

2002 Mitsubishi Mirage LS

2002 ENGINES 1.5L 4-Cylinder - Mirage

2002 ENGINES

1.5L 4-Cylinder - Mirage

ON-VEHICLE SERVICE

GENERAL INFORMATION

Items			Specifications
Type			In-line, Overhead Camshaft
Number of cylinders			4
Bore mm (in.)			75.5 (2.97)
Stroke mm (in.)			82.0 (3.23)
Piston displacement cm ³ (cu.in.)			1,468 (86.6)
Compression ratio			9.0
Firing order			1-3-4-2
Valve timing	Intake valve	Opens	BTDC 14°
		Closes	ABDC 48°
	Exhaust valve	Opens	BBDC 54°
		Closes	ATDC 10°
Lubrication			Pressurized feed-full filtration

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Fig. 1: General Information

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

SERVICE SPECIFICATIONS

2002 Mitsubishi Mirage LS

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Items		Standard value	Limit
Generator drive belt vibration frequency Hz	When checked	144 - 176	-
	When a used belt is installed	153 - 169	-
	When a new belt is installed	203 - 227	-
Generator 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	785 - 981 (176 - 220)	-
Generator drive belt deflection (Reference value) mm (in.)	When checked	8.7 - 11.4 (.34 - .45)	-
	When a used belt is installed	9.2 - 10.6 (.36 - .42)	-
	When a new belt is installed	5.7 - 6.9 (.22 - .27)	-
Power steering oil pump and A/C compressor drive belt vibration frequency Hz	When checked	137 - 168	-
	When a used belt is installed	145 - 160	-
	When a new belt is installed	174 - 199	-
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. 2: Service Specifications (1 Of 2)

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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Items		Standard value	Limit
Power steering oil pump and A/C compressor drive belt deflection (Reference value) mm (in.)	When checked	9.6 - 12.4 (.38 - .49)	-
	When a used belt is installed	10.2 - 11.6 (.40 - .46)	-
	When a new belt is installed	7.2 - 9.0 (.28 - .36)	-
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)	-
A/C compressor drive belt deflection (Reference value) mm (in.)	When checked	4.6 - 6.2 (.18 - .24)	-
	When a used belt is installed	5.0 - 5.7 (.20 - .22)	-
	When a new belt is installed	3.4 - 4.3 (.13 - .17)	-
Basic ignition timing at idle		5°BTDC ± 3°	-
Actual ignition timing at curb idle		Approx. 10°BTDC	-
CO contents %		0.5 or less	-
HC contents ppm		100 or less	-
Curb idle speed r/min		700 ± 100	-
Compression pressure (at 300 r/min) kPa (psi)		1,290 (188)	min. 920 (133)
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.)		-	103.2 (4.06)

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Fig. 3: Service Specifications (2 Of 2)

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

SEALANT

Item	Specified sealant
Oil pan	3M AAD Part No. 8672, 8704 or 3M AAD Part No. 8679/8678 or equivalent

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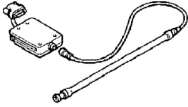
Fig. 4: Sealant

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

SPECIAL TOOLS

2002 Mitsubishi Mirage LS

2002 ENGINES 1.5L 4-Cylinder - Mirage

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

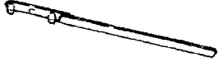
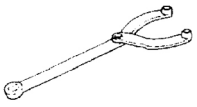
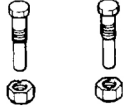
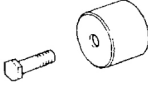
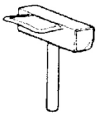
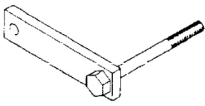
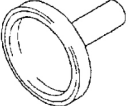
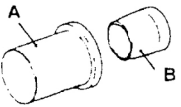
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Fig. 5: Special Tools (1 Of 3)

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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Tool	Tool number and name	Supersession	Application
	MD998747 Crankshaft pulley holder	General service tool	Holding the crankshaft pulley
	MB990767 End yoke holder	MB990767-01	Holding the camshaft sprocket
	MD998719 or MD998754 Crankshaft pulley holder pin	MIT308239	Holding the camshaft sprocket
	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>
	MD998718 Crankshaft rear oil seal installer	MD998718-01	Press-in of the crankshaft rear oil seal
	A: MD998304 Crankshaft front oil seal installer B: MD998305 Crankshaft front oil seal guide	A: MD998304-01 B: MD998305-01	Press-in of the crankshaft front oil seal
	MB991653 Cylinder head bolt wrench	General service tool	Removal and installation of the cylinder head bolt

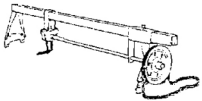
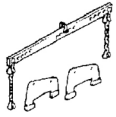
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Fig. 6: Special Tools (2 Of 3)

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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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. 7: Special Tools (3 Of 3)

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TROUBLESHOOTING

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Symptom	Probable cause	Remedy
Compression too low	Cylinder head gasket blown	Replace gasket
	Piston ring worn or damage	Replace rings
	Piston or cylinder worn	Repair or replace piston and/or cylinder block
	Valve seat worn or damage	Repair or replace valve and/or seat ring
	Valve guide worn or damage	Replace valve guide
Oil pressure drop	Engine oil level too low	Check engine oil level
	Oil pressure switch faulty	Replace oil pressure switch
	Oil filter clogged	Install new filter
	Oil pump gears or cover worn	Replace gears and/or cover
	Thin or diluted engine oil	Change engine oil to correct viscosity
	Oil relief valve stuck (opened)	Repair relief valve
	Excessive bearing clearance	Replace bearings
Oil pressure too high	Oil relief valve stuck (closed)	Repair relief valve
Noisy valves	Malfunction of lash adjuster (Entry of air into the high pressure chamber, etc.)	Check the lash adjuster
	Thin or diluted engine oil (low oil pressure)	Change engine oil
	Valve stem or valve guide worn or damage	Replace valve and/or guide
Connecting rod noise/ main bearing noise	Insufficient oil supply	Check engine oil level
	Low oil pressure	Refer to "Oil pressure drop"
	Thin or diluted engine oil	Change engine oil
	Excessive bearing clearance	Replace bearings
Timing belt noise	Incorrect belt tension	Adjust belt tension and/or replace timing belt
Excessive engine rolling and vibration	Loose engine roll stopper (Front, Rear)	Retighten
	Loose transaxle mount bracket	
	Loose engine mount bracket	
	Loose center member	
	Broken transaxle mount insulator Broken engine mount insulator Broken engine roll stopper insulator	Replace

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Fig. 8: Troubleshooting

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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	144 - 176
Tension N (lbs.)	392 - 588 (88 - 132)
Deflection (Reference value) mm (in.)	8.7 - 11.4 (.34 - .45)

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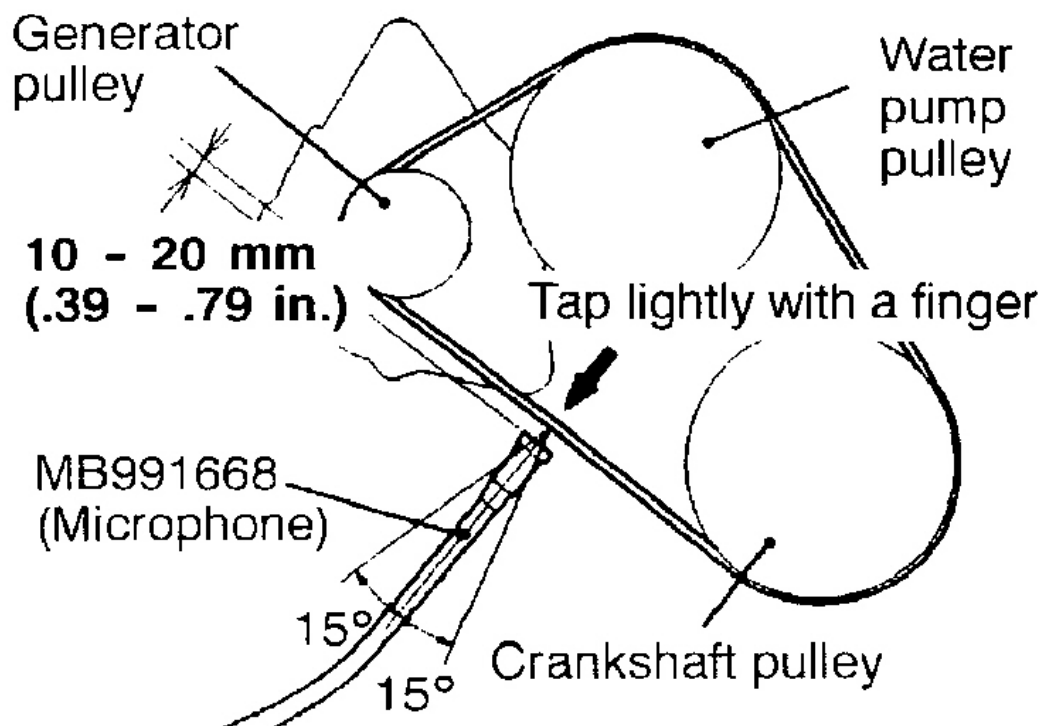
Fig. 9: Generator Drive Belt Specifications

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 +/- 15°).
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.

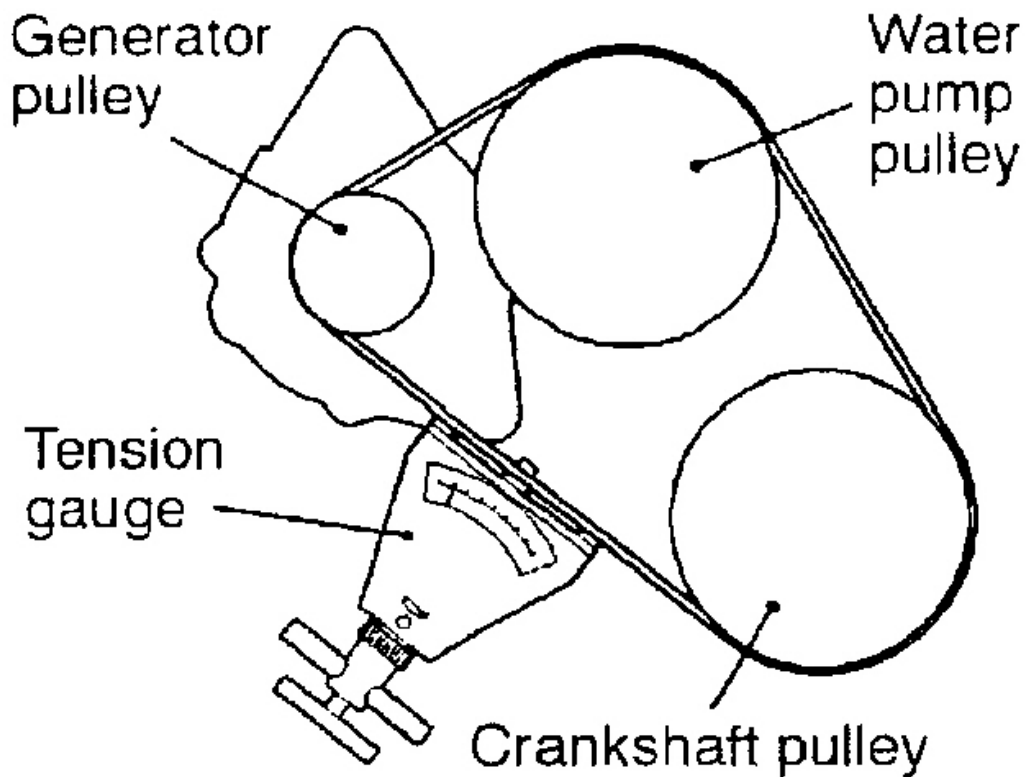


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Fig. 10: Checking Drive Belt Tension By Using Scan Tool
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

< When using a tension gauge >

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

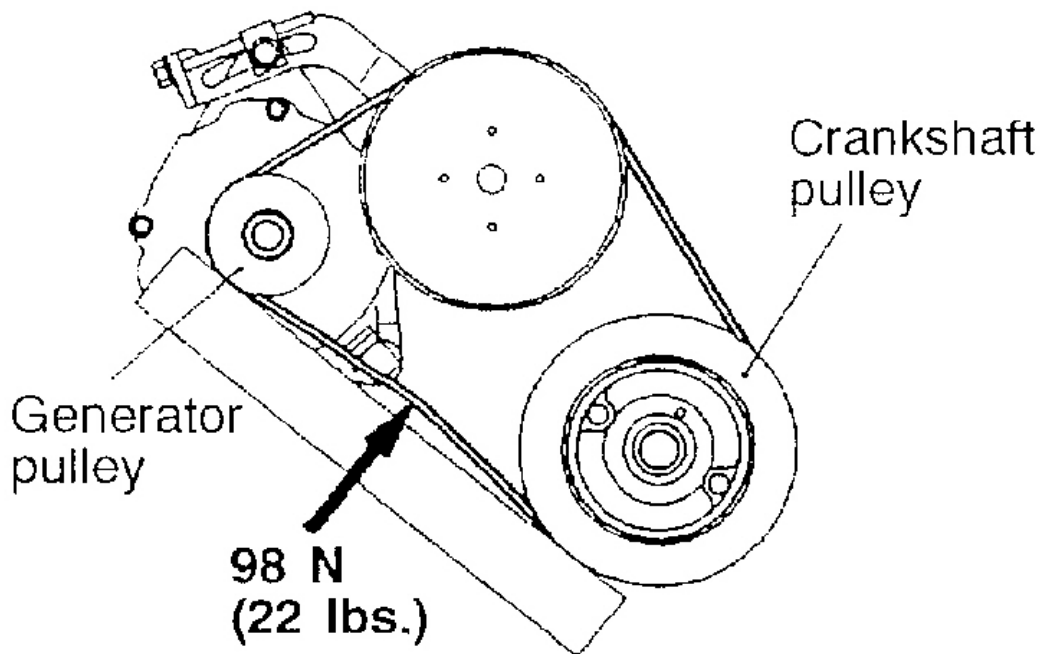


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Fig. 11: Checking Drive Belt Tension By Using Tension Gauge
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

< 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. 12: Checking Drive Belt Deflection

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

GENERATOR DRIVE BELT TENSION ADJUSTMENT

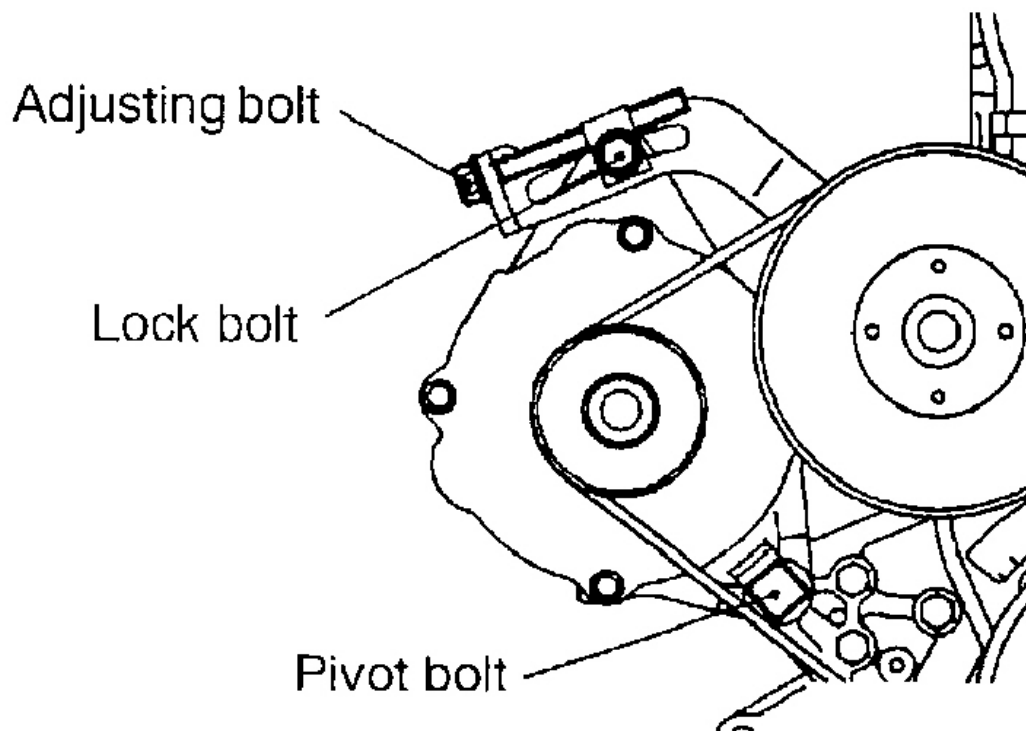
1. Loosen the nut of the generator pivot bolt.
2. Loosen the lock bolt.
3. Turn the adjusting bolt to adjust the belt tension vibration frequency, belt tension or deflection to the standard value.

Standard value:

Items	When a used belt is installed	When a new belt is installed
Vibration frequency Hz	153 - 169	203 - 227
Tension N (lbs.)	441 - 539 (99 - 121)	785 - 981 (176 - 220)
Deflection (Reference value) mm (in.)	9.2 - 10.6 (.36 - .42)	5.7 - 6.9 (.22 - .27)

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Fig. 13: Generator Drive Belt Tension Frequency Specifications
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.



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Fig. 14: Adjusting Generator Drive Belt Tension

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**

< Vehicles with power steering >

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

Standard value:

Items	When checked	When a used belt is installed	When a new belt is installed
Vibration frequency Hz	137 - 168	145 - 160	174 - 199
Tension N (lbs.)	392 - 588 (88 - 132)	441 - 539 (99 - 121)	637 - 833 (143 - 187)
Deflection (Reference value) mm (in.)	9.6 - 12.4 (.38 - .49)	10.2 - 11.6 (.40 - .46)	7.2 - 9.0 (.28 - .35)

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Fig. 15: Drive Belt Vibration Frequency Specifications

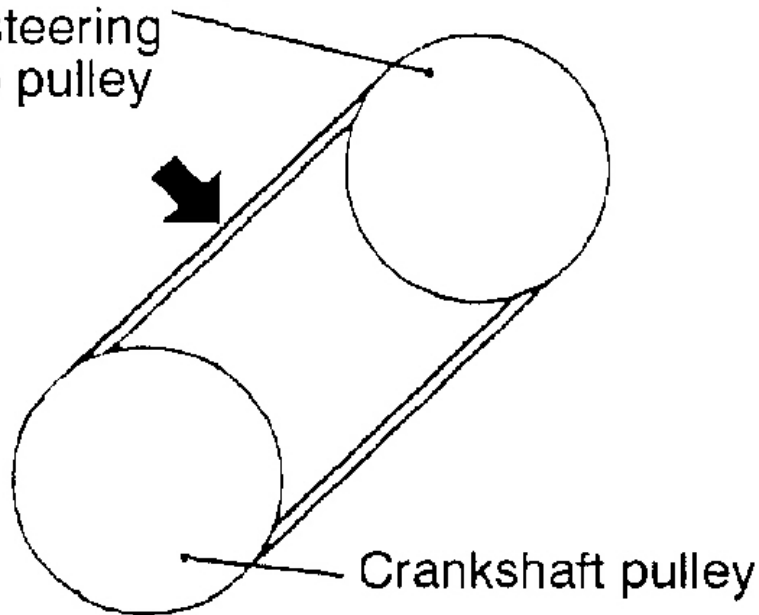
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

< When 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.

<Vehicles without A/C>

Power steering
oil pump pulley



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Fig. 16: Checking Drive Belt Tension (Vehicles Without A/C)
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

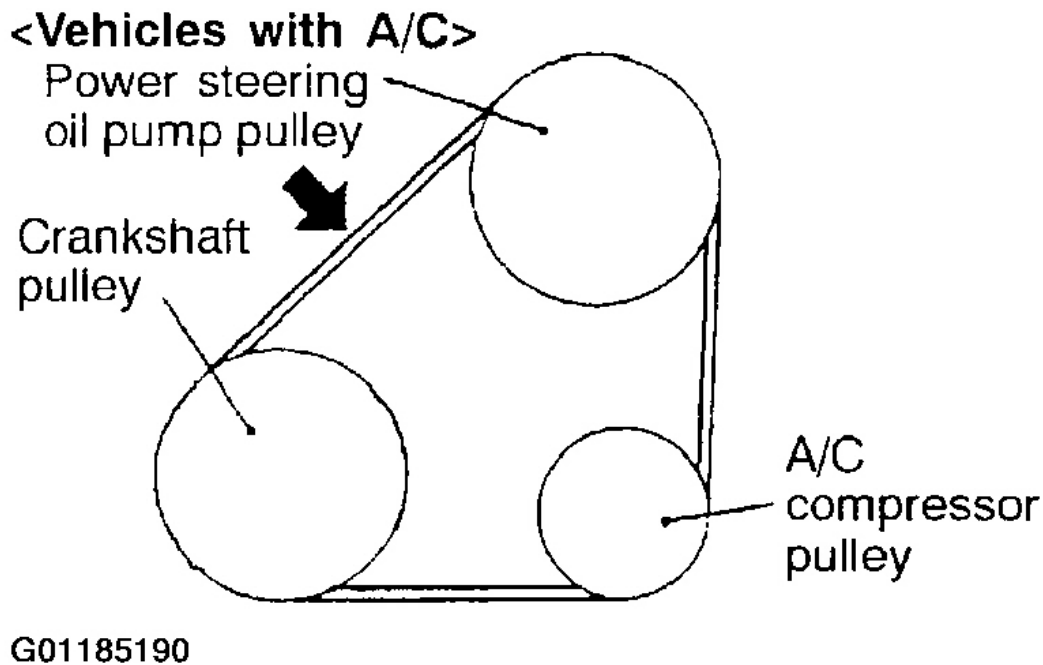


Fig. 17: Checking Drive Belt Tension (Vehicles With A/C)
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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

< When 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.

2. If the tension or deflection is outside the standard value, adjust by the following procedure.
 1. Loosen power steering oil pump fixing bolts A, B and C.
 2. Adjust the amount of belt deflection using adjusting bolt D.
 3. Tighten fixing bolts A, B and C.

Tightening torque:

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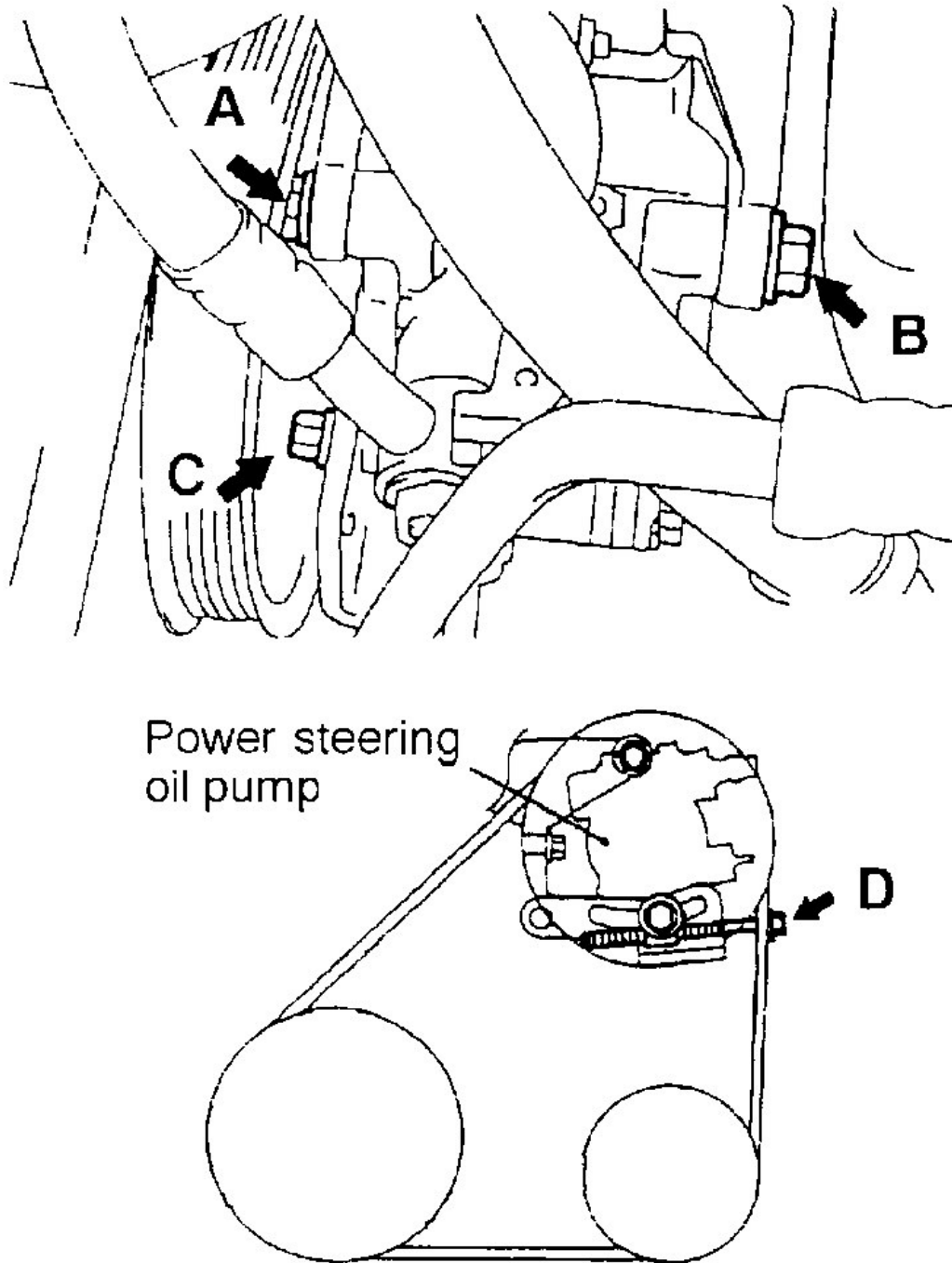
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Bolts A and B: 39 Nm (29 ft.lbs.)

Bolt C: 49 Nm (36 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).



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Fig. 18: Checking Belt Deflection Amount & Tension
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

AIR CONDITIONING COMPRESSOR DRIVE BELT TENSION CHECK AND ADJUSTMENT

< Vehicles without power steering >

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

Standard value:

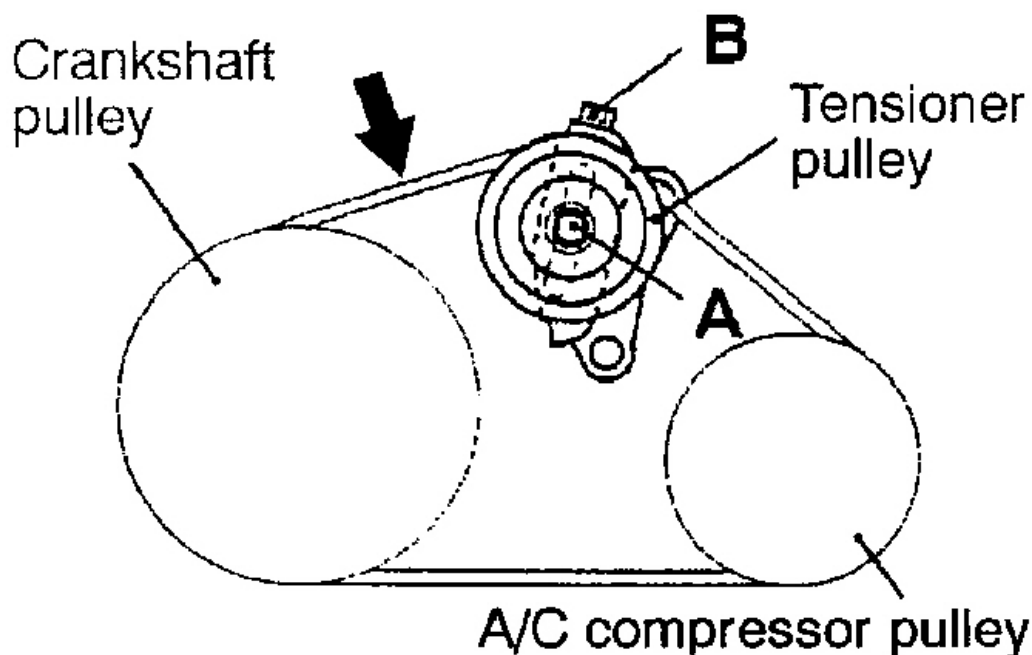
< When using the scan tool (MUT-II) >

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) >.

< When 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).



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Fig. 19: Using Belt Tension Gauge To Check Belt Tension
 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.

Items	When checked	When a used belt is installed	When a new belt is installed
Vibration frequency Hz	137 - 168	145 - 160	174 - 199
Tension N (lbs.)	392 - 588 (88 - 132)	441 - 539 (99 - 121)	637 - 833 (143 - 187)
Deflection (Reference value) mm (in.)	9.6 - 12.4 (.38 - .49)	10.2 - 11.6 (.40 - .46)	7.2 - 9.0 (.28 - .35)

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Fig. 20: Checking A/C Compressor Drive Belt Tension
 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 tension 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 vehicles 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.
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. 10° BTDC

NOTE: **Ignition timing is variable within about +/- 7°, even under normal operating.**

CURB IDLE SPEED CHECK

1. Before inspection, set the vehicles 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 by referring to GROUP 13A - Troubleshooting.

IDLE MIXTURE CHECK

1. Before inspection, set the vehicles 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

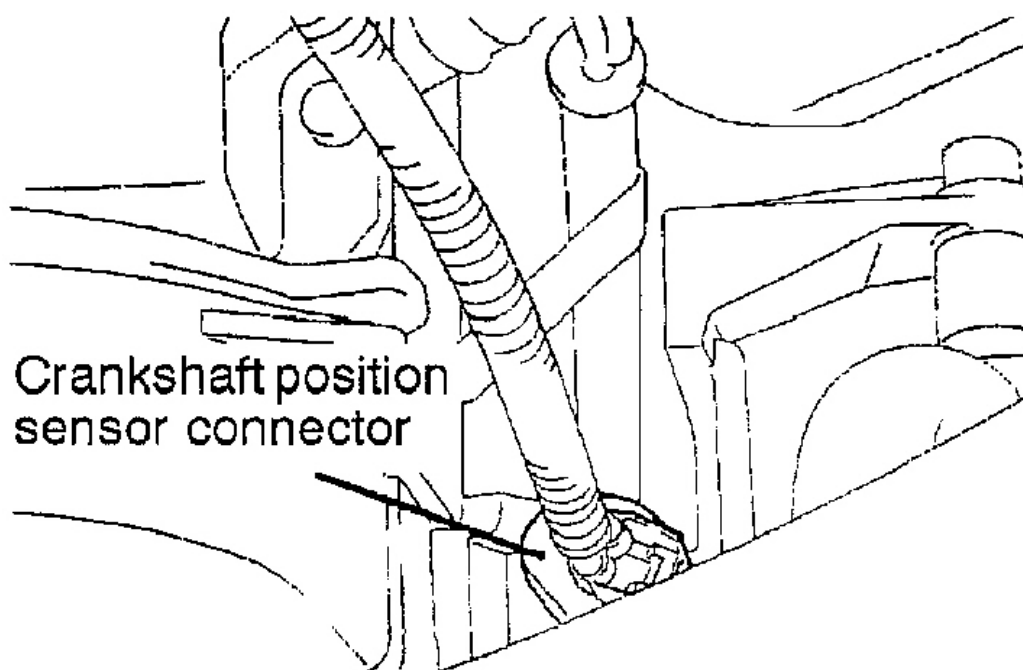
NOTE: **Replace the three-way catalyst whenever the CO and HC contents do not remain inside the standard value. (even though the result of the inspection is normal on all items).**

COMPRESSION PRESSURE CHECK

1. Before inspection, check that the engine oil, starter and battery are normal. Also, set the vehicle to 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 control unit from carrying out ignition and fuel injection.**



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Fig. 21: Disconnecting Crankshaft Position Sensor Connector
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

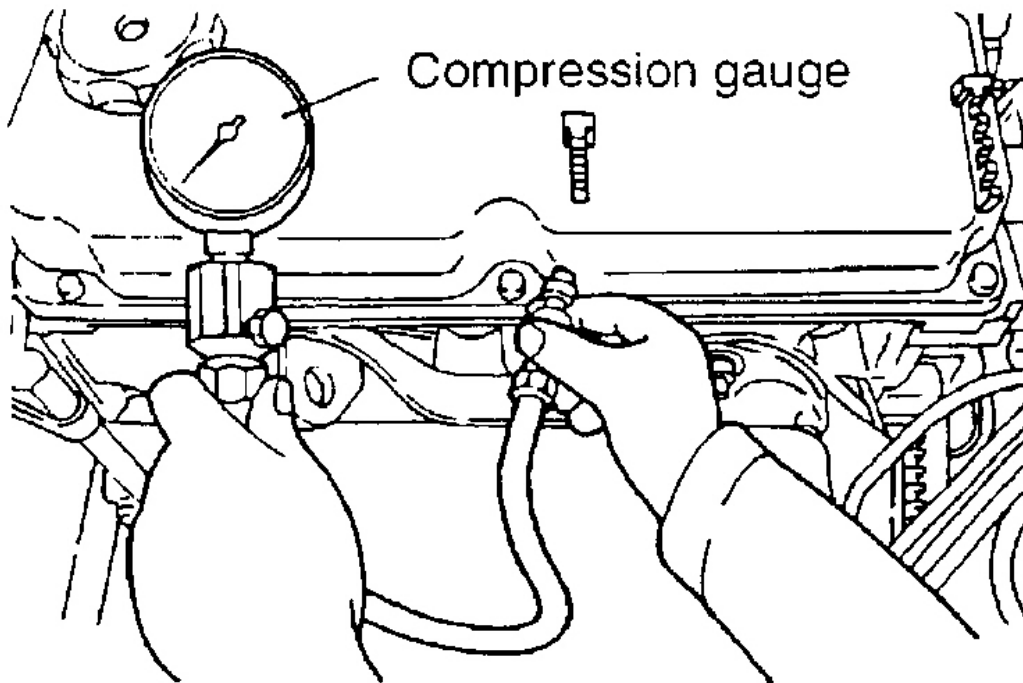
5. Cover the spark plug hole with a shop towel etc., and after the engine has been cranked, check that no foreign material is adhering to the shop towel.

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.



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Fig. 22: Setting Compression Gauge

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

7. Crank the engine with the throttle valve fully open and measure the compression pressure.

Standard value (at engine speed of 300 r/min):

1,290 kPa (188 psi)

Limit (at engine speed of 300 r/min):

min. 920 kPa (133 psi)

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)

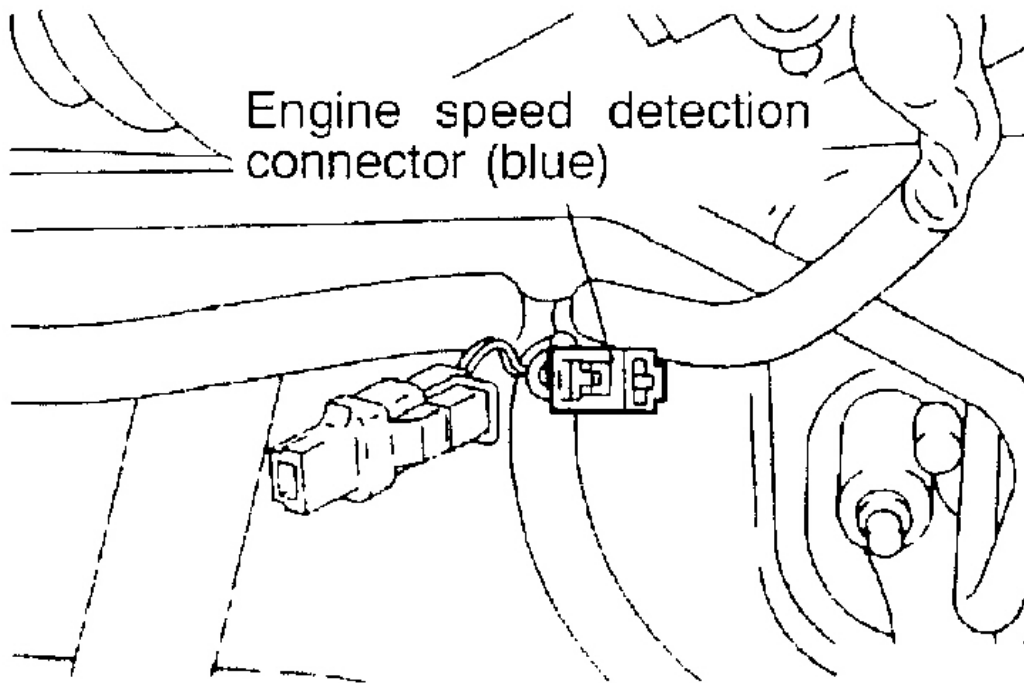
9. If there is a cylinder with compression or a compression difference that is outside the limit, pour a small amount of engine oil through the spark plug hole, and repeat the operations in steps 7 and 8.
 1. If the compression increases after oil is added, the cause of the malfunction is a worn or damaged 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.



G01185196

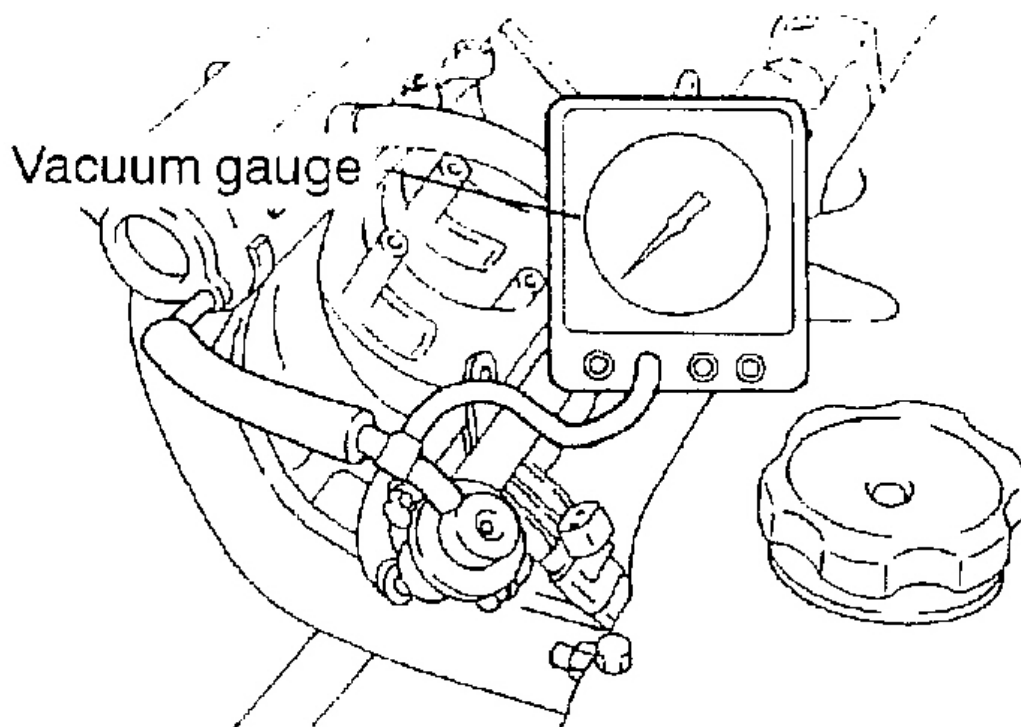
Fig. 23: Connecting Primary Voltage Detection Type Tachometer To Connector
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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.
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.)



G01185197

Fig. 24: Checking Manifold Vacuum

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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 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.

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

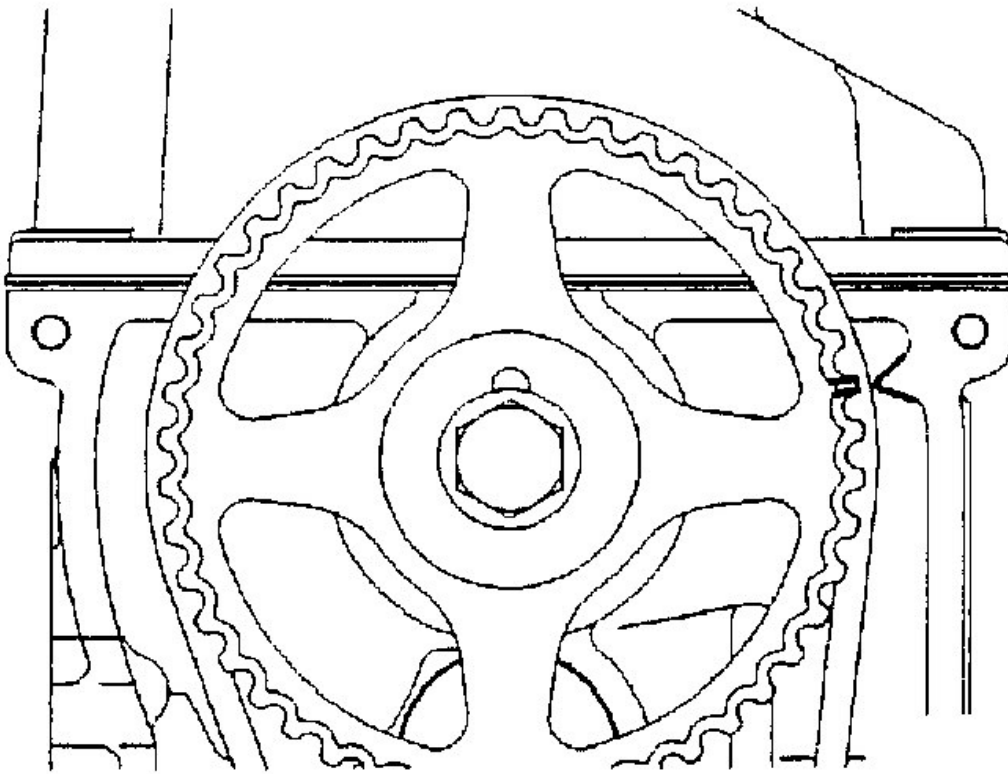
**G01185198**

Fig. 25: Adjusting Timing Belt Tension

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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.

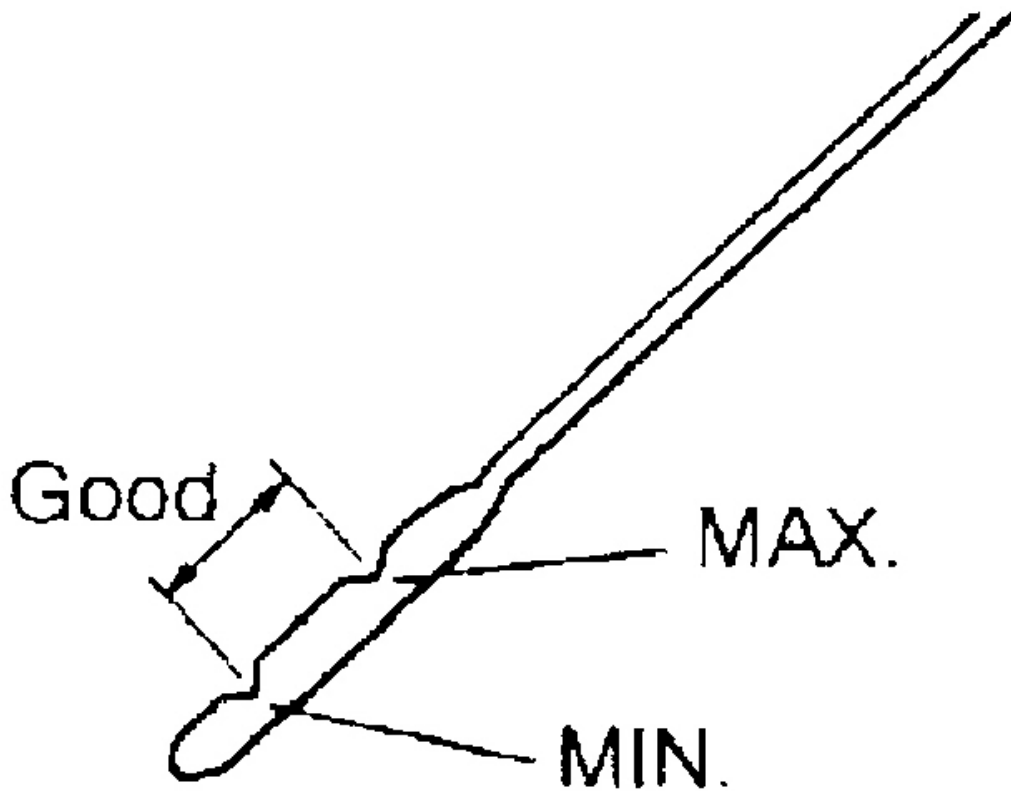
5. Bleed the air from the lash adjuster. See **Fig. 7**.
6. If the abnormal noise does not stop even after purging the air, wash the lash adjuster. See **ROCKER ARMS AND CAMSHAFT**.

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.



G01185199

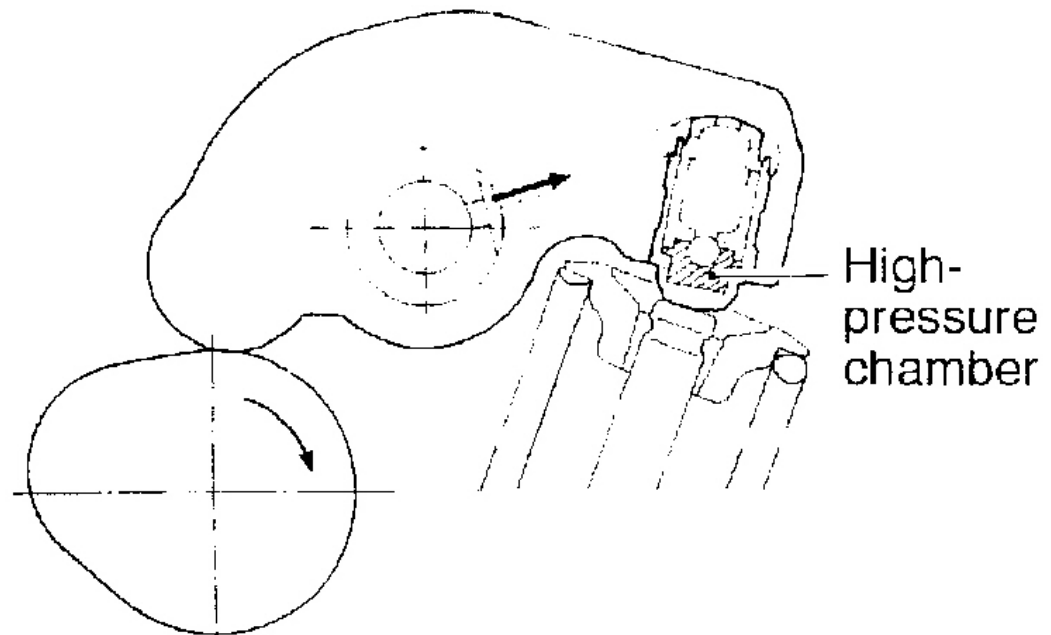
Fig. 26: Checking Engine Oil

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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.
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.

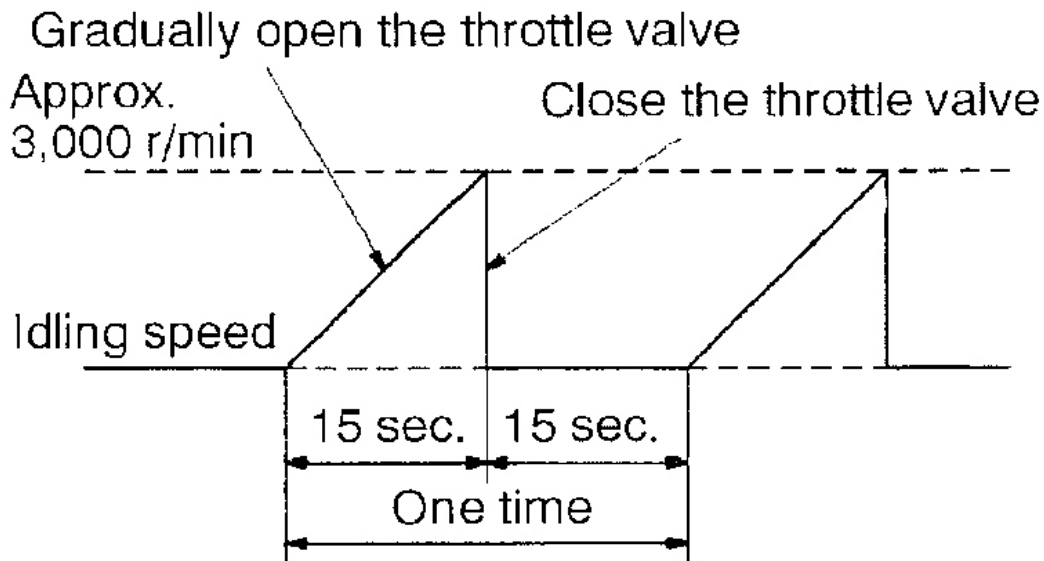


G01185200

Fig. 27: 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



G01185201

Fig. 28: 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 AND INSTALLATION

2002 Mitsubishi Mirage LS

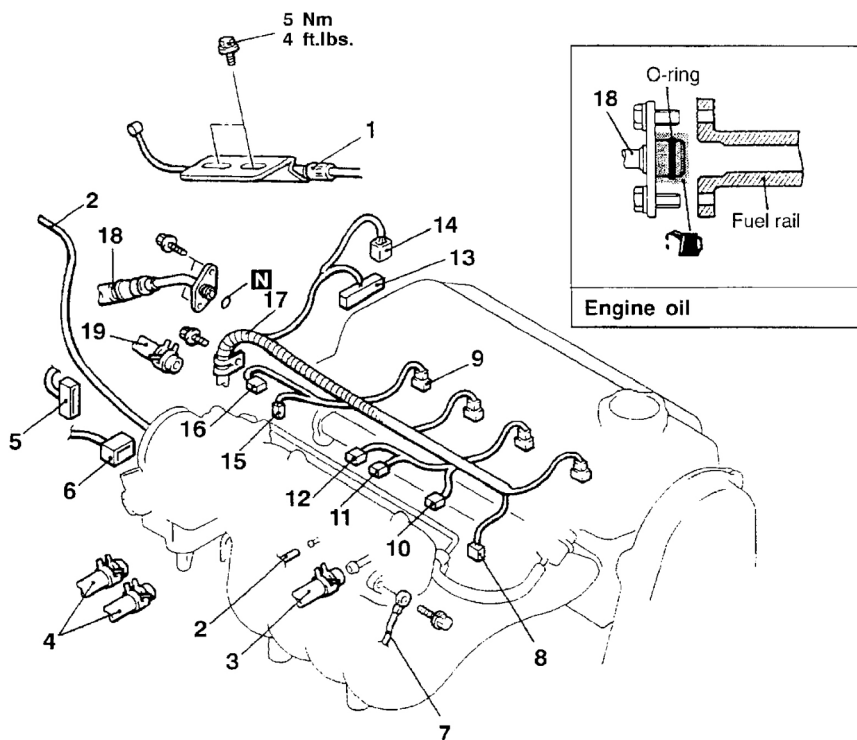
2002 ENGINES 1.5L 4-Cylinder - Mirage

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

Post-installation Operation

- (1) Front Catalytic Converter Installation
- (2) Radiator Installation
- (3) Air Cleaner Installation
- (4) Hood Installation
- (5) Under Cover Installation
- (6) Drive Belt Tension Adjustment
- (7) Accelerator Cable Adjustment



Removal steps

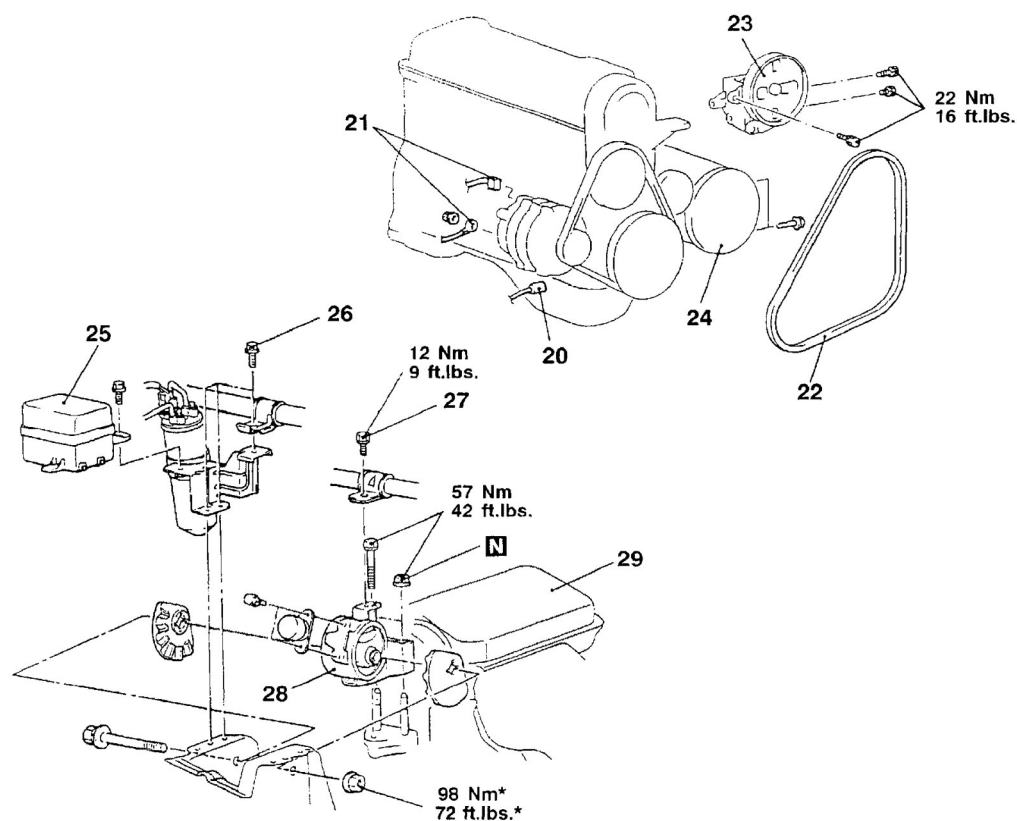
- | | |
|---|---|
| 1. Accelerator cable connection | 11. Evaporative emission purge solenoid connector |
| 2. Vacuum hose connection | 12. EGR solenoid connector |
| 3. Brake booster vacuum hose connection | 13. Distributor connector |
| 4. Heater hose connection | 14. Heated oxygen sensor connector |
| 5. Throttle position sensor connector | 15. Engine coolant temperature gauge unit connector |
| 6. Idle speed control connector | 16. Engine coolant temperature sensor connector |
| 7. Ground cable connection | 17. Control wiring harness |
| 8. Heated oxygen sensor connector | ▶C◀ 18. High-pressure fuel hose connection |
| 9. Injector connector | 19. Fuel return hose connection |
| 10. Intake air temperature sensor connector | |

G01185202

Fig. 29: Removing & Installing Engine Assembly (1 Of 2)
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2002 Mitsubishi Mirage LS

2002 ENGINES 1.5L 4-Cylinder - Mirage



- 20. Oil pressure switch connector
- 21. Generator connector
- 22. Drive belt
(Power steering and A/C)
- 23. Power steering oil pump and
bracket assembly
- 24. Air conditioning compressor
• Transaxle assembly
- 25. Air conditioning relay box
- 26. Air conditioning receiver bracket
mounting bolts

- 27. Power steering hose mounting bolt
- 28. Engine mount bracket
- 29. 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.

G01185203

Fig. 30: 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.

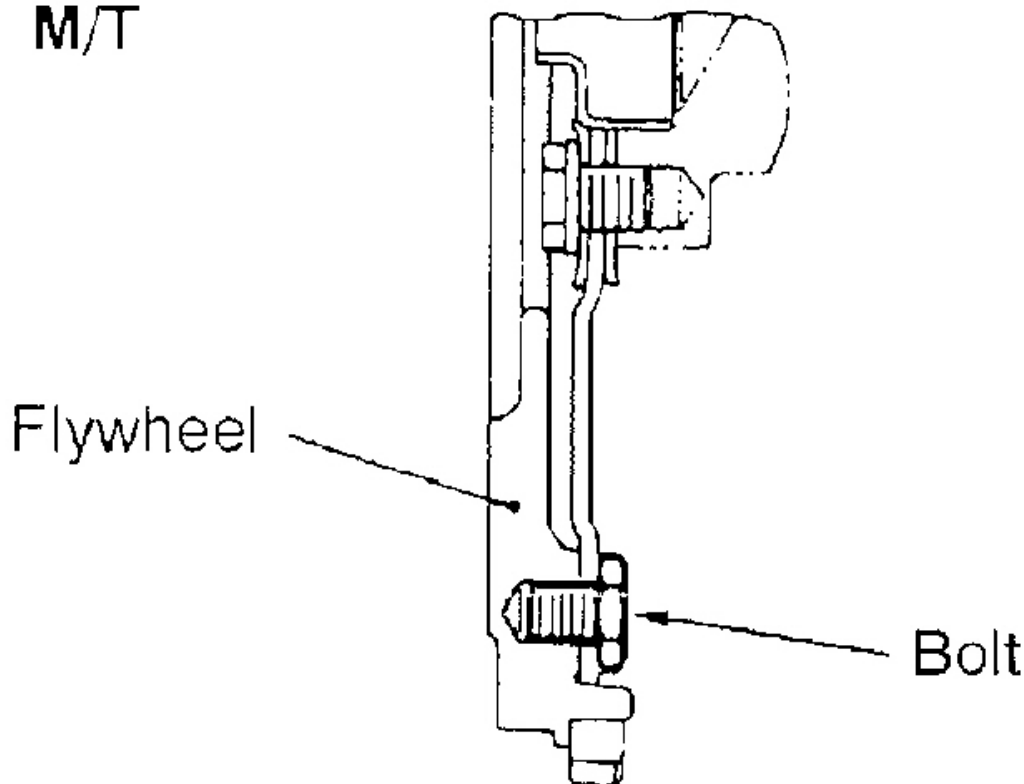
NOTE: Place the removed A/C compressor where it will not be a hindrance when removing and installing the engine assembly, and tie it with a cord.

< 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



G01185204

Fig. 31: Identifying Flywheel Bolt (M/T)

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.

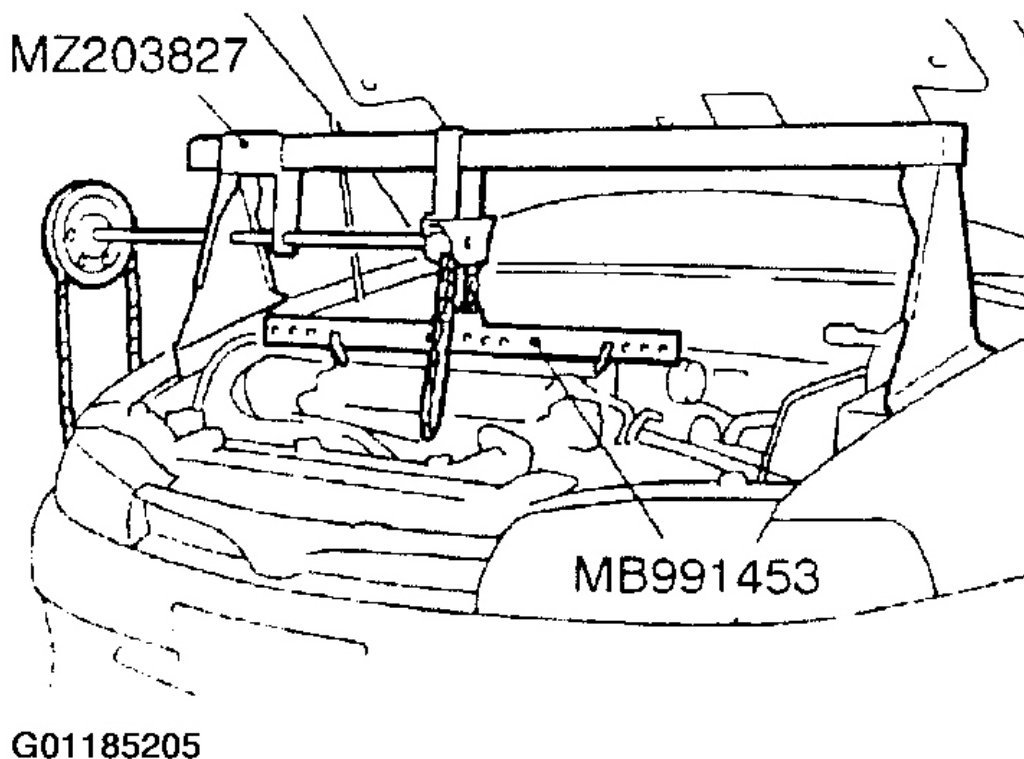


Fig. 32: Removing Engine Mount Bracket

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.

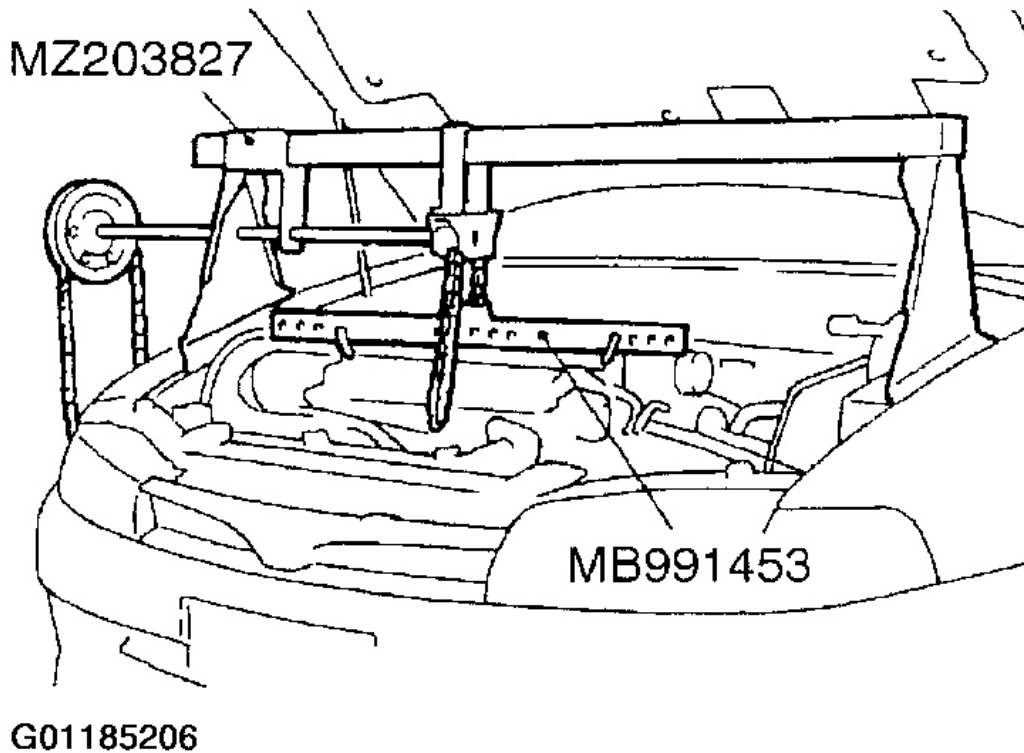


Fig. 33: Installing Engine Mount Bracket
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>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 fuel high-pressure hose to the right and left, 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.

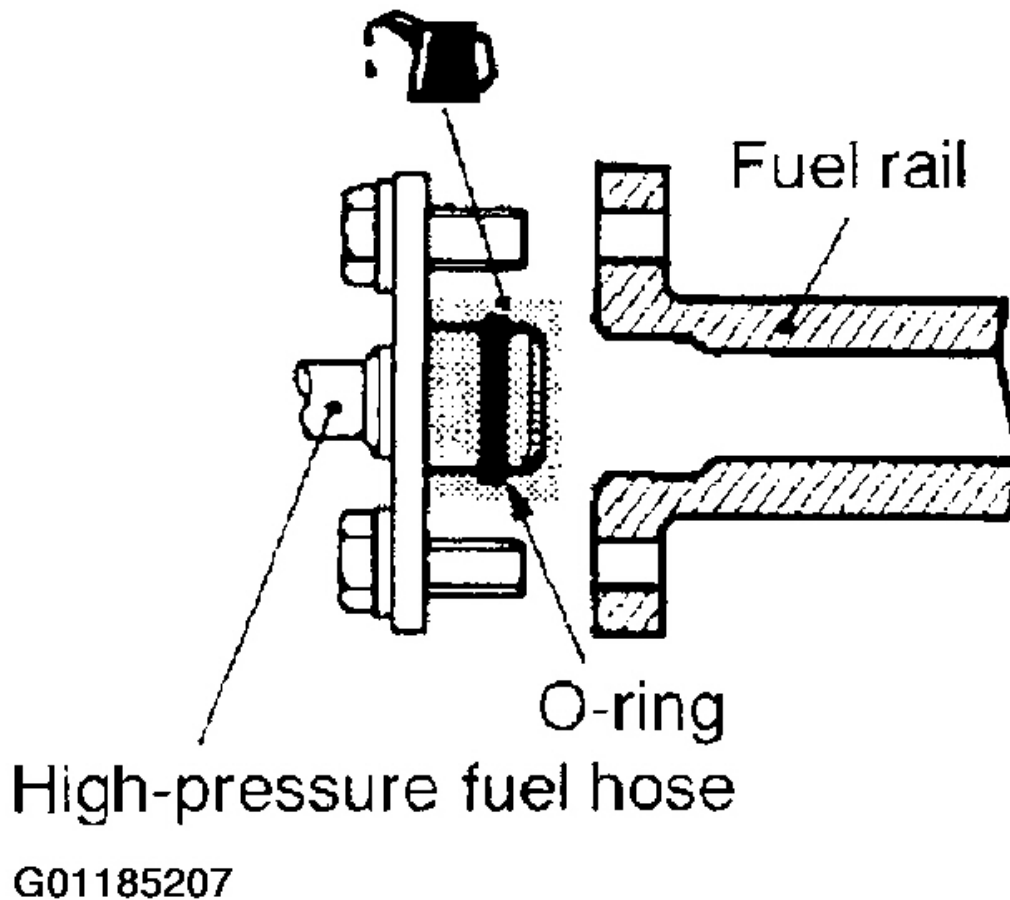


Fig. 34: Installing High-Pressure Fuel Hose

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

CRANKSHAFT PULLEY

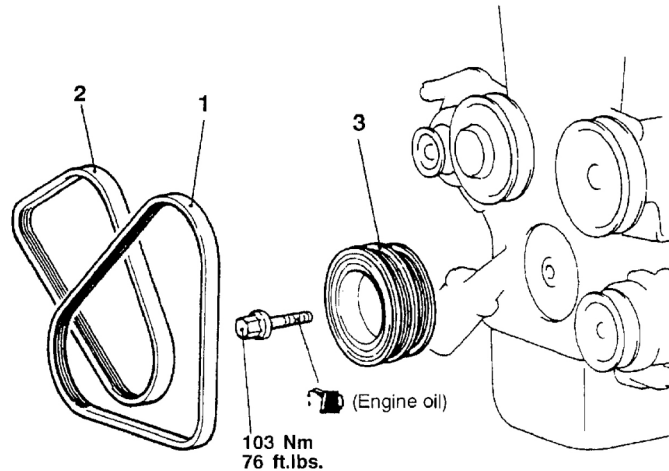
REMOVAL AND INSTALLATION

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



G01185208

Fig. 35: Removing & Installing Crankshaft Pulley

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

REMOVAL SERVICE POINT

< A > CRANKSHAFT PULLEY REMOVAL

Use a drive belt, other than the engine's drive belt and special tool MD998747 to hold the rolling while removing the puller bolt.

- CAUTION:**
1. This drive belt will get damaged. Do not use the engine's drive belt.
 2. Never use a damaged drive belt.

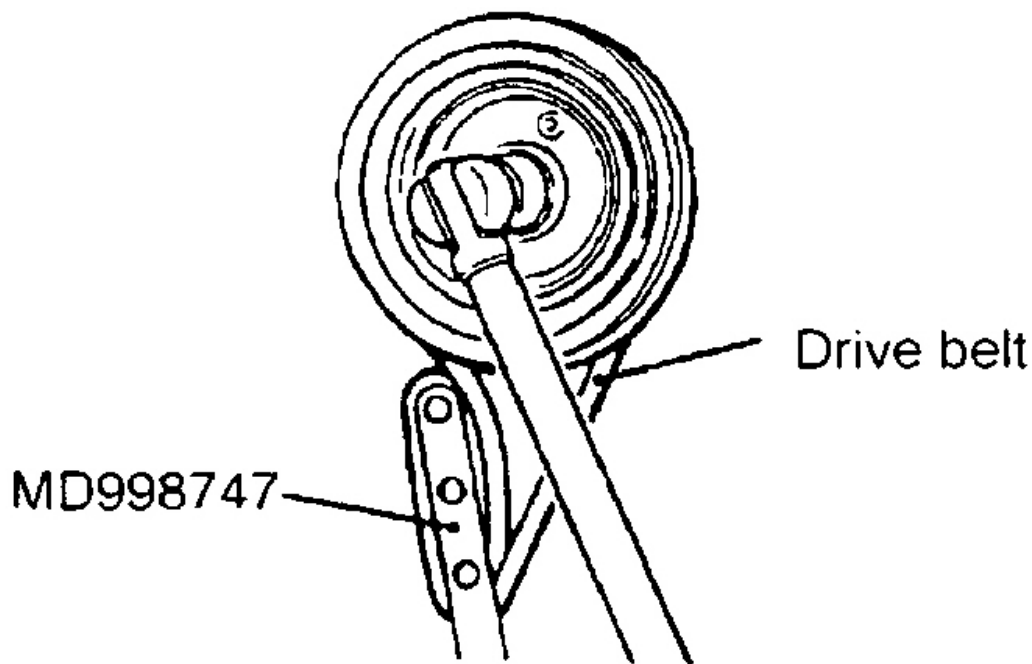


Fig. 36: Removing Crankshaft Pulley Bolt
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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.

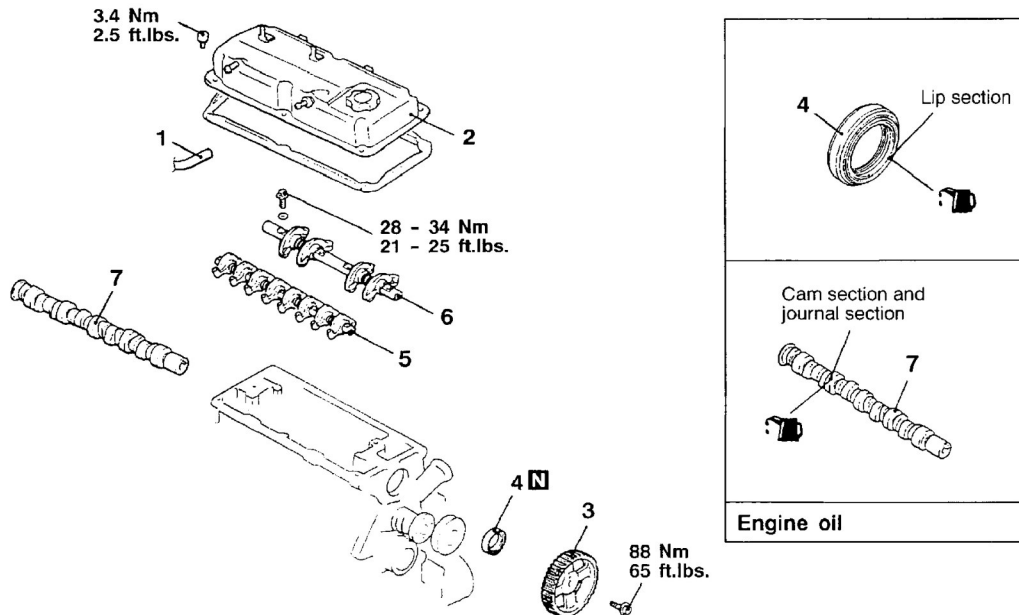
- CAUTION:**
1. This drive belt will get damaged. Do not use the engine's drive belt.
 2. Never use a damaged drive belt.

CAMSHAFT AND CAMSHAFT OIL SEAL

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

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



Removal steps

- | | |
|--|---|
| <p>1. PCV hose connection</p> <p>2. Rocker cover</p> <p>3. Camshaft sprocket</p> <p>4. Camshaft oil seal</p> <p>5. Lash adjuster, intake rocker arm and shaft assembly</p> | <p>6. Lash adjuster, exhaust rocker arm and shaft assembly</p> <p>7. Camshaft</p> |
|--|---|

G01185210

Fig. 37: Removing & Installing Camshaft & Camshaft Oil Seal
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

REMOVAL SERVICE POINTS

< A > CAMSHAFT SPROCKET REMOVAL

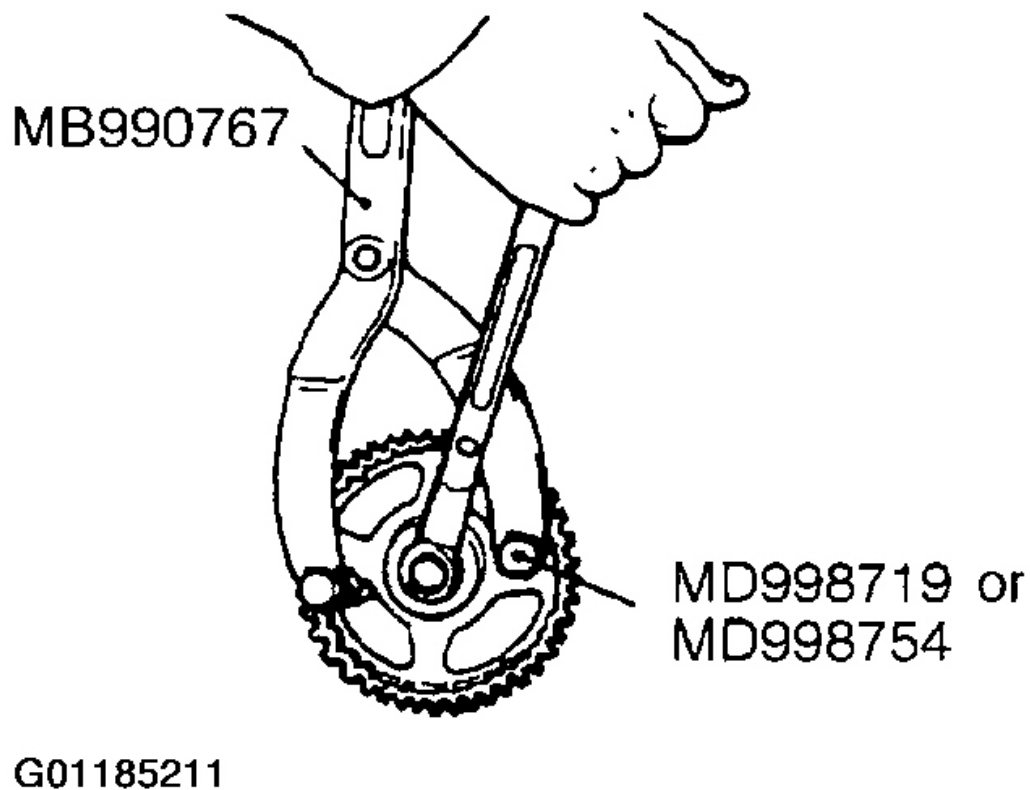


Fig. 38: Removing Camshaft Sprocket

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.

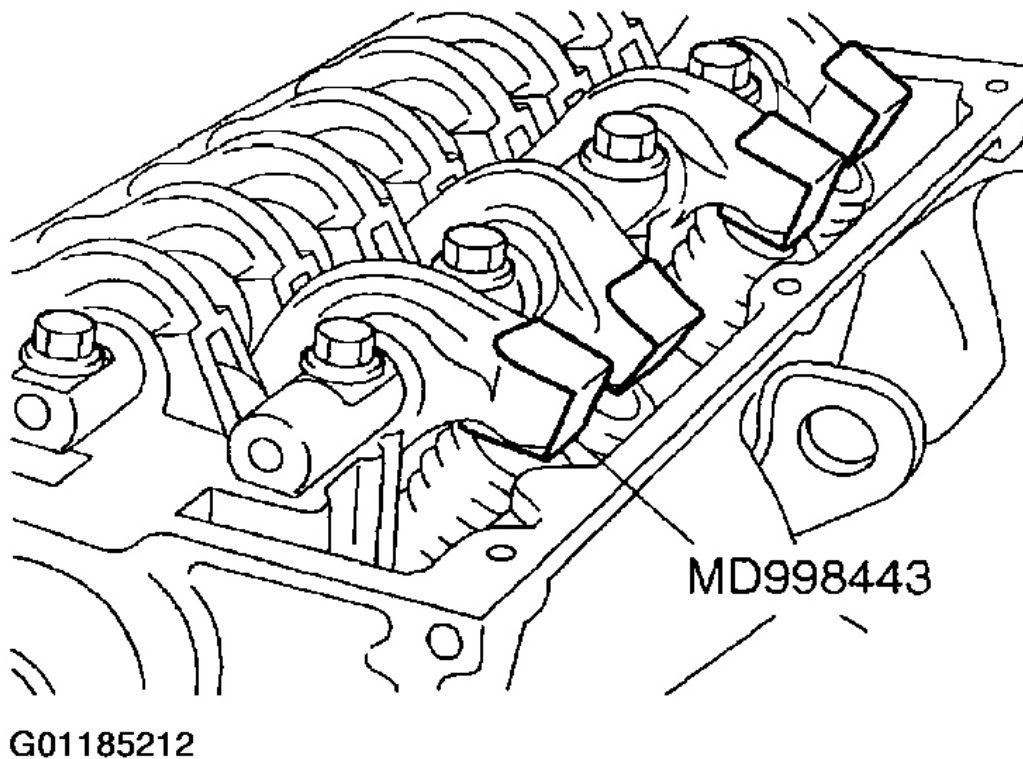


Fig. 39: Installing Special Tool MD998443

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.

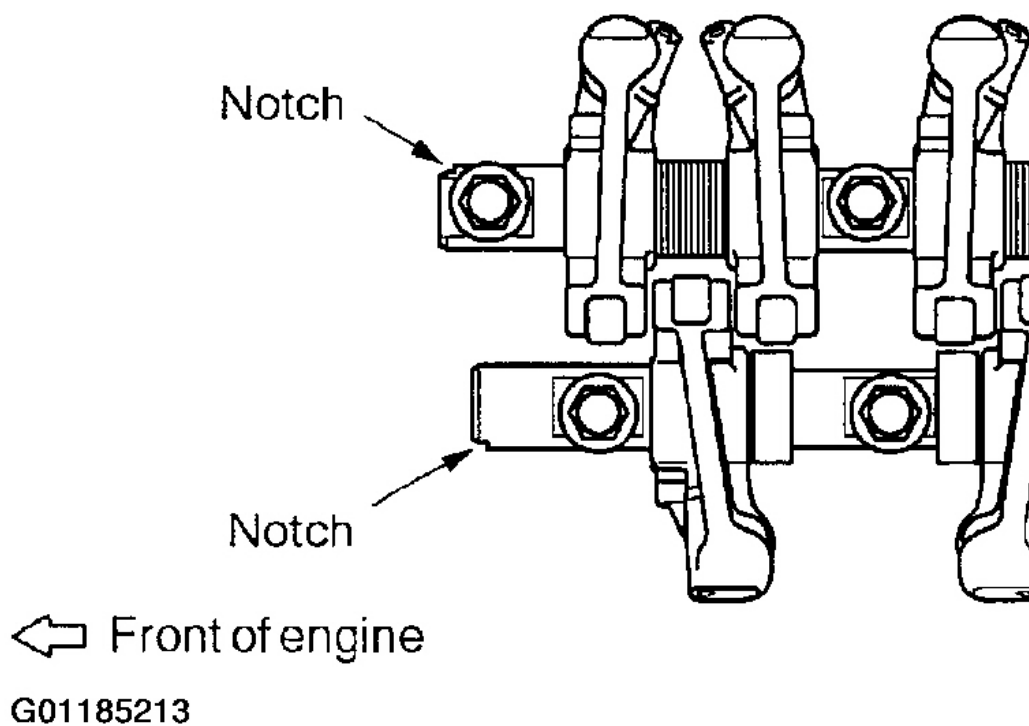
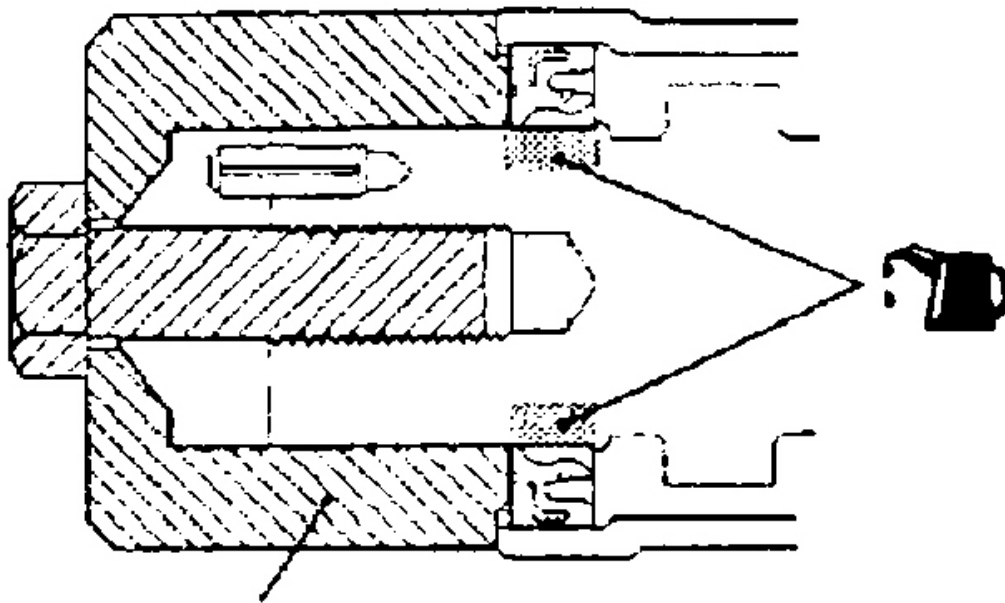


Fig. 40: Setting Notch Of Rocker Arm Shaft
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

INSTALLATION SERVICE POINTS

>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

G01185214

Fig. 41: Installing Camshaft Oil Seal

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

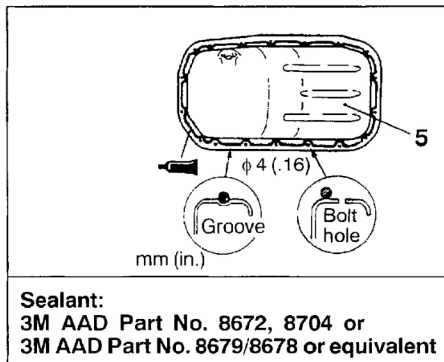
>C< CAMSHAFT SPROCKET INSTALLATION

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.

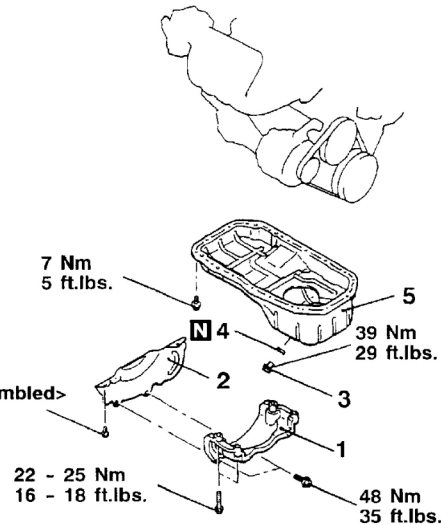
OIL PAN**REMOVAL AND INSTALLATION**

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 | |



- <Bolt and washer assembled>
9 Nm
7 ft.lbs.
- <Flange bolts>
10 Nm
7 ft.lbs.



Removal steps

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

- ◀A▶ ▶A◀
4. Drain plug gasket
 5. Oil pan

G01185215

Fig. 42: Removing & Installing Oil Pan

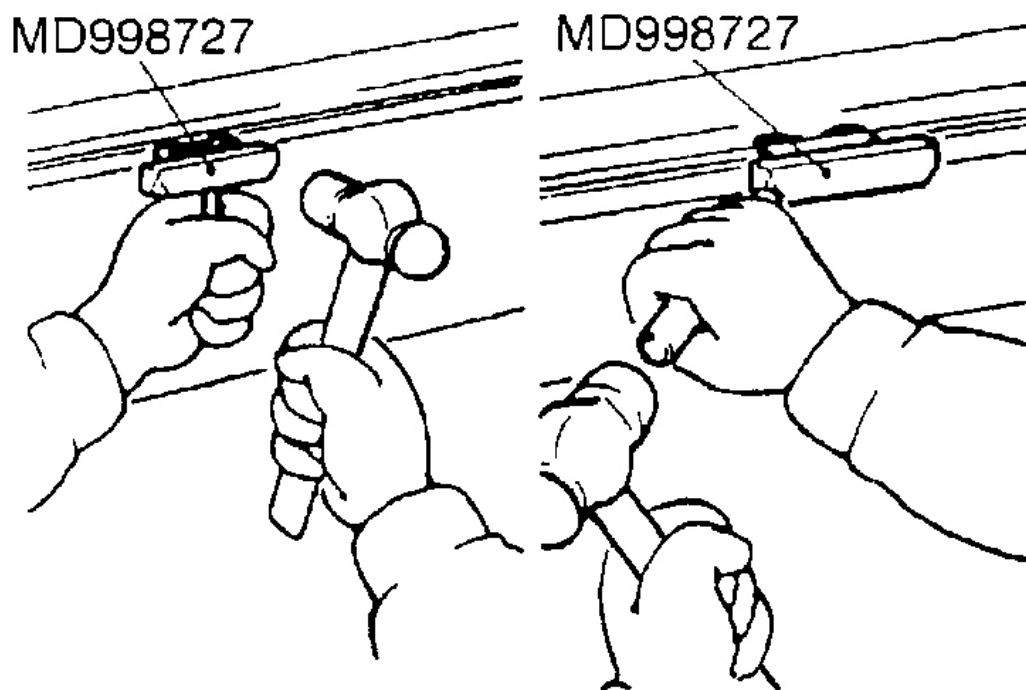
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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.



G01185216

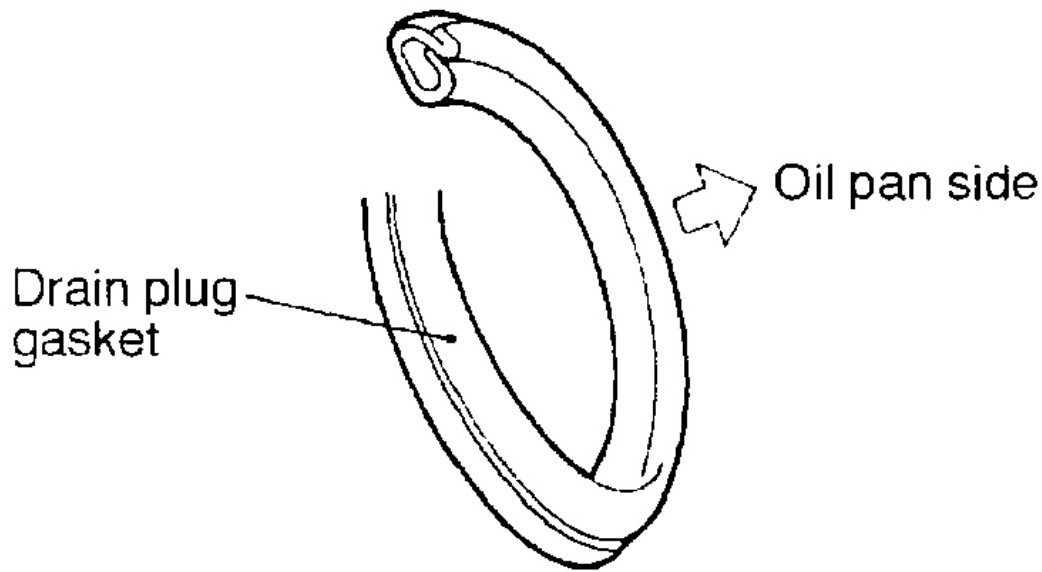
Fig. 43: Removing Oil Pan

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.



G01185217

Fig. 44: Installing Drain Plug Gasket

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

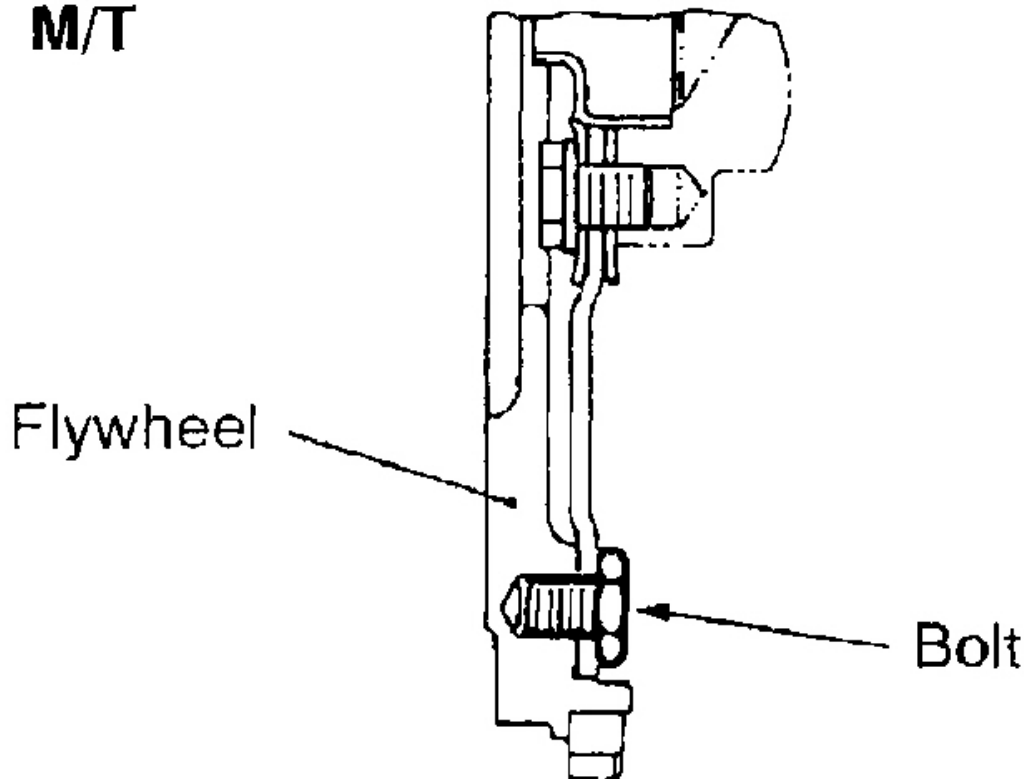
CRANKSHAFT OIL SEAL

REMOVAL AND INSTALLATION

< 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



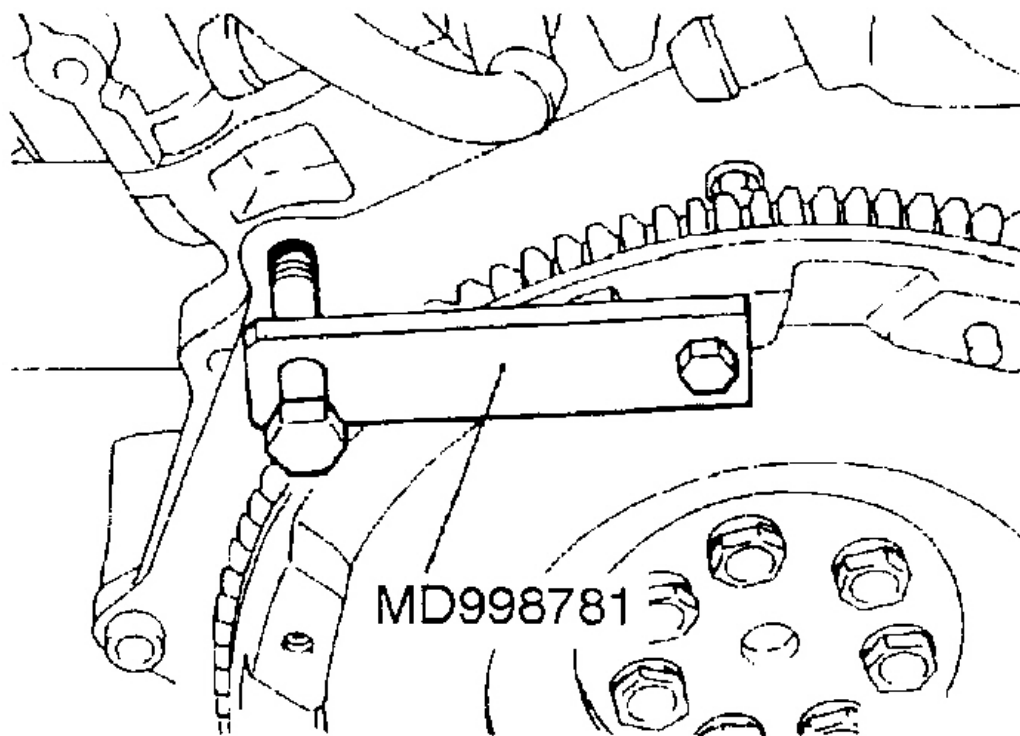
G01185219

Fig. 46: Identifying Flywheel Mounting Bolt (M/T)
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

< A/T >: See REMOVAL & INSTALLATION - A/T .

< B > 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.



G01185220

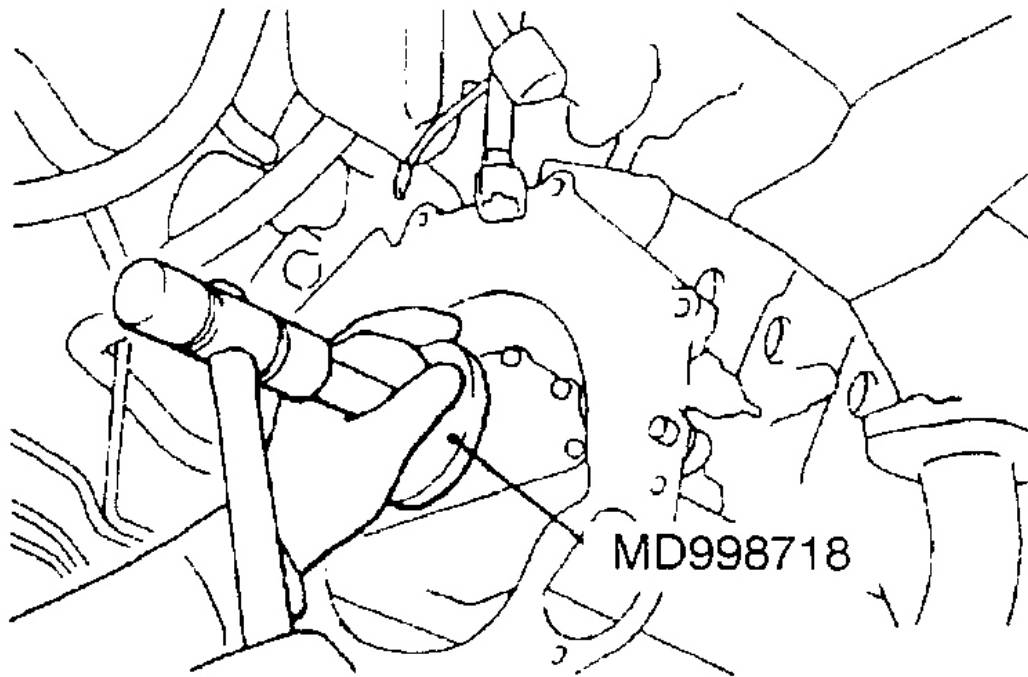
Fig. 47: Using Special Tool MD998781

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

INSTALLATION SERVICE POINTS

>A< CRANKSHAFT REAR OIL SEAL INSTALLATION

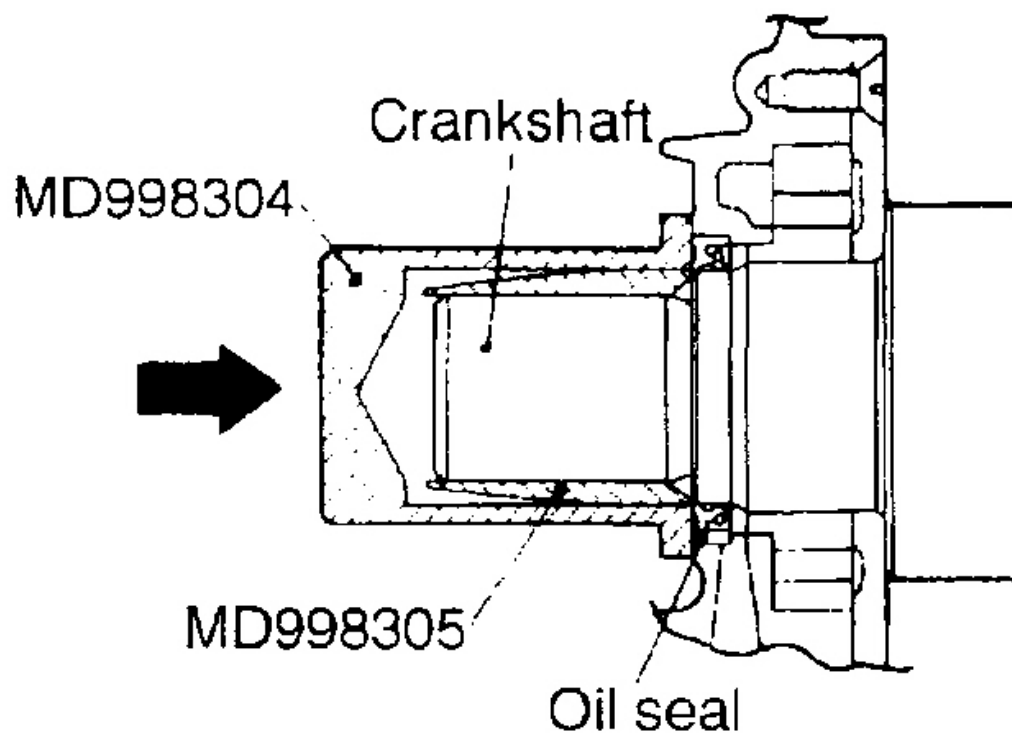
1. Apply a small amount of engine oil to the entire circumference of the oil seal lip.
2. Tap in the oil seal as show in the illustration.

**G01185221****Fig. 48: Installing Crankshaft Rear Oil Seal****Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.****>B< DRIVE PLATE < A/T >/FLYWHEEL < M/T >/ADAPTER PLATE INSTALLATION**

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.



G01185222

Fig. 49: Installing Crankshaft Front Oil Seal
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

CYLINDER HEAD GASKET

REMOVAL AND INSTALLATION

2002 Mitsubishi Mirage LS

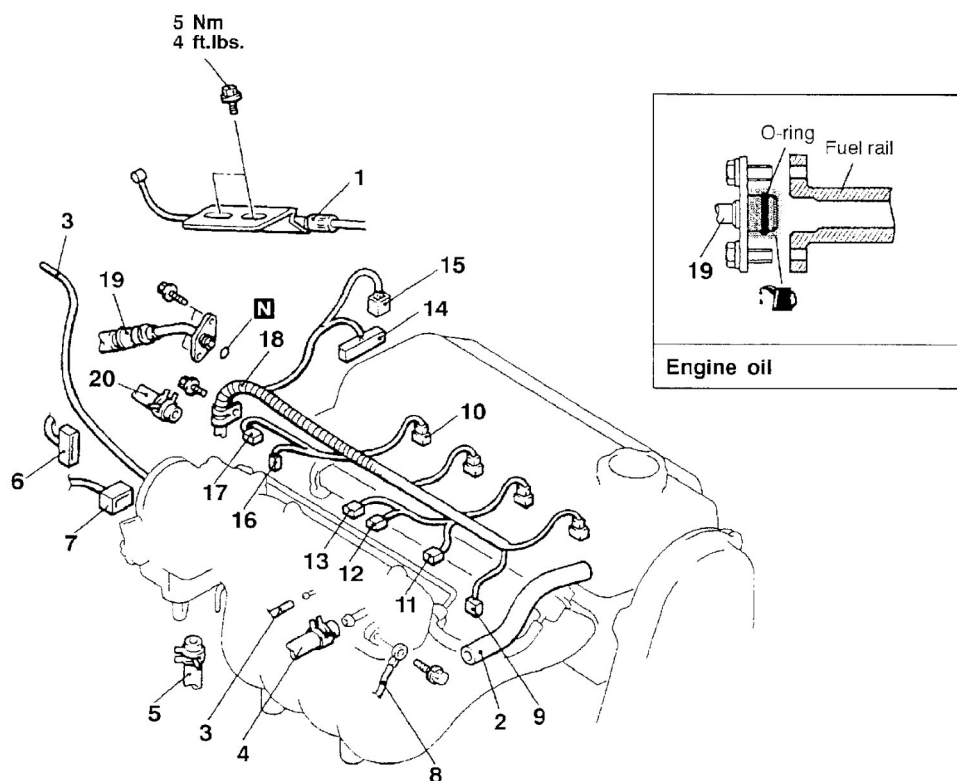
2002 ENGINES 1.5L 4-Cylinder - Mirage

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

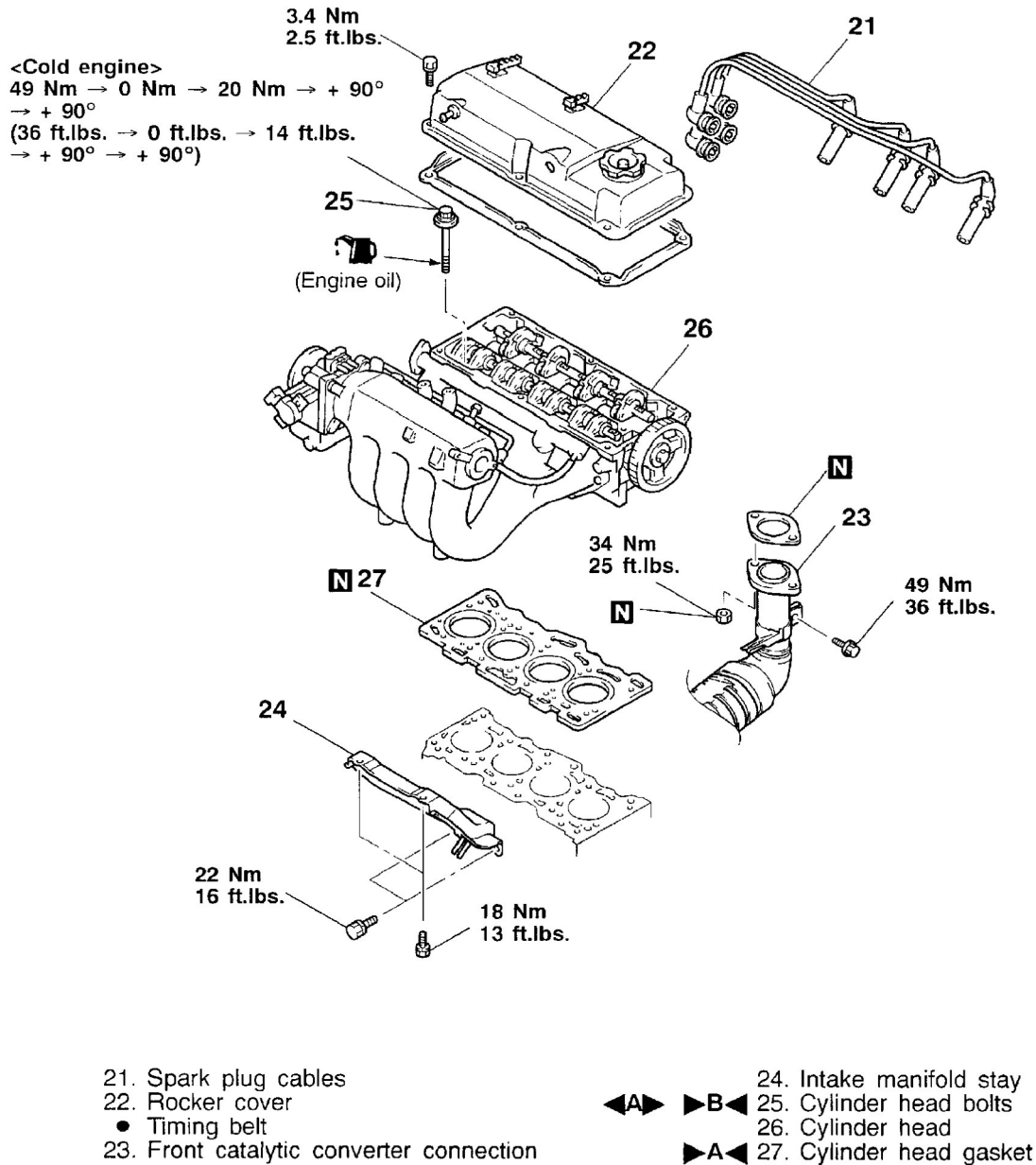


Removal steps

1. Accelerator cable connection
2. PCV hose
3. Vacuum hose connection
4. Brake booster vacuum hose connection
5. Water hose connection
6. Throttle position sensor connector
7. Idle speed control connector
8. Ground cable connection
9. Heated oxygen sensor connector
10. Injector connector
11. Intake air temperature sensor connector
12. Evaporative emission purge solenoid connector
13. EGR solenoid connector
14. Distributor connector
15. Heated oxygen sensor connector
16. Engine coolant temperature gauge unit connector
17. Engine coolant temperature sensor connector
18. Control wiring harness
19. High-pressure fuel hose connection
20. Fuel return hose connection

G01185223

Fig. 50: Removing & Installing Cylinder Head Gasket (1 Of 2)
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.



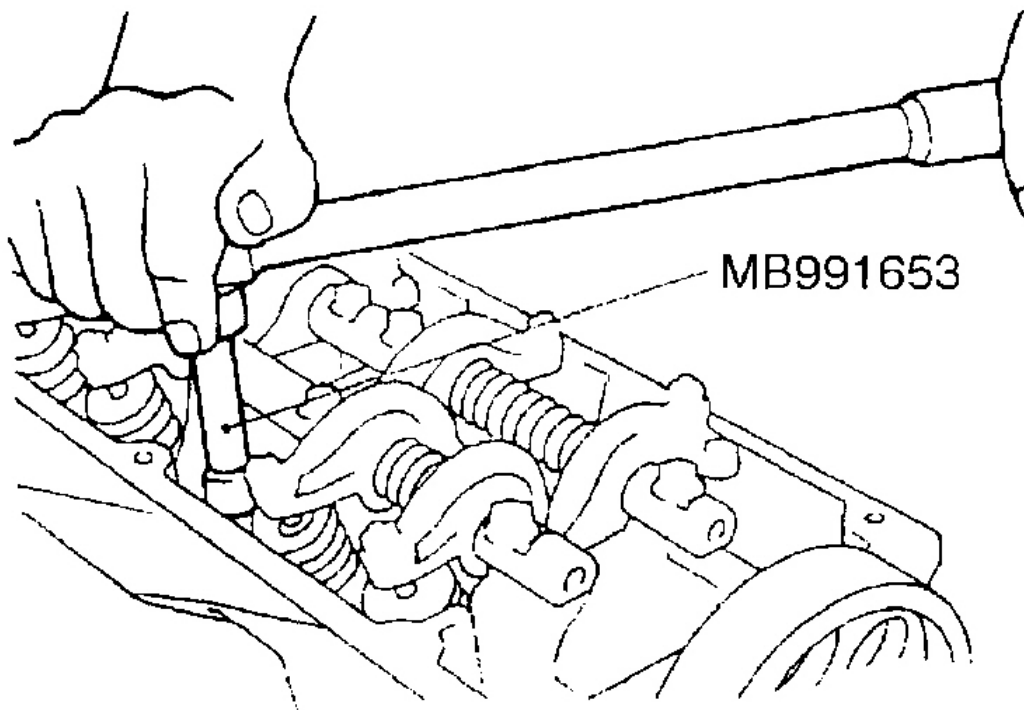
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Fig. 51: Removing & Installing Cylinder Head Gasket (2 Of 2)
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

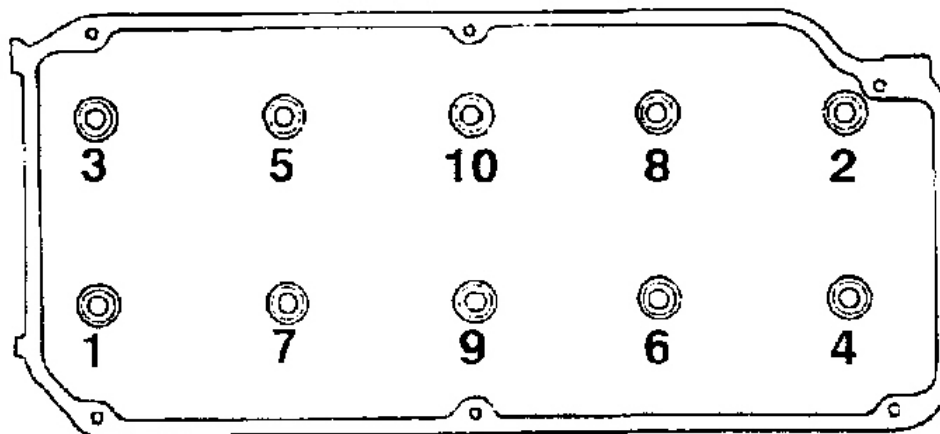
REMOVAL SERVICE POINT

< A > CYLINDER HEAD BOLT REMOVAL

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



Intake side ← Front of engine



Exhaust side

G01185225

Fig. 52: Removing Cylinder Head Bolt

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): 103.2 mm (4.06 in.)

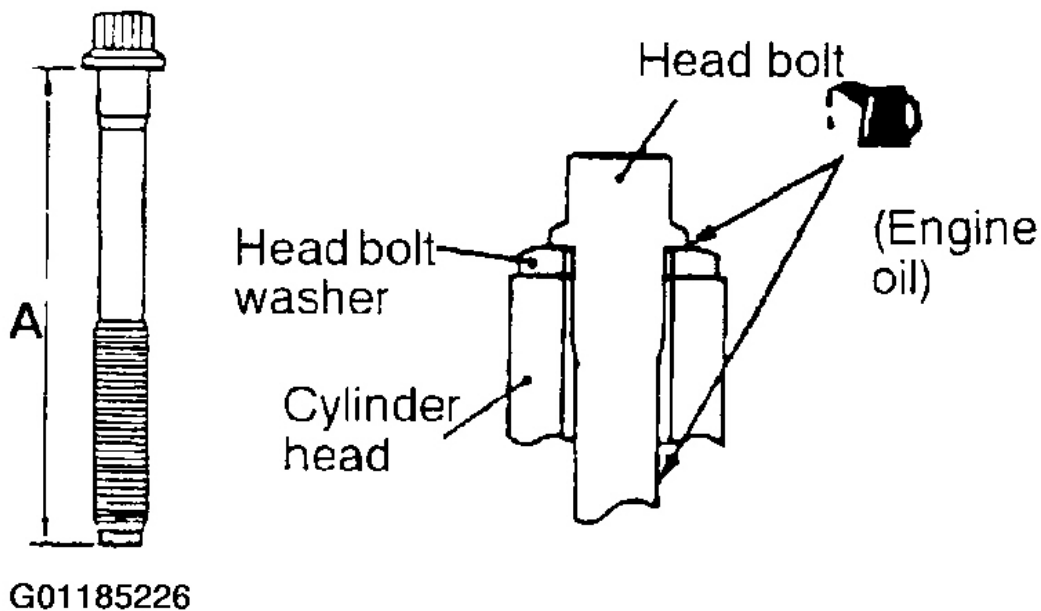
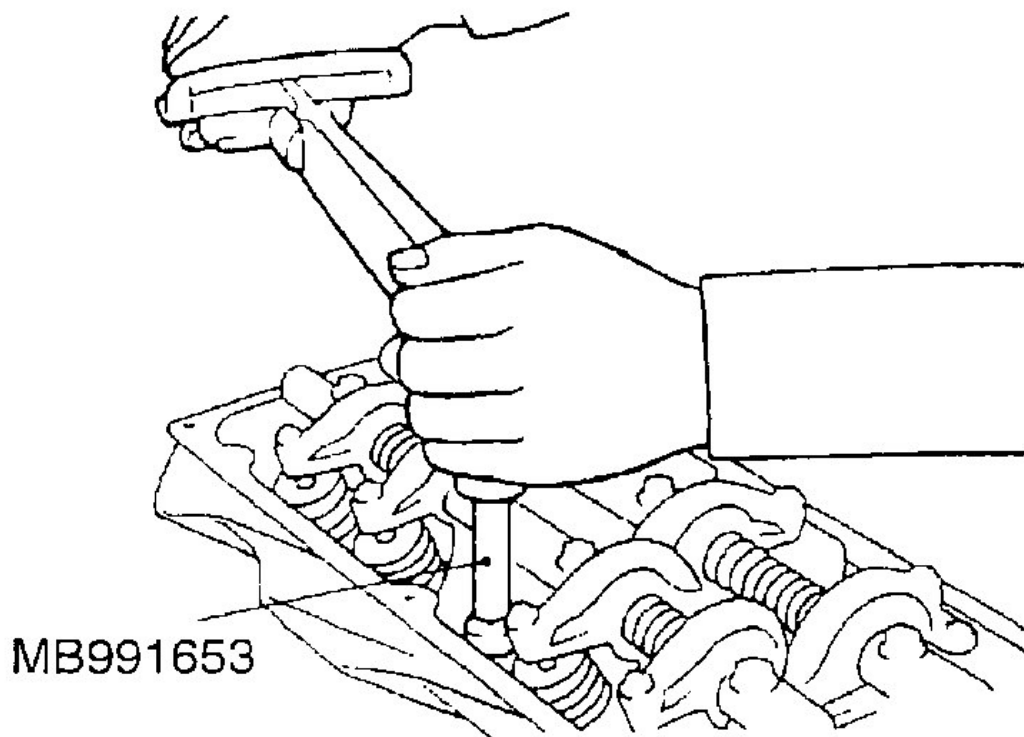
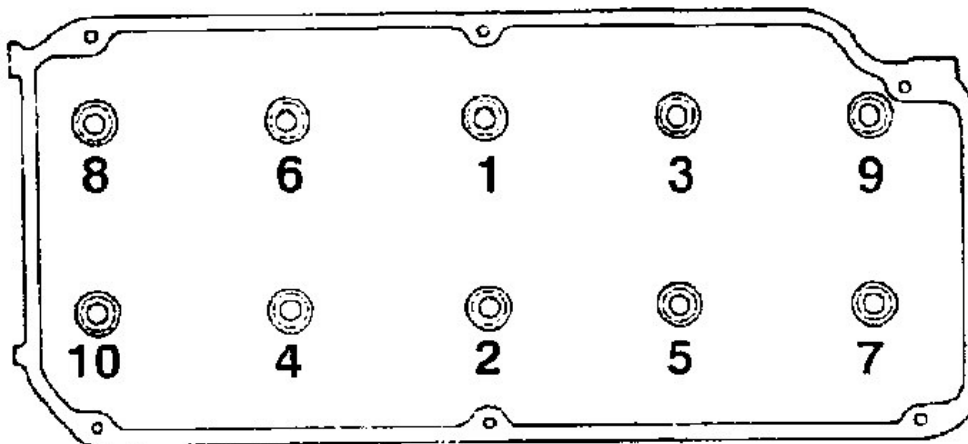


Fig. 53: Measuring Length Of Cylinder Head Bolt
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2. The head bolt washer should be installed with the burred side, caused by tapping out, facing upward.
3. Using the special tool, tighten the bolts by the following procedure.



Intake side ← **Front of engine**



Exhaust side

G01185228

Fig. 54: Tightening Cylinder Head Bolts

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

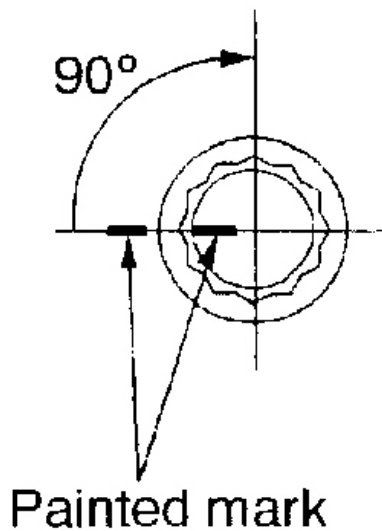
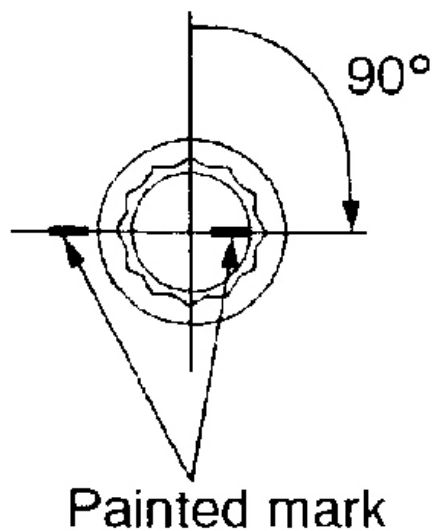
Step	Operation	Remarks
1	Tighten to 49 Nm (36 ft.lbs.)	Tighten in the order shown in the illustration.
2	Fully loosen.	Loosen in the reverse order of that shown in the illustration.
3	Tighten to 20 Nm (14 ft.lbs.)	Tighten in the order shown in the illustration.
4	Tighten 90° of a turn.	In the order shown 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. 55: Cylinder Head Bolt Tightening Procedure

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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

Step 4**Step 5**

G01185229

Fig. 56: Measuring Tightening Angle Of Cylinder Head Bolts
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 fuel rail. Be careful not to damage the O-ring. After installing, check that the hose turns smoothly.

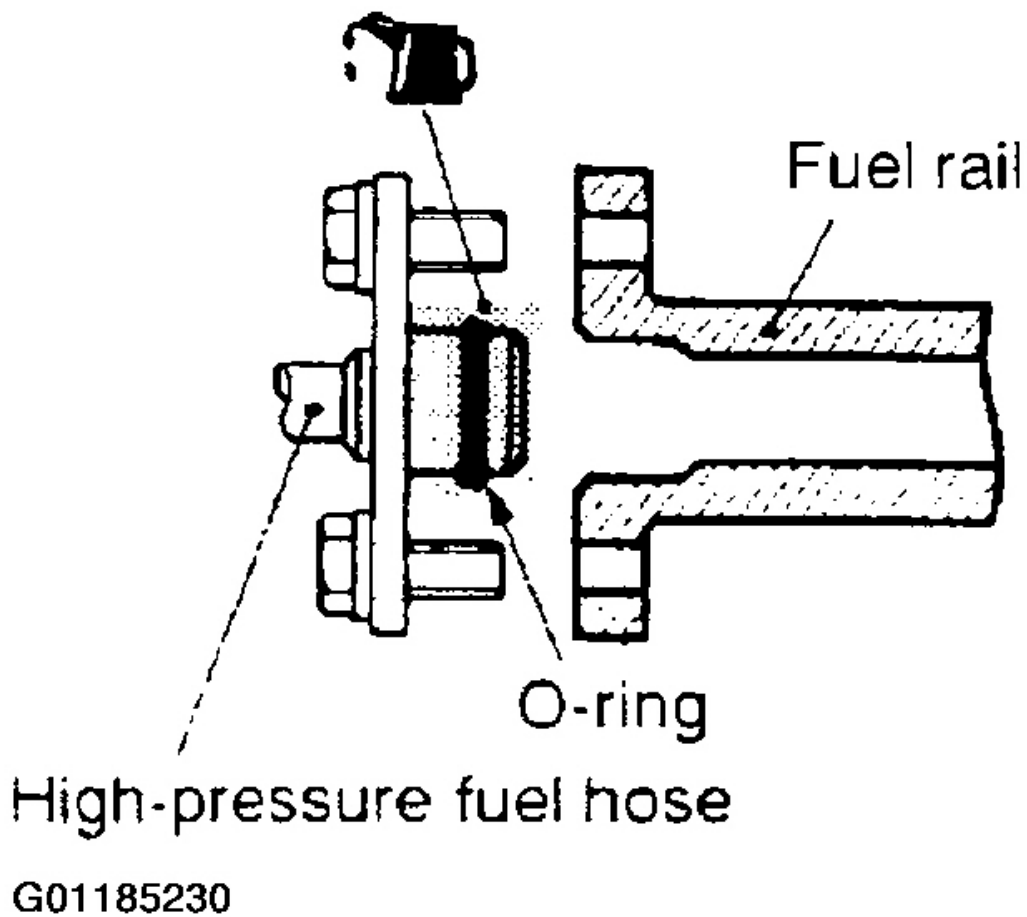


Fig. 57: Installing High-Pressure Fuel Hose

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

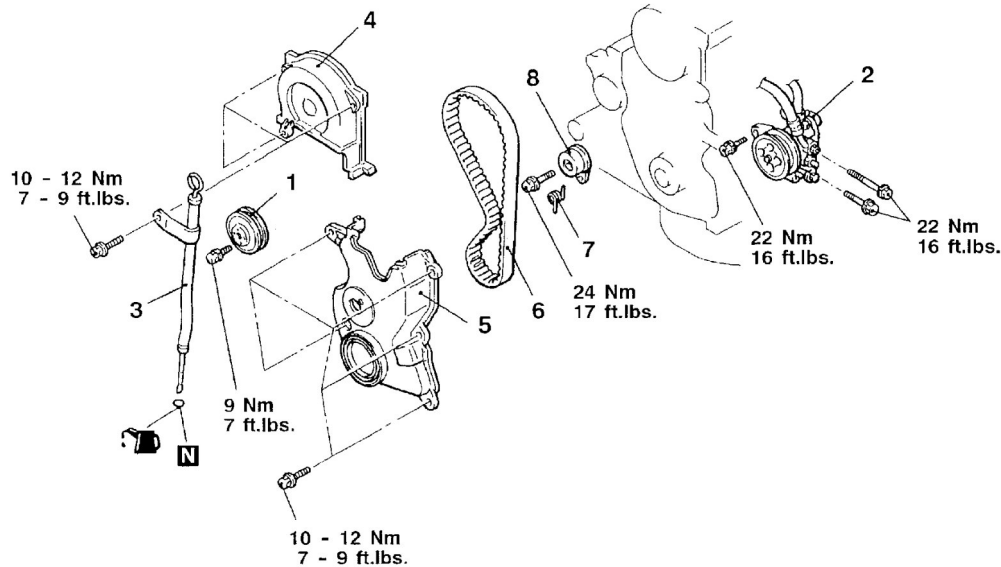
3. If the hose does not turn smoothly, the O-ring is probably being clamped. Disconnect the high-pressure fuel hose and check the O-ring for damage. After this, re-insert the fuel rail and check that the hose turns smoothly.

TIMING BELT

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

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



Removal steps

1. Water pump pulley
2. Power steering oil pump and bracket assembly
3. Oil dipstick guide assembly
4. Timing belt upper cover

5. Timing belt lower cover
- Timing belt tension adjustment
6. Timing belt
7. Tensioner spring
8. Timing belt tensioner

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Fig. 58: Removing & Installing Timing Belt

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 timing belt, and tie it with a cord.

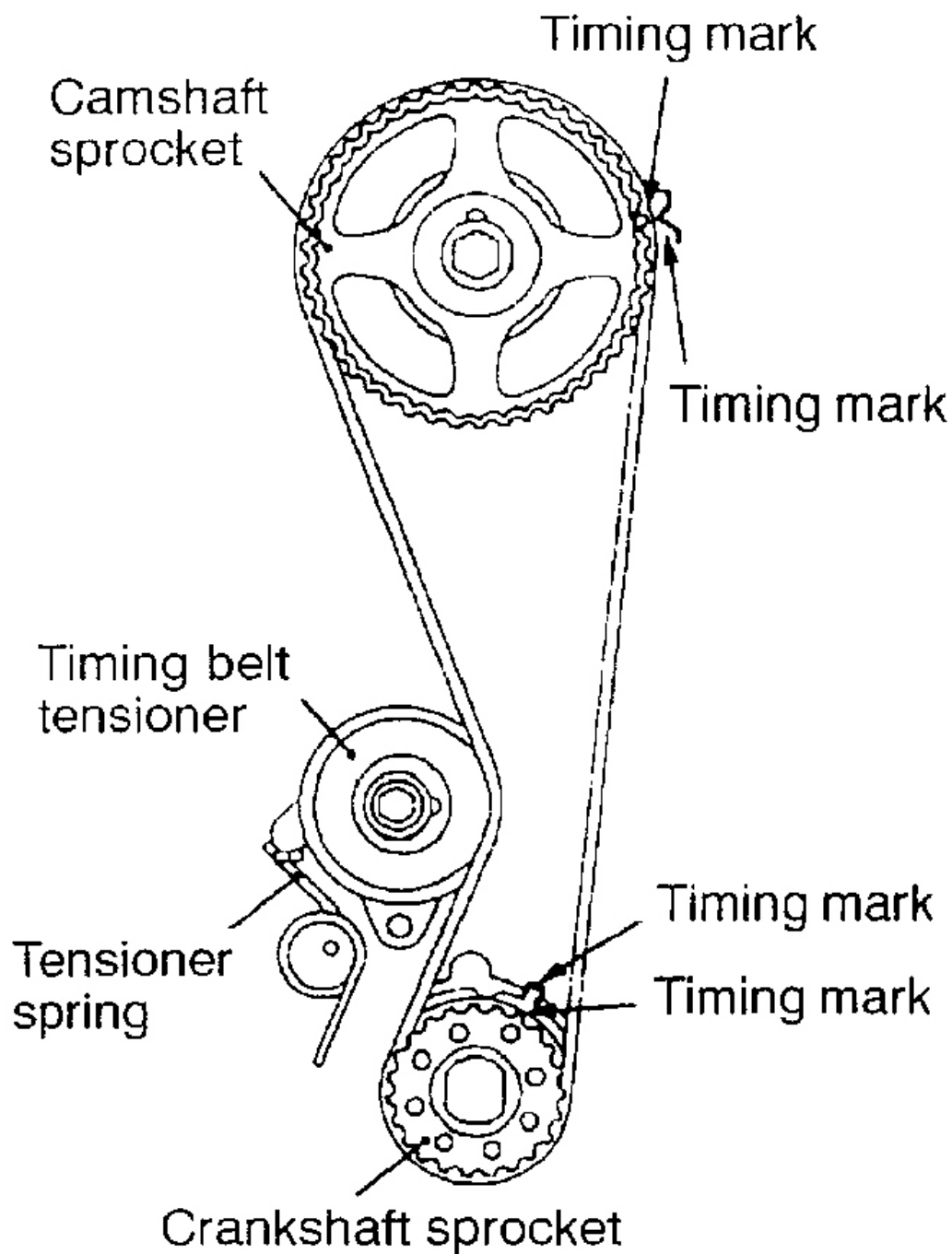
< B > TIMING BELT REMOVAL

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

2002 Mitsubishi Mirage LS

2002 ENGINES 1.5L 4-Cylinder - Mirage

CAUTION: The crankshaft should always be turned only clockwise.

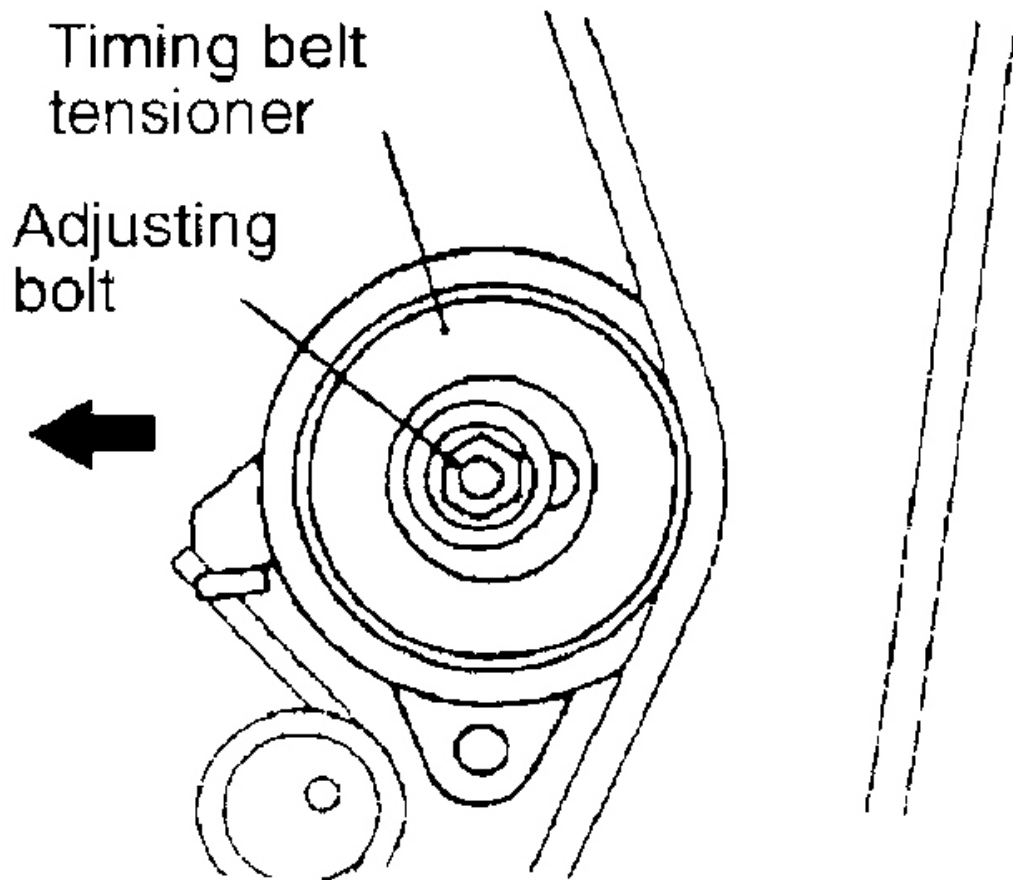


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Fig. 59: Aligning Timing Marks

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2. Loosen the adjusting bolt.
3. Move the timing belt tensioner to the water pump side and temporarily tighten the adjusting bolt so that the tensioner does not return.



G01185233

Fig. 60: Removing Timing Belt

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

4. 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).

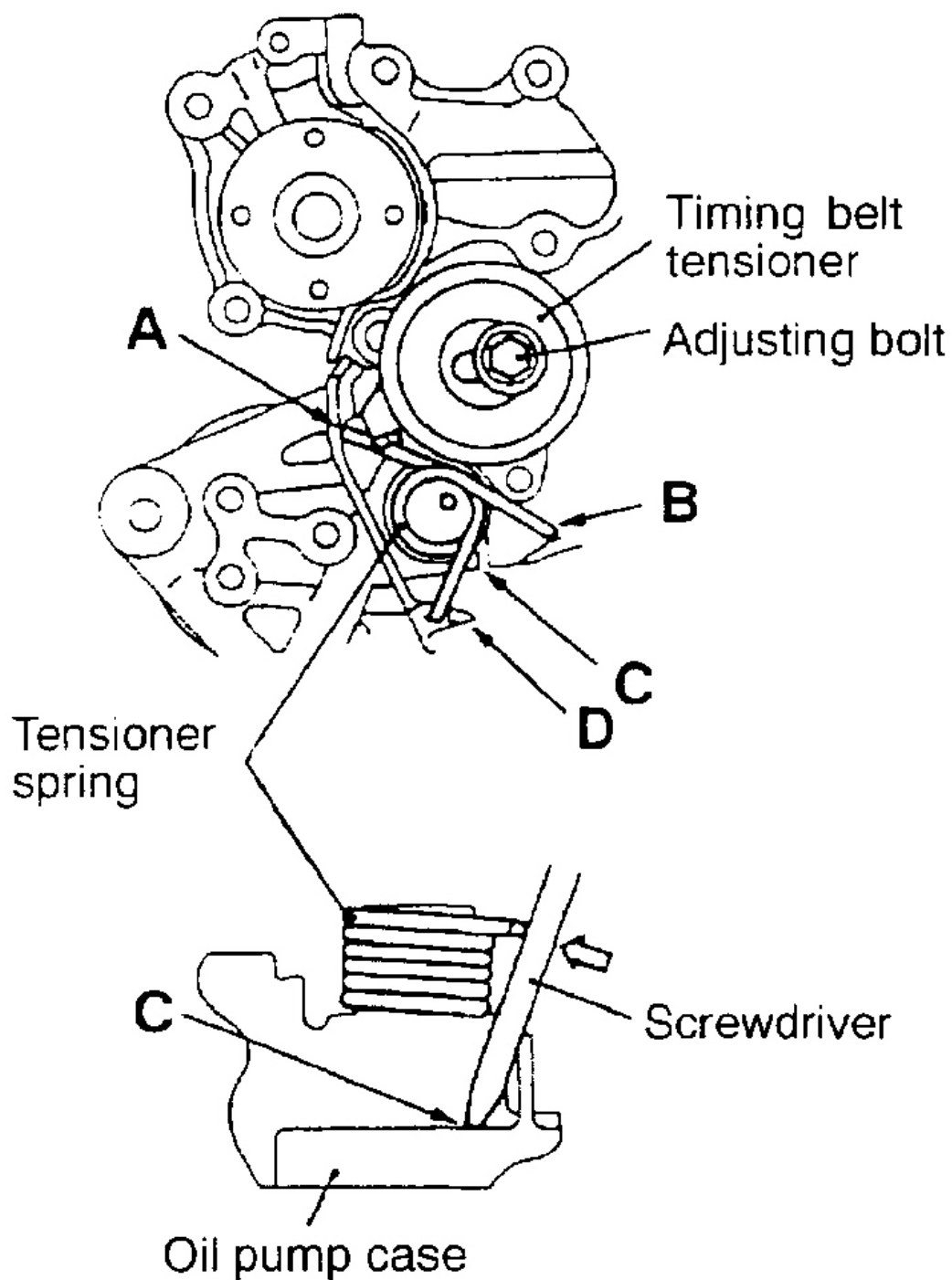
INSTALLATION SERVICE POINTS

2002 Mitsubishi Mirage LS

2002 ENGINES 1.5L 4-Cylinder - Mirage

>A< TIMING BELT TENSIONER/TENSIONER SPRING/TIMING BELT INSTALLATION

1. Put the protrusion of the timing belt tensioner on the end (A) of the tensioner spring as shown.



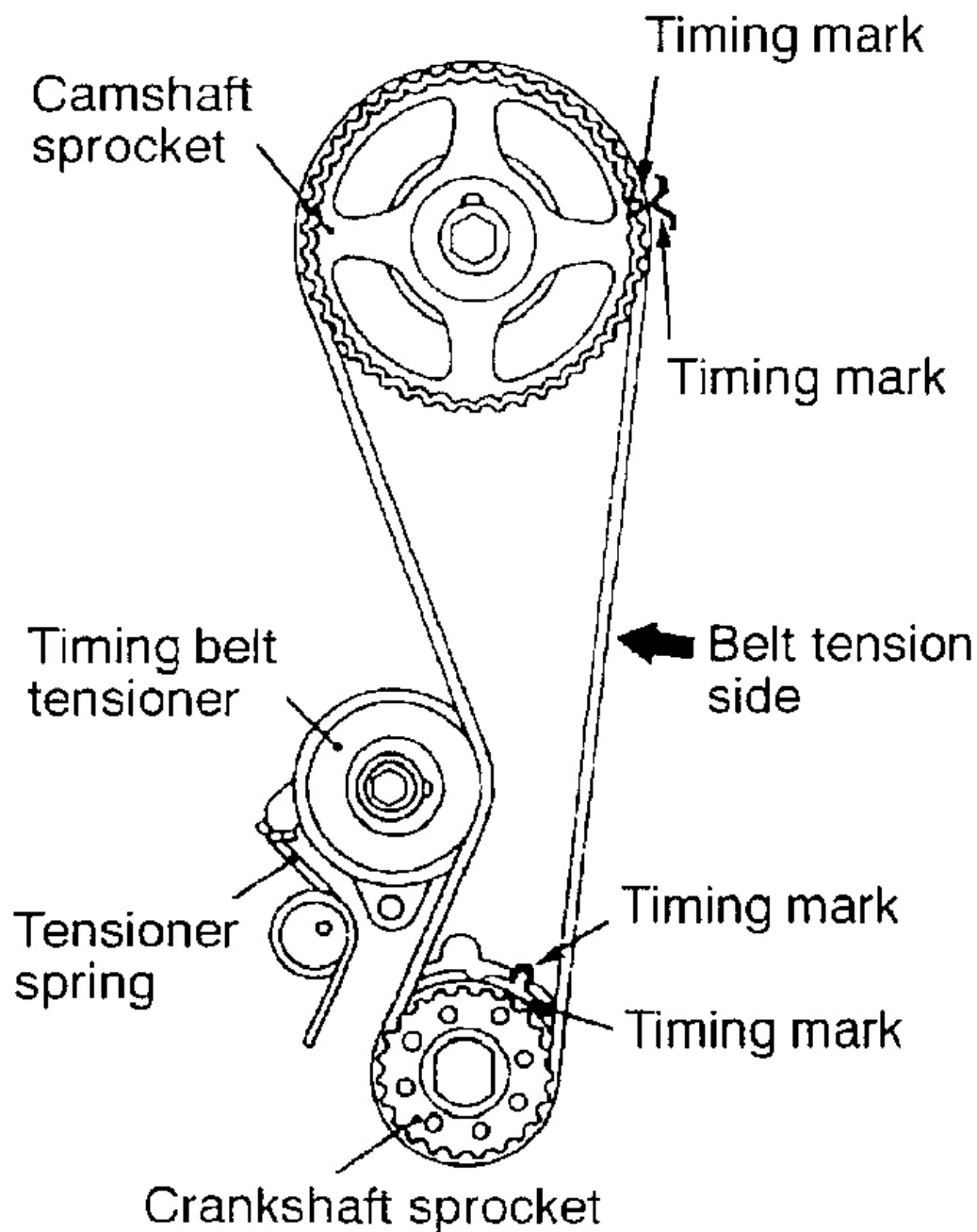
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Fig. 61: Installing Timing Belt Tensioner

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2. Move the timing belt tensioner close to the water pump, and temporarily tighten the adjusting bolt.
3. Put a screwdriver in (C), push the protrusion (B) of the tensioner spring in the shown direction, and place it on the stopper (D) of the oil pump case.
4. Align each of the camshaft sprocket and the crankshaft sprocket timing marks.
5. 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. Camshaft sprocket
 3. Tensioner pulley

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



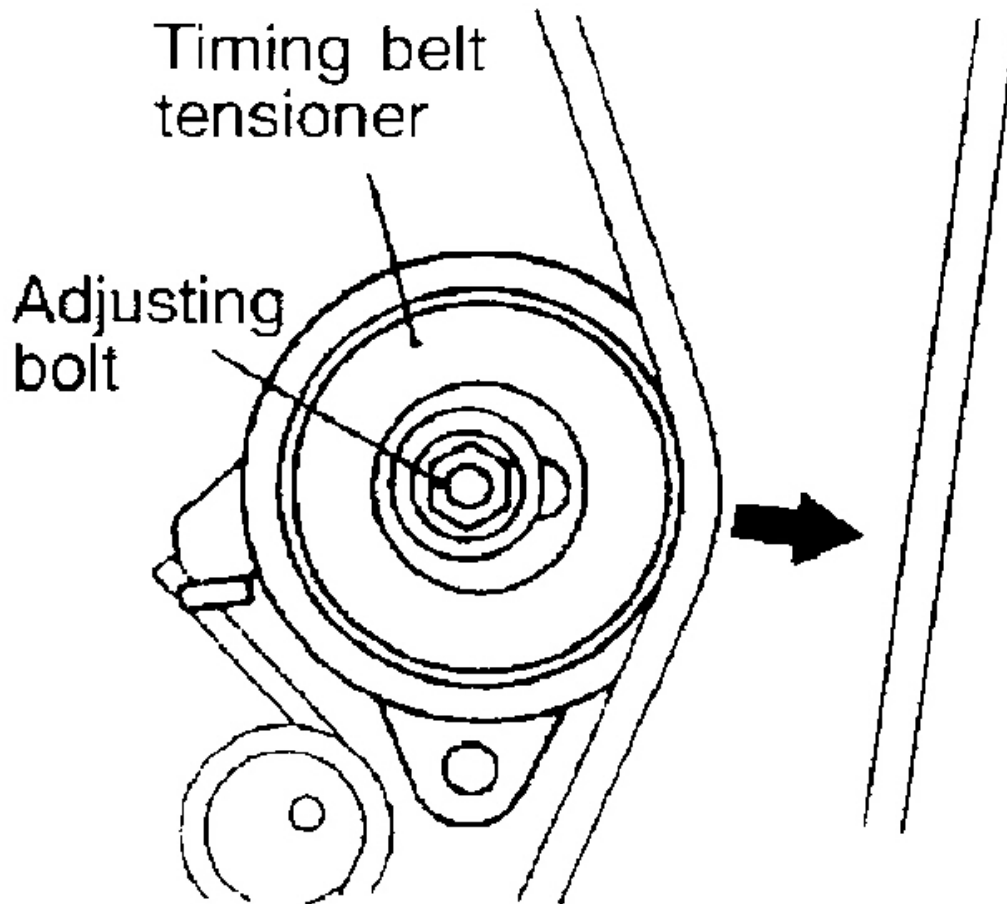
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Fig. 62: Installing Timing Belt

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>B< TIMING BELT TENSION ADJUSTMENT

1. Initially loosen the adjusting bolt of the timing belt tensioner fixed to the water pump side by 1/2 - 1/4 turn, and use the force of the tensioner spring to apply tension to the belt.



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Fig. 63: Adjusting Timing Belt Tension

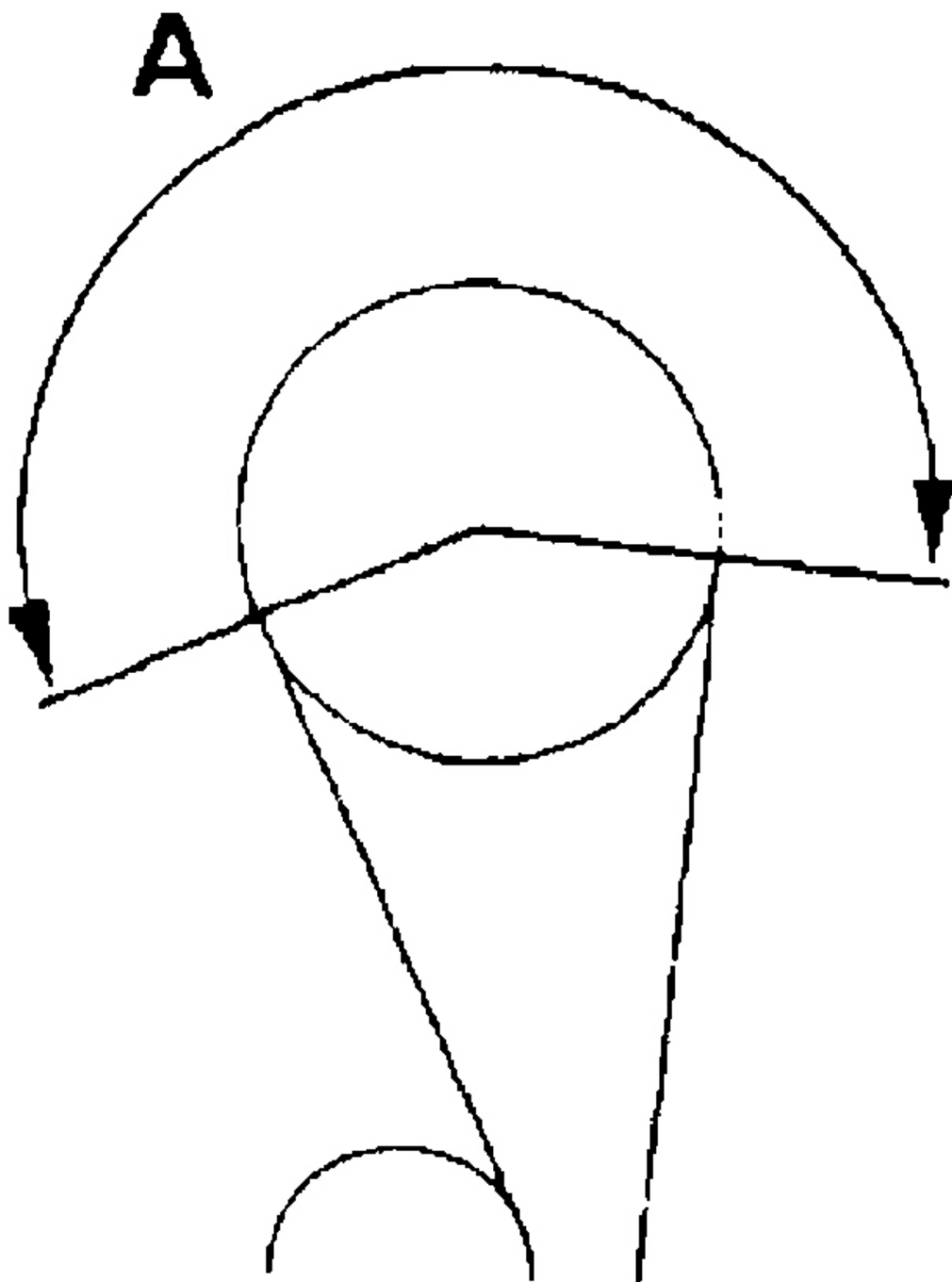
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2. Turn the crankshaft in the proper rotation direction (right turn) 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 in the opposite direction (left turn).

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. 64: Checking Timing Belt Teeth Engagement In Camshaft Sprocket

2002 Mitsubishi Mirage LS

2002 ENGINES 1.5L 4-Cylinder - Mirage

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

OVERHAUL**GENERAL INFORMATION****GENERAL SPECIFICATION****General Specification**

Description		Specifications
Type		In-line OHV, SOHC
Number of cylinders		4
Combustion chamber		Hemispherical type
Total displacement dm ³ (cu.in.)		1,468 (89.6)
Cylinder bore mm (in.)		75.5 (2.97)
Piston stroke mm (in.)		82.0 (3.23)
Compression ratio		9.0
Number of valve	Intake	8
	Exhaust	4
Valve timing	Intake opening	BTDC 14°
	Intake closing	ABDC 48°
	Exhaust opening	BBDC 54°
	Exhaust closing	ATDC 10°
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 LS

2002 ENGINES 1.5L 4-Cylinder - Mirage

Item		Standard	Limit
Rocker arms, rocker shafts, and camshaft			
Camshaft cam height mm (in.)	Intake-primary	38.78 (1.53)	38.28 (1.51)
	Intake-secondary	38.78 (1.53)	38.28 (1.51)
	Exhaust	39.10 (1.54)	38.60 (1.52)
Cylinder head and valves			
Cylinder head gasket surface flatness mm (in.)		Less than 0.05 (.002)	0.2 (.008)
Cylinder head gasket surface grinding limit (including grinding of cylinder block gasket surface) mm (in.)		-	0.2 (.008)
Cylinder head overall height mm (in.)		106.9 - 107.1 (4.209 - 4.217)	-
Cylinder head bolt shank length mm (in.)		-	103.2 (4.063)
Valve margin mm (in.)	Intake	1.0 (.039)	0.5 (.020)
	Exhaust	1.5 (.059)	1.0 (.039)
Valve stem diameter mm (in.)		6.6 (.260)	-
Valve stem-to-guide clearance mm (in.)	Intake	0.02 - 0.050 (.0008 - .0020)	0.10 (.0039)
	Exhaust	0.050 - 0.085 (.0020 - .0033)	0.15 (.0059)
Valve face angle mm (in.)		45° - 45.5°	-
Valve stem projection mm (in.)	Intake	43.70 (1.720)	44.20 (1.740)
	Exhaust	43.30 (1.705)	43.80 (1.724)
Overall valve length mm (in.)	Intake	100.75 (3.967)	100.25 (3.947)
	Exhaust	101.05 (3.976)	100.55 (3.959)
Valve spring free height mm (in.)	Intake	46.1 (1.815)	45.6 (1.795)
	Exhaust	46.8 (1.843)	46.3 (1.823)
Valve spring load/installed height N/mm (lbs./in.)	Intake	226/40.0 (51/1.57)	-
	Exhaust	284/39.6 (64/1.56)	-
Valve spring squareness		2° or less	4°
Valve seat contact width mm (in.)		0.9 - 1.3 (.035 - .051)	-
Valve guide internal diameter mm (in.)		6.6 (.260)	-
Valve guide projection mm (in.)		17.0 (.670)	-
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 rods			
Piston outside diameter mm (in.)		75.5 (2.97)	-
Piston ring side clearance mm (in.)	No. 1 ring	0.03 - 0.07 (.0012 - .0028)	0.1 (.0039)
	No. 2 ring	0.02 - 0.06 (.0008 - .0024)	0.1 (.0039)
Piston ring end gap mm (in.)	No. 1 ring	0.20 - 0.35 (.0079 - .0138)	0.8 (.031)
	No. 2 ring	0.35 - 0.50 (.0138 - .0197)	0.8 (.031)
	Oil ring	0.20 - 0.50 (.0079 - .0197)	1.0 (.039)
Piston pin outside diameter mm (in.)		18.0 (0.71)	-
Piston pin press-in load (at room temperature) N (lbs.)		4900 - 14700 (1100 - 3300)	-
Crankshaft pin oil clearance mm (in.)		0.01 - 0.04 (.0008 - .0016)	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 - 0.18 (.0020 - .0071)	0.25 (.010)
Crankshaft journal diameter mm (in.)		48.0 (1.89)	-
Crankshaft pin diameter mm (in.)		42.0 (1.65)	-
Crankshaft journal oil clearance mm (in.)		0.02 - 0.04 (.0008 - .0016)	0.1 (.004)
Cylinder block gasket surface flatness mm (in.)		0.05 (.020)	0.1 (.004)
Cylinder block gasket surface grinding limit (including grinding of cylinder head gasket surface) mm (in.)		-	0.2 (.008)
Cylinder block overall height mm (in.)		256 (10.1)	-
Cylinder bore cylindricity mm (in.)		0.01 (.0004) or less	-
Cylinder bore mm (in.)		75.5 (2.97)	-
Piston-to-cylinder clearance mm (in.)		0.02 - 0.04 (.0008 - .0016)	-

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Fig. 65: Service Specifications

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

REWORK DIMENSIONS

2002 Mitsubishi Mirage LS

2002 ENGINES 1.5L 4-Cylinder - Mirage

Item	Standard	
Cylinder head and valves		
Oversize valve guide hole diameter mm (in.)	0.05 O.S.	12.050 – 12.068 (.4744 – .4751)
	0.25 O.S.	12.250 – 12.268 (.4823 – .4830)
	0.50 O.S.	12.500 – 12.518 (.4921 – .4928)
Oversize intake valve seat ring hole diameter mm (in.)	Primary	0.3 O.S. 27.300 – 27.325 (1.0748 – 1.0758)
		0.6 O.S. 27.600 – 27.625 (1.0866 – 1.0876)
	Secondary	0.3 O.S. 32.300 – 32.325 (1.2717 – 1.2726)
		0.6 O.S. 32.600 – 32.625 (1.2835 – 1.2845)
Oversize exhaust valve seat ring hole diameter mm (in.)	0.3 O.S.	35.300 – 35.325 (1.3898 – 1.3907)
	0.6 O.S.	35.600 – 35.625 (1.4016 – 1.4026)

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Fig. 66: Rework Dimensions

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

TORQUE SPECIFICATIONS

Torque Specifications (1 Of 2)

Item	Nm	ft.lbs.
Generator and ignition system		
Water pump pulley bolt	9	7
Generator brace bolt (generator side)	22	16
Generator brace bolt (tightened with water pump)	23	17
Generator pivot bolt nut	44	32
Oil dipstick guide bolt	23	17
Crankshaft pulley bolt	120 -- 135	87 -- 97
Spark plug	25	18
Distributor bolt	12	9
Timing belt		
Timing belt cover bolt	11	8
Timing belt tensioner bolt	23	17
Crankshaft angle sensor bolt	9	7
Engine support bracket bolt	35	25
Camshaft sprocket bolt	88	64
Fuel and emission control system		
Fuel rail bolt	11	8
Fuel pressure regulator bolt	9	7
Throttle body bolt	18	13
Air temperature sensor	13	9
EGR valve bolt	21	15
Water pump		
Water inlet fitting bolt	22	16

2002 Mitsubishi Mirage LS

2002 ENGINES 1.5L 4-Cylinder - Mirage

Water inlet pipe bolt	12	9
Thermostat case bolt	23	17
Engine coolant temperature gauge unit	11	8
Engine coolant temperature sensor	29	21
Water pump	13	9
Intake and exhaust manifolds		
Intake manifold bolt and nut	17	12
Intake manifold stay bolt	M8	17
	M10	21
Exhaust manifold cover bolt	29	21

Torque Specifications (2 Of 2)

Item	Nm	ft.lbs.
Exhaust manifold nut	17	12
Rocker arms and camshaft		
Rocker cover bolt	4	3
Rocker shaft bolt	31	22
Cylinder head and valves		
Cylinder head bolt [Tighten to 49 N.m (35 ft.lbs.), then completely loosen and retighten as described.]	20 + 90° + 90°	15 + 90° + 90°
Oil pump and oil pan		
Oil pan bolt	7	5
Drain plug	39	28
Oil screen bolt	18	13
Front case bolt	13	9
Relief plug	44	32
Oil pump cover bolt	10	7
Pistons and connecting rods		
Connecting rod nut	17 + 90° to 100°	12 + 90° to 100°
Crankshaft and cylinder block		
Flywheel bolt <M/T>	132	95
Drive plate bolt <A/T>	132	95
Rear plate bolt	10	7
Bell housing cover bolt	10	7
Rear oil seal case bolt	11	8
Bearing cap bolt	51	37
Oil pressure switch	18	13

SEALANTS

2002 Mitsubishi Mirage LS

2002 ENGINES 1.5L 4-Cylinder - Mirage

Item	Specified sealant	Quantity
Water pump	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
Front case	Mitsubishi Genuine Part No. MD970389 or equivalent	As required
Oil pan	Mitsubishi Genuine Part No. MD970389 or equivalent	As required
Oil pressure switch	3M™ AAD Part No. 8672 or equivalent	As required

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Fig. 67: Sealants

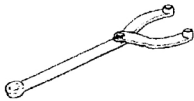
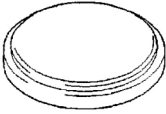
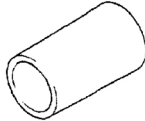
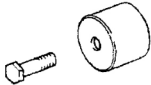
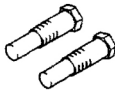
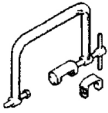
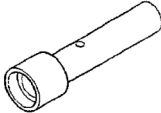
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OVERHAUL

SPECIAL TOOLS

2002 Mitsubishi Mirage LS

2002 ENGINES 1.5L 4-Cylinder - Mirage

Tool	Tool number and name	Supersession	Application
	MB990767 End yoke holder Use with MD998715	MB990767-01 Use with MIT308239	Holding camshaft sprocket when loosening or torquing bolt
	MD998011 Crankshaft rear oil seal installer	MD998011-01 Use with MB990938-01	Installation of crankshaft rear oil seal
	MD998304 Crankshaft front oil seal installer	MD998304-01	Installation of crankshaft front oil seal
	MD998305 Crankshaft front oil seal guide	MD998305-01	Installation of crankshaft front oil seal.
	MD998713 Camshaft oil seal installer	MD998713-01	Installation of camshaft oil seal
	MD998715 Pulley holding pins (2)	MIT308239	Holding camshaft sprocket when loosening or torquing bolt
	MD998727 Oil pan remover	MD998727-01	Removal of oil pan
	MD998735 Valve spring compressor	MD998735-01	Compression of valve spring
	MD998760 Valve stem seal installer	MD998760-01	Installation of valve stem seal.

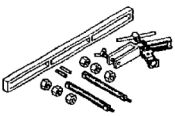
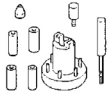
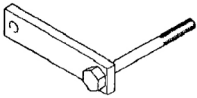
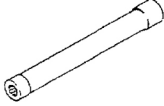
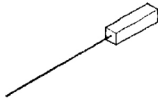
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Fig. 68: Special Tools (1 Of 2)

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2002 Mitsubishi Mirage LS

2002 ENGINES 1.5L 4-Cylinder - Mirage

Tool	Tool number and name	Supersession	Application
	MD998772 Valve spring compressor	General service tool	Compressing valve spring.
	MD998780 Piston pin setting tool	MIT216941	Removal and installation of piston pin
	MD998781 Flywheel stopper	General service tool	Holding flywheel
	MB991659 Guide-D	-	Guide for removal and Press-fitting of piston pins
	MB991653 Cylinder head bolt wrench	General service tool	Loosening and torquing of cylinder head bolt
	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.

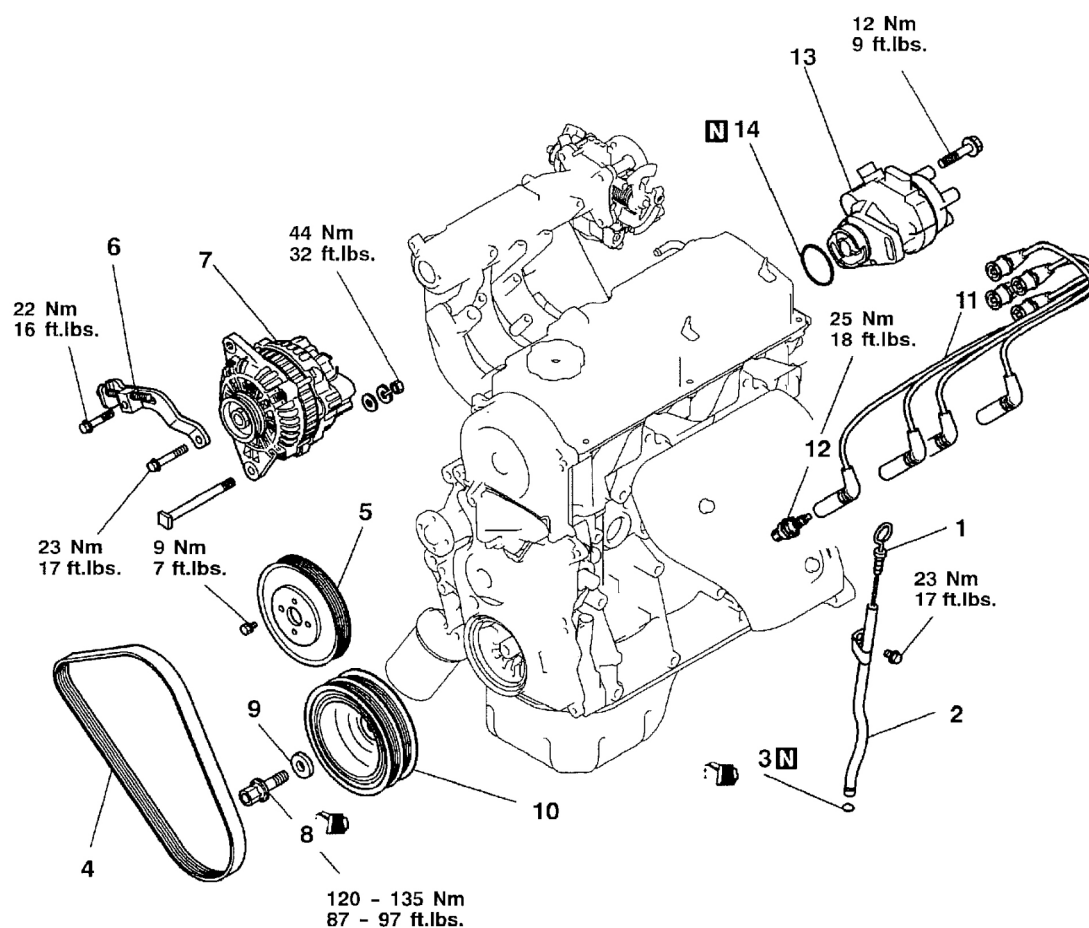
G01185245

Fig. 69: Special Tools (2 Of 2)

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

GENERATOR AND IGNITION SYSTEM

REMOVAL AND INSTALLATION



Removal steps

1. Oil dipstick
2. Oil dipstick guide
3. O-ring
4. Drive belt
5. Water pump pulley
6. Generator brace
7. Generator

8. Crankshaft pulley bolt
9. Crankshaft pulley washer
10. Crankshaft pulley
11. Spark plug cables
12. Spark plugs
13. Distributor
14. O-ring

G01185246

Fig. 70: 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.

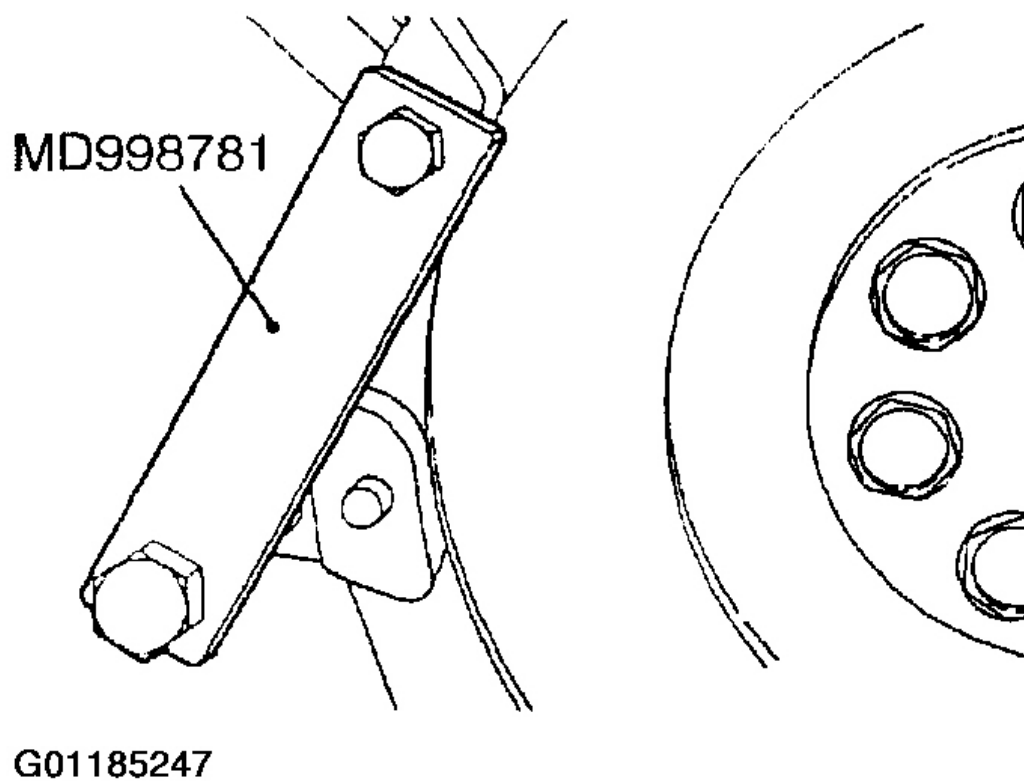
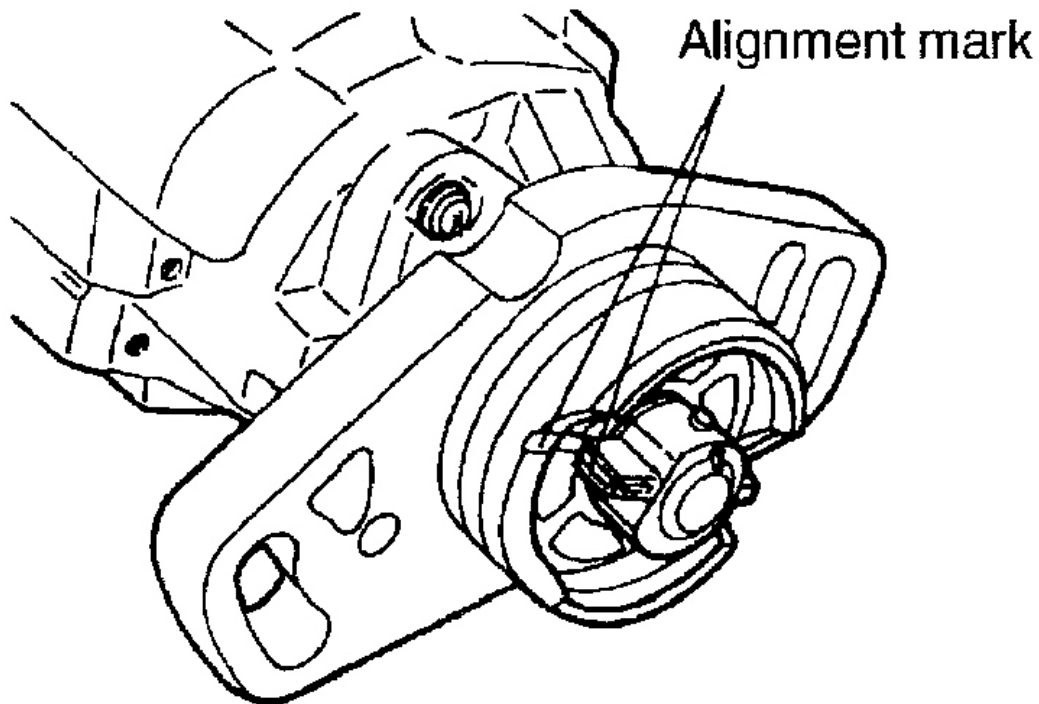


Fig. 71: Locking Flywheel Or Drive Plate
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

INSTALLATION SERVICE POINTS

>A< DISTRIBUTOR INSTALLATION

1. Turn the crankshaft clockwise until cylinder No. 1 is at top dead center on its compression stroke.
2. Align the alignment marks on the distributor housing and coupling.



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Fig. 72: Aligning Alignment Marks On Distributor Housing & Coupling
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. Install the distributor onto the engine, and tighten the mounting bolts to the specified torque.

>B< CRANKSHAFT BOLT INSTALLATION

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

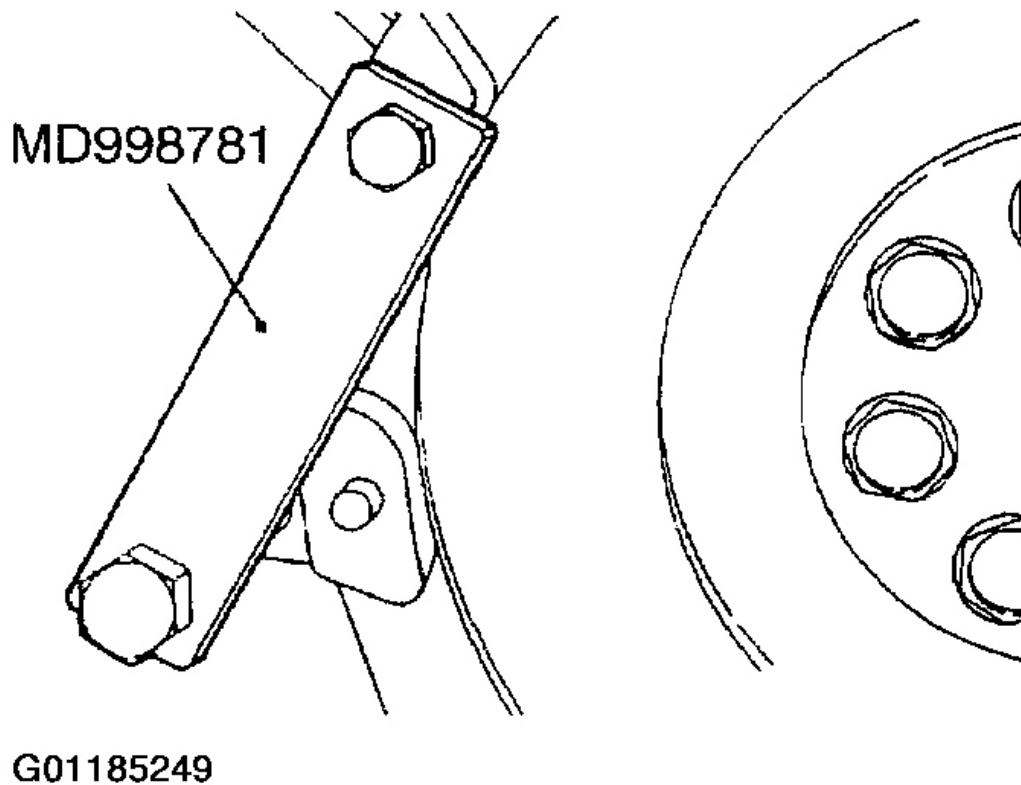
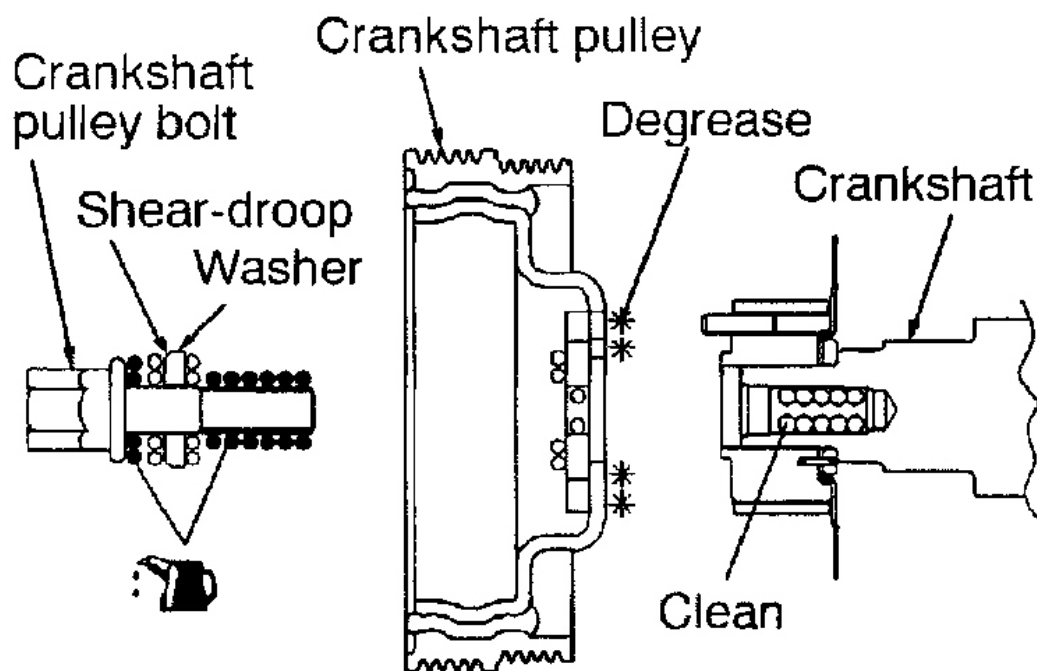


Fig. 73: Locking Flywheel Or Drive Plate

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 bolt seating surfaces.
6. Install the washer so that the worn section on the outer diameter is facing toward the seating surface of the crankshaft pulley bolt.



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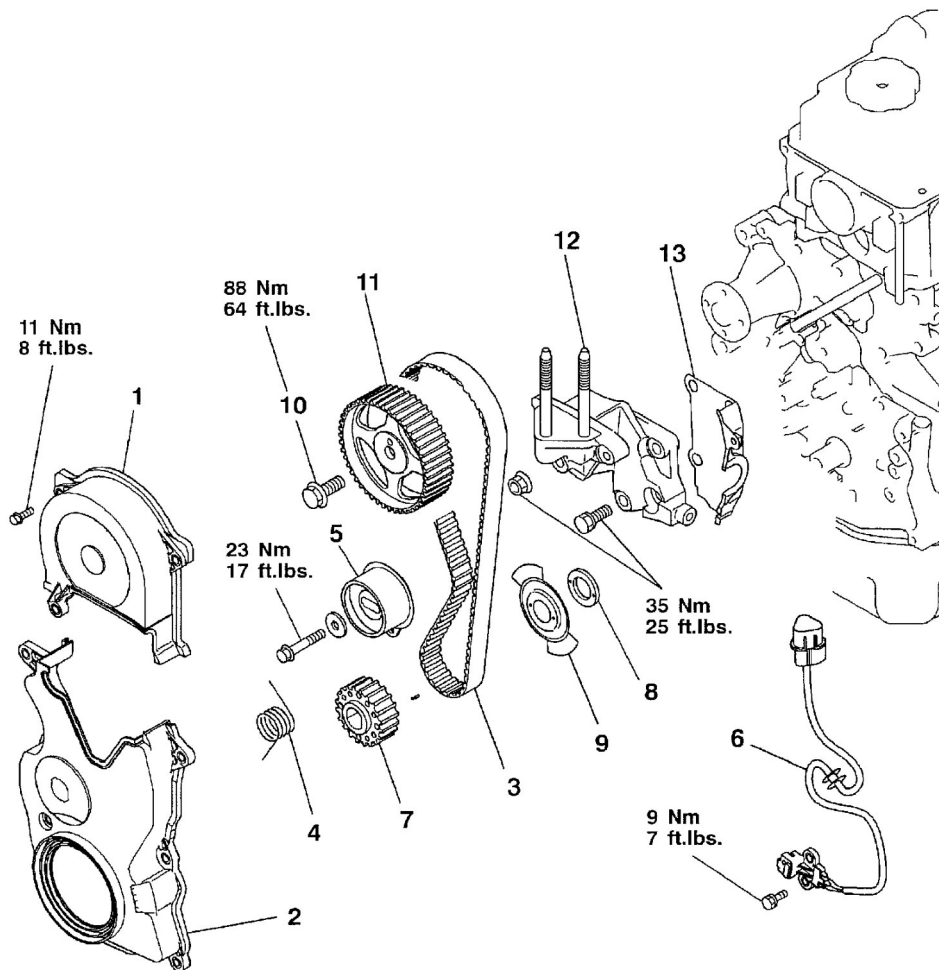
Fig. 74: Installing Crankshaft Bolt

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

7. Tighten the crankshaft bolt to the specified torque of 120 - 135 Nm (87 - 97 ft.lbs.).

TIMING BELT

REMOVAL AND INSTALLATION



Removal steps

- | | |
|----------------------------|----|
| 1. Timing belt upper cover | ▶D |
| 2. Timing belt lower cover | ▶C |
| 3. Timing belt | ▶C |
| 4. Tensioner spring | ▶C |
| 5. Timing belt tensioner | ▶C |
| 6. Crankshaft angle sensor | ▶B |
| 7. Crankshaft sprocket | ▶B |

- | | |
|-----------------------------|----|
| 8. Crankshaft spacer | ◀B |
| 9. Crankshaft sensing blade | ◀B |
| 10. Camshaft sprocket bolt | ◀A |
| 11. Camshaft sprocket | ◀A |
| 12. Engine support bracket | |
| 13. Timing belt rear cover | |

G01185251

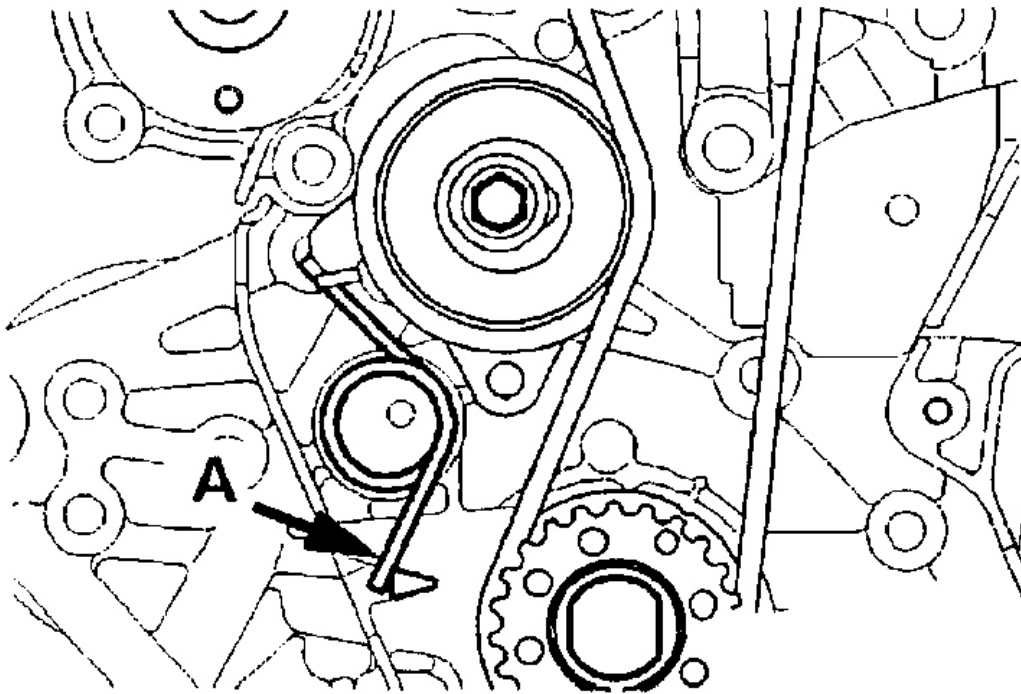
Fig. 75: Removing & Installing Timing Belt

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

REMOVAL SERVICE POINTS

< A > TIMING BELT/TENSIONER SPRING/TIMING BELT TENSIONER REMOVAL

1. Using pliers, grip the tensioner spring end (marked "A" in the illustration) and remove it from the front case lug. Then, remove the tensioner spring.

**G01185252****Fig. 76: Removing Tensioner Spring****Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

2. Remove the timing belt tensioner, and then remove the timing belt.
3. If the timing belt is to be reused, chalk an arrow on the belt to indicate the direction of rotation before removing it. This will ensure the timing belt is fitted correctly when reused.

< B > CAMSHAFT SPROCKET BOLT REMOVAL

1. Using the special tools shown in the illustration, lock the camshaft sprocket in position.

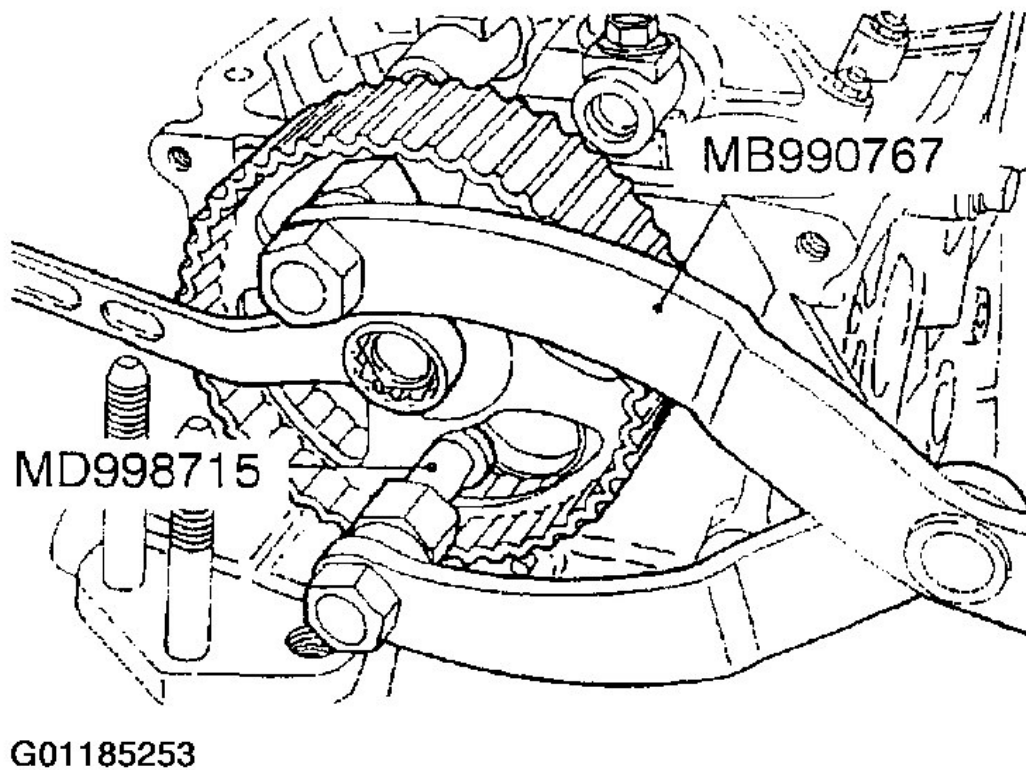


Fig. 77: Using Special Tools MB990767 & MD998715
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2. Loosen the camshaft sprocket bolt.

INSTALLATION SERVICE POINTS

>A< CAMSHAFT SPROCKET BOLT INSTALLATION

1. Using the special tools shown in the illustration, lock the camshaft sprocket in the position.
2. Tighten the camshaft sprocket bolt to the specified torque.

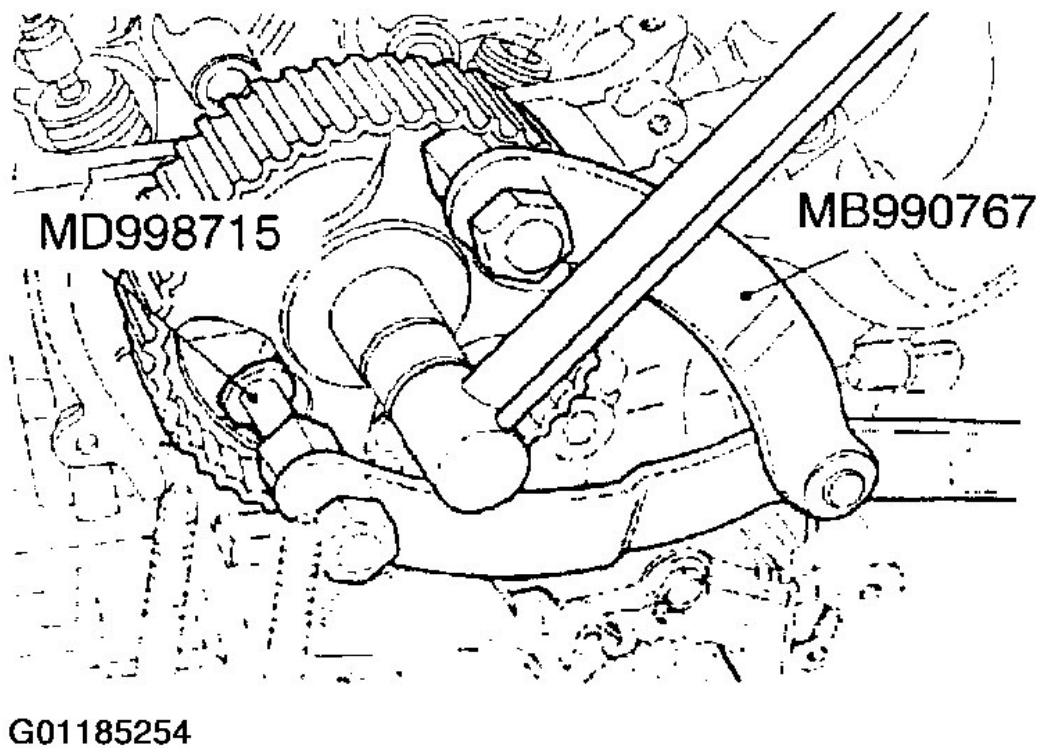
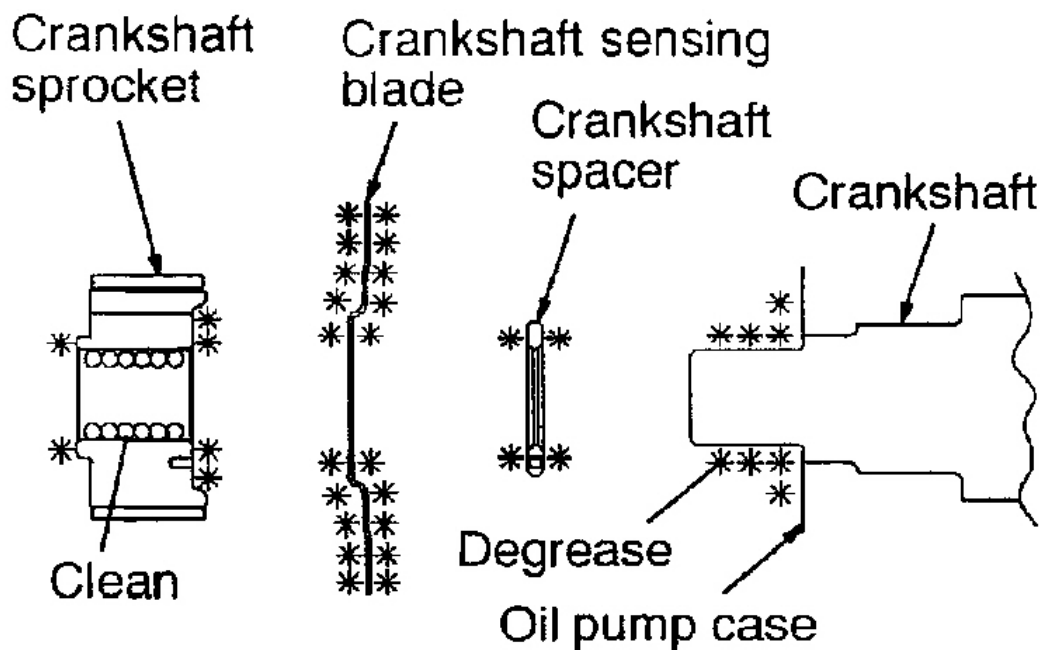


Fig. 78: Installing Camshaft Sprocket Bolt
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>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.**

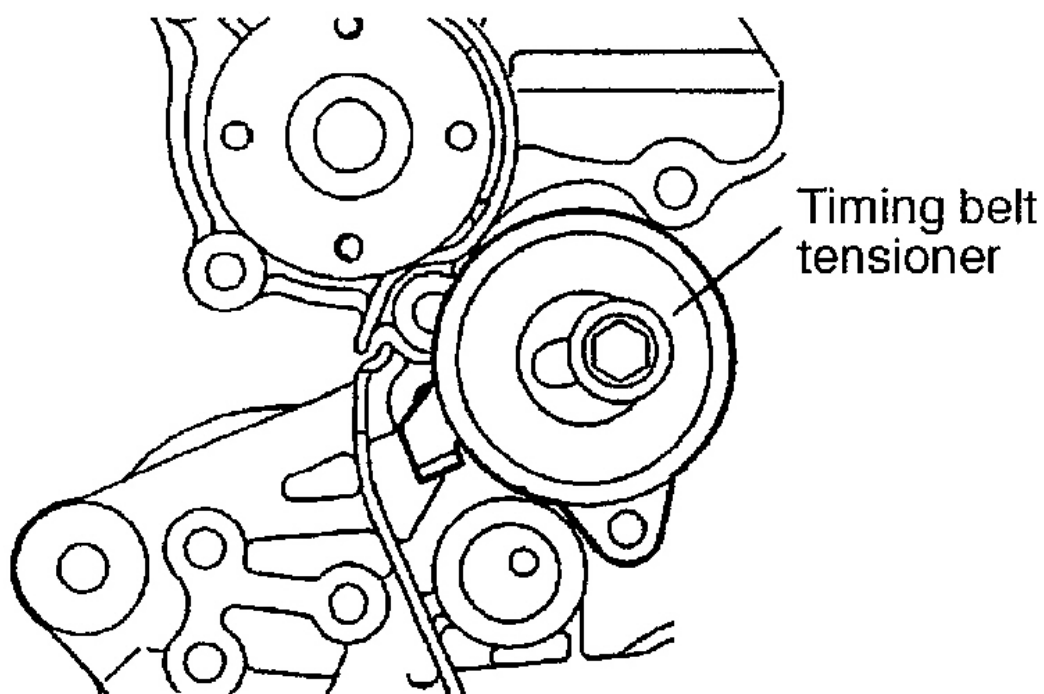


G01185255

Fig. 79: Cleaning Mating Surfaces Of Crankshaft Sprocket, Crankshaft, Sensing Blade & Spacer
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>C< TIMING BELT TENSIONER/TENSIONER SPRING INSTALLATION

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

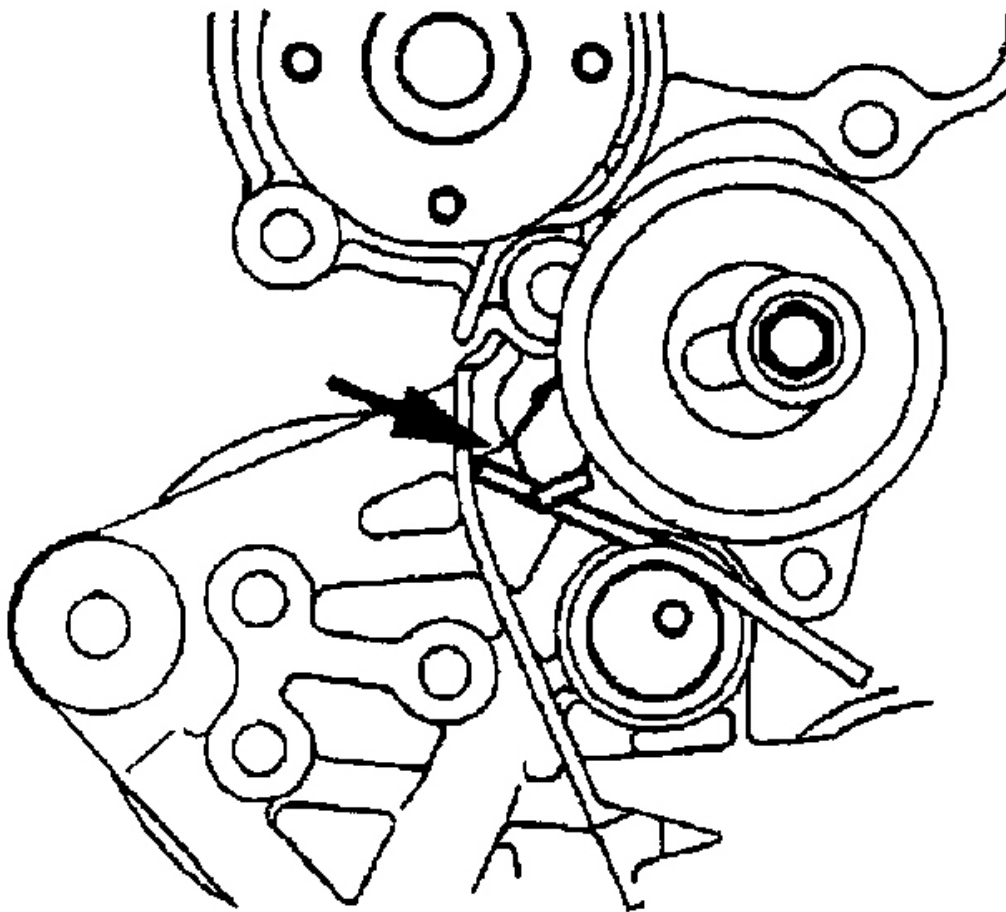


G01185256

Fig. 80: Installing Timing Belt Tensioner

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2. Install the tensioner spring onto the boss of the front case, and then hook the spring end to the tensioner arm.

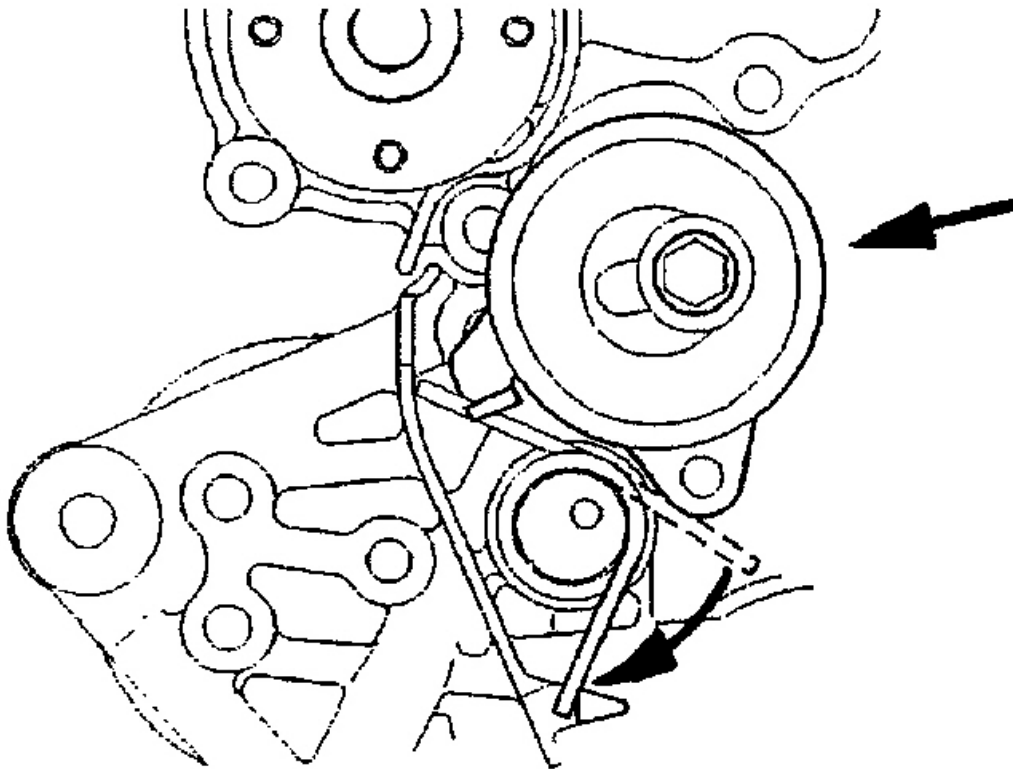


G01185257

Fig. 81: Installing Tensioner Spring

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. Grip the other end of the tensioner spring projection and then hook it onto the front case lug as shown in the illustration.
4. Move the timing belt tensioner in the direction shown and temporarily tighten the bolt.



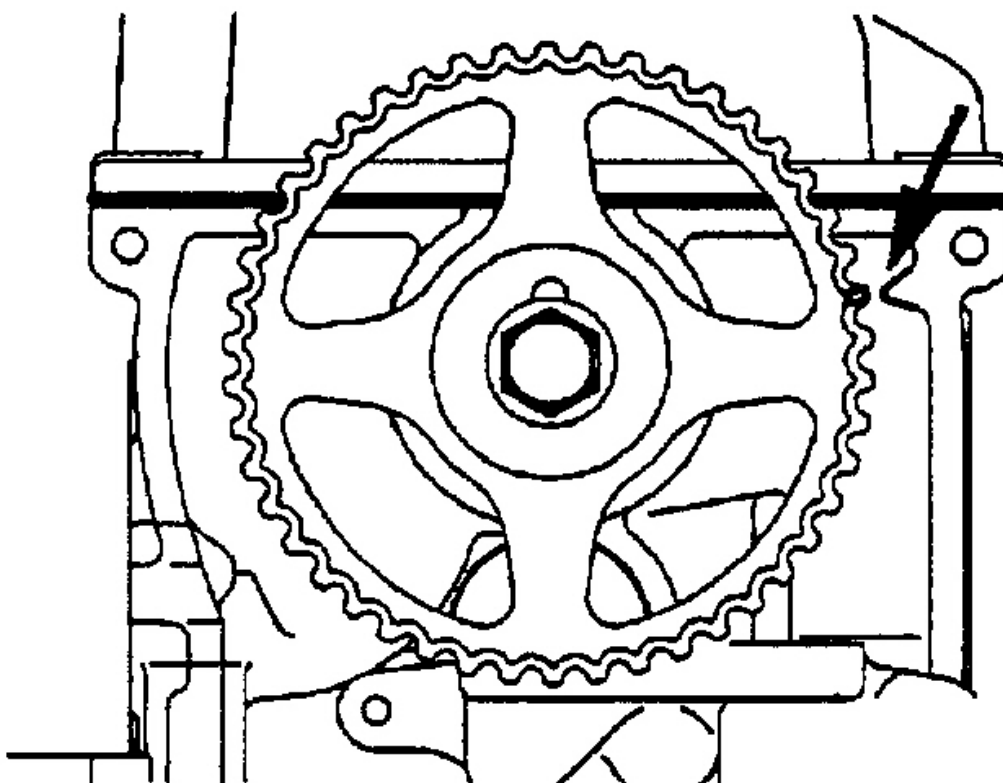
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Fig. 82: Moving Timing Belt Tensioner

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>D< TIMING BELT INSTALLATION

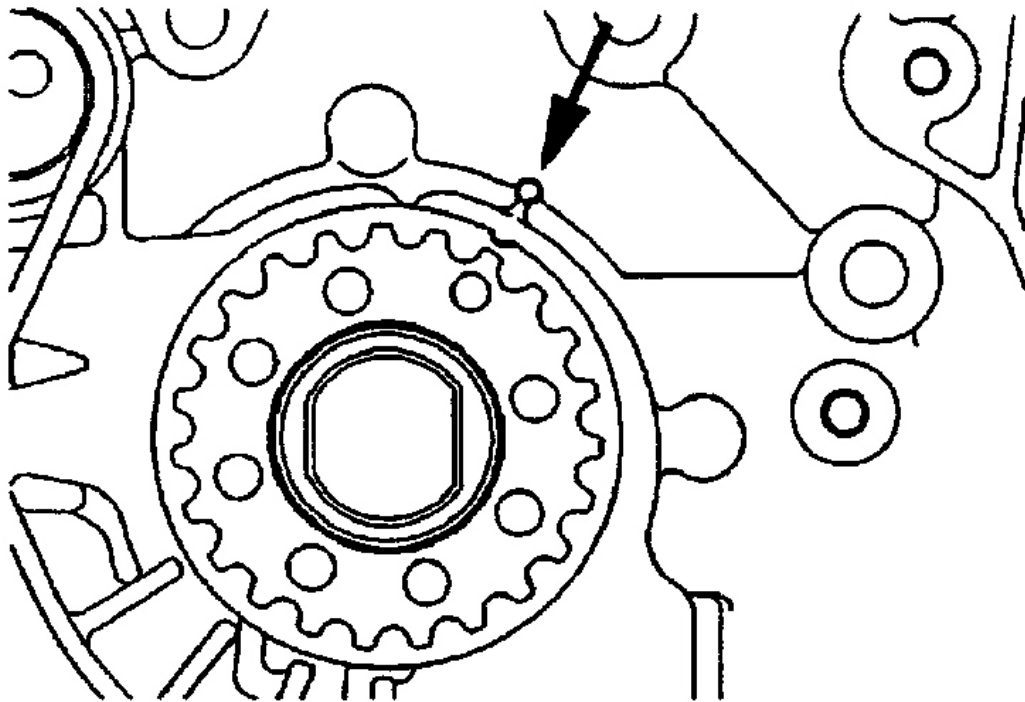
1. Align the camshaft sprocket timing mark with the timing mark on the cylinder head.



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Fig. 83: Aligning Camshaft Sprocket Timing Mark With The Timing Mark On The Cylinder Head
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

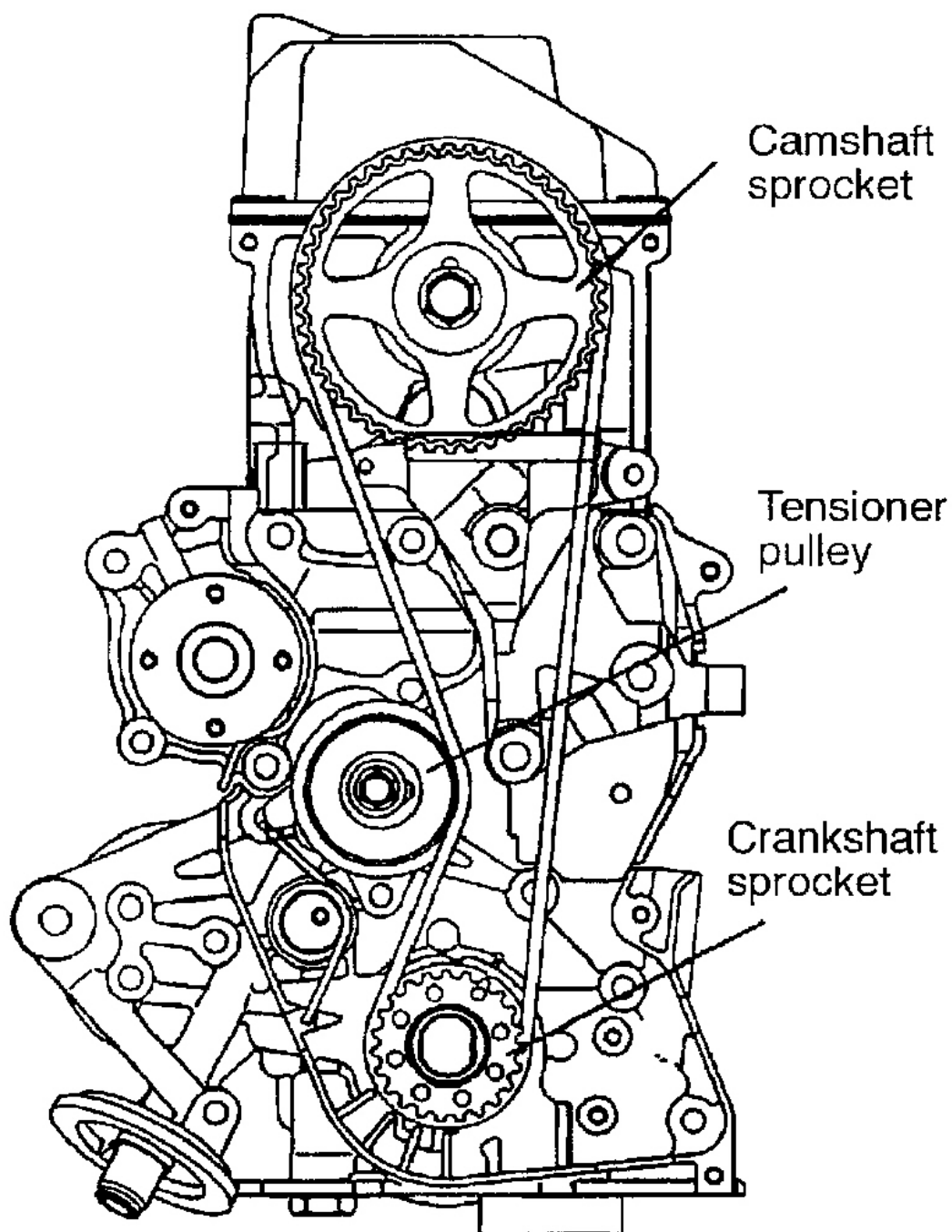
2. Align the crankshaft sprocket timing mark with the timing mark on the front case.



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

3. Keeping the tension side of the timing belt tight, fit the timing belt onto the crankshaft sprocket, camshaft sprocket and tensioner in that order.



G01185261

Fig. 85: Fitting Timing Belt Onto The Crankshaft Sprocket, Camshaft Sprocket & Tensioner
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

4. Loosen the timing belt tensioner mounting bolt by 1/4 to 1/2 of a turn and allow the tensioner spring to apply tension to the timing belt.
5. Turn the crankshaft twice clockwise and check that the all timing marks are correctly aligned.

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 counter-clockwise.

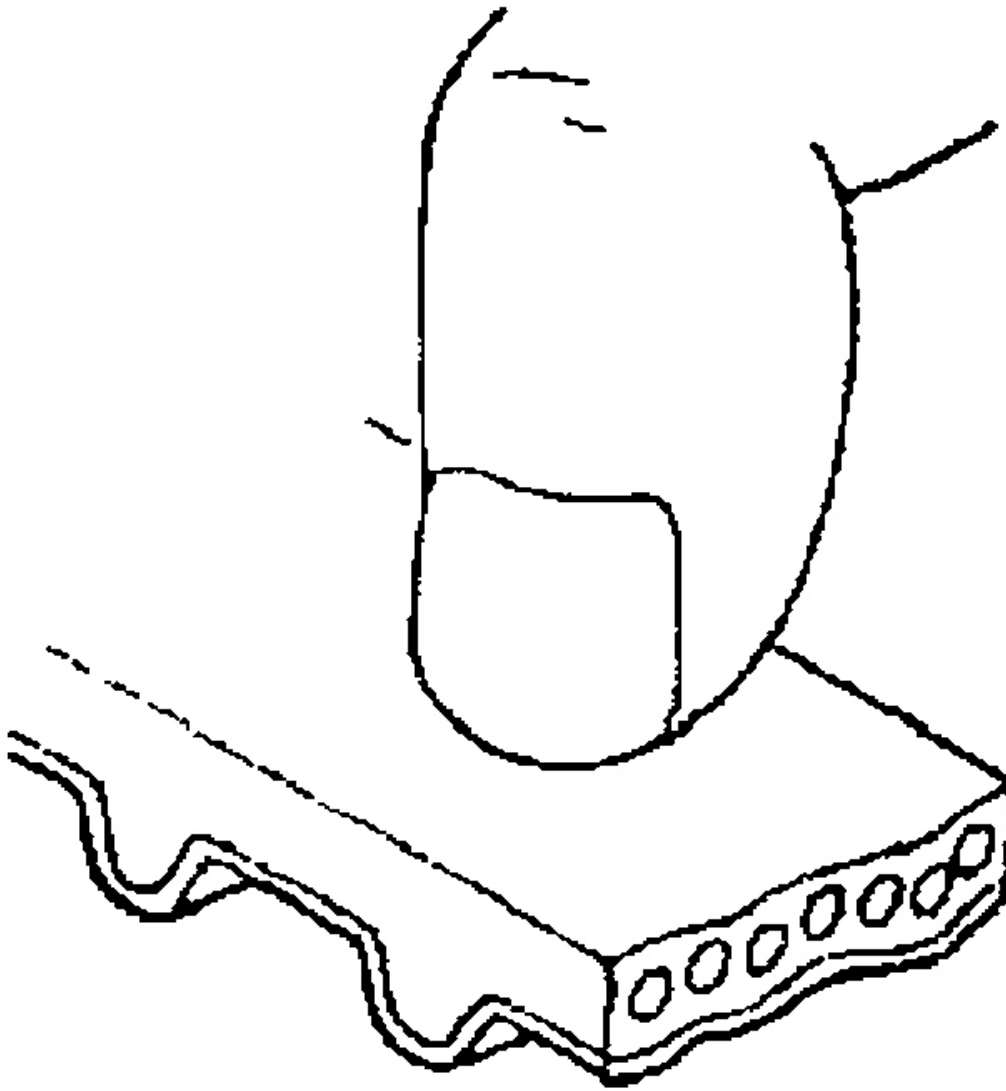
6. Tighten the timing belt tensioner mounting bolt to the specified torque.

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).



G01185262

Fig. 86: 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.

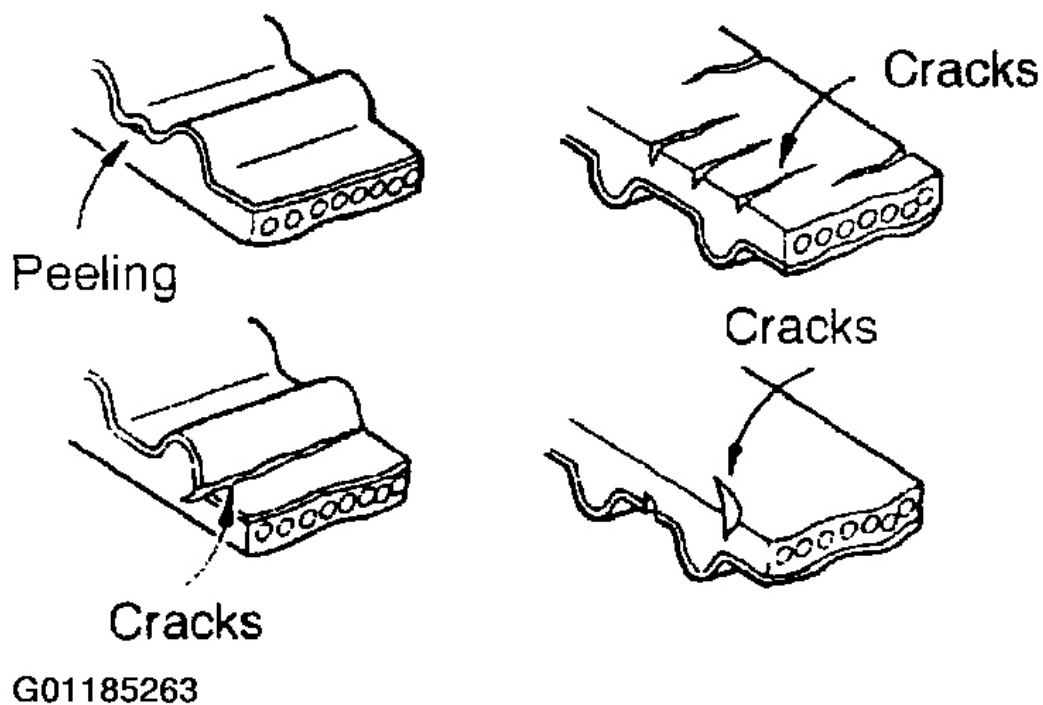


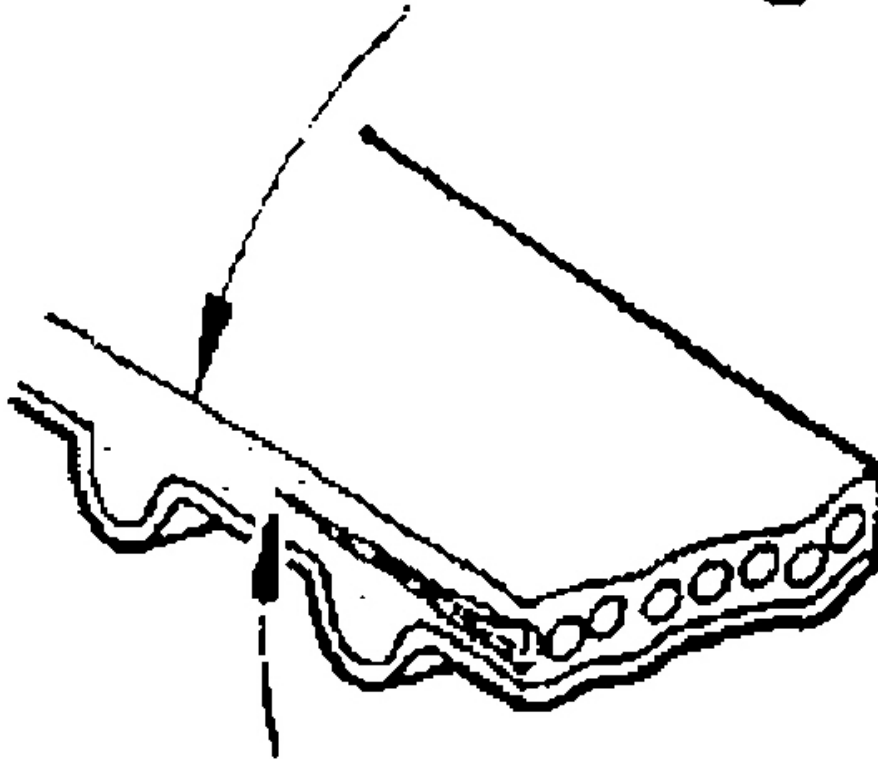
Fig. 87: Checking Cracks On Timing Belt

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.

Rounded edge



Abnormal wear (exposed core wire)

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Fig. 88: Checking Abnormal Wear On Timing Belt Sides
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

7. Abnormal wear on teeth.

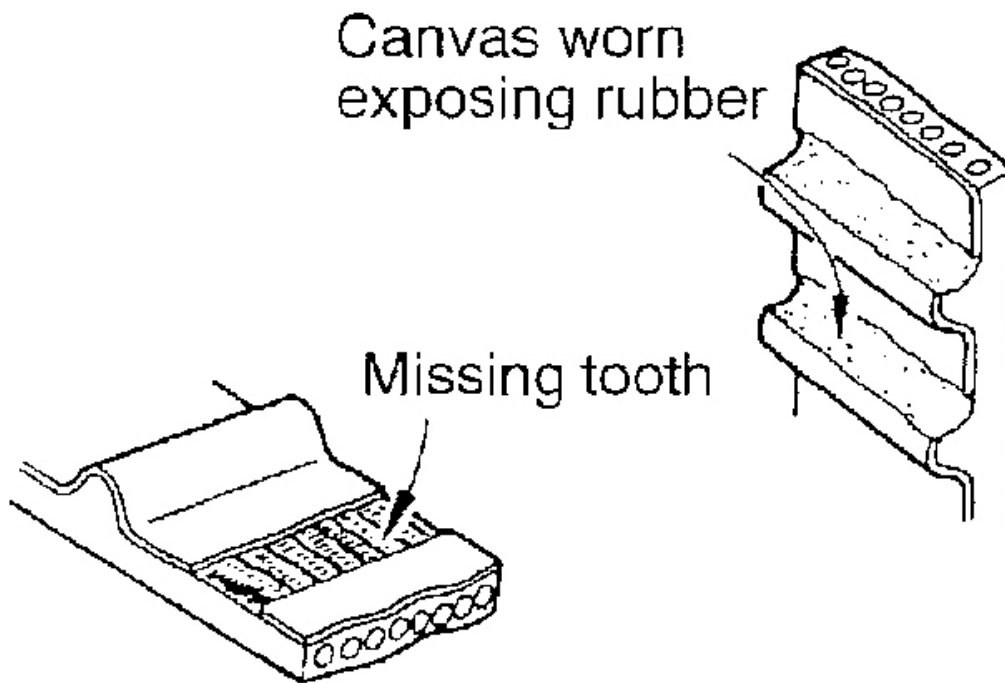
Initial stage:

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.

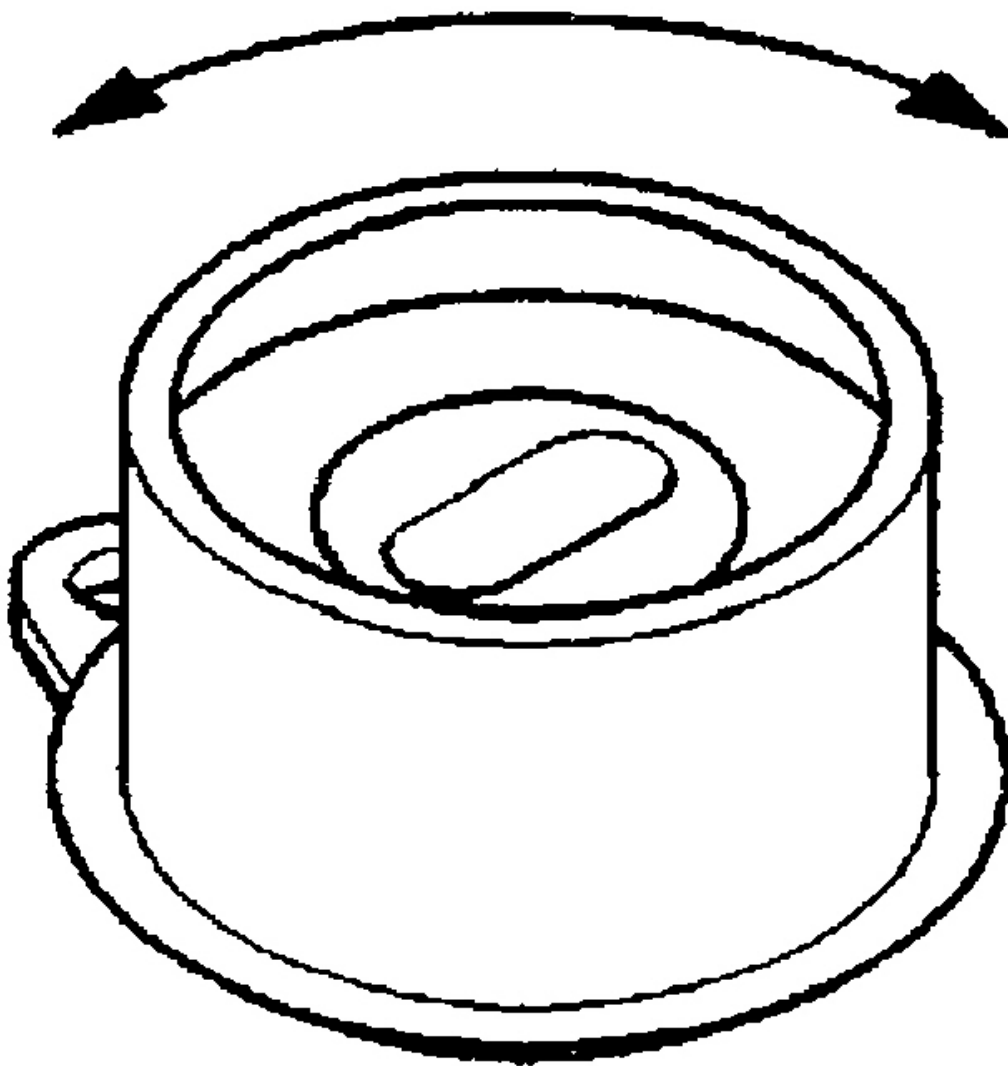


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Fig. 89: Checking For Missing Tooth On Timing Belt
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

TENSIONER PULLEY

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



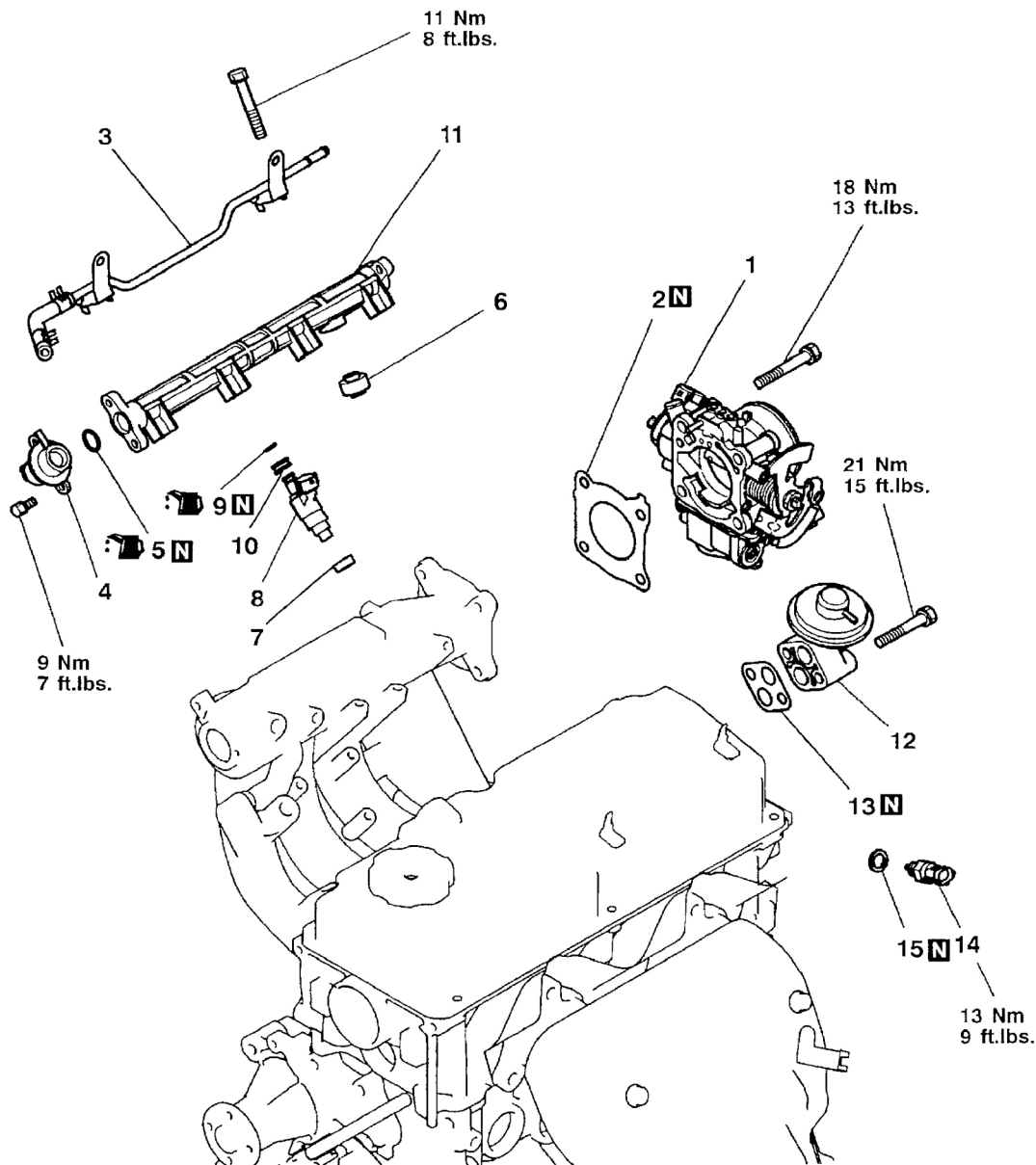
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Fig. 90: Checking Tensioner Pulley

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

FUEL AND EMISSION CONTROL SYSTEM

REMOVAL AND INSTALLATION



Removal steps

- | | | |
|-----|----------------------------|----------------------------|
| ►C◄ | 1. Throttle body assembly | 9. O-ring |
| ►B◄ | 2. Gasket | 10. Grommet |
| | 3. Fuel return pipe | 11. Fuel rail |
| | 4. Fuel pressure regulator | 12. EGR valve |
| | 5. O-ring | 13. Gasket |
| | 6. Insulator | 14. Air temperature sensor |
| ►A◄ | 7. Insulator | 15. Gasket |
| | 8. Injector | |

G01185267

Fig. 91: Removing & Installing Fuel & Emission Control System
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

INSTALLATION SERVICE POINTS**>A< INJECTOR 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.

CAUTION: If the injector does not rotate smoothly, its O-ring may be binding. If this occurs, remove the injector from the fuel rail, check the O-ring, and re-insert the injector.

>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.

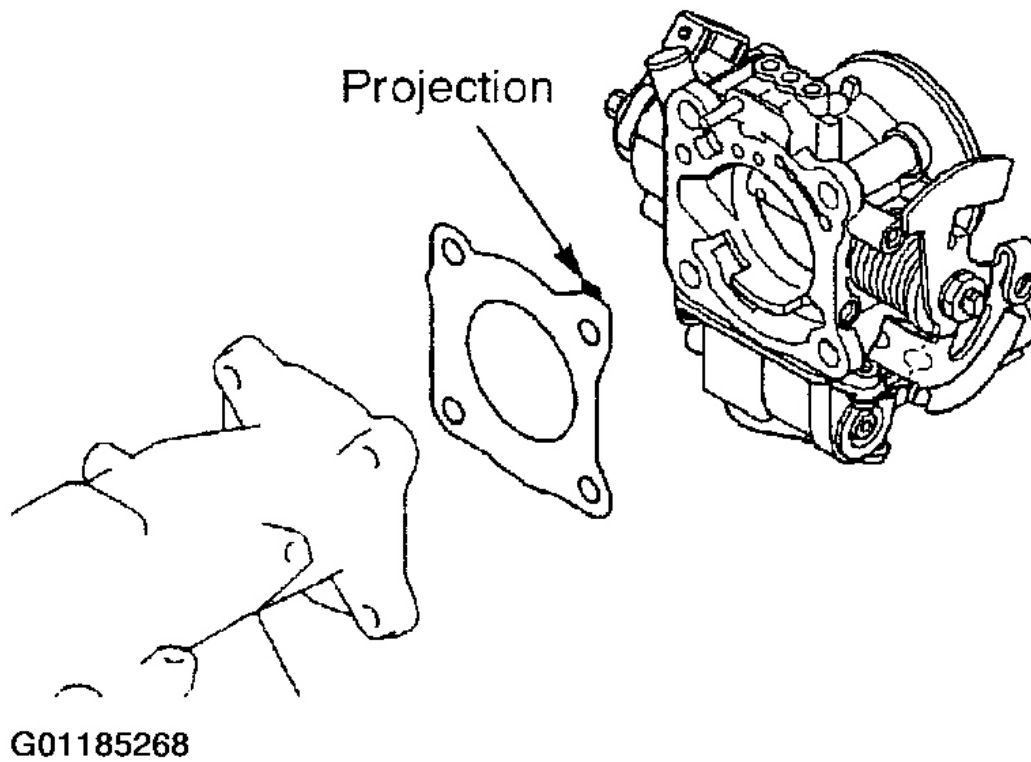
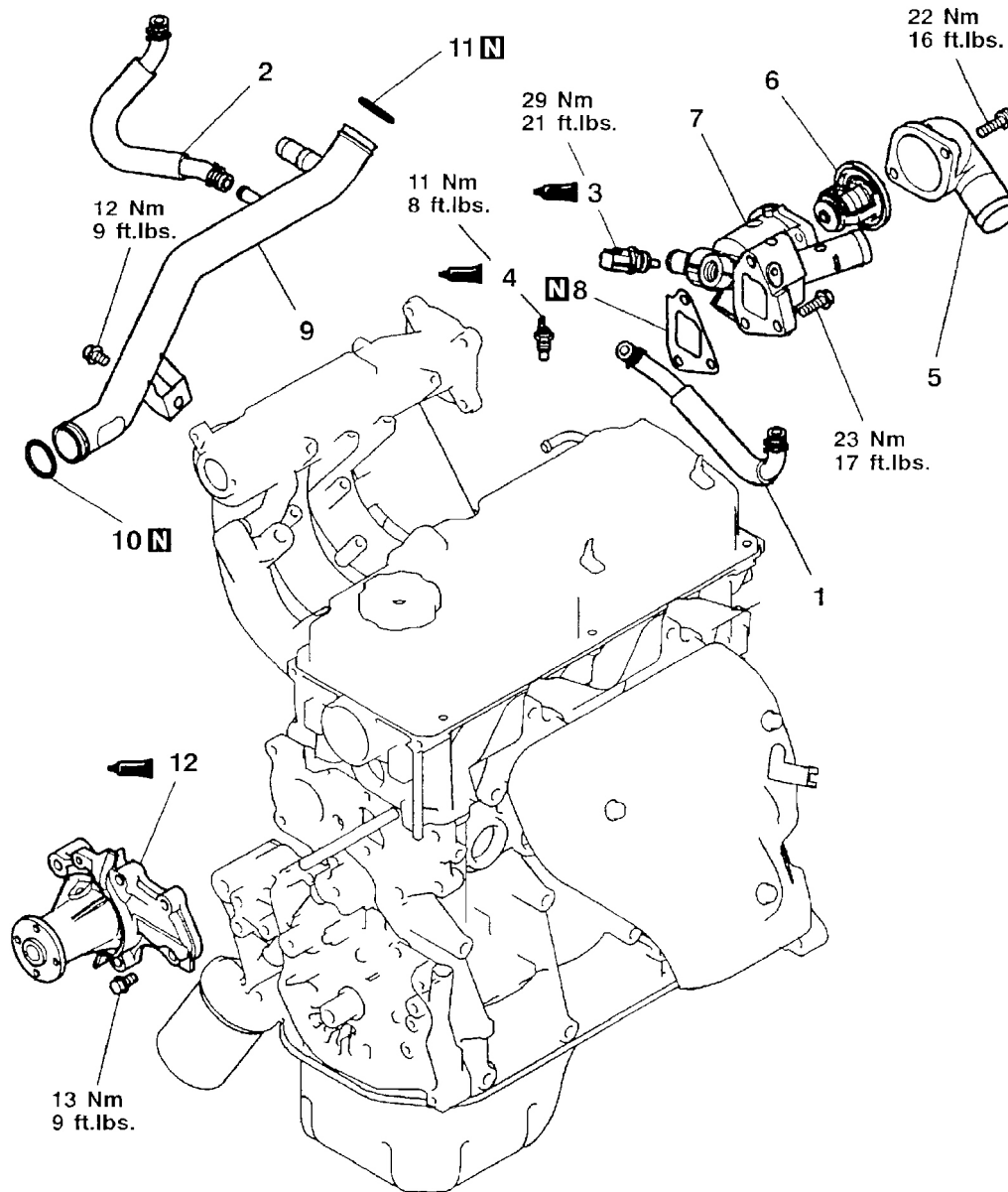


Fig. 92: Installing Gasket

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

WATER PUMP AND WATER HOSE

REMOVAL AND INSTALLATION



Removal steps

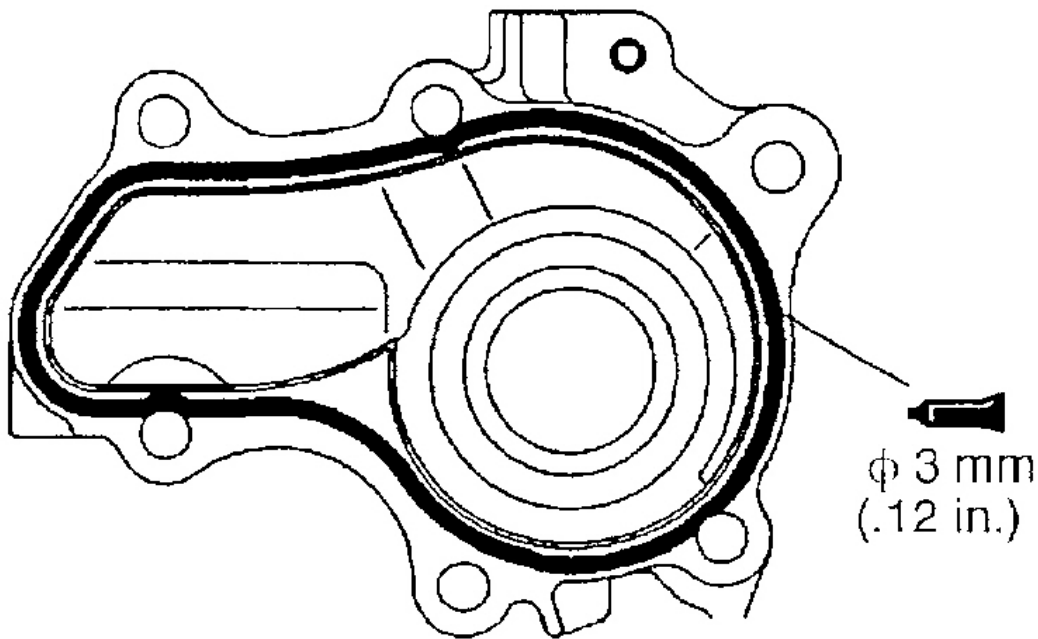
- | | |
|--|-------------------------|
| 1. Water hose | 7. Thermostat case |
| 2. Water hose | 8. Gasket |
| ▶E◀ 3. Engine coolant temperature sensor | ▶B◀ 9. Water inlet pipe |
| ▶D◀ 4. Engine coolant temperature gauge unit | ▶B◀ 10. O-ring |
| 5. Water inlet fitting | ▶B◀ 11. O-ring |
| ▶C◀ 6. Thermostat | ▶A◀ 12. Water pump |

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Fig. 93: 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 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 water pump within 15 minutes after applying the sealant.

**G01185270****Fig. 94: 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.

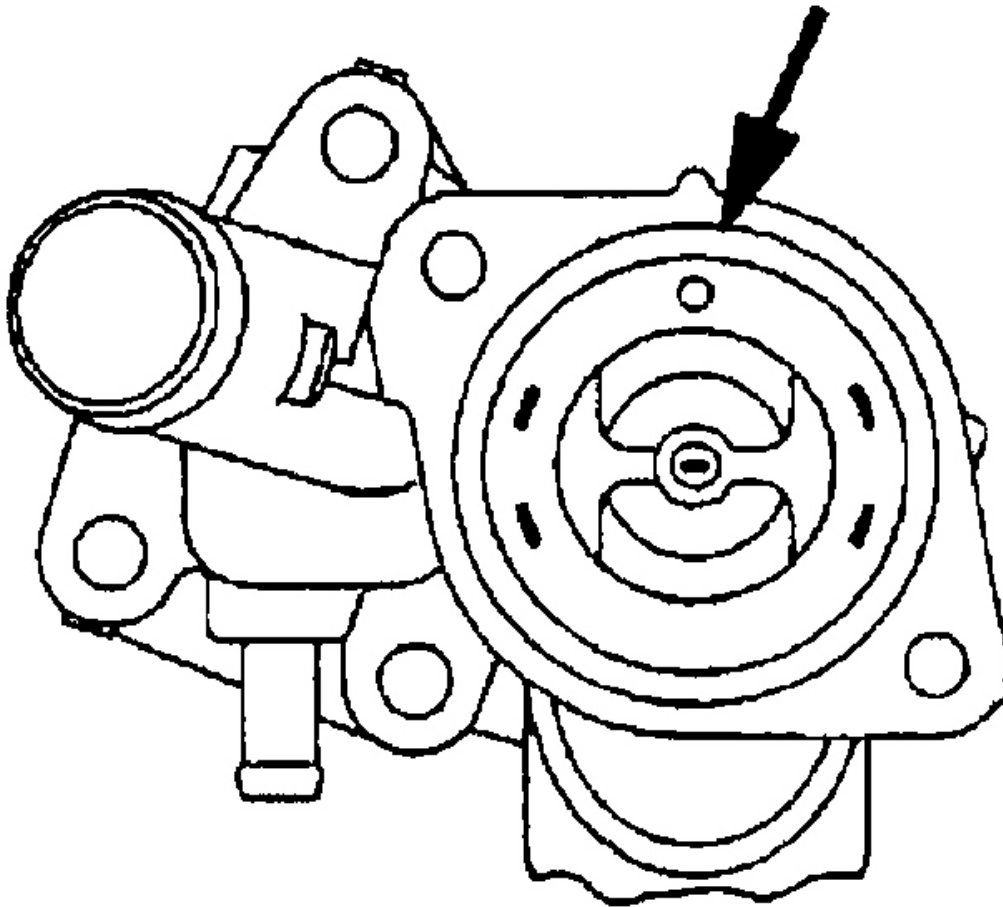
Specified sealant:**Mitsubishi Genuine Part No. MD970389 or equivalent.****>B< O-RING/WATER PIPE INSTALLATION**

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 thermostat case.

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

>C< THERMOSTAT INSTALLATION

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



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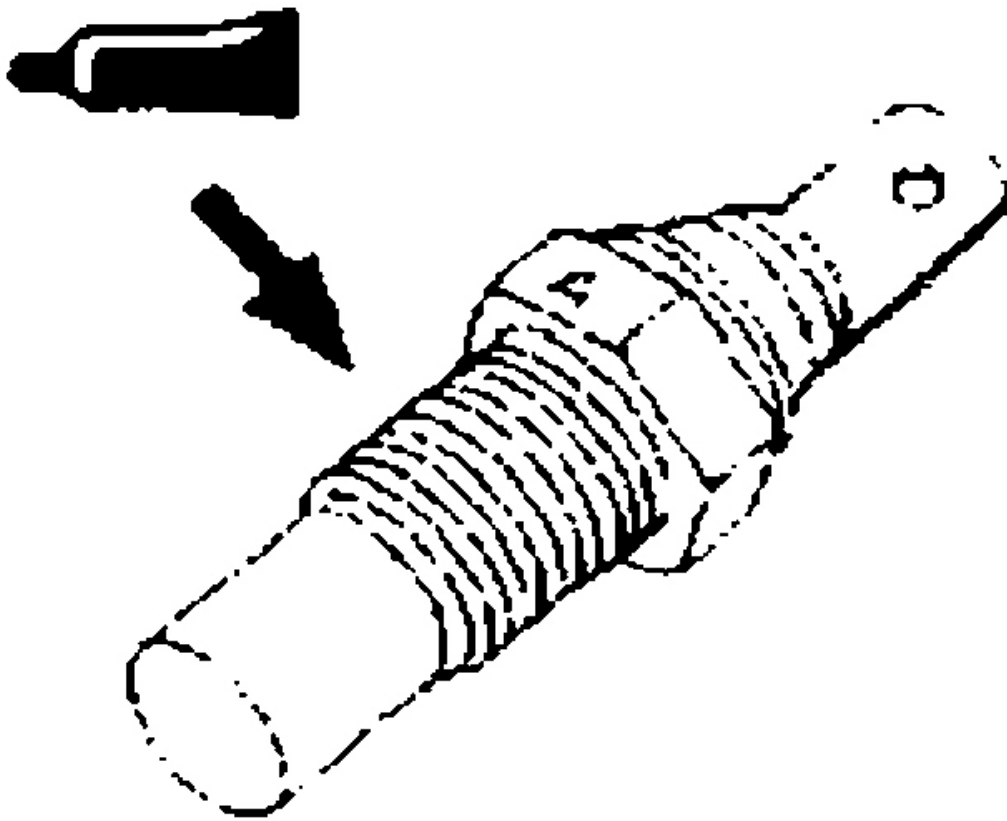
Fig. 95: Installing Thermostat
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>D< ENGINE COOLANT TEMPERATURE GAUGE UNIT INSTALLATION

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

Specified sealant:

3M™ AAD Part No. 8672 or equivalent.



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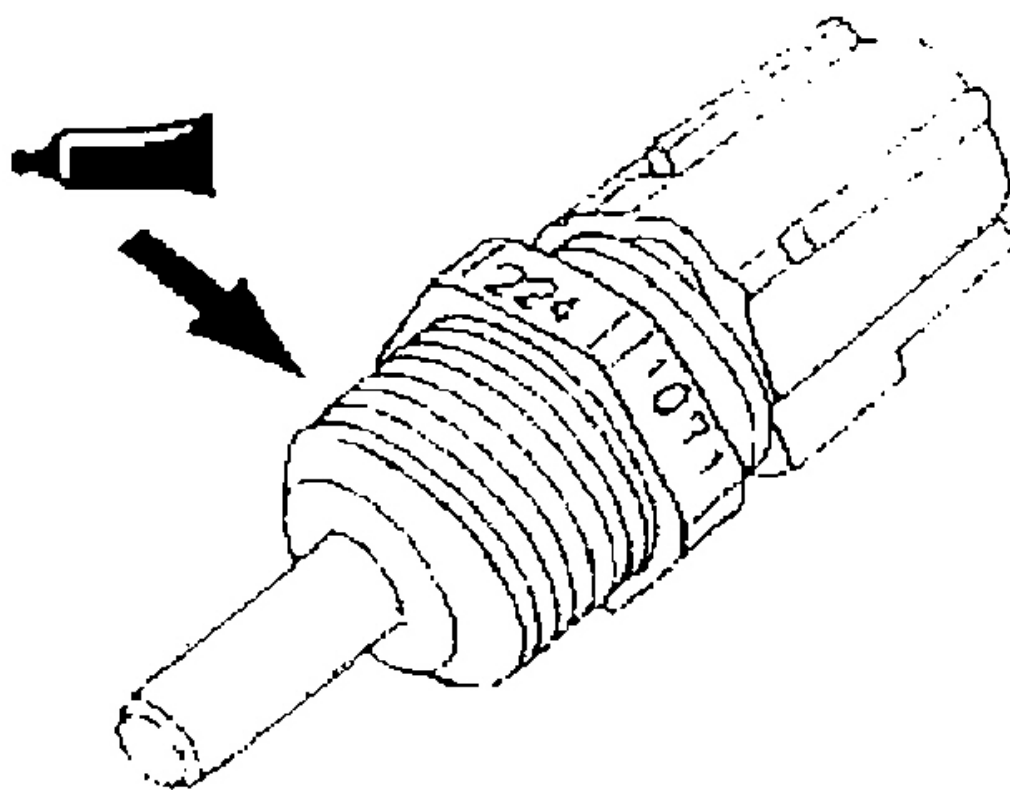
Fig. 96: Applying Sealant To Gauge Unit
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>E< ENGINE COOLANT TEMPERATURE SENSOR INSTALLATION

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

Specified sealant:

3M™ AAD Part No. 8731 or equivalent.

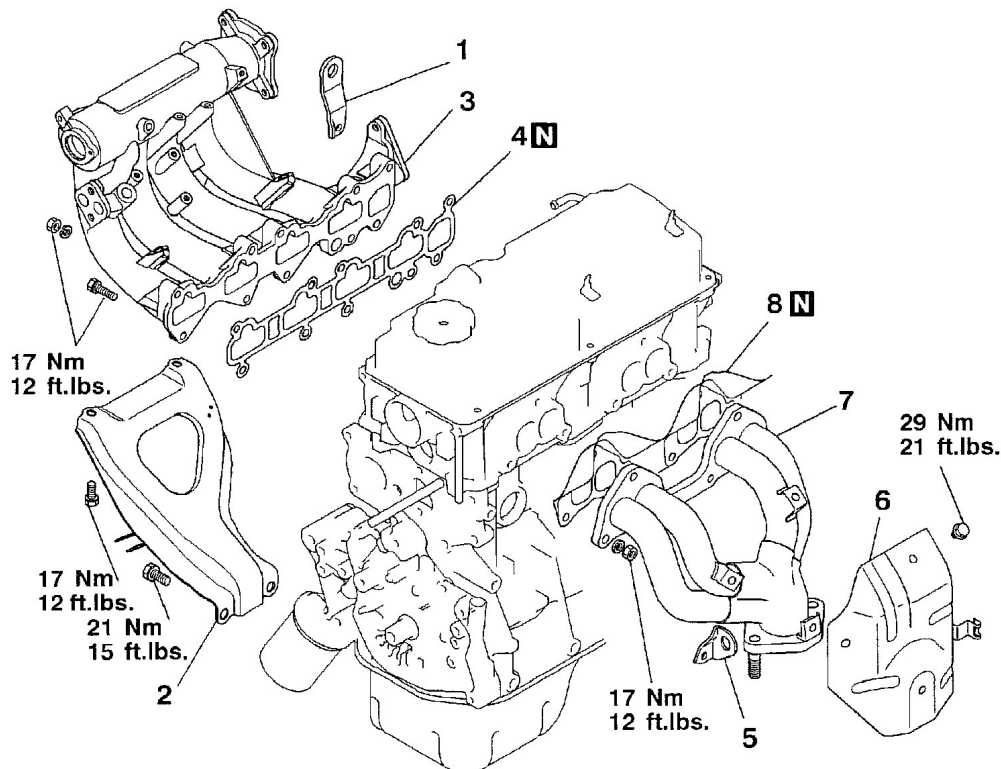


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Fig. 97: Applying Sealant To Sensor Thread
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

INTAKE AND EXHAUST MANIFOLDS

REMOVAL AND INSTALLATION



Removal steps

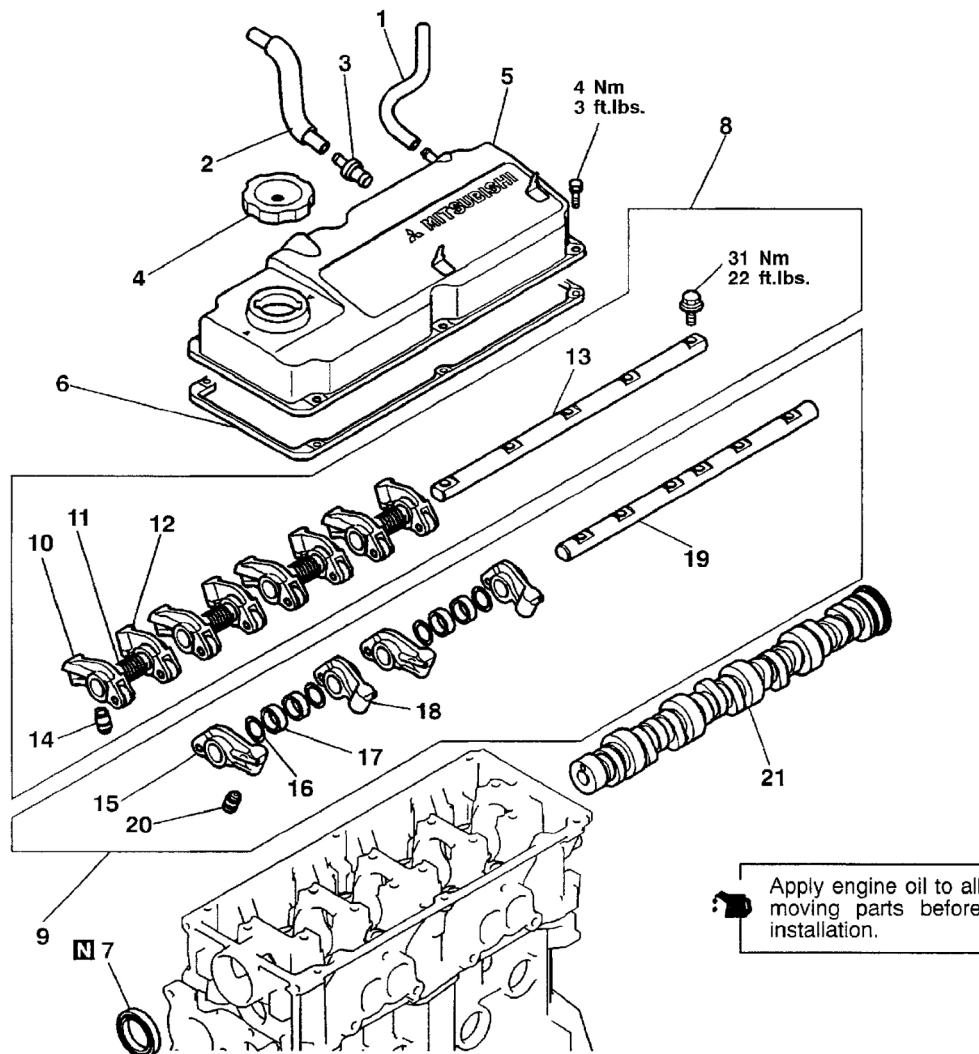
- | | |
|---------------------------|----------------------------|
| 1. Engine hanger | 5. Engine hanger |
| 2. Intake manifold stay | 6. Exhaust manifold cover |
| 3. Intake manifold | 7. Exhaust manifold |
| 4. Intake manifold gasket | 8. Exhaust manifold gasket |

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Fig. 98: Removing & Installing Intake & Exhaust Manifolds
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

ROCKER ARMS AND CAMSHAFT

REMOVAL AND INSTALLATION



Removal steps

1. Breather hose
2. PCV hose
3. PCV valve
4. Oil filler cap
5. Rocker cover
6. Rocker cover gasket
7. Camshaft oil seal
8. Rocker arm and shaft assembly (intake)
9. Rocker arm and shaft assembly (exhaust)

10. Rocker arm A
11. Rocker arm spring
12. Rocker arm B
13. Rocker arm shaft
14. Lash adjuster
15. Rocker arm C
16. Wave washer
17. Spacer
18. Rocker arm D
19. Rocker arm shaft
20. Lash adjuster
21. Camshaft

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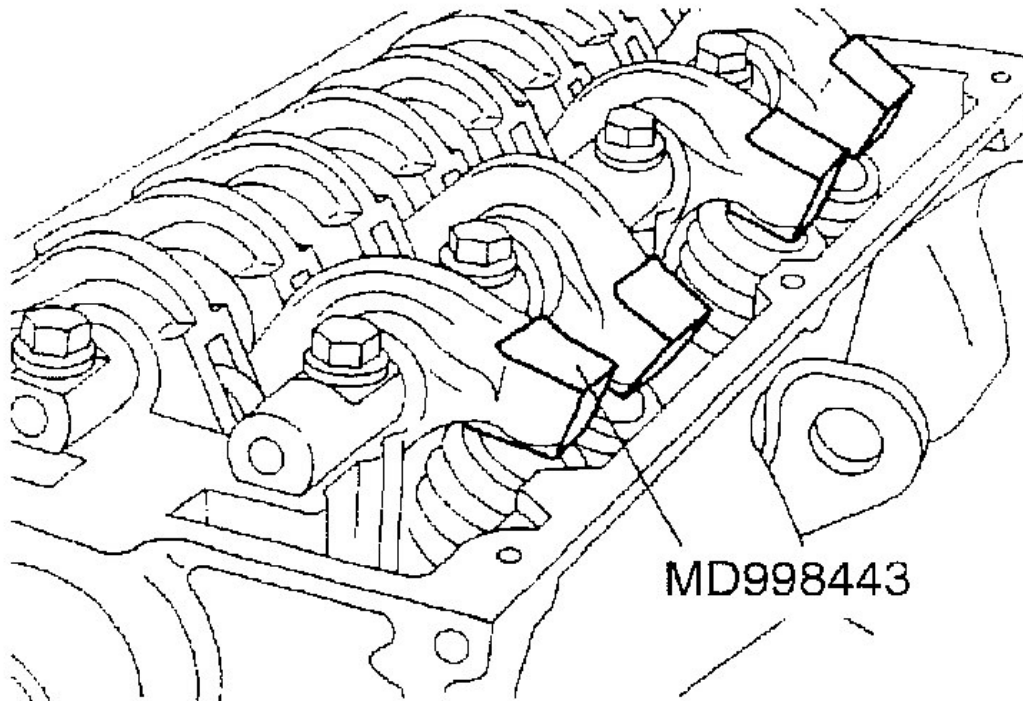
Fig. 99: Removing & Installing Rocker Arms & Camshaft
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

REMOVAL SERVICE POINTS

< A > ROCKER ARM AND ROCKER ARM SHAFT REMOVAL

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

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



G01185276

Fig. 100: Setting Special Tool MD998443
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

INSTALLATION SERVICE POINT

>A< LASH ADJUSTER INSTALLATION

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

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.

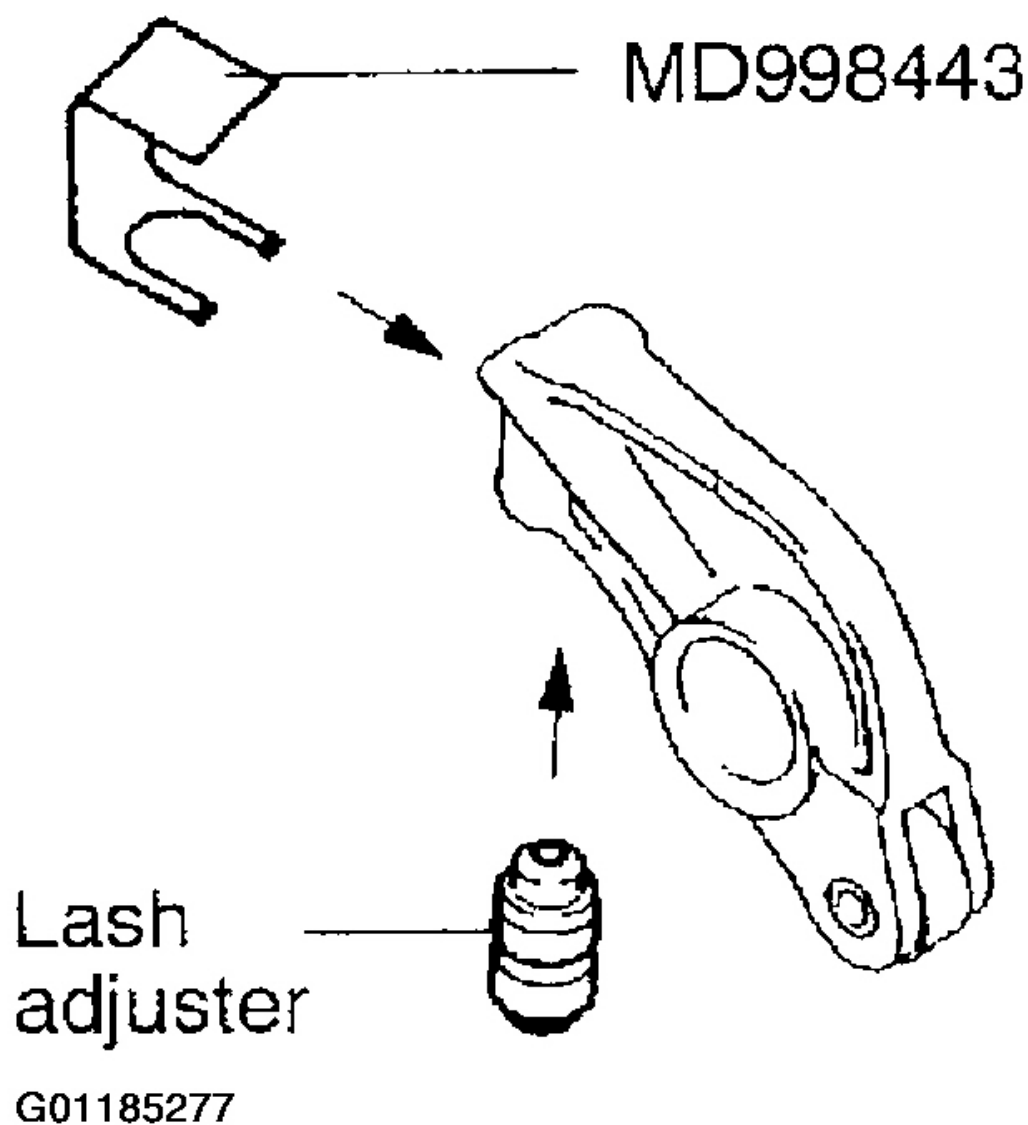


Fig. 101: Installing Lash Adjuster

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>B< ROCKER ARM SHAFT INSTALLATION

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

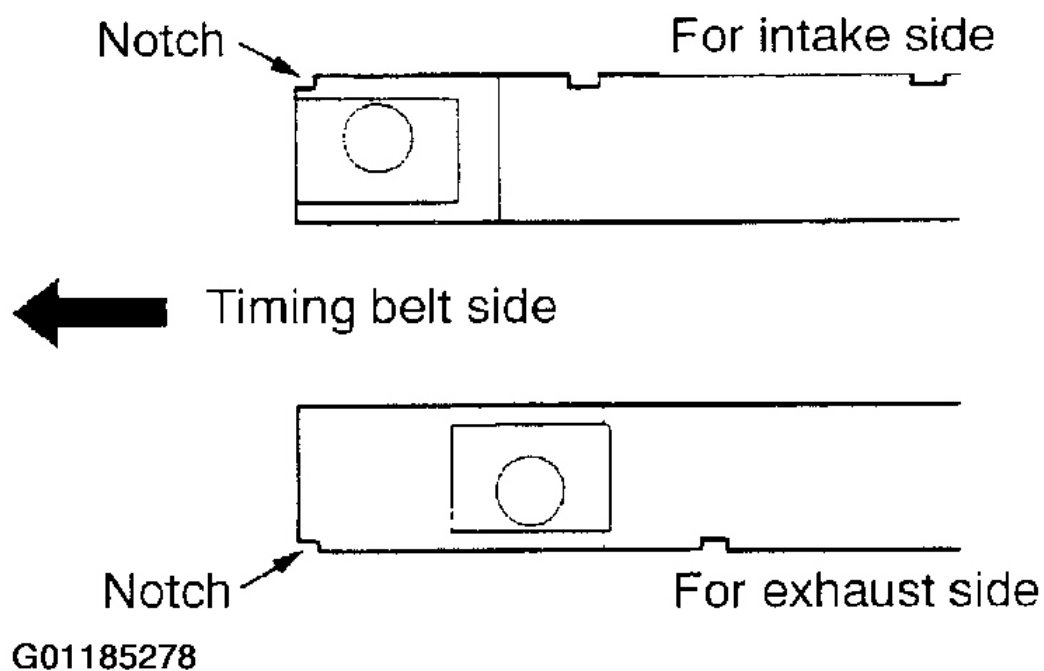
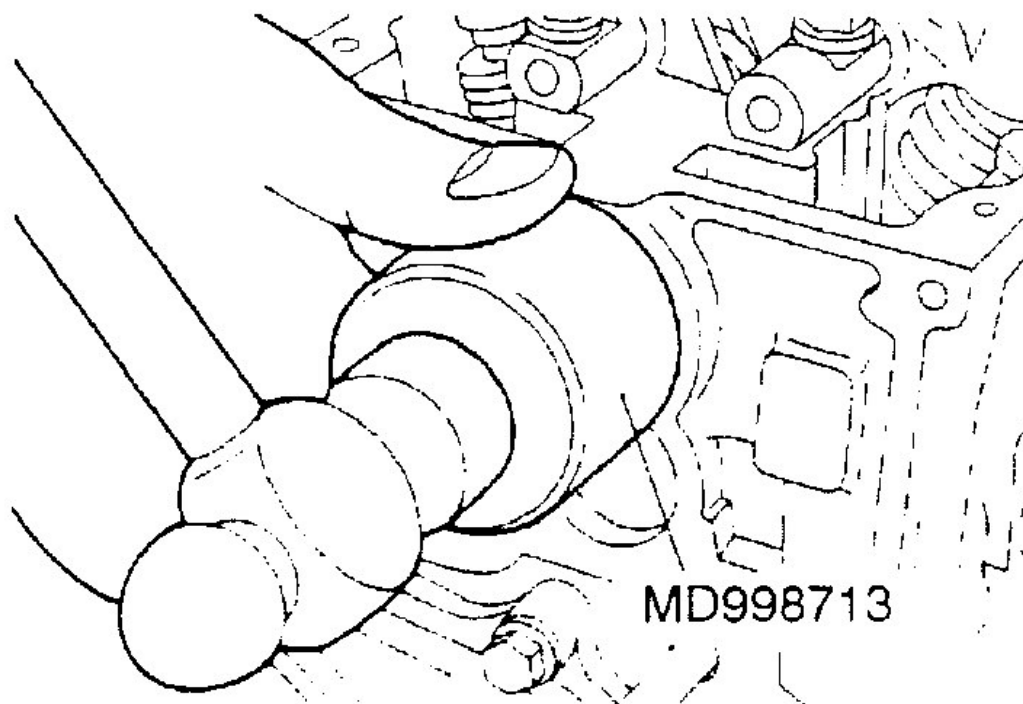


Fig. 102: Installing Rocker Arm Shafts

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>C< CAMSHAFT OIL SEAL INSTALLATION



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Fig. 103: Installing Camshaft 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:

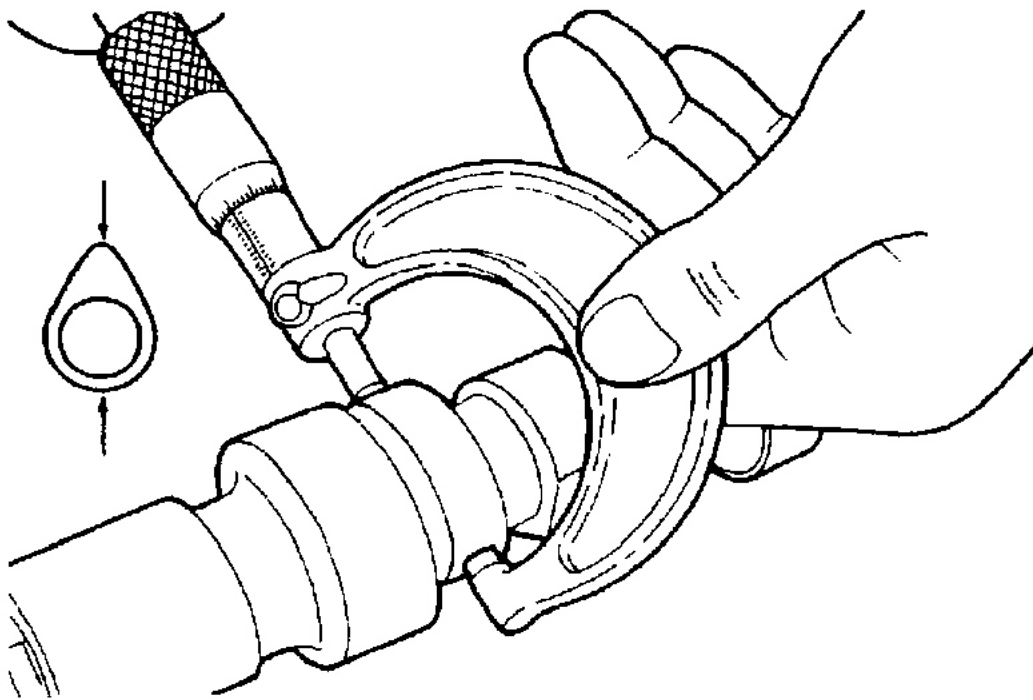
Intake: 38.78 mm (1.53 in.)

Exhaust: 39.10 mm (1.54 in.)

Limit:

Intake: 38.28 mm (1.51 in.)

Exhaust: 38.60 mm (1.52 in.)



G01185280

Fig. 104: 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.

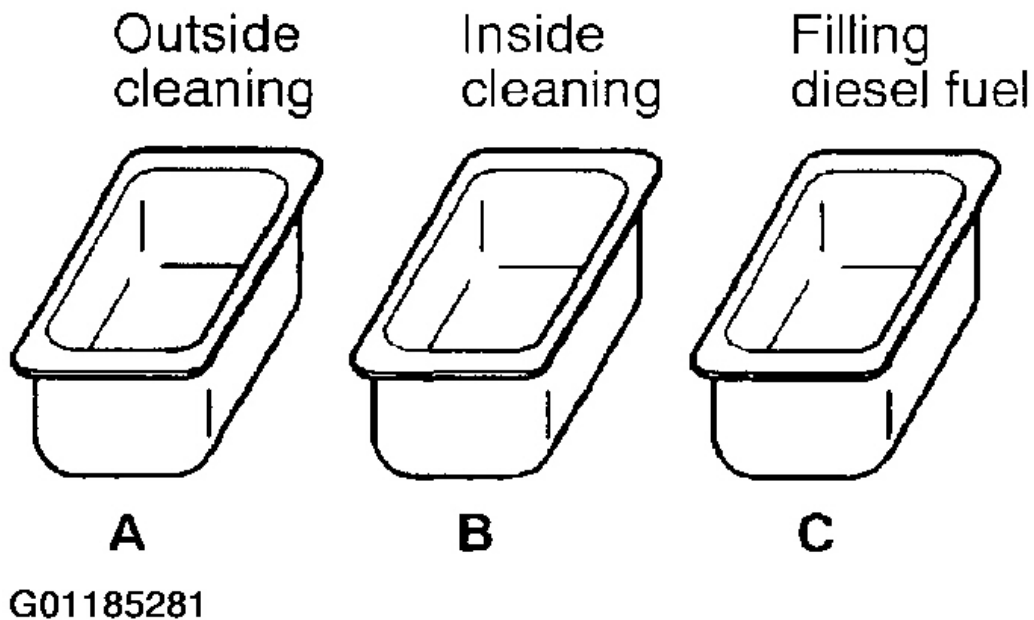
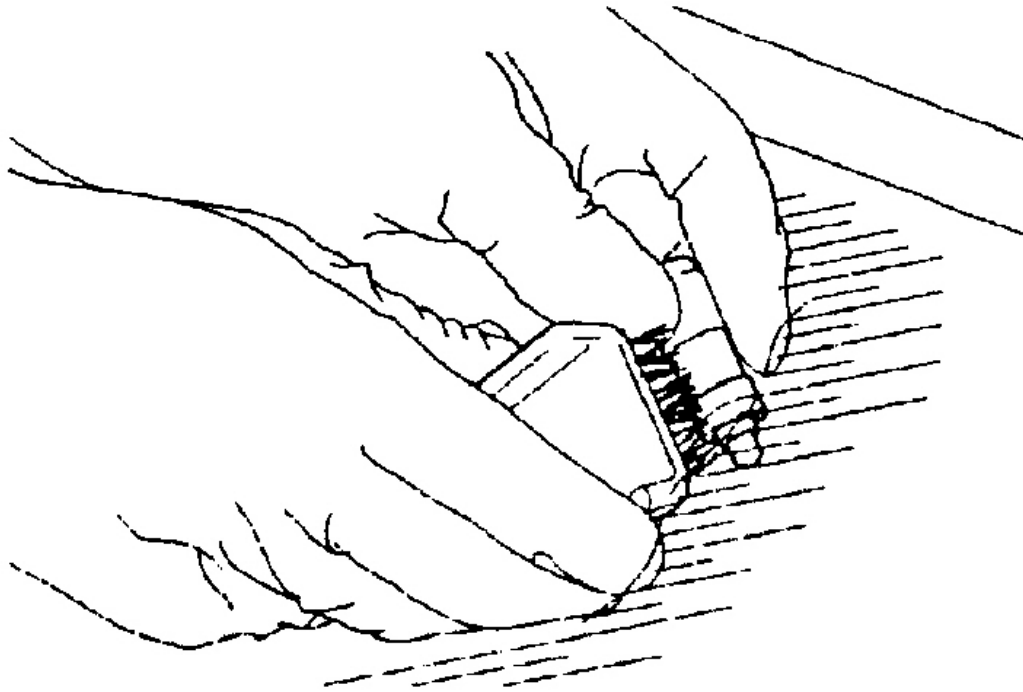


Fig. 105: Cleaning Lash Adjusters

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.



G01185282

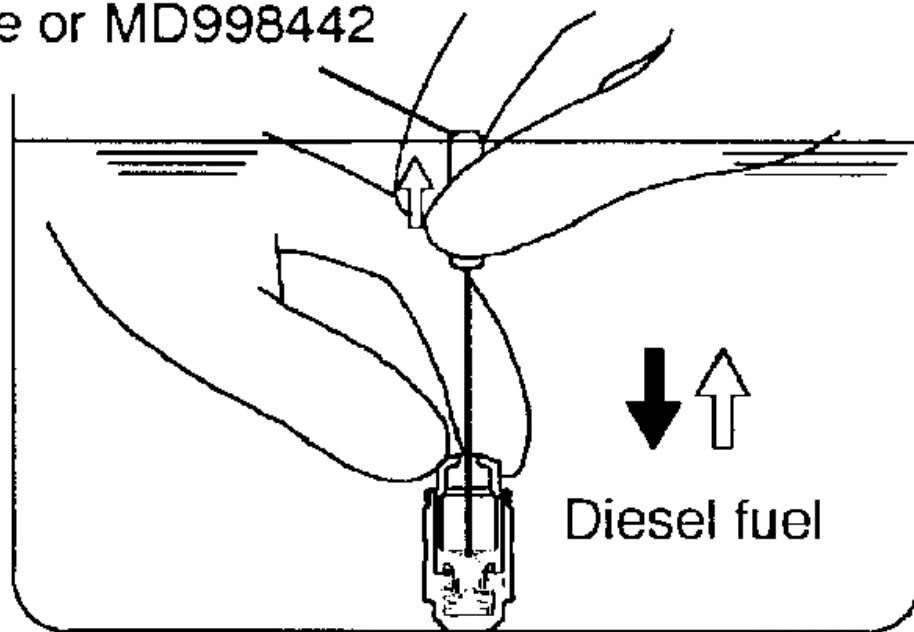
Fig. 106: Using Nylon Brush

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 remove 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.

Wire or MD998442



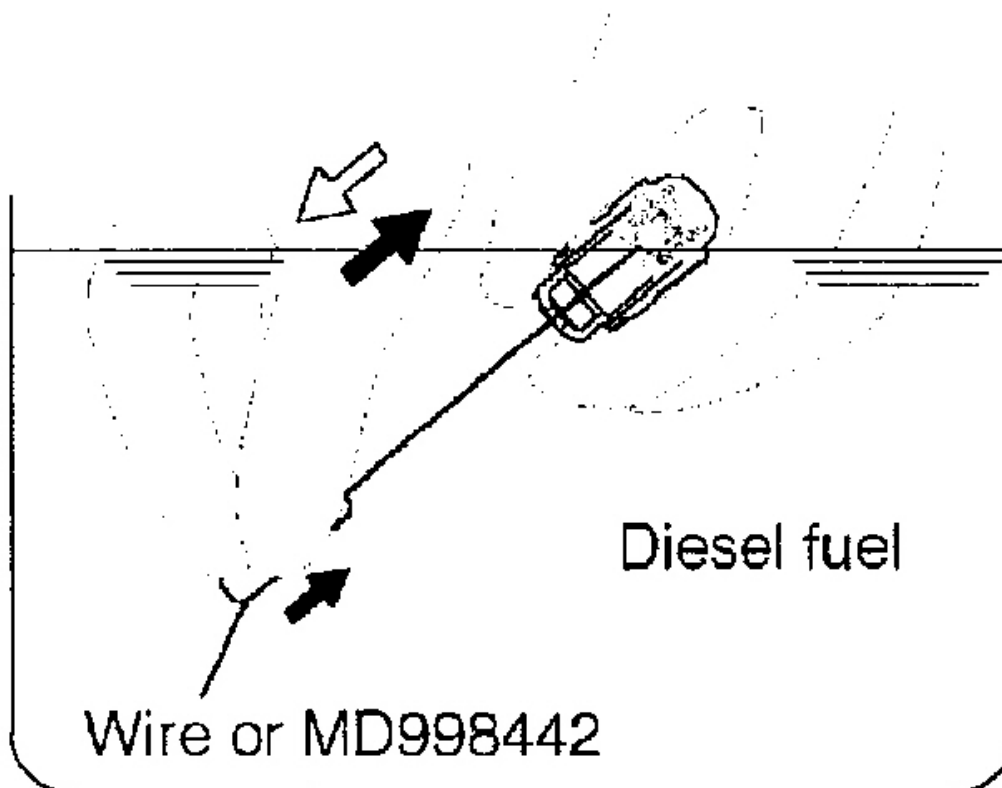
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Fig. 107: Eliminating Stiffness In Plunger

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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

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.



G01185284

Fig. 108: Removing Lash Adjuster From Container

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.

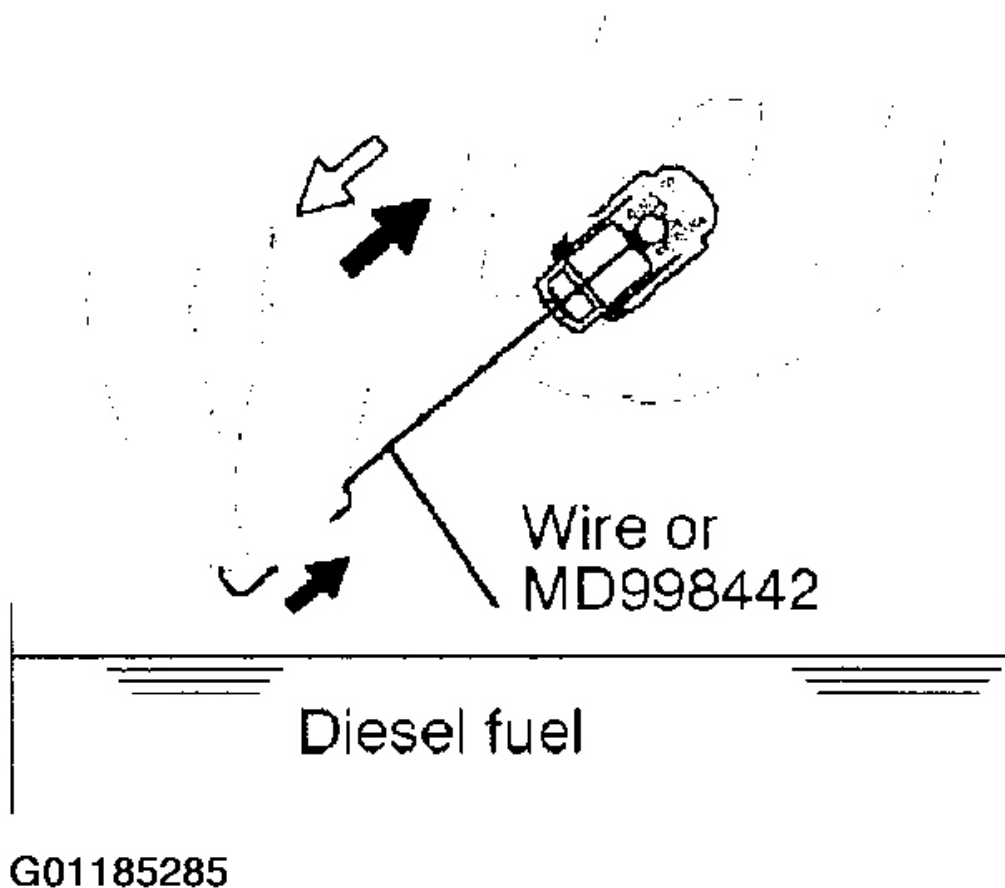
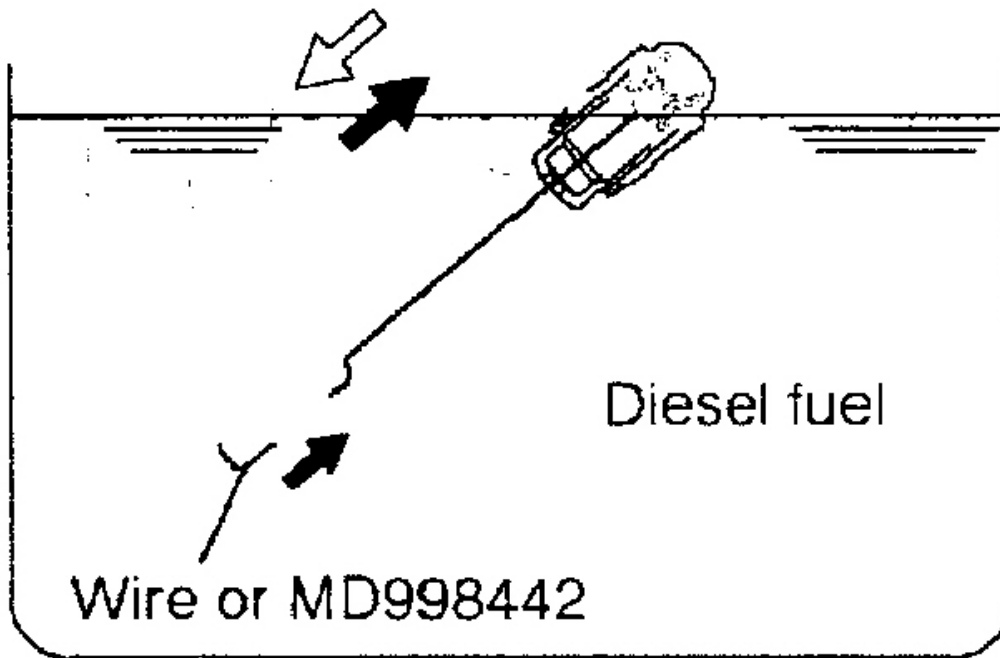


Fig. 109: Using Special Tool MD998442

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.



G01185286

Fig. 110: Removing Lash Adjuster From Container

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.

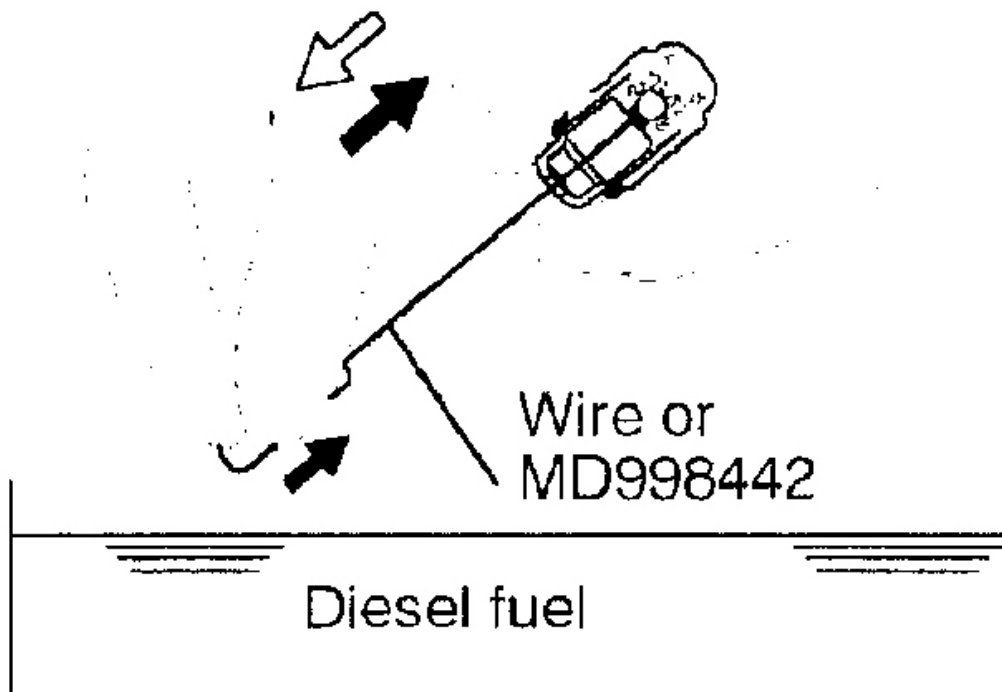
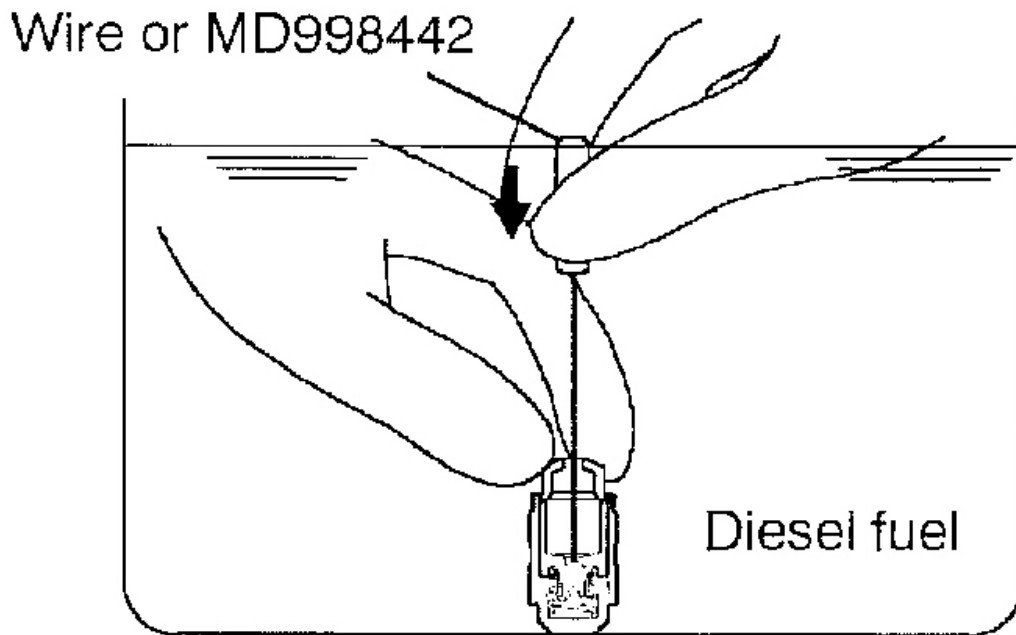
**G01185287**

Fig. 111: 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.



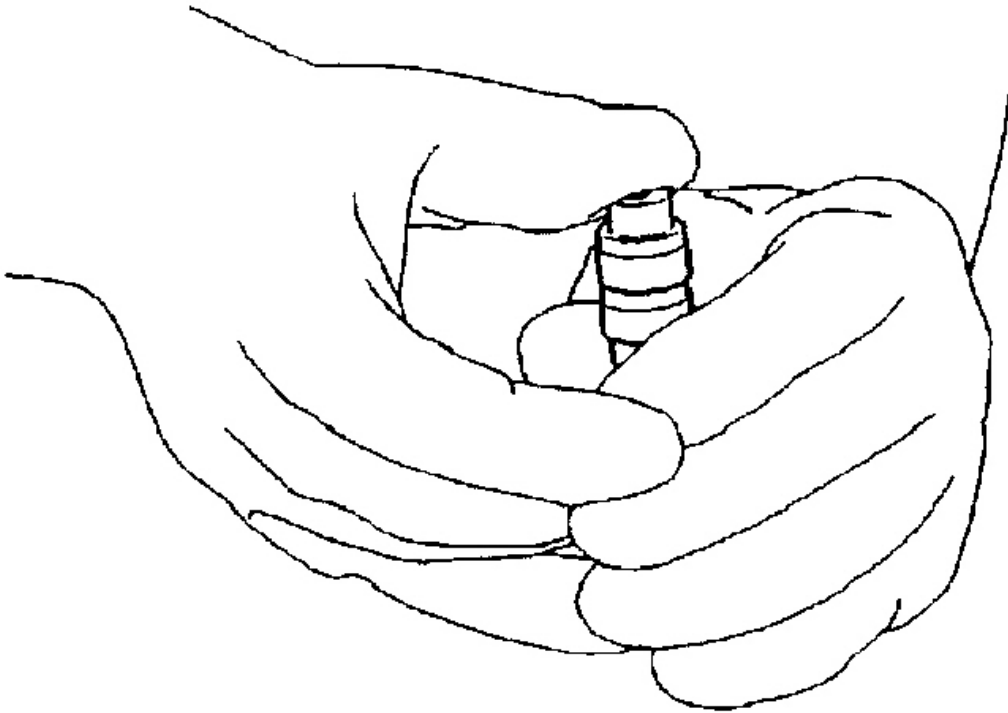
G01185288

Fig. 112: 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.

NOTE: If lash adjuster contracts, perform the operations 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.

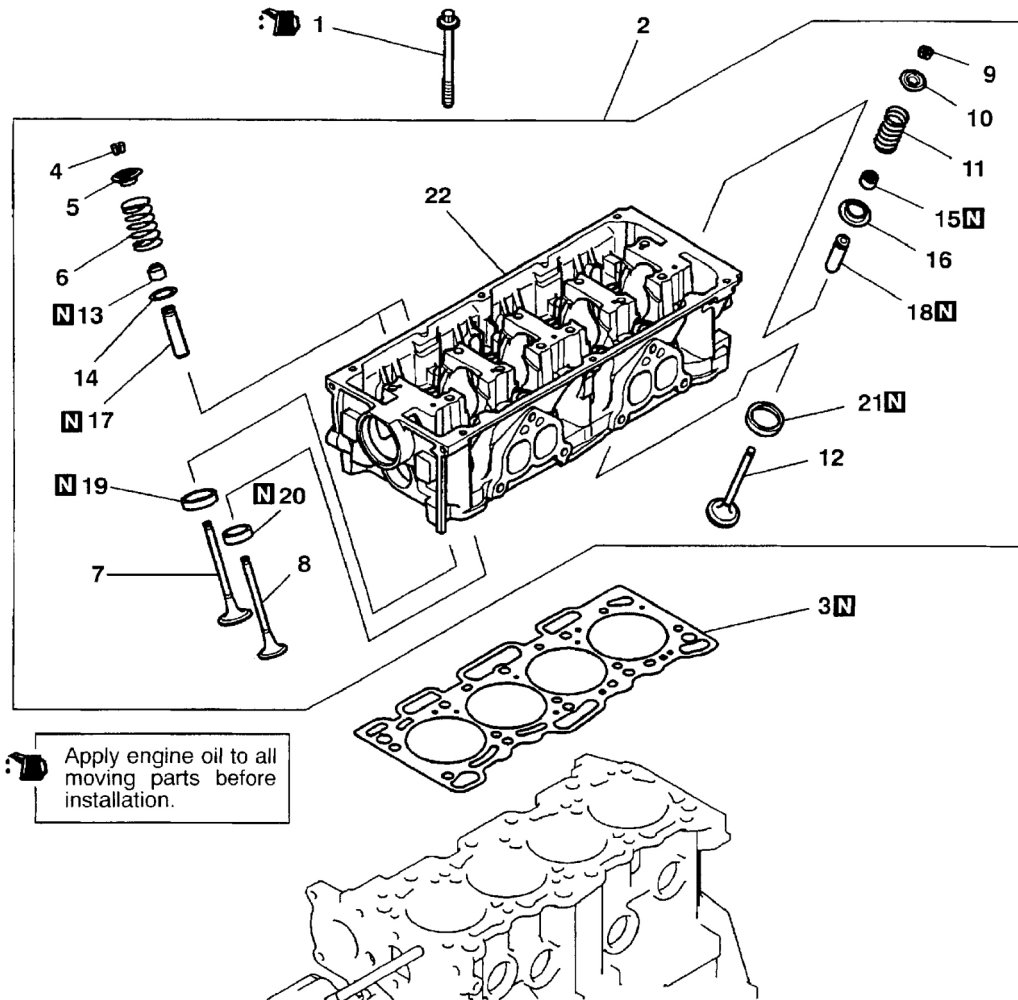


G01185289

Fig. 113: Positioning Lash Adjuster Upright
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

CYLINDER HEAD AND VALVES

REMOVAL AND INSTALLATION



Removal steps

- | | | | |
|---------|-----------------------------|---------|-----------------------------------|
| ◀A▶ ▶D▶ | 1. Cylinder head bolt | ◀C▶ ▶A▶ | 12. Exhaust valve |
| ◀B▶ ▶C▶ | 2. Cylinder head assembly | ◀C▶ ▶A▶ | 13. Valve stem seal |
| | 3. Cylinder head gasket | | 14. Valve spring seat |
| ◀B▶ ▶C▶ | 4. Retainer lock | | 15. Valve stem seal |
| ▶B▶ | 5. Valve spring retainer | | 16. Valve spring seat |
| | 6. Valve spring | | 17. Intake valve guide |
| | 7. Intake valve (primary) | | 18. Exhaust valve guide |
| | 8. Intake valve (secondary) | | 19. Intake valve seat (primary) |
| ◀B▶ ▶C▶ | 9. Retainer lock | | 20. Intake valve seat (secondary) |
| ▶B▶ | 10. Valve spring retainer | | 21. Exhaust valve seat |
| | 11. Valve spring | | 22. Cylinder head |

G01185290

Fig. 114: Removing & Installing Cylinder Head & Valves
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

REMOVAL SERVICE POINTS

< A > CYLINDER HEAD BOLT REMOVAL

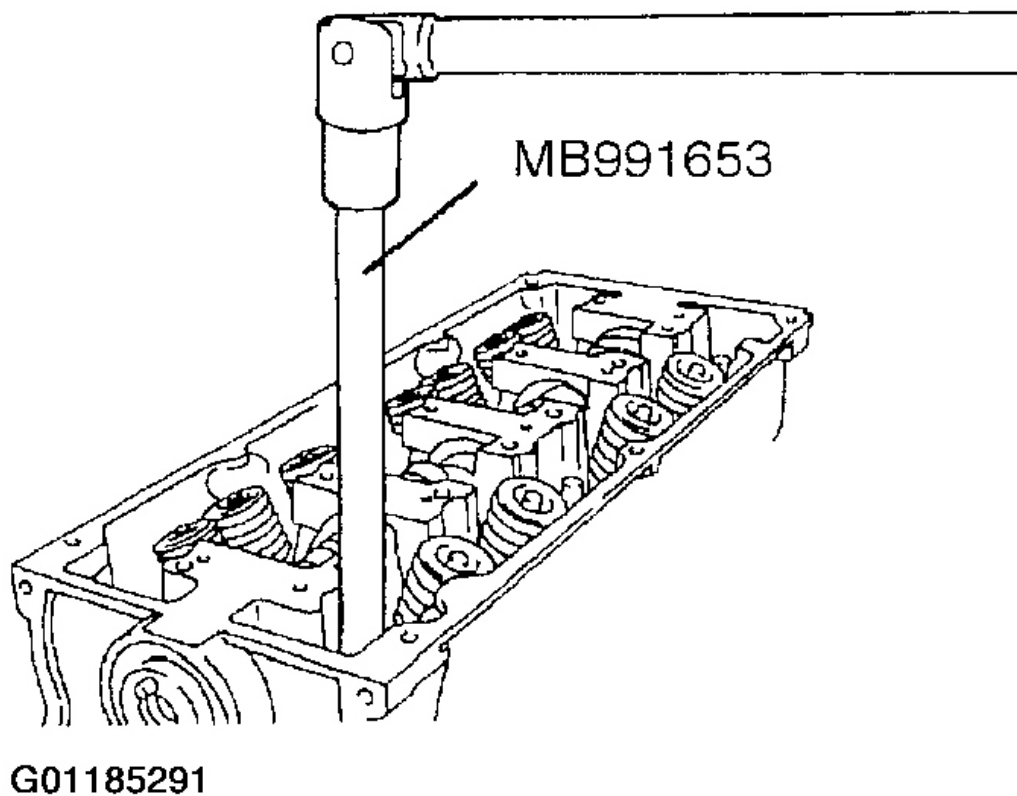


Fig. 115: Removing Cylinder Head Bolt
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

< 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.

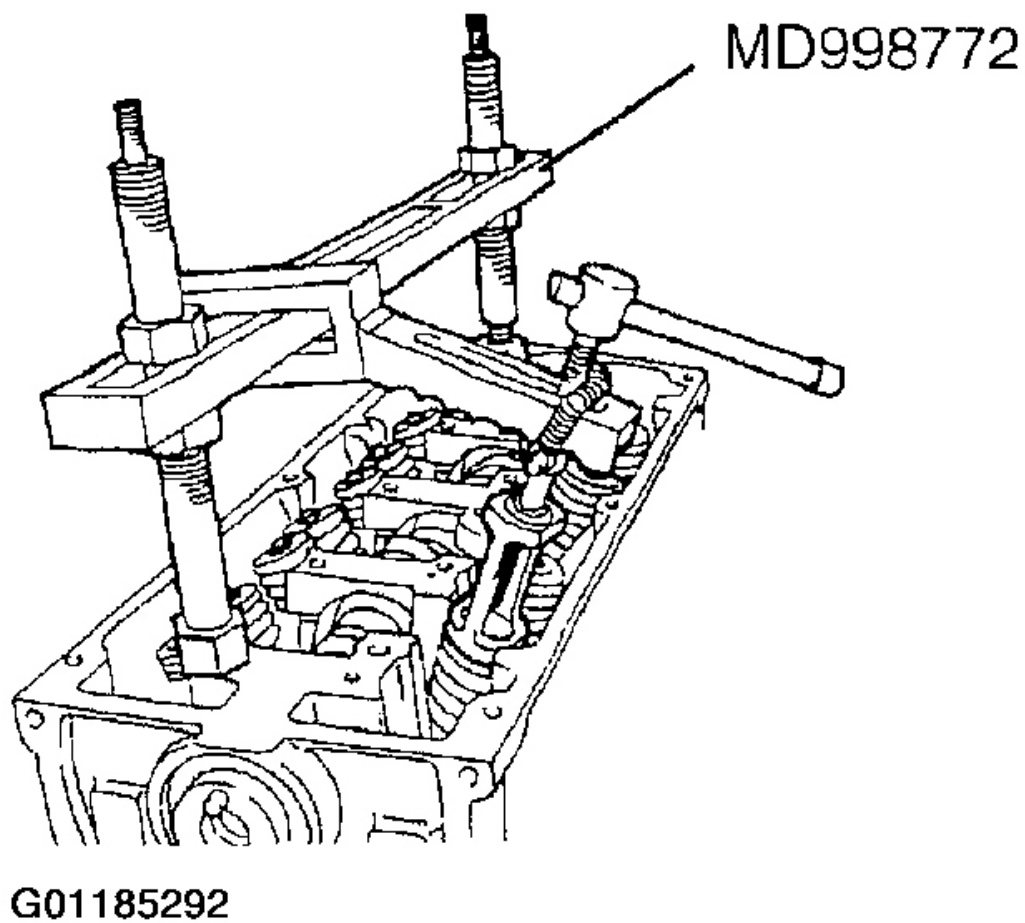
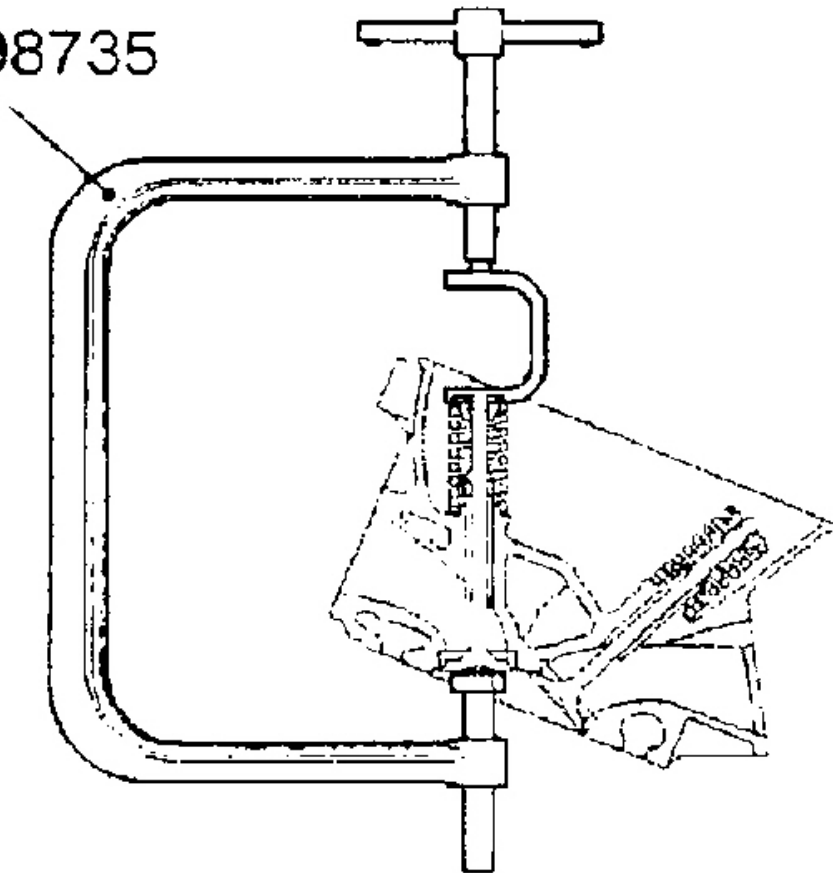


Fig. 116: Using Special Tool MD998772
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

MD998735

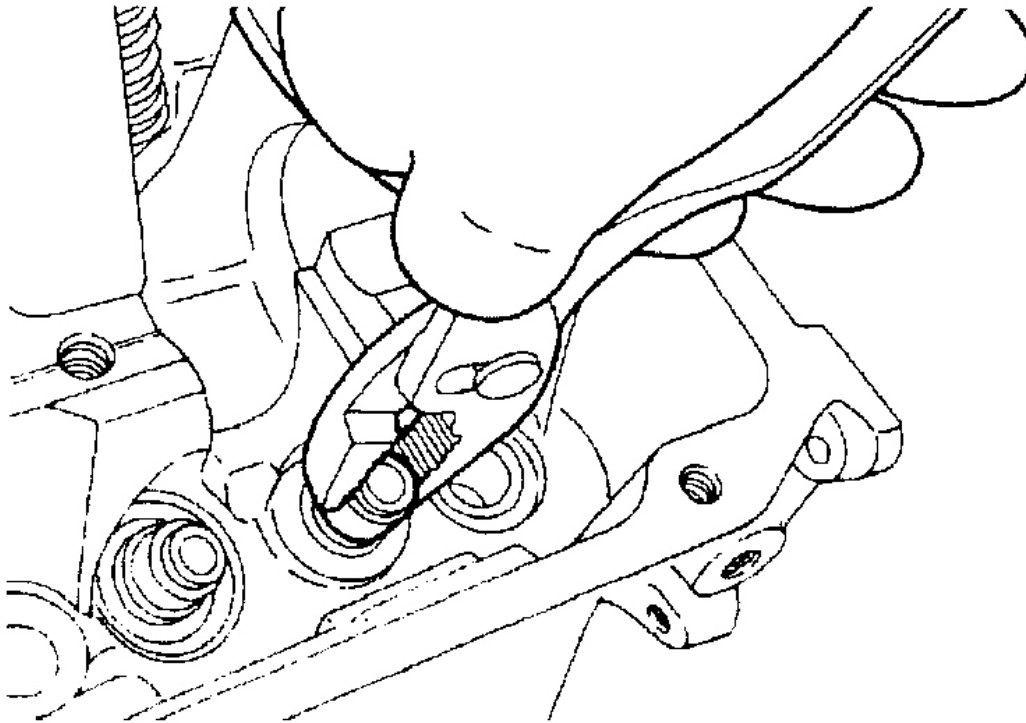


G01185293

Fig. 117: Using Special Tool MD998735

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>C< VALVE STEM SEAL REMOVAL



G01185294

Fig. 118: 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 the 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.

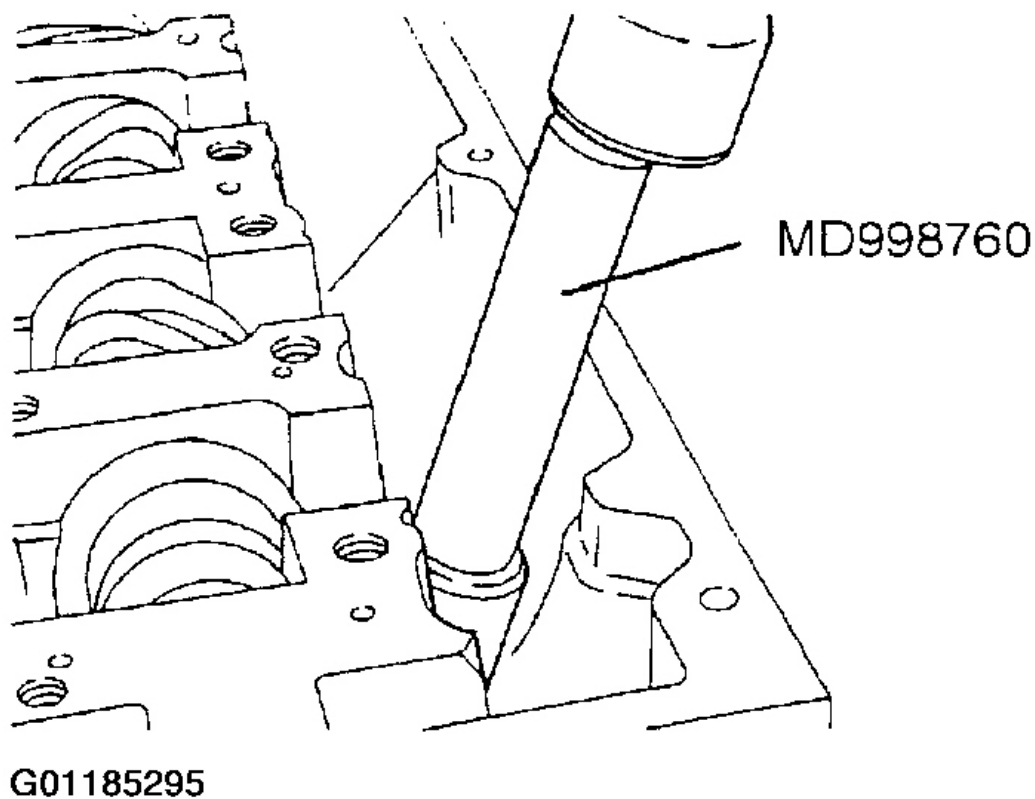


Fig. 119: Installing New Valve Stem Seal
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

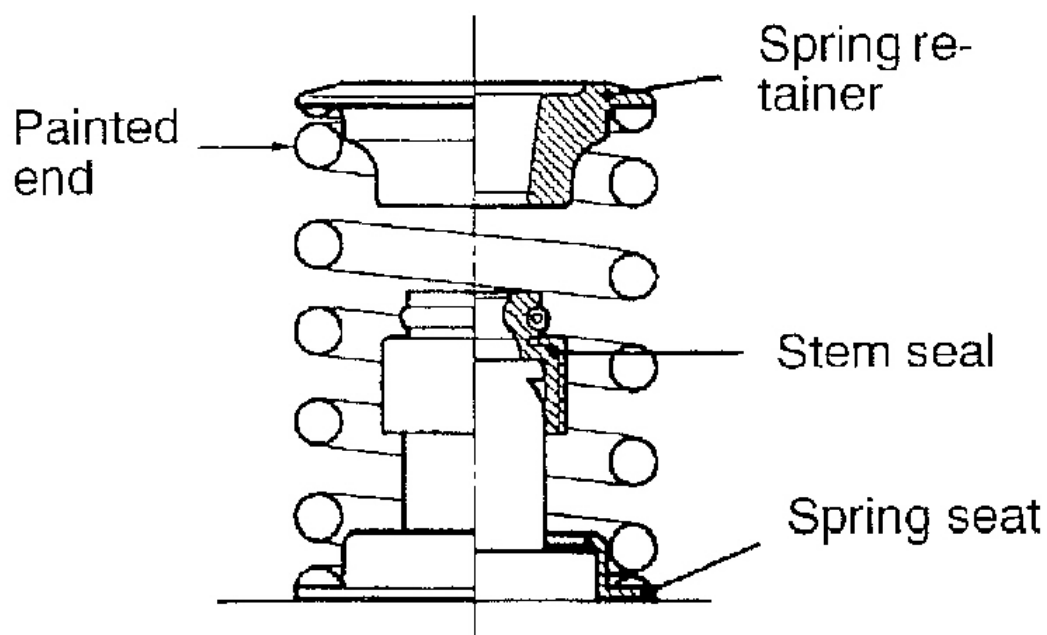
>B< VALVE SPRING INSTALLATION

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

Paint colors:

Intake: Orange

Exhaust: Yellow



G01185296

Fig. 120: 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 the retainer to be in contact with the stem seal, and damage it.

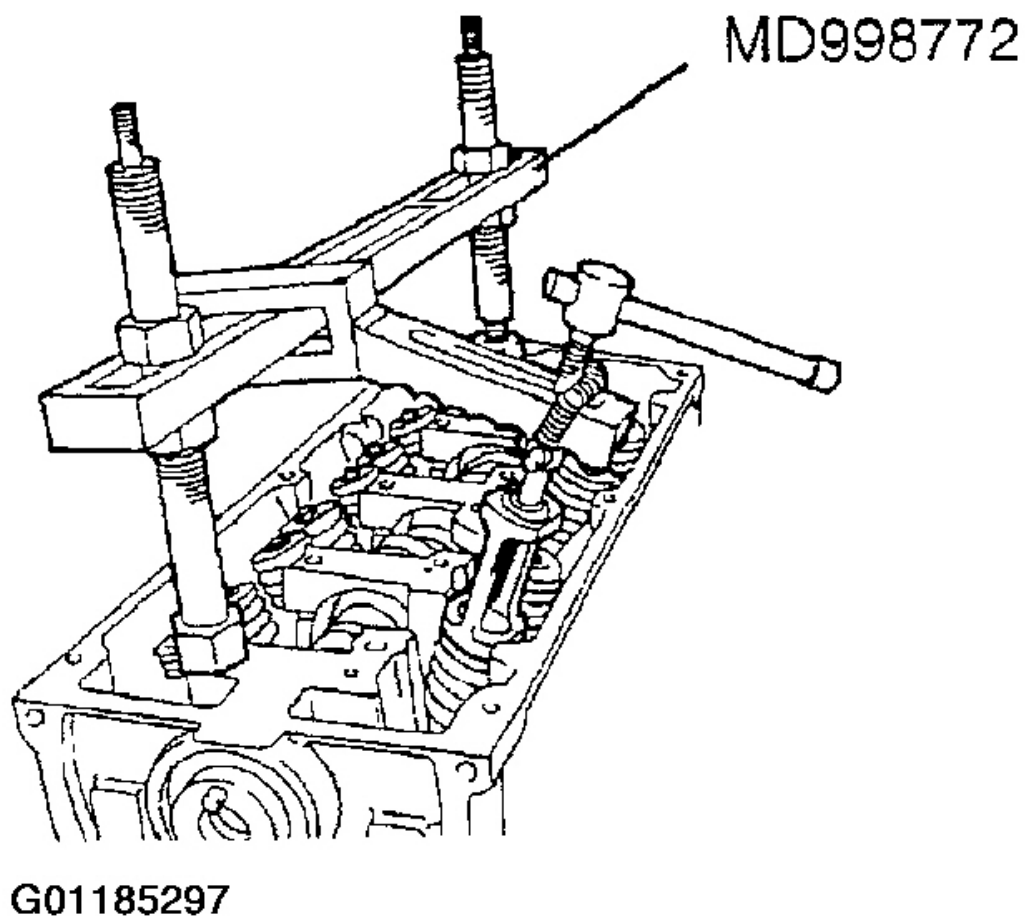


Fig. 121: Using Special Tool MD998772
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

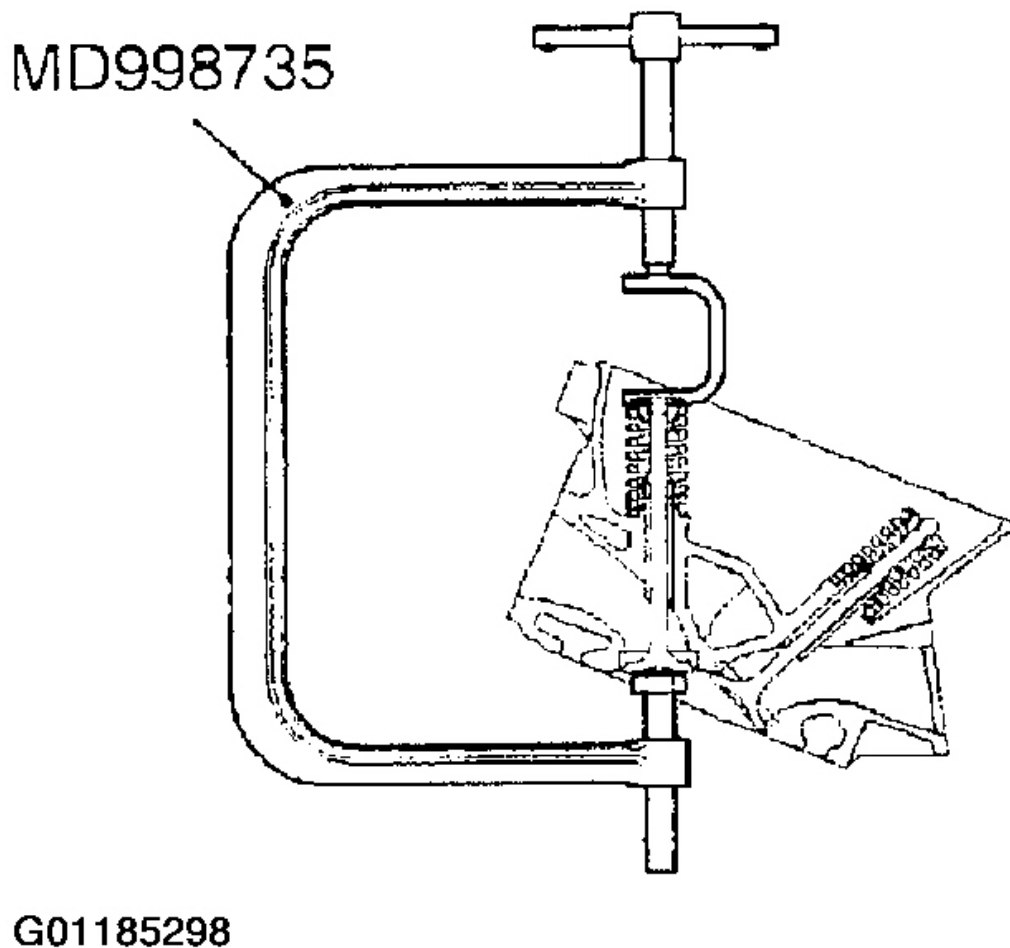
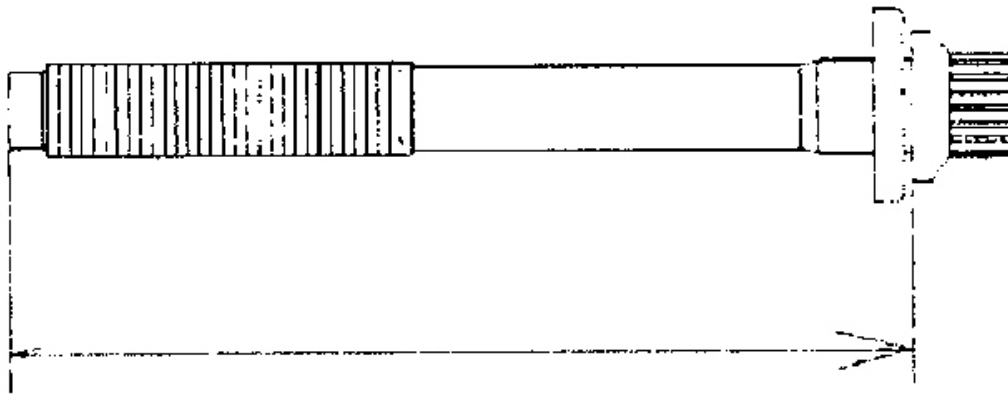


Fig. 122: Using Special Tool MD998735
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>D< CYLINDER HEAD BOLT INSTALLATION

1. When 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. 103.2 mm (4.063 in.)



Shank length

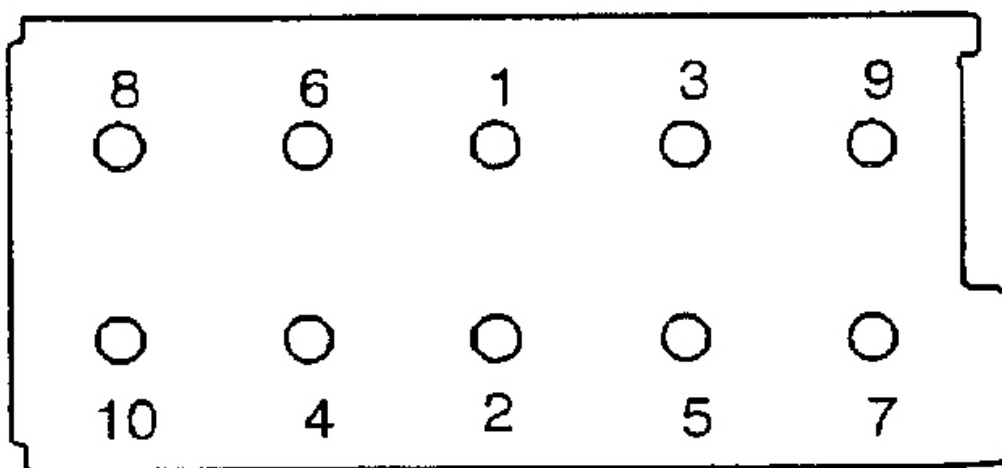
G01185299

Fig. 123: Measuring Cylinder Head Bolt Shank Length

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2. Apply engine oil to the bolt thread and washer.
3. Tighten the bolts in the sequence shown until each is torqued to 49 Nm (35 ft.lbs.) using the special tool (MB991653).
4. Loosen all bolts fully.
5. Retighten the bolts in the sequence shown until each is torqued to 20 Nm (15 ft.lbs.).

← Timing belt side

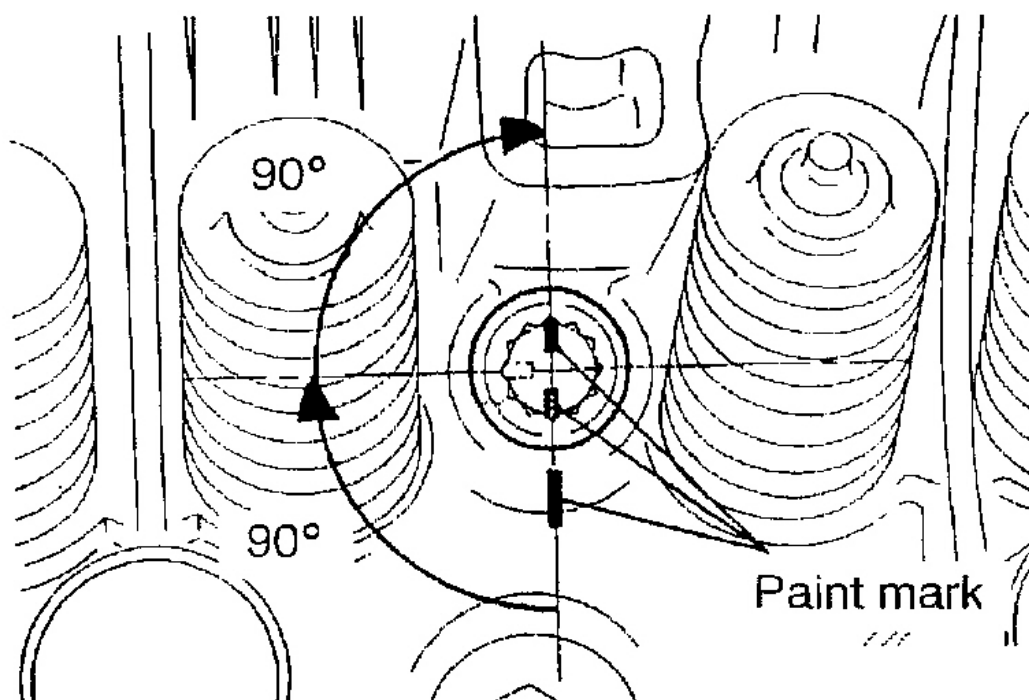


G01185300

Fig. 124: Retightening Cylinder Head Bolts

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

6. Make paint marks on the cylinder head bolt heads and cylinder head as shown.



G01185301

Fig. 125: Making Paint Marks On Cylinder Head Bolt Heads & Cylinder Head
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

7. In accordance with the tightening sequence, tighten each bolt by 90° (1/4 turn).
8. Tighten each bolt by a 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 carry out the installation procedure again.

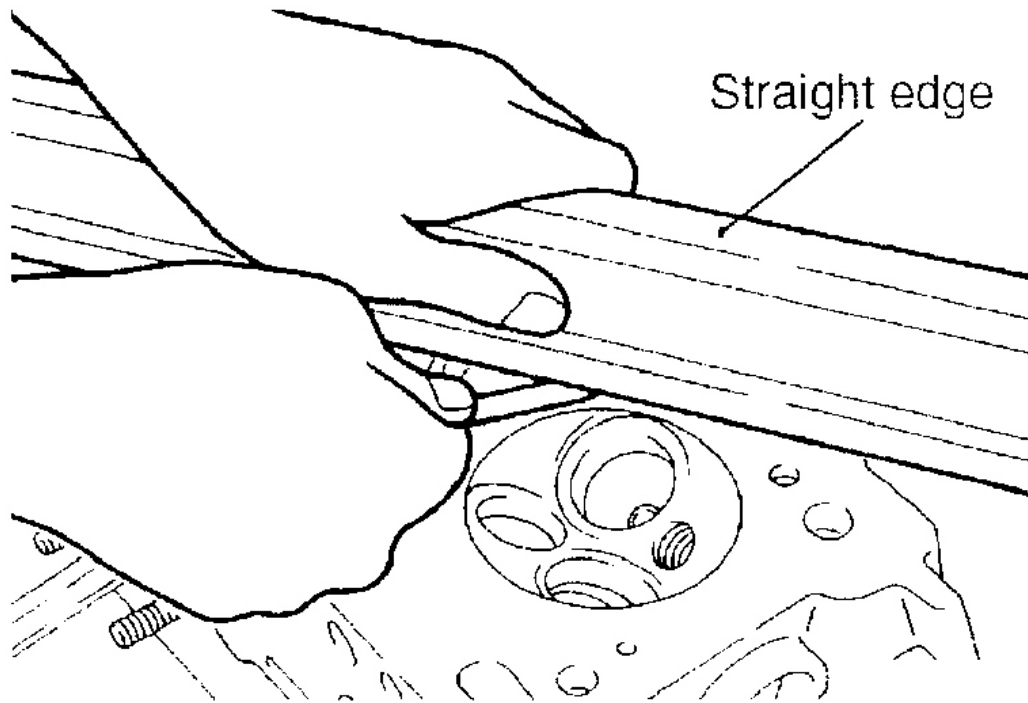
INSPECTION

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: 0.05 mm (.002 in.) or less

Limit: 0.2 mm (.008 in.)



G01185302

Fig. 126: 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):

106.9 - 107.1 mm (4.209 - 4.217 in.)

VALVES

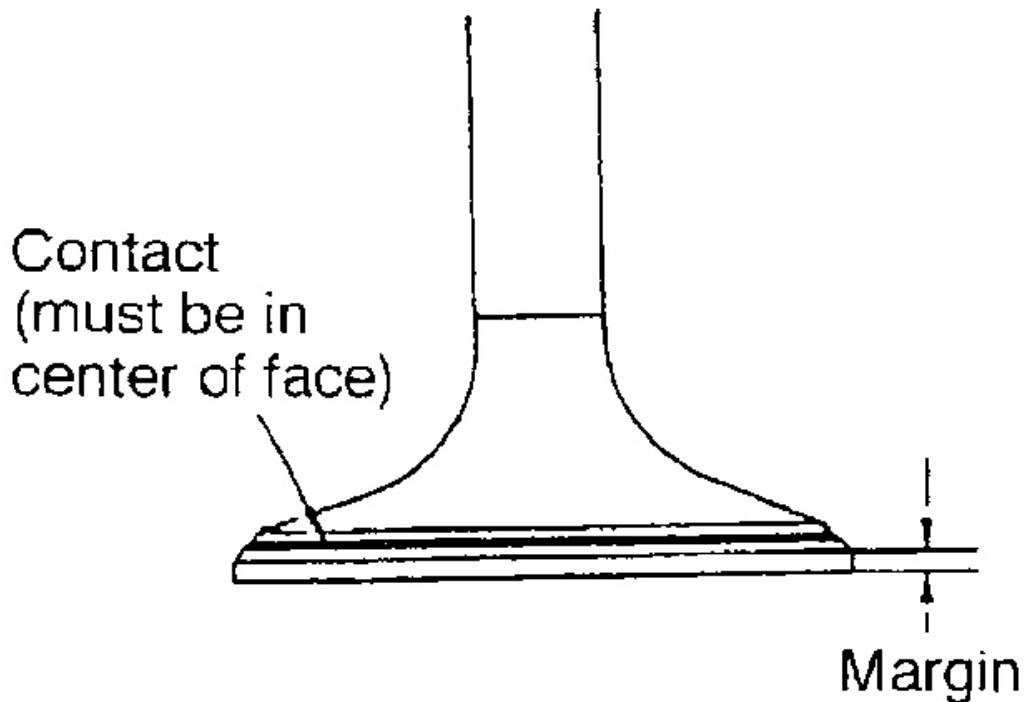
1. Check the valve face for correct contact. If contact is uneven or incomplete, reface the valve seat.

2. If the margin is less than specified, replace the valve.

Standard value:**Intake: 1.0 mm (.039 in.)****Exhaust: 1.5 mm (.059 in.)****Limit:****Intake: 0.5 mm (.020 in.)****Exhaust: 1.0 mm (.039 in.)**

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

Standard value:**Intake: 100.75 mm (3.967 in.)****Exhaust: 101.05 mm (3.978 in.)****Limit:****Intake: 100.25 mm (3.947 in.)****Exhaust: 100.55 mm (3.959 in.)**



G01185303

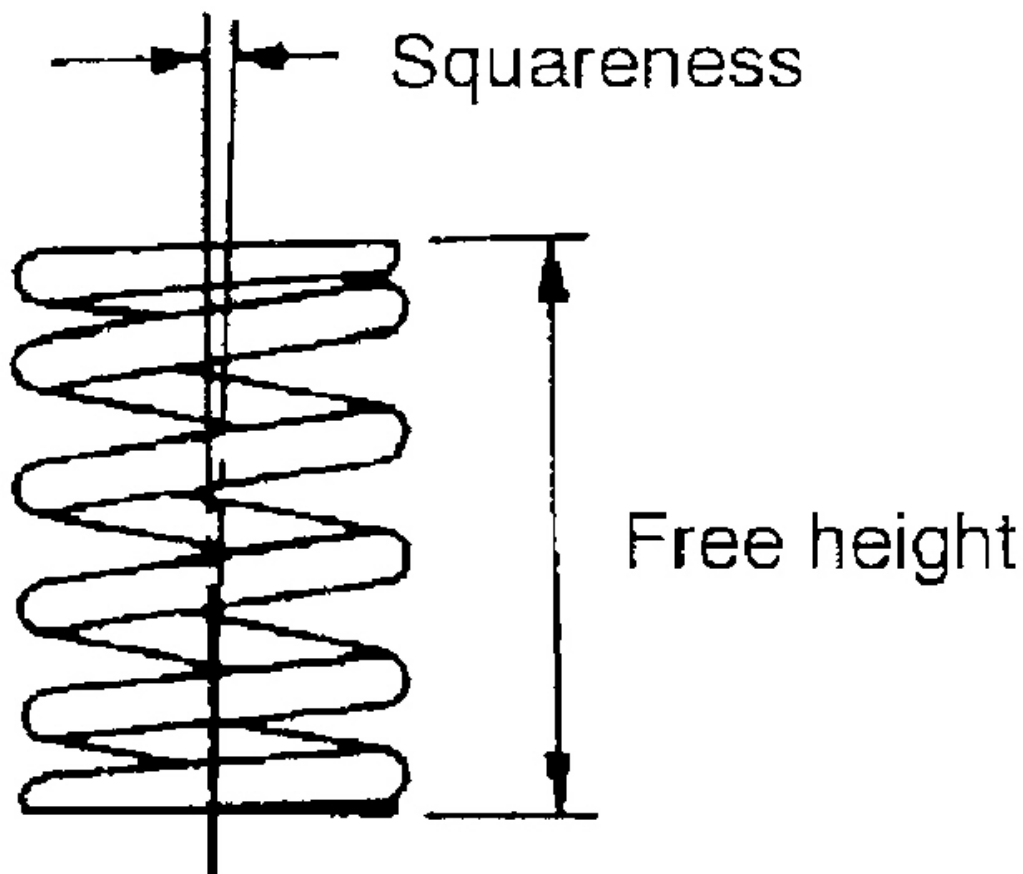
Fig. 127: Measuring Valve Length

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:**Intake: 46.1 mm (1.815 in.)****Exhaust: 46.8 mm (1.843 in.)****Limit:****Intake: 45.6 mm (1.795 in.)****Exhaust: 46.3 mm (1.823 in.)**



G01185304

Fig. 128: Measuring Valve Spring Free Height
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

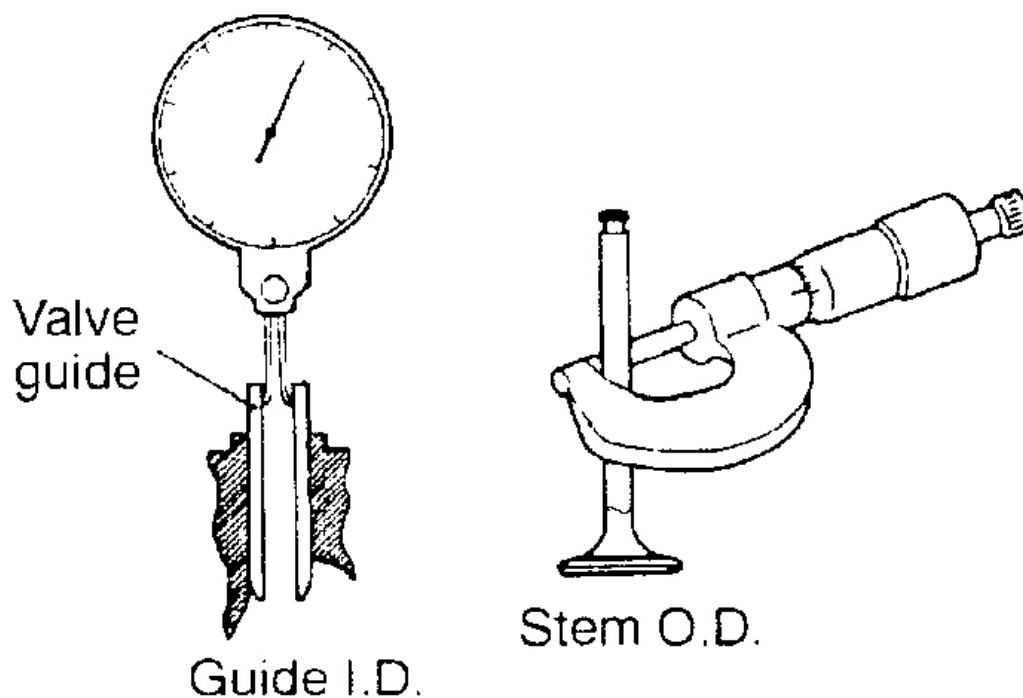
2. Measure the squareness of the spring. If the measurement is less than specified, replace the spring.

Standard value: 2° or less

Limit: 4°

VALVE GUIDES

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

Standard value:**Intake: 0.020 - 0.050 mm (.0008 - .0020 in.)****Exhaust: 0.050 - 0.085 mm (.0020 - .0033 in.)****Limit:****Intake: 0.10 mm (.0039 in.)****Exhaust: 0.15 mm (.0059 in.)**

G01185305

Fig. 129: Measuring Clearance Between The Valve Guide & Valve Stem
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

VALVE SEATS

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:

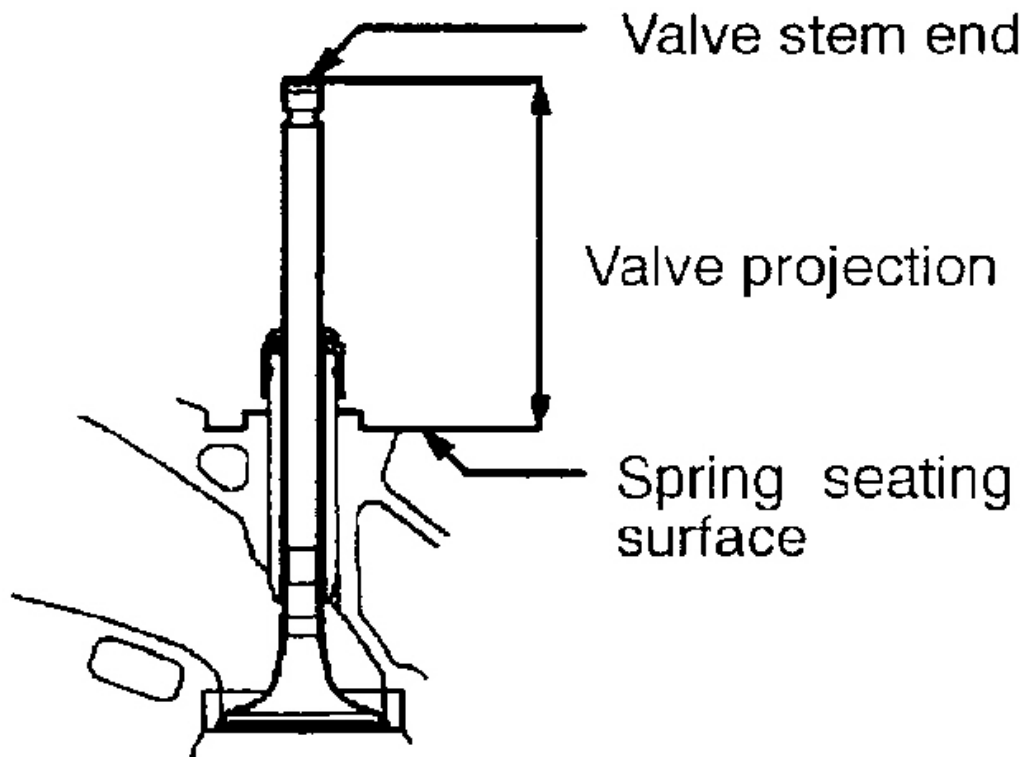
Intake: 43.70 mm (1.720 in.)

Exhaust: 43.30 mm (1.705 in.)

Limit:

Intake: 44.20 mm (1.740 in.)

Exhaust: 43.80 mm (1.724 in.)



G01185306

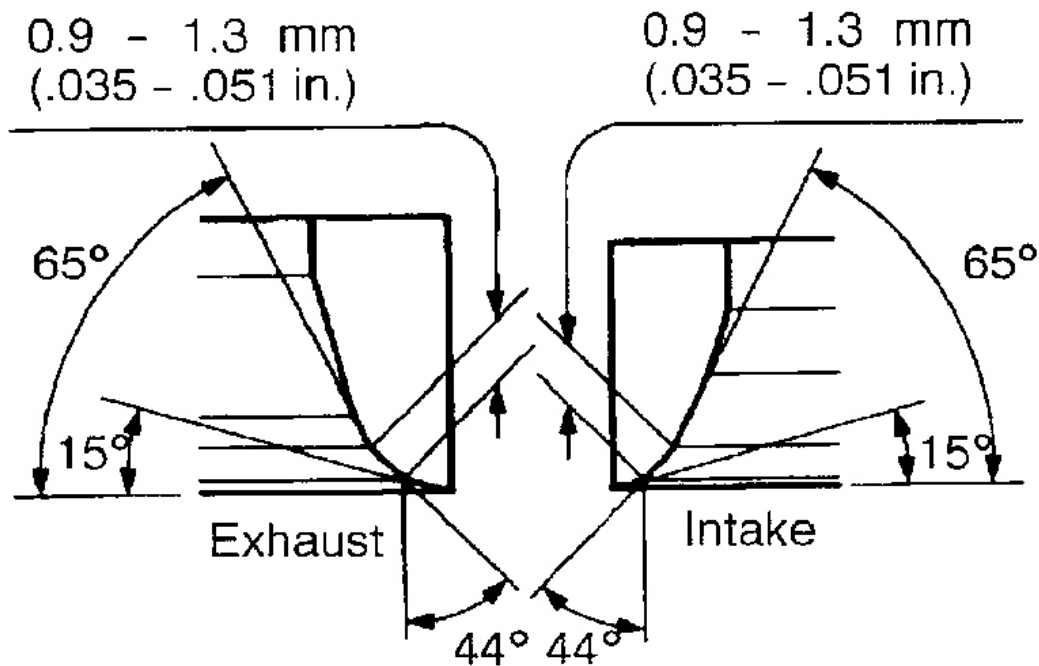
Fig. 130: Measuring Valve Stem Projection

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.

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



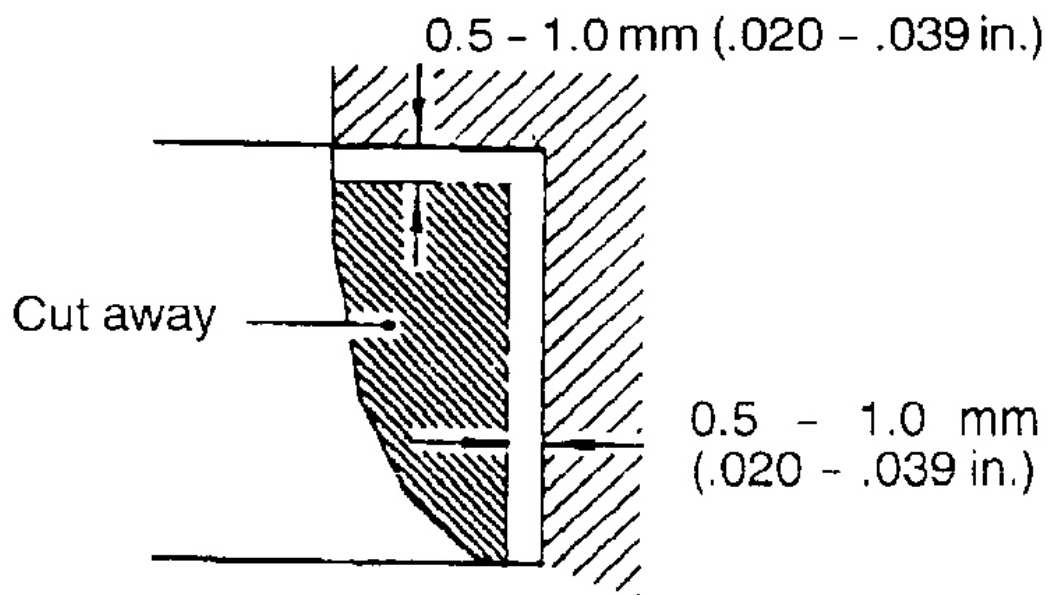
G01185307

Fig. 131: Grinding Valve Seat

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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.

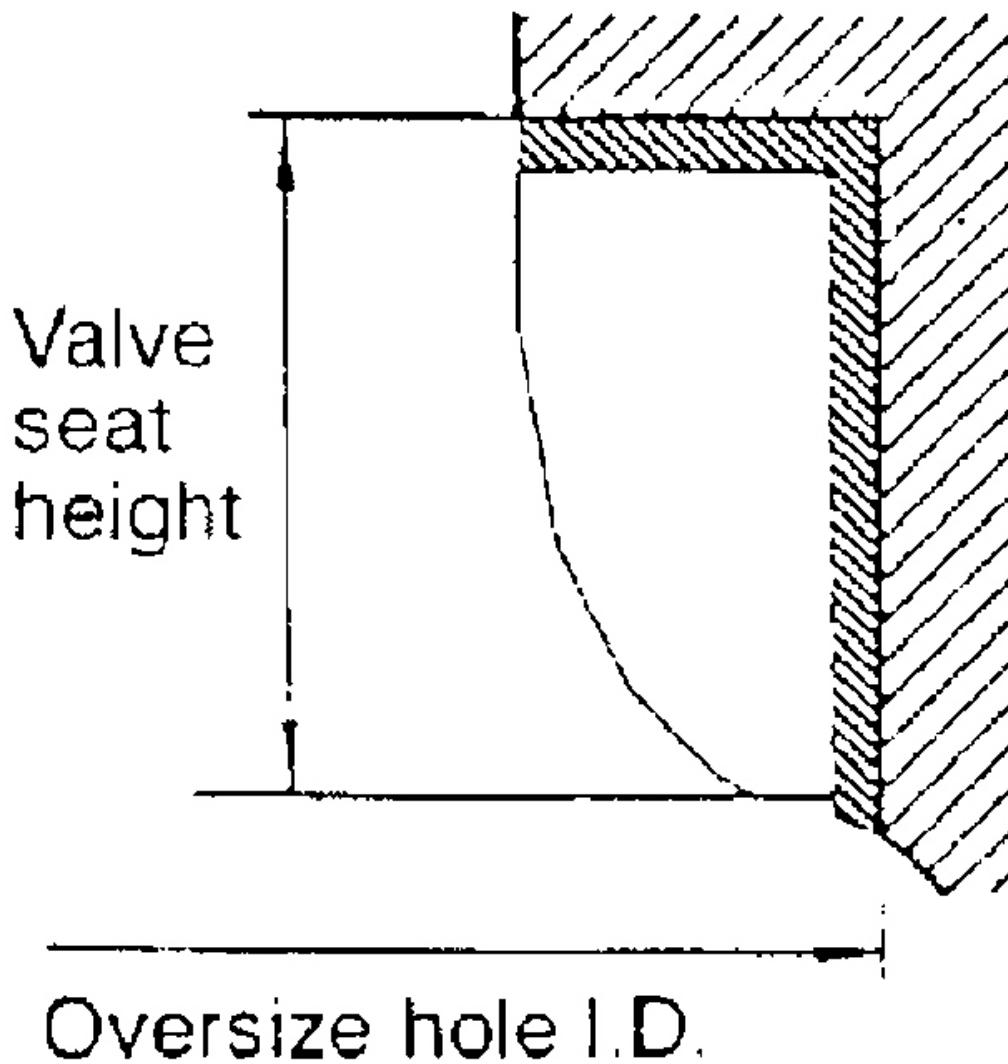


G01185308

Fig. 132: 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.



G01185309

Fig. 133: Reboring Valve Seat Hole

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Intake valve seat hole diameters (0.3 O.S.)

Primary: 27.300 - 27.325 mm

(1.0748 - 1.0758 in.)

Secondary: 32.300 - 32.325 mm

(1.2717 - 1.2726 in.)

Intake valve seat hole diameters (0.6 O.S.)**Primary: 27.600 - 27.625 mm****(1.0866 - 1.0876 in.)****Secondary: 32.600 - 32.625 mm****(1.2835 - 1.2844 in.)****Exhaust valve seat hole diameters (0.3 O.S.)****35.300 - 35.325 mm (1.3898 - 1.3907 in.)****Exhaust valve seat hole diameters (0.6 O.S.)****35.600 - 35.625 mm (1.4016 - 1.4026 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****0.05 O.S.: 12.050 - 12.068 mm (.4744 - .4751 in.)****0.25 O.S.: 12.250 - 12.268 mm (.4823 - .4830 in.)****0.50 O.S.: 12.500 - 12.518 mm (.4921 - .4928 in.)**

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

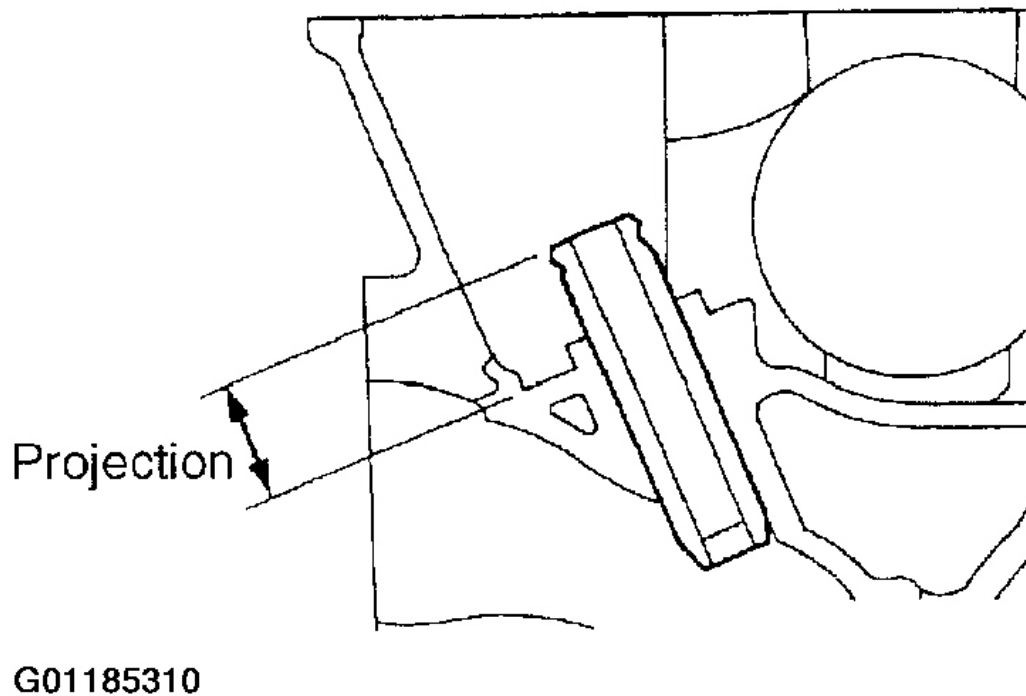


Fig. 134: Measuring Valve Guide Projection
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Standard value: 17 mm (.670 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: 44.0 mm (1.732 in.)

EXHAUST: 49.5 mm (1.949 in.)

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

OIL PUMP AND OIL PAN

REMOVAL AND INSTALLATION

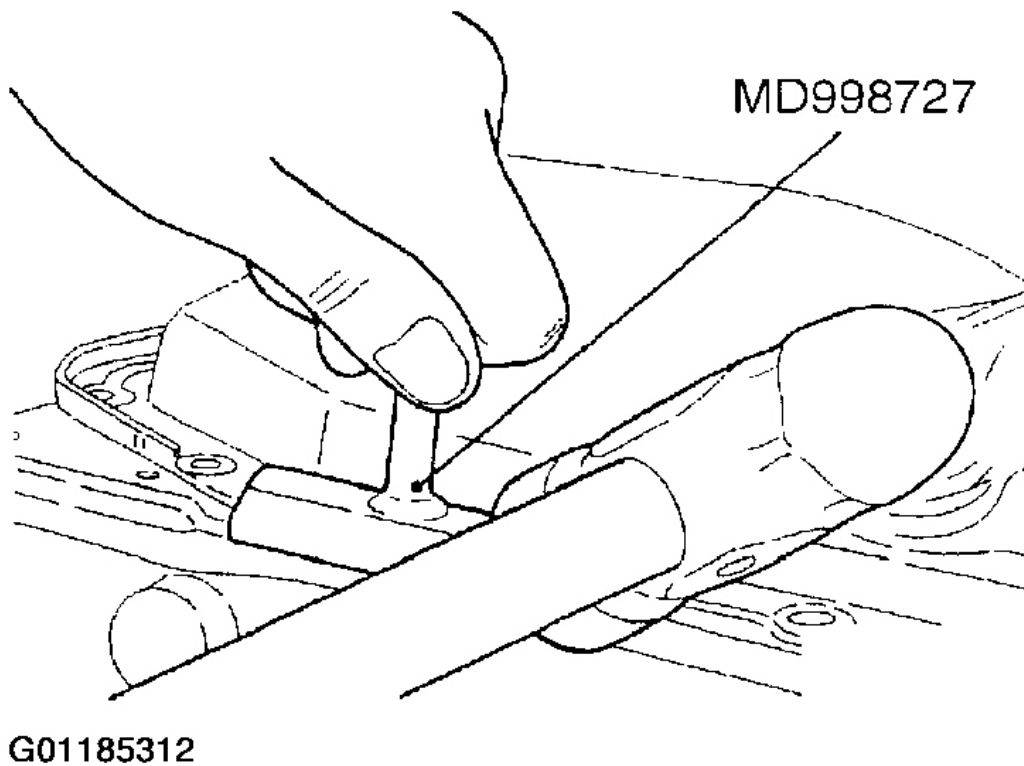


Fig. 136: Using Special Tool MD998727

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.

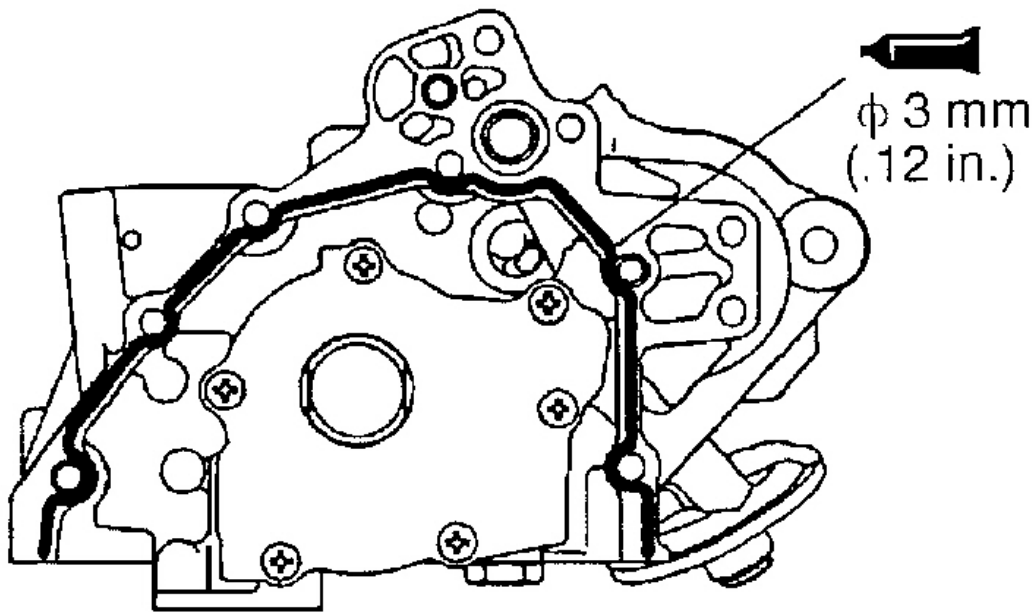
INSTALLATION SERVICE POINTS

>A< 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 apply the sealant.

Specified sealant:

Mitsubishi Genuine Part No. MD970389 or equivalent.



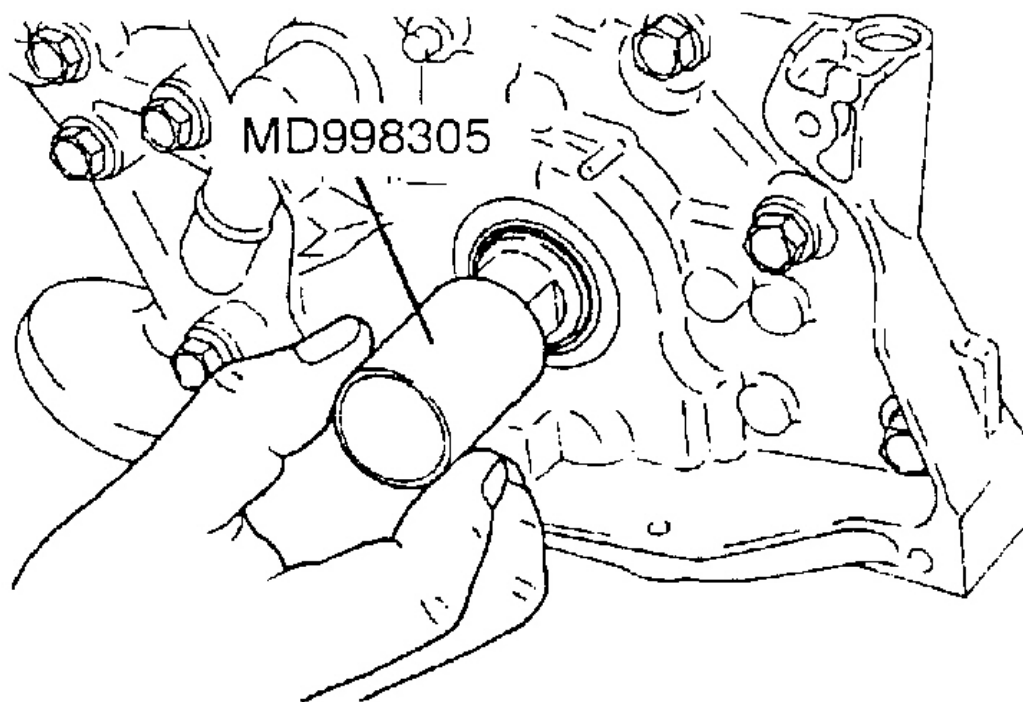
G01185313

Fig. 137: 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.

>B< FRONT OIL SEAL INSTALLATION

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

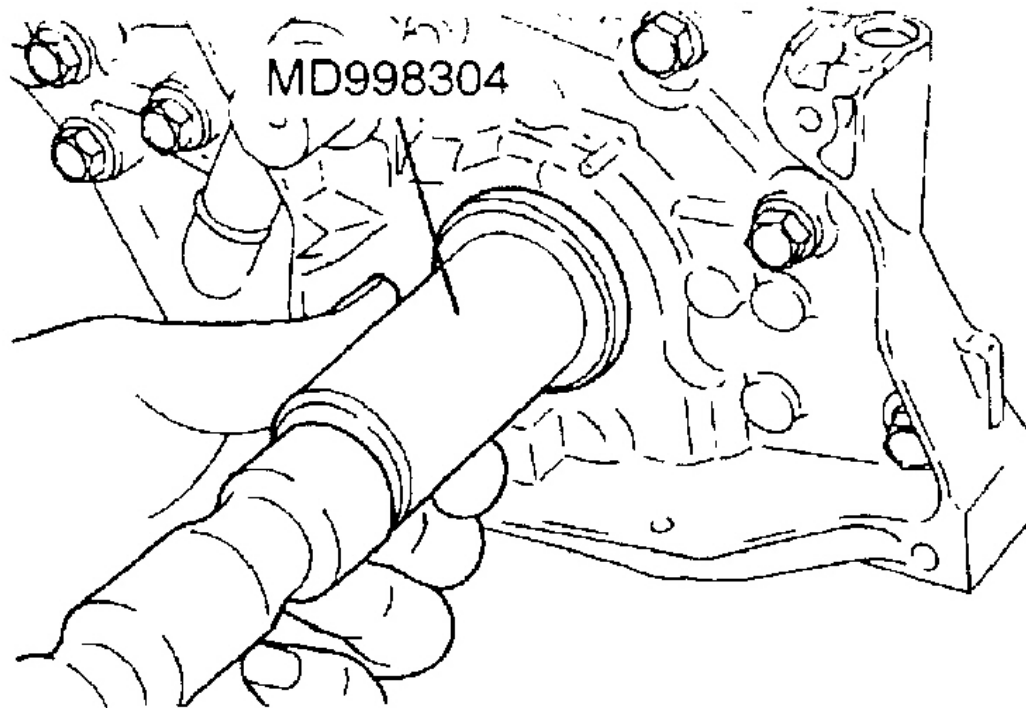


G01185314

Fig. 138: 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.



G01185315

Fig. 139: Installing Oil Seal

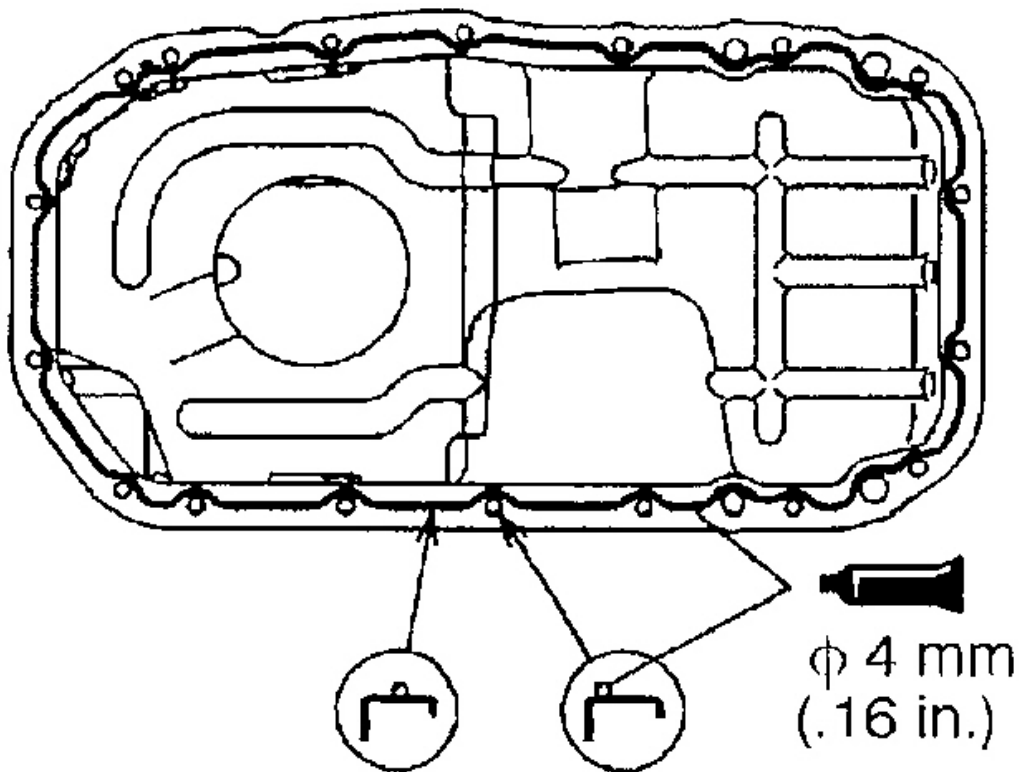
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>C< 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 the sealant

Specified sealant:

Mitsubishi Genuine Part No. MD970389 or equivalent.



G01185316

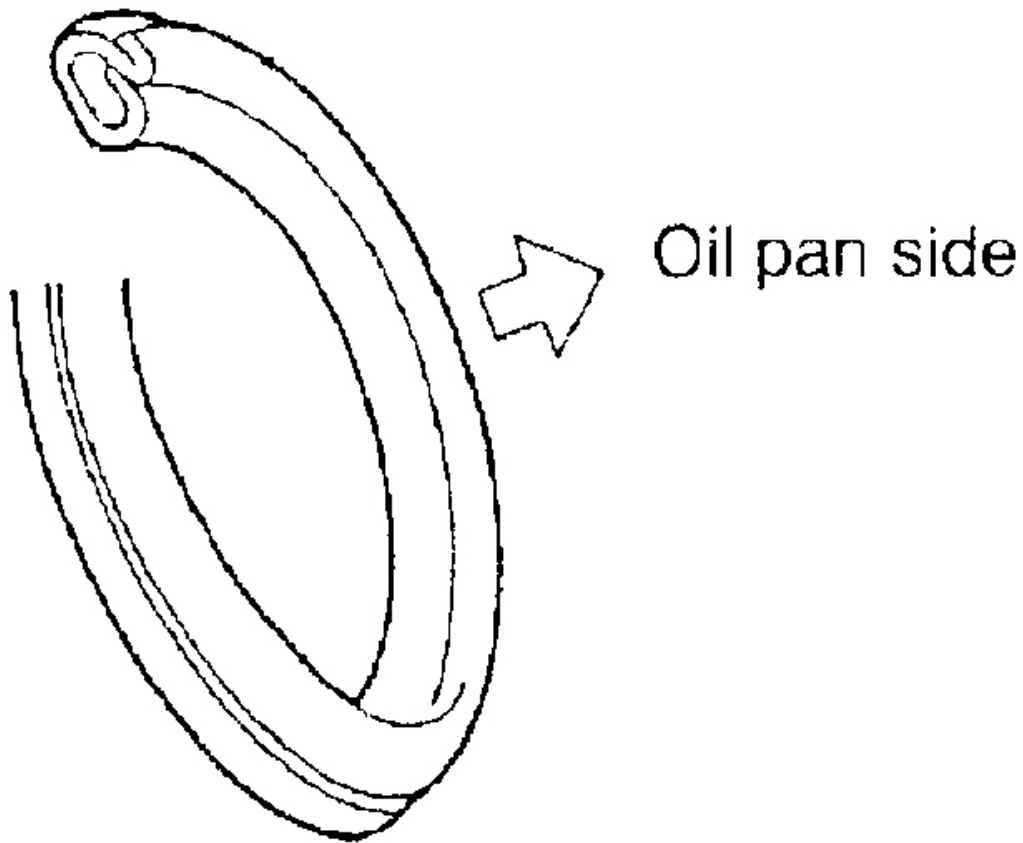
Fig. 140: Applying Sealant To Oil Pan Flange
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. Tighten the oil pan bolts to 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.

>D< 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.



G01185317

Fig. 141: Installing Drain Plug Gasket

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>E< OIL FILTER INSTALLATION

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

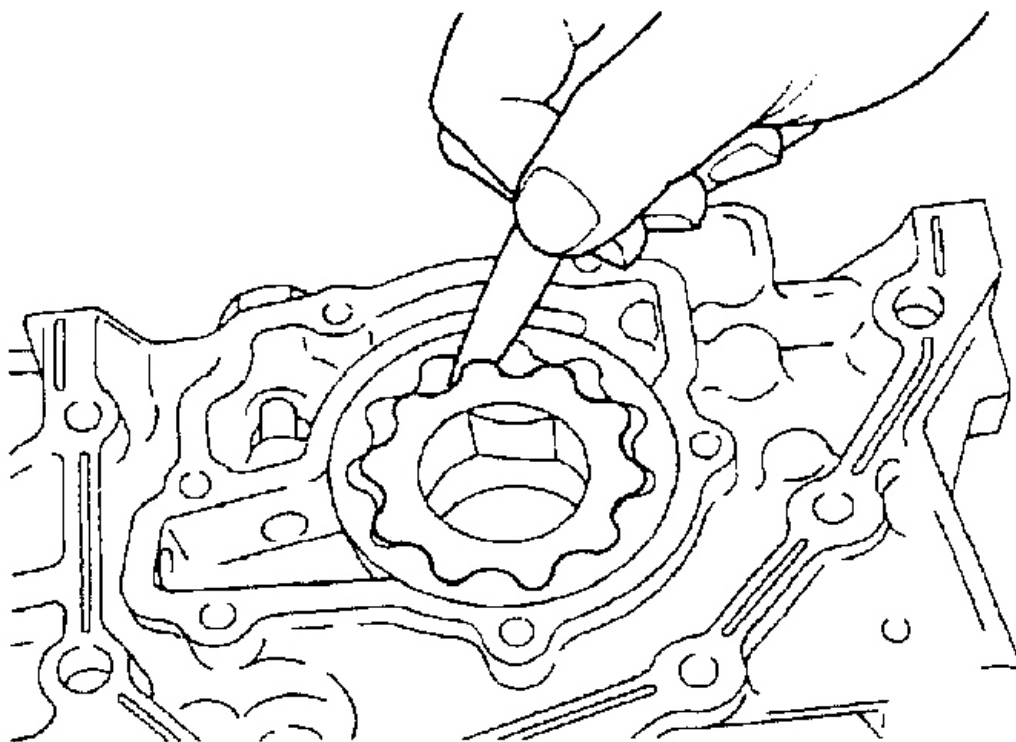
CAUTION: The oil filter must be tightened using a commercially available filter wrench. If the filter is tightened by hand only, it will be insufficiently torqued, resulting in oil leaks.

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.)

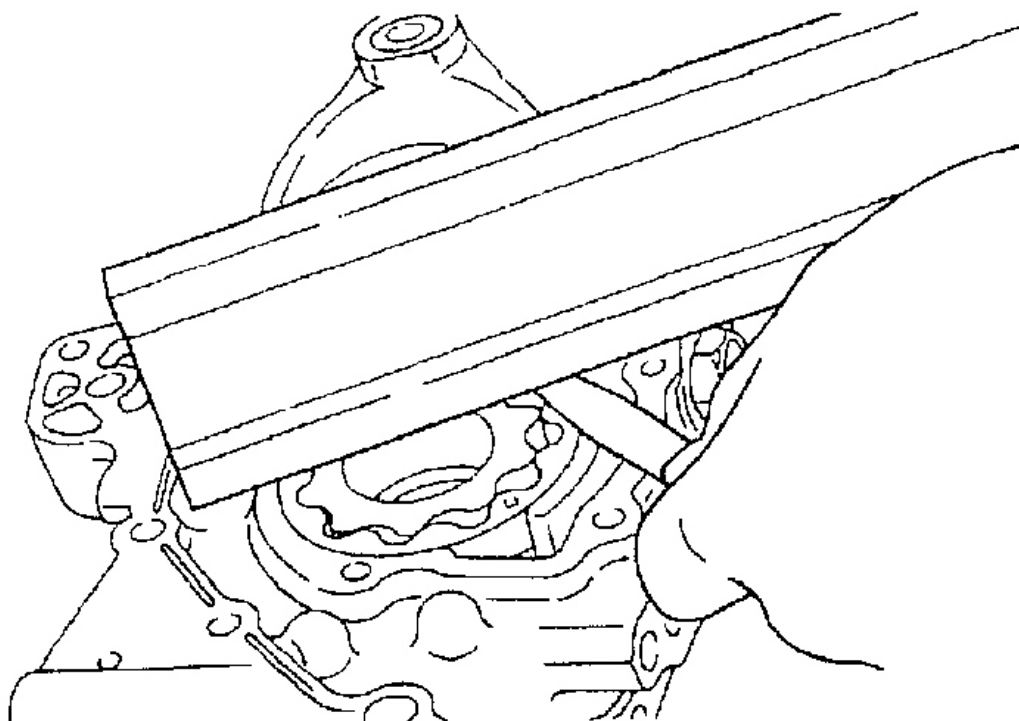


G01185318

Fig. 142: Checking Tip Clearance Using Feeler Gauge
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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

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



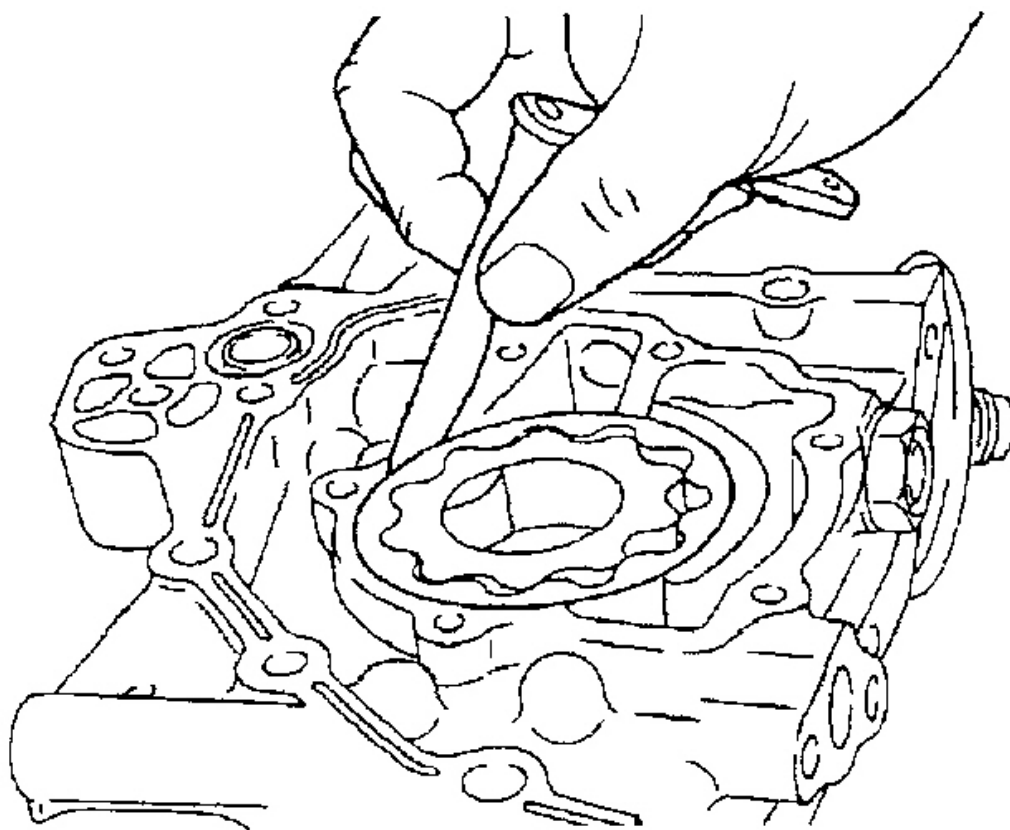
G01185319

Fig. 143: Checking Side Clearance Using Straight Edge & Feeler Gauge
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

4. Check the body clearance using a feeler gauge.

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

Limit: 0.35 mm (.0138 in.)



G01185320

Fig. 144: Checking Body Clearance Using Feeler Gauge
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

PISTONS AND CONNECTING RODS

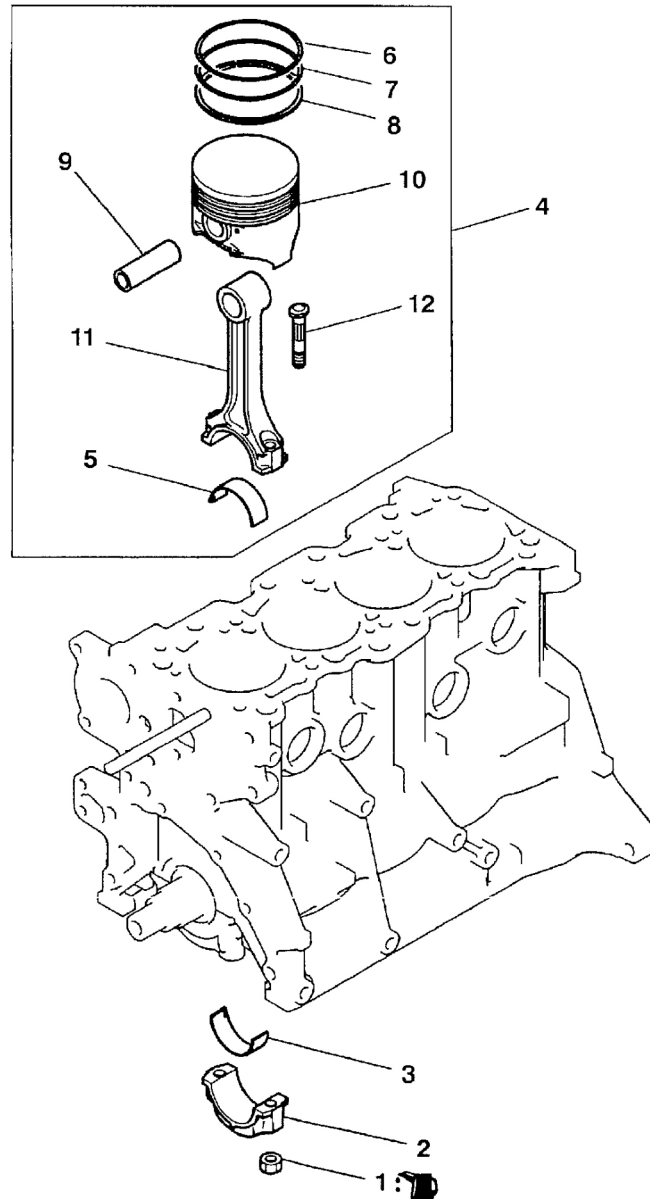
REMOVAL AND INSTALLATION

2002 Mitsubishi Mirage LS

2002 ENGINES 1.5L 4-Cylinder - Mirage



Apply engine oil to all moving parts before installation.



Removal steps

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

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

G01185321

Fig. 145: 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.

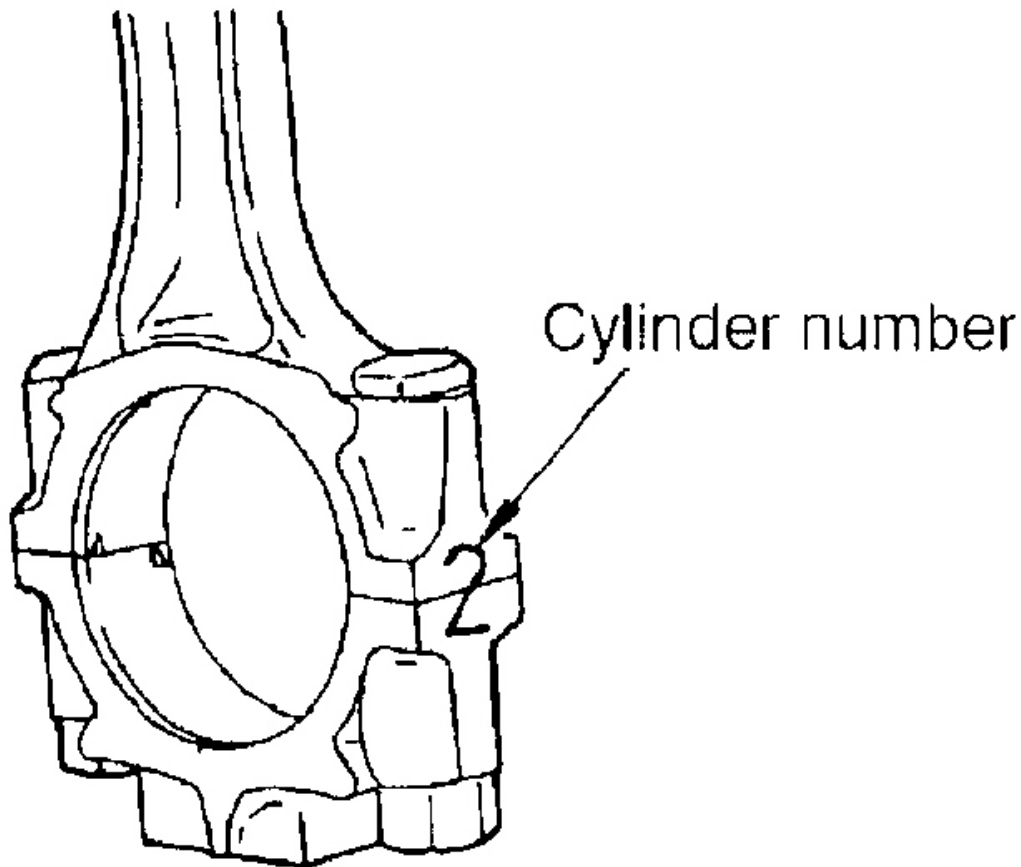
**G01185322**

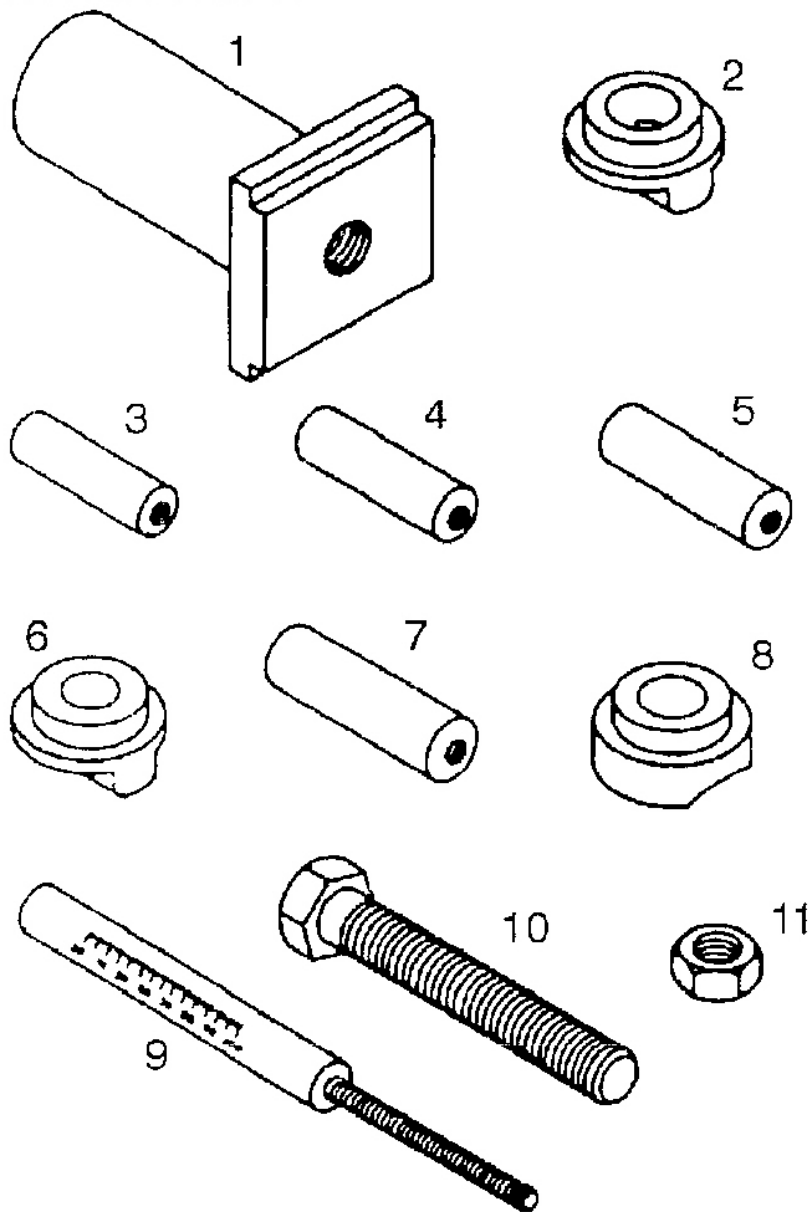
Fig. 146: Marking Cylinder Number On Side Of Connecting Rod
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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



G01185324

Fig. 147: Identifying Piston Pin Setting Tool Components (1 Of 2)
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2002 Mitsubishi Mirage LS

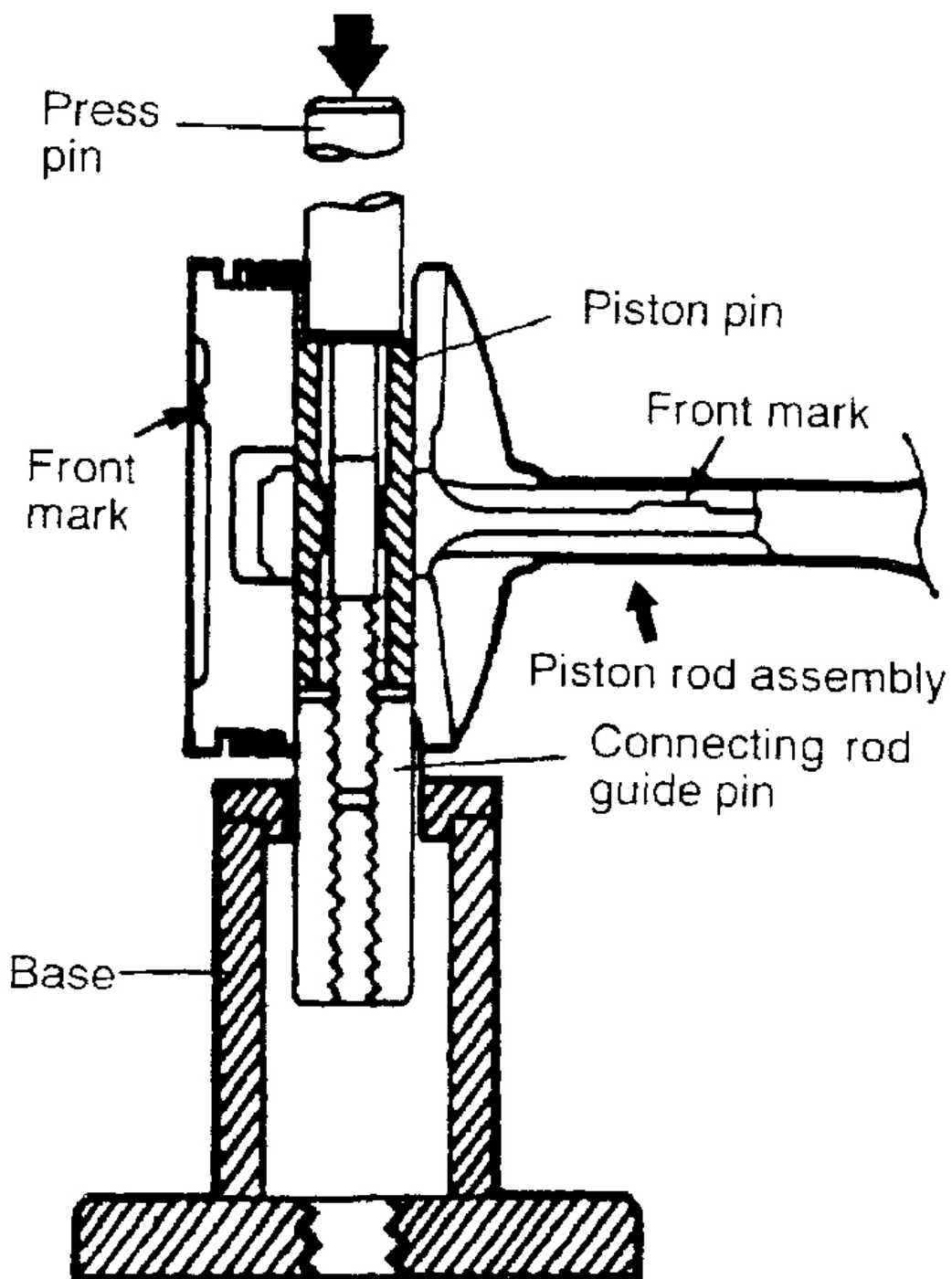
2002 ENGINES 1.5L 4-Cylinder - Mirage

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

G01185323

Fig. 148: Identifying Piston Pin Setting Tool Components (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.



G01185325

Fig. 149: Positioning Piston Assembly On Piston Support

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

5. Press the piston pin out of the assembly.

IMPORTANT: To avoid piston damage,

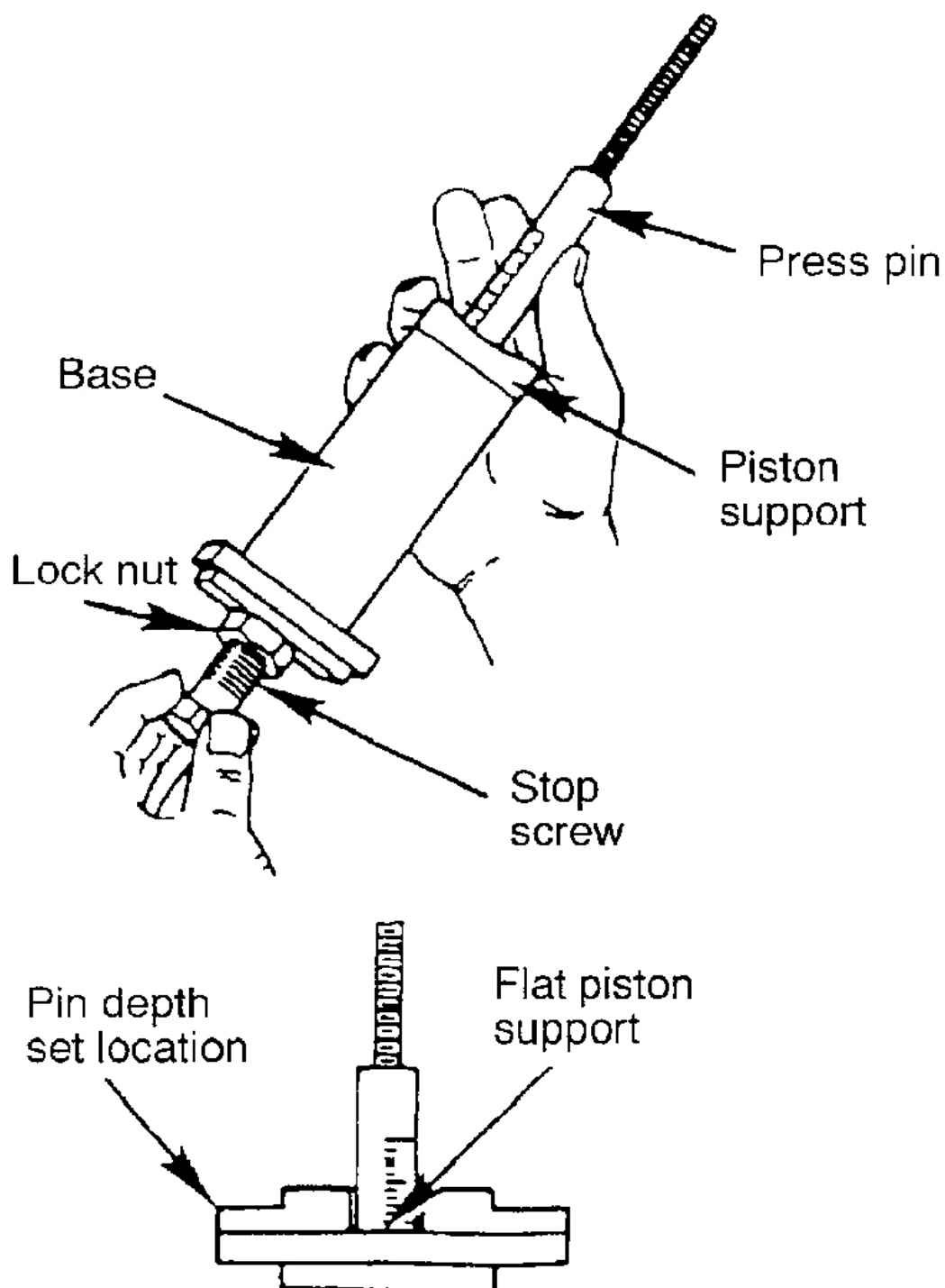
- THE PISTON SUPPORT MUST SEAT SQUARELY AGAINST THE PISTON.
- VERIFY THAT THE PISTON PIN WILL SLIDE THROUGH THE HOLE IN THE PISTON SUPPORT.

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.

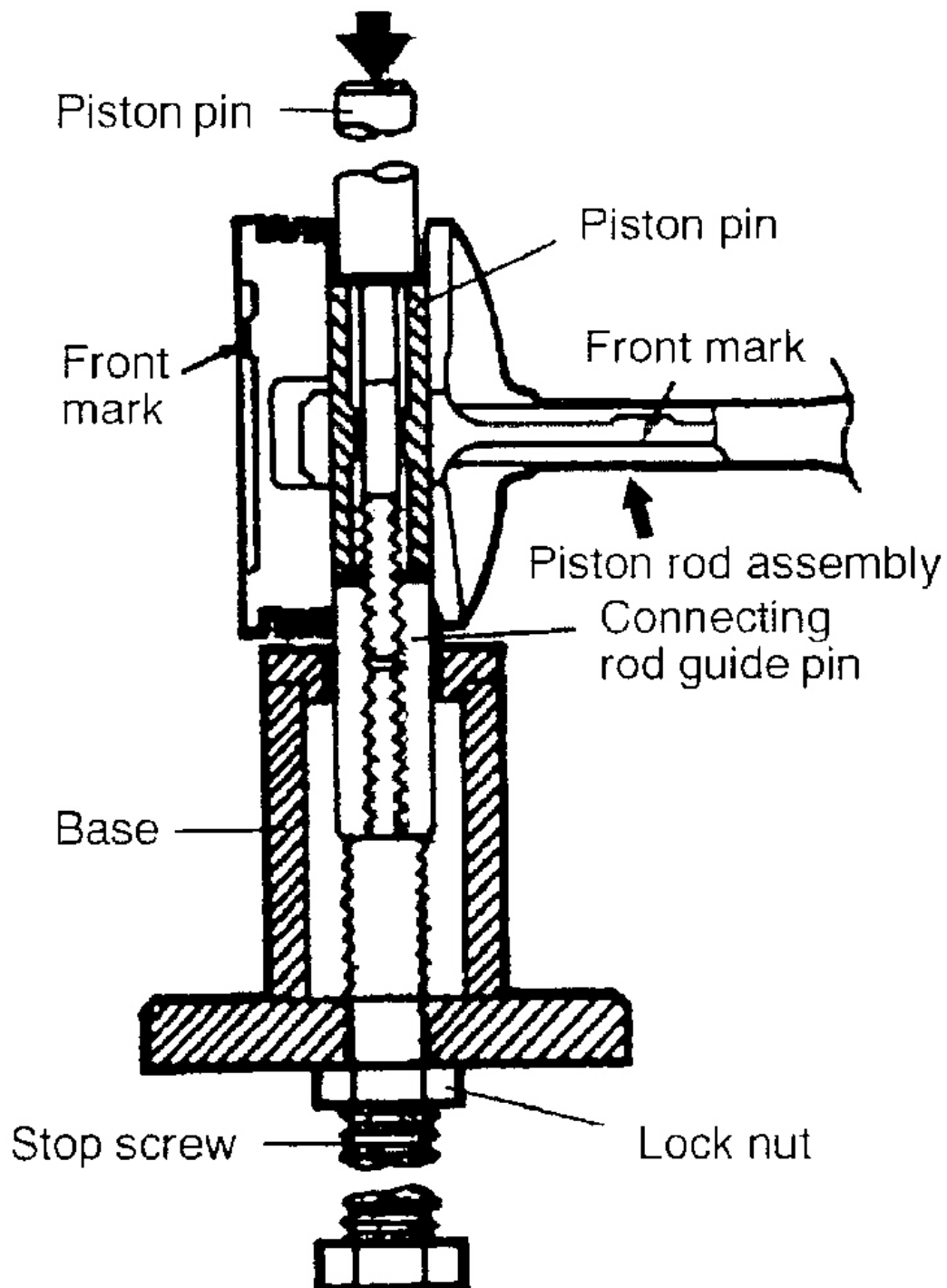


G01185326

Fig. 150: Adjusting Stop Screw To The Depth

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. Place the base on press support blocks.
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.



G01185327

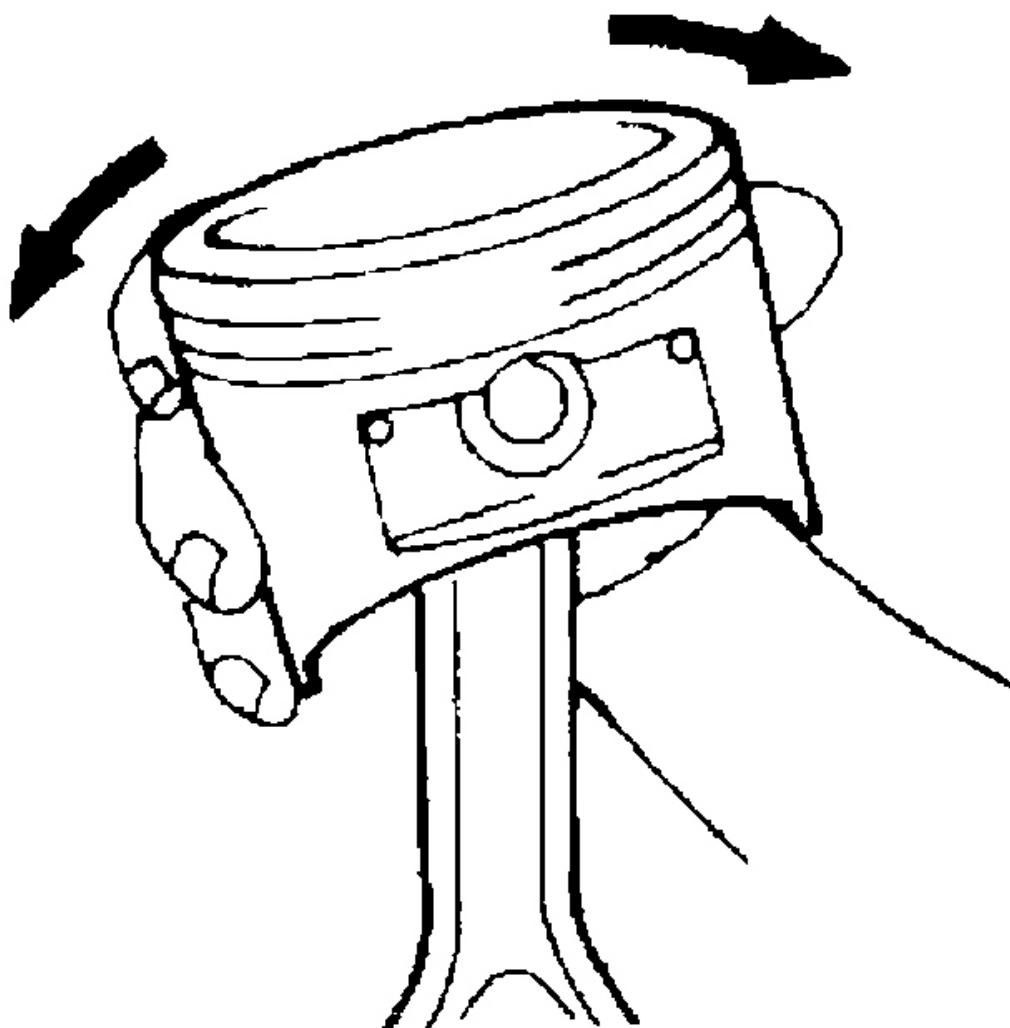
Fig. 151: Installing Piston Pin

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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.



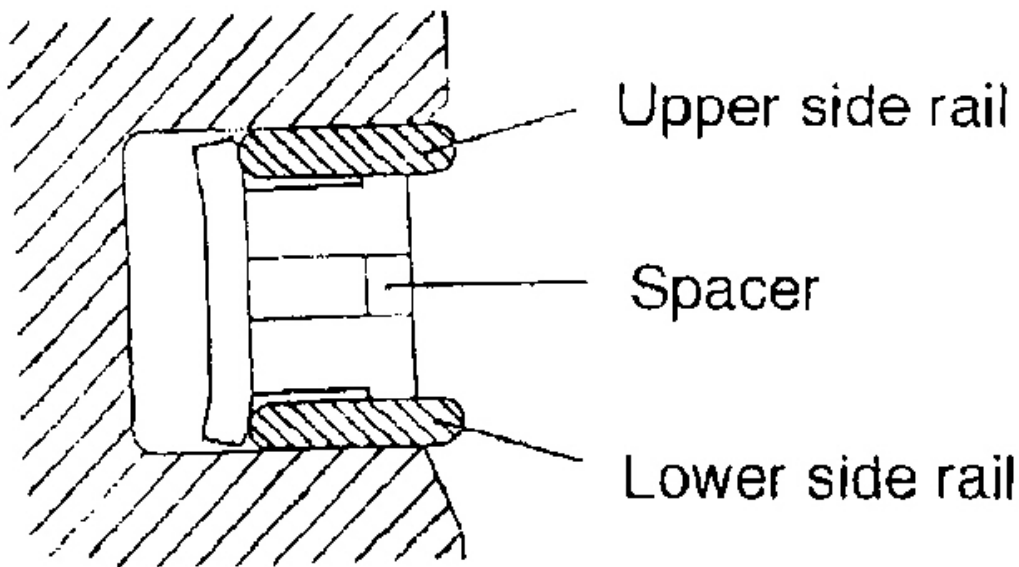
G01185328

Fig. 152: 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.

**G01185329****Fig. 153: Fitting Oil Ring Spacer Into The Piston Ring Groove**

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:

2002 Mitsubishi Mirage LS

2002 ENGINES 1.5L 4-Cylinder - Mirage

Size	Color
STD	None
0.50 mm O.S.	Blue
1.00 mm O.S.	Yellow

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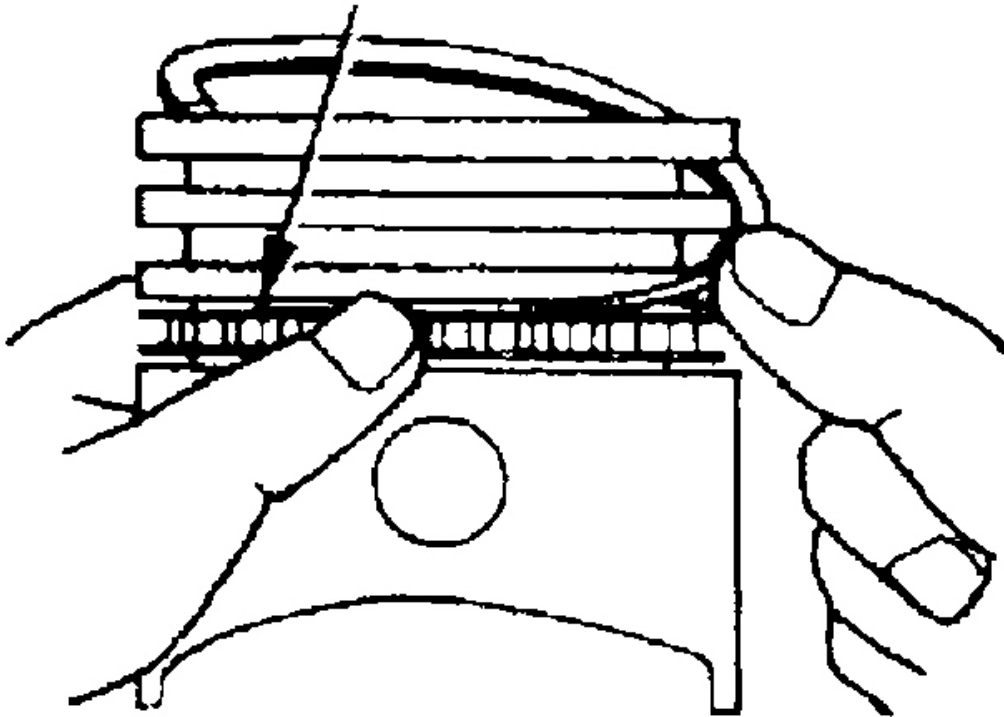
Fig. 154: Identifying Spacer & Side Rails

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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.

Side rail gap



G01185331

Fig. 155: 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

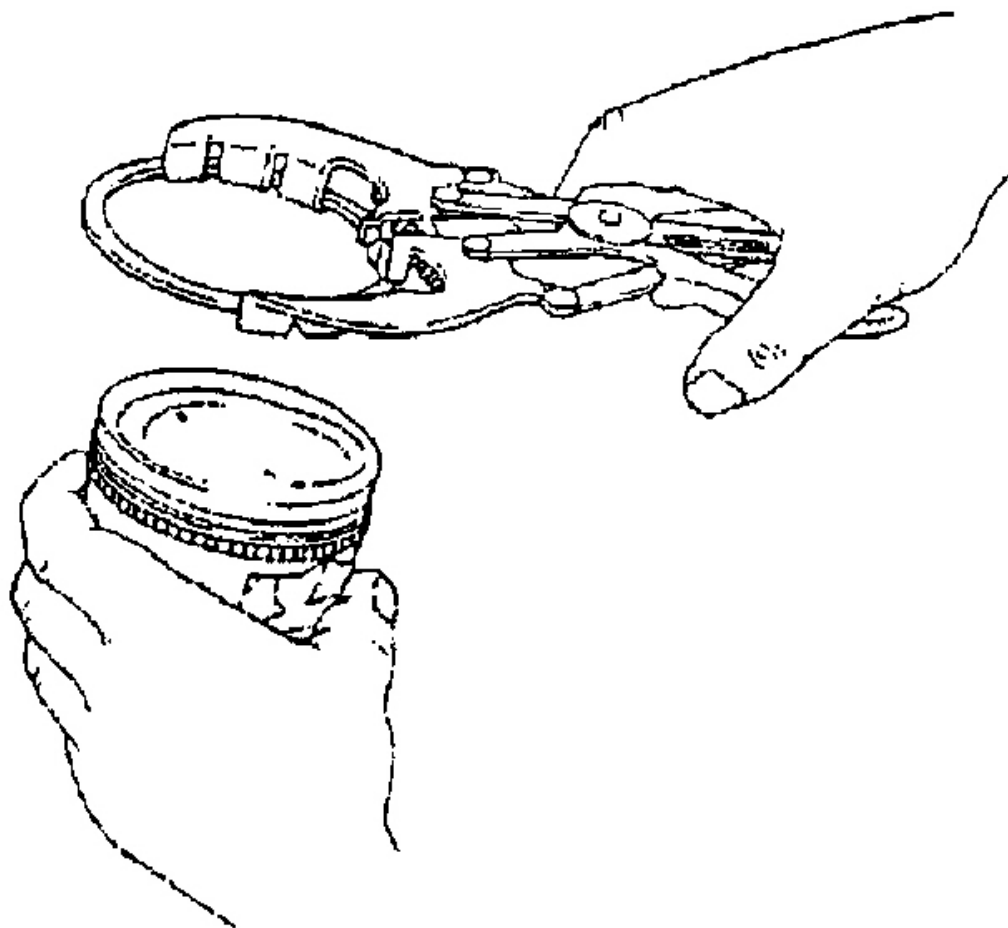
1. Using a ring expander, fit ring No. 2 and ring No. 1 with their identification marks facing upward (on the piston crown side).

Identification marks:

No. 1 ring: 1T

No. 2 ring: 2T

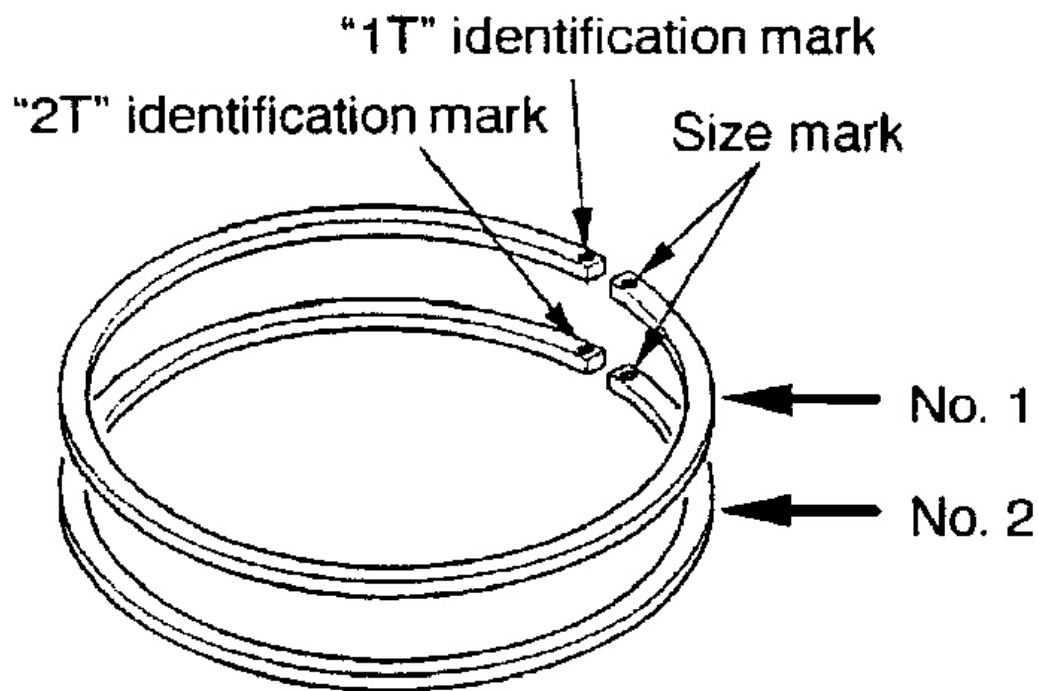
NOTE: Piston rings are stamped with size marks as follows:



G01185332

Fig. 156: Using Ring Expander

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.



G01185334

Fig. 157: Identifying Piston Rings

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Size	Size mark
STD	None
0.50 mm O.S.	50
1.00 mm O.S.	100

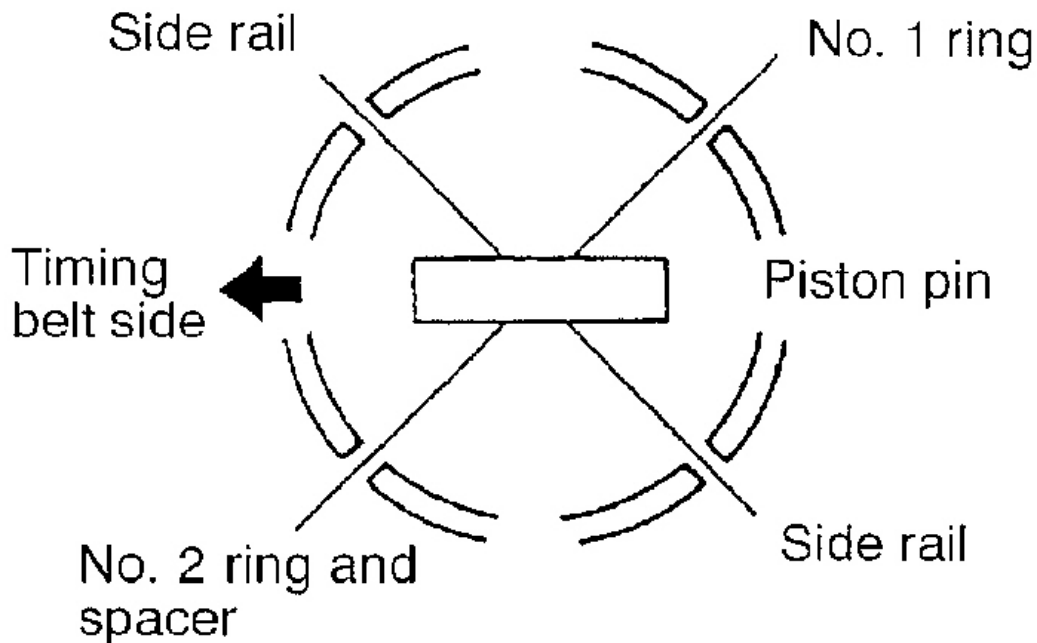
G01185333

Fig. 158: Identifying 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 rings, and oil ring.
2. Align the gaps of the piston rings and oil ring (side rails and spacer) as shown.



G01185335

Fig. 159: 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.

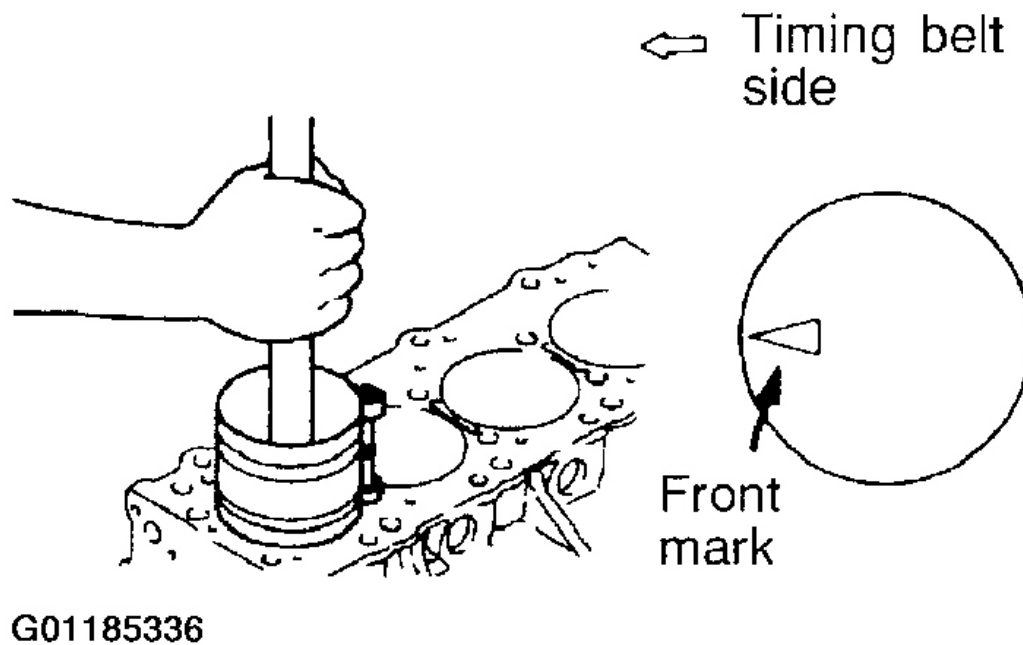


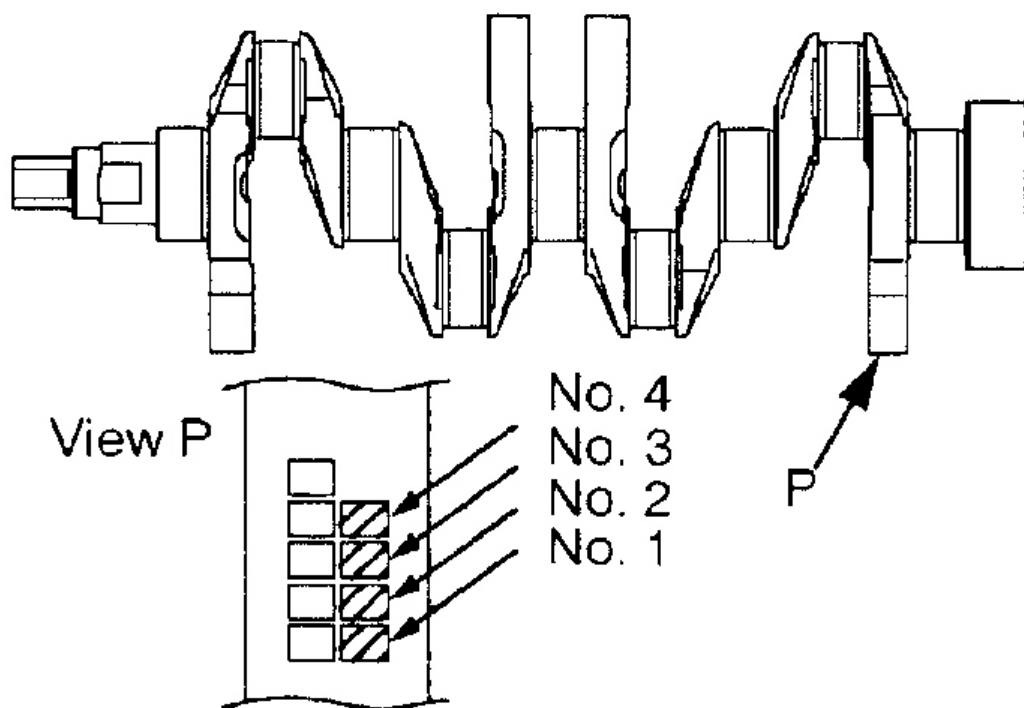
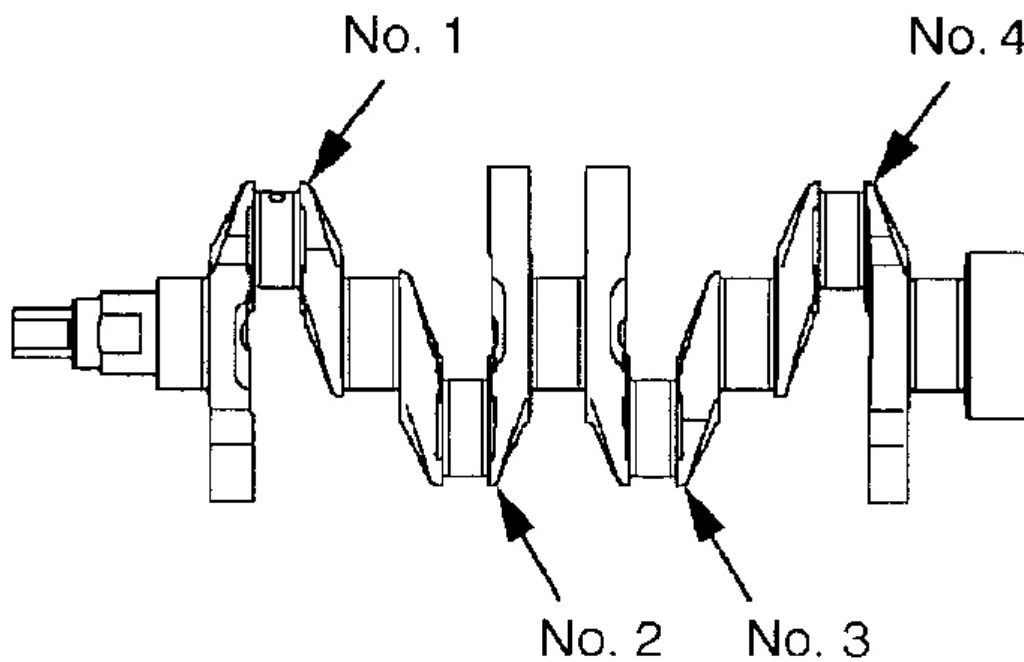
Fig. 160: Installing Piston & Connecting Rod Assembly
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>E< CONNECTING ROD BEARING INSTALLATION

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

2002 Mitsubishi Mirage LS

2002 ENGINES 1.5L 4-Cylinder - Mirage



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2002 Mitsubishi Mirage LS

2002 ENGINES 1.5L 4-Cylinder - Mirage

Fig. 161: Connecting Rod Bearing Identification Marks

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

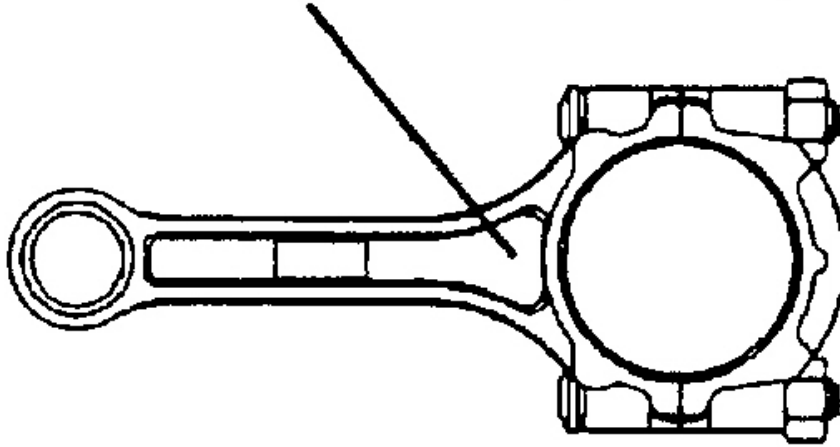
Crankshaft pin O.D.		Connecting rod big end I.D.	Connecting rod bearing	
Identifi- cation color	Identifi- cation mark	Identification color	Identifi- cation mark	Identifi- cation color
Yellow	I	White	1	Yellow
		None	1	Yellow
		Yellow	2	None
None	II	White	1	Yellow
		None	2	None
		Yellow	3	Blue
White	III	White	2	None
		None	3	Blue
		Yellow	3	Blue

G01185337

Fig. 162: Identifying Connecting Rod Bearing Identification Marks

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

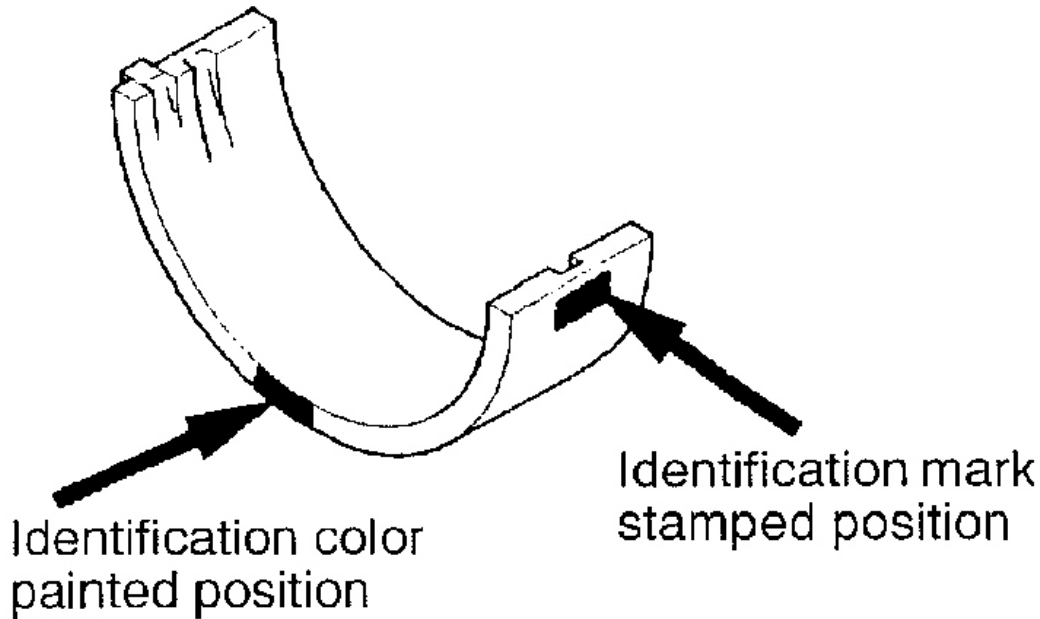
Connecting rod
Identification color painted position



G01185339

Fig. 163: Locating Connecting Rod Identification Color
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Connecting rod bearing

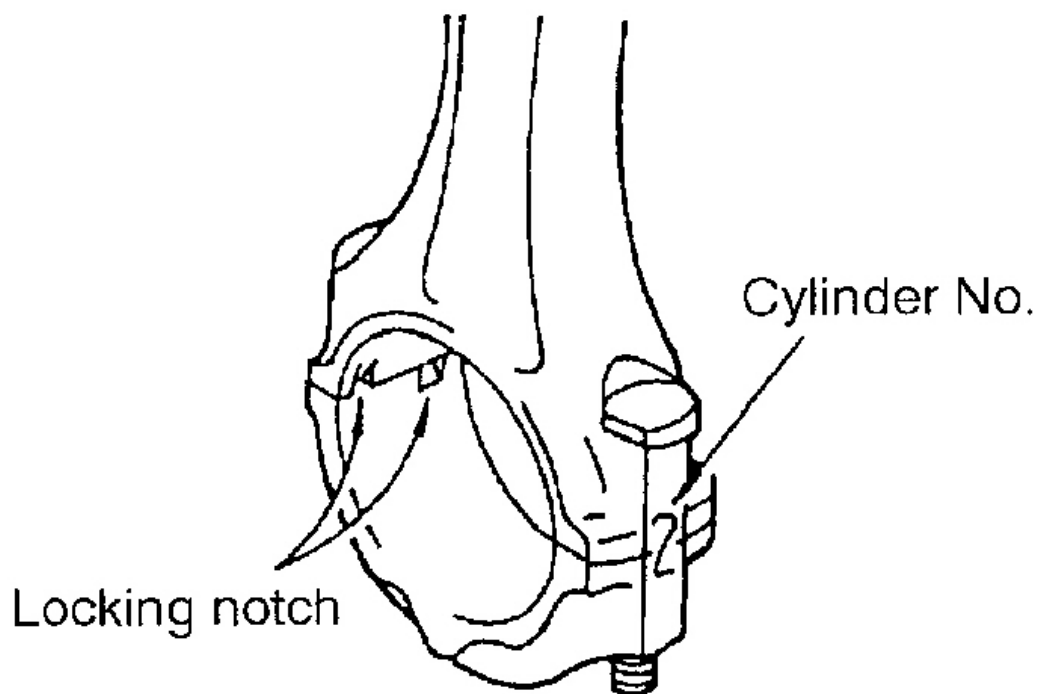


G01185340

Fig. 164: Locating Connecting Rod Bearing Identification Color
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.



G01185341

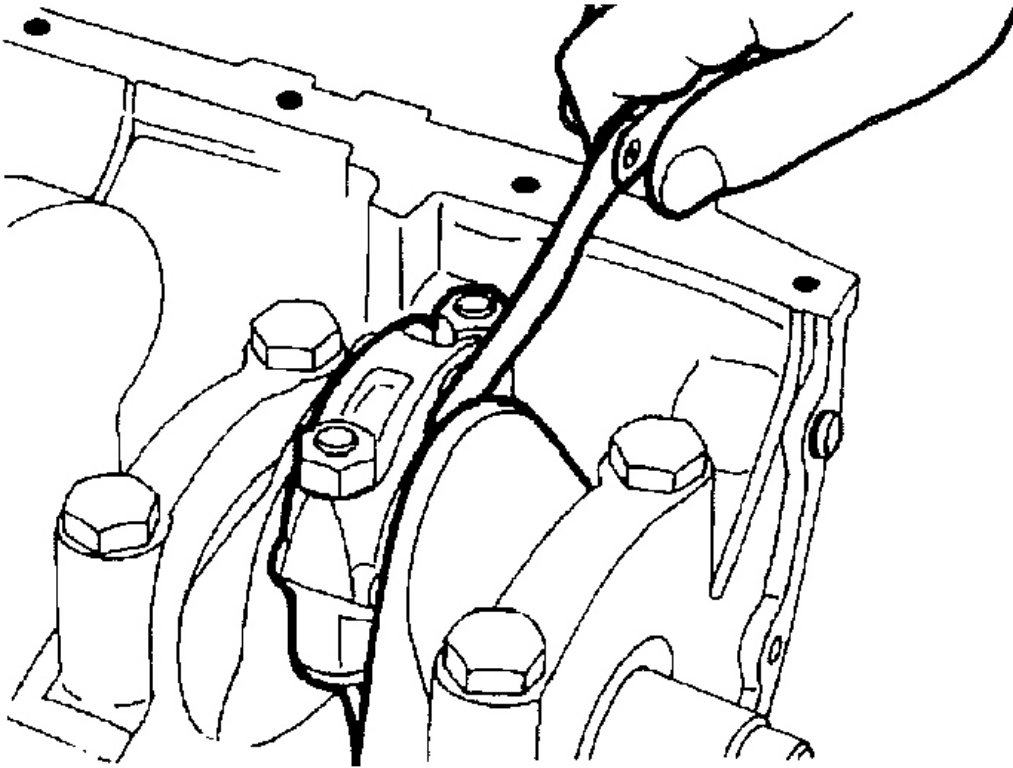
Fig. 165: Aligning Connecting Rod Marks

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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

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

Limit: 0.4 mm (.016 in.)



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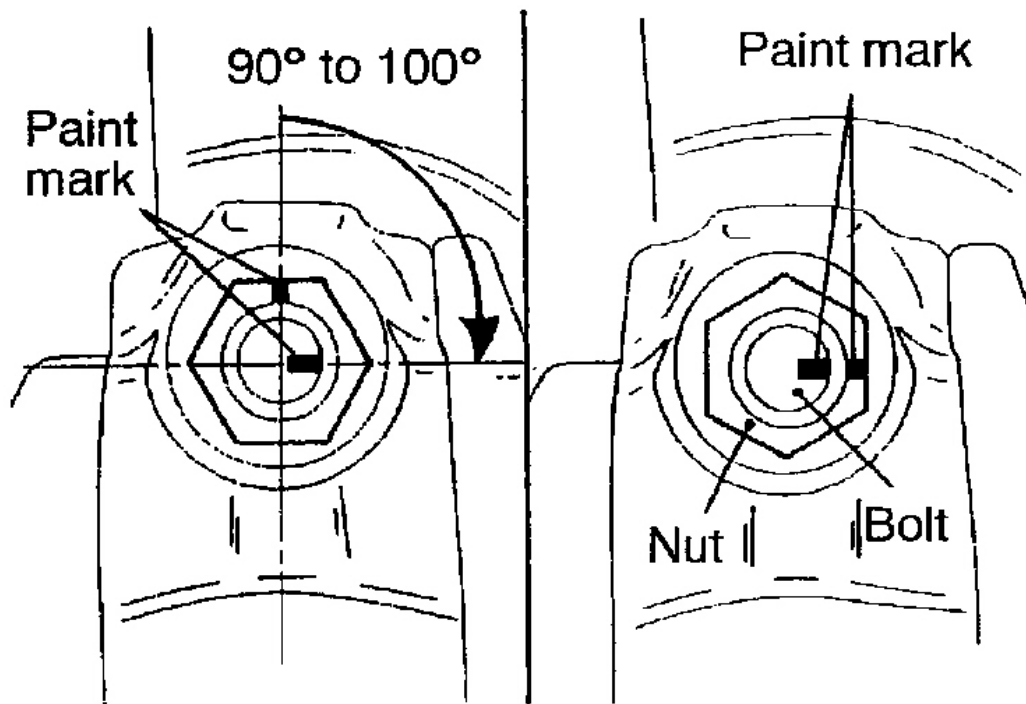
Fig. 166: Checking Connecting Rod Big End Side Clearance
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>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 17 Nm (12 ft.lbs.).
5. Make a paint mark on the head of each nut.



G01185343

Fig. 167: Making Paint Marks

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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.

- CAUTION:**
1. If the nut is turned less than 90°, proper fastening performance may not be expected. When tightening the nuts, 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.

2002 Mitsubishi Mirage LS

2002 ENGINES 1.5L 4-Cylinder - Mirage

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: 0.1 mm (.004 in.)

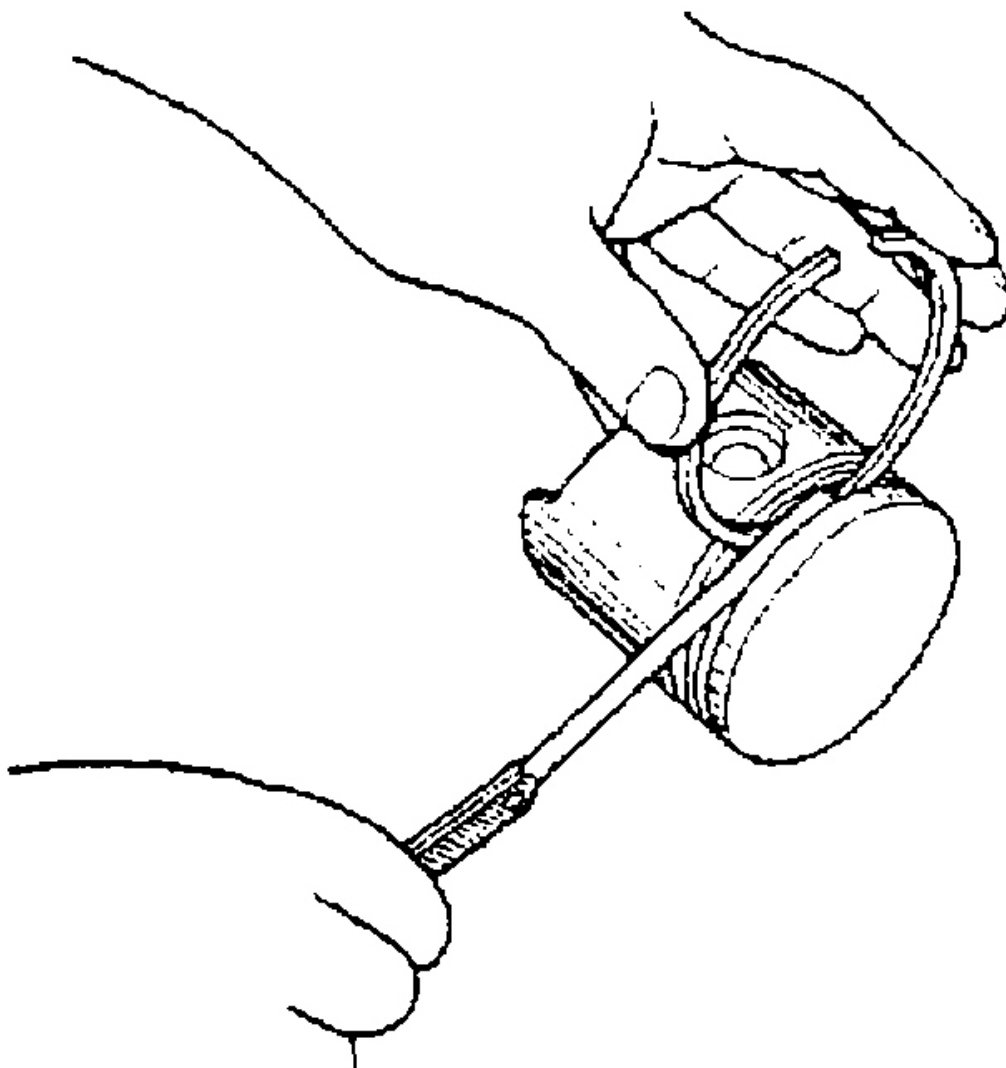
**G01185344**

Fig. 168: Checking Piston Ring Side Clearance
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2. Insert 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:

2002 Mitsubishi Mirage LS

2002 ENGINES 1.5L 4-Cylinder - Mirage

No. 1 ring: 0.20 - 0.35 mm (.0079 - .0138 in.)

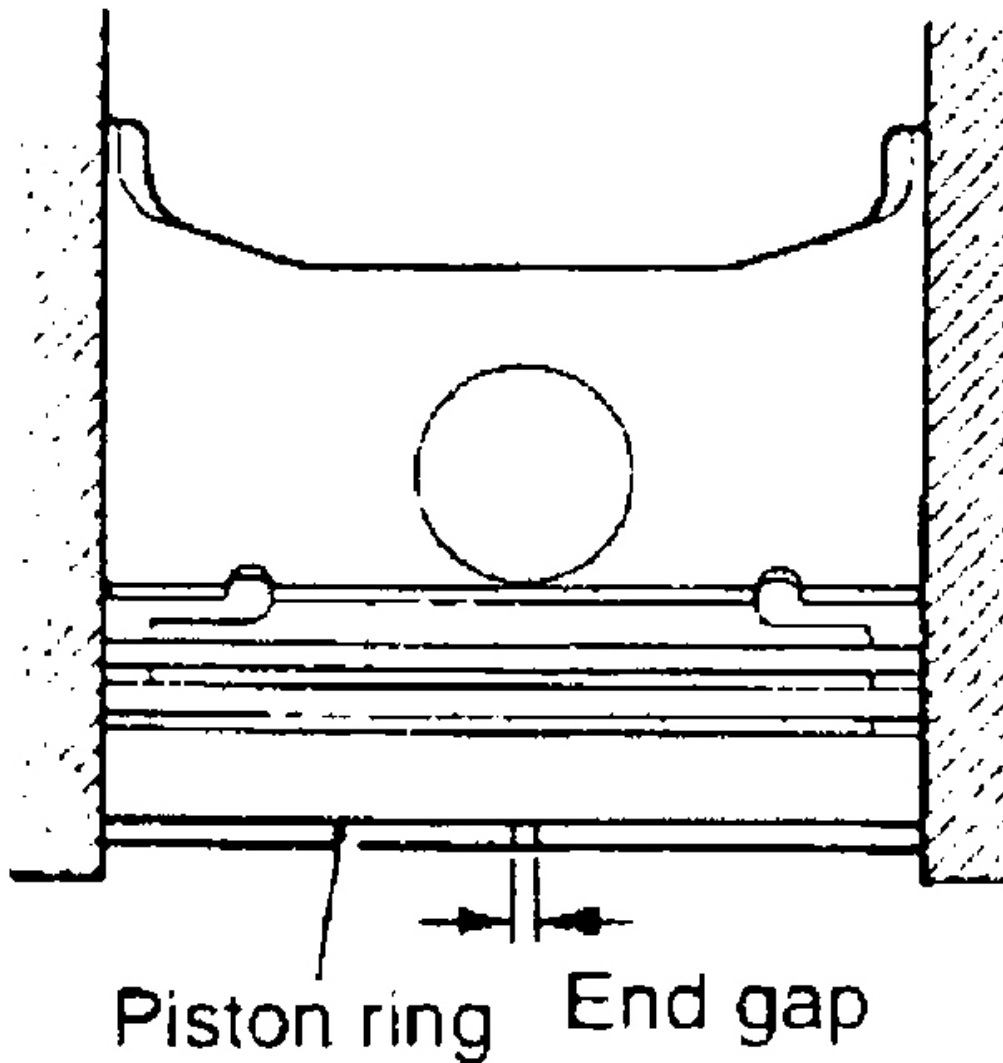
No. 2 ring: 0.35 - 0.50 mm (.0138 - .0197 in.)

Oil ring: 0.20 - 0.50 mm (.0079 - .0197 in.)

Limit:

No. 1, No. 2 ring: 0.8 mm (.031 in.)

Oil ring: 1.0 mm (.039 in.)



G01185345

Fig. 169: Measuring Piston Ring End Gap

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

CRANKSHAFT PIN OIL CLEARANCE (PLASTIC GAUGING MATERIAL METHOD)

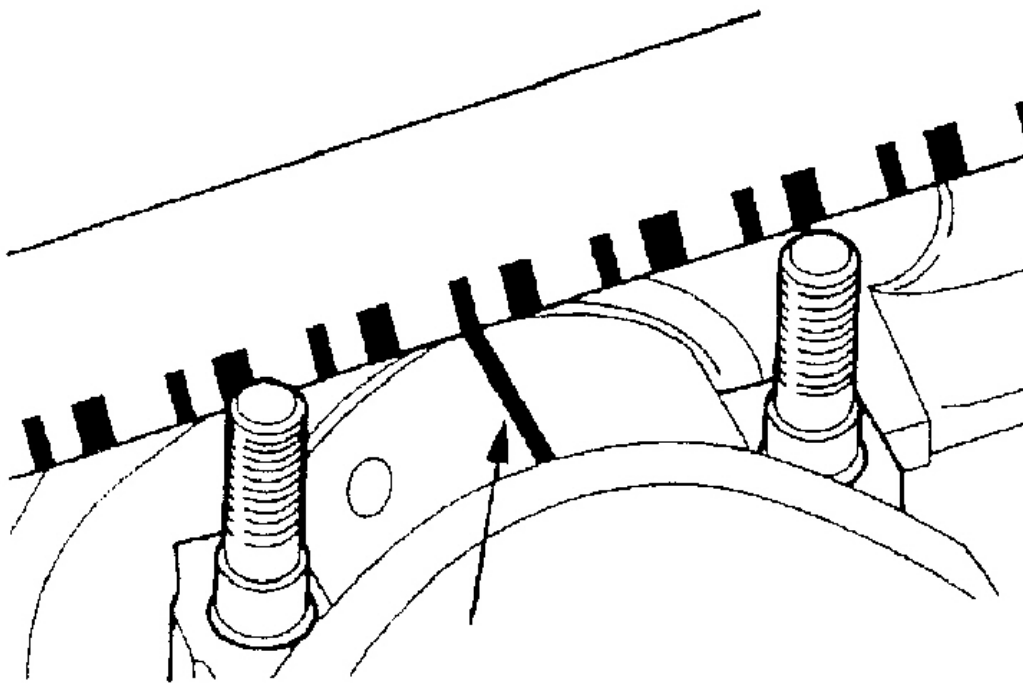
1. Remove oil from crankshaft pin and connecting rod bearing.
2. Cut the plastic gauging material to the same length as the width of bearing and place it on a crankshaft pin in parallel with its axis.
3. Install the connecting rod cap carefully and tighten the nuts to the specified torque. See >G<

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 the plastic gauging material package.

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

Limit: 0.1 mm (.004 in.)



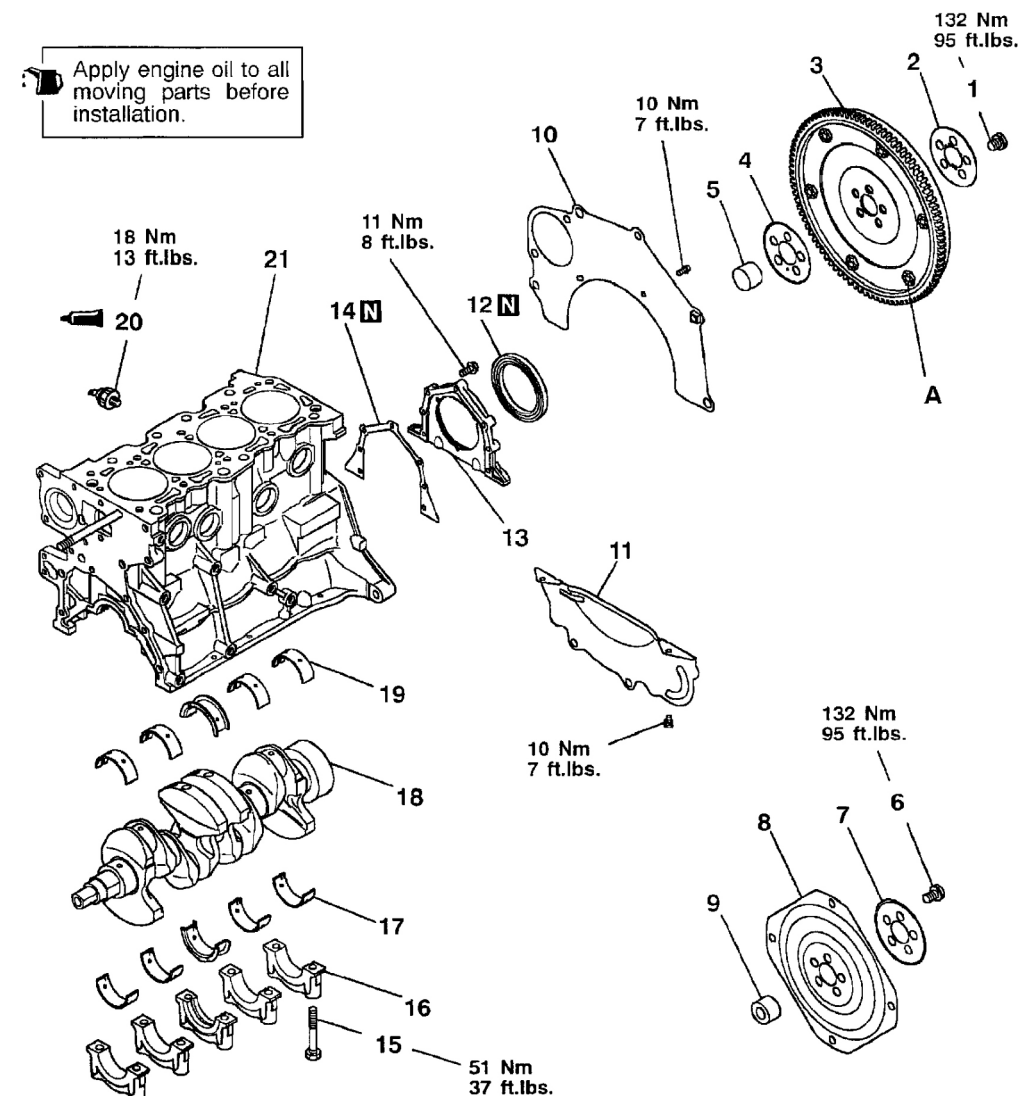
G01185346

Fig. 170: Measuring Crankshaft Pin Oil Clearance
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

CRANKSHAFT AND CYLINDER BLOCK**REMOVAL AND INSPECTION**



Apply engine oil to all moving parts before installation.



Removal steps

1. Flywheel bolt <M/T>
2. Adapter plate <M/T>
3. Flywheel (Non-disassemblable part) <M/T>
4. Adapter plate <M/T>
5. Crankshaft bushing <M/T>
6. Drive plate bolt <A/T>
7. Adapter plate <A/T>
8. Drive plate <A/T>
9. Crankshaft bushing <A/T>
10. Rear plate
11. Bell housing cover
- ▶D◀ 12. Rear oil seal
13. Rear oil seal case
14. Rear oil seal case gasket

- ▶C◀ 15. Bearing cap bolt
- ▶C◀ 16. Bearing cap
- ▶B◀ 17. Crankshaft bearing (lower)
18. Crankshaft
- ▶B◀ 19. Crankshaft bearing (upper)
- ▶A◀ 20. Oil pressure switch
21. 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 type flywheel to be out of balance, giving damage to the flywheel.

G01185347

Fig. 171: Removing & Inspecting Crankshaft & Cylinder Block
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

INSTALLATION SERVICE POINTS

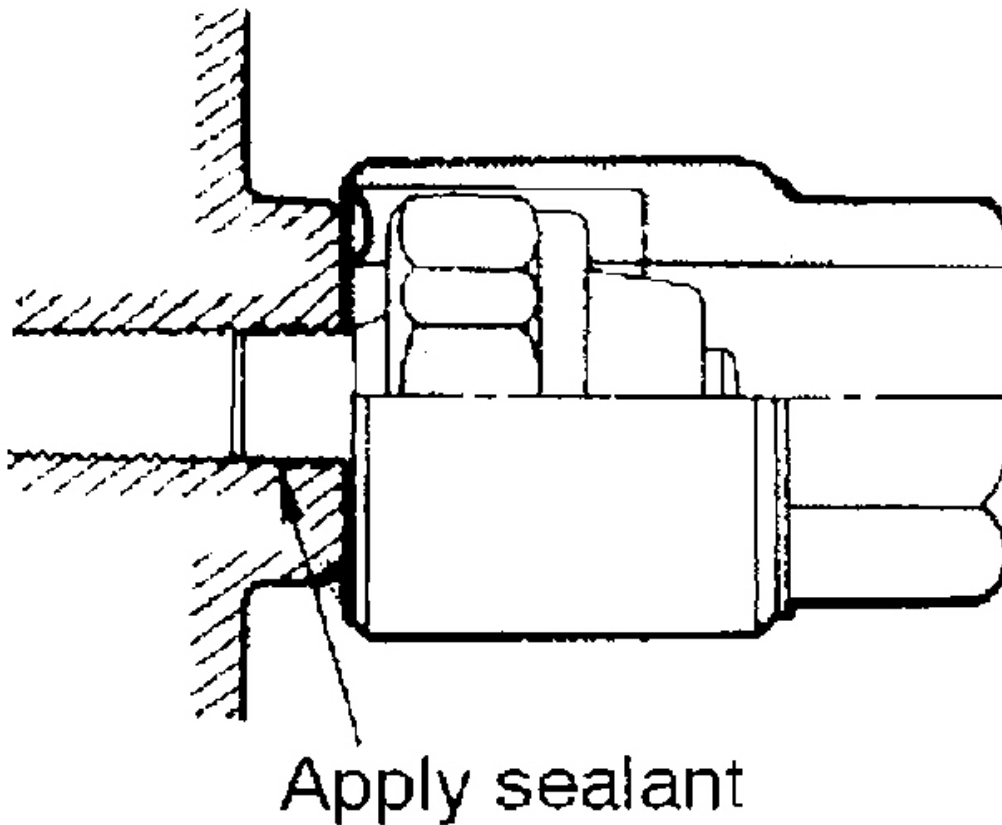
>A< OIL PRESSURE SWITCH INSTALLATION

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

Specified sealant:

3M™ AAD Part No. 8672 or equivalent.

CAUTION: Use care to allow the sealant to plug the oil passage.



G01185348

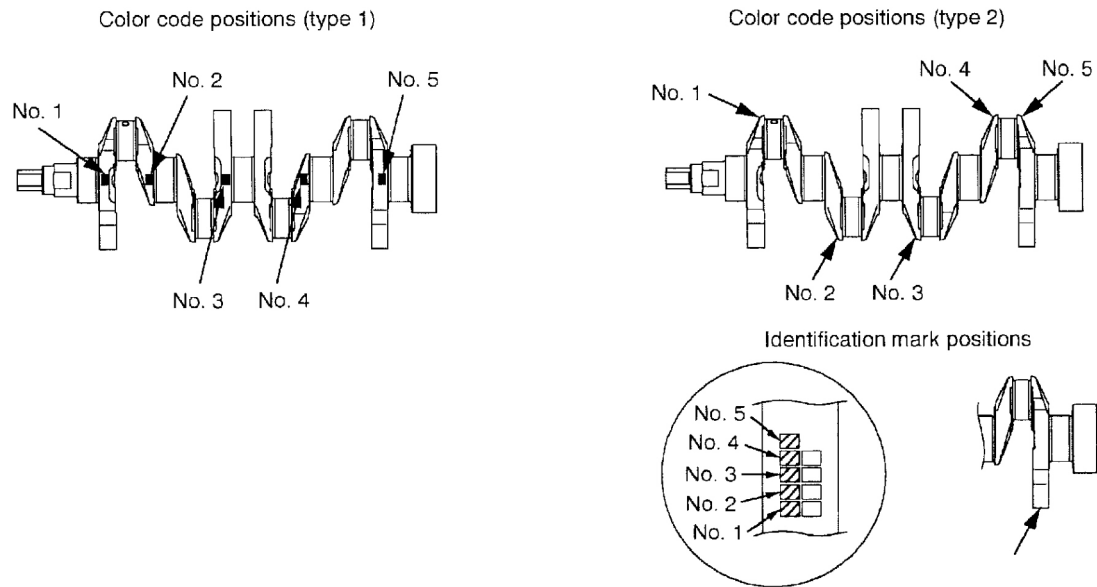
Fig. 172: Applying Sealant To Oil Pressure Switch
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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

>B< CRANKSHAFT BEARING INSTALLATION

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



G01185349

Fig. 173: Identifying Crankshaft Bearing Color Code Positions
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

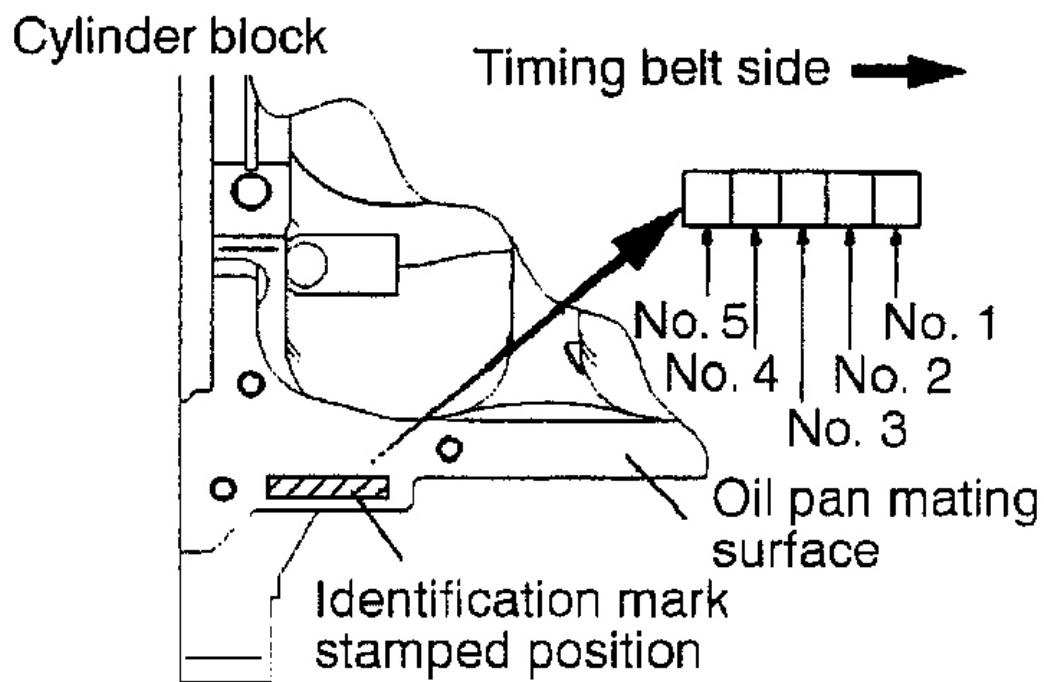
2002 Mitsubishi Mirage LS

2002 ENGINES 1.5L 4-Cylinder - Mirage

Crankshaft journal O.D.		Cylinder block bearing bore I.D.	Crankshaft bearing
Identification color	Identification mark	Identification mark	Identification mark
Yellow	1	0	1
		1	2
		2	3
None	2	0	2
		1	3
		2	4
White	3	0	3
		1	4
		2	5

G01185350

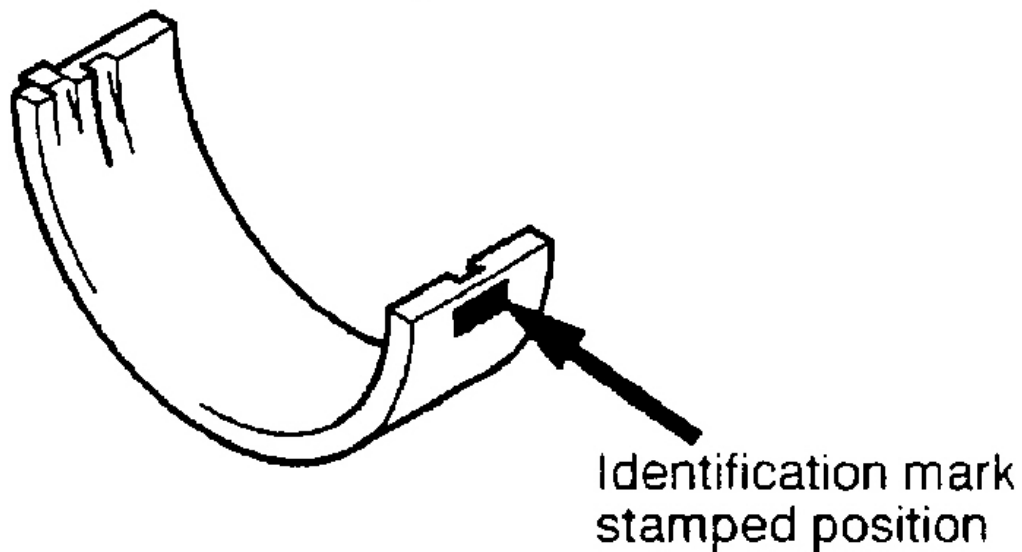
Fig. 174: Crankshaft Bearing Color Code Chart**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**



G01185351

Fig. 175: Cylinder Block Identification Mark Stamped Position
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

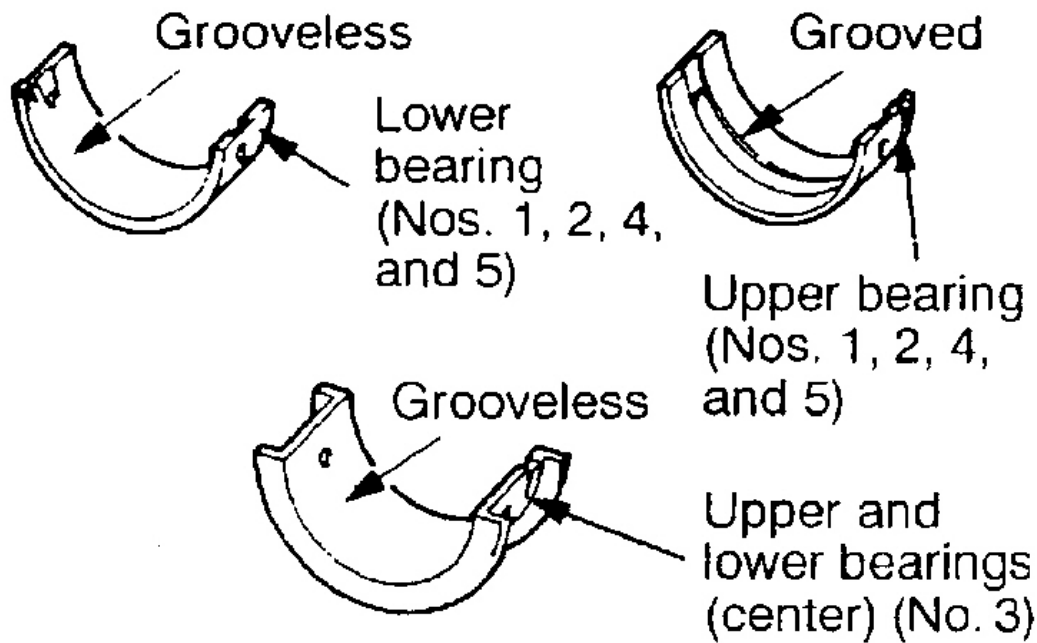
Crankshaft bearing



G01185352

Fig. 176: Crankshaft Bearing Identification Mark Stamped Position
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2. Install the crankshaft bearings to the cylinder block and bearing caps as shown illustration.

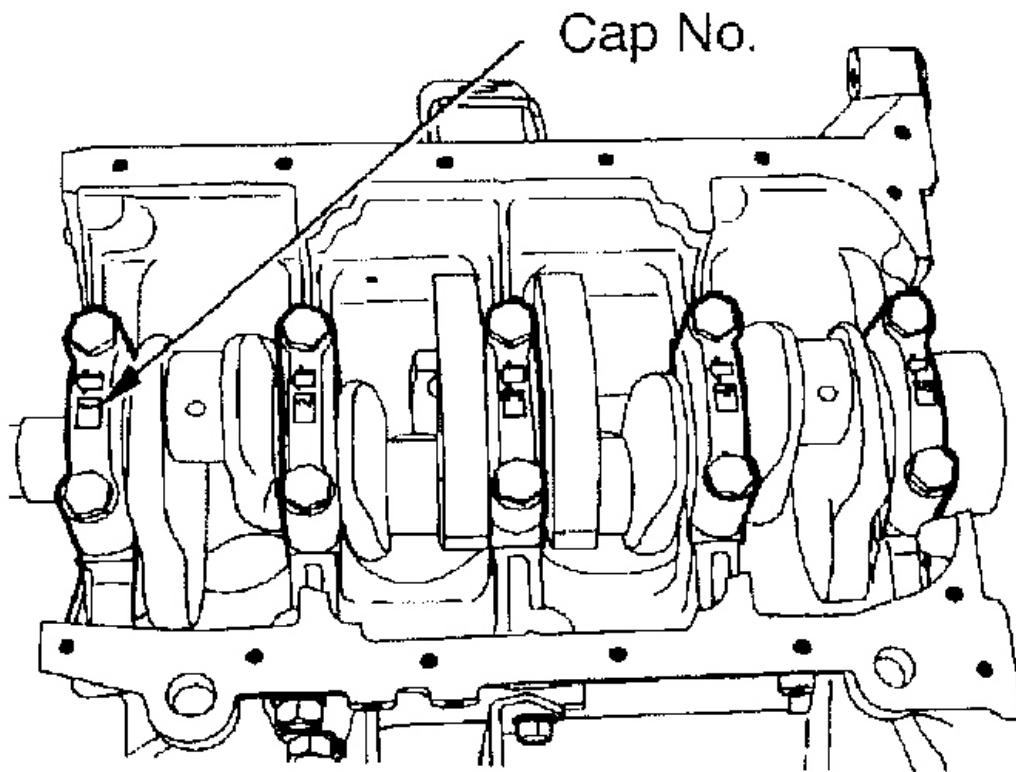


G01185353

Fig. 177: Installing Crankshaft Bearings To Cylinder Block & Bearing Caps
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>C< BEARING CAP INSTALLATION

1. On the bottom surface of each bearing cap is the cap's number and an arrow. Starting at the timing belt side, install the bearing caps in numerical order. Ensure that the arrows point toward the timing belt side.



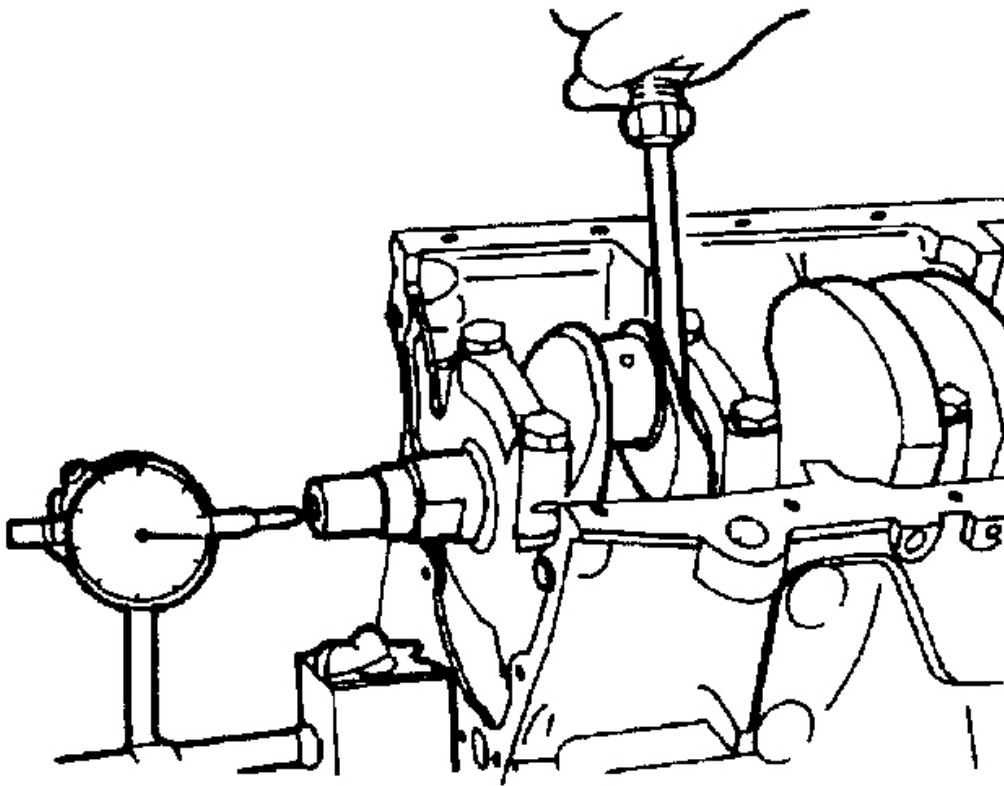
G01185354

Fig. 178: Installing Bearing Caps In Numerical Order
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2. Check that the crankshaft rotates smoothly.
3. Measure the end play in the crankshaft. If the measurement exceeds the specified limit, replace the crankshaft bearings.

Standard value: 0.05 - 0.18 mm (.0020 - .0071 in.)

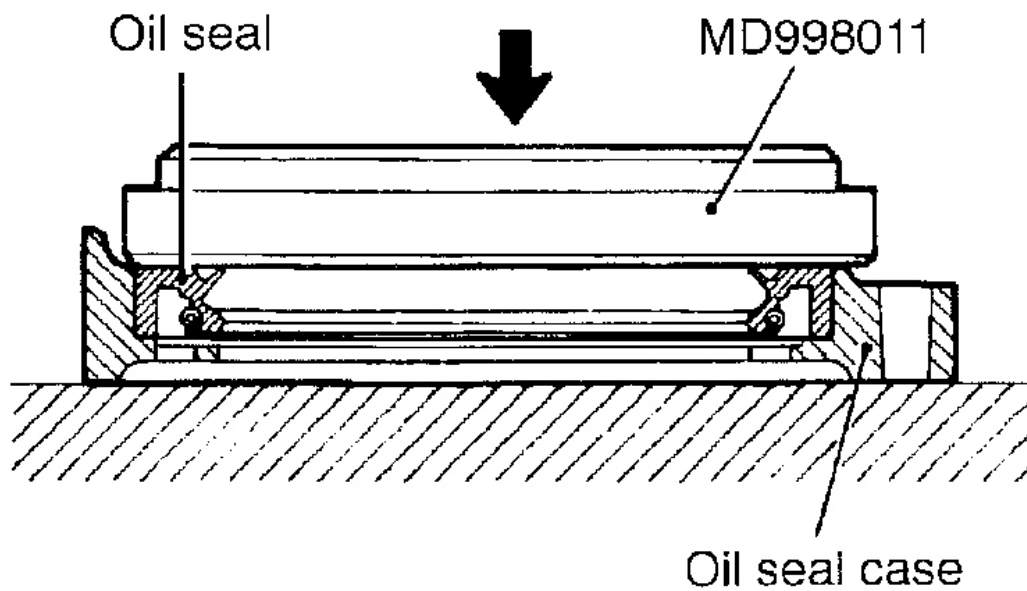
Limit: 0.25 mm (.010 in.)



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Fig. 179: Measuring End Play In Crankshaft
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>D< REAR OIL SEAL INSTALLATION



G01185356

Fig. 180: Installing Rear Oil Seal

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

INSPECTION

CRANKSHAFT JOURNAL OIL CLEARANCE (PLASTIC GAUGING MATERIAL METHOD)

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

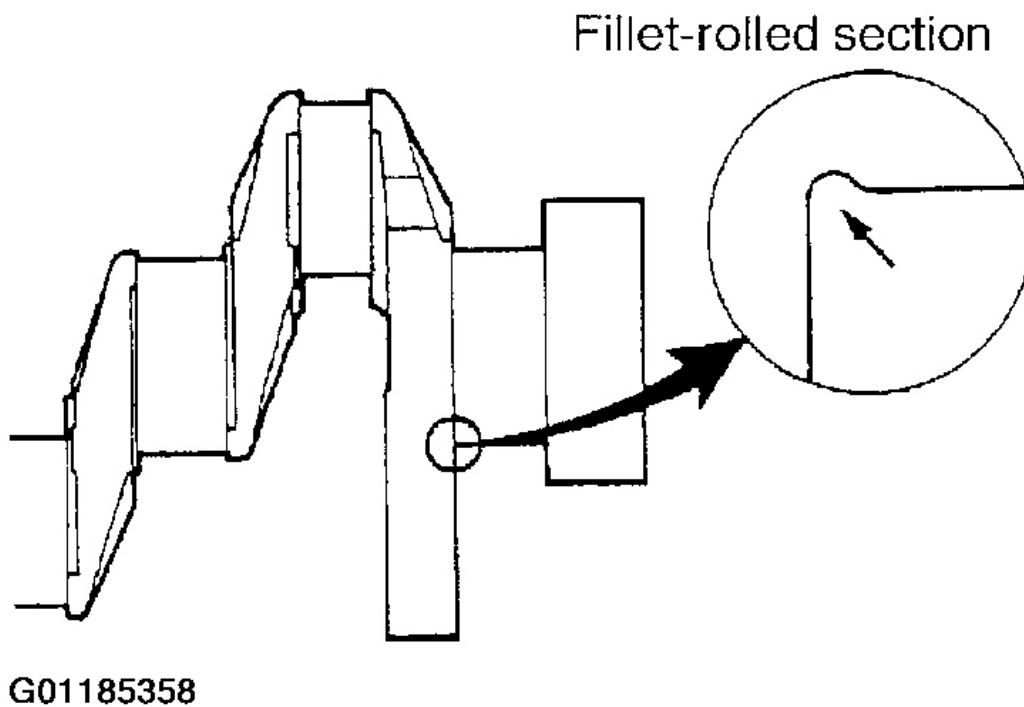


Fig. 181: Identifying Fillet-Rolled Section

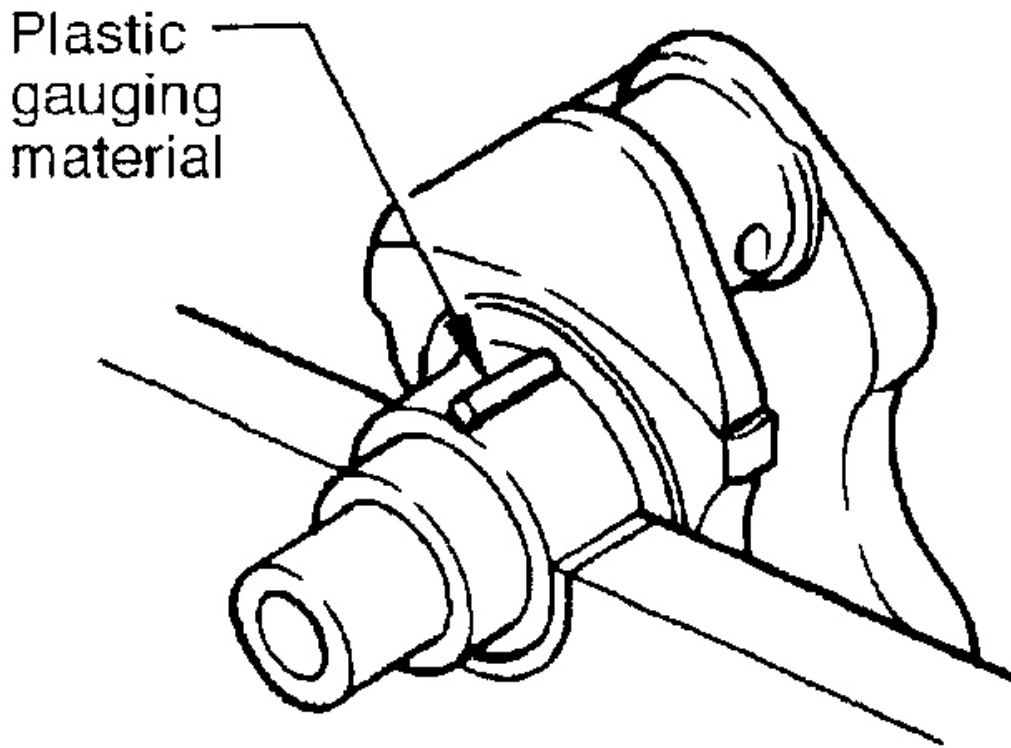
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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 plastic gauging material at its widest part by using a scale printed on plastic gauging material package.

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

Limit: 0.1 mm (.0039 in.)

NOTE: The crankshaft pins and journals are fillet-rolled and must not be machined to undersize dimensions.



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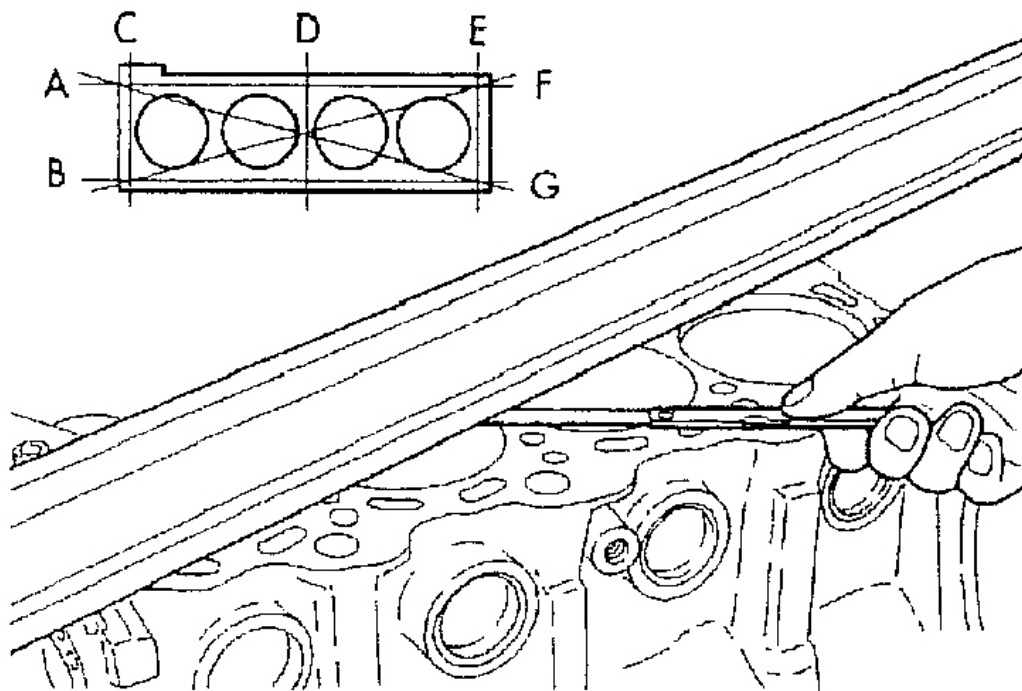
Fig. 182: Cutting Plastic Gauging Material To The Same Length As The Width Of The Bearing
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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 (.0039 in.)

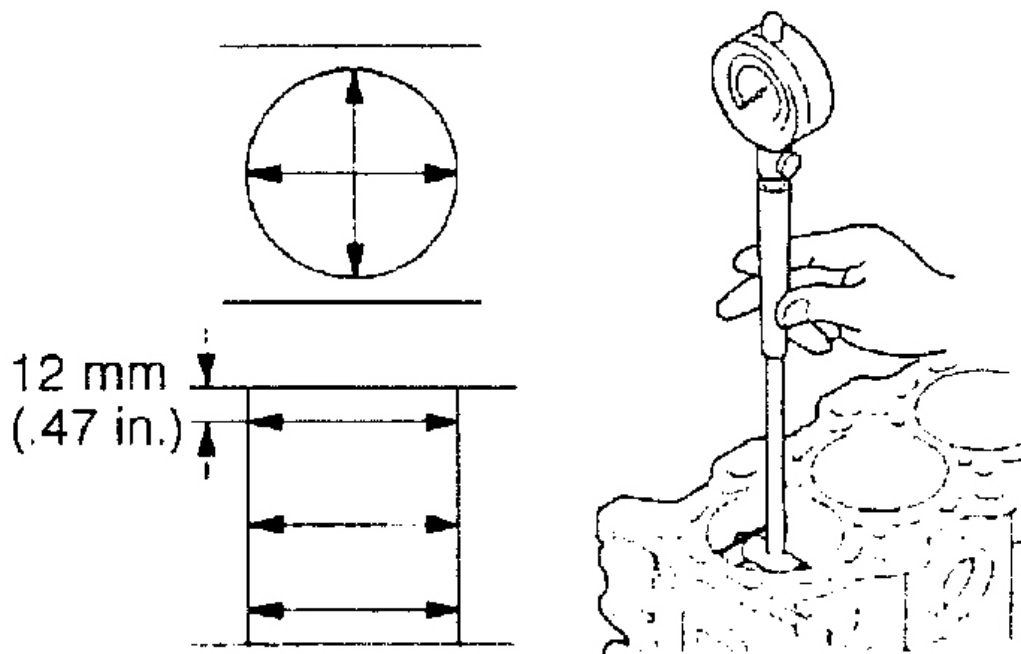


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Fig. 183: Checking Cylinder Block Top Surface**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

3. Check the cylinder walls for cracks and seizure marks. If defects are evident, bore all the cylinders to oversize or replace the cylinder block.
4. 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. 75.5 mm (2.97 in.)****Cylindricity: 0.01 mm (.0004 in.) or less**



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Fig. 184: Measuring Cylinder Bore & Cylindricity
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

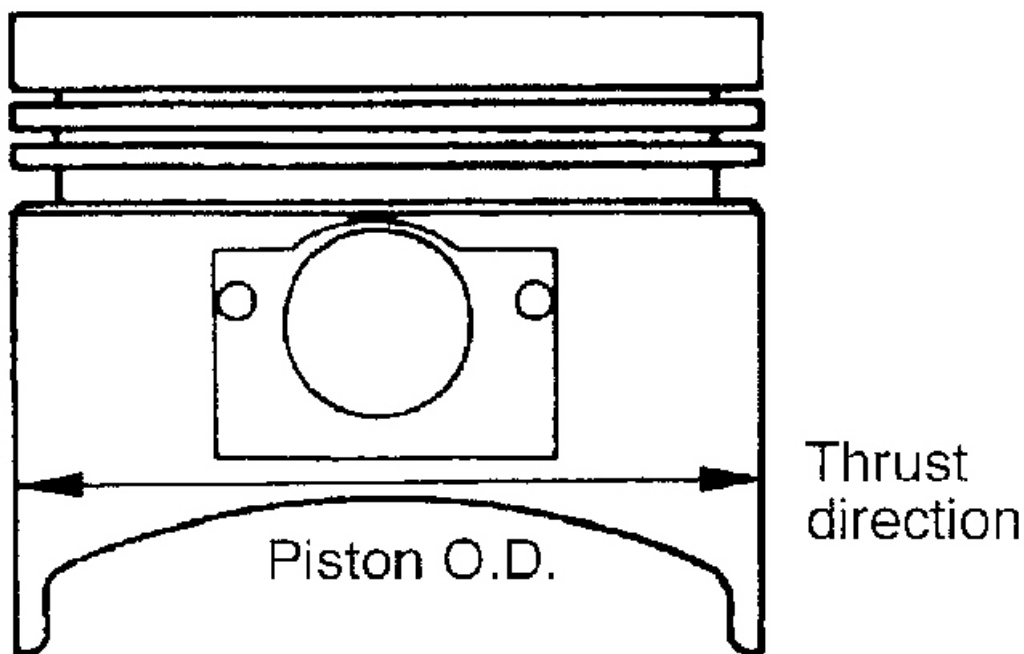
BORING CYLINDERS

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

Piston side identification

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

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



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Fig. 185: Measuring O.D. 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. 186: Calculating Boring Finish Dimension

2002 Mitsubishi Mirage LS

2002 ENGINES 1.5L 4-Cylinder - Mirage

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

4. Bore each cylinder 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 the pistons and cylinders.

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**

Application	Ft. Lbs. (N.m)
Camshaft Sprocket Bolt	65 (88)
Connecting Rod Cap Nut	(1)
Crankshaft Pulley Bolt	76 (103)
Cylinder Head Bolt ⁽²⁾	
Step 1	36 (49)
Step 2	Fully Loosen
Step 3	14 (19)
Step 4	Additional 1/4 turn
Step 5	Additional 1/4 turn
Drive Plate-To-Crankshaft Bolt (A/T)	94-101 (127-137)
Engine Support Bracket	26 (35)
Exhaust Manifold-To-Engine Bolt	13 (18)
Flywheel-To-Crankshaft Bolt (M/T)	94-101 (127-137)
Intake Manifold Bolt	13 (18)
Intake Manifold Brace Bolt	15 (20)
Main Bearing Cap Bolt	38 (52)
Oil Pressure Switch	13 (18)
Oil Pump Relief Valve Plug	32 (44)
Oil Screen Bolt	13 (18)
Rocker Arm Shaft Bolt	23 (31)
Throttle Body-To-Intake Manifold Bolt	13 (18)
Timing Belt Tensioner Bolt	17 (23)
INCH Lbs. (N.m)	

2002 Mitsubishi Mirage LS

2002 ENGINES 1.5L 4-Cylinder - Mirage

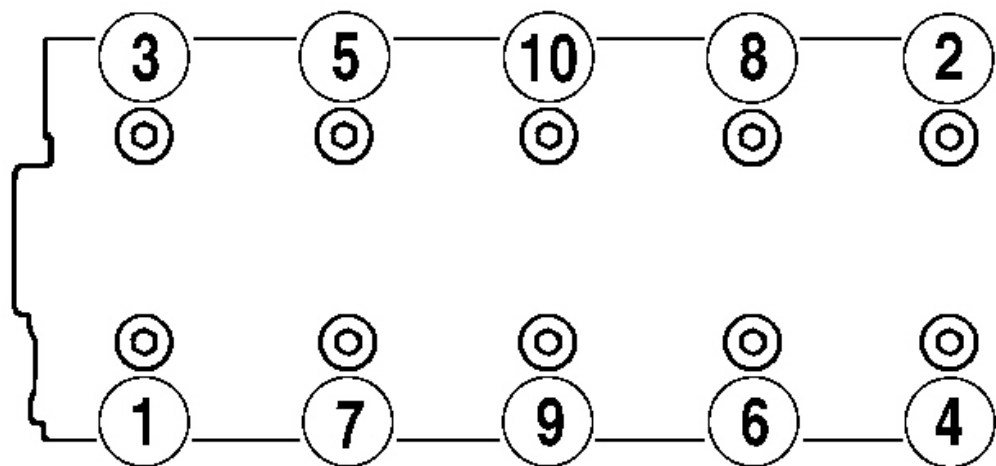
Bellhousing Cover Bolt	80 (9)
Front Cover Bolt	115 (13)
Fuel Rail Bolt	97 (11)
Oil Pan Bolt	62 (7)
Oil Pump Internal Cover Bolt	89 (10)
Rocker Cover Bolt	30 (3.4)
Timing Belt Cover Bolt	97 (11)
Water Pump Pulley Bolt	80 (9)

(1) First tighten to 13 ft. lbs. (17 N.m), then tighten nut an additional 1/4 turn.

(2) Tighten bolts in sequence. See **Fig. 187**

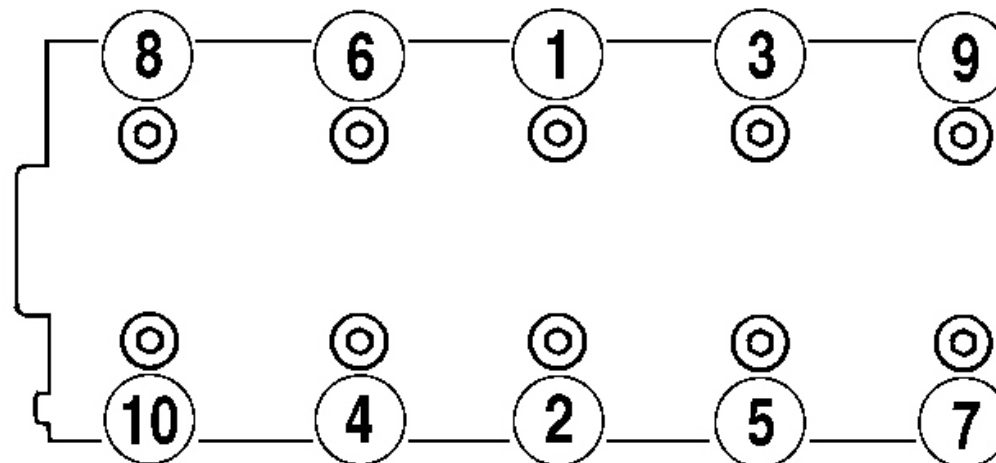
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← TIMING BELT SIDE



REMOVAL

← TIMING BELT SIDE



INSTALLATION

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Fig. 187: Cylinder Head Bolt Removal & Installation Sequence
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.