

2003 ENGINE

Engine Mechanical - Montero (3.8L)

GENERAL DESCRIPTION

The 6G75 (3.8 L) engine is a six-cylinder engine. The cylinder numbers are assigned as 1-3-5 for the right bank and 2-4-6 for the left bank from the front of the engine (timing belt side). This engine is fired in the order of 1-2-3-4- 5-6 cylinders.

Engine Mechanical General Specification Table

ITEMS			SPECIFICATIONS
Type			V type, overhead camshaft
Number of cylinders			6
Bore mm (in)			95.0 (3.74)
Stroke mm (in)			90.0 (3.54)
Piston displacement cm ³ (cu. in)			3,828 (233.6)
Compression ratio			10.0
Firing order			1-2-3-4-5-6
Valve timing	Intake valve	Opens (BTDC)	5°
		Closes (ABDC)	55°
	Exhaust valve	Opens (BBDC)	51°
		Closes (ATDC)	17°

DIAGNOSIS

TROUBLE SYMPTOM	PROBABLE CAUSE	REMEDY
Compression is too low	Blown cylinder head gasket	Replace the gasket.
	Worn or damaged piston rings	Replace the rings.
	Worn piston or cylinder	Repair or replace the piston and/or the cylinder block.
	Worn or damaged valve seat	Repair or replace the valve and/or the seat ring.
Drop in oil pressure	Engine oil level is too low	Check the engine oil level.
	Malfunction of oil pressure switch	Replace the oil pressure switch.
	Clogged oil filter	Install a new filter.
	Worn oil pump gears or cover	Replace the gears and/or the cover.
	Thin or diluted engine oil	Change the engine oil to the correct viscosity.
	Stuck (opened) oil relief valve	Repair the relief valve.
	Excessive bearing clearance	Replace the bearings.
Oil pressure too high	Stuck (closed) oil relief valve	Repair the relief valve.

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Fig. 1: Engine Mechanical Diagnosis Symptom Table (1 Of 2)

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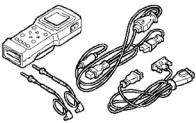
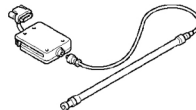
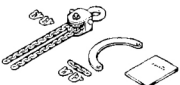
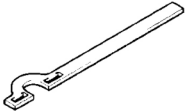
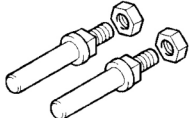
TROUBLE SYMPTOM	PROBABLE CAUSE	REMEDY
Noisy valves	Malfunction of lash adjuster (including entry of air into high pressure chamber)	Check the lash adjuster.
	Thin or diluted engine oil (low oil pressure)	Change the engine oil.
	Worn or damaged valve stem or valve guide	Replace the valve and/or the guide.
Connecting rod noise/main bearing noise	Insufficient oil supply	Check the engine oil level.
	Thin or diluted engine oil	Change the engine oil.
	Excessive bearing clearance	Replace the bearings.

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Fig. 2: Engine Mechanical Diagnosis Symptom Table (2 Of 2)

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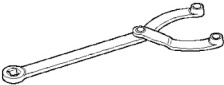
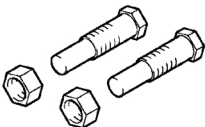
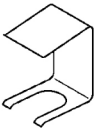
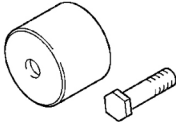

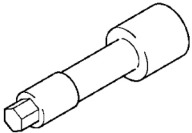
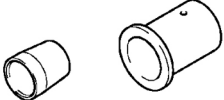
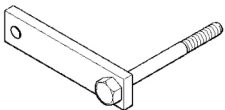
SPECIAL TOOLS

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MB991502 Scan tool (MUT-II)	MB991496-OD	Ignition timing check idle speed check
	MB991668 Belt tension meter set	Tool not available	Measurement of drive belt tension (used together with scan tool <MUT-II>)
	MB991683 Sling chain set	—	Removal and installation of engine assembly
	MB991800 Pulley holder	MB991800-01	Holding the crankshaft pulley
	MB991802 Pin B	MB991802-01	Holding the crankshaft pulley

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Fig. 3: Identifying Special Tools (1 Of 3)

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TOOL	TOOL NUMBER AND NAME	SUPERSESSON	APPLICATION
	MB990767 End yoke holder	MB990767-01	Holding the camshaft sprocket
	MD998715 Crankshaft pulley holder pin	MIT308239	Holding the camshaft sprocket
	MD998443 Auto-lash adjuster holder	MD998443-01	Holding the auto-lash adjuster
	MD998713 Camshaft oil seal installer	MD998713-01	Press-in of the camshaft oil seal
	MB991559 Camshaft oil seal adapter installer	—	Press-fitting the camshaft oil seal (left bank side)
	MD998051 Cylinder head bolt wrench	MD998051-01 or General service tool	Cylinder head bolt removal and installation
	MD998717 Crankshaft front oil seal installer	MD998717-01	Press-in of the crankshaft front oil seal
	MD998781 Flywheel stopper	General service tool	Securing the drive plate

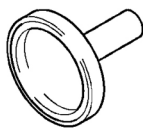
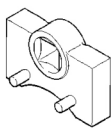

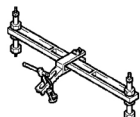
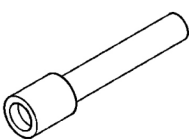
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Fig. 4: Identifying Special Tools (2 Of 3)

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TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MD998718 Crankshaft rear oil seal installer	MD998718-01	Press-fitting the crankshaft rear oil seal
	MD998767 Timing pulley socket wrench	MD998752-01	Timing belt tension adjustment
	MD998769 Crankshaft pulley spacer	General service tool	Rotating the crankshaft when installing the timing belt
	MD998772 Valve spring compressor	General service tool	Compressing valve spring
	MD998774 Valve stem seal installer	MD998774-01	Valve stem seal installer

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Fig. 5: Identifying Special Tools (3 Of 3)

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

ON VEHICLE SERVICE

DRIVE BELT TENSION CHECK

CAUTION: Perform the check after rotating the engine in the normal direction (one revolution or more).

1. Check that the indicator mark of the auto-tensioner is located between the marks shown as "A" on the tensioner bracket.

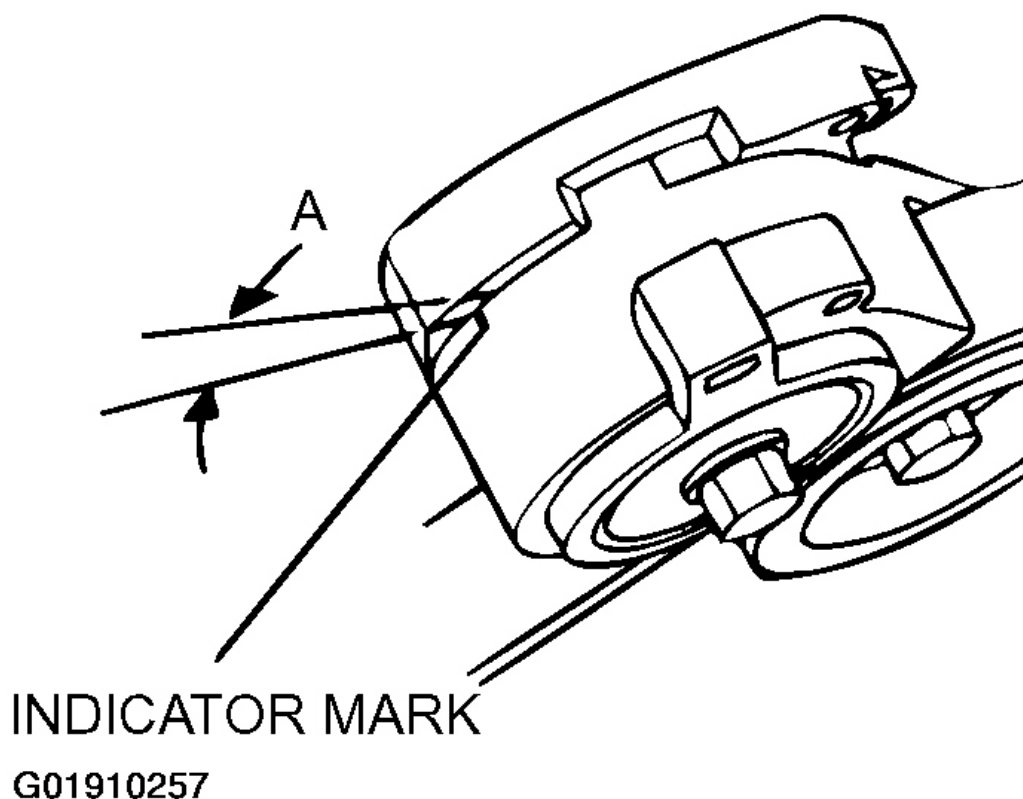


Fig. 6: Identifying Auto-Tensioner Indicator Mark Lies Position
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

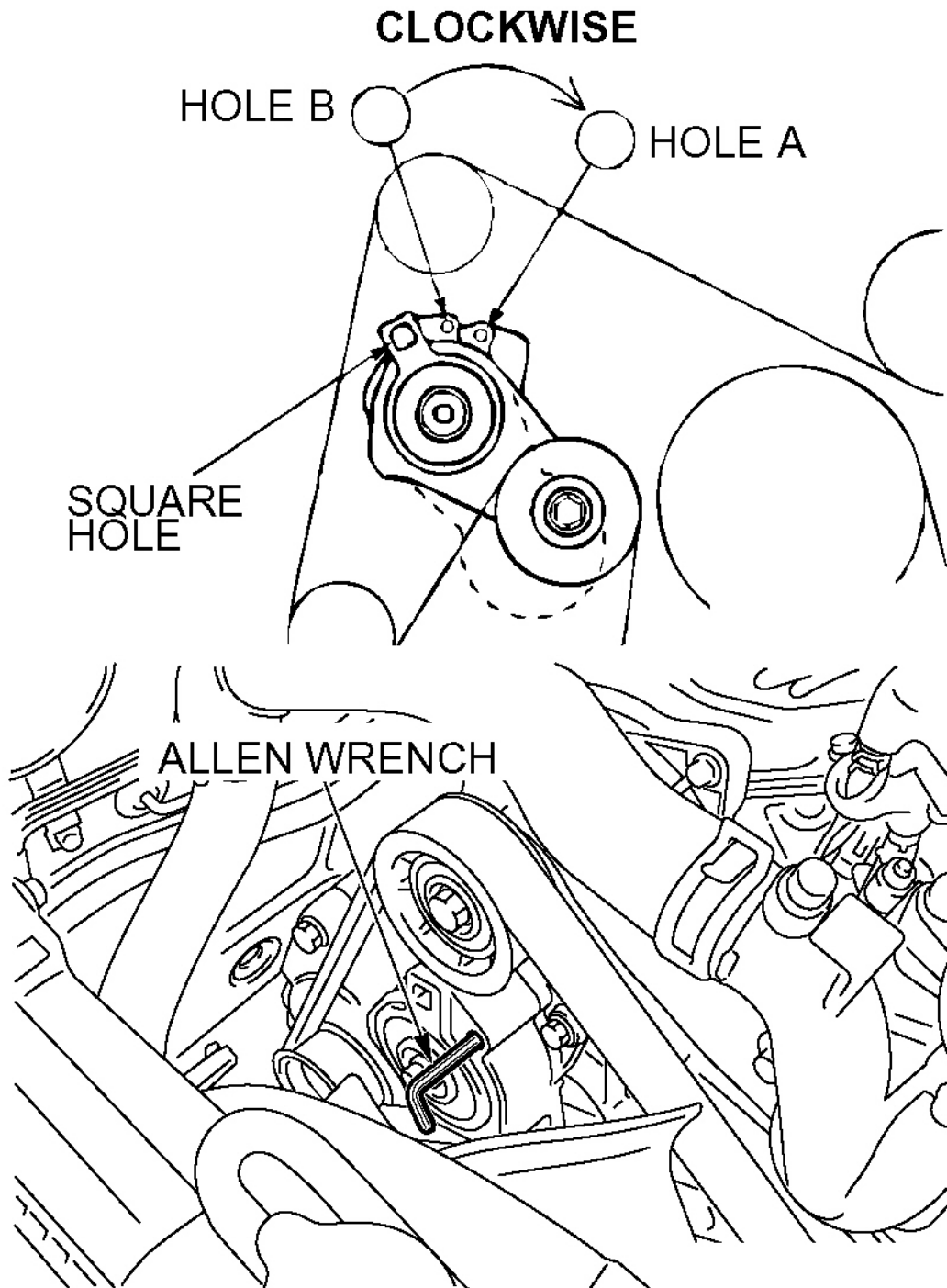
2. If the mark is located out of the space "A," replace the drive belt.

NOTE: Since the auto-tensioner is used, it is not necessary to adjust the tension of the belt. .

AUTO-TENSIONER CHECK

1. Run the engine at idling speed and then stop it to check whether the drive belt is centered on the auto-tensioner pulley.
2. Insert a 1/2 inch breaker bar into the square hole on the drive belt auto tensioner, and rotate it clockwise until the tensioner touches the stopper.
3. Align hole B with hole A, and insert a 5.0 mm (0.20 inch) Allen wrench to hold the tensioner. Then loosen the drive belt, and then remove the drive belt auto tensioner.
4. Move the auto-tensioner right and left by using a 1/2 inch breaker bar or similar tool to verify that it moves smoothly.

5. If some abnormality is found during the above mentioned check (1) and (3), replace the auto-tensioner.



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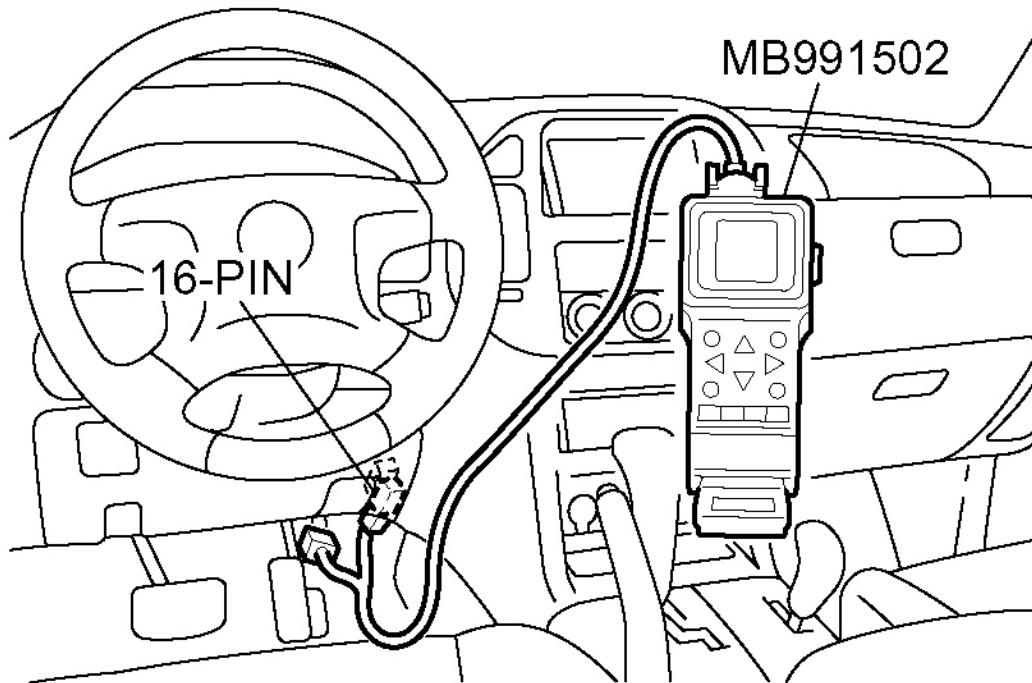
Fig. 7: Checking Auto-Tensioner**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.****IGNITION TIMING CHECK****Required Special Tool:**

MB991502: Scan Tool (MUT-II)

1. Before inspection, set vehicles in the following condition:
 - Engine coolant temperature: 80 - 95°C (176 - 203°F)
 - Lights and all accessories: OFF
 - Transmission: P range

CAUTION: To prevent damage to scan tool MB991502, always turn the ignition switch to "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

2. Connect scan tool MB991502 to the data link connector.



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Fig. 8: Connecting Scan Tool To Data Link Connector (Ignition Timing Check)
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. Set up a timing light.
4. Start the engine and run it at idle.
5. Check that the idle speed is approximately 750 RPM.
6. Select scan tool MB991502 actuator test "ITEM NUMBER 17".
7. Check that basic ignition timing is within the standard value.

Standard value: 5° BTDC +/- 3°

8. If the basic ignition timing is not within the standard value, check the following items:
 - Diagnosis Output
 - Timing Belt Cover And Crankshaft Position Sensor Installation Conditions
 - Crankshaft Sensing Blade Condition

CAUTION: If the actuator test is not canceled, the forced drive will continue for 27 minutes. Driving in this state could lead to engine failure.

9. Press the clear key on scan tool MB991502 (select forced drive stop mode), and cancel the actuator test.
10. Check that the actual ignition timing is at the standard value.

Standard value: Approximately 10° BTDC

NOTE: Ignition timing fluctuates about +/- 7° Before Top Dead Center, even under normal operating condition.

NOTE: It is automatically further advanced by about 5° to 10° Before Top Dead Center at higher altitudes.

CURB IDLE SPEED CHECK

Required Special Tool:

MB991502: Scan Tool (MUT-II)

1. Before inspection and adjustment set vehicles in the following condition.
 - Engine coolant temperature: 80 - 95°C (176 - 203°F)
 - Lights, and all accessories: OFF
 - Transmission: P range

CAUTION: To prevent damage to scan tool MB991502, always turn the ignition switch to "LOCK" (OFF) position before connecting or disconnecting

scan tool MB991502.

2. Connect scan tool MB991502 to the data link connector.

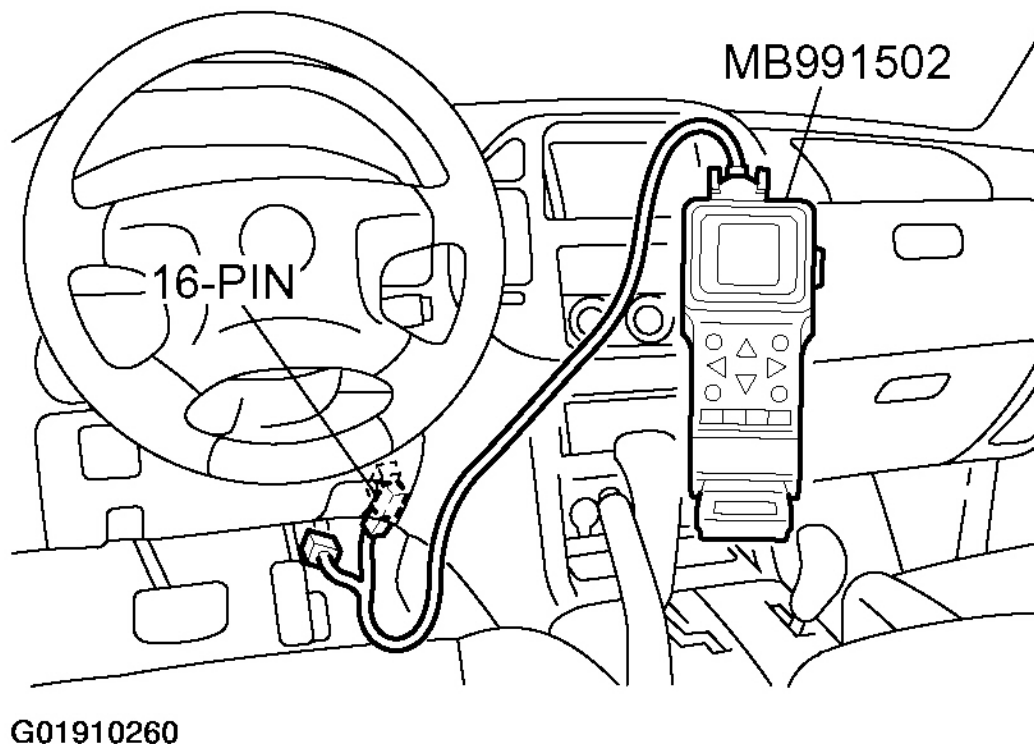


Fig. 9: Connecting Scan Tool To Data Link Connector (Curb Idle Speed Check)
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. Check the basic ignition timing.

Standard value: 5° BTDC +/- 3°

4. Start the engine.
5. Run the engine at idle for 2 minutes.
6. Check the idle speed. Select item number 22 and take a reading of the idle speed.

Curb idle speed: 700 +/- 100 r/min

NOTE: The idle speed is controlled automatically by the idle air control system.

7. If the idle speed is outside the standard value, refer to **IDLE SPEED & IGNITION TIMING** . .

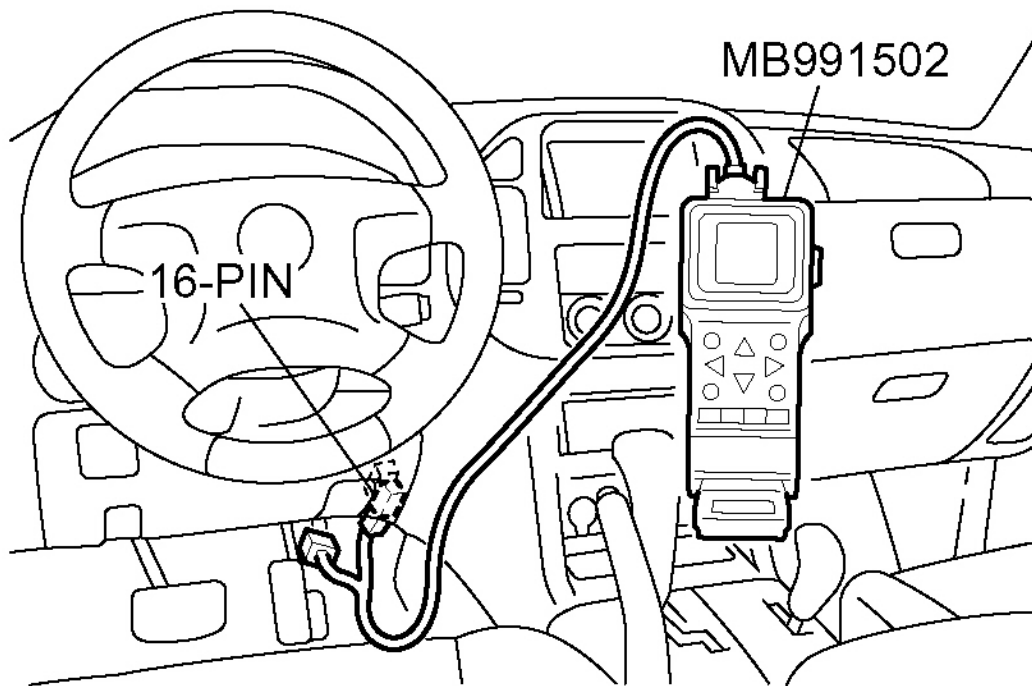
IDLE MIXTURE CHECK**Required Special Tool:**

MB991502: Scan Tool (MUT-II)

1. Before inspection, set vehicles in the following condition:
 - Engine coolant temperature: 80 - 95°C (176 - 203°F)
 - Lights, and all accessories: OFF
 - Transmission: P range

CAUTION: To prevent damage to scan tool MB991502, always turn the ignition switch to "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

2. Connect scan tool MB991502 to the data link connector.



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Fig. 10: Connecting Scan Tool To Data Link Connector (Idle Mixture Check)

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. Check that the basic ignition timing is within the standard value.

Standard value: 5° BTDC +/- 3°

4. Start the engine and increase the engine speed to 2,500 r/min for 2 minutes.
5. Set the CO, HC tester.
6. Check the CO contents and the HC contents at idle.

Standard value:

CO contents: 0.5% or less

HC contents: 100 ppm or less

7. If the CO and HC contents do not remain inside the standard value, check the following items:

NOTE: **Replace the catalytic converter when the CO and HC contents do not remain inside the standard value, even though the result of the inspection is normal for all items.**

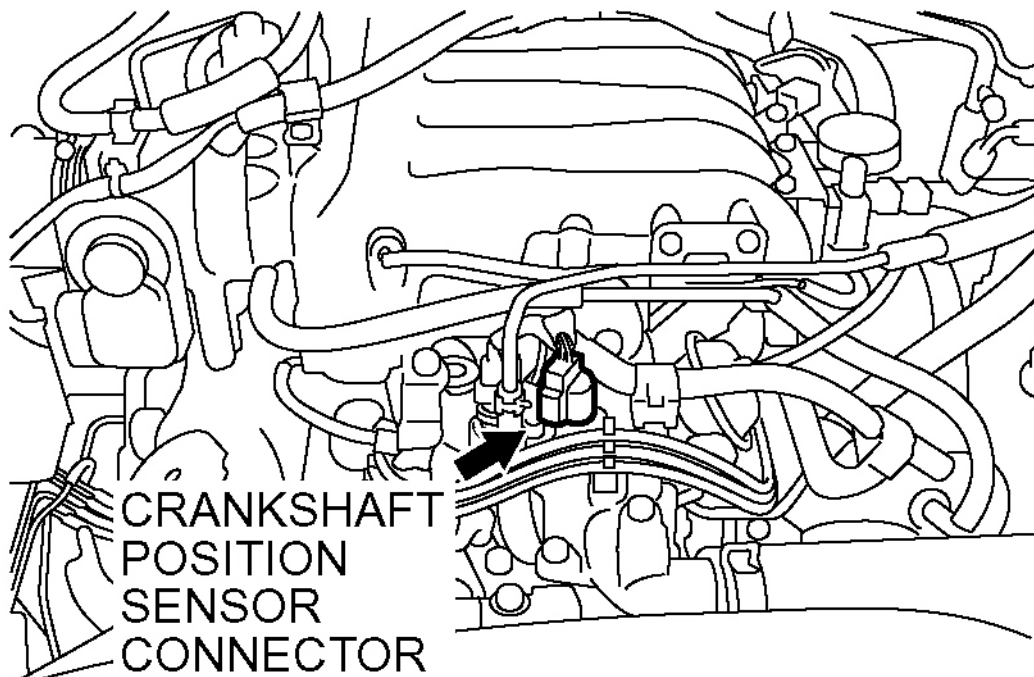
- Diagnosis Output
- Closed-Loop Control (When The Closed-Loop Control Is Carried Out Normally, The Output Signal Of The Heated Oxygen Sensor Changes Between 0 - 400 MV And 600 - 1,000 MV At Idle.)
- Fuel Pressures
- Injector
- Ignition Coil, Spark Plug Cable, Spark Plug
- EGR System And EGR Valve Leak
- Evaporative Emission System
- Compression Pressure

COMPRESSION PRESSURE CHECK

1. Before inspection, check that the engine oil, starter and battery are normal. Also, set the vehicle in the following condition:
 - Engine coolant temperature: 80 - 95°C (176 - 203°F)
 - Lights, and all accessories: OFF
 - Transmission: P range
2. Disconnect the spark plug cables.
3. Remove all of the spark plugs.
4. Disconnect the crankshaft position sensor connector.

NOTE: **Doing this will prevent the engine control module from carrying out**

ignition and fuel injection.



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Fig. 11: Identifying Crankshaft Position Sensor Connector Location
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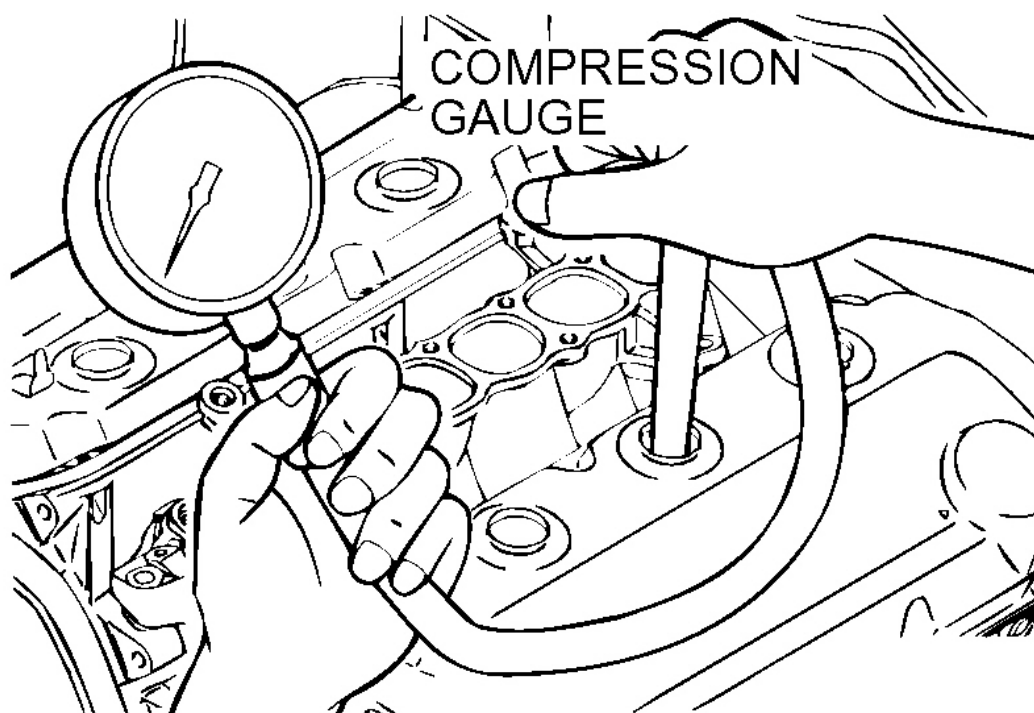
WARNING: Keep your distance from the spark plug hole when cranking. Oil, fuel, etc., may spray out from the spark plug hole and may cause serious injury.

5. Cover the spark plug hole with a shop towel etc., during cranking. After the engine has been cranked, check for foreign material adhering to the shop towel.
6. Set compression gauge to one of the spark plug holes.
7. Crank the engine with the throttle valve fully open and measure the compression pressure.

Standard value (at engine speed of 250 - 400 r/min): 1,177 kPa (171 psi)

Minimum limit (at engine speed of 250 - 400 r/min): 875 kPa (127 psi)

8. Measure the compression pressure for all the cylinders, and check that the pressure differences of the cylinders are below the limit.



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Fig. 12: Measuring Compression Pressure

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Limit: 98 kPa (14 psi)

9. If there is a cylinder with compression or a compression difference that is outside the limit, pour a small amount of engine oil through the spark plug hole, and repeat the operations in steps 6 to 8.
 1. If the compression increases after oil is added, the cause of the malfunction is a worn or damaged piston ring and/or cylinder inner surface.
 2. If the compression does not rise after oil is added, the cause is a burnt or defective valve seat, or pressure is leaking from the gasket.
10. Connect the crankshaft position sensor connector.
11. Install the spark plugs and spark plug cables.
12. Use the scan tool to erase the diagnostic trouble codes.

NOTE: This will erase the diagnostic trouble code resulting from the crankshaft position sensor connector being disconnected.

MANIFOLD VACUUM CHECK

1. Start the engine and allow it to warm up until the temperature of the engine coolant reaches 80 - 95°C (176 - 203°F).
2. Connect a tachometer.
3. Attach a Tee-fitting union to the vacuum hose between the fuel pressure regulator and the intake manifold plenum, and connect a vacuum gauge.
4. Start the engine and check that idle speed is within specification. Then check the vacuum gauge reading.

Idle speed: 700 +/- 100 r/min

Minimum limit: 60 kPa (18 in Hg)

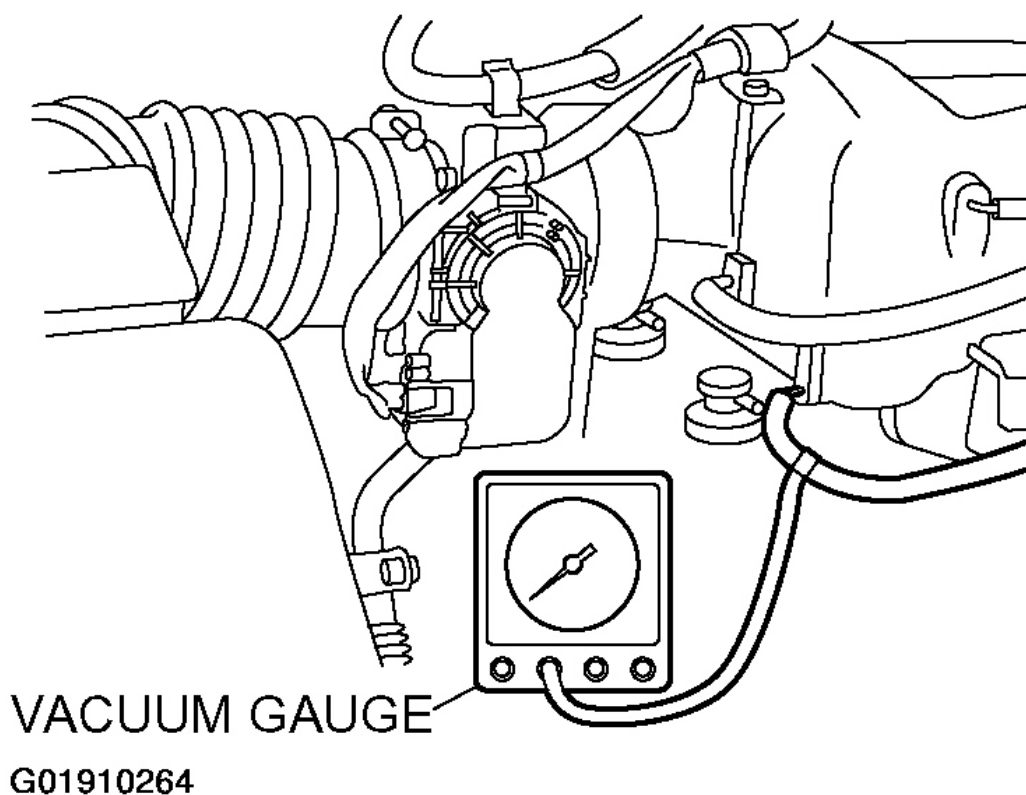


Fig. 13: Checking Manifold Vacuum

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

LASH ADJUSTER CHECK

If an abnormal noise (chattering noise) suspected to be caused by malfunction of the lash adjuster is produced immediately after starting the engine and does not disappear, perform the following check.

NOTE: An abnormal noise due to malfunction of the lash adjuster is produced immediately after starting the engine and changes with the engine speed, irrespective of the engine load. If, the abnormal noise is not produced immediately after starting the engine or does not change with the engine speed, or it changes with the engine load, the lash adjuster is not the cause for the abnormal noise.

NOTE: When the lash adjuster is malfunctioning, the abnormal noise is rarely eliminated by continuing the warming-up of the engine at idle speed.

However, the abnormal noise may disappear only when seizure is caused by oil sludge in the engine whose oil is not maintained properly.

1. Start the engine.
2. Check if the abnormal noise produced immediately after starting the engine, changes with the change in the engine speed.

If the abnormal noise is not produced immediately after starting the engine or it does not change with the engine speed, the lash adjuster is not the cause for the noise. Therefore, investigate other causes. The abnormal noise is probably caused by some other parts than the engine proper if it does not change with the engine speed. (In this case, the lash adjuster is in good condition.)

3. With the engine idling, change the engine load (shift from N to D range, for example) to make sure that there is no change in the level of abnormal noise.

If there is a change in the level of abnormal noise, suspect a tapping noise due to worn crankshaft bearing or connecting rod bearing. In this case, the lash adjuster is in good condition.

4. After completion of warm-up, run the engine at idle to check for abnormal noise.

If the noise is reduced or disappears, clean the lash adjuster (Refer to **LASH ADJUSTERS**). As it is suspected that the noise is due to seizure of the lash adjuster. If there is no change in the level of the abnormal noise, proceed to step 5.

5. Run the engine to bleed the lash adjuster system (Refer to **BLEEDING LASH ADJUSTER SYSTEM**).
6. If the abnormal noise does not disappear after air bleeding operation, clean the lash adjuster (Refer to **LASH ADJUSTER INSTALLATION**).

Bleeding Lash Adjuster System

NOTE: Parking the vehicle on a grade for a long time may decrease oil in the lash adjuster, causing air to enter the high pressure chamber when starting the engine.

NOTE: After parking for many hours, oil may run out from the oil passage and take time before oil is supplied to the lash adjuster, causing air to enter the high

pressure chamber.

NOTE: In the above cases, abnormal noise can be eliminated by bleeding the lash adjuster system.

1. Check engine oil and add or change oil if required.

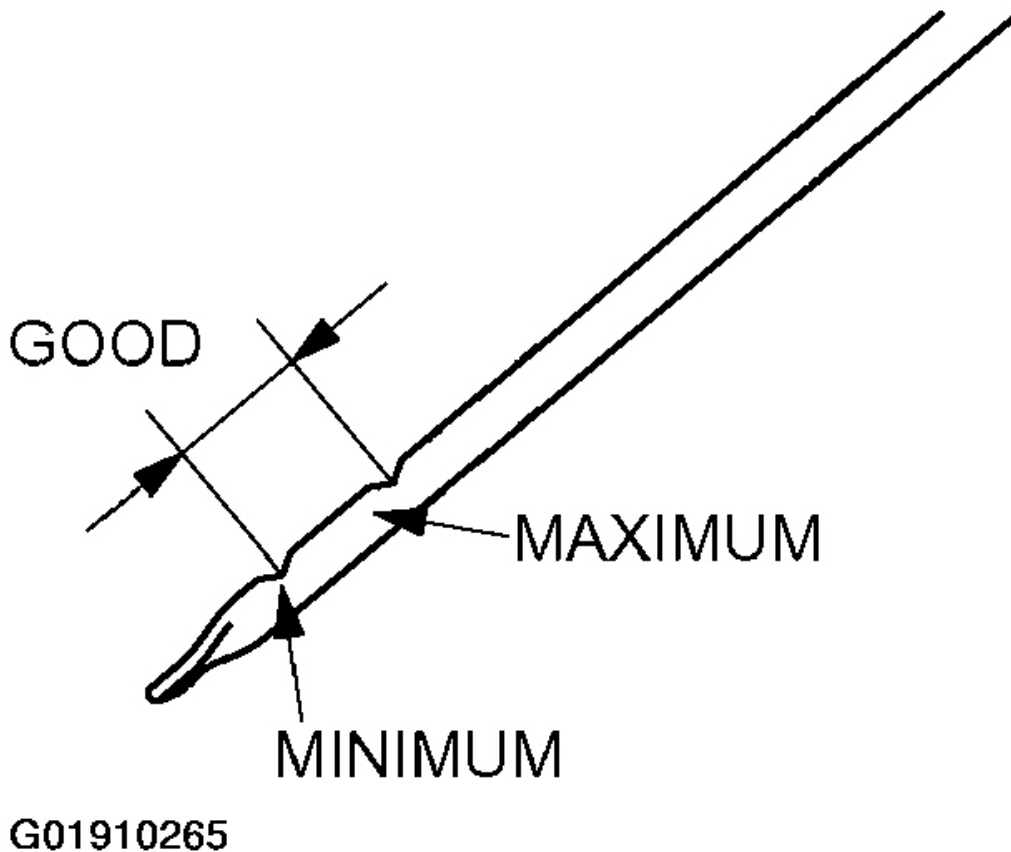


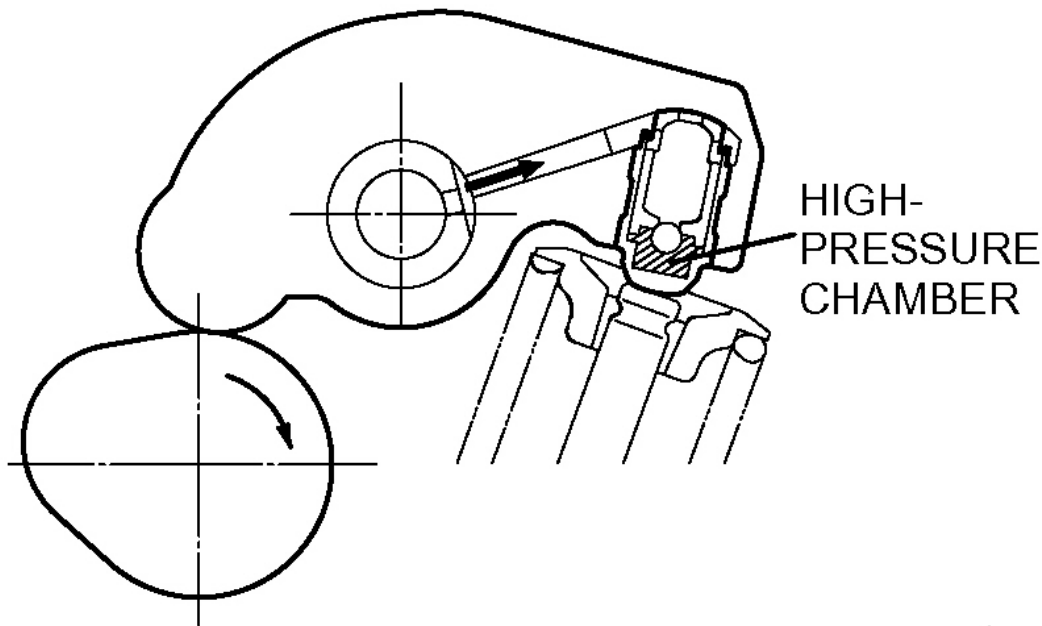
Fig. 14: Identifying Engine Oil OK Position On Dipstick
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

NOTE: If the engine oil level is low, air is sucked from the oil screen, causing air to enter the oil passage.

NOTE: If the engine oil level is higher than specification, oil may be stirred by the crankshaft, causing oil to be mixed with a large quantity of air.

- NOTE:** If oil is deteriorated, air is not easily separated from oil, increasing the quantity of air contained in oil.
- NOTE:** If air mixed with oil enters the high pressure chamber inside the lash adjuster from the above causes, air in the high pressure chamber is compressed excessively while the valve is opened, resulting in an abnormal noise when the valve closes. This is the same phenomenon as that observed when the valve clearance has become excessive. The lash adjuster can resume normal function when air entered the lash adjuster is removed.

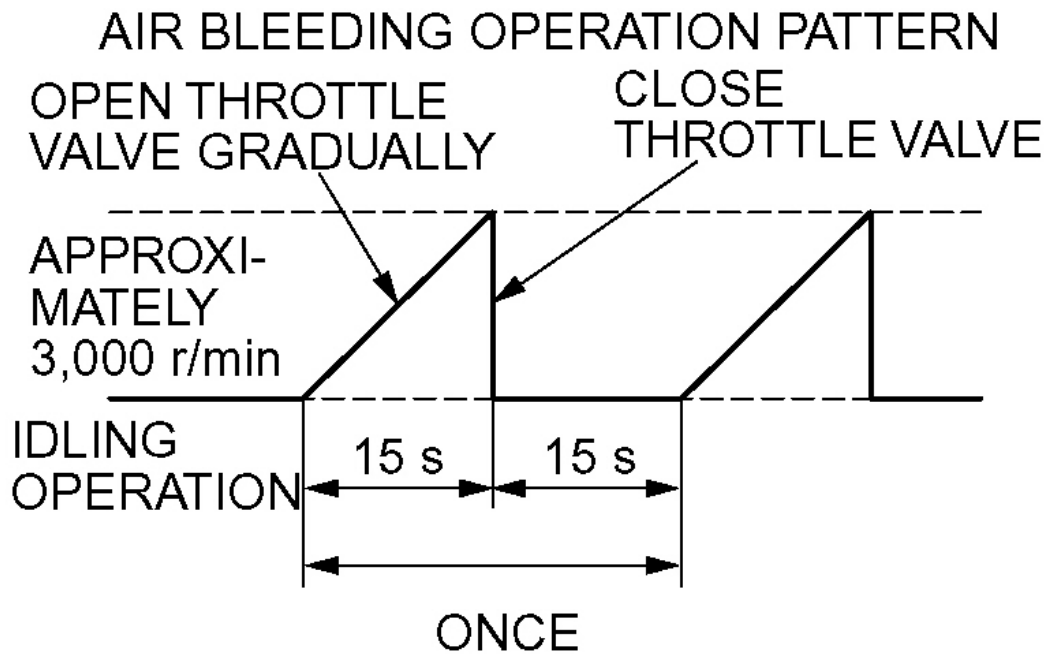
2. Idle the engine for one to three minutes to warm it up.



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Fig. 15: Identifying Lash Adjuster & Valve Train Components
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. Repeat the operation pattern, shown in left figure, at no load to check for abnormal noise. (Usually the abnormal noise is eliminated after repetition of the operation 10 to 30 times. If, however, no change is observed in the level of abnormal noise after repeating the operation more than 30 times, suspect that the abnormal noise is due to some other factors.



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Fig. 16: Air Bleeding Operation Pattern

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

4. After elimination of abnormal noise, repeat the operation shown in left figure five more times.
5. Run the engine at idle for one to three minutes to make sure that the abnormal noise has been eliminated.

ENGINE ASSEMBLY

REMOVAL & INSTALLATION

CAUTION: *: Indicates parts which should be initially tightened, and then fully tightened after placing the vehicle horizontal and loading the full weight of the engine on the vehicle body.

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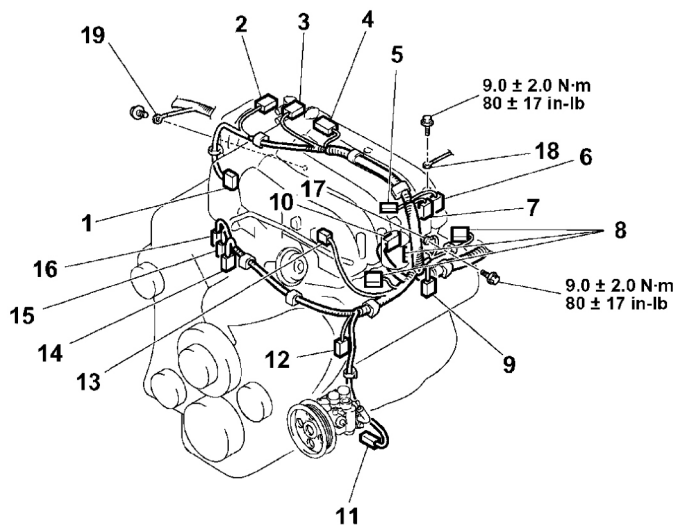
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Pre-removal Operation

- Skid Plate and Under Cover Removal
- Engine Oil Draining (Refer to On-vehicle Service – Engine Oil Replacement)
- Engine Coolant Draining (Refer to On-vehicle Service – Engine Coolant Replacement.)
- Fuel Line Pressure Reduction [Refer to On-vehicle Service – Fuel Pump Relay Disconnection (How to Reduce Pressurized Fuel Lines).]
- Hood Removal (Refer to Hood.)
- Battery Removal
- Air Cleaner and Air Intake Hose Removal (Refer to Air Cleaner)
- Radiator Removal (Refer to Radiator)
- Cooling Fan and Clutch Assembly Removal (Refer to Cooling Fan)
- Front Exhaust Pipe Removal (Refer to Exhaust Pipe and Main Muffler.)
- Transmission Assembly Removal (Refer to Transmission and Transfer Assembly.)

Post-installation Operation

- Transmission Assembly Installation (Refer to Transmission and Transfer Assembly.)
- Front Exhaust Pipe Installation
- Radiator Installation
- Cooling Fan and Clutch Assembly Installation (Refer to Cooling Fan)
- Air Cleaner and Air Intake Hose Installation
- Battery Installation
- Hood Installation (Refer to Hood.)
- Engine Oil Refilling (Refer to On-vehicle Service – Engine Oil Replacement.)
- Engine Coolant Refilling (Refer to On-vehicle Service – Engine Coolant Replacement.)
- Fuel Leak Check
- Skid Plate and Under Cover Installation



REMOVAL STEPS

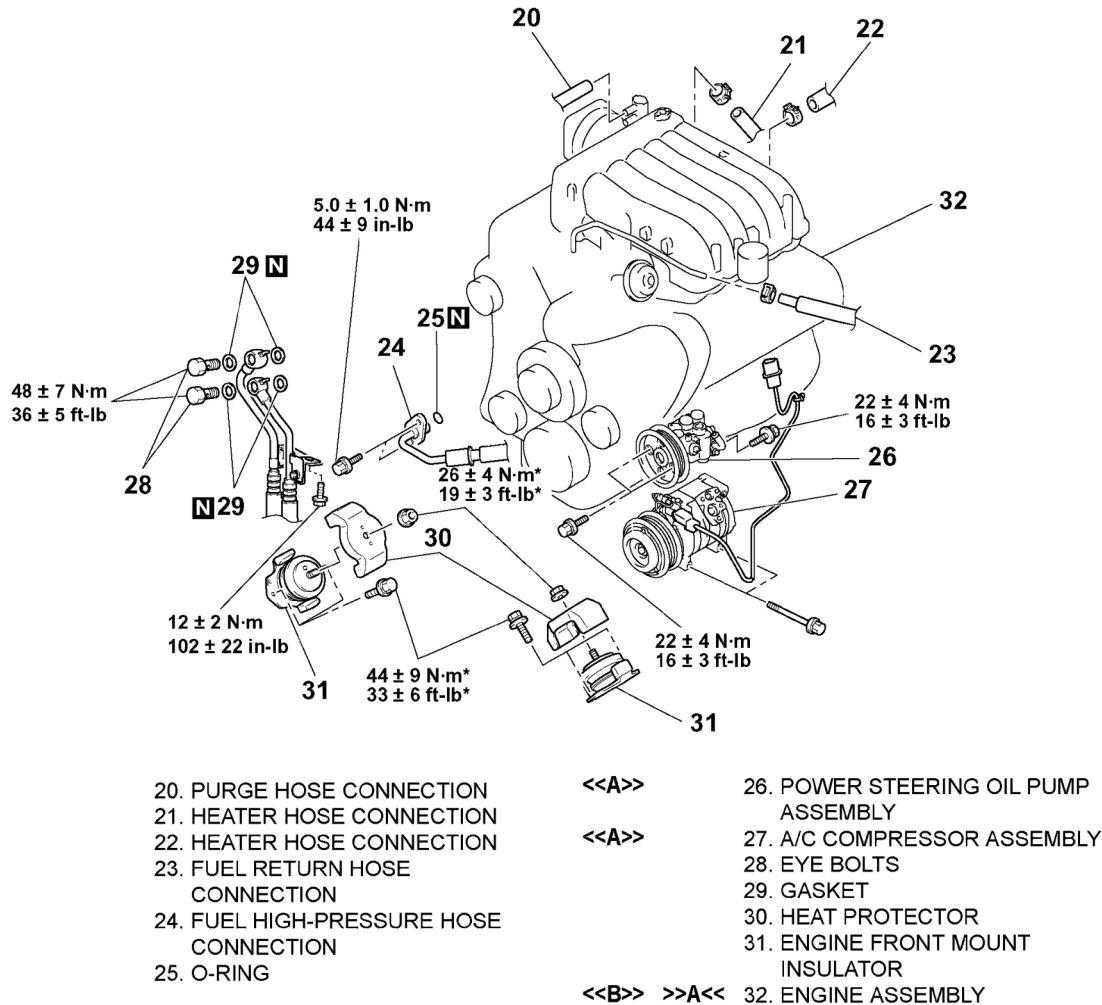
1. THROTTLE POSITION SENSOR CONNECTOR
2. EGR CONNECTOR
3. RIGHT BANK HEATED OXYGEN SENSOR CONNECTOR
4. MANIFOLD DIFFERENTIAL PRESSURE SENSOR
5. NOISE CONDENSER CONNECTOR
6. CONTROL WIRING HARNESS AND CAMSHAFT POSITION SENSOR WIRING HARNESS CONNECTOR
7. KNOCK SENSOR CONNECTOR
8. IGNITION COIL CONNECTOR
9. LEFT BANK HEATED OXYGEN SENSOR CONNECTOR
10. CONTROL WIRING HARNESS AND INJECTION WIRING HARNESS COMBINATION CONNECTOR

REMOVAL STEPS (Continued)

11. POWER STEERING PUMP SWITCH CONNECTOR
12. A/C COMPRESSOR ASSEMBLY CONNECTOR
13. INTAKE MANIFOLD TUNING SOLENOID CONNECTOR
14. CRANKSHAFT POSITION SENSOR CONNECTOR
15. ENGINE COOLANT TEMPERATURE GAUGE UNIT CONNECTOR
16. ENGINE COOLANT TEMPERATURE GAUGE SENSOR CONNECTOR
17. GROUND CABLE
18. GROUND CABLE
19. GROUND CABLE

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Fig. 17: Engine Assembly Removing Procedure & Torque Specifications (1 Of 2)
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.



G01910269

Fig. 18: Engine Assembly Removing Procedure & Torque Specifications (2 Of 2)
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Required Special Tool:

- MB991683: Sling Chain Set

Removal Service Points

<< A >> Power Steering Oil Pump Assembly/A/C Compressor Assembly Removal

1. Remove the oil pump and A/C compressor (with the hose attached).
2. Suspend the removed oil pump (by using wire or similar material) at a place where no damage will be caused during removal/installation of the engine assembly.

<< B >> Engine Assembly Removal

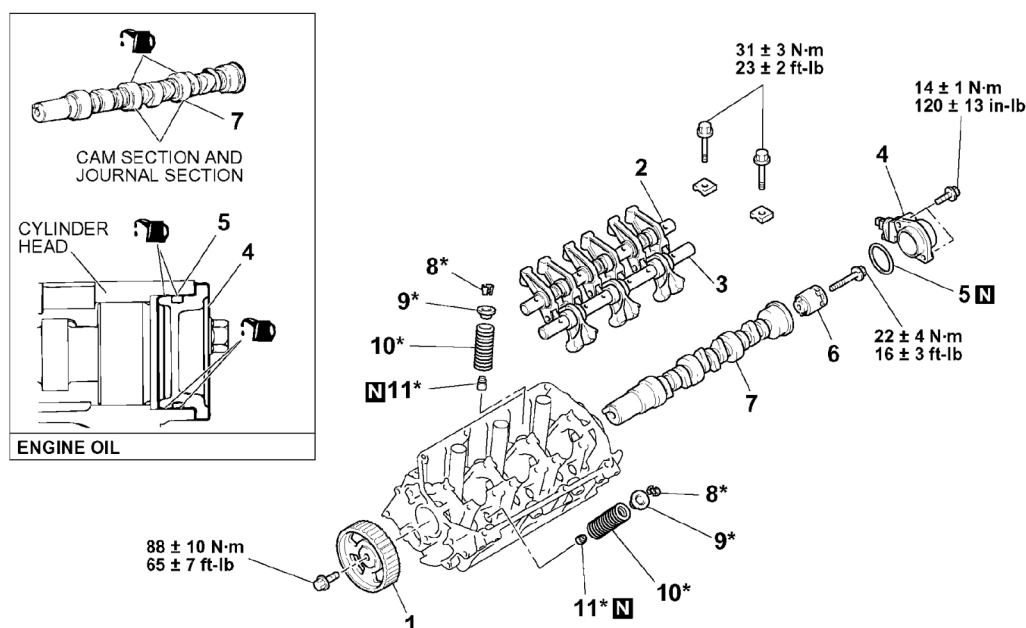
1. Check that all cables, hoses, harness connectors, etc. are disconnected from the engine.
2. Use special tool MB991683 and chain block to lift the engine assembly slowly and remove it.

>> A << Engine Assembly Installation

Install the engine assembly. When doing so, check carefully that all pipes and hoses are connected, and that none are twisted, damaged, etc.

CAMSHAFT AND VALVE STEM SEAL**REMOVAL & INSTALLATION**

CAUTION: Remove and assemble the marked parts in each cylinder unit.



CAMSHAFT REMOVAL STEPS

- CYLINDER HEAD ASSEMBLY

- <<A>> >>F<< 1. CAMSHAFT SPROCKET
<> >>E<< 2. ROCKER ARM, SHAFT AND LASH ADJUSTER ASSEMBLY (INTAKE SIDE)
<> >>E<< 3. ROCKER ARM, SHAFT AND LASH ADJUSTER ASSEMBLY (EXHAUST SIDE)
>>D<< 4. CAMSHAFT POSITION SENSOR SUPPORT
5. O-RING
6. SENSING CAMSHAFT POSITION CYLINDER
7. CAMSHAFT

VALVE STEM SEAL REMOVAL STEPS

- ROCKER COVER

- <> >>E<< 2. ROCKER ARM, SHAFT AND LASH ADJUSTER ASSEMBLY (INTAKE SIDE)
<> >>E<< 3. ROCKER ARM, SHAFT AND LASH ADJUSTER ASSEMBLY (EXHAUST SIDE)
<<C>> >>C<< 8. VALVE SPRING RETAINER LOCKS
>>B<< 9. VALVE SPRING RETAINERS
>>A<< 10. VALVE SPRINGS
>>A<< 11. VALVE STEM SEALS

G01910270

Fig. 19: Removing Camshaft & Valve Stem Seals & Torque Specifications
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Required Special Tools:

MB990767: End Yoke Holder

MD998443: Auto-lash Adjuster Holder

MD998715: Crankshaft Pulley Holder Pin

MD998772: Valve Spring Compressor

MD998774: Valve Stem Seal Installer

Removal Service Points

<< A >> Camshaft Sprocket Removal

Use special tools MD998715 and MB990767 to remove the camshaft sprocket.

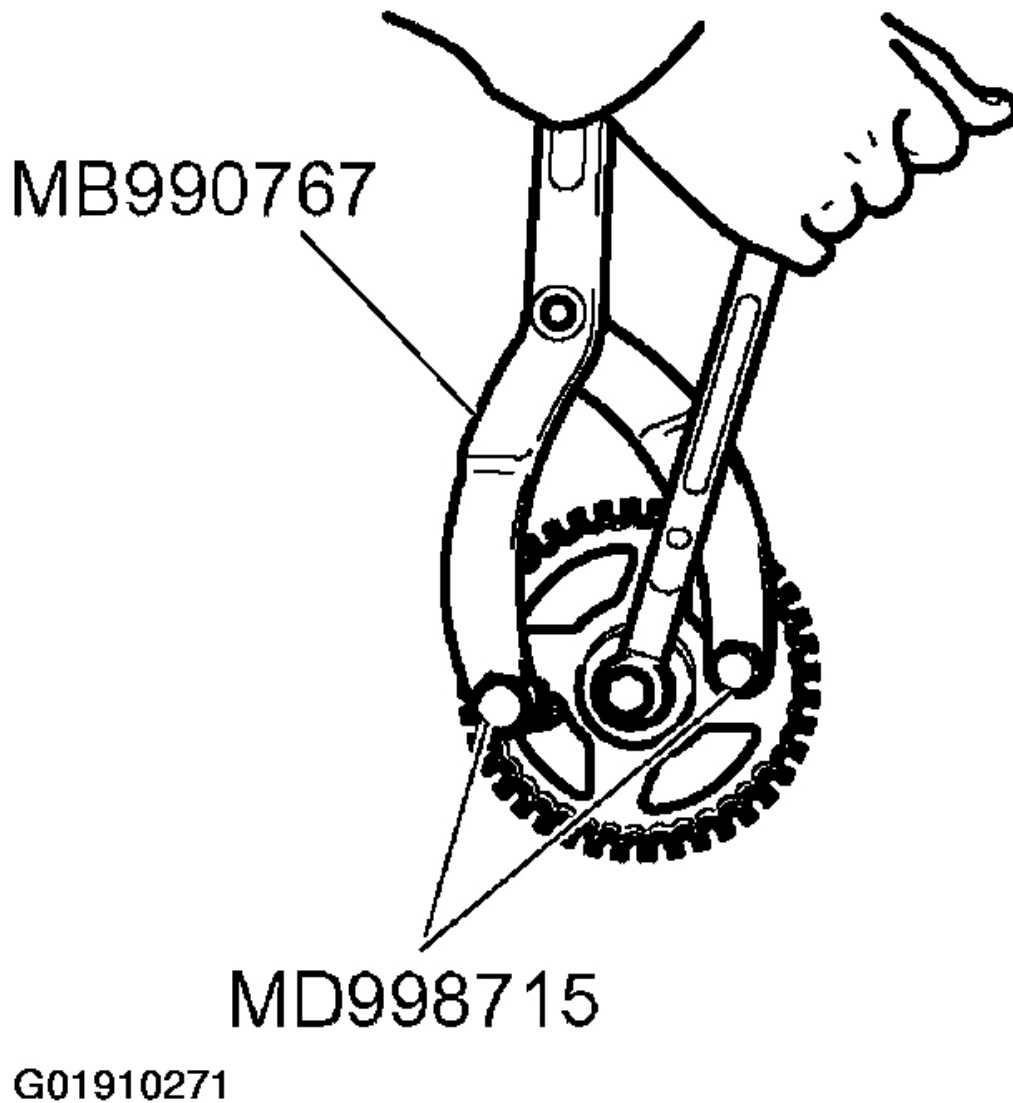
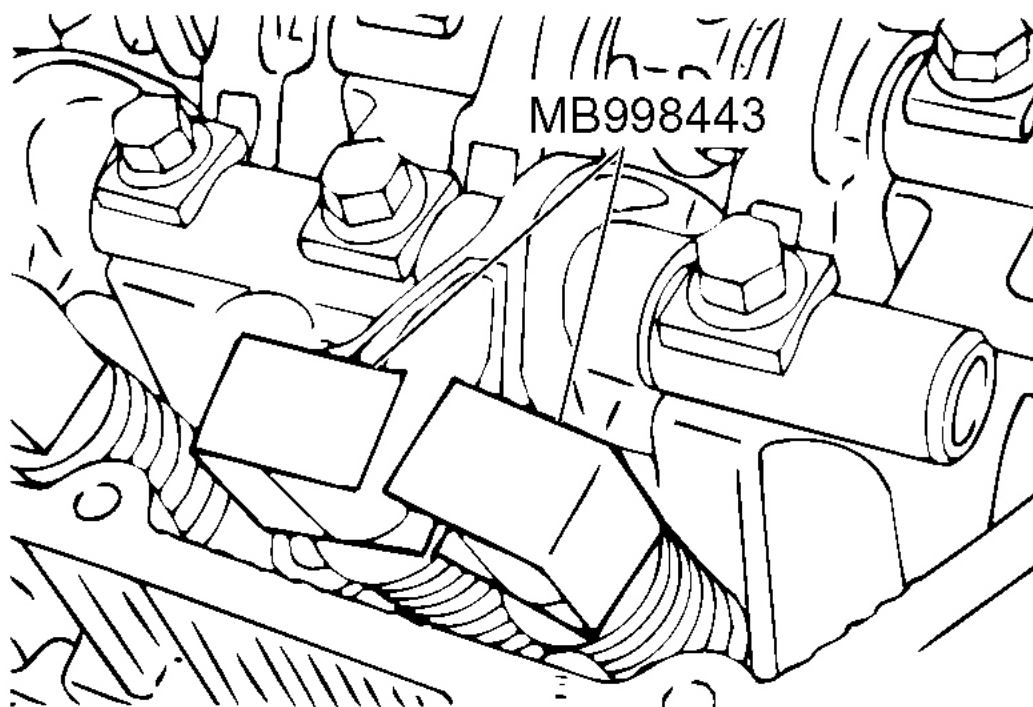


Fig. 20: Removing Camshaft Sprocket
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Rocker Arm & Shaft Assembly Removal

1. Install special tool MD998443 as shown in the illustration so that the lash adjusters will not fall out.



G01910272

Fig. 21: Installed Position Of Lash Adjuster Special Tool
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

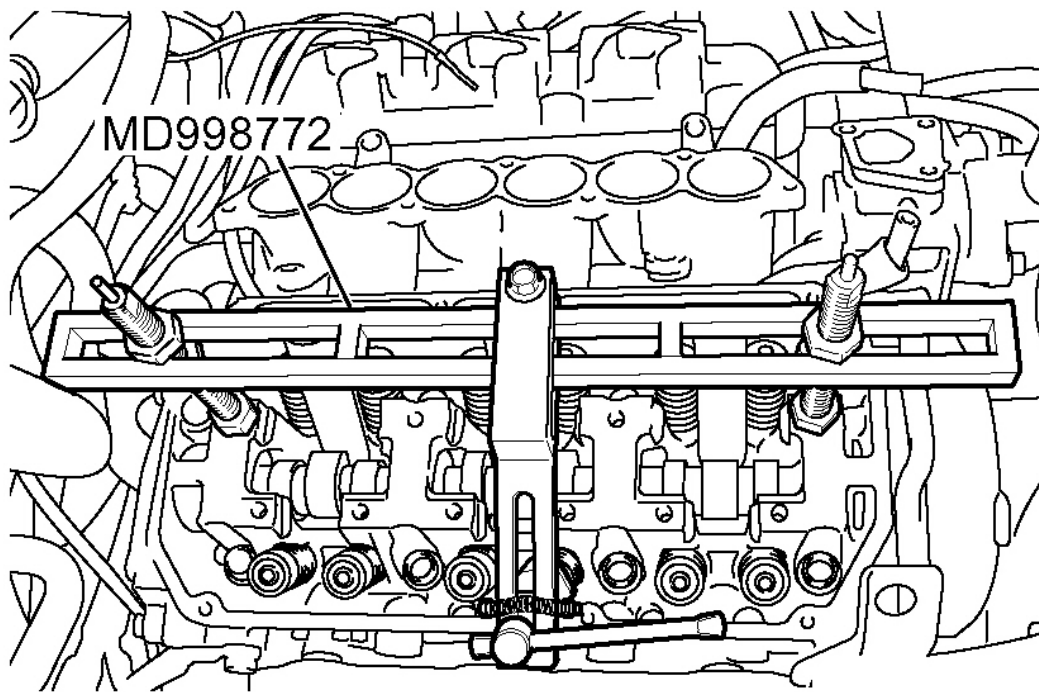
CAUTION: Never disassemble the rocker arm and shaft assembly.

2. Loosen the rocker arm and shaft assembly mounting bolt, and then remove the rocker arm and shaft assembly with the bolt still attached.

<< C >> Valve Spring Retainer Locks Removal

CAUTION: When removing valve spring retainer locks, leave the piston of each cylinder in the TDC (Top Dead Center) position. The valve may fall into the cylinder if the piston is not properly in the TDC position.

Use special tool MD998772 to compress the valve spring, and remove the valve spring retainer locks.

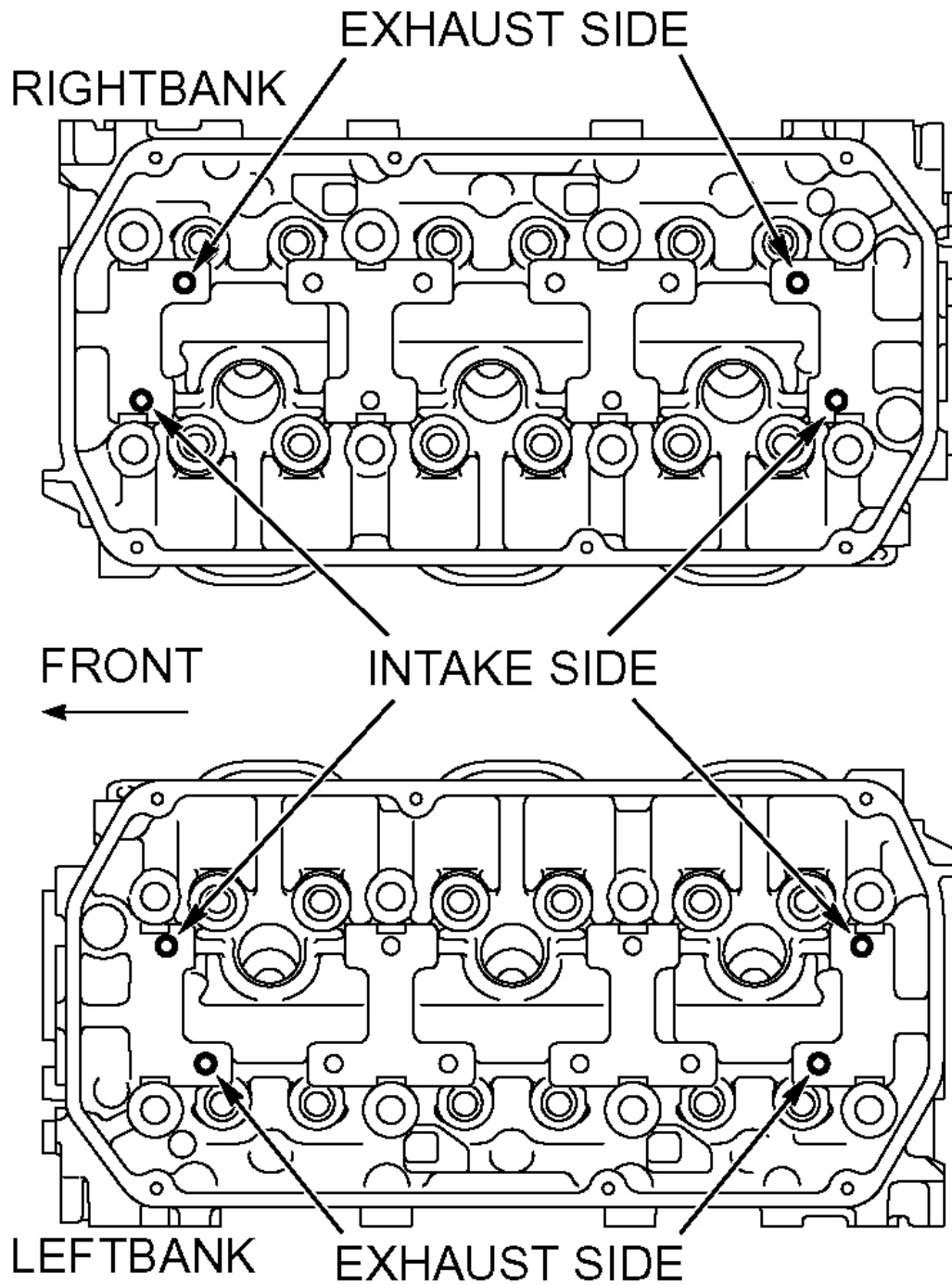


G01910273

Fig. 22: Compressing Valve Spring Using Special Tool
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

NOTE: Installation position of valve spring compressor special tool (MD998772) is different between exhaust side and intake side.

INSTALLATION POSITION



G01910274

Fig. 23: Identifying Installation Position For Valve Spring Compressor
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Installation Service Points

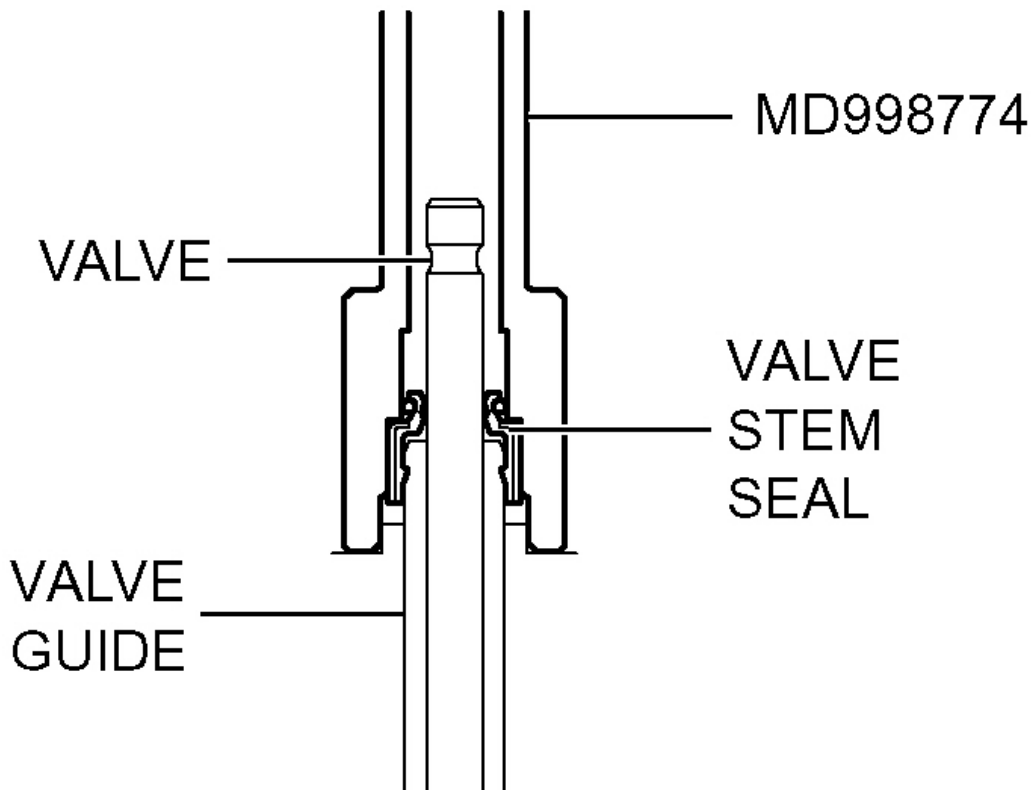
>> A << Valve Stem Seals Installation

1. Apply a small amount of engine oil to the valve stem seals.

CAUTION:

- Valve stem seals cannot be reused.
- Special tool MD998774 must be used to install the valve stem seal. Improper installation could result in oil leaking past the valve guide.

2. Use special tool MD998774 to fill a new valve stem seal in the valve guide using the valve stem area as a guide.

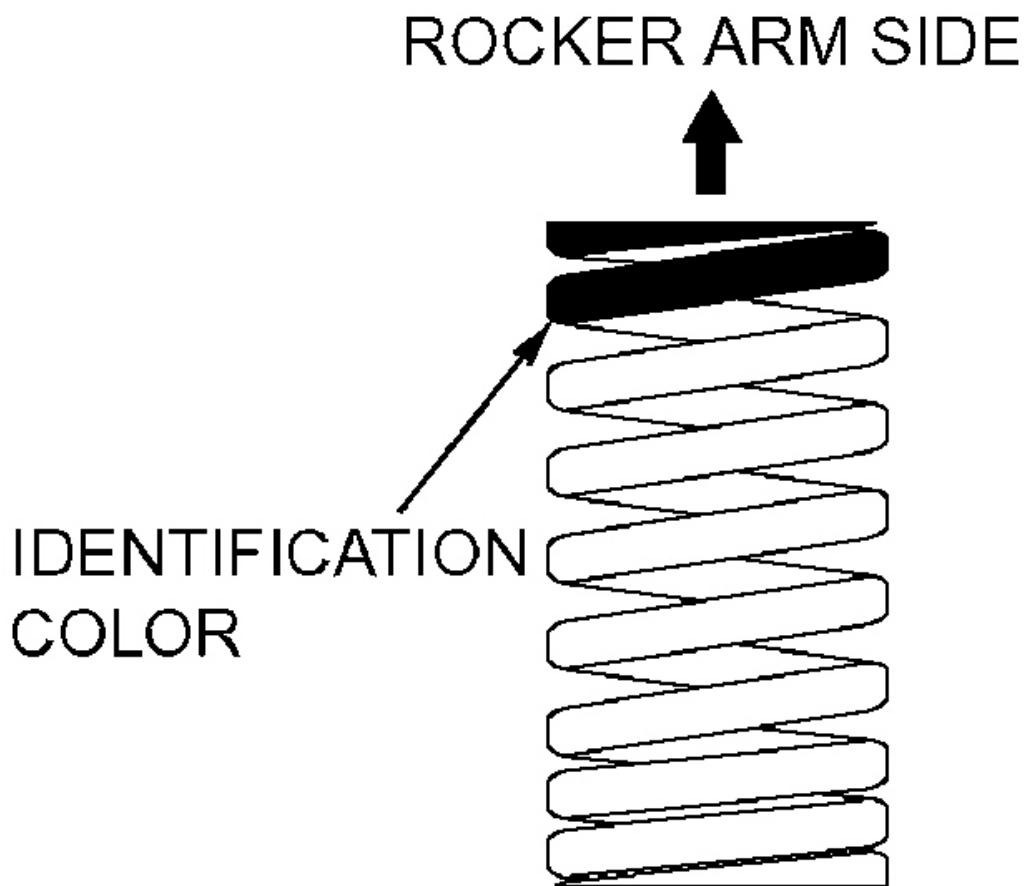


G01910275

Fig. 24: Installing Valve Stem Seal**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

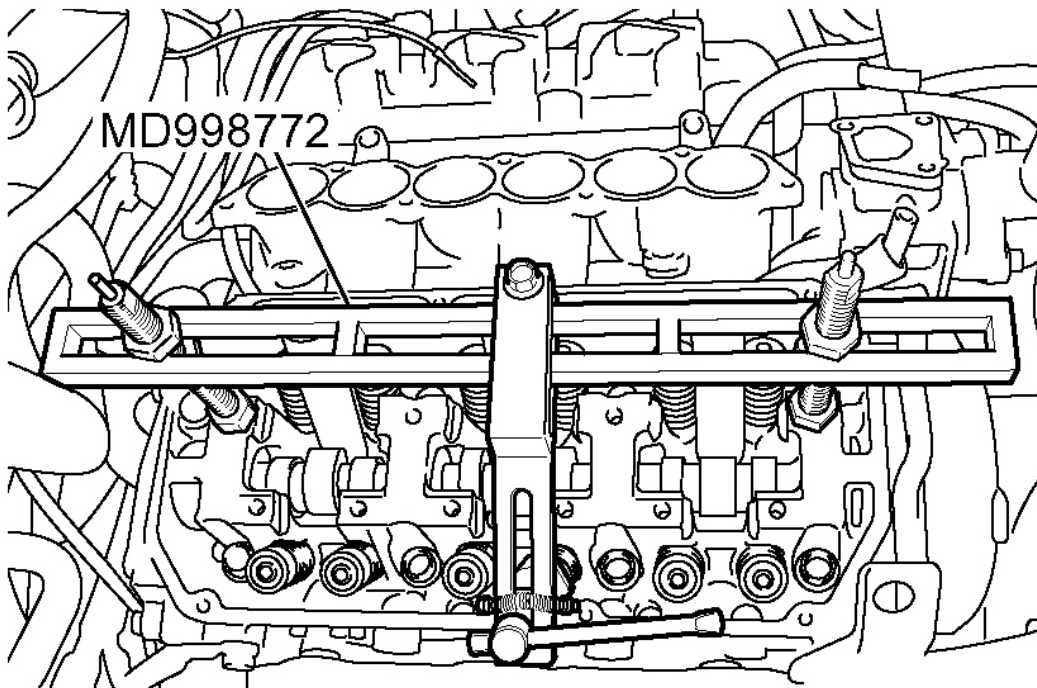
>> B << Valve Springs Installation

Install the valve springs with its identification color painted end facing the rocker arm.

**G01910276****Fig. 25: Identifying Correct Installation Position Of Valve Springs****Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

>> C << Valve Spring Retainer Locks Installation

Use special tool MD998772 to compress the valve spring in the same manner as removal.



G01910277

Fig. 26: Compressing Valve Spring Using Special Tool
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

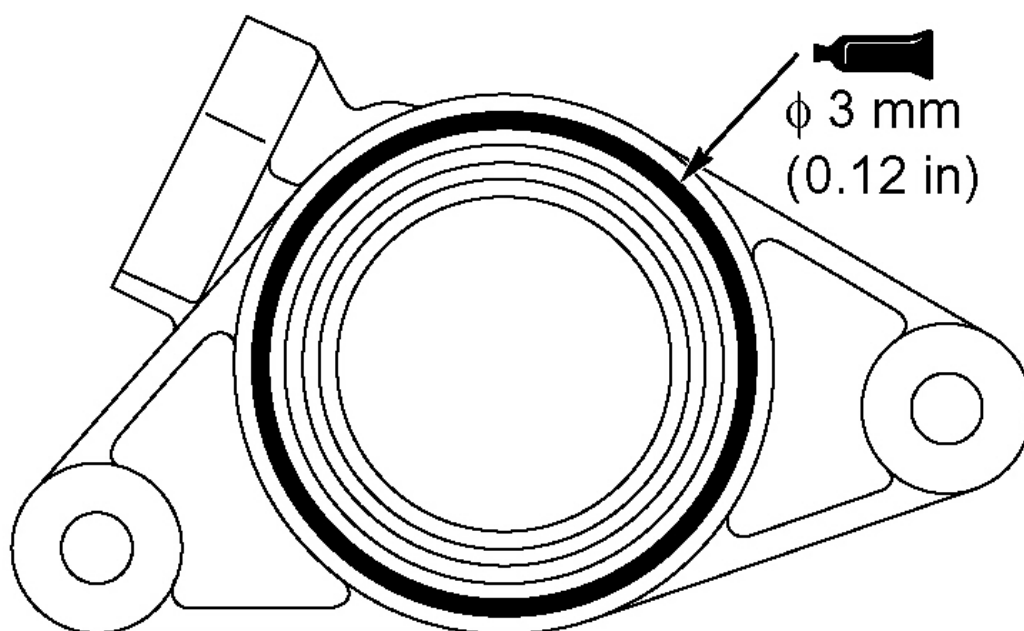
>> D << Camshaft Position Sensor Support Installation

1. Remove sealant from the camshaft position sensor support and cylinder head surfaces.
2. Apply the sealant to the camshaft position sensor support flange in a continuous bead as shown in the illustration.

Specified sealant: MITSUBISHI GENUINE PART MD970389 or equivalent

NOTE: **Install the camshaft position sensor support within 15 minutes after applying liquid gasket.**

3. Install the camshaft position sensor support to the cylinder head.



G01910278

Fig. 27: Applying Sealant To Camshaft Position Sensor Support Flange
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

CAUTION: Then wait at least one hour. Never start the engine or let engine oil or coolant touch the adhesion surface during that time.

4. Tighten the camshaft position sensor support mounting bolts to the specified torque.

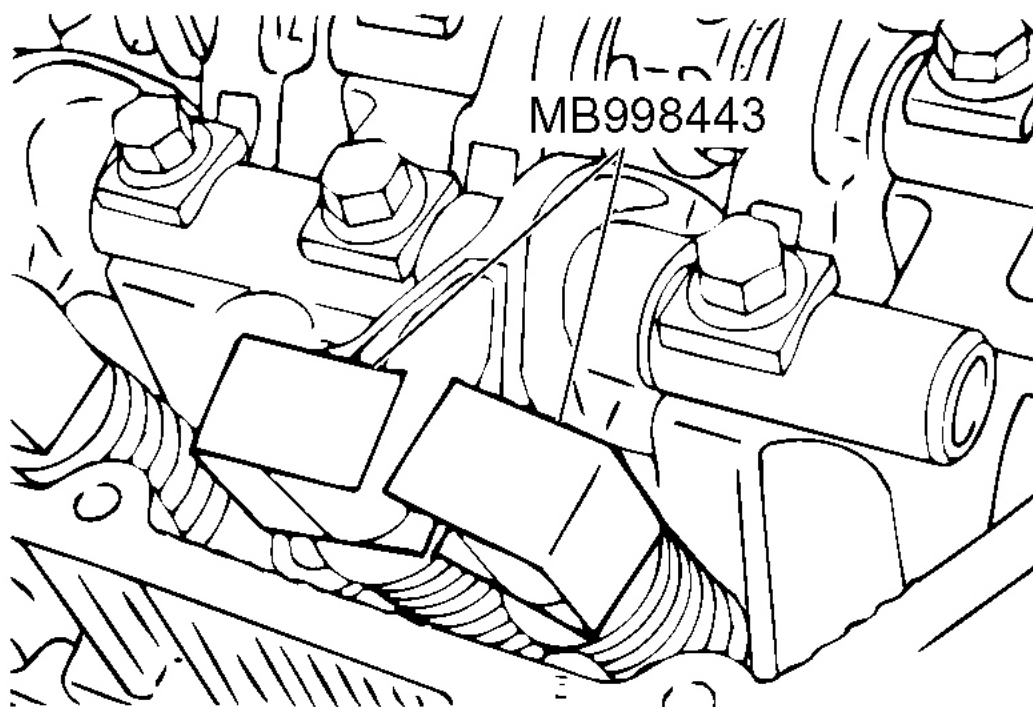
Tightening torque: 14 +/- 1 N.m (120 +/- 13 in-lb)

>> E << Rocker Arm & Shaft Assembly Installation

1. Install the rocker arm, shaft and lash adjuster assembly.
2. Tighten the mounting bolts to the specified torque.

Tightening torque: 31 +/- 3 N.m (23 +/- 2 ft-lb)

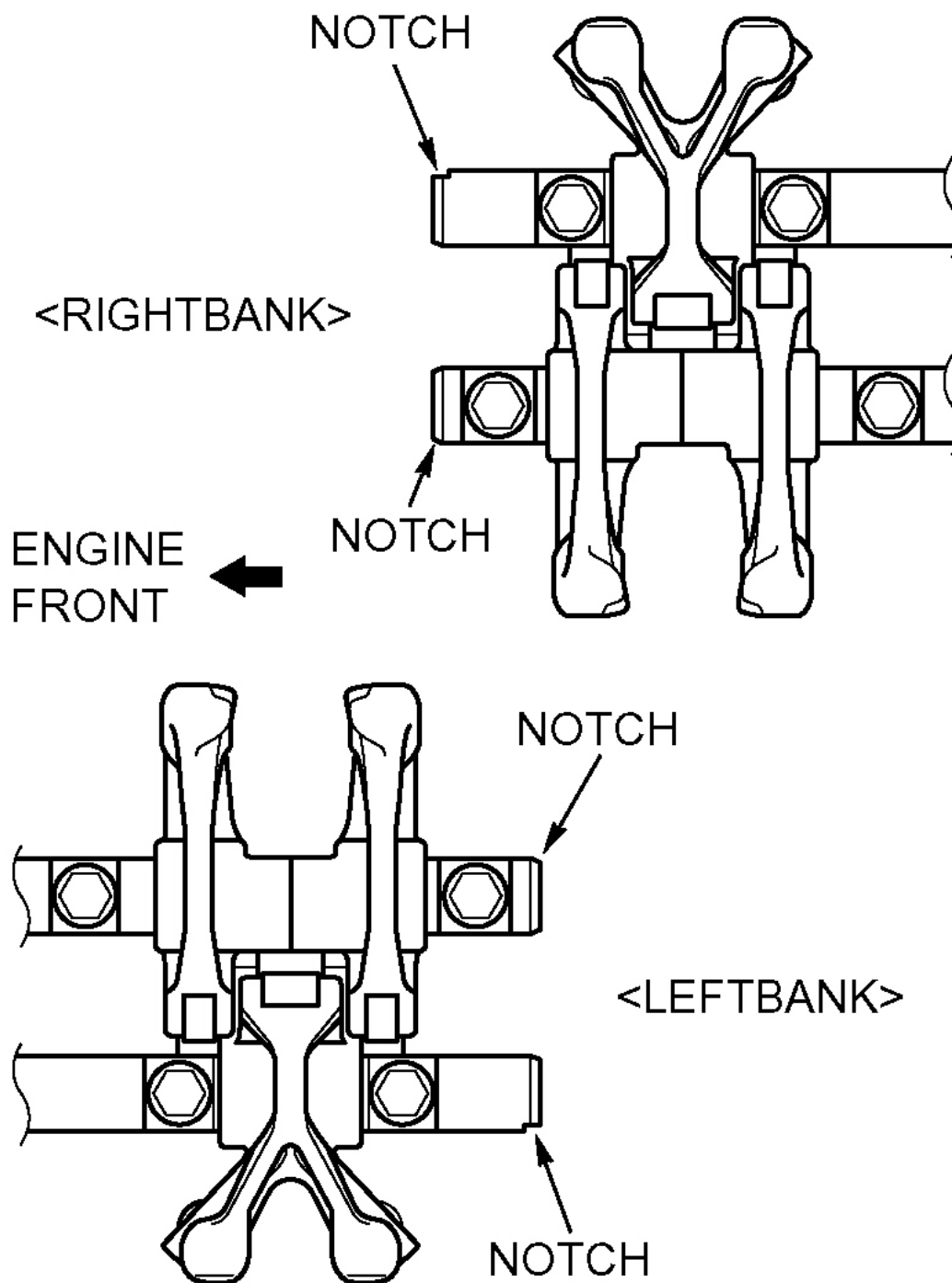
3. Remove special tool MB998443.



G01910279

Fig. 28: Installing Rocker Arm, Shaft And Lash Adjuster Using Special Tool
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

4. Check that notches in the each rocker shaft are facing the direction shown in the illustration.



G01910280

Fig. 29: Identifying Correct Rocker Shaft Assembly Position
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>> F << Camshaft Sprocket Installation

1. Use special tools MD998715 and MB990767 in the same way as during removal to install the camshaft sprocket.
2. Tighten the camshaft sprocket mounting bolt to the specified torque.

Tightening torque: 88 +/- 10 N.m (65 +/- 7 ft-lb)

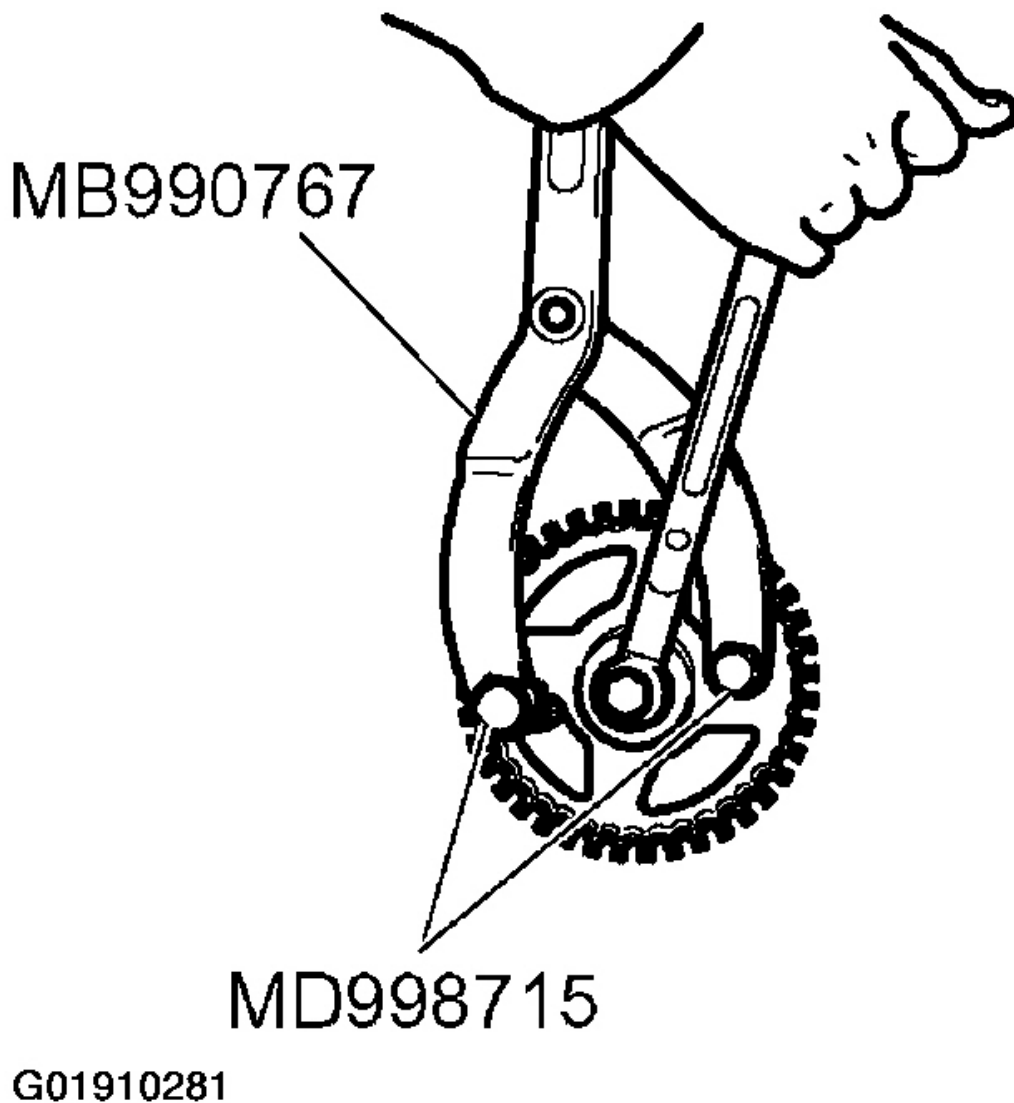


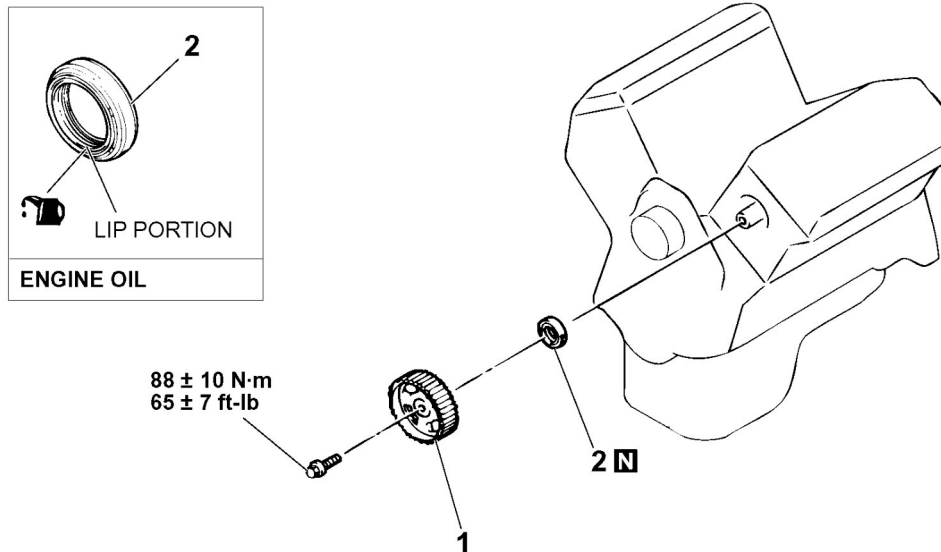
Fig. 30: Installing Camshaft Sprocket
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

CAMSHAFT OIL SEAL

REMOVAL & INSTALLATION

Pre-removal and Post-installation Operation

- Timing Belt Removal and Installation



REMOVAL STEPS

- <<A>> >>B<< 1. CAMSHAFT SPROCKET
<> >>A<< 2. CAMSHAFT OIL SEAL

G01910282

Fig. 31: Removing Camshaft Oil Seal

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Required Special Tools:

MB990767: End Yoke Holder

MB991559: Camshaft Oil Seal Adapter

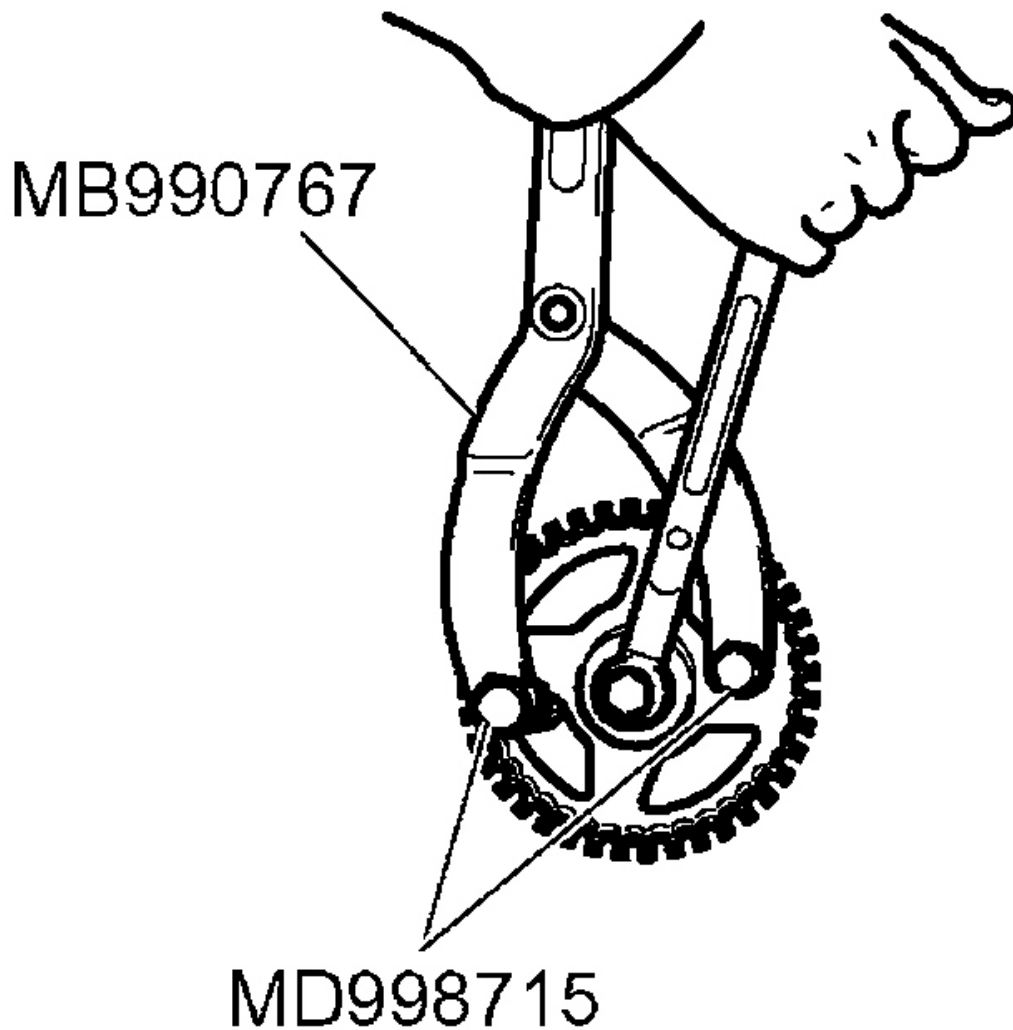
MD998713: Camshaft Oil Seal Installer

MD998715: Crankshaft Pulley Holder Pin

Removal Service Points

<< A >> Camshaft Sprocket Removal

Use special tools MD998715 and MB990767 to remove the camshaft sprocket.



G01910283

Fig. 32: Removing Camshaft Sprocket

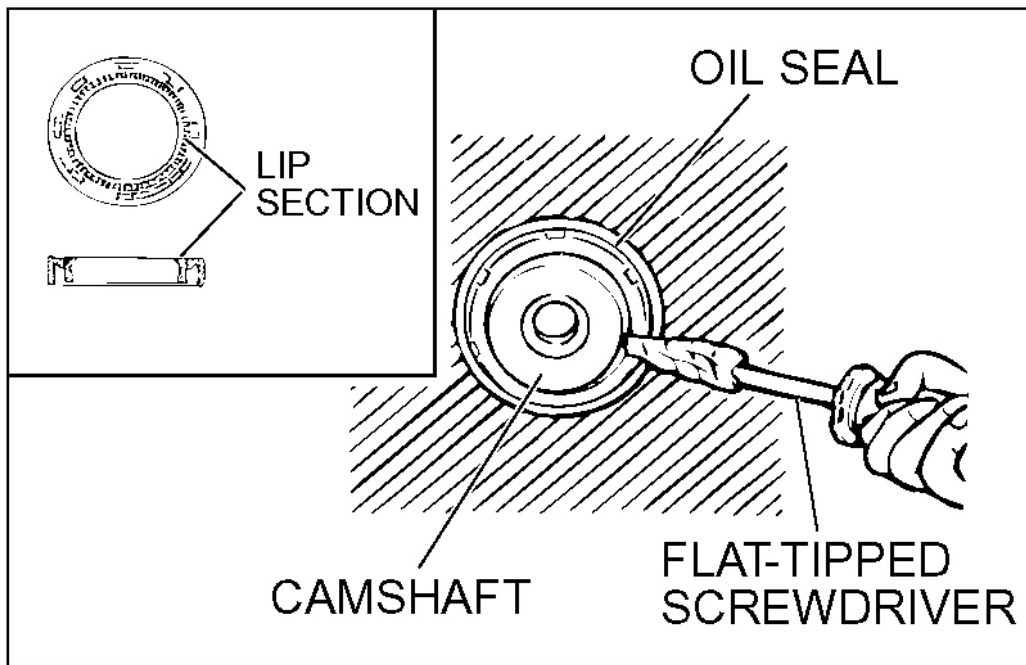
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Camshaft Oil Seal Removal

1. Make a notch in the oil seal lip section with a knife, etc.

CAUTION: Be careful not to damage the camshaft and the cylinder head.

2. Cover the end of a flat-tipped screwdriver with a shop towel and insert into the notched section of the oil seal, and pry out the oil seal to remove it.



G01910284

Fig. 33: Prying Out Camshaft Oil Seal

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Installation Service Points**>> A << Camshaft Oil Seal Installation**

1. Apply engine oil to the camshaft oil seal lip.
2. Use special tools MD998713 and MB991559 to press-fit the camshaft oil seal.

<LEFT BANK>

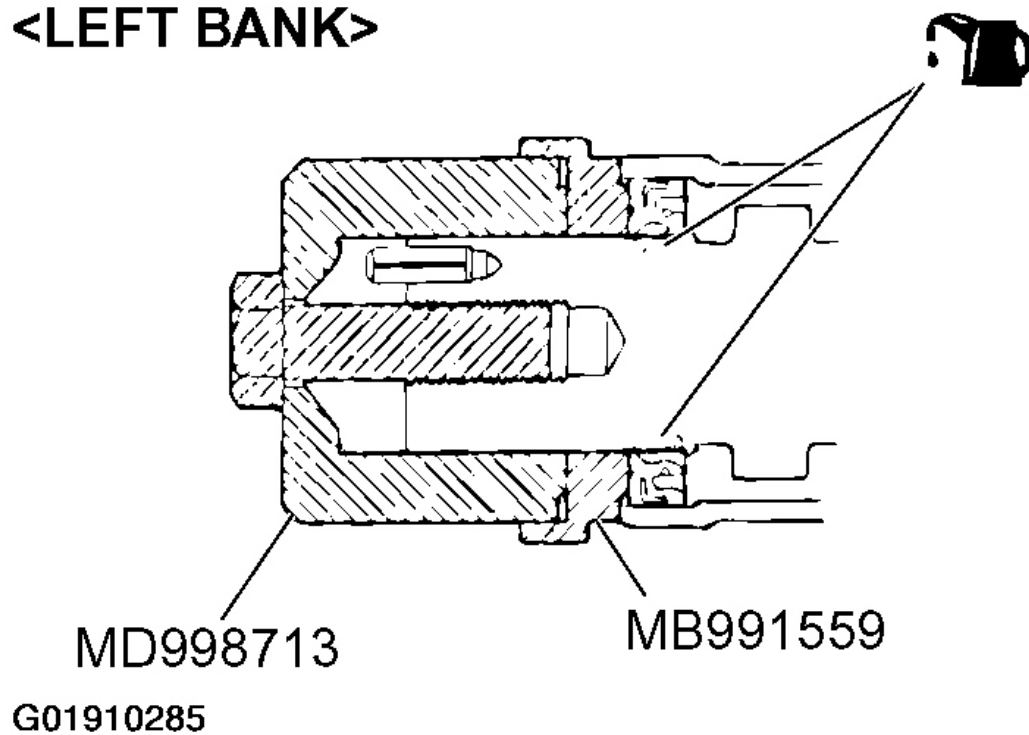


Fig. 34: Installing Camshaft Oil Seal (Left Bank)

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

<RIGHT BANK>

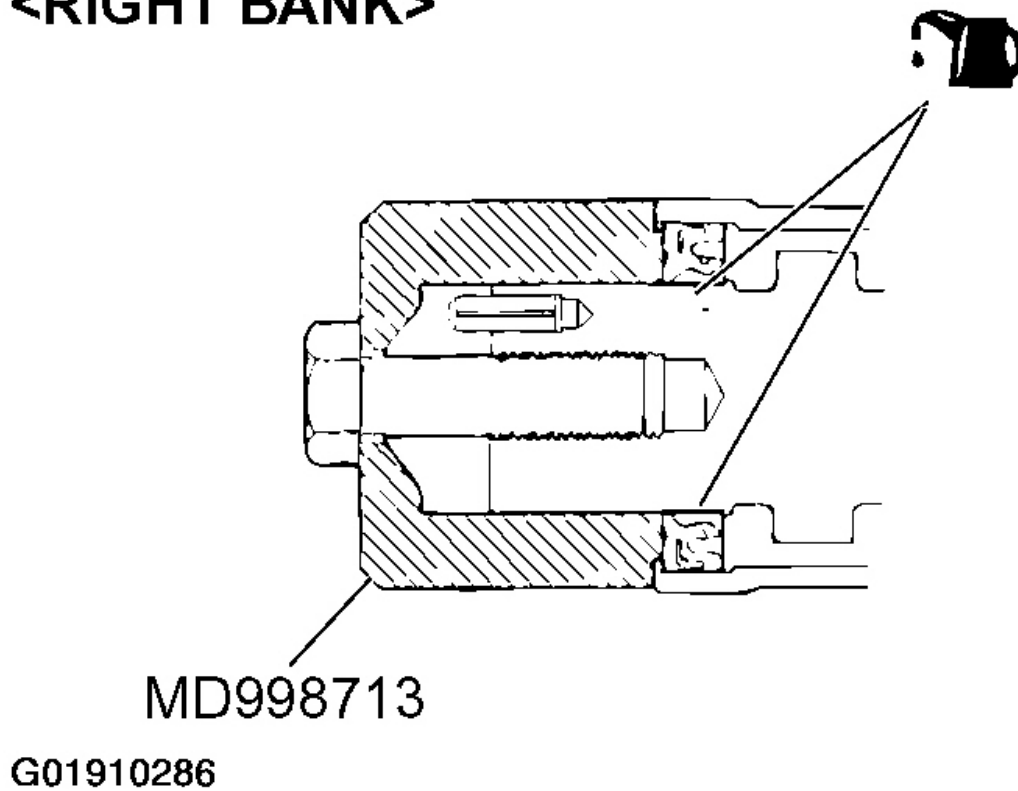


Fig. 35: Installing Camshaft Oil Seal (Right Bank)

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>> B << Camshaft Sprocket Installation

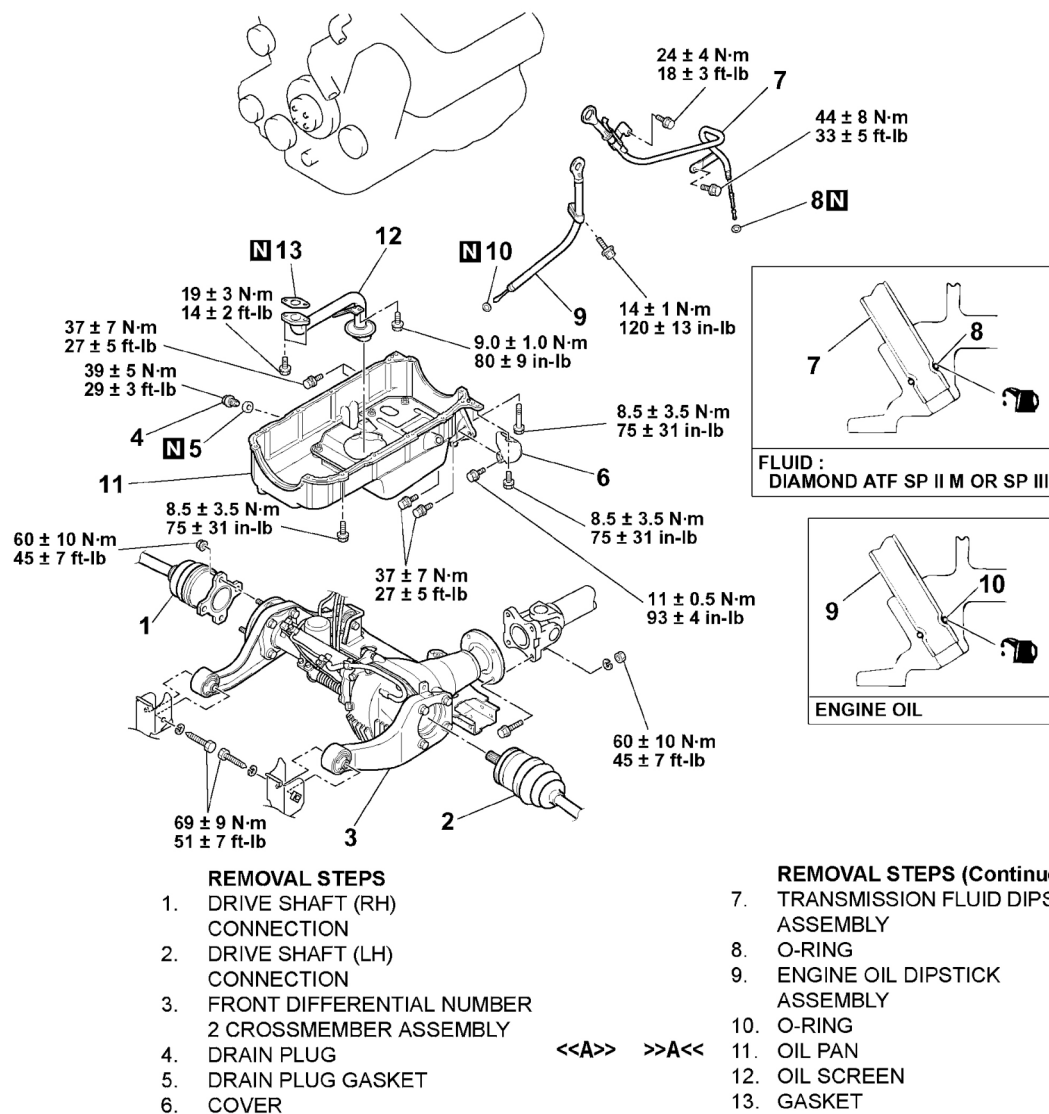
Use special tools MD998715 and MB990767 in the same way as during removal to install the camshaft sprocket.

OIL PAN & OIL SCREEN

REMOVAL & INSTALLATION

Pre-removal and Post-installation Operation

- Skid Plate and Under Cover Removal and Installation
- Engine Oil Draining and Refilling (Refer to On-vehicle Service.)
- Starter Motor Removal and Installation (Refer to Starter motor assembly.)



G01910287

Fig. 36: Removing Oil Pan & Oil Screen & Torque Specifications
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

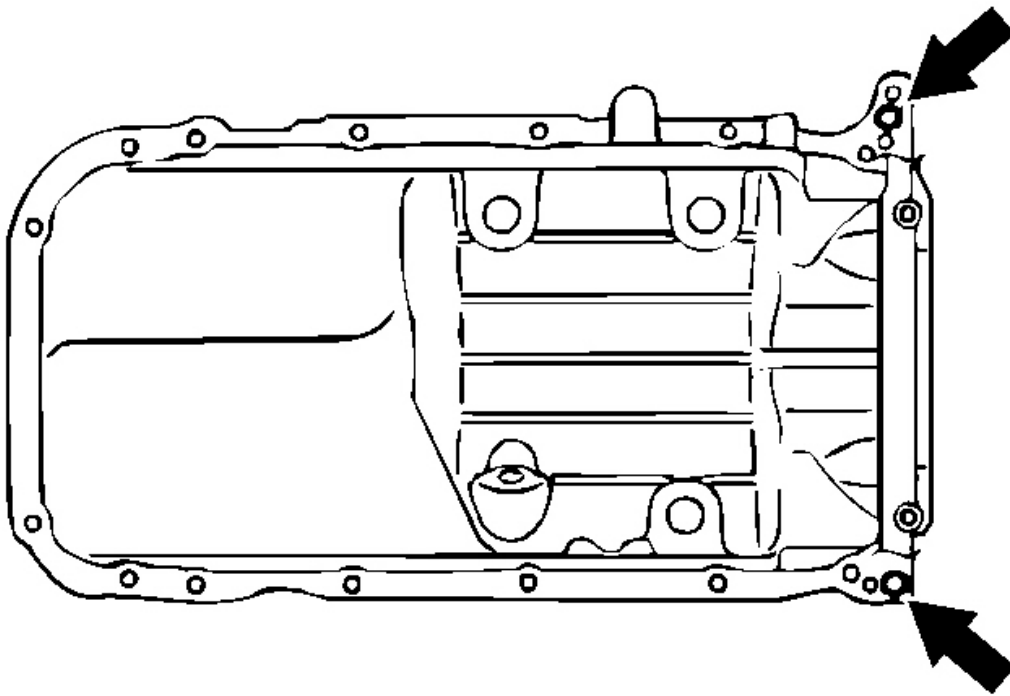
Removal Service Point

<< A >> Oil Pan Removal

1. Remove the oil pan mounting bolts.

CAUTION: Do not use the oil pan remover (MD998727). It will damage the oil pan (aluminum made).

2. Screw the bolts (M10) securing the oil pan to the transmission assembly in the illustrated bolt holes, then remove the oil pan.



G01910288

Fig. 37: Removing Oil Pan

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Installation Service Points

>> A << Oil Pan Installation

1. Remove sealant from the oil pan and cylinder block mating surfaces.
2. Degrease the sealant-coated surface and the engine mating surface.
3. Apply a bead of the sealant to the cylinder block mating surface of the engine oil pan as shown.

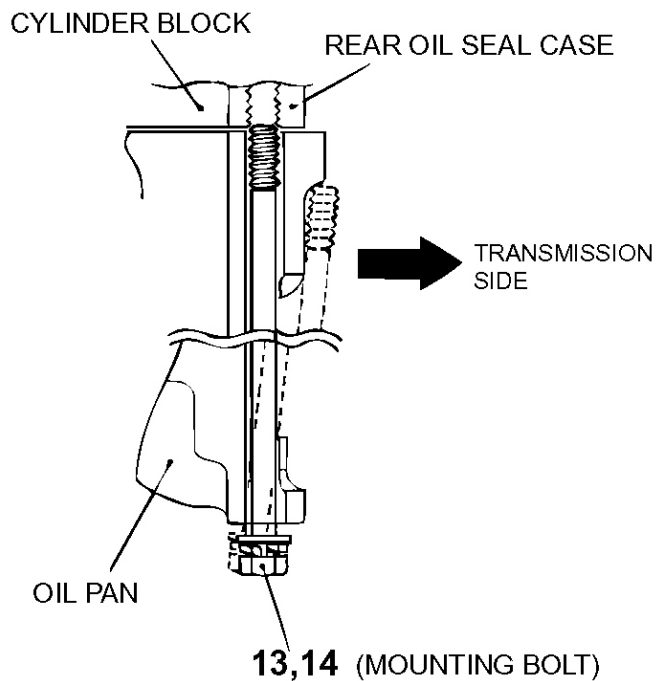
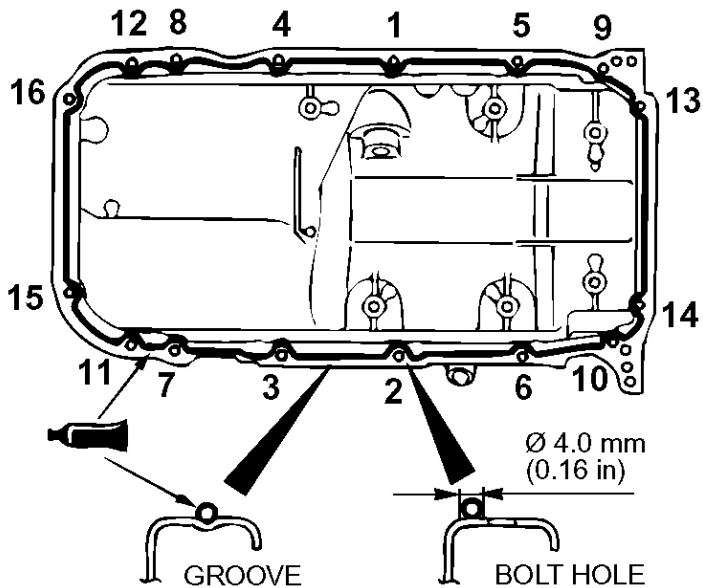
Specified sealant: MITSUBISHI GENUINE PART MD970389 or equivalent

NOTE: The sealant should be applied in a continuous bead approximately 4.0 mm (0.16 inch) in diameter.

4. Assemble the oil pan to the cylinder block within 30 minutes after applying the sealant.

CAUTION: The bolt holes for bolts 13 and 14 in the illustration are cut away on the transmission side. Be careful not to insert these bolts at an angle.

5. Tighten the bolts in order of the numbers shown in the illustration.



G01910289

Fig. 38: Identifying Sealant Application & Oil Pan Bolt Tightening Sequence
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

INSPECTION

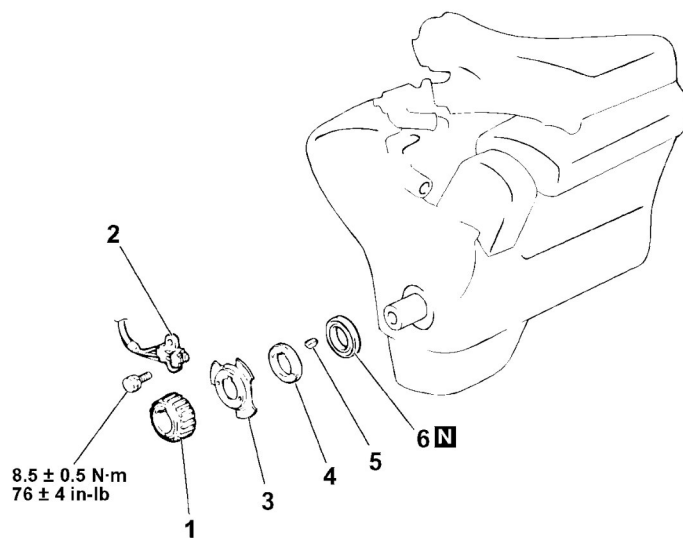
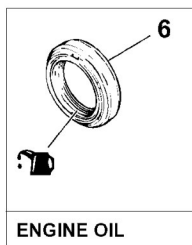
- Check the oil pan for cracks.
- Check the oil pan sealant-coated surface for damage and deformation.
- Check the oil screen for cracked, clogged or damaged wire net and pipe.

CRANKSHAFT OIL SEAL

REMOVAL & INSTALLATION < FRONT OIL SEAL >

Pre-removal and Post-installation Operation

- Timing Belt Removal and Installation



- REMOVAL STEPS**
- >>B<< 1. CRANKSHAFT SPROCKET
2. CRANKSHAFT POSITION SENSOR
- >>B<< 3. CRANKSHAFT SENSING BLADE

- REMOVAL STEPS (Continued)**
- >>B<< 4. CRANKSHAFT SPACER
5. KEY
- >>A<< 6. CRANKSHAFT FRONT OIL SEAL

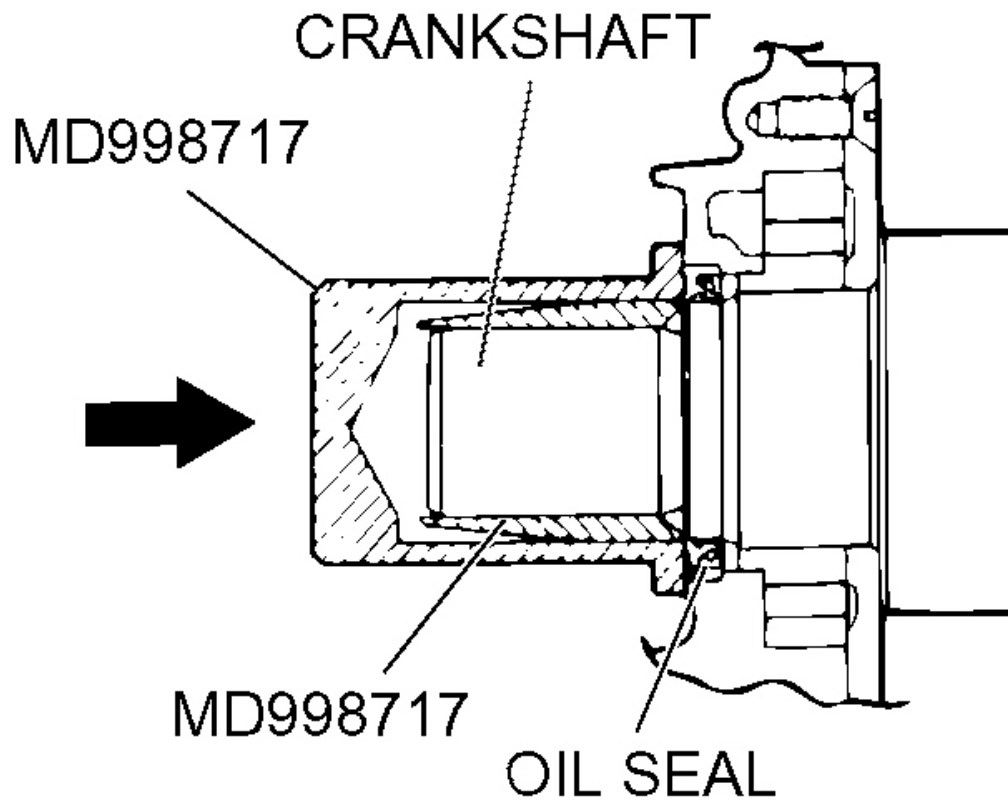
G01910290

Fig. 39: Removing Front Crankshaft Oil Seal
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Installation Service Point

>> A << Crankshaft Front Oil Seal Installation

1. Apply a small amount of engine oil to the oil seal lip and then insert.
2. Using special tool MD998717, tap the oil seal into the front case.

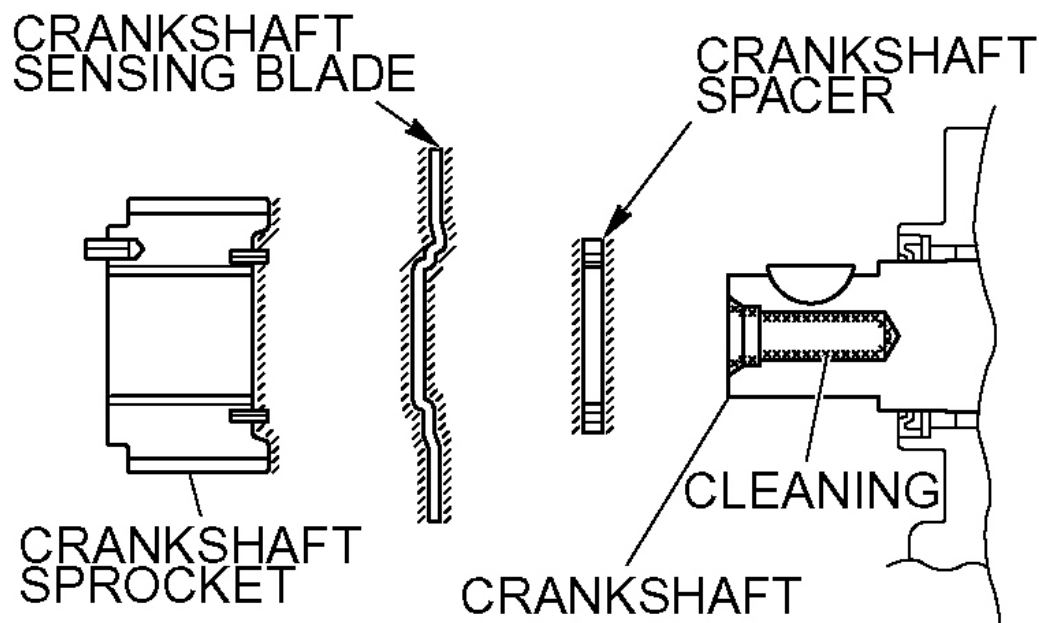


G01910291

Fig. 40: Installing Front Oil Seal Into Front Case
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>> B << Crankshaft Spacer/Crankshaft Sensing Blade/Crankshaft Sprocket Installation

To prevent the crankshaft pulley mounting bolt from loosening, degrease or clean the crankshaft, the crankshaft spacer, the crankshaft sensing blade and the crankshaft at the shown positions.



SHADED PART : DEGREASE

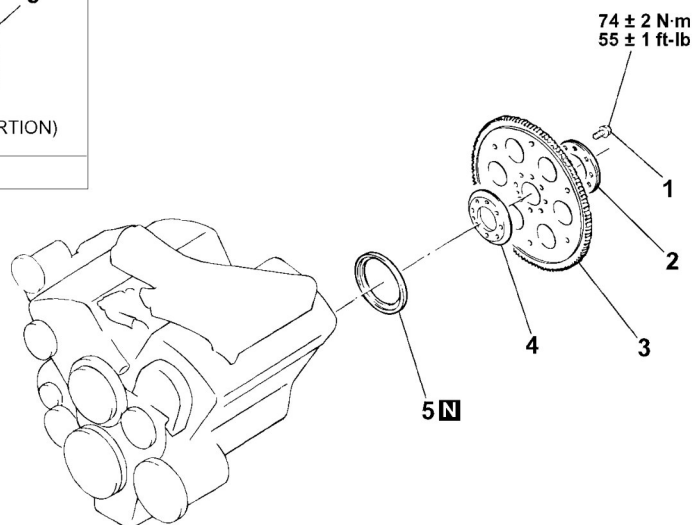
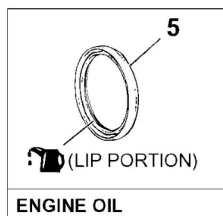
G01910292

Fig. 41: Installing Crankshaft Spacer, Crankshaft Sensing Blade & Crankshaft Sprocket
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

REMOVAL & INSTALLATION < REAR OIL SEAL >

Pre-removal and Post-installation Operation

- Transmission and Transfer Assembly Removal and Installation



- <<A>> >>B<<
- REMOVAL STEPS**
1. DRIVE PLATE BOLT
 2. ADAPTOR PLATE
 3. DRIVE PLATE

- >>A<<
- REMOVAL STEPS (Continued)**
4. CRANKSHAFT ADAPTOR
 5. CRANKSHAFT REAR OIL SEAL

G01910293

Fig. 42: Removing Crankshaft Rear Oil Seal

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Required Special Tools:

MD998718: Crankshaft Rear Oil Seal Installer

MD998781: Flywheel Stopper

Removal Service Point

<< A >> Drive Plate Bolt Removal

Use special tool MD998781 to secure the drive plate and remove the drive plate bolt.

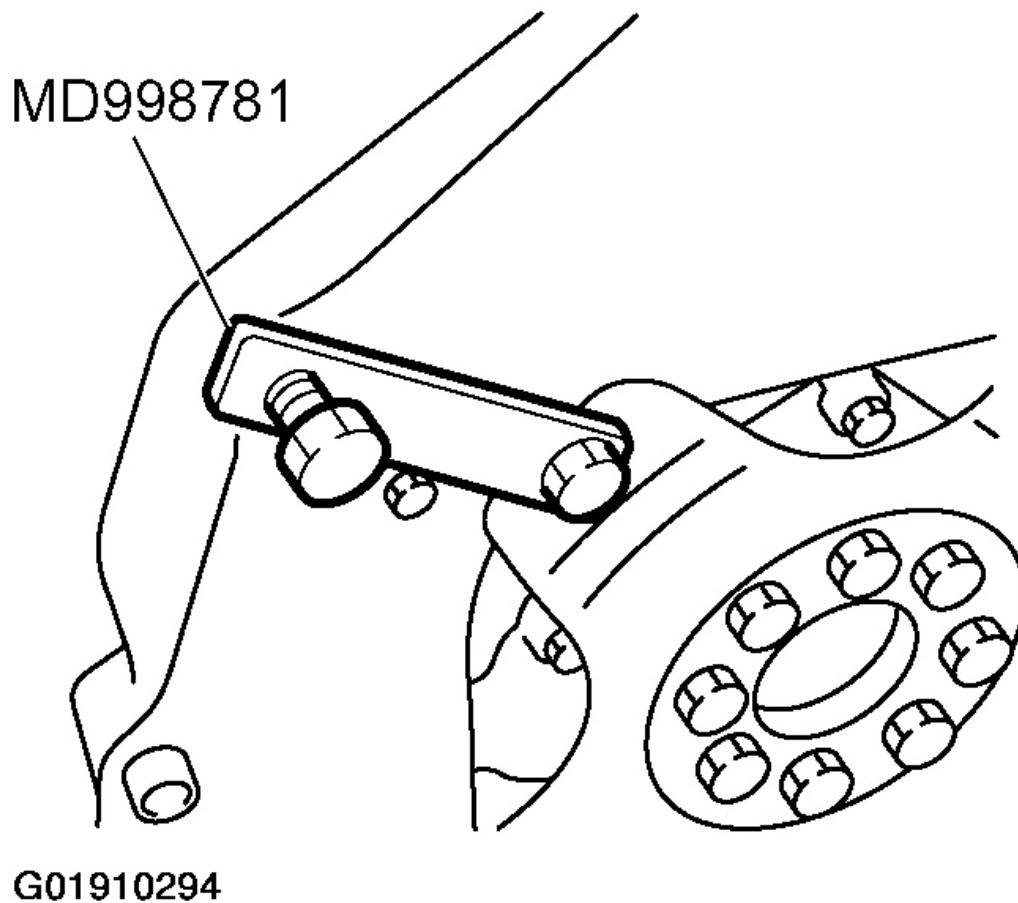


Fig. 43: Securing Drive Plate Use Special Tool
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Installation Service Points

>> A << Crankshaft Rear Oil Seal Installation

1. Apply a small amount of engine oil to the entire circumference of the oil seal lip.
2. Use special tool MD998718 to tap in the oil seal as shown in the illustration.

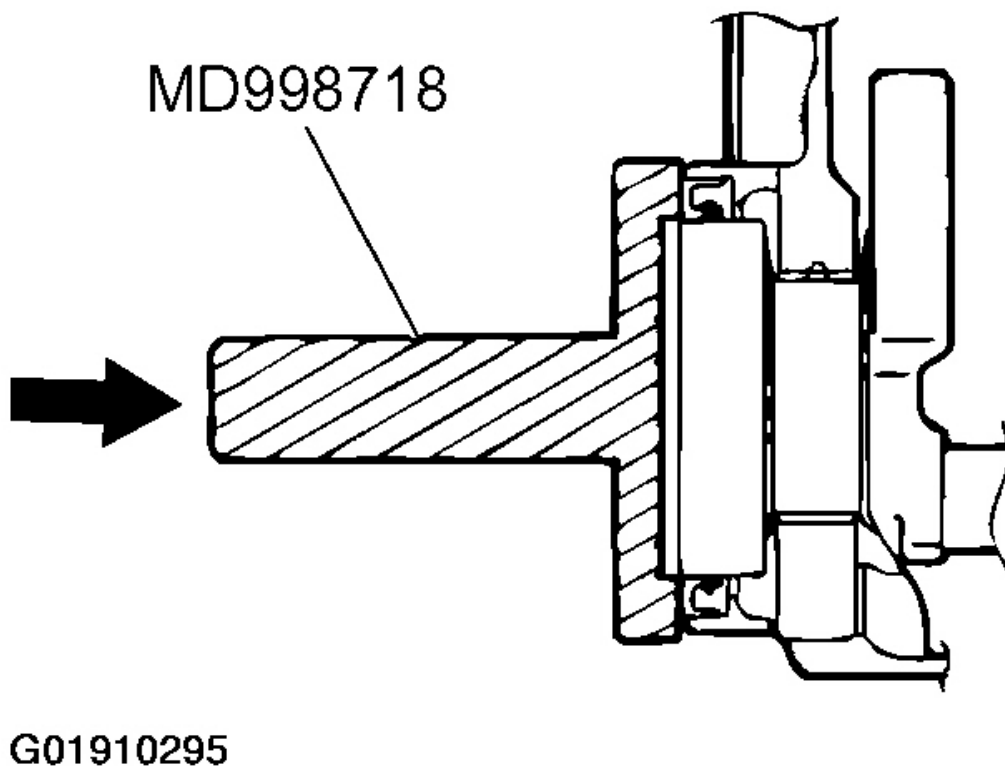


Fig. 44: Installing Rear Oil Seal

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>> B << Drive Plate Bolt Installation

Use special tool MD998781 in the same way as during removal to install the drive plate bolt.

CYLINDER HEAD GASKET

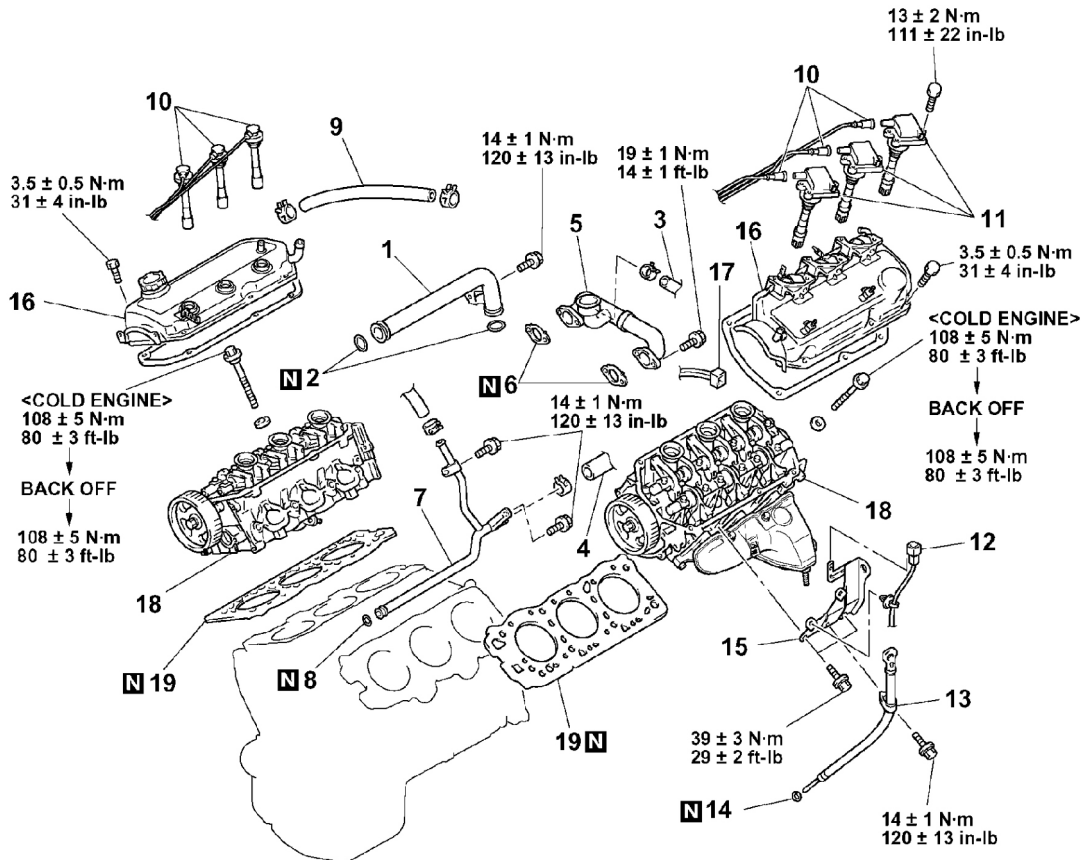
REMOVAL & INSTALLATION

2003 Mitsubishi Montero XLS

2003 ENGINE Engine Mechanical - Montero (3.8L)

Pre-removal and Post-installation Operation

- Intake Manifold Removal and installation (Refer to Intake Manifold.)
- Timing Belt Removal and installation
- Front Exhaust Pipe Removal and Installation (Refer to Exhaust and Main Muffler.)



REMOVAL STEPS

1. WATER OUTLET PIPE ASSEMBLY
- >>C<< 2. O-RING
3. HEATER HOSE CONNECTION
- >>D<< 4. HEATER HOSE CONNECTION
- >>D<< 5. WATER PASSAGE ASSEMBLY
6. GASKET
7. WATER PIPE ASSEMBLY
- >>C<< 8. O-RING

REMOVAL STEPS (Continued)

9. BREATHER HOSE
10. SPARK PLUG CABLE
11. IGNITION COIL
12. OXYGEN SENSOR CONNECTOR
13. ENGINE OIL DIPSTICK ASSEMBLY
14. O-RING
15. INTAKE MANIFOLD PLENUM STAY
16. ROCKER COVER
17. CAMSHAFT POSITION SENSOR CONNECTOR
- <<A>> >>B<< 18. CYLINDER HEAD ASSEMBLY
- >>A<< 19. CYLINDER HEAD GASKET

G01910296

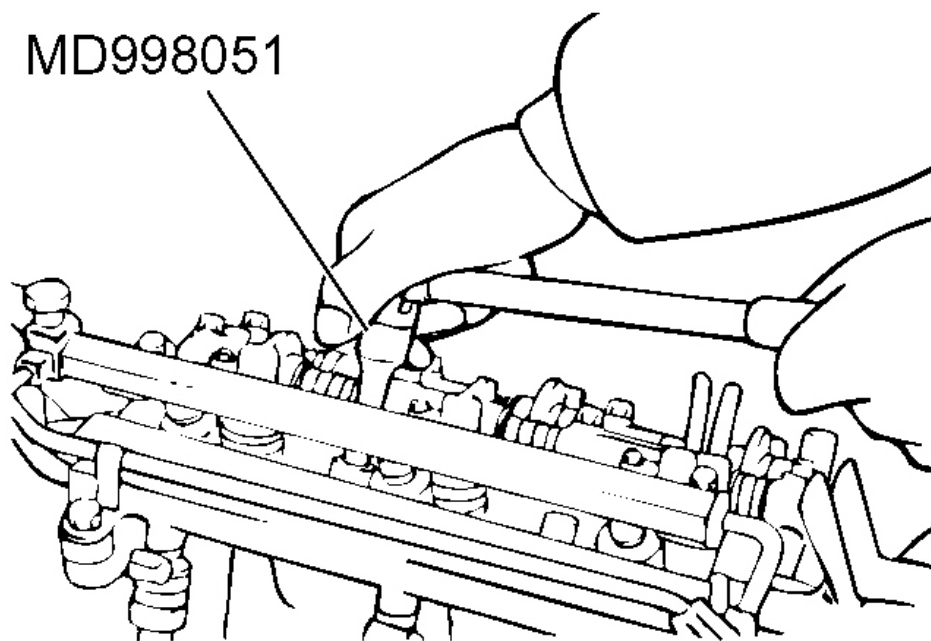
Fig. 45: Removing & Installing Cylinder Head Gasket & Torque Specifications
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Required Special Tool:

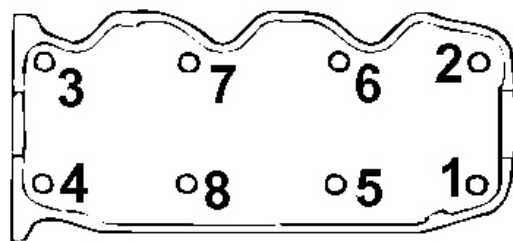
MD998051: Cylinder Head Bolt Wrench

Removal Service Point**<< A >> Cylinder Head Assembly Removal**

Use special tool MD998051 to tighten each bolt two or three steps in the order shown in the illustration.



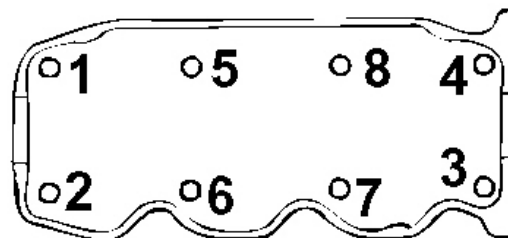
EXHAUST SIDE



RIGHT
BANK

FRONT ← INTAKE SIDE

LEFT
BANK

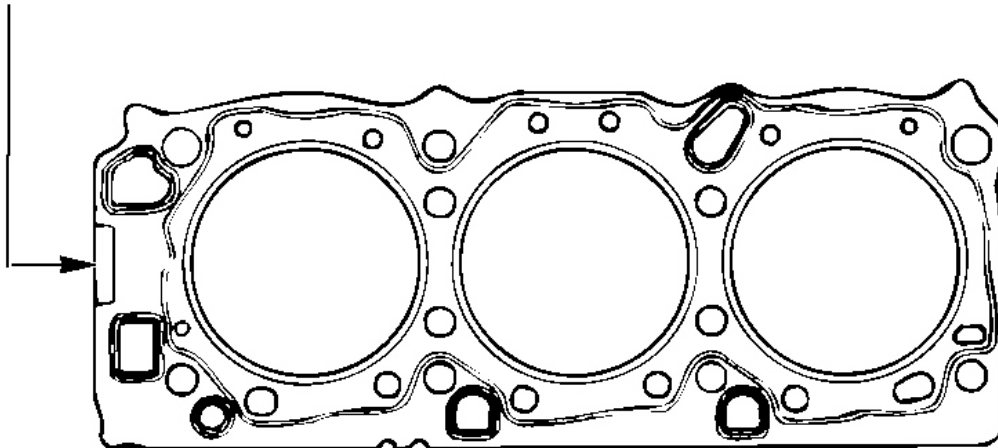


EXHAUST SIDE

G01910297

Fig. 46: Cylinder Head Bolt Removal Sequence**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.****Installation Service Points****>> A << Cylinder Head Gasket Installation**

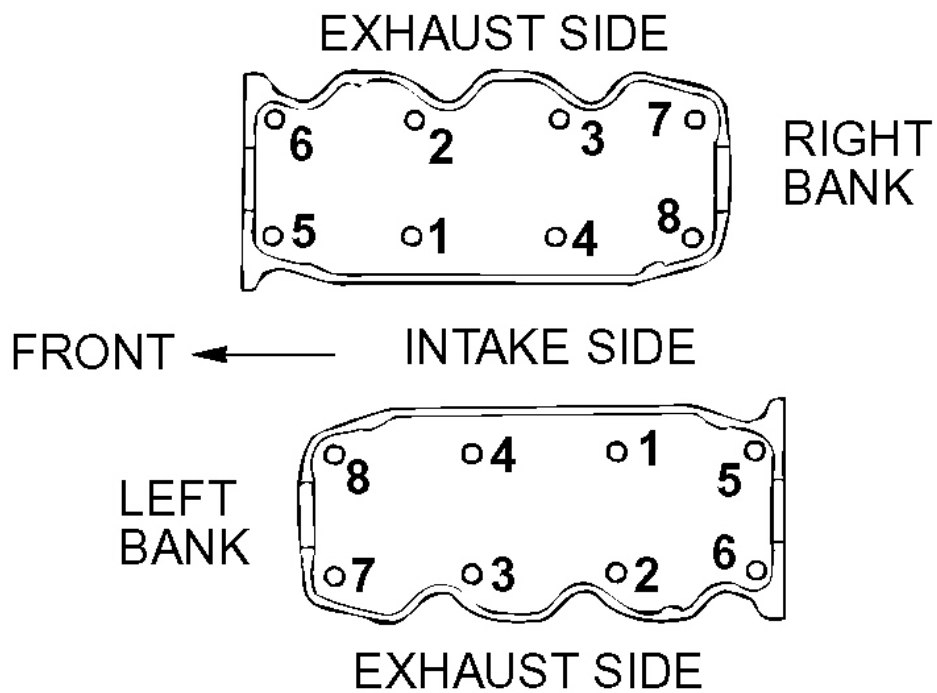
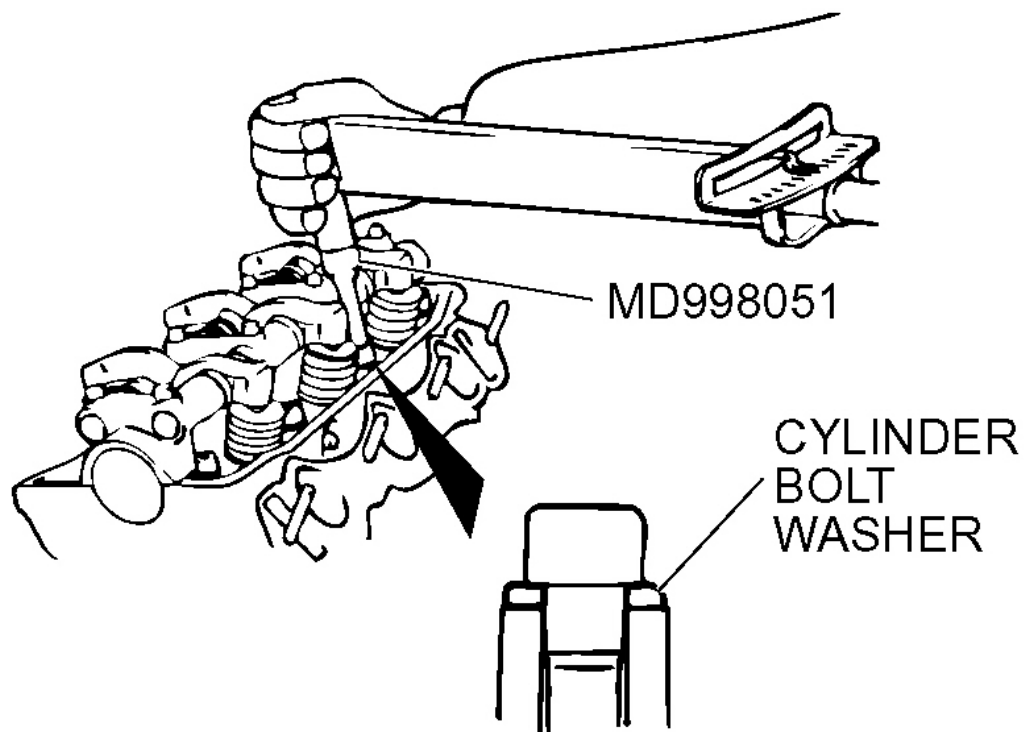
1. Degrease the cylinder head and cylinder block gasket mounting surfaces.
2. Make sure that the gasket has the proper identification mark for the engine.
3. Lay the cylinder head gasket on the cylinder block with the identification mark at the front top.

IDENTIFICATION MARK**G01910298****Fig. 47: Identifying Cylinder Head Gasket Correct Installed Position****Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.****>> B << Cylinder Head Assembly Installation**

CAUTION: Be careful that no foreign material gets into the cylinder, coolant passages or oil passages. Engine damage may result.

1. Use a scraper to clean the gasket surface of the cylinder head assembly.

CAUTION: Install the head bolt washers with the beveled side facing upwards as shown in the illustration.



G01910299

Fig. 48: Cylinder Head Bolt Tightening Sequence (Cylinder Head Assembly Installation)
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

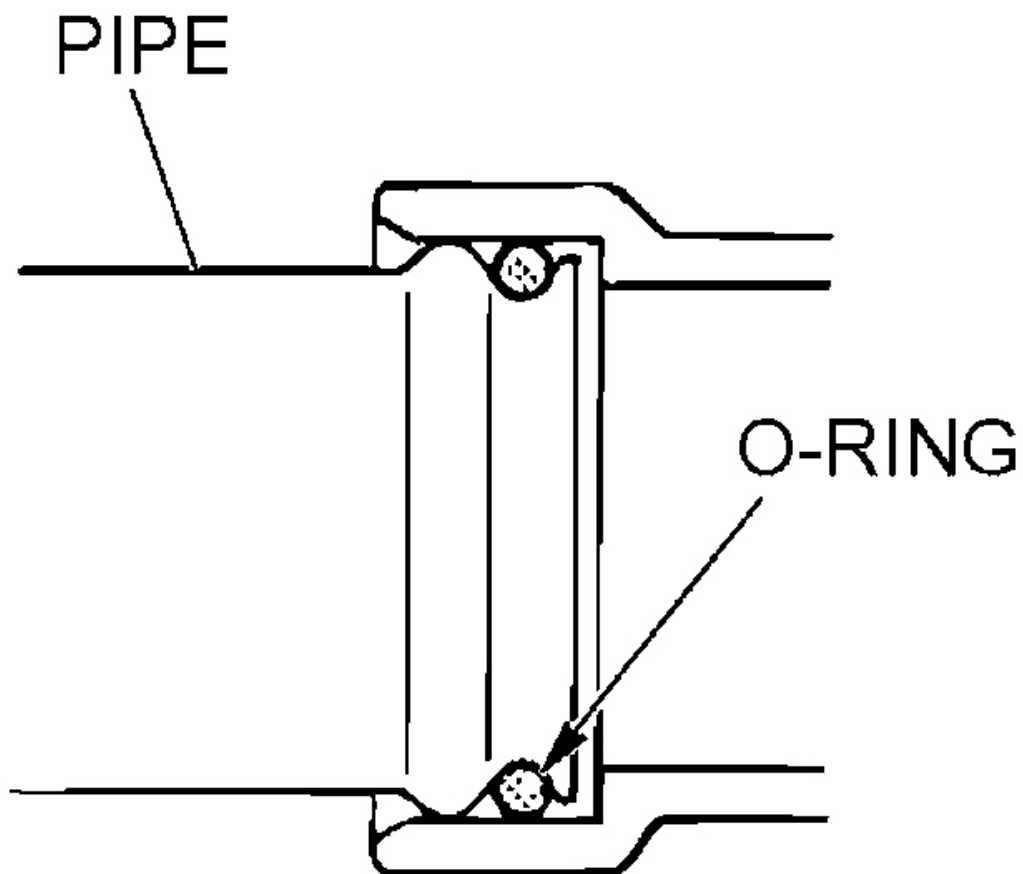
2. Using special tool MD998051 and a torque wrench, tighten the bolts to the specified torque in the order shown in the illustration. Torque in two or three cycles.

Tightening torque: 108 +/- 5 N.m (80 +/- 3 ft-lb)

>> C << O-Ring Installation

CAUTION: Never apply lubricant such as engine oil to the O-ring.

Install the O-ring into the groove of the pipe, and then apply water around the O-ring.

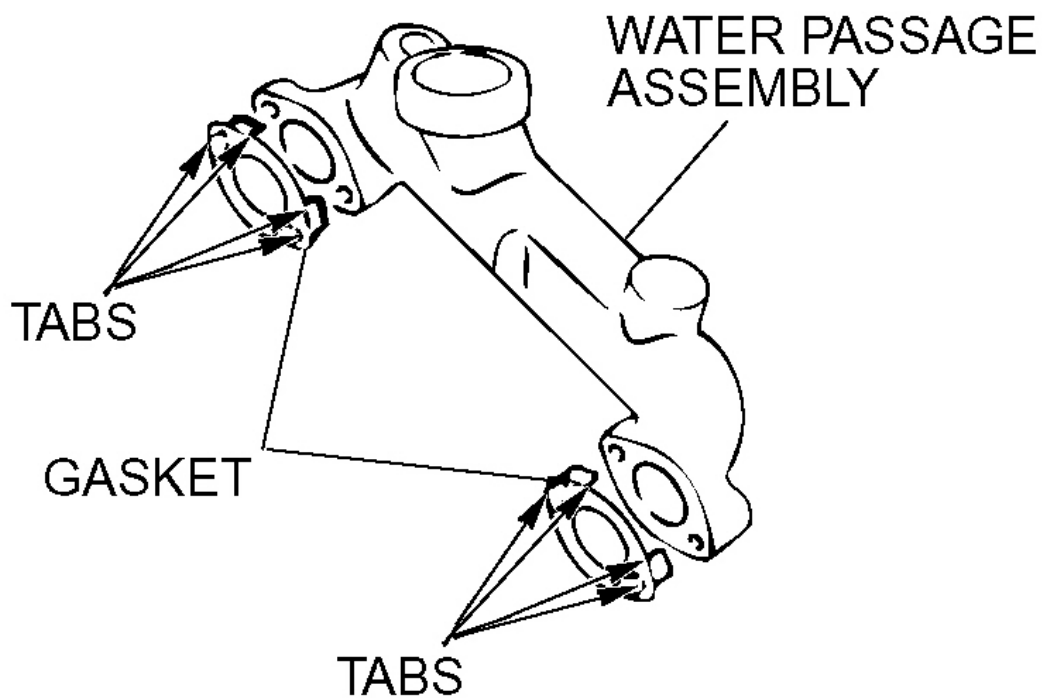


G01910300

Fig. 49: Identifying O-Ring Installation Position In Pipe Groove
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>> D << Gasket/Water Passage Assembly Installation

Bend the tabs onto the water passage assembly. Then install the water passage assembly to the cylinder head so that the gasket doesn't slip.



G01910301

Fig. 50: Installing Water Passage Assembly Gaskets
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

TIMING BELT

REMOVAL & INSTALLATION

2003 Mitsubishi Montero XLS

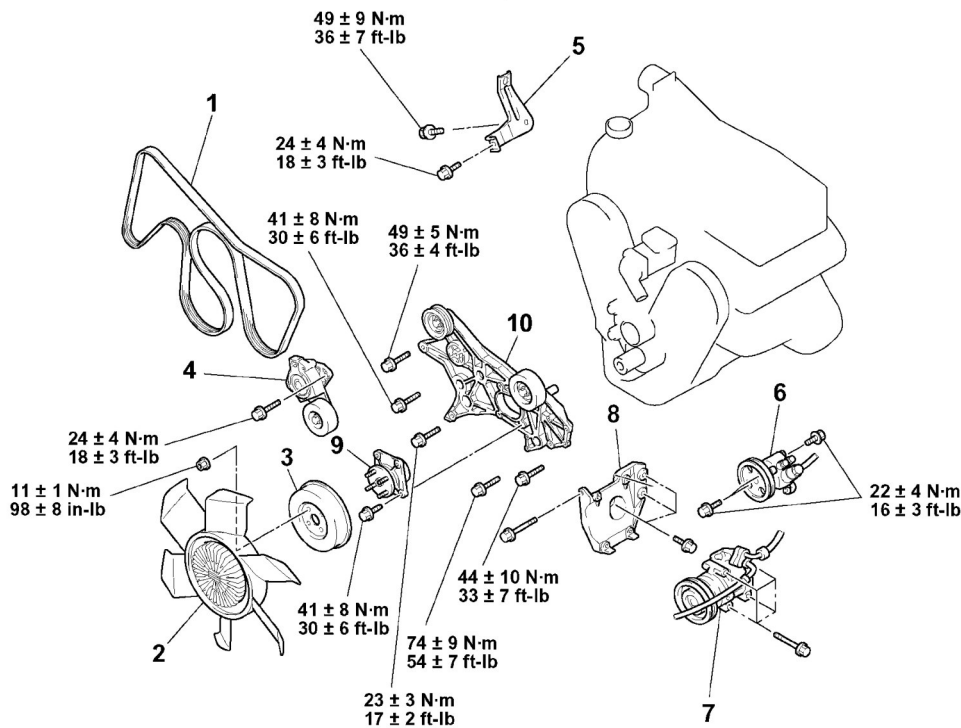
2003 ENGINE Engine Mechanical - Montero (3.8L)

Pre-removal Operation

- Skid Plate and Under Cover Removal
- Engine Coolant Draining (Refer to On-vehicle.)
- Battery and Battery Tray Removal
- Air Cleaner Removal (Refer to Air Cleaner.)
- Radiator Shroud Cover Removal (Refer to Radiator.)

Post-installation Operation

- Radiator Shroud Cover Installation (Refer to Radiator.)
- Air Cleaner Installation (Refer to Air Cleaner.)
- Battery and Battery Tray Installation
- Engine Coolant Refilling (Refer to On-vehicle Service.)
- Skid Plate and Under Cover Installation



REMOVAL STEPS

1. DRIVE BELT
2. COOLING FAN
3. COOLING FAN PULLEY
4. DRIVE BELT AUTO TENSIONER
5. ACCESSORY MOUNT STAY
6. POWER STEERING OIL PUMP ASSEMBLY

<>

REMOVAL STEPS (Continued)

7. A/C COMPRESSOR ASSEMBLY
8. COMPRESSOR BRACKET
9. COOLING FAN BRACKET ASSEMBLY
10. ACCESSORY MOUNT ASSEMBLY

>>D<<

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Fig. 51: Removing & Installing Timing Belt & Torque Specifications (1 Of 2)
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

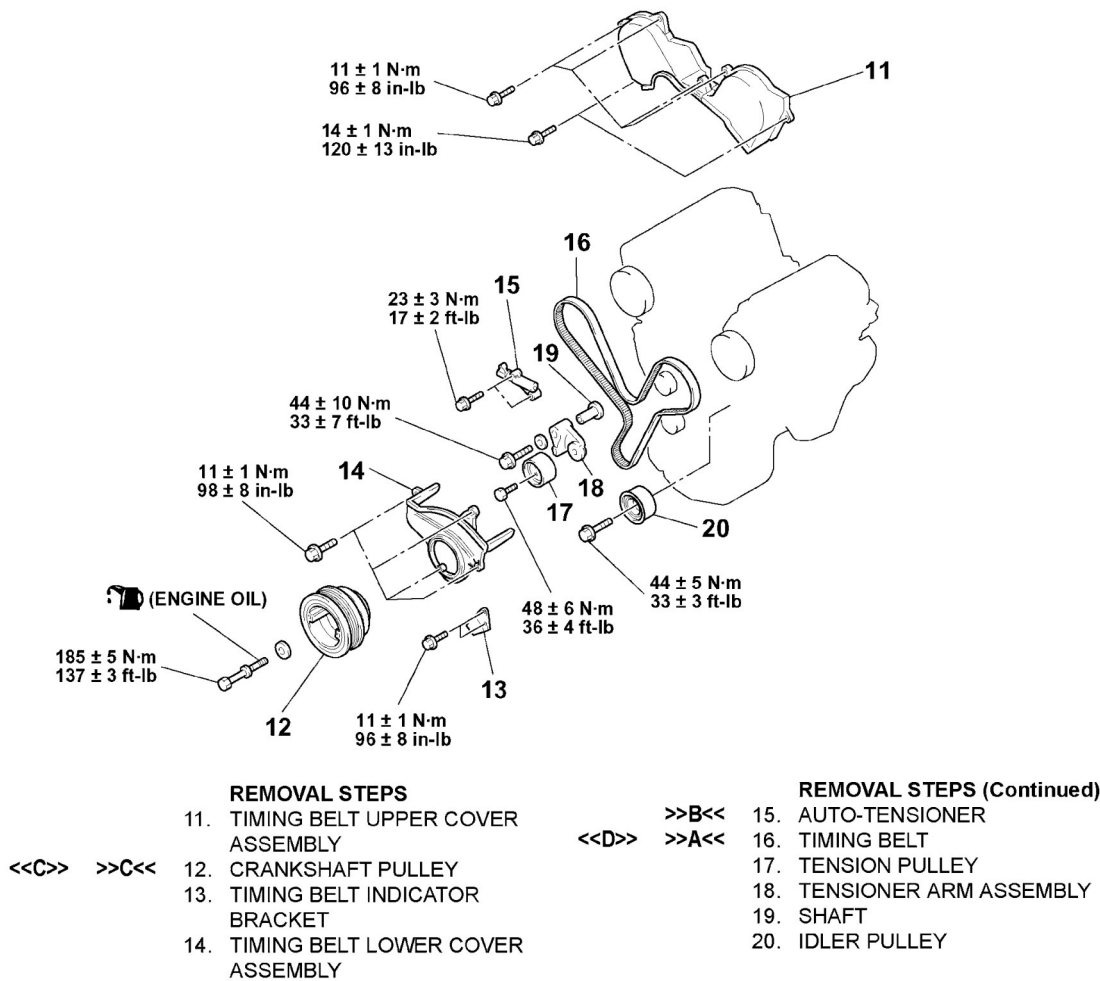


Fig. 52: Removing & Installing Timing Belt & Torque Specifications (2 Of 2)
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Required Special Tools:

MB991800: Pulley Holder

MD991802: Pin B

MD998767: Tension Pulley Socket Wrench

MD998769: Crankshaft Pulley Spacer

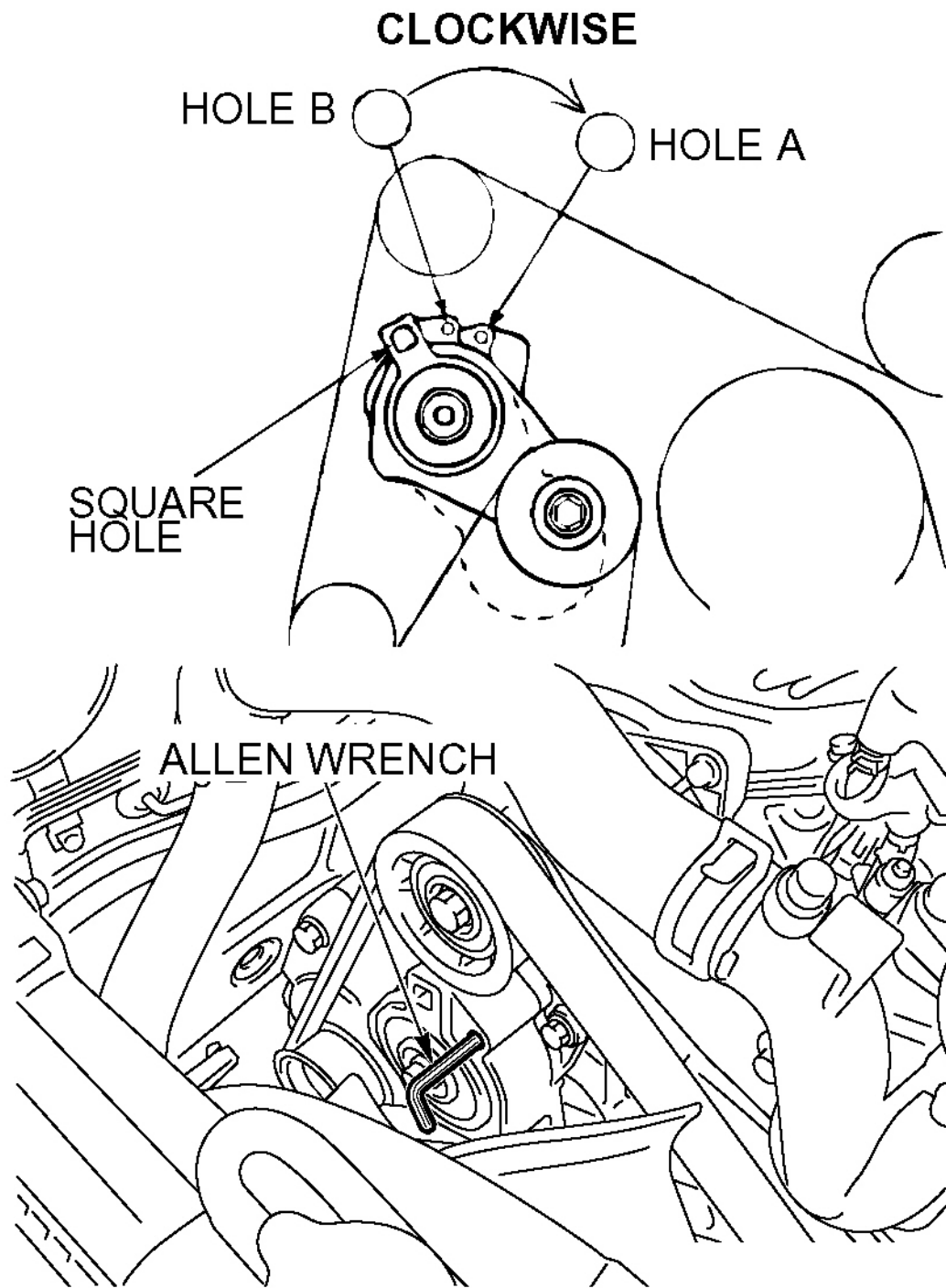
Removal Service Points

<< A >> Drive Belt Auto Tensioner Removal

The following operations will be needed due to the introduction of the serpentine drive system with the drive

belt auto tensioner.

1. Insert a 12.7 mm (1/2 inch) breaker bar into the square hole on the drive belt auto tensioner, and rotate it clockwise until the tensioner touches the stopper.
2. Align hole B with hole A, and insert a 5.0 mm (0.20 inch) Allen wrench to hold the tensioner. Then loosen the drive belt, and then remove the drive belt auto tensioner.



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Fig. 53: Removing Drive Belt & Auto Tensioner
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Power Steering Oil Pump Assembly/A/C Compressor Assembly Removal

1. Do not disconnect the hoses to remove the pump and compressor.
2. Support the removed pump and compressor with a wire, etc. so that they will not get in the way while working.

<< C >> Crankshaft Pulley Removal

Use special tools MB991800 and MB991802 to remove the crankshaft pulley from the crankshaft.

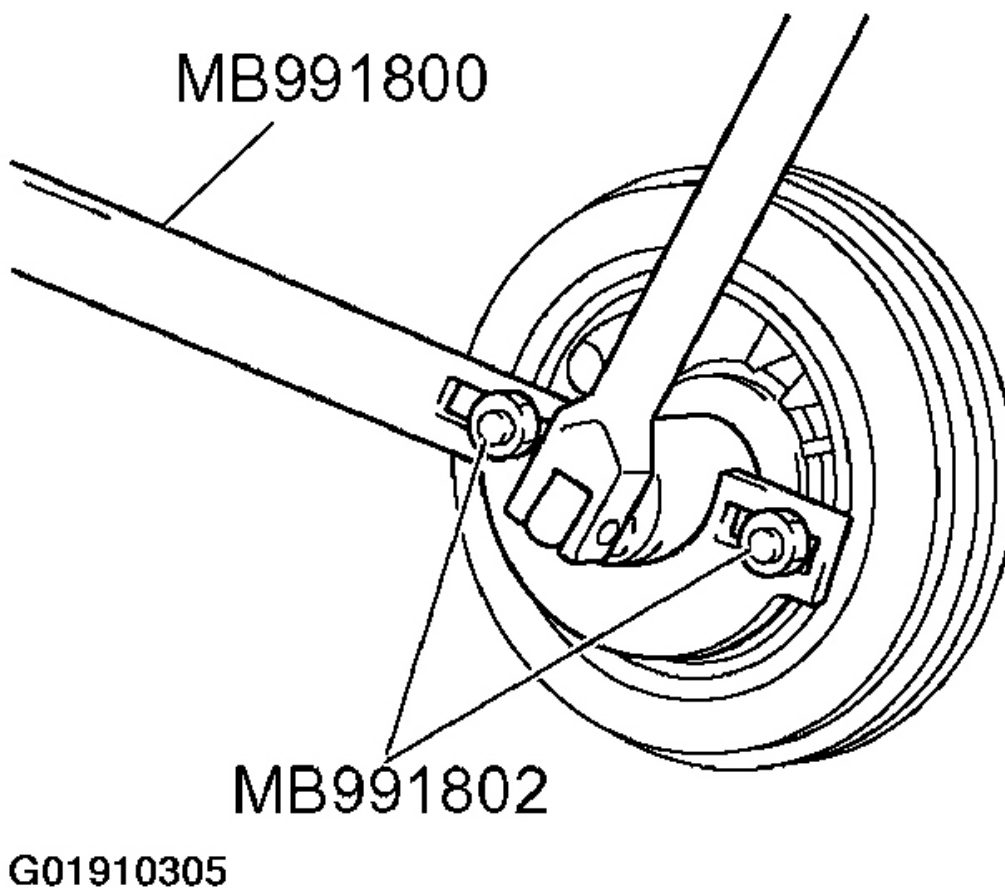
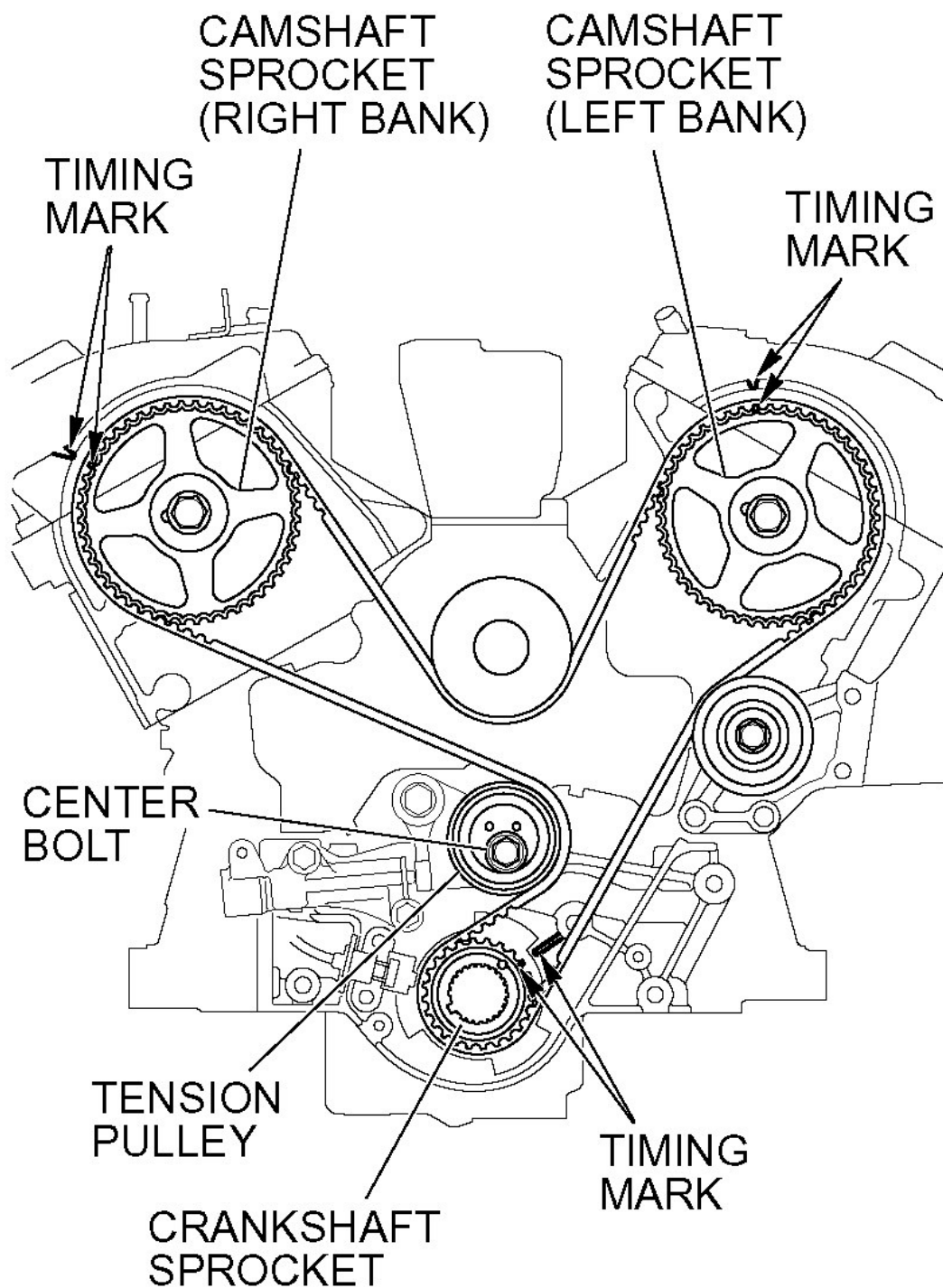


Fig. 54: Removing Crankshaft Pulley From Crankshaft
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

<< D >> Timing Belt Removal

CAUTION: Never turn the crankshaft counterclockwise.

1. Turn the crankshaft clockwise to align each timing mark and to set the number 1 cylinder to compression top dead center.
2. If the timing belt is to be reused, chalk mark the flat side of the belt with an arrow indicating the clockwise direction.
3. Loosen the center bolt of the tension pulley, and then remove the timing belt.



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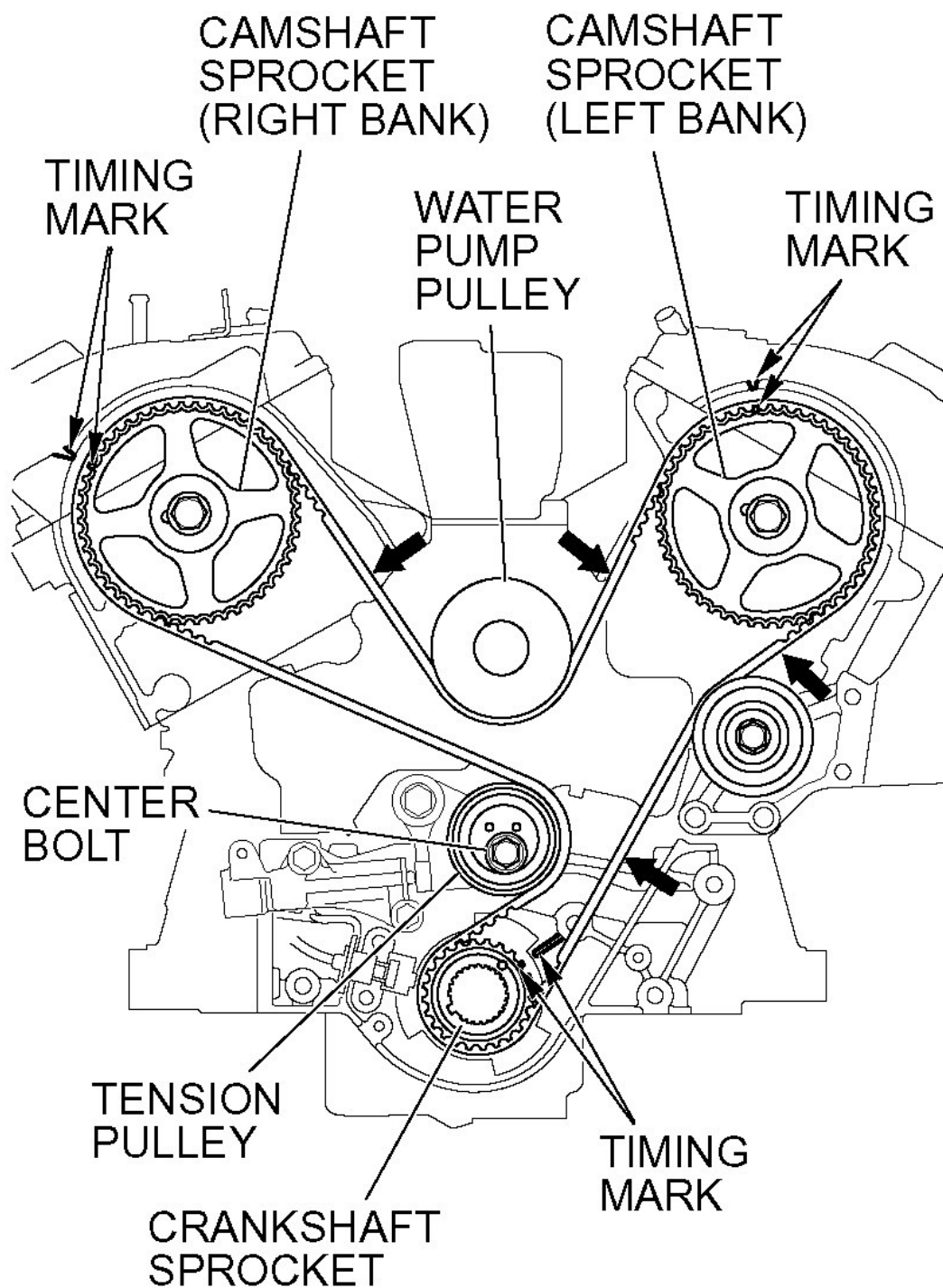
Fig. 55: Identifying Timing Belt Alignment Marks

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Installation Service Points**>> A << Timing Belt Installation**

1. Align the timing marks of the camshaft sprocket with those of crankshaft sprocket.

CAUTION: The camshaft sprocket (right bank) can turn easily due to the spring force applied, so be careful not to get your fingers caught.



G01910307

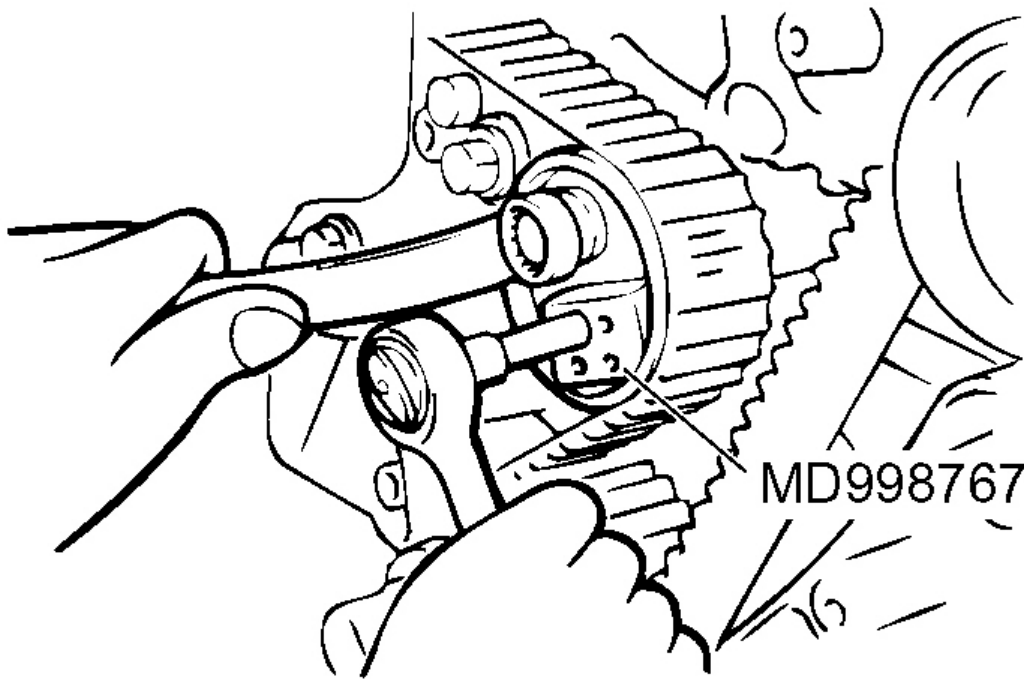
Fig. 56: Installing Timing Belt

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2. Install the timing belt by the following procedure so that there is no deflection in the timing belt between each sprocket and pulley.
 1. Crankshaft Sprocket
 2. Idler Pulley
 3. Camshaft Sprocket (Left Bank)
 4. Water Pump Pulley
 5. Camshaft Sprocket (Right Bank)
 6. Tension Pulley
3. Turn the camshaft sprocket counterclockwise until the tension side of the timing belt is firmly stretched. Check all timing marks again.

CAUTION: When tightening the center bolt, be careful that the tensioner pulley does not turn with the bolt.

4. Use special tool MD998767 to push the tensioner pulley into the timing belt, and then temporarily tighten the center bolt.



G01910308

Fig. 57: Pre-Tensioning Timing Belt

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

5. Use special tool MD998769 to turn the crankshaft 1/4 turn counterclockwise and then turn it again clockwise until the timing marks are aligned.

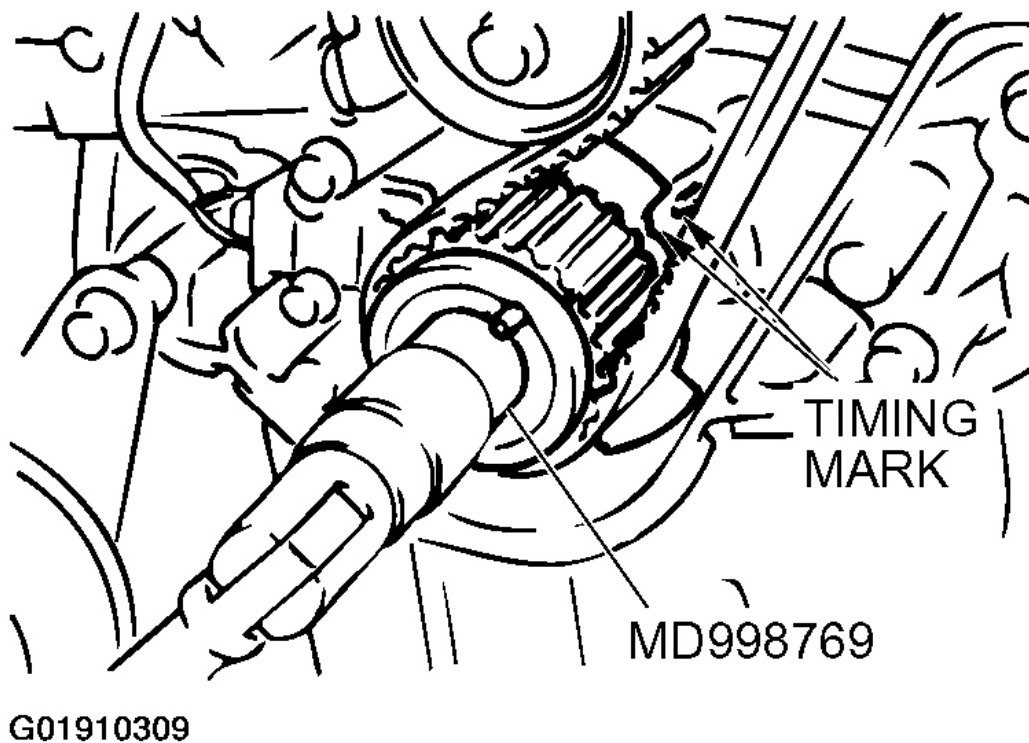
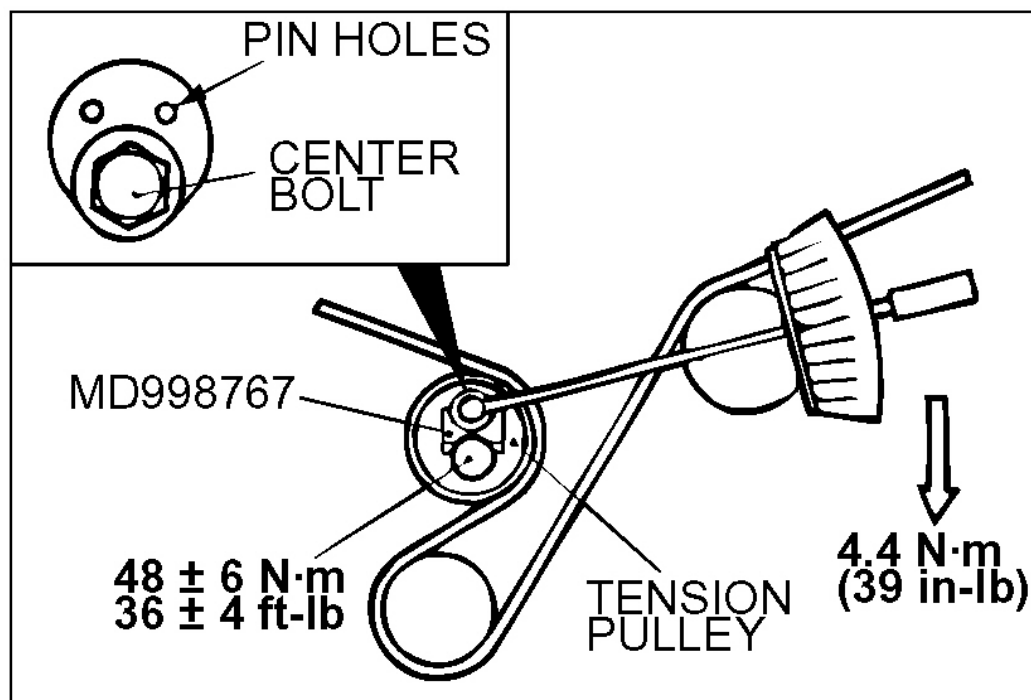


Fig. 58: Aligning Crankshaft Timing Mark

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

6. Loosen the center bolt of the tensioner pulley. Use special tool MD998767 and a torque wrench to apply the standard torque to the timing belt as shown in the illustration. Then tighten the center bolt to the specified torque.
 - **Standard value: 4.4 N.m (39 in-lb) < Timing belt tension torque >**
 - **Tightening torque: 48 +/- 6 N.m (36 +/- 4 ft-lb)**

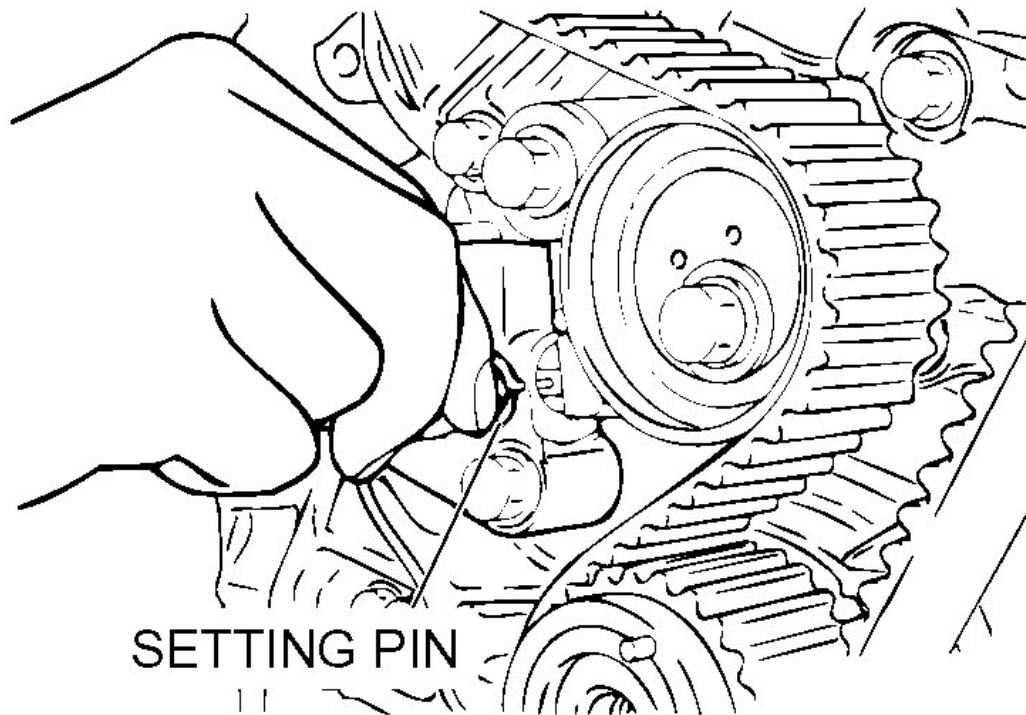


G01910310

Fig. 59: Tensioning Timing Belt

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

- Remove the setting pin that has been inserted into the auto-tensioner.
- Turn the crankshaft two turns clockwise to align the timing marks.



G01910311

Fig. 60: Removing Setting Pin From Auto-Tensioner
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

- Wait for at least five minutes, and then check that the auto-tensioner pushrod extends within the standard value.

Standard value (A): 4.8 - 5.5 mm (0.19 - 0.22 inch)

- If no, repeat the operation in steps (5) to (9) above.
- Check again that the timing marks of each sprocket are aligned.

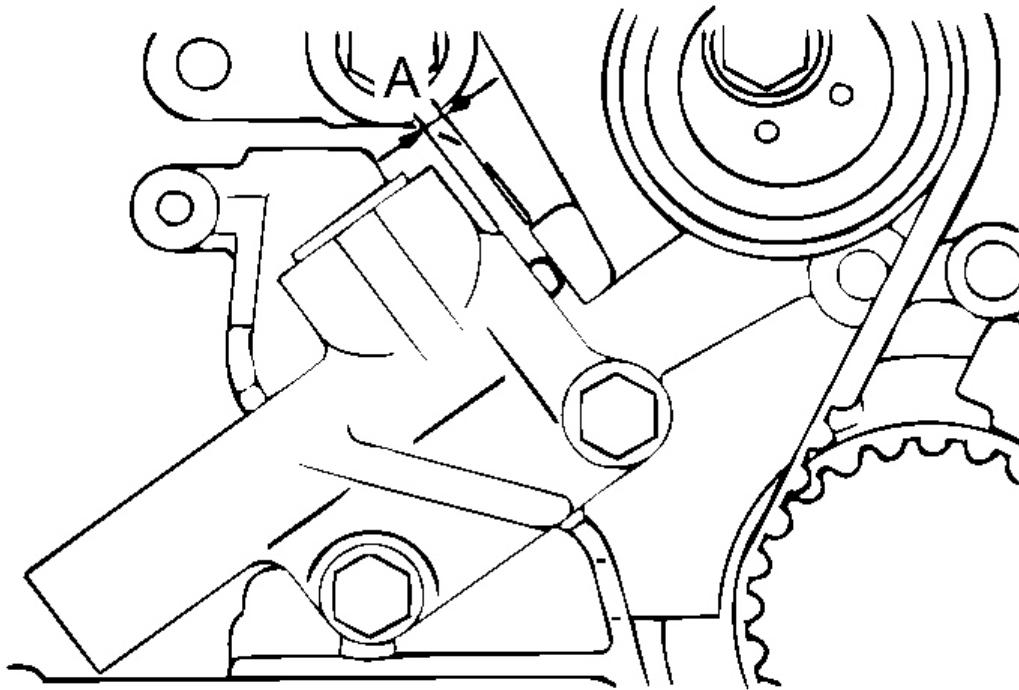
**G01910312**

Fig. 61: Identifying Auto-Tensioner Pushrod Extension Limit
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>> B << Auto-Tensioner Installation

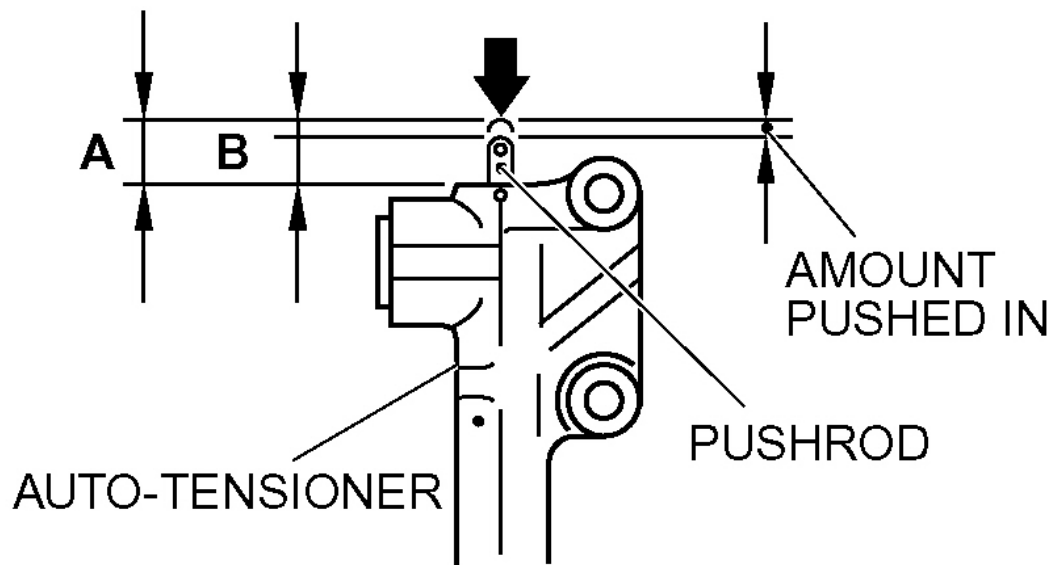
1. While holding the auto-tensioner by hand, press the end of the pushrod against a metal surface (such as the cylinder block) with a force of 98 - 196 N (72 - 145 pound) and measure how far the pushrod is pushed in.

Standard value: Within 1 mm (0.04 inch)

A: Length when no force is applied

B: Length when force is applied

A - B: Amount pushed in



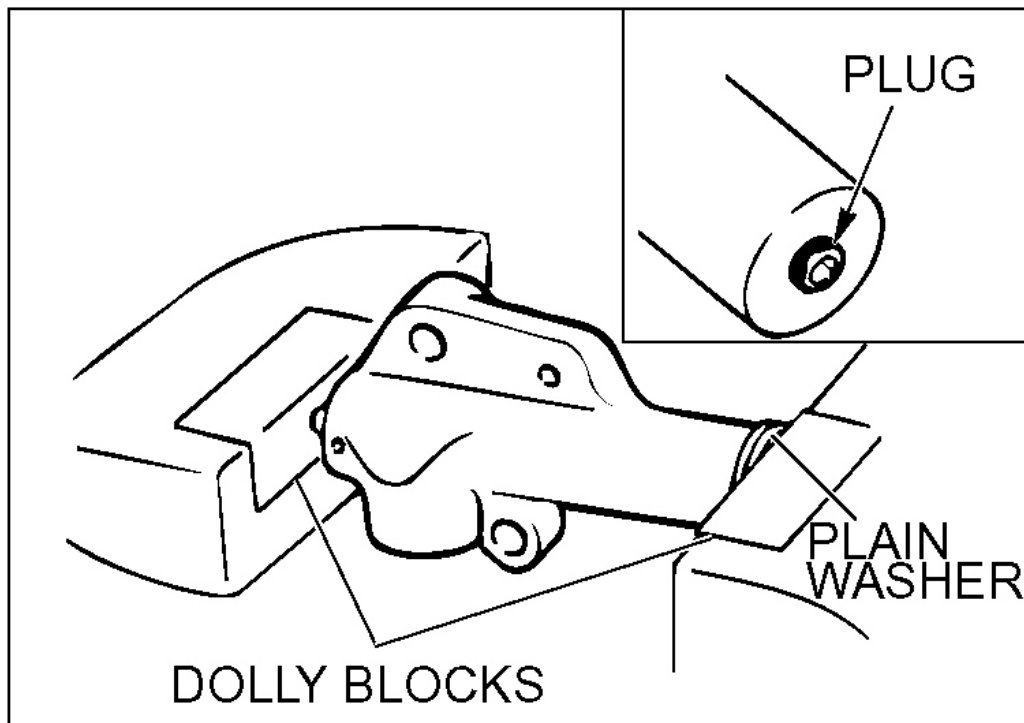
G01910313

Fig. 62: Identifying Auto-Tensioner Pushrod Pushed In Amount
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

CAUTION:

- Place the auto-tensioner perpendicular to the jaws of the vice.
- If there is a plug at the base of the auto-tensioner, insert a plain washer onto the end of the auto-tensioner to protect the plug.

2. If it is not within the standard value, replace the auto-tensioner.
3. Place two dolly blocks in a vice as shown in the illustration, and then place the auto-tensioner in the vice.



G01910314

Fig. 63: Compressing Auto-Tensioner With Vice
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

CAUTION: Never compress the pushrod too fast, or the pushrod may be damaged.

4. Slowly compress the pushrod of the auto-tensioner until pin hole A in the pushrod is aligned with pin hole B in the cylinder.

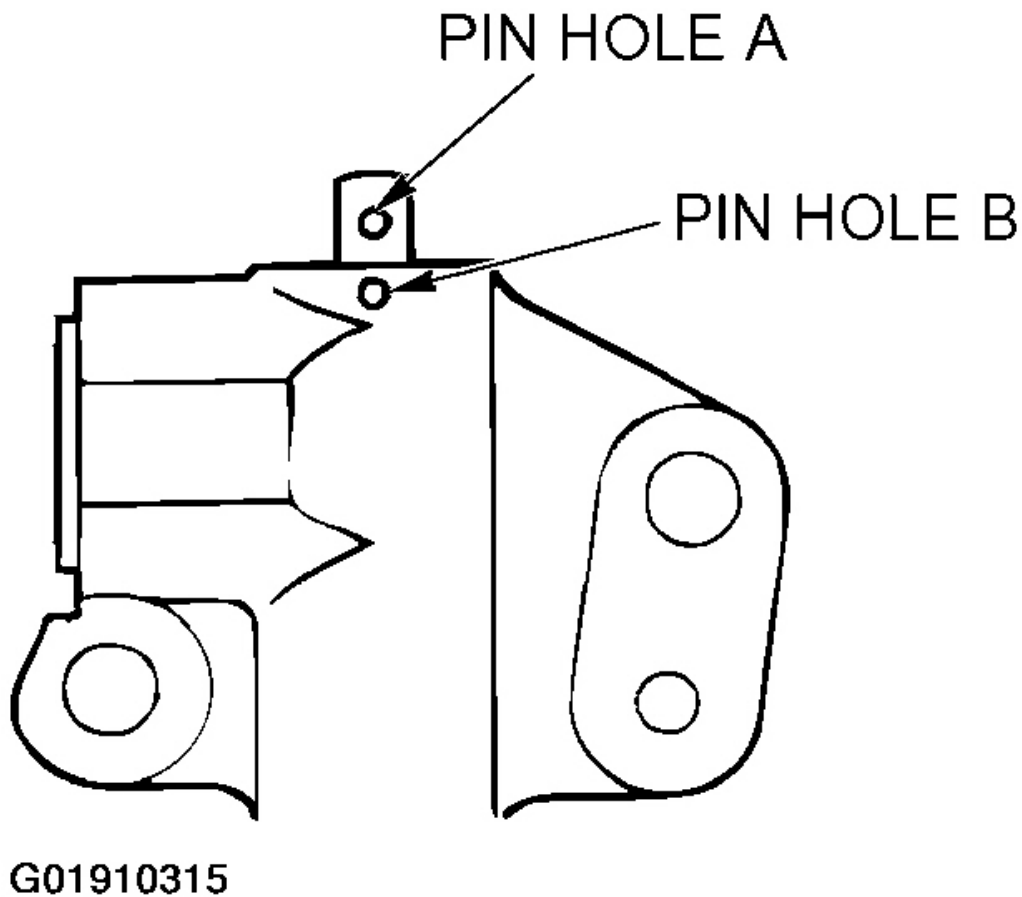


Fig. 64: Identifying Auto-Tensioner Pin Holes

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

5. Insert the setting pin into the pin holes once they are aligned.

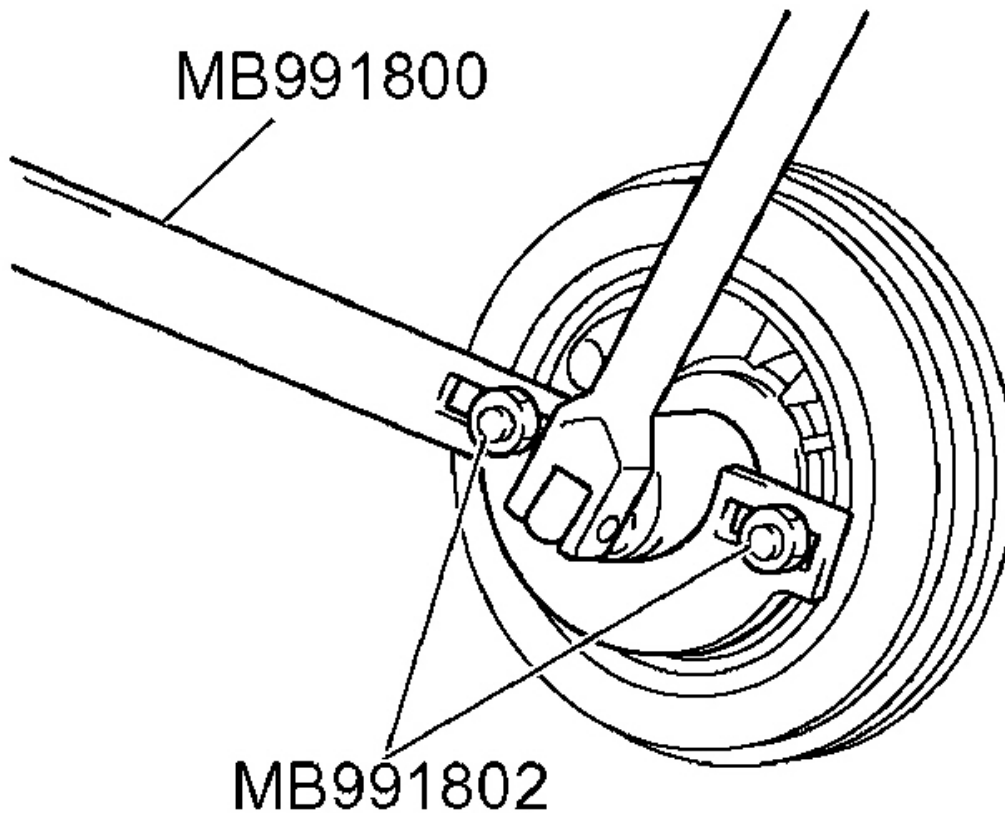
NOTE: If replacing the auto-tensioner, the pin will already be inserted into the pin holes of the new part.

CAUTION: Do not remove the setting pin from the auto-tensioner.

6. Install the auto-tensioner to the engine.

>> C << Crankshaft Pulley Installation

Use special tools MB991800 and MB991802 to install the crankshaft pulley.



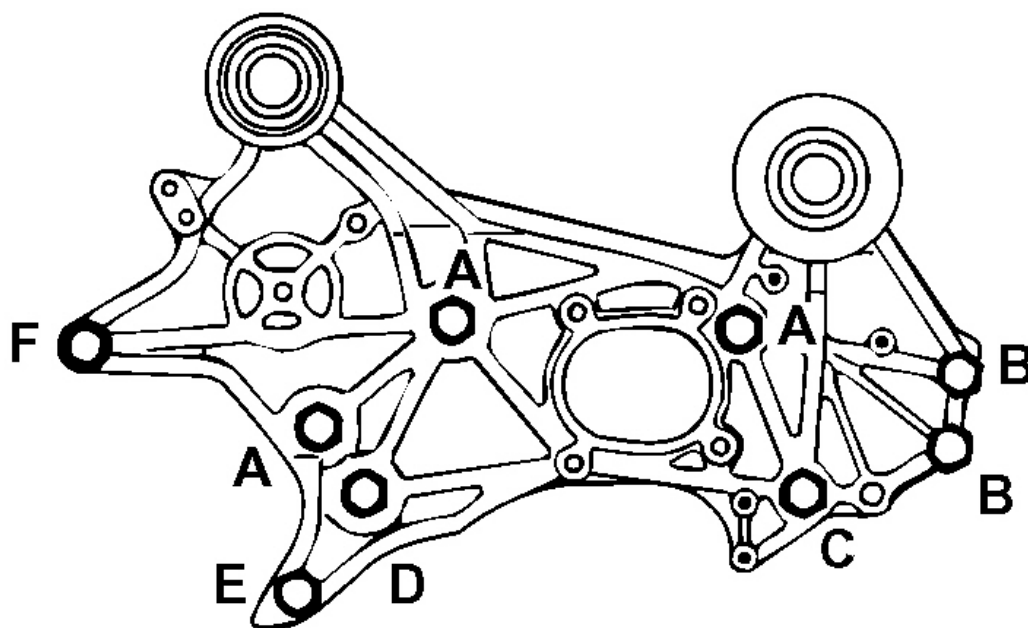
G01910316

Fig. 65: Installing Crankshaft Pulley

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>> D << Accessory Mount Assembly Installation

Install the bolts to the shown positions, and tighten them to the specified torque.



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Fig. 66: Identifying Accessory Mount Assembly Bolt Installation Sequence
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

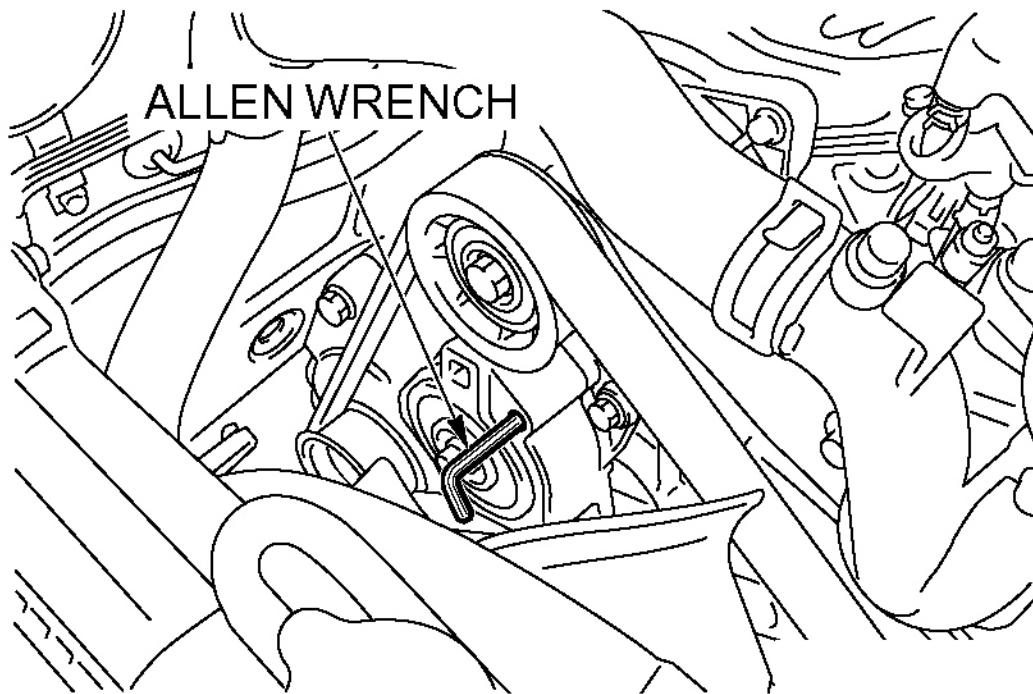
Bolt (symbol)	Diameter × length mm (in)	Tightening torque N·m (ft-lb)
A	10 × 100 (0.4 × 3.9)	41 ± 8 (30 ± 6)
B	10 × 30 (0.4 × 1.2)	41 ± 8 (30 ± 6)
C	10 × 100 (0.4 × 3.9)	44 ± 10 (33 ± 7)
D	12 × 100 (0.5 × 3.9)	74 ± 9 (54 ± 7)
E	8 × 30 (0.3 × 1.2)	23 ± 3 (17 ± 2)
F	10 × 100 (0.4 × 3.9)	49 ± 5 (36 ± 4)

G01910318

Fig. 67: Accessory Mount Assembly Bolt Torque Specifications
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>> E << Drive Belt Auto Tensioner Installation

1. Install the drive belt auto tensioner with the Allen wrench inserted.
2. After the drive belt has been installed, remove the Allen wrench while holding the drive belt auto tensioner with a socket wrench drive. Then release the drive belt auto tensioner slowly.



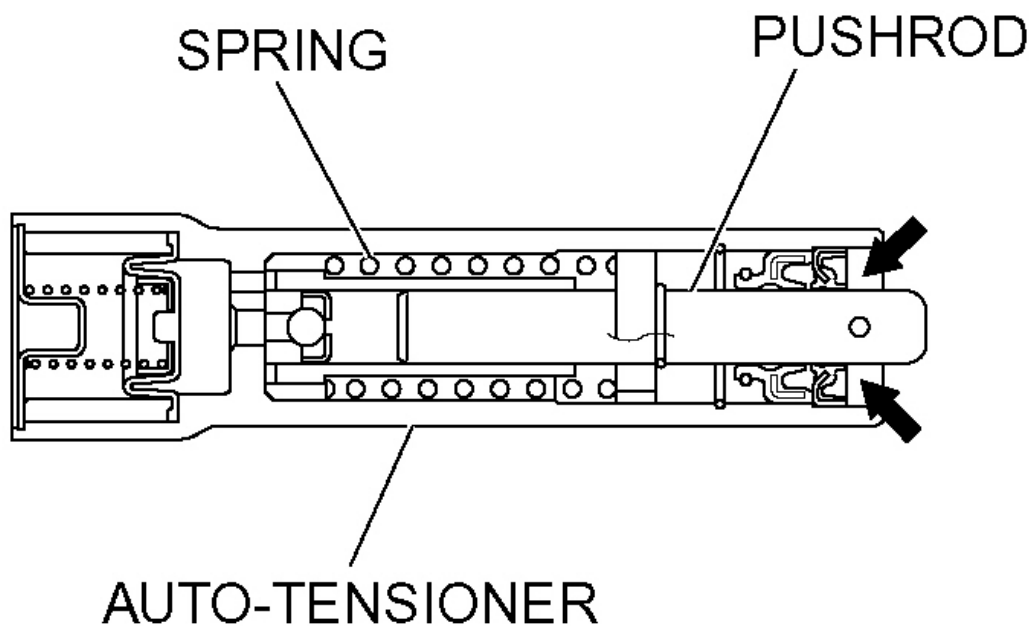
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Fig. 68: Removing Allen Wrench From Tensioner
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

INSPECTION

Auto-Tensioner

- Check the auto-tensioner for possible leaks.
- Check the pushrod for cracks.



G01910320

Fig. 69: Inspecting Auto-Tensioner

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

2003 Mitsubishi Montero XLS

2003 ENGINE Engine Mechanical - Montero (3.8L)

ITEMS	SPECIFICATIONS
A/T fluid dipstick assembly attaching bolt	44 ± 8 N·m (33 ± 5 ft-lb)
A/T fluid dipstick assembly attaching bolt	24 ± 4 N·m (18 ± 3 ft-lb)
Accessory mount assembly mounting bolt (10 × 100, 10 × 30)	41 ± 8 N·m (30 ± 6 ft-lb)
Accessory mount assembly mounting bolt (10 × 100)	44 ± 10 N·m (33 ± 7 ft-lb)
Accessory mount assembly mounting bolt (12 × 100)	74 ± 9 N·m (54 ± 7 ft-lb)
Accessory mount assembly mounting bolt (8 × 30)	23 ± 3 N·m (17 ± 2 ft-lb)
Accessory mount assembly mounting bolt (10 × 100)	49 ± 5 N·m (36 ± 4 ft-lb)
Accessory mount stay mounting bolt	49 ± 9 N·m (36 ± 7 ft-lb)
Accessory mount stay mounting bolt	24 ± 4 N·m (18 ± 3 ft-lb)
Auto tensioner mounting bolt	23 ± 3 N·m (17 ± 2 ft-lb)
Cooling fan attaching nut	11 ± 1 N·m (98 ± 8 in-lb)
Cooling fan bracket assembly	41 ± 8 N·m (30 ± 6 ft-lb)
Camshaft position sensor support attaching bolt	14 ± 1 N·m (120 ± 13 in-lb)
Camshaft sprocket attaching bolt	88 ± 10 N·m (65 ± 7 ft-lb)
Crankshaft position sensor attaching bolt	8.5 ± 0.5 N·m (76 ± 4 in-lb)
Crankshaft pulley attaching bolt	185 ± 5 N·m (137 ± 3 ft-lb)

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Fig. 70: Fastener Torque Specifications Index (1 Of 2)
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2003 Mitsubishi Montero XLS

2003 ENGINE Engine Mechanical - Montero (3.8L)

ITEMS	SPECIFICATIONS
Cylinder head bolt <cold engine>	108 ± 5 N·m (80 ± 3 ft-lb)→back off→108 ± 5 N·m (80 ± 3 ft-lb)
Drive belt auto tensioner attaching bolt	24 ± 4 N·m (18 ± 3 ft-lb)
Drive plate attaching bolt	74 ± 4 N·m (55 ± 3 ft-lb)
Drain plug	39 ± 5 N·m (29 ± 3 ft-lb)
Drive shaft (RH) attaching nut	60 ± 10 Nm (45 ± 7 ft-lb)
Engine oil dipstick assembly attaching bolt	14 ± 1 N·m (120 ± 13 in-lb)
Engine front mount insulator attaching bolt	44 ± 9 N·m (33 ± 6 ft-lb)
Engine mount insulator attaching nut	26 ± 4 N·m (19 ± 3 ft-lb)
Front differential number 2 crossmember assembly attaching bolt	69 ± 9 N·m (51 ± 7 ft-lb)
Front propeller shaft connection nut	60 ± 10 N·m (45 ± 7 ft-lb)
Fuel high-pressure hose bolt	5.0 ± 1.0 N·m (44 ± 9 in-lb)
Ground cable mounting bolt	9.0 ± 2.0 N·m (80 ± 17 in-lb)
Idler pulley attaching bolt	44 ± 5 N·m (33 ± 3 ft-lb)
Ignition coil bolt	13 ± 2 N·m (111 ± 22 in-lb)
Intake manifold plenum stay bolt	39 ± 3 N·m (29 ± 2 ft-lb)
Oil cooler eye bolt	48 ± 7 N·m (36 ± 5 ft-lb)
Oil cooler hose bracket bolt	12 ± 2 N·m (102 ± 22 in-lb)
Oil pan attaching bolt	8.5 ± 3.5 N·m (75 ± 31 in-lb)
Oil pan attaching bolt	37 ± 7 N·m (27 ± 5 ft-lb)
Oil pan attaching bolt	11 ± 0.5 N·m (93 ± 4 ft-lb)
Oil screen attaching bolt	19 ± 3 N·m (14 ± 2 ft-lb)
Oil screen attaching bolt	9.0 ± 1.0 N·m (80 ± 9 in-lb)
Power steering oil pump assembly mounting bolt	22 ± 4 N·m (16 ± 3 ft-lb)
Rocker arm and shaft assembly mounting bolt	31 ± 3 N·m (23 ± 2 ft-lb)
Rocker cover attaching bolt	3.5 ± 0.5 N·m (31 ± 4 in-lb)
Sensing camshaft position cylinder	22 ± 4 N·m (16 ± 3 ft-lb)
Timing belt lower cover assembly attaching bolt	11 ± 1 N·m (98 ± 8 in-lb)
Timing belt upper cover assembly attaching bolt	11 ± 1 N·m (96 ± 8 in-lb)
Timing belt upper cover assembly attaching bolt	14 ± 1 N·m (120 ± 13 in-lb)
Timing belt indicator bracket attaching bolt	11 ± 1 N·m (96 ± 8 in-lb)
Tension arm assembly attaching bolt	44 ± 10 N·m (33 ± 7 ft-lb)
Tension pulley attaching bolt	48 ± 6 N·m (36 ± 4 ft-lb)
Water outlet pipe attaching bolt	14 ± 1 N·m (120 ± 13 in-lb)
Water passage assembly attaching bolt	19 ± 1 N·m (14 ± 1 ft-lb)
Water pipe assembly attaching bolt	14 ± 1 N·m (120 ± 13 in-lb)

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Fig. 71: Fastener Torque Specifications Index (2 Of 2)
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

SERVICE SPECIFICATIONS

2003 Mitsubishi Montero XLS**2003 ENGINE Engine Mechanical - Montero (3.8L)**

ITEMS		STANDARD VALUE	LIMIT
Drive belt tension	Vibration frequency Hz (Reference)	87 – 119	–
	Tension N (Reference)	226 – 422	–
Basic ignition timing at idle		5°BTDC ± 3°	–
Actual ignition timing at curb idle		Approximately 10° BTDC	–
CO contents %		0.5 or less	–
HC contents ppm		100 or less	–
Curb idle speed r/min		700 ± 100	–
Compression pressure (250 - 400 r/min) kPa (psi)		1200 (171)	Minimum 890 (127)
Compression pressure difference of all cylinder kPa (psi)		–	100 (14)
Intake manifold vacuum at curb idle kPa (in Hg)		–	Minimum 60 (18)
Auto-tensioner pushrod movement mm (in)		Within 1.0 (0.04)	–
Timing belt tension torque N·m (in-lb)		4.4 (39)	–
Auto tensioner rod protrusion amount mm (in)		4.8 – 5.5 (0.19 – 0.22)	–

G01910323

Fig. 72: Service Specifications Index**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.****LUBRICANT**

ITEM	SPECIFICATION
A/T fluid	DIAMOND ATF SP-II M or DIAMOND ATF SP III

G01910324

Fig. 73: Lubricant Specifications Index**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.****SEALANTS**

ITEM	SPECIFIED SEALANT
Camshaft position sensor support	MITSUBISHI GENUINE Part No. MD970389 or equivalent
Oil pan	MITSUBISHI GENUINE Part No. MD970389 or equivalent

G01910325

Fig. 74: Sealants Specifications Index**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**