# GROUP 11A

# ENGINE MECHANICAL

CONTENTS

## GENERAL INFORMATION

M11102000001USA0000010001

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

| ITEMS | | | SPECIFICATIONS |
|---|---|---|---|
| Type | | | V type, overhead camshaft |
| Number of cylinders | | | 6 |
| Bore mm (in) | | | 87.6 (3.45) |
| Stroke mm (in) | | | 82.9 (3.26) |
| Total displacement $cm^3$(cu. in) | | | 2,998 (182.9) |
| Compression ratio | | | 9.5 |
| Firing order | | | 1-2-3-4-5-6 |
| Valve timing | Intake valve | Opens (BTDC) | -1° <Low speed cam> |
| | | | 18° <High speed cam> |
| | | Closes (ABDC) | 37° <Low speed cam> |
| | | | 86° <High speed cam> |
| | Exhaust valve | Opens (BBDC) | 55° |
| | | Closes (ATDC) | 17° |
| Lubrication system | | | Pressure feed, full-flow filtration |
| Oil pump type | | | Trochoid type |

## ENGINE DIAGNOSIS

M11102000007USA0000010000

| 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 | Incorrect valve clearance <Intake side> | Adjust valve clearance |

| SYMPTOMS | PROBABLE CAUSE | REMEDY |
|---|---|---|
| | Malfunction of lash adjuster (including entry of air into high pressure chamber) <Exhaust side> | Check the lash adjuster. |
| | Thin or diluted engine oil (low engine oil pressure) | Change the engine oil. |
| | Worn or damaged valve stem or valve guide | Replace the valve and/or the guide. |
| Connecting rod noise/ main bearing noise | Insufficient oil supply | Check the engine oil level. |
| | Thin or diluted engine oil | Change the engine oil. |
| | Excessive bearing clearance | Replace the bearings. |

## SERVICE SPECIFICATIONS

M11102000003USA0000010000

| Item | | Standard value | Limit |
|---|---|---|---|
| Power steering oil pump drive belt tension (When checked) | Vibration frequency Hz | 128 - 165 | - |
| | Tension N (lb) | 294 - 490 (66 - 110) | - |
| | Deflection (Reference) mm (in) | 11.9 - 15.6 (0.47 - 0.61) | - |
| Power steering oil pump drive belt tension (When adjusted) | Vibration frequency Hz | 138 - 157 | - |
| | Tension N (lb) | 343 - 441 (77 - 99) | - |
| | Deflection (Reference) mm (in) | 12.7 - 14.6 (0.50 - 0.57) | - |
| Power steering oil pump drive belt tension (When replaced) | Vibration frequency Hz | 165 - 196 | - |
| | Tension N (lb) | 490 - 686 (110 - 154) | - |
| | Deflection (Reference) mm (in) | 9.2 - 11.9 (0.36 - 0.47) | - |
| Basic ignition timing at idle | | 5°BTDC ± 3° | - |
| Actual ignition timing at curb idle | | Approximately 10° BTDC | - |
| CO contents % | | 0.5 or less | - |
| HC contents ppm | | 100 or less | - |
| Curb idle speed r/min | | 600 ± 100 | - |
| Compression pressure (200 r/min) kPa (psi) | | 1,460 (212) | Minimum 1,050 (153) |
| Compression pressure difference of all cylinder kPa (psi) | | - | 98 (14) |
| Intake manifold vacuum at curb idle kPa (in Hg) | | - | Minimum 60 (18) |
| Auto-tensioner rod protrusion amount mm (in) | | 9.1 - 13.4 (0.36 - 0.52) | - |

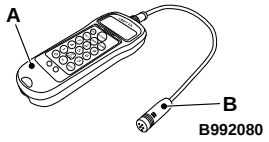
## SEALANTS

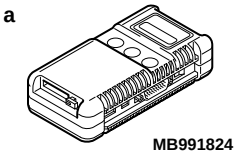
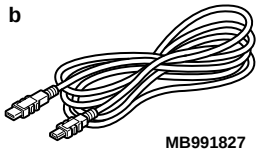
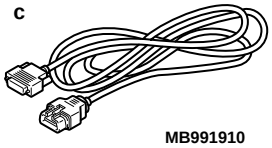
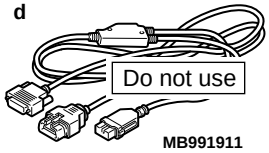
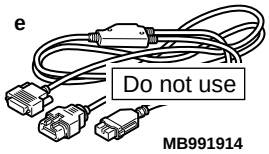
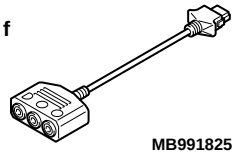
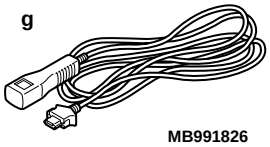
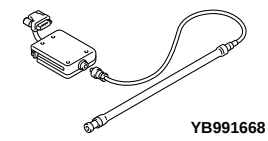
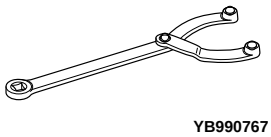
M11102000005USA0000010000

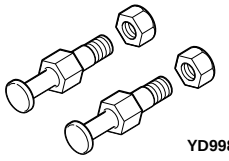
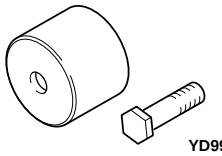
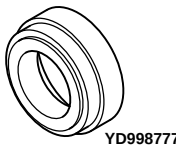
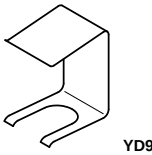
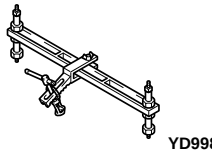
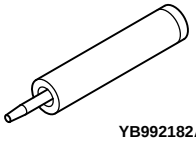
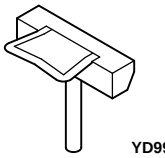
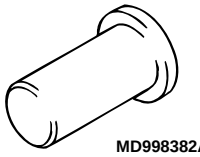
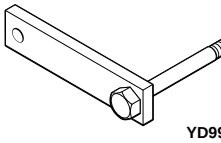
| Item | Specified sealant |
|---|---|
| Engine upper oil pan, engine lower oil pan | 3M™ AAD Part No.8672, 8704, 3M™ AAD Part No.8679/8678 or equivalent |
| Engine oil pressure switch | 3M™ ADD Part number 8672 or equivalent |

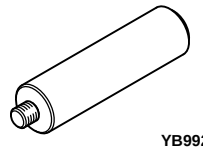
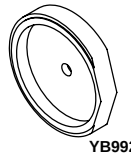
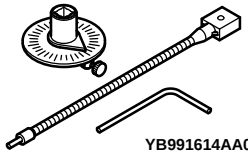
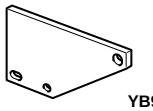
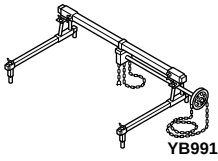
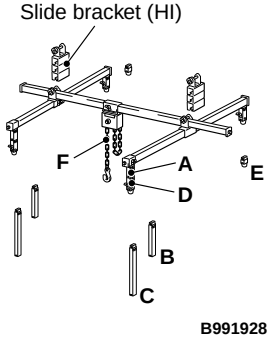
## SPECIAL TOOLS

M11102000006USA0000010000

| Tool | Tool number and name | Supersession | Application |
|---|---|---|---|
|  | MB992080<br>Belt tension meter set<br>A: MB992081<br>Belt tension meter<br>B: MB992082<br>Microphone assembly | Tool not available | Drive belt tension check |

| Tool | Tool number and name | Supersession | Application |
|---|---|---|---|
| a  MB991824<br>b  MB991827<br>c  MB991910<br>d  Do not use MB991911<br>e  Do not use MB991914<br>f  MB991825<br>g  MB991826<br>YB991958 AA00 | MB991958<br>Scan tool (M.U.T.-III sub assembly)<br>A: MB991824<br>Vehicle communication interface (V.C.I.)<br>B: MB991827<br>M.U.T.-III USB cable<br>C: MB991910<br>M.U.T.-III main harness A (Vehicles with CAN communication system)<br>D: MB991911<br>M.U.T.-III main harness B (Vehicles without CAN communication system)<br>E: MB991914<br>M.U.T.-III main harness C (for Daimler Chrysler models only)<br>F: MB991825<br>M.U.T.-III adapter harness<br>G: MB991826<br>M.U.T.-III trigger harness | MB991824-KIT<br>*NOTE: MB991826 M.U.T.-III Trigger Harness is not necessary when pushing V.C.I. ENTER key.* | **⚠ CAUTION**<br>**For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.**<br>▪ Drive belt tension check<br>▪ Ignition timing check<br>▪ Curb idle speed check<br>▪ Idle mixture check<br>▪ Erasing the diagnostic trouble code |
|  YB991668 | MB991668<br>Belt tension meter set | Tool not available | Drive belt tension check [used together with scan tool (M.U.T.-III sub assembly)] |
|  YB990767 | MB990767<br>End yoke holder | MB990767-01 | Holding the crankshaft pulley and camshaft sprocket |

| Tool | Tool number and name | Supersession | Application |
|---|---|---|---|
|  YD998719 | MD998719<br>Pin | MIT308239 | |
|  YD998713 | MD998713<br>Camshaft oil seal installer | MD998713-01 | Press-in of the camshaft oil seal |
|  YD998777AA00 | MD998777<br>Camshaft oil seal installer adapter | - | Press-fitting the camshaft oil seal (left bank) |
|  YD998443 | MD998443<br>Auto-lash adjuster holder | MD998443-01 | Holding the auto-lash adjuster |
|  YD998772 | MD998772<br>Valve spring compressor | General service tool | Compressing valve spring |
|  YB992182AA00 | MB992182<br>Valve stem seal installer | - | Valve stem seal installation |
|  YD998727 | MD998727<br>Oil pan FIPG cutter | MD998727-01 | Engine lower oil pan removal |
|  MD998382AA01 | MD998382<br>Crankshaft front oil seal installer | MD998382-01 | Press-in of the crankshaft front oil seal |
|  YD998781 | MD998781<br>Flywheel stopper | General service tool | Securing the drive plate |

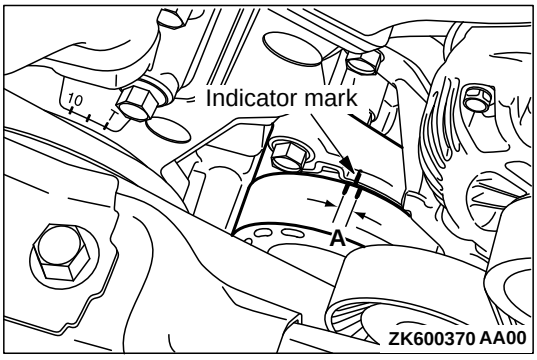
| Tool | Tool number and name | Supersession | Application |
|---|---|---|---|
|  YB992075 | MB992075<br>Handle | - | Crankshaft rear oil seal installation |
|  YB992183AA00 | MB992183<br>Crankshaft rear oil seal installer | - | |
|  YB991614AA00 | MB991614<br>Angle gauge | - | Cylinder head bolt installation |
|  YD998716AA00 | MD998716<br>Crankshaft wrench | MD998716-01 | Rotating the crankshaft when installing the timing belt |
|  YB992208 | MB992208<br>Engine hanger plate A | General Service Tool | Supporting the engine assembly during removal and installation of the transaxle assembly |
|  YB991454AA01 | MB991454<br>Engine hanger balancer | MZ203827-01 | When the engine hanger is used: Supporting the engine assembly during removal and installation of the transaxle assembly<br>*NOTE: Special tool MB991454 is a part of engine hanger attachment set MB991453.* |
|  YB991895 | MB991895<br>Engine hanger | Tool not available | |
|   B991928 | MB991928<br>Engine hanger<br>A: MB991929<br>Joint (50) ×2<br>B: MB991930<br>Joint (90) ×2<br>C: MB991931<br>Joint (140) ×2<br>D: MB991932<br>Foot (standard) ×4<br>E: MB991933<br>Foot (short) ×2<br>F: MB991934 | Tool not available | |

| Tool | Tool number and name | Supersession | Application |
|---|---|---|---|
| | Chain and hook assembly | | |

# ON-VEHICLE SERVICE

## GENETATOR DRIVE BELT TENSION CHECK

M11102000918USA0000010000




**⚠ CAUTION**

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

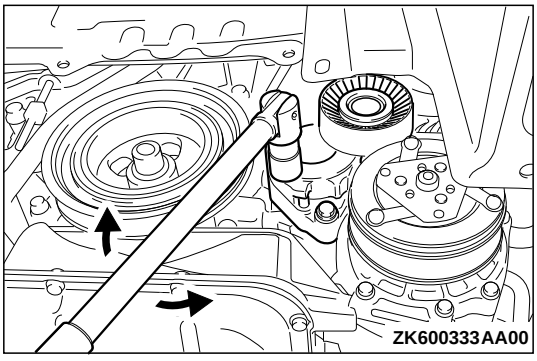
1. Make sure that the indicator mark is within the area marked with A in the illustration.
2. If the mark is out of the area, replace the drive belt. (Refer to P.11A-21).

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

## AUTO-TENSIONER CHECK

M11102000905USA0000010000

## OPERATION CHECK




1. Turn OFF the engine, then check to see that the drive belt is not protruding from the pulley width of the auto-tensioner.
2. Remove the drive belt. (Refer to P.11A-21).
3. Securely insert the spindle handle or ratchet handle at a 12.7 mm (1/2-inch) angle into the hexagonal boss of the auto tensioner. Turn the auto-tensioner slowly to the left and right to check and see that there is no binding or noise.
4. If there are any problems in the procedure 1 or 3, replace the auto-tensioner. (Refer to P.11A-49).
5. Install the drive belt. (Refer to P.11A-21).

## DRIVE BELT TENSION CHECK AND ADJUSTMENT

M11102000906USA0000010000

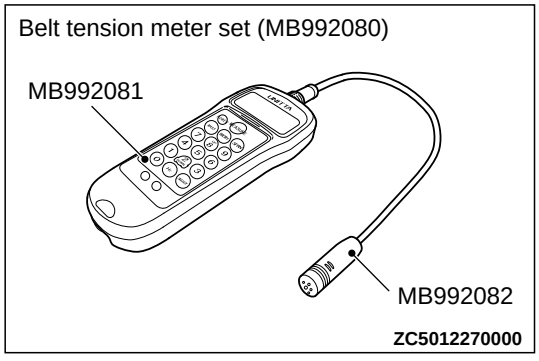
## POWER STEERING OIL PUMP DRIVE BELT TENSION CHECK

### WHEN USING SPECIAL TOOL MB992080: RECOMMENDATION

Required Special Tools:

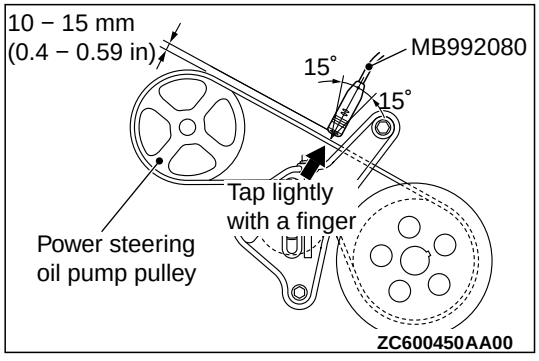
- MB992080: Belt tension meter set
  - MB992081: Belt tension meter
  - MB992082: Microphone assembly

*NOTE: The vibration frequency measuring method is recommended for check and adjustment of the drive belt tension.*




1. Connect the special tool MB992082 to the special tool MB992081 of the Special tool MB992080.
2. Press the "POWER" button to turn on the power supply.
3. Press the numeral key of "1" and check that "No.1" appears on the upper left of the display.

   *NOTE: This operation is to temporarily set the preset data such as the belt specifications, because if the measurement is taken without input of the belt specifications, conversion to tension value (N) cannot be made, resulting in judgement of error.*
4. Press "Hz" button twice to change the display to the frequency display (Hz).




**⚠ CAUTION**

- **The temperature of the surface of the belt should be as close to normal temperature as possible.**
- **Do not allow any contaminants such as water or oil to get onto the microphone.**
- **If strong gusts of wind blow against the microphone or if there are any loud sources of noise nearby, the values measured by the microphone may not correspond to actual values.**
- **If the microphone is touching the belt while the measurement is being made, the values measured by the microphone may not correspond to actual values.**
- **Do not take the measurement while the vehicle's engine is running.**

5. Hold special tool MB992080 to the middle of the drive belt between the pulleys (at the place indicated by arrow), approximately 10 - 15 mm (0.4 - 0.59 inch) away from the rear surface of the belt so that it is perpendicular to the belt (within an angle of ± 15 degree).
6. Press the "MEASURE" button.

7. Gently tap the middle of the belt between the pulleys (the place indicated by the arrow) with your finger as shown in the illustration, and measure that the vibration frequency of the belt is within the standard value.
   **Standard value: 128 - 165 Hz**

**WHEN USING SCAN TOOL MB991958: RECOMMENDATION**

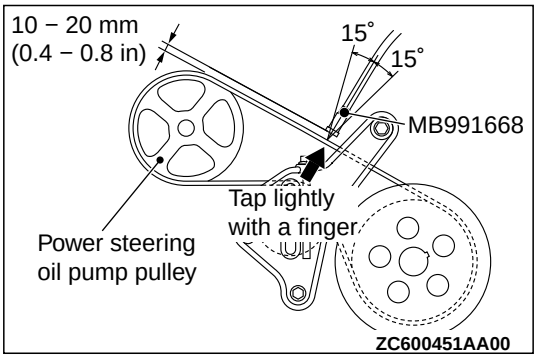
Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991910: M.U.T.-III Main Harness A
- MB991668: Belt Tension Meter Set

*NOTE: The vibration frequency measuring method is recommended for check and adjustment of the drive belt tension.*

**⚠ CAUTION**

**To prevent damage to special tool MB991824, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting special tool MB991824.**

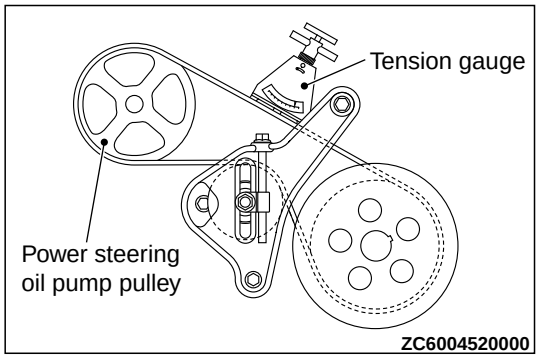
1. Connect special tool MB991668 to special tool MB991824.
2. Connect special tool MB991910 to special tool MB991824.
3. Connect scan tool MB991910 to the data link connector.
4. Turn the ignition switch to the "ON" position and select "Belt Tension" from the menu special tool MB991824 screen.




**⚠ CAUTION**

- **The temperature of the surface of the belt should be as close to normal temperature as possible.**
- **Do not allow any contaminants such as water or oil to get onto the microphone.**
- **If strong gusts of wind blow against the microphone or if there are any loud sources of noise nearby, the values measured by the microphone may not correspond to actual values.**
- **If the microphone is touching the belt while the measurement is being made, the values measured by the microphone may not correspond to actual values.**
- **Do not take the measurement while the vehicle's engine is running.**

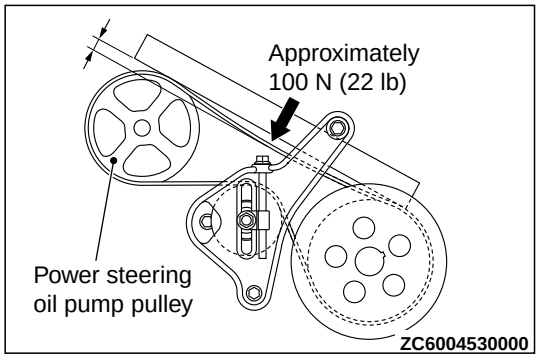
5. Hold special tool MB991668 to the middle of the drive belt between the pulleys (at the place indicated by the arrow), about 10 - 20 mm (0.4 - 0.8 inch) away from the rear surface of the belt and so that it is perpendicular to the belt (within an angle of ± 15 degree angle).
6. Gently tap the middle of the belt between the pulleys (the place indicated by the arrow) with your finger as shown in the illustration, and check that the vibration frequency of the belt is within the standard value.
   **Standard value: 128 - 165 Hz**




**WHEN USING A TENSION GAUGE**

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

**Standard value: 294 - 490 N (66 - 110 pound)**

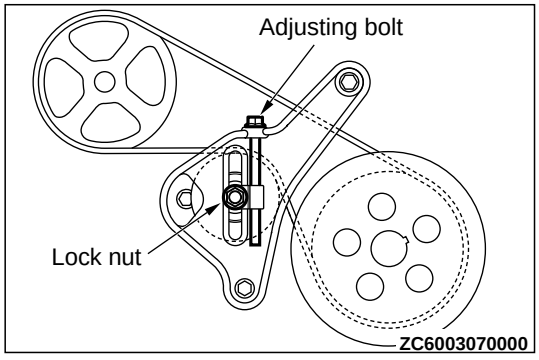



**BELT DEFLECTION CHECK**

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

**Standard value: 11.9 - 15.6 mm (0.47 - 0.61 inch)**

## POWER STEERING OIL PUMP DRIVE BELT TENSION ADJUSTMENT




If the tension or deflection is outside the standard value, adjust by the following procedure.

1. Loosen the tensioner pulley lock nut.
2. Adjust the belt tension to the standard value by turning the adjusting bolt. The tension will increase when turning the adjusting bolt clockwise, and decrease when turning counterclockwise.

**Standard value:**

| Item | When adjusted | When replaced |
|---|---|---|
| Vibration frequency Hz | 138 - 157 | 165- 196 |
| Tension N (lb) | 343 - 441 (77 - 99) | 490 - 686 (110 - 154) |
| Deflection (Reference) mm (in) | 12.7 - 14.6 (0.50 - 0.57) | 9.2 - 11.9 (0.36 - 0.47) |

3. Tighten the lock nut to the specified torque.

**Tightening torque: 47 ± 11 N·m (35 ± 8 ft-lb)**

**⚠ CAUTION**

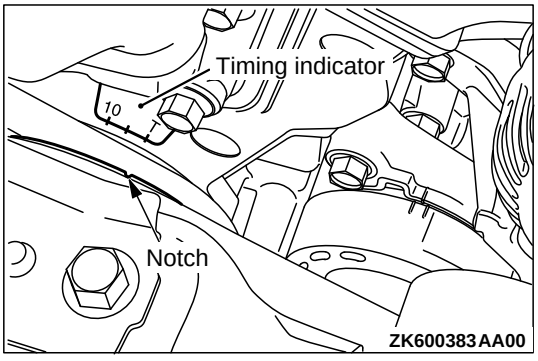
**Check after turning the crankshaft one or more rotations clockwise.**

4. Check the belt deflection amount and tension, and readjust if necessary.
5. When the belt tension is adjusted by measuring the belt deflection, adjust it with a tool for vibration frequency measurement or tension measurement afterward.

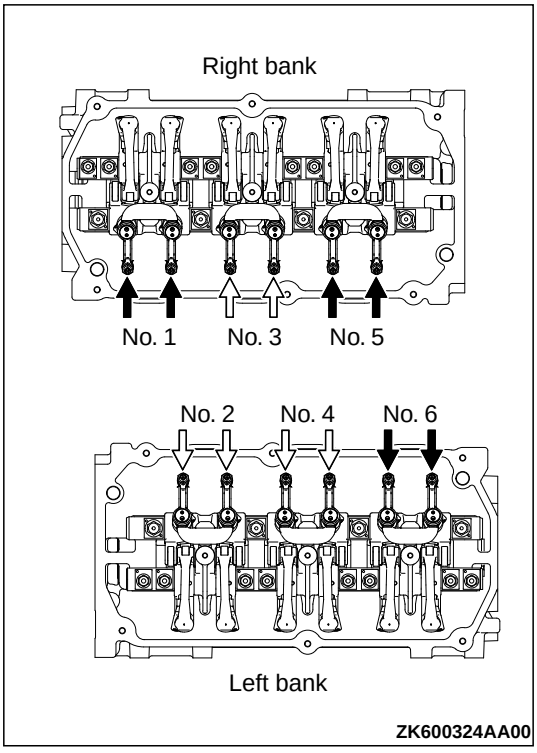
## VALVE CLEARANCE CHECK AND ADJUSTMENT

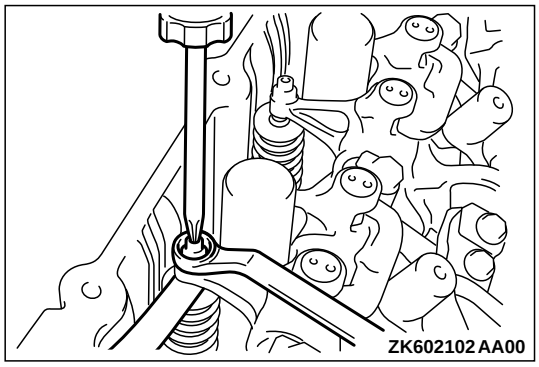
M11102000901USA0000010000

1. Before inspection, set the vehicle in the following condition:
   - Engine coolant temperature: 80 - 95°C (176 - 203°F)
2. Remove all of the ignition coils.
3. Remove the rocker cover.
4. Turn the crankshaft clockwise until the notch on the pulley is lined up with the "T" mark on the timing indicator.




5. Move the rocker arms on the No.1 and No.4 cylinders up and down by hand to determine which cylinder has its piston at the top dead center on the compression stroke.
   If both intake and exhaust valve rocker arms have a valve lash, the piston in the cylinder corresponding to these rocker arms is at the top dead center on the compression stroke.
6. Valve clearance inspection and adjustment can be performed on rocker arms indicated by white arrow mark when the No.1 cylinder piston is at the top dead center on the compression stroke, and on rocker arms indicated by black arrow mark when the No.4 cylinder piston is at the top dead center on the compression stroke.



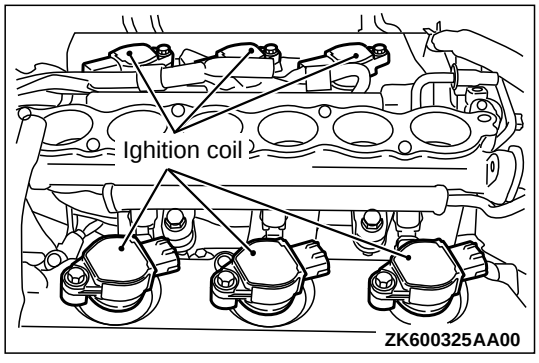



7. Measure the valve clearance for intake side.
   If the valve clearance is not as specified, loosen the rocker arm lock nut and adjust the clearance using a thickness gauge while turning the adjusting screw.
   **Standard value (hot engine): 0.20 mm (0.008 inch)**

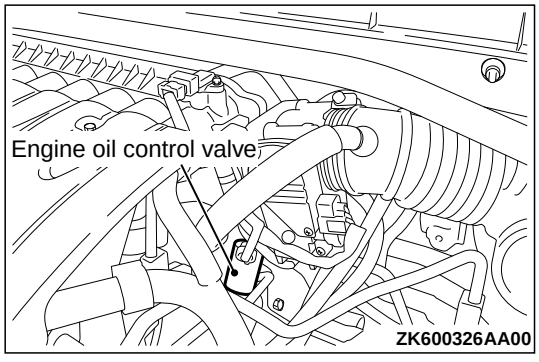
   *NOTE: Valve clearance check and adjustment is unnecessary for exhaust side due to auto lash adjuster installed.*
8. While holding the adjusting screw with a screwdriver to prevent it from turning, tighten the lock nut to the specified torque.
   **Tightening torque: 9 ± 1 N·m (80 ± 9 in-lb)**
9. Turn the crankshaft 360 degrees to line up the notch on the crankshaft pulley with the "T" mark on the timing indicator.
10. Repeat steps (7) and (8) on other valves for clearance adjustment.
11. Install the rocker cover.
12. Install the ignition coils.

## ROCKER ARM PISTON OPERATION CHECK

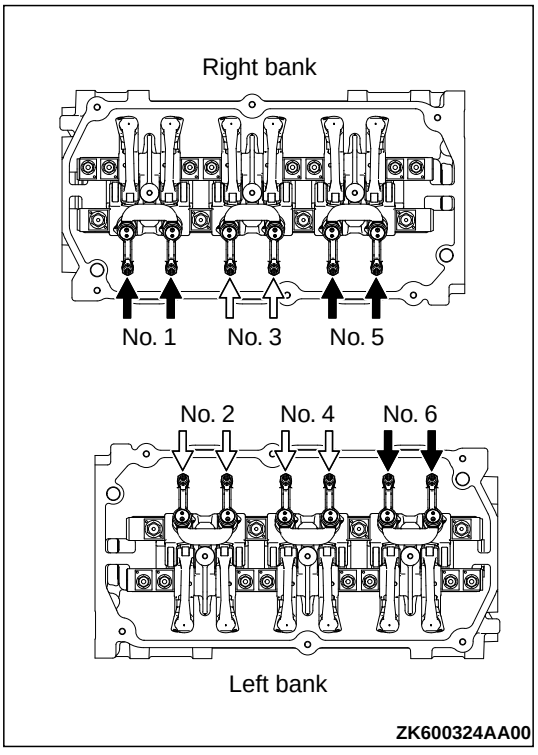
M11102000908USA0000010000




1. Remove all of the ignition coils.
2. Remove the rocker cover.

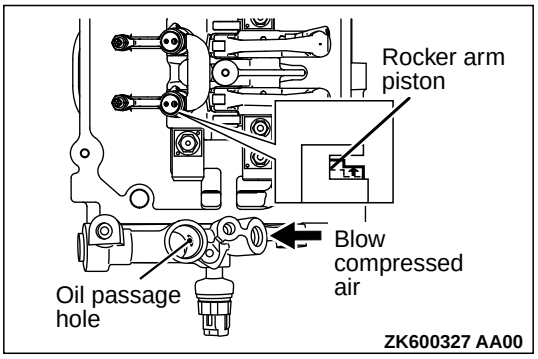



3. Remove the engine oil control valve.
4. Remove the oil pipe.
5. Turn the crankshaft clockwise until the notch on the crankshaft pulley is lined up with the "T" mark on the lower cover of timing belt.




6. Move the rocker arms on the No.1 and No.4 cylinders up and down by hand to determine which cylinder has its piston at the top dead center on the compression stroke.

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




7. While shutting up the oil passage hole at the depth of the engine oil control valve's installation hole by finger not to leak air, blow compressed air into the engine oil pressure switch's installation hole by air blowgun. At this time, confirm that the rocker arm piston can operate.

*NOTE: To fully confirm the check, prevent the compression air from leaking as much as possible by bind vinly tape to the end of air blowgun. The compression air pressure is required more than 620 kPa (90 psi).*

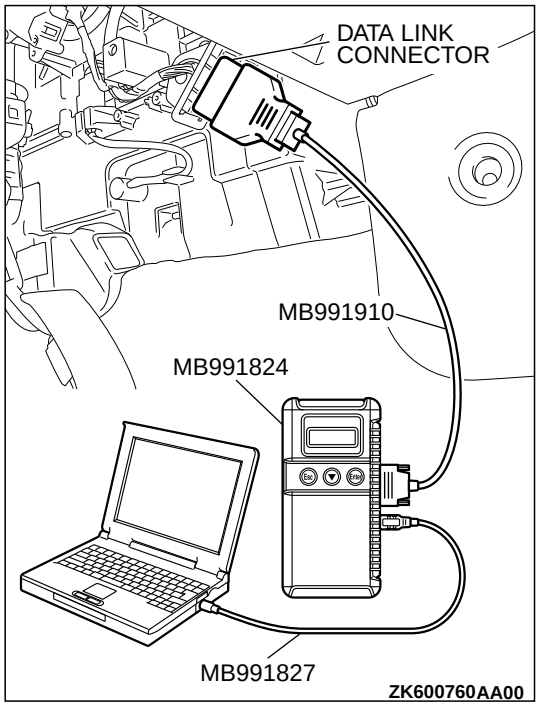
8. Turn the crankshaft clockwise until the notch on the crankshaft pulley is lined up with the "T" mark on the lower cover of timing belt.
9. Confirm the rest of the rocker arm pistons under the procedure 7.
10. When the rocker arm piston does not operate, replace the rocker arm assy.
11. Install the engine oil pressure switch and the engine oil control valve. (Refer to Camshaft and Valve Stem Seal - Removal and Installation P.11A-27.)
12. Install the rocker cover.
13. Install all of the ignition coils.

## IGNITION TIMING CHECK

M11102000902USA0000010000

**Required Special Tool:**

MB991958: Scan Tool (M.U.T.-III Sub Assembly)
- MB991824: V.C.I.
- MB991827: M.U.T.-III USB Cable
- MB991910: M.U.T.-III Main Harness A

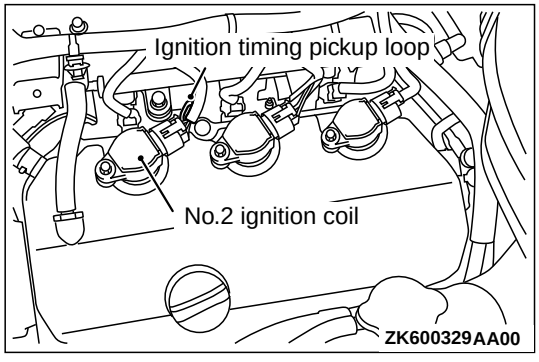



1. Before inspection, set the vehicle in the following condition:
   - Engine coolant temperature: 80 - 95°C (176 - 203°F)
   - Lights and all accessories: OFF
   - Transaxle: P range

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

   **⚠ CAUTION**

   **To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.**
2. Connect scan tool MB991958 to the data link connector.




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

   *NOTE: The power supply line is looped and also longer than the other ones.*
4. Start the engine and run it at idle.
5. Check that the idle speed is approximately 600 r/min.
6. Select scan tool MB991958 actuator test "item number 4".
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

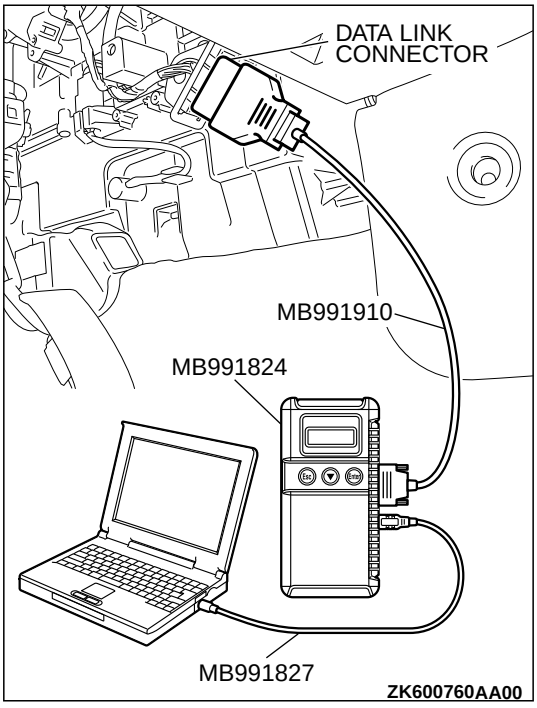
M11102000912USA0000010000

**Required Special Tool:**

MB991958: Scan Tool (M.U.T.-III Sub Assembly)
- MB991824: V.C.I.
- MB991827: M.U.T.-III USB Cable
- MB991910: M.U.T.-III Main Harness A

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

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




**⚠ CAUTION**

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

2. Connect scan tool MB991958 to the data link connector.
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 2 and take a reading of the idle speed.
   **Curb idle speed: 600 ± 100 r/min**

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

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.13Ab-49.

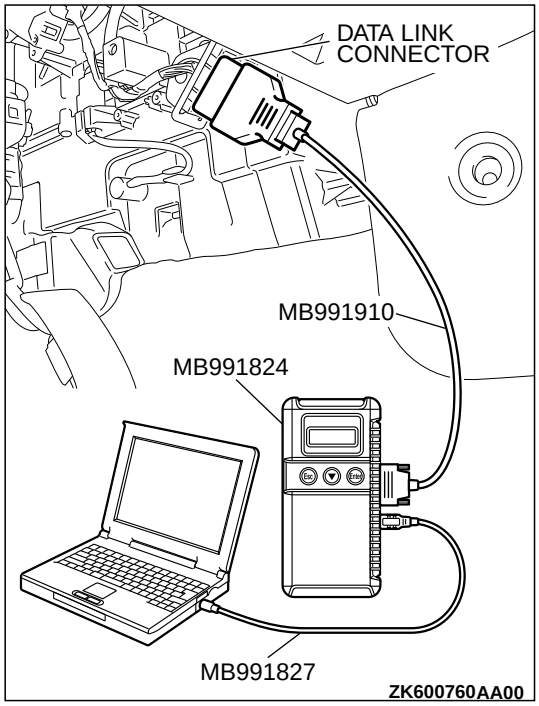
## IDLE MIXTURE CHECK

M11102000913USA0000010000

**Required Special Tool:**

MB991958: Scan Tool (M.U.T.-III Sub Assembly)
- MB991824: V.C.I.
- MB991827: M.U.T.-III USB Cable
- MB991910: M.U.T.-III Main Harness A

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




- Transmission: P range

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

**⚠ CAUTION**

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

2. Connect scan tool MB991958 to the data link connector.
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
- EGR system and EGR valve leak
- Evaporative emission system
- Compression pressure

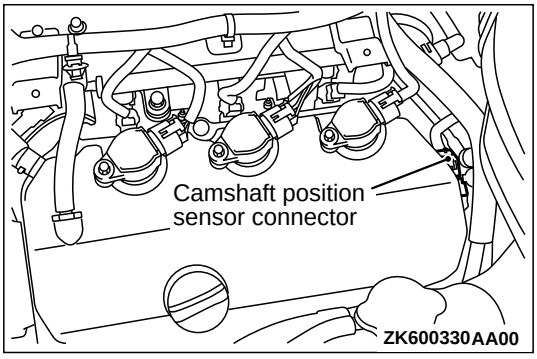
## COMPRESSION PRESSURE CHECK

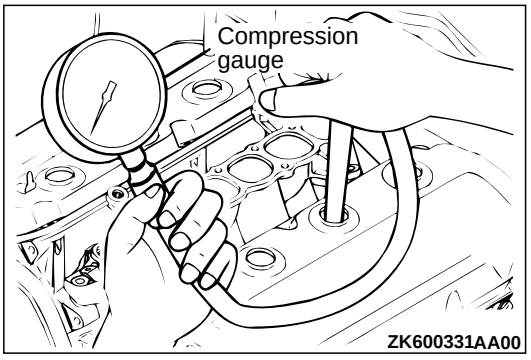
M11102000903USA0000010000

Required Special Tool:

MB991958: Scan Tool (M.U.T.-III Sub Assembly)
- MB991824: V.C.I.
- MB991827: M.U.T.-III USB Cable
- MB991910: M.U.T.-III Main Harness A

1. Before inspection, check that the engine oil, starter and battery are normal. Also, set the vehicle in the following condition:
   - Engine coolant temperature: 80 - 95°C (176 - 203°F)
   - Lights and all accessories: OFF




- Transmission: P range

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

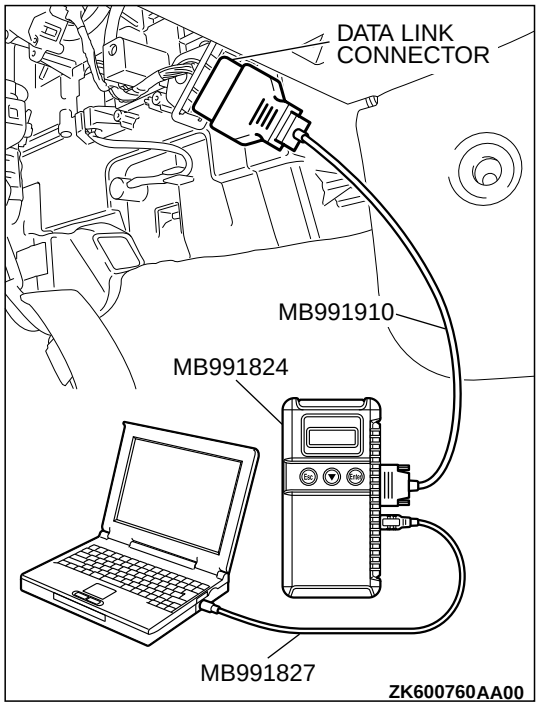
2. Remove all of the ignition coils and spark plugs.
3. Disconnect the crankshaft position sensor connector.

*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.***

4. Cover the spark plug hole with a shop towel etc., during cranking. After the engine has been cranked, check for foreign material adhering to the shop towel.
5. Set compression gauge to one of the spark plug holes.
6. Crank the engine and measure the compression pressure.
   **Standard value (at engine speed of 200 r/min): 1,460 kPa (212 psi)**
   **Minimum limit (at engine speed of 200 r/min): 1,050 kPa (153 psi)**
7. Measure the compression pressure for all the cylinders, and check that the pressure differences of the cylinders are below the limit.
   **Limit: 98 kPa (14 psi)**
8. If there is a cylinder with compression or a compression difference that is outside the limit, pour a small amount of engine oil through the spark plug hole, and repeat the operations in steps 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.
9. Connect the crankshaft position sensor connector.
10. Install the spark plugs and ignition coils.



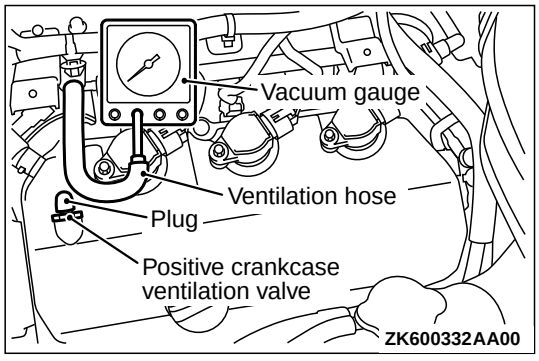

11. Use the scan tool MB991958 to erase the diagnostic trouble codes.

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

## MANIFOLD VACUUM CHECK

M11102000904USA0000010000

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. Disconnect the ventilation hose from the positive crankcase ventilation (PCV) valve, and connect a vacuum gauge to the ventilation hose.
4. Plug the PCV valve.
5. Start the engine and check that idle speed is within specification. Then check the vacuum gauge reading.
   **Idle speed: 600 ± 100 r/min**
   **Minimum limit: 60 kPa (18 in Hg)**




## LASH ADJUSTER CHECK

M11102000914USA0000010000

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

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

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

*NOTE: After parking for many hours, oil may run out from the oil passage and take time before oil is supplied to the*

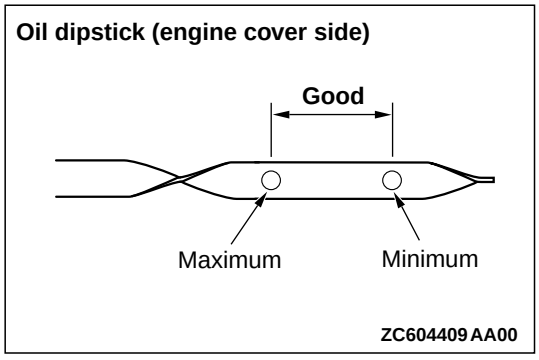
*lash adjuster, causing air to enter the high pressure chamber.*

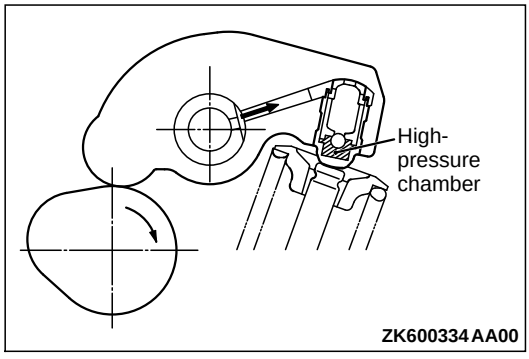
*NOTE: In the above cases, abnormal noise can be eliminated by bleeding the lash adjuster system.*

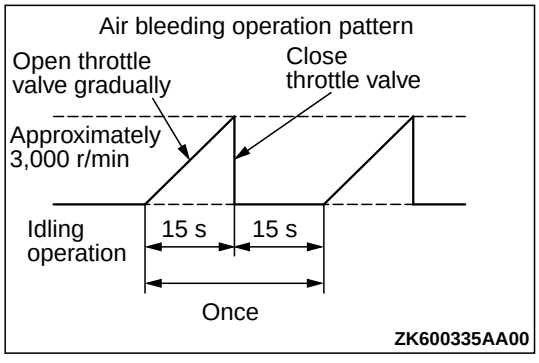
*NOTE: An abnormal noise due to malfunction of the lash adjuster is produced immediately after starting the engine and changes with the engine speed, irrespective of the engine load. If, the abnormal noise is not produced immediately after starting the engine or does not change with the engine speed,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

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

1. Start the engine.
2. Check if the abnormal noise produced immediately after starting the engine, changes with the change in the engine speed.
   If the abnormal noise is not produced immediately after starting the engine or it does not change with the engine speed, the lash adjuster is not the cause for the noise. Therefore, investigate other causes. The abnormal noise is probably caused by some other parts than the engine proper if it does not change with the engine speed. (In this case, the lash adjuster is in good condition.)
3. With the engine idling, change the engine load (shift from N to D range, for example) to make sure that there is no change in the level of abnormal noise.
   If there is a change in the level of abnormal noise, suspect a tapping noise due to worn crankshaft bearing or connecting rod bearing (In this case, the lash adjuster is in good condition.).
4. After completion of warm-up, run the engine at idle to check for abnormal noise.
   If the noise is reduced or disappears, clean the lash adjuster (Refer to GROUP 11B, Engine Overhaul - Rocker Arms and Camshaft - Lash Adjuster Inspection P.11B-43). 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.).
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 - Lash Adjuster Inspection P.11B-43).




**Bleeding 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.

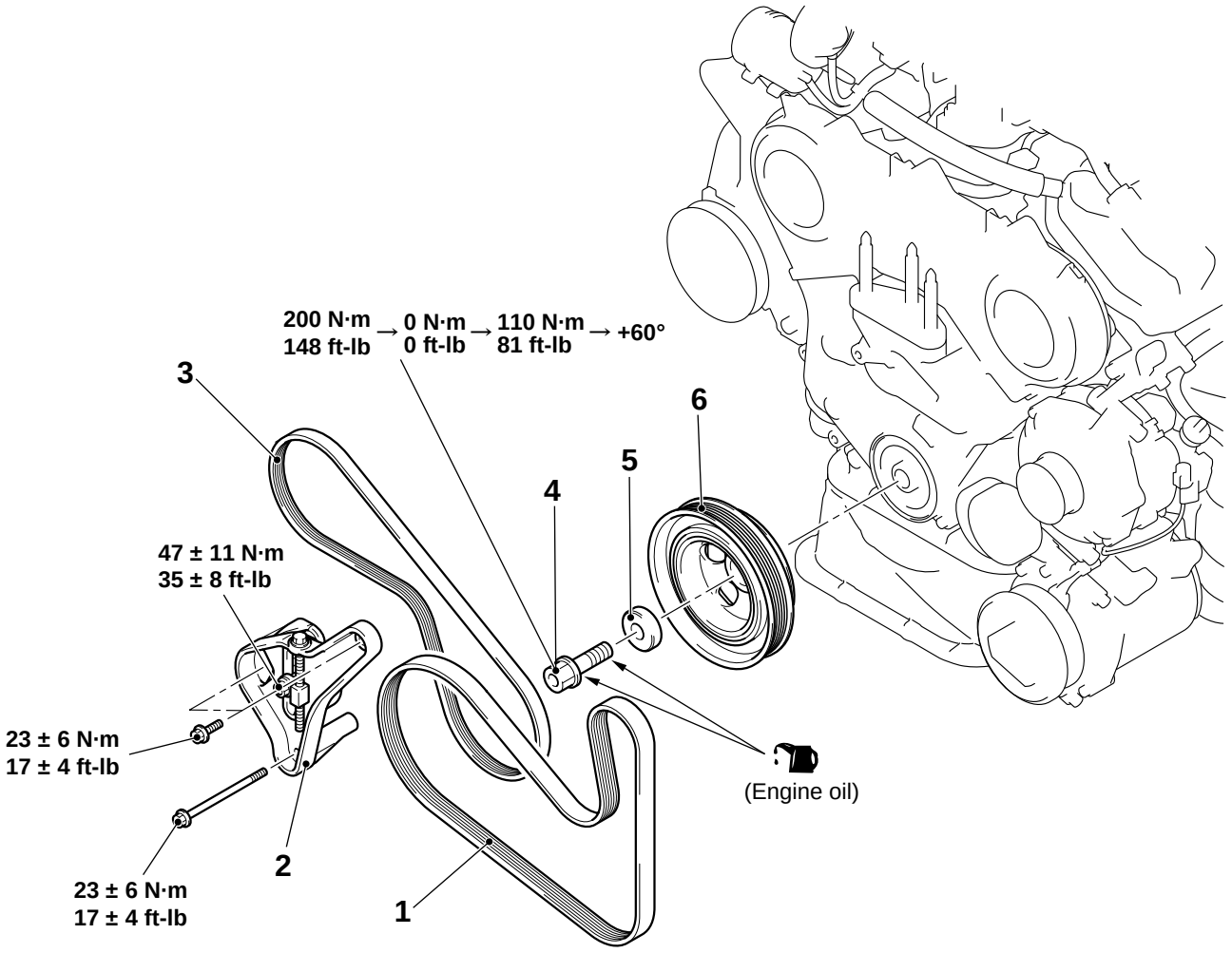
# CRANKSHAFT PULLEY

## REMOVAL AND INSTALLATION

M11102000016USA0000010000

**Pre-removal Operation**
- Engine Room Side Under Cover Removal (Refer to GROUP 51A, Under Cover P.51A-18).

**Post-installation Operation**
- Drive Belt Tension Check and Adjustment (Refer to P.11A-9).
- Engine Room Side Under Cover Installation (Refer to GROUP 51A, Under Cover P.51A-18).

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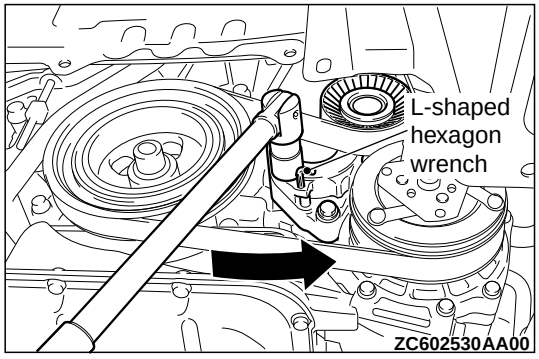
| | | Removal steps | | | | | Removal steps |
|---|---|---|---|---|---|---|---|
| <<A>> | 1. | Generator drive belt | <<B>> | >>A<< | 4. | Crankshaft pulley center bolt |
| | 2. | Power steering tensioner pulley bracket assembly | <<B>> | >>A<< | 5. | Crankshaft pulley washer |
| | 3. | Power steering oil pump drive belt | <<B>> | >>A<< | 6. | Crankshaft pulley |

Required Special Tools:
- MB990767: End Yoke Holder
- MD998719: Pin

## REMOVAL SERVICE POINTS

### <<A>> GENERATOR DRIVE BELT REMOVAL

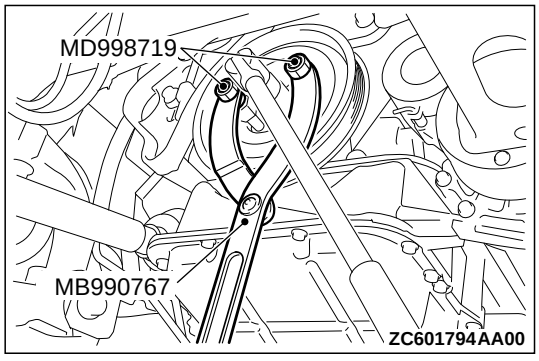



**⚠ CAUTION**

**When the generator drive belt is reused, draw an arrow indicating the rotating direction on the back of the belt using chalk to install the same direction.**

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

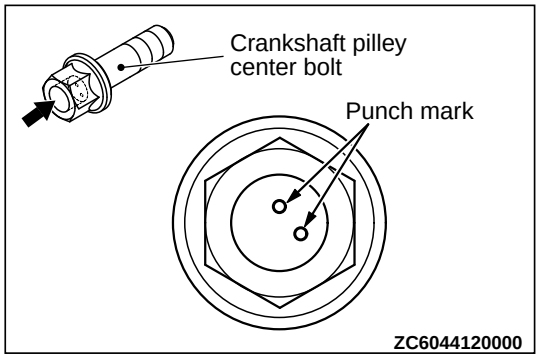
### <<B>> CRANKSHAFT PULLEY CENTER BOLT/ CRANKSHAFT PULLEY WASHER/CRANKSHAFT PULLEY REMOVAL




**⚠ CAUTION**

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

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

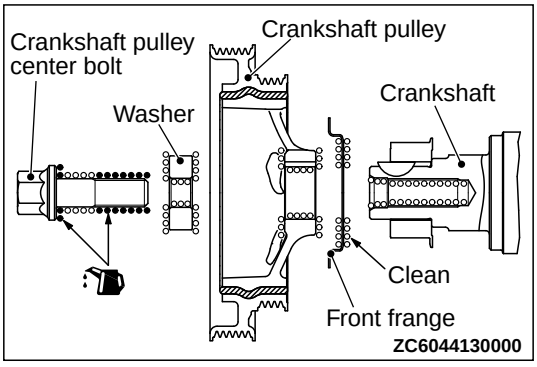



**⚠ CAUTION**

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

## INSTALLATION SERVICE POINT

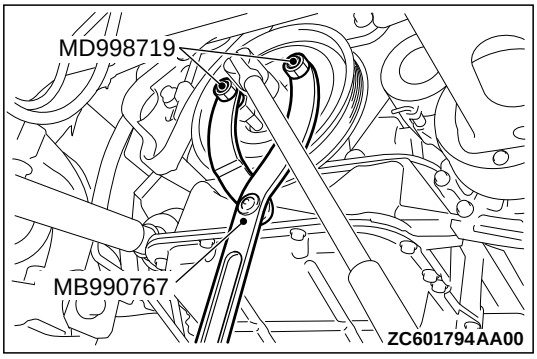
### >>A<< CRANKSHAFT PULLEY/CRANKSHAFT PULLEY WASHER/CRANKSHAFT PULLEY CENTER BOLT INSTALLATION




**⚠ CAUTION**

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

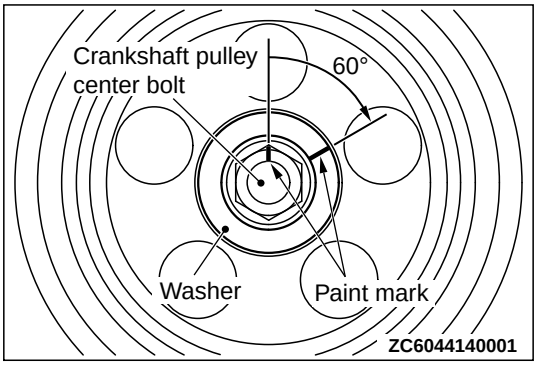
1. Clean the bolt hole in crankshaft bolt and crankshaft pulley's seating surface.
2. Degrease the cleaned seating surface of the front flange and crankshaft pulley.
3. Install the front flange and crankshaft pulley.
4. Apply oil to the threads of crankshaft bolt and the outer surface of washer.
5. Use special tools MB990767 and MD998719 to install the crankshaft pulley.
6. Tighten the crankshaft bolt to 200 N·m (148 ft-lb).
7. Loosen the crankshaft bolt fully.
8. Tighten the crankshaft bolt to 110 N·m (81 ft-lb).




9. Make a paint mark on the crankshaft bolt.

**⚠ CAUTION**

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




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

# CAMSHAFT OIL SEAL

## REMOVAL AND INSTALLATION

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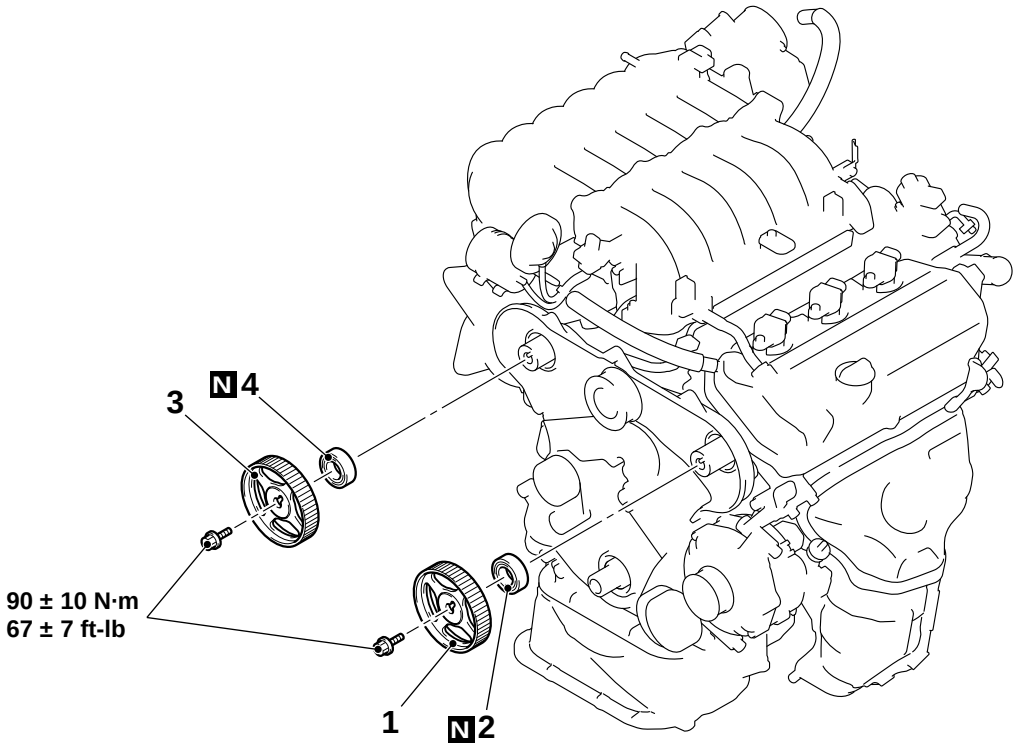
**Pre-removal and Post-installation Operation**

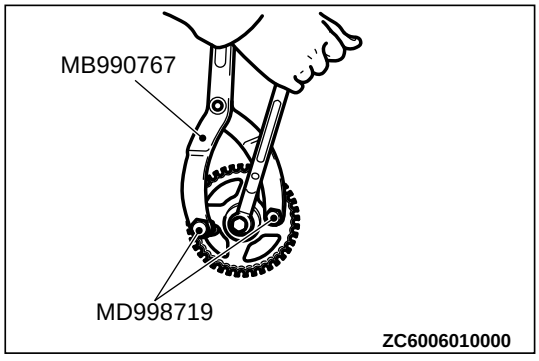
- Timing Belt Removal and Installation (Refer to P.11A-49).



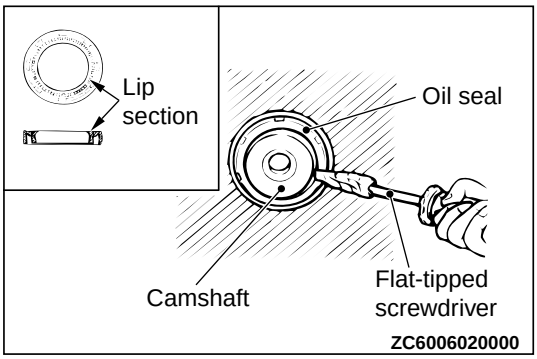

| | | | Removal steps |
|---|---|---|---|
| <<A>> | >>B<< | 1. | Left bank camshaft sprocket |
| <<B>> | >>A<< | 2. | Camshaft oil seal |
| <<A>> | >>B<< | 3. | Right bank camshaft sprocket |
| <<B>> | >>A<< | 4. | Camshaft oil seal |

Required Special Tools:
- MB990767: End Yoke Holder
- MD998713: Camshaft Oil Seal Installer
- MD998719: Pin
- MD998777: Camshaft Oil Seal Installer Adapter

## REMOVAL SERVICE POINTS




**<<A>> CAMSHAFT SPROCKET REMOVAL**
Use special tools MB990767 and MD998719 to remove the camshaft sprocket.




**<<B>> CAMSHAFT OIL SEAL REMOVAL**

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

**⚠ CAUTION**

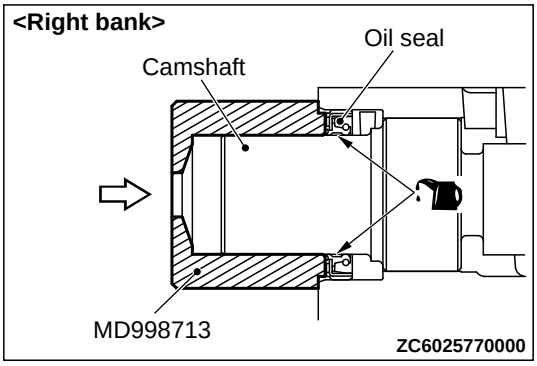
**Be careful not to damage the camshaft and the cylinder head.**

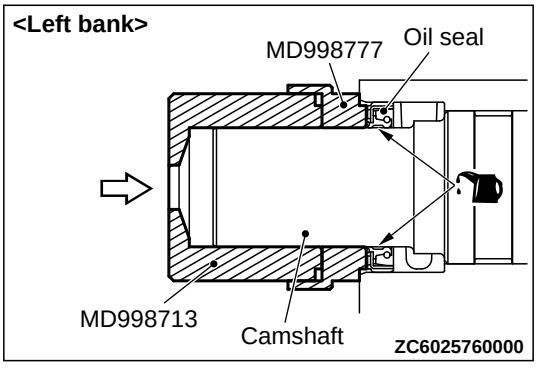
2. Cover the end of a flat-tipped screwdriver with a shop towel and insert into the notched section of the oil seal, and pry out the oil seal to remove it.

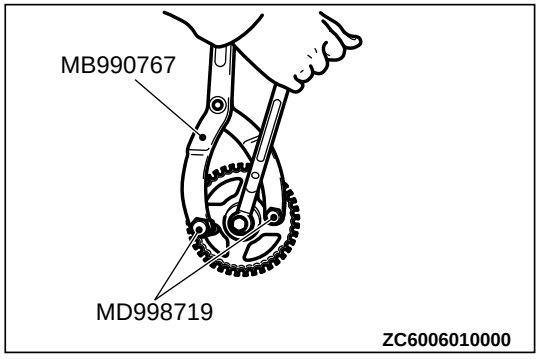
## INSTALLATION SERVICE POINTS

**>>A<< CAMSHAFT OIL SEAL INSTALLATION**

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






**>>B<< CAMSHAFT SPROCKET INSTALLATION**

1. Use special tools MB990767 and MD998719 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: 90 ± 10 N·m (67 ± 7 ft-lb)**

# CAMSHAFT AND VALVE STEM SEAL

## REMOVAL AND INSTALLATION

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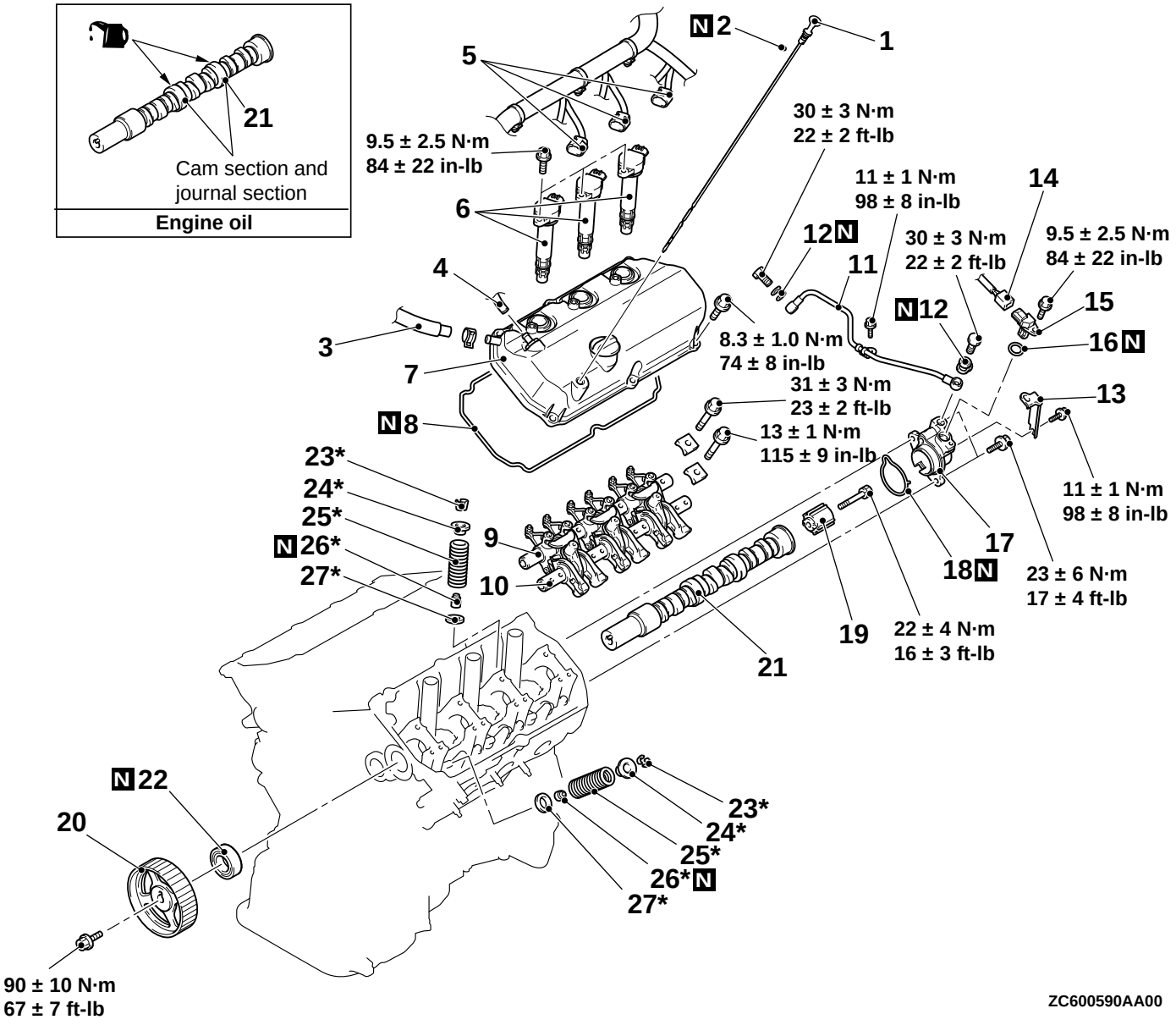
**⚠ CAUTION**

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

## <Left bank>




**Camshaft removal steps**

- Engine cover (Refer to GROUP 16c, Ignition Coil P.16c-6). <<A>> >>D<<
- Timing belt (Refer to P.11A-49).
- Thermostat housing (Refer to GROUP 14, Water Hose and Water Pipe P. 14-23). <<A>> >>D<<

1. Engine oil level gauge
2. O-ring
3. Blow-by hose connection
4. PCV hose connection
5. Ignition coil connector
6. Ignition coil
7. Rocker cover

**Camshaft removal steps**

8. Rocker cover gasket
9. Rocker arm and shaft assembly (intake side)
10. Rocker arm, shaft and lash adjuster assembly (exhaust side)
11. Oil pipe assembly
12. Gasket
13. Harness bracket
14. Camshaft position sensor connector
15. Camshaft position sensor
16. O-ring
17. Camshaft position sensor support

**Camshaft removal steps**

18. Camshaft position sensor support gasket
19. Camshaft position sensing cylinder

<<B>> >>G<< 20. Camshaft sprocket

21. Camshaft

<<C>> >>F<< 22. Camshaft oil seal

**Valve stem seal removal steps**

· Engine cover (Refer to GROUP 16c, Ignition Coil P.16c-6).

1. Engine oil level gauge
2. O-ring
3. Blow-by hose connection
4. PCV hose connection
5. Ignition coil connector
6. Ignition coil

**Valve stem seal removal steps**

>>E<< 7. Rocker cover

8. Rocker cover gasket

<<A>> >>D<< 9. Rocker arm and shaft assembly (intake side)

<<A>> >>D<< 10. Rocker arm, shaft and lash adjuster assembly (exhaust side)

· Spark plug (Refer to GROUP 16c, Ignition Coil P.16c-6).

· Engine hanger

<<E>> >>C<< 23. Valve spring retainer lock

24. Valve spring retainer

>>B<< 25. Valve spring

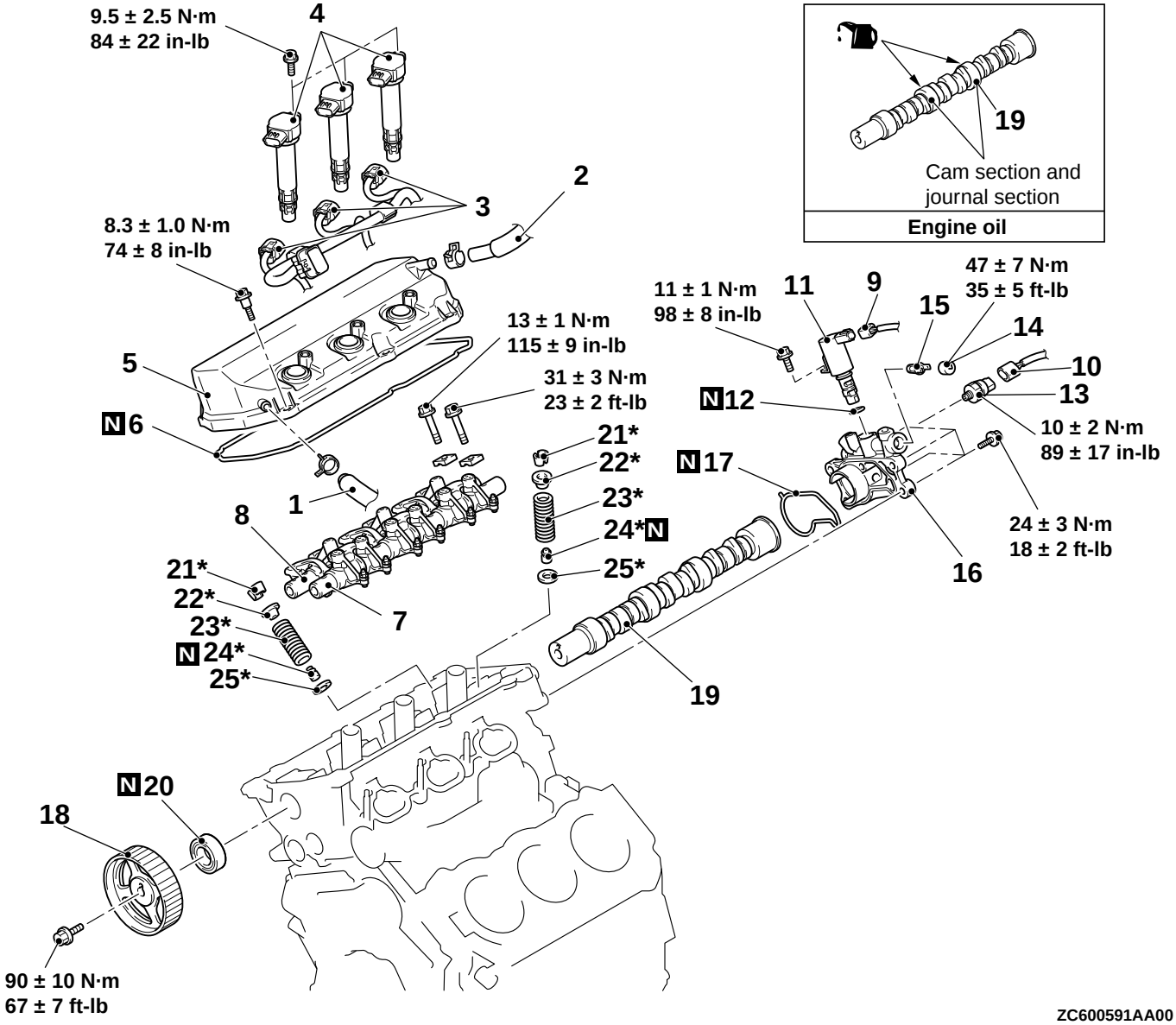
>>A<< 26. Valve stem seal

27. Valve spring seat

Required Special Tools:

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

## <Right bank>

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**Camshaft removal steps**

- Intake manifold plenum (Refer to GROUP 15, Intake Manifold Plenum P. 15-7).
- Timing belt (Refer to P.11A-49).
- Thermostat housing (Refer to GROUP 14, Water Hose and Water Pipe P. 14-23).

1. Blow-by hose connection
2. Breather hose connection
3. Ignition coil connector
4. Ignition coil
5. Rocker cover
6. Rocker cover gasket

<<A>> >>D<< 7. Rocker arm and shaft assembly (intake side)

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

9. Engine oil control valve connector
10. Engine oil pressure switch connector

>>I<< 11. Engine oil control valve

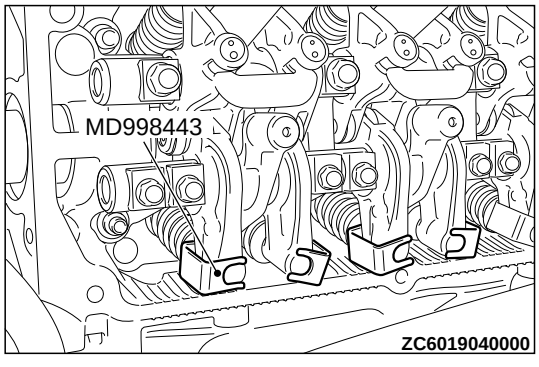
>>I<< 12. O-ring

>>H<< 13. Engine oil pressure switch

14. Plug
15. Engine oil control valve filter
16. Engine oil control valve housing
17. Engine oil control valve housing gasket

| | | | |
|---|---|---|---|
| | | | **Camshaft removal steps** |
| <<B>> | >>G<< | 18. | Camshaft sprocket |
| | | · | Engine control module [Refer to GROUP 13Aa, Engine Control Module (ECM) P.13Aa-37]. |
| | | · | Air cleaner bracket (Refer to GROUP 15, Air Cleaner P.15-6). |
| | | 19. | Camshaft |
| <<C>> | >>F<< | 20. | Camshaft oil seal |
| | | | **Valve stem seal removal steps** |
| | | · | Intake manifold plenum (Refer to GROUP 15, Intake Manifold Plenum P. 15-7). |
| | | · | Timing belt (Refer to P.11A-49). |
| | | 1. | Blow-by hose connection |
| | | 2. | Breather hose connection |
| | | 3. | Ignition coil connector |
| | | 4. | Ignition coil |
| | | | **Valve stem seal removal steps** |
| | >>E<< | 5. | Rocker cover |
| | | 6. | Rocker cover gasket |
| <<A>> | >>D<< | 7. | Rocker arm and shaft assembly (intake side) |
| <<A>> | >>D<< | 8. | Rocker arm, shaft and lash adjuster assembly (exhaust side) |
| | | · | Spark plug (Refer to GROUP 16c, Ignition Coil P.16c-6). |
| <<D>> | | · | Power steering oil pump (Refer to GROUP 37, Power Steering Oil Pump Assembly P.37-34). |
| <<E>> | >>C<< | 21. | Valve spring retainer lock |
| | | 22. | Valve spring retainer |
| | >>B<< | 23. | Valve spring |
| | >>A<< | 24. | Valve stem seal |
| | | 25. | Valve spring seat |

**Required Special Tools:**
- MB990767: End Yoke Holder
- MB992182: Valve Stem Seal Installer
- MD998443: Auto-lash Adjuster Holder
- MD998713: Camshaft Oil Seal Installer
- MD998719: Pin
- MD998772: Valve Spring Compressor




## REMOVAL SERVICE POINTS

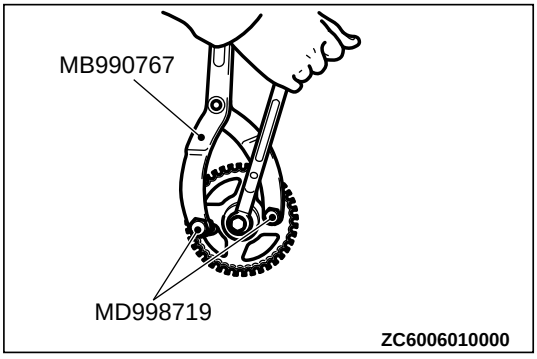
### <<A>> ROCKER ARM AND SHAFT ASSEMBLY (INTAKE SIDE)/ROCKER ARM, SHAFT AND LASH ADJUSTER ASSEMBLY (EXHAUST SIDE) REMOVAL

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

**⚠ CAUTION**

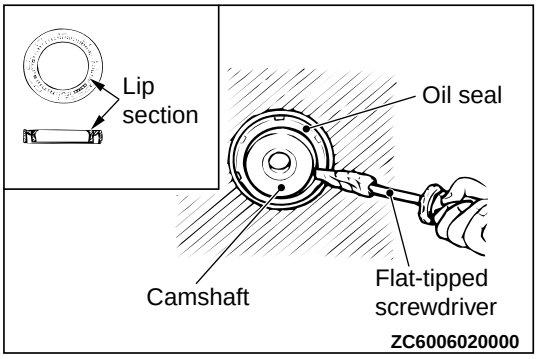
**Never disassemble the rocker arm and shaft assembly.**

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




**<<B>> CAMSHAFT SPROCKET REMOVAL**

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




**<<C>> CAMSHAFT OIL SEAL REMOVAL**

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

**⚠ CAUTION**

**Be careful not to damage the camshaft and the cylinder head.**

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

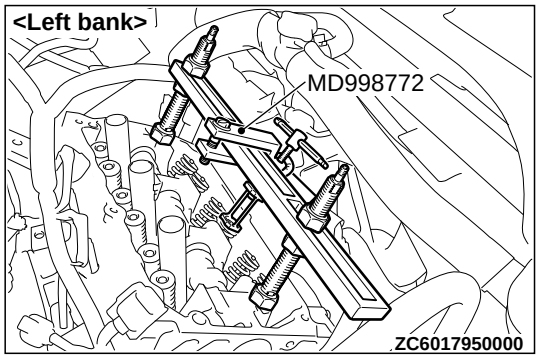
**<<D>> POWER STEERING OIL PUMP REMOVAL**

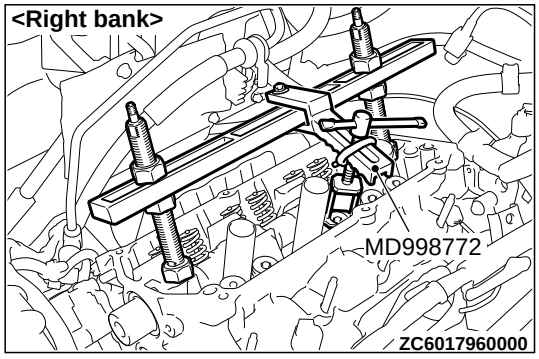
1. With the hose installed, remove the power steering oil pump from the bracket.
2. Tie the removed power steering oil pump using a string at a position where it will not interfere with the removal and installation of valve stem seal.

**<<E>> VALVE SPRING RETAINER LOCK REMOVAL**

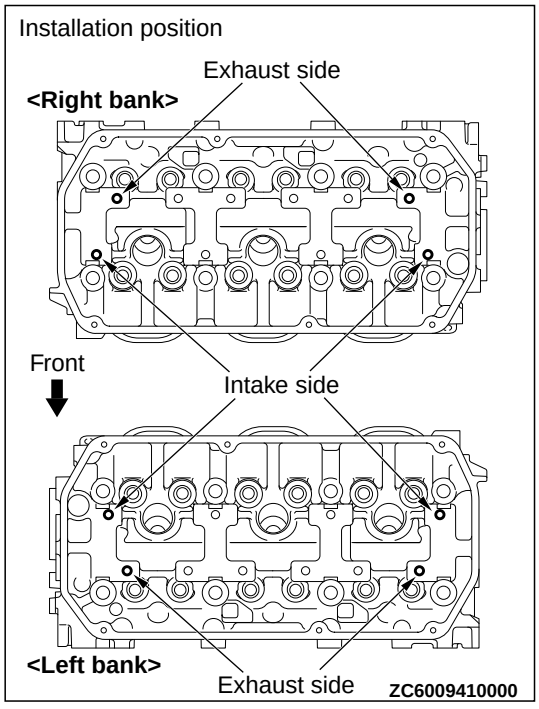
**⚠ CAUTION**

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




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

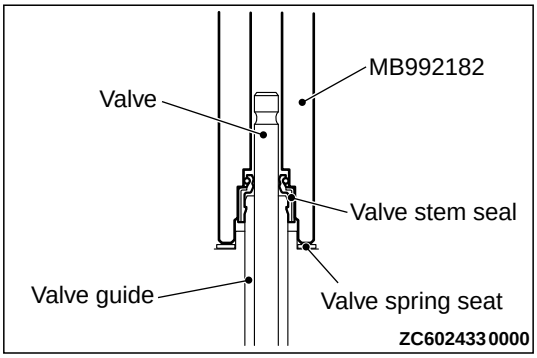



*NOTE: Installation position of special tool is different between exhaust side and intake side.*

## INSTALLATION SERVICE POINTS

**>>A<< VALVE STEM SEAL INSTALLATION**

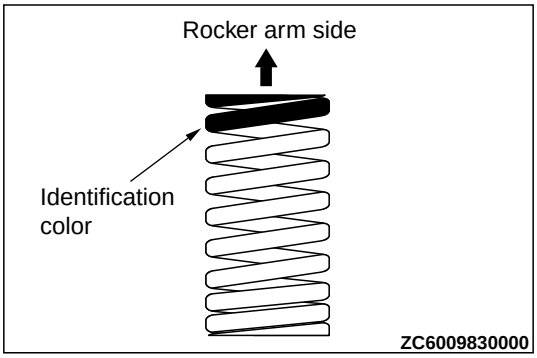
1. Apply a small amount of engine oil to the valve stem seal.




**⚠ CAUTION**

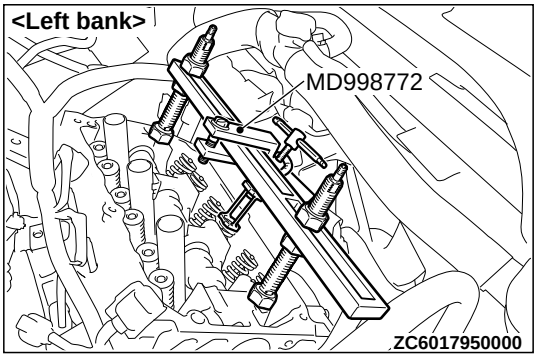
- **Valve stem seals cannot be reused.**
- **Special tool must be used to install the valve stem seal. Improper installation could result in oil leaking past the valve guide.**

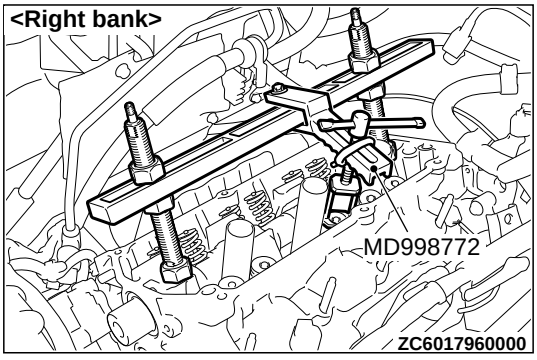
2. Use special tool MB992182 to fill a new valve stem seal in the valve guide using the valve stem area as a guide.




**>>B<< VALVE SPRING INSTALLATION**

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



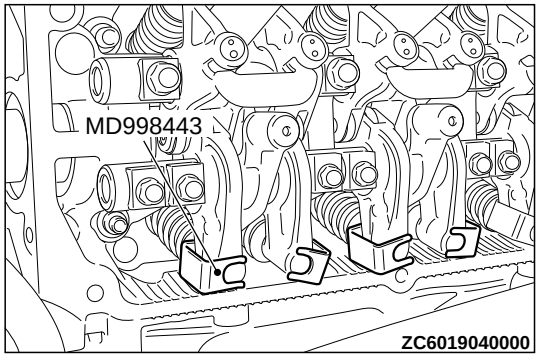




**>>C<< VALVE SPRING RETAINER LOCK INSTALLATION**

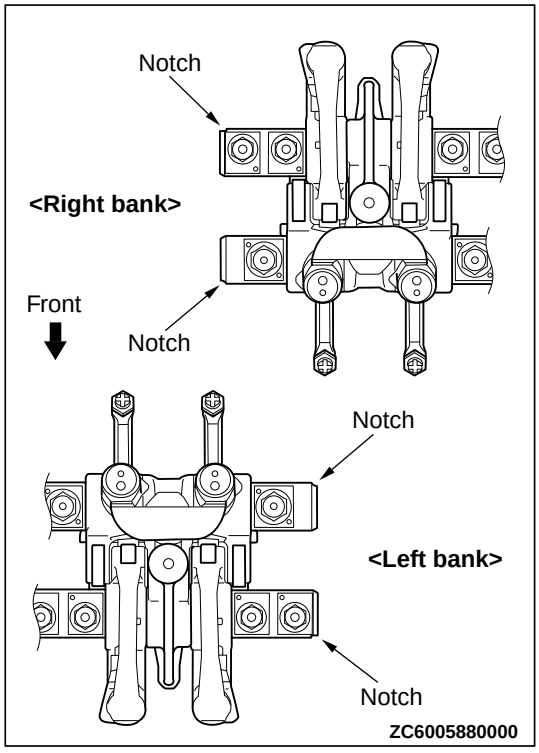
Use special tool MD998772 to compress the valve spring in the same manner as removal.

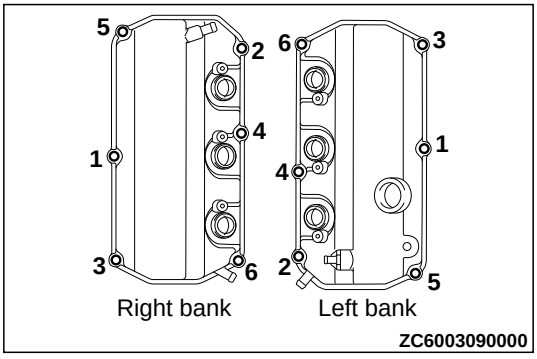
**>>D<< ROCKER ARM, SHAFT AND LASH ADJUSTER ASSEMBLY (EXHAUST SIDE)/ROCKER ARM AND SHAFT ASSEMBLY (INTAKE SIDE) INSTALLATION**

1. Install the rocker arm, shaft and lash adjuster assembly (exhaust side) and rocker arm and shaft assembly (intake side).
2. Tighten the mounting bolts to the specified torque.
   **Tightening torque:**
   **<Intake side> 31 ± 3 N·m (23 ± 2 ft-lb)**
   **<Exhaust side> 13 ± 1 N·m (115 ± 9 in-lb)**
3. Remove special tool MD998443.



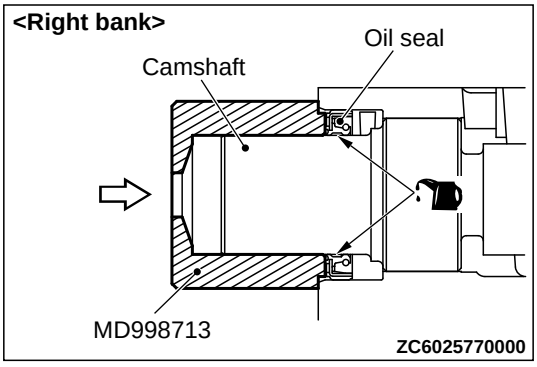

4. Check that notches in the each rocker shaft are facing the direction shown in the illustration.

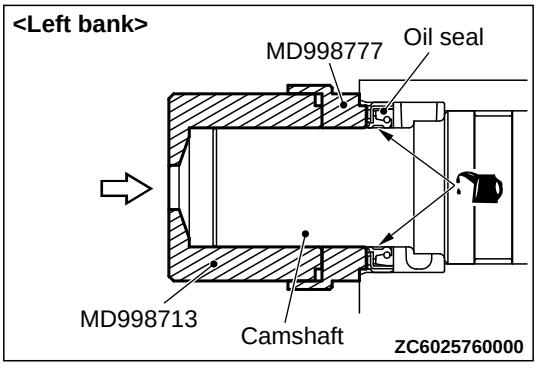





**>>E<< ROCKER COVER INSTALLATION**

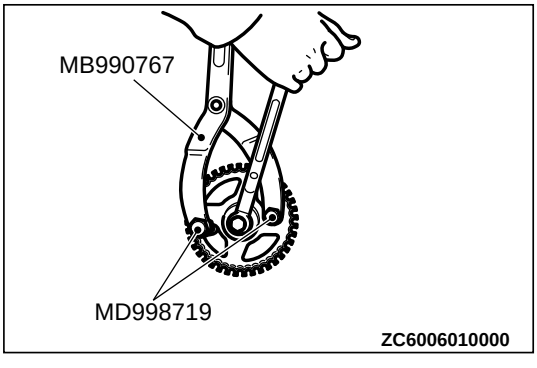
Tighten the bolts in order of the numbers shown in the illustration.




**>>F<< CAMSHAFT OIL SEAL INSTALLATION**

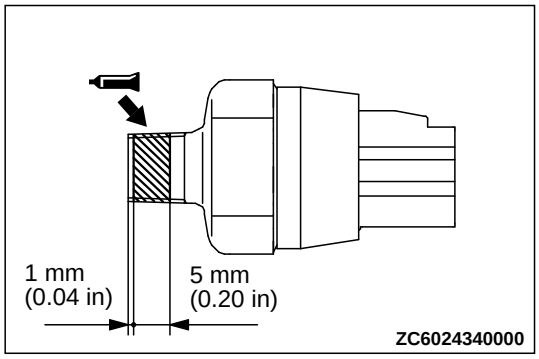
1. Apply engine oil to the camshaft oil seal lip.
2. Use special tools MD998713 and MD998777 to press-fit the camshaft oil seal.




**>>G<< CAMSHAFT SPROCKET INSTALLATION**

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

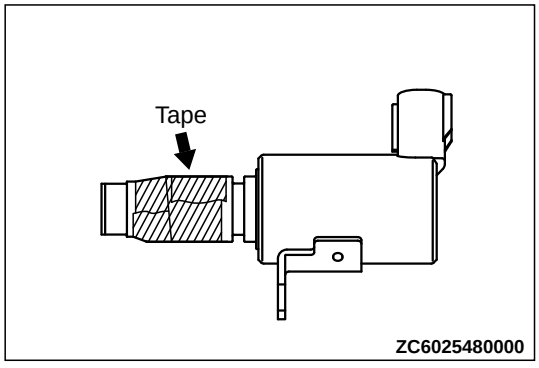
**Tightening torque: 90 ± 10 N·m (67 ± 7 ft-lb)**




**>>H<< ENGINE OIL PRESSURE SWITCH INSTALLATION**

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

**Specified Sealant: 3M™ ADD Part number 8672 or equivalent**




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

**⚠ CAUTION**

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

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

**Tightening torque: 11 ± 1 N·m (98 ± 8 in-lb)**

# OIL PAN AND OIL STRAINER

## REMOVAL AND INSTALLATION

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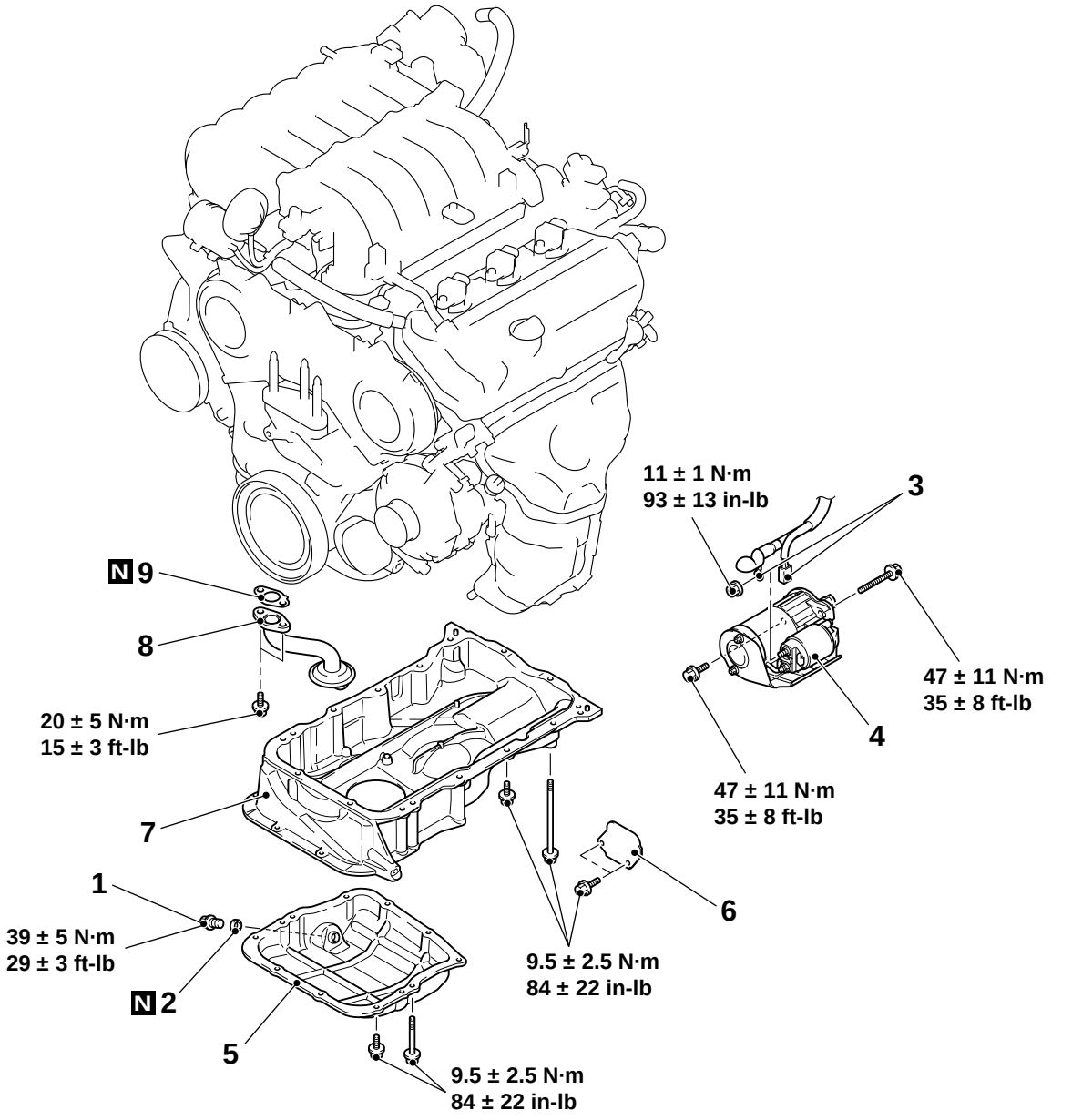
**Pre-removal and Post-installation Operation**

- Under Cover Removal and Installation (Refer to GROUP 51A, Under Cover P.51A-18).
- Engine Oil Draining and Refilling (Refer to GROUP 12, On-vehicle Service - Engine Oil Replacement P.12-4).

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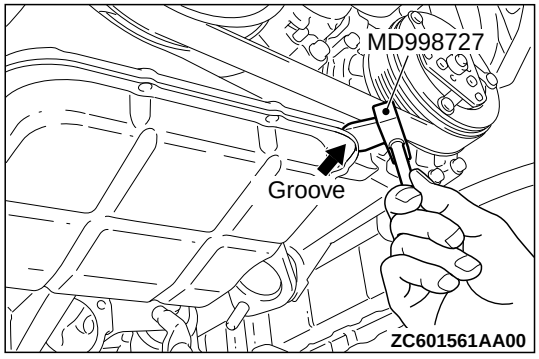
| | | | Removal steps |
|---|---|---|---|
| | | 1. | Engine oil pan drain plug |
| | >>C<< | 2. | Engine oil pan drain plug gasket |
| | | 3. | Starter connector and terminal |
| | | 4. | Starter assembly |
| <<A>> | >>B<< | 5. | Engine lower oil pan |
| | | · | Front exhaust pipe (Refer to GROUP 15, Exhaust Pipe and Main Muffler P. 15-16). |

| | | | Removal steps |
|---|---|---|---|
| | >>A<< | 6. | Cover |
| <<B>> | >>A<< | 7. | Engine upper oil pan |
| | | 8. | Oil strainer |
| | | 9. | Oil strainer gasket |

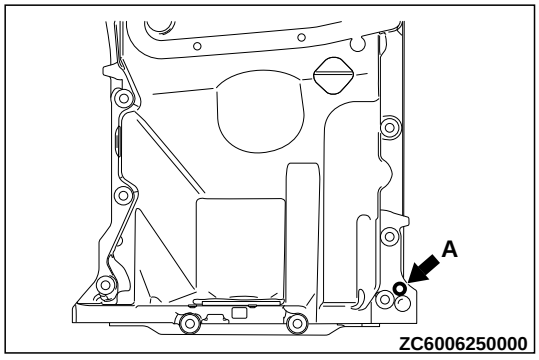
Required Special Tool: MD998727: Oil Pan FIPG Cutter

## REMOVAL SERVICE POINTS




**<<A>> ENGINE LOWER OIL PAN REMOVAL**

Insert the special tool MD998727, into the groove shown in the illustration. Strike and slide it and then cut the liquid gasket.




**<<B>> ENGINE UPPER OIL PAN REMOVAL**

1. Remove the engine upper oil pan mounting bolts.

**⚠ CAUTION**

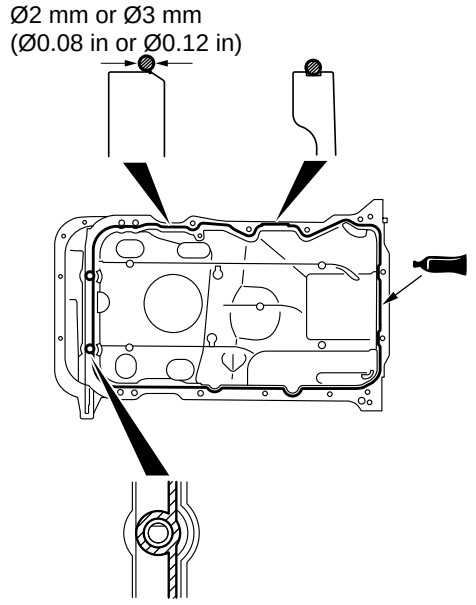
**Do not use special tool MD998727. The engine upper oil pan is made of aluminum and this tool will damage it.**

2. Screw in the bolt (M10 × 1.5) into bolt hole A in the location shown. Then lift the upper oil pan and remove it.

## INSTALLATION SERVICE POINTS

**>>A<< ENGINE UPPER OIL PAN/COVER INSTALLATION**

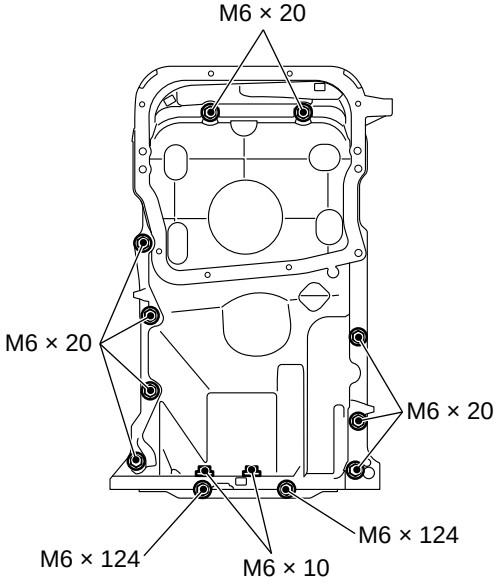
1. Remove sealant from the oil pan and cylinder block mating surfaces.
2. Degrease the sealant-coated surface and the engine mating surface.




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 mm (0.16 inch) in diameter.*
4. Assemble the oil pan to the cylinder block within 15 minutes after applying the sealant.

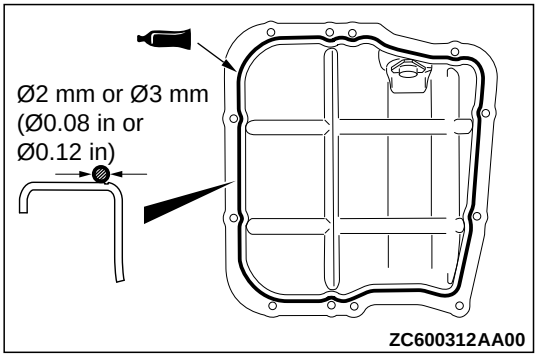
**Bolt specifications**




5. Install the bolts to the engine upper oil pan and cover as shown, and tighten them to the specified torque.
   **Tightening torque: 9.5 ± 2.5 N·m (84 ± 22 in-lb)**

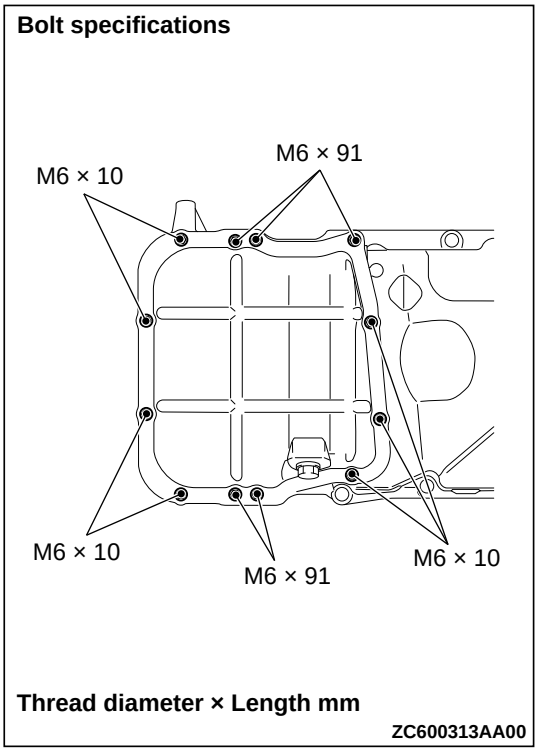
**>>B<< ENGINE LOWER OIL PAN INSTALLATION**

1. Remove sealant from the engine lower oil pan and engine upper oil pan.

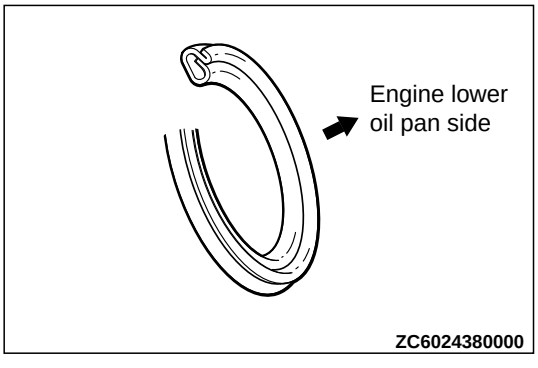



2. Apply a bead of the sealant to the mating surface of the engine lower oil pan as shown.
   **Specified sealant: 3M™ AAD Part No.8672, 8704, 3M™ AAD Part No.8679/8678 or equivalent**

   *NOTE: Install the engine lower oil pan within 15 minutes after applying sealant.*
3. Assemble the engine lower oil pan to the engine upper oil pan.




4. Install the bolts to the lower oil pan as shown, and tighten them to the specified torque.
   **Tightening torque: 9.5 ± 2.5 N·m (84 ± 22 in-lb)**




**>>C<< ENGINE OIL PAN DRAIN PLUG INSTALLATION**
Replace the gasket with a new gasket. Install the new gasket in the direction shown in the illustration.

## INSPECTION

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- Check the oil pan for cracks.

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

# CRANKSHAFT FRONT OIL SEAL

## REMOVAL AND INSTALLATION

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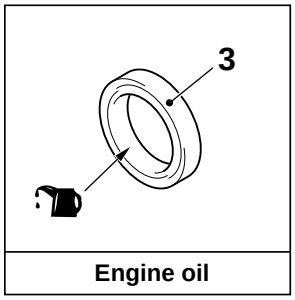
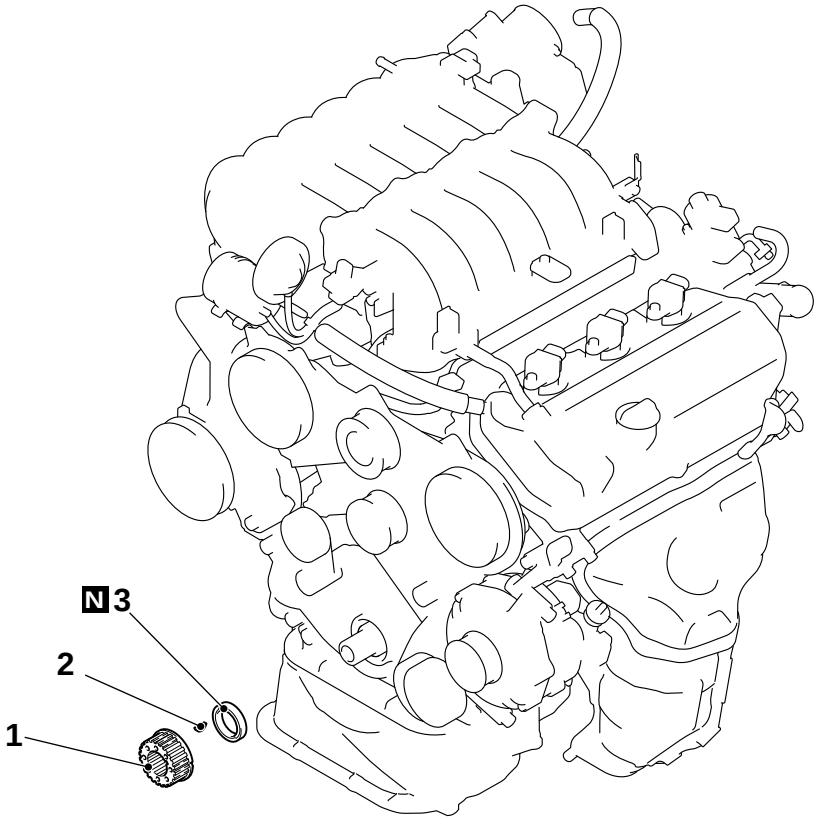
**Pre-removal and Post-installation Operation**
- Timing Belt Removal and Installation (Refer to P.11A-49).

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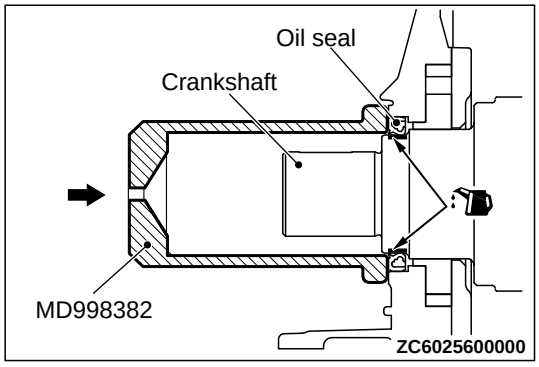
| | | Removal steps |
|---|---|---|
| >>B<< | 1. | Crankshaft sprocket |
| | 2. | Key |
| >>A<< | 3. | Crankshaft front oil seal |

Required Special Tool:
- MD998382: Crankshaft Front Oil Seal Installer

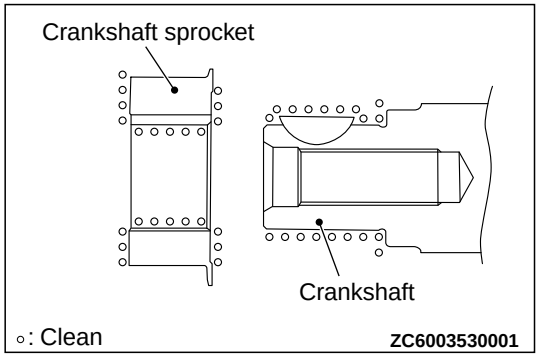
## INSTALLATION SERVICE POINTS

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

1. Apply a small amount of engine oil to the oil seal lip and then insert the o-ring.




2. Using special tool MD998382, tap the oil seal into the front case.




**>>B<< CRANKSHAFT SPROCKET INSTALLATION**
Clean the crankshaft and crankshaft sprocket, and mount them.

# CRANKSHAFT REAR OIL SEAL

## REMOVAL AND INSTALLATION

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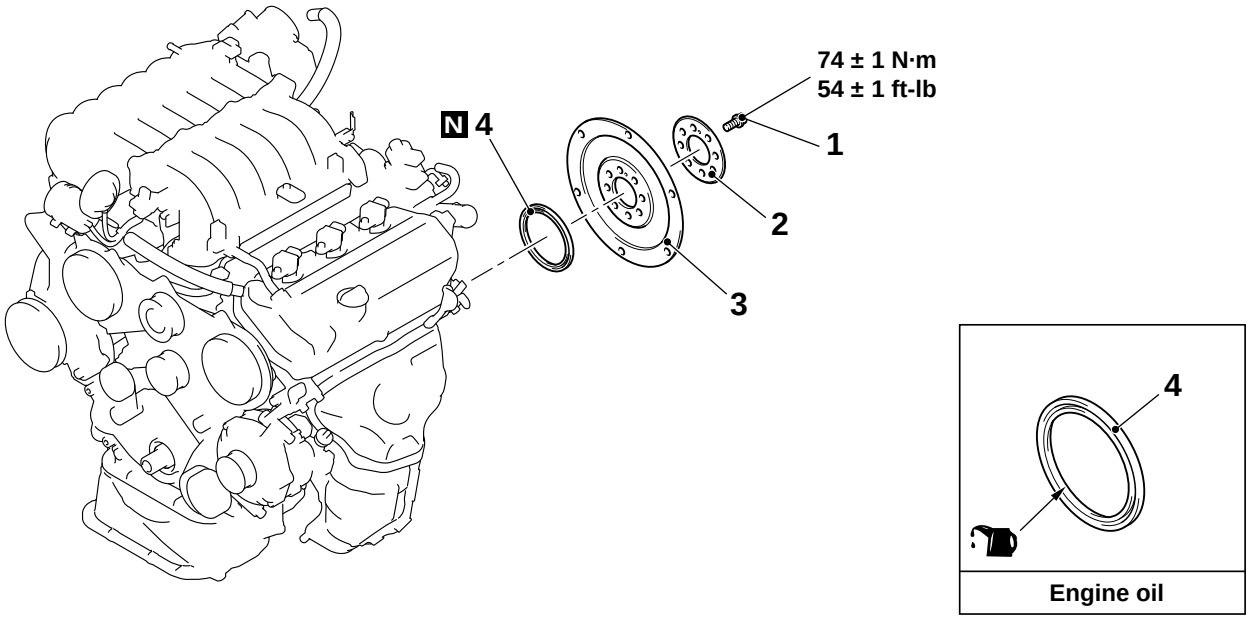
**Pre-removal and Post-installation Operation**
- Transaxle Assembly Removal and Installation (Refer to GROUP 23A, Transaxle Assembly P.23A-170).

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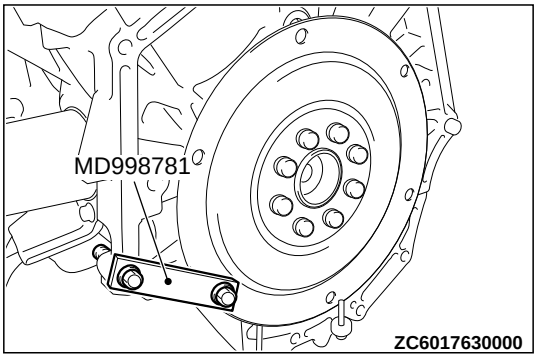
| | | | Removal steps |
|---|---|---|---|
| <<A>> | >>B<< | 1. | Drive plate bolts |
| | | 2. | Adaptor plate |
| | | 3. | Drive plate |
| >>A<< | | 4. | Crankshaft rear oil seal |

**Required Special Tools:**
- MB992075: Handle
- MB992183: Crankshaft Rear Oil Seal Installer
- MD998781: Flywheel Stopper

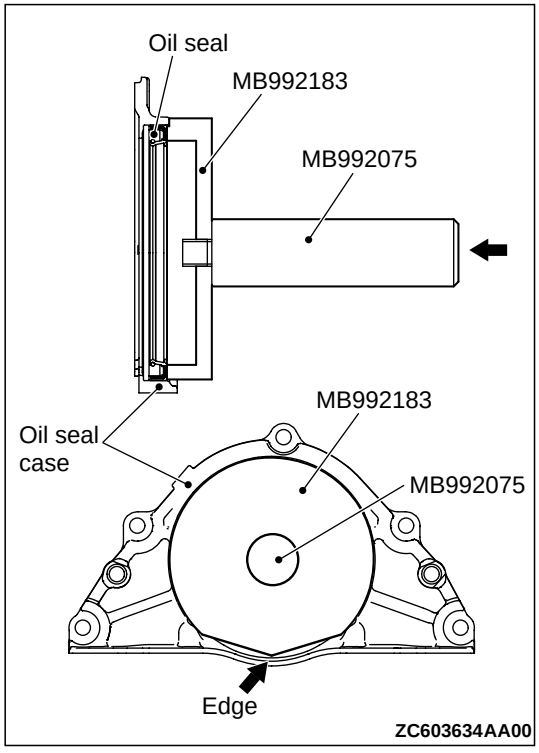
## REMOVAL SERVICE POINT




### <<A>> DRIVE PLATE BOLTS REMOVAL

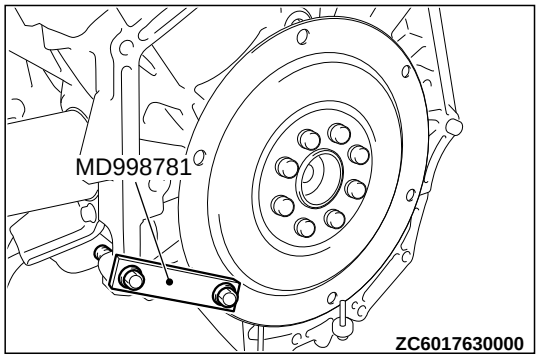
Use special tool MD998781 to secure the drive plate and remove the drive plate bolts.

## INSTALLATION SERVICE POINTS




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

Use special tool MB992075 and MB992183, press-fit a new crankshaft rear oil seal into the oil seal case.




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

1. Use special tool MD998781 to secure the drive plate in the same manner as removal.
2. Tighten the drive plate bolts to the specified torque.

**Tightening torque: 74 ± 1 N·m (54 ± 1 ft-lb)**

# CYLINDER HEAD GASKET

## REMOVAL AND INSTALLATION

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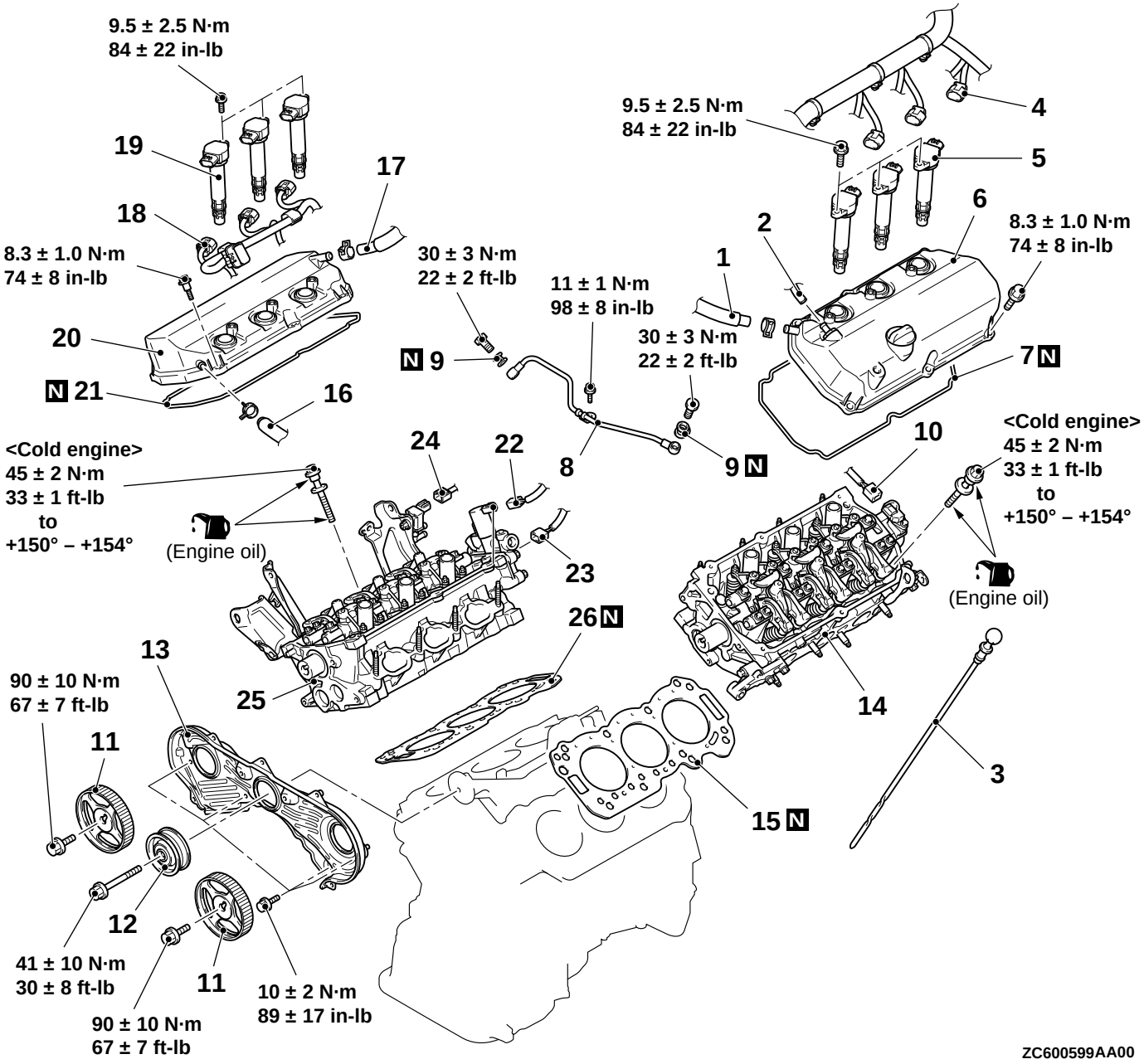
**Pre-removal and Post-installation Operation**

- Intake Manifold Removal and Installation (Refer to GROUP 15, Intake Manifold P.15-8).
- Exhaust Manifold Removal and Installation (Refer to GROUP 15, Exhaust Manifold P.15-11).
- Timing Belt Removal and Installation (Refer to P.11A-49).
- Thermostat Housing Removal and Installation (Refer to GROUP 14, Water Hose and Water Pipe P.14-23).

▪ Generator Removal and Installation (Refer to GROUP 16a, Generator Assembly P.16a-13).

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| | | Removal steps | | | Removal steps |
|---|---|---|---|---|---|
| | 1. | Blow-by hose connection | | 12. | Idler pulley |
| | 2. | PCV hose connection | | 13. | Timing belt rear cover |
| | 3. | Engine oil dipstick | <<B>> >>A<< | 14. | Left bank cylinder head assembly |
| | 4. | Ignition coil connector | | 15. | Cylinder head gasket |
| | 5. | Ignition coil | | 16. | Blow-by hose connection |
| | 6. | Rocker cover | | 17. | Breather hose connection |
| | 7. | Rocker cover gasket | | 18. | Ignition coil connector |
| | 8. | Oil pipe | | 19. | Ignition coil |
| | 9. | Gasket | | 20. | Rocker cover |
| | 10. | Camshaft position sensor connector | | 21. | Rocker cover gasket |
| <<A>> >>B<< | 11. | Camshaft sprocket | | 22. | Engine oil control valve connector |

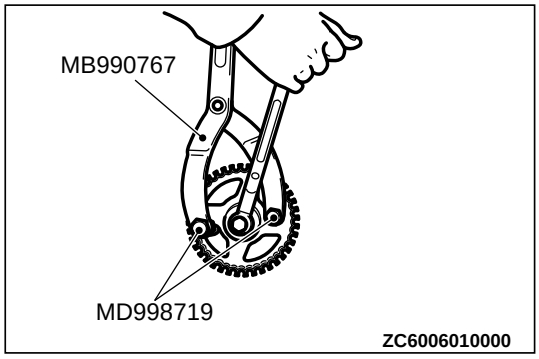
| | | Removal steps |
|---|---|---|
| | 23. | Engine oil pressure switch connector |
| | 24. | Solenoid valve connector |
| <<B>> >>A<< | 25. | Right bank cylinder head assembly |
| | 26. | Cylinder head gasket |

Required Special Tools:
- MB990767: End Yoke Holder
- MB991614: Angle Gauge
- MD998719: Pin

## REMOVAL SERVICE POINTS

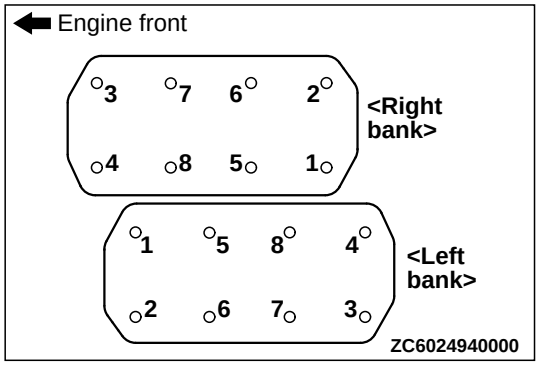
### <<A>> CAMSHAFT SPROCKET REMOVAL

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




### <<B>> CYLINDER HEAD ASSEMBLY REMOVAL

Loosen the bolts in two or three steps in the order of the numbers shown in the illustration, and remove them.



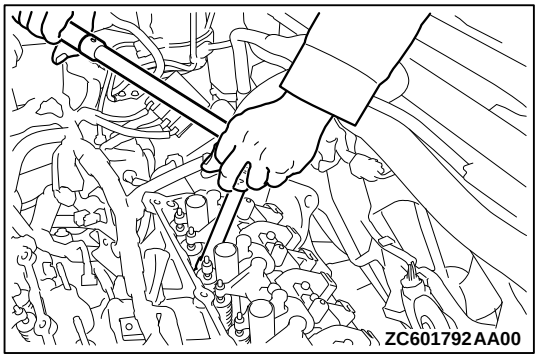

## INSTALLATION SERVICE POINTS

### >>A<< 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.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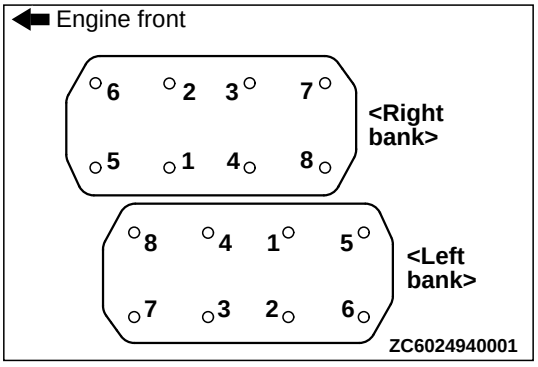
2. Tighten the bolts to the specified torque in the order shown in the illustration. (in two or three cycles)
**Tightening torque: 45 ± 2 N·m (33 ± 1 ft-lb)**



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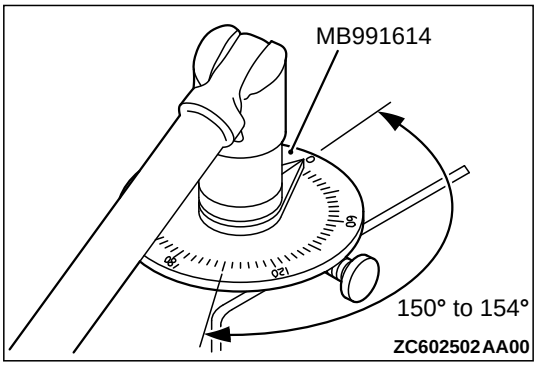

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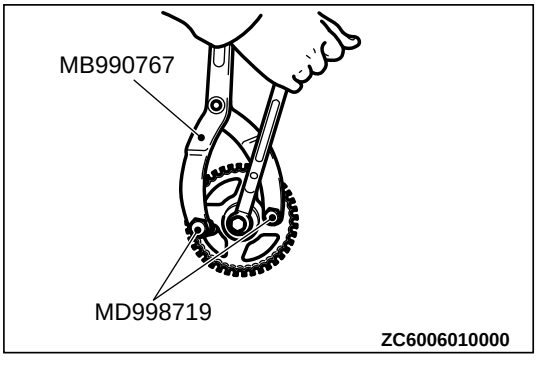
**⚠ CAUTION**
- **If the bolt is turned less than 150 to 154 degrees, proper fastening performance may not be achieved. Be sure to turn the bolt exactly 150 to 154 degrees.**
- **If the bolts is overtightened, loosen the bolt completely and then retighten it by repeating the tightening procedure from step 1.**

3. Using special tool MB991614, tighten the cylinder head bolt another 150 to 154 degrees.



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**>>B<< CAMSHAFT SPROCKET INSTALLATION**

1. Use special tools MB990767 and MD998719 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: 90 ± 10 N·m (67 ± 7 ft-lb)**

# TIMING BELT

## REMOVAL AND INSTALLATION

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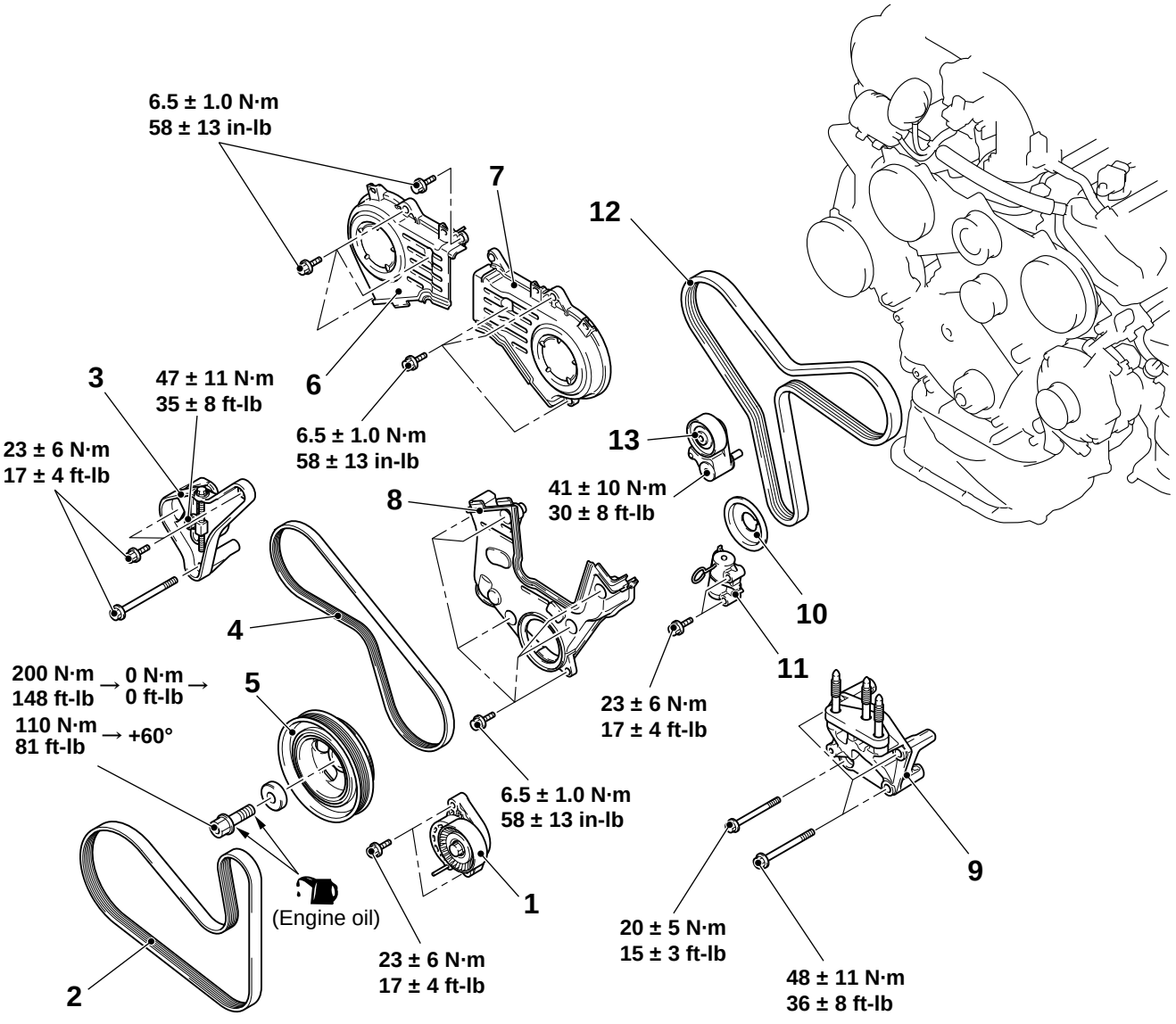
**Pre-removal Operation**
- Engine Cover Removal (Refer to GROUP 16c, Ignition Coil P.16c-6).
- Engine Room Under Cover and Engine Room Side Cover Removal (Refer to GROUP 51A, Under Cover P.51A-18).

**Post-installation Operation**
- Drive Belt Tension Check and Adjustment (Refer to P.11A-9).
- Engine Room Under Cover and Engine Room Side Cover Installation (Refer to GROUP 51A, Under Cover P.51A-18).
- Engine Cover Installation (Refer to GROUP 16c, Ignition Coil P. 16c-6).

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| | | Removal steps |
|---|---|---|
| <<A>> | 1. | Drive belt auto-tensioner |
| <<A>> | 2. | Generator drive belt |
| | 3. | Power steering tensioner pulley bracket |
| | 4. | Power steering oil pump drive belt |
| <<B>> >>B<< | 5. | Crankshaft pulley |
| | 6. | Timing belt front upper cover, right |
| | 7. | Timing belt front upper cover, left |

**Removal steps**

8. Timing belt lower cover
· Engine front mounting bracket (Refer to GROUP 32, Engine Mounting P. 32-3).
9. Engine support bracket

<<C>> >>A<<
<<D>> >>A<<

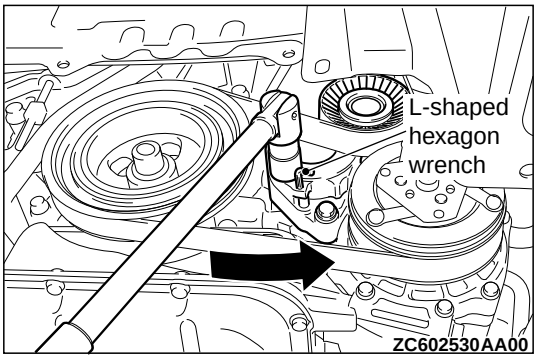
**Removal steps**

10. Front flange
11. Timing belt auto-tensioner
12. Timing belt
13. Tensioner pulley assembly

**Required Special Tools:**
- MB990767: End Yoke Holder
- MD998716: Crankshaft Wrench
- MD998719: Pin

## REMOVAL SERVICE POINTS

### <<A>> DRIVE BELT AUTO-TENSIONER/GENERATOR DRIVE BELT REMOVAL

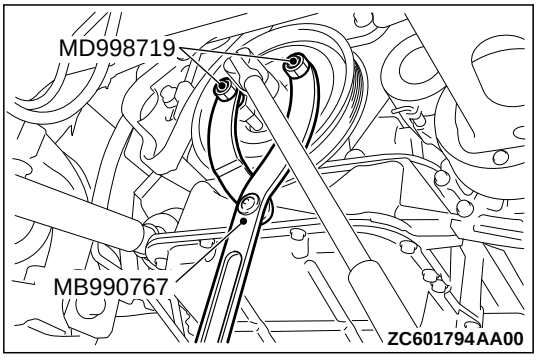



**⚠ CAUTION**

**When the generator drive belt is reused, draw an arrow indicating the rotating direction on the back of the belt using chalk to install the same direction.**

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

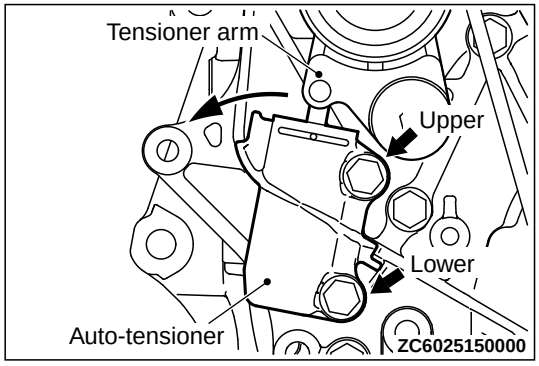
### <<B>> CRANKSHAFT PULLEY REMOVAL




**⚠ CAUTION**

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

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



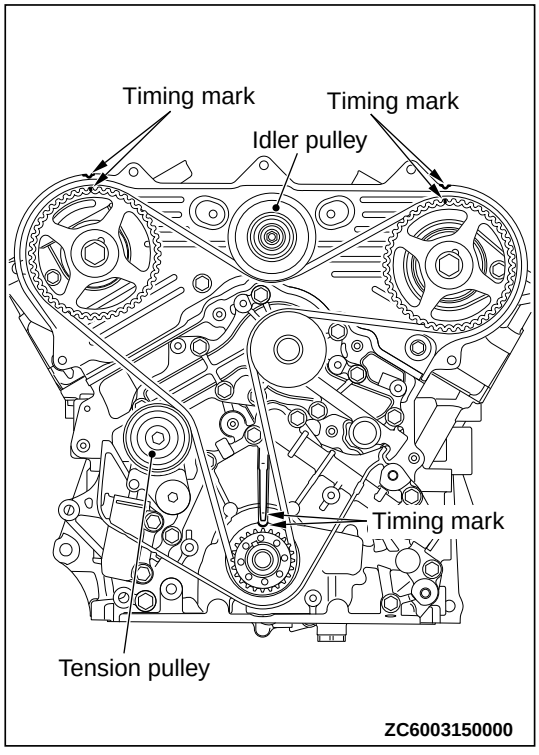

**<<C>> TIMIING BELT AUTO-TENSIONER REMOVAL**

1. Remove the upper tightening bolt of the auto-tensioner.

**⚠ CAUTION**

**The auto-tensioner rotates centering on the flange bolt due to the rod thrust, so please make sure your finger is not trapped.**

2. Loosen the lower tightening bolt of the auto-tensioner slowly and slide the auto-tensioner slightly. Remove the rod from the tensioner arm.
3. Remove the lower tightening bolt of the auto-tensioner.




**<<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 an arrow on the flat side of the belt, indicating the clockwise direction.
3. Loosen the center bolt of the tensioner pulley, then remove the timing belt.

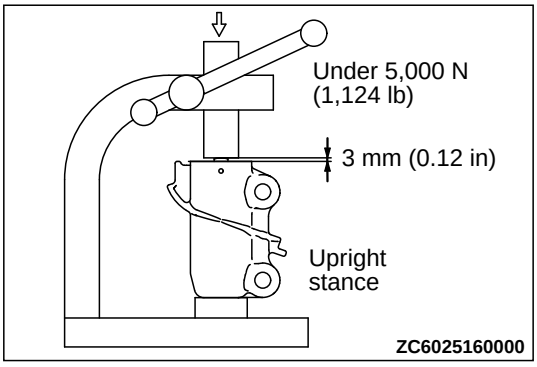
## INSTALLATION SERVICE POINTS

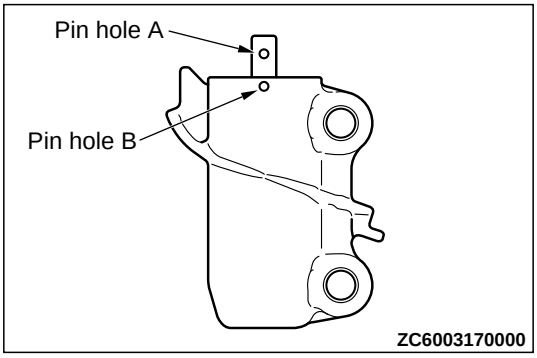
**>>A<< TIMING BELT/TIMING BELT AUTO-TENSIONER INSTALLATION**

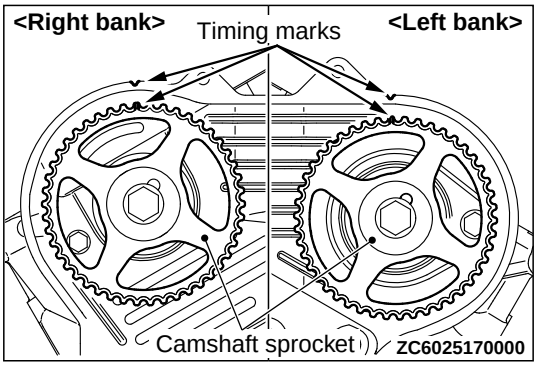
**⚠ CAUTION**

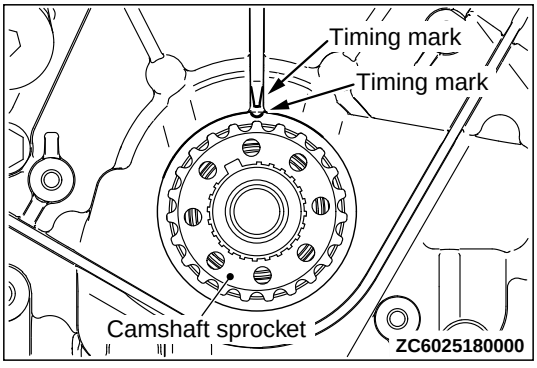
**Always bleed the auto-tensioner of air before installing the auto-tensioner ( P.11A-54).**

Insert the pin into the rod of the auto-tensioner under the following procedures.



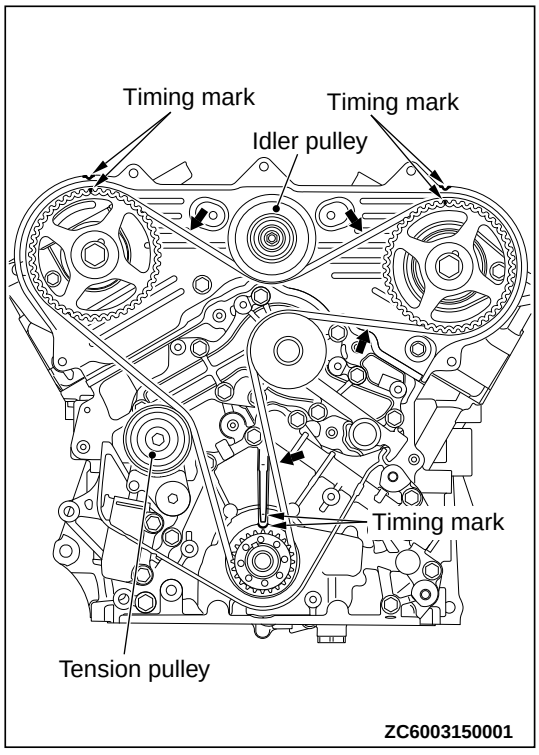

**⚠ CAUTION**

**Notable factors for inserting pin**

- **Always use the vertical press and put the auto-tensioner vertically.**
- **Do not apply the load of 5,000 N (1,124 pound) or more to the rod.**
- **Do not press the rod beyond the dimension shown in the illustration.**

1. Put the auto-tensioner vertically to the vertical press not to be in the sideways direction.
2. Slowly close the vice to force the rod in until the hole (A) of the rod is lined up with set hole (B) of the cylinder.
3. Insert a pin into the set holes.
4. Remove the auto-tensioner from the vice.

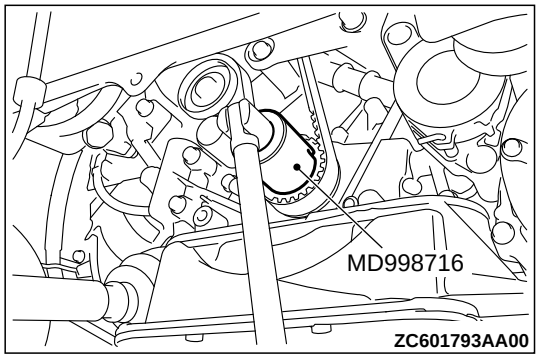
5. Align the timing marks on the camshaft sprockets with those on the timing belt rear cover and the timing mark on the crankshaft sprocket with that on the engine block as shown in the illustration.



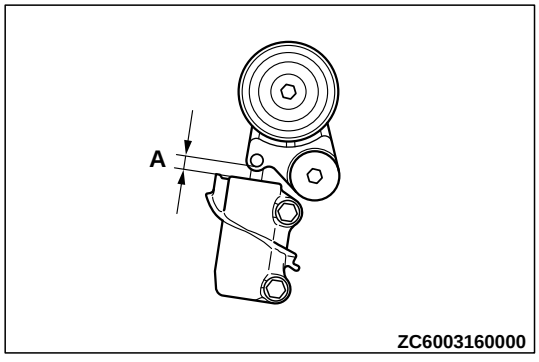

**⚠ CAUTION**

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

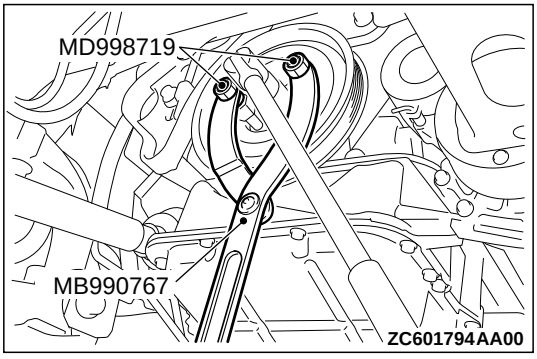
6. Install the timing belt by the following procedure so that there is no deflection in the timing belt between each sprocket and pulley.
   (1) Crankshaft sprocket
   (2) Water pump pulley
   (3) Camshaft sprocket (Left bank)
   (4) Idler pulley
   (5) Camshaft sprocket (Right bank)
   (6) Tensioner pulley
7. Turn the camshaft sprocket (Right bank) counterclockwise until the tension side of the timing belt is firmly stretched. Check all the timing marks again.




8. Use special tool MD998716 to turn the crankshaft 1/4 turn counterclockwise, then turn it again clockwise until the timing marks are aligned.
9. Remove the setting pin that has been inserted into the auto-tensioner.
10. Turn the crankshaft clockwise twice to align the timing marks.




11. Wait for at least five minutes, then check that the auto-tensioner pushrod extends within the standard value range.
    **Standard value (A): 9.1 - 13.4 mm (0.36 - 0.52 inch)**
12. If not, repeat the operation in steps 1 to 6 above.
13. Check again that the timing marks of the sprockets are aligned.




**>>B<< CRANKSHAFT PULLEY INSTALLATION**

Use special tools MB990767 and MD998719 to install the crankshaft pulley.

## INSPECTION

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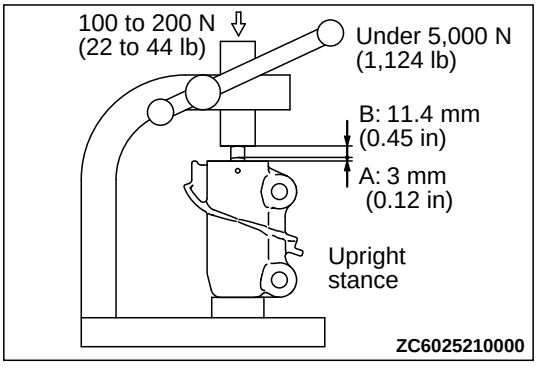
## TIMING BELT AUTO-TENSIONER CHECK

1. Check for oil leak from seal, and replace it if leak is detected.
2. Check for wear or damage at the top of the rod. Replace it, if required.




## AIR BLEEDING METHOD

**⚠ CAUTION**

- **Always use the vertical press and put the auto-tensioner vertically.**
- **Do not apply the load of 5,000 N (1,124 pound) or more to the rod.**
- **Do not press the rod beyond Dimension "A" shown in the illustration.**

1. Set the auto-tensioner as shown in the illustration.
2. Press the rod slowly down to the lowest point "A" shown in the illustration.
3. Repeat the procedure 2 three times.
4. While the rod is projected at the point "B" shown in the illustration, push the rod with 100 - 200 N (22 - 44 pound). Check the enough stiffness. If the stiffness is not enough, replace the auto-tensioner.
5. Press down the rod slowly. Put the pin through the hole and secure it.

# 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.00-30).**

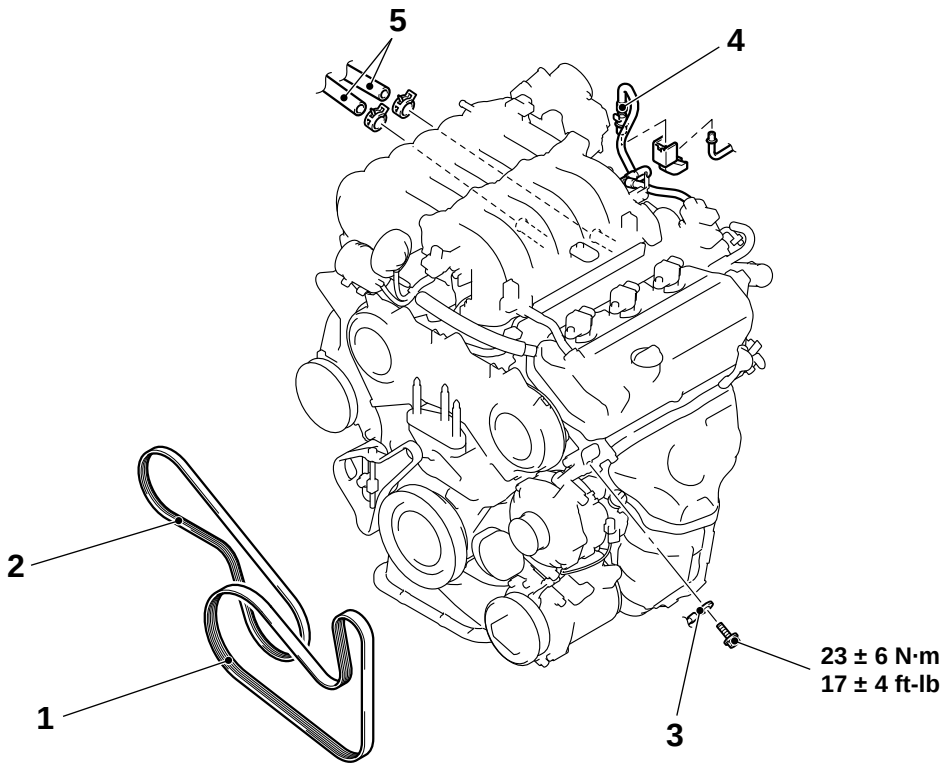
**▪*: indicates parts which should be temporarily tightened, and then fully tightened with the engine weight applied on the vehicle body.**

**Pre-removal Operation**

- Under Cover Removal (Refer to GROUP 51A, Under Cover P.51A-18).
- Fuel Line Pressure Reduction [Refer to GROUP 13Aa, On-vehicle Service - Fuel Pump Connector Disconnection (How to Reduce Pressurized Fuel Lines) P.13Aa-20].
- Engine Coolant Draining (Refer to GROUP 14, On-vehicle Service - Engine Coolant Replacement P.14-15).
- Engine Oil Draining (Refer to GROUP 12, On-vehicle Service - Engine Oil Replacement P.12-4).
- Transmission Fluid Draining (Refer to GROUP 23A, On-vehicle Service - Transmission Fluid Change P.23A-153).
- Transfer Oil Draining (Refer to GROUP 23A, On-vehicle Service - Transfer Oil Change P.23A-159).
- Hood Removal (Refer to GROUP 42Aa, Hood P.42Aa-5).
- Engine Cover Removal (Refer to GROUP 16c, Ignition Coil P. 16c-6).
- Air Cleaner Removal (Refer to GROUP 15, Air Cleaner P. 15-6).
- Engine Control Module (ECM) Removal [Refer to GROUP 13Aa, Engine Control Module (ECM) P.13Aa-37].
- Battery and Battery Tray Removal
- Front Exhaust Pipe and Front Exhaust Pipe RH Removal (Refer to GROUP 15, Exhaust Pipe and Main Muffler P. 15-16).
- Strut Tower Bar Removal (Refer to GROUP 42Aa, Strut Tower Bar P.42Aa-11).
- Driveshaft Removal (Refer to GROUP 26, Driveshaft Assembly P.26-17).
- Propeller Shaft Removal (Refer to GROUP 25, Propeller Shaft P.25-5).
- Pressure Hose Assembly and Return Tube B Removal (Refer to GROUP 37, Power Steering Hoses P.37-39).
- Rear Roll Stopper Removal (Refer to GROUP 32, Engine Roll Stopper and Centermember P.32-6).
- Transfer Removal (Refer to GROUP 23A, Transfer Assembly P.23A-176).
- Starter Removal (Refer to GROUP 16b, Starter Assembly P. 16b-5).
- Radiator Upper Hose and Radiator Lower Hose Removal (Refer to GROUP 14, Radiator P.14-27).

**Post-installation Operation**

- Radiator Upper Hose and Radiator Lower Hose Installation (Refer to GROUP 14, Radiator P.14-27).
- Starter Installation (Refer to GROUP 16b, Starter Assembly P. 16b-5).
- Transfer Installation (Refer to GROUP 23A, Transfer Assembly P.23A-176).
- Rear Roll Stopper Installation (Refer to GROUP 32, Engine Roll Stopper and Centermember P.32-6).
- Pressure Hose Assembly and Return Tube B Installation (Refer to GROUP 37, Power Steering Hoses P.37-39).
- Propeller Shaft Installation (Refer to GROUP 25, Propeller Shaft P.25-5).
- Driveshaft Installation (Refer to GROUP 26, Driveshaft Assembly P.26-17).
- Strut Tower Bar Installation (Refer to GROUP 42Aa, Strut Tower Bar P.42Aa-11).
- Front Exhaust Pipe and Front Exhaust Pipe RH Installation (Refer to GROUP 15, Exhaust Pipe and Main Muffler P. 15-16).
- Battery and Battery Tray Installation
- Engine Control Module (ECM) Installation [Refer to GROUP 13Aa, Engine Control Module (ECM) P.13Aa-37].
- Air Cleaner Installation (Refer to GROUP 15, Air Cleaner P. 15-6).
- Drive Belt Tension Check and Adjustment (Refer to P.11A-9).
- Engine Oil Refilling (Refer to GROUP 12, On-vehicle Service - Engine Oil Replacement P.12-4).
- Transmission Fluid Refilling (Refer to GROUP 23A, On-vehicle Service - Transmission Fluid Change P.23A-153).
- Transfer Oil Refilling (Refer to GROUP 23A, On-vehicle Service - Transfer Oil Change P.23A-159).
- Engine Coolant Refilling (Refer to GROUP 14, On-vehicle Service - Engine Coolant Replacement P.14-15).
- Fuel Leak Check
- Hood Installation (Refer to GROUP 42Aa, Hood P. 42Aa-5).
- Engine Cover Installation (Refer to GROUP 16c, Ignition Coil P.16c-6).
- Under Cover Installation (Refer to GROUP 51A, Under Cover P.51A-18).

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**Removal steps**

1. Generator drive belt
2. Power steering oil pump drive belt
3. Grounding cable connection

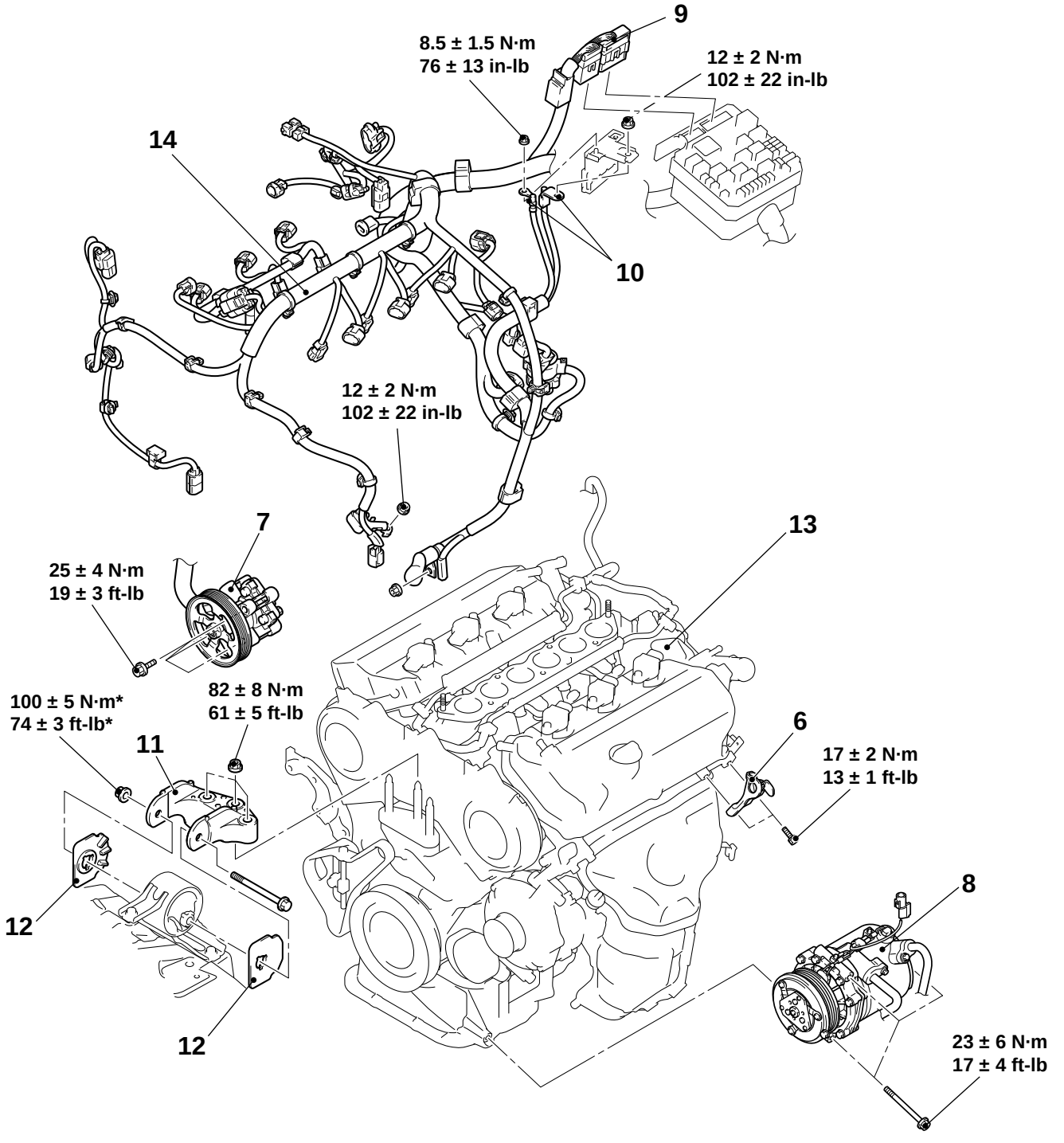
<<A>> >>C<< 4. Fuel high-pressure hose connection

5. Heater hose connection

· Intake manifold plenum (Refer to GROUP 15, Intake Manifold Plenum P. 15-7).

**Removal steps**

· Right bank exhaust manifold (Refer to GROUP 15, Exhaust Manifold P. 15-11).

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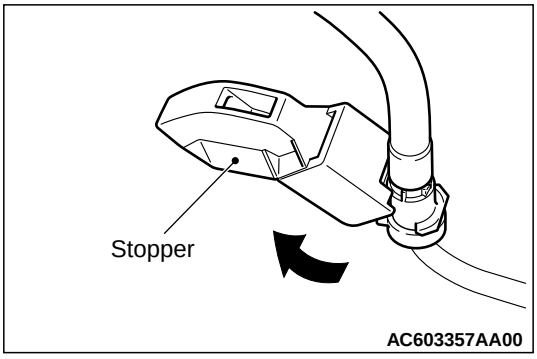
6. Engine hanger
<<B>> >>B<< · Transaxle assembly (Refer to GROUP 23A, Transaxle Assembly P. 23A-170).
<<C>> 7. Power steering oil pump assembly
<<D>> 8. A/C compressor assembly
9. Control wiring harness (relay box side)
10. Control wiring harness (battery side)
<<E>> >>A<< 11. Engine mounting bracket
>>A<< 12. Engine mounting insulator stopper
<<F>> >>A<< 13. Engine assembly
14. Control wiring harness

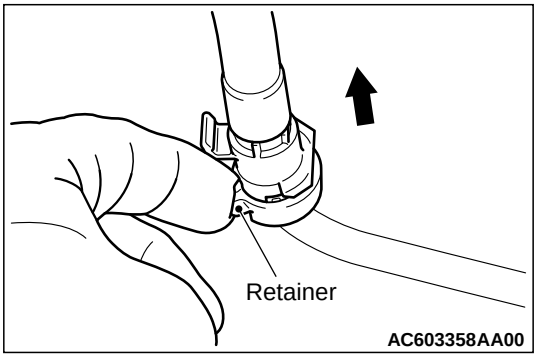
Required Special Tools:
- MB991454: Engine Hanger Balancer
- MB991895: Engine Hanger
- MB991928: Engine Hanger

## REMOVAL SERVICE POINTS

### <<A>> FUEL HIGH-PRESSURE HOSE DISCONNECTION




1. Remove the fuel high-pressure hose stopper.




2. Remove the fuel high-pressure hose in the direction shown in the figure while the retainer is pulled up.

*NOTE: If the retainer is released, install it after removing the fuel high-pressure hose.*

### <<B>> TRANSAXLE ASSEMBLY REMOVAL

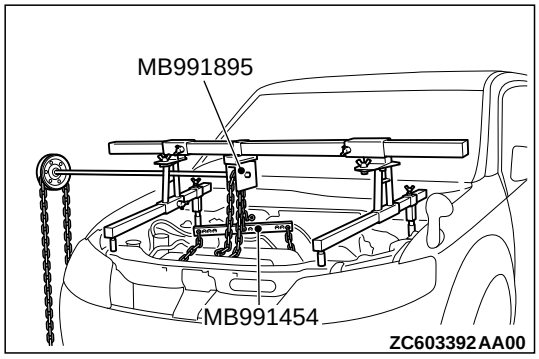
Remove the transaxle assembly (Refer to GROUP 23A, Transaxle Assembly P.23A-176).

### <<C>> POWER STEERING OIL PUMP ASSEMBLY REMOVAL

1. Remove the power steering oil pump from the engine with the hose attached.
2. Place the removed power steering oil pump in a place where it will not be a hindrance when removing and installing the engine assembly, and secure it with a cord or wire.

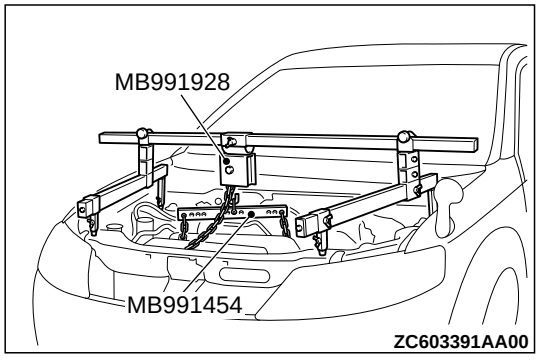
### <<D>> A/C COMPRESSOR ASSEMBLY REMOVAL

1. Remove the compressor from the compressor bracket with the hose still attached.
2. Place the removed A/C compressor where it will not be a hindrance when removing and installing the engine assembly, and secure it with a cord or wire.

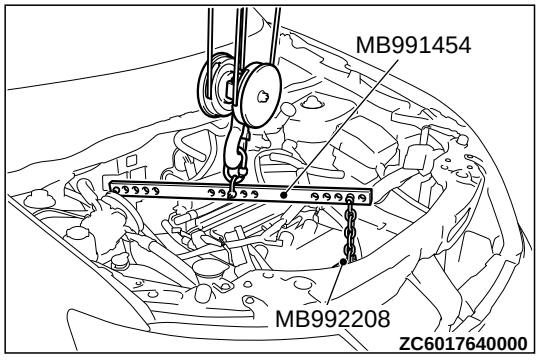



**<<E>> ENGINE MOUNTING BRACKET REMOVAL**

1. Support the engine with a garage jack.
2. Engine hanger MB991895 is used
   Remove special tool MB991895.




3. Engine hanger MB991928 is used
   Remove special tool MB991928.
4. When removing the transaxle assembly, remove the special tool MB992208 (Right bank) that supported the engine assembly.

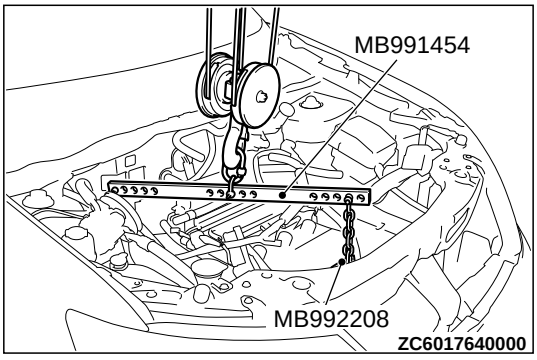



5. Mount the special tool MB991454 to the engine right hanger and special tool MB992208 (Left bank), and support the engine assembly using the chain block or others.
6. Place a garage jack against the engine oil pan with a piece of wood in between so that the weight of the engine is no longer being applied to the engine mounting bracket.
7. Loosen the engine mount mounting nuts and bolt, and remove the engine mounting bracket.

**<<F>> ENGINE ASSEMBLY REMOVAL**

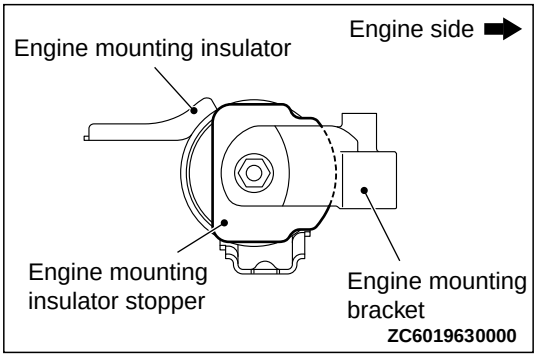
After checking that all cables, hoses and wiring harness connectors and so on are disconnected from the engine, lift the chain block slowly to remove the engine assembly upward from the engine compartment.

## INSTALLATION SERVICE POINTS




### >>A<< ENGINE ASSEMBLY/ENGINE MOUNTING INSULATOR STOPPER/ENGINE MOUNTING BRACKET INSTALLATION

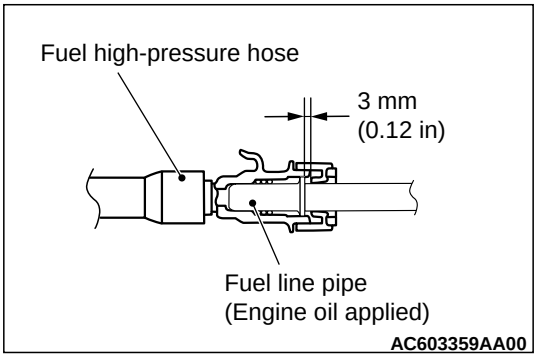
1. Install the engine assembly, being careful not to pinch the cables, hoses or wiring harness connectors.
2. Support the engine assembly with a garage jack.




3. Mount the engine mounting insulator stopper to be positioned as shown in the figure, then mount the engine mounting bracket.

### >>B<< TRANSAXLE ASSEMBLY INSTALLATION

Install the transaxle assembly (Refer to GROUP 23A, Transaxle Assembly P.23A-176).

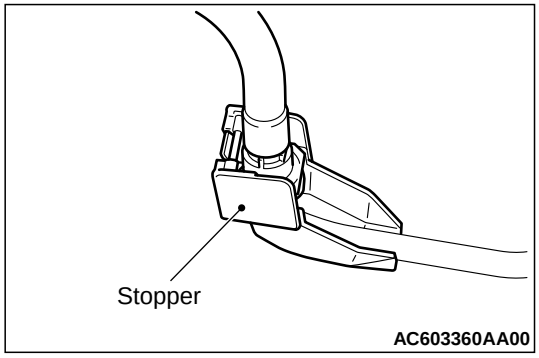



### >>C<< FUEL HIGH-PRESSURE HOSE CONNECTION

**⚠ CAUTION**

**After connecting the fuel high-pressure hose, slightly pull it to ensure that it is installed securely. Also confirm that there is a play approximately 3 mm (0.12 inch). Then install the stopper securely.**

Apply a small amount of engine oil to the fuel line pipe and then install the fuel high-pressure hose.


Stopper
AC603360AA00

**MEMO**