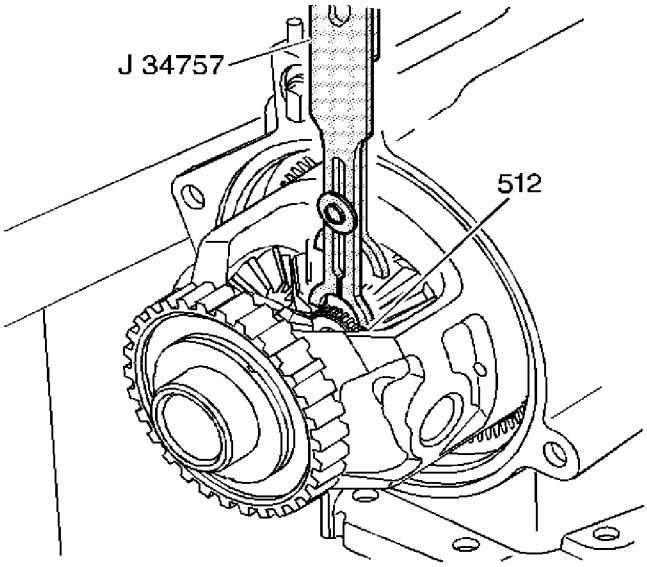
Output Shaft Disassemble

Tools Required

J 34757 Snap Ring Remover and Installer



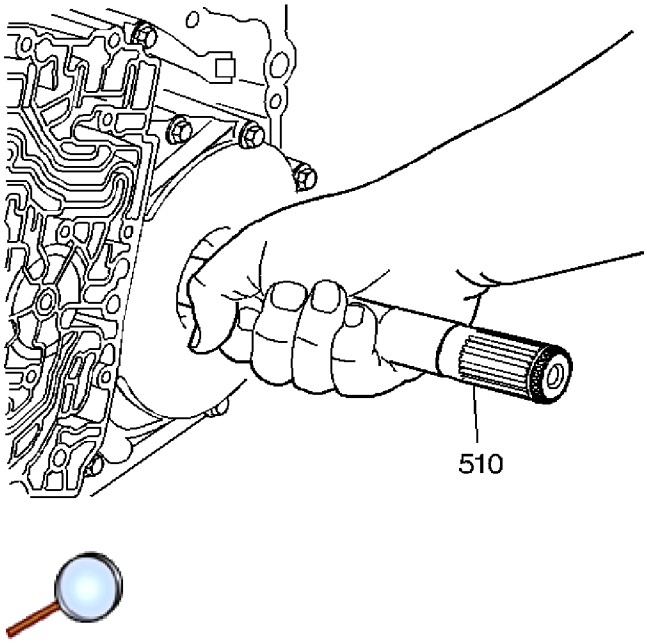
1. Remove the four case extension bolts (5).
2. Remove the case extension assembly (6) and remove the extension seal (8).
3. Leave the front differential carrier thrust washer (715) and the bearing (714) on the carrier.



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4. Rotate the differential carrier until you can see the end of the output shaft.
5. Rotate the output shaft while holding the carrier, until the opening on the drive shaft snap ring is visible.
6. Use J 34757 in order to push the snap ring (512) partially off of the output shaft.
7. Remove the snap ring with needle nose pliers.



Important: Be careful not to damage the bearing on the output shaft.

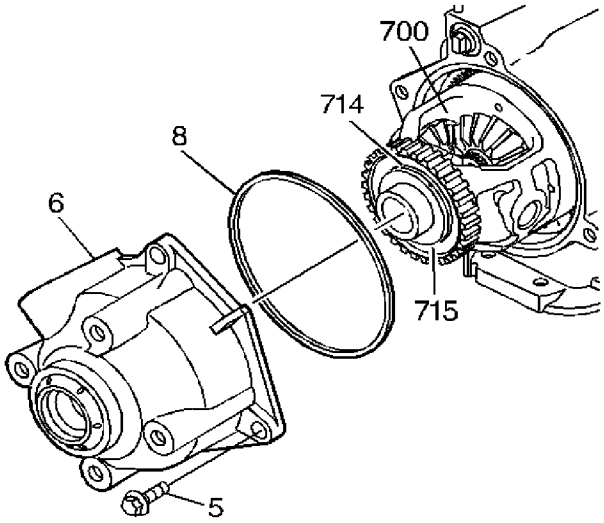
8. Pull the output shaft (510) out of the transmission.

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Front Differential Carrier End Play Check

Tools Required

- J 8001 Dial Indicator Set
- J 25025-7A Dial Indicator Stand
- 4t80E Alignment Pin Set and Mounting Post
- J 26958 Output Shaft Loading and Aligning tool
- J 26958-10B Adapter Plug
- J 28585 Snap Ring Remover
- J 38385 Output Shaft Loading Tool Adapter

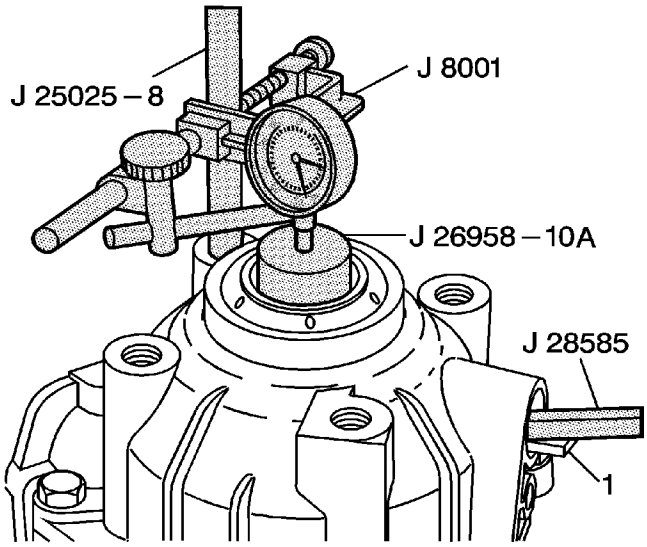


1. Make sure that the thrust washer (714) and the bearing (715) are still on the front differential carrier.
2. Install the case extension seal (8) onto the case extension (6).
3. Install the case extension assembly (6) onto the transmission (3).
4. Install only two of the four case extension bolts (5).

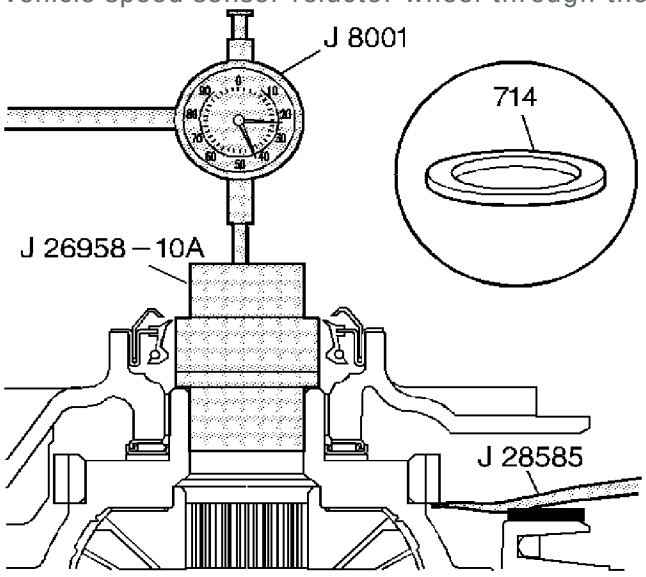
Tighten
Do not torque the bolts. Tighten them only until the case extension is fully seated.

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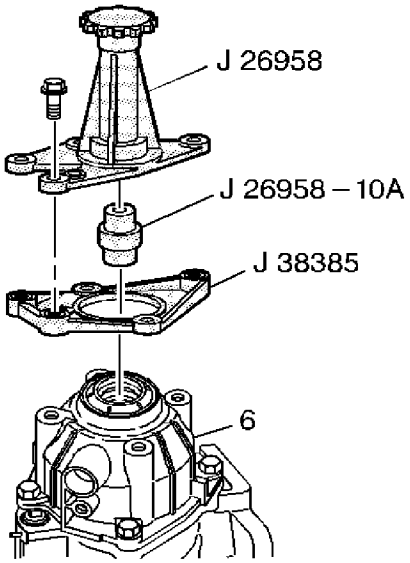


5. Position the transmission so that the case extension is facing upward.
6. Install 4t80E , J 26958-10B , and J 8001 .
7. Set the dial indicator to zero.
8. Use J 28585 or a large screwdriver in order to lift the front differential carrier. Pry up on the vehicle speed sensor reluctor wheel through the sensor hole in the case extension.



9. Note the dial indicator reading before changing the carrier thrust washer (714):
   - If the dial indicator reading is less than 0.12 mm (0.005 in), install the next smaller size thrust washer, then recheck.
   - If the dial indicator reading is greater than 0.62 mm (0.025 in), install the next larger size thrust washer, then recheck.
   - If the dial indicator reading is 0.12-0.62 mm (0.005-0.025 in), the thrust washer is correct.

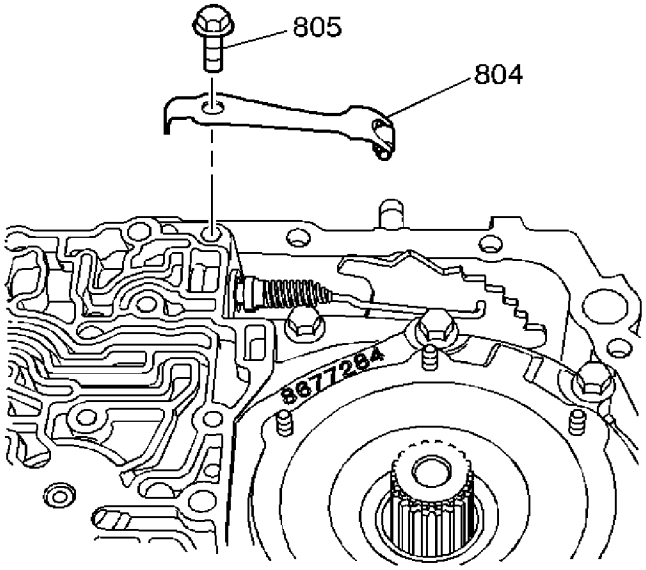
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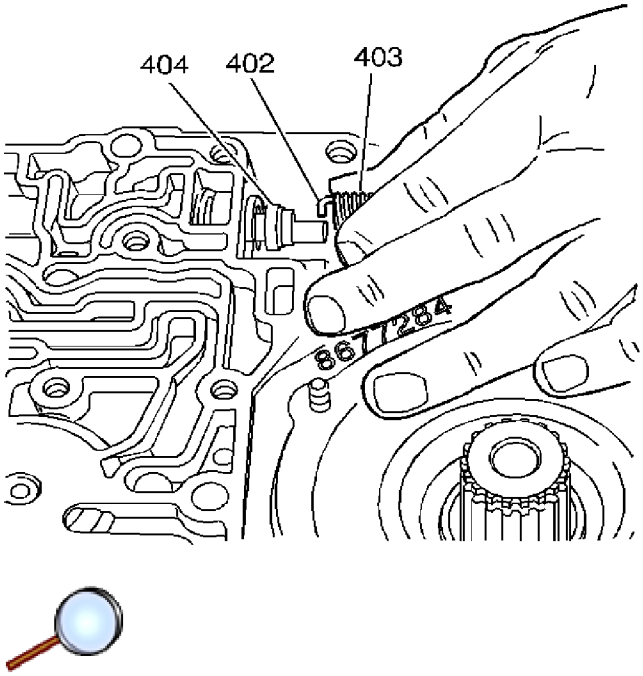
10. Remove J 8001 and J 25025-7A .
11. Install J 26958 , J 26958-10B , and J 38385 onto the case extension (6).

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Manual Valve Link and Fluid Dam Removal



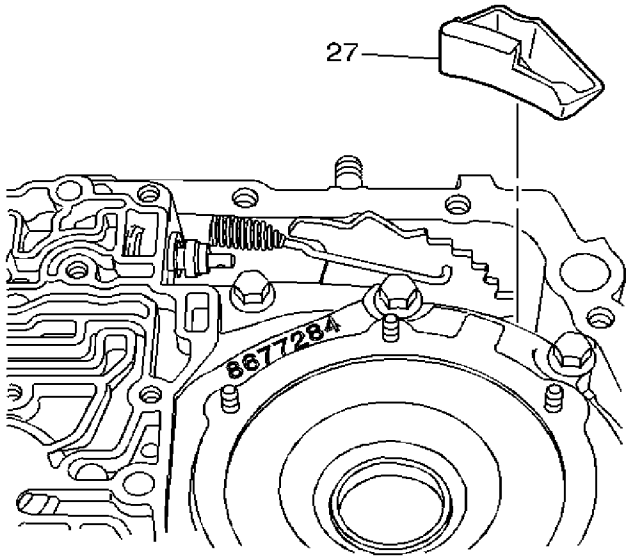
1. Remove the manual shift detent bolt (805).
2. Remove the manual shift detent assembly (804).



3. Compress the manual valve link spring (403).
4. Lift the manual valve link (402) off of the manual valve (404).
5. Position the manual valve link (402) so that the valve will not interfere with the case cover removal.

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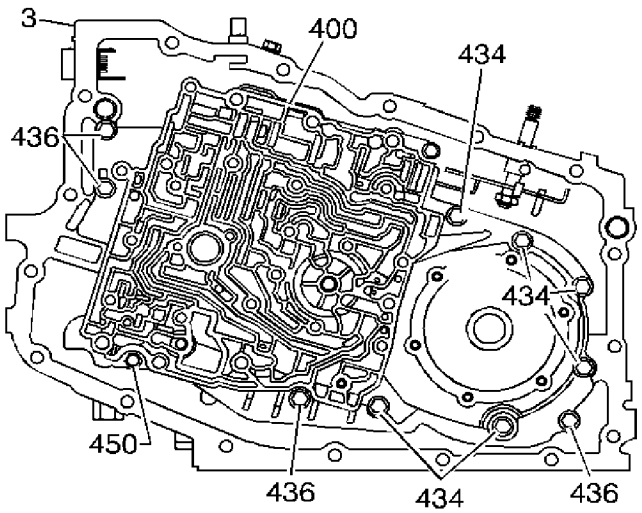
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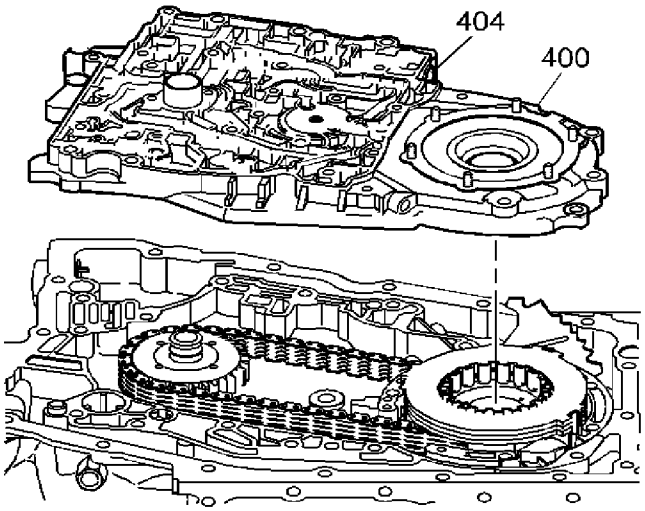
6. Remove the oil dam (27) from the case.

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Case Cover and Gaskets Disassemble



1. Remove the indicated case cover bolts (434, 435, 436, 450, 804, 805).

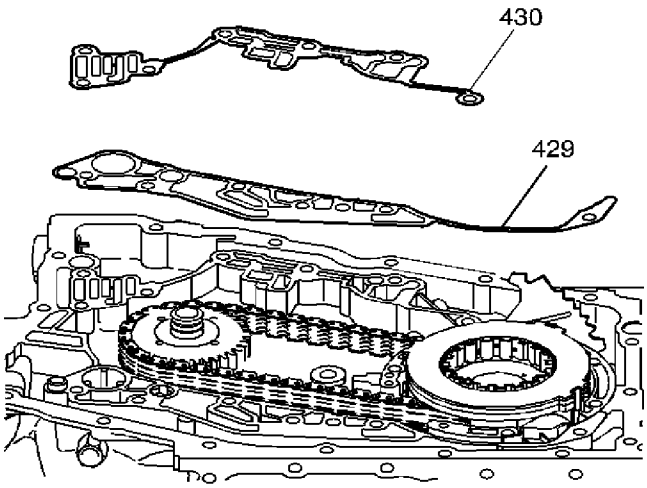


Important: Be sure to hold the manual valve (404) in place.

2. Lift the case cover assembly (400) off of the case.

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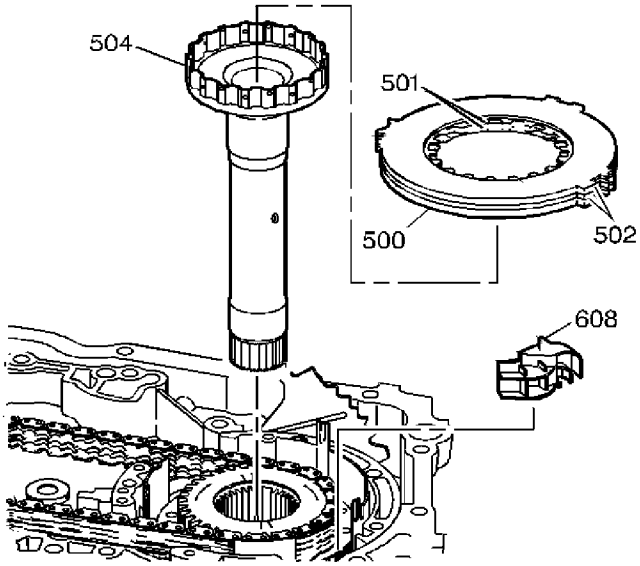
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3. Remove the upper (430) and the lower (429) case cover gaskets.

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4th Clutch Components Disassemble

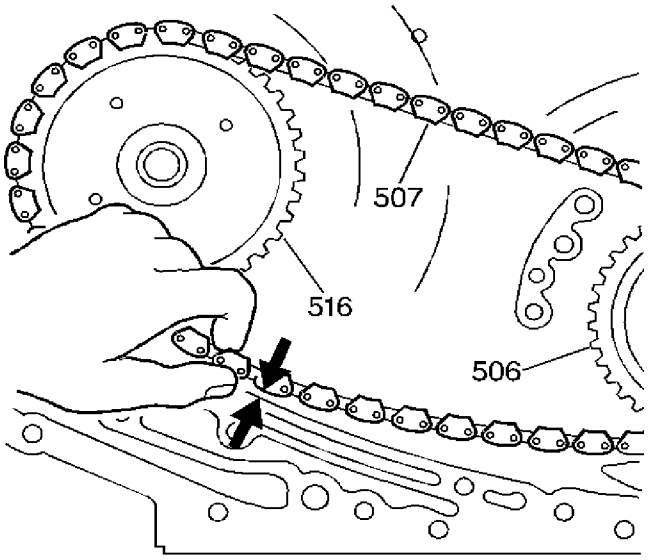


1. Remove the fourth clutch backing plate (500).
2. Remove the fourth clutch fiber and steel plates (501, 502).
3. Remove the fourth clutch shaft assembly (504).
4. Remove the drive link lube scoop (608).

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Drive Link Stretch Check

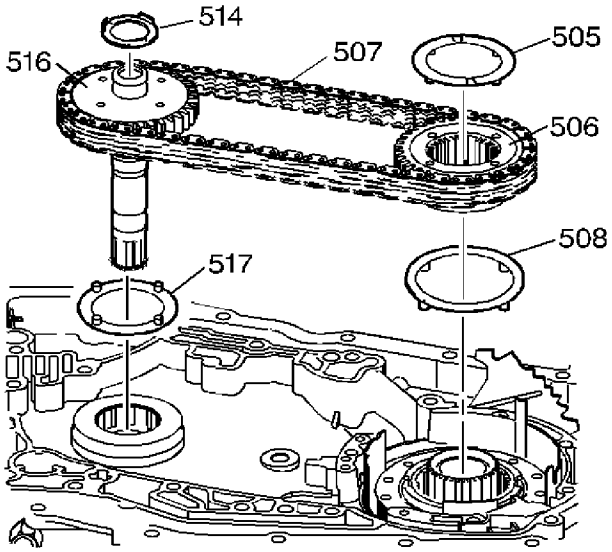


1. Make sure that the driven sprocket support (609) and both sprockets (516, 506) are fully seated.
2. Pull the drive link (507) toward the case at the indicated location.
3. Measure the distance between the case and the drive link:
   - If the measurement is 3.2 mm (1/8 in) or greater, reuse the drive link.
   - If the measurement is less than 3.2 mm (1/8 in), replace the drive link.

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Drive Sprocket, Driven Sprocket, and Drive Link Disassemble

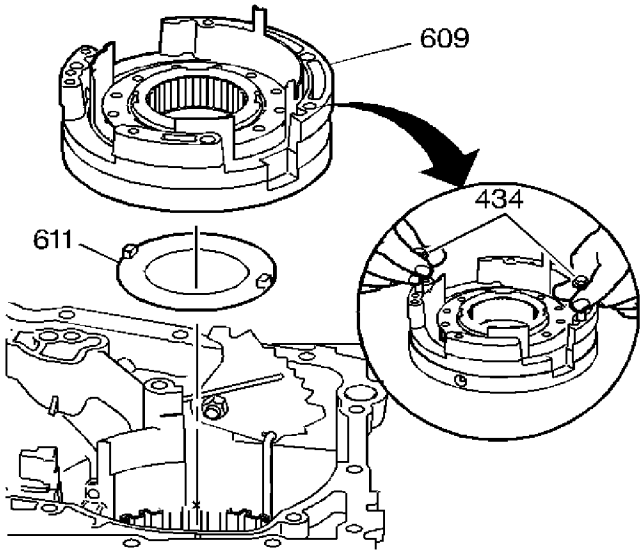


1. Remove the fourth clutch shaft thrust washer (505).
2. Remove the drive sprocket thrust washer (514). The washer may be stuck to the case cover.
3. Note the location of the master link on the drive link assembly:
   - This link is a different color than the rest
   - This link will be facing either up or down towards the case
   - The drive link assembly must be in the same position during installation
4. Lift the drive, driven sprockets and the drive link assembly out of the case:
   - Lift both sides evenly
   - If necessary, tap the turbine shaft gently with a rubber mallet.
5. Remove the thrust washers (517, 508) from the drive and driven sprocket. These washers may be stuck to the sprockets.

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Driven Sprocket Support Disassemble



1. With your fingers, insert two 13 mm channel plate bolts (434) into the driven sprocket support assembly (609).
2. Grasp the bolts and lift the support assembly from the case.
3. Remove the thrust washer (611) from the second clutch housing. The washer may be stuck to the support assembly.

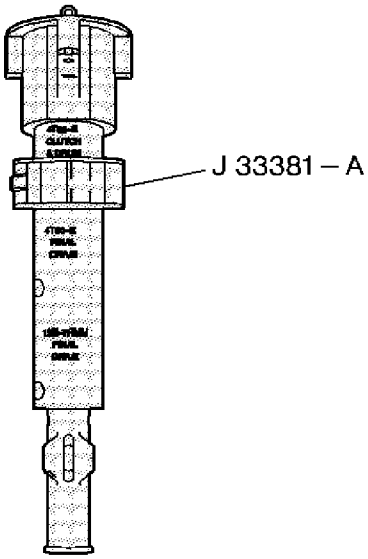
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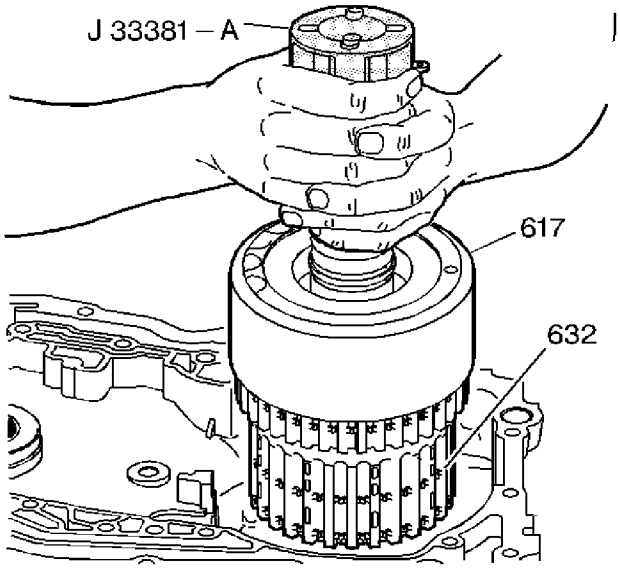
2nd Clutch and Input Clutch Removal

Tools Required

J 33381-A Final Drive Remover and Installer



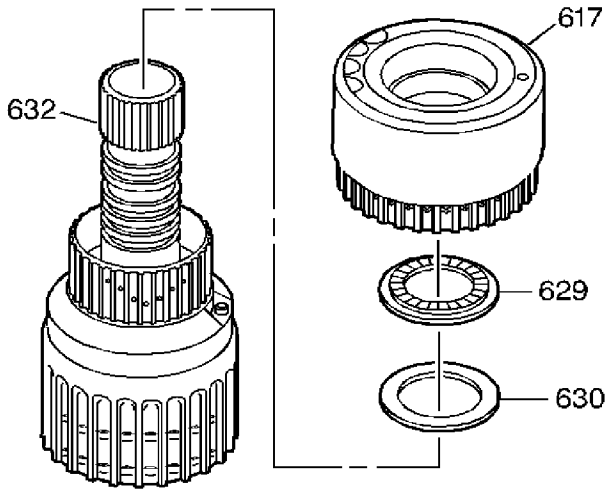
1. Adjust the collar on tool J 33381-A to the 4T60-E CLUTCH & DRUM setting. Make sure that the threaded rod is fully loosened.



2. Install J 33381-A into the second clutch housing assembly (617).

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3. Tighten the threaded rod of J 33381-A until the rod is finger tight.
4. Lift up J 33381-A with the second clutch (617) and the input clutch assemblies (632) attached. The sprag clutch assemblies will also be attached.
5. Place the complete assembly on the bench.
6. Loosen the threaded rod of J 33381-A .
7. Remove J 33381-A from the assembly.

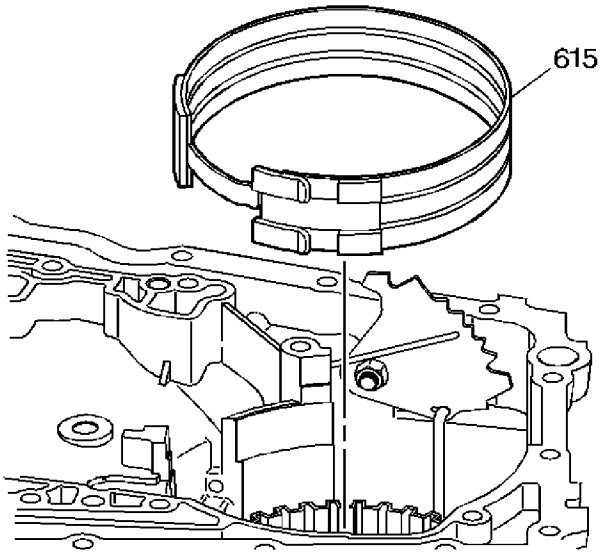




8. Lift the second clutch housing assembly (617) off of the input clutch housing.
9. Remove the input clutch housing thrust bearing (629) from the input housing.
10. Remove the selective thrust washer (630) from the input clutch housing.

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Reverse Band Removal

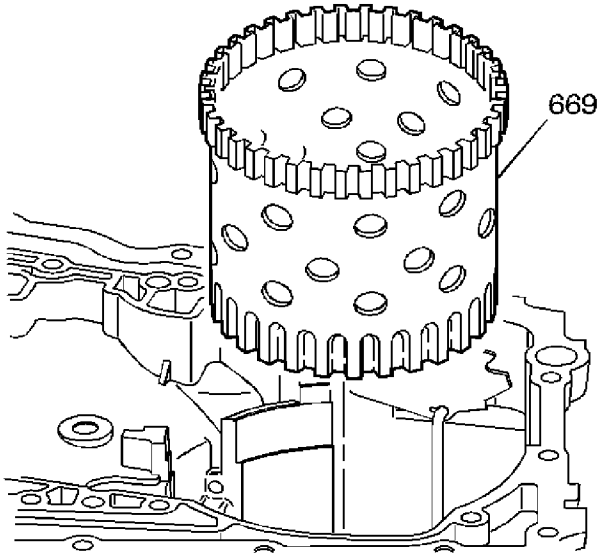


Tilt the band in order to disengage the band from the anchor pin in the case. Remove the reverse band assembly (615).

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Reverse Reaction Drum Removal



Remove the reverse reaction drum (669).

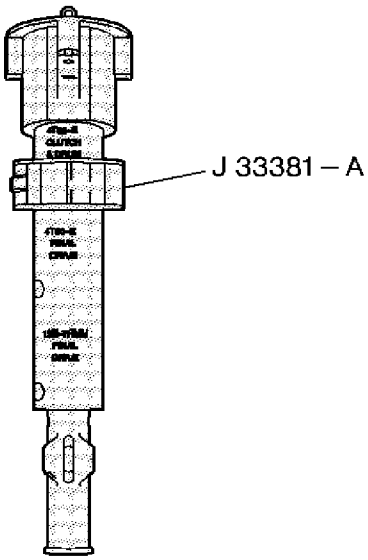
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Input Clutch Housing End Play Check

Tools Required

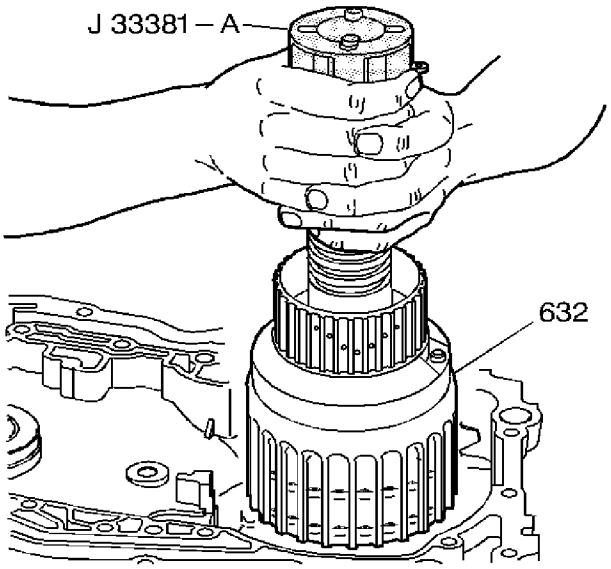
- J 26958 Output Shaft Loading and Aligning Tool
- J 26958-10B Adapter Plug
- J 33381-A Final Drive Remover and Installer
- J 33386-A Input Shaft End Play Tool
- J 38385 Output Shaft Loading Tool Adapter
- J 43425 Output Shaft Loading Tool Adapter



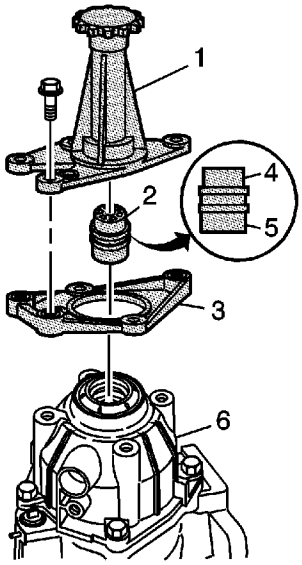
1. Adjust the collar on tool J 33381-A to the 4T60-E CLUTCH & DRUM setting.

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2. Install J 33381-A into the input clutch housing assembly (632).
3. Tighten the threaded rod of J 33381-A until the rod is finger tight.
4. Use J 33381-A in order to lift the input clutch housing assembly (632). The sprag clutch assemblies will also be attached.
5. Install the assembly (632) into the case. Be sure that the assembly is down all the way.



Important: The tool J 38385 (3) is used on a standard duty transmission, and J 43425 (3) is used on a heavy duty transmission.

6. Install J 38385 (3) for a standard duty transmission or J 43425 (3) for a heavy duty transmission.

Important: The tool J 26958-10B (2) is model specific and can be used on a standard duty

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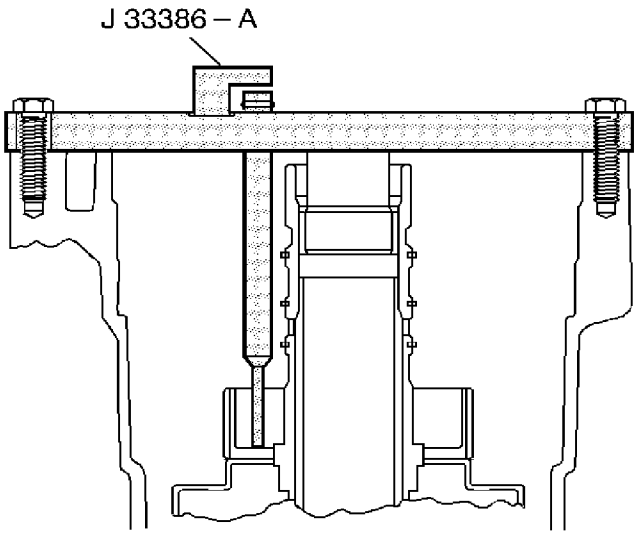
and a heavy duty transmission. This tool has a small end (4) and a larger end (5). Standard duty would use the smaller end (4) facing down, and a heavy duty would use the larger end (5) facing down.

7. Install J 26958-10B (2) depending on model. Stadard duty uses this tool with the smaller end (4) facing down. Heavy duty uses this tool with the larger end (5) facing down.

   Important: Install bolts and tighten securely to prevent tool deflection during end play measurement.

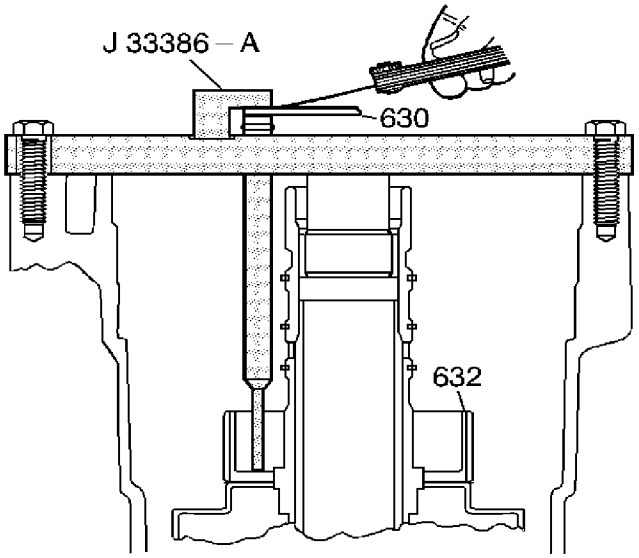
8. Install J 26958 (1) onto the case extension (6).

9.



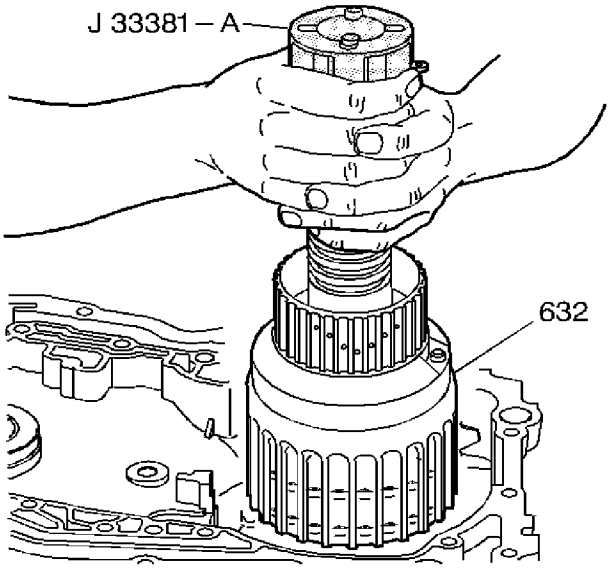


10. Using two bolts, install J 33386-A onto the case.
11. Tighten the bolts in order to securely hold J 33386-A .
12. Tighten J 26958 finger tight in order to eliminate differential carrier end play.



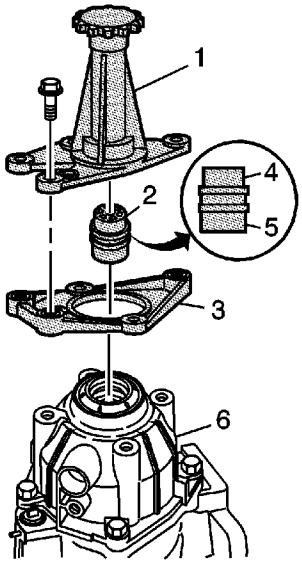
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13. Insert the thrust washer (630) from the input clutch housing (632) into J 33386-A as indicated. If the thrush washer will not fit into J 33386-A , select the next size smaller thrust washer and recheck.
14. Use a feeler gage in order to measure the clearance between J 33386-A and the thrust washer (630).
    - If the clearance is less than 0.0521 mm (0.006 in), use the current size thrust washer.
    - If the clearance is 0.0521 mm (0.006 in) or more, select the next size larger thrust washer and recheck.
15. Refer to the Thrust Washer Selection Guide in End Play Specifications .



16. Remove J 33386-A .
17. Adjust the collar on tool J 33381-A to the 4T60-E CLUTCH & DRUM setting. Make sure that the threaded rod is fully loosened.
18. Install J 33381-A into the input clutch housing (632).
19. Tighten the threaded rod of J 33381-A until the rod is finger tight.
20. Use J 33381-A in order to lift the input clutch housing assembly (632). The sprag clutch assemblies will also be attached.
21. Remove the assembly (632) from the case.

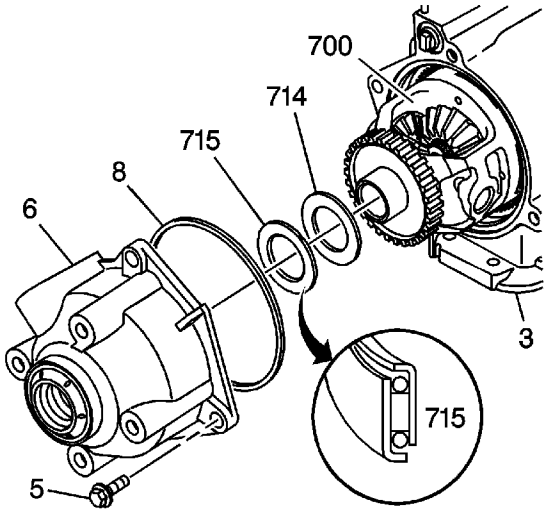
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22. Position the transmission so that the oil pan is facing down.
23. Remove J 26958 (1), J 26958-10B (2), and J 38385 (3) or J 43425 (3).

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Case Extension Disassemble

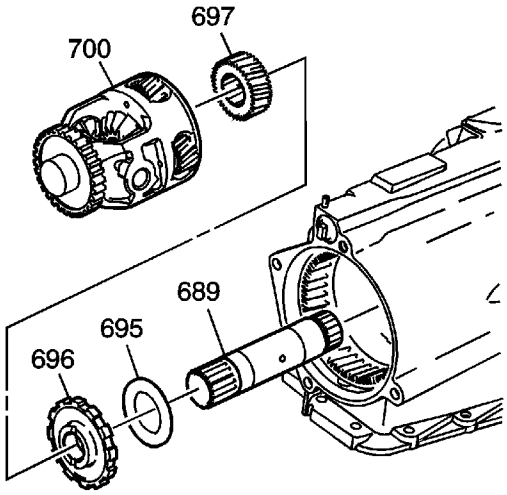


1. Remove the two case extension bolts (5).
2. Remove the case extension assembly (6) and remove the seal (8).
3. Remove the differential carrier thrust washer (715).
4. Remove the differential carrier thrust bearing (714).

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Differential Carrier Components Disassemble

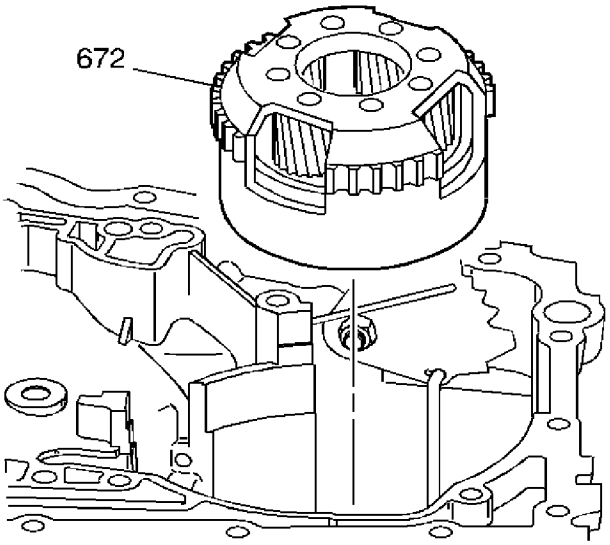


1. Remove the differential carrier assembly (700).
2. Remove the thrust bearing (698) from the differential carrier sun gear. The bearing may be stuck to the carrier assembly.
3. Remove the differential carrier sun gear (697).
4. Remove the park gear (696).
5. Remove the thrust bearing (695) from the differential carrier internal gear.
6. Remove the shaft differential carrier sun gear (689).

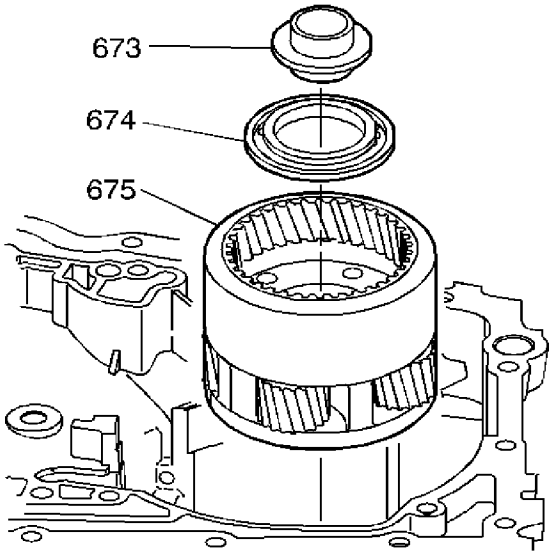
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Input and Reaction Carrier Disassemble



1. Position the transmission so that the case cover joint is facing upward.
2. Remove the input carrier assembly (672).

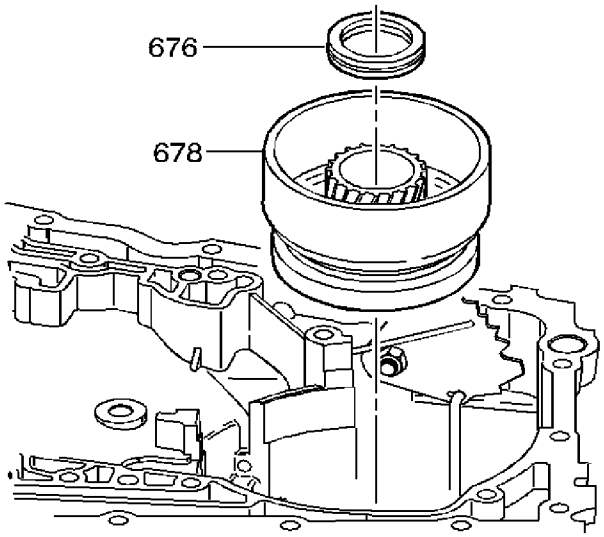


3. Remove the input carrier, reaction carrier lube dam (673). The dam may be stuck to the input carrier assembly.
4. Remove the thrust bearing (674) from the reaction carrier.
5. Remove the reaction carrier assembly (675).

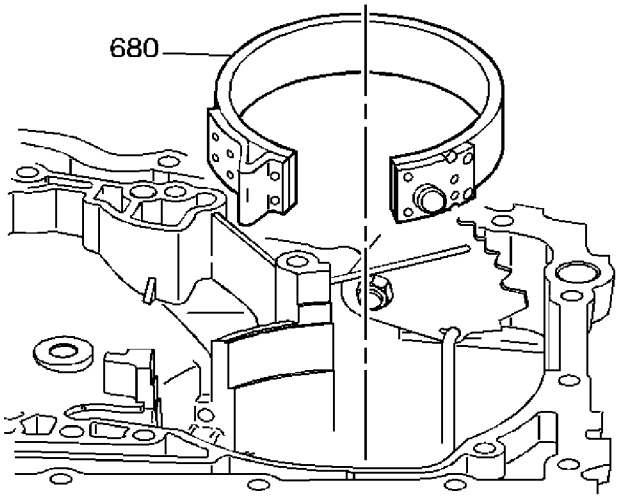
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Reaction Sun Gear and Manual 2-1 Band Removal



1. Remove the thrust bearing (676) from the reaction sun gear.
2. Remove the reaction sun gear assembly (678).



3. Tilt the band in order to disengage the manual 2-1 band assembly (680) from the anchor pin. Remove the manual 2-1 band assembly from the case.

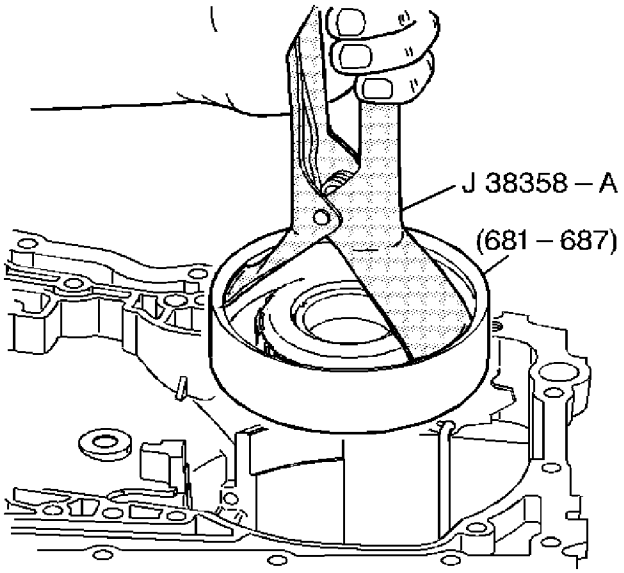
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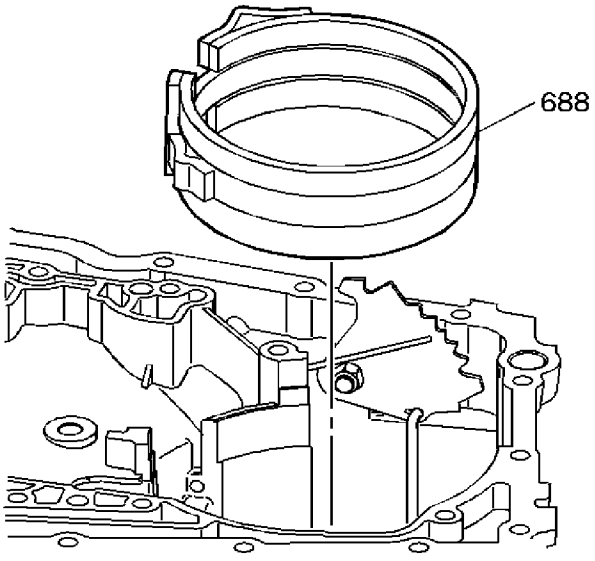
1-2 Support Drum and Forward Band Removal

Tools Required

J 38358-A 1-2 Support Remover and Installer



1. Install J 38358-A onto the 1-2 support drum assembly (681-687).
2. Lift J 38358-A with the 1-2 support drum out of the case.



3. Tilt the forward band assembly (688) in order to disengage the band from the anchor pin in

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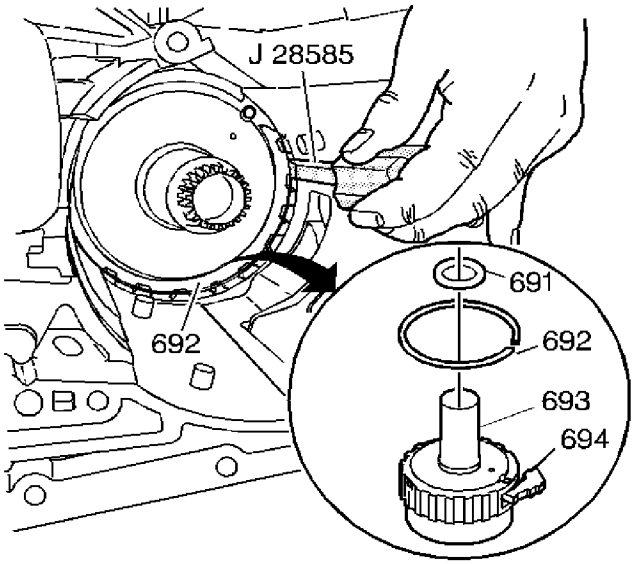
the case. Remove the forward band assembly.

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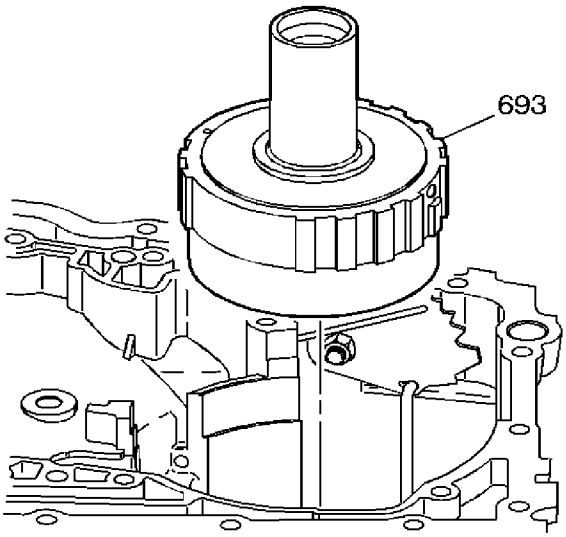
Differential Carrier Internal Gear Removal

Tools Required

J 28585 Snap Ring Remover



1. Remove the thrust washer (691) from the differential carrier internal gear.
2. UseJ 28585 or a large screwdriver in order to remove the differential carrier internal gear snap ring (692).



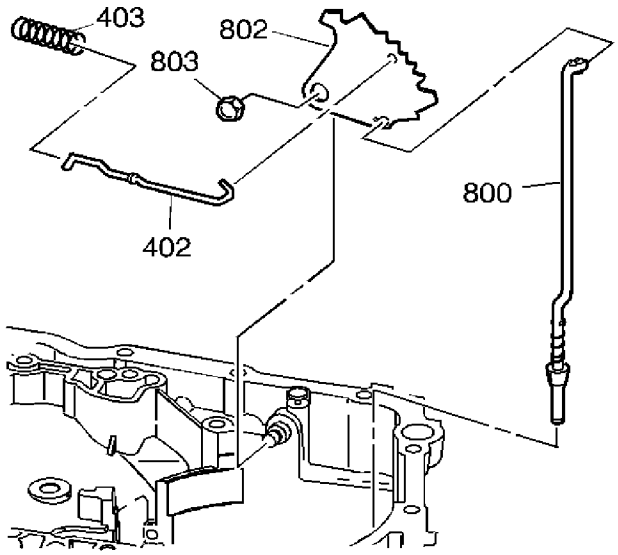
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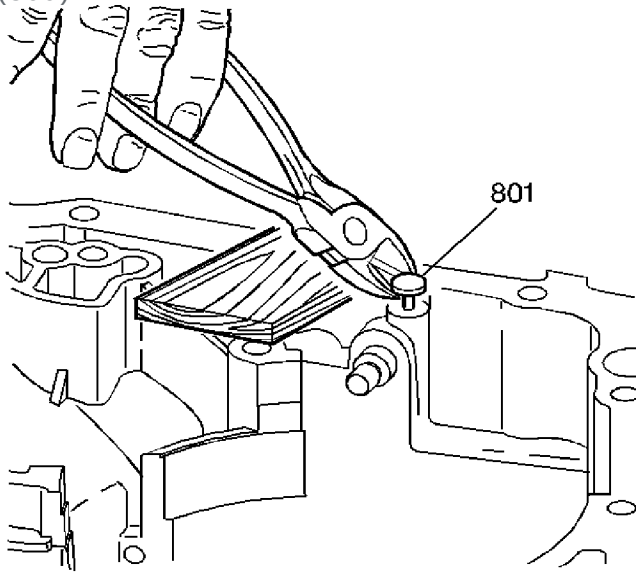
3. Lift the differential carrier internal gear assembly (693) out of the case by depressing the park pawl assembly in order to clear the case.

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Park System Components Disassemble

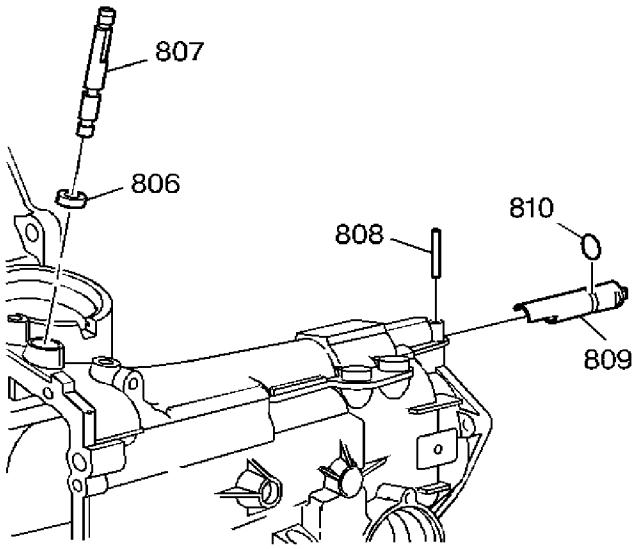


1. Disassemble the manual valve link and spring from the manual shift detent lever.
2. Remove the nut (803) for the manual shift detent lever from the manual shift shaft (807).
3. Remove the manual shift detent lever (802) and remove the park pawl actuator assembly (800).



4. Use side cutting pliers in order to remove the manual shift shaft pin (801):
   - Do not cut through the pin
   - Protect the case with a piece of wood or rubber

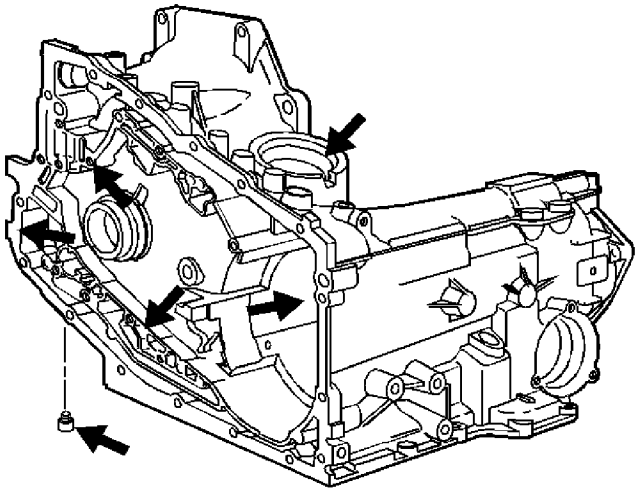
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5. Position the transmission so that the reverse band servo bore is facing upward.
6. Pull the manual shift shaft (807) out of the case.
7. Use a small screwdriver in order to pry the manual shift shaft seal (806) from the case:
8. Remove the park pawl actuator guide pin (808).
9. Remove the park pawl actuator guide assembly (809) from the case.
10. Remove the actuator guide seal (810) from the guide.

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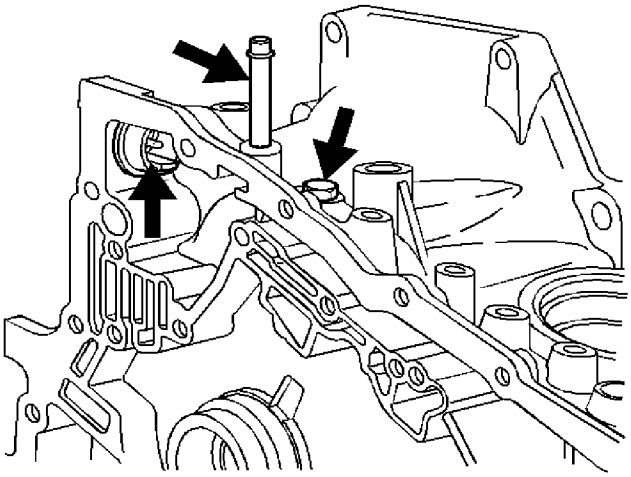
Case Assembly Inspection



1. Inspect the components that are still on the transmission case for the following conditions:
   - Loose, cross-threaded, or damaged oil cooler pipe fittings
   - A loose, missing, or damaged transmission name plate
2. Inspect the transmission case for the following conditions:
   - Gasket sealing surfaces that are damaged or which have porosity
   - Bolt or screw holes that are stripped or damaged (repair with a thread insert)
   - Damaged or porous case oil passages
   - Damaged snap ring grooves or housing splines
   - Loose, missing, or damaged band anchor pins
   - Damaged or porous case surfaces
   - Plugged drain back holes for the torque converter oil seal

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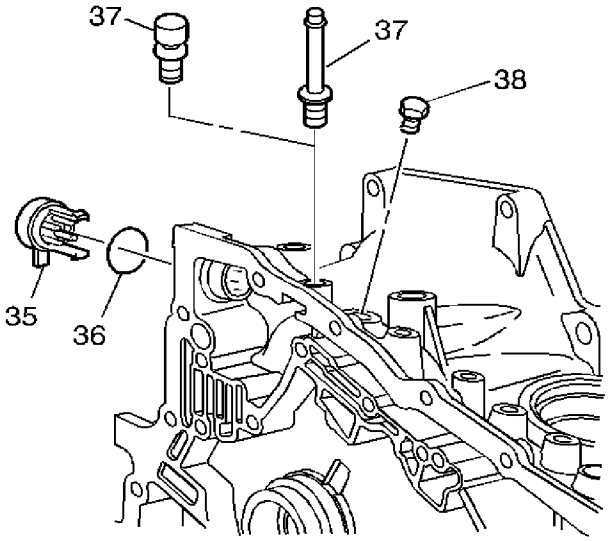
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3. Inspect the components that are still on the transmission case for the following conditions:
   - A loose, plugged, or damaged transmission vent assembly
   - A loose, cross-threaded, or damaged oil pressure test hole plug
   - A damaged transmission electrical connector or seal

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Case Components Disassemble



1. Use a small screwdriver in order to pry open the tab of the electrical connector assembly (35).
2. Remove the electrical connector assembly (35) and the O-ring (36).
3. Check to see if the vent is damaged or plugged. If so, use a channel locks type of pliers and a large screwdriver in order to remove the vent assembly (37).
4. Remove the oil pressure test hole plug (38).

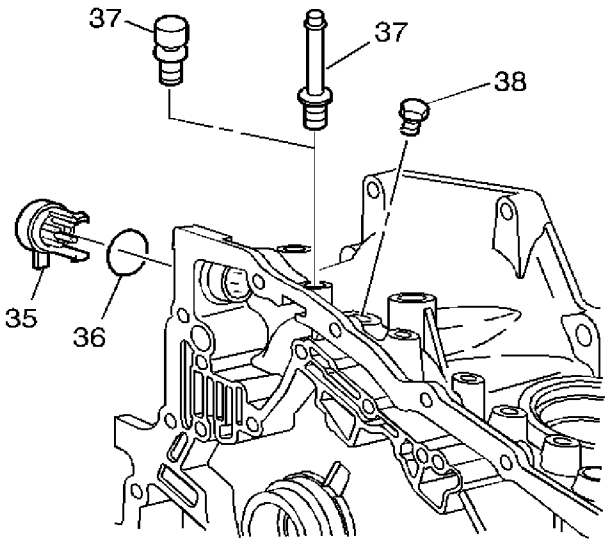
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Case Components Assemble

Tools Required

J 36850 Assembly Lubricant



1. Install a new O-ring seal (36) onto the electrical connector assembly (35). Lubricate with J 36850 or equivalent.
2. Install the electrical connector assembly (35) into the case. Lubricate with J 36850 or equivalent.
3. Use a hammer and a punch in order to install the vent assembly (37), if necessary.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

4. Install the oil pressure test hole plug (38).

   Tighten
   Tighten the test hold plug to 11 N·m (97 lb in).

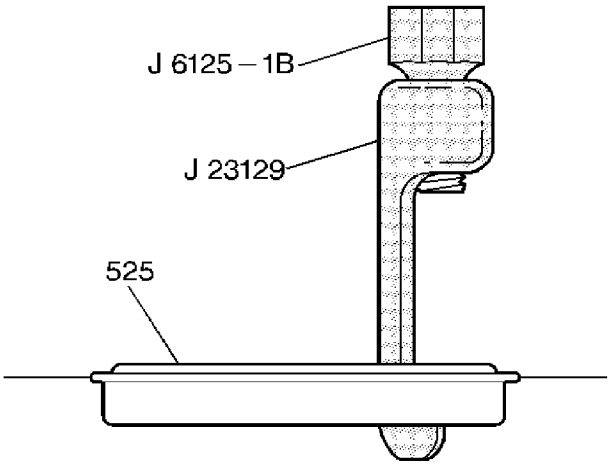
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Torque Converter Fluid Seal Removal

Tools Required

- J 6125-1B Slide Hammer
- J 23129 Converter Housing Seal Remover



1. Assemble J 6125-1B and J 23129 .

   Important: Do not damage the transmission case during the removal of the torque converter seal assembly.

2. Remove the oil seal assembly (525) from the case:
   - Use J 6125-1B and J 23129 in order to remove the seal
   - Install J 23129 between the seal and stator support
   - Alternately, use a large, flat blade screwdriver in order to pry out the seal. Use a block of wood to pry against

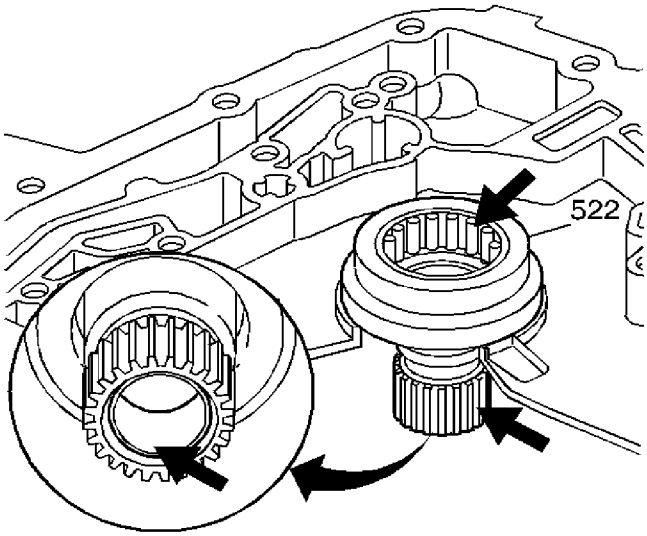
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Drive Sprocket Support Disassemble

Tools Required

- J 23907 Universal Slide Hammer and Puller
- J 26941 Drive Sprocket Support Bearing Remover

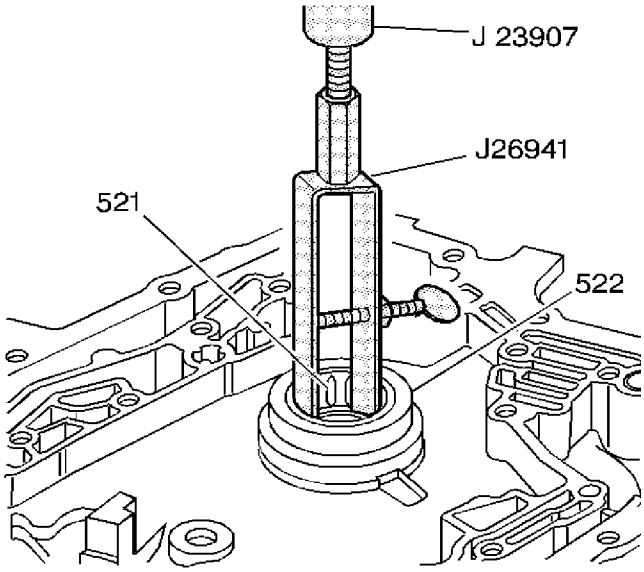




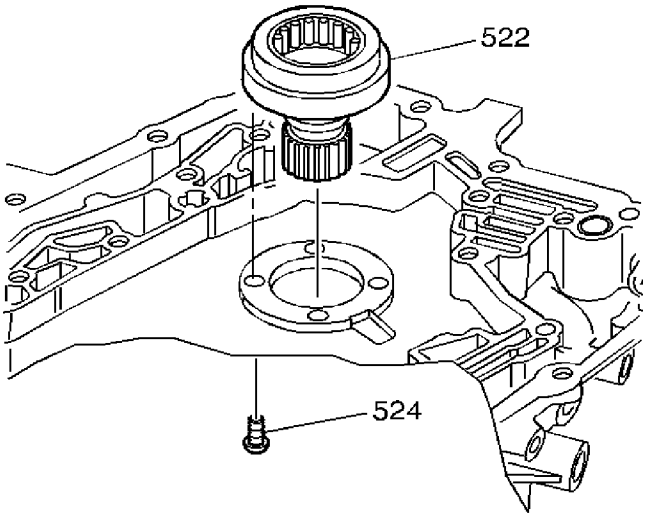
1. Inspect the drive sprocket support (522) for the following conditions:
   - Damaged splines
   - A damaged drive sprocket support bearing
   - A damaged turbine shaft bushing (pressed inside the support)
2. Remove the drive sprocket support bearing only if the bearing is damaged.
3. Remove the drive sprocket support assembly only if the support is damaged.

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4. Assemble J 23907 and J 26941 .
5. Use J 23907 and J 26941 in order to remove the bearing assembly (521) from the drive sprocket support.



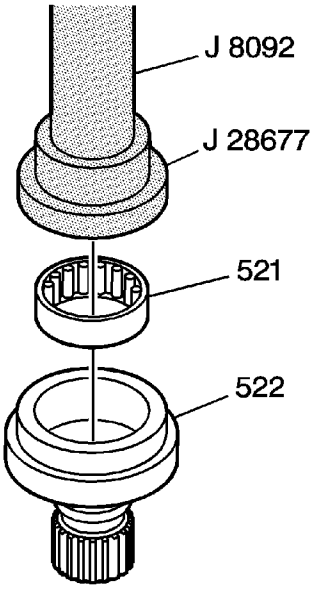
6. Remove the four drive sprocket support bolts (524).
7. Remove the drive sprocket support assembly (522).

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Drive Sprocket Support Assemble

Tools Required

- J 8092 Driver Handle
- J 28677 Drive Sprocket Support Bearing Installer
- J 36850 Transmission Assembly Lubricant



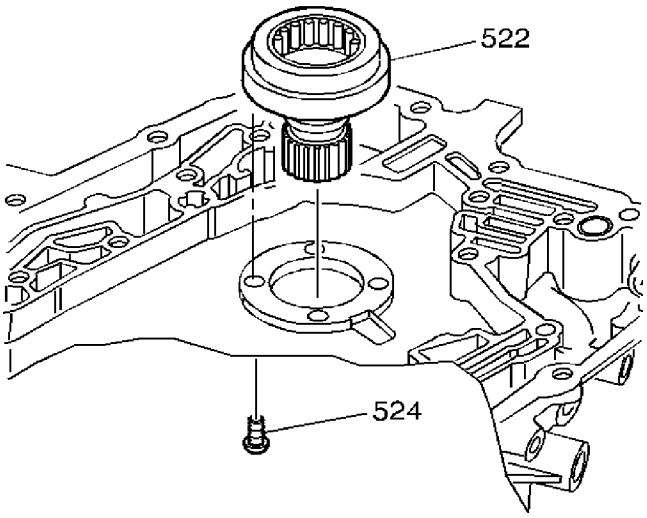
1. Assemble J 28677 and J 8092 .
2. Lubricate drive sprocket support bearing (521) with J 36850 .

   Important: When installing the new bearing the part number should be visible (facing upward).

3. Using the assembled tool, press in the drive sprocket support bearing (521).

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4. Install the drive sprocket support assembly (522).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

5. Install the four drive sprocket support bolts (524).

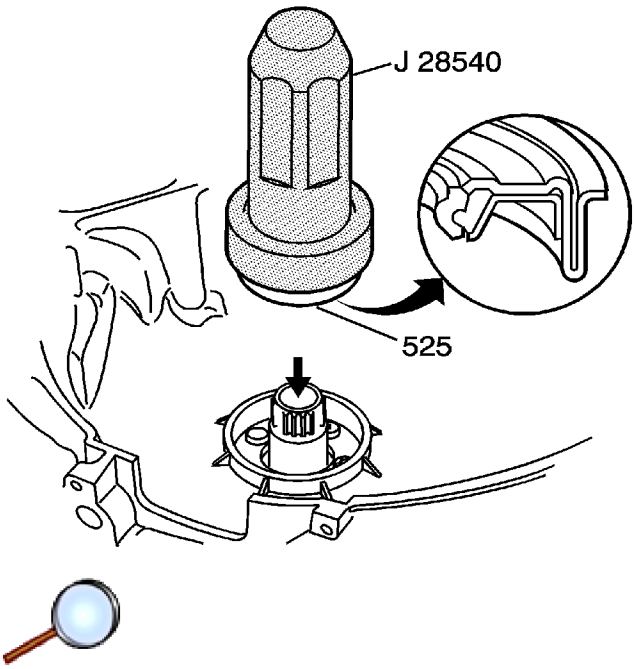
Tighten
Tighten the bolts to 25 N·m (18 lb ft).

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Torque Converter Fluid Seal Assemble

Tools Required

J 28540-A Converter Seal Installer



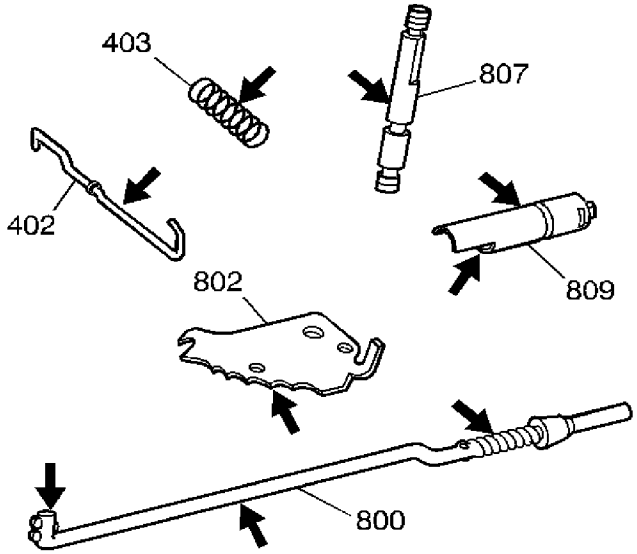
Notice: Install the seal onto the tool before installing into the case to prevent damage to the seal.

Use J 28540-A and a mallet in order to install the torque converter oil seal (525).

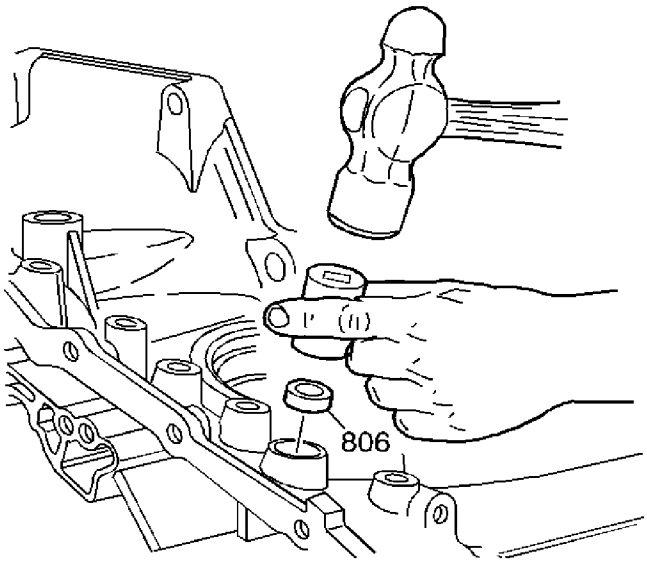
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Park System Components Assemble



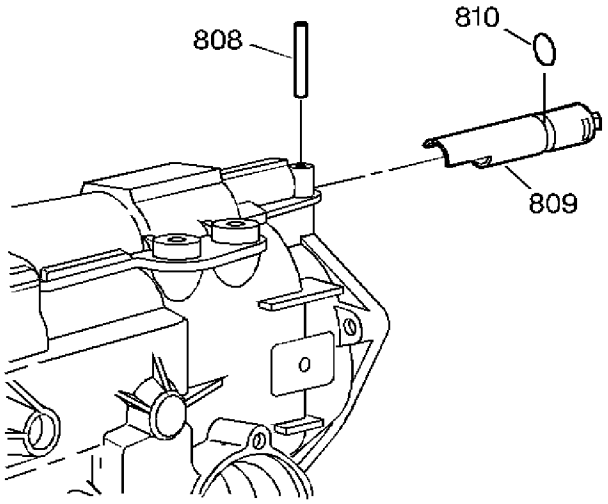
1. Inspect the park system components for the following conditions:
   - A worn park pawl actuator guide (809).
   - A cracked or bent park pawl actuator assembly (800).
   - A damaged manual shift shaft detent lever (802).
   - A worn, stripped, or bent manual shift shaft (807).
   - A bent or damaged manual valve link (402).
   - A kinked or bent manual valve link spring (403).



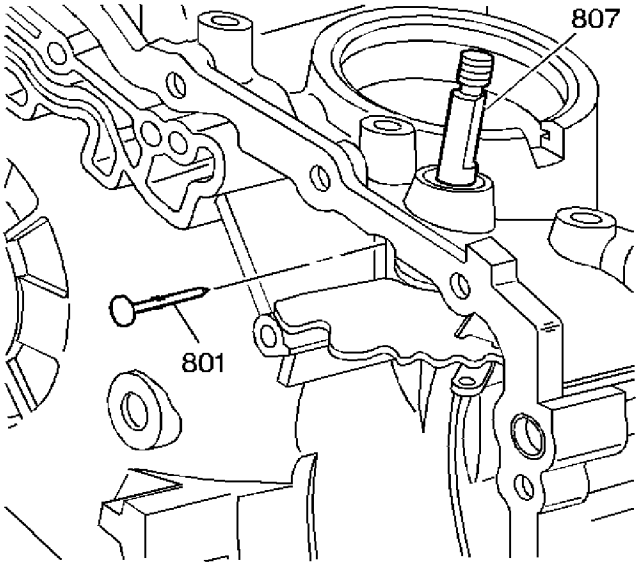
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2. Use a 9/16 in socket and a hammer in order to install the manual shift shaft seal assembly (806) into the case.

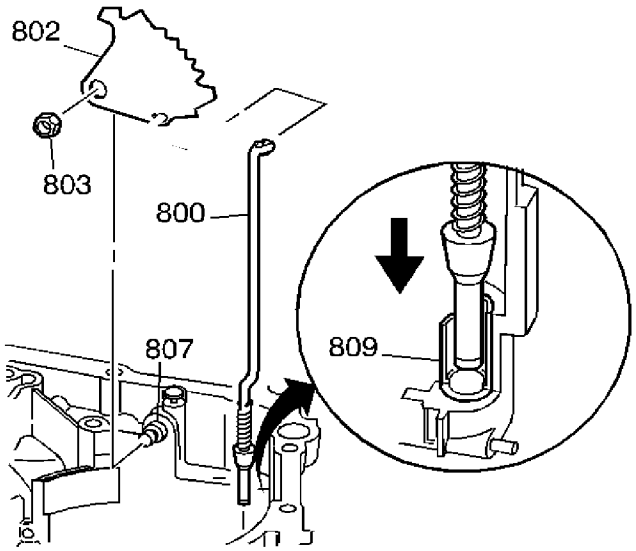


3. Install a new park pawl actuator guide O-ring seal (810) onto the park pawl actuator guide (809).
4. Install the actuator guide assembly into the case.
5. Align the slot for the actuator guide pin (808) in the park pawl with the pin hole in the case.
6. Use a mallet in order to install the actuator guide pin (808).



7. Install the manual shift shaft (807) into the case.
8. Align the groove for the manual shift shaft pin with the pin hole in the case.
9. Use a mallet in order to install the shaft pin (801).

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10. Position the transmission so that the case cover flange is facing upward.
11. Install the park pawl actuator assembly (800).
12. Assemble the manual shift shaft detent lever (802) onto the actuator assembly and onto the manual shift shaft (807).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

13. Install the nut (803) on the manual shift shaft.

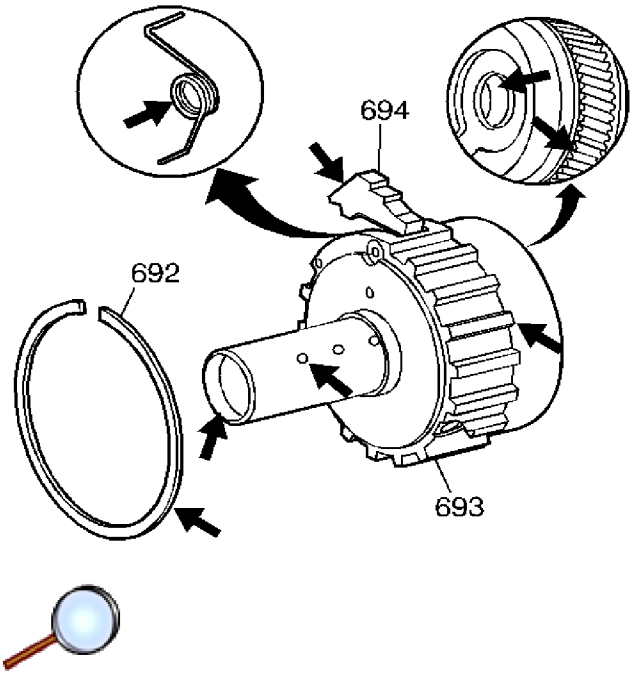
Tighten
Tighten the nut to 32 N·m (23 lb ft).

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Differential Carrier Internal Gear Assemble

Tools Required

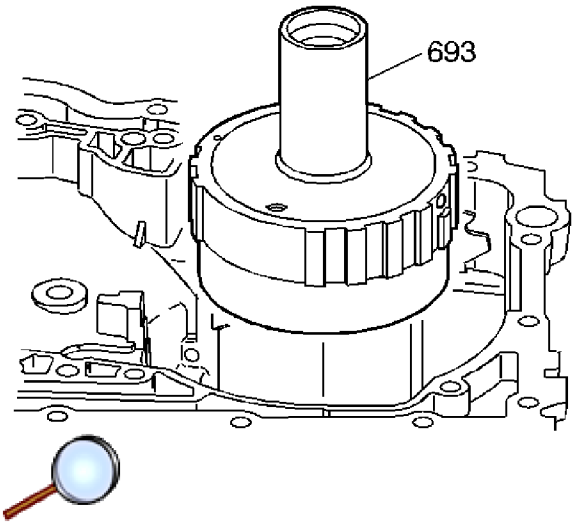
J 28585 Snap Ring Remover



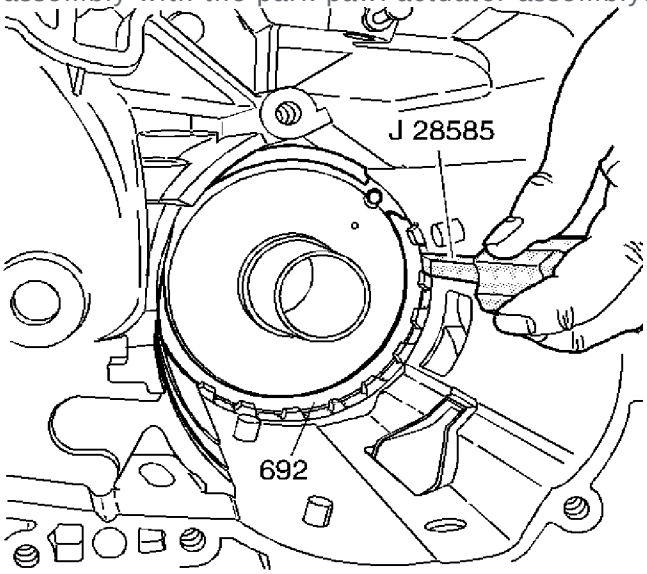
1. Inspect the differential carrier internal gear assembly (693) for the following conditions:
   - Damaged or worn bushings
   - Plugged lube oil holes
   - Damaged case splines
   - Damaged or worn gear teeth
   - A damaged or worn park pawl assembly (694)
   - A damaged snap ring (692)

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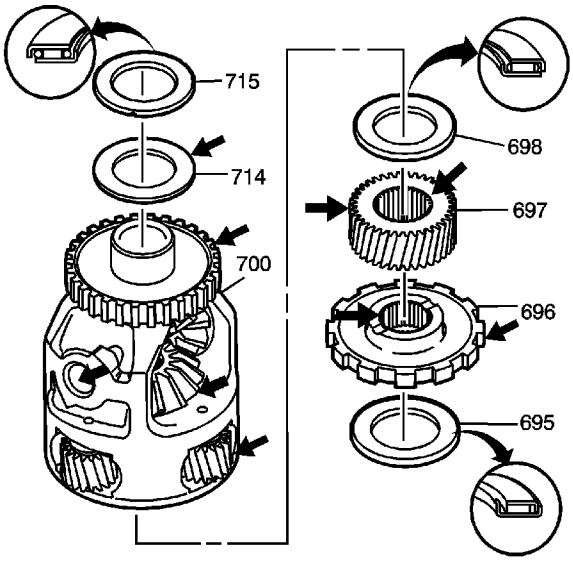
2. Install the differential carrier internal gear assembly (693) into the case. Align the park pawl assembly with the park pawl actuator assembly.



3. Use J 28585 or a long screwdriver in order to install the snap ring (692) into the case as shown.

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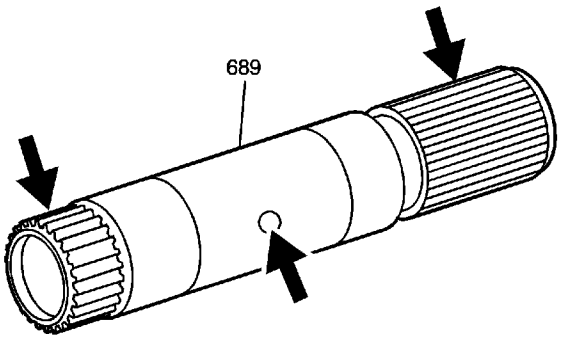
Differential Carrier Inspection



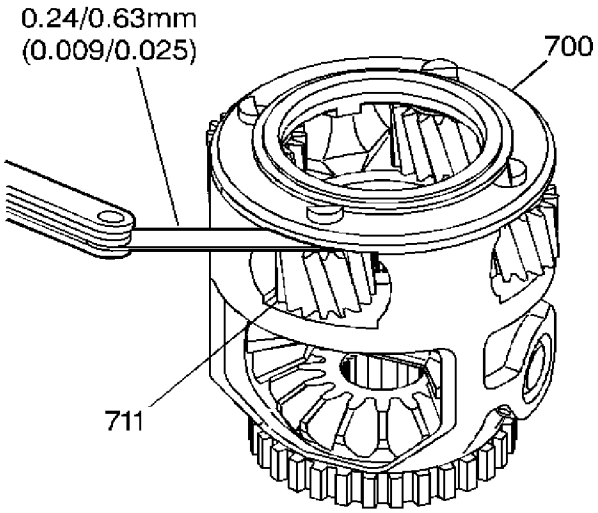
1. Inspect the differential carrier assembly (700) for the following conditions:
   - Damaged or worn teeth, bearing rollers, washers, or pins on the differential planetary pinion gear
   - Damaged or worn teeth or splines on the final drive sun gear (697)
   - Damaged or worn teeth, splines, or thrust washers on the differential side gear
   - Damaged or worn teeth, thrust washers, or shaft on the differential pinion gear
   - Damaged or worn lugs or splines on the parking gear (696)
   - A damaged vehicle speed sensor reluctor wheel
   - Damaged internal gear/parking gear thrust bearing (695), differential carrier/sun gear thrust bearing (698) or differential carrier/case thrust bearing (715)
   - A damaged or worn differential carrier/case selective thrust washer (714)
   - A damaged differential/final drive carrier housing (700)

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2. Inspect the final drive sun gear shaft (689) for the following conditions:
   - Damaged or worn splines
   - Cracks at lube oil holes
   - Damaged or worn bearing journals



3. Use a feeler gauge in order to measure the end play of the differential carrier planetary pinion gear.

   Specification
   End play should be 0.24-0.63 mm (0.009-0.025 in).

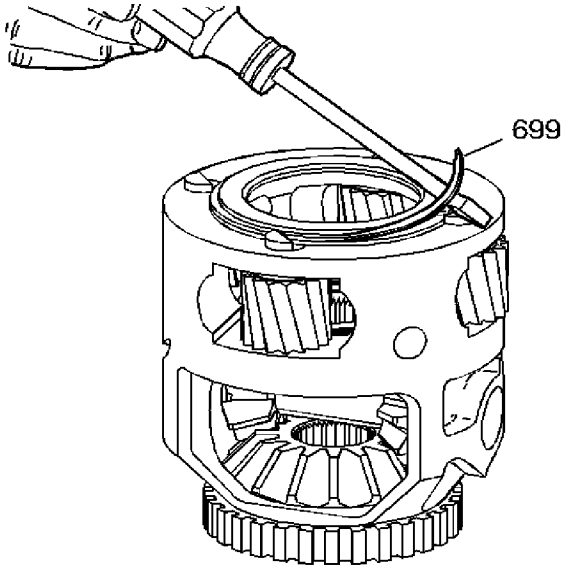
4. If the end play check or the component inspection indicates a condition, repair the

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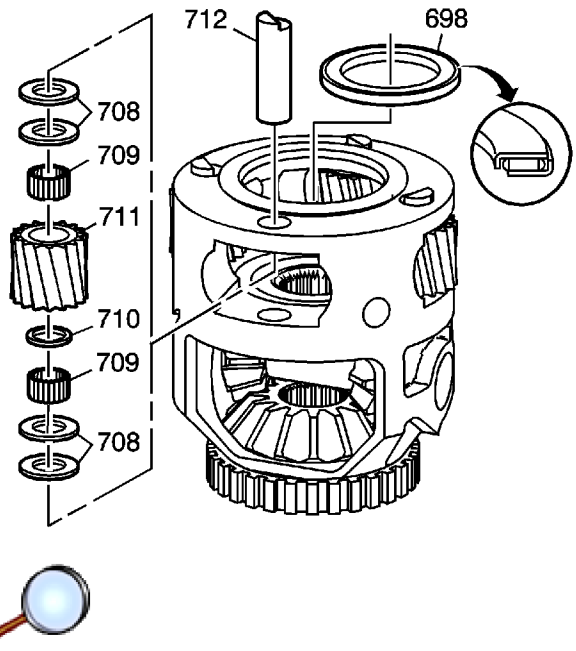
differential/final drive carrier assembly (700).

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Differential Carrier Disassemble



1. Use a screwdriver in order to remove the snap ring (699) from the front differential carrier.



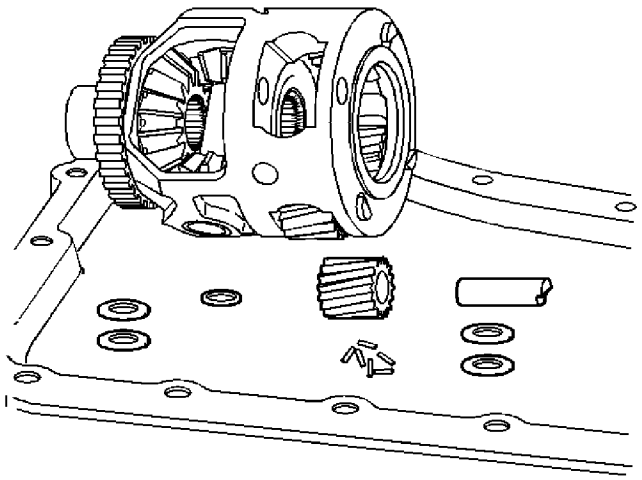
Important: Keep all washers and bearings together with the planetary pinion gear and pin. The pinion gears, washers, and bearings must be reinstalled in the original locations.

2. Remove the first planetary pinion by removing the following parts:
   2.1. The planetary pinion gear pin (712)

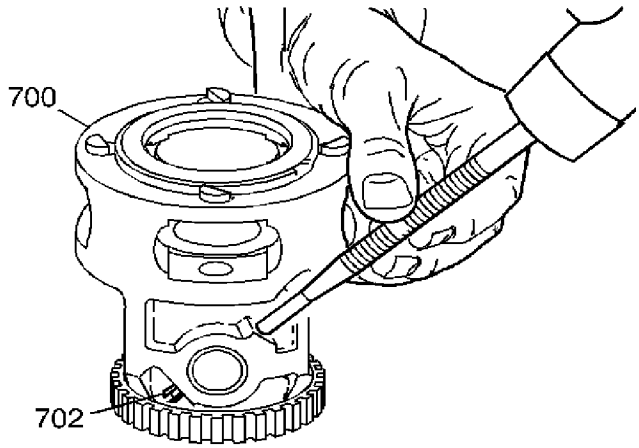
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2.2. The pinion thrust washers (708)
2.3. The pinion gear roller bearings (709)
2.4. The bearing roller spacer (710)
2.5. The pinion (711)

3. Remove the remaining planetary pinions in the same way.
4. Remove the differential carrier sun gear thrust bearing assembly (698).

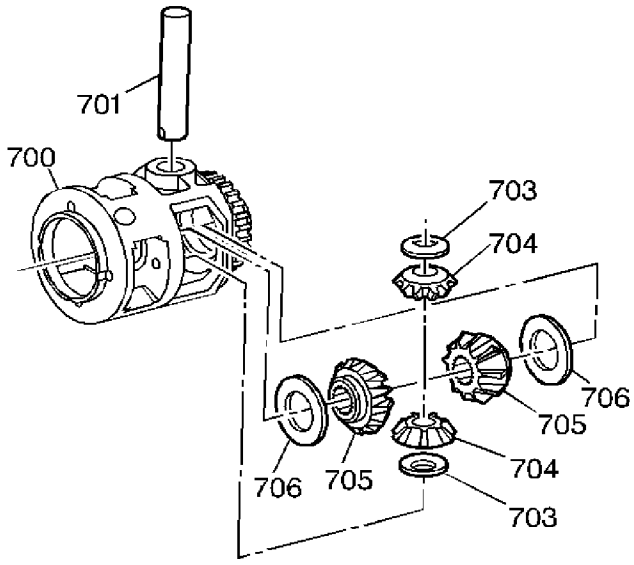


5. Place the final drive carrier components into an oil pan in order to make sure that none of the bearing rollers are lost.



6. Use a drift punch and a mallet in order to remove the differential pinion gear shaft pin (702).

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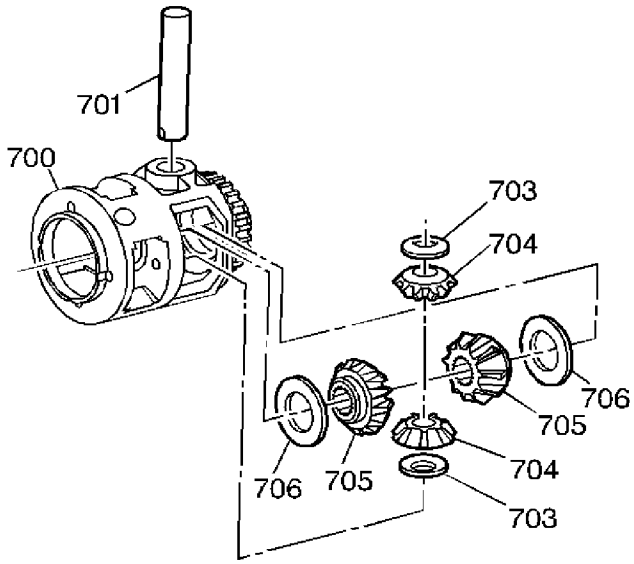
7. Remove the differential pinion shaft (701).
8. Remove the differential pinion gears (704).
9. Remove the differential pinion gear thrust washers (703).
10. Remove the differential side gears (705).
11. Remove the differential side gear thrust washers (706).

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Differential Carrier Assemble

Tools Required

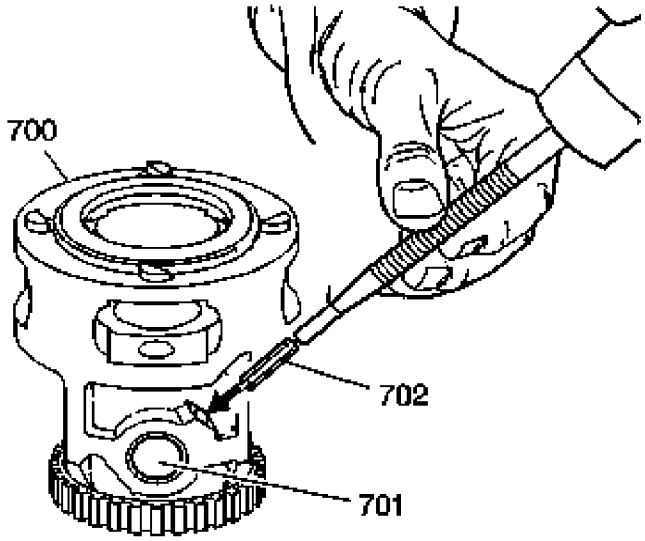
J 36850 Assembly Lubricant (or equivalent)



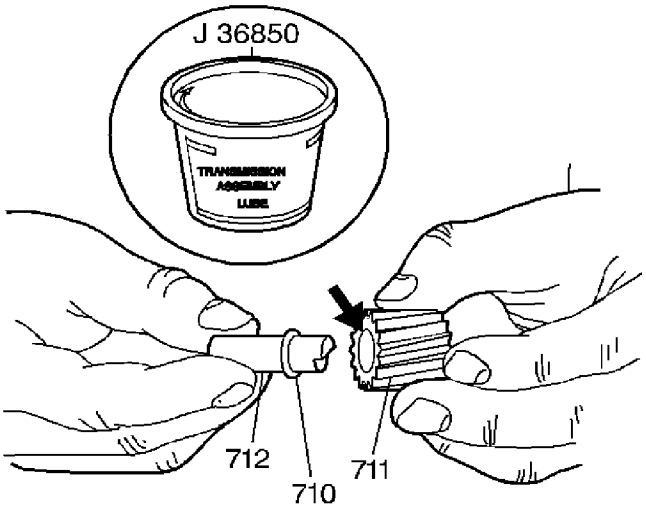
1. Affix the differential side gear thrust washers (706) to the side gears (705). Apply J 36850 or equivalent.
2. Install the side gears (705) with the thrust washers into the differential carrier housing (700).
3. Affix the differential pinion thrust washers (703) to the pinion gears (704). Apply J 36850 or equivalent.
4. Install the pinion gears with thrust washers into the differential carrier housing (700). Rotate the pinion gears into position.
5. Install the differential pinion shaft (701) into the differential carrier housing.

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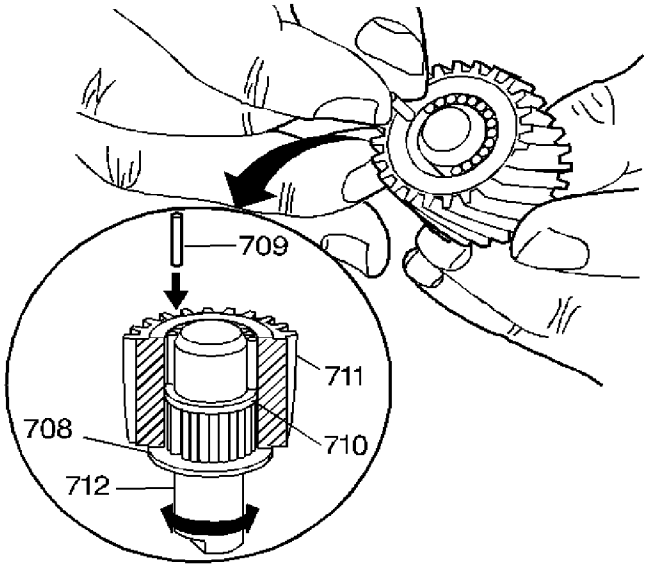


6. Align the hole in the pinion gear shaft (701) to the hole in the differential carrier housing (700).
7. Use a drift punch and a mallet in order to install the pinion gear shaft pin (702) into the differential carrier housing (700).

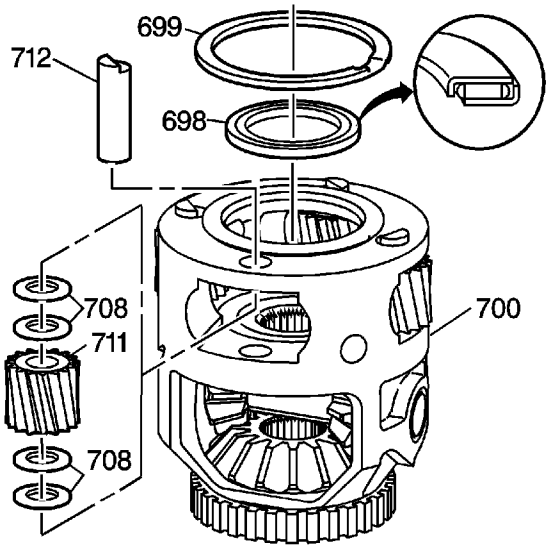


8. Apply J 36850 or equivalent to the inside of a differential carrier planetary pinion gear (711).
9. For each planetary pinion gear, insert a bearing roller spacer (710) onto the pin (712). The spacer must be inserted between the two rows of bearing rollers.

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10. For each planetary pinion gear, assemble the bearing rollers (709) into the gear (711) one at a time.
    - Use plenty of J 36850 or equivalent in order to aid assembly
    - Use a washer (708) on the bottom of the pinion gear (711) in order to help hold the bearing rollers (709) in place.
    - The number of rollers in the pinion gear is model dependent:
      - The 3.05/3.06 and 3.29/3.33 ratio differential carriers have two rows of 22 rollers (44 total)
      - The 2.86/2.84 ratio differential carriers have two rows of 18 rollers (36 total)
    - Occasionally twist the pinion gear pin (712) in order to help align the rollers



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11. Install the differential carrier sun gear thrust bearing (698) into the carrier housing.
12. Remove each planetary pinion gear pin (712) from its pinion gear (711). Be careful not to move the rollers out of position.
13. Affix two pinion gear thrust washers (708) on each side of the pinion gear (711). Apply J 36850 or equivalent.

Important: Make sure that the pinion is installed in the same way that it was removed. If the gear is installed upside down, noise may result, because of the change in the gear wear pattern.

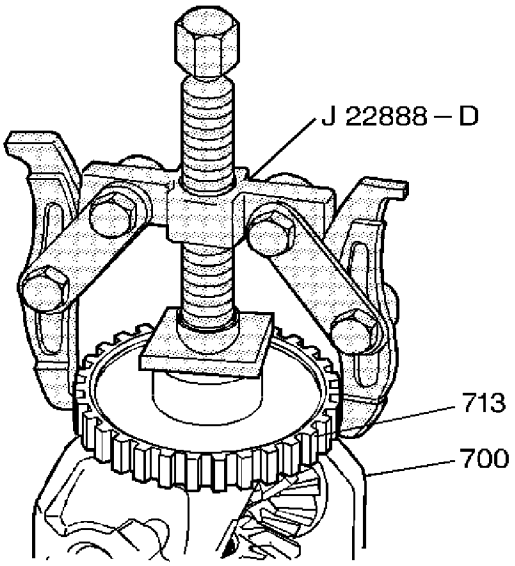
14. Install the pinion gear assemblies (711) into the carrier housing (700).
15. Install each planetary pinion gear pin (712).
16. Install the snap ring (699) over the planetary pinion gear pins.

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Vehicle Speed Sensor Reluctor Wheel Disassemble

Tools Required

J 22888-D Universal Bearing Puller

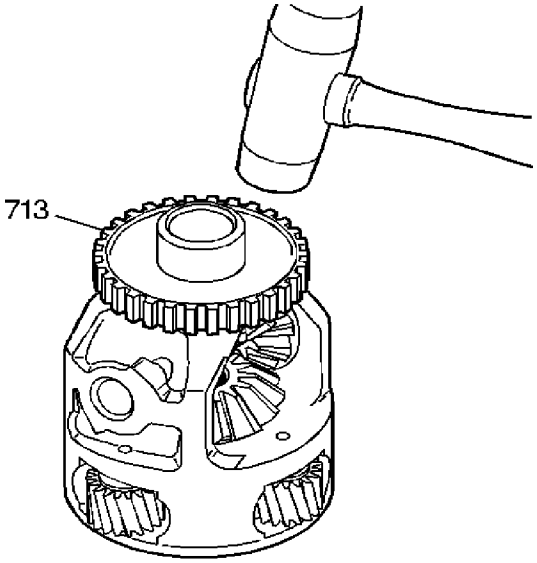


1. Do not remove the vehicle speed sensor reluctor wheel (713) unless the wheel is damaged.
2. Use J 22888-D and a piece of flat metal stock in order to remove the vehicle speed sensor reluctor wheel (713).

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Vehicle Speed Sensor Reluctor Wheel Assemble



1. Warm the vehicle speed sensor reluctor wheel before installation
2. Use a plastic mallet in order to install the vehicle speed sensor reluctor wheel (713) onto the differential carrier housing. Tap evenly around the reluctor wheel with the mallet until fully seated.

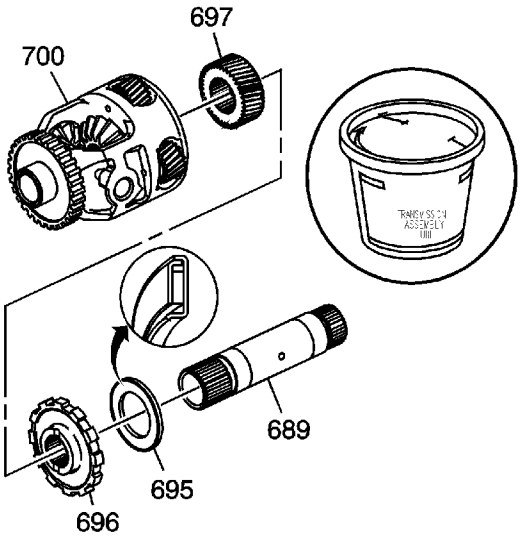
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Differential Carrier Components Assemble

Tools Required

J 36850 Assembly Lubricant (or equivalent)



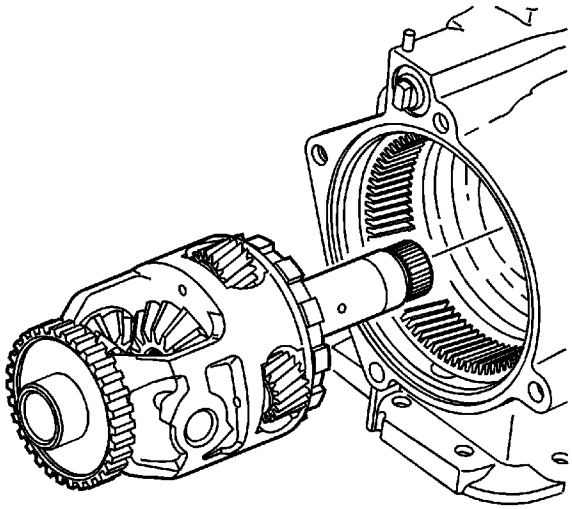
1. Assemble the carrier/sun gear thrust bearing (698), the final drive sun gear (697) with the chamfered side toward the parking gear (696) into the differential/final drive carrier assembly (700).
2. Assemble the parking gear (696) onto the final drive sun gear shaft (689)
3. Assemble the final drive sun gear shaft/parking gear assembly (689/696) into the final drive sun gear (697).

Important: Apply J 36850 or equivalent to the parking gear side of the bearing (695).

4. Assemble the internal gear/parking gear thrust bearing (695) to the parking gear (696).

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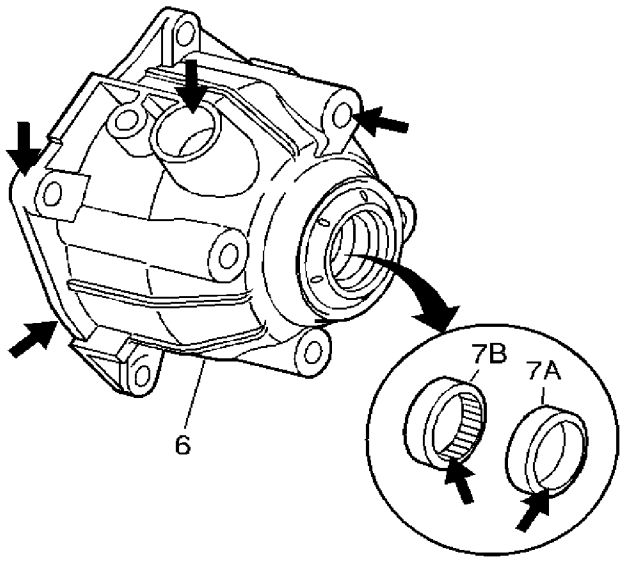
5. Install the differential/final drive carrier assembly into the case.

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Case Extension Assemble

Tools Required

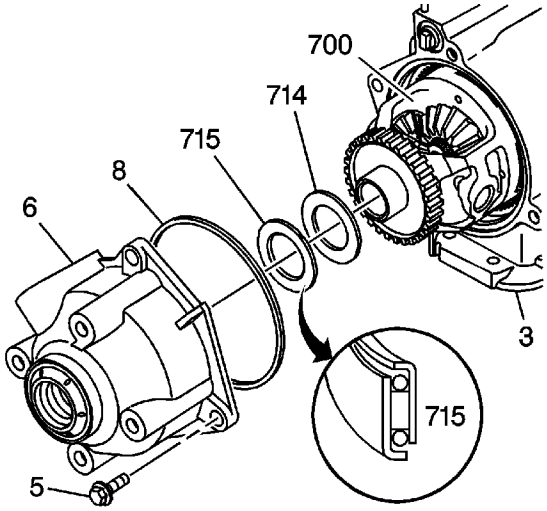
- J 26958 Output Shaft Loading Tool
- J 26958-10A Adapter Plug
- J 38385 Output Shaft Loading Tool Adapter



1. Inspect the case extension assembly (6) for the following conditions:
   - A damaged or porous sealing surface for the case extension seal
   - A damaged or porous sealing surface for the vehicle speed sensor
   - A damaged or porous sealing surface for the right drive shaft oil seal assembly
   - Damaged bolt holes
   - A worn or damaged front differential carrier bushing (7A) or output shaft bearing assembly (7B)
   - A porous or damaged case extension housing

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2. Install the differential carrier/case selective thrust washer (714) onto the differential/final drive carrier assembly (700).
3. Install the thrust bearing (715) onto the differential/final drive carrier assembly (700).
4. Affix the seal (8) onto the case extension (6).
5. Install the case extension assembly (6) onto the case (3).
6. Install only two case extension bolts (5) for later removal.

Tighten
Tighten the bolts until the extension is flush to the case.

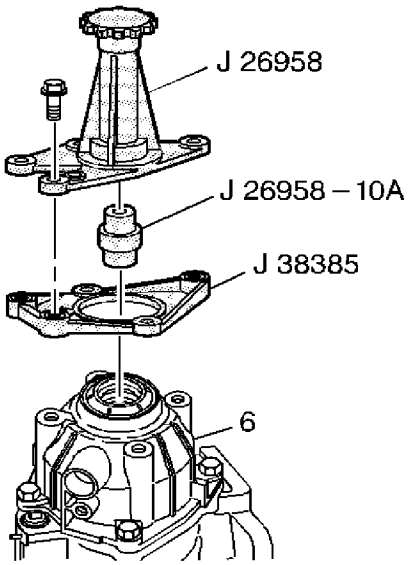
7. Perform end play check, refer to Differential Carrier End Play Check.

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Input Clutch Housing End Play Tool Assemble

Tools Required

- J 26958 Output Shaft Loading Tool
- J 26958-10B Adaptor Plug
- J 38385 Output Shaft Loading Tool Adaptor



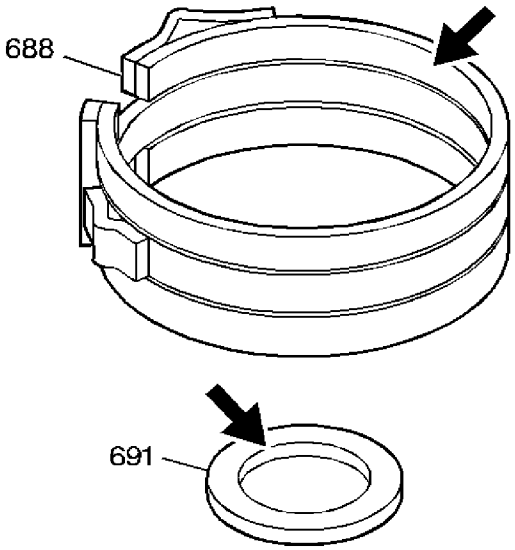
Important: Install the bolts and tighten all bolts in order to prevent tool deflection during end play measurement.

Install the input clutch housing assembly end play tool as shown. You will use this tool in order to perform the selective washer check for the input clutch housing.

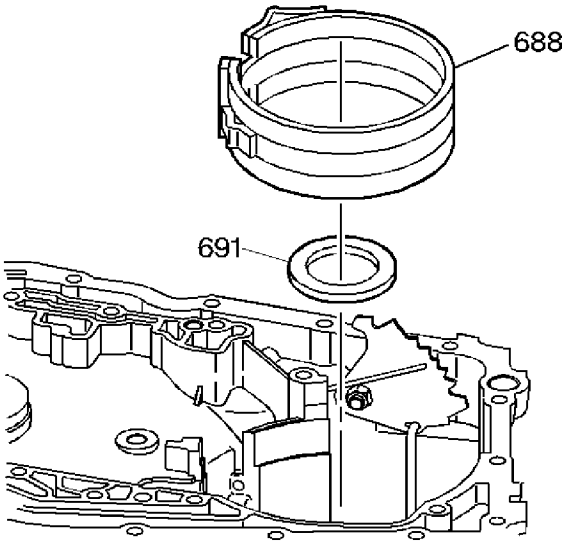
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Forward Band Assemble



1. Inspect the forward band assembly (688) for the following conditions:
   - Damaged or severely worn friction material
   - Damaged apply or anchor pin features
2. Inspect the thrust washer (691) from the differential carrier internal gear for damage.



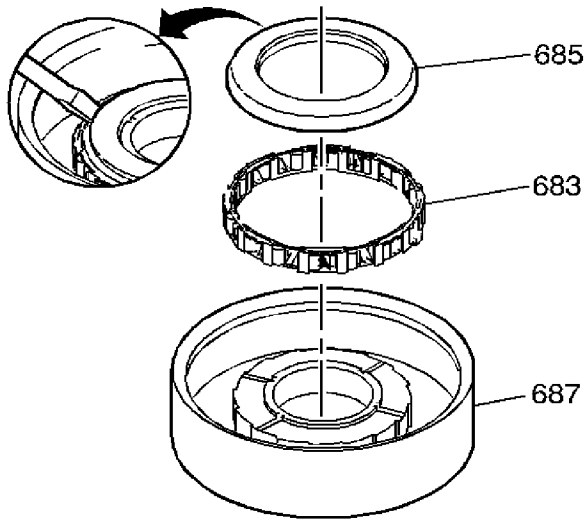
3. Position the transmission case so that the flange for the case cover is facing up.
4. Install the thrust washer (691) for the differential carrier internal gear into the case. Position as indicated.

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5. Install the forward band assembly (688) into the case.
   - Locate the band assembly onto the forward band anchor pin
   - Position the band apply pin feature in the opening of the case

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1-2 Support Roller Clutch Disassemble

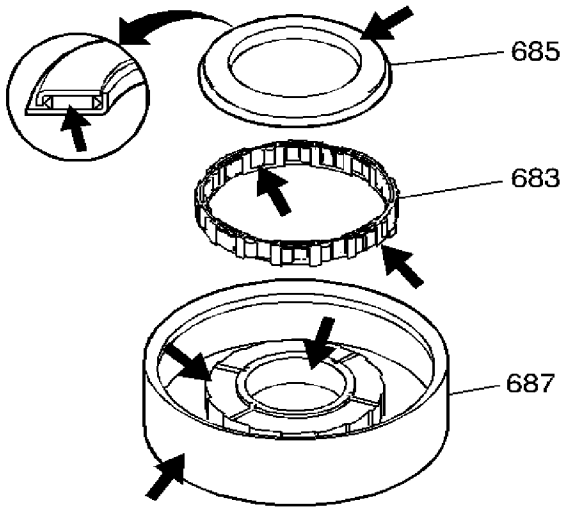


1. Use a small screwdriver in order to gently pry the thrust bearing (685) off of the 1-2 support drum (687).
2. Lift the 1-2 clutch roller assembly (683) out of the 1-2 support drum.

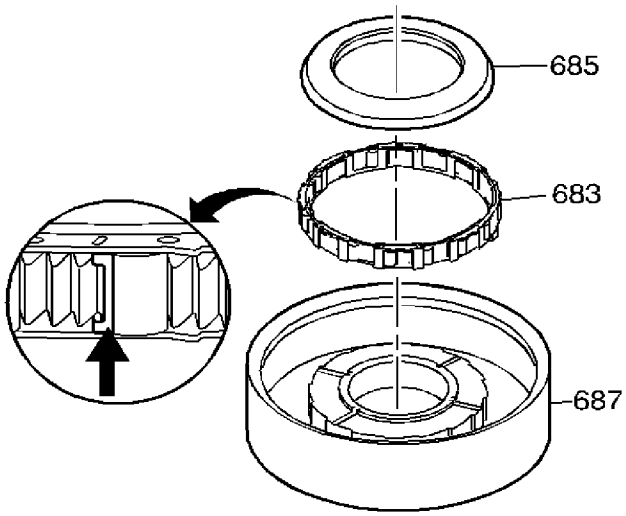
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1-2 Support Roller Clutch Assemble



1. Inspect the 1-2 support roller clutch components for the following conditions:
   - A scored or burned contact surface for the manual 2-1 band on the 1-2 support drum (687)
   - A damaged or worn forward drum bushing
   - A damaged or worn inner race of the 1-2 support roller clutch
   - A damaged or worn 1-2 clutch roller assembly (683)
   - A damaged thrust bearing (685)



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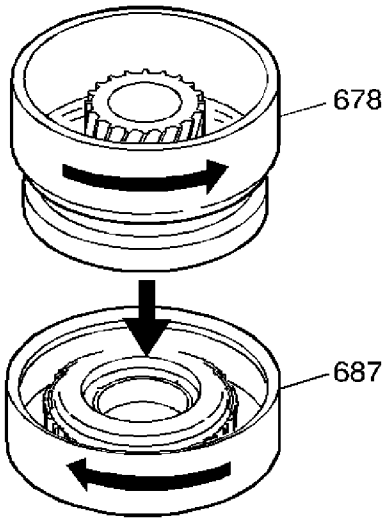
2. Install the 1-2 clutch roller assembly (683) into the 1-2 support drum.

   Important: Note the position of the cage assembly to the inner race.

3. Install the thrust bearing (685) onto the 1-2 support drum (687). Press down with hand pressure only.

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1-2 Support Roller Clutch Functional Check



1. Position the 1-2 support drum assembly (687) on the bench as shown.
2. Install the reaction sun gear assembly (678) into the 1-2 support drum (687).
3. Rotate the components as indicated by the arrows:
   - The roller clutch should move freely in the indicated directions
   - The roller clutch should lock in the direction opposite of that indicated
4. If the roller clutch does not function as described, reassemble the clutch correctly, or replace the assembly.

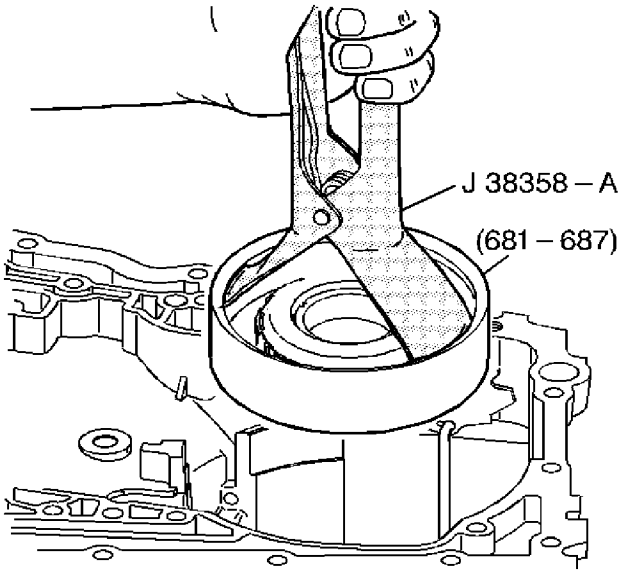
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1-2 Support Drum Assemble

Tools Required

J 38358-A 1-2 Support Remover/Installer

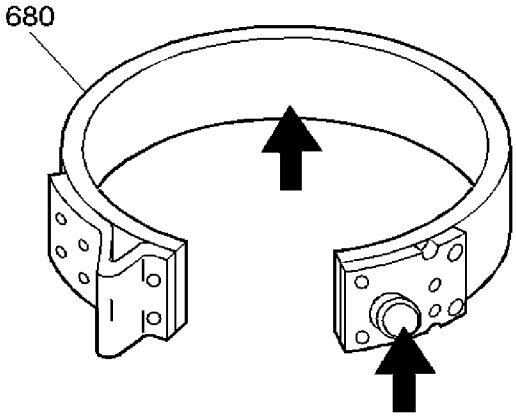


Use J 38358-A in order to assemble the 1-2 support drum assembly (681-687) into the case.

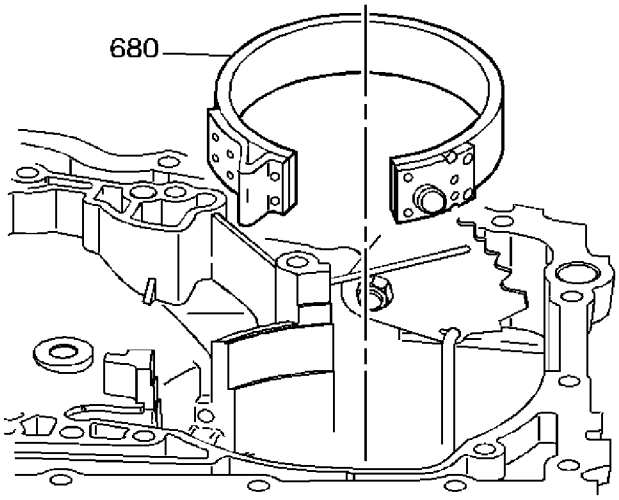
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Manual 2-1 Band Assemble



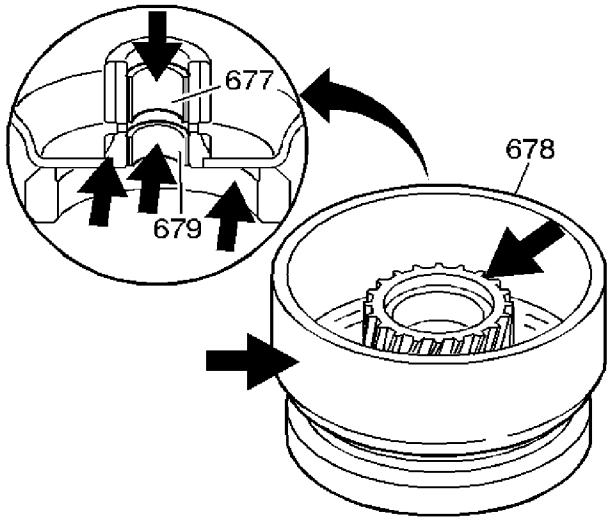
1. Inspect the 2-1 manual band (680) for the following:
   - Cracked or separated friction material
   - Burnt friction material
   - Cracks around the apply lugs



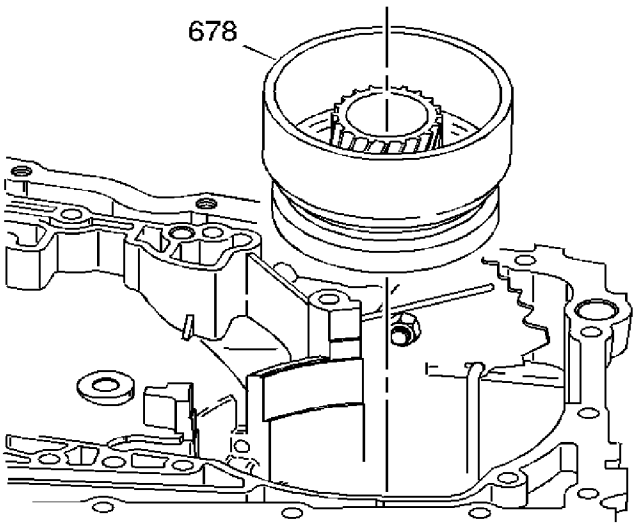
2. Squeeze the manual 2-1 band assembly (680) and install the assembly into the case.
3. Position the band on the anchor pin.

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Reaction Sun Gear and Drum Assemble



1. Inspect the reaction sun gear and drum assembly (678) for the following:
   - Worn or scored bushings
   - Damaged reaction sun gear teeth
   - The band apply area of the drum for discoloration or wear
   - The welds connecting the sun gear to the drum for voids or cracks
   - A worn or damaged 1-2 support outer race



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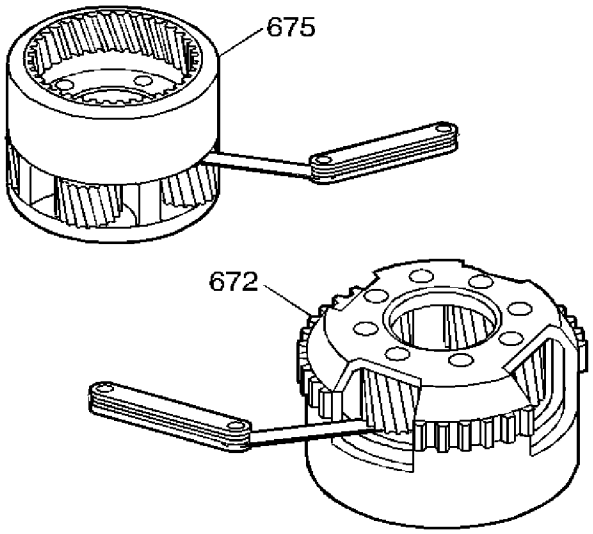
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2. Install the reaction sun gear and drum assembly (678) into the case.
3. Check that the lugs engage with the 1-2 support roller clutch inner race.

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Input and Reaction Carrier Pinion End Play Check



1. Use feeler gages in order to check for excessive pinon gear end play in the input carrier assembly (672) and in the reaction carrier assembly (675).
2. End play should measure 0.23-0.77 mm (0.009-0.030 in).

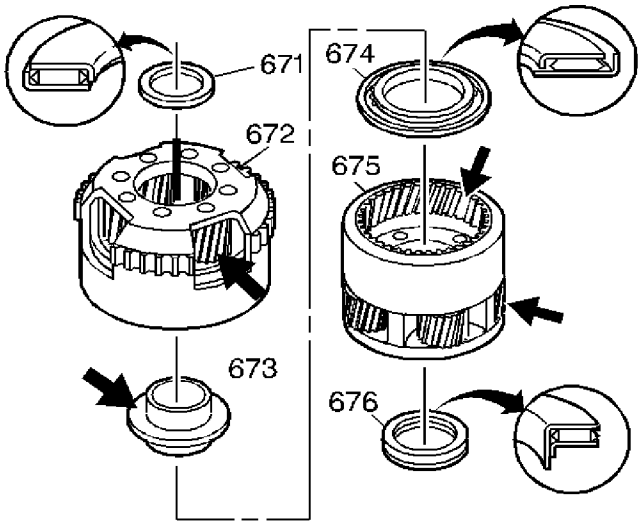
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Input and Reaction Carrier Assemble

Tools Required

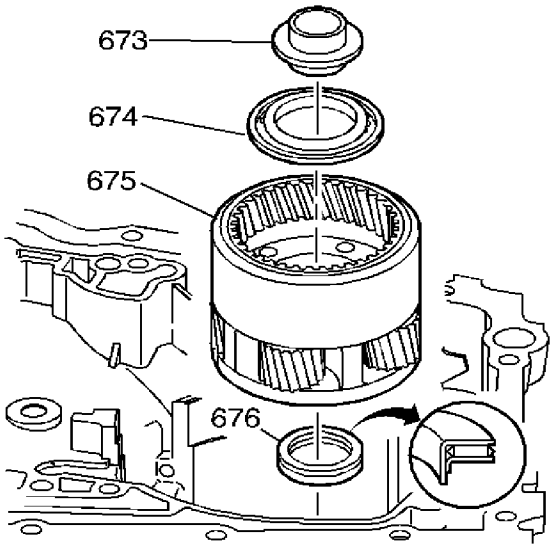
J 36850 Transjel™



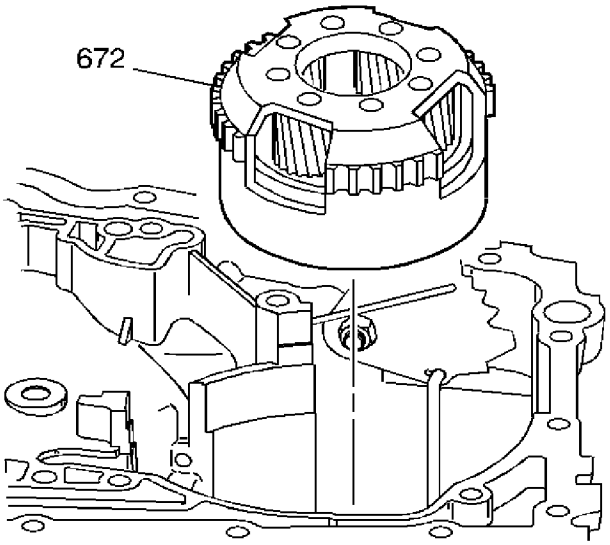
1. Inspect the thrust bearings (671, 674, 676) for the following:
   - A damaged cage
   - Damaged or missing rollers
2. Inspect the reaction carrier assembly (675) for damage to the pinion/internal gear teeth.
3. Inspect the input carrier assembly (672) for damage to the pinion/spline teeth.
4. Inspect the lube dam (673) for the following:
   - Cracks
   - Damage

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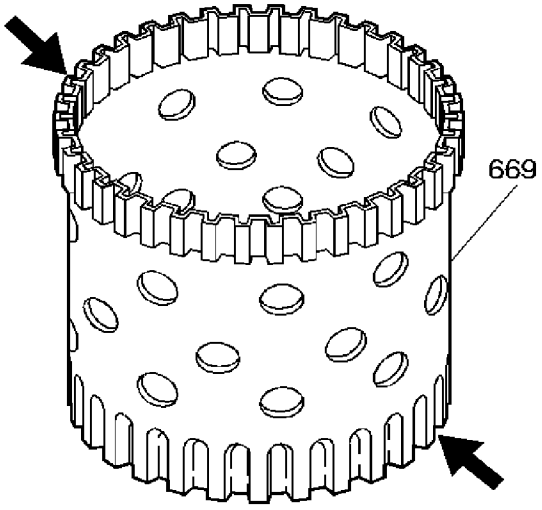
5. Affix the thrust bearing (676) onto the reaction carrier (675). Use J 36850 or equivalent in order to retain the bearing.
6. Install the reaction carrier (675) into the case and rotate the carrier so that the pinions engage the reaction sun gear.
7. Affix the thrust bearing (674) into the input carrier (675). Use J 36850 or equivalent in order to retain the bearing.
8. Install the lube dam (673) into the reaction carrier assembly (675). Use J 36850 or equivalent in order to retain the dam.



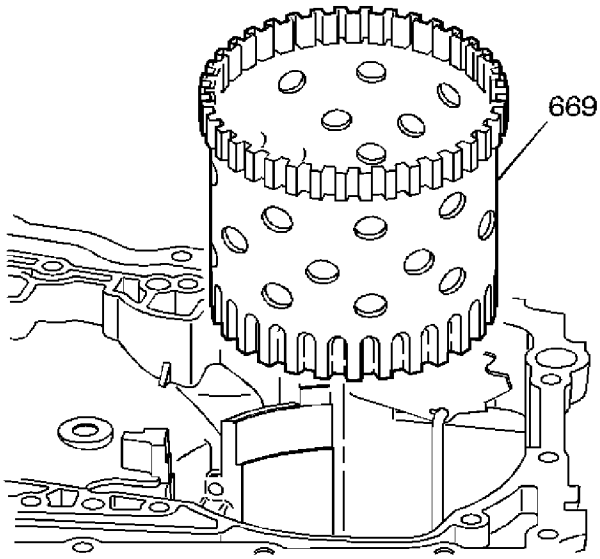
9. Insert the input carrier assembly (672) into the case and rotate the carrier so that the pinions engage the reaction carrier internal gear.

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Reverse Reaction Drum Assemble



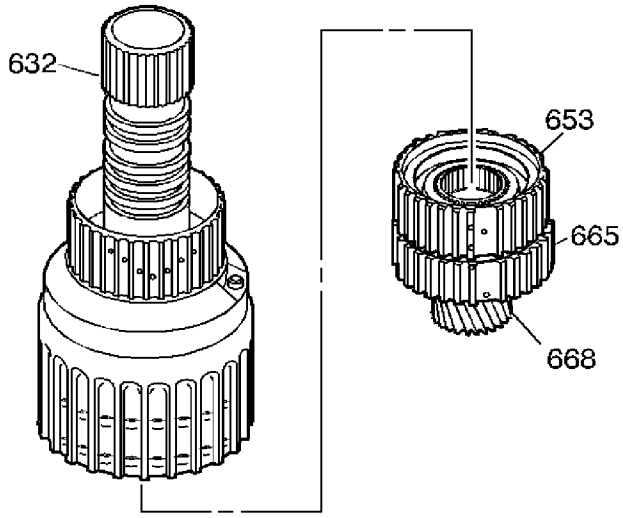
1. Inspect the reverse reaction drum (669) for the following:
   - Cracks
   - Damaged splines
   - Distortion



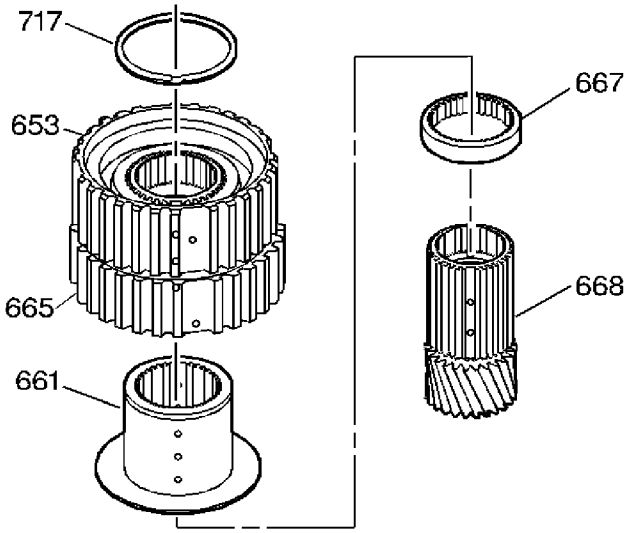
2. Install the reverse reaction drum (669) into the case and engage the drum onto the input carrier splines as shown.

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Input and Third Sprag Clutches Disassemble



1. Disassemble the input and third sprag clutch assemblies (653, 665) from the input clutch housing assembly (632).



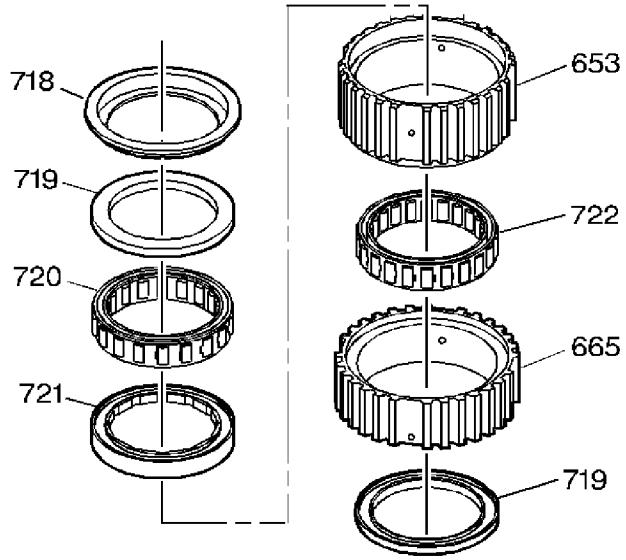
Important: After you remove the spiral lock retaining ring (717), discard the ring. Use a new spiral lock retaining ring when you reassemble the sprag.

2. Use a tapered blade screwdriver in order to remove the spiral lock retaining ring (717) from

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the input clutch sprag outer race retainer.

3. Remove the third clutch sprag assembly (665) and the input clutch sprag assembly (653) from the input and third clutch sprag inner race (661).
4. Remove the input and third clutch sprag inner race (661) and the input sun gear spacer (667) from the input sun gear (668).



5. Remove the 3rd clutch sprag outer race retainer (718).
6. Remove the input and third clutch sprag end bearings (719) and the input and third clutch sprag center bearing (721) from the sprag outer races (653, 665).

Important: Do not disassemble the sprag elements.

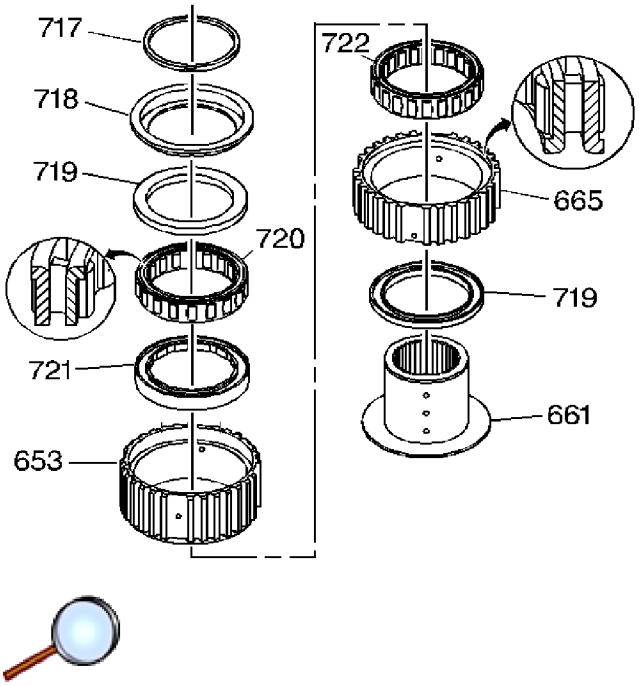
7. Remove the 3rd clutch and input clutch sprag assemblies (720, 722) from the sprag outer races (653, 665).

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Input and Third Sprag Clutches Assemble

Tools Required

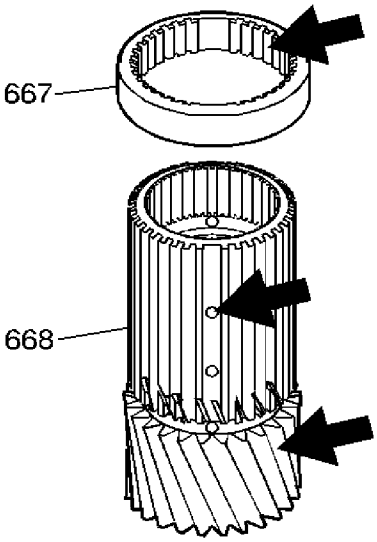
J 41022-A Spiral Snap Ring Installer



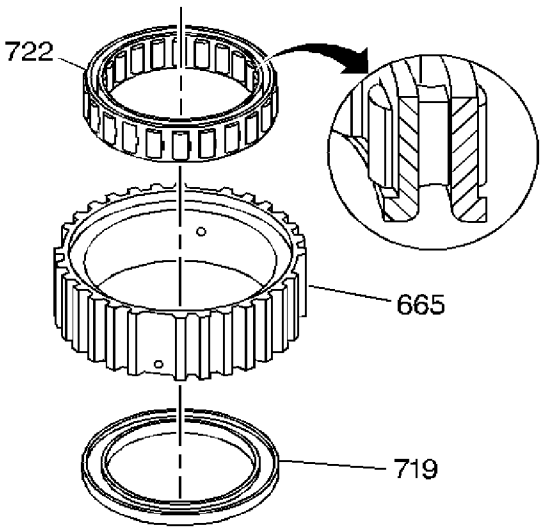
1. Inspect the outer races of the input sprag (653) and third sprag (665) for the following:
   - Worn or damaged splines
   - Scoring on the inside diameter of the races
   - Wear or cracks
2. Inspect the sprag elements for flat spots.
3. Inspect the cage assemblies (720, 722) for distortion or broken ribbon tabs.
4. Inspect the end bearings (719) and the center bearing (721) for cracks.

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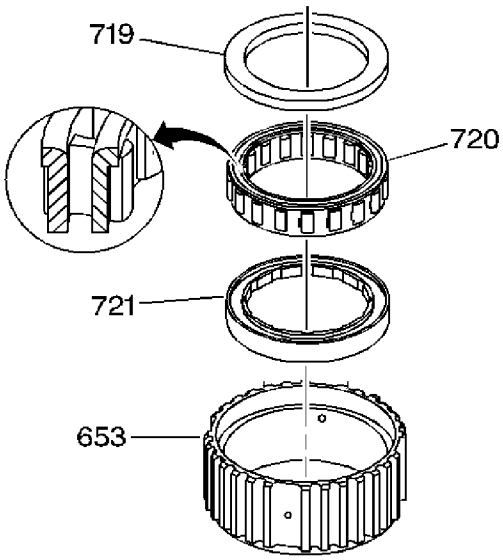


5. Inspect the input sun gear spacer (667) for the following:
   - Worn or damaged splines
   - Wear or cracks
6. Inspect the input sun gear (668) for the following:
   - Worn or damaged splines
   - Plugged lube holes or cracks



7. Position the input clutch sprag on a suitable flat work surface with the lip facing downwards.
8. Insert the end bearing (719) for the input and third clutch sprag into the outer race (665).
9. Insert the input sprag assembly (722) into the outer race (665).

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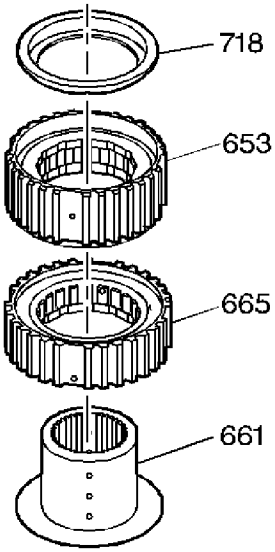
10. Position the third clutch sprag outer race (653) on a suitable flat work surface with the lube dam side facing down.

Important: The lip on the third sprag must be in the up position.

11. Insert the center bearing (721) of the input and third clutch sprag into the third clutch.

Important: The lip on the sprag cage must be in the up position.

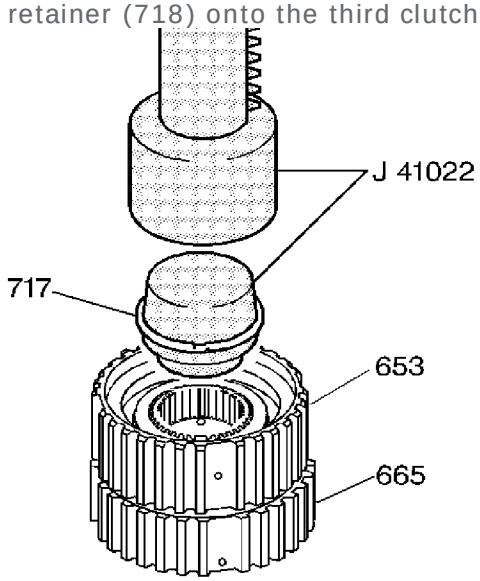
12. Install the third sprag assembly (720) into the third clutch outer race (653).
13. Insert the end bearing (719) into the third clutch outer race.



14. Install the input sprag assembly (665) onto the inner race (661) of the input and third clutch sprag.

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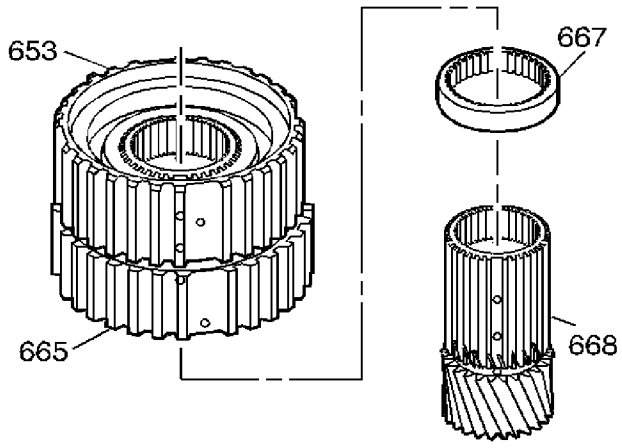
15. Install the third sprag assembly (653) onto the inner race (661).
16. Affix the retainer (718) onto the third clutch sprag outer race.



Important: Use new snap rings. Do not attempt to reinstall old rings.

Important: Be sure that you seat the spiral snap ring in the groove on the inner race. The tabs and the slots on the snap ring must lock.

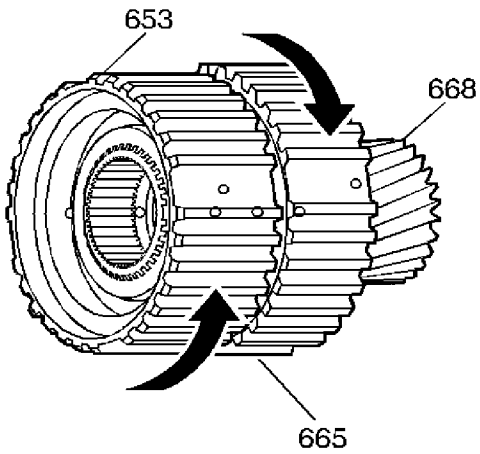
17. Attach J 41022-A to an arbor press. Use this tool combination and a small flat blade screwdriver in order to install the snap ring (717) onto the input clutch sprag.



18. Assemble the spacer (667) onto the input sun gear (668).
19. Assemble the input and third sprag clutch assemblies (665, 653) onto the input sun gear (668).

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Input and Third Sprag Clutches Functional Check



1. Hold the input sun gear (668) stationary in the position shown.
2. The third sprag clutch outer race (653) should rotate only in the direction shown by the arrow and not in the opposite direction.
3. The input sprag clutch assembly (665) should rotate only in the direction shown by the arrow and not in the opposite direction.

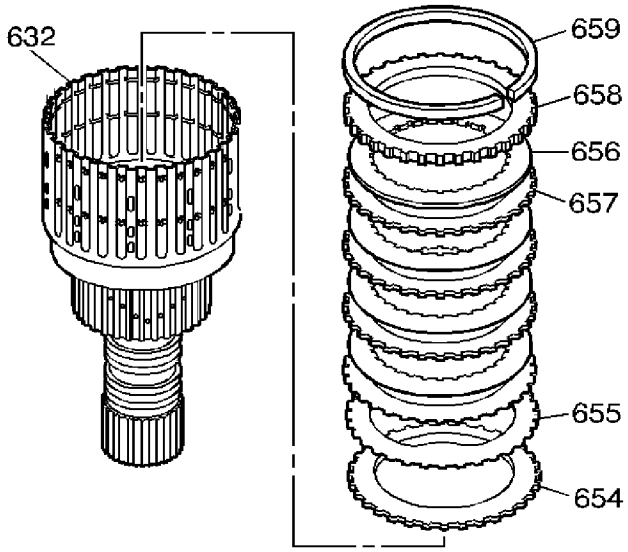
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Input and 3rd Clutch Disassemble

Tools Required

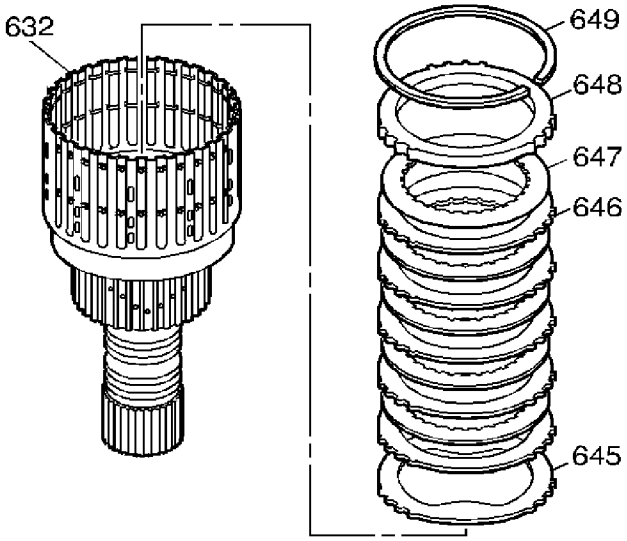
- J 23327 Clutch Spring Compressor
- J 25018-A Clutch Spring Compressor Adapter
- J 8059 Snap Ring Pliers



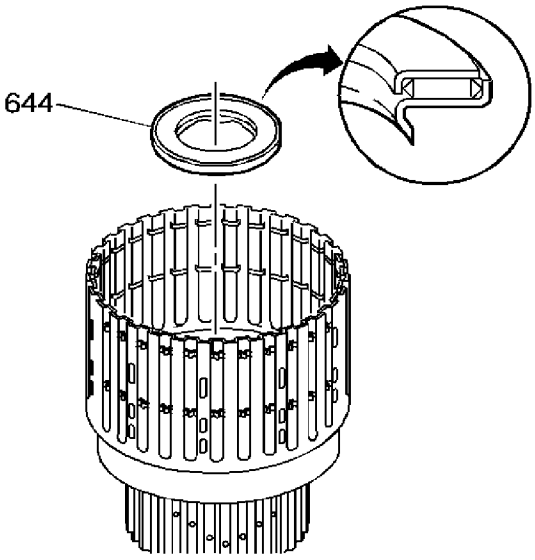
1. Use a flat blade screwdriver in order to remove the retaining ring (659) from the input shaft and housing assembly (632).
2. Remove the input clutch backing plate (658).
3. Remove all of the input clutch plate assemblies (656, 657).
4. Remove the input clutch waved plate (655) and the input clutch apply plate (654).

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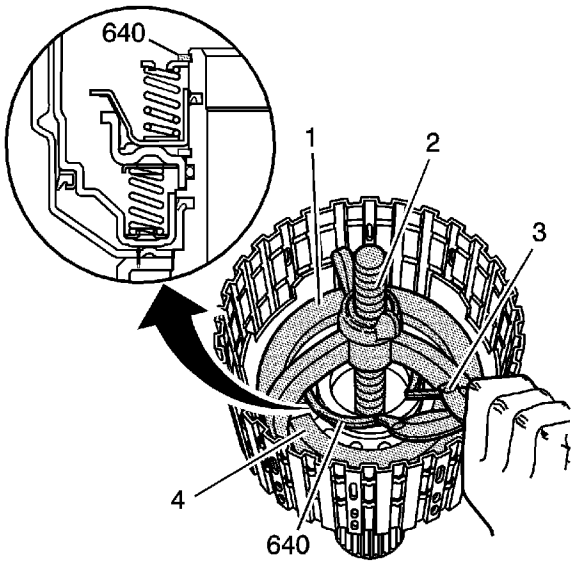


5. Use a flat blade screwdriver in order to remove the retaining ring (649) from the input shaft and housing assembly (632).
6. Remove the third clutch backing plate (648)
7. Remove the third clutch plate assemblies (646, 647).
8. Remove the third clutch waved plate (645).



9. Remove the input shaft thrust bearing assembly (644).

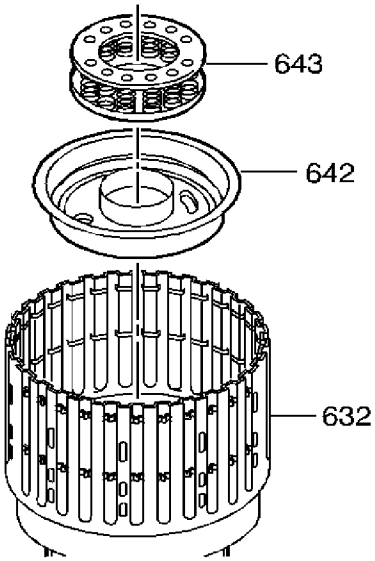
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10. Use J 23327 and J 25018-A in order to compress the third clutch spring retainer and guide assembly.

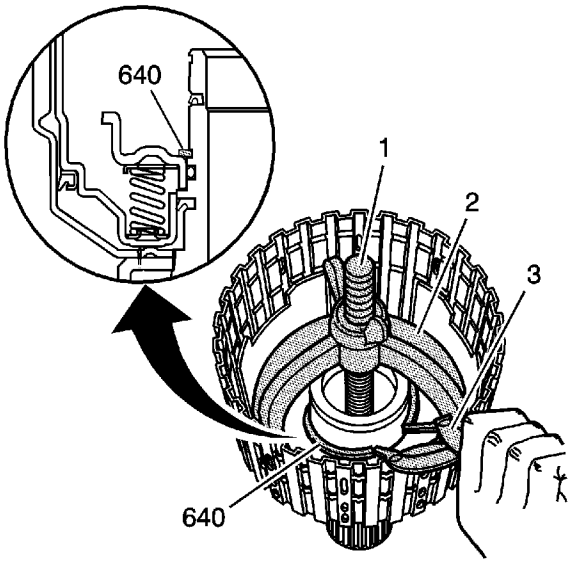
Important: Do not overexpand the retaining ring during removal.

11. Use J 8059 in order to remove the retaining ring (640) from the input shaft and housing assembly.
12. Remove J 23327 and J 25018-A from the input shaft and housing assembly.



13. Remove the third clutch retainer and guide spring assembly (643).
14. Remove the third clutch piston and seal assembly (642).

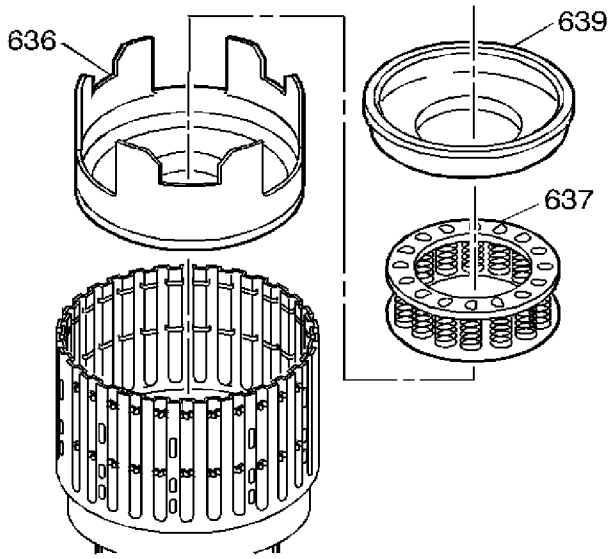
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15. Use J 23327 in order to compress the input clutch spring and retainer assembly.

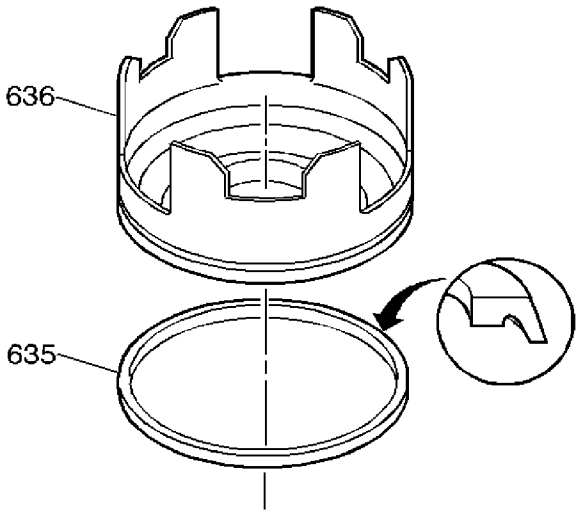
Important: Do not overexpand the retainer ring during removal.

16. Use J 8059 in order to remove the retainer ring (640) from the input shaft and housing assembly.
17. Remove J 23327 from the input shaft and housing assembly.

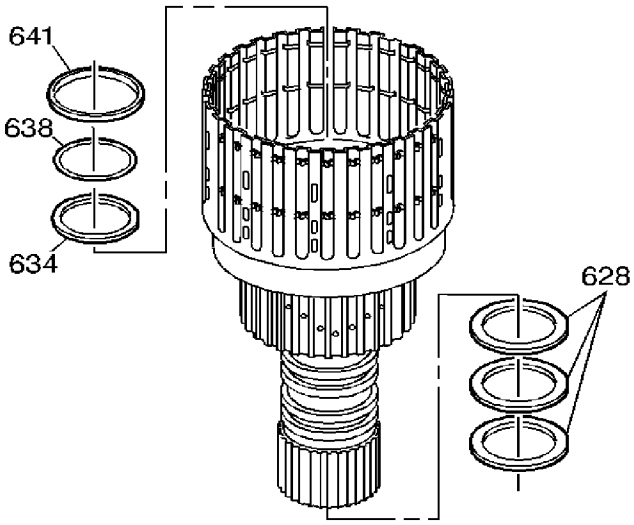


18. Remove the third clutch piston housing (639).
19. Remove the input clutch spring and retainer assembly (637).
20. Remove the input clutch piston assembly (636).

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21. Remove the input clutch piston outer seal (635).



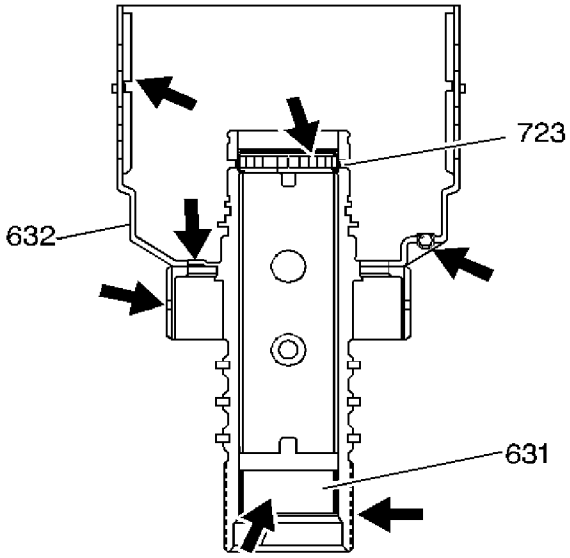
22. Remove the third clutch piston inner seal (641).
23. Remove the third clutch housing O-ring seal (638).
24. Remove the input clutch piston inner seal (634).

Important: Do not damage the grooves on the shaft when you remove the oil seal rings.

25. Cut the input shaft oil seal rings (628).
26. Remove the input shaft oil seal rings (628).

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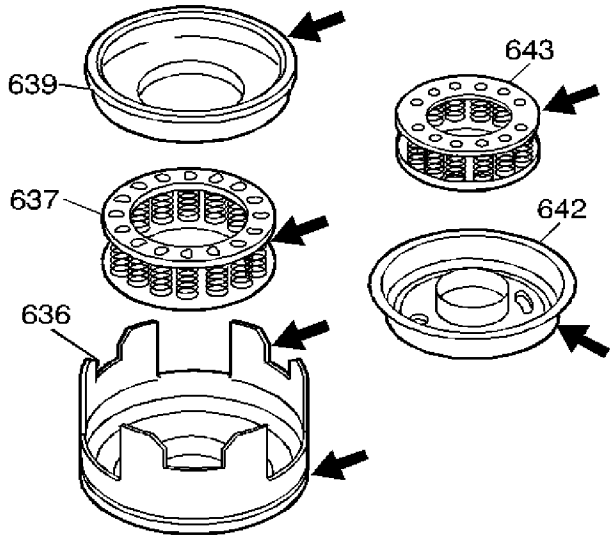
Input Clutch Housing Assembly Inspection



1. Inspect the input clutch housing assembly (632) for the following:
   - Plugged feed passages
   - Worn or damaged splines
   - Input shaft bushing (631) wear
   - Seal ring groove nicks or burrs
   - Cracks or blocked fluid passages in the input shaft
   - Damage or wear to the thrust bearing (723) in the input clutch housing
2. With the ball check valve assembly in its seated position in transmission fluid, Inspect the assembly for leaks.

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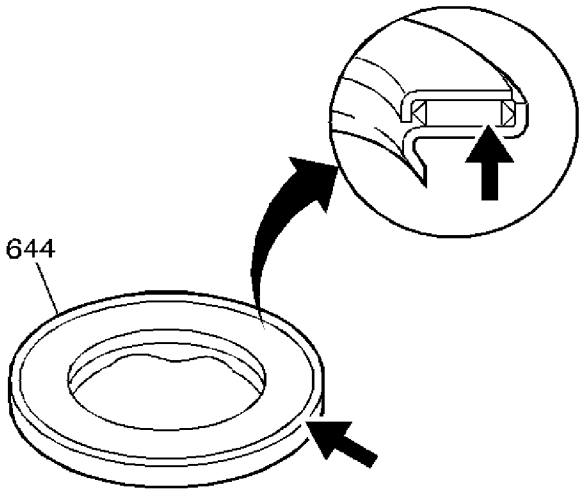
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3. Inspect the input clutch piston (636) for the following:
   - Cracks or damage to seal grooves
   - Wear on piston lugs
4. Inspect the input clutch spring and retainer assembly (637) for a damaged cage and distorted or missing springs.
5. Inspect the third clutch piston housing (639) for damage.
6. Inspect the third clutch spring retainer and guide assembly (643) for a damaged cage and distorted or missing springs.

Important: Do not attempt to reuse the third clutch piston and seal assembly.

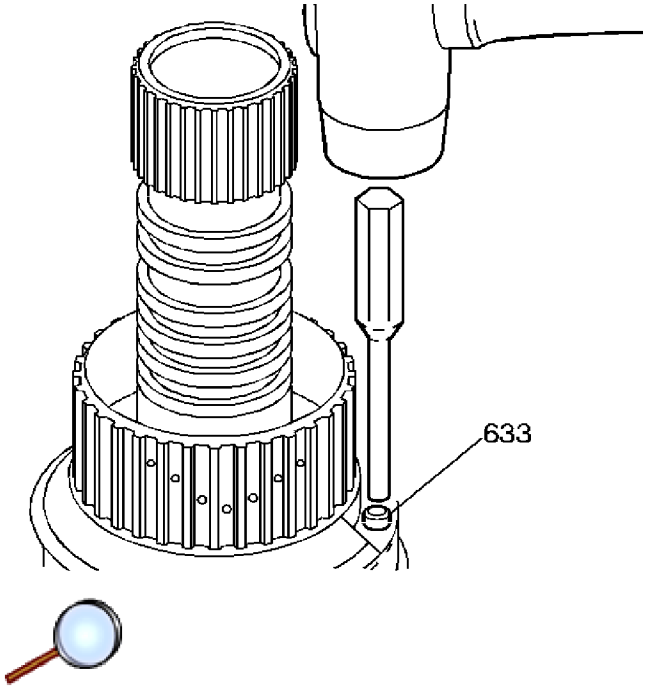
7. Replace the third clutch piston and seal assembly (642).



8. Inspect the input shaft thrust bearing assembly (644) for damage or wear.

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Input Clutch Housing Retainer and Ball Disassemble



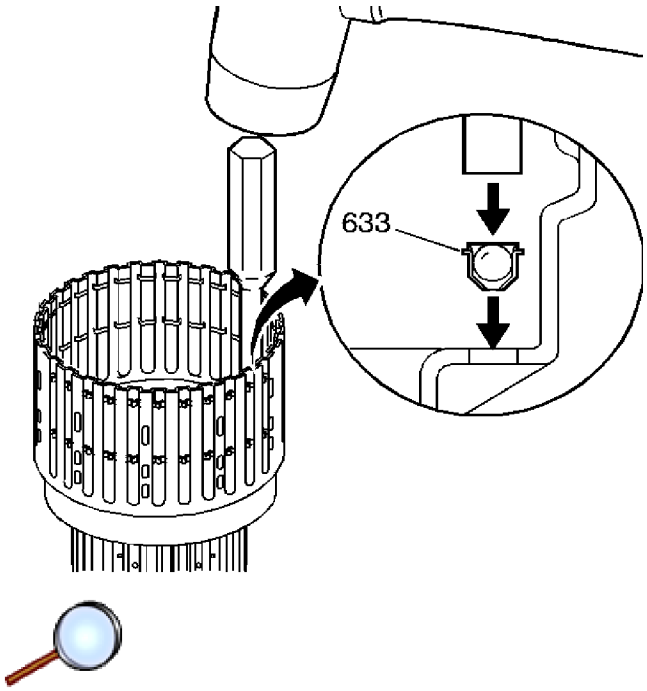
Important: Perform this procedure only if the inspection or leak check procedure indicated a problem.

Use a 6.25 mm (1/4 in) drift and mallet in order to remove the ball check valve assembly (633) from the input clutch housing.

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Input Clutch Housing Retainer and Ball Assemble



Use a 9.5 mm drift and mallet in order to assemble a new ball check valve assembly (633) into the input clutch housing.

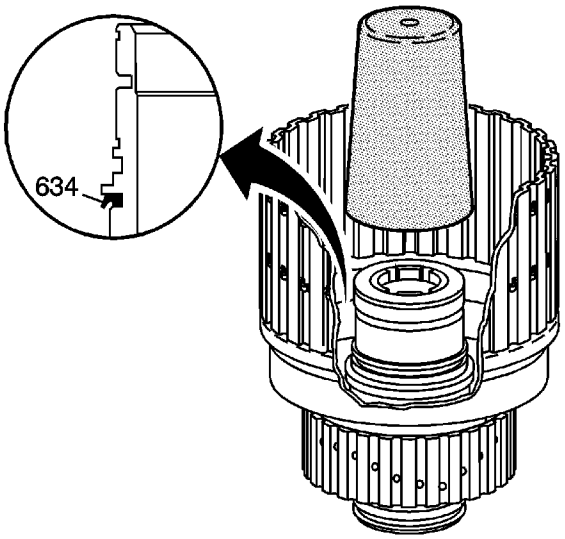
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Input and 3rd Clutch Assemble

Tools Required

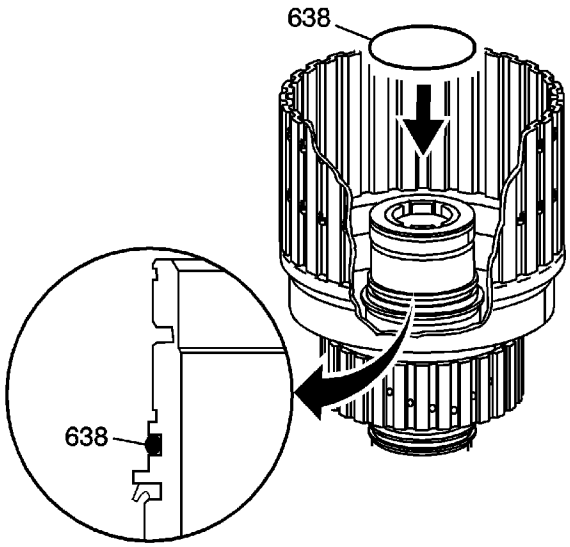
- J 37361 Input Clutch Inner Piston Seal Protector
- J 37362 Third Clutch Inner Piston Seal Protector
- J 23327 Clutch Spring Compressor
- J 25018-A Clutch Spring Compressor Adapter
- J 8059 Snap Ring Pliers



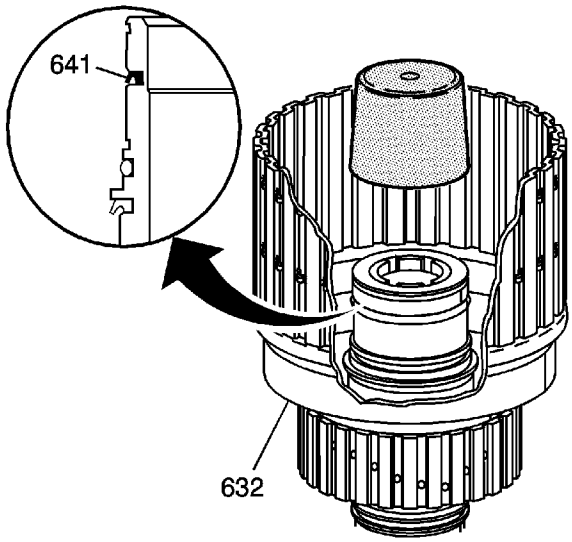
1. Use transmission fluid in order to lubricate the new input clutch piston inner seal (634).
2. UseJ 37361 in order to install the new seal.

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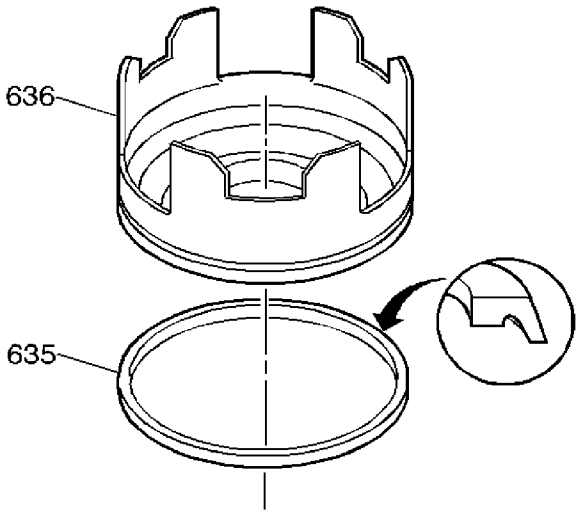


3. Insert a new third clutch housing O-ring seal (638) in the input shaft and housing assembly.

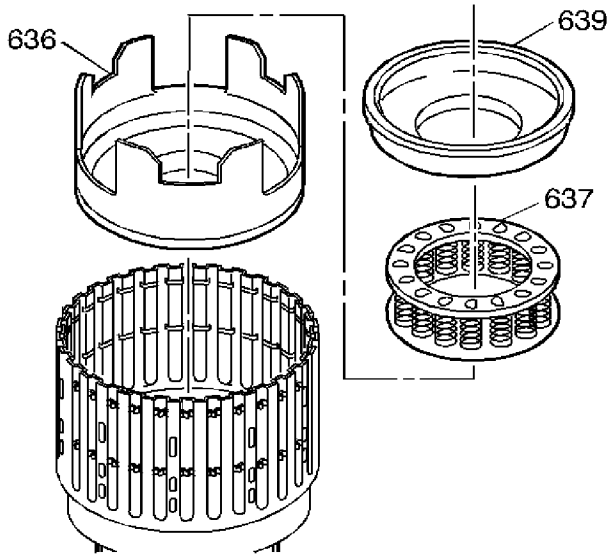


4. Use transmission fluid in order to lubricate the new third clutch piston inner seal (641).
5. Use J 37362 in order to install the seal in the input shaft and housing assembly (632).

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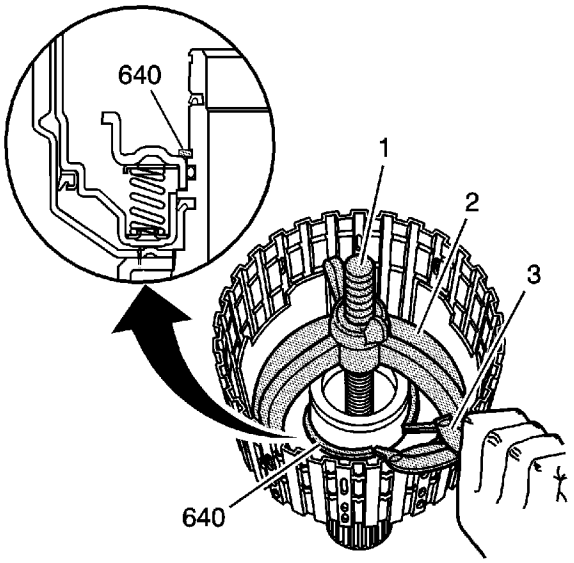


6. Use transmission fluid in order to lubricate the new input clutch piston outer seal (635).
7. Insert the new seal onto the input clutch piston assembly (636).

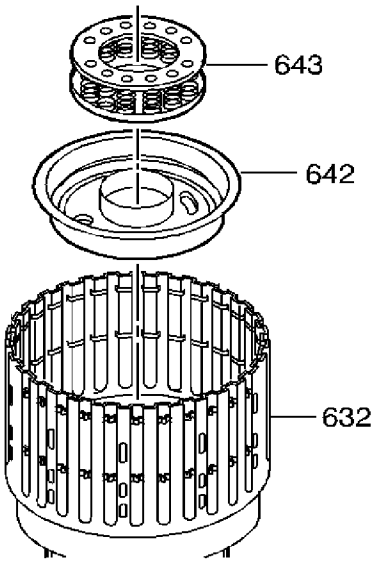


8. Install the input clutch piston assembly (636) into the input shaft and housing assembly.
9. Install the input clutch spring and retainer assembly (637) into the input shaft and housing assembly.
10. Install the third clutch piston housing (639) into the input shaft and housing assembly.

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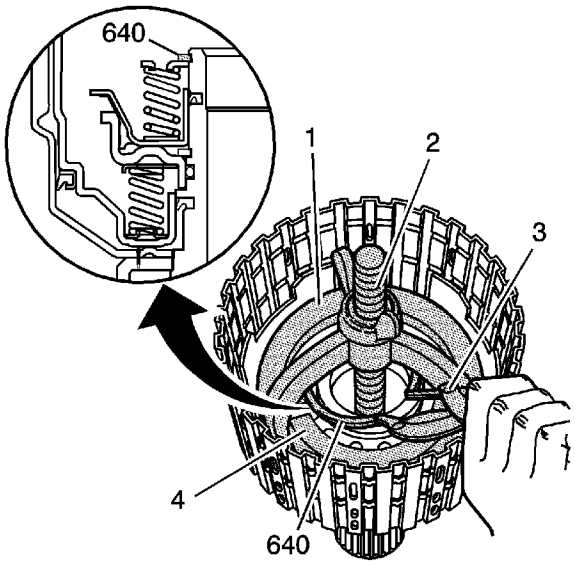


11. Use J 23327 and J 8059 in order to install the third clutch piston housing retaining ring (640) in the input shaft and housing assembly.
12. Remove the J 23327 .

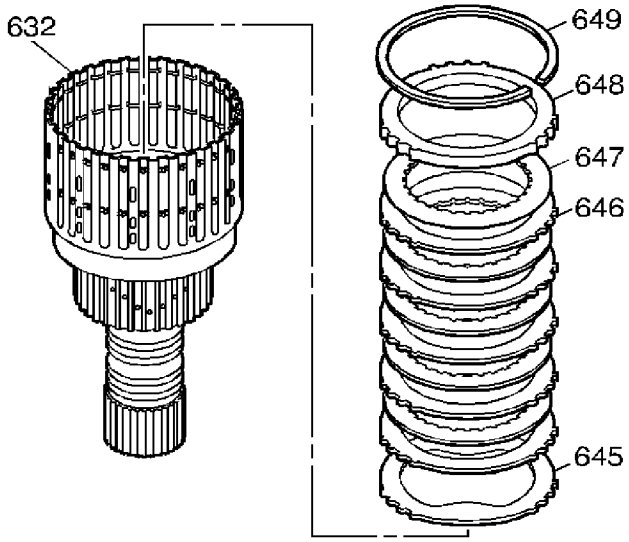


13. Use transmission fluid in order to lubricate the new third clutch piston and seal assembly (642). Install the third clutch piston and seal assembly (642) into the input shaft and housing assembly (632).
14. Install the third clutch spring retainer and guide assembly (643) into the input shaft and housing assembly (632).

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15. Use J 23327 , J 25018-A and J 8059 in order to install the third clutch spring retainer and guide assembly retaining ring (640).
16. Remove the J 23327 .

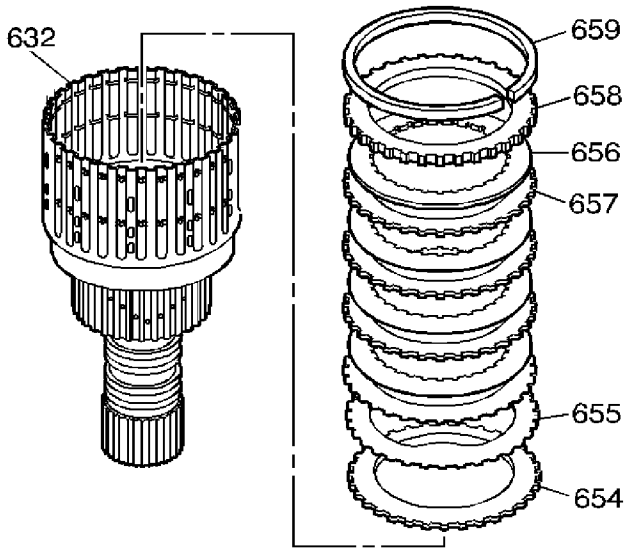


17. Insert the third clutch waved plate (645) into the input shaft and housing assembly (632).

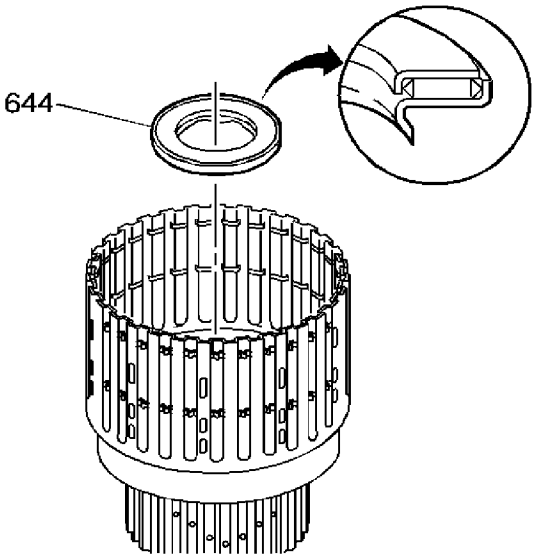
Important: Place the first externally splined plate with its steel side against the waved plate. Place the fiber side of all plates face upward.

18. Insert the third clutch plates assemblies into the input housing. Start by inserting a third clutch plate (646) with external splines. Alternate with the internally splined clutch plates (647).
19. Insert the third clutch backing plate (648) with the word UP facing upward.
20. Insert the retaining ring (649) into the input shaft and housing assembly (632).

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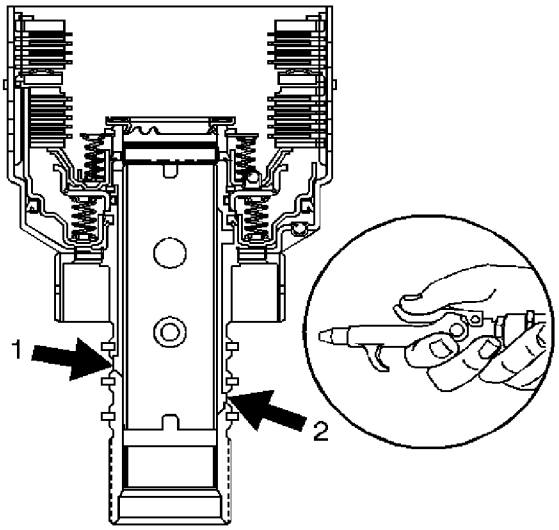
21. Insert the input clutch apply plate (654) into the input shaft and housing assembly (632), so that the notched side of the teeth are facing downward against the retaining ring on the third clutch backing plate.
22. Install the input clutch waved plate (655).
23. Install the input clutch plates (656, 657) starting with an input clutch steel plate (657) and alternating with input clutch fiber plate assemblies (656).
24. Insert the input clutch backing plate (658) with the tapered side of the teeth facing upward.
25. Insert the retaining ring (659) in the input shaft and housing assembly (632).



26. Insert the input shaft thrust bearing assembly (644).

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Input and 3rd Clutch Functional Air Check





Notice: Do not exceed the recommended amount of air pressure or it may damage or cause seals to roll.

1. Use a rubber tipped air nozzle in order to apply a maximum 138 kPa (20 psi) at each indicated fluid passage.
2. Listen for the following:
   - The third clutch (1) assembly to apply
   - The input clutch (2) assembly to apply

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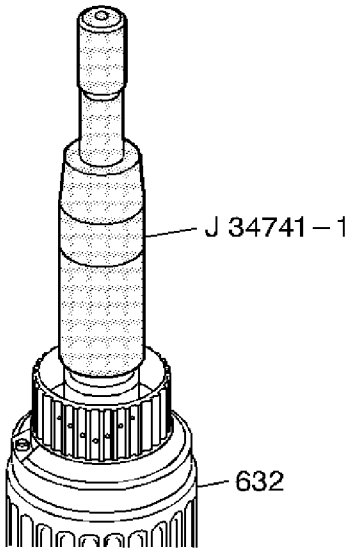
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Input Clutch Housing Fluid Seal Ring Assemble

Tools Required

J 34741-A Input Seal Installer contains:

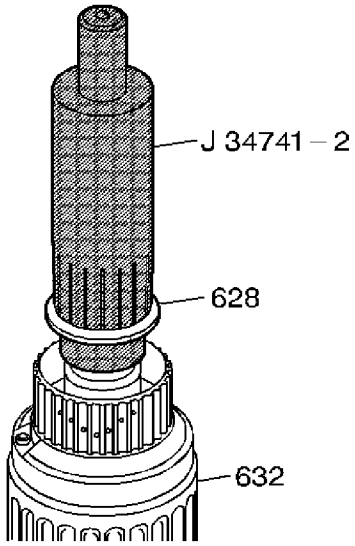
- J 34741-1 Adjustable Seal Protector
- J 34741-2 Seal Pusher
- J 34741-3 Seal Sizer



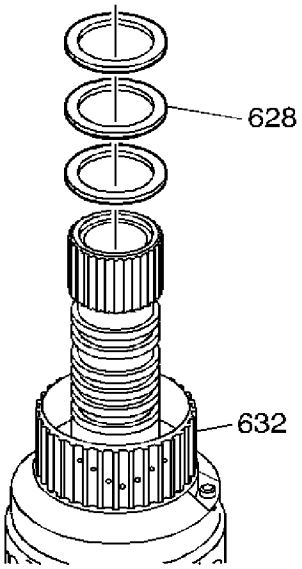
1. Install J 34741-1 into the input clutch housing (632). Adjust J 34741-1 so that the bottom of the seal installer aligns with the lowest seal ring groove.
2. Use transmission fluid in order to lubricate the oil seal ring for the input clutch housing. Position the ring on the J 34741-1 .

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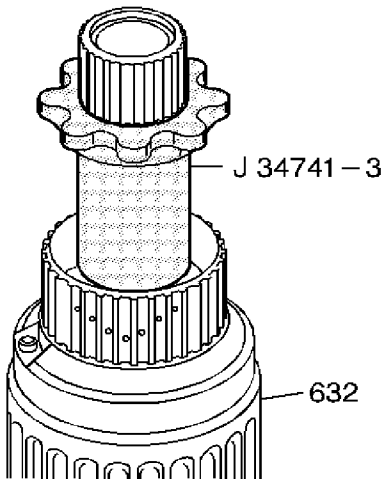


3. Position J 34741-2 onto the J 34741-1 . Push the seal (628) into the seal ring groove.



4. Repeat this procedure for the second and the third seal rings (628).

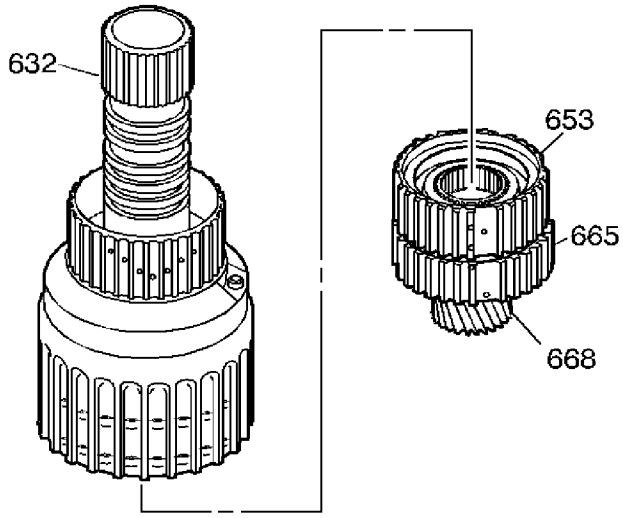
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5. Remove the input seal installer.
6. Use a twisting motion in order to assemble J 34741-3 over the seals.
7. Leave J 34741-3 in place until the input clutch housing assembly (632) is assembled into the transmission.

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Input Clutch Housing and Sprag Clutches Assemble



1. Use a small screwdriver in order to align the teeth of the input clutch plate assembly and the third clutch plate assembly. This will ease installation of the sprag clutch assembly.

   Important: Make sure that the sprag clutch assembly is fully seated into the housing.

2. Insert the combined input sprag clutch (665), third sprag clutch (653) and input sun gear (668) assembly into the input clutch housing assembly (632).

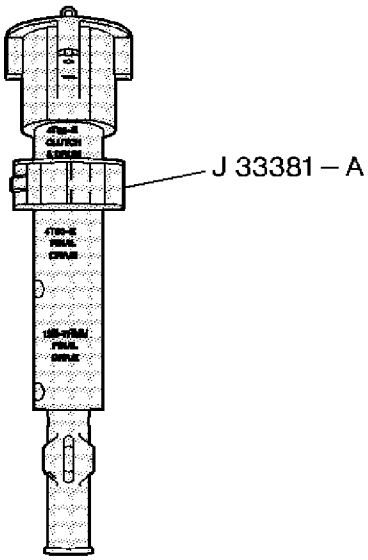
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Input Clutch Housing End Play Check

Tools Required

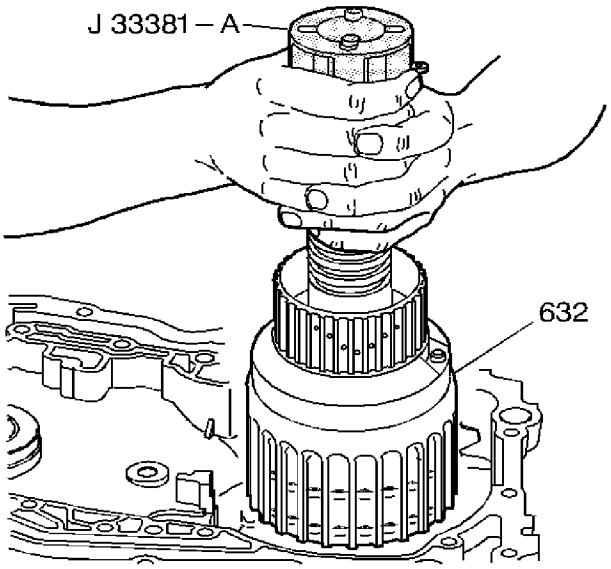
- J 26958 Output Shaft Loading and Aligning Tool
- J 26958-10B Adapter Plug
- J 33381-A Final Drive Remover and Installer
- J 33386-A Input Shaft End Play Tool
- J 38385 Output Shaft Loading Tool Adapter
- J 43425 Output Shaft Loading Tool Adapter



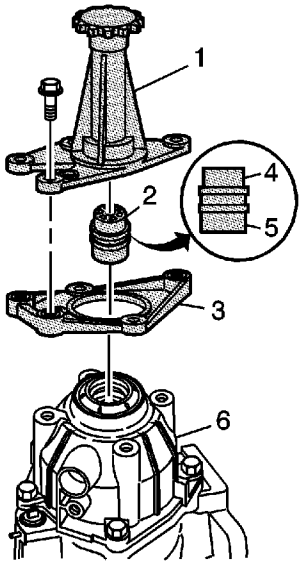
1. Adjust the collar on tool J 33381-A to the 4T60-E CLUTCH & DRUM setting.

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2. Install J 33381-A into the input clutch housing assembly (632).
3. Tighten the threaded rod of J 33381-A until the rod is finger tight.
4. Use J 33381-A in order to lift the input clutch housing assembly (632). The sprag clutch assemblies will also be attached.
5. Install the assembly (632) into the case. Be sure that the assembly is down all the way.



Important: The tool J 38385 (3) is used on a standard duty transmission, and J 43425 (3) is used on a heavy duty transmission.

6. Install J 38385 (3) for a standard duty transmission or J 43425 (3) for a heavy duty transmission.

Important: The tool J 26958-10B (2) is model specific and can be used on a standard duty

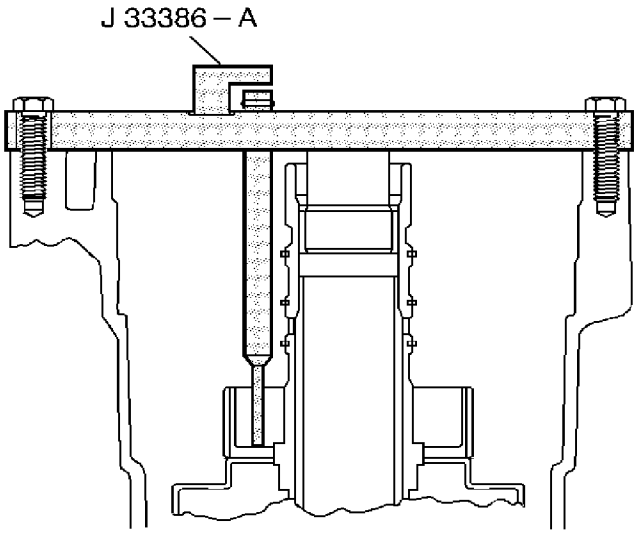
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and a heavy duty transmission. This tool has a small end (4) and a larger end (5). Standard duty would use the smaller end (4) facing down, and a heavy duty would use the larger end (5) facing down.

7. Install J 26958-10B (2) depending on model. Stadard duty uses this tool with the smaller end (4) facing down. Heavy duty uses this tool with the larger end (5) facing down.

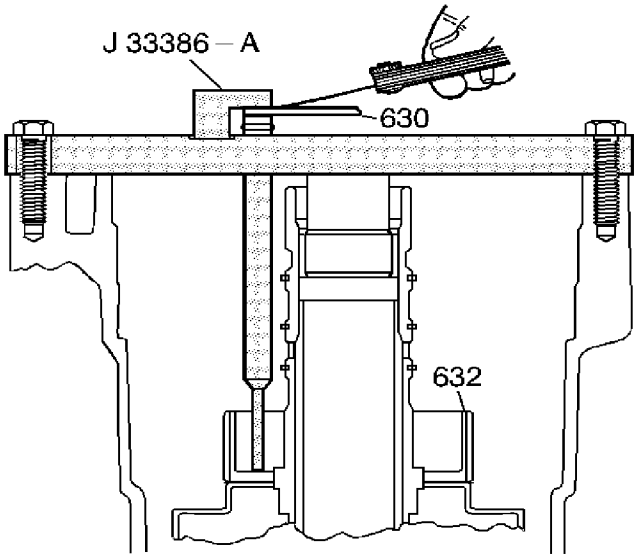
Important: Install bolts and tighten securely to prevent tool deflection during end play measurement.

8. Install J 26958 (1) onto the case extension (6).



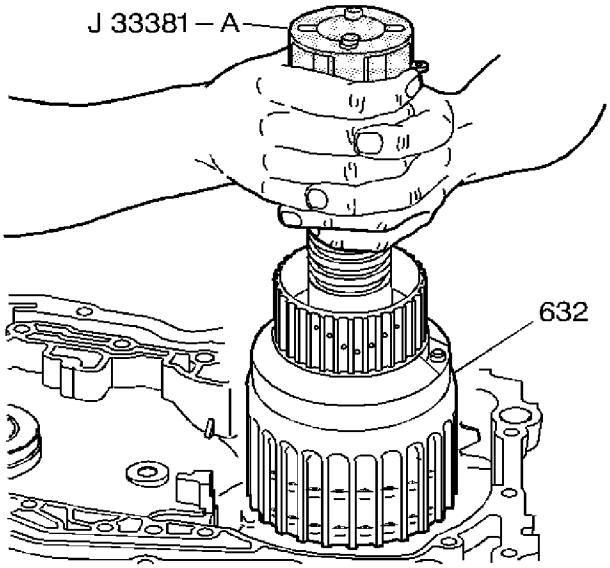


9. Using two bolts, install J 33386-A onto the case.
10. Tighten the bolts in order to securely hold J 33386-A .
11. Tighten J 26958 finger tight in order to eliminate differential carrier end play.



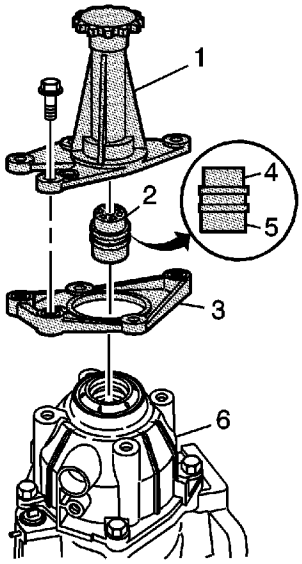
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12. Insert the thrust washer (630) from the input clutch housing (632) into J 33386-A as indicated. If the thrush washer will not fit into J 33386-A , select the next size smaller thrust washer and recheck.
13. Use a feeler gage in order to measure the clearance between J 33386-A and the thrust washer (630).
    - If the clearance is less than 0.0521 mm (0.006 in), use the current size thrust washer
    - If the clearance is 0.0521 mm (0.006 in) or more, select the next size larger thrust washer and recheck
14. Refer to the Thrust Washer Selection Guide in End Play Specifications .



15. Remove J 33386-A .
16. Adjust the collar on tool J 33381-A to the 4T60-E CLUTCH & DRUM setting. Make sure that the threaded rod is fully loosened.
17. Install J 33381-A into the input clutch housing (632).
18. Tighten the threaded rod of J 33381-A until the rod is finger tight.
19. Use J 33381-A in order to lift the input clutch housing assembly (632). The sprag clutch assemblies will also be attached.
20. Remove the assembly (632) from the case.

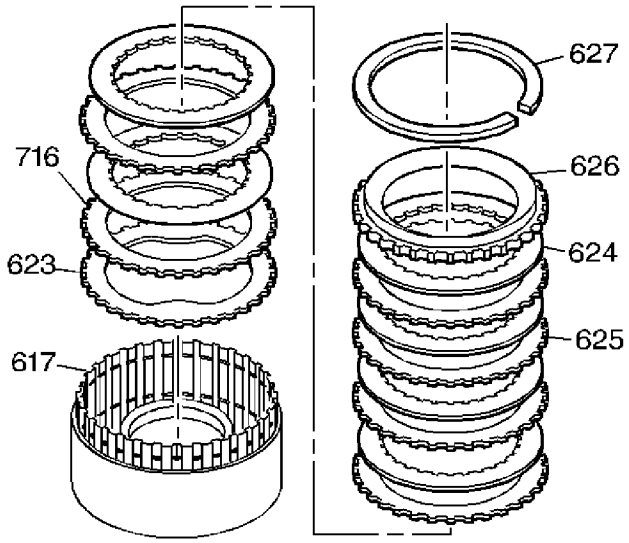
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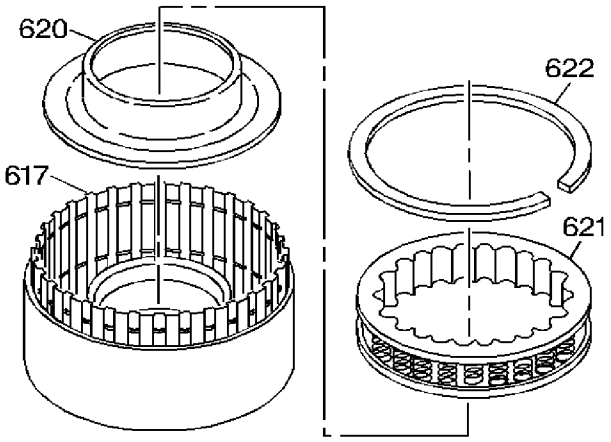
21. Position the transmission so that the oil pan is facing down.
22. Remove J 26958 (1), J 26958-10B (2), and J 38385 (3) or J 43425 (3).

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2nd Clutch Disassemble



1. Use a flat blade screwdriver in order to remove the retaining ring (627) from the second clutch housing.
2. Remove the second clutch backing plate (626). Remove the alternating second clutch fiber plates (624). Remove the second clutch steel plates (625).
3. Remove the second clutch apply plate (716). Remove the second clutch waved plate (623).



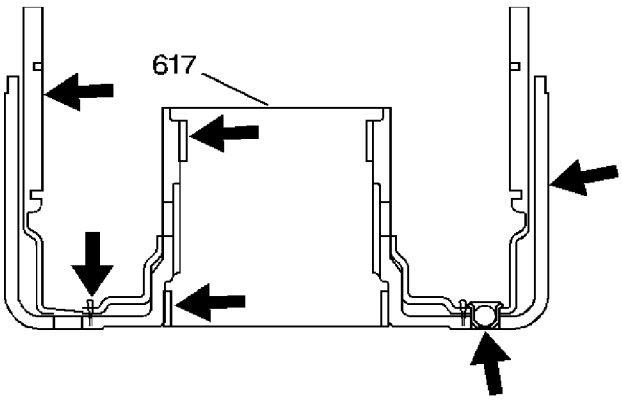
4. Use a flat blade screwdriver in order to remove the retaining ring (622) from the second clutch housing.
5. Remove the second clutch spring assembly (621).

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6. Remove the second clutch piston assembly (620).

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2nd Clutch Housing Assembly Inspection

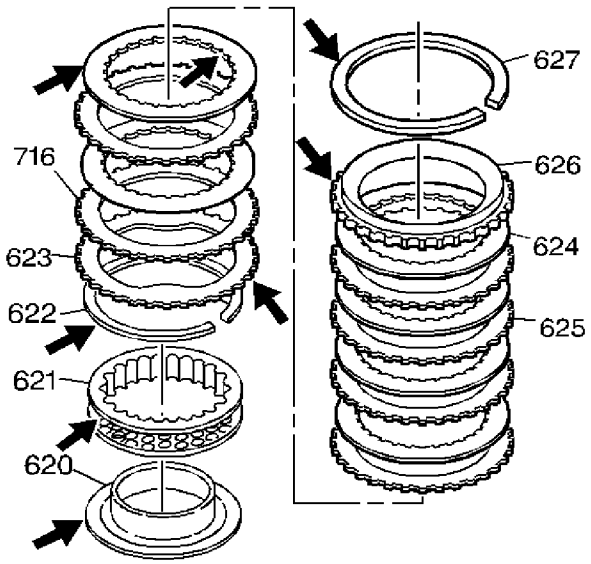




1. Inspect the second clutch housing assembly (617) for the following:
   - A leaking or damaged ball check valve in the second clutch housing. Turn the housing in order to seat the check ball. Use transmission fluid in order to check for leaks.
   - Scored or worn bushings
   - Discolored band surface or wear on the drum caused by excess heat
   - Flatness of the band surface on the drum
   - Damaged reverse reaction drum splines
   - Cracks in welds

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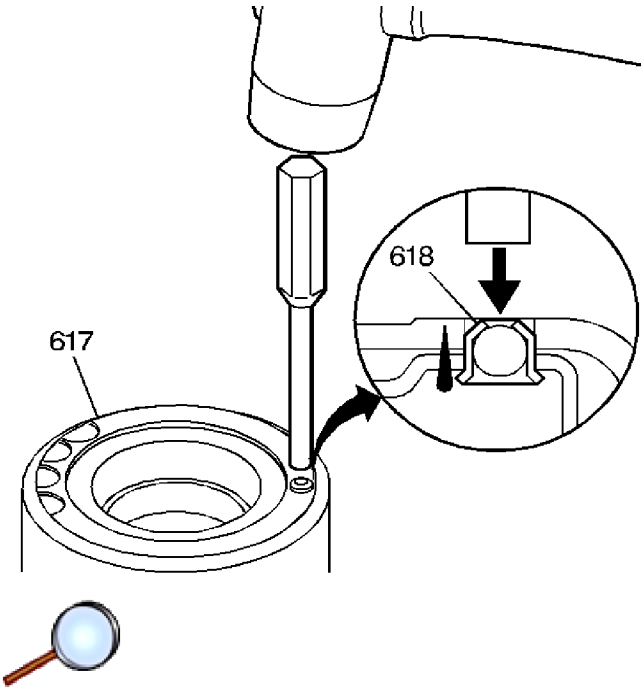
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2. Inspect the backing plate (626) and the waved plate (623) of the second clutch for cracks or heat spots.
3. Inspect the steel plates (625) and the apply plate (716) of the second clutch for wear.
4. Inspect the fiber plates (624) of the second clutch for wear, flaking, or lining separation.
5. Inspect the spring assembly (621) of the second clutch for damage to the ring cage. Check for distorted or missing springs.
6. Inspect the spring snap ring (622) of the second clutch for damage. Inspect the snap ring (627) of the second clutch backing plate for damage.

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Second Clutch Housing Retainer/Ball Disassemble



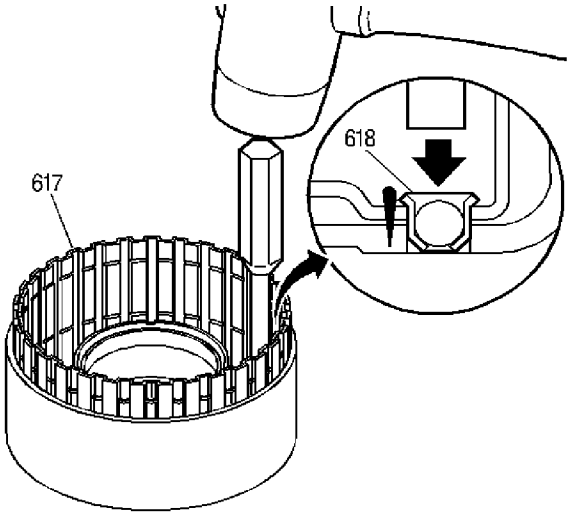
Important: If the ball check valve assembly (618) does not leak, do not remove the assembly.

Use a 6.25 mm (1/4 in) drift and a mallet in order to remove the ball check valve assembly (618) from the second clutch housing (617).

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Second Clutch Housing Retainer/Ball Assemble





Use a 9.5 mm (3/8 in) drift and a mallet in order to assemble a new ball check valve assembly (618) in the second clutch housing (617).

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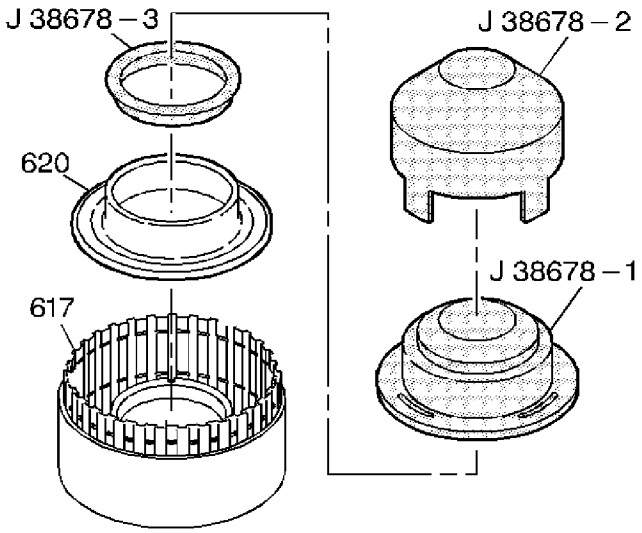
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2nd Clutch Assemble

Tools Required

J 38678-A Second Clutch Piston Assembly Tool contains:

- J 38678-A -1 Protector
- J 38678-A -2 Installer
- J 38678-A -3 Adapter



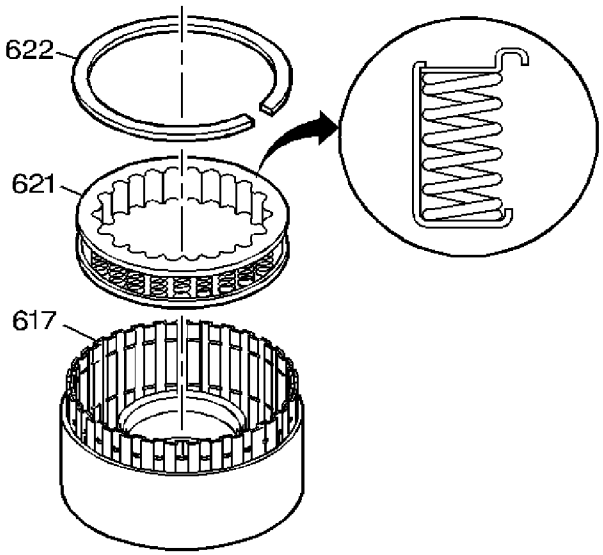
1. Install J 38678-A -3 into the new second clutch piston assembly (620).
2. Install the piston and J 38678-A -3 into J 38678-A -1 protector.
3. Install the piston assembly into the second clutch housing assembly (617).

Important: Carefully center the inner seal protector onto the hub by pushing down on the center of J 38678-A -1.

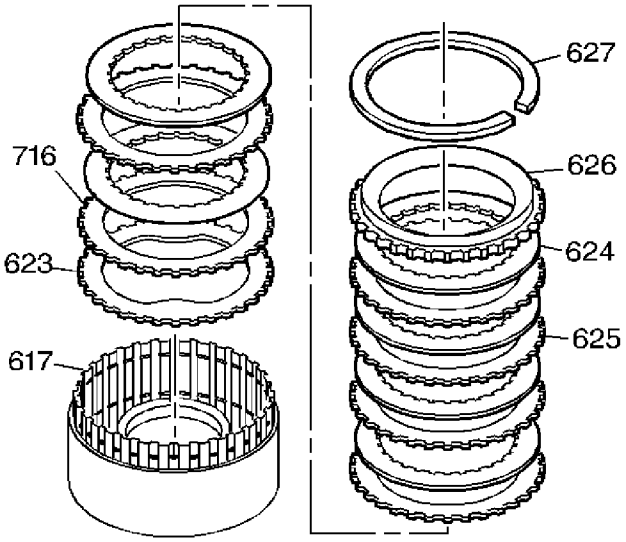
4. Insert the legs of J 38678-2 installer into the slots of J 38678-A -1 protector.
5. Using your hand, press down on the installer J 38678-A -2 until the piston is seated.

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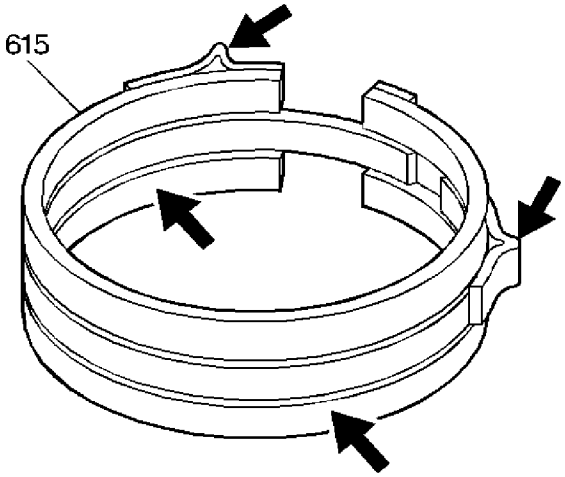
6. Assemble the second clutch spring assembly (621) into the second clutch housing assembly (617).
7. Install the snap ring (622) in the second clutch housing.



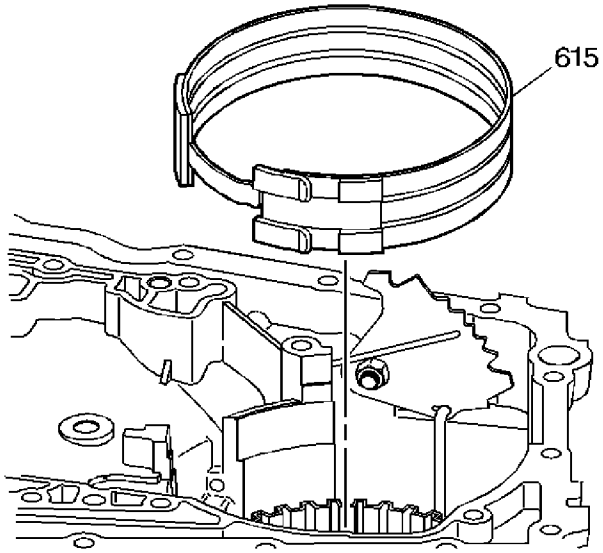
8. Install the waved plate (623) into the second clutch housing (617).
9. Install the apply plate (716) into the second clutch housing, with the marking DN or DOWN toward the piston.
10. Install a fiber plate (624), followed by a steel plate (625) into the second clutch housing.
11. Assemble remaining plates, alternating between steel and fiber.
12. Install the backing plate (626) into the second clutch housing, with the machined side facing up and the smooth side facing down.
13. Install the snap ring (627) into the second clutch housing.

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Reverse Band Assemble



1. Inspect the reverse band assembly (615) for the following:
   - Cracks
   - Scoring
   - Lining separation
   - Wear of the fiber material
2. Inspect the apply lug for cracks.



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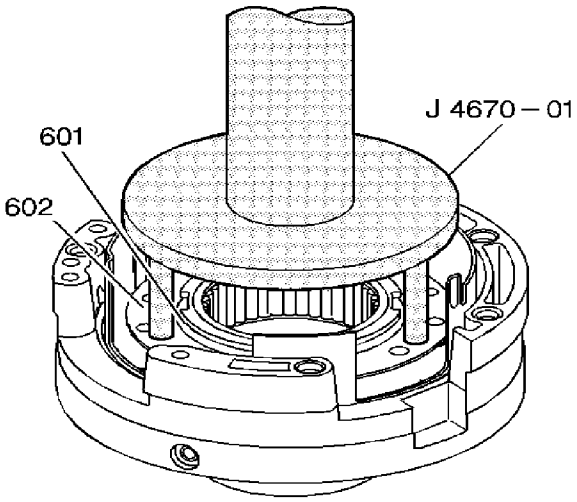
3. Install the reverse band assembly (615) into the case with the band end aligned on the anchor pin in the case.

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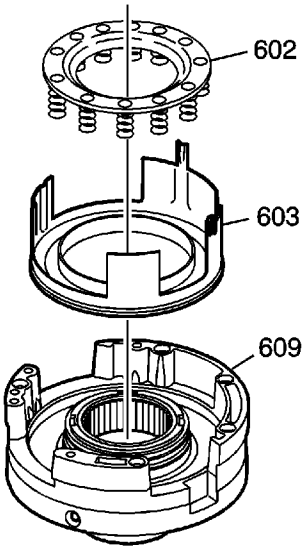
Driven Sprocket Support Components Disassemble

Tools Required

J 4670-01 Clutch Spring Compressor



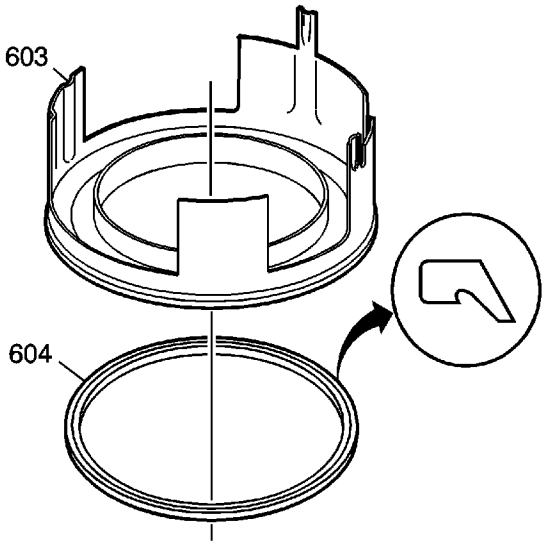
1. Use J 4670-01 clutch spring compressor in order to compress the fourth clutch spring assembly (602). Remove the snap ring (601) from the driven sprocket support assembly.



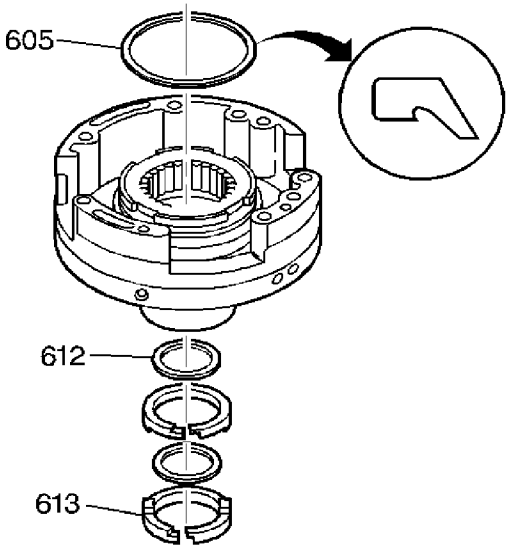
2. Remove the spring assembly (602) and remove the fourth clutch piston assembly (603) from

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the driven sprocket support assembly (609).



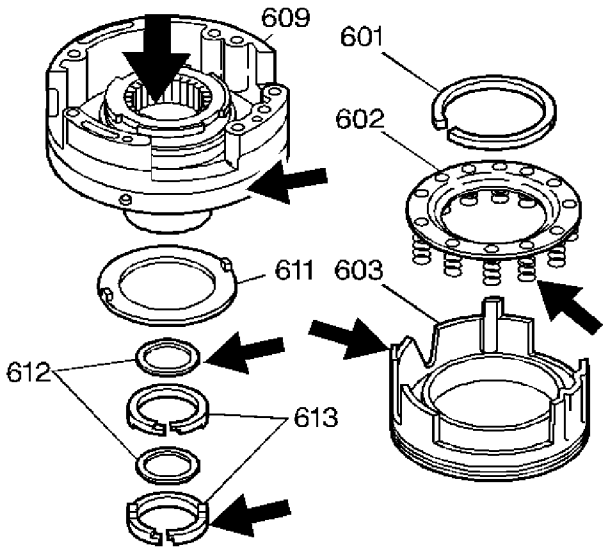
3. Remove the outer seal (604) from the fourth clutch piston (603).



4. Remove the inner seal (605) for the fourth clutch piston from the driven sprocket support assembly hub.
5. Remove the oil seal rings (613) and the four-lobed ring seal (612) from the driven sprocket support.

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Driven Sprocket Support Components Inspection



1. Inspect the driven sprocket support assembly (609) for the following:
   - Worn or cut oil seal rings (612)
   - Rolled or cut second clutch housing oil seal ring seals (613)
   - Damage to the piston seal surface in the driven sprocket support assembly
   - Blocked or porous oil passages in the driven sprocket support assembly
   - A leaking or missing cup plug
2. Inspect the fourth clutch piston (603) for damage.
3. Inspect the thrust washer (611) from the second clutch housing for cracks or distortion.
4. Inspect the fourth clutch spring assembly (602) for distorted or missing springs.
5. Inspect the driven sprocket bearing assembly for foreign material and missing, flat, or damaged rollers.
6. Replace the Teflon® seal rings (613) under the following conditions:
   - The rings are cut or damaged
   - You are performing a complete overhaul
7. Inspect all seal ring grooves for debris, burrs, or damage.

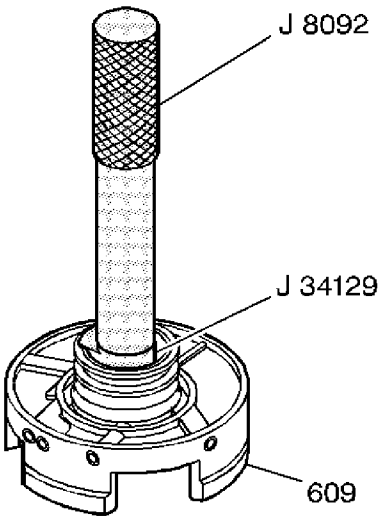
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Driven Sprocket Support Bearing Disassemble

Tools Required

- J 34129 Bearing Remover
- J 8092 Driver Handle



Use J 34129 , J 8092 and a hammer in order to remove the driven sprocket support bearing assembly from the driven sprocket support assembly (609).

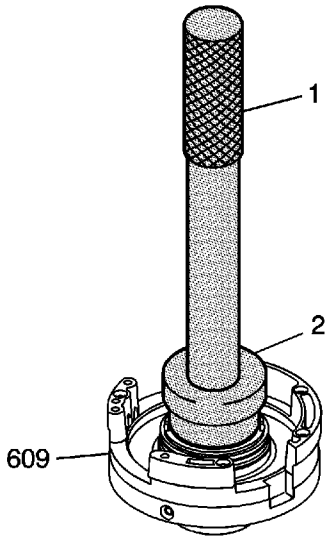
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Driven Sprocket Support Bearing Assemble

Tools Required

- J 34126 Sprocket/Remover Bearing Remover
- J 8092 Driver Handle



Important: Position the driven sprocket support bearing assembly so that markings on the edge are facing up.

Use J 34126 (2) , J 8092 (1) and a hammer in order to seat the driven sprocket support bearing assembly flush with or below the driven sprocket support assembly (609) hub.

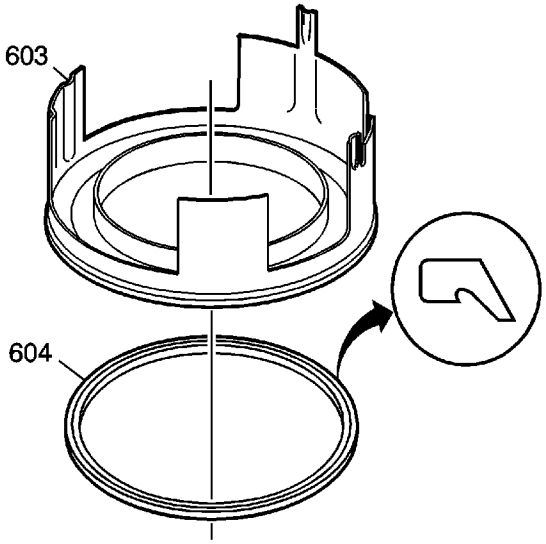
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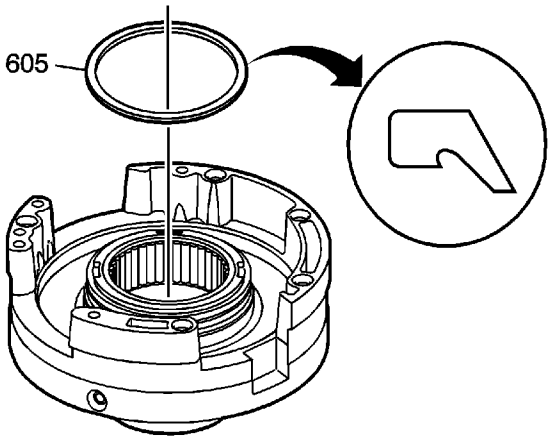
Driven Sprocket Support Components Assemble

Tools Required

J 4670-01 Clutch Spring Compressor



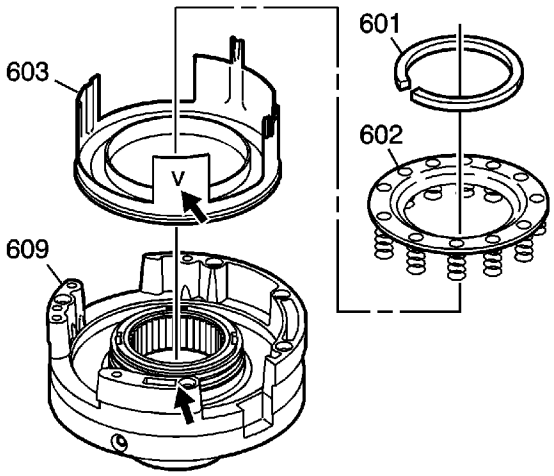
1. Use transmission fluid in order to lubricate a new outer seal (604) for the fourth clutch piston (603). Affix the seal to the piston.



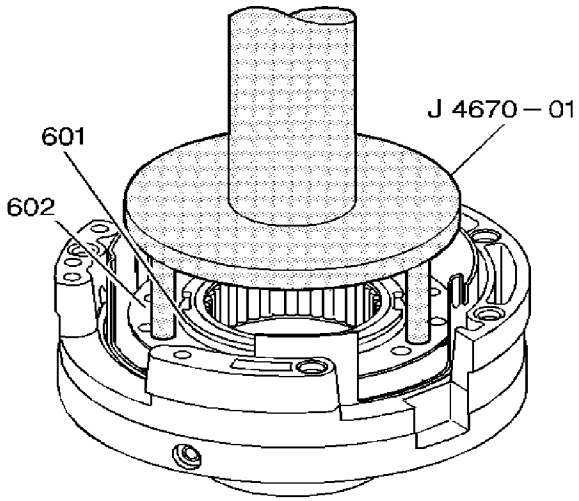
2. Use transmission fluid in order to lubricate a new inner seal (605) for the fourth clutch

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piston. Affix the seal to the driven sprocket support hub.

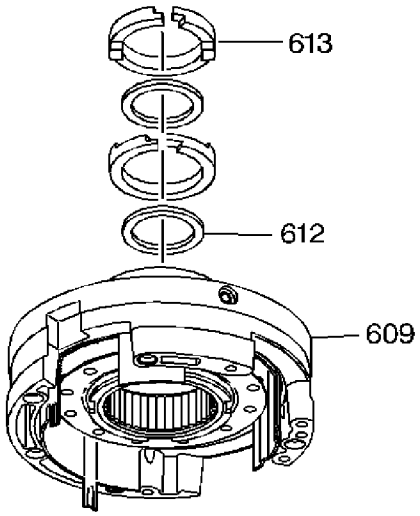


3. Insert the fourth clutch piston assembly (603) into the driven sprocket support (609) and align as shown.
4. Insert the fourth clutch spring assembly (602) into the piston.



5. Use J 4670-01 in order to install the fourth clutch spring snap ring (601).

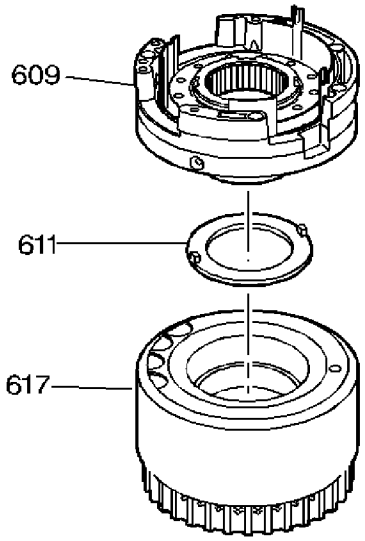
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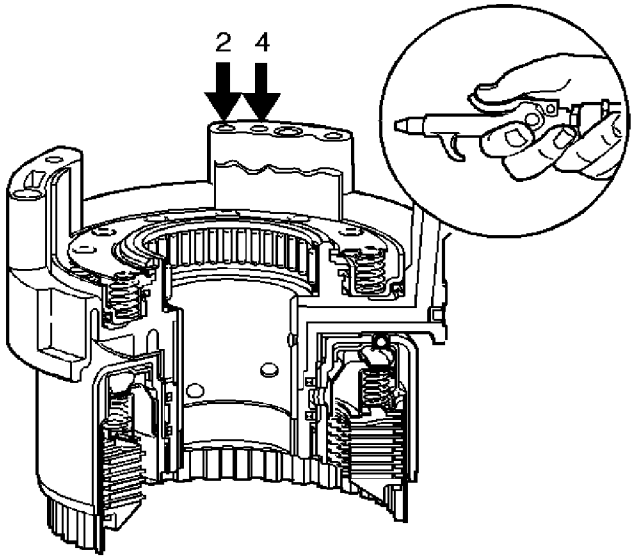
6. If you are installing new oil seal rings (613) for the second clutch housing, lubricate the rings. Insert the rings onto the driven sprocket support hub.
7. Affix the four lobed ring seals (612) for the second clutch housing onto the driven sprocket support hub (609).

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4th and 2nd Clutch Functional Air Check



1. For the purposes of this test, attach the driven sprocket support assembly (609) and the second clutch housing thrust washer (611) onto the second clutch housing assembly (617).



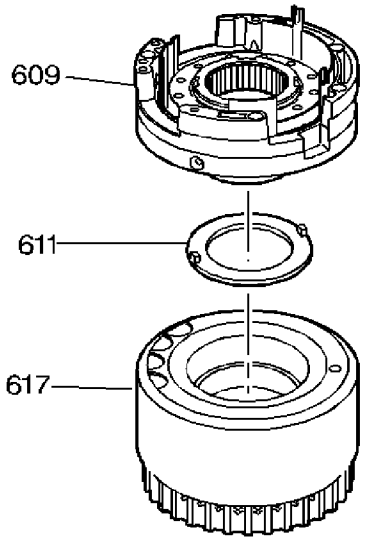
Important: Air pressure that exceeds recommended intensity may damage the seals or cause the seals to roll.

2. Apply 138 kPa (20 psi) to the feed holes marked 2 and 4, and listen for the second and

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fourth clutches to apply.

3. Hold the pressure for five seconds. If the clutches do not apply and hold, then disassemble the driven sprocket support components. Inspect all of the seals and clutches for proper assembly. When finished, repeat the functional check.



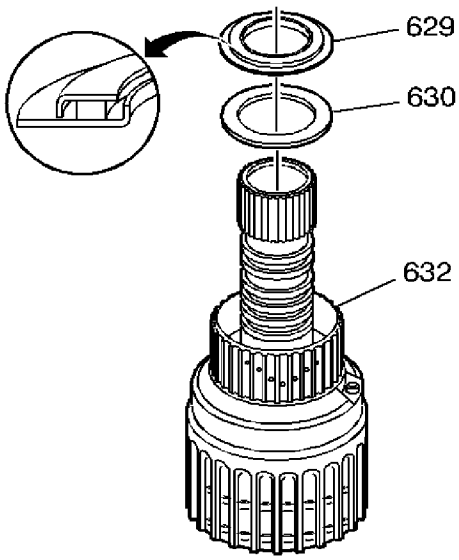
4. When the clutches apply and hold correctly, remove the driven sprocket support assembly (609) and the second clutch housing thrust washer (611) from the second clutch housing assembly (617).

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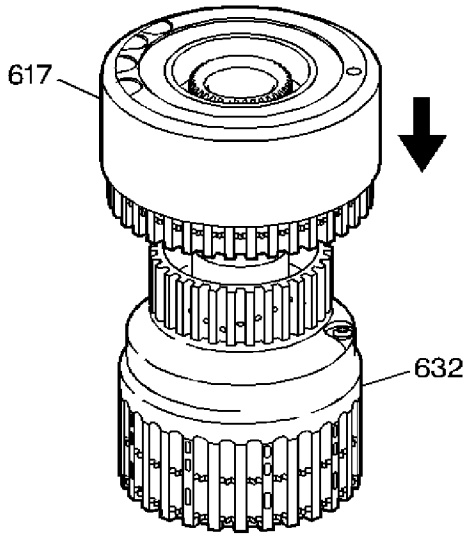
Second, Input, and Sprag Clutches Assemble

Tools Required

J 33381-A Final Drive Remover and Installer



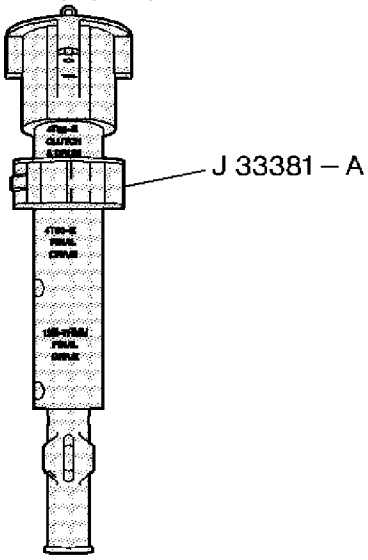
1. Be sure that the selective thrust washer (630) and the thrust bearing assembly (629) for the input clutch housing are in place.
2. Use a small screwdriver in order to align the second clutch teeth so that they slide onto the second clutch hub of the input clutch housing assembly (632).



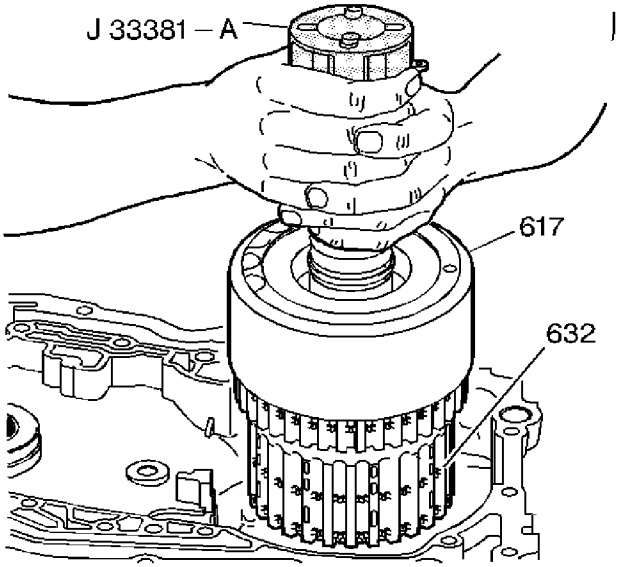
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3. Affix the second clutch housing assembly (617) onto the second clutch hub of the input clutch housing assembly (632).



4. Adjust the collar on tool J 33381-A to the 4T60-E CLUTCH & DRUM setting. Make sure that the threaded rod is fully loosened.



5. Install J 33381-A into the second clutch housing assembly (617).
6. Tighten the threaded rod of J 33381-A until the rod is finger tight.
7. Use J 33381-A in order to lift the second clutch housing (617) and the input clutch assembly (632). The sprag clutch assemblies will also be attached.

Important: After you have installed the housing, confirm that the top of the second clutch is flush or slightly below the top of the reverse band assembly contact area.

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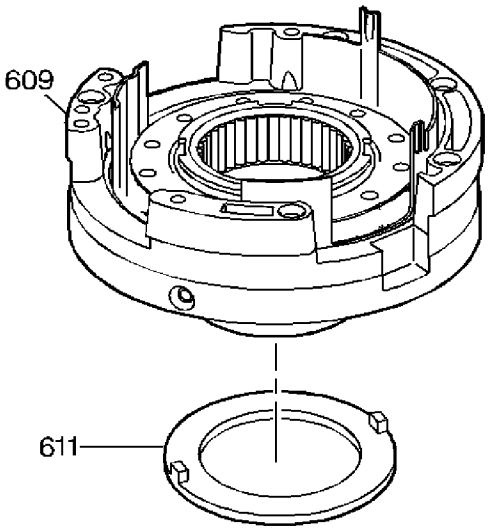
8. Install the housing (617) and the assembly (632) into the case. Be sure that the assembly is down all the way.

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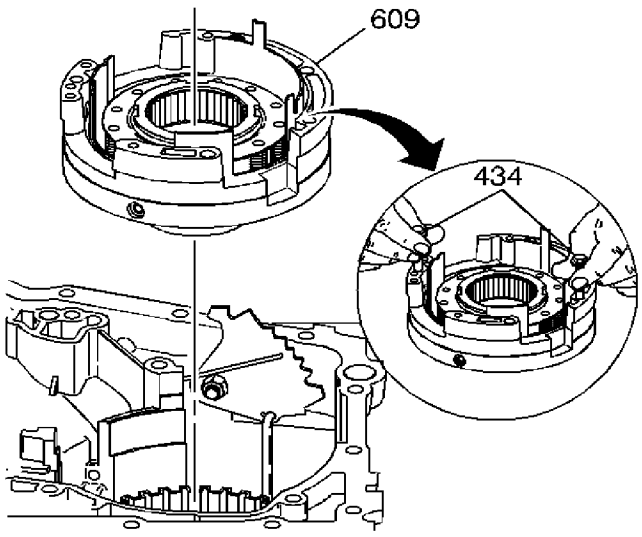
Driven Sprocket Support Assemble

Tools Required

J 36850 Assembly Lubricant (or equivalent)



1. Use J 36850 or equivalent in order to secure the second clutch housing thrust washer (611) to the driven sprocket support assembly (609).



2. Finger start two 13 mm channel plate bolts (434) into the driven sprocket support assembly

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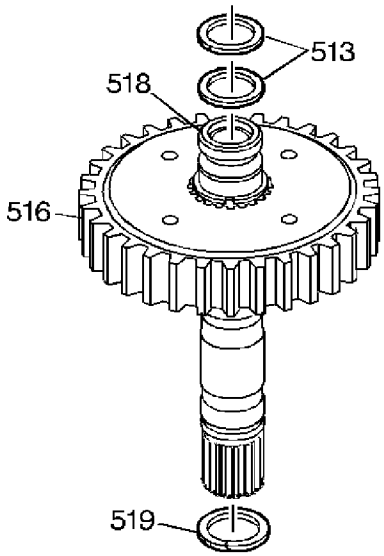
(609).

Important: If the driven sprocket support assembly (609) is not flush with or slightly below the case, then one of the clutches is not fully seated.

3. Using the bolts (434), lift the driven sprocket support assembly (609) into the case and align as shown. The top of the driven sprocket support assembly (609) should be flush with the case.

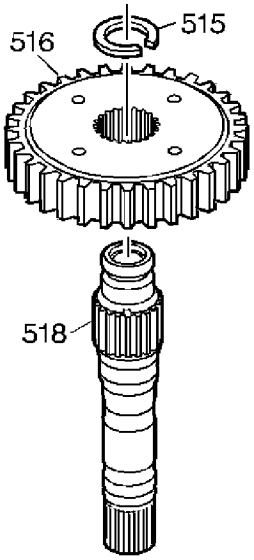
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Drive Sprocket and Turbine Shaft Disassemble



Important: Do not damage the grooves under the oil seal rings.

1. Cut the oil seal rings (513, 519) from the turbine shaft.
2. Remove the oil seal rings.



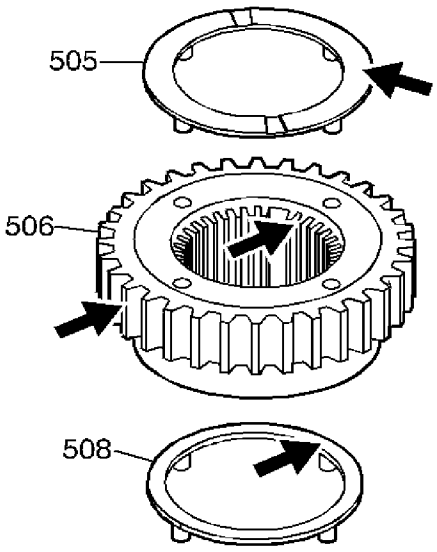
3. Remove the drive sprocket snap ring (515).
4. Remove the drive sprocket (516) from the turbine shaft (518).

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Drive Sprocket and Turbine Shaft Assemble

Tools Required

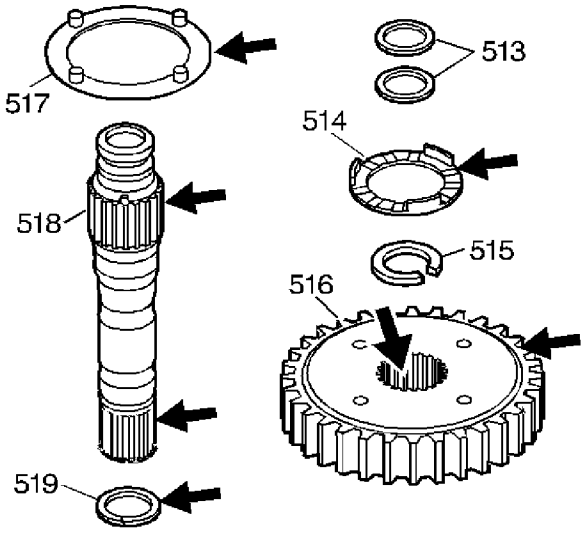
- J 29569-1 Seal Installer
- J 29569-2 Sizing Tool
- J 36850 Assembly Lubricant



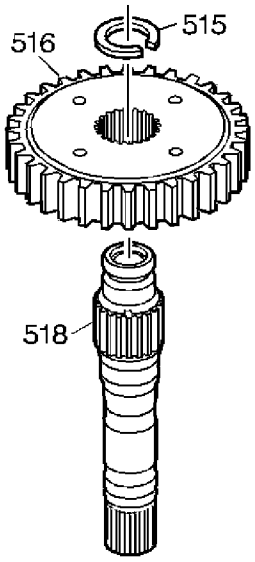
1. Inspect the driven sprocket (506) for the following:
   - Worn or chipped teeth
   - Uniform teeth size
   - Stripped or damaged splines
   - Bearing surface damage
2. Inspect the fourth clutch shaft thrust washer (505) and the driven sprocket thrust washer (508) for wear or cracks.

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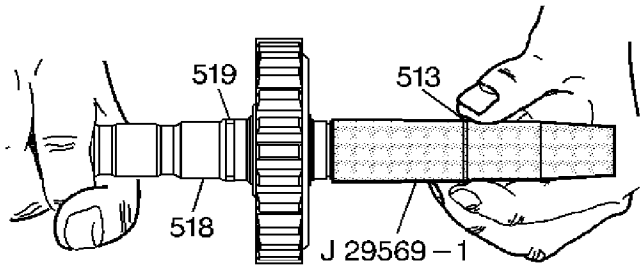


3. Inspect the drive sprocket (516) for the following:
   - Worn or chipped teeth
   - Uniform teeth size
   - Stripped or damaged splines
   - Bearing surface damage
4. Inspect the turbine shaft (518) for the following:
   - A cracked sleeve
   - Damaged bushing journals
   - Stripped or damaged splines
5. Inspect the thrust washers (514, 517) for wear or cracks.

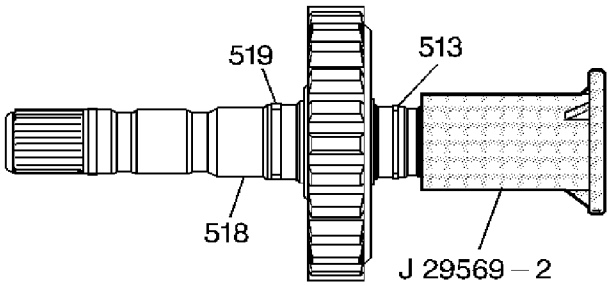


6. Insert the turbine shaft (518) into the drive sprocket (516) and attach the snap ring (515).

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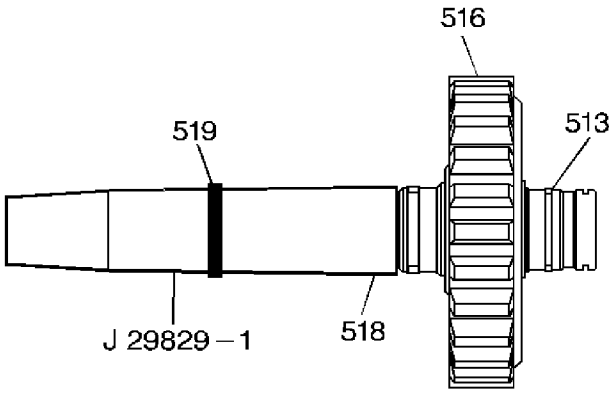


7. Install J 29569-1 onto the turbine shaft (518). Coat the tool shaft with J 36850 or equivalent.
8. Slide the turbine shaft seals (513) into position.

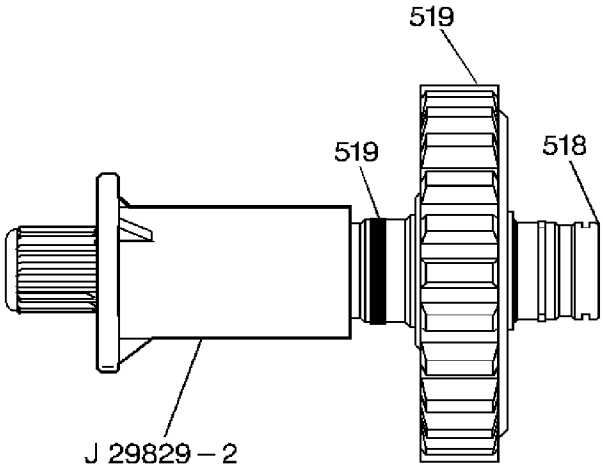


9. Use J 29569-2 in order to size the turbine shaft oil seal rings (513).

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10. Install J 29829-1A onto the turbine shaft (518). Coat the tool shaft with J 36850 or equivalent.
11. Slide the turbine shaft oil seal ring (519) into position.



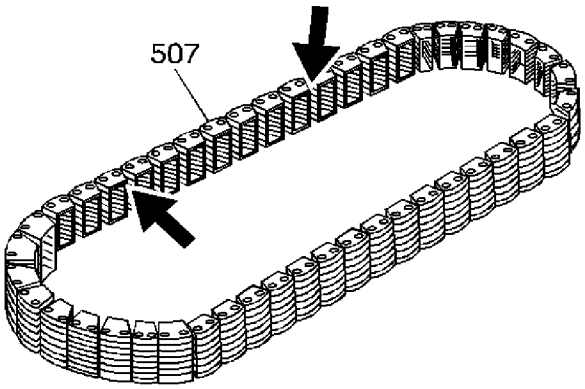
12. Use J 29829-2 in order to size the turbine shaft oil seal ring (519).

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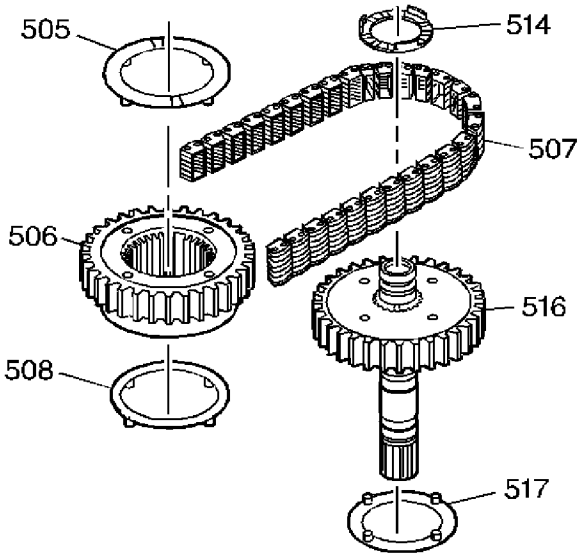
Drive and Driven Sprocket Components Assemble

Tools Required

J 36850 Assembly Lubricant



1. Inspect the drive link assembly (507) for damaged, cracked, or binding links.



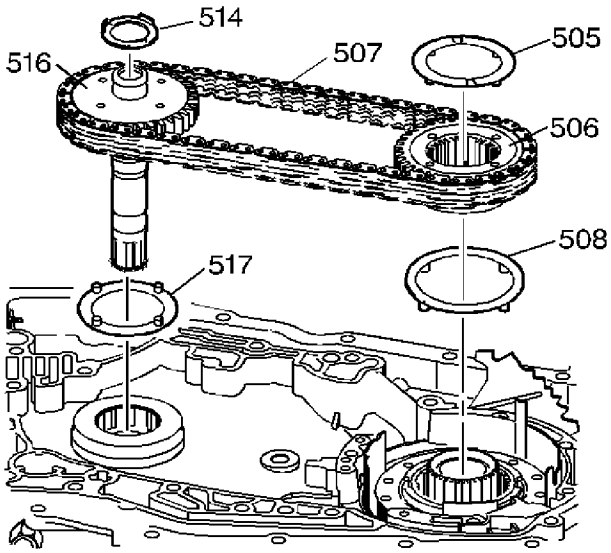
2. Use J 36850 or equivalent in order to retain the thrust washer (517) onto the drive sprocket (516).

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3. Use J 36850 or equivalent in order to retain the thrust washer (508) onto the driven sprocket support.

Important: The drive link assembly must be installed correctly.

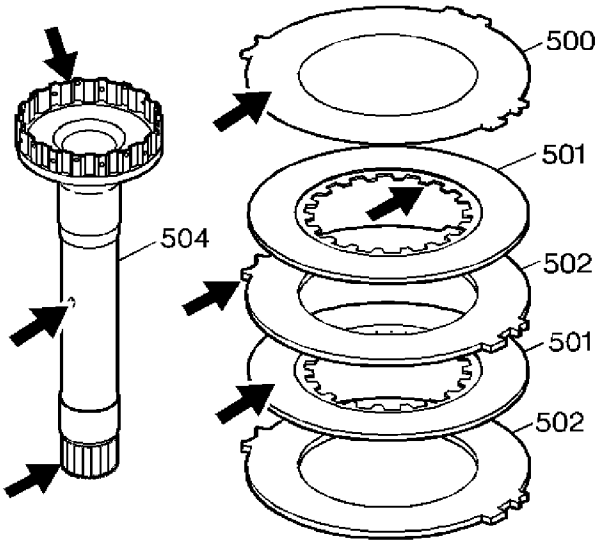
4. Assemble the drive and driven sprockets into the drive link assembly (507) according to one of the following criteria:
   - If an old drive link is being reinstalled, put the drive link assembly with the master link (different color) facing up or down, whichever way it was found during disassembly
   - If a new drive link assembly is being installed, put the drive link assembly with the master link facing upward.



5. Install the drive link assembly and the sprockets into the case by hand. A slight rocking motion may be required in order to work the sprockets into place.

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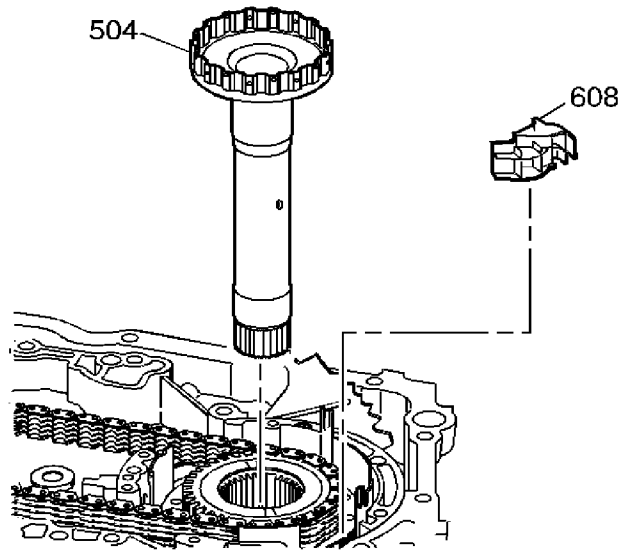
4th Clutch Components Assemble



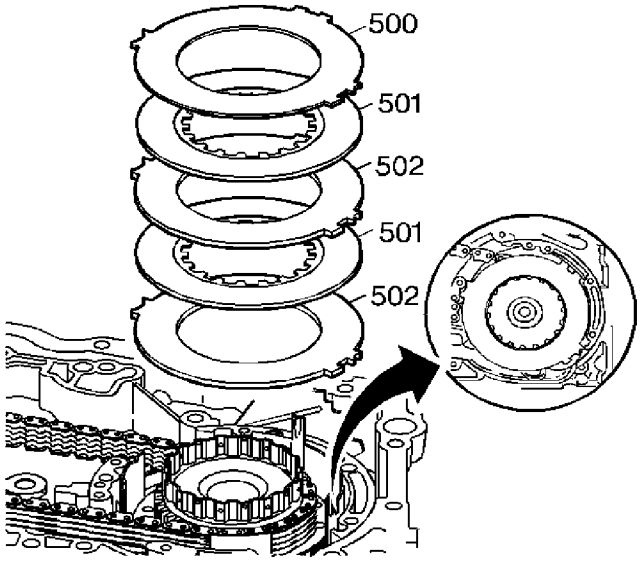
1. Inspect the fourth clutch assembly for the following conditions:
   - Wear or damage to the steel plates (500, 502)
   - Peened splines, flaking, or worn fiber on the fiber plates (501)
2. Inspect the fourth clutch shaft assembly (504) for the following conditions:
   - Cut or worn fourth clutch plate splines
   - Damage or wear to the fourth clutch shaft bushing
   - A damaged bushing journal
   - Stripped splines for the input sun gear
   - Cracks or damage to the hub or shaft

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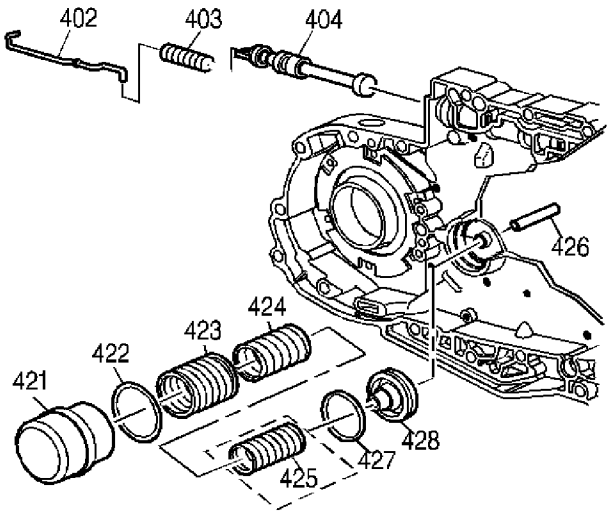
3. Insert the fourth clutch shaft (504) into the case through the driven sprocket. The shaft must fully seat into the input sun gear.
4. Insert the drive link lube scoop (608) into the case.



5. Insert a steel fourth clutch plate (502) into the driven sprocket support with the machined side towards the sprocket.
6. Insert the remaining fourth clutch plates, alternating between fiber plates (501) and steel plates (502).
7. The clutch plates should align in the driven sprocket support as shown.
8. Insert the fourth clutch reaction plate (500) onto the driven sprocket support.

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Case Cover Components Disassemble



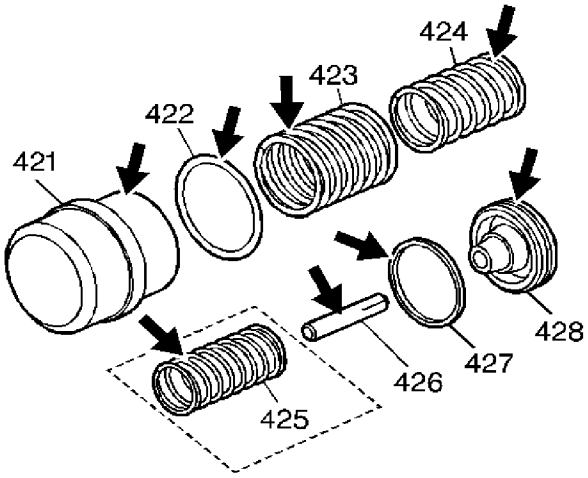
Important: Do not remove any of the bore plugs unless inspection indicates that replacement is necessary.

1. Remove the manual valve (404).
2. Remove the cylinder (421) and the seal (422) for the 3-4 accumulator piston.
3. Remove the outer spring (423), middle spring (424), and inner spring (425) for the 3-4 accumulator piston.
4. Remove the pin (426) for the 3-4 accumulator piston.

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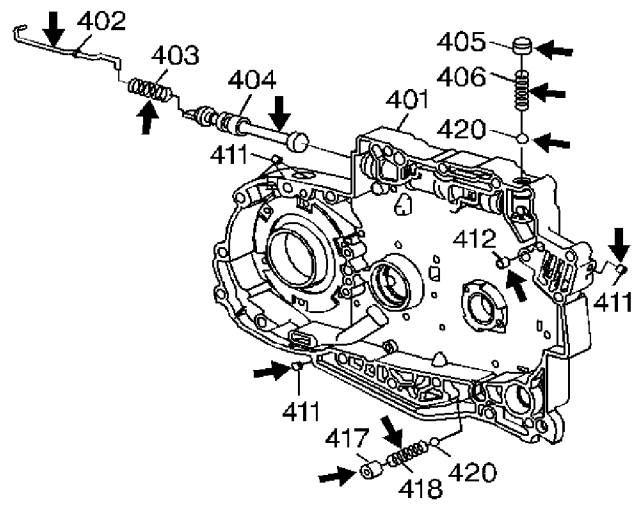
Case Cover Components Inspection



1. Inspect the 3-4 accumulator piston (428) for the following:
   - Porosity
   - A scored pin
   - A nicked groove in the piston sleeve
2. Inspect the piston pin (426) from the 3-4 accumulator for scoring and free movement in the piston bore.
3. Inspect the springs (423-425) from the 3-4 accumulator for distorted or broken coils.
4. Inspect the piston cylinder (421) from the 3-4 accumulator for the following:
   - Porosity or cracks
   - A rough or scored seal surface
   - A cut seal

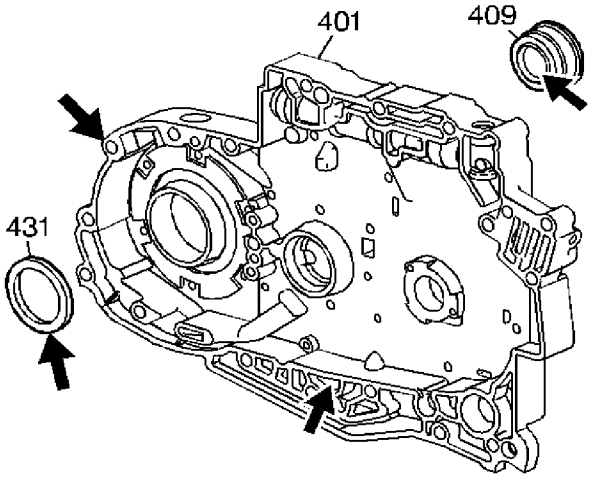
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Important: Do not remove the blowoff valves unless the valves are damaged.

5. Inspect the ball valve spring (418), the bore plug (417), and the ball valve (420) for damage.
6. Inspect the ball valve spring (406), the bore plug (405), and the ball valve (420) for damage.
7. Inspect the manual valve (404), the link (402), and the link spring (403) for damage.
8. Inspect the manual valve (404) for binding or looseness in the case cover assembly (401).
9. Inspect the case cover plugs, and inspect the orificed cup plug. Correct the following conditions:
   - Part is loose
   - Part is missing
   - Part is plugged



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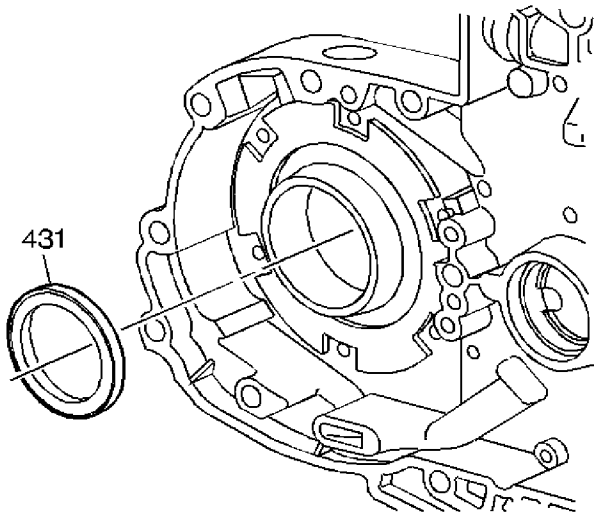


Important: Do not remove the bearing unless the bearing is damaged.

10. Inspect the bearing assembly (431) for damage or roughness.
11. Inspect the oil seal (409) for a missing garter spring or for a cut lip seal.
12. Inspect the case cover (401) for the following:
    - Porosity
    - Interconnected fluid passages
    - Cracks or rough machined surfaces

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Case Cover Bearing Disassemble



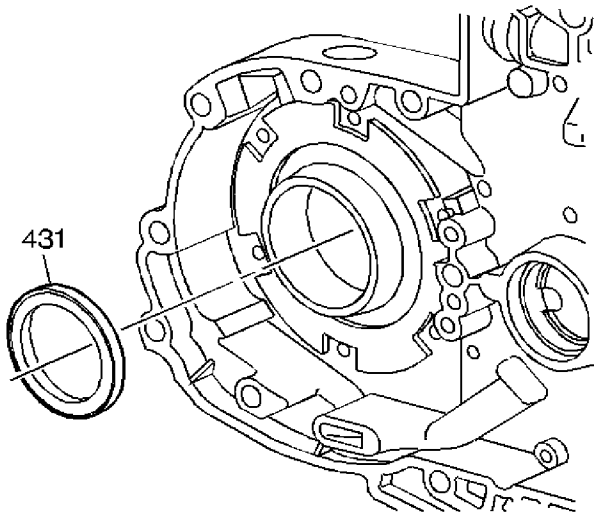


Remove the bearing assembly (431) from the case cover.

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Case Cover Bearing Assemble



Important: Do not bend or damage the bearing during installation.

Install the bearing assembly (431) onto the case cover.

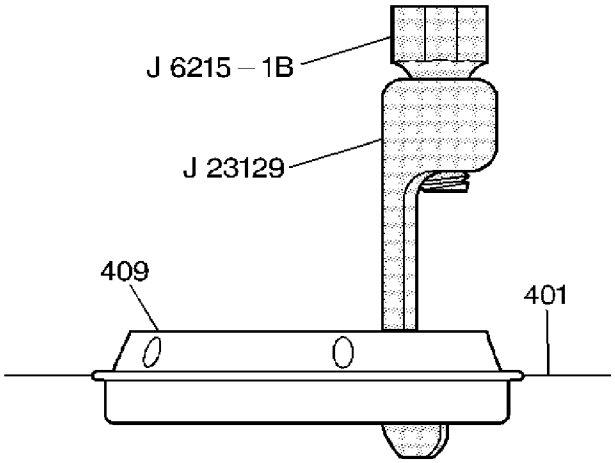
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Drive Axle Oil Seal Removal - Left Side

Tools Required

- J 23129 Converter Housing Seal Remover
- J 6125-1B Slide Hammer



Use J 23129 and J 6125-1B in order to remove the oil seal assembly (409) from the case cover (401).

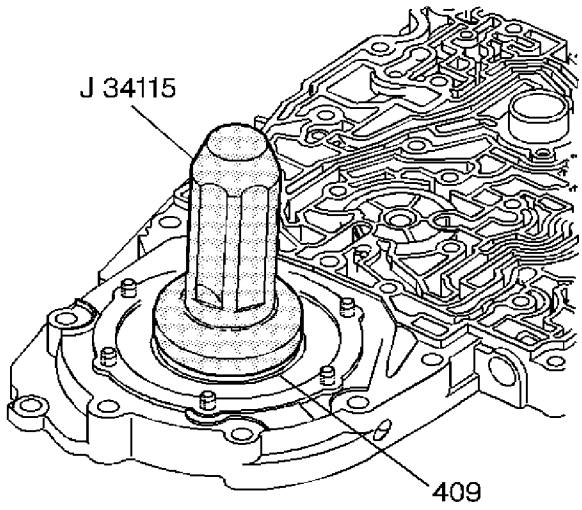
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Drive Shaft Oil Seal Assemble - Left Side

Tools Required

J 34115 Axle Seal Installer



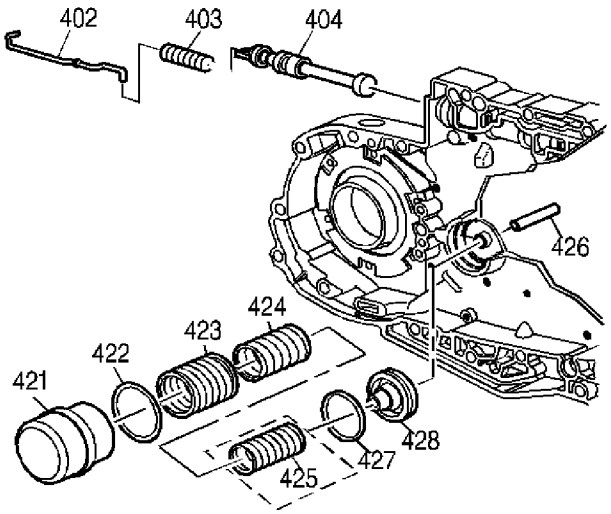
Important: When you remove a drive axle from the transmission for any reason, inspect the axle sealing surface (tripot shank) for corrosion. If corrosion is evident, clean the surface with a 320 grit cloth or equivalent. Clean off any remaining debris with automatic transmission fluid. Wipe the surface dry and reinstall the drive axle free of any build up.

Use J 34115 in order to install the oil seal assembly (409) for the front wheel drive shaft.

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Case Cover Components Assemble

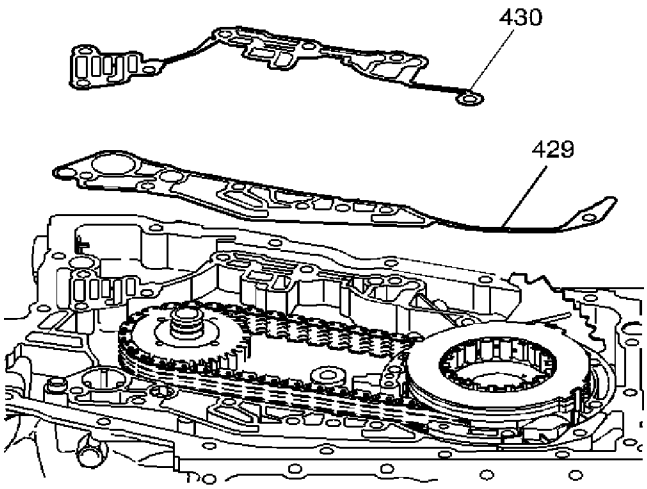


1. Install a new seal (427) onto the 3-4 accumulator piston (428).
2. Insert the 3-4 accumulator piston (428) into the case cover.
3. Affix a new seal (422) onto the accumulator piston cylinder (421).
4. Install the springs (423, 424, 425) into the 3-4 accumulator cylinder (421).
5. Use a slight twisting motion in order to insert the accumulator piston cylinder (421) into the case cover.
6. Insert the 3-4 accumulator piston pin (426) through the front of the case cover and into the piston (428).
7. Assemble the manual valve (402, 403, 404) and insert the valve assembly into the case cover.

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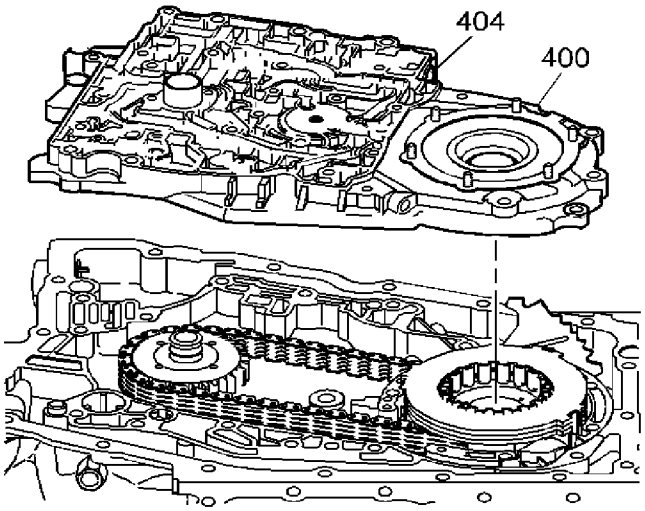
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Case Cover and Gaskets Assemble



Important: Do not use any type of adhesive or sealer when assembling the gaskets. You may use Transjel™ or equivalent as an aid.

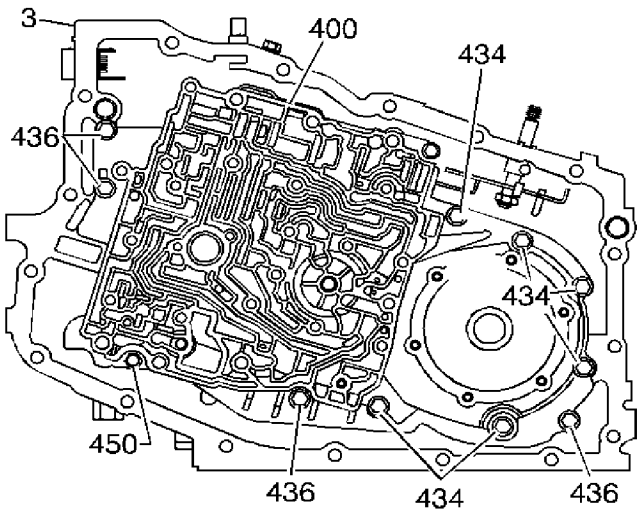
1. Assemble the upper and lower gaskets (430, 429) for the automatic transmission case cover.



2. Hold the manual valve in place and carefully assemble the case cover (400) onto the pins in

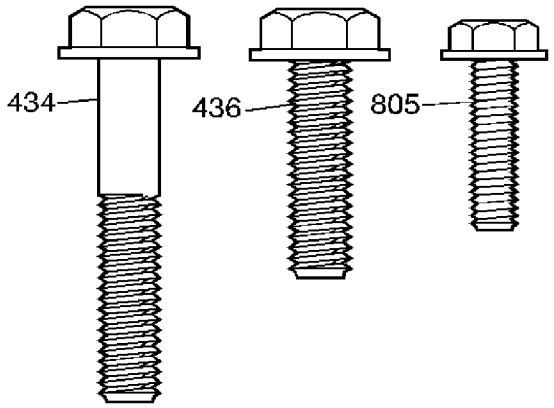
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the case.



Important: Do not use an impact wrench in order to tighten cover bolts.

3. Finger start all transmission case cover bolts into the locations noted (434, 436, 805).



4. Use 10 mm and 13 mm sockets in order to tighten all the bolts.

Tighten
Tighten all the bolts to 20.0-27.0 N·m (14.7-20.0 lb ft).

Refer to *Fastener Notice* .

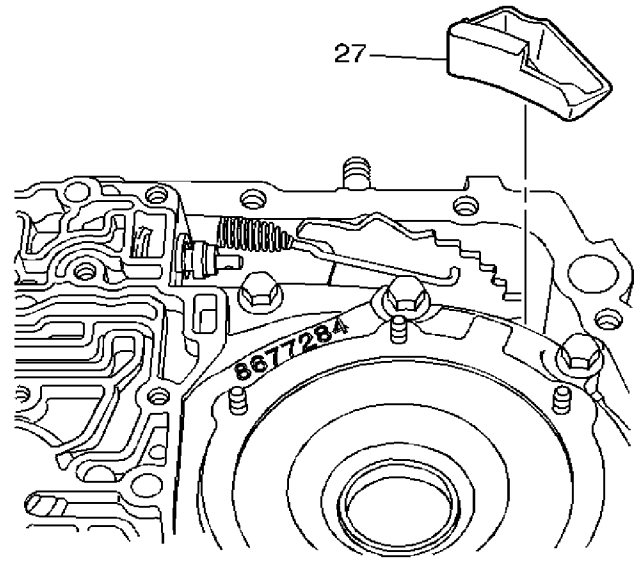
5. Some transmission models have a temperature sensor (450) which is located in the case

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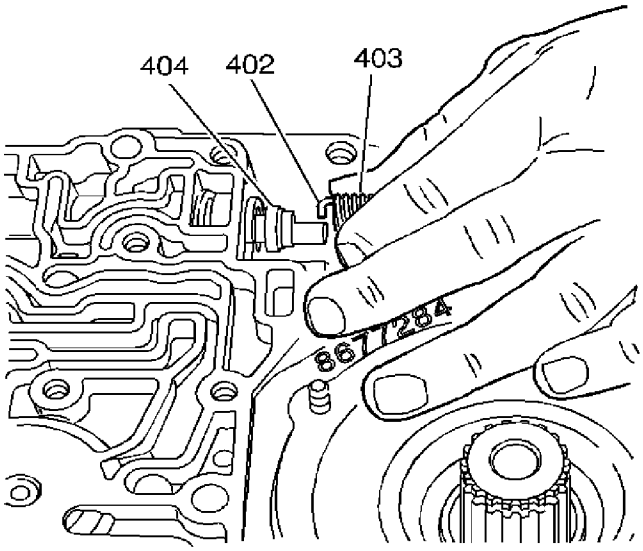
cover. Install the temperature sensor at this time.

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Manual Valve Link and Fluid Dam Assemble



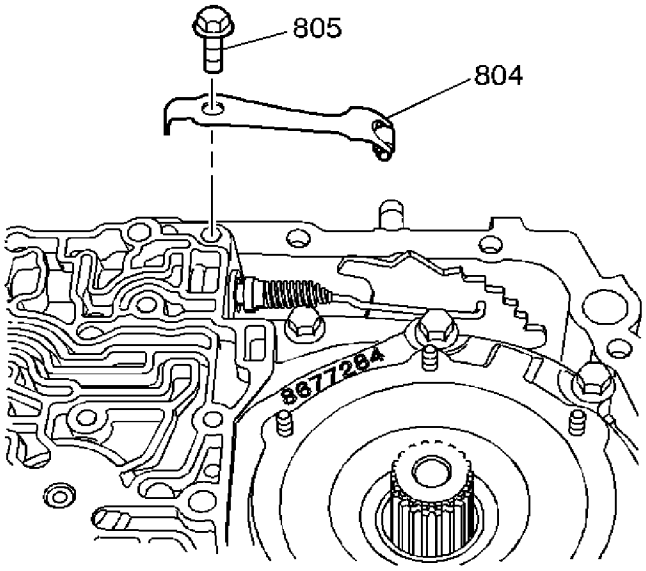
1. Insert the transmission oil dam (27) into the case.



2. Insert the manual valve link and spring assembly into the manual shift shaft detent lever.
3. Pull back the manual valve spring (403) and connect the manual valve link (402) to the manual valve.

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Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

4. Attach the manual shift shaft detent assembly (804) to the case with a bolt (805).

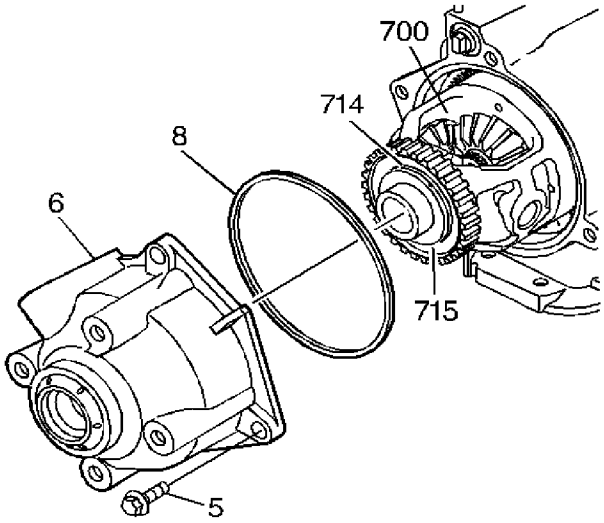
Tighten
Tighten the bolt to 12 N·m (106 lb in).

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Differential Carrier End Play Check

Tools Required

- J 8001 Dial Indicator Set
- J 25025-1 Dial Indicator Stand
- J 25025-B Alignment Pin Set and Mounting Post
- J 26958 Output Shaft Loading and Aligning tool
- J 26958-10A Adapter Plug
- J 28585 Snap Ring Remover
- J 38385 Output Shaft Loading Tool Adapter

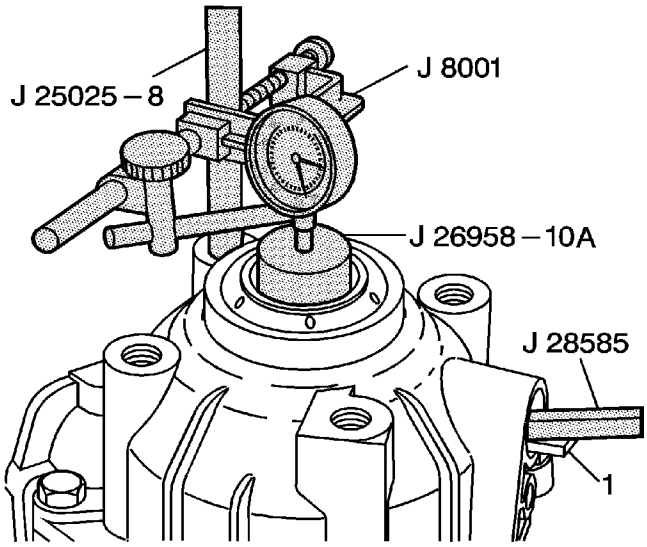


1. Make sure that the thrust washer (714) and the bearing (715) are still on the front differential carrier.
2. Install the case extension seal (8) onto the case extension (6).
3. Install the case extension assembly (6) onto the transmission case.
4. Install only two of the four case extension bolts (5).

Tighten
Do not torque the bolts. Tighten them only until the case extension is fully seated.

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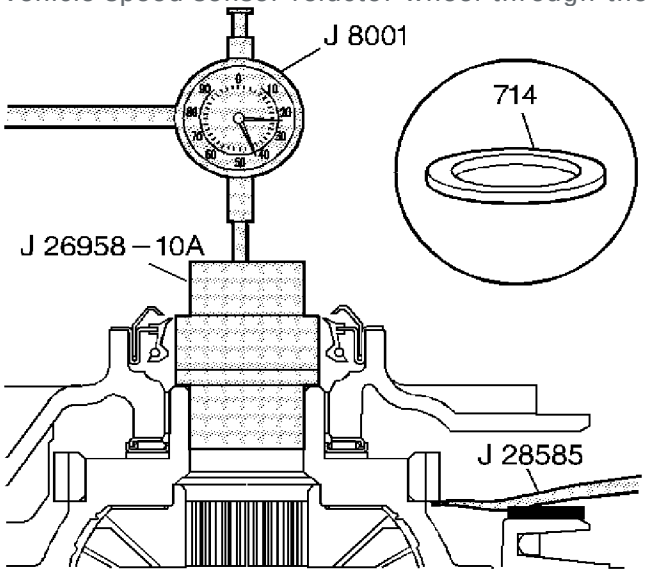
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5. Position the transmission so that the case extension is facing upward.
6. Install J 25025-B , J 26958-10A , and J 8001 .
7. Set the dial indicator to zero.

Important: Protect the VSS sensor bore with a piece of wood or rubber while prying.

8. Use J 28585 or a large screwdriver in order to lift the front differential carrier. Pry up on the vehicle speed sensor reluctor wheel through the sensor hole in the case extension.



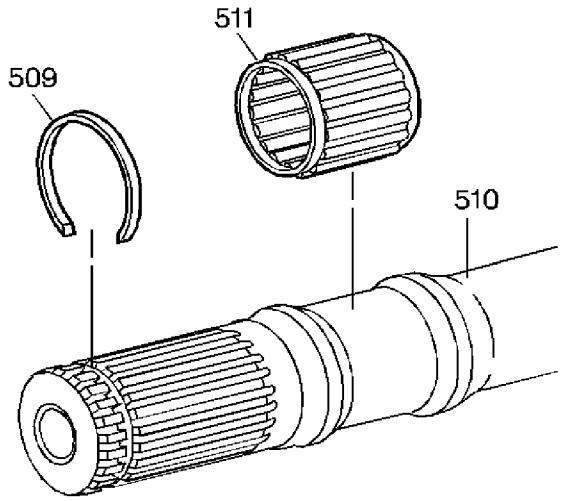
9. Note the dial indicator reading before changing the carrier thrust washer (714):
   - If the dial indicator reading is less than 0.12 mm (0.005 in), install the next smaller size thrust washer, then recheck.
   - If the dial indicator reading is greater than 0.62 mm (0.025 in), install the next larger size thrust washer, then recheck.

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- If the dial indicator reading is 0.12-0.62 mm (0.005-0.025 in), the thrust washer is correct.
- Remove J 8001 and J 25025-1 .

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Output Shaft Bearing Disassemble

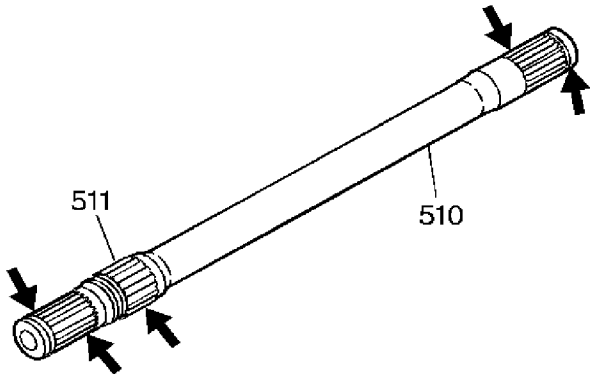


1. Remove the fourth clutch bearing (511) from the output shaft.
2. Remove the drive axle snap ring (509) from the output shaft.

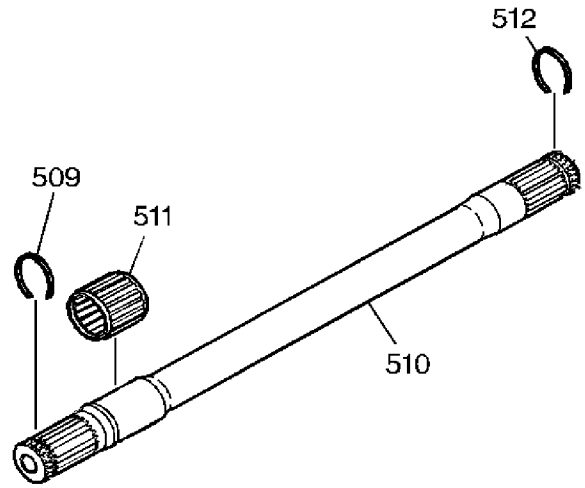
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Output Shaft Assemble



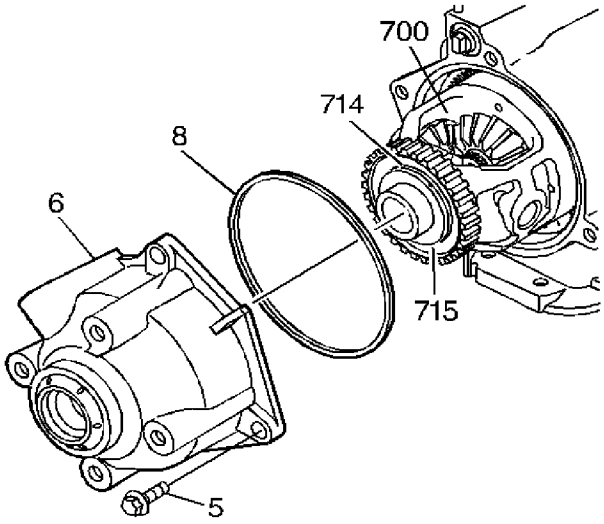
1. Inspect the output shaft and the bearing for the following:
   - A cracked or deformed bearing cage
   - Damaged bushing journals
   - Stripped splines
   - A damaged retainer ring groove



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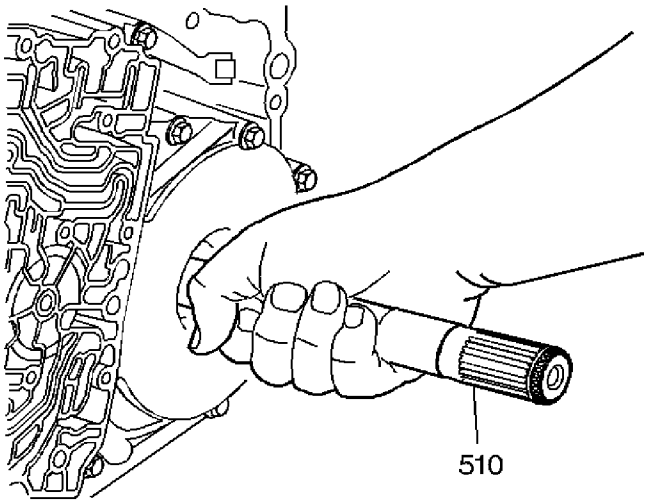
2. Affix the drive axle retainer ring (509) and the output shaft differential in board snap ring (512) onto the output shaft (510).
3. Affix the fourth clutch bearing (511) onto the output shaft (510).



4. Rotate the transmission so that the oil pan flange faces downward.

Important: Be sure that the differential thrust washer (714) and the thrust bearing (715) are either on the differential carrier assembly or in the case extension.

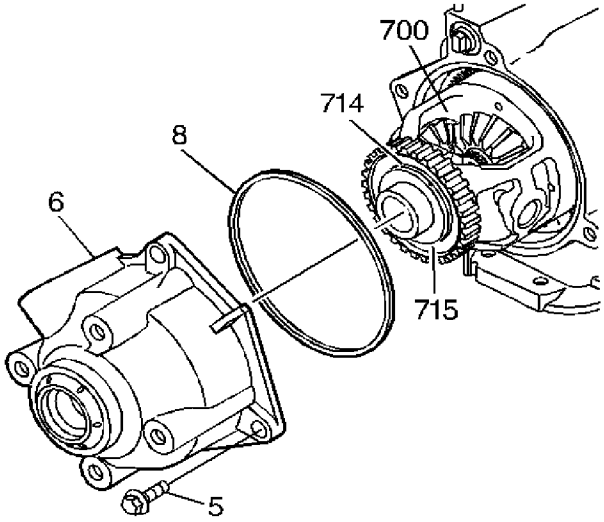
5. Remove the transmission case extension bolts (5). Remove the case extension assembly (6).



Important: During installation, do not push too hard, or damage could occur to the bushings or the bearings.

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6. Hold the front differential carrier (700) in place and carefully install the output shaft (510) into the transmission . Extend the shaft through the differential side gear.





7. Select a thrust washer (714) for the front differential carrier. The choice of washer will be indicated by the final measurement of the drive end play procedure.
8. Affix the thrust washer (714) and the thrust bearing (715) onto the differential carrier (700).
9. Attach the case extension assembly (6) to the case (3) with four bolts (5).

Tighten
Tighten the bolts to 36 N·m (27 lb ft).

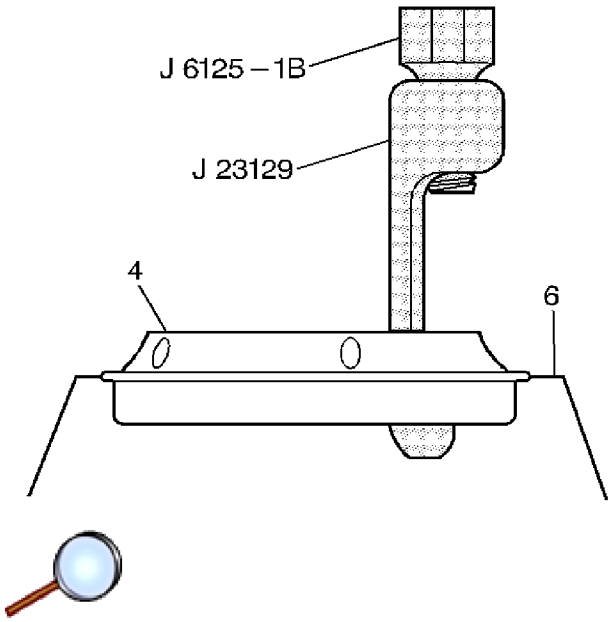
Refer to *Fastener Notice* .

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Drive Shaft Oil Seal Disassemble - Right Side

Tools Required

- J 23129 Converter Housing Seal Remover
- J 6125-1B Slide Hammer



Use J 23129 and J 6125-1B in order to remove the oil seal assembly (4) from the front wheel drive shaft.

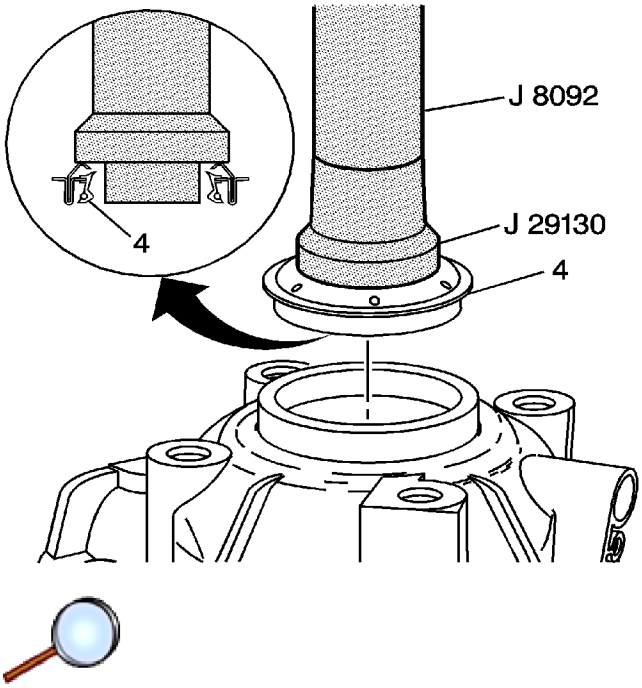
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Drive Shaft Oil Seal Assemble - Right Side

Tools Required

- J 29130 Axle Seal Installer
- J 8092 Handle



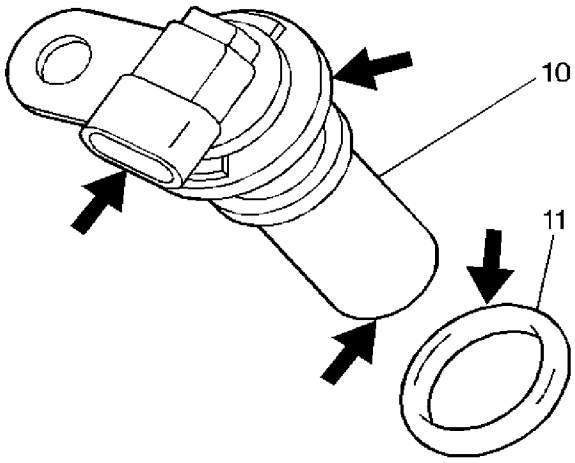
Important: Inspect the seal assembly (4). Be sure that the seal was not damaged during assembly. Check that the garter spring was not dislodged.

Use J 29130 and J 8092 in order to install the oil seal assembly (4) on the front wheel drive shaft.

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Vehicle Speed Sensor Assemble

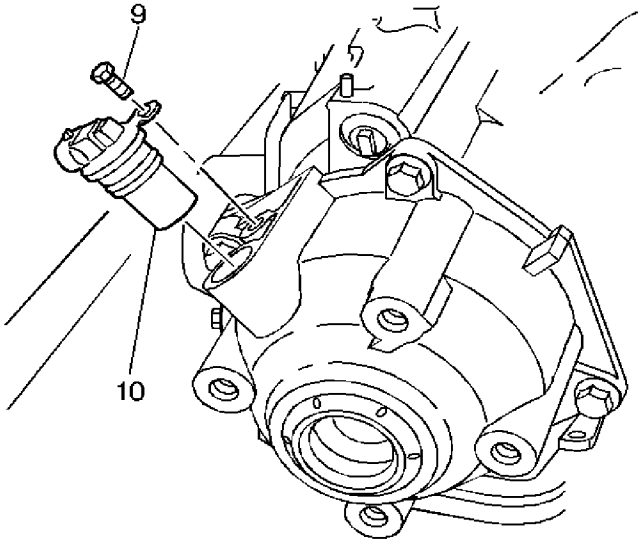


Important: Handle the vehicle speed sensor assembly carefully.

1. Inspect the vehicle speed sensor assembly (10) and the vehicle speed sensor O-ring seal (11) for the following conditions:
   - Damaged connector
   - Cracked housing
   - Signs of rotor damage
   - Cuts or nicks on the O-ring seal
2. Install a new O-ring seal (11) on the vehicle speed sensor assembly (10).

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3. Install the vehicle speed sensor assembly (10) into the case extension.

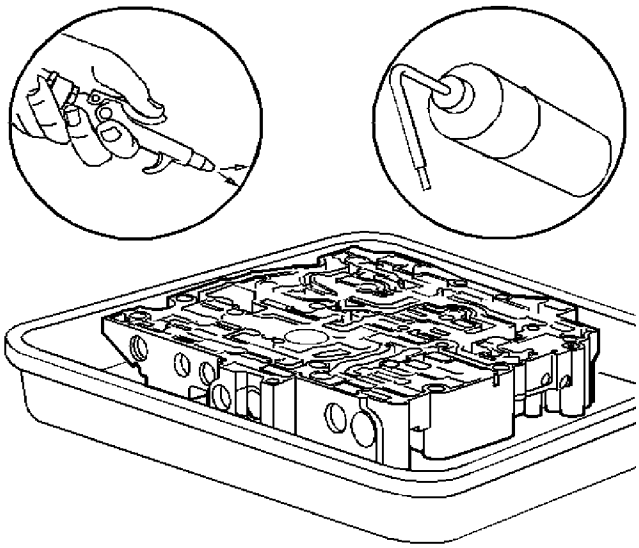
Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

4. Install the vehicle speed sensor bolt (9).

Tighten
Tighten the bolt to 12 N·m (106 lb in).

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Control Valve Body Clean





Important: Do not use solvent in order to clean the solenoid valves or the neoprene seals.

1. Clean the control valve body thoroughly in clean solvent.

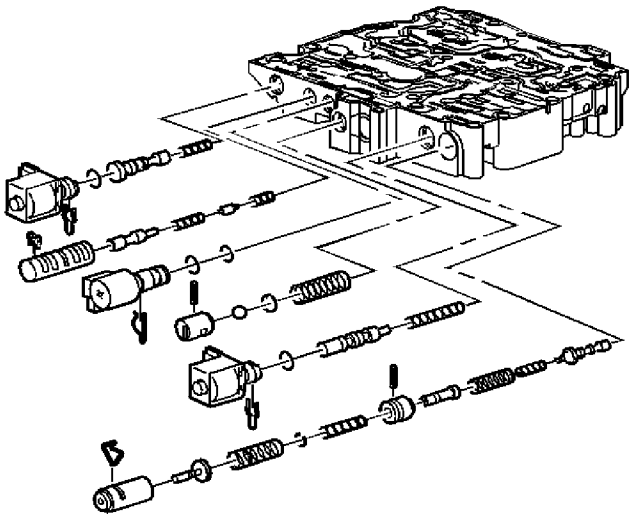
Important: In the following steps, handle the parts carefully in order to avoid nicks and scratches.

2. Move the valves with a pick or a small screwdriver in order to dislodge any dirt or debris.
3. Use an air nozzle in order to dry the control valve body and to blow out all of the passages.
4. Gently probe the small passages with a piece of identification tag wire or the equivalent.

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Control Valve Body Inspection



1. Inspect the control valve body for the following:
   - A damaged or rough pump shaft bearing
   - Casting porosity
   - Interconnected oil passages
   - Damaged machined surfaces
   - Foreign material
2. Inspect the solenoids for the following:
   - Cut seals
   - Bent connectors or broken wires
   - Cracked or damaged plastic housings
   - Foreign material
3. Inspect the valves and bushings for the following:
   - Wear
   - Nicks
   - Scratches
4. Inspect the springs for damaged or distorted coils.

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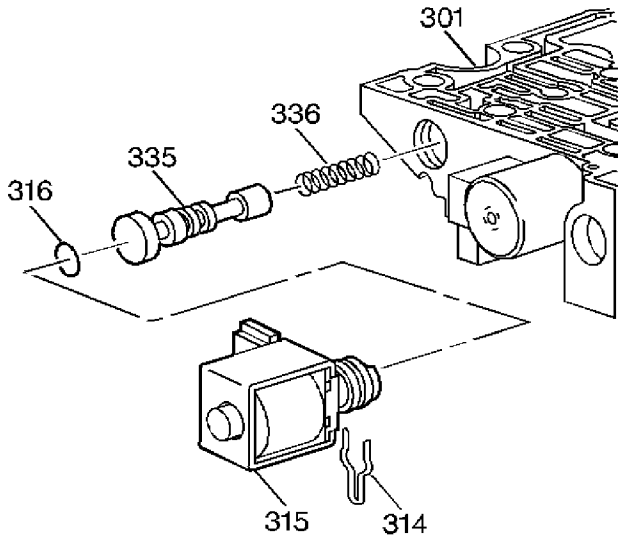
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Control Valve Body Disassemble

Caution: Valve springs can be tightly compressed. Use care when removing retainers and plugs. Personal injury could result.

Important: Position the control valve assembly on a clean surface before disassembly.

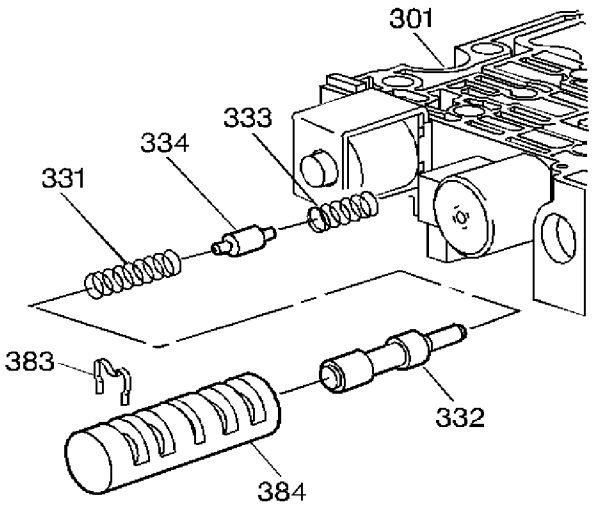
Important: All valves, springs, and bushings must be laid out on a clean surface in exactly the same way in which the parts are removed. This will aid reassembly.



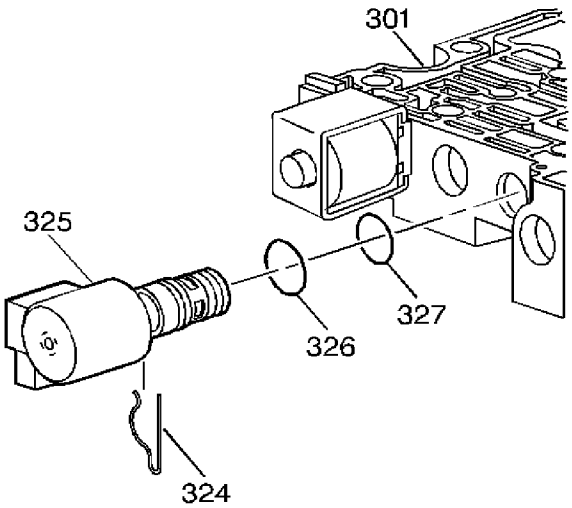
1. Remove the spring clip retainer (314) from the torque converter clutch (TCC) solenoid.
2. Remove the TCC solenoid valve (315) and seal (316).
3. Remove the converter clutch valve (335) and the spring (336).

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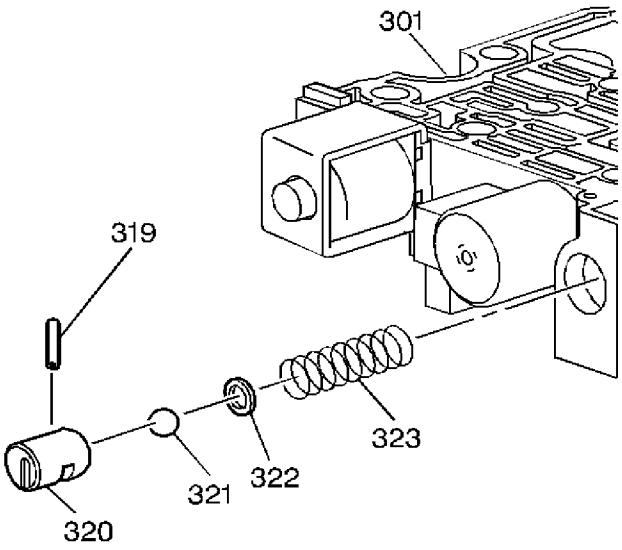


4. Remove the retainer (383) from the sleeve (384) of the TCC regulator valve (332).
5. Remove the sleeve (384), the TCC regulator valve (332), and the spring (331).
6. Remove the isolator valve (334) and the spring (333).

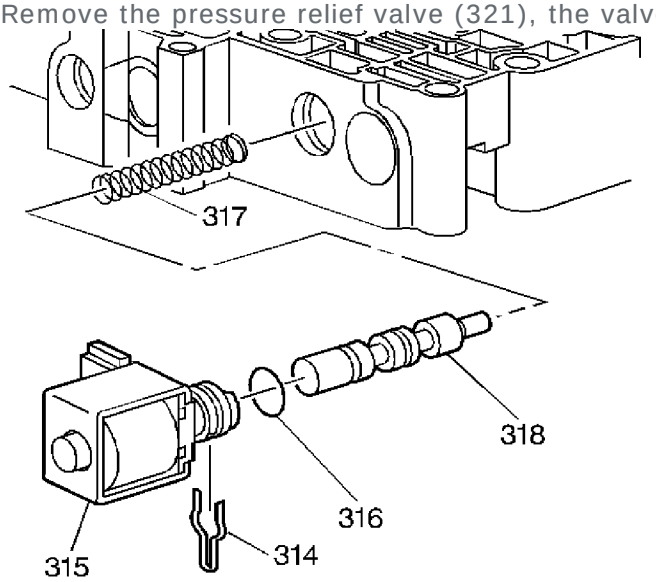


7. Remove the retainer (324) from the PWM solenoid valve assembly.
8. Remove the PWM solenoid valve assembly (325).
9. Remove the solenoid valve seals (326, 327).

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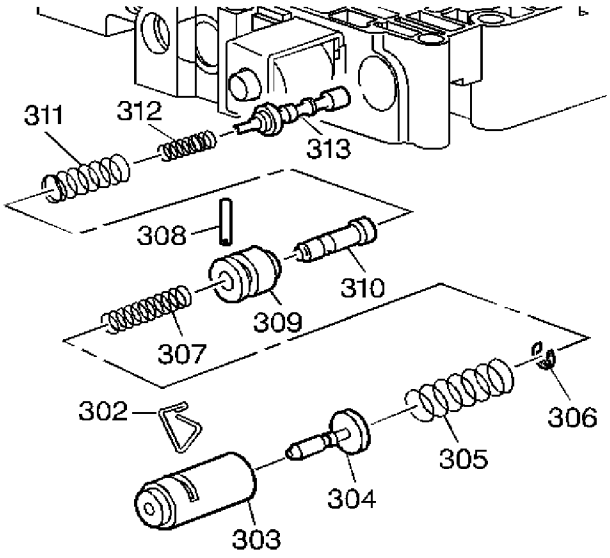


10. Remove the retaining pin (319) from the oil pump pressure relief valve.
11. Remove the bushing (320) from the oil pump pressure relief valve.
12. Remove the pressure relief valve (321), the valve seat (322), and the spring (323).

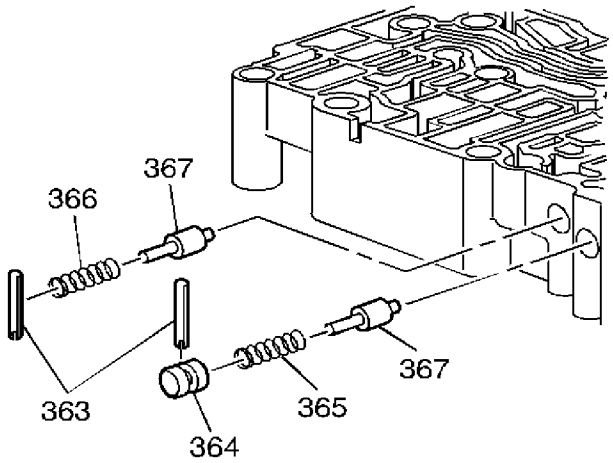


13. Remove the retainer (314) from the 1-2, 3-4 shift solenoid valve assembly (315).
14. Remove the 1-2, 3-4 shift solenoid valve assembly (315) and the valve seal (316).
15. Remove the 1-2 shift valve (318).
16. Remove the 1-2 shift valve spring (317).

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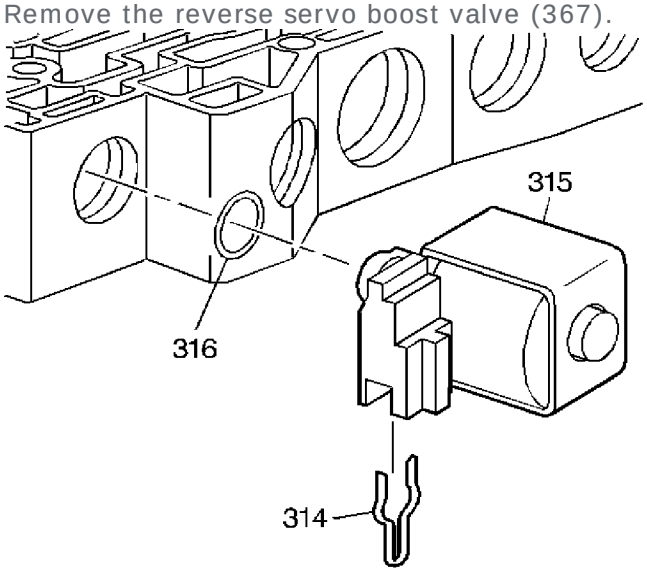
17. Remove the retainer (302) from the line boost valve.
18. Remove the bore plug (303) from the line boost valve, the valve (304), and the spring (305).
19. Remove the retainer (306) from the pressure regulator.
20. Remove the reverse boost spring (307).
21. Remove the bushing retainer (308) from the reverse boost valve.
22. Remove the bushing (309) from the reverse boost valve.
23. Remove the reverse boost valve (310), the springs (311, 312), and the pressure regulator valve (313).



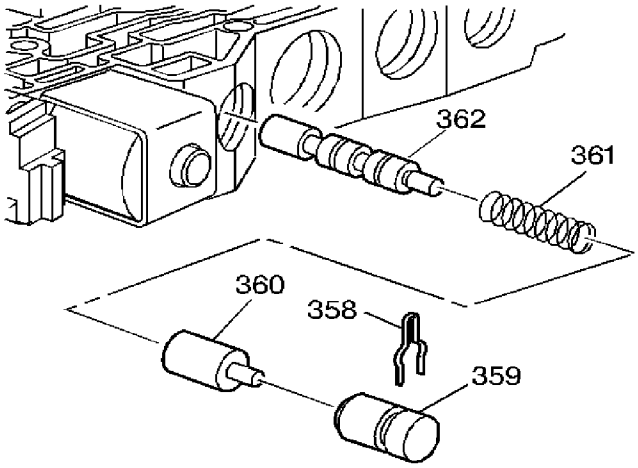
24. Remove the coiled spring pin (363) and the valve spring (366) from the forward servo boost valve.
25. Remove the forward servo boost valve (367).
26. Remove the coiled spring pin (363) and the valve spring (365) from the reverse servo boost valve.
27. Remove the bore plug (364) from the reverse servo boost valve.

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28. Remove the reverse servo boost valve (367).

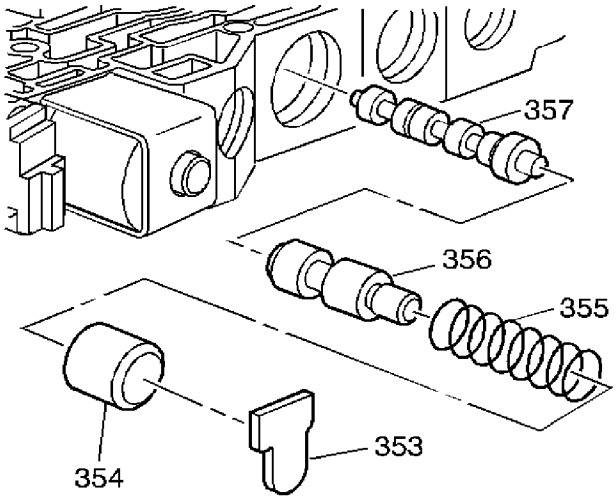


29. Remove the retainer (314) from the 2-3 shift solenoid valve.
30. Remove the 2-3 shift solenoid valve assembly (315).
31. Remove the shift solenoid valve seal (316).

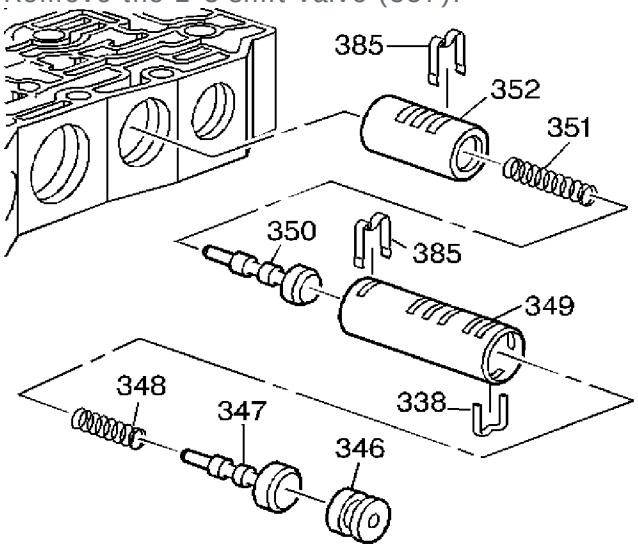


32. Remove the plug retainer (358) from the 4-3 manual downshift valve.
33. Remove the bore plug (359) from the 4-3 manual downshift valve.
34. Remove the 4-3 manual downshift valve (360) and the spring (361).
35. Remove the 3-4 shift valve (362).

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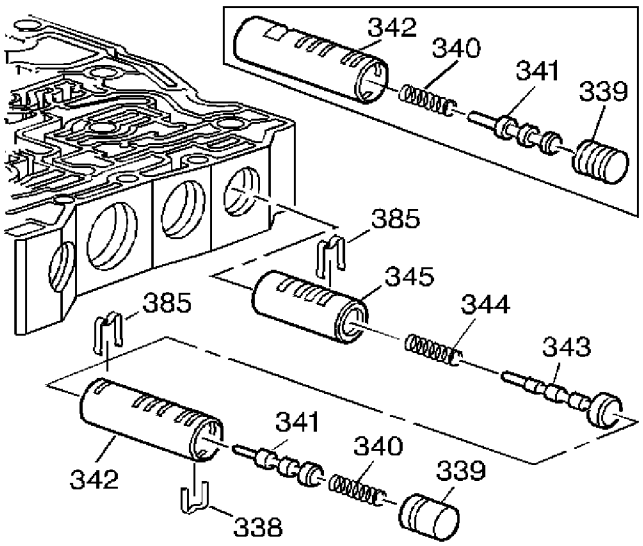


36. Remove the bore plug retainer (353) from the 2-3 shift valve.
37. Remove the bore plug (354).
38. Remove the spring (355) from the 3-2 manual downshift valve.
39. Remove the 3-2 manual downshift valve (356).
40. Remove the 2-3 shift valve (357).



41. Remove the retainer (385) from the 1-2 accumulator valve bushing.
42. Remove the 1-2 accumulator valve bushing (349) and the 1-2 accumulator valve assembly.
43. Remove the plug retainer (338) from the 1-2 accumulator valve bushing.
44. Remove the plug (346), the valve (347), and the spring (348) from the 1-2 accumulator valve bushing.
45. Remove the retainer (385) from the 3-4 accumulator valve bushing assembly.
46. Remove the 3-4 accumulator valve (350) and the spring (351) from the bushing.
47. Remove the 3-4 accumulator valve bushing (352).

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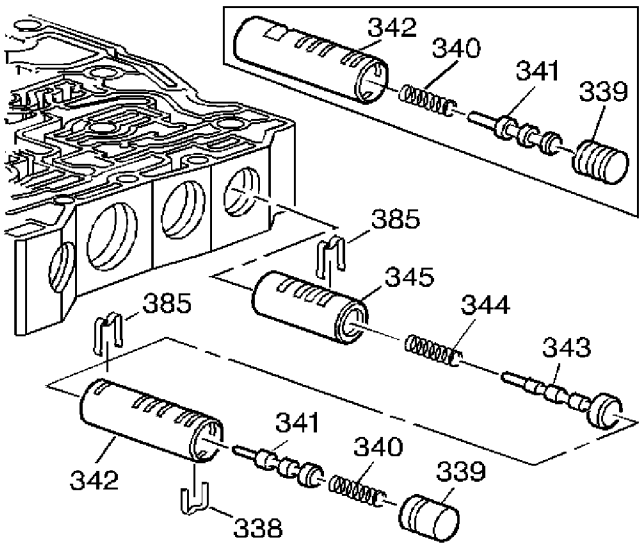
48. Remove the retainer (385) from the 1-2 accumulator valve bushing.
49. Remove the 1-2 accumulator valve bushing (342) and the 1-2 accumulator valve assembly.
50. Remove the plug retainer (338) from the 1-2 accumulator valve bushing.

Important: The position of the valve and the spring in the 1-2 accumulator assembly may vary by model.

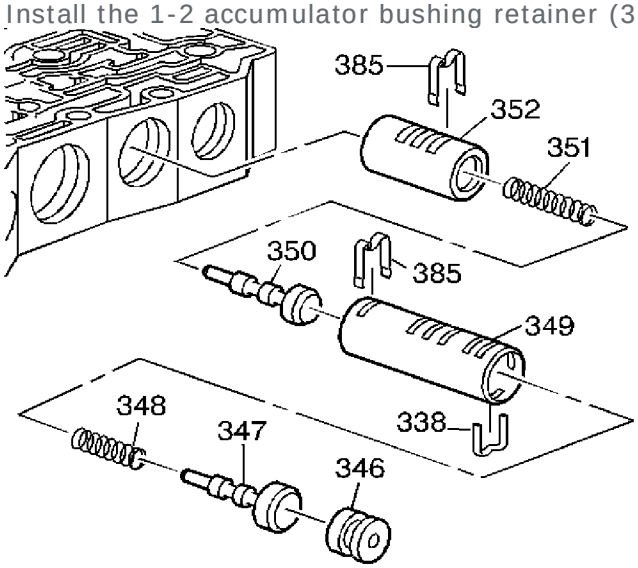
51. Remove the plug (339), the 1-2 accumulator valve (341), and the spring (340) from the bushing.
52. Remove the retainer (385) from the 2-3 accumulator valve bushing assembly.
53. Remove the 2-3 accumulator valve (343) and the spring (344) from the bushing.
54. Remove the 2-3 accumulator valve bushing (345).

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Control Valve Body Assemble



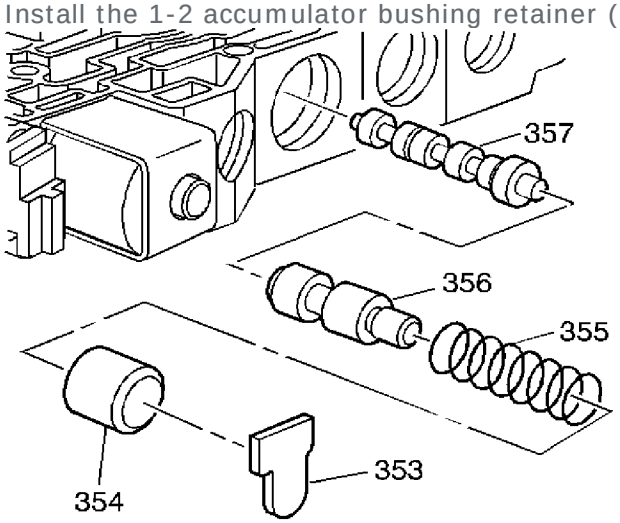
1. Insert the 2-3 accumulator valve bushing (345) into the valve body.
2. Insert the 2-3 accumulator valve (343) and the spring (344) into the valve body.
3. Install the bushing retainer (385).
4. Insert the 1-2 accumulator valve (341) and the spring (340) into the 1-2 accumulator bushing (342).
5. Insert the 1-2 accumulator bushing plug (339) and the plug retainer (338) into the 1-2 accumulator bushing (342).
6. Insert the 1-2 accumulator valve assembly into the valve body.
7. Install the 1-2 accumulator bushing retainer (385).



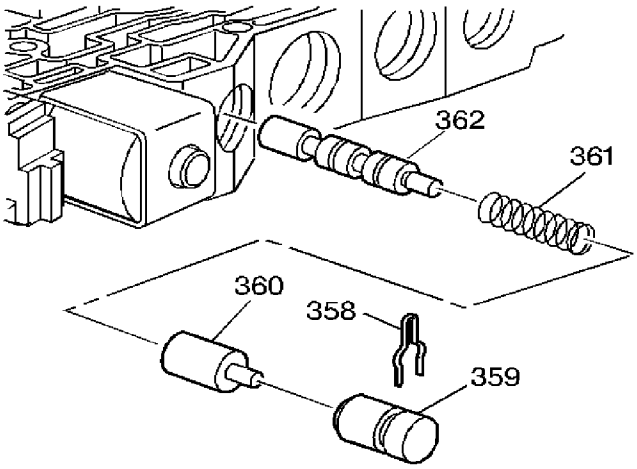
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8. Insert the 3-4 accumulator valve bushing (352) into the valve body.
9. Insert the 3-4 accumulator valve (350) and the spring (351) into the valve body.
10. Install the bushing retainer (385).
11. Install the 1-2 accumulator valve (347) and the spring (348) into the 1-2 accumulator bushing (349).
12. Insert the 1-2 accumulator bushing plug (346) and the plug retainer (338) into the 1-2 accumulator bushing (349).
13. Insert the 1-2 accumulator valve assembly into the valve body.
14. Install the 1-2 accumulator bushing retainer (385).

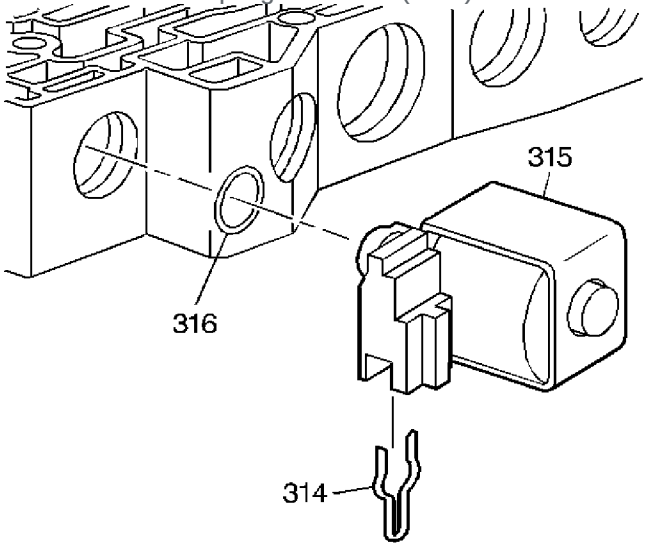


15. Install the 2-3 shift valve (357) into the valve body.
16. Assemble the 3-2 manual downshift valve (356) and the spring (355).
17. Insert the bore plug (354) into the valve body.
18. Install the bore plug retainer (353).

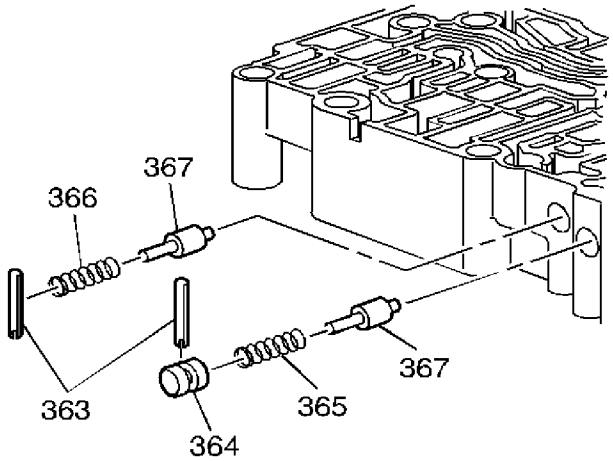


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19. Install the 3-4 shift valve (362) into the valve body.
20. Assemble the 4-3 manual downshift valve (360) and the spring (361).
21. Insert the bore plug (359) into the valve body.
22. Install the bore plug retainer (358).



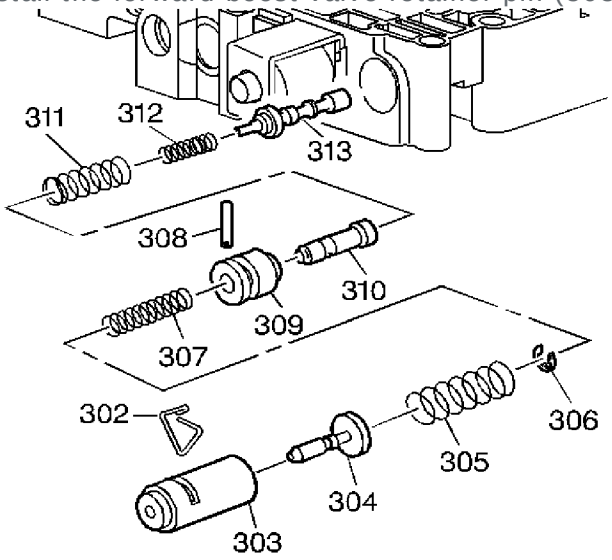
23. Insert a new seal (316) onto the 2-3 shift solenoid valve (315).
24. Install the 2-3 shift solenoid valve (315) into the valve body.
25. Install the solenoid valve retainer (314).



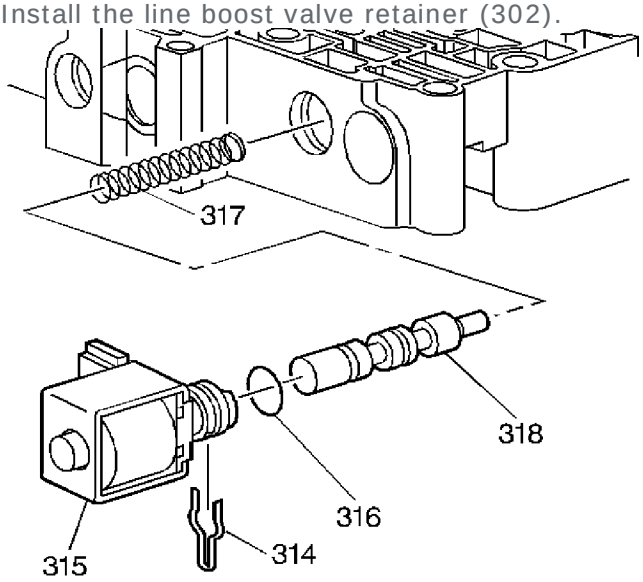
26. Assemble the reverse boost valve (367) and the spring (365).
27. Install the boost valve bore plug (364).
28. Install the coiled spring pin (363).
29. Assemble the forward servo boost valve (367) and the valve spring (366).

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30. Install the forward boost valve retainer pin (363).

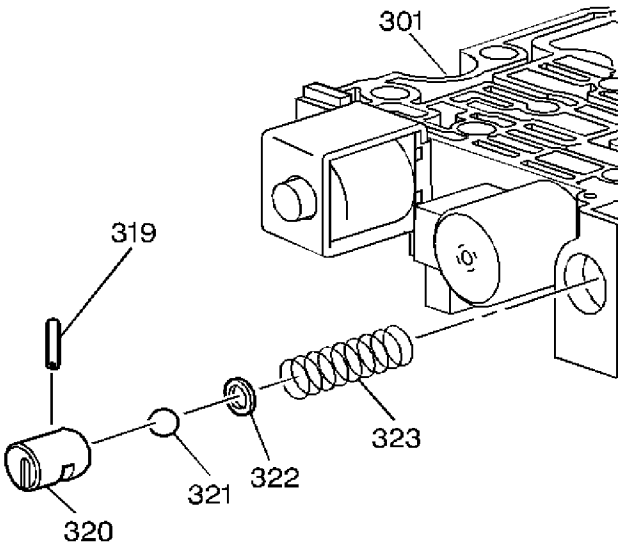


31. Install the reverse boost valve (310), the springs (311, 312), and the pressure regulator valve (313) into the valve body.
32. Assemble the reverse boost valve bushing (309) and the retainer (308).
33. Insert the reverse boost spring (307) into the valve body.
34. Insert the pressure regulator retainer (306).
35. Install the spring (305), the line boost valve (304), and the bore plug (303) into the valve body.
36. Install the line boost valve retainer (302).

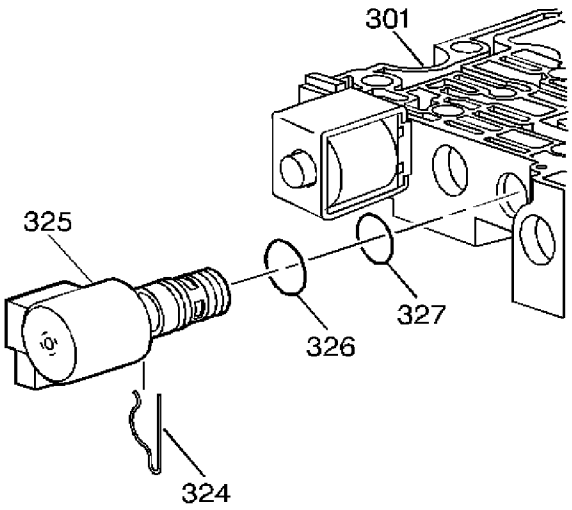


37. Install the valve spring (317) and the 1-2 shift valve (318) into the 1-2 shift valve body.
38. Insert the seal (316) onto the 1-2 shift solenoid valve (315).
39. Insert the shift solenoid valve (315) into the valve body.
40. Install the shift solenoid valve retainer (314).

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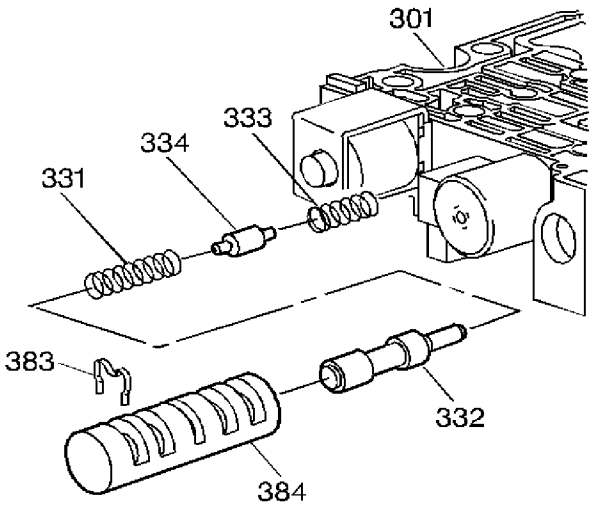


41. Insert the valve spring (323), the valve seat (322), and the valve (321) into the oil pump pressure relief valve body.
42. Insert the pressure relief bushing (320) into the valve body.
43. Install the bushing retaining pin (319)

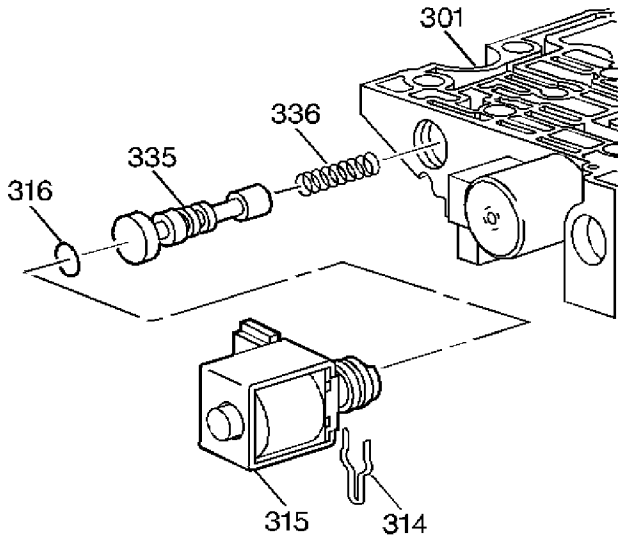


44. Affix new seals (326, 327) onto the PWM solenoid valve assembly (325).
45. Insert the solenoid valve (325) into the valve body.
46. Install the retainer (324) into the PWM solenoid valve assembly.

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47. Insert the isolator spring (333) and the valve (334) into the valve body.
48. Insert the torque converter clutch (TCC) regulator valve (332) and the spring (331) into the valve sleeve (384).
49. Insert the valve sleeve assembly into the valve body.
50. Insert the TCC regulator valve retainer (383).



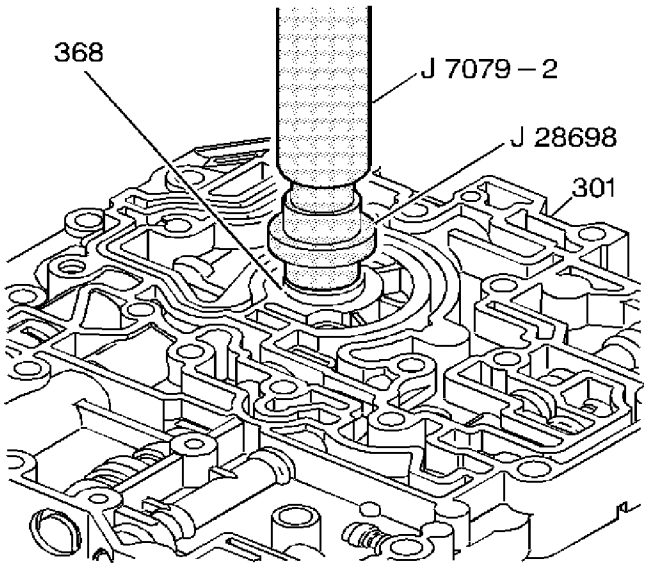
51. Insert the TCC valve spring (336) and the valve (335) into the valve body.
52. Install a new seal (316) onto the TCC solenoid valve (315).
53. Insert the solenoid valve (315) into the valve body.
54. Install the solenoid valve retainer (314).

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Oil Pump Shaft Bearing Disassemble

Tools Required

- J 28698 Pump Bearing Remover
- J 7079-2 Driver Handle



1. Use J 28698 andJ 7079-2 in order to push the pump shaft bearing (368) partially out of the valve body.
2. Use a screwdriver in order to complete the removal of the pump shaft bearing.

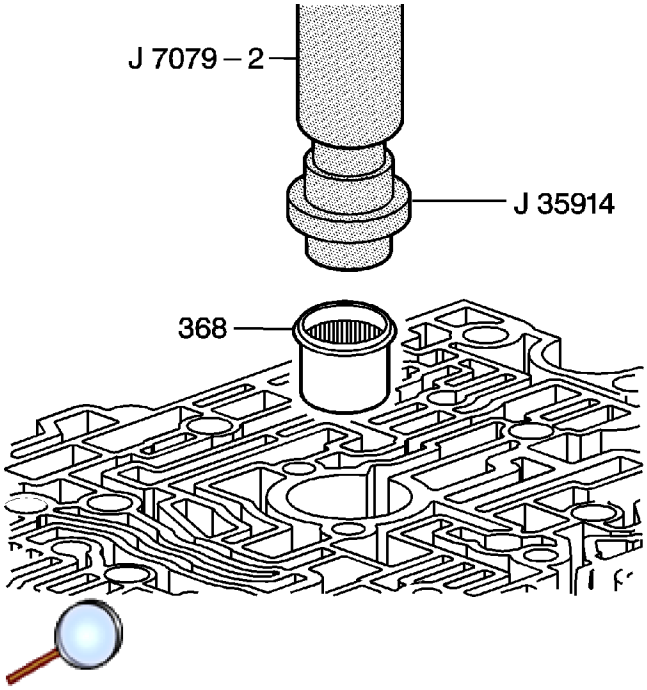
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Oil Pump Shaft Bearing Assemble

Tools Required

- J 35914 Pump Bearing Remover/Installer
- J 7079-2 Driver Handle

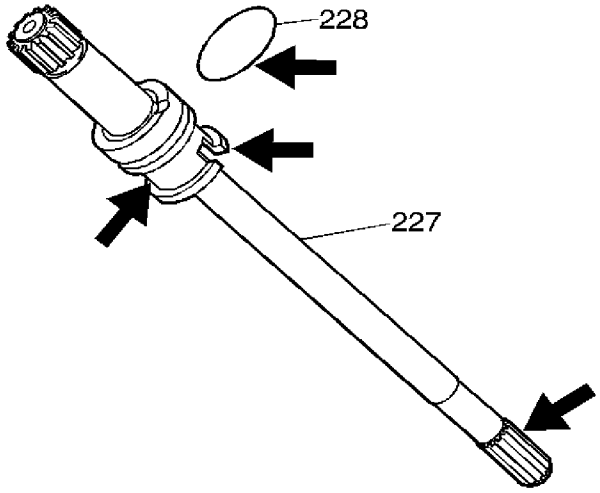


Use J 35914 , J 7079-2 , and a hammer. Gently tap the pump shaft bearing (368) into the valve body.

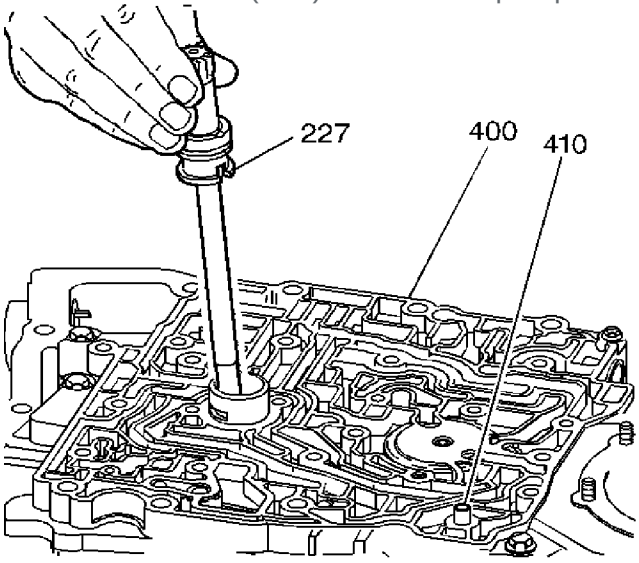
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Oil Pump Drive Shaft Assemble



1. Inspect the oil pump drive shaft (227) for the following:
   - A scored or rough journal surface
   - Stripped or burred splines
   - A cut or damaged seal
2. Install a new seal (228) onto the oil pump drive shaft (227).



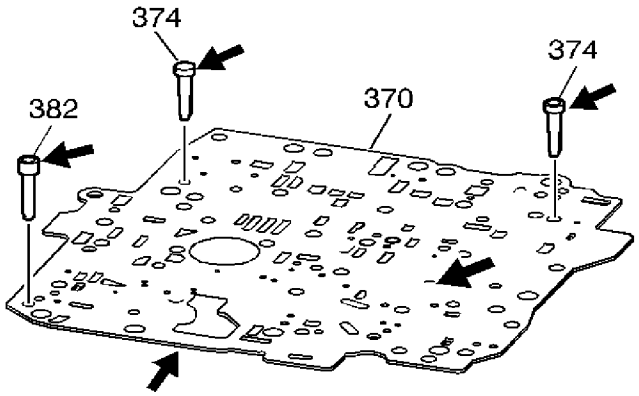
3. Install the oil pump drive shaft assembly (227) into the channel plate (400).

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Control Valve Body and Spacer Plate Assemble

Tools Required

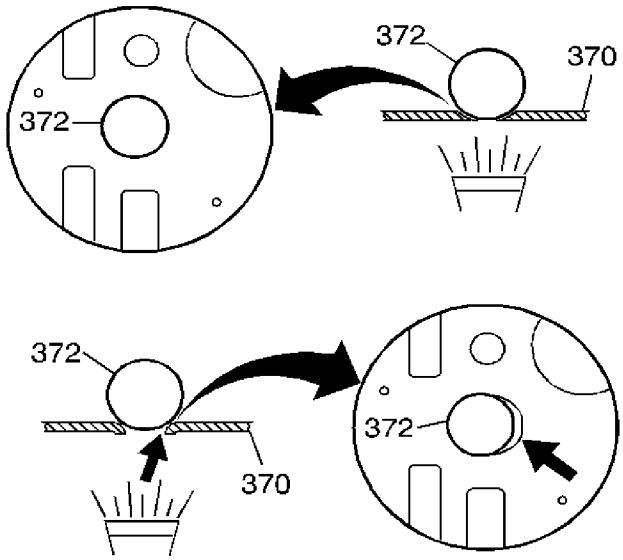
- J 25025 Guide Pins
- J 36850 Assembly Lubricant



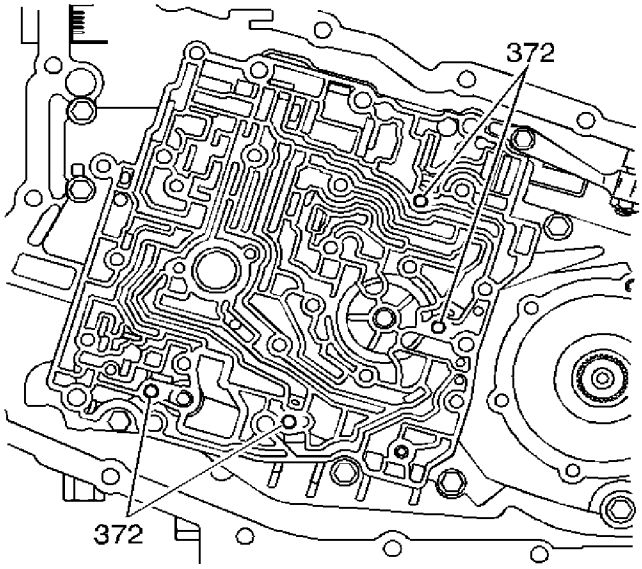
1. Inspect the spacer plate (370) from the control valve body for the following:
   - Bent or stuck thermal elements
   - Plugged holes
   - Damage from being bent
   - Plugged or damaged solenoid screens

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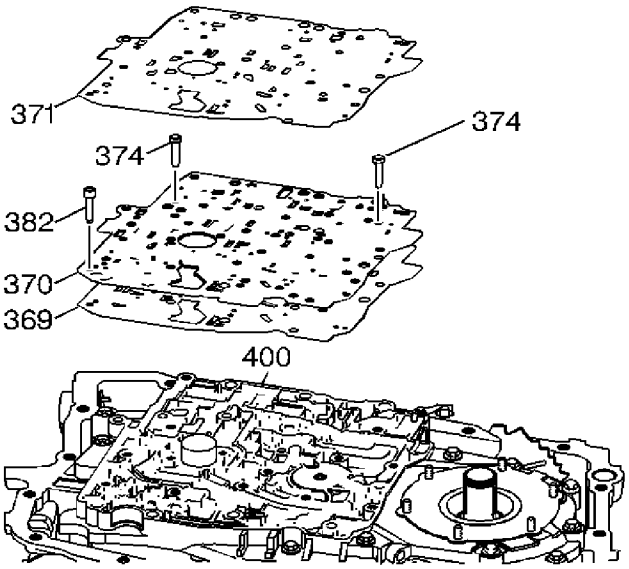


2. Inspect each check valve seat (370) for excessive peening. Place a ball check valve (372) on each seat and use a flashlight in order to look for visible light between the valve and the seat.

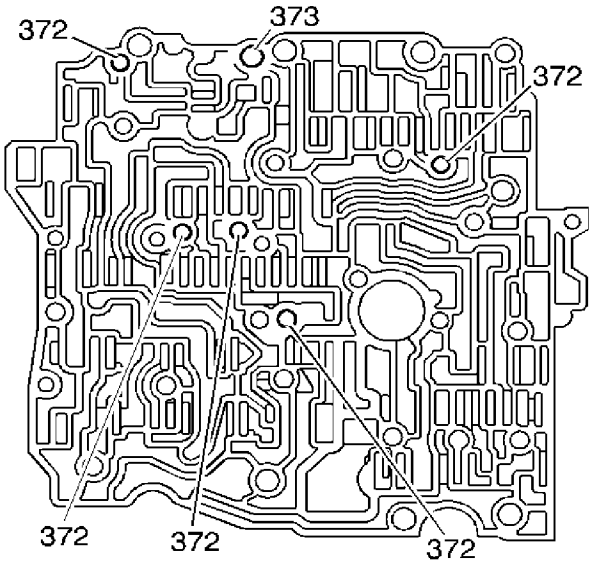


3. Place the ball check valves (372) into the valve seats in the case cover.
4. Use J 36850 or equivalent in order to hold the valves in position.

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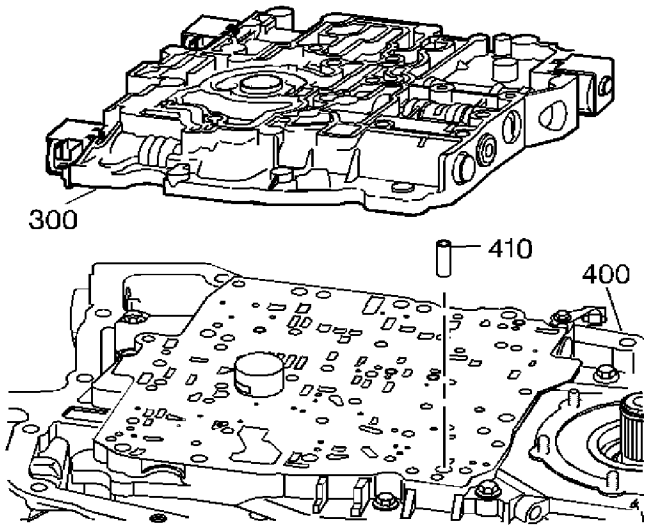


5. Insert the solenoid screens (374) into the valve body spacer plate (370).
6. Insert the TCC orifice screen (382) into the valve body spacer plate (370).
7. Assemble the valve body spacer plate and two spacer plate gaskets (369, 371) onto the channel plate (400).



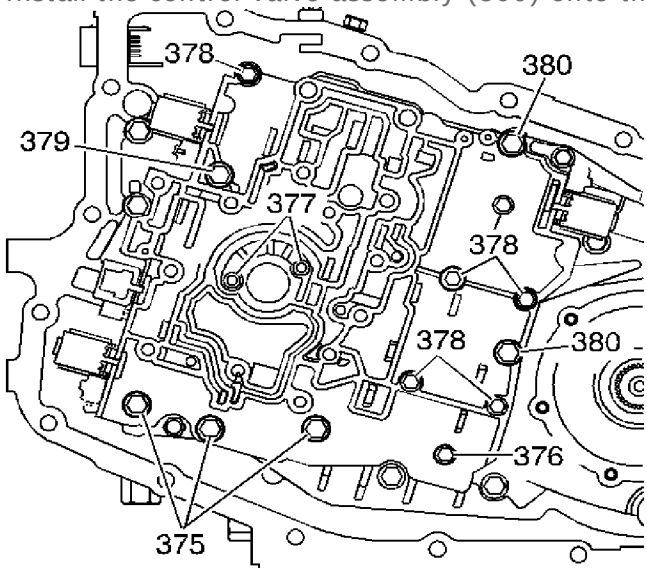
8. Position the check ball valves (372, 373) onto the valve body assembly. Retain the valves with J 36850 or equivalent.

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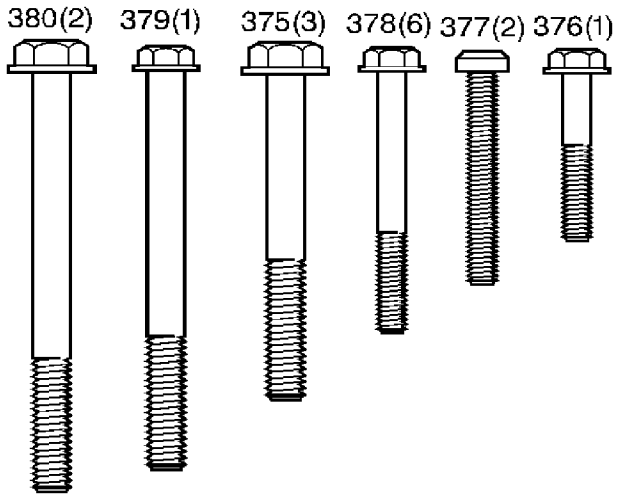
Important: Be sure that the check ball valves do not fall out of the valve body assembly during installation.

9. Install the control valve body alignment sleeve (410) into the case cover (400).
10. Install the control valve assembly (300) onto the case cover and the guide pins (410).



11. Install the retaining bolts (375-380) into the valve body at the locations indicated.

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Important: Tighten and torque the bolts in a spiral pattern starting from the center. If the bolts are torqued at random, valve bores may become distorted and inhibit proper valve operation.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

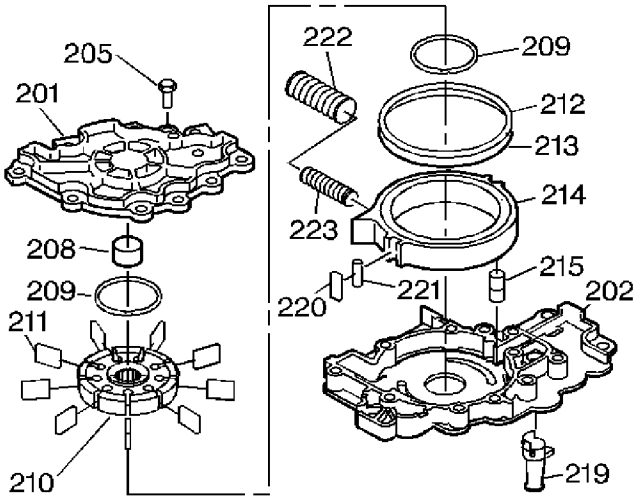
12. Tighten the valve body assembly bolts.

Tighten

- Tighten bolts 380, 379, 375 to 25 N·m (18 lb ft).
- Tighten bolts 376, 378 to 12 N·m (106 lb in).
- Tighten bolts 377 to 12 N·m (106 lb in).

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Transmission Fluid Pump Disassemble



Important: The automatic transmission oil pump assembly has a pump slide, seal, vanes, and a rotor that are factory selected for size. Do not switch parts with another pump.

1. Remove the oil pump cover bolts (205).
2. Remove the oil pump cover (201).
3. Remove the pump rotor (210), the vane rings (209) and the bushing (208).
4. Remove the vanes (211), the oil seal ring (212), and the slide seal (213).

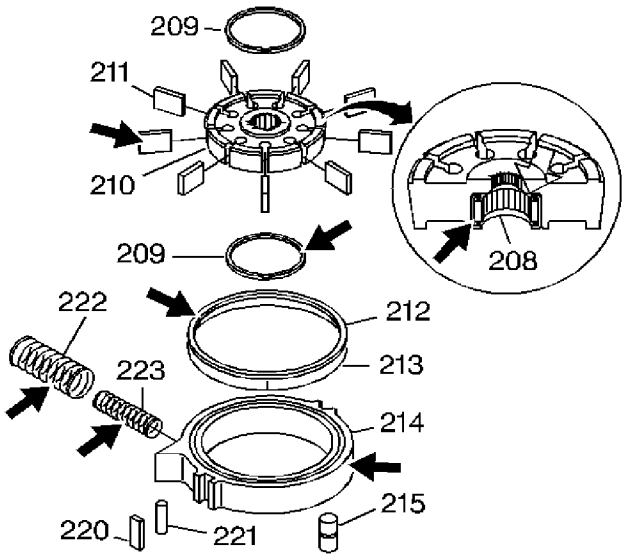
Caution: Valve springs can be tightly compressed. Use care when removing retainers and plugs. Personal injury could result.

5. Remove the outer and the inner oil pump prime springs (222, 223).
6. Remove the pump slide seal (220) and the slide seal support (221).
7. Remove the pump slide pivot pin (215).
8. Remove the oil screen assembly (219).

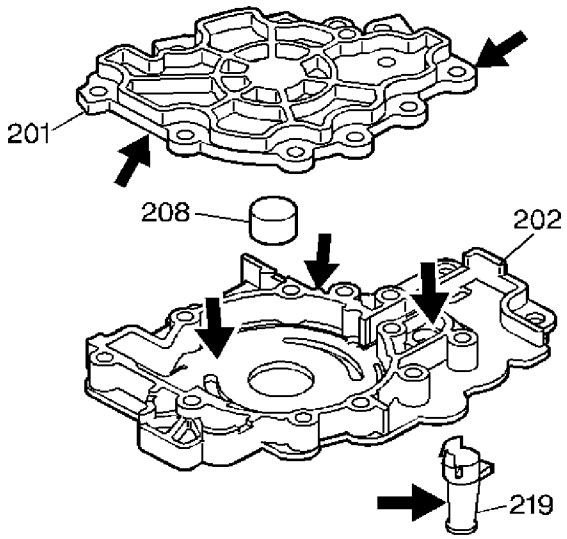
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Transmission Fluid Pump Assemble



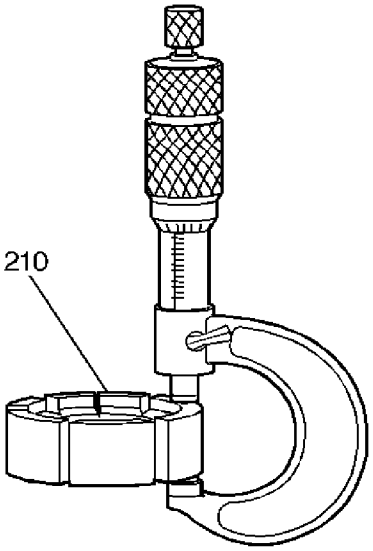
1. Inspect the oil pump for the following:
   - A worn, scored, or gouged pump slide (214)
   - Cracks, wear, or damage to the rotor (210), or the vanes (211)
   - Cuts or damage to the seals (212, 213)
   - Broken priming springs (222, 223)



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2. Inspect the oil pump body (202) for the following:
   - Porosity
   - A worn, scored, or damaged pump pocket
   - Interconnected oil passages
   - Damaged machine surfaces
3. Inspect the pressure screen assembly (219) for damage or debris.
4. Inspect the oil pump cover (201) for cracks, wear, or gouges from the pump vanes.
5. Inspect the bushing (208) for wear, scoring, and scratches.

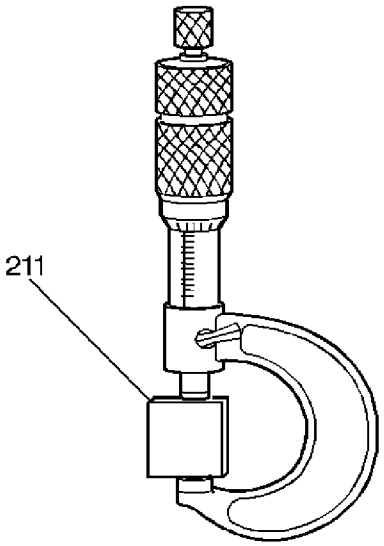




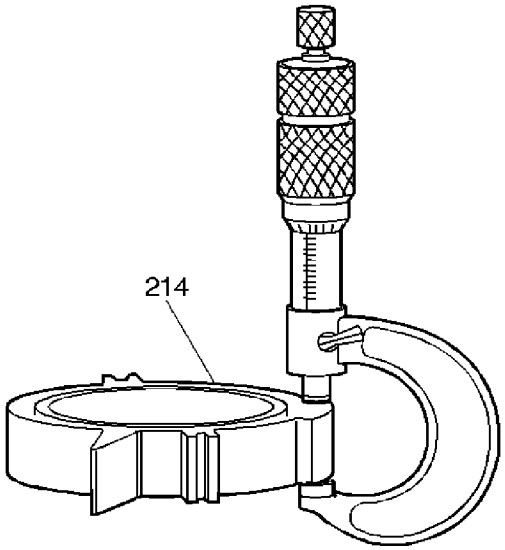
Important: Laser marks on the oil pump body indicate the size of the selective parts which were used in assembly. If these correct parts are not selected for replacement, damage to the oil pump and to the transmission will occur.

6. Measure the pump rotor (210).
7. Select the proper replacement size. Refer to the Rotor Selection table found in Oil Pump Specifications .

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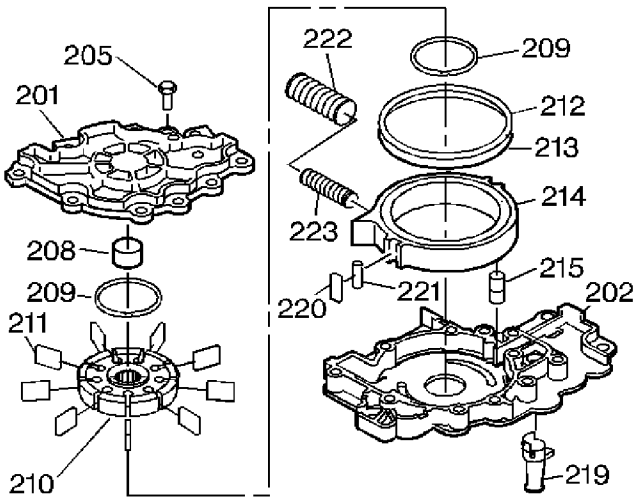


8. Measure the oil pump vanes (211).
9. Select the proper replacement size. Refer to the Vane Selection table found in Oil Pump Specifications .



10. Measure the oil pump slide (214).
11. Select the proper replacement size. Refer to the Slide Selection table found in Oil Pump Specifications .

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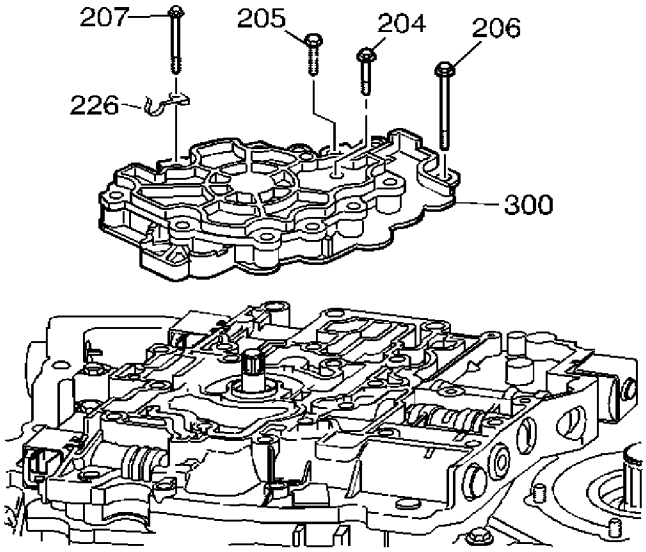
12. Insert the oil pump screen (219).
13. Insert the pump slide seal (221) and the support (220) into the slot on the slide (214).
14. Insert the pump slide (214) and the pivot pin (215) into the pump body (202).
15. Install the inner and the outer priming springs (222, 223) as an assembly into the pump body (202).
16. Install the first vane ring (209).
17. Insert the oil seal (213) and the oil seal ring (212) into the slide.
18. Insert the rotor (210) into the pump body (202).
19. Assemble the pump vanes (211) into the rotor (210). The vanes must be flush with the top of the rotor.
20. Install the second vane ring (209).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

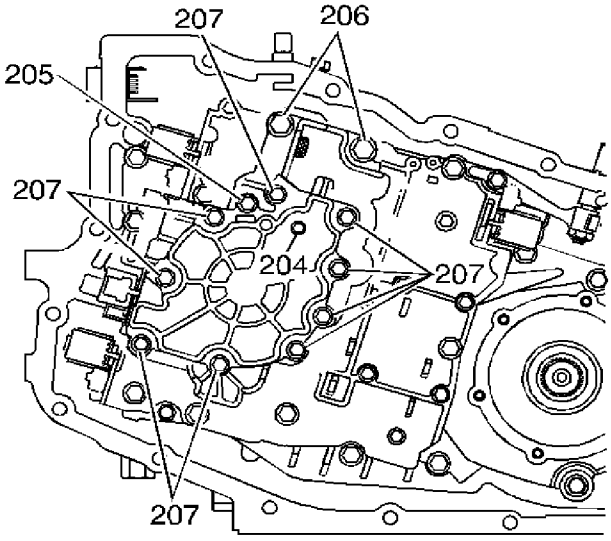
21. Insert the pump cover (201) and the bolt (205).

Tighten
Tighten the bolts to 25 N·m (18 lb ft).

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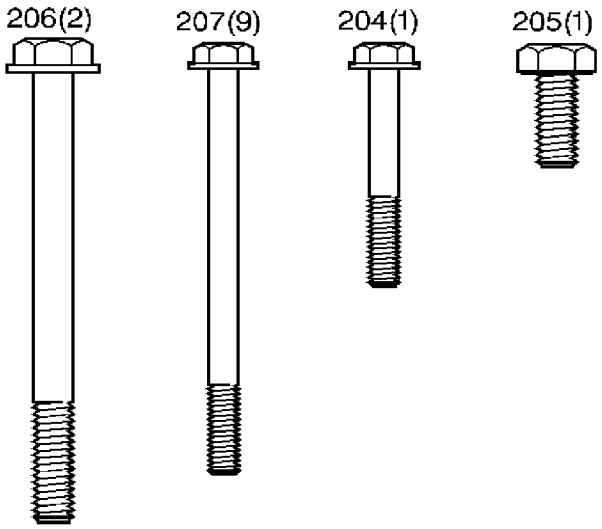


22. Install the transmission oil pump assembly (300) onto the control valve assembly.



23. Install the 11 oil pump bolts as indicated (204, 206, 207)

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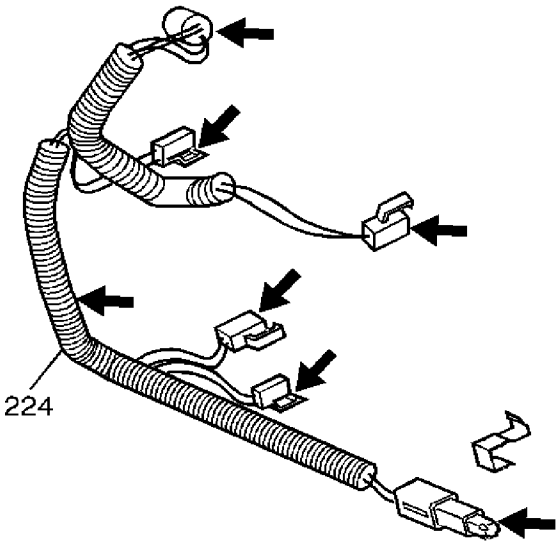
24. Tighten the bolts (204, 205, 206, 207).

Tighten

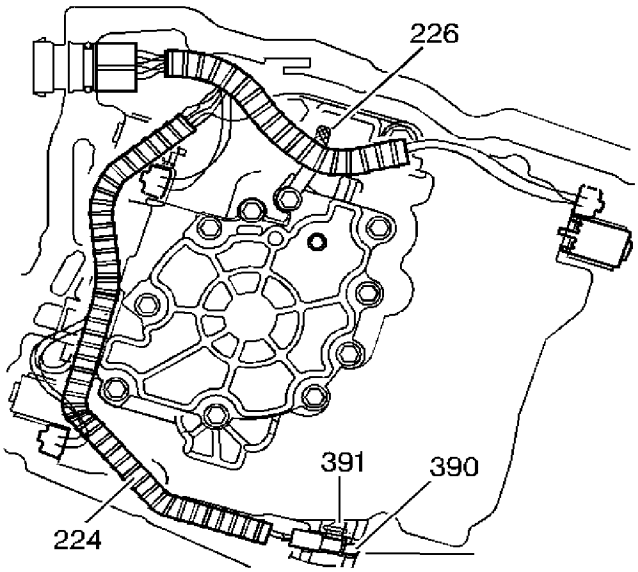
- Tighten the bolts (204, 207) to 12 N·m (106 lb in).
- Tighten the bolts (205) to 25 N·m (18 lb ft).
- Tighten the bolts (206) to 33 N·m (24 lb ft).

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Wiring Harness Assemble



1. Inspect the transmission wiring harness assembly (224) for the following:
   - Cut or pinched wires
   - Cut wire insulation
   - Bent or broken electrical connectors



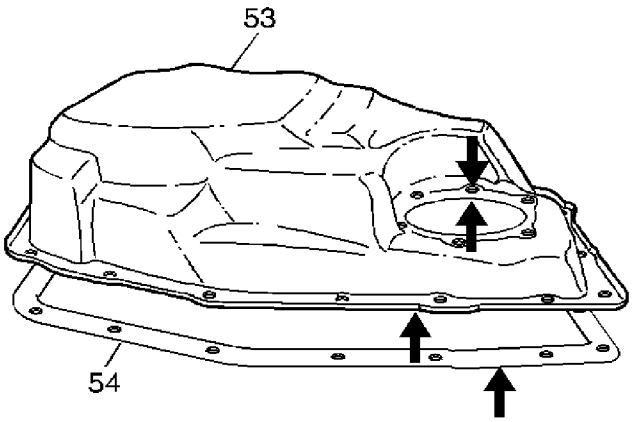
2. Position the wire harness assembly (224) onto the valve body and pump assembly.
3. Mate each connector to its respective electrical component. Engage the locking tabs.

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4. Secure the harness conduit into the retaining clips (225, 226).
5. Insert the automatic transmission temperature sensor (391) into the retaining clip (390).

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Control Valve Body and Gasket Assemble



Important: Some models are assembled with stamped steel control valve body covers. Some models are assembled with cast aluminum covers that have machined surfaces and threaded bolt holes. Refer to the following procedures accordingly.

1. Inspect the control valve body cover for the following:

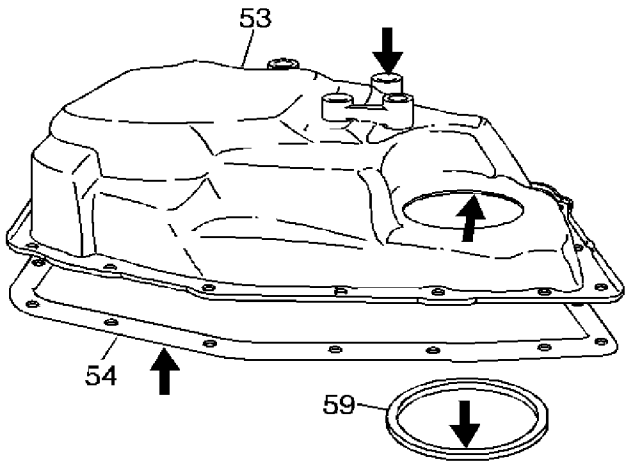
Stamped steel

- Dents to the gasket sealing surfaces
- Dents anywhere that may cause interference during assembly
- Flatness of the gasket sealing surfaces

2. Inspect the valve body cover gaskets for nicks or other damage.

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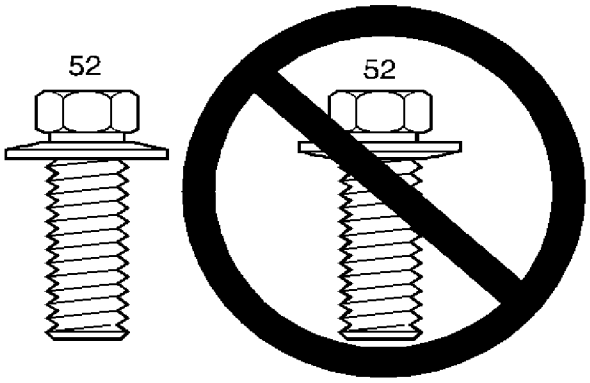


3. Inspect the control valve body cover for the following:

Cast aluminum

- Cracks, nicks, or other damage to the gasket seal surfaces
- Bolt holes for damaged or stripped threads
- Cracks or porosity in the casting

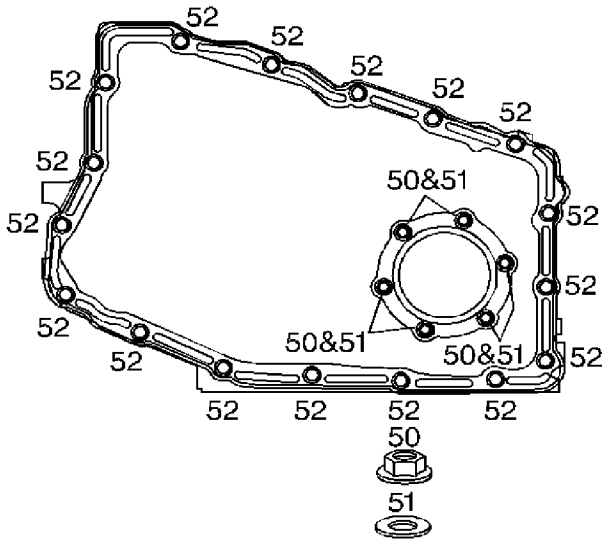
4. Inspect the valve body cover gaskets for nicks or other damage. With the aluminum valve body covers, you may reuse any non-damaged gaskets.



Important: Do not use bolts with inverted conical washers when you assemble the stamped steel control valve body cover.

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5. Inspect the bolts (52) for inverted washers.





6. Affix the cover gasket onto the transmission case assembly:

Stamped steel side cover

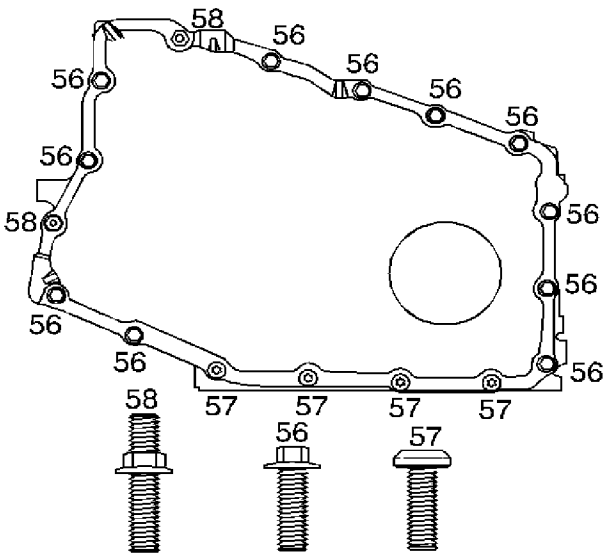
- Affix the steel cover inner cover gasket onto the case cover.
- Position the steel cover onto the case.
- Finger start the bolts and nuts.

Tighten
Tighten the bolts to 11 N·m (98 lb in).

Tighten
Tighten the nuts to 8 N·m (71 lb in).

- Refer to *Fastener Notice* .

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7. Affix the cover gasket onto the transmission case assembly:

Cast aluminum side cover

- Affix the inner valve body cover gasket onto the case cover.
- Position the aluminum cover onto the case.
- Finger start the bolts in the positions shown.

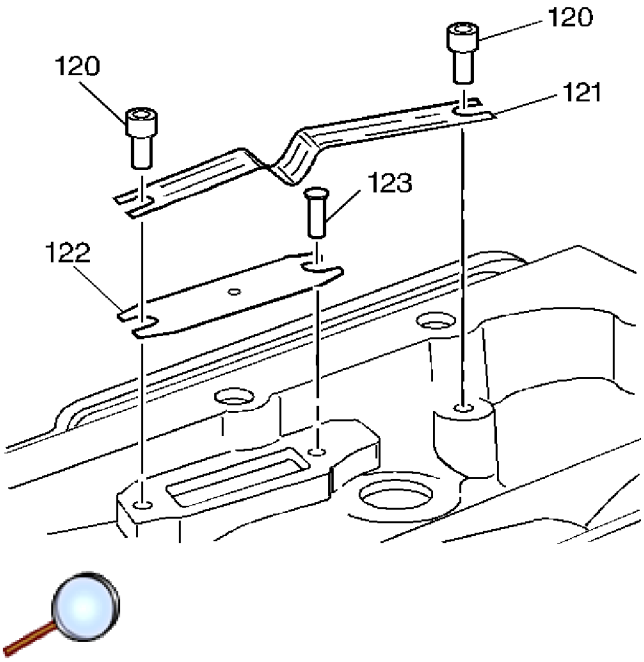
Tighten
Tighten the bolts to 11 N·m (98 lb in).

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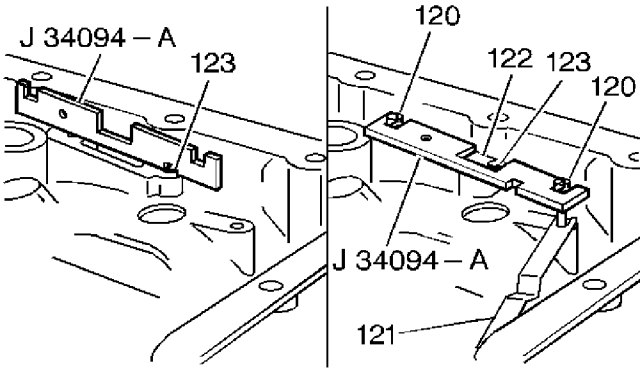
Thermo Element Adjustment

Tools Required

J 34094-A Thermal Element Height Gauge



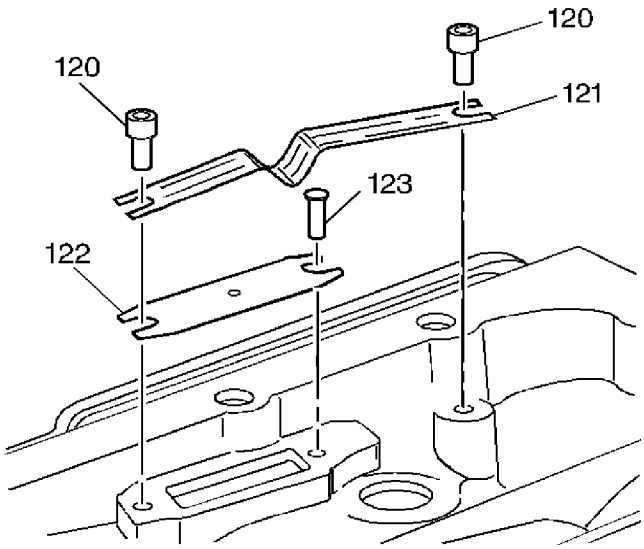
1. Remove the thermo element plate pins (120).
2. Remove the thermo element (121) and the thermo element plate (122).



3. Use J 34094-A in order to set the height of the thermo element plate center pin (123).

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4. Install the thermo element plate (122).
5. Use J 34094-A in order to set the height of the thermo element plate pin (120) that is farthest from the accumulators.
6. Use J 34094-A in order to set the height of the second thermo element plate pin (120).

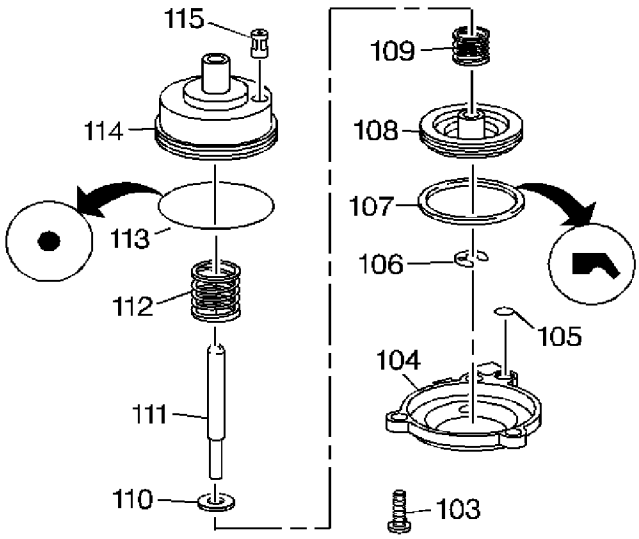




7. Carefully install the thermo element (121) between the two thermo element plate pins (120).
8. The V in the thermo element (121) must contact the thermo element plate (123).

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2-1 Manual Band Servo Disassemble

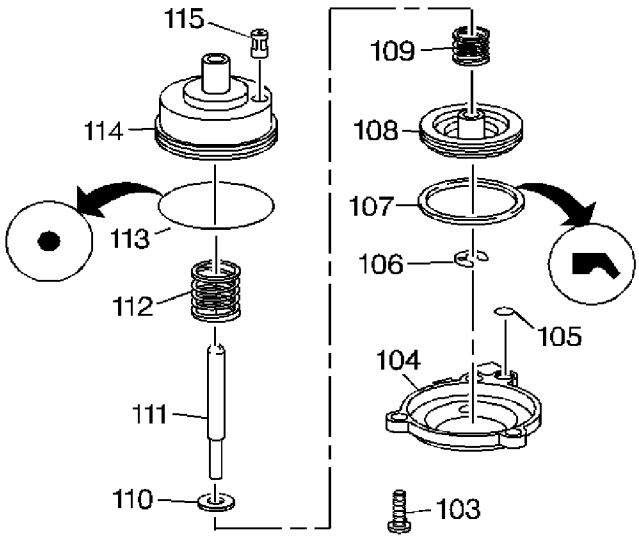


1. Remove the servo piston cylinder (114) from the servo cover (104).
2. Remove the O-ring seal (113) from the servo piston cylinder (114).
3. Remove the servo piston assembly (106-111), the servo piston spring (112) and the servo exhaust screen (115) from the servo piston cylinder (114).
4. Remove the servo piston seal (107) from the servo piston (108).
5. Use a small screwdriver in order to remove the servo piston pin retaining ring (106) from the servo piston pin (111).
6. Remove the servo piston (108), the servo piston cushion spring (109) and the servo piston spring retainer (110) from the servo piston pin (111).

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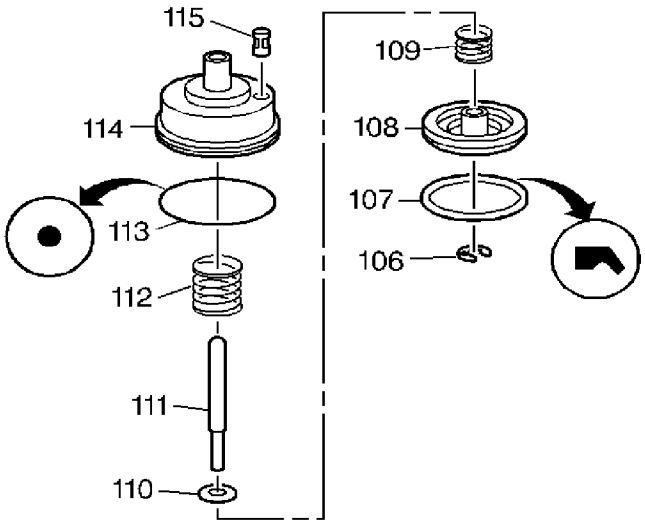
2-1 Manual Band Servo Assemble



1. Inspect the components of the 2-1 manual band servo for the following conditions:
   - A damaged, worn or porous servo piston cylinder (114)
   - A damaged, worn or porous servo piston (108)
   - A damaged or worn servo piston pin (111)
   - A broken or damaged servo piston spring (112)
   - A broken or damaged servo piston cushion spring (109)
   - A damaged or plugged servo exhaust screen (115)
   - A damaged servo cover seal (105)
   - A damaged servo piston seal (107)
   - A damaged servo piston cylinder O-ring seal (113)

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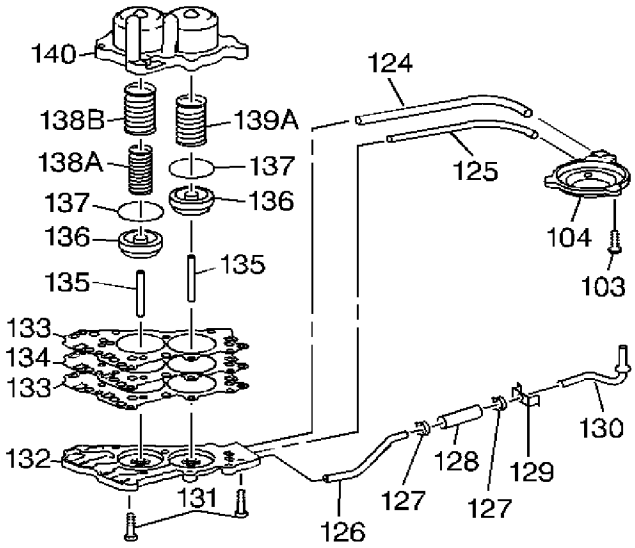




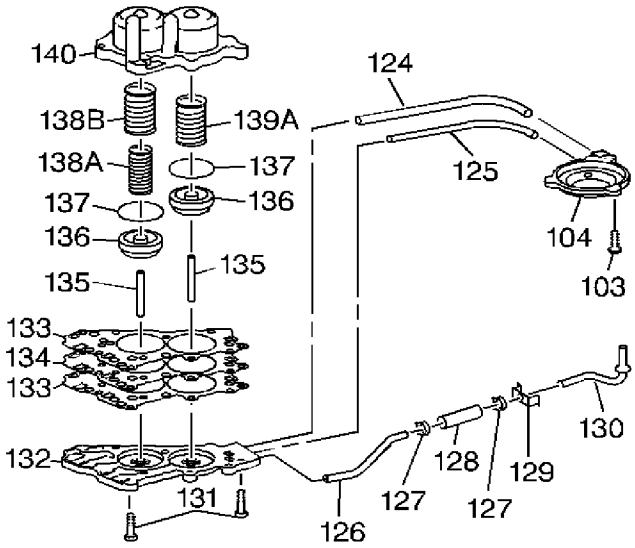
2. Assemble the servo piston spring retainer (110), the servo piston cushion spring (109) and the servo piston (108) onto the servo piston pin (111).
3. Use a small screwdriver in order to install the servo piston pin retaining ring (106).
4. Install the servo piston seal (107) onto the servo piston (108). Lubricate the servo piston seal (107) with automatic transmission fluid.
5. Assemble the servo exhaust screen (115) and the servo piston cylinder O-ring seal (113) onto the servo piston cylinder (114). Lubricate the servo piston cylinder O-ring seal (113) with automatic transmission fluid.
6. Attach the servo piston spring (112) to the servo piston assembly (106-111).
7. Install the servo piston and spring assembly (106-112) into the servo piston cylinder assembly (113-115) and set the assemblies aside.

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Accumulator Components Disassemble



1. Remove the seven remaining accumulator cover bolts (131) from the accumulator assembly.
2. Remove the accumulator cover (132), the spacer plate (134), and the gaskets (133) from the accumulator housing assembly (140).
3. Remove the 1-2 and 2-3 accumulator pistons (136), the piston pins (135), and the inner and outer springs (138, 139) from the accumulator housing (140). The springs and the pistons vary by model.
4. Remove the piston oil seal rings (137) from the 1-2 and 2-3 accumulator pistons (134).



5. Disassemble the manual 2-1 band servo. Remove the forward band servo oil pipes (124,

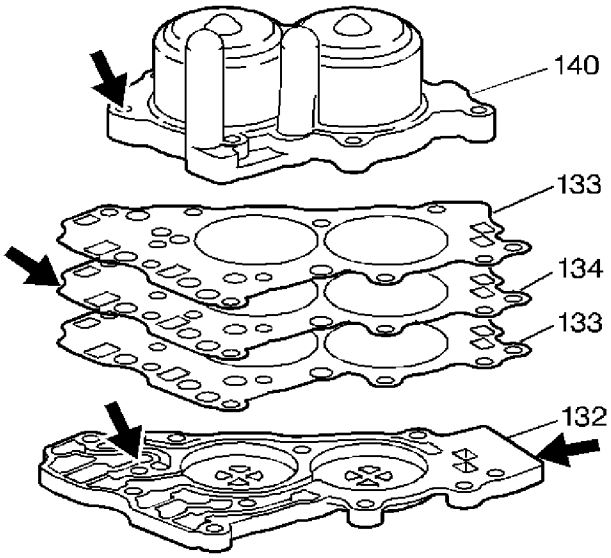
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125), and remove the lube oil pipe assembly (126) from both the accumulator cover (132) and from the manual 2-1 band servo cover (104).

6. Remove the following parts:
   - The lube oil pipe (126)
   - The hose clamps (127)
   - The hose (128)
   - The lube oil pipe retainer (129)
   - The lube oil pipe and the washer (130)

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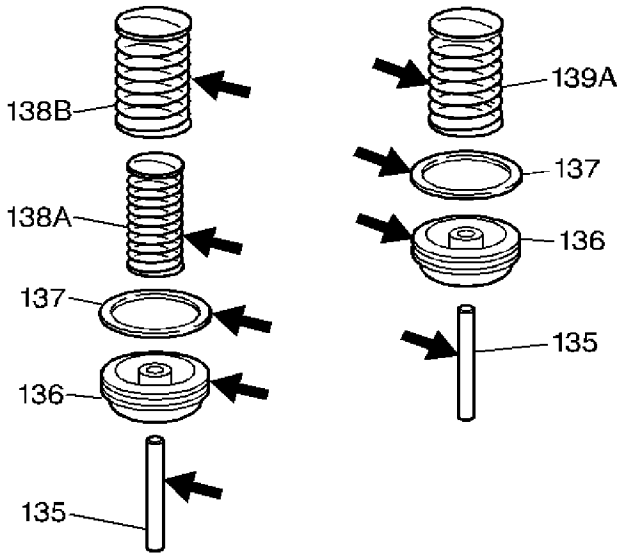
Accumulator Components Assemble



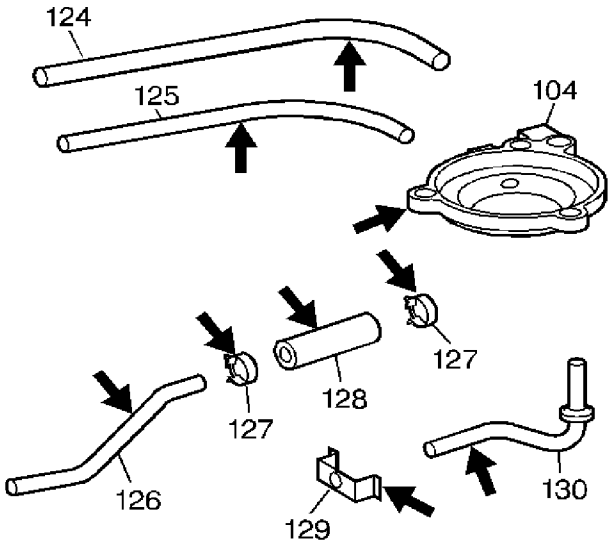
1. Inspect the accumulator housing (140), the spacer plate (134), the gaskets (133), and the cover (132) for the following conditions:
   - A damaged lube, and servo oil pipe holes in the accumulator cover.
   - A damaged, improperly machined, or porous accumulator cover
   - A bent or damaged accumulator spacer plate
   - Damaged accumulator cover gaskets
   - Stripped or damaged bolt holes in the accumulator housing
   - A damaged, worn, improperly machined, or porous accumulator housing

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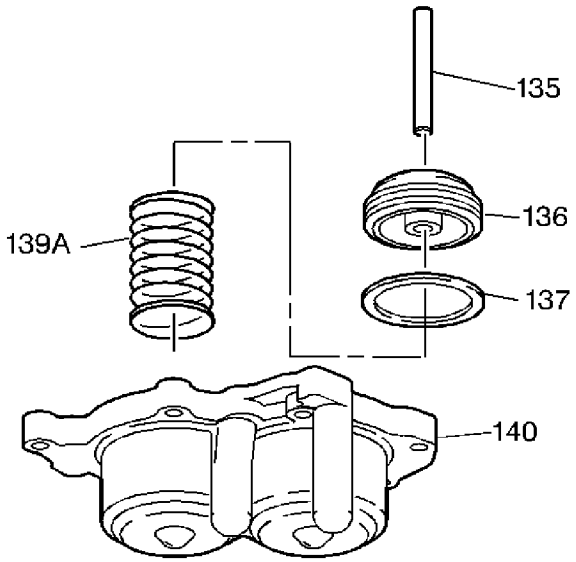
2. Inspect the accumulator pistons (136), the springs (138, 139), the seals (137), and the pins (135) for the following conditions:
   - Broken or collapsed piston springs (inner and outer)
   - Broken or collapsed piston cushion springs
   - Bent or worn accumulator piston pins
   - Damaged, worn, or porous accumulator pistons
   - Damaged accumulator piston seals



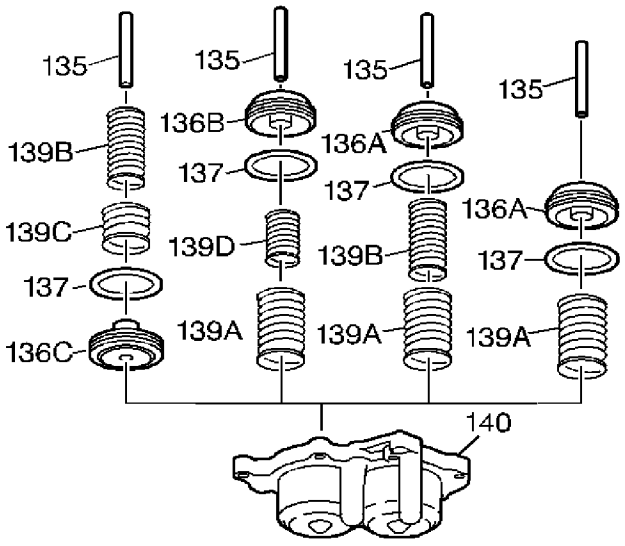
3. Inspect the servo and lube oil pipe components (124-130) and the manual 2-1 band servo cover (104) for the following conditions:
   - A damaged lube, and servo oil pipe holes in the servo cover

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- A damaged, improperly machines, or porous servo cover
- Bent, plugged, or damaged lube and servo oil pipes
- A plugged or damaged lube oil hose
- Damaged hose clamps
- A damaged lube oil pipe retainer
- A missing lube oil pipe washer

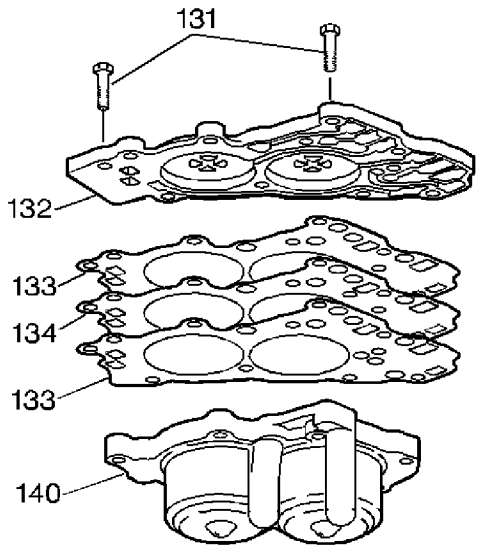


4. Install the oil seal ring (137) onto the 2-3 accumulator piston (136). Lubricate the oil seal ring with automatic transmission fluid.
5. Assemble the piston pin (135) and the 2-3 accumulator piston (136).
6. Insert the inner and outer springs (138) for the 2-3 accumulator piston, and the piston assembly (136) into the accumulator housing (140). The springs may vary by model.



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7. Install the oil seal ring (137) onto the 1-2 accumulator piston (136). The piston may vary by model. Lubricate the oil seal ring with automatic transmission fluid.
8. Assemble the piston pin (135) and 1-2 accumulator piston (136).
9. Insert the inner and outer springs (139) for the 1-2 accumulator piston, and the piston assembly (136) into the accumulator housing (140). The springs and the pistons and the order of installation may vary by model.



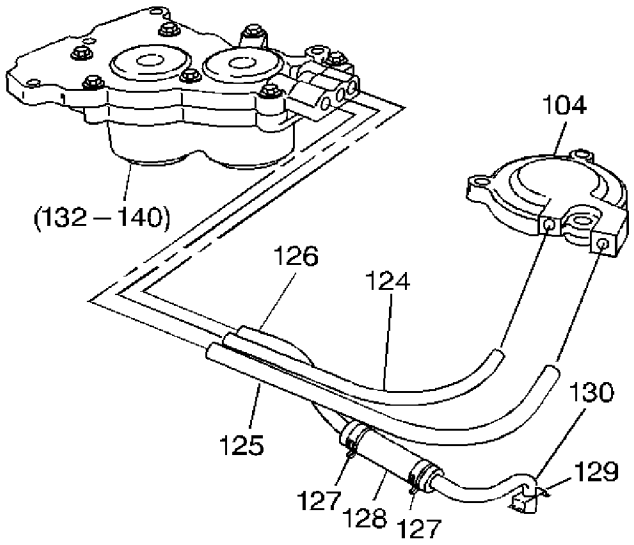
10. Install the accumulator spacer plates (134), the gaskets (133), and the cover (132) onto the accumulator housing (140).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

11. Install seven accumulator cover bolts (131).

Tighten
Tighten the bolts to 12 N·m (106 lb in).

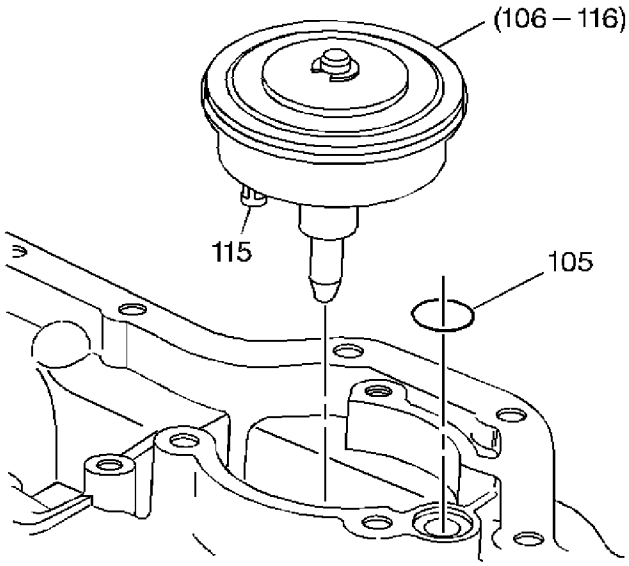
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12. Assemble the following parts:
    - The lube oil pipe (126)
    - The hose (128)
    - The hose clamps (127)
    - The pipe retainer (126)
    - The pipe with the washer (130)
13. Install the manual 2-1 band servo and the forward band servo oil pipes (124, 125) into the accumulator assembly (132-140).
14. Install the manual 2-1 band servo and the forward band servo oil pipes (124, 125) into the manual 2-1 band servo cover (104).
15. Install the lube oil pipe assembly (126) into the accumulator assembly (132-140).

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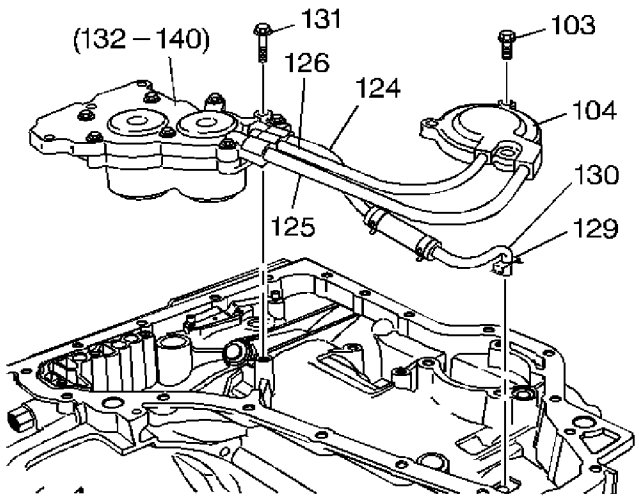
Accumulator Assembly, 2-1 Band Servo Assemble



1. Install the 2-1 manual band servo cover seal (105) into the case. Lubricate the 2-1 manual band servo cover seal (105) with automatic transmission fluid.

   Notice: Do not damage the 2-1 manual band servo exhaust screen on installation.

2. Install the 2-1 manual band servo assembly (106-116) into the case. Make sure that the 2-1 manual band servo pin engages the 2-1 manual band assembly.



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3. Install the accumulator (132-140) and 2-1 manual band servo cover assembly (104) into the case.
4. Install the lube oil pipe and washer assembly (130) through the case and into the lube hole in the differential carrier internal gear.
5. Use a screwdriver in order to lock the lube oil pipe retainer (129) into the case.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

6. Install the three 2-1 manual band servo cover bolts (103).

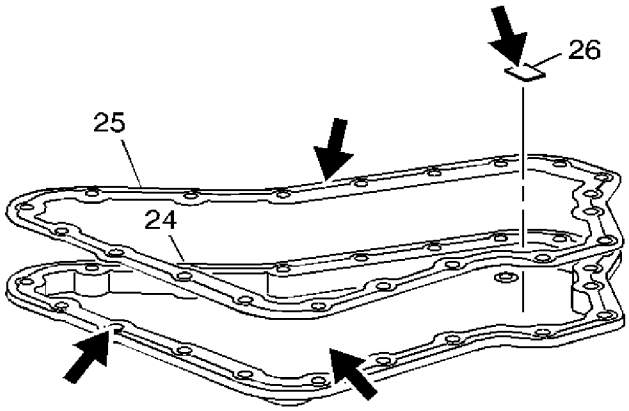
   Tighten
   Tighten the bolts to 25 N·m (18 lb ft).

7. Install the four accumulator cover bolts (131).

   Tighten
   Tighten the bolts to 12 N·m (106 lb in).

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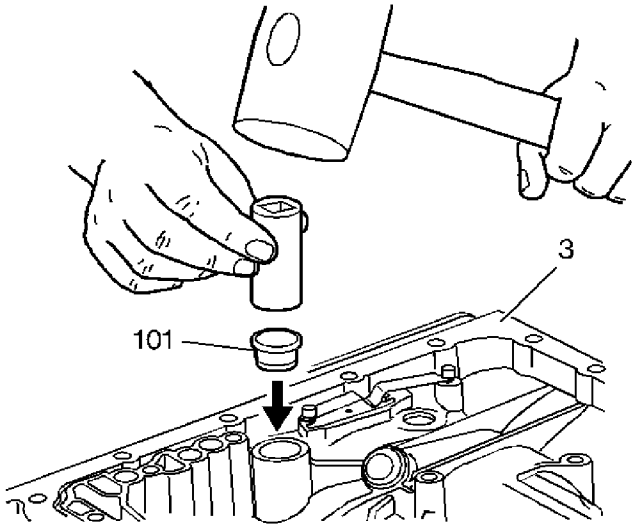
Transmission Fluid Pan and Filter Assemble



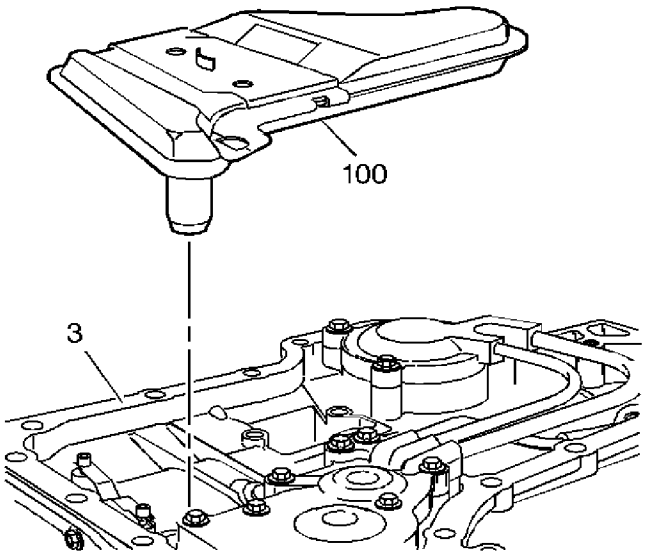
1. Inspect the oil pan (24) for the following conditions:
   - A damaged sealing surface
   - A dented or cracked bottom surface
2. Inspect the oil pan gasket (25) for the following conditions:
   - A bent or damaged seal core
   - A damaged rubber seal surface
   - A damaged gasket
3. Inspect the oil pan magnet (26) for damage or misalignment
4. Clean the oil pan (24), the oil pan gasket (25) and the oil pan magnet (26) in order to remove any sediment.

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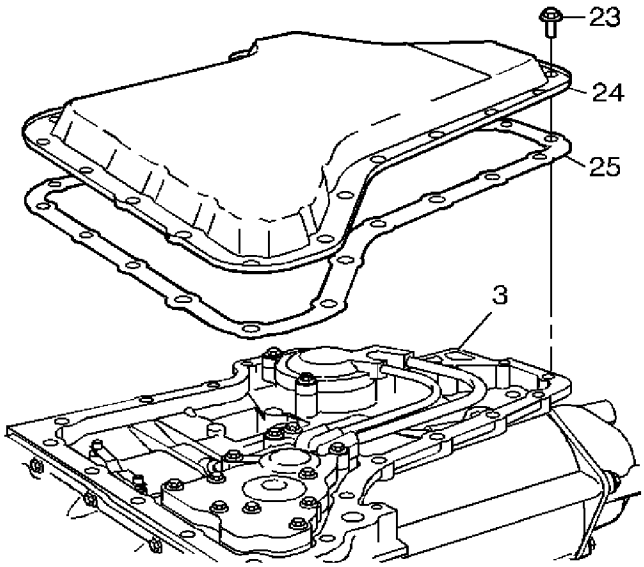


5. Position the transmission so that the oil pan sealing surface is facing upward.
6. Lubricate the oil filter seal assembly (101) with transmission fluid.
7. Using a socket and a plastic mallet, gently tap the oil filter seal assembly (101) into the case (3).



8. Install the oil filter assembly (100) into the case (3).

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9. Install the oil pan gasket (25) onto the case (3). The old gasket is reusable if the gasket is not damaged.
10. Install the oil pan (24) onto the case (3).

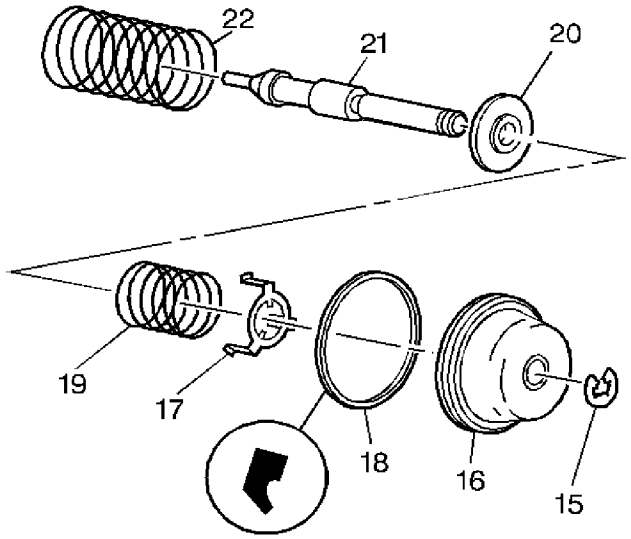
Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

11. Install the 20 oil pan bolts (23).

Tighten
Tighten the bolts to 14 N·m (10 lb ft).

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Forward Band Servo Components Disassemble

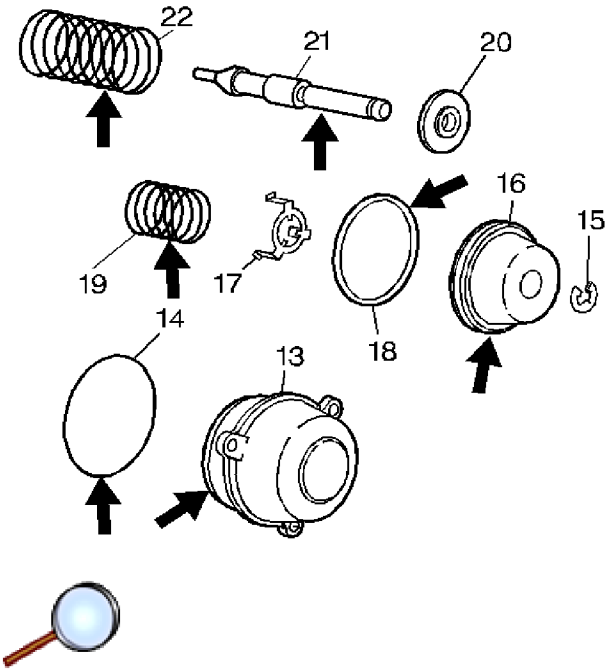


1. Remove the servo piston spring (22) from the servo assembly.
2. Remove the oil seal ring (18) from the servo piston (16).
3. Use a small screwdriver in order to remove the snap ring (15) from the servo piston pin (21).
4. Remove the servo piston (16), the servo piston cushion spring (19), the cushion spring retainer (17), and the servo piston pin (21).
5. If the cushion spring retainer (17) is damaged, remove the retainer from the servo piston.

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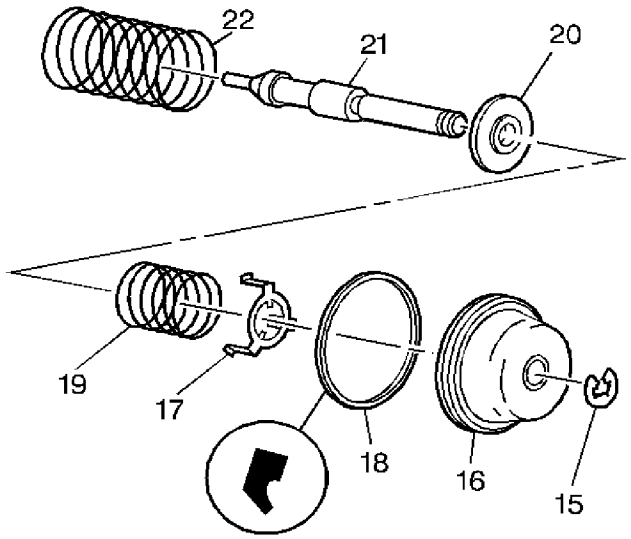
Forward Band Servo Assemble



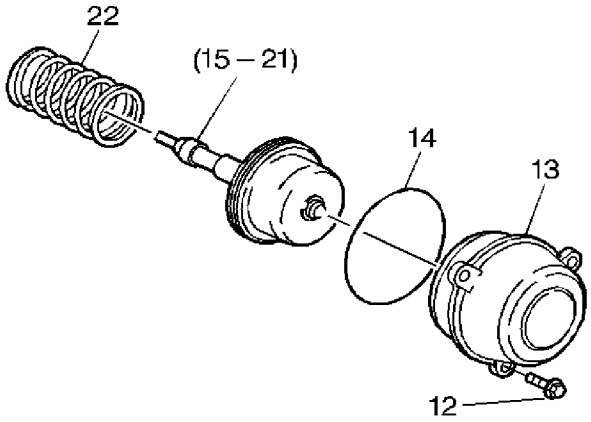
1. Inspect the forward band servo components for the following conditions:
   - A damaged, worn, or porous servo piston
   - A damaged servo piston seal
   - A damaged, worn, or porous servo cover
   - A damaged servo cover seal
   - A broken or collapsed servo piston spring
   - A broken or collapsed servo piston cushion spring
   - A damaged or worn servo piston pin

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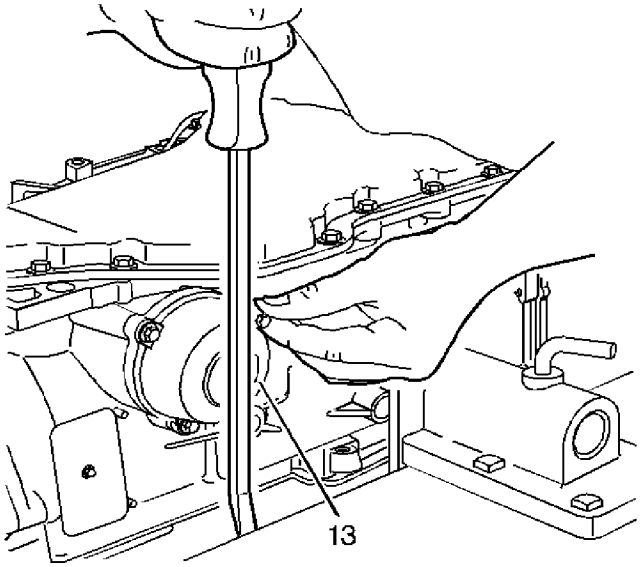


2. Install the servo piston cushion spring retainer (17) into the servo piston, if necessary.
3. Assemble the servo piston (16), the servo piston cushion spring (19), the cushion spring retainer (20), and the servo piston pin (21).
4. Install the servo pin snap ring (15) into the servo piston pin (21).
5. Install the servo piston oil seal ring (18) into the servo piston (16).
6. Install the servo piston spring (22) into the servo assembly.



7. Position the transmission so that the oil pan is facing up.
8. Affix the servo cover seal (14) onto the servo cover (13).
9. Install the servo assembly (13-22) into the servo cover. Pivot the servo into the cover in order to prevent the piston seal from being damaged.
10. Install the servo and the cover assembly (13-22) into the case (3).

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11. Using a long screwdriver, pry against the work bench in order to compress the forward band servo assembly (13).
12. Hold the servo assembly compressed.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

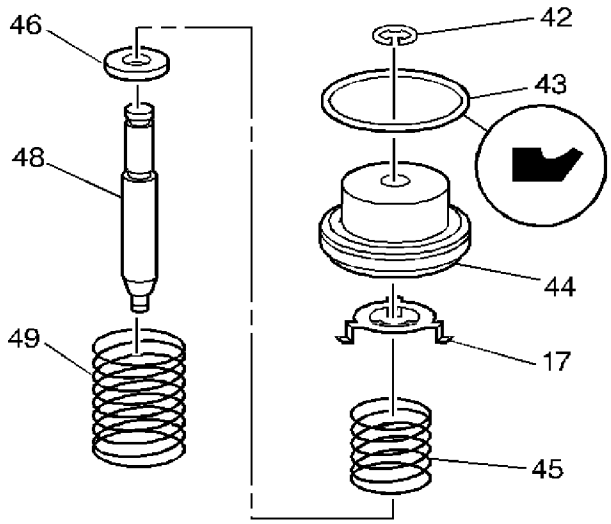
13. Install the three forward band servo cover bolts (12).

Tighten
Tighten the bolts to 12 N·m (106 lb in).

14. Remove the long screwdriver.

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Reverse Band Servo Components Disassemble

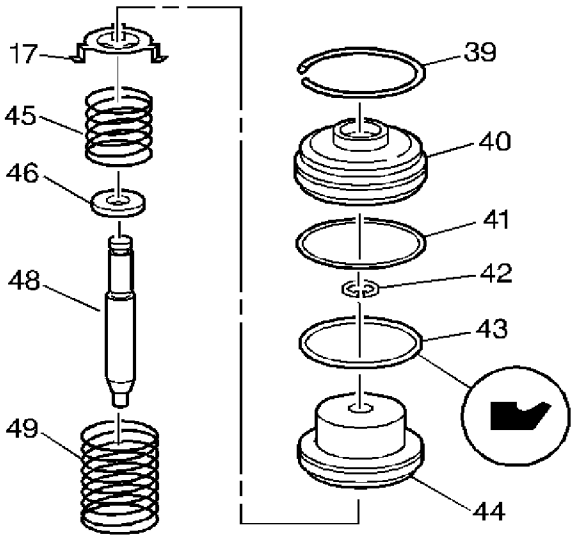


1. Remove the reverse band servo piston spring (49) from the servo piston assembly (44).
2. Remove the oil seal ring (43) from the servo piston (44).
3. Use a small screwdriver in order to remove the snap ring (42) from the servo piston pin (48).
4. Remove the servo piston (44), the servo piston cushion spring (45), the servo piston retainer (46), and the servo piston pin (48).
5. If the servo piston cushion spring retainer (17) is damaged, remove the retainer from the servo piston (44).

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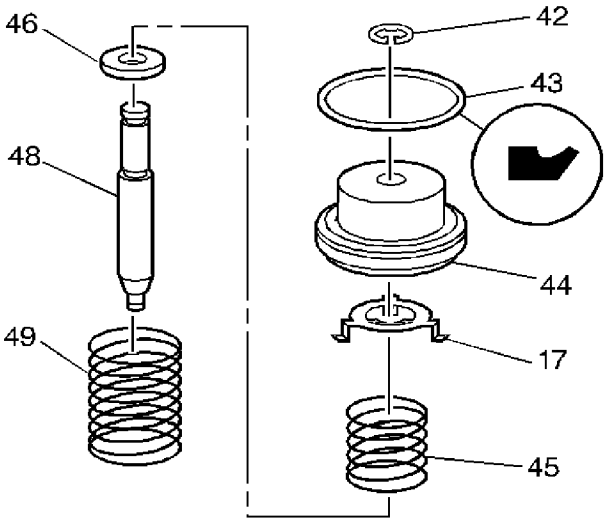
Reverse Band Servo Assemble



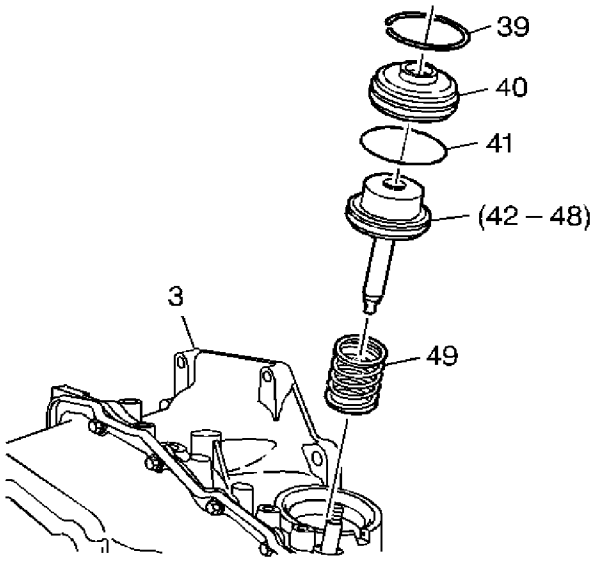
1. Inspect the reverse band servo components for the following conditions:
   - A damaged, worn, or porous servo piston (44)
   - A damaged, worn, or porous servo cover (40)
   - A damaged servo piston seal (43)
   - A damaged servo cover seal (41)
   - A damaged servo cover snap ring (39)
   - A broken or collapsed servo piston spring (49)
   - A broken or collapsed servo piston cushion spring (45)
   - A damaged or worn servo piston pin (48)

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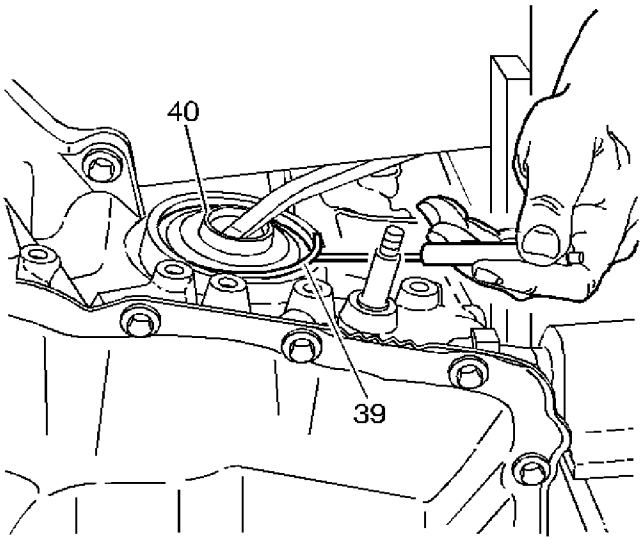


2. Install the cushion spring retainer (17) into the servo piston (44), if necessary.
3. Assemble the servo piston (44), the servo piston cushion spring (45), the servo piston retainer (46), and the servo piston pin (48).
4. Install the servo pin snap ring (42) into the servo piston pin (48).
5. Install the oil seal ring (43) into the servo piston (44).
6. Assemble the piston spring (49) into the servo assembly (43-48).



7. Position the transmission so that the oil pan is facing down.
8. Affix the seal (41) onto the servo cover (40).
9. Install the servo and the cover assembly into the case (3).

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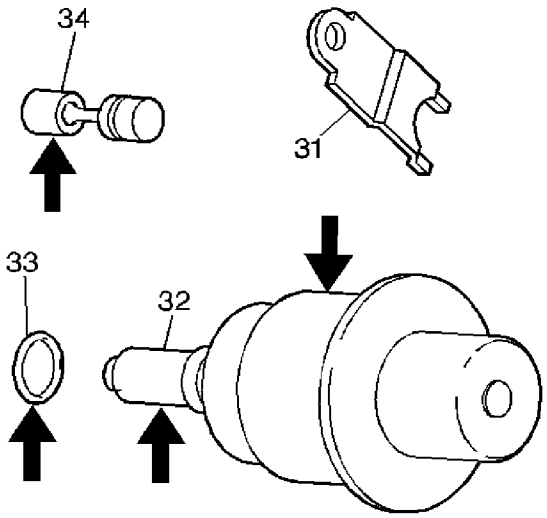
10. Using a long screwdriver, pry against the work bench in order to compress the reverse band servo assembly.
11. Hold the servo assembly compressed.
12. Use a small screwdriver in order to install the reverse band servo cover snap ring (39).
13. Remove the long screwdriver.

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Vacuum Modulator Inspection

Tools Required

- J 23738-A Hand Vacuum Pump (or equivalent)
- J 36619 Modulator Checking Tool

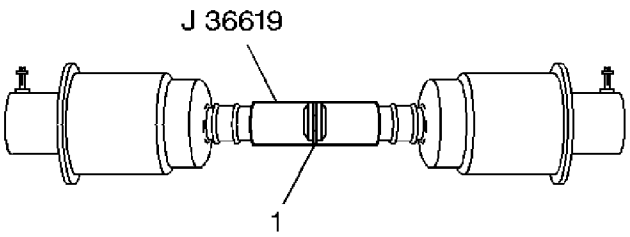




1. Inspect the modulator components for the follow conditions:
   - A damaged modulator valve (34)
   - A damaged modulator assembly (32)
   - A damaged modulator O-ring seal (33)
   - A damaged modulator retainer (31)
2. Install J 23738-A or equivalent onto the vacuum pipe nipple of the modulator assembly.
3. Apply 15 kPa of vacuum to the modulator assembly (32) under the following criteria:
   - Hold the vacuum for 30 seconds
   - Confirm that the plunger retracts into the modulator assembly
4. Remove J 23738-A from the modulator assembly.

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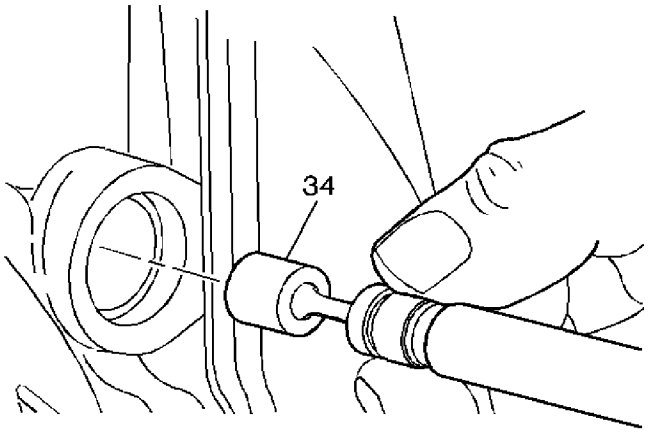
5. Use a modulator assembly that is known to be good.
6. Install J 36619 between the good modulator and the modulator to be checked.
7. Push the modulators towards each other.
8. Note the indicator on J 36619 :
   - If the indicator line (1) is visible, the modulator is OK
   - If the indicator line moves out of view, replace the modulator

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Vacuum Modulator and Valve Assemble

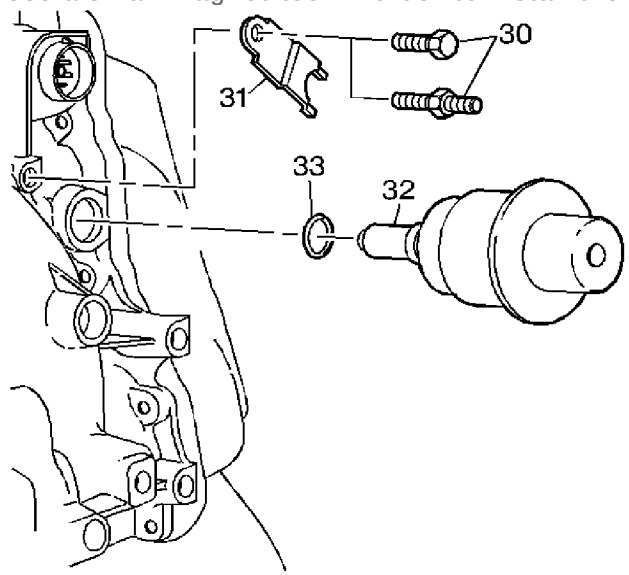
Tools Required

J 36850 Assembly Lubricant (or equivalent)





1. Use a small magnet tool in order to install the modulator valve (34) into the case.





2. Apply J 36850 or equivalent to a new modulator O-ring seal (33).
3. Install the new O-ring seal (33) onto the modulator assembly (32).

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4. Install the modulator assembly (32) into the case (3).
5. Install the modulator retainer (31).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

6. Install the modulator retainer bolt (30).

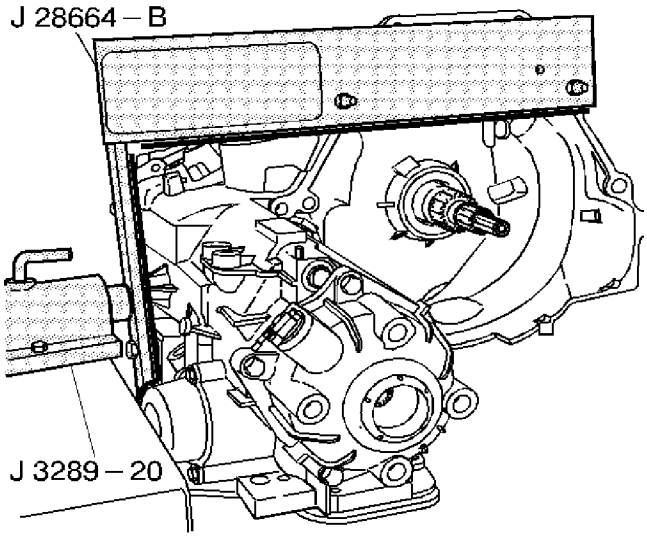
Tighten
Tighten the bolt to 23 N·m (17 lb ft).

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Transmission Holding Fixture Disassemble

Tools Required

- J 28664-B Transmission Holding Fixture
- J 3289-20 Holding Fixture Base



1. Remove the pin from J 3289-20 .
2. Remove the transmission and J 28664-B from J 3289-20 .
3. Remove J 28664-B from the transmission.

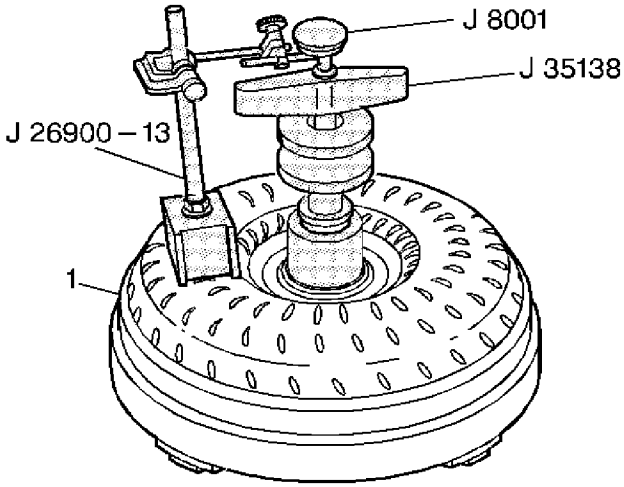
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Torque Converter Inspection

Tools Required

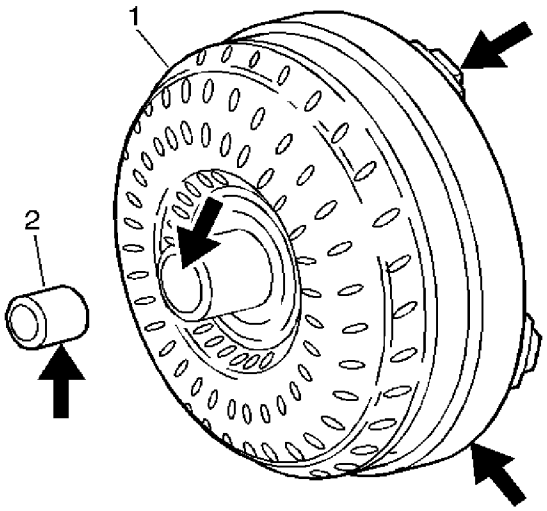
- J 8001 Dial Indicator Set
- J 26900-13 Magnetic Indicator Base
- J 35138 Torque Converter End Play Checking Tool



1. Position the torque converter (1) on the bench with the flywheel lugs facing down.
2. Install J 26900-13 , J 35138 , and J 8001 onto the torque converter (1).
3. Set the dial indicator to 0.
4. Lift J 35138 and note the dial indicator reading:
   - The torque converter end play should be 0.5 mm (0.020 in) or less
   - If the end play is too high, replace the torque converter (1)

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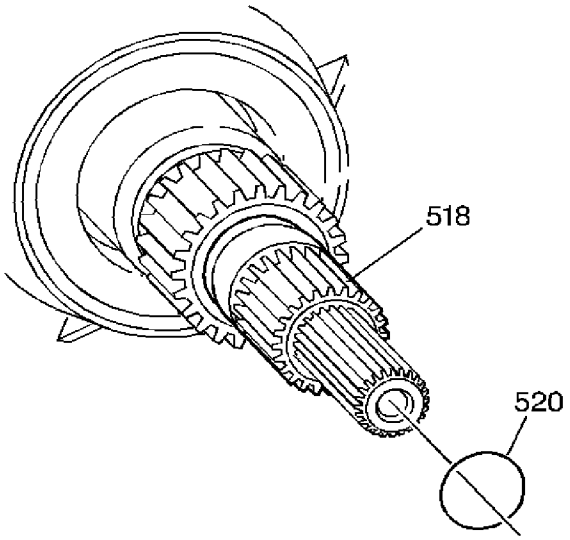
5. Inspect and replace the torque converter (1) for the following conditions:
   - Overheated (torque converter will be blue in color)
   - Leaking at the weld areas
   - A damaged torque converter pilot
   - Evidence of metal particles in the converter, the oil cooler, or the cooler pipes
   - A damaged torque converter stator, a damaged pump, or a damaged turbine
   - A damaged or worn torque converter bushing (2)
   - Contaminated automatic transmission fluid due to engine coolant
6. Inspect the torque converter for stripped bolt hole threads. If found, repair the torque converter.

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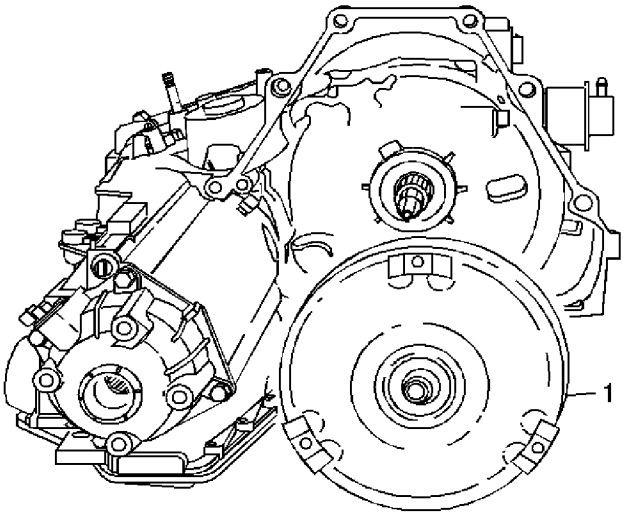
Torque Converter Assemble

Tools Required

J 36850 Assembly Lubricant (or equivalent)



1. Apply J 36850 or equivalent to a new turbine shaft O-ring seal (520).
2. Apply J 36850 or equivalent to the turbine shaft splines (518).
3. Affix the turbine shaft O-ring seal (520) onto the turbine shaft (518).



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Caution: The torque converter weighs approximately 65 lbs. Personal injury may result if you lift the torque converter improperly.

4. Install the torque converter assembly (1).

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Fastener Tightening Specifications

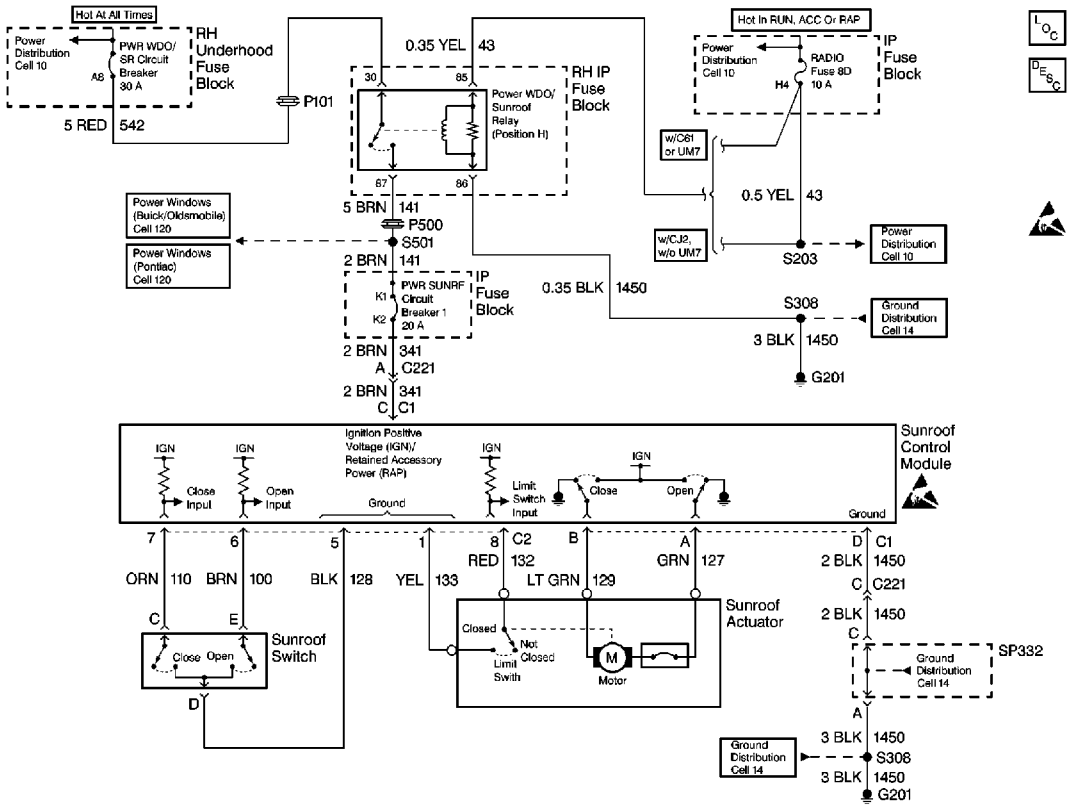
Application	Specification	
	Metric	English
Sunroof Glass Retaining Screws	3 N·m	27 lb in
Sunroof Motor Actuator	3 N·m	27 lb in

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Sunroof Schematics

Cell 122

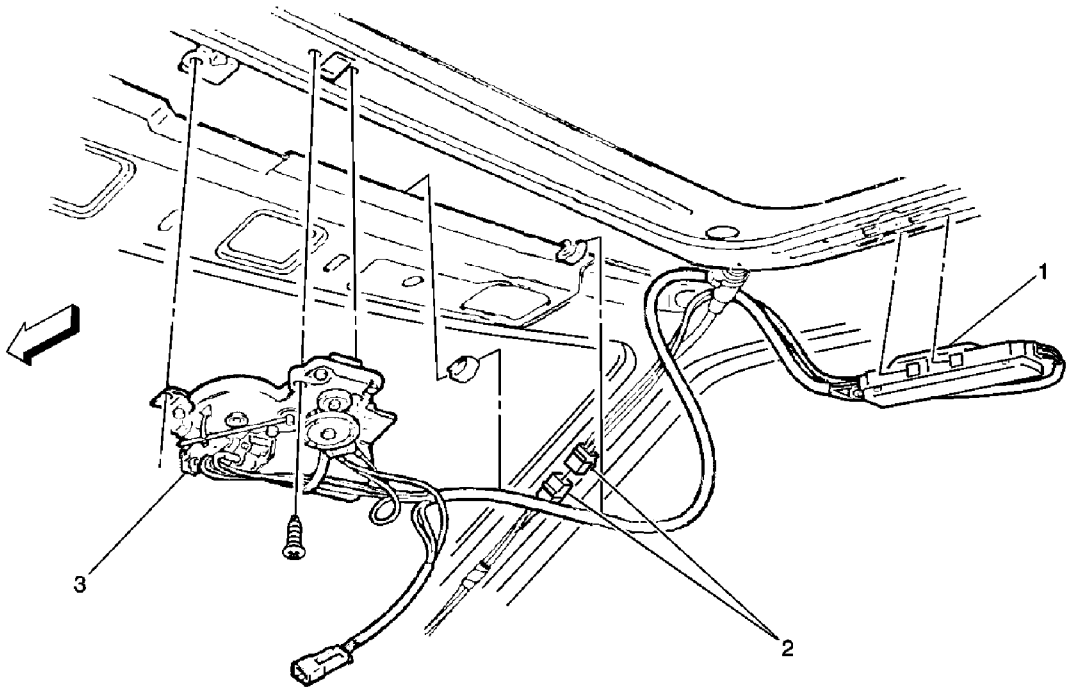


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Power Roof Systems Component Views

Passenger Compartment, In the Center of the Headliner



(1) Sunroof Control Module
(2) C221
(3) Sunroof Actuator
(1) G301
(2) Inflatable Restraint Sensing And Diagnostic Module

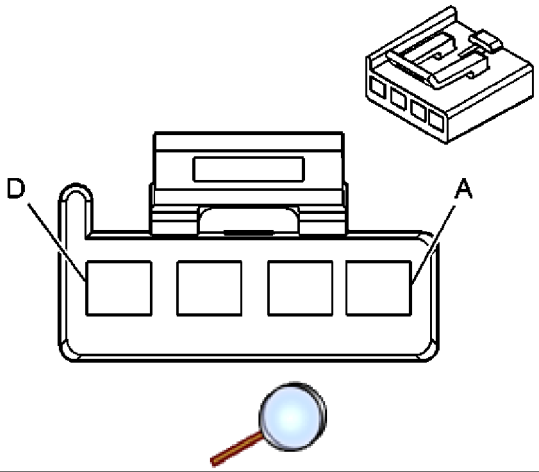
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Power Roof Systems Connector End Views

Table 1: Sunroof Control Module C1
Table 2: Sunroof Control Module C2
Table 3: Sunroof Switch

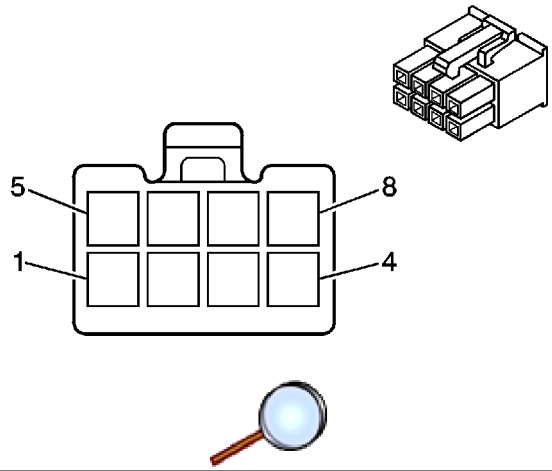
Sunroof Control Module C1



Connector Part Information	• 12052856 • 4 Way F Metri-Pack 280 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	GRN	127	Motor Control - Open
B	BLU	129	Motor Control - Closed
C	BRN	341	Fused Output - IGN
D	BLK	1450	Ground

Sunroof Control Module C2



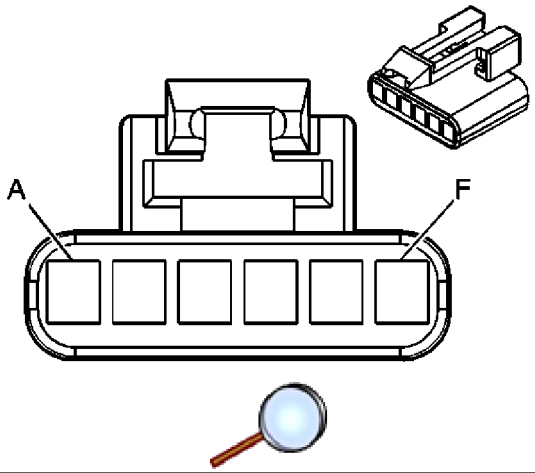
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Connector Part Information	• 30-39-1080 • 8 Way F

Pin	Wire Color	Circuit No.	Function
1	YEL	133	Sunroof Limit Switch Closed Signal
2-4	--	--	Not Used
5	WHT	128	Sunroof Switch Return
6	BRN	100	Sunroof Switch Signal - Open
7	ORN	110	Sunroof Switch Signal - Closed
8	RED	132	Sunroof Limit Switch Signal

Sunroof Switch



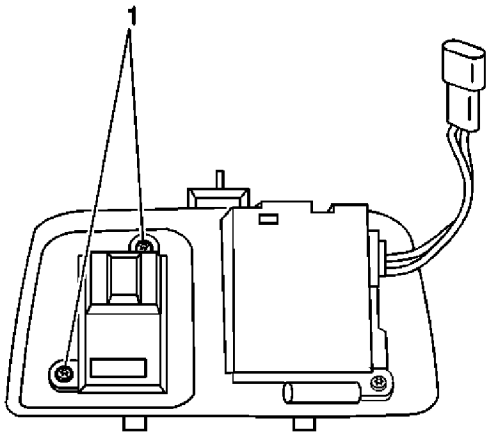
Connector Part Information	• 12064860 • 6 Way F Metri-Pack 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A-B	--	--	Not Used
C	ORN	110	Sunroof Switch Close Input
D	WHT	128	Sunroof Return
E	BRN	100	Sunroof Switch Open Input
F	--	--	Not Used

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Sunroof Switch Replacement (Buick)

Removal Procedure

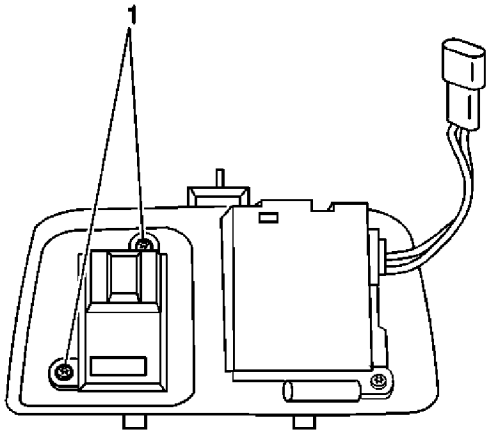


1. Using a flat-bladed tool, gently pry the front courtesy / reading lamp tabs inward.
2. Disconnect the electrical connectors.
3. Remove the overhead console.
4. Remove the fasteners (1) securing the power sunroof switch to the overhead console.
5. Remove the power sunroof switch.

Installation Procedure

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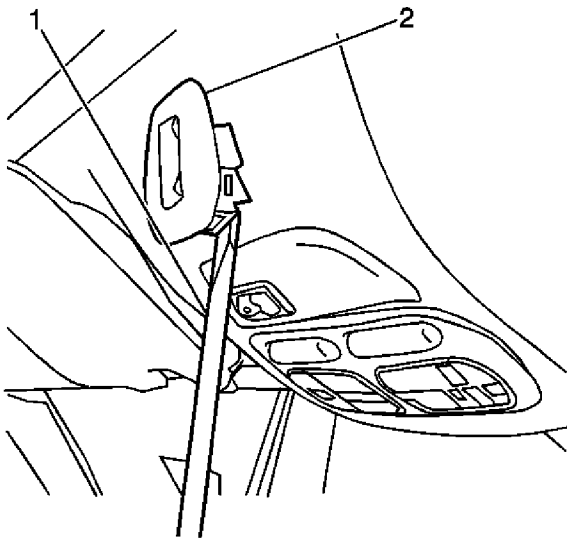


1. Install the power sunroof switch into the overhead console.
2. Install the fasteners (1) to secure the power sunroof switch.
3. Connect the electrical connectors.
4. Install the overhead console into the headliner opening.

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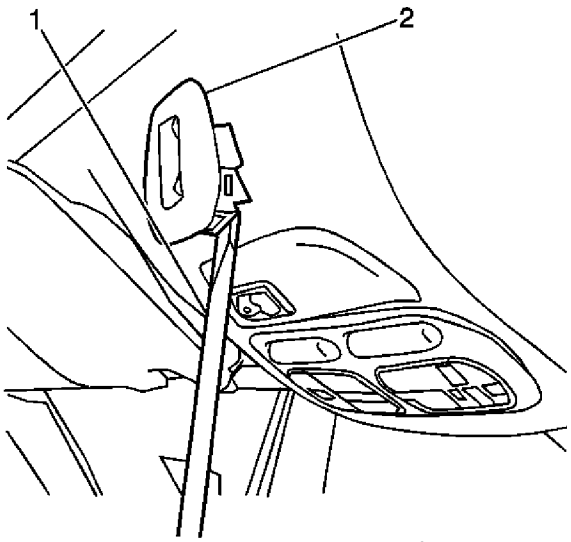
Sunroof Switch Replacement (Pontiac With CF5)

Removal Procedure



1. Using a flat-bladed tool (1), gently pry the sunroof switch (2) from the headliner.
2. Disconnect the electrical connector.
3. Remove the sunroof switch (2).

Installation Procedure



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1. Connect the electrical connector to the sunroof switch (2).
2. Gently press the sunroof switch (2) into the headliner assembly.

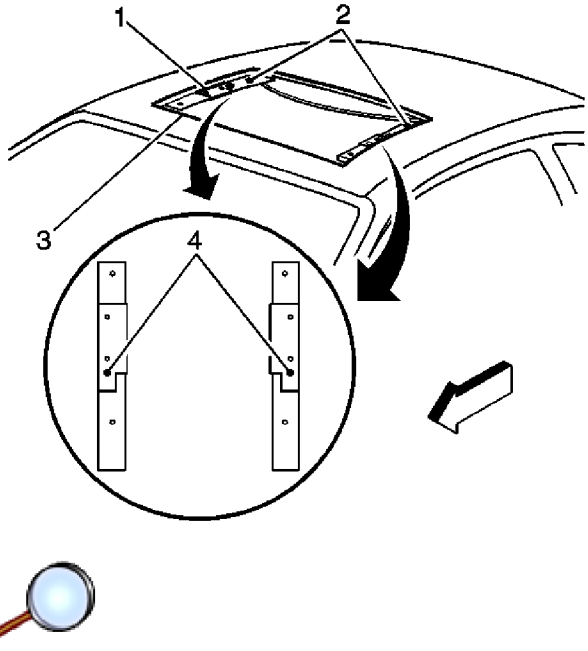
   The locking tabs on the switch secure the switch to the headliner assembly.

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Sunroof Replacement

Removal Procedure

Notice: Use care when removing and installing the headliner. If reusing the headliner lay the headliner down flat on a clean surface. Excessive bending will damage the headliner.



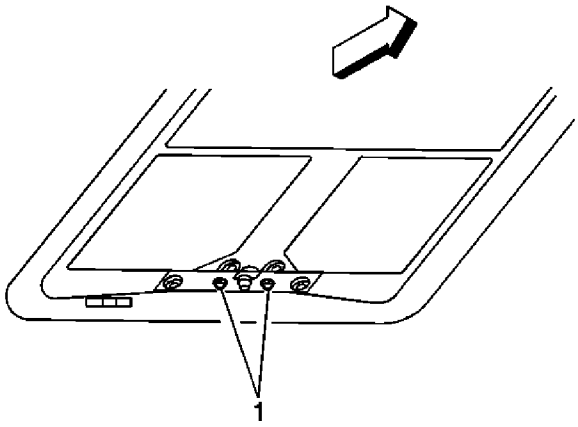
1. Lower the headliner. Refer to Headlining Trim Panel Replacement in Interior Trim.
2. Cycle the glass panel to the rear.

Important: Do not remove the fine-thread machine fasteners (4) second from the rear. Identify the fasteners from the inside of the vehicle.

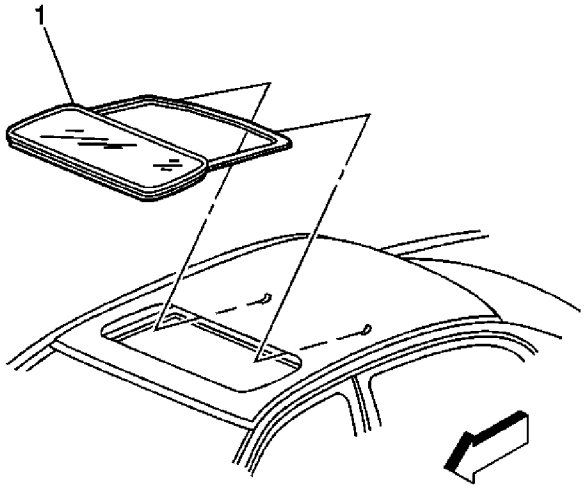
3. Remove the 8 fasteners (2) from the cover plates. Start with the rear most fastener on both sides.
4. Cycle the glass panel to the flush or closed position.
5. Remove the motor. Refer to Power Sunroof Motor Replacement .

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6. Remove the 2 transmission fasteners (1) at the rear of the sunroof housing.



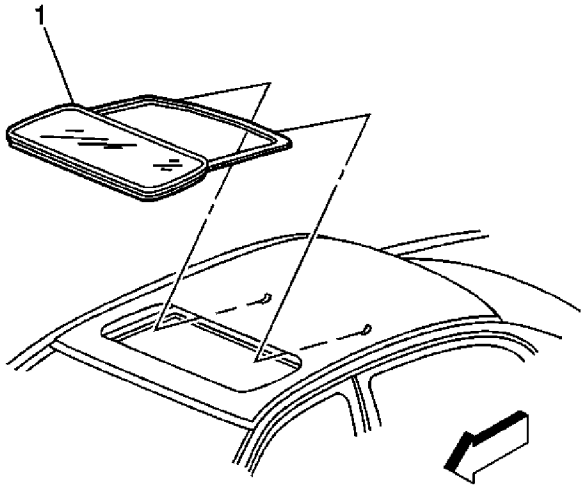
Important:

- To prevent damage to the finish, mask the roof panel in front of the sunroof opening using masking tape and paper.
- Handle the module by the glass panel. Do not squeeze the module or bend the components.

7. Remove the sunroof module (1) by lifting up and forward.

Installation Procedure

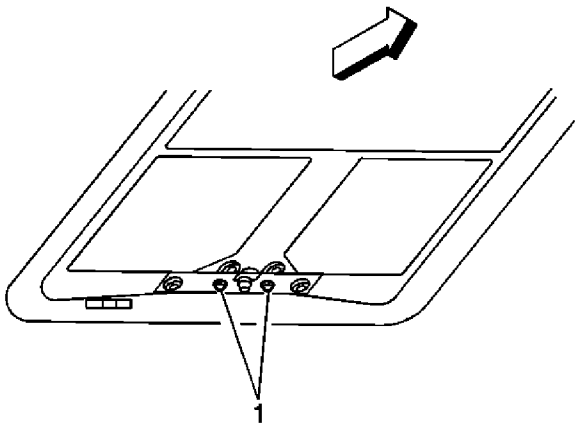
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1. Insert the rear of the module through the roof opening. Index the module on the raised guides on the track.
2. Slide the module (1) into the sunroof opening. Do not damage the finish at the front of the opening.

   As you slide the module under the rear retaining clips, you will feel resistance during the last 6-9 cm (2-3 in) of travel.

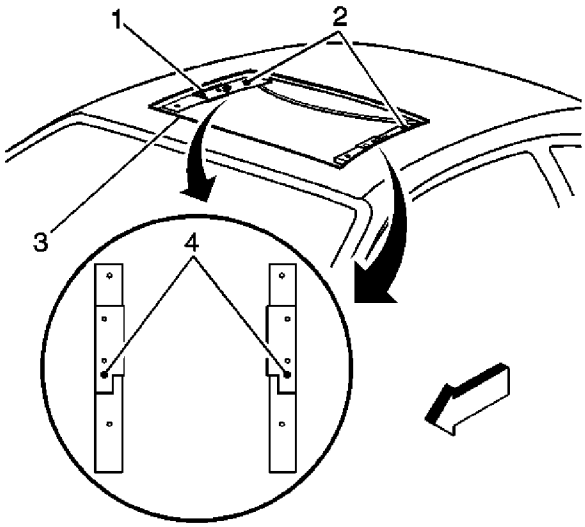
3. Verify that the module (1) is under the clips. This will prevent noise during travel over road irregularities.
4. Lower the glass panel into the opening.



5. Install the 2 fasteners (1) in the transmission.

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6. Install the motor. Refer to Power Sunroof Motor Replacement .
7. Cycle the glass fully to the rear.
8. Cycle the glass forward 3 mm (0.125 in) in order to remove the load from the bumpers.



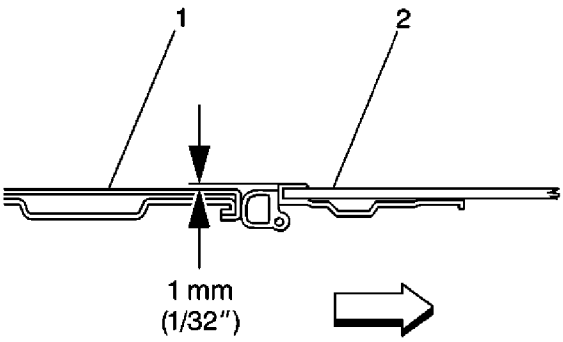


9. Install the 2 rear fasteners (one per side) in the module (3) in order to align the unit.
10. Install the 6 fasteners (2).
11. Inspect for the following conditions:
    - Proper operation
    - Proper fit
    - Synchronization
12. Install the headliner. Refer to Headlining Trim Panel Replacement in Interior Trim.

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Sunroof Panel Vertical Adjustment

In order to provide the proper sealing and minimize the windnoise, adjust the height of the sliding glass panel in the following manner:



- Equal in height from side-to-side
- Front of the sliding glass panel (1), flush to 1.0 mm (0.040 in) below the roof panel (2)
- Rear of the sliding glass panel, flush to 1.0 mm (0.040 in) above the roof panel

With the sliding glass panel in the closed position, inspect the height of the glass panel at the following locations:

- The front of the glass panel
- The rear of the glass panel

If the panel height is not within the above specifications, perform the following adjustment procedure:

Important: Adjust the sliding glass panel height one corner at a time. Only adjust the corners that are not at the proper height. After adjusting each corner, inspect the height of the entire sliding glass panel in order to determine if additional adjustment is required.

1. With the glass panel fully closed, slide the sunshade fully rearward.
2. Remove the 3 fasteners from the front edge of the shield ring. Slide the shield ring rearward.

Important: DO NOT loosen all 3 of the fasteners on the side being adjusted.

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3. In order to adjust any corner, complete the following steps:
   3.1. Loosen the glass panel mounting fastener nearest to the corner being adjusted.
   3.2. Loosen the center mounting fastener on the side being adjusted.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

4. After loosening the 2 fasteners, move the glass panel up or down by hand.

   Tighten
   Tighten the 2 fasteners to 3 N·m (27 lb in).

5. Inspect the sliding glass panel height.

   Readjust the height as needed.

6. Repeat the adjustment procedures on the other corners as needed in order to meet the height specifications.
7. Slide the shield ring forward.
8. Install the 3 retaining fasteners.

   Tighten
   Tighten the 3 fasteners to 3 N·m (27 lb in).

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Sunroof Panel Horizontal Adjustment

Ensure that the glass panel weatherstrip seal has contact with the metal roof panel around the entire periphery of the seal when the sliding glass panel is in the closed position. Ensure that the weatherstrip is not crushed at either of the following locations:

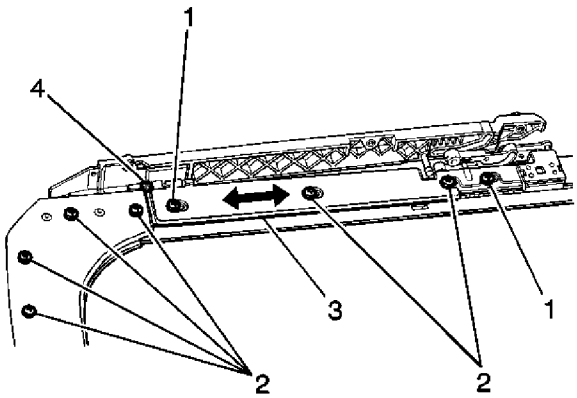
- The front of the panel
- The rear of the panel

Inspect for contact of the seal with the metal roof panel around the periphery of the seal. Insert one of the following components between the seal and the metal roof panel:

- A business card
- A 0.381 mm (0.015 in) feeler gage

Drag the card or gage around the entire seal contact area.

Ensure that the business card or the feeler gage is making continuous contact between the seal and the metal roof panel around the entire seal contact area. If the gap is excessive at the front or rear of the panel, adjust the sliding glass panel in the fore/aft position.





1. Fully open the sliding glass panel.
2. Working from the top of the vehicle, note the position of the track assembly on the fore/aft adjustment scale.
3. Loosen the track cover rail fasteners (2) on both sides of the sunroof module.
4. For fore/aft adjustment, loosen only those fasteners called out in the graphic.
5. Slide the track cover rail on both sides forward or rearward as needed 1 or 2 notches on the adjustment scale (4).

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Tighten the fasteners.

Ensure that the following items are positioned evenly fore/aft:

- The left tracks
- The right tracks

6. Close the sliding glass panel.
7. Inspect the seal position again using a business card or feeler gage.
8. Repeat the adjustment procedure as needed in order to achieve the correct seal contact.

Ensure that all of the fasteners are tight after the adjustment procedure.

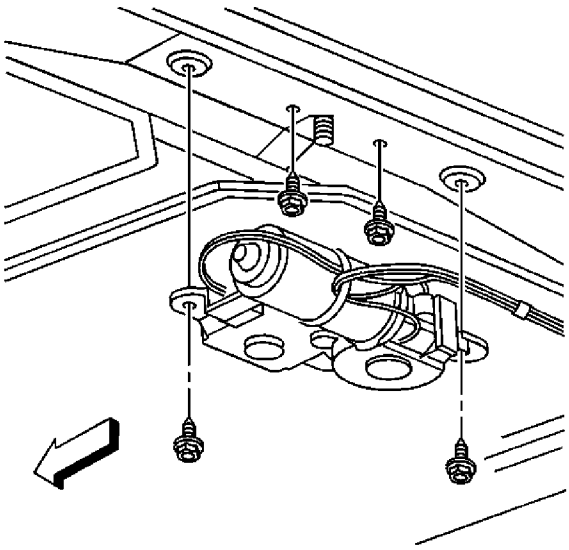
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Track and Motor Synchronization

When the sliding glass panel is in the closed position, verify that the following conditions exist:

- The glass panel is centered in the roof panel opening.
- The lifter arms firmly hold the glass panel in position.

1. Completely or partially open the sunroof.
2. Close the sunroof. Use the switch until the motor stops.
3. Verify that the following conditions exist:
   - The sliding glass panel and the motor are in the closed position.
   - The sliding glass panel is approximately even with the roof panel.
   - The sliding glass panel is level and centered in the roof opening.
4. Adjust the motor synchronization if the following conditions exist:
   - The rear of the panel is noticeably low or high in the rear.
   - The rear of the panel is loose and may be moved up and down using your hand.
5. If the following conditions do not exist, refer to Sunroof Panel Vertical Adjustment and Sunroof Panel Horizontal Adjustment :
   - The glass panel is centered approximately in the opening.
   - The glass panel is even with the roof panel.
   - The glass panel is not loose at the rear.
6. Lower the rear of the headliner in order to access sunroof motor. Refer to Headlining Trim Panel Replacement in Interior Trim.



Important: Do not disconnect the electrical connection.

7. Remove the sunroof motor from the mounting.

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8. With the motor removed from the mounting and the ignition in the ON position, move the sunroof switch to the rear position for several seconds.

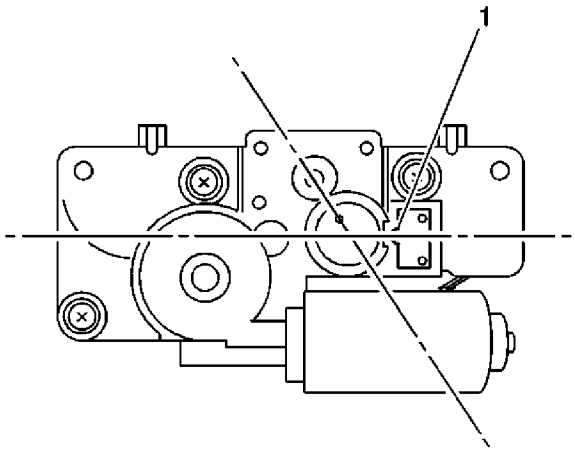
   Release the switch.

9. Push the switch into the forward position.

   Hold the switch until the motor stops.

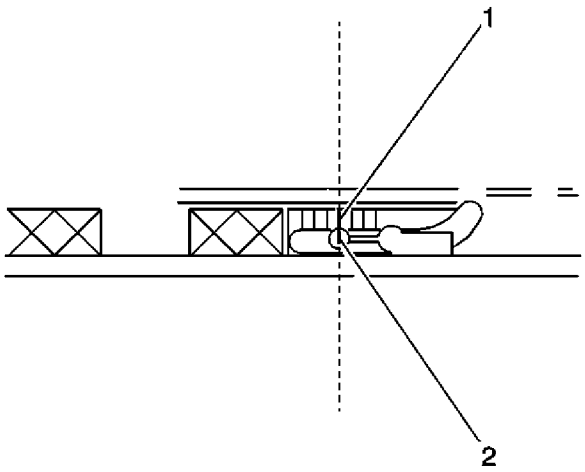
   Important: Do not move the sunroof switch until after the motor is installed.

10. Turn the ignition to the OFF position.
11. Slide the sunshade fully rearward.
12. Remove the 3 fasteners from the front edge of the shield ring.
13. Slide the shield ring rearward.



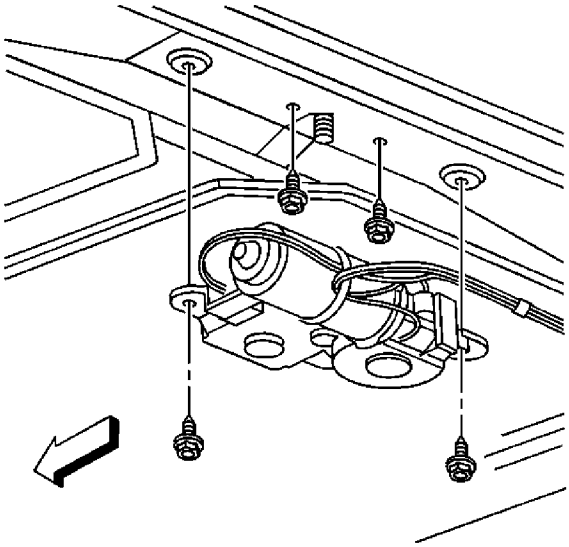


14. Locate the sunroof track transmission drive gear (1).



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15. Turn the sunroof track transmission drive gear clockwise or counterclockwise as needed in order to align the lifter guide pin (2) with the fourth rib (1) from the rear of the lifter arm.
16. Verify that the following conditions exist:
    - The lifter arms hold the rear of the glass panel tightly in position.
    - The glass panel cannot be moved up or down using your hand.
17. If the glass panel is loose, inspect the tightness of the glass panel mounting fasteners. Refer to Sunroof Glass Panel Replacement .



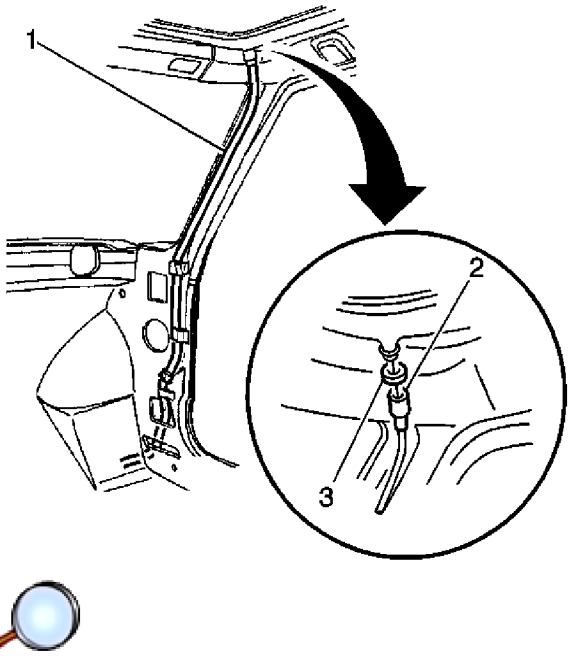
18. Install the motor and the cover.
19. Turn the ignition to the ON position.
20. Verify the proper operation of the sunroof by cycling the sunroof from a closed position to the vent position, and to a fully open position.

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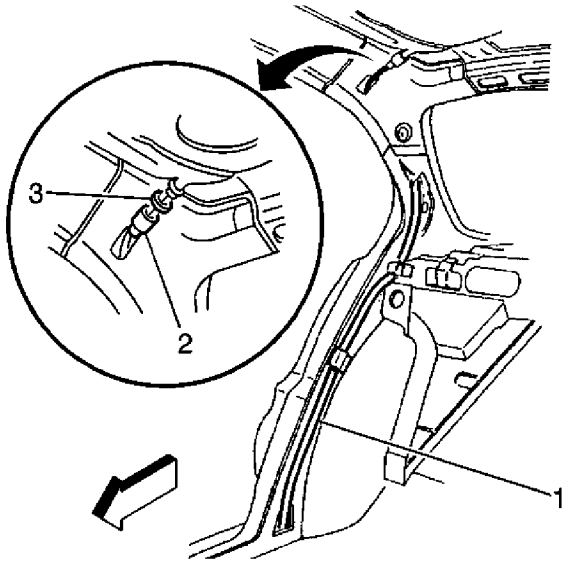
Sunroof Drain Hose Replacement

Removal Procedure

1. Lower the headliner in order to access the drain hose connections. Refer to Headlining Trim Panel Replacement in Interior Trim.
2. Remove the clamp (3) and the drain hose (2) from the drain spout.
3. Remove the interior moldings in order to access the drain hose retaining clips. Refer to Windshield Pillar Garnish Molding Replacement or Rear Quarter Trim Panel Replacement in Interior Trim.
4. Remove the tape from the drain hose.



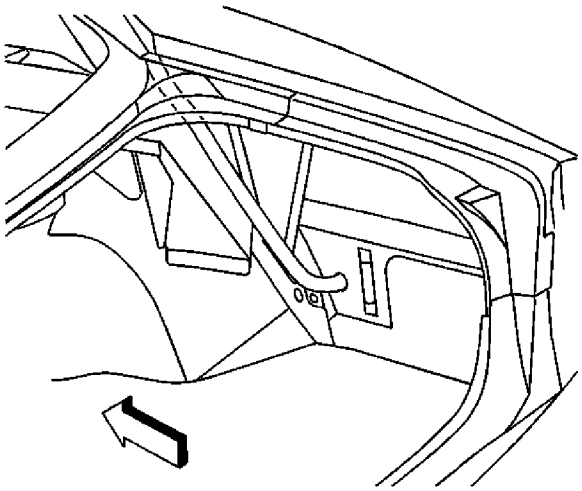
5. Remove the front drain hose (1) from the retaining clips.



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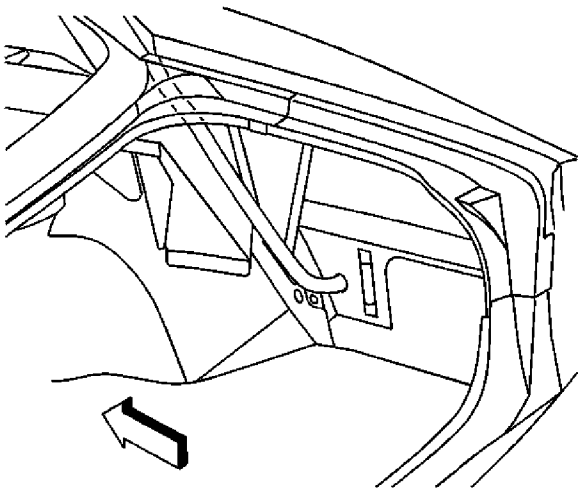
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6. Remove the rear upper drain hose (1) from the retaining clips.
7. Remove the clamp (3) and the drain hose (2) from the drain spout.
8. Remove the rear compartment trim panels. Refer to Rear Compartment Side Trim Replacement - Left Side or Rear Compartment Side Trim Replacement - Right Side in Body Rear End.



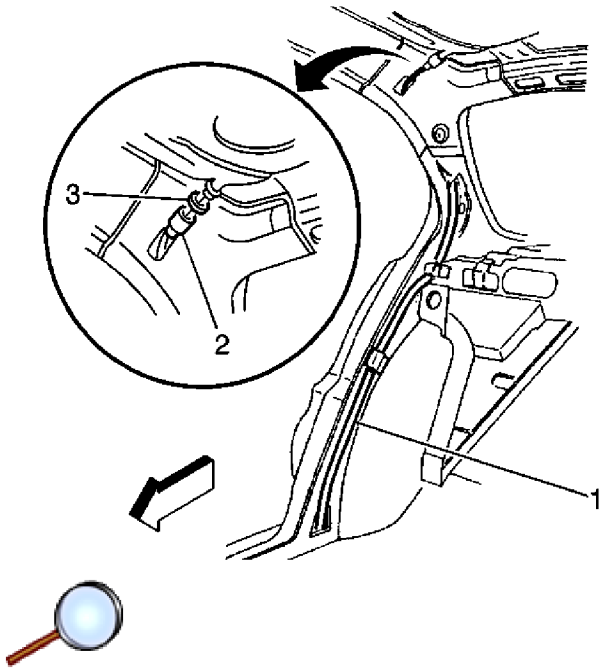
9. Remove the rear lower drain hose from the retaining clips.

Installation Procedure

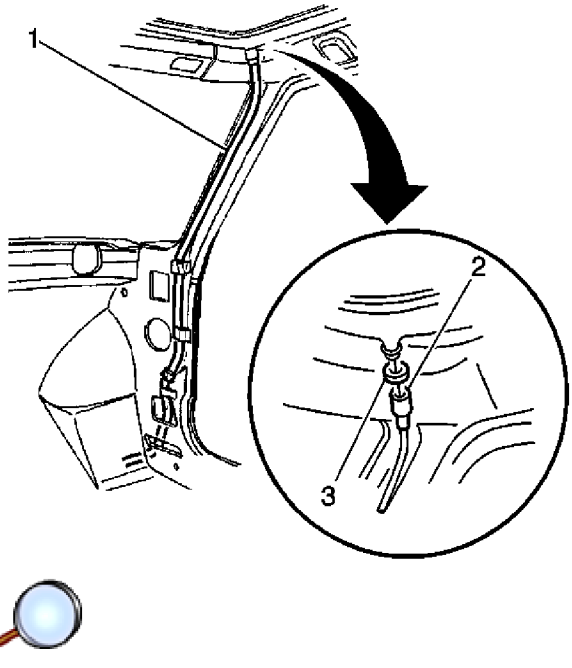


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1. Clip the rear lower drain hose into position.
2. Install the rear compartment trim. Refer to Rear Compartment Side Trim Replacement - Left Side or Rear Compartment Side Trim Replacement - Right Side in Body Rear End.



3. Clip the rear upper drain hose (1) into position.
4. Attach the hose (2) to the drain spout and secure the hose clamp (3).



5. Clip the front drain hose (1) into position.
6. Apply adhesive tape in order to secure the hose to the pillar.
7. Install the interior moldings. Refer to Windshield Pillar Garnish Molding Replacement or Rear Quarter Trim Panel Replacement in Interior Trim.

Important: When installing the drain hose clamps (3), position the clamps in order to maintain clearance between the clamps and the headliner.

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8. Install the drain hose (2) to the drain spout and secure the clamps (3).

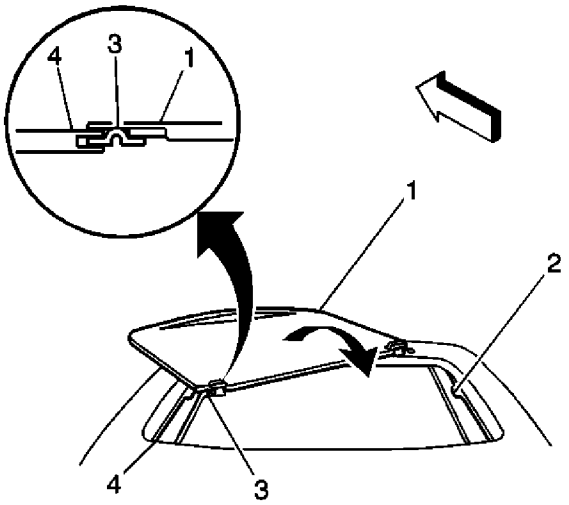
Notice: Use care when removing and installing the headliner. If reusing the headliner lay the headliner down flat on a clean surface. Excessive bending will damage the headliner.

9. Install the headliner to the roof. Refer to Headlining Trim Panel Replacement in Interior Trim.

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Sunshade, Lifter Arm, Trough and Shield Replace

Sunshade Removal Procedure

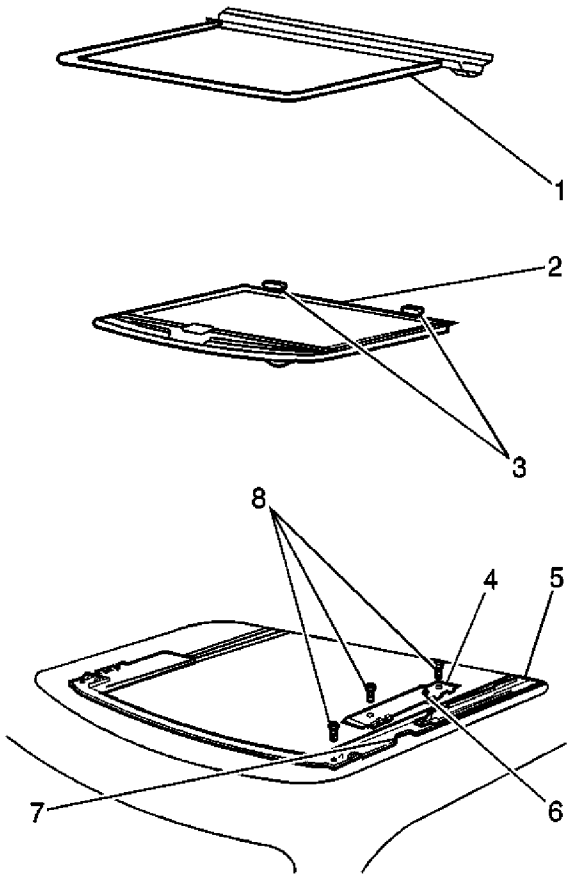


1. Remove the glass panel. Refer to Sunroof Glass Panel Replacement .
2. Cycle the unit to the vent position.
3. Slide the trough and shield forward.
4. Slide the sunshade (1) forward.
5. Lift and turn the front edge of the sunshade (1) in order to disengage the clips (3).

Sunshade Installation Procedure

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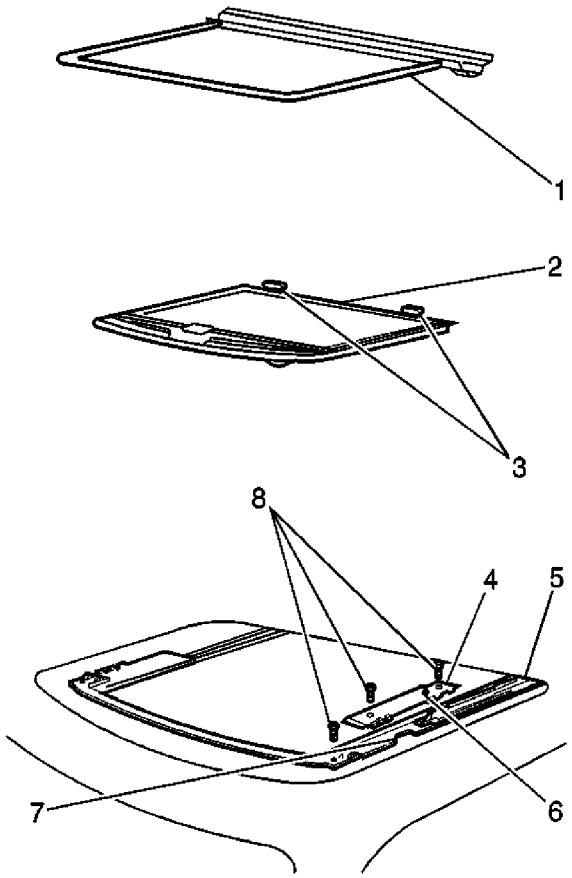


1. Slide the trough and shield (1) forward.
2. Flex the sunshade (2) in order to clear the stops (3).
3. Keeping the unit centered, slide the sunshade (2) to the rear.
4. Slide the sunshade (2) forward.
5. Install the glass panel. Refer to Sunroof Glass Panel Replacement .

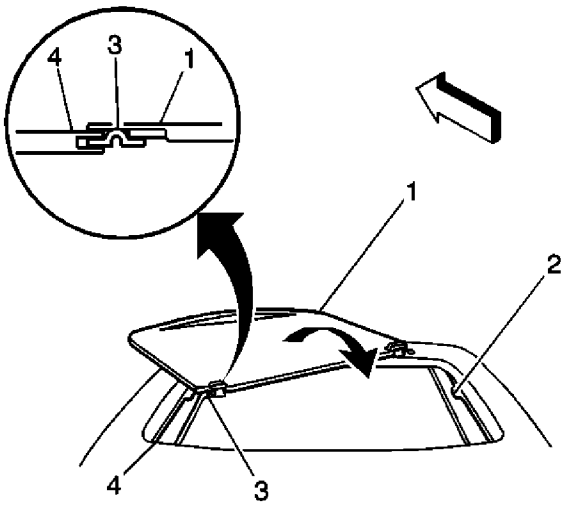
Lifter Arm Removal Procedure

1. Remove the glass panel. Refer to Sunroof Glass Panel Replacement .
2. Cycle the unit to the rear until the lift pin is clear.

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3. Remove the cover plates (4) on each side.
4. Remove the 3 screws (8) on each side.

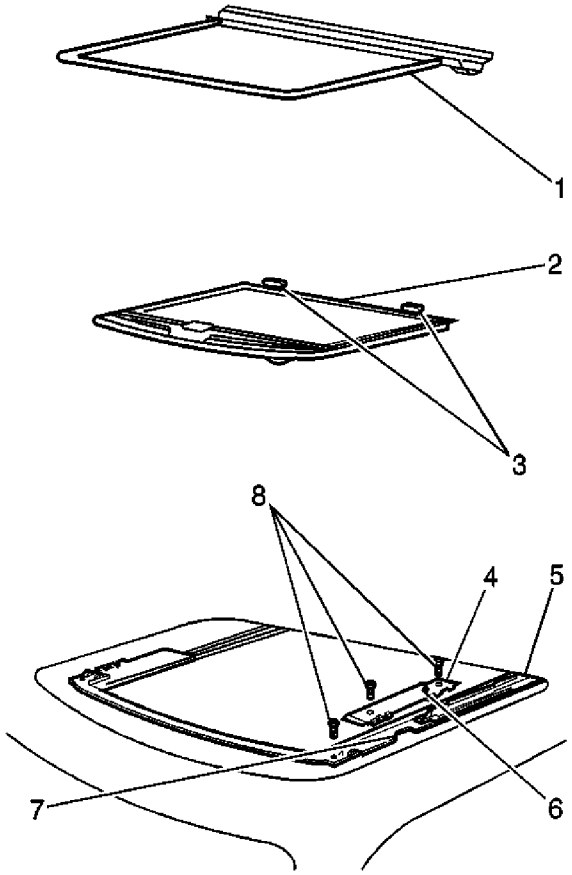


5. Cycle the unit (1) rearward in order to expose the openings in the track (2).
6. Remove the front lifter guides (3) from the track (4).

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7. Cycle the unit forward in order to release the lifter arm from the trolley.

Lifter Arm Installation Procedure

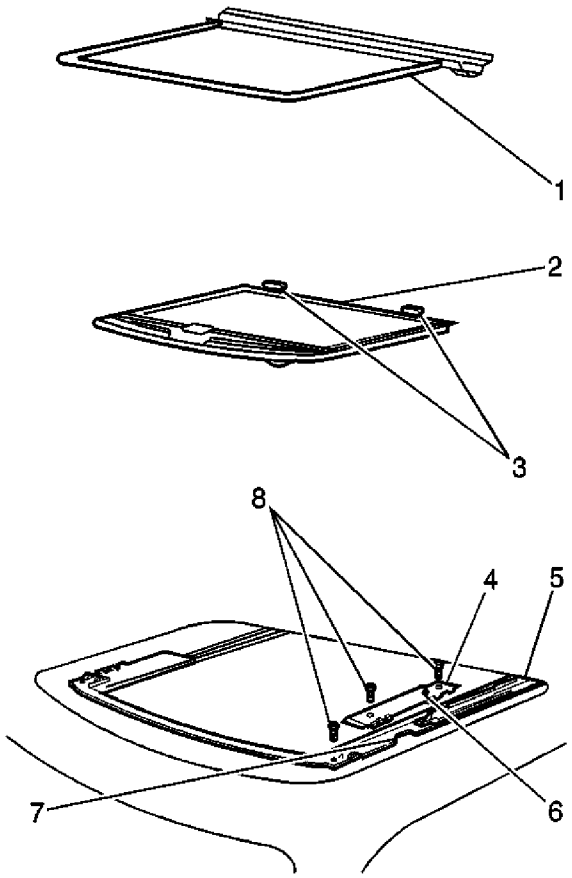


1. Install the lifter arms (5).
2. Install the cover plates (4).
3. Install the machined screws (8).
4. Cycle the trough and shield assembly (1) to the full rear travel position.
5. Install the glass panel. Refer to Sunroof Glass Panel Replacement .

Trough and Shield Removal Procedure

1. Remove the glass panel. Refer to Sunroof Glass Panel Replacement .
2. Cycle the unit to the rear until the lift pin is clear.

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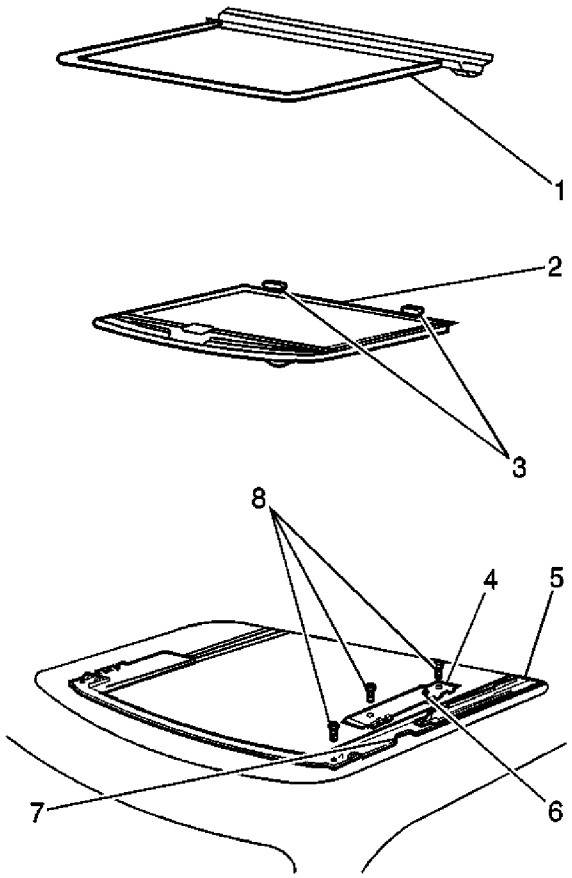
3. Remove the cover plates (4).
4. Cycle the unit forward in order to expose the openings in the track (7).
5. Remove the lifter arms (5) by sliding the arms to the rear.
6. Lift out the arms through the openings in the track (7).
7. Cycle the trolley forward.

   Do not disengage the cable from the transmission.

8. Pull the trough and shield assembly (1) forward.
9. Lift out the trough and shield assembly (1) through the opening in the track (7).

Trough and Shield Installation Procedure

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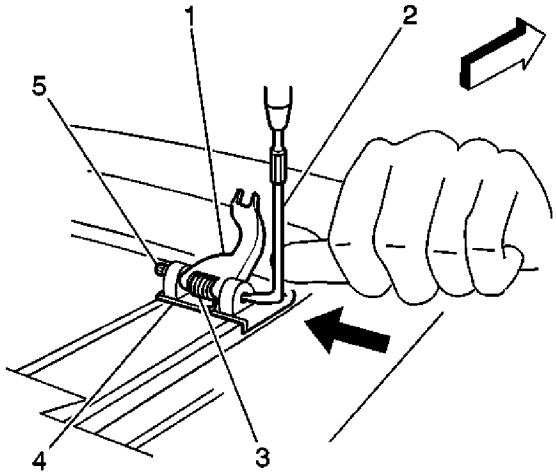
1. Install the guide shoes of the trough and shield assembly (1) into the opening (7) in the track.
2. Engage the guide shoes of the trough and shield assembly (1) in the slot on the track (7).
3. Center the trough and shield assembly (1).
4. Push the trough and shield assembly (1) into the housing until the assembly is seated.
5. Install the lifter arms (5).
6. Install the machined screws (8) in order to secure the cover plates (4).
7. Cycle the trough and shield assembly (1) to full rear travel.
8. Install the glass panel. Refer to Sunroof Glass Panel Replacement .

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Sunroof Air Deflector Replacement

Removal Procedure

1. Cycle the glass panel to the rear.





2. Push the pin (5) out of the deflector lift arm bracket.

Important: Note the position of the springs (3) before removal in order to ensure proper operation after assembly.

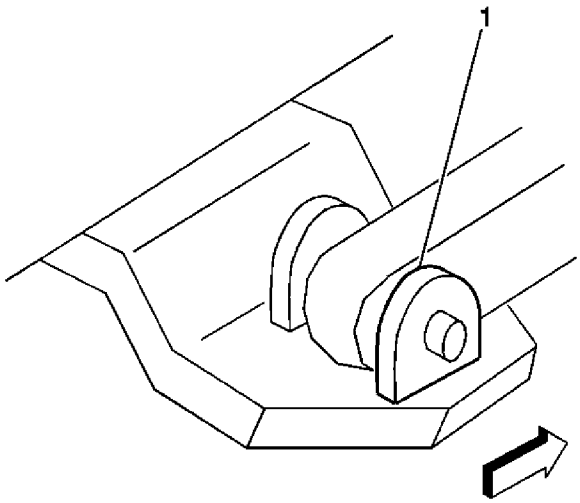
3. Remove the spring (3).
4. Raise the deflector lift arm to the vertical position.
5. Snap the molded pin (5) out of the bracket (4).

Installation Procedure

Important: In order to ensure a secure fit, slightly squeeze the bracket arms (1) together using pliers.

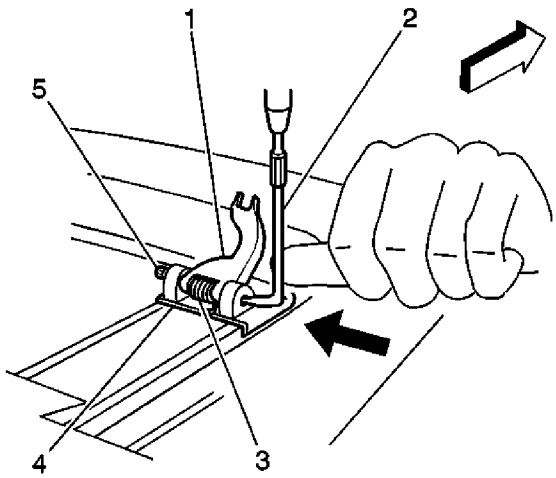
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1. Install the pin in the deflector arm.

Important: Return the springs to the position noted during removal.



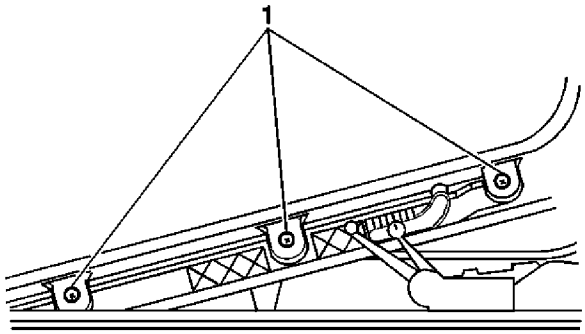
2. Install the spring (3) and the pin (5) in the deflector lift arm (one per side).

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Sunroof Glass Panel Replacement

Removal Procedure

Caution: When working with any type of glass or sheet metal with exposed or rough edges, wear approved safety glasses and gloves in order to reduce the chance of personal injury.



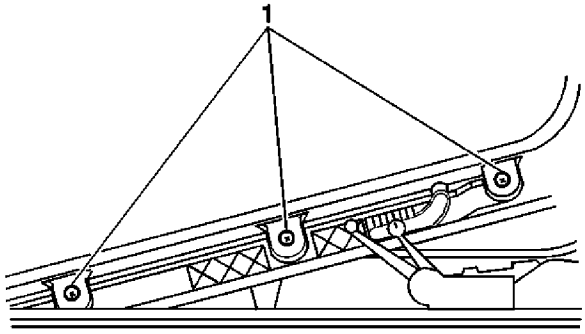
1. Remove the three screws from the trough and shield assembly.
2. Slide the trough and shield assembly to the rear.
3. Cycle the glass panel to the vent position.
4. Remove the 3 screws (1) from each side of the glass panel.
5. Remove the glass panel.

Installation Procedure

Caution: When working with any type of glass or sheet metal with exposed or rough edges, wear approved safety glasses and gloves in order to reduce the chance of personal injury.

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1. Install the glass panel.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the 3 screws (1) to each side of the glass panel.

   Tighten
   Tighten the screws to 3 N·m (27 lb in).

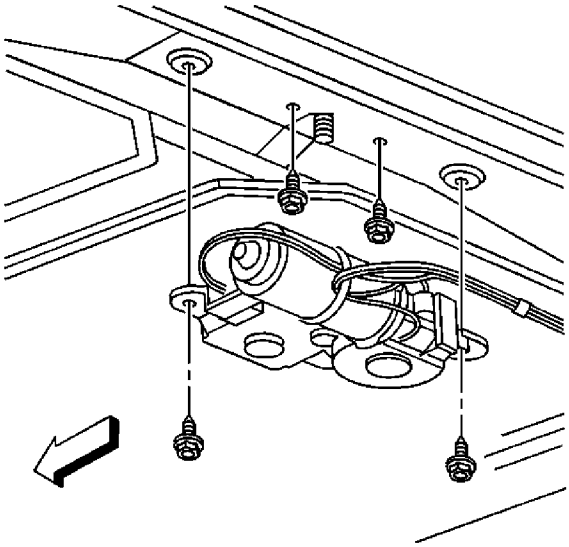
3. Close the glass panel to the flush position.
4. Install the 3 screws to the trough and shield assembly.

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Power Sunroof Motor Replacement

Removal Procedure

Important: Whenever the motor is removed from the vehicle, both the track and the motor must be synchronized before installation. Refer to Track and Motor Synchronization .



1. Lower the formed headliner at the rear.
2. Remove the fasteners attaching the motor to the roof panel.

Important: Note the location of the wire connectors before disconnecting.

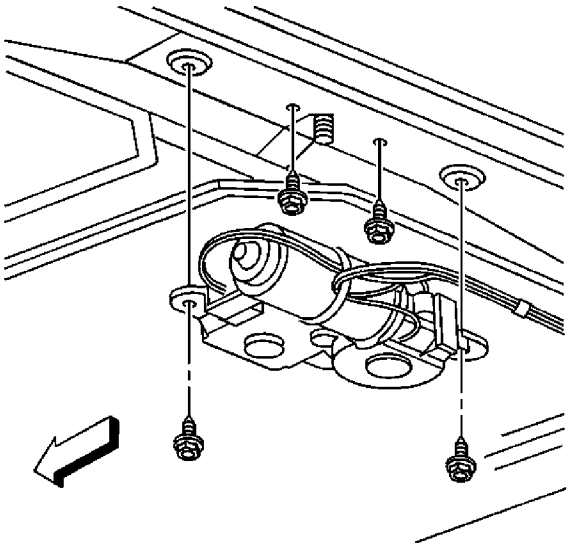
3. Disconnect the wiring connectors from the motor.
4. Remove the power sunroof motor.

Installation Procedure

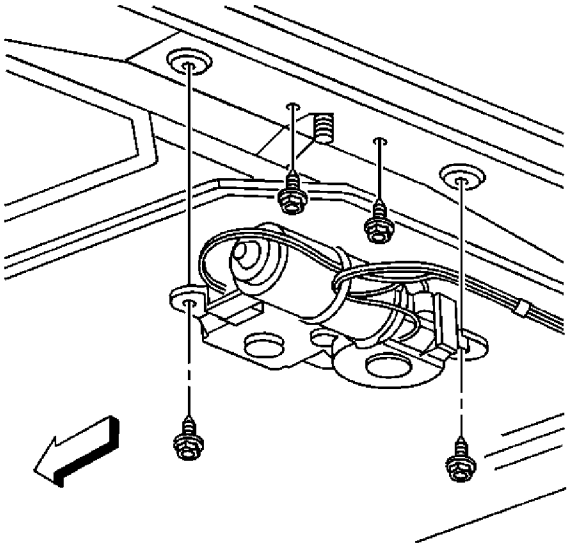
Important: Whenever the motor is removed from the vehicle, both the track and the motor must be synchronized before installation. Refer to Track and Motor Synchronization .

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1. Connect the wiring harness connectors to the motor.
2. Synchronize the motor. Refer to Track and Motor Synchronization .



3. Install the motor to the roof and the transmission.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

4. Install the fasteners attaching the motor to the roof panel.

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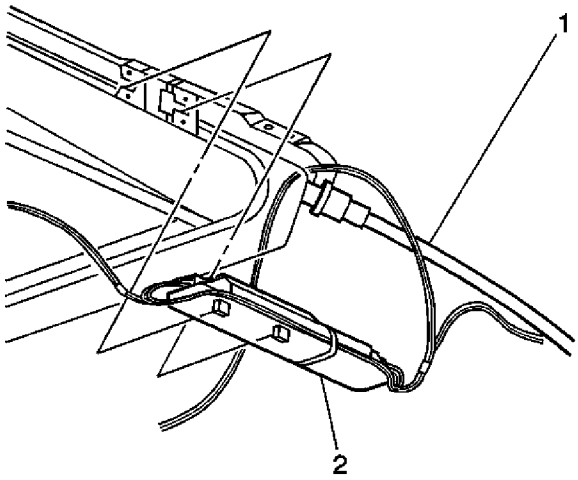
Tighten
Tighten the fasteners to 3 N·m (27 lb in).

5. Install the formed headliner.

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Power Sunroof Express Module Replacement

Removal Procedure

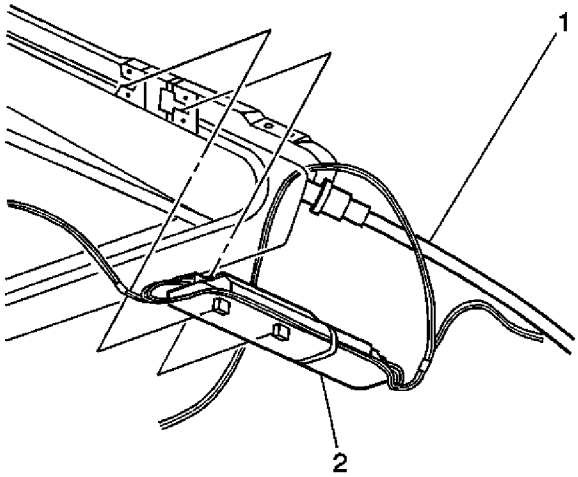


1. Lower the formed headliner at the rear. Refer to Headlining Trim Panel Replacement in Interior Trim.
2. Remove the express module (2) by sliding out the slots in the bracket toward the center of the vehicle.
3. Disconnect the wiring connector from the express module (2).

Installation Procedure

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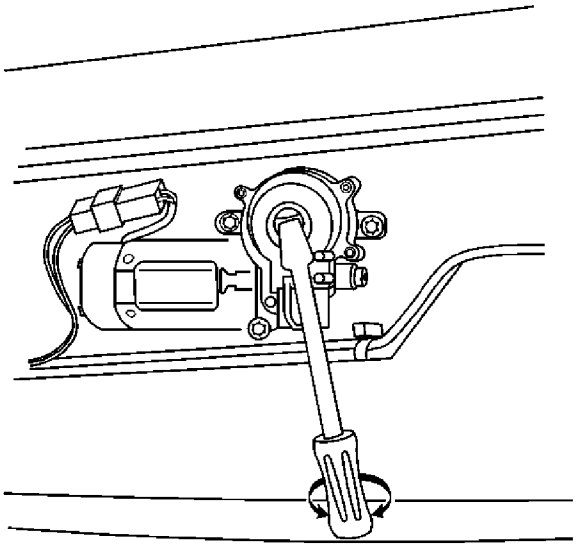
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1. Connect the wiring connector to the express module (2).
2. Install the express module (2).
3. Secure the formed headliner. Refer to Headlining Trim Panel Replacement in Interior Trim.

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Sunroof Manual Operation



Important: The sunroof motor drive gear is made of nylon, care should be taken not to damage the slot in the drive gear.

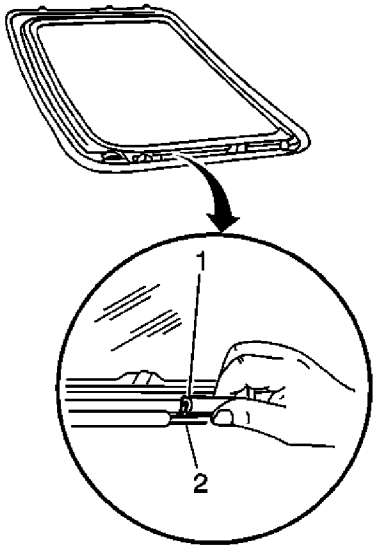
The sunroof can be operated manually by simultaneously depressing and turning the center slot in the sunroof motor drive gear with a large straight-bladed screwdriver.

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Sunroof Glass Panel Seal Replacement

Removal Procedure

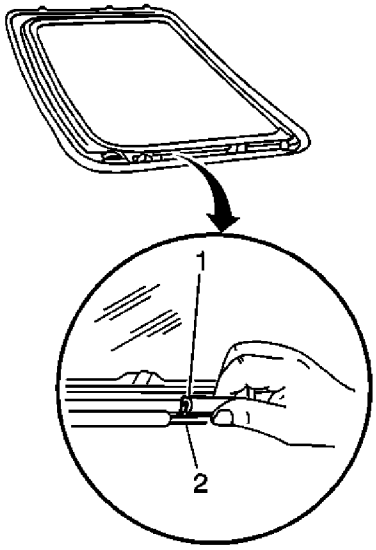




1. Remove the sunroof glass panel. Refer to Sunroof Glass Panel Replacement .
2. Pull seal (1) from the channel at the rim of the glass in order to remove the seal (1).

Installation Procedure

1. Clean the old adhesive from the channel at the rim of the glass.



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2. Apply a 152 mm (6 in) strip of adhesive to the side of the glass panel.
3. Start with the end of the seal (1) covering 77 mm (3.03 in) of the previously applied adhesive.

   Working around the glass panel, push the seal (1) into the channel (2).

4. Cut free the end of the seal (1) at the side in order to allow a 3-5 mm (1/8-3/16 in) overlap.
5. Place a small amount of the adhesive on the free end of the seal (1).
6. Butt the ends of the seal (1) together, pushing the free end into the channel (2).
7. Force the remainder of the seal (1) into the channel (2).
8. Allow the adhesive to dry.
9. Install the glass panel. Refer to Sunroof Glass Panel Replacement .
10. Adjust the sunroof glass panel in order to achieve good sealing action. Refer to Sunroof Panel Vertical Adjustment .

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Fastener Tightening Specifications

Application	Specification	
	Metric	English
Front Driver/Passenger Seat Buckle Nut	28 N·m	21 lb ft
Front Driver/Passenger Seat Buckle-Side Belt Load Bar Bolt	40 N·m	30 lb ft
Front Driver/Passenger Seat Buckle-Side Dual Retractor Fasteners	25 N·m	18 lb ft
Front Driver/Passenger Seat Shoulder Belt Bolt	42 N·m	31 lb ft
Front Seat Shoulder Belt Guide Loop Bolt	42 N·m	31 lb ft
Rear Seat Anchor Bolt	35 N·m	26 lb ft
Rear Seat Center Nut	30 N·m	22 lb ft
Rear Seat Retractor-Side Belt Assembly Bolt	30 N·m	22 lb ft

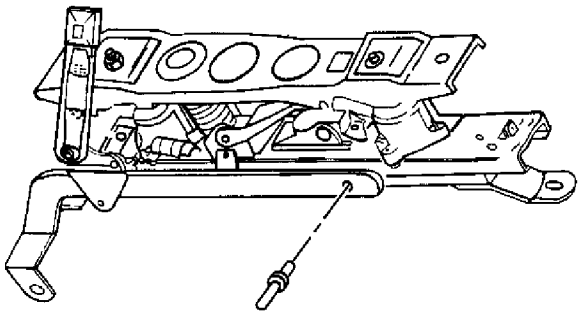
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Seat Belt Buckle Replacement - Left Front

Removal Procedure

Caution: Load bar assembly must be replaced as a unit only. Do not substitute parts for any reason, or personal injury could result in the event of a collision.

1. Remove the seat assembly. Refer to Seat Replacement in Seats.





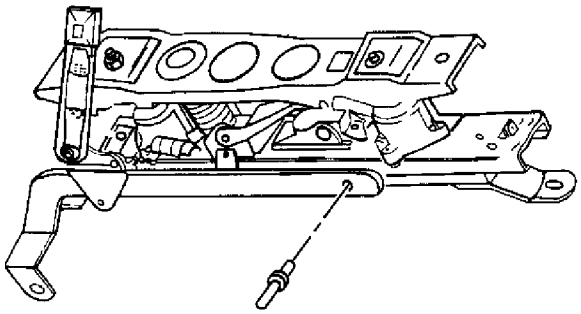
2. Disconnect the load bar assembly from the tunnel and anchor nuts holding the seat adjusters to the floor.
3. Disconnect the electrical connector at the buckle (drivers side only).
4. Drill out the rivet using a 3/16-inch bit.
5. Remove the load bar assembly.

Important: Driver and passenger buckle assemblies may be replaced separately if necessary, by removing the nut with the seats still installed.

6. Remove the nut holding the buckle assembly to the load bar assembly.
7. Remove the buckle assembly.

Installation Procedure

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1. Connect the load bar assembly to the seat adjuster using a 3/16-inch rivet.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Connect the buckle assembly to the load bar assembly and secure with a nut.

   Tighten
   Tighten the nut to 28 N·m (21 lb ft).

   Caution: Make sure bolt is through both parts. Failure to do so will result in system failure, leading to injury in the event of a collision.

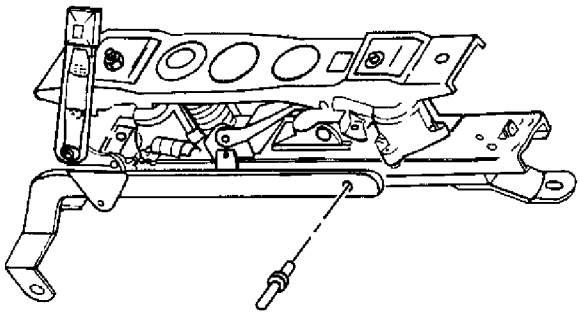
3. Install the seat assembly. Secure the nuts to the seat adjuster and bolt for the center lap belt and the load bar assembly. Refer to Seat Replacement in Seats and Carpet.
4. Connect the electrical connector to the seat harness (drivers side only).

Seat Belt Buckle Replacement - Right Front

Removal Procedure

Caution: Load bar assembly must be replaced as a unit only. Do not substitute parts for any reason, or personal injury could result in the event of a collision.

1. Remove the seat assembly. Refer to Seat Replacement in Seats and Carpet.





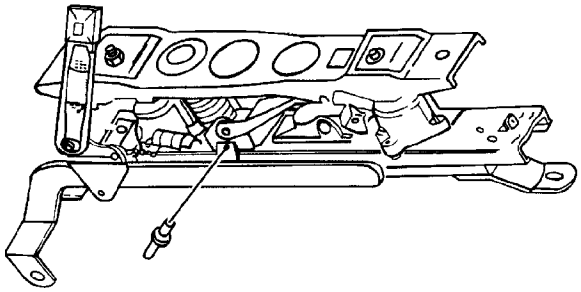
2. Disconnect the load bar assembly from the tunnel and anchor nuts holding the seat adjusters to the floor.
3. Drill out the rivet using a 3/16-inch bit.
4. Remove the load bar assembly.

Important: Driver and passenger buckle assemblies may be replaced separately if necessary, by removing the nut with the seats still installed.

5. Remove the nut holding the buckle assembly to the load bar assembly.
6. Remove the buckle assembly.

Installation Procedure

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1. Connect the load bar assembly to the seat adjuster using a 3/16-inch rivet.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Connect the buckle assembly to the load bar assembly and secure with a nut.

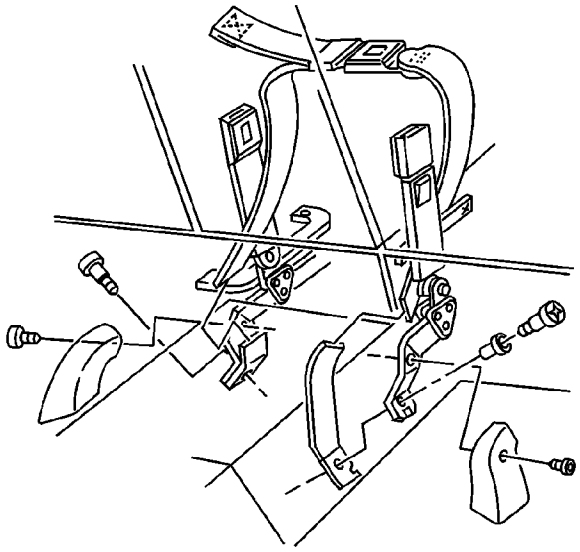
   Tighten
   Tighten the nut to 28 N·m (21 lb ft).

   Caution: Make sure bolt is through both parts. Failure to do so will result in system failure, leading to injury in the event of a collision.

3. Install the seat assembly. Secure the nuts to the seat adjuster and bolt for the center lap belt and the load bar assembly. Refer to Seat Replacement in Seats.

Seat Belt Replacement - Center

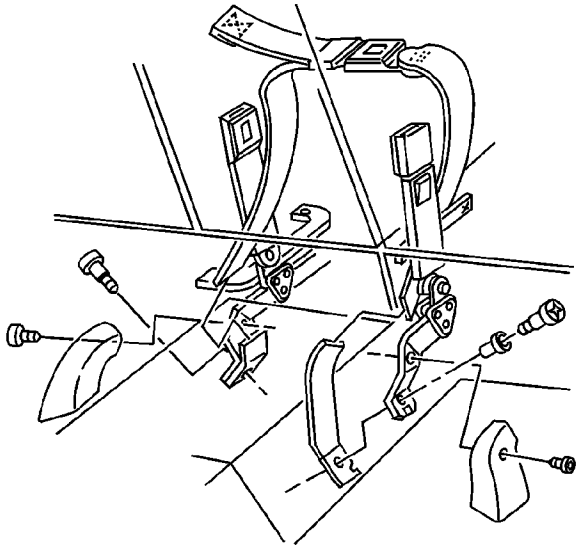
Removal Procedure



1. Remove the fasteners.
2. Remove the covers.
3. Remove the anchor bolts.
4. Separate the belt from the load bar assembly by bending away and discarding the ferrule.
5. Pull the center belt through the seat and the strap.

Installation Procedure

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1. Install the belt through the openings in the seat, if on the latch side, or through the strap sewn to the side of the seat, if on the buckle side.
2. Align the tab on the belt with the slot on the load bar assembly.
3. Position the belt and the load bar assembly over the anchor hole in the tunnel.

Caution: When reinstalling load bar make sure anchor bolt is through the load bar, and center belt holes. Center belt and load bar hole should be correctly lined up using the projection on the belt and notch in load bar for reference. Failure to do so will result in injury in the event of a collision.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

4. Install the anchor bolts through the load bar assembly, lap belts and secure.

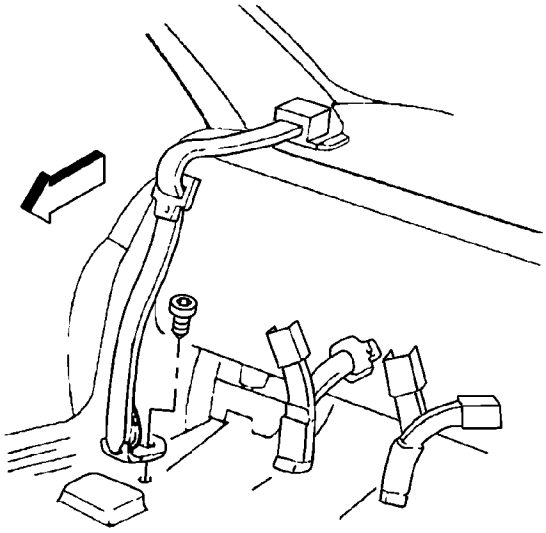
Tighten
Tighten the anchor bolts to 40 N·m (30 lb ft).

5. Install the load bar covers.
6. Install the fasteners in order to secure the covers.

Rear Seat Belt Replacement

Removal Procedure

1. Remove the rear seat back. Refer to Rear Seat Back Replacement in Seats.
2. Remove the rear window trim panel. Refer to Rear Window Shelf Trim Panel Replacement in Interior Trim.

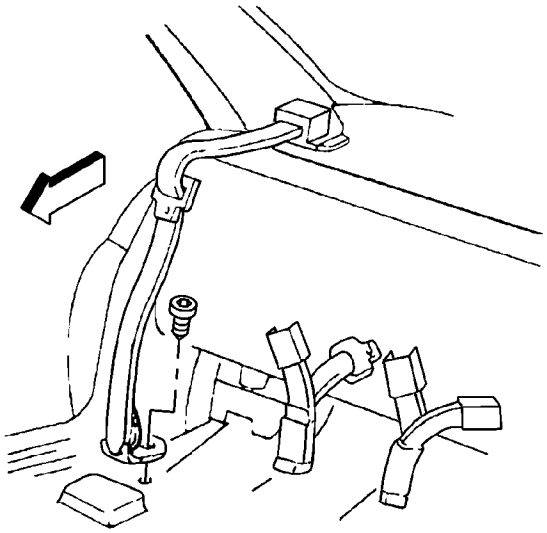




3. Remove the lap belt retractor anchor bolts and retractors.
4. Remove shoulder and lap belt retractors from vehicle.

Installation Procedure

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1. Position tab on the shoulder retractor with the hole in the shelf panel. Place the shoulder belt retractor on the shelf panel and install the anchor bolts.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the anchor bolt.

   Tighten
   Tighten the anchor bolt to 30 N·m (22 lb ft).

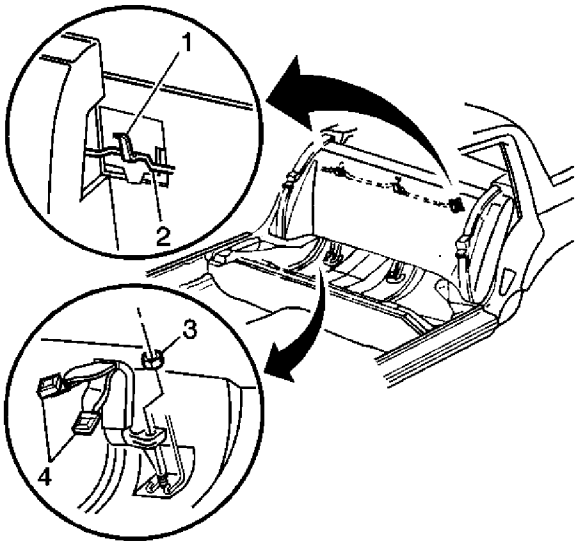
3. Position the lap belt on the floor so the tabs on the bottom of the retractor are on each side of the bump on the floor pan. The bump is forward of the anchor hole. Ensure that the webbing is not twisted.
4. Install the anchor nuts.

   Tighten
   Tighten the nuts to 30 N·m (22 lb ft).

5. Install the rear window trim panel. Refer to Rear Window Shelf Trim Panel Replacement in Interior Trim.
6. Install the rear seat back. Refer to Rear Seat Back Replacement in Seats.

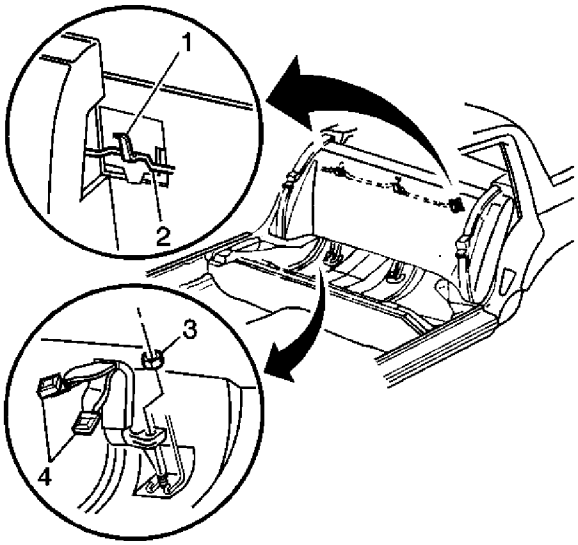
Seat Belt Replacement - Center Rear

Removal Procedure



1. Remove the rear seat cushion. Refer to Rear Seat Cushion Replacement in Seats.
2. Remove the nuts (3) attaching belt assembly (4)to floor pan assembly.
3. Remove the belt assembly (4) (both sides).

Installation Procedure



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1. Install the belt assembly (4) to the studs on the floorpan.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the two nuts (3).

   Tighten
   Tighten the nuts to 35 N·m (26 lb ft).

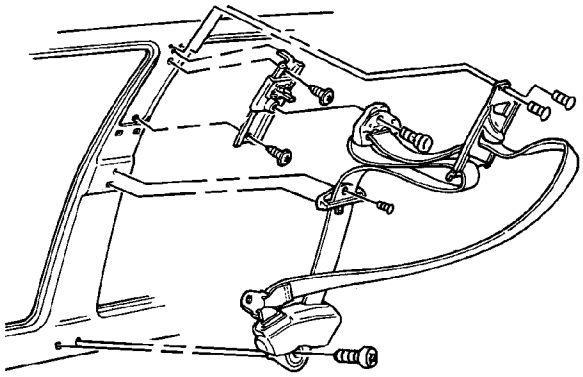
3. Install the rear seat cushion. Refer to Rear Seat Cushion Replacement in Seats.

Seat Belt Retractor Replacement - Left Front

Removal Procedure

Caution: The seat belt assembly and/or bracket assembly must be replaced as a unit only. Do not substitute parts for any reason, or personal injury could result.

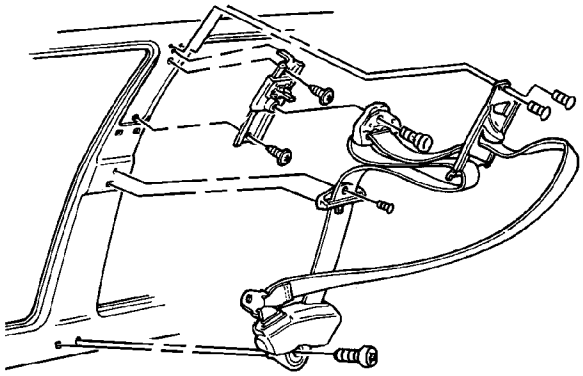
1. Remove the center pillar trim. Refer to Center Pillar Garnish Molding Replacement in Interior Trim.



2. Remove the fasteners and slide track.
3. Remove the anchor bolt and guide loop.
4. Remove the fastener and intermediate guide.
5. Remove the carpet retainer.
6. Move the seat full forward in order to remove the anchor bolt.
7. Remove the dual retractor.
8. Remove the fasteners from the shoulder belt guide adjustment bracket assembly.
9. Remove the shoulder belt guide adjustment bracket assembly.

Installation Procedure

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Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

1. Install the shoulder belt guide bracket assembly and the fasteners into the center pillar near the roof.

   Tighten
   Tighten the fasteners to 25 N·m (19 lb ft)

2. Install the anchor bolt for the dual retractor into center pillar at the rocker.

   Tighten
   Tighten the bolt to 42 N·m (31 lb ft).

3. Install the anchor bolt for the guide loop into the bracket assembly.

   Tighten
   Tighten the bolt to 42 N·m (31 lb ft).

   Important: When installing slide track, care must be taken to engage the head of the guide loop into the socket on the back of the slide track (5 positions of adjustment are provided). After the trim is installed a check should be made to see if the slide track locks into all 5 positions.

4. Install the slide track and the 2 fasteners.

   Tighten

Tighten the two fasteners to 1.9 N·m (16 lb in).

5. Install the intermediate guide and fastener.

   Tighten
   Tighten the intermediate guide fastener to 1.9 N·m (16 lb in).

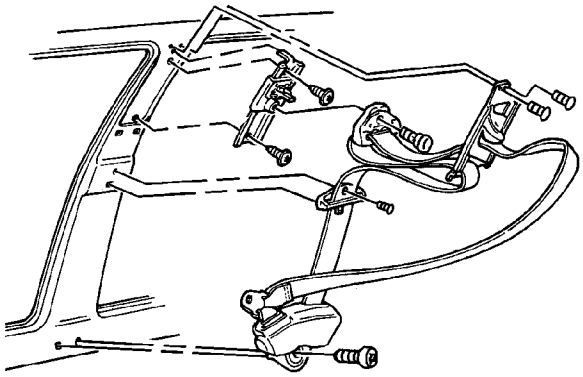
6. Install the center pillar trim. Refer to Center Pillar Garnish Molding Replacement in Interior Trim.

Seat Belt Retractor Replacement - Right Front

Removal Procedure

Caution: The seat belt assembly and/or bracket assembly must be replaced as a unit only. Do not substitute parts for any reason, or personal injury could result.

1. Remove the center pillar trim. Refer to Refer to Center Pillar Garnish Molding Replacement in Interior Trim.



2. Remove the fasteners and the slide track.
3. Remove the anchor bolt and the guide loop.
4. Remove the fastener and the intermediate guide.
5. Remove the anchor bolt.
6. Remove the dual retractor
7. Remove the fasteners from the bracket assembly.
8. Remove the bracket assembly.

Installation Procedure

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

1. Install the 2 fasteners and the bracket assembly into the center pillar near the roof.

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Tighten
Tighten the fasteners to 25 N·m (19 lb ft)

2. Install the anchor bolt for dual retractor into center pillar at rocker.

   Tighten
   Tighten the bolt to 42 N·m (31 lb ft).

3. Install the anchor bolt for the guide loop into the bracket assembly.

   Tighten
   Tighten the bolt to 42 N·m (31 lb ft).

   Important: When installing slide track, care must be taken to engage the head of the guide loop into the socket on the back of the slide track (5 positions of adjustment are provided). After the trim is installed a check should be made to see if the slide track locks into all 5 positions.

4. Install the slide track and 2 fasteners.

   Tighten
   Tighten the two slide track fasteners to 1.9 N·m (16 lb in).

5. Install the intermediate guide and fastener.

   Tighten
   Tighten the intermediate guide fastener to 1.9 N·m (16 lb in).

6. Install the center pillar trim. Refer to Refer to Center Pillar Garnish Molding Replacement in Interior Trim.

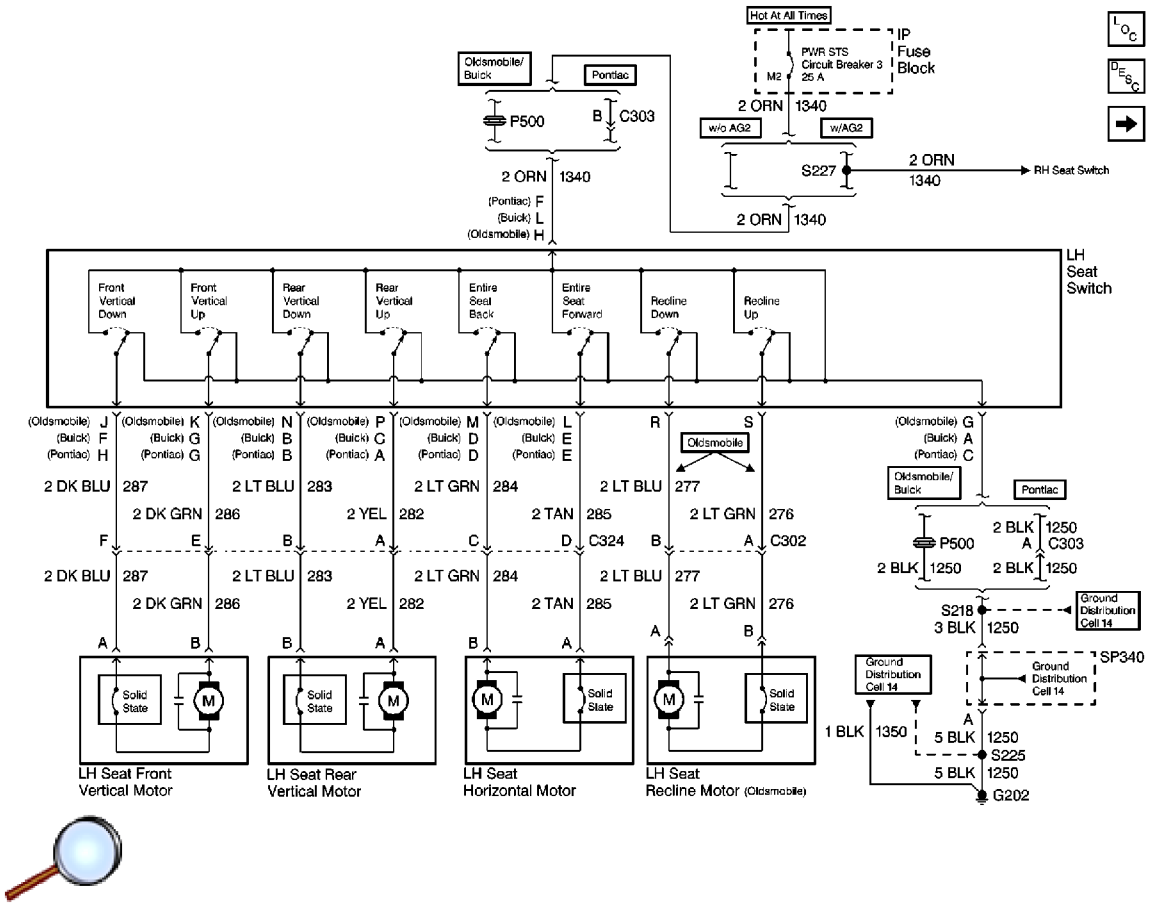
Fastener Tightening Specifications

Application	Specification	
	Metric	English
Load Bar Bolt	42 N·m	31 lb ft
Rear Seat Lap Belt Nut	35 N·m	26 lb ft
Seat Adjuster to Floor Pan Nut	34 N·m	25 lb ft
Seat Adjuster to Seat Cushion Frame Bolts	24 N·m	18 lb ft

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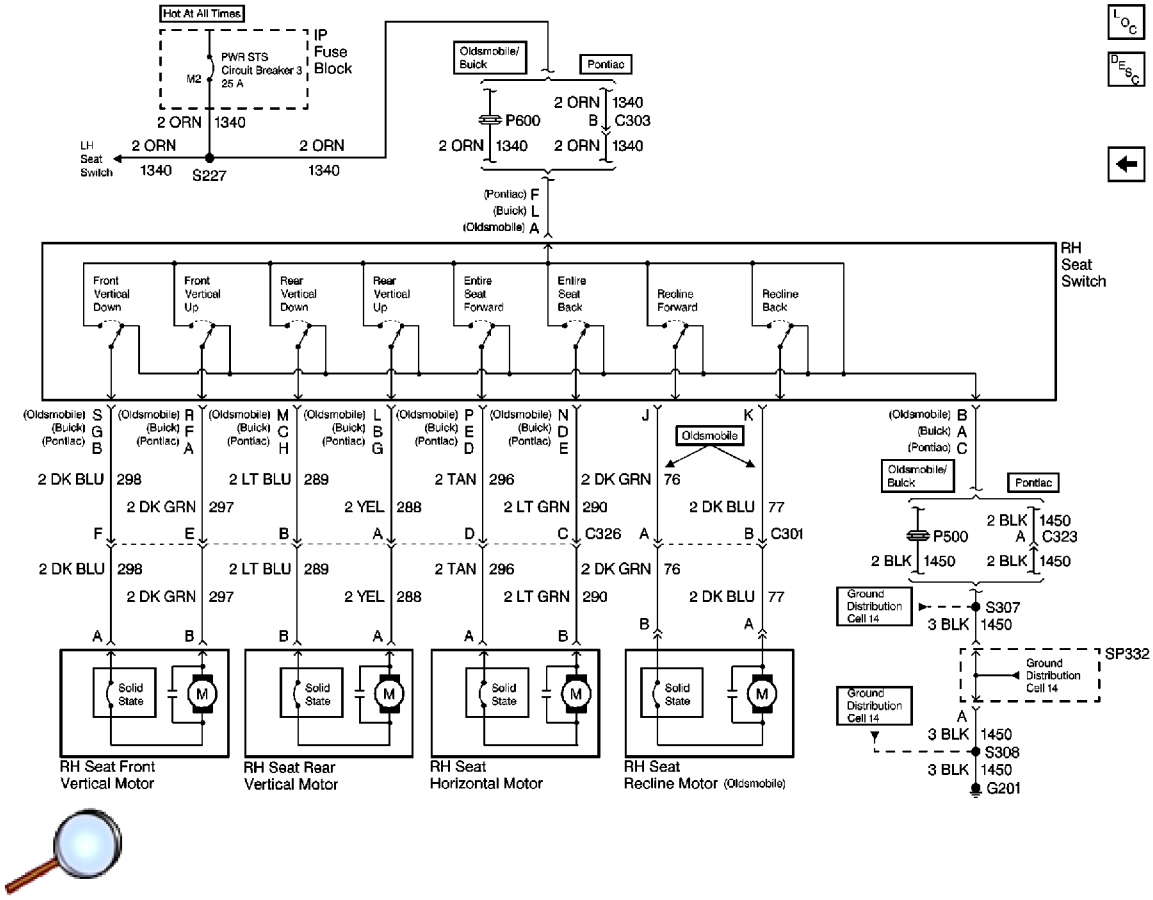
Cell 140: LH Power Seat



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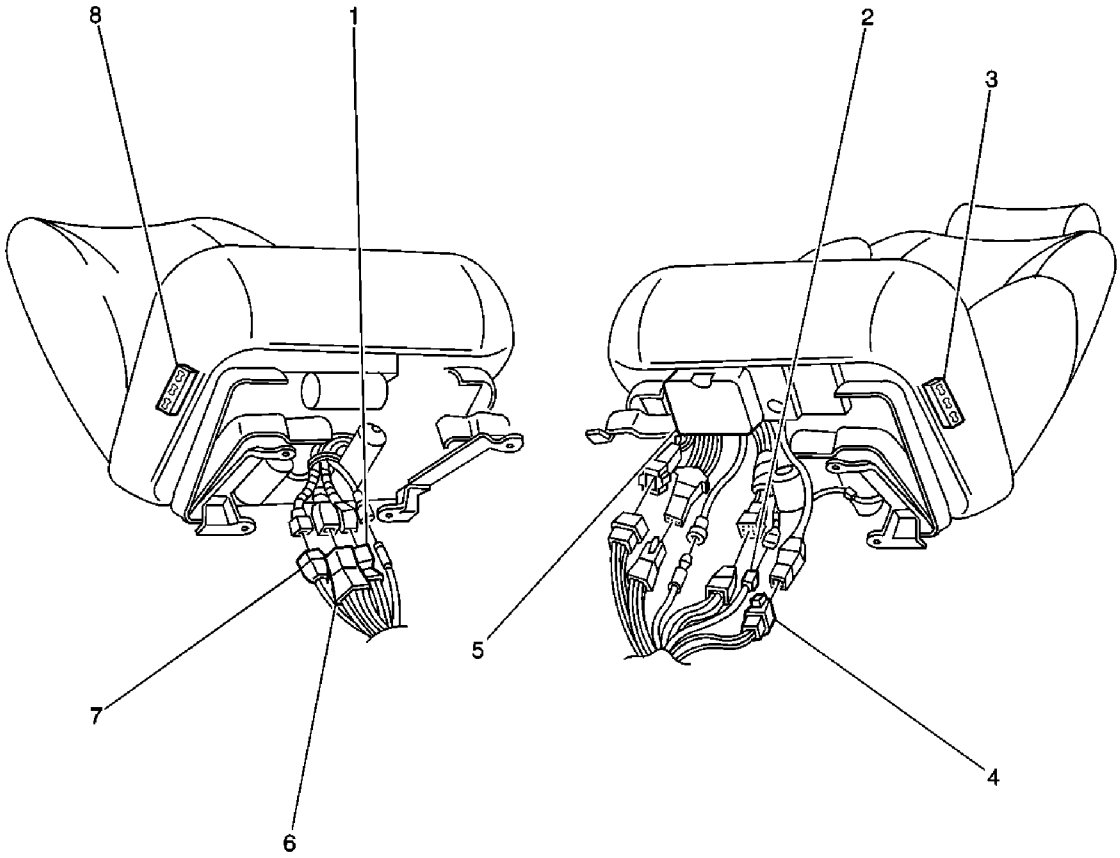
Cell 140: RH Power Seat



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Passenger Compartment, Under the Front Seats

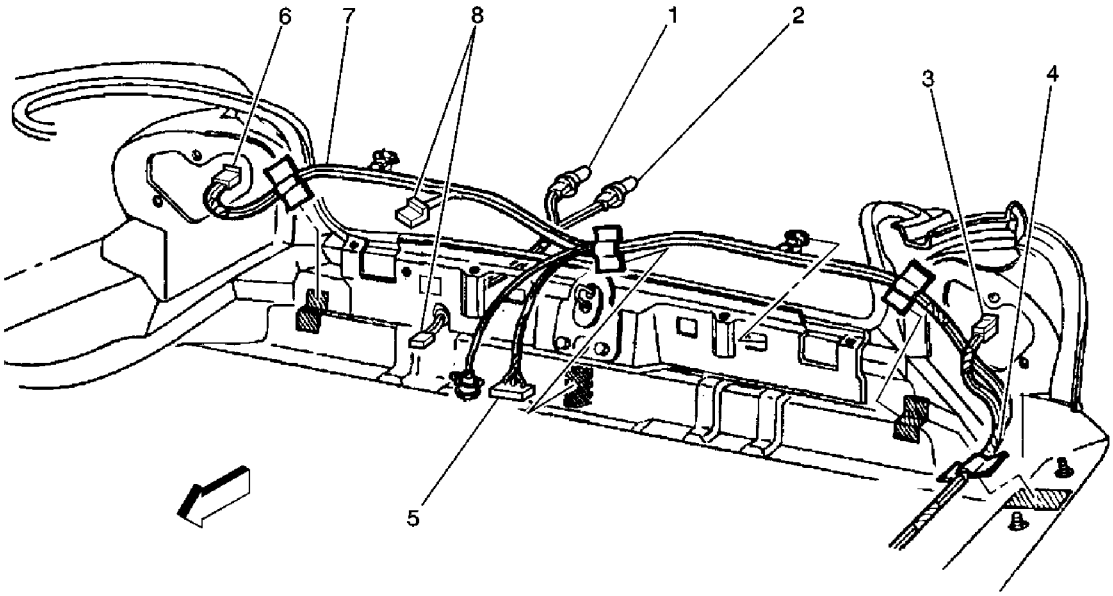


(1) C345 (Pontiac With AL7) C313 (Oldsmobile)
(2) C303 (Buick, Oldsmobile)
(3) LH Seat Switch (Oldsmobile/Pontiac w/AG1,AG2)
(4) C324 (Buick, Oldsmobile)
(5) Seat Module
(6) C326 (Buick/Oldsmobile) C323 (Pontiac Without AL7) C353 (Pontiac With AL7)
(7) C341
(8) RH Seat Switch (Oldsmobile/Pontiac w/AG1,AG2)

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Rear Compartment (Pontiac)

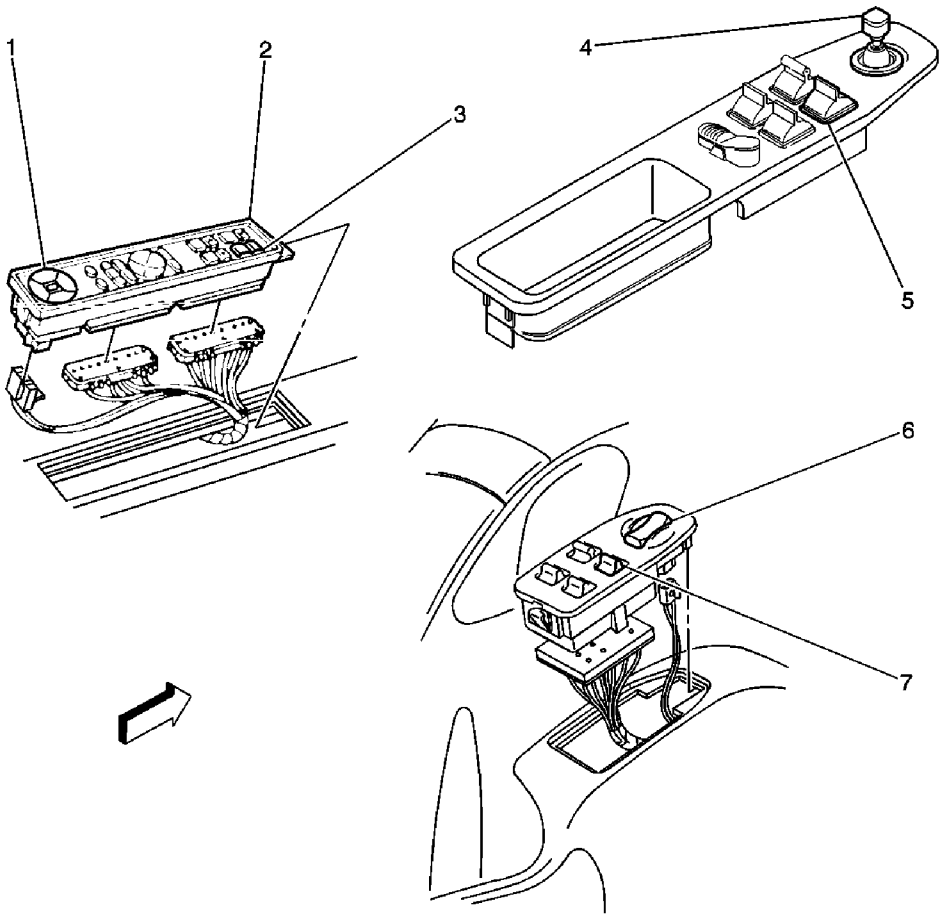


(1) License Lamp
(2) License Lamp
(3) C404
(4) S429, S430
(5) Inflator Switch
(6) C405
(7) S431 S432
(8) C401

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Passenger Compartment, On the Door Armrest



(1) Mirror Switch (Buick)
(2) LH Seat Switch -- RH Similar (Buick)
(3) LH Front Power Window Switch -- RH Similar (Buick)
(4) Mirror Switch (Oldsmobile)
(5) LH Front Power Window Switch -- RH Similar (Oldsmobile)
(6) LH Power Door Lock Switch -- RH Similar (Pontiac)
(7) LH Front Power Window Switch -- RH Similar (Pontiac)

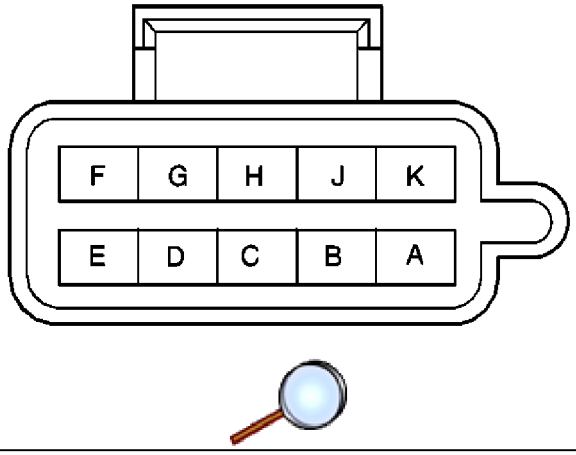
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Power Seat Connector End Views

Table 1: Console Seat Switch C3
Table 2: LH Seat Switch
Table 3: LH Seat Switch
Table 4: Memory Seat / Mirror Module C1
Table 5: Memory Seat / Mirror Module C2
Table 6: Memory Seat / Mirror Module C3
Table 7: RH Seat Cushion Air Valve
Table 8: RH Seat Switch (Oldsmobile)
Table 9: Seat Air Control Module
Table 10: Seat Control Module C1 (Pontiac)
Table 11: Seat Control Module C4 (Pontiac)
Table 12: Seat Control Module C2 (Pontiac with AL7)
Table 13: Seat Control Module C2
Table 14: Seat Control Module C4 (Pontiac)

Console Seat Switch C3



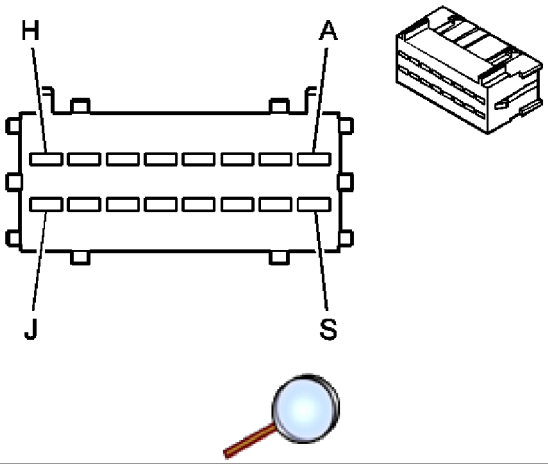
Connector Part Information	• 12064872 • 10-Way M Metri-Pak 150 Series (BLU)

Pin	Wire Color	Circuit No.	Function
A	DK GRN	1518	Power Seat Switch Input - Front Vertical - Up
B	DK BLU	1520	Power Seat Switch Input - Front Vertical - Down
C	YEL	1519	Power Seat Switch Input - Rear Vertical Up
D	LT BLU	1521	Power Seat Switch Input - Rear Vertical Down
E	TAN	1522	Power Seat Switch Input - Horizontal Fore
F	LT GRN	1523	Power Seat Switch Input - Horizontal Back
G	BLK/GRN	1269	Power Seat Switch Input - Recline Forward

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H	WHT/DK GRN	1270	Power Seat Switch Input - Recline Back
J	--	--	Not Used
K	BRN	1674	Power Seat Switch Input - Driver/Passenger Select

LH Seat Switch



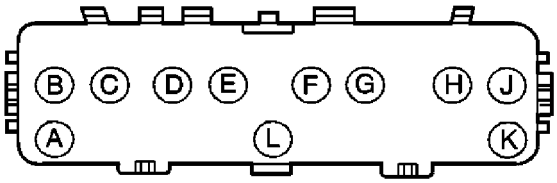
Connector Part Information	• 12129431 • 16-Way F Metri-Pak 280 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	--	--	Not Used
B	GRY	8	Instrument Panel Feed
C	WHT	615	Memory Seat Switch Signal - Memory 1
D	ORN	614	Memory Seat Switch Signal - Set
E	PPL	616	Memory Seat Switch Signal - Memory 2
F	ORN	640	Fuse Output Battery Type III Fuse
G	BLK	1250	Ground
H	ORN	640	Fuse Output Battery - Type III
J	DK BLU	2878	Power Seat Motor Feed - Drivers - Front Vertical Down
J	DK BLU	1520	Power Seat Switch Signal - Front Vertical Down
K	DK GRN	286	Power Seat Motor Feed - Drivers - Front Vertical Up
K	TAN	1158B	Hand Set Fax Data Signal
L	TAN	285	Power Seat Motor Feed - Driver s- Horizontal Fore
L	TAN	1522	Power Seat Switxh Signal - Horizontal Fore
M	LT GRN	2840	Power Seat Motor Feed - Driver and Vertical Up
M	LT GRN	1523	Power Seat Switch Signal - Horizontal Fore
N	LT BLU	283	Power Seat Motor Feed - Drivers Rear Vertical Down

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N	LT BLU	1521	Power Seat Switch Signal - Rear Vertical Down
P	YEL	282	Power Seat Motor Feed - Drivers Rear Vertical Up
P	YEL	1519	Power Seat Switch Signal - Rear Vertical Up
R	LT BLU	277	Power Seat Motor Feed - Drivers Recline Aft
R	LT BLU	277	Power Seat Motor Feed - Drivers Recline Aft
S	LT GRN	276	Power Seat Motor Feed - Drivers Recline Fore

LH Seat Switch



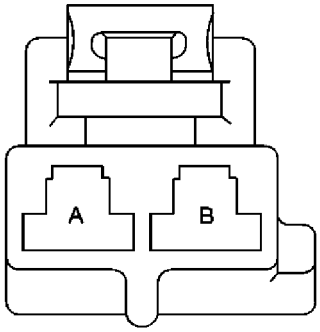


Connector Part Information	• 12034024 • 11-Way F Pin Grip (BLK)

Pin	Wire Color	Circuit No.	Function
A	BLK	1250	Ground
B	LT BLU	283	Power Seat Motor Feed Driver Rear Vertical Down
C	YEL	282	Power Seat Motor Feed Driver Rear Vertical Up
D	LT GRN	284	Power Seat Motor Feed Driver Horizontal Aft
E	TAN	285	Power Seat Motor Feed Driver Horizontal Fore
F	DK BLU	287	Power Seat Motor Feed Driver Front Vertical Down
G	DK GRN	286	Power Seat Motor Feed Driver Front Vertical Up
H-K			Not Used
L	ORN	1340	Fuse Output Battery

Memory Seat / Mirror Module C1

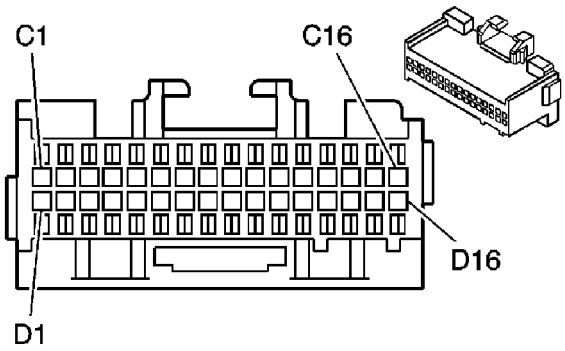
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Connector Part Information	• 12064749 • 2-Way F Metri - Pack 480 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	ORN	1340	Fused Output - Battery
B	BLK	1250	Ground

Memory Seat / Mirror Module C2



Connector Part Information	• 12110207 • 32-Way F Micro - Pack 100 Series (BLU)

Pin	Wire Color	Circuit No.	Function
C1	DK GRN	784	Memory Mirror Position Input - Left Vertical Motor
C2	GRY/BLK	786	Memory Mirror Position Input - Left Horizontal Motor
C3	BRN	787	Memory Mirror Position Input - Right Vertical Motor
C4	GRY	1831	Power Mirror Switch Input - Right Horizontal Motor - Left
C5	LT GRN	275	Neutral Safety Switch Output - Park
C6	BRN/WHT	1832	Power Mirror Switch Input - Right Vertical Motor - Up

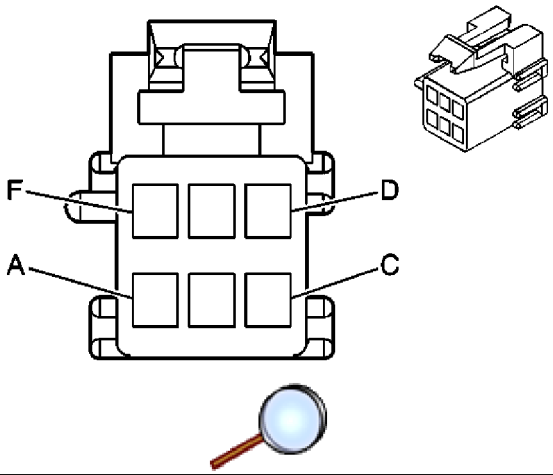
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C7	LT GRN	1523	Power Seat Switch Input - Horizontal Back
C8	YEL	1517	Power Mirror Switch Input - Left Vertical Motor - Up
C9	PPL	616	Memory Seat Switch Input - Memory 2
C10	BLK	782	Sensor Return - Memory Seat / Mirror
C11	PPL	1985	Memory Seat / Mirror Module Input - Memory Personalization
C12	PNK	39	Fused Output - IGN
C13	LT GRN	276	Power Seat Motor Control - Driver - Recline Fore
C14	DK BLU	1520	Power Seat Switch Input - Front Vertical Down
C15	LT BLU	1521	Power Seat Switch Input - Rear Vertical Down
C16	LT BLU	277	Power Seat Motor Control - Driver - Recline Back
D1	LT BLU/BLK	785	Memory Mirror Position Sensor Input - Right Horizontal Motor
D2	GRY	788	Memory Mirror Position Control - 5 Volt Reference
D3	TAN	568	Memory Seat Position Sensor Input - Rear Vertical Motor
D4	DK GRN	569	Memory Seat Position Sensor Input - Horizontal Motor
D5	WHT	615	Memory Switch Input - Memory 1
D6	RED/WHT	1513	Power Mirror Switch Input - Right Horizontal Motor - Right
D7	WHT	1512	Power Mirror Switch Input - Left Horizontal Motor - Right
D8	ORN	614	Memory Seat Switch Input - Set
D9	BRN/WHT	557	Memory Seat Position Sensor Input - Front Vertical Motor
D10	WHT/BLK	570	Memory Seat Position Sensor Input - Driver Recline Motor
D11	LT BLU	1516	Power Mirror Switch Input - Left Horizontal Motor - Left
D12	YEL/BLK	571	Diagnostic Input - Memory Seat
D13	--	--	Not Used
D14	TAN	1522	Power Seat Switch Input - Horizontal Fore
D15	DK GRN	1518	Power Seat Switch Input - Horizontal Fore
D16	YEL	1519	Power Seat Switch Input - Rear Vertical Up

Memory Seat / Mirror Module C3



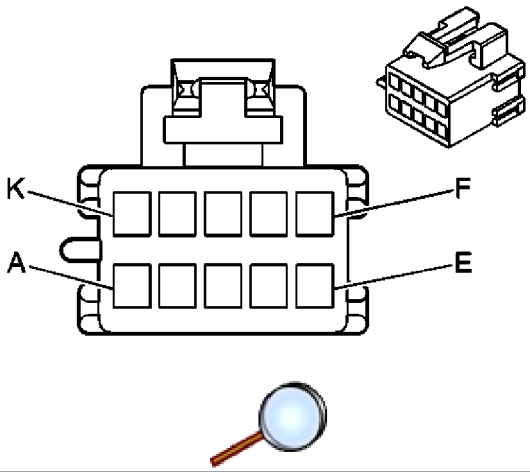
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Connector Part Information	• 12064762 • 6-Way F Metri - Pack 150 Series (GRY)

Pin	Wire Color	Circuit No.	Function
A	BRN/WHT	1498	Power Mirror Motor Control - Right Vertical Motor - Up Direction
B	WHT	818	Power Mirror Motor Control - Left Horizontal Motor - Right Direction
C	YEL	88	Power Mirror Motor Control - Left Vertical Motor - Up Direction
D	LT BLU	82	Power Mirror Motor Control - Left Horizontal Motor - Left Direction
E	RED/WHT	881	Power Mirror Motor Control - Right Horizontal Motor - Right Direction
F	GRY	90	Power Mirror Control - Right Horizontal Motor - Left Direction

RH Seat Cushion Air Valve

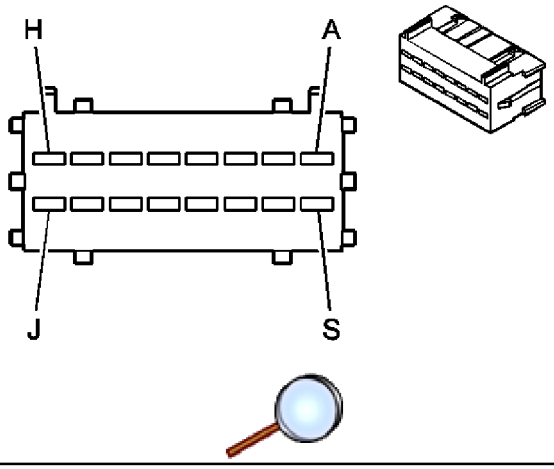


Connector Part Information	• 12064769 • 10-Way F Metri - Pack 150 Series (NAT)

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Pin	Wire Color	Circuit No.	Function
A	--	--	Not Used
B	LT BLU	1259	Pneumatic Seat Solenoid Control-Lower Lumbar-Passenger
C	PNK	1265	Pneumatic Seat Solenoid Control-Lateral- Passenger
D-E	--	--	Not Used
F	RED	798	Pneumatic Seat Solenoid Output - Passenger
G	--	--	Not Used
H	PNK	1260	Pneumatic Seat Solenoid Lumbar-Passenger
J	ORN	1261	Pneumatic Seat Solenoid Upper Lumbar-Passenger
K	PNK	1265	Pneumatic Seat Solenoid Control-Lateral- Passenger

RH Seat Switch (Oldsmobile)



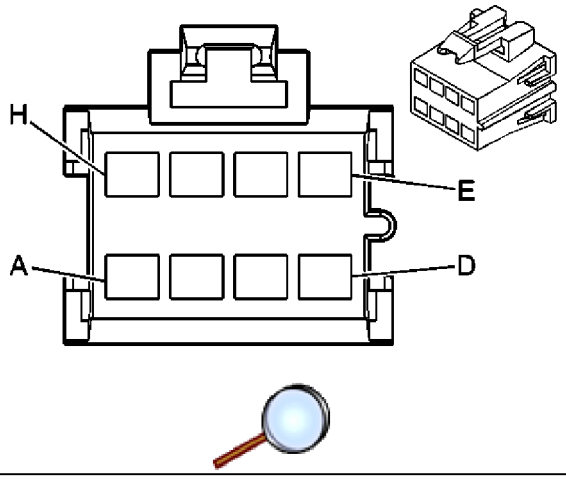
Connector Part Information	• R12129431 • 16-Way F Metri-Pack 280 (ACT) Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	ORN	1340	Fuse Output Battery
B	BLK	1450	Ground
C-F			Not Used
G	GRY	8	Instrument Panel Lamp Control
H			Not Used
J	DK GRN	76	Power Seat Motor Control-Passenger- Recline Fore
K	DK BLU	77	Power Seat Motor Control-Passenger- Recline Back
L	YEL	288	Power Seat Motor Control-Passenger- Rear Vertical Up
M	LT BLU	289	Power Seat Motor Control-Passenger- Rear Vertical Down
N	LT GRN	290	Power Seat Motor Control-Passenger- Horizontal Back

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P	TAN	296	Power Seat Motor Control-Passenger- Horizontal Fore
R	DK GRN	297	Power Seat Motor Control-Passenger- Front Vertical Up
S	DK BLU	298	Power Seat Motor Control-Passenger- Front Vertical Down

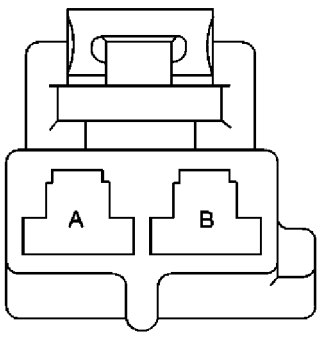
Seat Air Control Module



Connector Part Information	• 12064998 • 8-Way F Metri - Pack 280 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	BLK	769	Pneumatic Seat Select Switch
B	BLK	1250	Ground
C	TAN	768	Power Seat Motor Control-Driver Lumbar Up
D	WHT	766	Pneumatic Seat Relay Control-Coil Driver Inflate
E	BLK	1250	Ground
F	ORN	1340	Fuse Output-Battery
G	PPL	767	Power Seat Motor Control-Driver Lumbar Down
H	GRY	764	Pneumatic Seat Relay Control-Coil Driver Deflate

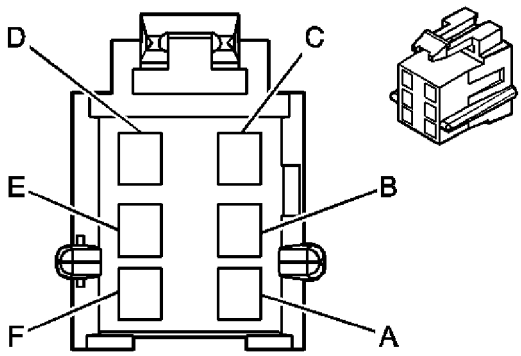
Seat Control Module C1 (Pontiac)



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Connector Part Information	• 12064749 • 2-Way F Metri - Pack 480 Series (BLK)		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	ORN	1340	Fuse Output - Battery - Type III Fuse
B	BLK	1250	Ground

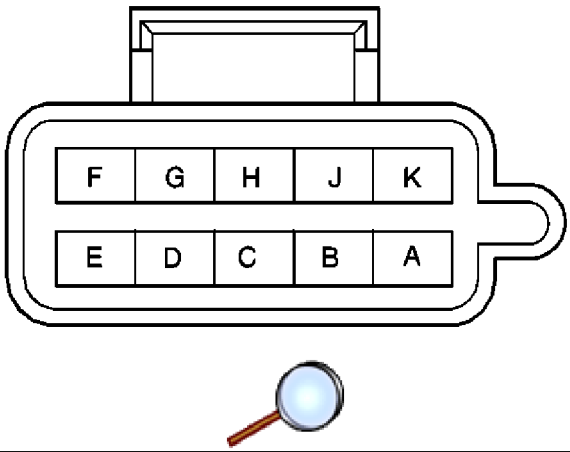
Seat Control Module C4 (Pontiac)



Connector Part Information	• 12064752 • 6-Way F Metri - Pack 280 Series (BLK)		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	DK BLU	298	Power Seat Motor Control - Passenger - Front Vertical Down
B	LT BLU	289	Power Seat Motor Control - Passenger - Rear Vertical Down
C	LT GRN	290	Power Seat Motor Control - Passenger - Horizontal Back
D	DK BLU	1247	Power Seat Motor Output - Passenger
E	DK BLU	77	Power Seat Motor Control - Passenger - Recline Back
F	--	--	Not Used

Seat Control Module C2 (Pontiac with AL7)

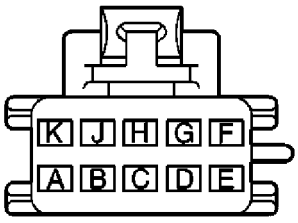
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Connector Part Information	• 12064770 • 10-Way M Metri-Pack 150 Series (NAT)

Pin	Wire Color	Circuit No.	Function
A	GRY	764	Pneumatic Seat Relay Control-Coil-Driver Deflate
B	RED	798	Pneumatic Seat Solenoid Output-Passenger Seat
C	ORN	640	Fused Output - Battery
D	BLK	769	Pneumatic Seat Select Switch Output - Driver
E	BLK	1250	Ground
F	LT BLU	1259	Pneumatic Seat Solenoid Control - Lower Lumbar - Passenger
G	PNK	1260	Pneumatic Seat Solenoid Control - Lumbar - Passenger
H	ORN	1261	Pneumatic Seat Solenoid Control - Upper Lumbar - Passenger
J	PNK	1265	Pneumatic Seat Solenoid Control - Lateral - Passenger
K	WHT	766	Pneumatic Seat Relay Control Coil - Driver - Inflate

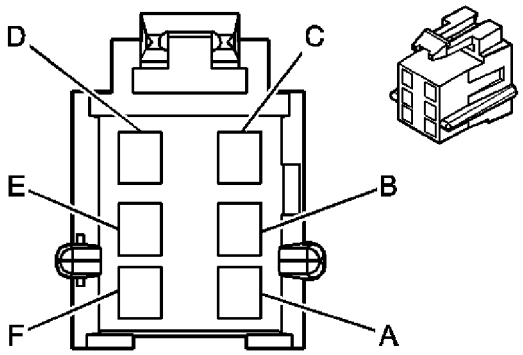
Seat Control Module C2



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Connector Part Information	• 12064871 • 10-Way F Metri-Pak 150 Series (BLU)		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	DK GRN	1518	Power Seat Switch Input - Front Vertical Up
B	DK BLU	1520	Power Seat Switch Input - Front Vertical Down
C	YEL	1519	Power Seat Switch Input - Rear Vertical Up
D	LT BLU	1521	Power Seat Switch Input - Rear Vertical Down
E	TAN	1522	Power Seat Switch Input - Horizontal Fore
F	LT GRN	1523	Power Seat Switch Input - Horizontal Back
G	BLK GRN	1269	Power Seat Switch Input - Recline Forward
H	WHT GRN	1270	Power Seat Switch Input - Recline Back
J	--	--	Not Used
K	BRN	1674	Power Seat Switch - Driver/Passenger Select

Seat Control Module C4 (Pontiac)

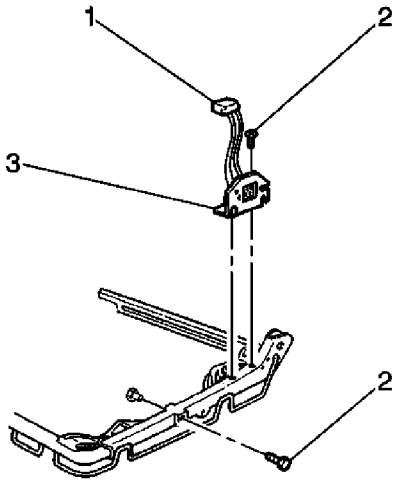


Connector Part Information	• 12064752 • 6-Way F Metri - Pack 280 Series (BLK)		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	DK BLU	298	Power Seat Motor Control - Passenger - Front Vertical Down
B	LT BLU	289	Power Seat Motor Control - Passenger - Rear Vertical Down
C	LT GRN	290	Power Seat Motor Control - Passenger - Horizontal Back
D	DK BLU	1247	Power Seat Motor Output - Passenger
E	DK BLU	77	Power Seat Motor Control - Passenger - Recline Back
F	--	--	Not Used

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Power Seat Switch Replacement

Removal Procedure

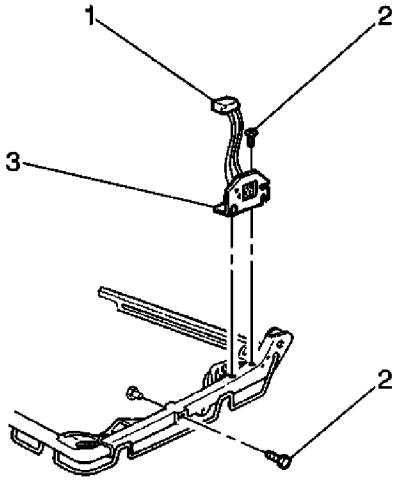


1. Remove the fasteners (2) attaching the seat switch bezel to the seat.
2. Partially remove the switch bezel (1).
3. Disconnect the electrical connector.
4. Remove the seat switch. Refer to one of the following procedures:
   - Power Seat Switch Replacement in Doors.
   - Console Front Trim Plate Replacement in Instrument Panel, Gauges and Console.

Installation Procedure

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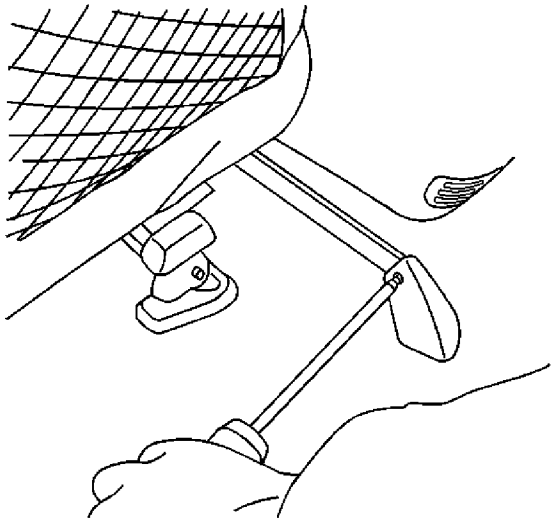
1. Install the seat switch. Refer to one of the following procedures:
   - Console Front Trim Plate Replacement in Instrument Panel, Gauges and Console.
   - Power Seat Switch Replacement in Doors.
2. Connect the electrical connectors.
3. Install the switch bezel to the seat.
4. Install the fasteners (2).
5. Verify that the seat operates correctly.

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Driver or Passenger Seat Replacement (Buick/Oldsmobile)

Removal Procedure

1. Remove the fasteners that retain the floor support covers.
2. Remove the floor support covers.

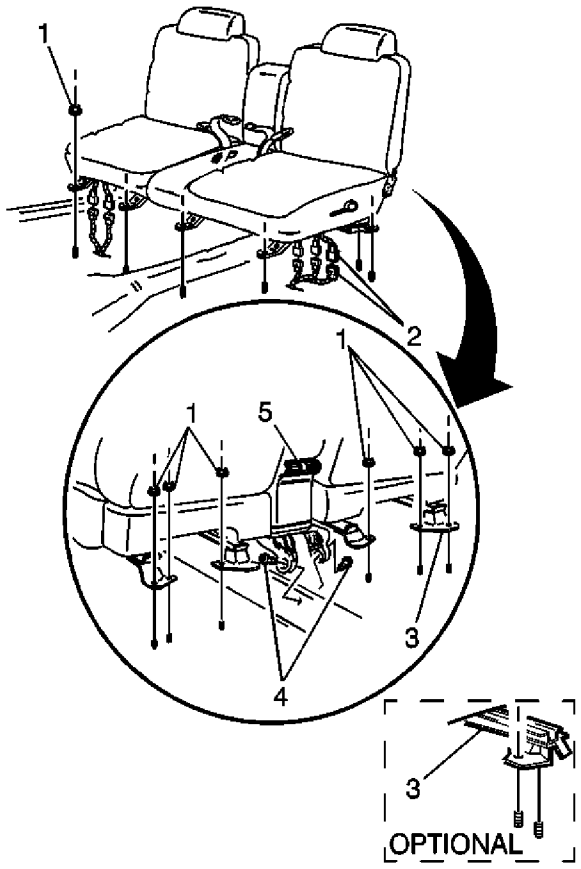




3. Remove the load bar cover.
4. Move the seat to the full rearward position.
5. Remove the front floor support covers.
6. Remove the front nuts that retain the adjuster to the floor pan.
7. Move the seat to the full forward position.

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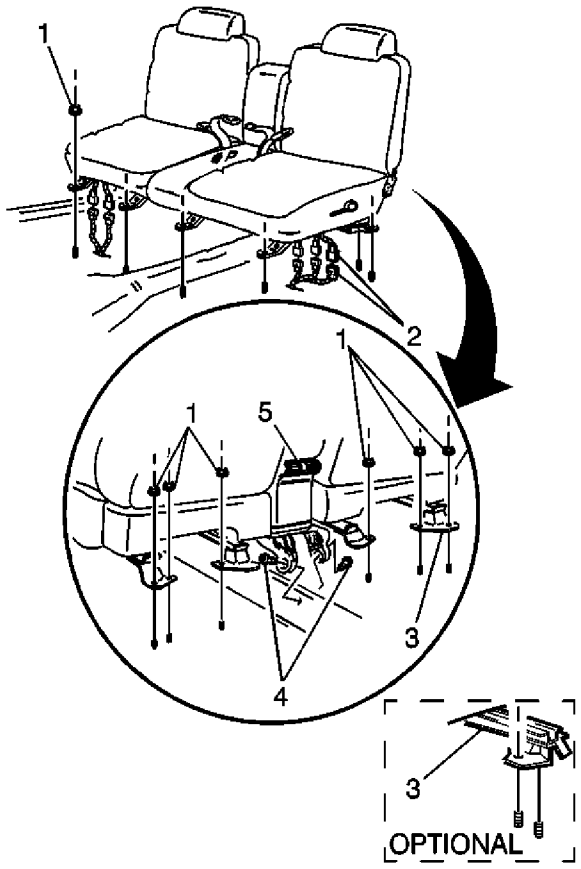


Caution: On seats with a manual adjuster, failure to place the seat in the full forward position prior to removal of the rear attaching nuts could allow the seat track to suddenly spring forward, resulting in personal injury.

8. Remove the rear nuts that retain the adjuster (3) to the floor pan. (The insert shows the manual adjuster.)
9. Remove the load bar bolt (4).
10. Tilt the seat forward.
11. Disconnect the following components:
    - The electrical connectors (2)
    - The air hose (if equipped)
    - The HVAC duct (5) at the armrest (if equipped)
12. Remove the rear seat cushion, prior to front seat removal. Refer to Rear Seat Cushion Replacement .
13. Remove the left front seat out the left rear door, with the aid from an assistant.

Installation Procedure

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1. Install the front seat, with the aid from an assistant, through the left rear door opening.
2. Install the rear seat cushion. Refer to Rear Seat Cushion Replacement in Seats.
3. Connect or install the following components:
   - The electrical connectors (2)
   - The air hose (if equipped)
   - The HVAC duct (5) at the armrest (if equipped)

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

4. Install the load bar bolt (4).

   Tighten
   Tighten the load bar bolt to 35 N·m (26 lb ft).

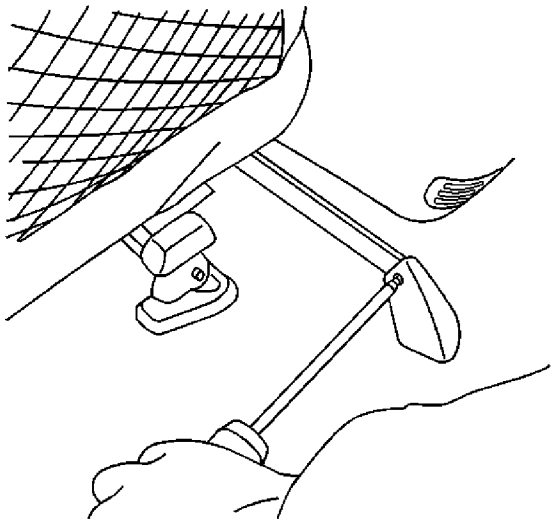
5. Install the rear nuts in order to attach the adjuster (3) to the floor pan. (The insert shows the manual adjuster).

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Tighten
Tighten the rear nuts to 34 N·m (25 lb ft).

6. Install the front nuts in order to attach the adjuster (3) to the floor pan. (The insert shows the manual adjuster.)

Tighten
Tighten the front nuts to 34 N·m (25 lb ft).



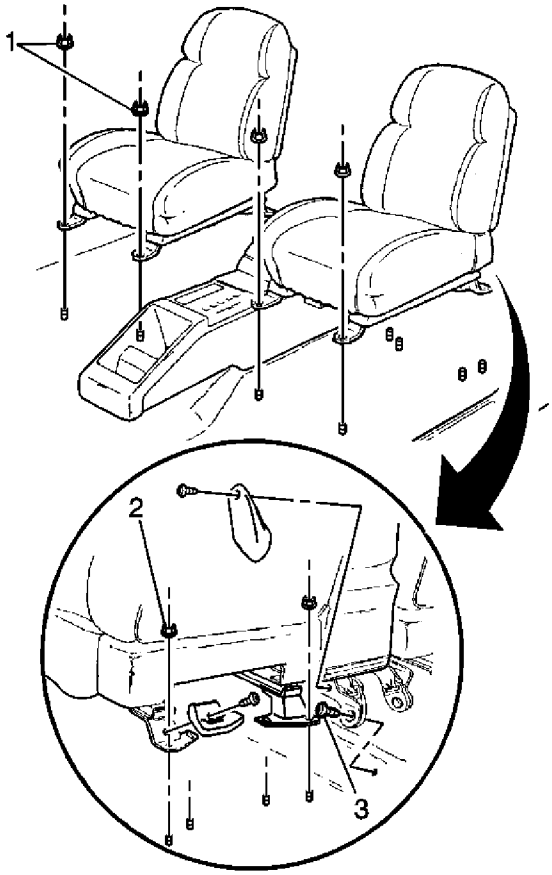


7. Move the seat to the full forward position.
8. Install the load bar cover.
9. Install the floor support covers front and rear.
10. Install the floor support cover fasteners front and rear.

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Driver or Passenger Seat Replacement (Pontiac)

Removal Procedure



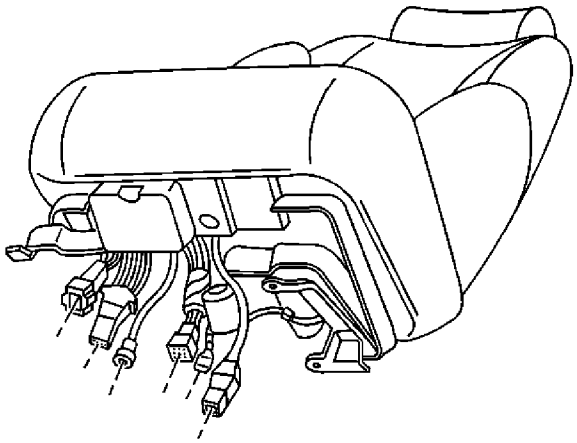
1. Remove the fasteners that retain the floor support covers.
2. Remove the floor support covers.
3. Remove the load bar cover.
4. Move the seat to the full rearward position.
5. Remove the front nuts (1) that attach the adjuster to the floor pan.
6. Move the seat to the full forward position.

Caution: On seats with a manual adjuster, failure to place the seat in the full forward position prior to removal of the rear attaching nuts could allow the seat track to suddenly spring forward, resulting in personal injury.

7. Remove the rear nuts (2) that attach the adjuster to the floor pan.
8. Remove the load bar bolt (3).

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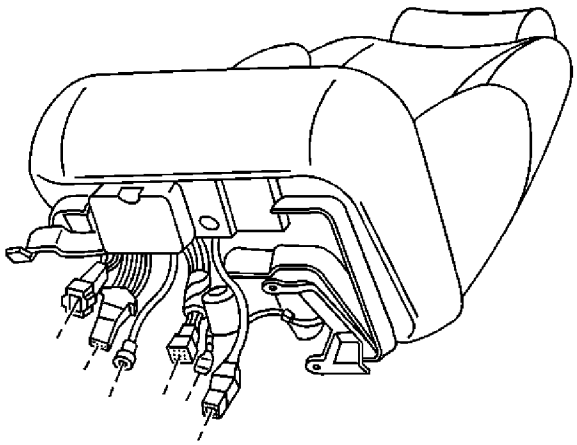
9. Tilt the seat rearward.
10. Disconnect the following components:
    - The electrical connectors
    - The air hose
    - The HVAC duct at the armrest, where applicable.
11. Remove the seat with aid from an assistant.

Installation Procedure

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Object Number: 314048 Size: MH

1. Install the seat with aid from an assistant.



2. Connect or install the following components:
   - The electrical connectors (2)

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- The air hose
- The HVAC duct at the armrest, where applicable.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the load bar bolt (3).

   Tighten
   Tighten the load bar bolt to 42 N·m (31 lb ft).

4. Install the rear nuts in order to attach the adjuster to the floor pan.

   Tighten
   Tighten the rear nuts (2) to 34 N·m (25 lb ft).

5. Install the front nuts in order to attach the adjuster to the floor pan.

   Tighten
   Tighten the front nuts (1) to 34 N·m (25 lb ft).

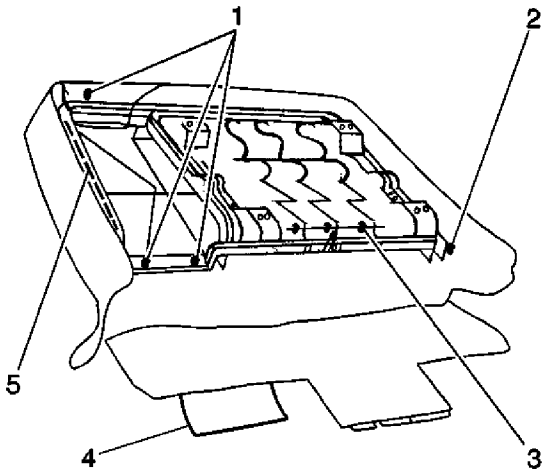
6. Move the seat to the full rearward position.
7. Install the load bar cover.
8. Install the floor support covers.
9. Tighten the floor support cover fasteners.

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Front Seat Cushion Replacement

Removal Procedure

1. In order to ease in the removal of the adjuster, raise the seat back to the fully inclined (up) position before you remove the seat
2. Remove the seat. Refer to Seat Replacement .
3. Place the seat on a clean, protected surface.
4. Remove the adjusters.
5. Disconnect the air lines, if necessary.
6. Remove the following components, if necessary.
   - The side trim panel fasteners
   - The front trim panel fasteners
7. Disconnect the recliner switch electrical connectors, if necessary.
8. Remove the panels, if necessary.

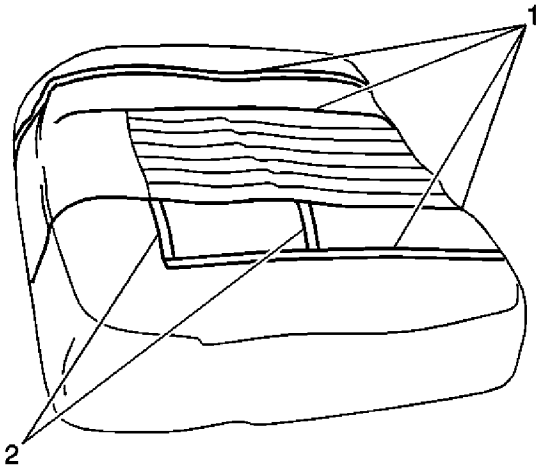




9. Remove the hog rings (1, 2, 3) from the seat cover.
10. Disconnect the J-section retainers (5).
11. Pull the seat cover back to access the pivot bolts.
12. Remove the recliners. Refer to Front Seat Power Recliner Replacement or Seat Back Recliner Replacement .
13. Remove the right pivot bolt.
14. Remove the left pivot bolt.
15. Note the routing of the air lines.
16. Remove the seat back.

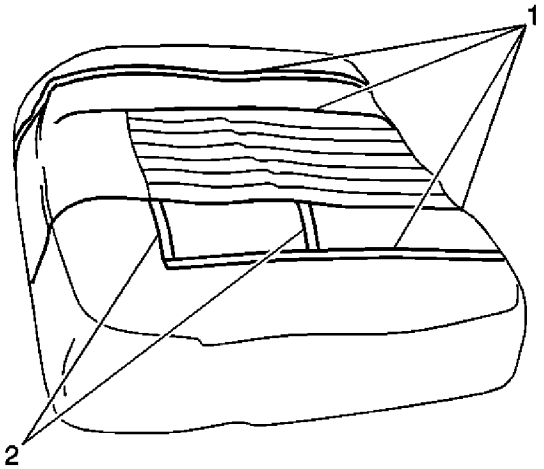
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17. Disengage the hook and loop strips (2).
18. Remove the seat cover from the cushion.
19. Remove the hog rings retaining the cushion.
20. Remove the cushion.

Installation Procedure



1. Install the cushion to the frame.
2. Install the hog rings to the cushion.
3. Install the seat cover (1) to the cushion.

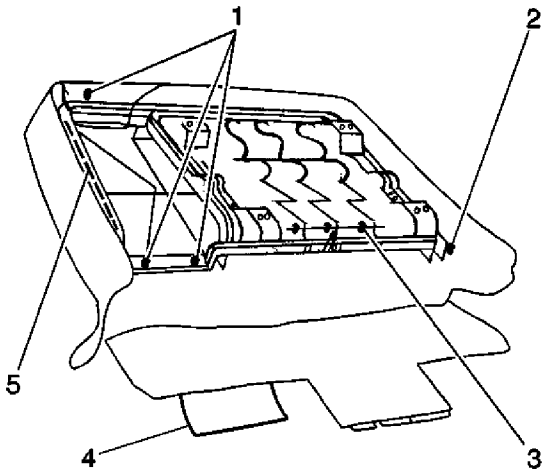
   Smooth out the wrinkles.

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4. Install the seat back.

   Check air line routing.

5. Install the left pivot bolt.
6. Install the right pivot bolt.
7. Install the recliners. Refer to Front Seat Power Recliner Replacement or Seat Back Recliner Replacement .





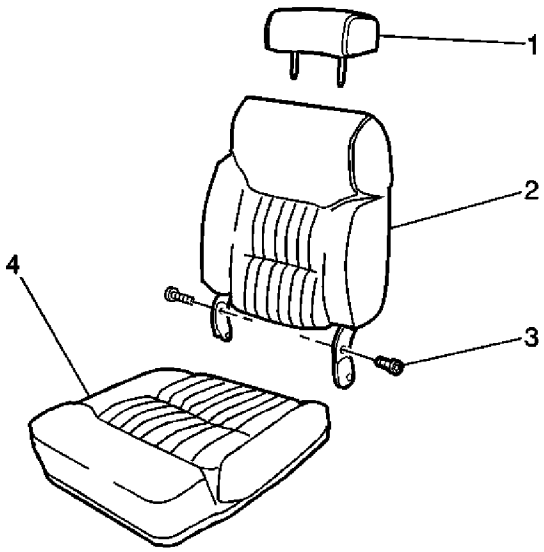
8. Connect the J-section retainers (5).
9. Install the hog rings (1, 2, 3) to the seat cover.
10. Install the panels, if necessary.
11. Connect the recliner switch electrical connectors, if necessary.
12. Install the following components, if necessary:
    - The front trim panel fasteners
    - The side trim panel fasteners
13. Connect the air lines, if necessary.
14. Install the following components to the seat:
    - The adjusters
    - The 4 bolts
15. Install the seat. Refer to Seat Replacement .

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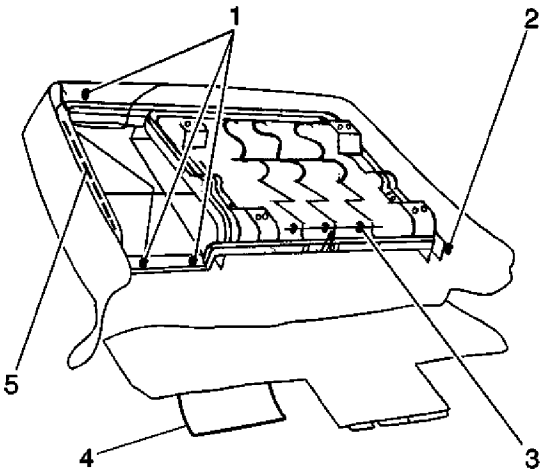
Front Seat Cushion Cover Replacement

Removal Procedure

1. Remove the seat. Refer to Seat Replacement in order to remove the following components:
   - The seat
   - The adjusters



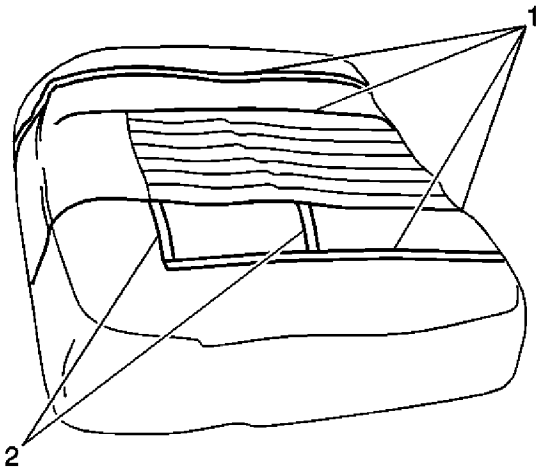
2. Remove the seat back (2) from the seat.
3. Remove the recliner handle or the power recliner switch, if applicable.
4. Remove the armrest. Refer to Front Seat Armrest Replacement .



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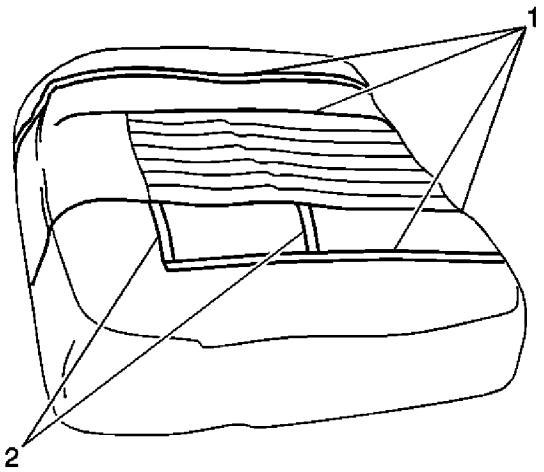
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5. Remove the hog rings (1) and the cushion cover.
6. Remove the J-section retainer (5).
7. Remove the hog rings and the pad from the springs (3).
8. Remove the pad and the cover from the frame.
9. Remove the hog rings (2) and the cover from the bottom of the cushion.



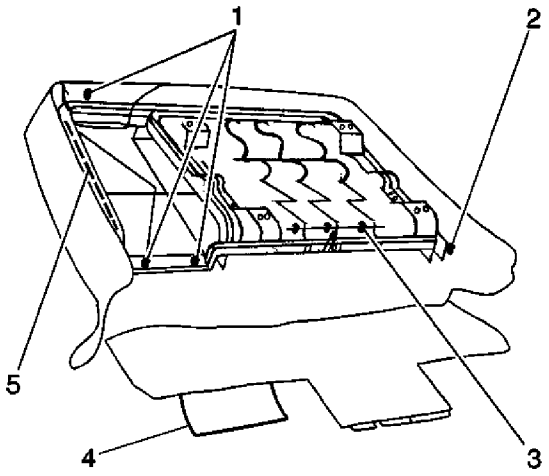
10. Remove the hog rings in the pad behind the cover.
11. Disengage the hook and loop strips (2).

Installation Procedure

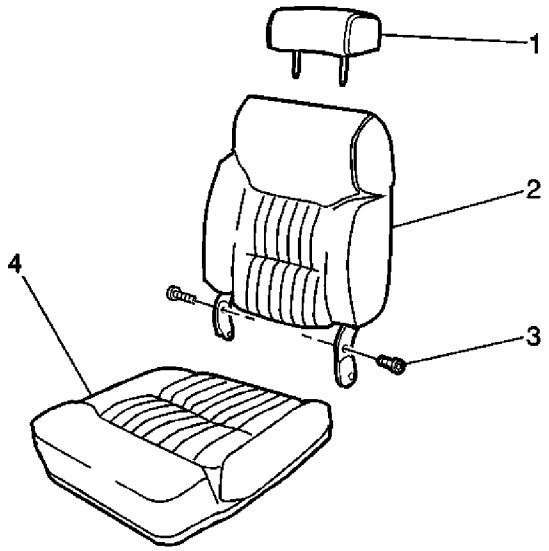


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1. Align the locating holes in the cover (1) with the work lines on the pad.
2. Install the hog rings in the pad behind the cover.



3. Install the hog rings (2) and the cover to the bottom of the cushion.
4. Install the pad and the cover to the frame.
5. Install the hog rings and the pad to the springs (3).
6. Install the J-section retainer (5).
7. Install the hog rings (1) and the cushion cover.



8. Install the armrest. Refer to Front Seat Armrest Replacement .
9. Install the recliner handle or the power recliner switch, if applicable.
10. Install the seatback (2) to the seat.
11. Refer to Seat Replacement in order to install the following components:

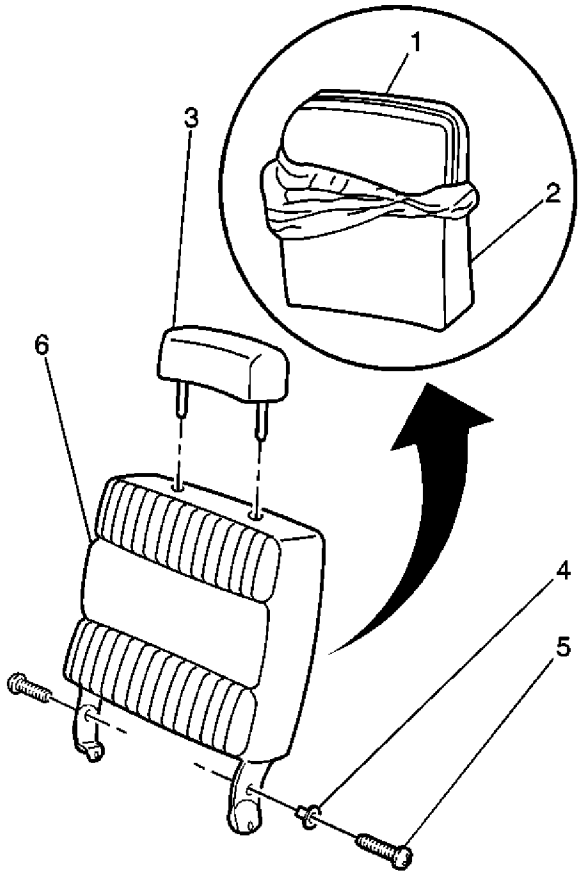
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- The seat
- The adjusters

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Front Seat Back Replacement (Buick)

Removal Procedure

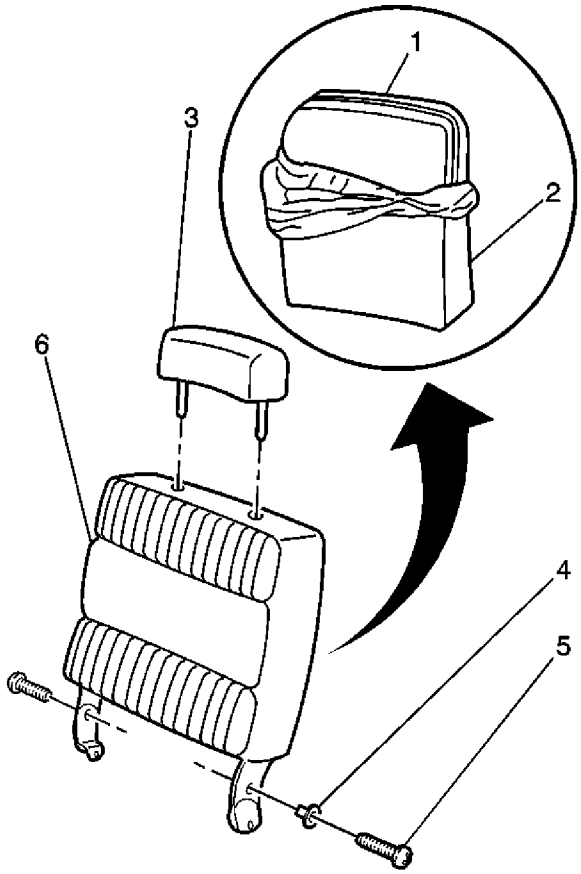


1. Remove the front seat cushion. Refer to Front Seat Cushion Replacement .
2. Remove the zipper or the J-retainer at the bottom of the seat back.
3. Remove the hook-and-loop strip from each side of the plate assembly.
4. Peel back the cover as far as the center insert tie-down wire.
5. Remove the hog rings.
6. Remove the back insert pads.
7. Peel back the cover (2).
8. Remove the hog rings from each side of the upper bolster tie-down wires.
9. Remove the hog rings from the rear bottom tie-down of the seat back.
10. Remove the hog rings from the excess welt cords on each side of the seat back.
11. Remove the head restraint (3). Refer to Front Seat Head Restraint Replacement .
12. Remove the cover.
13. Remove the pad from the seat back frame (1).

Installation Procedure

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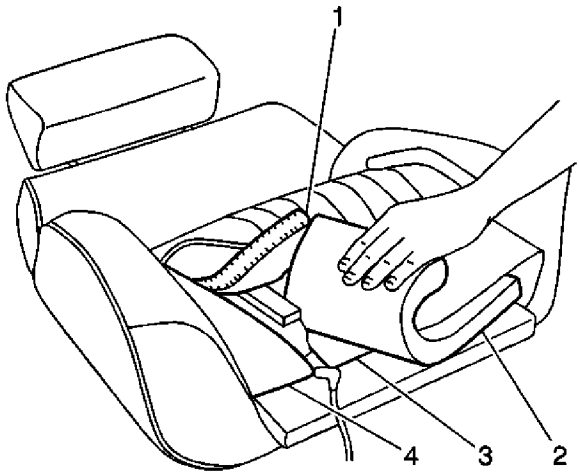
1. Install the pad to the seat back frame (1).
2. Install the cover (2).
3. Install the head restraint (3). Refer to Front Seat Head Restraint Replacement .
4. Install the hog rings to the excess welt cords on each side of the seat back.
5. Install the hog rings to the rear bottom tie-down of the seat back.
6. Install the hog rings to each side of the upper bolster tie-down wires.
7. Install the back insert pads.
8. Install the hog rings.
9. Install the hook-and-loop strip from each side of the plate assembly.
10. Install the zipper or the J-retainer at the bottom of the seat back.
11. Install the seat cushion. Refer to Front Seat Cushion Replacement .

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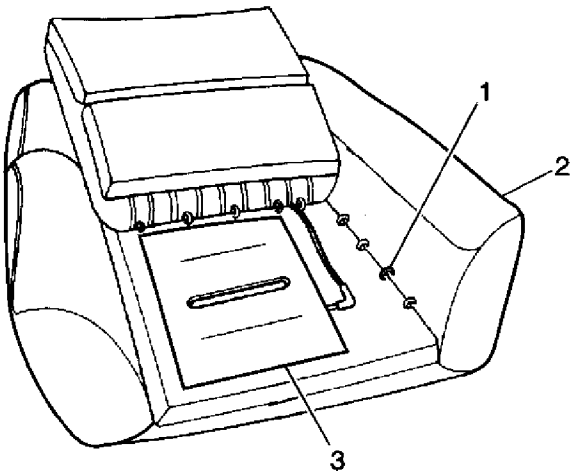
Front Seat Back Replacement (Oldsmobile)

Removal Procedure

1. Remove the front seat cushion. Refer to Front Seat Cushion Replacement .
2. Remove the zipper or the J-retainer at the bottom of the seat back.



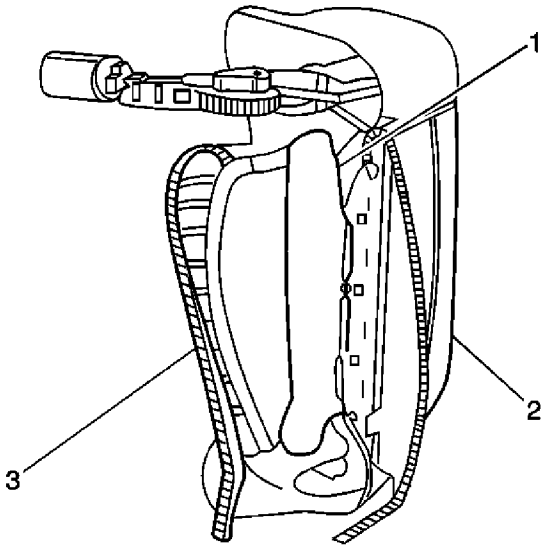
3. Remove the hook-and-loop strip (1) from each side of the plate assembly.
4. Peel back the cover as far as the center insert tie-down wire.
5. Remove the hog rings.
6. Remove the back insert pads (2).



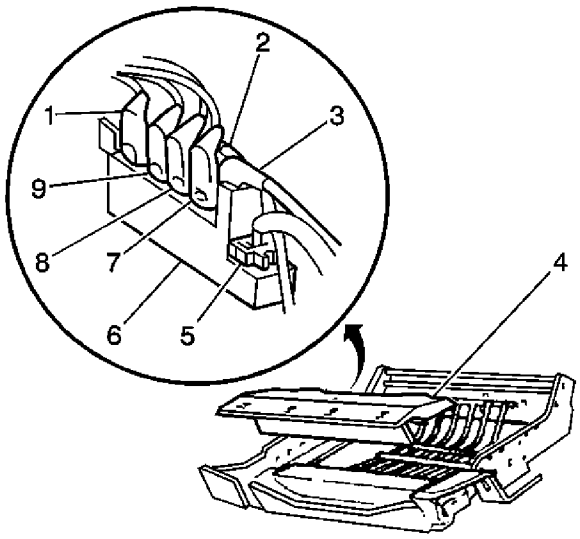
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7. Peel back the cover (2).
8. Remove the hog rings (1) from each side of the upper bolster tie-down wires.
9. Remove the hog rings (1) from the rear bottom tie-down of the seat back.
10. Remove the hog rings (1) from the excess welt cords on each side of the seat back.
11. Remove the head restraint. Refer to Front Seat Head Restraint Replacement .

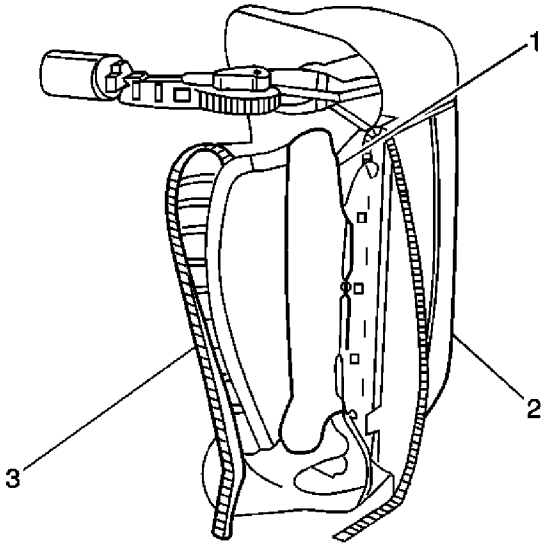


12. Remove the cover (2).



13. Remove the blue air line (8) from the lumbar bladder (4).
14. Remove the bladder (4).
15. Remove the following air lines from the contour bladders:
    - The green air line (9)
    - The orange air line (7)
16. Unsnap the bolster bladder assembly from each side of the seat back mounting hinges.
17. Unsnap the bladders from each side of the upper contour plates.

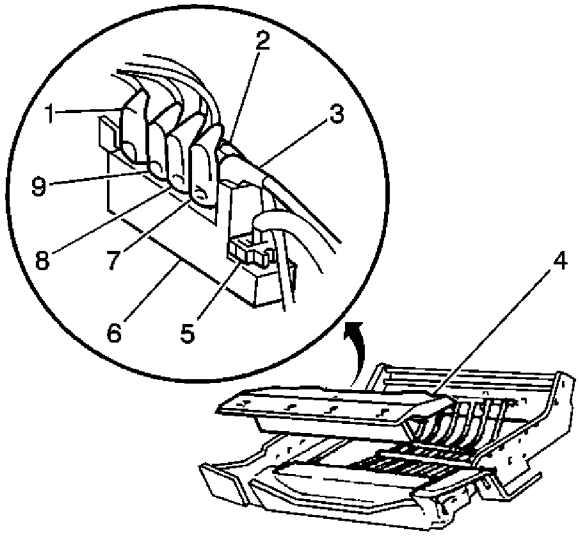
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18. Remove the pad (1) from the seat back frame.

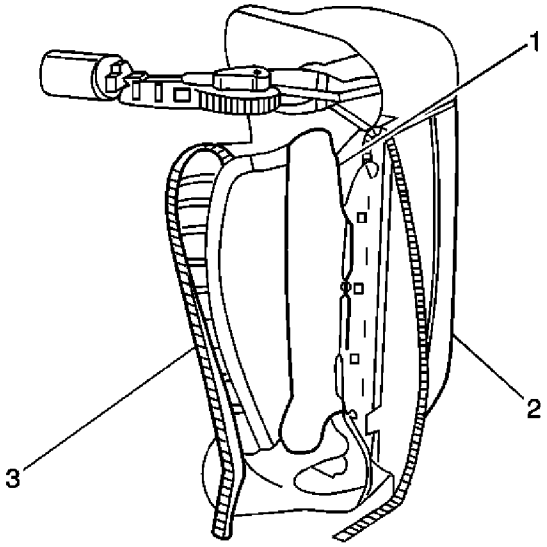
Installation Procedure

1. Install the pad (1) to the seat-back frame.

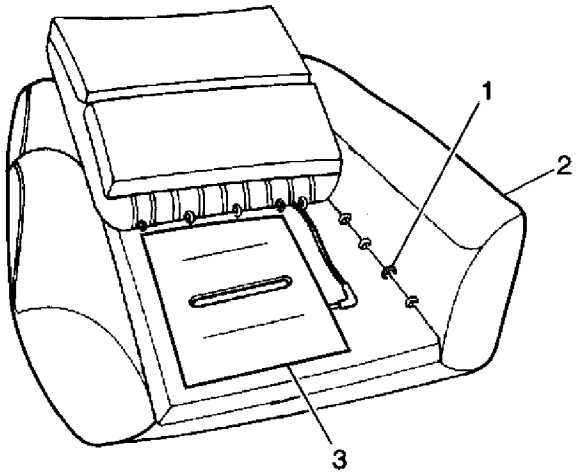


2. Snap the bladders into the upper contour plates on each side.
3. Snap the bolster bladder assembly to the mounting hinges on the seat back.
4. Install the following air lines to the contour bladder:
   - The green air line (9)
   - The orange air line (7)
5. Install the lumbar bladder (8).
6. Install the blue air line (8) to the lumbar bladder (8).

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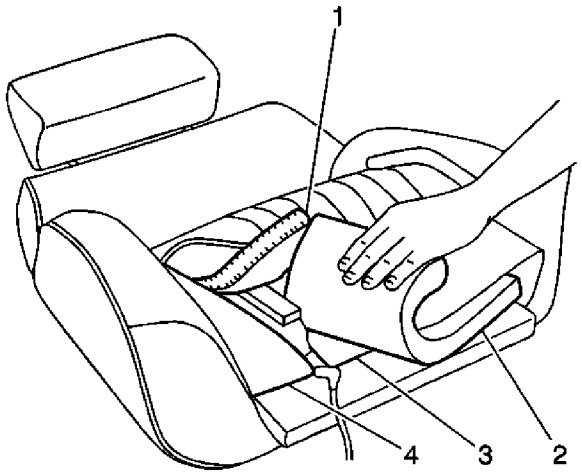


7. Install the cover (2).
8. Install the head restraint. Refer to Front Seat Head Restraint Replacement .



9. Install the hog ring welt cords (1) on each side of the seat back.
10. Install the hog ring seat back to the bottom tie-down.
11. Install the hog ring cover (2) at each side of the upper bolster tie-down wires.

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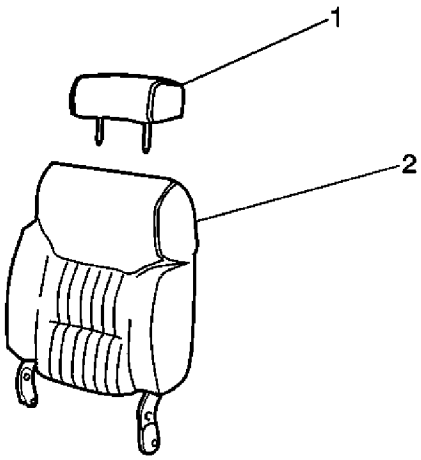
12. Install the back insert pads (2).
13. Install the hog ring cover as far as the center insert tie-down wire.
14. Install each side of the plate assembly.
15. Install the zipper or the J-retainer at the bottom of the seat back.
16. Install the seat cushion. Refer to Front Seat Cushion Replacement .

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Front Seat Back Replacement (Pontiac With AL7)

Removal Procedure

1. Remove the front seat. Refer to Seat Replacement .
2. Remove the headrest. Refer to Front Seat Head Restraint Replacement .
3. Remove the headrest guides.
4. Remove the seat cushion. Refer to Front Seat Cushion Replacement .
5. Disconnect the J-retainer at the bottom of the seat back.
6. Remove the rear finish panel.
7. Disconnect J-retainer from seat back outer support.
8. Remove the hog rings from the seat back cover.

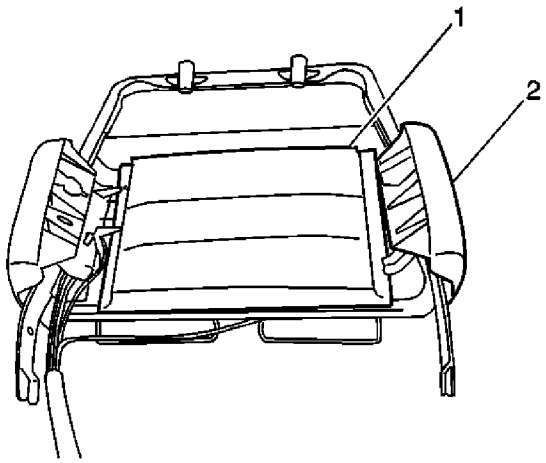




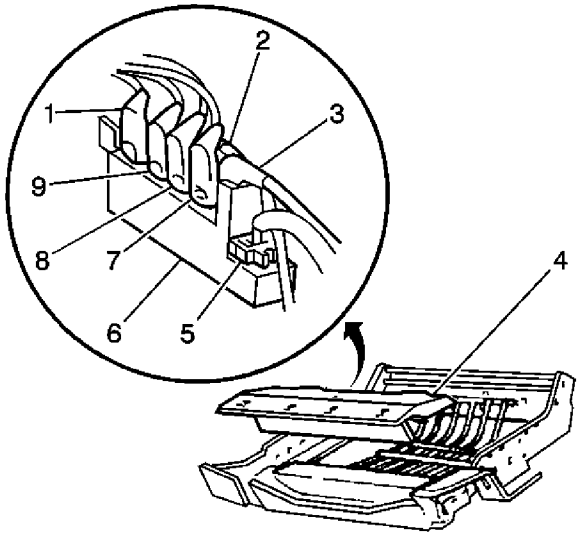
9. Remove the seat back cover (2).
10. Remove the seat back pad.
11. Disconnect the air hoses from the lumbar bladder.

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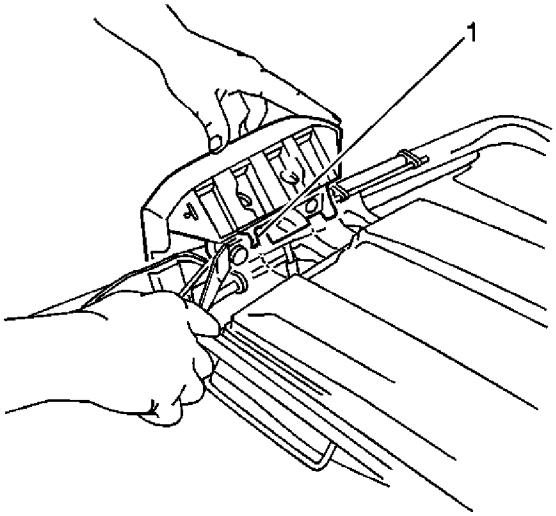


12. Remove the lumbar bladder (1).

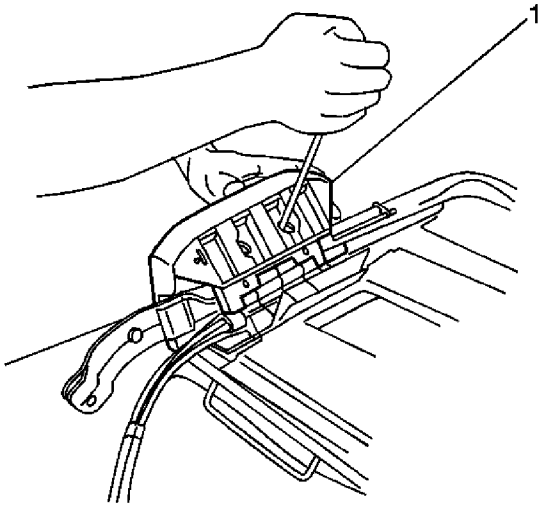


13. Disconnect the air hoses (1) from the contour bladders.

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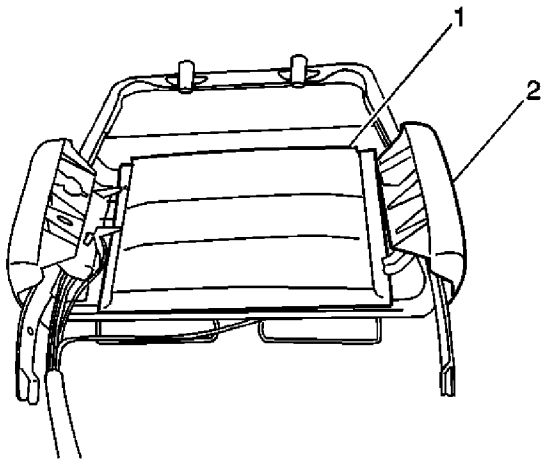
14. Remove the retainers from the contour bladders (1).
15. Remove the bladders.



16. Remove the retainers from the contour plates (1).
17. Remove the contour plates.

Installation Procedure

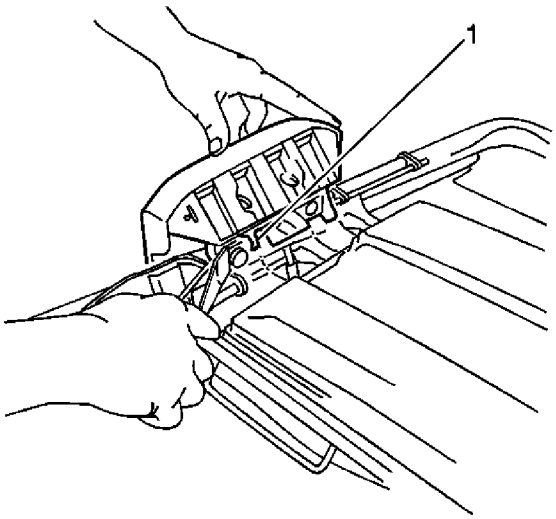
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1. Install the contour plates to the seat frame (2).

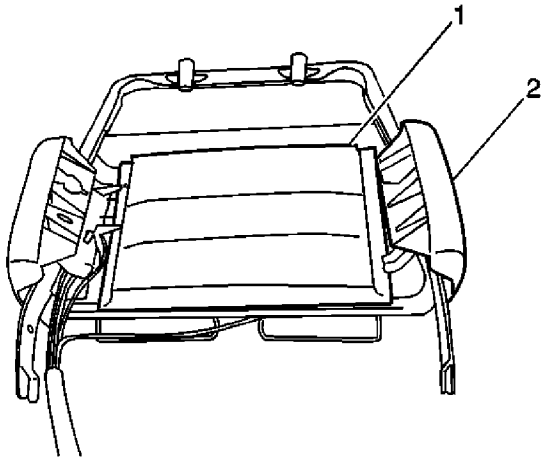
   Install the fasteners.

2. Install the contour bladders.

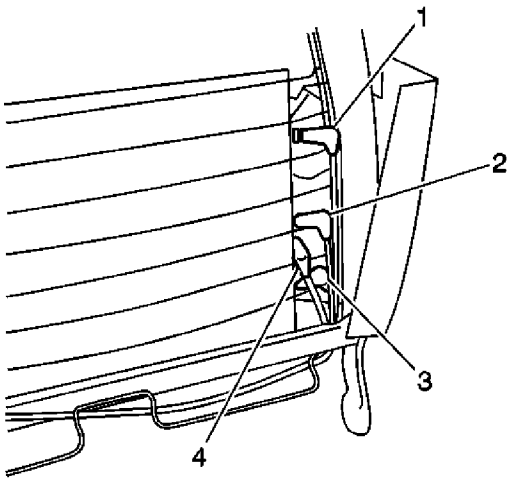


3. Install the contour bladder retainers (1).
4. Connect the air hoses to the contour bladders.

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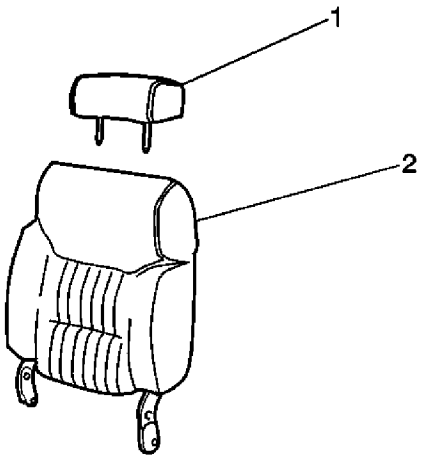


5. Install the lumbar bladder (1).



6. Connect the green air hose to the lumbar bladder (1).
7. Connect the white air hose to the lumbar bladder (2).
8. Connect the yellow air hose to the lumbar bladder (3).
9. Connect the blue air hose to the lumbar bladder (4).
10. Install the seat back pad.

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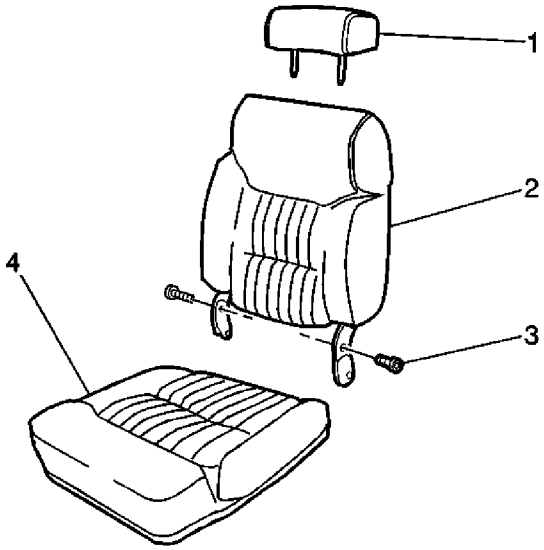
11. Install the seat back cover (2).
12. Smooth out the wrinkles.
13. Install the hog rings to the seat back cover in order to secure.
14. Fasten the seat back cover J-retainer to the seat back frame outer support.
15. Install the seatback finish panel.
16. Connect the J-retainer at the bottom of the seat back.
17. Install the seat cushion. Refer to Front Seat Cushion Replacement .
18. Install the headrest guides.
19. Install the headrest. Refer to Front Seat Head Restraint Replacement .
20. Install the front seat. Refer to Seat Replacement .

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Seat Back Cover and Pad Replacement

Removal Procedure

1. Remove the head restraint and guides. Refer to Front Seat Head Restraint Replacement .
2. Refer to Seat Replacement in order to remove the following components:
   - The seat
   - The seat adjusters
3. Remove the recliner attachment roll pins at the rear of the seat. Refer to Seat Back Recliner Replacement .

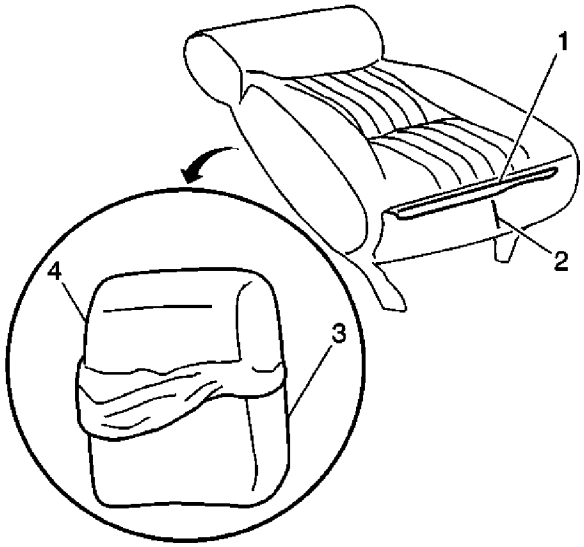




4. Remove the assist strap, if applicable.
5. Remove the pivot bolts (3).
   - On the passenger side, push down the trim cover, remove the hog rings and pull up in order to gain access to the bolts.
   - On the driver side, the outboard bolt is accessible from the side. Push down on the trim at the rear of the seat. The inboard bolt is located on the underside of the seat, near the armrest.
6. Remove the seat back (2) from the cushion (3).

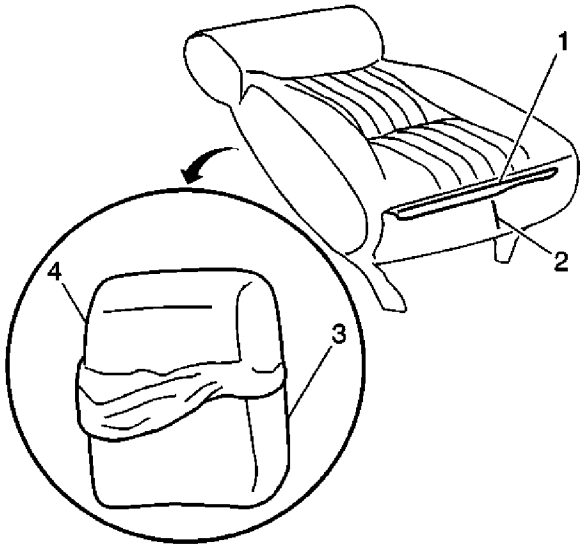
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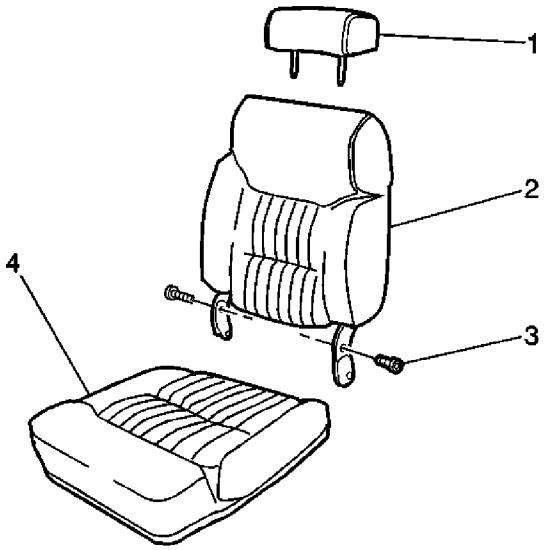
7. Disengage the J-section retainer (1) at the bottom of the seat back.
8. Disengage the hook-and-loop attachments inside the cover.
9. Remove the cover (4) from the pad (3).

Installation Procedure



1. Install the cover (4) onto the pad (3). Align the locating holes in the cover to the grooves in the pad (3).
2. Install the hook-and-loop attachments on the cover to the pad.
3. Install the J-section retainer (1) at the bottom of the seatback.

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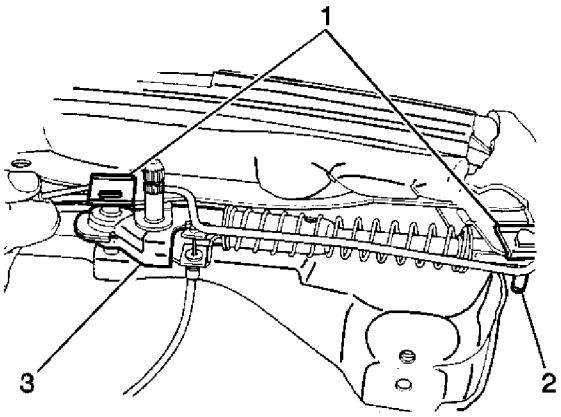
4. Install the pivot bolts (3) in order to attach the seat back (2) to the seat cushion (4).
5. Install the assist strap, if applicable.
6. Install the recliner attachment roll pins at the rear of the seat. Refer to Seat Back Recliner Replacement .
7. Refer to Seat Replacement in order to install the following components:
   - The seat
   - The seat adjusters
8. Install the head restraint and guides. Refer to Front Seat Head Restraint Replacement .

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Seat Back Recliner Replacement

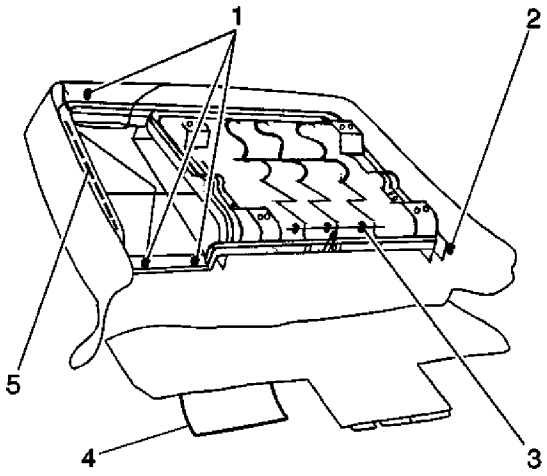
Removal Procedure

1. Refer to Seat Replacement in order to remove the following components:
   - The seat
   - The seat adjusters





2. Using a flat-bladed tool, remove the retaining clips (1) from the recliner handle (3).
3. Remove the recliner handle (3).



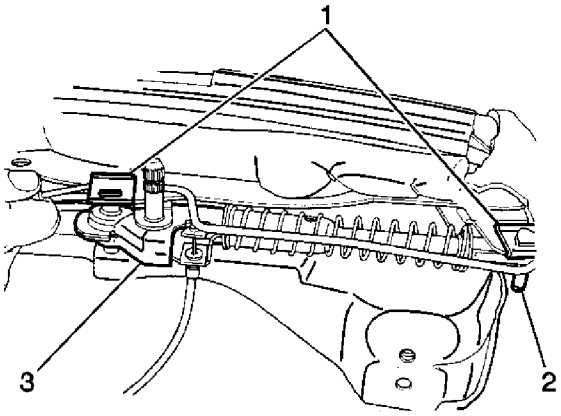
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4. Disconnect the J-section retainer (5) on the seat cushion cover.

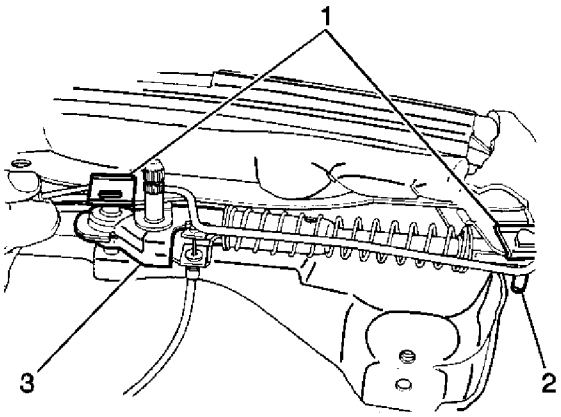
   Pull the cover out of the way.

5. Remove the hog rings (1) from the guide pin at the carpet flap covering (4) at the rear of the recliner.



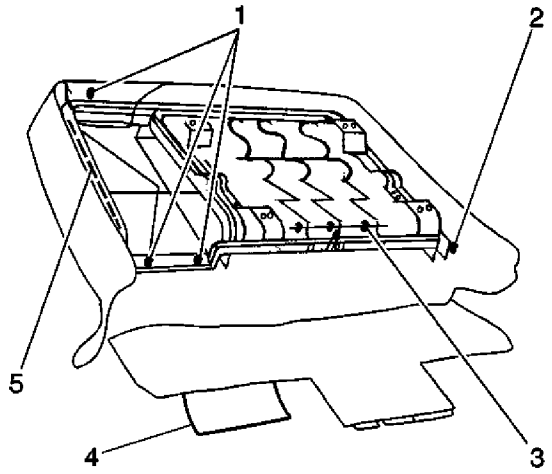
6. Using a small hammer and a punch, remove the clips (1) from the guide pins (2).
7. Remove the recliner assembly (3).

Installation Procedure

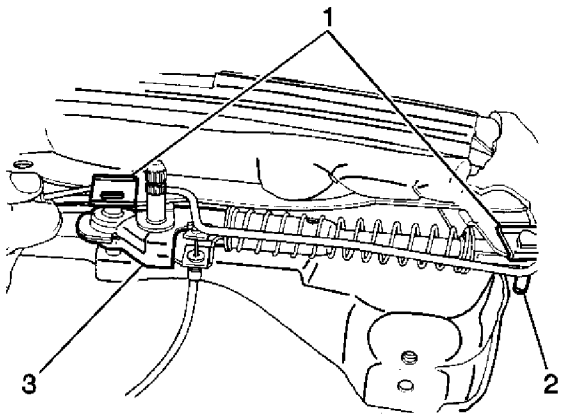


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1. Install the recliner assembly (3).
2. Install the guide pin (2) at the front of the recliner. Press firmly in order to fit the guide pin into place.
3. Install the guide pin (2) at the rear of the recliner. Press firmly in order to fit the guide pin into place.
4. Install the retainer clips (1).



5. Install the hog rings (1) to the carpet flap (4) in order to cover the guide pin at the rear of the recliner.
6. Install the J-section retainer (5) on the cover.



7. Install the retaining clip (1) on the handle.
8. Install the recliner handle.

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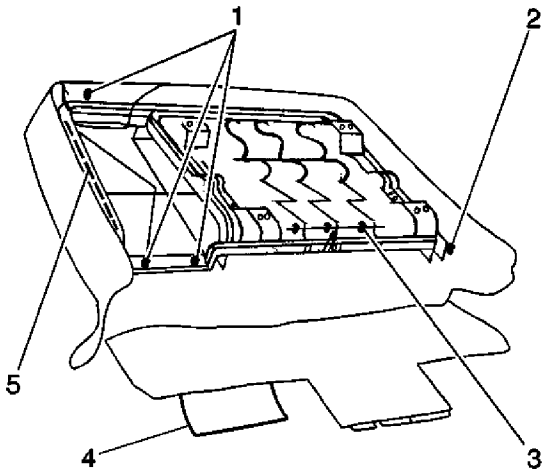
9. Refer to Seat Replacement in order to install the following components:
   - The seat
   - The seat adjusters

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Front Seat Power Recliner Replacement

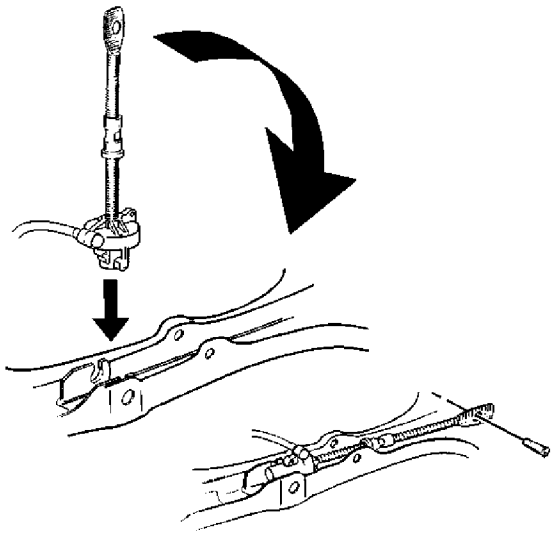
Removal Procedure

1. Remove the seat. Refer to Seat Replacement .
2. Place the seat on a clean, protected surface.
3. Remove the seat adjuster retainers.
4. Disconnect the electrical connectors, if necessary.
5. Remove the seat adjusters from the seat.





6. Remove the hog rings (1, 2, 3) from the seat cover.
7. Pull back the trim flap.
8. Disconnect the side J-retainers (5).
9. Pull back the seat cover to expose the recliner roll pins.

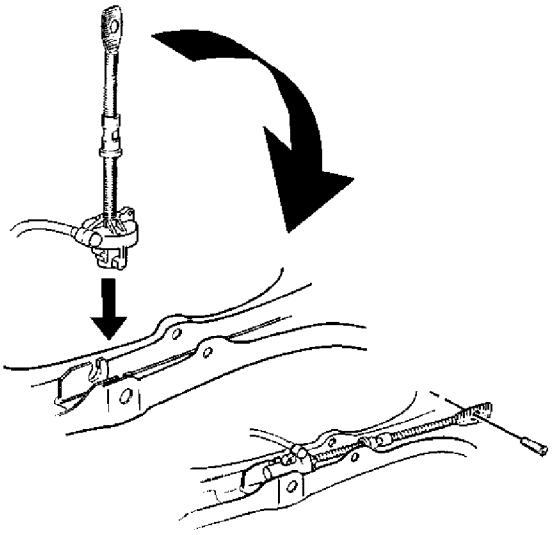


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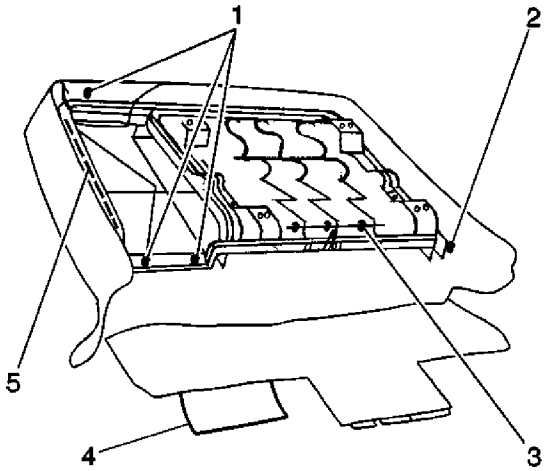
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10. Remove the roll pins from the seat back frame.
11. Disconnect the air lines, if necessary.
12. Remove the fasteners from the power recliner motor mounting bracket.
13. Release the actuator from the seat frame by lifting actuator shafts upward.
14. Remove the recliner assembly.

Installation Procedure



1. Install the recliner assembly vertically then rotate to the downward position.
2. Install the fasteners to the power recliner motor mounting bracket.
3. Connect the air lines, if necessary.
4. Install the roll pins to the seat back frame.



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5. Connect the side J-retainers (5).
6. Install the hog ring (1, 2, 3) to the seat cover.
7. Install the seat adjusters to the seat.
8. Connect the electrical connectors, if necessary.
9. Install the seat adjuster retainers.
10. Install the seat. Refer to Seat Replacement

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Front Seat Lumbar Support Replacement (AM1,AM2)

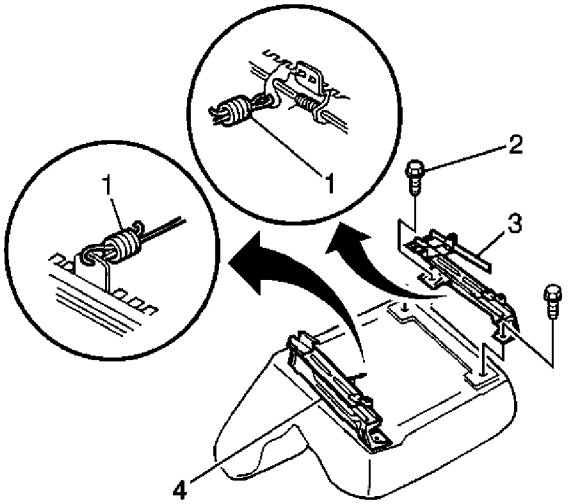
Removal Procedure

1. Remove the seat with the aid from an assistant. Refer to one of the following procedures:

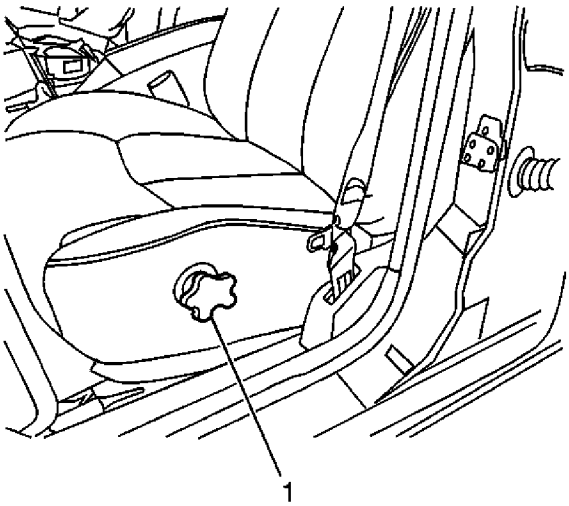
   Seat Replacement

   Seat Replacement

2. Place the seat upside down on a clean, protected surface.



3. Remove the adjuster bolts (2) and the adjuster assembly (4).



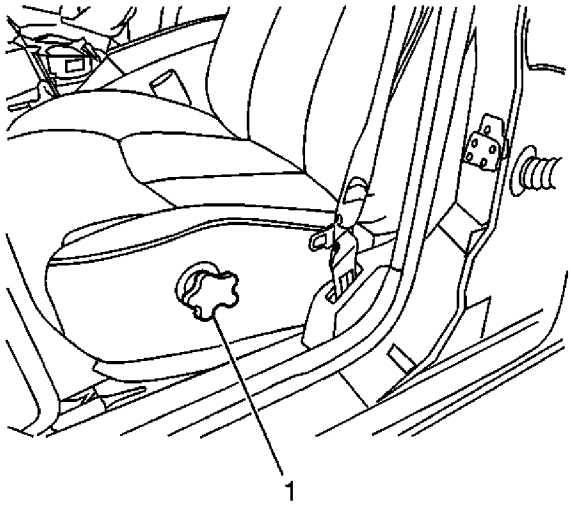
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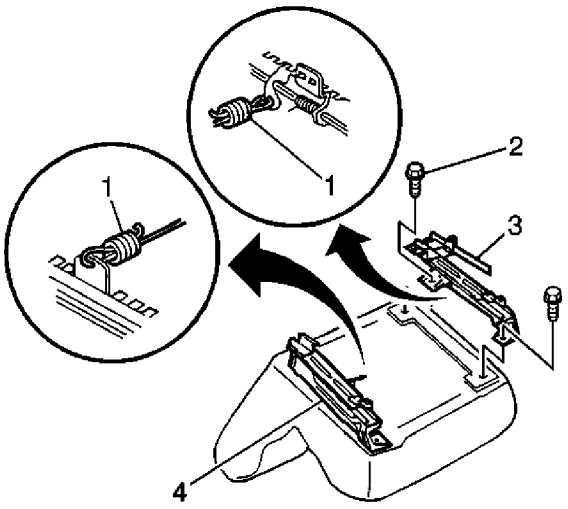
4. Remove the lumbar knob (1). Refer to Lumbar Support Knob Replacement .
5. Remove the lumbar adjuster.

Installation Procedure

1. Install the lumbar adjuster.



2. Install the lumbar knob (1). Refer to Lumbar Support Knob Replacement .



3. Install the seat adjuster assembly (4) and bolts (2).

Caution: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK

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position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

4. Install the adjuster assembly bolts.

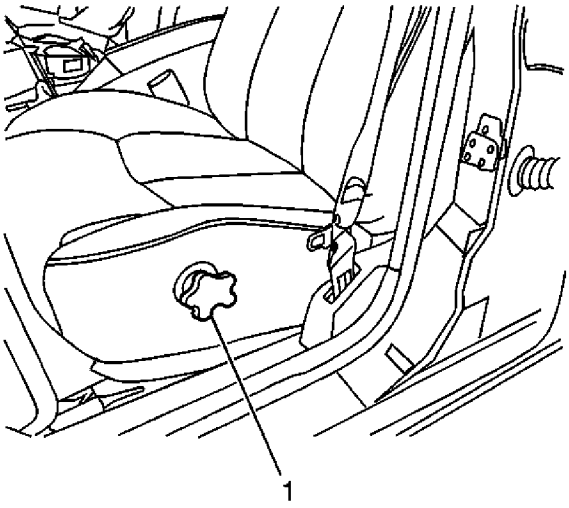
   Tighten
   Tighten the adjuster assembly bolts to 24 N·m (17 lb ft).

5. With the aid from an assistant, install the seat. Refer to Seat Replacement .

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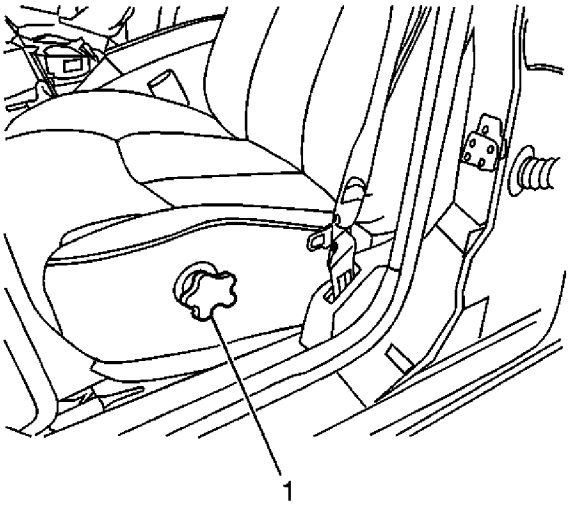
Lumbar Support Knob Replacement (AM1,AM2)

Removal Procedure



1. Carefully pull outward the manual lumbar knob (1), in order to remove.
2. Remove the lumbar knob.

Installation Procedure



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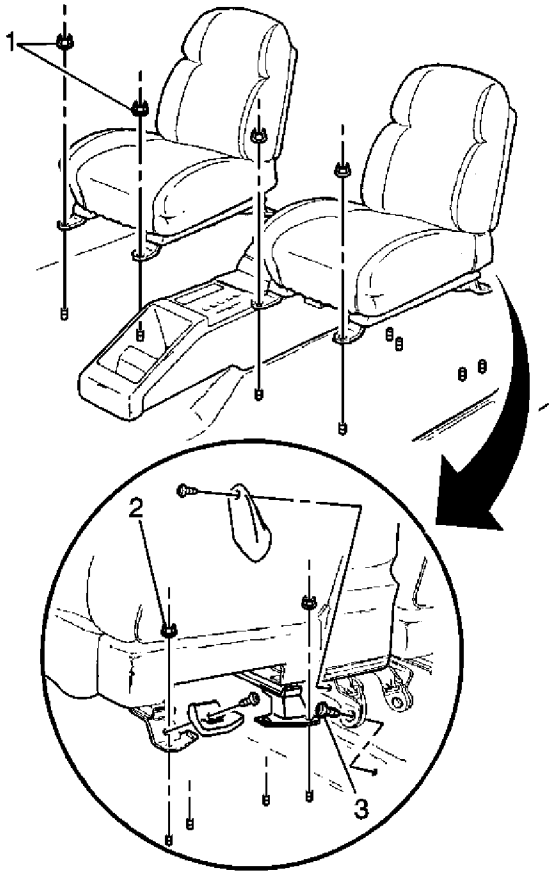


1. Align the lumbar knob (1) and index the slot with the actuator shaft.
2. Carefully push inward the knob in order to secure the knob, to the actuator shaft.

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Front Seat Adjuster Replacement

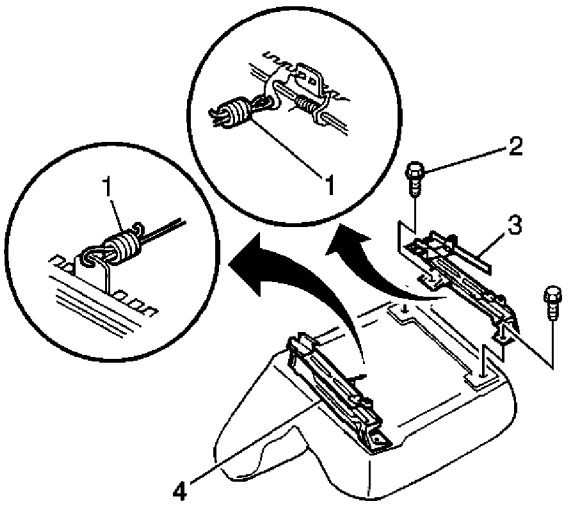
Removal Procedure



1. Remove the front seat. Refer to Seat Replacement .
2. Place the seat upside down on a clean protected surface.

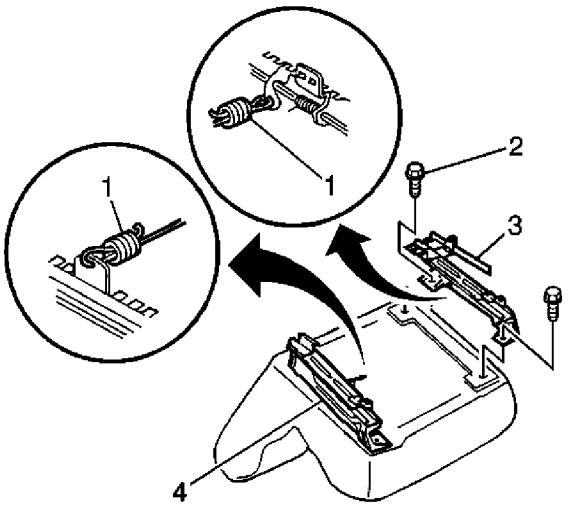
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3. Remove the adjuster to seat cushion frame bolts (2).
4. Remove the adjuster assembly (4).

Installation Procedure



1. Install the seat adjuster assembly (4) to the seat cushion frame.

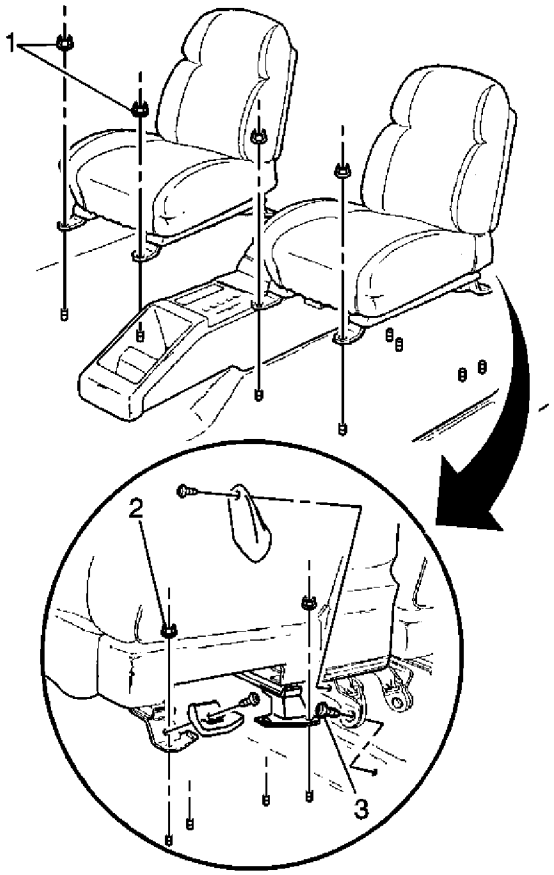
Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and

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may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the seat adjuster bolts (2).

Tighten
Tighten the bolts to 24 N·m (17 lb ft).



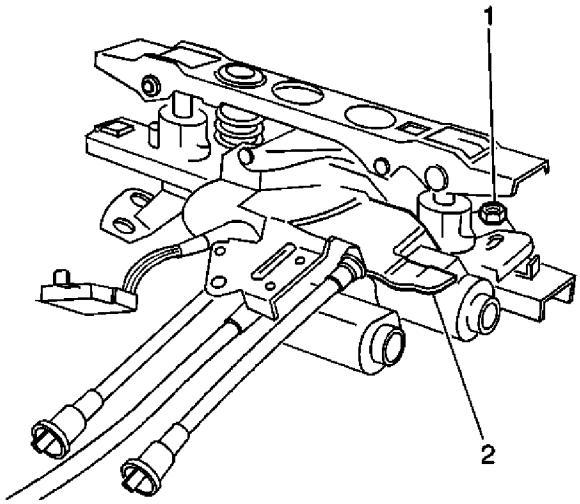
3. Install the front seat. Refer to Seat Replacement .

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Front Seat Adjuster Motor Replacement

Removal Procedure

1. Remove the seat. Refer to Seat Replacement .



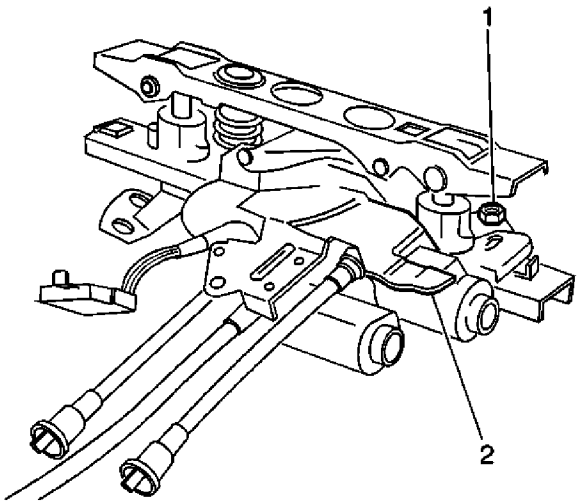


2. Place the seat upside down on a clean, protected surface.
3. Disconnect the electrical connectors.
4. Remove the drive cables from the motor.
5. Use the drill bit in order to remove the retaining rivets.
6. Remove the motor from the motor support (2).

Installation Procedure

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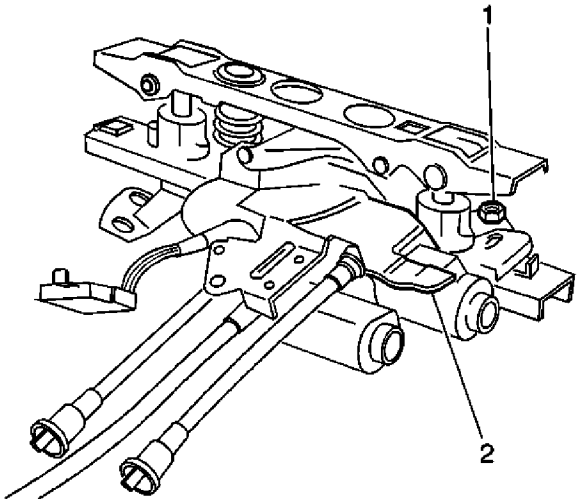
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1. Install the motor to the motor support (2).
2. Secure the motor with a nut (1) and a bolt.
3. Install the drive cables to the motor.
4. Connect the electrical connectors to the motor.
5. Install the seat. Refer to Seat Replacement .

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Seat Horizontal and Vertical Drive Cable Replacement



Important: Remove the nut (1) that secures the motor support bracket in order to gain access to the inboard cable connector at the motor or the outboard rear vertical gear nut.

Disconnect the cables by squeezing the oblong connectors at the following components:

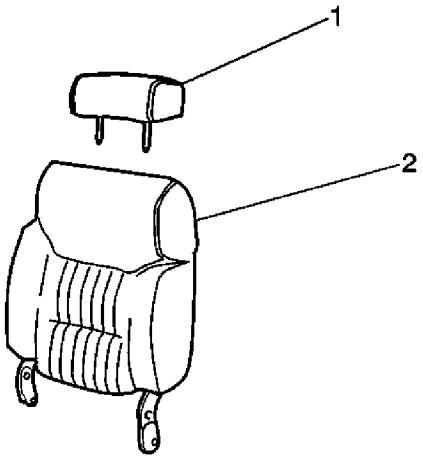
- The motors
- The adjuster drives
- The position sensors, if equipped.

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Driver or Passenger Seat Head Restraint Replacement

Removal Procedure

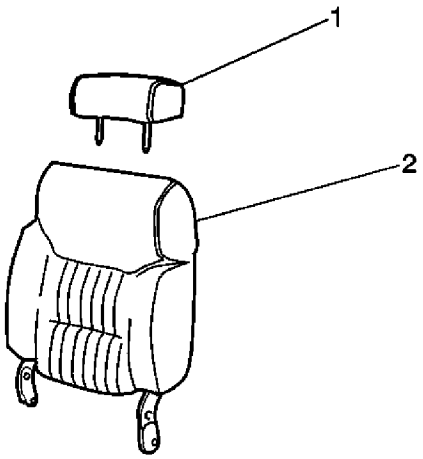


1. Raise the head restraint (1) to the full up position.
2. Disengage the lock by inserting a small-pointed tool or a medium sized paper clip into the hole in the front of the headrest guide.
3. Pull upward the head restraint out of the guide while applying pressure to the locks with the small-pointed tool.
4. Remove the head restraint assembly (1).

Installation Procedure

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1. Insert the head restraint into the head restraint guides (1).

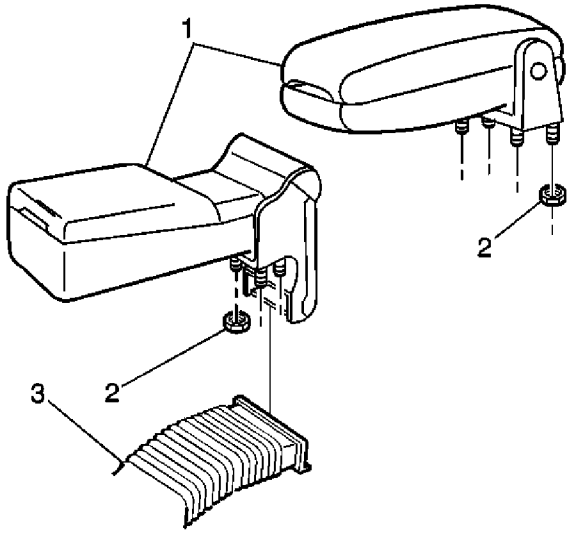
   Push the head restraint to the full-down position.

2. Verify that the lock springs are engaged by pulling upward on the head restraint.

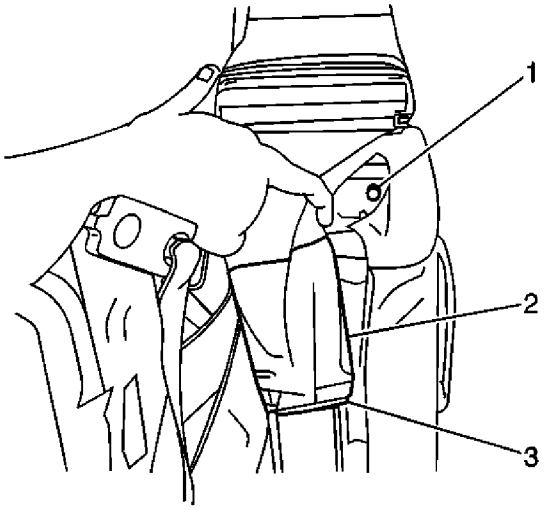
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Front Seat Armrest Replacement (Storage)

Removal Procedure



1. Remove the seat. Refer to Seat Replacement .
2. Remove the HVAC duct (3) at the armrest, if applicable.



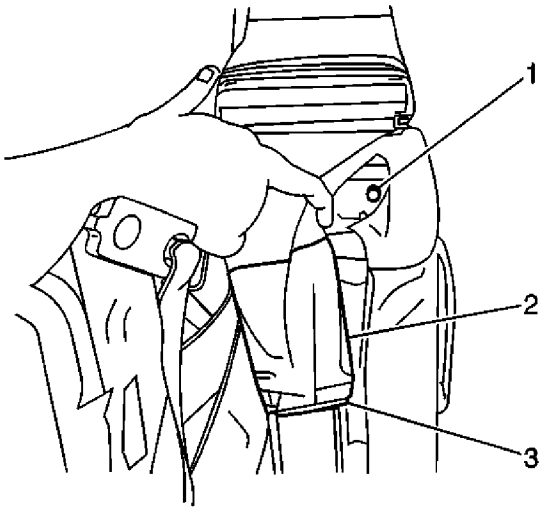
3. Remove the hog rings (3) from the seat cushion flap (2) on the underside of the seat
4. Remove the following components:

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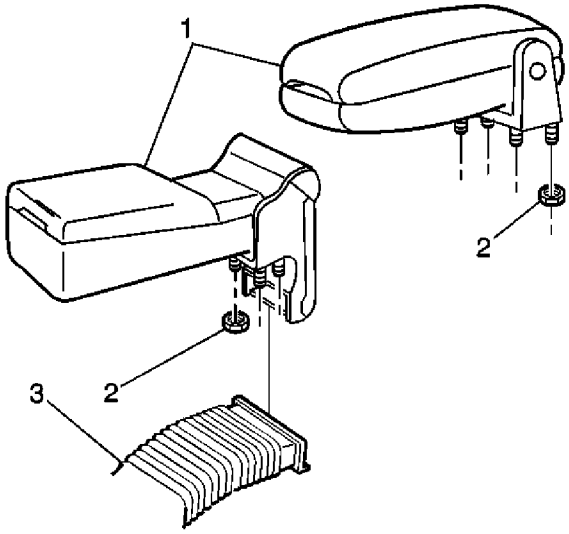
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- The 4 nuts (1)
- The armrest

Installation Procedure



1. Install the following components:
   - The 4 nuts (1)
   - The armrest (1)
2. Install the hog rings (3) to the seat cushion flap (2) on the underside of the seat.



3. Install the HVAC duct (3) at the armrest, if applicable.

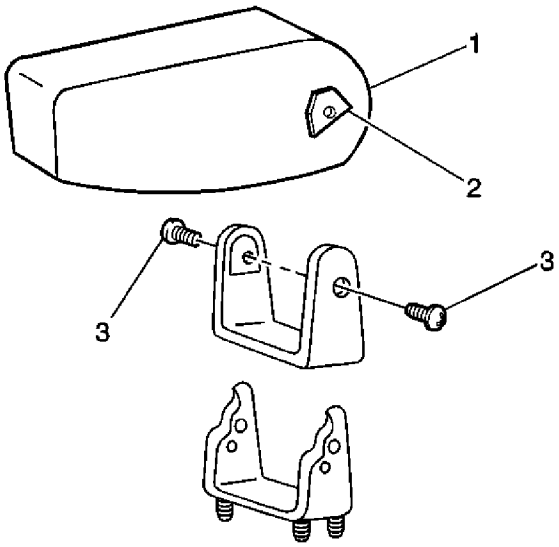
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4. Install the seat. Refer to Seat Replacement .

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Front Seat Armrest Replacement (Center with foam)

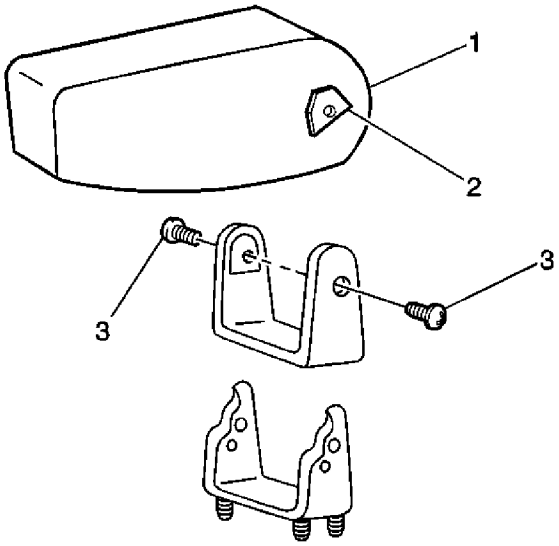
Removal Procedure





1. Remove the seat from the vehicle.
2. Remove the fasteners (3) that attach the armrest (1).
3. Remove the armrest (1).

Installation Procedure



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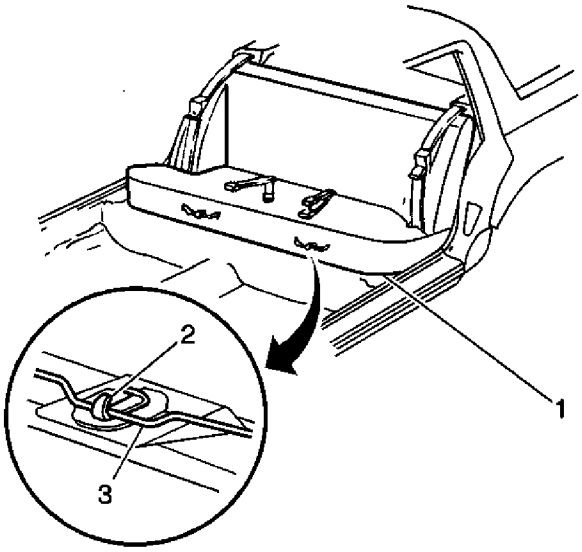


1. Install the armrest (1).
2. Install the fasteners (3) to the armrest (1).
3. Install the seat into the vehicle.

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Rear Seat Cushion Replacement

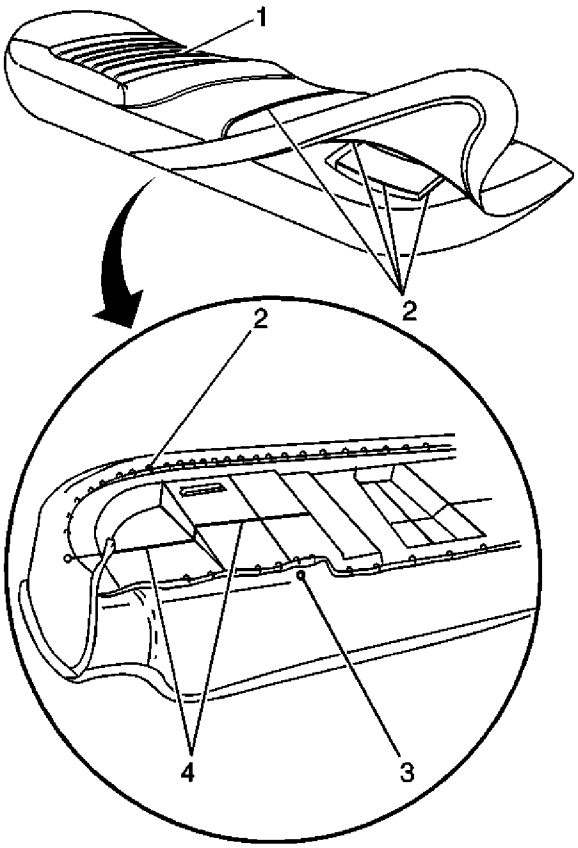
Removal Procedure



1. Push the lower forward edge of the seat cushion (1) rearward.
2. Lift upward and pull forward on the seat cushion frame in order to disengage the cushion frame wires (3) from the retainers (2) on the rear seat pan.
3. If the cushion is difficult to disengage from the seat pan retainers, grasp the lower edge of the seat cushion at the retainer location on one side of the seat. Exert enough rearward pressure in order to disengage the seat from the retainers.
4. Place the seat upside down on a clean surface.

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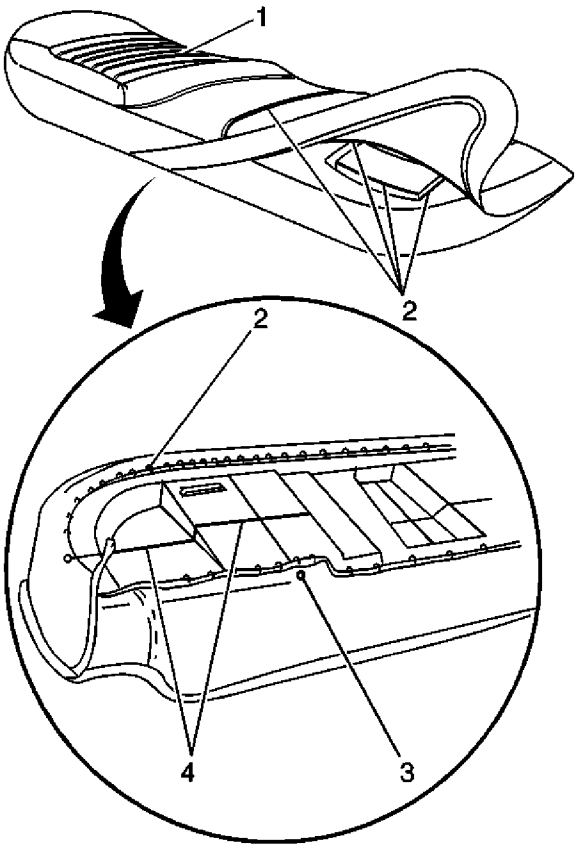
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5. Remove the hog rings (2) on the cushion frame.
6. Turn the seat over. Disengage the hook-and-loop (1) under the top surface of the cover.
7. Remove the cover.

Installation Procedure

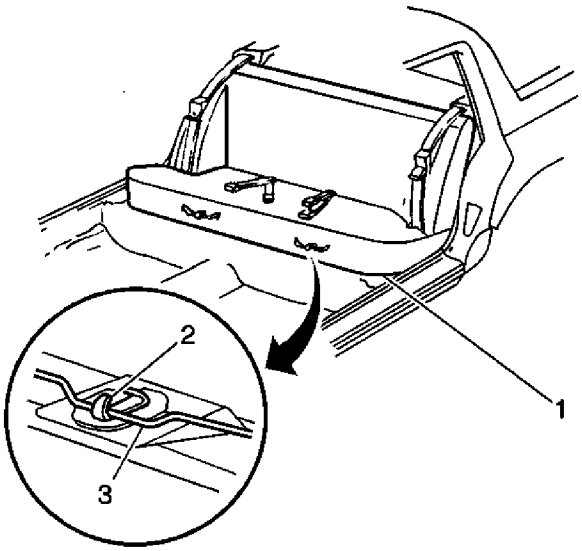
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1. Install the cover over the pad. Align the locating holes (3) in the cover to the work lines (4) in the pad.
2. Engage the hook-and-loop (1).
3. Install the hog rings (2).

   Work outward toward the corners until you have installed all of the hog rings.

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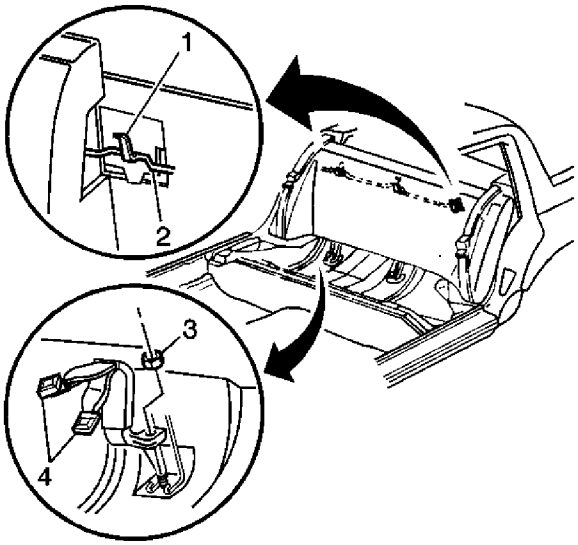
4. Carefully lift the cushion into the body. Do not damage the adjacent trim.
5. Position the rear edge of the cushion under the rear seat back while you position the seat belt straps.
6. Align the frame wire offsets (3) at the front of the seat cushion frame with the retainers (2) on the floor pan. Push the seat cushion rearward until the offsets engage in the retainers. Fully engage the retainers by pressing down and pulling the cushion forward.
7. If the cushion is difficult to engage to the seat pan retainers, grasp the lower edge of the seat cushion at the retainer location on one side of the seat. Exert enough rearward pressure in order to engage the seat into the retainers.

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Rear Seat Back Cushion Replacement

Removal Procedure

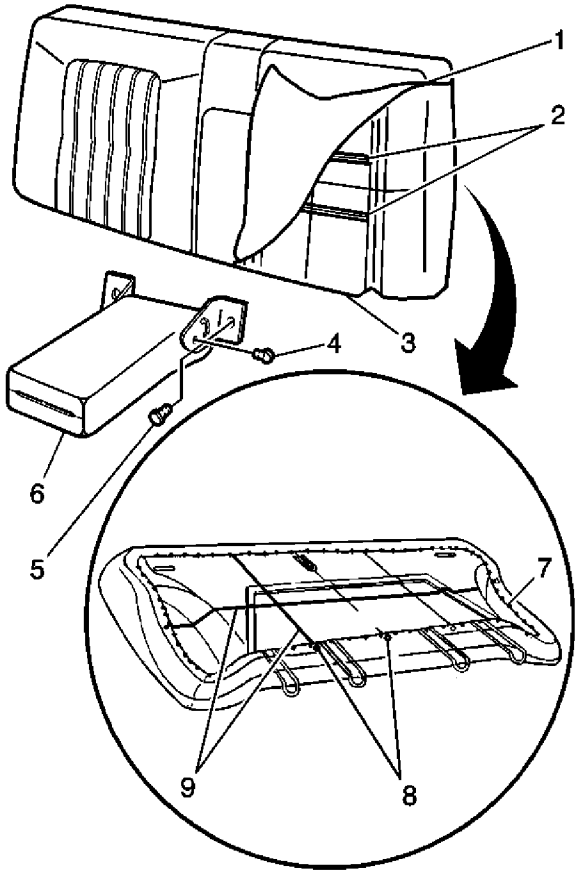
1. Remove the rear seat cushion. Refer to Rear Seat Cushion Replacement .



2. Remove the following components from the inner studs:
   - The lap belt nuts (3)
   - The lap belts (4)
3. Remove the push-nuts from the outer studs.
4. Remove the rear seat back from the vehicle.

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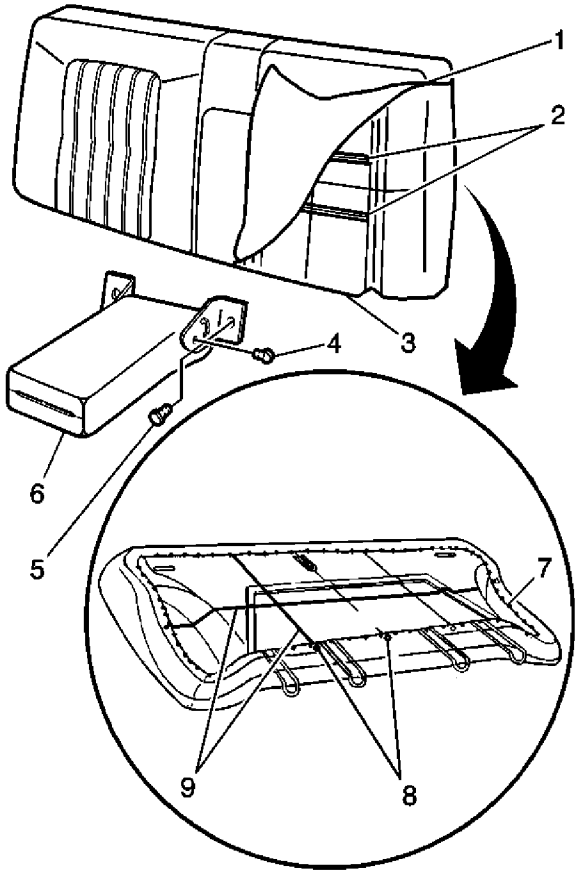
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5. Perform the following steps in order to remove the armrest (6), if applicable:
   5.1. Remove the bolts (5) from the seat back.
   5.2. Remove the pivot screws (4).
   5.3. Remove the armrest (6).
6. Remove the hog rings (7) from the seat back frame
7. Disengage the hook and loop strips (2).
8. Remove the cover (1).

Installation Procedure

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1. Install the cover (1) over the pad (3). Align the locating holes (8) in the cover to the work lines (9) in the pad.
2. Install the hog rings (7).

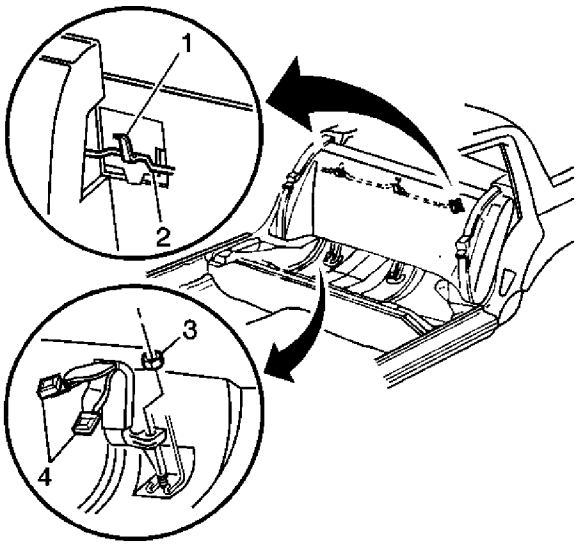
   Work outward toward the corners until you have installed all of the hog rings.

3. Turn over the seat.

   Engage the hook and loop strips (2).

4. Perform the following steps in order to install the armrest (6), if applicable:
   4.1. Secure the armrest (6) to the support with pivot screws (4).
   4.2. Attach the armrest (6) to the seat back with bolts (5).
5. Install the rear seat back.

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Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

6. Install the lap belt nuts (3).

   Tighten
   Tighten the lap belt nuts to 35 N·m (25 lb ft).

7. Verify that the shoulder belts (4) operate freely.
8. Install the rear seat cushion. Refer to Rear Seat Cushion Replacement .

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Fastener Tightening Specifications

Application	Specification	
	Metric	English
Inflatable Restraint Front End Discriminating Sensor Fasteners	12 N·m	9 lb ft
Inflatable Restraint IP Module Bolts (Buick)	11 N·m	94 lb in
Inflatable Restraint IP Module Nuts (Buick)	10 N·m	84 lb in
Inflatable Restraint IP Module Fasteners (Oldsmobile)	16 N·m	12 lb ft
Inflatable Restraint IP Module Bolts (Pontiac)	2 N·m	17 lb in
Inflatable Restraint IP Module Nuts (Pontiac)	10 N·m	84 lb in
Inflatable Restraint Sensing and Diagnostic Module (SDM) Fasteners	9 N·m	80 lb in
Inflatable Restraint Steering Wheel Module Screws	3 N·m	27 lb in

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Scan Tool Data List

The scan tool used provides the following capabilities:

- Read the data list
- Read current and history diagnostic trouble codes (DTCs)
- Clear the DTCs after a repair is completed

Before attempting to communicate with the SIR system, ensure that the scan tool contains the latest software. Connect the scan tool to the data link connector (DLC) and turn the ignition switch to the RUN position. The scan tool reads the serial data sent from the inflatable restraint sensing and diagnostic module (SDM) serial data output terminal 5 to the DLC terminal 9. The following table shows the typical values of the data displays under the following conditions:

- The ignition switch is in the RUN position.
- The engine is OFF.
- The driver seatbelt is buckled.

Data List	Description	Typical Value
Ignition	Ignition 1 power feed	12 V
Lamp Driver	Warning lamp control method (hard wired lamp)	Internal
Driver Resistance	Driver deployment loop resistance	2.6 ohms
Passenger Resistance	Passenger deployment loop resistance	2.2 ohms
Driver Senselo	Driver low terminal voltage	4.1 V
Passenger Senselo	Passenger low terminal voltage	4.1 V
Driver VDIF	Voltage difference between driver high and driver low terminals	4-8 mV
Passenger VDIF	Voltage difference between passenger high and passenger low terminals	4-8 mV
Warning Lamp ON	Continuous warning lamp ON time	0 - 182 Hrs
Warning Lamp Control	Warning lamp state commanded by the SDM (On/Off)	Off
Lamp Driver Feedback	Warning lamp state detected by the SDM (Active/Inactive)	Inactive
Warning Lamp Cycles	Ignition cycles of the current warning lamp state	0 - 125 Cycles
Driver Seatbelt	Driver seatbelt status (Buckled/Unbuckled)	Buckled

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Scan Tool Data Definitions

The Scan Tool Data Definitions contain a short description of all SIR related parameters available on the scan tool. The list is in alphabetical order.

ADS: The scan tool displays Active or Inactive. The inflatable restraint forward discriminating sensor sends an Active signal to the SDM in order to show the SDM's state of readiness.

Coil Resistance: The scan tool displays 0-5 ohms. The SDM performs the resistance measurement test once each ignition cycle and verifies the SIR Contact Coil resistances are within the normal ranges.

Driver Bag Energy Reserve: The scan tool displays 0-25 volts. The SDM measures the internal reserve voltage available in order to activate the driver side deployment loop.

Driver Resistance: The scan tool displays 0-6.3 ohms. The SDM performs the resistance measurement test once each ignition cycle.After the resistance check, the SDM verifies the Ignition 1 voltage and the 23-volt loop reserve are within the normal ranges. At that time, the SDM supplies a constant current to the driver deployment loop. The SDM measures the voltage drop across the deployment loop and converts the measured voltage value to a deployment loop resistance value.

Driver Seat Belt: The scan tool displays Buckled or Unbuckled. The signal from the drivers seat-belt switch indicates that the seat belt is buckled.

Driver Senselo: The scan tool displays 0-20 volts. The SDM measures the low-side terminal voltage of the driver deployment loop, and the scan tool displays this voltage as Driver Senselo.

Driver VDIF: The scan tool displays 0-500 mV. The SDM measures the voltage difference between driver high and driver low circuits, and the scan tool displays this voltage difference as Driver VDIF.

Ignition: The scan tool displays 0-25.5 volts. The ignition represents the system voltage which is measured by the SDM at the SDM ignition feed.

Lamp Driver Feedback: The scan tool displays Active or Inactive. The warning lamp state is detected by the SDM.

Passenger Bag Energy Reserve: The scan tool displays 0-25 volts. The SDM measures the internal reserve voltage available in order to activate the passenger side deployment loop.

Passenger Resistance: The scan tool displays 0-6.3 ohms. The SDM performs the resistance measurement test once each ignition cycle and verifies the Ignition 1 voltage and 23-volt loop reserve are within the normal ranges. At that time, the SDM supplies a constant current to the passenger deployment loop. The SDM measures the voltage drop across the deployment loop and converts the measured voltage value to a resistance value of the passenger deployment loop.

Passenger Senselo: The scan tool displays 0-20 volts. The SDM measures the low-side terminal voltage of the passenger deployment loop, and the scan tool displays this voltage as Passenger Senselo.

Passenger VDIF: The scan tool displays 0-500 mV. The SDM measures the voltage difference between passenger high and passenger low circuits and displays this voltage difference as

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Passenger VDIF.

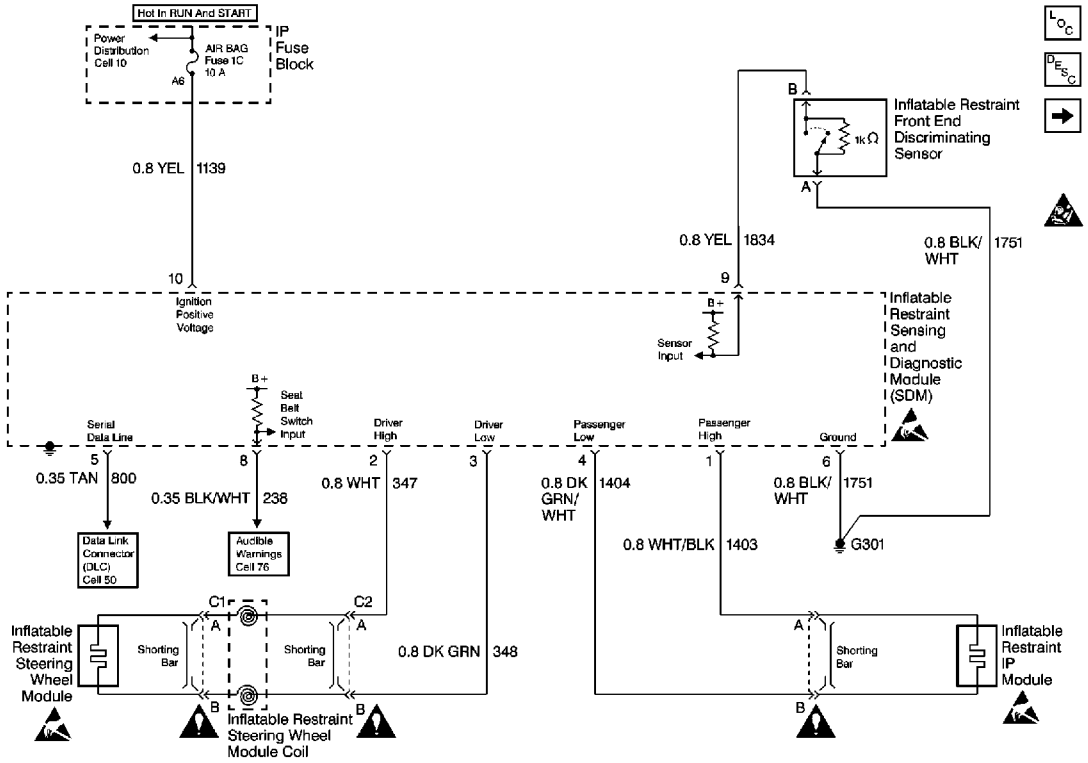
SIR System Type: The scan tool displays the type of deployment loops.

Warning Lamp Control: The scan tool displays ON or OFF. The warning lamp state is commanded by the SDM.

Warning Lamp Cycles: The scan tool displays 0-125 cycles. The ignition cycles of the current warning lamp state.

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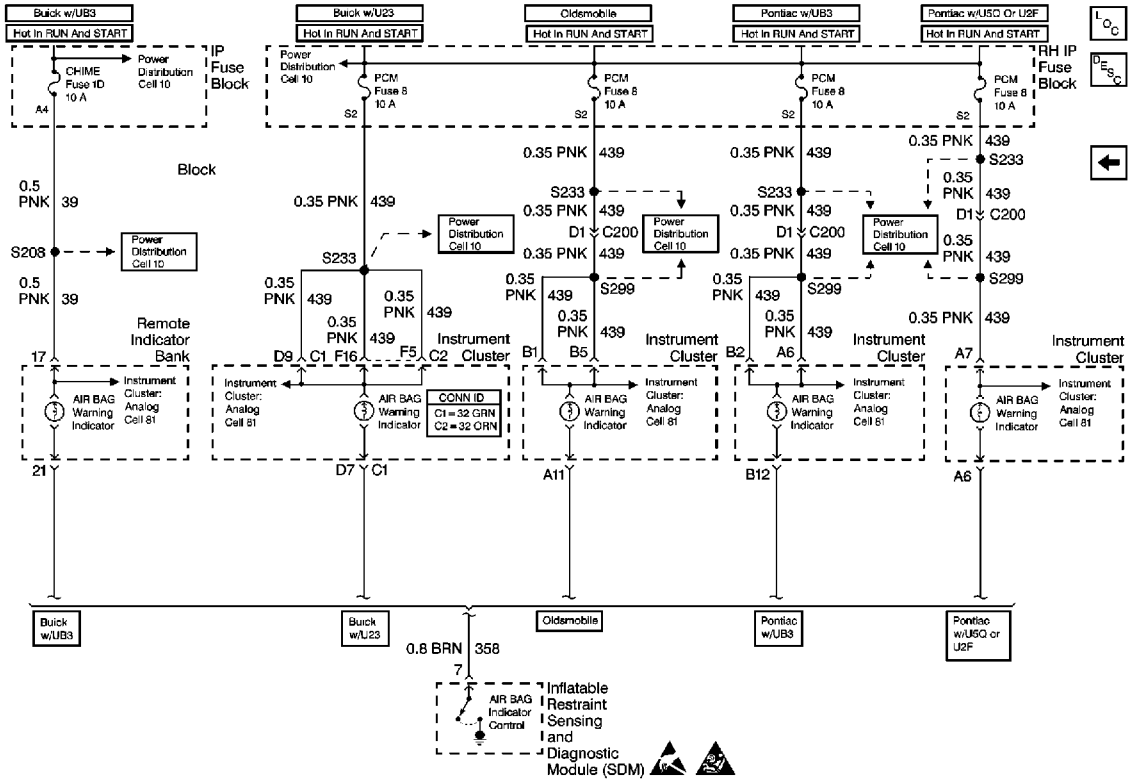
Cell 47



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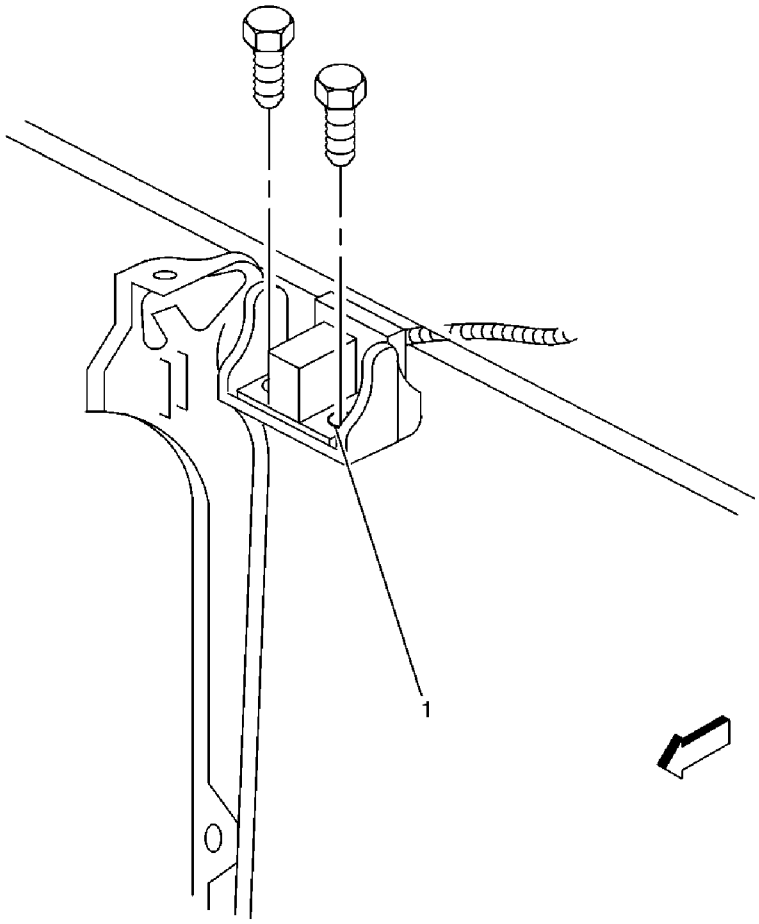
Cell 47: AIR BAG Indicator



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Engine Compartment, Center Front

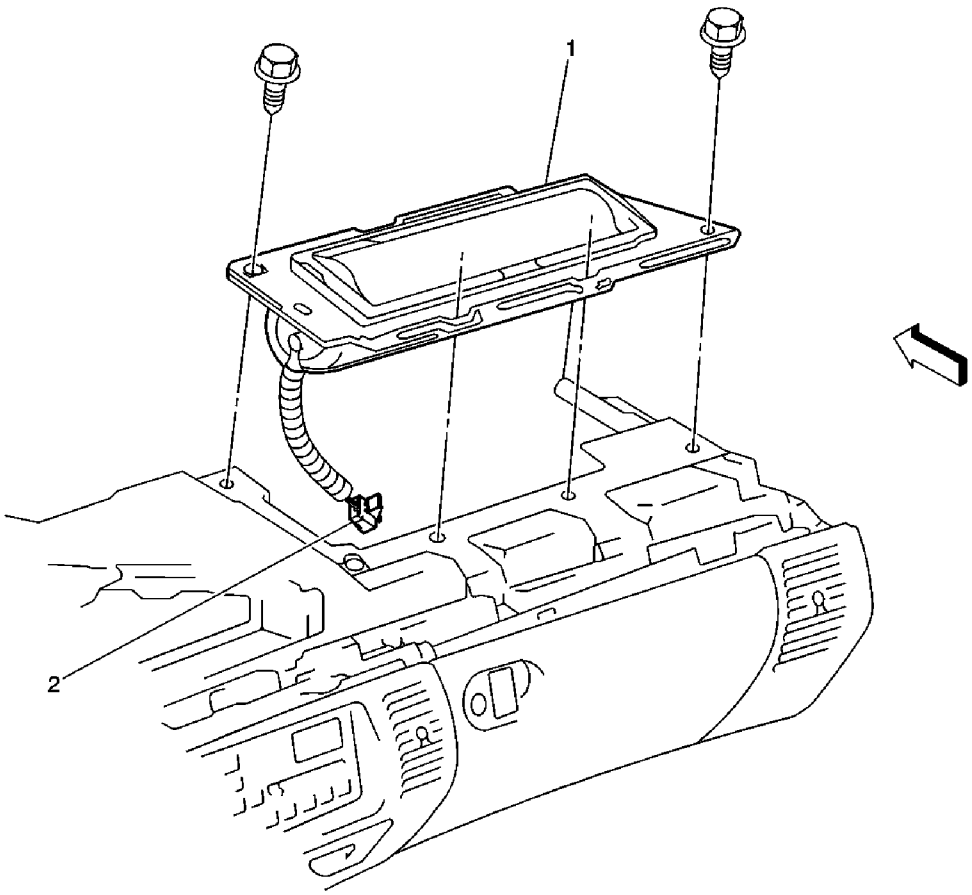


(1) Inflatable Restraint Front End Discriminating Sensor

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Passenger Compartment, RH Front

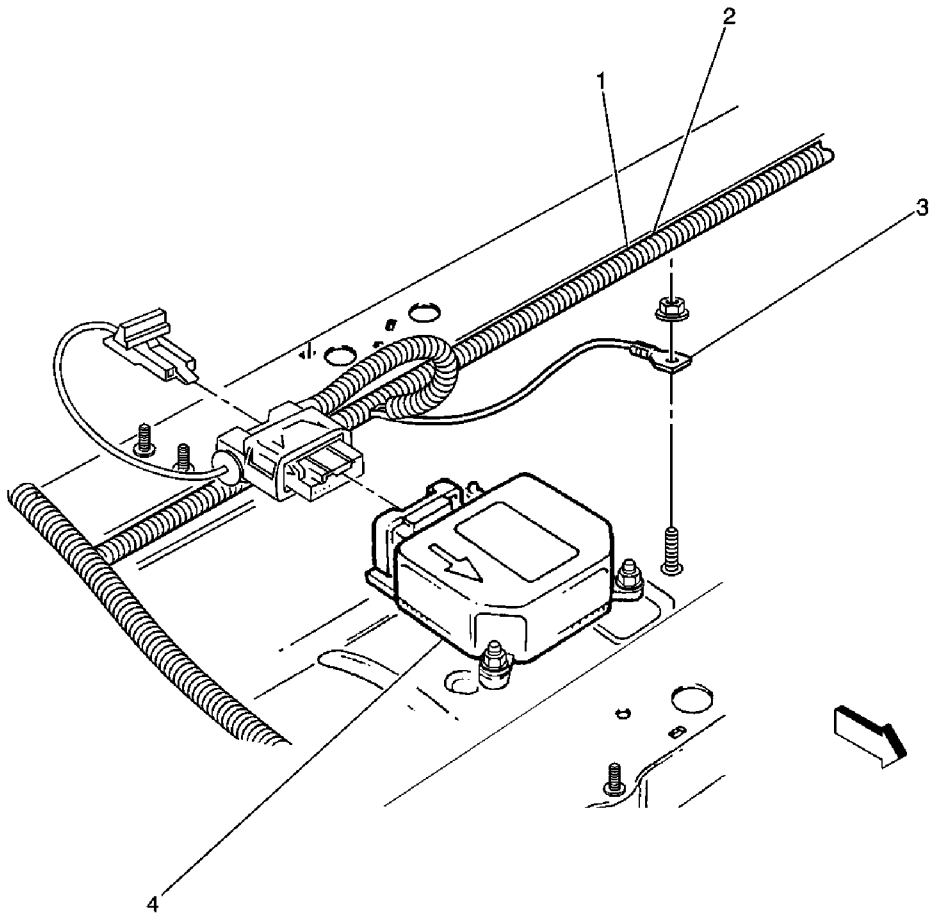


(1) Inflatable Restraint IP Module
(2) Inflatable Restraint IP Module connector

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Passenger Compartment, Under the Right Hand Front Seat

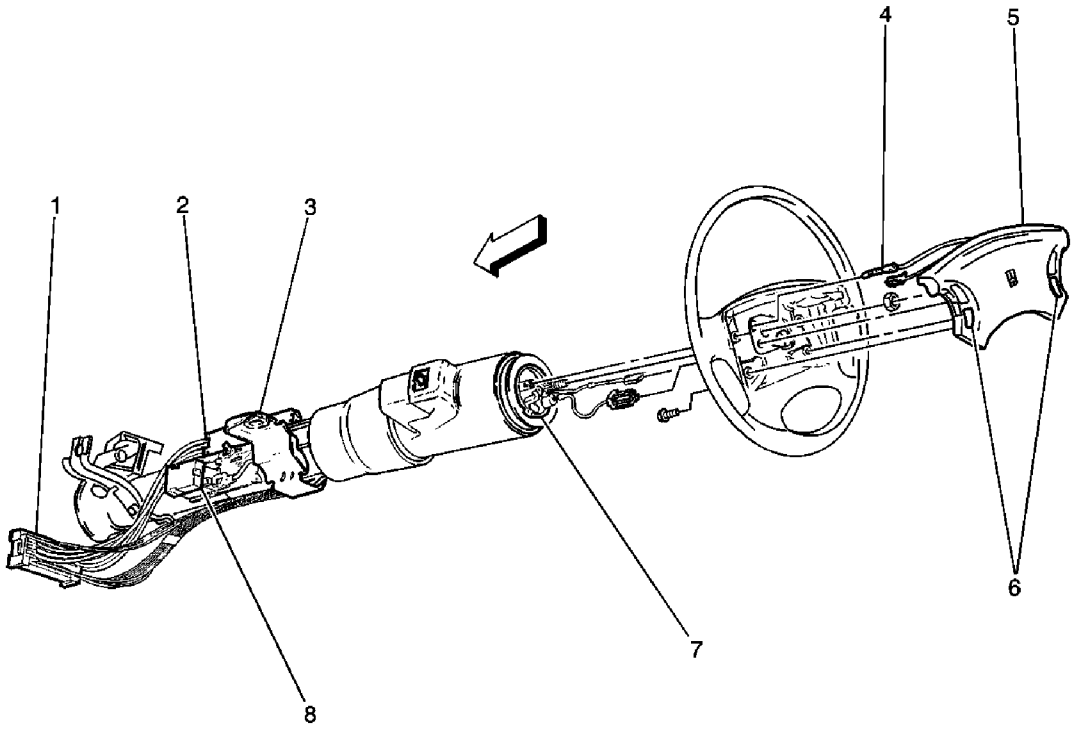


(1) S302
(2) S303
(3) G301
(4) Inflatable Restraint Sensing and Diagnostic Module (SDM)

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Passenger Compartment, Steering Column



(1) C202
(2) Ignition Switch
(3) Shift Interlock Actuator (Hidden)
(4) Horn Switch
(5) Inflatable Restraint Steering Wheel Module
(6) Steering Wheel Controls LH and RH
(7) Inflatable Restraint Steering Wheel Module Coil
(8) Headlamp Dimmer Switch

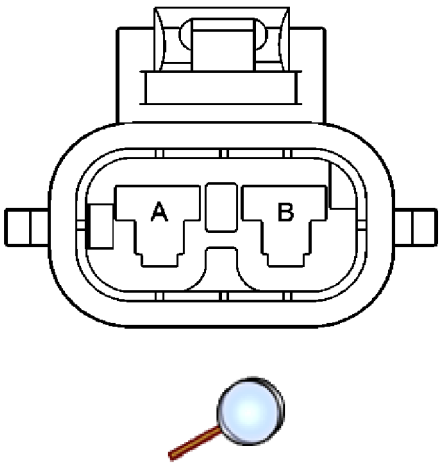
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SIR Connector End Views

Table 1: Inflatable Restraint Front End Discriminating Sensor
Table 2: Inflatable Restraint IP Module
Table 3: Inflatable Restraint Sensing and Diagnostic Module (SDM)
Table 4: Inflatable Restraint Steering Wheel Module Coil

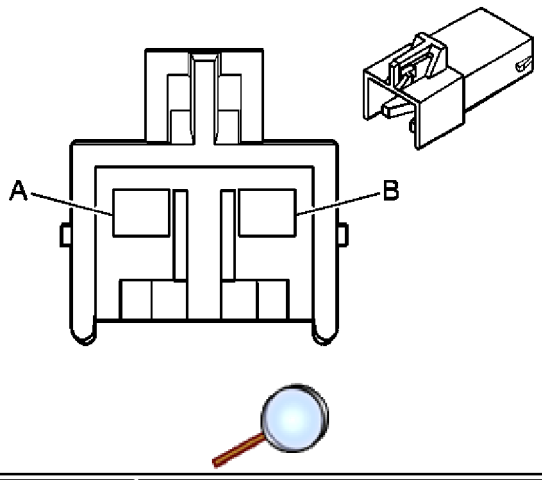
Inflatable Restraint Front End Discriminating Sensor



Connector Part Information	• 12084302 • 2 Way F Metri-Pack 280 Series Sealed (YEL)

Pin	Wire Color	Circuit No.	Function
A	BLK/WHT	1751	Ground
B	YEL	1834	SIR Forward Sensor Signal

Inflatable Restraint IP Module



Connector Part Information	• 12110288

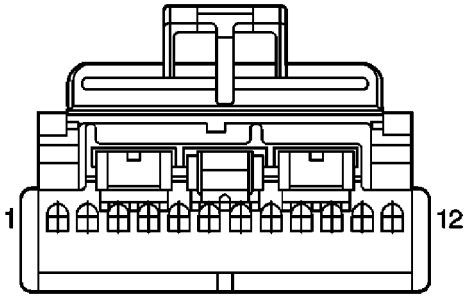
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	• 2 Way M Metri-Pack 280 Series (YEL)

Pin	Wire Color	Circuit No.	Function
A	WHT/BLK	1403	Passenger High
B	DK GRN/WHT	1404	Passenger Low

Inflatable Restraint Sensing and Diagnostic Module (SDM)



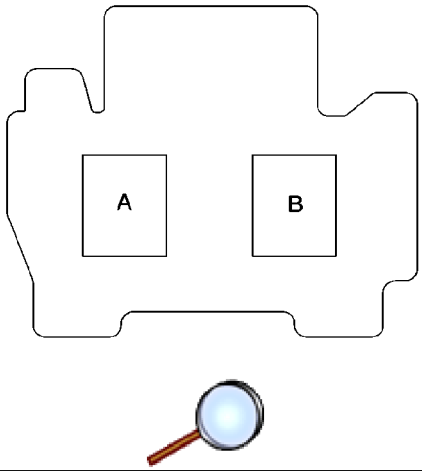


Connector Part Information	• 12160333 • 12 Way F Micro-Pack 100 Series (YEL)

Pin	Wire Color	Circuit No.	Function
1	WHT/BLK	1403	SIR Inflator Feed - Passenger High
2	WHT	347	SIR Inflator Feed - Driver High
3	DK GRN	348	SIR Inflator Output - Driver Low
4	DK GRN/WHT	1404	SIR Inflator Output - Passenger Low
5	TAN	800	Serial Data Signal (UART)
6	BLK/WHT	1751	Ground
7	BRN	358	SIR Indicator Lamp Output
8	BLK/WHT	238	Seat Belt Switch Signal
9	YEL	1834	SIR Forward Sensor Signal
10	YEL	1139	Ignition 1
11-12	--	--	Not Used

Inflatable Restraint Steering Wheel Module Coil

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Connector Part Information	• 12092851 • 2 Way M Metri-Pack 280 Series (YEL)		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	WHT	347	Driver High
B	DK GRN	348	Driver Low

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SIR Service Precautions

Caution: When you are performing service on or near the SIR components or the SIR wiring, you must disable the SIR system. Refer to Disabling the SIR System. Failure to follow the correct procedure could cause air bag deployment, personal injury, or unnecessary SIR system repairs.

The inflatable restraint sensing and diagnostic module (SDM) maintains a reserve energy supply. The reserve energy supply provides deployment power for the air bags. Deployment power is available for as much as 10 minutes after disconnecting the vehicle power by any of the following methods:

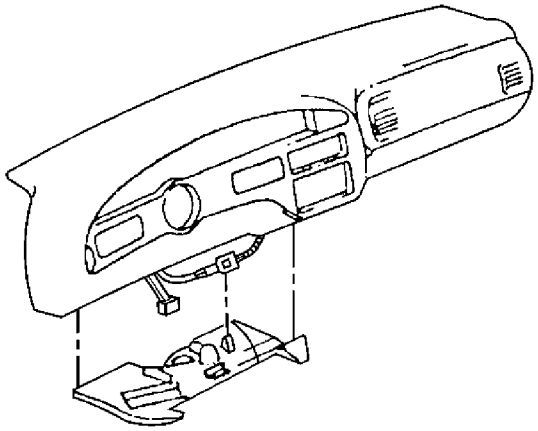
- Turn the ignition switch to the OFF position.
- Remove the fuse that provides power to the SDM.
- Disconnect the vehicle battery from the vehicle electrical system.

Disabling the SIR system prevents deploying of the air bags from the reserve energy supply power.

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Disabling the SIR System



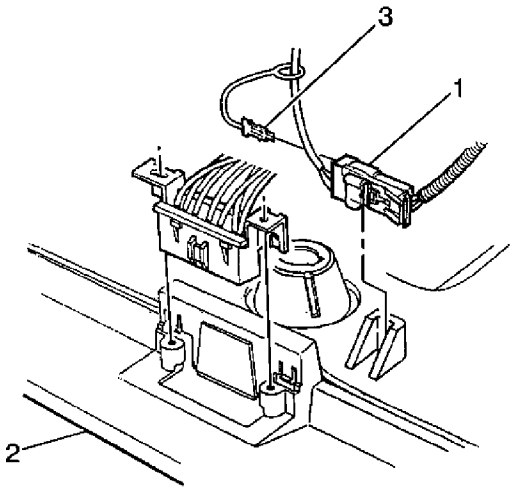
1. Turn the steering wheel in order to ensure that the vehicle's wheels point straight ahead.
2. Turn the ignition switch to the OFF position.
3. Remove the key from the ignition switch.

Important: With the AIR BAG Fuse removed and the ignition switch in the RUN position, the AIR BAG warning lamp illuminates. This is normal operation, and does not indicate an SIR system malfunction.

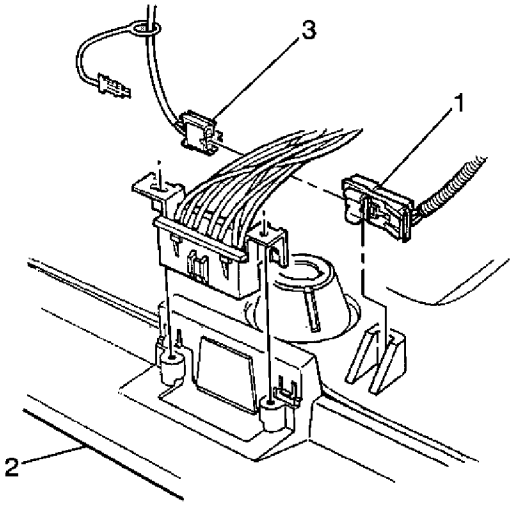
4. Remove the AIR BAG Fuse from the IP fuse block.
5. Remove the left sound insulator. Refer to Instrument Panel Insulator Panel Replacement - Left Side in Instrument Panel, Gauges and Console.

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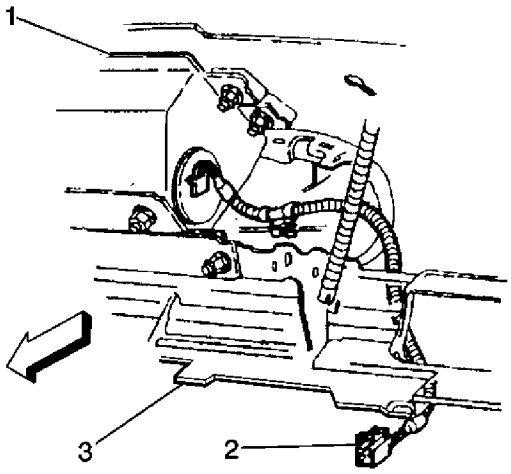


6. Remove the connector position assurance (CPA) (3) from the inflatable restraint steering wheel yellow 2-way connector (1). The 2-way connector is located at the base of the steering column.

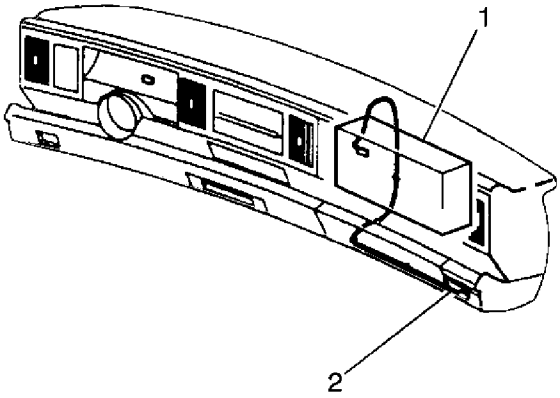


7. Disconnect the inflatable restraint steering wheel yellow 2-way connector (1,3). This connector is located at the base of the steering column.

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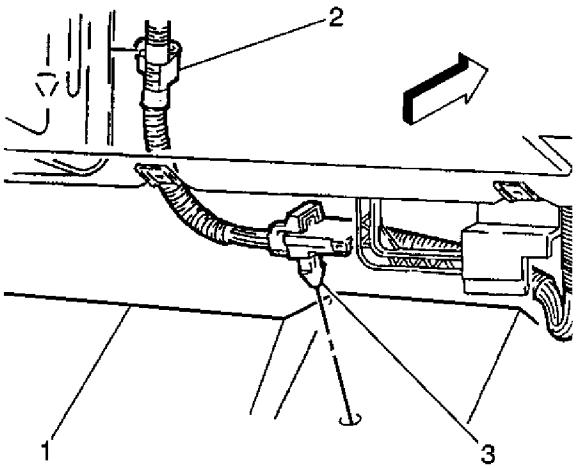


8. Remove the right sound insulator (3). Refer to Instrument Panel Insulator Panel Replacement - Right Side in Instrument Panel, Gauges and Console.
9. Locate the inflatable restraint IP module yellow 2-way connector (2) (Pontiac).

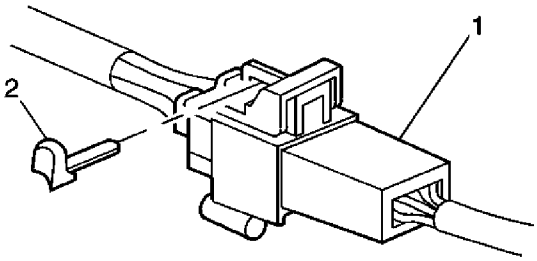


10. Locate the inflatable restraint IP module yellow 2-way connector (2) (Buick).

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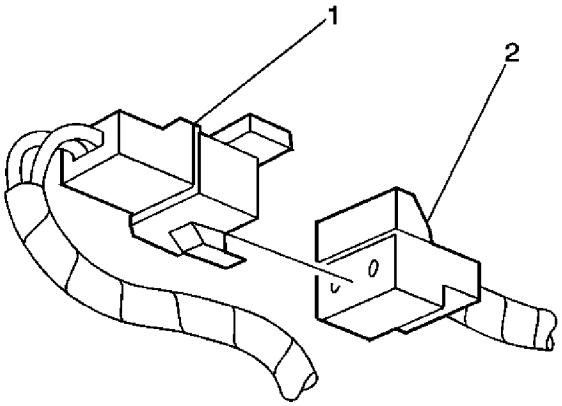


11. Locate the inflatable restraint IP module yellow 2-way connector (3) (Oldsmobile).



12. Remove the connector position assurance (CPA) (2) from the inflatable restraint IP module yellow 2-way connector (1). The connector is located above the right sound insulator.

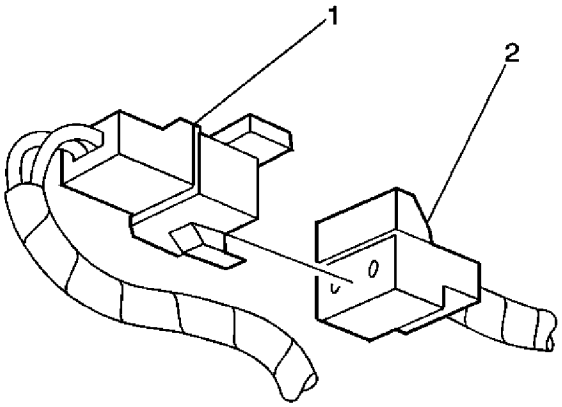
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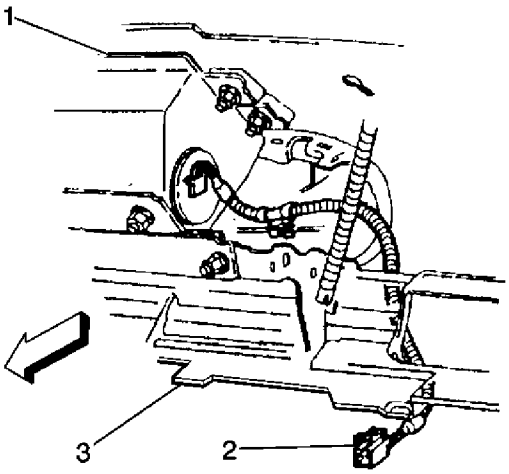
13. Disconnect the inflatable restraint IP module yellow 2-way connector (2) from the harness connector (1). The connector is located above the right sound insulator.

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Enabling the SIR System



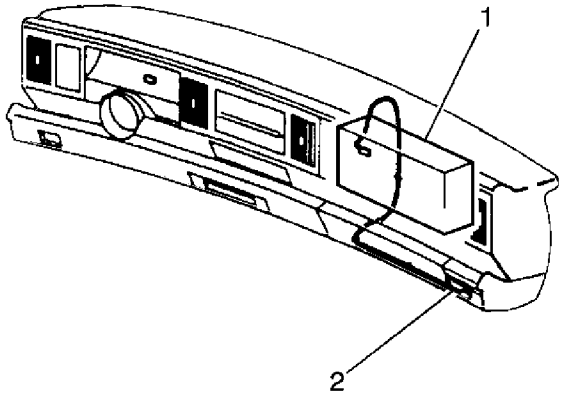
1. Remove the key from the ignition switch.
2. Connect the inflatable restraint IP module yellow 2-way connector (2). The connector is located above the right sound insulator.



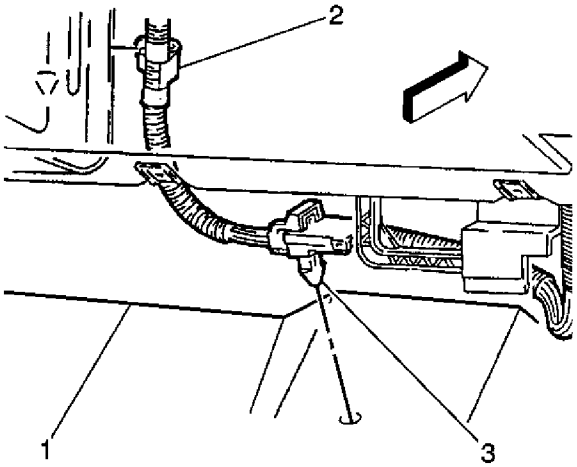
3. Attach the inflatable restraint IP module yellow 2-way connector (2) to the IP sound insulator (1) (Pontiac).

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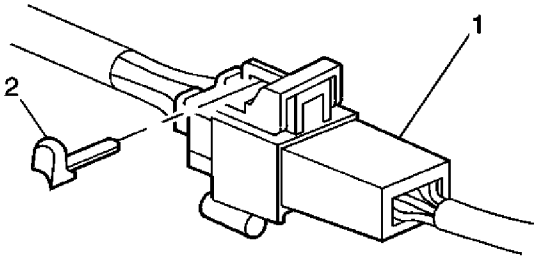


4. Attach the inflatable restraint IP module yellow 2-way connector to the IP (2) (Buick).

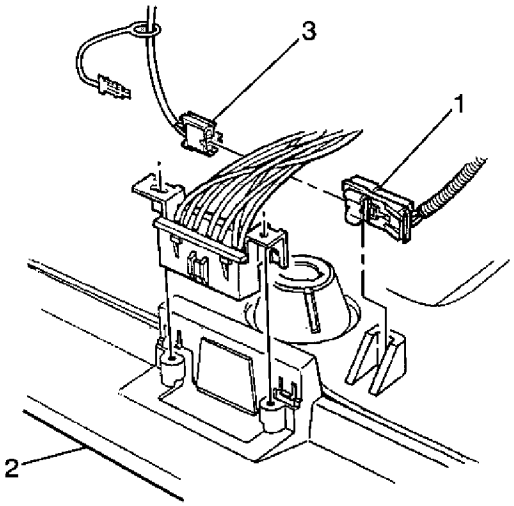


5. Attach the inflatable restraint IP module yellow 2-way connector (3) to the IP sound insulator (1) (Oldsmobile).

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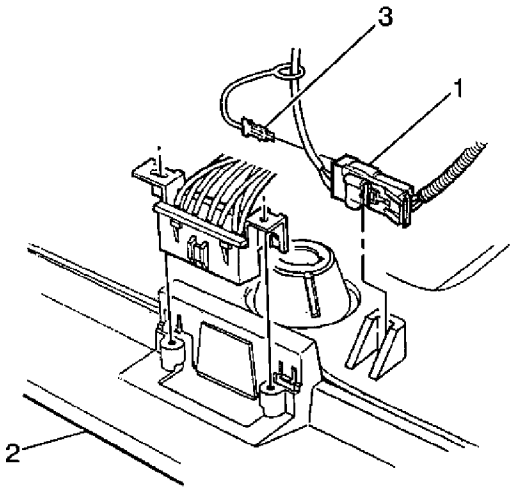


6. Install the connector position assurance (CPA) (2) to the inflatable restraint IP module yellow 2-way connector (1). The connector is located above the right sound insulator.
7. Install the right sound insulator. Refer to Instrument Panel Insulator Panel Replacement - Right Side in Instrument Panel, Gauges, and Console.

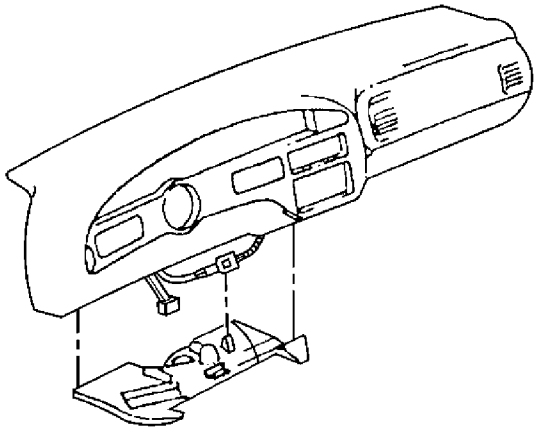


8. Connect the inflatable restraint steering wheel yellow 2-way connector (1,3). The connector is located near the base of the steering column.

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9. Install the connector position assurance (CPA) (3) to the inflatable restraint steering wheel yellow 2-way connector (1). The connector is located near the base of the steering column.



10. Install the left sound insulator. Refer to Instrument Panel Insulator Panel Replacement - Left Side in Instrument Panel, Gauges, and Console.
11. Install the AIR BAG fuse in the IP fuse block.

Important: Ensure that you remain a safe distance from both of the air bags.

12. Turn the ignition switch to the RUN position. The following actions should occur:
    12.1. The AIR BAG warning lamp will flash 7 times.
    12.2. The AIR BAG warning lamp will then turn OFF.
13. Perform the SIR diagnostic system check. Refer to SIR Diagnostic System Check .

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General Service Instructions

- Do not expose the inflator modules to temperatures above 65°C (150°F).
- Verify the correct replacement part number. Do not substitute a component from a different vehicle.
- Do not repair any of the following components. Service the following components by replacement only:
  - The inflatable restraint sensing and diagnostic module (SDM)
  - The inflatable restraint IP (inflator) module
  - The inflatable restraint steering wheel (inflator) module
  - The inflatable restraint steering wheel module coil
  - The inflatable restraint front end discriminating sensor
- Use only original GM replacement parts available from your authorized GM dealer. Do not use salvaged parts for repairs to the SIR system.
- Do not install any of the following components if the components have been dropped from a height of 91 centimeters (3 feet) or greater. Discard the component:
  - The inflatable restraint sensing and diagnostic module (SDM)
  - The inflatable restraint IP (inflator) module
  - The inflatable restraint steering wheel (inflator) module
  - The inflatable restraint steering wheel module coil
  - The inflatable restraint front end discriminating sensor
- When you replace the SDM, verify that the following conditions are met:
  - The mounting surface is clean.
  - The arrow on the module points toward the front of the vehicle.
  - The module is flat on the mounting surface, parallel to the vehicle datum line.
  - The module fasteners are installed and tightened as specified.
- In order to avoid setting false diagnostic trouble codes, only apply power to the SIR system when 1 of the following 2 conditions is met:
  - All SIR system components are properly mounted and electrically connected.
  - A diagnostic procedure directs you to apply power.
- Begin diagnosis of malfunctions with the SIR Diagnostic System Check. Perform the SIR Diagnostic System Check in order to verify the following items:
  - The proper operation of the AIR BAG warning lamp.
  - Communication with the SDM through the serial data line.
  - The presence or absence of diagnostic trouble codes.
  - Whether additional diagnosis is required and where the information resides.
- Not beginning with the SIR Diagnostic System Check may result the following conditions:
  - Extended diagnostic time
  - Incorrect diagnosis
  - Unneeded parts replacement

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Inflatable Restraint Sensing and Diagnostic Module Replacement

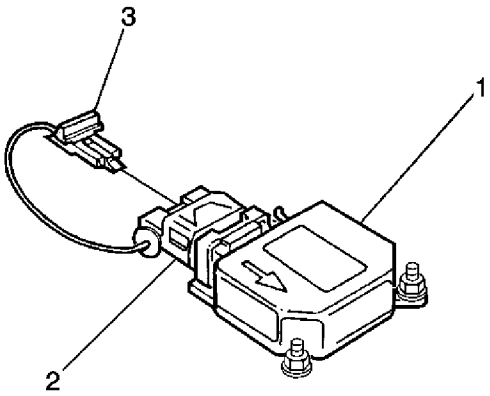
Removal Procedure

CAUTION: Be careful when you handle a sensing and diagnostic module (SDM). Do not strike or jolt the SDM. Before applying power to the SDM:

- Remove any dirt, grease, etc. from the mounting surface
- Position the SDM horizontally on the mounting surface
- Point the arrow on the SDM toward the front of the vehicle
- Tighten all of the SDM fasteners and SDM bracket fasteners to the specified torque value

Failure to follow the correct procedure could cause air bag deployment, personal injury, or unnecessary SIR system repairs.

1. Disable the SIR system. Refer to Disabling the SIR System .
2. Remove the passenger front seat. Refer to Seat Replacement in Seats.
3. Remove the right carpet retainer. Refer to Front Floor Mat/Carpet Replacement in Interior Trim.

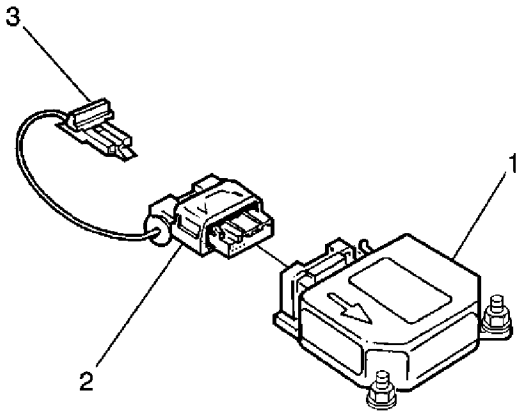




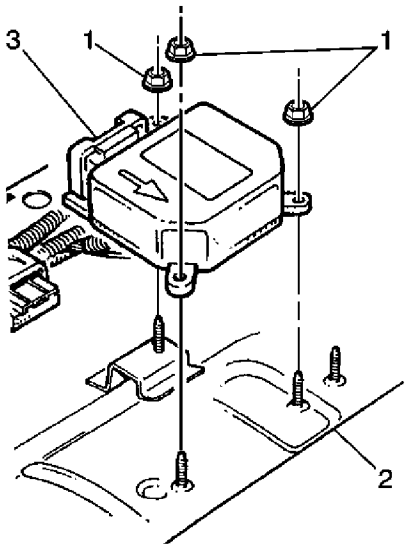
4. Lift up the carpet and insulation in order to access the inflatable restraint sensing and diagnostic module (SDM).
5. Remove the connector position assurance (CPA) (3) from the SDM harness connector (2).

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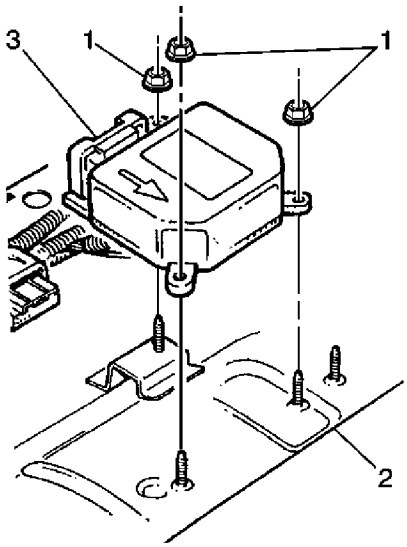
6. Disconnect the SDM harness connector (2) from the SDM (1).



7. Remove the SDM (3) mounting fasteners (1).
8. Remove the SDM (3) from the floor sheet metal (2).

Installation Procedure

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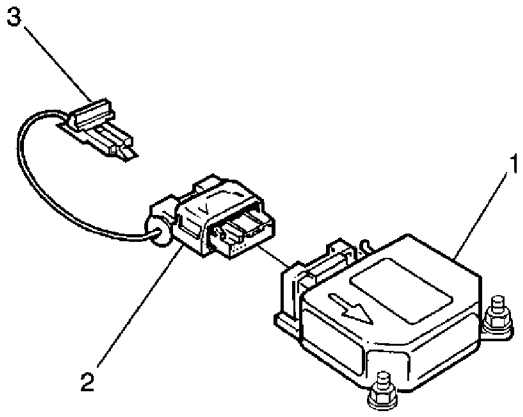


1. Install the SDM (3) to the floor sheet metal (2).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

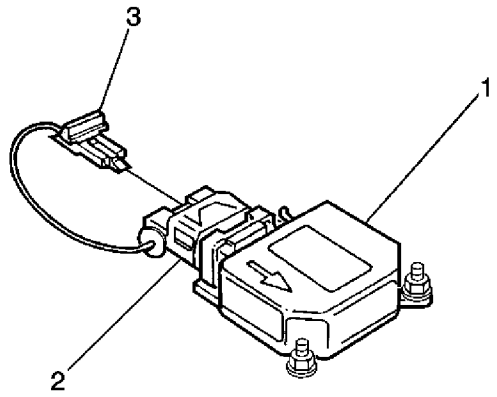
2. Install the SDM mounting fasteners (1).

Tighten
Tighten fasteners to 9 N·m (80 lb in).



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3. Install the SDM harness connector (2) to the SDM (1).



4. Install the connector position assurance (CPA) (3) to the SDM harness (2) connector.
5. Install the right carpet retainer. Refer to Front Floor Mat/Carpet Replacement in Interior Trim.
6. Install the passenger front seat. Refer to Seat Replacement in Seats.

Important: The AIR BAG indicator may remain ON after the SDM has been replaced. DTC B1001 may set requiring the SDM part number to be set in multiple modules. If the indicator remains ON after enabling the SIR system, perform the diagnostic system check and follow the steps thoroughly to ensure that the SDM is set properly.

7. Enable the SIR system. Refer to Enabling the SIR System .

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Instrument Panel Inflatable Restraint Module Replacement (Buick)

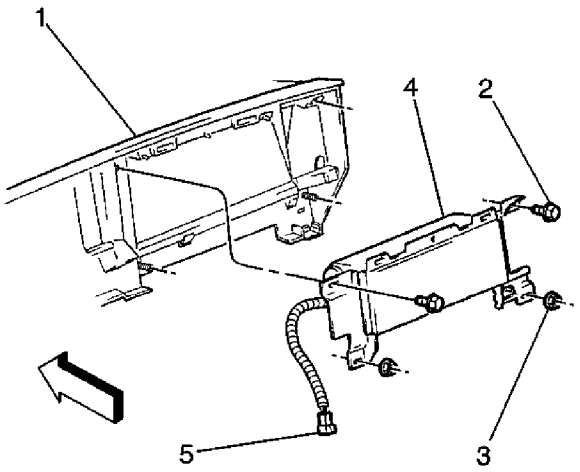
Removal Procedure

Caution: When you are carrying an undeployed inflator module:

- Do not carry the inflator module by the wires or connector on the inflator module
- Make sure the bag opening points away from you

When you are storing an undeployed inflator module, make sure the bag opening points away from the surface on which the inflator module rests. When you are storing a steering column, do not rest the column with the bag opening facing down and the column vertical. Provide free space for the air bag to expand in case of an accidental deployment. Otherwise, personal injury may result.

1. Disable the SIR system. Refer to Disabling the SIR System .

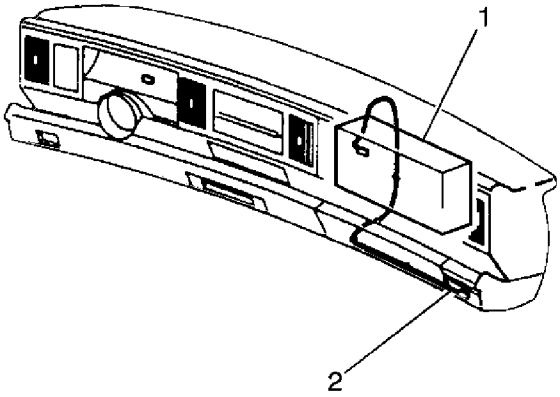


2. Remove the IP cluster trim panel. Refer to Instrument Cluster Trim Panel Replacement in Instrument Panel, Gauges and Console.
3. Remove the inflatable restraint IP module mounting fasteners (2,3).
4. Remove the inflatable restraint IP module (4) from the IP (1).
5. Fully deploy the module before disposal. If the module was replaced under warranty, fully deploy and dispose of the module after the required retention period. Refer to Inflator Module Handling, Shipping, and Scrapping .

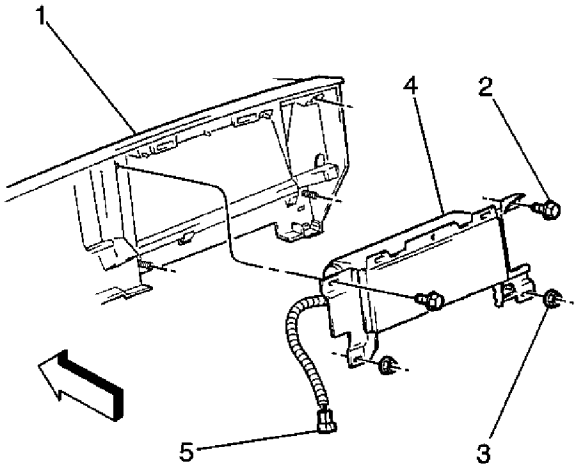
Installation Procedure

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1. Route the pigtail (5) down through the IP (1).



2. Slide the inflatable restraint IP module (4) into the IP opening (1).

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

Important: Install the top fasteners first.

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3. Install all of the inflatable restraint IP module mounting fasteners.

   Tighten

   - Tighten the nuts to 10 N·m (84 lb in).
   - Tighten the bolts to 11 N·m (94 lb in).

4. Install the IP cluster trim panel. Refer to Instrument Cluster Trim Panel Replacement in Instrument Panel, Gauges and Console.
5. Enable the SIR system. Refer to Enabling the SIR System .

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Instrument Panel Inflatable Restraint Module Replacement (Oldsmobile)

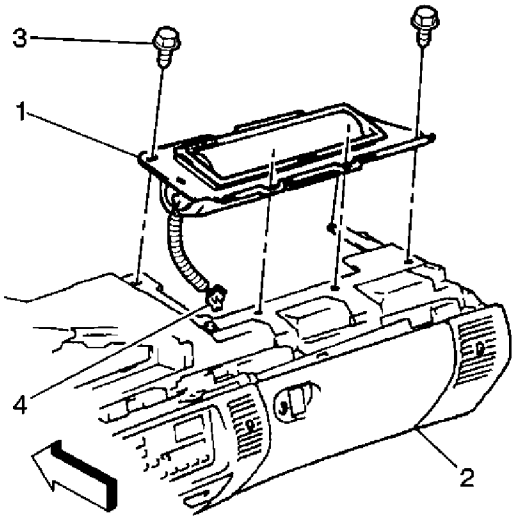
Removal Procedure

Caution: When you are carrying an undeployed inflator module:

- Do not carry the inflator module by the wires or connector on the inflator module
- Make sure the bag opening points away from you

When you are storing an undeployed inflator module, make sure the bag opening points away from the surface on which the inflator module rests. When you are storing a steering column, do not rest the column with the bag opening facing down and the column vertical. Provide free space for the air bag to expand in case of an accidental deployment. Otherwise, personal injury may result.

1. Disable the SIR system. Refer to Disabling the SIR System .

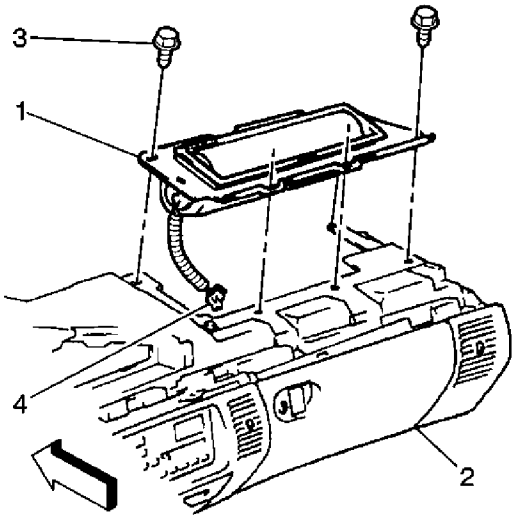


2. Remove the IP upper trim pad. Refer to Instrument Panel Upper Trim Pad Replacement in Instrument Panel, Gauges and Console.
3. Remove the inflatable restraint IP module mounting fasteners (3).
4. Remove the inflatable restraint IP module (1) from the IP (2).
5. Fully deploy the module before disposal. If the module was replaced under warranty, fully deploy and dispose of the module after the required retention period. Refer to Inflator Module Handling, Shipping, and Scrapping .

Installation Procedure

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1. Route the pigtail (4) down through the IP (2).
2. Slide the inflatable restraint IP module (1) into the IP opening.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install all of the inflatable restraint IP module mounting fasteners.

   Tighten
   Tighten fasteners to 16 N·m (12 lb ft).

4. Install the upper IP trim pad. Refer to Instrument Panel Upper Trim Pad Replacement in Instrument Panel, Gauges, and Console.
5. Enable the SIR system. Refer to Enabling the SIR System .

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Instrument Panel Inflatable Restraint Module Replacement (Pontiac)

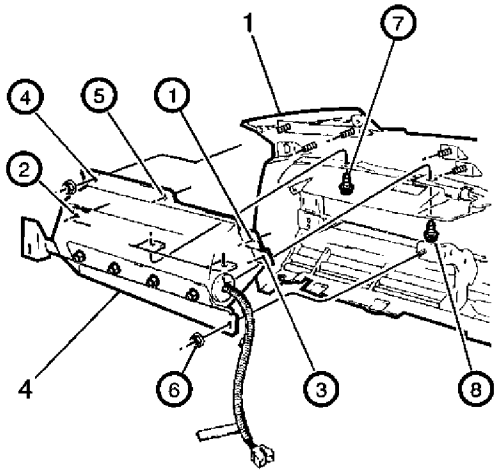
Removal Procedure

Caution: When you are carrying an undeployed inflator module:

- Do not carry the inflator module by the wires or connector on the inflator module
- Make sure the bag opening points away from you

When you are storing an undeployed inflator module, make sure the bag opening points away from the surface on which the inflator module rests. When you are storing a steering column, do not rest the column with the bag opening facing down and the column vertical. Provide free space for the air bag to expand in case of an accidental deployment. Otherwise, personal injury may result.

1. Disable the SIR system. Refer to Disabling the SIR System .

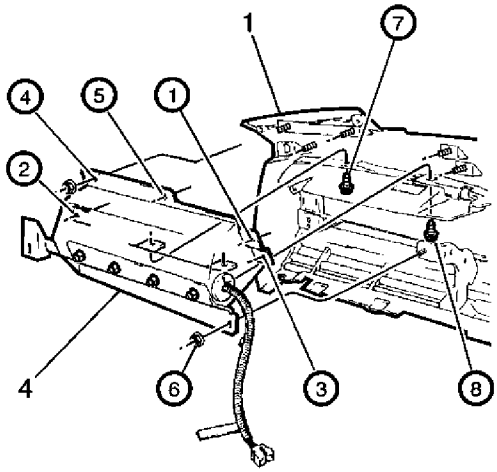


2. Remove the IP assembly. Refer to Instrument Panel Assembly Removal in Instrument Panel, Gauges, and Console.
3. Remove the inflatable restraint IP module mounting bolts (7,8).
4. Remove the inflatable restraint IP module mounting nuts (6,5,4,3,2,1).
5. Remove the inflatable restraint IP module (4) from the IP (1).
6. Fully deploy the module before disposal. If the module was replaced under warranty, fully deploy and dispose of the module after the required retention period. Refer to Inflator Module Handling, Shipping, and Scrapping .

Installation Procedure

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1. Slide the inflatable restraint IP module (4) into the IP opening.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install all of the inflatable restraint IP module mounting fasteners.

   Tighten

   - Tighten the nuts, in the proper order (1,2,3,4,5,6) to 10 N·m (84 lb in).
   - Tighten the bolts, in the proper order (7,8) to 2 N·m (17 lb in).

3. Install the IP Assembly. Refer to Instrument Panel Assembly Removal in Instrument Panel, Gauges, and Console.
4. Enable the SIR system. Refer to Enabling the SIR System .

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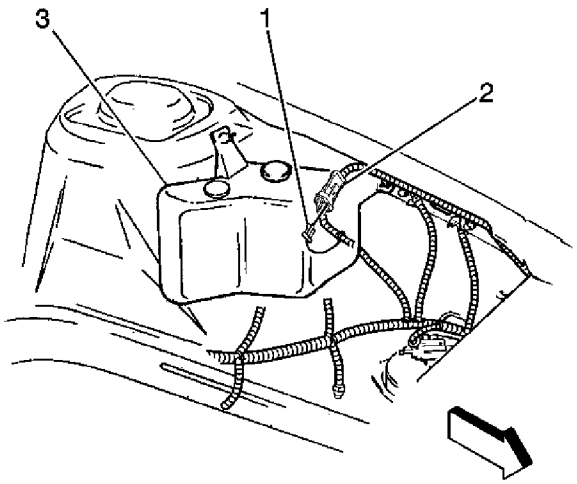
Inflatable Restraint Front End Discriminating Sensor Replacement

Removal Procedure

Caution: Be careful when you handle a sensor. Do not strike or jolt a sensor. Before applying power to a sensor:

- Remove any dirt, grease, etc. from the mounting surface.
- Position the sensor horizontally on the mounting surface.
- Point the arrow on the sensor toward the front of the vehicle.
- Tighten all of the sensor fasteners and sensor bracket fasteners to the specified torque value.

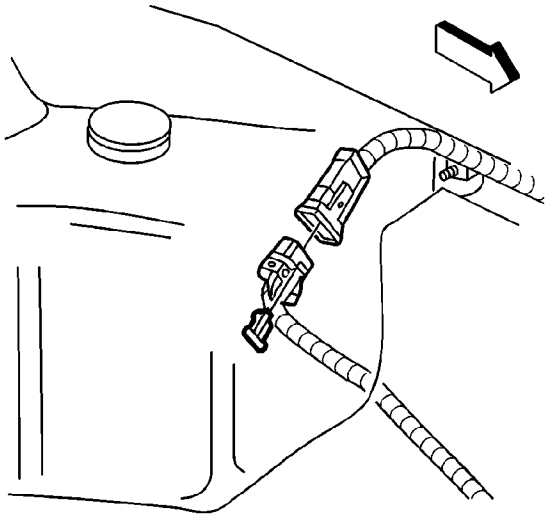
Failure to follow the correct procedure could cause air bag deployment, personal injury, or unnecessary SIR system repairs.



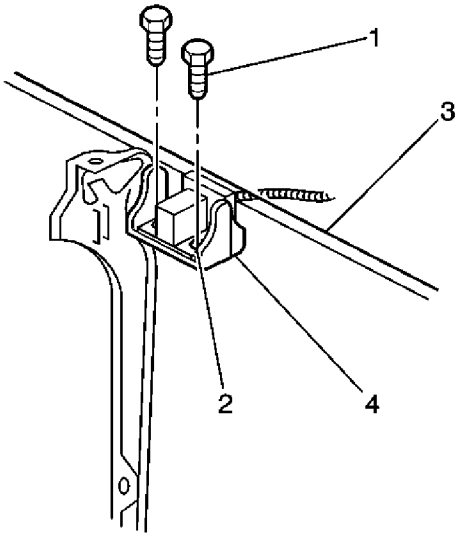
1. Disable the SIR system. Refer to Disabling the SIR System .
2. Remove the connector position assurance (CPA) (1) from the inflatable restraint front end discriminating sensor harness connector (2).

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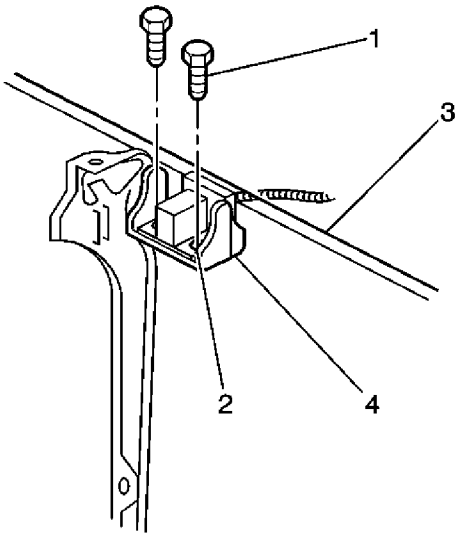
3. Disconnect the inflatable restraint front end discriminating sensor harness connector from the pigtail connector.



4. Remove the inflatable restraint front end discriminating sensor mounting fasteners (1).
5. Remove the inflatable restraint front end discriminating sensor (2) from the front end discriminating sensor bracket (4).

Installation Procedure

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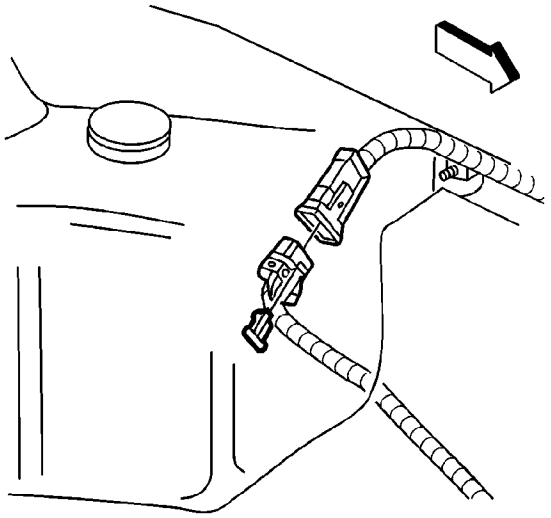
1. Install the inflatable restraint front end discriminating sensor (2) to the front end discriminating sensor bracket (4).

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

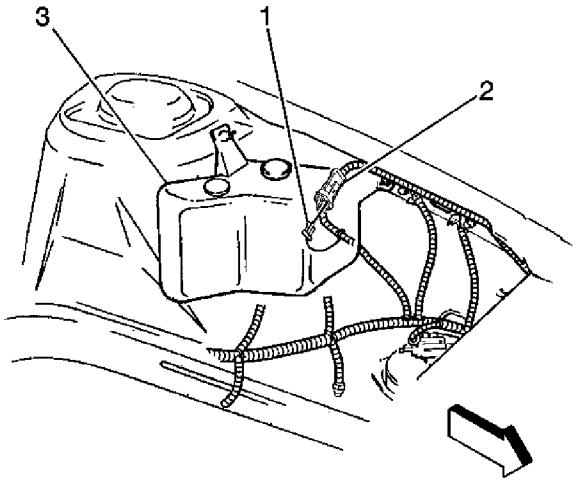
2. Install the inflatable restraint front end discriminating sensor mounting fasteners (1).

   Tighten
   Tighten fastener to 12 N·m (9 lb ft).

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3. Connect the inflatable restraint front end discriminating sensor harness connector to the pigtail connector.



4. Install the connector position assurance (CPA) (1) to the inflatable restraint front end discriminating sensor harness connector (2).
5. Enable the SIR system. Refer to Enabling the SIR System .

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Steering Wheel Inflatable Restraint Module Replacement

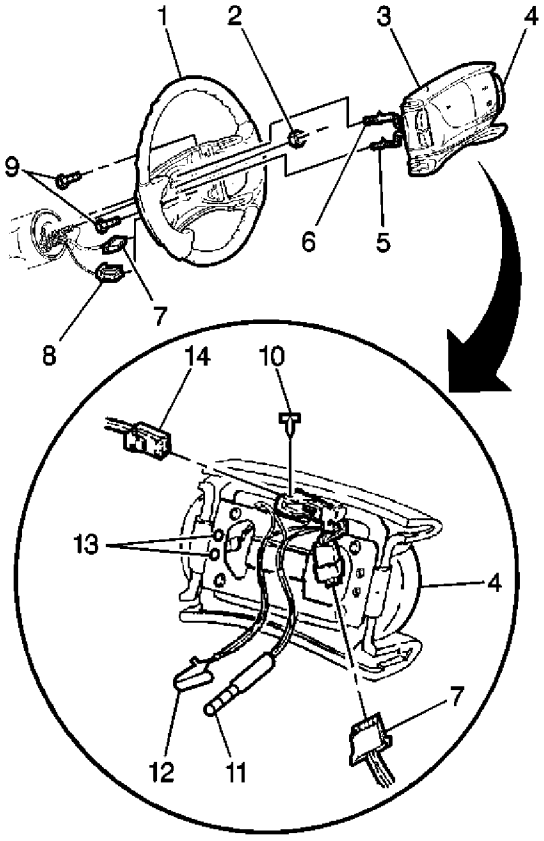
Removal Procedure

Caution: When you are carrying an undeployed inflator module:

- Do not carry the inflator module by the wires or connector on the inflator module
- Make sure the bag opening points away from you

When you are storing an undeployed inflator module, make sure the bag opening points away from the surface on which the inflator module rests. When you are storing a steering column, do not rest the column with the bag opening facing down and the column vertical. Provide free space for the air bag to expand in case of an accidental deployment. Otherwise, personal injury may result.

1. Disable the SIR System. Refer to Disabling the SIR System .



2. Remove the 2 screws (9) at the back of the steering wheel (1).

Important: Note the wire routing for assembly reference.

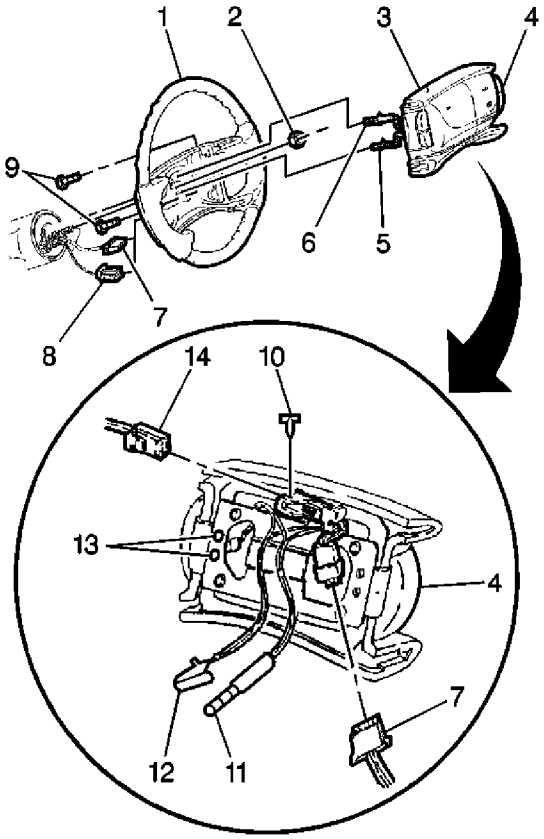
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3. Position the inflator module (3) in order to gain access to the wire connectors.
4. Push in and rotate the horn contact lead (6) counterclockwise.
5. Remove the horn contact lead (6) from the steering column horn tower.
6. Remove the horn contact lead (6).
7. Remove the retainer (CPA) (10) from the SIR wiring connector.
8. Remove the SIR wiring connector from the inflatable restraint steering wheel module (3).
9. Disconnect the steering wheel control switch connector (7).
10. Remove the inflatable restraint steering wheel module (3).

Installation Procedure

1. Connect the steering wheel switch connector, if equipped.



2. Install the retainer (CPA) (10) to the SIR wiring connector.
3. Route the horn contact lead (6) to the steering column horn tower.
4. Push the lead (6) into the horn tower.
5. Rotate the lead (6) clockwise to locked position.
6. Install the horn ground to lead (6).
7. Install the SIR connector and retainer (CPA).

Important: Do not pinch any wires.

8. Install the inflatable restraint steering wheel module (3) to the steering wheel (1).

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First install the top surface of the module (3) in order to ease assembly and fit.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

9. Install the 2 screws (9) through the back of the steering wheel (1) to the inflator module (3).

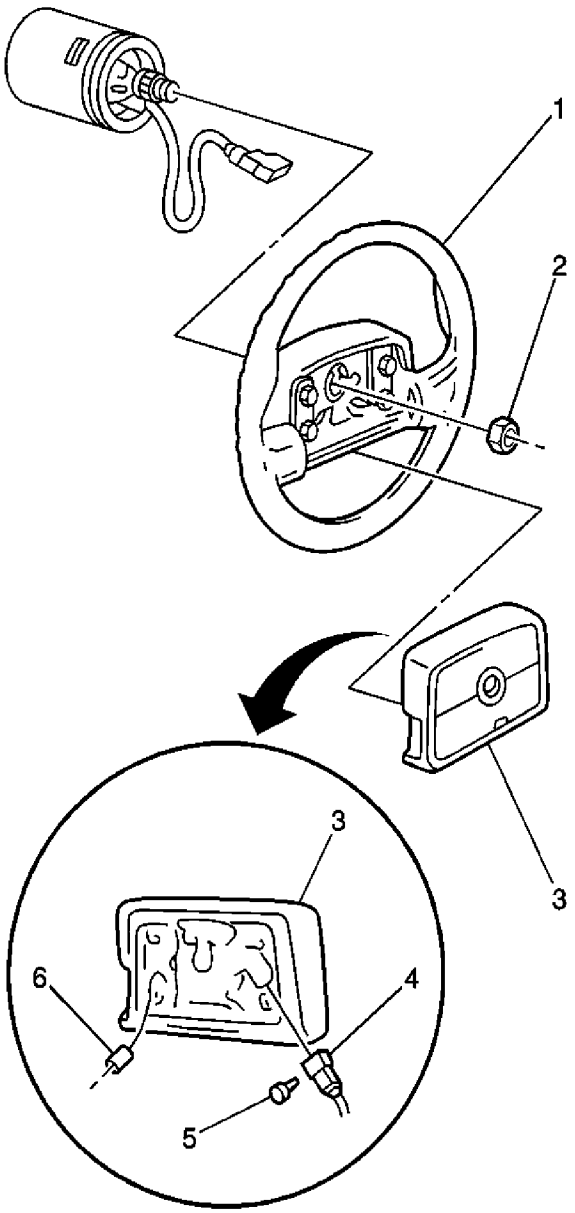
   Tighten
   Tighten the screws to 3 N·m (27 lb in).

10. Enable the SIR system. Refer to Enabling the SIR System .

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Steering Wheel Inflatable Restraint Module Coil Replacement

Removal Procedure

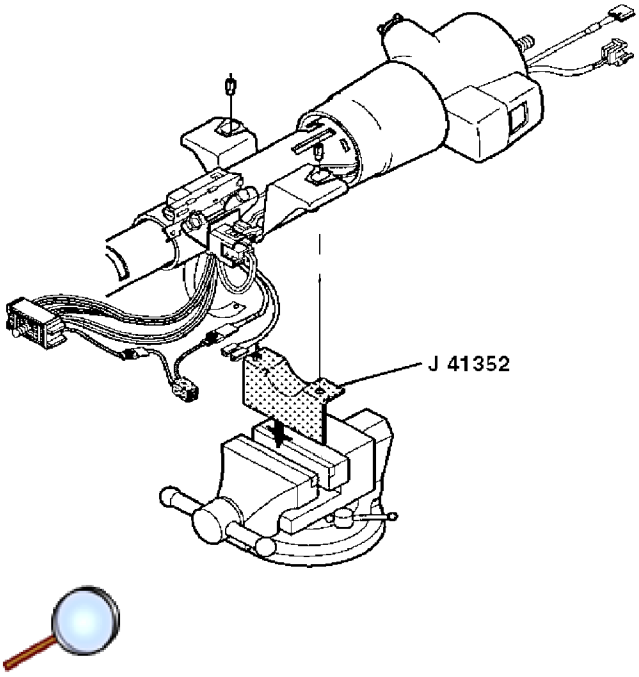


1. Turn the ignition switch to the OFF position.
2. Disable the SIR system. Refer to Disabling the SIR System .
3. Remove the steering wheel inflator module (3). Refer to Inflatable Restraint Steering Wheel

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Module Replacement .

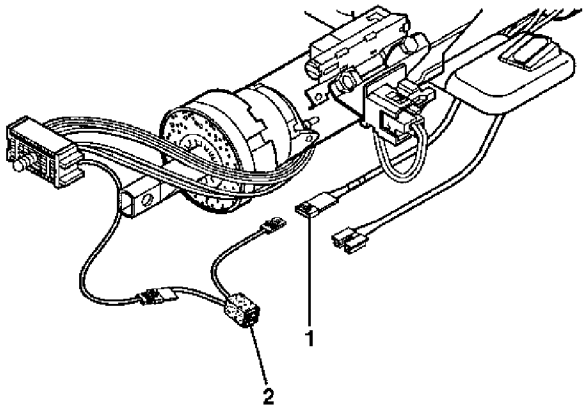
4. Remove the steering wheel retaining nut (2).
5. Remove the steering wheel (1) from the steering column shaft. Refer to Steering Wheel Replacement .



Important: The column must be in the 12 o'clock position.

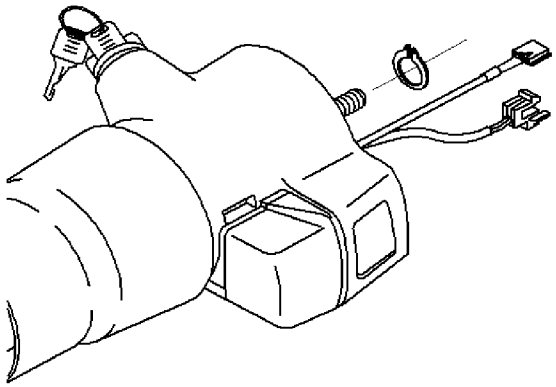
To align the steering shaft assembly to the 12 o'clock position. Turn the key to the off/lock position. Pull the key out and turn the steering shaft until you hear a click.

6. The turn signal switch assembly must be in the UP position.
7. Refer to Inflatable Restraint Steering Wheel Module Coil Disassemble - Off Vehicle in Steering for complete procedure.
8. Pop the wire harness assembly out of the wire harness strap (1).
9. Check steering column for accident damage. Refer to Steering Column Accident Damage Inspection - Off Vehicle in Steering.

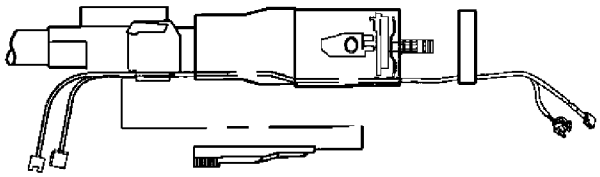


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10. Remove the SIR connector (1) from the fused jumper assembly connector (2).



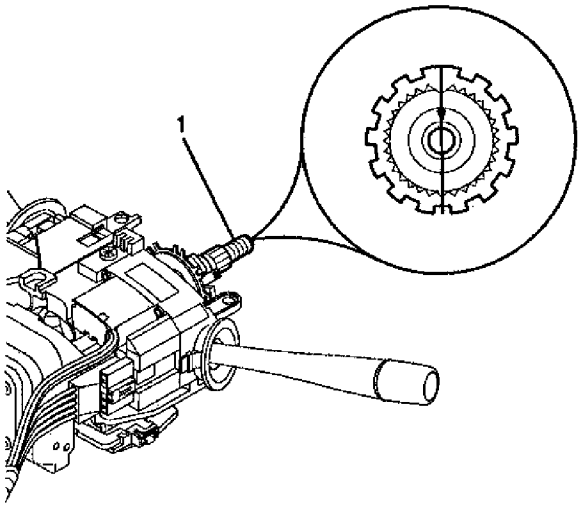
11. Remove the retaining ring.



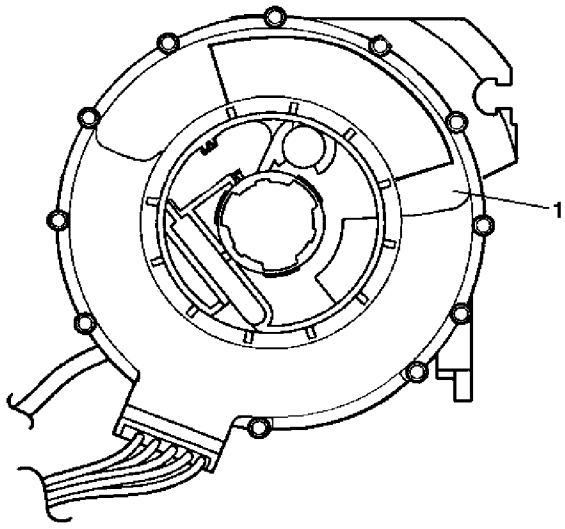
12. Remove the wire protector.
13. Remove the SIR coil assembly.
14. To remove the SIR coil assembly completely refer to the upper tilt head component assembly Turn Signal Cancel Cam and Upper Bearing Inner Race - Disassemble - Off Vehicle in Steering.

Installation Procedure

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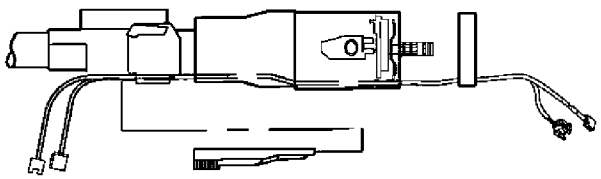


1. To install the inflatable restraint steering wheel module coil:
   - Make sure that the wheels are straight ahead.
   - Align the block tooth and the centering mark on the race and upper shaft assembly (1) at the 12 o'clock position.



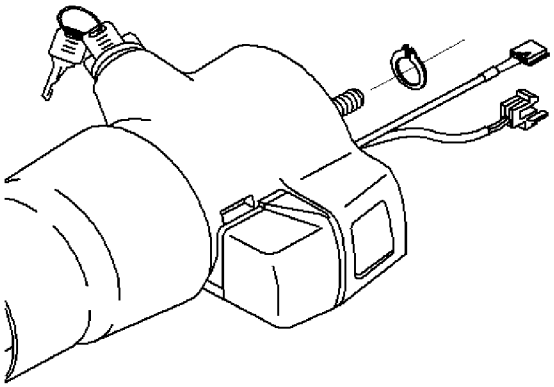
2. The new SIR coil assembly will come pre-centered.
3. If installing the existing SIR coil assembly, proceed to the next step.
4. Follow the instructions on the notice (1) of the SIR coil assembly.

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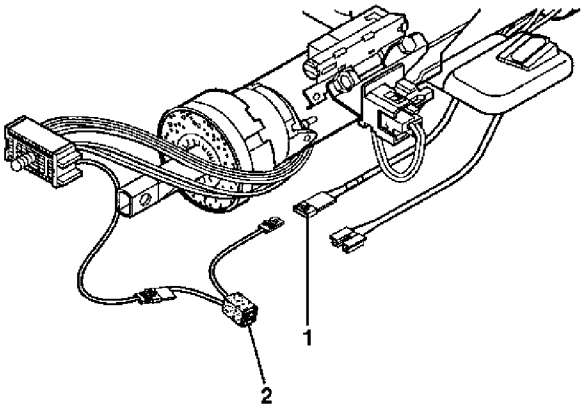
Important: The column must be in the 12 o'clock position.

5. Align the steering column to the 12 o'clock position.
6. Install the hanging SIR coil assembly onto the race and upper shaft assembly.
7. The new SIR coil assembly will come precentered. Once installed, pull the tab and remove.
8. If the SIR coil assembly is completely off refer to the upper tilt head component assembly Turn Signal Cancel Cam and Upper Bearing Inner Race - Assemble - Off Vehicle in Steering.
9. Install the wire protector into the support bracket.

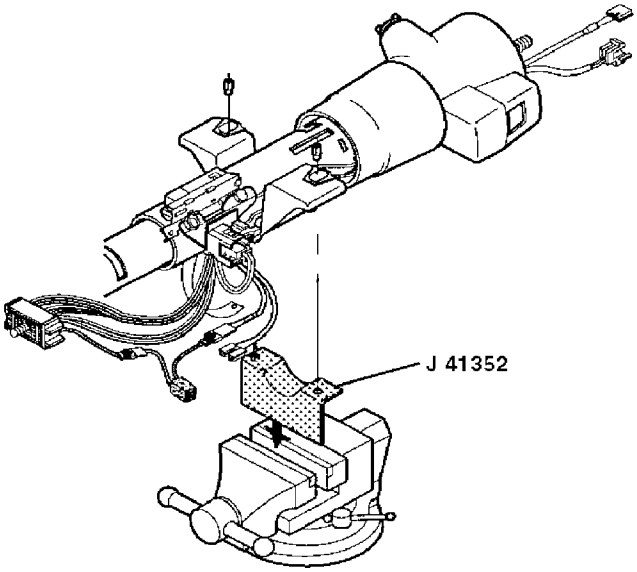


10. Install the retaining ring.

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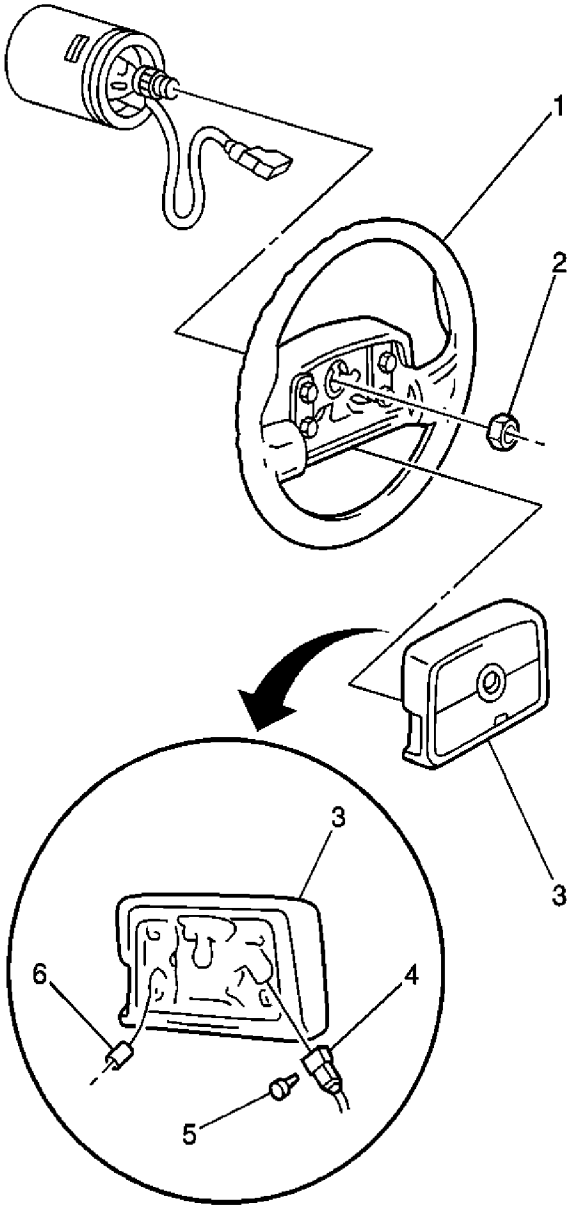


11. Install the SIR coil assembly connector (1) to the fused jumper assembly connector (2).



12. Put the wire harness assembly into the wire harness strap (1). Refer to Inflatable Restraint Steering Wheel Module Coil Assemble - Off Vehicle for complete installation procedure located in Steering.

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13. Install the steering wheel (1). Refer to Steering Wheel Replacement in Steering.
14. Install the steering wheel inflator module (3). Refer to Inflatable Restraint Steering Wheel Module Replacement .
15. Enable the SIR system. Refer to Enabling the SIR System .

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Wiring Repair

The supplemental inflatable restraint (SIR) system requires special wiring repair procedures due to the sensitive nature of the circuitry. Follow the specific procedures and instructions when working with the SIR system wiring, and the wiring components (such as connectors and terminals).

Important: Do not use the terminals in the kit in order to replace damaged SIR system terminals unless specifically indicated by the terminal package.

Tools Required

J-38125 Terminal Repair Kit

The tool kit J-38125 contains the following items:

- Special sealed splices - in order to repair the SIR system wiring
- A wire stripping tool
- A special crimping tool
- A heat torch
- An instruction manual

The sealed splices has the following 2 critical features:

- A special heat shrink sleeve environmentally seals the splice. The heat shrink sleeve contains a sealing adhesive inside.
- A cross hatched (knurled) core crimp provides necessary contact integrity for the sensitive, low energy circuits.

The J-38125 also serves as a generic terminal repair kit. The kit contains the following items:

- A large sampling of common GM electrical terminals
- The correct tools in order to attach the terminals to wires
- The correct tools in order to remove the terminals from connectors

SIR Connector (Plastic Body and Terminal Metal Pin) Repair

Use the connector repair assembly packs in order to repair the damaged SIR wire harness connectors and the terminals. Do not use the connector repair assembly pack in order to repair the pigtails. These kits include an instruction sheet and the sealed splices. Use the sealed splices in order to splice the new wires, connectors, and terminals to the harness. The splice crimping tool is color keyed in order to match the splices from the J-38125 . You must use the splice crimping tool in order to apply these splices.

The terminals in the SIR system are made of a special metal. This metal provides the necessary

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contact integrity for the sensitive, low energy circuits. These terminals are only available in the connector repair assembly packs. Do not substitute any other terminals for those in the assembly packs.

If the individual terminals are damaged on the sensing and diagnostic module (SDM) harness connector, use 1 of the following 2 components in order to replace the SDM harness connector:

- The SDM harness connector pigtail assembly
- The SDM harness connector replacement kit

If the individual terminals are damaged on any other SIR connection, use the appropriate connector repair assembly pack in order to replace the entire connection. Replace the entire SIR wiring harness, if needed, in order to maintain SIR circuit integrity.

SIR Wire Pigtail Repair

Important: Do not make wire, connector, or terminal repairs on components with wire pigtails.

A wire pigtail is a wire or wires attached directly to the device (not by a connector). If a wiring pigtail is damaged, you must replace the entire component (with pigtail). The inflatable restraint steering wheel module coil is an example of a pigtail component.

SIR Wire Repair

Tools Required

J-38125 Terminal Repair Kit

> **Important:** Refer to *Wiring Repairs* in Wiring Systems in order to determine the correct wire size for the circuit you are repairing. You must obtain this information in order to ensure circuit integrity.

1. If any wire except the pigtail is damaged, repair the wire by splicing in a new section of wire of the same gauge size (0.5 mm (.020 in), 0.8 mm (.031 in), 1.0 mm (.039 in) etc.). Use the sealed splices and splice crimping tool from the J-38125 . Use the following wiring repair procedures in order to ensure the integrity of the sealed splice.

   Important: You must perform the following procedures in the listed order. Repeat the procedure if any wire strands are damaged. You must obtain a clean strip with all of the wire strands intact.

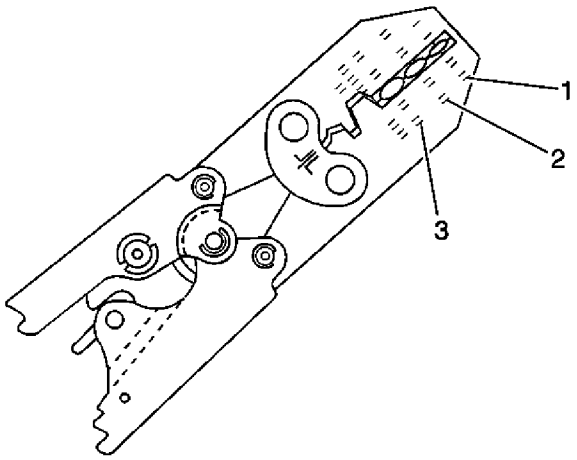
2. Open the harness by removing any tape:
   - Use a sewing seam ripper (available from sewing supply stores) in order to cut open the harness in order to avoid wire insulation damage.
   - Use the crimp and sealed splice sleeves on all types of insulation except tefzel and coaxial.
   - Do not use the crimp and sealed splice sleeve to form a splice with more than 2 wires coming together.
3. Cut as little wire off the harness as possible. You may need the extra length of wire in order to change the location of a splice.

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Adjust splice locations so that each splice is at least 40 mm (1.5 in) away from the other splices, harness branches, or connectors.

4. Strip the insulation:
   - When adding a length of wire to the existing harness, use the same size wire as the original wire.
   - Perform one of the following items in order to find the correct wire size:
     - Find the wire on the schematic and convert the metric size to the equivalent AWG size.
     - Use an AWG wire gauge.
     - If you are unsure of the wire size, begin with the largest opening in the wire stripper and work down until achieving a clean strip of the insulation.
   - Strip approximately 7.5 mm (0.313 in) of insulation from each wire to be spliced.
   - Do not nick or cut any of the strands. Inspect the stripped wire for nicks or cut strands.
   - If the wire is damaged, repeat this procedure after removing the damaged section.
5. Select the proper sealed splice sleeve according to wire size.

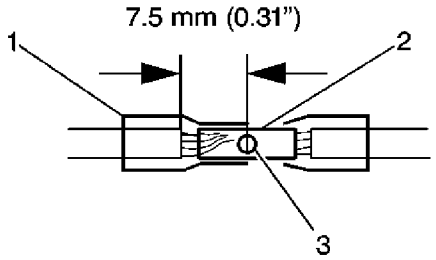
   Refer to the following table for color coding of the splice sleeves, and the crimp tool nests.





6. Use the Splice Crimp Tool from the J-38125 in order to position the splice sleeve in the proper color nest of the Splice Crimp Tool.

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7. Place the splice sleeve in the nest. Ensure that the crimp falls midway between the end of the barrel and the stop. The sleeve has a stop (3) in the middle of the barrel (2) in order to prevent the wire (1) from going further. Close the hand crimper handles slightly in order to firmly hold the splice sleeve in the proper nest.



8. Insert the wire into the splice sleeve barrel until the wire hits the barrel stop.
9. Tightly close the handles of the crimp tool until the crimper handles open when released.

   The crimper handles will not open until you apply the proper amount of pressure to the splice sleeve. Repeat steps 4 and 5 for the opposite end of the splice.

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10. Using the heat torch, apply heat to the crimped area of the barrel.
11. Gradually move the heat barrel to the open end of the tubing:
    - The tubing will shrink completely as the heat is moved along the insulation.
    - A small amount of sealant will come out of the end of the tubing when sufficient shrinkage is achieved.

Crimp and Seal Splice Table

Splice Sleeve Color	Crimp Tool Nest Color	Wire Gauge mm² / (AWG)
Salmon (yellow-pink)	Red (1)	0.5-0.8 / (18-20)
Blue	Blue (2)	1.0-2.0 / (14-16)
Yellow	Yellow (3)	3.0-5.0 / (10-12)

SIR System Wire Splice Repair

Apply a new splice (not sealed) from the J-38125 if damage occurs to any of the original equipment splices (3 wires or more) in the SIR wiring harness. Carefully follow the instructions included in the kit for proper splice clip application.

Connector Position Assurance (CPA)

The connector position assurance (CPA) is a small plastic insert that fits through the locking tabs of all the SIR system electrical connectors. The CPA ensures that the connector halves cannot vibrate apart. You must have the CPA in place in order to ensure good contact between the SIR mating terminals.

Terminal Position Assurance (TPA)

The terminal position assurance (TPA) insert resembles the plastic combs used in the control module connectors. The TPA keeps the terminal securely seated in the connector body. Do not

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remove the TPA from the connector body unless you remove a terminal for replacement.

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Repairs and Inspections Required After a Collision

Accident With or Without Air Bag Deployment -- Component Inspections

CAUTION: Proper operation of the Supplemental Inflatable Restraint (SIR) sensing system requires that any repairs to the vehicle structure return the vehicle structure to the original production configuration. Not properly repairing the vehicle structure could cause non-deployment of the air bag(s) in a frontal collision or deployment of the air bag(s) for conditions less severe than intended.

After any collision, inspect the following components as indicated. If you detect any damage, replace the component. If you detect any damage to the mounting points or mounting hardware, repair the component or replace the hardware as needed:

- Steering column

  Perform the steering column accident damage checking procedures. Refer to Steering.
- Inflatable restraint front end discriminating sensor

  Determine the need for replacement based on the following Sensor Replacement Guidelines.
- IP Knee Bolsters

  Inspect the knee bolsters for bending, twisting, buckling, or any other type of damage.
- IP brackets, braces, etc.

  Inspect for bending, twisting, buckling, or any other type of damage.
- IP steering column reinforcement plate

  Inspect for bending, twisting, buckling, or any other type of damage.
- Seat Belts

  Perform the seat belt operational and functional checks. Refer to Operational and Functional Checks in Seat Belts.

Accident With Air Bag Deployment -- Component Replacement and Inspections

After a collision involving air bag deployment, replace the following components. If you detect any damage to the mounting points or mounting hardware, repair or replace the mounting points and mounting hardware as needed:

- Inflatable restraint IP (inflator) module
- Inflatable restraint steering wheel (inflator) module
- Inflatable restraint sensing and diagnostic module (SDM)

After a collision involving air bag deployment, inspect the inflatable restraint steering wheel module coil and the coil wiring pigtail for melting, scorching, or other damage due to excessive heat. Perform this component inspection in addition to the inspections indicated above in Accident With or Without Air Bag Deployment. If you detect any damage, replace the component. If you detect

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any damage to the mounting points or mounting hardware, repair the component or replace the hardware as needed.

Sensor Replacement Guidelines

The SIR sensor replacement policy requires replacing the sensors in the area of accident damage. The area of accident damage is defined as the portion of the vehicle that is crushed, bent, or damaged due to a collision. If the vehicle has a SIR sensor mounted forward of the radiator, replace the SIR sensor.

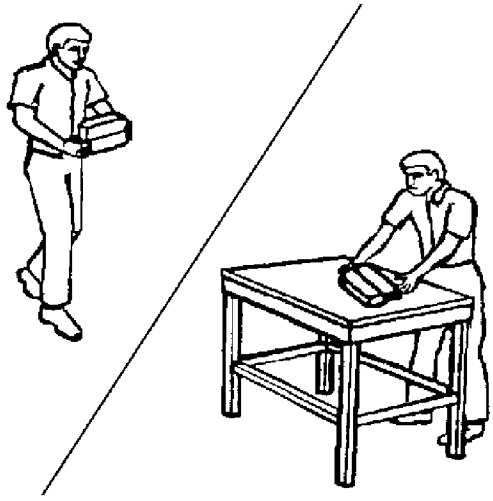
- Replace the sensor even if the air bags have not deployed.
- Replace the sensor even if the sensor appears to be undamaged.

Sensor damage which is not visible, such as slight bending of the mounting bracket or cuts in the wire insulation, may cause improper operation of the SIR sensing system. Do not try to determine whether the sensor is undamaged, replace the sensor. Also, replace the sensor if a Diagnostic Trouble Code (DTC) table indicates a malfunctioning sensor.

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Inflator Module Handling, Shipping, and Scrapping

Live (Undeployed) Inflator Module





Caution: When you are carrying an undeployed inflator module:

- Do not carry the inflator module by the wires or connector on the inflator module
- Make sure the bag opening points away from you

When you are storing an undeployed inflator module, make sure the bag opening points away from the surface on which the inflator module rests. When you are storing a steering column, do not rest the column with the bag opening facing down and the column vertical. Provide free space for the air bag to expand in case of an accidental deployment. Otherwise, personal injury may result.

Use special care when handling and storing a live (undeployed) inflator module. An air bag deployment produces rapid gas generation. This may cause the inflator module, or an object in front of the inflator module, to jettison through the air in the unlikely event of an accidental deployment.

Shipping Procedures for Live (Undeployed) Inflator Modules

Service personnel should refer to the latest Service Bulletins for proper SIR inflator module shipping procedures.

Scrapping Procedure

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During the course of a vehicle's useful life, you may need to dispose of a live (undeployed) inflator module. The following information covers the proper procedures for disposing of a live inflator module. Before you dispose of a live inflator module, you must deploy the inflator module. Do not dispose of live inflator modules through normal refuse channels.

Caution: In order to prevent accidental deployment of the air bag which could cause personal injury, do not dispose of an undeployed inflator module as normal shop waste. The undeployed inflator module contains substances that could cause severe illness or personal injury if the sealed container is damaged during disposal. Use the following deployment procedures to safely dispose of an undeployed inflator module. Failure to dispose of an inflator module as instructed may be a violation of federal, state, province, or local laws.

Do not deploy an air bag in the following situations:

- If you replace an inflator module under warranty, you may need to return the inflator module, undeployed, to Delphi Interior & Lighting Systems. Refer to the latest service bulletin regarding SIR shipping procedures.
- If a vehicle is the subject of a Product Liability Report related to the SIR system and is subject to a Preliminary Investigation (GM-1241), do not alter the SIR system in any manner. Refer to the latest service bulletin on SIR shipping procedures.
- If a vehicle is involved in a campaign affecting the inflator modules, follow the instructions in the Campaign Service Bulletin for proper SIR handling and shipping procedures.

Deployment Procedures

The inflator module may be deployed inside or outside of the vehicle. The method used depends upon the final disposition of the vehicle. Review the following procedures in order to determine which procedure will work best in a given situation.

Deployment Outside of the Vehicle (Inflatable Restraint Steering Wheel Module)

Tools Required

J 38826 SIR Deployment Harness

When you intend to return the vehicle to service, deploy the inflator modules outside of the vehicle. Consider the following examples:

- Using the SIR Diagnostics, you determine that the inflator module does not function correctly.
- The inflator module is cosmetically damaged, such as a scratch or a rip in the cover.
- The inflator module pigtail (if equipped) is damaged.
- The inflator module connector is damaged.
- An inflator module connector terminal is damaged.

Deployment and disposal of a malfunctioning inflator module is subject to any required retention period.

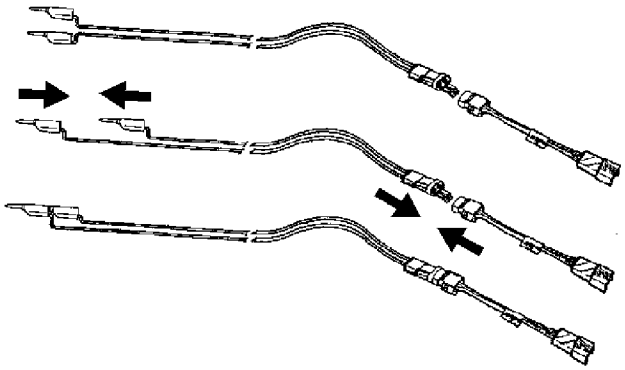
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You must follow these inflator module deployment procedures exactly. Always wear safety glasses during this deployment procedure. Do not remove your safety glasses until the deployed inflator module is scrapped or shipped. Before performing theses deployment procedures, ensure that you are familiar with servicing the SIR system. You should also know how to handle the inflator module properly. Carefully read the procedures before you begin. These procedures require the use of the following tools:

- J 38826 SIR Deployment Harness
- The appropriate pigtail adapter

Do not perform the procedure without the J 38826 and the adapter.

CAUTION: When you are deploying an inflator module for disposal, perform the deployment procedures in the order listed. Failure to follow the procedures in the order listed may result in personal injury.

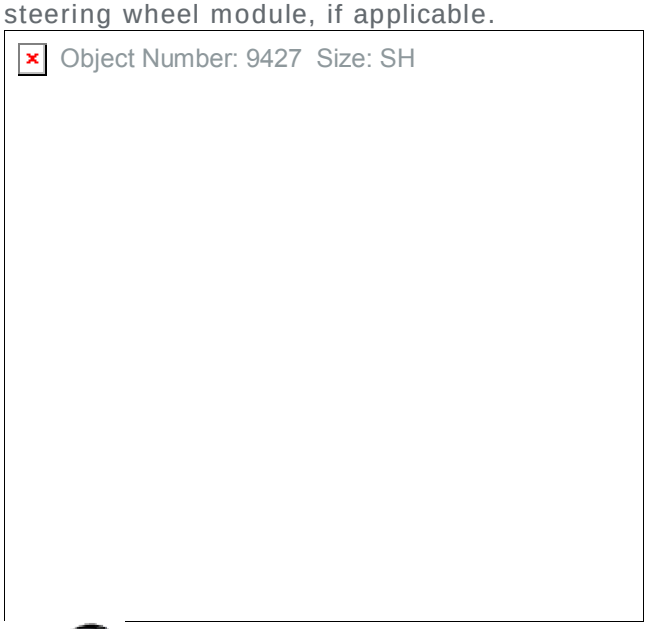


Important: This information applies only to inflatable restraint steering wheel modules. Refer to Deployment Outside of the Vehicle (Inflatable Restraint IP Module) in this section for information on inflatable restraint IP module scrapping.

1. Turn the ignition switch to the LOCK position.
2. Remove the key.
3. Put on safety glasses.
4. Inspect the J 38826 and the appropriate pigtail adapter for damage. If either the harness or the adapter is damaged, obtain a replacement.
5. Short the 2 SIR deployment harness leads together by fully seating one banana plug into the other, as shown in the figure.
   - Keep the SIR deployment harness shorted until you are ready to deploy the air bag.
   - Do not connect the SIR deployment harness to a power source until you are ready to deploy the air bag.

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6. Connect the appropriate pigtail adapter to the J 38826 .
7. Remove the inflatable restraint steering wheel module from the vehicle. Refer to Inflatable Restraint Steering Wheel Module Replacement .
8. Remove the horn lead from the back of the inflatable restraint steering wheel module, if applicable.
9. Remove the redundant steering wheel control lead(s) from the back of the inflatable restraint steering wheel module, if applicable.
10. Remove all horn buttons and steering wheel control buttons from the inflatable restraint steering wheel module, if applicable.



Caution: When you are carrying an undeployed inflator module:

- Do not carry the inflator module by the wires or connector on the inflator module
- Make sure the bag opening points away from you

When you are storing an undeployed inflator module, make sure the bag opening points away from the surface on which the inflator module rests. When you are storing a steering column, do not rest the column with the bag opening facing down and the column vertical. Provide free space for the air bag to expand in case of an accidental deployment. Otherwise, personal injury may result.

11. With the vinyl trim cover facing up and away from the surface, place the inflatable restraint steering wheel module on a work bench or other surface.
12. Place the inflatable restraint steering wheel module away from all loose or flammable objects.

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Object Number: 9428 Size: SH

13. Clear a space on the ground about 1.85 m (6 ft) in diameter where you intend to deploy the inflatable restraint steering wheel module. If possible, use a paved, outdoor location free of activity. Otherwise, use a space free of activity on the shop floor. Provide sufficient ventilation.
14. Clear all loose or flammable objects from the deployment area.
15. Place the inflatable restraint steering wheel module in the space just cleared, with its vinyl trim cover facing up.

Object Number: 9429 Size: SH

16. Extend the SIR deployment harness and the pigtail adapter to full length from the inflatable restraint steering wheel module.
17. Place a power source near the shorted end of the SIR deployment harness. Use a vehicle battery when available, but always use a power source that meets the following criteria:
    - 12 volts minimum
    - 2 amps minimum

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Object Number: 9430 Size: SH



Important: Firmly seat the pigtail adapter into the inflatable restraint steering wheel module connector. If you do not do this, the inflator module may not deploy.

18. Connect the inflatable restraint steering wheel module to the pigtail adapter on the SIR deployment harness.
    - The deployment harness shall remain shorted until you are ready to deploy the air bag.
    - Do not connect the SIR deployment harness to a power source until you are ready to deploy the air bag.
    - The inflator module will immediately deploy when you connect the power source.
19. Clear the area of all people and loose or flammable objects.
20. Place the inflatable restraint steering wheel module with the vinyl trim cover facing up.
21. Notify all people in the immediate area before you deploy the inflatable restraint steering wheel module for the following reasons:
    - An inflatable restraint steering wheel module deployment is very loud.
    - The deployment may startle any uninformed people in the area.

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Object Number: 39382 Size: SH



22. Separate the 2 banana plugs on the SIR deployment harness.

Object Number: 39388 Size: SH



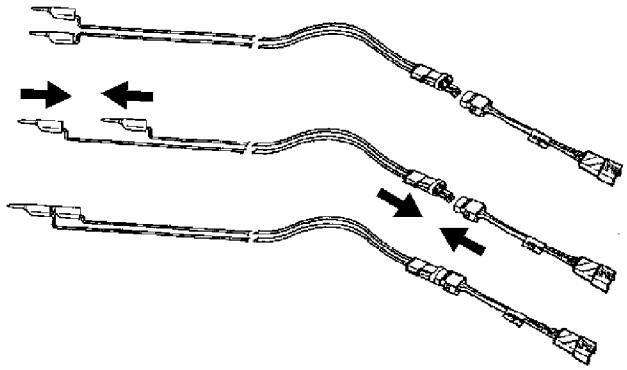
CAUTION: When you are deploying an inflator module for disposal, perform the deployment procedures in the order listed. Failure to follow the procedures in the order listed may result in personal injury.

Notice: When the air bag deploys, the inflatable restraint steering wheel module may jump about 30 cm (1 ft) vertically. This is a normal reaction of the inflatable restraint steering wheel module to the force of the rapid gas expansion inside the air bag.

Notice: The rapid gas expansion involved with deploying an air bag is very loud. Notify all people in the immediate area that you intend to deploy the inflator module.

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23. Connect the SIR deployment harness wires to the power source. This immediately deploys the inflatable restraint steering wheel module.
24. Use a vehicle battery when available, but always use a power source that complies to the following criteria:
    - 12 volts minimum
    - 2 amps minimum
25. Disconnect the SIR deployment harness from the power source.





26. Short the SIR deployment harness leads together by fully seating 1 banana plug into the other.
27. In the unlikely event that the inflatable restraint steering wheel module did not deploy after following these procedures, proceed immediately with Steps 33-36. If the inflatable restraint steering wheel module did deploy, proceed with Steps 28-32.

Object Number: 9433 Size: SH



28. Put on a pair of shop gloves in order to protect your hands from possible heat and irritation.

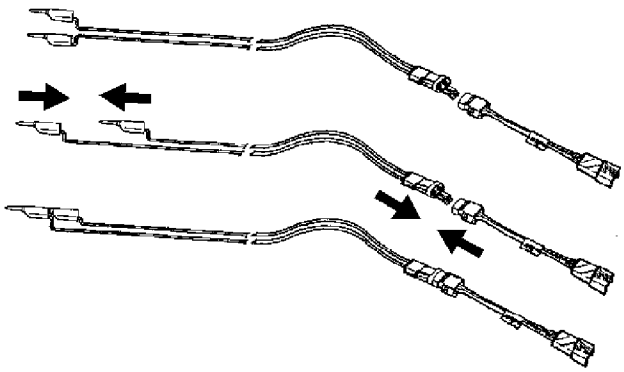
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when you handle the deployed inflatable restraint steering wheel module.

After the inflatable restraint steering wheel module has deployed, the surface of the air bag may contain a powdery residue. This powder consists primarily of cornstarch (used to lubricate the bag as it inflates), and by-products of the chemical reaction. The deployment reaction produces sodium hydroxide dust (similar to lye soap). The sodium hydroxide quickly reacts with the atmospheric moisture. This atmospheric moisture converts the sodium hydroxide into sodium carbonate and sodium bicarbonate (baking soda). Therefore, you will probably find no sodium hydroxide present after the deployment. Gloves and safety glasses are recommended. Gloves and safety glasses prevent possible irritation of the skin or eyes.

CAUTION: Immediately following the deployment of an air bag, the metal surfaces of the inflator module are very hot. Do not place the deployed inflator module near any flammable objects. Wait for about ten minutes before touching any metal surface of the inflator module. Disregarding these precautions may cause fire or personal injury.

29. The metal canister and the area surrounding the inflatable restraint steering wheel module are very hot. Do not touch the metal areas of the inflatable restraint steering wheel module for about 10 minutes after deployment. Use care if you must move the deployed inflatable restraint steering wheel module. Always wear gloves and handle the inflatable restraint steering wheel module by the air bag or by the vinyl trim.
30. Disconnect the pigtail adapter from the inflatable restraint steering wheel module as soon after the deployment as possible. This will prevent the hot inflatable restraint steering wheel module canister from damaging either the pigtail adapter or the SIR deployment harness. The pigtail adapter and the SIR deployment harness are reusable.
31. Inspect both the pigtail adapter and the SIR deployment harness for damage after each use. Replace the pigtail adapter or the SIR deployment harness, as necessary.
32. Allow the deployed inflatable restraint steering wheel module to cool for at least 10 minutes. Dispose of the deployed inflatable restraint steering wheel module through the normal refuse channels.
33. Wash your hands with a mild soap and water.



Notice: Follow the remaining steps in the unlikely event that the inflatable restraint steering wheel module did not deploy after following these procedures.

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34. Disconnect the SIR deployment harness from the power source. Confirm that you have shorted the 2 banana plugs together.
35. Disconnect the pigtail adapter from the inflatable restraint steering wheel module.

Caution: When you are carrying an undeployed inflator module:

- Do not carry the inflator module by the wires or connector on the inflator module
- Make sure the bag opening points away from you

When you are storing an undeployed inflator module, make sure the bag opening points away from the surface on which the inflator module rests. When you are storing a steering column, do not rest the column with the bag opening facing down and the column vertical. Provide free space for the air bag to expand in case of an accidental deployment. Otherwise, personal injury may result.

36. Temporarily store the inflatable restraint steering wheel module with the vinyl trim cover facing up.
37. Call the Technical Assistance group for further assistance.

Deployment Outside of the Vehicle (Inflatable Restraint IP Module)

Caution: In order to prevent accidental deployment of the air bag which could cause personal injury, do not dispose of an undeployed inflator module as normal shop waste. The undeployed inflator module contains substances that could cause severe illness or personal injury if the sealed container is damaged during disposal. Use the following deployment procedures to safely dispose of an undeployed inflator module. Failure to dispose of an inflator module as instructed may be a violation of federal, state, province, or local laws.

General Motors dealers should refer to the latest General Motors Service Bulletins for live (undeployed) inflatable restraint IP module scrapping and disposal procedures. All others should contact a local General Motors dealership for live inflatable restraint IP module scrapping and disposal procedures. Dispose of deployed inflatable restraint IP modules through normal refuse channels.

Deployment Inside Vehicle (Vehicle Scrapping Procedure)

Deploy the inflator modules inside of the vehicle when destroying the vehicle or when salvaging the vehicle for parts. This includes but is not limited to the following situations:

- The vehicle has completed its useful life.
- Irreparable damage occurs to the vehicle in a non-deployment type accident.
- Irreparable damage occurs to the vehicle during a theft.
- The vehicle is being salvaged for parts to be used on a vehicle with a different VIN as opposed to rebuilding as the same VIN.

CAUTION: When you are deploying an inflator module for disposal, perform the deployment procedures in the order listed. Failure to follow the procedures in the order listed may result in personal injury.

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Object Number: 39392 Size: SH

1. Turn the ignition switch to the OFF position.
2. Remove the ignition key.
3. Put on safety glasses.
4. Remove all loose objects from the front seats.
5. Disconnect the inflatable restraint steering wheel module yellow 2-way connector.
6. Cut the yellow 2-way harness connector out of the vehicle, leaving at least 16 cm (6 in) of wire at the connector.
7. Strip 13 mm (0.5 in) of insulation from each of the connector wire leads.

Object Number: 39390 Size: SH

8. Cut 2 4.6 m (15 ft) deployment wires from a 0.8 mm^2 (18 gauge) or thicker multi-strand wire. Use these wires in order to fabricate the driver deployment harness.
9. Strip 13 mm (0.5 in) of insulation from both ends of the wires cut in the previous step.
10. Twist together 1 end from each of the wires in order to short the wires. Deployment wires shall remain shorted, and not connected to a power source until you are ready to deploy the air bag.

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Object Number: 39393 Size: SH



11. Twist together 1 connector wire lead to one deployment wire.
12. Verify that the previous connection is secure.

Object Number: 39408 Size: SH



13. Bend flat the twisted connection.
14. Secure and insulate the connection using electrical tape.

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Object Number: 39414 Size: SH

15. Twist together, bend, and tape the remaining connector wire lead to the remaining deployment wire.
16. Connect the deployment harness to the inflatable restraint steering wheel module yellow 2-way connector.

Object Number: 188200 Size: SH

17. Route the deployment harness out of the vehicle's driver side.

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Object Number: 68649 Size: SH

18. Disconnect the inflatable restraint IP module yellow 2-way harness connector.
19. Cut the harness connector out of the vehicle, leaving at least 16 cm (6 in) of wire at the connector.
20. Strip 13 mm (0.5 in) of insulation from each of the connector wire leads.

Object Number: 68651 Size: SH

21. Cut 2 6.1 m (20 ft) deployment wires from a 0.8 mm^2 (18 gauge) or thicker multi-strand wire. These wires will be used to fabricate the passenger deployment harness.
22. Strip 13 mm (0.5 in) of insulation from both ends of the wires cut in the previous step.
23. Twist together 1 end from each of the wires in order to short the wires.

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Object Number: 68652 Size: SH



24. Twist together 1 connector wire lead to 1 deployment wire.

Object Number: 68660 Size: SH



25. Bend flat the twisted connection.
26. Secure and insulate the connection using electrical tape.

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Object Number: 68662 Size: SH



27. Twist together, bend, and tape the remaining connector wire lead to the remaining deployment wire.
28. Connect the deployment harness to the inflatable restraint IP module yellow 2-way connector.

Object Number: 188211 Size: SH



29. Route the deployment harness out of the passenger side of the vehicle.
30. Clear the inside and outside of the vehicle of any people or loose and flammable objects.
31. Stretch the driver harness to full length.
32. Stretch the passenger harness to full length.
33. Completely cover the windshield and front door window openings with a drop cloth.

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Object Number: 188218 Size: SH

34. Place a power source, 12 volt minimum/2 amp minimum (vehicle battery) near the shorted end of the harness.
35. Separate the 2 ends of the driver deployment harness wires.
36. Connect the driver deployment harness wires to the power source in order to deploy the inflatable restraint steering wheel module.
37. Disconnect the driver deployment harness wires from the power source.

Object Number: 188228 Size: SH

38. Separate the 2 ends of the passenger deployment harness wires.
39. Connect the passenger deployment harness wires to the power source in order to deploy the inflatable restraint IP module.
40. Disconnect the passenger deployment harness wires from the power source.

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Object Number: 188200 Size: SH

41. Twist together 1 end of each wire on the driver deployment harness in order to short the wires.

Object Number: 188211 Size: SH

42. Twist together 1 end of each wire on the passenger deployment harness in order to short the wires.
43. Remove the drop cloth from the vehicle.
44. Disconnect both harnesses from the vehicle.
45. Discard the harnesses.
46. Scrap the vehicle in the same manner as a non-SIR equipped vehicle.
    - 46.1. Remove the undeployed module(s) from the vehicle. Refer to Inflatable Restraint Steering Wheel Module Replacement and Inflatable Restraint Instrument Panel Module Replacement .
    - 46.2. Temporarily store the module(s).
    - 46.3. Call the Technical Assistance Group for further assistance.

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Handling a Deployed Inflator Module

Object Number: 9433 Size: SH



After the inflator module has deployed, the surface of the air bag may contain a powdery residue. this powder consists primarily of cornstarch (used to lubricate the bag as it inflates), and by-products of the chemical reaction. The deployment reaction produces sodium hydroxide dust (similar to lye soap). The sodium hydroxide quickly reacts with the atmospheric moisture. This atmospheric moisture converts the sodium hydroxide into sodium carbonate and sodium bicarbonate (baking soda). Therefore, you will probably find no sodium hydroxide present after the deployment. Gloves and safety glasses are recommended. Gloves and safety glasses prevent possible irritation of the skin or eyes.

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Fastener Tightening Specifications (Unit Repair)

Fastener Tightening Specifications

Part Number	Description of Use	Qty	Thread Size	Specifications	
				Metric	English
5	Bolt, Case Extension	4	M10 x 1.5 x 35.0	35.5 N·m	26.0 lb ft
9	Bolt, Speed Sensor	1	M8 x 1.25 x 12.0	11.0 N·m	97.5 lb in
12	Bolt, FWD Servo Cover	3	M6 x 1.0 x 20.0	10.0 N·m	88.5 lb in
23	Bolt, Oil Pan	20	M6 x 1.0 x 17.0	11.5 N·m	95.0 lb in
28	Ball Check Assembly, Cooler	1	3/8-18	52.0 N·m	38.5 lb ft
29	Connector--Cooler (Inverted Flared Tube)	1	1/4-18	38.0 N·m	28.0 lb ft
30	Bolt, Modulator	1	M8 x 1.25 x 20.0	23.5 N·m	17.3 lb ft
38	Plug, Pipe--(Line Pressure)	2	1/8-27	10.5 N·m	93.0 lb in
50	Nut, Case Side Cover (Flanged Hex)	6	M6 x 1.0	8.0 N·m	71.2 lb in
52	Screw and Conical Washer Assembly	17	M8 x 1.25 x 21.3	11.0 N·m	97.5 lb in
56	Bolt, Metric Hex (Structural Side Cover)	11	M8 x 1.25 x 25.0	23.5 N·m	17.3 lb ft
57	Bolt, Torx® Head (Structural Side Cover)	4	M8 x 1.25 x 21.0	23.5 N·m	17.3 lb ft
58	Stud, Structural Side Cover to Case	2	M8 x 1.25 x 25.0	23.5 N·m	17.3 lb ft
103	Bolt, 2-1 Manual Servo Cover	3	M8 x 1.25 x 25.0	23.5 N·m	17.3 lb ft
131	Bolt, Hex Flange (Accumulator Cover and Housing)	11	M6 x 1.0 x 28.0	11.0 N·m	97.5 lb in
204	Bolt, Pump Cover to Valve Body	1	M6 x 1.0 x 45.0	11.0 N·m	97.5 lb in
205	Bolt, Pump Cover to Pump Body	1	M8 x 1.25 x 20.0	23.5 N·m	17.3 lb ft
206	Bolt, Pump Body to Case	2	M8 x 1.25 x 95.0	23.5 N·m	17.3 lb ft
207	Bolt, Pump Cover to Channel Plate	9	M6 x 1.0 x 85.0	11.0 N·m	97.5 lb in
375	Bolt, Valve Body to Case	3	M8 x 1.25 x 70.0	23.5 N·m	17.3 lb ft
376	Bolt, Valve Body to Channel Plate	1	M6 x 1.0 x 35.0	11.0 N·m	97.5 lb in

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377	Bolt, Valve Body to Channel Plate (Torx®)	2	M6 x 1.0 x 45.0	12.0 N·m	9.0 lb ft
378	Bolt, Valve Body to Channel Plate	6	M6 x 1.0 x 55.0	11.0 N·m	97.5 lb in
379	Bolt, Special, Valve Body to Case	1	M8 x 1.25 x 85.0	23.5 N·m	17.3 lb ft
380	Bolt, Valve Body to Case	1	M8 x 1.25 x 90.0	23.5 N·m	17.3 lb ft
434	Bolt, Channel Plate to Case	6	M8 x 1.25 x 45.0	23.5 N·m	17.3 lb ft
436	Bolt, Channel Plate to Case	4	M8 x 1.25 x 30.0	23.5 N·m	17.3 lb ft
450	Temperature Sensor	1	1/8-27	7.0 N·m	62.0 lb in
524	Screw, Case to Drive Sprocket Support	4	M8 x 1.25 x 23.5	23.5 N·m	17.3 lb ft
803	Nut, Manual Shaft to Detent Lever	1	M10 x 1.5	31.5 N·m	23.2 lb ft
805	Bolt, Special, Manual Detent Sprig to Channel Plate	1	M6 x 1.0 x 16.0	11.0 N·m	97.5 lb in

Range Reference

Range Reference Chart

Range	Park	Reverse	Neutral	OD				D			2		1
Gear				1st	2nd	3rd	4th	1st	2nd	3rd	1st	2nd	1st
1-2 Shift Solenoid	ON	ON	ON	ON	OFF	OFF	ON	@ ON	@ OFF	@ OFF	@ ON	@ OFF	@ON
2-3 Shift Solenoid	ON	ON	ON	ON	ON	OFF	OFF	@ ON	@ ON	@ OFF	@ ON	@ ON	@ON
4th Clutch	--	--	--	--	--	--	A	--	--	--	--	--	
Reverse Band	--	A	--	--	--	--	--	--	--	--	--	--	
2nd Clutch	--	--	--	--	A	A	A	--	A	A	--	A	--
3rd Clutch	--	--	--	--	--	A	*	--	--	A	--	--	A
3rd Sprag Clutch	--	--	--	--	--	H	O	--	--	H	--	--	H
Input Clutch	*	A	*	A	*	--	--	A	*	A	A	*	A
Input Sprag Clutch	*	H	*	H	O	--	--	H	O	H	H	O	H
2/1 Band	--	--	--	--	--	--	--	--	--	--	A	A	A
1/2 Support Roller Clutch	--	--	--	H	H	O	O	H	H	O	H	H	H
Forward Band	--	--	--	A	A	A	A	A	A	A	A	A	A

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

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Shift Speed

Hydra-Matic 4T60-E Shift Speed Chart

Transmission Model	6BSW	6CUW
Vehicle Series	N	N
Engine Displacement	3.1L	2.4L
Engine RPO Code	L82	LD9
Engine VIN Code	M	T
Overall Axle Ratio	2.93	3.42
Final Drive Ratio	3.29	3.05
Drive/Driven Sprocket Teeth	37/33	33/37
Minimum Throttle 1-2 Upshift	9	9
Wide Open Throttle 1-2 Upshift	43	42
Minimum Throttle 2-3 Upshift	20	16
Wide Open Throttle 2-3 Upshift	82	80
Minimum Throttle 3-4 Upshift	32	23
Wide Open Throttle 3-4 Upshift	N/A	102
Minimum TCC Apply - Third Gear	45	33
Minimum TCC Apply - Fourth Gear	48	44
N/V Ratio - Third Gear/TCC On	46	48
N/V Ratio - Fourth Gear/TCC On	32	34

- N/V Ratio = Engine RPM to Vehicle Speed Ratio
- N/A = Not Available
- Speeds are indicated in Miles Per Hour (MPH). MPH = Km/h x 1.609

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Temperature Versus Resistance

Temperature vs Resistance

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

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End Play Specifications

Thrust Washer Selection Guide

ID Number	Dimension (mm)	Dimension (in)	Color
1	2.90-3.00	0.114-0.118	Orange/Green
2	3.05-3.15	0.120-0.124	Orange/Black
3	3.20-3.30	0.126-0.130	Orange
4	3.35-3.45	0.132-0.136	White
5	3.50-3.60	0.138-0.142	Blue
6	3.65-3.75	0.144-0.148	Pink
7	3.80-3.90	0.150-0.154	Brown
8	3.95-4.05	0.156-0.159	Green
9	4.10-4.20	0.161-0.165	Black
10	4.25-4.35	0.167-0.171	Purple
11	4.40-4.50	0.173-0.177	Purple/White
12	4.55-4.65	0.179-0.183	Purple/Blue
13	4.70-4.80	0.185-0.189	Purple/Pink
14	4.85-4.95	0.191-0.195	Purple/Brown
15	5.00-5.10	0.197-0.200	Purple/Green

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Oil Pump Specifications

Oil Pump Specifications (4T60-E)

Thickness (mm)	Thickness (in)
Rotor Selection	
17.953-17.963	0.7068-0.7072
17.963-17.973	0.7072-0.7076
17.973-17.983	0.7076-0.7080
Slide Selection	
17.983-17.993	0.7080-0.7084
17.993-18.003	0.7084-0.7088
18.003-18.013	0.7088-0.7092
Vane Selection	
17.943-17.961	0.7064-0.7071
17.961-17.979	0.7071-0.7078
17.979-17.997	0.7078-0.7085

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Fluid Capacity Specifications

	Liters	Quarts
(approximate)		
Bottom Pan Removal	7.0	7.4
Complete Overhaul	9.5	10.0
Dry	12.7	13.4

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Line Pressure

Hydra-matic 4T60-E Transmission

	Range	Models	kPa	psi
Minimum Line Pressure: 1250 RPM 61 kPa (18" Hg) Vacuum	D4, D3, D2	BSW, CUW	512-596	74-86
--	D1	BSW, CUW	921-1333	134-193
--	P, R, N	BSW, CUW	460-696	67-101
Full Line Pressure: 1250 RPM 0 kPa (0" Hg) Vacuum	D4, D3, D2	BSW, CUW	1148-1400	166-203
--	D1	BSW, CUW	921-1333	134-193
--	P, R, N	BSW, CUW	1540-1898	223-275

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Model Build Information

Table A					
Transmission Model	**6ACW**	**6AFW**	**6ASW**	**6HBW**	**6BSW**
Vehicle Series	C,H	W	C,H	W	N
Engine Displacement	3.8l	3.1L	3.8L	3.8L	3.1L
Engine RPO Code	L36	L82	L36	L36	L82
Engine VIN Code	K	M	K	K	M
Overall Axle Ratio	3.06	3.33	2.84	3.06	2.93
Final Drive Ratio	3.06	3.33	2.84	3.06	3.29
Drive/Driven Sprocket Teeth	35/35	35/35	35/35	35/35	37/33
VSS Rotor Teeth	30	30	30	30	30
Final Drive Assembly	STD	STD	STD	STD	FP
Output Shaft	STD	STD	STD	STD	STD
Torque Converter K-factor	163	180	122	163	140
Converter Clutch	TCC	TCC	TCC	TCC	TCC
Case Side Cover Pan	STEEL	SSC	STEEL	SSC	SSC
SSC Mount Bolt Pattern	N/A	4 BOLT	N/A	4 BOLT	6 BOLT
Transmission Vent Assembly	CAP	CAP	CAP	CAP	TUBE
Temperature Sensor	391	391	391	391	391
1-2 Accumulator Valve (Primary)	STD	INVERT	STD	STD	STD
1-2 Accumulator Piston	136B	136C	136B	136B	136A
1-2 Accumulator Spring(s)	139A,D	139A,C	139A,D	139A,D	139A
2-3 Accumulator Piston	136A	136A	136A	136A	136A
2-3 Accumulator Spring(s)	138A,B	138A,B	138A,B	138A,B	138A,B
3-4 Accumulator Spring(s)	423,4,5	423,4	423,4,5	423,4,5	423,4

Notes:

- FP = Fine Pitch
- HD = Heavy Duty
- N/A = Not Available
- SSC = Case Aluminum Structural Side Cover Pan
- STD = Standard
- STEEL = Stamped Steel Side Cover Pan
- VSS = Vehicle Speed Sensor
- K-factor = Torque converter numeric rating (combines stall speed and torque multiplication ratings)

This chart does not identify all unique build items and this chart may be subject to change.

Table B					
Transmission Model	**6BXW**	**6CAW**	**6CTW**	**6CUW**	**6PAW**

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Vehicle Series	H	G	G	N	A
Engine Displacement	3.8L	3.8L	3.8L	2.4L	3.1L
Engine RPO Code	L36	L36	L67	LD9	L82
Engine VIN Code	K	K	1	T	M
Overall Axle Ratio	3.06	3.05	2.93	3.42	2.97
Final Drive Ratio	3.06	3.05	3.29	3.05	3.33
Drive/Driven Sprocket Teeth	35/35	35/35	37/33	33/37	37/33
VSS Rotor Teeth	30	30	30	30	30
Final Drive Assembly	STD	FP	FP,HD	FP	STD
Output Shaft	STD	STD	LONG	STD	STD
Torque Converter K-factor	163	163	163	203	140
Converter Clutch	TCC	TCC	TCC	TCC	TCC
Case Side Cover Pan	STEEL	SSC	SSC	SSC	STEEL
SSC Mount Bolt Pattern	N/A	6 BOLT	6 BOLT	6 BOLT	N/A
Transmission Vent Assembly	CAP	CAP	CAP	TUBE	CAP
Temperature Sensor	391	391	450	N/A	391
1-2 Accumulator Valve (Primary)	STD	STD	STD	STD	STD
1-2 Accumulator Piston	136B	136B	136A	136A	136B
1-2 Accumulator Spring(s)	139A,D	139A,D	139A	139A	139A,D
2-3 Accumulator Piston	136A	136A	136A	136A	136A
2-3 Accumulator Spring(s)	138A,B	138A,B	138A,B	138A,B	138A,B
3-4 Accumulator Spring(s)	423,4,5	423,4,5	423,4	423,4	423,4

Notes:

- FP = Fine Pitch
- HD = Heavy Duty
- N/A = Not Available
- SSC = Case Aluminum Structural Side Cover Pan
- STD = Standard
- STEEL = Stamped Steel Side Cover Pan
- VSS = Vehicle Speed Sensor
- K-factor = Torque converter numeric rating (combines stall speed and torque multiplication ratings)

This chart does not identify all unique build items and this chart may be subject to change.

Table C

Transmission Model	6PBW	6PKW	6WFW	6YLW	6YRW
Vehicle Series	W	U	L	C,H	H
Engine Displacement	3.4L	3.4L	3.1L	3.8L	3.8L
Engine RPO Code	LQ1	LA1	L82	L67	L67
Engine VIN Code	X	E	M	1	1
Overall Axle Ratio	3.43	3.29	2.93	2.93	2.93
Final Drive Ratio	3.06	3.29	3.29	3.29	3.29

Drive/Driven Sprocket Teeth	33/37	35/35	37/33	37/33	37/33
VSS Rotor Teeth	30	30	30	30	30
Final Drive Assembly	STD	FP	FP	FP,HD	FP,HD
Output Shaft	STD	STD	STD	LONG	LONG
Torque Converter K-factor	177	163	140	163	163
Converter Clutch	ECCC	TCC	TCC	TCC	TCC
Case Side Cover Pan	SSC	STEEL	SSC	STEEL	STEEL
SSC Mount Bolt Pattern	4 BOLT	4 BOLT	6 BOLT	N/A	N/A
Transmission Vent Assembly	CAP	CAP	TUBE	CAP	CAP
Temperature Sensor	391	391	391	450	450
1-2 Accumulator Valve (Primary)	STD	STD	STD	STD	STD
1-2 Accumulator Piston	136B	136A	136A	136A	136A
1-2 Accumulator Spring(s)	139A,D	139A	139A	139A	139A
2-3 Accumulator Piston	136A	136A	136A	136A	136A
2-3 Accumulator Spring(s)	138A,B	138A,B	138A,B	138A,B	138A,B
3-4 Accumulator Spring(s)	423,4	423,4	423,4	423,4	423,4

Notes:

- FP = Fine Pitch
- HD = Heavy Duty
- N/A = Not Available
- SSC = Case Aluminum Structural Side Cover Pan
- STD = Standard
- STEEL = Stamped Steel Side Cover Pan
- VSS = Vehicle Speed Sensor
- K-factor = Torque converter numeric rating (combines stall speed and torque multiplication ratings)

This chart does not identify all unique build items and this chart may be subject to change.

Component Resistance (VIN M)

Component Resistance Chart

Cavities	Component	Resistance @ 20° C (68°F)	Resistance @ 88° C (190°F)
A-E	1-2 Shift Solenoid valve	19-24ohms	24-31ohms
B-E	2-3 Shift Solenoid valve	19-24ohms	24-31ohms
C-E	Torque Converter Clutch (TCC) Pulse Width Modulation (PWM) Solenoid valve	10-12ohms	13-15ohms
D-E	Torque Converter Clutch (TCC) Solenoid valve	19-24ohms	24-31ohms
F-G	Automatic Transmission Fluid Temperature (TFT) Sensor	varies with temperature	
When components are at temperatures other than 20°C (68°F)			

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Component Resistance (VIN T)

Note: This diagnostic procedure is written for all components at 20°C (68°F).

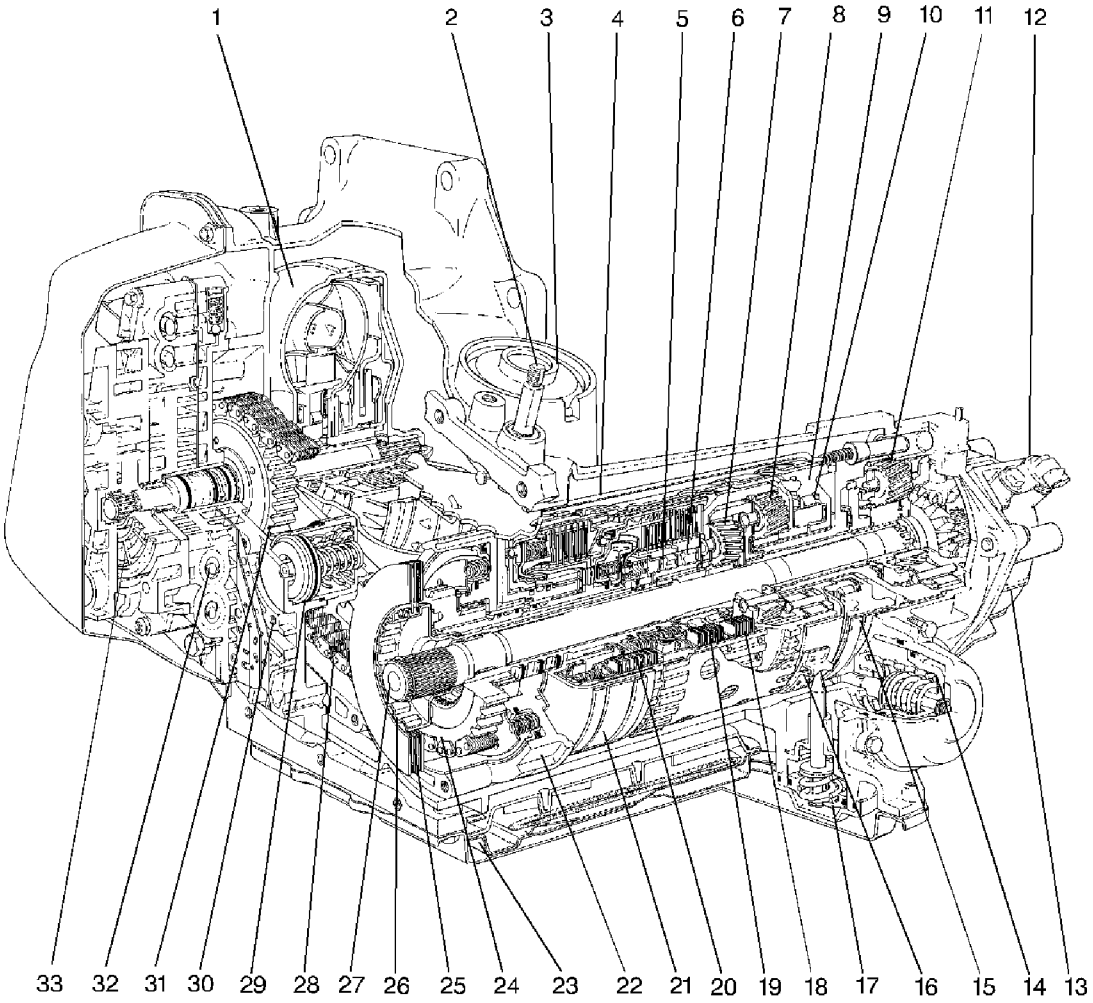
The accompanying component resistance chart may be helpful when components are at temperatures other than 20°C (68°F).

Component Resistance Chart

Cavities	Component	Resistance @ 20° C (68°F)	Resistance @ 88° C (190°F)
A-E	1-2 Shift Solenoid valve	19-24ohms	24-31ohms
B-E	2-3 Shift Solenoid valve	19-24ohms	24-31ohms
C-E	Torque Converter Clutch (TCC) Pulse Width Modulation (PWM) Solenoid valve	10-12ohms	13-15ohms
D-E	Torque Converter Clutch (TCC) Solenoid valve	19-24ohms	24-31ohms

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Transmission Major Component Locations

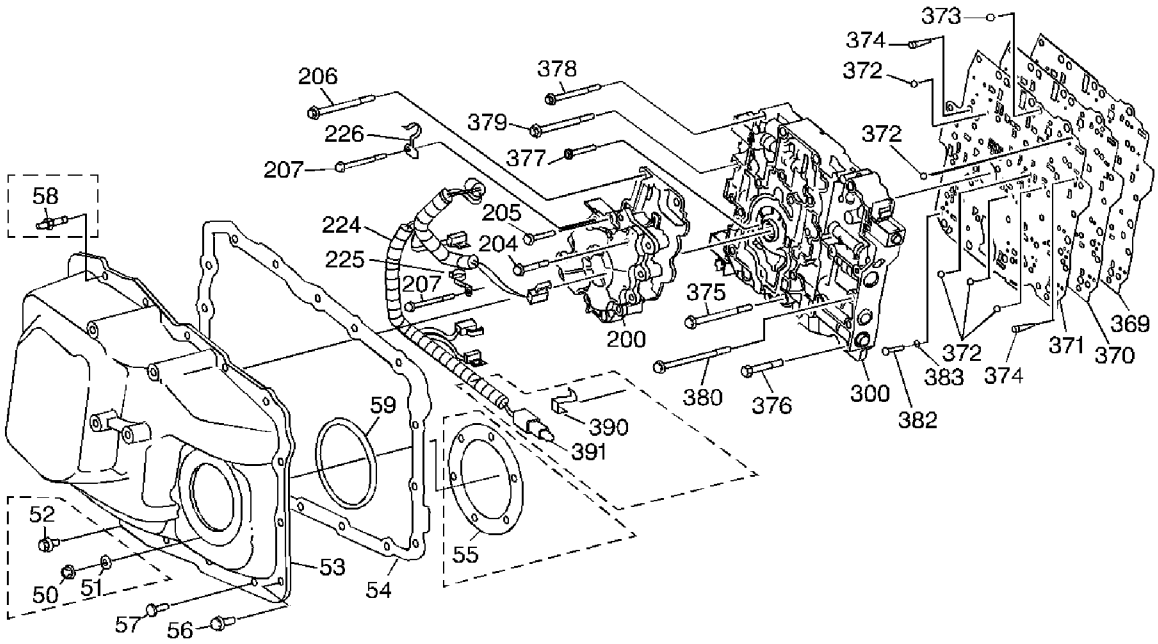


(1) Torque Converter Assembly
(2) Manual Shaft
(3) Reverse Servo Assembly
(4) Parking Lock Actuator
(5) 3rd Sprag Clutch Assembly
(6) Input Sprag Clutch Assembly
(7) Input Carrier Assembly
(8) Reaction Carrier Assembly
(9) 1-2 Support Assembly
(10) 1-2 Support Roller Clutch Assembly
(11) Final Drive Differential Assembly

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(12) Speed Sensor
(13) Case Extension
(14) Forward Servo Assembly
(15) Forward Band Assembly
(16) 2-1 Band Assembly
(17) 2-1 Manual Servo Assembly
(18) Input Clutch Assembly
(19) 3rd Clutch Assembly
(20) 2nd Clutch Assembly
(21) Reverse Band Assembly
(22) Driven Sprocket Support
(23) Filter Assembly
(24) Driven Sprocket
(25) 4th Clutch Assembly
(26) 4th Clutch Hub and Shaft Assembly
(27) Output Shaft
(28) Drive Link Assembly
(29) 3-4 Accumulator Assembly
(30) Channel Plate Assembly
(31) Drive Sprocket
(32) Control Valve Body Assembly
(33) Pump Assembly

Case and Associated Parts (1 of 4)

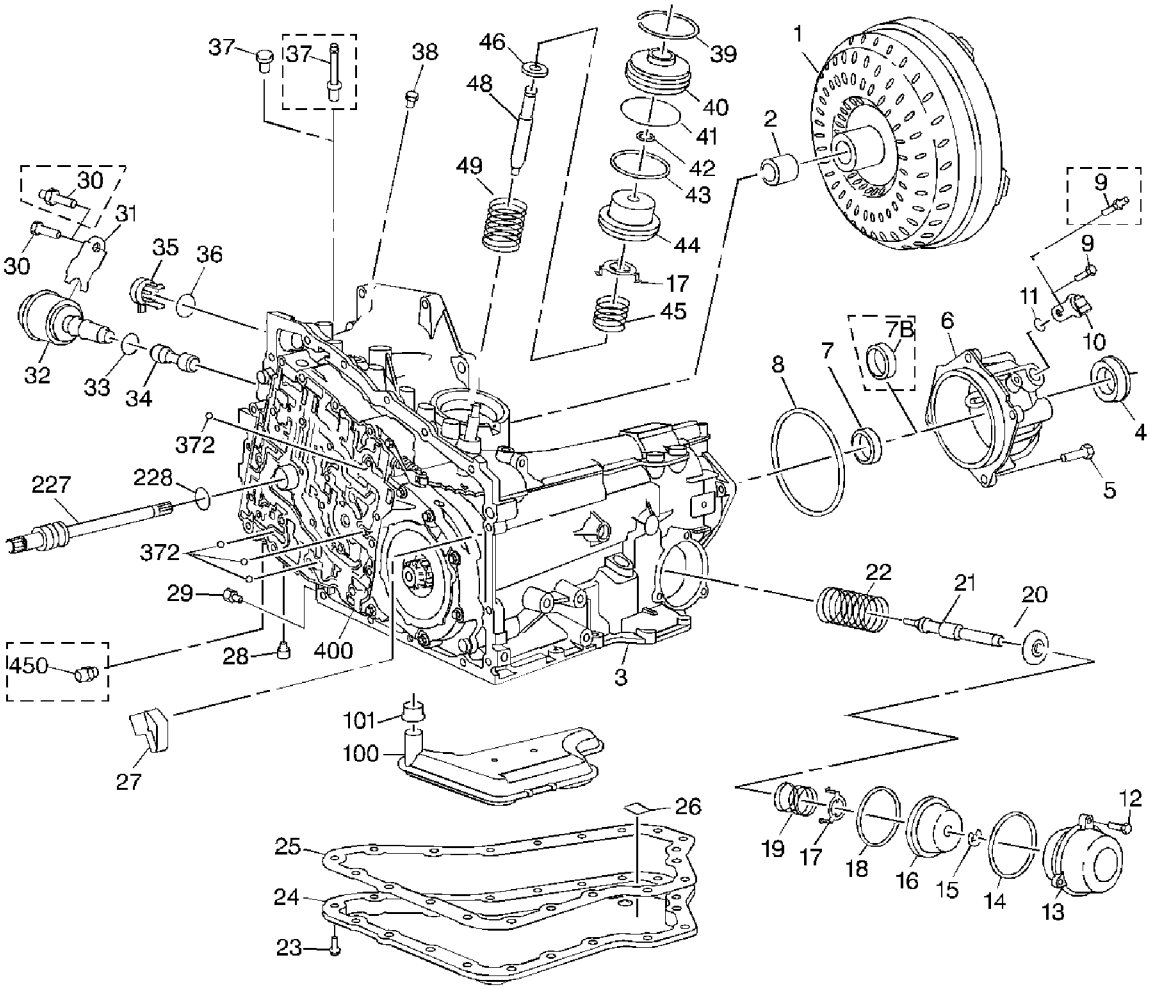


(50) Case Side Cover Nut M6 1.0 (6)
(51) Conical Washer (6)
(52) Screw and Conical Washer Assembly--Side Cover M8 X 1.25 X 21.3 (17)
(53) Case Side Cover Pan
(54) Case Side Cover Gasket
(55) Inner Case Side Cover Gasket
(56) Structural Side Cover Metric Hex Bolt (11)
(57) Structural Side Cover Torx Head Bolt (4)
(58) Structural Side Cover to Case Stud (2)
(59) Structural Side Cover to Channel Plate Seal
(200) Oil Pump Complete Body Assembly
(204) Pump Cover to Valve Body Bolt M6 X 1.0 X 45.0 (1)
(205) Pump Cover to Pump Body Bolt M8 X 1.25 X 20.0 (1)
(206) Pump Body to Case Bolt M8 X 1.25 X 95.0 (2)
(207) Pump Cover to Channel Plate Bolt M6 X 1.0 X 85.0 (10)
(207) Pump Cover to Channel Plate Bolt M6 X 1.0 X 85.0 (10)
(224) Wiring Harness Assembly
(225) Conduit Clip

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(226) Conduit Clip
(300) Control Valve Body Assembly
(369) Channel Plate/Spacer Plate Gasket
(370) Valve Body Spacer Plate Assembly
(371) Valve Body to Spacer Plate Assembly
(372) 0.25 Diameter Ball
(372) 0.25 Diameter Ball
(372) 0.25 Diameter Ball
(373) Ball
(374) Filter
(374) Filter
(375) Valve Body to Case Bolt M8 X 1.25 X 70.0 (3)
(376) Valve Body to Case Bolt M6 X 1.0 X 35.0 (1)
(377) Valve Body to Channel Plate Bolt M6 X 1.0 X 45.0 (2)
(378) Valve Body to Channel Plate Bolt M6 X 1.0 X 55.0 (6)
(379) Special Valve Body to Case Bolt M8 X 1.25 X 85.0 (1)
(380) Valve Body to Case Bolt M8 X 1.25 X 90.0 (2)
(382) Converter Clutch Assembly Screen Assembly
(383) Seal, TCC Screen (O-Ring)
(390) Temperature Sensor Clip
(391) Temperature Sensor

Case and Associated Parts (2 of 4)



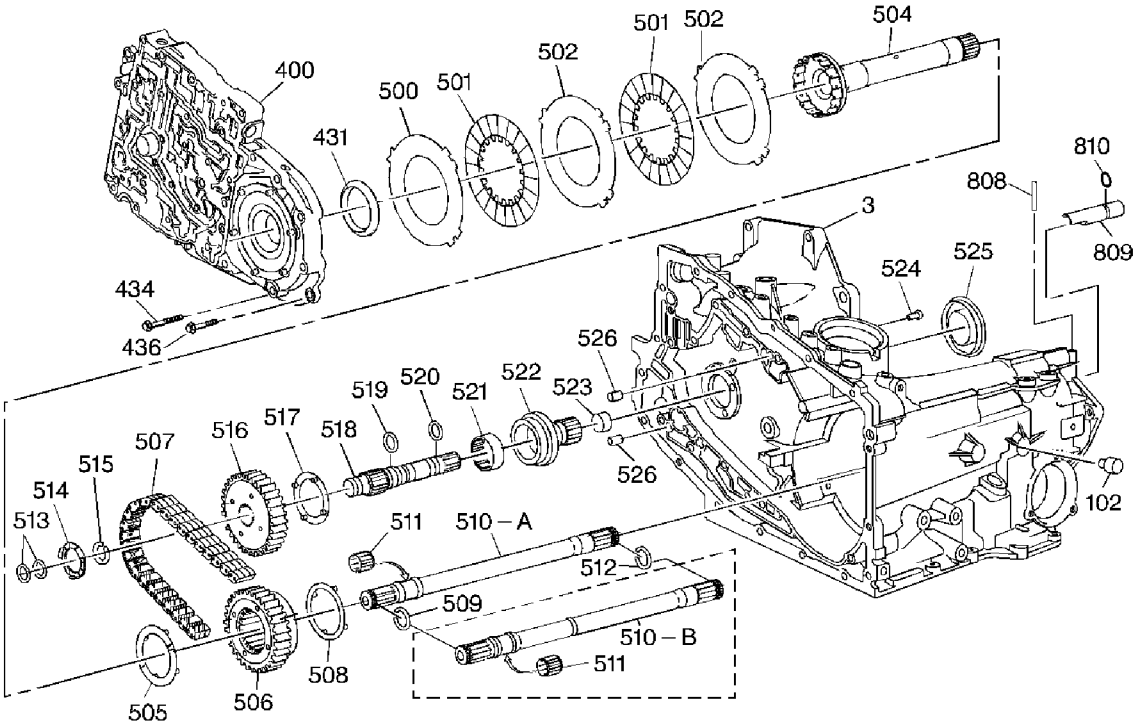
(1) Complete Converter Assembly
(2) Converter Pump Bushing
(3) Transmission Case
(4) Axle Oil Seal Assembly
(5) Case Extension Bolt M10 X 1.5 X 35.0
(6) Case Extension
(7) Differential to Case Bushing
(7b) Differential to Case Bearing (Heavy Duty)
(8) Extension to Case seal
(9) Speed Sensor Bolt M8 X 1.25 X 12.0
(9) Speed Sensor Bolt M8 X 1.25 X 12.0

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(10) Complete Speed Sensor Assembly
(11) O-Ring Speed Sensor Seal
(12) FWD Servo Cover Bolt M6 X 1.0 X 20.0
(13) Forward servo Cover
(14) O-Ring Seal (Servo Cover)
(15) Internal Retaining Ring
(16) Servo Forward Piston
(17) Servo Spring Retainer (1st and 2nd)
(17) Servo Spring Retainer (1st and 2nd)
(18) Oil Seal Piston
(19) Forward Servo Cushion Spring
(20) Servo Cushion Spring Retainer
(21) Forward Band Apply Pin
(22) Servo Return Spring
(23) Special Transmission Oil Pan M8 X 1.25 X 18.0
(24) Transmission Oil Pan
(25) Transmission Oil Pan Gasket
(26) Chip Collector Magnet
(27) Oil Reservoir Weir
(28) Check Assembly Cooler Ball 3/8-18
(29) Cooler line Connector (Inverter Flared Tube 1/4-18
(30) Modulator Bolt M8 X 1.25 X 20.0
(30) Modulator Bolt M8 X 1.25 X 20.0
(31) Modulator retainer
(32) Transmission Modulator Assembly
(33) O-Ring Seal
(34) Modulator Valve
(35) Electrical Connector (7 Way)
(36) O-Ring Seal
(37) Transmission Vent Assembly
(37) Transmission Vent Assembly
(38) Pipe Plug 1/8 27
(39) Servo Cover Retaining Ring
(40) Servo Cover
(41) O-Ring Seal (Servo Cover)
(42) Internal Retaining Ring
(43) Oil Seal Piston Ring
(44) Servo reverse Piston
(45) Reverse Servo Cushion Spring
(46) Servo Cushion Spring Retainer
(48) Reverse Apply Pin
(49) Servo Return Spring
(100) Transmission Oil Filter Assembly
(101) Filter Neck To case seal Assembly
(227) Oil Pump Drive Shaft Assembly

(228) Oil seal Pump Shaft Ring
(372) Ball 0.25 Dia.
(372) Ball 0.25 Dia.
(400) Complete Channel Plate Assembly
(450) Temperature Sensor

Case and Associated Parts (3 of 4)

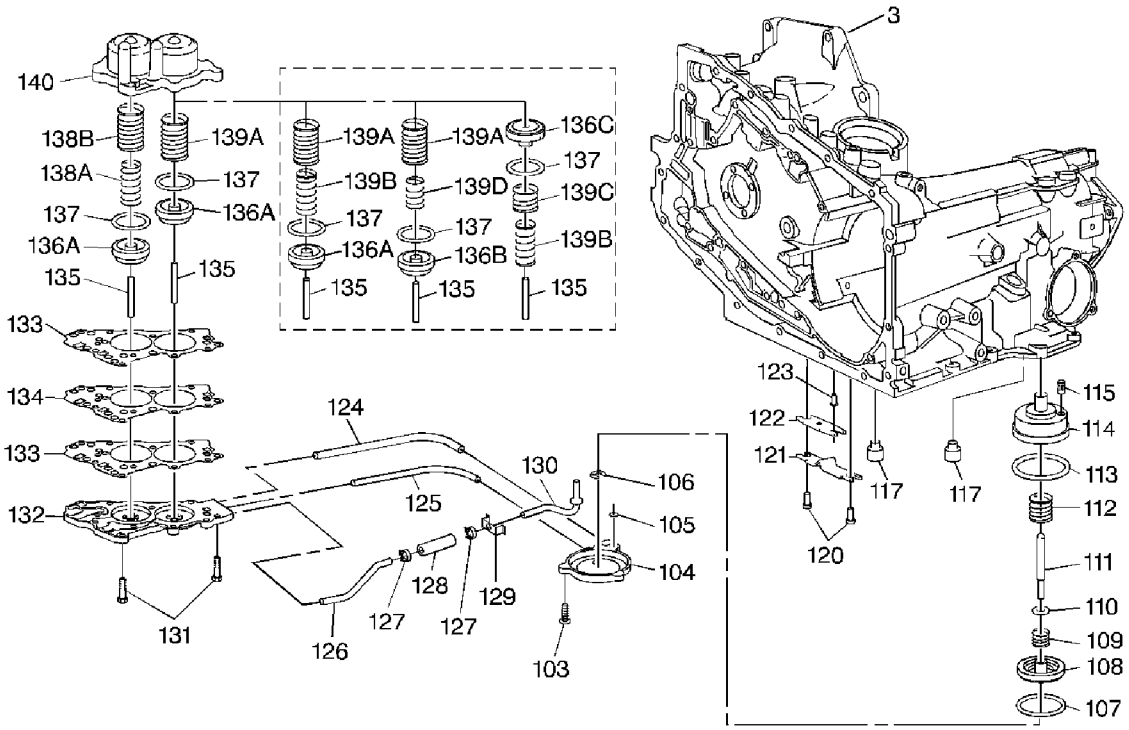


(3) Transmission Case
(102) Band Anchor Pin
(400) Complete Channel Plate Assembly
(431) Channel Plate 4th Clutch Hub and Bearing Assembly
(434) Channel Plate to Case Bolt M8 X 1.25 mm X 45.0 mm
(436) Channel Plate to Case Bolt M8 X 1.25 mm X 30.0 mm
(500) 4th Clutch Backing Plate
(501) 4th Clutch Plate Assembly
(501) 4th Clutch Plate Assembly
(502) 4th Clutch Apply Plate
(502) 4th Clutch Apply Plate
(504) 4th Clutch Hub and Shaft Assembly
(505) Thrust Washer (4th Clutch Hub to Driven Sprocket)
(506) Driven Sprocket
(507) Drive Link Assembly
(508) Thrust Washer (Driven and 2nd Clutch Drum)
(509) Output Shaft/Drive Axle Ring
(510a) Output Shaft (Standard)

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(510b) Output Shaft (Heavy Duty)
(511) 4th Clutch/Output Shaft Bearing
(511) 4th Clutch/Output Shaft Bearing
(512) Inboard Output Shaft Differential Ring
(513) Oil Seal Ring (Turbine Shaft/Sleeve)
(514) Thrust Washer (Drive Sprocket/Channel Plate)
(515) Turbine Shaft to Drive Sprocket Ring (Snap)
(516) Drive Sprocket
(517) Thrust Washer (Drive Sprocket/Support)
(518) Turbine Shaft
(519) Oil Seal Ring
(520) O-Ring Seal
(521) Drive Support/Sprocket Bearing Assembly
(522) Drive Sprocket Support
(523) Drive Sprocket Support Bushing
(524) Drive Sprocket Support Screw M8 X 1.25 mm X 23.5 mm
(525) Converter Oil Helix Seal Assembly
(526) Pin, Dowel
(526) Pin, Dowel
(808) Guide Retaining Pin
(809) Actuator Guide
(810) O-Ring Seal

Case and Associated Parts (4 of 4)

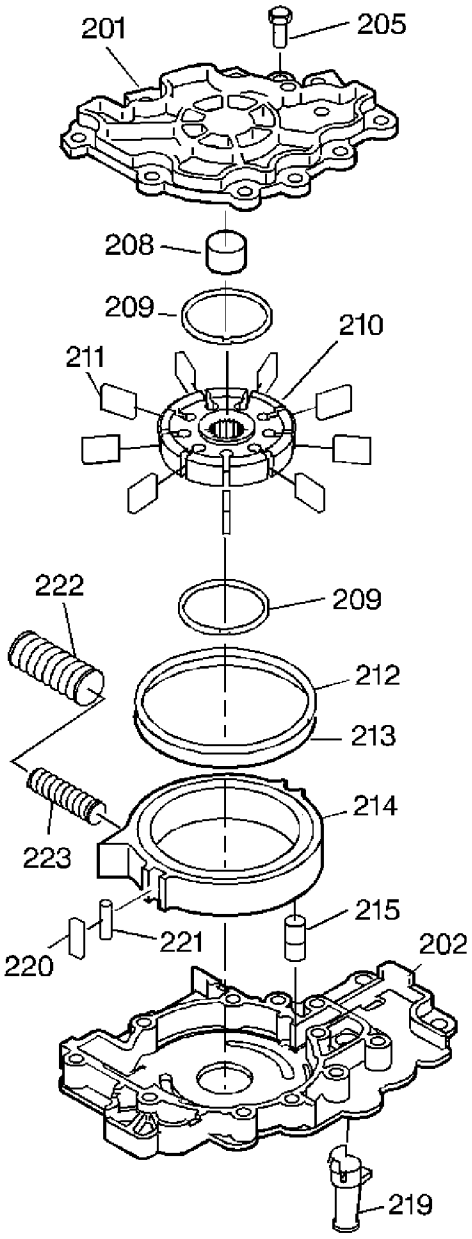


(3) Transmission Case
(103) 2-1 Manual Servo Cover Bolt M8 X 1.25mm X 25.0mm (3)
(104) 2-1 Manual Servo Body Cover
(105) 2-1 Servo Square Cut Seal
(106) Bottom Retaining Clip
(107) Lip Seal
(108) 2-1 Manual Servo Piston
(109) 2-1 Manual Servo Cushion Spring
(110) Internal Servo Spring Manual Cushion Retainer
(111) 2-1 Manual Apply Pin
(112) 2-1 Manual Servo Return Spring
(113) O-Ring Seal
(114) 2-1 Manual Servo Body
(115) 2-1 Servo Filter
(117) Band Anchor Forward and Reverse Pin
(117) Band Anchor Forward and Reverse Pin
(120) Thermo Element Pin Washer Assembly
(121) Thermostatic Element

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(122) Thermostatic Element Plate
(123) Thermal Element Pin
(124) Forward Servo Apply Pipe
(125) Manual Servo Apply Pipe
(126) Lube Oil Pipe
(127) Hose Clamp
(127) Hose Clamp
(128) Lube Oil Hose
(129) Lube Pipe Clip Retainer
(130) Pipe and Washer Assembly
(131) Accumulator Cover and Housing Hex Flange Bolt M6 X 1.0mm X 28.0mm (11)
(132) Accumulator Cover
(133) Accumulator Cover Gasket
(133) Accumulator Cover Gasket
(134) Accumulator Spacer Plate
(135) Pin, 2-3 Accumulator
(135) Pin, 2-3 Accumulator
(135) Pin, 2-3 Accumulator
(135) Pin, 2-3 Accumulator
(135) Pin, 2-3 Accumulator
(136a) Conventional 1-2 and 2-3 Accumulator Piston
(136a) Conventional 1-2 and 2-3 Accumulator Piston
(136a) Conventional 1-2 and 2-3 Accumulator Piston
(136b) Offset 1-2 and 2-3 Accumulator Piston
(136c) Inverted 1-2 and 2-3 Accumulator Piston
(137) Oil Seal Accumulator Piston Ring
(137) Oil Seal Accumulator Piston Ring
(137) Oil Seal Accumulator Piston Ring
(137) Oil Seal Accumulator Piston Ring
(137) Oil Seal Accumulator Piston Ring
(138a) Inner 2-3 Accumulator Spring
(138b) Outer 2-3 Accumulator Spring
(139a) Outer 1-2 Accumulator Spring
(139a) Outer 1-2 Accumulator Spring
(139a) Outer 1-2 Accumulator Spring
(139b) Inner 1-2 Accumulator Spring
(139b) Inner 1-2 Accumulator Spring
(139c) Outer 1-2 Accumulator Spring
(139d) 1-2 Accumulator Assist Spring and Retainer Assembly
(140) Machined Accumulator Housing

Oil Pump Assembly

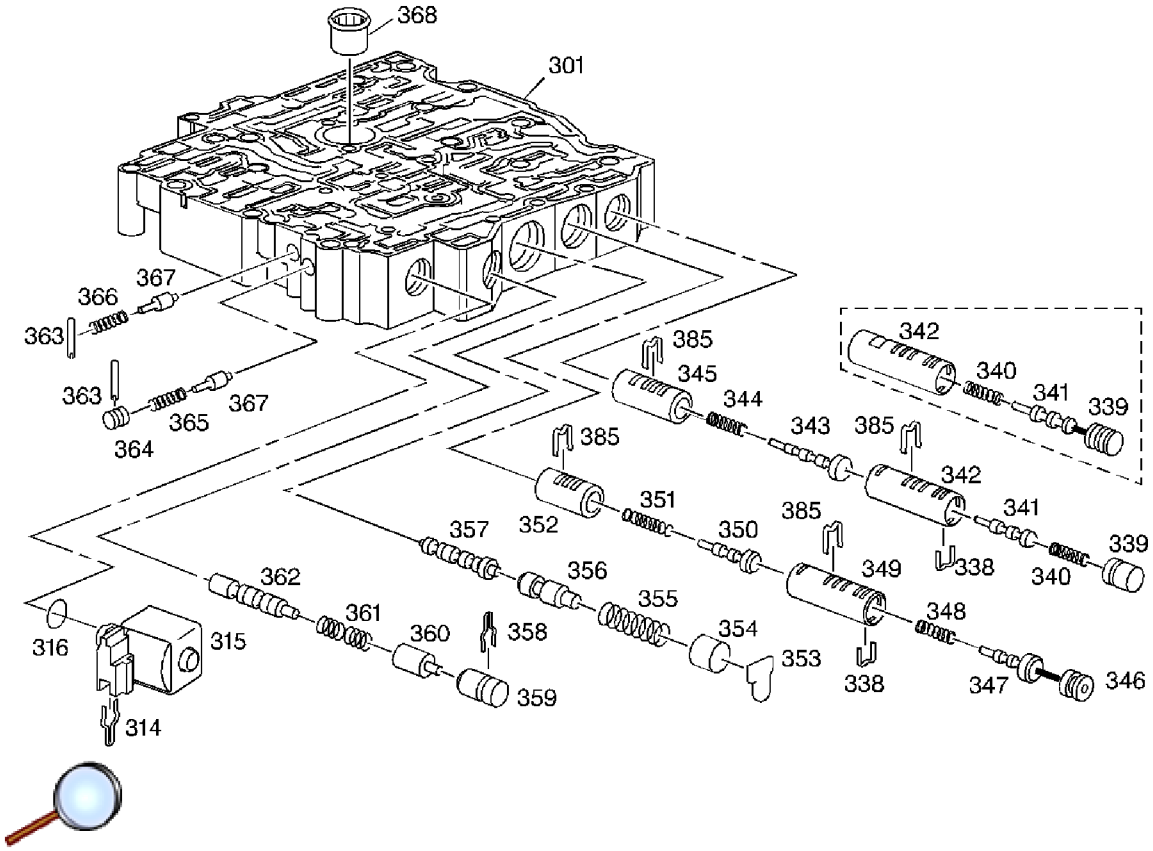


(201) Pump Cover
(202) Oil Pump Body
(205) Pump Cover to Pump Body Bolt - M8 X 1.25mm X 20.0mm (1)
(208) Auxiliary Valve Body Bushing (Pump Shaft)
(209) Pump Vane Ring

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(209) Pump Vane Ring
(210) Oil Pump Selective Rotor
(211) Pump Selective Vane
(212) Slide to Cover Selective Oil Seal Ring
(213) O-Ring Seal
(214) Oil Pump Selective Slide
(215) Pump Slide Pivot Pin
(219) Oil Pump Pressure Screen Assembly
(220) Pump Slide Seal
(221) Oil Pump Slide Seal Support
(222) Outer Pump Priming Spring
(223) Inner Pump Priming Spring

Control Valve Body Assembly (1 of 2)

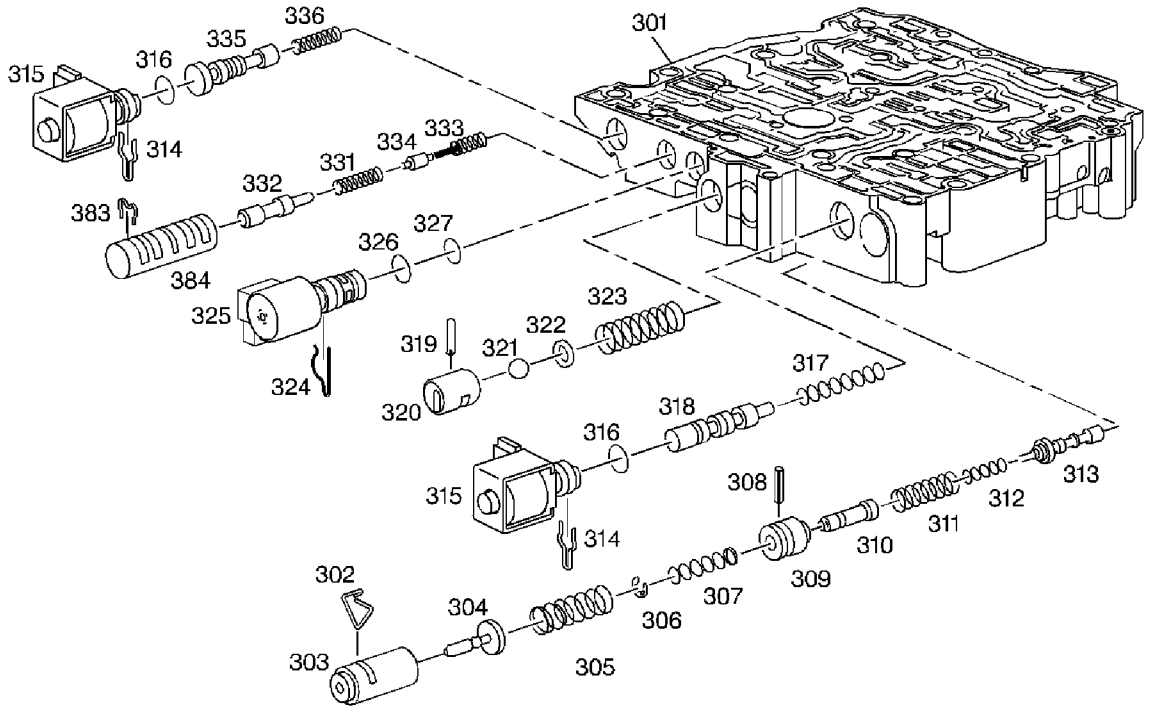


(301) Control Valve Body (Machined)
(314) Spring Clip Retainer
(315) Solenoid Assembly
(316) O-Ring Seal
(338) 1-2 Accumulator Plug Retainer (Primary and Secondary)
(338) 1-2 Accumulator Plug Retainer (Primary and Secondary)
(339) 1-2 Accumulator Plug (Primary)
(339) 1-2 Accumulator Plug (Primary)
(340) 1-2 Accumulator Valve Spring (Primary)
(340) 1-2 Accumulator Valve Spring (Primary)
(341) 1-2 Accumulator Valve
(341) 1-2 Accumulator Valve
(342) 1-2 Accumulator Valve Bushing (Primary)
(342) 1-2 Accumulator Valve Bushing (Primary)
(343) 2-3 Accumulator Valve
(344) 2-3 Accumulator Valve Spring
(345) 2-3 Accumulator Valve Bushing
(345) 2-3 Accumulator Valve Bushing

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(346) 1-2 Accumulator Plug (Secondary)
(347) 1-2 Accumulator Valve (Secondary)
(348) 1-2 Accumulator Valve Spring (Secondary)
(349) 1-2 Accumulator Bushing (Secondary)
(350) 3-4 Accumulator Valve
(351) 3-4 Accumulator Valve Spring
(352) 3-4 Accumulator Valve Bushing
(353) 2-3 Shift Retainer
(354) 2-3 Shift Bore Plug
(355) 3-2 Downshift Valve Spring
(356) 3-2 Manual Downshift Spring
(357) 2-3 Shift Valve
(358) Spring Clip Retainer
(359) 3-4 Shift Bore Plug
(360) 4-3 Manual Downshift Valve
(361) 4-3 Manual Downshift Spring
(362) 3-4 Shift Valve
(363) Coiled Spring Pin
(363) Coiled Spring Pin
(364) Reverse Boost Bore Plug
(365) Servo Boost Valve Spring (Reverse)
(366) Servo Boost Valve Spring (Forward)
(367) Forward and Reverse Servo Boost Valve
(368) Oil Pump Drive Bearing and Sleeve
(385) Accumulator Bushing Assembly Retainer (2-3 and 1-2 Secondary and Primary)
(385) Accumulator Bushing Assembly Retainer (2-3 and 1-2 Secondary and Primary)

Control Valve Body Assembly (2 of 2)

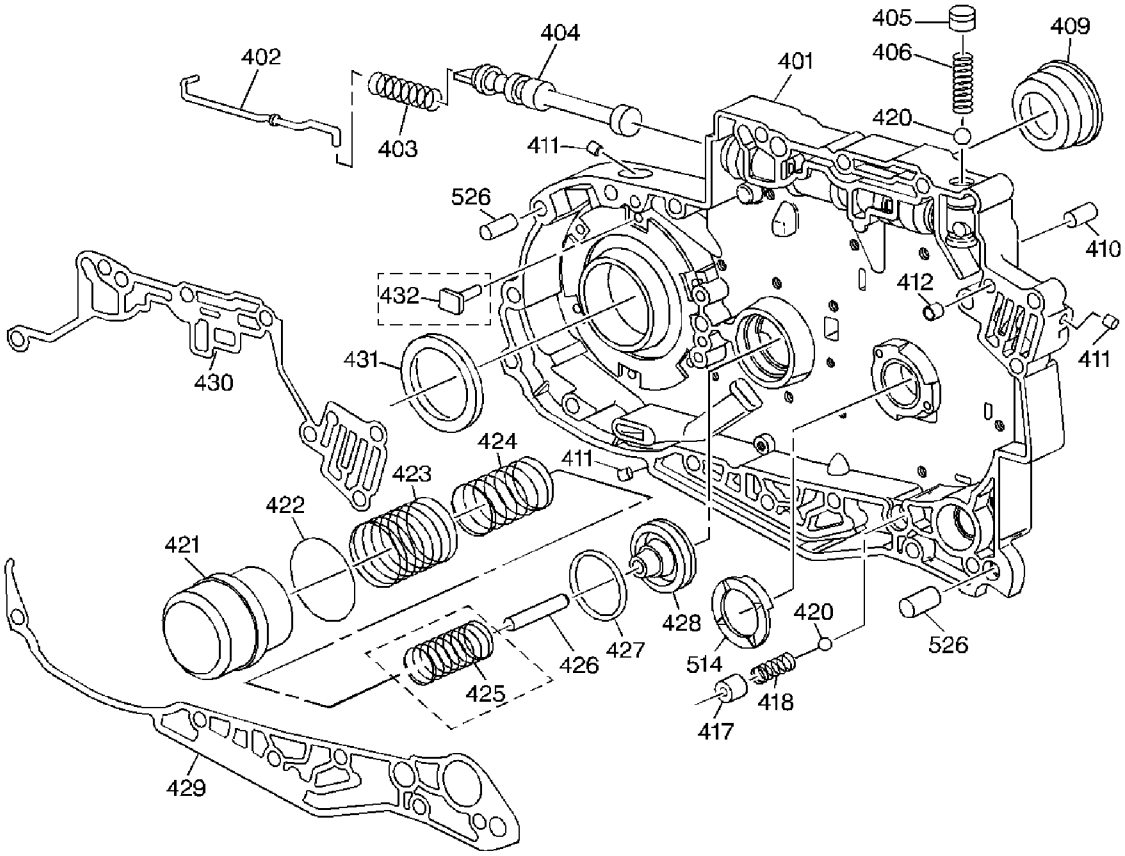


(301) Machined Control Valve Body
(302) Line Boost Valve and Bushing Retainer
(303) Line Boost Valve Retainer
(304) Line Boost Valve
(305) Pressure Regulator Modulator Boost Spring
(306) Pressure Regulator Retainer
(307) Reverse Boost Spring
(308) Grooved Pin
(309) Reverse Boost Valve Bushing
(310) Reverse Boost Valve
(311) Outer Pressure Regulator Valve Spring
(312) Pressure Regulator Valve Isolator Spring
(313) Pressure Regulator Valve
(314) Spring Clip Retainer
(314) Spring Clip Retainer
(315) Solenoid Assembly
(315) Solenoid Assembly
(316) O-Ring Seal

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(316) O-Ring Seal
(318) 1-2 Shift Valve
(319) Coiled Spring Pin
(320) Pump Pressure Relief Bushing
(321) 0.375 Diameter Ball
(322) Spring Seat
(324) 3-4 Shift Solenoid Retainer
(325) PWM Solenoid Assembly
(326) PWM Solenoid O-Ring
(327) PWM Solenoid O-Ring
(331) Isolator Spring
(332) Converter Clutch Regulator Valve
(333) Converter Clutch Regulator Spring
(334) Isolator Valve
(335) Converter Clutch Valve
(336) Converter Clutch Spring
(383) Converter Clutch Regulator Retainer
(384) Converter Clutch Regulator Bushing

Channel Plate Assembly

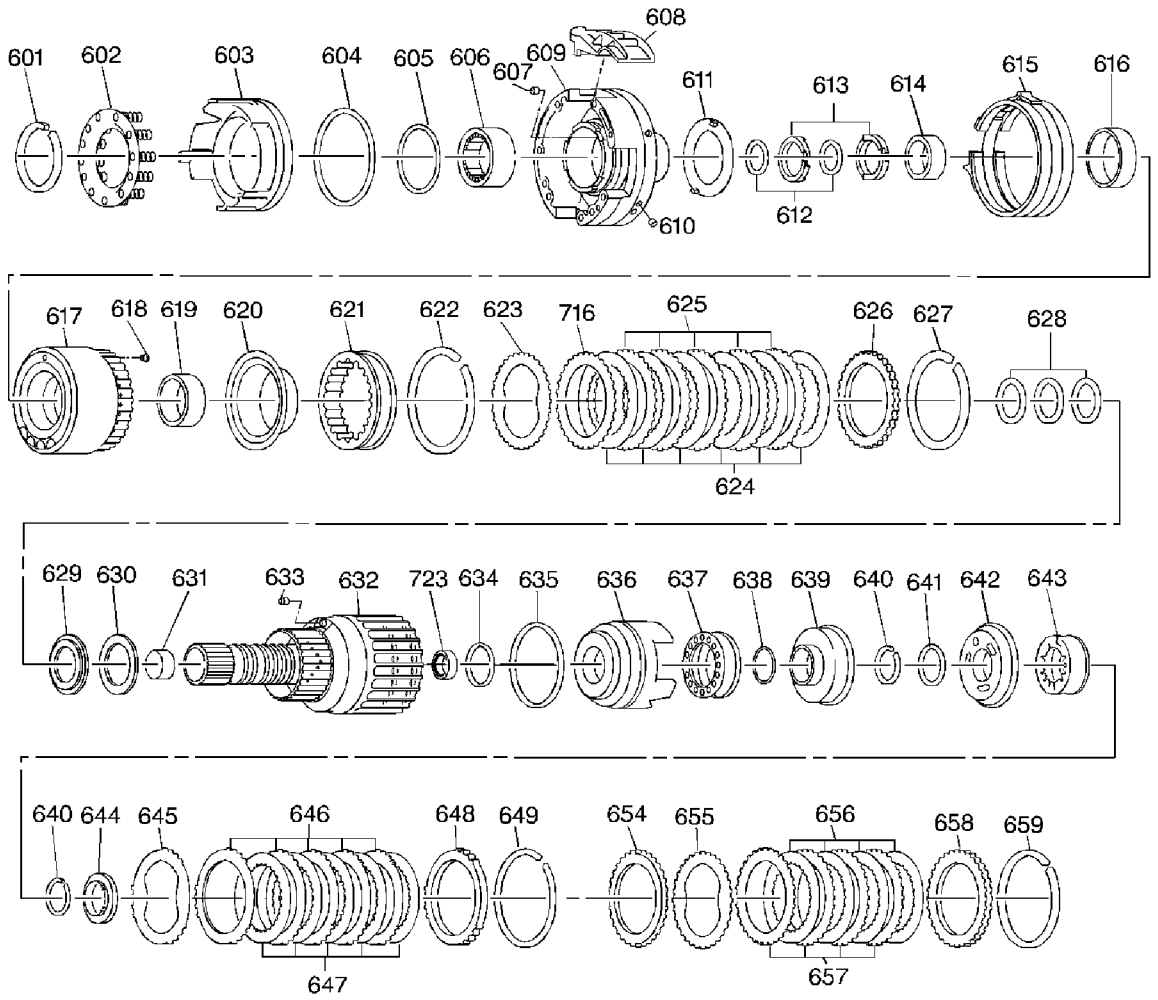


(401) Channel Plate
(402) Manual Valve Link
(403) Manual Valve Retainer Link
(404) Manual Valve
(405) Low Blow Off Plug
(406) Low Blow Off Spring
(409) Left Side Axle Oil Seal Assembly
(410) Control Valve Body Alignment Sleeve
(411) Bore Plug
(411) Bore Plug
(411) Bore Plug

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(412) Orificed Cup Plug
(417) Blow Off Cup Plug
(418) TCC Blow Off Spring
(420) 0.375" Diameter Ball
(420) 0.375 Diameter Ball
(421) 3-4 Accumulator Canister
(422) O-Ring Seal
(423) Outer 3-4 Accumulator Spring
(424) Middle 3-4 Accumulator Spring
(425) Inner 3-4 Accumulator Spring
(426) 3-4 Accumulator Pin
(427) 3-4 Accumulator Piston Oil Seal Ring
(428) 3-4 Accumulator Piston
(429) Lower Channel Plate Gasket
(430) Upper Channel Plate Gasket
(431) 4th Channel Hub to Channel Plate Bearing Assembly
(432) Channel Plate to Side Cover Stud M6 X 1.0mm X 18.0mm (6)
(514) Drive Sprocket/Channel Plate Thrust Washer
(526) Dowel Pin
(526) Dowel Pin

Internal Components (1 of 2)



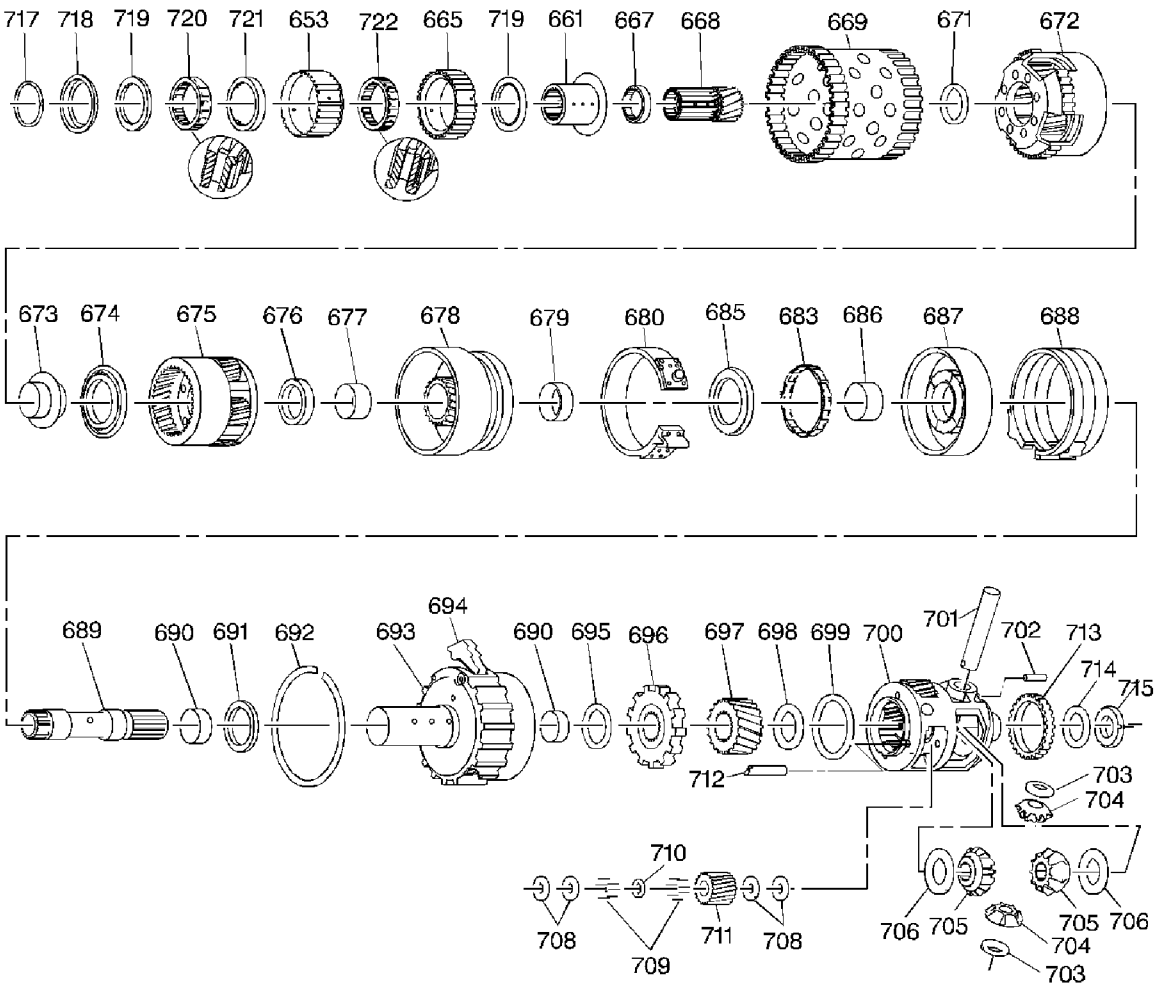
(601) 4th Clutch Return Spring Snap Ring
(602) 4th Clutch Piston Return Spring Assembly
(603) 4th Clutch Piston
(604) 4th Clutch Piston Seal (Outer)
(605) 4th Clutch Piston Seal (Inner)
(606) Drawn Cup Bearing Assembly
(607) Orificed Cup Plug
(608) Chain Scavenging Scoop
(609) Driven Sprocket Support
(610) Cup Plug
(611) Thrust Washer (Driven Sprocket Support/2nd Clutch Drum)

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(612) Four Lobed Ring Seal
(613) Oil Seal Ring
(614) Driven Sprocket Support Bushing
(615) Reverse Band Assembly
(616) 75.5 O.D. X 8.0 Bushing
(617) 2nd Clutch Housing
(618) Check Valve Retainer and Ball Assembly (Forward Clutch)
(619) 70.0 O.D. X 11.0 Bushing
(620) 2nd Clutch Piston with Molded Seal
(621) 2nd Clutch Apply Ring and Release Spring Assembly
(622) Snap Ring
(623) 2nd Clutch Plate (Waved)
(624) 2nd Clutch Plate Assembly (Fiber)
(625) 2nd Clutch Reaction Plate (Steel)
(626) Backing Support Ring Plate (Steel)
(627) 2nd Clutch Snap Ring (Outer)
(628) Oil Seal Ring (Input Shaft)
(629) Thrust Bearing (Support Sprocket/Thrust Washer)
(630) Selective Thrust Washer (Bearing/Input Clutch Hub)
(631) Input Shaft Bushing
(632) Input Housing Sleeve and Shaft Assembly
(633) Check Valve Retainer and Ball Assembly
(634) Input Clutch Piston Seal (Inner)
(635) Input Clutch Piston Seal (Outer)
(636) Input Clutch Piston
(637) Input Spring and Retainer Assembly
(638) O-Ring Seal
(639) 3rd Clutch Piston Housing
(640) Snap Ring (3rd Clutch Piston Housing/Input Shaft
(640) Snap Ring (3rd Clutch Piston Housing/Input Shaft)
(641) 3rd Clutch Piston Seal (Inner)
(642) 3rd Clutch Piston Seal and Ball Capsule Assembly
(643) 3rd Clutch Spring Retainer and Guide Assembly
(644) Thrust Bearing Assembly
(645) 3rd Clutch Plate (Waved)
(646) 3rd Clutch Plate Assembly (Sprocket Support/Spline OD)
(647) 3rd Clutch Plate Assembly (Sprocket Support/Spline ID)
(648) Backing Plate
(649) Snap Ring
(654) Input Clutch Apply Plate
(655) Input Clutch Plate (Waved)
(656) Input Clutch Plate Assembly (Fiber)
(657) Input Clutch Plate (1.9 Flat)
(658) Clutch Backing Plate (Steel)
(659) Snap Ring

(716) 2nd Clutch Apply Reaction Plate (Tapered)
(723) 4th Clutch Shaft to Input Housing Bearing

Internal Components (2 of 2)



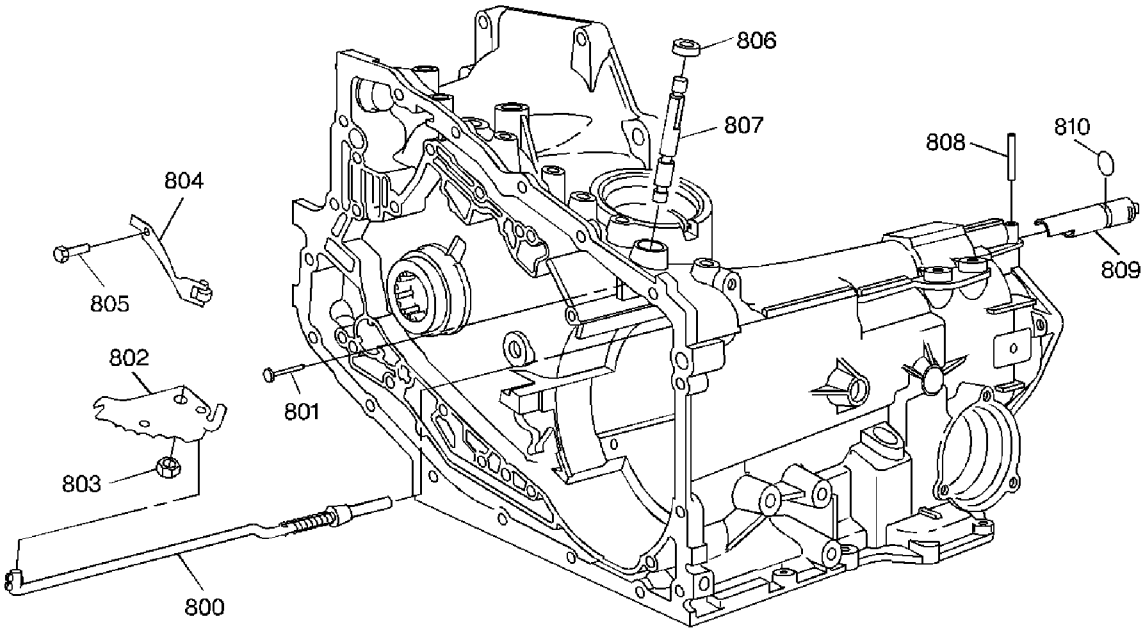
(653) 3rd Sprag Clutch Outer Race
(661) Input Sprag Clutch Inner Race
(665) Input Sprag Clutch Outer Race
(667) Input Sun Gear Spacer
(668) Input Sun Gear
(669) Reverse Reaction Drum
(671) Thrust Bearing Assembly
(672) Complete Input Carrier Assembly
(673) Input Carrier to Reaction Carrier Dam
(674) Input/Reaction Carrier Thrust Bearing Assembly
(675) Reaction Complete Carrier Assembly

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(676) Reaction Carrier/Sun Gear Thrust Bearing Assembly
(677) Left Hand Reaction Sun Gear Bushing
(678) Reaction Sun Drum Bushing Assembly Gear
(679) Right Hand Reaction Sun Gear Bushing
(680) 2-1 Band Assembly
(683) 1-2 Support Roller Assembly
(685) Thrust Assembly/Low Race Bearing Assembly
(686) 1-2 Support Bushing
(687) 1-2 Support Inner Race
(688) Forward Band Assembly
(689) Final Drive Sun Gear Shaft
(690) Final Drive Internal Gear Bushing
(691) Thrust Washer (1/2 Support/Internal Gear)
(692) Snap Ring (Final Drive Internal Gear Sprocket)
(693) Final Drive Internal Gear
(694) Pawl Lockout Pawl and Pin Assembly
(695) Thrust Bearing Assembly (Internal Gear/Parking Gear)
(696) Parking Gear
(697) Final Drive Sun Gear
(698) Thrust Carrier/Sun Gear Bearing Assembly
(699) Spiral Pin Retaining Ring
(700) Complete Differential/Final Drive Carrier Assembly
(701) Differential Pinion Shaft
(702) Differential Pinion Shaft Retaining Pin
(703) Thrust Washer (Differential Pinion)
(703) Thrust Washer (Differential Pinion)
(704) Differential Pinon Gear
(704) Differential Pinon Gear
(705) Differential Side Gear
(705) Differential Side Gear
(706) Bronze Thrust Washer (Differential Side Gear)
(706) Bronze Thrust Washer (Differential Side Gear)
(708) Pinion Thrust Washer (Steel)
(708) Pinion Thrust Washer (Steel)
(709) Roller Needle Bearing
(710) Pinion Needle Bearing Spacer
(711) Final Drive Planet Pinion
(712) Planet Pinion Pin
(713) Speed Sensor Rotor (29 or 30 Teeth)
(714) Differential Carrier/Case Washer (Thrust)
(715) Thrust Bearing Assembly
(717) Spiral Lock Ring
(718) 3rd Clutch Sprag Retainer
(719) End Bearing
(719) End Bearing

(720) 3rd Sprag Assembly
(721) Center Bearing
(722) Input Sprag Input

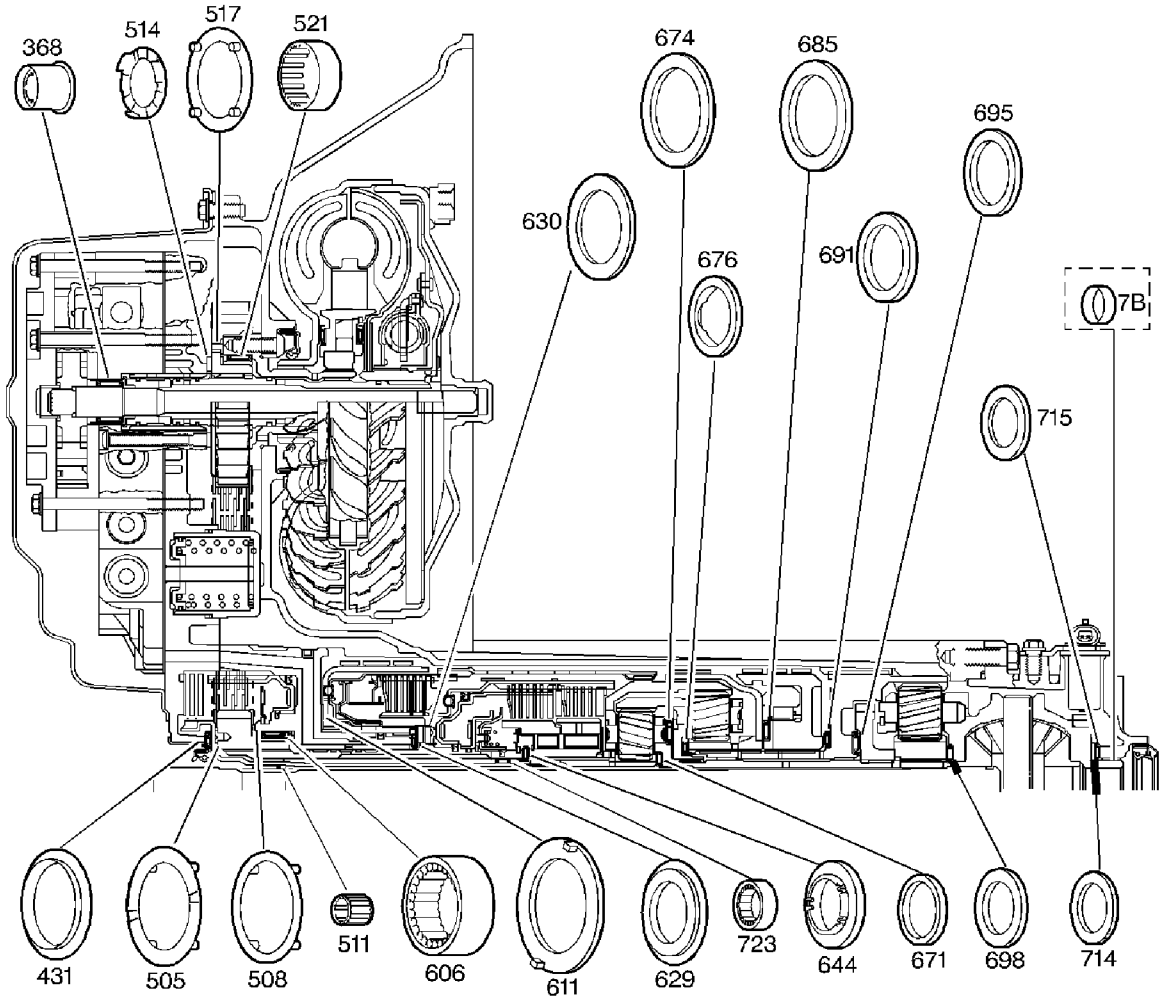
Manual Shaft and Park System Components



(800) Parking Lock Actuator Assembly
(801) Manual Shift to Case Pin
(802) Inside Detent Lever
(803) Manual Shaft/Detent Lever Nut (Hex) M10 X 1.5
(804) Manual Detent Spring and Roller Assembly
(805) Special Manual Detent Spring to Channel Plate Bolt M6 X 1.0 X 16.0
(806) Manual Shaft Seal
(807) Manual Shaft
(808) Guide Retaining Pin
(809) Actuator Guide
(810) O-Ring Seal

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Thrust Washer and Bearing Locations

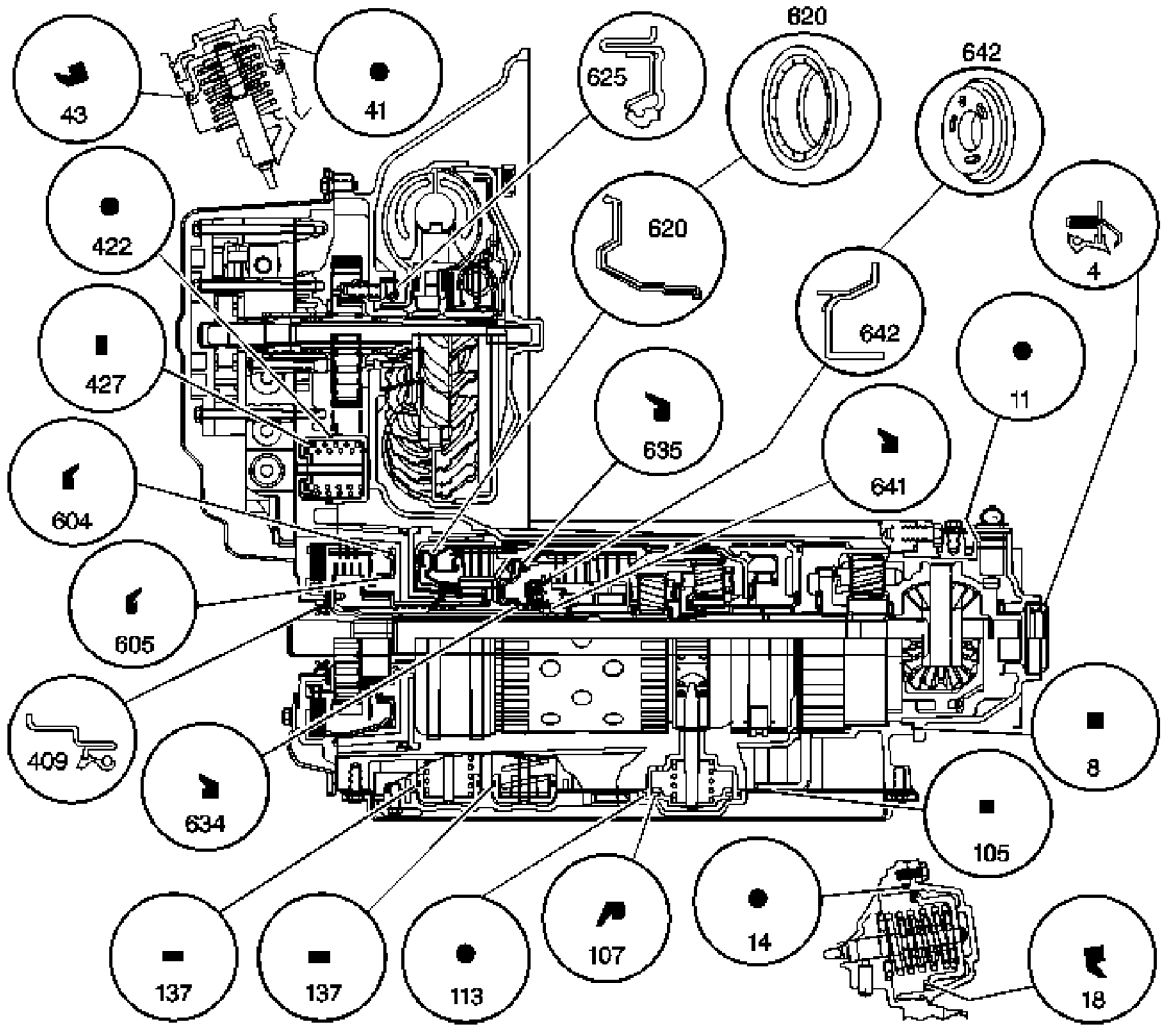


(7b) Differential to Case Bearing (Heavy Duty)
(368) Oil Pump Drive Bearing and Sleeve
(431) 4th Clutch Hub/Channel Plate Bearing Assembly
(505) Thrust Washer (4th Clutch Hub/Driven Sprocket)
(508) Thrust Washer (Driven and 2nd Clutch Drum)
(511) 4th Clutch/Output Shaft Bearing
(514) Thrust Washer (Drive Sprocket/Channel Plate)
(517) Thrust Washer (Drive Sprocket/Support)
(521) Drive Support/Sprocket Bearing Assembly (Drawn Cup)
(608) Drawn Cup Bearing Assembly
(611) Thrust Washer (Driven Sprocket Support/2nd Clutch Drum)

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(629) Thrust Bearing (Support Sprocket/Thrust Washer)
(630) Thrust Washer (Bearing/Input Clutch Hub) Selective
(644) Thrust Bearing Assembly
(671) Thrust Bearing Assembly
(674) Thrust Bearing Assembly (Input/Reaction Carrier)
(676) Thrust Bearing Assembly (Reaction Carrier/Sun Gear)
(685) Thrust Assembly/Low Race Bearing Assembly
(691) Thrust Washer (1-2 Support/Internal Gear)
(695) Thrust Bearing Assembly (Internal Gear/Parking Gear)
(698) Thrust Carrier/Sun Gear Bearing Assembly
(714) Differential Carrier/Case Washer (Thrust)
(715) Thrust Bearing Assembly (Differential Carrier/Case)
(723) 4th Clutch Shaft to Input Housing Bearing

Seal Locations

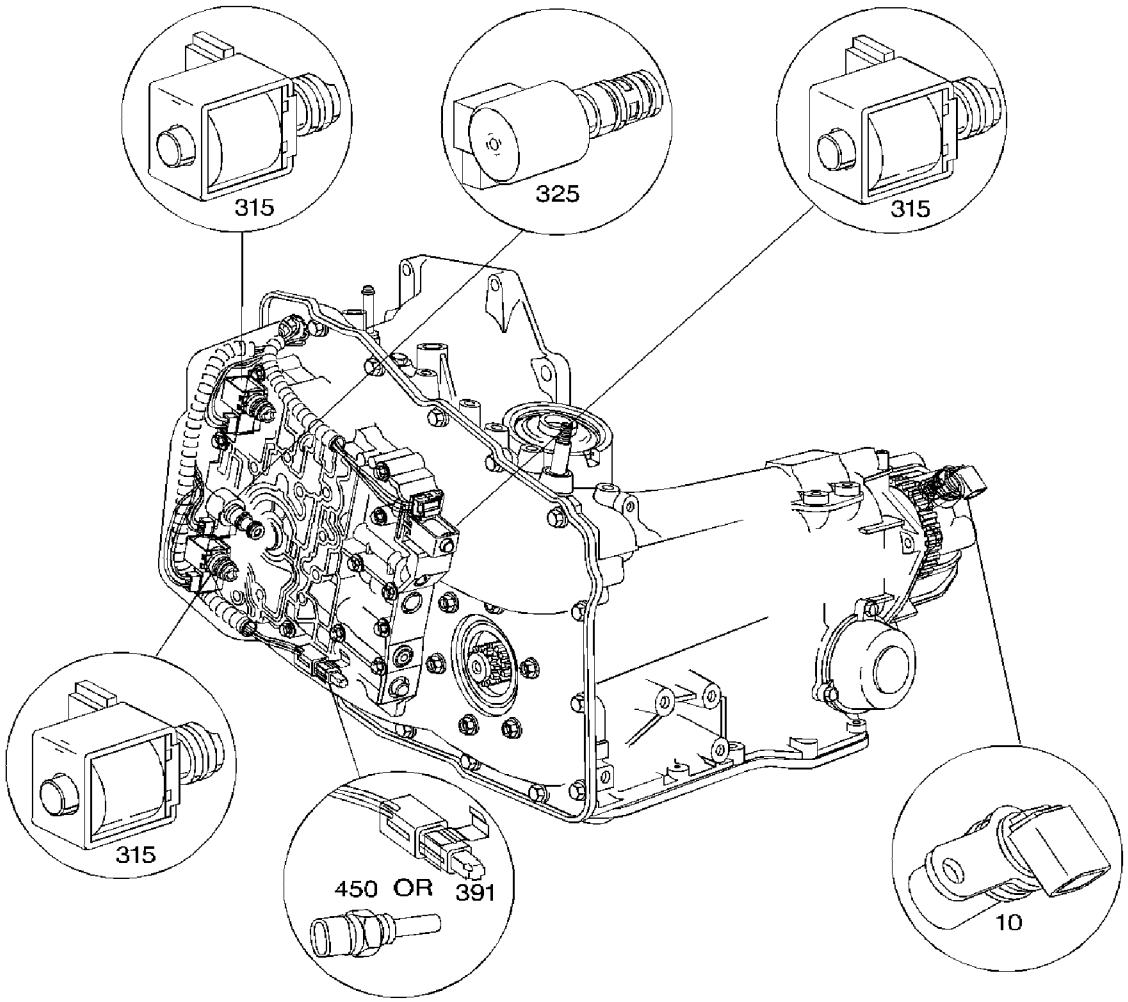


(4) Axle Oil Seal Assembly
(8) Extension to Case Seal
(11) O-Ring Speed Sensor Seal
(14) O-Ring Seal (Forward Servo Cover)
(18) Oil Seal Ring (Forward Servo Piston)
(41) O-Ring Seal (Reverse Servo Cover)
(43) Oil Seal Ring (Reverse Servo Piston)
(105) Square Cut Seal (2-1 Servo)
(107) Lip Seal (Manual 2-1 Servo Piston)
(113) O-Ring Seal (Manual 2-1 Servo Cover)
(137) Oil Seal Accumulator Piston Ring

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(137) Oil Seal Accumulator Piston Ring
(409) Axle Oil Seal Assembly (Left Side)
(422) O-Ring Seal
(427) Oil Seal Ring (3-4 Accumulator Piston)
(525) Converter Oil Helix Seal Assembly
(604) Fourth Clutch Piston Seal (Outer)
(605) Fourth Clutch Piston Seal (Inner)
(620) Second Clutch Piston with Molded Seal
(620) Second Clutch Piston with Molded Seal
(634) Input Clutch Piston Seal (Inner)
(635) Input Clutch Piston Seal (Outer)
(641) Third Clutch Piston Seal (Inner)
(642) Seal and Ball Capsule ASM., Third Clutch Piston
(642) Seal and Ball Capsule ASM., Third Clutch Piston

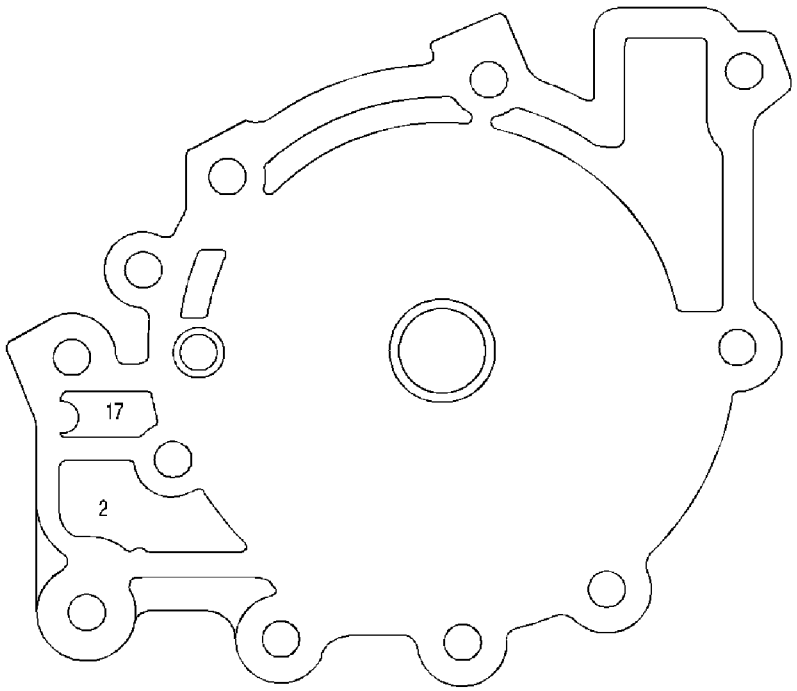
Electronic Component Locations



(10) Vehicle Speed Sensor
(315) 1-2 Shift Solenoid, 2-3 Shift Solenoid or TCC Solenoid
(315) 1-2 Shift Solenoid, 2-3 Shift Solenoid or TCC Solenoid
(315) 1-2 Shift Solenoid, 2-3 Shift Solenoid or TCC Solenoid
(325) PWM Solenoid
(391) Temperature Sensor
(450) Temperature Sensor

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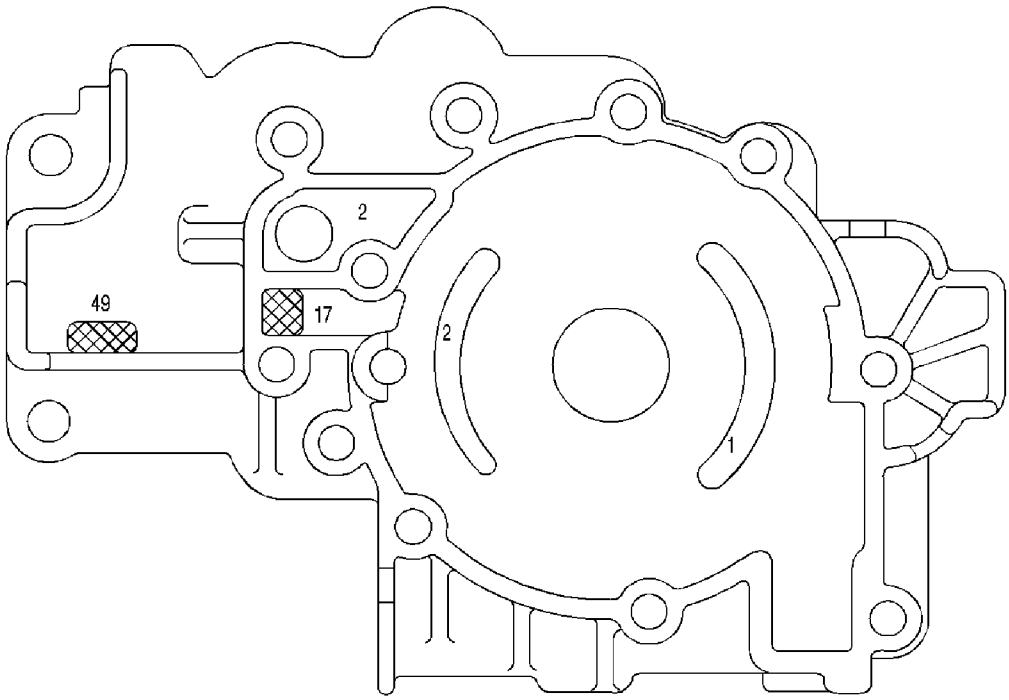
Pump Cover Fluid Passages (Oil Pump Body Side)



(2) Line
(17) Decrease

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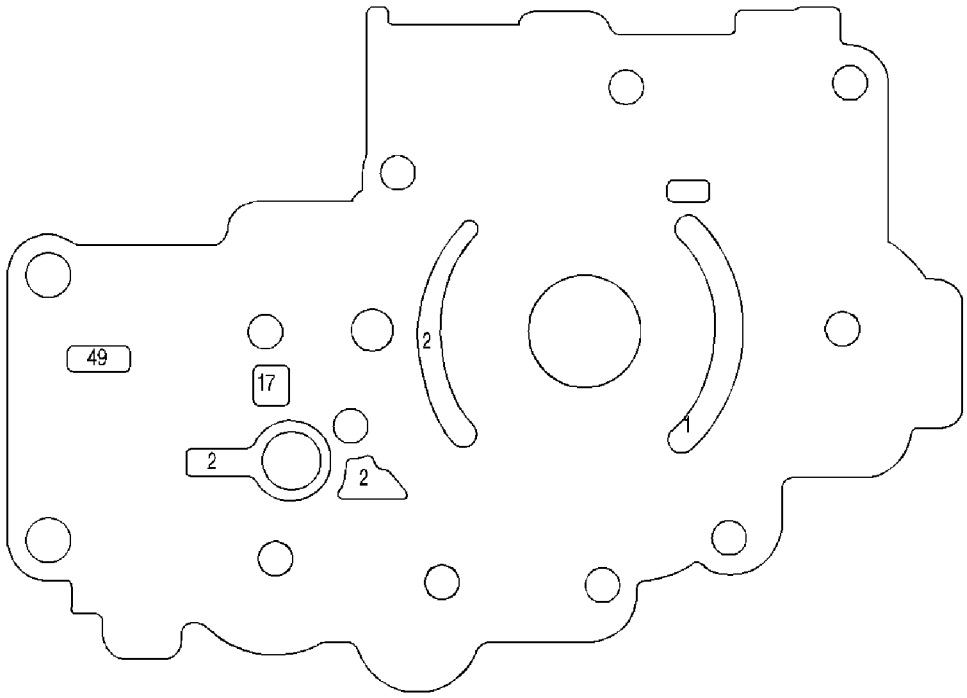
Oil Pump Body Fluid Passages (Pump Cover Side)



(1) Suction
(2) Line
(2) Line
(17) Decrease
(49) Exhaust

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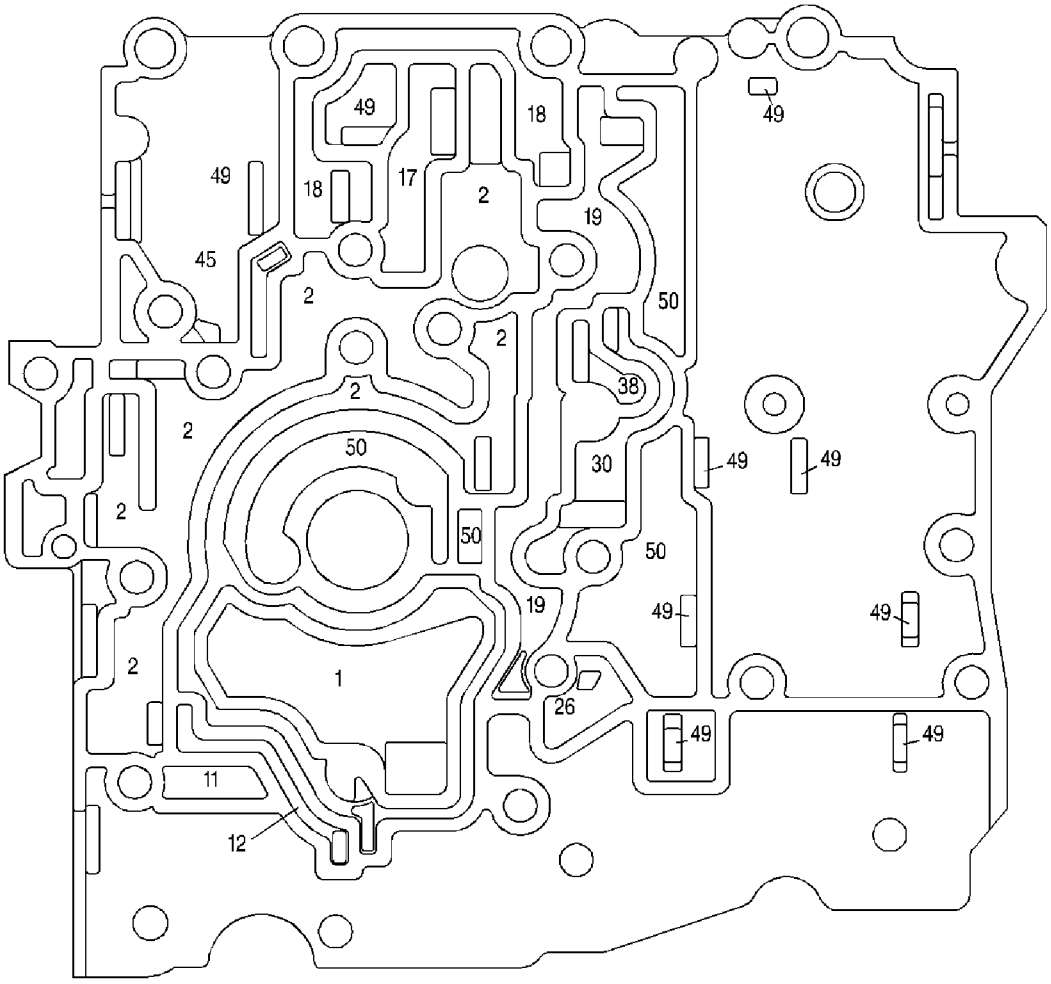
Oil Pump Body Fluid Passages (Control Valve Body Side)



(1) Suction
(2) Line
(2) Line
(2) Line
(17) Decrease
(49) Exhaust

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Control Valve Body Fluid Passages (Oil Pump Side)

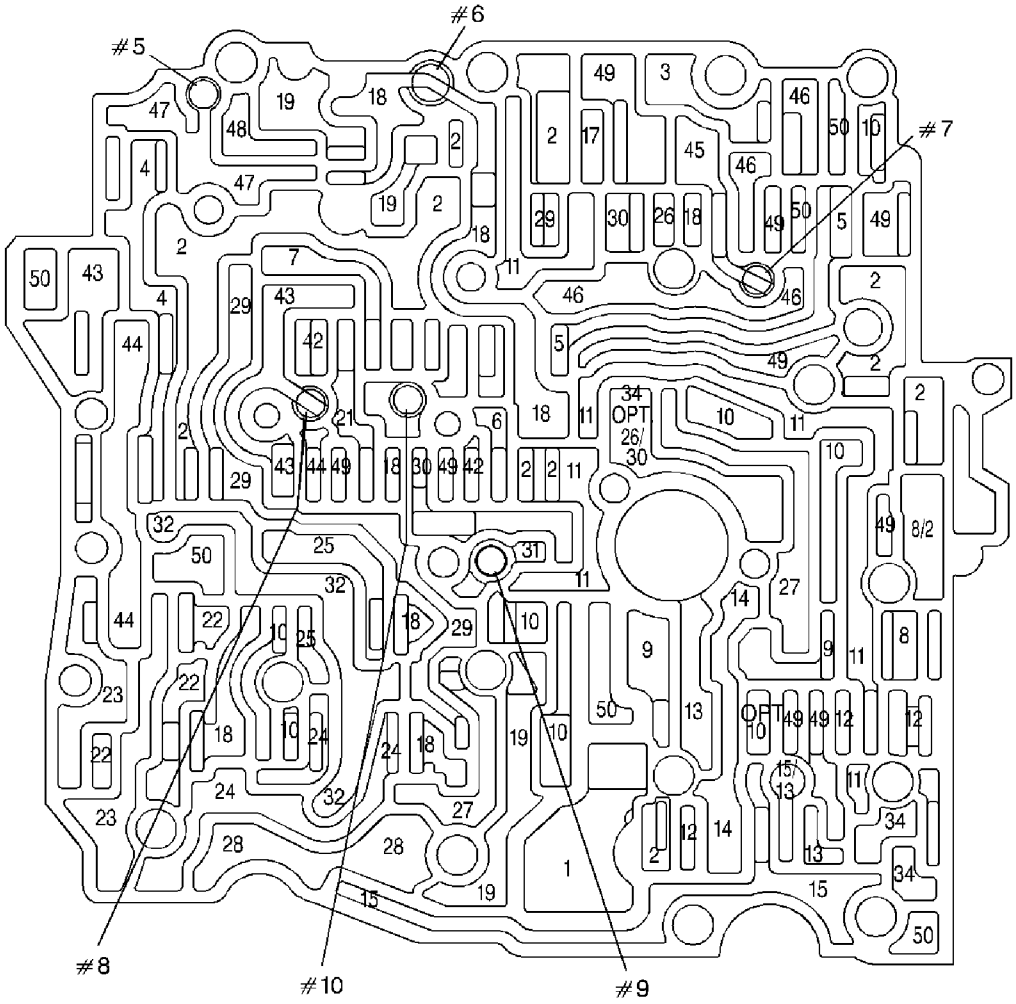


(1) Suction
(2) Line
(2) Line
(2) Line
(2) Line
(2) Line
(2) Line
(2) Line
(2) Line
(11) Converter Feed
(12) Regulated Apply

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(17) Decrease
(18) D-4
(18) D-4
(19) Drive Servo Apply
(19) Drive Servo Apply
(26) 2nd
(30) 3rd
(38) 4th
(45) Low
(49) Exhaust
(49) Exhaust
(49) Exhaust
(49) Exhaust
(49) Exhaust
(49) Exhaust
(49) Exhaust
(49) Exhaust
(49) Exhaust
(50) Void
(50) Void
(50) Void

Control Valve Body Fluid Passages (Channel Plate Side)



(#5) Reverse--Reverse Servo Checkball (372)
(#6) D-4--Drive Servo Apply Checkball (373)
(#7) Low--Low-1st Checkball (372)
(#8) D-2--Manual 2-1 Servo Feed Checkball (372)
(#9) 3rd--3rd Clutch Checkball (372)
(#10) 4th--4th Clutch Checkball (372)
(1) Suction
(2) PRN
(2) PRN
(2) PRN
(2) PRN

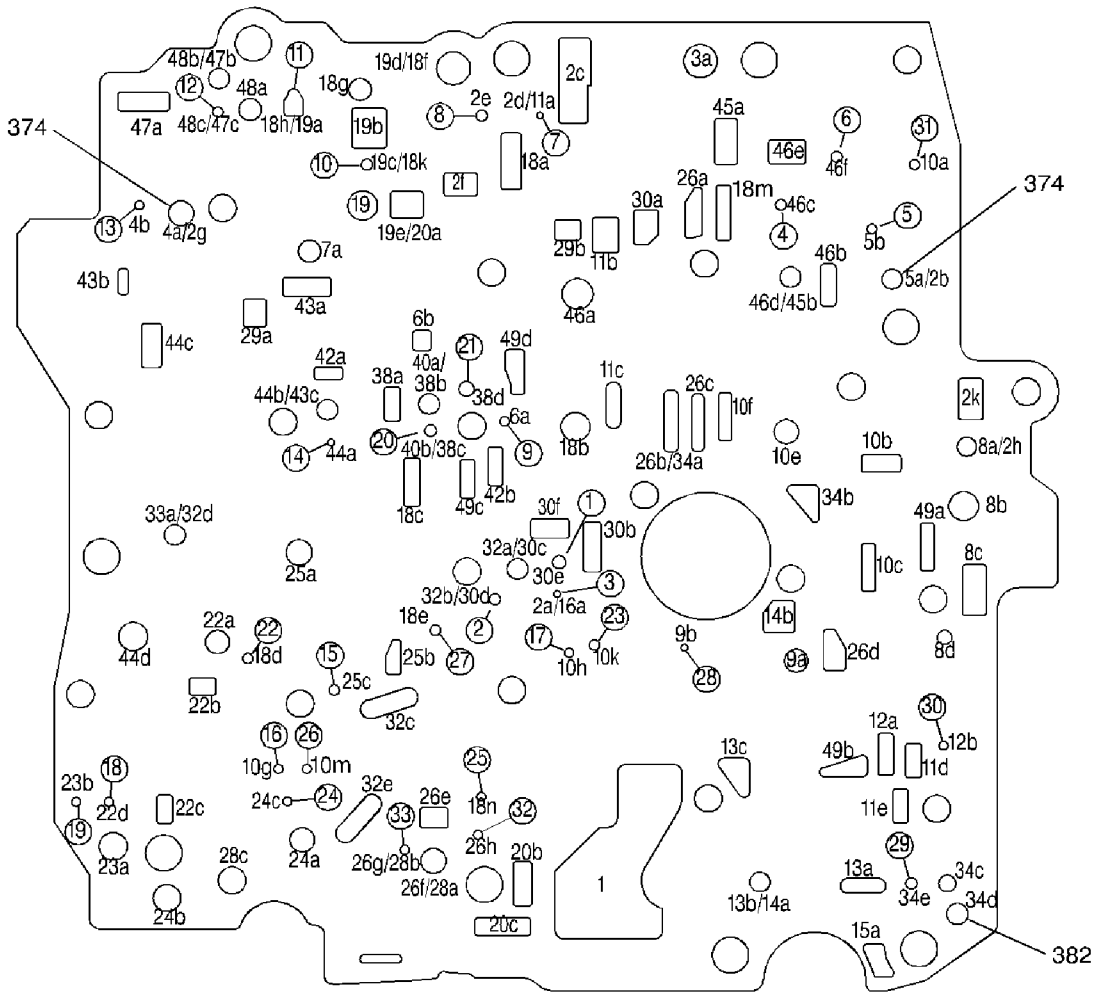
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(2) PRN
(2) PRN
(2) PRN
(2) PRN
(2) PRN
(2) PRN
(2) PRN
(2) PRN
(3) PRN
(4) Solenoid B
(4) Solenoid B
(5) Solenoid A
(5) Solenoid A
(6) Input Clutch Feed
(7) Input Clutch
(8) PWM Feed
(8) PWM Feed
(9) PWM
(9) PWM
(10) Modulator
(10) Modulator
(10) Modulator
(10) Modulator
(10) Modulator
(10) Modulator
(10) Modulator
(10) Modulator
(11) Converter Feed
(11) Converter Feed
(11) Converter Feed
(11) Converter Feed
(11) Converter Feed
(11) Converter Feed
(11) Converter Feed
(11) Converter Feed
(12) Regulated Apply
(12) Regulated Apply
(12) Regulated Apply
(13) Release
(13) Release
(13) Release
(14) Apply
(14) Apply
(15) Cooler
(15) Cooler
(15) Cooler

(17) Decrease
(18) D-4
(18) D-4
(18) D-4
(18) D-4
(18) D-4
(18) D-4
(18) D-4
(19) Drive Servo Apply
(19) Drive Servo Apply
(19) Drive Servo Apply
(19) Drive Servo Apply
(21) Auxiliary Input Clutch Feed
(22) Primary Trim
(22) Primary Trim
(22) Primary Trim
(23) 1-2 Accumulator
(23) 1-2 Accumulator
(24) 2-3 Accumulator
(24) 2-3 Accumulator
(24) 2-3 Accumulator
(25) 3-4 Accumulator
(25) 3-4 Accumulator
(26) 2nd
(26) 2nd
(27) 2nd/2nd Exhaust
(27) 2nd/2nd Exhaust
(28) 2nd Clutch
(28) 2nd Clutch
(29) Solenoid B Off
(29) Solenoid B Off
(29) Solenoid B Off
(29) Solenoid B Off
(30) 3rd
(30) 3rd
(30) 3rd
(31) 3rd/3rd Exhaust
(32) 3rd Clutch
(32) 3rd Clutch
(32) 3rd Clutch
(34) TCC Signal
(34) TCC Signal
(34) TCC Signal
(42) D-3
(42) D-3

(43) D-2
(43) D-2
(43) D-2
(44) Manual 2-1 Servo Feed
(44) Manual 2-1 Servo Feed
(44) Manual 2-1 Servo Feed
(45) Low
(46) Low-1st
(46) Low-1st
(46) Low-1st
(46) Low-1st
(47) Reverse
(47) Reverse
(48) Reverse Servo
(49) Exhaust
(49) Exhaust
(49) Exhaust
(49) Exhaust
(49) Exhaust
(49) Exhaust
(49) Exhaust
(49) Exhaust
(49) Exhaust
(50) Void
(50) Void
(50) Void
(50) Void
(50) Void
(50) Void

Typical Spacer Plate Fluid Passages



(374) 1-2 Solenoid and 2-3 Solenoid Filter
(374) 1-2 Solenoid and 2-3 Solenoid Filter
(382) Converter Clutch Assembly Screen Assembly
(1) Suction
(1) Suction
(2) Line
(2) Line
(2) Line
(2) Line
(2) Line
(2) Line

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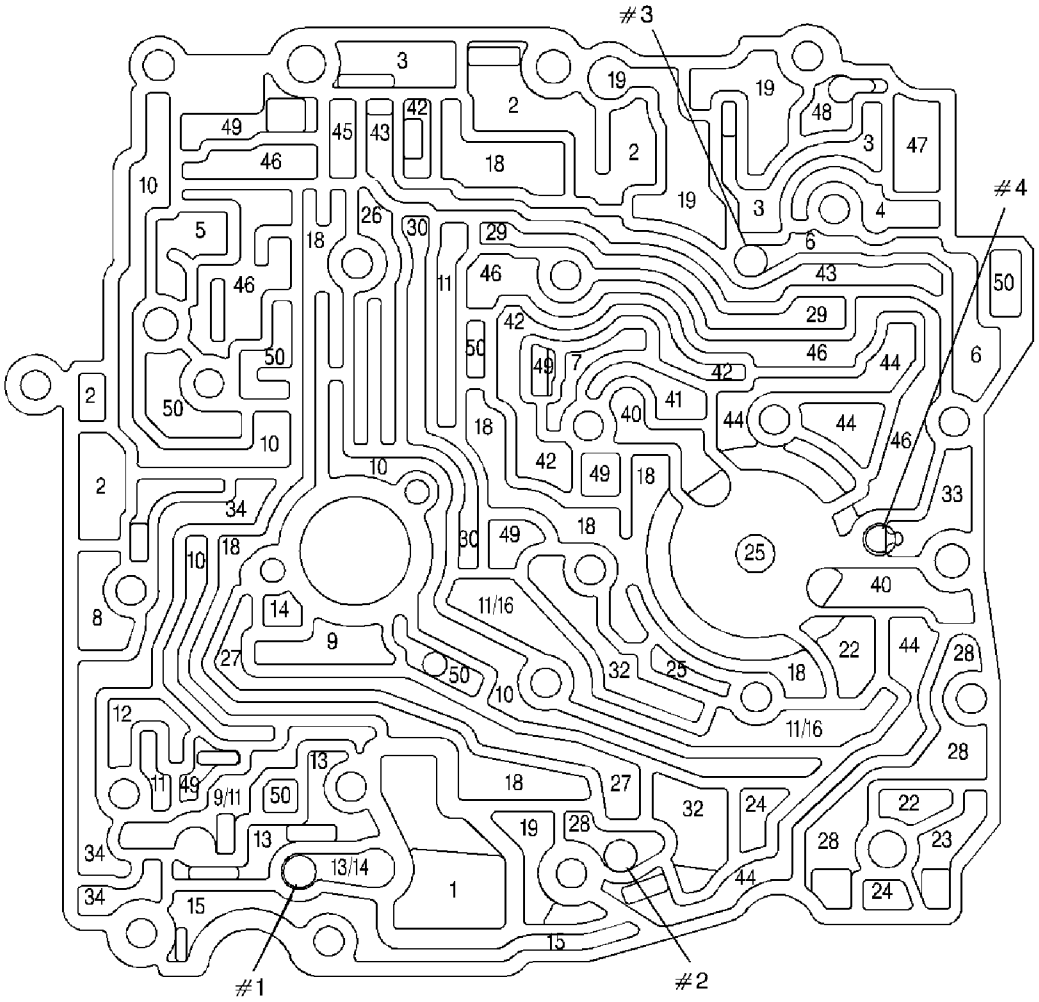
(2) Line
(2) Line
(2) Line
(2) Line
(3) PRN
(3) PRN
(4) Solenoid B
(4) Solenoid B
(4) Solenoid B
(5) Solenoid A
(5) Solenoid A
(5) Solenoid A
(6) Input Clutch Feed
(6) Input Clutch Feed
(6) Input Clutch Feed
(7) Input Clutch
(7) Input Clutch
(8) PWM Feed
(8) PWM Feed
(8) PWM Feed
(8) PWM Feed
(8) PWM Feed
(9) PWM
(9) PWM
(9) PWM
(10) Modulator
(10) Modulator
(10) Modulator
(10) Modulator
(10) Modulator
(10) Modulator
(10) Modulator
(10) Modulator
(10) Modulator
(10) Modulator
(11) Converter Feed
(11) Converter Feed
(11) Converter Feed
(11) Converter Feed
(11) Converter Feed
(11) Converter Feed
(12) Regulated Apply
(12) Regulated Apply
(12) Regulated Apply
(13) Release

(13) Release
(13) Release
(13) Release
(14) Apply
(14) Apply
(14) Apply
(15) Cooler
(15) Cooler
(16) Lube
(16) Lube
(17) Decrease
(18) D-4
(18) D-4
(18) D-4
(18) D-4
(18) D-4
(18) D-4
(18) D-4
(18) D-4
(18) D-4
(18) D-4
(18) D-4
(18) D-4
(18) D-4
(19) Drive Servo Apply
(19) Drive Servo Apply
(19) Drive Servo Apply
(19) Drive Servo Apply
(19) Drive Servo Apply
(19) Drive Servo Apply
(19) Drive Servo Apply
(20) Servo Apply
(20) Servo Apply
(20) Servo Apply
(20) Servo Apply
(21) Auxiliary Input Clutch Feed
(22) Primary Trim
(22) Primary Trim
(22) Primary Trim
(22) Primary Trim
(22) Primary Trim
(23) 1-2 Accumulator
(23) 1-2 Accumulator
(23) 1-2 Accumulator
(24) 2-3 Accumulator
(24) 2-3 Accumulator

(24) 2-3 Accumulator
(24) 2-3 Accumulator
(25) 3-4 Accumulator
(25) 3-4 Accumulator
(25) 3-4 Accumulator
(25) 3-4 Accumulator
(26) 2nd
(26) 2nd
(26) 2nd
(26) 2nd
(26) 2nd
(26) 2nd
(26) 2nd
(26) 2nd
(26) 2nd
(27) 2nd/2nd Exhaust
(28) 2nd Clutch
(28) 2nd Clutch
(28) 2nd Clutch
(28) 2nd Clutch
(29) Solenoid B Off
(29) Solenoid B Off
(29) Solenoid B Off
(30) 3rd
(30) 3rd
(30) 3rd
(30) 3rd
(30) 3rd
(30) 3rd
(30) 3rd
(31) 3rd/3rd Exhaust
(32) 3rd Clutch
(32) 3rd Clutch
(32) 3rd Clutch
(32) 3rd Clutch
(32) 3rd Clutch
(32) 3rd Clutch
(33) 3rd Clutch/Low-1st
(33) 3rd Clutch/Low-1st
(34) TCC Signal
(34) TCC Signal
(34) TCC Signal
(34) TCC Signal
(34) TCC Signal
(38) 4th

(38) 4th
(38) 4th
(38) 4th
(40) 4th Clutch
(40) 4th Clutch
(42) D-3
(42) D-3
(43) D-2
(43) D-2
(43) D-2
(44) Manual 2-1 Servo Feed
(44) Manual 2-1 Servo Feed
(44) Manual 2-1 Servo Feed
(45) Low
(45) Low
(46) Low-1st
(46) Low-1st
(46) Low-1st
(46) Low-1st
(46) Low-1st
(46) Low-1st
(47) Reverse
(47) Reverse
(47) Reverse
(48) Reverse Servo
(48) Reverse Servo
(48) Reverse Servo
(49) Exhaust
(49) Exhaust
(49) Exhaust

Channel Plate Fluid Passages (Control Valve Body Side)



(#1) Release--TCC Apply Checkball (372)
(#2) 2nd--2nd Clutch Checkball (372)
(#3) PRN--Input Clutch Checkball (372)
(#4) 3rd Clutch--Low-1st Checkball (372)
(1) Suction
(2) Line
(2) Line
(2) Line
(2) Line
(3) PRN
(3) PRN

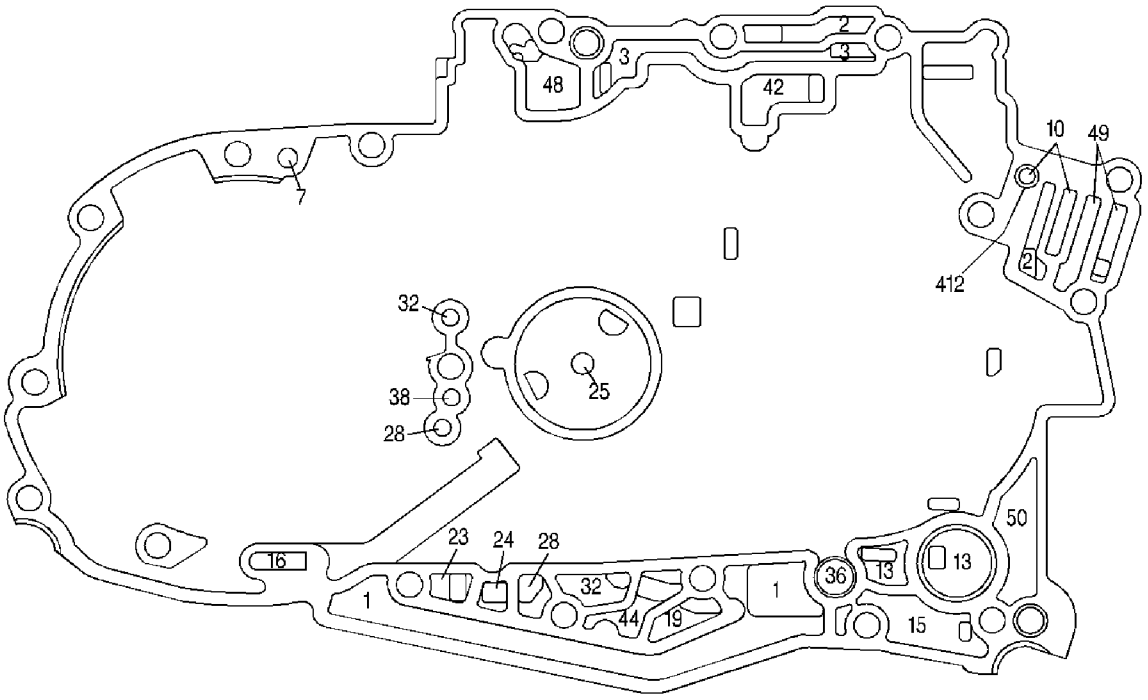
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(3) PRN
(4) Solenoid B
(5) Solenoid A
(6) Input Clutch Feed
(6) Input Clutch Feed
(7) Input Clutch
(8) PWM Feed
(9) PWM
(9) PWM
(10) Modulator
(10) Modulator
(10) Modulator
(10) Modulator
(10) Modulator
(11) Converter Feed
(11) Converter Feed
(11) Converter Feed
(11) Converter Feed
(11) Converter Feed
(12) Regulated Apply
(13) Release
(13) Release
(13) Release
(14) Apply
(14) Apply
(15) Cooler
(15) Cooler
(16) Lube
(16) Lube
(18) D-4
(18) D-4
(18) D-4
(18) D-4
(18) D-4
(18) D-4
(18) D-4
(18) D-4
(18) D-4
(19) Drive Servo Apply
(19) Drive Servo Apply
(19) Drive Servo Apply
(19) Drive Servo Apply
(22) Primary Trim
(22) Primary Trim
(23) 1-2 Accumulator
(24) 2-3 Accumulator

(24) 2-3 Accumulator
(25) 3-4 Accumulator
(25) 3-4 Accumulator
(26) 2nd
(27) 2nd-2nd Exhaust
(27) 2nd/2nd Exhaust
(28) 2nd Clutch
(28) 2nd Clutch
(28) 2nd Clutch
(28) 2nd Clutch
(29) Solenoid B Off
(29) Solenoid B Off
(30) 3rd
(30) 3rd
(32) 3rd Clutch
(32) 3rd Clutch
(33) 3rd Clutch/Low-1st
(34) TCC Signal
(34) TCC Signal
(34) TCC Signal
(40) 4th Clutch
(40) 4th Clutch
(41) 4th Clutch Exhaust
(42) D-3
(42) D-3
(42) D-3
(42) D-3
(43) D-2
(43) D-2
(44) Manual 2-1 Servo Feed
(44) Manual 2-1 Servo Feed
(44) Manual 2-1 Servo Feed
(44) Manual 2-1 Servo Feed
(45) Low
(46) Low-1st
(46) Low-1st
(46) Low-1st
(46) Low-1st
(46) Low-1st
(47) Reverse
(48) Reverse Servo
(49) Exhaust
(49) Exhaust
(49) Exhaust
(49) Exhaust

(49) Exhaust
(49) Exhaust
(50) Void
(50) Void
(50) Void
(50) Void
(50) Void
(50) Void

Channel Plate Fluid Passages (Case Side)

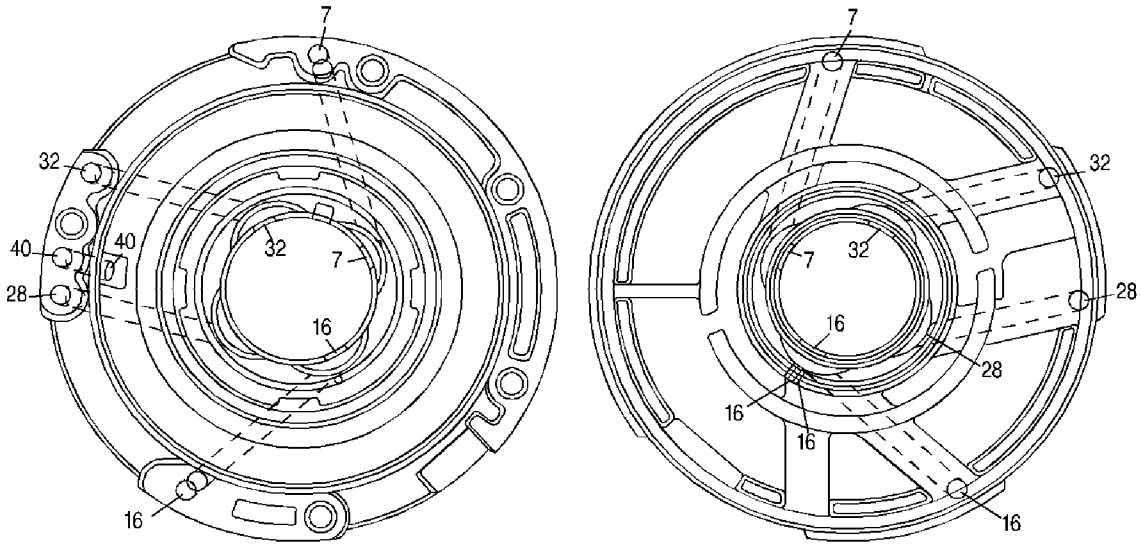


(1) Suction
(1) Suction
(2) Line
(2) Line
(3) PRN
(3) PRN
(7) Input Clutch
(10) Modulator
(13) Release
(13) Release
(15) Cooler
(16) Lube
(19) Drive Servo Apply
(23) 1-2 Accumulator
(24) 2-3 Accumulator
(25) 3-4 Accumulator
(28) 2nd Clutch
(28) 2nd Clutch

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(32) 3rd Clutch
(32) 3rd Clutch
(36) TCC Accumulator Feed Blow Off
(38) 4th
(42) D-3
(44) Manual 2-1 Servo Feed
(48) Reverse Servo
(49) Exhaust
(50) Void
(412) Cup Orificed Plug

Driven Sprocket Support Fluid Passages

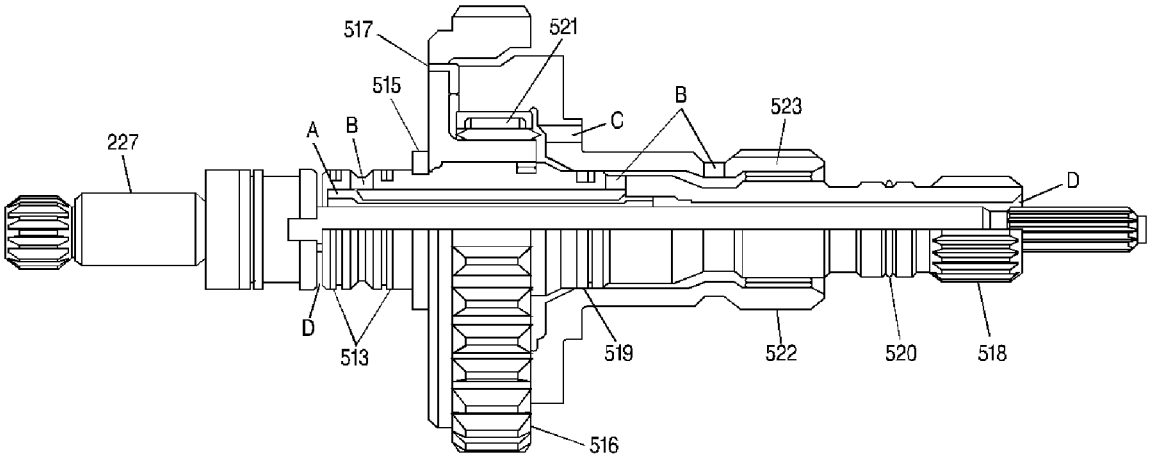


(7) Input Clutch
(7) Input Clutch
(7) Input Clutch
(7) Input Clutch
(16) Lube
(16) Lube
(16) Lube
(16) Lube
(16) Lube
(16) Lube
(28) 2nd Clutch
(28) 2nd Clutch
(28) 2nd Clutch
(32) 3rd Clutch
(32) 3rd Clutch
(32) 3rd Clutch
(32) 3rd Clutch
(40) 4th Clutch

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(40) 4th Clutch

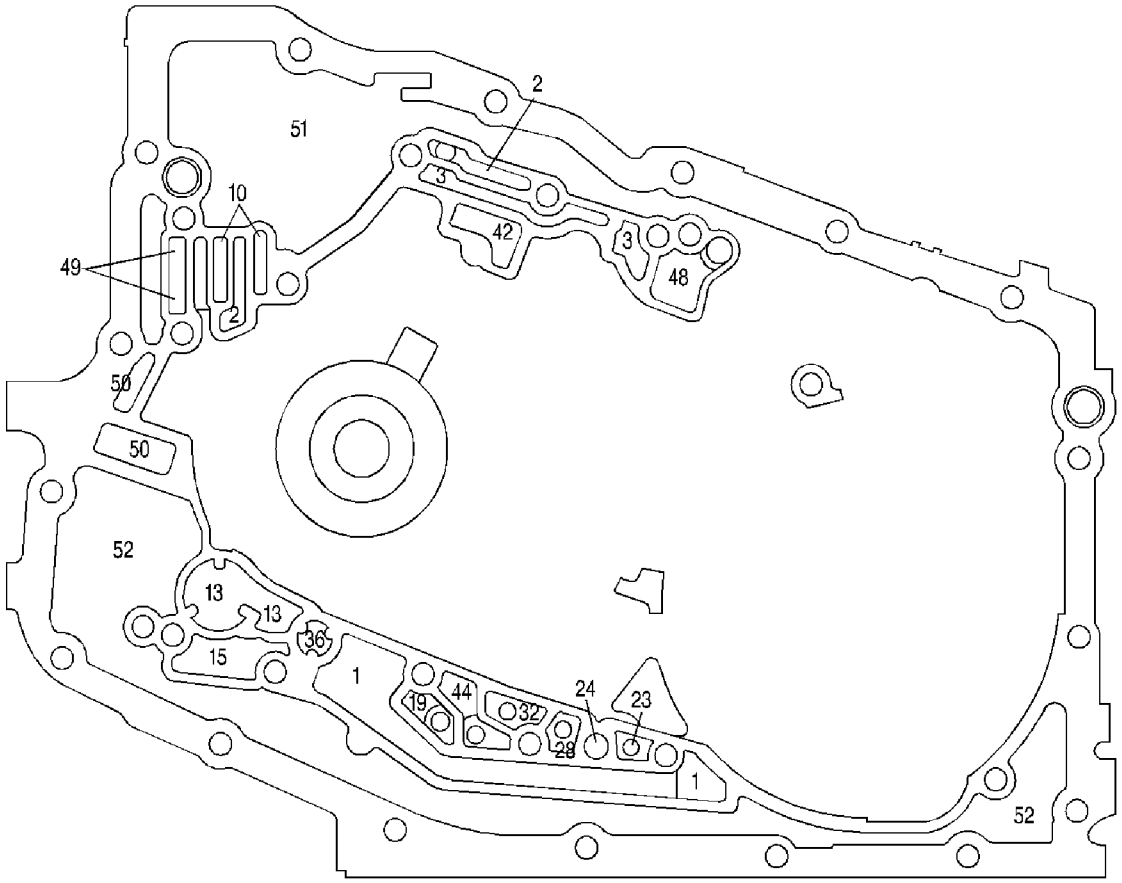
Oil Pump Drive Shaft and Drive Sprocket Support Fluid Passages



(a) Steel Sleeve
(b) Converter Apply
(b) Converter Apply
(c) Converter Seal Drainback
(d) Converter Release
(d) Converter Release
(227) Oil Pump Drive Shaft Assembly
(513) Oil Seal Ring (Turbine Shaft/Sleeve)
(515) Turbine Shaft To Drive Sprocket Ring (Snap)
(516) Drive Sprocket
(517) Thrust Washer (Drive Sprocket/Support)
(518) Turbine Shaft
(519) Oil Seal Ring (Turbine Shaft/Support)
(520) O-Ring Seal (Turbine Shaft/Hub) Green
(521) Drive Support/Sprocket Bearing Assembly (Drawn Cup)
(522) Drive Sprocket Support
(523) Drive Sprocket Support Bushing

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Case Fluid Passages (Channel Plate Side)

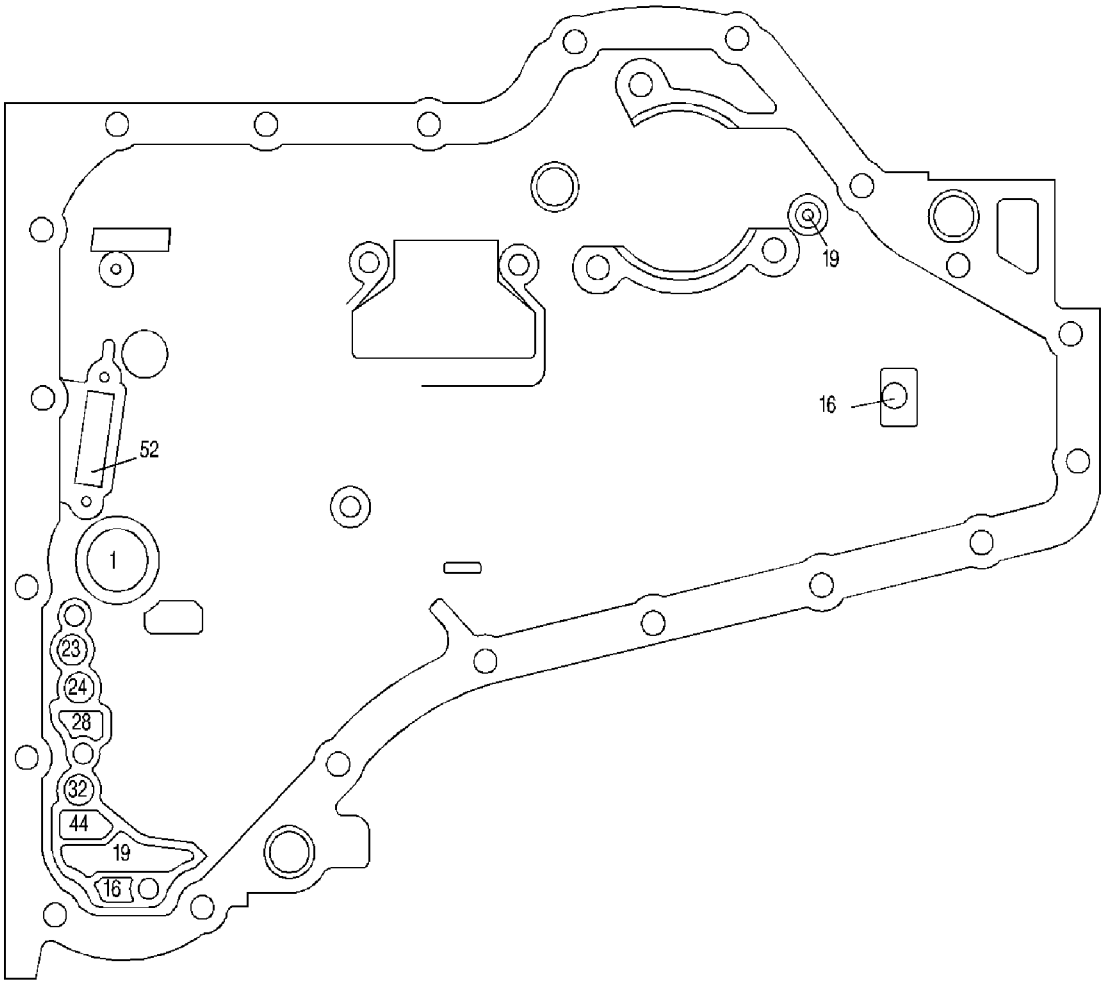


(1) Suction
(1) Suction
(2) Line
(2) Line
(3) PRN
(3) PRN
(10) Modulator
(13) Release
(13) Release
(15) Cooler
(19) Drive Servo Apply

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(23) 1-2 Accumulator
(24) 2-3 Accumulator
(28) 2nd Clutch
(32) 3rd Clutch
(36) TCC Accumulator Feed Blow Off
(42) D-3
(44) Manual 2-1 Servo Feed
(48) Reverse Servo
(49) Exhaust
(50) Void
(50) Void
(51) Vent
(52) Thermo Element
(52) Thermo Element

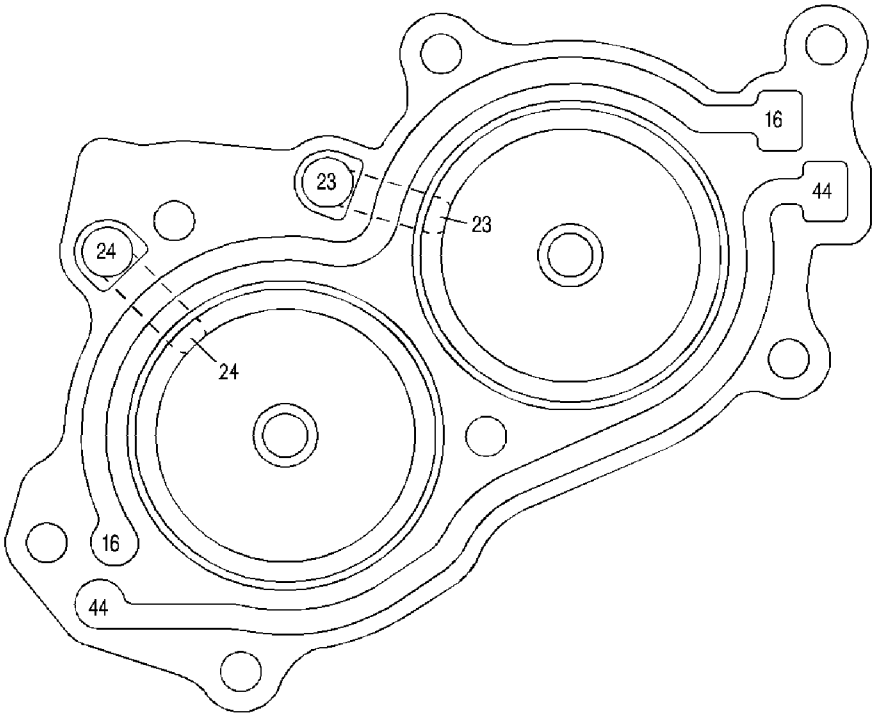
Case Fluid Passages (Bottom)



(1) Suction
(16) Lube
(16) Lube
(19) Drive Servo Apply
(19) Drive Servo Apply
(23) 1-2 Accumulator
(24) 2-3 Accumulator
(28) 2nd Clutch
(32) 3rd Clutch
(44) Manual 2-1 Servo Feed
(52) Thermo Element Exhaust

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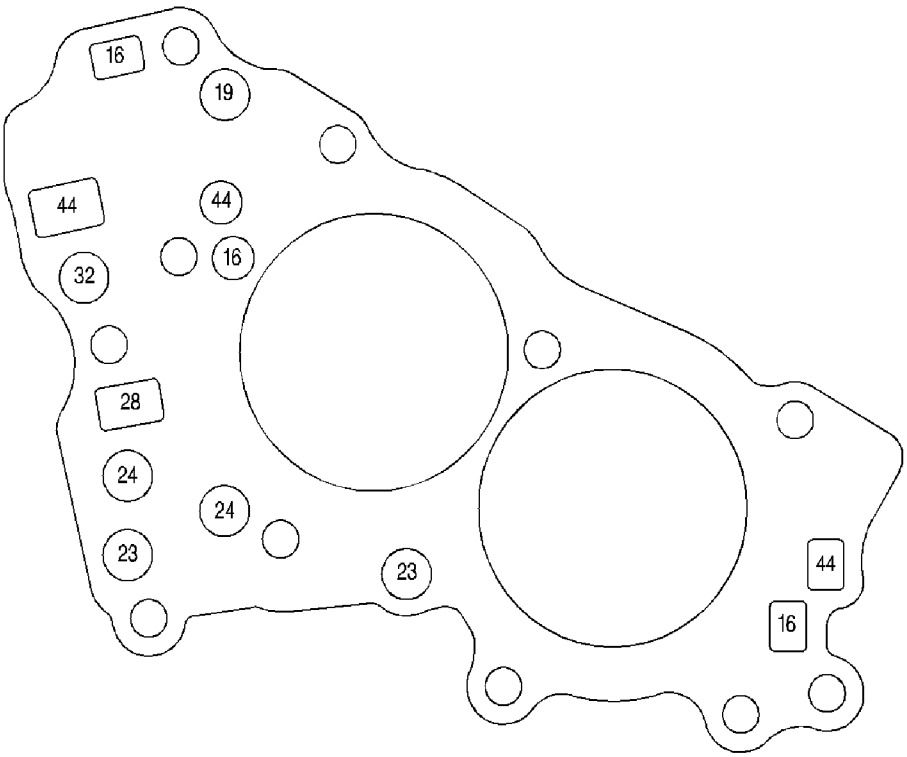
Accumulator Housing Fluid Passages



(16) Lube
(16) Lube
(23) 1-2 Accumulator
(23) 1-2 Accumulator
(24) 2-3 Accumulator
(24) 2-3 Accumulator
(44) Manual 2-1 Servo Feed
(44) Manual 2-1 Servo Feed

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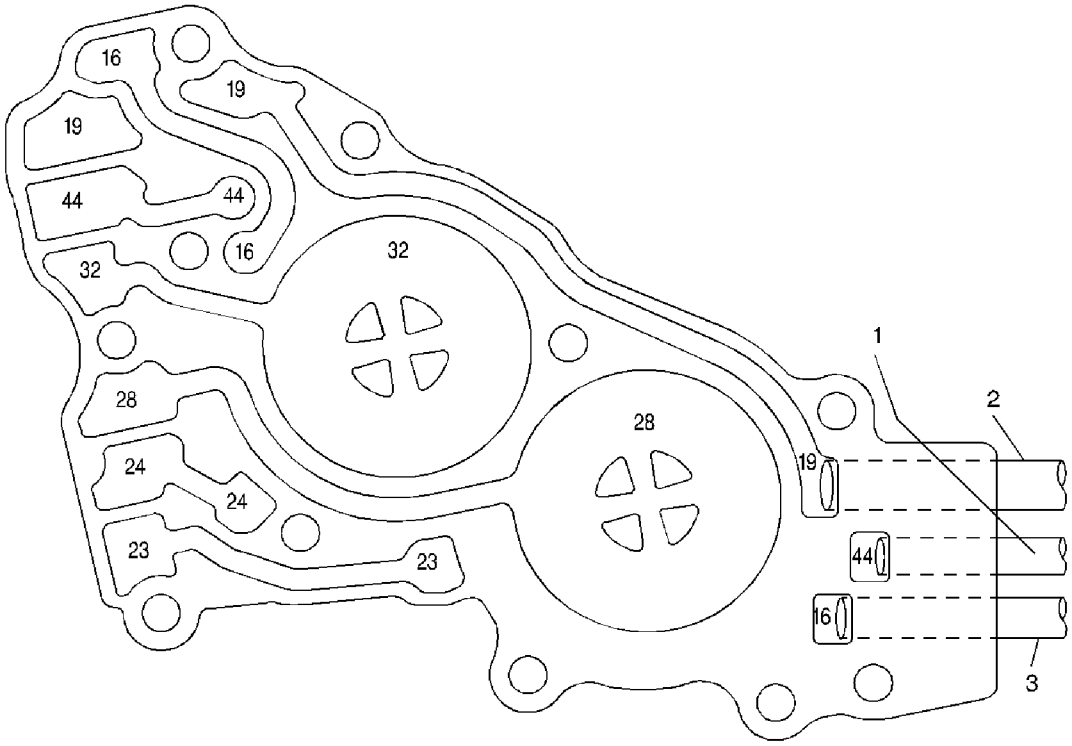
Accumulator Spacer Plate Fluid Passages



(16) Lube
(16) Lube
(16) Lube
(19) Drive Servo Apply
(23) 1-2 Accumulator
(23) 1-2 Accumulator
(24) 2-3 Accumulator
(24) 2-3 Accumulator
(28) 2nd Clutch
(32) 3rd Clutch
(44) Manual 2-1 Servo Feed
(44) Manual 2-1 Servo Feed
(44) Manual 2-1 Servo Feed

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Accumulator Cover Fluid Passages

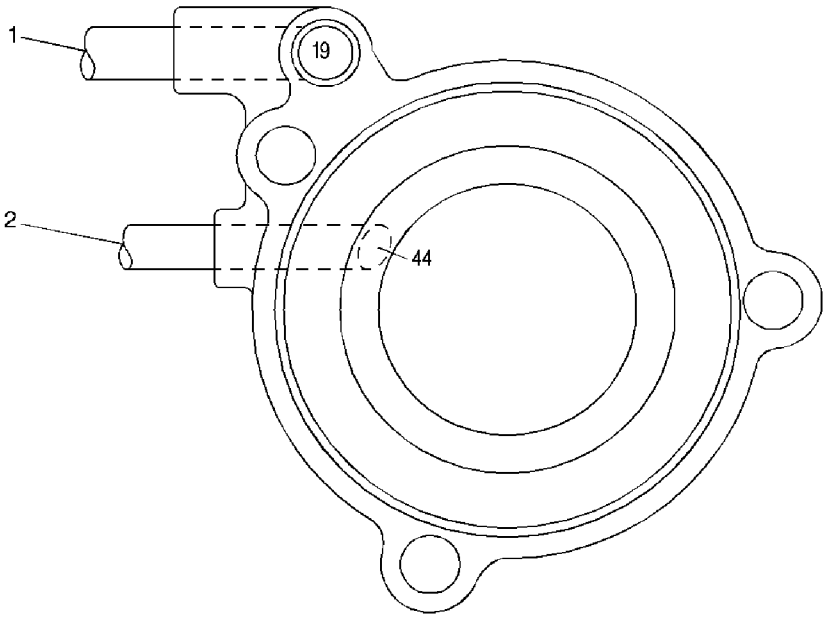


(1) Manual Servo Apply Pipe
(2) Forward Servo Apply Pipe
(3) Lube Oil Pipe
(16) Lube
(16) Lube
(16) Lube
(19) Drive Servo Apply
(19) Drive Servo Apply
(19) Drive Servo Apply
(23) 1-2 Accumulator
(23) 1-2 Accumulator
(24) 2-3 Accumulator
(24) 2-3 Accumulator
(28) 2nd Clutch
(28) 2nd Clutch
(32) 3rd Clutch
(32) 3rd Clutch
(44) Manual 2-1 Servo Feed

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(44) Manual 2-1 Servo Feed
(44) Manual 2-1 Servo Feed

2-1 Manual Servo Body Cover Fluid Passages



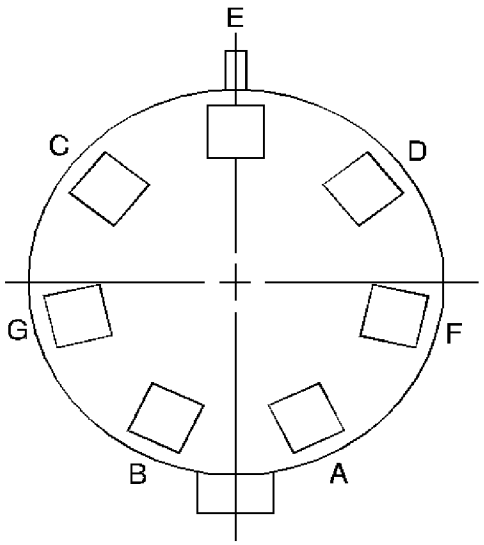
(1) Forward Servo Apply Pipe
(2) Manual Servo Apply Pipe
(19) Drive Servo Apply
(44) Manual 2-1 Servo Feed

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Automatic Transmission Inline Harness Connector End View (2.4L VIN T)

Table 1: 4T60-E, C/Hcar, trans. side
Table 2: 4T60-E, Ncar (VIN T), engine side

Wiring Harness Assembly 7-way Connector, Transmission Side



4T60-E, C/Hcar, trans. side

Connector Part Information	• 8683061 • 7-way Metri-Pack 150 Series • Black		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	0.8 BLK	1222	1-2 Shift Solenoid (1-2 SS) Valve Control
B	0.8 BLU	1223	2-3 Shift Solenoid (2-3 SS) Valve Control
C	0.8 BLK	418	Torque Converter Clutch Pulse Width Modulation Solenoid (TCC PWM Sol.) Valve Control
	0.8		Torque Converter Clutch Solenoid (TCC Sol.) Valve

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D	TAN	422	Control
E	0.8 RED	741	Ignition Positive Voltage
F	0.8 BRN	1227	Automatic Transmission Fluid Temperature (TFT) Sensor Input
G	0.8 GRY	452	Sensor Ground

Wiring Harness Assembly 7-way Connector, Engine Side

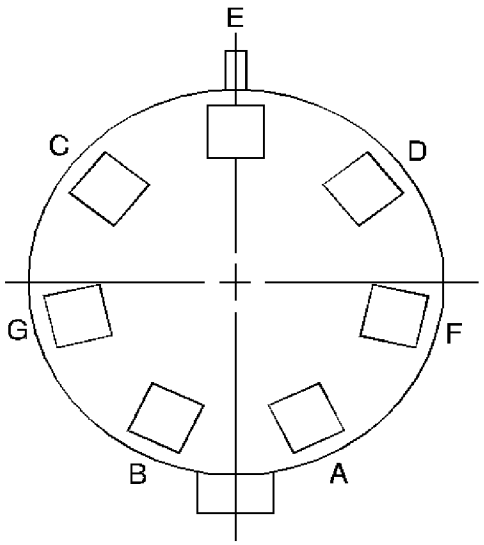
4T60-E, Ncar (VIN T), engine side

Connector Part Information	• 12126467 • 7-way Metri-Pack 150 Series • Black		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	0.5 LT GRN	1222	1-2 SS Valve Control
B	0.5 YEL/BLK	1223	2-3 SS Valve Control
C	0.5 BRN	418	TCC PWM Sol. Valve Control
D	0.5 TAN/BLK	422	TCC Sol. Valve Control
E	0.8 PNK	439	Ignition Positive Voltage

Automatic Transmission Inline Harness Connector End View (3.1L VIN M)

Table 1: 4T60-E, C/Hcar, trans. side
Table 2: 4T60-E, Ncar (VIN M), engine side

Wiring Harness Assembly 7-way Connector, Transmission Side



4T60-E, C/Hcar, trans. side

Connector Part Information	• 8683061 • 7-way Metri-Pack 150 Series • Black		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	0.8 BLK	1222	1-2 Shift Solenoid (1-2 SS) Valve Control
B	0.8 BLU	1223	2-3 Shift Solenoid (2-3 SS) Valve Control
C	0.8 BLK	418	Torque Converter Clutch Pulse Width Modulation Solenoid (TCC PWM Sol.) Valve Control
	0.8		Torque Converter Clutch Solenoid (TCC Sol.) Valve

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D	TAN	422	Control
E	0.8 RED	741	Ignition Positive Voltage
F	0.8 BRN	1227	Automatic Transmission Fluid Temperature (TFT) Sensor Input
G	0.8 GRY	452	Sensor Ground

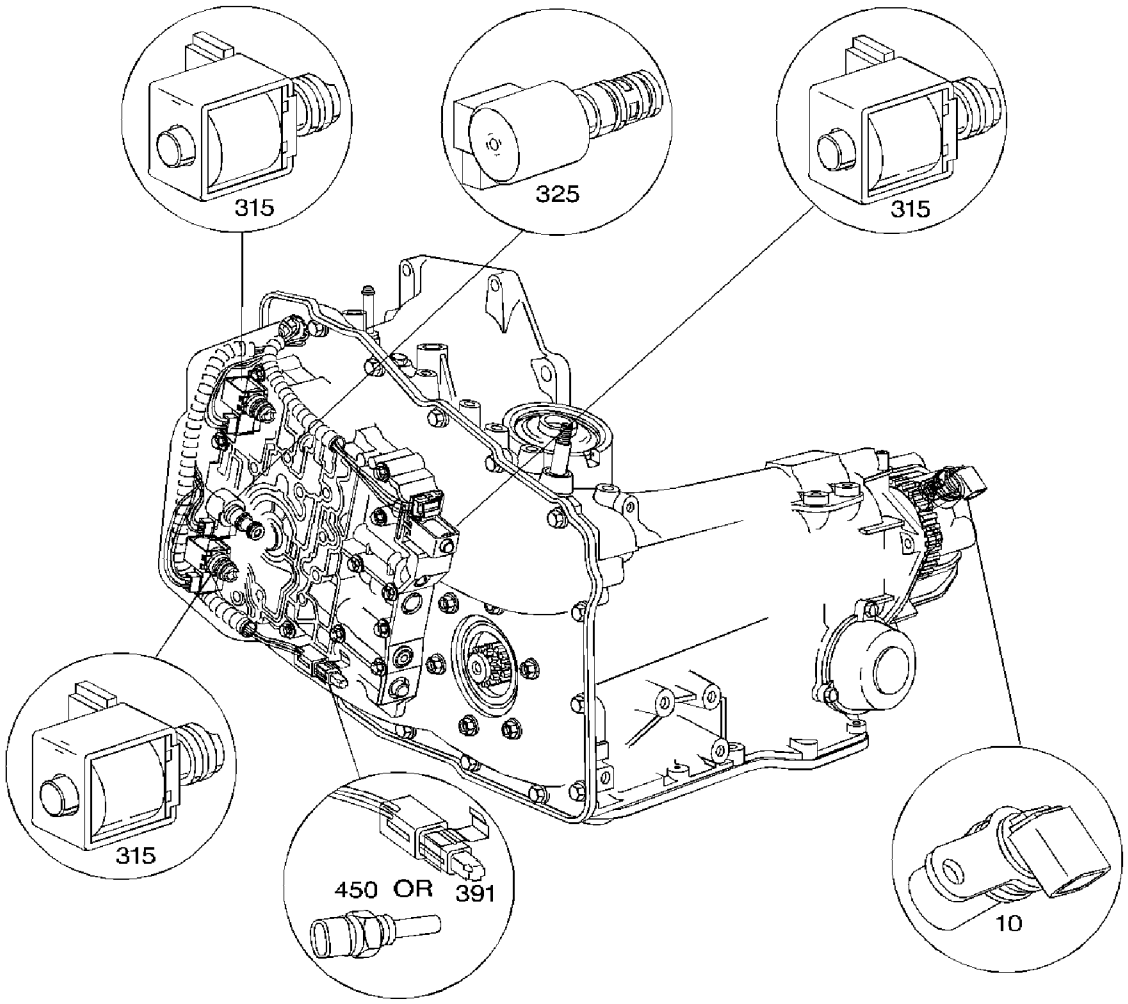
Wiring Harness Assembly 7-way Connector, Engine Side

4T60-E, Ncar (VIN M), engine side

Connector Part Information	• 12126467 • 7-way Metri-Pack 150 Series • Black		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	0.5 LT GRN	1222	1-2 SS Valve Control
B	0.5 YEL/BLK	1223	2-3 SS Valve Control
C	0.5 BRN	418	TCC PWM Sol. Valve Control
D	0.5 TAN/BLK	422	TCC Sol. Valve Control
E	0.8 PNK	439	Ignition Positive Voltage
F	0.5 YEL/BLK	1227	TFT Sensor Signal
G	0.5 ORN	1057	Sensor Ground

Automatic Transmission Electronic Component Views

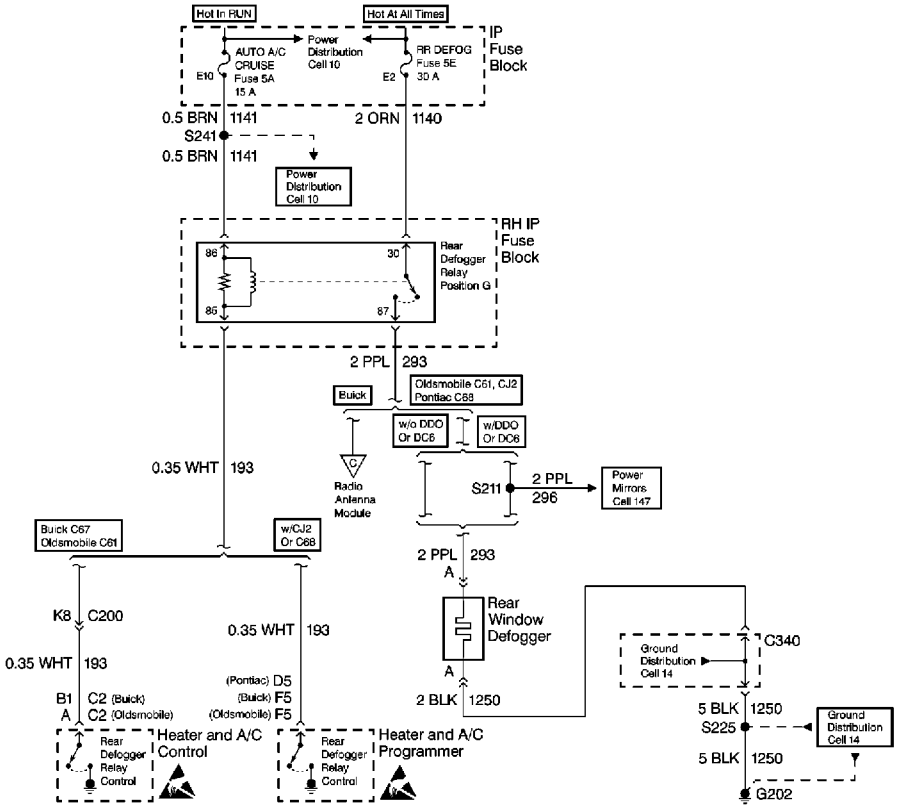
Electronic Component Locations



(325) Torque Converter Clutch Pulse Width Modulation Solenoid Valve
(315) 2-3 Shift Solenoid Valve (upper right)
(10) Vehicle Speed Sensor
(391) Automatic Transmission Fluid Temperature Sensor
(315) Torque Converter Clutch Solenoid Valve (lower left)
(315) 1-2 Shift Solenoid Valve (upper left)

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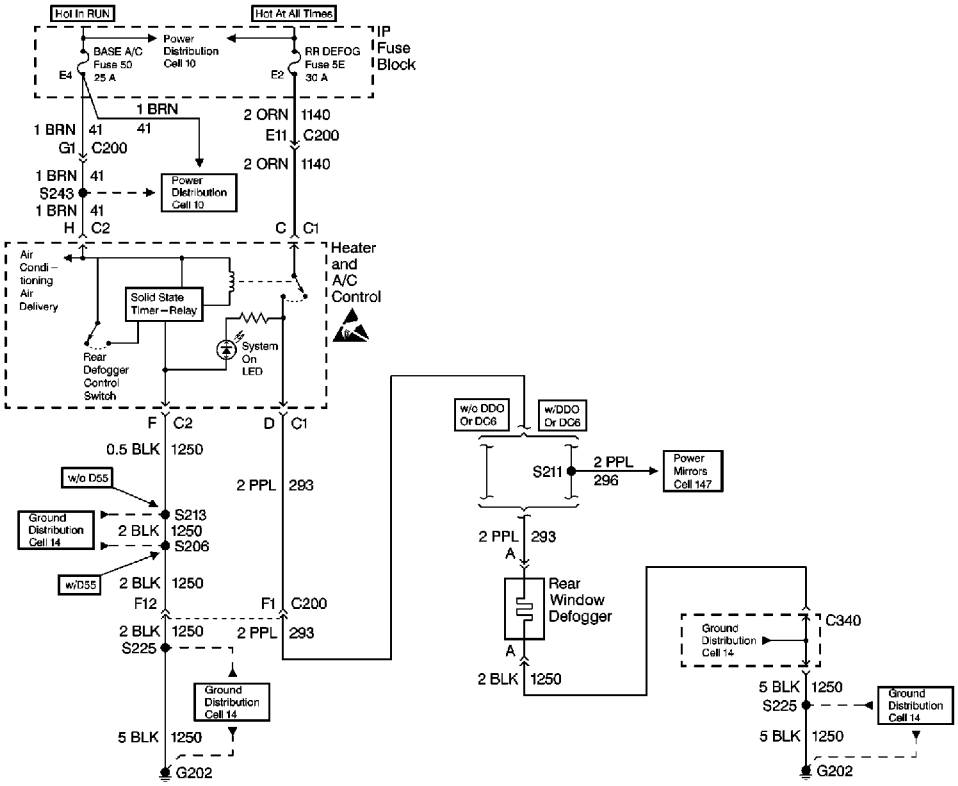
Cell 61: Rear Defogger Relay



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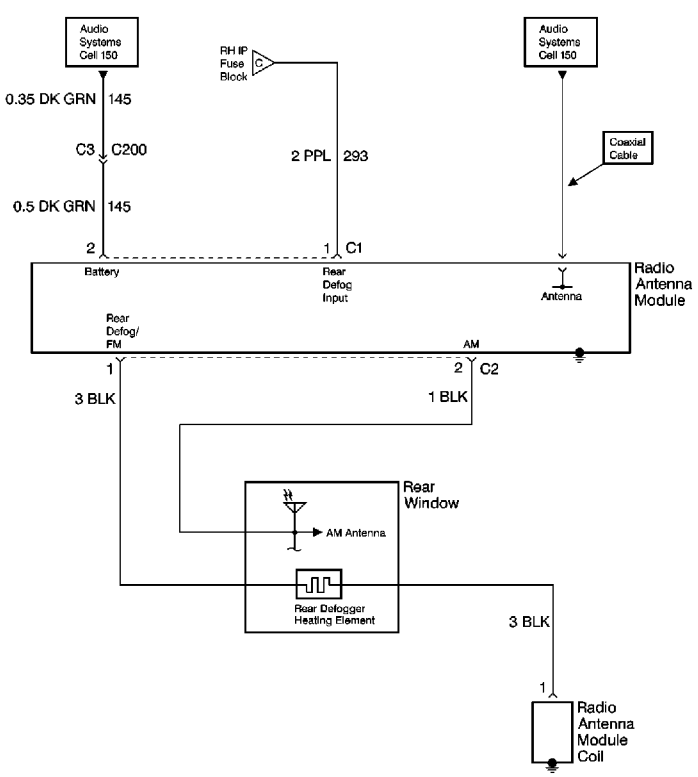
Cell 61: Rear Defogger Switch



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Cell 61: Rear Defogger

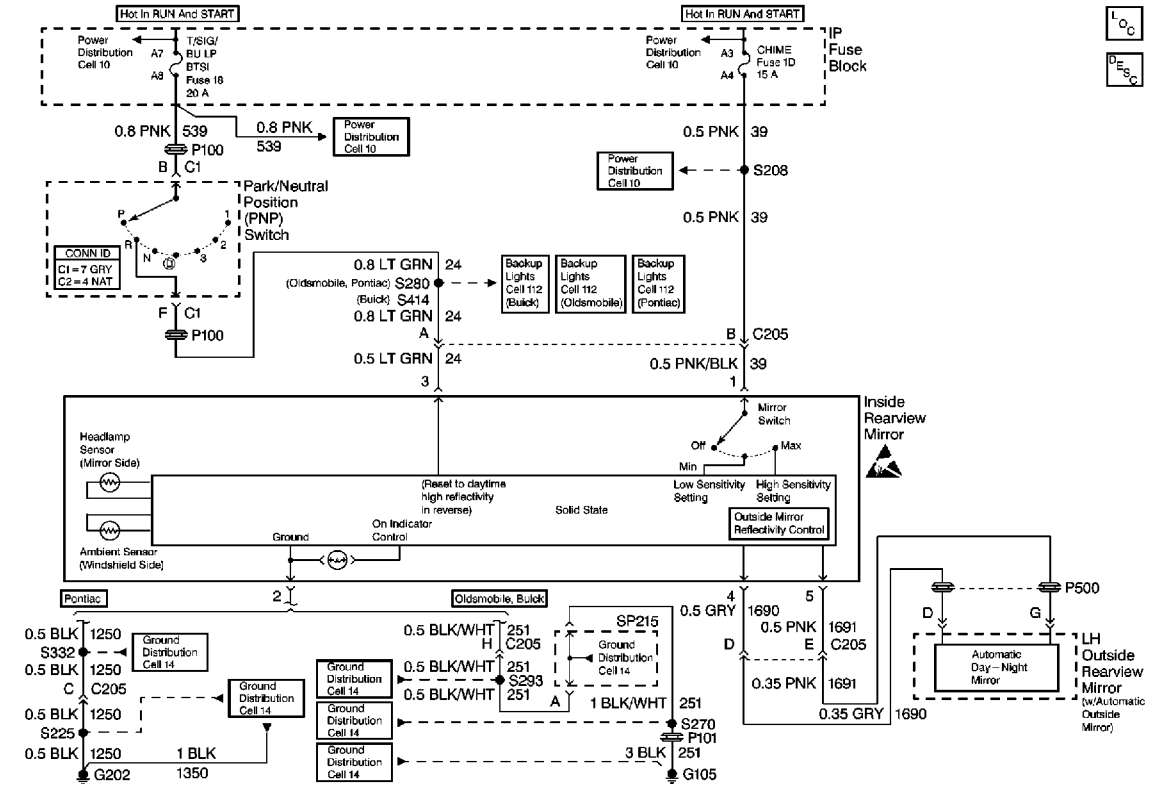


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Automatic Day-Night Mirrors Schematics

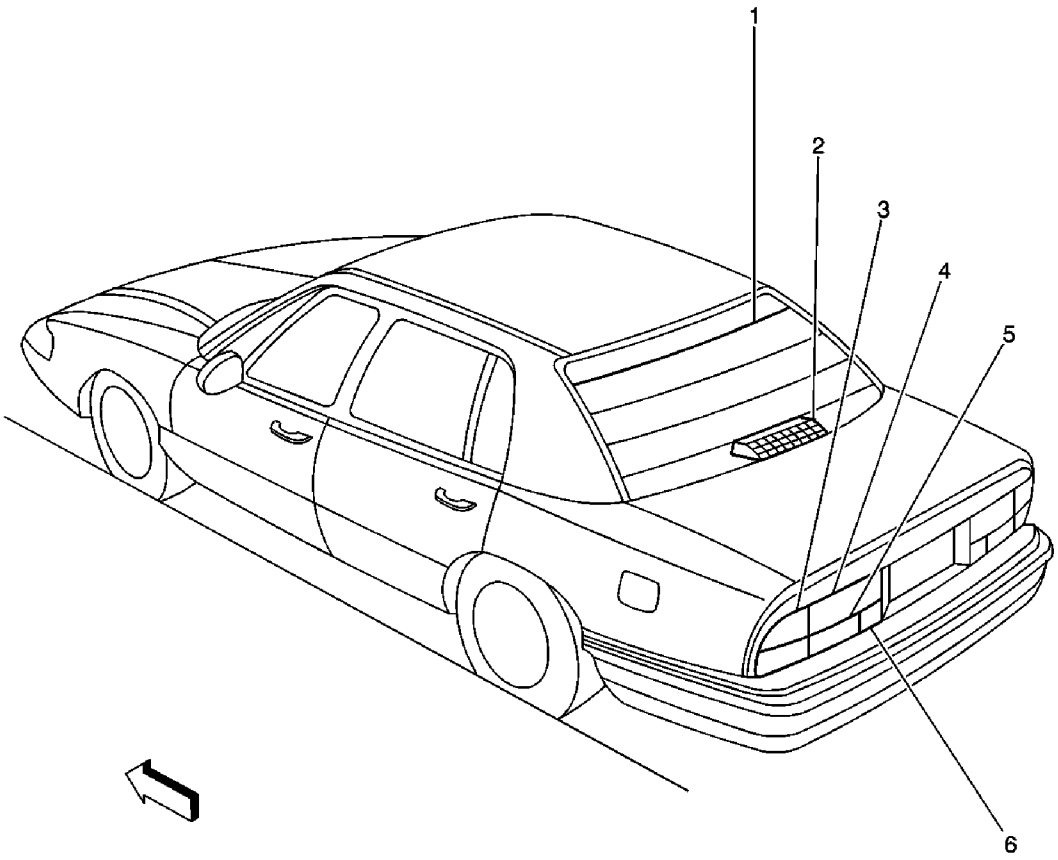
Cell 148



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Rear of the Vehicle

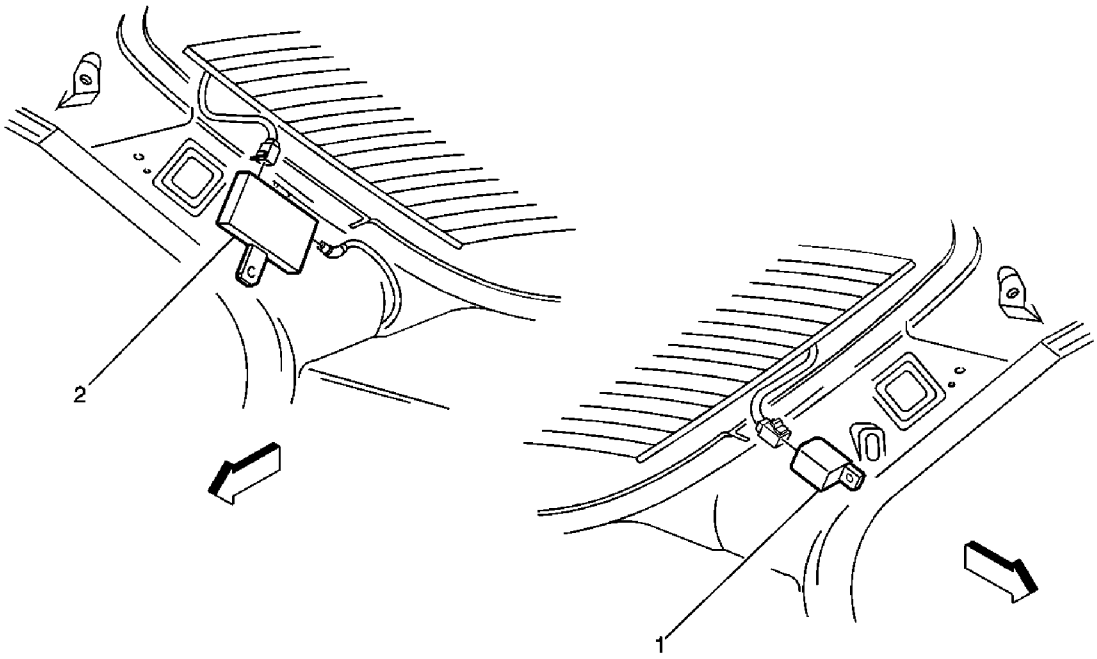


(1) Rear Window Defogger
(2) High Mounted Stop Lamp
(3) LH Tail Lamp (RH Similar)
(4) LH Tail/Stop Lamp (RH Similar)
(5) LH Tail/Stop/Turn Lamp (RH Similar)
(6) LH Backup Lamp (RH Similar)

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Rear of the Passenger Compartment



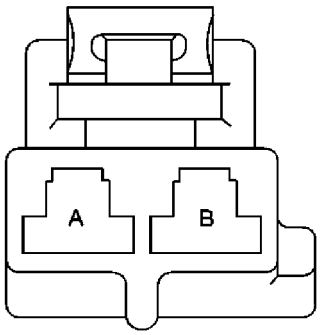
(1) Radio Antenna Module Coil
(2) Radio Antenna Module

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Stationary Windows Connector End Views

Radio Antenna Module (Buick)





Connector Part Information	• 12162414 • 2 Way F (BLK)

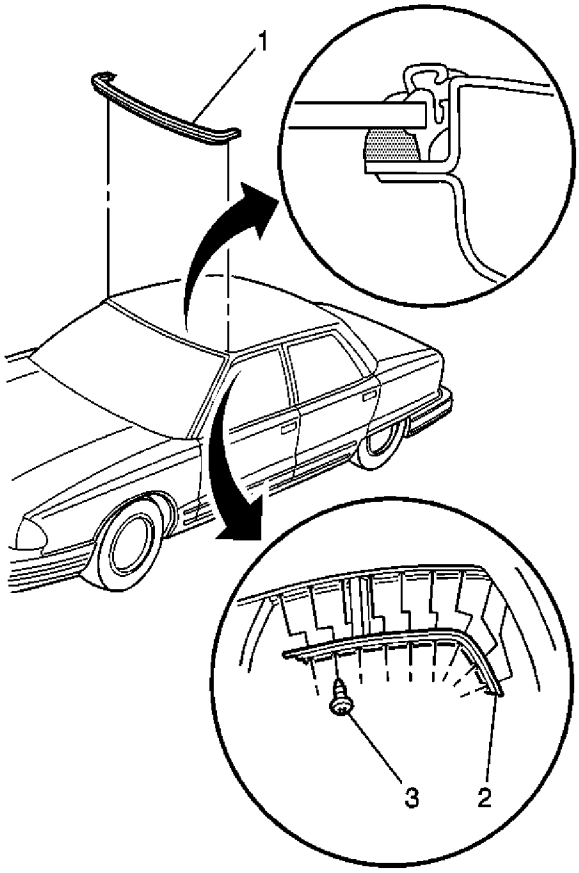
Pin	Wire Color	Circuit No.	Function
A	PPL	293	Rear Defogger Element Feed
B	DK GRN	145	Power Antenna Relay Feed - Coil

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Reveal Molding Replacement

Removal Procedure



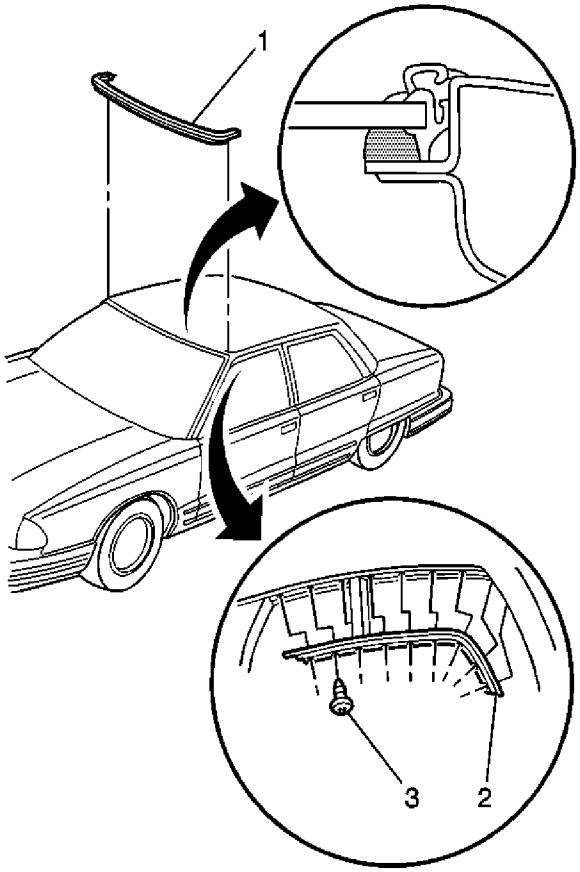
1. Remove the side reveal molding fasteners (3).
2. Remove the side reveal moldings (2).
3. Remove the drip rail molding fasteners.
4. Remove the drip rail moldings.
5. Use a flat-bladed tool in order to carefully pry the end of the windshield reveal molding (1) out approximately 9 cm (3 in).
6. Grasp the molding with your hand. Slowly pull the reveal molding from the retainer.
7. Complete the following step if the reveal molding retainer is to be replaced.

Important: If the reveal molding retainer for the windshield is being replaced, refer to Windshield Replacement .

Installation Procedure

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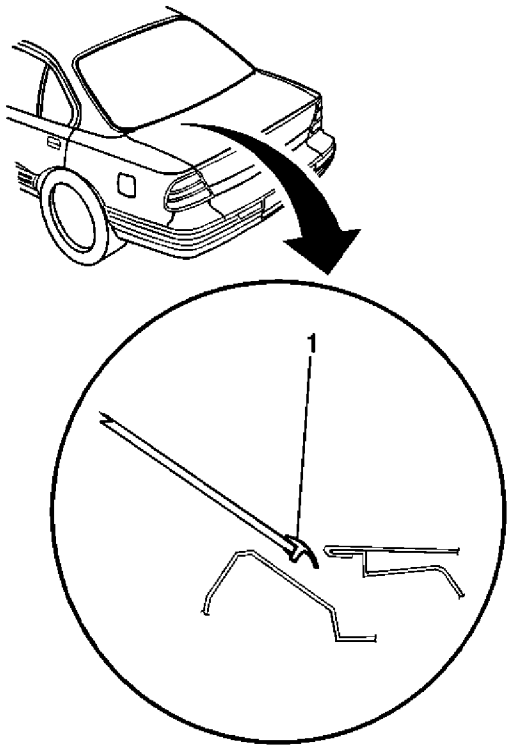


1. Apply tape in order to temporarily keep the reveal molding flush with the windshield.
2. Begin installation from the center of the window.
3. Press the reveal molding (1) into the retainer.
4. Install the drip rail moldings.
5. Install the drip rail molding fasteners.
6. Install the side reveal moldings (2).
7. Install the side reveal molding fasteners (3).

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Rear Window Reveal Molding Replacement

Removal Procedure



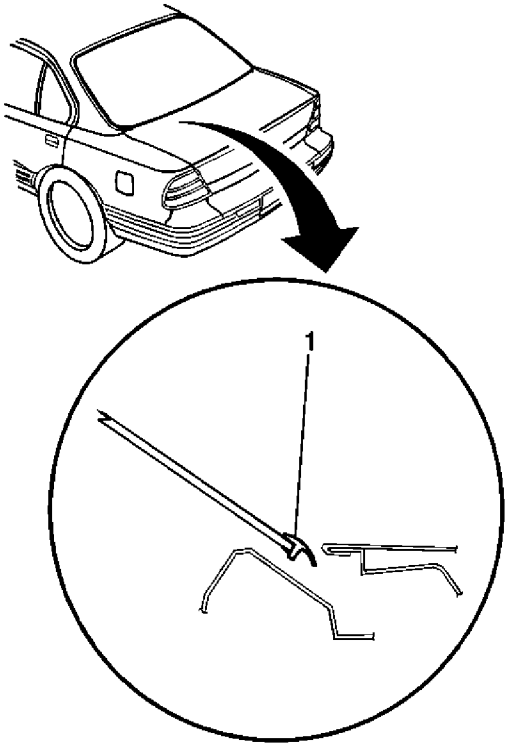
Important: The rear reveal molding is removed during the rear window removal.

Remove the rear window (1). Refer to Rear Window Replacement .

Installation Procedure

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1. Press the molding (2) on to the glass edge.

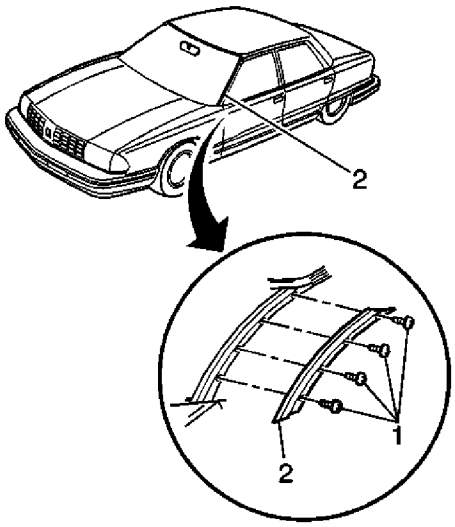
   Start from the center of the window (1).

2. Install the rear window. Refer to Rear Window Replacement .

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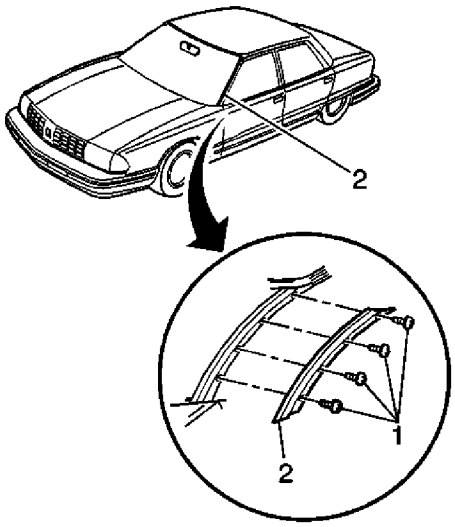
Windshield Side Reveal Molding Replacement

Removal Procedure



1. Remove the 4 fasteners (1).
2. Remove the side reveal molding (2).

Installation Procedure



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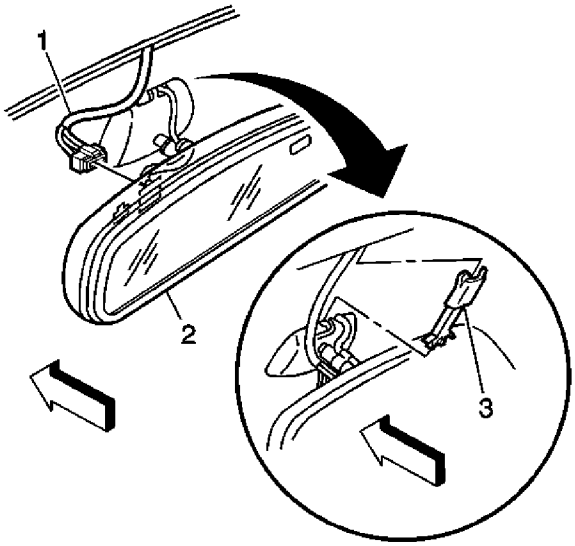
1. Install the side reveal molding (2).
2. Install the 4 screws (1).

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Inside Rearview Mirror Replacement (With DD8 and DC4)

Removal Procedure

Notice: Do not use tools or other objects to pry the mirror mount or the mirror away from the windshield. Using tools may damage the mirror mount, the mirror or the windshield.



1. Disconnect the electrical connector (1) from the mirror (2).

   Adjust the mirror to the full down position.

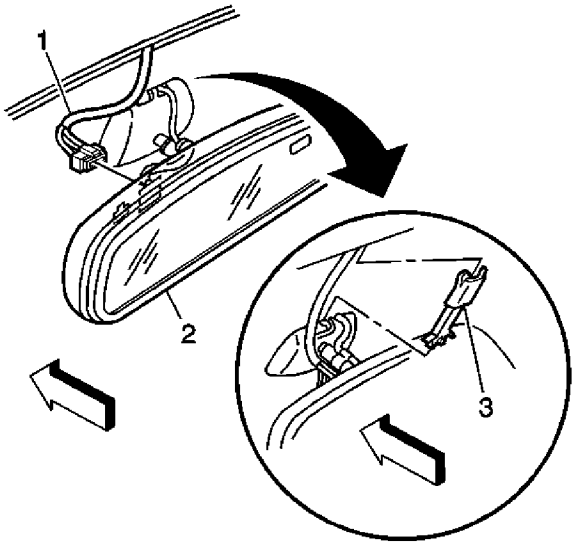
   Using both hands, grasp both sides of the mirror (2) at the top.

2. Remove the mirror assembly from the button by rotating the mirror in a downward-rearward motion.

Installation Procedure

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1. Install the center bottom of the mirror mount against the windshield at the top of the button.
2. Slide the mount onto the button. Keep the mount parallel to the windshield.
3. As the mount begins to grip the button, apply a force against the button. Maintain a downward force until the mount snaps onto the button with an audible click.

   This operation requires at least 20 pounds of force.

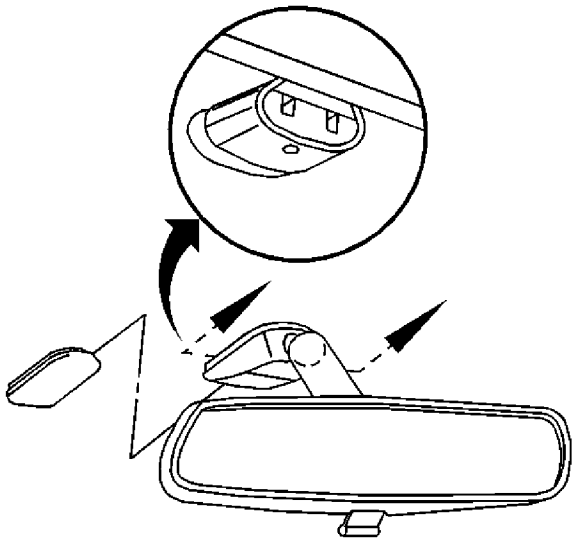
4. Ensure that the mirror is securely attached to the button by adjusting the mirror in a normal up/down and a side to side range.
5. Connect the electrical connector (1).
6. Move the sensitivity switch lever to the MAX position. Turn the vehicle ignition OFF.
7. In low ambient light, the OFF/M/C/M letters should be illuminated. If the letters are not lit, inspect the connectors and/or the wiring.
8. For electrochromatic mirrors, test the mirror by simulating glare. Perform the following steps:
   - 8.1. Cover the forward facing sensor, located on the right side of the mirror back, using a black cloth.
   - 8.2. Hold the cloth over the sensor until the glass starts to darken to the non-reflective stage.
   - 8.3. Remove the cloth. The mirror returns to the clear reflective stage.
   - 8.4. Repeat the previous 3 steps several times in order to ensure that the mirror operates correctly.

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Inside Rearview Mirror Replacement (Except DC4)

Removal Procedure

Notice: Do not use tools or other objects to pry the mirror mount or the mirror away from the windshield. Using tools may damage the mirror mount, the mirror or the windshield.





1. Adjust the mirror to the full down position.

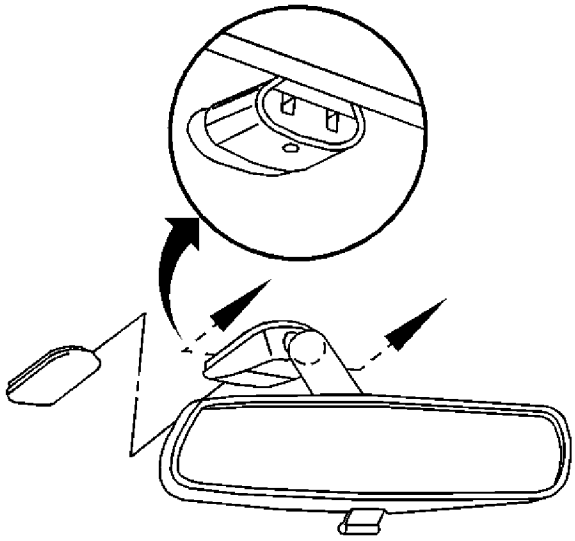
   With both hands, grasp both sides of the mirror at the top.

2. Remove the mirror assembly from the button by rotating the mirror in a downward-rearward motion.

Installation Procedure

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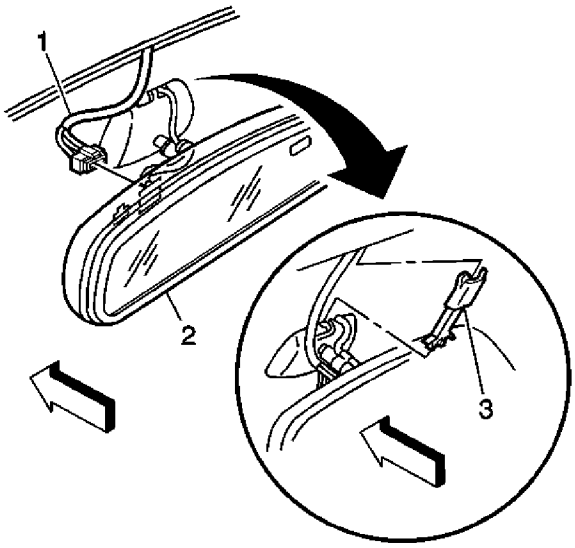
1. Install the center bottom of the mirror mount against the windshield at the top of the button.
2. Slide the mount onto the button, keeping the mount parallel to the windshield.
3. As the mount starts to grip the button, apply a force against the button while maintaining a downward force until the mount snaps onto the button with an audible click.
4. This operation requires at least 20 pounds of force.
5. Check to make sure the mirror is securely attached to the button by adjusting the mirror in a normal up/down and a side to side range.

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Inside Rearview Mirror Replacement (With DD7)

Removal Procedure

Notice: Do not use tools or other objects to pry the mirror mount or the mirror away from the windshield. Using tools may damage the mirror mount, the mirror or the windshield.





1. Unplug the electrical connector from the mirror.

   Adjust the mirror to the full down position.

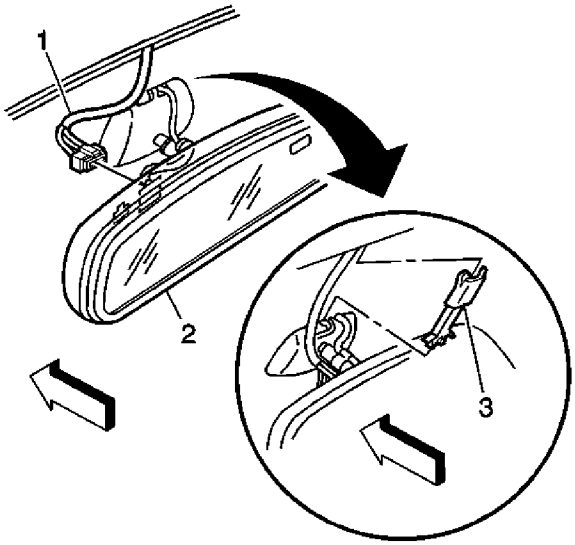
   With both hands, grasp both sides of the mirror at the top.

2. Remove the mirror assembly from the button by rotating the mirror in a downward-rearward motion.

Installation Procedure

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1. Install the center bottom of the mirror mount against the windshield at the top of the button.
2. Slide the mount onto the button, keeping the mount parallel to the windshield.
3. As the mount begins to grip the button, apply a force against the button while maintaining a downward force until the mount snaps onto the button with an audible click.
4. This operation requires at least 20 pounds of force.
5. Check to make sure the mirror is securely attached to the button by adjusting the mirror in a normal up/down and a side to side range.
6. Connect the electrical connector.
7. Move the Sensitivity switch lever to the MAX position and turn the vehicle ignition off.
8. In low ambient light, the OFF/M/C/M letters should be illuminated. If they are not lit, check connectors and/or wiring.
9. For Electrochromatic mirrors, test the mirror by simulating glare as follows:
10. Cover the forward facing sensor, located on the right side of the mirror back with a black cloth.
11. Hold the cloth over the sensor until you notice the glass start to darken to the non-reflective stage.
12. Remove the cloth and the mirror will return to the clear reflective stage.
13. Repeat the previous three steps several times to make sure the mirror operates correctly.
14. Calibrate compass if necessary. Refer to Compass Calibration Description .

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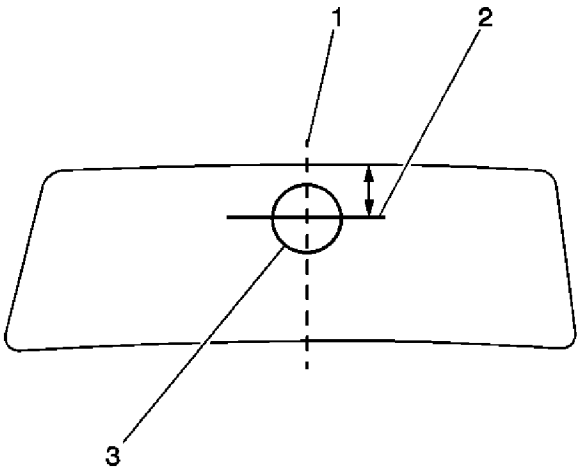
Rearview Mirror Support Installation

The rearview mirror is attached to a support. The support is secured to the windshield glass. The glass supplier installs the support by using a plastic-polyvinyl butyl adhesive. Replacement windshield glass has the mirror support bonded to the glass assembly.

Removal may cause damage to the windshield. If the support becomes detached, use the installation procedure below.

In order to install a detached mirror support or install a new part, the following items are needed:

- GM P/N 1052369 LOCTITE® Minute-Bond Adhesive 312 2 component pack or the equivalent
- A mirror support
- A wax marking pencil or a crayon
- Rubbing alcohol
- A clean paper towel
- A fine emery cloth or sandpaper (320 or 360 grit)
- A clean toothpick





1. Use a wax marking pencil or a crayon in order to mark the position of the mirror support on the outside surface of the windshield.

   If the mirror location cannot be determined by residue from the previous support, measure and mark the windshield (1) in order to locate the bottom of the support.

2. Draw a circle around the mirror support location (3) on the outside of the window in order to indicate the cleaning area.

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3. Use paper towel and one of the following items in order to clean the circled area on the inside of the window:
   - A scouring cleanser
   - A window cleaner
   - A polishing compound
4. In order to remove any traces of scouring powder or cleaning solution, rub the area until completely clean.

   Dry the area using an alcohol saturated paper towel.

5. Use a piece of fine grit (320 or 360) emery cloth or sandpaper in order to sand the bonding surface of the rearview mirror support . If you are reusing the original rearview mirror support, remove all traces of the factory installed adhesive.
6. Wipe the sanded mirror support using a clean paper towel saturated with alcohol.

   Allow the support to dry.

7. In order to prepare the rearview mirror support prior to installation, follow the directions on the manufacturer's kit.
8. Position the support onto the premarked location, placing the rounded end upward.

   Press the support against the window for 30-60 seconds.

9. Exert steady pressure against the window.

   After 5 minutes, use one of the following items in order to remove any excess adhesive:

   - An alcohol moistened paper towel
   - A window cleaning solution
10. Reinstall the mirror.

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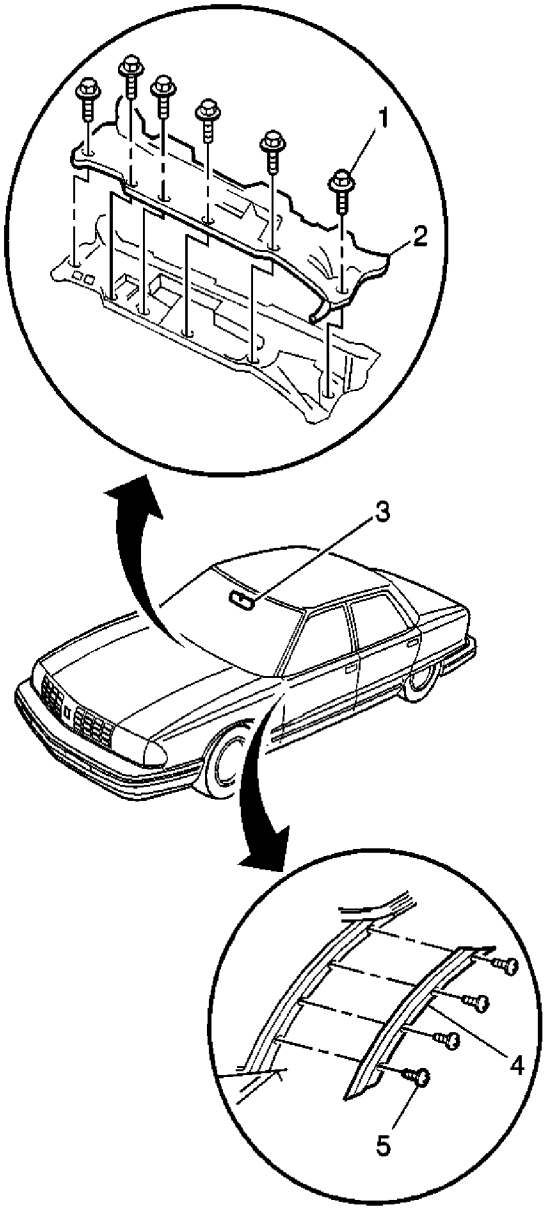
Windshield Replacement (Long Method)

Removal Procedure

Tools Required

J 39032 Stationary Glass Removal Tool

1. Remove the drip moldings.
2. Remove the side reveal molding. Refer to Windshield Side Reveal Molding Replacement .
3. Remove the wiper arms. Refer to Windshield Wiper Arm Replacement in Wiper/Washer Systems.



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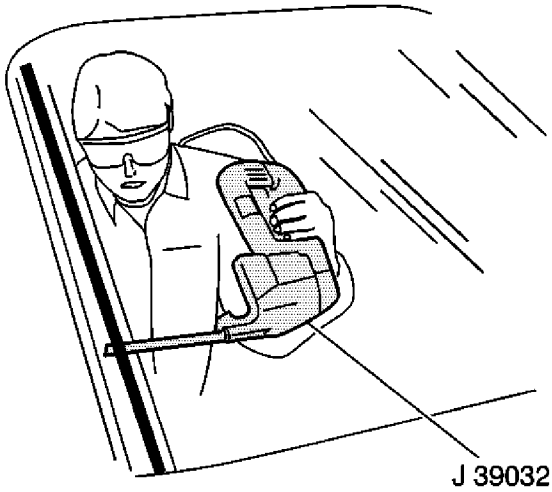
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Notice: Be sure to follow the service procedure when removing the air inlet grille panel. Failure to follow service procedure may cause damage to the air inlet grille panel or the windshield.

4. Remove the air inlet screen.
5. Remove the rearview mirror (3). Refer to Inside Rearview Mirror Replacement .
6. Remove the windshield pillar molding. Refer to Windshield Pillar Garnish Molding Replacement in Interior Trim.
7. Remove the front sunshades. Refer to Sunshade Replacement in Interior Trim.
8. Remove the upper console fasteners, if equipped.
9. Partially lower the headliner in order for access.

Caution: If broken glass falls into the defroster outlets, it can be blown into the passenger compartment and cause personal injury.

10. Remove the defroster grille. Refer to Defroster Grille Replacement in Instrument Panel, Gauges and Console.

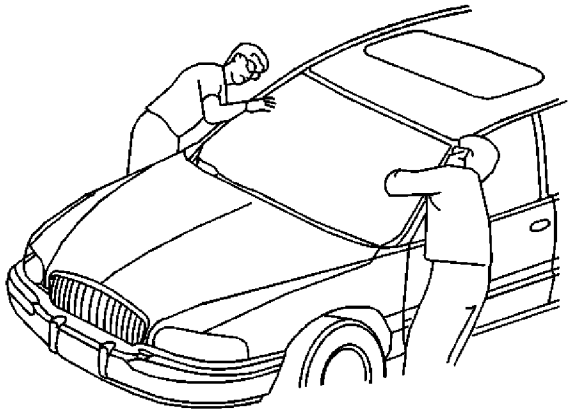


Caution: When working with any type of glass or sheet metal with exposed or rough edges, wear approved safety glasses and gloves in order to reduce the chance of personal injury.

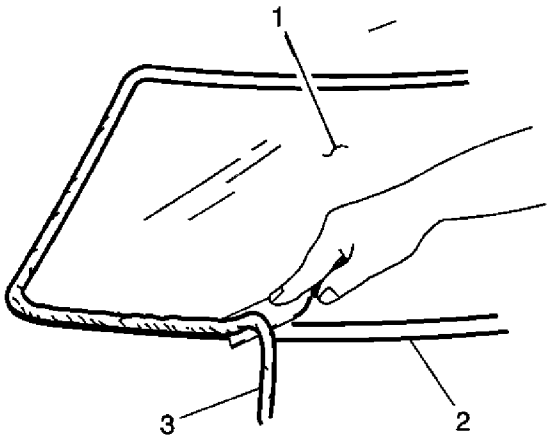
11. From the inside of the vehicle, cut out the windshield.

    Use the J 39032

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12. Remove the windshield, with the aid of an assistant.
13. Remove the reveal molding retainer from the windshield.



14. If you will reuse the original window (1), use a razor knife in order to remove any existing urethane adhesive (3) from the following locations:
    - The window (1)
    - The windshield body surface (2)

Caution: Failure to prep the area prior to the application of primer may cause insufficient bonding of urethane adhesive. Insufficient bonding of urethane adhesive may allow unrestrained occupants to be ejected from the vehicle resulting in personal injury.

15. Clean the surface of the window where new urethane adhesive applies. Clean around the edge of the inside surface of the window.

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Use one of the following cleaners:

- A clean isopropyl alcohol dampened cloth
- GM Window Cleaner P/M 1050427 or the equivalent

Inspection Procedure

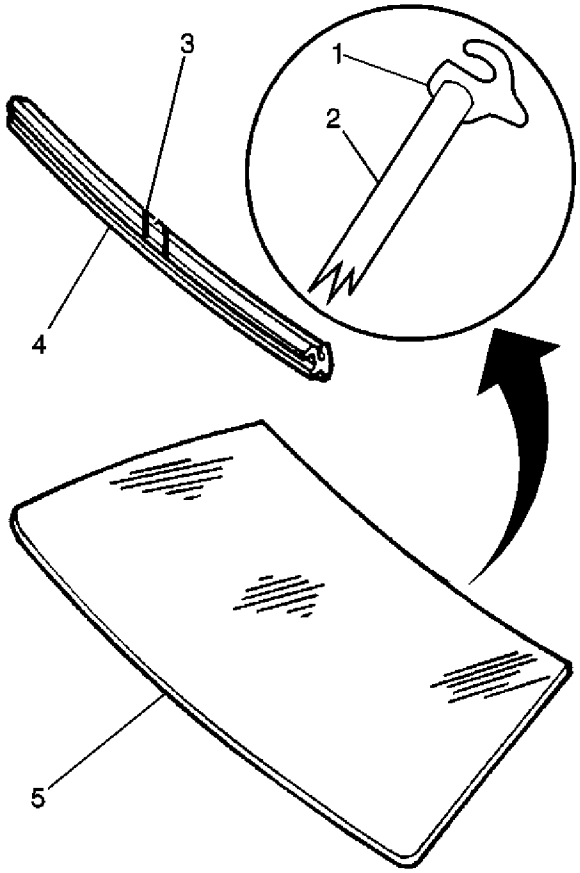
1. The following components may reveal the causes of a broken windshield:
   - The flange of the windshield opening
   - The windshield reveal molding
   - The windshield
   - The acoustic strip
2. Inspect for any of the following conditions in order to prevent future breakage of the windshield:
   - High welds
   - Solder spots
   - Hardened spot weld sealer
   - Any obstruction or irregularity in the pinchweld flange.
   - The acoustic strip was not installed
3. Inspect the condition of the windshield opening and the adhesive bead. Refer to Adhesive Service Kit Description .

Installation Procedure

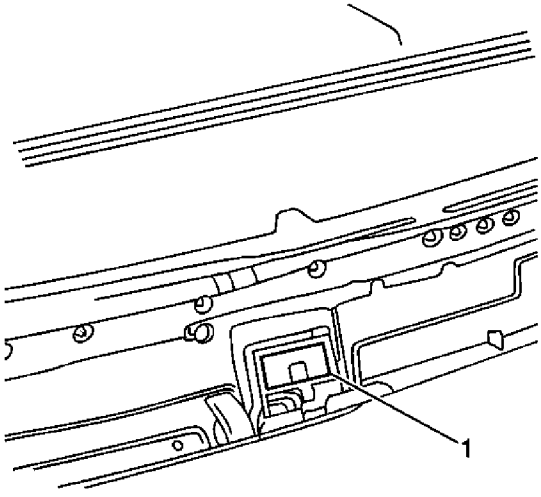
Tools Required

J 24811 Urethane Adhesive Dispensing Gun

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1. Firmly press the reveal molding retainer (4) onto the edge of the windshield (2).



Caution: When working with any type of glass or sheet metal with exposed or rough edges,

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wear approved safety glasses and gloves in order to reduce the chance of personal injury.

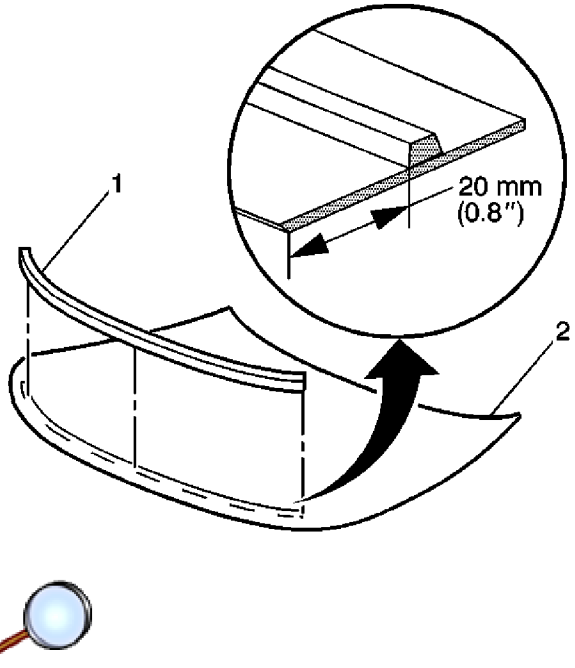
2. With the aid of an assistant, dry fit the window in the opening in order to determine the correct position.

   Fit the window by completing the following steps:

   2.1. Position the window in the opening on top of the windshield blocks (1).
   2.2. Use masking tape in order to mark the location of the window in the opening.
   2.3. Slit the masking tape at the window edge. During installation, the tape on the window aligns with the tape on the body.
   2.4. Remove the window from the opening.

   Place the window inside up on a clean protected surface.

3. Install the reveal molding.
4. Install the defroster grille. Refer to Defroster Grille Replacement

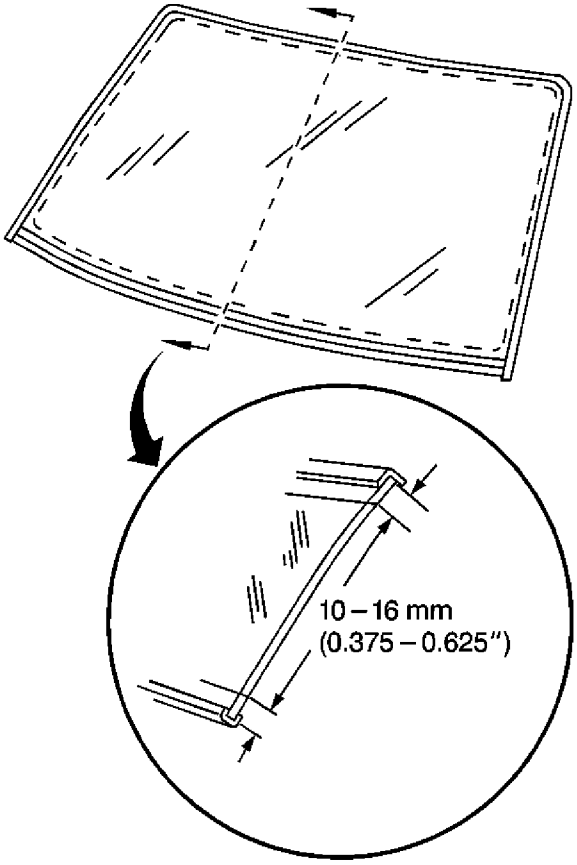


Caution: Failure to prep the area prior to the application of primer may cause insufficient bonding of urethane adhesive. Insufficient bonding of urethane adhesive may allow unrestrained occupants to be ejected from the vehicle resulting in personal injury.

Notice: Failure to install the acoustic strip could cause windshield breakage.

5. Install the acoustic strip (1).

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Caution: Failure to prep the area prior to the application of primer may cause insufficient bonding of urethane adhesive. Insufficient bonding of urethane adhesive may allow unrestrained occupants to be ejected from the vehicle resulting in personal injury.

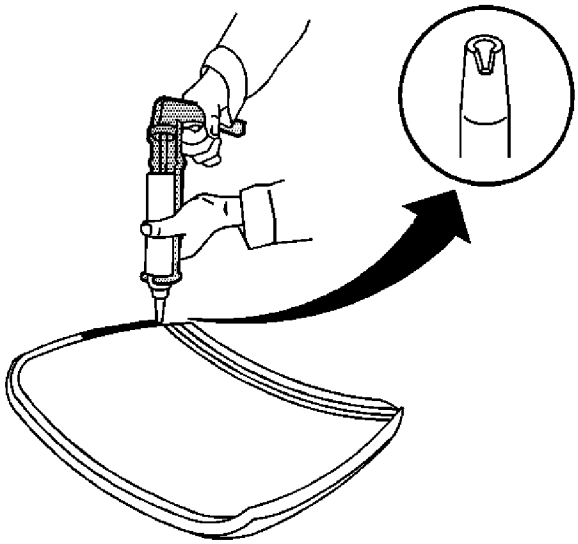
Important: Prevent the Window Prep 1 (clear) from running into the vision area of the windshield.

This primer dries almost instantly. This primer may stain the windshield if not applied evenly.

6. Use a new dauber in order to apply Window Prep 1 (clear) to the edges of the window.
7. Shake the Window Primer 2 (black) well.
8. Use a new dauber in order to apply the primer 2 (black) over the previously applied clear primer.

Allow approximately 6-10 minutes for drying the Window Primer 2 (black).

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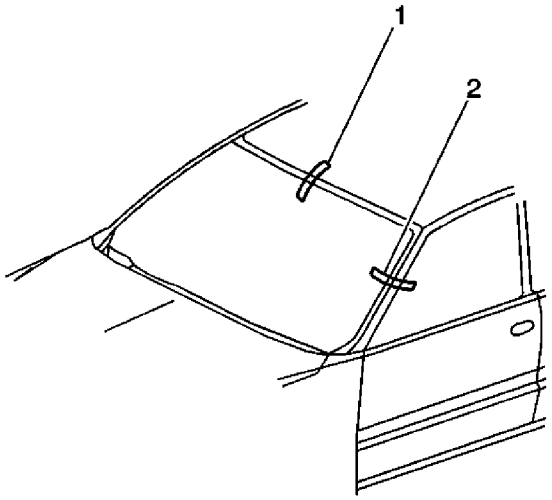


Caution: When replacing stationary windows, use Urethane Adhesive Kit GM P/N 12346392 (Canadian P/N 10952983), or a urethane adhesive system meeting GM Specification GM3651G, to maintain original installation integrity. Failure to use the urethane adhesive kit will result in poor retention of the window which may allow unrestrained occupants to be ejected from the vehicle resulting in personal injury.

9. Apply a 14 mm (9/16 in) high and 8 mm (5/16 in) wide bead of urethane adhesive to the windshield over the previously applied primers.

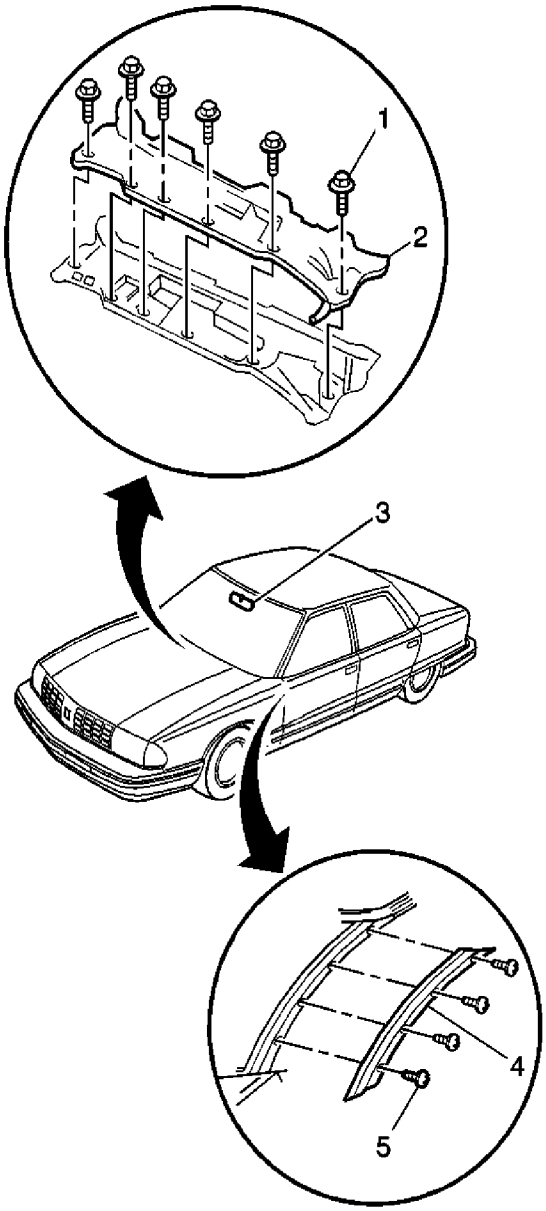
   Use a J 24811 .

10. With the aid of a helper, install the windshield in the opening.



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11. Align the tape lines on the windshield and on the body surfaces.
12. Firmly press the windshield into place.
13. Tape the windshield (1,2) to the body in order to minimize movement.



14. Install the side reveal moldings (4). Refer to Windshield Side Reveal Molding Replacement
15. Install the air inlet grille screen (2).
16. Install the wiper arms. Refer to Windshield Wiper Arm Replacement in Wiper/Washer Systems.

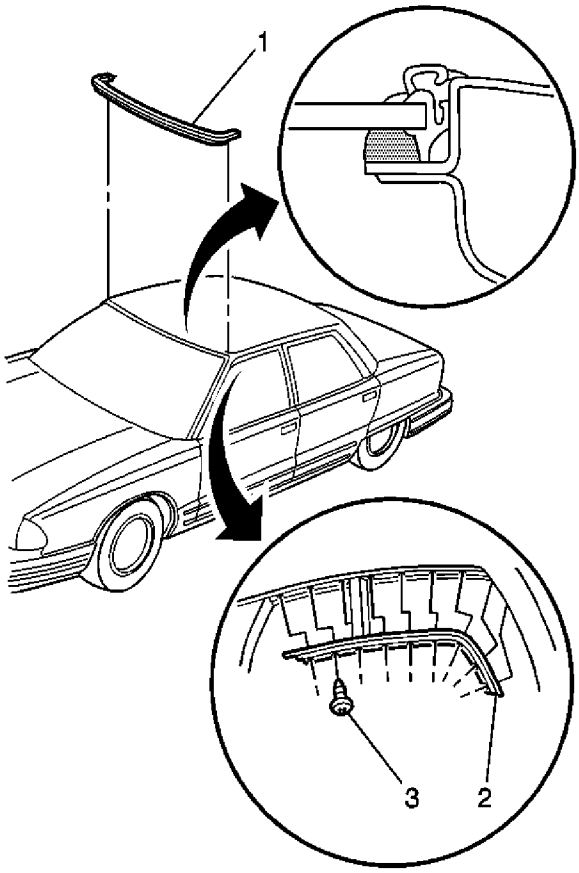
Important: DO NOT direct a hard stream of high pressure water at the fresh urethane adhesive.

17. Watertest the window immediately using a soft spray.

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Use warm or hot water in order to accelerate the cure of the adhesive.

18. If you find a leak, use a plastic paddle in order to apply extra urethane adhesive at the leak point.





19. Install the drip moldings (2).
20. Install the overhead console fasteners.
21. Install the sunshade. Refer to Sunshade Replacement in Interior Trim.
22. Install the windshield pillar moldings. Refer to Windshield Pillar Garnish Molding Replacement in Interior Trim.
23. Install the rearview mirror. Refer to Inside Rearview Mirror Replacement or Rearview Mirror Support Installation .

Important:

- Partially lower a door window in order to prevent pressure build-ups when closing the doors prior to the urethane adhesive cure.
- DO NOT DRIVE THE VEHICLE until the urethane adhesive is cured.
- DO NOT USE COMPRESSED AIR in order to dry the urethane adhesive.

24. Allow a minimum of 6 hours at room temperature, 22°C (72°F), at 30 percent relative humidity for curing the urethane adhesive.

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Windshield Replacement (Short Method)

Removal Procedure

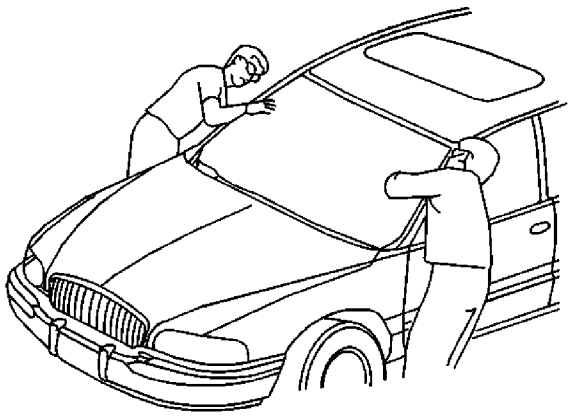
Caution: When replacing stationary windows, use Urethane Adhesive Kit GM P/N 12346392 (Canadian P/N 10952983), or a urethane adhesive system meeting GM Specification GM3651G, to maintain original installation integrity. Failure to use the urethane adhesive kit will result in poor retention of the window which may allow unrestrained occupants to be ejected from the vehicle resulting in personal injury.

Caution: When working with any type of glass or sheet metal with exposed or rough edges, wear approved safety glasses and gloves in order to reduce the chance of personal injury.

1. Apply masking tape around the windshield in order to protect the painted surface of the vehicle.
2. Remove the inside rear view mirror. Refer to Inside Rearview Mirror Replacement .
3. Lower the front of the headliner. Refer to Headlining Trim Panel Replacement .
4. Remove the windshield wiper arms. Refer to Windshield Wiper Arm Replacement in Wipers Washer Systems.
5. Remove the reveal moldings. Refer to Reveal Molding Replacement .

Caution: If broken glass falls into the defroster outlets, it can be blown into the passenger compartment and cause personal injury.

6. Lubricate the cutting area prior to windshield removal.
7. Use the equalizer, refer to Special Tools from the inside of the glass in order to cut the urethane seal.





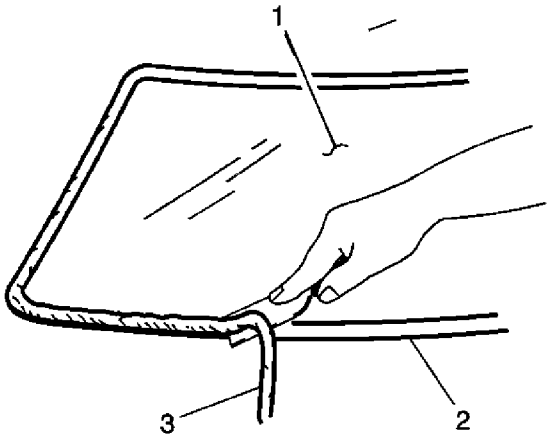
8. With the aid from an assistant, carefully remove the windshield.

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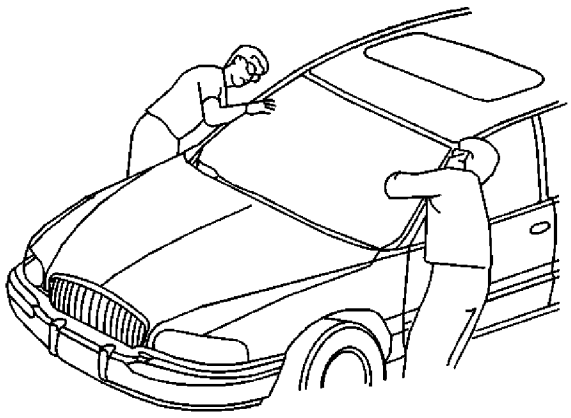
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Installation Procedure

1. Reposition the headliner to the original position. Refer to Headlining Trim Panel Replacement .



2. Remove excessive urethane from pinch weld area.
3. Clean pinch weld area.
4. Apply pinch weld primer.
5. Replace the foam tape seal at the bottom side of the cowl area.
6. Clean the new glass.
7. Apply the two-part primer to the new windshield sealing surface.
8. Apply the urethane to the pinch weld area.



9. Carefully install the new windshield with the aid from an assistant.
10. Install the reveal moldings. Refer to Reveal Molding Replacement .

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11. Install the windshield wiper arms. Refer to Windshield Wiper Arm Replacement in Wipers Washer Systems.
12. Clean the windshield and remove the masking tape.
13. Install the rear view mirror. Refer to Inside Rearview Mirror Replacement .
14. Water test the urethane seal.

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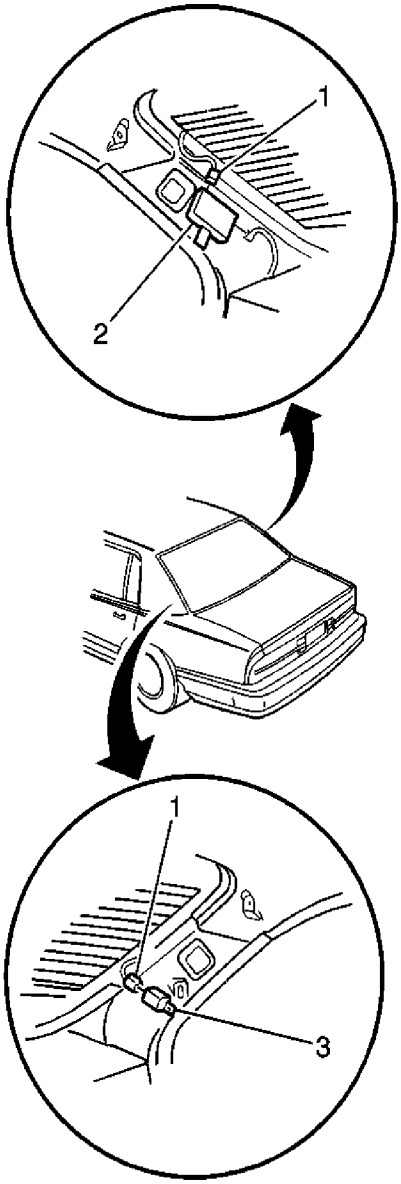
Rear Window Replacement (Long Method)

Removal Procedure

Tools Required

J 24402-A Cold Knife Glass Sealant Remover

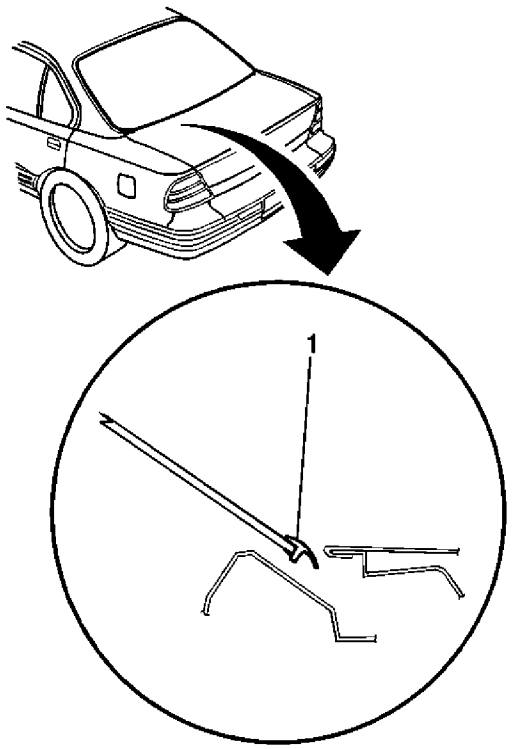
1. Mark the center of the window.
2. Remove the upper interior quarter trim. Refer to Rear Quarter Trim Panel Replacement in Interior Trim.



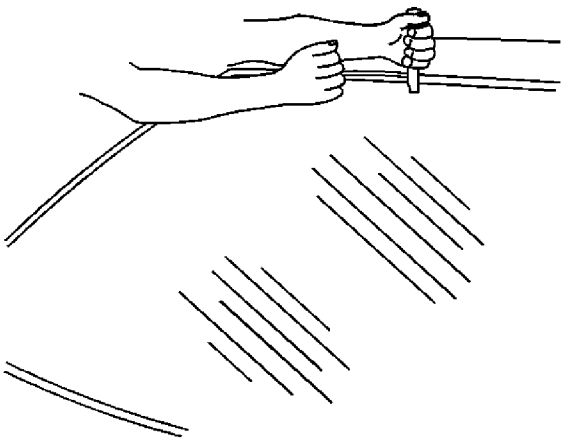
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3. Disconnect the rear window defogger connectors (1,2,3).



4. Pull the reveal molding (1) from the rear window. Refer to Rear Window Reveal Molding Replacement .



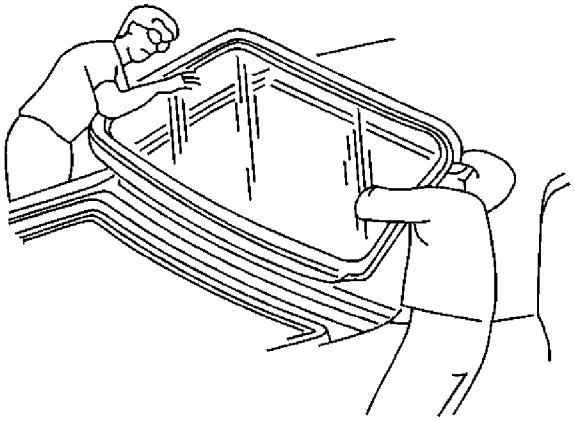
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Caution: When working with any type of glass or sheet metal with exposed or rough edges, wear approved safety glasses and gloves in order to reduce the chance of personal injury.

Important: Use a short blade on the cold knife to avoid cutting the defroster wires.

5. Working outside of the vehicle, cut out the window.

   Use a J 24402-A .



6. With the aid of an assistant, remove the rear window.
7. If you reuse the original window, use a razor knife in order to remove any existing urethane adhesive from the window edge and from the body surface.

   Caution: Failure to prep the area prior to the application of primer may cause insufficient bonding of urethane adhesive. Insufficient bonding of urethane adhesive may allow unrestrained occupants to be ejected from the vehicle resulting in personal injury.

8. Clean the surface of the window which new urethane adhesive contacts. Clean around the edge of the inside surface of the window.

   Use one of the following cleaners:

   - A clean isopropyl alcohol dampened cloth
   - GM Window Cleaner P/M 1050427 or the equivalent

Inspection Procedure

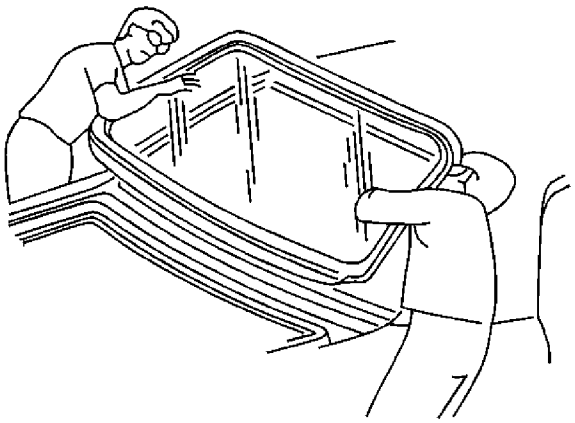
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1. The following components may reveal the causes of a broken window:
   - The flange of the window opening
   - The window reveal molding
   - The window
2. Inspect for any of the following conditions in order to prevent future breakage of the window:
   - High welds
   - Solder spots
   - Hardened spot weld sealer
   - Any obstruction or irregularity in the pinchweld flange.
3. Inspect the condition of the window opening and the adhesive bead. Refer to Adhesive Service Kit Description .

Installation Procedure

Tools Required

J 24811 Urethane Adhesive Dispensing Gun



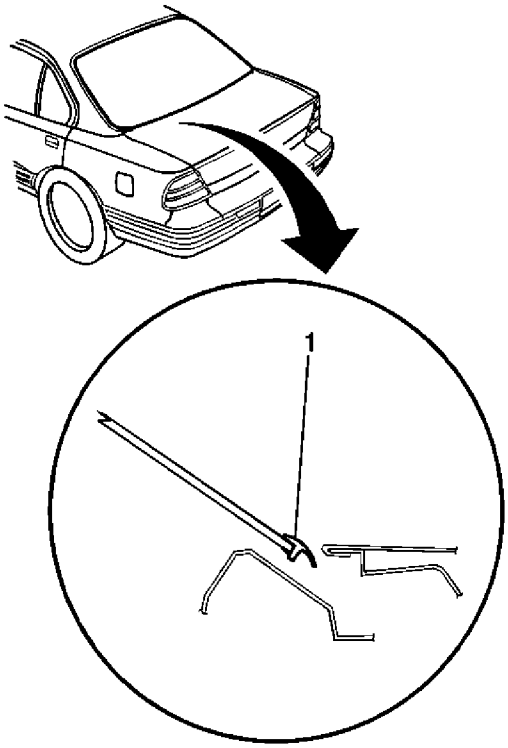
Caution: When working with any type of glass or sheet metal with exposed or rough edges, wear approved safety glasses and gloves in order to reduce the chance of personal injury.

1. With the aid of an assistant, dry fit the window (2) in the opening in order to determine the correct position. Fit the window by completing the following steps:
   1.1. Position the window in the opening.
   1.2. Use masking tape in order to mark the location of the window in the opening.
   1.3. Slit the masking tape at the window edge. During installation, the tape on the window aligns with the tape on the body.

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1.4. Remove the window from the opening.

Place the window inside up on a clean protected surface.



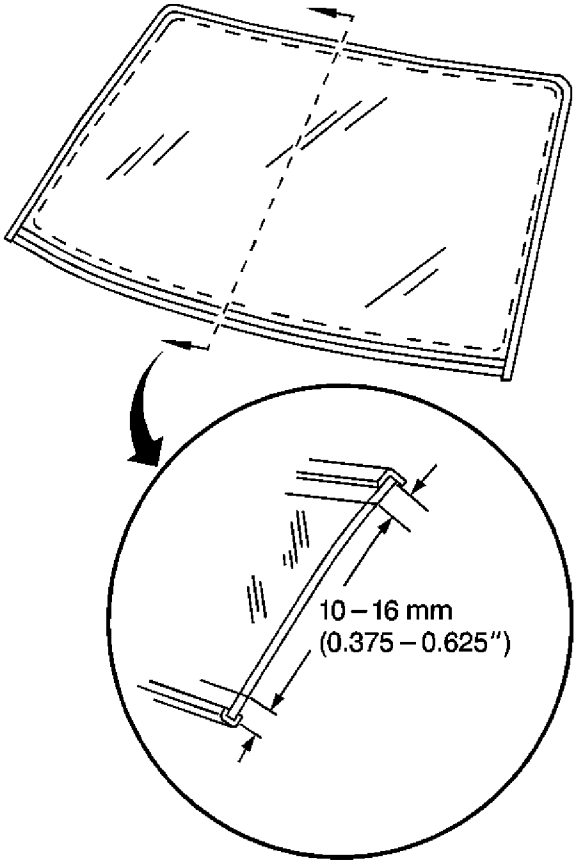


2. Position the reveal molding (1) to the edge of the window.
3. Press the reveal molding onto the window.

Start at the center of the of the window.

Work outward.

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Caution: Failure to prep the area prior to the application of primer may cause insufficient bonding of urethane adhesive. Insufficient bonding of urethane adhesive may allow unrestrained occupants to be ejected from the vehicle resulting in personal injury.

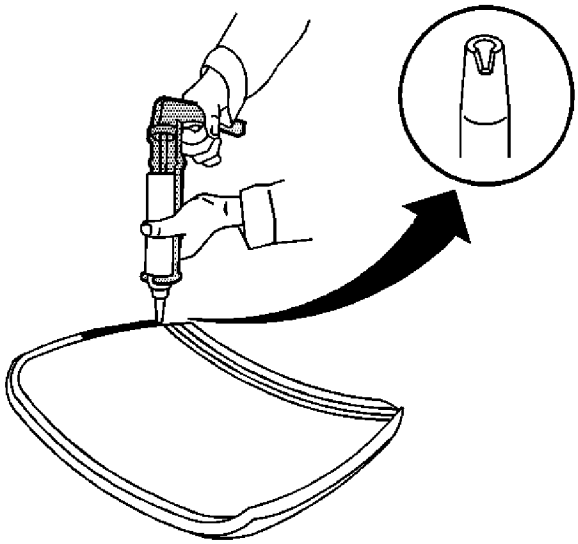
Important: Prevent the Window Prep 1 (clear) from running into the vision area of the window.

This primer dries almost instantly. This primer may stain the window if not applied evenly.

4. Use a new dauber in order to apply Window Prep 1 (clear) to the edges of the window.
5. Immediately wipe the primed area with a clean cloth.
6. Shake the Window Primer 2 (black) well.
7. Use a new dauber in order to apply the primer 2 (black) over the previously applied clear primer.

Allow approximately 6-10 minutes the Window Primer to dry 2.

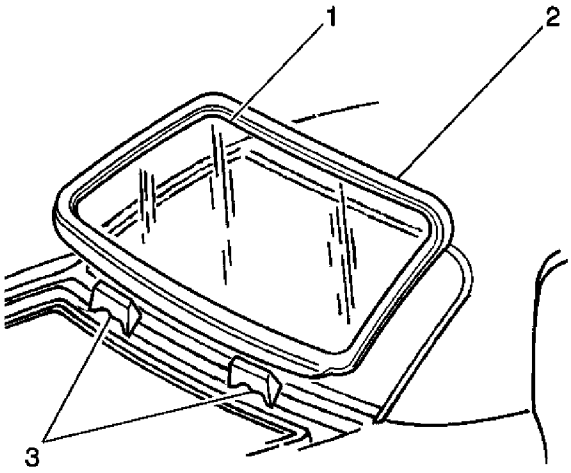
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Caution: When replacing stationary windows, use Urethane Adhesive Kit GM P/N 12346392 (Canadian P/N 10952983), or a urethane adhesive system meeting GM Specification GM3651G, to maintain original installation integrity. Failure to use the urethane adhesive kit will result in poor retention of the window which may allow unrestrained occupants to be ejected from the vehicle resulting in personal injury.

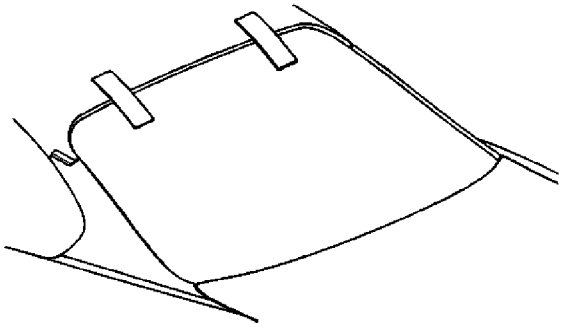
8. Apply a 14 mm (5/16 in) high and 8 mm (5/16 in) wide bead of urethane adhesive (3) to the window.

   Use a J 24811 .



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9. With the aid of a helper, install the window (1) in the opening.
10. Align the tape lines on the window and the body surface.
11. Press firmly the window into place.





12. Tape the window to the body in order to minimize movement.
13. Clean any excess urethane from the body with a lint free cloth.

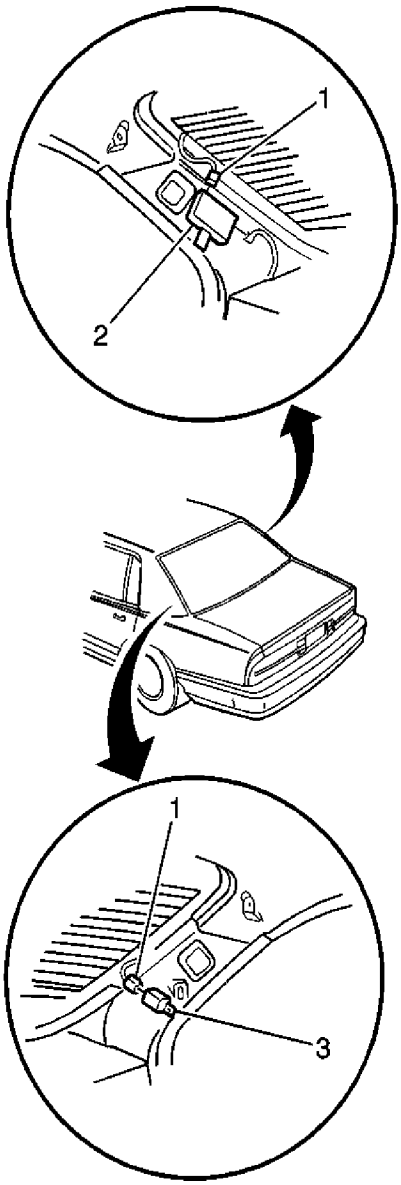
Important: DO NOT direct a hard stream of high pressure water at the fresh urethane adhesive.

14. Watertest the window immediately using a soft spray.

Use warm or hot water in order to accelerate the cure of the adhesive. Refer to Water Hose Test in Waterleaks.

15. If you find a leak, use a plastic paddle in order to apply extra urethane adhesive at the leak point.

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16. Connect the rear window defogger connectors (1,2,3).
17. Install the upper interior quarter trim. Refer to Rear Quarter Trim Panel Replacement

Important:

- Partially lower a door window in order to prevent pressure build up when closing the doors prior to the urethane adhesive cure.
- DO NOT DRIVE THE VEHICLE until the urethane adhesive is cured.
- DO NOT USE COMPRESSED AIR in order to dry the urethane adhesive.

18. Allow 6 hours at room temperature, 22°C (72°F), at 30 percent relative humidity for curing the urethane adhesive.

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Rear Window Replacement (ShortMethod)

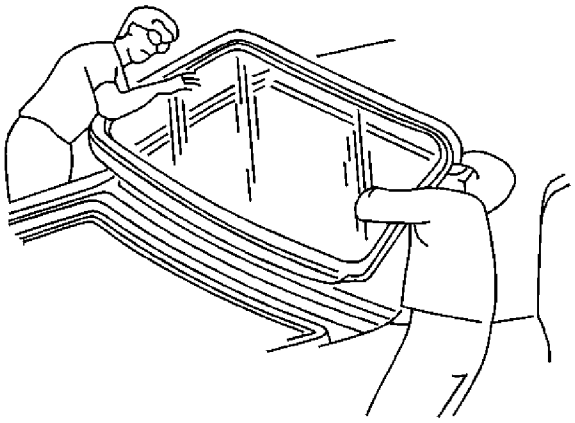
Removal Procedure

Caution: When replacing stationary windows, use Urethane Adhesive Kit GM P/N 12346392 (Canadian P/N 10952983), or a urethane adhesive system meeting GM Specification GM3651G, to maintain original installation integrity. Failure to use the urethane adhesive kit will result in poor retention of the window which may allow unrestrained occupants to be ejected from the vehicle resulting in personal injury.

1. Use masking tape in order to protect the painted surface around the rear window.
2. Remove the reveal molding. Refer to Rear Window Reveal Molding Replacement .
3. Remove the rear quarter trim panels. Refer to Rear Quarter Trim Panel Replacement in Interior Trim.
4. Disconnect the electrical connector to the rear defogger grid and antenna (if applicable).

Caution: When working with any type of glass or sheet metal with exposed or rough edges, wear approved safety glasses and gloves in order to reduce the chance of personal injury.

5. Cut the urethane with a cold knife from the exterior of the back glass.





6. With the aid from an assistant, remove the back glass.
7. Remove any excessive urethane from the pinch weld area.
8. Clean the pinch weld area.

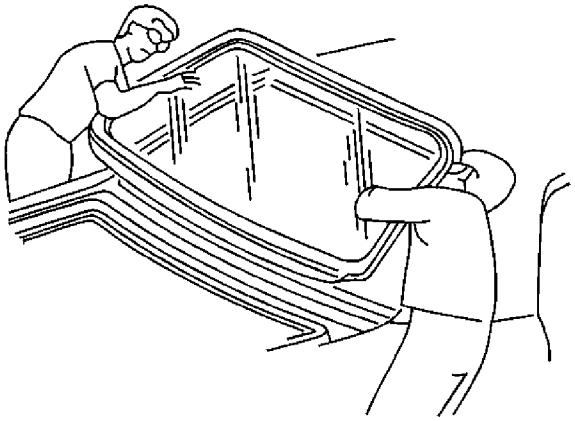
Installation Procedure

1. Apply pinch weld primer.
2. Clean the new rear window.
3. Apply the two-part primer to the sealing edge of the new glass.

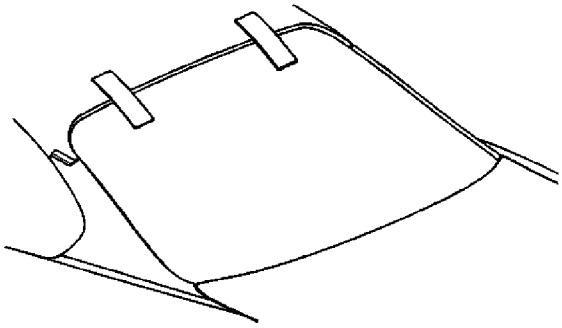
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4. Install the new reveal molding to the rear window.
5. Apply urethane to the pinch weld area.



6. With the aid from an assistant, install the new rear window.



7. Apply masking tape in order to hold the rear window in place until the urethane has cured.
8. Connect the electrical connector to the rear defogger grid and antenna (if applicable).
9. Install the rear quarter trim panels. Rear Quarter Trim Panel Replacement in Interior Trim.
10. Remove the masking tape from the painted surface.
11. Clean the new rear window and surrounding area.
12. Water test the urethane seal for leaks.

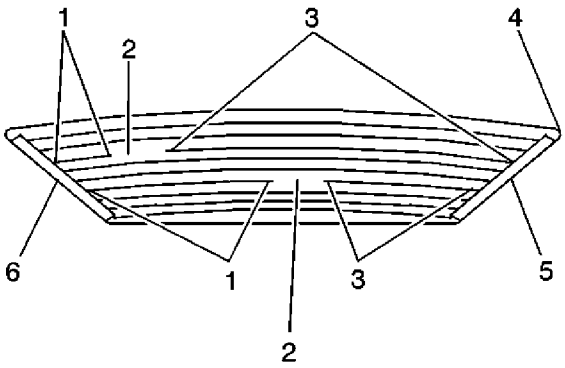
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Grid Line Repair

Caution: To avoid personal injury:

- Do not allow the repair material to come in contact with skin or eyes and avoid breathing vapors.
- Do not use near sparks or open flame.

Important: The rear defogger repair kit GM P/N 12346001 contains all of the materials needed to repair the rear window defogger grid lines. You may also use an equivalent repair material.



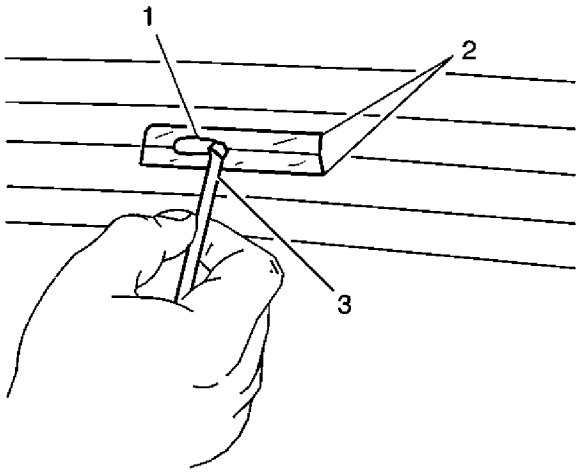
1. Disconnect the battery feed at the rear window defogger system.
2. Inspect the rear window defogger grid lines (1,3).
3. Use a grease pencil in order to mark the grid line breaks (2) on the outside of the window (4).
4. Complete the following steps in order to prep the grid line area to be repaired:
   - Buff the grid line to about 6.0 mm (0.25 in) beyond each side of the break using fine steel wool.
   - Wipe the area clean using a cloth dampened with alcohol.

Important:

- Use a repair decal or tape strips (2) in order to control the width of the repair.
- If you use a decal, ensure that the die-cut metering slot is the same width as the grid line.

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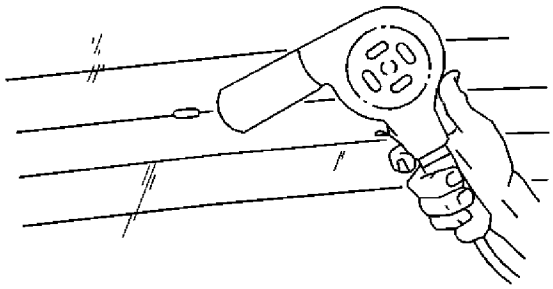




5. Complete one of the following steps:
   - Install a grid line repair decal.
   - Install 2 strips of tape (2).
     - One positioned above the repair area.
     - One positioned below the repair area.
6. Remove the clamp from the container of the grid repair material.
7. Thoroughly mix the hardener and the silver plastic.

   If the hardener is crystallized, immerse the packet in hot water until the hardener liquefies.

8. Apply the grid repair material (1) to the repair area using a small plastic paddle (3) or an equivalent.
9. Carefully remove the decal or the tape (2).



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Notice: The grid line repair material must be cured with heat. To avoid heat damage to the interior trim, protect the trim near the repair area where heat is to be applied.

10. Using a heat gun, apply heat to the repair area:
    - Hold the heat gun nozzle 25 mm (1 in) from the repair surface.
    - Use a minimum temperature of 149°C (300°F).
    - Apply the heat for 1-2 minutes.
11. Inspect the grid line repair for appearance:
    11.1. If the grid line appears to be discolored, apply a tincture of iodine to the grid line using a pipe cleaner or a fine brush.
    11.2. Allow the iodine to dry for at least 30 seconds.
    11.3. Use a lint free cloth to carefully wipe off any excess iodine.

Important: Protect the trim from heat damage.

12. Allow the repair area to cure undisturbed for at least 24 hours.
13. Test the defogger operation in order to verify that the grid line is repaired.

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Rear Window Defogger Braided Lead Wire

1. You may reattach the rear defogger bus bar lead wire or terminal by resoldering.

   Notice: Use only enough heat to melt the solder. Using excessive heat can damage the rear window defogger components or the rear window.

2. Use a solder containing 3 percent silver and a rosin flux paste.
3. Before soldering the bus bar, buff the repair area with fine steel wool. This removes the oxide coating formed during the glass manufacture.
4. Use a brush in order to apply a paste-type rosin flux in small quantities to the following locations:
   - The wire lead
   - The bus bar repair area
5. Beforehand, coat the soldering iron tip with solder.

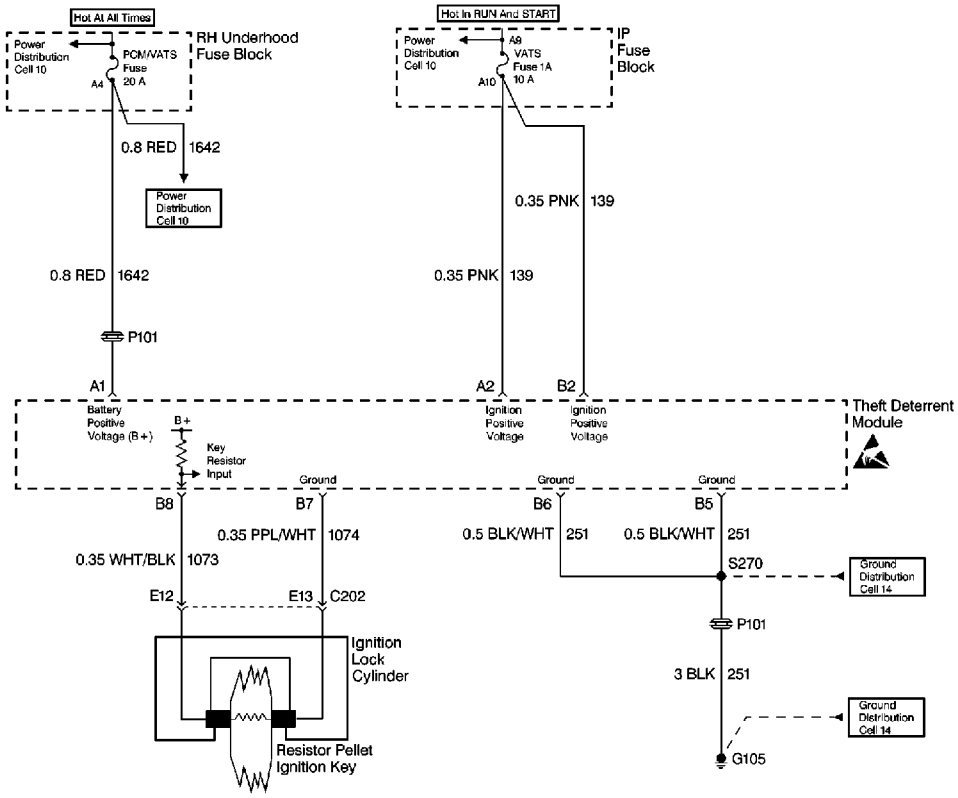
   Use only enough heat in order to melt the solder. Use only enough solder in order to ensure a complete repair.

6. DO NOT overheat the wire when resoldering the wire to the bus bar.

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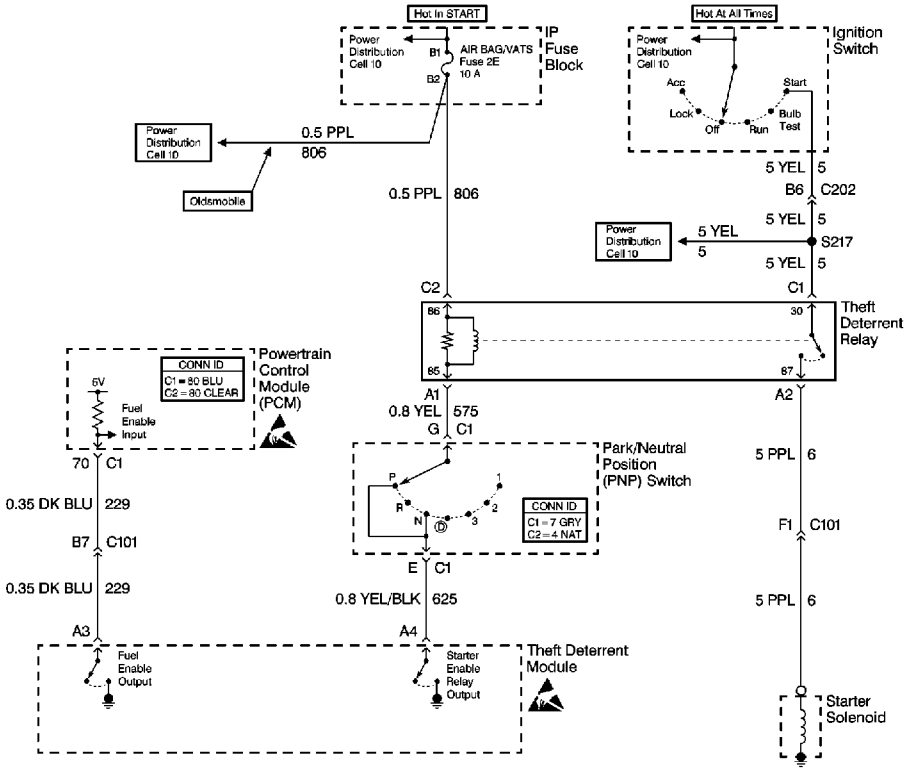
tomsn048@gmail.com

Cell 133: PASS-Key II System



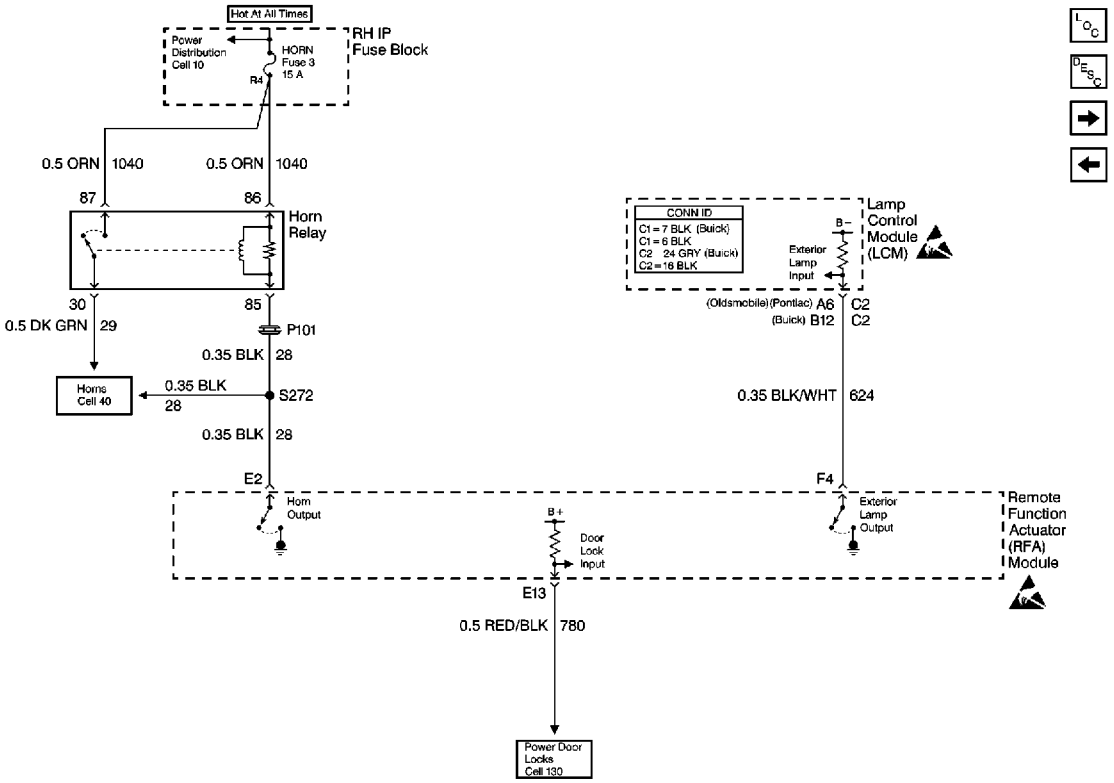
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Cell 133: Ignition Switch



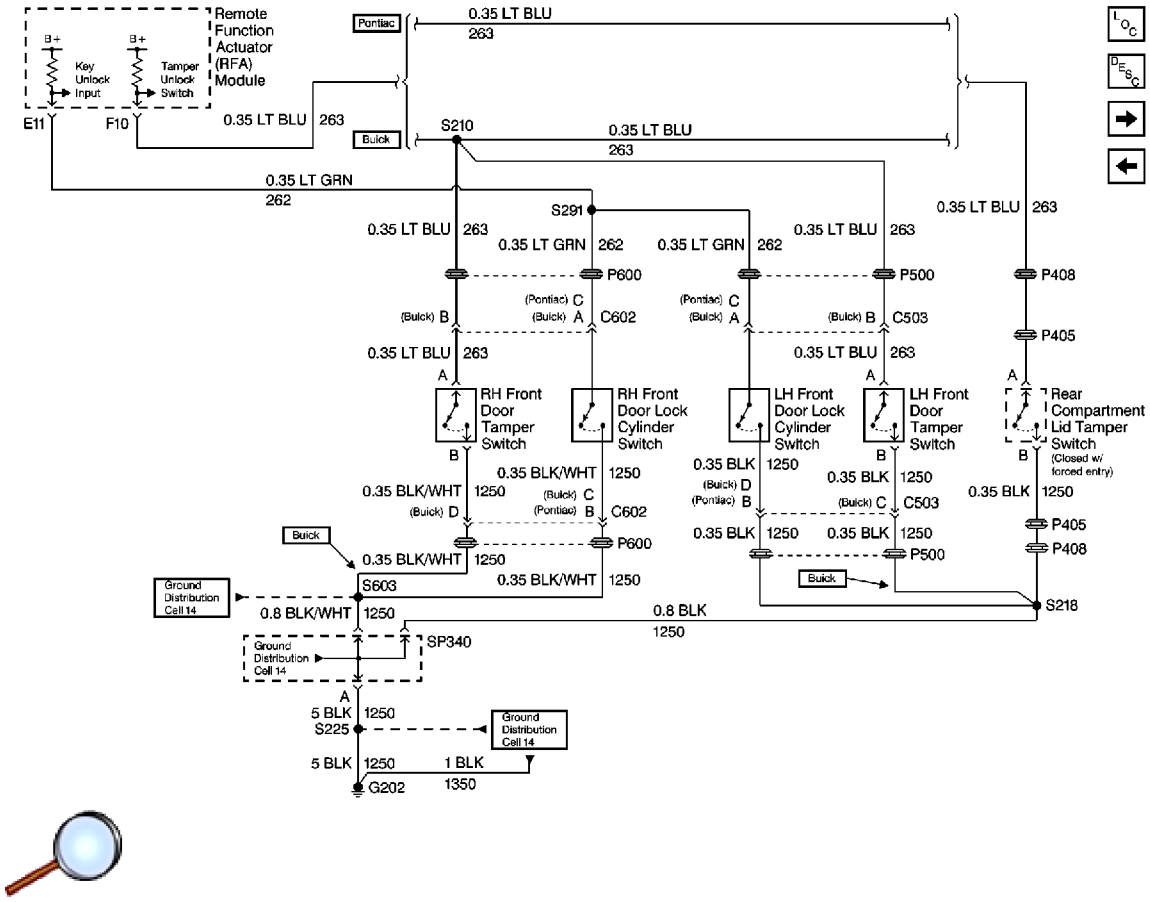
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Cell 133: Content Theft Deterrent System (CTD) -- UA6



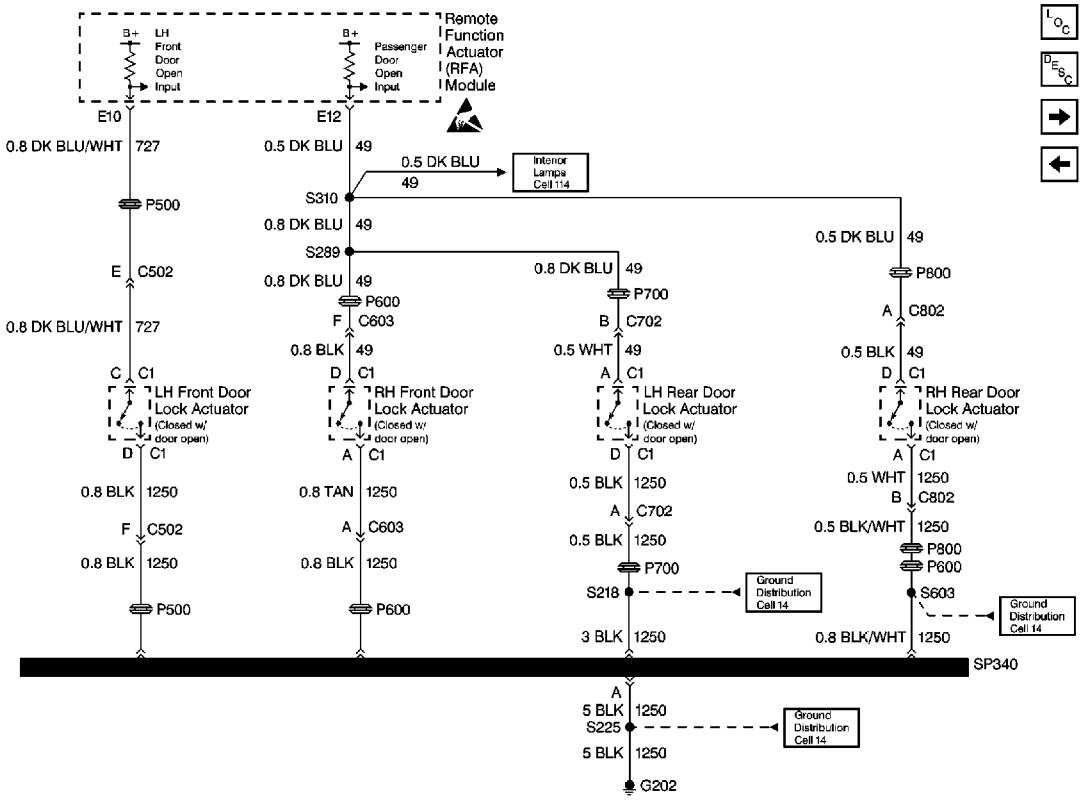
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Cell 133: RH Front Door Tamper Switch



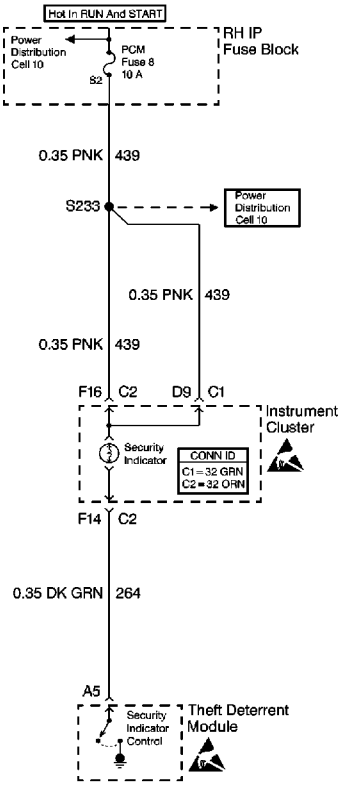
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Cell 133: Content Theft Deterrent System (CTD) -- UA6



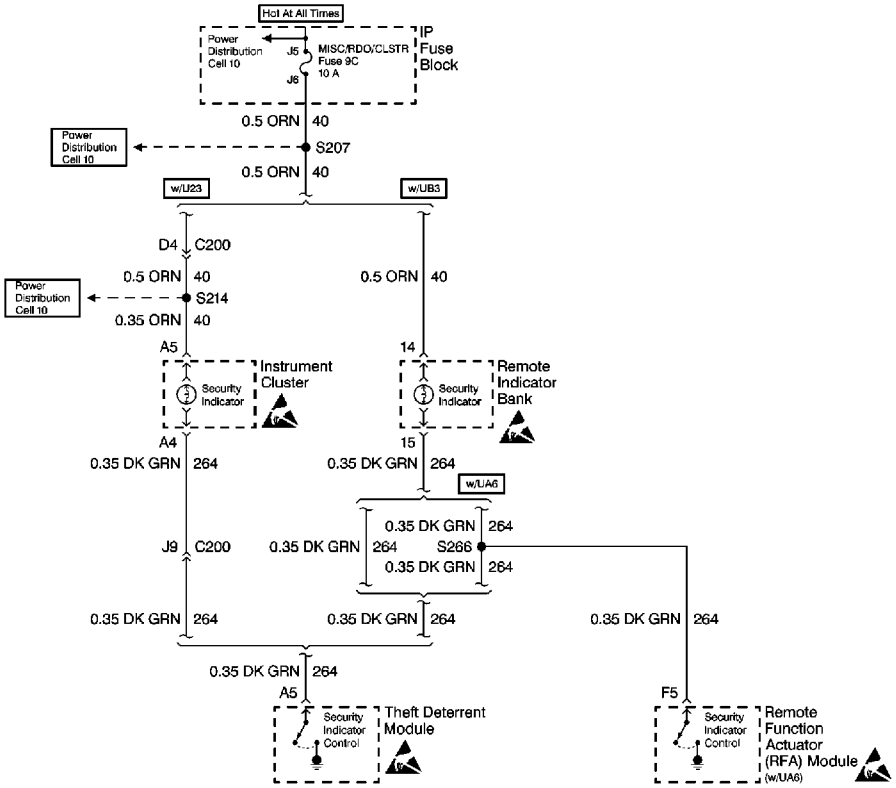
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Cell 133: Oldsmobile



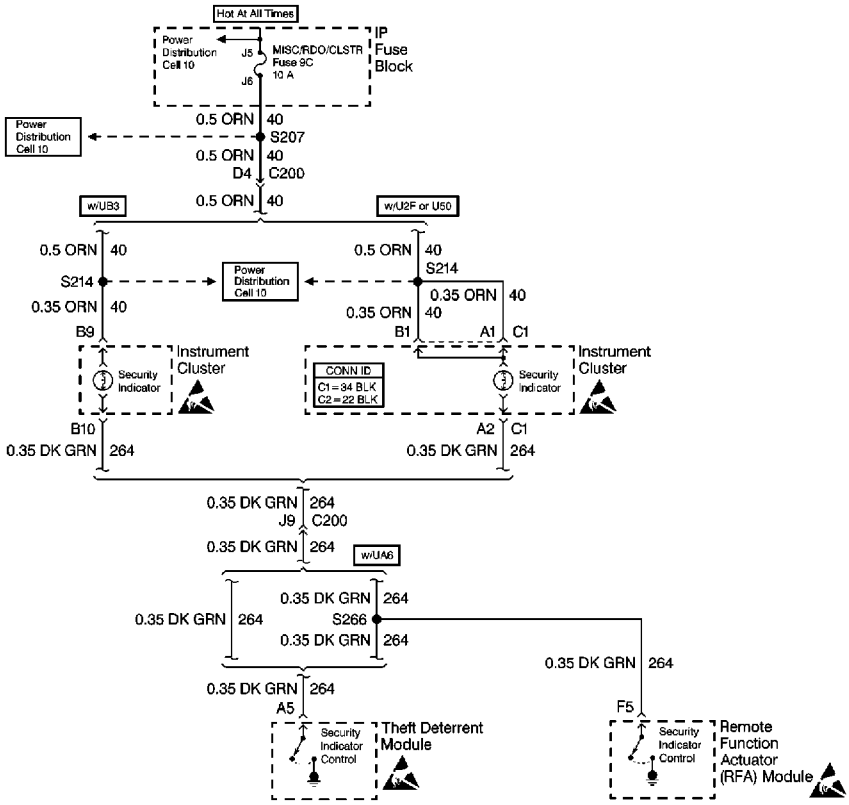
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Cell 133: Buick



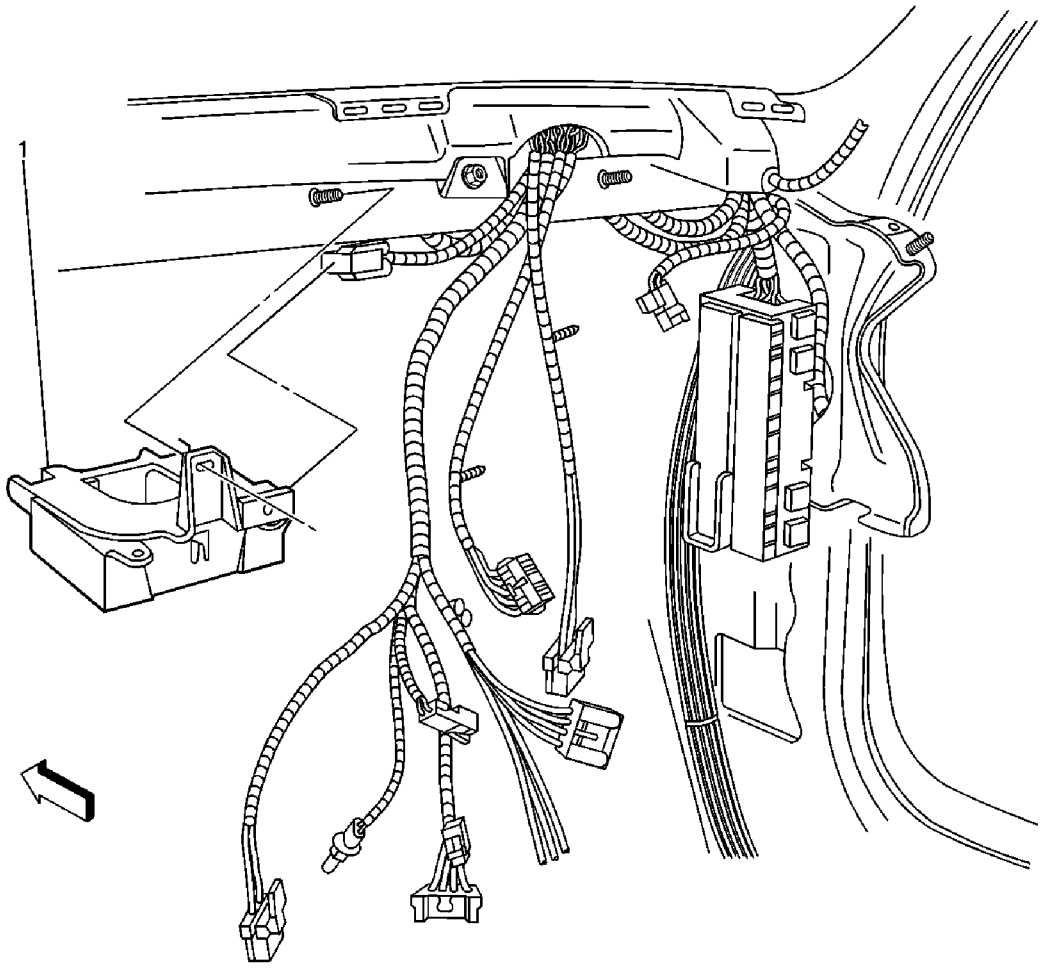
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Cell 133: Pontiac



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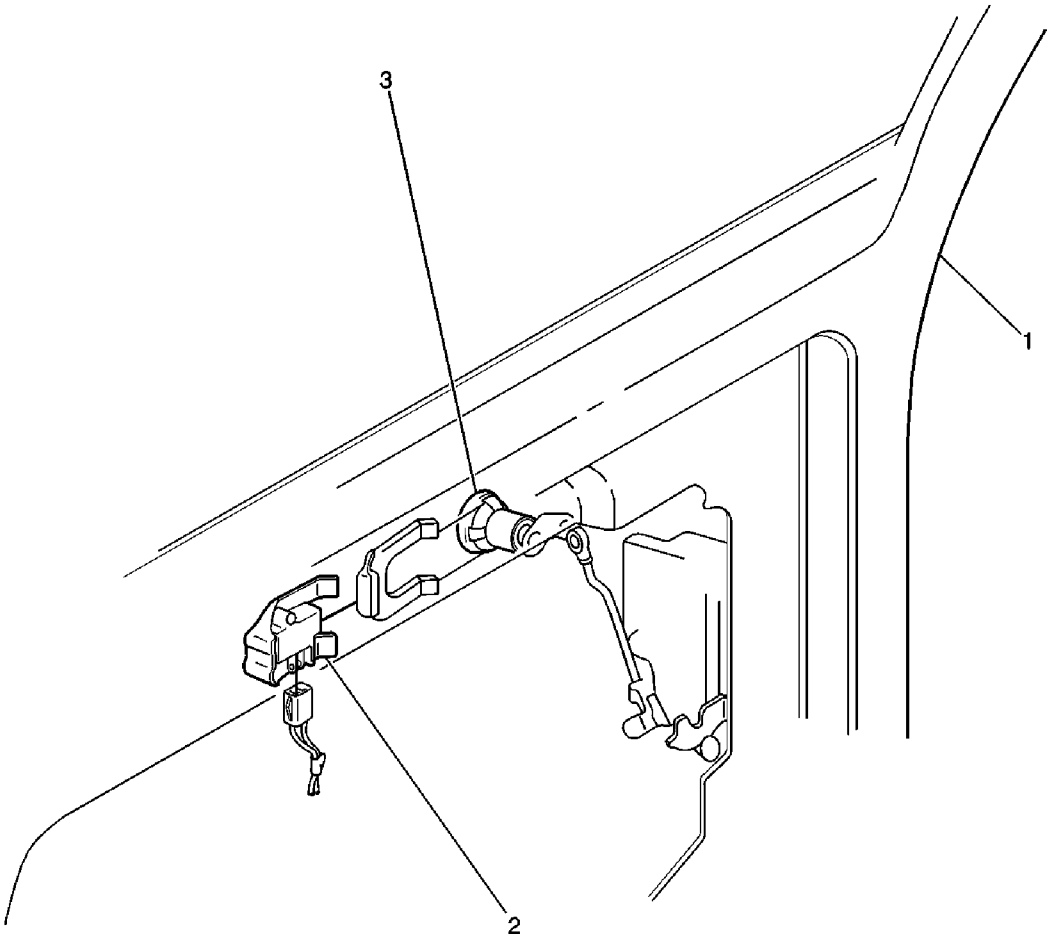
Passenger Compartment, Behind the Right Side of the IP



(1) Theft Deterrent Module

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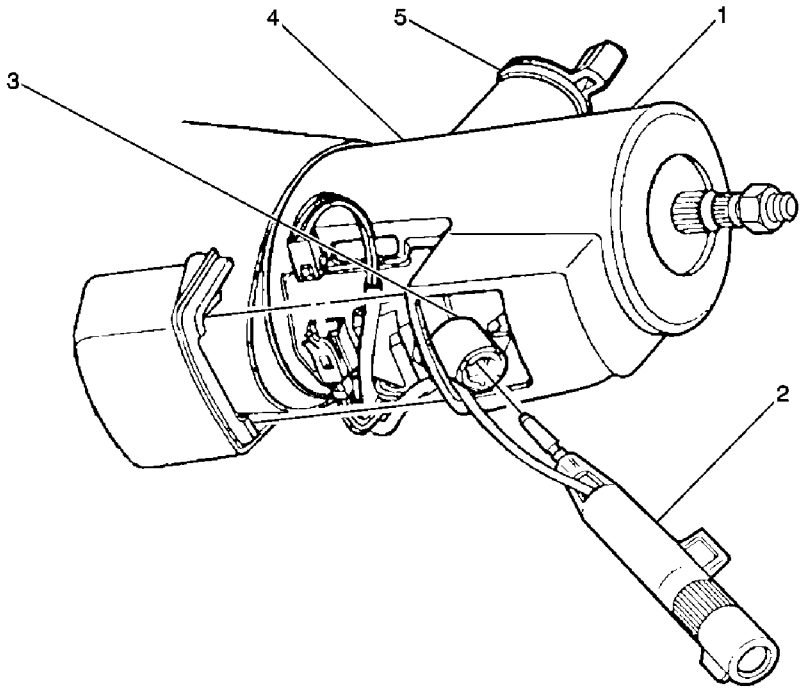
RH Front Door



(1) RH Front Door (LH Similar)
(2) RH Front Door Lock Cylinder Switch (LH Similar)
(3) RH Front Door Lock Cylinder (LH Similar)

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Top of the Steering Column



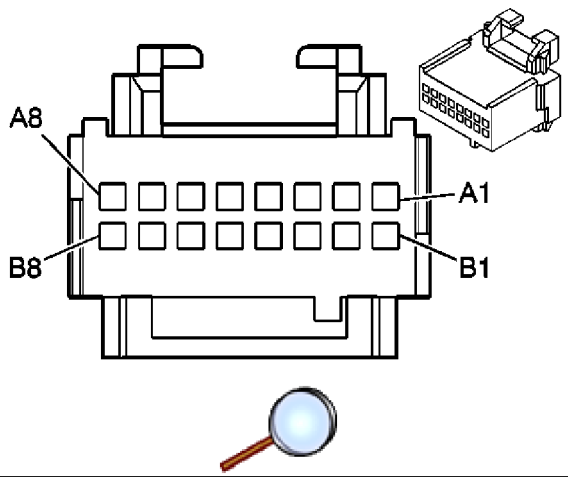
(1) Turn Hazard Switch (Hidden)
(2) Multifuntion Lever
(3) Windshield Wiper Switch
(4) Ignition Switch (Hidden)
(5) Ignition Lock Cylinder

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Theft Deterrent System Connector End Views

Table 1: Pass-Key® II Theft Deterrent Module
Table 2: Rear Compartment Lid Tamper Switch

Pass-Key® II Theft Deterrent Module

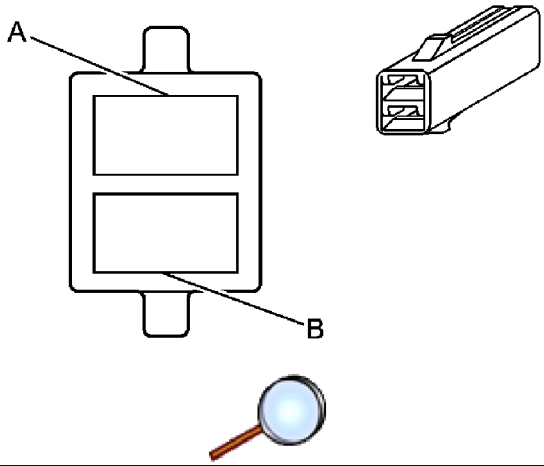


Connector Part Information	• 12110259 • 16-Way F Micro - Pack 100 Series (GRN)

Pin	Wire Color	Circuit No.	Function
A1	RED	1642	Fused Output - Battery
A2	PNK	139	Fused Output - IGN
A3	DK BLU	229	Vehicle Anti-Theft System Signal - Disable Engine
A4	YEL/BLK	625	Vehicle Anti-Theft System - Starter Enable Relay Output - Coil
A5	DK GRN	264	Security Indicator Lamp Feed
A6-A8	--	--	Not Used
B1	--	--	Not Used
B2	PNK	139	Fused Output - IGN
B3-B4	--	--	Not Used
B5	BLK/WHT	251	Ground
B6	BLK/WHT	251	Ground
B7	PPL/WHT	1074	Ignition Key Resistor Return
B8	WHT/BLK	1073	Ignition Key Resistor Feed

Rear Compartment Lid Tamper Switch

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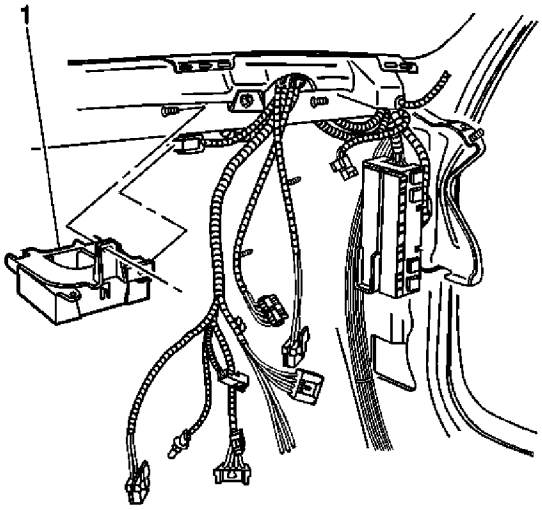


Connector Part Information	• 08900863 • 2-Way F 56 Series (BLK)		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	LT BLU	263	Tamper Switch Signal
B	BLK	1250	Ground

Theft Deterrent Module Replacement

Removal Procedure

1. Remove the instrument panel. Refer to Instrument Panel Assembly Removal .
2. Remove the fastener from the rear edge of the module.

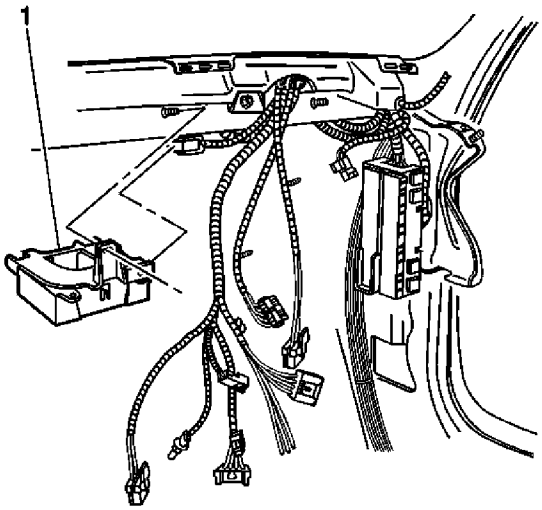




3. Remove the PASS-Key® II module from the bracket (1).
4. Disconnect the electrical connection(s).

Installation Procedure

1. Connect the electrical connection(s).



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2. Install the PASS-Key® II module to the bracket (1).
3. Install the fastener.
4. Install the instrument panel. Refer to Instrument Panel Assembly Removal .

Theft Deterrent Relay Replacement

Removal Procedure

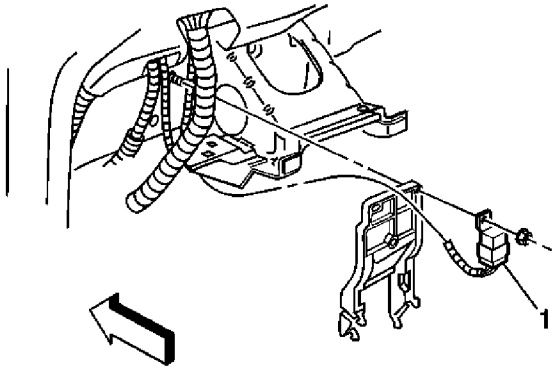
Caution: This vehicle is equipped with a Supplemental Inflatable Restraint (SIR) System. Failure to follow the correct procedure could cause the following conditions:

- Air bag deployment
- Personal injury
- Unnecessary SIR system repairs

In order to avoid the above conditions, observe the following guidelines:

- Refer to SIR Component Views in order to determine if you are performing service on or near the SIR components or the SIR wiring.
- If you are performing service on or near the SIR components or the SIR wiring, disable the SIR system. Refer to Disabling the SIR System.

1. Disable the SIR system. Refer to Disabling the SIR System in SIR.
2. Remove the instrument panel (IP) assembly. Refer to Instrument Panel Assembly Removal .

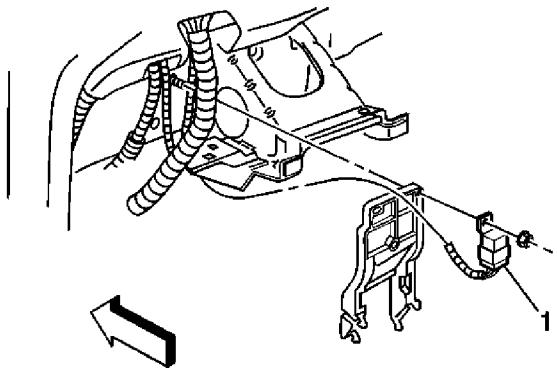




3. Remove the following components from the stud:
   - The fastener
   - The starter enable relay (1)
4. Disconnect the starter enable relay connector.
5. Remove the starter enable relay (1).

Installation Procedure

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1. Install the starter enable relay connector.

   Position the relay (1) over the stud.

   Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

2. Install the fastener to the stud.

   Tighten
   Tighten the fastener to 4.5 N·m (40 lb in).

3. Install the IP assembly. Refer to Instrument Panel Assembly Removal .
4. Enable the SIR system. Refer to Enabling the SIR System in SIR.

Programming Additional Keys

Tools Required

J 35628-A Vats/Pass Interrogator Tester

Important: When servicing the PASS-Key® II system, obtain all the vehicle ignition keys. Verify the key code values with the J 35628-A .

1. In order to copy a PASS-Key® II ignition key, determine the necessary key code or resistance value.
2. Determine the master ignition key code using the J 35628-A as outlined in the following procedure:

   Important: Disconnect the tool wiring connectors.

   2.1. Turn ON the J 35628-A .
   2.2. Insert the key into the tool lock cylinder.
   2.3. Note the measured key code of the master ignition key as displayed on the key code reader.
   2.4. Obtain a key blank matching the key code.
   2.5. Cut the key blank to match the original key.

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Programming Replacement Keys, Ignition Cylinder, or Powertrain Control Module

Tools Required

- J 35628-A Vats/Pass Interrogator Tester
- J 35628-90 Vats/Pass Harness Adapter

In order to replace lost PASS-Key® II ignition keys, determine the required mechanical cut and the key code to start the vehicle from the vehicle invoice.

If the codes are not available, use the following steps in order to determine the code:

1. Determine the mechanical cut from the following sources:
   - The code sticker on the steering column (ignition) lock cylinder
   - The original key knock outs
   - If the mechanical cut can not be determined, replace the steering column (ignition) lock cylinder.
2. Using the J 35628-A and the J 35628-90 , determine the correct key code using the following steps:
   2.1. Connect the J 35628-90 (48 way) connectors to both the body harness and the steering column harness of the steering column inline connector C202.

   Important: Do not connect to the ignition lock switch.

   2.2. Connect one J 35628-90 (2 way) connector to the harness side of the steering column (ignition) lock cylinder connector.
   2.3. Connect the other end of the J 35628-90 (2 way) connector to the J 35628-A .
   2.4. Turn on the J 35628-A .
   2.5. Place the key code switch in the number 1 position.
   2.6. Start the engine with the new mechanically cut key.

   If the engine starts, the key code is 1.

   2.7. If the engine does not start, turn the ignition switch to the OFF position.
   2.8. Press the 4 minute timer on the J 35628-A .
   2.9. When the timer light turns OFF, or the START CAR message is displayed, place the J 35628-A key code switch in the next position (2, 3, 4...).
   2.10. Attempt to start the engine.

   If the engine starts, you have the correct key code. Proceed to the next step.

   If the engine does not start, perform the previous 3 steps.

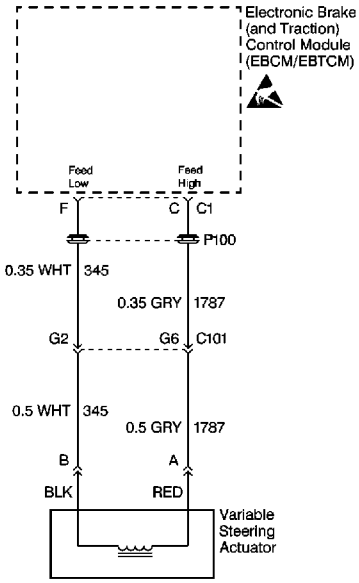
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2.11. Make a new ignition key using the correct key code and the mechanical cut.

2.12. Ensure that the new key starts the engine.

Steering Assist Schematics

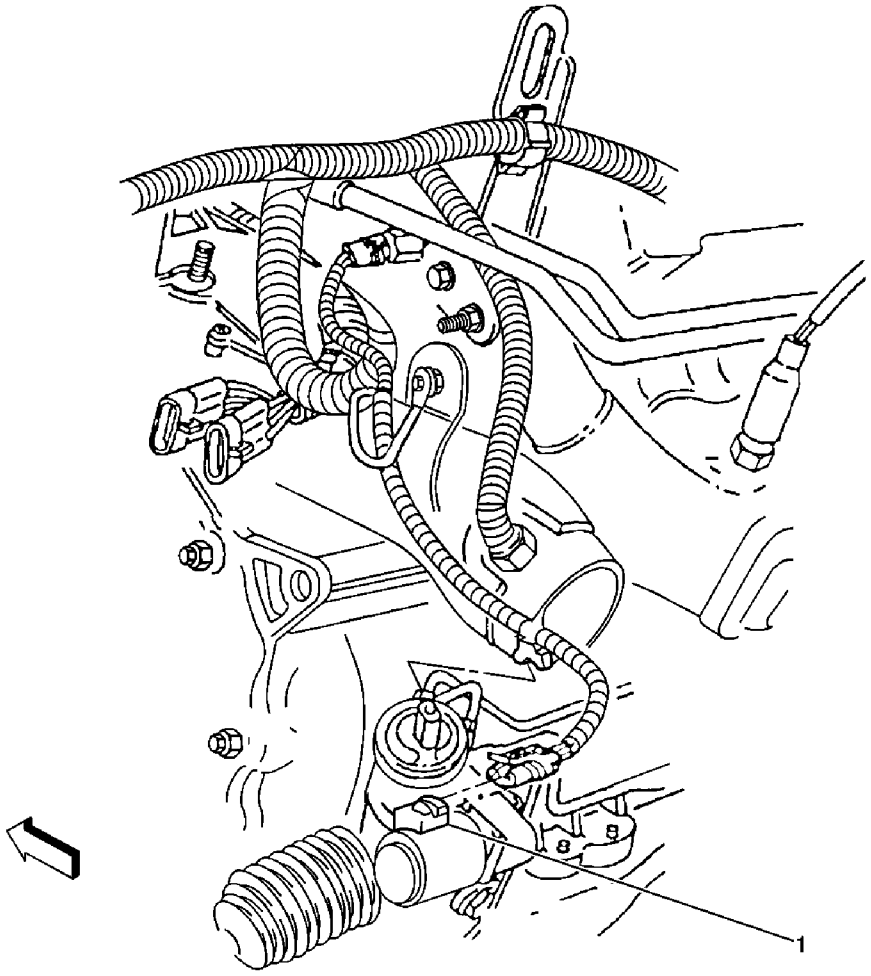
Cell 45



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Steering Assist Component Views

Engine, Rear Left Side

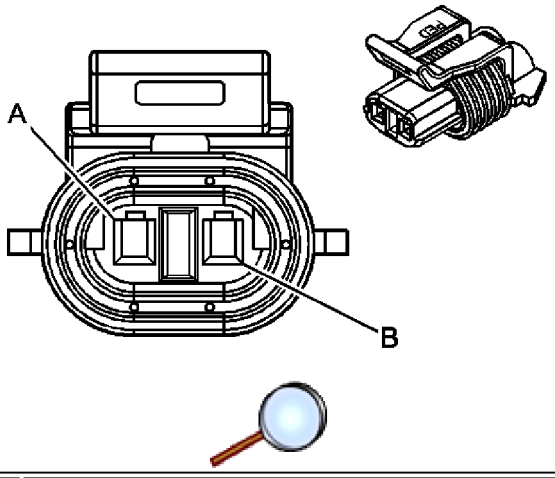


(1) Variable Steering Actuator

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Steering Assist Connector End Views

Variable Steering Actuator



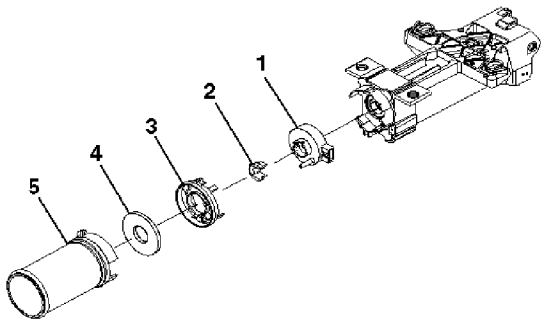
Connector Part Information	• 12052635 • 2 Way F Metric Pack 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	GRY	1787	Magnetic Steering Variable Assist Motor Feed - High Effort
B	WHT	345	Magnetic Steering Variable Assist Motor Feed - Low Effort

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Steering Wheel Position Sensor or Steering Shaft Lower Bearing Replacement

Removal Procedure



Caution: This vehicle is equipped with a Supplemental Inflatable Restraint (SIR) System. Failure to follow the correct procedure could cause the following conditions:

- Air bag deployment
- Personal injury
- Unnecessary SIR system repairs

In order to avoid the above conditions, observe the following guidelines:

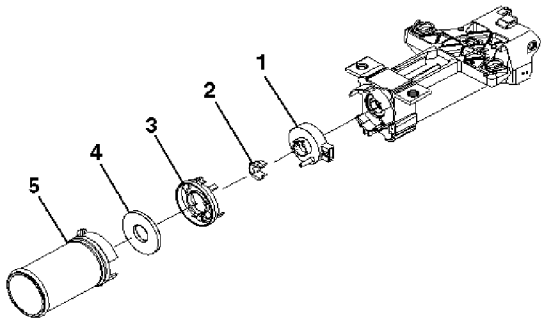
- Refer to SIR Component Views in order to determine if you are performing service on or near the SIR components or the SIR wiring.
- If you are performing service on or near the SIR components or the SIR wiring, disable the SIR system. Refer to Disabling the SIR System.

1. Disable the inflatable restraint steering wheel module. Refer to Disabling the SIR System in SIR.
2. Remove the steering column from the vehicle. Refer to Steering Wheel Replacement .
3. Remove the following from the steering shaft:
   3.1. boot (5)
   3.2. steering shaft seal (4)
   3.3. sensor retainer (3)
   3.4. sensor locator (2)

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3.5. steering wheel position sensor (1), refer to Steering Wheel Position Sensor Centering .

Installation Procedure



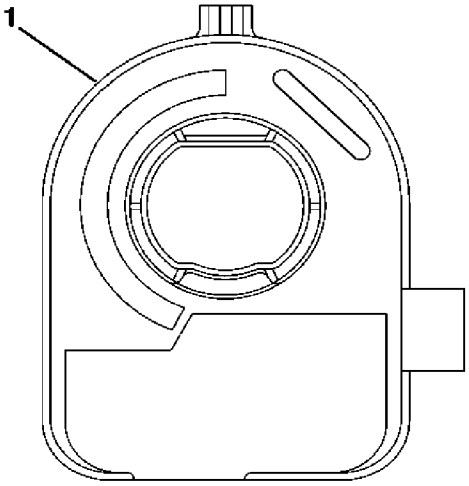
1. Install the following onto the steering shaft:
   1.1. steering wheel position sensor (1), refer to Steering Wheel Position Sensor Centering .
   1.2. sensor locator (2)
   1.3. sensor retainer (3)
   1.4. steering shaft seal (4)
   1.5. boot (5)
2. Install the steering column to the vehicle. Refer to Steering Wheel Replacement .
3. Enable the SIR system. Refer to Enabling the SIR System in SIR.

Steering Wheel Position Sensor Centering

Removal Procedure

Important: Identify the type of steering wheel position sensor from the illustrations below BEFORE removing the sensor from the steering column. Once you have identified the steering wheel position sensor, follow the instructions listed in the removal procedure.

1. Verify the type of steering wheel position sensor.



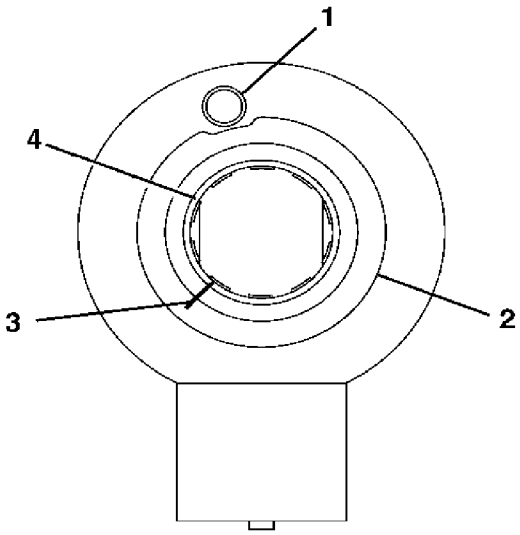


2. From the technicians point of view, the FRONT of the sensor (1) connector will be on the right.

Important: If reusing the existing sensor, you do not have to align the sensor before removal. Centering is not required when it is time to reinstall.

3. Remove the connector from the sensor.
4. Remove the sensor (1) from the adapter and bearing assembly.
5. To install the sensor, proceed to step 1 in the installation section.

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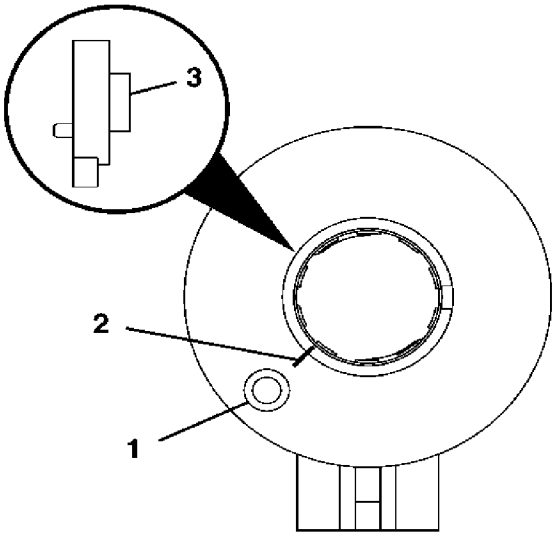




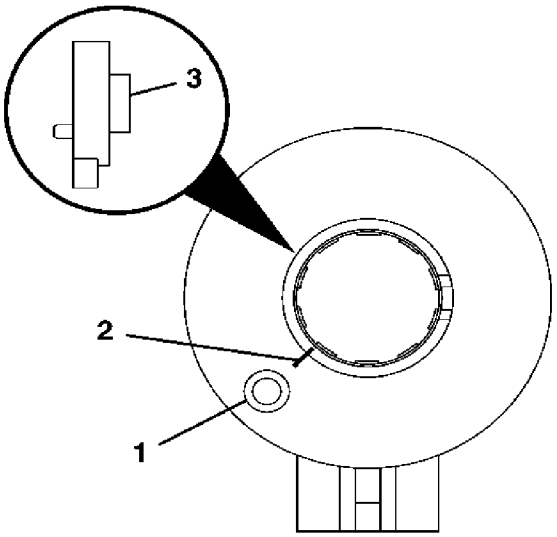
6. From the technicians point of view, the FRONT of the sensor will have:
   - foam ring (2)
   - pin hole (1) for centering pin (note location of pin hole)
   - flush rotor flange cuff (4)

Important: If reusing the existing sensor, you must make an alignment mark on the rotor flange cuff (3) before removing the sensor. Failure to do so will cause misalignment when installing the sensor. A new sensor will be required if misaligned.

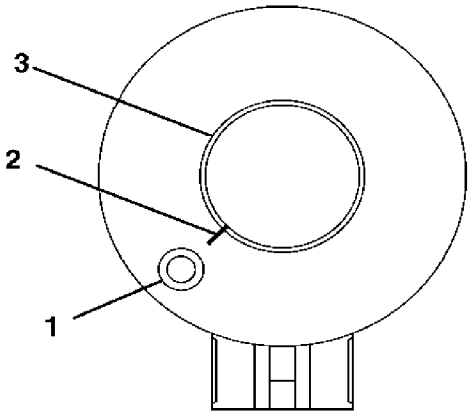
7. Make an alignment mark on the flush rotor flange cuff (3).
8. Remove the connector from the sensor.
9. Remove the sensor from the adapter and bearing assembly.
10. To install the sensor, proceed to step 5 in the installation section.



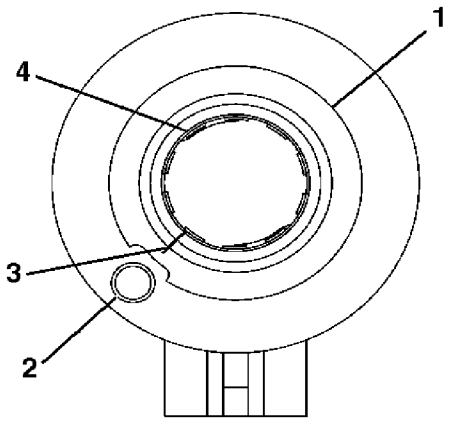
11. From the technicians point of view, the FRONT of the sensor will have:
    - raised rotor flange cuff (3)
    - alignment mark (2) on rotor flange cuff (3) for installation
    - pin hole (1) for centering pin (note location of pin hole)
12. Remove the connector from the sensor.
13. Remove the sensor from the adapter and bearing assembly.
14. To install the sensor, proceed to step 9 in the installation section.



15. From the technicians point of view, the FRONT of the sensor will have:
    - raised rotor flange cuff (3)
    - alignment mark (2) on rotor flange cuff (3) for installation
    - pin hole (1) for centering pin (note location of pin hole)
    - sensor clip in FRONT of the sensor
16. Remove the connector from the sensor.
17. Remove the sensor clip from the sensor.
18. Remove the sensor from the adapter and bearing assembly.
19. To install the sensor, proceed to step 13 in the installation section.



20. From the technicians point of view, the FRONT of the sensor will have:
    - flush rotor flange cuff (3)
    - pin hole (1) for centering pin (note location of pin hole)
    - alignment mark (2) on flush rotor flange cuff (3) for installation
21. Remove the connector from the sensor.
22. Remove the sensor from the adapter and bearing assembly.
23. To install the sensor, proceed to step 17 in the installation section.

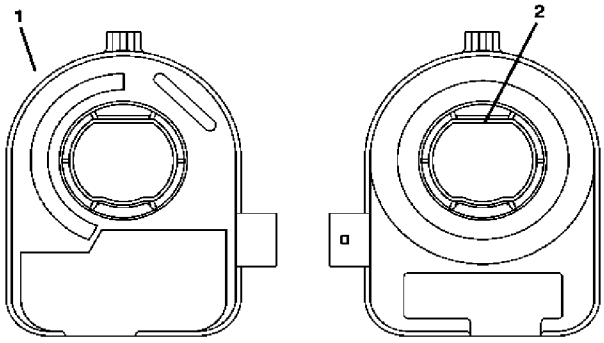


24. From the technicians point of view, the FRONT of the sensor will have:
    - flush rotor flange cuff (4)
    - pin hole (2) for centering pin (note location of pin hole)
    - alignment mark (3) on flush rotor flange cuff (4) for installation

- foam ring (1)

25. Remove the connector from the sensor.
26. Remove the sensor from the adapter and bearing assembly.
27. To install the sensor, proceed to step 21 in the installation section.

Installation Procedure



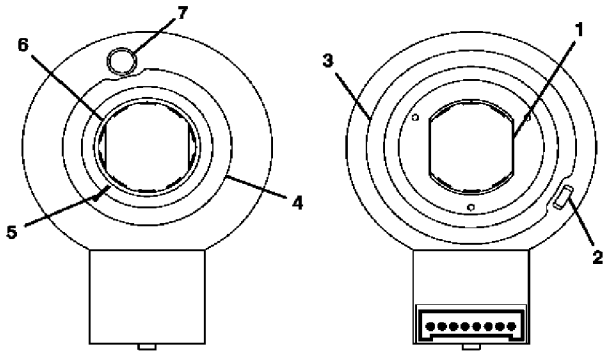


Important: If reusing the existing sensor, no centering of the sensor is required.

1. If installing a new sensor, it will come with a pin installed in the sensor. Do not remove the pin until the sensor is seated.
2. From the technicians point of view, the FRONT of the sensor (1) connector will be on your right.

   From the technicians point of view, the BACK of the sensor (2) connector will be on your left.

3. Looking at the FRONT of the sensor, align the sensor with the steering shaft and install into the adapter and bearing assembly.
4. Install the connector to the sensor.



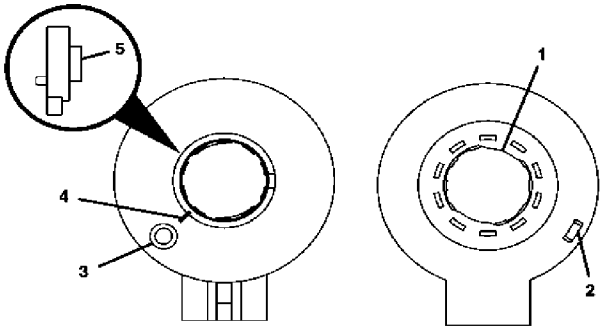


5. From the technicians point of view, the FRONT of the sensor will have:
   - foam ring (4)
   - pin hole (7) for centering pin (note location of pin hole)
   - flushed rotor flange cuff (6)
   - alignment mark (5) for installation
6. From the technicians point of view, the BACK of the sensor will have:
   - double D flats (1)
   - foam ring (3)
   - alignment tab (2) for installing into the adapter and bearing assembly.
   - view of the inside of the connector

Important: If reusing the existing sensor, you must align the marks on the flush rotor flange cuff before installation. The alignment mark must stay aligned until the sensor is seated into the adapter and bearing assembly.

If installing a new sensor, it will come with a pin installed in the sensor. Do not remove the pin until the sensor is seated. If the new sensor did not come with a pin installed, you must reorder a new sensor.

7. Looking at the FRONT of the sensor, align the sensor with the steering shaft and install into the adapter and bearing assembly.
8. Install the connector to the sensor.



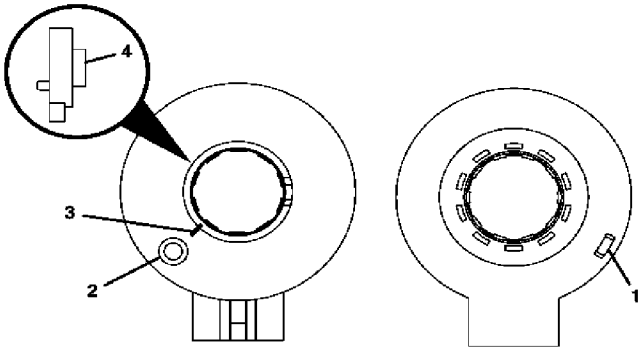


9. From the technicians point of view, the FRONT of the sensor will have:
   - pin hole (3) for centering pin (note location of pin hole)
   - raised rotor flange cuff (5)
   - alignment mark (4) for installation
10. From the technicians point of view, the BACK of the sensor will have:
   - double D flats (1)
   - alignment tab (2) for installing into the adapter and bearing assembly.

Important: If reusing the existing sensor, you must align the marks on the raised rotor flange cuff before installation. The alignment mark must stay aligned until the sensor is seated into the adapter and bearing assembly.

If installing a new sensor, it will come with a pin installed in the sensor. Do not remove the pin until the sensor is seated. If the new sensor did not come with a pin installed, you must reorder a new sensor.

11. Looking at the FRONT of the sensor, align the sensor with the steering shaft and install into the adapter and bearing assembly.
12. Install the connector to the sensor.



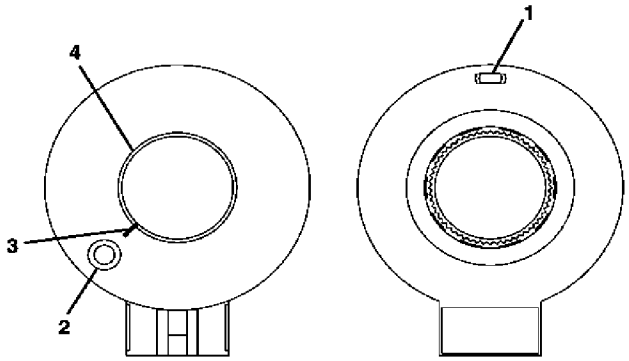


13. From the technicians point of view, the FRONT of the sensor will have:
    - pin hole (2) for centering pin (note location of pin hole)
    - raised rotor flange cuff (4)
    - alignment mark (3) for installation
14. From the technicians point of view, the BACK of the sensor will have an alignment tab (1) for installation. This sensor does not have double D flats.

Important: If reusing the existing sensor, you must align the marks on the raised rotor flange cuff before installation. The alignment mark must stay aligned until the sensor is seated into the adapter and bearing assembly.

If installing a new sensor, it will come with a pin installed in the sensor. Do not remove the pin until the sensor is seated. If the new sensor did not come with a pin installed, you must reorder a new sensor.

15. Looking at the FRONT of the sensor, align the sensor with the steering shaft and install into the adapter and bearing assembly.
16. Install the connector to the sensor.



17. From the technicians point of view, the FRONT of the sensor will have:
    - pin hole (2) for centering pin (note location of pin hole)
    - flush rotor flange cuff (4)
    - alignment mark (3) for installation
18. From the technicians point of view, the BACK of the sensor will have an alignment tab (1) for installation. This sensor does not have double D flats.

    Important: If reusing the existing sensor, you must align the marks on the flush rotor flange cuff before installation. The alignment mark must stay aligned until the sensor is seated into the adapter and bearing assembly.

    If installing a new sensor, it will come with a pin installed in the sensor. Do not remove the pin until the sensor is seated. If the new sensor did not come with a pin installed, you must reorder a new sensor.

19. Looking at the FRONT of the sensor, align the sensor with the steering shaft and install into the adapter and bearing assembly.
20. Install the connector to the sensor.

Object Number: 1203820 Size: SH



21. From the technicians point of view, the FRONT of the sensor will have:
    - pin hole (3) for centering pin (note location of pin hole)
    - flush rotor flange cuff (5)
    - alignment mark (4) for installation
    - foam ring (6)
22. From the technicians point of view, the BACK of the sensor will have:
    - double D flats (1)
    - alignment tab (2) for installing into the adapter and bearing assembly.

Important: If reusing the existing sensor, you must align the marks on the flush rotor flange cuff before installation. The alignment mark must stay aligned until the sensor is seated into the adapter and bearing assembly.

If installing a new sensor, it will come with a pin installed in the sensor. Do not remove the pin until the sensor is seated. If the new sensor did not come with a pin installed, you must reorder a new sensor.

23. Looking at the FRONT of the sensor, align the sensor with the steering shaft and install into the adapter and bearing assembly.
24. Install the connector to the sensor.

Variable Effort Steering Programming

The variable power steering system has 3 response modes. Use a scan tool and the following table in order to select the Variable Power Steering response mode per customer request.

Action	Result
1. Connect a scan tool to the data link connector (DLC). 2. Input vehicle information and select Chassis.	• Delco Bosch ABS/TCS • Magna Steer
Select Magna Steer.	• Diagnostics • Recalibration
Select Recalibration.	Magna Steer Recalibration Procedure - Be sure Ignition is ON Engine OFF Press [ENTER] to Start
Press [ENTER].	Is VIN Correct?
Select YES.	Does vehicle have Magna Steer RPO # <NV8> ?
Select YES.	Recal with the FACTORY STANDARD calibration
Select NO.	Select Calibration • More Firm • Factory Calibration • Less Firm
Select the desired response mode.	Magna Steer Recalibration Procedure is complete Press [EXIT] to Return to Menu.
Exit the scan tool.	Reprogramming is complete.

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Fastener Tightening Specifications

Application	Specification	
	Metric	English
Hub Nut	160 N·m	118 Lb Ft
Inner Joint Large Seal Clamp	176 N·m	130 Lb Ft
Outer Joint Large Seal Clmp	176 N·m	130 Lb Ft

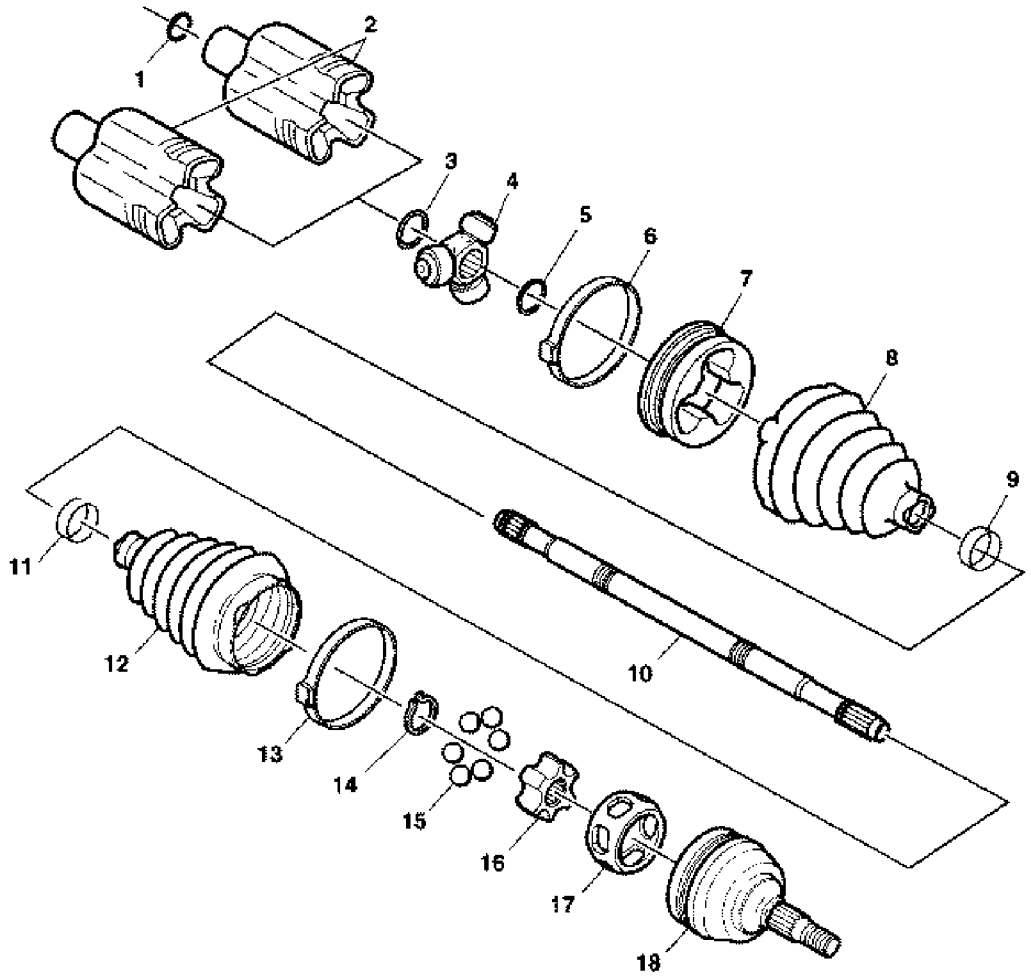
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GM SPO Group Numbers

Application	GM SPO Group Number
Front Wheel Drive Axle Shaft Boot Kit	6.061
Front Wheel Drive Shaft	6.055

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Disassembled Views (Halfshaft Assembly)



(1) Retaining Ring
(2) Retainer and Housing Assembly
(3) Spacer Ring
(4) Tripot Spider Assembly
(5) Spacer Ring
(6) Seal Retaining Clamp
(7) Tripot Trilobal Bushing
(8) Inboard Seal
(9) Swage Ring
(10) Halfshaft Bar
(11) Swage Ring
(12) Outboard Seal

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(13) Seal Retaining Clamp
(14) Race Retaining Ring
(15) Chrome Alloy Balls
(16) CV Joint Inner Race
(17) CV Joint Cage
(18) CV Joint Outer Race

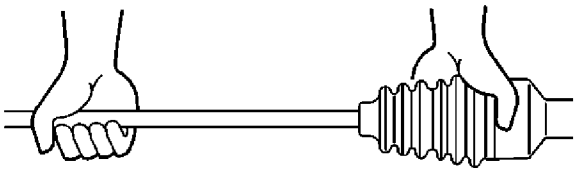
Wheel Drive Shaft Replacement

Removal Procedure

Tools Required

- J 2619-01 Slide Hammer
- J 28733-B Front Hub Spindle Remover
- J 33008 Axle Shaft Remover
- J 36226 Ball Joint Separator

1. Raise the vehicle and suitably support. Refer to Lifting and Jacking the Vehicle in General Information.
2. Remove the wheel and tire. Refer to Tire and Wheel Removal and Installation in Wheel and Tires.
3. Loosen or remove the stabilizer shaft link assembly bolt as needed. Refer to Stabilizer Shaft Link Replacement in Steering.



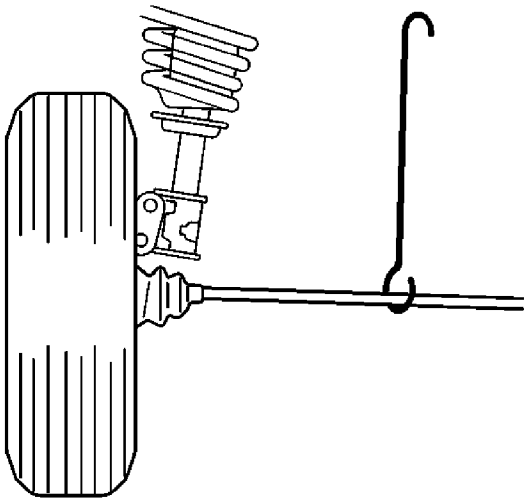


4. Remove the ball joint cotter pin and nut.

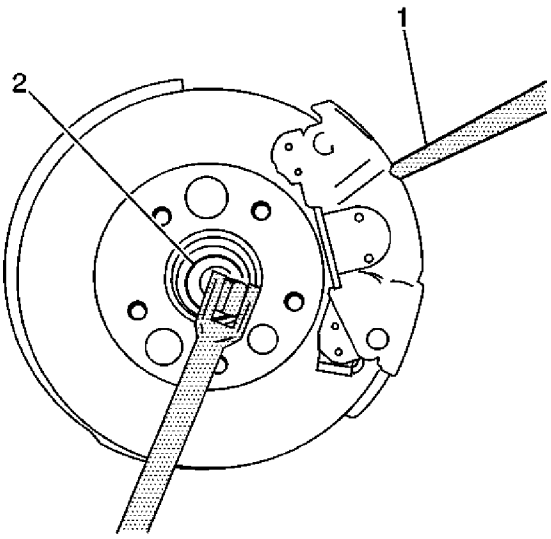
Notice: Do not overextend the wheel drive shaft. Allowing the inboard joint to overextend can cause separation of the internal components and lead to joint failure.

5. Loosen the joint using the J 36226 . The grease fitting may have to be removed from the ball joint for tool access. If removing the right axle, turn the wheel to the left; if removing the left axle, turn the wheel to the right.

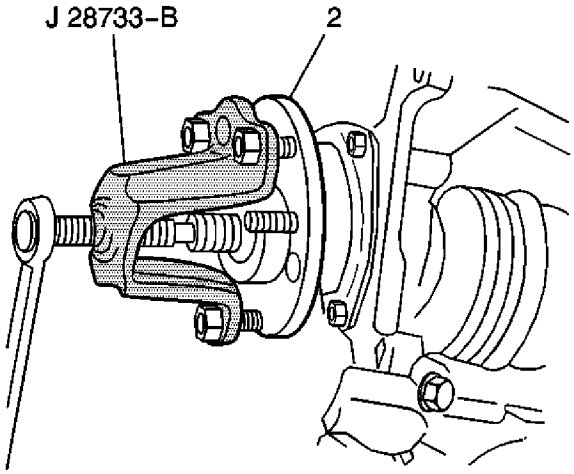
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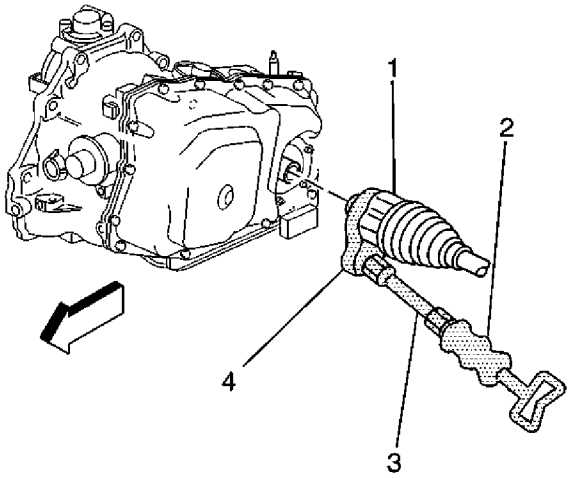
6. With the pry bar between the suspension support and the lower control arm, separate the joint.



7. Remove the hub nut (2). Insert a drift or screwdriver (1) into the caliper and rotor to prevent the rotor from turning.



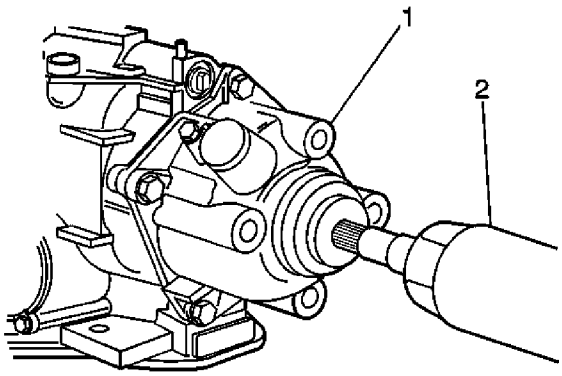
8. Disconnect the axle from the hub using the (1) J 28733-B . The hub may be partially installed to protect the threads. Move the strut and knuckle rearward.



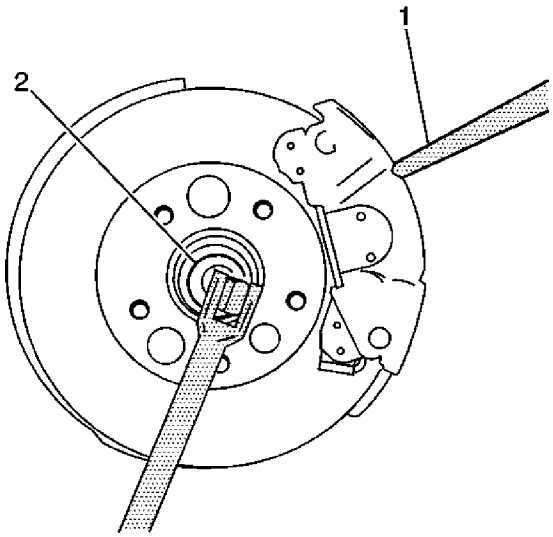
Notice: Do not attempt to free the ball stud by using a pickle fork or wedge type tool, because seal or bushing damage could result. Use the proper tool to separate all ball joints.

9. Using the (4) J 33008 and the (2) J 2619-01 , disconnect the drive axle from the transaxle.

Installation Procedure



1. Inspect the tripot housing at the transmission seal surface for corrosion, if corrosion is present, sand the surface in a rotational motion around the sealing surface with 320 grit emery cloth until smooth.
2. Lubricate the tripot housing surface with clean transmission fluid.
3. Push the axle into the transaxle (1). Verify that the drive axle is seated by grasping the inner joint housing and pulling. Do not pull on the drive axle shaft.



Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

4. Install the drive axle into the hub and bearing. Install a new hub nut (2). Insert a drift or screwdriver (1) into the caliper and rotor to prevent the rotor from turning.

   Tighten
   Hub nut to 145 N·m (107 lb ft).

5. Connect the ball joint to the knuckle.

   Tighten
   Ball joint nut to 10 N·m (88 lb in). Then tighten an additional 120 degrees (2 flats on nut) during which a torque of 55 N·m (41 lb ft) must be obtained.

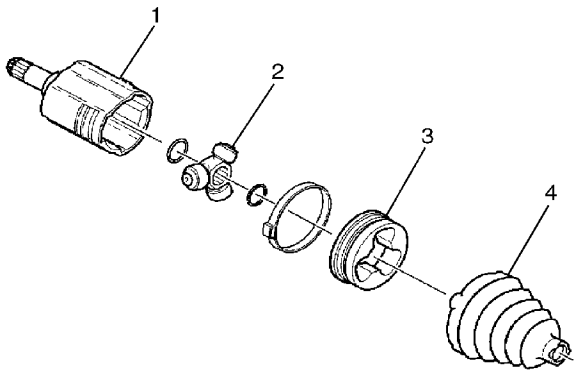
6. Install the cotter pin. In order to align the slot in the nut, tighten nut (up to one more flat).
7. Install the stabilizer shaft link assembly. Tighten nut to 17 N·m (13 lb ft). Refer to Stabilizer Shaft Link Replacement in Steering.
8. Install the wheel and tire. Refer to Tire and Wheel Removal and Installation in Wheel and Tires.
9. Lower the vehicle.

Wheel Drive Shaft Inner Joint and Boot Replacement (Inboard Assembly)

Tools Required

- J 35910 Earred Clamp Tool
- J 41048 Small Swage Tool
- J 8059 Snap Ring Pliers

Disassembly Procedure



Notice: With the removal of the wheel drive shaft for any reason, the transmission sealing surface (the tripot male/female shank of the joint) should be inspected for corrosion. If corrosion is evident, the surface should be cleaned with 320 grit cloth or equivalent in a rotational motion only. Do not clean with an oscillating motion. Transmission fluid may be used to clean off any remaining debris and the joint wiped dry before installation. Corrosion on the joint sealing surface may damage the transmission seals and cause a fluid leak.

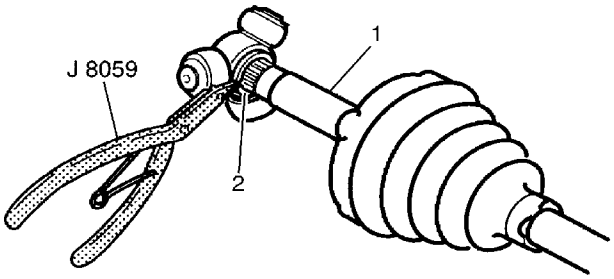
1. Use a hand grinder in order to cut through the swage ring. Do not damage the tripot housing (1).
2. Remove the large boot retaining clamp from the tripot joint with side cutter.
3. Dispose of the large boot retaining clamp.

Notice: Do not cut through the wheel drive shaft inboard or outboard boot during service. Cutting through the boot may damage the sealing surface of the housing and the tripot or

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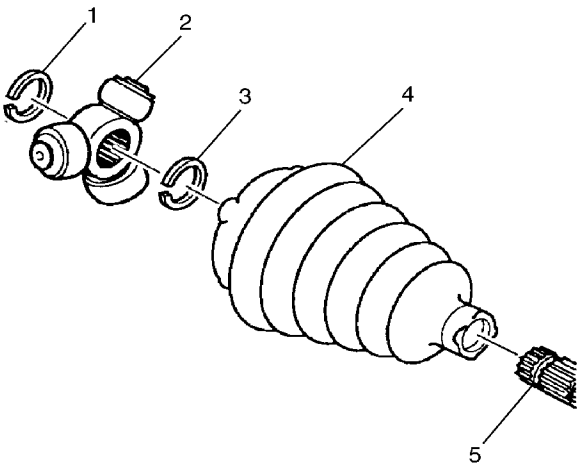
the constant velocity joint bushing. Damage to the sealing surface may lead to water and dirt intrusion and premature wear of the constant velocity joint.

4. Separate the halfshaft inboard boot from the trilobal tripot bushing (3) at the large diameter.
5. Slide the boot (4) away from the joint along the halfshaft bar.
6. Remove the housing (1) from the tripot joint spider (2) and the halfshaft bar.
7. Remove the trilobal tripot bushing (3) from the housing (1).





8. Spread spacer ring (2) with the J 8059 .
9. Slide the spacer ring and tripot joint spider back on halfshaft bar (1).

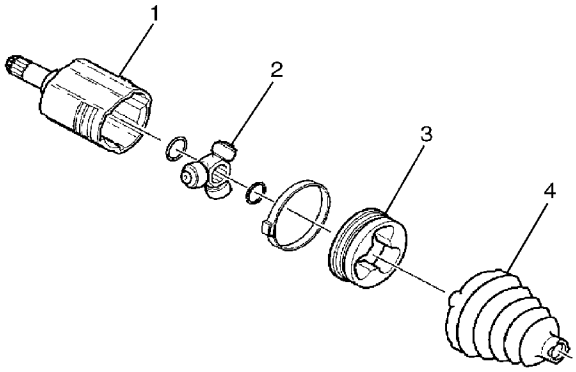




10. Remove the halfshaft bar retaining ring from the groove (5) on the halfshaft bar.
11. Slide tripot joint spider assembly (2) off of the halfshaft bar.
12. Clean the following items with cleaning solvent:
    - The tripot balls

- The needle rollers
- The housing

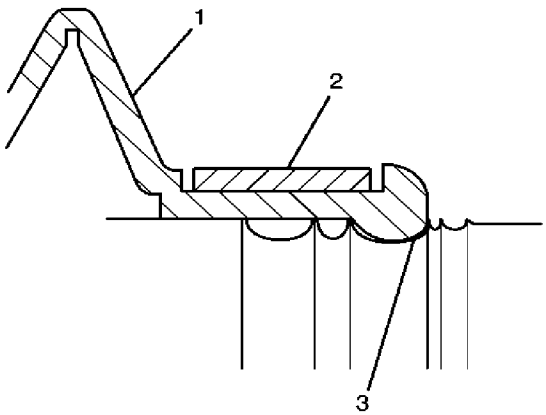
13. Remove all traces of old grease and any contaminates. Dry all parts.



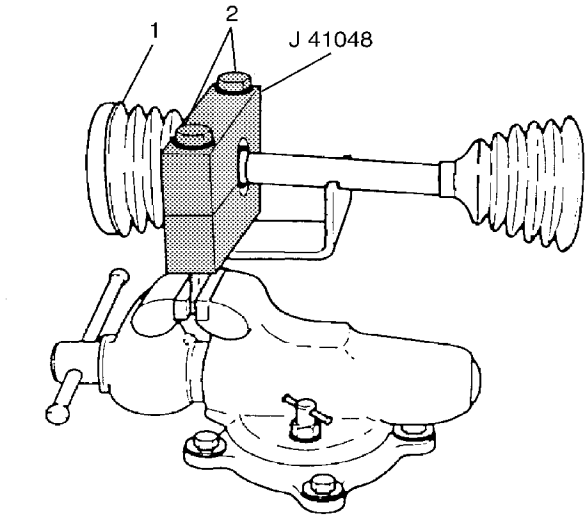


14. Inspect the following parts for damage or wear:
    - The halfshaft inboard boot (4)
    - The tripot joint spider assembly (2)
    - The housing (1)
    - The trilobal tripot bushing (3)
    - The needle rollers

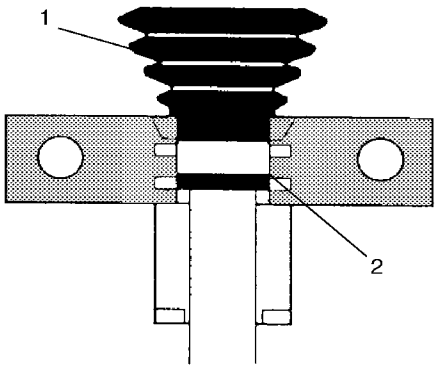
Assembly Procedure



1. Place the new small boot clamp (2) onto the small end of the joint boot (1). Slide the joint boot (1) and the small boot clamp (2) onto the halfshaft bar.
2. Position the small end of the joint boot (1) into the joint boot groove (3) on the halfshaft bar.



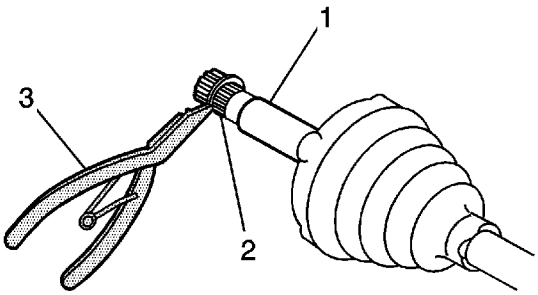
3. Mount J 41048 in a vise and proceed as follows:
   3.1. Position the outboard end (1) of the halfshaft assembly in tool J 41048 .
   3.2. Align the top of boot neck on the bottom die using the indicator.
   3.3. Place the top half of the J 41048 on the lower half of the J 41048 .
   3.4. Before proceeding, ensure there are no pinch points on the halfshaft inboard boot. This could cause damage to the halfshaft inboard boot.
   3.5. Insert the bolts (2).
   3.6. Tighten the bolts by hand until snug.



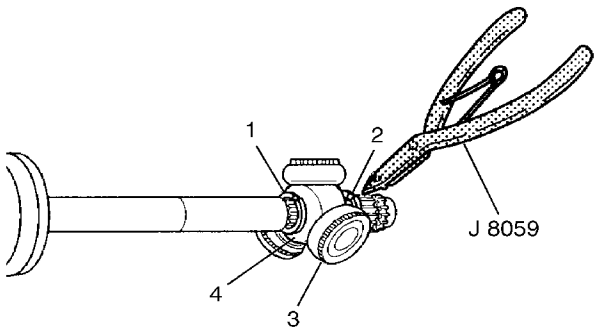
Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

4. Align the following items:
   - The halfshaft inboard boot (1)
   - The housing
   - The swage ring (2)

Tighten
Tighten each bolt of J 41048 180 degrees at a time using a ratchet wrench. Alternate between each bolt until both sides are bottomed.

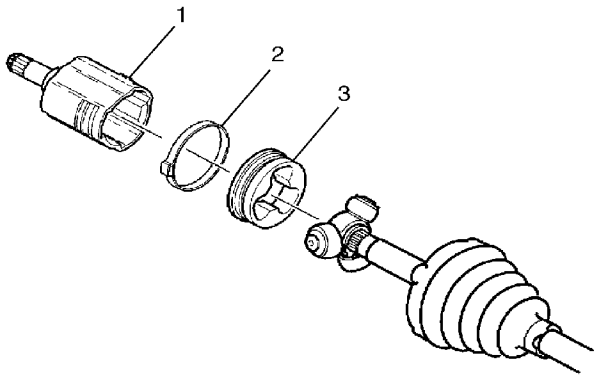


5. Install the spacer ring (2) on the halfshaft bar (1) in groove using J 8059 .



Important: Ensure that the counterbored face of the tripot joint spider (2) faces toward the end of the halfshaft bar (4).

6. Slide the tripot joint spider assembly (2) toward the spacer ring (1) as far as it will go on the halfshaft bar (4).
7. Install the halfshaft bar retaining ring in the groove of the halfshaft bar.



Important: Ensure the trilobal tripot bushing (3) is flush with the face of the housing (1).

8. Place approximately half of the grease from the service kit in the halfshaft inboard boot. Use the remainder of the grease to repack the housing.
9. Install the trilobal tripot bushing (3) to housing.
10. Position the larger new boot retaining clamp (2) on the halfshaft inboard boot.
11. Slide the housing (1) over the tripot joint spider assembly on the halfshaft bar.

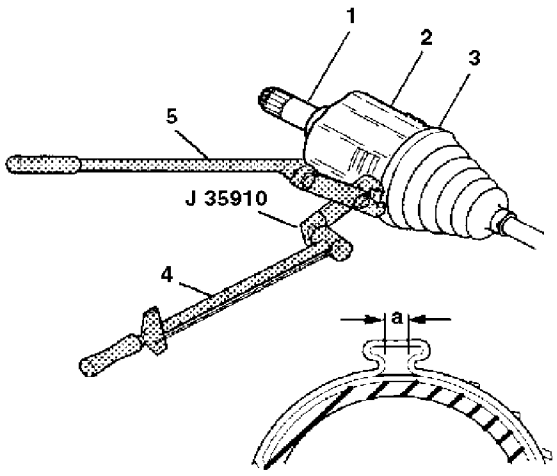
Object Number: 221916 Size: SH

12. Slide the large diameter of the halfshaft inboard boot (2), with the larger clamp (3) in place, over the outside of the trilobal tripot bushing and locate the lip of the boot in the groove.

Important: The halfshaft inboard boot must not be dimpled, stretched out or out of shape in any way. If the halfshaft inboard boot is not shaped correctly, carefully insert a thin flat blunt

tool (no sharp edges) between the large boot opening and the trilobal tripot bushing in order to equalize the pressure. Shape the halfshaft inboard boot properly by hand. Remove the tool.

13. Position the joint assembly at the proper vehicle dimension.





14. Align the following items while latching:
    - The halfshaft inboard boot (3)
    - The tripot housing (1)
    - The large boot retaining clamp (2)

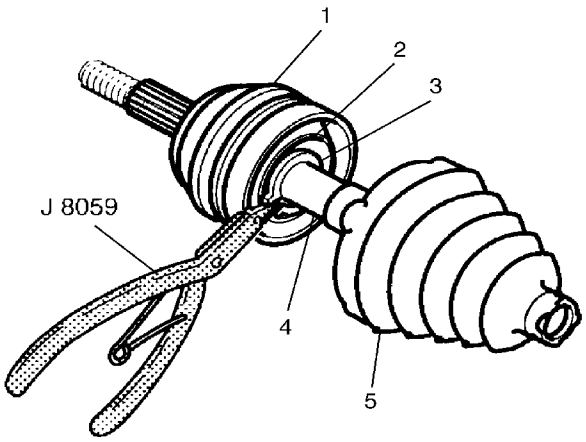
Tighten
Crimp the boot retaining clamp (2) with J 35910 to 176 N·m (130 lb ft). Add the breaker bar (5) and the torque wrench (4) to the J 35910 if necessary.

Wheel Drive Shaft Outer Joint and Boot Replacement

Tools Required

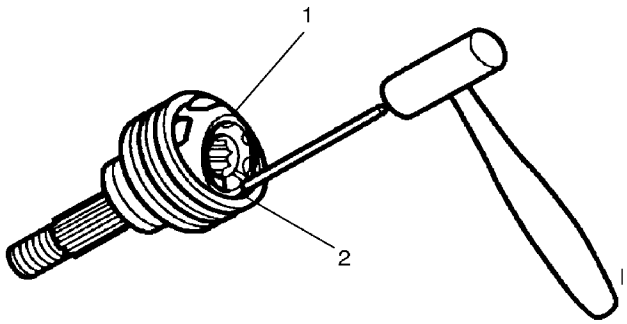
- J 35910 Earred Clamp Tool
- J 41048 Small Swage Tool
- J 8059 Snap Ring Pliers

Disassembly Procedure

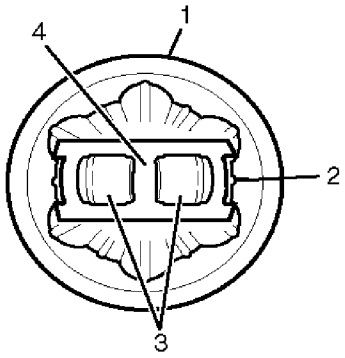


1. Remove the large boot retaining clamp from the CV joint with a side cutter. Discard the boot retaining clamp.
2. Remove the small boot retaining clamp from the halfshaft bar with a side cutter. Discard the boot retaining clamp.
3. Separate the outboard boot (5) from CV joint outer race (1) at the large diameter and slide the boot (5) away from the CV joint along the bar (4).
4. Wipe the grease from the face of the CV joint inner race (2).
5. Spread the ears on the race retaining ring (3) using J 8059 and remove the CV joint assembly from the bar (4).
6. Remove the boot (5) from the bar (4).

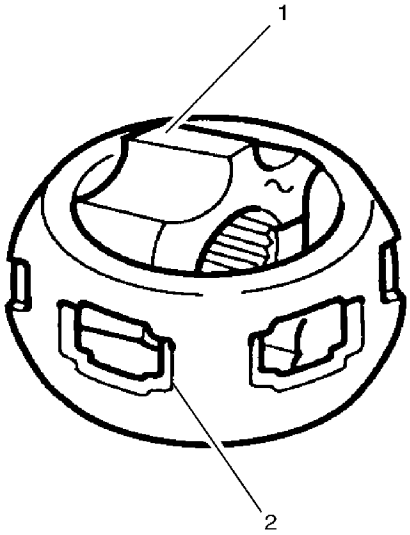
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7. Use a brass drift and a hammer to gently tap on the CV joint cage (1) until it is tilted enough to remove the first chrome alloy ball (2).
8. Tilt cage in the opposite direction to remove the opposing ball (2).
9. Repeat this process until all six balls are removed.



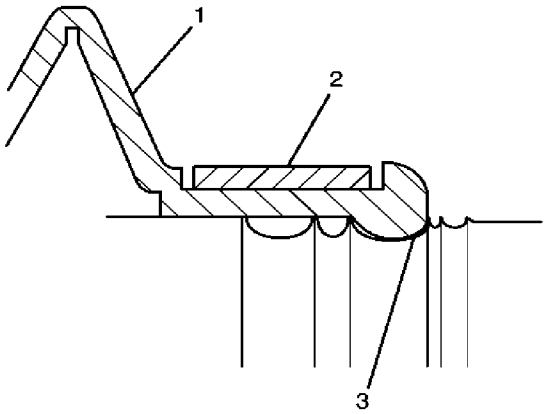
10. Position the CV joint cage (4) and the CV joint inner race 90 degrees to the centerline of the CV joint outer race (1) and align the CV joint cage windows (3) with the lands of the CV joint outer race (2).
11. Remove the CV joint cage (4) and the CV joint inner race from the CV joint outer race (1).



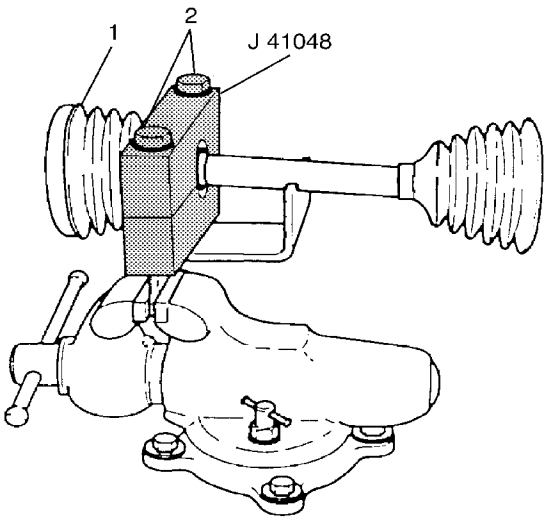


12. Rotate the CV joint inner race 90 degrees to the centerline of the CV joint cage with the lands of the CV joint inner race (1) aligned with the windows of the CV joint cage (2).
13. Pivot the inner race into the cage window (2) and remove the inner race (1).
14. Clean the following items thoroughly with cleaning solvent:
    - The inner and outer race assemblies
    - The CV joint cage
    - The balls
15. Remove all traces of old grease and any contaminates.
16. Dry all the parts.

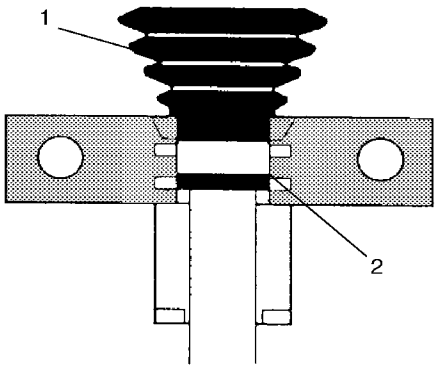
Assembly Procedure



1. Place the new swage ring (2) onto the small end of the joint boot (1). Slide the boot (1) and the swage ring (2) onto the halfshaft bar.
2. Position the small end of the boot (1) into the boot groove (3) on the halfshaft bar.



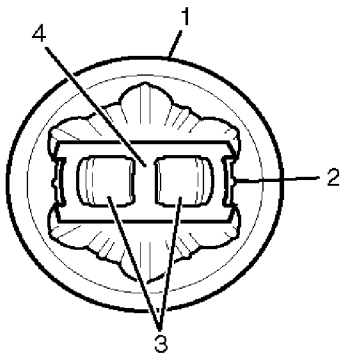
3. Mount theJ 41048 in a vise and proceed as follows:
   3.1. Position the outboard end (1) of the halfshaft assembly in tool J 41048 .
   3.2. Align the top of boot neck on the bottom die using the indicator.
   3.3. Place the top half of the J 41048 on the lower half of the J 41048 .
   3.4. Before proceeding, ensure there are no pinch points on the boot. This could cause damage to the boot.
   3.5. Insert the bolts (2).
   3.6. Tighten the bolts by hand until snug.



Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

4. Align the following items:
   - The boot (1)
   - The swage ring (2)

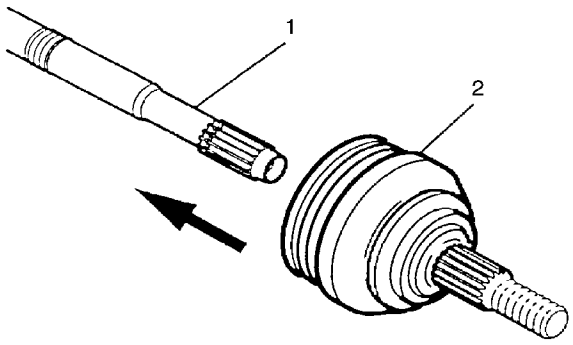
Tighten
Tighten each bolt of theJ 41048 180 degrees at a time using a ratchet wrench. Alternate between each bolt until both sides are bottomed.



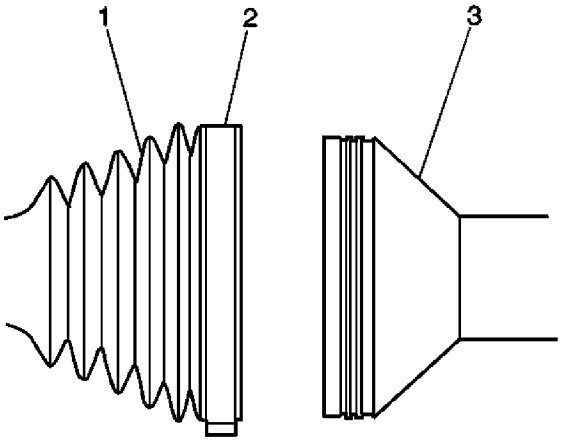
5. Put a light coat of grease from the service kit on the ball grooves of the inner race and the outer race (1).
6. Hold inner race 90 degrees to the centerline of the cage (4) with the lands of the inner race aligned with the windows of the cage and insert the inner race into the cage.
7. Hold the cage and the inner race 90 degrees to the centerline of the outer race (1) and align the cage windows (3) with the lands of the outer race (2).

Important: Ensure that the retaining ring side of the inner race faces the halfshaft bar.

8. Place the cage (4) and the inner race into the outer race (1).
9. Insert the first chrome ball then tilt the cage in the opposite direction to insert the opposing ball.
10. Repeat this process until all six balls are in place.
11. Place approximately half the grease from the service kit inside the outboard boot and pack the CV joint with the remaining grease.

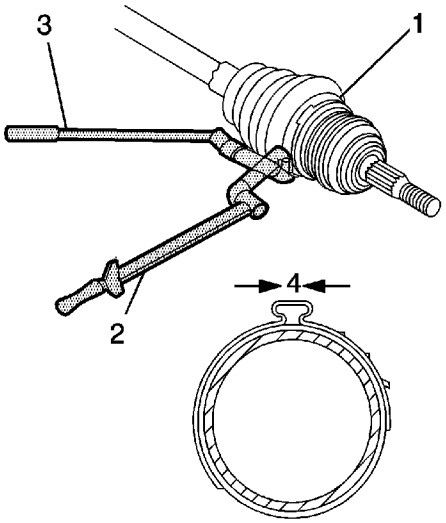


12. Push the CV joint (2) onto the halfshaft bar (1) until the retaining ring is seated in the groove on the bar.



Important: The outboard boot (1) must not be dimpled, stretched or out of shape in any way. If the boot (1) is not shaped correctly, equalize the pressure in the boot (1) and shape the boot (1) properly by hand.

13. Slide large diameter of the outboard boot (1) with the large boot retaining clamp (2) in place over the outside of the CV joint outer race (3) and locate the boot lip in the groove on the CV joint outer race (3).



14. Crimp the boot retaining clamp (1) using the J 35910 , a breaker bar (3), and a torque

wrench (2)

Tighten
Tighten the boot retaining clamp to 176 N·m (130 lb ft).

15. Check the gap dimension on the clamp ear. If the gap dimension is larger than shown, continue tightening until gap dimension is reached.

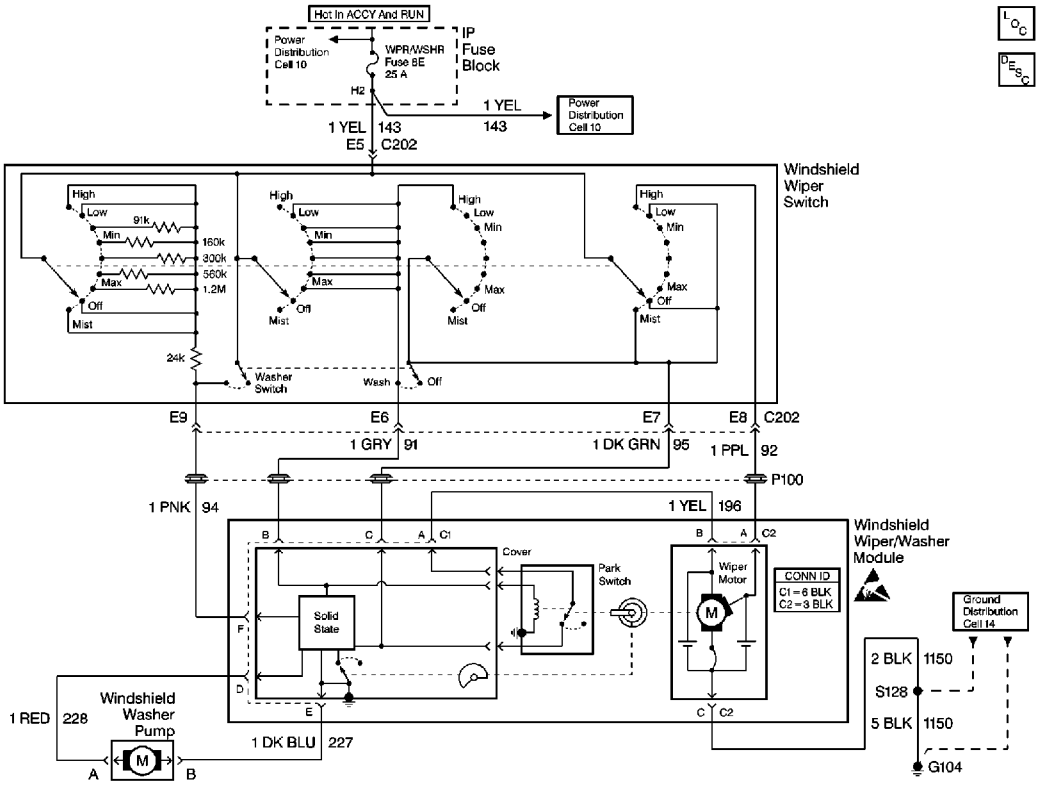
Fastener Tightening Specifications

Application	Specification	
	Metric	English
Solvent Container Nuts	5 N·m	44 lb in
Transmission Screws	8 N·m	71 lb in
Wiper Motor Screws	9 N·m	80 lb in
Wiper Motor Cover Screws	3 N·m	26 lb in

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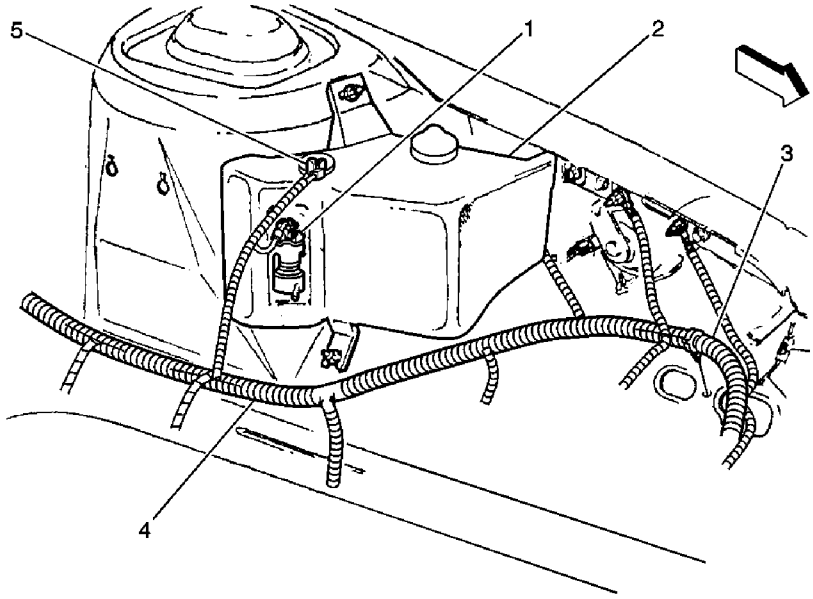
Wiper / Washer System (Pulse) Schematics

Cell 91



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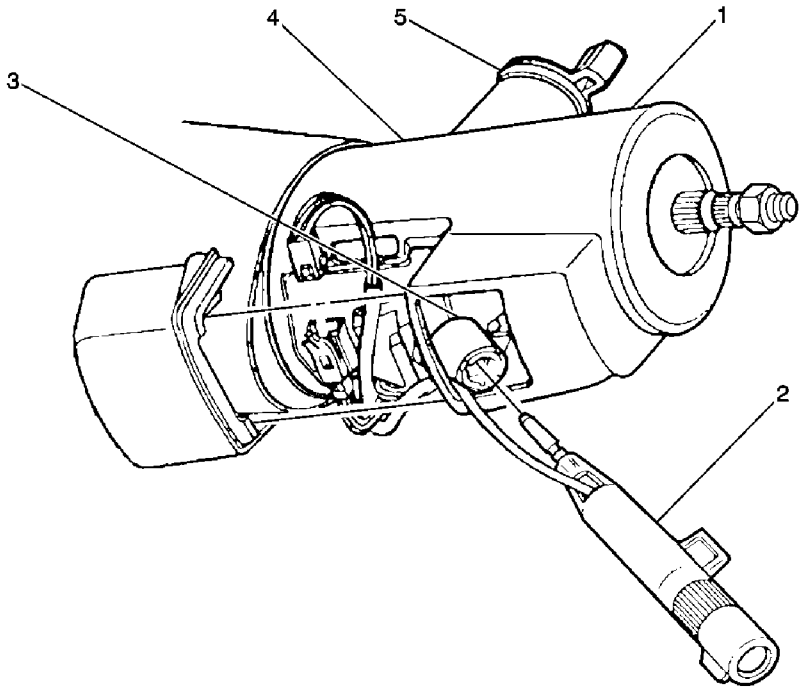
Engine Compartment, Near the Left Strut Tower



(1) Windshield Washer Pump
(2) Windshield Washer Solvent Reservoir
(3) S128
(4) S124
(5) Windshield Washer Solvent Level Switch

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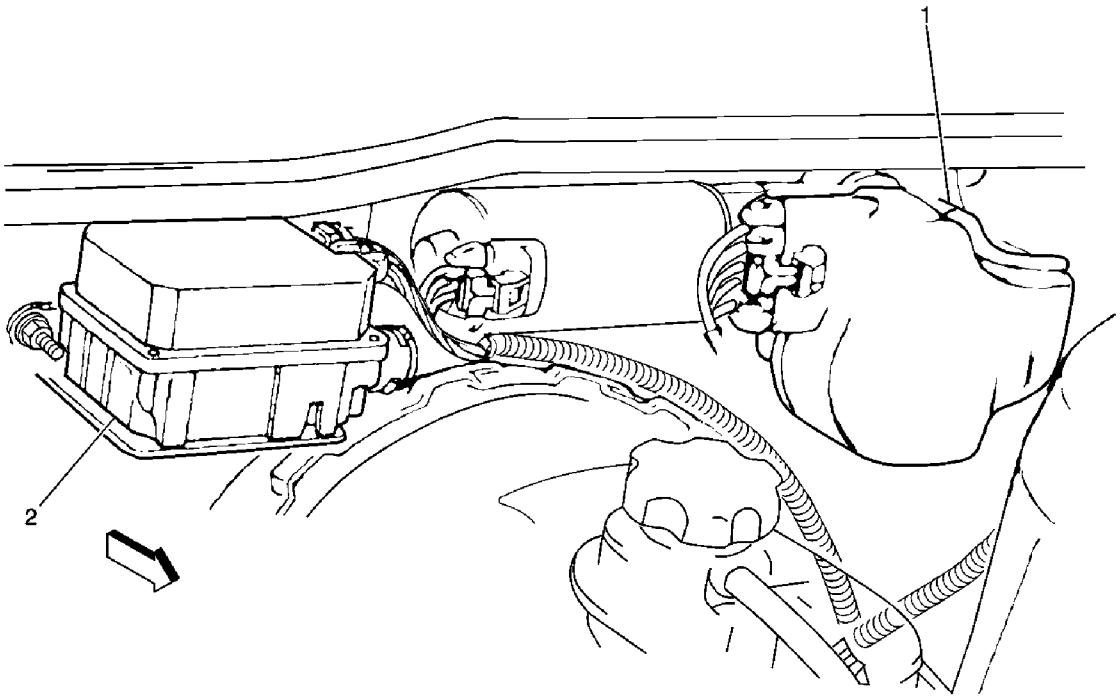
Top of the Steering Column



(1) Turn Hazard Switch (Hidden)
(2) Multifuntion Lever
(3) Windshield Wiper Switch
(4) Ignition Switch (Hidden)
(5) Ignition Lock Cylinder

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Left Hand Rear of the Engine Compartment



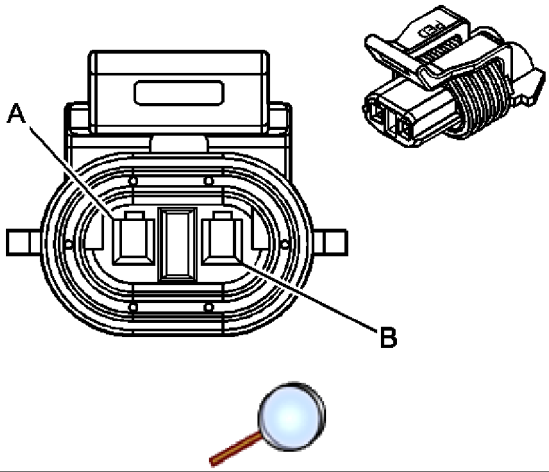
(1) Windshield Wiper/Washer Module
(2) Cruise Control Module

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Wiper / Washer Connector End Views

Table 1: Windshield Washer Pump
Table 2: Windshield Wiper/Washer Module C1
Table 3: Windshield Wiper/Washer Module C2

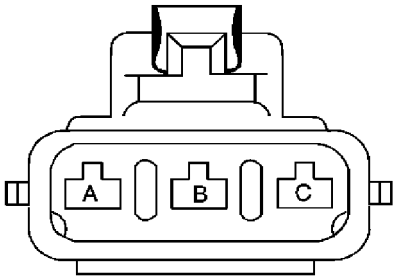
Windshield Washer Pump



Connector Part Information	• 12052635 • 2-Way F Metric Pack 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	RED	228	Windshield Washer Pump Motor Feed
B	DK BLU	227	Windshield Washer Pump Motor Return

Windshield Wiper / Washer Module C1

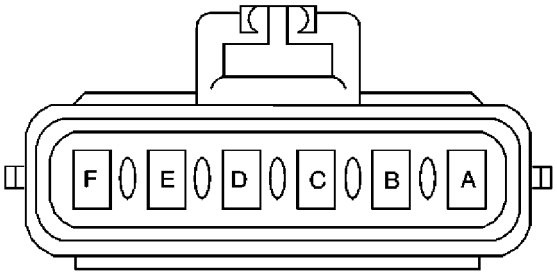


Connector Part Information	• 12059569 • 3-Way F Metric Pack 280 Series (BLK)

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Pin	Wire Color	Circuit No.	Function
A	PPL	92	Windshield Wiper Motor Feed - High Speed
B	YEL	196	Windshield Wiper Motor Feed - Pack Switch Controlled
C	BLK	1150	Ground

Windshield Wiper / Washer Module C2



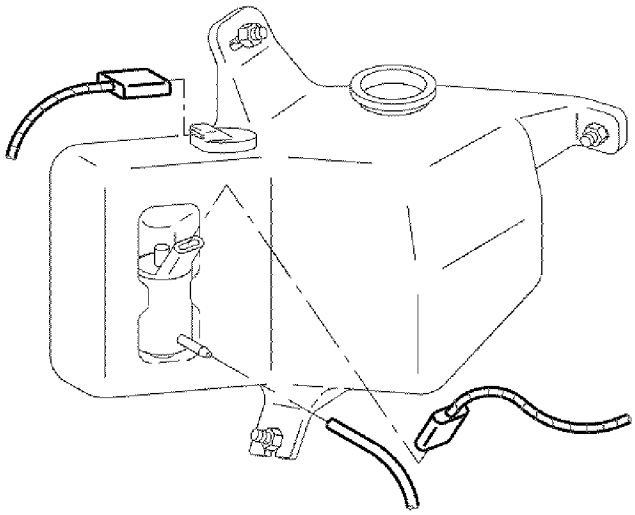


Connector Part Information	• 12059572 • 6 Way F Metric Pack 280 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	YEL	196	Windshield Wiper Motor Feed - Park Switch Controlled
B	GRY	91	Windshield Wiper Relay Feed Coil
C	DK GRN	95	Windshield Wiper Motor Feed - Low Speed
D	RED	228	Windshield Washer Pump Motor Feed
E	DK BLU	227	Windshield Washer Pump Motor Return
F	PNK	94	Windshield Washer Switch Signal

Windshield Washer Solvent Container Replacement

Removal Procedure



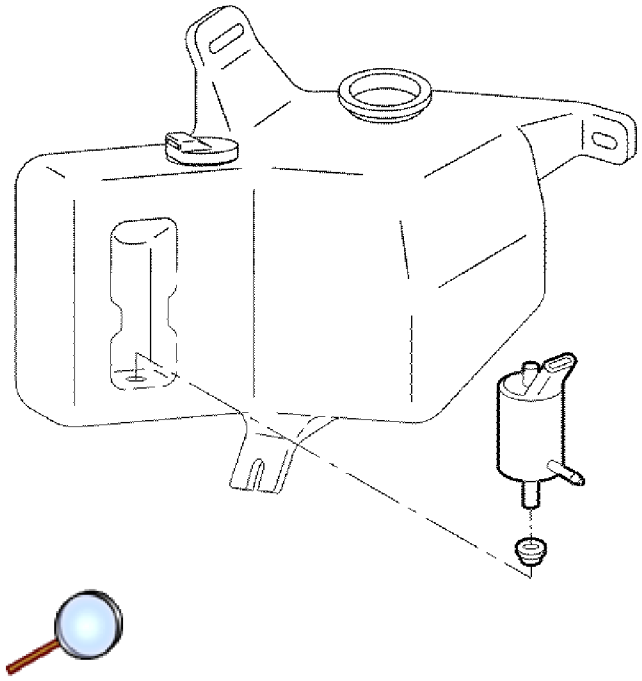
1. Remove the washer solvent from the washer solvent container.
2. Disconnect the electrical connectors from the washer pump and the solvent level sensor switch.
3. Disconnect the hose from the washer pump.

Object Number: 415960 Size: SH

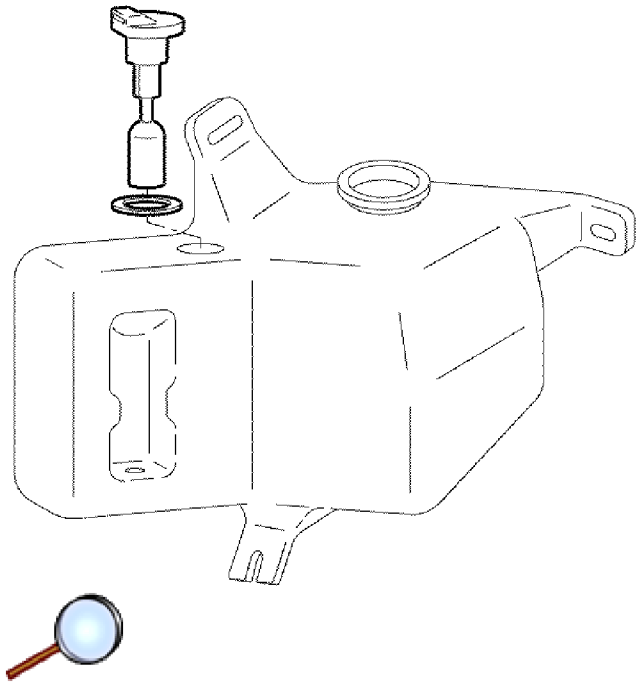
4. Loosen the nut at the bottom of the washer solvent container.

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5. Remove two nuts and the washer solvent container.



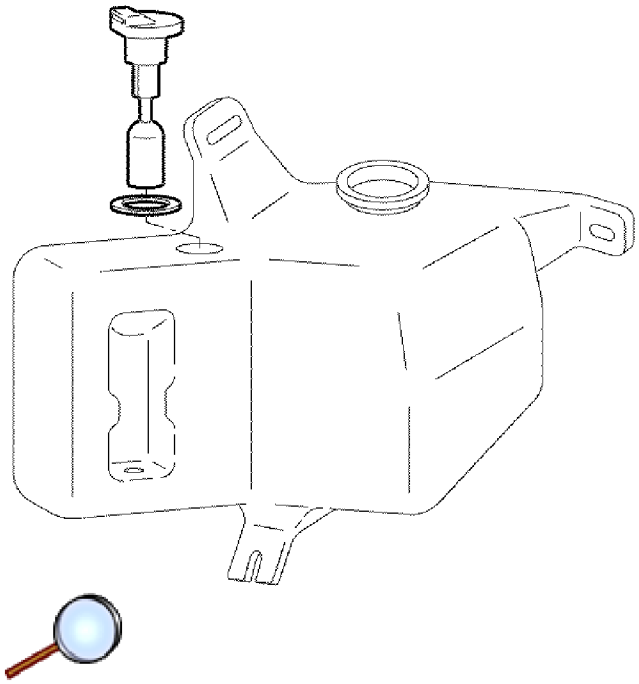
6. Remove the washer pump and seal from the container.



7. Remove the solvent level sensor switch and seal from the washer solvent container.

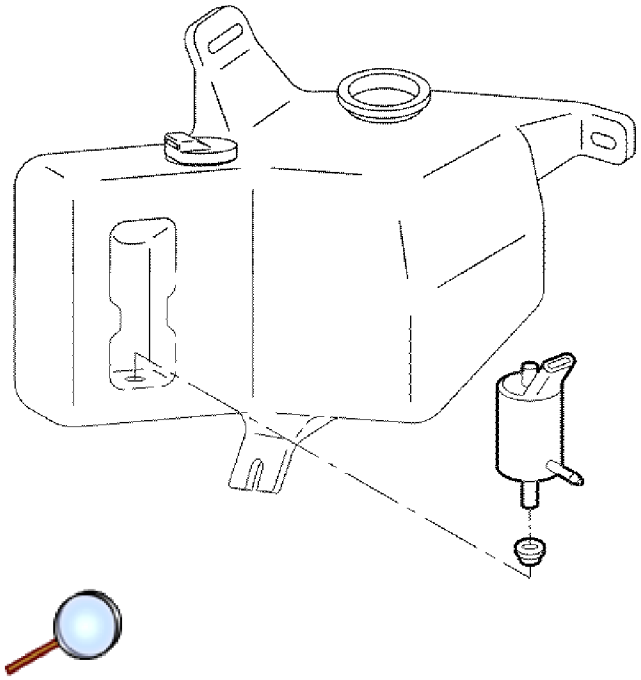
Installation Procedure

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.



Important: The tab on the solvent level sensor switch must be lined up with the slot in the hole.

1. Install the solvent level sensor switch and seal in the washer solvent container.



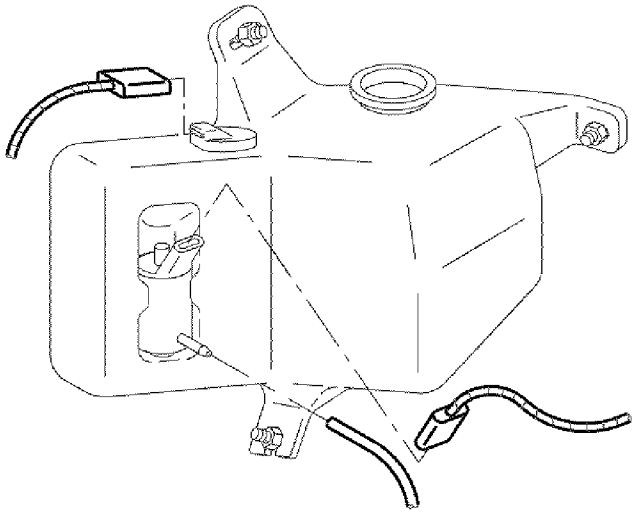
Important: The new washer pump must be pushed all the way into the container seal.

2. Install the washer pump and the seal into the washer solvent container.

Object Number: 415960 Size: SH

3. Install the washer solvent container with three nuts.

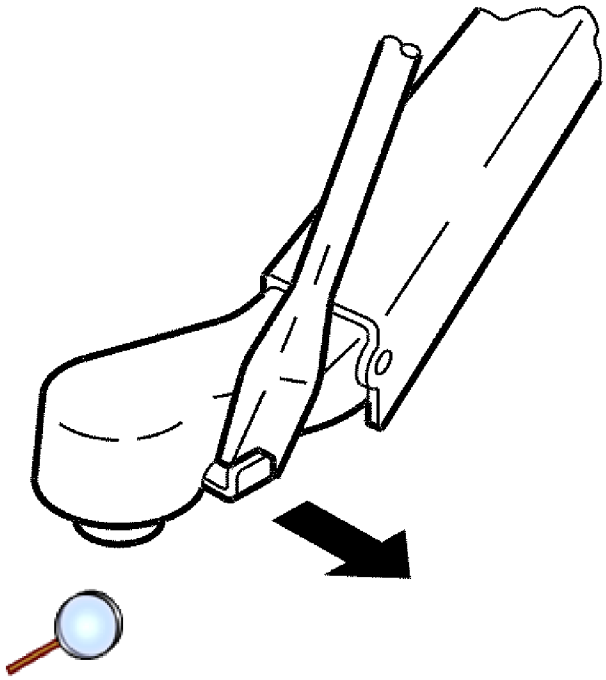
Tighten
Tighten the nuts to 5 N·m (44 lb in).



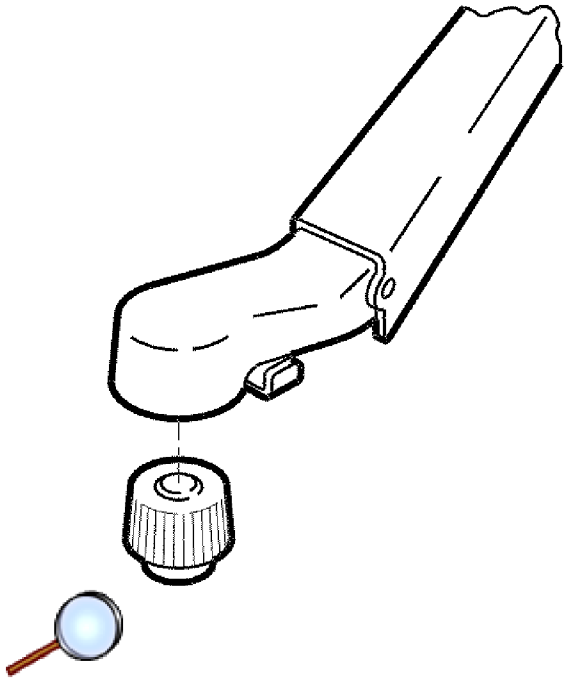
4. Connect the electrical connectors to the solvent level sensor switch and the washer pump.
5. Connect the hose to the washer pump.
6. Fill the washer solvent container with washer solvent.

Windshield Wiper Arm Replacement

Removal Procedure



1. Open the hood with the wiper arms in the parked position.
2. Lift the wiper blade from the windshield and disengage the retaining latch with a screwdriver.

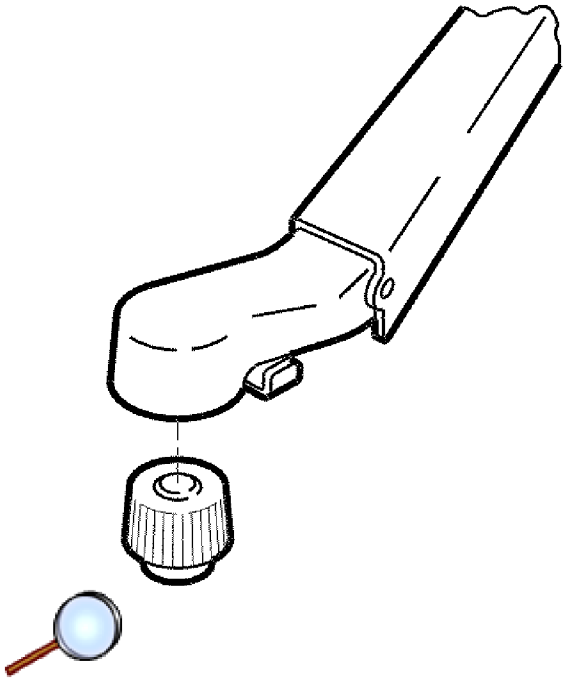


3. Remove the wiper arm from the wiper transmission drive shaft.
4. Remove the wiper blade from the wiper arm if required. Refer to Windshield Wiper Blade

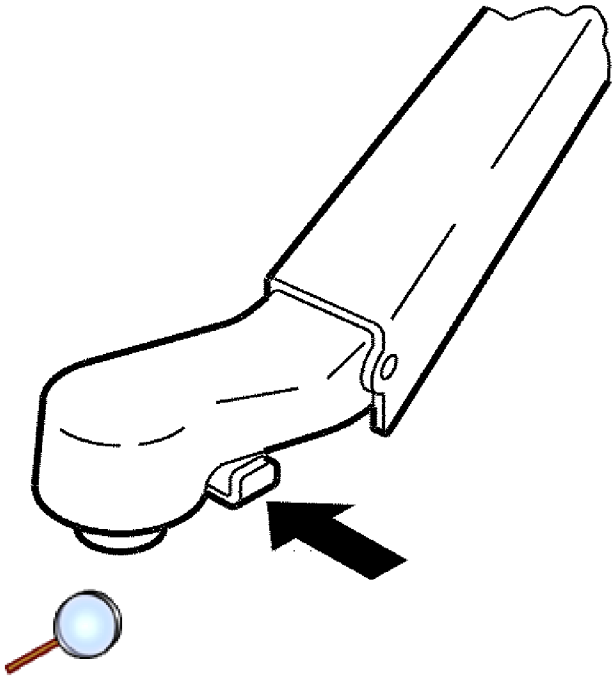
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Replacement .

Installation Procedure



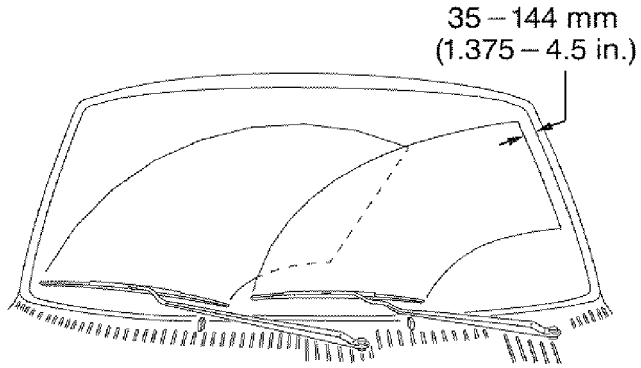
1. Install the wiper blade if removed. Refer to Windshield Wiper Blade Replacement .
2. Position the wiper arm slightly below the stop surface of the park ramp, then press the arm head casting fully onto the transmission drive shaft.



3. Push in the arm retaining latch.
4. Lift the replaced wiper arm over park ramp D.
5. Close the hood.

Inspection Procedure

-

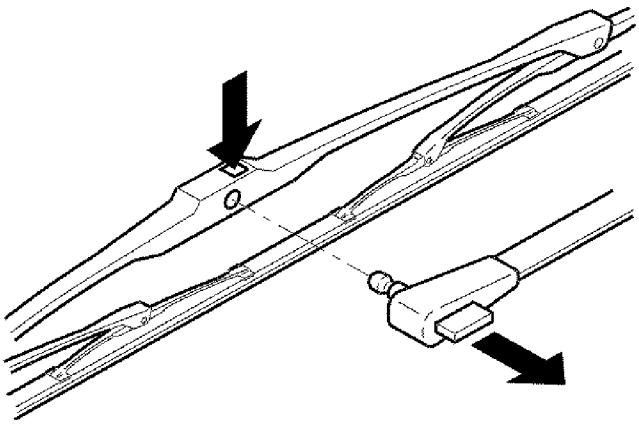




- Inspect the wiper pattern. The wiper arm should be 35-114 mm (1.375-4.5 in) from the top of the driver's blade to the edge of the molding in the outwipe position.
- Inspect the park position. Both the wiper arms must be against the park ramps.
- The correct park position and outwipe dimensions are determined with the wipers operating at low speed on wet glass.

Windshield Wiper Blade Replacement

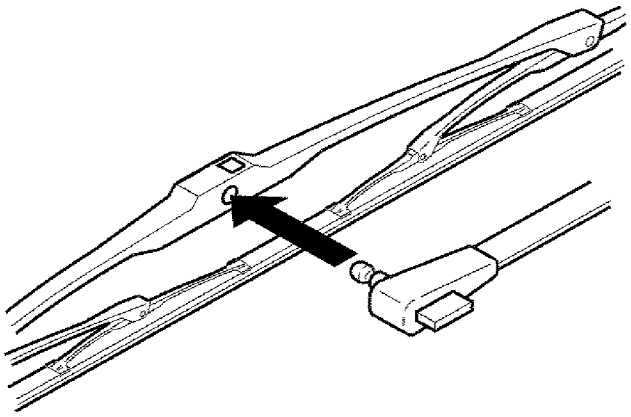
Removal Procedure



1. Turn the ignition switch to the ACCY position.
2. Set the wiper switch to the PULSE position.
3. Turn the ignition off when the wipers are at the innerwipe position and not moving.
4. Remove the wiper blade from the wiper arm by pushing down on the release latch and pulling the wiper blade from the wiper arm.

Installation Procedure

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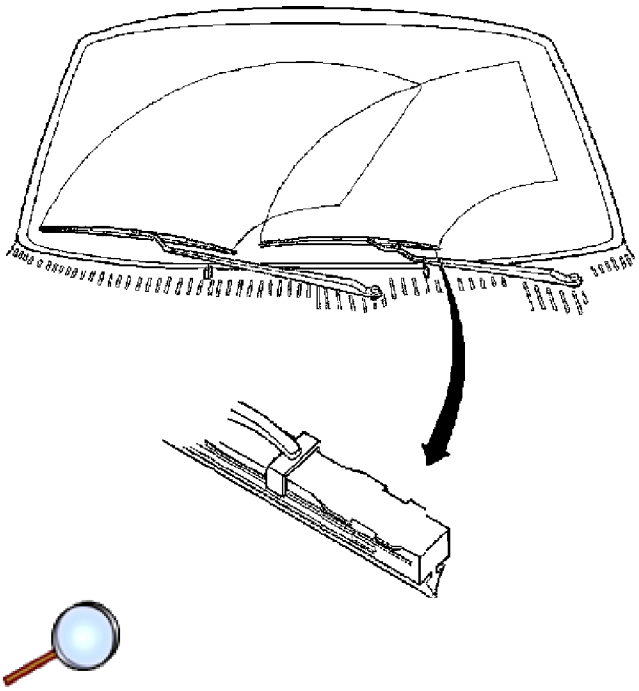


Important: Use only 22-inch beam-type blades. With the windshield wipers at the innerwipe position, the blades must be installed with the wiper blade element notches pointed toward the head casting of the wiper arm.

1. Install the wiper blade from the wiper arm.
2. Operate the wipers and check for proper operation.

Wiper Blade Element Replacement

Removal Procedure

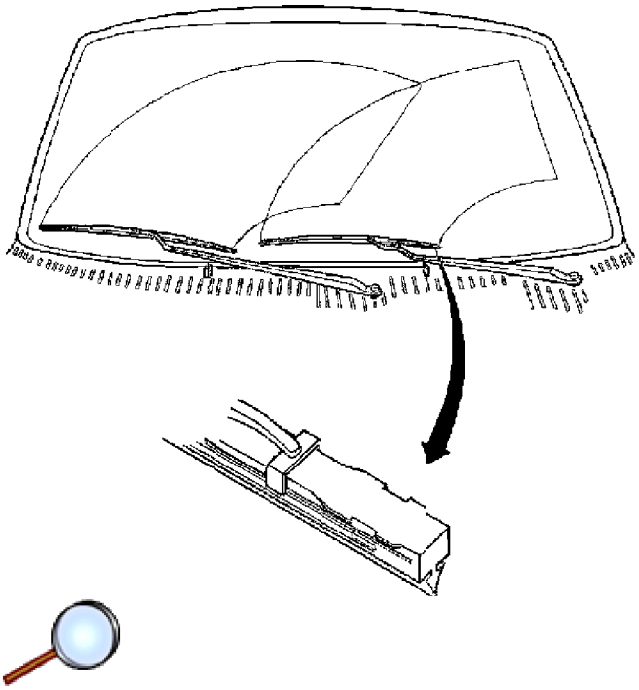


Important: The wiper blade element must be replaced if removed from the wiper blade.

1. Remove the wiper blade from the wiper arm. Refer to Windshield Wiper Blade Replacement .
2. Remove the wiper blade element by pulling out through the wiper blade claws.

Installation Procedure

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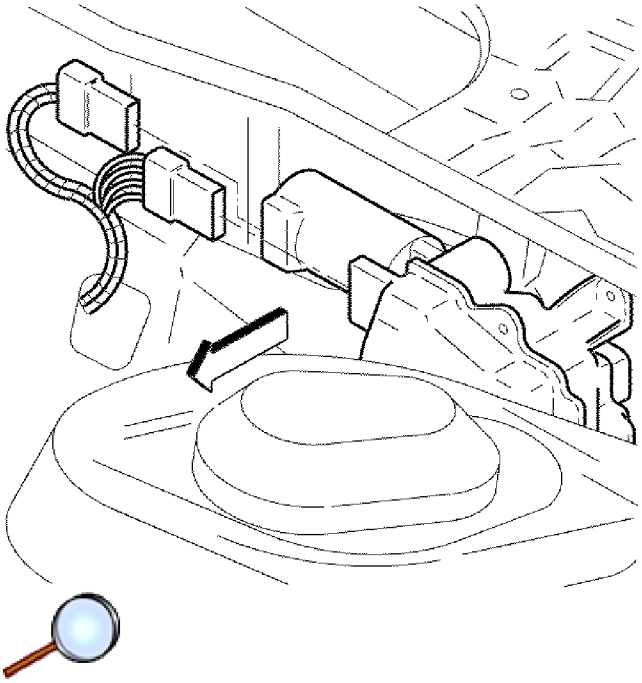
1. Install the wiper blade element into the wiper blade by sliding the wiper blade element through the wiper blade claws until the claw is locked into the notches in the wiper blade element.

   Important: Be sure the wiper blade element is secure in all the claw sets and that the element moves back and forth freely as the wiper blade flexes.

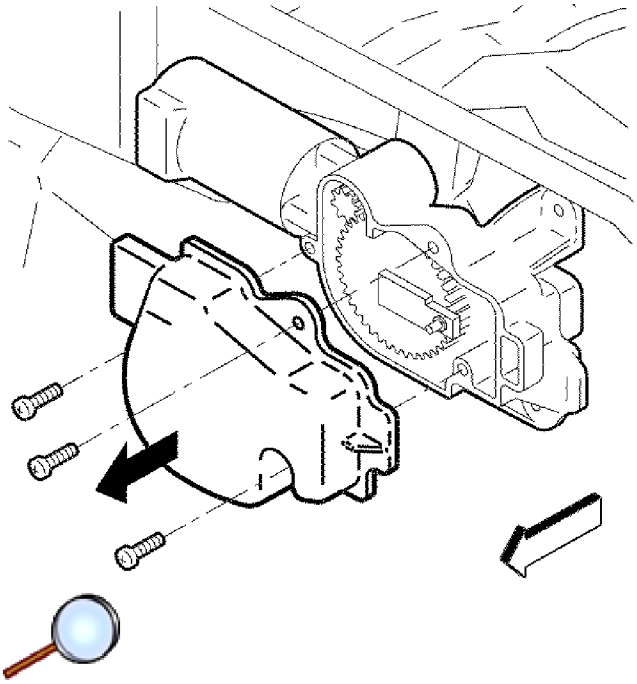
2. Install the wiper blade onto the wiper arm. Refer to Windshield Wiper Blade Replacement .
3. Operate the wipers and check for proper operation.

Windshield Wiper Motor Cover Replacement

Removal Procedure



1. Disconnect the electrical connectors from the cover and the wiper motor.

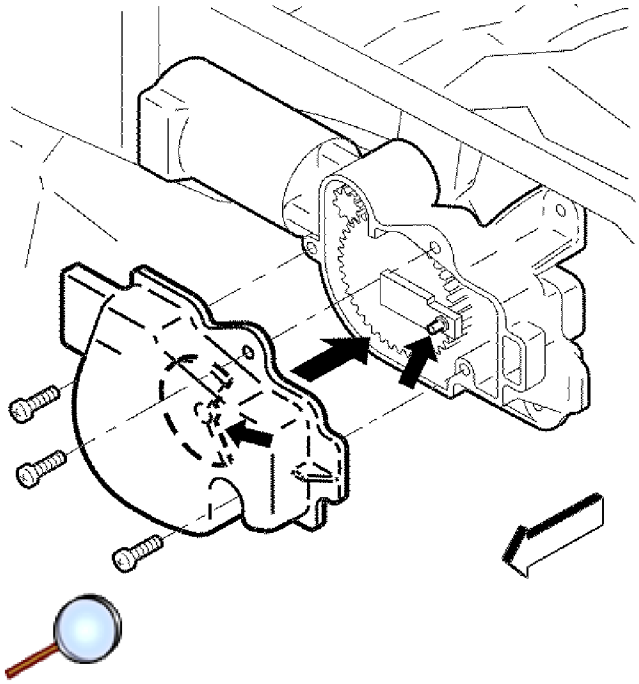


2. Remove three screws.
3. Remove the wiper motor cover.

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Installation Procedure

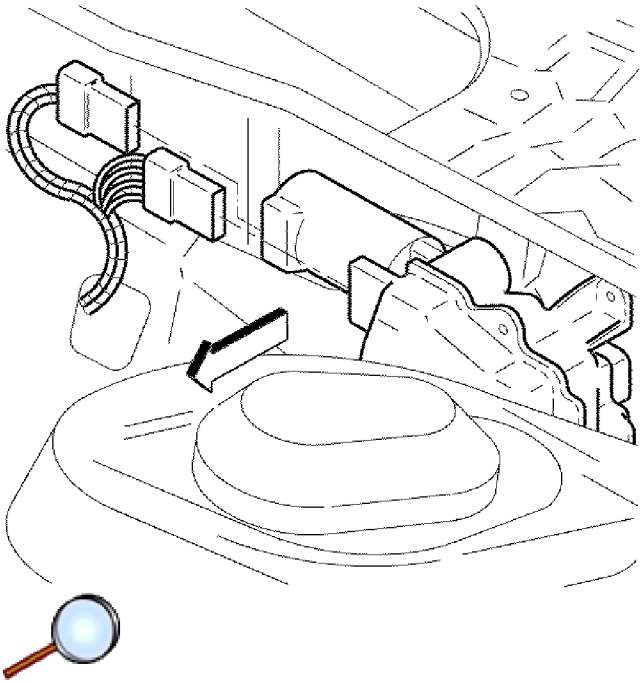
Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.



Important: Always install the cover with the wiper motor in the park position and the drive pin in the open area of the cam.

1. Install the wiper motor cover.
2. Install three screws.

Tighten
Tighten the screws to 3N·m (26 lb in).



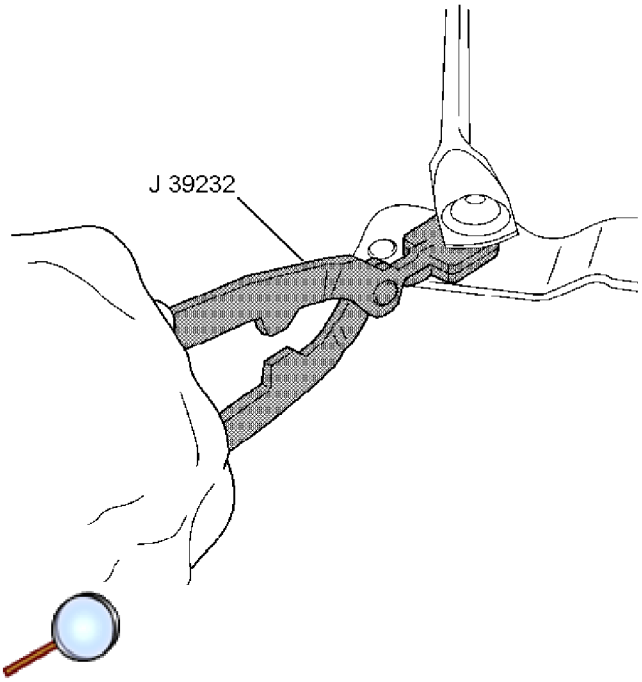
3. Connect the electrical connectors onto the cover and the wiper motor.

Windshield Wiper Motor Replacement

Removal Procedure

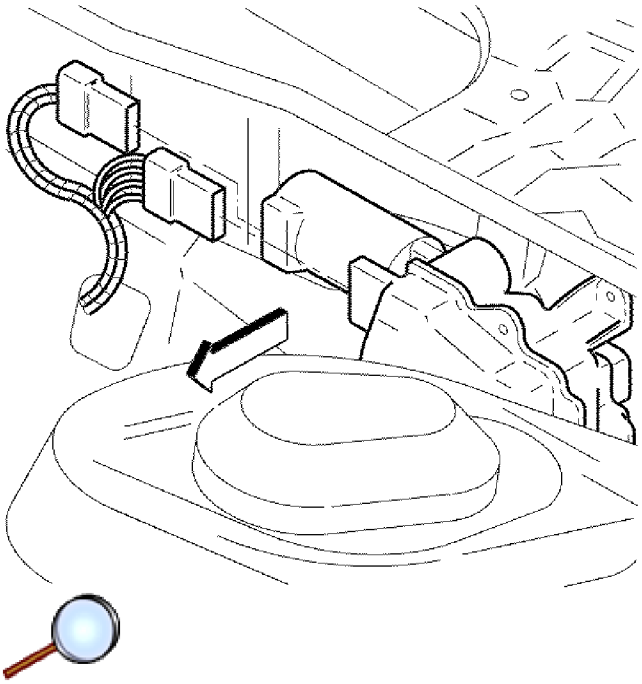
Tools Required

J 39232 Wiper Transmission Separator

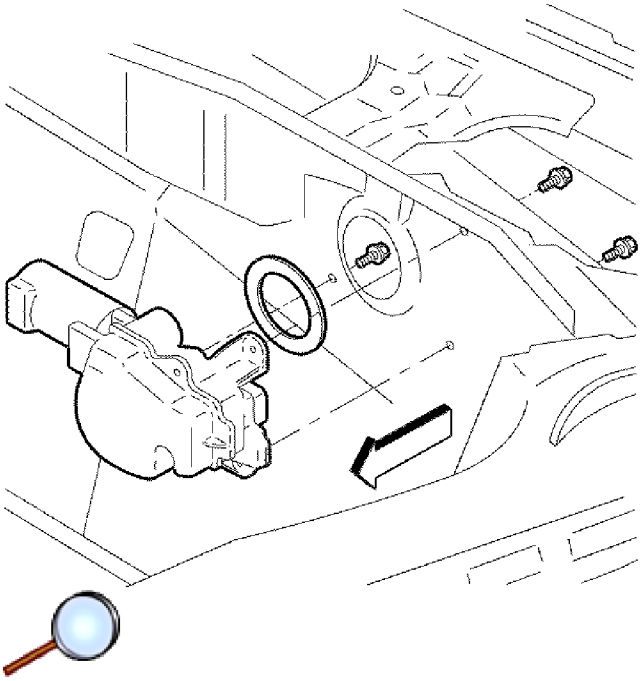


1. Remove the wiper arm and blades. Refer to Windshield Wiper Arm Replacement .
2. Disconnect the washer hose.
3. Remove the air inlet grille panel. Refer to Air Inlet Grille Panel Replacement
4. Remove the transmission drive link socket from the wiper motor crank arm using the J 39232 Wiper Transmission Separator.

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5. Disconnect the electrical connectors from the wiper motor.



6. Remove three screws.
7. Remove the wiper motor and the seal while guiding the crank arm through the hole.

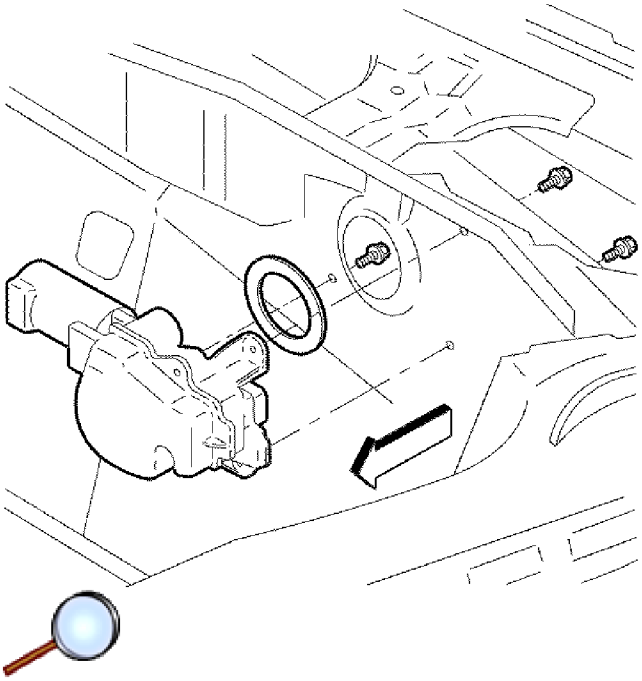
Installation Procedure

Tools Required

J 39529 Wiper Transmission Installer

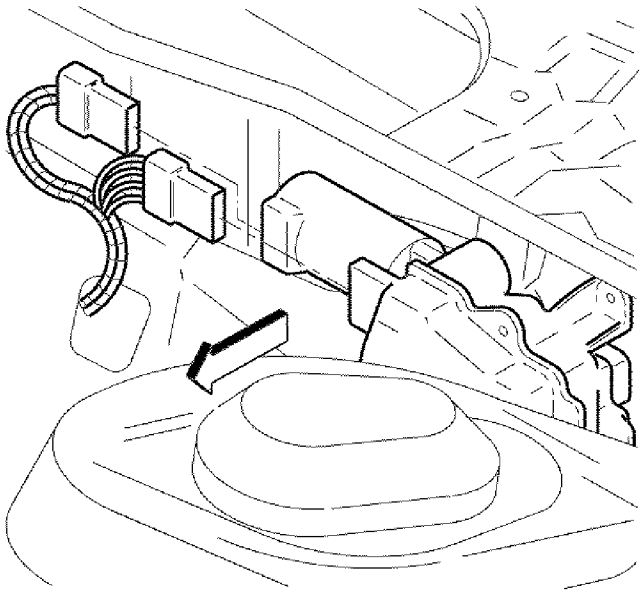
Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners

requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

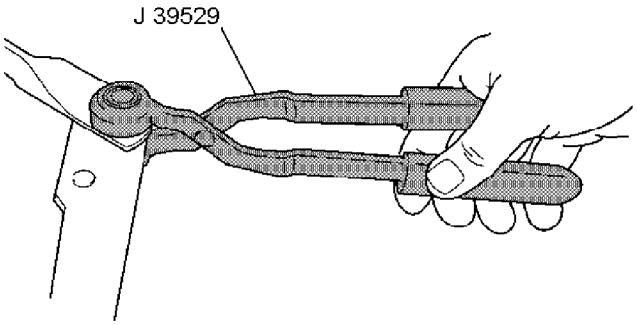


1. Install the wiper motor and the seal while guiding the crank arm through the hole.
2. Install three screws.

Tighten
Tighten the screws to 9 N·m (80 lb in).



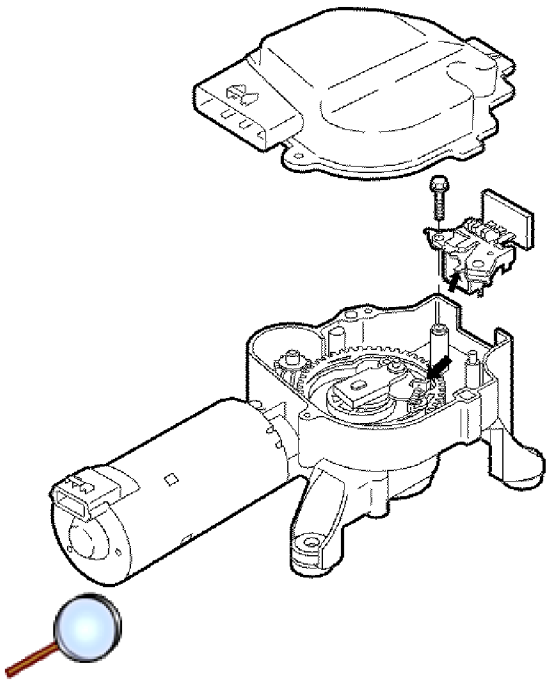
3. Connect the electrical connectors to the wiper motor.



4. Install the transmission drive link socket to the wiper motor crank arm ball using the J 39529 Wiper Transmission Installer. Be sure the socket is fully seated on the ball.
5. Install the air inlet grille panel. Refer to Air Inlet Grille Panel Replacement .
6. Install the wiper arms and blades. Refer to Windshield Wiper Arm Replacement .

Wiper Motor Park Switch Replacement

Removal Procedure



1. Remove the wiper motor. Refer to Windshield Wiper Motor Replacement .

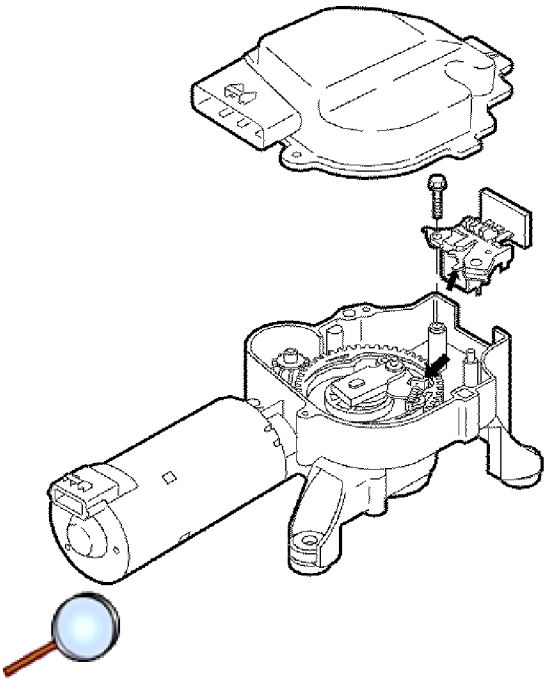
   Important: If the wiper motor is in the park position, operate the wiper motor as required to remove the pawl from the relay slot.

2. Remove the wiper motor cover. Refer to Wiper Motor Cover Replacement .
3. Remove the screw and the park switch.

Installation Procedure

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

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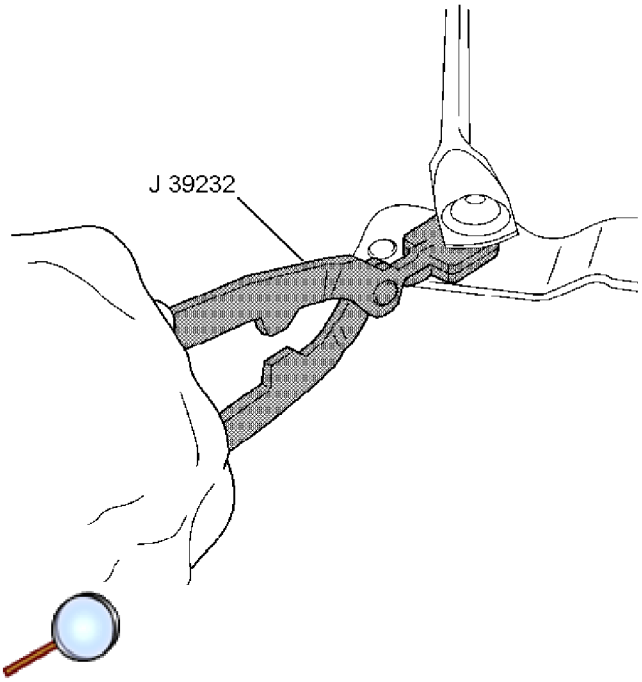
1. Install the new park switch and the screw.
2. Operate the wiper motor back into the park position (pawl in the relay slot).
3. Install the wiper motor cover. Refer to Wiper Motor Cover Replacement , and follow the procedure carefully.
4. Install the wiper motor. Refer to Windshield Wiper Motor Replacement .

Windshield Wiper Transmission Replacement

Removal Procedure

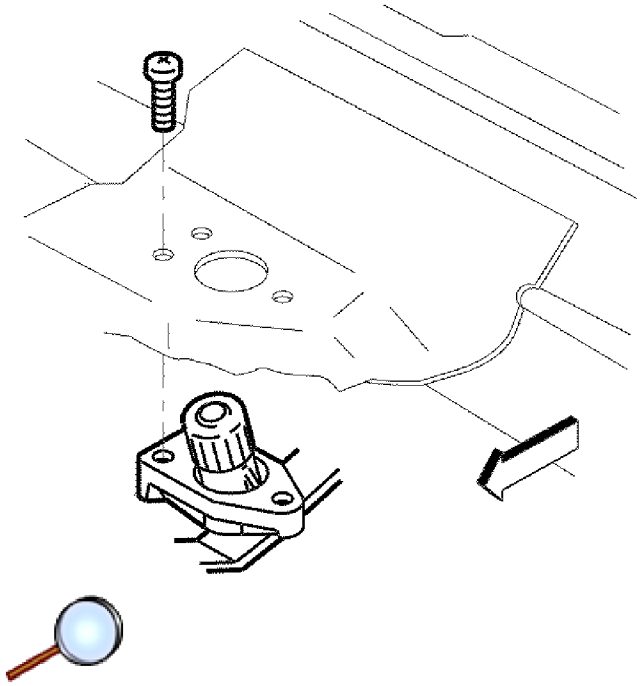
Tools Required

J 39232 Wiper Transmission Separator

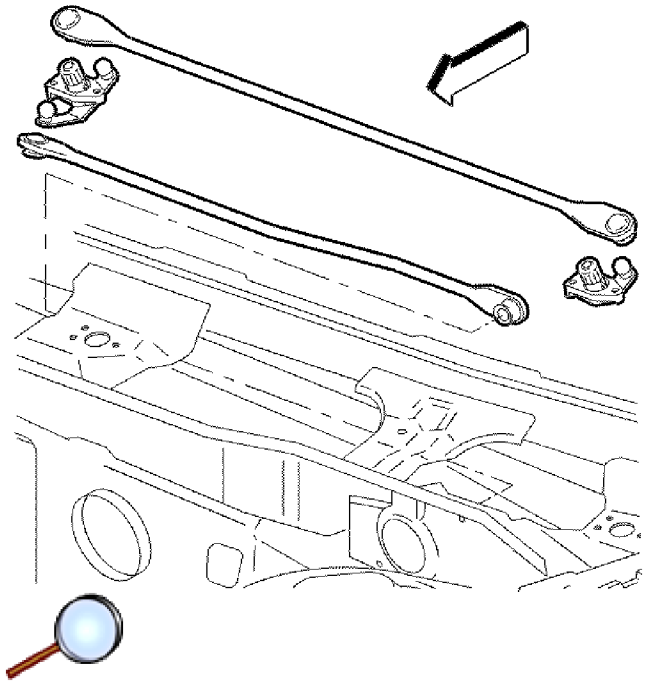


1. Remove the wiper arm and blades. Refer to Windshield Wiper Arm Replacement .
2. Remove the air inlet grille panel. Refer to Air Inlet Grille Panel Replacement .
3. Disconnect the transmission drive link sockets from the wiper motor crank arm and the transmission drive shafts using the J 39232 Wiper Transmission Separator.

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4. Remove six screws.

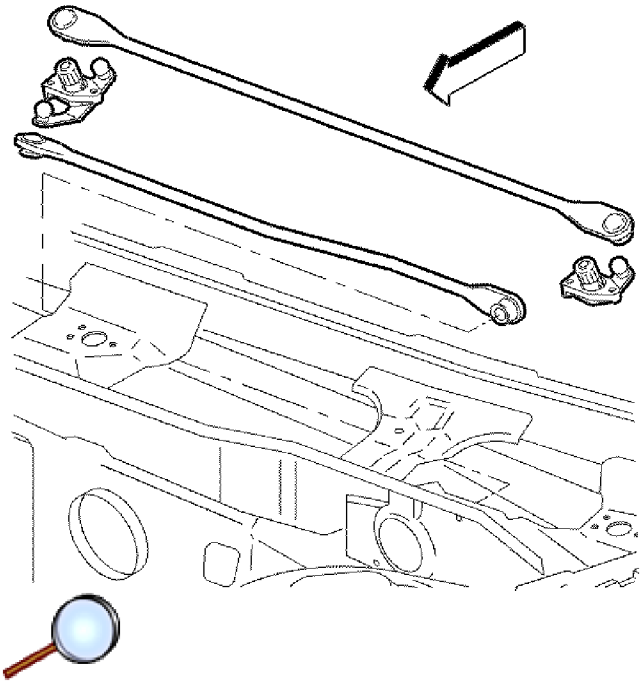


5. Remove the transmission drive shafts and drive links by guiding them through the access hole in the shroud upper panel.

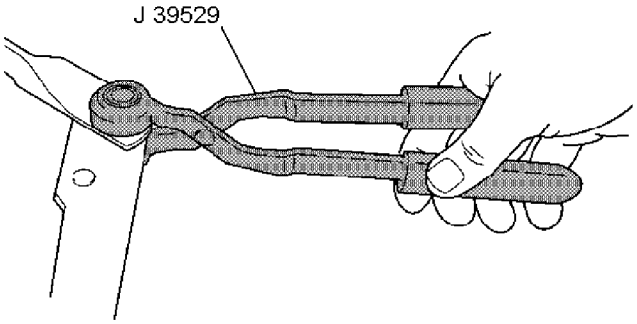
Installation Procedure

Tools Required

J 39529 Wiper Transmission Installer

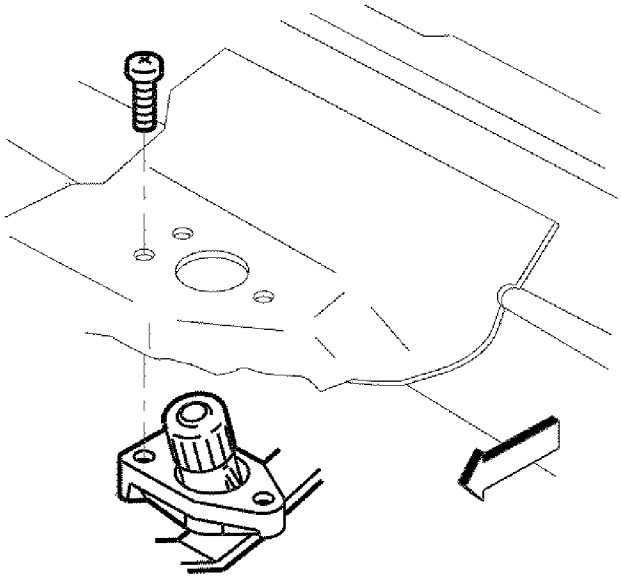


1. Install the transmission drive shafts by positioning them in the plenum chamber through the shroud upper panel openings.



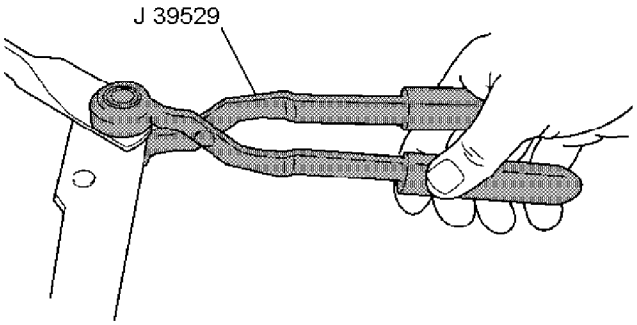
2. Install the drive links on the drive shafts using the J 39529 Wiper Transmission Installer.

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.



3. Install the transmission with the drive shafts positioned through the drive shaft clearance holes.
4. Install six screws.

Tighten
Tighten the screws to 8 N·m (71 lb in).



Important: The socket must be fully seated on the ball.

5. Install the transmission drive link socket to the wiper motor crank arm ball using the J 39529 Wiper Transmission Installer.

6. Install the air inlet grille panel. Refer to Air Inlet Grille Panel Replacement .
7. Install the wiper arms. Refer to Windshield Wiper Arm Replacement .

Wiper Chatter Repair

Some vehicles may exhibit a condition where the windshield wipers chatter and/or wipe unevenly. Several items may contribute to this condition. To completely repair this condition, ALL the items listed below should be checked and repaired as necessary.

- Windshield Glass Cleaning
- Blade Element Cleaning
- Wiper Arm Pressure Check
- Blade Element Set Check

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Windshield Glass Cleaning

Clean the windshield with windshield cleaner, GM P/N 1050011 or equivalent. The cleaner used should be one which will not harm paint finish or scratch glass. The glass is clean when water no longer beads, but sheets across the entire glass surface.

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Wiper Blade Element Cleaning

Lift each blade off of the windshield and clean the element with a cloth saturated in full strength washer solution. Rinse blades with water.

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