

2003 ENGINES**On-Vehicle Service, Removal & Installation - Diamante****GENERAL DESCRIPTION**

The 6G74 (3.5L) 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). The engine is fired in the order of the 1, 2, 3, 4, 5, and 6 cylinders.

Identifying Engine Specifications

ITEMS			SPECIFICATIONS
Type			V-type, Over Head Camshaft
Number of cylinders			6
Bore mm (in.)			93.0 (3.65)
Stroke mm (in.)			85.8 (3.37)
Piston displacement cm ³ (cu.in.)			3,497 (213.5)
Compression ratio			9.0
Firing order			1-2-3-4-5-6
Valve timing	Intake valve	Opens (BTDC)	13°
		Closes (ABDC)	55°
	Exhaust valve	Opens (BBDC)	51°
		Closes (ATDC)	17°
Valve overlap			30°
Intake valve duration			248°
Exhaust valve duration			248°

DIAGNOSIS

2003 Mitsubishi Diamante LS

2003 ENGINES On-Vehicle Service, Removal & Installation - Diamante

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 (open) oil relief valve	Repair the relief valve.
Oil pressure too high	Excessive bearing clearance	Replace the bearings.
	Stuck (closed) oil relief valve	Repair the relief valve.
Noisy valves	Malfunction of lash adjuster	Replace 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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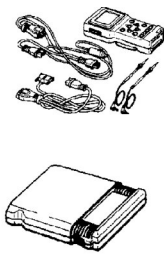
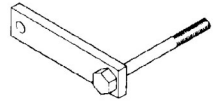
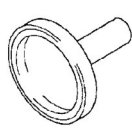
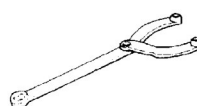
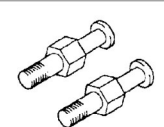
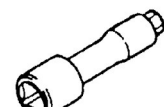
Fig. 1: Diagnosis Symptom Table

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

SPECIAL TOOLS

2003 Mitsubishi Diamante LS

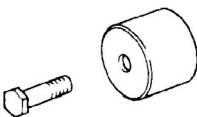
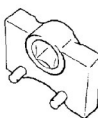
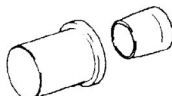
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TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MB991502 Scan tool (MUT-II) ROM pack	– –	Checking of engine idling speed
	MD998781 Flywheel stopper	–	Drive plate supporting
	MD998718 Crankshaft rear oil seal installer	MD998718-01	Installation of the crankshaft rear oil seal
	MB990767 End yoke holder	MB990767-01	Supporting the sprocket and shaft pulley during removal and installation Use with MD998715
	MD998715 Pulley holding pins	MIT308239	Supporting the crankshaft pulley when crankshaft bolt and pulley are removed or reinstalled. Use together with MB990767 Camshaft pulley supporting
	MD998769 Crankshaft sprocket spacer	–	Used if the crankshaft needs to be rotated to attach the timing belt, etc.
	MD998051 Wrench, cylinder head bolt	MD998051-01	Loosening and tightening of cylinder head bolt

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Fig. 2: Identifying Of Special Tool (1 Of 2)

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

TOOL	TOOL NUMBER AND NAME	SUPERSESION	APPLICATION
	MD998713 Camshaft oil seal installer	MD998713-01	Camshaft oil seal installation
	MB991559 Camshaft oil seal installer	—	Press fitting the camshaft oil seal (For left bank)
	MD998767 Tension pulley socket wrench	MD998752-01	Adjustment of the timing belt
	MD998717 Crankshaft front oil seal installer	MD998717-01	Press-fitting of crankshaft front oil seal

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Fig. 3: Identifying Of Special Tool (2 Of 2)

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

ON-VEHICLE SERVICE

DRIVE BELT TENSION CHECK AND ADJUSTMENT

Check the belt tension by using a belt-tension gauge or apply 98 N (22 lbs.) of force to the belt midway between the pulleys as shown in the illustration, and measure the deflection.

ITEM		CHECK VALUE	ADJUST- MENT VALUE NEW BELT	ADJUST- MENT VALUE USED BELT
For generator and A/C	Tension N (lbs.)	490-686 (109-152)	784-980 (174-218)	539-637 (120-142)
	Deflection <Reference value> mm (in.)	7.9-9.7 (.31-.38)	6.0-7.2 (.24-.28)	8.2-9.3 (.32-.37)
For power steering	Tension N (lbs.)	373-569 (83-126)	608-804 (135-179)	422-520 (93.8-116)
	Deflection <Reference value> mm (in.)	11.0-14.2 (.43-.56)	8.4-9.3 (.33-.37)	11.7-13.4 (.46-.52)

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Fig. 4: Identifying Drive Belt Tension Specifications
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

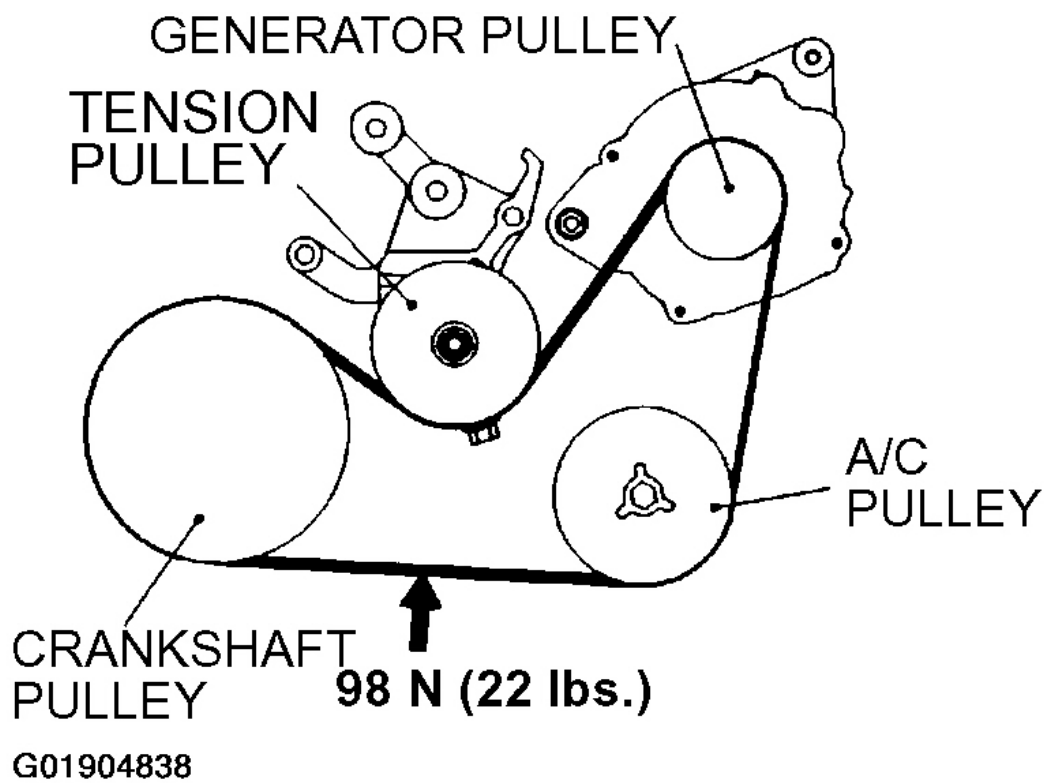
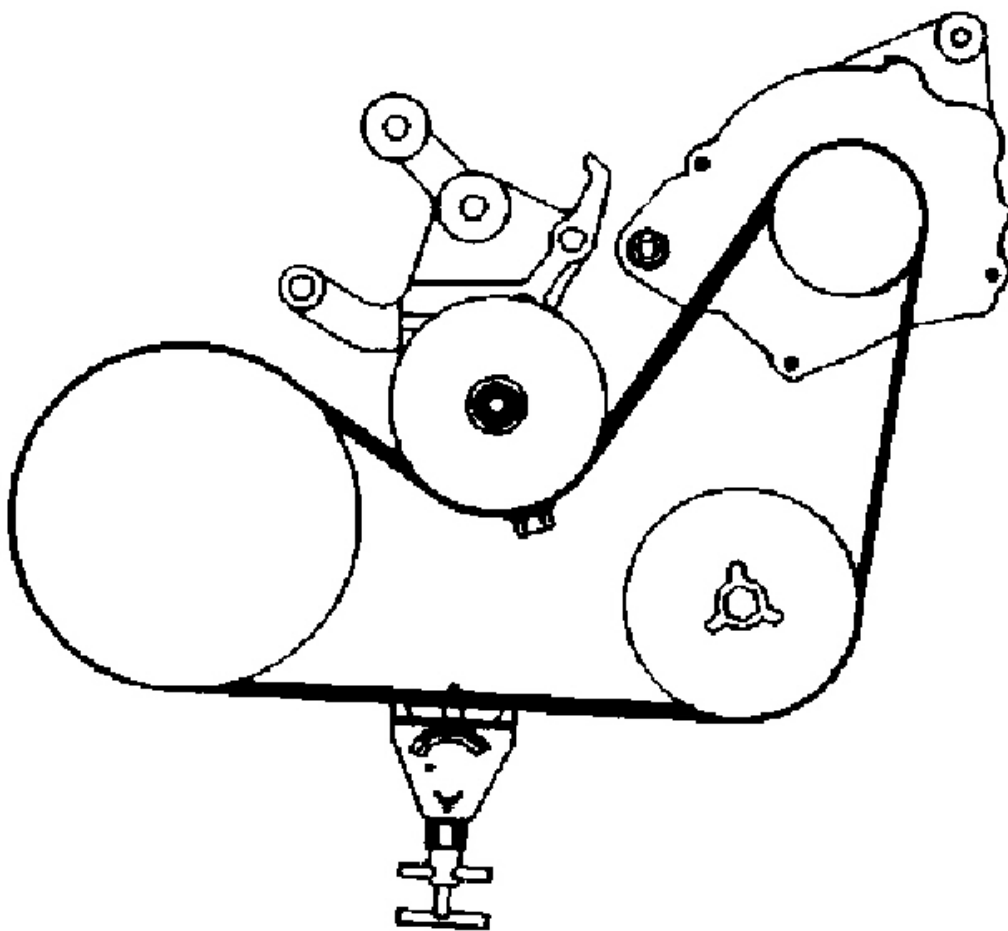


Fig. 5: Checking Drive Belt Tension

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.



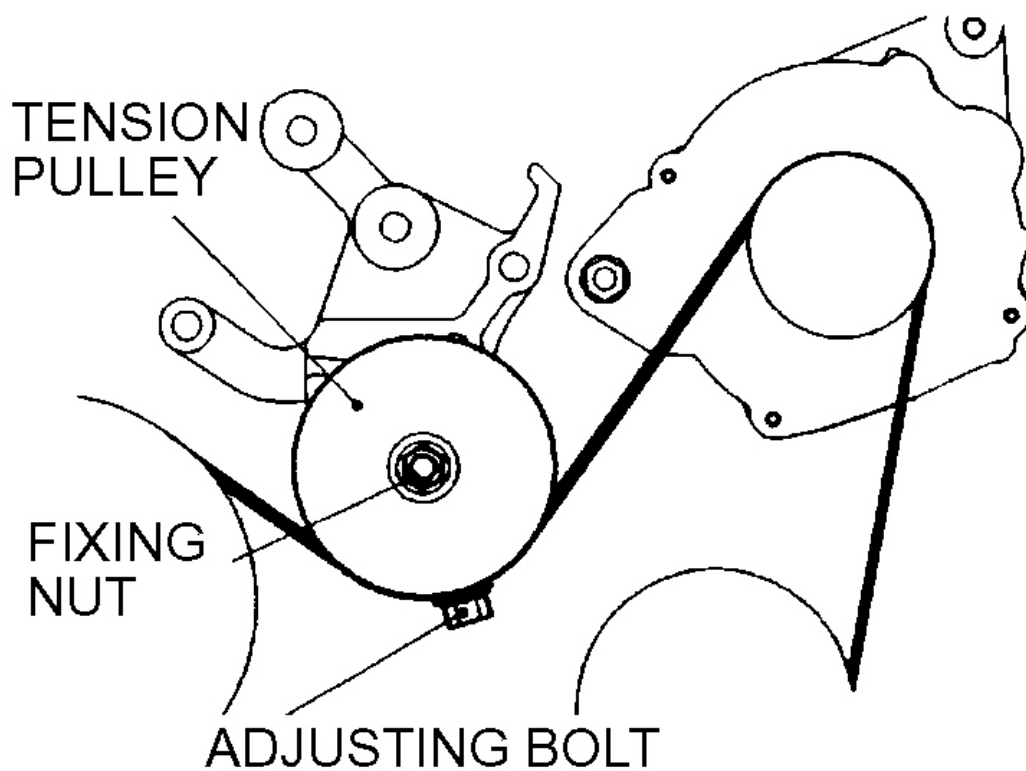
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Fig. 6: Adjusting Drive Belt Tension

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

GENERATOR AND AIR-CONDITIONING COMPRESSOR DRIVE BELT TENSION ADJUSTMENT

1. Loosen the tension pulley fixing nut.
2. Adjust the belt tension using the adjusting bolt.
3. Tighten the fixing nut.
4. Crank the engine once or more.
5. check the belt tension.

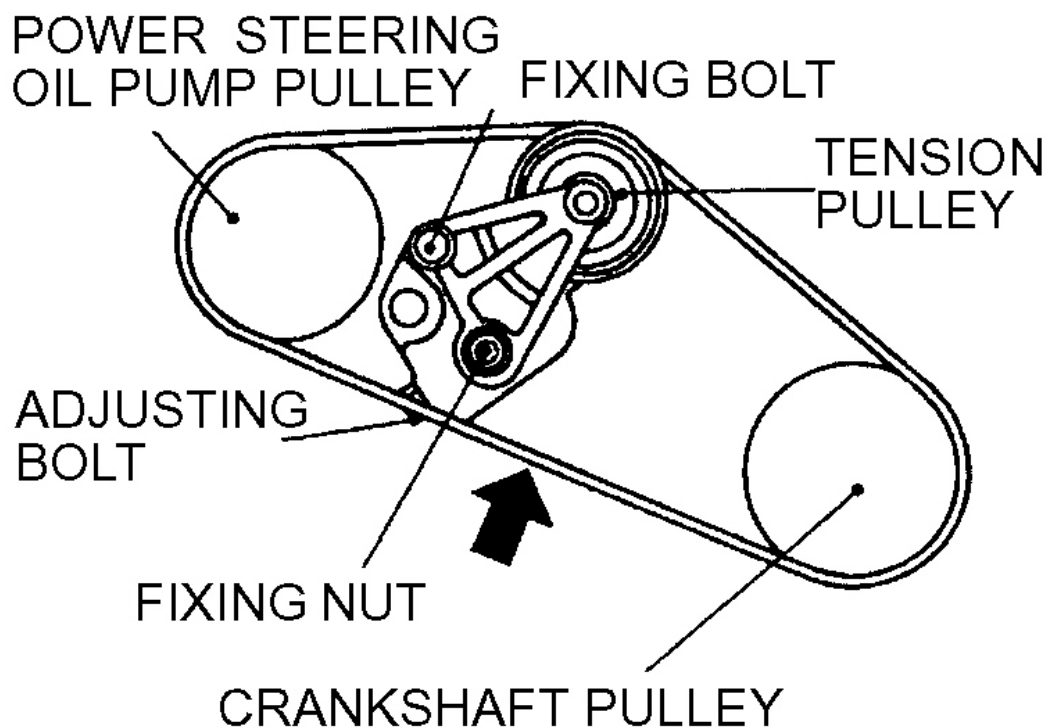


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Fig. 7: Adjusting Generator & Air Conditioning Compressor Drive Belt Tension
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

POWER STEERING OIL PUMP BELT TENSION ADJUSTMENT

1. Loosen the tension pulley fixing nut.
2. Adjust the belt tension using the adjusting bolt.
3. Tighten the fixing nut.
4. Crank the engine once or more.
5. Check the belt tension.

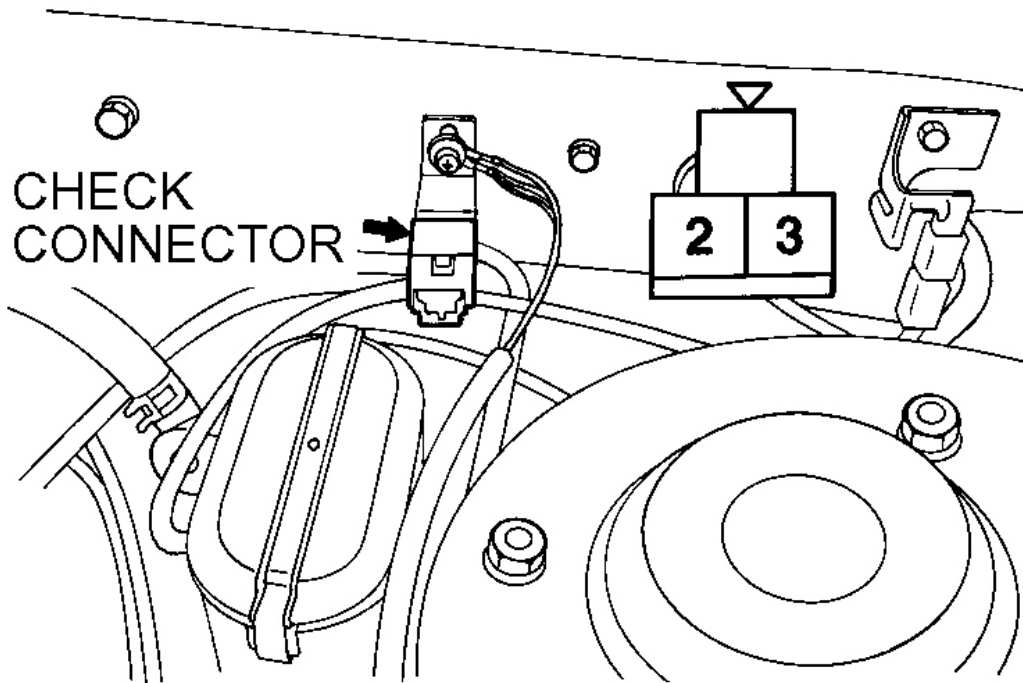


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Fig. 8: Adjusting Power Steering Oil Pump Belt Tension
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

IGNITION TIMING CHECK

1. Before inspection, set the vehicle to the following conditions.
 - Engine coolant temperature: 80-95°C (176-203°F)
 - Lights and all accessories: OFF
 - Transmission: Neutral (P range)
2. Insert a paper clip into the No. 3 terminal of the 3 pin connector shown in illustration.



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Fig. 9: Locating Connector For Ignition Timing Check
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. Connect a primary voltage detection type tachometer to the paper clip.
4. Install the timing light.
5. Start the engine and run at idle.
6. Check that the idle speed is about 700 r/min.
7. Turn the ignition switch to OFF.
8. Connect the scan tool to the data link connector.
9. Start the engine and run it at idle.
10. Select the MFI system Actuator Test from the scan tool menu and scroll to item 17 - Basic Ignition Timing.
11. Press the "Y" Key and check that the basic ignition timing is the standard value.

Standard value: 5°BTDC+/-3°

12. If the ignition timing value is not within the standard value range, refer to **SYSTEM & COMPONENT TESTING** and check the crankshaft position sensor.
13. Check that the idling ignition timing is at the correct value.

Standard value: Approx. 10°BTDC

NOTE: Ignition timing is variable within about $\pm 8^\circ$, even under normal operating conditions.

NOTE: And it is automatically further advanced by about 5° from 10° BTDC at higher altitudes.

CURB IDLE SPEED CHECK

1. Before inspection set the vehicle to the following conditions.
 - Engine coolant temperature: $80-95^\circ\text{C}$ ($176-203^\circ\text{F}$)
 - Lights and all accessories: OFF
 - Transmission: Neutral (P for A/T)
2. Check the basic ignition timing.

Standard value: 5° BTDC $\pm 3^\circ$
3. After turning the ignition switch to OFF, connect a tachometer or the scan tool to the data link connector (white).

NOTE: For the procedures for setting the tachometer, refer to **IGNITION TIMING CHECK.**

4. Start the engine and run it at idle.
5. Run the engine at idle for 2 minutes.
6. Check the curb idle speed.

Standard value: 700 ± 100 r/min

NOTE: The idle speed is adjusted automatically by the idle air control (IAC) system.

7. If there is a deviation from the standard value, refer to **SYSTEM & COMPONENT TESTING** and check the MFI components.

IDLE MIXTURE CHECK

1. Before inspection, set the vehicle to the following conditions.
 - Engine coolant temperature: $80-95^\circ\text{C}$ ($176-203^\circ\text{F}$)
 - Lights and all accessories: OFF
 - Transmission: Neutral (P range)
2. Check to be sure that the basic ignition timing is at the standard value.

Standard value: 5° BTDC $\pm 3^\circ$
3. After turning the ignition switch to OFF, connect a tachometer, or connect the scan tool to the data link connector.

NOTE: For the procedures for setting the tachometer, refer to IGNITION TIMING CHECK.

4. Start the engine and race it at an engine speed of 2,500 r/min for two minutes.
5. Connect a CO and HC tester.
6. Check the CO contents and the HC contents while the engine is idling.

Standard value: CO contents: 0.5% or less

HC contents: 100 ppm or less

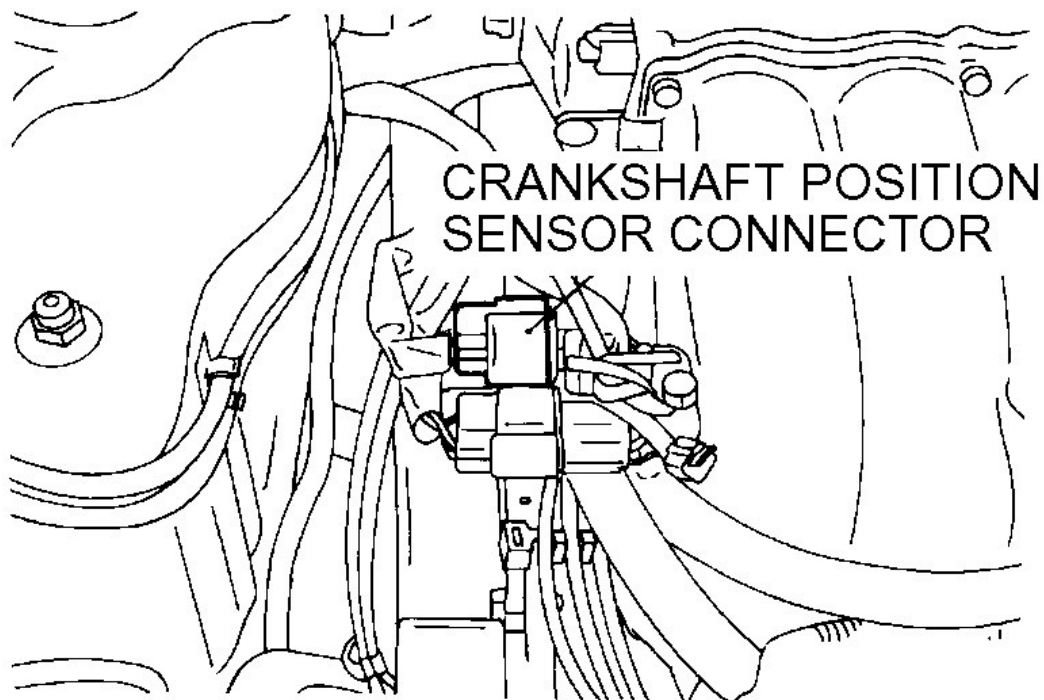
7. If the concentrations are outside the standard values, check the following items.
 - Diagnostic output
 - Closed loop control (If closed loop control is being carried out normally, the heated oxygen sensor output signal will vary between 0-400 mV and 600-1,000 mV while the engine is idling.)
 - Fuel pressure
 - Injectors
 - Ignition coil, spark plug cables, spark plugs
 - Evaporative emission control system
 - Compression pressure

NOTE: If the results of the checks for all items are normal but the CO and HC concentrations still exceed the standard values, replace the three-way catalyst.

COMPRESSION PRESSURE CHECK

1. Before inspection, check that the engine oil, starter and battery are normal. Also, set the vehicle to the following conditions.
 - 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. 10: Locating Crankshaft Position Sensor Connector
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

5. Cover the spark plug hole with a rag, and after the engine has been cranked, check that no foreign material is adhering to the rag.

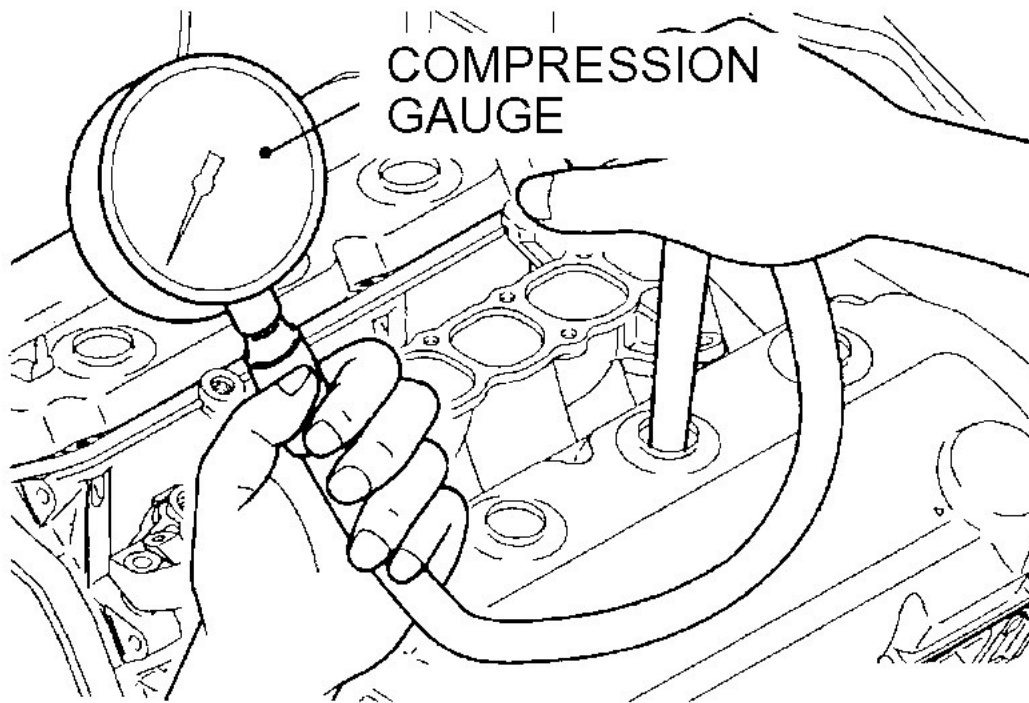
WARNING: Keep away from the spark plug hole when cranking.

WARNING: Do not let water, oil, fuel, etc. enter the cylinder through cracks, or these heated materials will gush out from the spark plug hole, which is dangerous.

6. Set the compression gauge to a spark plug mounting hole.
7. Crack the engine with the throttle valve fully open and measure the compression pressure.

Standard value: 1200 kPa (171 psi.)/250-400 r/min

Limit: min. 890 kPa (127 psi.)/250-400 r/min



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Fig. 11: Measuring Compression At Each Cylinder

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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

Limit: max. 100 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 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 leaking from the gasket.
10. Reconnect the crankshaft position sensor connector.
11. Reinstall the spark plugs and spark plug cables.
12. Use the scan tool to erase the diagnostic trouble codes, or disconnect the negative battery cable for 10 seconds or more and then reconnect it.

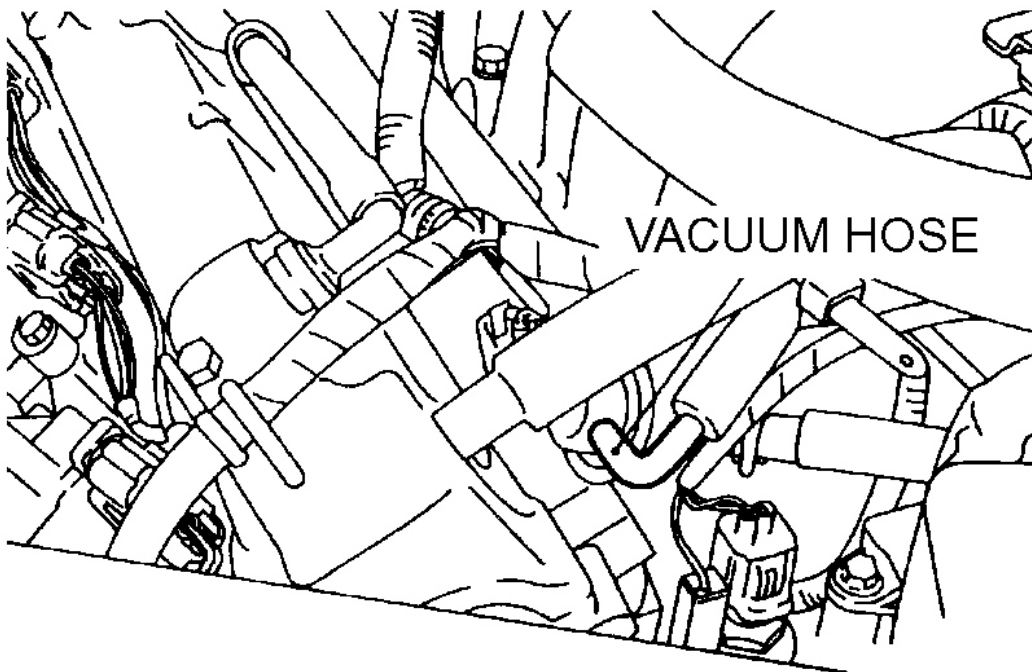
NOTE: This will erase the diagnostic trouble code resulting from the crankshaft position sensor connector being disconnected.

MANIFOLD VACUUM CHECK

1. Before inspection, set the vehicle to the following conditions.
 - Engine coolant temperature: 80-95°C (176-203°F)
 - Lights and all accessories: OFF
 - Transmission: Neutral P range
2. Connect a tachometer or connect the scan tool to the data link connector.

NOTE: For the procedures for setting the tachometer, refer to **IGNITION TIMING CHECK**.

3. Connect a three-way joint to the vacuum hose between the intake manifold plenum and the fuel-pressure regulator, and then connect a vacuum gauge.



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Fig. 12: Locating Vacuum Hose

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

4. Start the engine and check that the idle speed is within the standard value range. Take a reading of the vacuum gauge.

Limit: min. 60 kPa (18 in. Hg)

LASH ADJUSTER CHECK

If an abnormal noise (clattering 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 engine speed, regardless 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, malfunction of the lash adjuster is not the cause for the abnormal noise.

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

1. Start the engine.
2. Check if 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, malfunction of the lash adjuster is not the cause for the noise. Therefore, investigate other causes. If the abnormal noise does not change with the engine speed, it is probably caused by some parts other than the engine. (In this case, the valve 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, a tapping noise due to worn crankshaft bearing or connecting rod bearing is suspected. (In this case, the lash adjuster is in good condition.)

4. After the engine is warmed up, run it at idle and check for abnormal noise. If the noise is reduced or disappears, clean the lash adjuster as the noise may be caused by a seized or sticking lash adjuster. Refer to **ENGINE OVERHAUL**. If there is no change in the level of the abnormal noise, proceed to next step.
5. Run the engine to bleed the lash adjuster system. Refer to **BLEEDING THE LASH ADJUSTER SYSTEM**.
6. If the abnormal noise does not disappear after performing the bleeding air bleeding operation, clean the lash adjuster. Refer to **ENGINE OVERHAUL**.)

BLEEDING THE LASH ADJUSTER SYSTEM

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

NOTE: After being parked for many hours, oil may run out from the oil passage. It takes time before oil is supplied to the lash adjuster, causing air to enter the high pressure chamber.

NOTE: In the above cases, eliminate the abnormal noise by bleeding the lash adjusters as follows:

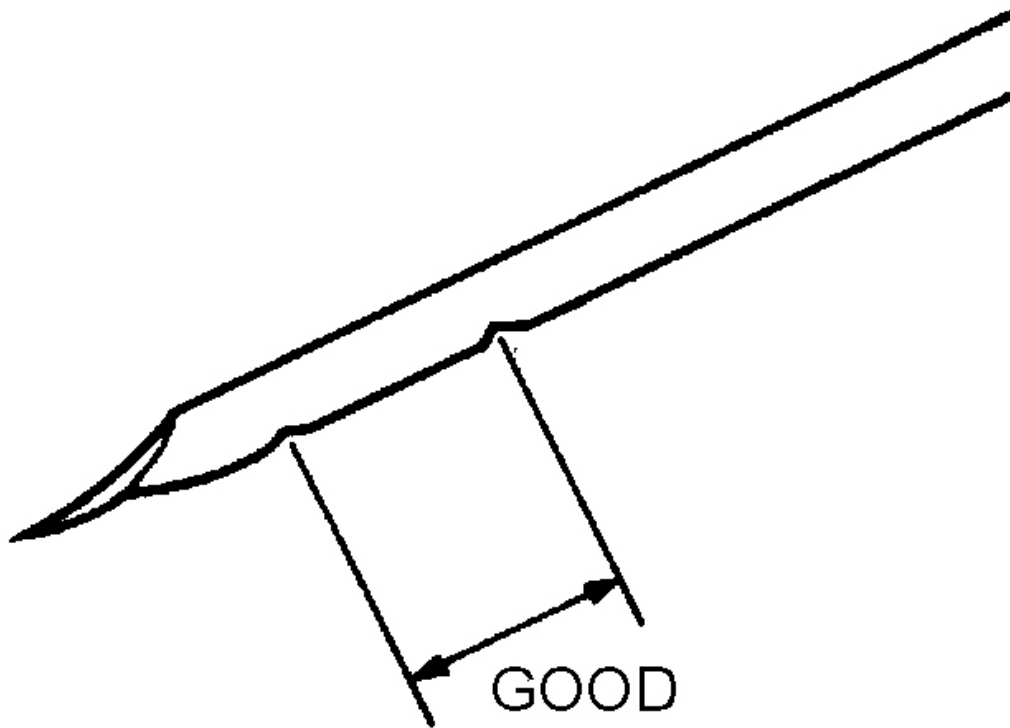
1. Check the engine oil. Add or change oil if required.

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 air.

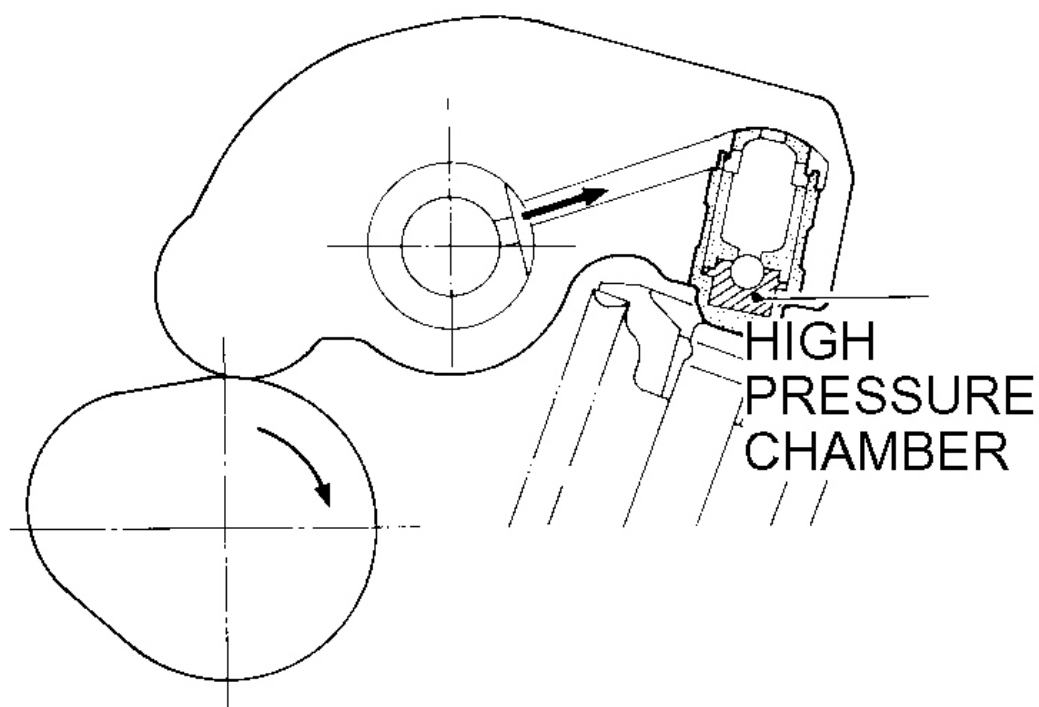
NOTE: If oil is deteriorated, air is not easily separated from the oil, increasing the quantity of air contained in the oil.

NOTE: If oil mixed with air enters the high pressure chamber inside the lash adjuster from the above causes, air in the high pressure chamber is excessively compressed while the valve is opened, resulting in abnormal noise at closing of the valve. This is the same phenomenon as when the valve clearance has become excessive. The lash adjuster can resume normal function when air that has entered the lash adjuster is removed.



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Fig. 13: Identifying Correct Engine Oil Level
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.



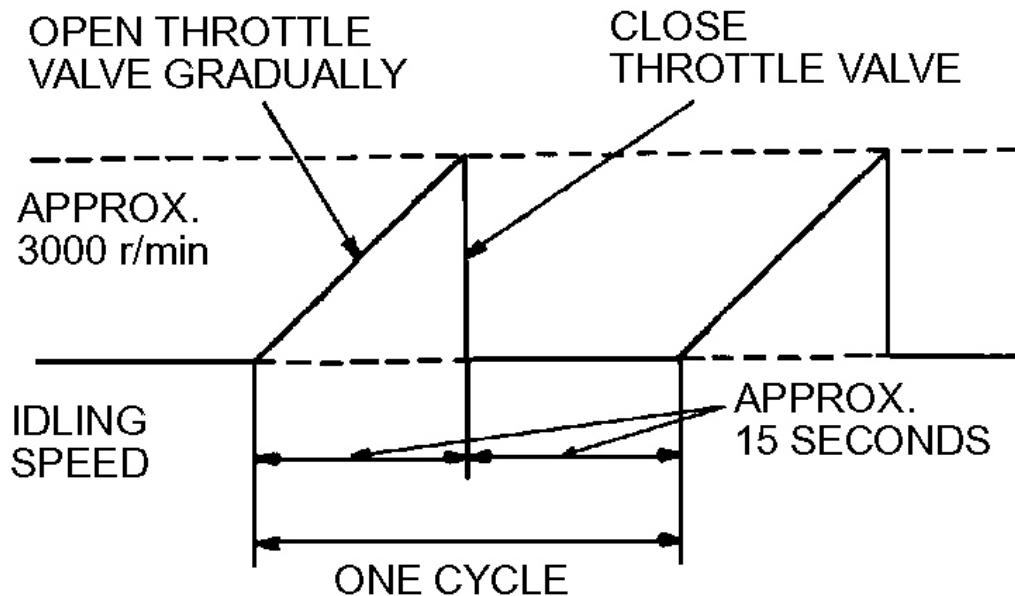
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Fig. 14: Locating High Pressure Chamber**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

2. Idle the engine for 1 to 3 minutes.
3. Repeat the operation pattern shown in illustration at no load to check for abnormal noise.

(Typically the abnormal noise is eliminated after repeating the operating 10 to 30 times. If no change is observed in the abnormal noise after repeating the operation 30 times, it is suspected that the abnormal noise is due to some other factors.

AIR BLEEDING OPERATION PATTERN



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Fig. 15: Locating Air Bleeding Operation Pattern

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

4. After elimination of abnormal noise, repeat the operation shown in illustration five more times.
5. Run the engine at idle for 1 to 3 minutes to make sure that the abnormal noise has been eliminated.
6. If abnormal noise is not eliminated, clean the lash adjuster. Refer to **ENGINE OVERHAUL** .

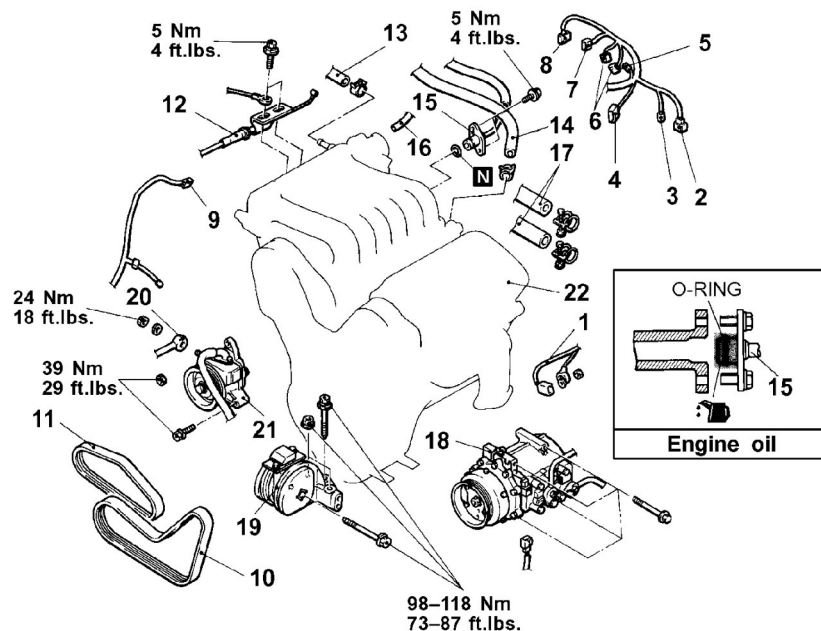
ENGINE ASSEMBLY**REMOVAL AND INSTALLATION**

Pre-removal Operation

- Hood Removal
- Air Cleaner Removal
- Drainage of Coolant
- Radiator Removal
- Fuel Flow Prevention
- Drainage of Power Steering Fluid
- Front Exhaust Pipe
- Washer Tank Removal
- Engine Cover Removal
- Transaxle Assembly Removal

Post-installation Operation

- Transaxle Installation
- Engine Cover Installation
- Washer Tank Installation
- Front Exhaust Pipe Installation
- Filling with Power Steering Fluid
- Radiator Installation
- Filling with Coolant
- Air Cleaner Installation
- Accelerator Cable Adjustment
- Hood Installation



REMOVAL STEPS

- | | |
|--|---|
| 1. GENERATOR CONNECTOR | 12. CONNECTION OF THE ACCELERATOR CABLE |
| 2. WATER TEMPERATURE CONNECTOR | 13. CONNECTION OF BRAKE BOOSTER VACUUM HOSE |
| 3. WATER TEMPERATURE GAUGE CONNECTOR | 14. CONNECTION OF FUEL RETURN HOSE |
| 4. INJECTOR HARNESS CONNECTOR | 15. CONNECTION OF FUEL HIGH PRESSURE HOSE |
| 5. CONDENSER CONNECTOR | 16. CONNECTION OF THE PURGE HOSE |
| 6. DISTRIBUTOR CONNECTOR | 17. CONNECTION OF HEATER HOSE |
| 7. ISC SERVO CONNECTOR | 18. A/C COMPRESSOR |
| 8. TPS CONNECTOR | 19. ENGINE MOUNT |
| 9. CRANK ANGLE SENSOR CONNECTOR | 20. PRESSURE HOSE |
| 10. DRIVE BELT (FOR GENERATOR AND A/C) | 21. POWER STEERING OIL PUMP |
| 11. DRIVE BELT (FOR POWER STEERING) | 22. ENGINE ASSEMBLY |

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Fig. 16: Removing/Installing Engine Assembly Components
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

REMOVAL SERVICE POINTS

>> A << A/C COMPRESSOR/OIL PUMP (POWER STEERING) REMOVAL

Remove the oil pump and air conditioning compressor (with the hose attached).

NOTE: Suspend the removed compressor and oil pump (by using wire or similar material) at a place where no damage will be caused during removal and installation of the engine assembly.

>> B << ENGINE MOUNT BRACKET

1. Place a garage jack against the engine oil pan through a square bar so that the weight of the engine is not placed on the engine mount bracket.
2. Remove the special tool (used during removal of the transmission assembly).
3. Hold the engine assembly with a chain block.
4. Detach the engine mount bracket.

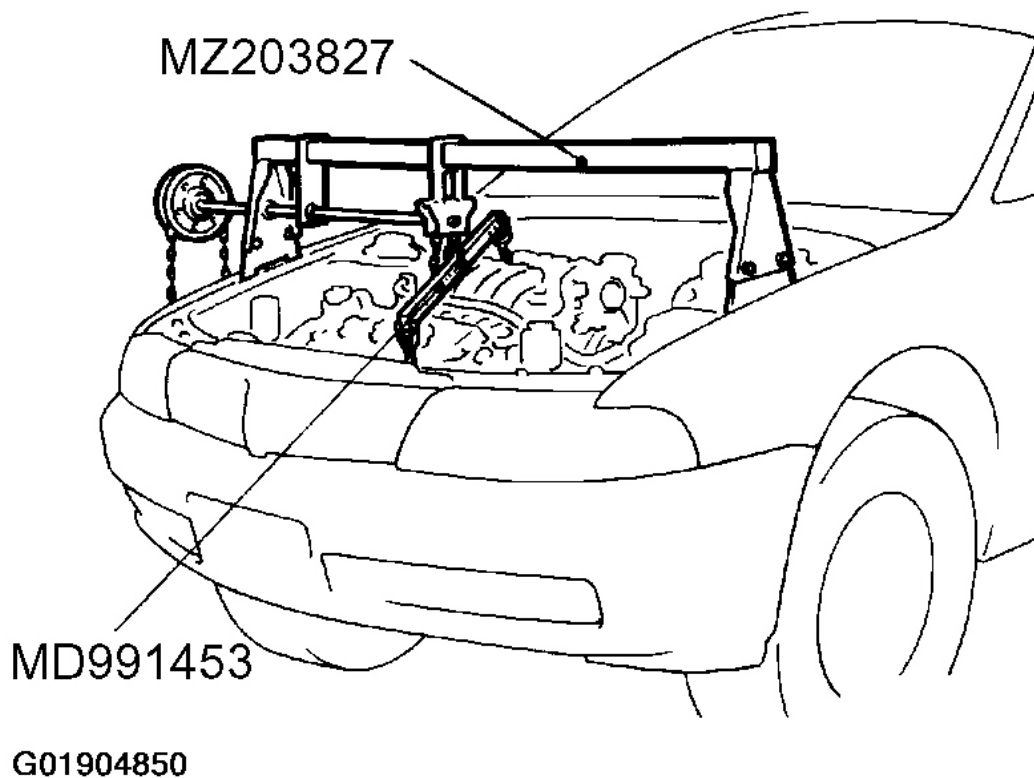


Fig. 17: Identifying Special Tool Used For Transmission Removal
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>> C << ENGINE ASSEMBLY REMOVAL

1. Check that all cables, hoses, harness connectors, etc. are disconnected from the engine.
2. Lift the chain block slowly to remove the engine assembly upward from the engine compartment.

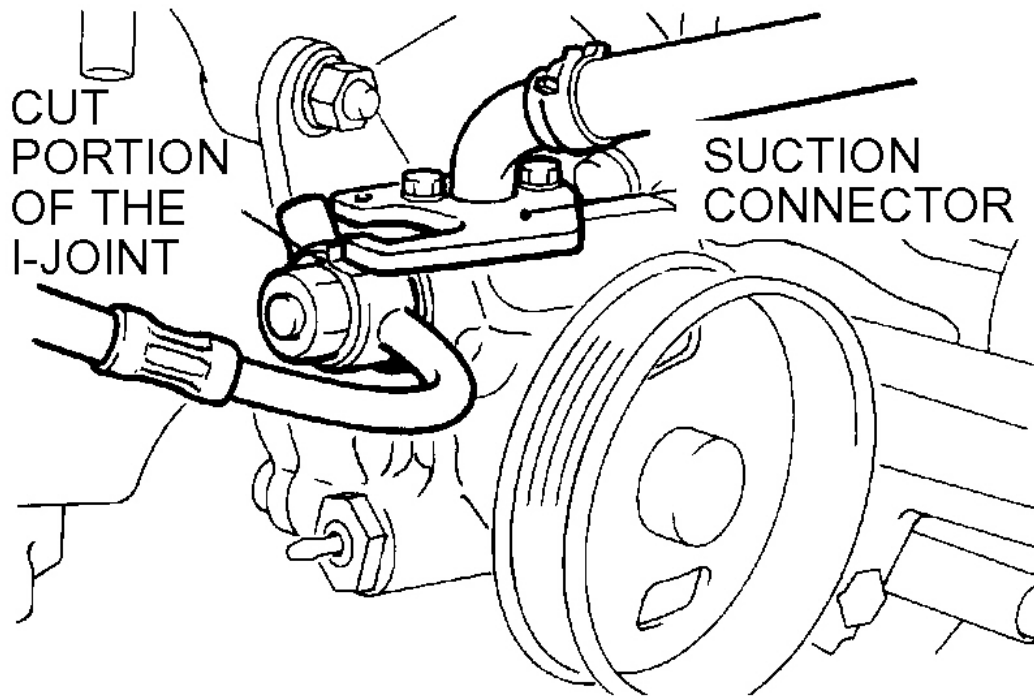
INSTALLATION SERVICE POINTS

<< 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.

<< B >> PRESSURE HOSE

- Apply a small amount of new engine oil to the pressure hose O-ring.



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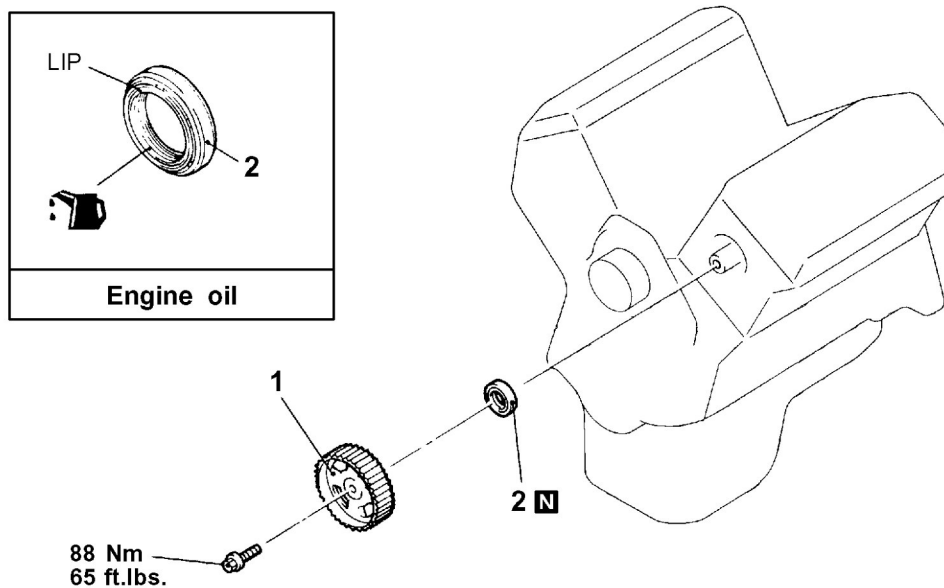
Fig. 18: Applying Small Amount Of New Engine Oil To O-Ring
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

CAMSHAFT OIL SEAL

REMOVAL AND INSTALLATION

Pre-removal and Post-installation operation

- Timing Belt Removal and Installation



REMOVAL STEPS



1. CAMSHAFT SPROCKET
2. CAMSHAFT OIL SEALS

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Fig. 19: Removing/Installing Camshaft Oil Seal
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

REMOVAL SERVICE POINTS

>> A << CAMSHAFT SPROCKET REMOVAL

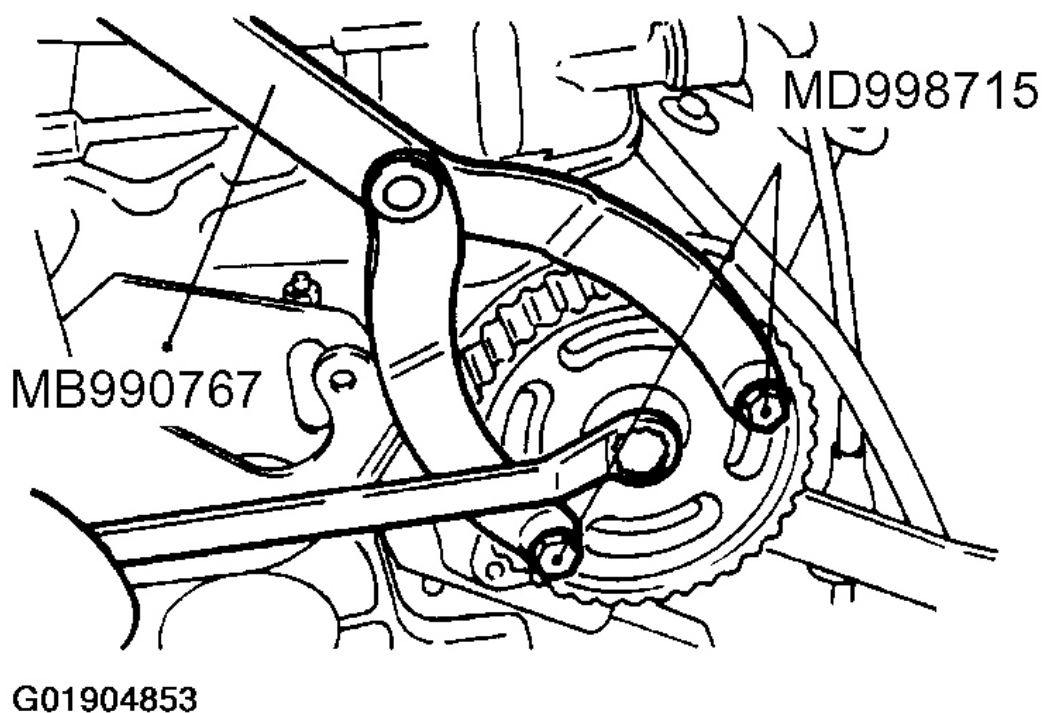


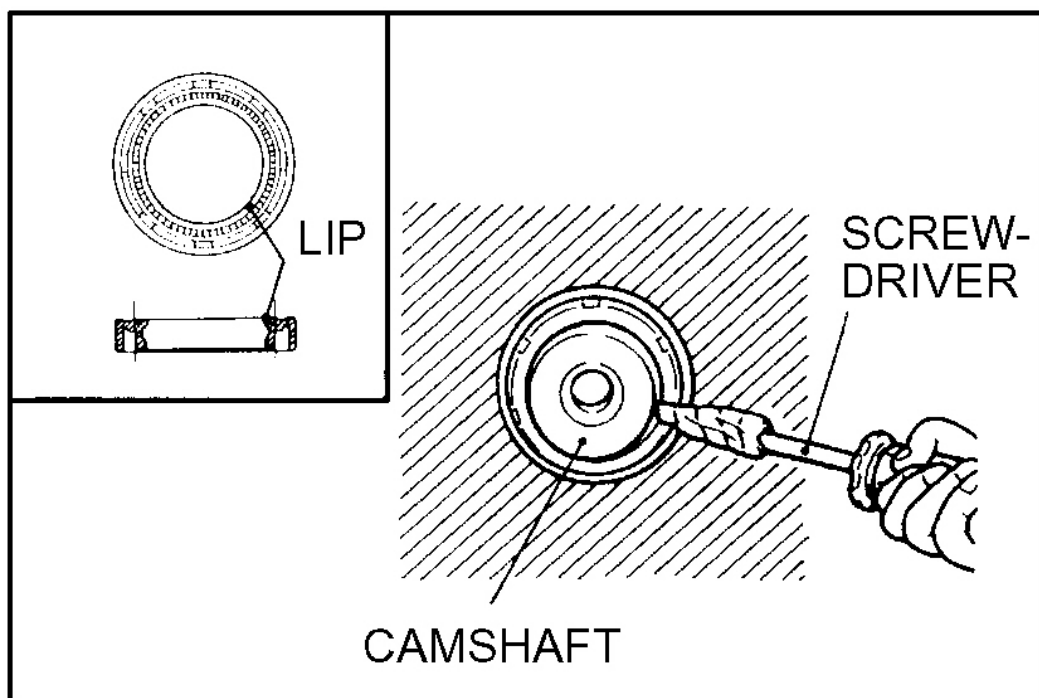
Fig. 20: Removing Camshaft Sprocket

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>> B << CAMSHAFT OIL SEAL REMOVAL

1. Cut out a portion in the camshaft oil seal lip.
2. Cover the tip of a screwdriver with a cloth and apply it to the cutout in the oil seal to pry off the oil seal.

CAUTION: Use care not to damage the camshaft and cylinder head.



G01904854

Fig. 21: Removing Camshaft Oil Seal

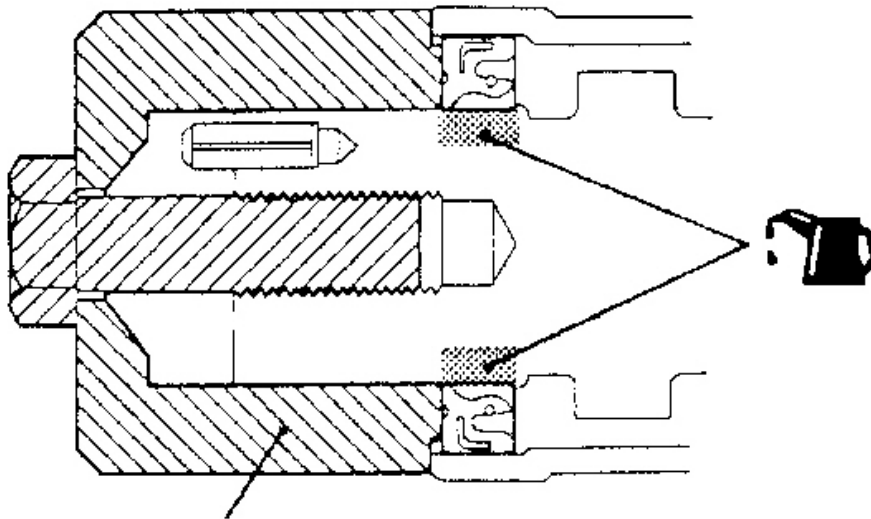
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

INSTALLATION SERVICE POINTS**<< A >> CAMSHAFT OIL SEAL INSTALLATION**

Coat engine oil on the whole circumference of the oil seal lip section.

Using the special tool, press fit the oil seal.

<REAR BANK SIDE>



MD998713

G01904855

Fig. 22: Lubricating Rear Bank Side Oil Seal
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

<FRONT BANK SIDE>

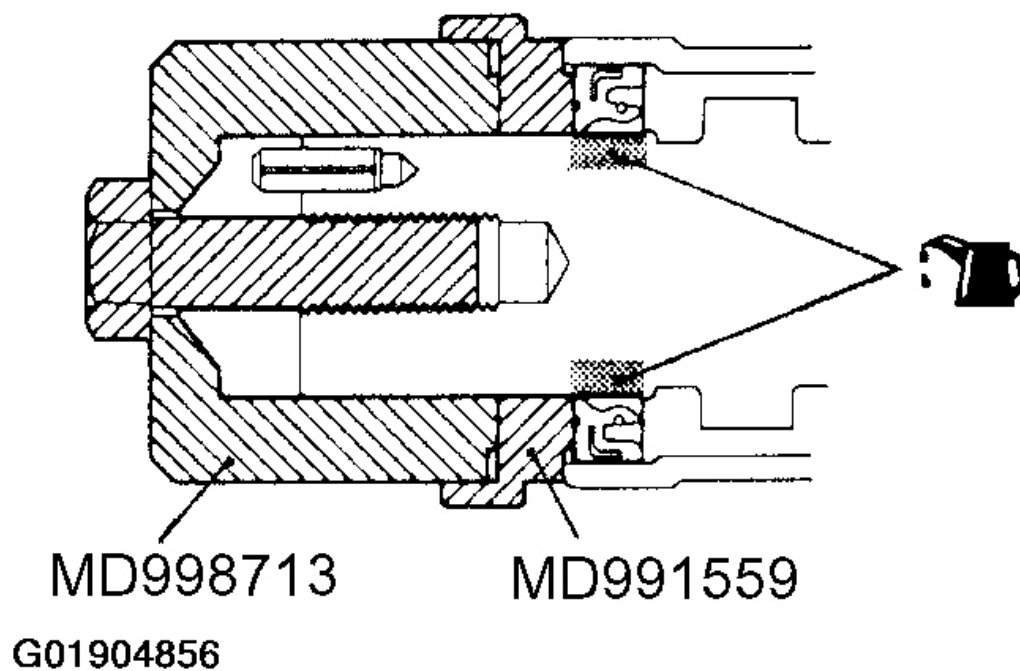


Fig. 23: Lubricating Front Bank Side Oil Seal
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

<< B >> CAMSHAFT SPROCKET INSTALLATION

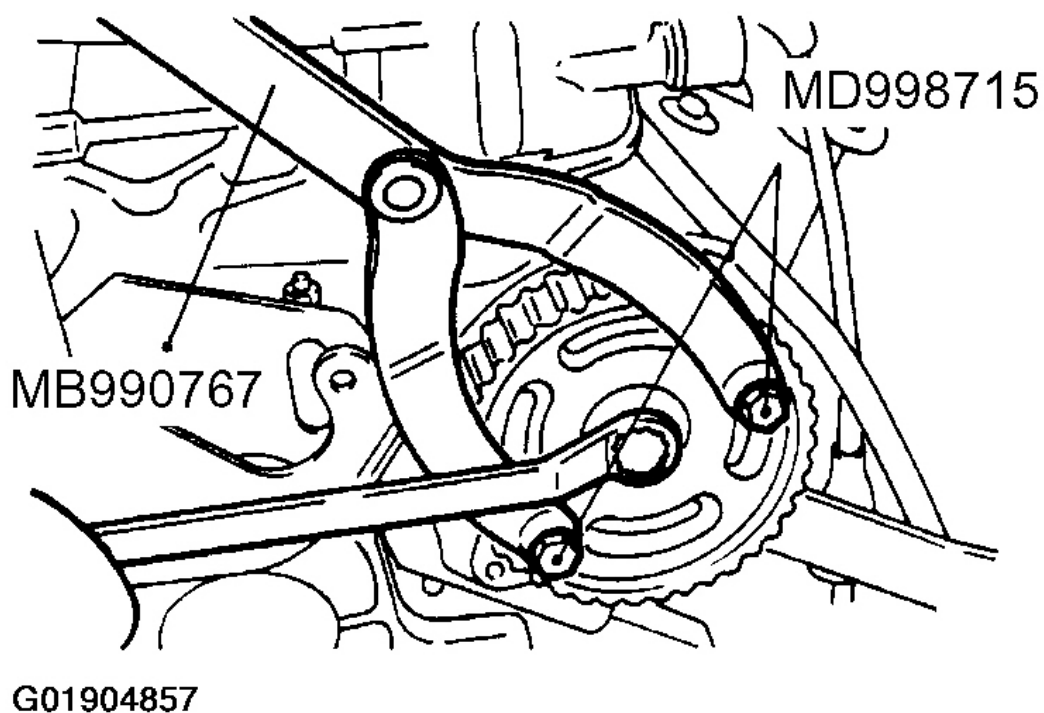


Fig. 24: Installing Camshaft Sprocket

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

CRANKSHAFT OIL SEALS

FRONT OIL SEAL

REMOVAL AND INSTALLATION

2003 Mitsubishi Diamante LS

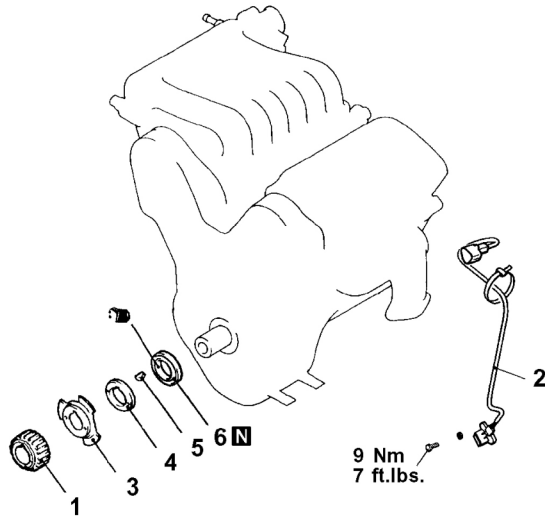
2003 ENGINES On-Vehicle Service, Removal & Installation - Diamante

Pre-removal and Post-installation Operation

- Timing Belt Removal and Installation

Adjustment

- Engine Adjustment



REMOVAL STEPS

1. CRANKSHAFT SPROCKET
2. CRANKSHAFT POSITION SENSOR
3. CRANKSHAFT SENSING BLADE
4. CRANKSHAFT SPACER
5. KEY
6. CRANKSHAFT FRONT OIL SEAL

G01904858

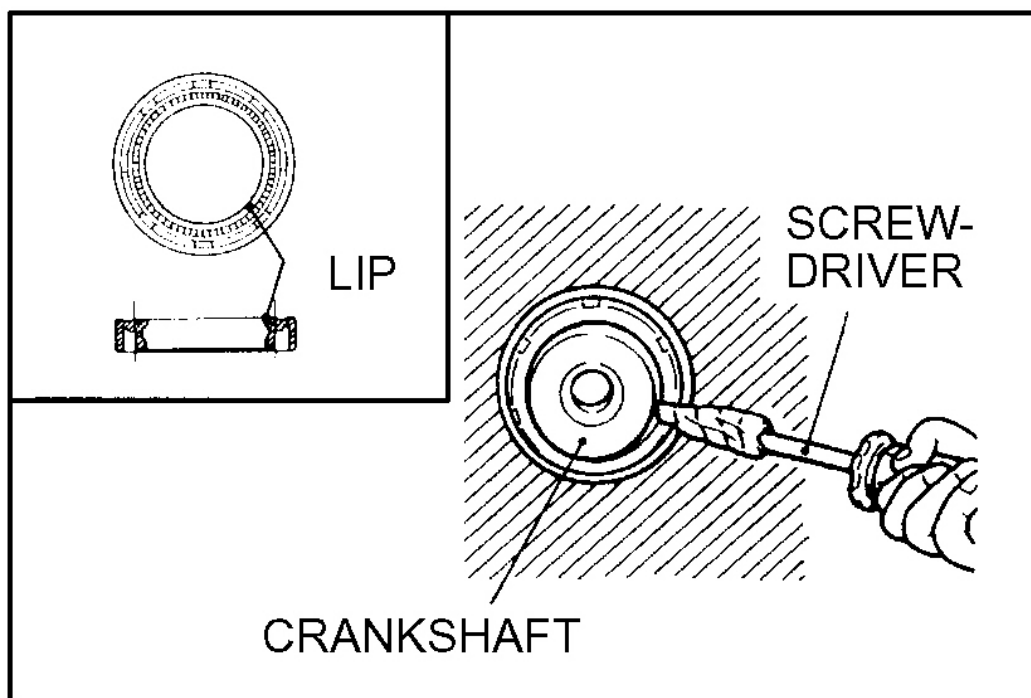
Fig. 25: Removing/Installing Front Crankshaft Oil Seals
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

REMOVAL SERVICE POINT

>> A << OIL SEAL REMOVAL

1. Cut out a portion in the crankshaft oil seal lip.
2. Cover the tip of a screwdriver with a cloth and apply it to the cutout in the oil seal to pry off the oil seal.

CAUTION: Take care not to damage the crankshaft and oil pump case.



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Fig. 26: Removing Crankshaft Oil Seal (Front)

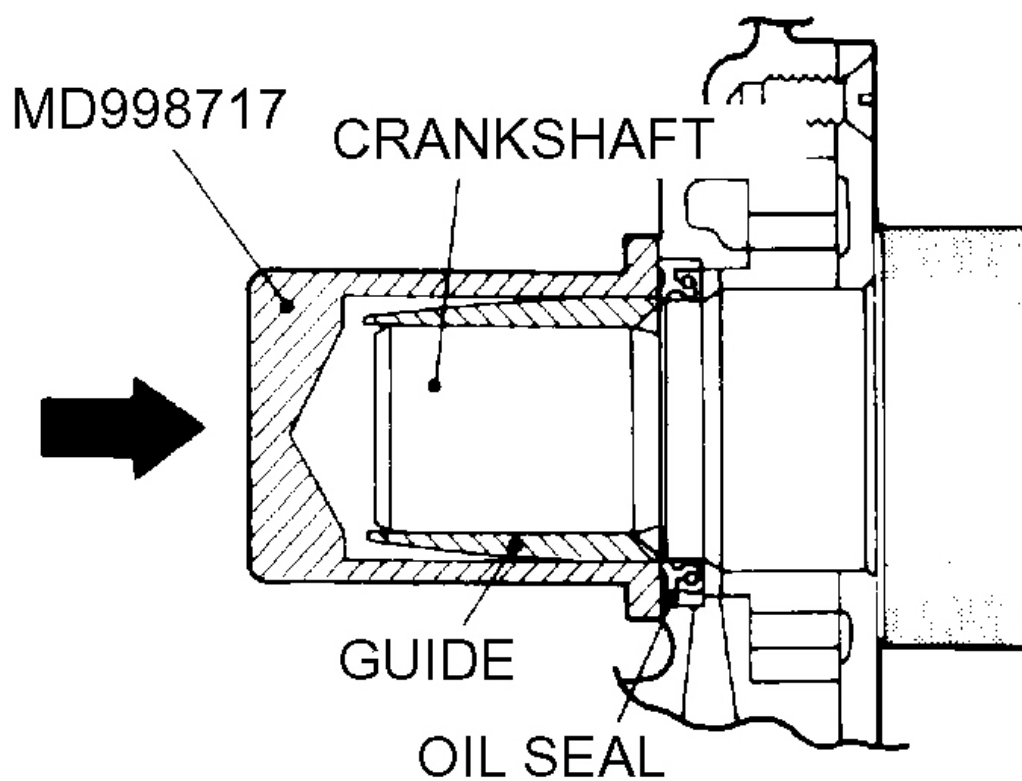
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

INSTALLATION SERVICE POINT

<< A >> OIL SEAL INSTALLATION

Using the special tool, knock the oil seal into the oil pump case.

NOTE: **Knock it as far as the surface.**



G01904860

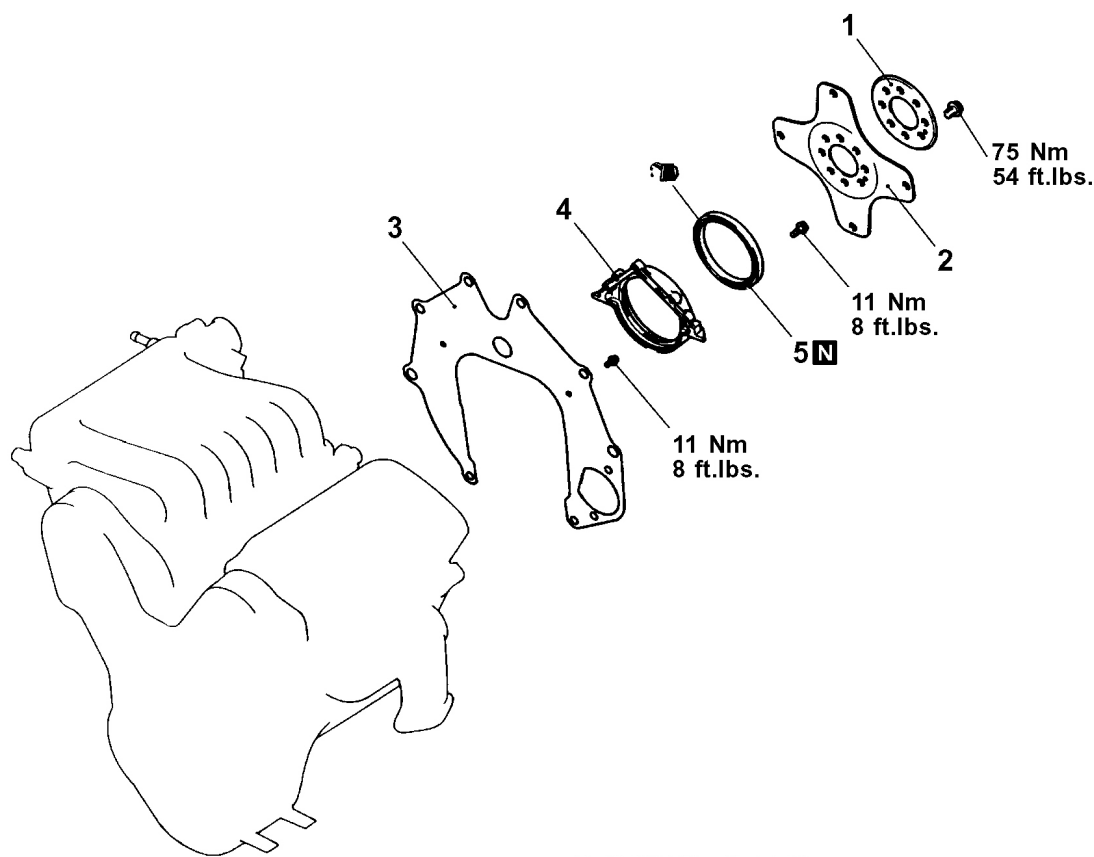
Fig. 27: Installing Crankshaft Oil Seal (Front)
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

REAR OIL SEAL

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Transaxle Removal and Installation



REMOVAL STEPS

1. ADAPTOR PLATE
2. DRIVE PLATE
3. REAR PLATE
4. OIL SEAL CASE
5. OIL SEAL

◀A▶ ▶B◀

◀B▶ ▶A◀

G01904861

Fig. 28: Removing/Installing Rear Crankshaft Oil Seals

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

REMOVAL SERVICE POINTS

>> A << DRIVE PLATE ADAPTOR PLATE REMOVAL

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

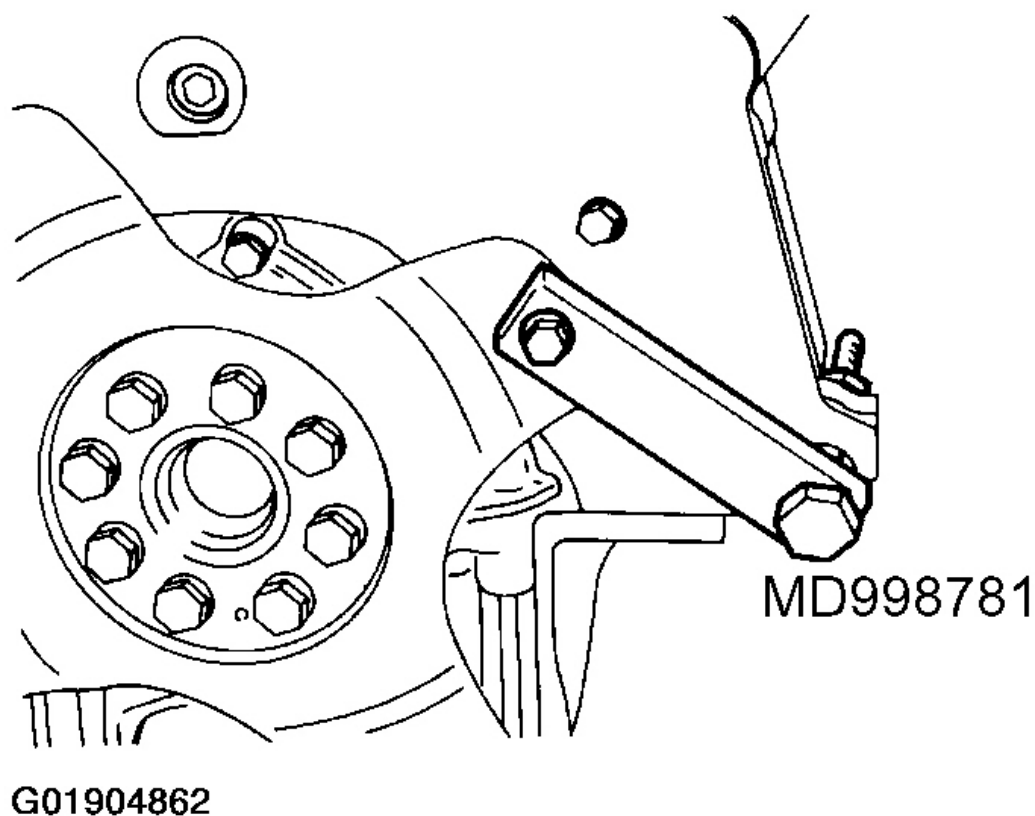
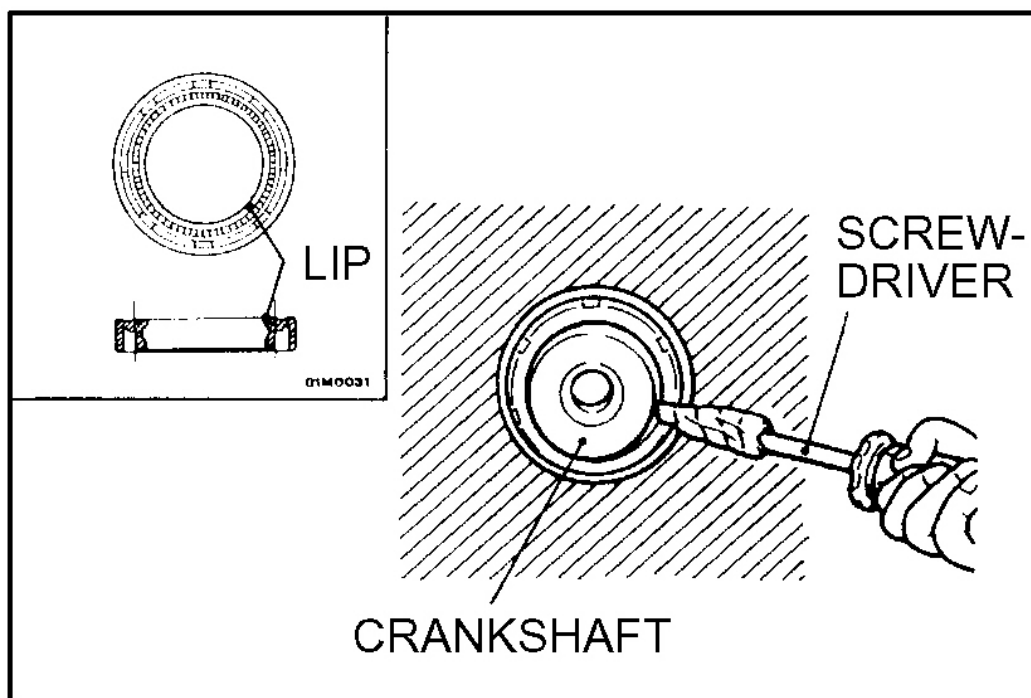


Fig. 29: Securing Drive Plate For Removal
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>> B << OIL SEAL REMOVAL

1. Cut out a portion in the crankshaft oil seal lip.
2. Cover the tip of a screwdriver with a cloth and apply it to the cutout in the oil seal to pry off the oil seal.

CAUTION: Take care not to damage the crankshaft and oil seal case.



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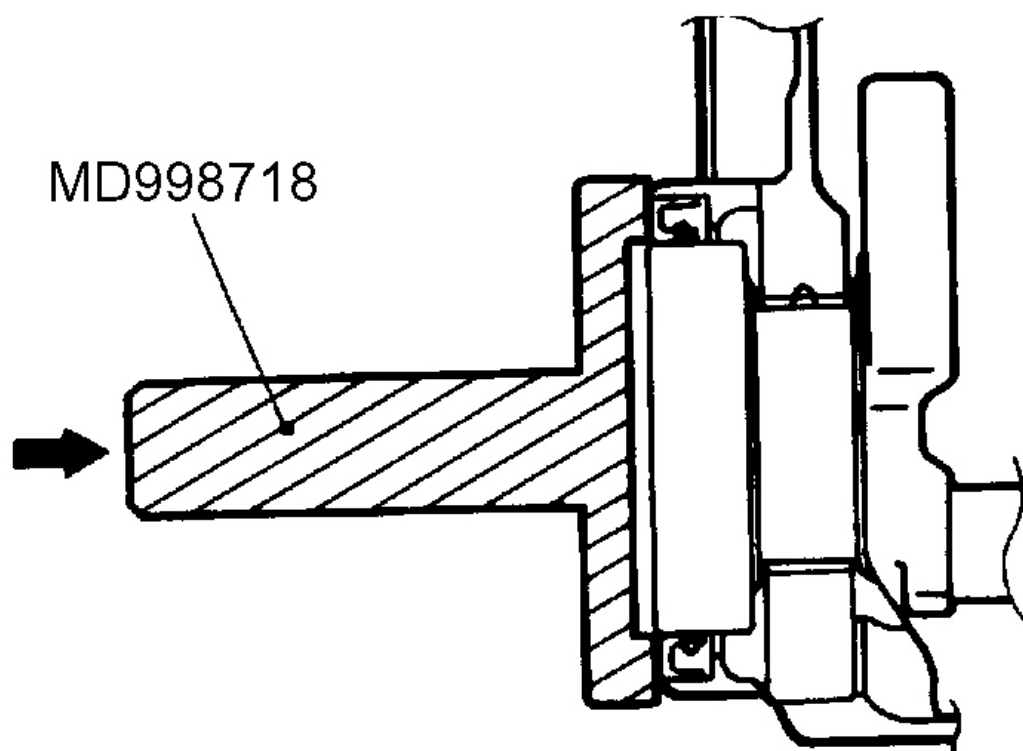
Fig. 30: Removing Crankshaft Oil Seal (Rear)

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

INSTALLATION SERVICE POINTS

<< A >> OIL SEAL INSTALLATION

Using the special tool, press fit a new crankshaft rear oil seal into the oil seal case.



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Fig. 31: Installing Crankshaft Oil Seal (Rear)
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

<< B >> DRIVE PLATE ADAPTOR PLATE INSTALLATION

Use the special tool to secure the drive plate, and tighten the bolts.

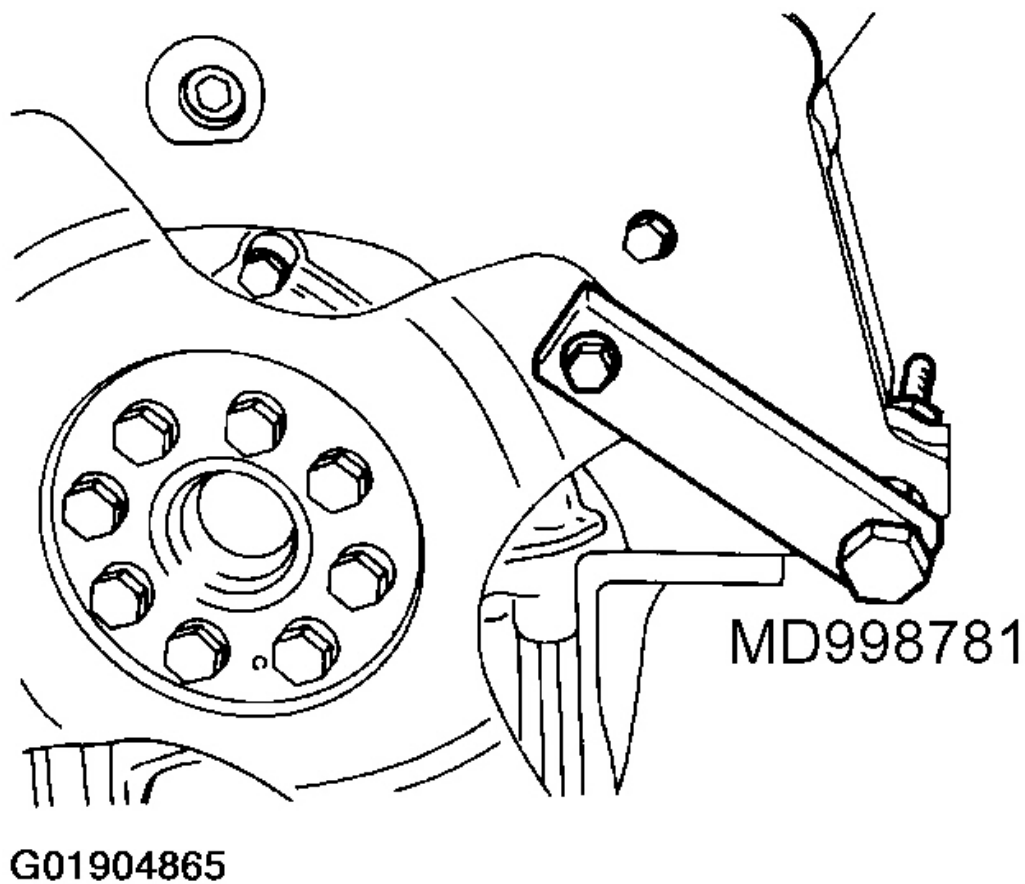


Fig. 32: Securing Drive Plate For Installation

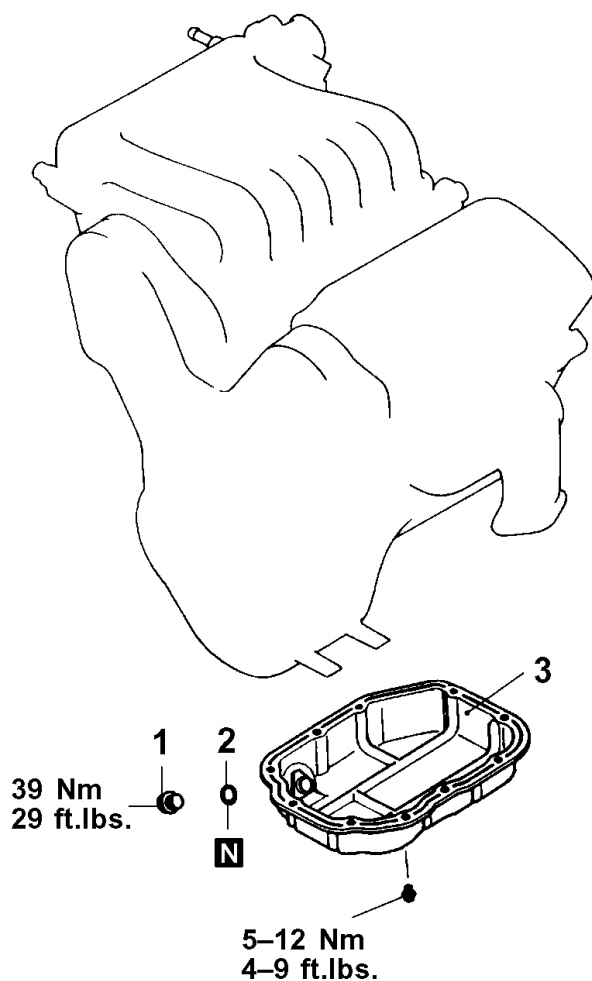
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

OIL PAN - LOWER

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Front Exhaust Pipe
- Draining and Filling Engine Oil



REMOVAL STEPS

1. DRAIN PLUG
2. DRAIN PLUG GASKET
3. OIL PAN, LOWER



G01904866

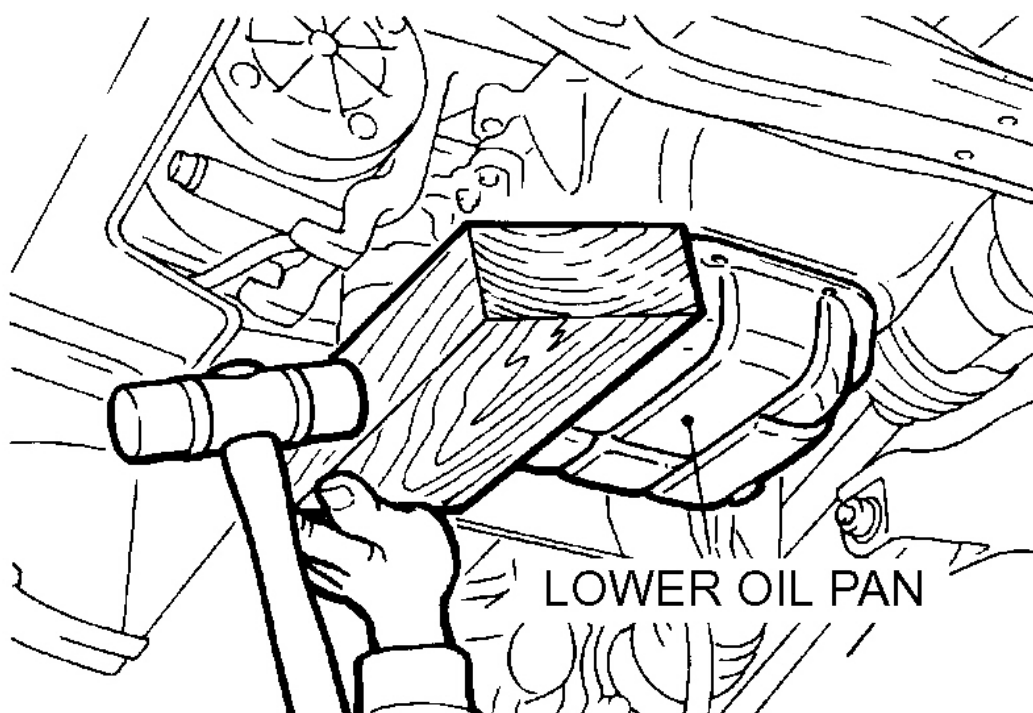
Fig. 33: Removing/Installing Lower Oil Pan
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

REMOVAL SERVICE POINT

>> A << OIL PAN, LOWER REMOVAL

1. Remove the oil pan, lower installation bolt.
2. Place a wooden block against the oil pan, lower as shown in the figure and remove by tapping with a hammer.

CAUTION: The use of an oil pan remover (MD998727) can damage the oil pan, upper (aluminum made).



G01904867

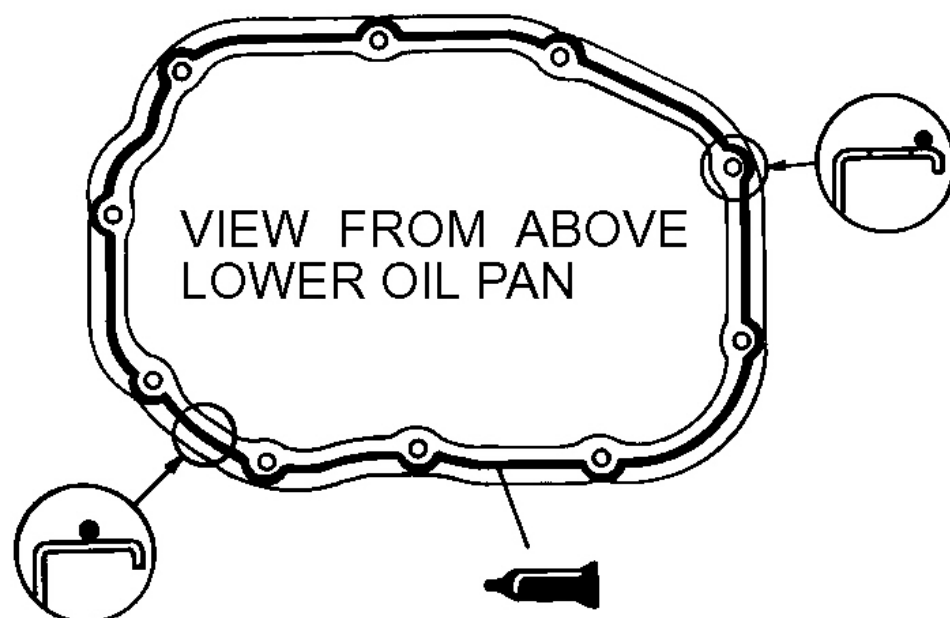
Fig. 34: Placing Wooden Block Against Lower Oil Pan
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

INSTALLATION SERVICE POINT**<< A >> OIL PAN, LOWER INSTALLATION**

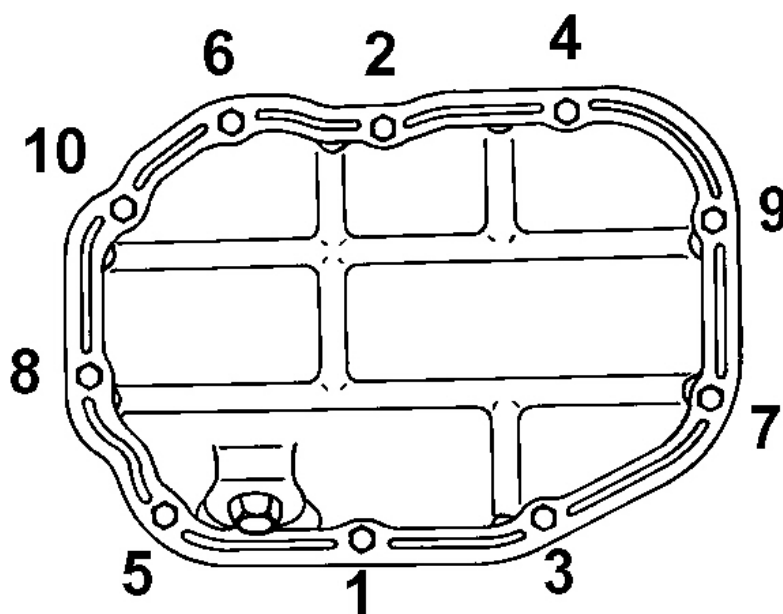
1. Remove sealant from oil pan and cylinder block mating surfaces.
2. Degrease the sealant-coated surface and the engine mating surface.
3. Apply the specified sealant around and gasket surface of oil pan as specified in illustration.

Specified sealant: MITSUBISHI GENUINE PART No. MD970389 or equivalent

NOTE: **The sealant should be applied in a continuous bead approximately 4 mm (.16 in.) in diameter.**



FLANGE BOLT TIGHTENING SEQUENCE



VIEW FROM THE BOTTOM OF THE LOWER OIL PAN

G01904868

Fig. 35: Applying Sealant Around Gasket Surface Of Oil Pan & Bolt Tightening Sequence
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

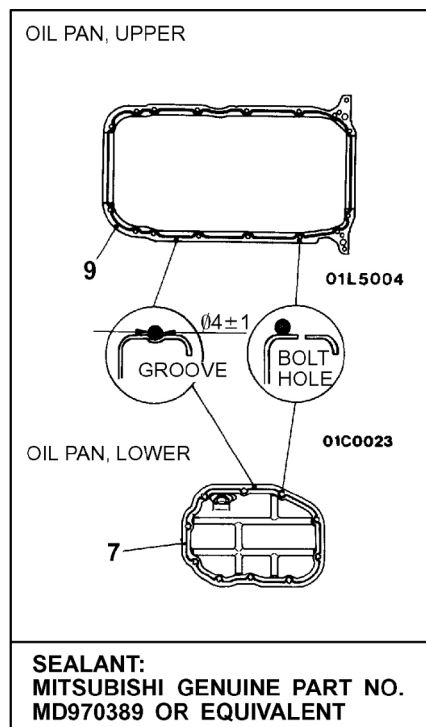
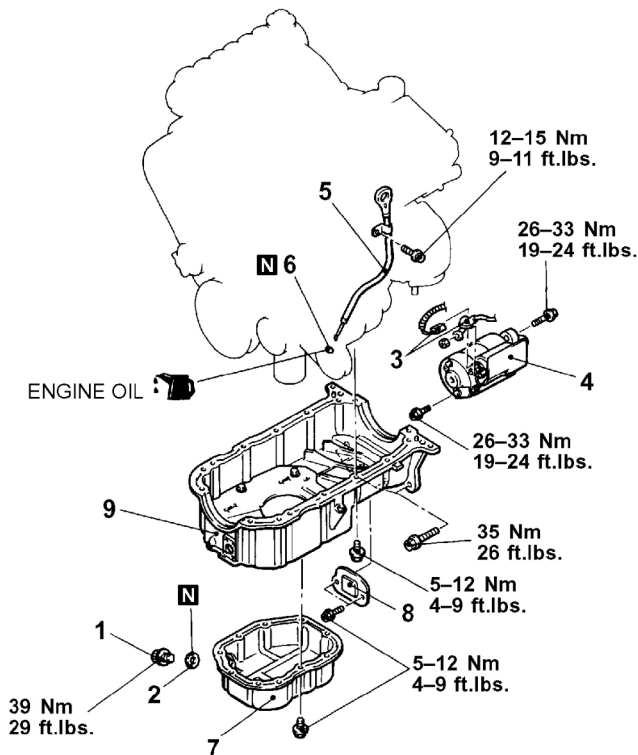
4. Assemble oil pan to cylinder block within 30 minutes after applying the sealant.
5. Tighten the oil pan mounting bolt in the order illustrated (left).

OIL PAN - UPPER

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Draining and Filling with Engine Oil
- Oil pan, Lower



REMOVAL STEPS

1. DRAIN PLUG
2. DRAIN PLUG GASKET
3. STARTER CONNECTOR
4. STARTER
5. OIL GAUGE AND GUIDE

6. O-RING
7. OIL PAN, LOWER
8. COVER
9. OIL PAN, UPPER

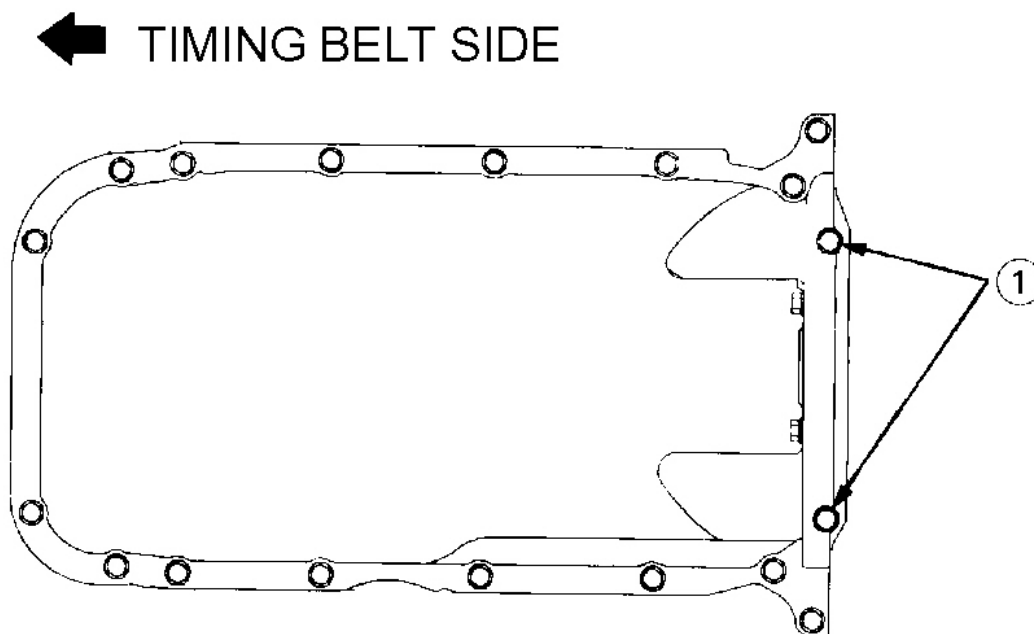


G01904869

Fig. 36: Removing/Installing Upper Oil Pan
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

REMOVAL SERVICE POINT**>> A << OIL PAN, UPPER REMOVAL**

1. Detach the bolt (1) shown at left.
2. Detach all other bolts.



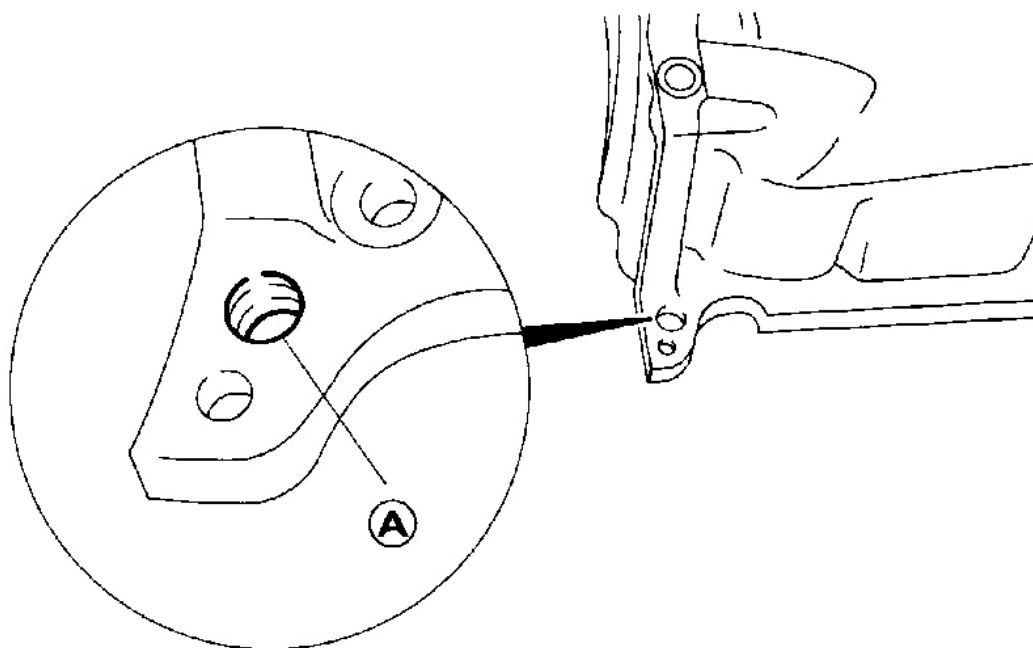
G01904870

Fig. 37: Locating Detaching Bolt

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. Screw a bolt into bolt hole (A) shown in illustration (at both ends) to remove the oil pan.

CAUTION: The use of an oil pan remover (MD998727) can damage the oil pan, upper (aluminum made).



G01904871

Fig. 38: Locating Bolt Hole

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

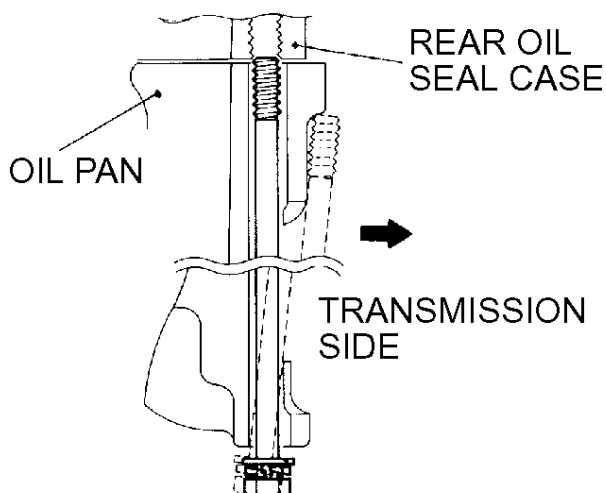
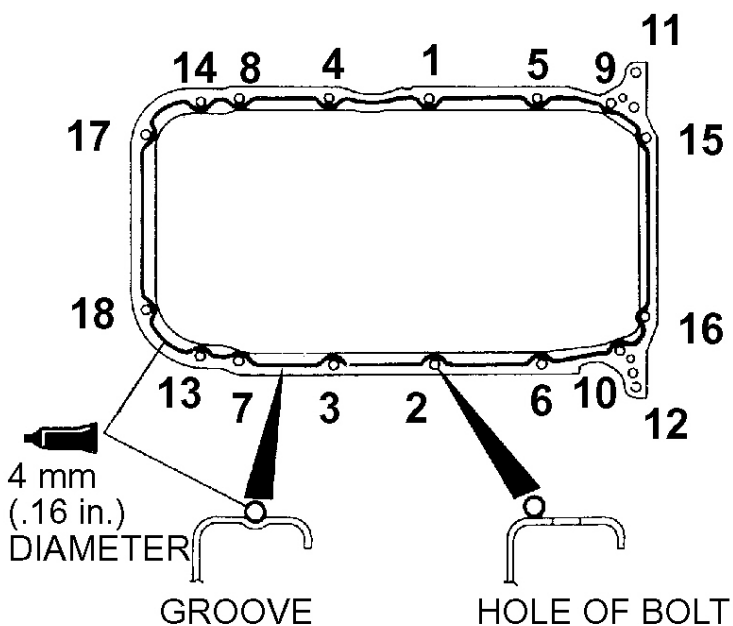
INSTALLATION SERVICE POINT

<< A >> OIL PAN, UPPER INSTALLATION

1. Remove the sealant from the oil pan and cylinder block mating surfaces.
2. Degrease the sealant-coated surface and the engine mating surface.
3. Apply specified sealant around the gasket surface of the oil pan as shown in the illustration.

Specified sealant: MITSUBISHI GENUINE PART No. MD970389 or equivalent

NOTE: The sealant should be applied in a continuous bead approximately 4 mm (.16 in.) in diameter.



G01904872

Fig. 39: Applying Sealant Around Gasket Surface Of Oil Pan
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

4. Install the oil pan to the cylinder block within 30 minutes after applying the sealant.
5. Tighten the oil pan mounting bolts in the order shown in the illustration at left.

CAUTION: The bolt holes for bolts 15 and 16 in the illustration are cut away on the transmission side, so be careful not to insert these bolts at an angle.

INSPECTION

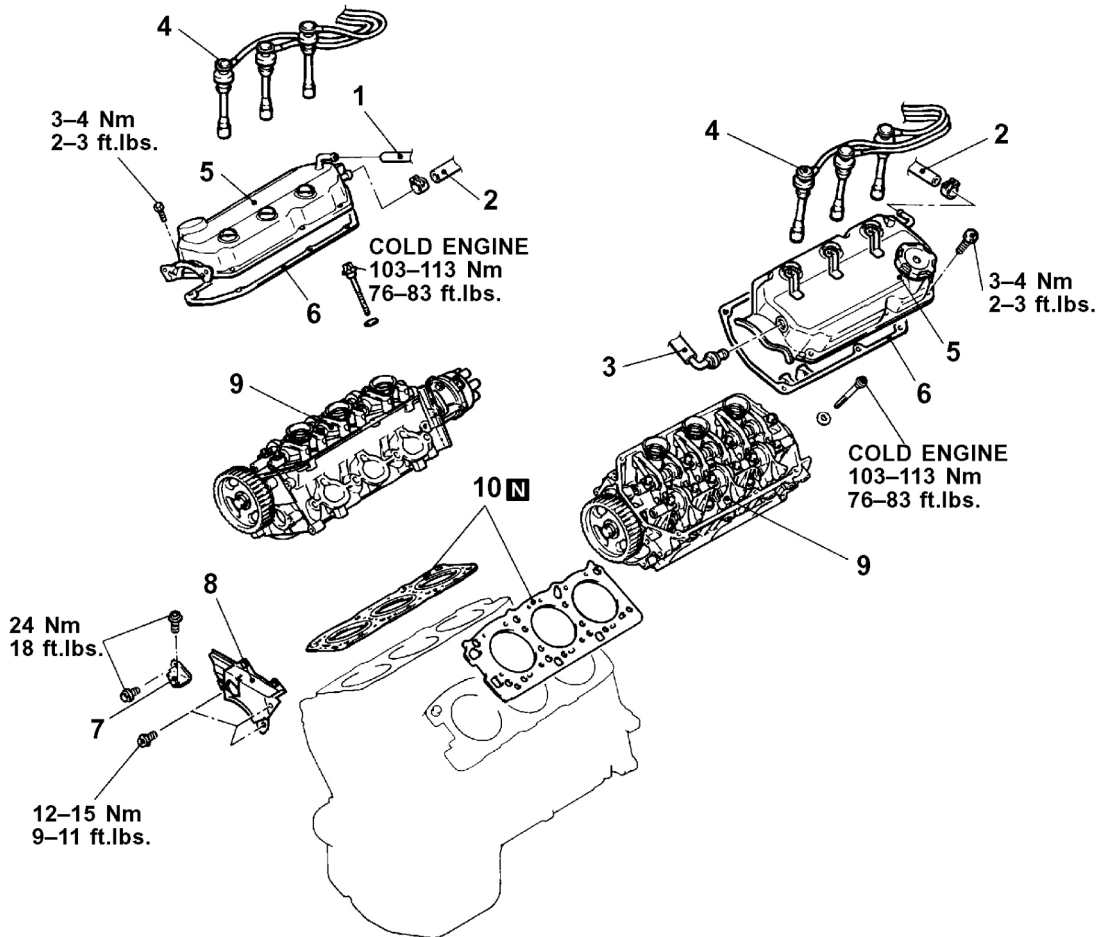
- Check the oil pan for cracks
- Check the sealant coated surface of the oil pan for damage and deformation.

CYLINDER HEAD GASKET

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Engine Coolant Draining and Supplying
- Intake Manifold Removal and Installation
- Exhaust Manifold Removal
- Water Hose Pipe Removal
- Timing Belt Removal and Installation



REMOVAL STEPS

1. BREATHER HOSE
2. BLOW-BY HOSE
3. PVC HOSE
4. SPARK PLUG CABLE
5. ROCKER COVER
6. ROCKER COVER GASKET

7. BRACKET
8. TIMING BELT COVER (REAR CENTER)
9. CYLINDER HEAD
10. CYLINDER HEAD GASKET



G01904873

Fig. 40: Removing/Installing Cylinder Head Gasket
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

REMOVAL SERVICE POINT**>> A << CYLINDER HEAD ASSEMBLY REMOVAL**

Using the special tool, after loosening the bolts (in 2 or 3 cycles), remove the cylinder head assembly.

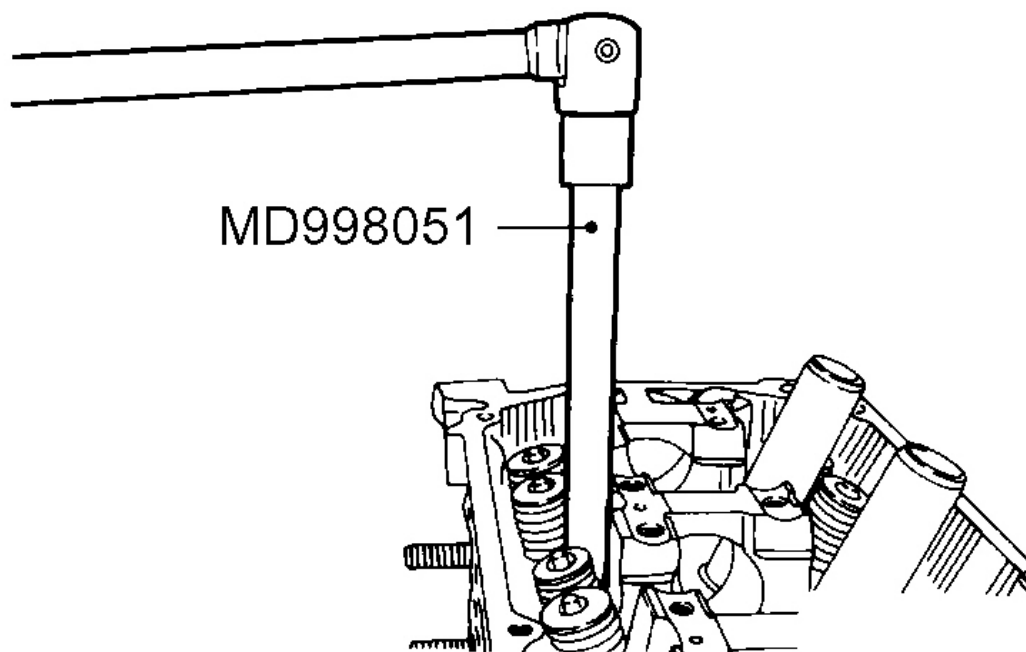
**G01904874**

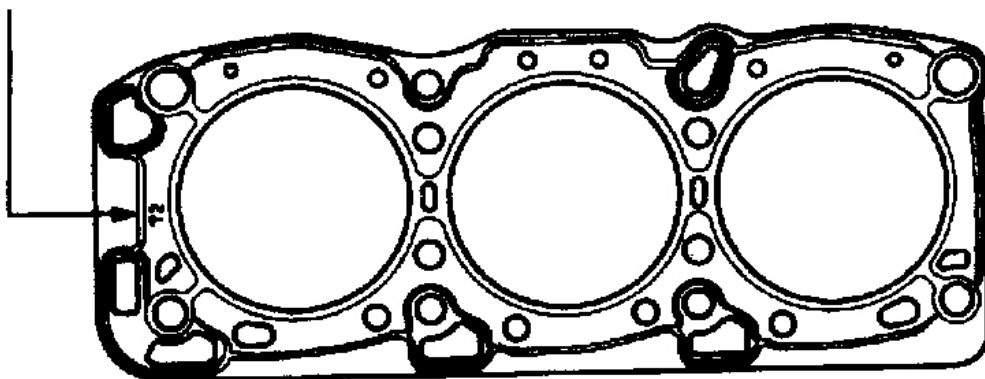
Fig. 41: Removing Cylinder Head Assembly

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

INSTALLATION SERVICE POINTS**<< A >> CYLINDER HEAD GASKET INSTALLATION**

1. Degrease the mounting surface of the cylinder head gasket.
2. Lay the cylinder head gasket on cylinder block with the identification mark at front top.

IDENTIFICATION
MARK



G01904875

Fig. 42: Locating Identification Mark On Cylinder Head Gasket
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

<< B >> CYLINDER HEAD ASSEMBLY INSTALLATION

Using the special tool, tighten the bolts in the order shown in illustration in two or three steps.

CAUTION: Attach the head bolt washer in the direction shown in the figure.

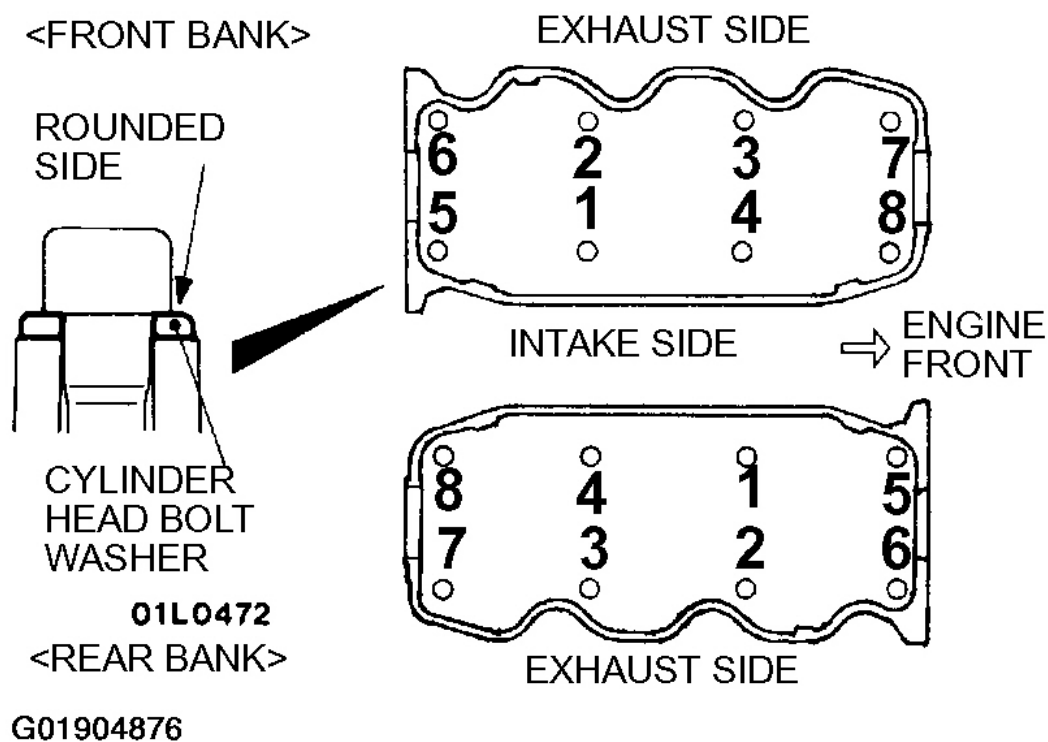


Fig. 43: Locating Cylinder Head Bolt Tightening Sequence
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

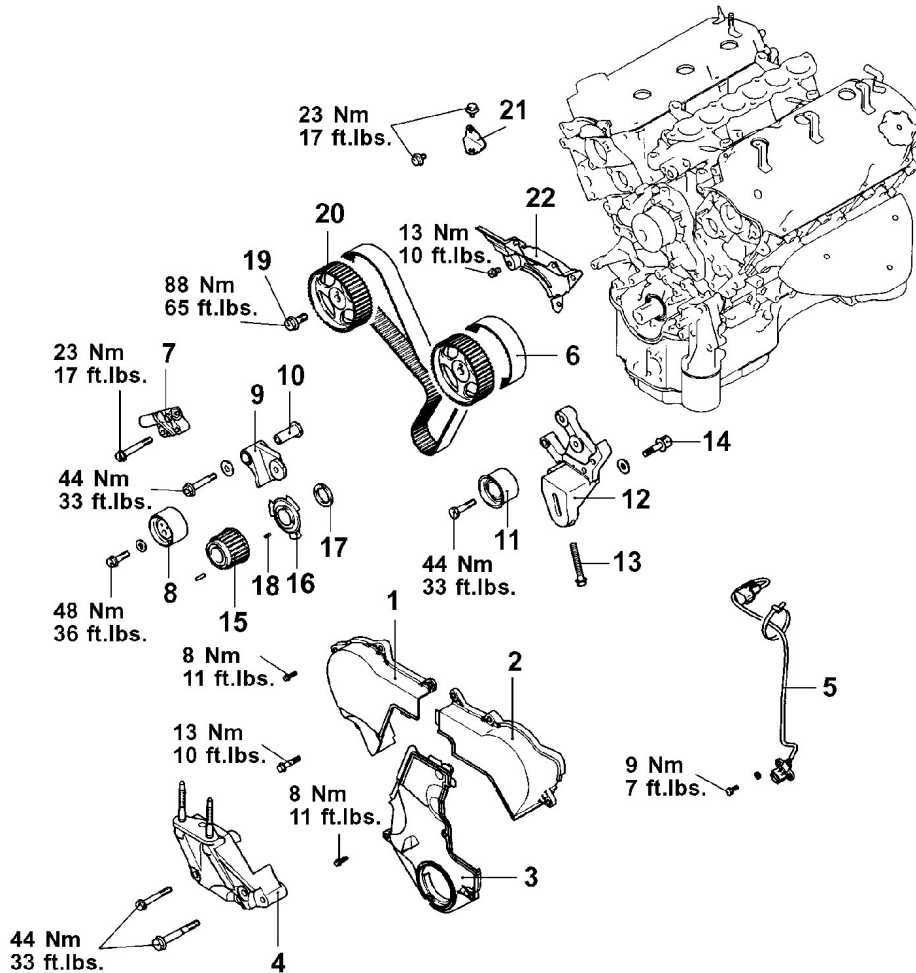
TIMING BELT

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

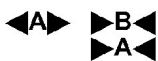
Removal and installation

- Generator and drive belt
- Crankshaft pulley



REMOVAL STEPS

- | | |
|---|------------------------------------|
| 1. TIMING BELT FRONT UPPER COVER, REAR | 11. IDLER PULLEY |
| 2. TIMING BELT FRONT UPPER COVER, FRONT | 12. IDLER PULLEY ADJUSTING BRACKET |
| 3. TIMING BELT FRONT LOWER COVER | 13. ADJUSTING BOLT |
| 4. ENGINE SUPPORT BRACKET | 14. ADJUSTING STUD |
| 5. CRANK ANGLE SENSOR | 15. CRANKSHAFT SPROCKET |
| 6. TIMING BELT | 16. SENSING BLADE |
| 7. AUTOMATIC TENSIONER | 17. CRANKSHAFT SPACER |
| 8. TENSIONER PULLEY | 18. CRANKSHAFT KEY |
| 9. TENSIONER ARM | 19. CAMSHAFT SPROCKET BOLT |
| 10. SHAFT | 20. CAMSHAFT SPROCKET |
| | 21. BRACKET |
| | 22. TIMING BELT REAR COVER |



G01904877

Fig. 44: Removing/Installing Timing Belt

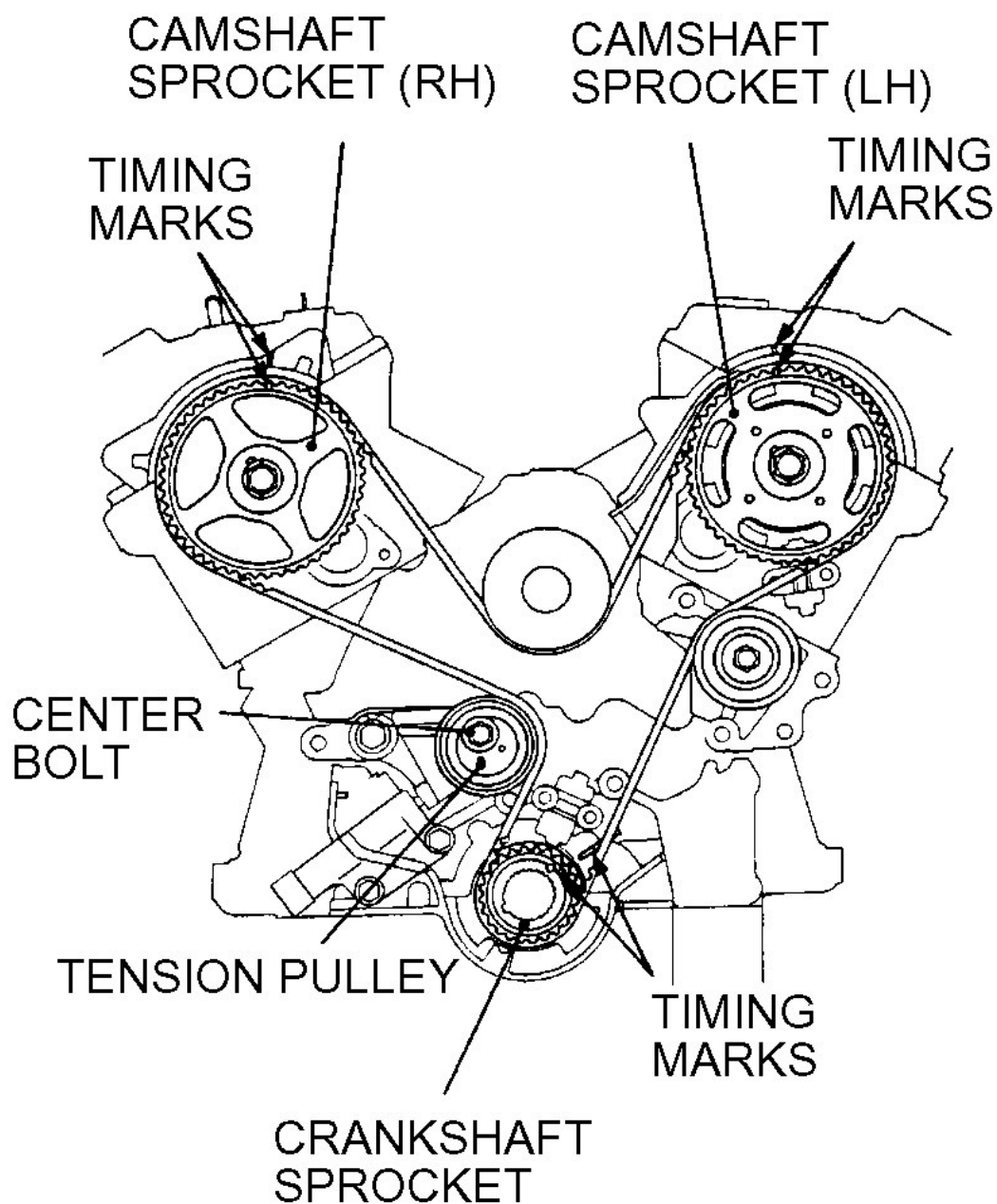
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

REMOVAL SERVICE POINT

>> A << TIMING BELT REMOVAL

1. Align the timing marks.
2. Loosen the center bolt on the tension pulley to remove the timing belt.

CAUTION: Make a mark on the back of the timing belt, indicating the direction of rotation, so it may be reassembled in the same direction, if it is to be reused.



G01904878

Fig. 45: Locating Timing Marks For Belt Removal
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

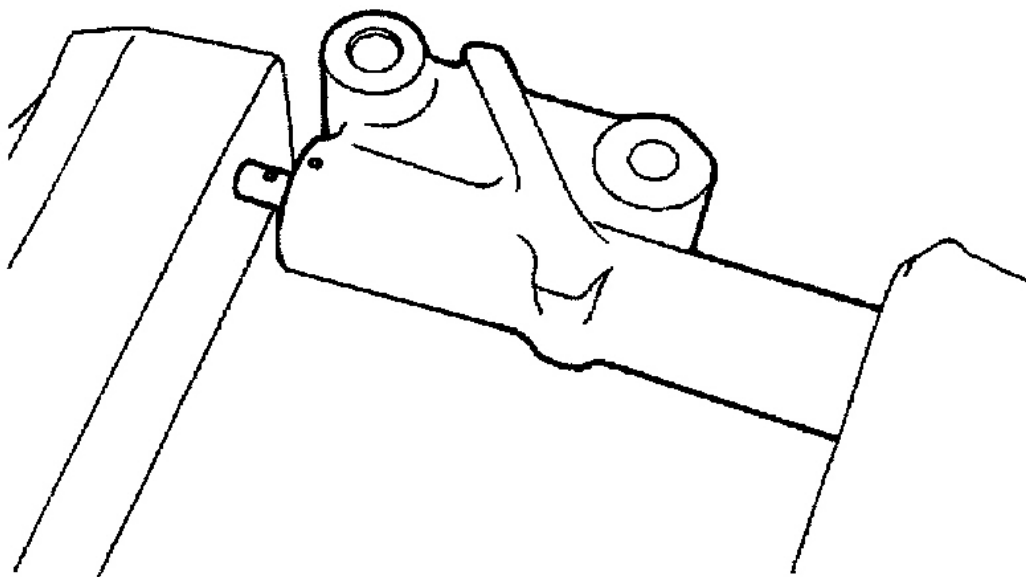
INSTALLATION SERVICE POINTS

<< A >> AUTO TENSIONER INSTALLATION

1. If the auto tensioner rod is in its fully extended position, reset it as follows.
 1. Keep the auto tensioner level and in that position, clamp it in the vice with soft jaws.
 2. Slowly compress the push rod of the auto tensioner until pin hole A is aligned with pin hole B in the cylinder.

CAUTION: The auto tensioner must be placed at a right angle to the pressing surface of press or vice.

CAUTION: Push in the rod slowly to prevent the push rod from being damaged.



G01904879

Fig. 46: Compressing Auto Tensioner Rod
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

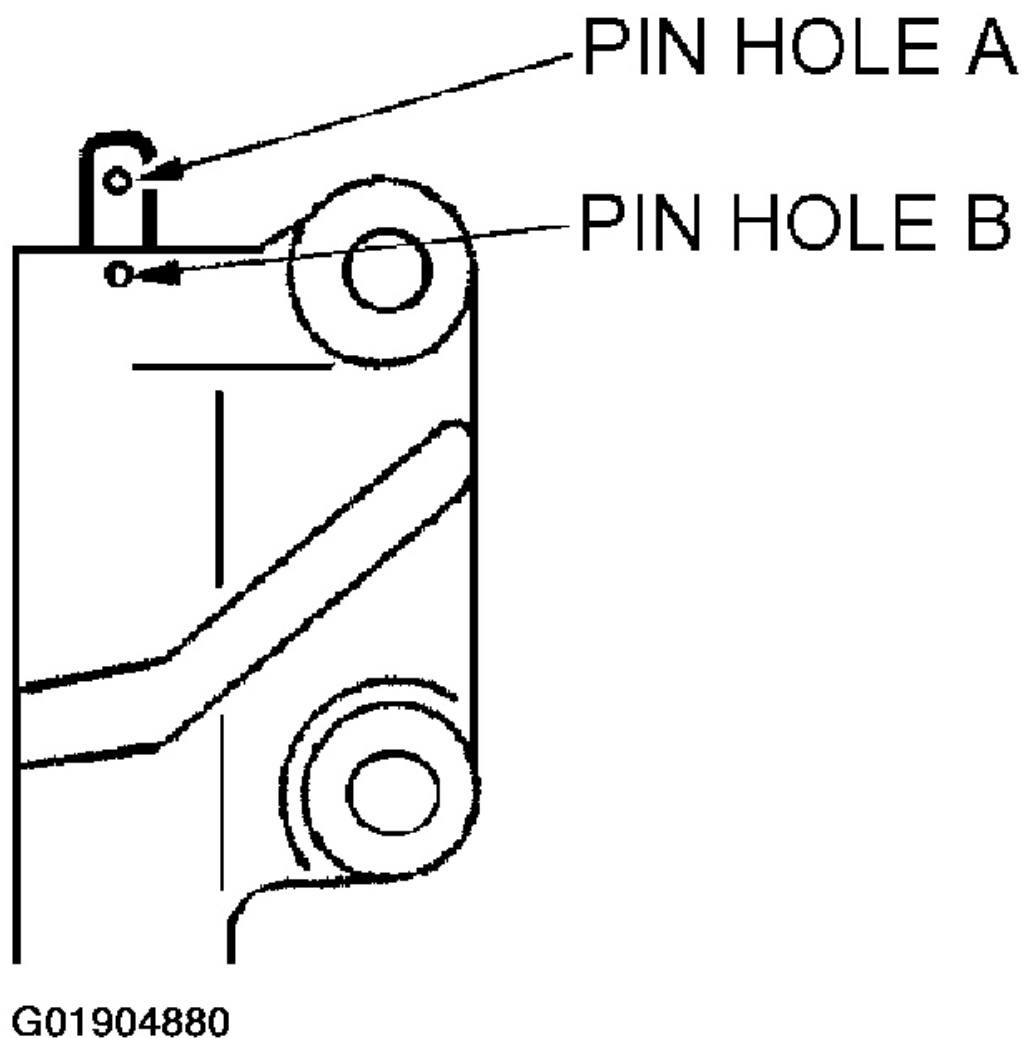


Fig. 47: Locating Pin Holes Of Auto Tensioner
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. Insert a wire [1.4 mm (.055 in.) in diameter] into the pin holes.

NOTE: The wire should be as stiff as possible (such as piano wire, etc.), and should be bent into the shape of an "L".

4. Unclamp the auto tensioner from the vice.
2. Install the auto tensioner.

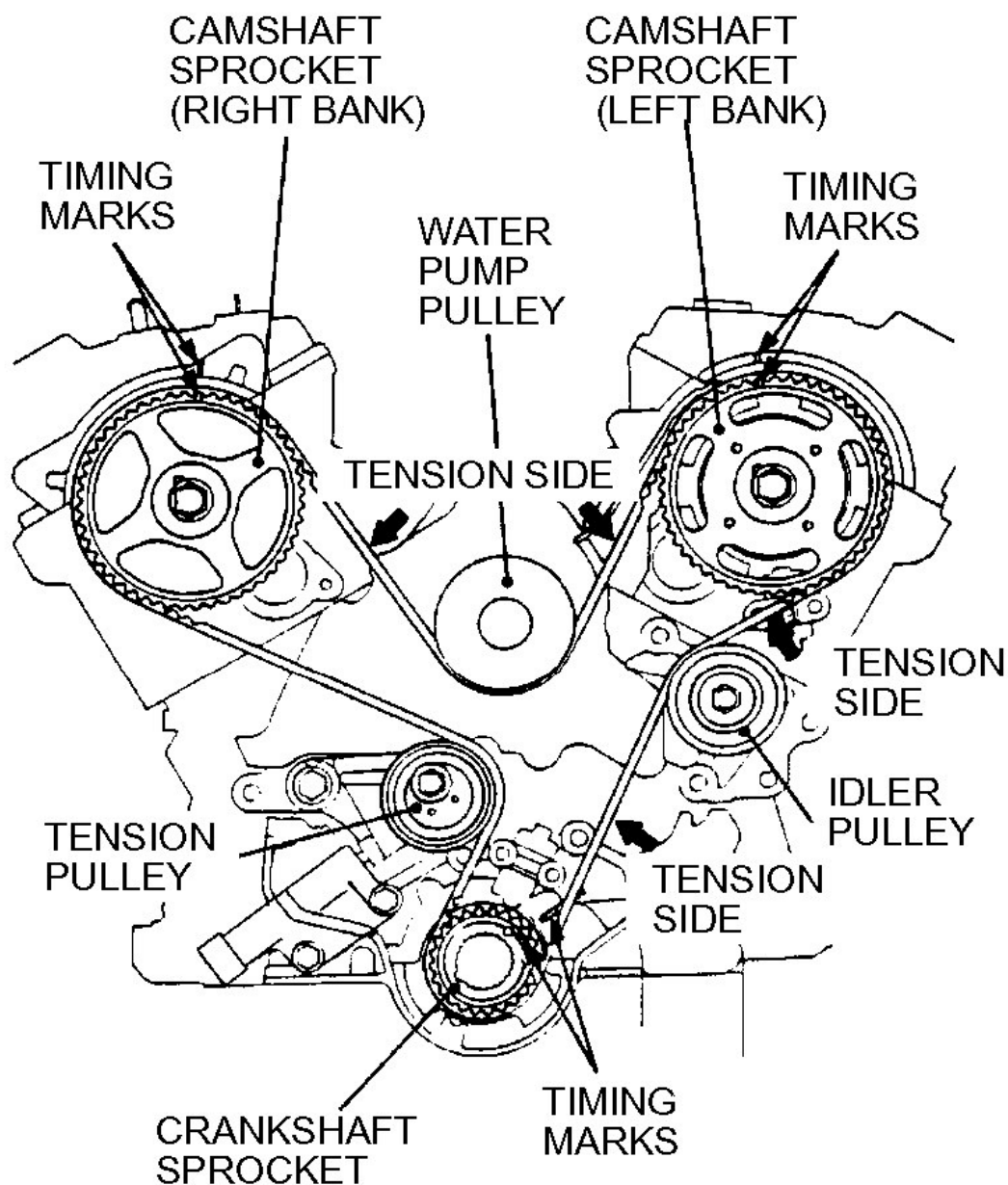
CAUTION: Leave the wire installed in the auto tensioner.

<< B >> TIMING BELT INSTALLATION

1. Align the timing marks of the camshaft sprockets and crankshaft sprocket.
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

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

3. Turn the camshaft sprocket (right bank) counterclockwise until the tension side of the timing belt is firmly stretched, and then check again that all timing marks are aligned.

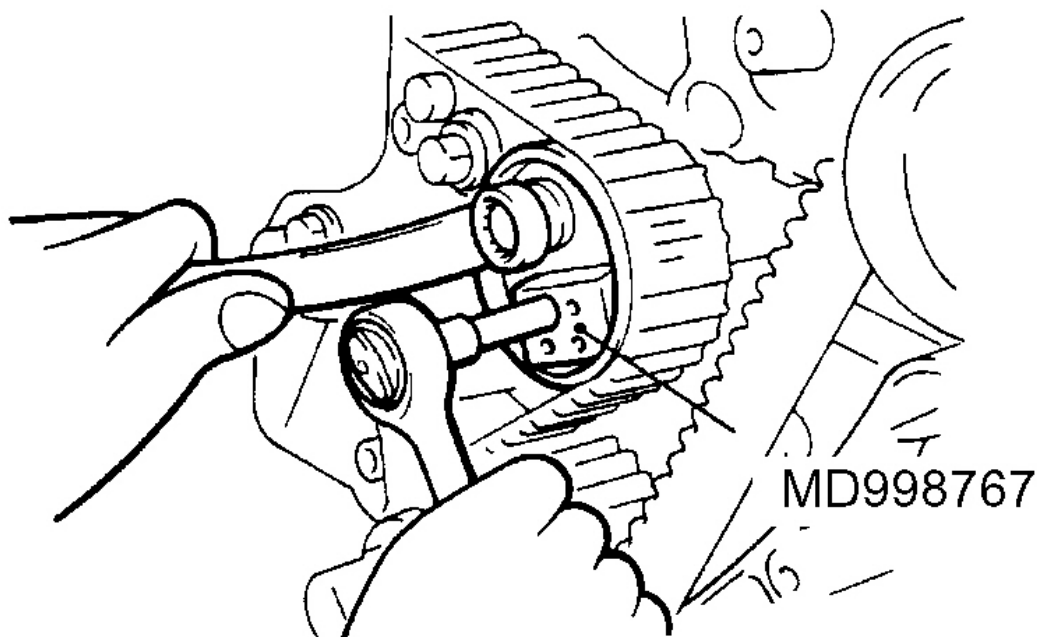


G01904881

Fig. 48: Locating Timing Marks For Belt Installation

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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



G01904882

Fig. 49: Pushing Tension Pulley Into Timing Belt

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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

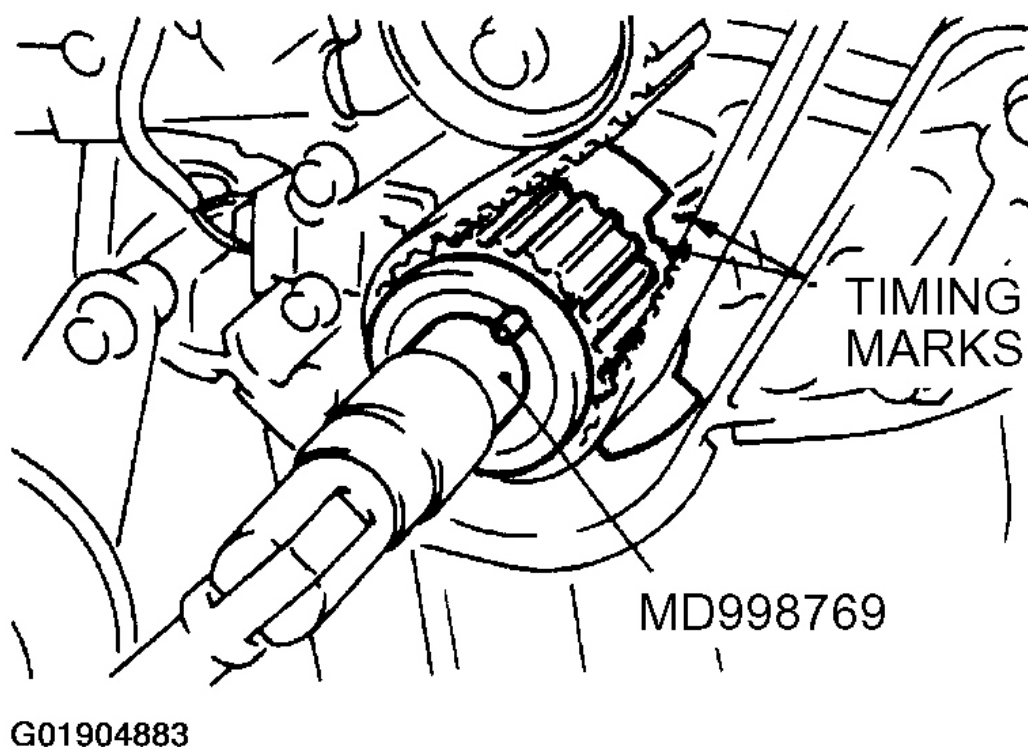


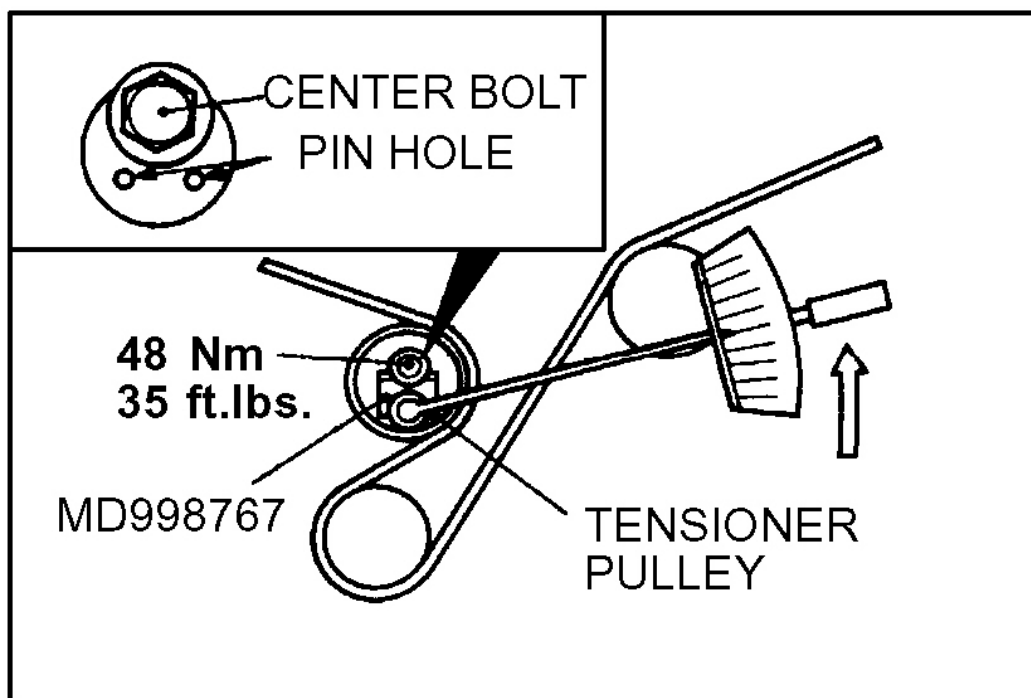
Fig. 50: Aligning Timing Mark

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

6. Loosen the center bolt on the tensioner pulley. Using the special tool and torque wrench, apply tensioning torque to the timing belt and, at the same time, tighten the center bolt to specification.

Reference value: 4.4 N.m (3.3 ft. lbs.) (Timing belt tensioning torque)

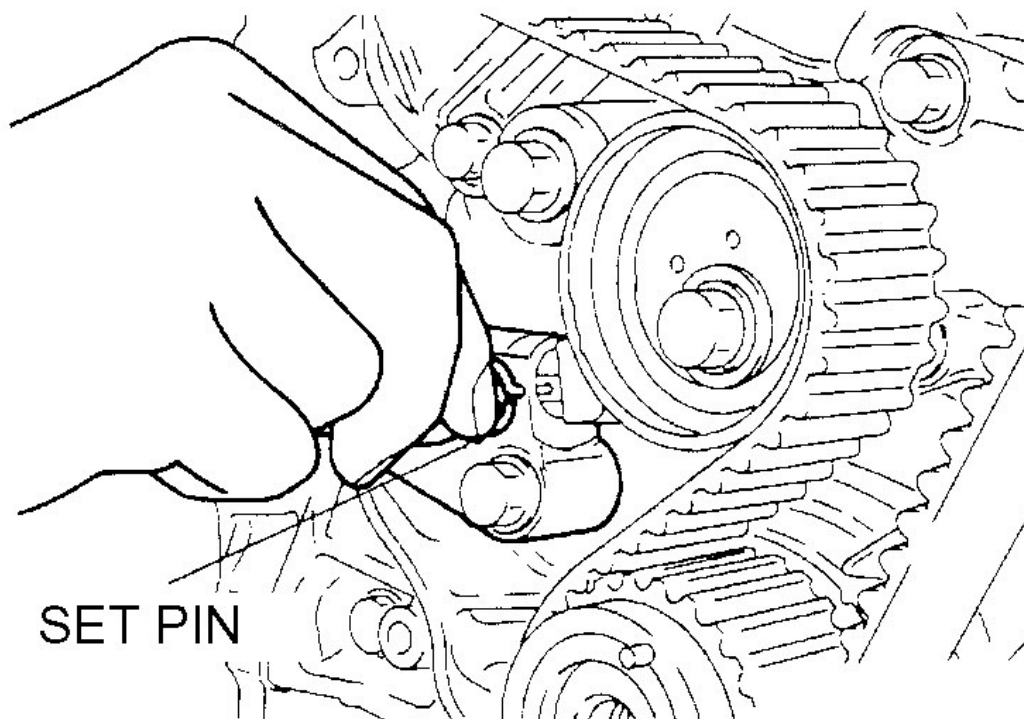
CAUTION: When tightening the center bolt, ensure that the tensioner pulley does not turn with the bolt.



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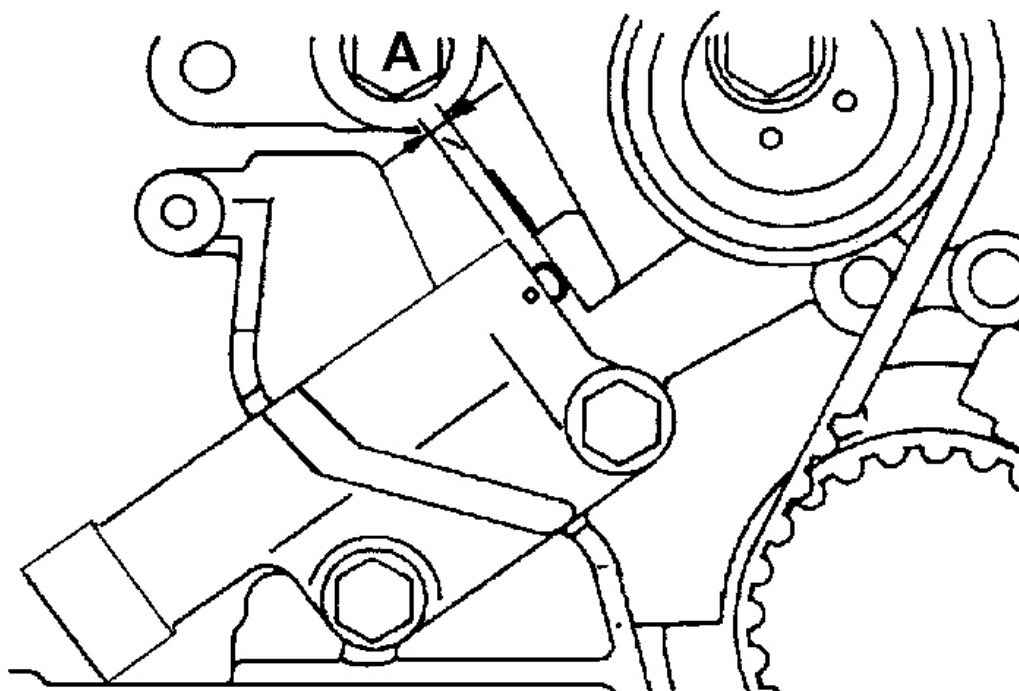
Fig. 51: Loosening Center Bolt On Tensioner Pulley**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

7. Remove the setting pin that has been inserted into the auto tensioner.

**G01904885****Fig. 52: Removing Setting Pin****Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

8. Turn the crankshaft two turns clockwise to align the timing marks.
9. Leave everything in this condition for five minutes or more, and then check that the protrusion of the auto tensioner push rod is within the range of the standard value.

Standard value (A): 4.8-6.0 mm (.189-.236 in.)



G01904886

Fig. 53: Locating Range Of Protrusion Of Auto Tensioner Push Rod
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

10. If the protrusion is out of specification, repeat steps (5) to (9).
11. Check again that timing marks on all sprockets are aligned properly.

INSPECTION

AUTO TENSIONER

- Check the auto-tensioner for possible leaks.
- Check the push rod for cracks.

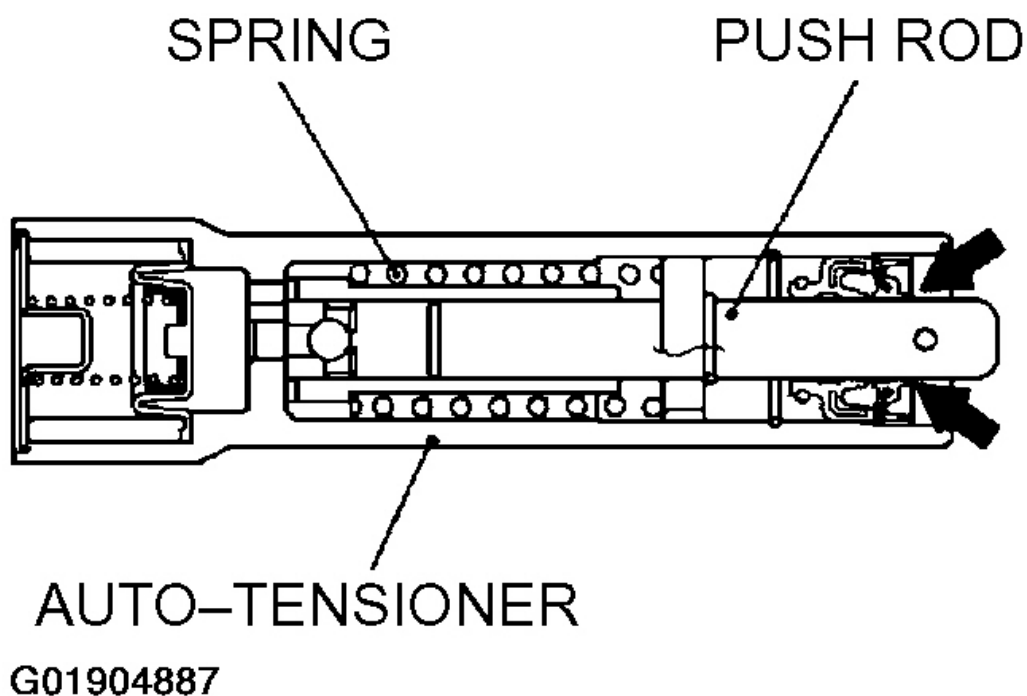


Fig. 54: Inspecting Auto Tensioner

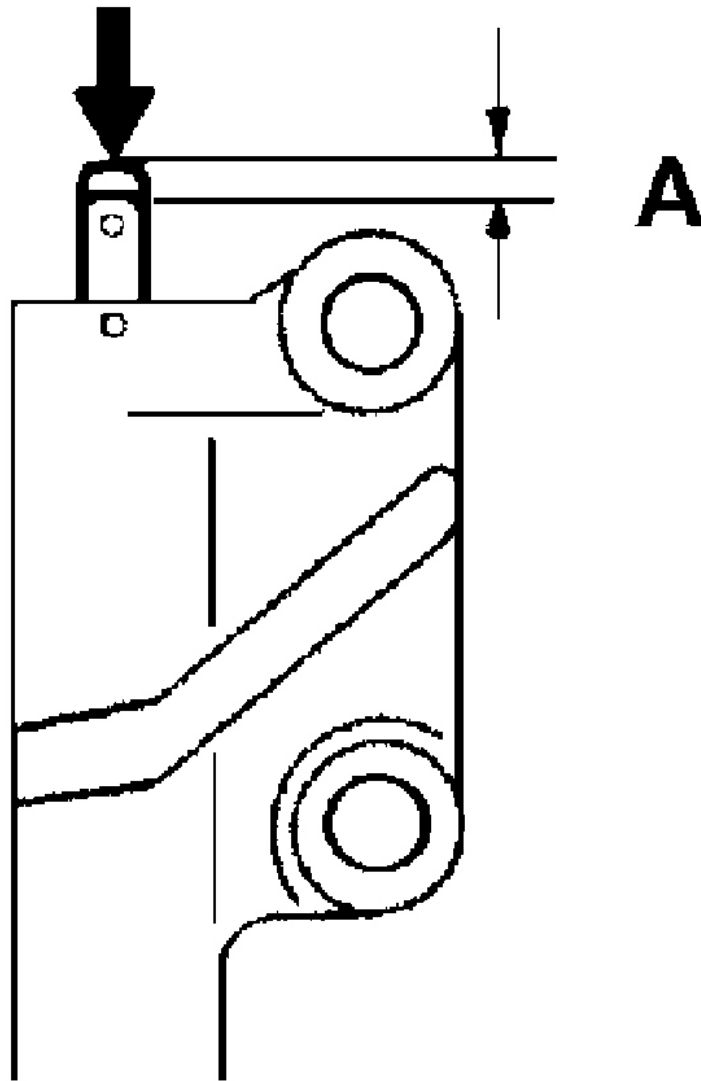
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

1. Hold the auto tensioner by hand and measure contraction (A) when pressing the tip of the rod on a steel (cylinder block; etc.) with a force of 98-196 N (22-44 lbs.).

Standard value (A): 1 mm (.04 in.) or less

2. If not within the standard value, replace the auto tensioner.

**98–196 N
(22–44 lbs.)**



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Fig. 55: Measuring Contraction Of Auto Tensioner Rod
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATION
FASTENER TIGHTENING SPECIFICATION

ITEMS	SPECIFICATION
Accelerator cable	5 N.m (4 ft. lbs.)
Automatic tensioner	23 N.m (17 ft. lbs.)
Bracket	24 N.m (18 ft. lbs.)
Camshaft sprocket	88 N.m (65 ft. lbs.)
Crankshaft position sensor	9 N.m (7 ft. lbs.)
Cylinder head < cold engine >	103-113 N.m (76-83 ft. lbs.)
Drive plate	75 N.m (54 ft. lbs.)
Engine mount	98-118 N.m (73-78 ft. lbs.)
Engine support bracket	44 N.m (33 ft. lbs.)
High pressure fuel hose	5 N.m (4 ft. lbs.)
Idler pulley	44 N.m (33 ft. lbs.)
Oil drain plug	39 N.m (29 ft. lbs.)
Oil gauge and guide	12-15 N.m (9-11 ft. lbs.)
Oil pan, lower	5-12 N.m (4-9 ft. lbs.)
Oil pan, upper	5-12 N.m (4-9 ft. lbs.)
Oil seal case	11 N.m (8 ft. lbs.)
Power steering oil pump	39 N.m (29 ft. lbs.)
Power steering pressure hose	24 N.m (18 ft. lbs.)
Rear plate	11 N.m (8 ft. lbs.)
Rocker cover	3-4 N.m (2-3 ft. lbs.)
Starter motor	26-33 N.m (19-24 ft. lbs.)
Tensioner arm	44 N.m (33 ft. lbs.)
Tensioner pulley	48 N.m (36 ft. lbs.)
Timing belt cover < rear >	13 N.m (10 ft. lbs.)
Timing belt cover < rear center >	12-15 N.m (9-11 ft. lbs.)
Timing belt front lower cover	8 N.m (11 ft. lbs.)
Timing belt front upper cover, front	8 N.m (11 ft. lbs.)
Timing belt front upper cover, rear	8 N.m (11 ft. lbs.)

SERVICE SPECIFICATIONS

2003 Mitsubishi Diamante LS

2003 ENGINES On-Vehicle Service, Removal & Installation - Diamante

ITEMS			STANDARD VALUE	LIMIT
Drive belt tension N (lbs.)	Generator and A/C compressor V-ribbed type	When checked	490–686 (109–152)	–
		When new belt is installed	784–980 (174–218)	–
		When used belt is installed	539–637 (120–142)	–
	Power steering pump	When checked	373–569 (83–126)	–
		When new belt is installed	608–804 (135–179)	–
		When used belt is installed	422–520 (94–116)	–
Drive belt deflection <Reference value> mm (in.)	Generator and A/C compressor V-ribbed type	When checked	7.9–9.7 (.31–.38)	–
		When new belt is installed	6.0–7.2 (.24–.28)	–
		When used belt is installed	8.2–9.3 (.32–.37)	–
	Power steering pump	When checked	11.0–14.2 (.43–.56)	–
		When new belt is installed	8.4–9.3 (.33–.37)	–
		When used belt is installed	11.7–13.4 (.46–.52)	–
Basic ignition timing at idle			5° BTDC ± 3°	–
Actual ignition timing at curb idle			Approx. 10° BTDC	–
CO contents %			0.5 or less	–
HC contents ppm			100 or less	–
Curb idle speed r/min			700±100	–

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Fig. 56: Service Specifications Table (1 Of 2)
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

ITEMS		STANDARD VALUE	LIMIT
Compression pressure (250–400 r/min) kPa (psi)		1,200 (171)	min. 890 (127)
Compression pressure difference of all cylinder kPa (psi)		–	max. 100 (14)
Intake manifold vacuum at curb idle kPa (in.Hg)		–	min. 60 (18)
Timing belt	Amount of projection of auto tensioner rod mm (in.) (Distance between the tensioner arm and auto tensioner body)	4.8 – 6 .0 (.189 – .236)	–

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Fig. 57: Service Specifications Table (2 Of 2)
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

SEALANT

ITEMS	RECOMMENDED SEALANT
Oil pan	MITSUBISHI GENUINE Part No. MD970389 or equivalent

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Fig. 58: Sealant Specifications
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.