

GROUP 11C

ENGINE MECHANICAL <2.4L ENGINE>

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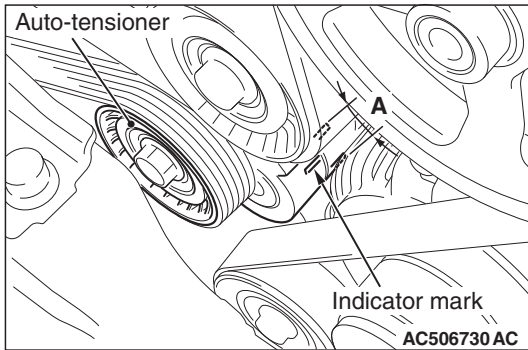
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SYMPTOMS	PROBABLE CAUSE	REMEDY
Connecting rod noise/main bearing noise	Insufficient oil supply	Check the engine oil level.
	Thin or diluted engine oil	Change the engine oil.
	Excessive bearing clearance	Replace the bearings.

SERVICE SPECIFICATIONS

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Item		Standard value	Limit
Drive belt tension	Vibration frequency Hz (Reference)	102 –129	–
	Tension N (lb) (Reference)	248 –400 (56 – 90)	–
Valve clearance (at cold) mm (in)	Intake valve	0.20 ±0.03 (0.008 ±0.001)	–
	Exhaust valve	0.30 ±0.03 (0.012 ±0.001)	–
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		650 ± 100	–
Compression pressure (200 r/min) kPa (psi)		1,440 (208.8)	Minimum 1,000 (145.0)
Compression pressure difference of all cylinder kPa (psi)		–	100 (14.5)
Intake manifold vacuum at curb idle kPa (in Hg)		–	Minimum 60 (17.8)



⚠ CAUTION

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

3. Make sure that the indicator mark on the auto-tensioner is within the area marked with A in the illustration.
4. If the mark is out of the area A, replace the drive belt (Refer to P.11C-19.)

NOTE: The drive belt tension check is not necessary as the auto-tensioner is adopted.

5. Tighten the radiator condenser tank mounting bolts to the specified torque.

Tightening torque: 12 ± 2 N·m (102 ± 22 in-lb)

AUTO-TENSIONER CHECK

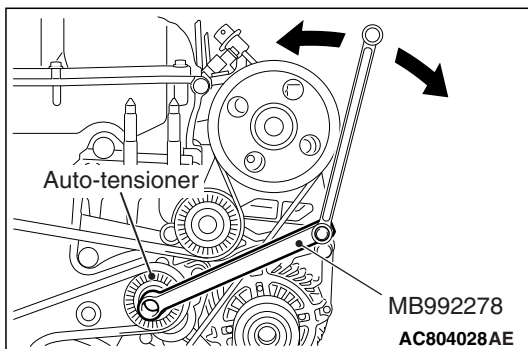
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OPERATION CHECK

Required Special Tool:

MB992278: Belt tension release wrench

1. Turn off the engine from the idle state 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 P.11C-19.)
3. Using the special tool MB992278 and a straight offset wrench as shown, check that no binding is present by turning the auto-tensioner in the left and right directions.
4. If there are any problems in the procedure 1 or 3, replace the auto-tensioner (Refer to P.11C-64.)
5. Install the drive belt (Refer to P.11C-19.)



FUNCTION CHECK

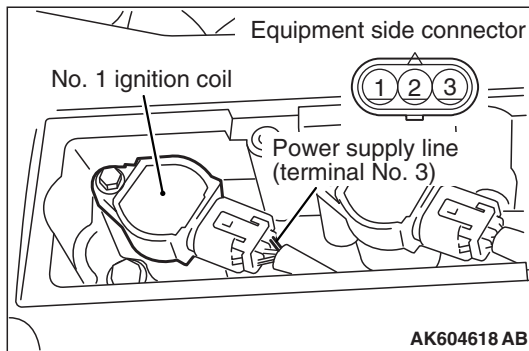
The auto-tensioner can be checked whether it is in good condition by checking its tension.

<When the vibration frequency is measured: Recommendation>

Required Special Tools:

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

1. Check the tension of the drive belt (Refer to P.11C-8.)
2. Check the tension of the drive belt in the following procedures.



3. Set the timing light to the terminal No. 3 power supply line (white-red) of the ignition coil No. 1.
4. Start the engine.
5. Run the engine at idle for 2 minutes.
6. Check 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.

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

Curb idle speed: 650 \pm 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 GROUP 13B, Multiport Fuel Injection (MFI) Diagnosis – Symptom Chart P.13B-56).

9. 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.

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

IDLE MIXTURE CHECK

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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: Neutral (P range on vehicles with CVT)

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.

CRANKSHAFT PULLEY

REMOVAL AND INSTALLATION

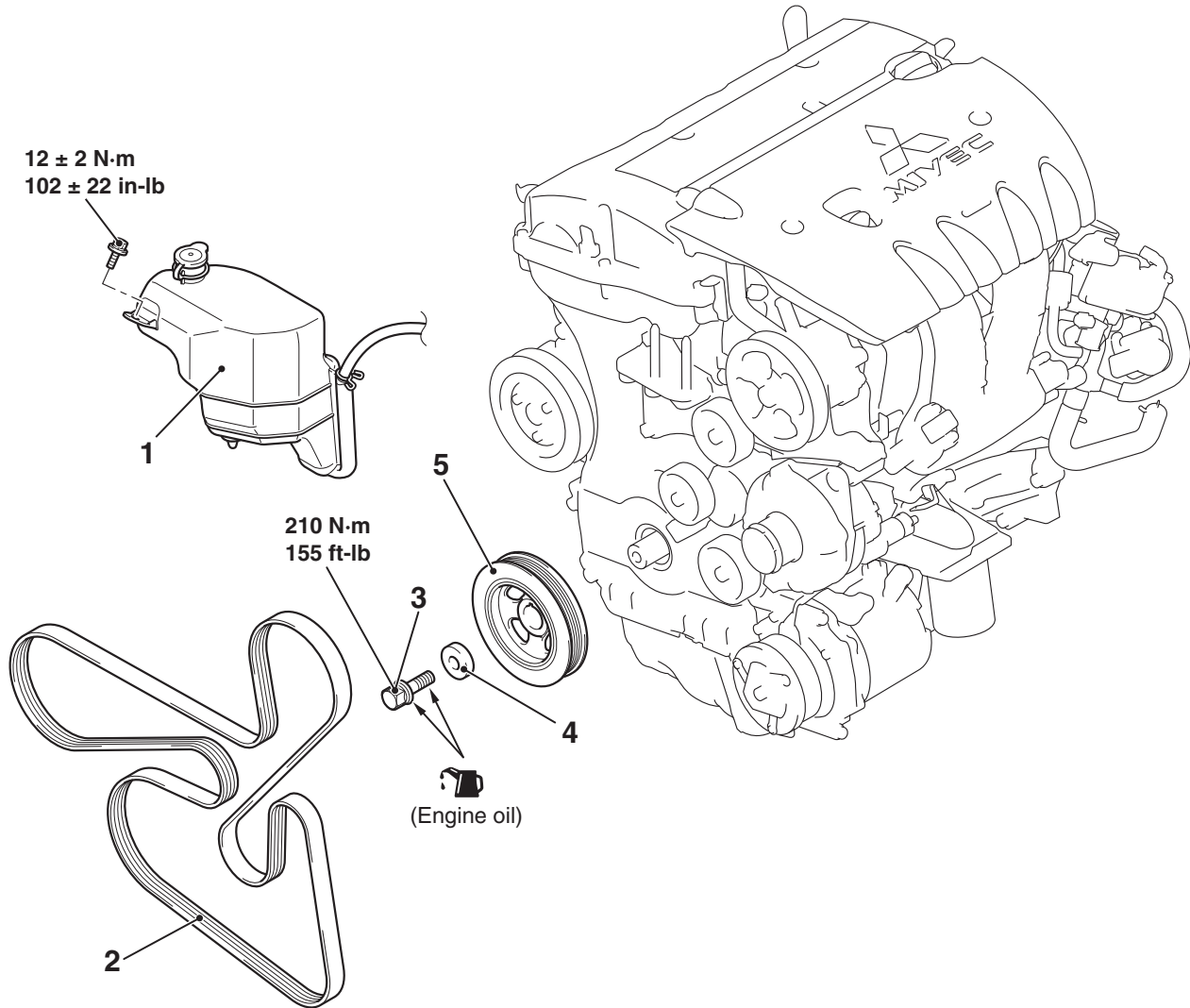
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Pre-removal Operation

- Engine Room Under Cover Front B and Engine Room Side Cover (RH) Removal (Refer to GROUP 51, Under Cover P.51-20.)

Post-installation Operation

- Drive Belt Tension Check (Refer to P.11C-8.)
- Engine Room Under Cover Front B and Engine Room Side Cover (RH) Installation (Refer to GROUP 51, Under Cover P.51-20.)



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Removal steps

- <<A>> 1. Radiator condenser tank assembly
<> >>B<< 2. Drive belt
<<C>> >>A<< 3. Crankshaft pulley center bolt

Removal steps (Continued)

- <<C>> >>A<< 4. Crankshaft pulley washer
<<C>> >>A<< 5. Crankshaft pulley

Required Special Tools:

- MB992278: Belt Tension Release Wrench
- MB990767: Front Hub and Flange Yoke Holder
- MD998719: Pin

CAMSHAFT

REMOVAL AND INSTALLATION

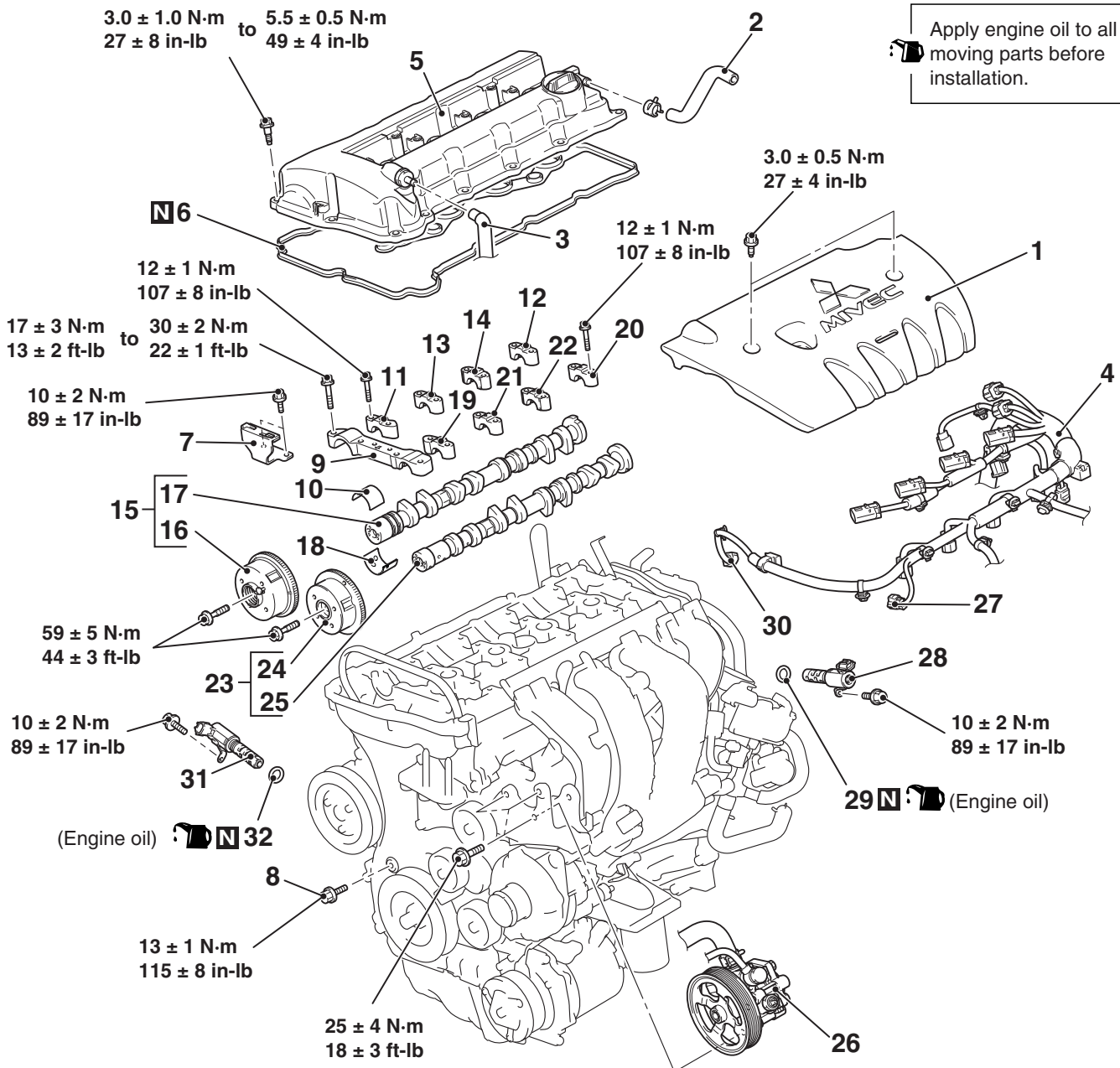
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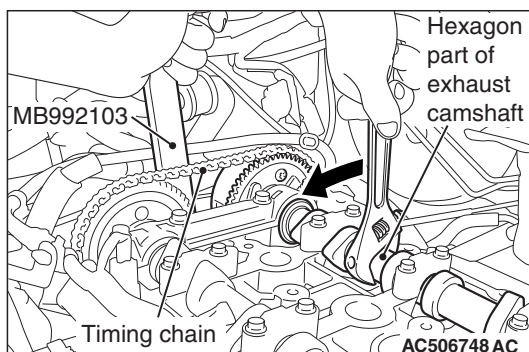
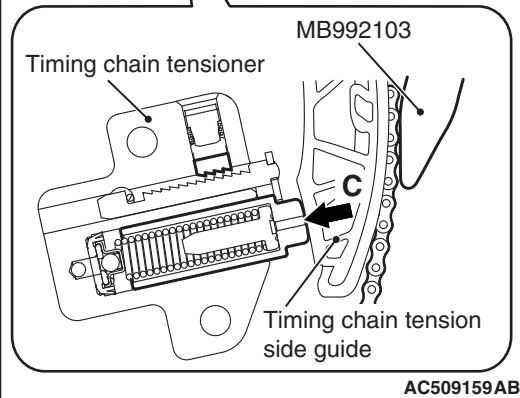
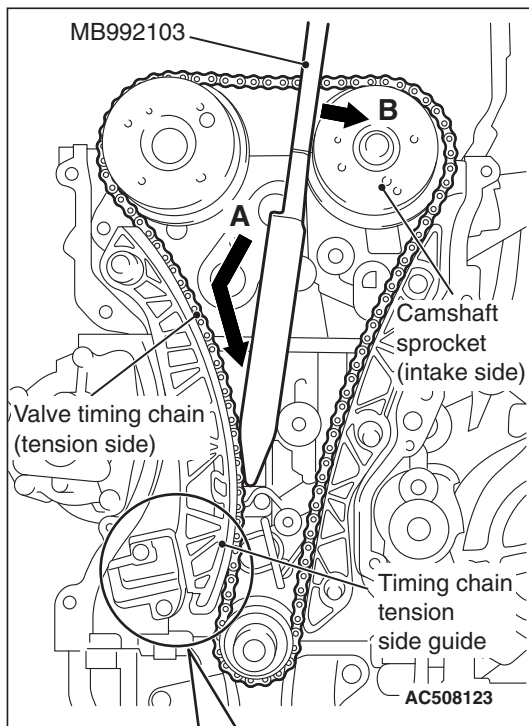
Pre-removal Operation

- Engine Room Under Cover Front A, B and Engine Room Side Cover (RH) Removal (Refer to GROUP 51, Under Cover P.51-20.)
- Air Cleaner Assembly Removal (Refer to GROUP 15, Air Cleaner P.15-10.)
- Strut Tower Bar Removal (Refer to GROUP 42A, Strut Tower Bar P.42A-15.)
- Ignition Coil Removal (Refer to GROUP 16, Ignition System –Ignition Coil P.16-51.)

Post-installation Operation

- Ignition Coil Installation (Refer to GROUP 16, Ignition System –Ignition Coil P.16-51.)
- Strut Tower Bar Installation (Refer to GROUP 42A, Strut Tower Bar P.42A-15.)
- Air Cleaner Assembly Installation (Refer to GROUP 15, Air Cleaner P.15-10.)
- Engine Room Under Cover Front A, B and Engine Room Side Cover (RH) Installation (Refer to GROUP 51, Under Cover P.51-20.)





2. With the timing chain tensioner unlocked, insert special tool MB992103 inside the timing chain case assembly along the tension side of the timing chain until the insertion guide line aligns with the upper surface of the timing chain case assembly (Figure A.)

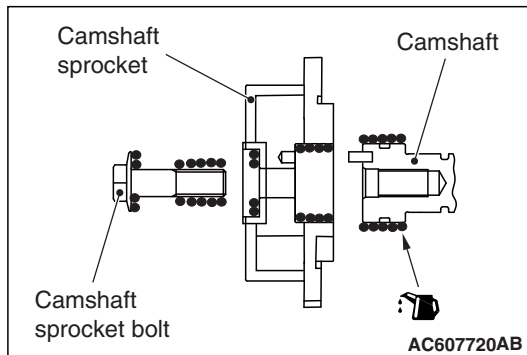
NOTE: With the timing chain tensioner unlocked, insert the special tool MB992103 along the tension side of the timing chain, according to the special tool MB992103 top shape. The special tool MB992103 can be inserted smoothly to the position where the special tool MB992103 insertion guide line aligns with the timing chain case assembly top surface (Figure B), and the spread timing chain tension side guide can be held (Figure C.)

3. With the special tool MB992103 inserted up to the insertion guide line, press the special tool MB992103 against the intake side camshaft sprocket and spread and hold the timing chain tension side guide.
4. Remove the flat-tipped precision screwdriver unlocking the timing chain tensioner.

CAUTION

The timing chain may snag on by other parts. After sagging the timing chain, never rotate the crankshaft.

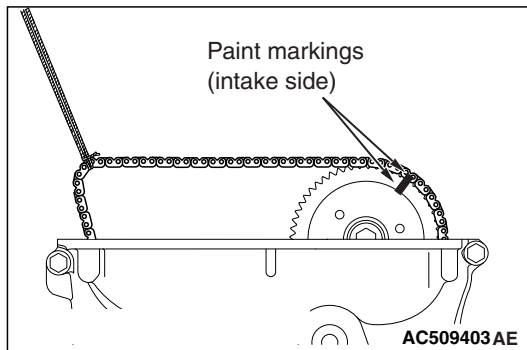
5. With the timing chain tension side guide spread, hook the special tool MB992103 over the hexagon part of the camshaft on the exhaust side, and turn the camshaft clockwise to apply slack to the timing chain between the camshaft sprockets.



2. Apply an adequate and minimum amount of engine oil to the camshaft and camshaft sprocket as shown in the figure.
3. Install the camshaft sprocket to the camshaft.
4. Apply an adequate and minimum amount of engine oil to the camshaft sprocket mounting bolt.
5. Tighten the camshaft sprocket mounting bolt to the specified torque.

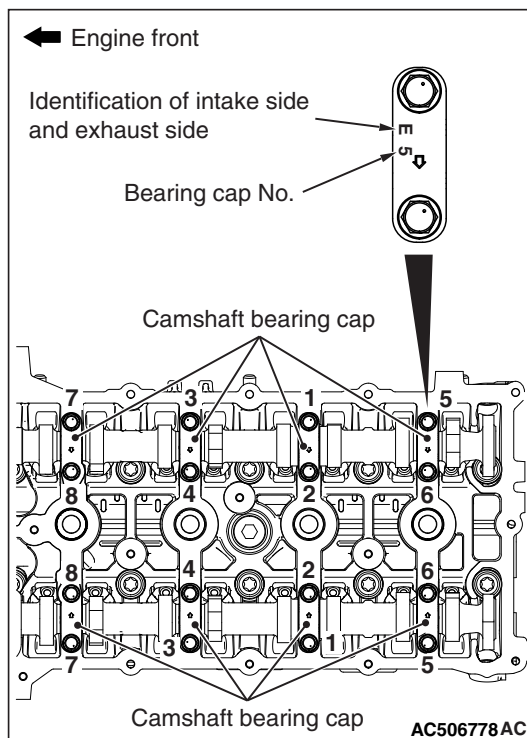
Tightening torque: $59 \pm 5 \text{ N} \cdot \text{m}$ ($44 \pm 3 \text{ ft-lb}$)

>>C<< CAMSHAFT AND CAMSHAFT SPROCKET ASSEMBLY (INTAKE SIDE) INSTALLATION



1. Align the intake side paint mark of the timing chain which was put at removal with the paint mark of the intake side camshaft sprocket, and install the camshaft sprocket to the timing chain.
2. Install the camshaft and camshaft sprocket assembly (intake side) to the cylinder head.

>>D<< THRUST CAMSHAFT BEARING CAP/CAMSHAFT BEARING CAP/OIL FEEDING CAMSHAFT BEARING CAP/CAMSHAFT BEARING INSTALLATION



1. Install the camshaft bearing caps to the cylinder head.

NOTE: Because the thrust camshaft bearing cap and camshaft bearing cap are the same in shape, check the bearing cap number and additionally its symbol to identify the intake and exhaust sides for correct installation.

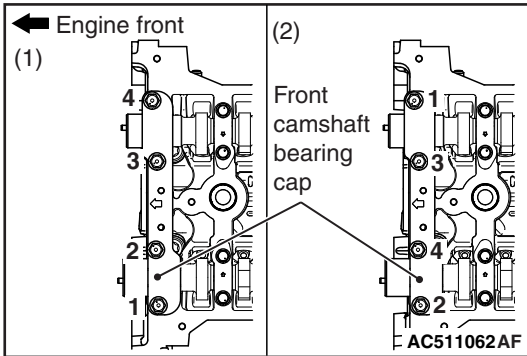
2. Tighten each camshaft bearing cap mounting bolts to the specified torque in the order of number shown in the figure in two or three steps.

Tightening torque: $12 \pm 1 \text{ N} \cdot \text{m}$ ($107 \pm 8 \text{ in-lb}$)

>>F<< FRONT CAMSHAFT BEARING CAP INSTALLATION

⚠ CAUTION

When the mounting bolts are tightened with the front camshaft bearing cap tilted, the front camshaft bearing cap is damaged. Install the front camshaft bearing cap properly to the cylinder head and camshaft.



1. Install the front camshaft bearing cap to the cylinder head, and temporarily tighten the front camshaft bearing cap mounting bolts to the specified torque in the order of the figure (1.)

Tightening torque: 17 ± 3 N·m (13 ± 2 ft-lb)

2. Tighten the front camshaft bearing cap mounting bolts again to the specified torque in the order of the figure (2.)

Tightening torque: 30 ± 2 N·m (22 ± 1 ft-lb)

3. After the front camshaft bearing cap installation, check that the paint markings of the camshaft sprocket and the timing chain and the timing mark of the crankshaft pulley and the 0-degree angle position of ignition timing indicator are aligned respectively.

>>G<< ROCKER COVER ASSEMBLY INSTALLATION

1. Wipe off the sealant on the mating surface of the rocker cover assembly and cylinder head and timing chain case assembly, and degrease the surface where the sealant is applied.

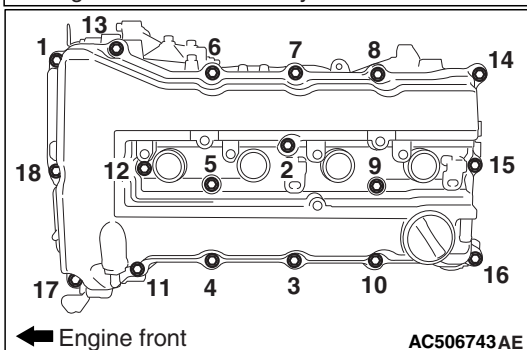
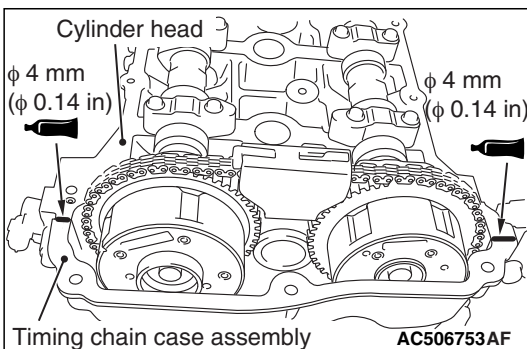
⚠ CAUTION

After the installation, until a sufficient period of time (one hour or more) elapses, do not apply the oil or water to the sealant application area or start the engine.

2. Apply sealant to the joint between the cylinder head and timing chain case assembly as shown in the figure and install the rocker cover assembly to the cylinder head.

Specified sealant: Three bond 1217G or equivalent

NOTE: Install the rocker cover assembly immediately after applying sealant.



3. Tighten the rocker cover assembly mounting bolts to the specified torque in the order of number shown in the figure.

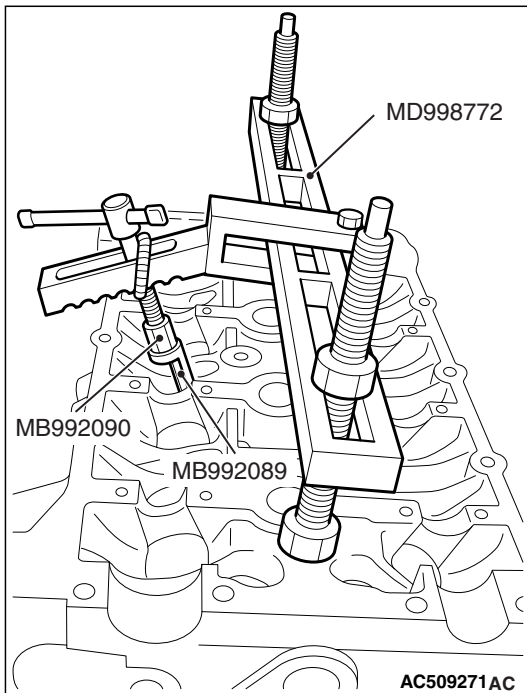
Tightening torque: 3.0 ± 1.0 N·m (27 ± 8 in-lb)

4. Tighten again the rocker cover assembly mounting bolts to the specified torque in the order of number shown in the figure.

Tightening torque: 5.5 ± 0.5 N·m (49 ± 4 in-lb)

>>B<< VALVE SPRING RETAINER LOCK INSTALLATION

In the same manner as removal, use special tool MD998772 (with special tools MB992090 and MB992089 attached) to compress the valve spring, and install the valve spring retainer lock.



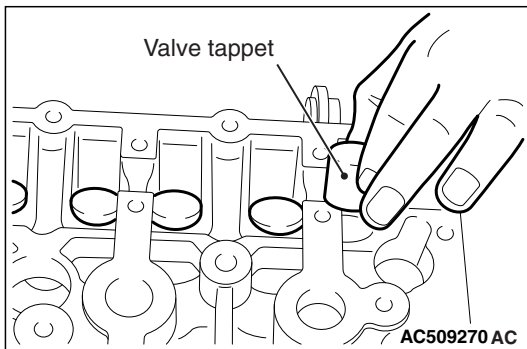
>>C<< VALVE TAPPET INSTALLATION

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

⚠ CAUTION

- Do not use pliers or other tools to install the valve tappets. Always install them by hand.
- Be sure to install the valve tappets in the same position as before.

2. Install the valve tappet to the cylinder head.

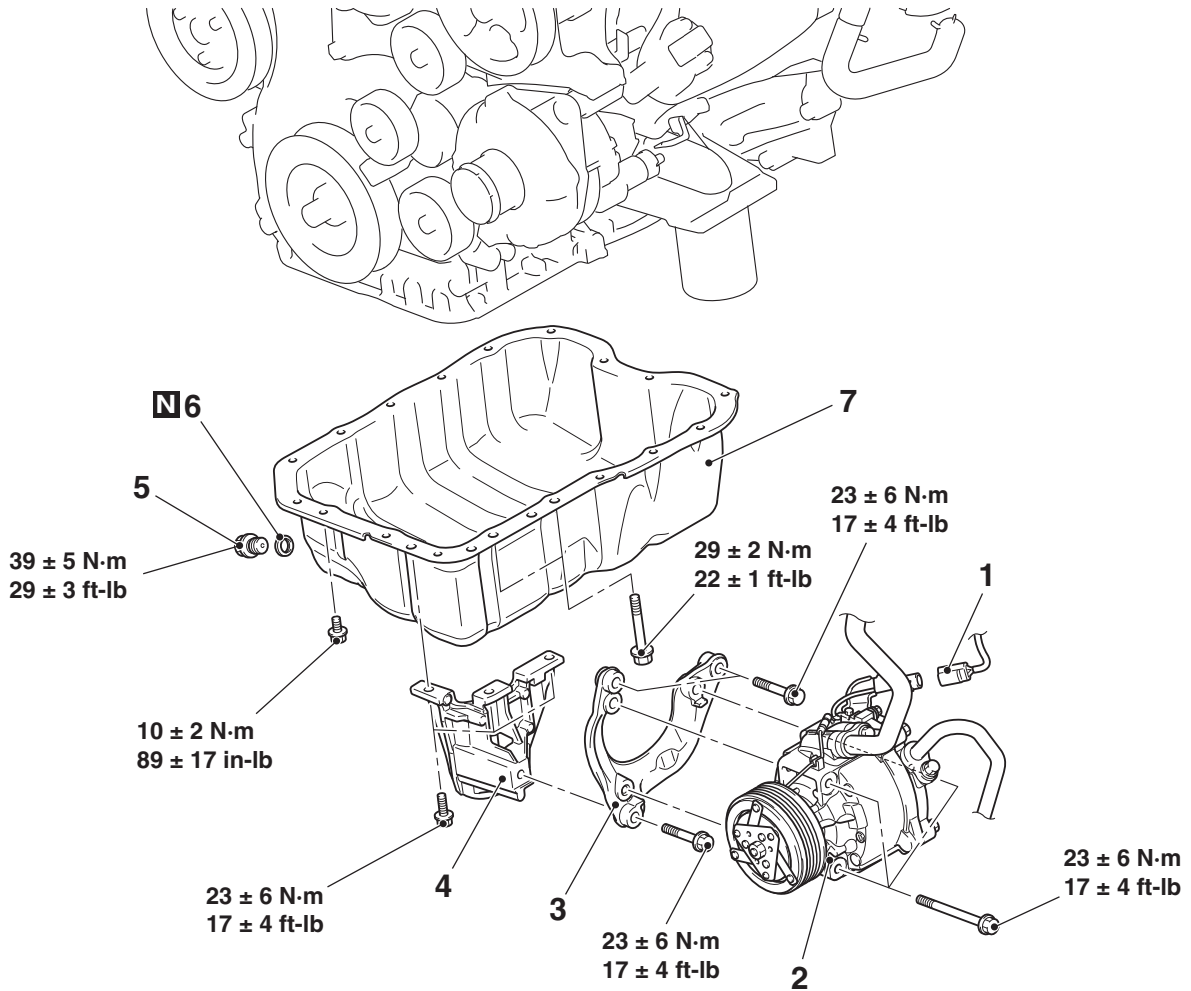


OIL PAN

REMOVAL AND INSTALLATION

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<p>Pre-removal Operation</p> <ul style="list-style-type: none"> • Engine Room Under Cover Front A, B and Engine Room Side Cover (RH) Removal (Refer to GROUP 51, Under Cover P.51-20.) • Engine Oil Draining (Refer to GROUP 12, On-vehicle Service –Engine Oil Replacement P.12-5.) • Drive Belt Removal (Refer to P.11C-19.) 	<p>Post-installation Operation</p> <ul style="list-style-type: none"> • Drive Belt Installation (Refer to P.11C-19.) • Engine Oil Refilling (Refer to GROUP 12, On-vehicle Service –Engine Oil Replacement P.12-5.) • Engine Room Under Cover Front A, B and Engine Room Side Cover (RH) Installation (Refer to GROUP 51, Under Cover P.51-20.)
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Removal steps

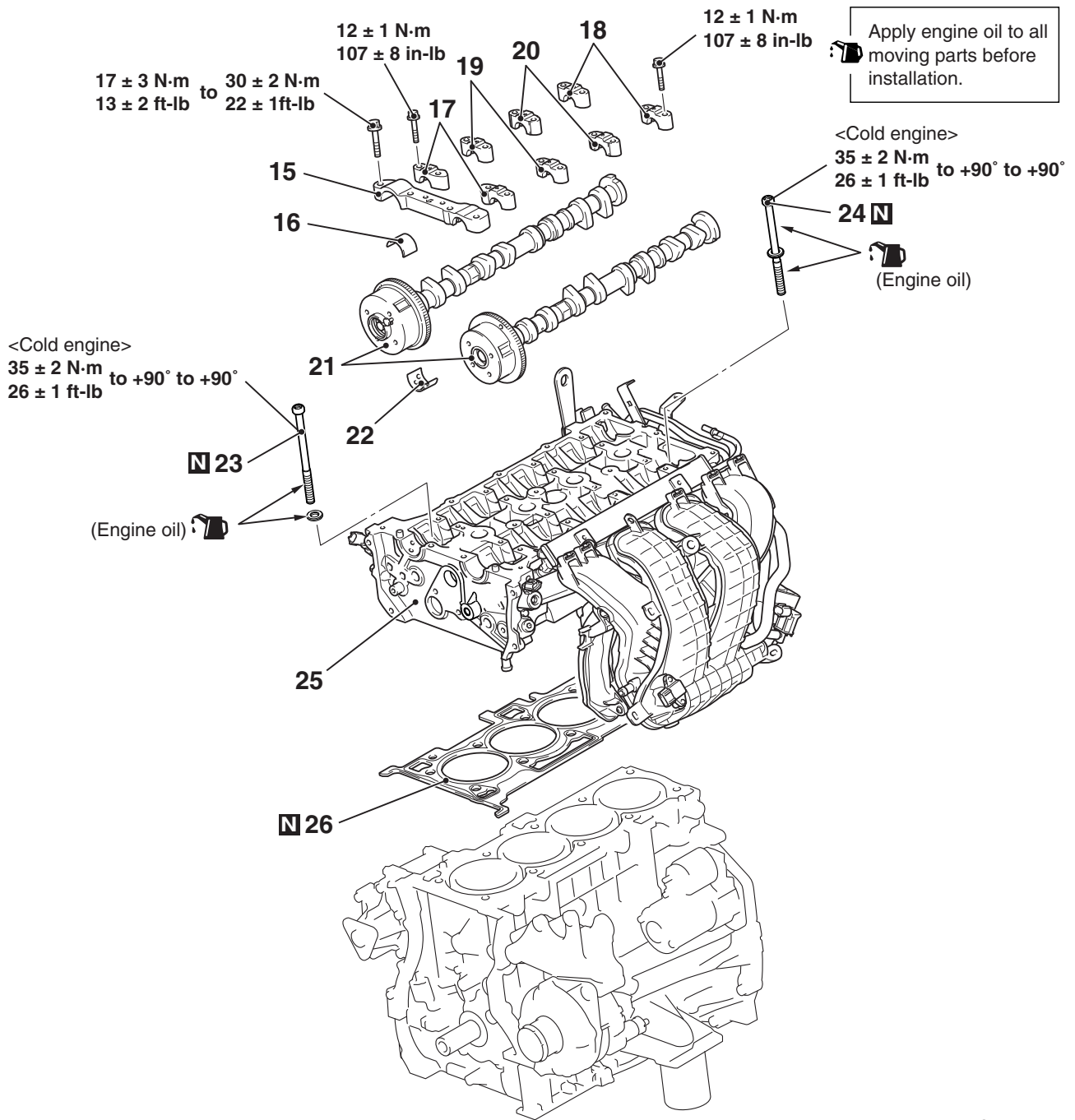
Removal steps (Continued)

- <<A>> >>C<<
1. A/C compressor and clutch connector connection
 2. A/C compressor and clutch assembly
 3. A/C compressor bracket A

- <> >>A<<
4. A/C compressor bracket B
 5. Engine oil pan drain plug
 6. Engine oil pan drain plug gasket
 7. Engine oil pan

Required Special Tool:

- MD998727: Oil Pan FIPG Cutter



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Removal steps

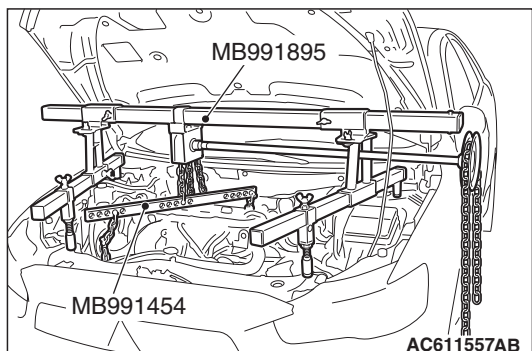
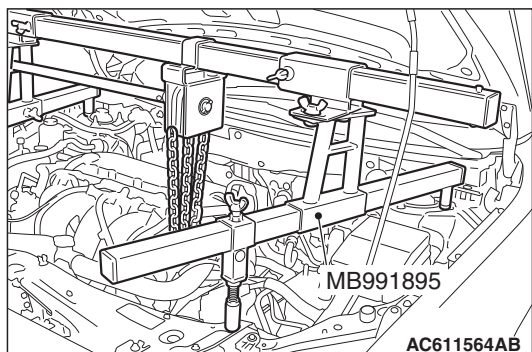
- Valve timing chain (Refer to P.11C-64)
- <<C>> >>E<< 15. Front camshaft bearing cap
- >>C<< 16. Camshaft bearing
- <<D>> >>D<< 17. Oil feeding camshaft bearing cap
- <<D>> >>D<< 18. Camshaft bearing cap
- <<D>> >>D<< 19. Camshaft bearing cap

Removal steps (Continued)

- <<D>> >>D<< 20. Thrust camshaft bearing cap
- >>C<< 21. Camshaft and camshaft sprocket assembly
- >>C<< 22. Camshaft bearing
- <<E>> >>B<< 23. Cylinder head bolt
- <<E>> >>B<< 24. Cylinder head bolt assembly
- >>A<< 25. Cylinder head assembly
- >>A<< 26. Cylinder head gasket

Required Special Tools:

- MB991454: Engine Hanger Balancer
- MB991895: Engine Hanger
- MB991928: Engine Hanger



2. <Special tool MB991895 is used>
(1) Set the foot of special tool MB991895 as shown in the figure.

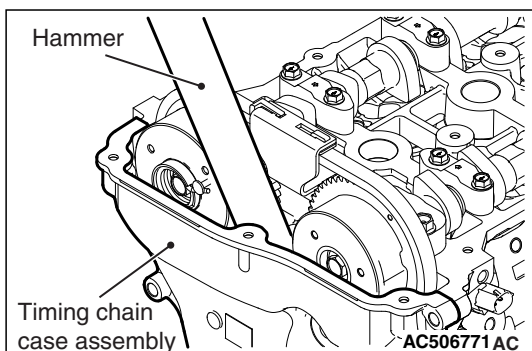
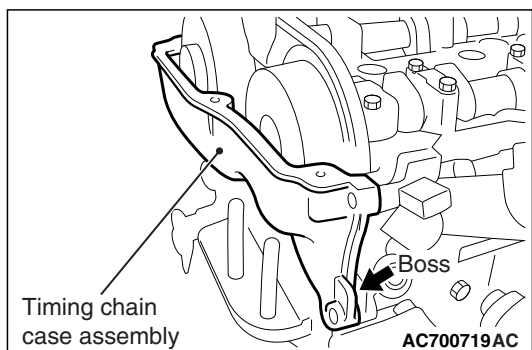
NOTE: Slide the foot to adjust the engine hanger balance.

- (2) Mount special tool MB991454 to the power steering oil pump bracket and the engine hanger, and set it to special tool MB991895 to support the engine and transaxle assembly.

<<D>> TIMING CHAIN CASE ASSEMBLY REMOVAL

⚠ CAUTION

If the adhesive strength of sealant on the timing chain case assembly is so strong that the boss may be damaged by peeling off, do not peel it off forcibly.



1. After removing the timing chain case assembly mounting bolts, slightly pry the boss of the timing chain case assembly shown in the figure using a flat-tipped screwdriver, and remove the timing chain case assembly from the cylinder head and cylinder block.
2. If the sealant cannot be peeled off easily, insert a wooden hammer shank into the timing chain case assembly inside as shown in the figure, pry slightly, and remove the timing chain case assembly from the cylinder head and cylinder block.

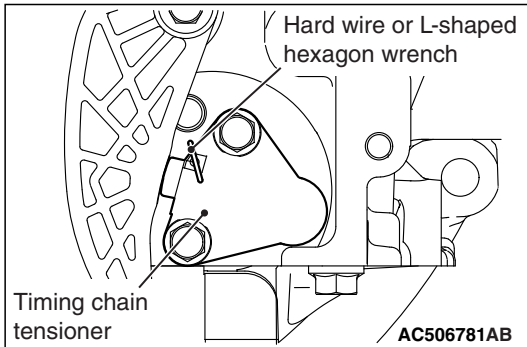
REMOVAL SERVICE POINT

<<A>> TIMING CHAIN TENSIONER REMOVAL

⚠ CAUTION

Securely install the plunger of the timing chain tensioner. Otherwise, it may pop out.

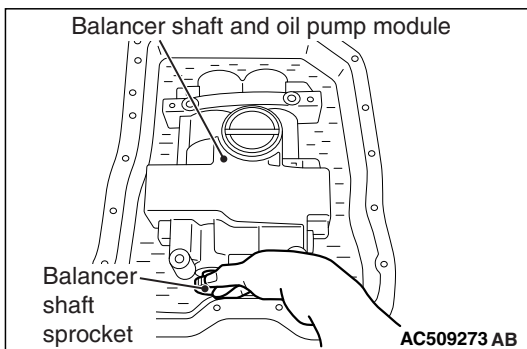
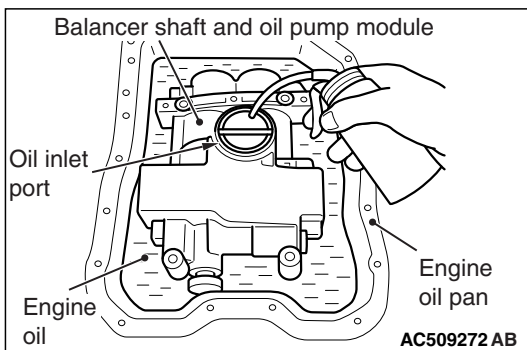
1. Press the balancer timing chain against the timing chain tensioner, compress the plunger of the timing chain tensioner and insert hard wire (piano wire, etc.) or L-shaped hexagon wrench [1.5 mm (0.05 inch)] to fix the plunger of the timing chain tensioner.
2. Remove the timing chain tensioner.



INSTALLATION SERVICE POINTS

>>A<< CRANKSHAFT SPROCKET/BALANCER TIMING CHAIN/BALANCER SHAFT AND OIL PUMP MODULE INSTALLATION

1. When installing the new balancer shaft and oil pump module, apply oil to the oil pump in the balancer shaft and oil pump module and the balancer shaft bearing as follows.
 - (1) Clean the inside of the removed engine oil pan, and put the balancer shaft and oil pump module into the engine oil pan with its oil inlet port facing up.
 - (2) Pour new engine oil until two-thirds of the balancer shaft and oil pump module is soaked.
 - (3) Fill the new engine oil [approximately 50 cm³ (3.05 cu.in.)] into the balancer shaft and oil pump module from the oil inlet port.
 - (4) Turn the balancer shaft sprocket of the balancer shaft and oil pump module clockwise four rotations or more to apply the engine oil to the entire area of the oil pump and the balancer shaft bearing.



ENGINE ASSEMBLY

REMOVAL AND INSTALLATION

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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.00-38.)

Pre-removal Operation

- Hood Removal (Refer to GROUP 42A, Hood P.42A-7.)
- Fuel Line Pressure Reduction (Refer to GROUP 13B, On-vehicle Service –How to Reduce Pressurized Fuel Lines P.13B-1000.)
- Engine Room Under Cover Front A, B and Engine Room Side Cover Removal (Refer to GROUP 51, Under Cover P.51-20.)
- Engine Coolant Draining (Refer to GROUP 14, On-vehicle Service –Engine Coolant Replacement P.14-26.)
- Engine Oil Draining (Refer to GROUP 12, On-vehicle Service –Engine Oil Replacement P.12-5.)
- Transmission Oil Draining (Refer to GROUP 22A, On-vehicle Service –Transmission Oil Replacement P.22A-8) <M/T.>
- Transmission Fluid Draining (Refer to GROUP 23A, On-vehicle Service –Transmission Fluid Replacement P.23A-136) <CVT.>
- Engine Upper Cover Removal (Refer to P.11C-24.)
- Exhaust Manifold Removal (Refer to GROUP 15, Exhaust Manifold P.15-26.)
- Air Cleaner Assembly Removal (Refer to GROUP 15, Air Cleaner P.15-10.)
- Battery and Battery Tray Removal (Refer to GROUP 54A, Battery P.54A-10.)
- Engine control module Removal (Refer to GROUP 13B, Engine Control Module P.13B-1022.)
- Radiator Removal (Refer to GROUP 14, Radiator P.14-53.)
- Drive Belt Removal (Refer to P.11C-19.)

Post-installation Operation

- Drive Belt Installation (Refer to P.11C-19.)
- Radiator Installation (Refer to GROUP 14, Radiator P.14-53.)
- Engine control module Installation (Refer to GROUP 13B, Engine Control Module P.13B-1022.)
- Battery and Battery Tray Installation (Refer to GROUP 54A, Battery P.54A-10.)
- Air Cleaner Assembly Installation (Refer to GROUP 15, Air Cleaner P.15-10.)
- Exhaust Manifold Installation (Refer to GROUP 15, Exhaust Manifold P.15-26.)
- Transmission Oil Draining (Refer to GROUP 22A, On-vehicle Service –Transmission Oil Replacement P.22A-8) <M/T.>
- Transmission Fluid Draining (Refer to GROUP 23A, On-vehicle Service –Transmission Fluid Replacement P.23A-136) <CVT.>
- Engine Oil Refilling (Refer to GROUP 12, On-vehicle Service –Engine Oil Replacement P.12-5.)
- Engine Coolant Refilling (Refer to GROUP 14, On-vehicle Service –Engine Coolant Replacement P.14-26.)
- Drive Belt Tension Check (Refer to P.11C-8.)
- Fuel Leak Check.
- Engine Room Under Cover Front and Engine Room Side Cover Installation (Refer to GROUP 51, Under Cover P.51-20.)
- Engine Upper Cover Installation (Refer to P.11C-24.)
- Hood Installation (Refer to GROUP 42A, Hood P.42A-7.)