

GROUP 11A

ENGINE MECHANICAL

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GENERAL DESCRIPTION

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

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

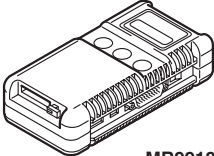
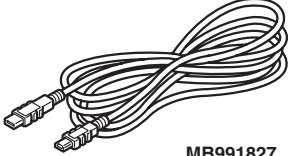

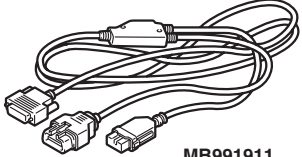
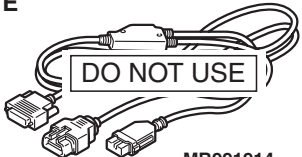
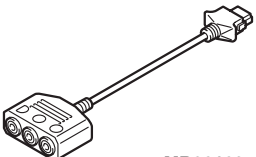

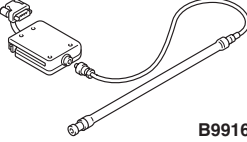
ENGINE DIAGNOSIS

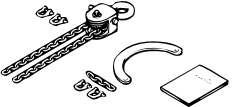
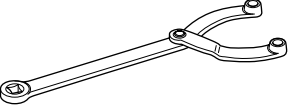
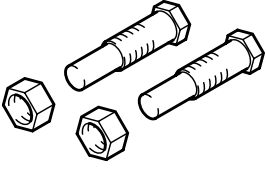
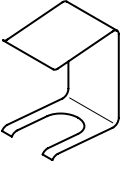
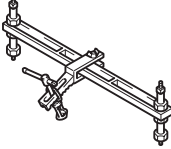
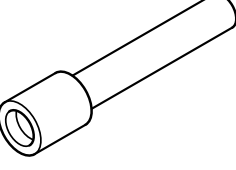
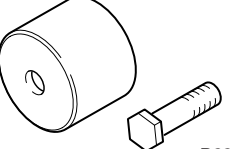

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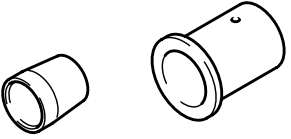
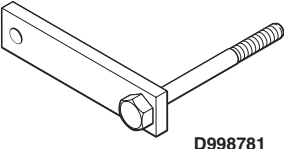
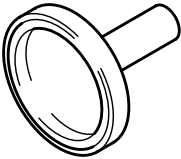
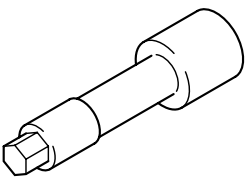
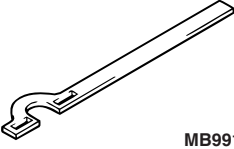
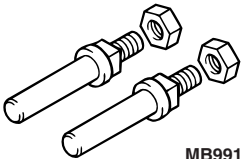
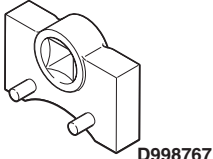
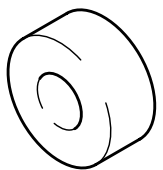
SYMPTOMS	PROBABLE CAUSE	REMEDY
Compression is too low	Blown cylinder head gasket	Replace the gasket.
	Worn or damaged piston rings	Replace the rings.
	Worn piston or cylinder	Repair or replace the piston and/or the cylinder block.
	Worn or damaged valve seat	Repair or replace the valve and/or the seat ring
Drop in engine oil pressure	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.
	Worn oil pump gears or cover	Replace the gears and/or the cover.
	Thin or diluted engine oil	Change the engine oil to the correct viscosity.
	Stuck (opened) oil relief valve	Repair the relief valve.
	Excessive bearing clearance	Replace the bearings.
Engine oil pressure too high	Stuck (closed) oil relief valve	Repair the relief valve.
Noisy valves	Malfunction of lash adjuster (including entry of air into high pressure chamber)	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.

SPECIAL TOOLS

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TOOL	TOOL NUMBER AND NAME	SUPERSESSON	APPLICATION
<p>A</p>  <p>MB991824</p> <p>B</p>  <p>MB991827</p> <p>C</p>  <p>MB991910</p> <p>D</p>  <p>MB991911</p> <p>E</p>  <p>MB991914</p> <p>F</p>  <p>MB991825</p> <p>G</p>  <p>MB991826 MB991958</p>	<p>MB991958 Scan tool (MUT-III sub assembly) A: MB991824 Vehicle communication interface (V.C.I.)</p> <p>B: MB991827 MUT-III USB cable</p> <p>C: MB991910 MUT-III main harness A (Vehicles with CAN communication system)</p> <p>D: MB991911 MUT-III main harness B (Vehicles without CAN communication system)</p> <p>E: MB991914 MUT-III main harness C (for Daimler Chrysler models only)</p> <p>F: MB991825 MUT-III measurement adapter</p> <p>G: MB991826 MUT-III trigger harness</p>	<p>MB991824-KIT</p> <p><i>NOTE: G: MB991826 MUT-III trigger harness is not necessary when pushing V.C.I. ENTER key.</i></p>	<ul style="list-style-type: none"> • Drive belt tension check • Ignition timing check • Curb idle speed check • Idle mixture check • Erasing the diagnostic trouble code <p>⚠ CAUTION If you connect MUT-III main harness A to a vehicle without CAN communication system to use the MUT-III, a pulse signal may interfere with the simulated vehicle speed lines, thus causing the MUT-III inoperative. Therefore, use the MUT-III main harness B (MB991911) instead.</p>
 <p>B991668</p>	<p>MB991668 Belt tension meter set</p>	<p>Tool not available</p>	<p>Measurement of drive belt tension (used together with scan tool <MUT-III Sub Assembly>)</p>

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 <p align="center">B991683</p>	MB991683 Sling chain set	Tool not available	Removal and installation of engine assembly
 <p align="center">B990767</p>	MB990767 Front hub and flange yoke holder	MB990767-01	Holding the camshaft sprocket
	MD998715 Crankshaft pulley holder pin	MIT308239	Holding the camshaft sprocket
 <p align="center">D998443</p>	MD998443 Auto-lash adjuster holder	MD998443-01	Holding the auto-lash adjuster
 <p align="center">AC204024</p>	MD998772 Valve spring compressor	General service tool	Compressing valve spring
	MB991999 Valve stem seal installer	-	Valve stem seal installer
 <p align="center">D998713</p>	MD998713 Camshaft oil seal installer	MD998713-01	Press-in of the camshaft oil seal
 <p align="center">B991559</p>	MB991559 Camshaft oil seal installer adapter	Tool not available	Press-fitting the camshaft oil seal (left bank side)

TOOL	TOOL NUMBER AND NAME	SUPERSESION	APPLICATION
	MD998717 Crankshaft front oil seal installer	MD998717-01	Press-in of the crankshaft front oil seal
 D998781	MD998781 Flywheel stopper	General service tool	Securing the drive plate
	MD998718 Crankshaft rear oil seal installer	MD998718-01	Press-fitting the crankshaft rear oil seal
	MD998051 Cylinder head bolt wrench	MD998051-01 or General service tool	Cylinder head bolt removal and installation
 MB991800	MB991800 Pulley holder	MB991800-01	Holding the crankshaft pulley
 MB991802	MB991802 Pin B	MB991802-01	Holding the crankshaft pulley
 D998767	MD998767 Tension pulley socket wrench	MD998752-01	Timing belt tension adjustment
	MD998769 Crankshaft pulley spacer	General service tool	Rotating the crankshaft when installing the timing belt

ON-VEHICLE SERVICE

DRIVE BELT TENSION CHECK

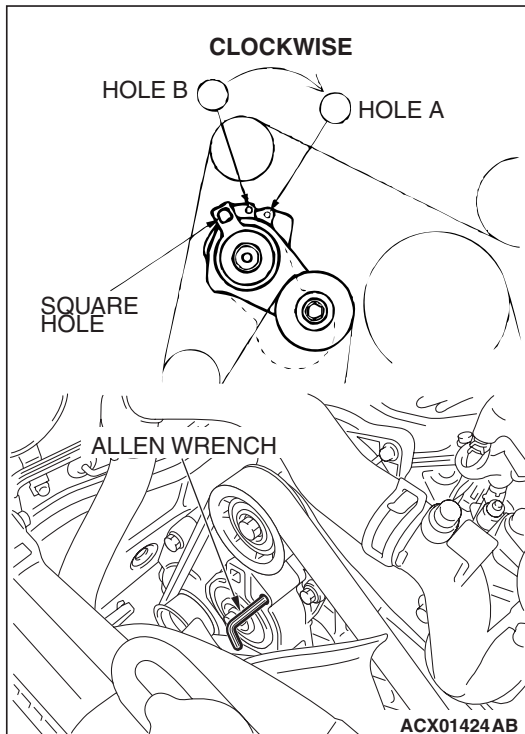
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Refer to GROUP 00, Maintenance Service – Drive Belts
(Check Condition) [P.00-43](#).

AUTO-TENSIONER CHECK

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



IGNITION TIMING CHECK

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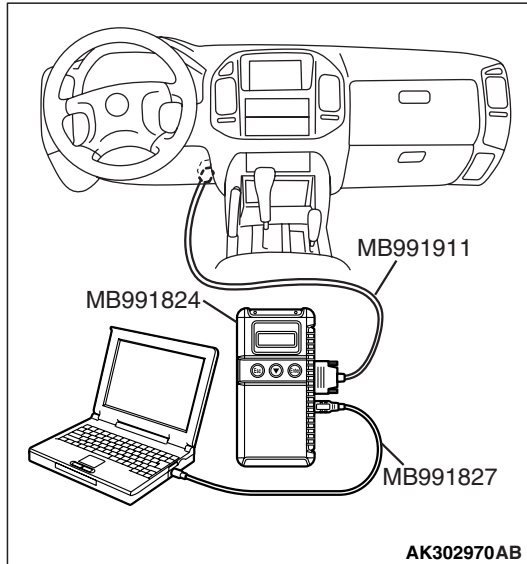
Required Special Tools:

MB991958: Scan Tool (MUT-III Sub Assembly)

- MB991824: V.C.I.
- MB991827: MUT-III USB Cable
- MB991911: MUT-III Main Harness B

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: 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.
3. Set up a timing light.
4. Start the engine and run it at idle.
5. Check that the idle speed is approximately 700 r/min.
6. Select scan tool MB991958 actuator test "item number 17".
7. Check that basic ignition timing is within the standard value.

Standard value: 5° BTDC ± 3°

8. If the basic ignition timing is not within the standard value, check the following items:
 - Diagnostic output
 - Timing belt cover and crankshaft position sensor installation conditions
 - Crankshaft sensing blade condition

⚠ CAUTION

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

9. Press the clear key on scan tool MB991958 (select forced drive stop mode), and cancel the actuator test.
10. Check that the actual ignition timing is at the standard value.

Standard value: Approximately 10° BTDC

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

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

CURB IDLE SPEED CHECK

M1111003500870

Required Special Tools:

MB991958: Scan Tool (MUT-III Sub Assembly)

- MB991824: V.C.I.
- MB991827: MUT-III USB Cable
- MB991911: MUT-III Main Harness B

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: 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.
3. Check the basic ignition timing.

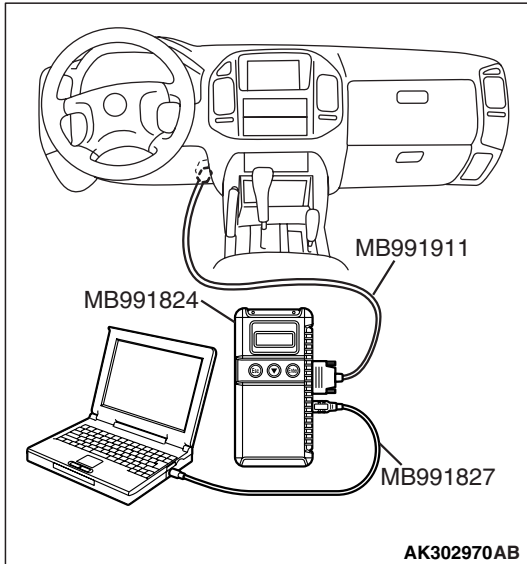
Standard value: 5° BTDC ± 3°

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

Curb idle speed: 700 ± 100 r/min

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

7. If the idle speed is outside the standard value, refer to GROUP 13A, Multiport Fuel Injection (MFI) – Multiport Fuel Injection (MFI) Diagnosis – Symptom Chart P.13A-38.



IDLE MIXTURE CHECK

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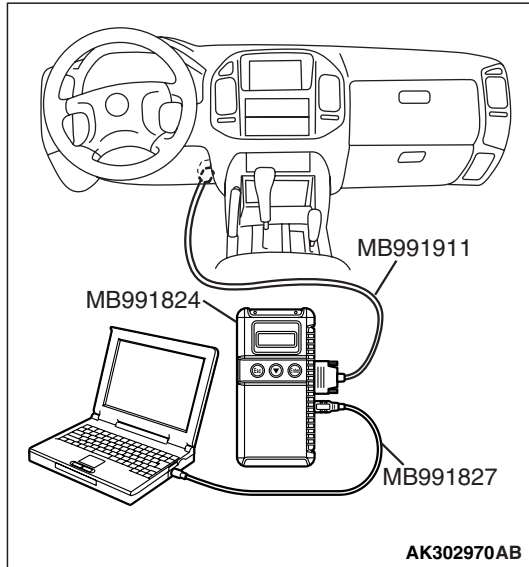
Required Special Tools:

MB991958: Scan Tool (MUT-III Sub Assembly)

- MB991824: V.C.I.
- MB991827: MUT-III USB Cable
- MB991911: MUT-III Main Harness B

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

Standard value: 5° BTDC ± 3°

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

Standard value:

CO contents: 0.5% or less

HC contents: 100 ppm or less

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

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

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

COMPRESSION PRESSURE CHECK

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Required Special Tools:

MB991958: Scan Tool (MUT-III Sub Assembly)

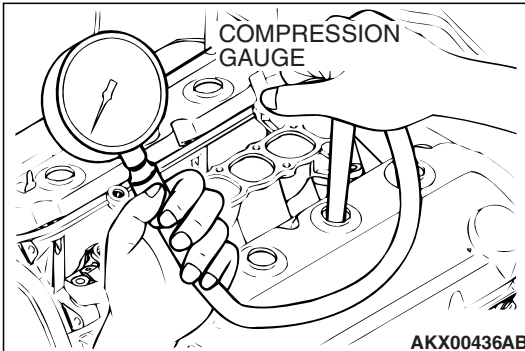
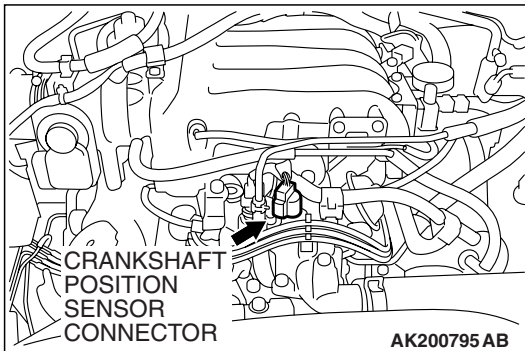
- MB991824: V.C.I.
- MB991827: MUT-III USB Cable
- MB991911: MUT-III Main Harness B

1. Before inspection, check that the engine oil, starter and battery are normal. Also, set the vehicle in the following condition:

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

NOTE: 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. Disconnect the spark plug cables.
3. Remove all of the spark plugs.



4. Disconnect the crankshaft position sensor connector.
NOTE: Doing this will prevent the engine control module from carrying out ignition and fuel injection.

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

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

Standard value (at engine speed of 250 – 400 r/min):
1,548 kPa (225 psi)

Minimum limit (at engine speed of 250 – 400 r/min):
1,117 kPa (162 psi)

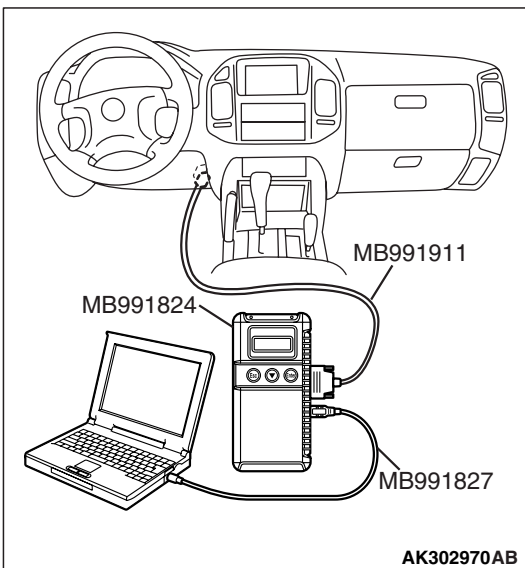
8. Measure the compression pressure for all the cylinders, and check that the pressure differences of the cylinders are below the limit.

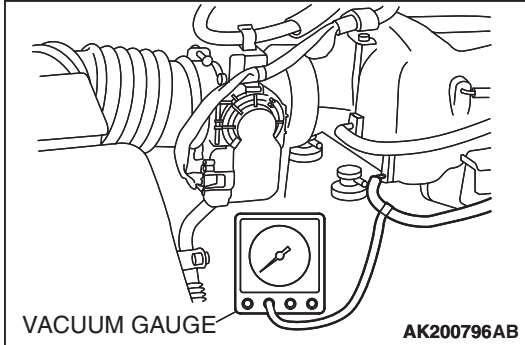
Limit: 98 kPa (14 psi)

9. If there is a cylinder with compression or a compression difference that is outside the limit, pour a small amount of engine oil through the spark plug hole, and repeat the operations in steps 6 to 8.
 - (1) If the compression increases after oil is added, the cause of the malfunction is a worn or damaged piston ring and/or cylinder inner surface.
 - (2) If the compression does not rise after oil is added, the cause is a burnt or defective valve seat, or pressure is leaking from the gasket.

10. Connect the crankshaft position sensor connector.
11. Install the spark plugs and spark plug cables.
12. Use the scan tool MB991958 to erase the diagnostic trouble codes.

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





MANIFOLD VACUUM CHECK

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

Idle speed: 700 ± 100 r/min

Minimum limit: 60 kPa (18 in Hg)

LASH ADJUSTER CHECK

M1111002900552

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

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

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

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

1. Start the engine.
2. Check if the abnormal noise produced immediately after starting the engine, changes with the change in the engine speed.
If the abnormal noise is not produced immediately after starting the engine or it does not change with the engine speed, the lash adjuster is not the cause for the noise. Therefore, investigate other causes. The abnormal noise is probably caused by some other parts than the engine proper if it does not change with the engine speed. (In this case, the lash adjuster is in good condition.)
3. With the engine idling, change the engine load (shift from N to D range, for example) to make sure that there is no change in the level of abnormal noise.

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

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

If the noise is reduced or disappears, clean the lash adjuster (Refer to GROUP 11B, Engine Overhaul – Rocker Arms and Camshaft – Inspection P.11B-24). 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 P.11A-13.).
6. If the abnormal noise does not disappear after air bleeding operation, clean the lash adjuster (Refer to GROUP 11B, Engine Overhaul – Rocker Arms and Camshaft – Inspection P.11B-24).

Bleeding lash adjuster system

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

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

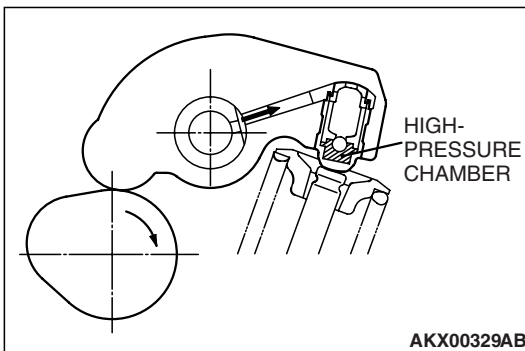
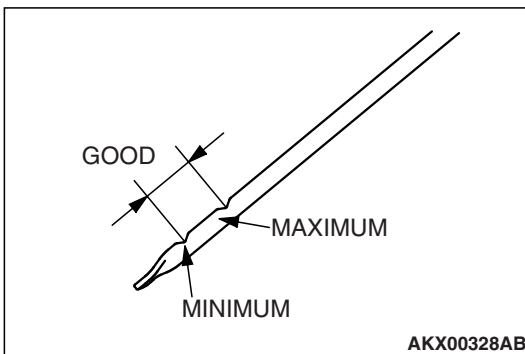
NOTE: In the above cases, abnormal noise can be eliminated by bleeding the lash adjuster system.

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

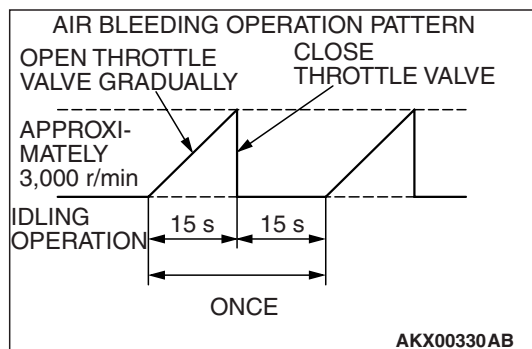
NOTE: If the engine oil level is low, air is sucked from the oil screen, causing air to enter the oil passage.

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

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



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



2. Idle the engine for one to three minutes to warm it up.
3. Repeat the operation pattern, shown in left figure, at no load to check for abnormal noise. (Usually the abnormal noise is eliminated after repetition of the operation 10 to 30 times. If, however, no change is observed in the level of abnormal noise after repeating the operation more than 30 times, suspect that the abnormal noise is due to some other factors.)
4. After elimination of abnormal noise, repeat the operation shown in left figure five more times.
5. Run the engine at idle for one to three minutes to make sure that the abnormal noise has been eliminated.

ENGINE ASSEMBLY

REMOVAL AND INSTALLATION

M1112001002094

CAUTION

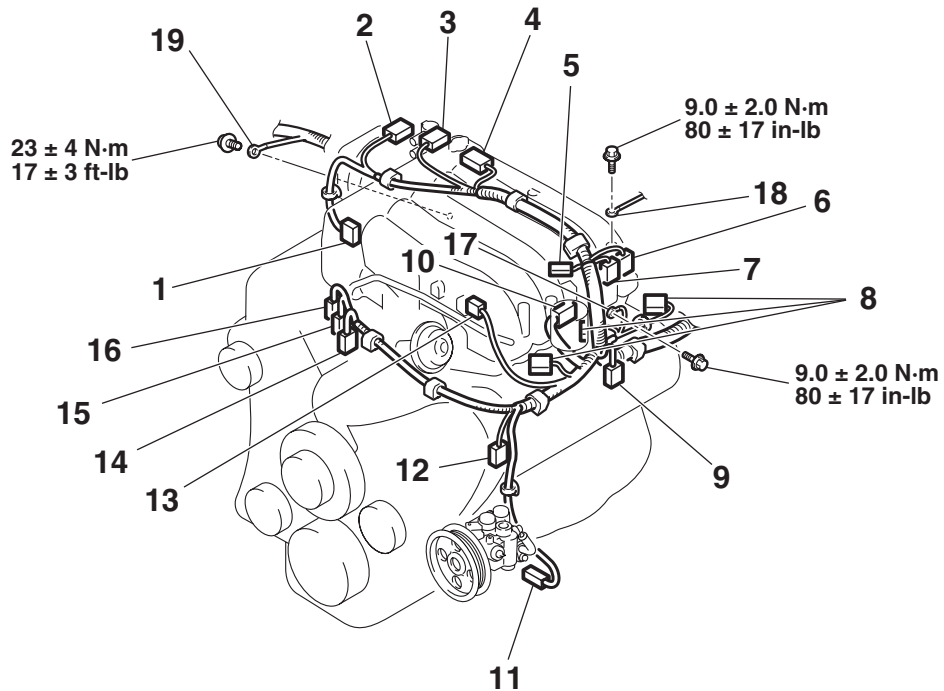
- When the engine assembly replacement is performed, use scan tool MB991958 to initialize the learning value (Refer to GROUP 00, Initialization Procedure for Learning Value in MFI Engine P.00-23).
- *: Indicates parts which should be initially tightened, and then fully tightened after placing the vehicle horizontal and loading the full weight of the engine on the vehicle body.

Pre-removal Operation

- Skid Plate and Under Cover Removal
- Engine Oil Draining (Refer to GROUP 12, On-vehicle Service – Engine Oil Replacement P.12-3.)
- Engine Coolant Draining (Refer to GROUP 14, On-vehicle Service – Engine Coolant Replacement P.14-6.)
- Fuel Line Pressure Reduction [Refer to GROUP 13A, On-vehicle Service – Fuel Pump Connector Disconnection (How to Reduce Pressurized Fuel Lines) P.13A-1051.]
- Hood Removal (Refer to GROUP 42, Hood P.42-5.)
- Battery Removal
- Air Cleaner and Air Intake Hose Removal (Refer to GROUP 15, Air Cleaner P.15-6.)
- Radiator Removal (Refer to GROUP 14, Radiator P.14-8.)
- Cooling Fan and Clutch Assembly Removal (Refer to GROUP 14, Cooling Fan P.14-10)
- Front Exhaust Pipe Removal (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-13.)
- Transmission Assembly Removal (Refer to GROUP 23A, Transmission and Transfer Assembly P.23A-566.)

Post-installation Operation

- Transmission Assembly Installation (Refer to GROUP 23A, Transmission and Transfer Assembly P.23A-566.)
- Front Exhaust Pipe Installation (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-13.)
- Radiator Installation (Refer to GROUP 14, Radiator P.14-8.)
- Cooling Fan and Clutch Assembly Installation (Refer to GROUP 14, Cooling Fan P.14-10)
- Air Cleaner and Air Intake Hose Installation (Refer to GROUP 15 P.15-6.)
- Battery Installation
- Hood Installation (Refer to GROUP 42, Hood P.42-5.)
- Engine Oil Refilling (Refer to GROUP 12, On-vehicle Service – Engine Oil Replacement P.12-3.)
- Engine Coolant Refilling (Refer to GROUP 14, On-vehicle Service – Engine Coolant Replacement P.14-6.)
- Fuel Leak Check
- Skid Plate and Under Cover Installation



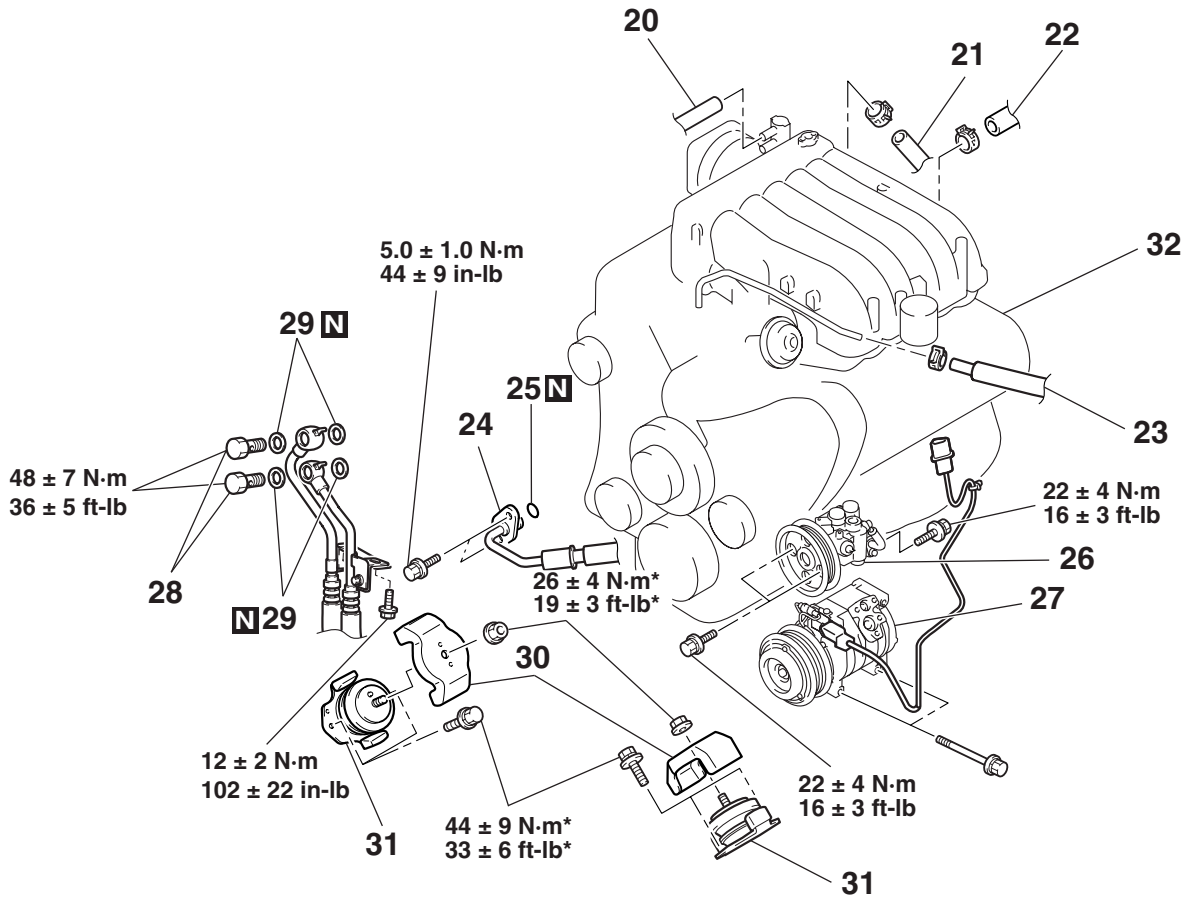
AC204398AC

REMOVAL STEPS

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

REMOVAL STEPS (Continued)

10. CONTROL WIRING HARNESS AND INJECTION WIRING HARNESS COMBINATION CONNECTOR
11. POWER STEERING PUMP SWITCH CONNECTOR
12. A/C COMPRESSOR ASSEMBLY CONNECTOR
13. INTAKE MANIFOLD TUNING SOLENOID CONNECTOR
14. CRANKSHAFT POSITION SENSOR CONNECTOR
15. ENGINE COOLANT TEMPERATURE GAUGE UNIT CONNECTOR
16. ENGINE COOLANT TEMPERATURE GAUGE SENSOR CONNECTOR
17. GROUNDING CABLE
18. GROUNDING CABLE
19. GROUNDING CABLE



AC204056 AB

- 20. PURGE HOSE CONNECTION
- 21. HEATER HOSE CONNECTION
- 22. HEATER HOSE CONNECTION
- 23. FUEL RETURN HOSE CONNECTION
- 24. FUEL HIGH-PRESSURE HOSE CONNECTION
- 25. O-RING

<<A>>

<<A>>

<> >>A<<

- 26. POWER STEERING OIL PUMP ASSEMBLY
- 27. A/C COMPRESSOR ASSEMBLY
- 28. EYE BOLTS
- 29. GASKET
- 30. HEAT PROTECTOR
- 31. ENGINE FRONT MOUNT INSULATOR
- 32. ENGINE ASSEMBLY

Required Special Tool:

- MB991683: Sling Chain Set

REMOVAL SERVICE POINTS

<<A>> POWER STEERING OIL PUMP ASSEMBLY / A/C COMPRESSOR ASSEMBLY REMOVAL

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

<> ENGINE ASSEMBLY REMOVAL

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

INSTALLATION SERVICE POINT

>>A<< ENGINE ASSEMBLY INSTALLATION

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

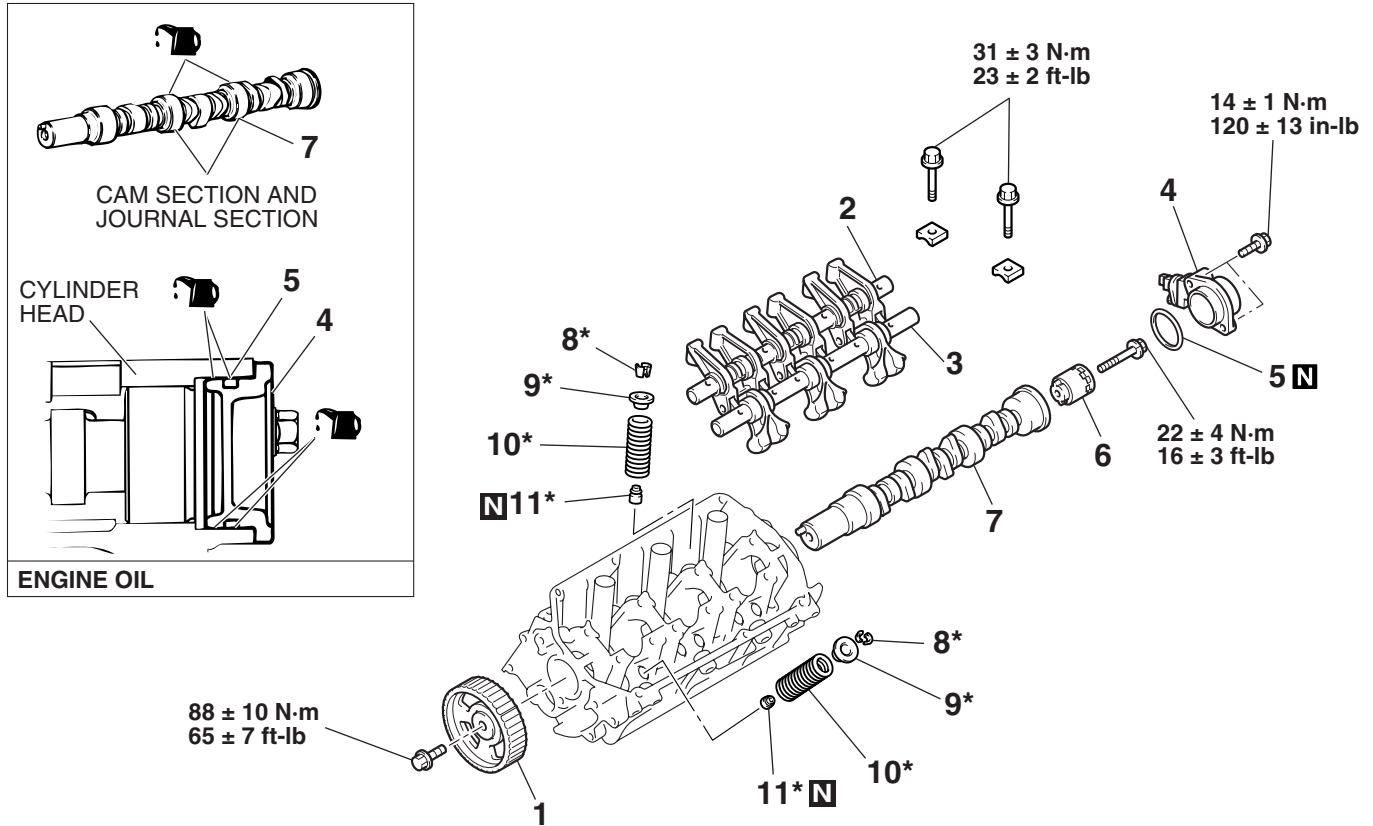
CAMSHAFT AND VALVE STEM SEAL

REMOVAL AND INSTALLATION

M1112006600824

CAUTION

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



AC204227AB

CAMSHAFT REMOVAL STEPS

- CYLINDER HEAD ASSEMBLY (REFER TO P.11A-31.)
- <<A>> >>F<< 1. CAMSHAFT SPROCKET
- <> >>E<< 2. ROCKER ARM, SHAFT AND LASH ADJUSTER ASSEMBLY (INTAKE SIDE)
- <> >>E<< 3. ROCKER ARM, SHAFT AND LASH ADJUSTER ASSEMBLY (EXHAUST SIDE)
- >>D<< 4. CAMSHAFT POSITION SENSOR SUPPORT
- 5. O-RING
- 6. SENSING CAMSHAFT POSITION CYLINDER
- 7. CAMSHAFT

VALVE STEM SEAL REMOVAL STEPS

- ROCKER COVER (REFER TO P.11A-31.)
- <> >>E<< 2. ROCKER ARM, SHAFT AND LASH ADJUSTER ASSEMBLY (INTAKE SIDE)
- <> >>E<< 3. ROCKER ARM, SHAFT AND LASH ADJUSTER ASSEMBLY (EXHAUST SIDE)
- <<C>> >>C<< 8. VALVE SPRING RETAINER LOCKS
- >>B<< 9. VALVE SPRING RETAINERS
- >>A<< 10. VALVE SPRINGS
- >>A<< 11. VALVE STEM SEALS

Required Special Tools:

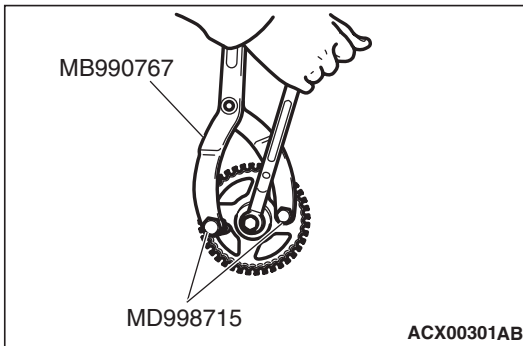
- MB990767: Front Hub and Flange Yoke Holder
- MB991999: Valve Stem Seal Installer
- MD998443: Auto-lash Adjuster Holder

- MD998715: Crankshaft Pulley Holder Pin
- MD998772: Valve Spring Compressor

REMOVAL SERVICE POINTS

<<A>> CAMSHAFT SPROCKET REMOVAL

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



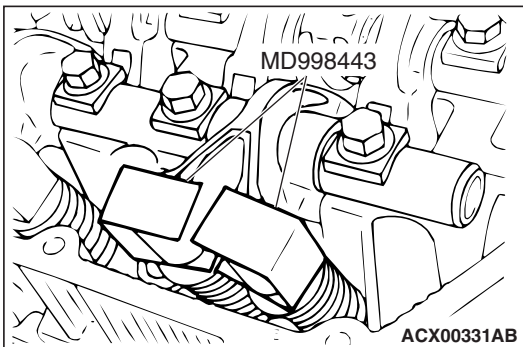
<> ROCKER ARM, SHAFT AND LASH ADJUSTER ASSEMBLY REMOVAL

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.

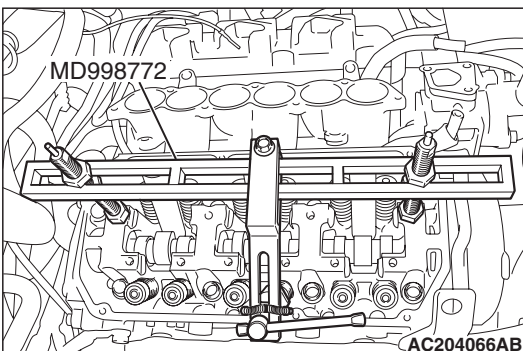


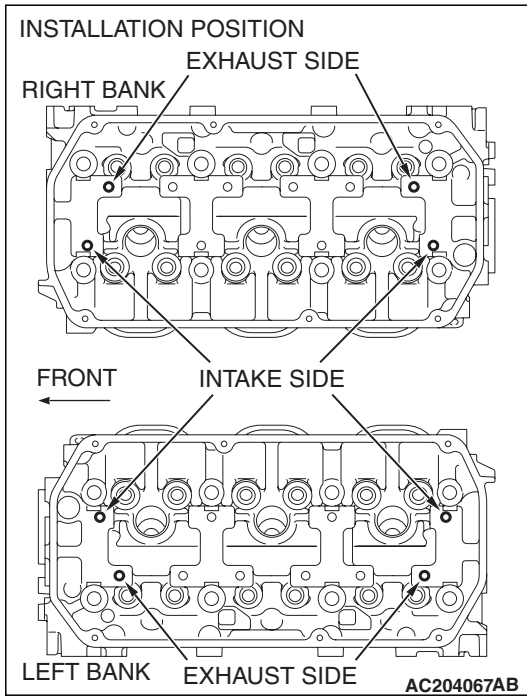
<<C>> VALVE SPRING RETAINER LOCKS REMOVAL

⚠ CAUTION

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

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





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

INSTALLATION SERVICE POINTS

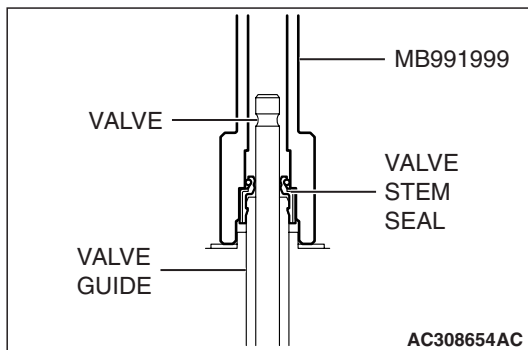
>>A<< VALVE STEM SEALS INSTALLATION

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

⚠ CAUTION

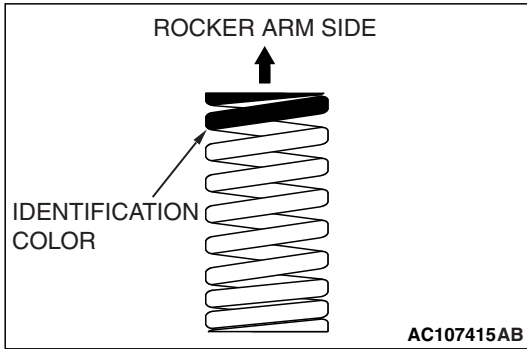
- Valve stem seals cannot be reused.
- Special tool MB991999 must be used to install the valve stem seal. Improper installation could result in oil leaking past the valve guide.

2. Use special tool MB991999 to fill a new valve stem seal in the valve guide using the valve stem area as a guide.



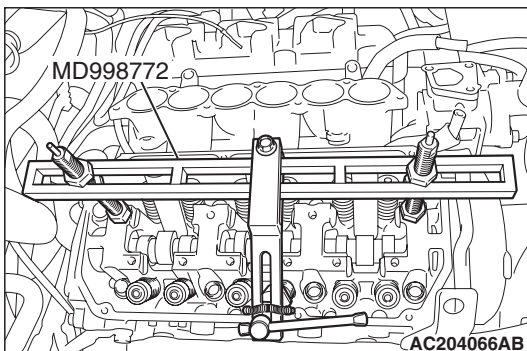
>>B<< VALVE SPRINGS INSTALLATION

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



>>C<< VALVE SPRING RETAINER LOCKS INSTALLATION

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



>>D<< CAMSHAFT POSITION SENSOR SUPPORT INSTALLATION

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

Specified sealant: 3M™ AAD Part No.8672, 3M™ AAD Part No.8679/8678 or equivalent

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

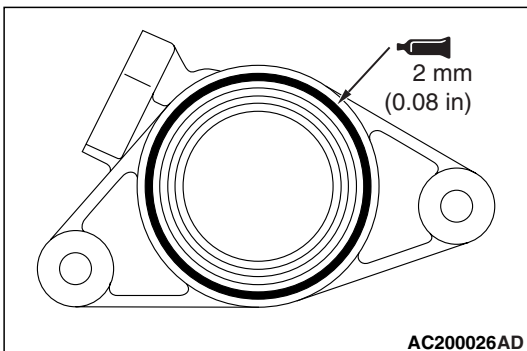
3. Install the camshaft position sensor support to the cylinder head.

⚠ CAUTION

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

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

Tightening torque: 14 ± 1 N·m (120 ± 13 in-lb)

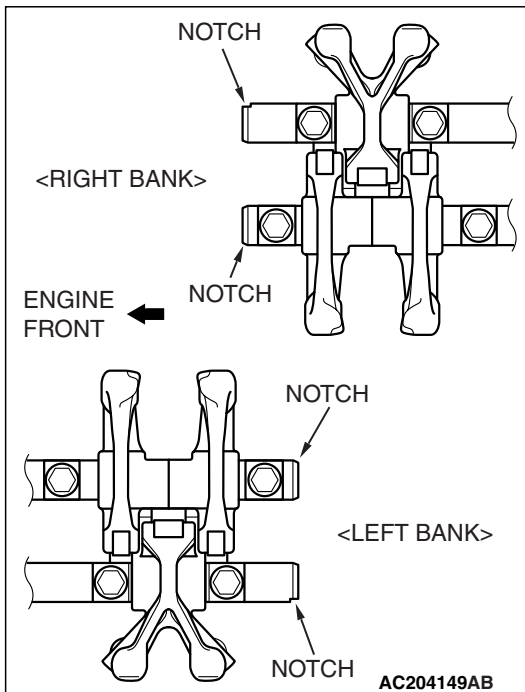
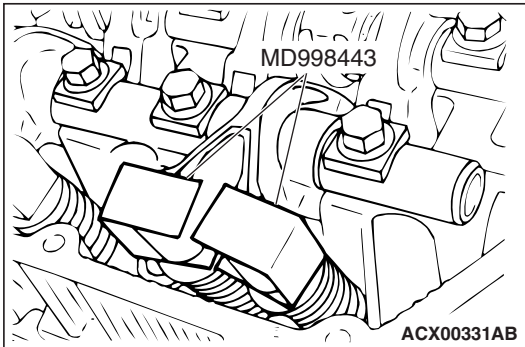


>>E<< ROCKER ARM, SHAFT AND LASH ADJUSTER ASSEMBLY INSTALLATION

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

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

3. Remove special tool MD998443.

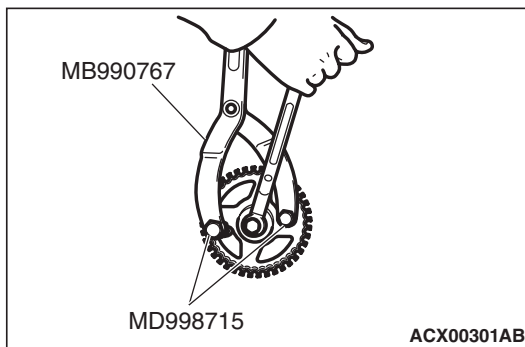


4. Check that notches in the each rocker shaft are facing the direction shown in the illustration.

>>F<< CAMSHAFT SPROCKET INSTALLATION

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

Tightening torque: 88 ± 10 N·m (65 ± 7 ft-lb)



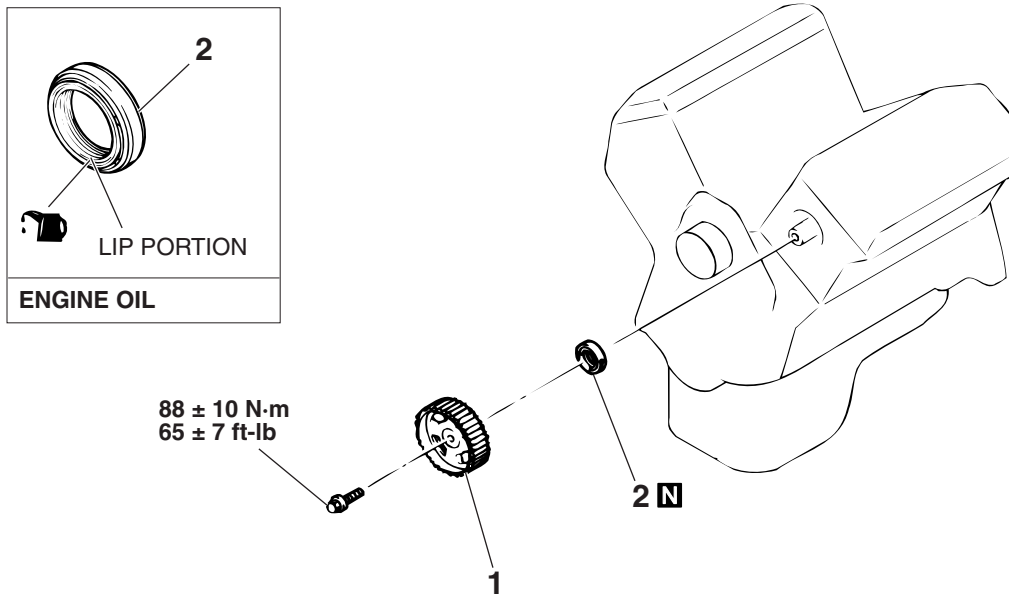
CAMSHAFT OIL SEAL

REMOVAL AND INSTALLATION

M1112002200147

Pre-removal and Post-installation Operation

- Timing Belt Removal and Installation (Refer to P.11A-35.)



ACX00375AC

REMOVAL STEPS

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

Required Special Tools:

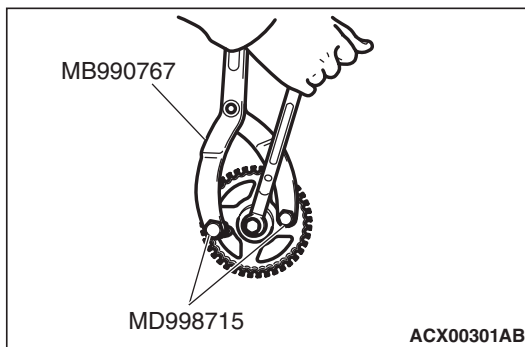
MB990767: Front Hub and Flange Yoke Holder
MB991559: Camshaft Oil Seal Installer Adapter

MD998713: Camshaft Oil Seal Installer
MD998715: Crankshaft Pulley Holder Pin

REMOVAL SERVICE POINTS

<<A>> CAMSHAFT SPROCKET REMOVAL

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



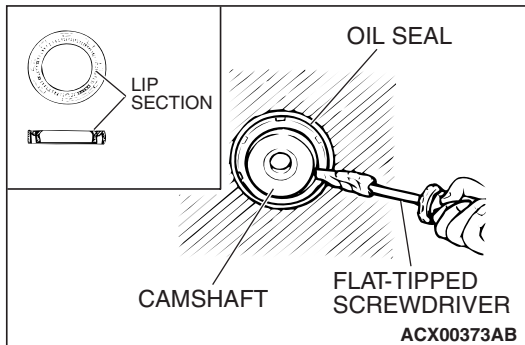
<> CAMSHAFT OIL SEAL REMOVAL

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.

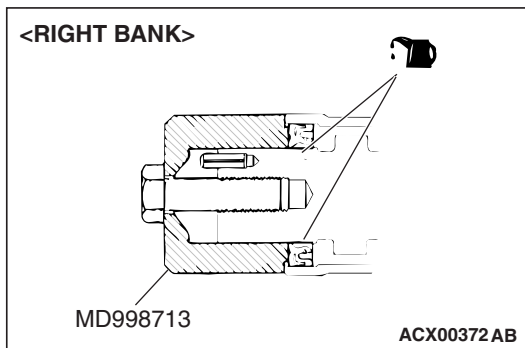
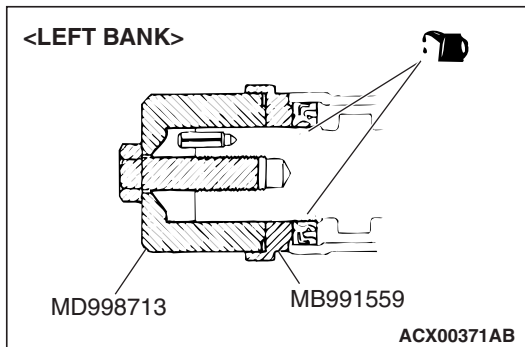
2. Cover the end of a flat-tipped screwdriver with a shop towel and insert into the notched section of the oil seal, and pry out the oil seal to remove it.



INSTALLATION SERVICE POINTS

>>A<< CAMSHAFT OIL SEAL INSTALLATION

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



>>B<< CAMSHAFT SPROCKET INSTALLATION

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

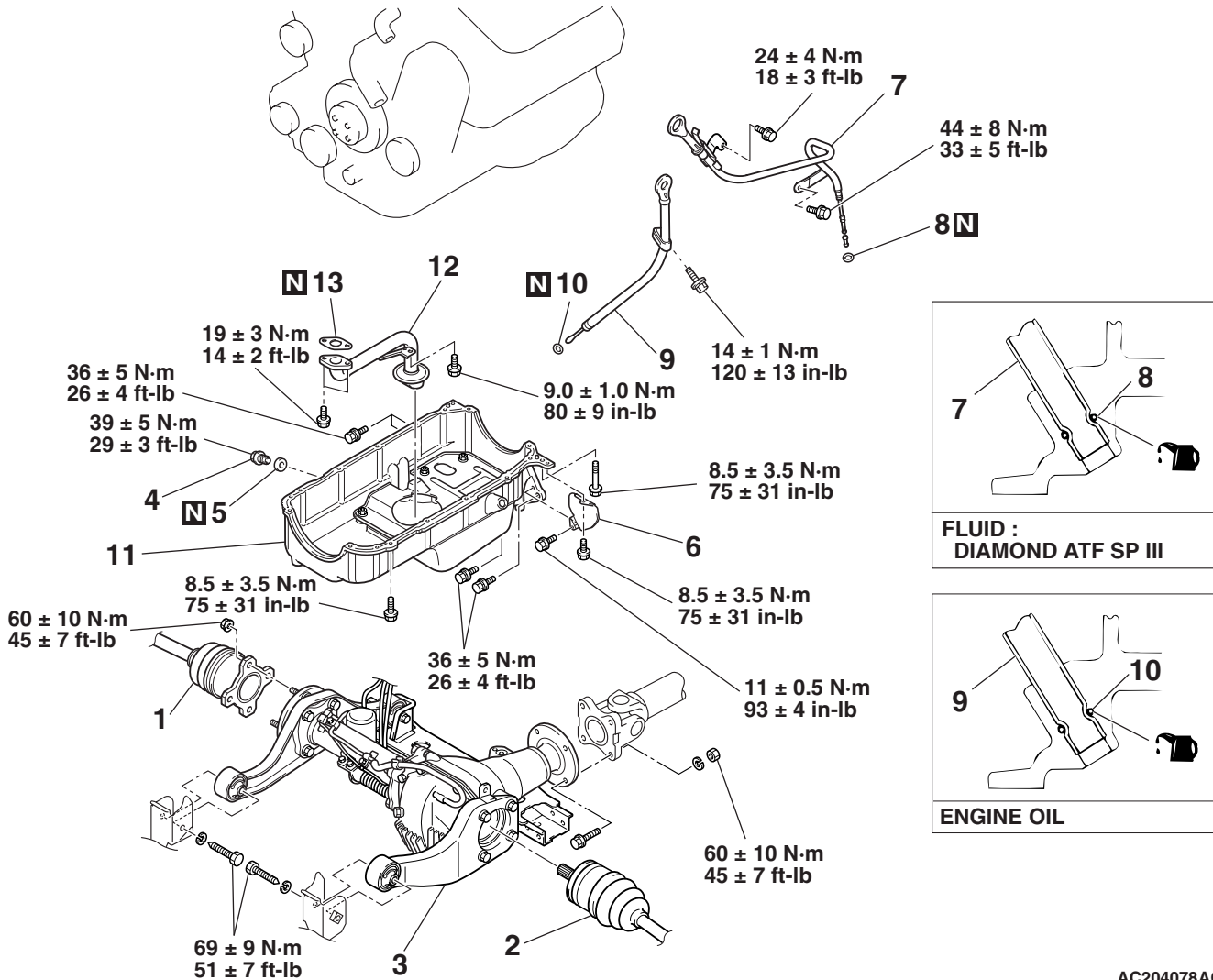
OIL PAN AND OIL SCREEN

REMOVAL AND INSTALLATION

M1112002500290

Pre-removal and Post-installation Operation

- Skid Plate and Under Cover Removal and Installation
- Engine Oil Draining and Refilling (Refer to GROUP 12, On-vehicle Service P.12-3.)
- Starter Motor Removal and Installation (Refer to GROUP 16, Starter motor assembly P.16-22.)



REMOVAL STEPS

1. DRIVE SHAFT (RH) CONNECTION
2. DRIVE SHAFT (LH) CONNECTION
3. FRONT DIFFERENTIAL NUMBER 2 CROSSMEMBER ASSEMBLY
4. DRAIN PLUG
5. DRAIN PLUG GASKET
6. COVER

REMOVAL STEPS (Continued)

7. TRANSMISSION FLUID DIPSTICK ASSEMBLY
8. O-RING
9. ENGINE OIL DIPSTICK ASSEMBLY
10. O-RING
11. OIL PAN
12. OIL SCREEN
13. GASKET

AC204078AC

REMOVAL SERVICE POINT

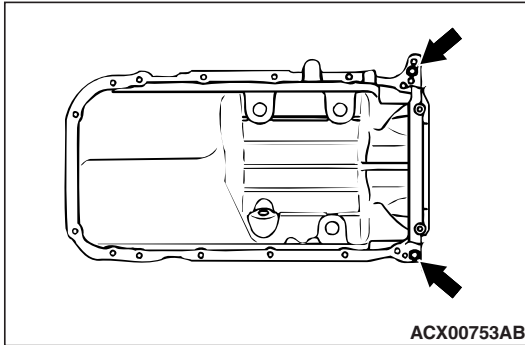
<<A>> OIL PAN REMOVAL

1. Remove the oil pan mounting bolts.

CAUTION

Do not use the oil pan FIPG cutter (MD998727). It will damage the oil pan (aluminum made).

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



INSTALLATION SERVICE POINT

>>A<< OIL PAN INSTALLATION

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

Specified sealant: 3M™ AAD Part No.8672, 8704, 3M™ AAD Part No.8679/8678 or equivalent

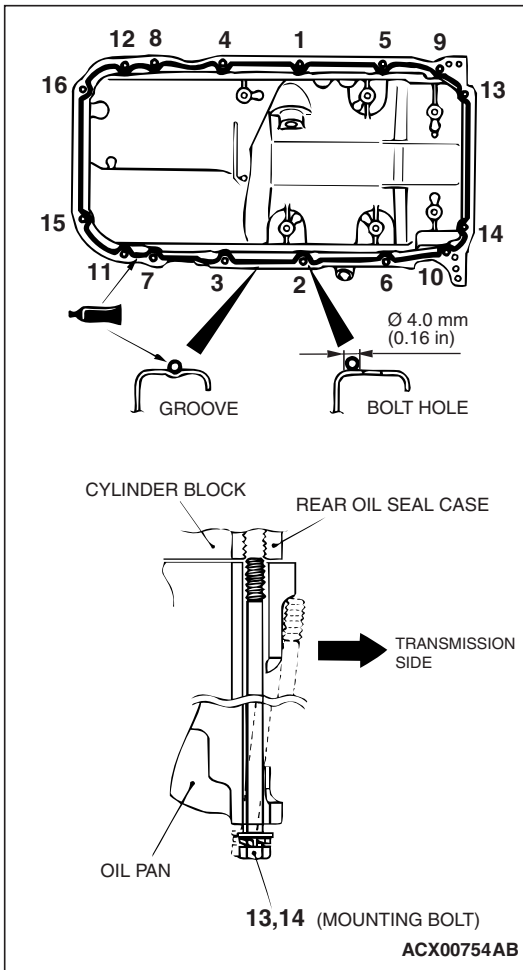
NOTE: The sealant should be applied in a continuous bead approximately 4.0 mm (0.16 inch) in diameter.

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

CAUTION

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

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



INSPECTION

M1112002600101

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

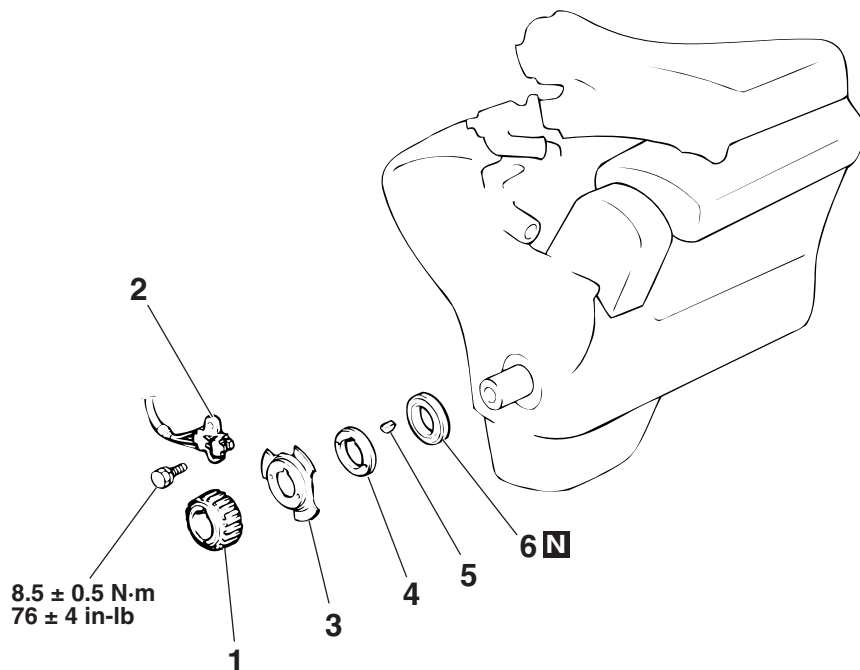
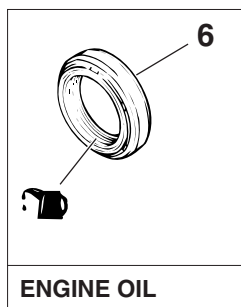
CRANKSHAFT OIL SEAL

REMOVAL AND INSTALLATION <FRONT OIL SEAL>

M1112003400575

Pre-removal and Post-installation Operation

- Timing Belt Removal and Installation (Refer to P.11A-35.)



ACX00362AC

REMOVAL STEPS

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

REMOVAL STEPS (Continued)

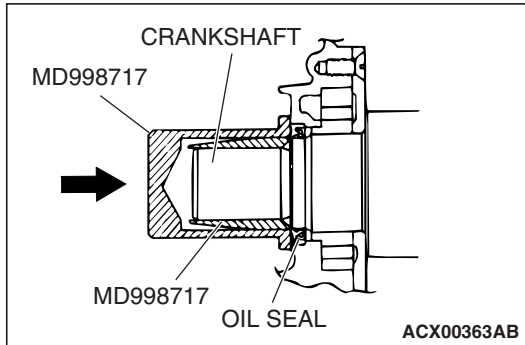
- >>B<< 4. CRANKSHAFT SPACER
5. KEY
>>A<< 6. CRANKSHAFT FRONT OIL SEAL

Required Special Tool:

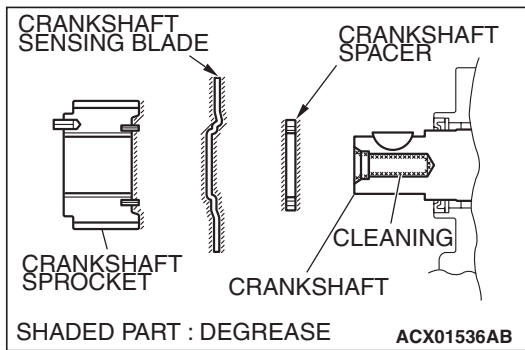
MD998717: Crankshaft Front Oil Seal Installer

INSTALLATION SERVICE POINTS**>>A<< CRANKSHAFT FRONT OIL SEAL INSTALLATION**

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

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

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

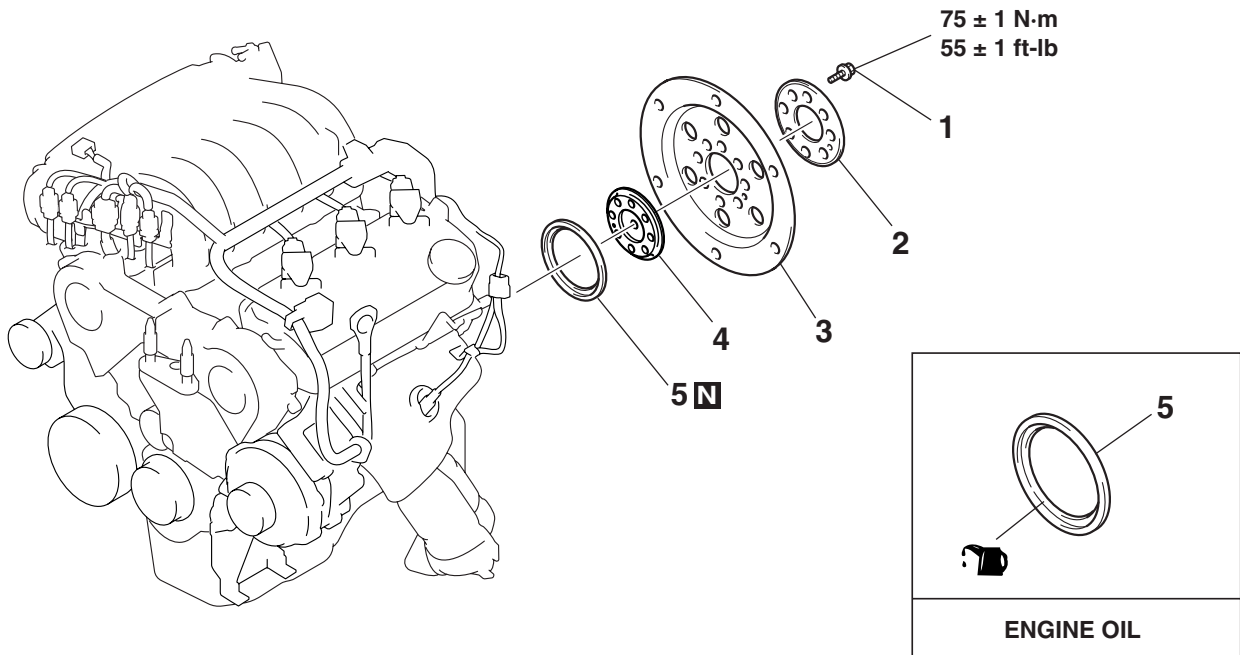


REMOVAL AND INSTALLATION <REAR OIL SEAL>

M1112003700640

Pre-removal and Post-installation Operation

- Transaxle Assembly Removal and Installation (Refer to GROUP 23A, Transaxle P.23A-566.)



AC500078AB

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

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

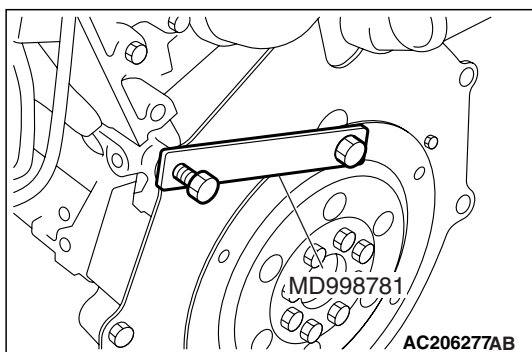
Required Special Tools:

- MD998718: Crankshaft Rear Oil Seal Installer
- MD998781: Flywheel Stopper

REMOVAL SERVICE POINT

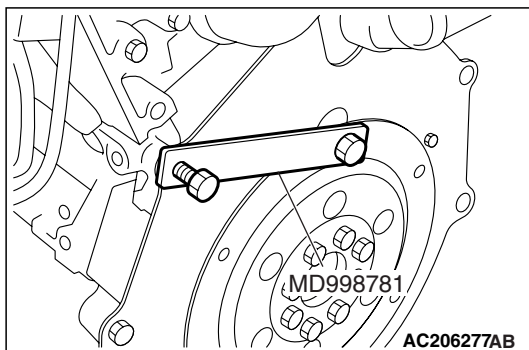
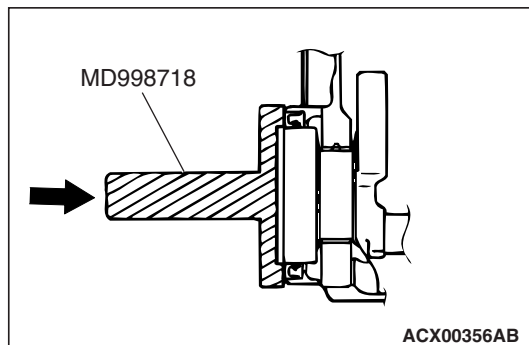
<<A>> DRIVE PLATE BOLTS REMOVAL

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



INSTALLATION SERVICE POINTS**>>A<< CRANKSHAFT REAR OIL SEAL INSTALLATION**

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

**>>B<< DRIVE PLATE BOLTS INSTALLATION**

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

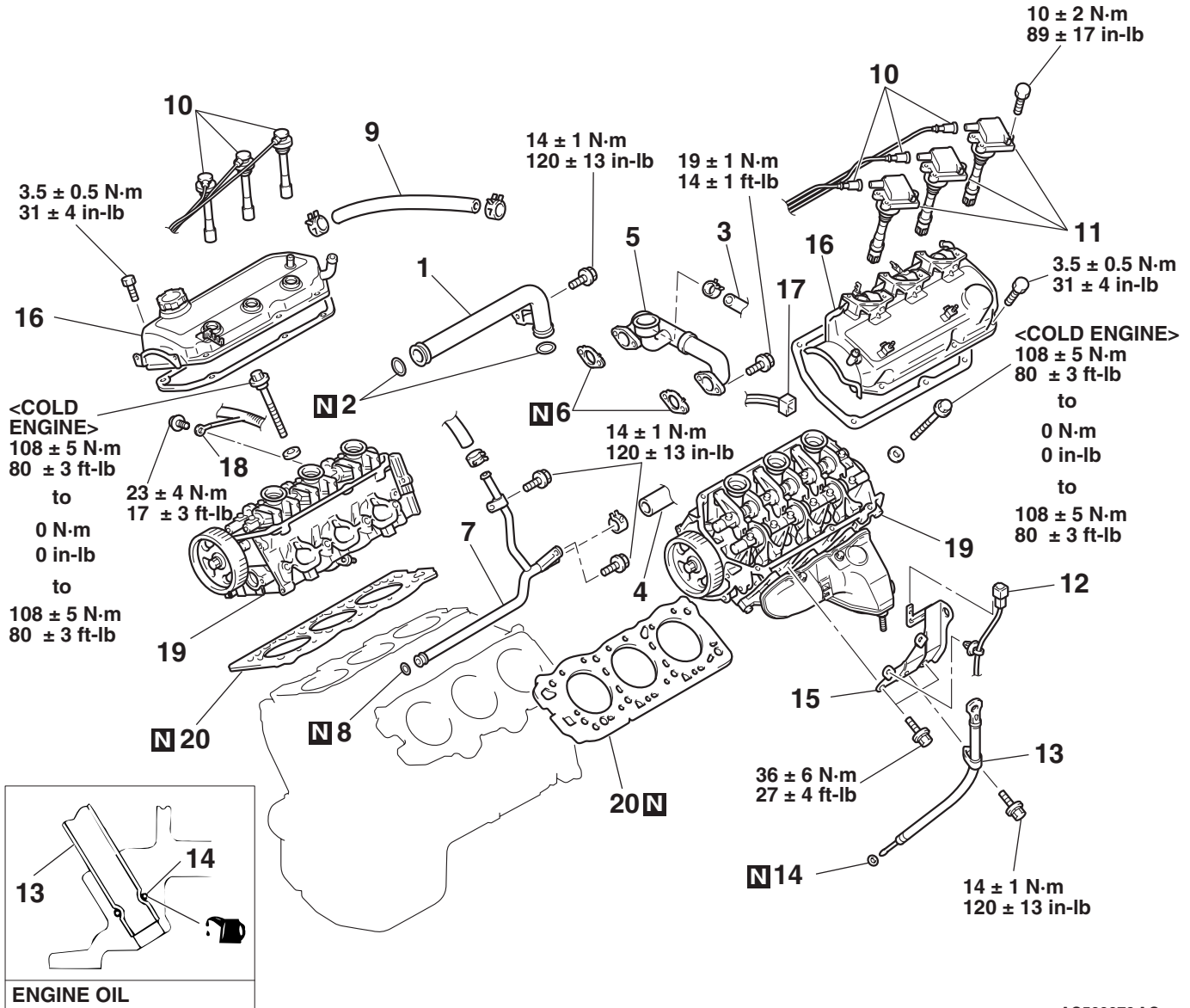
CYLINDER HEAD GASKET

REMOVAL AND INSTALLATION

M1112004001539

Pre-removal and Post-installation Operation

- Intake Manifold Removal and installation (Refer to GROUP 15, Intake Manifold P.15-7.)
- Timing Belt Removal and installation (Refer to P.11A-35.)
- Front Exhaust Pipe Removal and Installation (Refer to GROUP 15, Exhaust and Main Muffler P.15-13.)



AC500079 AC

REMOVAL STEPS

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

REMOVAL STEPS (Continued)

10. SPARK PLUG CABLE
11. IGNITION COIL
12. LEFT BANK HEATED OXYGEN SENSOR (FRONT) CONNECTOR
13. ENGINE OIL DIPSTICK ASSEMBLY
14. O-RING
15. INTAKE MANIFOLD PLENUM STAY

TSB Revision

REMOVAL STEPS (Continued)

- 16. ROCKER COVER
- 17. CAMSHAFT POSITION
SENSOR CONNECTOR
- 18. GROUNDING CABLE
CONNECTION
- <<A>> >>B<< 19. CYLINDER HEAD ASSEMBLY
- >>A<< 20. CYLINDER HEAD GASKET

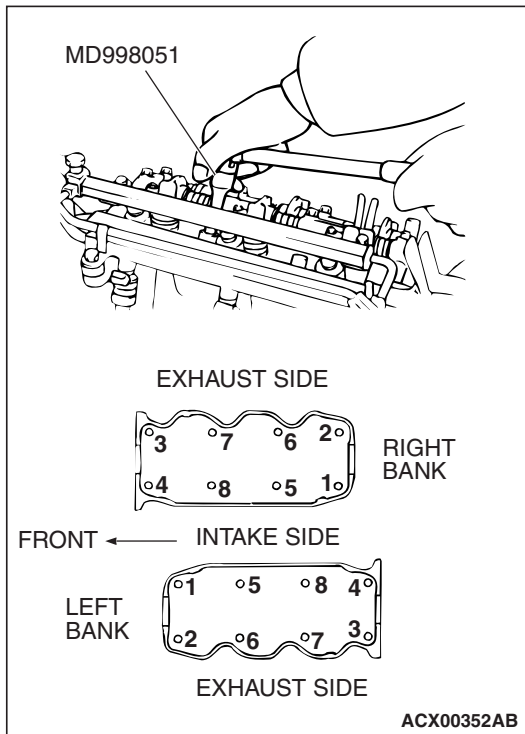
Required Special Tool:

MD998051: Cylinder Head Bolt Wrench

REMOVAL SERVICE POINT

<<A>> CYLINDER HEAD ASSEMBLY REMOVAL

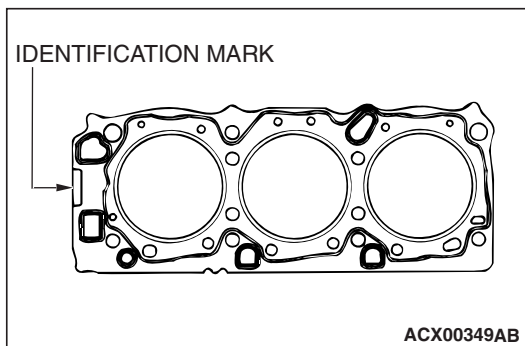
Use special tool MD998051 to loosen each bolt two or three steps in the order shown in the illustration.



INSTALLATION SERVICE POINTS

>>A<< CYLINDER HEAD GASKET INSTALLATION

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



>>B<< CYLINDER HEAD ASSEMBLY INSTALLATION

⚠ CAUTION

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

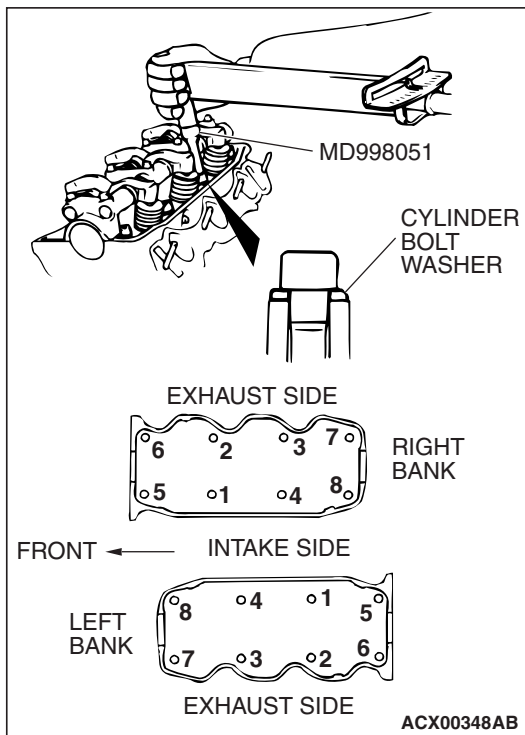
1. Use a scraper to clean the gasket surface of the cylinder head assembly.

⚠ CAUTION

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

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

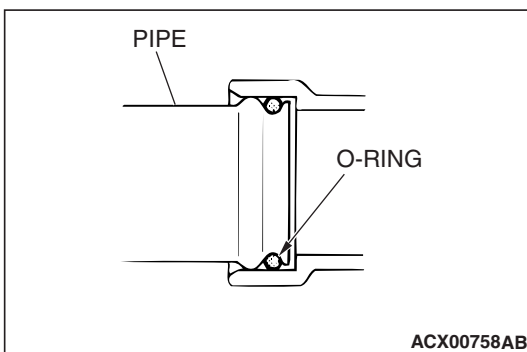
Tightening torque: 108 ± 5 N·m (80 ± 3 ft-lb) to 0 N·m (0 in-lb) to 108 ± 5 N·m (80 ± 3 ft-lb)



>>C<< O-RING INSTALLATION

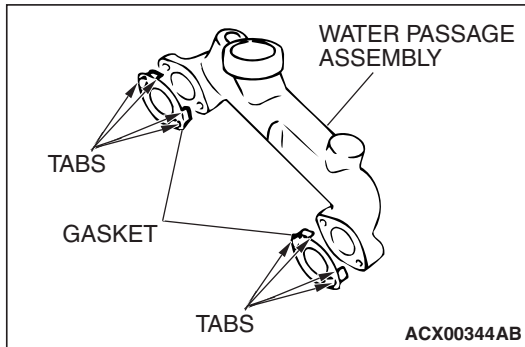
⚠ CAUTION

Never apply lubricant such as engine oil to the O-ring. Install the O-ring into the groove of the pipe, and then apply water around the O-ring.



**>>D<< GASKET/WATER PASSAGE ASSEMBLY
INSTALLATION**

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



TIMING BELT

REMOVAL AND INSTALLATION

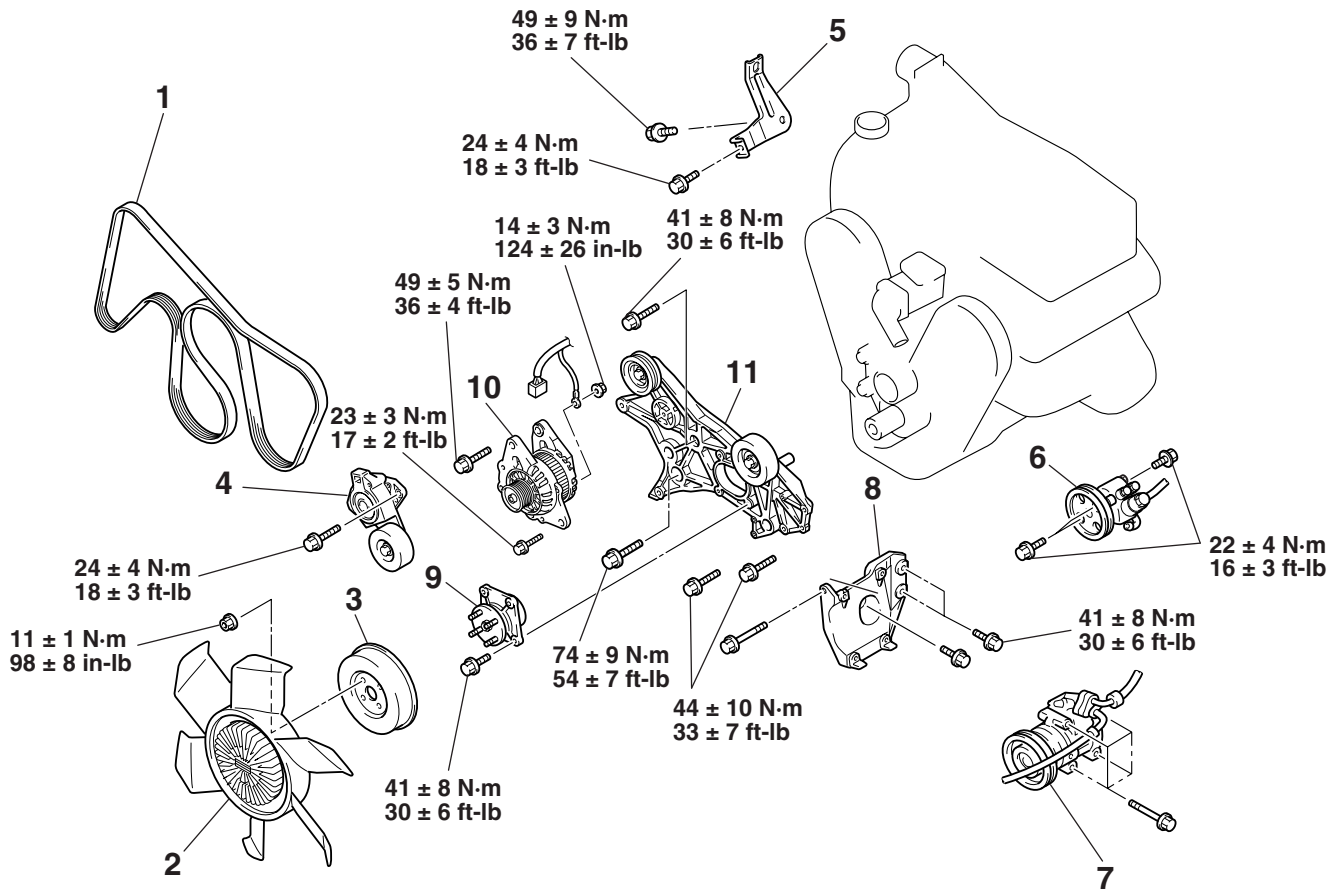
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Pre-removal Operation

- Skid Plate and Under Cover Removal
- Engine Coolant Draining (Refer to GROUP 14, On-vehicle Service P.14-6.)
- Battery and Battery Tray Removal
- Air Cleaner Removal (Refer to GROUP 15, Air Cleaner P.15-6.)
- Radiator Shroud Cover Removal (Refer to GROUP 14, Radiator P.14-8.)

Post-installation Operation

- Radiator Shroud Cover Installation (Refer to GROUP 14, Radiator P.14-8.)
- Air Cleaner Installation (Refer to GROUP 15, Air Cleaner P.15-6.)
- Battery and Battery Tray Installation
- Engine Coolant Refilling (Refer to GROUP 14, On-vehicle Service P.14-6.)
- Skid Plate and Under Cover Installation



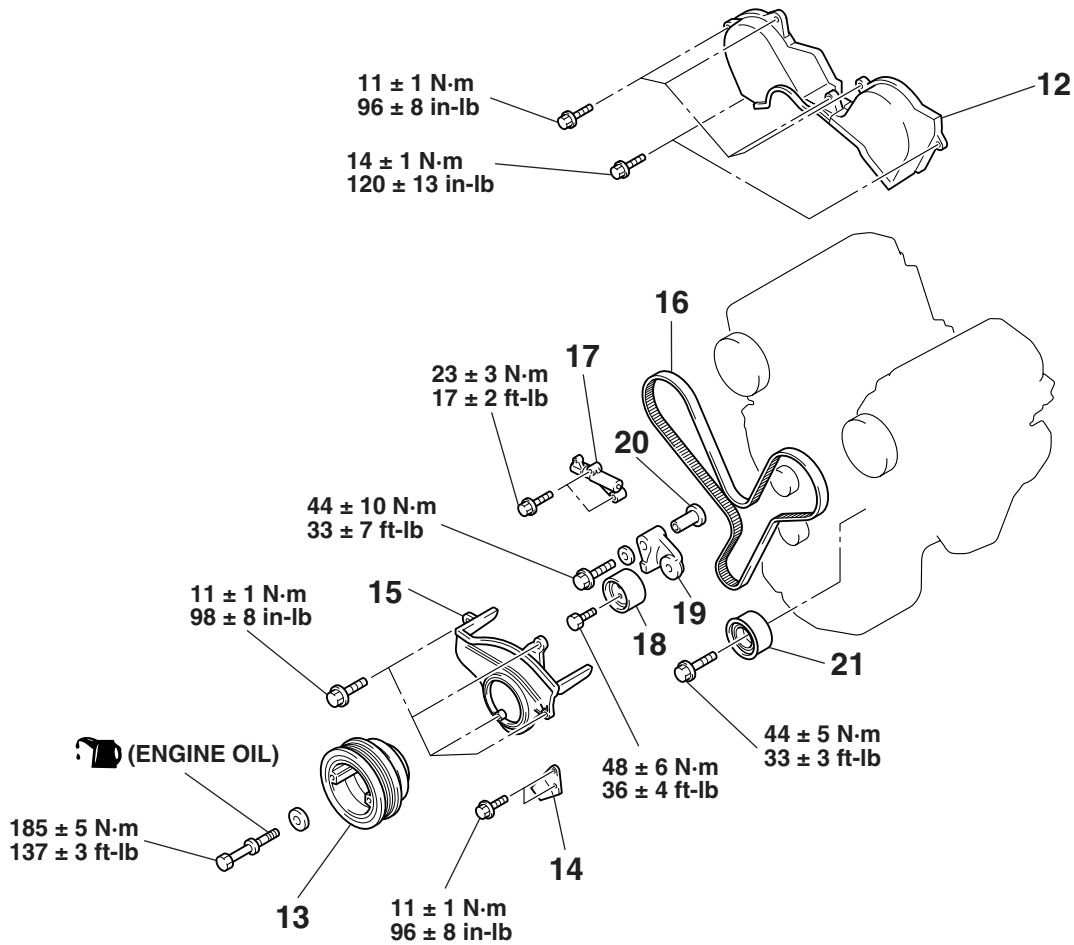
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REMOVAL STEPS

1. DRIVE BELT
2. COOLING FAN
3. COOLING FAN PULLEY
- <<A>> >>E<< 4. DRIVE BELT AUTO TENSIONER
- <> 5. ACCESSORY MOUNT STAY
- <> 6. POWER STEERING OIL PUMP ASSEMBLY
- <> 7. A/C COMPRESSOR ASSEMBLY

REMOVAL STEPS (Continued)

8. COMPRESSOR BRACKET
9. COOLING FAN BRACKET ASSEMBLY
- >>D<< 10. GENERATOR
11. ACCESSORY MOUNT ASSEMBLY



AC204108AC

REMOVAL STEPS

- <<C>> >>C<< 12. TIMING BELT UPPER COVER ASSEMBLY
- <<C>> >>C<< 13. CRANKSHAFT PULLEY
- <<C>> >>C<< 14. TIMING BELT INDICATOR BRACKET
- <<C>> >>C<< 15. TIMING BELT LOWER COVER ASSEMBLY

REMOVAL STEPS (Continued)

- <<D>> >>B<< 16. TIMING BELT
- >>A<< 17. AUTO-TENSIONER
- >>A<< 18. TENSION PULLEY
- >>A<< 19. TENSIONER ARM ASSEMBLY
- >>A<< 20. SHAFT
- >>A<< 21. IDLER PULLEY

Required Special Tools:

- MB991800: Pulley Holder
- MB991802: Pin B

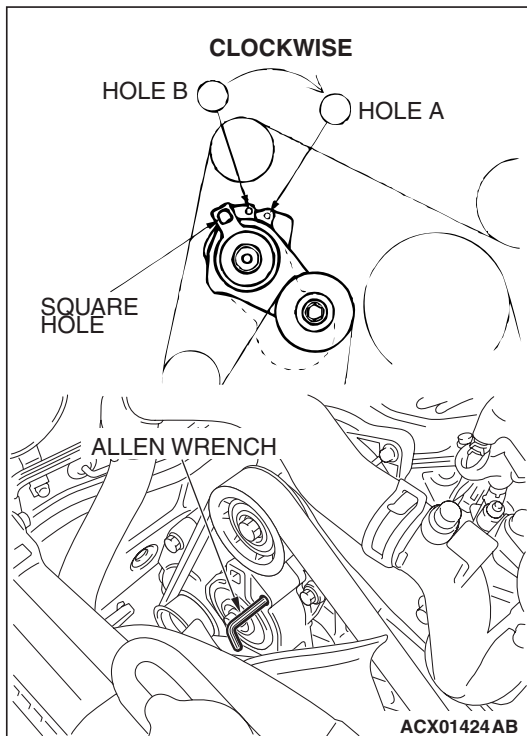
- MD998767: Tension Pulley Socket Wrench
- MD998769: Crankshaft Pulley Spacer

REMOVAL SERVICE POINTS

<<A>> DRIVE BELT AUTO TENSIONER REMOVAL

The following operations will be needed due to the introduction of the serpentine drive system with the drive belt auto tensioner.

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

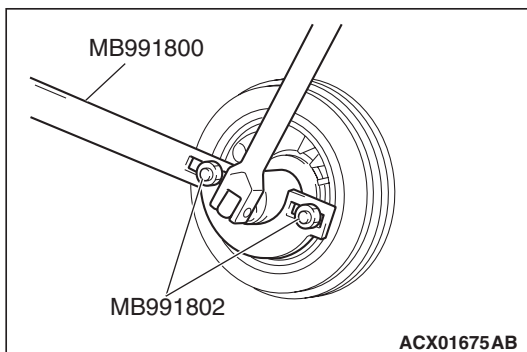


<> POWER STEERING OIL PUMP ASSEMBLY / A/C COMPRESSOR ASSEMBLY REMOVAL

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

<<C>> CRANKSHAFT PULLEY REMOVAL

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

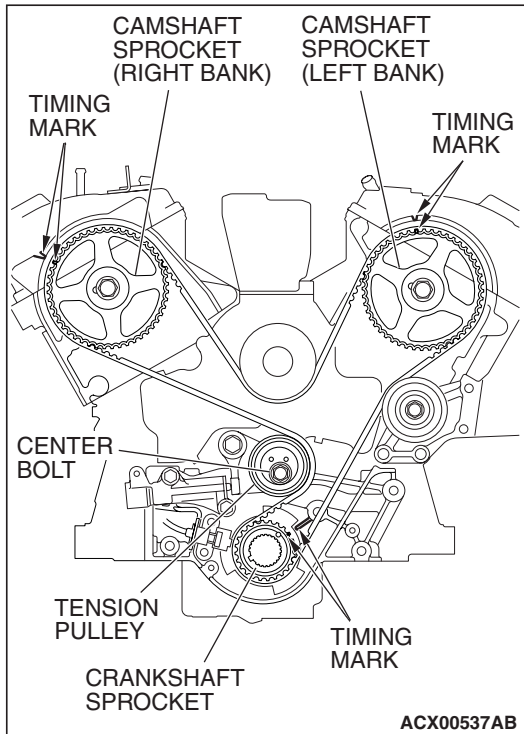


<<D>> TIMING BELT REMOVAL

⚠ CAUTION

Never turn the crankshaft counterclockwise.

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



INSTALLATION SERVICE POINTS

>>A<< AUTO-TENSIONER INSTALLATION

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

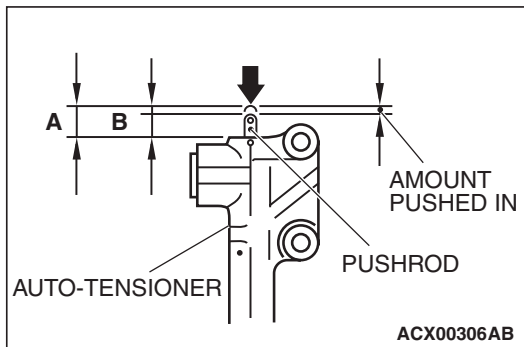
Standard value: Within 1 mm (0.04 inch)

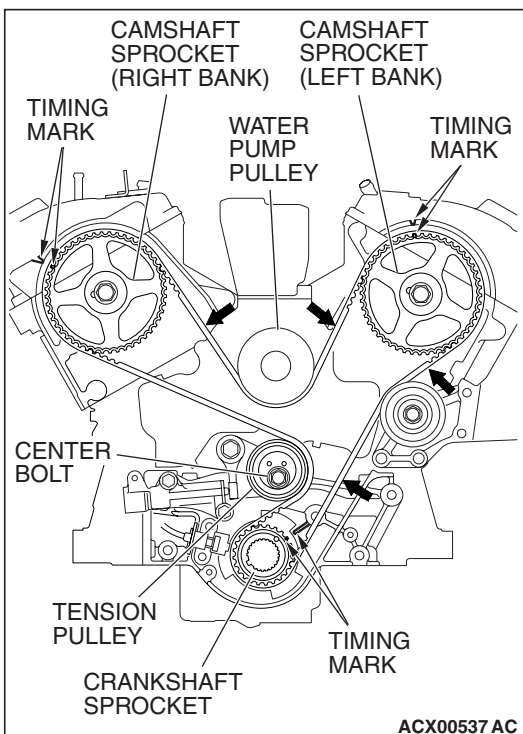
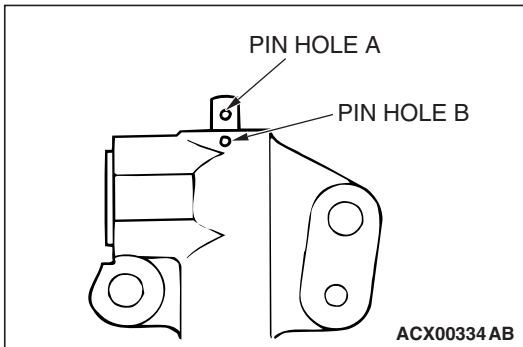
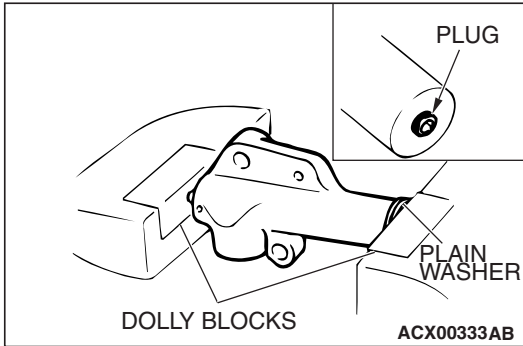
A: Length when no force is applied

B: Length when force is applied

A – B: Amount pushed in

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





⚠ CAUTION

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

3. Place two dolly blocks in a vice as shown in the illustration, and then place the auto-tensioner in the vice.

⚠ CAUTION

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

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

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

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

⚠ CAUTION

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

6. Install the auto-tensioner to the engine.

>>B<< TIMING BELT INSTALLATION

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

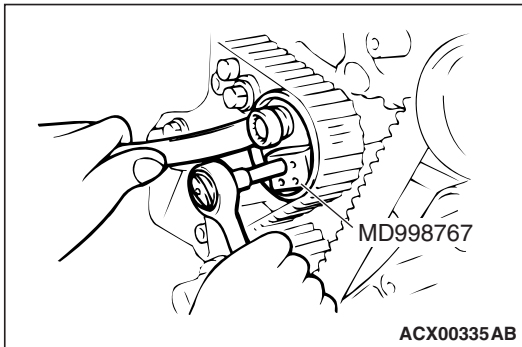
⚠ CAUTION

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

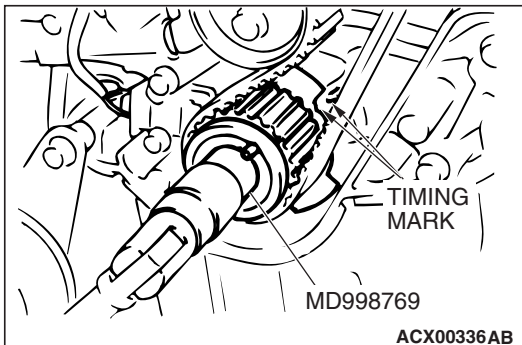
2. Install the timing belt by the following procedure so that there is no deflection in the timing belt between each sprocket and pulley.

- (1) Crankshaft sprocket
- (2) Idler pulley
- (3) Camshaft sprocket (Left bank)
- (4) Water pump pulley
- (5) Camshaft sprocket (Right bank)
- (6) Tension pulley

3. Turn the camshaft sprocket counterclockwise until the tension side of the timing belt is firmly stretched. Check all timing marks again.



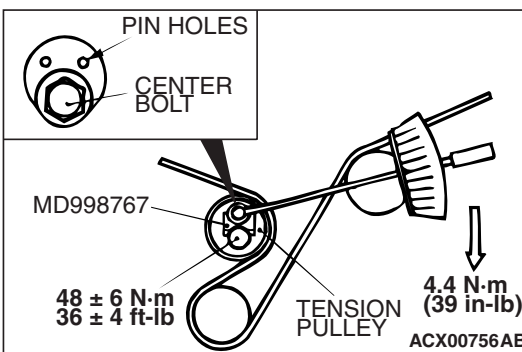
4. Use special tool MD998767 to push the tensioner pulley into the timing belt, and then temporarily tighten the center bolt.



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

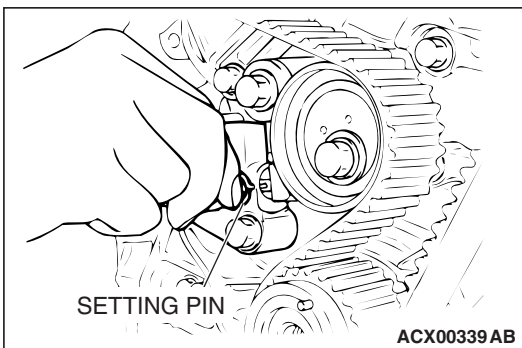
CAUTION

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

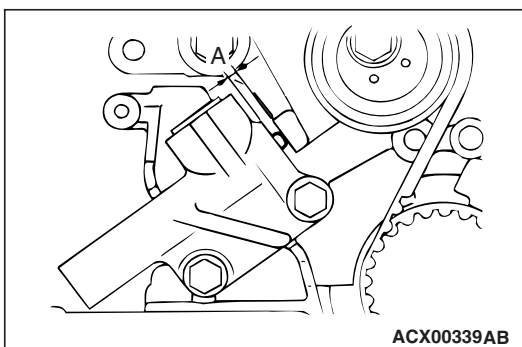


6. Loosen the center bolt of the tensioner pulley. Use special tool MD998767 and a torque wrench to apply the standard torque to the timing belt as shown in the illustration. Then tighten the center bolt to the specified torque.

- **Standard value: 4.4 N·m (39 in·lb) <Timing belt tension torque>**
- **Tightening torque: 48 ± 6 N·m (36 ± 4 ft·lb)**



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



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

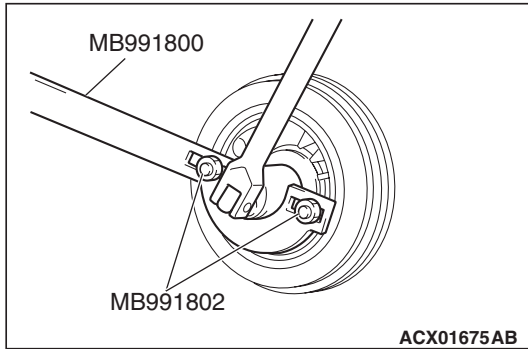
Standard value (A): 4.8 – 5.5 mm (0.19 – 0.22 inch)

10. If no, repeat the operation in steps (5) to (9) above.

11. Check again that the timing marks of each sprocket are aligned.

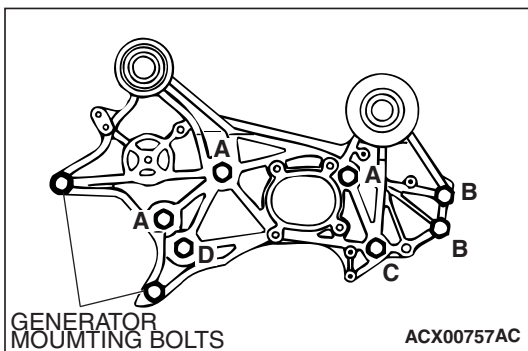
>>C<< CRANKSHAFT PULLEY INSTALLATION

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



>>D<< ACCESSORY MOUNT ASSEMBLY INSTALLATION

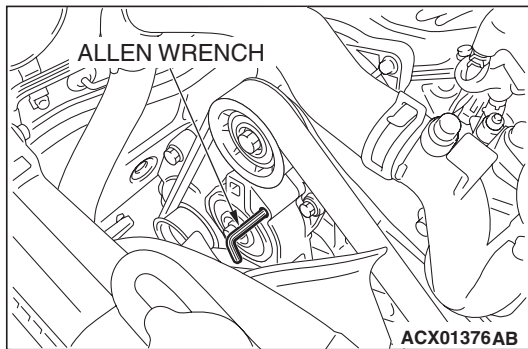
Install the bolts to the shown positions, and tighten them to the specified torque.



Bolt (symbol)	Diameter × length mm (in)	Tightening torque N·m (ft·lb)
A	10 × 100 (0.4 × 3.9)	41 ± 8 (30 ± 6)
B	10 × 30 (0.4 × 1.2)	41 ± 8 (30 ± 6)
C	10 × 100 (0.4 × 3.9)	44 ± 10 (33 ± 7)
D	12 × 100 (0.5 × 3.9)	74 ± 9 (54 ± 7)

>>E<< DRIVE BELT AUTO TENSIONER INSTALLATION

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

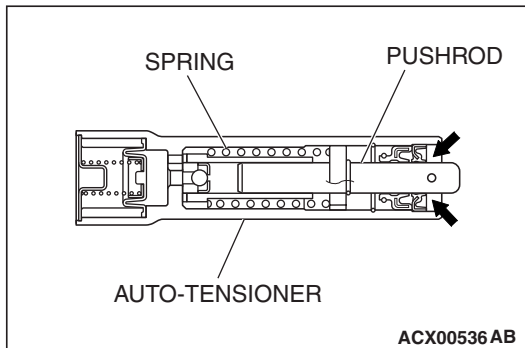


INSPECTION

M1112004400255

AUTO-TENSIONER

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



SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1111003800547

ITEM	SPECIFICATION
Accessory mount assembly mounting bolt (10 × 100, 10 × 30)	41 ± 8 N·m (30 ± 6 ft-lb)
Accessory mount assembly mounting bolt (10 × 100)	44 ± 10 N·m (33 ± 7 ft-lb)
Accessory mount assembly mounting bolt (12 × 100)	74 ± 9 N·m (54 ± 7 ft-lb)
Accessory mount stay mounting bolt	49 ± 9 N·m (36 ± 7 ft-lb)
Accessory mount stay mounting bolt	24 ± 4 N·m (18 ± 3 ft-lb)
Auto tensioner mounting bolt	23 ± 3 N·m (17 ± 2 ft-lb)
Compressor bracket mounting bolt	41 ± 8 N·m (30 ± 6 ft-lb)
Cooling fan attaching nut	11 ± 1 N·m (98 ± 8 in-lb)
Cooling fan bracket assembly	41 ± 8 N·m (30 ± 6 ft-lb)
Camshaft position sensor support attaching bolt	14 ± 1 N·m (120 ± 13 in-lb)
Camshaft sprocket attaching bolt	88 ± 10 N·m (65 ± 7 ft-lb)
Crankshaft position sensor attaching bolt	8.5 ± 0.5 N·m (76 ± 4 in-lb)
Crankshaft pulley attaching bolt	185 ± 5 N·m (137 ± 3 ft-lb)
Cylinder head bolt <cold engine>	108 ± 5 N·m (80 ± 3 ft-lb) to 0 N·m (0 in-lb) to 108 ± 5 N·m (80 ± 3 ft-lb)
Drive belt auto tensioner attaching bolt	24 ± 4 N·m (18 ± 3 ft-lb)
Drive plate attaching bolt	75 ± 1 N·m (55 ± 1 ft-lb)
Drain plug	39 ± 5 N·m (29 ± 3 ft-lb)
Drive shaft (RH) attaching nut	60 ± 10 Nm (45 ± 7 ft-lb)
Engine oil dipstick assembly attaching bolt	14 ± 1 N·m (120 ± 13 in-lb)
Engine front mount insulator attaching bolt	44 ± 9 N·m (33 ± 6 ft-lb)
Engine mount insulator attaching nut	26 ± 4 N·m (19 ± 3 ft-lb)
Front differential number 2 crossmember assembly attaching bolt	69 ± 9 N·m (51 ± 7 ft-lb)
Front propeller shaft connection nut	60 ± 10 N·m (45 ± 7 ft-lb)
Fuel high-pressure hose bolt	5.0 ± 1.0 N·m (44 ± 9 in-lb)

ITEM	SPECIFICATION
Generator harness terminal bolt	14 ± 3 N·m (124 ± 26 in-lb)
Generator mounting bolt (8 × 30)	23 ± 3 N·m (17 ± 2 ft-lb)
Generator mounting bolt (10 × 100)	49 ± 5 N·m (36 ± 4 ft-lb)
Grounding cable mounting bolt	9.0 ± 2.0 N·m (80 ± 17 in-lb)
Grounding cable mounting bolt	23 ± 4 N·m (17 ± 3 ft-lb)
Idler pulley attaching bolt	44 ± 5 N·m (33 ± 3 ft-lb)
Ignition coil bolt	10 ± 2 N·m (89 ± 17 in-lb)
Intake manifold plenum stay bolt	36 ± 6 N·m (27 ± 4 ft-lb)
Oil cooler eye bolt	48 ± 7 N·m (36 ± 5 ft-lb)
Oil cooler hose bracket bolt	12 ± 2 N·m (102 ± 22 in-lb)
Oil pan attaching bolt	8.5 ± 3.5 N·m (75 ± 31 in-lb)
Oil pan attaching bolt	36 ± 5 N·m (26 ± 4 ft-lb)
Oil pan attaching bolt	11 ± 0.5 N·m (93 ± 4 ft-lb)
Oil screen attaching bolt	19 ± 3 N·m (14 ± 2 ft-lb)
Oil screen attaching bolt	9.0 ± 1.0 N·m (80 ± 9 in-lb)
Power steering oil pump assembly mounting bolt	22 ± 4 N·m (16 ± 3 ft-lb)
Rocker arm and shaft assembly mounting bolt	31 ± 3 N·m (23 ± 2 ft-lb)
Rocker cover attaching bolt	3.5 ± 0.5 N·m (31 ± 4 in-lb)
Sensing camshaft position cylinder	22 ± 4 N·m (16 ± 3 ft-lb)
Timing belt lower cover assembly attaching bolt	11 ± 1 N·m (98 ± 8 in-lb)
Timing belt upper cover assembly attaching bolt	11 ± 1 N·m (96 ± 8 in-lb)
Timing belt upper cover assembly attaching bolt	14 ± 1 N·m (120 ± 13 in-lb)
Timing belt indicator bracket attaching bolt	11 ± 1 N·m (96 ± 8 in-lb)
Tension arm assembly attaching bolt	44 ± 10 N·m (33 ± 7 ft-lb)
Tension pulley attaching bolt	48 ± 6 N·m (36 ± 4 ft-lb)
Transmission fluid dipstick assembly attaching bolt	44 ± 8 N·m (33 ± 5 ft-lb)
Transmission fluid dipstick assembly attaching bolt	24 ± 4 N·m (18 ± 3 ft-lb)
Water outlet pipe attaching bolt	14 ± 1 N·m (120 ± 13 in-lb)
Water passage assembly attaching bolt	19 ± 1 N·m (14 ± 1 ft-lb)
Water pipe assembly attaching bolt	14 ± 1 N·m (120 ± 13 in-lb)

SERVICE SPECIFICATIONS

M1111000300855

ITEM	STANDARD VALUE	LIMIT
Basic ignition timing at idle	5°BTDC ± 3°	–
Actual ignition timing at curb idle	Approximately 10° BTDC	–
CO contents %	0.5 or less	–
HC contents ppm	100 or less	–
Curb idle speed r/min	700 ± 100	–
Compression pressure (250 - 400 r/min) kPa (psi)	1548 (225)	Minimum 1117 (162)
Compression pressure difference of all cylinder kPa (psi)	–	98 (14)
Intake manifold vacuum at curb idle kPa (in Hg)	–	Minimum 60 (18)
Auto-tensioner pushrod movement mm (in)	Within 1.0 (0.04)	–
Timing belt tension torque N·m (in-lb)	4.4 (39)	–
Auto tensioner rod protrusion amount mm (in)	4.8 – 5.5 (0.19 – 0.22)	–

LUBRICANT

M1112000400059

ITEM	SPECIFICATION
Transmission fluid	DIAMOND ATF SP III

SEALANTS

M1111000500053

ITEM	SPECIFIED SEALANT
Camshaft position sensor support	3M™ AAD Part No.8672, 3M™ AAD Part No.8679/8678 or equivalent
Oil pan	3M™ AAD Part No.8672, 8704, 3M™ AAD Part No.8679/8678 or equivalent