

2012 ENGINE**Mechanical - 3.0L - Outlander****GENERAL INFORMATION**

The 6B31 (3.0 L) engine is a six-cylinder engine. The cylinder numbers are assigned as 1-3-5 for the right bank and 2-4-6 for the left bank from the front of the engine (timing belt side). This engine is fired in the order of 1-2-3-4-5-6 cylinders.

GENERAL SPECIFICATIONS

ITEMS			SPECIFICATIONS
Type			V type, overhead camshaft
Number of cylinders			6
Bore mm (in)			87.6 (3.45)
Stroke mm (in)			82.9 (3.26)
Total displacement cm ³ (cu. in)			2, 998 (182.9)
Compression ratio			10.5
Firing order			1-2-3-4-5-6
Valve timing	Intake valve	Opens (BTDC)	-1° < Low speed cam >
			18° < High speed cam >
		Closes (ABDC)	37° < Low speed cam >
			86° < High speed cam >
	Exhaust valve	Opens (BBDC)	55°
		Closes (ATDC)	20°
Lubrication system			Pressure feed, full-flow filtration
Oil pump type			Trochoid type

ENGINE DIAGNOSIS**ENGINE DIAGNOSIS CHART**

SYMPTOMS	PROBABLE CAUSE	REMEDY
Compression is too low	Blown cylinder head gasket	Replace the gasket.
	Worn or damaged piston rings	Replace the rings.
	Worn piston or cylinder	Repair or replace the piston and/or the cylinder block.
	Worn or damaged valve seat	Repair or replace the valve and/or the seat ring
Drop in engine oil	Engine oil level is too low	Check the engine oil level.
	Malfunction of engine oil pressure switch	Replace the engine oil pressure switch.
	Clogged oil filter	Install a new filter.
		Replace the gears and/or the

2012 Mitsubishi Outlander SE

2012 ENGINE Mechanical - 3.0L - Outlander

pressure	Worn oil pump gears or cover	cover.
	Thin or diluted engine oil	Change the engine oil to the correct viscosity.
	Stuck (opened) oil relief valve	Repair the relief valve.
	Excessive bearing clearance	Replace the bearings.
Engine oil pressure too high	Stuck (closed) oil relief valve	Repair the relief valve.
Noisy valves	Incorrect valve clearance < Intake side >	Adjust valve clearance
	Malfunction of lash adjuster (including entry of air into high pressure chamber) < Exhaust side >	Check the lash adjuster.
	Thin or diluted engine oil (low engine oil pressure)	Change the engine oil.
	Worn or damaged valve stem or valve guide	Replace the valve and/or the guide.
Connecting rod noise/main bearing noise	Insufficient oil supply	Check the engine oil level.
	Thin or diluted engine oil	Change the engine oil.
	Excessive bearing clearance	Replace the bearings.

SERVICE SPECIFICATIONS**SERVICE SPECIFICATIONS**

Item		Standard value	Limit
Power steering oil pump drive belt tension	Vibration frequency Hz	119 - 225	-
	Deflection (Reference) mm (in)	8.5 - 18.3 (0.33 - 0.72)	-
Basic ignition timing at idle		5°BTDC ± 3°	-
Actual ignition timing at curb idle Approximately		10° BTDC	-
CO contents %		0.5 or less	-
HC contents ppm		100 or less	-
Curb idle speed r/min		600 ± 100	-
Compression pressure (200 r/min) kPa (psi)		1, 650 (239)	Minimum 1, 150 (167)
Compression pressure difference of all cylinder kPa (psi)		-	98 (14)
Intake manifold vacuum at curb idle kPa (in Hg)		-	Minimum 60 (18)
Cylinder head bolt outside diameter mm (in)		-	0.1 (0.0039)
Auto-tensioner rod protrusion amount mm (in)		9.1 - 13.4 (0.36 - 0.52)	-

SEALANTS AND ADHESIVE**SEALANTS AND ADHESIVE SPECIFICATIONS**

Item	Specified sealant and adhesive	Remark

2012 Mitsubishi Outlander SE

2012 ENGINE Mechanical - 3.0L - Outlander

Engine oil pressure switch	ThreeBond 1141J, ThreeBond 1215, ThreeBond 1212D or equivalent	Semi-drying sealant
Engine upper oil pan	ThreeBond 1227D, ThreeBond 1217G (Mitsubishi Genuine Part No. 1000A923), LOCTITE 5970, LOCTITE 5900 or equivalent	Semi-drying sealant
Engine lower oil pan	ThreeBond 1227D, ThreeBond 1217G (Mitsubishi Genuine Part No. 1000A923), ThreeBond 1207F (Mitsubishi Genuine Part No. 1000A992), LOCTITE 5970, LOCTITE 5900 or equivalent	Semi-drying sealant
Drive plate bolt	ThreeBond 1324 or equivalent	Anaerobic adhesive

SPECIAL TOOLS**SPECIAL TOOLS**

Tool	Tool number and name	Supersession	Application
	MB992080 Belt tension meter set a. MB9912081 Belt tension meter b. MB992082 Microphone assembly	Tool not available	Drive belt tension (frequency) measurement
	MB991958 Scan tool (M.U.T.-III sub assembly) a. MB991824 Vehicle communication interface (V.C.I.) b. MB991827 M.U.T.-III USB cable c. MB991910 M.U.T.-III main harness A (Vehicles with CAN communication system) d. MB991911 M.U.T.-III main harness B (Vehicles without CAN)	MB991824-KIT NOTE: MB991826 M.U.T.-III Trigger Harness is not necessary when pushing V.C.I. ENTER key.	CAUTION: For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly. • Ignition timing check • Curb idle speed check

2012 Mitsubishi Outlander SE

2012 ENGINE Mechanical - 3.0L - Outlander

	communication system) e. MB991914 M.U.T.-III main harness C (for Chrysler models only) f. MB991825 M.U.T.-III adapter harness g. MB991826 M.U.T.-III trigger harness		• Idle mixture check • Erasing the diagnostic trouble code
	MB990767 Front hub and flange yoke holder	MB990767-01	Holding the crankshaft pulley and camshaft sprocket
	MD998719 Pin	MIT308239	
	MD998713 Camshaft oil seal installer	MD998713-01	Press-in of the camshaft oil seal

2012 Mitsubishi Outlander SE

2012 ENGINE Mechanical - 3.0L - Outlander

	MD998777 Camshaft oil seal installer adapter	-	Press-fitting the camshaft oil seal (left bank)
	MD998443 Auto-lash adjuster holder	MD998443-01	Holding the auto-lash adjuster
	MD998772 Valve spring compressor	General service tool	Compressing valve spring
	MB992182 Valve stem seal installer	-	Valve stem seal installation

2012 Mitsubishi Outlander SE

2012 ENGINE Mechanical - 3.0L - Outlander

	MD998727 Oil pan FIPG cutter	MD998727-01	Engine lower oil pan removal
	MD998382 Crankshaft front oil seal installer	MD998382-01	Press-in of the crankshaft front oil seal
	MD998781 Flywheel stopper	General service tool	Securing the drive plate
	MB992075 Handle	-	Crankshaft rear oil seal installation

2012 Mitsubishi Outlander SE

2012 ENGINE Mechanical - 3.0L - Outlander

	MB992183 Crankshaft rear oil seal installer	-	
	MB991614 Angle gauge	-	Cylinder head bolt installation
	MD998716 Crankshaft wrench	MD998716-01	Rotating the crankshaft when installing the timing belt
	MB992275 Drive belt installer	-	Power steering oil pump drive belt installation

2012 Mitsubishi Outlander SE

2012 ENGINE Mechanical - 3.0L - Outlander

	MB992276 Drive belt remover	-	Power steering oil pump drive belt removal
	MB992208 Engine hanger plate A	General Service Tool	Supporting the engine assembly during removal and installation of the transaxle assembly
	MB991454 Engine hanger balancer	MZ203827-01	When the engine hanger is used: Supporting the engine assembly during removal and installation of the transaxle assembly NOTE: Special tool MB991454 is a part of engine hanger
	MB991895 Engine hanger	Tool not available	
	MB991928		

	Engine hanger		attachment set MB991453.
	a. MB991929 Joint (50) x 2	Tool not available	
	b. MB991930 Joint (90) x 2		
	c. MB991931 Joint (140) x 2		
	d. MB991932 Foot (standard) x 4		
	e. MB991933 Foot (short) x 2		
	f. MB991934 Chain and hook assembly		

ON-VEHICLE SERVICE

GENERATOR DRIVE BELT TENSION CHECK

CAUTION: Check the drive belt tension after turning the crankshaft clockwise one turn or more.

1. Make sure that the indicator mark is within the area marked with A in the illustration.
2. If the mark is out of the area, replace the drive belt. (Refer to CRANKSHAFT PULLEY .

NOTE: The drive belt tension adjustment is not necessary, as the engine is equipped with an auto-tensioner.

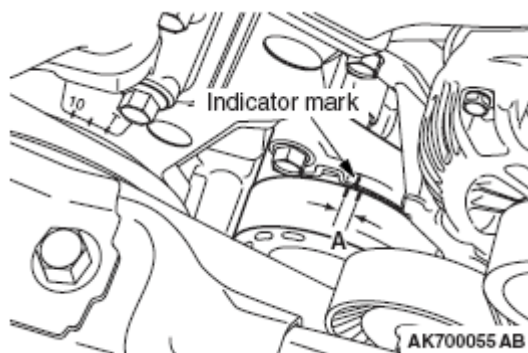


Fig. 1: Identifying Indicator Mark On Auto-Tensioner Is Within Marked Area A
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

AUTO-TENSIONER CHECK

OPERATION CHECK

1. Turn OFF the engine, then check to see that the drive belt is not protruding from the pulley width of the auto-tensioner.
2. Remove the drive belt. (Refer to **CRANKSHAFT PULLEY** .
3. Securely insert the spindle handle or ratchet handle with a 17 mm (11/16-inch) socket into the hexagonal boss of the auto tensioner. Turn the auto-tensioner slowly to the left and right to check and see that there is no binding or noise.
4. If there are any problems in the procedure 1 or 3, replace the auto-tensioner. (Refer to **<< A >> TIMING BELT AUTO-TENSIONER REMOVAL** .
5. Install the drive belt. (Refer to **CRANKSHAFT PULLEY** .

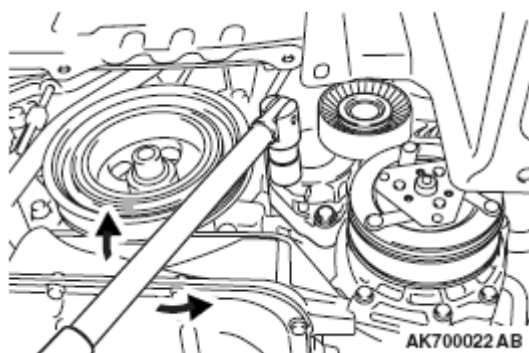


Fig. 2: Turning Auto-Tensioner To Left And Right To Check There Is No Binding Or Noise
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

POWER STEERING OIL PUMP DRIVE BELT TENSION CHECK

NOTE:

- An elastic stretch-type belt is used for the power steering oil pump drive, therefore, the tension adjustment is not necessary.
- Perform the power steering oil pump drive belt tension check according to the following procedures.

< WHEN THE VIBRATION FREQUENCY IS MEASURED: RECOMMENDATION >

Required Special Tools:

- MB992080: Belt Tension Meter Set
 - MB992081: Belt Tension Meter
 - MB992082: Microphone Assembly

CAUTION:

- When measuring the vibration frequency, make sure that the engine is cold.
- Measure the vibration frequency after turning the crankshaft clockwise one turn or more.

1. Connect the special tool MB992082 to the special tool MB992081 of the special tool MB992080.
2. Press the "POWER" button to turn on the power supply.
3. Press number key 1. Check to ensure that "No. 01" appears on the upper left of the display and that the following numeric values are displayed for individual items (M, W, and S):

M 000.9 g/m

W 010.0 mm/R

S 0100 mm

Belt tension meter set (MB992080)

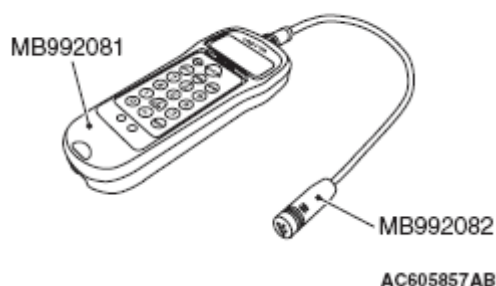


Fig. 3: Identifying Belt Tension Meter Set (MB992080)

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

If numeric values have not been entered (new tool), set them according to the belt specifications as shown in the illustration below. Once you set them, you do not have to set them again. The settings remain undeleted even after battery replacement.

NOTE: This operation is to temporarily set the preset data such as the belt specifications, because if the measurement is taken without input of the belt specifications, conversion to tension value (N) cannot be made, resulting in judgment of error.

< Setting procedure >

1. Press down the "MASS" button till the belt mass select display appears.
2. Press the "UP" or "DOWN" button to select "01 1.5GT 0.9" and press the "MEASURE" button to decide it.

Check to ensure that "M 000.9 g/m" is displayed.

3. Press the "WIDTH" button to change to the belt width input display.
4. Press number keys 0, 1, 0, and 0 sequentially, and press the "SELECT" button to apply them. Check to ensure that "W 010.0 mm/R" appears on the display.
5. Press the "SPAN" button to change to the span length input display.

6. Press number keys 0, 1, 0, and 0 sequentially, and press the "SELECT" button to apply them. Check to ensure that "S 0100 mm" appears on the display.
4. Press "Hz" button twice to change the display to the frequency display (Hz).

CAUTION:

- Do not allow any contaminants such as water or oil to get onto the microphone.
 - If strong gusts of wind blow against the microphone or if there are any loud sources of noise nearby, the values measured by the microphone may not correspond to actual values.
 - If the microphone is touching the belt while the measurement is being made, the values measured by the microphone may not correspond to actual values.
 - Do not take the measurement while the vehicle's engine is running.
5. Hold the special tool MB992080 to the middle of the power steering oil pump drive belt between the pulleys (at the place indicated by arrow), approximately 10 - 15 mm (0.4 - 0.59 inch) away from the rear surface of the power steering oil pump drive belt so that it is perpendicular to the power steering oil pump drive belt (within an angle of ± 15 degrees).
 6. Press the "MEASURE" button.
 7. Gently tap the middle of the power steering oil pump drive belt between the pulleys (the place indicated by the arrow) with your finger as shown in the illustration, and measure that the vibration frequency of the power steering oil pump drive belt is within the standard value.

Standard value: 119 - 225 Hz

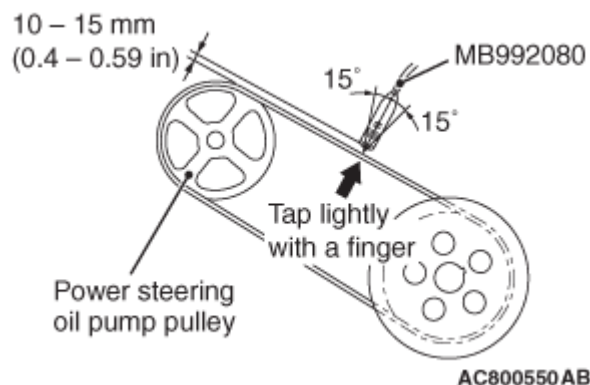


Fig. 4: Checking Tension Of Drive Belt Using Special Tool MB992080
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

NOTE: To take the measurement repeatedly, flip the power steering oil pump drive belt again.

8. After the completion of the measurement, press and hold the "POWER" button to turn off the power

supply.

9. If not within the standard value, replace the power steering oil pump drive belt (Refer to **CRANKSHAFT PULLEY**).

< WHEN THE DEFLECTION IS MEASURED >

CAUTION:

- When measuring the flexure, make sure that the engine is cold.
- Measure the flexure after turning the crankshaft clockwise one turn or more.

Apply approximately 100 N (22 pound) of force to the middle of the power steering oil pump drive belt between the pulleys (at the place indicated by the arrow) and check that the amount of deflection is within the standard value.

Standard value (Reference): 8.5 - 18.3 mm (0.33 - 0.72 inch)

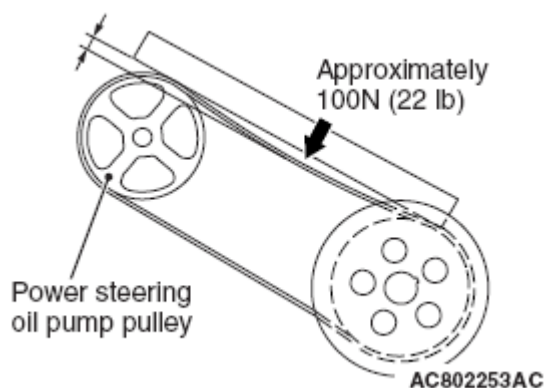


Fig. 5: Applying Approximately 100 N (22 Pound) Of Force To Middle Of Power Steering Oil Pump Drive Belt Between Pulleys (At Place Indicated By Arrow)
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

POWER STEERING OIL PUMP DRIVE BELT INSPECTION

1. Check the every part of power steering oil pump drive belt for damage including cracks or delamination in detail by a visual inspection or touching.
2. If there is the damage, replace the power steering oil drive belt with a new one.

VALVE CLEARANCE CHECK AND ADJUSTMENT

Refer to **GENERAL - MAINTENANCE SERVICE - INTAKE AND EXHAUST VALVE CLEARANCE (INSPECT AND ADJUST)**

ROCKER ARM PISTON OPERATION CHECK

1. Remove all of the ignition coils.

2. Remove the rocker cover.

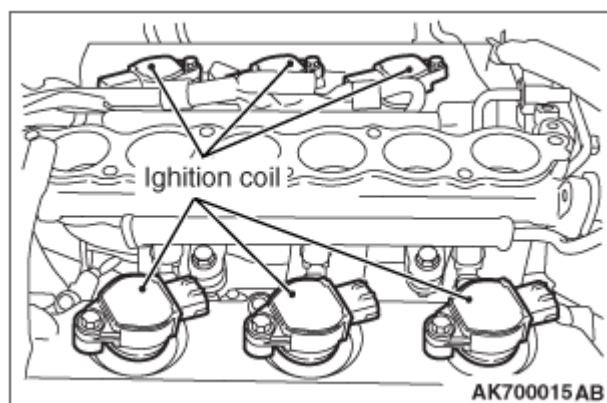


Fig. 6: Identifying Ignition Coils

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. Remove the engine oil control valve.
4. Remove the oil pipe.
5. Turn the crankshaft clockwise until the notch on the crankshaft pulley is lined up with the "T" mark on the lower cover of timing belt.

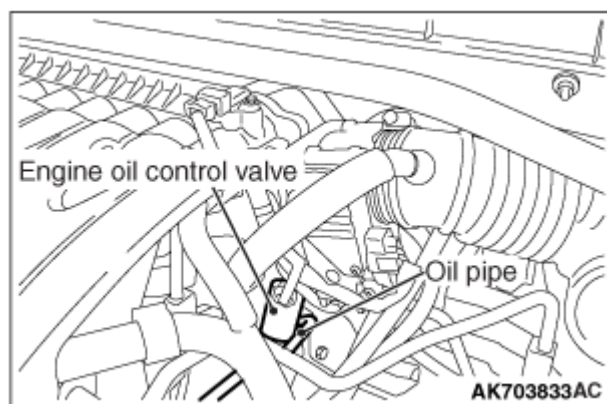


Fig. 7: Identifying Engine Oil Control Valve And Oil Pipe

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

6. The rocker arm piston operation check can be performed on rocker arms indicated by white arrow mark when the No. 1 cylinder piston is at the top dead center on the compression stroke, and on rocker arms indicated by black arrow mark when the No. 4 cylinder piston is at the top dead center on the compression stroke.

NOTE:

If the rocker arm of No. 6 cylinder at the intake side is moved up and down and the rocker arm is moved, No. 1 cylinder is at top dead center on compression stroke. If the rocker arm of No. 6 cylinder at the intake side is moved up and down and the rocker arm is not moved, No. 4 cylinder is at

top dead center on compression stroke.

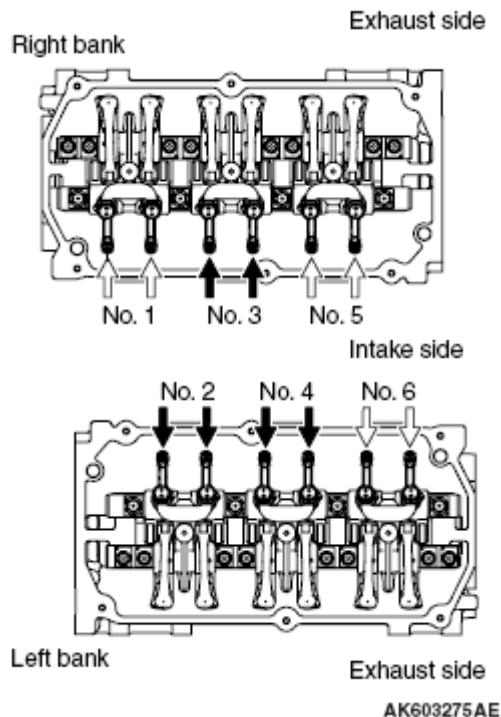


Fig. 8: Locating Rocker Arms

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

7. While putting your hands over the oil passage hole located at the back of the engine oil control valve installation hole in order to prevent air leakage, use an air blow gun to blow compressed air to the oil pipe installation hole at the right bank side. At that time, check that the rocker arm piston at the right bank side is operated.

NOTE: To surely perform the check, wrap the top of the air blow gun with a vinyl tape. Prevent compressed air leakage as much as possible. The pressure of 620 kPa (90 psi) or more is necessary for the compressed air.

8. Use the air blow gun to blow the compressed air to the oil pipe installation hole at the left bank side. At that time, check that the rocker arm piston at the left bank side is operated.

NOTE: To surely perform the check, wrap the top of the air blow gun with a vinyl tape. Prevent compressed air leakage as much as possible. The pressure of 620 kPa (90 psi) or more is necessary for the compressed air.

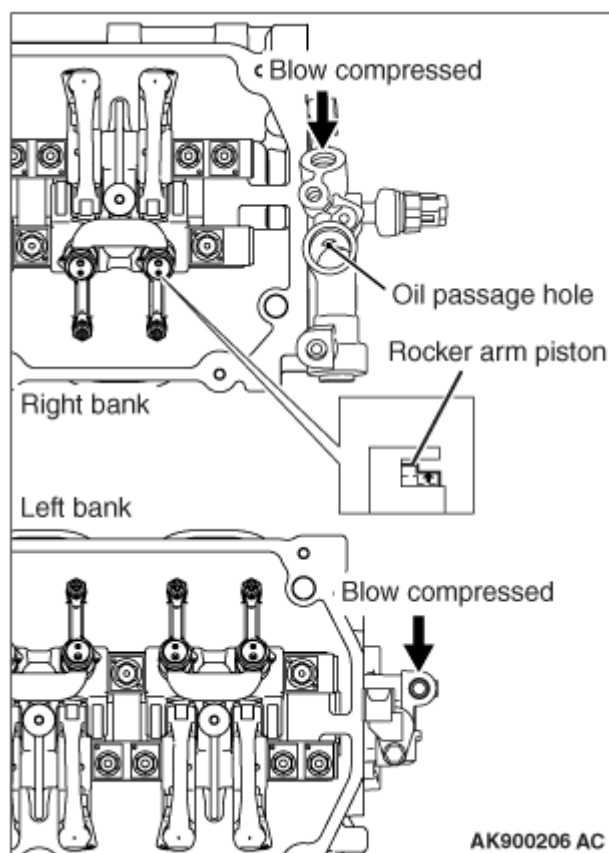


Fig. 9: Locating Oil Passage Hole

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

9. Turn the crankshaft clockwise until the notch on the crankshaft pulley is lined up with "T" mark on the lower cover of timing belt.
10. Confirm the rest of the rocker arm pistons under the procedure 7 - 8.
11. When the rocker arm piston does not operate, replace the rocker arm assy.
12. Install the oil pipe and the engine oil control valve. (Refer to **REMOVAL AND INSTALLATION** .
13. Install the rocker cover.
14. Install all of the ignition coils.

IGNITION TIMING CHECK

Required Special Tool:

MB991958: Scan Tool (M.U.T.-III Sub Assembly)

- MB991824: V.C.I.
- MB991827: M.U.T.-III USB Cable
- MB991910: M.U.T.-III Main Harness A

1. Before inspection, set the vehicle in the following condition:

- Engine coolant temperature: 80 - 95°C (176 - 203°F)
- Lights and all accessories: OFF
- Transaxle: P range

NOTE: On vehicles for Canada, the headlight, taillight, etc. remain lit even when the lighting switch is in "OFF" position but this is no problem for checks.

CAUTION: To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

2. Connect scan tool MB991958 to the data link connector.

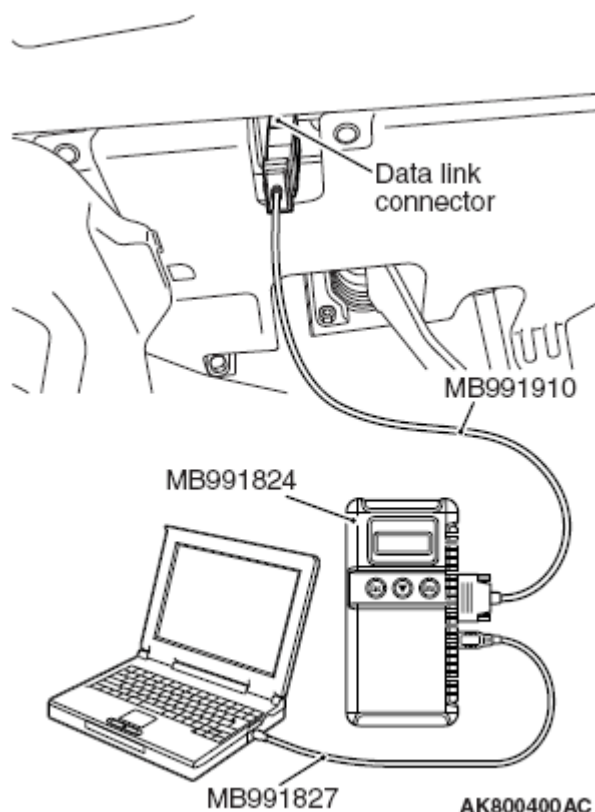


Fig. 10: Connecting Scan Tool MB991958 To Data Link Connector
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. Set the timing light to the power supply line (terminal No. 1) of the ignition coil No. 2.

NOTE: The power supply line is looped and also longer than the other ones.

4. Start the engine and run it at idle.
5. Check that the idle speed is approximately 600 r/min.
6. Select scan tool MB991958 actuator test "item number 11".
7. Check that basic ignition timing is within the standard value.

Standard value: 5° BTDC ± 3°

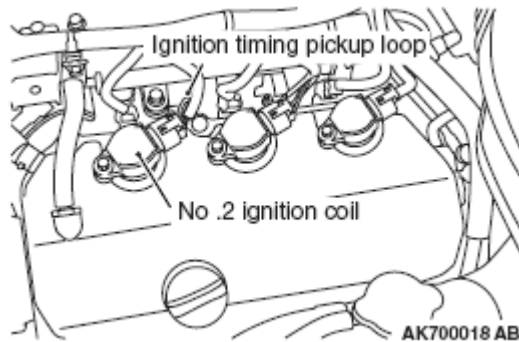


Fig. 11: Identifying Ignition Timing Pickup Loop And No. 2 Ignition Coil
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

8. If the basic ignition timing is not within the standard value, refer to SYMPTOM CHART .

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

9. Cancel the setting mode of the scan tool MB991958.
10. Check that the actual ignition timing is at the standard value.

Standard value: Approximately 10° BTDC

NOTE: The ignition timing fluctuates about $\pm 7^\circ$, even under normal operating condition.

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

NOTE: Wait till approximately 1 minute passes after the engine started, and check the ignition timing when the engine stabilized.

11. Remove the timing light.

CAUTION: To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or

disconnecting scan tool MB991958.

12. Disconnect scan tool MB991958 from the data link connector.

CURB IDLE SPEED CHECK**Required Special Tool:**

MB991958: Scan Tool (M.U.T.-III Sub Assembly)

- MB991824: V.C.I.
- MB991827: M.U.T.-III USB Cable
- MB991910: M.U.T.-III Main Harness A

1. Before inspection, set the vehicle in the following condition:

- Engine coolant temperature: 80 - 95°C (176 - 203°F)
- Lights and all accessories: OFF
- Transmission: P range

NOTE: On vehicles for Canada, the headlight, taillight, etc. remain lit even when the lighting switch is in "OFF" position but this is no problem for checks.

CAUTION: To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

2. Connect scan tool MB991958 to the data link connector.

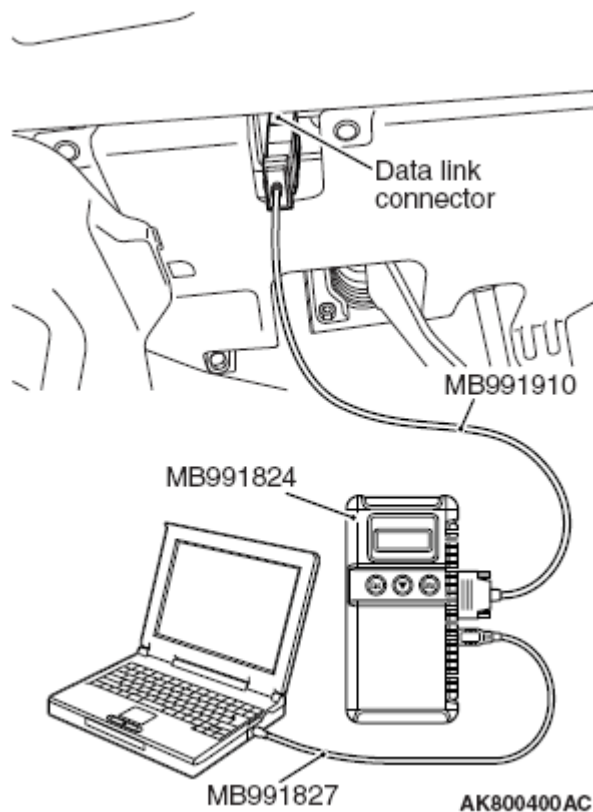


Fig. 12: Connecting Scan Tool MB991958 To Data Link Connector
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. Set the timing light to the power supply line (terminal No. 1) of the ignition coil No. 2.

NOTE: The power supply line is looped and also longer than the other ones.

4. Start the engine.
5. Run the engine at idle for 2 minutes.
6. Check that the actual ignition timing is at the standard value.

Standard value: Approximately 10° BTDC

NOTE: The ignition timing fluctuates about $\pm 7^\circ$, even under normal operating condition.

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

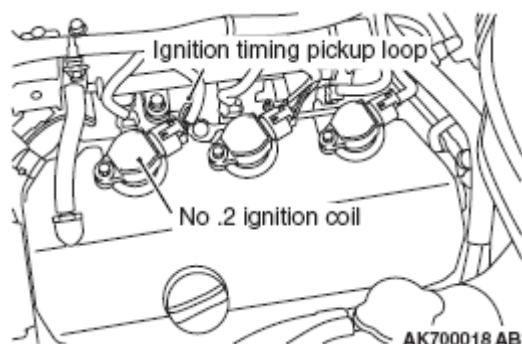


Fig. 13: Identifying Ignition Timing Pickup Loop And No. 2 Ignition Coil
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

7. Check the idle speed. Select item number 2 and take a reading of the idle speed.

Curb idle speed: 600 ± 100 r/min

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

8. If the idle speed is outside the standard value, refer to SYMPTOM CHART.

CAUTION: To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

9. Disconnect scan tool MB991958 from the data link connector.

IDLE MIXTURE CHECK

Required Special Tool:

MB991958: Scan Tool (M.U.T.-III Sub Assembly)

- MB991824: V.C.I.
- MB991827: M.U.T.-III USB Cable
- MB991910: M.U.T.-III Main Harness A

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

NOTE: On vehicles for Canada, the headlight, taillight, etc. remain lit even when the lighting switch is in "OFF" position but this is no problem for checks.

CAUTION: To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

2. Connect scan tool MB991958 to the data link connector.

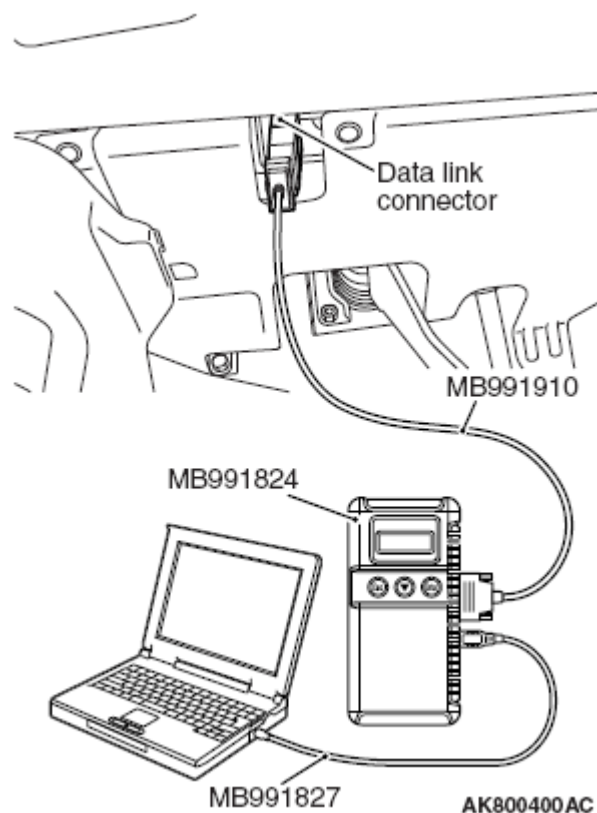


Fig. 14: Connecting Scan Tool MB991958 To Data Link Connector
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. Set the timing light to the power supply line (terminal No. 1) of the ignition coil No. 2.

NOTE: The power supply line is looped and also longer than the other ones.

4. Start the engine and run it at idle.
5. Check that the actual ignition timing is at the standard value.

Standard value: Approximately 10° BTDC

NOTE: The ignition timing fluctuates about $\pm 7^\circ$, even under normal operating condition.

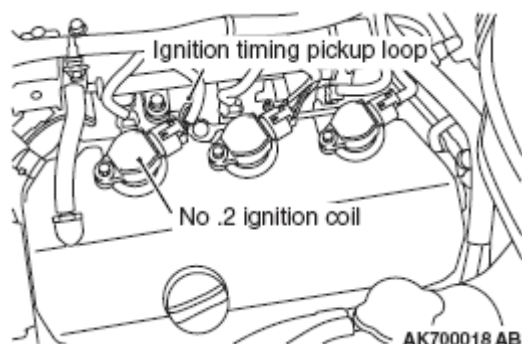


Fig. 15: Identifying Ignition Timing Pickup Loop And No. 2 Ignition Coil
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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

NOTE: Wait till approximately 1 minute passes after the engine started, and check the ignition timing when the engine stabilized.

6. Increase the engine speed to 2, 000 - 3, 000 r/min for 2 minutes.
7. Set the CO, HC tester.
8. Check the CO contents and the HC contents at idle.

Standard value:

CO contents: 0.5% or less

HC contents: 100 ppm or less

9. If the CO and HC contents do not remain inside the standard value, refer to **SYMPTOM CHART**.
10. Remove the CO, HC tester and timing light.

CAUTION: To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

11. Disconnect scan tool MB991958 from the data link connector.

COMPRESSION PRESSURE CHECK

Required Special Tool:

MB991958: Scan Tool (M.U.T.-III Sub Assembly)

- MB991824: V.C.I.

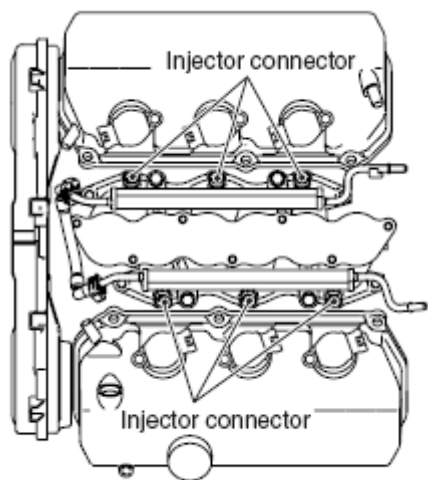
- MB991827: M.U.T.-III USB Cable
 - MB991910: M.U.T.-III Main Harness A
1. Before inspection, check that the engine oil, starter and battery are normal. Also, set the vehicle in the following condition:
 - Engine coolant temperature: 80 - 95°C (176 - 203°F)
 - Lights and all accessories: OFF
 - Transaxle: P range

NOTE: On vehicles for Canada, the headlight, taillight, etc. remain lit even when the lighting switch is in "OFF" position but this is no problem for checks.

2. Remove all of the ignition coils and spark plugs.
3. Disconnect the injector connector.

WARNING: Keep your distance from the spark plug hole when cranking. Oil, fuel, etc., may spray out from the spark plug hole and may cause serious injury.

4. Cover the spark plug hole with a shop towel etc., during cranking. After the engine has been cranked, check for foreign material adhering to the shop towel.



AK703815 AD

Fig. 16: Identifying Injector Connector

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

5. Set compression gauge to one of the spark plug holes.
6. Crank the engine and measure the compression pressure.

Standard value (at engine speed of 200 r/min): 1, 650 kPa (239 psi)

Minimum limit (at engine speed of 200 r/min): 1, 150 kPa (167 psi)

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

Limit: 98 kPa (14 psi)

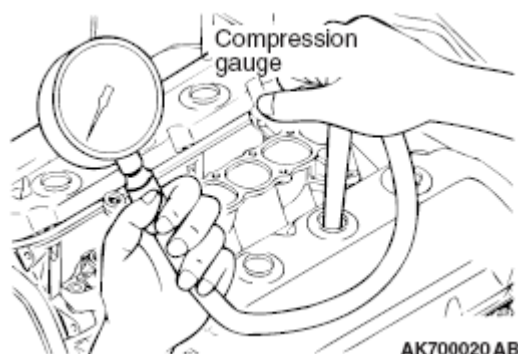


Fig. 17: Measuring Compression Pressure

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

8. 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 5 to 7.
 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.
9. Connect the injector connector.
10. Install the spark plugs and ignition coils.
11. Use the scan tool MB991958 to erase the diagnostic trouble codes.

NOTE: This will erase the diagnostic trouble code resulting from the injector connector being disconnected.

12. Select "Mode \$0A" from "Special Function" of Scan tool MB991958. Check whether the permanent-DTC (PDTC) is stored or not. If stored, clear the PDTC. (Refer to **DIAGNOSTIC FUNCTION**)

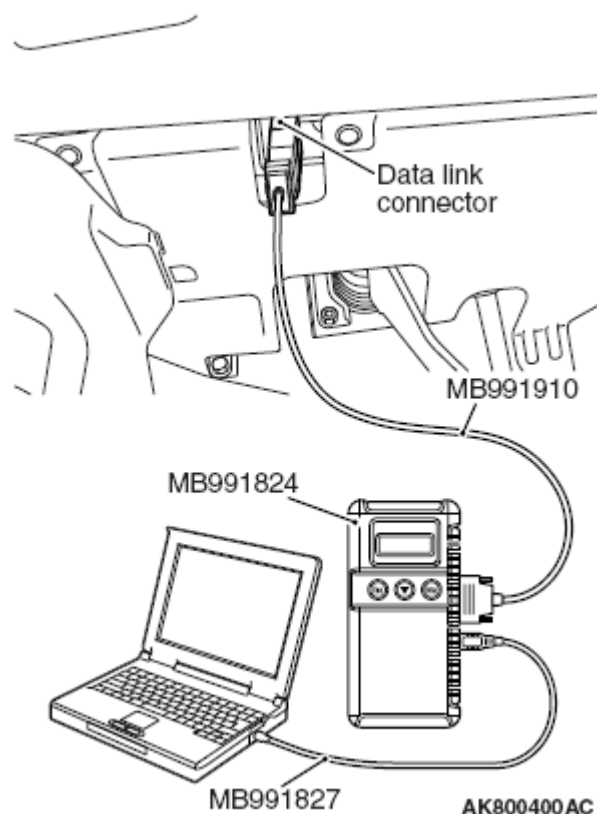


Fig. 18: Connecting Scan Tool MB991958 To Data Link Connector
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

MANIFOLD VACUUM CHECK

Required Special Tool:

MB991958: Scan Tool (M.U.T.-III Sub Assembly)

- MB991824: V.C.I.
- MB991827: M.U.T.-III USB Cable
- MB991910: M.U.T.-III Main Harness A

1. Before inspection, set the vehicle in the following condition:

- Engine coolant temperature: 80 - 95°C (176 - 203°F)
- Lights and all accessories: OFF
- Transaxle: P range

NOTE:

On vehicles for Canada, the headlight, taillight, etc. remain lit even when the lighting switch is in "OFF" position but this is no problem for checks.

CAUTION: To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

2. Connect scan tool MB991958 to the data link connector.

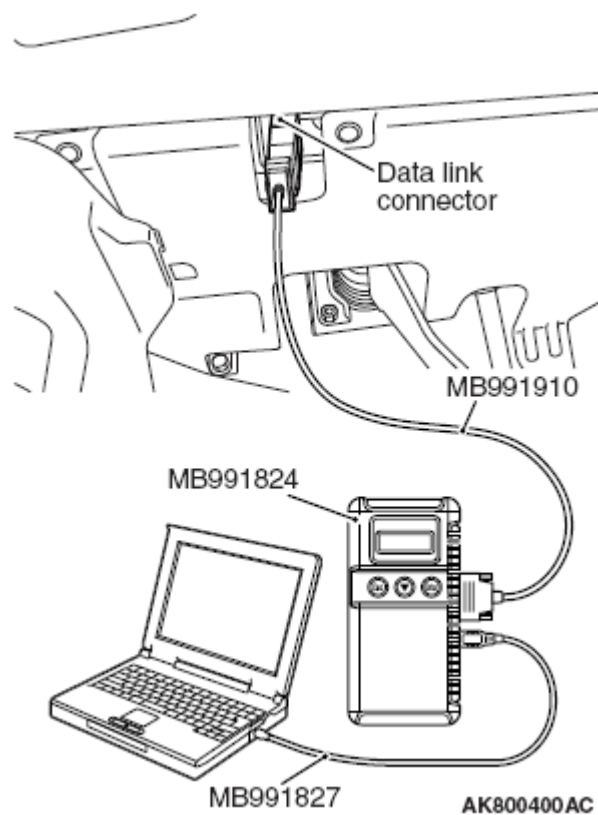


Fig. 19: Connecting Scan Tool MB991958 To Data Link Connector
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

3. Disconnect the ventilation hose from the positive crankcase ventilation (PCV) valve, and then connect a vacuum gauge to the ventilation hose. Plug the PCV valve.
4. Start the engine and check that idle speed is approximately 600 r/min.
5. Check the intake manifold vacuum.

Limit: Minimum 60 kPa (18 in Hg)

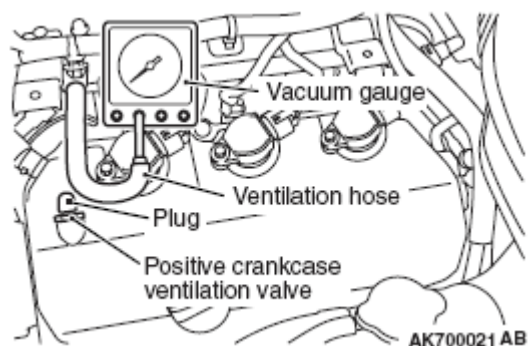


Fig. 20: Checking Intake Manifold Vacuum

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

6. Turn off the ignition switch.
7. Remove the vacuum gauge and then connect the ventilation hose to the PCV valve.

CAUTION: To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

8. Disconnect scan tool MB991958 from the data link connector.

LASH ADJUSTER CHECK

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

NOTE: The lash adjuster is installed in exhaust side only.

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

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

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

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

abnormal noise.

NOTE: When the lash adjuster is malfunctioning, the abnormal noise is rarely eliminated by continuing the warming-up of the engine at idle speed. However, the abnormal noise may disappear only when seizure is caused by oil sludge in the engine whose oil is not maintained properly.

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

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

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

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

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

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

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

Bleeding lash adjuster system

NOTE: It can possibly be difficult to check the oil level within 30 seconds of the engine stopped because of the structure of oil level gauge. If it's difficult, the oil level must be checked later. The oil level always check at the one side of oil level gauge: at the rear side of the vehicle. The oil level cannot be checked at the another side because the engine oil adheres to all the surfaces.

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

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

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

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

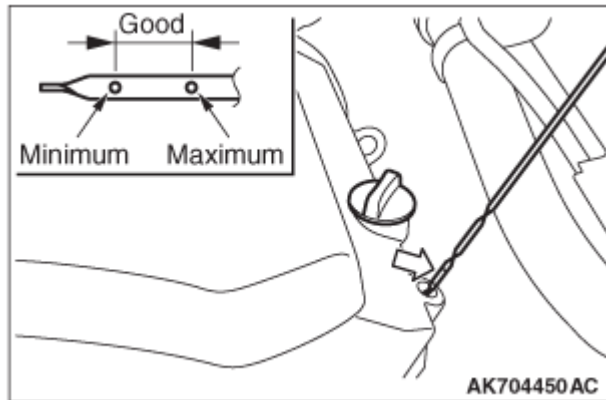


Fig. 21: Checking Engine Oil Level

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

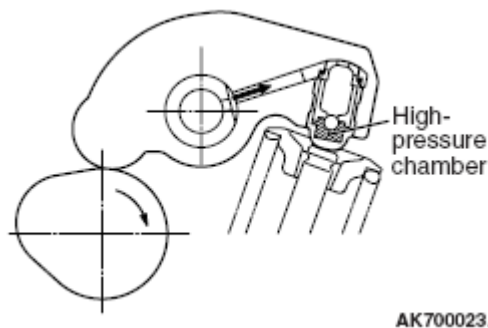


Fig. 22: Identifying High-Pressure Chamber

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

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

2. Idle the engine for one to three minutes to warm it up.
3. Repeat the operation pattern, shown in left in the illustration, at no load to check for abnormal noise. (Usually the abnormal noise is eliminated after repetition of the operation 10 to 30 times. If, however, no change is observed in the level of abnormal noise after repeating the operation more than 30 times,

suspect that the abnormal noise is due to some other factors.)

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

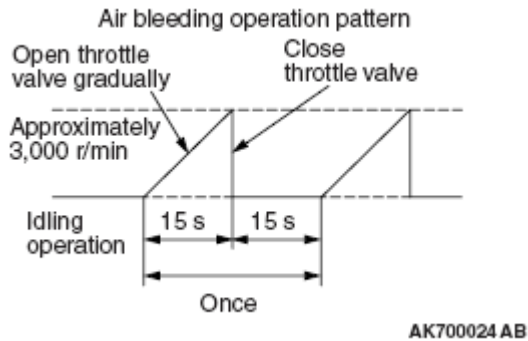


Fig. 23: Air Bleeding Operation Pattern Chart
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

CRANKSHAFT PULLEY

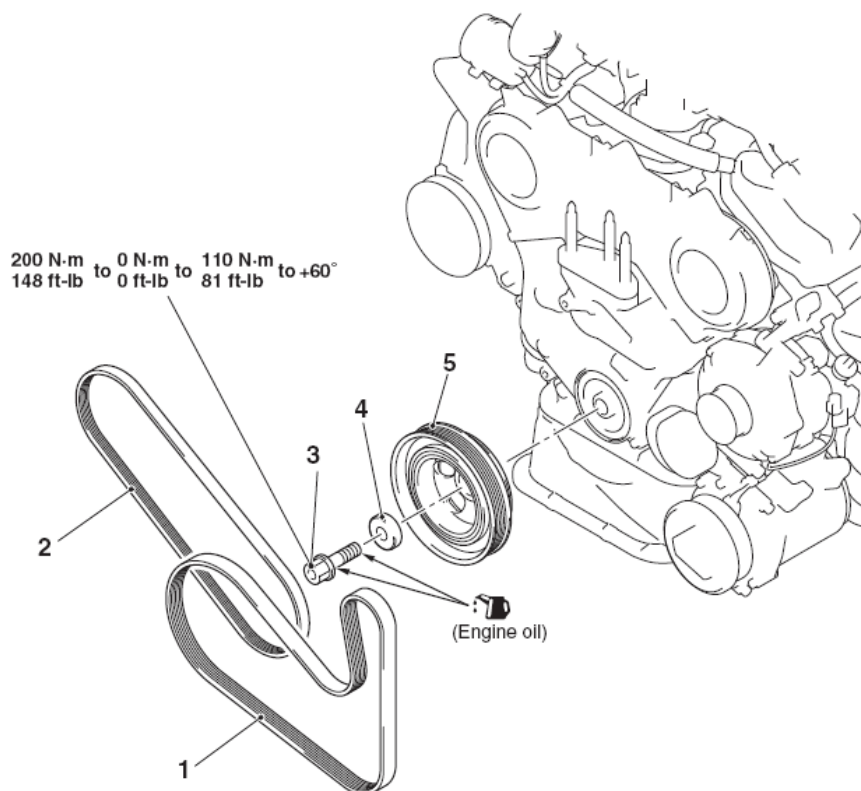
REMOVAL AND INSTALLATION

Pre-removal Operation

- Engine Room Under Cover Front B and Engine Room Side Cover (RH) Removal

Post-installation Operation

- Generator Drive Belt Tension Check
- Power Steering Oil Pump Drive Belt Tension Check
- Engine Room Under Cover Front B and Engine Room Side Cover (RH) Installation



AC800552AC

Removal steps

- | | | | | | | | |
|-------|-------|----------------------|------------------------------------|-------|-------|--------------------------|-------------------|
| <<A>> | 1. | Generator drive belt | <<C>> | >>A<< | 4. | Crankshaft pulley washer | |
| <> | >>B<< | 2. | Power steering oil pump drive belt | <<C>> | >>A<< | 5. | Crankshaft pulley |
| <<C>> | >>A<< | 3. | Crankshaft pulley center bolt | | | | |

Fig. 24: Identifying Crankshaft Pulley Removal And Installation With Torque Specifications
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Required Special Tools:

- MB990767: Front Hub and Flange Yoke Holder
- MD998719: Pin
- MB992275: Drive Belt Installer
- MB992276: Drive Belt Remover

REMOVAL SERVICE POINTS**<< A >> GENERATOR DRIVE BELT REMOVAL**

CAUTION: When the generator drive belt is reused, draw an arrow indicating the

rotating direction on the back of the belt using chalk to install the same direction.

1. Turn the drive belt auto-tensioner to counterclockwise, and insert the L-shaped hexagon wrench to the auto-tensioner hole in order to fix the auto-tensioner.
2. Remove the generator drive belt.

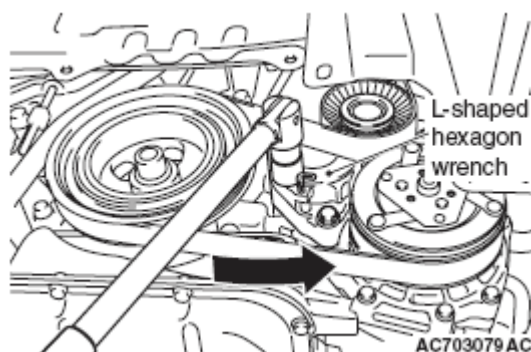


Fig. 25: Turning Drive Belt Auto-Tensioner To Counterclockwise
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

<< B >> POWER STEERING OIL PUMP DRIVE BELT REMOVAL

CAUTION:

- To reuse the power steering oil pump drive belt, draw an arrow indicating the rotating direction on the back of the power steering oil pump drive belt using chalk to install the same direction.
- Hang the special tool MB992276 on the vehicle components (including front side members) using a cord and paper clip to prevent from falling.

1. Set the special tool MB992276 as shown in the illustration and hold it by a finger.

CAUTION: Be careful that the finger holding the special tool MB992276 is not pinched.

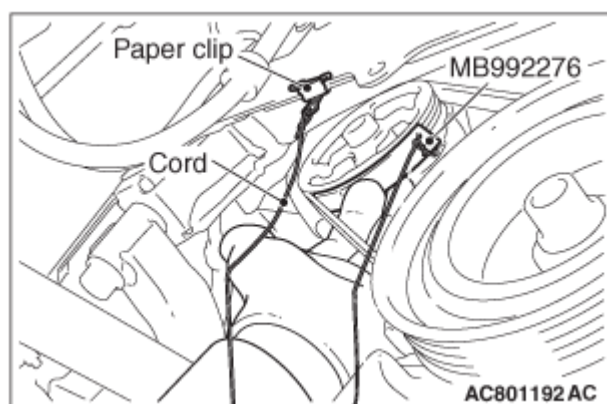


Fig. 26: Setting Special Tool MB992276

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2. Slightly turn the crankshaft pulley clockwise until the special tool MB992276 is pinched and held between the oil pump assembly pulley and the power steering oil pump drive belt as shown in the illustration.
3. If the special tool MB992276 is held, move the finger off.

CAUTION: If the power steering oil pump drive belt is detached, be careful that the special tool MB992276 is also detached and fallen.

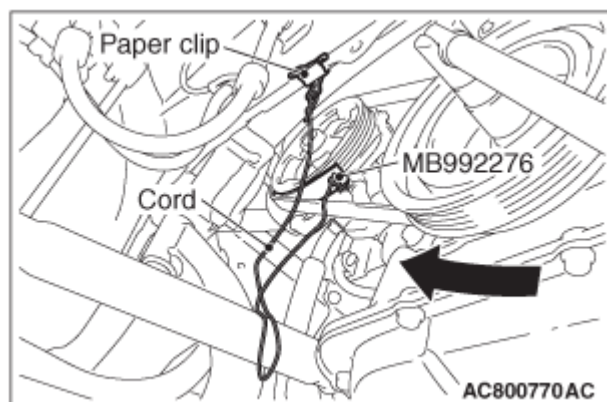


Fig. 27: Turning Crankshaft Pulley Clockwise Until Special Tool MB992276 Is Pinched And Held Between Oil Pump Assembly Pulley

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

4. Slowly turn the crankshaft pulley clockwise until the power steering oil pump drive belt goes aground on the special tool MB992276 and is detached.
5. Remove the special tool MB992276.

<< C >> CRANKSHAFT PULLEY CENTER BOLT/CRANKSHAFT PULLEY WASHER/CRANKSHAFT PULLEY REMOVAL

CAUTION: Use only the specified special tools, or a damaged pulley damper could result.

Use special tools MB990767 and MD998719 to remove the crankshaft pulley from the crankshaft.

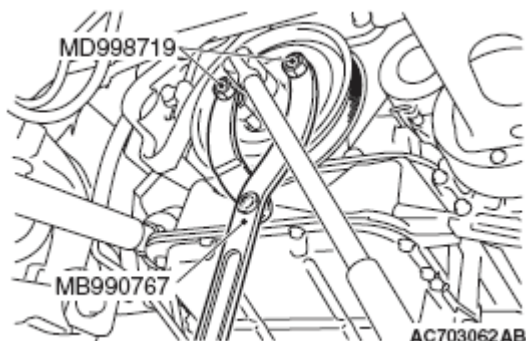


Fig. 28: Removing Crankshaft Pulley From Crankshaft Using Special Tools MB990767 And MD998719
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

CAUTION: Provide one punch mark on the head of the crankshaft pulley center bolt each time the bolt is removed. Replace the bolt that already has three punch marks. (The evidence of having been tightened three times)

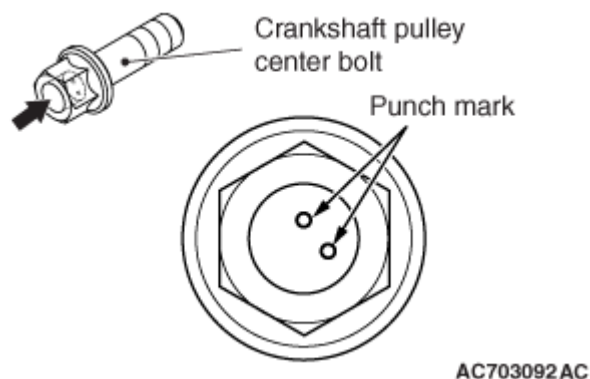


Fig. 29: Identifying Punch Mark On Head Of Crankshaft Pulley Center Bolt
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

INSTALLATION SERVICE POINTS

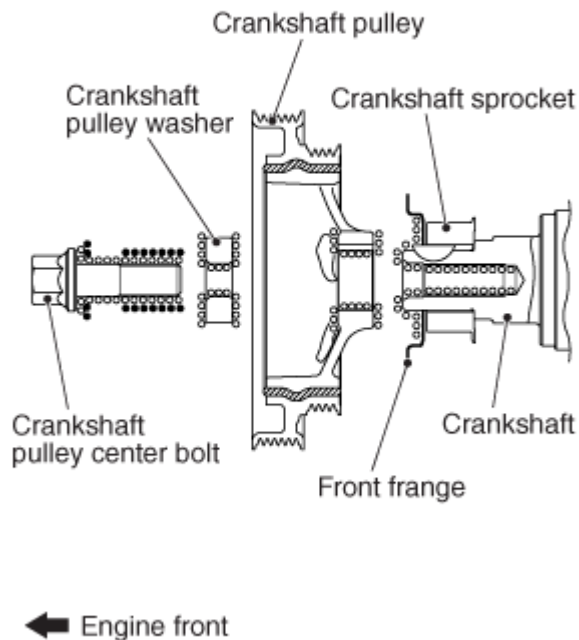
>> A << CRANKSHAFT PULLEY/CRANKSHAFT PULLEY WASHER/CRANKSHAFT PULLEY CENTER BOLT
INSTALLATION

CAUTION: Before installing the crankshaft pulley center bolt, check the number of punch marks on its head. (The bolt is reusable if it is two or less.) If the bolt has three punch marks, replace it.

1. Clean the bolt hole in crankshaft pulley center bolt and crankshaft pulley's seating surface.

2. Degrease the cleaned seating surface of the front flange and crankshaft pulley.
3. Install the front flange and crankshaft pulley.
4. Apply oil to the threads of crankshaft pulley center bolt and the outer surface of crankshaft pulley washer.

- : Wipe clean with a rag.
- : Wipe clean with a rag, degrease and apply a small amount of engine oil.



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Fig. 30: Applying Oil To Threads Of Crankshaft Pulley Center Bolt And Outer Surface Of Crankshaft Pulley Washer

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

5. Use special tools MB990767 and MD998719 to hold the crankshaft pulley.
6. Tighten the crankshaft pulley center bolt to 200 N.m (148 ft-lb).
7. Loosen the crankshaft pulley center bolt fully.
8. Tighten the crankshaft pulley center bolt to 110 N.m (81 ft-lb).

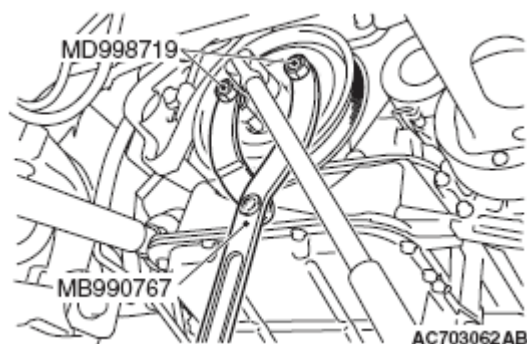


Fig. 31: Tightening Crankshaft Pulley Center Bolt
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

9. Make a paint mark on the crankshaft pulley center bolt.

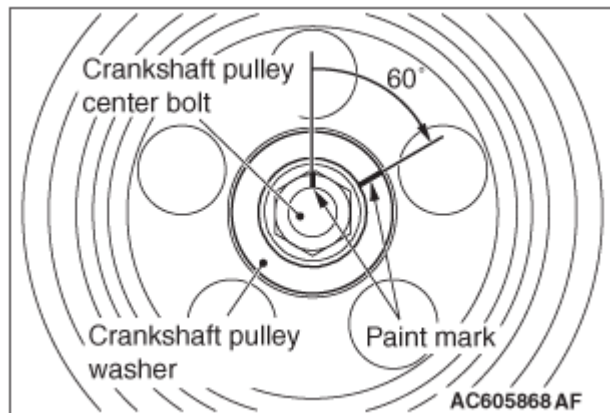


Fig. 32: Identifying Paint Mark On Crankshaft Pulley Center Bolt
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

CAUTION:

- If the crankshaft pulley center bolt is turned less than 60 degrees, proper fastening performance may not be achieved. Be careful to tighten the crankshaft pulley center bolt exactly 60 degrees.
- If the crankshaft pulley center bolt is overtightened (exceeding 60 degrees), loosen the crankshaft pulley center bolt completely and then retighten it by repeating the tightening procedure from step 6.

10. Make a paint mark on the crankshaft pulley center bolt end at a position 60 degrees from the paint mark made on the washer in the direction of tightening the crankshaft pulley center bolt.
11. Turn the crankshaft pulley center bolt another 60 degrees and make sure that the paint marks on the washer and crankshaft pulley center bolt are aligned.

>> B << POWER STEERING OIL PUMP DRIVE BELT INSTALLATION

CAUTION: Check that the belt is fitted in the notches of the notched pulley and the notches of crankshaft pulley securely.

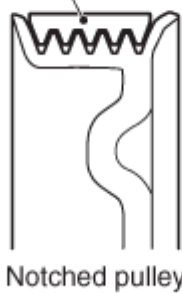
1. Install the power steering oil pump drive belt in the crankshaft pulley.

CAUTION:

- Hang the special tool MB992275 on the vehicle components (including front side members) using a cord and paper clip to prevent from falling.
- Be careful that the finger holding the special tool MB992275 is not pinched.

2. Set the special tool MB992275 and power steering oil pump drive belt in the oil pump assembly pulley and hold it by a finger as shown in the illustration.

Power steering oil pump drive belt



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Fig. 33: Checking Belt Is Fitted In Notches Of Notched Pulley And Notches Of Crankshaft Pulley Securely

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

NOTE:

- Check that the top surface of power steering oil pump drive belt goes aground on the special tool MB992275, and the power steering oil pump drive belt is fitted in the notched under the oil pump assembly pulley securely as shown in the illustration.

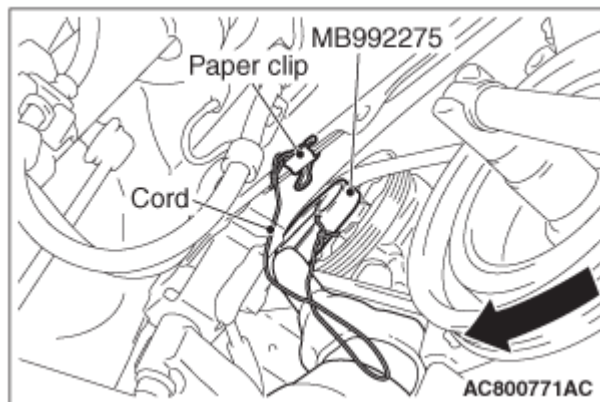


Fig. 34: Setting Special Tool MB992275 And Power Steering Oil Pump Drive Belt In Oil Pump Assembly Pulley
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

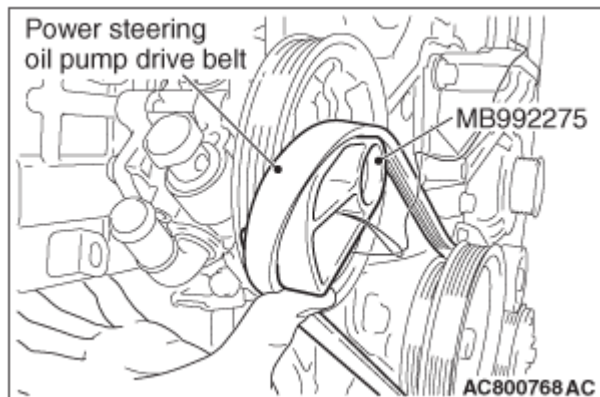


Fig. 35: Installing Power Steering Oil Pump Drive Belt Using Special Tool MB992275
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

- Slightly turn the crankshaft pulley clockwise until the special tool MB992275 is pinched and held between the oil pump assembly pulley and the power steering oil pump drive belt as shown in the illustration.

3. If the special tool MB992275 is held, move the finger off.

CAUTION: If the power steering oil pump drive belt is installed, be careful that the special tool MB992275 is detached and fallen.

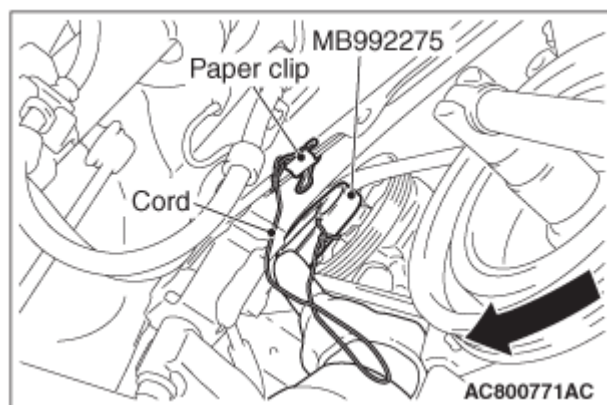


Fig. 36: Turning Crankshaft Pulley Clockwise

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

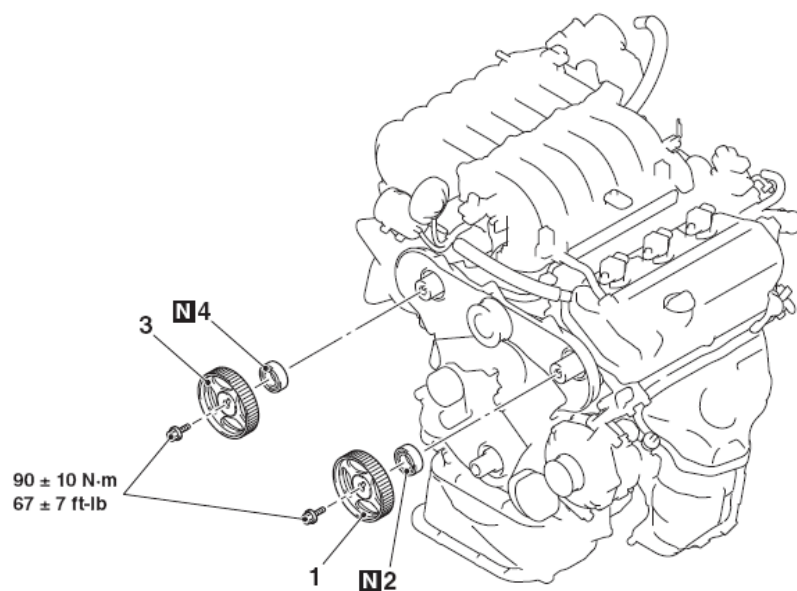
4. Slowly turn the crankshaft pulley clockwise and install the power steering oil pump drive belt.
5. Turn the crankshaft pulley until the special tool MB992275 is detached from the oil pump assembly and fallen, and then remove the special tool MB992275.
6. Turn the crankshaft pulley clockwise on several times and check that the power steering oil pump drive belt is installed in the oil pump assembly pulley and the crankshaft pulley securely.

CAMSHAFT OIL SEAL

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Timing Belt Removal and Installation



AC703047AB

Removal steps

- <<A>> >>B<< 1. Left bank camshaft sprocket
<> >>A<< 2. Camshaft oil seal

- <<A>> >>B<< 3. Right bank camshaft sprocket
<> >>A<< 4. Camshaft oil seal

Fig. 37: Identifying Camshaft Oil Seal Removal And Installation With Torque Specifications
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Required Special Tools:

- MB990767: Front Hub and Flange Yoke Holder
- MD998713: Camshaft Oil Seal Installer
- MD998719: Pin
- MD998777: Camshaft Oil Seal Installer Adapter

REMOVAL SERVICE POINTS

<< A >> CAMSHAFT SPROCKET REMOVAL

Use special tools MB990767 and MD998719 to remove the camshaft sprocket.

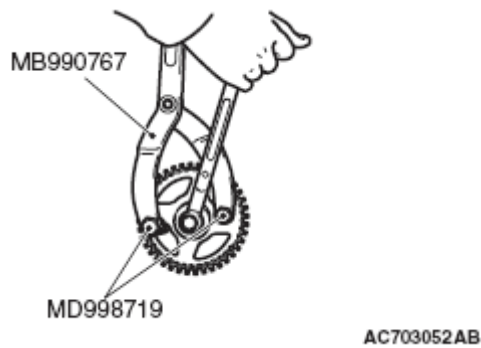


Fig. 38: Removing Camshaft Sprocket Using Special Tools MB990767 And MD998719
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

<< B >> CAMSHAFT OIL SEAL REMOVAL

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

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

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

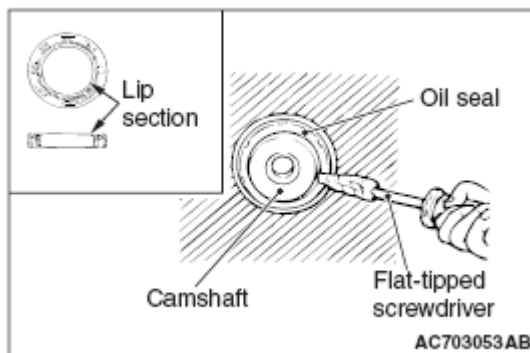


Fig. 39: Prying Out Camshaft Oil Seal
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

INSTALLATION SERVICE POINTS

>> A << CAMSHAFT OIL SEAL INSTALLATION

1. Apply engine oil to the camshaft oil seal lip.
2. Use special tools MD998713 and MD998777 to press-fit the camshaft oil seal.

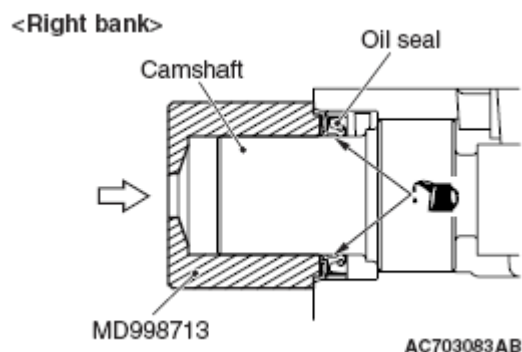


Fig. 40: Fitting Camshaft Oil Seal Using Special Tools MD998713 And MD998777 - Right Bank
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

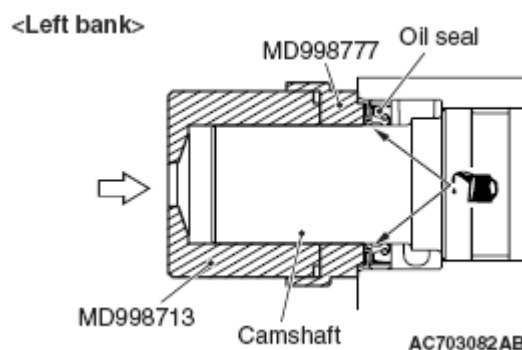


Fig. 41: Fitting Camshaft Oil Seal Using Special Tools MD998713 And MD998777 - Left Bank
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>> B << CAMSHAFT SPROCKET INSTALLATION

1. Use special tools MB990767 and MD998719 in the same way as during removal to hold the camshaft sprocket.
2. Tighten the camshaft sprocket mounting bolt to the specified torque.

Tightening torque: 90 ± 10 N.m (67 ± 7 ft-lb)

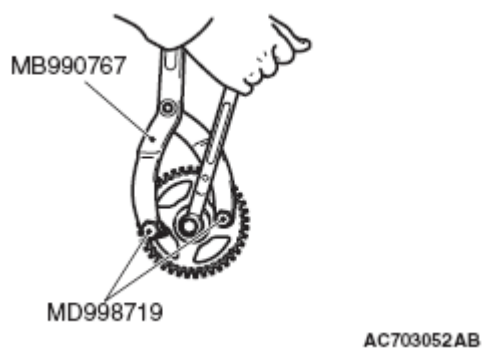


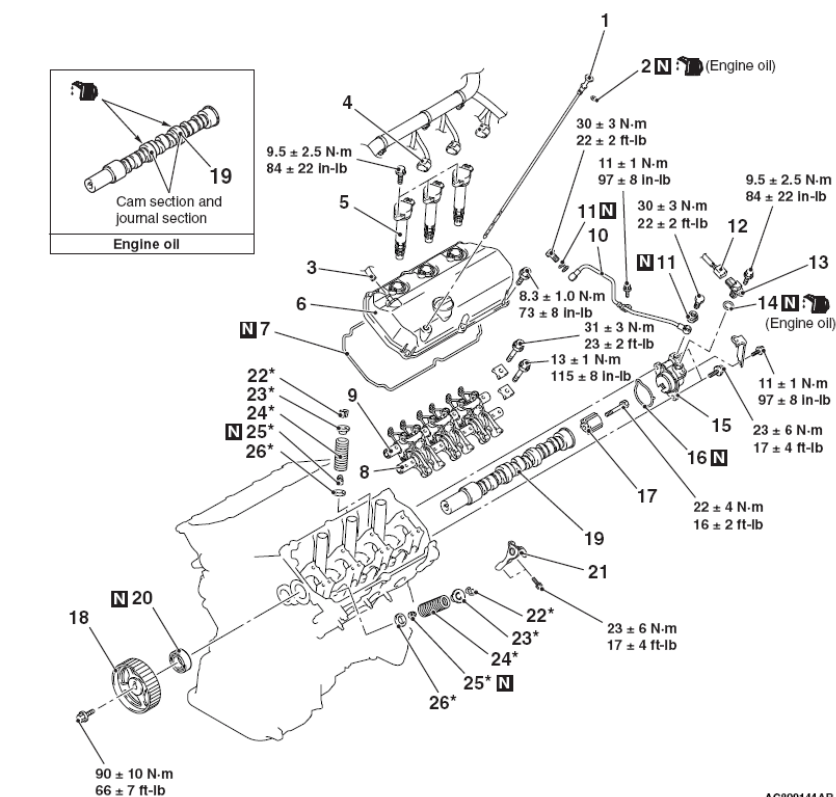
Fig. 42: Tightening Camshaft Sprocket Mounting Bolt To Specified Torque
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

CAMSHAFT AND VALVE STEM SEAL

REMOVAL AND INSTALLATION

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

< LEFT BANK >

**Camshaft removal steps**

- Engine cover

- Timing belt
- Thermostat housing

Camshaft removal steps

1. Engine oil dipstick
2. O-ring
3. PCV hose connection
4. Ignition coil connector
5. Ignition coil
- >>E<< 6. Rocker cover
7. Rocker cover gasket

Camshaft removal steps

- Valve clearance check and adjustment (intake valve)

<Installation only>.

- <<A>> >>D<< 8. Rocker arm, shaft and lash adjuster assembly (exhaust side)
- <<A>> >>D<< 9. Rocker arm and shaft assembly (intake side)

10. Oil pipe
11. Gasket
12. Camshaft position sensor connector
13. Camshaft position sensor
14. O-ring
15. Camshaft position sensor support
16. Camshaft position sensor support gasket
17. Camshaft position sensing cylinder
- <> >>G<< 18. Camshaft sprocket
- <<C>> >>F<< 19. Camshaft
- <<C>> >>F<< 20. Camshaft oil seal

Valve stem seal removal steps

- Engine cover

1. Engine oil dipstick
2. O-ring
3. PCV hose connection
4. Ignition coil connector
5. Ignition coil
- >>E<< 6. Rocker cover
7. Rocker cover gasket
- <<A>> >>D<< 8. Rocker arm, shaft and lash adjuster assembly (exhaust side)
- <<A>> >>D<< 9. Rocker arm and shaft assembly (intake side)
- Spark plug
21. Engine hanger
22. Valve spring retainer lock
23. Valve spring retainer
- >>B<< 24. Valve spring
- >>A<< 25. Valve stem seal
26. Valve spring seat

Fig. 43: Identifying Camshaft And Valve Stem Seal Removal/Installation With Torque Specifications - Left Bank

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Required Special Tools:

- MB990767: Front Hub and Flange Yoke Holder
- MB992182: Valve Stem Seal Installer
- MD998443: Auto-lash Adjuster Holder
- MD998713: Camshaft Oil Seal Installer
- MD998719: Pin
- MD998772: Valve Spring Compressor
- MD998777: Camshaft Oil Seal Installer Adapter

< RIGHT BANK >

- MB990767: Front Hub and Flange Yoke Holder
- MB992182: Valve Stem Seal Installer
- MD998443: Auto-lash Adjuster Holder
- MD998713: Camshaft Oil Seal Installer
- MD998719: Pin
- MD998772: Valve Spring Compressor

REMOVAL SERVICE POINTS

<< A >> ROCKER ARM, SHAFT AND LASH ADJUSTER ASSEMBLY (EXHAUST SIDE)/ROCKER ARM AND SHAFT ASSEMBLY (INTAKE SIDE) REMOVAL

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

CAUTION: Never disassemble the rocker arm and shaft assembly.

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

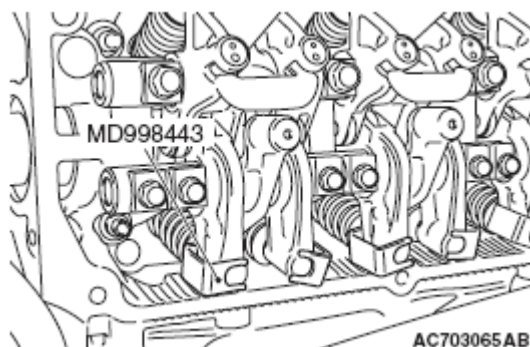


Fig. 45: Identifying Special Tool MD998443

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

<< B >> CAMSHAFT SPROCKET REMOVAL

Use special tools MB990767 and MD998719 to remove the camshaft sprocket.

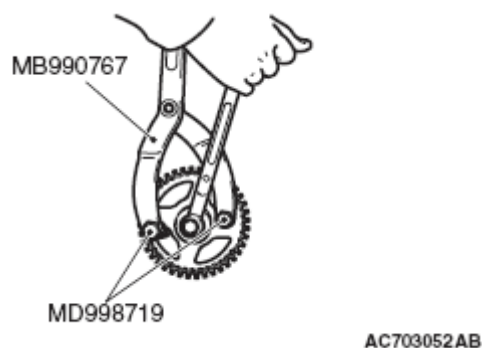


Fig. 46: Removing Camshaft Sprocket Using Special Tools MB990767 And MD998719
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

<< C >> CAMSHAFT OIL SEAL REMOVAL

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

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

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

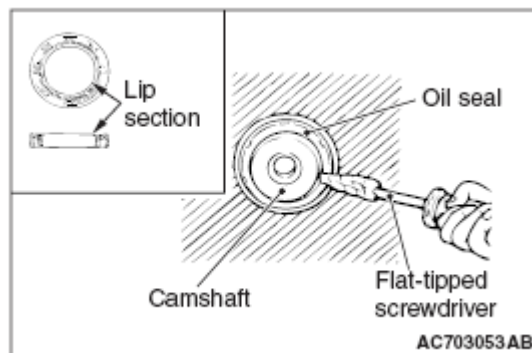


Fig. 47: Prying Out Camshaft Oil Seal
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

<< D >> VALVE SPRING RETAINER LOCK REMOVAL

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

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

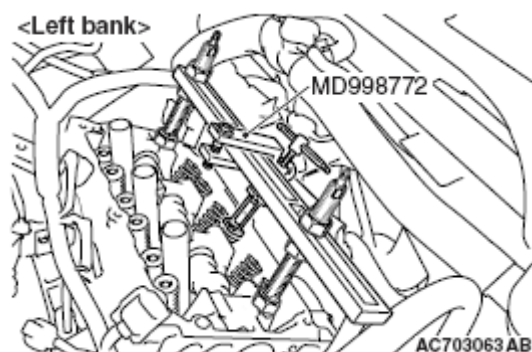


Fig. 48: Compressing Valve Spring Using Special Tool MD998772 - Left Bank
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

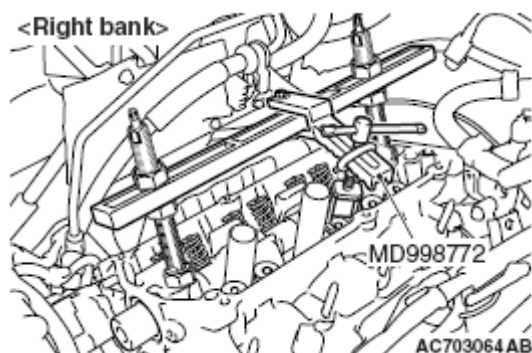


Fig. 49: Compressing Valve Spring Using Special Tool MD998772 - Right Bank
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Installation position

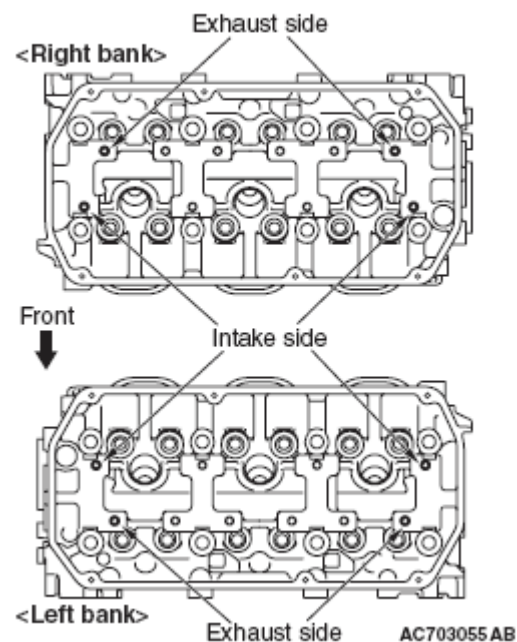


Fig. 50: Identifying Installation Position Of Special Tool MD998772 - Exhaust Side And Intake Side
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

NOTE: Installation position of special tool MD998772 is different between exhaust side and intake side.

<< E >> POWER STEERING OIL PUMP REMOVAL

1. With the hose installed, remove the power steering oil pump from the bracket.
2. Tie the removed power steering oil pump using a string at a position where it will not interfere with the removal and installation of valve stem seal.

INSTALLATION SERVICE POINTS

>> A << VALVE STEM SEAL INSTALLATION

CAUTION: Valve stem seal for intake valves and for exhaust valves are different. Be sure to install the correct ones.

- Valve stem seal identification color.

Intake: GREY

Exhaust: GREY GREEN

1. Apply an adequate and minimum amount of engine oil to the valve stem seal.

CAUTION:

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

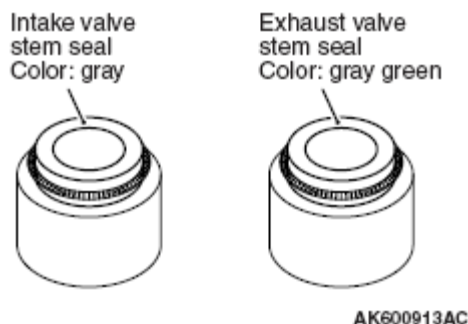


Fig. 51: Identifying Valve Stem Seals
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

2. Use special tool MB992182 to fill a new valve stem seal in the valve guide using the valve stem area as a

guide.

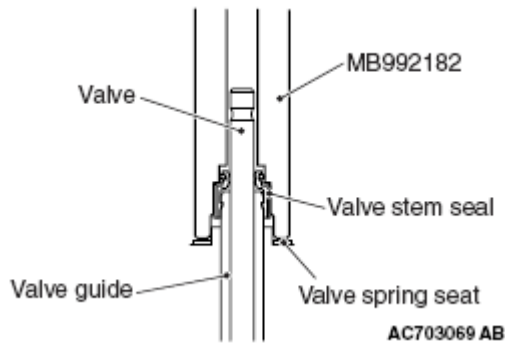


Fig. 52: Filling Valve Stem Seal In Valve Guide Using Valve Stem Area As Guide
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>> B << VALVE SPRING INSTALLATION

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

Identification color

Intake: White

Exhaust: Blue

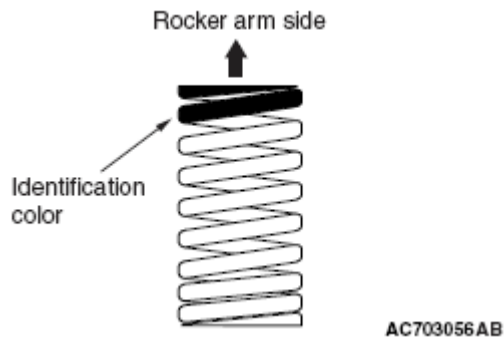


Fig. 53: Identifying Valve Spring End Identification Color
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>> C << VALVE SPRING RETAINER LOCK INSTALLATION

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

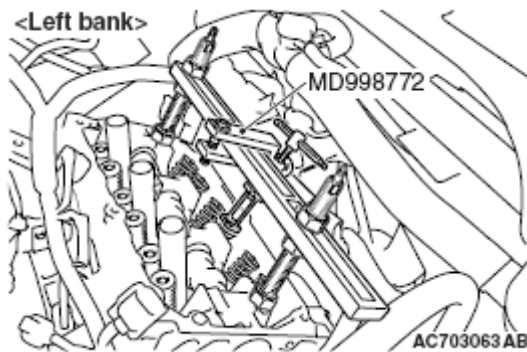


Fig. 54: Compressing Valve Spring Using Special Tool MD998772 - Left Bank
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

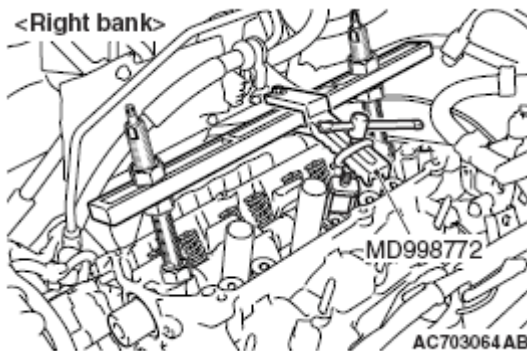


Fig. 55: Compressing Valve Spring Using Special Tool MD998772 - Right Bank
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>> D << ROCKER ARM AND SHAFT ASSEMBLY (INTAKE SIDE)/ROCKER ARM, SHAFT AND LASH ADJUSTER ASSEMBLY (EXHAUST SIDE) INSTALLATION

1. Install the intake side rocker arm and shaft assembly so that the $\phi 5.5$ mm (0.22 inch) holes of rocker arm shaft face the cylinder head side.
2. Tighten the intake side rocker arm shaft mounting bolts to the specified torque.

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

3. Install the exhaust side rocker arm, shaft and lash adjuster assembly so that the notch of rocker arm shaft is located as shown in the illustration.
4. Check that the identification mark of exhaust side rocker shaft cap is located as shown in the illustration.
5. Tighten the exhaust side rocker arm shaft mounting bolts to the specified torque.

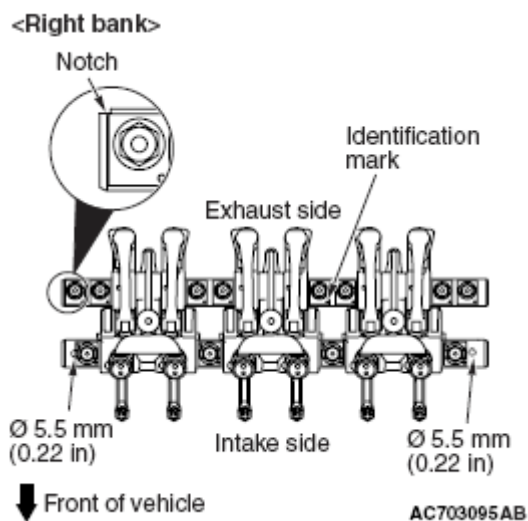


Fig. 56: Checking Identification Mark Of Exhaust Side Rocker Shaft Cap - Right Bank
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Tightening torque: 13 ± 1 N.m (115 ± 8 in-lb)

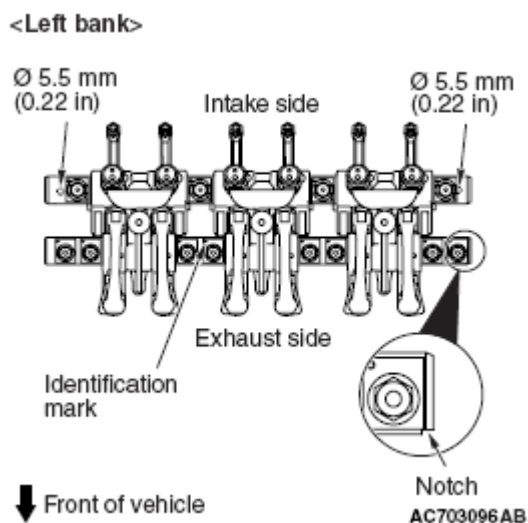


Fig. 57: Checking Identification Mark Of Exhaust Side Rocker Shaft Cap - Left Bank
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

6. Remove special tool MD998443.

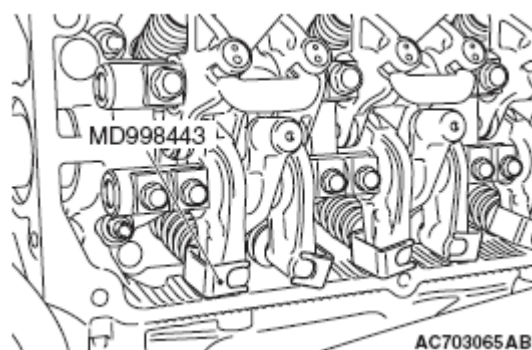


Fig. 58: Identifying Special Tool MD998443

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>> E << ROCKER COVER INSTALLATION

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

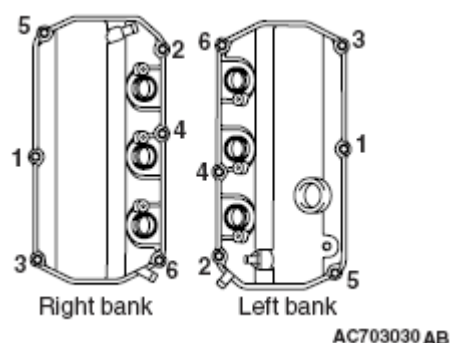


Fig. 59: Identifying Rocker Cover Bolts Tightening Sequence

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>> F << CAMSHAFT OIL SEAL INSTALLATION

1. Apply engine oil to the camshaft oil seal lip.
2. Use special tools MD998713 and MD998777 to press-fit the camshaft oil seal.

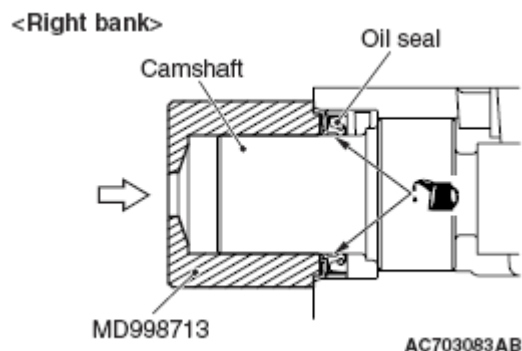


Fig. 60: Fitting Camshaft Oil Seal Using Special Tools MD998713 And MD998777 - Right Bank

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

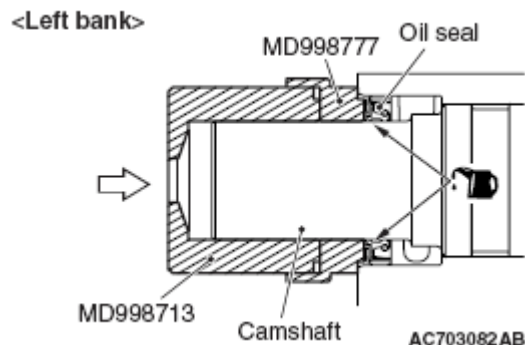


Fig. 61: Fitting Camshaft Oil Seal Using Special Tools MD998713 And MD998777 - Left Bank
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>> G << CAMSHAFT SPROCKET INSTALLATION

1. Use special tools MB990767 and MD998719 in the same way as during removal to hold the camshaft sprocket.
2. Tighten the camshaft sprocket mounting bolt to the specified torque.

Tightening torque: 90 ± 10 N.m (66 ± 7 ft-lb)

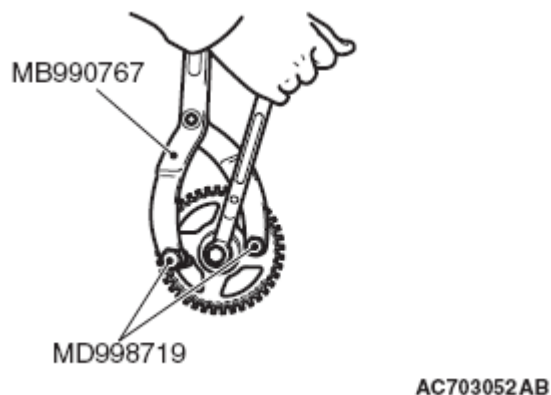


Fig. 62: Tightening Camshaft Sprocket Mounting Bolt
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>> H << ENGINE OIL PRESSURE SWITCH INSTALLATION

Apply the specified sealant to the thread of the engine oil pressure switch.

Specified sealant: ThreeBond 1141J or equivalent

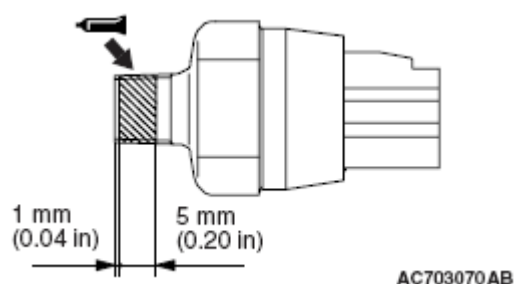


Fig. 63: Applying Specified Sealant To Thread Of Engine Oil Pressure Switch
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

>> I << O-RING/ENGINE OIL CONTROL VALVE INSTALLATION

CAUTION:

- Never re-use the O-ring.
- Before installing O-ring, wind sealing tape around the oil passages cut-out area of engine oil control valve, to prevent damage. If the O-ring is damaged, it can cause an oil leak.

1. Apply a small amount of engine oil to the O-ring and then install it to the engine oil control valve.
2. Install the engine oil control valve to the cylinder head.
3. Tighten the engine oil control valve.

Tightening torque: 11 ± 1 N.m (97 ± 8 in-lb)

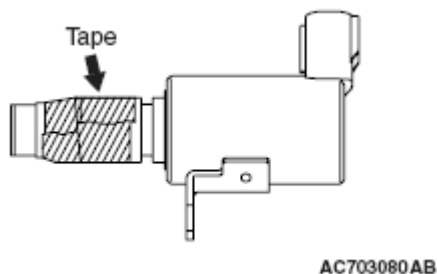


Fig. 64: Winding Sealing Tape Around Oil Passages Cut-Out Area Of Engine Oil Control Valve
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

OIL PAN AND OIL STRAINER

REMOVAL AND INSTALLATION