

2002 Mitsubishi Mirage DE

2002 ENGINES 1.8L 4-Cylinder - Mirage

2002 ENGINES**1.8L 4-Cylinder - Mirage****ON-VEHICLE SERVICE****GENERAL INFORMATION****GENERAL SPECIFICATIONS****General Specifications**

Items			Specifications
Type			In-line, Overhead Camshaft
Number of cylinders			4
Bore mm (in.)			81.0 (3.19)
Stroke mm (in.)			89.0 (3.50)
Piston displacement cm ³ (cu.in.)			1,834 (111.9)
Compression ratio			9.5
Firing order			1-3-4-2
Valve timing	Intake valve	Opens	BTDC 6°
		Closes	ABDC 54°
	Exhaust valve	Opens	BBDC 54°
		Closes	ATDC 6°
Lubrication			Pressurized feed-full filtration

SERVICE SPECIFICATIONS

2002 Mitsubishi Mirage DE

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Items		Standard value	Limit
Generator drive belt vibration frequency Hz	When checked	143 - 185	-
	When a used belt is installed	155 - 175	-
	When a new belt is installed	203 - 234	-
Generator drive belt tension N (lbs.)	When checked	294 - 490 (66 - 110)	-
	When a used belt is installed	343 - 441 (77 - 99)	-
	When a new belt is installed	588 - 784 (132 - 176)	-
Generator drive belt deflection (Reference value) mm (in.)	When checked	9.7 - 12.9 (.38 - .51)	-
	When a used belt is installed	10.5 - 12.0 (.41 - .47)	-
	When a new belt is installed	6.7 - 8.5 (.26 - .33)	-
Power steering oil pump and A/C compressor drive belt vibration frequency Hz	When checked	114 - 139	-
	When a used belt is installed	121 - 133	-
	When a new belt is installed	145 - 166	-
Power steering oil pump and A/C compressor drive belt tension N (lbs.)	When checked	392 - 588 (88 - 132)	-
	When a used belt is installed	441 - 539 (99 - 121)	-
	When a new belt is installed	637 - 833 (143 - 187)	-

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Fig. 1: Service Specifications (1 Of 2)

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Items		Standard value	Limit
Power steering oil pump and A/C compressor drive belt deflection (Reference value) mm (in.)	When checked	10.0 - 12.0 (.39 - .47)	-
	When a used belt is installed	10.0 - 11.0 (.39 - .43)	-
	When a new belt is installed	7.2 - 9.0 (.28 - .36)	-
Basic ignition timing at idle		5°BTDC ± 3°	-
Actual ignition timing at curb idle		Approx. 5°BTDC	-
CO contents %		0.5 or less	-
HC contents ppm		100 or less	-
Curb idle speed r/min		700 ± 100	-
Compression pressure (at 300 r/min) kPa (psi)		1,370 (199)	min. 1,040 (151)
Compression pressure difference of all cylinders kPa (psi)		-	max. 100 (14)
Intake manifold vacuum at curb idle kPa (in.Hg.)		-	min. 60 (18)
Cylinder head bolt shank length mm (in.)		-	96.4 (3.80)

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Fig. 2: Service Specifications (2 Of 2)

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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SEALANTS

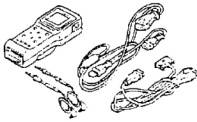
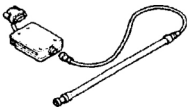
Items	Specified sealants
Oil pan	3M AAD Part No. 8672, 8704 or
Camshaft position sensor support	3M AAD Part No. 8679/8678 or equivalent
Flywheel bolt <M/T> or drive plate bolt <A/T>	3M AAD Part No. 8730 or 3M AAD Part No. 8731 or equivalent

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Fig. 3: Sealants

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

SPECIAL TOOLS

Tool	Tool number and name	Supersession	Application
	MB991502 Scan tool (MUT-II)	MB991496-OD	• Checking the ignition timing • Checking the idle speed
	MB991668 Belt tension meter set	Tool not available	Drive belt tension measurement

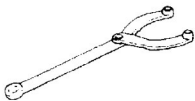
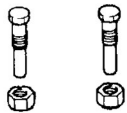
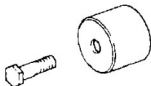
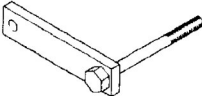
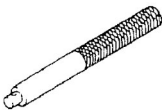
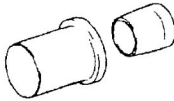
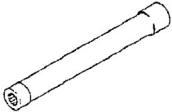
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Fig. 4: Special Tools (1 Of 3)

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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2002 ENGINES 1.8L 4-Cylinder - Mirage

Tool	Tool number and name	Supersession	Application
	MB990767 End yoke holder	MB990767-01	• Holding the camshaft sprocket • Holding the crankshaft pulley
	MD998719 or MD998754 Crankshaft pulley holder	MIT308239	
	MD998713 Camshaft oil seal installer	MD998713-01	Press-in of the camshaft oil seal
	MD998727 Oil pan remover	MD998727-01	Removal of oil pan
	MD998781 Flywheel stopper	General service tool	Securing the flywheel <M/T> or drive plate <A/T>
	MD998776 Crankshaft rear oil seal installer	MD998776-01	Press-in of the crankshaft rear oil seal
	MB990938 Handle	MB990938-01	
	MD998717 Crankshaft front oil seal installer	MD998717-01	Press-in of the crankshaft front oil seal
	MB991653 Cylinder head bolt wrench	General service tool	Removal and installation of the cylinder head bolt

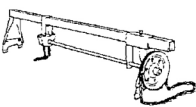
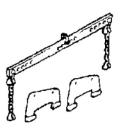
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Fig. 5: Special Tools (2 Of 3)

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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2002 ENGINES 1.8L 4-Cylinder - Mirage

Tool	Tool number and name	Supersession	Application
	MD998443 Lash adjuster holder (8)	MD998443-01	Supporting lash adjuster to prevent it from falling when rocker arm shaft assembly is removed or installed.
	GENERAL SERVICE TOOL MZ203827 Engine lifter	MZ203827-01	Supporting the engine assembly during removal and installation of the transaxle
	MB991453 Engine hanger assembly	MZ203827-01	

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Fig. 6: Special Tools (3 Of 3)

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

TROUBLESHOOTING

For troubleshooting see **1.5L 4 CYLINDER** .

COMPONENT ON-VEHICLE SERVICE

DRIVE BELT TENSION CHECK AND ADJUSTMENT

GENERATOR DRIVE BELT TENSION CHECK

Check drive belt tension in one of the following procedures.

Standard value:

Vibration frequency Hz	143 - 185
Tension N (lbs.)	294 - 490 (66 - 110)
Deflection (Reference value) mm (in.)	9.7 - 12.9 (.38 - .51)

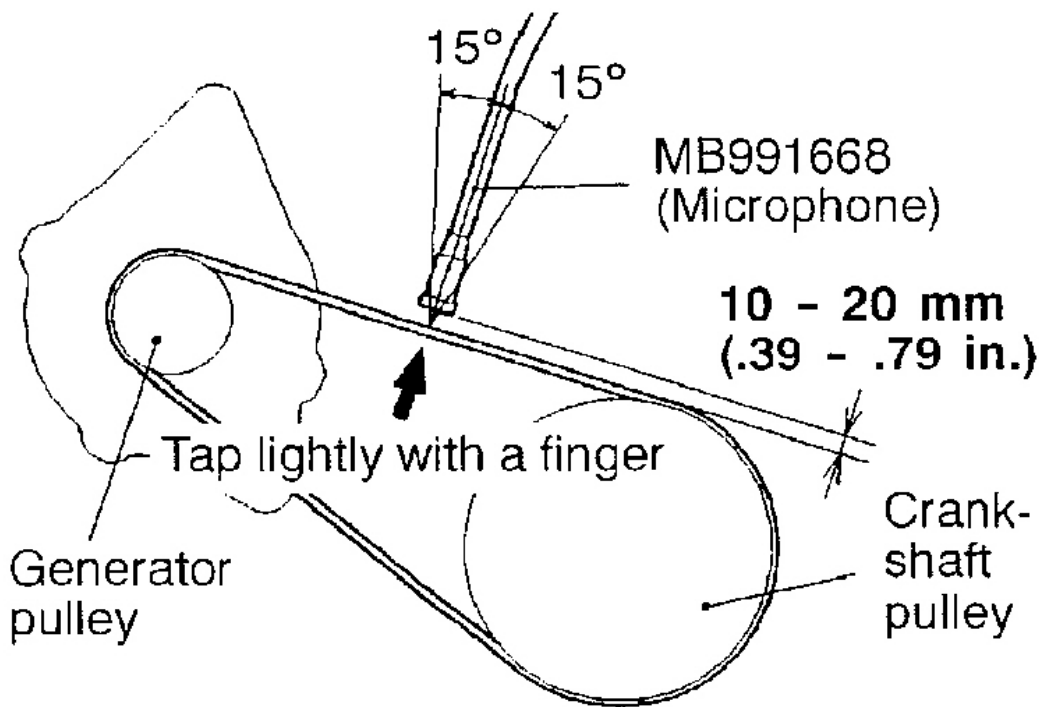
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Fig. 7: Generator Drive Belt Specifications

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

< When using the scan tool (MUT-II) >

1. Connect the belt tension meter set (special tool) to the scan tool (MUT-II).
2. Connect the scan tool (MUT-II) to the diagnosis connector.
3. Turn the ignition switch to "ON" and select "Belt Tension Measurement" on the menu screen.
4. Hold the microphone to the middle of the drive belt between the pulleys (at the place indicated by an arrow) about 10 - 20 mm (0.39 - 0.79 in.) away from the rear surface of the belt and so that it is perpendicular to the belt (within an angle of $\pm 15^\circ$).



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Fig. 8: Checking Belt Tension With Using Scan Tool (MUT-II)
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

5. Lightly tap the middle of the belt between the pulleys (the place indicated by the arrow) with your finger as shown in the illustration. Check that the vibration frequency of the belt is within the standard value.

CAUTION:

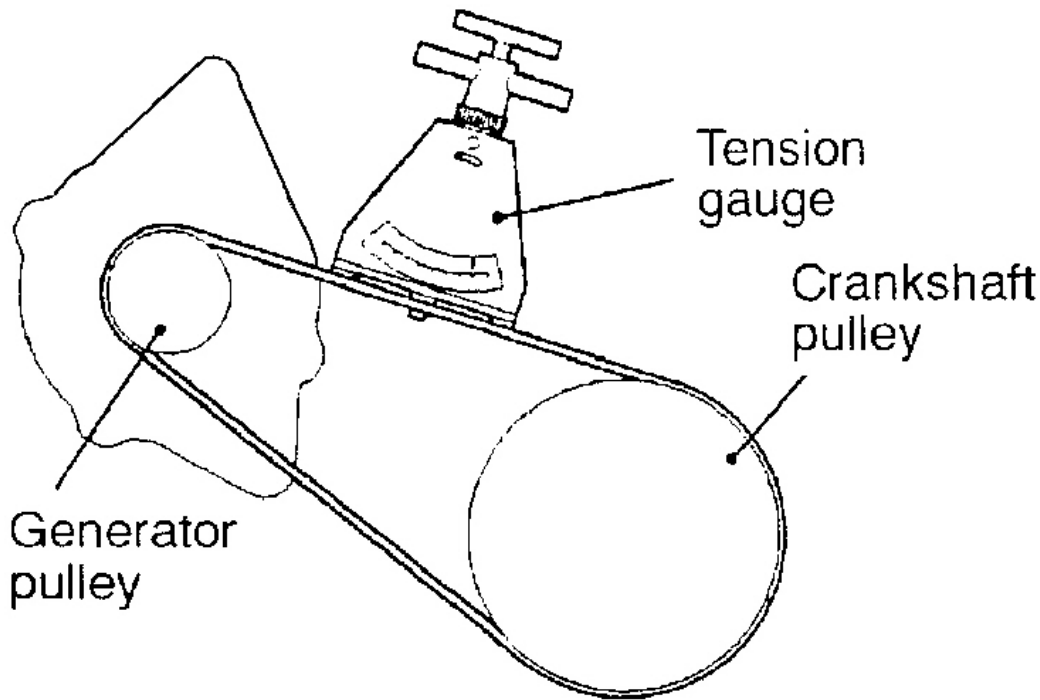
1. The temperature of the surface of the belt should be as close as possible to normal temperature.
2. Do not allow any contaminant such as water or oil to get onto the microphone.
3. If strong gusts of wind blow against the microphone or if there is any

source of loud noise nearby, the values measured by the microphone may not correspond to actual values.

4. If the microphone is touching the belt during the measurement, the values measured by the microphone may not correspond to actual values.
5. Do not take the measurement while the vehicle's engine is running.

< When using a tension gauge >

Use a belt tension gauge to check that the belt tension is within the standard value range.

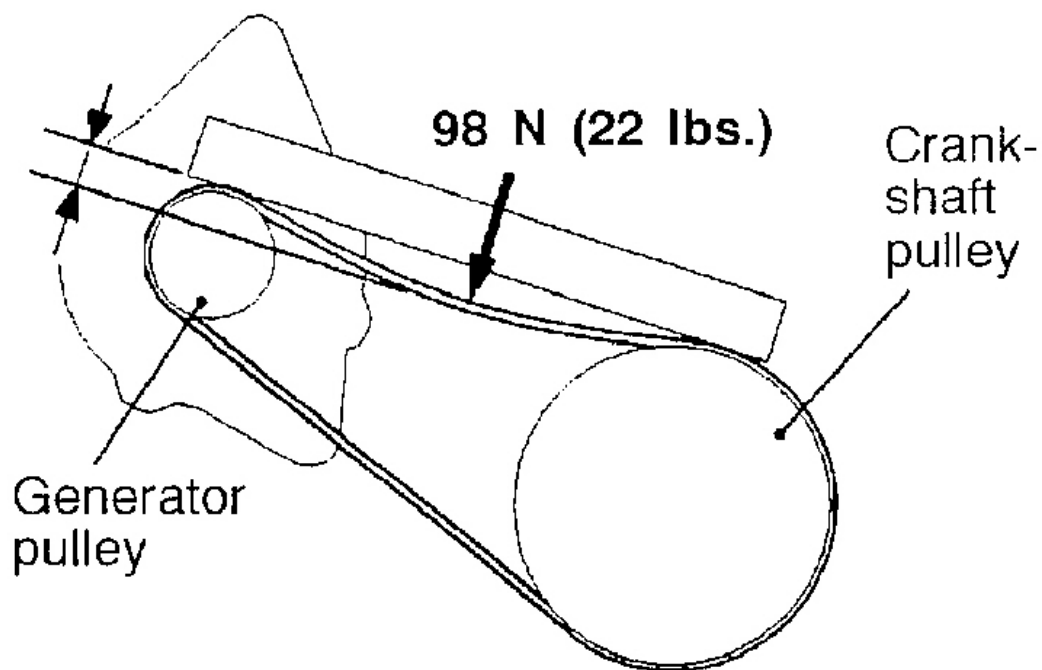


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Fig. 9: Checking Belt Tension With Tension Gauge
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

< Belt deflection check >

Apply 98 N (22 lbs.) of force to the middle of the drive belt between the pulleys (at the place indicated by the arrow) and check that the amount of deflection is within the standard value range.



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Fig. 10: Checking Belt Deflection

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

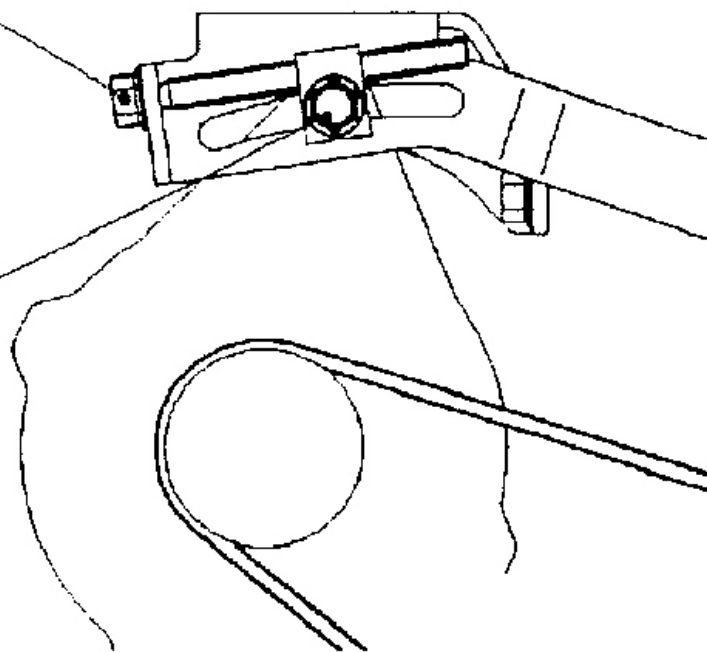
GENERATOR DRIVE BELT TENSION ADJUSTMENT

1. Loosen the nut of the generator pivot bolt.
2. Loosen the lock bolt.
3. Turn the adjusting bolt to adjust the belt tension vibration frequency, belt tension or deflection to the standard value.

Standard value:

Adjusting bolt

Lock bolt



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Fig. 11: Adjusting Generator Drive Belt Tension

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Items	When a used belt is installed	When a new belt is installed
Vibration frequency Hz	155 - 175	203 - 234
Tension N (lbs.)	343 - 441 (77 - 99)	588 - 784 (132 - 176)
Deflection (Reference value) mm (in.)	10.5 - 12.0 (.41 - .47)	6.7 - 8.5 (.26 - .33)

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Fig. 12: Generator Drive Belt Specifications

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

4. Tighten the nut of the generator pivot bolt.

Tightening torque: 44 Nm (33 ft.lbs.)

5. Tighten the lock bolt.

Tightening torque: 23 Nm (17 ft.lbs.)

6. Tighten the adjusting bolt.

Tightening torque: 5 Nm (3.7 ft.lbs.)**POWER STEERING OIL PUMP AND AIR CONDITIONING COMPRESSOR DRIVE BELT TENSION CHECK AND ADJUSTMENT**

1. Check drive belt tension in one of the following procedures.

Standard value:**< using the scan tool (MUT-II) >**

Lightly tap the middle of the belt between the pulleys (the place indicated by the arrow) with your finger as shown in the illustration. Check that the vibration frequency of the belt is within the standard value.

NOTE: Check drive belt vibration frequency with the scan tool (MUT-II) in the same procedure in **< When using the scan tool (MUT-II) >**.

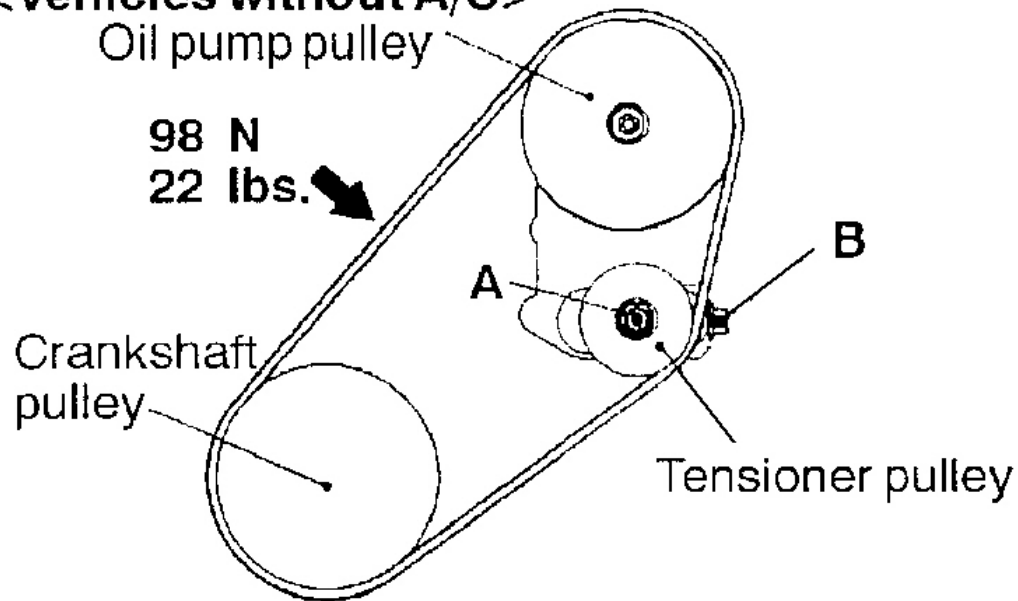
< using a tension gauge >

Use a belt tension gauge to check that the belt tension is at the standard value at a point half-way between the two pulleys (indicated by an arrow in the illustration).

< Belt deflection check >

Apply 98 N (22 lbs.) of force to the middle of the drive belt between the pulleys (at the place indicated by the arrow) and check that the amount of deflection is within the standard value range.

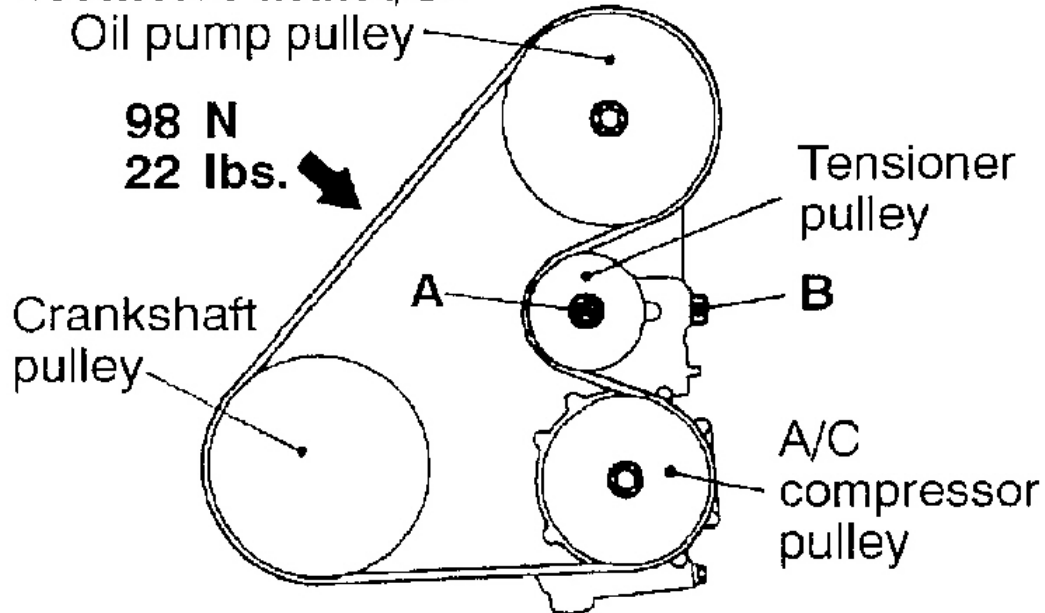
<Vehicles without A/C>



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Fig. 13: Checking Drive Belt Deflection (Vehicles Without A/C)
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

<Vehicles with A/C>



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Fig. 14: Checking Drive Belt Deflection (Vehicles With A/C)
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Items	When checked	When a used belt is installed	When a new belt is installed
Vibration frequency Hz	114 - 139	121 - 133	145 - 166
Tension N (lbs.)	392 - 588 (88 - 132)	441 - 539 (99 - 121)	637 - 833 (143 - 187)
Deflection (Reference value) mm (in.)	10.0 - 12.0 (.39 - .47)	10.0 - 11.0 (.39 - .43)	7.2 - 9.0 (.28 - .35)

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Fig. 15: Power Steering & A/C Drive Belt Specifications

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2. If the tension or deflection is outside the standard value, adjust by the following procedure.
 1. Loosen tensioner pulley fixing nut A.
 2. Adjust the amount of belt deflection using adjusting bolt B.
 3. Tighten fixing nut A.

Tightening torque: 25 Nm (19 ft.lbs.)>

4. Check the belt deflection amount and tension, and readjust if necessary.

CAUTION: Check after turning the crankshaft once or more clockwise (right turn).

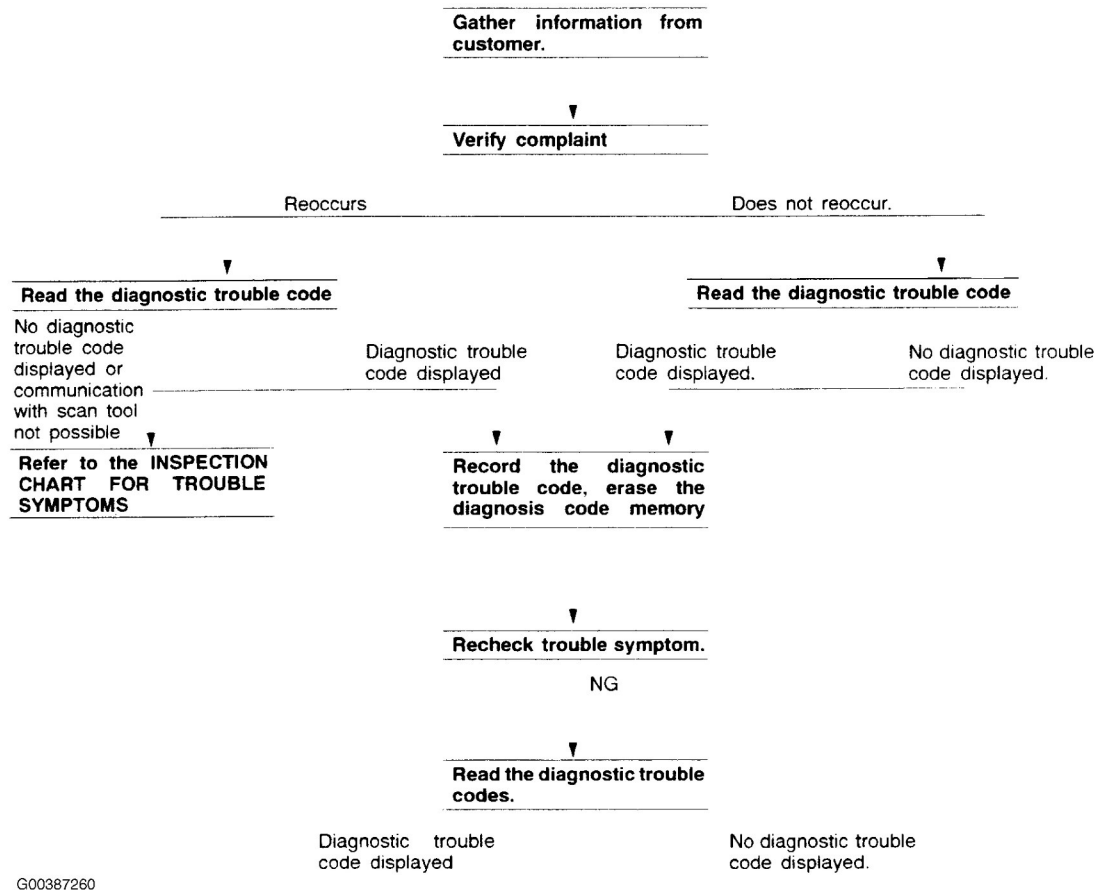
IGNITION TIMING CHECK

1. Before inspection, set the vehicle in the following condition:
 - Engine coolant temperature: 80 - 95°C (176 - 203°F)
 - Lights, electric cooling fan and all accessories: OFF
 - Transaxle: Neutral (P range on vehicles with A/T)
2. Connect the scan tool to the data link connector.
3. Set up a timing light.

4. Start the engine and run at idle.
5. Check that the idle speed is at approx. 700 r/min.
6. Select the "item No. 17" of the actuator test on the scan tool.
7. Check that basic ignition timing is within the standard value.

Standard value: 5° BTDC +/- 3°

8. If the basic ignition timing is outside the standard value, check the MFI components.



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Fig. 16: Diagnostic Troubleshooting Flow

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

9. Press the clear key of the scan tool (select force-activating cancel mode), and cancel the actuator test.

NOTE: If it is not cancelled, force-activation continues for 27 minutes. Do not drive the vehicle in this condition, or the engine could be damaged.

10. Check the actual ignition timing is at the standard value.

Standard value: Approx. 5 BTDC

NOTE:

1. Ignition timing is variable within about +/- 7°, even under normal operating.
2. The timing is automatically further advanced by approx. 5° from 5° BTDC at higher altitude.

CURB IDLE SPEED CHECK

1. Before inspection, set the vehicle in the following condition.
 - Engine coolant temperature: 80 - 95°C (176 - 203°F)
 - Lights, electric cooling fan and all accessories: OFF
 - Transaxle: Neutral (P range on vehicles with A/T)
2. Turn the ignition switch off and connect the scan tool to the data link connector.
3. Check that the basic ignition timing is within the standard value.

Standard value: 5° BTDC +/- 3°

4. Run the engine at idle for 2 minutes.
5. Check the curb idle speed. Select item No. 22 and take a reading of the idle speed.

Standard value: 700 +/- 100 r/min

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

6. If the idle speed is not within the standard value, check the MFI components see Fig. 16.

IDLE MIXTURE CHECK

1. Before inspection, set the vehicle in the following condition.
 - Engine coolant temperature: 80 - 95°C (176 - 203°F)
 - Lights, electric cooling fan and all accessories: OFF
 - Transaxle: Neutral (P range on vehicles with A/T)
2. Turn the ignition switch off and connect the scan tool to the data link connector.
3. Check that the basic ignition timing is within the standard value.

Standard value: 5°BTDC +/- 3°

4. Run the engine at 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:

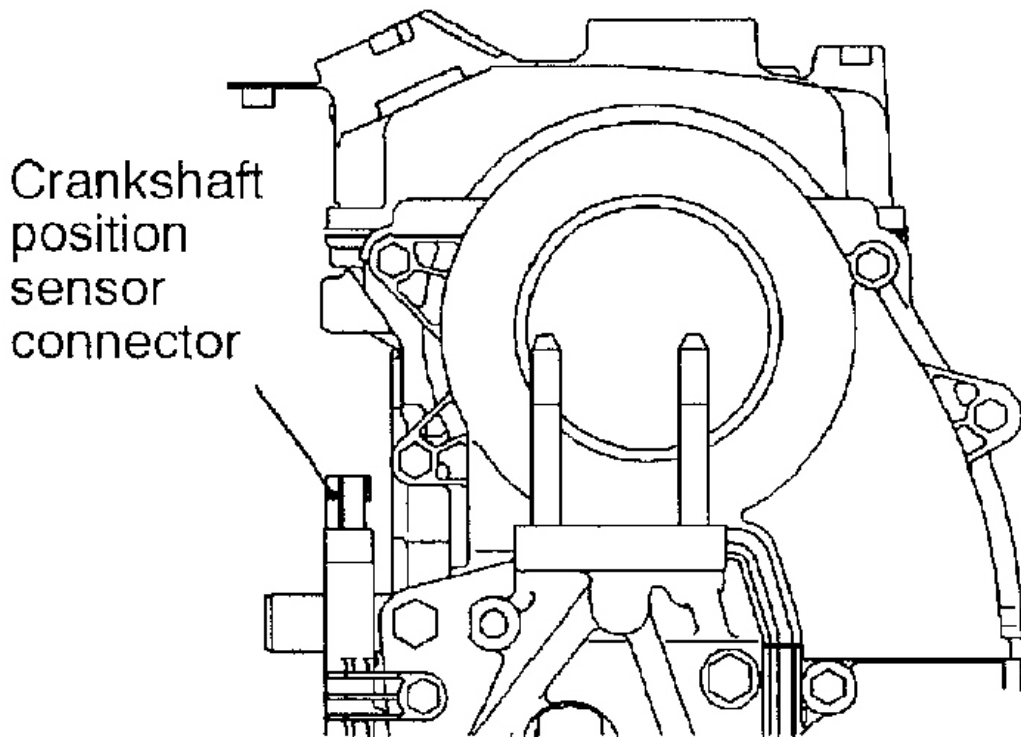
- Diagnostic output
- Closed-loop control (When the closed-loop control is carried out normally, the output signal of the heated oxygen sensor repeats between 0 - 400 mV and 600 - 1,000 mV at idle.)
- Fuel pressure
- Injector
- Ignition coil, spark plug cable, spark plug
- EGR system and the EGR valve leak
- Evaporative emission control system
- Compression pressure

NOTE: **Replace the three-way catalyst whenever the CO and HC contents do not remain inside the standard value. (even though the result of the inspection is normal on all items).**

COMPRESSION PRESSURE CHECK

1. Before inspection, set the vehicle in the following condition.
 - Engine coolant temperature: 80 - 95°C (176 - 203°F)
 - Lights, electric cooling fan and all accessories: OFF
 - Transaxle: Neutral (P range on vehicles with A/T)
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 module from carrying out ignition and fuel injection.**



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Fig. 17: Disconnecting Crankshaft Position Sensor Connector
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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

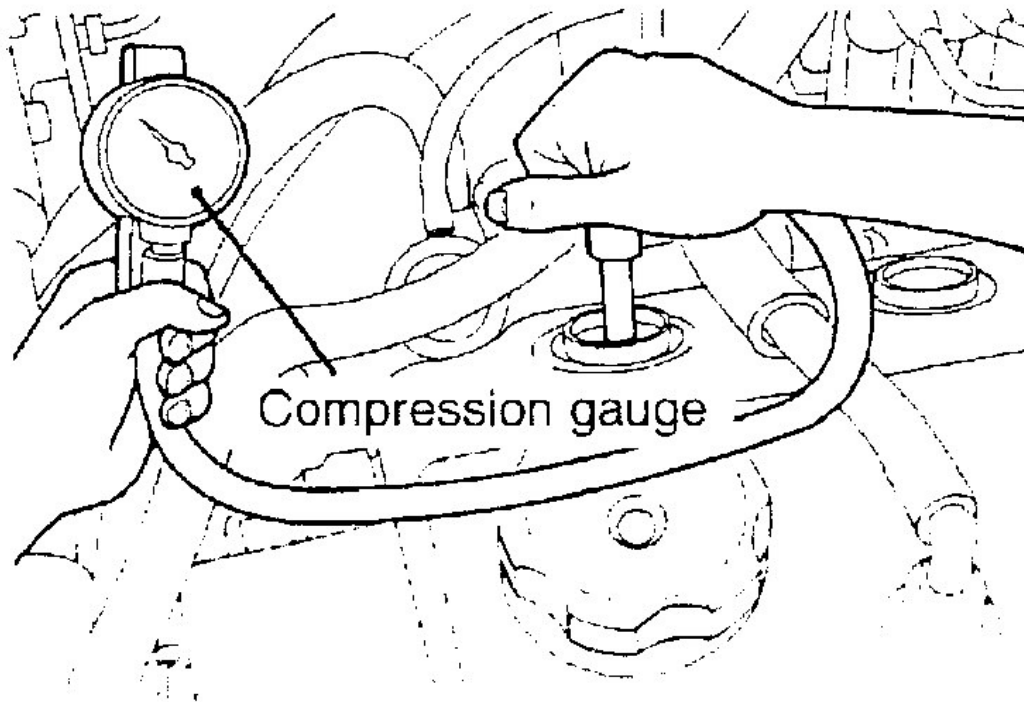
CAUTION:

1. Keep away from the spark plug hole when cranking.
2. If compression is measured with water, oil, fuel, etc., that has come from cracks inside the cylinder, these materials will become heated and will gush out from the spark plug hole, which is dangerous.

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 300 r/min): 1,370 kPa (199 psi)

Limit (at engine speed of 300 r/min): min. 1,040 kPa (151 psi)



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Fig. 18: Measuring Compression Pressure**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

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

Limit: max. 100 kPa (14 psi)

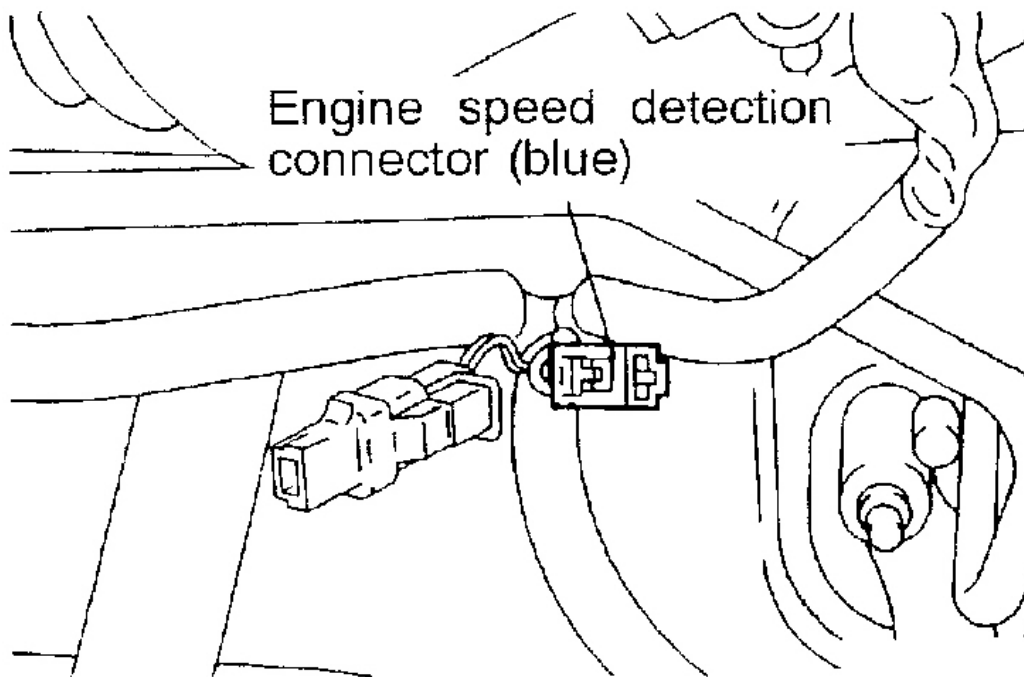
9. If there is a cylinder with compression or a compression difference that is outside the limit, pour a small amount of engine oil through the spark plug hole, and repeat the operations in steps 7 and 8.
 1. If the compression increases after oil is added, the cause of the malfunction is a worn or damaged 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, or disconnect the negative battery cable for more than 10 seconds and reconnect it.

WARNING: Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.

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

MANIFOLD VACUUM CHECK

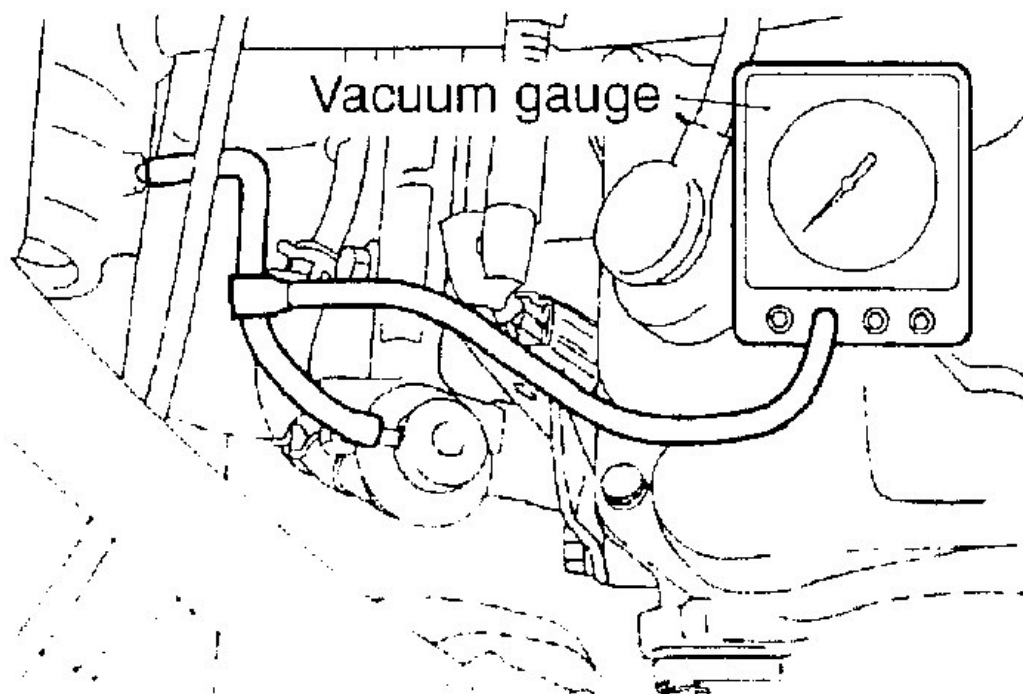
1. Before inspection, set the vehicle in the following condition.
 - Engine coolant temperature: 80 - 95°C (176 - 203°F)
 - Lights, electric cooling fan and all accessories: OFF
 - Transaxle: Neutral (P range on vehicles with A/T)
2. Connect the scan tool to the data link connector, or connect a primary voltage detection type tachometer to the connector through a paper clip.



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Fig. 19: Connecting Voltage Detection Type Tachometer To Connector
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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



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Fig. 20: Attaching Vacuum Gauge

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

4. Start the engine, and check that the curb idle speed is within the standard value range.

Standard value: 700 +/- 100 r/min

5. Check the manifold vacuum.

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

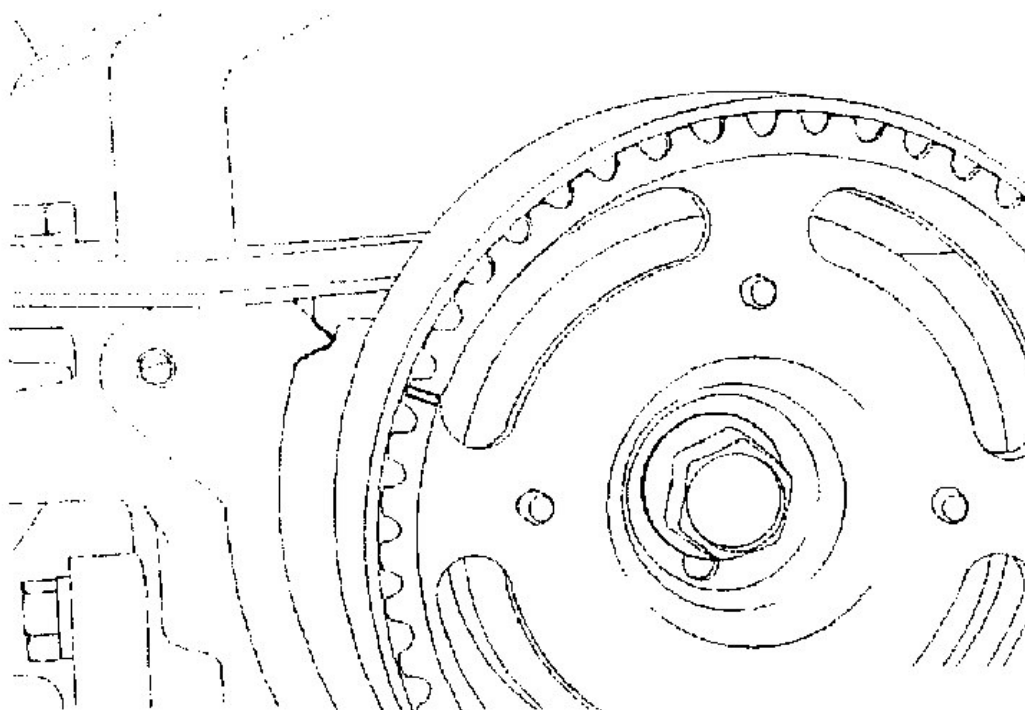
TIMING BELT TENSION ADJUSTMENT

1. Remove the timing belt upper cover.
2. Turn the crankshaft clockwise to set the No. 1 cylinder to the top dead compression center.

CAUTION: As the purpose of this procedure is to apply the proper amount of tension to the timing belt by means of the cam drive torque, be sure not to rotate the crankshaft counterclockwise.

3. Remove the access cover.
4. Loosen the timing belt tensioner fixing bolt to apply tension to the belt by means of the force of the tensioner spring.

CAUTION: The bolt can be loosened 90° - 180°. If the belt is loosened more than necessary, the bolt may fall inside the cover.



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Fig. 21: Adjusting Timing Belt Tension

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

5. Tighten the timing belt tensioner fixing bolt.
6. Install the access cover.
7. Install the timing belt upper cover.

LASH ADJUSTER CHECK

If an abnormal noise (clicking) assumed to be caused by a fault in the lash adjuster is heard and does not stop after the engine is started, inspect the following items.

NOTE:

1. The abnormal noise caused by the lash adjuster occurs just after starting and fluctuates according to the engine speed, but is not related to the engine load.

Thus, if the abnormal noise does not occur just after the engine speed, if it does not fluctuate according to the engine speed, or if it fluctuates according to the engine load, the lash adjuster is not the cause of the abnormal noise.

2. If the lash adjuster is defective, often the abnormal noise will not stop even if warm up operation is continued in the idling state.

Note that the abnormal noise may stop only if the noise is caused by fixing of oil sludge in an engine where the oil control is poor.

1. Start the engine.
2. Check whether the abnormal noise starts immediately after starting, and whether it fluctuates according to the engine speed when the engine speed is varied.

If the abnormal noise does not occur immediately after starting, or if it does not fluctuate according to the engine speed, the cause is not with the lash adjuster, so investigate for other causes of the abnormal noise. If the abnormal noise does not fluctuate according to the engine speed, it is assumed that the cause is not the engine unit. (In this case, the lash adjuster is normal.)

3. Check whether the abnormal noise level does not change when the engine load is fluctuated (ex., shift from N to D range) in the idling state.

If the abnormal noise level fluctuates, this may be a hitting sound caused by wear of the crankshaft bearings or connecting rod bearings. (In this case, the lash adjuster is normal.)

4. Check for abnormal noise in the idling state after warm up operation is completed.

If the abnormal noise is quieter or has stopped, it is assumed that the noise was caused by fixing of the lash adjuster due to oil sludge, etc., so wash the lash adjuster. See **ROCKER ARMS AND CAMSHAFT**. If the abnormal noise level does not fluctuate, go to next step.

5. Bleed the air from the lash adjuster.
6. If the abnormal noise does not stop even after purging the air, wash the lash adjuster. See **ROCKER ARMS AND CAMSHAFT**.

PURGING OF THE LASH ADJUSTER**NOTE:**

1. If the vehicle is parked for a long time on a slope, the oil in the lash adjuster will decrease, and air may enter the high pressure chamber when starting.
2. When the vehicle is parked for a long time, there will be no oil in the oil

passage, and it will take time for the oil to be supplied to the lash adjuster. Thus, air may enter the high pressure chamber.

3. In the above cases, the abnormal noise can be stopped by purging the lash adjuster.

1. Check the engine oil, and replenish or replace it if necessary.

NOTE:

1. If the engine oil level is low, air will be sucked in from the oil screen and will enter the oil passage.
2. If the engine oil level is higher than the specified amount, the oil will be mixed by the crankshaft and a large amount of air may enter the oil.

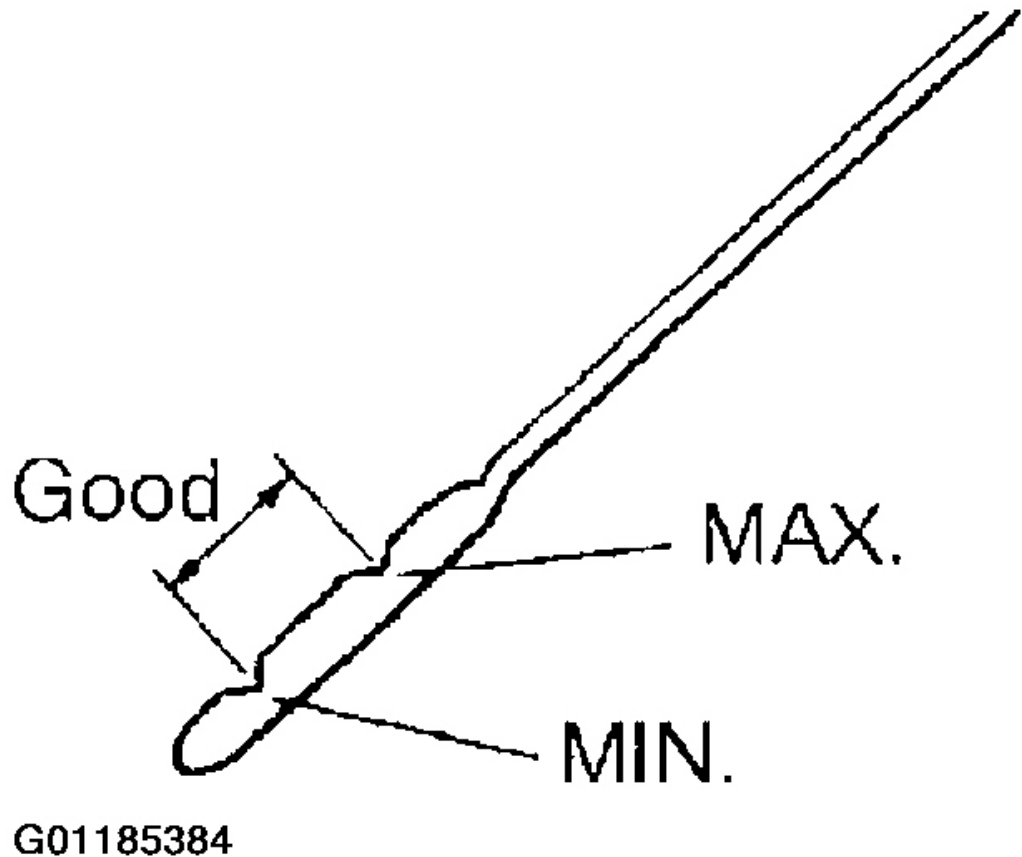
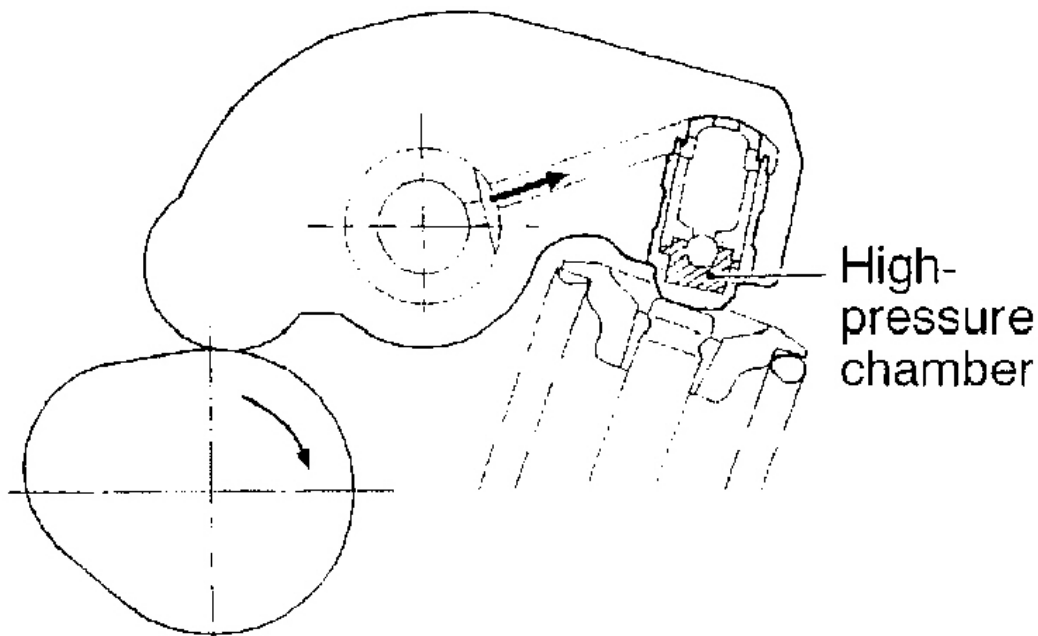


Fig. 22: Checking Engine Oil Level

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. If the oil is deteriorated, the air and oil will not separate easily, and the amount of air in the oil will increase.
4. If due to the above types of cases, air enters the oil and into the high pressure chamber of the lash adjuster, the air in the high pressure chamber will be compressed too much when the valve is opened, so abnormal noise will occur when the valve is shut. This is the same phenomenon as when the valve clearance is excessive. In this case, the lash adjuster functions will return to normal if the air in the lash adjuster is bled out.



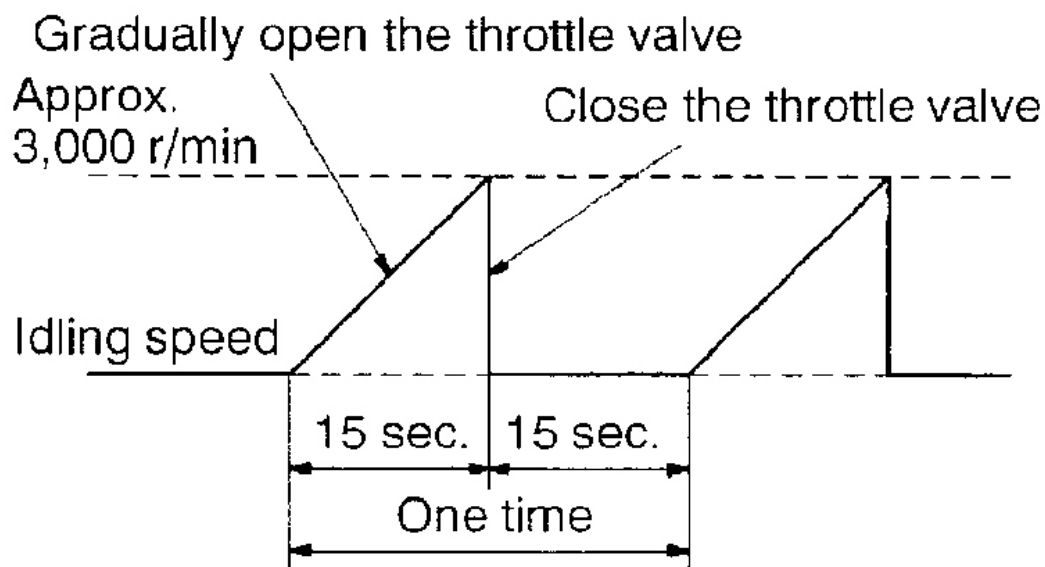
G01185385

Fig. 23: Identifying High Pressure Chamber

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2. Carry out warm up operation for one to three minutes in the idling state.
3. Repeat the operation pattern shown on the left in a no-load state, and check for abnormal noise. (Normally, the abnormal noise will stop after the pattern is repeated for 10 to 30 times, but if the abnormal noise level does not change even when the pattern is repeated for 30 or more times, the cause may be other than the entry of air.

Air bleeding operation pattern



G01185386

Fig. 24: Air Bleeding Operation Pattern

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

4. After the abnormal noise stops, repeat the operation pattern shown on the left for another five times.
5. For one to three minutes in the idling state, check that the abnormal noise has stopped.

ENGINE ASSEMBLY

REMOVAL & INSTALLATION

2002 Mitsubishi Mirage DE

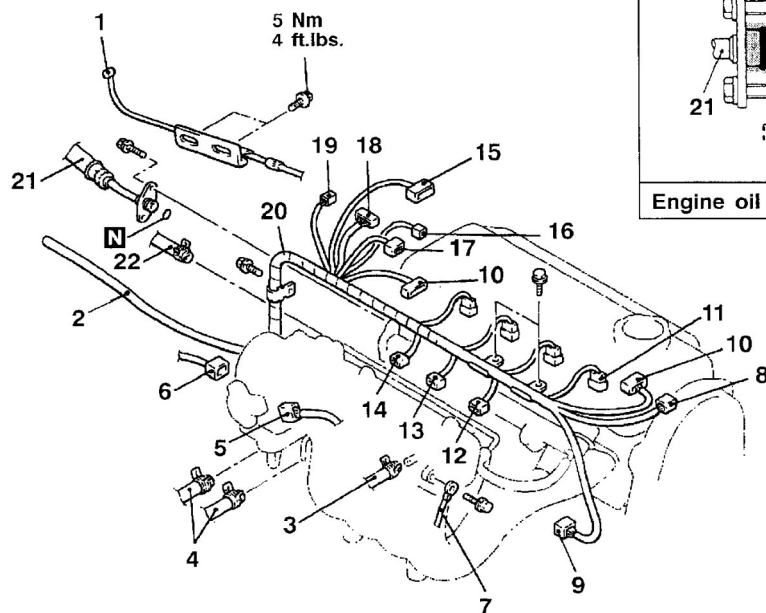
2002 ENGINES 1.8L 4-Cylinder - Mirage

Pre-removal Operation

- (1) Fuel Discharge Prevention
- (2) Under Cover Removal
- (3) Hood Removal
- (4) Air Cleaner Removal
- (5) Radiator Removal
- (6) Front Catalytic Converter Removal
- (7) Auto-cruise Vacuum Pump and Bracket Assembly Removal

Post-installation Operation

- (1) Auto-cruise Vacuum Pump and Bracket Assembly Installation
- (2) Front Catalytic Converter Installation
- (3) Radiator Installation
- (4) Air Cleaner Installation
- (5) Hood Installation
- (6) Under Cover Installation
- (7) Drive Belt Tension Adjustment
- (8) Accelerator Cable Adjustment



Engine oil

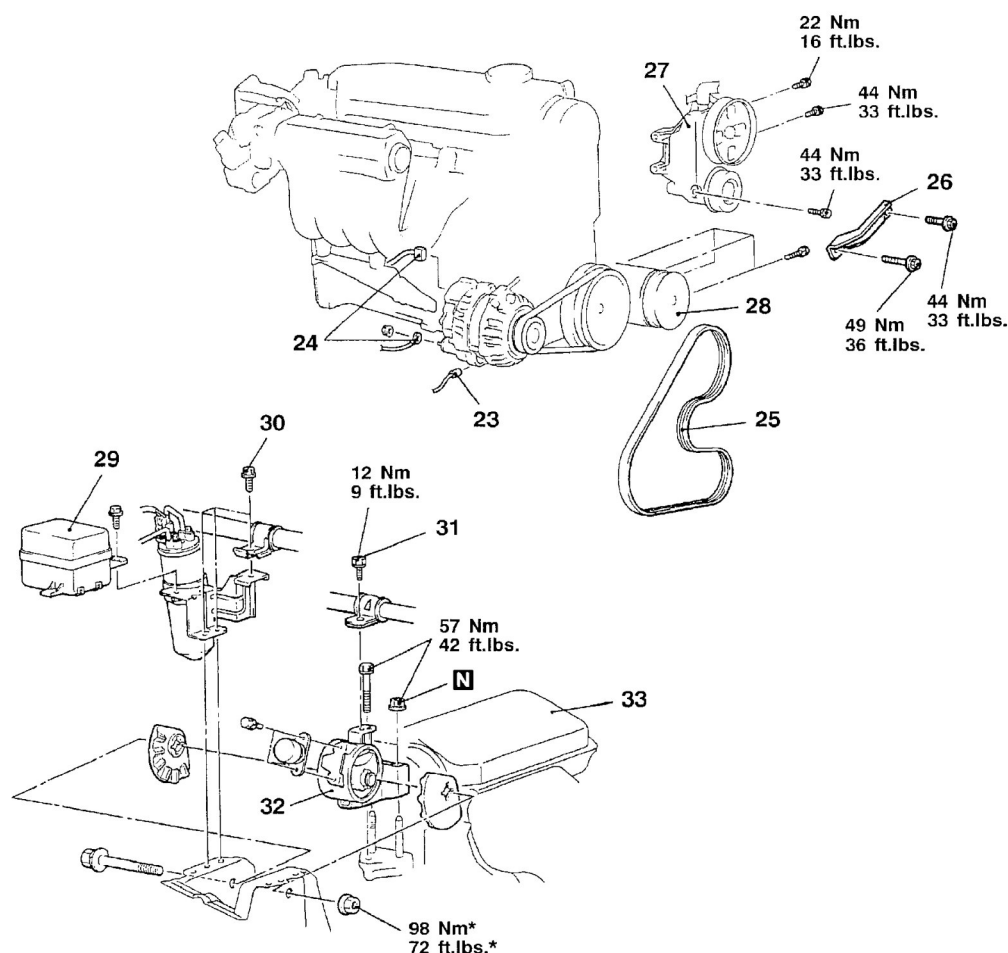
Removal steps

- | | |
|---|---|
| 1. Accelerator cable connection | 13. EGR solenoid connector |
| 2. Vacuum hose connection | 14. Manifold differential pressure sensor connector |
| 3. Brake booster vacuum hose connection | 15. Heated oxygen sensor connector |
| 4. Heater hose connection | 16. Engine coolant temperature gauge unit connector |
| 5. Throttle position sensor connector | 17. Engine coolant temperature sensor connector |
| 6. Idle speed control connector | 18. Camshaft position sensor connector |
| 7. Ground cable connection | 19. Noise condenser connector |
| 8. Crank angle sensor connector | 20. Control wiring harness |
| 9. Heated oxygen sensor connector | 21. High-pressure fuel hose connection |
| 10. Ignition coil connector | 22. Fuel return hose connection |
| 11. Injector connector | |
| 12. Evaporative emission purge solenoid | |



G01185387

Fig. 25: Removing & Installing Engine Assembly (1 Of 2)
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.



- 23. Oil pressure switch connector
- 24. Generator connector
- 25. Drive belt (Power steering and A/C)
- 26. Power steering pump bracket stay
- 27. Power steering oil pump and bracket assembly
- 28. Air conditioning compressor
- Transaxle assembly
- 29. Air conditioning relay box
- 30. Air conditioning receiver bracket mounting bolts

- 31. Power steering hose mounting bolt
- 32. Engine mount bracket
- 33. Engine assembly

Caution
Mounting locations marked by * should be provisionally tightened, and then fully tightened when the body is supporting the full weight of the engine.

G01185388

Fig. 26: Removing & Installing Engine Assembly (2 Of 2)
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

REMOVAL SERVICE POINTS

< A > POWER STEERING OIL PUMP AND BRACKET ASSEMBLY REMOVAL

Remove the power steering oil pump and bracket assembly from the engine with the hose attached.

NOTE: Place the removed power steering oil pump in a place where it will not be a

hindrance when removing and installing the engine assembly, and tie it with a cord.

< B > A/C COMPRESSOR REMOVAL

Disconnect the A/C compressor connector and remove the compressor from the compressor bracket with the hose still attached.

NOTE: Place the removed A/C compressor where it will not be a hindrance when removing and installing the engine assembly, and tie it with a cord.

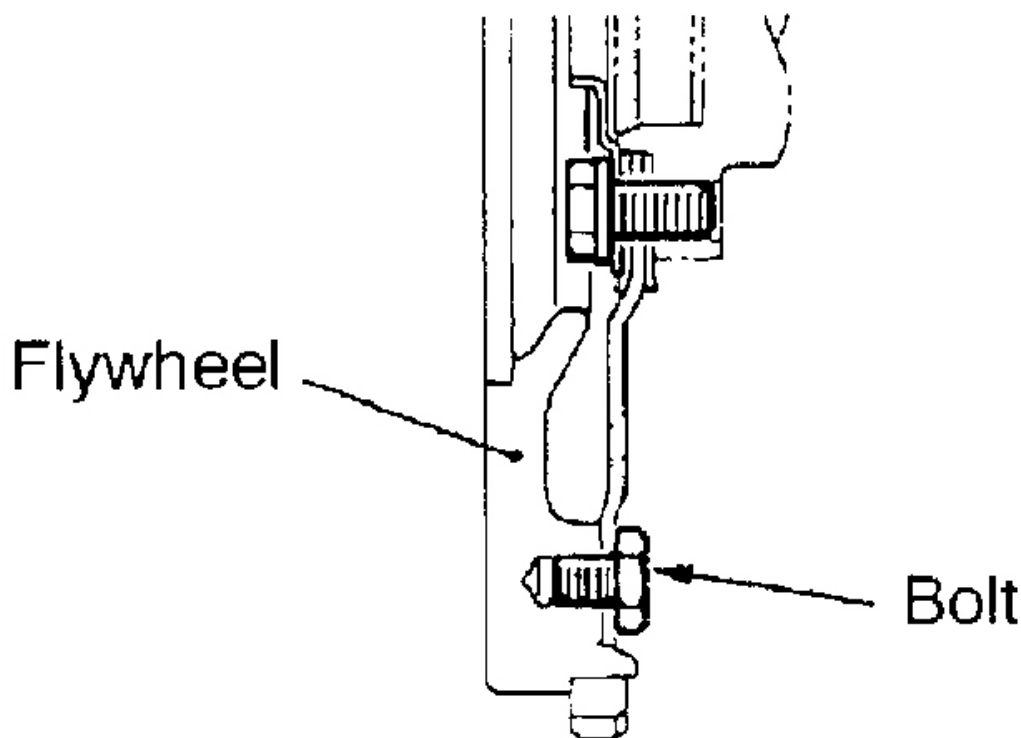
< C > TRANSAXLE ASSEMBLY REMOVAL

< M/T >:

See **REMOVAL & INSTALLATION - M/T** .

CAUTION: Do not remove the flywheel mounting bolt shown by the arrow. If this bolt is removed, the flywheel will become out of balance and damaged.

<M/T>



G01185389

Fig. 27: Identifying Flywheel Bolt

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

< A/T >:

See **REMOVAL & INSTALLATION A/T** .**< D > ENGINE MOUNT BRACKET REMOVAL**

1. Support the engine with a garage jack.
2. Remove the special tool which was attached when the transaxle assembly was removed.
3. Hold the engine assembly with a chain block or similar tool.
4. Place a garage jack against the engine oil pan with a piece of wood in between, jack up the engine so that the weight of the engine is no longer being applied to the engine mount bracket, and then remove the engine mount bracket.

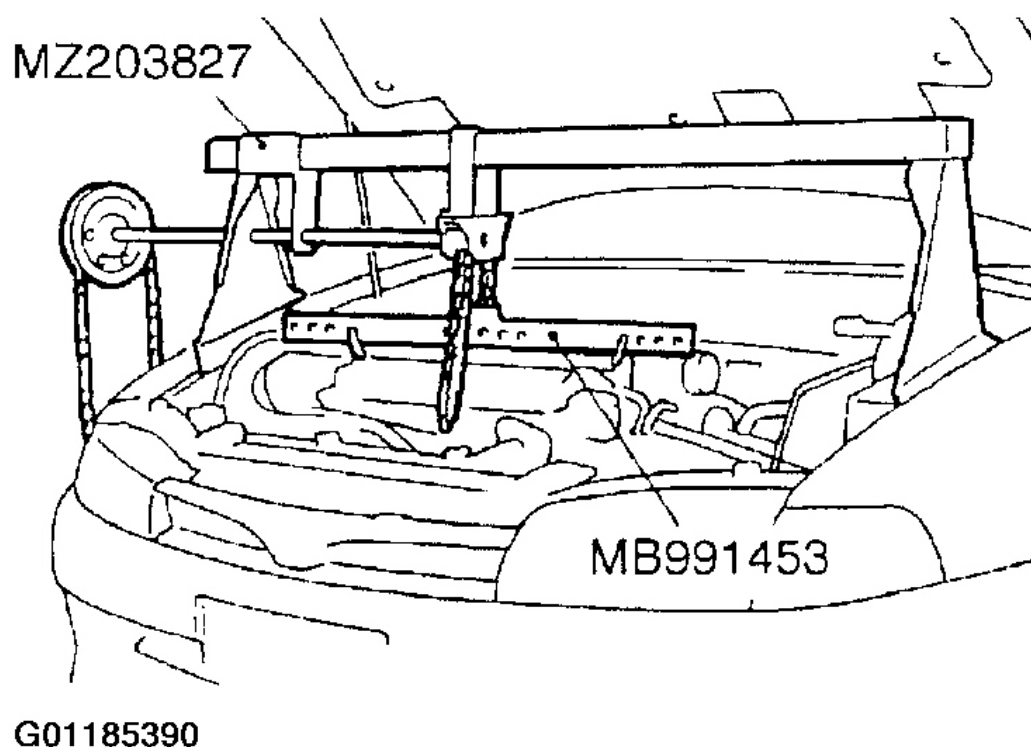


Fig. 28: Supporting Engine Assembly With Special Tool
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

< E > ENGINE ASSEMBLY REMOVAL

After checking that all cables, hoses and harness connectors, etc., are disconnected from the engine, 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, checking that the cables, hoses, and harness connectors are not pinched.

>B< ENGINE MOUNT BRACKET INSTALLATION

1. Place a garage jack against the engine oil pan with a piece of wood in between, and install the engine mount bracket while adjusting the position of the engine.
2. Support the engine with the garage jack.
3. Remove the chain block and support the engine assembly with the special tool.

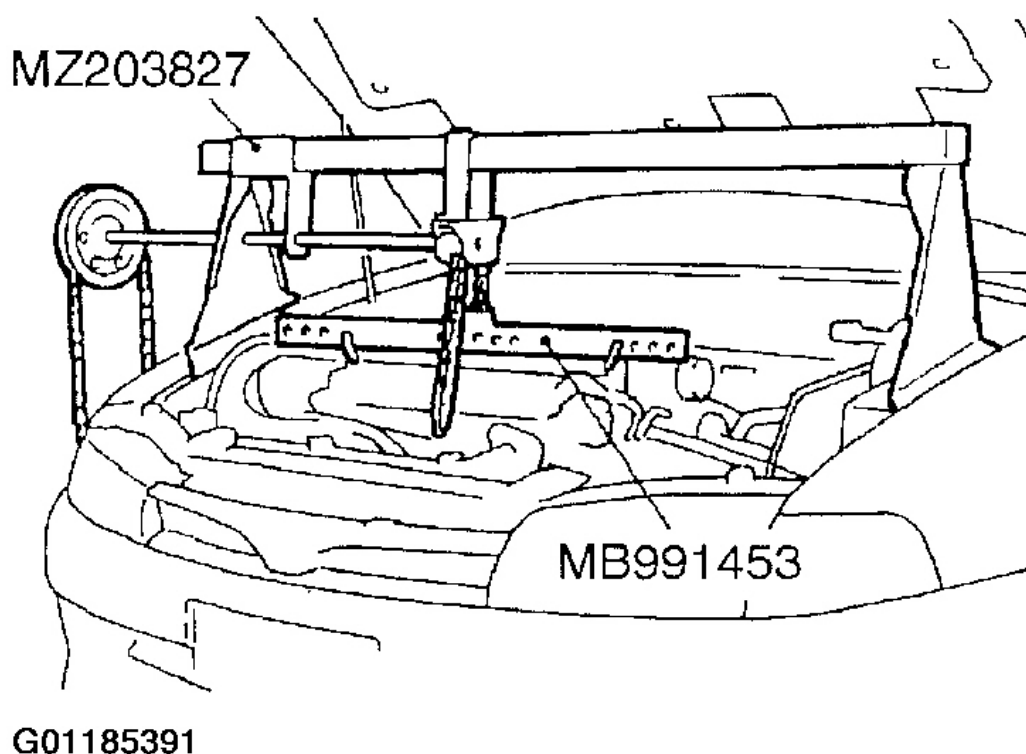


Fig. 29: Supporting Engine Assembly With Special Tool
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>C< HIGH-PRESSURE FUEL HOSE INSTALLATION

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

CAUTION: Do not let any engine oil get into the fuel rail.

2. While turning the high-pressure fuel hose clockwise and counterclockwise, install it to the fuel rail, while being careful not to damage the O-ring. After installing, check that the hose turns smoothly.
3. If the hose does not turn smoothly, the O-ring is probably being pinched. Disconnect the high-pressure fuel hose and check the O-ring for damage. After this, re-insert the fuel rail and check that the hose turns smoothly.

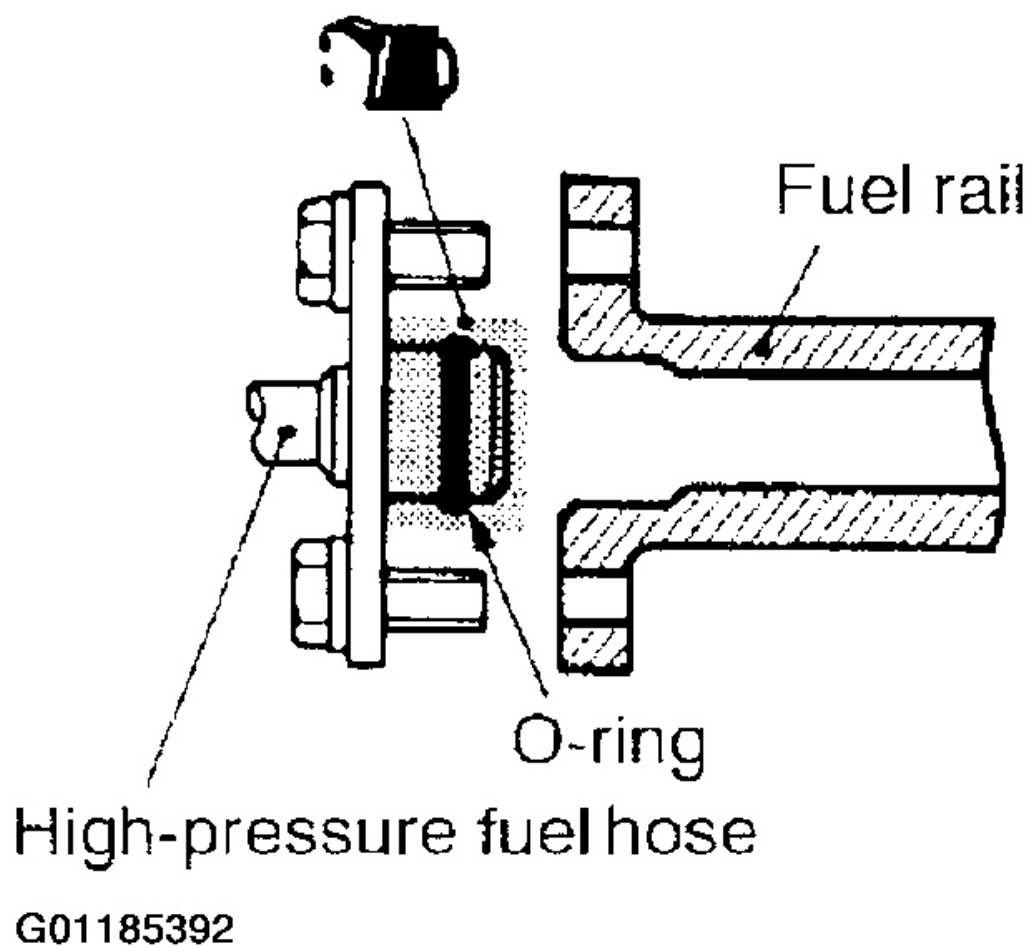


Fig. 30: Installing High-Pressure Fuel Hose

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

CRANKSHAFT PULLEY

REMOVAL & INSTALLATION

2002 Mitsubishi Mirage DE

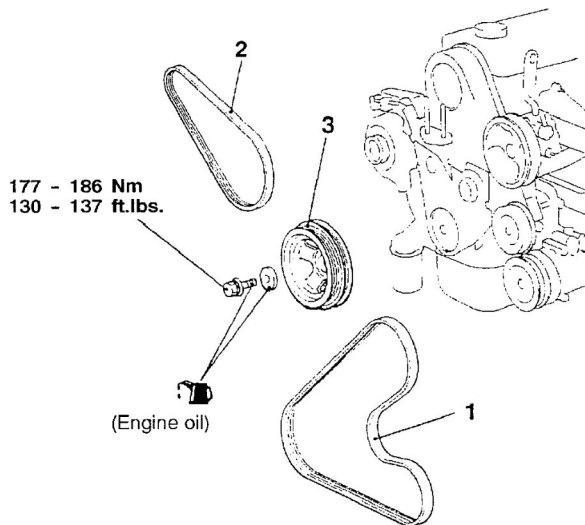
2002 ENGINES 1.8L 4-Cylinder - Mirage

Pre-removal Operation

- Under Cover Removal

Post-installation Operation

- (1) Drive Belt Tension Adjustment
- (2) Under Cover Installation



Removal steps

1. Drive belt (Power steering and A/C)



2. Drive belt (Generator)
3. Crankshaft pulley

G01185393

Fig. 31: Removing & Installing Crankshaft Pulley

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

REMOVAL SERVICE POINT

< A > CRANKSHAFT PULLEY REMOVAL

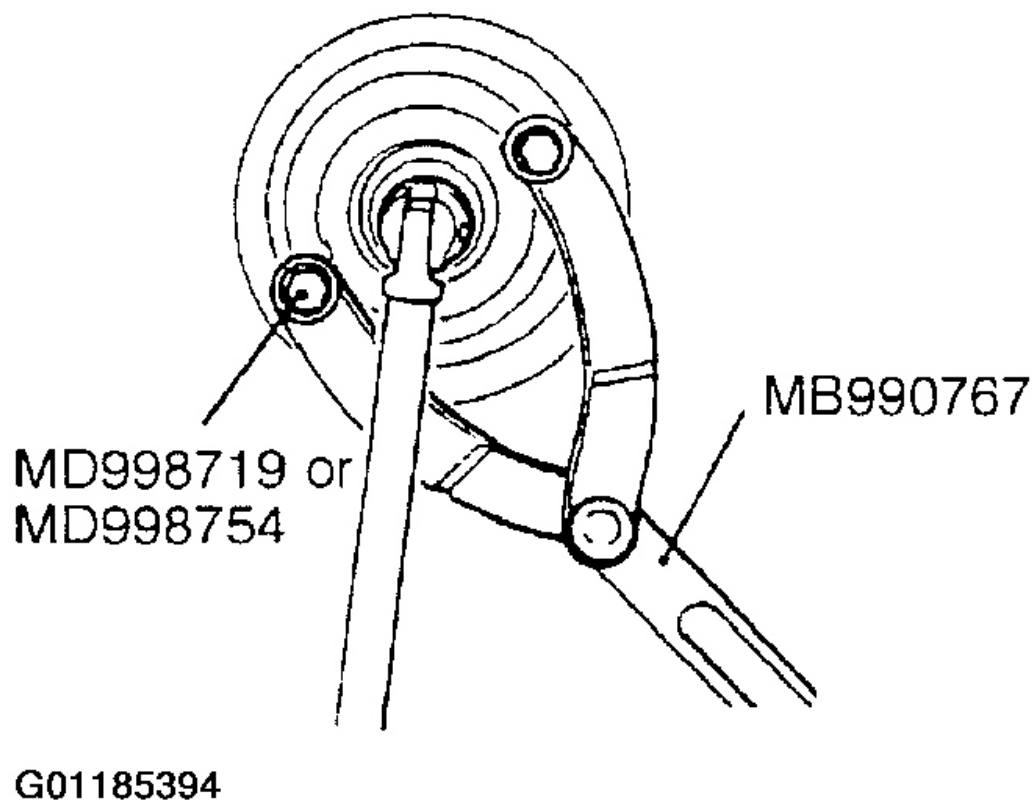


Fig. 32: Removing Crankshaft Pulley

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

INSTALLATION SERVICE POINT

< A > CRANKSHAFT PULLEY INSTALLATION

When installing the crankshaft bolt, apply a minimal amount of engine oil to the bearing surface and thread of the bolt.

CAMSHAFT AND CAMSHAFT OIL SEAL

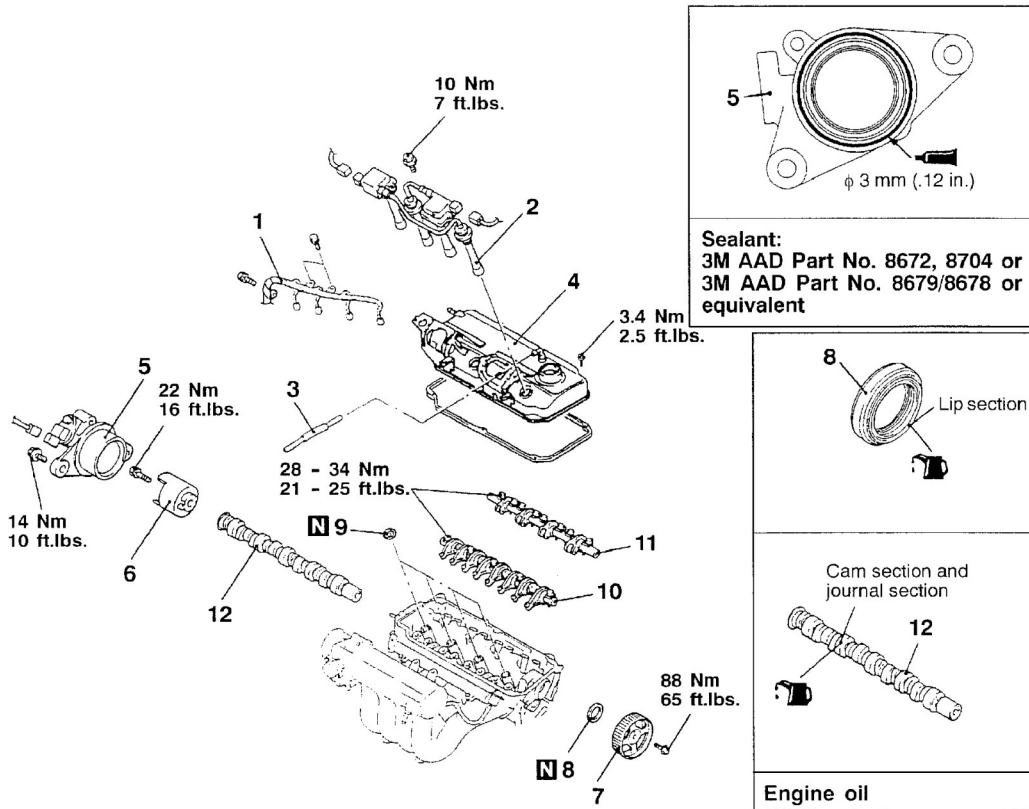
REMOVAL & INSTALLATION

2002 Mitsubishi Mirage DE

2002 ENGINES 1.8L 4-Cylinder - Mirage

Pre-removal and Post-installation Operation

- (1) Air Cleaner Removal and Installation
- (2) Timing Belt Removal and Installation



Removal steps

1. Control harness connection
2. Spark plug cable
3. PCV hose connection
4. Rocker cover
5. Camshaft position sensor support
6. Camshaft position sensing cylinder
7. Camshaft sprocket

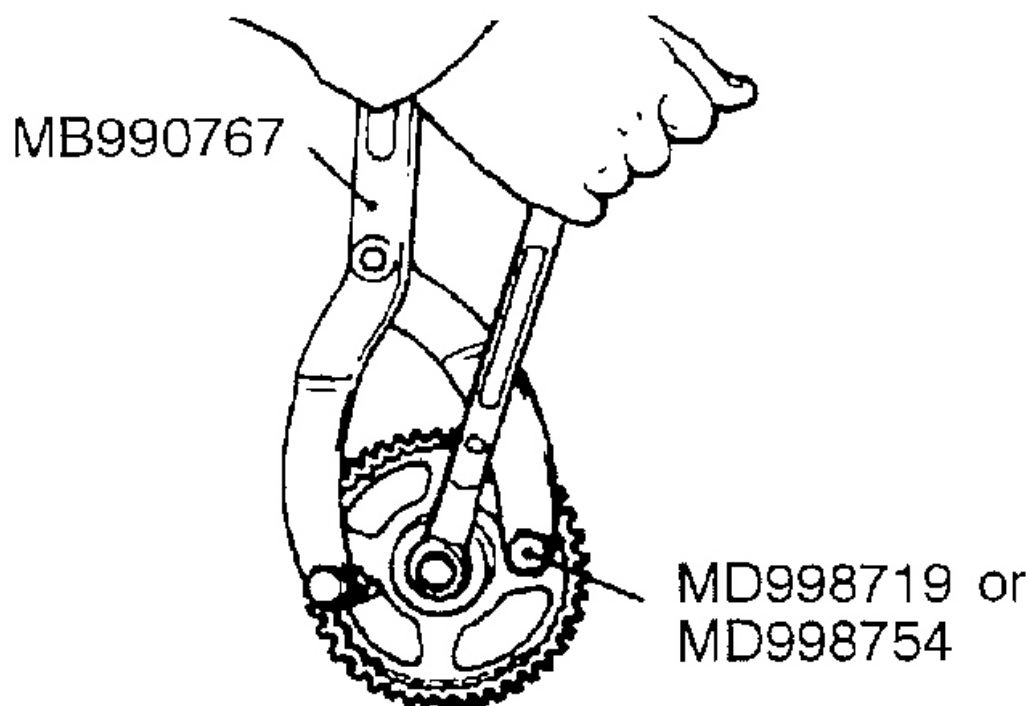
8. Camshaft oil seal
9. Spark plug guide oil seal
10. Lash adjuster, intake rocker arm and shaft assembly
11. Lash adjuster, exhaust rocker arm and shaft assembly
12. Camshaft

G01185395

Fig. 33: Removing & Installing Camshaft & Camshaft Oil Seal
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

REMOVAL SERVICE POINTS

< A > CAMSHAFT SPROCKET REMOVAL



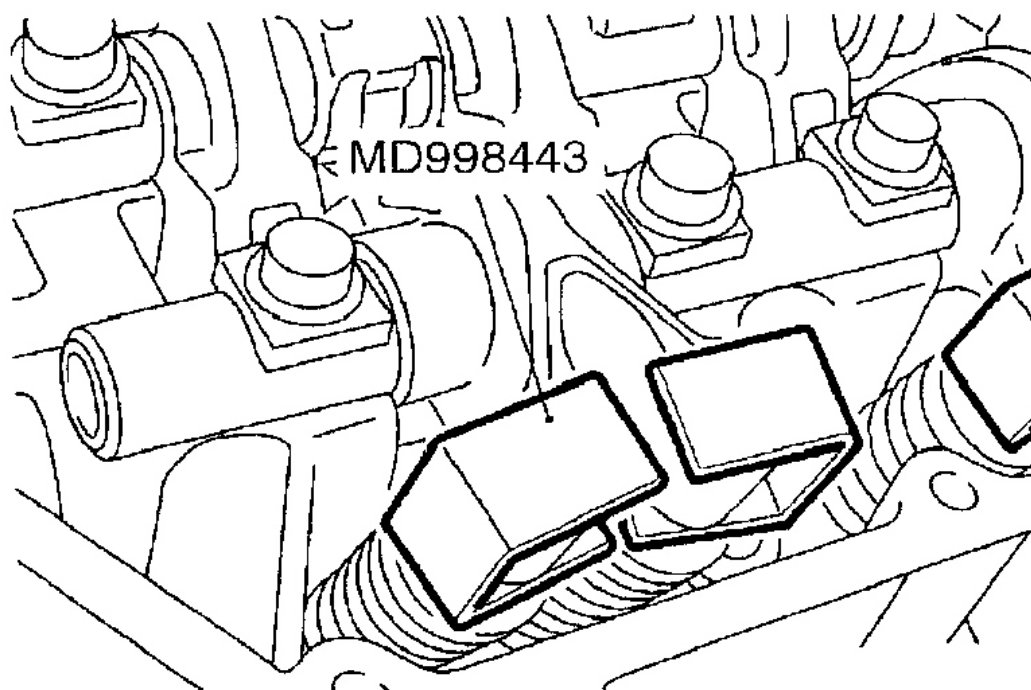
G01185396

Fig. 34: Removing Camshaft Sprocket

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

< B > LASH ADJUSTER, INTAKE ROCKER ARM AND SHAFT ASSEMBLY/LASH ADJUSTER, EXHAUST ROCKER ARM AND SHAFT ASSEMBLY REMOVAL

Before removing the lash adjuster, rocker arm and shaft assembly, install the special tools as shown in the illustration so that the lash adjusters will not fall out.



G01185397

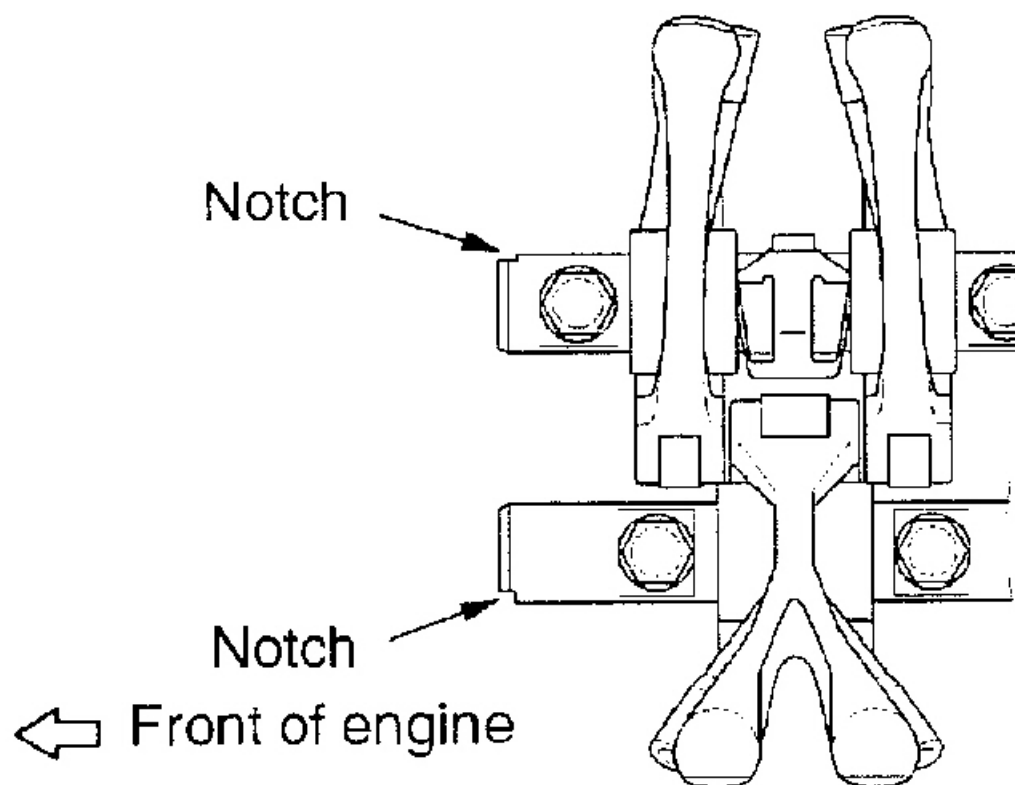
Fig. 35: Installing Special Tool MD998443

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

INSTALLATION SERVICE POINTS

< A > LASH ADJUSTER, EXHAUST ROCKER ARM AND SHAFT ASSEMBLY/LASH ADJUSTER, INTAKE ROCKER ARM AND SHAFT ASSEMBLY INSTALLATION

Set the notch of rocker arm shaft to the direction as shown in the illustration, and install the lash adjuster, rocker arm and shaft assembly.



G01185398

Fig. 36: Setting Notch Of Rocker Arm Shaft
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

< B > CAMSHAFT OIL SEAL INSTALLATION

1. Apply engine oil to the camshaft oil seal lip.
2. Use the special tool to press-fit the camshaft oil seal.

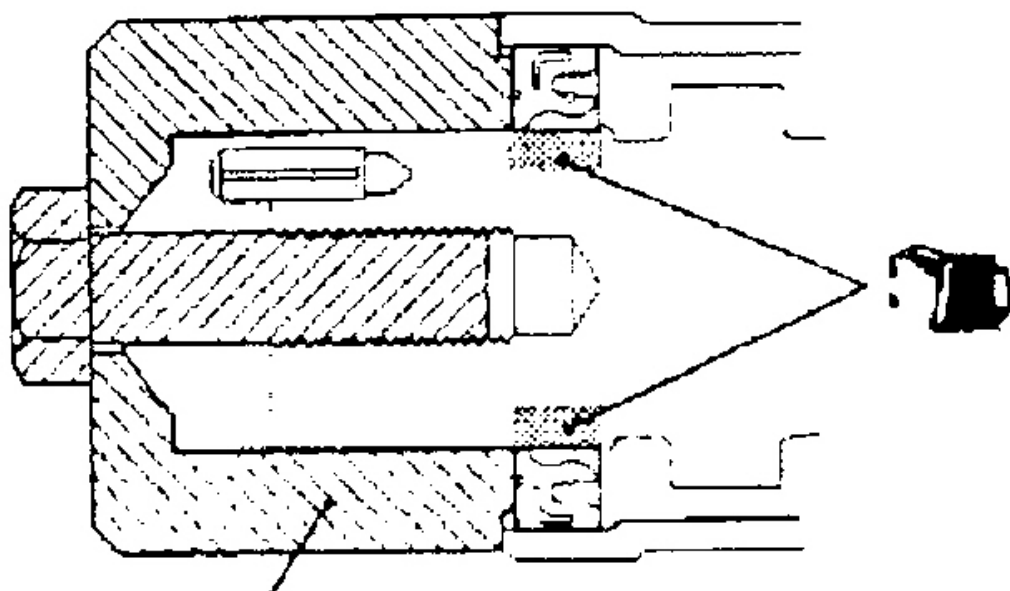
**MD998713****G01185399**

Fig. 37: Using Special Tool MD998713

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

< C > CAMSHAFT SPROCKET INSTALLATION

Use the special tool to stop the camshaft sprocket from turning in the same way as was done during removal, and then tighten the bolts to the specified torque.

OIL PAN

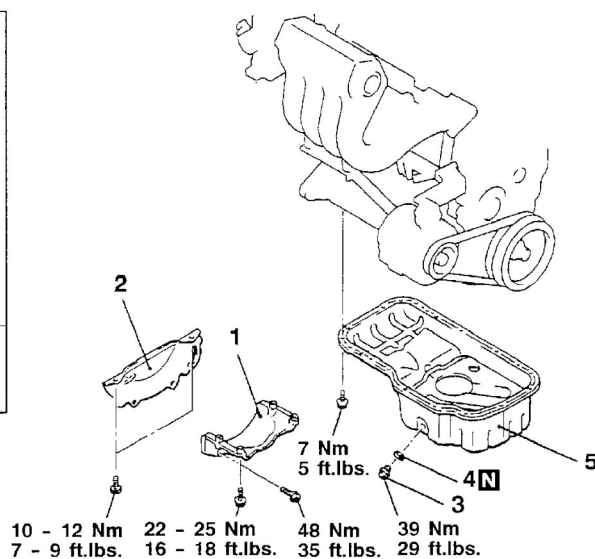
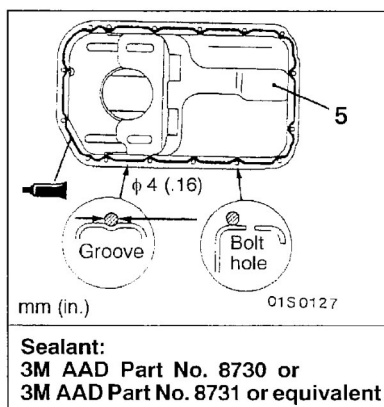
REMOVAL & INSTALLATION

Pre-removal and Post-installation Operation

(1) Engine Oil Draining and Supplying

(3) Front Catalytic Converter Removal and Installation

(2) Oil Dipstick Removal and Installation

**Removal steps**

1. Transaxle stay
2. Bell housing cover
3. Drain plug

4. Drain plug gasket
5. Oil pan

G01185400

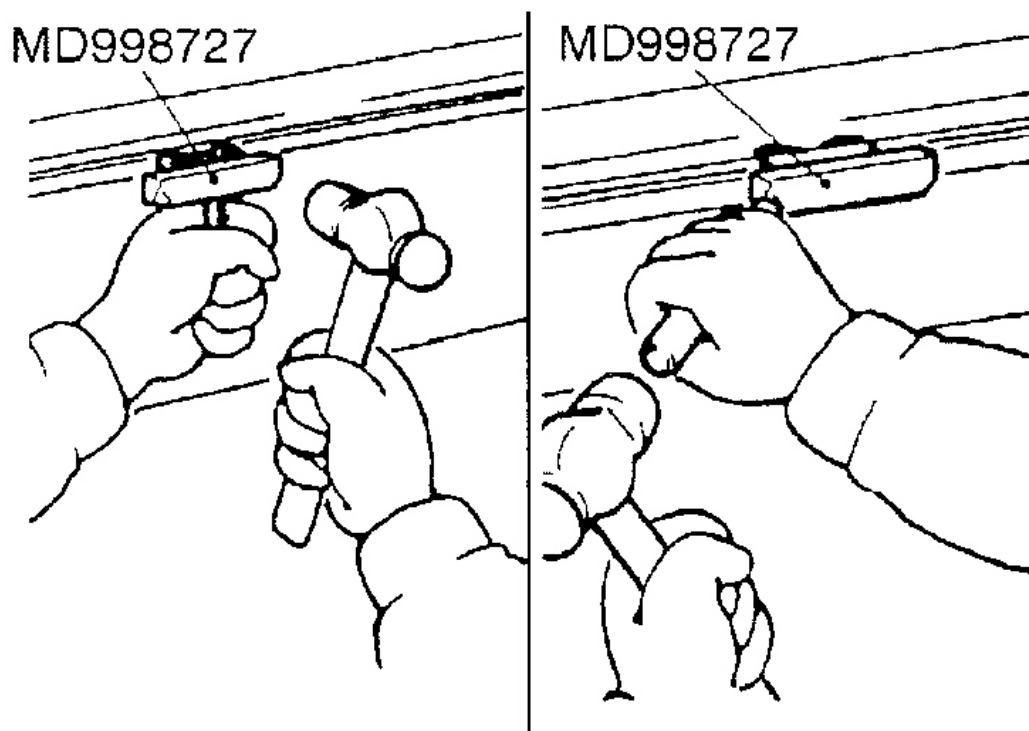
Fig. 38: Removing & Installing Oil Pan

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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

After removing the oil pan mounting bolts, remove the oil pan with the special tool and a brass bar.

CAUTION: Perform this slowly to avoid deformation of the oil pan flange.



G01185401

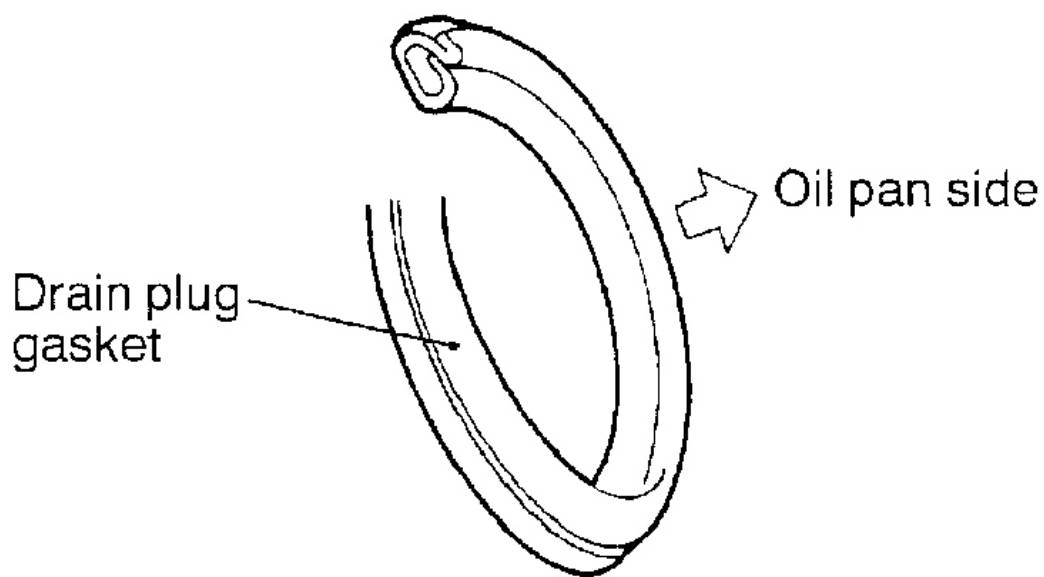
Fig. 39: Removing Oil Pan

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

INSTALLATION SERVICE POINT

>A< DRAIN PLUG GASKET INSTALLATION

Install the drain plug gasket so it faces in the direction shown in the illustration.



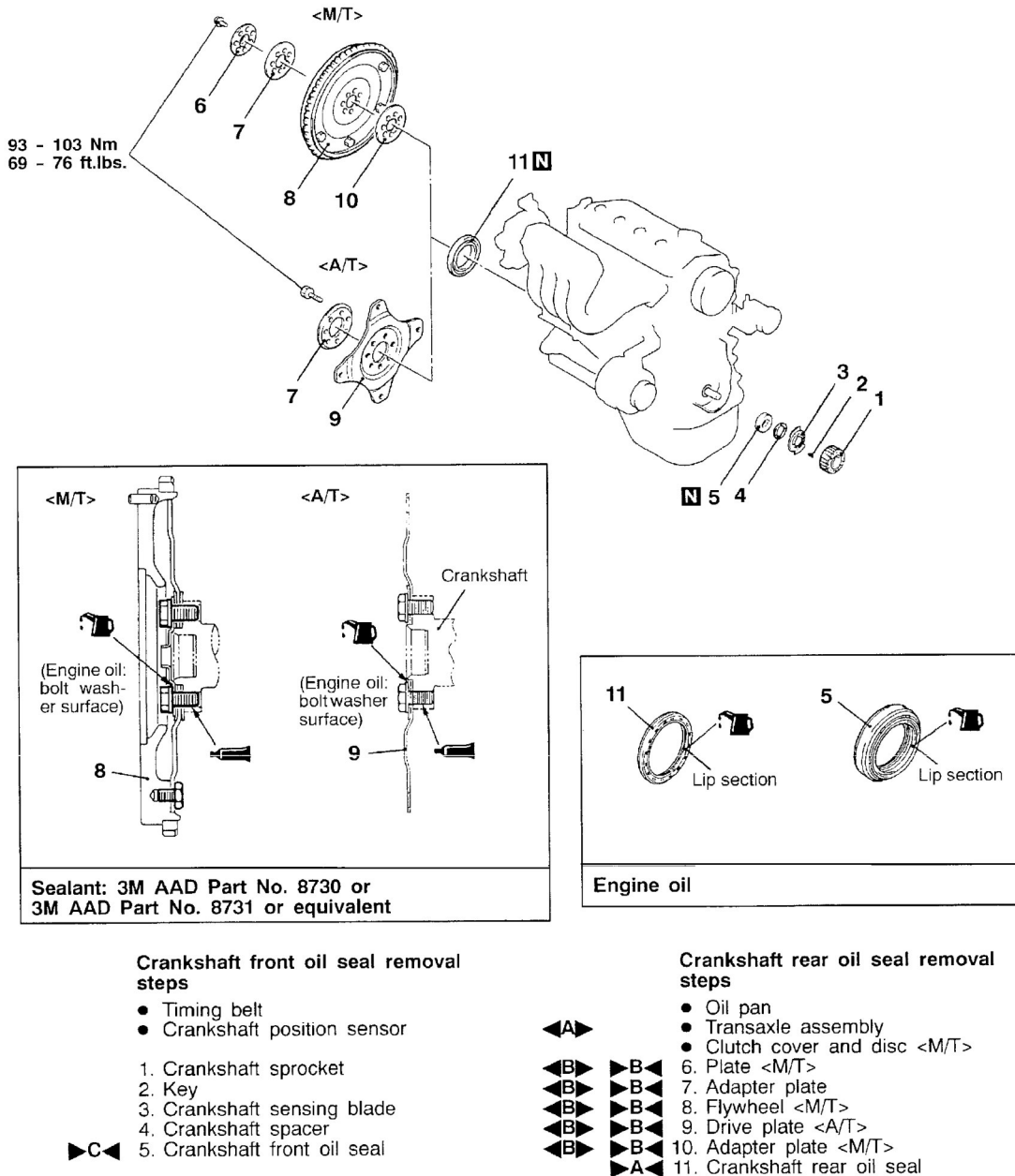
G01185402

Fig. 40: Installing Drain Plug Gasket

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

CRANKSHAFT OIL SEAL

REMOVAL & INSTALLATION



G01185403

Fig. 41: Removing & Installing Crankshaft Oil Seal
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

CAUTION: Do not disassemble the flywheel, as its runout is adjusted as an assembly. If it is disassembled, the flywheel may lose the balance and get damage.

REMOVAL SERVICE POINT

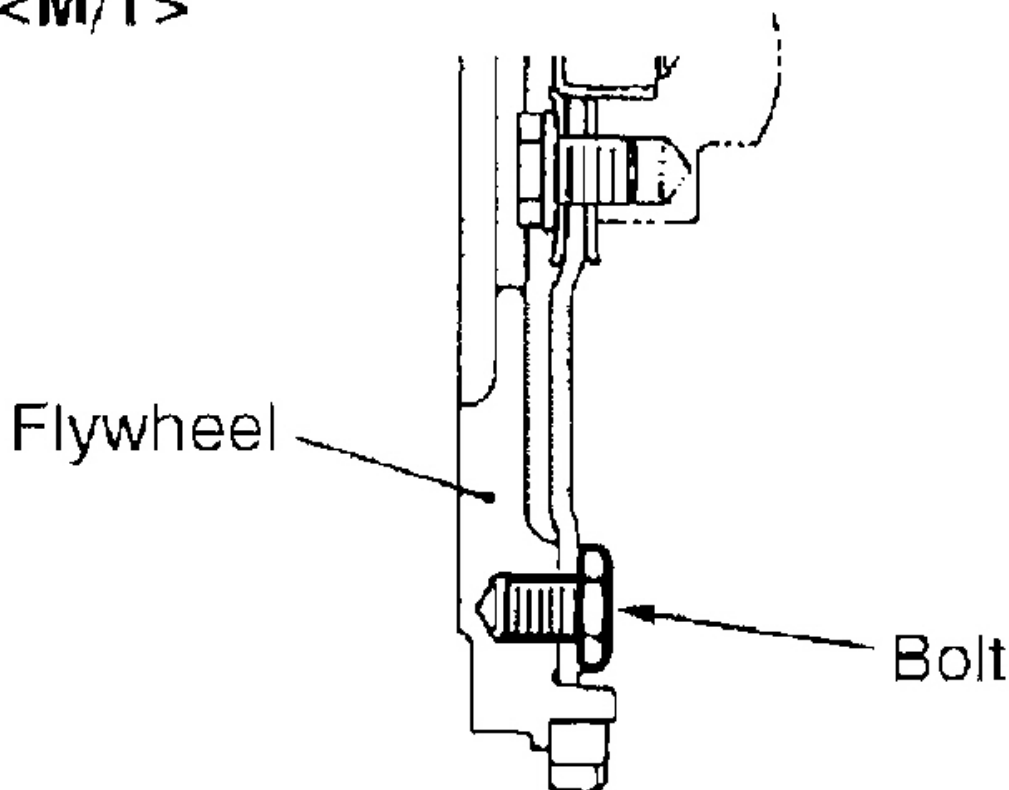
< A > TRANSAXLE ASSEMBLY REMOVAL

< M/T >:

See REMOVAL & INSTALLATION - M/T .

CAUTION: Do not remove the flywheel mounting bolt shown by the arrow. If this bolt is removed, the flywheel will become out of balance and damaged.

<M/T>



G01185404

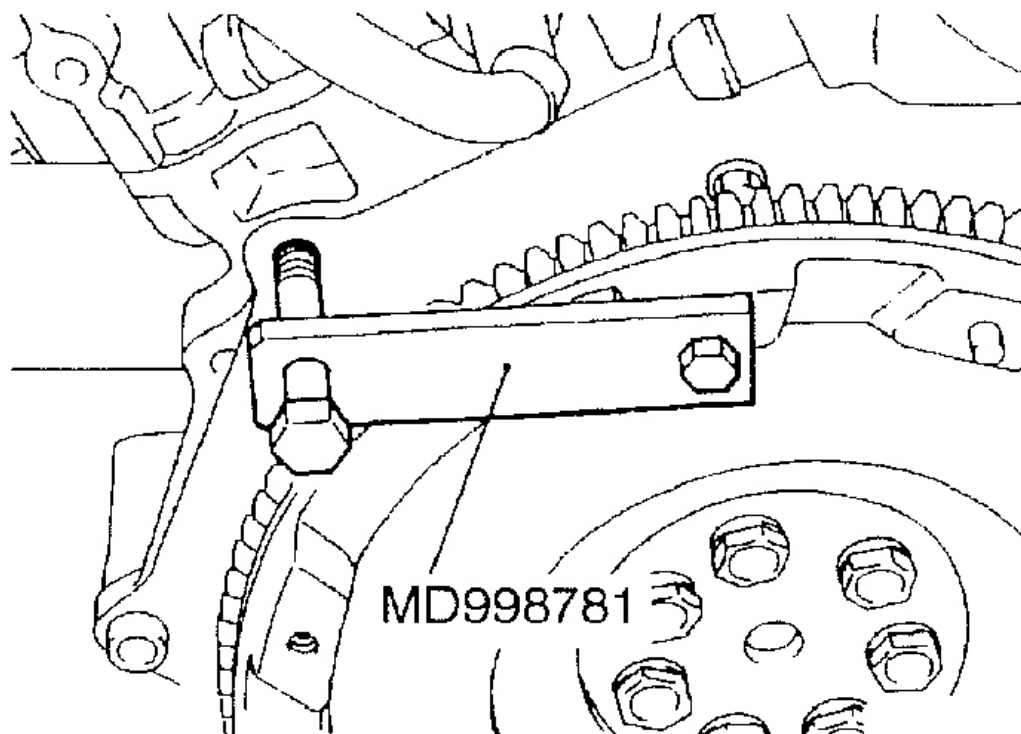
Fig. 42: Identifying Flywheel Mounting Bolt
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

< A/T >:

See REMOVAL & INSTALLATION A/T .

< B > PLATE < M/T >/ADAPTER PLATE/FLYWHEEL < M/T >/DRIVE PLATE < A/T > REMOVAL

Use the special tool to secure the flywheel or drive plate, and remove the bolts.



G01185405

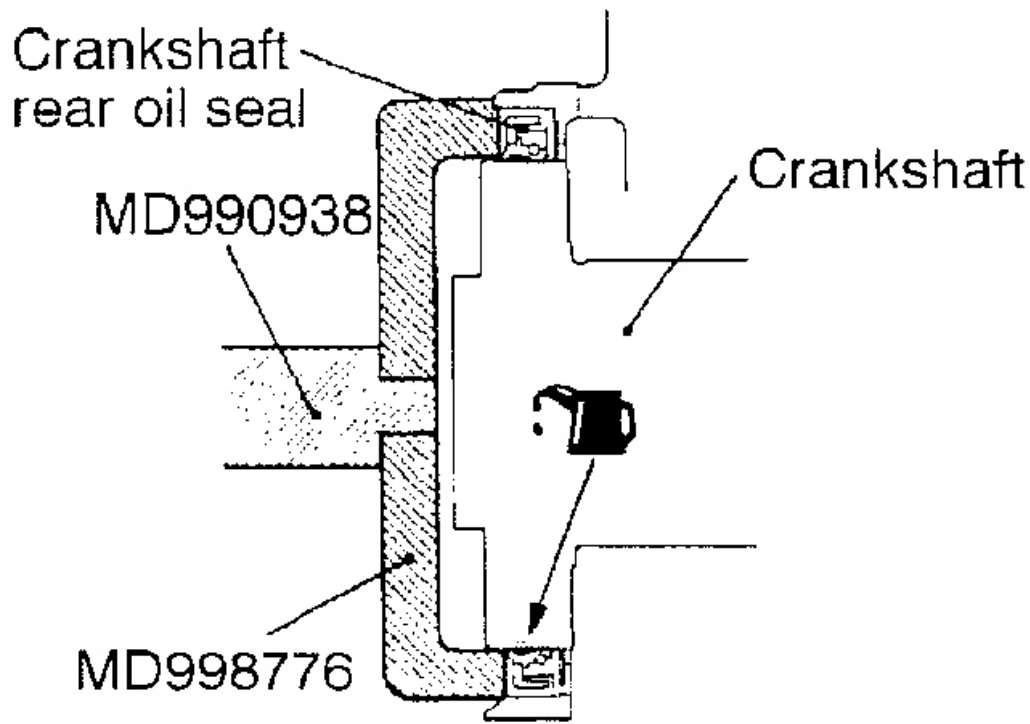
Fig. 43: Using Special Tool MD998781

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. Install the oil seal by tapping it as far as the chamfered position of the oil seal case as shown in the illustration.



G01185406

Fig. 44: Installing Crankshaft Rear Oil Seal
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>B< DRIVE PLATE < A/T >/FLYWHEEL < M/T >/ADAPTER PLATE/PLATE < M/T > INSTALLATION

1. Clean off all sealant, oil and other substances which are adhering to the threaded bolts, crankshaft thread holes and the flywheel or drive plate.
2. Apply oil to the bearing surface of the flywheel or drive plate bolts.
3. Apply oil to the crankshaft thread holes.
4. Apply sealant to the threaded mounting holes.

Specified sealant:

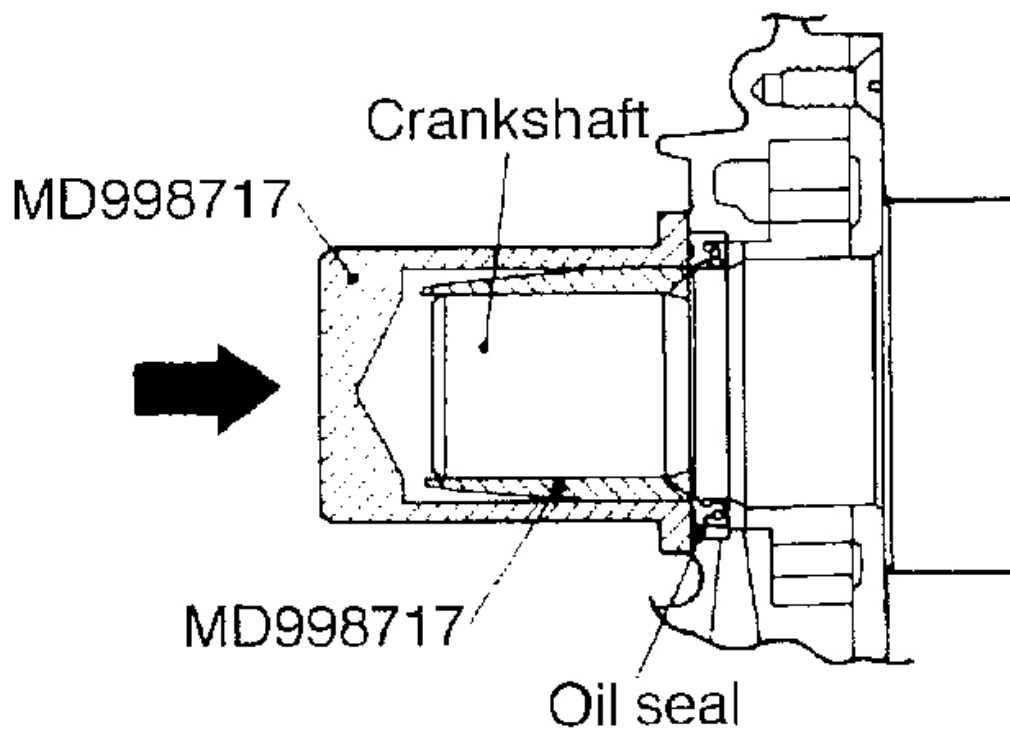
3M AAD Part No. 8730 or

3M AAD Part No. 8731 or equivalent

5. Use the special tool to hold the flywheel or drive plate in the same manner as removal, and install the bolt.

>C< CRANKSHAFT FRONT OIL SEAL INSTALLATION

1. Apply a small amount of engine oil to the entire circumference of the oil seal lip.
2. Tap the oil seal until it is flush with the oil seal case.

**G01185407****Fig. 45: Installing Crankshaft Front Oil Seal****Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.****CYLINDER HEAD GASKET****REMOVAL & INSTALLATION**

2002 Mitsubishi Mirage DE

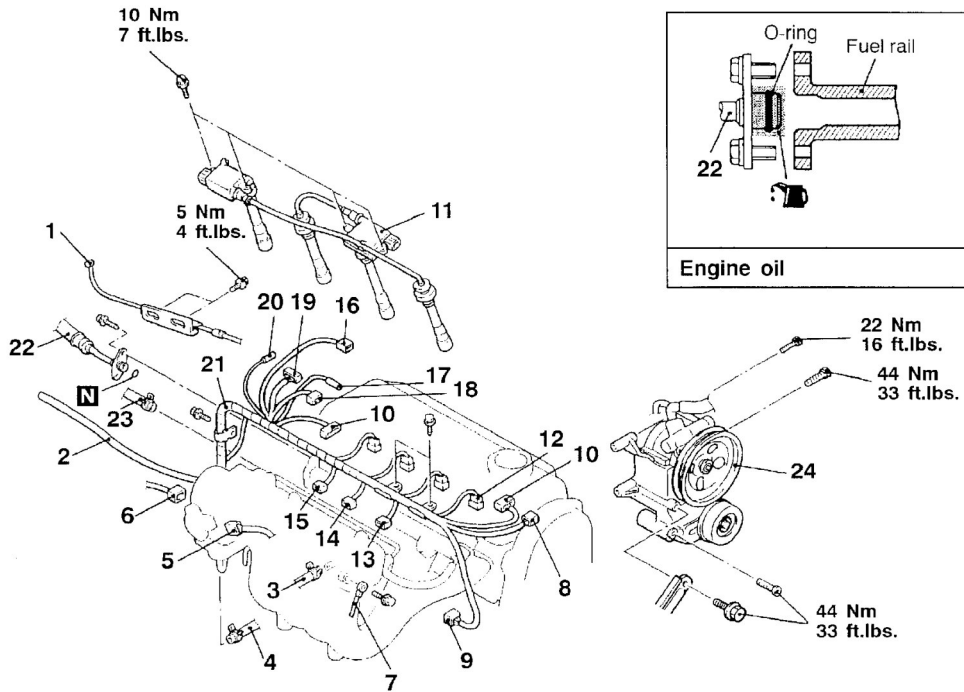
2002 ENGINES 1.8L 4-Cylinder - Mirage

Pre-removal Operation

- (1) Fuel Discharge Prevention
- (2) Engine Oil Draining
- (3) Thermostat Case Assembly Removal

Post-installation Operation

- (1) Thermostat Case Assembly Installation
- (2) Engine Oil Supplying
- (3) Accelerator Cable Adjustment



Removal steps

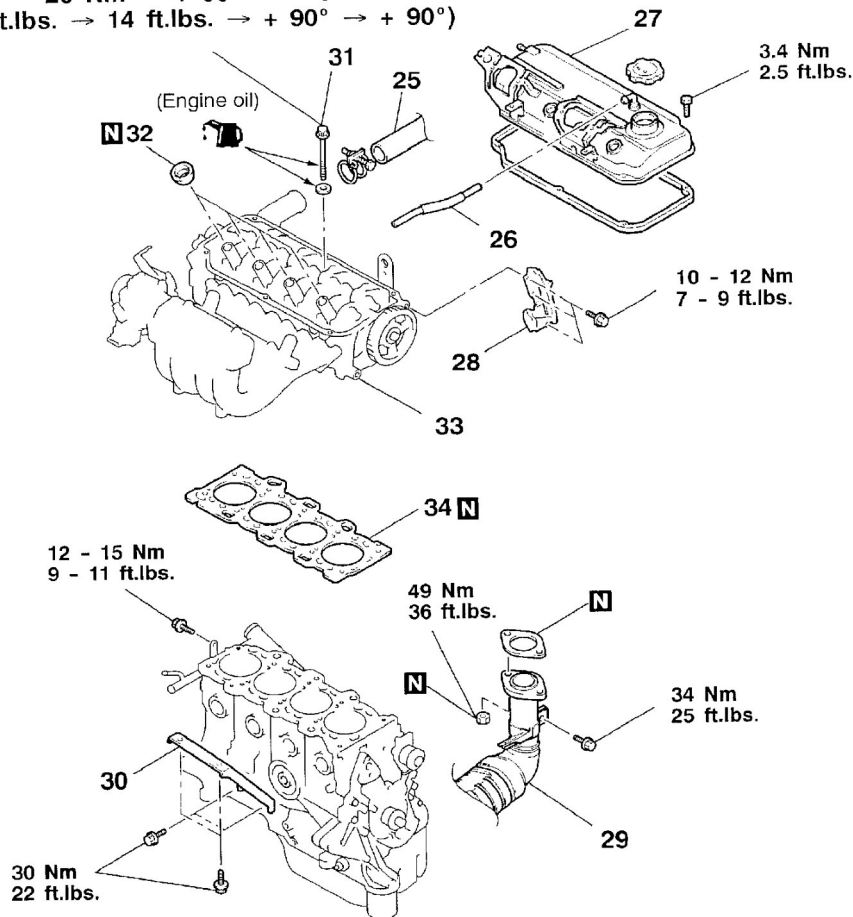
1. Accelerator cable connection
2. Vacuum hose connection
3. Brake booster vacuum hose connection
4. Water hose connection
5. Throttle position sensor connector
6. Idle speed control connector
7. Ground cable connection
8. Crankshaft position sensor connector
9. Heated oxygen sensor connector
10. Ignition coil connector
11. Ignition coil assembly
12. Injector connector
13. Evaporative emission purge solenoid connector
14. EGR solenoid valve connector
15. Manifold differential pressure sensor connector
16. Heated oxygen sensor connector
17. Engine coolant temperature gauge unit connector
18. Engine coolant temperature sensor connector
19. Camshaft position sensor connector
20. Noise condenser connector
21. Control wiring harness
22. High-pressure fuel hose connection
23. Fuel return hose connection
24. Power steering oil pump and bracket assembly

G01185408

Fig. 46: Removing & Installing Cylinder Head Gasket (1 Of 2)
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

<Cold engine>

74 Nm → 0 Nm → 20 Nm → + 90° → + 90°
(54 ft.lbs. → 0 ft.lbs. → 14 ft.lbs. → + 90° → + 90°)



G01185409

Fig. 47: Removing & Installing Cylinder Head Gasket (2 Of 2)
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

REMOVAL SERVICE POINTS

< A > POWER STEERING OIL PUMP AND BRACKET ASSEMBLY REMOVAL

Remove the power steering oil pump and bracket assembly from the engine with the hose attached.

NOTE: Place the removed power steering oil pump in a place where it will not be a

hindrance when removing and installing the cylinder head assembly, and tie it with a cord.

< B > RADIATOR UPPER HOSE DISCONNECTION

After making mating marks on the radiator hose and the hose clamp, disconnect the radiator hose.

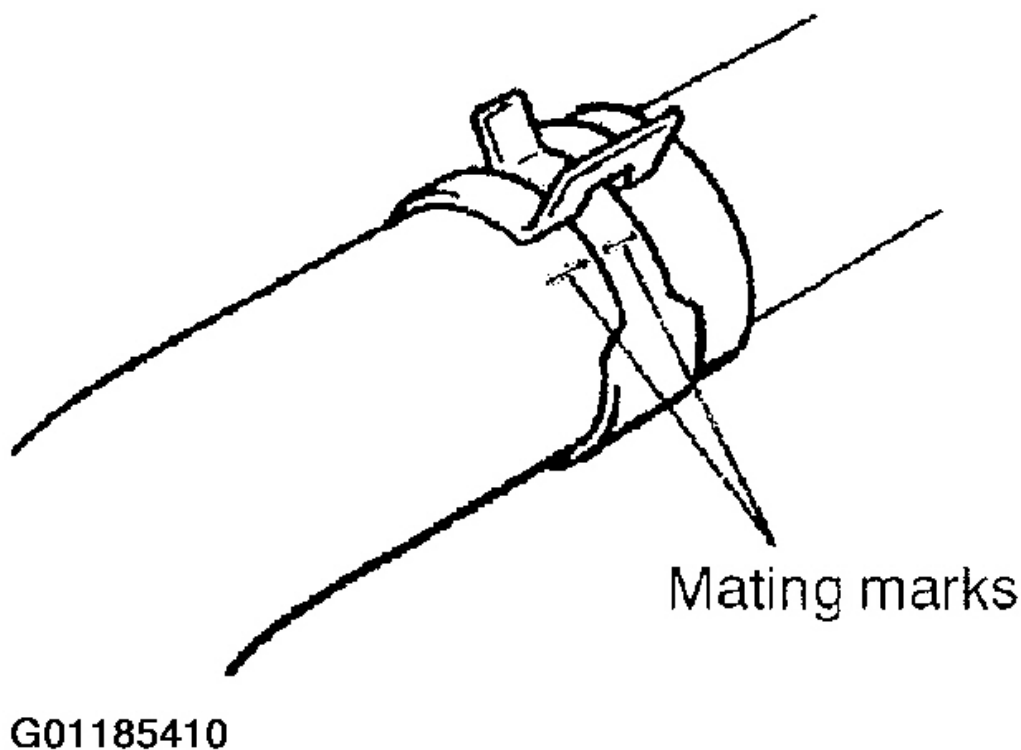
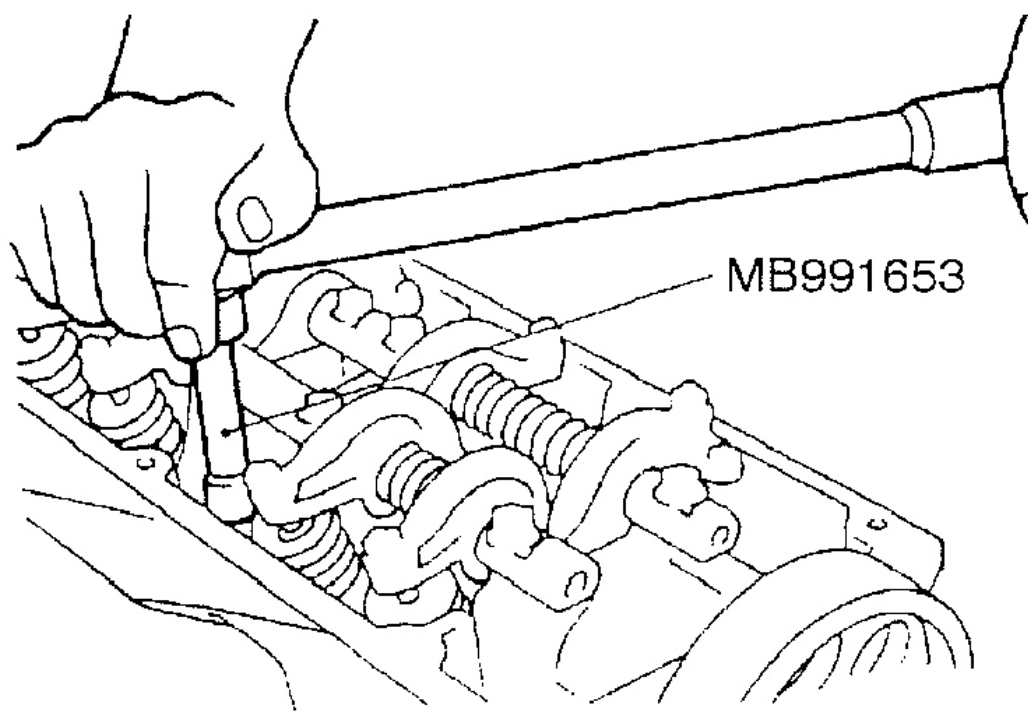


Fig. 48: Disconnecting Radiator Upper Hose
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

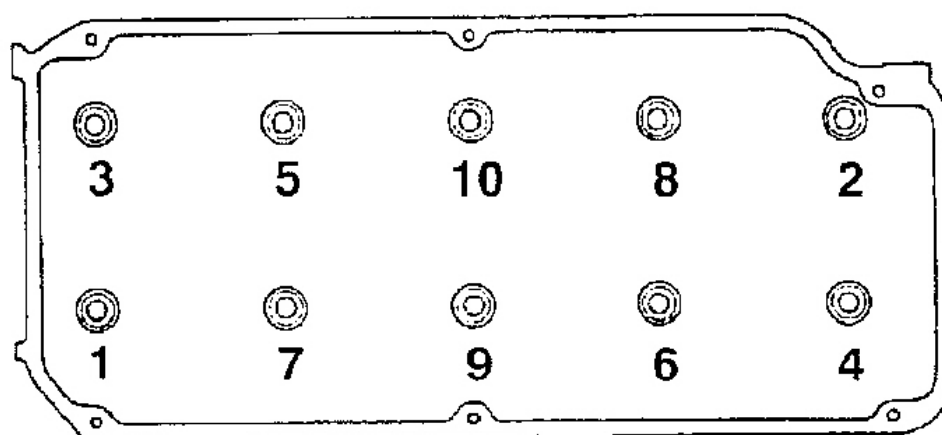
< C > CYLINDER HEAD BOLT REMOVAL

Using the special tool, loosen the bolts in 2 or 3 steps in the order of the numbers shown in the illustration, and remove the cylinder head assembly.

CAUTION: Because the plug guides cannot be replaced by themselves, be careful not to damage or deform them when removing the cylinder head bolts.



Intake side ← **Front of engine**



Exhaust side

G01185411

Fig. 49: Removing Cylinder Head Bolts

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

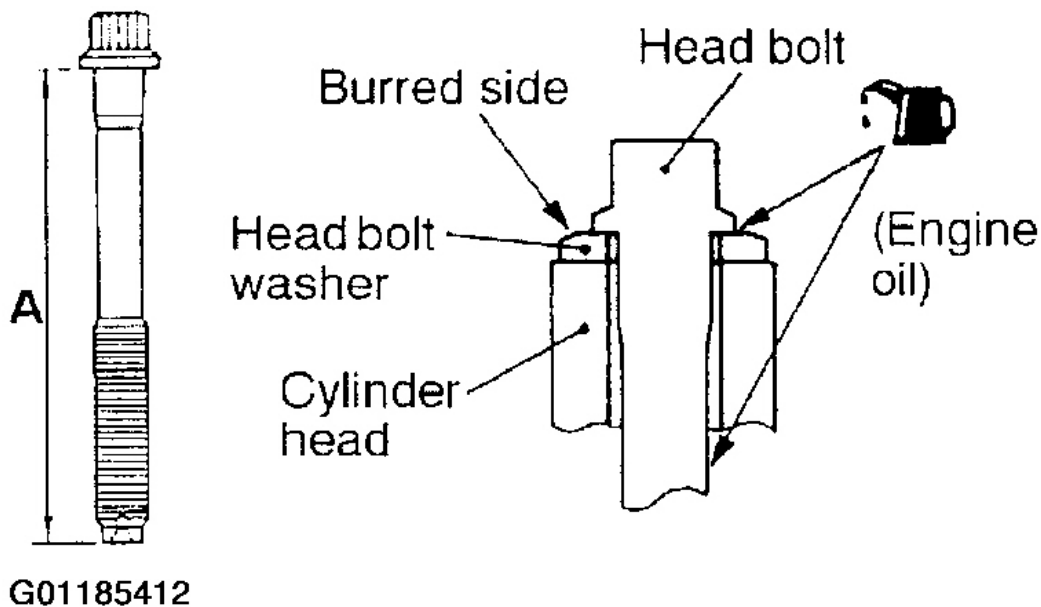
INSTALLATION SERVICE POINTS**>A< CYLINDER HEAD GASKET INSTALLATION**

1. Wipe off all oil and grease from the gasket mounting surface.
2. Install so that the cylinder head holes match the respective cylinder head gasket holes.

>B< CYLINDER HEAD BOLT INSTALLATION

1. When installing the cylinder head bolts, the length below the head of the bolts should be within the limit. If it is outside the limit, replace the bolts.

Limit (A): 96.4 mm (3.80 in.)

**Fig. 50: Measuring Length Of Cylinder Head Bolt**

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2. The head bolt washer should be installed with the burled side, caused by tapping out, facing upwards.
3. Apply a small amount of engine oil to the thread section and the washer of the cylinder head bolt.
4. Using the special tool, tighten the bolts by the following procedure.

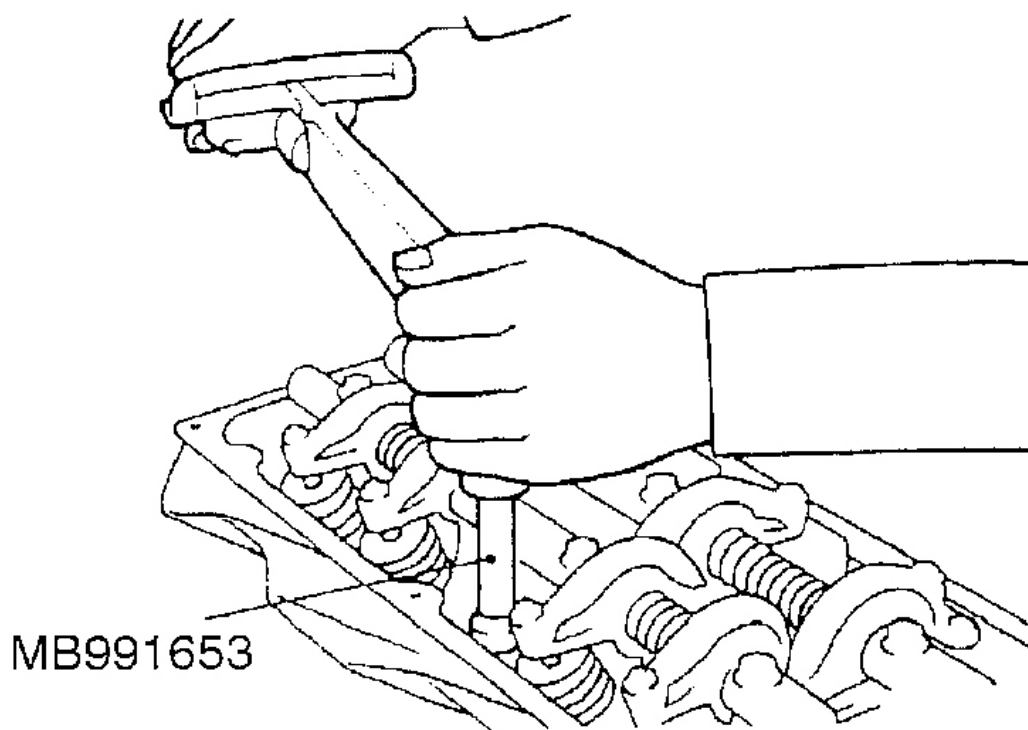
2002 Mitsubishi Mirage DE

2002 ENGINES 1.8L 4-Cylinder - Mirage

Step	Operation	Remarks
1	Tighten to 74 Nm (54 ft.lbs.).	In the order shown in the illustration.
2	Fully loosen.	In the reverse order of that shown in the illustration.
3	Tighten to 20 Nm (14 ft.lbs.).	In the order shown in the illustration.
4	Tighten 90° of a turn.	In the order shown in the illustration. Mark the head of the cylinder head bolt and cylinder head by paint.
5	Tighten 90° of a turn.	In the order shown in the illustration. Check that the painted mark of the head bolt is lined up with that of the cylinder head.

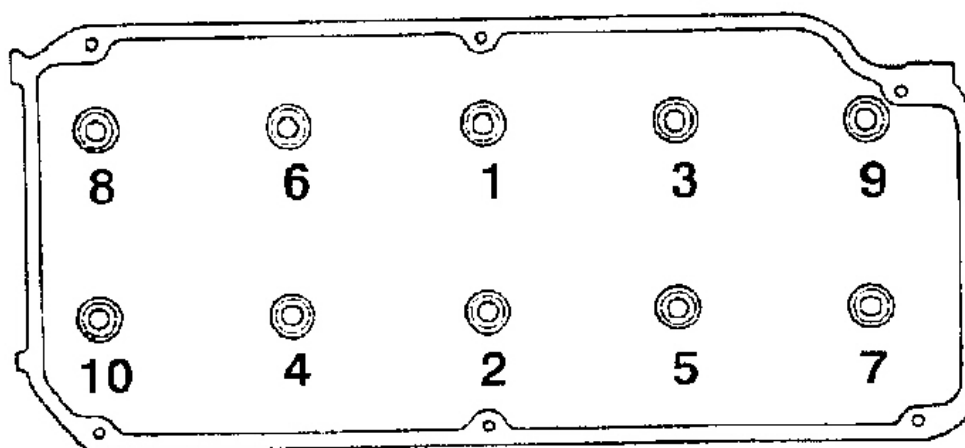
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Fig. 51: Cylinder Head Bolt Tightening Procedure**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**



Intake side

← Front of engine



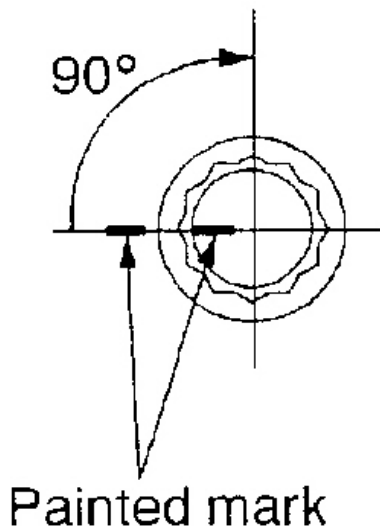
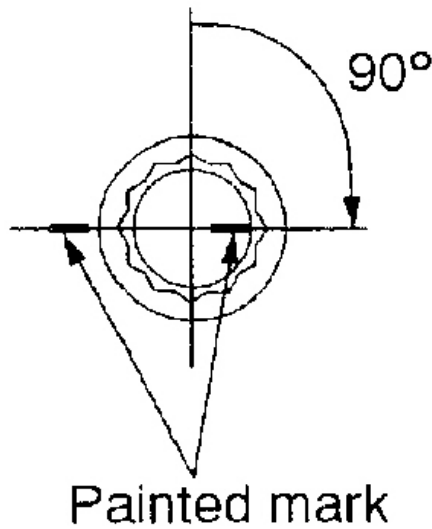
Exhaust side

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Fig. 52: Tightening Cylinder Head Bolts

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

- CAUTION:**
1. Always make a tightening angle just 90° . If it is less than 90° , the head bolt will be loosened.
 2. If it is more than 90° , remove the head bolt and repeat the procedure from step 1.

Step 4**Step 5**

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Fig. 53: Measuring Tightening Angle Of Cylinder Head Bolts

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>C< RADIATOR UPPER HOSE CONNECTION

1. Insert each hose as far as the projection of the water inlet fitting.
2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

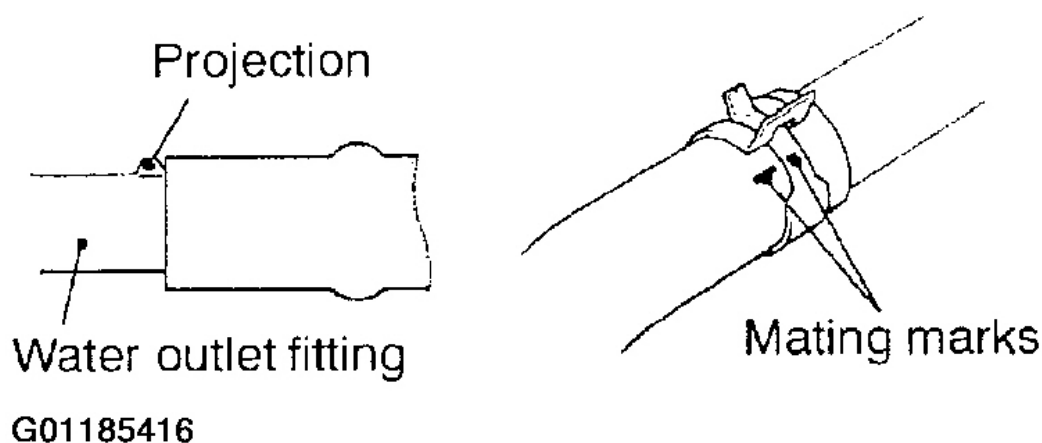


Fig. 54: Connecting Radiator Upper Hose

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>D< HIGH-PRESSURE FUEL HOSE INSTALLATION

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

CAUTION: Do not let any engine oil get into the fuel rail.

2. While turning the high-pressure fuel hose clockwise and counterclockwise, install the fuel rail, be careful not to damage the O-ring. After installing, check that the hose turns smoothly.

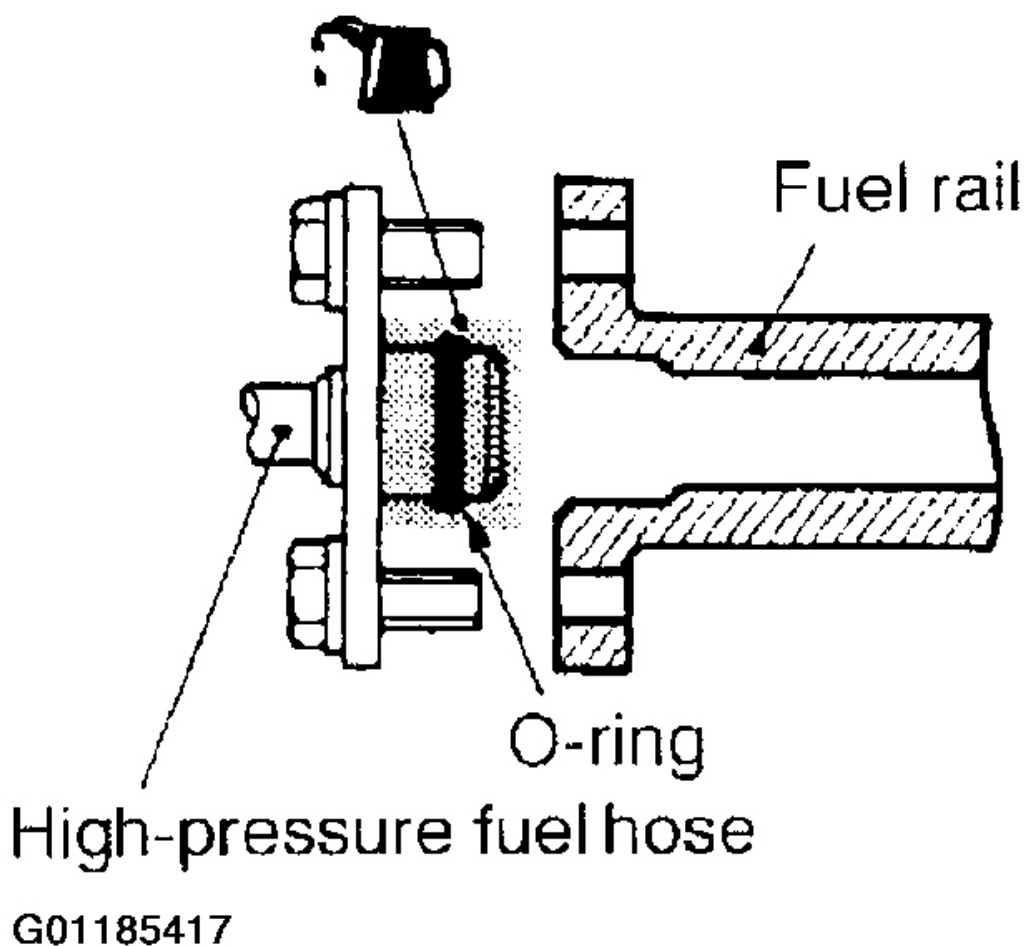


Fig. 55: Installing High-Pressure Fuel Hose

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

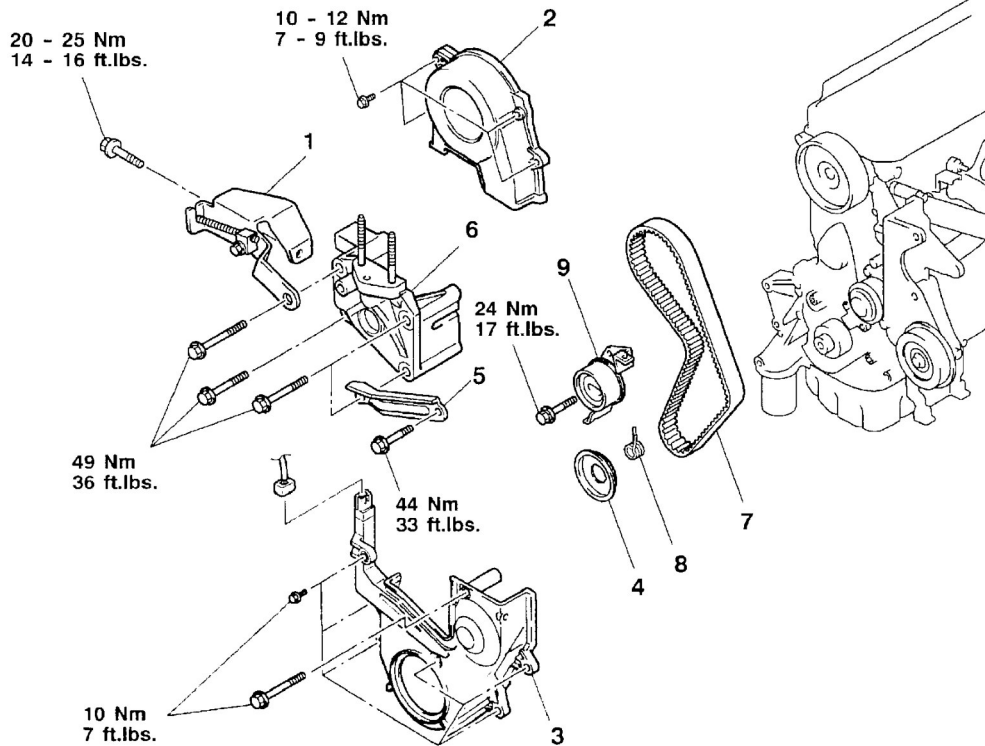
3. If the hose does not turn smoothly, the O-ring is probably being pinched. Disconnect the high-pressure fuel hose and check the O-ring for damage. After this, re-insert the fuel rail and check that the hose turns smoothly.

TIMING BELT

REMOVAL & INSTALLATION

Pre-removal and Post-installation Operation

- (1) Crankshaft Pulley Removal and Installation
- (2) Engine Mount Bracket Removal and Installation



Removal steps

1. Generator brace
2. Timing belt upper cover
3. Timing belt lower cover
4. Flange
5. Power steering pump bracket stay

6. Engine support bracket
- Timing belt tension adjustment
7. Timing belt
8. Tensioner spring
9. Timing belt tensioner

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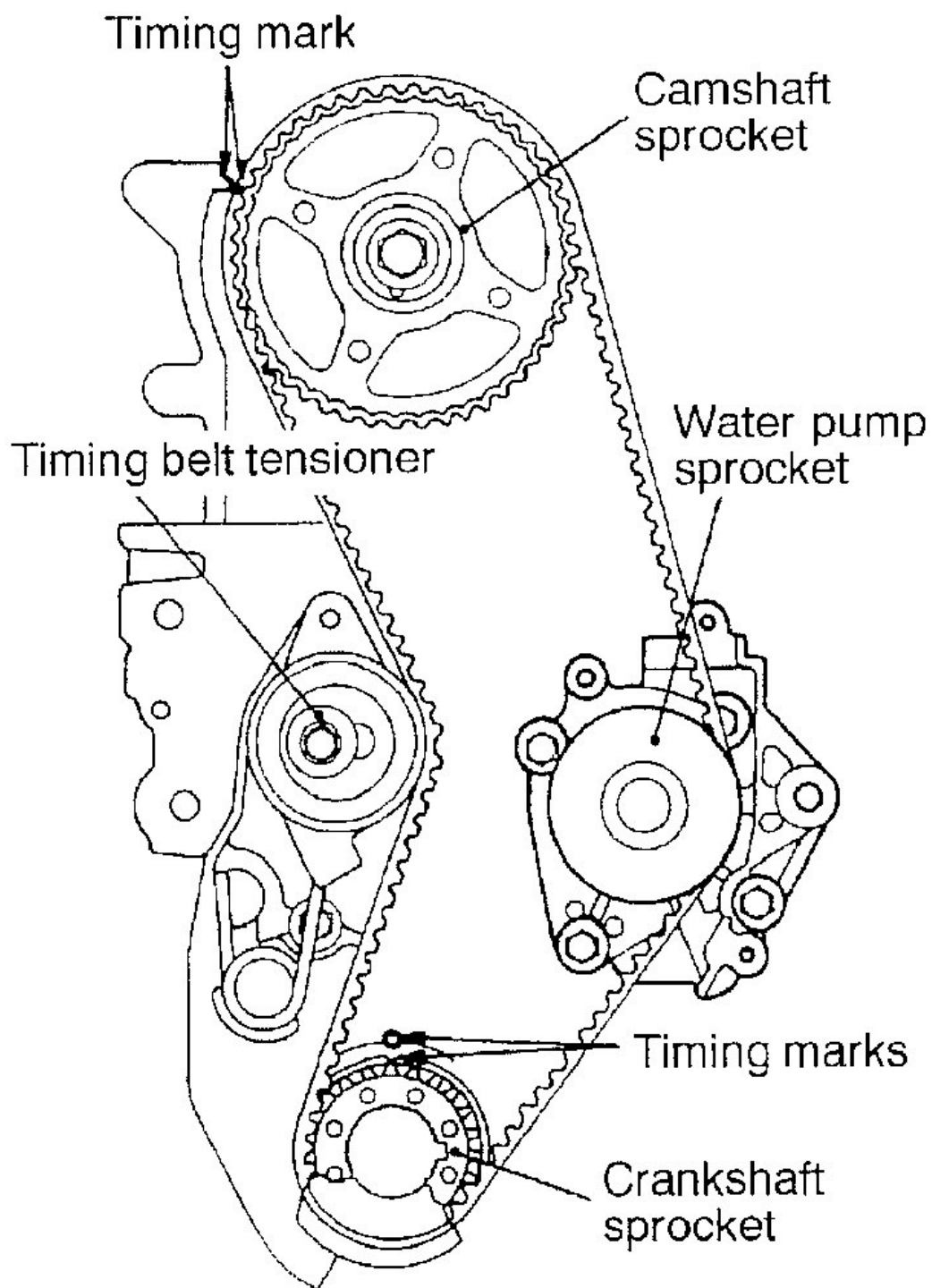
Fig. 56: Removing & Installing Timing Belt
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

REMOVAL SERVICE POINT

< A > TIMING BELT REMOVAL

1. Turn the crankshaft clockwise (right turn) to align each timing mark and to set the No. 1 cylinder at compression top dead center.

CAUTION: The crankshaft should always be turned only clockwise.

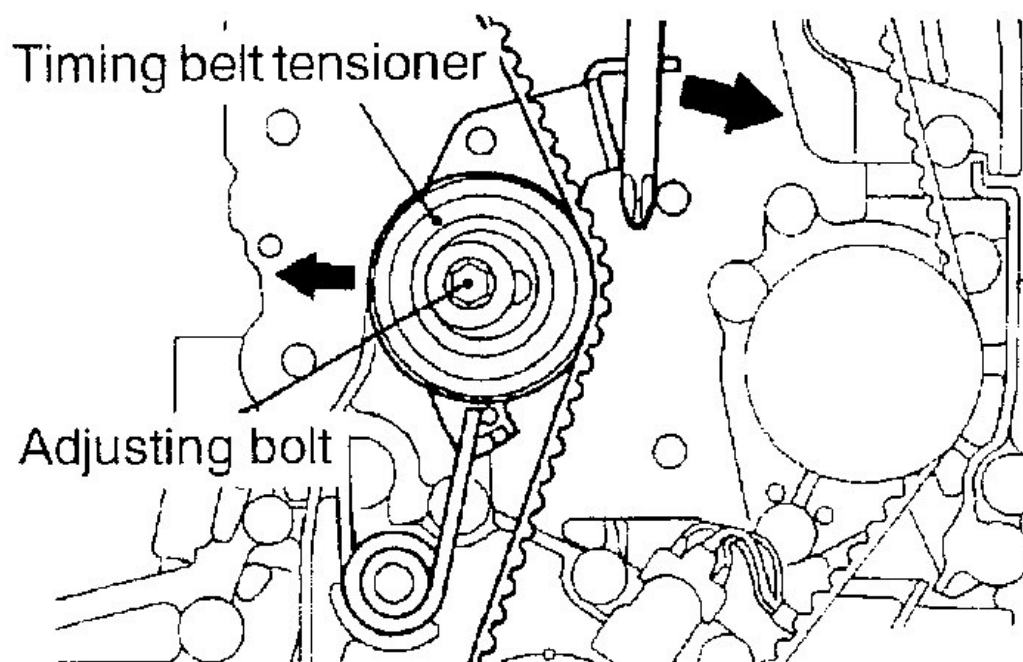


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Fig. 57: Turning Crankshaft Clockwise To Align Each Timing Mark
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2. Loosen the adjusting bolt.
3. Set a screwdriver to the timing belt tensioner and press it fully back in the direction of the arrow.
4. Provisionally tighten the adjusting bolt.
5. Remove the timing belt.

CAUTION: If the timing belt is to be re-used, use chalk to mark the flat side of the belt with an arrow indicating the direction of rotation (right turn).



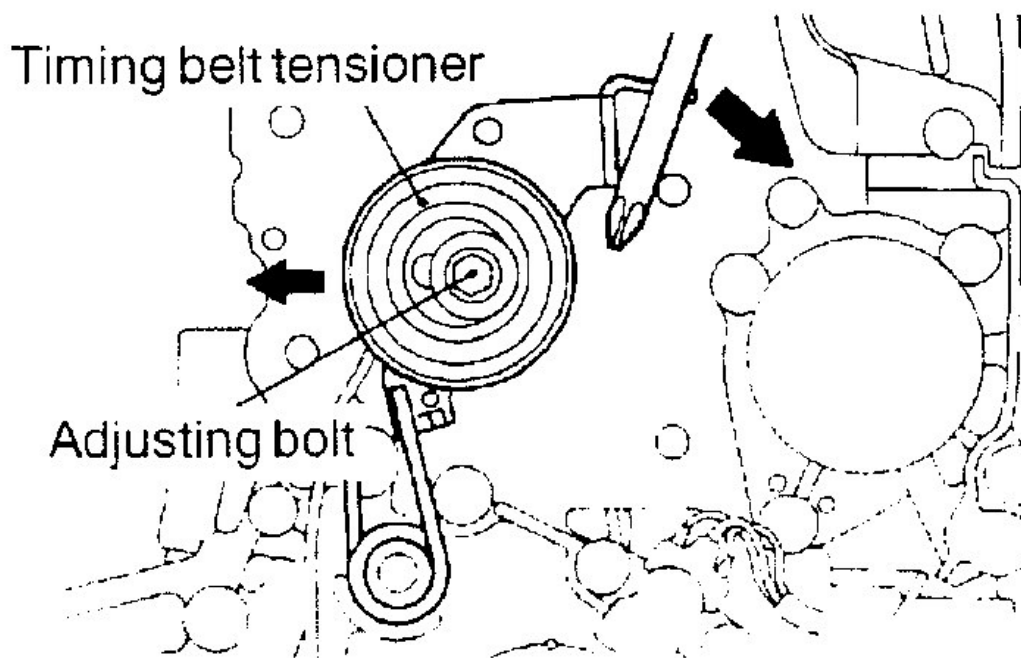
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Fig. 58: Removing Timing Belt
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

INSTALLATION SERVICE POINTS

>A< TIMING BELT INSTALLATION

1. Set a screwdriver to the timing belt tensioner and press it fully back in the direction of the arrow.



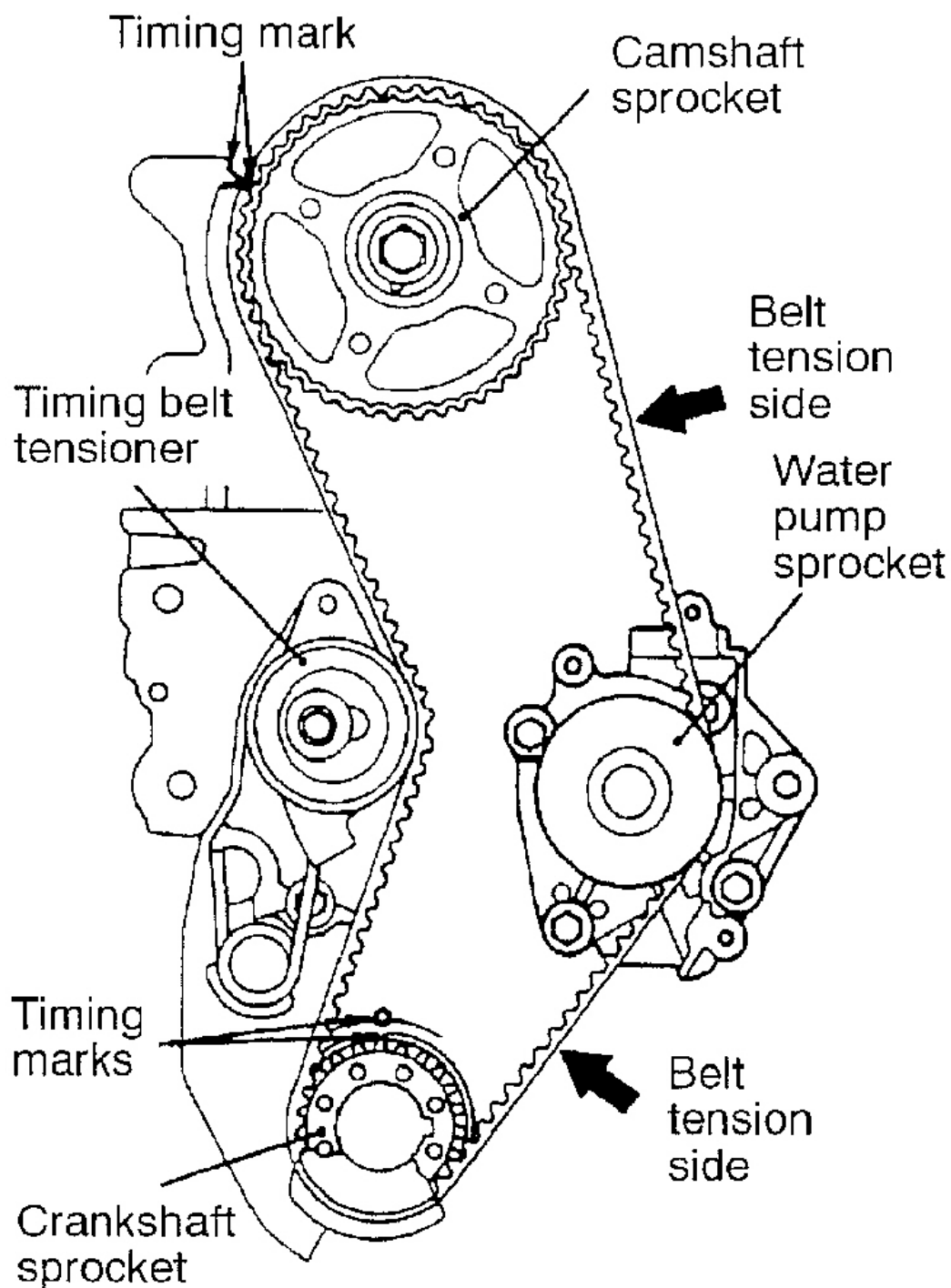
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Fig. 59: Loosening Timing Belt Tensioner

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2. Provisionally tighten the adjusting bolt.
3. Align each of the camshaft sprocket and the crankshaft sprocket timing marks.
4. Install the timing belt in the following order, while making sure that the tension side of the belt is not slackened.
 1. Crankshaft sprocket
 2. Water pump sprocket
 3. Camshaft sprocket
 4. Tensioner pulley

CAUTION: After installing the timing belt, apply force to turn the camshaft sprocket counterclockwise, and recheck to be sure that the belt is fully tensioned and that each timing mark is in the proper position.



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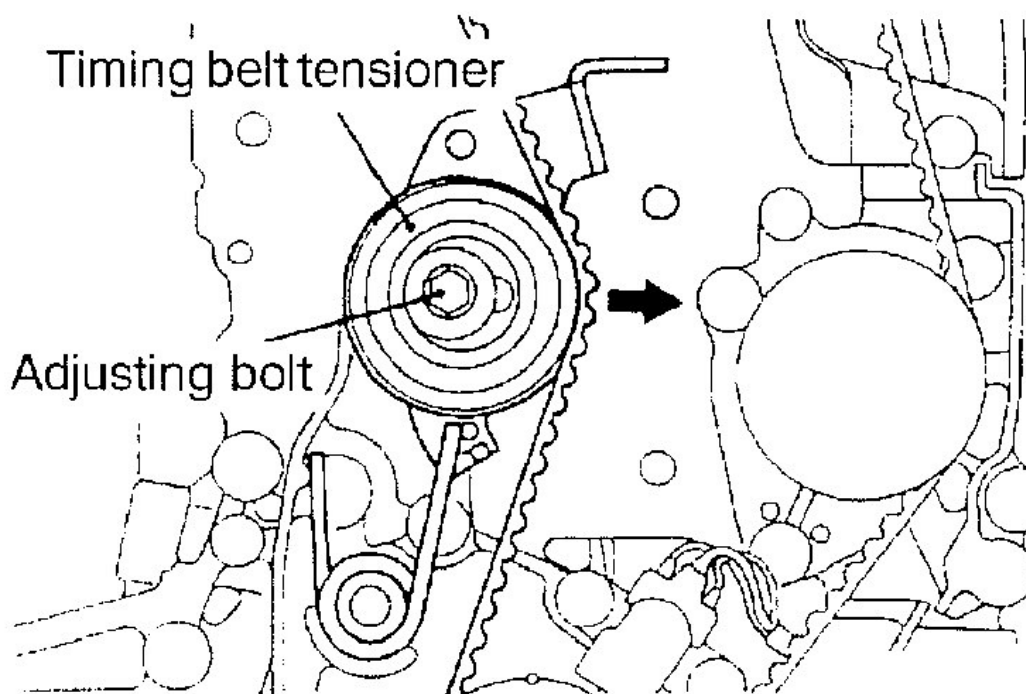
Fig. 60: Installing Timing Belt

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>B< TIMING BELT TENSION ADJUSTMENT

1. Loosen the adjusting bolt of the temporarily secured timing belt tensioner by 1/4 - 1/2 turn, and use the force of the tensioner spring to apply tension to the belt.
2. Turn the crankshaft clockwise for two rotations, and recheck to be sure that the timing marks on each sprocket are aligned.

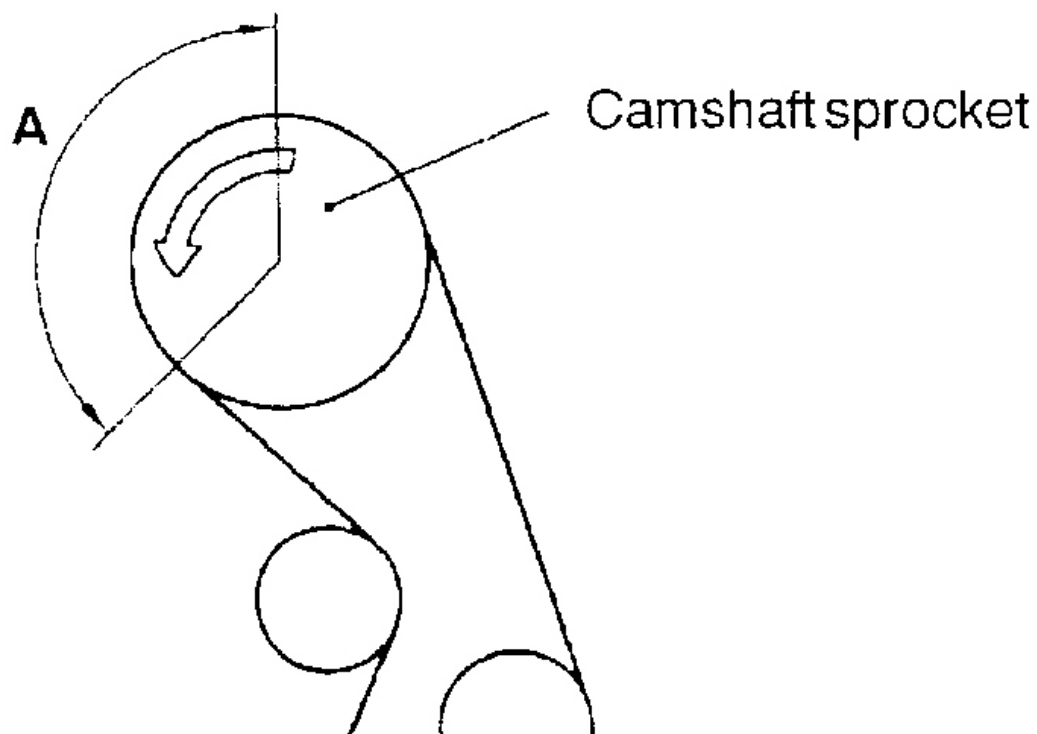
CAUTION: As the purpose of this procedure is to apply the proper amount of tension to the tension side of the timing belt by using the cam driving torque, turn the crankshaft only by the amount given above. Be sure not to turn the crankshaft counterclockwise.



G01185423

Fig. 61: Turning Crankshaft In Proper Rotation Direction
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. After checking to be sure that no belt teeth in the section marked with A are lifted up and that the teeth in each sprocket are engaged, secure the tensioner pulley.



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Fig. 62: Checking For Disengaged Timing Belt Teeth
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>C< FLANGE INSTALLATION

Install the flange as shown in the illustration.

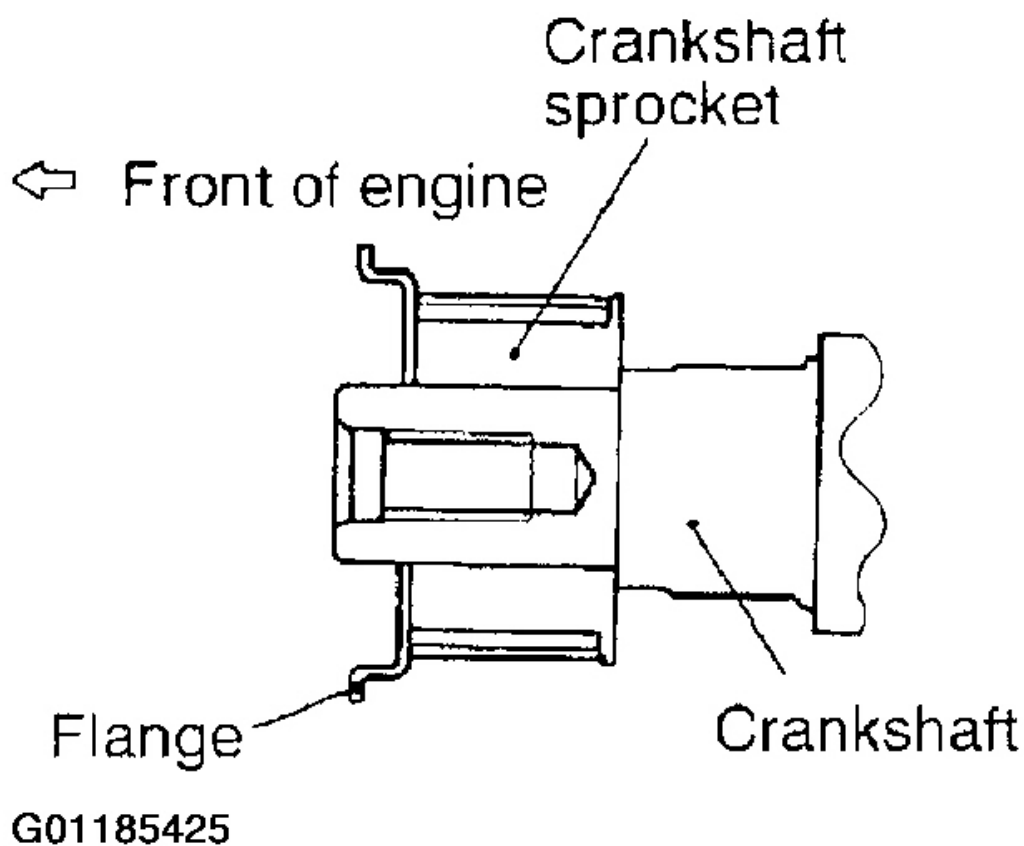
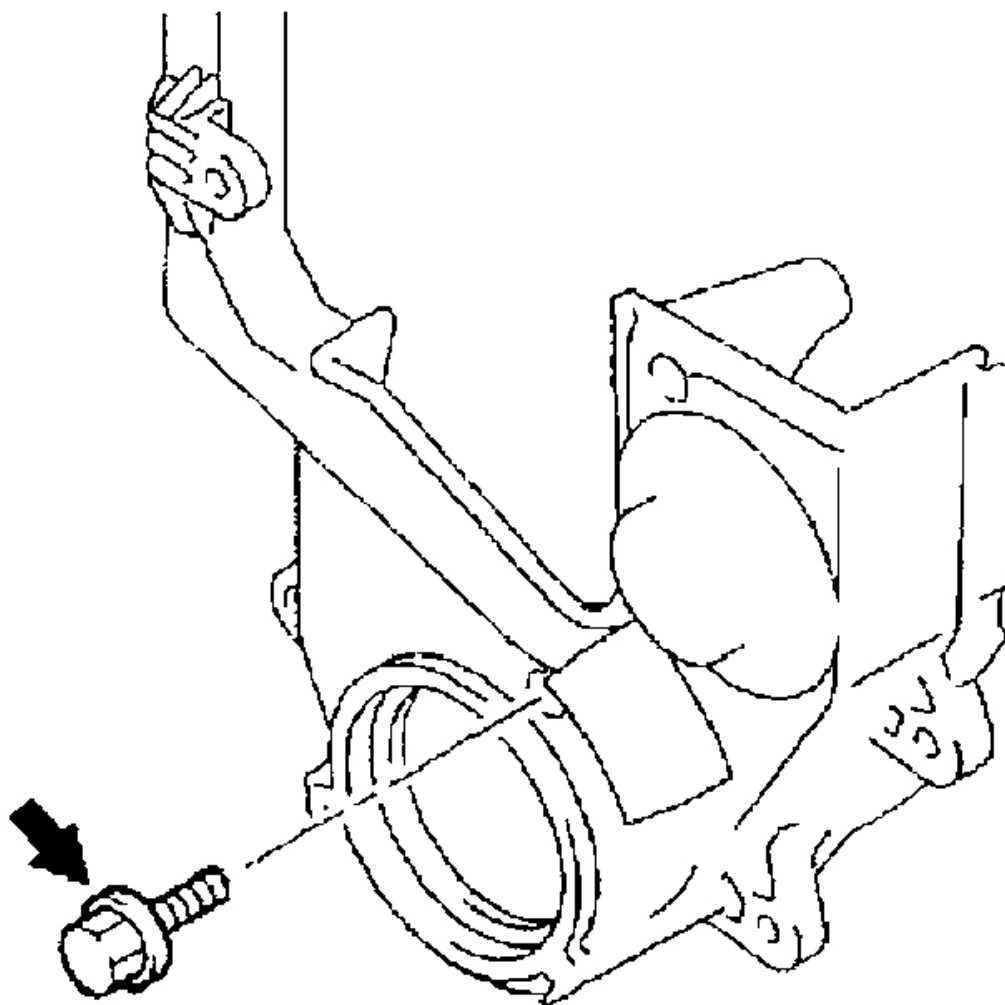


Fig. 63: Installing Flange

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>D< TIMING BELT LOWER COVER INSTALLATION

1. Install at first the bolt (M6 x 20 mm) indicated with the arrow in the illustration.



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Fig. 64: Installing Timing Belt Lower Cover

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2. Install and tighten remaining bolts to the specified torque.

Tightening torque: 10 Nm (7 ft.lbs.)

ENGINE OVERHAUL

GENERAL SPECIFICATION

2002 Mitsubishi Mirage DE

2002 ENGINES 1.8L 4-Cylinder - Mirage

General Specification

Descriptions			Specifications
Type			In-line OHV, SOHC
Number of cylinders			4
Combustion chamber			Pentroof type
Total displacement dm ³ (cu.in.)			1,834 (111.9)
Cylinder bore mm (in.)			81.0 (3.19)
Piston stroke mm (in.)			89.0 (3.50)
Compression ratio			9.5
Number of valve		Intake	8
		Exhaust	8
Valve timing	Intake valve	Opens (BTDC)	6°
		Closes (ABDC)	54°
	Exhaust valve	Opens (BBDC)	54°
		Closes (ATDC)	6°
Lubrication system			Pressure feed, full-flow filtration
Oil pump type			Trochoid type
Cooling system			Water-cooled forced circulation
Water pump type			Centrifugal impeller type

SPECIFICATIONS**SERVICE SPECIFICATIONS**

2002 Mitsubishi Mirage DE

2002 ENGINES 1.8L 4-Cylinder - Mirage

Items		Standard value	Limit
Rocker arms and camshaft			
Camshaft cam height mm (in.)	Intake	37.11 (1.46)	36.61 (1.44)
	Exhaust	37.15 (1.46)	36.65 (1.44)
Cylinder head and valve			
Cylinder head flatness of gasket surface mm (in.)		Less than 0.03 (.0012)	0.2 (.008)
Cylinder head grinding limit of gasket surface mm (in.)		-	0.2* (.008)
*Total resurfacing depth of both cylinder head and cylinder block			
Cylinder head overall height mm (in.)		119.9 - 120.1 (4.720 - 4.728)	-
Cylinder head bolt shank length mm (in.)		-	96.4 (3.795)
Valve stem O.D. mm (in.)		6.0 (.236)	-
Valve stem-to-guide clearance mm (in.)	Intake	0.02 - 0.05 (.0008 - .0020)	0.10 (.0039)
	Exhaust	0.05 - 0.09 (.0020 - .0035)	0.15 (.0059)
Valve face angle		45° - 45.5°	-
Valve margin mm (in.)	Intake	1.0 (.039)	0.5 (.020)
	Exhaust	1.3 (.051)	0.8 (.031)
Valve stem projection mm (in.)	Intake	49.30 (1.9409)	49.80 (1.9606)
	Exhaust	49.35 (1.9429)	49.85 (1.9626)
Overall valve length mm (in.)	Intake	110.15 (4.337)	109.65 (4.317)
	Exhaust	113.70 (4.476)	113.20 (4.457)
Valve spring free height mm (in.)		50.9 (2.00)	49.9 (1.96)
Valve spring load/installed height N/mm (lbs./in.)		216/44.2 (49/1.74)	-
Valve spring squareness		Max. 2°	4°
Valve seat contact width mm (in.)		0.9 - 1.3 (.035 - .051)	-
Valve guide I.D. mm (in.)		6.0 (.236)	-
Valve guide projection mm (in.)		14.0 (.551)	-
Oil pump and oil pan			
Oil pump tip clearance mm (in.)		0.06 - 0.18 (.0024 - .0071)	-
Oil pump side clearance mm (in.)		0.04 - 0.10 (.0016 - .0039)	-
Oil pump body clearance mm (in.)		0.10 - 0.18 (.0039 - .0071)	0.35 (.0138)
Piston and connecting rod			
Piston O.D. mm (in.)		81.0 (3.19)	-
Piston ring side clearance mm (in.)	No. 1	0.03 - 0.07 (.0012 - .0028)	0.1 (.0039)
	No. 2	0.02 - 0.06 (.0008 - .0024)	0.1 (.0039)
Piston ring end gap mm (in.)	No. 1	0.25 - 0.40 (.0098 - .0157)	0.8 (.031)
	No. 2	0.40 - 0.55 (.0157 - .0217)	0.8 (.031)
	Oil ring	0.20 - 0.60 (.0078 - .0236)	1.0 (.039)

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Fig. 65: Service Specifications (1 Of 2)

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2002 Mitsubishi Mirage DE

2002 ENGINES 1.8L 4-Cylinder - Mirage

Items	Standard value	Limit
Piston pin O.D. mm (in.)	19.0 (.75)	-
Piston pin press-in load [at room temperature] N (lbs.)	4900 - 14700 (1.1020 - 3.3070)	-
Crankshaft pin oil clearance mm (in.)	0.02 - 0.05 (.0008 - .0020)	0.1 (.004)
Connecting rod big end side clearance mm (in.)	0.10 - 0.25 (.0039 - .0098)	0.4 (.016)
Crankshaft and cylinder block		
Crankshaft end play mm (in.)	0.05 - 0.25 (.0020 - .0098)	0.4 (.016)
Crankshaft journal O.D. mm (in.)	50 (1.97)	-
Crankshaft pin O.D. mm (in.)	45 (1.77)	-
Crankshaft journal oil clearance mm (in.)	0.02 - 0.04 (.0008 - .0016)	0.1 (.004)
Cylinder block gasket surface flatness mm (in.)	0.05 (.0020)	0.1 (.004)
Cylinder block gasket surface grinding limit mm (in.)	-	0.2 (.008)
Cylinder block overall height mm (in.)	263.5 (10.374)	-
Cylinder bore I.D. mm (in.)	81.0 (3.19)	-
Cylinder bore cylindricity mm (in.)	0.01 (.0004) or less	-
Piston-to-cylinder clearance mm (in.)	0.02 - 0.04 (.0008 - .0016)	-
Bearing cap bolt shank length mm (in.)	-	71.1 (2.799)

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Fig. 66: Service Specifications (2 Of 2)

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

REWORK DIMENSIONS

Items	Standard value
Cylinder head and valves	
Oversize valve guide hole diameter mm (in.)	0.05 O.S. 11.05 - 11.07 (.4350 - .4358)
	0.25 O.S. 11.25 - 11.27 (.4429 - .4337)
	0.50 O.S. 11.50 - 11.52 (.4528 - .4535)
Oversize intake valve seat hole diameter mm (in.)	0.30 O.S. 31.80 - 31.83 (1.2520 - 1.2531)
	0.60 O.S. 32.10 - 32.13 (1.2638 - 1.2650)
Oversize exhaust valve seat hole diameter mm (in.)	0.30 O.S. 29.30 - 29.32 (1.1535 - 1.1543)
	0.60 O.S. 29.60 - 29.62 (1.1654 - 1.1661)

NOTE

O.S.: Oversize diameter

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Fig. 67: Rework Dimensions

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

NOTE: O.S.: Oversize diameter

SEALANT

2002 Mitsubishi Mirage DE

2002 ENGINES 1.8L 4-Cylinder - Mirage

Items	Specified sealant	Quantity
Water pump	Mitsubishi Genuine Part No. MD970389 or equivalent	As required
Thermostat case	Mitsubishi Genuine Part No. MD970389 or equivalent	As required
Engine coolant temperature sensor	3M™ AAD Part No. 8731 or equivalent	As required
Engine coolant temperature gauge unit	3M™ AAD Part No. 8672 or equivalent	As required
Oil pressure switch	3M™ AAD Part No. 8672 or equivalent	As required
Water outlet fitting	Mitsubishi Genuine Part No. MD970389 or equivalent	As required
Front case	Mitsubishi Genuine Part No. MD970389 or equivalent	As required
Oil pan	Mitsubishi Genuine Part No. MD970389 or equivalent	As required
Oil seal case	Mitsubishi Genuine Part No. MD970389 or equivalent	As required
Drive plate bolt	3M™ AAD Part No. 8731 or equivalent	As required
Flywheel bolt	3M™ AAD Part No. 8731 or equivalent	As required
Cam position sensor support	Mitsubishi Genuine Part No. MD970389 or equivalent	As required

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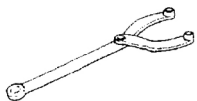
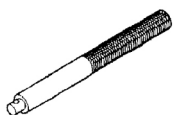
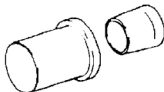
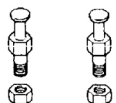
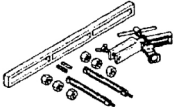
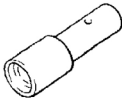
Fig. 68: Sealants

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

SPECIAL TOOLS

2002 Mitsubishi Mirage DE

2002 ENGINES 1.8L 4-Cylinder - Mirage

Tool	Tool number and name	Supersession	Application
	MB990767 End yoke holder Use with MD998719	MB990767-01 Use with MIT308239	Holding camshaft sprocket when loosening or torquing bolt
	MB990938 Handle	MB990938-01	Installation of crankshaft rear oil seal
	MD998713 Camshaft oil seal installer	MD998713-01	Installation of camshaft oil seal
	MD998716 Crankshaft wrench	MD998716-01	Turning crankshaft
	MD998717 Crankshaft front oil seal installer	MD998717-01	Installation of crankshaft front oil seal
	MD998719 Pulley holding pins (2)	MIT308239	Holding camshaft sprocket when loosening or torquing bolt
	MD998727 Oil pan remover	MD998727-01	Removal of oil pan
	MD998772 Valve spring compressor	General service tool	Compressing valve spring
	MD998774 Valve stem seal installer	MD998774-01	Installation of valve stem seal

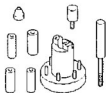
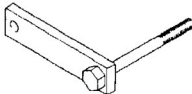
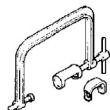
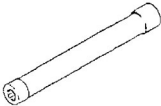
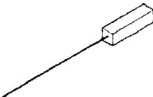
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Fig. 69: Special Tools (1 Of 2)

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2002 Mitsubishi Mirage DE

2002 ENGINES 1.8L 4-Cylinder - Mirage

Tool	Tool number and name	Supersession	Application
	MD998776 Crankshaft rear oil seal installer Use with MB990938	MD998376-01 Use with MB990938-01	Installation of crankshaft rear oil seal
	MD998780 Piston pin setting tool	MIT216941	Removal and installation of piston pin
	MD998781 Flywheel stopper	General service tool	Holding flywheel
	MD998735 Valve spring compressor	MD998735-01	Compression of valve spring
	MB991653 Cylinder head bolt wrench	-	Loosening and torquing of cylinder head bolt
	MB991659 Guide D	-	Removal of piston pin (Use with MD998780)
	MD998442 Air bleed wire	General service tool	Air bleeding of lash adjuster
	MD998443 Lash adjuster holder (8)	MD998443-01	Supporting lash adjuster to prevent it from falling when rocker arm shaft assembly is removed or installed.

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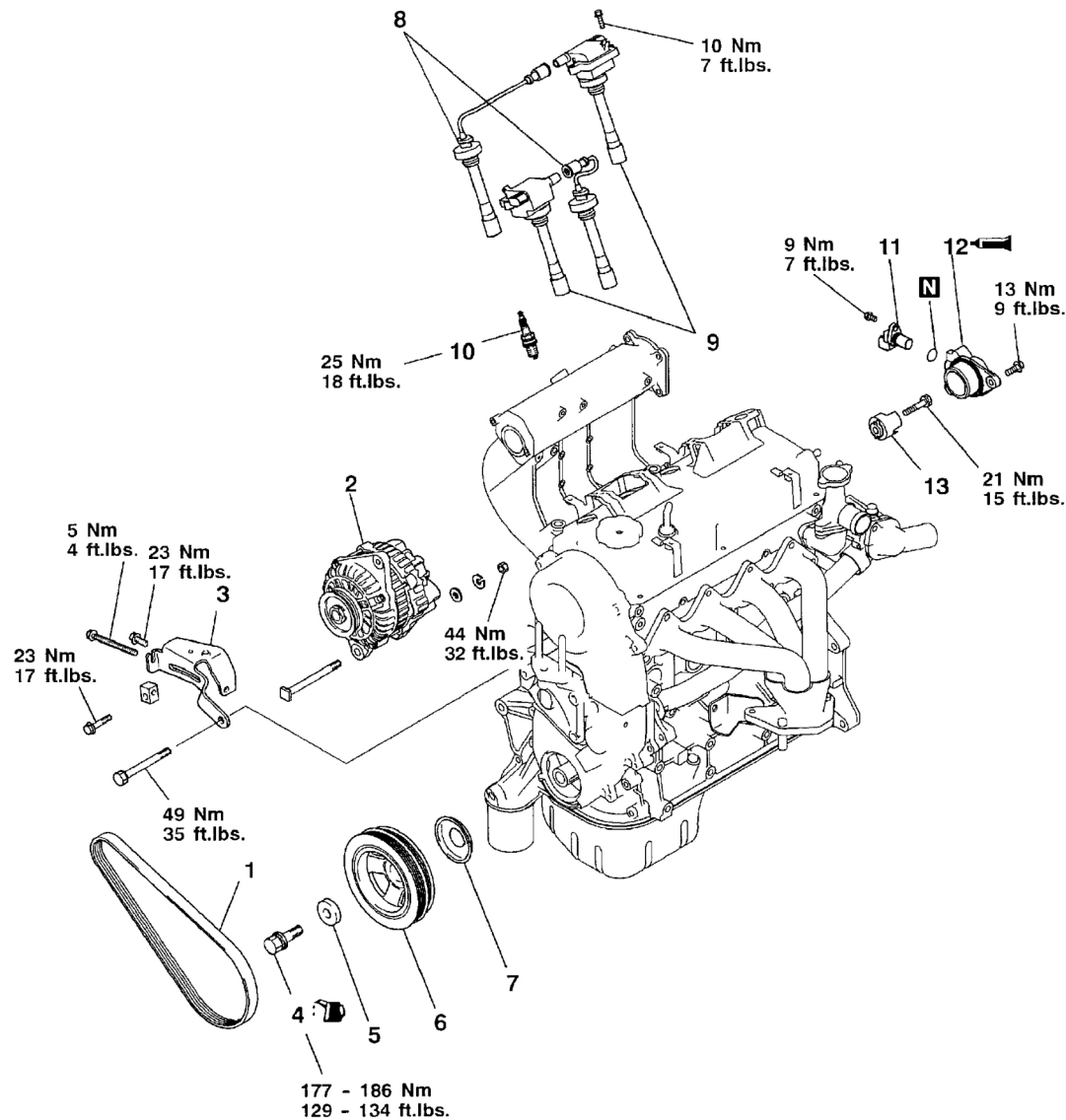
Fig. 70: Special Tools (2 Of 2)

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

OVERHAUL

GENERATOR AND IGNITION SYSTEM

REMOVAL & INSTALLATION



Removal steps

1. Drive belt
2. Generator
3. Generator brace
4. Crankshaft bolt
5. Crankshaft pulley washer
6. Crankshaft pulley
7. Front flange

8. Spark plug cable
9. Ignition coil
10. Spark plug
11. Cam position sensor
12. Cam position sensor support
13. Cam position sensing cylinder

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Fig. 71: Removing & Installing Generator & Ignition System
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

REMOVAL SERVICE POINT

< A > CRANKSHAFT BOLT REMOVAL

1. Lock the flywheel or drive plate in position using the special tool shown in the illustration, then loosen the crankshaft bolt.

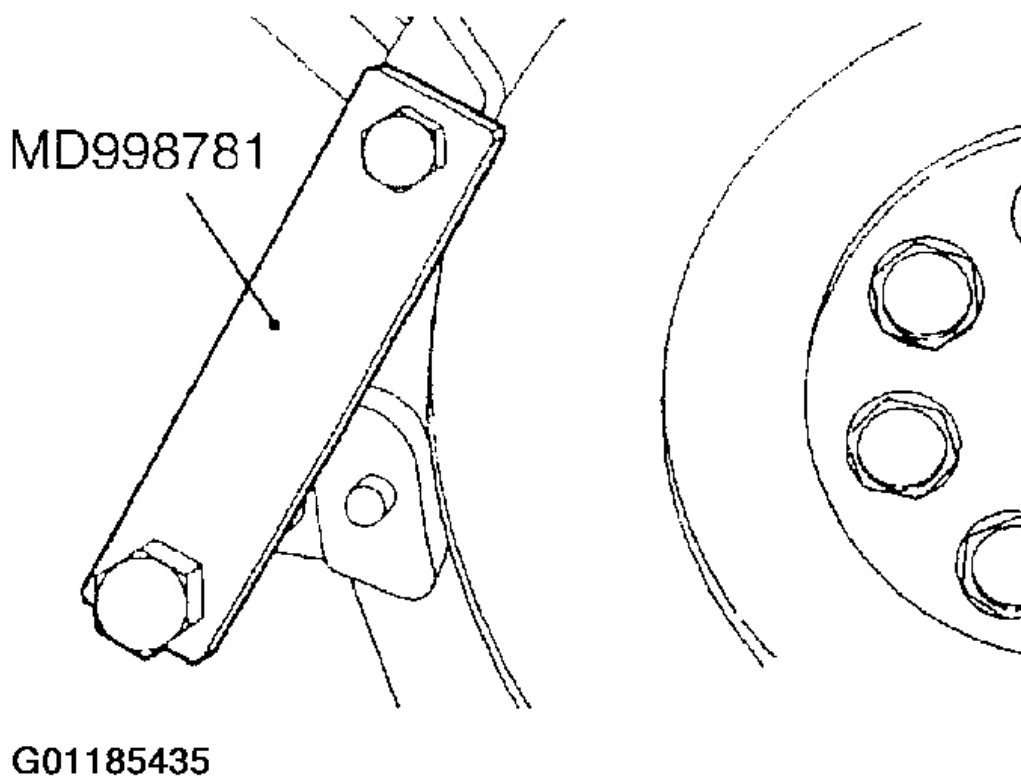


Fig. 72: Locking Flywheel Or Drive Plate

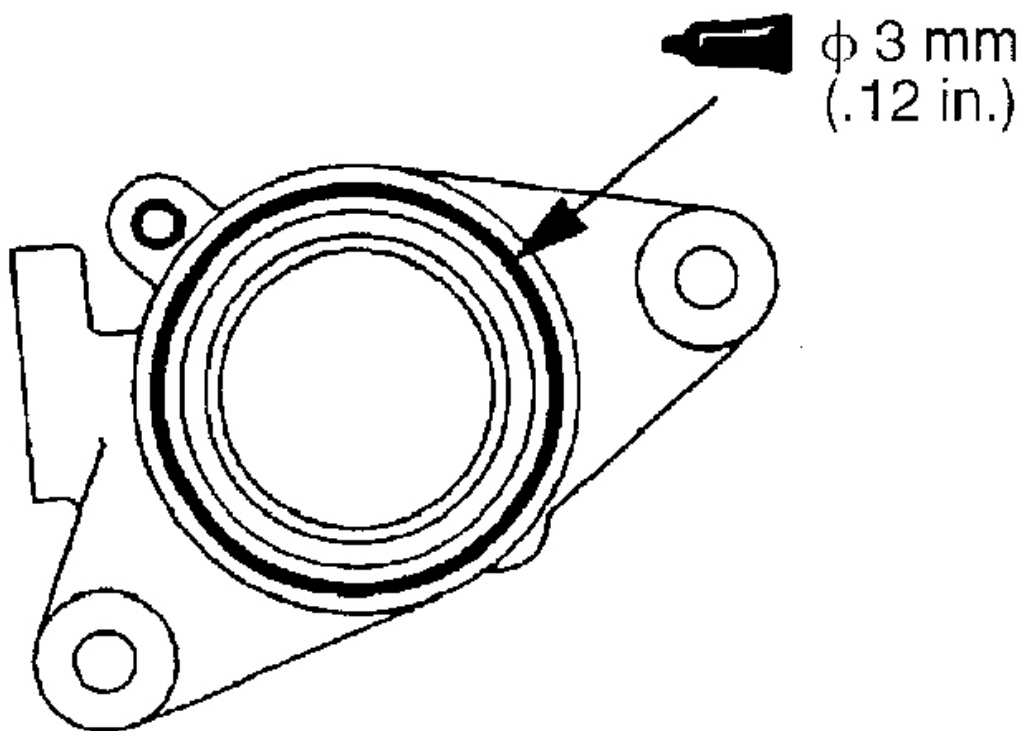
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

INSTALLATION SERVICE POINTS

>A< CAM POSITION SENSOR SUPPORT INSTALLATION

1. Clean the sealant application surfaces of cam position sensor support and cylinder head.
2. Apply a 3 mm (.12 in.) diameter bead of sealant to the area shown in the illustration. Be sure to install the sensor support within 15 minutes after applying sealant.

Specified sealant: Mitsubishi Genuine Part No. MD970389 or equivalent.



G01185436

Fig. 73: Applying Sealant To Cam Position Sensor Support
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. After installation, wait at least one hour. Never start the engine or let engine oil touch the adhesion surface during that time.

>B< CRANKSHAFT BOLT INSTALLATION

1. Lock the flywheel or drive plate in position using the special tool shown in the illustration.

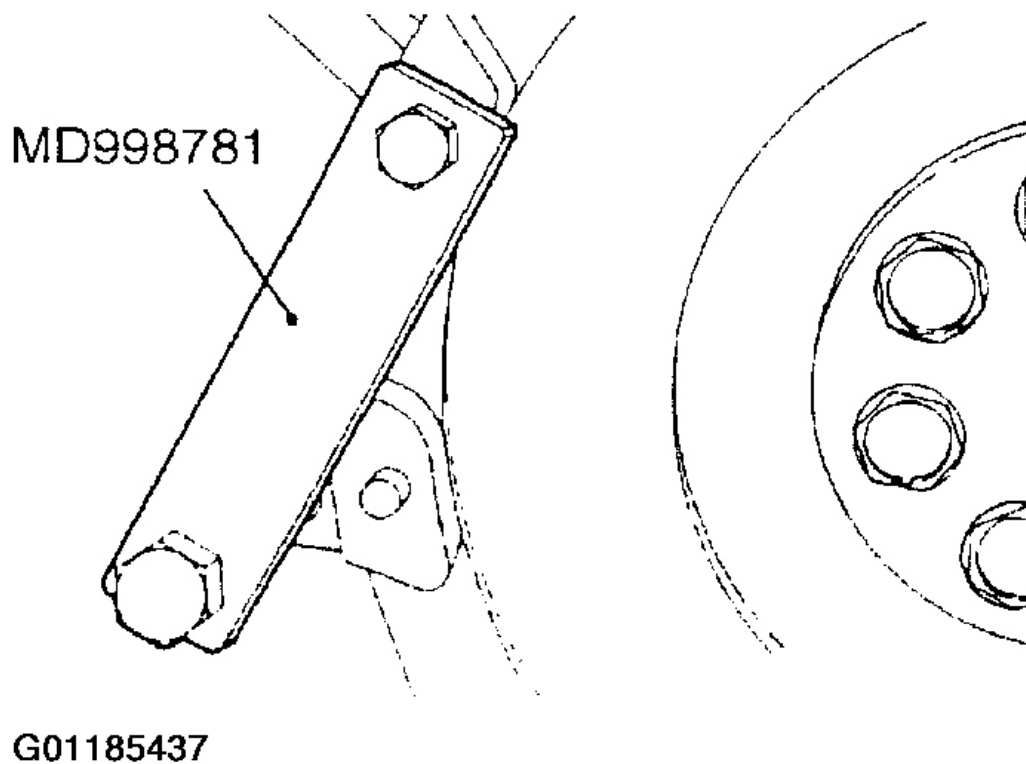
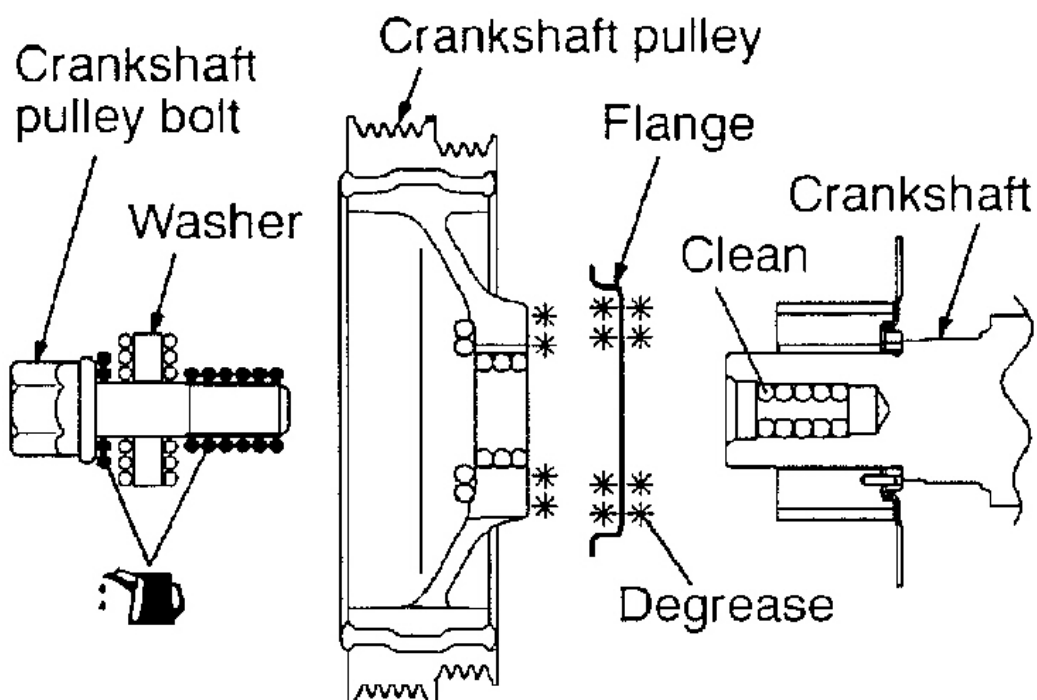


Fig. 74: Locking Flywheel Or Drive Plate

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2. Clean the bolt hole in crankshaft, crankshaft bolt and crankshaft pulley's seating surface.
3. Degrease the cleaned seating surface of the crankshaft pulley.
4. Install the crankshaft pulley.
5. Apply oil to the threads of crankshaft bolt and the outer surface of washer.



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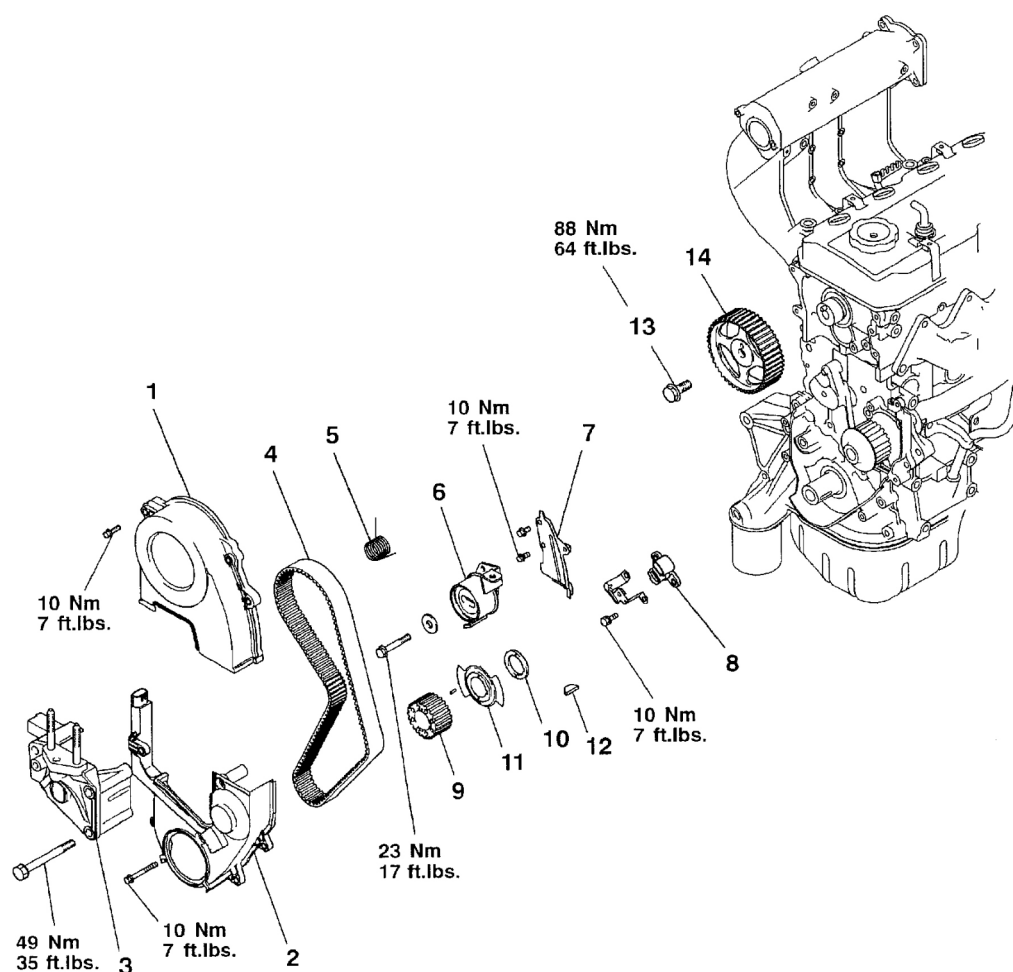
Fig. 75: Installing Crankshaft Bolt

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

6. Tighten the crankshaft bolt to the specified torque of 177 - 186 Nm (129 - 134 ft.lbs.)

TIMING BELT

REMOVAL & INSTALLATION



Removal steps

- | | | | |
|-----|----------------------------------|-----|------------------------------|
| ▶F◀ | 1. Timing belt front upper cover | ▶B◀ | 8. Crankshaft angle sensor |
| ▶E◀ | 2. Timing belt front lower cover | ▶B◀ | 9. Crankshaft sprocket |
| ▶D◀ | 3. Engine support bracket, right | ▶B◀ | 10. Crankshaft spacer |
| ▶C◀ | 4. Timing belt | ▶B◀ | 11. Crankshaft sensing blade |
| | 5. Tensioner spring | ▶A◀ | 12. Crankshaft key |
| | 6. Timing belt tensioner | ▶B◀ | 13. Camshaft sprocket bolt |
| | 7. Timing belt rear cover | | 14. Camshaft sprocket |

G01185439

Fig. 76: Removing & Installing Timing Belt
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

REMOVAL SERVICE POINTS

< A > TIMING BELT REMOVAL

1. Mark the belt running direction for reference in reinstallation.

2. Loosen the tensioner mounting bolt.
3. Insert a cross-tip screwdriver into the hole of the tensioner arm as shown illustration.

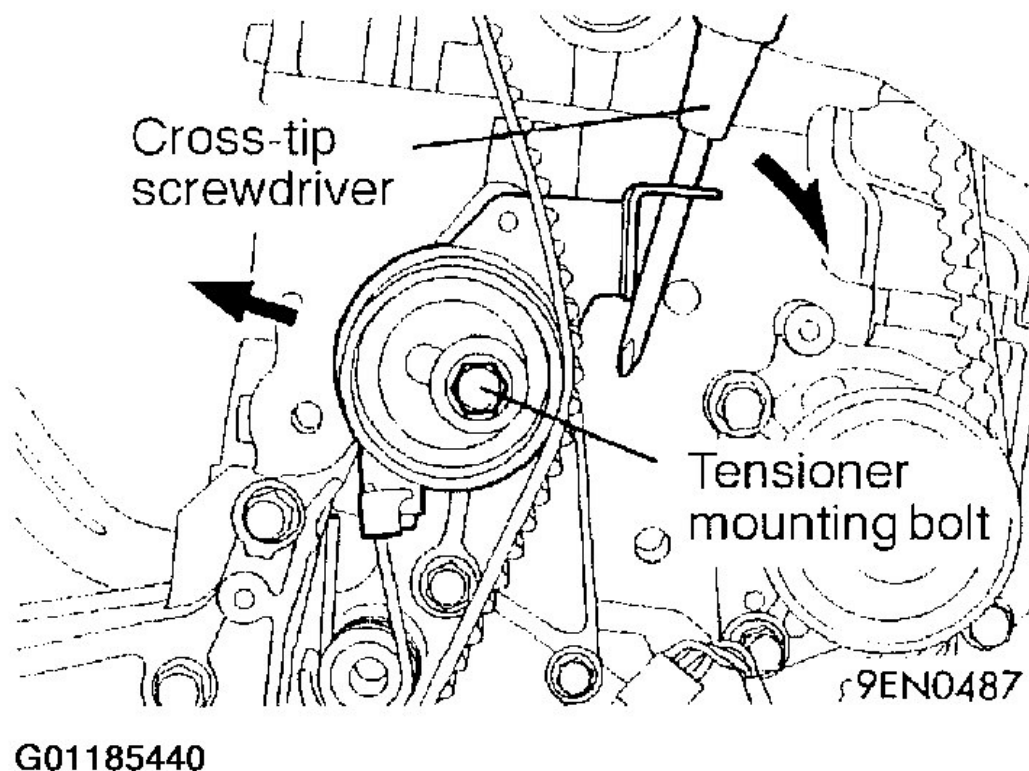


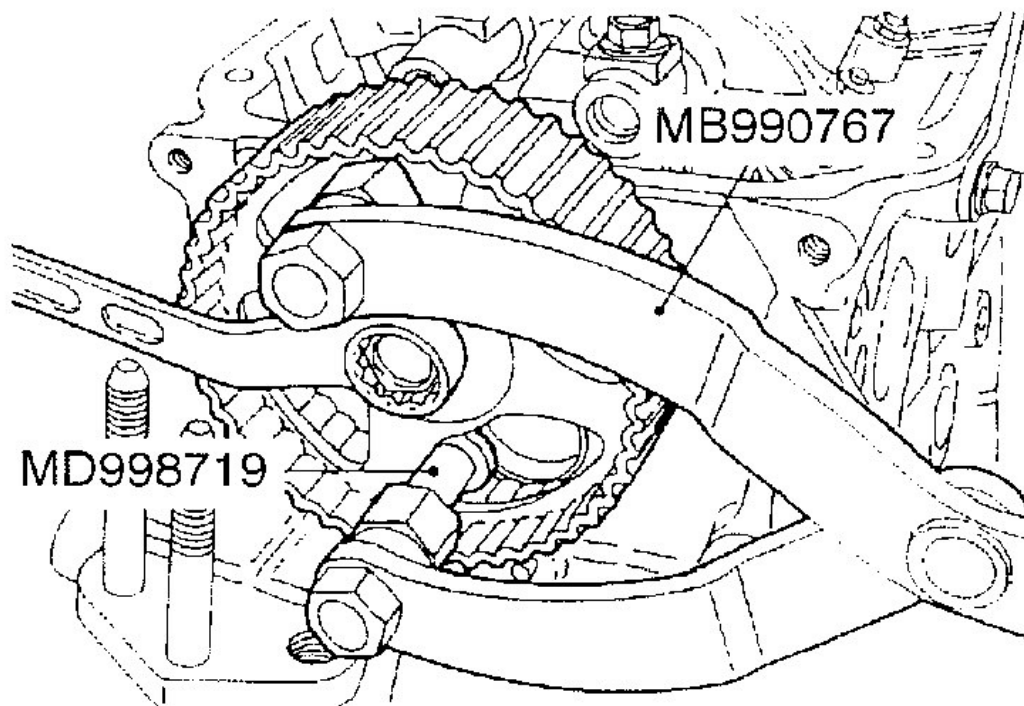
Fig. 77: Inserting Cross-Tip Screwdriver Into The Hole Of The Tensioner Arm
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

4. Move the screwdriver all the way in the direction of the arrow, and tighten the tensioner mounting bolt to hold this position.
5. Remove the timing belt.

NOTE:

1. Water oil on the belt shortens its life drastically, so the removed timing belt, sprocket, and tensioner must be kept free from oil and water. Do not immerse parts in cleaning solvent.
2. If there is oil or water on any part, check the front case oil seal, camshaft oil seal and water pump for leaks.

>B< CAMSHAFT SPROCKET BOLT LOOSENING

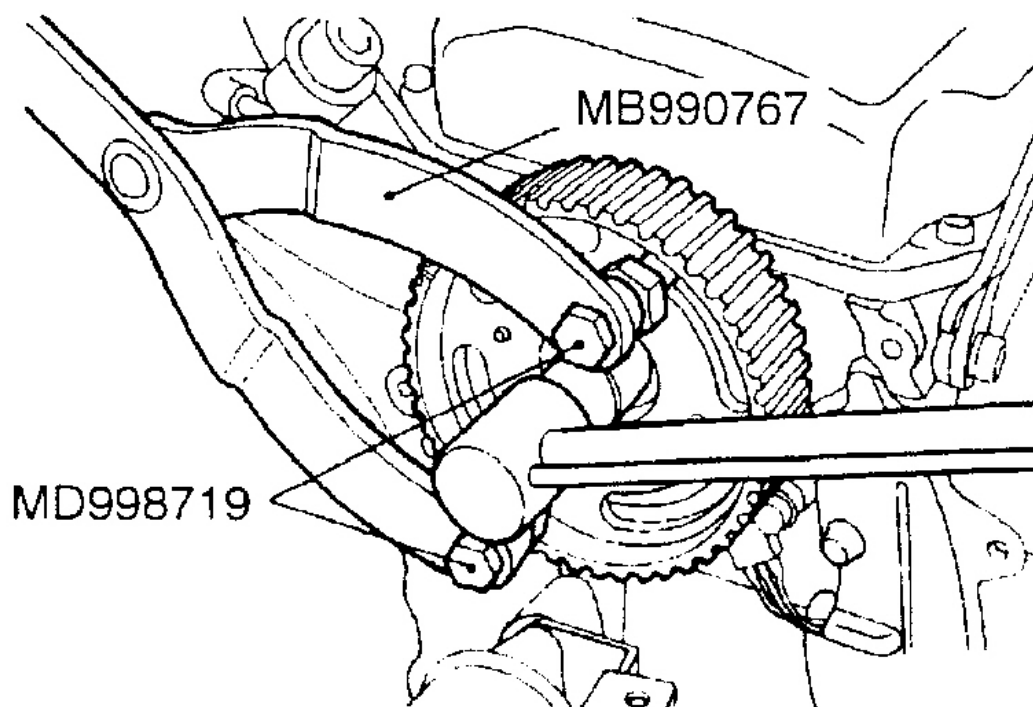


G01185441

Fig. 78: Loosening Crankshaft Sprocket Bolt
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

INSTALLATION SERVICE POINTS

>A< CAMSHAFT SPROCKET BOLT TIGHTENING



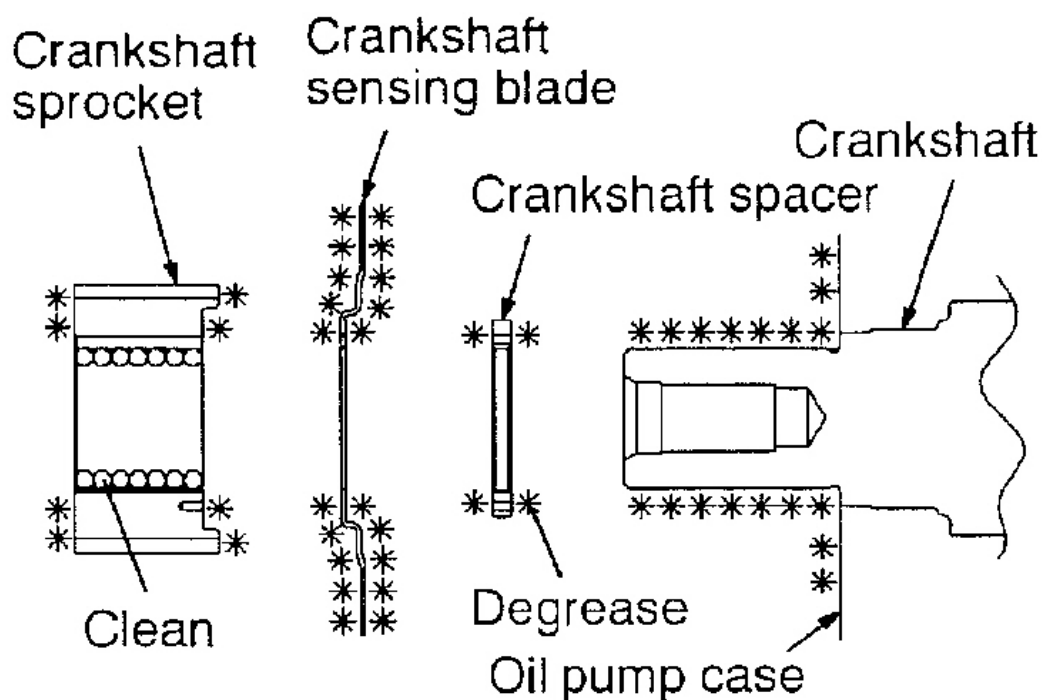
G01185442

Fig. 79: Tightening Camshaft Sprocket Bolt
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>B< CRANKSHAFT SENSING BLADE/CRANKSHAFT SPACER/CRANKSHAFT SPROCKET

1. Clean the hole in the crankshaft sprocket.
2. Clean and degrease the mating surfaces of the crankshaft sprocket and crankshaft; sensing blade; and spacer.

NOTE: **Degreasing is necessary to prevent decrease in friction between the mating surfaces due to presence of oil.**

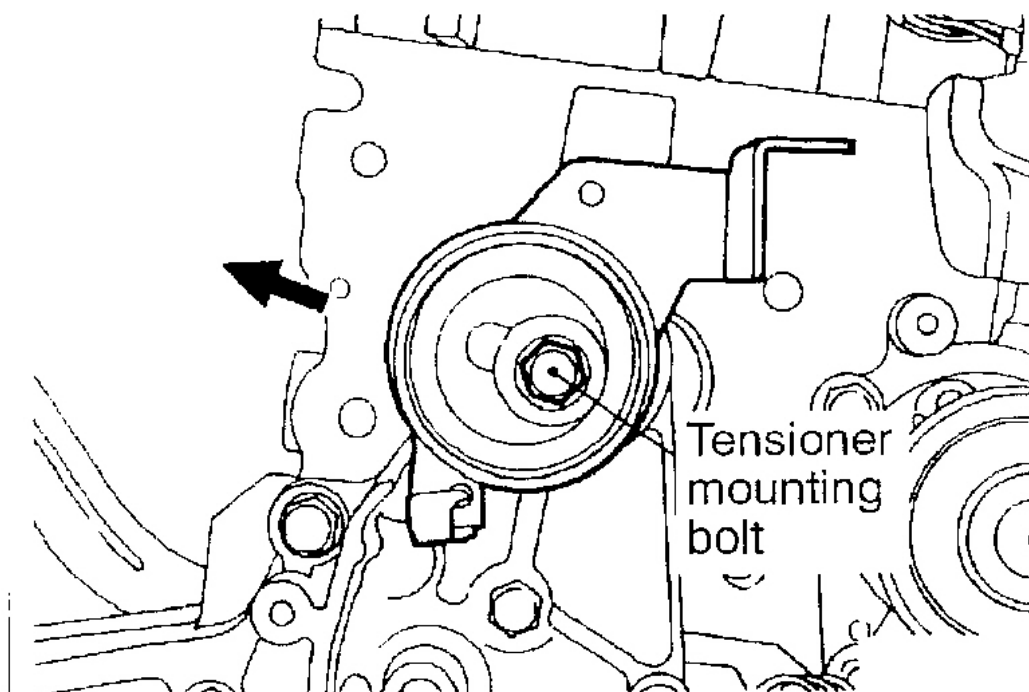


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Fig. 80: Cleaning Mating Surfaces Of Crankshaft Sprocket, Crankshaft, Sensing Blade & Spacer
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>C< TIMING BELT TENSIONER INSTALLATION

1. Install the timing belt tensioner in the illustrated position, and then tighten the tensioner mounting bolt.

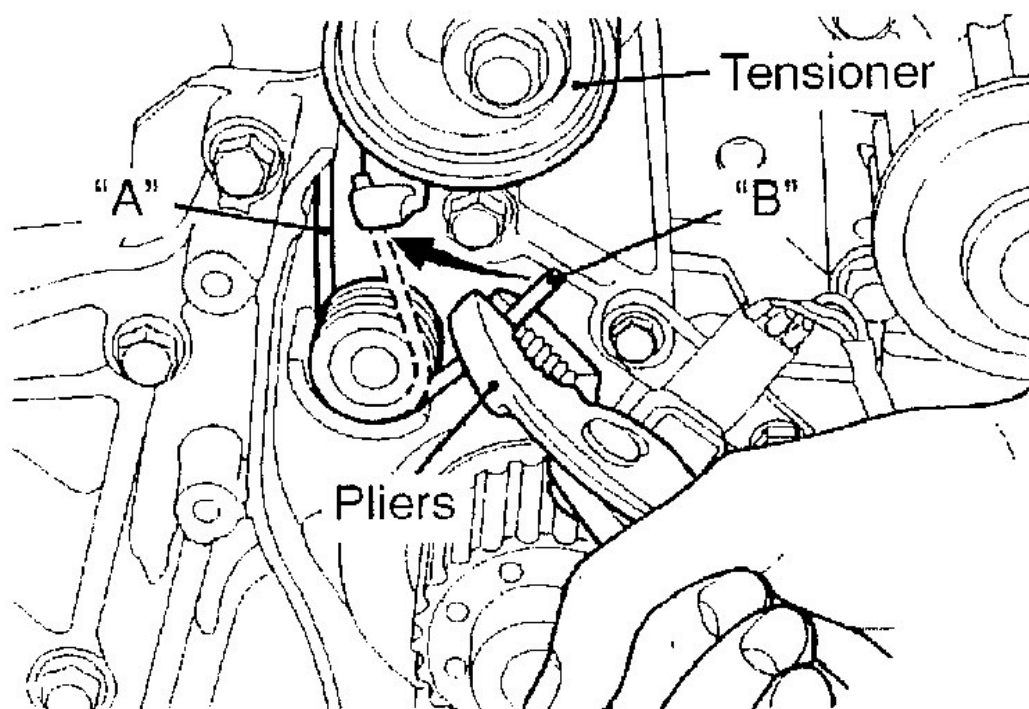


G01185444

Fig. 81: Installing Timing Belt Tensioner
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>D< TENSIONER SPRING INSTALLATION

1. Install the tensioner spring onto the boss of the front case, and then hook the spring end "A" (shorter one) to the front case rib.
2. Grip the spring end "B" (longer one), and then hook it onto the tensioner arm.



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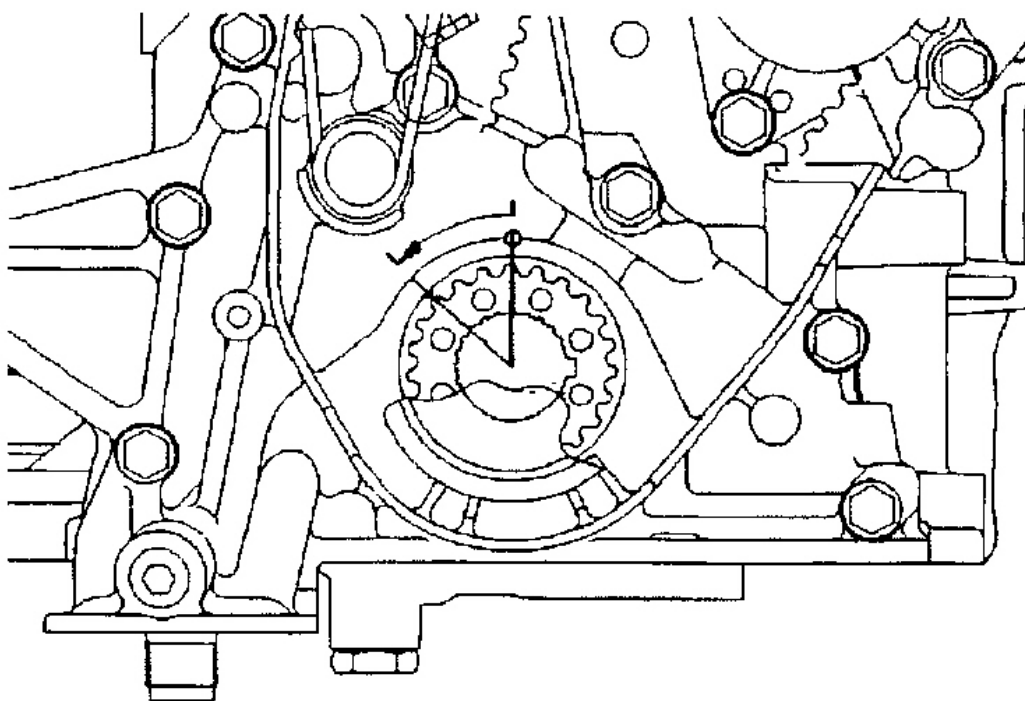
Fig. 82: Installing Tensioner Spring

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>E< TIMING BELT INSTALLATION

1. Align the crankshaft sprocket timing mark with the timing mark on the front case, and then rotate the crankshaft sprocket three teeth counterclockwise.

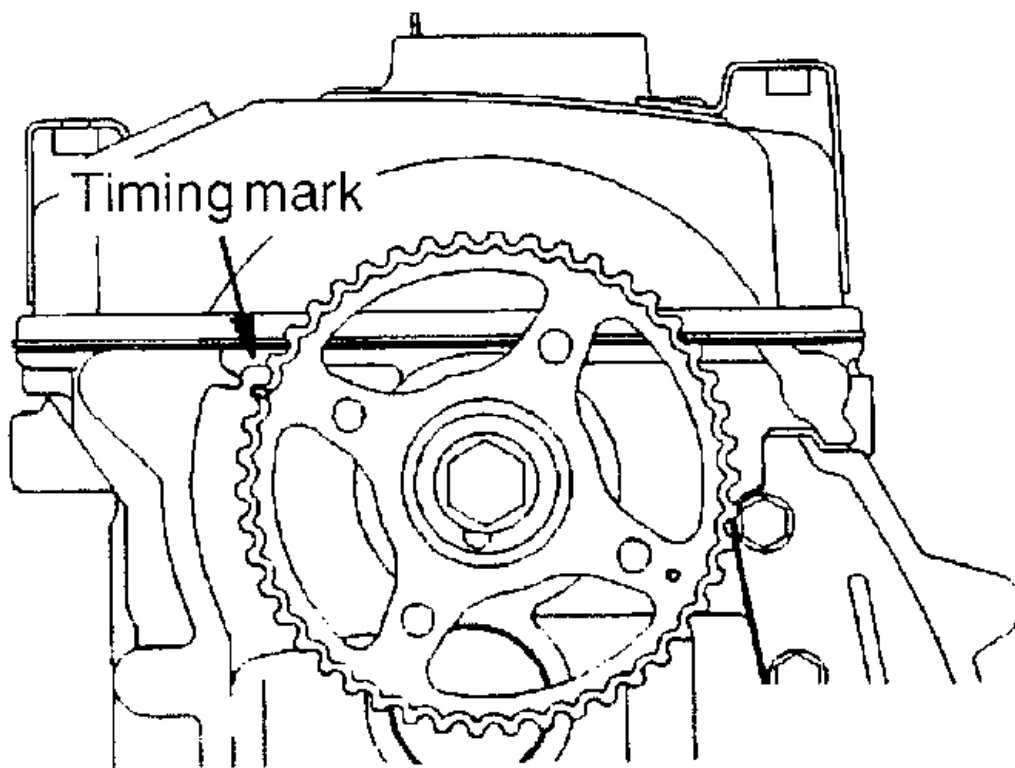
CAUTION: Aligning the timing marks positions the piston to the top dead center. Then, if the camshaft turns, the valves might interfere and damage the pistons.



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Fig. 83: Rotating Crankshaft Sprocket Three Teeth Counterclockwise
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

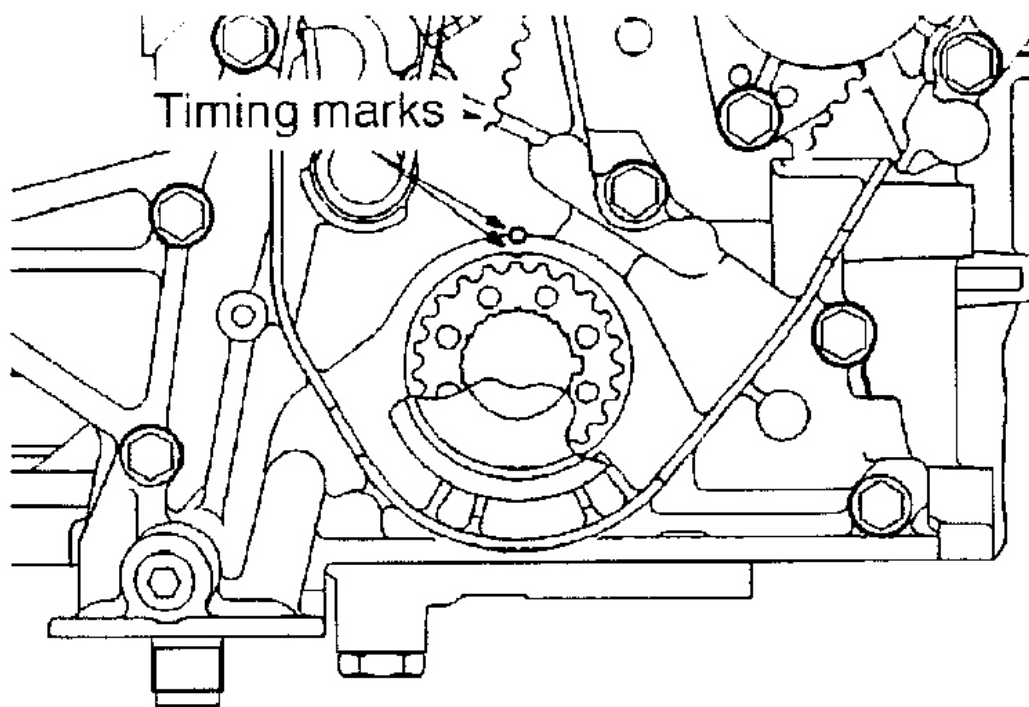
2. Align the camshaft sprocket timing mark with the timing mark on the cylinder head.



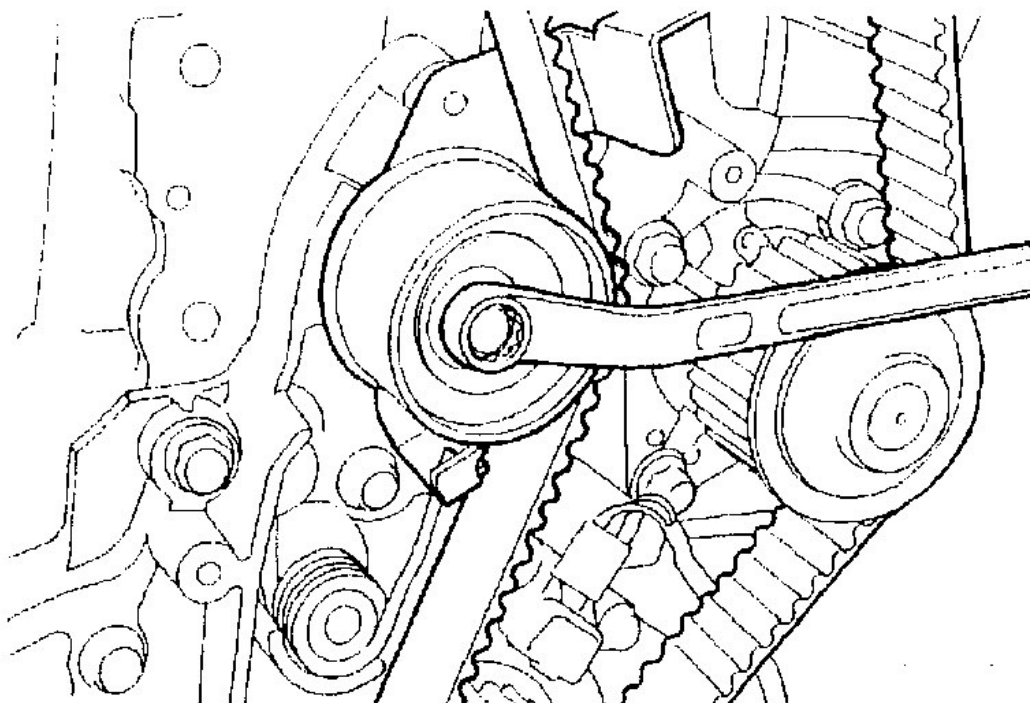
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Fig. 84: Aligning Camshaft Sprocket Timing Mark With The Timing Mark On The Cylinder Head
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. Rotate the crankshaft sprocket three teeth counterclockwise, and align the crankshaft sprocket timing mark with the timing mark on the front case.

**G01185448****Fig. 85: Aligning Crankshaft Timing Mark****Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

4. Keeping the tension side of the timing belt tight, fit the timing belt onto the crankshaft sprocket, water pump sprocket, camshaft sprocket and tensioner puller in that order.
5. Slightly loosen the timing belt tensioner bolt to tension the belt by a force of the tensioner spring.

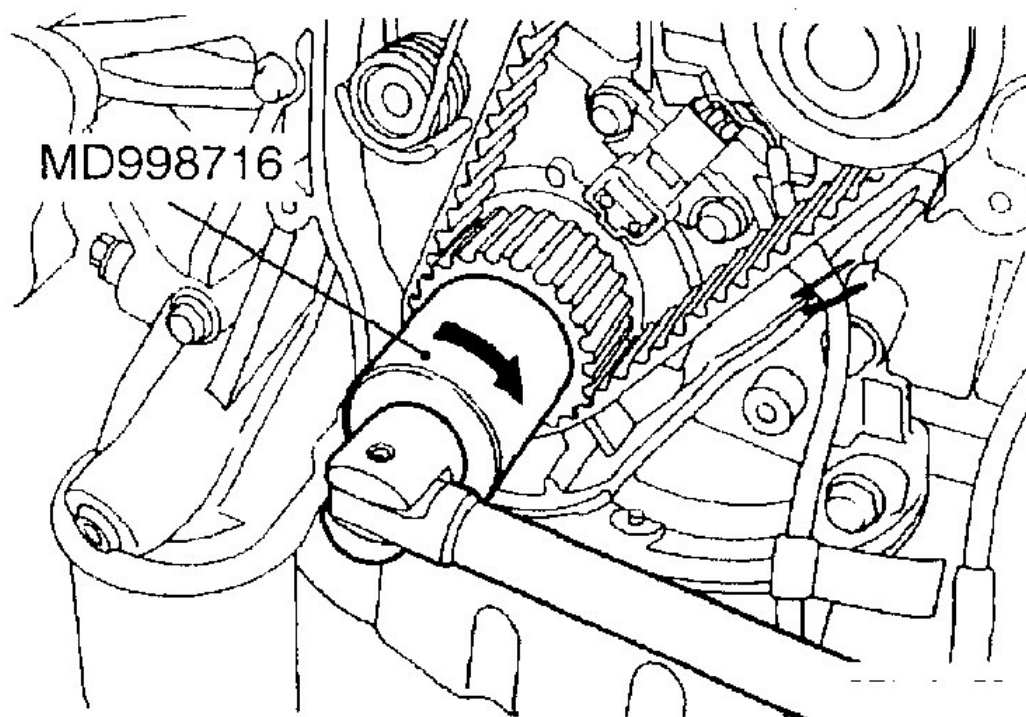


G01185449

Fig. 86: Loosening Timing Belt Tensioner

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

6. Turn the crankshaft twice in the clockwise direction.



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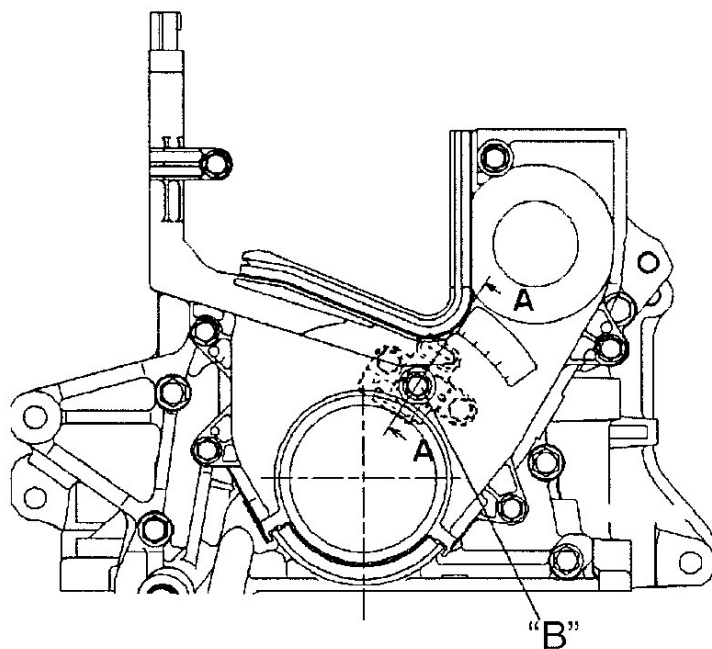
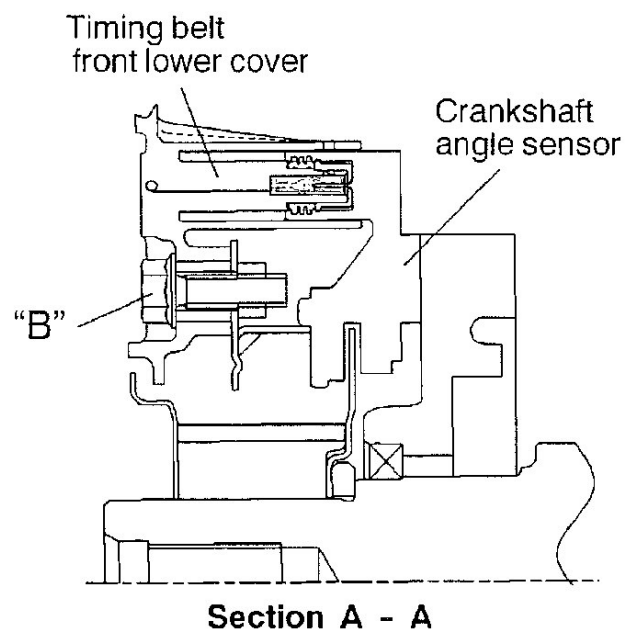
Fig. 87: Turning Crankshaft Twice In Clockwise Direction
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

CAUTION: This procedure utilizes the camshaft's driving torque to apply tension evenly to the timing belt. Be sure to turn the crankshaft as described above. Do not turn the crankshaft counterclockwise.

7. Check that the timing marks are correctly aligned.
8. Tighten the timing belt tensioner locking bolt to the specified torque.

< F > TIMING BELT FRONT LOWER COVER INSTALLATION

1. When installing the timing belt front lower cover, insert the terminal boss of the sensor securely into crankshaft angle sensor connector.
2. Tighten bolt "B" first and then tighten other bolts to specified torque.



G01185451

Fig. 88: Installing Timing Belt Front Lower Cover
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

INSPECTION

TIMING BELT

Check the timing belt closely. Replace the belt with a new one if any of the following defects are evident:

1. Hardened backing rubber (the backing rubber is glossy, non-elastic, and so hard that scratching with fingernails leaves no mark.)

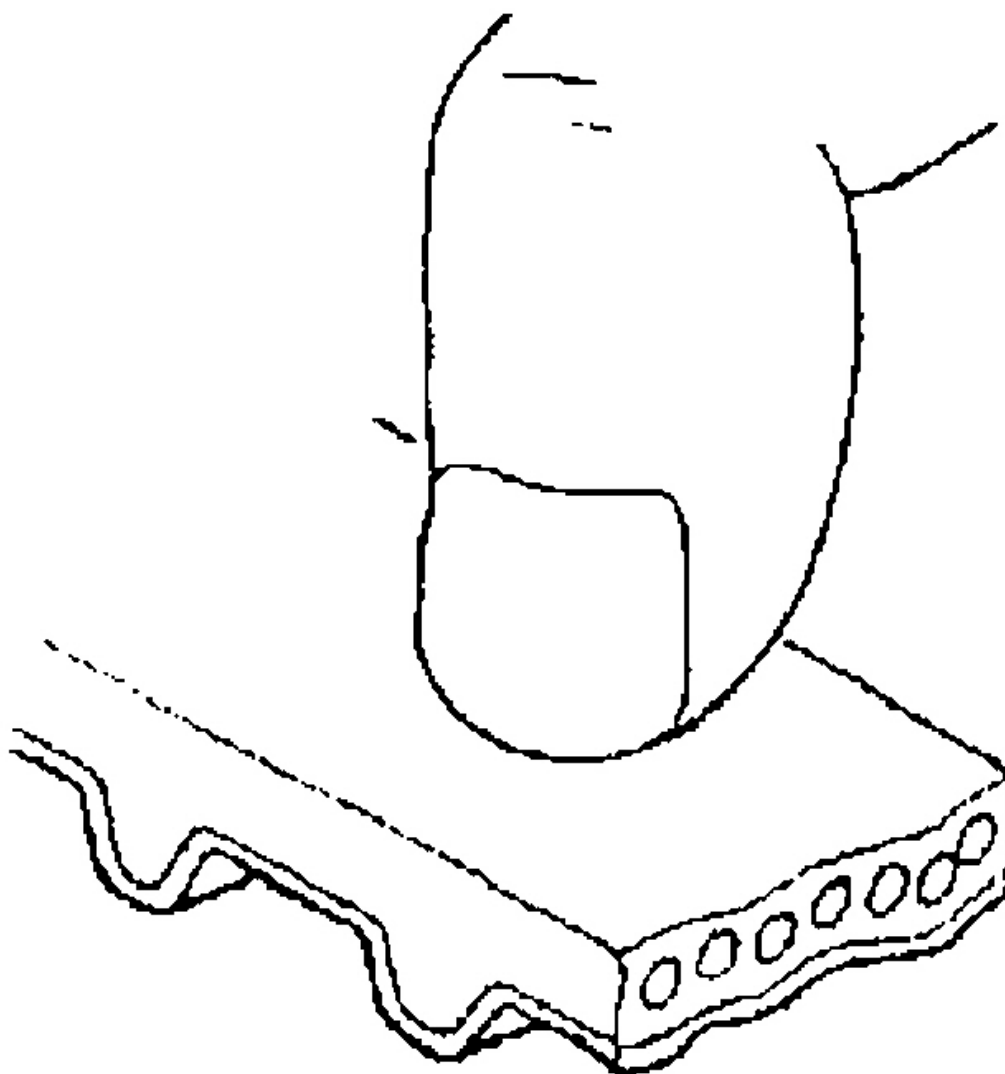
**G01185452**

Fig. 89: Checking Backing Rubber Of Timing Belt
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2. Surface cracks on the backing rubber.
3. Cracks or peeling of the canvas.
4. Cracks on the tooth bottom.
5. Cracks on the belt sides.

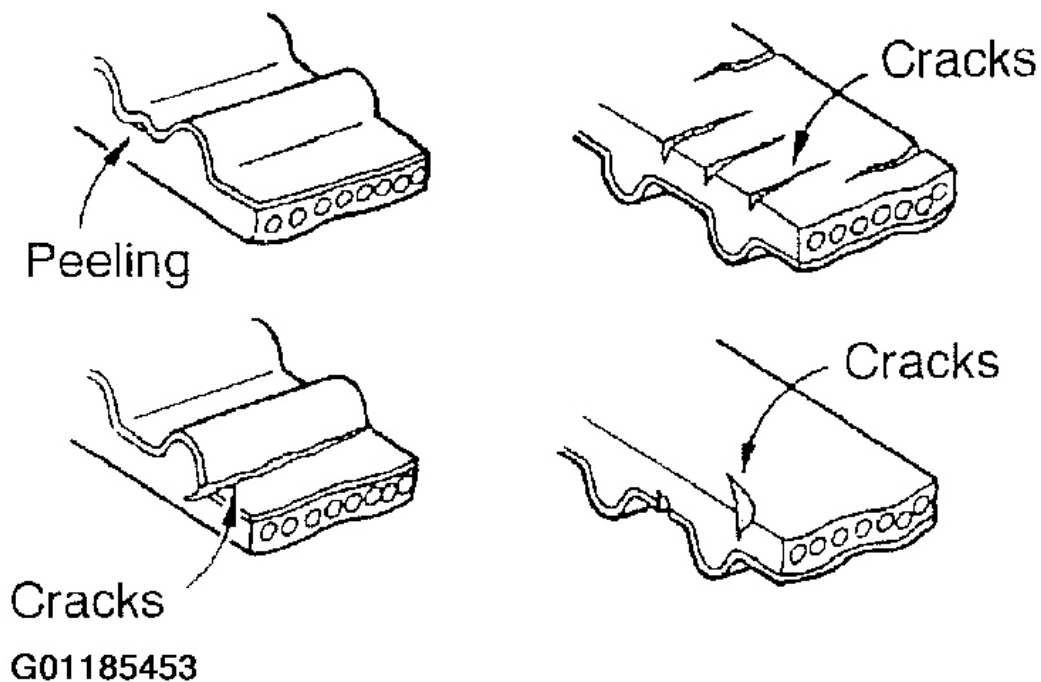
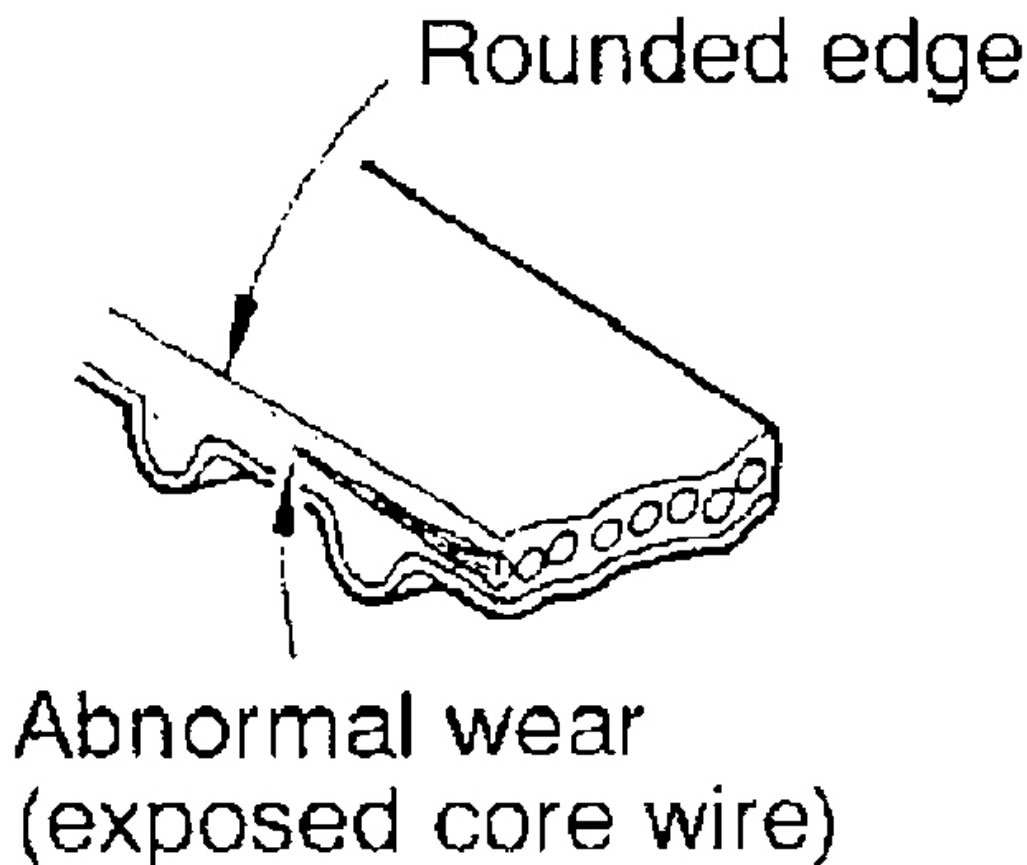


Fig. 90: Checking For Cracks On Timing Belt
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

6. Abnormal wear on the belt sides.

NOTE: The sides of the belt are normal if they are sharp as if cut by a knife.



G01185454

Fig. 91: Checking For Abnormal Wear On Timing Belt Sides
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

7. Abnormal wear on teeth.

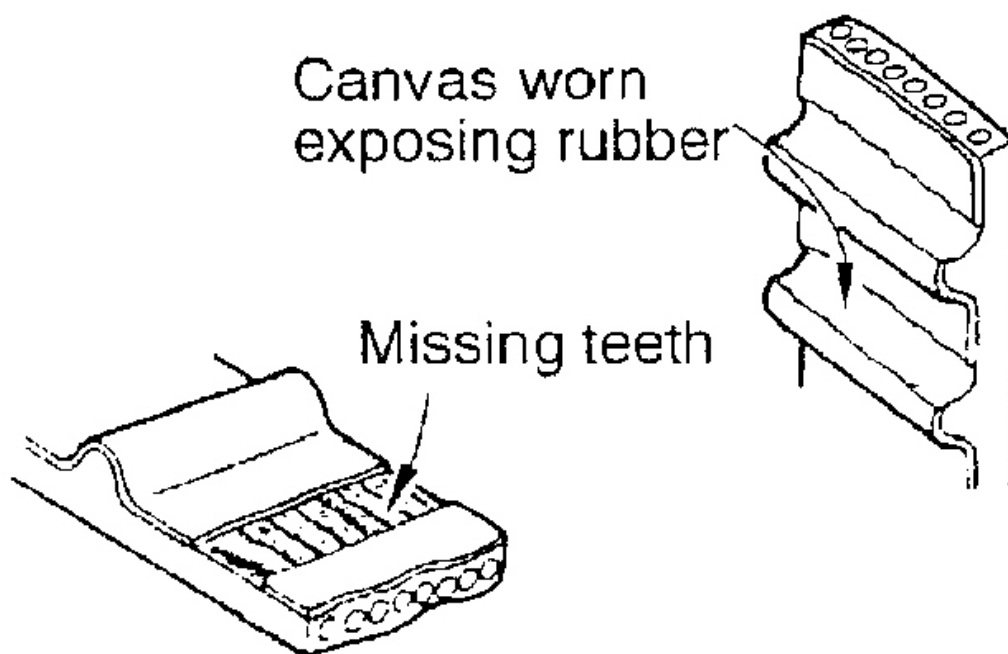
Initial stage:

Canvas worn (fluffy canvas fibers, rubbery texture gone, white discoloration, canvas texture indistinct)

Final stage:

Canvas worn, exposing rubber (tooth width reduced)

8. Missing teeth.

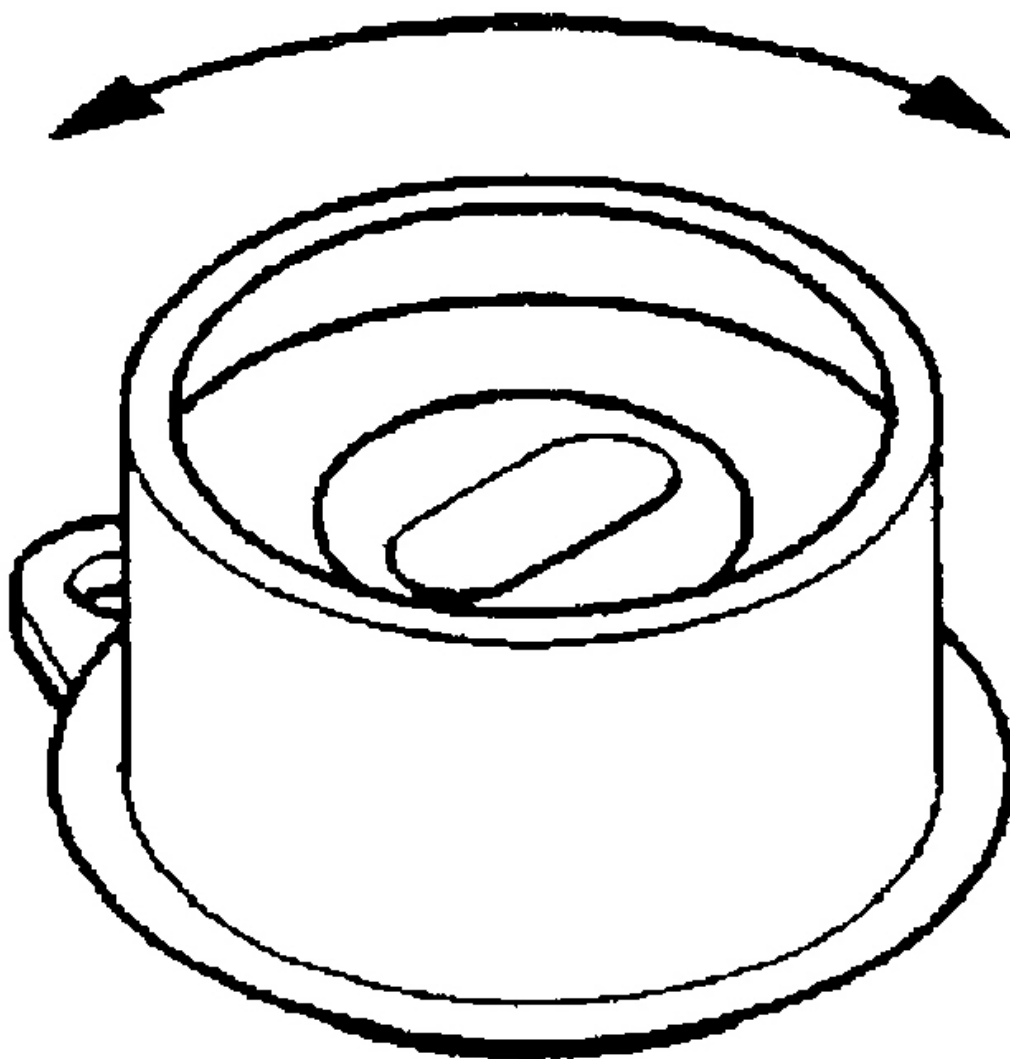


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Fig. 92: Checking For Missing Tooth On Timing Belt
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

TENSIONER PULLER

1. Check the pulley for smooth rotation, without play and are not noisy.



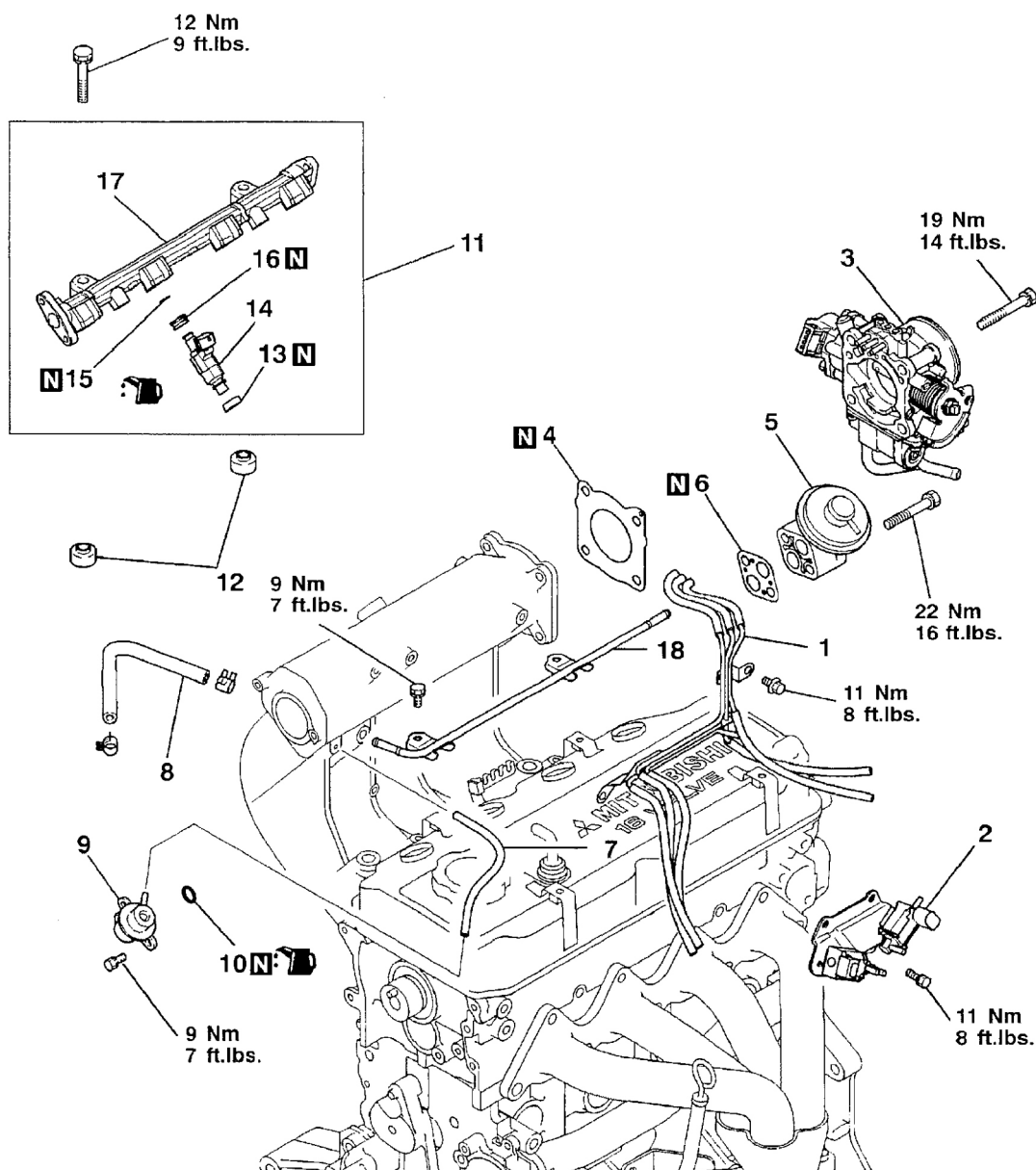
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Fig. 93: Checking Tensioner Pulley

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

FUEL AND EMISSION CONTROL SYSTEM

REMOVAL & INSTALLATION



Removal steps

1. Vacuum hose and pipe assembly
2. Solenoid valve assembly
3. Throttle body
4. Gasket
5. EGR valve
6. EGR valve gasket
7. Vacuum hose
8. Fuel hose
9. Fuel pressure regulator

10. O-ring
11. Fuel rail and injector
12. Insulator
13. Insulator
14. Injector
15. O-ring
16. Grommet
17. Fuel rail
18. Fuel return pipe

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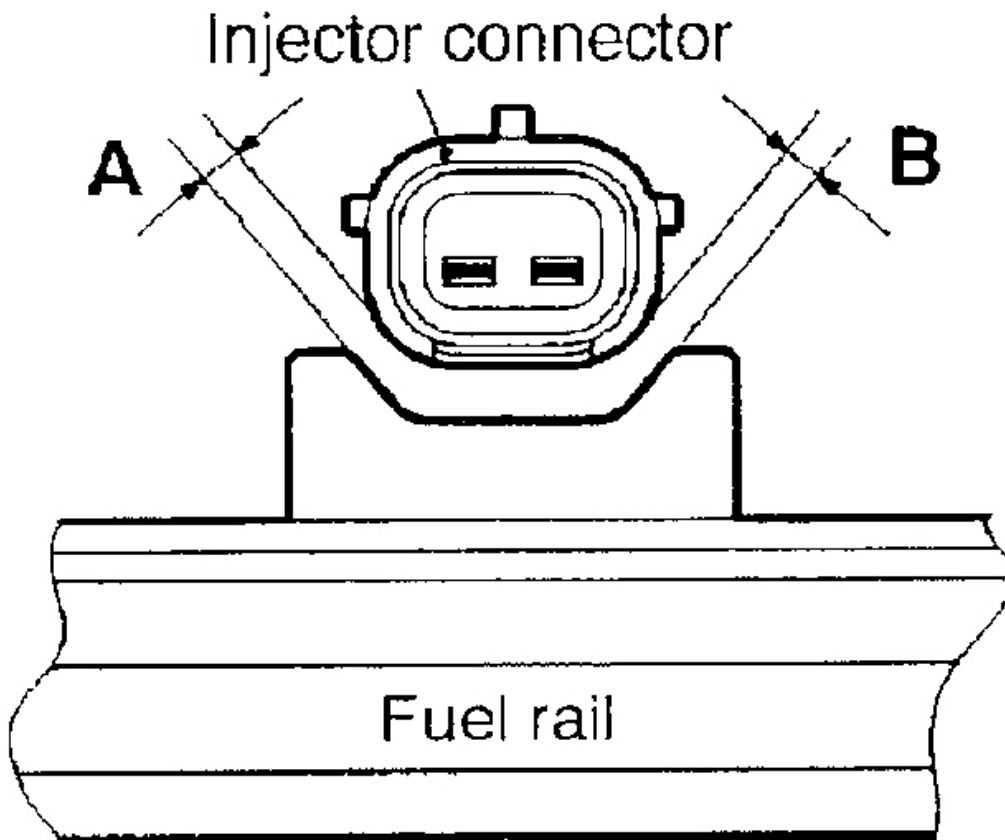
Fig. 94: Removing & Installing Fuel & Emission Control System

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

INSTALLATION SERVICE POINTS

>A< INJECTORS INSTALLATION

1. Fit a new O-ring and grommet onto the injector.
2. Apply clean engine oil or gasoline to the injector O-ring.
3. Fit the injector onto the fuel rail, turning it to the left and right as it goes in.
4. Check that the injector rotates smoothly.
5. Check that the clearance between the injector connector and the fuel rail is uniform ($A = B$).



G01185458

Fig. 95: Checking The Clearance Between Injector Connector & Fuel Rail
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>B< FUEL PRESSURE REGULATOR INSTALLATION

1. Apply a drop of clean engine oil to the O-ring, then insert the fuel pressure regulator into the fuel rail, being careful not to damage the O-ring.

CAUTION: Do not let engine oil get into the fuel rail.

2. Check that the fuel pressure regulator rotates smoothly. If it does not rotate smoothly, the O-ring may be binding. If this occurs, remove the fuel pressure regulator, check the O-ring for damage, then re-insert the regulator into the fuel rail.

>C< GASKET INSTALLATION

1. Position the projection as shown in the illustration.

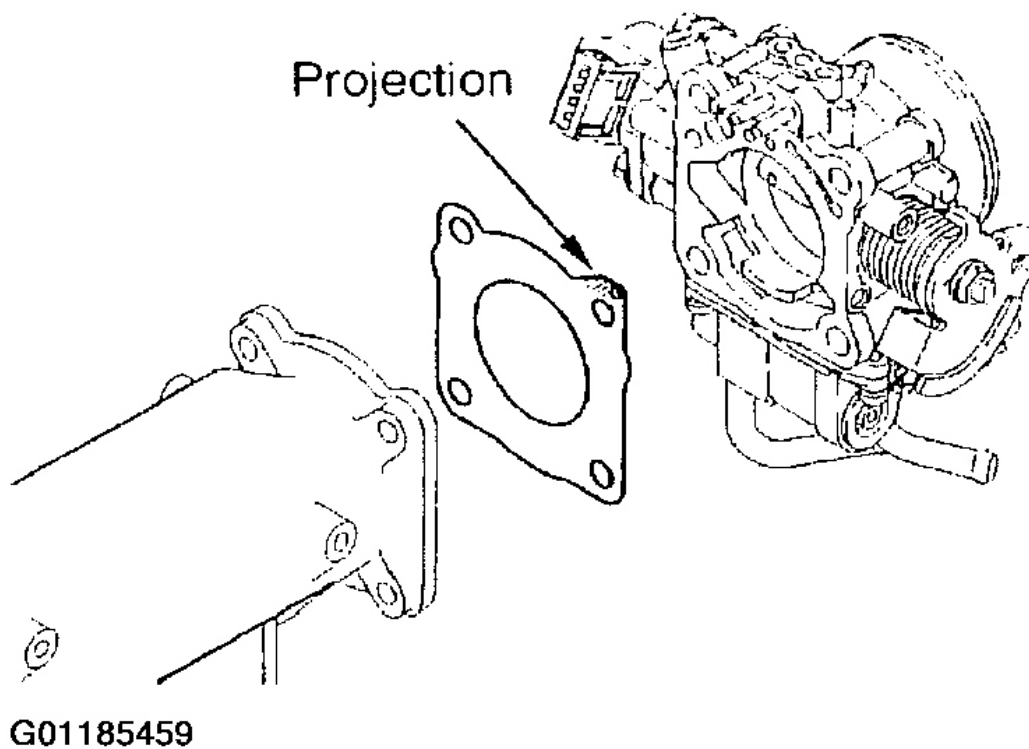
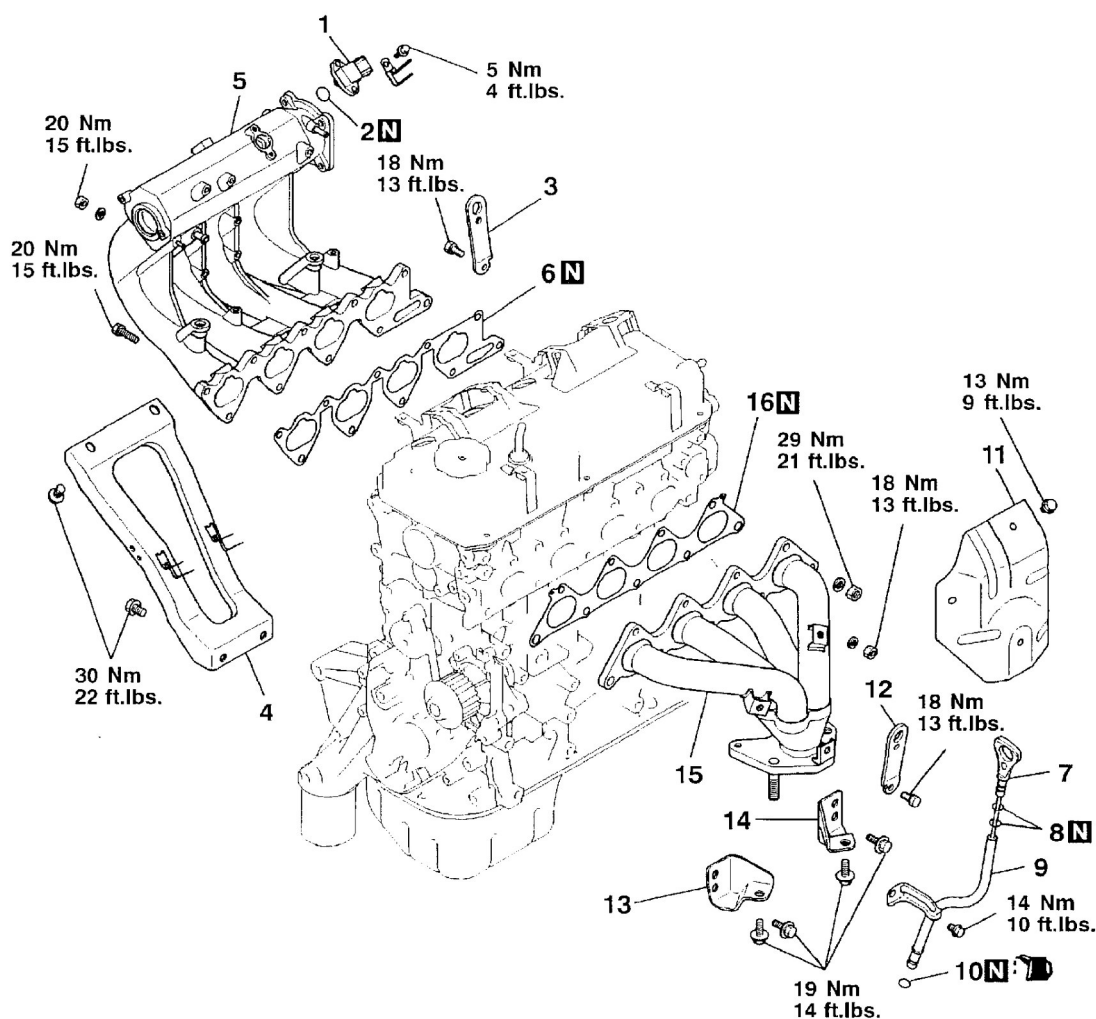


Fig. 96: Installing Gasket

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

INTAKE AND EXHAUST MANIFOLDS

REMOVAL & INSTALLATION



Removal steps

1. Manifold differential pressure sensor
2. O-ring
3. Engine hanger
4. Intake manifold stay
5. Intake manifold
6. Intake manifold gasket
7. Oil dipstick
8. O-ring

9. Oil dipstick guide
10. O-ring
11. Exhaust manifold cover
12. Engine hanger
13. Exhaust manifold bracket A
14. Exhaust manifold bracket B
15. Exhaust manifold
16. Exhaust manifold gasket



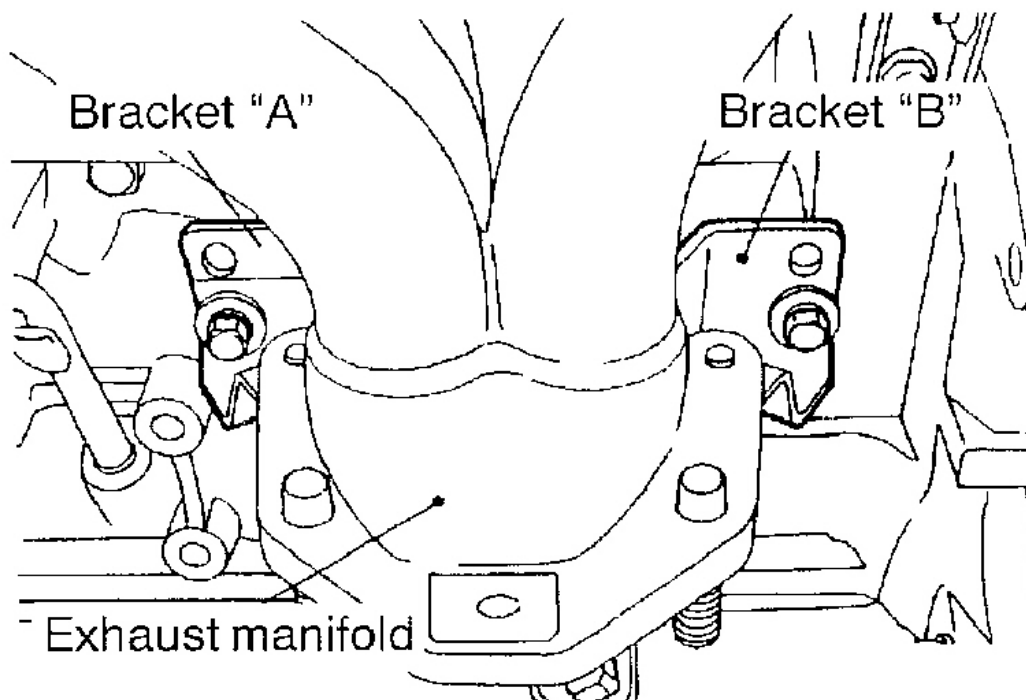
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Fig. 97: Removing & Installing Intake & Exhaust Manifolds
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

INSTALLATION SERVICE POINT

>A< EXHAUST MANIFOLD/BACKET INSTALLATION

1. Install the exhaust manifold brackets "A" and "B" as shown in the illustration, and finger tighten each bolt.



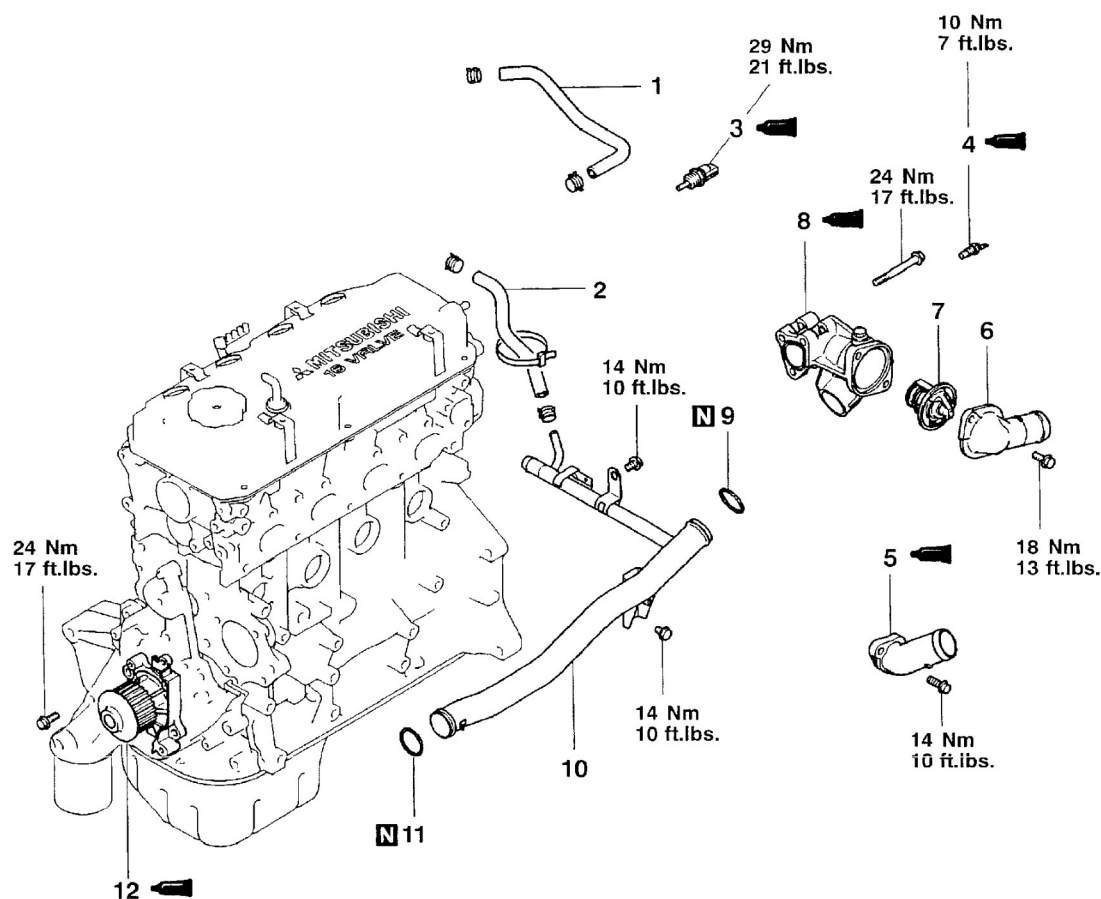
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Fig. 98: Installing Exhaust Manifold Brackets
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2. Tighten the all bolts to the specified torque.

WATER PUMP AND WATER HOSE

REMOVAL & INSTALLATION



Removal steps

- 1. Water hose A
- 2. Water hose B
- ▶G◀ 3. Engine coolant temperature sensor
- ▶F◀ 4. Engine coolant temperature gauge unit
- ▶E◀ 5. Water outlet fitting
- 6. Water inlet fitting

- ▶D◀ 7. Thermostat
- ▶C◀ 8. Thermostat case
- ▶B◀ 9. O-ring
- ▶B◀ 10. Water inlet pipe
- ▶B◀ 11. O-ring
- ▶A◀ 12. Water pump

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Fig. 99: Removing & Installing Water Pump & Water Hose
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

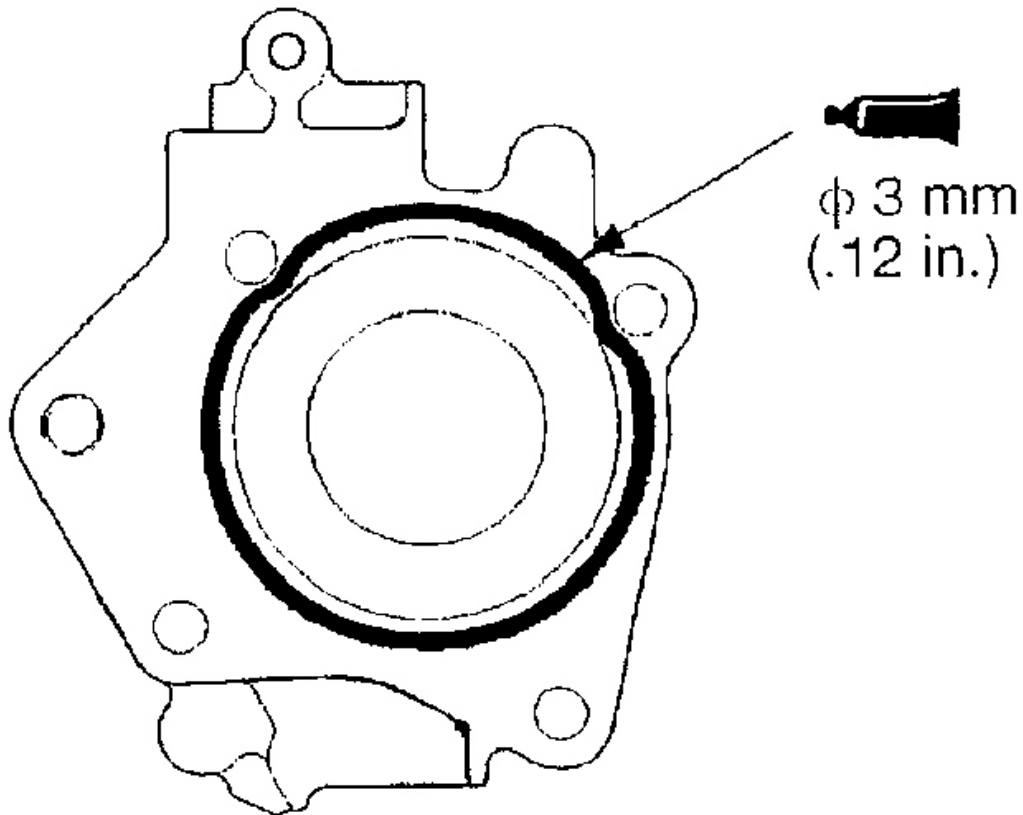
INSTALLATION SERVICE POINTS

>A< WATER PUMP INSTALLATION

1. Clean the sealant application surfaces of the water pump case and cylinder block.

2. Apply a 3 mm (.12 in.) diameter bead of sealant to the area shown in the illustration. Be sure to install the water pump within 15 minutes after applying sealant.

Specified sealant: Mitsubishi Genuine Part No. MD970389 or equivalent



G01185463

Fig. 100: Applying Sealant To Water Pump

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. After installation, wait at least one hour. Never start the engine or let coolant touch the adhesion surface during that time.

>B< WATER INLET PIPE/O-RING INSTALLATION

1. Replace the water inlet pipe O-ring with new ones, then apply water to the O-rings so that they can be inserted easily into the cylinder block and the thermostat case.

- CAUTION:**
1. Never apply any oil or grease to the O-ring.
 2. Secure the water pipe after the thermostat case has been installed.

>C< THERMOSTAT CASE INSTALLATION

1. Clean the sealant application surfaces of the thermostat case and cylinder head.
2. Apply a 3 mm (.12 in.) diameter bead of sealant to the area shown in the illustration. Be sure to install the thermostat case within 15 minutes after applying sealant.

Specified sealant: Mitsubishi Genuine Part No. MD970389 or equivalent

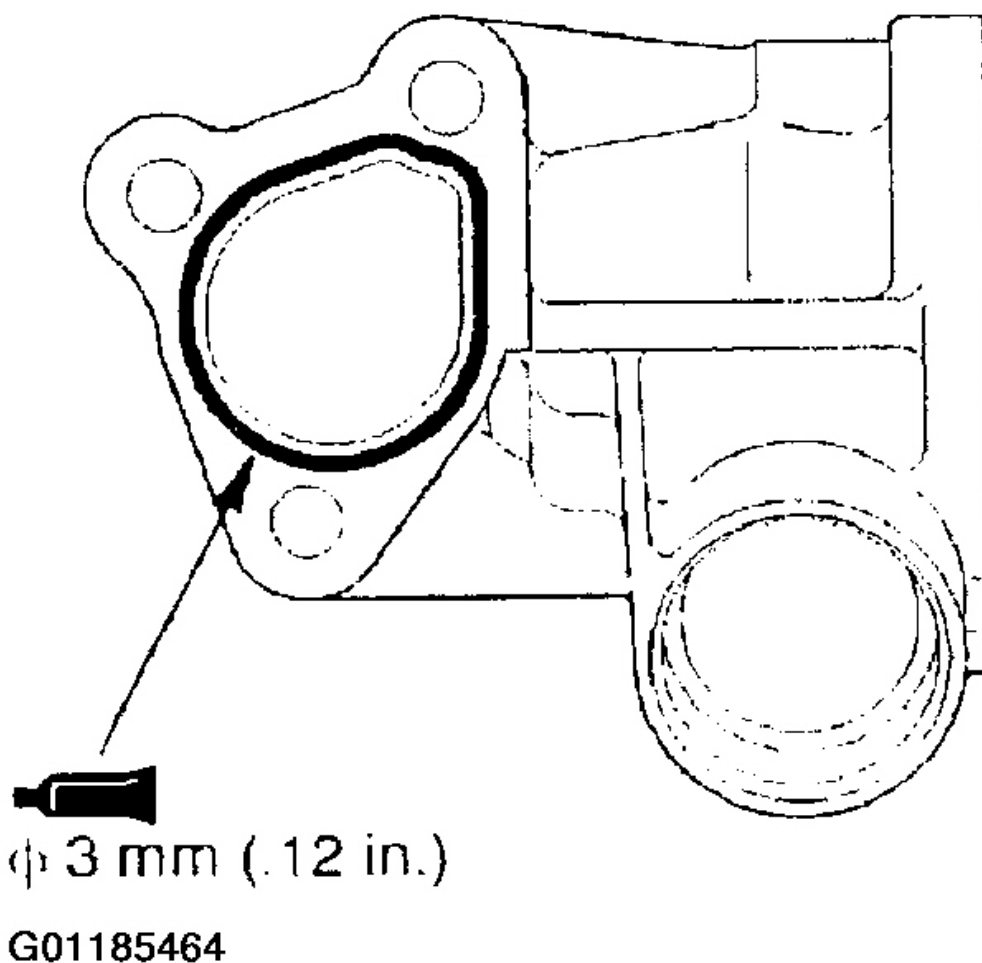


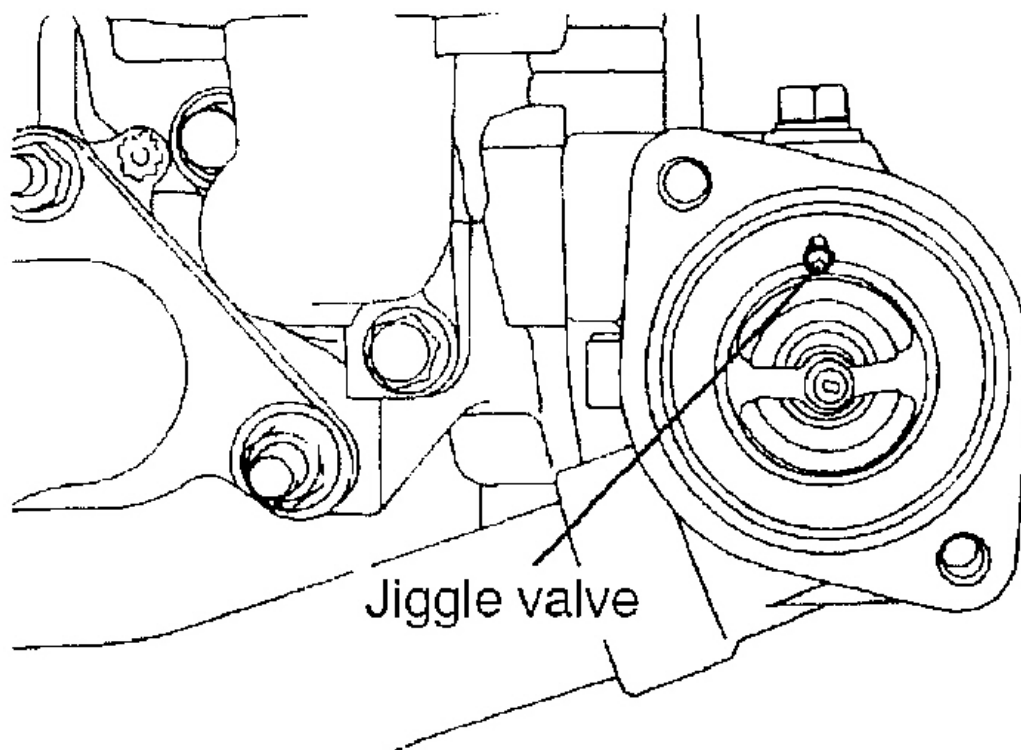
Fig. 101: Applying Sealant To Thermostat Case

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. After installation, wait at least one hour. Never start the engine or let coolant touch the adhesion surface during that time.

>D< THERMOSTAT INSTALLATION

1. Install the thermostat so that the jiggle valve is at the top.



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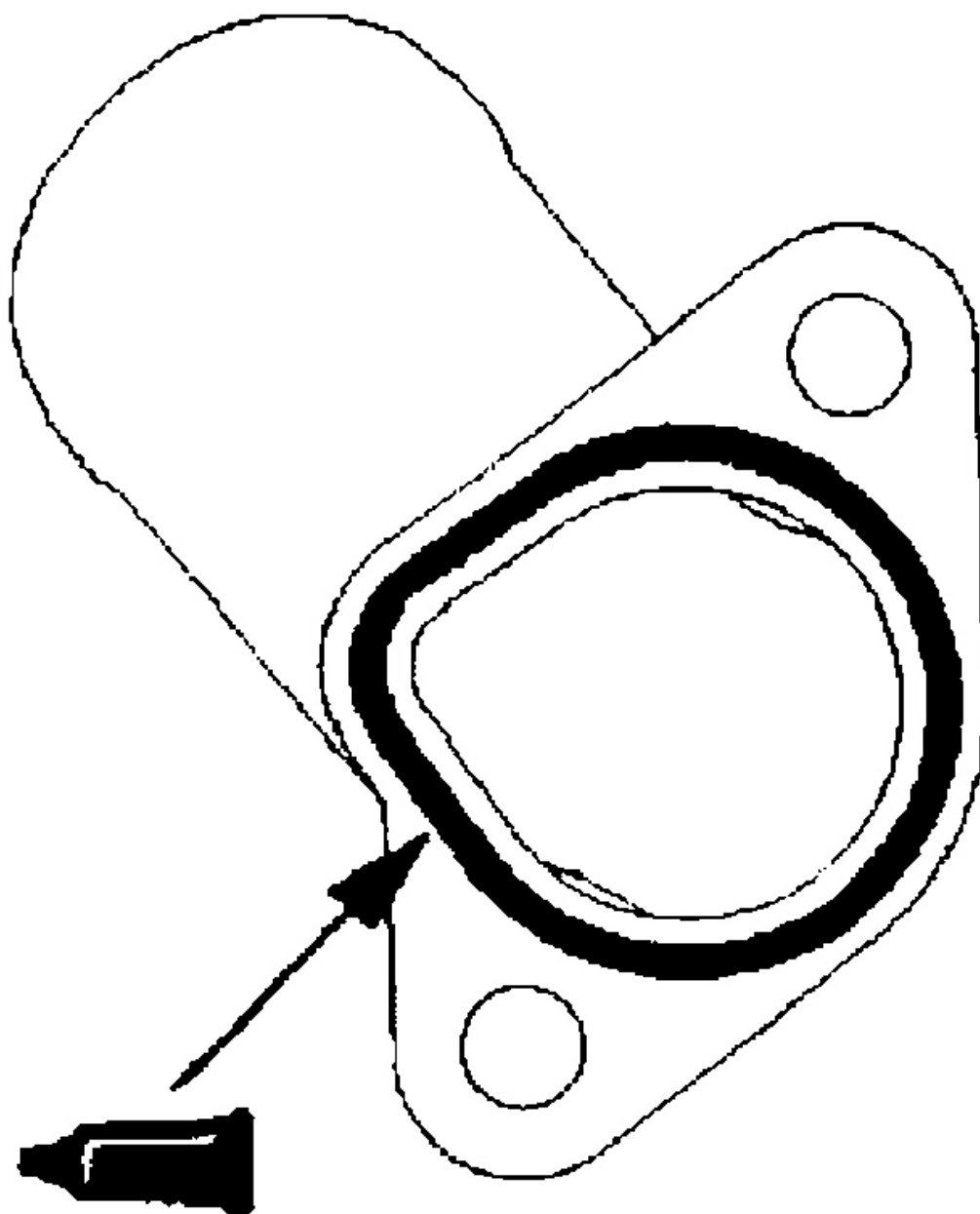
Fig. 102: Installing Thermostat

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>E< OUTLET FITTING INSTALLATION

1. Clean the sealant application surfaces of the fittings and cylinder head.
2. Apply a 3 mm (.12 in.) diameter bead of sealant to the area shown in the illustration. Be sure to install the fitting within 15 minutes after applying sealant.

Specified sealant: Mitsubishi Genuine Part No. MD970389 or equivalent



ϕ 3 mm (.12 in.)

G01185466

Fig. 103: Applying Sealant To Outlet Fitting

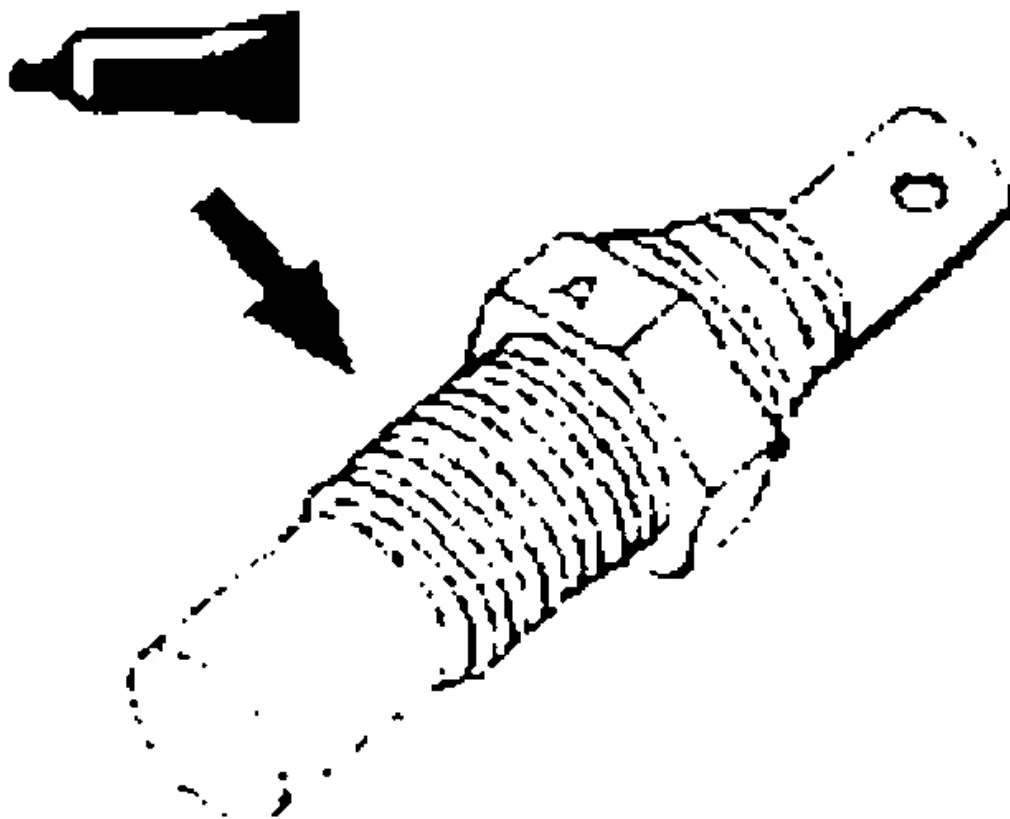
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. After installation, wait at least one hour. Never start the engine or let coolant touch the adhesion surface during that time.

>F< ENGINE COOLANT TEMPERATURE GAUGE UNIT INSTALLATION

1. When reusing the gauge unit, clean its thread.
2. Apply the specified sealant to the threads.

Specified sealant: 3M™ AAD Part No. 8731 or equivalent



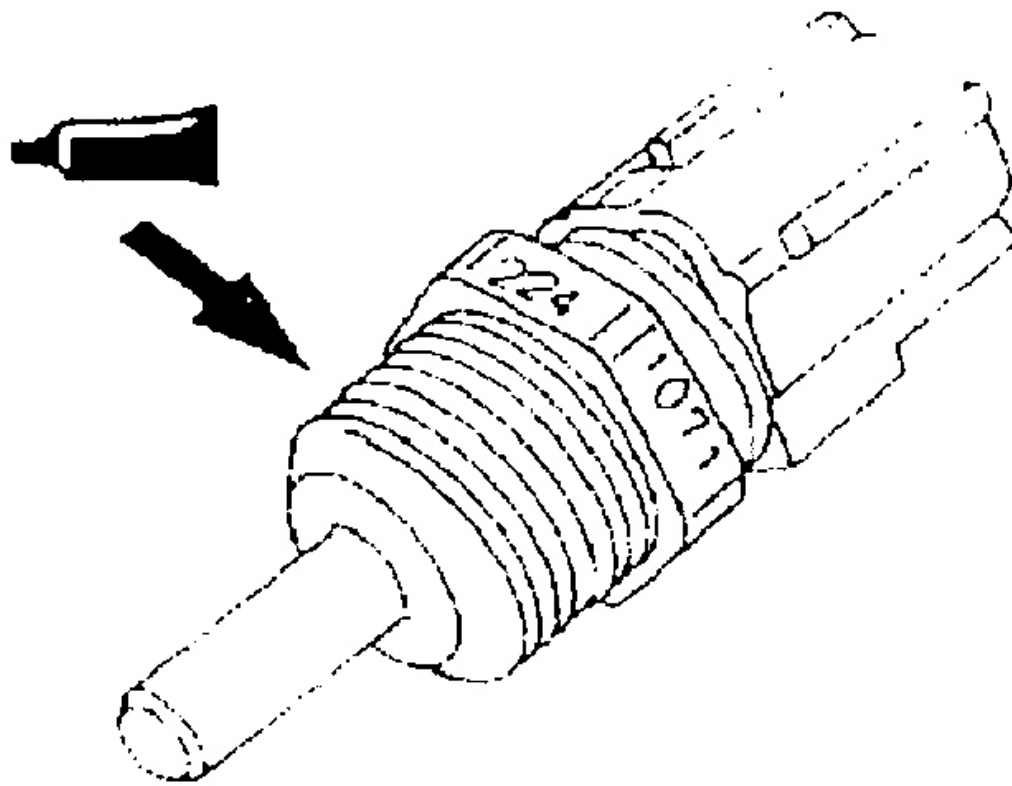
G01185467

Fig. 104: Applying Sealant To Temperature Gauge Unit
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>G< ENGINE COOLANT TEMPERATURE SENSOR INSTALLATION

1. When reusing the sensor, clean its thread.
2. Apply the specified sealant to the threads.

Specified sealant: 3M™ AAD Part No. 8672 or equivalent

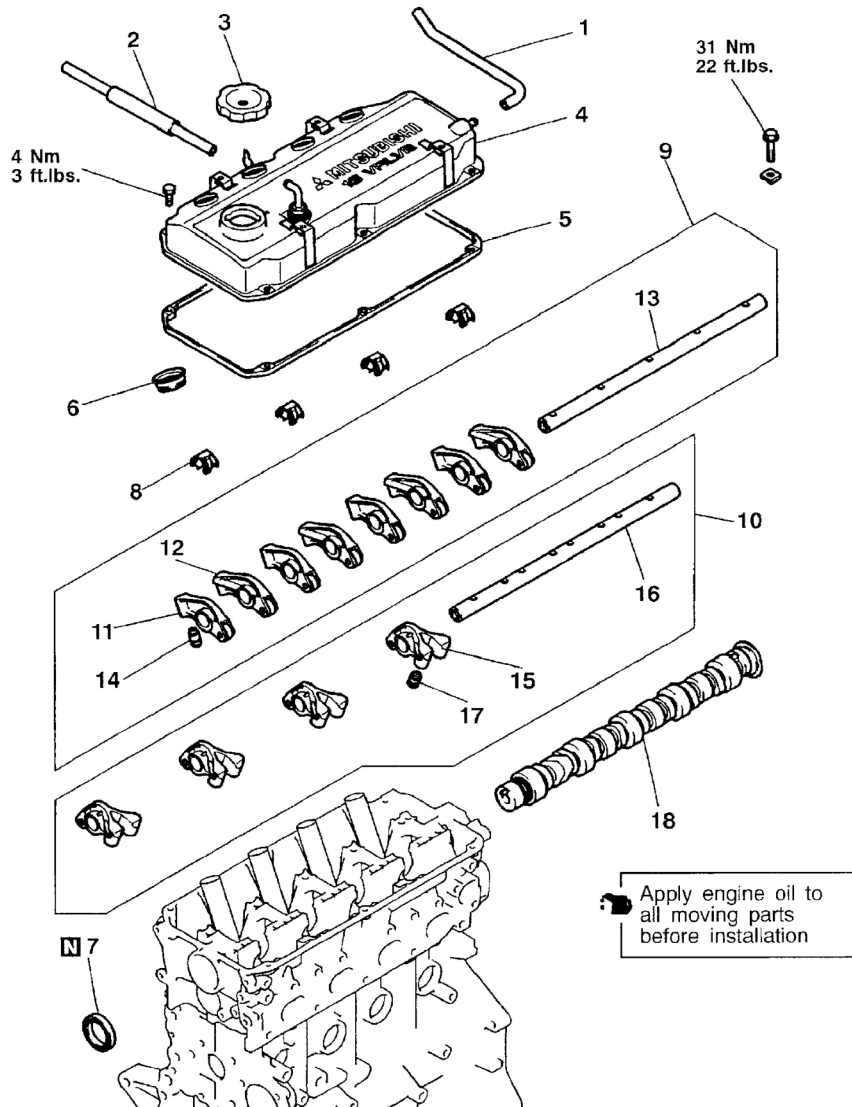


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Fig. 105: Applying Sealant To Temperature Sensor Thread
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

ROCKER ARMS AND CAMSHAFT

REMOVAL & INSTALLATION



Removal steps

1. Breather hose
2. P.C.V. hose
3. Oil filler cap
4. Rocker cover
5. Rocker cover gasket
6. Oil seal
7. Oil seal
8. Rocker arm spring
9. Rocker arms and rocker arm shaft (Intake)

◀A▶

10. Rocker arms and rocker arm shaft (Exhaust)
11. Rocker arm B
12. Rocker arm A
13. Rocker arm shaft
14. Lash adjuster
15. Rocker arm C
16. Rocker arm shaft
17. Lash adjuster
18. Camshaft

▶B▶

▶A▶

▶B▶

▶A▶

▶E▶
▶D▶
▶C▶

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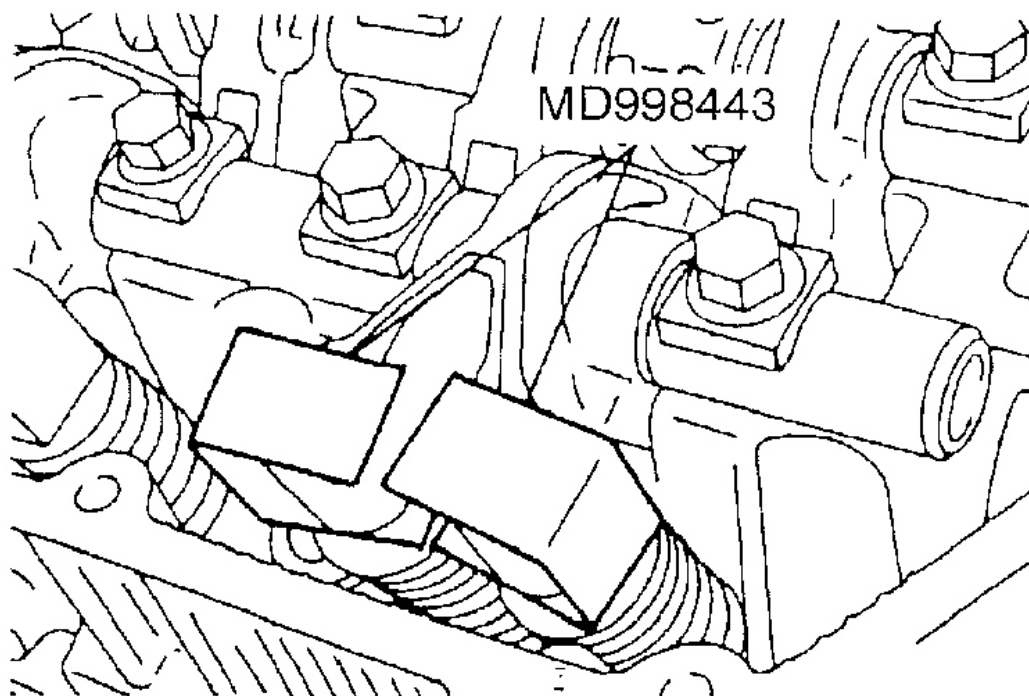
Fig. 106: Removing & Installing Rocker Arms & Camshaft
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

REMOVAL SERVICE POINT

< A > ROCKER ARM AND ROCKER ARM SHAFT REMOVAL

CAUTION: If the lash adjuster is re-used, clean the lash adjuster. See LASH ADJUSTERS.

1. Set special tool MD998443 to prevent the lash adjuster coming free and falling to the floor.



G01185470

Fig. 107: Setting Special Tool MD998443

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

INSTALLATION SERVICE POINTS

>A< LASH ADJUSTER INSTALLATION

CAUTION: If the lash adjuster is re-used, clean the lash adjuster. See LASH ADJUSTERS.

1. Fit the lash adjuster onto the rocker arm without allowing diesel fuel to spill out. Fit special tool MD998443 to prevent the lash adjuster coming free and falling to the floor.

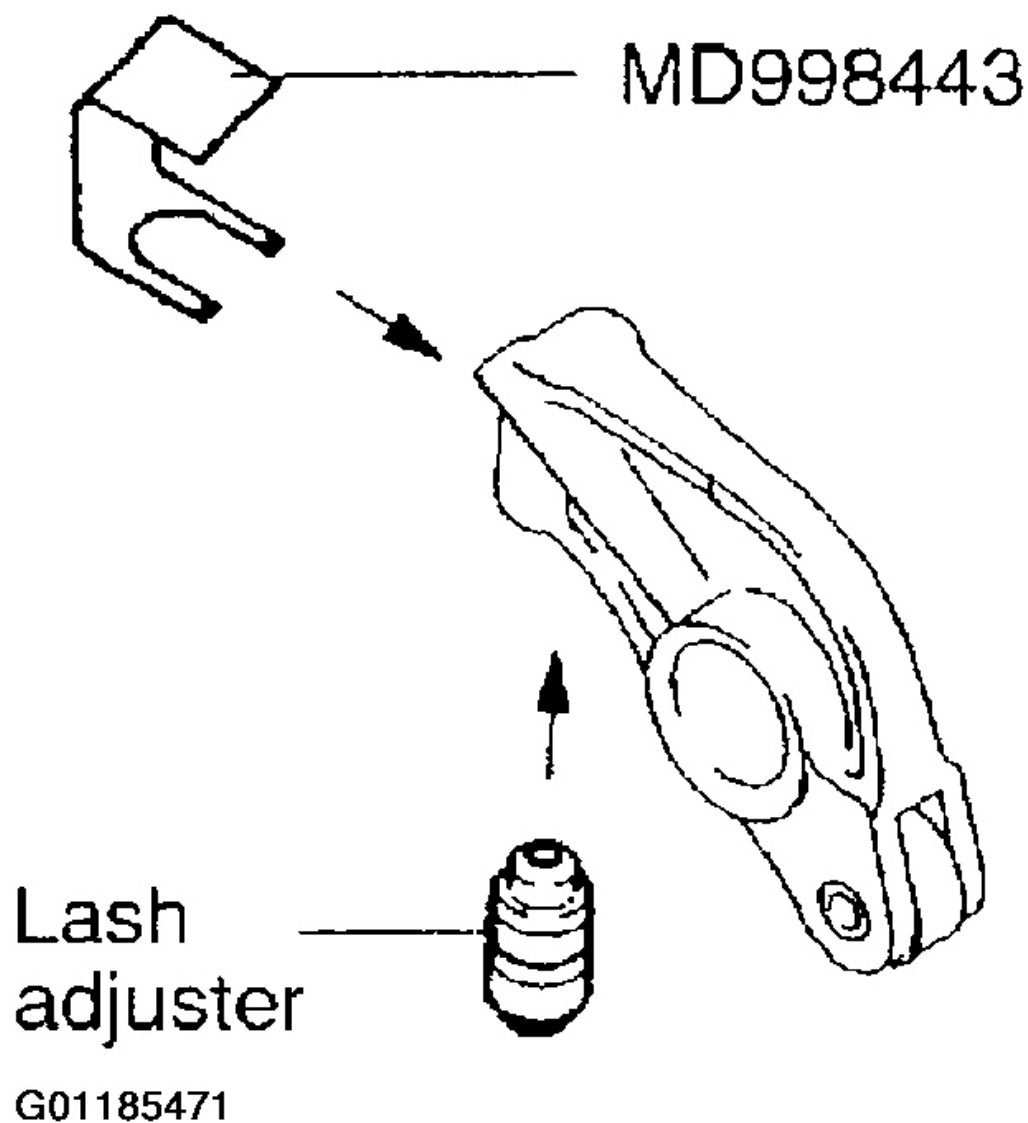


Fig. 108: Installing Lash Adjuster

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>B< ROCKER ARM SHAFT INSTALLATION

1. Install the rocker arm shafts, place the end with notched side toward the timing belt side as shown.

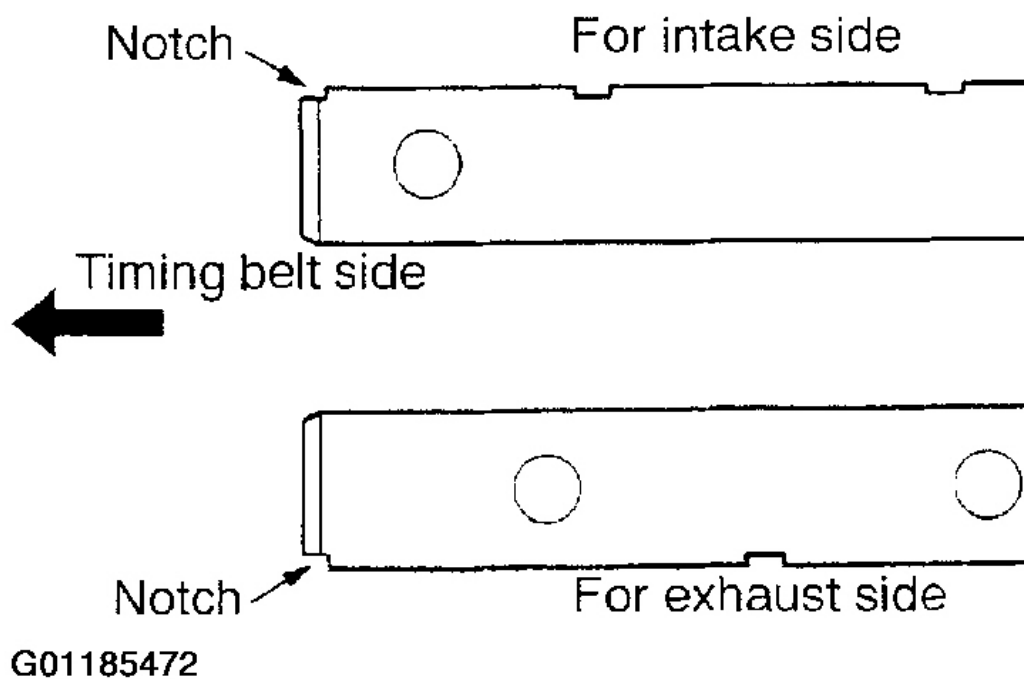
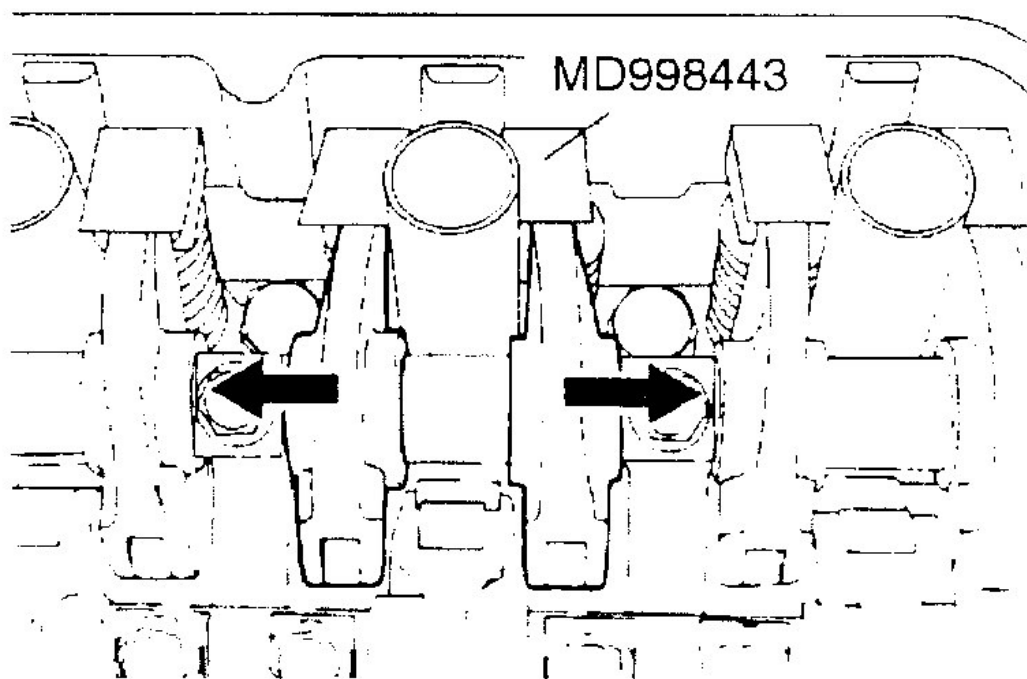


Fig. 109: Installing Rocker Arm Shafts

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>C< **ROCKER ARMS AND ROCKER ARM SHAFT INSTALLATION**

1. Move the rocker arms in the directions shown in the illustration before tightening the rocker arm shaft bolts.



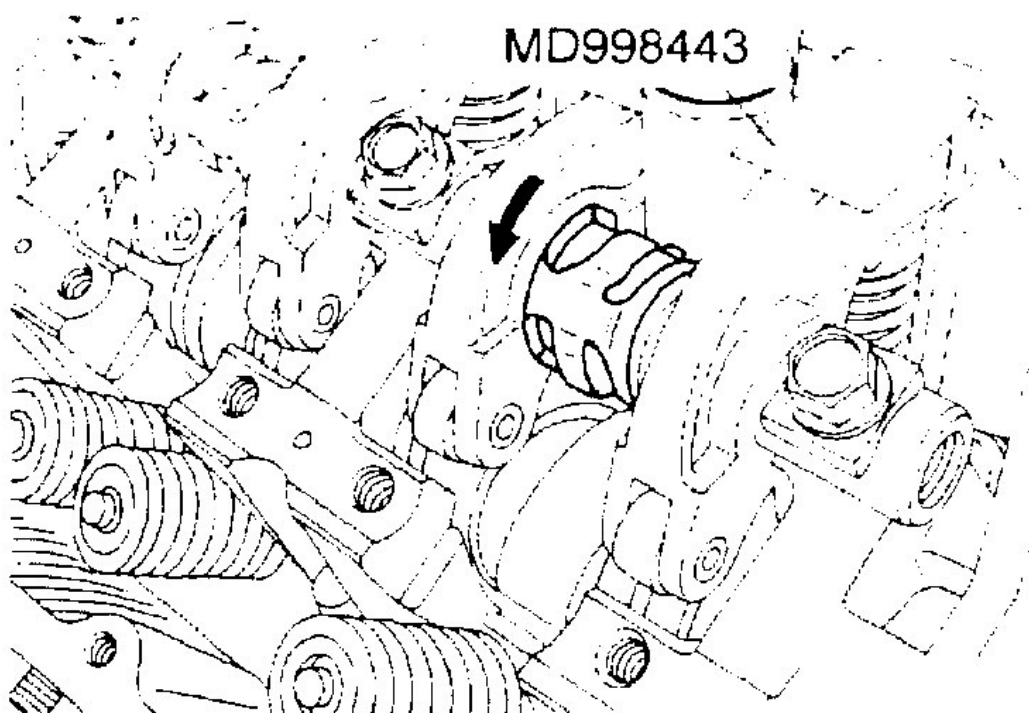
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Fig. 110: Tightening Rocker Arm Shaft Bolts

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>D< ROCKER ARM SPRING INSTALLATION

1. Insert the rocker arm spring at an angle to the spark plug guide and then install it so that it is at a right angle to the guide.



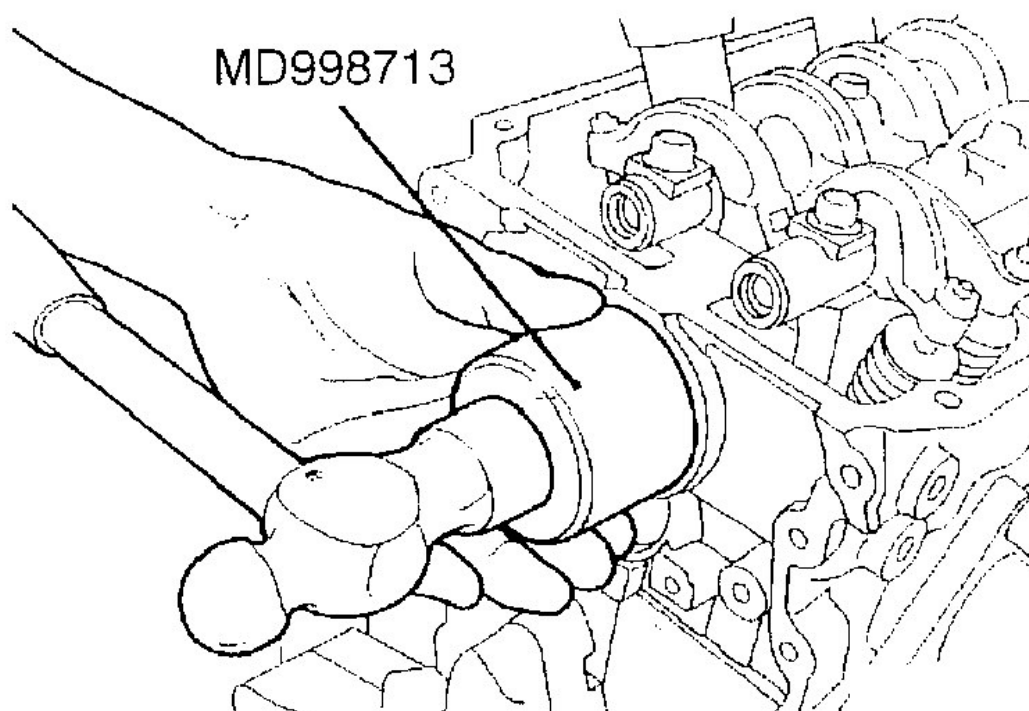
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Fig. 111: Installing Rocker Arm Spring

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2. Remove the special tools from rocker arms.

>E< OIL SEAL INSTALLATION



G01185475

Fig. 112: Installing Oil Seal

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

INSPECTION

CAMSHAFT

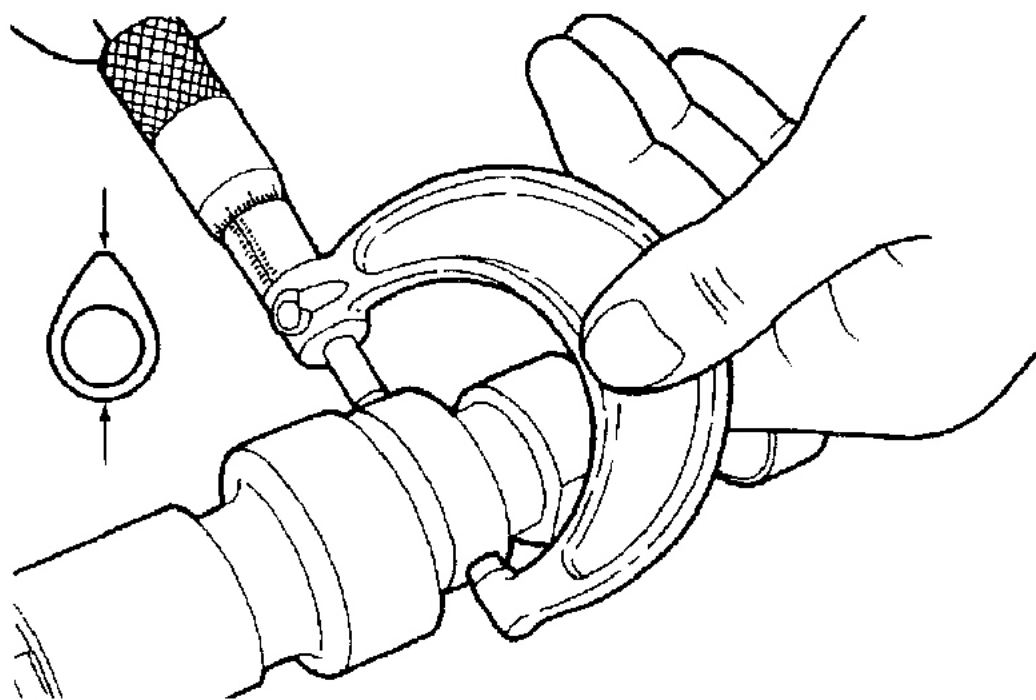
1. Measure the cam height and replace the camshaft if any height exceeds the specified limit.

Standard value: Intake: 37.11 mm (1.46 in.)

Exhaust: 37.15 mm (1.46 in.)

Limit: Intake: 36.61 mm (1.44 in.)

Exhaust: 36.65 mm (1.44 in.)



G01185476

Fig. 113: Measuring Cam Height

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

LASH ADJUSTERS

- CAUTION:**
1. The lash adjusters are precision-engineered mechanisms. Do not allow them to become contaminated by dirt or other foreign substances.
 2. Do not attempt to disassemble the lash adjusters.
 3. Use only fresh diesel fuel to clean the lash adjusters.

1. Prepare three containers and approximately 5 dm³ (30.5 quart) of diesel fuel. Into each container, pour enough diesel fuel to completely cover a lash adjuster when it is standing upright. Then, perform the following steps with each lash adjuster.

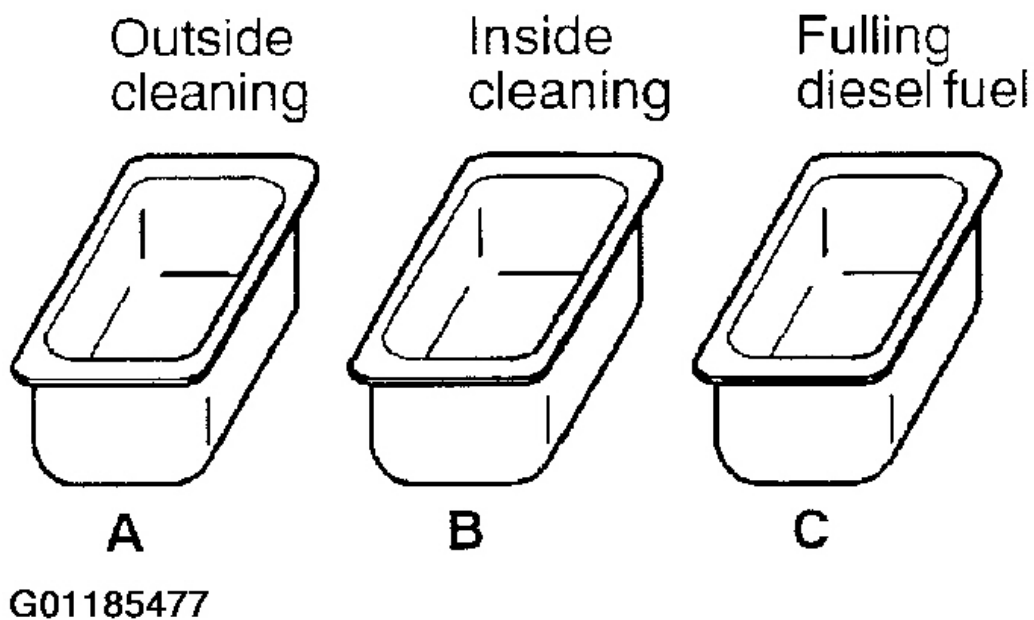
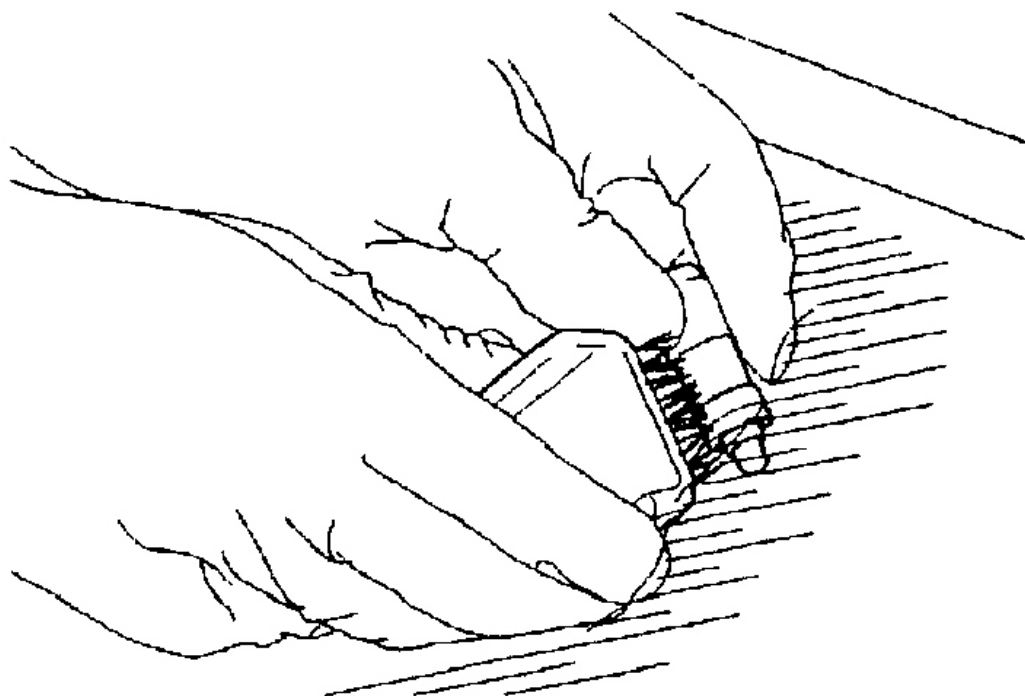


Fig. 114: Cleaning Lash Adjusters

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2. Place the lash adjuster in container A and clean its outside surface.

NOTE: Use a nylon brush if deposits are hard to remove.



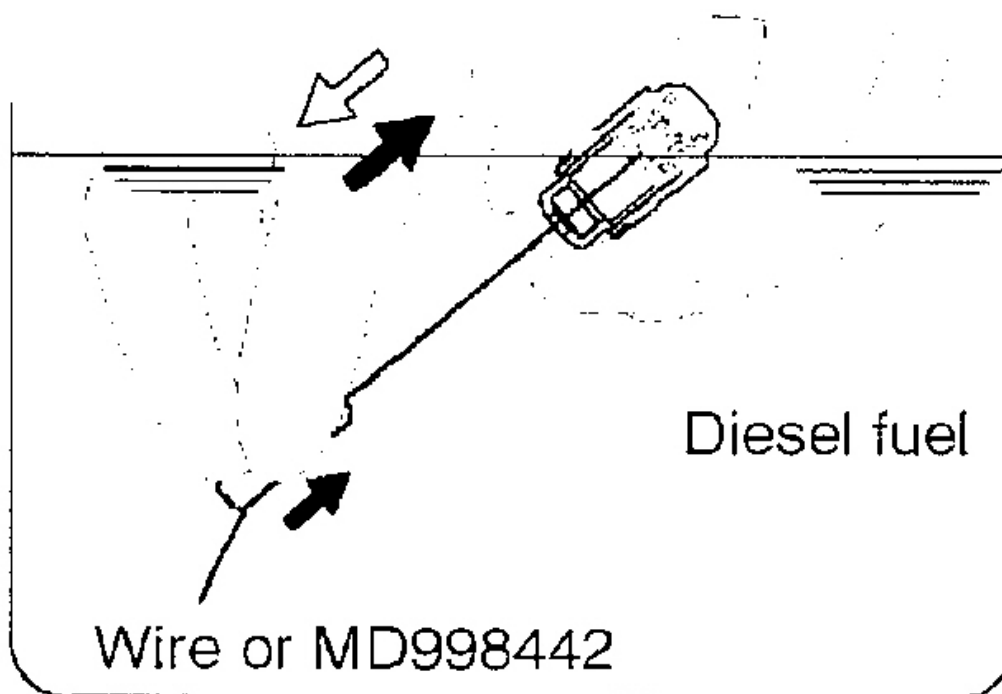
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Fig. 115: Using Nylon Brush**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

3. While gently pushing down the internal steel ball using wire [0.5 mm (.020 in.) in diameter] or special tool MD998442, move the plunger through 5 to 10 strokes until it slides smoothly. In addition to eliminating stiffness in the plunger, this operation will removed dirty oil.

CAUTION: The steel ball spring is extremely weak, so the lash adjuster's functionality may be lost if the air bleed wire is pushed in hard.

NOTE: If the plunger remains stiff or the mechanism appears otherwise abnormal, replace the lash adjuster.

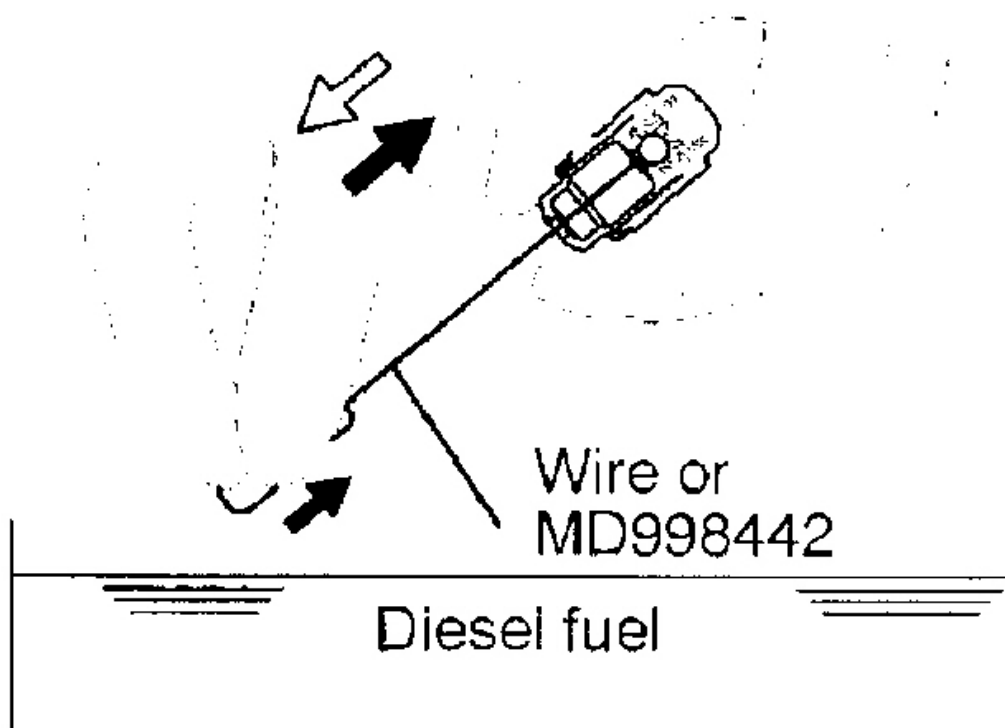


G01185479

Fig. 116: Eliminating Stiffness In Plunger

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

4. Remove the lash adjuster from the container. Then, push down the steel ball gently and push the plunger to eliminate diesel fuel from the pressure chamber.

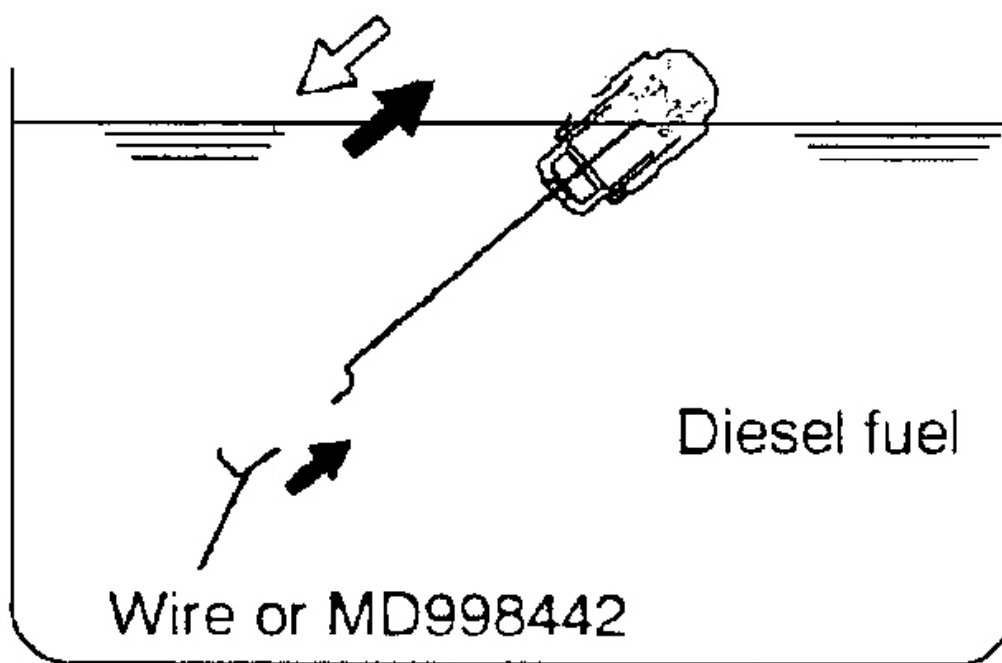


G01185480

Fig. 117: Eliminating Diesel Fuel From Pressure Chamber
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

5. Place the lash adjuster in container B. Then, gently push down the internal steel ball using wire [0.5 mm (.020 in.) in diameter] or special tool MD998442 and move the plunger through 5 to 10 strokes until it slides smoothly. This operation will clean the lash adjuster's pressure chamber.

CAUTION: The steel ball spring is extremely weak, so the lash adjuster's functionality may be lost if the air bleed wire is pushed in hard.

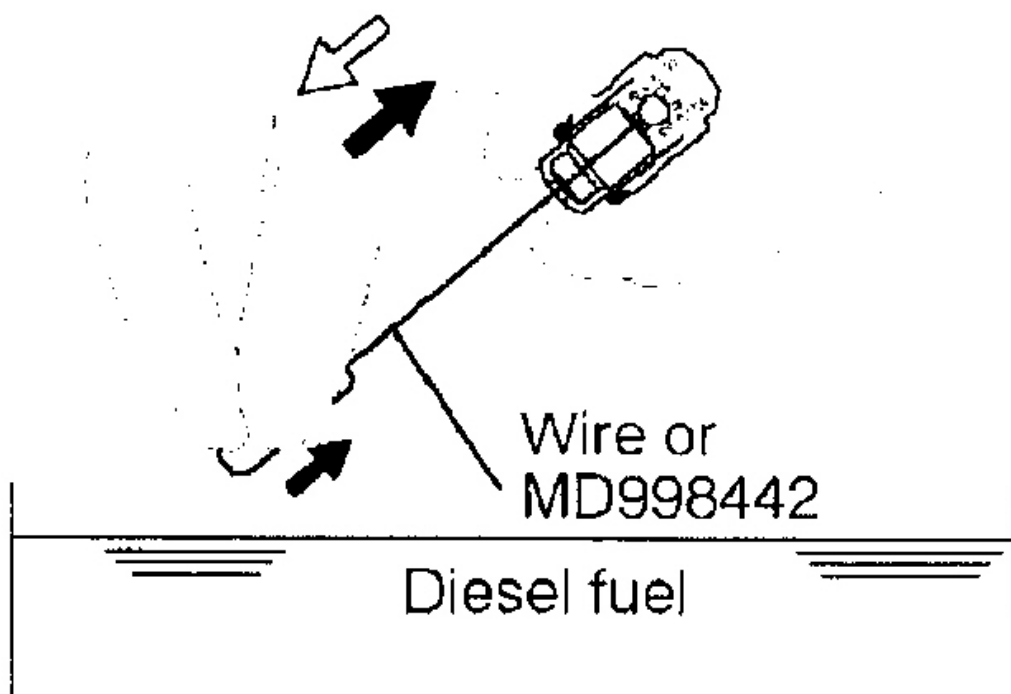


G01185481

Fig. 118: Cleaning Pressure Chamber

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

6. Remove the lash adjuster from the container. Then, push down the steel ball gently and push the plunger to eliminate diesel fuel from the pressure chamber.



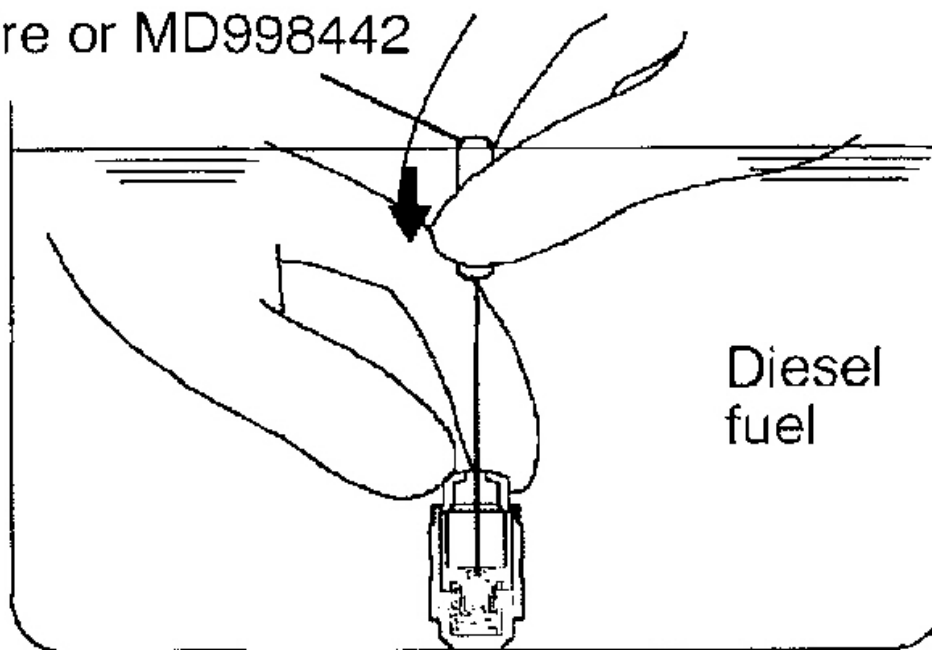
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Fig. 119: Eliminating Diesel Fuel From Pressure Chamber
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

7. Place the lash adjuster in container C. Then, gently push down the internal steel ball using wire [0.5 mm (.020 in.) in diameter] or special tool MD998442.

CAUTION: Do not use container C for cleaning. If cleaning is performed in container C, foreign matter could enter the pressure chamber when the chamber is filled with diesel fuel.

Wire or MD998442

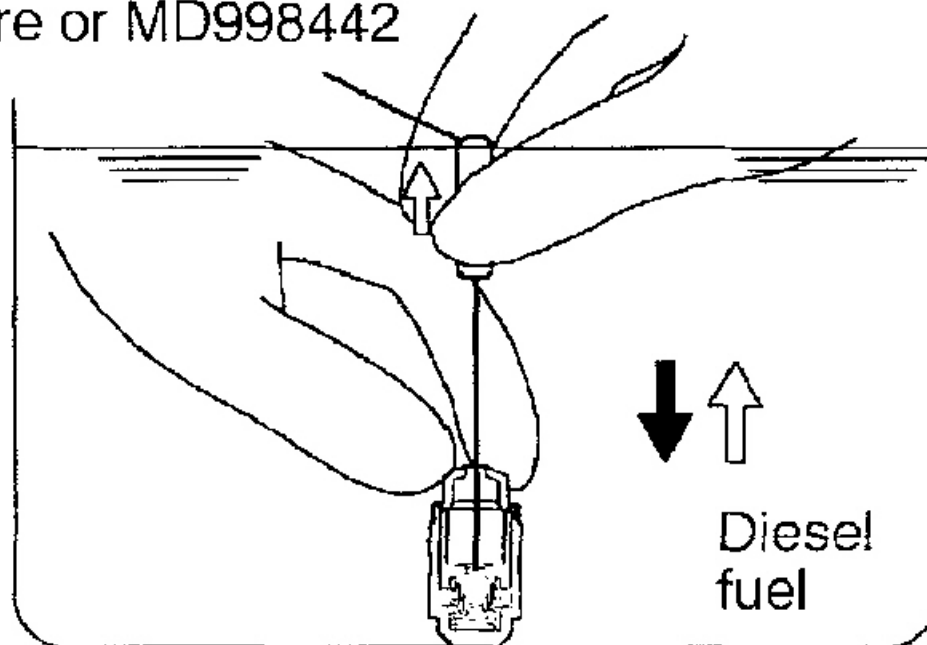


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Fig. 120: Placing Lash Adjuster In Container C**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

8. Stand the lash adjuster with its plunger at the top, then push the plunger downward firmly until it moves through its greatest possible stroke. Return the plunger slowly, then release the steel ball and allow the pressure chamber to fill with diesel fuel.

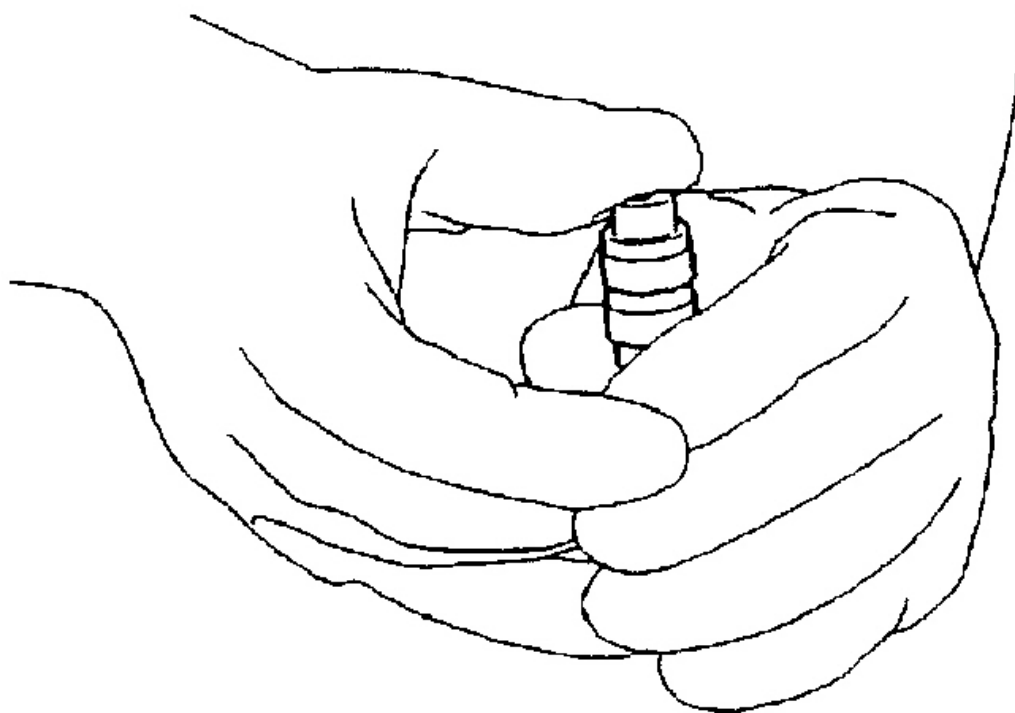
Wire or MD998442



G01185484

Fig. 121: Filling Pressure Chamber With Diesel Fuel**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

9. Remove the lash adjuster from the container, then stand the lash adjuster with its plunger at the top. Push the plunger firmly and check that it does not move. Also, check that the lash adjuster's height matches that of a new lash adjuster.



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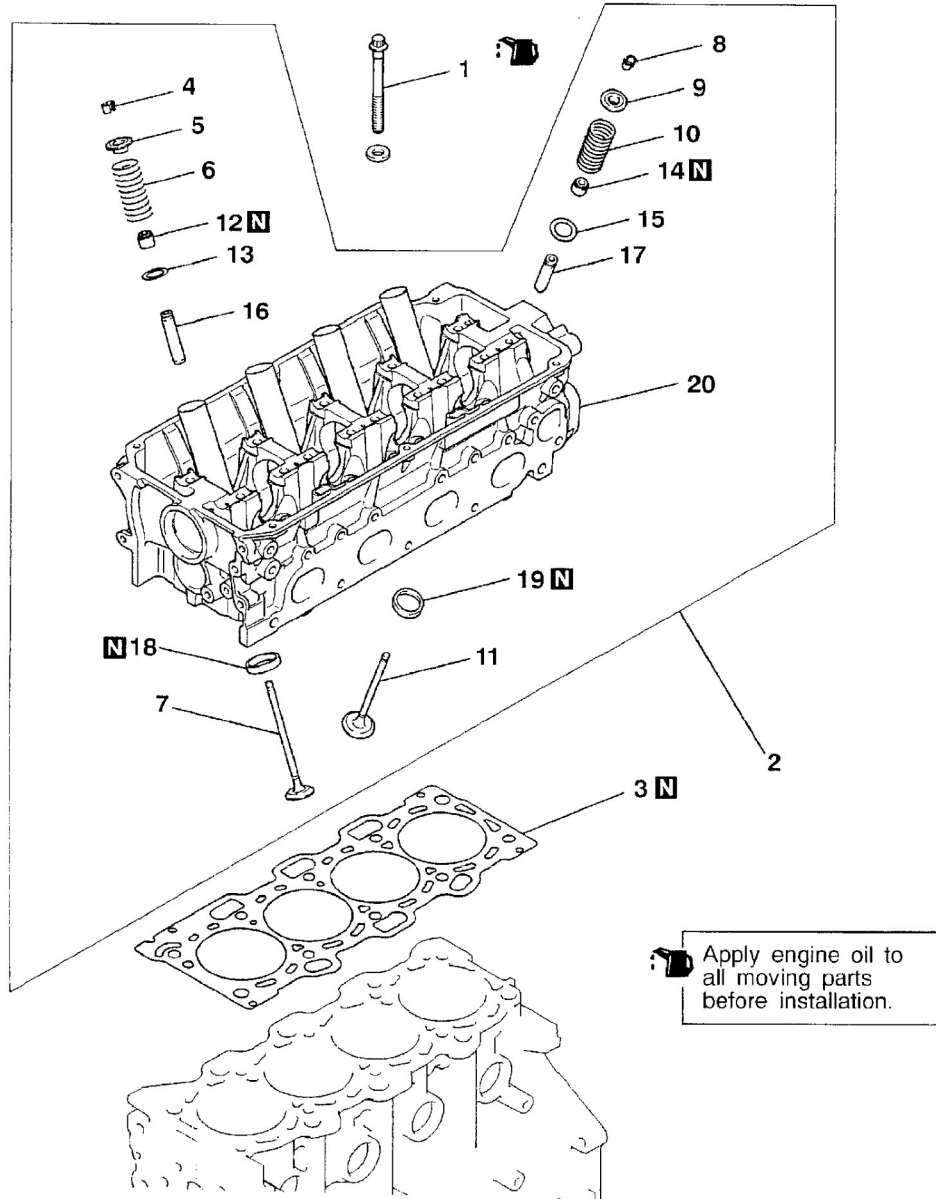
Fig. 122: Checking Lash Adjuster Plunger For Movement
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

NOTE: If lash adjuster contracts, perform the operation step 7 - 9 again to fill it with diesel fuel completely. Replace the lash adjuster if it still contracts after performing these steps.

10. Stand the lash adjuster upright to prevent diesel fuel spilling out. Do not allow the lash adjuster to become contaminated by dirt or other foreign matter. Fit the lash adjuster onto the engine as soon as possible.

CYLINDER HEAD AND VALVES

REMOVAL & INSTALLATION



Removal steps

- ◀A▶ ▶D▶ 1. Cylinder head bolt
- 2. Cylinder head assembly
- 3. Cylinder head gasket
- ◀B▶ ▶C▶ 4. Retainer lock
- 5. Valve spring retainer
- ▶B▶ 6. Valve spring
- 7. Exhaust valve
- ◀B▶ ▶C▶ 8. Retainer lock
- 9. Valve spring retainer
- ▶B▶ 10. Valve spring

- 11. Intake valve
- ◀C▶ ▶A▶ 12. Valve stem seal
- 13. Valve spring seat
- ◀C▶ ▶A▶ 14. Valve stem seal
- 15. Valve spring seat
- 16. Exhaust valve guide
- 17. Intake valve guide
- 18. Exhaust valve seat
- 19. Intake valve seat
- 20. Cylinder head

G01185486

Fig. 123: Removing & Installing Cylinder Head & Valves
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

REMOVAL SERVICE POINTS**< A > CYLINDER HEAD BOLT REMOVAL**

1. Loosen the cylinder head bolts using the special tool.

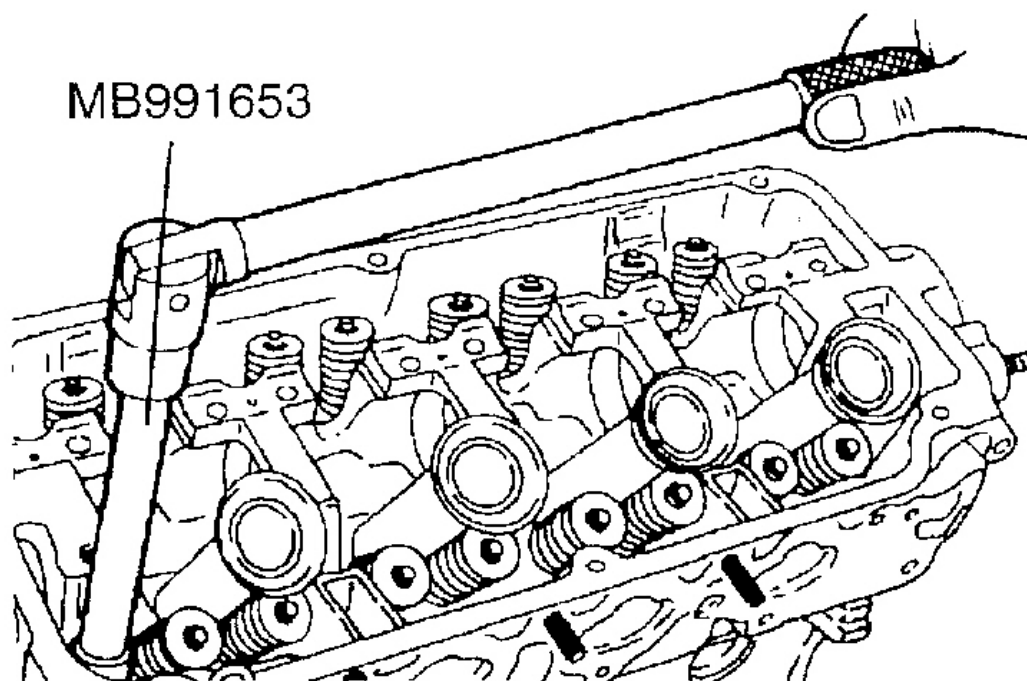
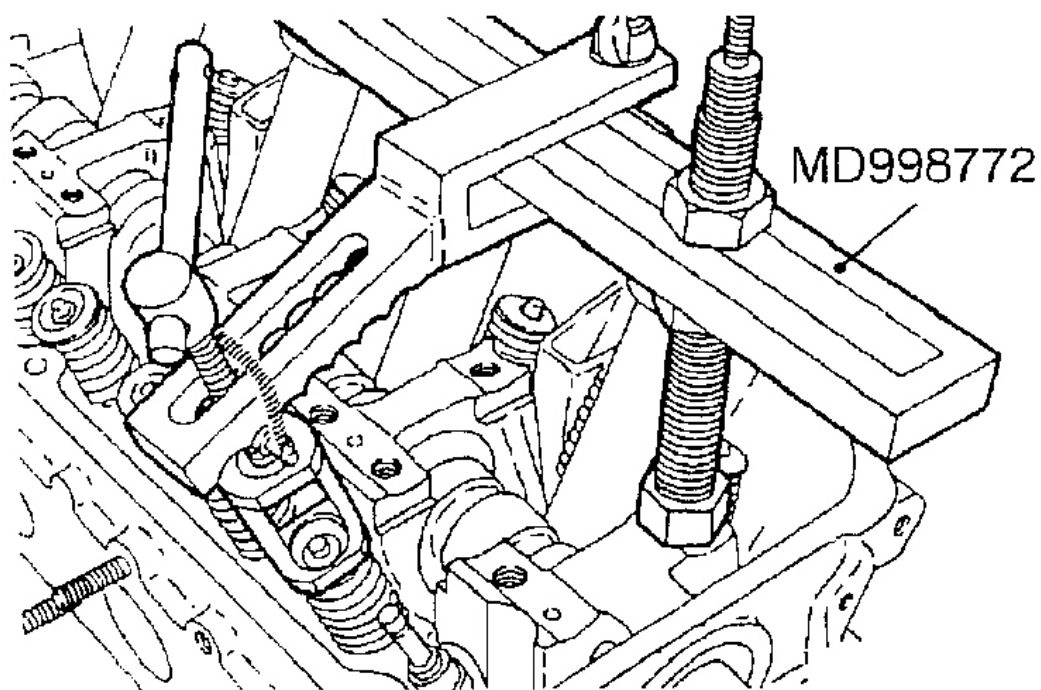
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Fig. 124: Removing Cylinder Head Bolts

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

< B > RETAINER LOCK REMOVAL

1. Tag removed valves, springs and other components, noting their cylinder numbers and locations to facilitate reassembly. Store these components safely.



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Fig. 125: Using Special Tool MD998772
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

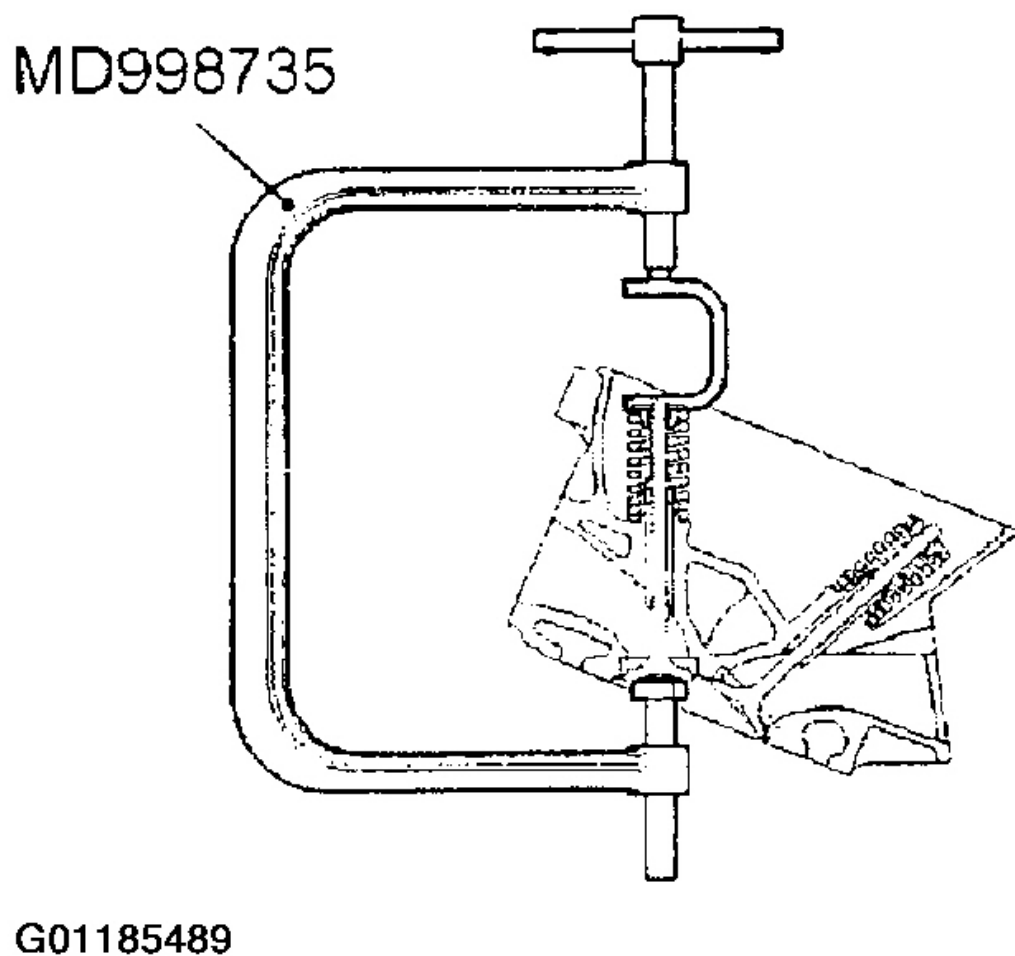
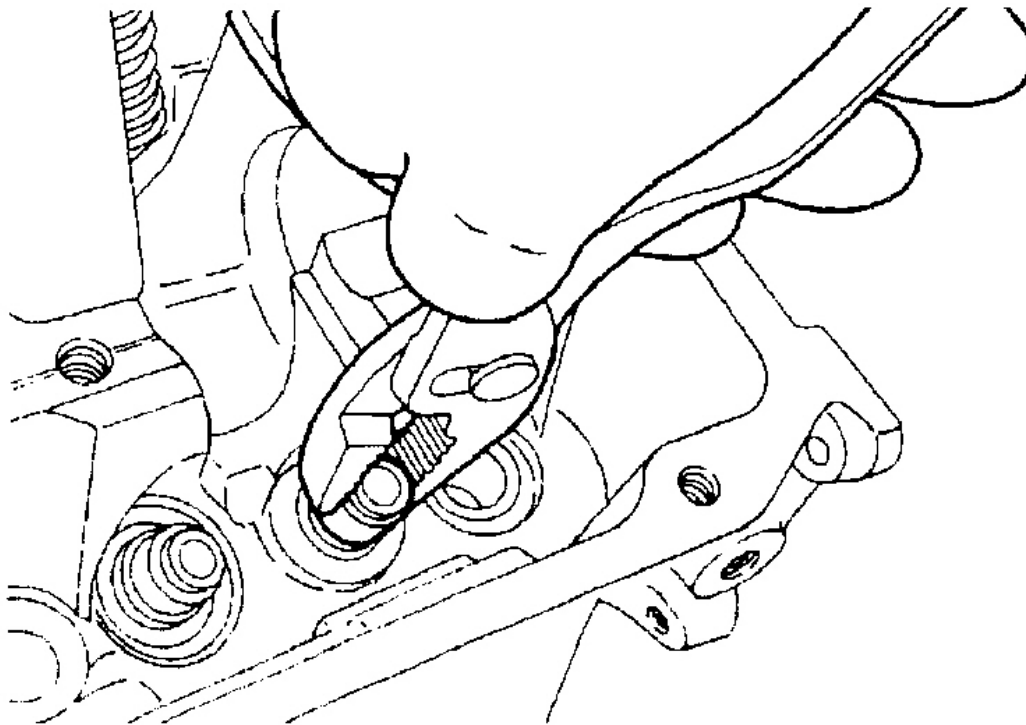


Fig. 126: Using Special Tool MD998735
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

< C > VALVE STEM SEAL REMOVAL



G01185490

Fig. 127: Removing Valve Stem Seal

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

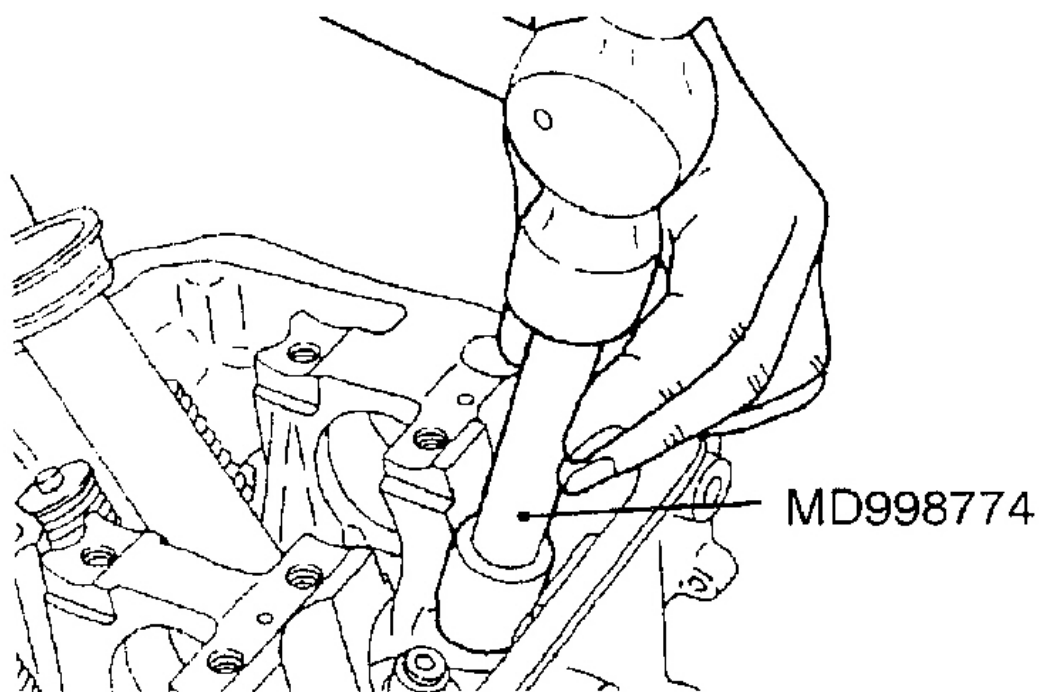
INSTALLATION SERVICE POINTS

>A< VALVE STEM SEAL INSTALLATION

1. Install the valve spring seat.
2. Install a new valve stem seal using the special tool shown in the illustration.

CAUTION:

1. Do not reuse removed valve stem seals.
2. The valve stem seal must be installed using the correct special tool. Incorrect installation could result in oil leaking past the valve guide.

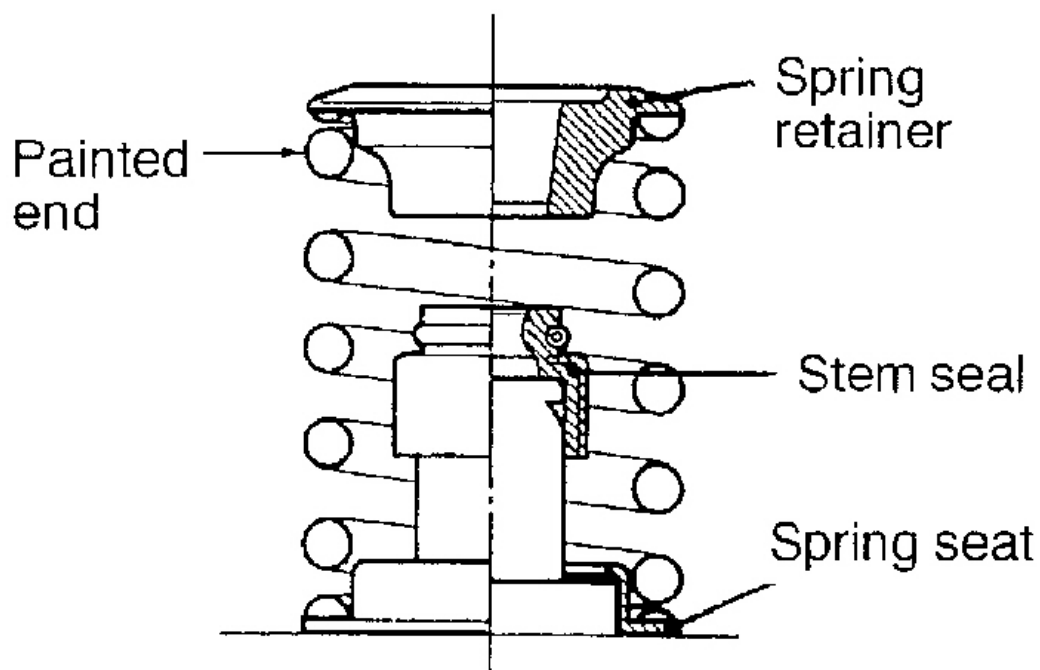


G01185491

Fig. 128: Installing New Valve Stem Seal
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>B< VALVE SPRING INSTALLATION

1. Install the valve spring so that the painted end is on the rocker arm side.



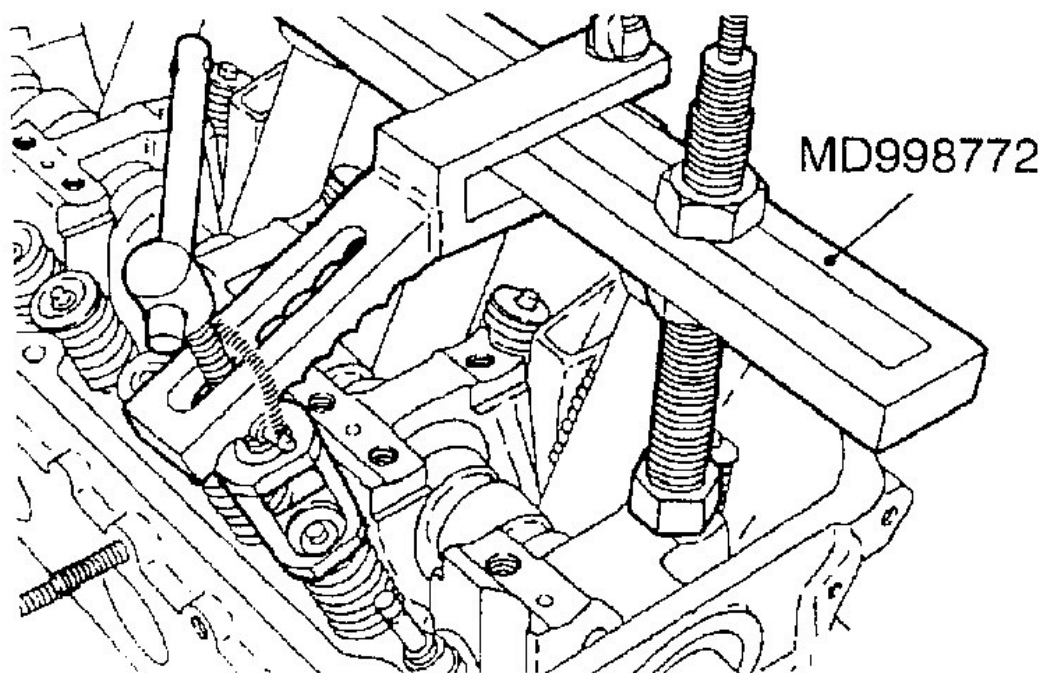
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Fig. 129: Installing Valve Spring

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>C< RETAINER LOCK INSTALLATION

1. The valve spring, if excessively compressed, causes the bottom end of retainer to be in contact with the stem seal, and damage it.

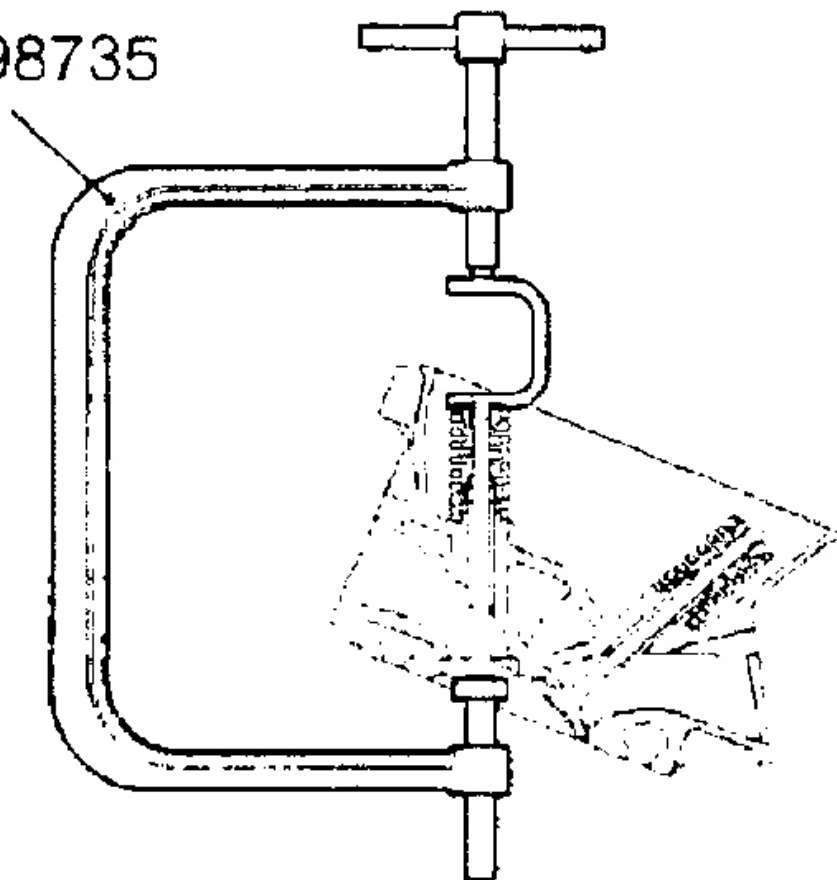


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Fig. 130: Using Special Tool MD998772

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

MD998735



G01185494

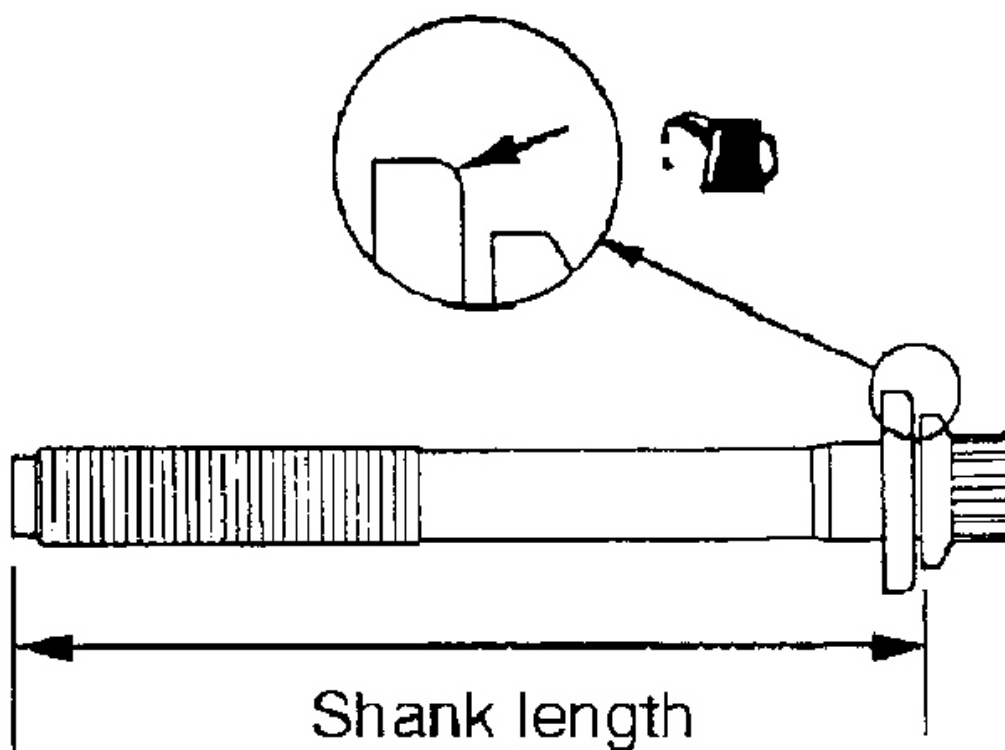
Fig. 131: Using Special Tool MD998735

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>D< CYLINDER HEAD BOLT INSTALLATION

1. Before reusing the cylinder head bolt, measure that its shank length does not exceed the specified limit. Replace the bolt if this measurement exceeds the limit.

Limit: Max. 96.4 mm (3.795 in.)

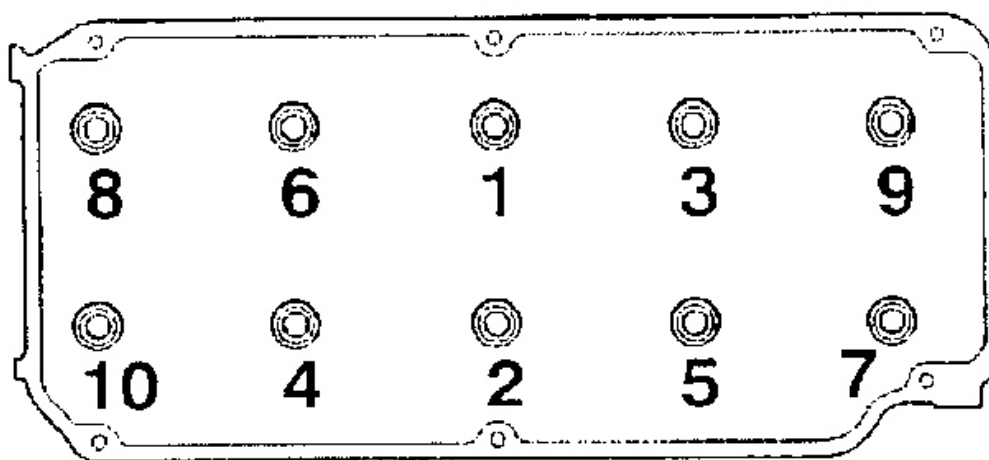


G01185495

Fig. 132: Measuring Cylinder Head Bolt Shank Length**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

2. Fit the washer as shown.
3. Apply engine oil to the bolt thread and washer.
4. Tighten the bolts in the sequence shown until each is torqued to 74 Nm (54 ft.lbs.) using the special tool (MB991653).
5. Loosen all bolts fully.
6. Retighten the bolts in the sequence shown until each is torqued to 20 Nm (15 ft.lbs.).
7. Make paint marks on the cylinder head bolt heads and cylinder head as shown.

← Timing belt side



G01185496

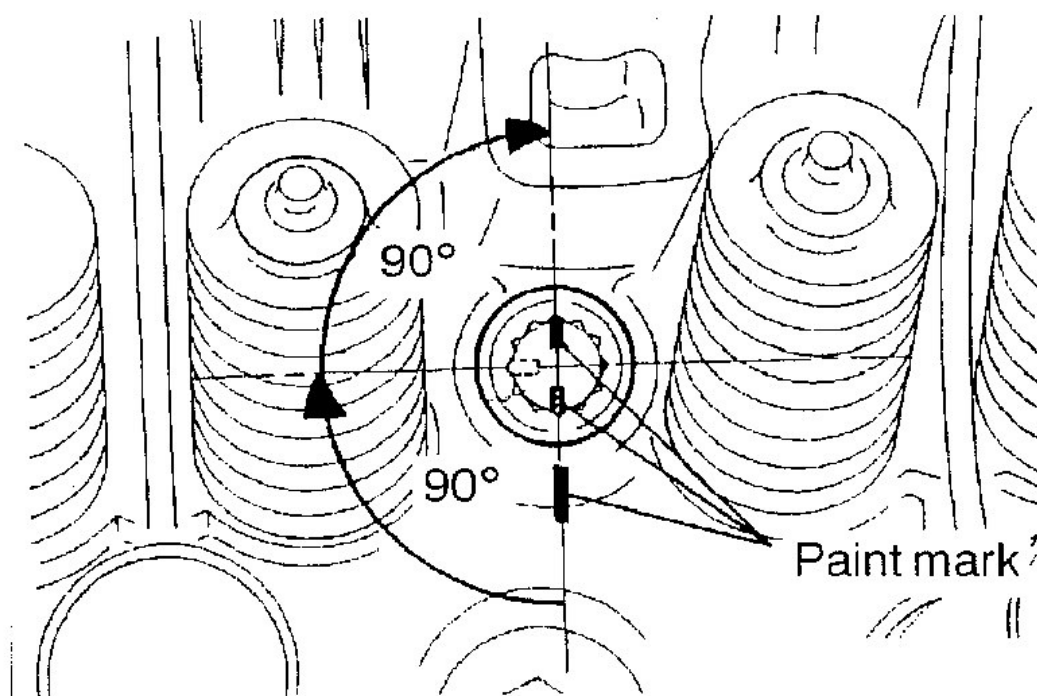
Fig. 133: Making Paint Marks On Cylinder Head Bolts

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

8. In accordance with the tightening sequence, tighten each bolt by 90° (1/4 turn).
9. Tighten each bolt by further 90° (1/4 turn) and check that the paint marks on the bolt head and cylinder head are aligned.

CAUTION: If the bolts are tightened by an angle of less than 90° (1/4 turn), they may not hold the cylinder head with sufficient strength.

If the bolts are tightened by an angle exceeding 90°, completely remove them and repeat the installation procedure.



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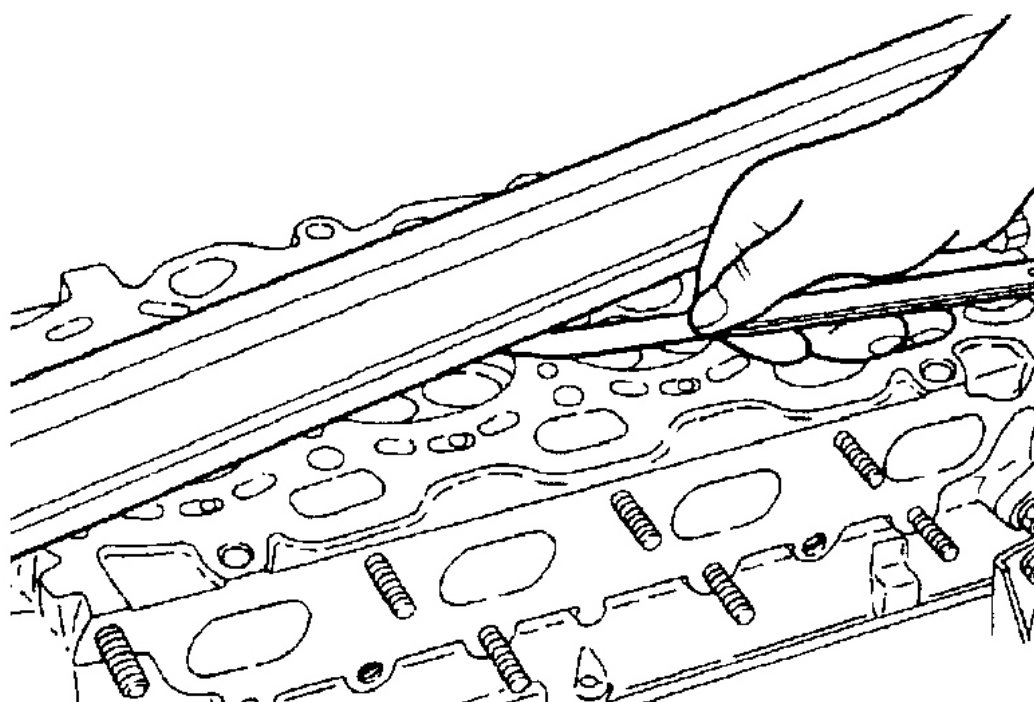
Fig. 134: Retightening Cylinder Head Bolts

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

INSPECTION**CYLINDER HEAD**

1. Before cleaning the cylinder head, check it for water leaks, gas leaks, cracks, and other damage.
2. Remove all oil, water scale, sealant, and carbon. After cleaning the oil passages, blow air through them to verify that they are not blocked.
3. Check the cylinder head gasket surface for flatness by using a straight edge and feeler gauge.

Standard value: 0.03 mm (.0012 in.)**Limit: 0.2 mm (.008 in.)**



G01185498

Fig. 135: Checking Cylinder Head Gasket Surface For Flatness

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

4. If flatness exceeds the specified limit, grind the gasket surface to specification.

Grinding limit: *0.2 mm (.008 in.)

*Includes/combined with cylinder block grinding

Cylinder head height (Specification when new): 119.9 - 120.1 mm (4.720 - 4.728 in.)**VALVE**

1. Check the valve face for correct contact. If contact is uneven or incomplete, reface the valve seat.
2. If the margin is less than specified, replace the valve.

Standard value: Intake: 1.0 mm (.039 in.)**Exhaust: 1.3 mm (.051 in.)****Limit: Intake: 0.5 mm (.020 in.)**

Exhaust: 0.8 mm (.031 in.)

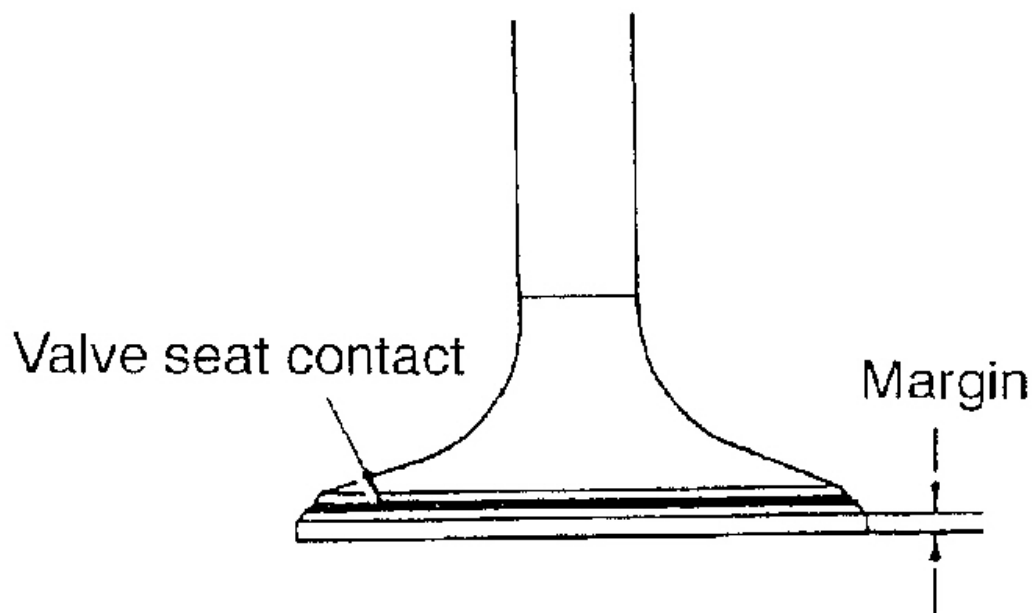
3. Measure the valve length. If the measurement is less than specified, replace the valve.

Standard value: Intake: 110.15 mm (4.337 in.)

Exhaust: 113.70 mm (4.476 in.)

Limit: Intake: 109.65 mm (4.317 in.)

Exhaust: 113.20 mm (4.457 in.)



G01185499

Fig. 136: Measuring Valve Length

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

VALVE SPRING

1. Measure the valve spring free height. If the measurement is less than specified, replace spring.

Standard value: 50.9 mm (2.00 in.)

Limit: 49.9 mm (1.96 in.)

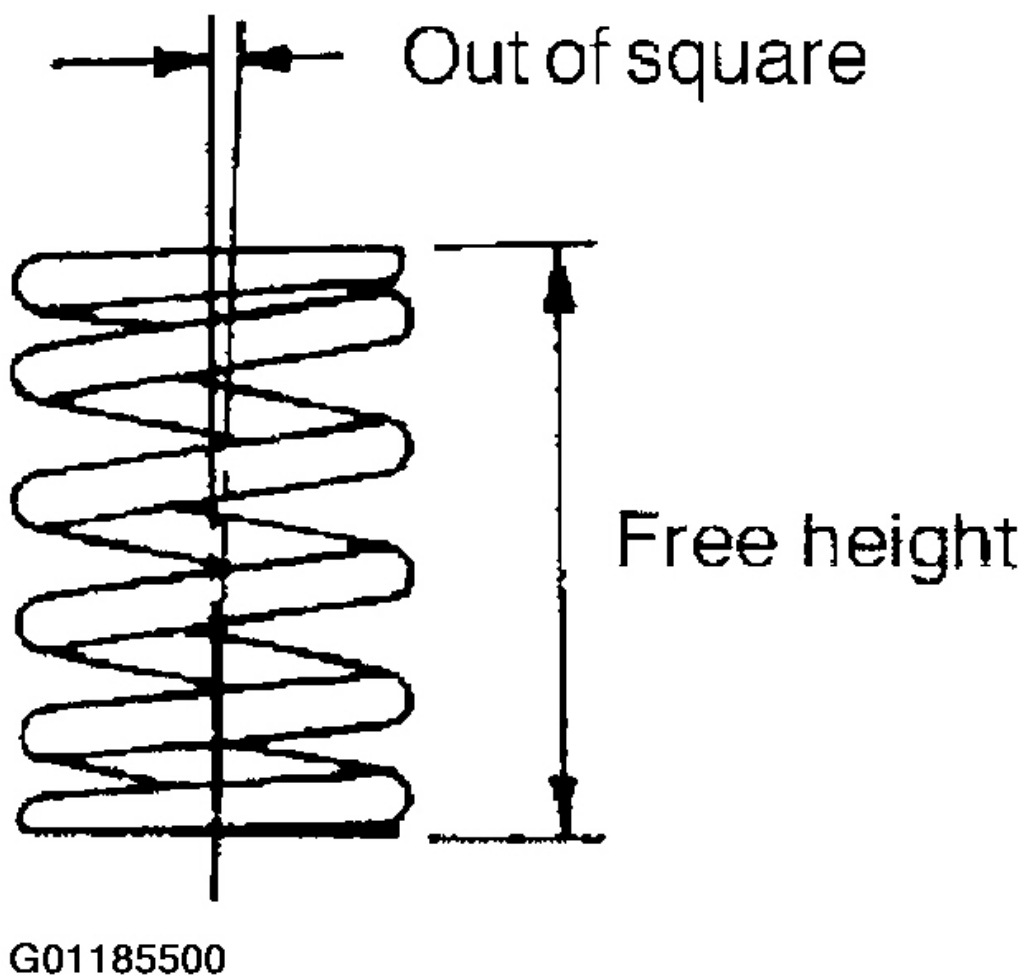


Fig. 137: Measuring Valve Spring Free Height
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2. Measure the squareness of the spring. If the measurement is less than specified, replace the spring.

Standard value: 2° or less

Limit: 4°

VALVE GUIDE

1. Measure the clearance between the valve guide and valve stem. If the clearance exceeds the specified limit, replace valve guide or valve, or both.

Standard value: Intake: 0.02 - 0.05 mm (.0008 - .0020 in.)

Exhaust: 0.05 - 0.09 mm (.0020 - .0035 in.)

Limit: Intake: 0.10 mm (.0039 in.)

Exhaust: 0.15 mm (.0059 in.)

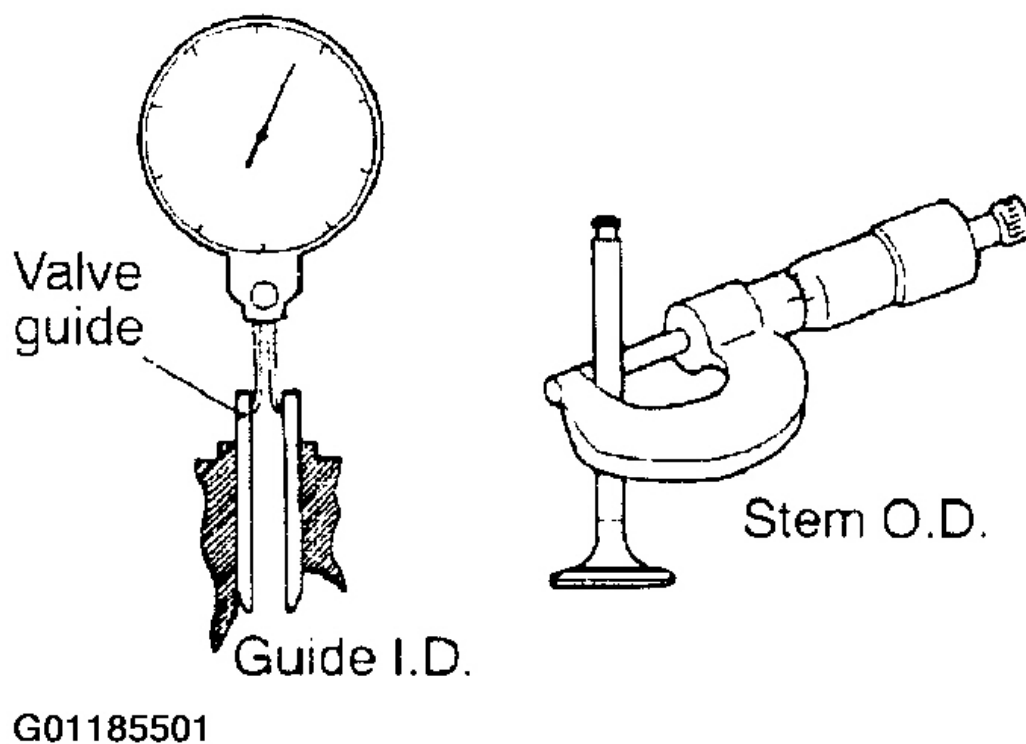


Fig. 138: Measuring Clearance Between The Valve Guide & Valve Stem
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

VALVE SEAT

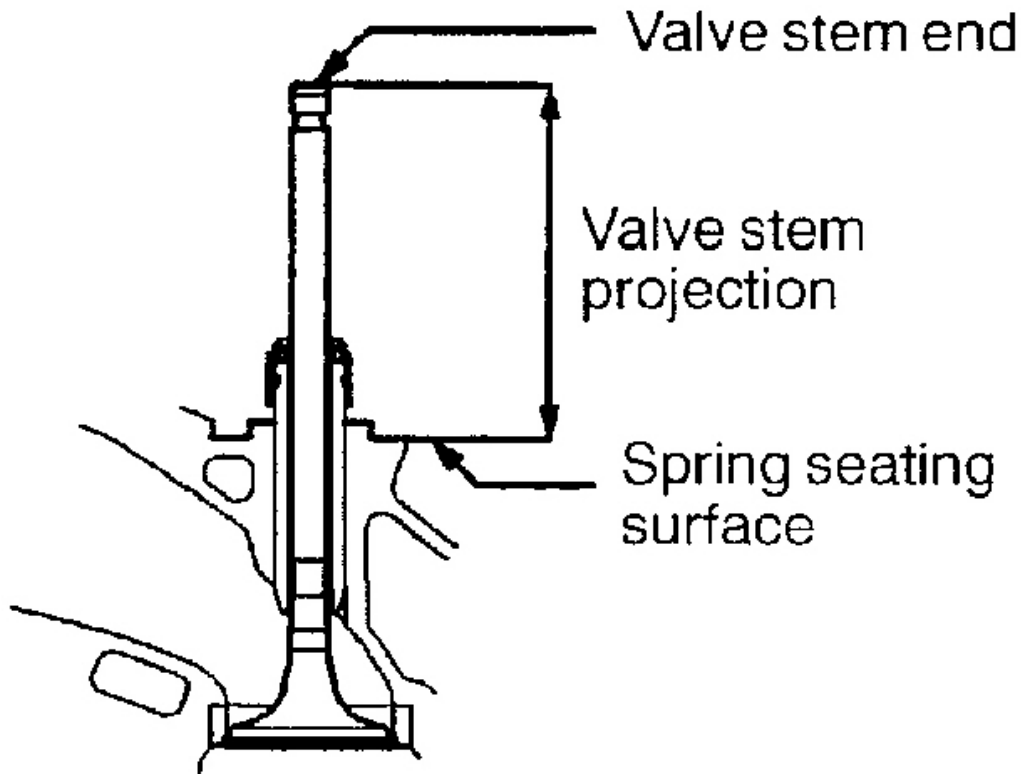
1. Assemble the valve, then measure the valve stem projection between the end of the valve stem and the spring seating surface. If the measurement exceeds the specified limit, replace the valve seat.

Standard value: Intake: 49.30 mm (1.9409 in.)

Exhaust: 49.35 mm (1.9429 in.)

Limit: Intake: 49.80 mm (1.9606 in.)

Exhaust: 49.85 mm (1.9626 in.)

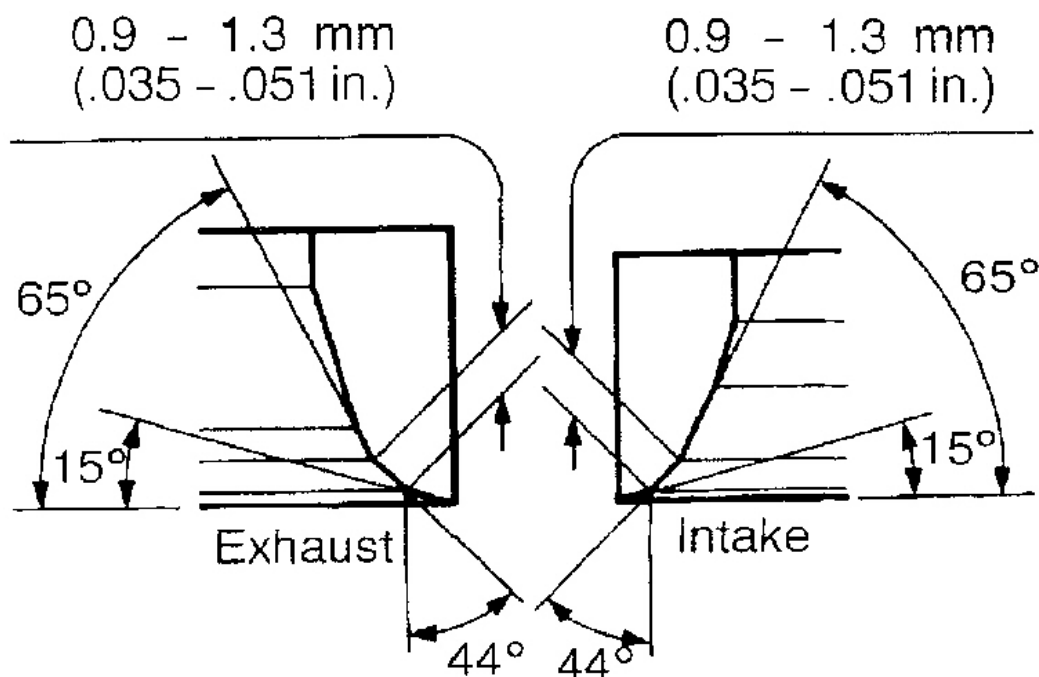


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Fig. 139: Measuring Valve Stem Projection Between End Of The Valve Stem & Spring Seating Surface
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

VALVE SEAT RECONDITIONING PROCEDURE

1. Before correcting the valve seat, check the clearance between the valve guide and valve. If necessary, replace the valve guide.
2. Using the appropriate special tool or seat grinder, correct the valve seat to achieve the specified seat width and angle.



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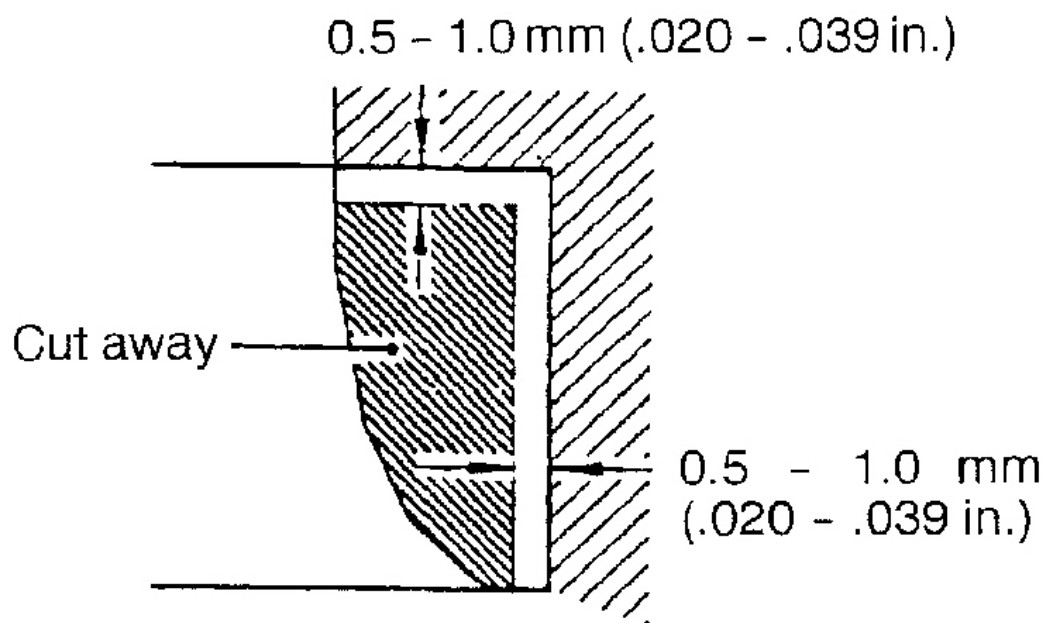
Fig. 140: Grinding Valve Seat

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. After correcting the valve seat, lap the valve and valve seat using lapping compound. Then, check the valve stem projection. See **VALVE**.

VALVE SEAT REPLACEMENT PROCEDURE

1. Cut the valve seat to be replaced from the inside to reduce the wall thickness. Then, remove the valve seat.



G01185504

Fig. 141: Cutting Valve Seat**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

2. Rebore the valve seat hole in the cylinder head to match the selected oversize valve seat diameter.

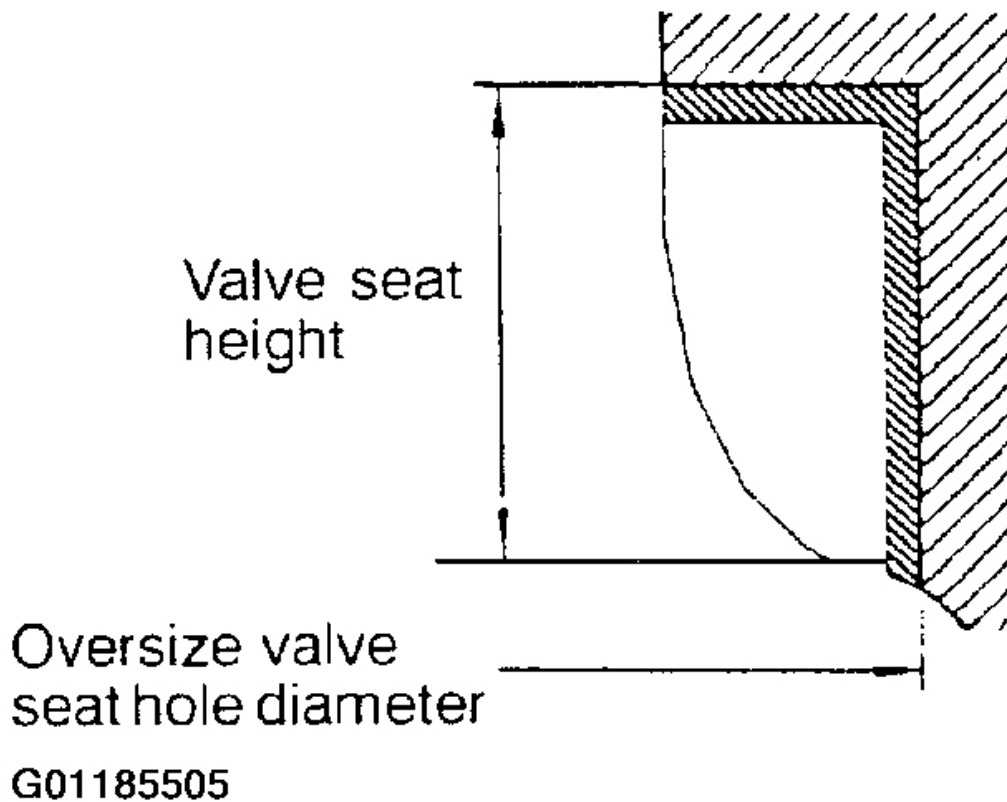


Fig. 142: Reboring Valve Seat Hole

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Intake valve seat hole diameter 0.3 O.S.: 31.80 - 31.83 mm (1.2520 - 1.2531 in.)

0.6 O.S.: 32.10 - 32.13 mm (1.2638 - 1.2650 in.)

Exhaust valve seat hole diameter 0.3 O.S.: 29.30 - 29.32 mm (1.1535 - 1.1543 in.)

0.6 O.S.: 29.60 - 29.62 mm (1.1654 - 1.1661 in.)

3. Prevent galling of the cylinder head bore by cooling the valve seat with liquid nitrogen before press-fitting it.
4. Correct the valve seat to achieve the specified width and angle. See **VALVE SEAT RECONDITIONING PROCEDURE**.

VALVE GUIDE REPLACEMENT PROCEDURE

1. Using a press, push the valve guide out toward the cylinder block side.

2. Rebore the valve guide hole in the cylinder head to match the oversize valve guide that is to be fitted.

CAUTION: Do not install a valve guide of the same size again.

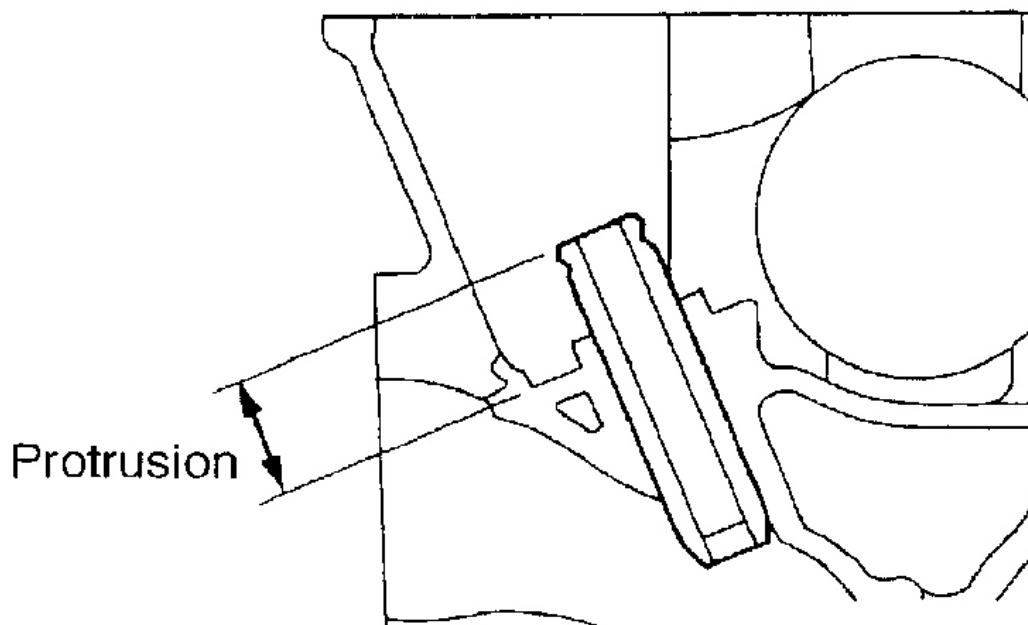
Valve guide hole diameters in cylinder head

0.05 O.S.: 11.05 - 11.07 mm (.4350 - .4358 in.)

0.25 O.S.: 11.25 - 11.27 mm (.4429 - .4337 in.)

0.50 O.S.: 11.50 - 11.52 mm (.4528 - .4535 in.)

3. Press-fit the valve guide until it projects by the specified amount.



G01185506

Fig. 143: Checking Valve Guide Protrusion

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Standard value: 14.0 mm (.551 in.)

- CAUTION:**
1. The valve guide must be installed from the upper side of the cylinder head.
 2. The valve guides differ in length on the intake and exhaust

sides.

VALVE GUIDE LENGTH:

INTAKE: 45.5 mm (1.791 in.)

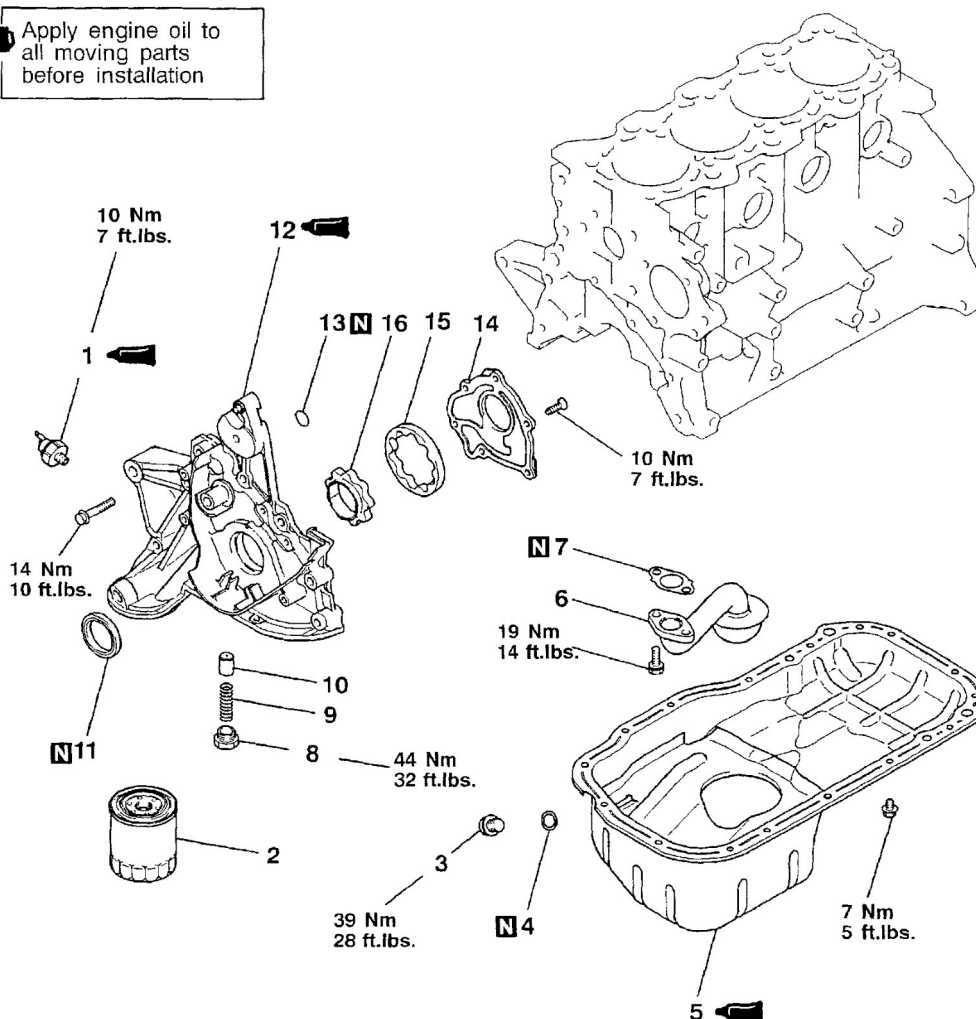
EXHAUST: 50.5 mm (1.988 in.)

4. After press-fitting the valve guide, insert a new valve and check that it slides smoothly.

OIL PUMP AND OIL PAN

REMOVAL & INSTALLATION

Apply engine oil to all moving parts before installation



Removal steps

- ▶G▶ 1. Oil pressure switch
- ▶F▶ 2. Oil filter
- ▶E▶ 3. Drain plug
- ▶D▶ 4. Gasket
- ▶A▶ 5. Oil pan
- 6. Oil screen
- 7. Oil screen gasket
- 8. Relief plug

- 9. Relief spring
- 10. Relief plunger
- ▶C▶ 11. Oil seal
- ▶B▶ 12. Front case
- ▶B▶ 13. O-ring
- ▶B▶ 14. Oil pump case cover
- ▶A▶ 15. Outer rotor
- ▶A▶ 16. Inner rotor

G01185507

Fig. 144: Removing & Installing Oil Pump & Oil Pan
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

REMOVAL SERVICE POINTS

< A > OIL PAN REMOVAL

1. Remove the oil pan mounting bolts.
2. Knock the special tool between the oil pan and cylinder block as shown in the illustration.

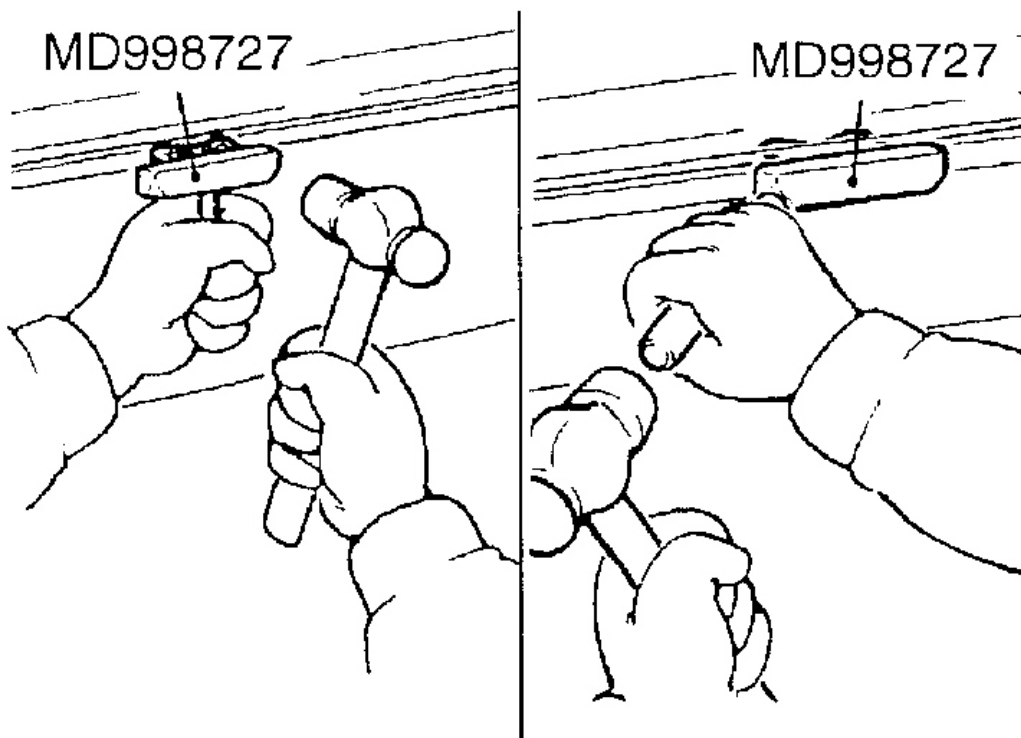
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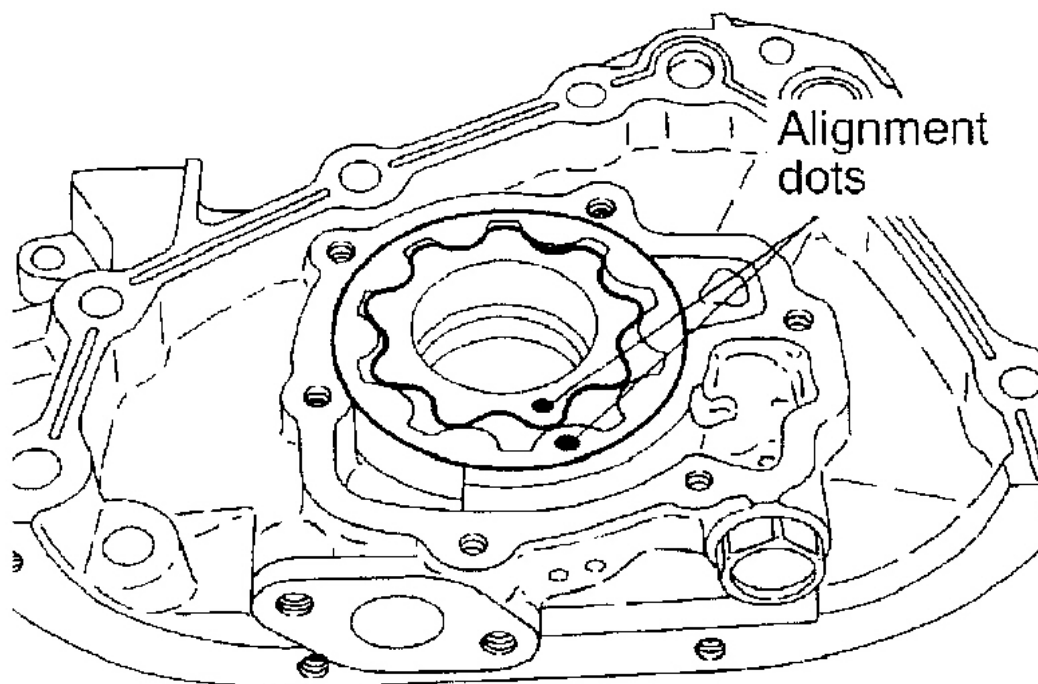
Fig. 145: Using Special Tool MD998727

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. Tapping the side of the special tool, slide the tool along the oil pan/cylinder block seal and thus remove the oil pan.

< B > OUTER ROTOR/INNER ROTOR REMOVAL

1. Make alignment dots on the outer and inner rotors for reference in reassembly.



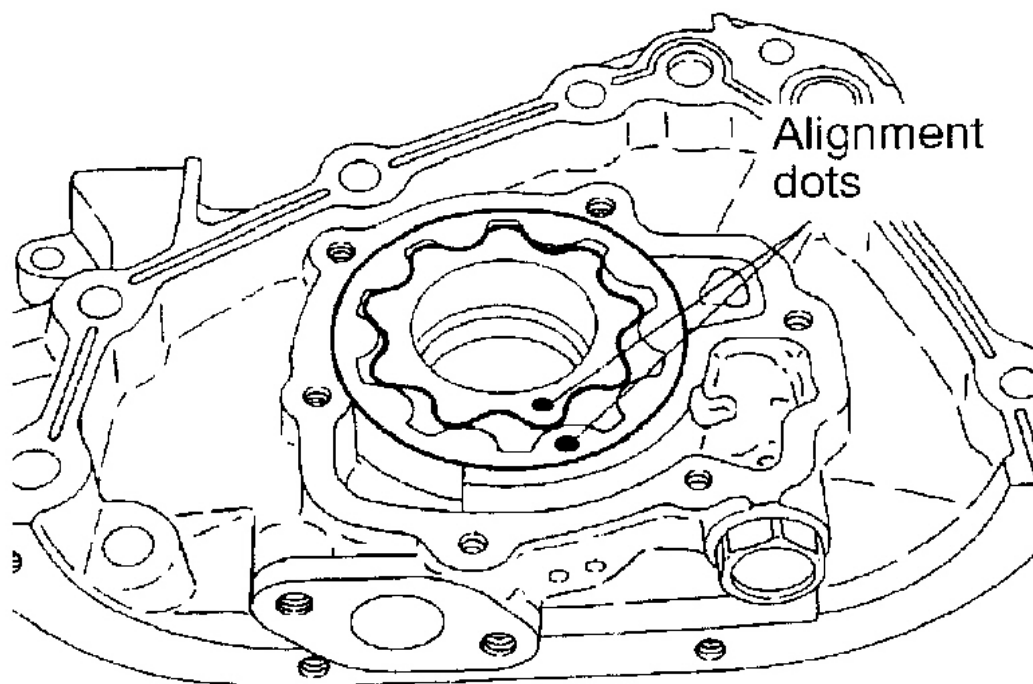
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Fig. 146: Making Alignment Dots On Outer & Inner Rotors
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

INSTALLATION SERVICE POINTS

>A< INNER ROTOR/OUTER ROTOR INSTALLATION

1. Apply engine oil to the rotors. Then, install the rotors ensuring that the alignment dots made at disassembly are properly aligned.



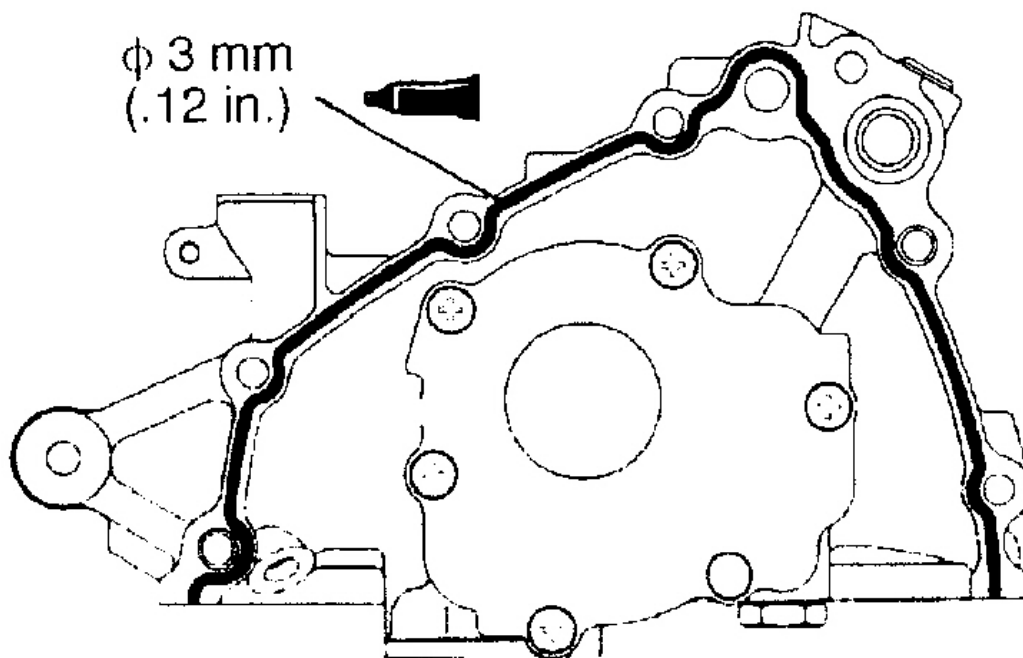
G01185510

Fig. 147: Installing Inner & Outer Rotor
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>B< FRONT CASE INSTALLATION

1. Clean the sealant application surfaces on the cylinder block and front case.
2. Apply a 3 mm (.12 in) diameter bead of sealant to the area shown. Be sure to install the front case within 15 minutes after applying sealant.

Specified sealant: Mitsubishi Genuine Part No. MD970389 or equivalent



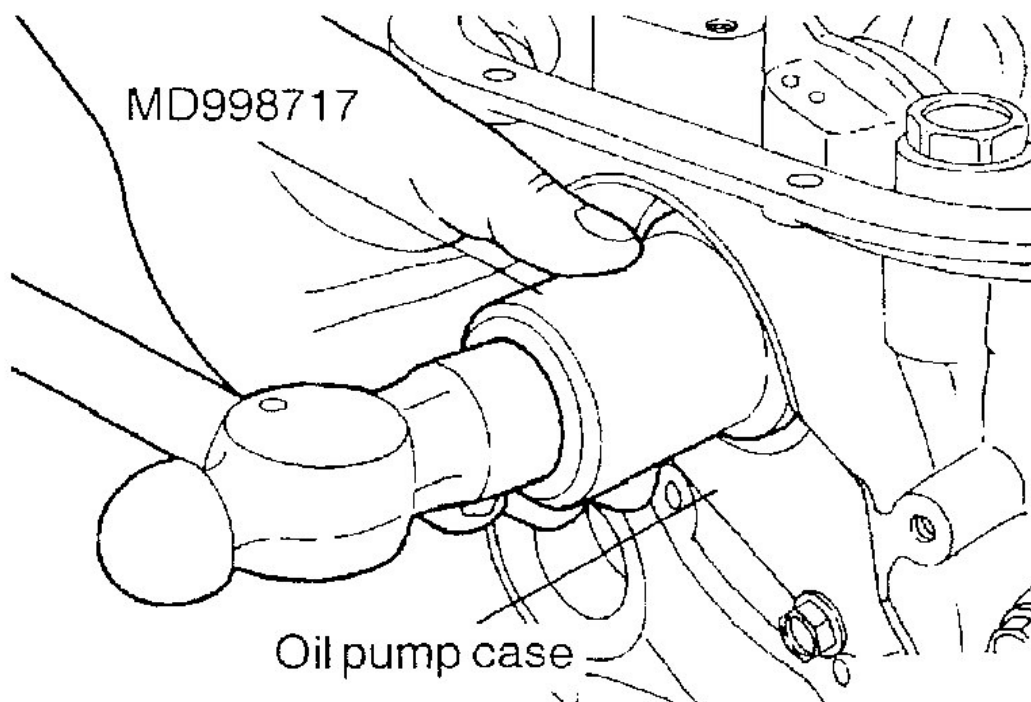
G01185511

Fig. 148: Applying Sealant To Cylinder Block & Front Case
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. Tighten the front case bolts to the specified torque.
4. After installation, wait at least one hour. Never start the engine or let engine oil touch the adhesion surface during that time.

>C< FRONT OIL SEAL INSTALLATION

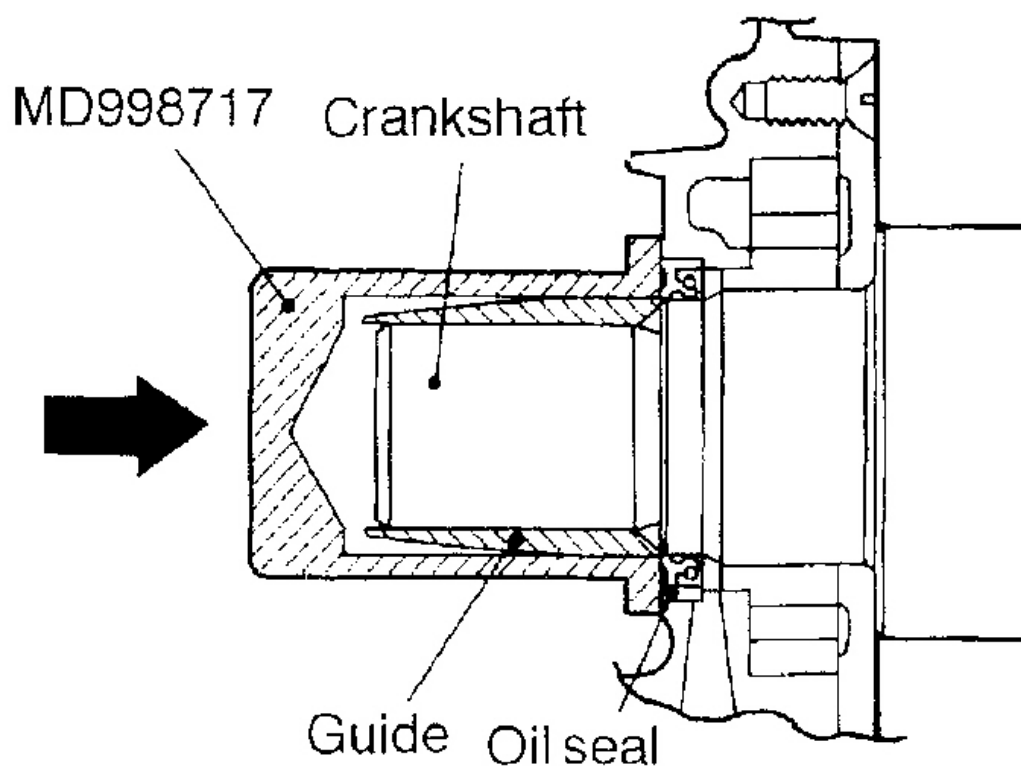
1. Place the special tool on the crankshaft front end and apply engine oil to the its outer diameter.



G01185512

Fig. 149: Placing Special Tool MD998305 On Crankshaft Front End
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2. Apply engine oil to the oil seal lip, then push the oil seal along the guide by hand until it touches the front case. Tap the oil seal into place using the special tool.



G01185513

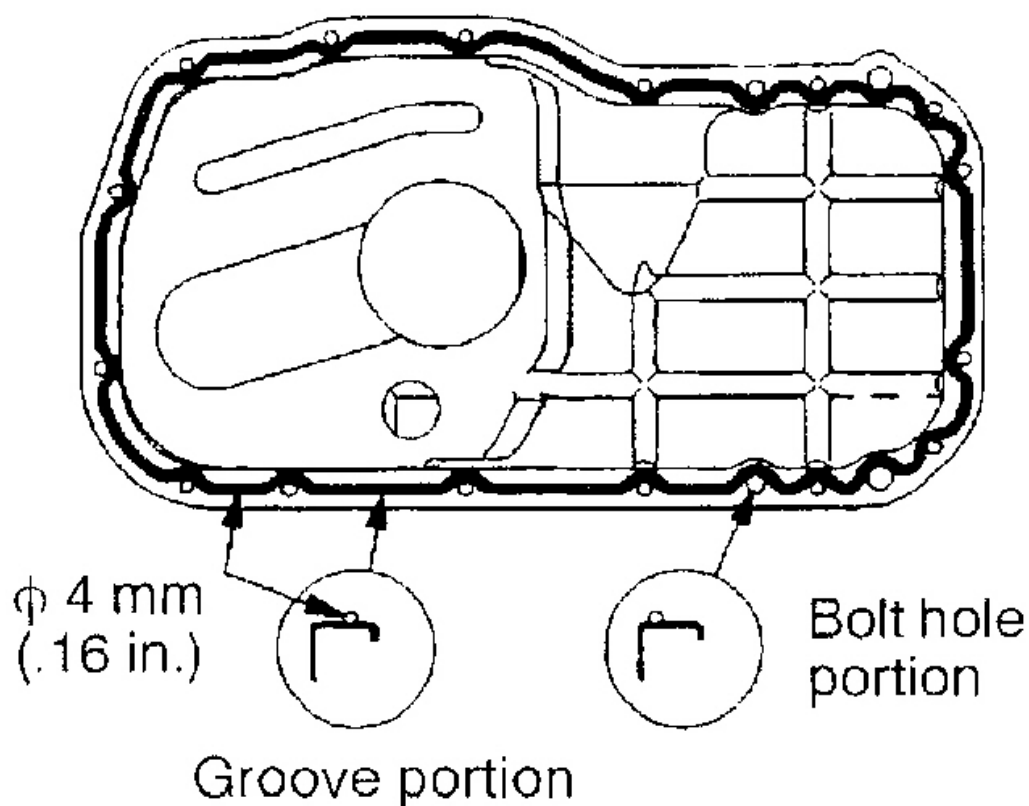
Fig. 150: Installing Oil Seal

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>D< OIL PAN INSTALLATION

1. Clean the mating surfaces of the oil pan and cylinder block.
2. Apply a 4 mm (.16 in.) diameter bead of sealant to the oil pan flange. Be sure to install the oil pan within 15 minutes after applying sealant.

Specified sealant: Mitsubishi Genuine Part No. MD970389 or equivalent



G01185514

Fig. 151: Applying Sealant To Oil Pan Flange

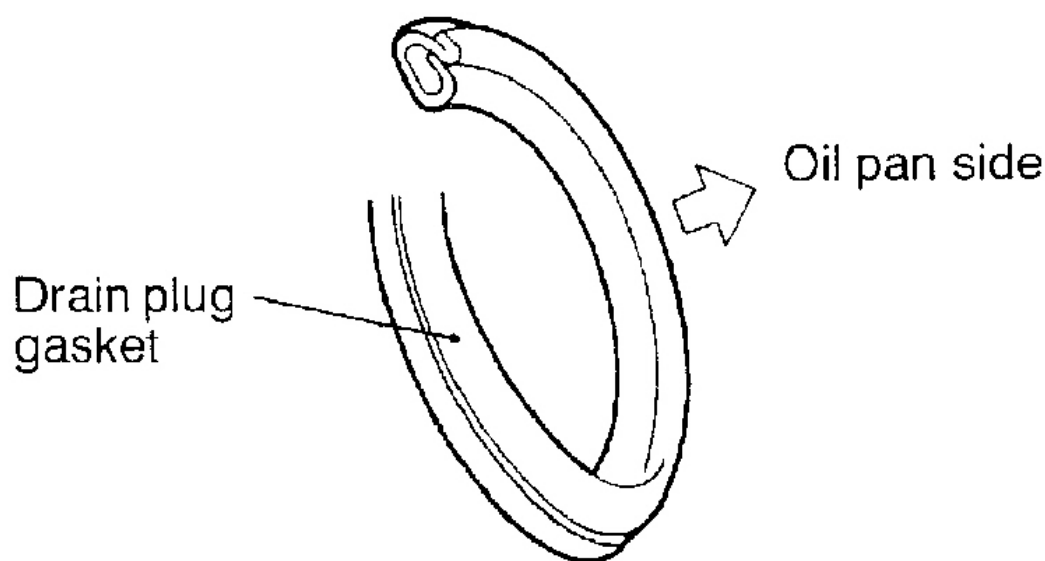
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. Tighten the oil pan bolts to the specified torque.
4. After installation, wait at least one hour. Never start the engine or let engine oil touch the adhesion surface during that time.

>E< DRAIN PLUG GASKET INSTALLATION

1. Replace the drain plug gasket with a new one. Fit the new gasket as shown.

CAUTION: If the gasket is installed in the wrong direction, oil leaks will be occurred.



G01185515

Fig. 152: Installing Drain Plug Gasket

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>F< OIL FILTER INSTALLATION

1. Clean the filter mounting surfaces on the front case.
2. Apply clean engine oil to the O-ring of the oil filter.
3. Screw on the oil filter until its O-ring is seated on the mounting surface. Then, give the oil filter one further turn.

CAUTION: The oil filter must be tightened using a commercially available filter wrench. If the filter is tightened by hand only, it will be insufficiently torqued, resulting in oil leaks.

>G< OIL PRESSURE SWITCH INSTALLATION

1. Apply the specified sealant to the threads of the switch.

Specified sealant: 3M™ AAD Part No. 8672 or equivalent

CAUTION: Use care not to allow the sealant to plug the oil passage.

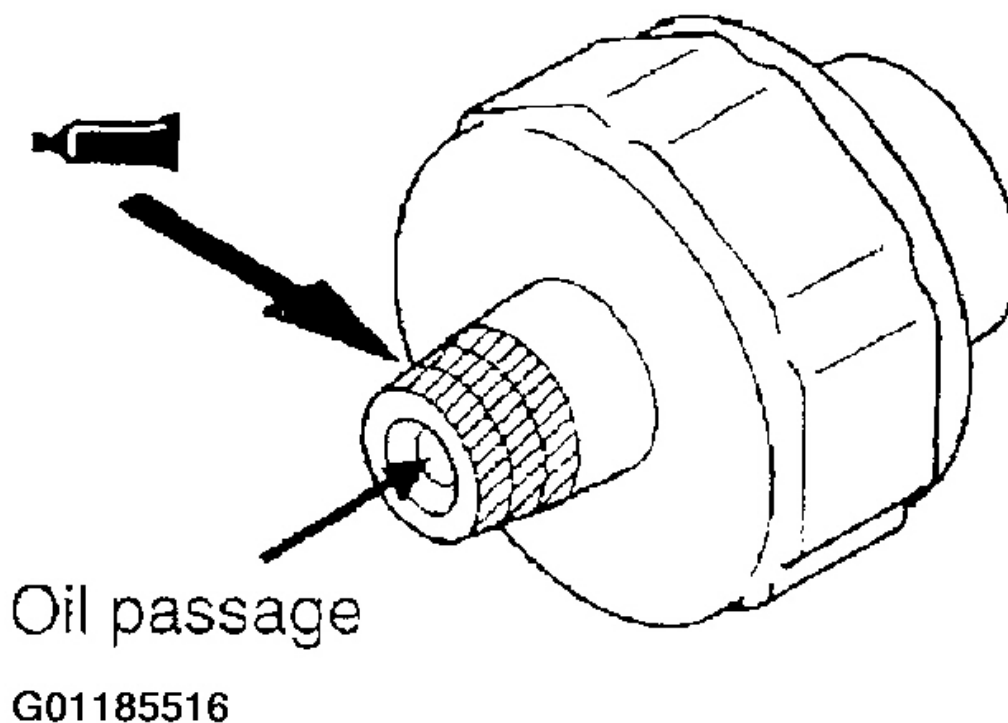


Fig. 153: Applying Sealant To Oil Pressure Switch

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2. Install and tighten the switch to the specified torque by using a socket wrench and torque wrench.

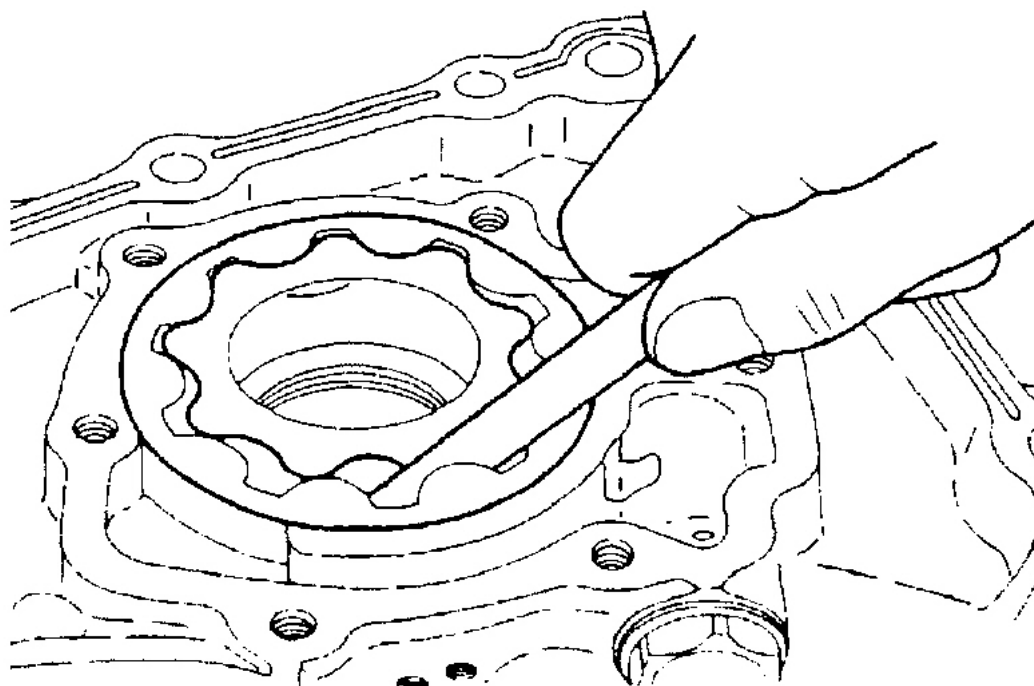
CAUTION: If the switch is tightened with a spanner or offset wrench, an over-torque may be applied and the switch to be damaged.

INSPECTION

OIL PUMP

1. Fit the rotors into the front case.
2. Check the tip clearance, using a feeler gauge.

Standard value: 0.06 - 0.18 mm (.0024 - .0071 in.)



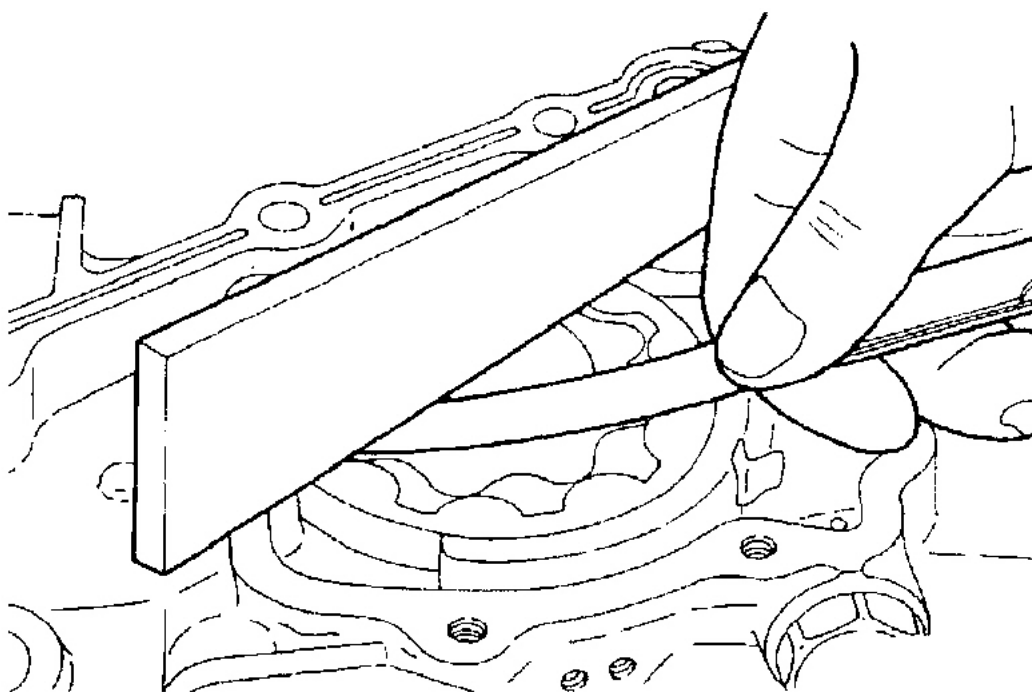
G01185517

Fig. 154: Checking Tip Clearance

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. Check the side clearance, using a straight and feeler gauge.

Standard value: 0.04 - 0.10 mm (.0016 - .0039 in.)



G01185518

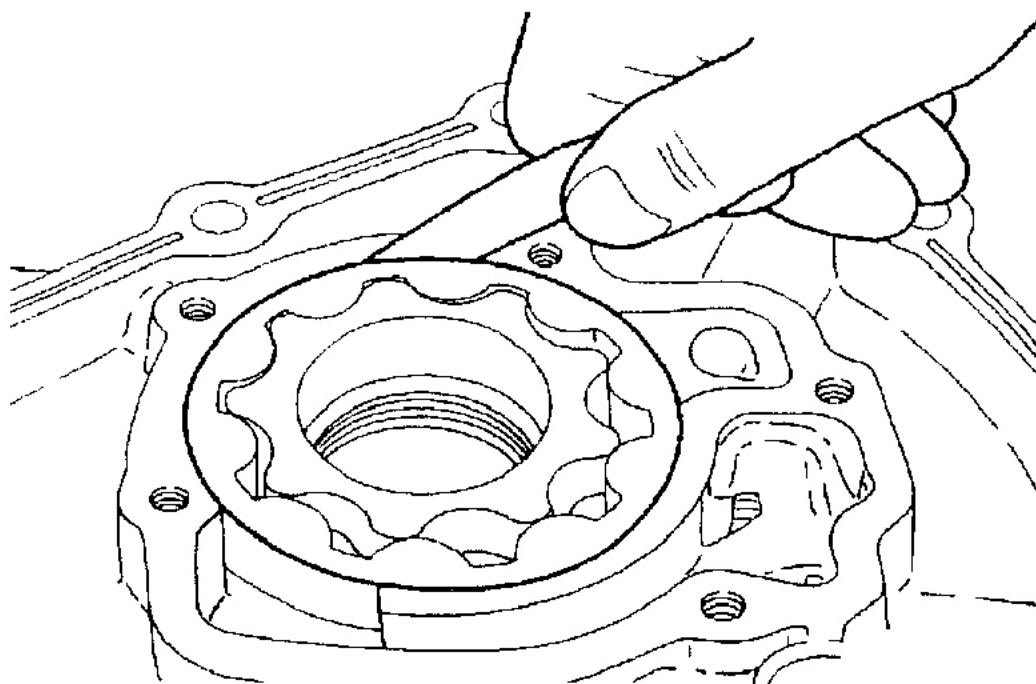
Fig. 155: Checking Side Clearance

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

4. Check the body clearance, using a feeler gauge.

Standard value: 0.10 - 0.18 mm (.0039 - .0071 in.)

Limit: 0.35 mm (.0138 in.)



G01185519

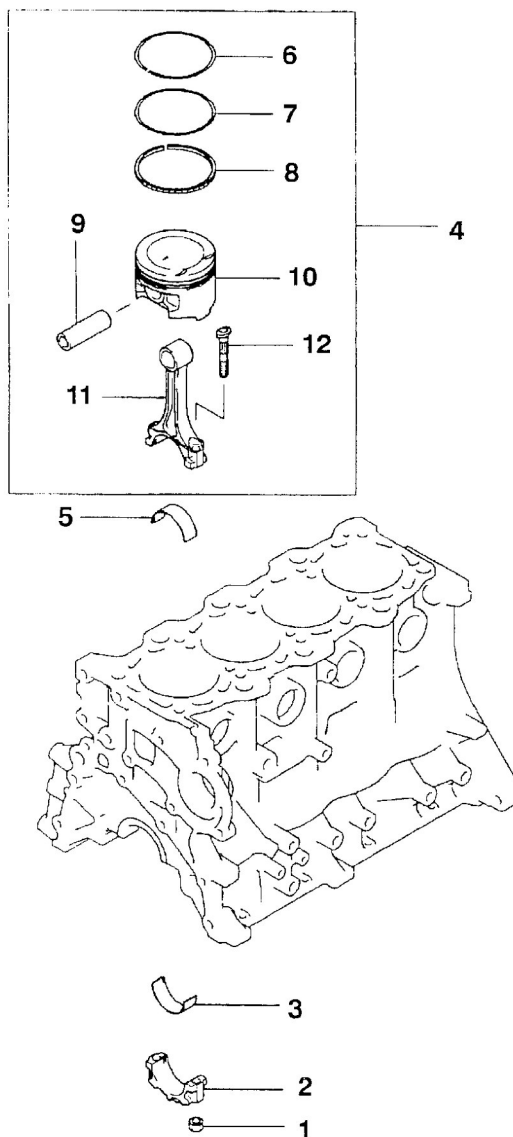
Fig. 156: Checking Body Clearance

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

PISTON AND CONNECTING ROD

REMOVAL & INSTALLATION

Apply engine oil to all moving parts before installation



Removal steps

- | | | |
|-----|-----|------------------------------|
| ◀A▶ | ▶G▶ | 1. Nut |
| | ▶F▶ | 2. Connecting rod cap |
| | ▶E▶ | 3. Connecting rod bearing |
| | ▶D▶ | 4. Piston and connecting rod |
| | ▶E▶ | 5. Connecting rod bearing |
| | ▶C▶ | 6. Piston ring No. 1 |

- | | |
|-----|----------------------|
| ▶C▶ | 7. Piston ring No. 2 |
| ▶B▶ | 8. Oil ring |
| ▶A▶ | 9. Piston pin |
| | 10. Piston |
| | 11. Connecting rod |
| | 12. Bolt |

G01185520

Fig. 157: Removing & Installing Pistons & Connecting Rods
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

REMOVAL SERVICE POINTS**< A > CONNECTING ROD CAP REMOVAL**

1. Mark the cylinder number on the side of the connecting rod big end for correct reassembly.

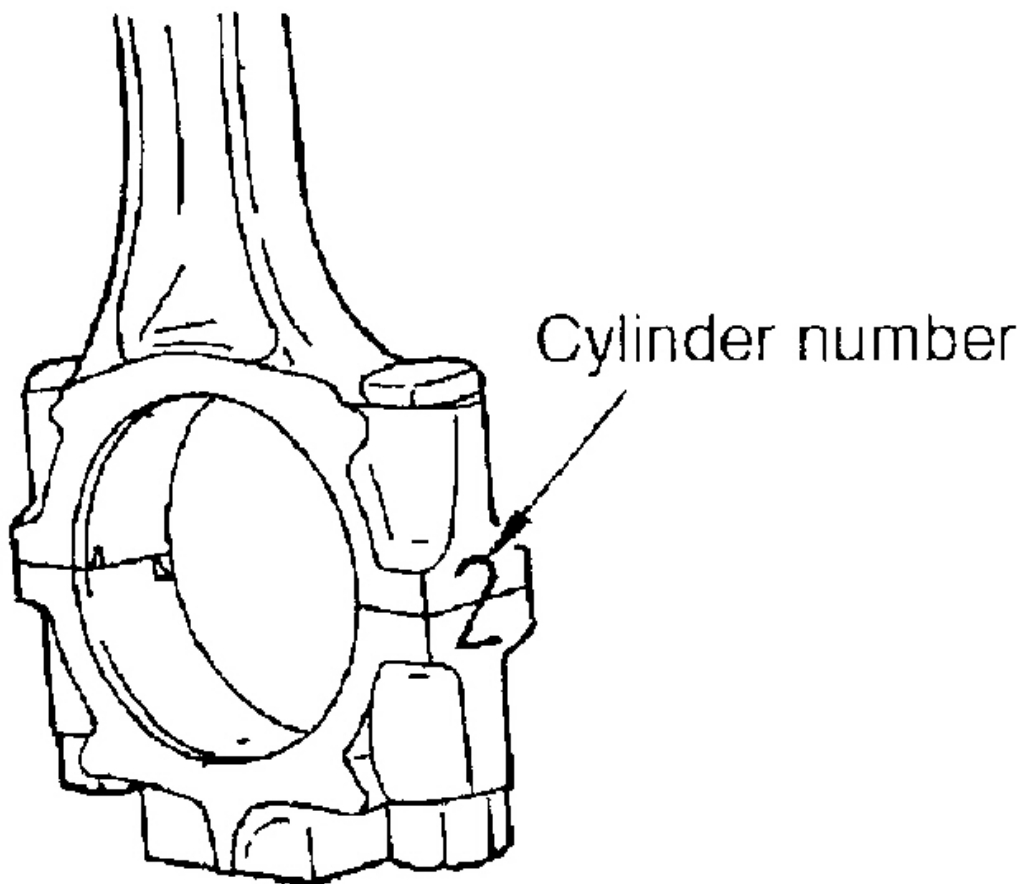
**G01185521**

Fig. 158: Marking Cylinder Number On Side Of Connecting Rod
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

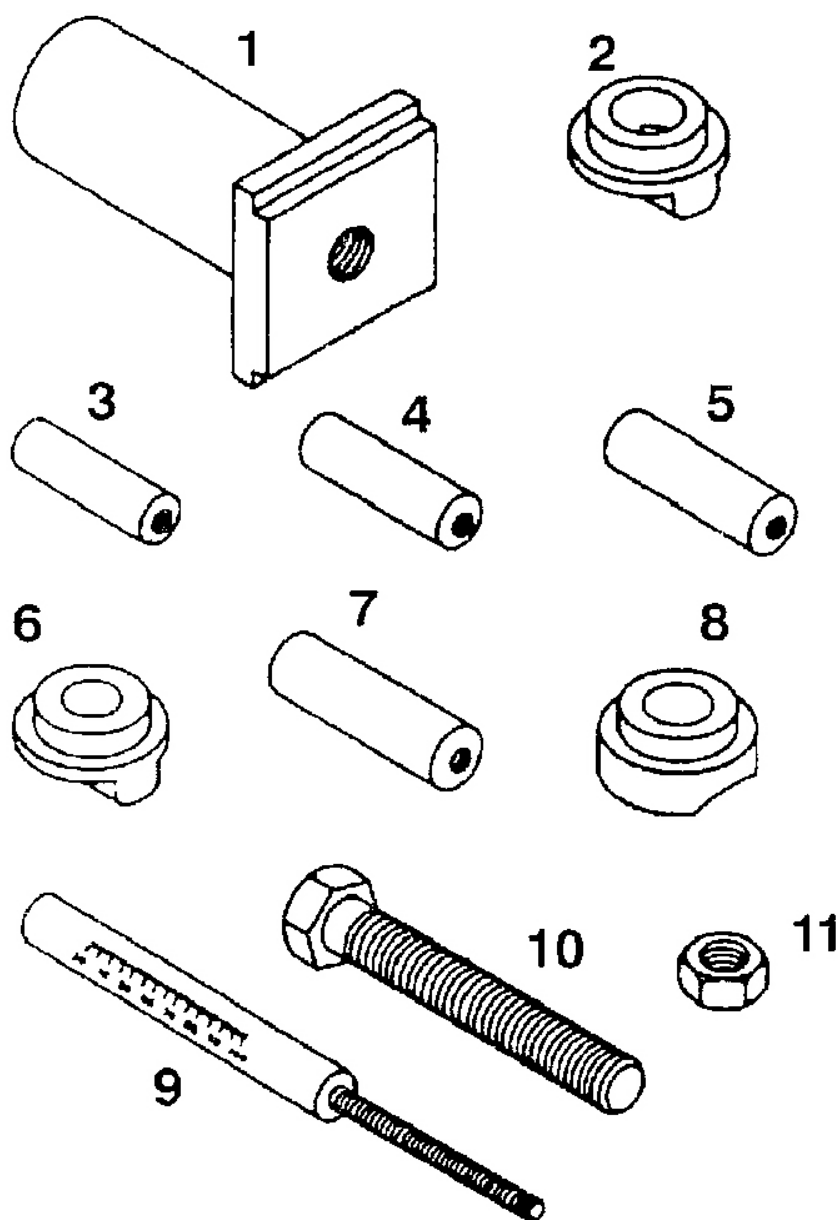
2. Keep the removed connecting rods, caps, and bearings in order according to the cylinder number.

< B > PISTON PIN REMOVAL

1. Remove the stop screw from the base.

2. Select the correct piston support for your application. Fit the piston support onto the base. Place the base on press support blocks.

Piston pin setting tool MIT216941



G01185523

Fig. 159: Identifying Piston Pin Setting Tool (1 Of 2)

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2002 Mitsubishi Mirage DE

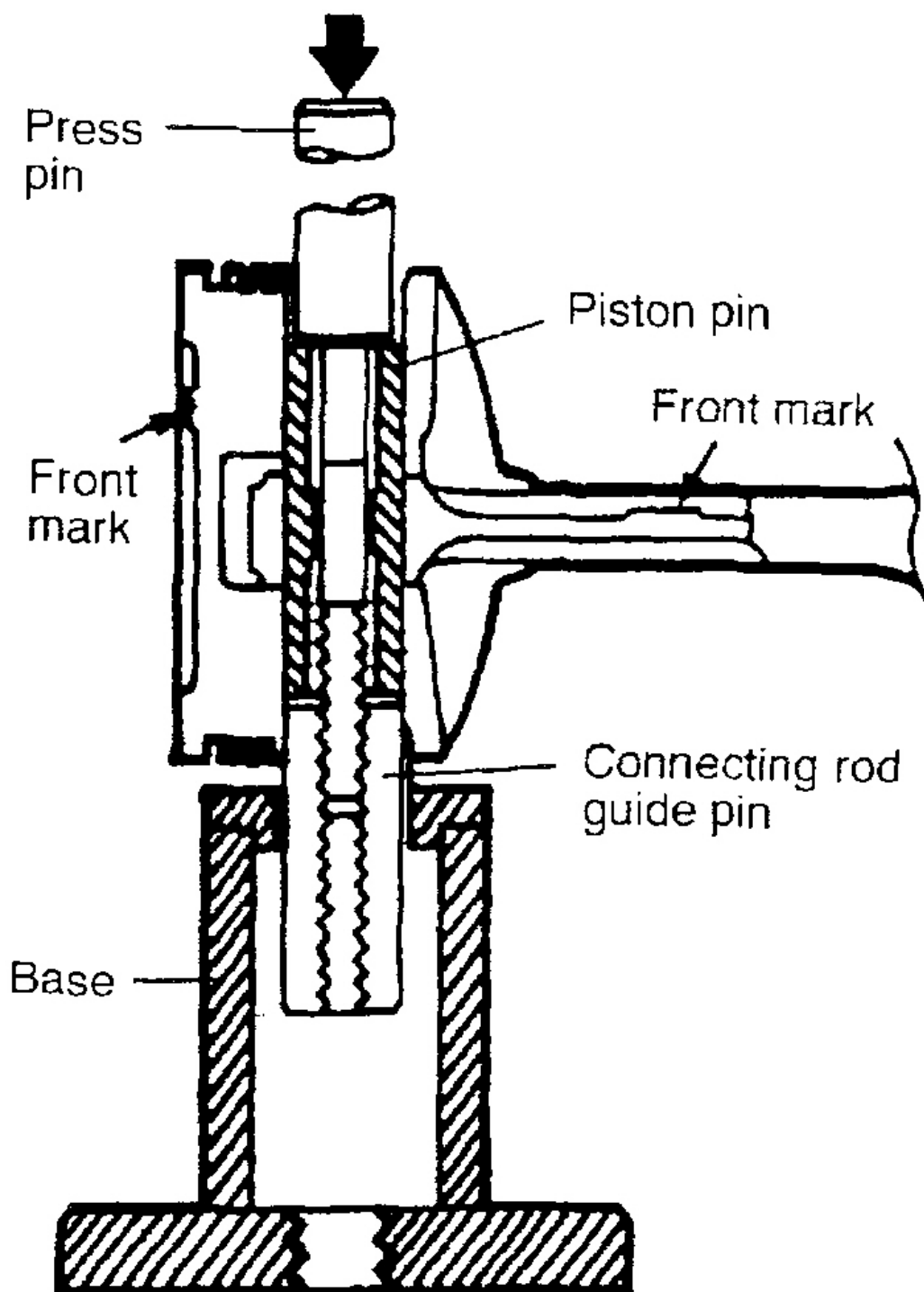
2002 ENGINES 1.8L 4-Cylinder - Mirage

Item No.	Part No.	Description
1	MIT310134	Base
2	MIT310136	Piston Support
3	MIT310137	Connecting Rod Guide Pin
4	MIT310138	Connecting Rod Guide Pin
5	MIT310139	Connecting Rod Guide Pin
6	MIT310140	Piston Support
7	MIT310141	Connecting Rod Guide Pin
8	MIT310142	Piston Support
9	MIT48143	Press Pin
10	216943	Stop Screw
11	10396	Nut

G01185522

Fig. 160: Identifying Piston Pin Setting Tool (2 Of 2)**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

3. Insert the press pin through the piston pin hole. Select the correct connecting rod guide pin. Thread the guide pin onto the threaded portion of the press pin.
4. Position the piston assembly on the piston support in the press. With the press pin up, insert the guide pin through the hole in the piston and through the hole in the piston support.
5. Press the piston pin out of the assembly.



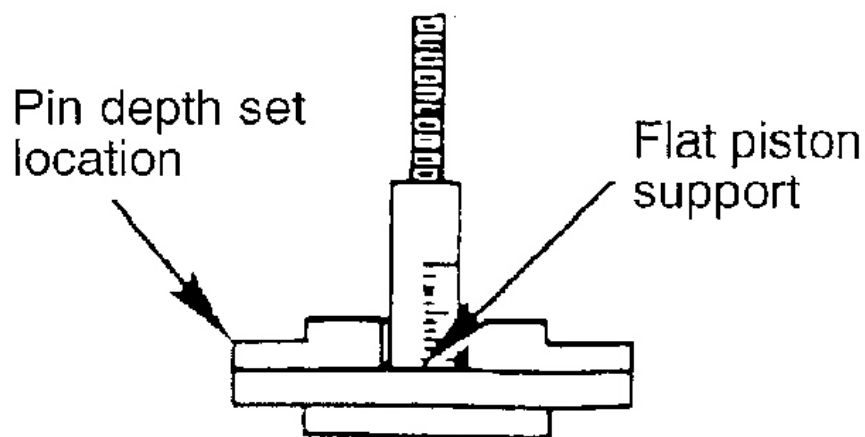
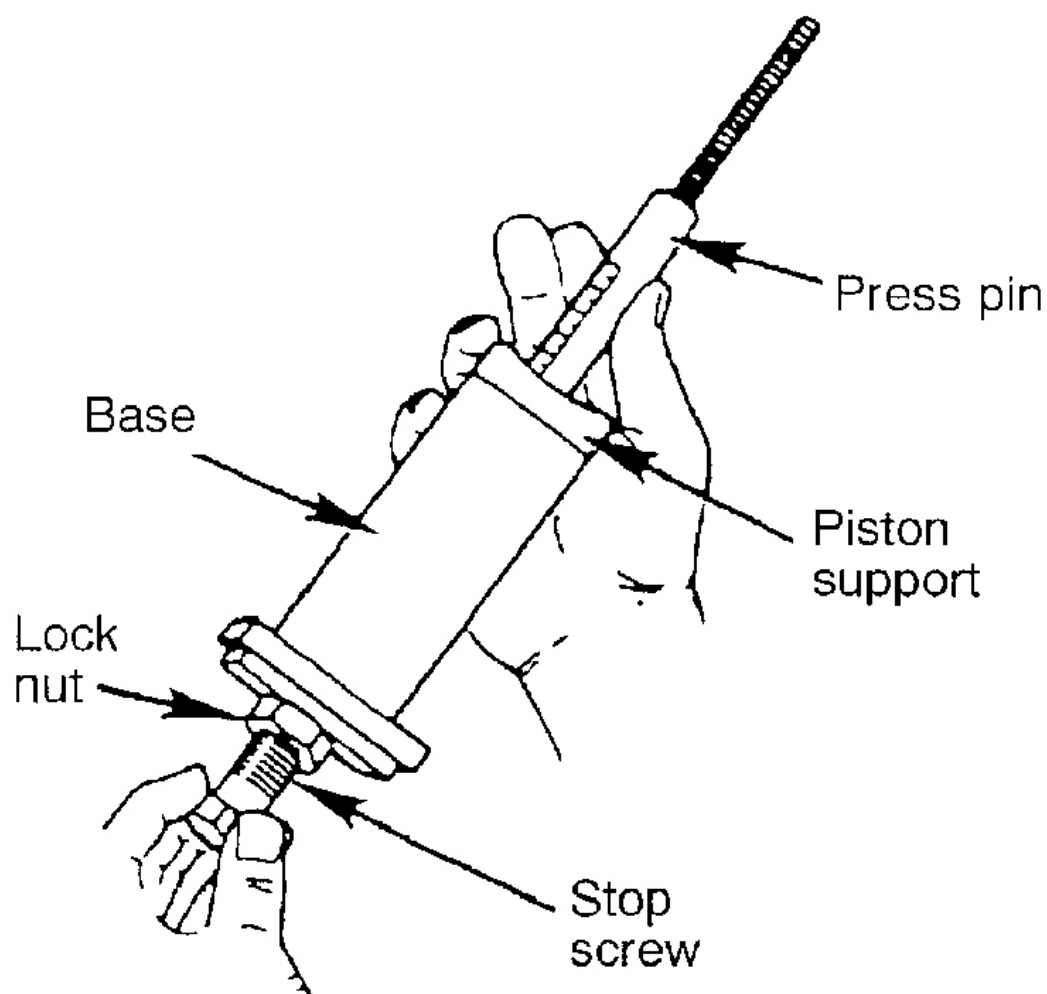
G01185524

Fig. 161: Removing Piston Pin**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.****IMPORTANT: To avoid piston damage,**

- The piston support must seat squarely against the piston.
 - Verify that the piston pin will slide through the hole in the piston support.
6. Remove the piston pin from the press pin.

INSTALLATION SERVICE POINTS**>A< PISTON PIN INSTALLATION**

1. Thread the stop screw and lock nut assembly into the base. Fit the correct piston support on top of the base. Insert the press pin, threaded end up, into the hole in the piston support until the press pin touches the stop screw.
2. Using the markings on the press pin, adjust the stop screw to the depth as shown below.

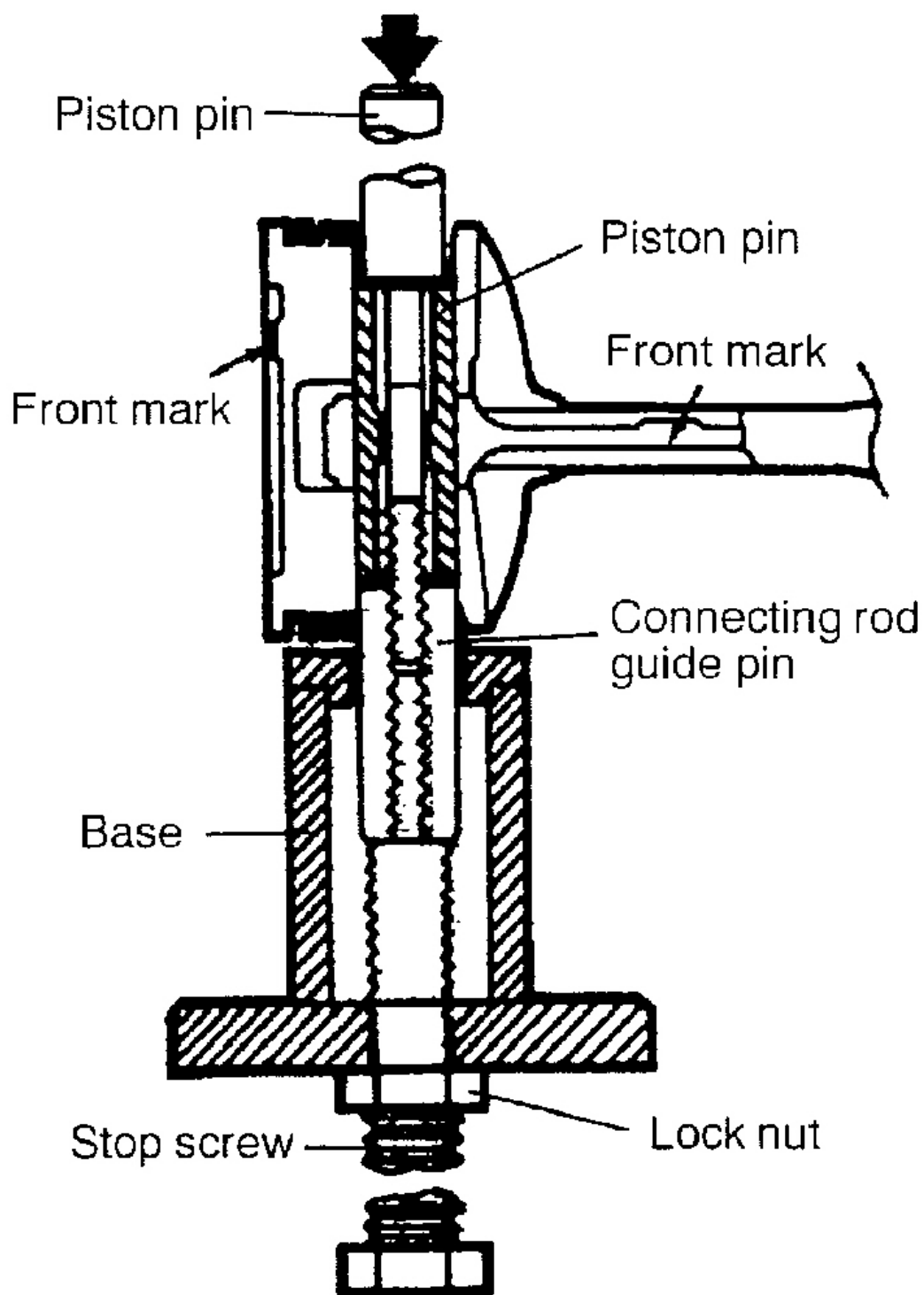


G01185525

Fig. 162: Installing Piston Pin (1 Of 2)

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. Place the base on press support blocks.



G01185526

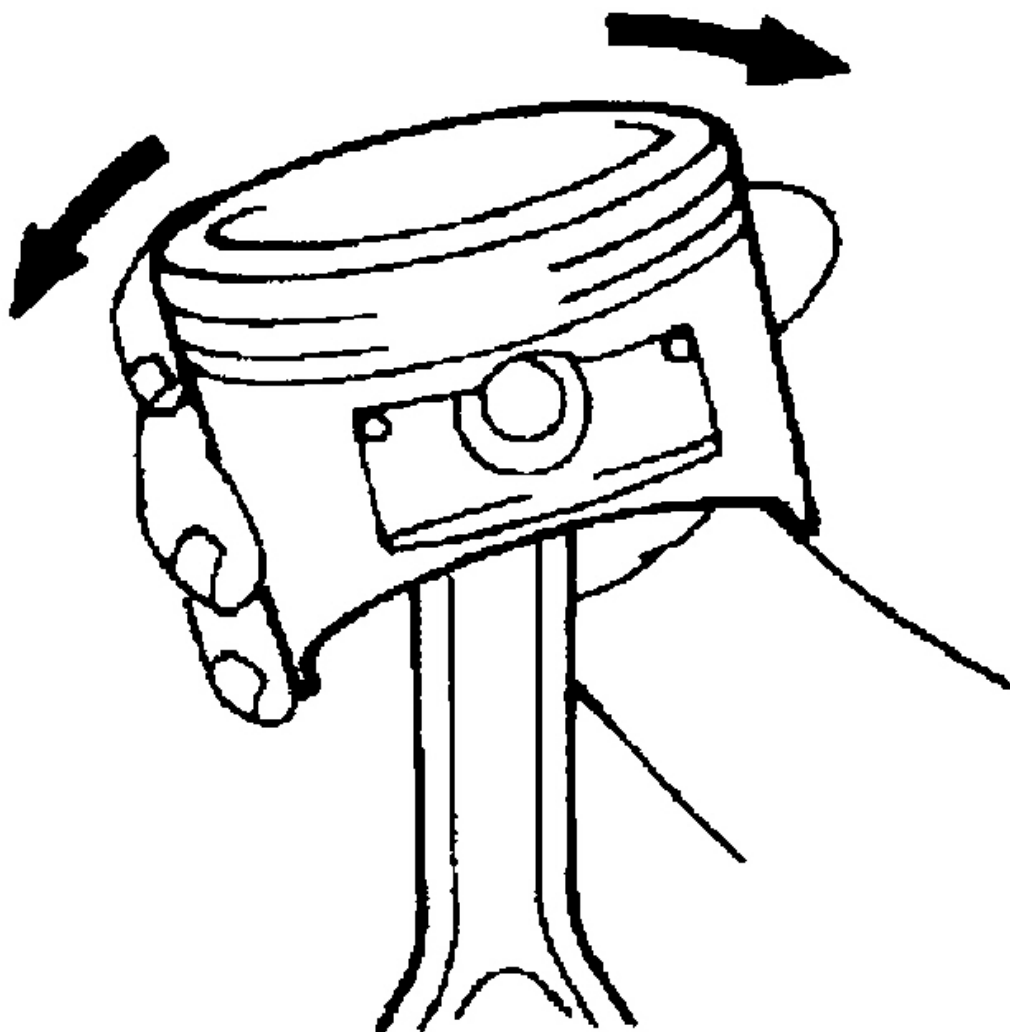
Fig. 163: Installing Piston Pin (2 Of 2)

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

4. Slide the piston pin over the threaded end of the press pin, and thread the correct guide pin up against it.
5. Coat the piston pin with oil, and with the connecting rod held in position, slide the guide pin through the piston and connecting rod.
6. Press the piston pin through the connecting rod until the guide pin contacts the stop screw.
7. Remove the piston assembly from the base. Remove the guide pin and press pin from the assembly.

IMPORTANT: Due to production tolerance variations, it is necessary to visually inspect the piston pin depth after installation to verify that the piston pin is centered. Adjust if necessary.

8. Check that the piston moves smoothly.



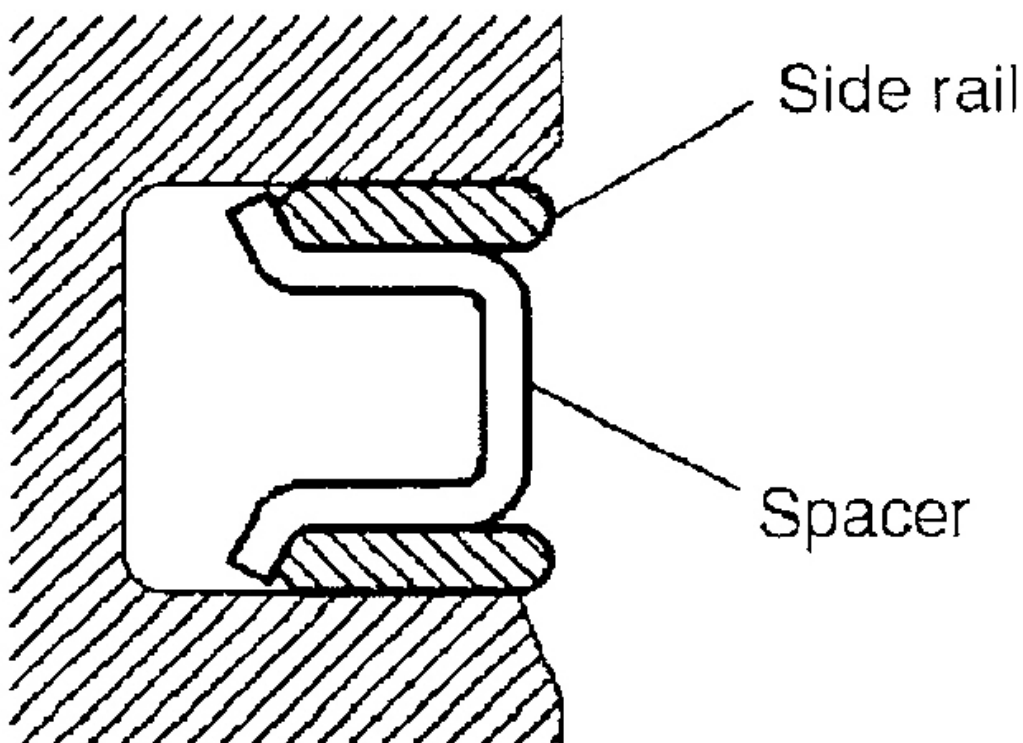
G01185527

Fig. 164: Checking Piston Pin

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>B< OIL RING INSTALLATION

1. Fit the oil ring spacer into the piston ring groove. Then fit the upper and lower side rails.



G01185529

Fig. 165: Installing Oil Ring

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

NOTE:

1. The spacer and side rails may be fitted in either direction. No distinction is made between top and bottom.
2. Spacer and side rail sizes are color-coded as follows:

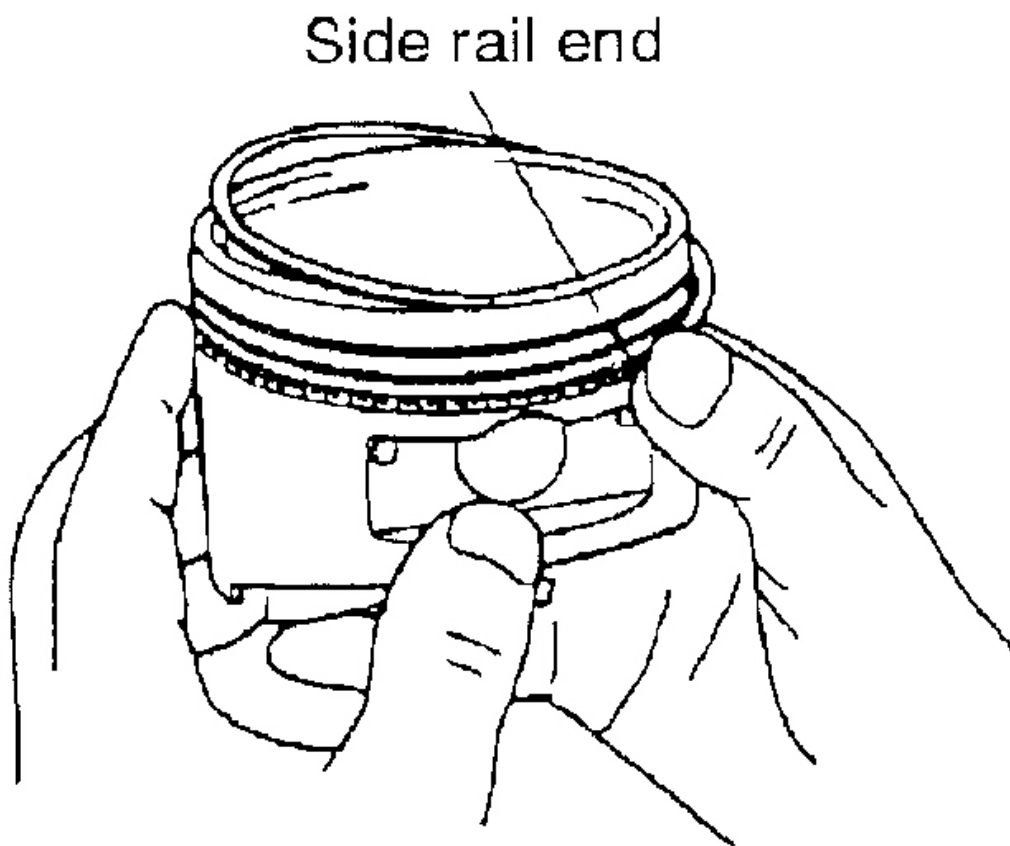
Size	Identification color
Standard size	None
0.50 mm O.S.	Blue
1.00 mm O.S.	Yellow

G01185528

Fig. 166: Spacer & Side Rail Sizes**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

NOTE: To install a side rail, fit one end of the rail into the groove, then press the rest of the rail into position by hand as shown.

CAUTION: Do not fit side rails using a piston ring expander since they may break.



G01185530

Fig. 167: Installing Side Rails

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2. After installing the side rails, check that they move smoothly in both directions.

>C< PISTON RING NO. 2/PISTON RING NO. 1 INSTALLATION

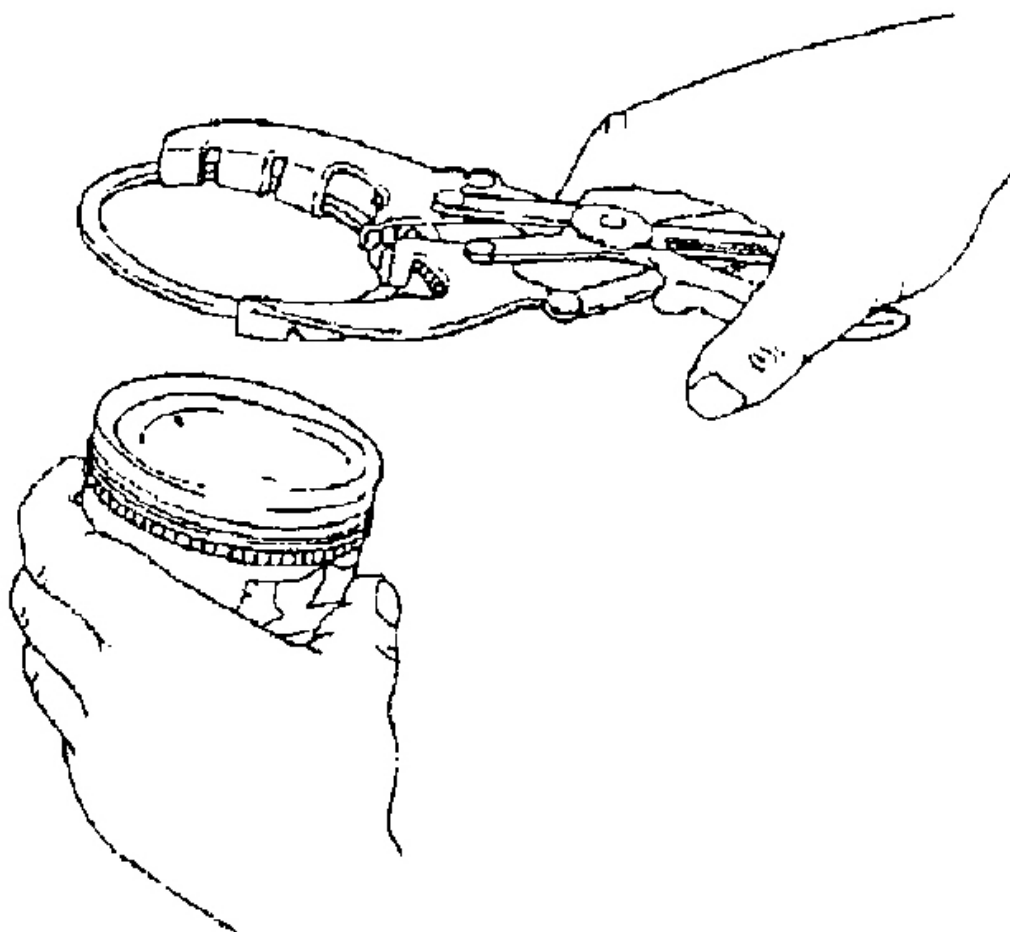
1. Using a ring expander, fit ring No. 2 and ring No. 1 with their identification marks facing upward (on the piston crown side).

Identification mark:

No. 1 ring: T

No. 2 ring: T2

NOTE: The piston ring is stamped with the following size mark.



G01185531

Fig. 168: Using Ring Expander

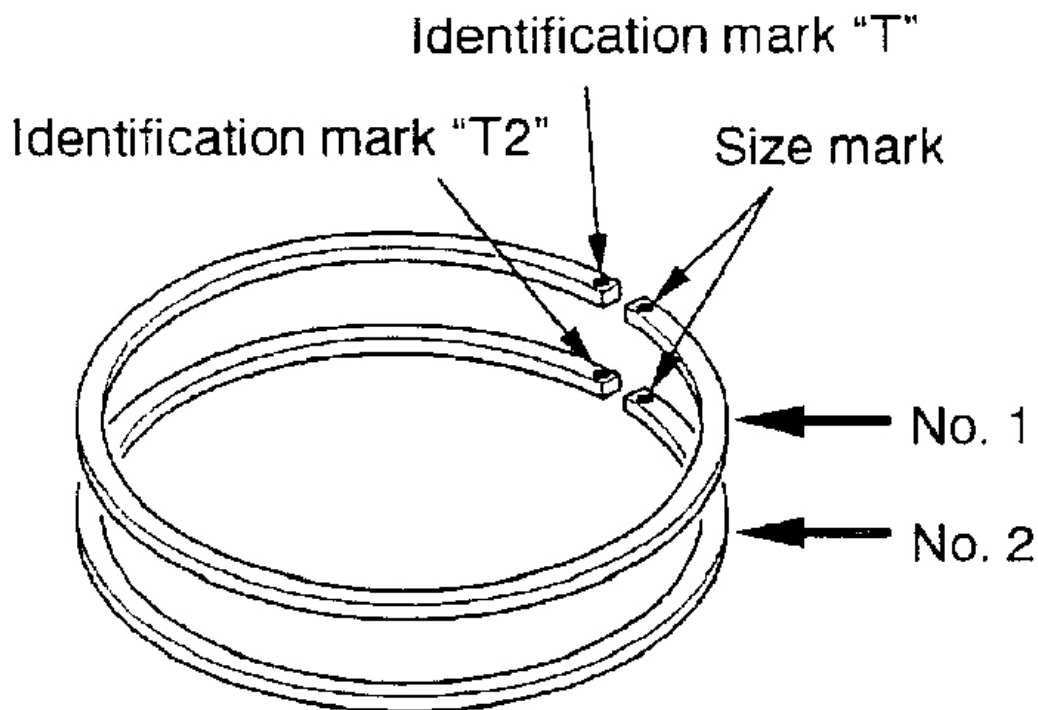
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Size	Size mark
Standard size	None
0.50 mm O.S.	50
1.00 mm O.S.	100

G01185532

Fig. 169: Piston Ring Size Specifications

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.



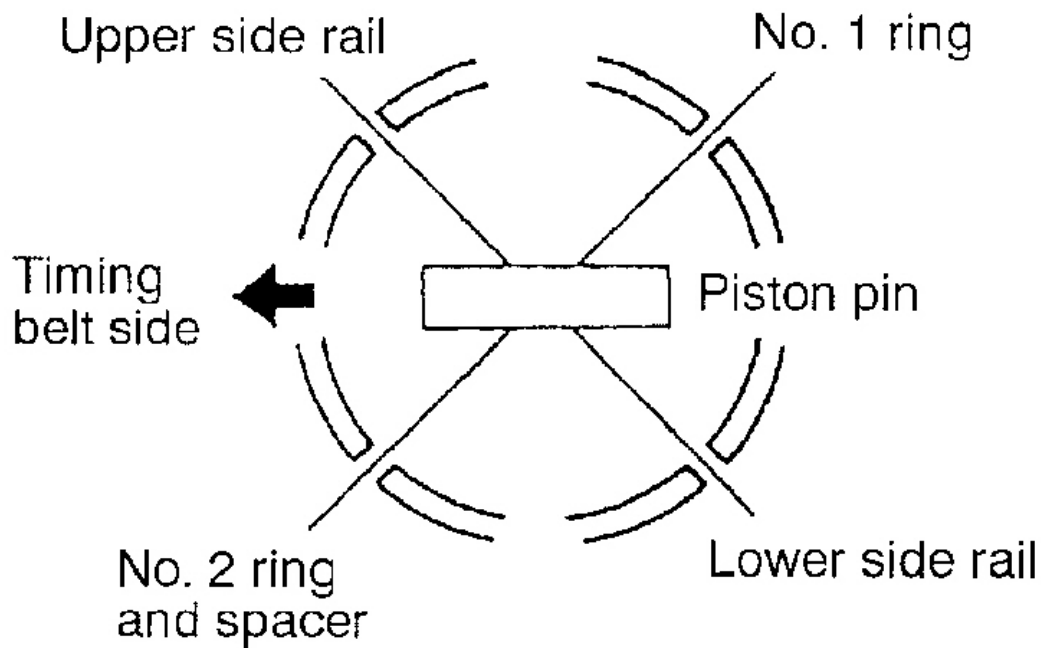
G01185533

Fig. 170: Locating Piston Ring Size Marks

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>D< PISTON AND CONNECTING ROD ASSEMBLY INSTALLATION

1. Apply oil to the piston, piston ring, and oil ring.
2. Align the gaps of the piston rings and oil rings (side rails and spacer) as shown.



G01185534

Fig. 171: Aligning Gaps Of Piston Rings & Oil Ring

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. With the piston crown's front arrow mark pointing toward the timing belt side, press the piston and connecting rod assembly into the cylinder from the top of the cylinder.
4. Compress the piston rings tightly with a suitable ring compression tool, then press the piston and connecting rod fully into the cylinder. Do not strike the piston hard since the piston rings may break and the crank pin may be nicked.

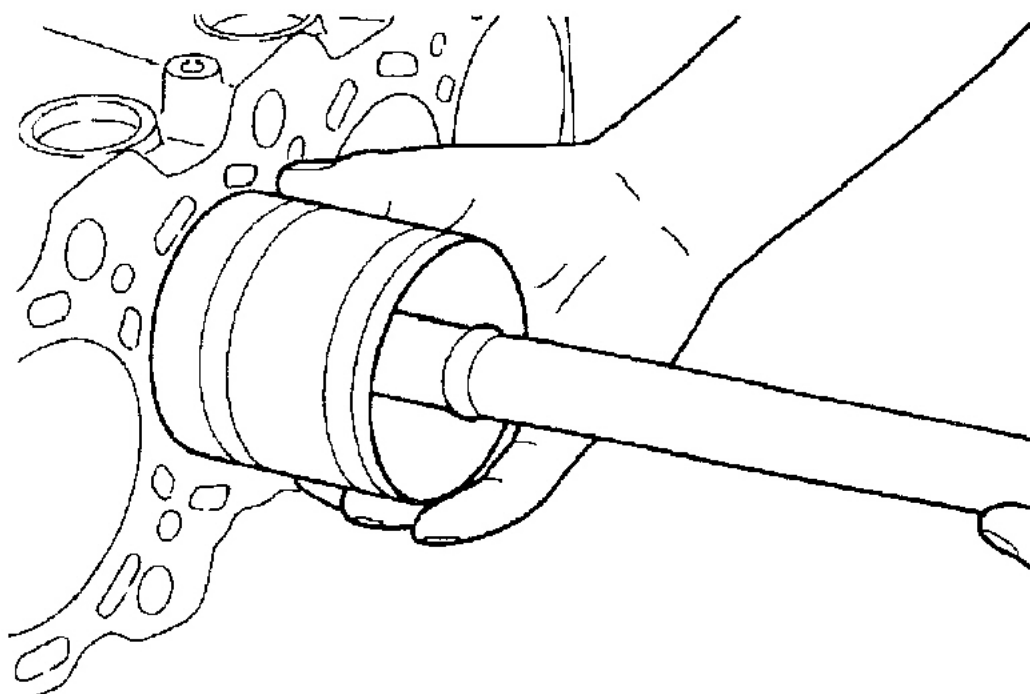
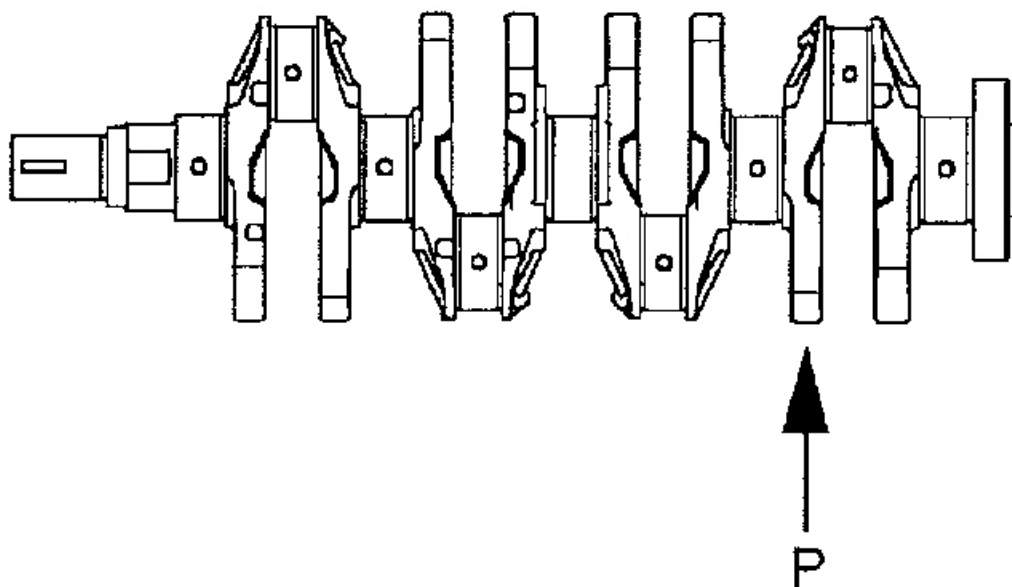
**G01185535**

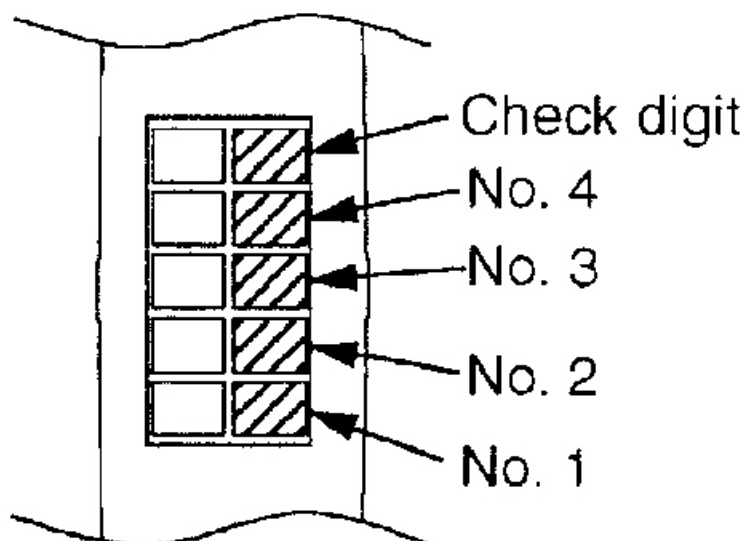
Fig. 172: Installing Piston & Connecting Rod Assembly
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>E< CONNECTING ROD BEARING INSTALLATION

1. When replacing the bearings and/or crankshaft, read off the identification mark on the crankshaft (as illustrated), and select a bearing according to the following table.



P view



G01185537

Fig. 173: Locating Identification Marks On Crankshaft

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

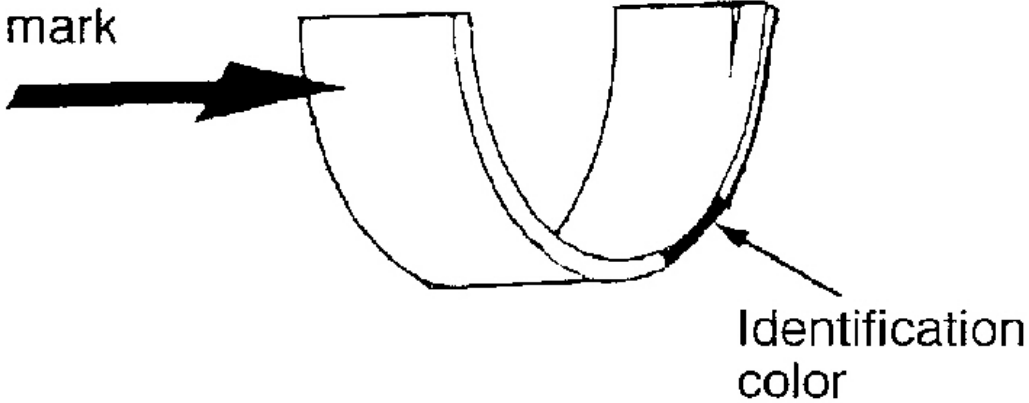
Crankshaft pin O.D.	Connecting rod bearing	
Identification mark	Identification mark	Identification color
1	S1	Brown
2	S2	Black
3	S3	Green

G01185536

Fig. 174: Identifying Connecting Rod Bearing Identification Marks

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Connecting rod bearing

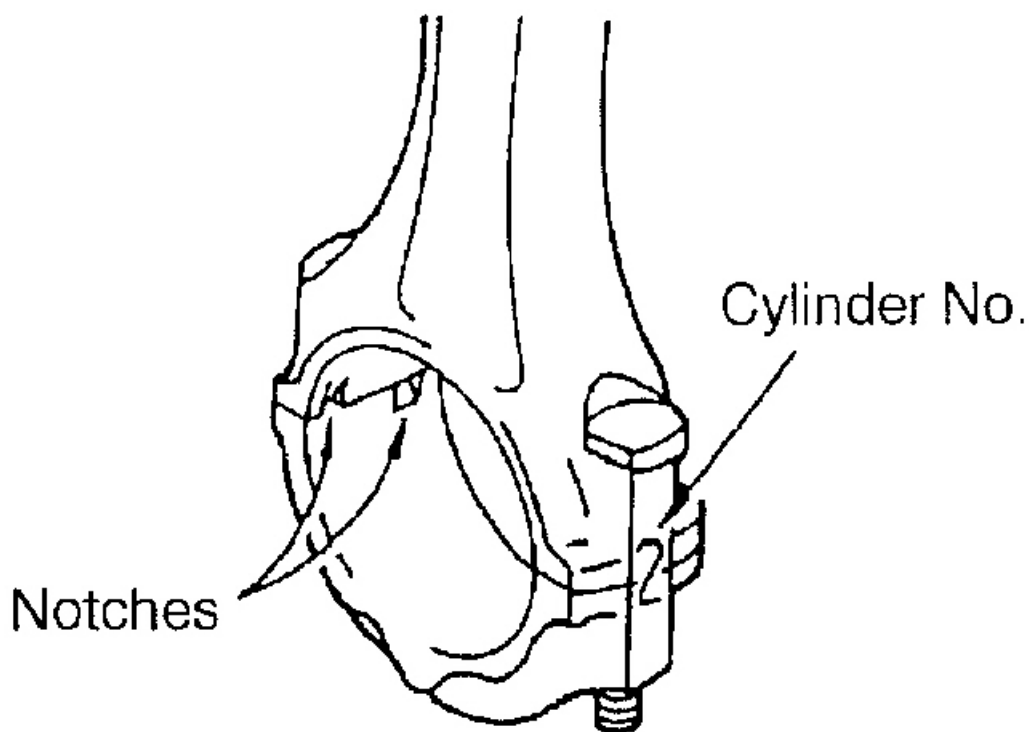
Identification
mark

G01185538

Fig. 175: Locating Identification Marks On Connecting Rod Bearing
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>F< CONNECTING ROD CAP INSTALLATION

1. Aligning the marks made during disassembly, fit the bearing cap onto the connecting rod. If the connecting rod is new and has no index mark, ensure that the bearing locking notches are both on the same side.



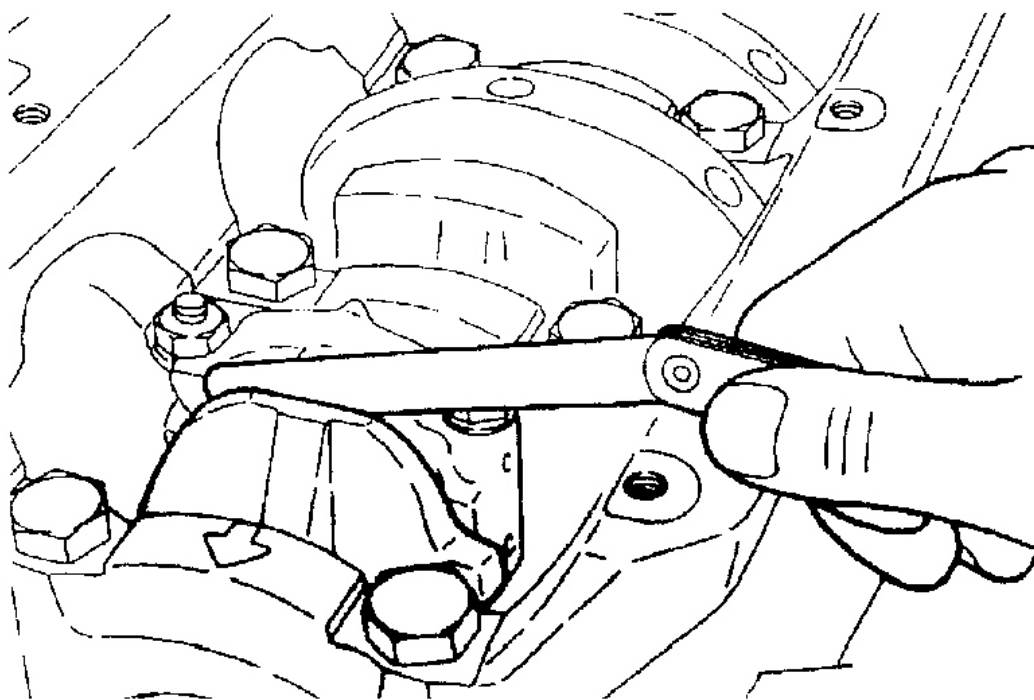
G01185539

Fig. 176: Aligning Connecting Rod Marks
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2. Check that the connecting rod big end side clearance confirms with specification.

Standard value: 0.10 - 0.25 mm (.0039 - .0098 in.)

Limit: 0.4 mm (.016 in.)



G01185540

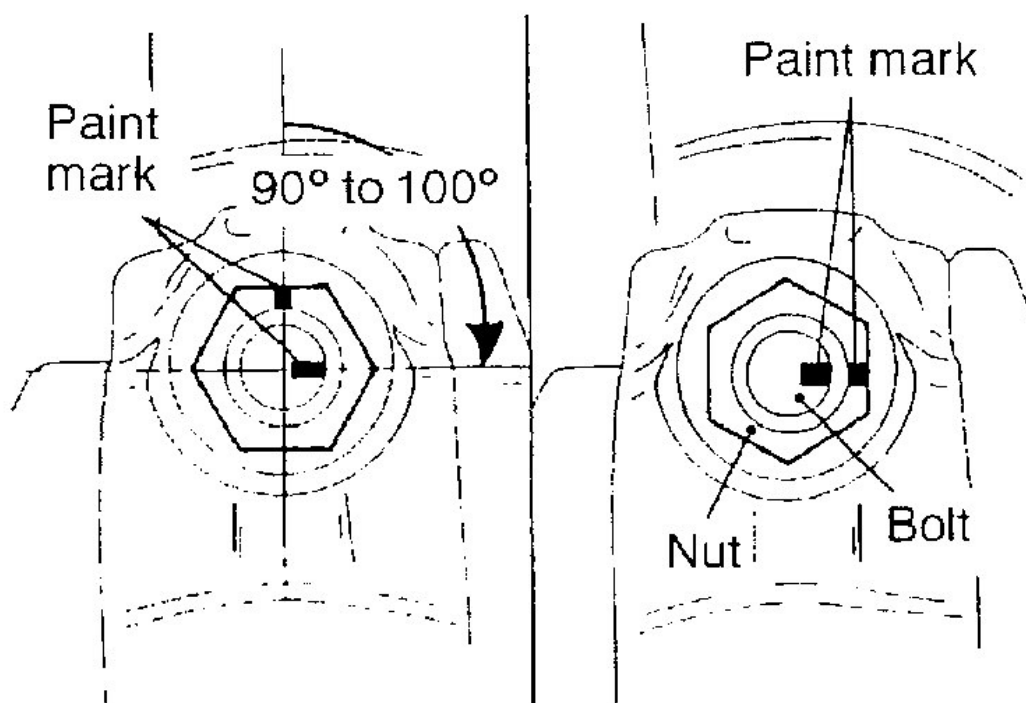
Fig. 177: Checking Connecting Rod Big End Side Clearance
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>G< CONNECTING ROD CAP NUT TIGHTENING

1. Since the connecting rod cap bolts and nuts are torqued using the plastic area tightening method, the bolts should be examined BEFORE reuse. If the bolt threads are "necked down", the bolt should be replaced.

Necking can be checked by running a nut with your fingers the full length of the bolt threads. If the nut does not run down smoothly, the bolt should be replaced.

2. Before installation of each nut, apply engine oil to the nut.
3. Install each nut to the bolt and finger-tighten it. Then tighten the nuts alternately to install the cap properly.
4. Tighten the nuts to a torque of 20 Nm (15 ft.lbs.).
5. Make a paint mark on the head of each nut.
6. Make a paint mark on the bolt end at the position 90° to 100° from the paint mark made on the nut in the direction of tightening the nut.
7. Give a 90° to 100° turn to the nut and make sure that the paint mark on the nut and that on the bolt are in alignment.



G01185541

Fig. 178: Turning Nut 90 To 100 Degrees

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

- CAUTION:**
1. If the nut is turned less than 90°, proper fastening performance may not be expected. When tightening the nut, therefore, be careful to give a sufficient turn to it.
 2. If the nut is overtightened (exceeding 100°), loosen the nut completely and then retighten it by repeating the tightening procedure from step 1.

INSPECTION**PISTON RING**

1. Check for side clearance.

If the limit is exceeded, replace the ring or piston, or both.

Standard value:

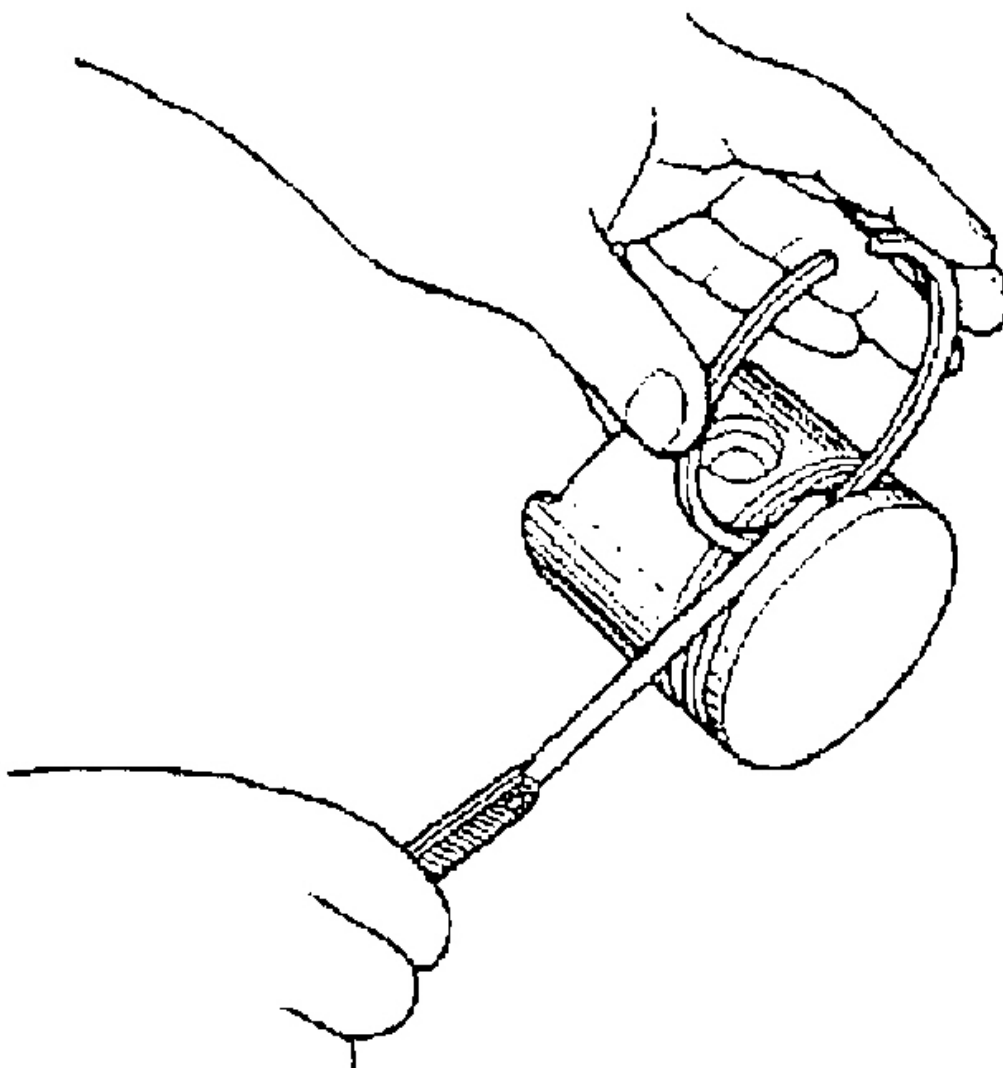
No. 1: 0.03 - 0.07 mm (.0012 - .0028 in.)

No. 2: 0.02 - 0.06 mm (.0008 - .0024 in.)

Limit:

No. 1: 0.1 mm (.0039 in.)

No. 2: 0.1 mm (.0039 in.)

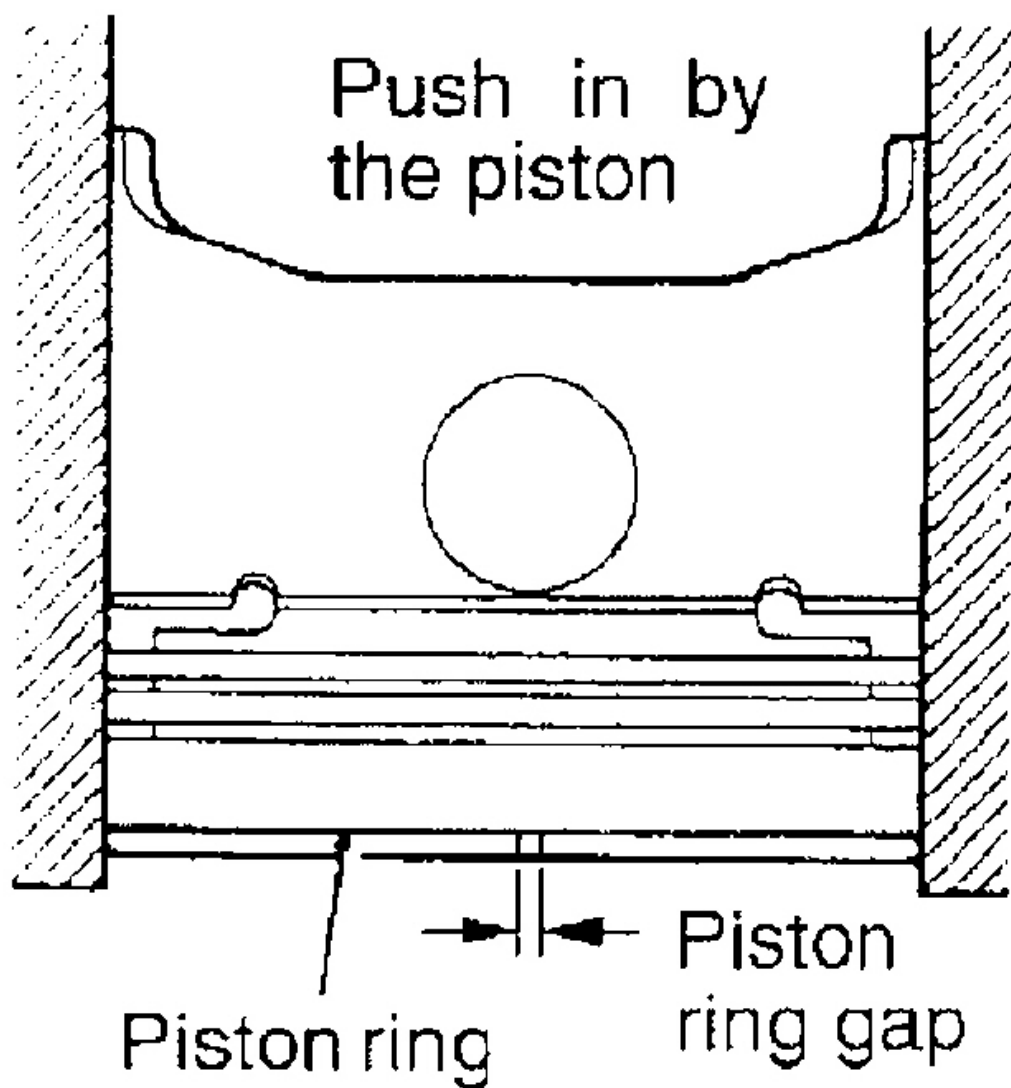


G01185542

Fig. 179: Checking Piston Ring Side Clearance**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

2. Install the piston ring into the cylinder bore. Force the ring down with a piston, the piston crown being in contact with the ring, to correctly position it at right angles to the cylinder wall. Then, measure the end gap with a feeler gauge. If the end gap is excessive, replace the piston ring.

Standard value:**No. 1: 0.25 - 0.40 mm (.0098 - .0157 in.)****No. 2: 0.40 - 0.55 mm (.0157 - .0217 in.)****Oil: 0.20 - 0.60 mm (.0078 - .0236 in.)****Limit:****No. 1, No. 2: 0.8 mm (.031 in.)****Oil: 1.0 mm (.039 in.)**



G01185543

Fig. 180: Measuring Piston Ring End Gap

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

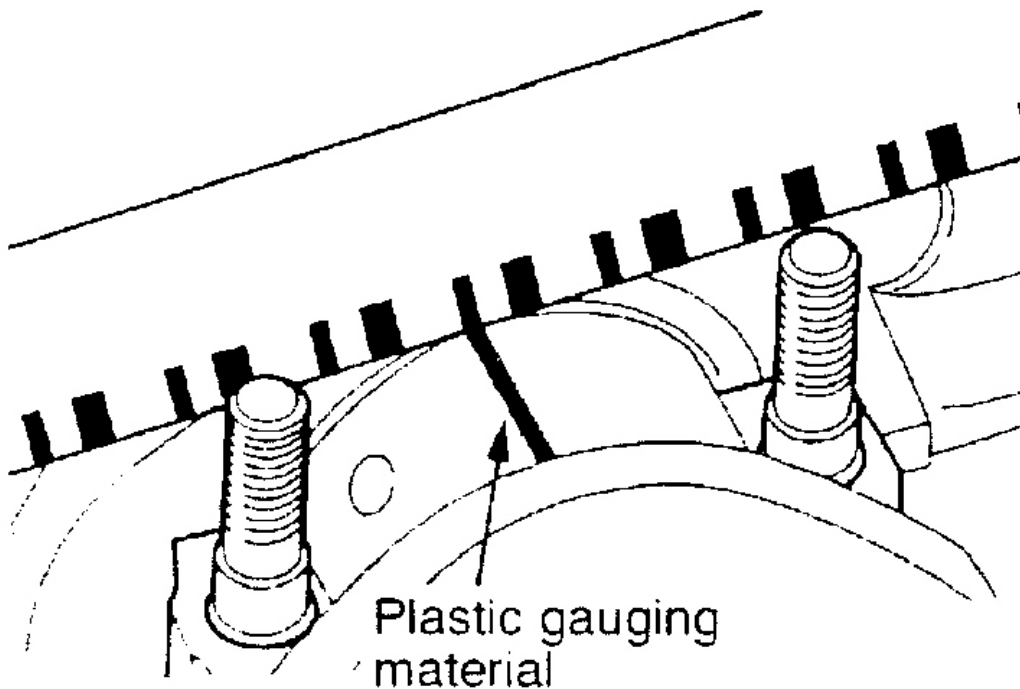
CRANKSHAFT PIN OIL CLEARANCE (PLASTIC GAUGING MATERIAL METHOD)

1. Remove oil from the crankshaft pin and connecting rod bearing.
2. Cut the plastic gauging material to the same length as the width of bearing and place it on crankshaft pin in parallel with its axis.

3. Install the connecting rod cap carefully and tighten the nuts to the specified torque. See **>G<** **CONNECTING ROD CAP NUT TIGHTENING.**
4. Carefully remove the connecting rod cap.
5. Measure the width of the plastic gauging material at its widest part by using a scale printed on its package.

Standard value: 0.02 - 0.05 mm (.0008 - .0020 in.)

Limit: 0.1 mm (.004 in.)

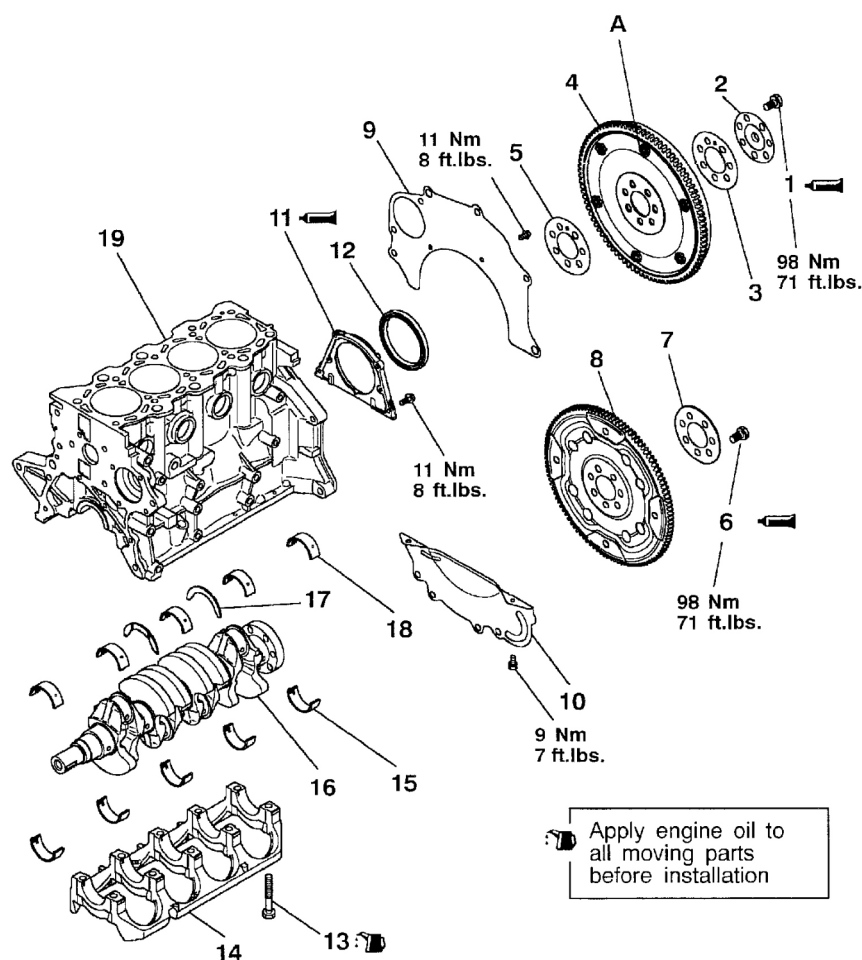


G01185544

Fig. 181: Measuring Crankshaft Pin Oil Clearance
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

CRANKSHAFT AND CYLINDER BLOCK

REMOVAL & INSTALLATION



Removal steps

- E◄ 1. Flywheel bolt <M/T>
- 2. Plate <M/T>
- 3. Adapter plate <M/T>
- 4. Flywheel (Non-disassemblable part) <M/T>
- 5. Adapter plate <M/T>
- E◄ 6. Drive plate bolt <A/T>
- 7. Adapter plate <A/T>
- 8. Drive plate <A/T>
- 9. Rear plate
- 10. Bell housing cover
- D◄ 11. Rear oil seal case
- C◄ 12. Rear oil seal
- B◄ 13. Bearing cap bolt

- B◄ 14. Bearing cap
- A◄ 15. Crankshaft bearing, lower
- 16. Crankshaft
- A◄ 17. Thrust plate
- A◄ 18. Crankshaft bearing, upper
- 19. Cylinder block

Caution

Do not remove any of the bolts "A" of the flywheel shown in the illustration. The balance of the flexible type flywheel is adjusted in an assembled condition. Removing the bolt, therefore, can cause the flexible flywheel to be out of balance, giving damage to the flywheel.

G01185545

Fig. 182: Removing & Installing Crankshaft & Cylinder Block
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

INSTALLATION SERVICE POINTS

>A< CRANKSHAFT BEARING INSTALLATION

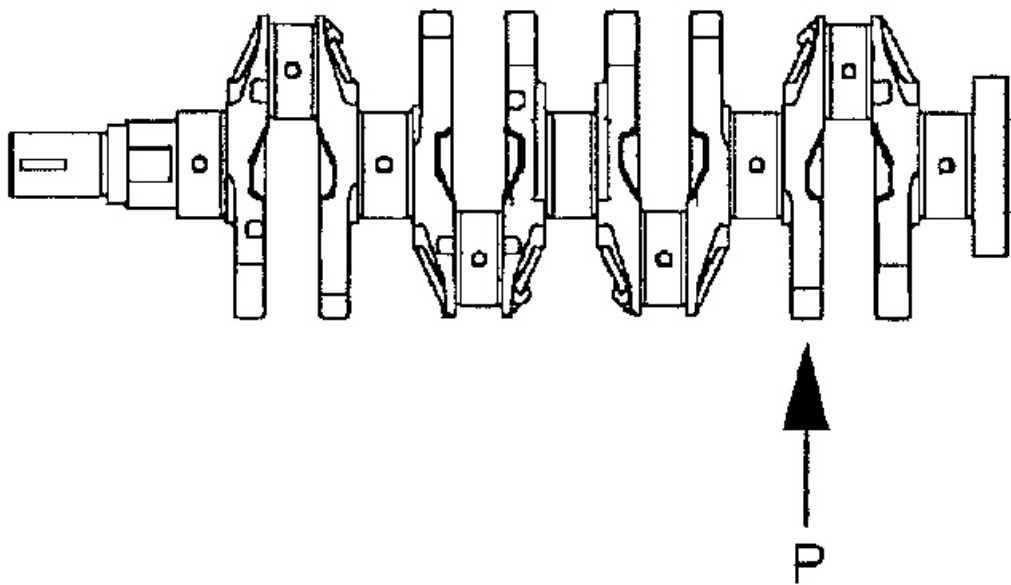
1. When replacing the bearings, crankshaft and/or cylinder block, read off the identification mark on the crankshaft and cylinder block (as illustrated), and select a bearing according to the following table.

Crankshaft journal O.D.	Cylinder block bearing bore I.D.	Crankshaft bearing	
Identification mark	Identification mark	Identification mark	Identification color
1	0	S1	Brown
	1	S2	Black
	2	S3	Green
2	0	S2	Black
	1	S3	Green
	2	S4	Yellow
3	0	S3	Green
	1	S4	Yellow
	2	S5	Red

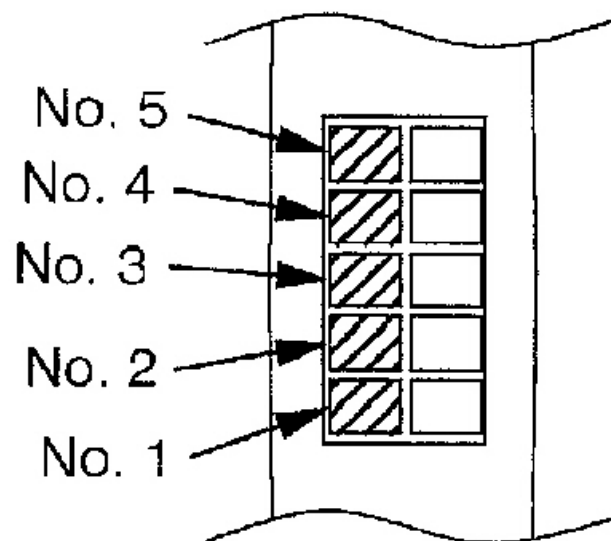
G01185546

Fig. 183: Crankshaft Bearing Color Code Chart

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.



P view



G01185547

Fig. 184: Identifying Crankshaft Bearing Color Code Positions
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

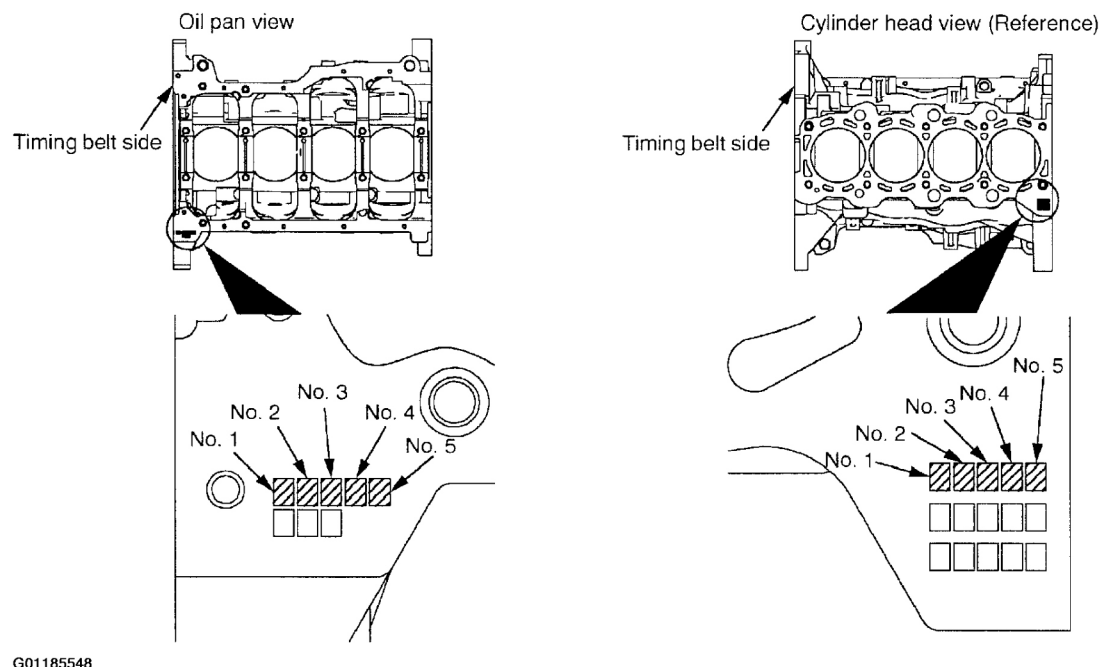
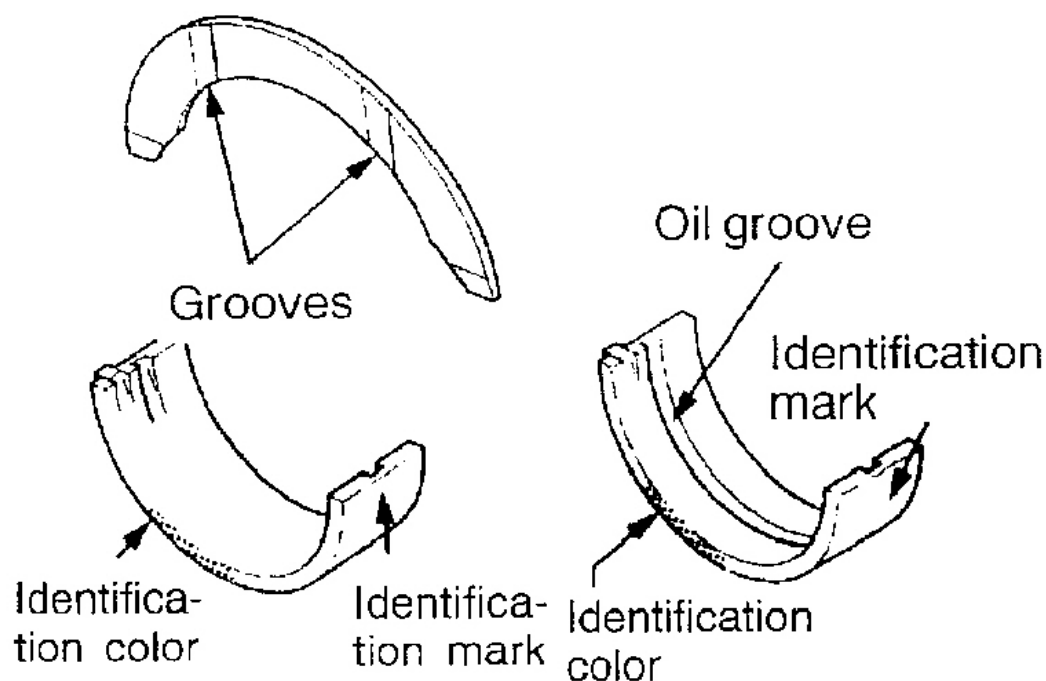


Fig. 185: Cylinder Block Identification Mark Stamped Position
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2. Install bearings having an oil groove to the cylinder block.
3. Install bearings having no oil groove onto the bearing caps.
4. Install the thrust bearings at the No. 3 upper bearing with the grooved side toward the crankshaft web.



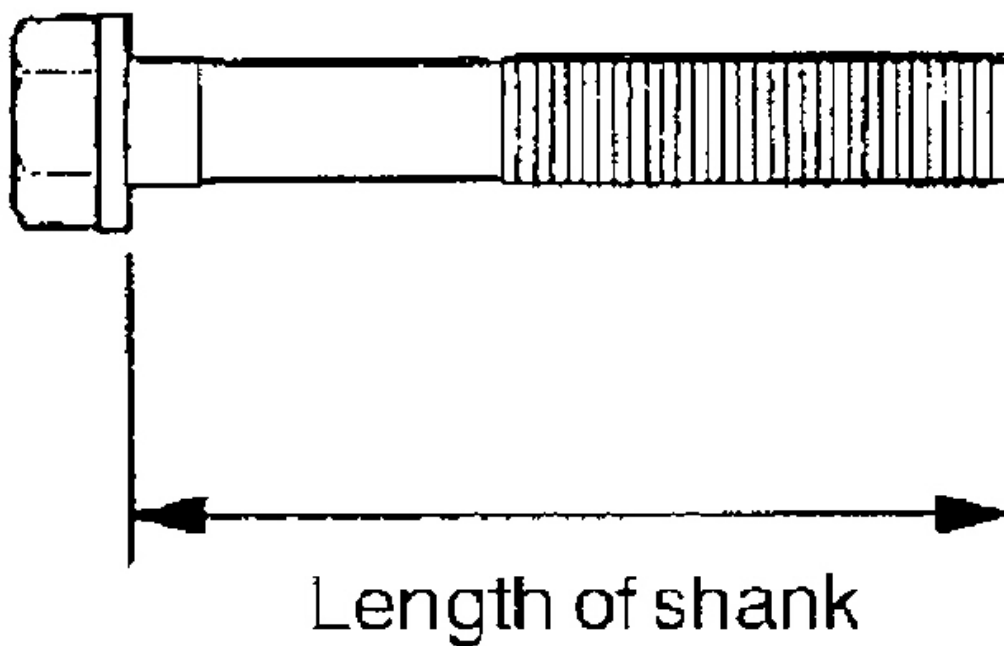
G01185549

Fig. 186: Installing Crankshaft Bearings To Cylinder Block & Bearing Caps
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>B< BEARING CAP/BEARING CAP BOLT INSTALLATION

1. Install the bearing cap so their arrow is positioned on the timing belt side.
2. When reusing the bearing cap bolt, measure that its shank length dose not exceed the specified limit.
Replace the bolt if this measurement exceeds the limit.

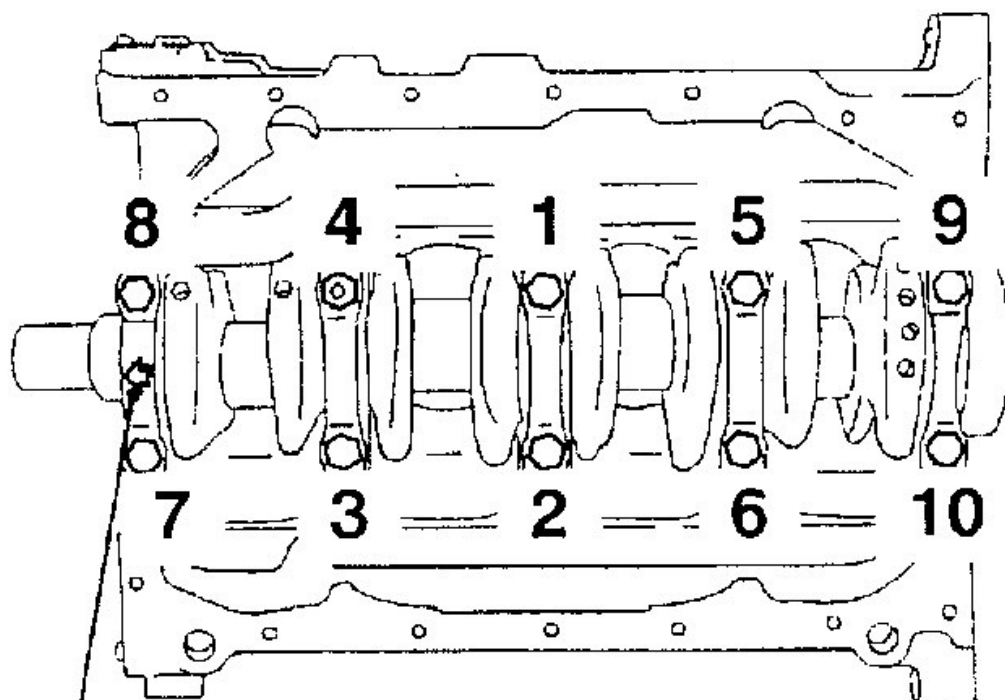
Limit: max. 71.1 mm (2.799 in.)



G01185550

Fig. 187: Measuring Bearing Cap Bolt Shank Length
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. Apply engine oil to the bolt thread and flange of the bolt.
4. Tighten the bearing cap bolts to 25 Nm (18 ft.lbs.) torque in the sequence shown.



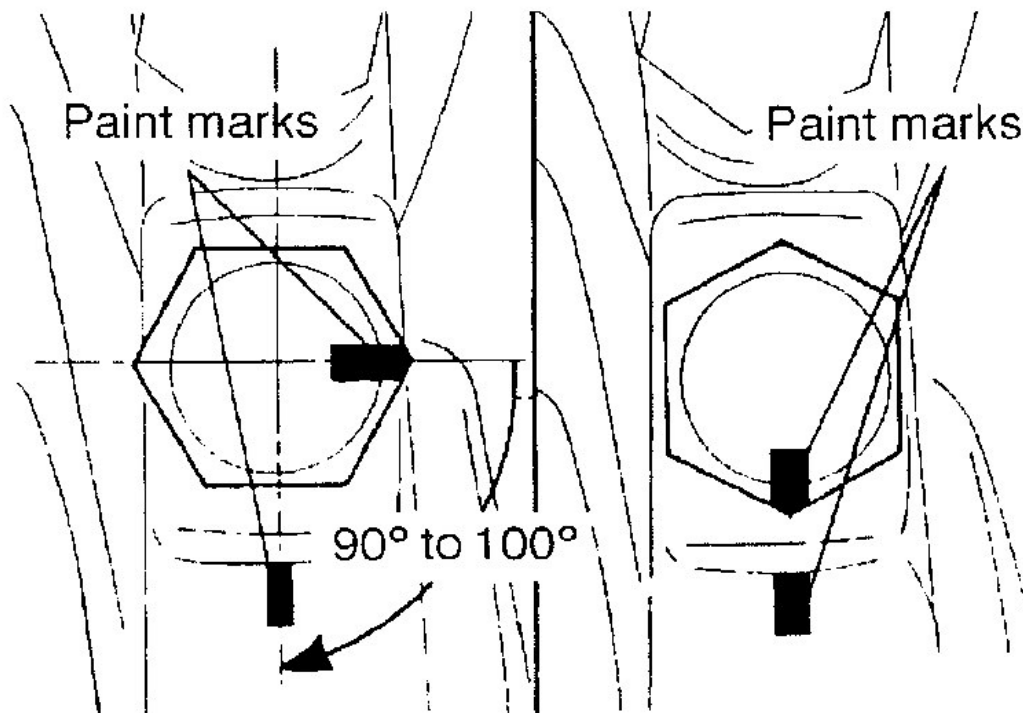
Arrow

G01185551

Fig. 188: Tightening Main Bearing Cap Bolts

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

5. Make a paint mark on the head of each bolt.



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Fig. 189: Making Paint Marks On Head Of Each Bolt

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

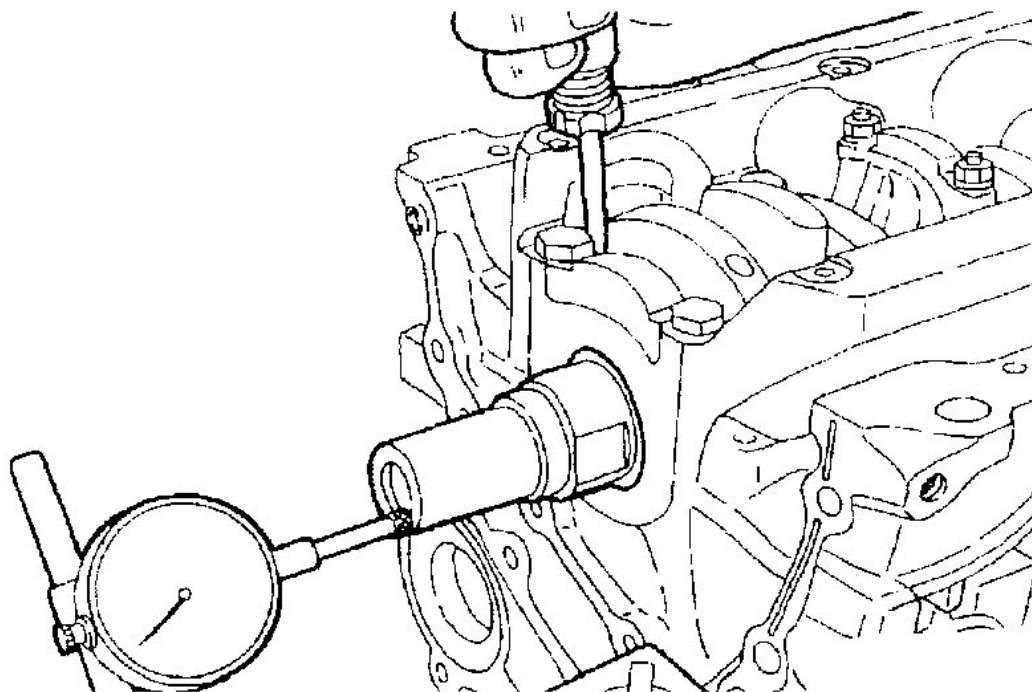
6. Make a paint mark on the bearing cap at the position 90° to 100° from the paint mark on the bolt head in the direction of tightening the bolt.
7. Give a 90° to 100° turn to the bolt in the tightening sequence. Make sure that the paint mark on the bolt and that on the bearing cap are in alignment.

CAUTION:

1. If the bolt is turned less than 90°, proper fastening performance may not be expected. When tightening the bolt, therefore, be careful to give a sufficient turn to it.
 2. If the bolt is overtightened (exceeding 100°), loosen the bolt completely and then retighten it by repeating the tightening procedure from step 1.
8. Check that the crankshaft rotates smoothly.
 9. Measure the end play in the crankshaft. If the measurement exceeds the specified limit, replace the crankshaft bearings.

Standard value: 0.05 - 0.25 mm (.0020 - .0098 in.)

Limit: 0.4 mm (.016 in.)



G01185553

Fig. 190: Measuring Crankshaft End Play

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>C< REAR OIL SEAL INSTALLATION

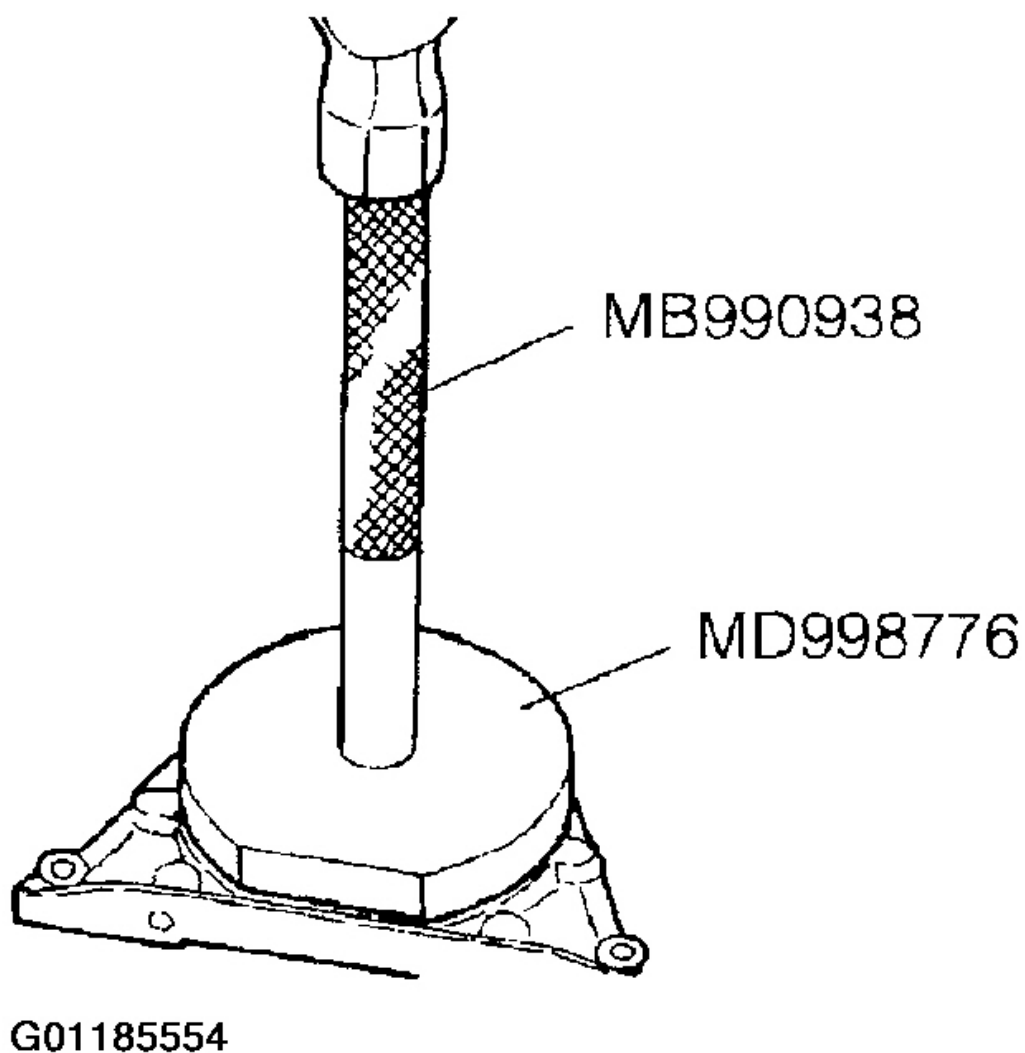
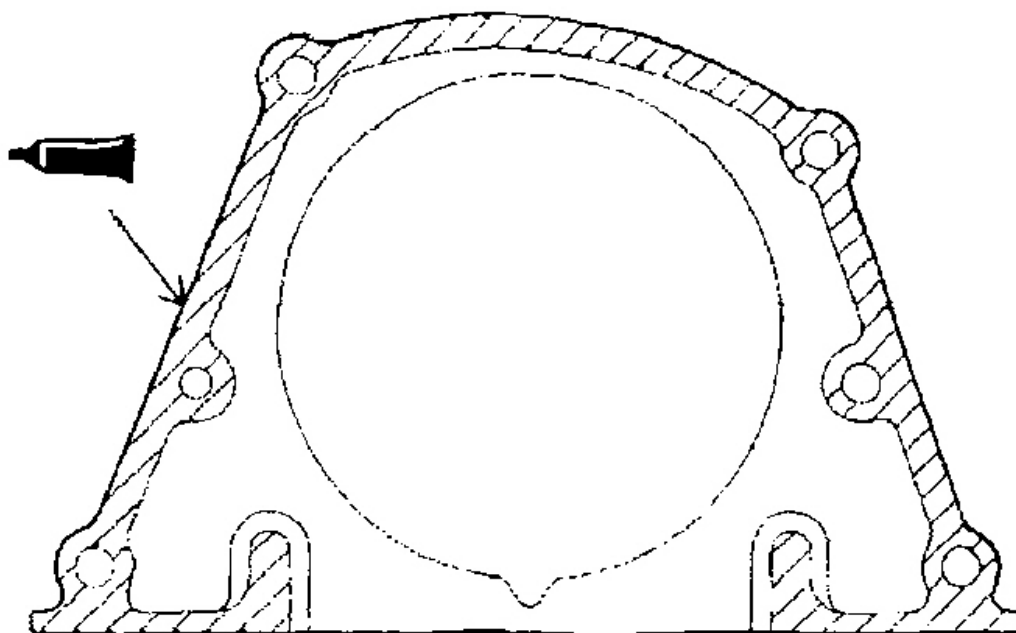


Fig. 191: Installing Rear Oil Seal

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>D< SEALANT APPLICATION TO OIL SEAL CASE

Specified sealant: Mitsubishi Genuine Part No. MD970389 or equivalent



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Fig. 192: Applying Sealant To Oil seal Case
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>E< DRIVE PLATE BOLT/FLYWHEEL BOLT INSTALLATION

1. Remove all the remaining sealant from bolts and thread holes of crankshaft.
2. Apply engine oil to the flange of bolt.
3. Apply engine oil into the thread holes of crankshaft.
4. Apply specified sealant to the thread of bolt.

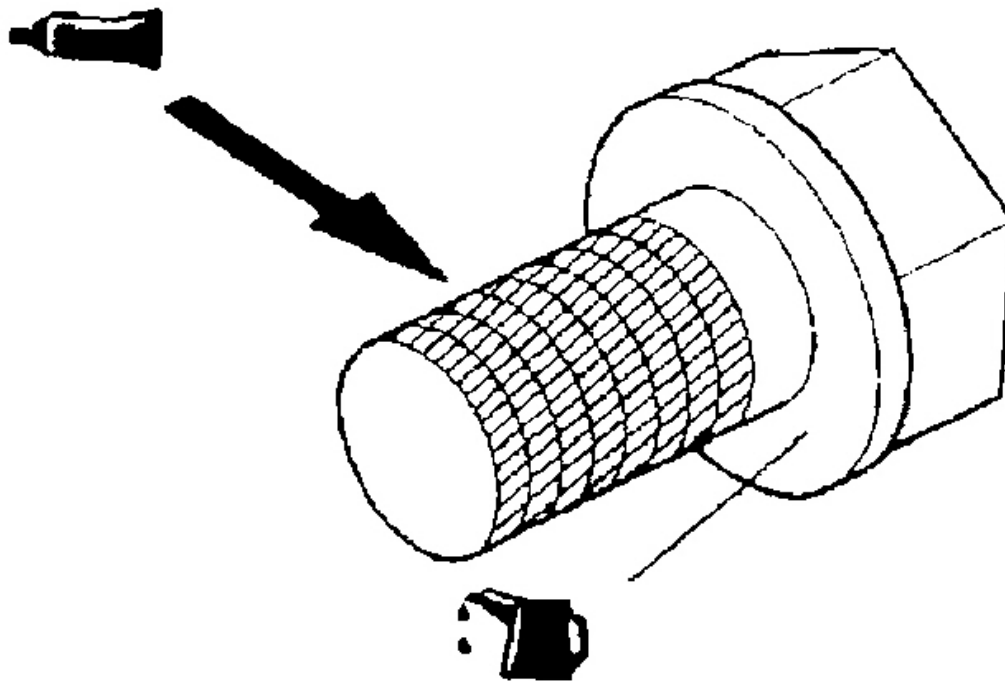
**G01185556**

Fig. 193: Applying Sealant To Threads Of Bolt
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

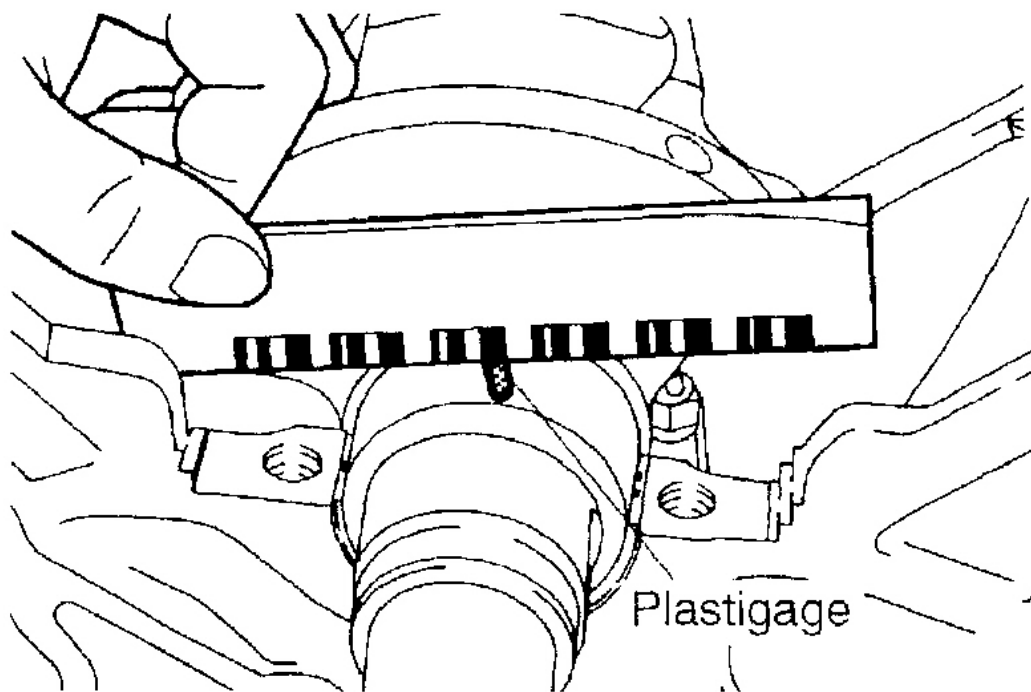
Specified sealant: 3M™ AAD Part No. 8672 or equivalent

5. Tighten the bolts to specified torque.

INSPECTION

CRANKSHAFT JOURNAL OIL CLEARANCE (PLASTIGAGE METHOD)

1. Remove oil from the crankshaft journal and the crankshaft bearing.
2. Install the crankshaft.
3. Cut the plastigage to the same length as the width of bearing and place it on the journal in parallel with its axis.

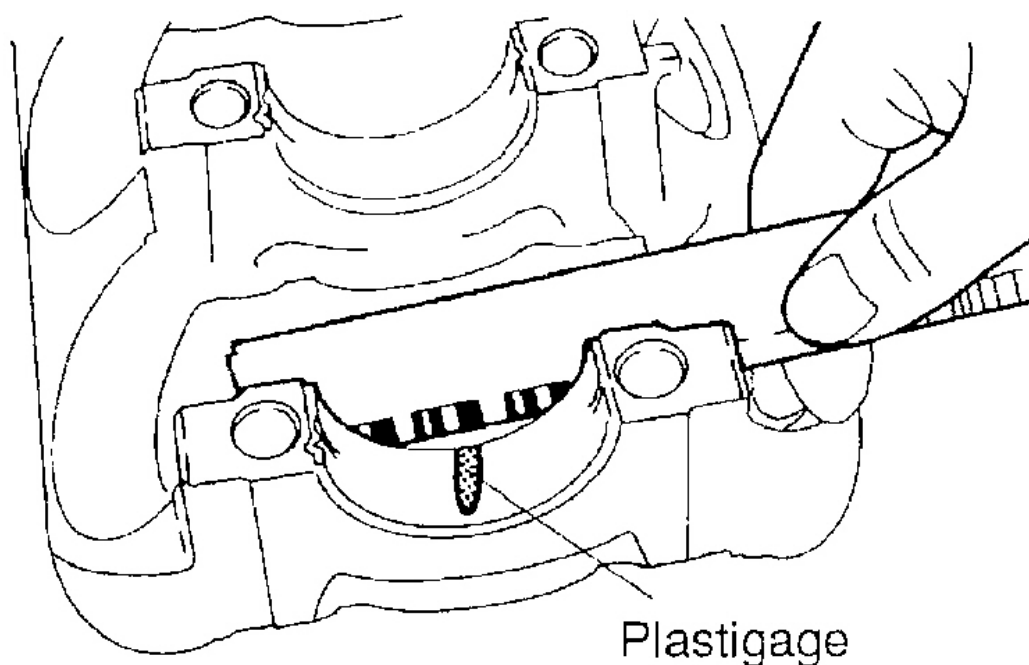


G01185557

Fig. 194: Measuring Width Of Plastigage**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

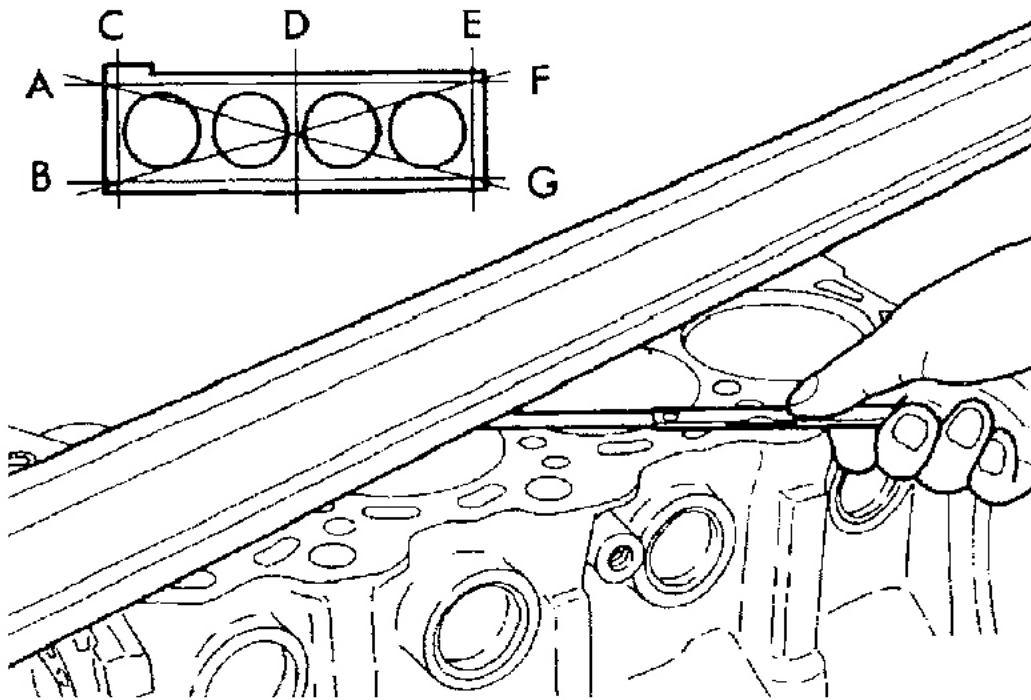
4. Install the crankshaft bearing cap carefully and tighten the bolts to the specified torque.
5. Carefully remove the crankshaft bearing cap.
6. Measure the width of the plastigage at its widest part by using a scale printed on the plastigage package.

Standard value: 0.02 - 0.04 mm (.0008 - .0016 in.)**Limit: 0.1 mm (.004 in.)**

**G01185558****Fig. 195: Measuring Width Of Plastigage****Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.****CYLINDER BLOCK**

1. Visually check for cracks, rust, and corrosion, and inspect the cylinder block using a flaw detecting agent. Rectify defects where possible or replace the cylinder block.
2. Ensure that the top surface is free of gasket chips and other foreign material. Check the cylinder block top surface for distortion using a straight edge and feeler gauge.

Standard value: 0.05 mm (.0020 in.) or less**Limit: 0.1 mm (.004 in.)**



G01185559

Fig. 196: Checking Cylinder Block

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. If the distortion is excessive, correct within the allowable limit or replace.

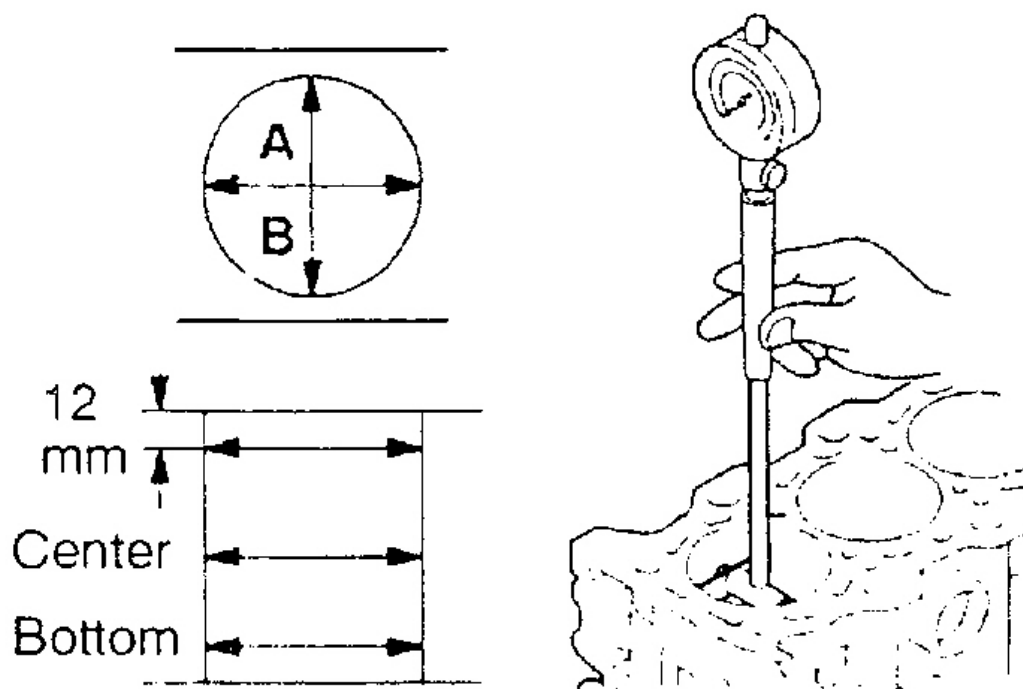
Grinding limit: 0.2 mm (.008 in.) The total thickness of the stock allowed to be removed from cylinder block and mating cylinder head 0.2 mm (.008 in.) at maximum.

Cylinder block height (when new): 263.5 mm (10.374 in.)

4. Check the cylinder walls for cracks and seizure marks. If defects are evident, bore all the cylinders to oversize or replace the cylinder block.
5. Using a cylinder gauge, measure each cylinder bore and cylindricity. If any cylinder is severely worn, bore all the cylinders to oversize and replace the piston and piston rings accordingly. Take measurements at the points shown.

Standard value: Cylinder bore I.D.: 81.0 mm (3.19 in.)

Cylindricity: 0.01 mm (.0004 in.) or less



G01185560

Fig. 197: Measuring Cylinder Bore & Cylindricity

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

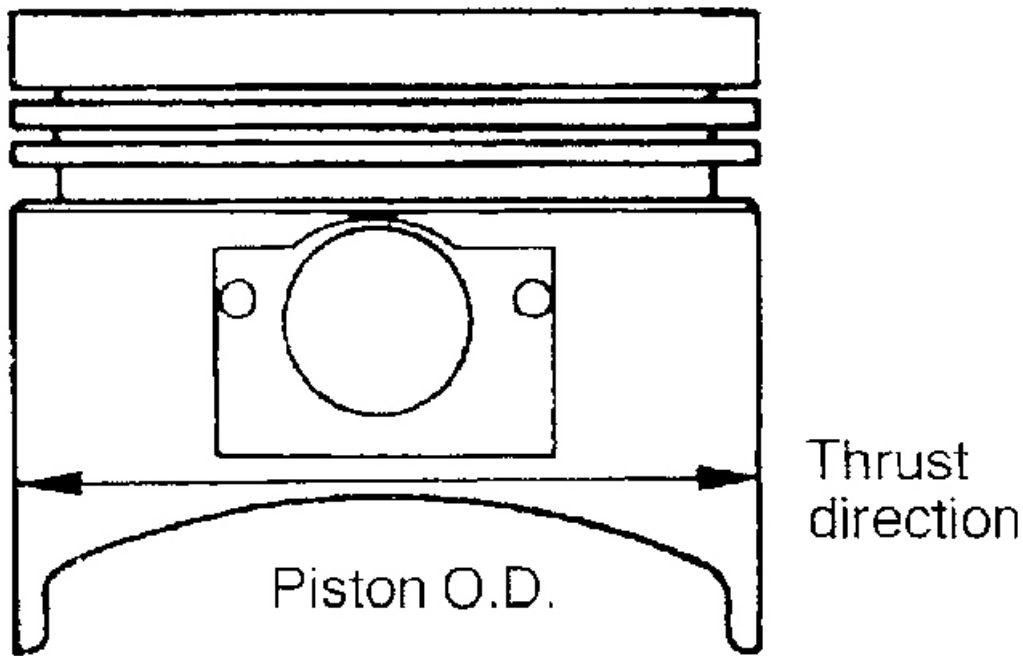
BORING CYLINDER

1. Oversize pistons should be based on the largest bore cylinder.

Piston size identification

NOTE: The size mark is stamped on the piston top.

2. Measure the outside diameter of piston to be used. Measure it in thrust direction as shown.



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Fig. 198: Measuring Outside Diameter Of Piston

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. Based on the measured piston O.D., calculate the boring finish dimension.

**Boring finish dimension = Piston O.D. + (Clearance between piston O.D. and cylinder) - 0.02 mm
(.0008 in.) (honing margin)**

Size	Identification mark
0.50 mm O.S.	0.50
1.00 mm O.S.	1.00

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Fig. 199: Calculating Boring Finish Dimension

2002 Mitsubishi Mirage DE

2002 ENGINES 1.8L 4-Cylinder - Mirage

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

4. Bore each cylinders to the calculated boring finish dimension.

CAUTION: To prevent distortion caused by heat increased during boring, bore the cylinders in the following order: No. 2, No. 4, No. 1, No. 3.

5. Hone the cylinders to the final finish dimension (Piston O.D. + Piston-to-cylinder clearance).
6. Check the clearance between piston and cylinder.

Standard value: 0.02 - 0.04 mm (.0008 - .0016 in.)

NOTE: When boring cylinders, finish all of four cylinders to the same oversize. Do not bore only one cylinder to an oversize.

TORQUE SPECIFICATIONS**TORQUE SPECIFICATIONS**

Items	Nm	ft.lbs.
Generator and ignition system		
Ignition coil	10	7
Spark plug	25	18
Crankshaft bolt	177 - 186	129 - 134
Generator brace (M10)	49	35
Generator brace (MB)	23	17
Lock bolt	23	17
Adjusting bolt	5	4
Generator pivot nut	44	32
Cam position sensor	9	7
Cam position sensor support	13	9
Cam position sensing cylinder	21	15
Timing belt		
Camshaft sprocket bolt	88	64
Crank angle sensor	10	7
Timing belt rear cover	10	7
Timing belt tensioner	23	17
Engine support bracket, right	49	35
Timing belt cover	10	7
Fuel system and emission system		

2002 Mitsubishi Mirage DE

2002 ENGINES 1.8L 4-Cylinder - Mirage

Fuel return pipe	9	7
Fuel rail	12	9
Fuel pressure regulator	9	7
EGR Valve	22	16
Throttle body	19	14
Vacuum hose and pipe assembly	11	8
Intake manifold and exhaust manifold		
Manifold differential pressure sensor	5	4
Exhaust manifold (M10)	29	21
Exhaust manifold (M8)	18	13
Exhaust manifold bracket	19	14
Engine hanger	18	9
Oil dipstick guide	14	10
Exhaust manifold cover	13	9
Intake manifold	20	15
Intake manifold stay	30	22
Water pump and water hose		
Water pump	24	17
Water inlet pipe	14	10
Thermostat case	24	17
Water inlet fitting	18	13
Water outlet fitting	14	10
Engine coolant temperature gauge unit	10	7
Engine coolant temperature sensor	29	21
Rocker arms and camshaft		
Rocker arm shaft	31	22
Rocker cover	4	3
Cylinder head and valves		
Cylinder head bolt [74 Nm (54 ft.lbs.) and then completely loosen finally tighten]	20 + 90° + 90°	15 + 90° + 90°

2002 Mitsubishi Mirage DE

2002 ENGINES 1.8L 4-Cylinder - Mirage

Oil pump and oil pan

Oil pump cover	10	7
Front case	14	10
Relief plug	44	32
Oil screen	19	14
Oil pan	7	5
Drain plug	39	28
Oil pressure switch	10	7

Piston and connecting rod

Connecting rod cap nut	20 + 90° to 100°	15 + 90° to 100°
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Crankshaft and cylinder block

Bearing cap bolt	25 + 90° to 100°	18 + 90° to 100°
Oil seal case	11	8
Bell housing cover	9	7
Rear plate	11	8
Drive plate bolt	98	71
Flywheel bolt	98	71