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CHEVROLET AND GMC
BLAZER • JIMMY • S10 • SONOMA

PISTON AND RING SPECIFICATIONS

All measurements are given in inches.

Year	Engine		Piston Clearance	Ring Gap			Ring Side Clearance		
	Displacement Liters	Engine ID/VIN		Top Compression	Bottom Compression	Oil Control	Top Compression	Bottom Compression	Oil Control
2002	2.2	4	0.0007- 0.0017	0.010- 0.020	0.012- 0.018	0.010- 0.03	0.0020- 0.0035	0.0008- 0.0031	0.0005- 0.0087
	4.3	W	0.0007- 0.0024	0.010- 0.016	0.015- 0.023	0.010- 0.029	0.0012- 0.0027	0.0015- 0.0031	0.0020- 0.0070
	2.2	4	0.0007- 0.0017	0.010- 0.020	0.012- 0.018	0.010- 0.03	0.0020- 0.0035	0.0008- 0.0031	0.0005- 0.0087
2003	4.3	W	0.0007- 0.0024	0.010- 0.016	0.015- 0.023	0.010- 0.029	0.0012- 0.0027	0.0015- 0.0031	0.0020- 0.0070
	2.2	4	0.0007- 0.0017	0.010- 0.020	0.012- 0.018	0.010- 0.03	0.0020- 0.0035	0.0008- 0.0031	0.0005- 0.0087
	4.3	W	0.0007- 0.0024	0.010- 0.016	0.015- 0.023	0.010- 0.029	0.0012- 0.0027	0.0015- 0.0031	0.0020- 0.0070
2004	4.3	W	0.0007- 0.0024	0.010- 0.016	0.015- 0.023	0.010- 0.029	0.0012- 0.0027	0.0015- 0.0031	0.0020- 0.0070
2005	4.3	W	0.0007- 0.0024	0.010- 0.016	0.015- 0.023	0.010- 0.029	0.0012- 0.0027	0.0015- 0.0031	0.0020- 0.0070

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TORQUE SPECIFICATIONS

All readings in ft. lbs.

Year	Engine		Cylinder Head Bolts	Main Bearing Bolts	Rod Bearing Bolts	Crankshaft			Manifold		Spark Plugs	Oil Pan Drain Plug
	Displacement Liters	Engine ID/VIN				Damper Bolts	Flywheel Bolts		Intake *	Exhaust		
2002	2.2	4	①	70	38	77	55		17	10	11	33
	4.3	W	②	77	③	74	74		④	⑤	11	18
2003	2.2	4	①	70	38	77	55		17	10	11	33
	4.3	W	②	77	③	74	74		④	⑤	11	18
2004	4.3	W	②	77	③	74	74		④	⑤	11	18
2005	4.3	W	②	77	③	74	74		④	⑤	11	18

* NOTE: Applies to Lower Manifold only.

① Short bolts: 43 ft. lbs. plus 90 degrees
Long bolts: 46 ft. lbs. plus 90 degrees

② 1st pass: 22 ft. lbs.

2nd pass:

Short bolt: Plus 55 degrees

Medium bolt: Plus 65 degrees

Long bolt: Plus 75 degrees

③ 20 ft. lbs. plus 70 degrees

④ Lower intake manifold:

1st pass: 27 inch lbs.

2nd pass: 106 inch lbs.

Final pass: 11 ft. lbs.

Upper manifold bolts:

1st pass: 44 inch lbs.

2nd pass: 88 inch lbs.

⑤ Tighten bolts to 12 ft. lbs.

Retorque to 22 ft. lbs.

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WHEEL ALIGNMENT

Year	Model		Caster		Camber		Toe-in (in.)
			Range (+/-Deg.)	Preferred Setting (Deg.)	Range (+/-Deg.)	Preferred Setting (Deg.)	
2002	Exc. ZQ8/Z87	Left	1.0	+2.8	1.0	0	0.10+/-0.10
		Right	1.0	+3.3	—	—	—
	ZQ8/Z87	Left	1.0	+4.7	1.0	0	0.10+/-0.10
		Right	1.0	+5.2	—	—	—
2003	Exc. ZQ8/Z87	Left	1.0	+2.8	1.0	0	0.10+/-0.10
		Right	1.0	+3.3	—	—	—
	ZQ8/Z87	Left	1.0	+4.7	1.0	0	0.10+/-0.10
		Right	1.0	+5.2	—	—	—
2004	Exc. ZQ8/Z87	Left	1.0	+2.8	1.0	0	0.10+/-0.20
		Right	1.0	+3.3	—	—	—
	ZQ8/Z87	Left	1.0	+4.7	1.0	0	0.10+/-0.20
		Right	1.0	+5.2	—	—	—
2005	Exc. ZQ8/Z87	Left	1.0	+2.8	1.0	0	0.10+/-0.20
		Right	1.0	+3.3	—	—	—
	ZQ8/Z87	Left	1.0	+4.7	1.0	0	0.10+/-0.20
		Right	1.0	+5.2	—	—	—

ZQ8: Sport chassis package

Z87: Low rider chassis package

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TIRE, WHEEL AND BALL JOINT SPECIFICATIONS

Year	Model	OEM Tires		Tire Pressures (psi)		Wheel Size	Ball Joint Inspection	Lug Nut (ft. lbs.)
		Standard	Optional	Front	Rear			
2002	2wd, base	P205/70R15	P235/70R15	36	36	6-JJ	U: 0.125 in. L ①	100
	2wd, Sport	P215/65R15	None	36	36	6-JJ	U: 0.125 in. L ①	100
	4wd, Reg. Cab, w/117.9 WB	P235/70R15	P235/75R15	36	36	6-JJ	U: 0.125 in. L ①	100
	4wd, all others	P235/75R15	None	36	36	6-JJ	U: 0.125 in. L ①	100
2003	2wd, base	P205/70R15	P235/70R15	36	36	6-JJ	U: 0.125 in. L ①	100
	2wd, Sport	P215/65R15	None	36	36	6-JJ	U: 0.125 in. L ①	100
	4wd, Reg. Cab, w/117.9 WB	P235/70R15	P235/75R15	36	36	6-JJ	U: 0.125 in. L ①	100
	4wd, all others	P235/75R15	None	36	36	6-JJ	U: 0.125 in. L ①	100
2004	2wd, base	P205/70R15	P235/70R15	36	36	6-JJ	U: 0.125 in. L ①	100
	2wd, Sport	P215/65R15	None	36	36	6-JJ	U: 0.125 in. L ①	100
	4wd, Reg. Cab, w/117.9 WB	P235/70R15	P235/75R15	36	36	6-JJ	U: 0.125 in. L ①	100
	4wd, all others	P235/75R15	None	36	36	6-JJ	U: 0.125 in. L ①	100
2005	2wd, base	P205/70R15	P235/70R15	36	36	6-JJ	U: 0.125 in. L ①	100
	2wd, Sport	P215/65R15	None	36	36	6-JJ	U: 0.125 in. L ①	100
	4wd, Reg. Cab, w/117.9 WB	P235/70R15	P235/75R15	36	36	6-JJ	U: 0.125 in. L ①	100
	4wd, all others	P235/75R15	None	36	36	6-JJ	U: 0.125 in. L ①	100

OEM: Original Equipment Manufacturer

PSI: Pounds Per Square Inch

STD: Standard

OPT: Optional

L: Lower

U: Upper

① Do not lift truck. Inspect the boss into which the grease fitting is threaded. Replace if the boss is flush or receded below the surface of the ball joint

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BRAKE SPECIFICATIONS

All measurements in inches unless noted

Year	Model		Brake Disc			Brake Drum Diameter				Brake Caliper	
			Original	Minimum	Maximum	Original	Max.	Maximum	Minimum	Bracket Mounting	
			Thickness	Thickness	Runout	Inside Diameter	Wear Limit	Machine Diameter	Lining Thickness	Bolts (ft. lbs.)	Bolts (ft. lbs.)
2002	Blazer	F	1.140	1.130	0.002	—	—	—	0.030	①	②
		R	0.787	0.735	0.002	9.50	9.59	9.56	0.030	①	23
	Jimmy	F	1.140	1.130	0.002	—	—	—	0.030	①	②
		R	0.787	0.735	0.002	9.50	9.59	9.56	0.030	①	23
	S10	F	1.140	1.130	0.002	—	—	—	0.030	①	②
		R	0.787	0.735	0.002	9.50	9.59	9.56	0.030	①	23
	Sonoma	F	1.140	1.130	0.002	—	—	—	0.030	①	②
		R	0.787	0.735	0.002	9.50	9.59	9.56	0.030	①	23
2003	Blazer	F	1.140	1.130	0.002	—	—	—	0.030	①	②
		R	0.787	0.735	0.002	9.50	9.59	9.56	0.030	①	23
	Jimmy	F	1.140	1.130	0.002	—	—	—	0.030	①	②
		R	0.787	0.735	0.002	9.50	9.59	9.56	0.030	①	23
	S10	F	1.140	1.130	0.002	—	—	—	0.030	①	②
		R	0.787	0.735	0.002	9.50	9.59	9.56	0.030	①	23
	Sonoma	F	1.140	1.130	0.002	—	—	—	0.030	①	②
		R	0.787	0.735	0.002	9.50	9.59	9.56	0.030	①	23
2004	Blazer	F	1.140	1.130	0.002	—	—	—	0.030	①	②
		R	0.787	0.735	0.002	9.50	9.59	9.56	0.030	①	23
	Jimmy	F	1.140	1.130	0.002	—	—	—	0.030	①	②
		R	0.787	0.735	0.002	9.50	9.59	9.56	0.030	①	23
	S10	F	1.140	1.130	0.002	—	—	—	0.030	①	②
		R	0.787	0.735	0.002	9.50	9.59	9.56	0.030	①	23
	Sonoma	F	1.140	1.130	0.002	—	—	—	0.030	①	②
		R	0.787	0.735	0.002	9.50	9.59	9.56	0.030	①	23
2005	Blazer	F	1.140	1.130	0.002	—	—	—	0.030	①	②
		R	0.787	0.735	0.002	9.50	9.59	9.56	0.030	①	23

NA: Not Available

① Dual piston caliper-to-knuckle: 133 ft. lbs.

② Single piston: 38 ft. lbs.

Dual piston 85 ft. lbs.

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CHEVROLET AND GMC BLAZER • JIMMY • S10 • SONOMA

SCHEDULED MAINTENANCE INTERVALS

GENERAL MOTORS—S-SERIES BLAZER, JIMMY, S10 PICKUP, SONOMA & XTREME

TO BE SERVICED	TYPE OF SERVICE	VEHICLE MILEAGE INTERVAL (x1000)															
		7.5	15	22.5	30	37.5	45	52.5	60	67.5	75	82.5	90	97.5	105	112.5	120
Accessory drive belt	S/I								✓								✓
Air cleaner filter	R				✓				✓				✓				✓
Automatic transmission fluid	R	Every 50,000 miles															
Brake system ①	S/I	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Chassis & suspension grease points	L	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CV-joint boots & axle seals	S/I	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Engine coolant system ②	S/I	Every 150,000 miles															
Engine oil & filter	R	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Front wheel bearings	S/I & L				✓				✓				✓				✓
Fuel filter	R				✓				✓				✓				✓
Fuel tank, cap & lines	S/I								✓								✓
PCV valve	S/I	Every 100,000 miles															
Rear/front axle fluid level	S/I	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Rotate tires	S/I	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Spark plug wires	S/I	Every 100,000 miles															
Spark plugs	R	Every 100,000 miles															

R: Replace S/I: Inspect and service, if necessary L: Lubricate

① This should be performed when the tires are removed for rotation.

② Drain, flush and refill the cooling system, inspect the system hoses, and clean the radiator and condenser.

③ 2-wheel drive models only.

FREQUENT OPERATION MAINTENANCE (SEVERE SERVICE)

If a vehicle is operated under any of the following conditions it is considered severe service:

- Towing a trailer or using a camper or car-top carrier.
- Repeated short trips of less than 5 miles in temperatures below freezing, or trips of less than 10 miles in any temperature.
- Extensive idling or low-speed driving for long distances as in heavy commercial use, such as delivery, taxi or police cars.
- Operating on rough, muddy or salt-covered roads.
- Operating on unpaved or dusty roads.
- Driving in extremely hot (over 90°) conditions.

Engine oil & filter: replace every 3000 miles or 3 months, whichever occurs first.

Chassis and suspension grease points: lubricate every 3000 miles.

Rear/front axle fluid level: inspect every 3000 miles.

Rotate the tires ever 6000 miles.

Brake system components: inspect ever 6000 miles.

Front wheel bearings (2-wheel drive only): clean, inspect and repack every 15,000 miles.

Air cleaner filter: inspect every 15,000 miles.

Automatic transmission fluid & filter: replace every 15,000 miles.

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ENGINE REPAIR

Distributor

REMOVAL

The 2.2L engine is equipped with a distributorless ignition.

4.3L Engine

1. Remove or disconnect the following:
 - Negative battery cable
 - Air cleaner assembly
 - Spark plug and coil wires
 - Electrical connector
 - Distributor cap
2. Use a grease pencil in order to note the position of the rotor in relation to the distributor housing.
3. Mark the distributor housing and the intake manifold location with a grease pencil.
4. Remove the mounting clamp hold down bolt and the distributor.

➔As the distributor is being removed from the engine, watch the rotor move in a counter-clockwise direction about 42 degrees. This will appear as slightly more than the 1 o'clock position. Note the position of the rotor segment. Place a second mark on the base of the distributor. This will aid in achieving proper rotor alignment during the distributor installation.

To install:

5. If installing a new distributor assembly, place 2 marks on the new distributor housing in the same location as the 2 marks on the original housing.
6. Align the rotor with the second mark.
7. Guide the distributor into the engine.
8. Align the hole in the distributor hold-down base over the mounting hole in the intake manifold.
9. As the distributor is being installed, observe the rotor moving in a clockwise direction about 42 degrees.
10. Once the distributor is completely seated, the rotor segment should be aligned with the mark on the distributor base.
11. If the rotor segment is not aligned with the number 1 mark, the driven gear teeth and the camshaft have meshed one or more teeth out of alignment. In order to correct this condition, remove and reinstall the distributor.
12. Install the distributor mounting clamp bolt and tighten to 18 ft. lbs. (25 Nm).

13. Install or connect the following:
 - Distributor cap
 - Electrical connector
 - Spark plug and coil wires
 - Air cleaner assembly
 - Negative battery cable

(25 Nm). Tighten the brace-to-engine stud nut to 37 ft. lbs. (50 Nm).

- Wires and the battery feed wire nut
- Heater hose bracket
- Accessory belt
- Negative battery cable

Alternator

REMOVAL

2.2L Engine

1. Remove or disconnect the following:
 - Passenger side wheel assembly
 - Alternator brace-to-block bolt, the brace-to-intake nut and the brace-to-engine stud
 - Alternator wiring
 - Accessory belt
 - Mounting bolts
 - Alternator

4.3L Engine

1. Remove or disconnect the following:
 - Negative battery cable
 - Air inlet duct, if necessary
 - Accessory belt
 - Heater hose brace
 - Wires
 - Mounting bolts
 - Alternator

INSTALLATION

2.2L Engine

Install or connect the following:

- Alternator
- Mounting bolts. Torque the left bolt to 22 ft. lbs. (30 Nm) and the right bolt to 32 ft. lbs. (43 Nm).
- Wires. Torque the battery feed wire nut to 71 inch lbs. (8 Nm).
- Alternator brace. Torque the nuts and bolts to 22 ft. lbs. (30 Nm).
- Accessory belt
- Negative battery cable

4.3L Engine

Install or connect the following:

- Alternator and loosely install the mounting bolts
- Tighten the rear bolt to 37 ft. lbs. (50 Nm) and the front bolt to 18 ft. lbs. (25 Nm)
- Tighten the brace-to-alternator and brace-to-intake retainers to 18 ft. lbs.

Ignition Timing

ADJUSTMENT

The ignition timing is preset and cannot be adjusted.

Engine Assembly

REMOVAL & INSTALLATION

2.2L Engine

➔In certain cases on some models the A/C system will have to be evacuated because the compressor may need to be removed from the vehicle to allow clearance for engine removal. On other models you may be able to set the compressor and lines to one side and still have enough clearance to remove the engine. In this case the system does not have to be evacuated because the lines do not have to be disconnected from the compressor. To check if your system has to be evacuated, unplug the electrical connectors from the compressor, then unbolt the compressor assembly. Unfasten any brackets holding the refrigerant lines and try to set the components aside so that you will have enough clearance for engine removal. If there is not enough clearance for engine removal you must recover the refrigerant from the A/C system with an approved recovery station before attempting to remove the engine from your vehicle. DO NOT attempt this without the proper equipment. R-134a should NOT be mixed with R-12 refrigerant and, depending on your local laws, attempting to service this system could be illegal.

1. Disconnect the negative battery cable and properly relieve the fuel system pressure.
2. Drain the engine cooling system and the engine oil into separate drain pans.
3. Remove or disconnect the following:
 - Hood
 - Oxygen Sensor (O₂S) electrical connection
 - Exhaust pipe from the manifold

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➔On some models it may also be necessary to disconnect the catalytic converter from the exhaust pipe.

- Braces from the engine and the transmission, if equipped
 - Starter motor
 - Transmission and separate it from the engine or, if necessary, remove it from the vehicle
 - Alternator rear brace by unfastening the bolt and nuts
 - Ground straps from the engine block
 - Drive belt
 - A/C compressor and bracket. If possible, set the compressor and bracket to one side without disconnecting the lines.
 - Hoses and transmission coolant lines engaged to the radiator
 - Radiator
 - Power steering pump and cap the power steering lines to avoid contamination
 - Heater hoses from the heater core
 - 12 volt supply from the mega fuse, if necessary
 - All electrical connections and wiring harnesses
 - All vacuum lines
 - Throttle cable, and if equipped the cruise control cable
 - Exhaust Gas Recirculation (EGR) pipe and the EGR valve
 - Fuel lines
4. Install a suitable lifting device to the engine.
5. Remove the engine mount bolts and carefully lift the engine from the vehicle. Pause several times while lifting the engine to make sure no wires or hoses have become snagged.

To install:

6. Carefully lower the engine into the vehicle and install the engine mount bolts. Remove the engine lifting device.
7. Install or connect the following:
- Fuel lines
 - 12 volt supply to the mega fuse, if removed
 - All vacuum lines, electrical connections and wiring harnesses
 - EGR valve and pipe, if removed
 - Throttle and if equipped, the cruise control cable
 - Heater hoses to the heater core
 - Power steering pump and attach the lines
 - A/C compressor
 - Radiator, all hoses and fluid cooler lines

- Water pump, if removed
 - Drive belt
 - Ground strap to the engine
 - Alternator rear brace and tighten the bolt and nuts, if removed
 - Transmission to the engine
 - Starter motor, if removed
 - Braces to the engine and the transmission, if equipped
 - Exhaust pipe to the manifold
 - Catalytic converter to the exhaust pipe, if removed
 - O₂S electrical connection
 - Battery
 - Hood
8. Check all powertrain fluid levels and add, as necessary. Be sure to properly fill the engine crankcase with clean engine oil.
9. Connect the battery cables and properly fill the engine cooling system.
10. Start and run the engine, then check for leaks.

4.3L Engine

1. Drain the engine cooling system
2. Drain the engine oil.
3. Remove or disconnect the following:
 - Negative battery cable
 - Fuel system pressure
 - Vacuum reservoir and/or the underhood light from the hood, as equipped
 - Outer cowl vent grilles
 - Hood
 - Oxygen Sensor (O₂S) and/or wiring
 - Exhaust pipes at the manifolds and loosen the hanger at the catalytic converter. This is necessary to remove the rear catalytic converter cushion mounts for removal of the exhaust assembly.
 - Skid plate, if equipped
 - Engine-to-transmission pencil braces
 - Slave cylinder and position aside, if equipped
 - Line clamp at the bell housing
 - Wiring from the starter
 - Starter
 - Transfer case
 - Oil filter
 - Engine mount through bolts
 - Rear engine mount crossbar, nut and washer
 - Bell housing bolts, except the upper left.
 - Battery ground (negative) cable from the engine
 - Front drive axle bolts and roll the axle downward, on 4WD vehicles
 - Air cleaner assembly

- Upper radiator shroud
 - Fan assembly
 - Drive belt assembly
 - Water pump pulley
 - Upper radiator hose
 - Air conditioning compressor, if equipped, and position aside with the lines intact
 - Lower radiator hose
 - Oil cooler and overflow lines from the radiator, plug the openings to prevent system contamination or excessive fluid loss
 - Radiator and lower radiator shroud
 - Power steering hoses from the steering gear, then cap the openings to prevent system contamination or excessive fluid loss
 - Heater hoses from the intake manifold and the water pump
 - Wiring harness and vacuum lines from the engine
 - Throttle cables
 - Remaining bell housing bolt
 - Fuel lines and the bracket
 - Ground strap(s) from the rear of the cylinder head
 - Front body mount bolts, on 4WD vehicles
4. Support the transmission.
5. Install a lifting device and lift the engine.

To install:

6. Install or connect the following:
- Engine into the vehicle
 - Front body mount bolts, on 4WD vehicles
 - Ground strap(s) to the rear of the cylinder head
 - Fuel lines and the bracket
 - Upper left bell-housing bolt
 - Throttle cables
 - Vacuum lines and wiring harness connectors
 - Heater hoses
 - Power steering hoses
 - Lower shroud and radiator
 - Oil cooler lines to the radiator and overflow hose
 - Lower radiator hose
 - Air conditioning compressor to the engine, if equipped
 - Upper radiator hose
 - Water pump pulley
 - Drive belt assembly
 - Fan assembly
 - Upper radiator shroud
 - Air cleaner assembly
 - Front drive axle, for 4WD vehicles
 - Battery ground strap to the engine block
 - Remaining bell housing bolts

- Engine mount through-bolts. Torque them to 49 ft. lbs. (66 Nm).
 - Rear engine mount crossbar nut and washer. Tighten the nut to 33 ft. lbs. (45 Nm).
 - Oil filter
 - Starter motor
 - Flywheel cover
 - Clutch slave cylinder, if equipped
 - Pencil brace and the skid plate, as equipped
 - Catalytic converter Y-pipe assembly and hangers
 - Hood
 - Outer cowl vent grilles
 - Vacuum reservoir and/or the underhood light to the hood, as equipped
 - Negative battery cable
7. Check all powertrain fluid levels and add, as necessary.
 8. Refill the engine crankcase.
 9. Refill the engine cooling system.
 10. Start and run the engine, then check for leaks.

Water Pump

REMOVAL & INSTALLATION

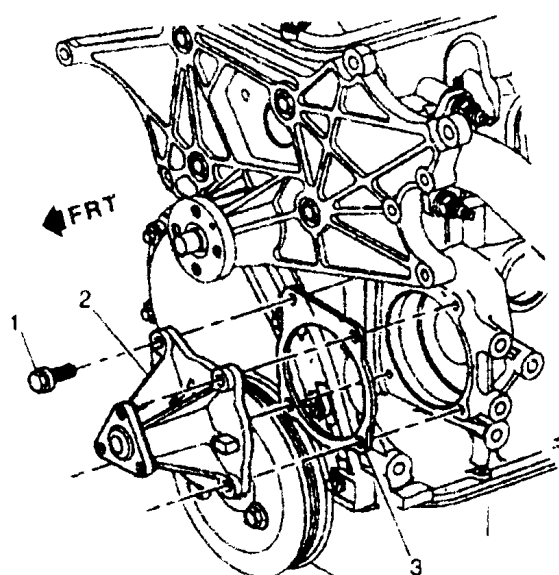
1. Disconnect the negative battery cable.
2. Drain the engine cooling system.
3. Relieve the belt tension and remove the accessory drive belts or the serpentine drive belt, as applicable.
4. Remove or disconnect the following:
 - Upper fan shroud
 - Fan or fan and clutch assembly, as applicable
 - Water pump pulley
 - Coolant hose(s) from the water pump

➔ **For the hoses on some engines, removal may be easier if the hose is left attached until the pump is free from the block. Once the pump is removed from the engine, the pump may be pulled (giving a better grip and greater leverage) from the tight hose connection.**

- Water pump retainers
- Water pump from the engine

*** WARNING

Note the positions of all retainers as some engines will utilize different length fasteners in different locations and/or bolts and studs in different locations.



1. BOLT
2. PUMP, COOLANT
3. GASKET

7924JG05

Exploded view of the water pump mounting—2.2L engine

To install:

5. Clean the gasket mounting surfaces.

➔ **The water pumps on some of the earlier engines covered may have been installed using sealer only, no gasket, at the factory. If a gasket is supplied with the replacement part, it should be used. Otherwise, a 1/8 in. (3mm) bead of RTV sealer should be used around the sealing surface of the pump.**

6. Apply sealant to the water pump retainer threads.
7. Install or connect the following:
 - Water pump using a new gasket. Tighten the water pump retainers to 18 ft. lbs. (25 Nm) for 2.2L engine or to 30 ft. lbs. (41 Nm) for 4.3L engine.
 - Coolant hose(s)
 - Water pump pulley
 - Fan or fan and clutch assembly
 - Serpentine drive belt (if equipped) by positioning the belt over the pulleys and carefully allow the tensioner back into contact with the belt
 - V-belts (if equipped) and adjust the tension
 - Upper fan shroud
 - Negative battery cable
8. Refill the engine cooling system.
9. Run the engine and check for leaks.

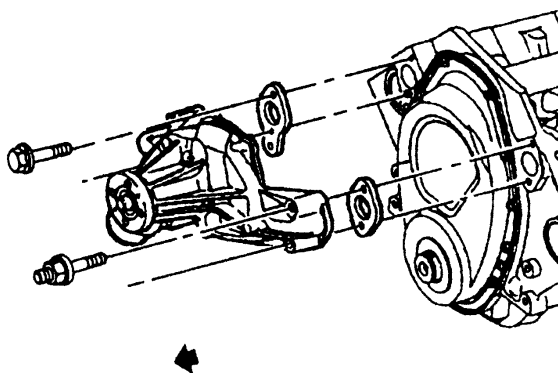
Heater Core

REMOVAL & INSTALLATION

1. Disconnect the negative battery cable.
2. Drain the engine cooling system.
3. Remove or disconnect the following:
 - Heater hoses from the heater core
4. Remove the instrument panel as follows:
 - a. Disable the air bag system.
 - b. Set the parking brake and block the wheels.
 - c. Disconnect the parking brake release cable from the parking brake lever.
 - d. Unfasten the screws that retain the DLC instrument panel left side sound insulator. Feed the DLC through the hole in the sound insulator.
 - e. Unfasten the right side sound insulator panel screws and remove the panel.
 - f. Unfasten the screws that attach the instrument panel left side sound insulator to the knee bolster and cowl panel.
 - g. Unfasten the nut that attaches the left side sound insulator to the accelerator pedal bracket.
 - h. Unplug the remote control door lock receiver module electrical connector.
 - i. Remove the door lock receiver module from the left side sound insula-

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7924JG06

Exploded view of the water pump assembly mounting—4.3L engine

tor. Remove the left side sound insulator.

j. Unfasten the screws that attach the instrument panel center sound insulator to the knee bolster, instrument panel, heater assembly and floor duct.

k. Remove the center sound insulator.

l. Unfasten the screws that attach the courtesy lamp to the knee bolster.

m. Unfasten the screws that attach the knee bolster to the instrument panel.

n. Disconnect the lap cooler duct from the knee bolster.

o. Unplug the lighter electrical connection and remove the knee bolster.

p. Unfasten the steering column-to-instrument panel nuts and lower the column.

q. Unfasten the screws that attach the instrument panel accessory trim plate to the instrument panel.

r. Remove the trim plate and unplug all necessary electrical connection.

s. Remove the heater and/or air conditioning control assembly.

t. Remove the radio and the storage compartment assembly (if equipped).

u. If necessary, remove the instrument cluster.

v. Unfasten the left and right instrument panel pivot bolts and the panel lower support bolt.

w. Unfasten the speaker grilles retaining screws and remove the speaker grilles.

x. Remove the windshield defroster grille using a flat-bladed prytool. Start at one end of the grille and work your way down the grille.

y. Unfasten the 4 instrument panel upper support screws.

z. Tag and unplug all necessary electrical connections.

aa. Remove the instrument panel from the vehicle.

5. Remove or disconnect the following:

- Air inlet assembly, if equipped

- Vacuum hoses
- Heater assembly studs, from inside the engine compartment
- Blower motor resistor
- From inside the heater case assembly,

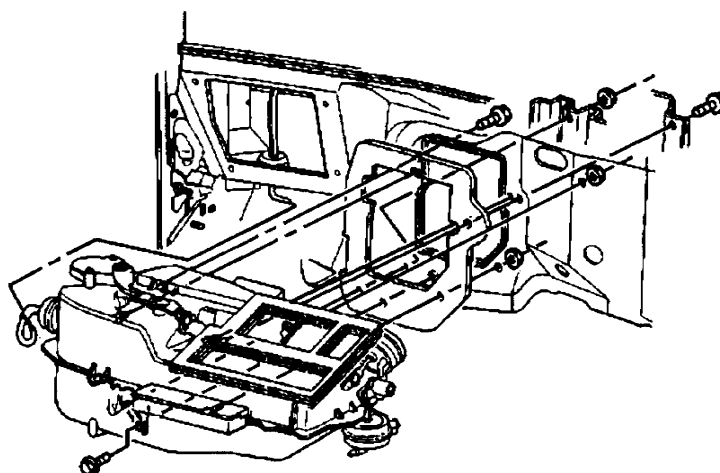
bly, the stud; the stud is located behind the blower motor resistor

- Heater assembly-to-chassis screws
- Heater assembly from the vehicle
- Access cover screws and cover from the heater assembly
- Heater core from the heater case assembly

To install:

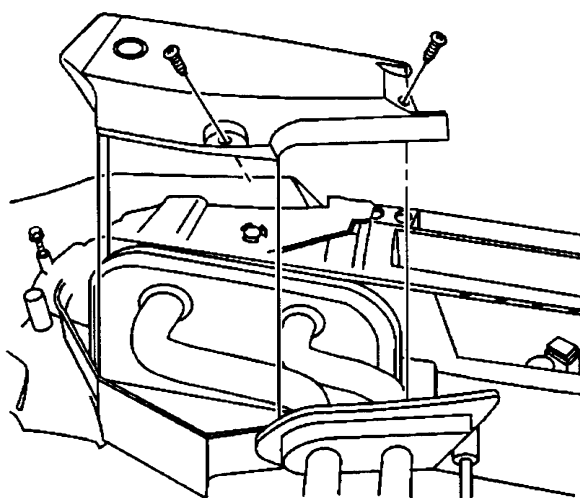
6. Install or connect the following:

- Heater core to the heater case assembly
- Access cover to the heater assembly and the cover screws
- Heater assembly to the vehicle
- Heater assembly-to-chassis screws and torque them to 40 inch lbs. (4.5 Nm)
- The stud, working inside the heater case assembly; the stud is located behind the blower motor resistor



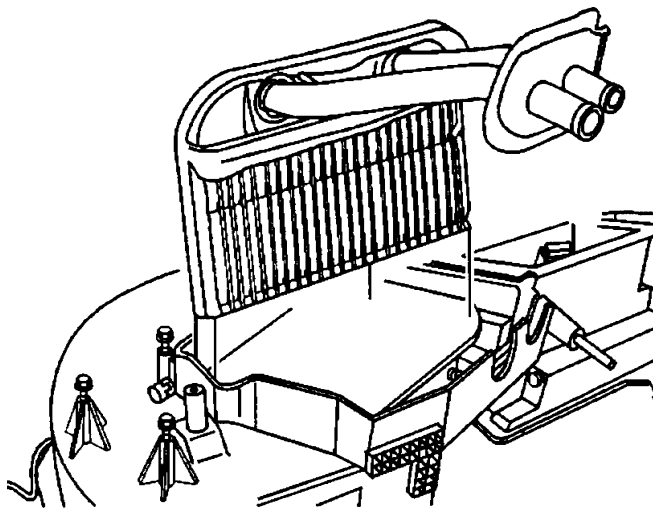
93113G77

View of the heater case assembly



93113G78

View of the heater case cover



93113G79

View of the heater core

- Blower motor resistor
 - Heater assembly studs, working inside the engine compartment, and torque them to 17 inch lbs. (1.9 Nm)
 - Vacuum hoses
 - Air inlet assembly, if equipped
7. Install the instrument panel as follows:
 - a. Rest the instrument panel on the lower pivot studs.
 - b. Attach the electrical connections.
 - c. Install but do not tighten the 4 upper instrument panel support screws.
 - d. Install the left and right panel pivot bolts. Tighten the bolts to 102 inch lbs. (11.5 Nm).
 - e. Install the panel lower support bolt. Tighten the bolt to 102 inch lbs. (11.5 Nm).
 - f. Tighten the upper support screws to 17 inch lbs. (1.9 Nm).
 - g. Install the windshield defroster grille and the speaker grilles.
 - h. Install the radio and storage compartment assembly (if equipped).
 - i. If removed, install the instrument cluster.
 - j. Install the heater and/or air conditioning control assembly.
 - k. Attach the electrical connections to the instrument panel accessory trim plate.
 - l. Place the trim plate in position and install its retaining screws. Tighten the screws to 17 inch lbs. (1.9 Nm).
 - m. Place the steering column into position and install its retaining nuts. Tighten the nuts to 22 ft. lbs. (30 Nm).
 - n. Attach the lighter electrical connection and the lap cooler duct to the knee bolster.
 - o. Place the knee bolster into position and install its retaining screws. Tighten the Torx® head screws to 80 inch lbs. (9

Nm) and the hex head screws to 17 inch lbs. (1.9 Nm).

p. Place the courtesy lamp in position and install its screws. Tighten the screws to 17 inch lbs. (1.9 Nm).

q. Place the instrument panel center sound insulator in position. Install the screws that attach the center sound insulator to the knee bolster, instrument panel and the floor duct. Tighten the screws to 17 inch lbs. (1.9 Nm).

r. Install the screw that attaches the center sound insulator to the heater assembly. Tighten the screw to 13 inch lbs. (1.5 Nm).

s. Install the remote control door lock receiver module to the instrument panel left side sound insulator.

t. Attach the door lock receiver electrical connection.

u. Install the nut that attaches the left side sound insulator to the accelerator pedal bracket. Tighten the nut to 35 inch lbs. (4 Nm).

v. Install the screw that attaches the left side sound insulator to cowl panel. Tighten the screw to 13 inch lbs. (1.5 Nm).

w. Install the screws that attach the left side sound insulator to knee bolster. Tighten the screw to 17 inch lbs. (1.9 Nm).

x. Feed the DLC through the hole in the sound insulator, place the DLC in position and install its retaining screws. Tighten the screws to 21 inch lbs. (2.4 Nm).

y. Install the right side sound insulator and tighten the screws

z. Connect the parking brake release cable to the lever.

aa. Enable the air bag system.

8. Install the heater hoses to the heater core.

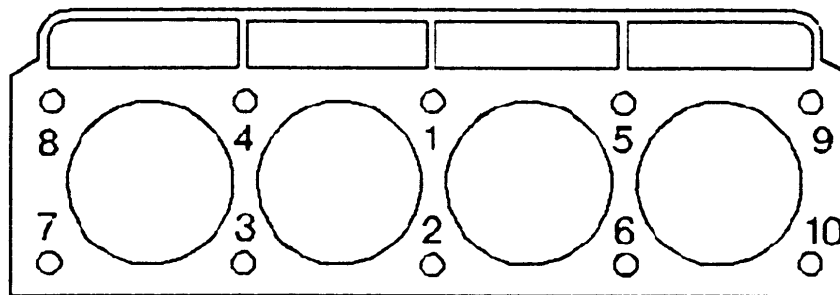
9. Refill the cooling system.

10. Connect the negative battery cable.

11. Run the engine to normal operating temperatures; then, check the climate control operation and check for leaks.

Cylinder Head**REMOVAL & INSTALLATION****2.2L Engine**

1. Relieve the fuel system pressure.
2. Disconnect the negative battery cable.
3. Drain the engine cooling system.
4. Remove or disconnect the following:
 - Air duct from the air inlet
 - Upper radiator hose and upper fan shroud
 - Radiator assembly
 - Lower fan shroud
 - Fan assembly
 - Drive belt assembly
 - Water pump pulley
 - Heater hose from the intake manifold and the thermostat housing
 - Thermostat housing
 - Alternator support brace and the alternator wiring
 - Air conditioning compressor with brackets, if equipped, move it aside without disconnecting the lines
 - Accessory bracket along with the alternator and power steering pump



7924JG07

Cylinder head bolt torque sequence—2.2L engine

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still attached. Be careful not to damage the steering pump lines.

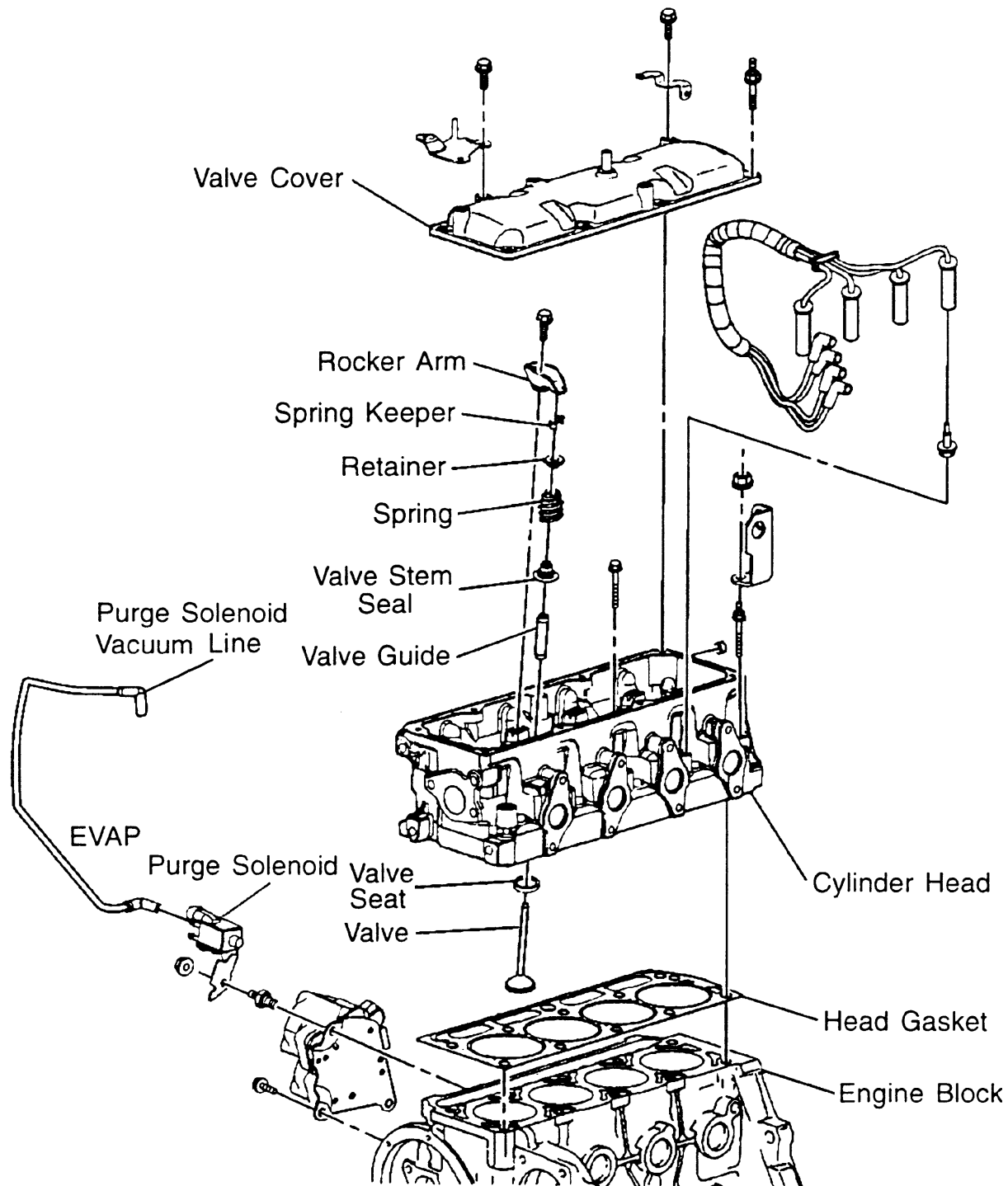
- Throttle cable and cable support linkage
- Heater hose from the water pump
- Oil fill tube
- Exhaust pipe
- Oxygen Sensor (O₂S)
- Exhaust manifold

- Electrical wiring and the vacuum hoses from the upper intake manifold
- Upper intake manifold
- Wiring from the lower intake manifold
- Fuel lines and the spark plug wires
- Lower intake manifold
- Rocker arm cover

- Rocker arms and pushrods
- Engine lift bracket from the rear of the engine
- Cylinder head bolts and studs
- Cylinder head from the engine

To install:

5. Clean and inspect the gasket mounting surfaces.
6. Install or connect the following:



Cylinder head and related components—2.2L engine

7924JG23

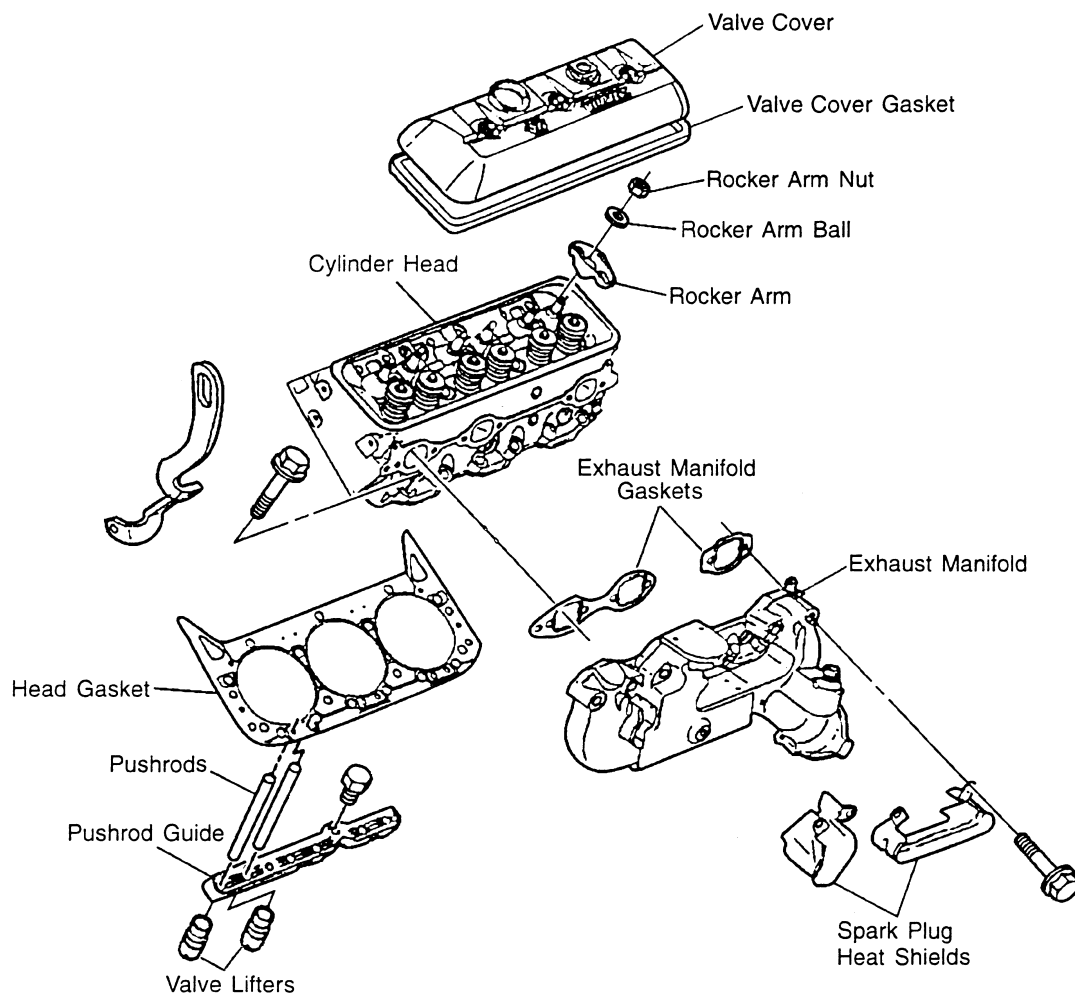
- Cylinder head using a new gasket
- Cylinder head bolt threads coated with sealer 1052080. Tighten the bolts within 15 minutes of sealer application, in sequence, to 46 ft. lbs. (63 Nm) for long bolts and to 43 ft. lbs. (58 Nm) for short bolts; then, tighten all bolts an additional 90 degree turn using a torque angle meter.
- Engine lift bracket
- Rocker arms and pushrods
- Rocker arm cover
- Lower intake manifold
- Spark plug wires and the fuel lines
- Lower intake manifold and wiring
- Upper intake manifold
- Vacuum hoses and electrical wiring to the upper intake
- Oil fill tube assembly
- Exhaust manifold
- Exhaust pipe and O₂S
- Heater hose to the water pump
- Throttle cable support and throttle cable

- Accessory support bracket and components
 - Air conditioning compressor, if equipped
 - Power steering support brace
 - Alternator support brace and wiring
 - Thermostat housing and the heater hose
 - Water pump pulley and drive belt assembly
 - Fan assembly
 - Radiator and the lower fan shroud
 - Upper fan shroud and upper radiator hose
 - Air inlet ductwork
 - Negative battery cable
7. Refill the engine cooling system and check for leaks.

4.3L Engine

1. Properly relieve the fuel system pressure, then disconnect the negative battery cable.

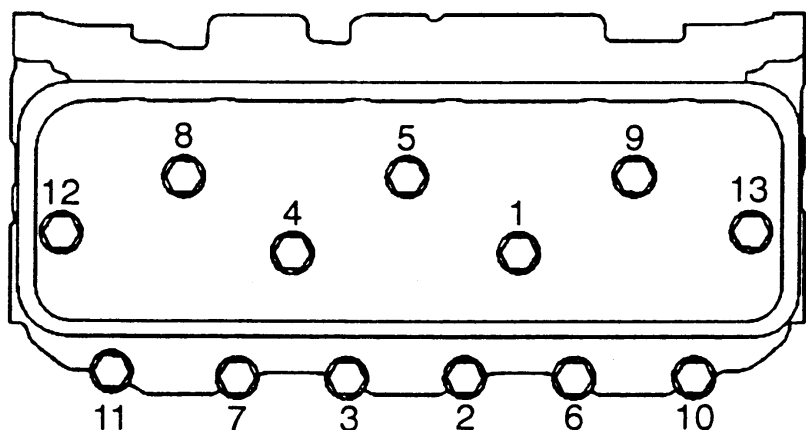
2. Drain the engine cooling system.
3. Remove or disconnect the following:
 - Intake manifold
 - Exhaust manifold
 - Alternator and bracket, if removing the right cylinder head
 - Cooling fan assembly
 - Air conditioning compressor (position it aside with the refrigerant lines attached)
 - Air pipe bracket and nut from the rear of the power steering pump if removing the left cylinder head
 - Engine accessory bracket with power steering pump (position the pump aside with the lines attached) and brackets, if removing the left cylinder head
 - Wiring harness and clip from the rear of the cylinder head
 - Coolant sensor wire
 - Wiring from the spark plugs
 - Spark plugs, if necessary
 - Ground wires and if necessary, the



7924JG25

Cylinder head and related components—4.3L engine

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7924JG08

Cylinder head bolt torque sequence—4.3L engine

fuel line bracket from the rear of the cylinder head

- Rocker arm cover

4. Loosen the rocker arms and remove the pushrods.

➔If valve train components, such as the rocker arms or pushrods, are to be reused, they must be tagged or arranged to insure installation in their original locations.

5. Unfasten the cylinder head bolts by loosening them in the reverse of the torque sequence, then carefully remove the cylinder head.

To install:

6. Carefully clean and inspect the cylinder head and the gasket mounting surfaces.

➔The gasket surfaces on both the head and block must be clean of any foreign matter and free of nicks or heavy scratches. The cylinder bolt threads in the block and thread on the bolts must be cleaned (dirt will affect the bolt torque).

➔DO NOT apply sealer to composition steel-asbestos gaskets.

7. If using a steel only gasket, apply a thin and even coat of sealer to both sides of the gaskets.

8. Place a new gasket over the dowel pins with the bead or the words "This Side Up" facing upward (as applicable), then carefully lower the cylinder head into position over the gasket and dowels.

9. Apply a coating of 12346004 or equivalent sealer to the threads of the cylinder head bolts, then thread the bolts into position until finger-tight.

10. Install the bolts in sequence to 22 ft. lbs. (30 Nm). The bolts must then be tight-

ened again in sequence in the following order:

- Short length bolts: (11, 7, 3, 2, 6, 10) 55 degrees.
- Medium length bolts: (12, 13) 65 degrees.
- Long length bolts: (1, 4, 8, 5, 9) 75 degrees.

11. Install or connect the following:

- Pushrods, secure the rocker arms and adjust the valves
- Rocker arm cover
- Spark plugs, if removed
- Spark plug wires
- Attach the fuel line bracket (if removed) and ground wires to the rear of the head and tighten the bolts to 22 ft. lbs. (30 Nm)
- Air conditioning compressor and bracket, if the left cylinder head was removed
- Alternator and bracket, if the right cylinder head was removed
- Engine accessory bracket with power steering pump if the left cylinder head was removed
- Air pipe bracket and nut to the rear of the power steering pump (if equipped), if the left cylinder head was removed. Tighten the nut to 30 ft. lbs. (41 Nm).
- A/C compressor, if the left cylinder head was removed
- Cooling fan assembly, if the left cylinder head was removed
- Wiring harness and clip to the rear of the cylinder head
- Coolant sensor wire
- Exhaust manifold
- Intake manifold
- Negative battery cable

12. Properly refill the engine cooling system.

13. Run the engine to check for leaks.

Rocker Arms

REMOVAL & INSTALLATION

2.2L Engine

- Remove or disconnect the following:
 - Rocker arm cover
 - Rocker arm retaining nut, arm and ball
 - Pushrod, if necessary

➔Valvetrain components, being reused, must be installed in their original positions. If removed, be sure to tag or arrange all rocker arms and pushrods to assure proper installation.

To install:

2. Inspect the rocker arms, balls and pushrods for damage or wear and replace as necessary.

3. Check the rocker arms, balls and their mating surfaces. Be sure the surfaces are smooth and free from scoring or other damage.

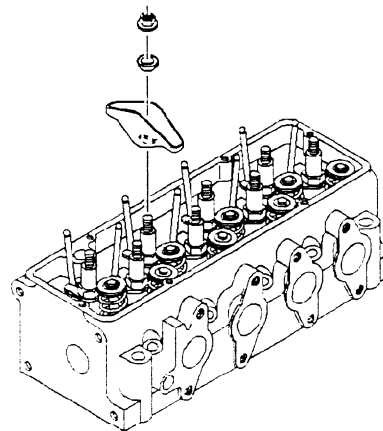
4. Check the rocker arm areas that contact the valve stems and the sockets that contact the pushrods, be sure these areas are smooth and free of both damage and wear.

5. Be sure the pushrods are not bent which can be determined by rolling them on a flat surface. Check the ends of the pushrods for scoring or roughness

6. Inspect the rocker arm bolts for thread damage. Check the rocker arm bolts in the shoulder area for contact damage with the rocker arm.

7. Install or connect the following:

- Pushrods making sure they are seated within the lifters, if removed
- New rocker arms and balls by coat-



7924JG45

Exploded view of the rocker arm assembly—2.2L engine

ing the friction surfaces using Dri-Slide Molykote® or equivalent pre-lube

** WARNING

When tightening a rocker arm retainer, be sure the lifter for that valve is resting on the base circle of the camshaft and not on the lobe, otherwise the valve train can be damaged. Do not over-tighten the retainers.

- Rocker arms and ball. Tighten the nuts to 18 ft. lbs. (25 Nm).
 - Rocker arm cover
8. Start and run the engine to check for leaks.

4.3L Engine

1. Remove or disconnect the following:
 - Rocker arm cover(s)
 - Rocker arm nut, rocker arm and ball washer

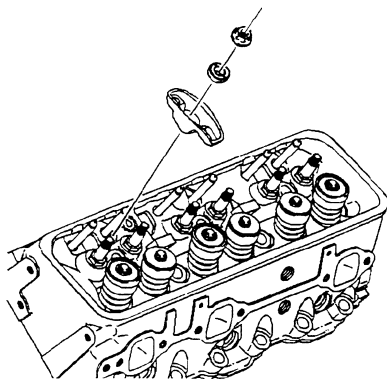
➔ **If only the pushrod is to be removed, loosen the rocker arm nut, swing the rocker arm to the side and remove the pushrod.**

- Pushrod(s)

To install:

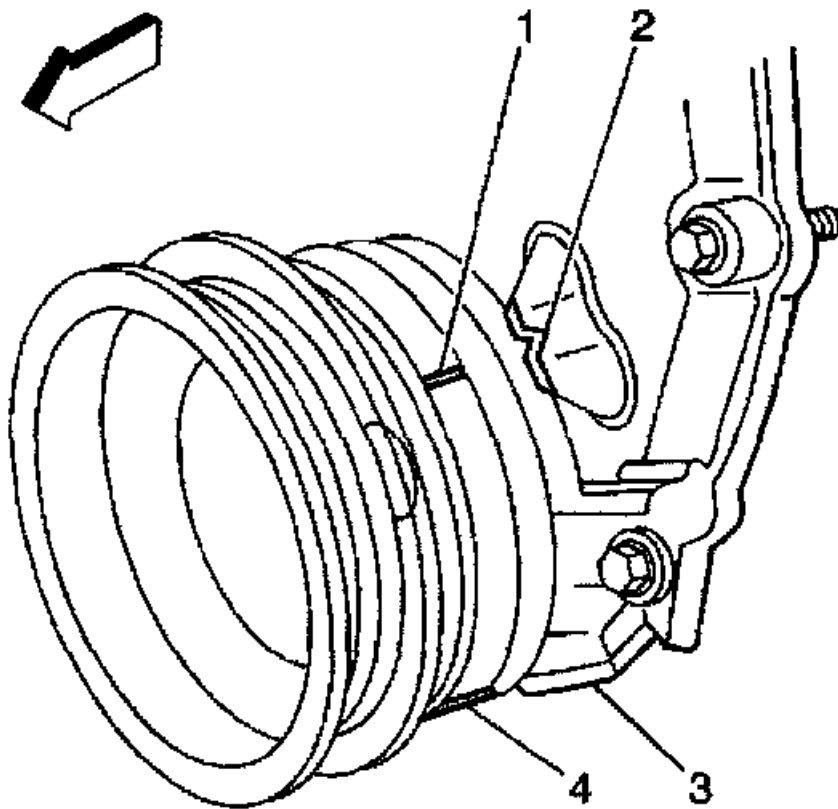
2. Inspect and replace components if worn or damaged.
3. Coat the bearing surfaces of the rocker arms and the rocker arm ball washers with Molykote® or equivalent pre-lube.
4. Install or connect the following:
 - Pushrods making sure they seat properly in the lifter
 - Rocker arms, ball washers and the nuts

➔ **The 4.3L engines are equipped with screw-in rocker arm studs with positive stop shoulders.**



7924JG46

Exploded view of the rocker arm assembly—4.3L engine



06025-S10P-G01

Positioning the crankshaft balancer—4.3L engine

- Rocker arm adjusting nuts and hand-tighten
5. Rotate the crankshaft balancer to position the crankshaft balancer alignment mark (1) 57-63 degrees clockwise or counterclockwise from the engine front cover alignment tab (2).
 6. Tighten the rocker arm bolts to 22 ft. lbs. (30 Nm). No further adjustment is necessary or possible.
 7. Install the rocker arm cover(s).
 8. Start and run the engine, then check for leaks and for proper ignition timing adjustment.

Intake Manifold

REMOVAL & INSTALLATION

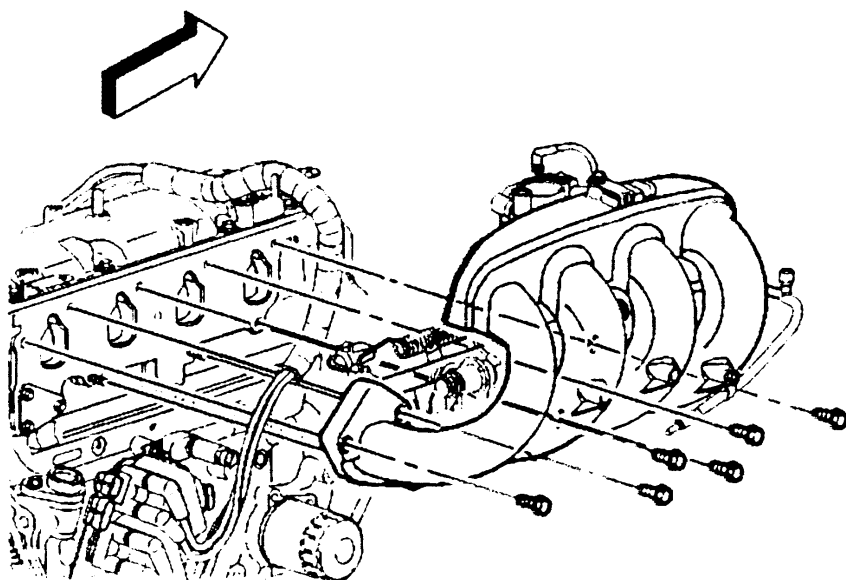
2.2L Engine

1. Remove or disconnect the following:
 - Negative battery cable and remove the air cleaner resonator.
 - Three vacuum hoses from the throttle body
 - Throttle cable support bracket and the throttle body assembly
 - Upper fan shroud and disconnect

the vacuum brake booster hose, if necessary

- Exhaust Gas Recirculation (EGR) pipe-to-manifold bolts and the EGR pipe-to-EGR adapter bolt, and the EGR pipe.
- EGR adapter
- Idle Air Control (IAC) motor connector
- Idle Air Control (IAC) motor
- Manifold Absolute Pressure (MAP) sensor connector
- Throttle Position (TP) sensor connector
- Fuel injector harness connector
- Right fender wheelhouse extension
- Retainers from the engine harness bracket, the transmission filler tube (if equipped) and the fuel system evaporator pipe
- Fuel pipes from the fuel rail
- Accelerator cable and if equipped, the cruise control cable
- Spark plug wires from the plugs
- Spark plug wire harness retainer from the heater hose pipe and set aside the harness
- Alternator rear brace by accessing the retaining nuts and bolts through the wheelhouse, if necessary
- Engine wiring harness bracket

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91113G02

Typical intake manifold mounting—2.2L engine shown

located at the rear of the cylinder head (if necessary), by unfastening the bracket-to-valve cover and bracket-to-cylinder head retainers, then slide the bracket off the bolt at the rear of the cylinder head

- Intake manifold bolts
- Fuel rail bracket
- Intake manifold and gasket

To install:

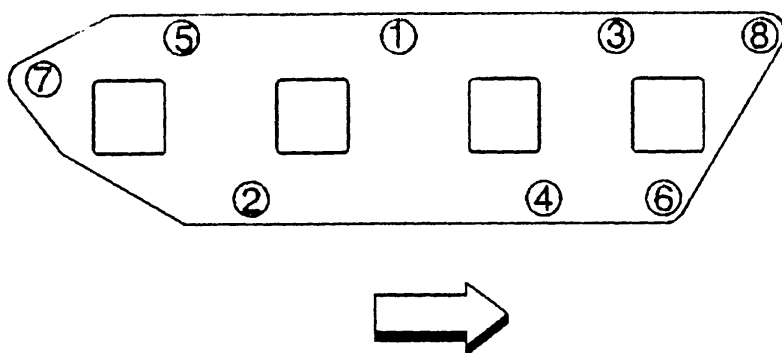
2. Carefully remove all traces of gasket material from the mating surfaces. Check the EGR passage to be sure it is free of excessive carbon deposits and clean, as necessary.

3. Install or connect the following:

- Lower intake manifold using a new gasket, then tighten the retaining bolts to 17 ft. lbs. (24 Nm) using the sequence illustrated
- Engine wiring harness bracket, if removed. Tighten the bracket-to-valve cover bolts to 88 inch lbs.

(10 Nm) and the bracket-to-cylinder head bolt to 18 ft. lbs. (25 Nm).

- Generator rear brace, if removed. Tighten the nuts and bolts to 18 ft. lbs. (25 Nm).
- Spark plug wire harness and retainer and attach the spark plug wires to the plugs
- Throttle body assembly, if removed and the throttle cable support bracket
- Three vacuum lines to the throttle body
- Accelerator cable and if equipped, the cruise control cable
- Fuel lines
- Retainers to the engine harness bracket, the transmission filler tube (if equipped) and the fuel system evaporator pipe
- IAC motor connector
- MAP sensor connector
- TP sensor connector



91113G03

Intake manifold bolt tightening sequence—2.2L engine

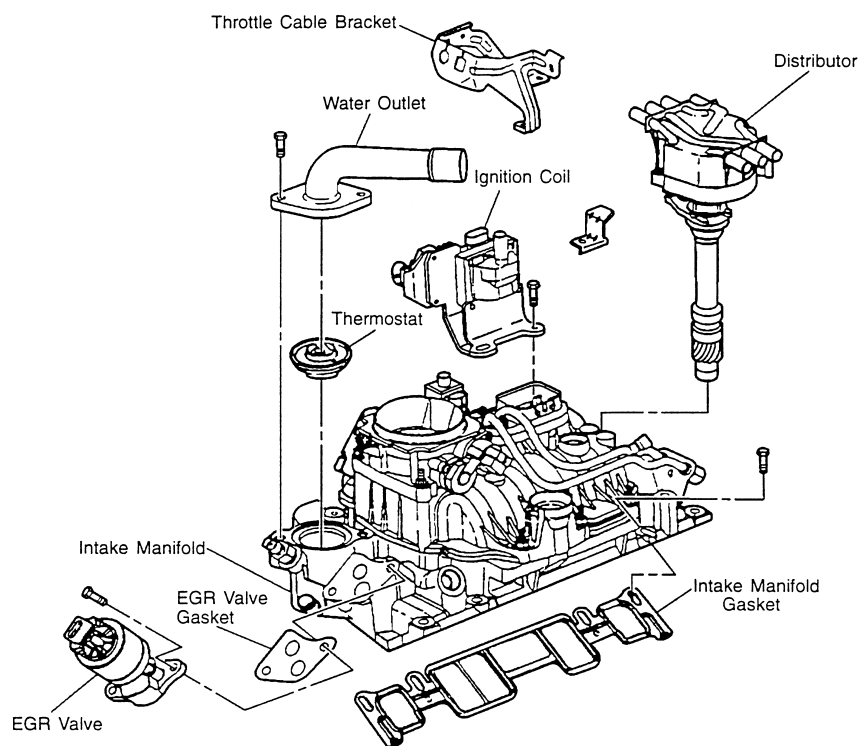
- Fuel injector harness connector
 - Wheelhouse extension
 - EGR adapter and tighten the retainers to 97 inch lbs. (11 Nm)
 - EGR pipe to the EGR adapter and tighten the bolt to 18 ft. lbs. (25 Nm)
 - EGR pipe-to-intake manifold bolts and tighten the bolts to 89 inch lbs. (10 Nm)
 - Upper fan shroud and the brake booster hose
 - Air cleaner resonator and connect the negative battery cable.
4. Start the engine and check for leaks.

4.3L Engine

➔If only the upper intake manifold is being removed, the fuel system pressure does not need to be released. **ALWAYS** release the pressure before disconnecting any fuel lines.

1. Remove the engine cover, if equipped
2. Properly relieve the fuel system pressure.
3. Drain the engine cooling system.
4. Remove or disconnect the following:

- Negative battery cable
- Air cleaner and air inlet duct
- Wiring harness connectors and brackets
- Throttle linkage from the upper intake manifold
- Ignition coil
- Fuel lines and bracket from the rear of the lower intake manifold
- Brake booster vacuum hose at the upper intake manifold
- Positive Crankcase Ventilation (PCV) hose at the rear of the upper intake manifold
- Vacuum hoses from both the front and rear of the upper intake
- Purge solenoid and bracket
- Upper intake manifold
- High Voltage Switch (HVS) assembly
- Upper radiator hose at the thermostat housing
- Heater hose at the lower intake manifold
- Wiring harnesses and brackets.
- Automatic transmission dipstick tube
- Exhaust Gas Recirculation (EGR) tube, clamp and tube
- Air conditioning compressor bracket-to-lower intake manifold pencil brace



7924/JG26

Intake manifold and related components—4.3L engine

- Alternator bracket bolts near the thermostat housing
- Lower intake manifold

5. Insert clean rags into the openings in the cylinder head to prevent dirt and debris from entering the engine.

6. Clean the gasket mounting surfaces. Be sure to inspect the manifold for warpage and/or cracks. If necessary, replace it.

To install:

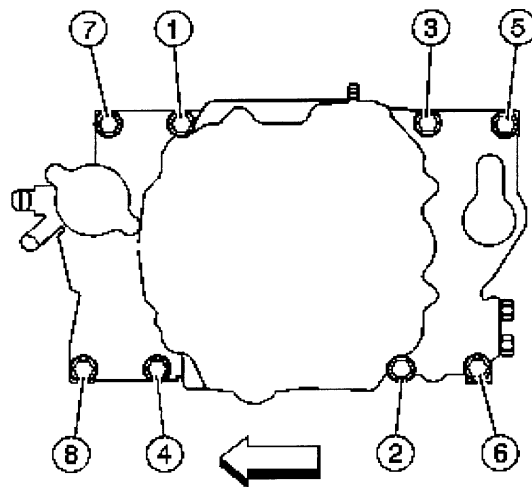
7. Remove the rags from the cylinder heads.

8. Position the gaskets on the cylinder

head with the port blocking plates to the rear and the **This Side Up** stamps facing upward. Then apply a $\frac{3}{16}$ in. (5mm) bead of RTV sealant on the front and rear of the engine block at the block-to-manifold mating surface. Extend the bead $\frac{1}{2}$ in. (13mm) up each cylinder head to seal and retain the gaskets.

9. Install the lower intake manifold. Tighten the bolts in sequence and in 3 steps, as follows:

- a. Step 1: 26 inch lbs. (3 Nm).
- b. Step 2: 106 inch lbs. (12 Nm).



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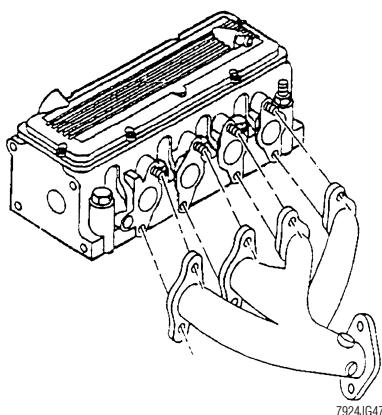
Lower intake manifold tightening sequence—4.3L engines

- c. Step 3: 11 ft. lbs. (15 Nm).
10. Install or connect the following:
 - Alternator bracket bolt near the thermostat housing
 - EGR tube, clamp and bolt
 - Wiring harness to the lower manifold components, including the injector, EGR valve and ECT sensor
 - Air conditioning compressor bracket-to-the lower intake manifold pencil braces
 - Transmission oil dipstick tube, if necessary
 - Fuel supply and return lines to the rear of the lower intake
 11. Temporarily reattach the negative battery cable, then pressurize the fuel system (by cycling the ignition without starting the engine) and check for leaks.
 12. Disconnect the negative battery cable.
 13. Install or connect the following:
 - Heater hose to the lower intake
 - Upper radiator hose to the thermostat housing
 - Vacuum hoses to the upper and lower intake manifold
 - New upper intake manifold gasket, making sure the green sealing lines are facing upward
 - Upper intake manifold being careful not to pinch the fuel injector wires between the manifolds
 - Manifold retainers. Tighten them to 88 inch lbs. (10 Nm) using two passes.
 - Purge solenoid and bracket
 - Brake booster vacuum hose at the upper intake manifold.
 - PCV hose to the rear of the upper intake manifold
 - Vacuum hoses to both the front and rear of the manifold assembly
 - Throttle linkage to the upper intake
 - Ignition coil
 - Wiring to the upper intake components including the TP sensor, IAC motor, MAP sensor and the IMTV.
 - Plastic cover
 - Air cleaner and air inlet duct
 - Negative battery cable
 14. Refill the engine cooling system.

Exhaust Manifold**REMOVAL & INSTALLATION****2.2L Engine**

1. Remove or disconnect the following:
 - Negative battery cable

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Exhaust manifold mounting—2.2L engine

- Air cleaner and duct work
- Oxygen Sensor (O₂S) from the manifold, if replacing it
- Drive belt
- Oil fill tube assembly
- Heater hose brace
- Power steering brace and set the pump aside
- Air conditioning pencil and rear braces. Set the compressor aside without disconnecting the lines
- Exhaust manifold nuts
- Exhaust manifold

To install:

2. Clean the exhaust manifold retainer threads and the gasket the mating surfaces.
3. Install or connect the following:
 - Exhaust manifold using a new gasket. Torque the nuts to 115 inch lbs. (13 Nm).
 - Exhaust pipe to the manifold
 - Air conditioning pencil and rear braces

- Heater hose
- Power steering and heater hose braces
- Oil fill tube assembly
- O₂S. Torque the sensor to 31 ft. lbs. (42 Nm), if necessary.
- Drive belt
- Air cleaner and duct work
- Negative battery cable

4.3L Engine

1. Remove or disconnect the following:

- Negative battery cable

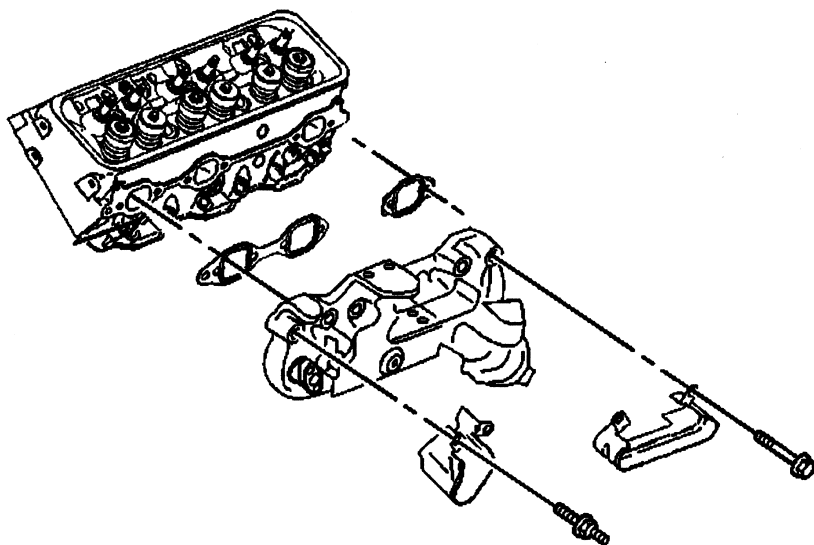
It will be easier if the vehicle is only supported to a height where underhood access is still possible, the vehicle may be left in position for the entire procedure. If the vehicle is raised too high for underhood access, it will have to be lowered, raised and lowered again during the procedure.

- Breather tube from the air cleaner outlet duct, if removing the left side manifold
- Air cleaner outlet duct retaining wingnut, if removing the left side manifold
- Intake Air Temperature (IAT) sensor harness connector, if removing the left side manifold
- Air cleaner outlet duct from the throttle body, if removing the left side manifold
- Exhaust pipe from the exhaust manifold. It may be necessary to remove the tires to gain access to the rear manifold bolts.

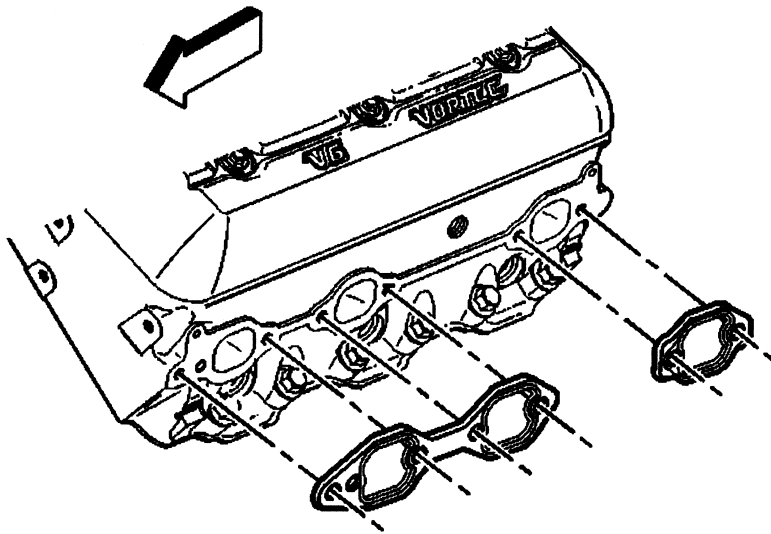
- Engine oil dipstick tube bolt, if removing the right side manifold
- Exhaust Gas Recirculation (EGR) inlet pipe from the left side manifold, if necessary
- Engine Coolant Temperature (ECT) sensor electrical connection
- Upper radiator support hose and nut
- Steering intermediate shaft, if removing the left side manifold
- Wheel house extension, if removing the right side manifold
- Spark plugs wires from the plugs
- Nuts attaching the secondary air injection pipe to the manifold
- Air injection pipe and gasket
- Locktangs (unbend), the exhaust manifold retaining bolts, washers and tab washers
- Heat shields
- Exhaust manifold
- Old gaskets and discard

To install:

2. Using a putty knife, clean the gasket mounting surfaces. Inspect the exhaust manifold for distortion, cracks or damage; replace if necessary.
3. Apply a threadlock such as GM 12345493 to the threads of the manifold retainers prior to installation.
4. Install or connect the following:
 - Exhaust manifold to the cylinder using a new gasket, then tighten the to 11 ft. lbs. (15 Nm) and then to 22 ft. lbs. (30 Nm). Once the bolts are tightened, bend the tabs on the washers back over the heads of all bolts in order to lock them in position.
 - Spark plug wires to the plugs
 - Fender wheelhouse extension and the tire assembly, if removed
 - Secondary air injection pipe with a NEW gasket to the manifold and tighten the nuts to 18 ft. lbs. (25 Nm), if removed
 - EGR inlet pipe, if removed
 - ECT sensor electrical connection, if removed
 - Upper radiator hose support and nut, if removed
 - Steering intermediate shaft, if removed (left side manifold only)
 - Engine oil dipstick tube bolt to 106 inch lbs. (12 Nm), if removed
 - Exhaust pipe to the manifold
 - Air cleaner outlet duct to the throttle body, if removed
 - IAT sensor harness connector, if removed



Exploded view of the exhaust manifold mounting—4.3L engine, left side shown



71461-SONO-G02

The new exhaust manifold gasket may have tab, which will help hold the gasket and bolts in place

- Air cleaner outlet duct retaining wingnut, if removed
- Breather tube to the air cleaner outlet duct, if removed
- Negative battery cable

Camshaft and Valve Lifters

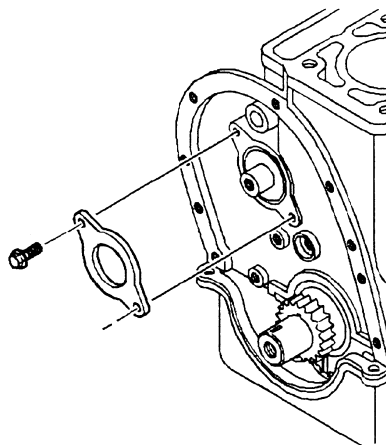
REMOVAL & INSTALLATION

2.2L Engine

1. Properly relieve the fuel system pressure.
2. Disconnect the negative battery cable.
3. Drain the engine cooling system and the engine oil.
4. Remove or disconnect the following:
 - Radiator
 - Rocker arm cover
 - Cylinder head
 - Anti-rotation bracket bolts and brackets
 - Valve lifters
 - Oil pump drive retaining bolt and the drive by lifting and twisting
 - Camshaft Position (CMP) sensor, if equipped
 - Crankshaft pulley and hub
 - Drive belt idler pulley
 - Timing cover from the engine
 - Timing chain and camshaft sprocket
 - Camshaft thrust plate
 - Camshaft by pulling it straight out of the engine, while turning it slightly as it is withdrawn and taking care not to damage the bearings.

To install:

5. Inspect the camshaft, journals and lobes for wear and replace, if necessary.
6. If removed, use the camshaft bearing tool to install a new set of bearings.
7. Coat the camshaft lobes and journals with a high viscosity oil with zinc such as GM 12345501.
8. Install or connect the following:
 - Camshaft by turning it slightly from side-to-side as it is inserted
 - Thrust plate. Torque the bolts to 106 inch lbs. (12 Nm).
 - Timing chain and camshaft sprocket
 - Timing cover
 - Serpentine drive belt idler pulley
 - Crankshaft pulley and hub



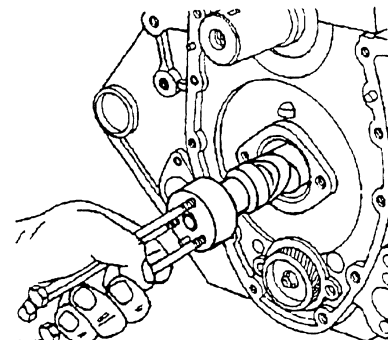
7924JG49

Remove the camshaft thrust plate and withdraw the camshaft from the engine—
2.2L engine

- Oil pump drive by inserting while twisting. Torque the fasteners to 18 ft. lbs. (25 Nm).
 - Valve lifters and the anti-rotation brackets
 - Cylinder head. Torque the bolts to 46 ft. lbs. (62 Nm) plus an additional 90 degrees turn.
 - Rocker arm cover
 - Radiator
 - Negative battery cable
9. Refill the engine cooling system.

4.3L Engine

1. Properly relieve the fuel system pressure.
2. Disconnect the negative battery cable.
3. Drain the engine cooling system.
4. Discharge and recover the refrigerant from the air conditioning system.
5. Remove or disconnect the following:
 - Radiator
 - Air conditioning condenser
 - Rocker arm covers
 - Intake manifold assembly
 - Rocker arms, pushrods and lifters
 - Crankshaft pulley and hub
 - Engine front (timing) cover
6. Align the timing marks on the crankshaft and camshaft sprockets.
7. Remove or disconnect the following:
 - Camshaft sprocket and timing chain
 - Balance shaft drive gear, if equipped
 - Camshaft thrust plate
 - Camshaft by installing the sprocket bolts or longer bolts the camshaft end to act as a handle; then, remove the camshaft while turning slightly from side to side, as necessary.



7924JG50

Thread 3 long bolts into the camshaft to use as a handle, then withdraw it from the engine

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➔Take care not to damage the camshaft bearings when removing the camshaft.

To install:

8. Lubricate the camshaft journals with clean engine oil or a suitable pre-lube.
9. Install or connect the following:
 - Camshaft being extremely careful not to contact the bearings with the cam lobes
 - Thrust plate. Torque the bolts to 106 inch lbs. (12 Nm).
 - Balance shaft drive gear, if equipped
 - Timing chain and camshaft sprocket
 - Engine front (timing) cover
 - Crankshaft pulley and hub
 - Valve lifters, pushrods and rocker arms. Adjust the valve clearance.
 - Intake manifold assembly
 - Rocker arm covers
 - Radiator
 - Negative battery cable
10. Refill the engine cooling system.

Valve Lash

ADJUSTMENT

2.2L Engine

Because the rocker arm fasteners are secured and tightened, valve lash is not adjustable on the 2.2L engine. If a valve-train problem is suspected, check that the rocker arm nuts are tightened to 18 ft. lbs. (25 Nm). Be very careful not to over-tighten the rocker arm nuts. ONLY tighten the nuts when the hydraulic lifter is resting on the base circle of the camshaft and not when it is held upward on the lobe. When valve lash falls out of specification (valve tap is heard), replace the rocker arm, pushrod and hydraulic lifter on the offending cylinder.

4.3L Engine

The 4.3L engines are equipped with screw-in rocker arm studs with positive stop shoulders. Because the shoulders that allow the rocker arms to be tightened into proper position, no adjustments are necessary or possible. If a valvetrain problem is suspected, check that the rocker arm nuts are tightened to 22 ft. lbs. (30 Nm). When valve lash falls out of specification (valve tap is heard), replace the rocker arm, pushrod and hydraulic lifter on the offending cylinder.

Starter Motor

REMOVAL & INSTALLATION

2 Wheel Drive (2WD) Models

2.2L ENGINE

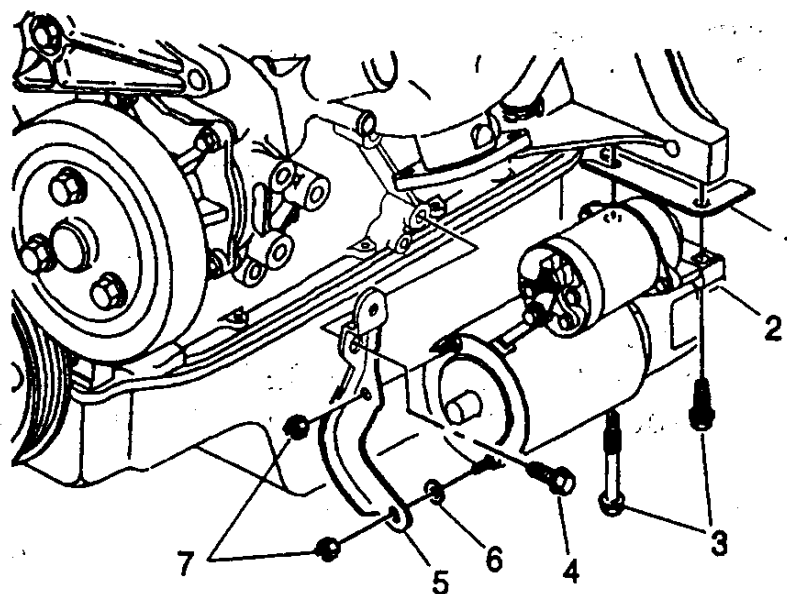
1. Remove or disconnect the following:
 - Negative battery cable
 - Front exhaust pipe, if necessary for access
 - Starter heat shield, if equipped
 - Brace rod from the front of the engine and the bell housing
 - Drivers side wheel to access the starter motor attaching bracket-to-engine bolt through the opening in the wheel well
 - Wires from the starter solenoid
 - Attaching bracket-to-engine mount bolt
 - Starter-to-engine block bolts. When removing the last bolt, be sure to

support the starter to keep it from falling and possibly injuring you.

- Starter and shims (if equipped) from the vehicle
- Bracket from the starter assembly, if equipped

To install:

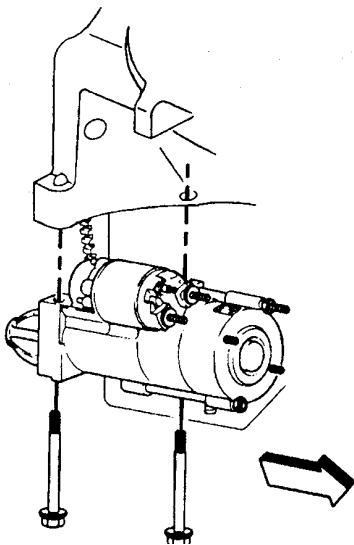
2. Install or connect the following:
 - Bracket to the starter, if removed. Tighten the bracket nuts to 97 inch lbs. (11 Nm).
 - Starter and shims (if equipped) into position in the vehicle and thread one of the retaining bolts to hold it in position.
 - Bracket-to-engine mount bolt (loosely), if equipped
 - Starter mounting bolt, then tighten all mounting fasteners to 32 ft. lbs. (43 Nm)
 - Wiring to the solenoid
 - Brace rod and tighten the retainers
 - Front exhaust pipe and tighten the fasteners, if removed
 - Starter heat shield, if equipped



1. SHIM
2. STARTER ASSEMBLY
3. BOLT, 43 N·m (32 LBS. FT.)
4. BOLT, 43 N·m (32 LBS. FT.)
5. BRACKET, STARTER MOTOR
6. WASHER
7. NUT, 11 N·m (97 LBS. IN.)

Starter motor and related components—2.2L engine

88452G08



88452G09

The starter motor on 4.3L engines is retained by two long bolts

- Driver's side wheel, if removed
- Negative battery cable

4.3L MODELS

1. Remove or disconnect the following:
 - Negative battery cable
 - Wires from the starter solenoid
 - Starter motor mounting bolts
 - Starter motor and if equipped, the shims

To install:

2. Install or connect the following:
 - Starter motor into position
 - Starter motor inboard bolt but do not tighten it at this time
 - Starter motor shims, if equipped
 - Outboard starter motor bolt. Tighten the bolts to 32 ft. lbs. (43 Nm).
 - Wires to the solenoid
 - Negative battery cable

4 Wheel Drive (4WD) Models

1. Remove or disconnect the following:
 - Negative battery cable

➔In some cases it may be easier to access the starter motor bolts if you raise the vehicle and remove the wheel assembly.

- Wheel assembly, if necessary
- Engine mounts
- Transmission mount and support the transmission assembly
- Starter-to-engine bolts and support the starter

2. Rotate the starter as necessary for access, then tag and disconnect the solenoid wiring.

3. Carefully lower the starter and shims (if equipped) from the vehicle. Note the location of any shims for installation purposes.

4. If necessary, remove the shield from the starter assembly.

To install:

5. Install or connect the following:
 - Starter into position in the vehicle along with any shims (making sure they are in their original positions), then tighten the mounting bolts to 37 ft. lbs. (50 Nm).
 - Shield to the starter assembly and tighten the retaining nuts to 106 inch lbs. (12 Nm), if removed
 - Wiring to the solenoid
 - Transmission mount and remove the supports
 - Secure the engine mounts, then remove the lifting device
 - Wheel assembly, if removed
6. Connect the negative battery cable.

Oil Pan

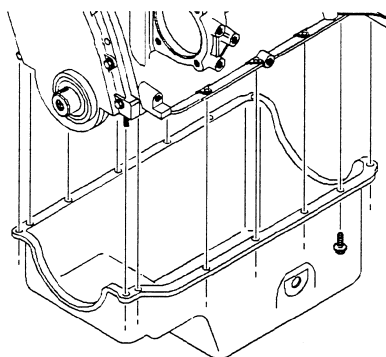
REMOVAL & INSTALLATION

2.2L Engine

1. Drain the engine oil.
2. Remove or disconnect the following:
 - Engine
 - Clutch pressure plate and disc, if equipped
 - Flywheel
 - Oil pan retainers and the pan

To install:

3. Clean the gasket mating surfaces
4. Install or connect the following:
 - New gasket and seal onto the oil pan using a thin bead of sealant at either side of the seal
 - Oil pan. Torque the bolts to 89 inch. lbs. (10 Nm).
 - Flywheel



7924JG51

Oil pan mounting—2.2L engine

- Pressure plate and disc, if equipped
- Engine

4.3L Engine

2WD MODELS

1. Drain the engine oil.
2. Remove or disconnect the following:

- Engine
- Oil level sensor, if equipped, and discard
- Oil pan retainers (nuts, studs and/or bolts) and rail reinforcements, if equipped
- Oil pan
- Rubber bell housing plugs and gasket

To install:

3. Clean the gasket mounting surfaces.

➔The alignment between the rear of the oil pan and the rear of the block is critical. The oil pan must be flush or slightly forward of the rear of the block to allow for proper alignment with the transmission housing. Use a feeler gauge to measure the clearance between the 3 oil pan-to-transmission contact points. If the clearance exceeds 0.011 in. (0.3mm) at any of the 3 points, realign the oil pan.

4. Apply sealant to the oil pan rail where it contacts the timing cover-to-block joint (front) and the crankshaft rear seal retainer-to-block joint (rear). Continue the bead of sealant about 1 in. (25mm) in both directions from each of the 4 corners.

5. Install or connect the following:
 - Rubber bell housing plugs, if equipped
 - Oil pan using a new gasket

➔The alignment between the rear of the pan and rear of the block is critical. The two surfaces must be flush to allow for proper alignment with the transmission housing.

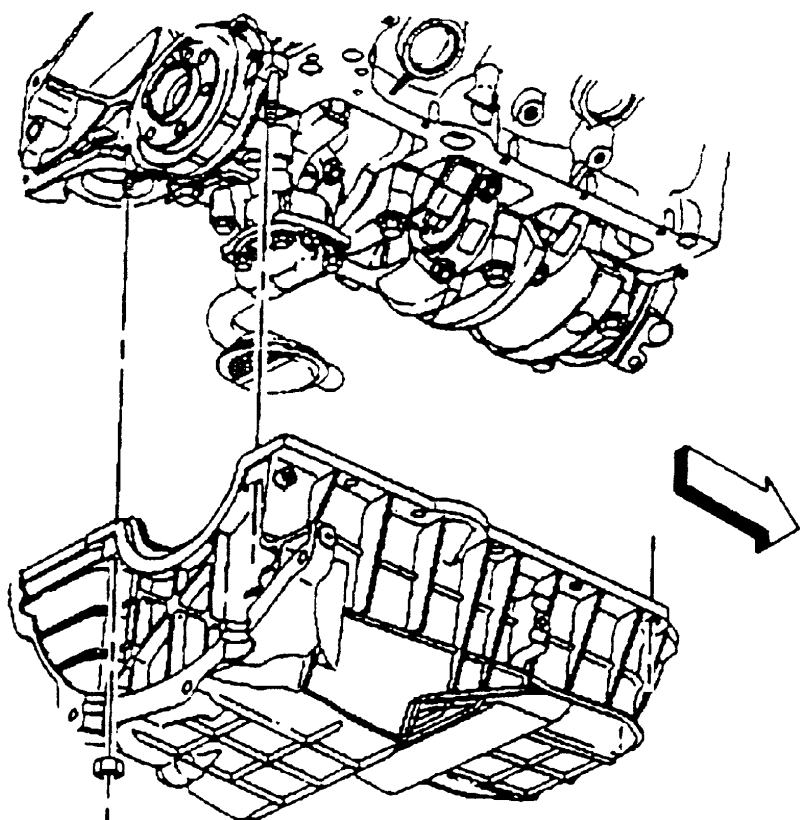
6. Use a feeler gauge to check the clearance between the oil pan-to-transmission contacts. If clearance exceeds 0.011 inch (0.3mm) at any of the three contact points, readjust the pan until the clearance is within specification.

7. Once the pan is in its correct position tighten the retainers to 18 ft. lbs. (25 Nm) using the proper sequence.

8. Install a new oil level sensor, if used and tighten to 115 inch lbs. (13 Nm).

9. Install the engine into the vehicle. Refill the crankcase with fresh oil. Start the

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Oil pan mounting—4.3L engine

engine, establish normal operating temperatures and check for leaks.

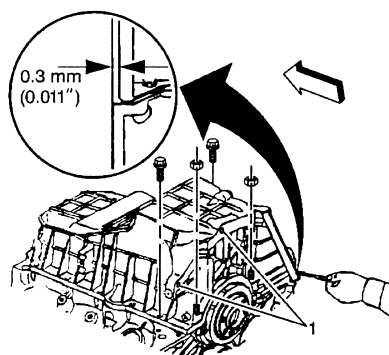
4WD MODELS

1. Disconnect the negative battery cable.
2. Drain the engine crankcase oil.
3. Remove or disconnect the following:
 - Dipstick
 - Drivebelt splash shield, the front axle shield and the transfer case shield
 - Front skid plate and the flywheel cover
 - Left and right engine mount through-bolts
4. Raise the engine using a lifting device and block in position. This may be accomplished using large wooden blocks between the motor mounts and brackets.

➔ **Use extreme caution when blocking the engine in position. Get out from under the vehicle and rock the engine slightly once the blocks are in place to be sure the engine is properly supported.**

5. Remove or disconnect the following:
 - Oil cooler line
 - Pitman arm bolt and pitman arm

- Idler arm bolts and idler arm
- Front differential through-bolts
- Front driveshaft, if necessary
- Differential assembly by rolling it forward for clearance



7924JG16

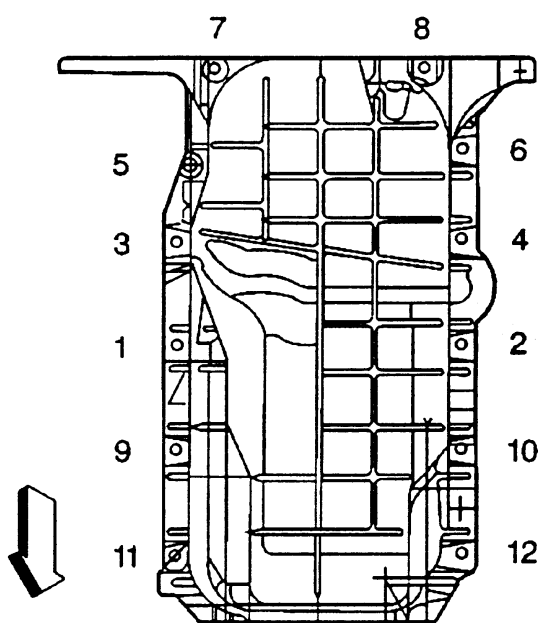
If the clearance between the 3 oil pan-to-transmission contact points exceeds 0.011 in. (0.3mm) at any of the 3 points, realign the oil pan—4.3L engine

- Starter motor
- Oil pan bolts, nuts and reinforcements
- Oil pan and discard the gasket

To install:

6. Clean the gasket mounting surfaces.

➔ **The alignment between the rear of the oil pan and the rear of the block is critical. The oil pan must be flush or slightly forward of the rear of the block to allow for proper alignment with the transmission housing. Use a feeler gauge to measure the clearance between the 3 oil pan-to-transmission contact points. If the clearance exceeds 0.011 in. (0.3mm) at any of the 3 points, realign the oil pan.**



7924JG17

Tighten the bolts in sequence to prevent warping the sealing surface of the oil pan—4.3L engine

7. Apply sealant to the oil pan rail where it contacts the timing cover-to-block joint (front) and the crankshaft rear seal retainer-to-block joint (rear). Continue the bead of sealant about 1 in. (25mm) in both directions from each of the 4 corners.

8. Install or connect the following:

- Oil pan, using a new gasket.
- Tighten the retainers, in sequence, to 18 ft. lbs. (25 Nm).
- Starter motor
- Differential by rolling it back into position
- Front driveshaft
- Front differential through-bolts
- Idler arm and secure using the retaining bolts
- Pitman arm and secure using the bolts
- Transfer case shield
- Flywheel cover
- Front skid plate
- Front axle shield
- Drive belt splash shield
- Dipstick
- Negative battery cable

9. Refill the engine crankcase.

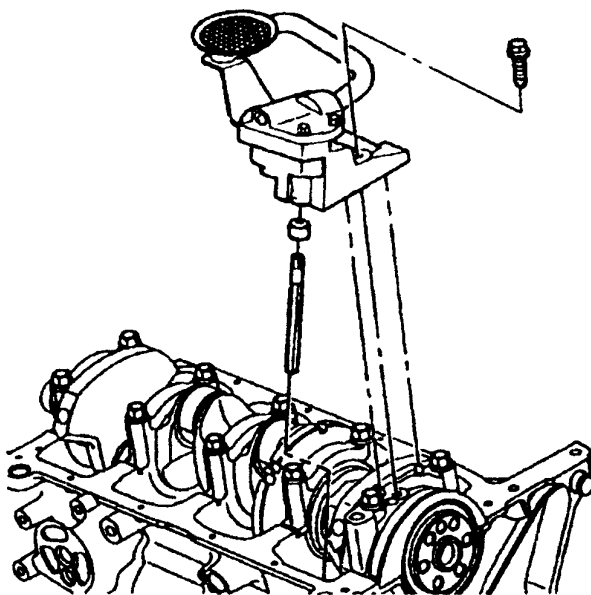
10. Start the engine and check for leaks.

Oil Pump

REMOVAL & INSTALLATION

1. Remove or disconnect the following:

- Oil pan
- Oil pump and the pickup tube/shaft, if equipped
- Extension shaft and retainer from



Exploded view of the oil pump mounting—2.2L engine

the pump, if necessary for the 2.2L engine

➔ **Be careful not to crack the retainer.**

To install:

2. Inspect the pins (oil pump locator) for damage, and replace the pins if required.

To install:

3. For the 2.2L engine, if the extension shaft was removed, heat the extension shaft retainer in hot water, then install the shaft and retainer to the oil pump. Be sure the retainer does not crack during installation.

4. Ensure that the pump pickup tube is tight in the pump body. If the tube should come loose, oil pressure will be lost and oil starvation will occur. If the pickup tube is loose it should be replaced.

5. If the pump has been disassembled and is being replaced or for any reason oil has been removed, it must be primed. It can either be filled with oil before installing the cover plate and oil kept within the pump during handling or the entire pump cavity can be filled with petroleum jelly.

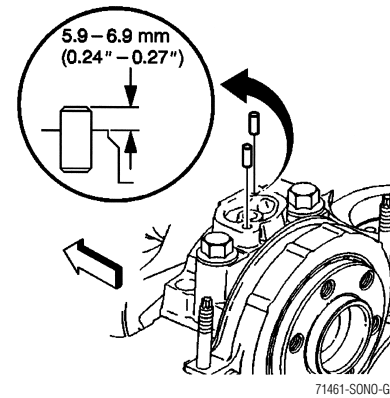
*** WARNING

If the pump is not primed, the engine could be damaged upon start up.

➔ **Do not reuse the oil pump driveshaft retainer. During assembly, install a NEW oil pump driveshaft retainer.**

6. Install or connect the following:

- Oil pump. Tighten oil pump/pickup tube retainer(s) to 32 ft. lbs. (44 Nm) for the 2.2L engine or to 65 ft. lbs. (90 Nm), for the 4.3L engine.



On 4.3L engines, inspect the pins (oil pump locator) for damage, and replace the pins if required

➔ **If the oil pump does not build up oil pressure almost immediately, remove the pan and check for a loose oil pump-to-pickup tube attachment. If necessary dismantle the pump and pack the pump cavity with petroleum jelly.**

- Oil pan

7. Refill the crankcase.

8. Disable the ignition system; crank engine for approximately 10 seconds to aid in priming the oil pump and reducing the risk of engine damage.

*** WARNING

Running the engine without measurable oil pressure will cause extensive damage.

Rear Main Seal

REMOVAL & INSTALLATION

2.2L Engine

Please note that the transmission assembly and transfer case, if equipped, must be removed to perform this procedure.

1. Remove or disconnect the following:

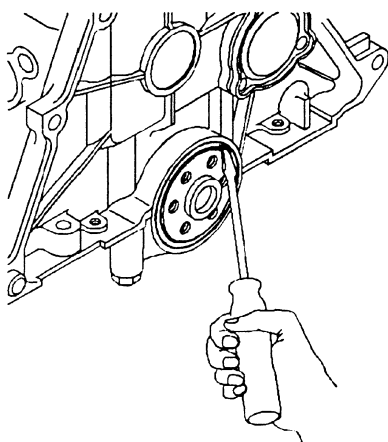
- Negative battery cable
- Transmission assembly and transfer case, if equipped
- Flexplate, if equipped
- Clutch assembly and flywheel, if equipped
- Crankshaft seal by prying it from out

➔ **Be careful not to damage the crankshaft seal surface with the prying tool.**

To install:

2. Install the new rear seal by lubricating it with engine oil and using a seal tool J-34686.

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7924JG19

Carefully pry the rear main oil seal out of its bore—2.2L engine

3. Slide the seal over the mandrel until the dust lip bottoms squarely against the tool collar.

4. Align the dowel pin of the tool with the dowel pinhole in the crankshaft and attach the tool to crankshaft.

5. Tighten the T-handle of the tool to push the seal into the bore. Continue until the tool collar is flush against the block.

6. Loosen the T-handle completely. Remove the attaching screws and tool. Check to be sure the seal is seated squarely in the bore.

7. Install or connect the following:

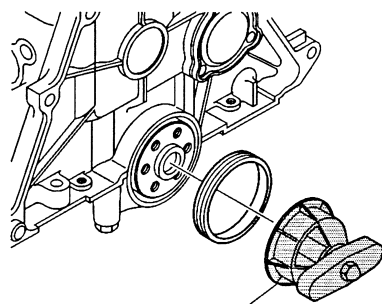
- Flywheel/clutch assembly or flexplate
- Transmission assembly and transfer case, if equipped
- Negative battery cable

8. Start the engine and check for leaks.

4.3L Engine

Please note that the transmission assembly and transfer case, if equipped, must be removed to perform this procedure.

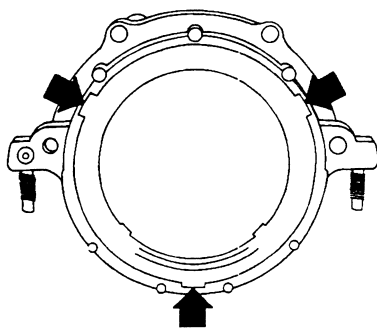
1. Remove or disconnect the following:



J 34686

7924JG44

Rear main oil seal installation using tool J-34686—2.2L engine



7924JG20

Carefully pry the rear main seal out of the retainer—4.3L engine

- Negative battery cable
- Transfer case, if equipped
- Transmission
- Clutch assembly/flywheel or flexplate

2. Remove the crankshaft rear oil seal by inserting a suitable prying tool into the notches provided in the seal retainer and prying the seal out. Take care not to damage the crankshaft sealing surface.

To install:

3. Inspect the crankshaft for grit, rust or burrs and correct as necessary.

4. Clean the running surface of the crankshaft with a non-abrasive cleaner.

5. Install or connect the following:

- New rear seal lubricated with engine oil and a seal installer
- Flywheel and clutch or flexplate
- Transmission
- Transfer case, if equipped
- Negative battery cable

6. Start the engine and verify no oil leaks.

Timing Chain, Sprockets, Front Cover and Seal

REMOVAL & INSTALLATION

Front Cover and Seal

2.2L ENGINE

1. Remove or disconnect the following:

- Negative battery cable
- Drive belt
- Cooling fan assembly and pulley
- Crankshaft pulley and hub
- Belt tensioner/idler pulley assembly
- Front oil pan-to-front cover nuts or studs
- Starter
- Alternator and brackets from the engine, then position them aside

- Oil pan bolts, loosen but do not remove
- Crankcase (timing) front cover bolts and the cover. Make sure all bolts are removed and be careful not to force and damage the cover.
- Old crankshaft seal from the cover using a suitable prytool. Be very careful not to distort the front cover or to score the end of the crankshaft.

To install:

2. Carefully remove all traces of gasket or sealant from the mating surfaces.

3. Lubricate the lips of a new seal with clean engine oil, then use a seal centering tool (such as J-35468) to install the seal to the front cover. Leave the tool in position in the seal until the cover is installed.

4. Apply a $\frac{3}{8}$ in. (10mm) wide by $\frac{5}{16}$ (5mm) thick bead of RTV sealer to the oil pan at the front crankcase cover sealing surface. Then apply a $\frac{1}{4}$ in. (6mm) by $\frac{1}{8}$ in. (3mm) thick bead of RTV to the crankcase front cover at the block sealing surface.

5. Install or connect the following:

- Crankcase front cover to the engine using the seal tool to assure it is properly centered and prevent damage to the hub. Tighten the cover retaining bolts to 97 inch lbs. (11 Nm), then remove the seal centering tool.
- Oil pan bolts
- Starter
- Alternator with brackets
- Belt tensioner/idler pulley assembly
- Belt assembly
- Crankshaft pulley and hub
- Cooling fan assembly and pulley
- Negative battery cable

4.3L ENGINE

1. Remove or disconnect the following:

- Negative battery cable
- Drain the engine cooling system.
- Crankshaft pulley and damper

** WARNING

The outer ring (weight) of the torsional damper is bonded to the hub with rubber. The damper must be removed with a puller that acts on the inner hub only. Pulling on the outer portion of the damper will break the rubber bond or destroy the tuning of the unit.

- Water pump assembly
- Crankshaft Position (CKP) sensor

➔ Depending upon the year of your truck, you may just need to loosen the oil pan bolts, or you may need to remove it completely.

- Oil pan or loosen bolts, as applicable
- Crankshaft Position (CKP) sensor, if equipped
- Front cover bolts and the reinforcements, if equipped
- Front cover from the engine

2. Pry the seal out of the front cover using a small prytool. Be very careful not to distort the front cover or to score the end of the crankshaft.

To install:

➔ Anytime the front cover is removed, the cover must be replaced upon reassembly. If you reuse the old cover, oil leaks may develop.

3. Clean the gasket mating surfaces of the engine and cover of all remaining gasket or sealer material. Be careful not to score or damage the surfaces.

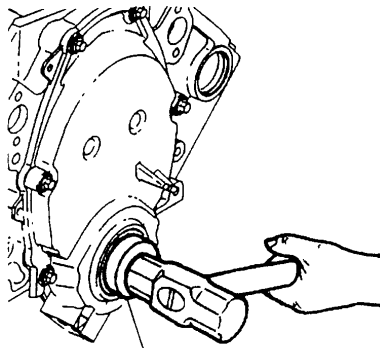
➔ The manufacturer suggests you wait until the front cover is mounted to the engine before you install the replacement crankshaft oil seal. This assures the cover is properly supported.

4. Install or connect the following:

- New front cover gasket to the engine or cover using gasket cement to hold it in position. Lubricate the front of the oil pan seal with engine oil to aid in reassembly.
- Front cover to the engine. Take care while engaging the front of the oil pan seal with the bottom of the cover. Apply sealer 12346141 to the oil pan rail where it contacts the timing cover-to-block joint (front) and the crankshaft rear seal retainer-to-block joint (rear). Continue the bead of sealant about 1 in. (25mm) in both directions from each of the four corners.
- Front cover retaining bolts and tighten to 106 inch. lbs. (12 Nm)

5. Lightly coat the lips of the replacement crankshaft seal with clean engine oil, then position the seal with the open end facing inward the engine. Use a suitable seal installation driver to position the seal in the front cover.

- CKP sensor O-ring and the sensor, if equipped
- Oil pan, if removed
- Tighten the oil pan bolts



J 35468

88453GAU

**Installing the crankshaft front oil seal—
4.3L engines**

- Water pump
 - Crankshaft damper and pulley
 - Negative battery cable
6. Properly refill the engine cooling system.
7. Run the engine until normal operating temperature has been reached, then check for leaks.

Timing Chain and Sprockets

2.2L ENGINE

1. Remove or disconnect the following:
- Negative battery cable

- Crankcase (timing) front cover from the engine

2. Turn the crankshaft until the timing marks on the sprockets are in alignment. The marks should also be in alignment with the tabs on the tensioner.

- Tensioner retaining bolts
- Camshaft sprocket retaining bolts
- Camshaft sprocket and timing chain at the same time
- Tensioner assembly
- Crankshaft Position (CKP) sensor, if equipped
- Crankshaft sprocket using J-22888-20, if equipped

To install:

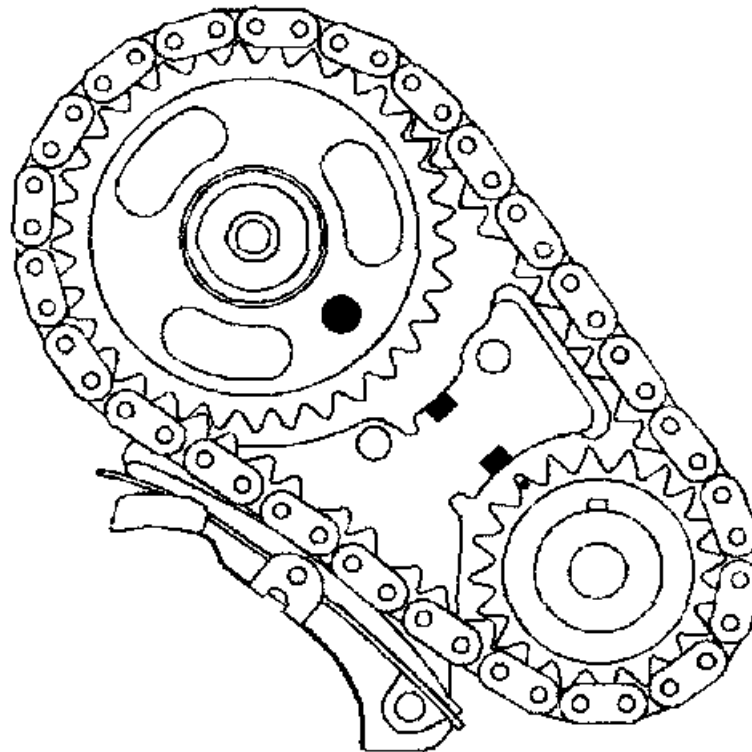
3. Install or connect the following:

- Crankshaft sprocket using a suitable installer such as J-5590, if removed. Make sure the sprocket is fully seated against the crankshaft.

4. Compress the tensioner spring and insert a cotter pin or nail in the hole provided to hold the tensioner in position.

- Tensioner retaining bolts
- Camshaft sprocket in the timing chain, position the chain under the crankshaft sprocket and the camshaft sprocket to the camshaft

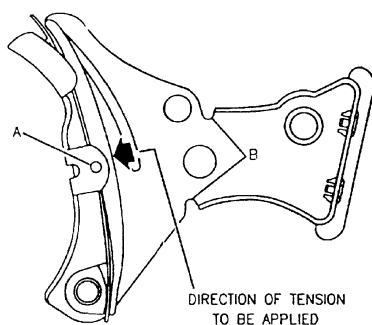
5. Verify that the timing marks are all properly aligned, then loosely install the camshaft sprocket bolt.



06025-S10P-G02

Timing chain, sprocket and camshaft alignment marks—2.2L engine

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A INSERT PIN AFTER TENSION HAS BEEN APPLIED
B TABS, USED FOR CAMSHAFT AND CRANKSHAFT ALIGNMENT

85383290

Locking the timing chain tensioner into position for chain installation—2.2L engine

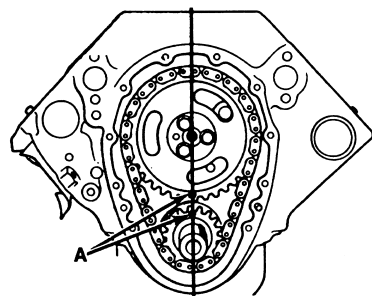
- CKP sensor, if equipped
- Tighten the tensioner bolts to 18 ft. lbs. (24 Nm), then tighten the camshaft sprocket bolt to 96 ft. lbs. (130 Nm)

6. Remove the cotter pin or nail holding the tensioner in position off the chain.
 - Timing cover to the engine

4.3L ENGINE

➔The following procedure requires the use of the Crankshaft Sprocket Removal tool No. J-5825-A and the Crankshaft Sprocket Installation tool No. J-5590.

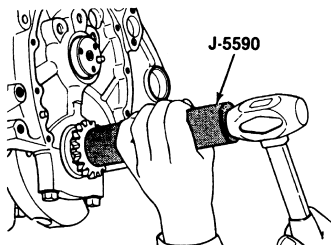
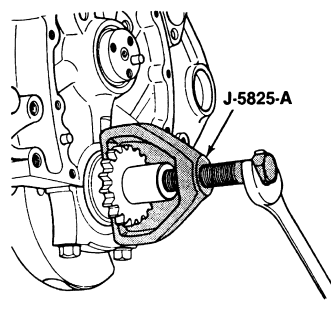
1. Remove the timing cover from the engine.
2. If equipped, remove the crankshaft reluctor ring.
3. Rotate the crankshaft until the No. 4 cylinder is on the Top Dead Center (TDC) of its compression stroke and the camshaft sprocket mark aligns with the mark on the crankshaft sprocket (facing each other at a point closest together in their travel) and in line with the shaft centers.



A. Align Marks as Shown

85383292

Timing mark alignment—4.3L engine



85383293

Removal (top) and installation of the crankshaft timing gear

4. Remove or disconnect the following:
 - Crankshaft Position (CKP) sensor reluctor ring, if equipped
 - Camshaft sprocket-to-camshaft nut and/or bolts
 - Camshaft sprocket (along with the timing chain). If the sprocket is difficult to remove, use a plastic mallet to bump the sprocket from the camshaft.

➔The camshaft sprocket (located by a dowel) is lightly pressed onto the camshaft and should come off easily. The chain comes off with the camshaft sprocket.

5. If necessary use J-5825-A crankshaft sprocket removal tool to free the timing sprocket from the crankshaft.

6. If necessary, remove the crankshaft sprocket key.

To install:

7. Inspect the timing chain and the timing sprockets for wear or damage, replace the damaged parts as necessary.

8. Using a putty knife, clean the gasket mounting surfaces. Using solvent, clean the oil and grease from the gasket mounting surfaces.

9. Install or connect the following:

- Crankshaft sprocket key, if removed
- Crankshaft sprocket onto the crankshaft using J-5590 crankshaft sprocket installation tool and a hammer without disturbing the position of the engine

➔During installation, coat the thrust surfaces lightly with Molykote® or an equivalent pre-lube.

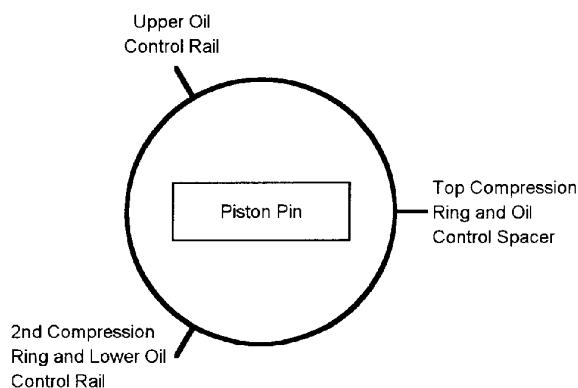
- Timing chain over the camshaft sprocket. Arrange the camshaft sprocket in such a way that the timing marks will align between the shaft centers and the camshaft locating dowel will enter the dowel hole in the cam sprocket.
- Timing chain under the crankshaft sprocket, then place the cam sprocket, with the chain still mounted over it, in position on the front of the camshaft
- Camshaft sprocket-to-camshaft retainers to 18 ft. lbs. (25 Nm)

10. With the timing chain installed, turn the crankshaft two complete revolutions, then check to make certain that the timing marks are in correct alignment between the shaft centers.

- CKP sensor reluctor ring, if equipped
- Timing cover

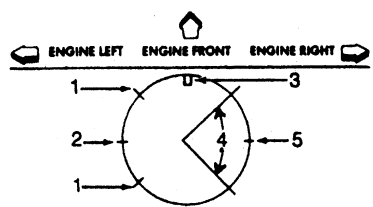
Piston and Ring

POSITIONING



7924AG12

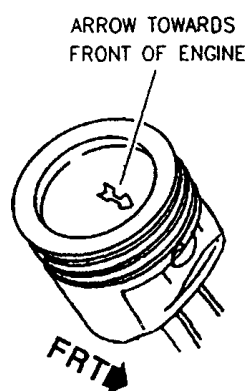
Piston ring end-gap spacing—2.2L engine



1. Oil ring rail gaps
2. 2nd Compression ring gap
3. Notch in piston
4. Oil ring spacer gap (tang in hole or slot with arc)
5. Top compression ring gap

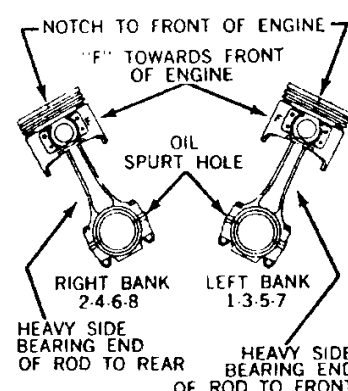
7924AG07

Piston ring end-gap spacing—4.3L engines



7924AG08

Piston/connecting rod-to-engine positioning—2.2L engines



7924AG09

Piston and connecting rod assembly positioning—4.3L engine

FUEL SYSTEM

Fuel System Service Precautions

Safety is the most important factor when performing not only fuel system maintenance but also any type of maintenance. Failure to conduct maintenance and repairs in a safe manner may result in serious personal injury or death. Maintenance and testing of the vehicle's fuel system components can be accomplished safely and effectively by adhering to the following rules and guidelines.

- To avoid the possibility of fire and personal injury, always disconnect the negative battery cable unless the repair or test procedure requires that battery voltage be applied.
- Always relieve the fuel system pressure prior to disconnecting any fuel system component (injector, fuel rail, pressure regulator, etc.), fitting or fuel line connection. Exercise extreme caution whenever relieving fuel system pressure, to avoid exposing skin, face and eyes to fuel spray. Please be advised that fuel under pressure may penetrate the skin or any part of the body that it contacts.
- Always place a shop towel or cloth around the fitting or connection prior to loosening to absorb any excess fuel due to spillage. Ensure that all fuel spillage (should it occur) is quickly removed from engine surfaces. Ensure that all fuel soaked cloths or towels are deposited into a suitable waste container.
- Always keep a dry chemical (Class B) fire extinguisher near the work area.
- Do not allow fuel spray or fuel vapors to come into contact with a spark or open flame.

• Always use a back-up wrench when loosening and tightening fuel line connection fittings. This will prevent unnecessary stress and torsion to fuel line piping.

Always follow the proper torque specifications.

- Always replace worn fuel fitting O-rings with new. Do not substitute fuel hose or equivalent where fuel pipe is installed.

Fuel System Pressure

RELIEVING

Multi-Port Fuel Injection and Central Port Injection Systems

The fuel systems operate under high fuel pressures. It is very important that the pressure be properly relieved prior to servicing the system or any of its components.

A Schrader valve is provided on these fuel systems to conveniently test or release the system pressure. A fuel pressure gauge and adapter will be necessary to connect the gauge to the fitting. Most of the MFI systems utilize a service valve on one end of the fuel rail assembly.

1. Before servicing the vehicle, refer to the precautions in the beginning of this section.
2. Disconnect the negative battery cable to assure the prevention of fuel spillage if the ignition switch is accidentally turned **ON** while a fitting is still detached.
3. Loosen the fuel filler cap to release the fuel tank pressure.
4. Be sure the release valve on the fuel gauge is closed, then connect the fuel gauge to the pressure fitting located on the inlet fuel pipe fitting.

⚠ CAUTION

When connecting the gauge to the fitting, be sure to wrap a rag around the fitting to avoid spillage. After

repairs, place the rag in an approved container.

5. Install the bleed hose portion of the fuel gauge assembly into an approved container, then open the gauge release valve and bleed the fuel pressure from the system.

6. When the gauge is removed, be sure to open the bleed valve and drain all fuel from the gauge assembly.

7. When fuel service is finished, tighten the fuel filler cap and connect the negative battery cable.

Fuel Filter

REMOVAL & INSTALLATION

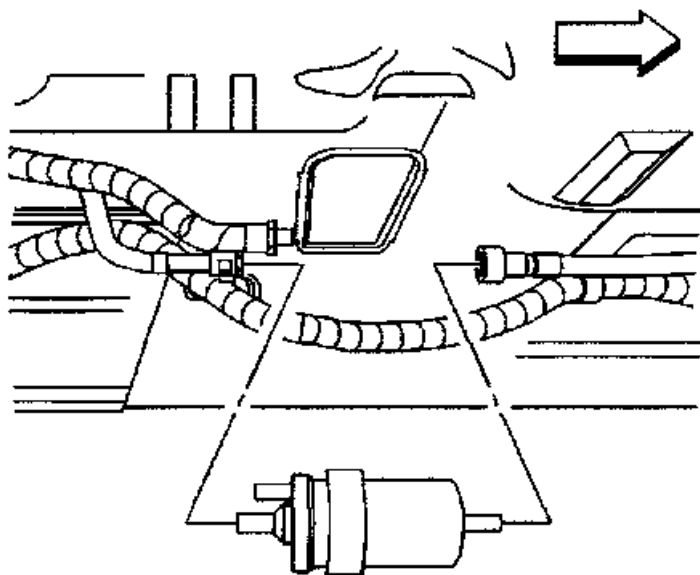
1. Before servicing the vehicle, refer to the precautions in the beginning of this section.
2. Properly relieve the fuel system pressure.
3. Remove or disconnect the following:
 - Negative battery cable
 - Fuel filler cap
 - Quick connect fittings from the filter
 - Filter feed nut and the clamp bolt
 - Filter and the clamp from the vehicle

To install:

4. Install or connect the following:
 - Filter and clamp with the directional arrow facing away from the inlet fuel tank, toward the throttle body

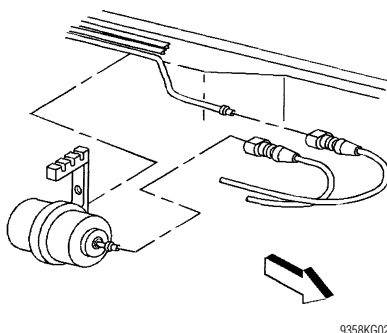
➡ **The filter has an arrow (fuel flow direction) on the side of the case, be sure to install it correctly in the system, the with arrow facing away from the fuel tank.**

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06025-S10P-G03

Fuel filter location along frame rail—2.2L engine



9358KG02

Fuel filter location along frame rail—4.3L engine

- Fuel feed nut
- Filter clamp assembly bolt
- Fuel quick disconnect fittings to the filter
- Fuel filler cap
- Negative battery cable

- Check for fuel leaks as follows:
 - Turn the ignition **ON** for 2 seconds.
 - Turn the ignition **OFF** for 10 seconds.
 - Turn the ignition **ON**.
 - Check for leaks.

Fuel Pump

REMOVAL & INSTALLATION

- Properly relieve the fuel system pressure.
- Disconnect the negative battery cable.

- Lower the spare tire.
- Remove or disconnect the following:
 - Rear tail lamp assemblies
 - Frame-to-pickup box bolts
 - Wiring harness ground wire from the frame
 - License plate lamp
 - Fuel filler neck-to-pickup box ground wire and screws
 - Fuel tank on crew cab models
 - Pickup box
 - Fuel sender electrical connectors
 - Fuel sender and Evaporative Emission (EVAP) pipes

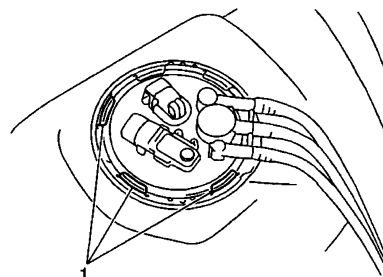
** WARNING

The fuel sender assembly may spring up from the fuel tank. When removing the sender from the fuel tank, keep in mind that the reservoir bucket is full of fuel, so you must tip the sender slightly during removal to avoid damaging the float. Discard the fuel sender O-ring and replace with a new one during installation.

- While holding the module fuel sender down, remove the snapping from the designated slots (1) found on the retainer.

To install:

- Install a new O-ring on the fuel sender to the tank.
- Align the tab on the front of the sender with the slot on the front of the retainer snapping.
- Slowly apply pressure to the top of the spring-loaded sender until it aligns flush with the retainer on the tank.



9358KG03

Hold the fuel sender down, and remove the snapping from the designated slots (1) found on the retainer

➔ **Make sure that the snapping is properly and fully seated in the tab slots.**

- Install or connect the following:
 - Snapping into the proper slots
 - Fuel and EVAP pipes
 - Electrical connectors
 - Negative battery cable
- Check for fuel leaks as follows:
 - Turn the ignition **ON** for 2 seconds.
 - Turn the ignition **OFF** for 10 seconds.
 - Turn the ignition **ON**.
 - Check for leaks.
- Install or connect the following:
 - Pickup box to the truck
 - Filler neck-to-pickup box screws and ground wire
 - License plate lamp
 - Wiring harness ground wire to the frame
 - Frame-to-pickup box bolts and tighten to 52 ft. lbs. (70 Nm)
 - Rear tail lamp assemblies

Fuel Injector

REMOVAL & INSTALLATION

2.2L Engine

- Relieve the fuel system pressure.
- Remove or disconnect the following:
 - Negative battery cable
 - Intake manifold, if necessary
 - Fuel injector electrical connections by pushing in the wire connector clip and gently pulling on the connector
 - Fuel feed inlet pipe from the rail

➔ **Use a back-up wrench on the fuel rail return fitting to prevent it from turning.**

- Fuel return pipe from the fuel pressure regulator

- Fuel pressure regulator
- Fuel rail attaching bolts and lift the fuel rail assembly from the cylinder head
- Fuel rail by moving the rail toward the front of the engine
- Fuel injector retaining clip
- Fuel injector

➔ **Because each injector is calibrated for a specific flow rate, make sure you only replace fuel injectors using an IDENTICAL part number to the old injectors.**

To install:

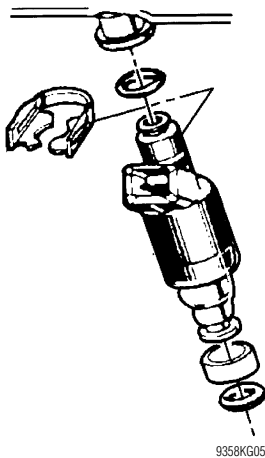
➔ **When installing the injector care should be taken not to tear or misalign O-rings.**

3. Lubricate the injector O-ring seals with clean engine oil and install them injector.
4. Install or connect the following:
 - Upper O-ring, lower back-up O-ring and lower O-ring
 - Fuel injector to the fuel rail
 - Fuel injector retaining clip
 - Fuel rail and insert it into the cylinder head
 - Fuel rail retaining bolts and tighten to 18 ft. lbs. (25 Nm)
 - Fuel pressure regulator

➔ **Use a back-up wrench on the fuel rail return fitting to prevent it from turning.**

- Return pipe to the fuel pressure regulator. Tighten the fuel pipe nut to 22 ft. lbs. (30 Nm).
- Fuel feed inlet pipe to rail

➔ **Rotate the fuel injectors as necessary to avoid stretching the wire harness.**



Exploded view of a typical fuel injector—
2.2L engine

- Injector electrical connections
 - Intake manifold, if removed
 - Negative battery cable
5. Inspect for leaks as follows:
 - a. Turn the switch to the **ON** position for 2 seconds.
 - b. Turn the ignition switch **OFF** for 10 seconds.
 - c. Turn the ignition switch to the **ON** position and check for leaks.

4.3L Engine

2002 VEHICLES

1. Relieve the fuel system pressure. Refer to the fuel system relief procedure in this section.
2. Relieve the fuel system pressure.
3. Remove or disconnect the following:
 - Negative battery cable
 - Fuel meter body electrical connection and the fuel feed and return hoses from the engine fuel pipes
 - Upper manifold assembly

➔ **When disconnecting the poppet nozzles, note the sequence for correct poppet nozzle placement to each cylinder.**

- Poppet nozzle out of the casting socket by squeezing the poppet nozzle locking tabs together while lifting the nozzle out of the casting socket
- Fuel meter body by releasing the locktabs

➔ **Each injector is calibrated. When replacing the fuel injectors, be sure to replace it with the correct injector.**

- Lower hold-down plate and nuts
4. While pulling the poppet nozzle tube downward, push with a small prytool down between the injector terminals and remove the injectors.

To install:

5. Lubricate the new injector O-ring seats with engine oil.
6. Install or connect the following:
 - O-rings on the injector
 - Fuel injector into the fuel meter body injector socket.
 - Lower hold-down plate and nuts. Torque the nuts to 27 inch lbs. (3 Nm).
 - Fuel meter body assembly into the intake manifold. Torque the fuel meter bracket retainer bolts to 88 inch. lbs. (10 Nm).

*** CAUTION

To reduce the risk of fire or injury ensure that the poppet nozzles are

properly seated and locked in their casting sockets

- Fuel meter body into the bracket and lock all the tabs in place

➔ **The fuel meter body assemblies are numbered to indicate poppet nozzle order.**

- Poppet nozzles into the casting sockets
 - Electrical connections
 - New o-ring seals on the fuel return and feed hoses
 - Fuel feed and return hoses and tighten the fuel pipe nuts to 22 ft. lbs. (30 Nm)
 - Negative battery cable
7. Turn the ignition **ON** for 2 seconds and then turn it **OFF** for 10 seconds. Again turn the ignition **ON** and check for leaks.
 8. Install the manifold plenum.

2003–05 VEHICLES

1. Relieve the fuel system pressure. Refer to the fuel system relief procedure in this section.
2. Relieve the fuel system pressure.
3. Remove or disconnect the following:
 - Negative battery cable
 - Upper manifold assembly

*** WARNING

Do not use any solvent that contains Methyl Ethyl Ketone (MEK). This solvent may damage fuel system components.

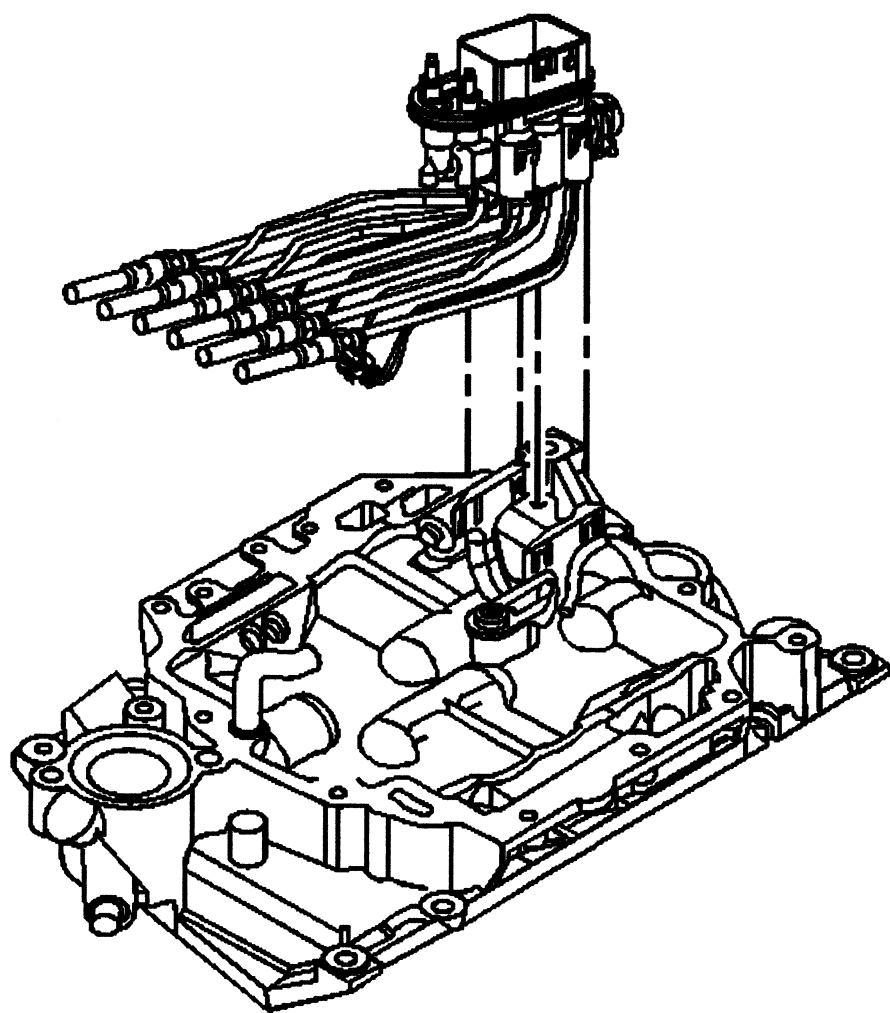
➔ **Before removal, clean the fuel meter body assembly with a spray type engine cleaner, GM X-30A or the equivalent, if necessary. Follow the package instructions. DO NOT soak fuel meter body assemblies in liquid cleaning solvent.**

4. Cover the fuel injector sockets to prevent dirt and other debris from entering the open fuel passages.

➔ **When disconnecting the fuel injectors, note the sequence to ensure correct injector placement to each cylinder.**

5. Lightly pull on the injector tube and use a small screwdriver to carefully release the injector from the manifold.
6. Remove the fuel meter body from the bracket by releasing the lock tabs on the bracket. Remove the injector retainer lock nuts and retainer.

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71461-S0N0-G04

Exploded view of the fuel meter assembly, including the injectors

➔Be careful when removing the fuel injectors to avoid damaging the electrical connector terminals. The fuel injector is serviced as a complete assembly only. Also, since the injectors are electrical components, these injectors should not be immersed in any type of liquid solvent or cleaner as damage may occur. Fuel injector cleaning is not recommended.

7. While pulling the fuel injector downward, push with a small tip punch down between the injector terminals until the injector is removed.

To install:

8. Lubricate the new injector O-ring seats with engine oil.
9. Install or connect the following:
 - O-rings on the injector
 - Fuel injector into the fuel meter body injector socket.
 - Retainer and the injector retainer lock nuts. Tighten the nuts to 27 inch lbs. (3 Nm).
 - Fuel meter body in the intake manifold. Push the fuel meter body into the bracket. Make sure all of the tabs are locked into place

➔The fuel meter body assemblies are numbered to indicate poppet nozzle order.

- Poppet nozzles into the casting sockets. Inspect the injectors in order to ensure they are firmly seated and locked in the casting sockets.
 - Upper intake manifold
 - Negative battery cable
10. Turn the ignition **ON** for 2 seconds and then turn it **OFF** for 10 seconds. Again turn the ignition **ON** and check for leaks.

DRIVE TRAIN

Manual Transmission

REMOVAL & INSTALLATION

- Shift the transmission into 3rd or 4th gear position.
- Remove or disconnect the following:
 - Negative battery cable
 - Shift lever and the if necessary, the shift housing
 - Parking brake cable for clearance
 - Propeller shaft
 - Side plate, if equipped
 - Transfer case and shift lever, on 4WD models
 - All wiring harness that would interfere with transmission removal
 - Fuel line retainers from the rear crossmember
 - Muffler from the catalytic converter
 - Exhaust pipes from the exhaust manifold
 - Catalytic converter hangar, if necessary
 - Exhaust section
 - Bolts and nuts attaching any transmission braces to the engine and transmission
- Disconnect the hydraulic clutch quick-connect from the concentric slave cylinder following 1 of the 2 steps:
 - Use 2 small prytools at 180 degrees from each other to depress the white plastic sleeve on the quick connect to separate the clutch line from the concentric slave cylinder quick connect.
 - Use special tool J-36221 to depress the white plastic sleeve on the quick connect to separate the clutch line end from the concentric slave cylinder quick connect.
- Remove or disconnect the following:
 - Bolts securing the clutch housing cover to the transmission, if equipped
 - Clutch plate and clutch cover, if necessary
- Support the transmission with a suitable jack.
 - Rear crossmember from the frame rail
 - Wiring harness from the front crossmember, if equipped. Move the wiring harness away from the transmission oil pan. Lower the transmission enough to gain access to the top of the transmission.
 - Fuel line retainers or wiring har-

nesses from the top of the transmission

- Bolt, washer, and nut securing the wiring harness ground wires to the engine block
- Bolts retaining the transmission to the engine. Pull the transmission straight back on the clutch hub splines.

6. Lower the transmission using the transmission jack.

To install:

Installation is the reverse of removal, but please note the following important steps.

7. Place a THIN coat of high-temperature grease on the main drive gear (input shaft) splines.

8. Secure the transmission to the floor jack and raise the transmission into position.

➡On some models, it may be necessary to rotate the transmission clockwise while inserting it into the clutch hub.

9. Slowly insert the input shaft through the clutch. Rotate the output shaft slowly to engage the splines of the input shaft into the clutch while pushing the transmission forward into place. Do not force the transmission into position, the transmission should easily fall into place once everything is properly aligned.

10. Tighten the transmission mounting bolts to 35 ft. lbs. (47 Nm).

11. Do not remove the transmission jack until the crossmembers have been installed.

12. Check the transmission fluid level and replenish as necessary.

Automatic Transmission

REMOVAL & INSTALLATION

- Remove or disconnect the following:
 - Negative battery cable
- Drain the transmission fluid.
 - Driveshaft from the transmission (2WD) and transfer case, if equipped (4WD)
- Support the transmission with a suitable transmission jack.
 - Shift cable from the transmission control lever and bracket
 - Nut and washer securing the transmission mount to the crossmember
 - Bolts and washers securing the mount to the transmission
 - Exhaust pipe from the exhaust manifold(s)

- Bolts securing the converter pan cover to the transmission, if equipped
- 3 bolts securing the torque converter to the flywheel
- Bolt, clip, and strap securing the three fuel lines and transmission vent hose to the transmission case
- Bolts and nut securing the transmission to the engine
- Oil filler tube and seal from the transmission
- Transmission cooler lines from the transmission. Plug the lines and the ports in the transmission.
- Wiring harness connectors from the transmission.

4. Inspect for any other wiring, brackets etc. which may interfere with the removal of the transmission.

5. Since the transmission acts as a rear engine mount, properly support the rear of the engine with an underbody support or other suitable support before attempting to remove the transmission. Otherwise the rear of the engine may pitch downward and components on the rear of the engine and on the firewall may be damaged.

6. Remove the transmission from the engine by pulling the transmission rearward to disengage it from the locator dowel pins on the back of the block. Carefully lower the transmission from the vehicle. Use care that the torque converter does not fall out of the front of the transmission.

➡Use converter holding strap tool No. J-21366, to secure the torque converter to the transmission during removal and installation procedures.

To install:

Installation is the reverse of removal, but please note the following important steps.

7. Make sure the torque converter is fully seated in the pump drive. If not, the transmission will not fit tightly to the rear of the engine block.

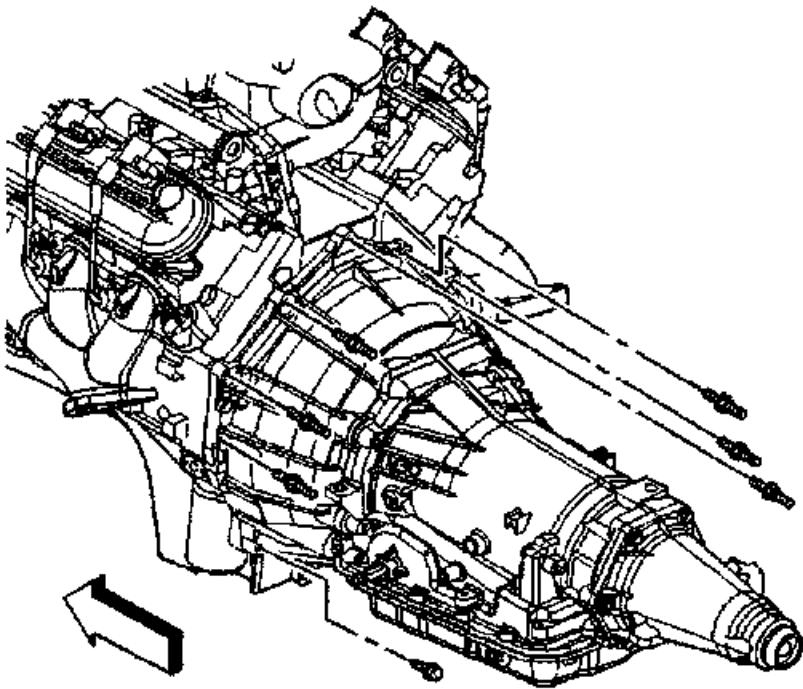
8. Raise the transmission into position and remove the torque converter holding strap and carefully. Slide the transmission forward until the dowel pins are engaged.

9. The torque converter should be flush with the flywheel and turn freely by hand.

10. Install the transmission-to-engine bolts. Tighten the bolts to 34 ft. lbs. (47 Nm).

11. Tighten the torque converter-to-flywheel bolts to 37 ft. lbs. (50 Nm).

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06025-S10P-G04

Automatic transmission mounting—4.3L engine shown: 2.2L similar

12. If equipped, tighten the converter pan cover to the transmission bolts to 37 ft. lbs. (50 Nm)

13. Tighten the bolts and washers securing the transmission mount to 35 ft. lbs. (47 Nm).

14. Tighten the nut and washer securing the transmission mount to the crossmember to 38 ft. lbs. (52 Nm).

15. Refill the transmission with the proper amount and type of fluid.

16. Connect the negative battery cable. Start the vehicle and allow to warm while checking for leaks. Road test the vehicle to check for shift quality.

Clutch

REMOVAL & INSTALLATION

1. Remove or disconnect the following:
 - Negative battery cable
 - Transmission
2. Install a clutch alignment tool or a used transmission input shaft to support the clutch.
3. If the clutch assembly is going to be reused, mark the flywheel, clutch cover and a pressure plate lug for alignment when installing.
4. Remove or disconnect the following:
 - Clutch cover bolts and washers
 - Clutch cover assembly and the clutch plate
 - Clutch alignment tool

5. Clean all parts and inspect for damage.

To install:

6. Install or connect the following:
 - Clutch alignment tool, to support the clutch

- Clutch cover by aligning the matchmarks or, if new, align the lightest part of the cover, identified by a yellow dot, with the heaviest part identified by an **X**.
- Clutch plate/clutch cover assembly to the flywheel. Tighten the bolts to 33 ft. lbs. (45 Nm) for 2.2L engines or to 29 ft. lbs. (40 Nm) for 4.3L engines.

➔ **Tighten each screw 1 turn at a time to avoid warping the clutch cover.**

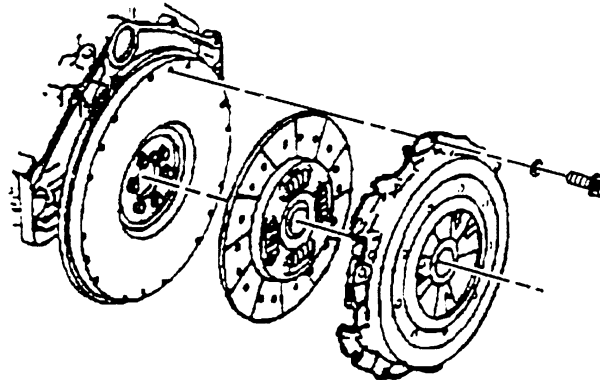
7. Remove the clutch alignment tool.
8. Install or connect the following:
 - Transmission
 - Negative battery cable

Hydraulic Clutch System

Bleeding air from the hydraulic clutch system is necessary whenever any part of the system has been disconnected or the fluid level (in the reservoir) has been allowed to fall so low, that air has been drawn into the master cylinder.

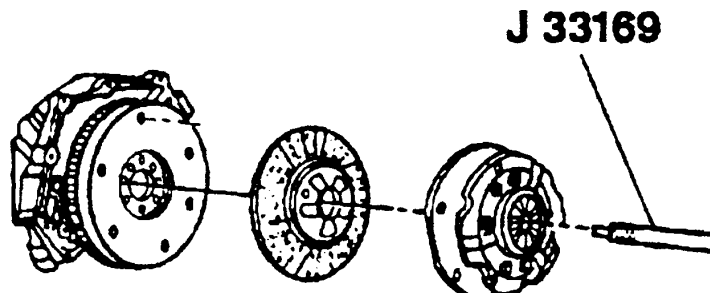
BLEEDING

1. Fill master cylinder reservoir with new brake fluid conforming to DOT 3 specifications.



7924JG53

Exploded view of the clutch disc and related components



7924JG22

Use the clutch alignment tool to center and support the clutch disc during installation

**** CAUTION**

Always use new fluid from a sealed container. Never, under any circumstances, use fluid that has been bled from a system to fill the reservoir as it may be aerated, have too much moisture content and possibly be contaminated.

2. Have an assistant fully depress and hold the clutch pedal, then open the bleeder screw.

3. Close the bleeder screw and have your assistant release the clutch pedal.

4. Repeat the procedure until all of the air is evacuated from the system. Check and refill master cylinder reservoir as required to prevent air from being drawn through the master cylinder.

➔ **Never release a depressed clutch pedal with the bleeder screw open or air will be drawn into the system.**

5. If the previous steps do not result in satisfactory pedal feel, remove the reservoir cap and pump the clutch pedal very fast for 30 seconds. Stop to let the air escape, then repeat the procedure as necessary to purge all remaining air.

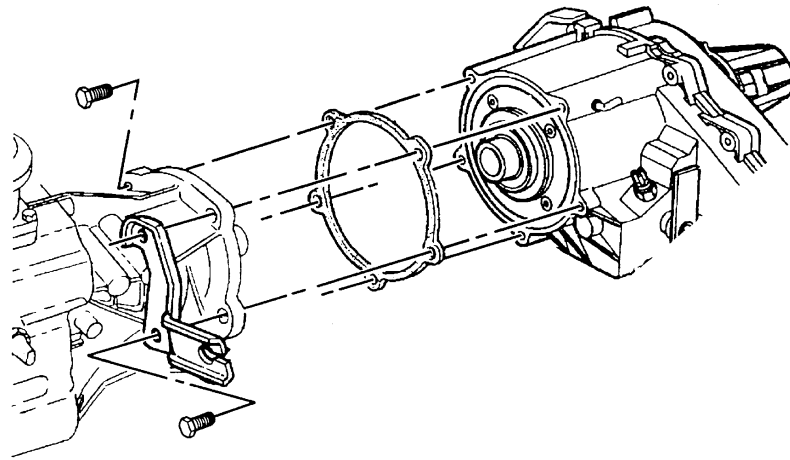
6. Test the clutch for proper operation.

Transfer Case Assembly**REMOVAL & INSTALLATION**

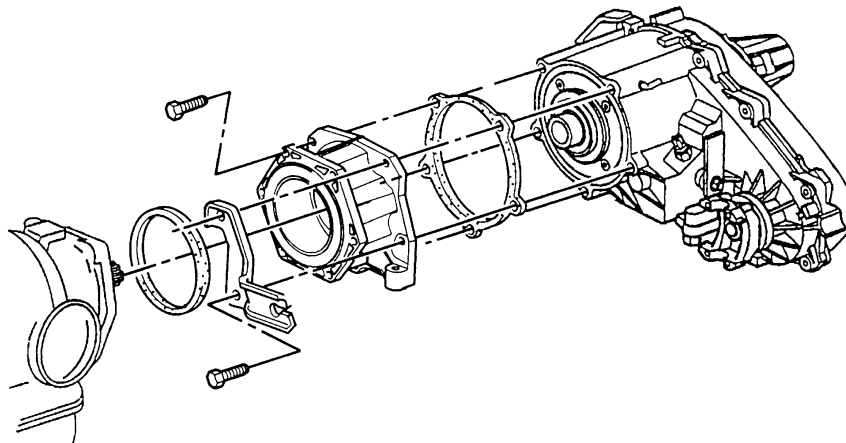
1. Disconnect the negative battery cable.
2. Shift the transfer case into the **4HI** range.
3. Drain the transfer case fluid.
4. Support the transfer case.
5. Remove or disconnect the following:
 - Skid plate
 - Front and rear driveshafts from the transfer case. Matchmark the shafts prior to removal.
 - Vacuum lines and/or the electrical connectors, as equipped
 - Transfer case shift rod/cable from the case, if applicable
 - Support brace-to-transfer case bolts, if applicable
 - Transfer case
6. Remove all traces of old gasket material from the mating surfaces.

To install:

7. Install or connect the following:
 - New gasket using sealer to hold it in position
 - Transfer case. Torque the bolts to 33–35 ft. lbs. (45–47 Nm).
 - Support brace bolts. Torque the



7924JG27

Typical transfer case-to-manual transmission mounting

7924JG28

Typical transfer case-to-automatic transmission mounting

- bolts to 35–37 ft. lbs. (47–50 Nm), if equipped.
- Shift rod to the case, if equipped
 - Vacuum lines and/or electrical connections, as necessary
 - Front and rear driveshafts by aligning the matchmarks
8. Refill the transfer case.
 - Skid plate, if equipped
 - Negative battery cable

Halfshaft**REMOVAL & INSTALLATION**

1. Unlock the steering column so the steering linkage is free to move.
2. Remove the front wheel and tire assemblies.
3. Insert a drift through the brake caliper and into one of the rotor vanes to prevent the drive axle from turning.

4. Remove the axle nut and washer. Remove the drift from the brake rotor.

5. Remove the front brake rotors and support the caliper with a piece of wire in order to prevent damage to the brake hose.

6. Remove the brackets from the upper control arm holding both the Anti-lock Brake System (ABS) wire and the brake hose.

7. Remove the ABS bracket located on the top of the upper control arm ball joint.

8. Strap the frame securely to the hoist in order to prevent movement.

➔ **Be careful that the jackstand does not damage or bend any components it may contact.**

9. Position a jackstand under the lower control arm. Support the weight of the steering knuckle assembly and lower control arm with a jackstand.

10. Disengage the wheel drive shaft from the hub by placing a brass drift against the

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outer end of the drive axle in order to protect the threads. Sharply strike the brass drift with a hammer. Do not attempt to remove the axle at this time.

11. Support the steering knuckle and assembly with a piece of wire in order to prevent damage to the outer tie rod and ABS wire.

12. Remove the upper ball joint.

13. Remove the lower part of shock absorber.

➔After the lower ball joint is loose from the knuckle, push the axle shaft in toward the differential carrier in order to allow room for the knuckle and assembly to be removed.

14. Remove the lower ball joint.

- Remove the axle from the steering knuckle assembly.

➔Lower the safety stand from the lower control arm in order to relieve the pressure of the torsion bar and in order to allow for clearance.

** WARNING

Be careful not to damage the axle seal during removal of the differential carrier shield.

15. Remove the front differential carrier shield.

16. Disconnect the left side halfshaft from the differential carrier by placing a block of wood or a brass drift against the tripot housing. Firmly strike the block of wood outward from the case with a hammer. Strike hard enough to overcome the

snapring pressure holding in the shaft. Disconnect the right side halfshaft in the same manner.

17. Pull the axle straight out from the differential carrier. Support the drive axle so the boot does not get torn.

** CAUTION

To prevent personal injury and/or component damage, do not allow the weight of the vehicle to load the front wheels, or attempt to operate the vehicle, when the halfshaft(s) or wheel drive shaft nut(s) are removed. To do so may cause the inner bearing race to separate, resulting in damage to brake and suspension components and loss of vehicle control.

18. Remove the halfshaft (drive axle).

To install:

19. Install the halfshaft to the differential carrier, as follows:

- With both hands on the tripot housing, align the splines on the shaft with the differential carrier.
- Center the drive axle into the differential carrier seal.
- Firmly push the shaft straight into the differential carrier until the snapring seats into place.

20. Raise the safety stand to support the weight of the lower control arm.

➔It will be necessary to slightly start the knuckle onto the drive axle while simultaneously guiding the lower ball stud to its proper location on the steering knuckle.

21. Install the lower ball joint.

22. Install the lower part of the shock absorber.

23. Install the upper ball joint.

24. Install the halfshaft/axle shaft washer and nut. Tighten to 103 ft. lbs. (140 Nm).

25. Install the ABS bracket located on the top of the upper control arm ball joint.

26. Install the brackets from the upper control arm holding both the ABS wire and the brake hose.

27. Install the front brake rotors.

28. Install the front differential carrier shield.

29. Remove the strap from the frame.

30. Install the front tire and wheel assemblies.

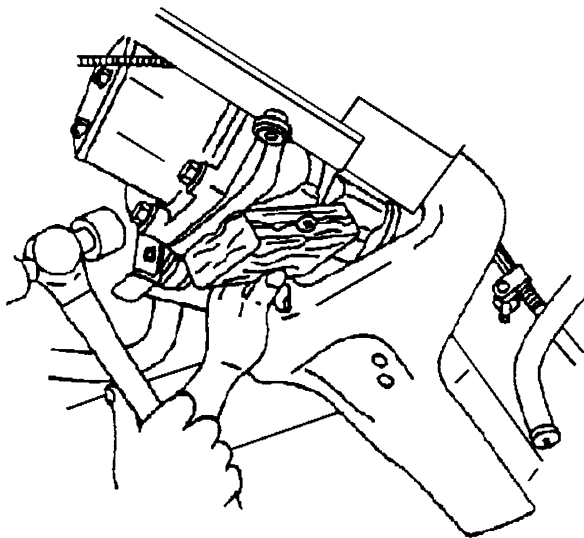
CV-Joints

OVERHAUL

Outer CV-Joint

➔This procedure requires the use of the following: J 35910 Seal Clamp Tool, J 41048 Swage Clamp Tool and J 8059 Snap Ring Pliers, or equivalent tools.

- Remove or disconnect the following:
 - Front wheel
 - Halfshaft and place it in a vise. Use protective covers on the vise to avoid damaging the halfshaft.
- Use a hand grinder to cut through the swage rings. Do not damage the outer race.
- Compress the seal on the halfshaft and away from the CV-joint outer race. Wipe all grease away from the face of the CV-joint.
- Find the halfshaft retaining snapring, which is in the inner race. Spread the snapring ears apart using Snapring Pliers J-8059, or equivalent.
- Pull the outer CV-joint from the halfshaft. Discard the old seal.
- Disassemble the chrome alloy balls from the CV-joint cage as follows:
 - Position a brass drift against the CV-joint cage and tap it with a hammer to tilt the cage.
 - Remove the 1st chrome alloy ball from the cage.
 - Tilt the cage in the opposite direction.
 - Remove the opposite chrome alloy ball.
 - Repeat the procedure until all 6 balls are removed.
- Disassemble the CV-joint cage and inner race as follows:



71461-SONO-G05

To separate the halfshaft, place a block of wood against the tripot housing. Firmly strike the block of wood outward from the case with a hammer

- Pivot the cage and race 90 degrees to the center line of the outer race.
 - Align the cage windows with outer race lands.
 - Remove the cage from the outer race.
 - Rotate the inner race upward and remove it from the cage.
- Thoroughly clean and inspect all parts.

To install:

- Lubricate the parts with a light coat of grease.
- Assemble the CV-joint cage and inner race, as follows:
 - Rotate the inner race 90 degrees to the cage centerline.
 - Align the cage windows with inner race lands.
 - Insert the inner race into the cage by rotating the inner race downward.
 - Insert the cage/inner race into the outer race.
- Assemble the chrome alloy balls into the CV-joint cage, as follows:
 - Position a brass drift against the CV-joint cage and tap it with a hammer to tilt the cage.
 - Insert the 1st chrome alloy ball into the cage.
 - Tilt the cage in the opposite direction.
 - Insert the opposite chrome alloy ball.
 - Repeat the procedure until all 6 balls are inserted.

12. Pack the CV-joint seal and the CV-joint assembly with the grease supplied in the kit. The amount of grease supplied in this kit has been pre-measured for this application.

13. Place the new small swage clamp onto the CV-joint seal.

14. Place the large retaining clamp on the seal.

15. Position the small end of the CV-joint seal into the joint seal groove on the halfshaft bar.

16. Position the outboard end of the halfshaft assembly in Swage Clamp Tool J 41048, or equivalent. Align the swage clamp within the clamp tool.

17. Place the top half of the Swage Clamp Tool J 41048 on the bottom half. Check to make sure there are no pinch points on the seal before proceeding with procedures. Insert the bolts and tighten by hand until snug.

18. Align the seal, the halfshaft bar and swage clamp. Tighten each bolt 180 degrees at a time, using a ratchet wrench. Alternate between each bolt until both sides are bottomed.

19. Loosen the bolts. Separate the dies. Check the swage clamp for any "lip" deformities. If the deformities exist, place the swage clamp back into the Swage Clamp Tool J 41048.

20. Make sure the retaining ring side of the CV-joint inner race faces the halfshaft bar before installation.

21. Place the retaining snapping into the CV-Joint inner race.

➡The retaining snapping inside of the inner race will engage in the halfshaft bar groove with a "click" when the CV-Joint is in the proper position.

22. Slide the CV-Joint onto the halfshaft bar. Pull on the CV-Joint to be sure it is properly engaged.

23. Slide the large diameter of the CV-Joint seal, with the large retaining ring in place, over the outside edge of the CV-Joint outer race.

24. Position the lip of the CV-Joint seal into the groove on the CV-Joint outer race. Make sure to remove any excess air from the CV-Joint seal.

➡Make sure the boot lies flat against the outer race.

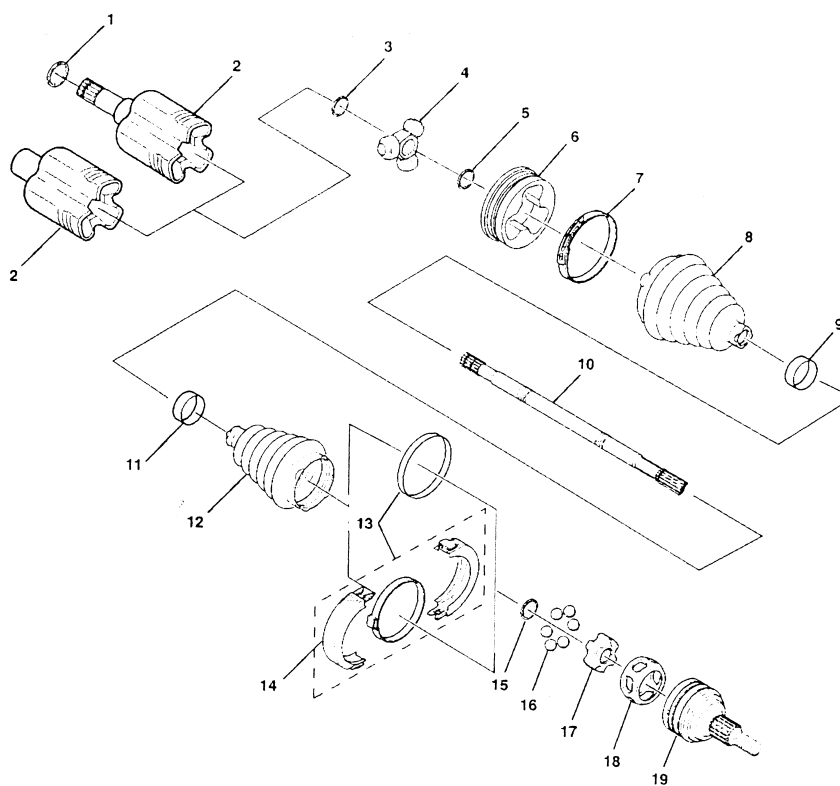
25. Using the Crimp tool J-35910, a torque wrench and a breaker bar, crimp the large CV-joint boot clamp to 130 ft. lbs. (176 Nm).

26. Check the clamp gap dimension; if it is not 0.085 in. (2.15mm), continue tightening the clamp until it is.

27. Install the halfshaft and the front wheel.

Inner (Tri-Pot) Joint

➡This procedure requires the use of the following: J 35566 Drive Axle Seal Clamp Pliers, J 41048 Swage Clamp Tool and J 8059 Snap Ring Pliers, or equivalent tools.



- Differential Shaft Ring
- Tripot Housing Assembly
- Spacer Ring
- Tripot Joint Spider Assembly
- Spacer Ring
- Tripot Bushing
- Boot Retaining Clamp
- Tripot Joint Boot
- Halfshaft Swage Ring
- Halfshaft Bar

- Halfshaft Swage Ring
- CV Joint Boot
- Swage Ring
- Clamp Protector
- Race Retaining Ring
- Ball
- CV Joint Inner Race
- CV Joint Cage
- CV Joint Outer Race

Exploded view of the CV-Joint Assembly

9308JG09

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1. Remove or disconnect the following:
 - Front wheel
 - Halfshaft and place it in a vise
 - Clamp from the boot with a pair of side cutters.

➔**Be careful not to damage the tripot housing.**

2. Use a hand grinder to cut through the swage ring.
 - Tripot housing and the trilobal tripot bushing from the halfshaft bar. Thoroughly degrease the housing and the spider assembly. Discard the tripot bushing. Use 320 grit 3M cloth (or equivalent) to remove any evident corrosion in the transmission sealing surface. Allow the housing and the spider assembly to dry.

➔**Handle the tripot spider assembly with care or the tripot balls and needle rollers may separate from the spider trunnion.**

3. Compress the tripot boot onto the halfshaft bar, away from the spider assembly
4. Spread the spacer rings using Snap Ring Pliers J 8059, or equivalent, to remove the spider assembly.
5. Remove the following items:
 - The spacer ring
 - The spider assembly
 - The second spacer ring
 - The tripot boot
6. Discard the tripot boot and spacer rings. Clean the halfshaft bar. Use a wire brush to remove any rust in the boot mounting area (grooves). Inspect the needle rollers, needle bearings and the trunnion. Inspect the tripot housing for unusual wear, cracks, or other damage. Use the appropriate kit to replace any damaged parts.

To install:

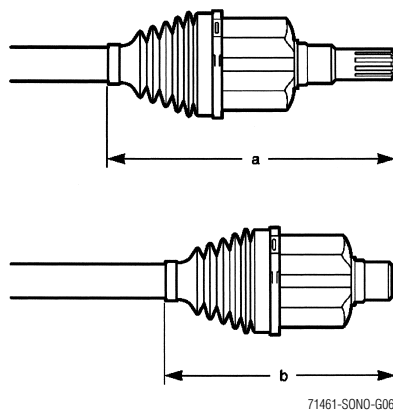
7. Position the new swage clamp onto the neck of the boot. Do not swage. Slide the new small swage clamp and the boot to the proper position on the halfshaft bar.
8. Position the neck of the boot in the boot groove on the halfshaft bar. In order to swage the swage clamp, position the inboard end of the halfshaft assembly in Swage Clamp Tool J 41048, or equivalent. align the swage clamp within J 41048.
9. Place the top half of the Swage Clamp Tool J 41048 on the bottom half. Check to make sure there are no pinch points on the boot before continuing. Insert the bolts and tighten by hand until snug.
10. Align the boot, the halfshaft bar and the swage clamp. Tighten each bolt 180 degrees at a time, using a ratchet wrench.

Alternate between each bolt until both sides are bottomed.

11. Loosen the bolts and separate the dies.

➔**If deformities exist in the swage clamp, place the swage clamp back into the Swage Clamp Tool. Make sure the swage clamp covers the whole swaging area. Re-swage the swage clamp.**

12. Inspect the swage clamp for any "lip" deformities.
13. Assemble the joint with the convolute retainer in the correct position. Assemble the joint to meet the specified dimension to avoid boot damage.
14. Install the convolute retainer over the boot capturing four convolutions
15. Install the spacer ring and spider assembly onto the halfshaft bar. Install the other spacer ring in the groove at the end of the halfshaft bar. Ensure that the rings are fully seated.
16. Pack the boot and housing with the grease supplied in the kit. The amount of grease supplied in this kit has been pre-measured for this application.
17. Place the large retaining clamp on the boot. Place the housing and the new trilobal tripot bushing over the spider assembly.
18. Install the boot onto the trilobal tripot bushing.
19. Measure the inboard stroke position (see accompanying diagram):
 - a. For male tripot housing assembly: dimension a = 11 in. (280mm).
 - b. For female tripot housing assembly: dimension b = 9 in. (228mm).
20. Secure the large retaining clamp and the boot to the housing using Drive Axle Seal Clamp Pliers J 35566, or equivalent.
21. Remove the convolute retainer from the boot.
22. Install the halfshaft and the front wheel.



Measure the inboard stroke position as shown

Axle Shaft, Bearing and Seal

REMOVAL & INSTALLATION

For the Axle Shaft, Bearing and Seal, Removal and Installation, please refer to Wheel Bearing procedure located in the section.

Pinion Seal

REMOVAL & INSTALLATION

➔**The following procedure requires the use of the Pinion Holding tool J-8614-10, the Pinion Flange Removal tool J-8614-1, J-8614-2, J-8614-3 and the Pinion Seal Installation tool J-23911.**

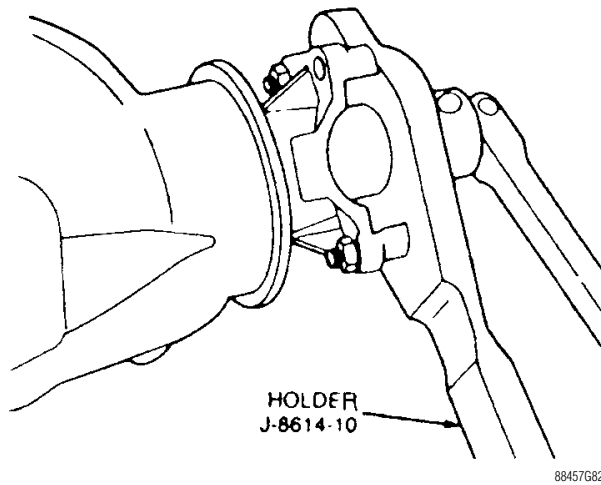
1. Remove or disconnect the following:
 - Driveshaft from the pinion flange. Matchmark the driveshaft prior to removal.
 - Driveshaft from the rear axle pinion flange and support the shaft up in body tunnel by wiring it to the exhaust pipe.

➔**If the U-joint bearings are not retained by a retainer strap, use a piece of tape to hold bearings on their journals.**

2. Mark the position of the pinion stem, flange and nut for reference.
3. Use an inch lbs. torque wrench to measure the amount of torque necessary to turn the pinion, then note this measurement as it is the combined pinion bearing, seal, carrier bearing, axle bearing and seal preload.
4. Remove or disconnect the following:
 - Pinion flange nut and washer, using a Pinion Holding tool J-8614-10 and a Pinion Flange Removal tool J-8614-1, J-8614-2, J-8614-3, as applicable
 - Pinion flange
 - Pinion oil seal by driving it out of the differential with a blunt chisel; DO NOT damage the carrier

To install:

5. Examine the seal surface of pinion flange for tool marks, nicks or damage, such as a groove worn by the seal. If damaged, replace flange.
6. Examine the carrier bore and remove any burrs that might cause leaks around the O.D. of the seal.
7. Apply GM seal lubricant 1050169 to the outside diameter of the pinion flange and sealing lip of new seal.
8. Install or connect the following:
 - New pinion oil seal using a seal installer tool



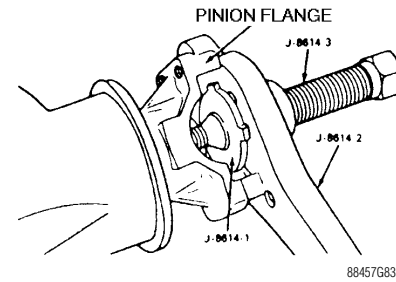
Removing the pinion nut using a pinion holding fixture tool

- Pinion flange and tighten nut to the same position as marked earlier. Tighten the nut a little at a time and turn the pinion flange several times after each tightening in order to set the rollers.
- 9. Measure the torque necessary to turn the pinion and compare this to the reading taken during removal. Tighten the nut additionally, as necessary to achieve the same preload as measured earlier,

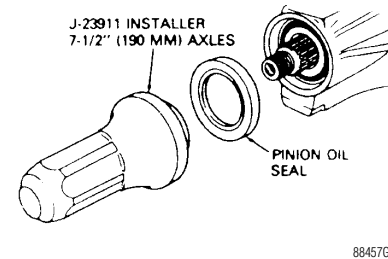
then tighten an additional 3–5 inch lbs. (0.34–0.56 Nm).

➔ **If fluid was lost from the differential housing during this procedure, be sure to check and add additional fluid, as necessary.**

10. Remove the support then align and secure the driveshaft assembly to the pinion flange.



A puller and adapter should be used to withdraw the pinion from the housing



Use the appropriately sized installation tool to drive the new seal into position.

➔ **The original matchmarks MUST be aligned to assure proper shaft balance and prevent vibration.**

STEERING AND SUSPENSION

Air Bag

*** CAUTION

Some vehicles are equipped with an air bag system, also known as the Supplemental Inflatable Restraint (SIR) system. The system must be disabled before performing service on or around system components, steering column, instrument panel components, wiring and sensors. Failure to follow safety and disabling procedures could result in accidental air bag deployment, possible personal injury and unnecessary system repairs.

PRECAUTIONS

Several precautions must be observed when handling the inflator module to avoid accidental deployment and possible personal injury.

- Never carry the inflator module by the wires or connector on the underside of the module.
- When carrying a live inflator module,

hold securely with both hands, and ensure that the bag and trim cover are pointed away.

- Place the inflator module on a bench or other surface with the bag and trim cover facing up.
- With the inflator module on the bench, never place anything on or close to the module, that may be thrown in the event of an accidental deployment.

2002 Vehicles

DISARMING

1. Turn the steering wheel so that the vehicle's wheels are pointing straight ahead.
2. Turn the ignition switch to **LOCK**, remove the key, then disconnect the negative battery cable.
3. Remove the AIR BAG fuse from the fuse block.
4. Remove the steering column filler panel or knee bolster.
5. Unplug the Connector Position Assurance (CPA) and yellow two way connector at the base of the steering column.
6. Remove the Connector Position Assurance (CPA) from the passenger yellow

two way connector located behind the glove box.

7. Unplug the yellow two way connector located behind the glove box.

8. Connect the negative battery cable.

➔ **With the AIR BAG fuse removed, the battery cable connected and the ignition in the ON position, the AIR BAG warning lamp will be ON. This is normal and does not indicate a system malfunction.**

ARMING

1. Disconnect the negative battery cable.
2. Attach the yellow two way connector located behind the glove box.
3. Install the Connector Position Assurance (CPA) to the passenger yellow two way connector located behind the glove box.
4. Turn the ignition switch to **LOCK**, then remove the key.
5. Attach the two way connector at the base of the steering column and the Connector Position Assurance (CPA).
6. Install the steering column filler panel or knee bolster.

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7. Install the AIR BAG fuse to the fuse block.
8. Connect the negative battery cable.
9. From the passenger seat, turn the ignition switch to **RUN** and make sure that the AIR BAG warning lamp flashes seven times and then shuts off. If the warning lamp does not shut off, make sure that the wiring is properly connected. If the light remains on, take the vehicle to a reputable repair facility for service.

2003–05 Vehicles

DISARMING

1. Turn the steering wheel so that the vehicle's wheels are pointing straight ahead.
2. Turn the ignition switch to **LOCK**, remove the key, then disconnect the negative battery cable.
3. Remove the SIR fuse from the fuse block.
4. Raise and support the vehicle.
5. Remove the Connector Position Assurance (CPA) from both inflatable restraints front end discriminating sensor connectors located on the frame crossmember.
6. Disconnect the inflatable restraints front end discriminating sensor connectors.

ARMING

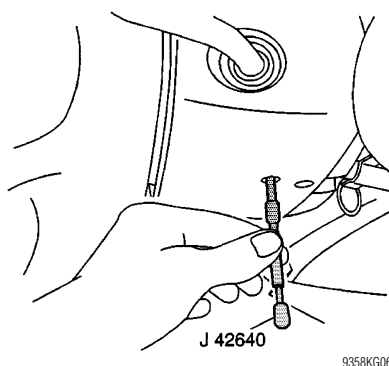
1. Disconnect the negative battery cable.
2. Connect the inflatable restraint front end discriminating sensor connectors to the inflatable restraints front end discriminating sensor.
3. Install the CPA to the inflatable restraints front end discriminating sensor connectors.
4. Install the SIR fuse into the fuse block.
5. Staying well away from all air bags, turn **ON** the ignition, with the engine **OFF**.
6. The AIR BAG indicator will flash 7 times.
7. The AIR BAG indicator will then turn **OFF**.
8. Perform the SIR-Diagnostic System Check if the AIR BAG indicator does not operate as described.

Power Steering Gear

REMOVAL & INSTALLATION

2 Wheel Drive (2WD) Models

1. Position a fluid catch pan under the power steering gear.

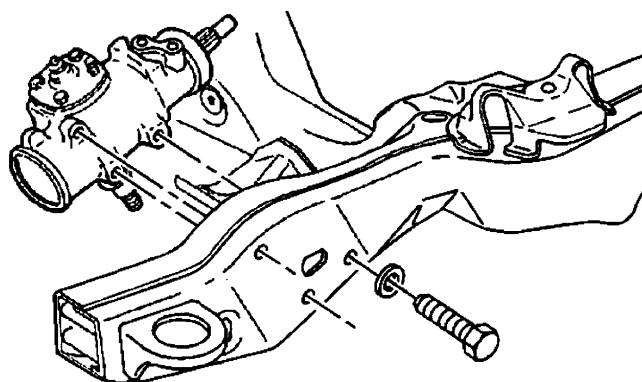


Use J 42640 to lock the steering column

** WARNING

Do NOT rotate the steering shaft after the steering column has been removed.

2. Lock the steering column through the access hole in the steering column lower trim cover using steering column anti-rotation pin J 42640.
3. Remove or disconnect the following:
 - Air cleaner assembly
 - Intermediate shaft from the steering gear
 - Feed and return fluid hoses from the steering gear. Immediately cap or plug all openings to prevent system contamination or excessive fluid loss.
 - Intermediate shaft lower coupling shield, if equipped
 - Lower intermediate shaft coupling bolt
 - Matchmark the lower intermediate shaft coupling and the steering shaft
 - Lower intermediate shaft coupling from the steering shaft
 - Pitman arm from the gear pitman shaft
 - Power steering gear-to-frame bolts



Power steering gear mounting

and washers, then carefully remove the steering gear from the vehicle

To install:

4. Install or connect the following:
 - Steering gear to the vehicle and tighten the bolts to 55 ft. lbs. (75 Nm)
 - Pitman arm
 - Intermediate shaft to the power steering, making sure the matchmarks line up. Tighten the bolt to 26 ft. lbs. (35 Nm).
 - Pressure and return hoses to the power steering gear. Tighten the pressure hose to 18 ft. lbs. (25 Nm) for 2.2L engines and 22 ft. lbs. (30 Nm) for 4.3L engines. Tighten the return hose to 18 ft. lbs. (25 Nm).
 - Shield over the intermediate shaft lower coupling, if equipped
 - Air cleaner assembly
5. Remove the steering column lock pin
6. Bleed the power steering system

4 Wheel Drive (4WD) Models

This procedure requires the use of the following special tools: J 24319-B Steering Linkage and Tie Rod Puller, J 42640 Steering Column Anti-Rotation Pin, J 29193 Steering Linkage Installer (12mm), J 29194 Steering Linkage Installer (14mm).

1. Position a fluid catch pan under the power steering gear.

** WARNING

DO NOT rotate the steering shaft after the steering column has been removed.

2. Lock the steering column through the access hole in the steering column lower trim cover using steering column anti-rotation pin J 42640.
3. Remove or disconnect the following:

- Air cleaner assembly
 - Intermediate shaft lower coupling shield, if equipped
 - Wiring harness clip from the power steering return hose at the power steering gear
 - Feed and return fluid hoses from the steering gear. Immediately cap or plug all openings to prevent system contamination or excessive fluid loss.
 - Lower intermediate shaft coupling bolt
 - Matchmark the lower intermediate shaft coupling and the steering shaft
 - Lower intermediate shaft coupling from the steering shaft
4. Raise the vehicle.
- Steering linkage shield
 - Differential carrier shield mounting bolts
 - Differential carrier shield
 - Pitman arm ball stud cotter pin and nut at the relay rod
 - Pitman arm from relay rod using a suitable puller
 - Steering gear mounting bolts and the washers from the frame
 - Steering gear
 - Pitman arm
- To install:**
5. Install or connect the following:
- Pitman arm
 - Steering gear
 - Power steering gear to the frame washers and mounting bolts. Tighten the bolts to 55 ft. lbs. (75 Nm).
 - Relay rod to the pitman arm ball stud. Ensure the seal is on the stud
6. On 2002–03 vehicles, seat the taper using tool J 29193 or J 29194 and tighten the tool to 48 ft. lbs. (62 Nm).
7. Remove the special tool from the pitman arm ball stud, if necessary.
8. Install or connect the following:
- New nut and cotter pin to the pitman arm ball stud at the relay rod and tighten the pitman arm ball stud nut at the relay rod to 61 ft. lbs. (83 Nm)
 - Differential carrier shield
 - Differential carrier shield mounting bolts
 - Steering linkage shield
9. Lower the vehicle.
- Intermediate shaft to the power steering, making sure the matchmarks line up. Tighten the bolt to 26 ft. lbs. (35 Nm).
 - Pressure and return hoses to the power steering gear. Tighten the

pressure hose to 22 ft. lbs. (30 Nm) and the return hose to 18 ft. lbs. (25 Nm).

- Wiring harness clip to the power steering return hose at the power steering gear
 - Shield over the intermediate shaft lower coupling, if equipped
 - Air cleaner assembly
10. Remove the steering column lock pin
11. Bleed the power steering system

Shock Absorbers

REMOVAL & INSTALLATION

Front

2WD MODELS

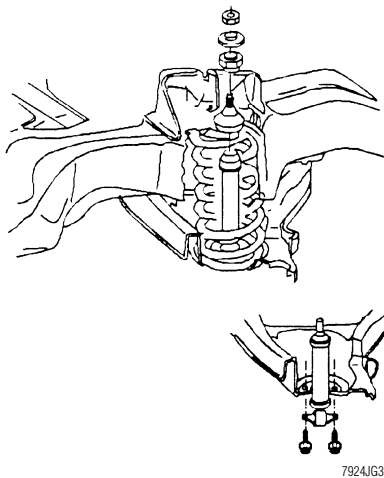
1. Remove or disconnect the following:
- Wheel
 - Mounting nut

➔ **Hold the shock absorber stem with a wrench while backing the nut off.**

- Retaining nut and grommet
- Shock absorber-to-lower control arm bolts
- Shock absorber
- Replace the parts, as necessary.

To install:

2. Fully extend the shock absorber stem, then push it up through the lower control arm and spring so that the upper stem passes through the mounting hole in the upper control arm frame bracket.
3. Install or connect the following:
- Retaining nut and grommet on the stem. Tighten the nut to 106 inch lbs. (12 Nm).
 - Shock absorber-to-lower control



Front shock absorber mounting—2WD vehicles

arm bolts and tighten to 22 ft. lbs. (30 Nm)

- Wheel

4WD MODELS

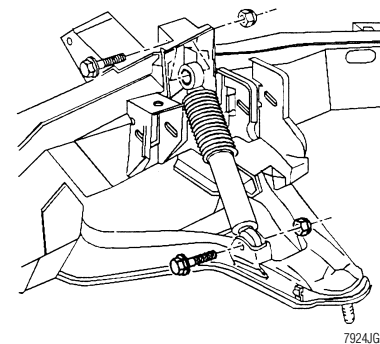
1. Remove or disconnect the following:
- Wheel
 - Lower nut/bolt and collapse the shock absorber
 - Shock absorber upper nut and bolt
 - Shock absorber

To install:

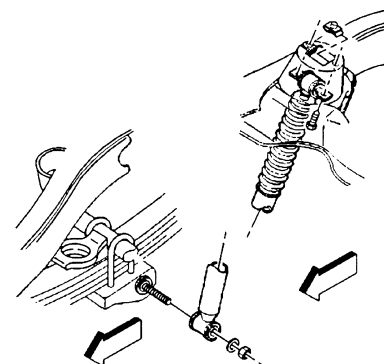
2. Install or connect the following:
- Shock absorber to the bracket. Tighten the nuts/bolts to 54 ft. lbs. (73 Nm).
 - Wheel

Rear

1. Properly support the rear axle assembly.
2. Remove or disconnect the following:
- Automatic level control air lines from the shock absorber, if equipped
 - Shock absorber-to-frame retainers at the top of the shock
 - Shock-to-axle retainers at the bottom of the shock
 - Shock absorber



Front shock absorber mounting—4WD vehicles



Rear shock absorber mounting

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To install:

3. Install the shock in the vehicle and loosely install the upper mounting fasteners to retain it.

4. Align the lower-end of the shock absorber with the axle mounting, then loosely install the retainers.

5. Tighten the upper shock retainers to 18 ft. lbs. (25 Nm). Tighten the lower shock retainers to 62 ft. lbs. (84 Nm).

6. If equipped, attach the automatic level control air lines to the shock absorber.

Coil Springs

REMOVAL & INSTALLATION

1. Remove or disconnect the following:

- Wheel
- Stabilizer shaft link from the lower control arm
- Shock absorber

2. Secure Coil Spring Remover & Installer tool J 23028-01, or equivalent to the end of a suitable jack. Cradle the lower control arms using the tool. Raise the jack to relieve tension on the lower control arm pivot bolts.

3. Turn the steering wheel to one side, to allow the steering linkage to clear the lower control arm front pivot bolt.

4. Remove or disconnect the following:

- Lower control arm rear and front pivot bolts and nuts

5. Lower tool J 23028-01 slowly to relieve tension from the coil spring.

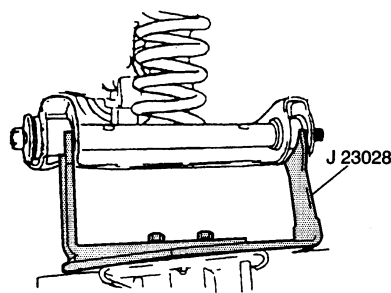
- Front coil spring and insulators. While removing the coil spring, do not apply any force to the lower control arm and/or ball joint.

To install:

6. Install or connect the following:

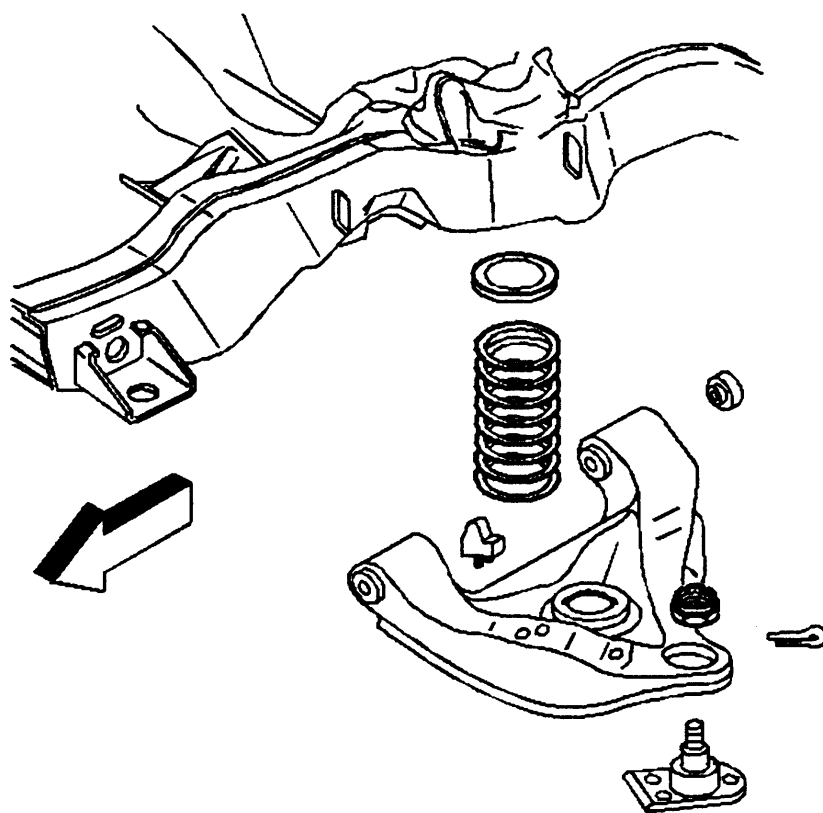
- Front coil spring and insulators on the lower control arm

➔ **Make sure that the coil spring covers all or part of one inspection drain hole.**



42372-SONO-G01

View of the installed coil spring removal tool



42372-SONO-G02

Exploded view of the coil spring removal

The other hole must be partly or completely uncovered. Rotate the coil spring as necessary.

7. Support the control arm using tool J 23028-01. Position the coil spring and insulator in the upper spring seat on the frame.

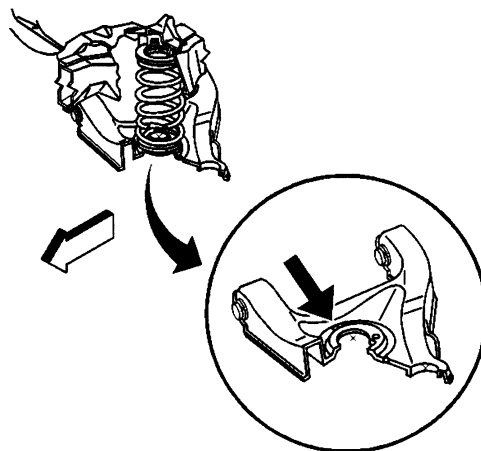
8. Raise the lower control arm using tool J 23028-01.

9. Install or connect the following:

- Lower control arm to the frame

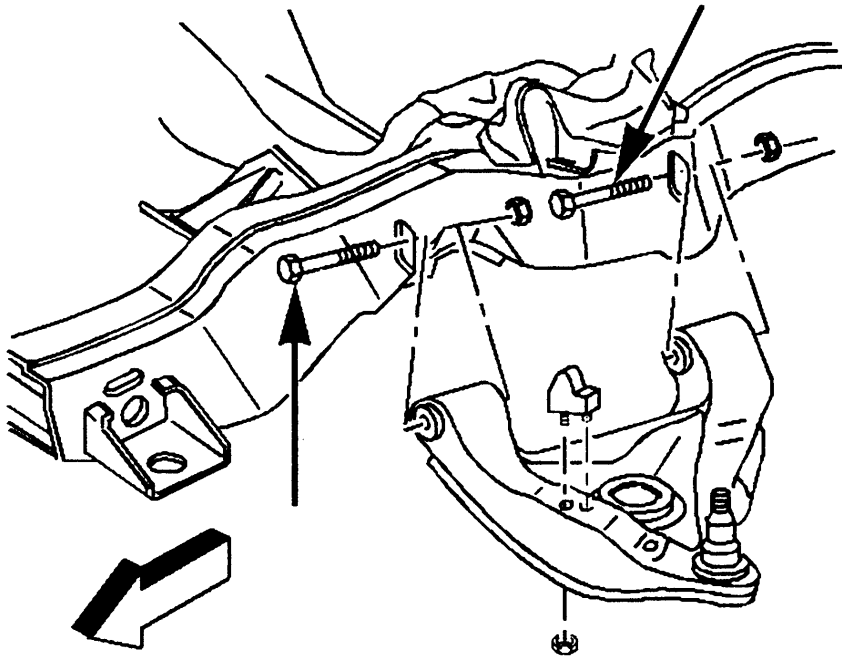
➔ **You must install the bolts in the direction shown to keep proper steering linkage clearance.**

- Lower control arm front and rear pivot bolts with NEW nuts. With the suspension loaded, torque the front bolt to 85 ft. lbs. (115 Nm) and the rear bolt to 72 ft. lbs. (98 Nm). Remove tool J 23028-01.



42372-SONO-G03

The coil spring must cover all or part of one inspection drain hole. The other hole must be partly or completely uncovered



42372-S0N0-G04

For steering linkage clearance, the control arm pivot bolts must be installed as shown

- Shock absorber
- Stabilizer shaft link to the lower control arm

10. Check and adjust the front wheel alignment.

Leaf Springs

REMOVAL & INSTALLATION

➔The following procedure requires the use of two sets of jackstands.

1. Support the rear axle with jackstands, support the axle and the body separately in order to relieve the load on the rear spring.
2. Remove or disconnect the following:
 - Wheel
 - Shock absorber
 - U-bolt nuts, washers, anchor plate and bolts
 - Spare tire, if equipped
 - Rear exhaust hangers and lower the rear exhaust, if necessary
 - Shackle-to-frame bolt, washers and nut
 - Fuel tank, if necessary
 - Front bracket nut, washers and bolt
 - Spring
 - Shackle from the spring, if necessary

To install:

3. Install or connect the following:
 - Shackle to the rearward spring eye using the bolt, washers and nut, but do not fully tighten at this time.

- Spring assembly
- Spring to the front bracket using the bolt, washers and nut, but do not fully tighten at this time.
- Fuel tank, if removed
- Shackle-to-frame bolt, washers and nut, but do not fully tighten at this time. If used, remove the spring support.
- U-bolts, anchor plate, washers and U-bolt nuts. Torque the nuts using 2 passes of a diagonal sequence:
 - a. Step 1: Torque to 18 ft. lbs. (25 Nm).
 - b. Step 2: Torque to 73 ft. lbs. (100 Nm) in the sequence.
- 4. Position the axle to achieve an approximate gap of 6.46–6.94 in. (164–176mm) between the axle housing tube and the metal surface of the rubber frame bumper bracket. Measure from the housing between the U-bolts to the metal part of the rubber bump stop on the frame.
- 5. While supporting the axle in this position, tighten the front and rear spring mounting fasteners to 89 ft. lbs. (122 Nm).
- 6. Install or connect the following:
 - Rear exhaust in position and tighten the hangers
 - Spare tire
 - Shock absorber

Torsion Bar

Instead of the coil spring used on the front suspension of 2WD vehicles, the 4WD vehicles are equipped with a torsion bar.

REMOVAL & INSTALLATION

➔The following procedure requires the use of the Torsion Bar Unloader tool J-36202.

1. Remove or disconnect the following:
 - Transmission shield, if equipped
 - Torsion bar unloader tool to relax the tension on the torsion bar adjusting arm screw; record the number of turns necessary to properly install the tool. Remove the adjusting screw and the unloader tool.
 - Lower link mount nut from one side
 - Torsion bars by disengaging them

➔Note the direction of the forward end and side of the torsion bar being removed

- Lower link nut from the opposite side
- Lower link mount, upper link mount nut
- Upper link mount
- Torsion bar from the frame

To install:

2. Install or connect the following:
 - Torsion bar and support
 - Upper link mount. Torque the nut to 48 ft. lbs. (68 Nm).
3. Place a jack under the torsion bar to release tension.
4. Install or connect the following:
 - Lower link mount bushing and nut. Torque the nut to 37 ft. lbs. (50 Nm).
 - Torsion bar unloader tool. Tighten the tool against the adjusting arm the same number turns recorded earlier and remove the tool. This loads the torsion bars.
 - Transmission shield, if removed

Steering Knuckle

REMOVAL & INSTALLATION

1. Raise and support the vehicle.
2. Support the lower control arm with jack stands.
3. Remove the wheel hub and bearing.
4. Remove the bolts that attach the splash shield to the steering knuckle.
5. Remove the cotter pin.
6. Remove the tie rod end stud nut.
7. Disconnect the tie rod end from the steering knuckle
8. Remove the lower ball joint stud from the steering knuckle.

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9. Remove the upper ball joint stud from the steering knuckle.
10. Raise the upper control arm. Disengage the ball joint stud from the steering knuckle.
11. Remove the steering knuckle from the lower ball joint stud.
- To install:**
12. Install the upper ball joint to the steering knuckle.
13. Install the lower ball joint to the steering knuckle.
14. Install the splash shield to the steering knuckle and tighten to 19 ft. lbs. (26 Nm).
15. Install the tie rod end to the steering knuckle. Ensure that the seal is on the stud.
16. Seat the taper using Steering Linkage Installer J-29193 and tighten the tool to 40 ft. lbs. (54 Nm).
17. Remove the tool.
18. Install the tie rod end retaining nut and tighten to 39 ft. lbs. (53 Nm).
19. Install the wheel hub and bearing.
20. Lower the vehicle.
21. Check the front wheel alignment.

Stabilizer Bar

REMOVAL & INSTALLATION

1. Raise and support the vehicle.
2. Remove the tire and wheel.
3. Remove the steering linkage shield, if equipped.
4. Remove the to the stabilizer shaft link retaining nut.
5. Remove the grommets and retainers from the stabilizer shaft link bolt.
6. Remove the stabilizer shaft bracket mounting bolts.
7. Remove the stabilizer shaft brackets.
8. Remove the stabilizer shaft.
9. Remove stabilizer shaft insulators from stabilizer shaft.
- To install:**
10. Install the stabilizer shaft insulators to the stabilizer shaft with the slits facing the front of the vehicle.
11. Install the stabilizer shaft.
12. Install the stabilizer shaft brackets over the stabilizer shaft insulators.
13. Install the stabilizer shaft bracket mounting bolts and tighten to 26 ft. lbs. (36 Nm) on 2WD vehicles, or 48 ft. lbs. (65 Nm) on 4WD vehicles..
14. Install the grommets and retainers from the stabilizer shaft link bolt.
15. Install the stabilizer shaft links and tighten to 13 ft. lbs. (18 Nm).
16. Install the wheel and tire.

17. Install the steering linkage shield, if equipped.
18. Lower the vehicle.

Ball Joints

REMOVAL & INSTALLATION

2 Wheel Drive (2WD) Vehicles

UPPER

➔The following procedure requires the use of a ball joint separator tool such as J-23742 and J-9519-E ball joint remover and installer set.

1. Raise and support the front of the vehicle safely by placing stands securely under the lower control arms. Because the vehicle's weight is used to relieve spring tension on the upper control arm, the stands must be positioned between the spring seats and the lower control arm ball joints for maximum leverage.

** CAUTION

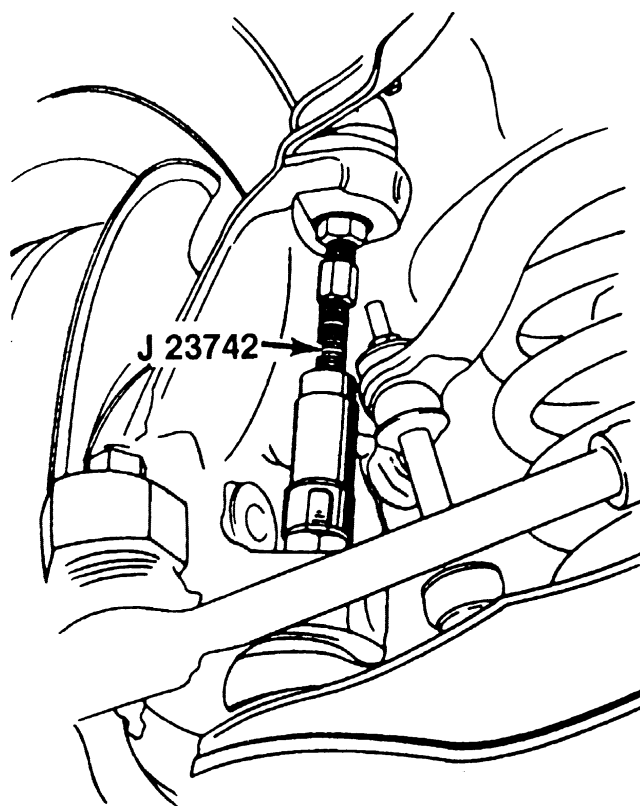
With components unbolted, the stand is holding the lower control arm in place against the coil spring. Make sure the stand is firmly positioned

and cannot move, or personal injury could result.

2. Remove or disconnect the following:
 - Tire and wheel assembly
 - Brake caliper and support it from the vehicle using a coat hanger or wire. Make sure the brake line is not stretched or damaged and that the caliper's weight is not supported by the line.
 - Cotter pin and retaining nut from the upper ball joint
 - Anti-lock brake sensor wire bracket, if equipped
 - Upper ball joint from the steering knuckle using tool J-23742 and pull the steering knuckle free of the ball joint

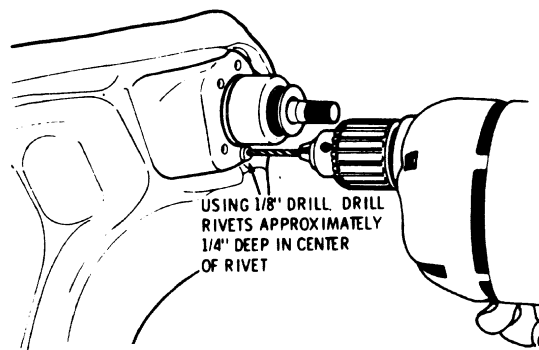
➔After separating the steering knuckle from the upper ball joint, be sure to support the steering knuckle/hub assembly to prevent damaging the brake hose.

3. Remove the riveted upper ball joint from the upper control arm as follows:
 - a. Drill a 1/8 in. (3mm) hole, about 1/4 in. (6mm) deep into each rivet.
 - b. Then use a 1/2 in. (13mm) drill bit, to drill off the rivet heads.



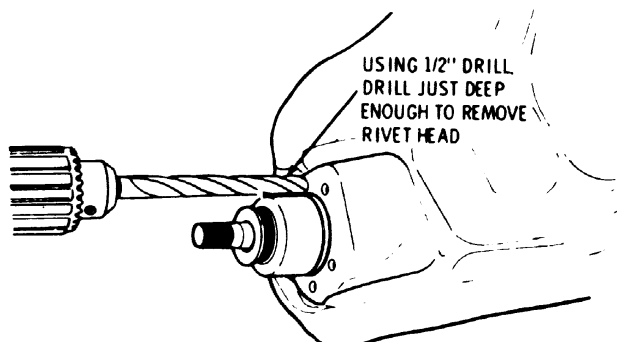
85388020

Use a ball joint separator tool to drive the upper ball joint from the steering knuckle



85388021

Drill a small guide hole into each ball joint rivet



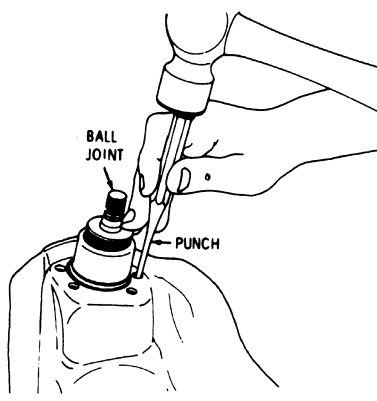
85388022

Then drill off the rivet heads

- c. Using a pin punch and the hammer, drive out the rivets in order to free the upper ball joint from the upper control arm assembly, then remove the upper ball joint.
4. Clean and inspect the steering knuckle hole. Replace the steering knuckle if the hole is out of round.

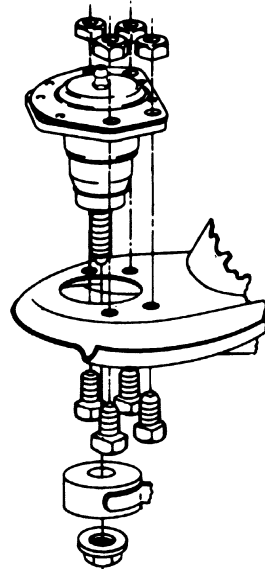
To install:

5. Install or connect the following:
- Ball joint in the upper control arm
 - Ball joint retaining nuts and bolts.



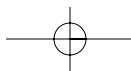
85388023

Punch the rivets out and remove the ball joint



85388024

Service ball joints are bolted to the control arm



- Ball joint to the knuckle. Make sure the joint is seated, then install the stud nut and tighten to 61 ft. lbs. (83 Nm). Insert a new cotter pin.

➔When installing the cotter pin, never loosen the castle nut to expose the cotter pin hole.

- Thread the grease fitting into the ball joint. Use a grease gun to lubricate the upper ball joint until grease appears at the seal.
 - Brake caliper
 - Tire and wheel assembly
6. Check and adjust the front end alignment, as necessary.

LOWER

➔The following procedure requires the use of a ball joint remover/installer set (the particular set may vary upon application but must include a clamping-type tool with the appropriately sized adapters) and a ball joint separator tool, such as J-23742.

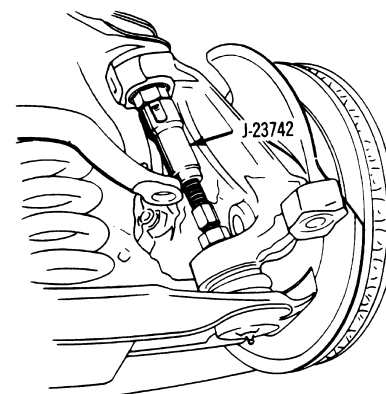
- Tire and wheel assembly

1. Position a jack under the spring seat of the lower control arm, then raise the jack to support the arm.

***** CAUTION**

The jack **MUST** remain under the lower control arm, during the removal and installation procedures, to retain the arm and spring positions. Make sure the jack is securely positioned and will not slip or release during the procedure or personal injury may result.

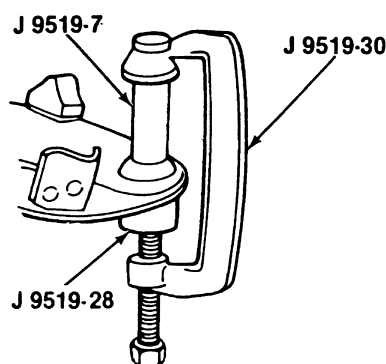
2. Remove or disconnect the following:
- Brake caliper and support it aside using a hanger or wire. Make sure



85388025

Use a ball joint separator to drive the lower joint from the knuckle

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85388027

Driving the lower joint from the control arm

the brake line is not stressed or damaged.

- Lower ball joint cotter pin and discard
- Ball joint stud nut
- Lower ball joint from the steering knuckle using tool J-23742

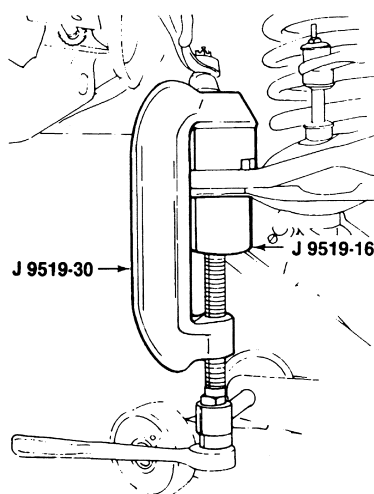
3. Carefully guide the lower control arm out of the opening in the splash shield using a putty knife. Position a block of wood between the frame and upper control arm to keep the knuckle out of the way.

- Grease fitting
- Ball joint from the control arm using the ball joint remover set along with the appropriate adapters

To install:

4. Clean the tapered hole in the steering knuckle of any dirt or foreign matter, then check the hole to see if it is out of round, deformed or otherwise damaged. If a problem is found, then knuckle must be replaced.

5. Install or connect the following:



85388029

Installing a new ball joint

- Press the new ball joint (with grease fitting pointing inward) until it bottoms in the control arm using a suitable installation set. Make sure the grease seal is facing inboard.
- Ball joint stud into the steering knuckle
- Ball joint retaining nut and tighten to 79 ft. lbs. (108 Nm)

➔ **When installing the cotter pin, never loosen the castle nut to expose the cotter pin hole.**

- Grease fitting into the ball joint, if not already installed
6. Use a grease gun to lubricate the joint until grease appears at the seal.
- Brake caliper
 - Tire and wheel assembly
7. Check and adjust the front end alignment, as necessary.

4 Wheel Drive (4WD) Vehicles

On 4WD vehicles both the upper and lower ball joints are removed in the same manner. Once the joint is separated from the steering knuckle the rivets are drilled and punched to free the joint from the control arm. Service joints are bolted into position with the retaining bolts threaded upward from beneath the control arm. In this manner, the joint is replaced in an almost identical fashion to the upper joints on 2WD vehicles.

1. Remove or disconnect the following:

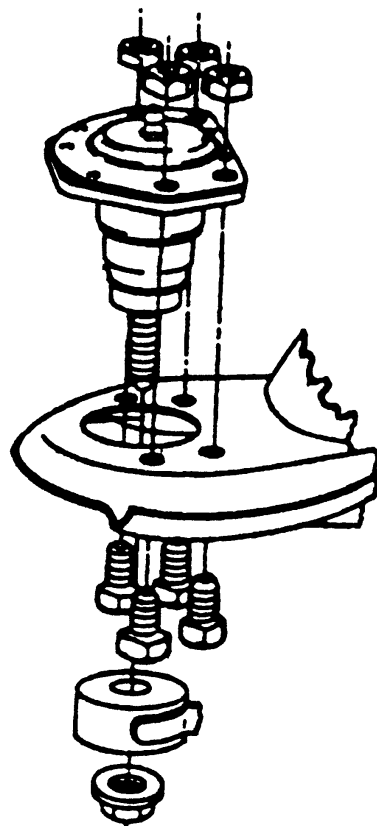
- Tire and wheel assembly
- Wheel speed sensor wiring connector from the upper control arm, if removing the upper ball joint
- Cotter pin from the ball joint, then loosen the retaining nut

2. Position a suitable ball joint separator tool such as J-36607, then carefully loosen the joint in the steering knuckle. Remove the tool and the retaining nut, then separate the joint from the knuckle.

➔ **After separating the steering knuckle from the upper ball joint, be sure to support the steering knuckle/hub assembly to prevent damaging the brake hose.**

3. Remove the riveted ball joint from the control arm:

- Drill a 1/8 in. (3mm) hole, about 1/4 in. (6mm) deep into each rivet.
- Then use a 1/2 in. (13mm) drill bit, to drill off the rivet heads.
- Using a pin punch and the ham-



7924JG40

The replacement ball joint comes with nuts and bolts for installation

mer, drive out the rivets in order to free the ball joint from the control arm assembly, then remove the ball joint.

To install:

4. Install or connect the following:

- Ball joint in the control arm
- Ball joint retaining nuts and bolts. Position the bolts threaded upward from under the control arm. Tighten the ball joint retainers to 17 ft. lbs. (23 Nm).
- Ball joint to the knuckle. Make sure the joint is seated, tighten the lower nut to 79 ft. lbs. (108 Nm) and the upper nut to 61 ft. lbs. (83 Nm). Install a new cotter pin.

➔ **When installing the cotter pin, never loosen the castle nut to expose the cotter pin hole, but DO NOT tighten more than an additional 1/8 turn.**

5. Use a grease gun to lubricate the upper ball joint.

- Wheel speed sensor wiring connector to the upper control arm, if the upper ball joint was removed
- Tire and wheel assembly

6. Check and adjust the front end alignment, as necessary.

Upper Control Arm**REMOVAL & INSTALLATION****2 Wheel Drive (2WD) Vehicles**

1. Remove or disconnect the following:
 - Negative battery cable
 - Wheel
 - Wheel speed sensor harness bracket retaining bolt and nut, if equipped
 - Support the lower control arm with a jack stand
 - Steering knuckle from upper control arm ball joint
 - Mounting nuts/bolts and shims

➔ **Make sure to note the location of the control arm shims prior to removal so that they may be installed in their original positions.**

- Upper control arm

To install:

2. Install or connect the following:
 - Upper control arm

➔ **Always tighten nut on the thinner shim pack first.**

- Mounting nuts/bolts and shims. Torque the nuts to 81–85 ft. lbs. (110–115 Nm).
- Steering knuckle to upper control arm ball joint
- New cotter pin

➔ **Tighten the nut to align the hole never loosen.**

- Wheel speed sensor harness bracket retaining bolt and nut, if equipped
- Wheel

4 Wheel Drive (4WD) Vehicles

1. Remove or disconnect the following:
 - Tire and wheel assembly
 - Support the lower control arm with a jack stand
 - Unload the torsion bar
 - Cotter pin from the ball joint, then loosen the retaining nut
 - Steering knuckle from the upper ball joint. Be sure to support the steering knuckle/hub assembly to prevent damaging the brake hose.

➔ **The 4WD vehicles do not use shims to adjust the front wheel alignment. Instead, the upper control arm bolts are equipped with cams, which are rotated to achieve caster and camber**

adjustments. In order to preserve adjustment and ease installation, matchmark the cams to the control arm before removal. If the control arm is being replaced, transfer the alignment marks to the new component before installation.

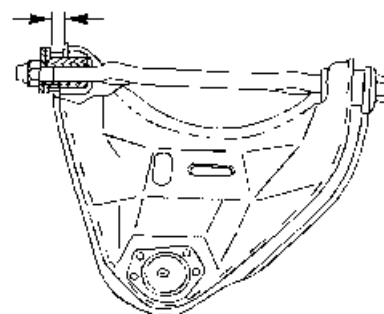
- Front and rear nuts retaining the control arm retaining bolts to the frame
 - Outer cams from the bolts
 - Bolts and inner cams
 - Control arm from the vehicle
 - Retaining nut and the bumper from the control arm, if necessary
2. If the bushings are being replaced, use a suitable bushing service set to remove the bushings from the arm.

To install:

3. Install or connect the following:
 - Bushing service set to drive the new bushings into the control arm, if removed
 - Bumper and retaining nut to the control arm, if removed. Tighten the bumper retaining nut to 20 ft. lbs. (27 Nm).
 - Control arm, retaining bolts (from the inside of the frame brackets facing outward) and the inner cams. The inner cams must be positioned on the bolts before they are inserted through the control arm and frame brackets.
 - Outer cams over the retaining bolts, then the nuts to the ends of the bolts at the front and rear of the control arm
4. Align the cams to the reference marks made earlier, then tighten the end nuts to 85 ft. lbs. (115 Nm).
 - Ball joint to the knuckle
 - Load the torsion bar
 - Tire and wheel assembly
5. Check and adjust the front end alignment, as necessary.

CONTROL ARM BUSHING REPLACEMENT**2 Wheel Drive (2WD) Vehicles**

1. Remove or disconnect the following:
 - Upper control arm and place it in a vise
 - Upper control arm shaft nuts and retainers
 - Upper control arm bushings using tool J 22269-1, a slotted washer and a short piece of pipe that is slightly larger than the bushing
 - Upper control arm shaft



06025-S10P-G05

Control arm bushing installation measurement**To install:**

- Upper control arm shaft
 - Upper control arm bushings using tool J 22269-1, a slotted washer and a short piece of pipe that is slightly larger than the bushing
2. Tighten J 22269-1 until the bushing is positioned on the shaft and the control arm as shown in the accompanying illustration. The measurement should be 0.48–0.52 inch (12.8–13.8mm) at both sides when the properly installed.
 - Upper control arm shaft nuts and retainers. Tighten to 85 ft. lbs. (115 Nm).
 - Upper control arm

4 Wheel Drive (4WD) Vehicles

If the bushings require replacement, refer to the control arm removal and installation procedure for bushing replacement.

Lower Control Arm**REMOVAL & INSTALLATION****2 Wheel Drive (2WD) Vehicles**

1. Remove or disconnect the following:
 - Coil spring
 - Lower ball joint from the steering knuckle
 - Lower control arm from the vehicle

To install:

2. Install or connect the following:
 - Lower control arm
 - Lower ball joint stud into the steering knuckle
 - Ball joint-to-steering knuckle nut and tighten to specification
 - New cotter pin to the lower ball joint stud
 - Coil spring
3. Align the vehicle.

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4 Wheel Drive (4WD) Vehicles

➔ **Tools Needed:** universal tie rod separator J-24319-01, torsion bar unloader J-36202, lower control arm bushing service kit J-36618 (if the control arm bushing are being replaced) and ball joint C-clamp J-9519-23. Whether or not the control arm or bushing are being replaced, **NEW control arm retaining nut should be used once the old ones have been loosened and removed.**

1. Raise and support the vehicle.
2. Remove the tire and wheel.
3. Remove the torsion bar from the lower control arm.
4. Remove the steering linkage shield.
5. Remove the stabilizer shaft link from the lower control arm.
6. Remove the stabilizer shaft bracket bolts.
7. Lower the stabilizer shaft.
8. Remove the shock absorber lower mounting bolt.
9. Compress the shock absorber.
10. Remove the steering knuckle.
11. Remove the lower control arm to the crossmember and the frame bracket mounting nuts and bolts.
12. Remove the lower control arm from the frame.

To install:

13. Install the front leg of the lower control arm into the crossmember before installing the rear leg into the frame bracket.
14. Install the lower control arm mounting bolts in the direction shown.

15. Tighten the nuts with the lower control arm at the proper trim height. Tighten the nuts and the bolts with the front suspension loaded.

16. Install the lower control arm mounting nuts and tighten to 81 ft. lbs. (110 Nm).

17. Install the steering knuckle.

18. Install the shock absorber lower mounting bolt and tighten to 54 ft. lbs. (73 Nm).

19. Raise the stabilizer shaft, install the stabilizer shaft bracket bolts and tighten to 48 ft. lbs. (65 Nm).

20. Install the stabilizer shaft link to the lower control arm.

21. Install the steering linkage shield.

22. Install the torsion bar.

23. Install the tire and wheel.

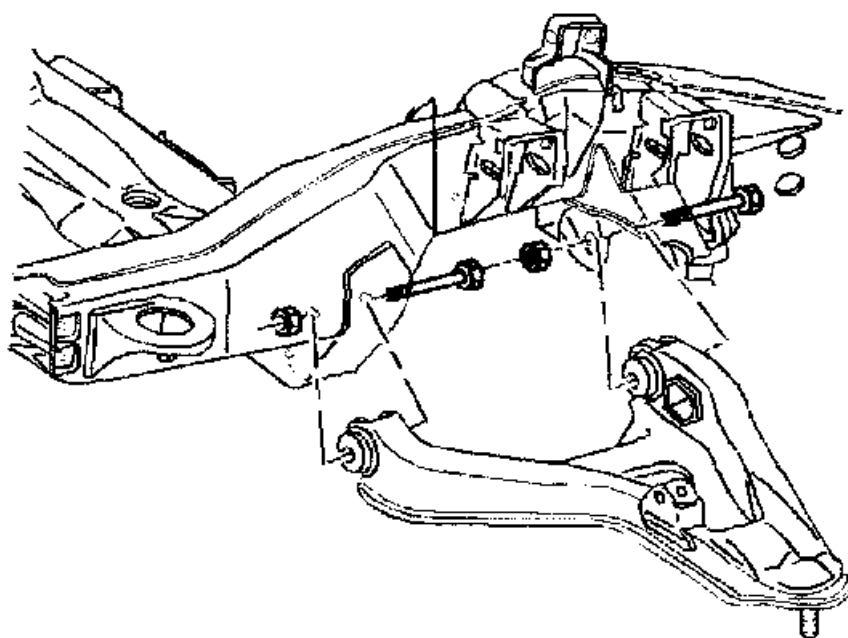
24. Lower the vehicle.

25. Check the front wheel alignment.

CONTROL ARM BUSHING REPLACEMENT

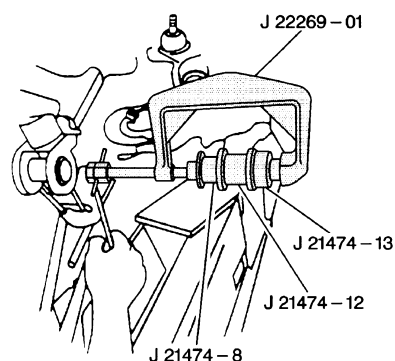
2 Wheel Drive (2WD) Vehicles

1. Remove lower control arm and place it in vise.
2. Install tools J 22269-01, 21474-8, 12 and 13 on the rear bushing and tighten until the bushing is removed.
3. Using a blunt chisel, drive the front bushing flare flush with the rubber part of the bushing.
4. Place a wedge or a spacer between the bushing housing to keep the housing from bending while removing or installing the bushing.



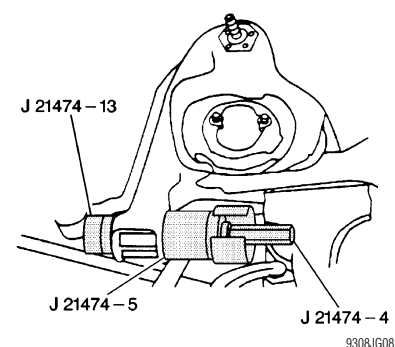
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Lower control arm mounting—4WD models



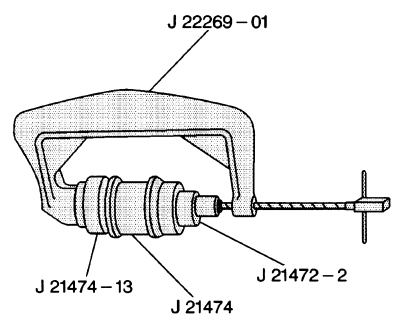
9308JG06

Removing the lower control arm rear bushing—all 2 wheel drive



9308JG08

Installing the lower control arm front bushing—all 2 wheel drive



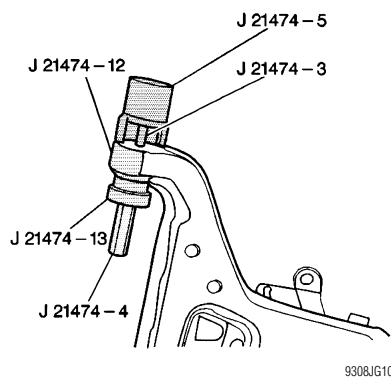
9308JG15

Installing the lower control arm rear bushing—all 2 wheel drive

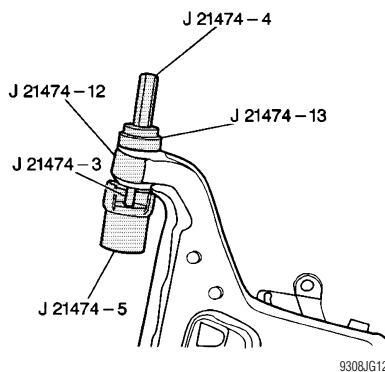
5. Install tools J 21474-3, 4, 5 and 6 on the front bushing and tighten until the bushing is removed.

To install:

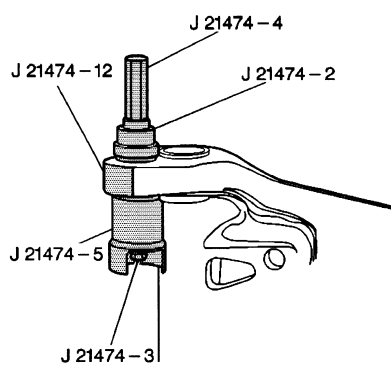
6. Install the front bushing into the control arm.
7. Install tools J 21474-4, 5 and 13. Tighten until the bushing is fully seated.
8. Install the rear bushing into the control arm.
9. Install tools J 22269-01, J 21474-2 and 13. Tighten until the bushing is fully seated.
10. Install the lower control arm.



Removing the lower control arm front bushing—4 wheel drive



Installing the lower control arm front bushing—4 wheel drive



Installing the lower control arm rear bushing—4 wheel drive

4 Wheel Drive (4WD) Vehicles

1. Remove lower control arm and place it in vise.

2. Using bushing service set J 21474, remove the front and rear bushings.

To install:

3. Using bushing service set J 21474, install the front and rear bushings.

4. Install the lower control arm.

Wheel Bearings

ADJUSTMENT

2 Wheel Drive (2WD) Vehicles

1. If equipped, remove the wheel/hub cover for access, then remove the dust cap from the hub.

2. Remove the cotter pin and loosen the spindle nut.

3. Spin the wheel forward by hand and torque the nut to 12 ft. lbs. (16 Nm) in order to fully seat the bearings and remove any burrs from the threads.

4. Back off the nut until it is just loose, then finger-tighten the nut.

5. Loosen the nut $\frac{1}{4}$ – $\frac{1}{2}$ turn until either hole in the spindle lines up with a slot in the nut, then install a new cotter pin. This may appear to be too loose, but it is the proper adjustment.

6. Proper adjustment creates 0.001–0.005 in. (0.025–0.127mm) endplay.

4 Wheel Drive (4WD) Vehicles

The front wheel bearings on the 4-wheel drive vehicles and 2004–05 2WD vehicles are not adjustable. If the bearings become loose or make noise, they must be replaced.

REMOVAL & INSTALLATION

Front

2WD MODELS 2002–2003

1. Remove or disconnect the following:
 - Wheel
 - Brake caliper with the pads without disconnecting the brake line
 - Grease cap
 - Cotter pin, spindle nut and washer
 - Hub

*** WARNING

Be careful not to drop the outer wheel bearing. As the hub is pulled forward, the outer wheel bearings will often fall forward and they may easily be removed at this time.

- Outer roller bearing assembly
- Inner seal by prying it out of the hub and discard it
- Inner bearing assembly

To install:

2. Clean all parts in solvent and allow to air dry, then check for excessive wear or damage. Inspect all of the parts for scoring, pitting or cracking and replace if necessary.

➡DO NOT remove the bearing races from the hub, unless they show signs of damage.

3. If it is necessary to remove the wheel bearing races, use the GM Front Bearing Race Removal tool J-29117 to drive the races from the hub/disc assembly. A hammer and brass drift may also be used to drive the races from the hub, but the race removal tool is quicker.

4. If the bearing races were removed, position the replacement races in the freezer for a few minutes and then install them to the hub:

a. Lightly lubricate the inside of the hub/disc assembly using wheel bearing grease.

b. Using the GM Seal Installation tools J-8092 and J-8850, drive the inner bearing race into the hub/disc assembly until it seats. Be sure the race is properly seated against the hub shoulder and is not cocked.

➡When installing the bearing races, be sure to support the hub/disc assembly with GM tool J-9746-02.

c. Using the GM Seal Installation tools J-8092 and J-8457, drive the outer race into the hub/disc assembly until it seats.

5. Using a high melting point wheel bearing grease, lubricate the bearings, races and spindle; be sure to place a gob of grease (inside the hub/disc assembly) between the races to provide an ample supply of lubricant.

➡To lubricate each bearing, place a gob of grease in the palm of the hand, then scoop the bearing through the grease until it is well lubricated.

6. Place the inner bearing in the hub, then apply a thin coating of grease to the sealing lip and install a new inner seal, making sure the seal flange faces the bearing cup.

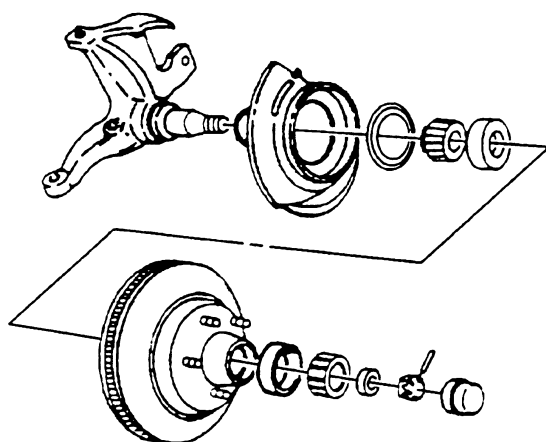
➡Although a seal installation tool is preferable, a section of pipe with a smooth edge or a suitably sized socket may be used to drive the seal into position. Be sure the seal is flush with the outer surface of the hub assembly.

7. Install or connect the following:

- Wheel hub over the spindle
- Outer bearing into the hub by hand
- Spindle washer and nut
- Brake caliper
- Wheel

8. Properly adjust the wheel bearings

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7924JG42

Wheel bearings, races and related components—2002-03 2WD vehicles

9. Install or connect the following:

- New cotter pin
- Dust cap
- Wheel cover

2WD MODELS 2004-05

1. Raise and support the vehicle.
2. Remove the tire and wheel.
3. Remove the brake rotor.
4. Remove the wheel speed sensor mounting bolt from the wheel hub and bearing.
5. Remove the wheel speed sensor from the wheel hub and bearing.
6. Remove the wheel hub and bearing-to-steering knuckle mounting bolts.
7. Remove the wheel hub and bearing from the steering knuckle.
8. Remove the splash shield from the steering knuckle.

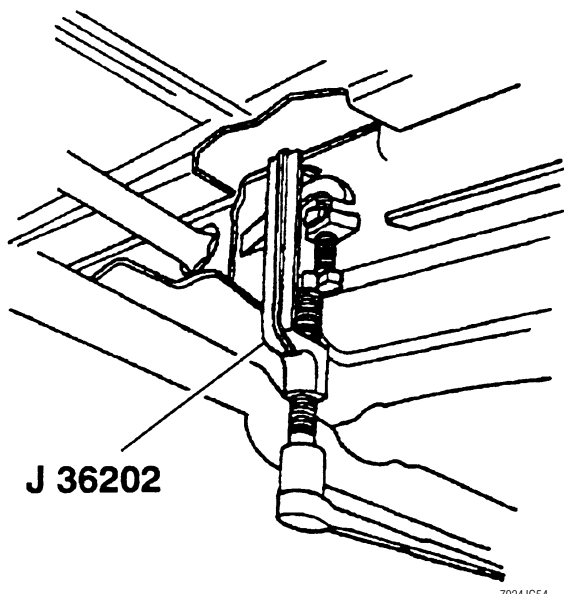
9. Remove the wheel hub seal.

To install:

10. Install the wheel hub seal.
11. Install and align the splash shield to the steering knuckle.
12. Install the wheel hub and bearing assembly to the steering knuckle. Align the threaded holes.
13. Install the mounting bolts and tighten to 77 ft. lbs. (105 Nm).
14. Install the wheel speed sensor and tighten to 13 ft. lbs. (18 Nm).
15. Install the rotor.
16. Install the tire and wheel.
17. Lower the vehicle.

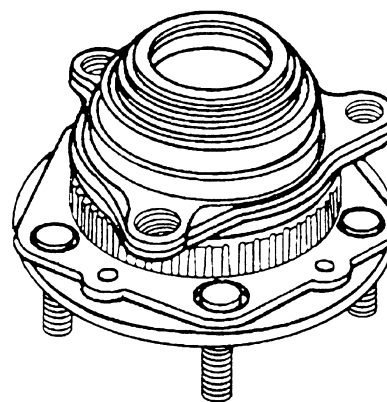
4WD MODELS

1. Install Torsion Bar Unloading tool J 36202 on the torsion bar adjusting bolt and remove the bolt. To aid during installation,



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Use Torsion Bar Unloading tool J 36202 to remove the adjusting bolt and unload the torsion bar



7924JG15

Hub and bearing assembly—4WD vehicles

count the number of turns required to remove the bolt.

2. Remove the wheel.
3. Install an axle shaft boot seal protector to the Tri-pot axle joint.
4. Remove or disconnect the following:
 - Cotter pin and retainer
 - Castle nut and the thrust washer
 - Brake caliper and support it aside using wire or a coat hanger

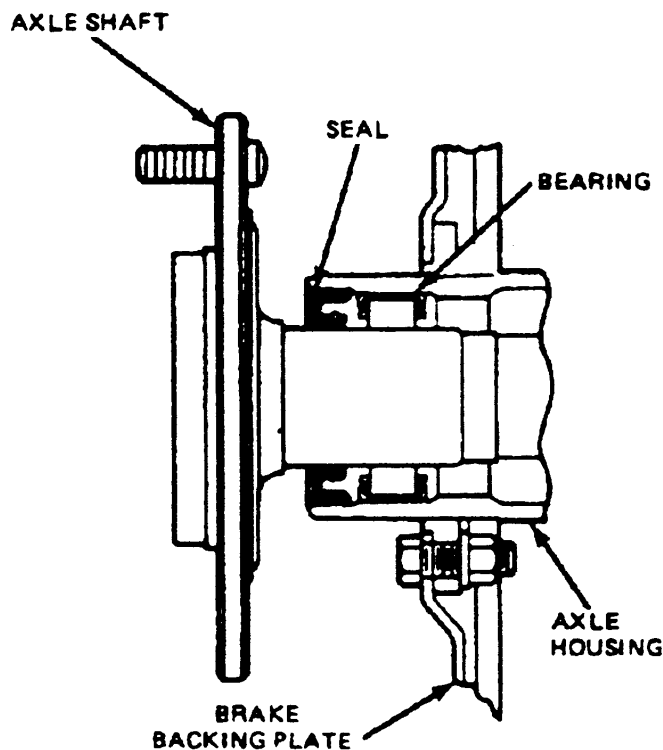
➔Be sure the brake line is not stretched or damaged.

- Brake disc from the wheel hub
- Halfshaft from the hub/bearing assembly, using a Spindle Remover tool J-28733-A to prevent damage to the shaft or hub/bearing assembly
- Hub/bearing assembly from the knuckle

5. Clean and inspect the parts for nicks, scores and/or damage, then replace them as necessary.

To install:

6. Install or connect the following:
 - Hub and bearing assembly by aligning the threaded holes. Torque the bolts to 77 ft. lbs. (105 Nm).
 - Tie rod end to the steering knuckle using the retaining nut
 - New cotter pin
 - Brake assembly
 - Halfshaft nut. Tighten the nut to 103 ft. lbs. (140 Nm).
 - Retainer and a new cotter pin but DO NOT back off specification in order to insert the cotter pin.
7. Remove the torsion bar unloader tool and the drive axle boot protector.
8. Install the wheel.
9. Check and/or adjust the vehicle trim height, as necessary.



7924JG55

Cross-sectional view of the rear axle, bearing and seal assembly

Rear

A new pinion shaft lockbolt should be installed whenever either of the axle shafts is removed.

The axle shaft and seal may be removed and replaced without disturbing the bearing or seal but it is highly recommended to replace the seals when removing the axle shaft.

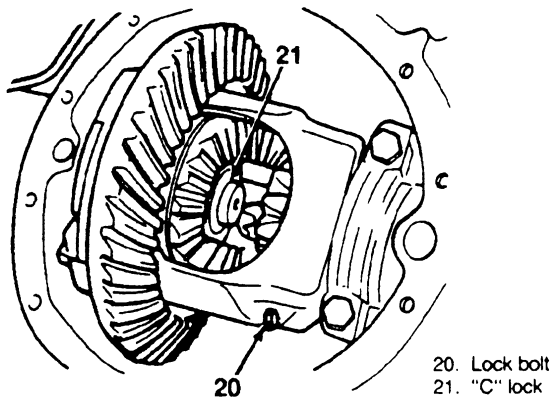
1. Remove or disconnect the following:
 - Rear wheels
 - Brake drums
2. Using a wire brush, clean the dirt/rust from around the rear axle cover.
3. Drain the fluid.

4. Remove or disconnect the following:
 - Rear pinion shaft lockbolt and the pinion shaft
 - C-lock from the button end of the axle shaft by pushing the axle shaft inward
 - Axle shaft from the axle housing

➔ **Be careful not to damage the oil seal.**

***** WARNING**

If equipped with an Anti-Lock Brake System (ABS), be careful not to damage the reflector ring on the axle shaft or the speed sensor bolted to



20. Lock bolt
21. "C" lock

7924JG56

Pinion shaft lockbolt and axle C-lock locations, inside the differential

the backing plate, immediately adjacent to the shaft.

5. Remove or disconnect the following:
 - Oil seal by prying it from the end of the rear axle housing

***** WARNING**

DO NOT damage the housing oil seal surface.

- Wheel bearing using the GM Slide Hammer tool J-2619, the GM Adapter tool J-2619-4 and the GM Axle Bearing Puller tool J-22813-01

To install:

6. Clean and inspect the components for excessive wear or damage and replace them, if necessary.
7. Install or connect the following:
 - New or reused bearing, coated with gear lubricant, using the Axle Shaft Bearing Installer tool J-34974 to drive the bearing in until it bottoms against the seat

***** WARNING**

Be sure the bearing installer does not contact and damage the speed sensor on ABS equipped vehicles.

- New seal lubricated with gear oil using the GM Axle Shaft Seal Installer tool J-33782 to seat it in the housing until it is flush with the axle tube

➔ **Be sure the seal installer does not contact and damage the speed sensor on ABS equipped vehicles.**

- Axle shaft into the housing by engaging the splines
- C-lock retainer on the axle shaft button end

***** WARNING**

BE CAREFUL not to damage the wheel bearing seal.

- Axle shaft by pulling it outward to seat the C-lock retainer in the counterbore of the side gears
 - Pinion shaft through the case and the pinions. Tighten the new lock-bolt to 27 ft. lbs. (36 Nm).
 - New rear axle cover gasket
 - Housing cover
 - Brake drums
 - Wheels
8. Refill the housing.

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BRAKES

Brake Caliper

REMOVAL & INSTALLATION

Front

1. Remove or disconnect the following:
 - $\frac{2}{3}$ of the brake fluid from the master cylinder reservoir
 - Tire and wheel assembly
 - Brake caliper fluid line, then plug it
 - Bolts retaining the caliper to the rotor
 - Caliper from the rotor
 - Disc brake pads from the caliper
 - Brake pad retaining clips from inside the caliper

To install:

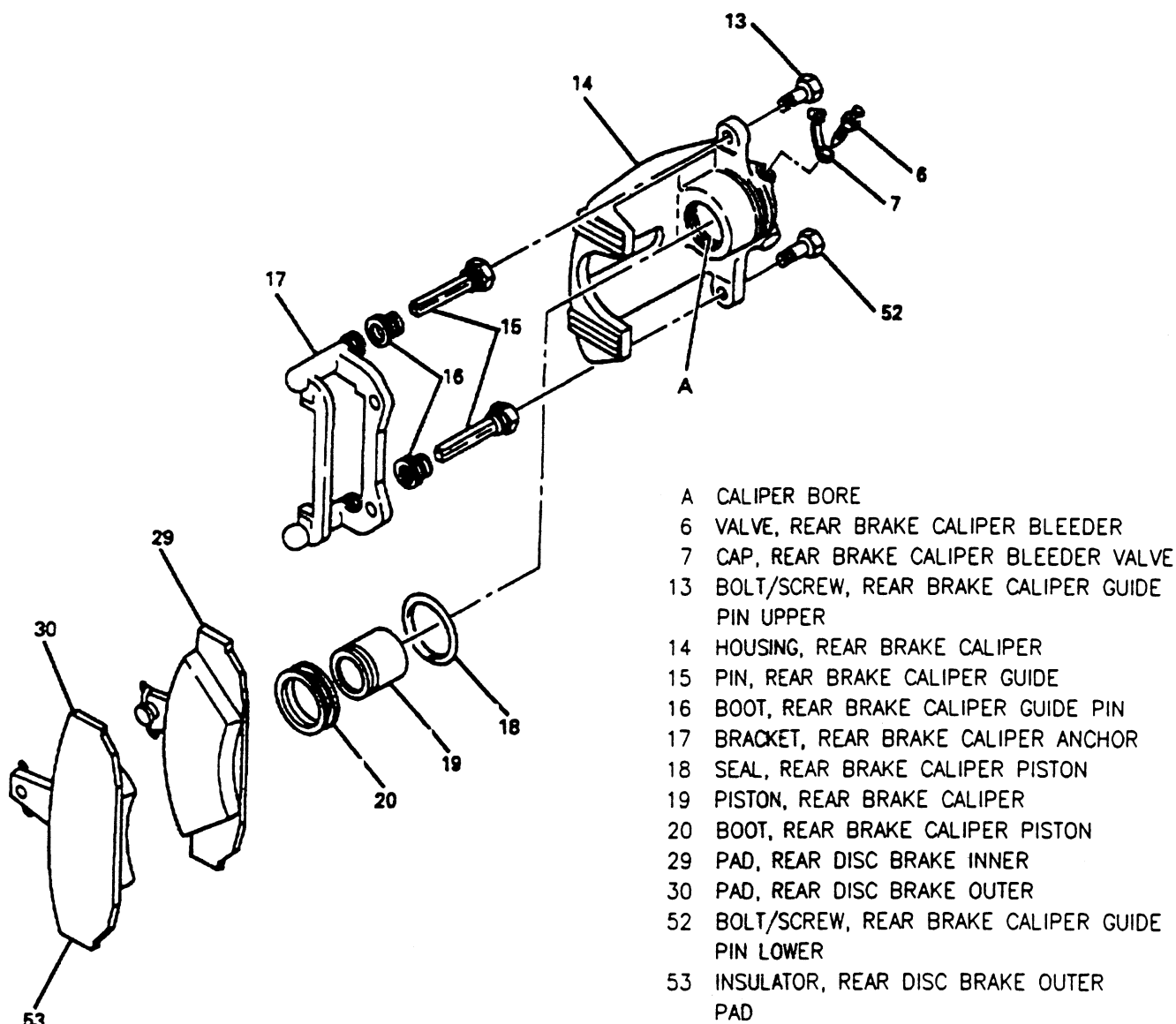
2. Clean and lubricate the sleeves and bushings with silicon grease.
3. Install or connect the following:
 - Pads in the caliper
 - Caliper in position over the rotor
 - Mounting bolts. Tighten to 38 ft. lbs. (51 Nm).
 - Fluid lines to the caliper, if disconnected, and tighten to 40 ft. lbs. (54 Nm)
 - Wheel and tire assembly
4. Refill the master cylinder to the correct level. Bleed the brake system if the fluid lines were disconnected from the caliper.

Rear

1. Remove or disconnect the following:
 - Rear tires and wheels
 - Brake hose; and cap the line
 - Retainers from caliper and remove caliper
 - Brake pads, if necessary

To install:

2. Install or connect the following:
 - Brake pads, if removed
 - Caliper over rotor, and onto mounts
 - Retainers, and tighten to 23 ft. lbs. or (31 Nm)
 - Brake hose, and tighten to 33 ft. lbs. (46 Nm)



Rear brake caliper

93026G44

- Rear tires and wheels
3. Refill the master cylinder to the correct level. Bleed the brake system if the fluid lines were disconnected from the caliper.

Disc Brake Pads

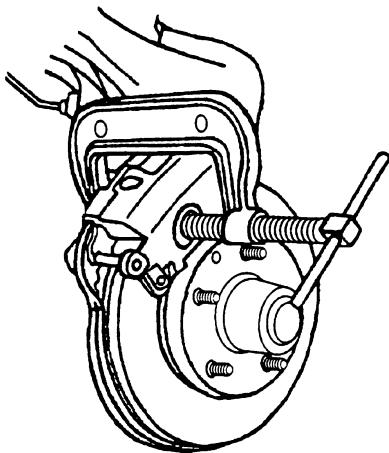
REMOVAL & INSTALLATION

Front

1. Remove or disconnect the following:
 - $\frac{2}{3}$ of the brake fluid from the master cylinder
2. Place a C-clamp around the outer pad and caliper; tighten the C-clamp until the piston is fully compressed in the caliper.
 - Remove top caliper retainer, and rotate caliper away from rotor
 - Inboard pad and retaining spring from the caliper
 - Outboard pad from the caliper
 - Sleeves and bushings

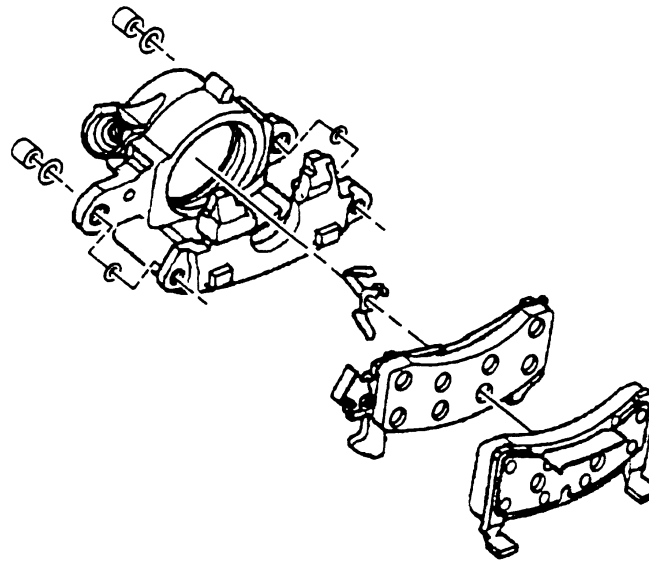
To install:

3. Clean and lubricate the sleeves and bushing with silicone lubricant and install them in the caliper.
4. Install or connect the following:
 - Retaining spring onto the inboard pad
 - Inboard pad in the caliper
 - Outboard pad into the caliper
 - Caliper in position over the rotor
 - Caliper mounting bolts. Bend the tabs, on the outboard brake pad, over the caliper.
 - Wheel and tire assemblies
5. Refill the master cylinder and pump pedal to attain full brake pedal before Road-testing the vehicle.



93026G47

Compressing the caliper piston with a C-clamp



93026G48

Exploded view of the single piston front disc brake caliper

Rear

1. Remove or disconnect the following:
 - $\frac{2}{3}$ of the brake fluid from the master cylinder
 - Wheels
2. Place a C-clamp around the outer pad and caliper; tighten the C-clamp until the piston is fully compressed in the caliper.
 - Top caliper retainer, and rotate caliper away from rotor
 - Inboard pad and retaining spring from the caliper
 - Outboard pad from the caliper

To install:

3. Clean and lubricate the sleeves and bushing with silicone lubricant and install them in the caliper.
4. Install or connect the following:
 - Retaining spring onto the inboard pad
 - Inboard pad in the caliper
 - Outboard pad into the caliper
 - Caliper in position over the rotor
 - Caliper mounting bolts
 - Wheel and tire assemblies
5. Refill the master cylinder and pump pedal to attain full brake pedal before Road-testing the vehicle.

Brake Drums

REMOVAL AND INSTALLATION

1. Remove or disconnect the following:
 - Wheel and tire assembly
 - Brake drum. If the drum will not pull off the axle, use a rubber mallet and tap it around the edge.

To install:

1. Install or connect the following:
 - Drum on the axle
 - Wheel and tire assembly
 - Refill the master cylinder and pump pedal to attain full brake pedal before road-testing the vehicle.

Brake Shoes

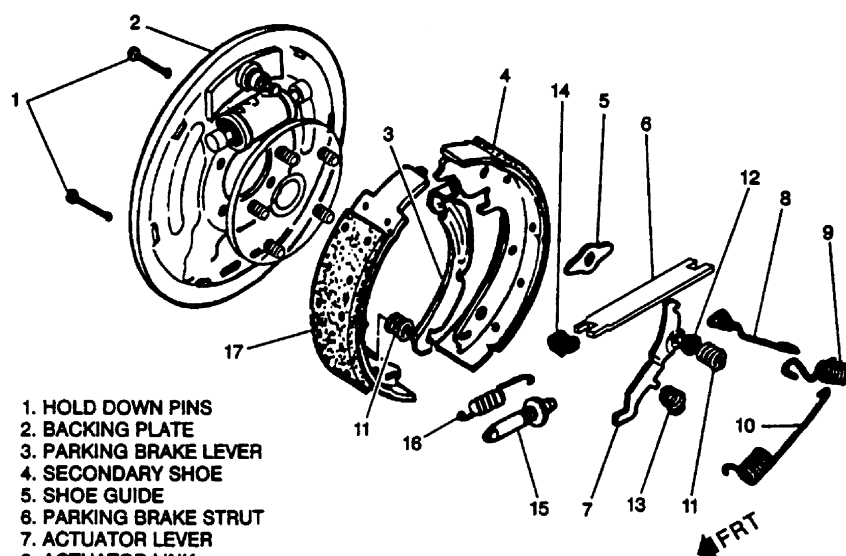
REMOVAL AND INSTALLATION

1. Remove or disconnect the following:
 - Wheel and tire assembly
 - Brake drum
 - Return springs from the brake shoes
 - Shoe guide
 - Hold-down springs and pins
 - Actuator lever and pivot
 - Lever return spring
 - Actuator link
 - Parking brake strut and spring
 - Parking brake lever
 - Brake shoes and the adjuster assembly

To install:

2. Lubricate the contact points on the backing plate and the adjuster with lithium grease.
3. Install or connect the following:
 - Parking brake lever, adjusting screw and spring assembly
 - Shoe assembly onto the backing plate
 - Parking brake lever, strut and strut spring
 - Actuator lever and lever pivot
 - Actuator link

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1. HOLD DOWN PINS
2. BACKING PLATE
3. PARKING BRAKE LEVER
4. SECONDARY SHOE
5. SHOE GUIDE
6. PARKING BRAKE STRUT
7. ACTUATOR LEVER
8. ACTUATOR LINK
9. RETURN SPRING
10. RETURN SPRING
11. HOLD DOWN SPRING
12. LEVER PIVOT
13. LEVER RETURN SPRING
14. STRUT SPRING
15. ADJUSTING SCREW ASSEMBLY
16. ADJUSTING SCREW SPRING
17. PRIMARY SHOE

Exploded view of the drum brake components

93026651

- Lever spring, the hold-down pins and springs
- Shoe guide
- Return springs
- Brake drum in position

1. Adjust the brakes as follows:

a. Remove the knockout area in the backing plate, behind the adjuster assembly.

b. Ensure the parking brake system is adjusted properly with no tension on the cables or parking brake lever. The tops of the shoes should be firmly seated against the upper spring retaining anchor, if not as specified, loosen the parking brake cables.

c. Install the drum and turn the brake adjuster until the wheels can just be turned by hand.

d. Then, back the adjuster off 24 notches. No brake drag should be felt after 12 notches.

e. Install an adjusting hole plug in the backing plate to prevent dirt and moisture from entering.

f. Readjust the parking brake cable as necessary.

2. Install the wheel and tire assemblies.

3. Refill the master cylinder and pump pedal to attain full brake pedal before Road-testing the vehicle.