# 2010 ENGINE

## Engine Mechanical <2.4L> - Galant

## GENERAL DESCRIPTION

The 4G69 (2.4L) engine is an in-line four cylinder engine. The cylinder numbers are assigned as 1 - 2 - 3 - 4 from the front of the engine (timing belt side). This engine is fired in the order of the 1, 3, 4 and 2 cylinders.

**ITEM SPECIFICATION**

| ITEM | | | SPECIFICATION |
|---|---|---|---|
| Type | | | In-line SOHC |
| Number of cylinders | | | 4 |
| Bore mm (in) | | | 87 (3.43) |
| Stroke mm (in) | | | 100.0 (3.94) |
| Total displacement $cm^3$ (cu in) | | | 2,378 (145.1) |
| Compression ratio | | | 9.5 |
| Firing order | | | 1 - 3 - 4 - 2 |
| Counterbalance shaft | | | Equipped |
| Valve timing | Intake valve | Opens (BTDC) | 4° <Low speed cam A> |
| | | | 6° <Low speed cam B> |
| | | | 24° <High speed cam> |
| | | Closes (ABDC) | 42° <Low speed cam A> |
| | | | 44° <Low speed cam B> |
| | | | 70° <High speed cam> |
| | Exhaust valve | Opens (BBDC) | 58° |
| | | Closes (ATDC) | 17° |
| Lubrication system | | | Pressure feed, full-flow filtration |
| Oil pump type | | | Involute gear type |

## ENGINE DIAGNOSIS

**SYMPTOM CHART**

| SYMPTOM | 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 |
| | Engine oil level is too low | Check the engine oil level |
| | Malfunction of engine oil pressure | Replace the engine oil pressure |


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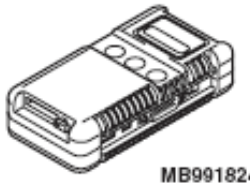
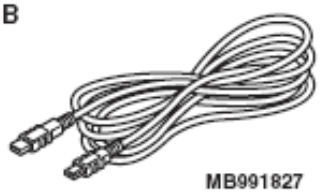
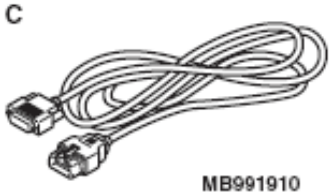
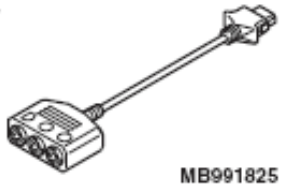
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|---|---|---|
| Drop in engine oil pressure | switch | switch |
| | Clogged oil filter | Install a new filter |
| | Worn oil pump gears or cover | Replace the gears and/or the cover |
| | Thin or diluted engine oil | Change the engine oil to correct 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 | Adjust valve clearance |
| | 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 |
| | Low engine oil pressure | Refer to engine oil pressure drop symptoms above |
| | Thin or diluted engine oil | Change the engine oil |
| | Excessive bearing clearance | Replace the bearings |

# SPECIAL TOOLS

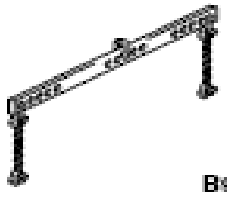
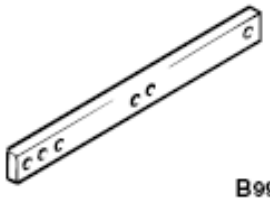
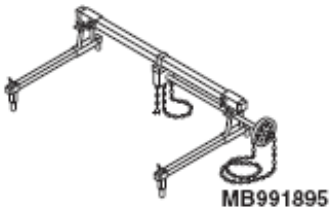
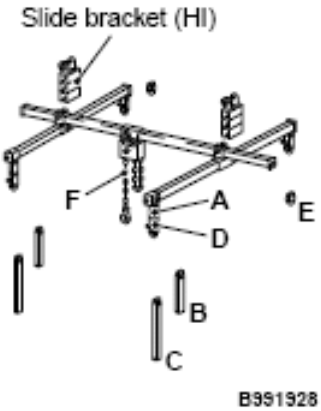
**SPECIAL TOOLS REFERENCE**

| 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<br>• Balancer timing belt tension check |
| | MB991958<br>Scan tool (M.U.T.-III sub assembly)<br>A. MB991824<br>Vehicle communication interface (V.C.I.) | | |

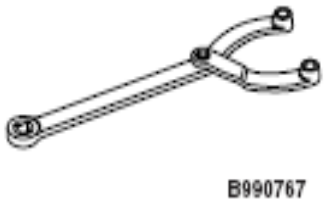
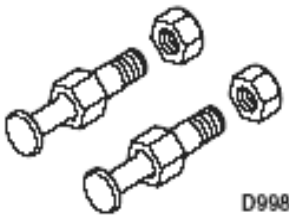
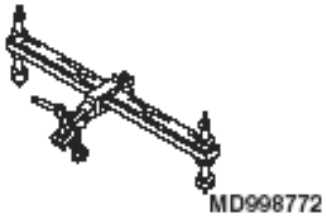
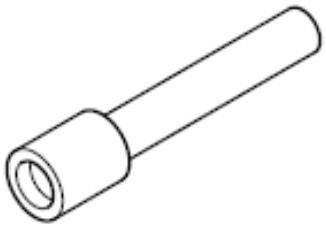
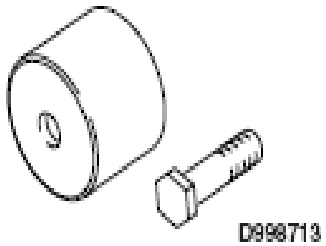
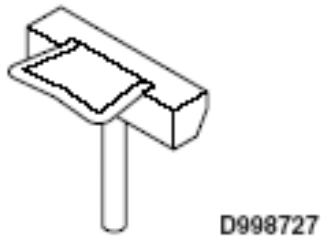
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| | | | |
|---|---|---|---|
| A<br><br>MB991824<br>B<br><br>MB991827<br>C<br><br>MB991910<br>D<br><br><br>MB991911<br>E<br><br><br>MB991914<br>F<br><br>MB991825<br>G<br><br>MB991826<br>MB991958 | B. MB991827<br>M.U.T.-III USB cable<br>C. MB991910<br>M.U.T.-III 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 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:**<br>**G: 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>• Ignition timing check<br>• Curb idle speed check<br>• Idle mixture check |
| | MB991454<br>Engine hanger balancer | MZ203827-01 | |

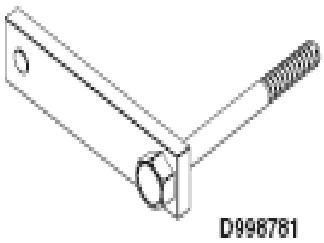
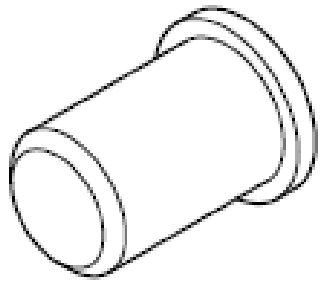
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| | | | |
|---|---|---|---|
|  B991454 | | | When the engine hanger is used: Supporting the engine assembly during removal and installation of the transaxle assembly<br><br>**NOTE:**<br>**Special tool MB991454 is a part of engine hanger attachment set MB991453.** |
|  B991527 | MB991527<br>Hanger | Tool not available | |
|  MB991895 | MB991895<br>Engine hanger | Tool not available | |
|   B991928 | MB991928<br>Engine hanger<br>A. MB991929<br>Joint (50) x 2<br>B. MB991930<br>Joint (90) x 2<br>C. MB991931<br>Joint (140) x 2<br>D. MB991932<br>Foot (standard) x 4<br>E. MB991933<br>Foot (short) x 2<br>F. MB991934<br>Chain and hook | Tool not available | |

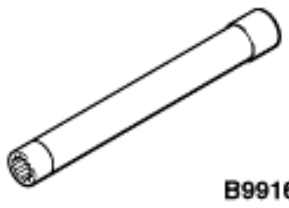
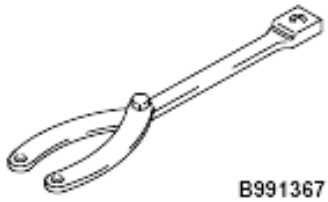
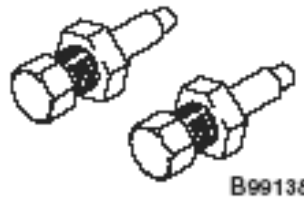
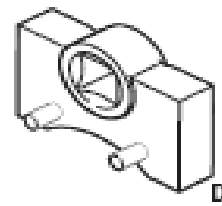
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| | | | |
|---|---|---|---|
| | assembly | | |
|  B990767 | MB990767<br>Front hub and flange yoke holder | MB990767-01 | Holding the camshaft sprocket |
|  D998719 | MD998719<br>Pin | MIT308239 | |
|  MD998772 | MD998772<br>Valve spring compressor | General service tool | Compressing valve spring |
|  | MB991999<br>Valve stem seal installer | - | Valve stem seal installation |
|  D998713 | MD998713<br>Camshaft oil seal installer | MD998713-01 | Camshaft oil seal installation |
|  D998727 | MD998727<br>Oil pan FIPG cutter | MD998727-01 | Oil pan removal |
| | | | |

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| | | | |
|---|---|---|---|
|  D998781 | MD998781<br>Flywheel stopper | General service tool | Supporting the A/T drive plate |
|  | MB990938<br>Installer bar | MB990938-01 | Crankshaft rear oil seal installation |
|  D998776 | MD998776<br>Crankshaft rear oil seal installer | MD998776-01 | |
|  D998285 | MD998285<br>Crankshaft front oil seal guide | MD998285-01 | Crankshaft front oil seal installation |
|  | MD998375<br>Crankshaft front oil seal installer | MD998375-01 | |
|  D998738 | MD998738<br>Adjusting bolt | MD998738-01 | Supporting the timing belt tensioner arm and timing belt tensioner adjuster |
| | | | |

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| | | | |
|---|---|---|---|
|  B991654 | MB991654<br>Cylinder head bolt wrench (12) | General service tool | Removal and installation of cylinder head bolt |
|  B991367 | MB991367<br>Special spanner | MB991367-01 | Holding the crankshaft camshaft drive sprocket |
|  B991385 | MB991385<br>Pin | MIT217213 | |
|  D998767 | MD998767<br>Tensioner wrench | MD998752-01 | Valve timing belt tension adjustment |

# ON-VEHICLE SERVICE

### DRIVE BELT TENSION CHECK

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

1. Make sure that the indicator mark is within the area marked with A in the illustration.
2. If the mark is out of the area, replace the drive belt. (Refer to **<<A>> DRIVE BELT REMOVAL** ).

**NOTE: The drive belt tension adjustment is not necessary as auto-tensioner is adopted.**

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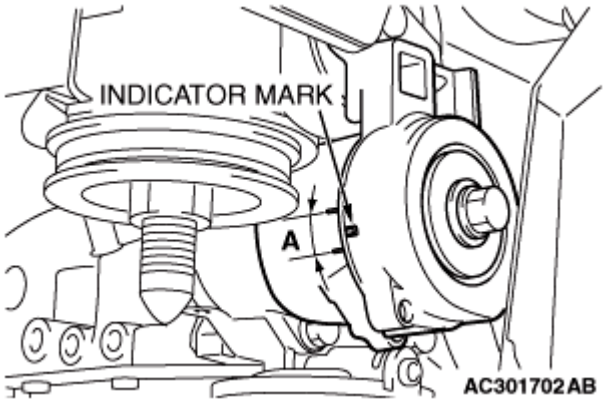



**Fig. 1: Identifying Indicator Mark Within Area Marked With A**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

## AUTO-TENSIONER CHECK

### OPERATION CHECK

1. Turn OFF the engine from the idle state then check to see that the drive belt is not protruding from the pulley width of the auto-tensioner.
2. Remove the drive belt. (Refer to **<<A>> DRIVE BELT REMOVAL** ).
3. Securely insert the spindle handle or ratchet handle with a 12.7 mm (1/2-inch) insertion angle into the jig hole of the auto tensioner. Turn the auto-tensioner to the left and right to check and see that there is no threading.
4. If there are any problems in the procedure 1 or 3, replace the auto-tensioner. (Refer to **TIMING BELT** ).
5. Install the drive belt. (Refer to **>>A << DRIVE BELT INSTALLATION** ).

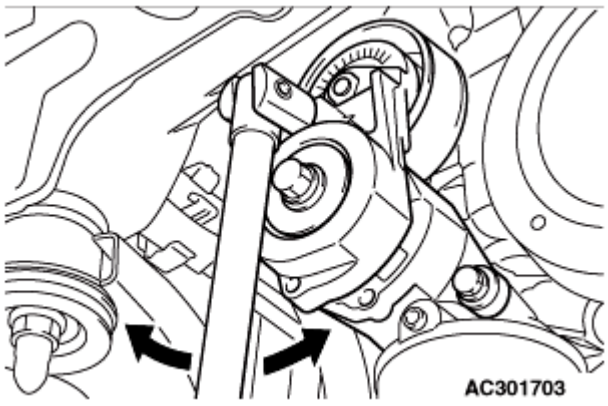



**Fig. 2: Turning Auto-Tensioner**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

### FUNCTION CHECK

You can verify if the auto-tensioner is defective or not by checking the drive belt tension.

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**< When the vibration frequency is measured: Recommendation>**

**Required Special Tools:**

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

1. Check the drive belt tension. (Refer to **DRIVE BELT TENSION CHECK** ).

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

2. Measure the drive belt tension vibration frequency by the following procedures:
   1. Connect special tool MB992082 to special tool MB992081 of 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.**

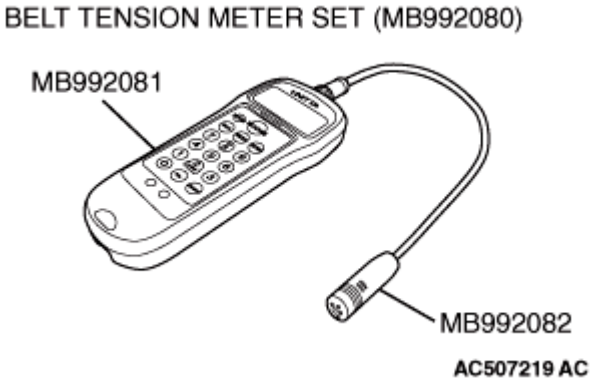



**Fig. 3: Connecting Special Tool MB992082 To Special Tool MB992081**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

   4. Press "Hz" button twice to change the display to the frequency display (Hz).

**CAUTION:**
- **Do not allow any contaminants such as water or oil to get onto the microphone.**
- **If strong gusts of wind blow against the microphone or if**

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**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.**

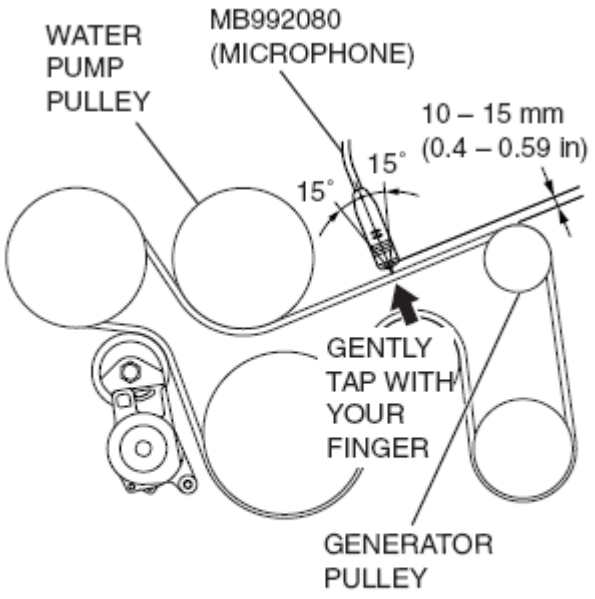
5. Hold special tool MB992080 to the middle of the drive belt between the pulleys (at the place indicated by arrow in illustration), approximately 10 - 15 mm (0.4 - 0.59 inch) away from the rear surface of the belt so that it is perpendicular to the belt (within an angle of ± 15 degree).
6. Press the "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: 120 - 154 Hz**

   **NOTE: To take the measurement repeatedly, fillip the belt again.**

8. Press and hold the "POWER" button to turn off the power supply.

3. If not within the standard value, replace the auto-tensioner. (Refer to **TIMING BELT** ).




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**Fig. 4: Holding Special Tool MB992080 To Middle Of Drive Belt Between Pulleys**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**< When tension is measured>**

1. Check the drive belt tension. (Refer to **DRIVE BELT TENSION CHECK** ).

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

2. Use a belt tension gauge in the middle of the belt between the pulleys (at the place indicated by the arrow in illustration) to measure that the belt tension is within the standard value.

   **Standard value: 340 - 562 N (76 - 126 pounds)**

3. If not within the standard value, replace the auto-tensioner. (Refer to **TIMING BELT** ).

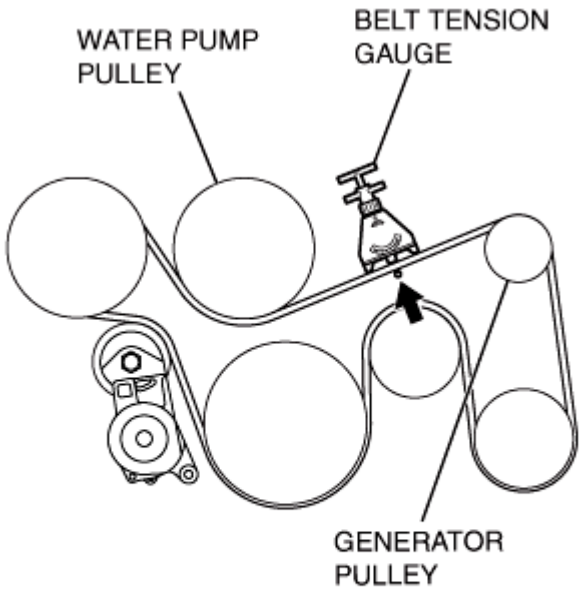



**Fig. 5: Checking Drive Belt Tension Using Tension Gauge**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

## VALVE CLEARANCE CHECK AND ADJUSTMENT

Refer to **INTAKE AND EXHAUST VALVE CLEARANCE (INSPECT AND ADJUST)**

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## ROCKER ARM PISTON OPERATION CHECK

1. Remove all of the ignition coils.
2. Remove the rocker cover.
3. Remove the engine oil control valve.
4. Remove the engine oil pressure switch.
5. Turn the crankshaft clockwise until the notch on the crankshaft pulley is lined up with "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.

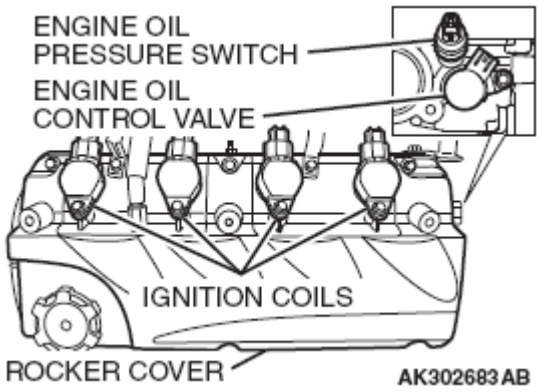



**Fig. 6: Removing Engine Oil Pressure Switch**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**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.**

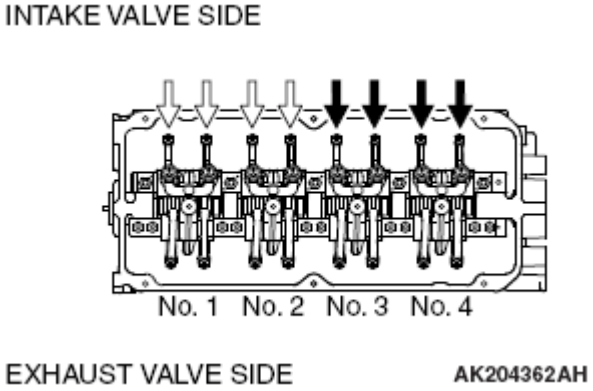



**Fig. 7: Checking Rocker Arm Piston**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

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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 compression 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 vinyl tape to the end of air blowgun. The compression air pressure is required more than 620 kPa (90 psi).**

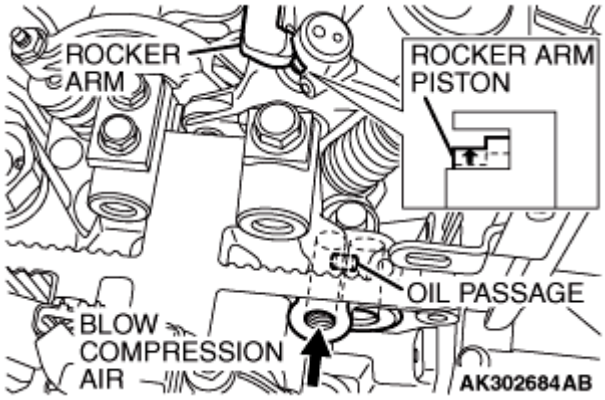



**Fig. 8: Identifying Rocker Arm Piston**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

8. Turn the crankshaft clockwise until the notch on the crankshaft pulley is lined up with "T" mark on the lower cover of timing belt. The compression air pressure is required more than 620 kPa (90 psi).
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 illustrations **REMOVAL AND INSTALLATION** .)
12. Install the rocker cover.
13. Install all of the ignition coils.

**IGNITION TIMING CHECK**

**Required Special Tool:**

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

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

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

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- Lights and all accessories: OFF
- Transaxle: P range

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

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

2. Connect scan tool MB991958 to the data link connector.
3. Set the timing light to the power supply line (terminal No. 1) of the ignition coil No. 1.

**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 700 r/min.
6. Select scan tool MB991958 actuator test "item number 11".
7. Check that basic ignition timing is within the standard value.

**Standard value: 5° BTDC ± 3°**

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


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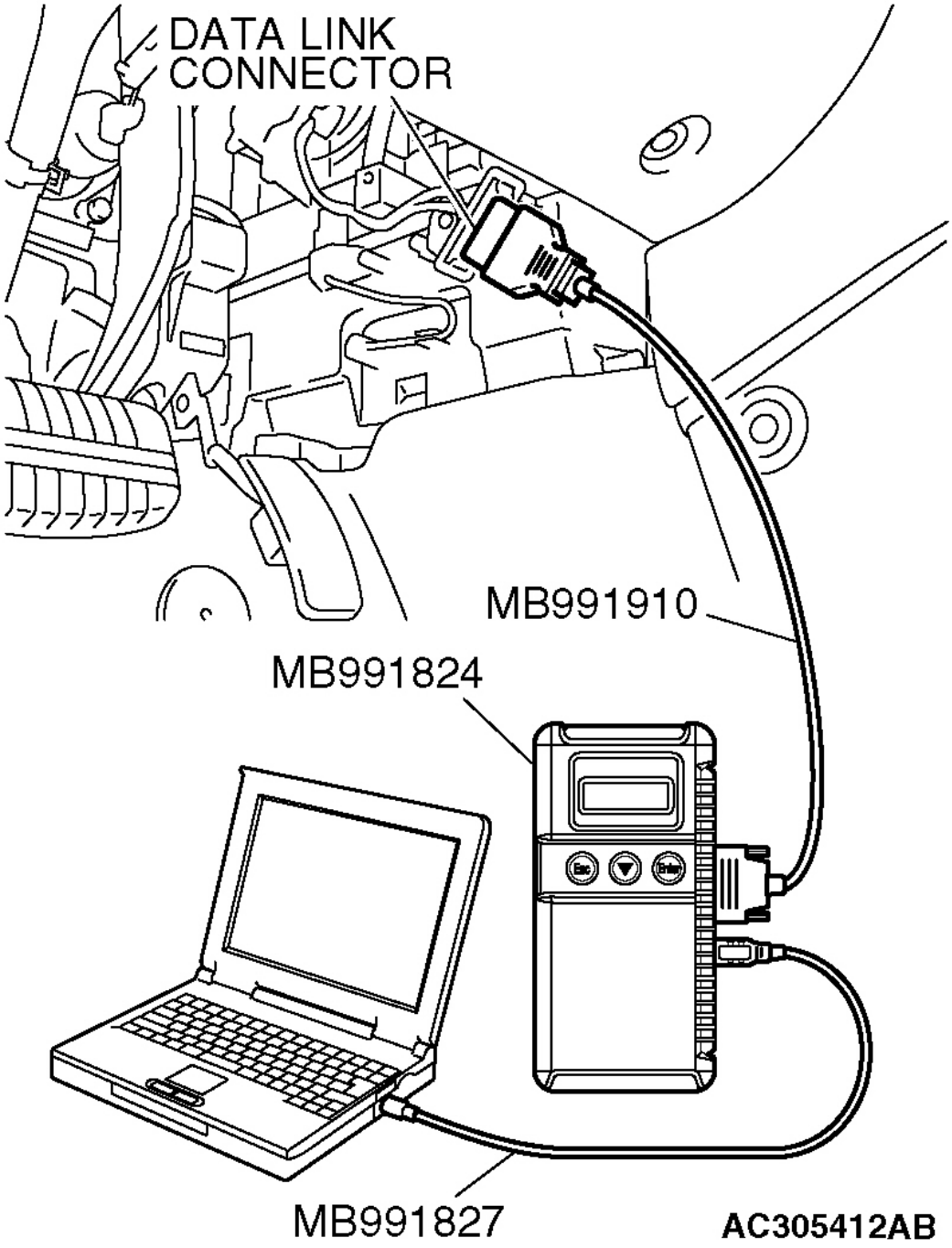



**Fig. 9: Connecting Scan Tool To Data Link Connector**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**CAUTION: If the actuator test is not canceled, the forced drive will continue**

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**for 27 minutes. Driving in this state could lead to engine failure.**

9. Cancel the actuator test function item No. 11, Basic ignition timing set mode, on the scan tool MB991958.
10. Check that the actual ignition timing is at the standard value.

    **Standard value: Approximately 10° BTDC**

    **NOTE: Ignition timing fluctuates about ± 7°, even under normal operating condition.**

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

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

11. Remove the timing light.
12. Turn the ignition switch to the "LOCK" (OFF) position and disconnect the scan tool MB991958.

**CURB IDLE SPEED CHECK**

**Required Special Tool:**

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

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

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

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

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

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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. 1.

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

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

**Standard value: Approximately 10° BTDC**

**NOTE: Ignition timing fluctuates about ± 7°, even under normal operating condition.**

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

7. Check the idle speed. Select item number 22 and take a reading of the idle speed.

**Curb idle speed: 700 ± 100 r/min**

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


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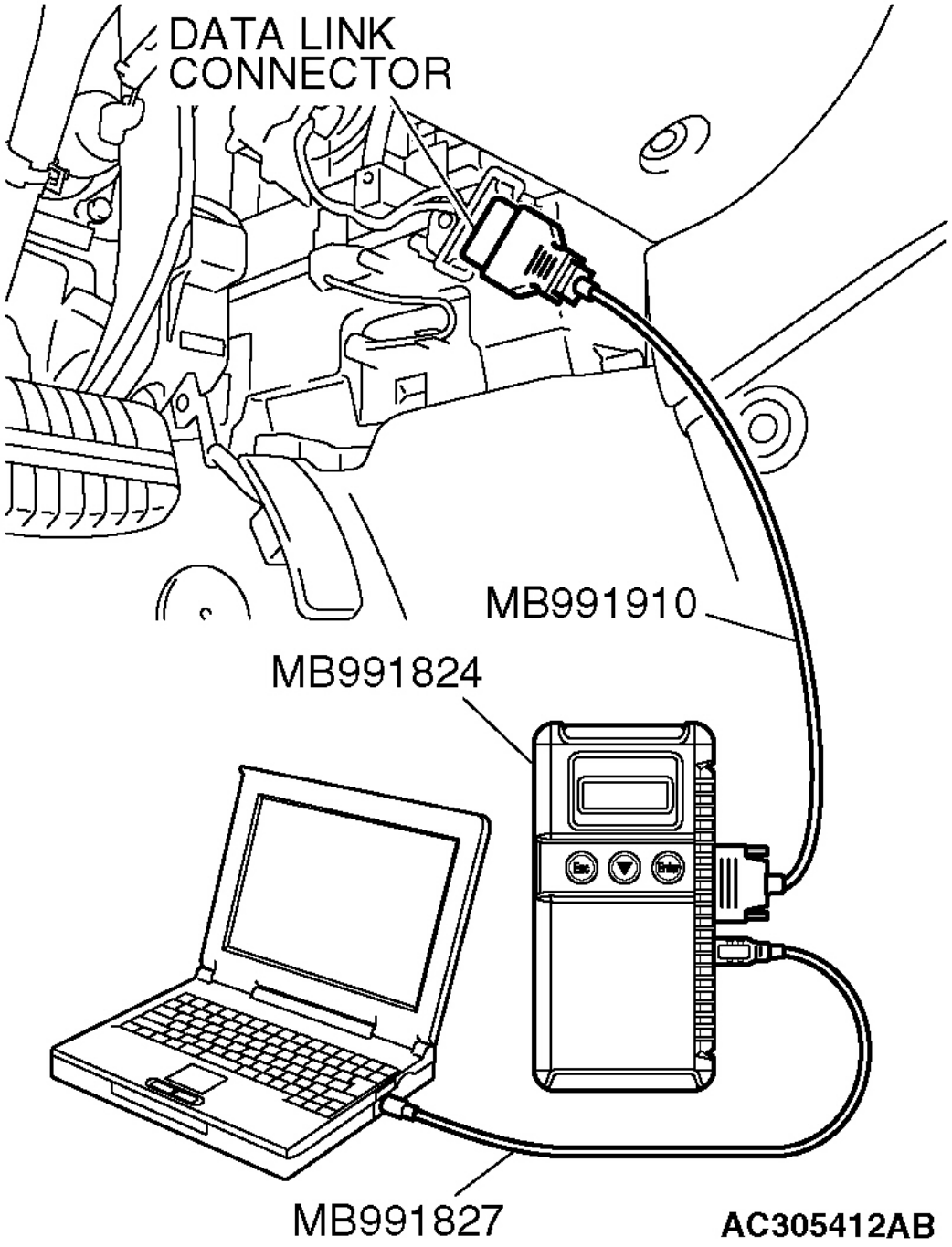



**Fig. 10: Connecting Scan Tool To Data Link Connector**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

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

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9. Remove the timing light.
10. Turn the ignition switch to the "LOCK" (OFF) position and disconnect the scan tool MB991958.

**IDLE MIXTURE CHECK**

**Required Special Tool:**

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

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

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

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

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

2. Connect scan tool MB991958 to the data link connector.
3. Set the timing light to the power supply line (terminal No. 1) of the ignition coil No. 1.

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

4. Start the engine and increase the engine speed to 2,000 - 3,000 r/min for 2 minutes.
5. Check that the actual ignition timing is within the standard value.

    **Standard value: Approximately 10° BTDC**

    **NOTE: Ignition timing fluctuates about ± 7°, even under normal operating condition.**

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

6. Set the CO, HC tester.

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7. Check the CO contents and the HC contents at idle.

   **Standard value:**

   **CO contents: 0.5 % or less**

   **HC contents: 100 ppm or less**

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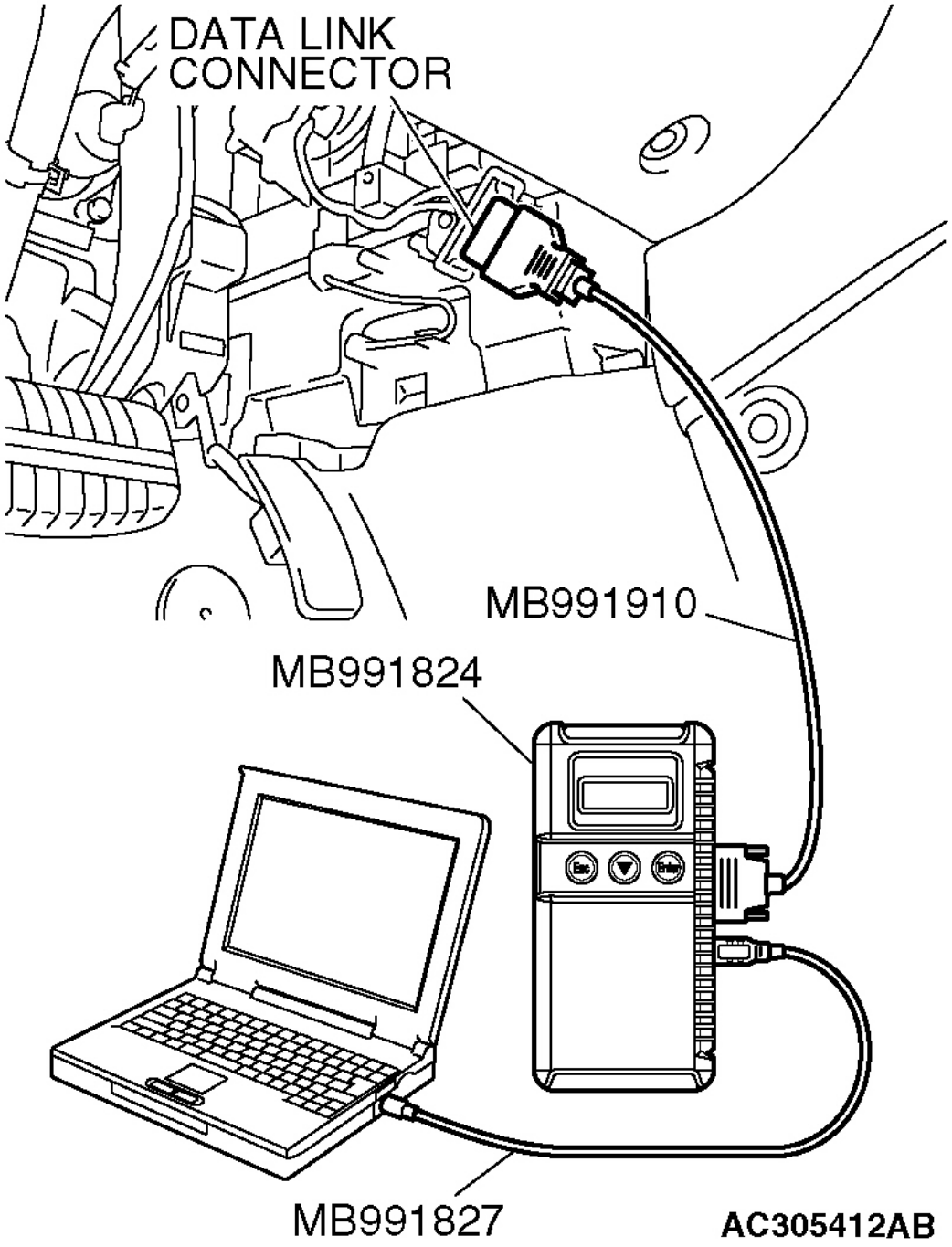



**Fig. 11: Connecting Scan Tool To Data Link Connector**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

8. If the CO and HC contents do not remain inside the standard value, inspect the MFI system. (Refer to

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**SYMPTOM CHART** .)

9. Remove the CO, HC tester and the timing light.
10. Turn the ignition switch to the "LOCK" (OFF) position and disconnect the scan tool MB 991958.

**COMPRESSION PRESSURE CHECK**

**Required Special Tool:**

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

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

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

   **NOTE: 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.


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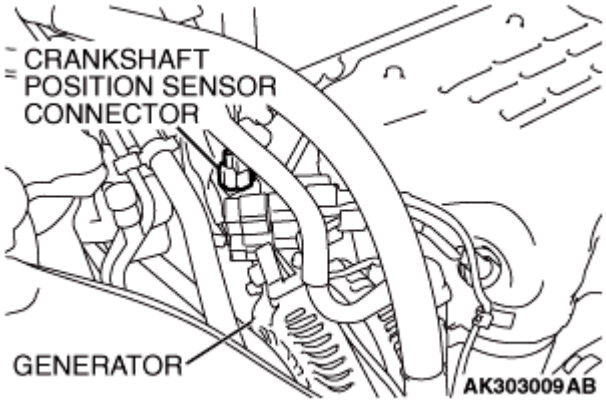



**Fig. 12: Disconnecting Crankshaft Position Sensor Connector**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

5. Set a compression gauge to one of the spark plug holes.
6. Crank the engine with the throttle valve fully open and measure the compression pressure.

   **Standard value (at engine speed of 200 r/min):**

   **1,560 kPa (226 psi)**

   **Minimum limit (at engine speed of 200 r/min):**

   **1,130 kPa (164 psi)**

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

   **Limit: 98 kPa (14 psi)**

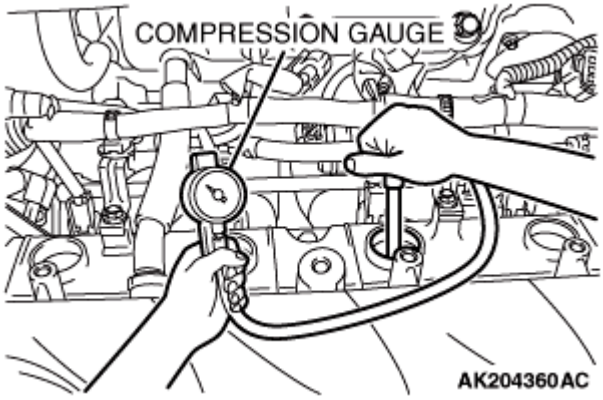



**Fig. 13: Measuring Compression Pressure**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

8. If there is a cylinder with compression or a compression difference that is outside the limit, pour a small

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amount of engine oil through the spark plug hole, and repeat the operations in steps 5 to 7.

1. If the compression increases after oil is added, the cause of the malfunction is a worn or damaged piston ring and/or cylinder inner surface.
2. If the compression does not rise after oil is added, the cause is a burnt or defective valve seat, or pressure is leaking from the gasket.

9. Connect the 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.**


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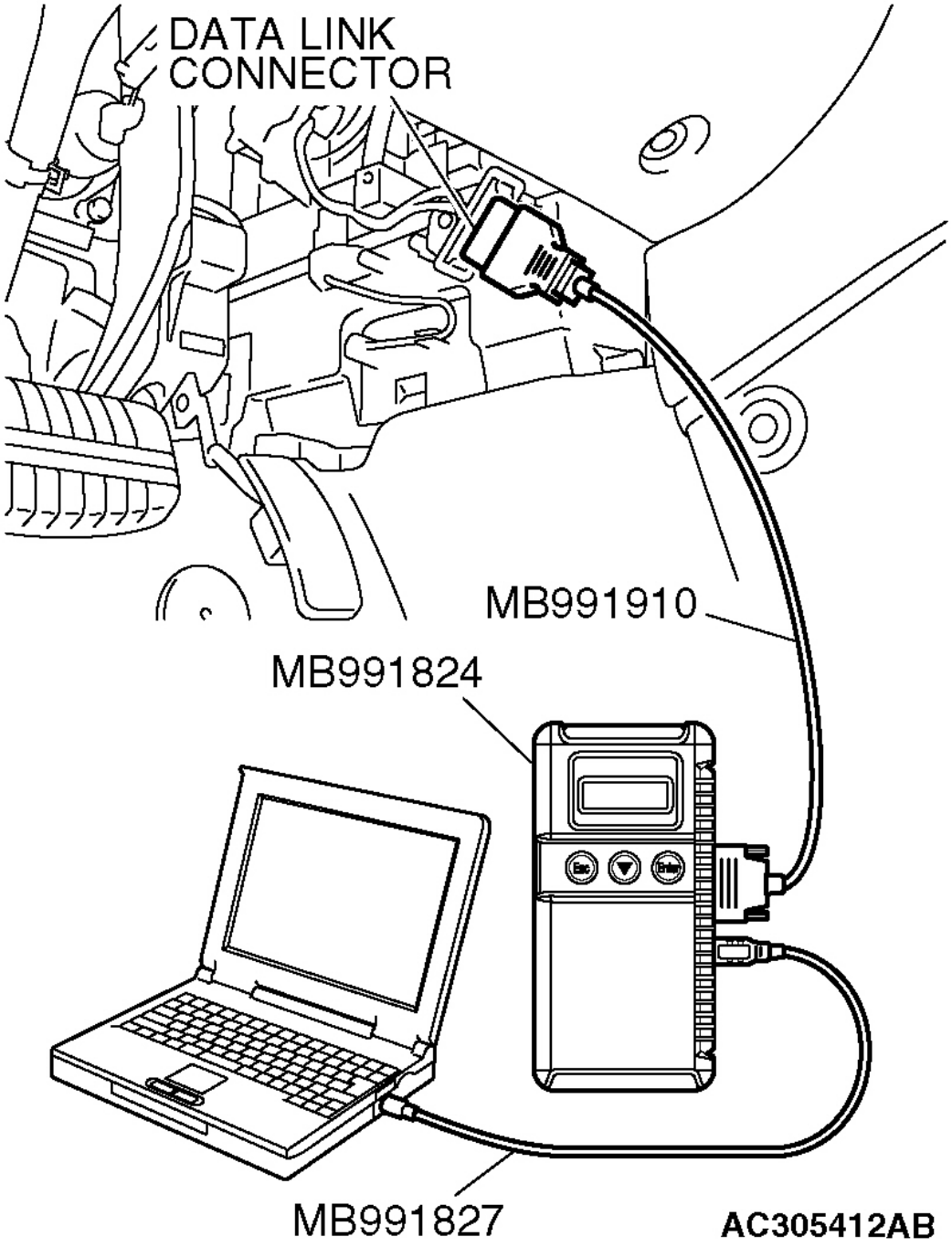



**Fig. 14: Connecting Scan Tool To Data Link Connector**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**MANIFOLD VACUUM CHECK**

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**Required Special Tool:**

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

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

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

   **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. Turn the ignition switch to the "LOCK" (OFF) position and connect the scan tool MB991958 to the data link connector.


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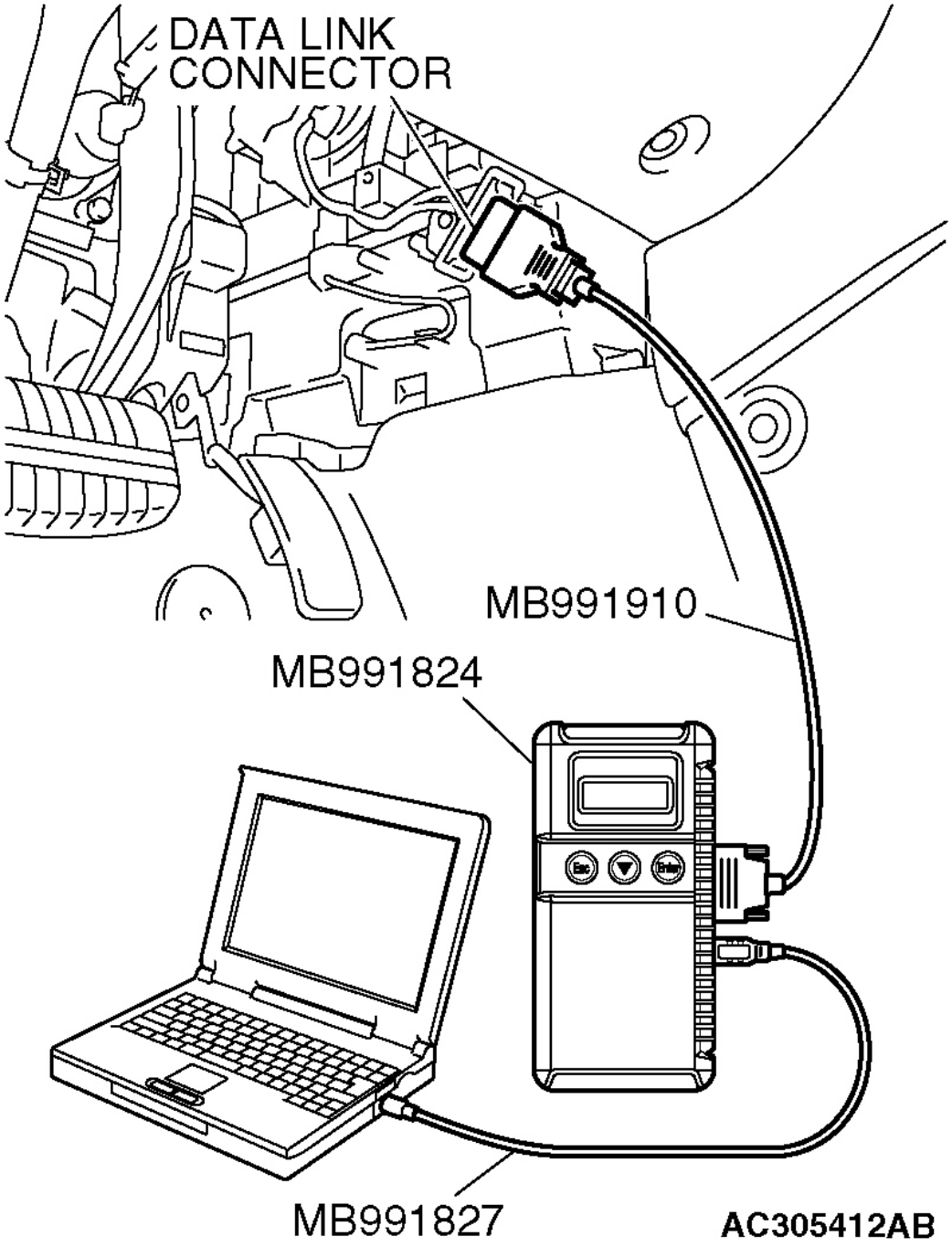



**Fig. 15: Connecting Scan Tool To Data Link Connector**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

3. Disconnect the ventilation hose from the positive crankcase ventilation (PCV) valve, and then connect a

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vacuum gauge to the ventilation hose. Plug the PCV valve.

4. Start the engine and check that idle speed is approximately 700 r/min.
5. Check the intake manifold vacuum.

   **Limit: Minimum 60 kPa (18 in Hg)**

6. Turn the ignition switch to the "LOCK" (OFF) position.
7. Remove the vacuum gauge and then connect the ventilation hose to the PCV valve.

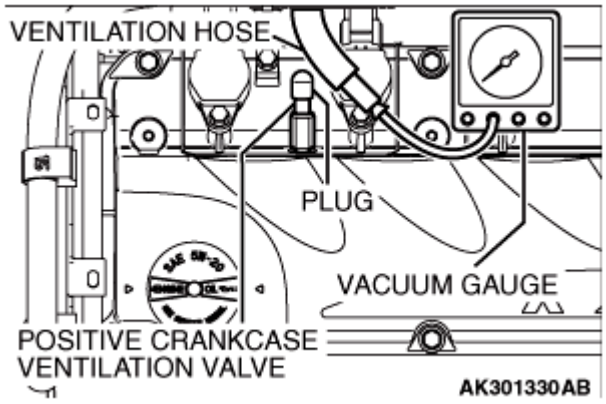



**Fig. 16: Connecting Vacuum Gauge To Ventilation Hose**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

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

# ENGINE ASSEMBLY

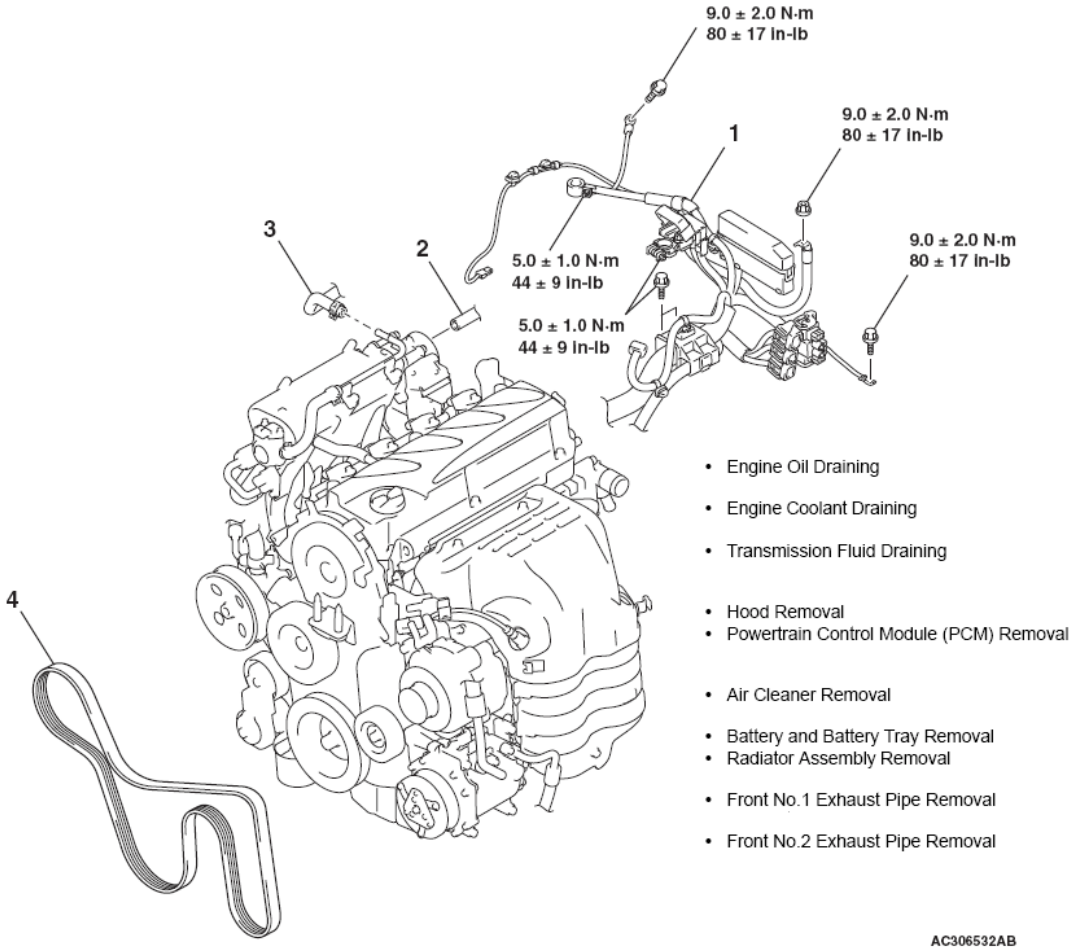
## REMOVAL AND INSTALLATION

**CAUTION:**

- **When the engine assembly replacement is performed, use scan tool MB991958 to initialize the learning value (Refer to INITIALIZATION PROCEDURE FOR LEARNING VALUE IN MFI ENGINE ).**
- ***: indicates parts which should be temporarily tightened, and then fully tightened with the engine weight applied on the vehicle body.**

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| Pre-removal Operation | Post-installation Operation |
|---|---|
| • Side Under Cover Removal<br>• Fuel Line Pressure Reduction<br>• Engine Oil Draining<br>• Engine Coolant Draining<br>• Transmission Fluid Draining<br>• Hood Removal<br>• Powertrain Control Module (PCM) Removal<br>• Air Cleaner Removal<br>• Battery and Battery Tray Removal<br>• Radiator Assembly Removal<br>• Front No.1 Exhaust Pipe Removal<br>• Front No.2 Exhaust Pipe Removal | • Front No.2 Exhaust Pipe Installation<br>• Front No.1 Exhaust Pipe Installation<br>• Radiator Assembly Installation<br>• Battery and Battery Tray Installation<br>• Air Cleaner Installation<br>• Powertrain Control Module (PCM) Installation<br>• Hood Installation<br>• Transmission Fluid Refilling<br>• Engine Coolant Refilling<br>• Engine Oil Refilling<br>• Fuel Leak Check<br>• Drive Belt Tension Check<br>• Side Under Cover Installation<br>• Front Wheel Alignment Check and Adjustment |



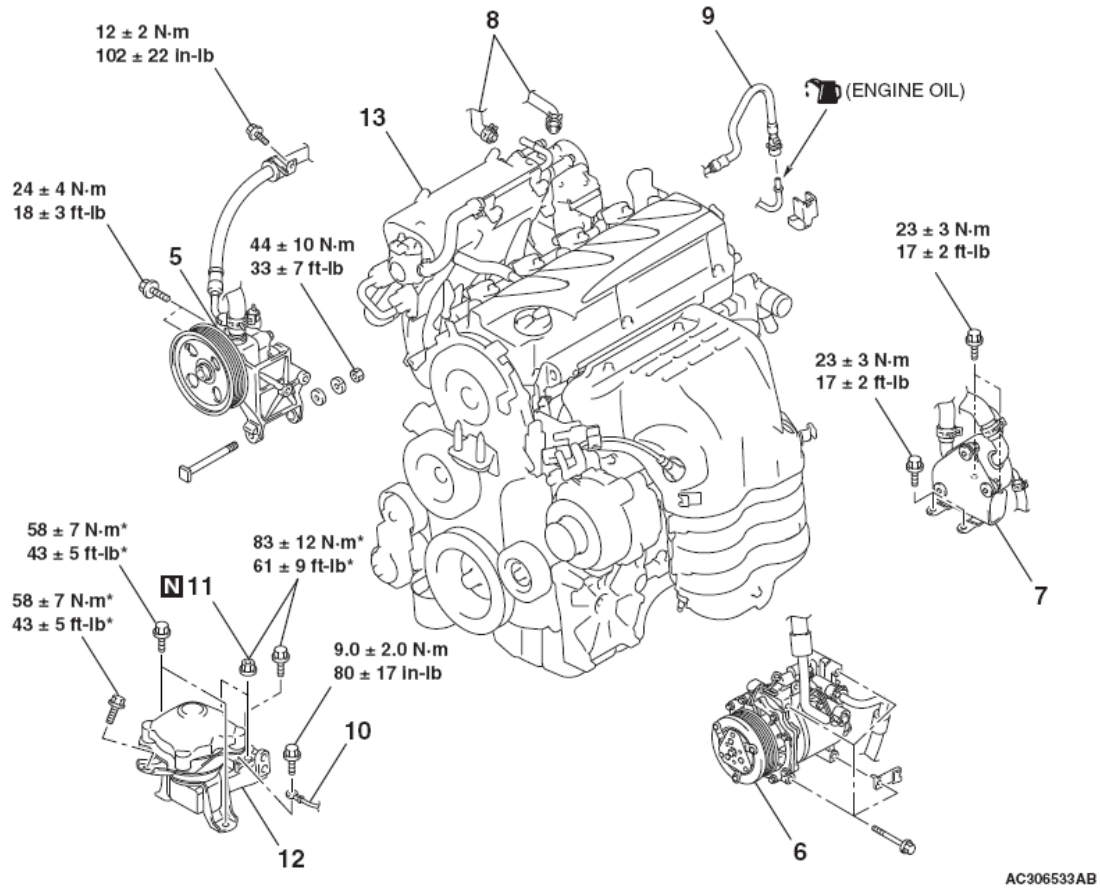

**REMOVAL STEPS**

1. CONTROL WIRING HARNESS CONNECTION
2. EVAPORATIVE EMISSION
<<A>> >>E<<
3. BRAKE BOOSTER VACUUM HOSE CONNECTION
4. DRIVE BELT
>>F<<



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**Fig. 17: Identifying Control Wiring Harness, Drive Belt And Evaporative Emission Vacuum Hose Connection With Torque Specifications**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**




**REMOVAL STEPS**

| | | | | | |
|---|---|---|---|---|---|
| <<B>> | | 5. POWER STEERING OIL PUMP AND BRACKET ASSEMBLY | <<F>> | >>C<< | • TRANSAXLE ASSEMBLY |
| <<C>> | | 6. A/C COMPRESSOR AND CLUTCH ASSEMBLY | | | 10. GROUNDING CABLE CONNECTION |
| <<D>> | | 7. ATF WARMER (TRANSMISSION FLUID COOLER) AND BRACKET ASSEMBLY | <<G>> | | • POWER STEERING OIL RESERVOIR |
| | | 8. HEATER WATER HOSES CONNECTION | <<H>> | >>B<< | 11. JAM NUTS |
| <<E>> | >>D<< | 9. FUEL HIGH-PRESSURE HOSE CONNECTION | <<I>> | >>A<< | 12. ENGINE FRONT MOUNTING BRACKET |
| | | | | | 13. ENGINE ASSEMBLY |

**Fig. 18: Identifying Autotensioner With Torque Specifications**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**Required Special Tools:**

- MB991454: Engine Hanger Balancer
- MB991527: Hanger
- MB991895: Engine Hanger
- MB991928: Engine Hanger

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**REMOVAL SERVICE POINTS**

**<<A>> DRIVE BELT REMOVAL**

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

1. Securely insert the spindle handle or ratchet handle with a 12.7 mm (1/2-inch) insertion angle into the jig hole of the auto-tensioner.
2. Rotate the auto-tensioner counterclockwise and align hole A with hole B.

**CAUTION: To reuse the drive belt, draw an arrow indicating the rotating direction (clockwise) on the back of the belt using chalk, etc.**

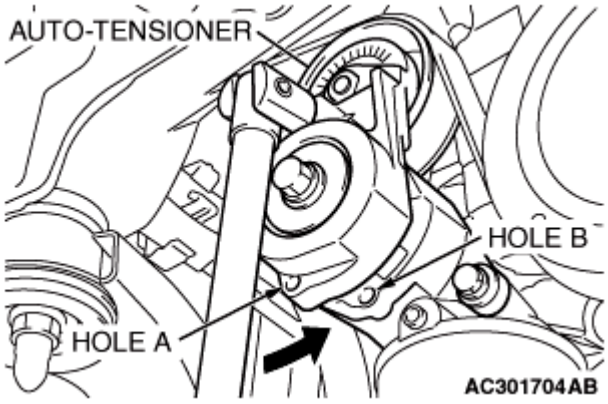



**Fig. 19: Rotating Auto-Tensioner Counterclockwise**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

3. Insert an L-shaped hexagon wrench, etc. into the hole to fix and then remove the drive belt.

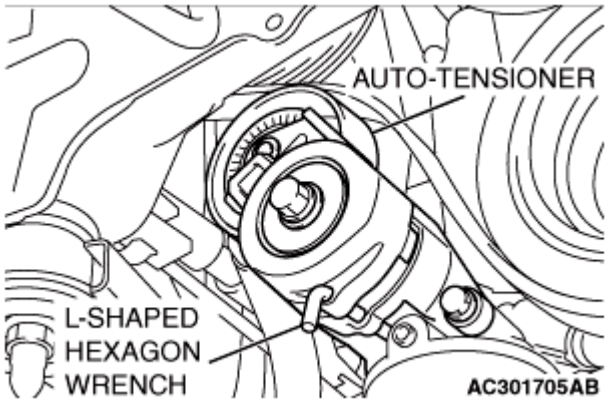



**Fig. 20: Inserting L-Shaped Hexagon Wrench**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**<<B>> POWER STEERING OIL PUMP AND BRACKET ASSEMBLY REMOVAL**

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1. With the hose installed, remove the power steering oil pump and bracket assembly from the engine assembly.
2. After removing the power steering oil pump and bracket assembly, secure it with a cord in the location where the removal and installation of the engine assembly cannot be hindered.

**<<C>> A/C COMPRESSOR AND CLUTCH ASSEMBLY REMOVAL**

1. With the hose installed, remove the A/C compressor and clutch assembly from the bracket.
2. After removing the A/C compressor and clutch assembly, secure it with a cord in the location where the removal and installation of the engine assembly cannot be hindered.

**<<D>> ATF WARMER (TRANSMISSION FLUID COOLER) AND BRACKET ASSEMBLY REMOVAL**

With the hose installed, remove the ATF warmer (transmission fluid cooler) and bracket assembly from the transmission case front roll stopper bracket.

**<<E>> FUEL HIGH-PRESSURE HOSE DISCONNECTION**

1. Remove the fuel high-pressure hose stopper.

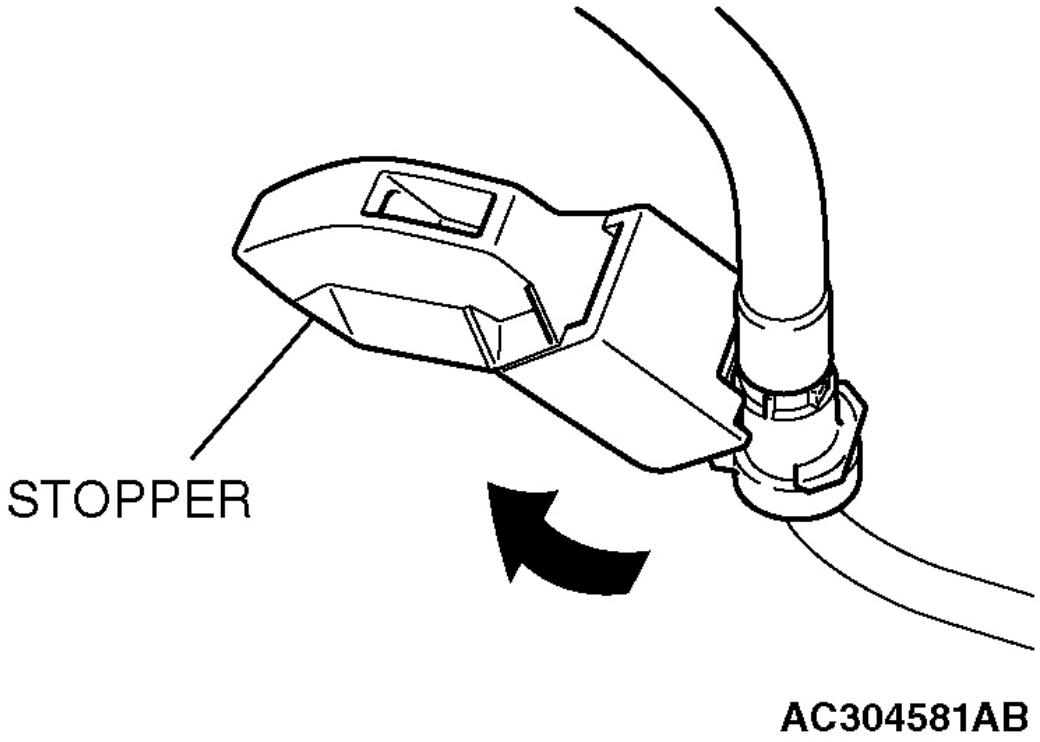



**Fig. 21: Removing Fuel High-Pressure Hose Stopper**

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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.**

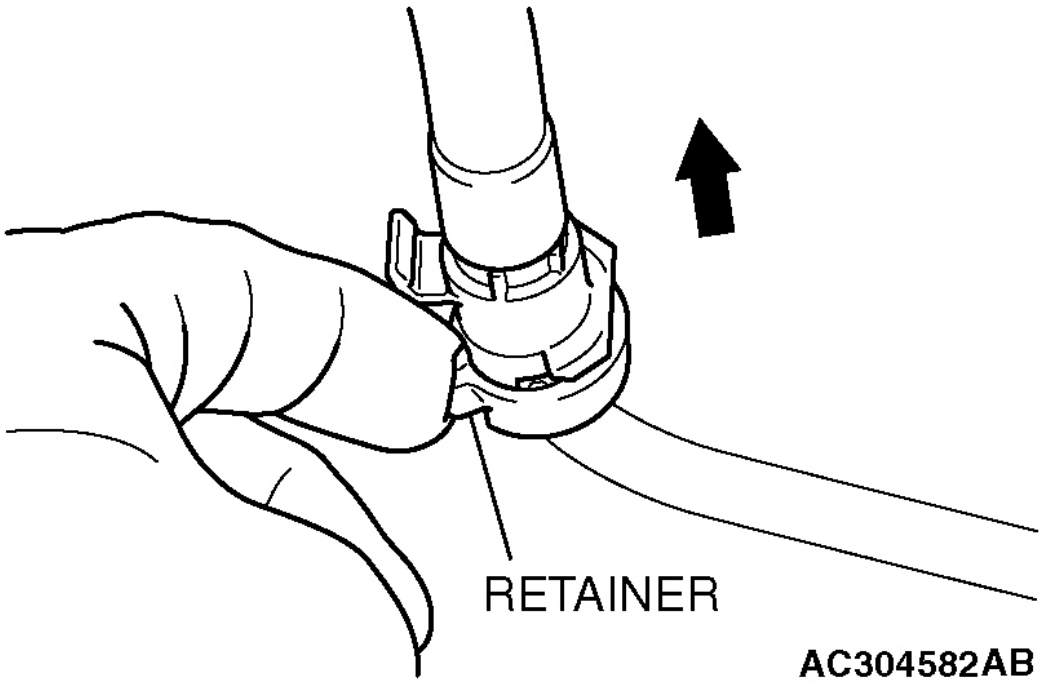



**Fig. 22: Pulling Up Retainer And Removing Fuel High-Pressure Hose**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**<<F>> TRANSAXLE ASSEMBLY REMOVAL**

1. Frame front end structure bar provisorily.

**NOTE: Secure A/C condenser and front end structure bar with a cord in the location where the removal and installation of the engine assembly cannot be hindered.**

2. Remove the transaxle assembly. (Refer to **TRANSAXLE ASSEMBLY** ).

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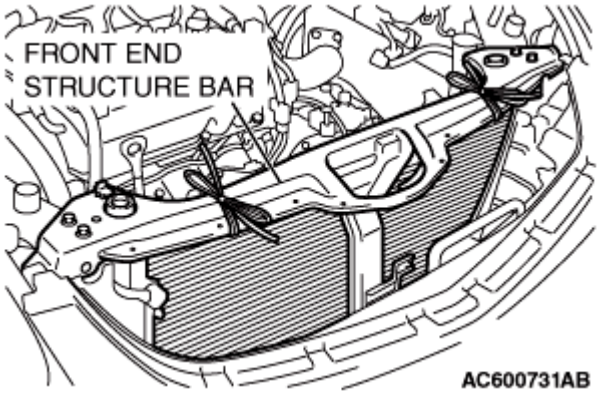



**Fig. 23: Identifying Frame Front End Structure Bar**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**<<G>> POWER STEERING OIL RESERVOIR REMOVAL**

1. With the hose installed, remove the power steering oil reservoir from the vehicle. (Refer to **POWER STEERING HOSES** ).
2. After removing the power steering oil reservoir, secure it with a cord in the location where the removal and installation of the engine front mounting bracket cannot be hindered.

**<<H>> ENGINE FRONT MOUNTING BRACKET REMOVAL**

1. Support the engine with a garage jack.
2. Remove the following special tool.
    1. < Special tool MB991895 is used>

       Remove special tool MB991895.

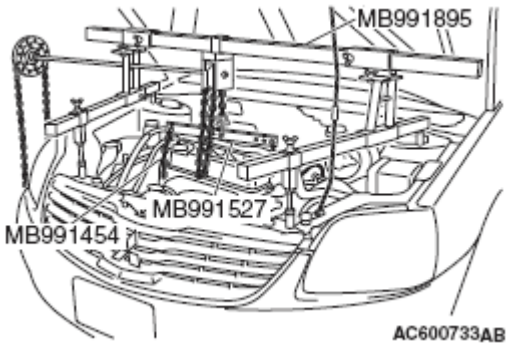



**Fig. 24: Identifying Special Tool MB991527 And MB991454**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

    2. < Special tool MB991928 is used>

       Remove special tool MB991928.

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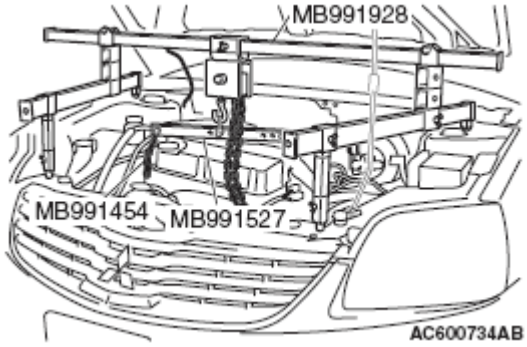



**Fig. 25: Identifying Special Tool MB991527 And MB991454**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

3. Hold the engine assembly with a chain block, etc.
4. Place a garage jack against the engine oil pan with a piece of wood in between so that the weight of the engine assembly is no longer being applied to the engine front mounting bracket.
5. Loosen the engine front mounting bracket mounting nuts and bolts, and remove the engine front mounting bracket.

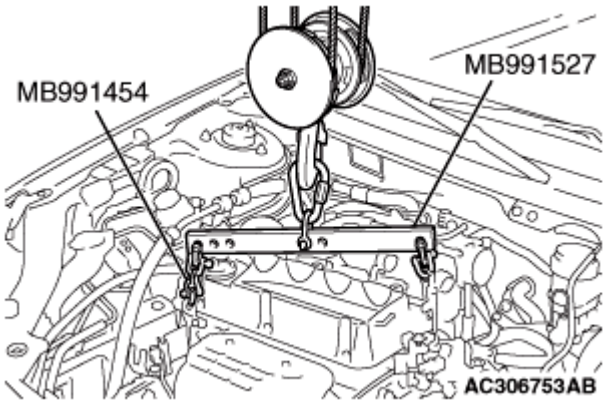



**Fig. 26: Placing Garage Jack Against Engine Oil Pan With Piece Of Wood**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**<<I>> 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 INSTALLATION**

Install the engine assembly, being careful not to pinch the cables, hoses or wiring harness connectors.

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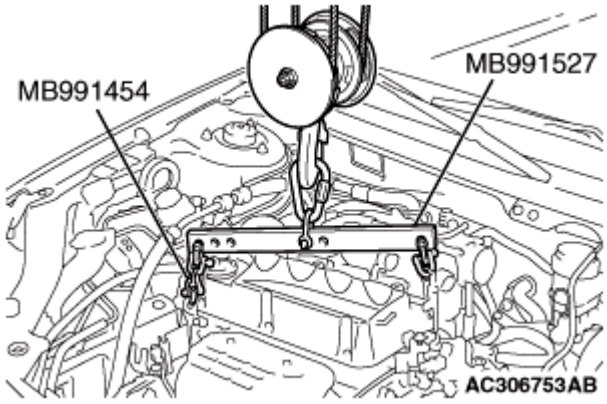



**Fig. 27: Placing Garage Jack Against Engine Oil Pan With Piece Of Wood**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**>>B << ENGINE FRONT MOUNTING BRACKET INSTALLATION**

1. Place a garage jack against the engine oil pan with a piece of wood in between, and install the engine front mounting bracket while adjusting the position of the engine.
2. Support the engine assembly with a garage jack.
3. Remove the chain block.
4. Use the following special tool as during removal to support the engine.
    1. < Special tool MB991895 is used>

       Set special tool MB991895. (Refer to **TRANSAXLE ASSEMBLY** ).

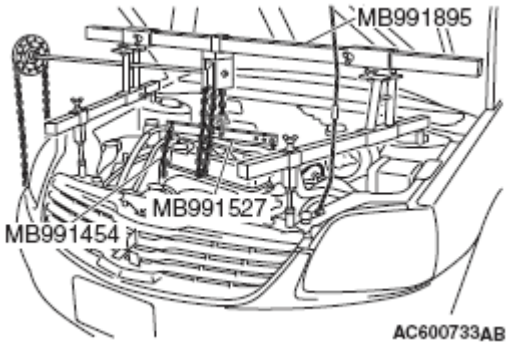



**Fig. 28: Identifying Special Tool MB991527 And MB991454**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

    2. < Special tool MB991928 is used>

       Set special tool MB991928. (Refer to **TRANSAXLE ASSEMBLY** ).

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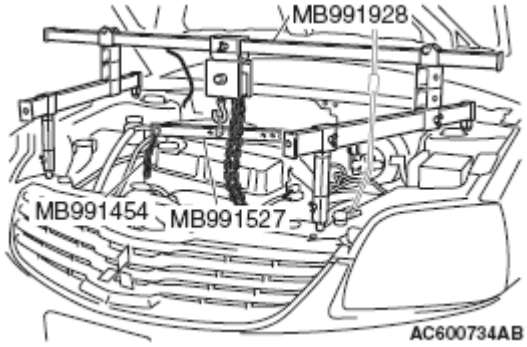



**Fig. 29: Identifying Special Tool MB991527 And MB991454**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**>>C << TRANSAXLE ASSEMBLY INSTALLATION**

1. Install the transaxle assembly. (Refer to **TRANSAXLE ASSEMBLY** ).
2. Remove the front end structure bar.

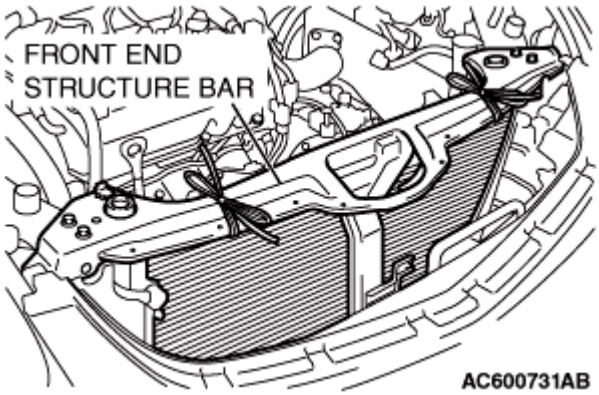



**Fig. 30: Identifying Frame Front End Structure Bar**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**>>D << 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.

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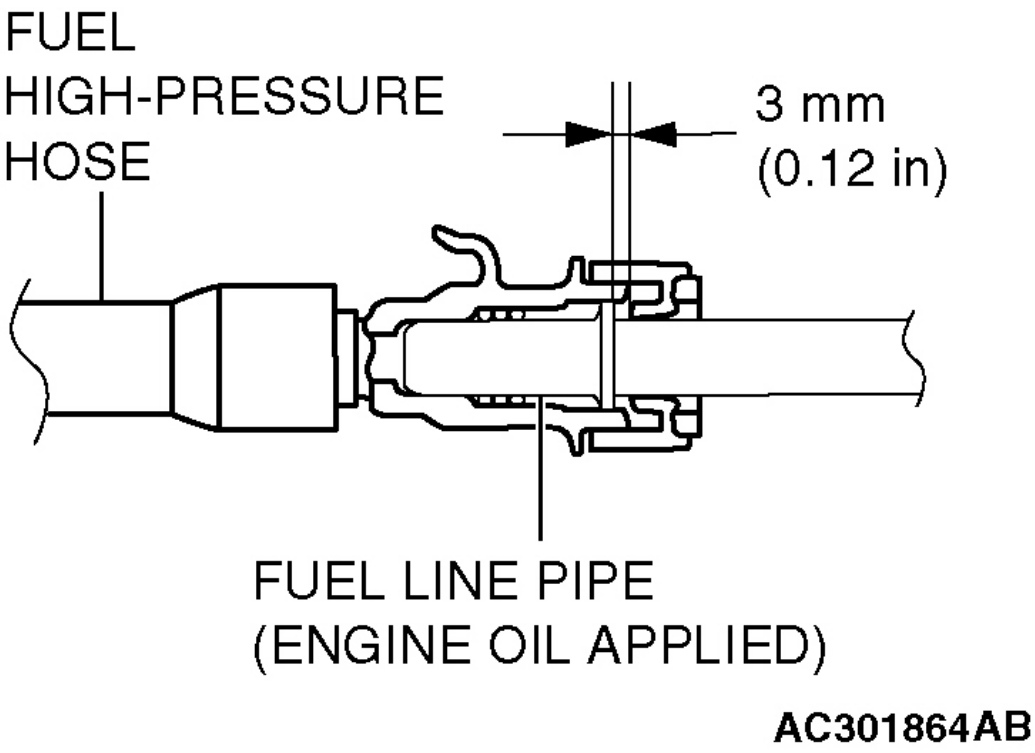



**Fig. 31: Installing Fuel High-Pressure Hose**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

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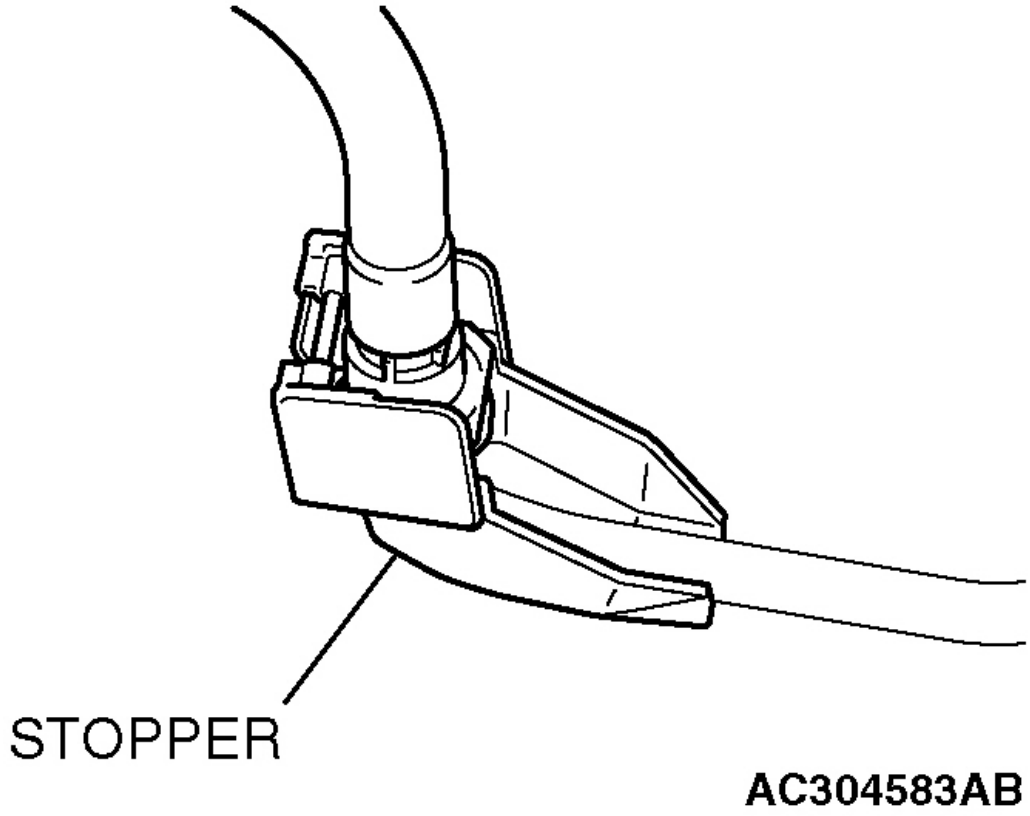



**Fig. 32: Identifying Stooper**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**>>E << DRIVE BELT INSTALLATION**

**CAUTION:**
- **To reuse the drive belt, install it while aligning the arrow mark on the backside of belt marked at the removal with the rotating direction.**
- **Check if there is no deviation of the drive belt at the angle pulley.**
- **Check if the drive belt is installed onto the center of the flat face of the flat pulley.**

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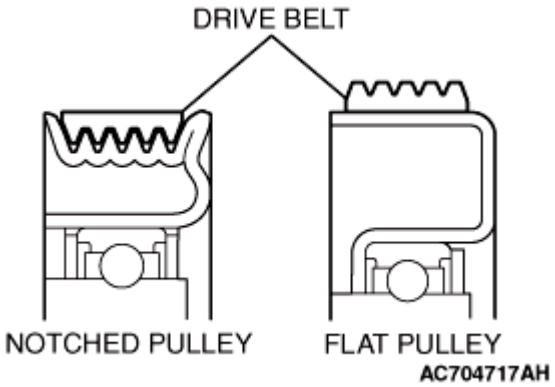



**Fig. 33: Identifying Drive Belt (Notched Pulley And Flat Pullry)**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

1. Install the drive belt to each pulley as shown in the figure.

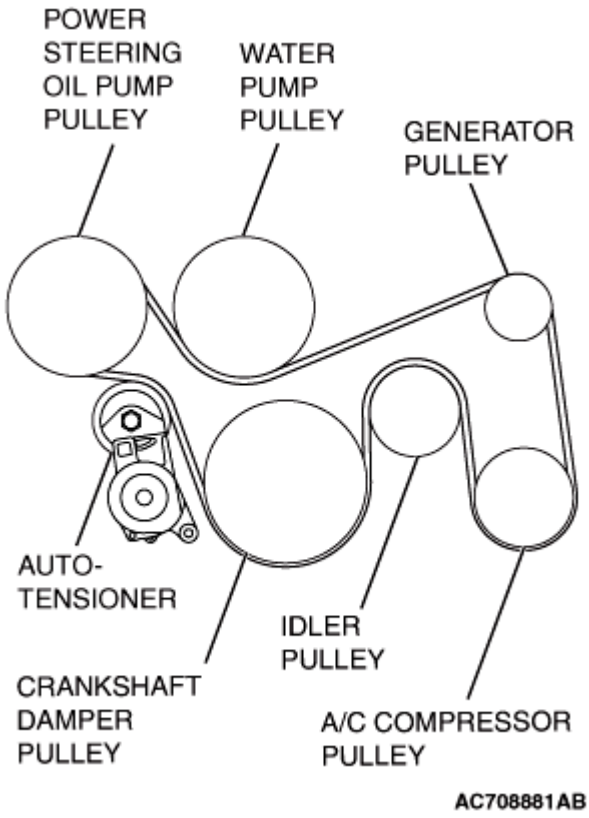



**Fig. 34: Identifying Power Steering Oil Pump Pulley, Water Pump Pulley, Idler Pulley And Crankshaft Damper Pulley**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**>>F << BRAKE BOOSTER VACUUM HOSE CONNECTION**

Insert vacuum hose with its paint mark facing upward.

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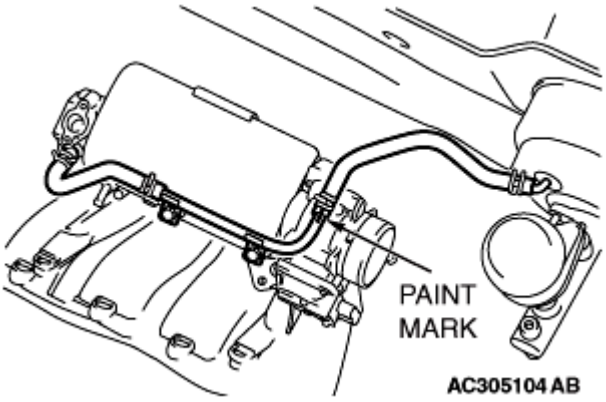
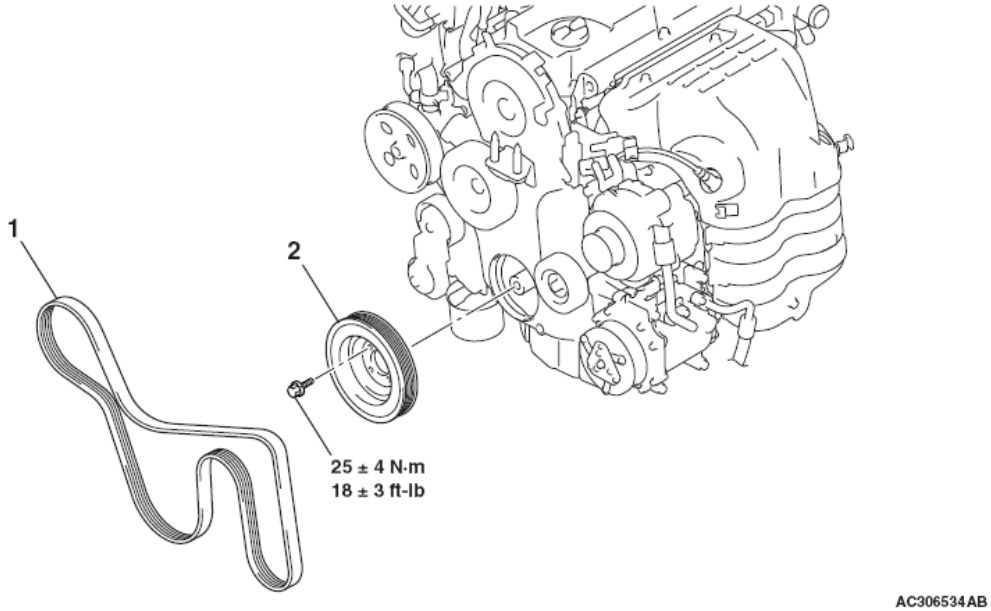



**Fig. 35: Inserting Vacuum Hose With Its Paint Mark Facing Upward**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

# CRANKSHAFT PULLEY

## REMOVAL AND INSTALLATION

| Pre-removal Operation | Post-installation Operation |
|---|---|
| • Side Under Cover Removal | • Drive Belt Tension Check<br>• Side Under Cover Installation |




**REMOVAL STEPS**
<<A>> >>A<< 1. DRIVE BELT
2. CRANKSHAFT DAMPER PULLEY

**Fig. 36: Identifying Crankshaft Damper Pulley And Drive Belt With Torque Specifications**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

### REMOVAL SERVICE POINT

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**<<A>> DRIVE BELT REMOVAL**

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

1. Securely insert the spindle handle or ratchet handle with a 12.7 mm (1/2-inch) insertion angle into the jig hole of the auto-tensioner.
2. Rotate the auto-tensioner counterclockwise and align hole A with hole B.

**CAUTION: To reuse the drive belt, draw an arrow indicating the rotating direction (clockwise) on the back of the belt using chalk, etc.**

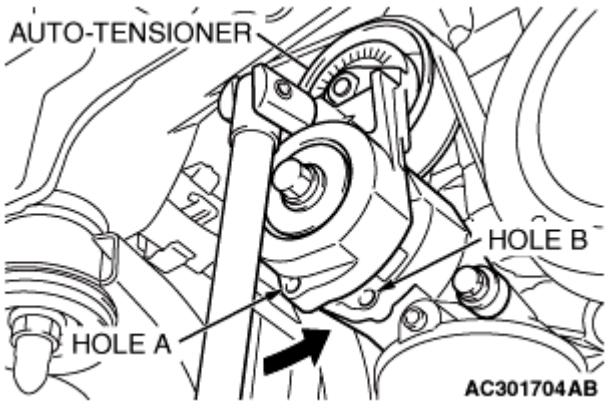



**Fig. 37: Rotating Auto-Tensioner Counterclockwise**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

3. Insert an L-shaped hexagon wrench, etc. into the hole to fix and then remove the drive belt.

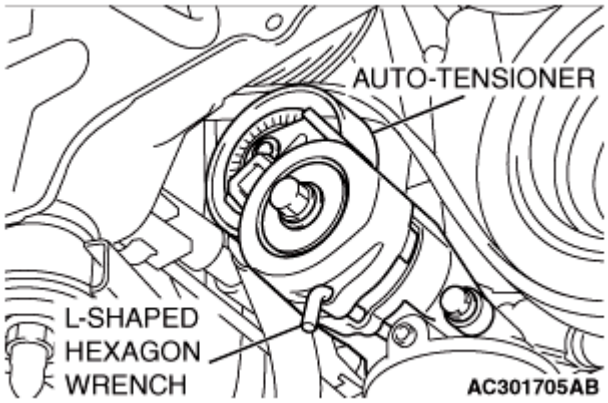



**Fig. 38: Inserting L-Shaped Hexagon Wrench**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**INSTALLATION SERVICE POINT**

**>>A << DRIVE BELT INSTALLATION**

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**CAUTION:**

- **To reuse the drive belt, install it while aligning the arrow mark on the backside of belt marked at the removal with the rotating direction.**
- **Check if there is no deviation of the drive belt at the angle pulley.**
- **Check if the drive belt is installed onto the center of the flat face of the flat pulley.**

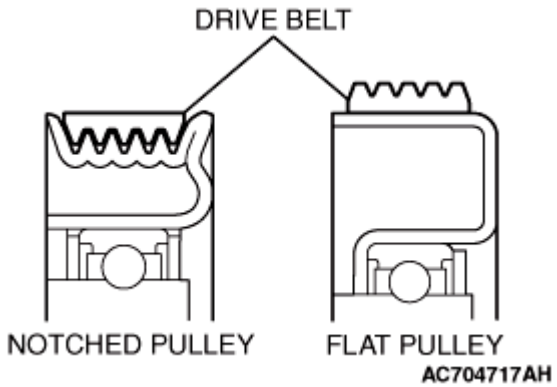
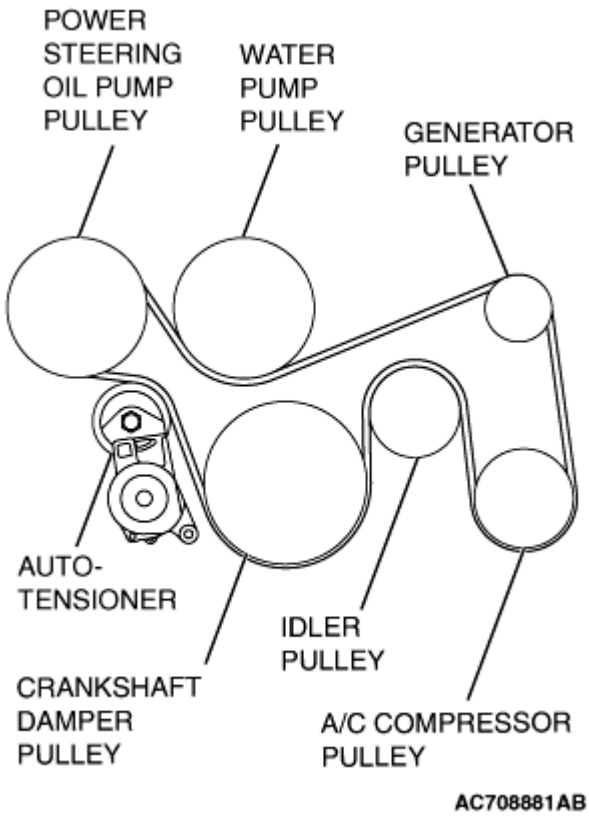



**Fig. 39: Identifying Drive Belt (Notched Pulley And Flat Pulley)**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

1. Install the drive belt to each pulley as shown in the figure.




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**Fig. 40: Identifying Power Steering Oil Pump Pulley, Water Pump Pulley, Idler Pulley And Crankshaft Damper Pulley**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

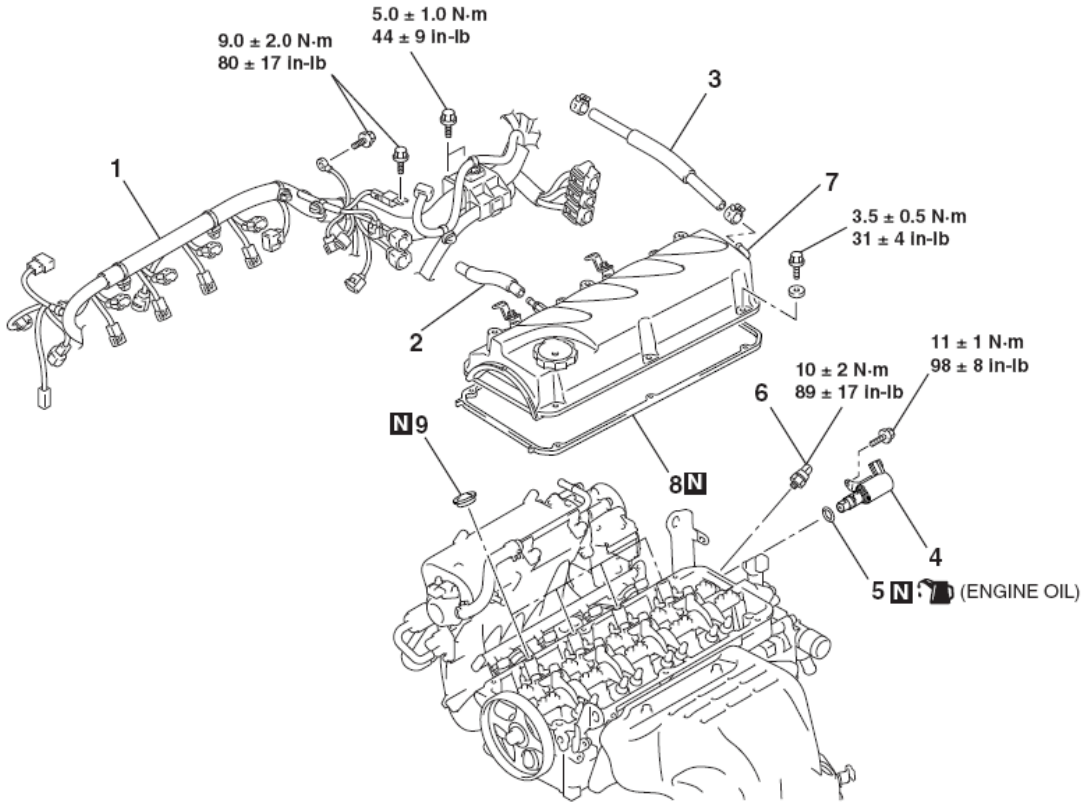
# CAMSHAFT AND VALVE STEM SEAL

## REMOVAL AND INSTALLATION

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

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| Pre-removal Operation | Post-installation Operation |
|---|---|
| • Powertrain Control Module (PCM) Removal<br>• Air Cleaner Removal<br>• Battery and Battery Tray Removal<br>• Ignition Coils Removal<br>• Timing Belt Upper Cover Removal | • Timing Belt Upper Cover Installation<br>• Ignition Coils Installation<br>• Battery and Battery Tray Installation<br>• Air Cleaner Installation<br>• Powertrain Control Module (PCM) Installation<br>• Drive Belt Tension Check<br>• Valve Clearance Check and Adjustment |

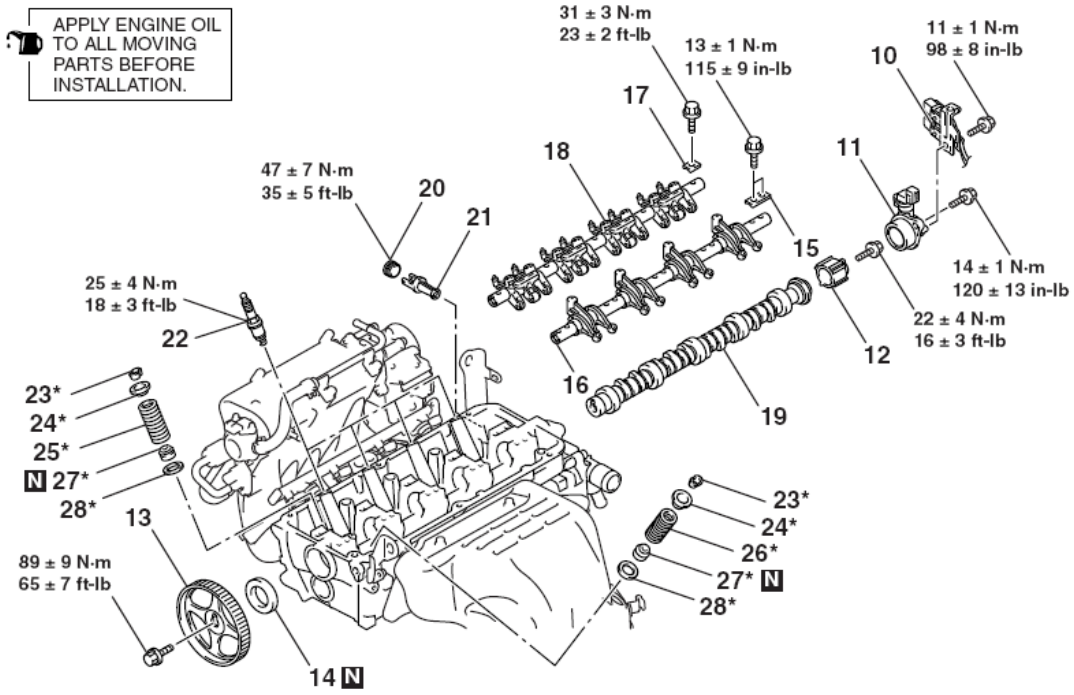



**CAMSHAFT REMOVAL STEPS**
1. CONTROL WIRING HARNESS CONNECTION
2. ROCKER COVER PCV HOSE
3. ROCKER COVER BREATHER HOSE
>>K<< 4. ENGINE OIL CONTROL VALVE
>>K<< 5. O-RING

**CAMSHAFT REMOVAL STEPS**
>>J<< 6. ENGINE OIL PRESSURE SWITCH
7. ROCKER COVER ASSEMBLY
8. ROCKER COVER GASKET
9. SPARK PLUG GUIDE OIL SEALS
• VALVE TIMING BELT

**Fig. 41: Identifying Camshaft And Valve Stem Seal Components With Torque Specification (1 Of 2)**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

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**CAMSHAFT REMOVAL STEPS**

10. CONNECTOR BRACKET
>>I<< 11. CAMSHAFT POSITION SENSOR SUPPORT
12. CAMSHAFT POSITION SENSING CYLINDER
<<A>> >>H<< 13. CAMSHAFT SPROCKET
>>G<< 14. CAMSHAFT OIL SEAL
>>F<< 15. EXHAUST ROCKER ARM SHAFT CAPS
<<B>> >>F<< 16. EXHAUST ROCKER ARM AND SHAFT ASSEMBLY
>>E<< 17. INTAKE ROCKER ARM SHAFT CAPS
<<B>> >>E<< 18. INTAKE ROCKER ARM AND SHAFT ASSEMBLY
<<C>> >>D<< 19. CAMSHAFT
• WATER INLET FITTING AND THERMOSTAT CASE ASSEMBLY
20. CYLINDER HEAD PLUG
21. ENGINE OIL CONTROL VALVE FILTER

**VALVE STEM SEAL REMOVAL STEPS**

1. CONTROL WIRING HARNESS CONNECTION
2. ROCKER COVER PCV HOSE
3. ROCKER COVER BREATHER HOSE
7. ROCKER COVER ASSEMBLY
8. ROCKER COVER GASKET
9. SPARK PLUG GUIDE OIL SEALS
>>F<< 15. EXHAUST ROCKER ARM SHAFT CAPS
<<B>> >>F<< 16. EXHAUST ROCKER ARM AND SHAFT ASSEMBLY
>>E<< 17. INTAKE ROCKER ARM SHAFT CAPS
<<B>> >>E<< 18. INTAKE ROCKER ARM AND SHAFT ASSEMBLY
22. SPARK PLUGS
<<D>> >>C<< 23. VALVE SPRING RETAINER LOCKS
24. VALVE SPRING RETAINERS
>>B<< 25. INTAKE VALVE SPRINGS
>>B<< 26. EXHAUST VALVE SPRINGS
>>A<< 27. VALVE STEM SEALS
28. VALVE SPRING SEATS

**Fig. 42: Identifying Camshaft And Valve Stem Seal Components With Torque Specification (2 Of 2)**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**Required Special Tools:**

- MB990767: Front Hub and Flange Yoke Holder
- MB991999: Valve Stem Seal Installer
- MD998713: Camshaft Oil Seal Installer
- MD998719: Pin

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- MD998772: Valve Spring Compressor

**REMOVAL SERVICE POINTS**

**<<A>> CAMSHAFT SPROCKET REMOVAL**

1. Hold the camshaft sprocket with special tools MB990767 and MD998719.
2. Loosen the camshaft sprocket mounting bolt and remove the camshaft sprocket.

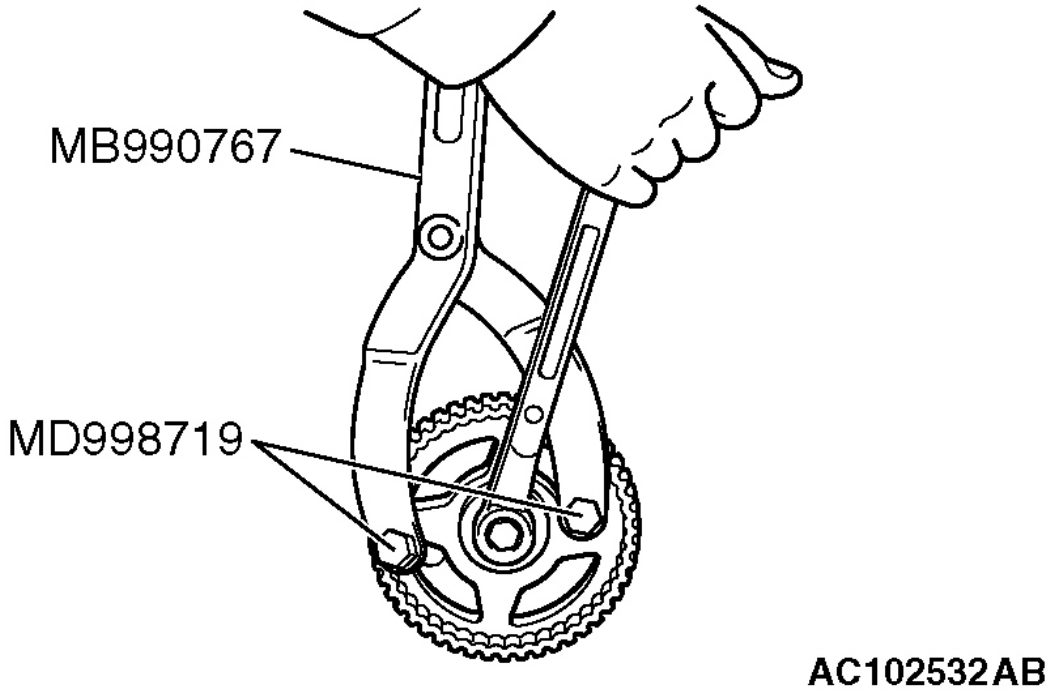



**Fig. 43: Loosening Camshaft Sprocket Mounting Bolt**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**<<B>> EXHAUST ROCKER ARM AND SHAFT ASSEMBLY/INTAKE ROCKER ARM AND SHAFT ASSEMBLY REMOVAL**

**CAUTION: Never disassemble the exhaust rocker arm and shaft assembly, and intake rocker arm and shaft assembly.**

**<<C>> CAMSHAFT REMOVAL**

1. Raise the transaxle assembly to a position in which the camshaft and transaxle mounting body side bracket do not touch it.

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2. Remove the camshaft.

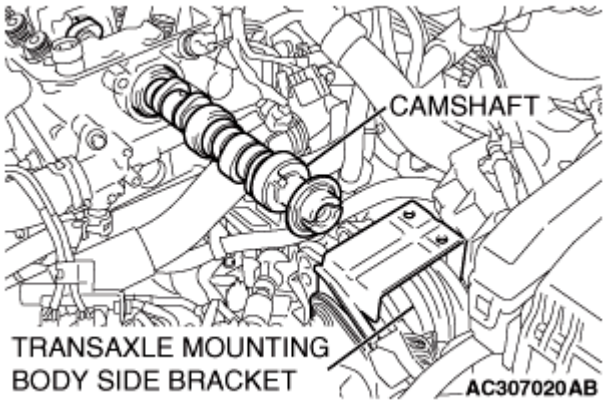



**Fig. 44: Removing Camshaft**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**<<D>> VALVE SPRING RETAINER LOCKS REMOVAL**

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

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

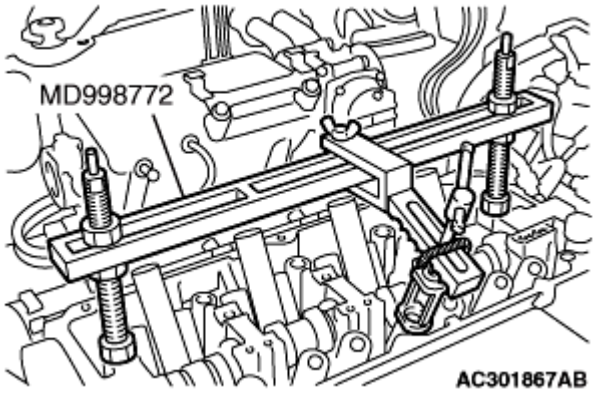



**Fig. 45: Removing Valve Spring Retainer Locks**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**INSTALLATION SERVICE POINTS**

**>>A << VALVE STEM SEALS INSTALLATION**

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

**CAUTION:**
- **Do not re-use the valve stem seal.**

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- **The special tool MB991999 must be used to install the valve stem seal. Improper installation could result in oil leaking past the valve guide.**

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

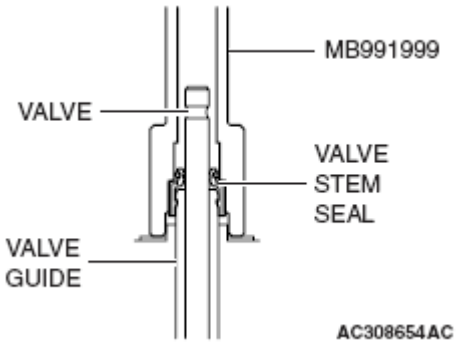



**Fig. 46: Installing Special Tool**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**>>B << EXHAUST VALVE SPRINGS/INTAKE VALVE SPRINGS INSTALLATION**

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

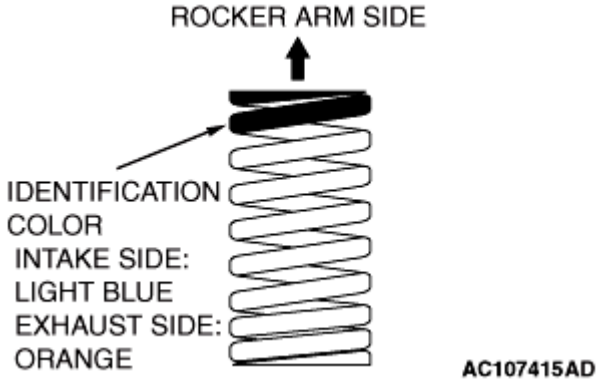



**Fig. 47: Installing Valve Springs With Identification Color Painted**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

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

Use special tool MD998772 to compress the valve spring and then install the valve spring retainer lock in the same manner as removal.

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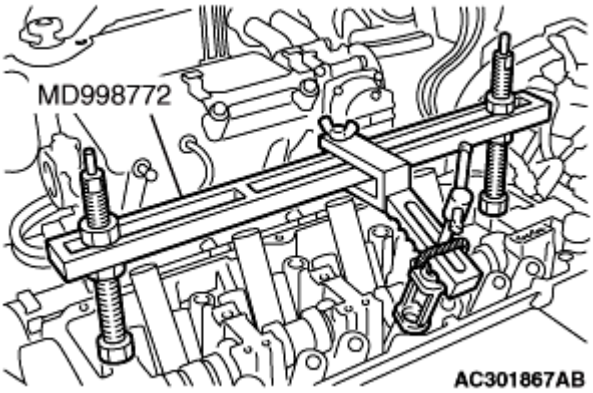



**Fig. 48: Removing Valve Spring Retainer Locks**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**>>D << CAMSHAFT INSTALLATION**

Set the dowel pin of the camshaft in the position shown in the figure.

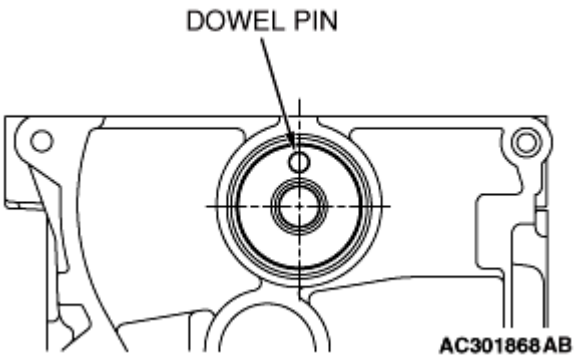



**Fig. 49: Setting Dowel Pin Of Camshaft**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**>>E << INTAKE ROCKER ARM AND SHAFT ASSEMBLY/INTAKE ROCKER ARM SHAFT CAPS INSTALLATION**

1. Place the intake rocker shaft so that its f 5.5 mm (0.22 inch) hole faces toward the cylinder head.
2. Install the intake rocker arm shaft caps.
3. Tighten the intake rocker shaft mounting bolts to the specified torque.

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

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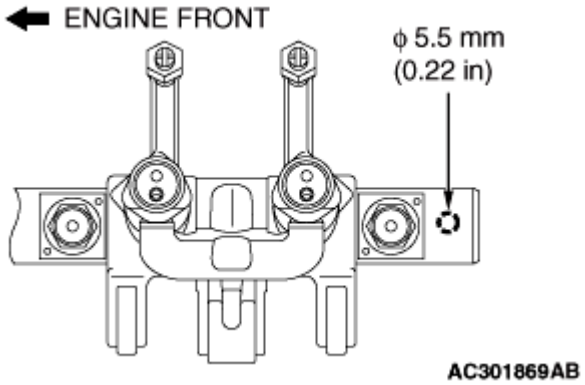



**Fig. 50: Placing Intake Rocker Shaft**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**>>F << EXHAUST ROCKER ARM AND SHAFT ASSEMBLY/EXHAUST ROCKER ARM SHAFT CAPS INSTALLATION**

1. Install the exhaust rocker shaft so that its notch is positioned as shown in figure.
2. Install the exhaust rocker arm shaft caps.
3. Tighten the exhaust rocker shaft mounting bolts to the specified torque.

**Tightening torque: 13 ± 1 N.m (115 ± 9 in-lb)**

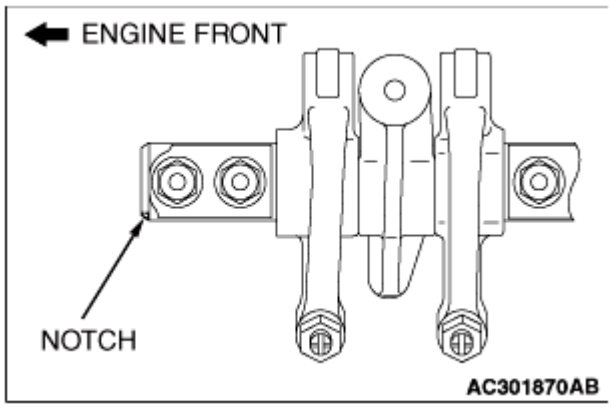



**Fig. 51: Installing Exhaust Rocker Shaft**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**>>G << CAMSHAFT OIL SEAL INSTALLATION**

1. Apply engine oil to the entire inner diameter of the oil seal lip.
2. Use special tool MD998713 to press-fit the oil seal as shown in figure.

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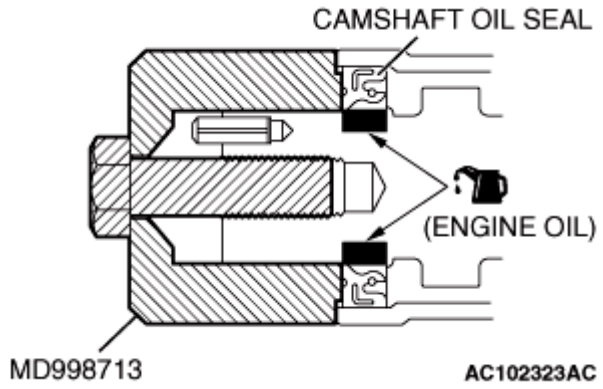



**Fig. 52: Applying Engine Oil To Entire Inner Diameter Of Oil Seal Lip**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**>>H << CAMSHAFT SPROCKET INSTALLATION**

1. Hold the camshaft sprocket with special tools MB990767 and MD998719 in the same manner as removal.
2. Tighten the camshaft sprocket mounting bolt to the specified torque.

**Tightening torque: 89 ± 9 N.m (65 ± 7 ft-lb)**

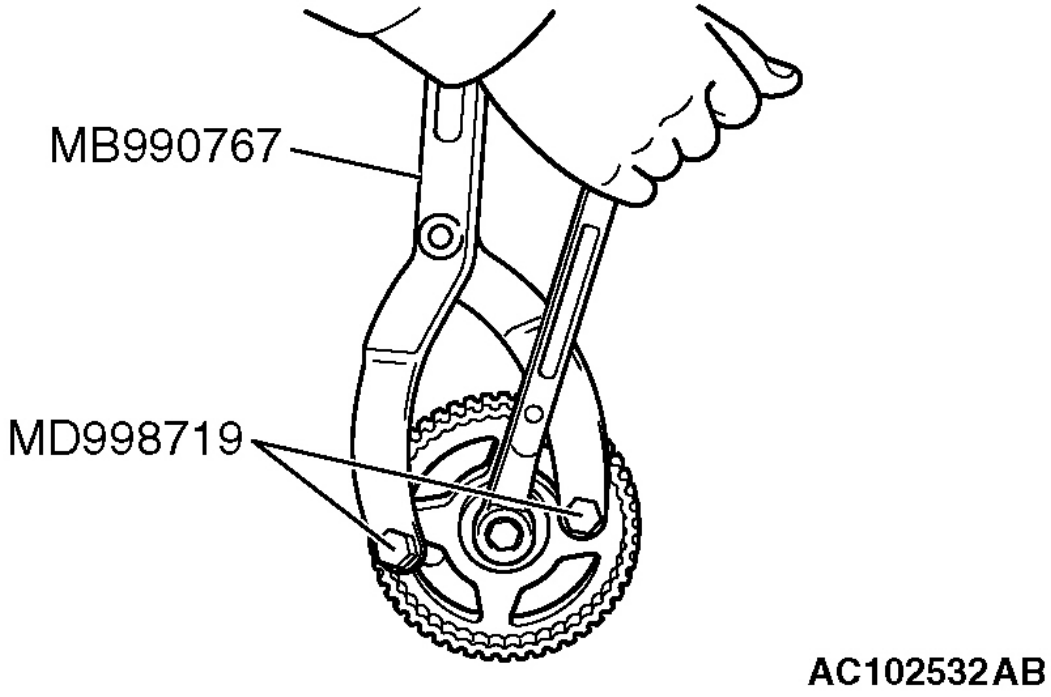



**Fig. 53: Loosening Camshaft Sprocket Mounting Bolt**

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**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**>>I << CAMSHAFT POSITION SENSOR SUPPORT INSTALLATION**

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

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

**NOTE: Install the camshaft position sensor support immediately after applying sealant.**

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

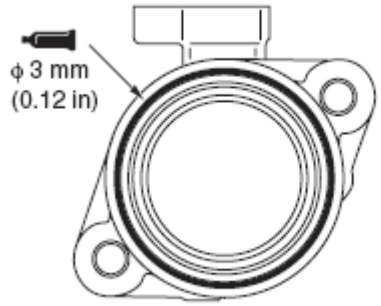



**Fig. 54: Applying Sealant To Camshaft Position Sensor Support Flange**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

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

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

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

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

1. Remove sealant from the engine oil pressure switch and cylinder head surfaces.
2. Apply sealant to the thread of the engine oil pressure switch as shown in figure.

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

**NOTE: Install the engine oil pressure switch immediately after applying sealant.**

**CAUTION: After the installation, until a sufficient period of time (one hour or**

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**more) elapses, do not apply the engine oil or water to the sealant application area or start the engine.**

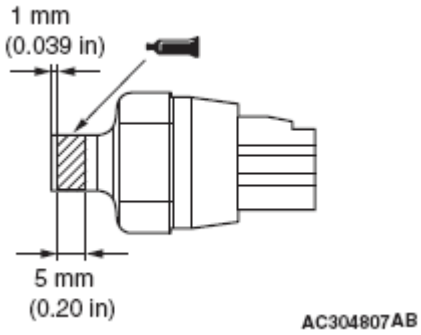



**Fig. 55: Applying Sealant To Thread Of Engine Oil Pressure Switch**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

3. Tighten the engine oil pressure switch to the specified torque as shown in figure.

**Tightening torque: 10 ± 2 N.m (89 ± 17 in-lb)**

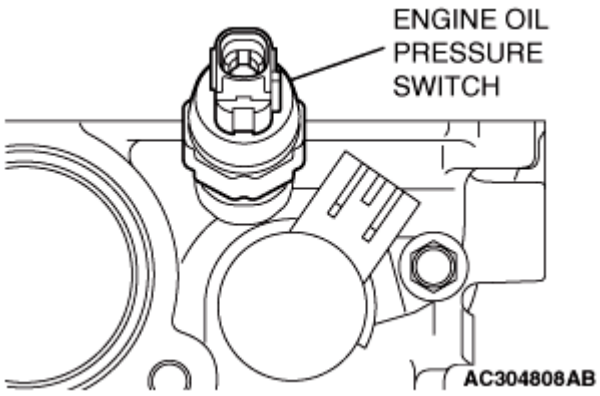



**Fig. 56: Tightening Engine Oil Pressure Switch**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

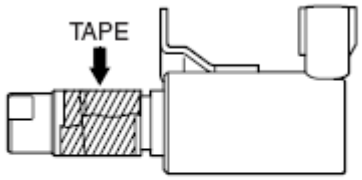
**>>K << O-RING/ENGINE OIL CONTROL VALVE INSTALLATION**

**CAUTION:**
- **Never re-use the O-ring.**
- **Before installing O-ring, wind the tape with the soft adhesion (sealing tape) around the oil passages cut-out area of engine oil control valve to prevent the damage. If the O-ring is damaged, it can be the cause of 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. Assemble the engine oil control valve to the cylinder head.
3. Tighten the engine oil control valve mounting bolt to the specified torque.

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




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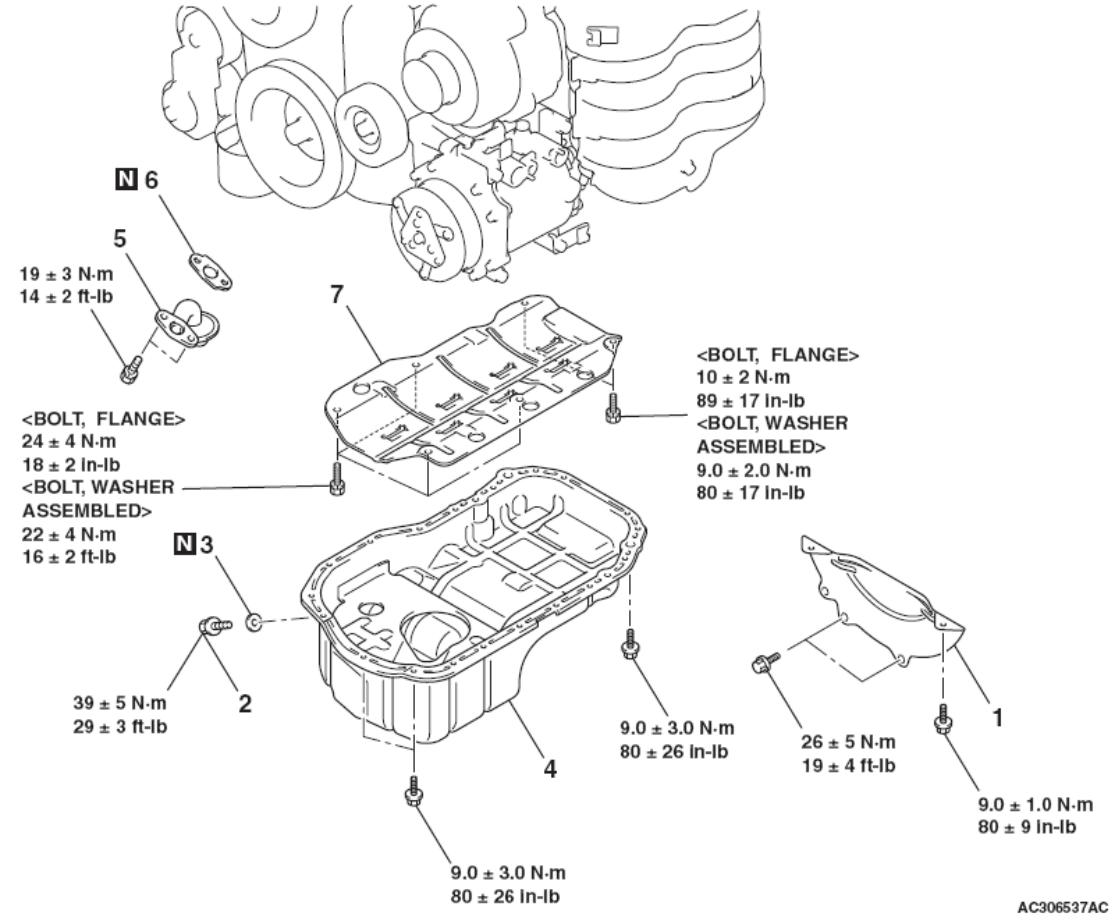
**Fig. 57: Applying Small Amount Of Engine Oil To O-Ring**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

# OIL PAN

## REMOVAL AND INSTALLATION

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| Pre-removal Operation | Post-installation Operation |
|---|---|
| • Side Under Cover Removal | • Front No.2 Exhaust Pipe Installation |
| • Engine Oil Draining | • Front No.1 Exhaust Pipe Installation |
| • Front No.1 Exhaust Pipe Removal | • Engine Oil Refilling |
| • Front No.2 Exhaust Pipe Removal | • Side Under Cover Installation |




**REMOVAL STEPS**

1. TORQUE CONVERTER HOUSING FRONT LOWER COVER
2. ENGINE OIL PAN DRAIN PLUG
>>B<< 3. ENGINE OIL PAN DRAIN PLUG GASKET
<<A>> >>A<< 4. ENGINE OIL PAN
5. ENGINE OIL PAN STRAINER
6. ENGINE OIL PAN STRAINER GASKET
7. BAFFLE PLATE

**Fig. 58: Identifying Oil Pan Components With Torque Specification**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

## Required Special Tool:

- MD998727: Oil Pan FIPG cutter

**REMOVAL SERVICE POINT**

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

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1. Remove the engine oil pan mounting bolts.

**CAUTION: Do not use special tool MD998727 in area A of the engine oil pan. Using the special tool in area A may cause deformation of the front case because the front case is made of aluminum.**

2. Tap special tool MD998727 into the range (B) between the cylinder block and the engine oil pan, and then slide the tool sideways.

**NOTE: If any sounding parts interfere with the removal, there is no need to use special tool MD998727.**

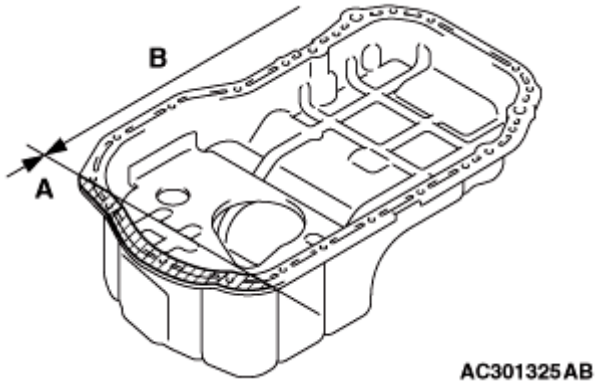



**Fig. 59: Locating Deformation Area**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

3. Remove the engine oil pan.

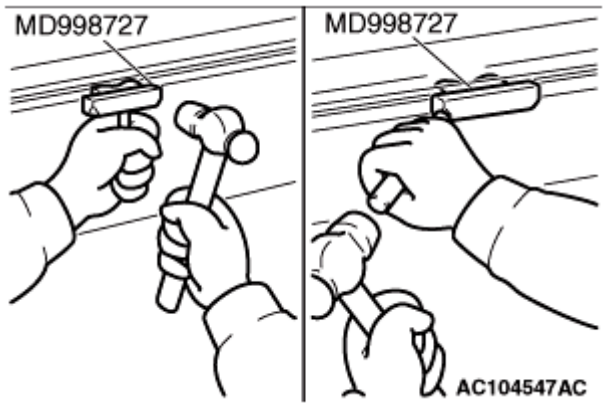



**Fig. 60: Removing Engine Oil Pan**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**INSTALLATION SERVICE POINTS**

**>>A << ENGINE OIL PAN INSTALLATION**

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1. Remove sealant from the engine oil pan, front case and cylinder block surfaces.
2. Apply a bead of the sealant to the cylinder block mating surface of the engine oil pan as shown in figure.

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

   **NOTE: Install the engine oil pan immediately after applying sealant.**

3. Assemble the engine oil pan to the cylinder block.

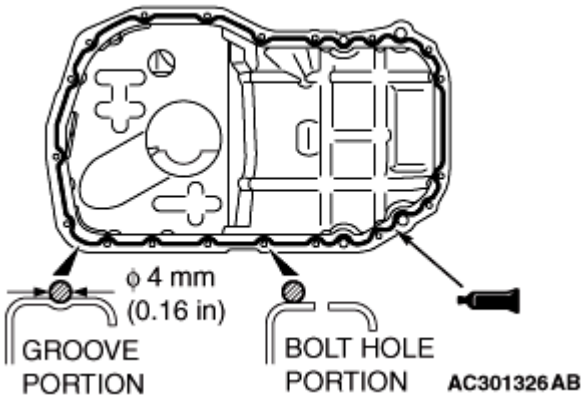



**Fig. 61: Applying Bead Of Sealant To Cylinder Block Mating Surface Of Engine Oil Pan**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

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

4. Tighten the engine oil pan mounting bolts to the specified torque. Be careful when installing, as the bolts indicated in the illustration have different lengths from the other bolts.

   **Tightening torque: 9.0 ± 3.0 N.m (80 ± 26 in-lb)**

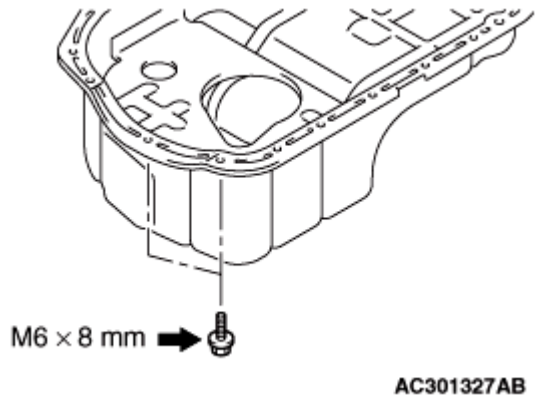


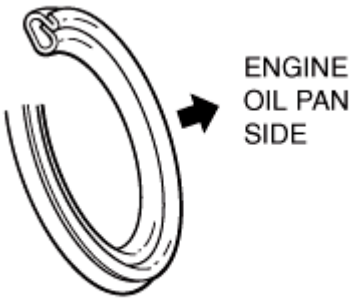

**Fig. 62: Identifying Engine Oil Pan Mounting Bolt**

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**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**>>B << ENGINE OIL PAN DRAIN PLUG GASKET INSTALLATION**

Replace the gasket with a new gasket. Install the new gasket in the direction shown in the illustration.




AC102325 AE

**Fig. 63: Locating Engine Oil Pan Drain Plug Gasket**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

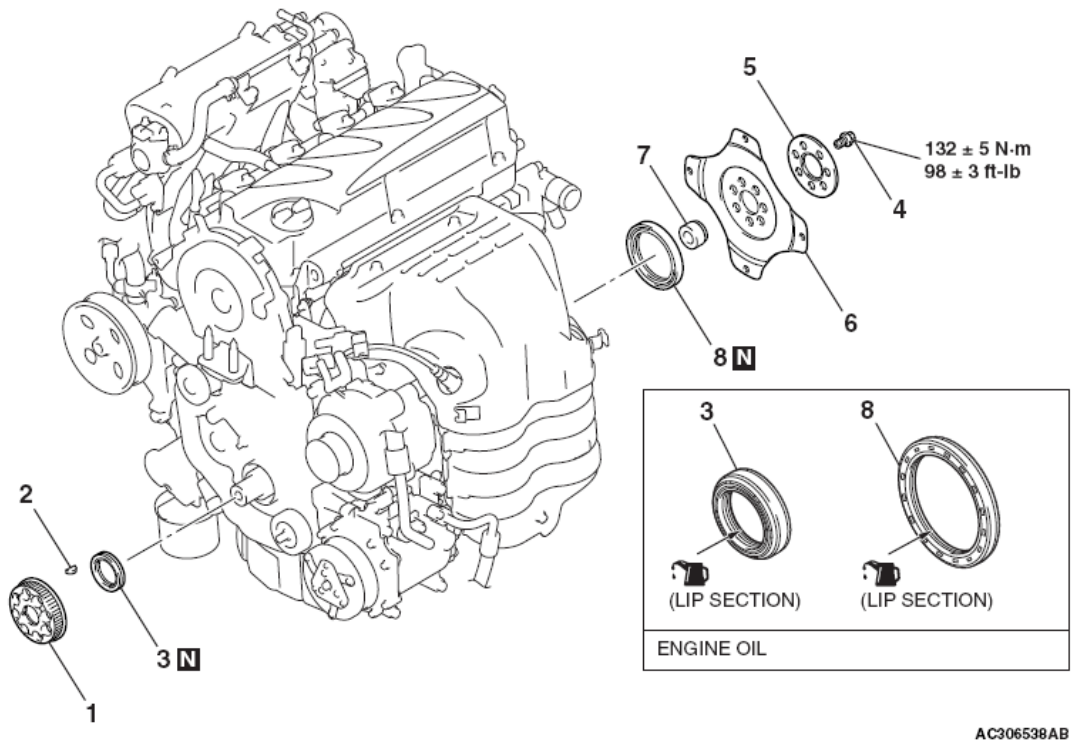
**INSPECTION**

- Check the oil pan for cracks.
- Check the oil pan sealant-coated surface for damage and deformation.

## CRANKSHAFT OIL SEAL

**REMOVAL AND INSTALLATION**

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**CRANKSHAFT FRONT OIL SEAL REMOVAL STEPS**

- VALVE TIMING BELT AND BALANCER TIMING BELT

>>D<< 1. CRANKSHAFT BALANCER SHAFT DRIVE SPROCKET
2. CRANKSHAFT KEY
>>C<< 3. CRANKSHAFT FRONT OIL SEAL

**CRANKSHAFT REAR OIL SEAL REMOVAL STEPS**

- TRANSAXLE ASSEMBLY

<<A>> >>B<< 4. A/T DRIVE PLATE BOLTS
5. A/T DRIVE PLATE ADAPTER PLATE
6. A/T DRIVE PLATE
7. CRANKSHAFT BUSH
>>A<< 8. CRANKSHAFT REAR OIL SEAL

**Fig. 64: Identifying Crankshaft Oil Seal, Valve Timing Belt, Crankshaft Front Oil Seal And Crankshaft Bush With Torque Specifications**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**Required Special Tools:**

- MB990938: Installer Bar
- MD998285: Crankshaft Front Oil Seal Guide
- MD998375: Crankshaft Front Oil Seal Installer
- MD998776: Crankshaft Rear Oil Seal Installer
- MD998781: Flywheel Stopper

**REMOVAL SERVICE POINT**

**<<A>> A/T DRIVE PLATE BOLTS REMOVAL**

1. Use special tool MD998781 to secure the A/T drive plate.

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2. Remove the A/T drive plate bolts.

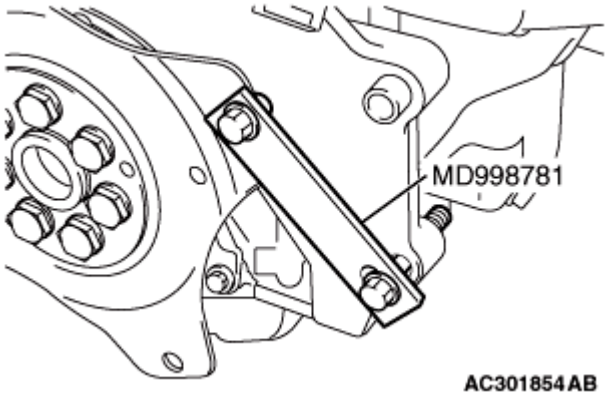



**Fig. 65: Removing A/T Drive Plate Bolts**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**INSTALLATION SERVICE POINTS**

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

1. Apply a small amount of engine oil to the entire inner diameter of the oil seal lip.
2. Use special tools MB990938 and MD998776 to press-fit the oil seal.

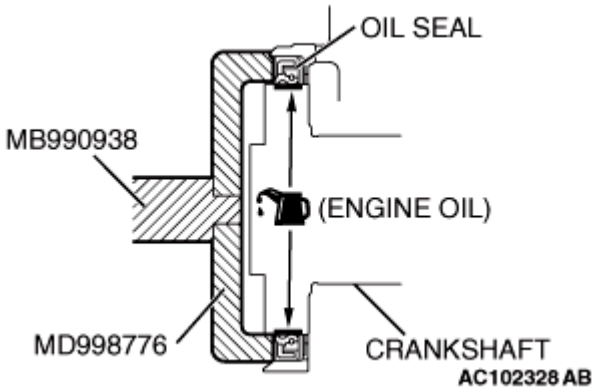



**Fig. 66: Applying Small Amount Of Engine Oil To Entire Inner Diameter**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**>>B << A/T DRIVE PLATE BOLTS INSTALLATION**

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

**Tightening torque: 132 ± 5 N.m (98 ± 3 ft-lb)**

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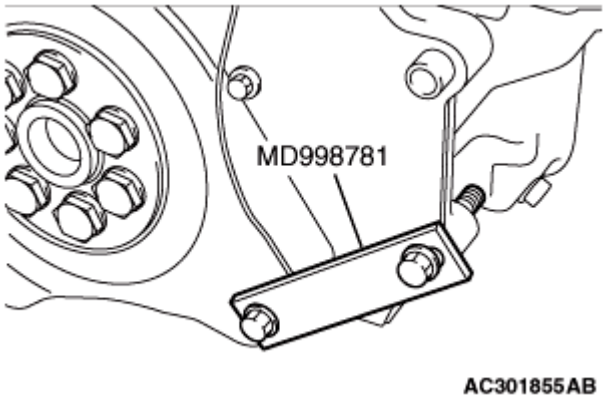



**Fig. 67: Tightening A/T Drive Plate Bolts**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

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

1. Apply a small amount of engine oil to the outer diameter of special tool MD998285 and install it to the crankshaft.
2. Apply a small amount of engine oil to the entire inner diameter of the oil seal lip.
3. Use special tool MD998375 to press-fit the oil seal.

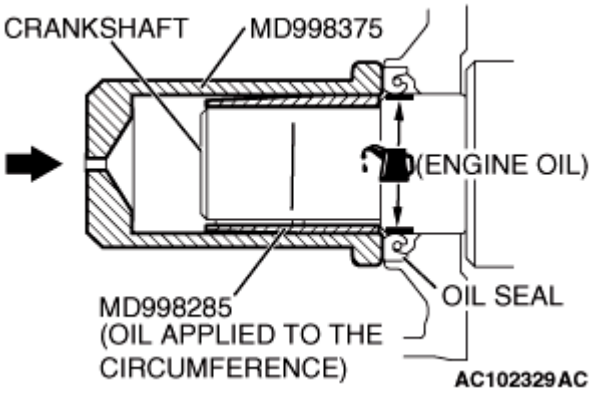



**Fig. 68: Applying Engine Oil To Crankshaft Front Oil Seal**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**>>D << CRANKSHAFT BALANCER SHAFT DRIVE SPROCKET INSTALLATION**

1. Clean or degrease the front case, the crankshaft and the crankshaft balancer shaft drive sprocket as shown in figure.

**NOTE: Also clean the degreased surfaces.**

2. Install the crankshaft balancer shaft drive sprocket in the direction shown in the illustration.

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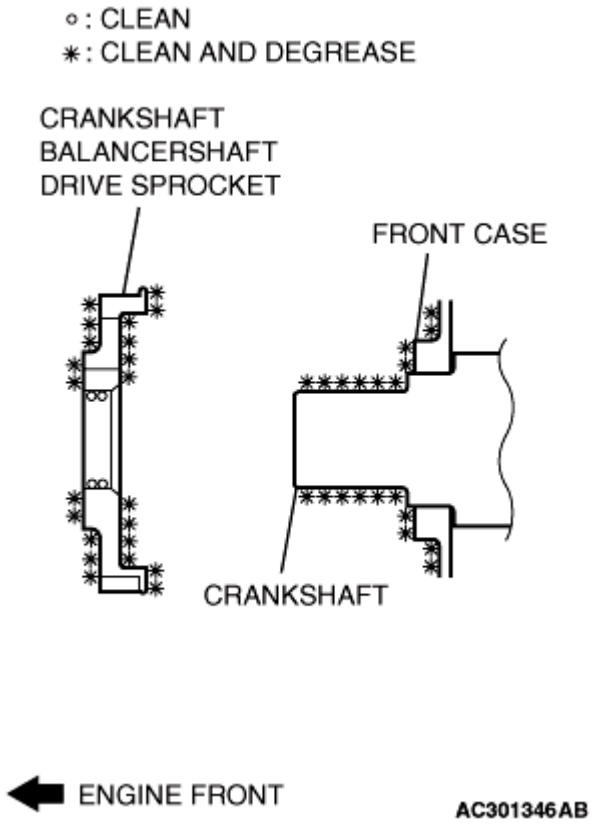


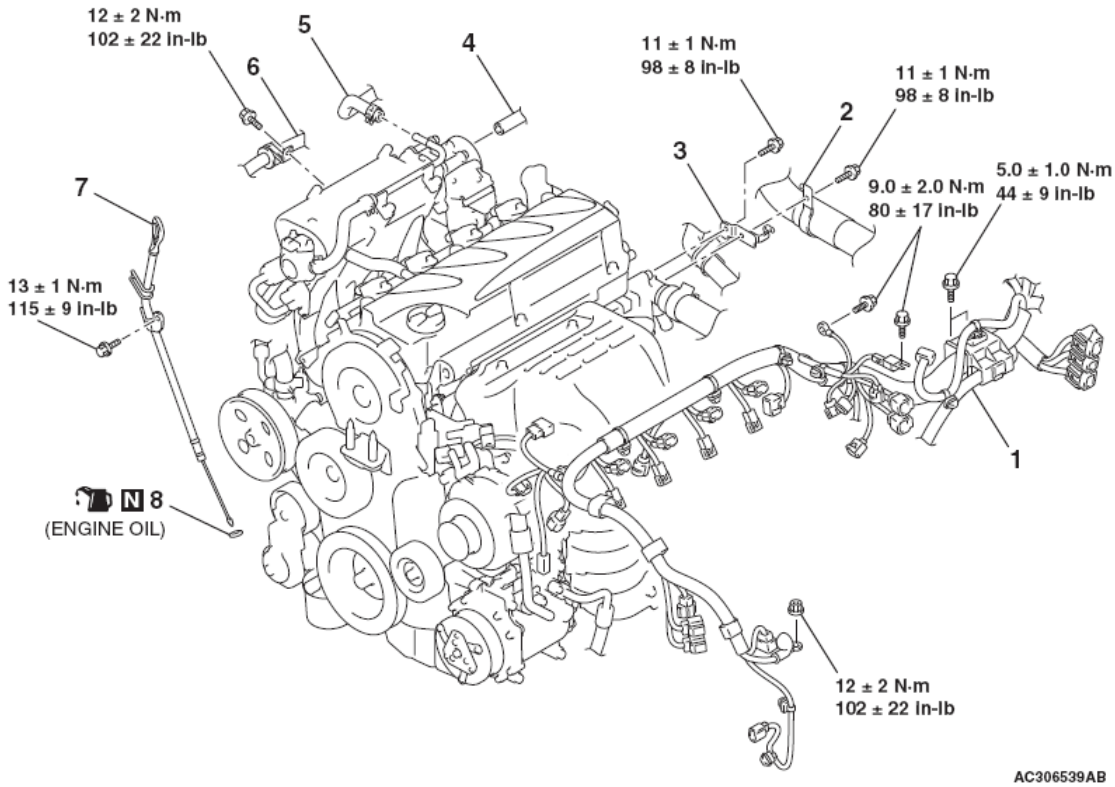

**Fig. 69: Locating Degreasing Part**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

## CYLINDER HEAD GASKET

### REMOVAL AND INSTALLATION

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| Pre-removal Operation | Post-installation Operation |
|---|---|
| • Fuel Line Pressure Reduction<br>• Engine Coolant Draining<br>• Powertrain Control Module (PCM) Removal<br>• Air Cleaner Removal<br>• Battery and Battery Tray Removal | • Battery and Battery Tray Installation<br>• Air Cleaner Installation<br>• Powertrain Control Module (PCM) Installation<br>• Engine Coolant Refilling<br>• Fuel Leak Check |



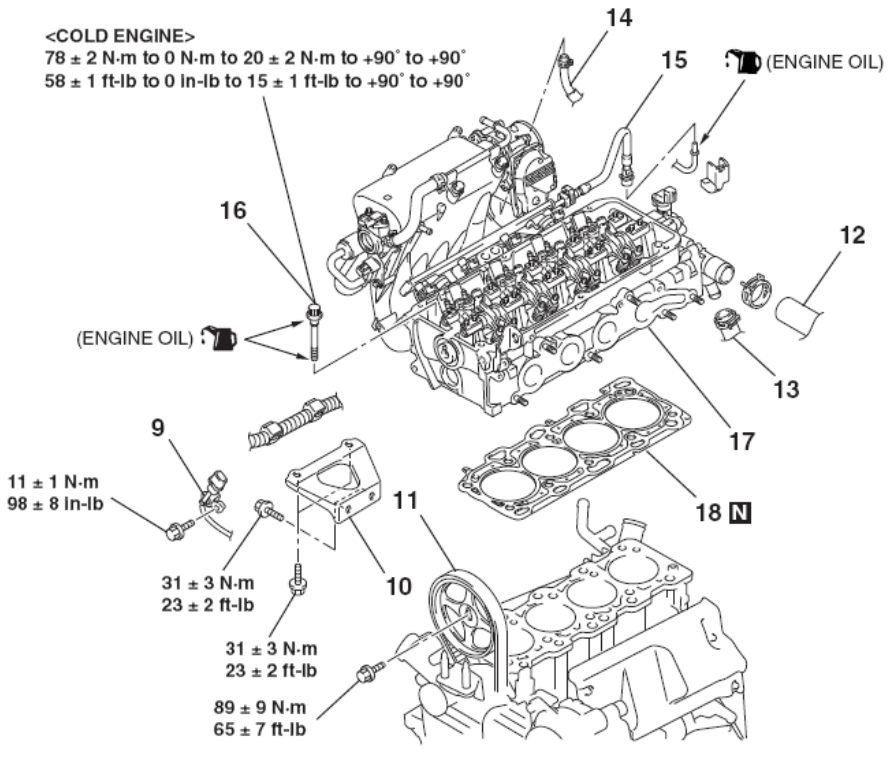

**REMOVAL STEPS**

1. CONTROL WIRING HARNESS CONNECTION
2. RADIATOR LOWER HOSE CLAMP
3. WATER HOSE CLAMP
4. EVAPORATIVE EMISSION VACUUM HOSE CONNECTION

>>F<< 5. BRAKE BOOSTER VACUUM HOSE CONNECTION
6. PRESSURE HOSE CLAMP
7. ENGINE OIL DIPSTICK AND DIPSTICK GUIDE
8. O-RING

**Fig. 70: Identifying Cylinder Head Components With Torque Specification (1 Of 2)**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

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**REMOVAL STEPS**

9. KNOCK SENSOR CONNECTION
10. INTAKE MANIFOLD STAY
    - EXHAUST MANIFOLD
    - TIMING BELT UPPER COVER
    - ENGINE FRONT MOUNTING BRACKET
11. <<A>> >>E<< CAMSHAFT SPROCKET
12. <<B>> >>D<< RADIATOR UPPER HOSE CONNECTION
13. WATER COOLER HOSE CONNECTION
14. WATER HOSE CONNECTION
    - WATER INLET FITTING AND THERMOSTAT CASE ASSEMBLY
15. <<C>> >>C<< FUEL HIGH-PRESSURE HOSE CONNECTION
    - ROCKER COVER ASSEMBLY
16. <<D>> >>B<< CYLINDER HEAD BOLTS
17. CYLINDER HEAD ASSEMBLY
18. >>A<< CYLINDER HEAD GASKET

**Fig. 71: Identifying Cylinder Head Components With Torque Specification (2 Of 2)**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**Required Special Tools:**

- MB990767: Front Hub and Flange Yoke Holder
- MB991654: Cylinder Head Bolt Wrench (12)
- MD998719: Pin
- MD998738: Adjusting Bolt

**REMOVAL SERVICE POINTS**

**<<A>> CAMSHAFT SPROCKET REMOVAL**

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**CAUTION: Never turn the crankshaft counterclockwise.**

1. Turn the crankshaft clockwise, align the timing marks on the camshaft sprocket to set number 1 cylinder to TDC of its compression stroke.

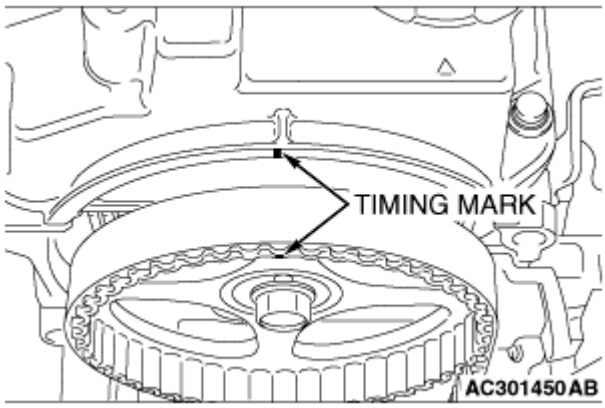



**Fig. 72: Aligning Timing Marks On Camshaft Sprocket**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

2. Remove the timing belt under cover rubber plug and then set special tool MD998738.

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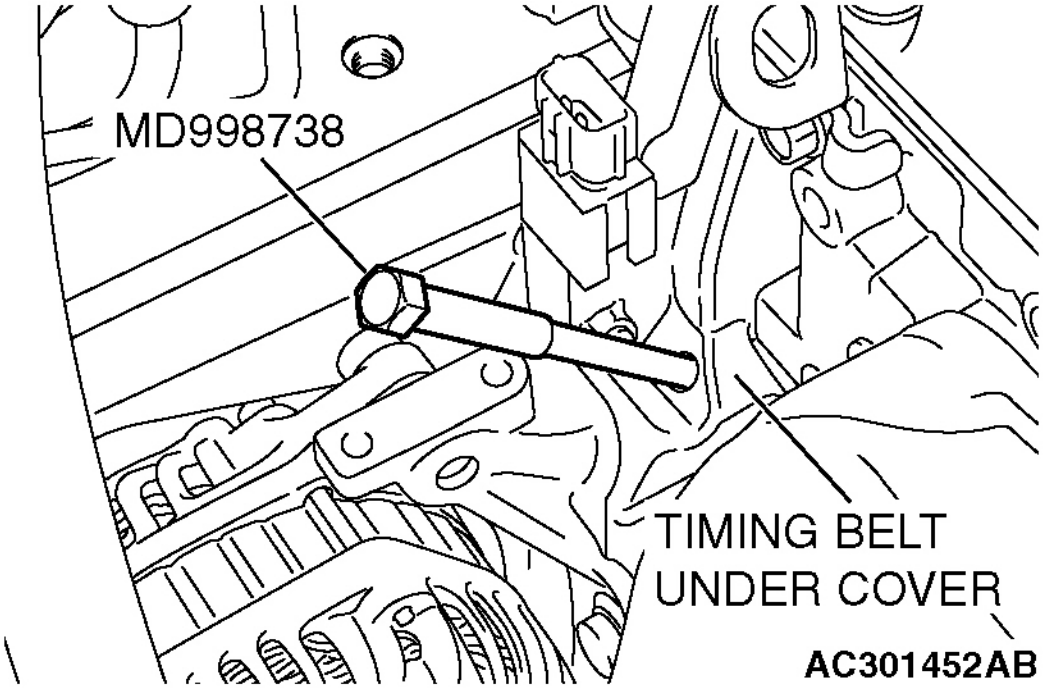



**Fig. 73: Removing Timing Belt Under Cover Rubber Plug**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

3. Screw in special tool MD998738 until it contacts the timing belt tensioner arm.

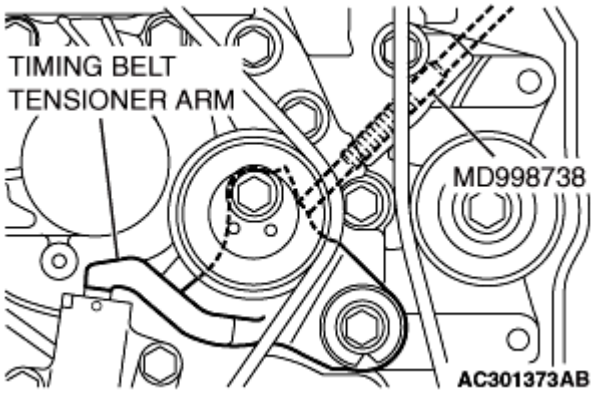



**Fig. 74: Screwing In Special Tool MD998738 By Hand**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

4. Secure the camshaft sprocket and valve timing belt with wiring bands and so on to prevent slippage between the camshaft sprocket and valve timing belt.

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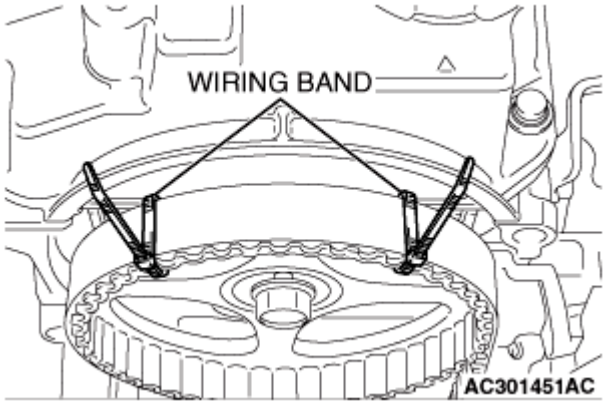
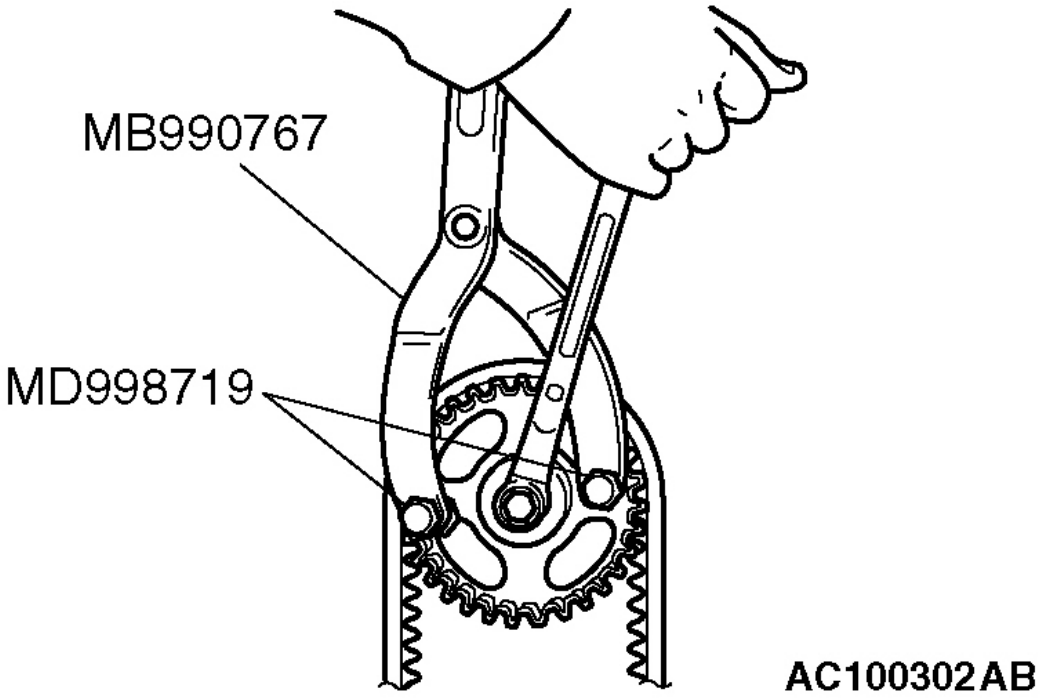



**Fig. 75: Securing Camshaft Sprocket And Valve Timing Belt With Wiring Bands**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

5. Hold the camshaft sprocket with special tools MB990767 and MD998719.

**CAUTION: Do not rotate the crankshaft after camshaft sprocket removal.**

6. Remove the camshaft sprocket with the valve timing belt and place it on the timing belt lower cover.




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**Fig. 76: Removing Camshaft Sprocket Bolt**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**<<B>> RADIATOR UPPER HOSE DISCONNECTION**

Make mating marks on the radiator upper hose and the hose clip as shown in figure to install them in the original position. Disconnect the radiator upper hose.

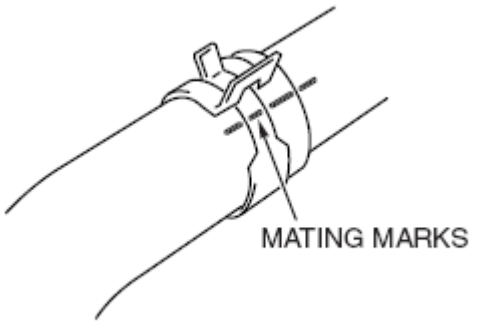



**Fig. 77: Identifying Mating Marks On Radiator Upper Hose And Hose Clip**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**<<C>> FUEL HIGH-PRESSURE HOSE REMOVAL**

1. Remove the fuel high-pressure hose stopper.

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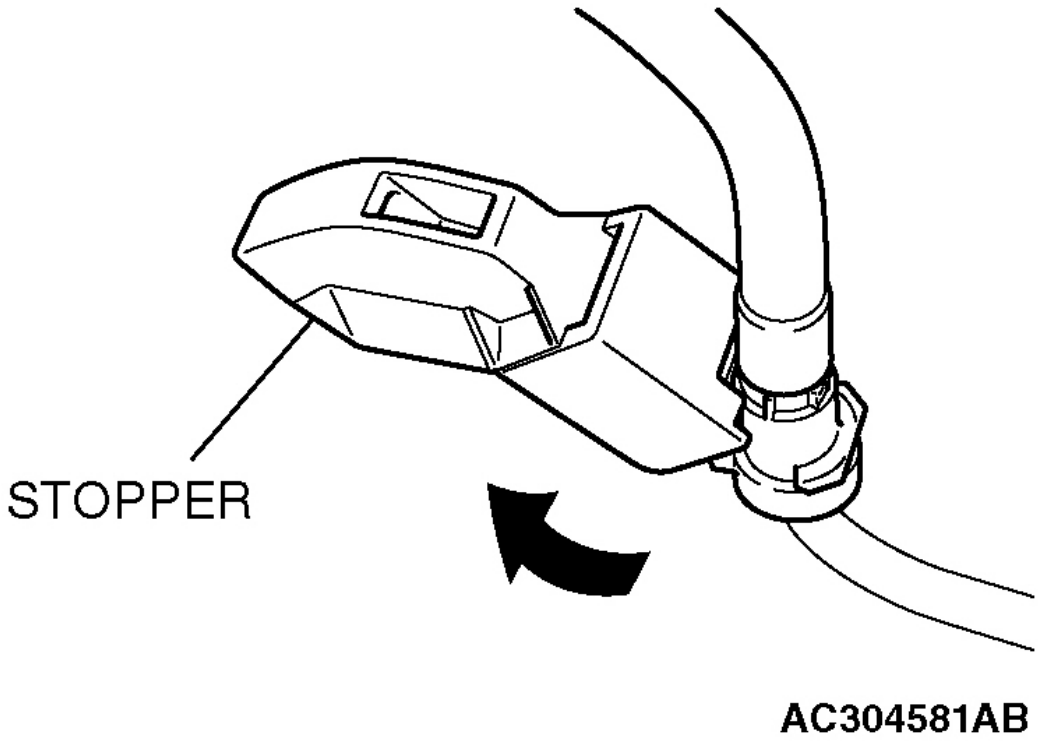



**Fig. 78: Removing Fuel High-Pressure Hose Stopper**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

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.**

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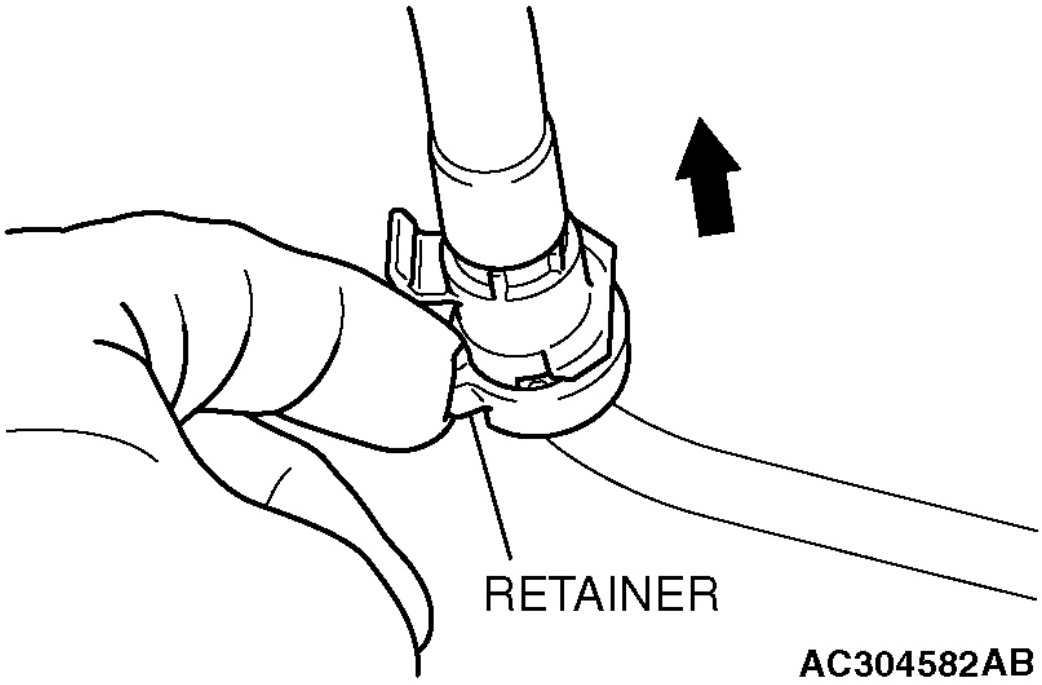



**Fig. 79: Pulling Up Retainer And Removing Fuel High-Pressure Hose**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**<<D>> CYLINDER HEAD BOLTS REMOVAL**

Use special tool MB991654 to loosen the cylinder head bolts in two or three steps in the order of the numbers shown in the illustration. If the cylinder head bolts cannot be pulled out due to the washer being trapped in the valve spring, raise the bolt slightly, then remove it while holding it by using a magnet.

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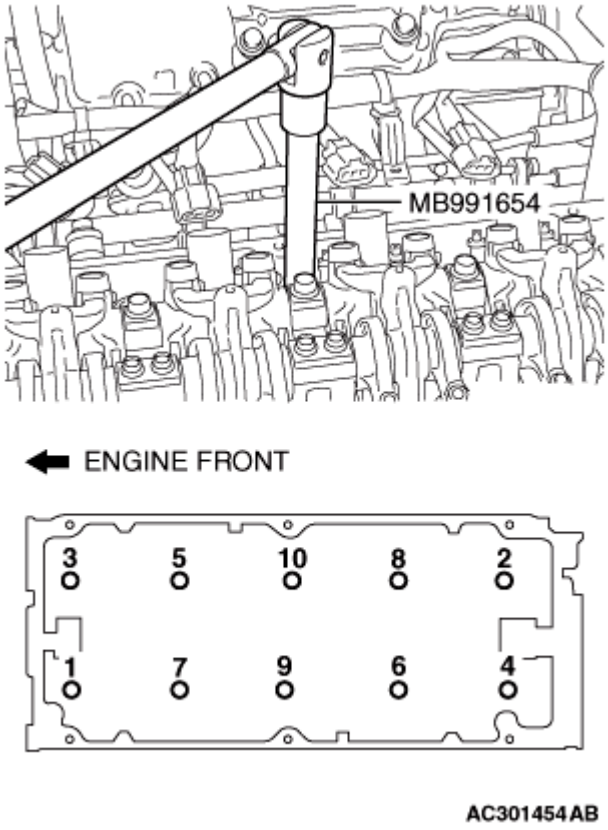



**Fig. 80: Loosening Cylinder Head Bolts**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**INSTALLATION SERVICE POINTS**

**>>A << CYLINDER HEAD GASKET INSTALLATION**

**CAUTION: Do not allow any foreign materials get into the coolant passages, oil passages and cylinder.**

1. Degrease the cylinder head gasket mounting surface.
2. Assemble to the cylinder block so the cylinder head gasket identification mark of "381" is at the top surface and on the exhaust side.

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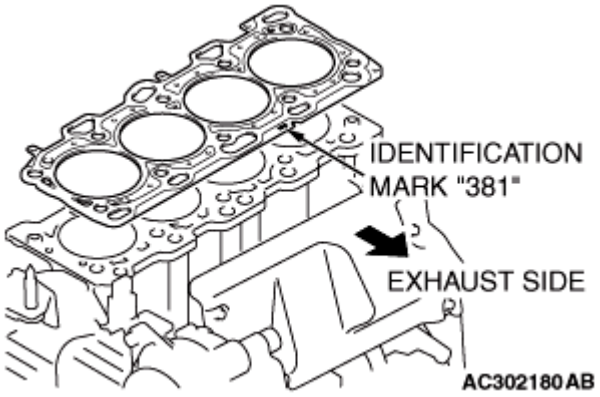



**Fig. 81: Locating Identification Marks**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**>>B << CYLINDER HEAD BOLTS INSTALLATION**

1. Check that the nominal length of each cylinder head bolt meets the limit. If it exceeds the limit, replace the bolts with a new one.

   **Limit (A): 99.4 mm (3.91 inches)**

2. Apply a small amount of engine oil to the thread of the bolts and to the washers.

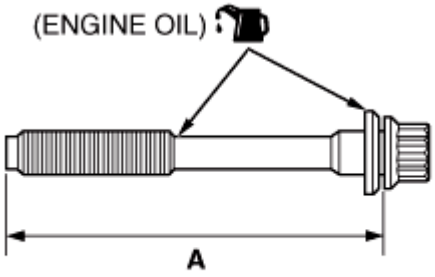



**Fig. 82: Applying Engine Oil To Cylinder Head Bolts**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

3. Use special tool MB991654 to tighten the cylinder head bolts in the following procedures.
   1. Tighten the bolts to 78 ± 2 N.m (58 ± 1 ft-lb) in the order shown in figure.
   2. Loosen the bolts fully in the reverse sequence to that shown.
   3. Tighten the bolts to 20 ± 2 N.m (15 ± 1 ft-lb) in the order shown.

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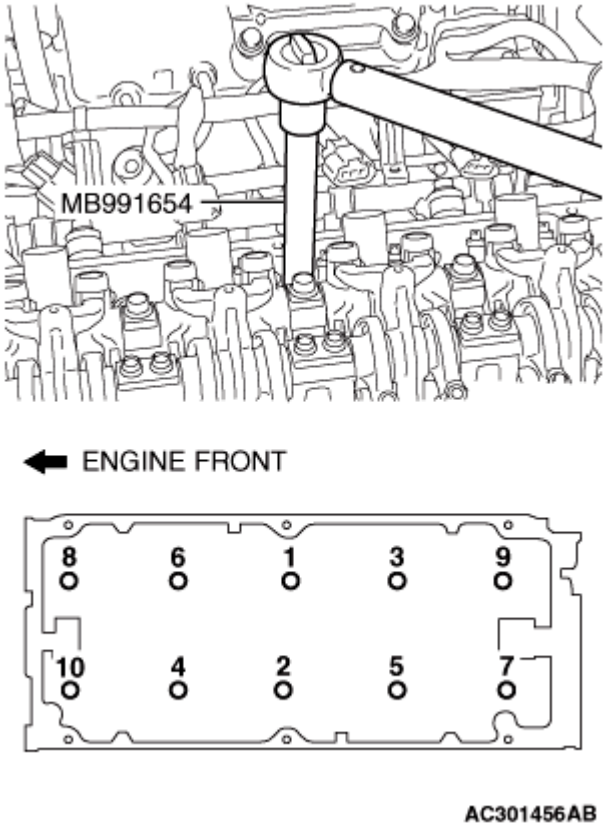



**Fig. 83: Tightening Cylinder Head Bolts**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

4. Apply a paint mark to the heads of the cylinder head bolts and cylinder head, then tighten 90 degree angle as shown in figure.

**CAUTION:**
- **When the tightening angle is smaller than the specified tightening angle, the appropriate tightening capacity cannot be secured.**
- **When the tightening angle is larger than the specified tightening angle, remove the bolt to start from the beginning again according to the procedure.**

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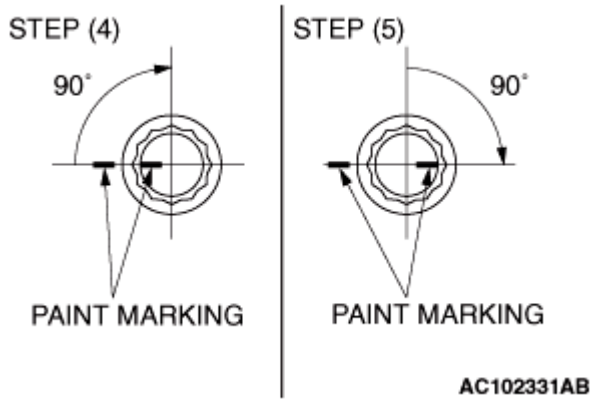



**Fig. 84: Identifying 90 Degree Angle Paint Mark**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

5. Tighten in a 90 degree angle as shown in the instructions of the figure, then check that the paint mark on the head of the cylinder head bolts and the paint mark on the cylinder head is on a linear line.

**>>C << FUEL HIGH-PRESSURE HOSE INSTALLATION**

**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.

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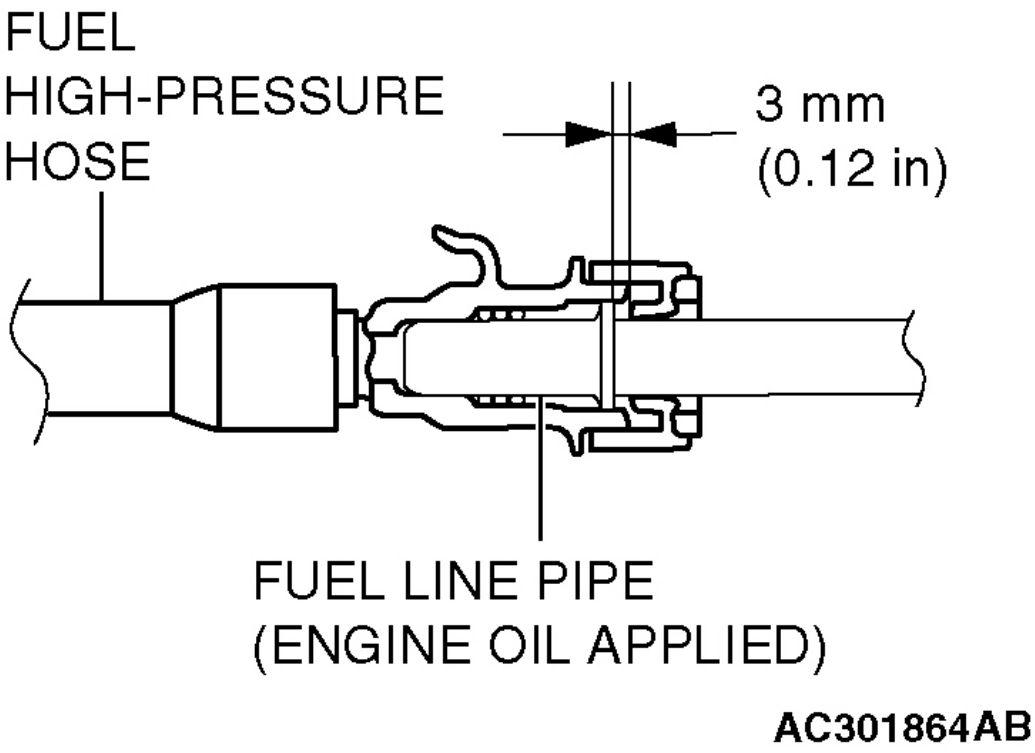



**Fig. 85: Installing Fuel High-Pressure Hose**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

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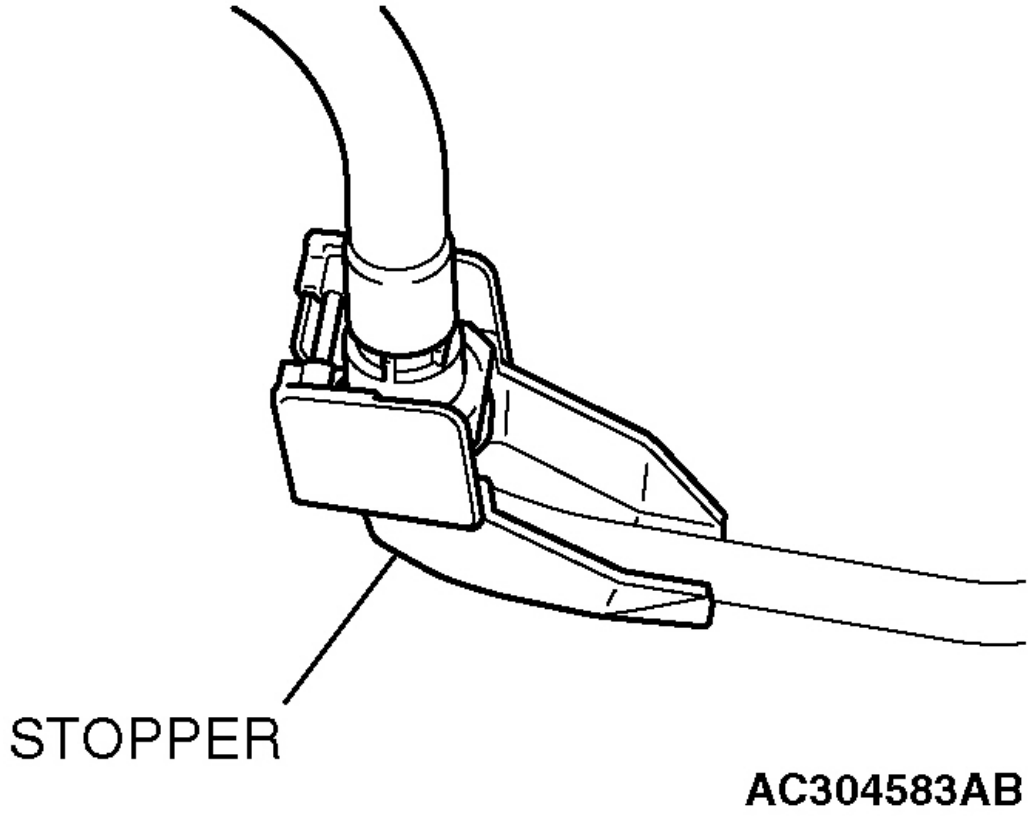



**Fig. 86: Identifying Stooper**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**>>D << RADIATOR UPPER HOSE CONNECTION**

1. Insert radiator upper hose as far as the protrusion of the water outlet fitting.
2. Align the mating marks on the radiator upper hose and hose clip, and then connect the radiator upper hose.

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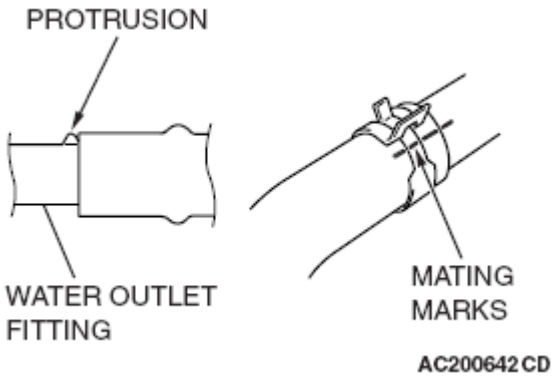



**Fig. 87: Aligning Mating Marks On Radiator Upper Hose And Hose Clip**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**>>E << CAMSHAFT SPROCKET INSTALLATION**

1. Hold the camshaft sprocket with special tools MB990767 and MD998719 in the same manner as removal.
2. Tighten the camshaft sprocket mounting bolt to the specified torque.

**Tightening torque: 89 ± 9 N.m (65 ± 7 ft-lb)**

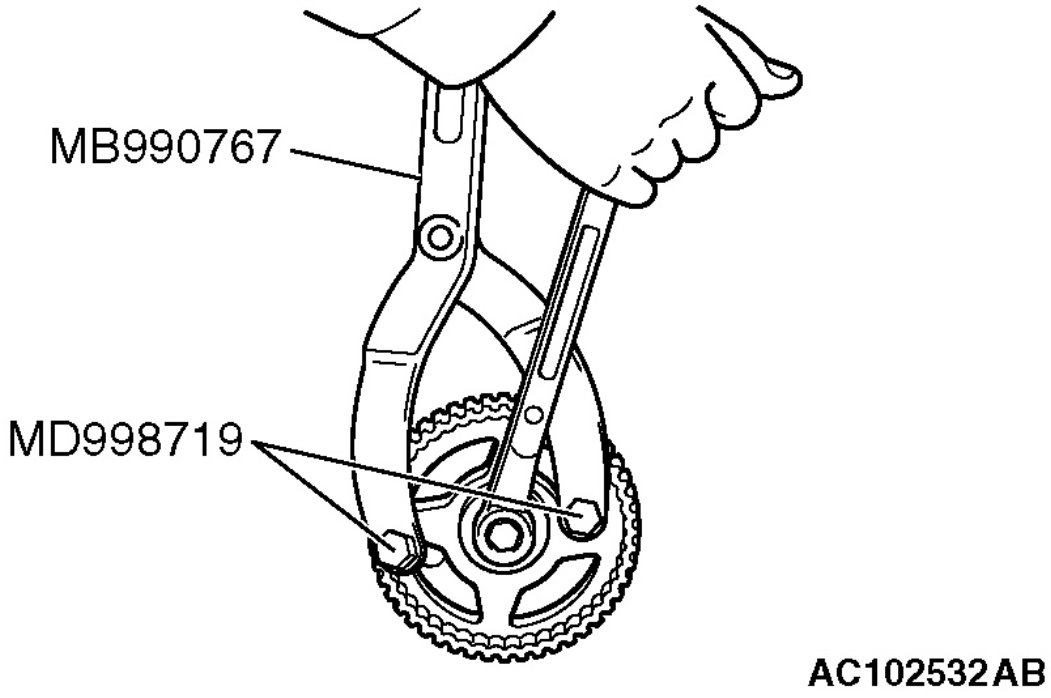



**Fig. 88: Loosening Camshaft Sprocket Mounting Bolt**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

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**>>F << BRAKE BOOSTER VACUUM HOSE CONNECTION**

Insert vacuum hose with its paint mark facing upward.

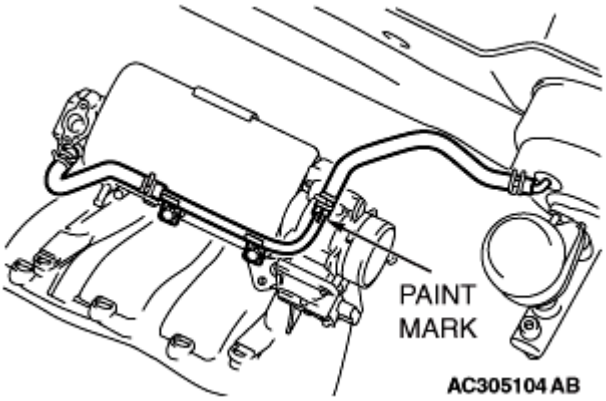


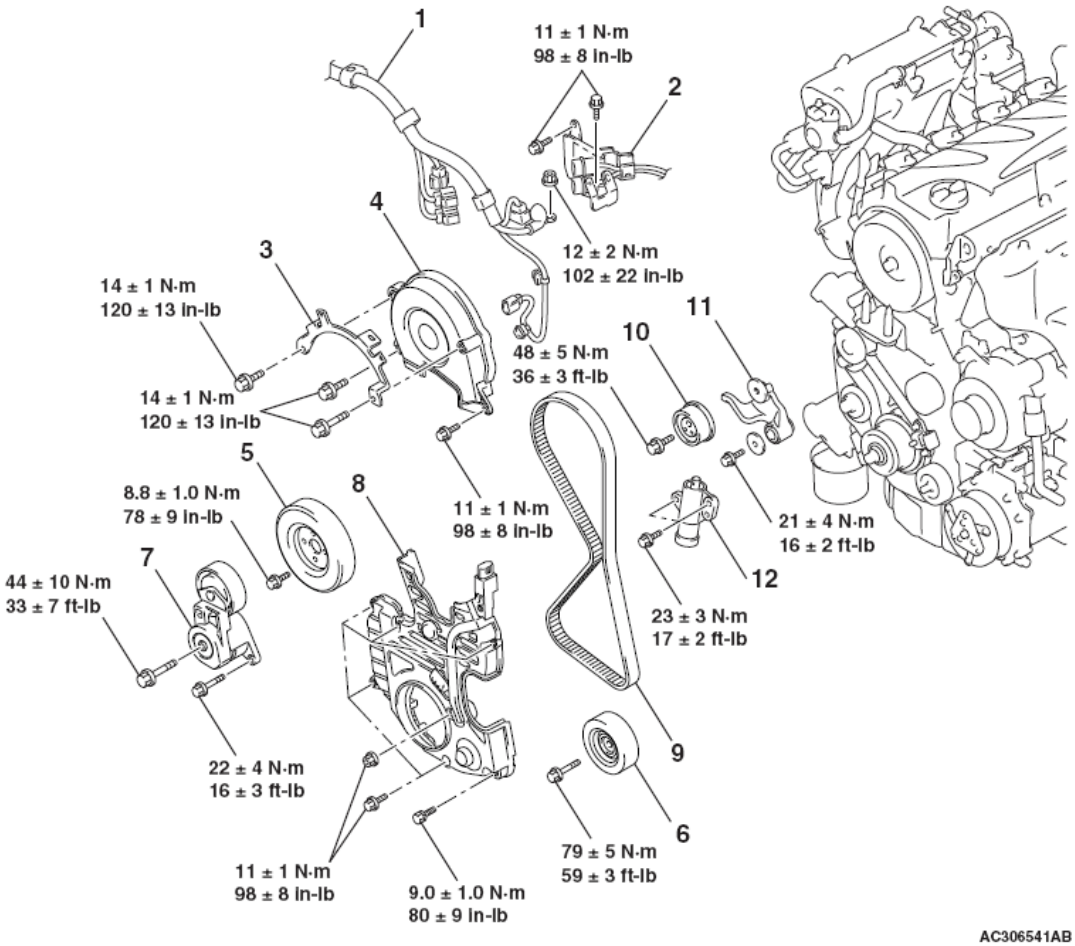

**Fig. 89: Inserting Vacuum Hose With Its Paint Mark Facing Upward**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

# TIMING BELT

**REMOVAL AND INSTALLATION**

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| Pre-removal Operation | Post-installation Operation |
|---|---|
| • Side Under Cover Removal<br>• Crankshaft Shaft Damper Pulley Removal | • Crankshaft Shaft Damper Pulley Installation<br>• Drive Belt Tension Check<br>• Side Under Cover Installation |

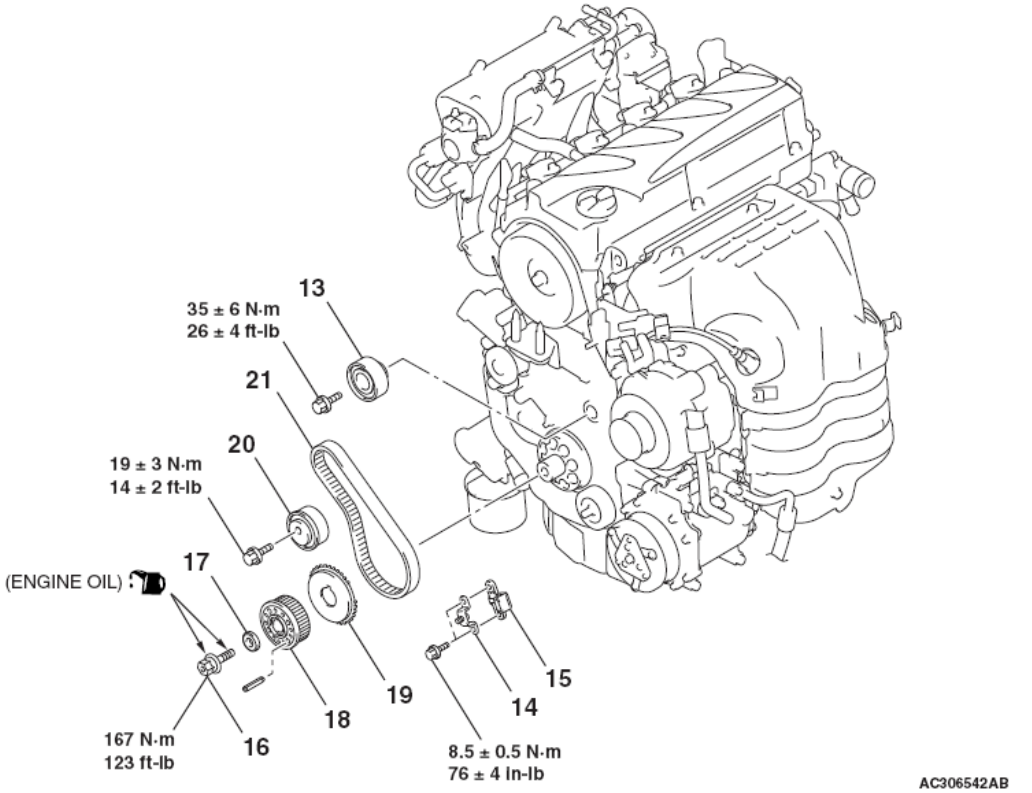



**REMOVAL STEPS**

1. CONTROL WIRING HARNESS CONNECTION
2. CONNECTOR BRACKET
3. HARNESS BRACKET
4. TIMING BELT UPPER COVER
   - ENGINE FRONT MOUNTING BRACKET <<A>>
5. WATER PUMP PULLEY
6. IDLER PULLEY
7. AUTO-TENSIONER
8. TIMING BELT LOWER COVER
   - VALVE TIMING BELT TENSION ADJUSTMENT (INSTALLATION ONLY) >>G<<
9. VALVE TIMING BELT >>F<<
10. TIMING BELT TENSIONER PULLEY >>E<<
11. TIMING BELT TENSIONER ARM
12. TIMING BELT TENSIONER ADJUSTER >>D<<

**Fig. 90: Identifying Timing Belt Components With Torque Specification (1 Of 2)**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

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| | | | | | |
|---|---|---|---|---|---|
| | | REMOVAL STEPS | | | |
| | | 13. TIMING BELT IDLER PULLEY | >>C<< | 19. | CRANKSHAFT ANGLE SENSING BLADE |
| | | 14. TIMING BELT LOWER COVER BRACKET | >>B<< | • | BALANCER TIMING BELT TENSION ADJUSTMENT (INSTALLATION ONLY) |
| | | 15. CRANKSHAFT POSITION SENSOR | | | |
| <<B>> | >>C<< | 16. CRANKSHAFT PULLEY CENTER BOLT | >>A<< | 20. | BALANCER TIMING BELT TENSIONER |
| <<B>> | >>C<< | 17. CRANKSHAFT PULLEY WASHER | <<C>> | >>A<< | 21. BALANCER TIMING BELT |
| <<B>> | >>C<< | 18. CRANKSHAFT CAMSHAFT DRIVE SPROCKET | | | |

**Fig. 91: Identifying Timing Belt Components With Torque Specification (2 Of 2)**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

## Required Special Tools:

- MB991367: Special Spanner
- MB991385: Pin
- MB992080: Belt Tension Meter Set
  - MB992081: Belt Tension Meter
  - MB992082: Microphone Assembly
- MD998738: Adjusting Bolt
- MD998767: Tensioner Wrench

### REMOVAL SERVICE POINTS

#### <<A>> VALVE TIMING BELT REMOVAL

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**CAUTION: Never turn the crankshaft counterclockwise.**

1. Turn the crankshaft clockwise, align each timing mark to set number 1 cylinder to TDC of its compression stroke.

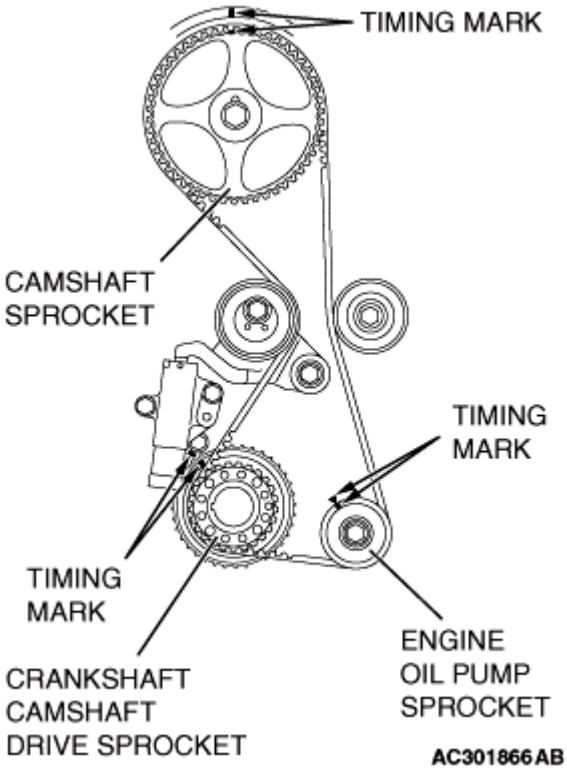



**Fig. 92: Identifying Timing Mark On Camshaft**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

2. Remove the timing belt under cover rubber plug and then set special tool MD998738.

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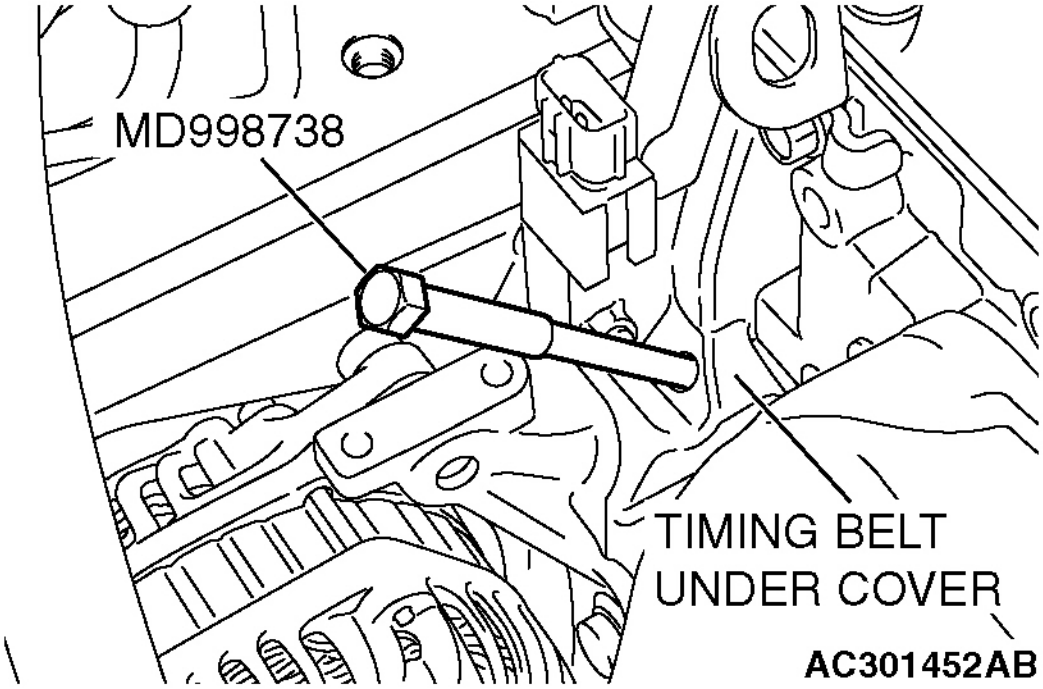



**Fig. 93: Removing Timing Belt Under Cover Rubber Plug**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

3. Screw in special tool MD998738 with hands until it contacts the timing belt tensioner arm.

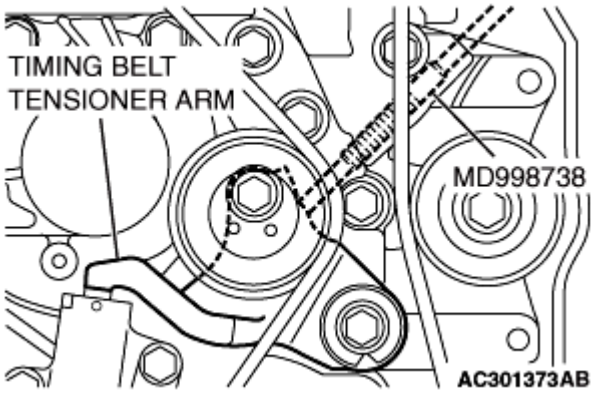



**Fig. 94: Screwing In Special Tool MD998738 By Hand**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**CAUTION: Special tool MD998738 can be gradually installed at a rate of a 30 degree turn per second. If it is screwed in all at once, the timing belt tensioner adjuster rod will not easily retract and special tool**

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**MD998738 may bend.**

4. Gradually screw in special tool MD998738 and then align the timing belt tensioner adjuster rod set hole A with the timing belt tensioner adjuster cylinder set hole B.

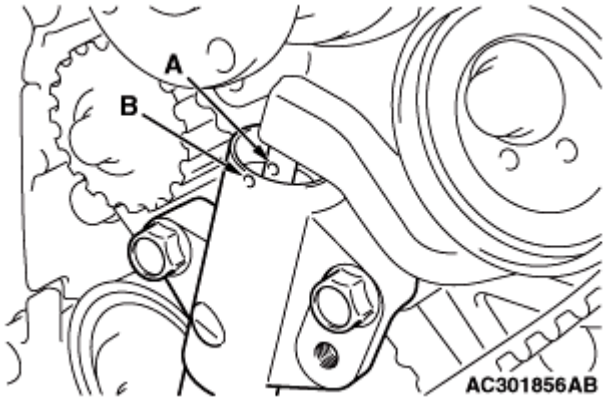



**Fig. 95: Aligning Timing Belt Tensioner Adjuster**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

5. Insert a wire or pin in the set hole aligned.

**CAUTION: To reuse the valve timing belt, draw an arrow indicating the rotating direction (clockwise) on the back of the belt using chalk, etc.**

6. After removal of special tool MD998738, loosen the timing belt tensioner pulley mounting bolts and remove the valve timing belt.

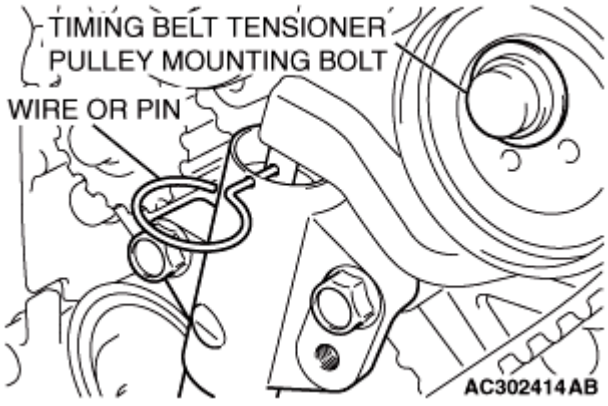



**Fig. 96: Identifying Timimg Belt Tensioner Pulley Mounting Bolt**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**<<B>> CRANKSHAFT PULLEY CENTER BOLT/CRANKSHAFT PULLEY WASHER/CRANKSHAFT CAMSHAFT DRIVE SPROCKET REMOVAL**

1. Hold the crankshaft camshaft drive sprocket with special tools MB991367 and MB991385.

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2. Loosen the crankshaft pulley center bolt and remove the crankshaft pulley washer and crankshaft camshaft drive sprocket.

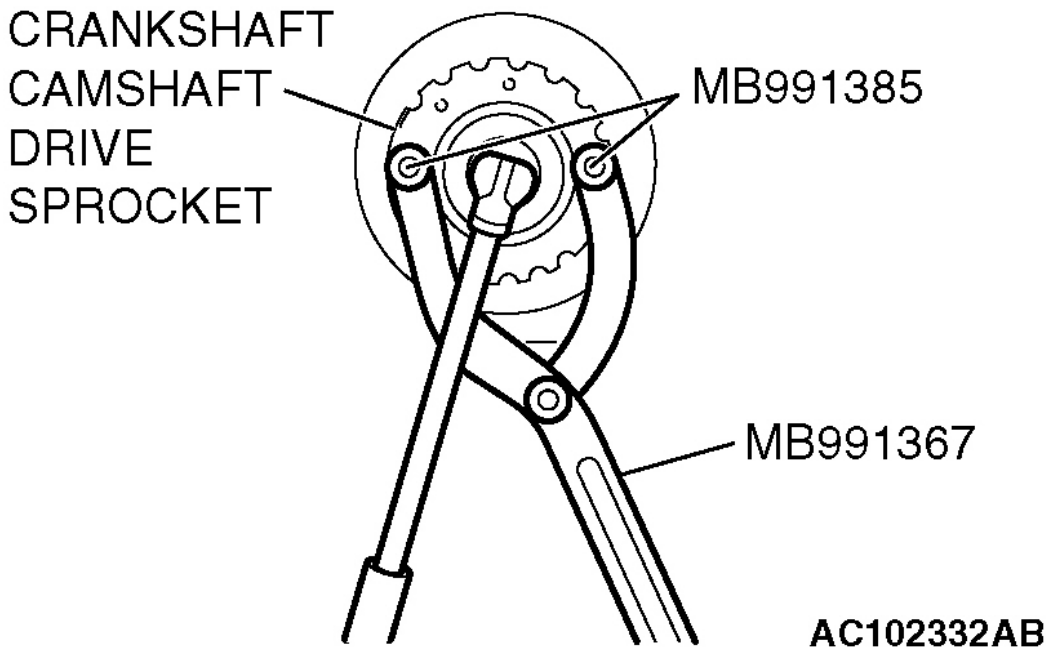



**Fig. 97: Loosening Crankshaft Pulley Center Bolt**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**<<C>> BALANCER TIMING BELT REMOVAL**

**CAUTION: To reuse the balancer timing belt, draw an arrow indicating the rotating direction on the back of the belt using chalk, etc.**

**INSTALLATION SERVICE POINTS**

**>>A << BALANCER TIMING BELT/BALANCER TIMING BELT TENSIONER INSTALLATION**

1. Ensure that the crankshaft balancer shaft drive sprocket timing marks and balancer shaft sprocket timing marks are aligned.
2. Install the balancer timing belt on the crankshaft balancer shaft drive sprocket and balancer shaft sprocket. There should be no slack on the tension side.

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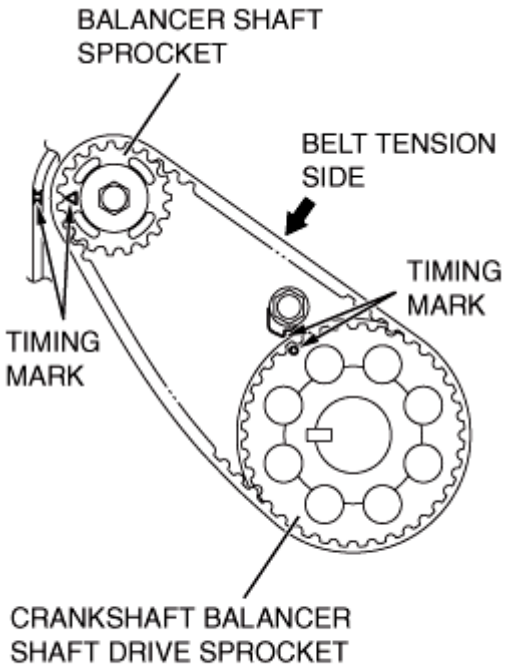



**Fig. 98: Identifying Crankshaft Balancer Shaft Drive Sprocket Timing Marks And Balancer Shaft Sprocket Timing Marks**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

3. Assemble and temporarily fix the center of the pulley of the balancer timing belt tensioner so that it is at the top left from the center of the assembling bolt, and the pulley flange is at the front-side of the engine.
4. Adjust the balancer timing belt tension.

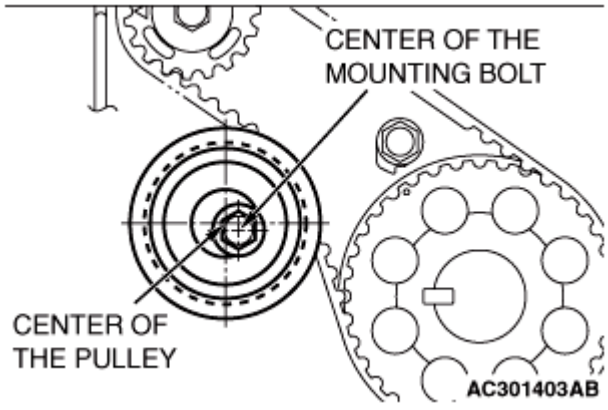



**Fig. 99: Adjusting Balancer Timing Belt Tension**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**>>B << BALANCER TIMING BELT TENSION ADJUSTMENT**

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**CAUTION: When tightening the mounting bolts, ensure that the tensioner does not rotate with the bolts. Allowing it to rotate with the bolts can cause excessive tension of the belt.**

1. Lift with your fingers the balancer timing belt tensioner in the direction of the arrow in illustration. Apply a tensile torque of [3.0 ± 0.4 N.m (26 ± 4 in-lb)] to the balancer timing belt so the belt is tense without any looseness. Tighten the assembling bolt to the specified torque in this state. Then, fix the balancer timing belt tensioner.

   **Tightening torque: 19 ± 3 N.m (14 ± 2 ft-lb)**

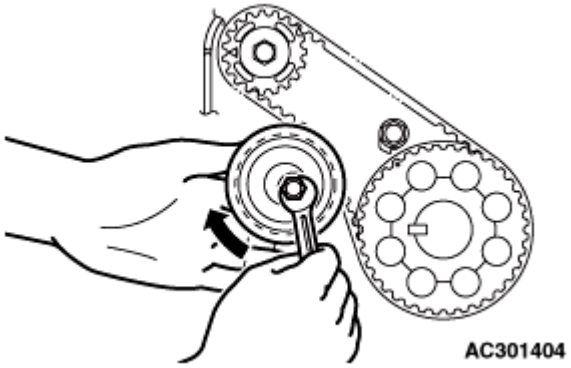



**Fig. 100: Tightening Assembling Bolt**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

2. Turn the crankshaft clockwise two turns to set number 1 cylinder to TDC of its compression stroke and check that sprocket timing marks are aligned.

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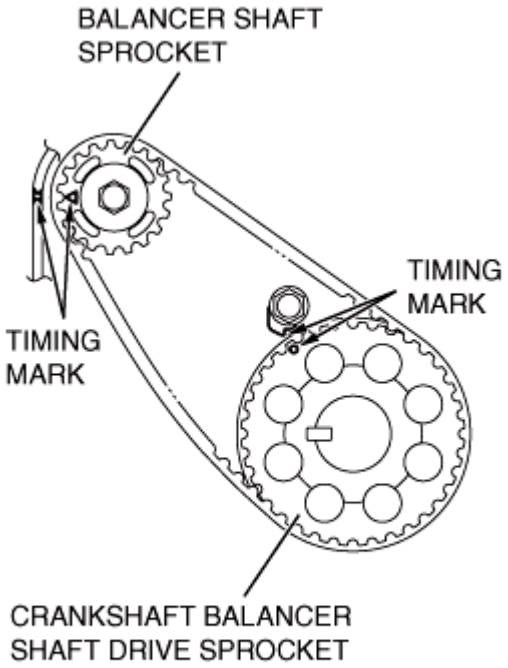



**Fig. 101: Checking Sprocket Timing Marks**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**CAUTION: When measuring the tension, make sure that the engine is cold.**

3. Check the balancer timing belt tension in the following procedure.
    1. With your finger tip lightly tap the center of the balancer timing belt between the sprockets in the location shown by the arrow in the illustration, then check whether the belt vibration frequency is within the standard value.

**NOTE: Refer to AUTO-TENSIONER CHECK , for information regarding the vibration frequency measurement method using special tool MB992080.**

**Standard value: 70 - 100 Hz**

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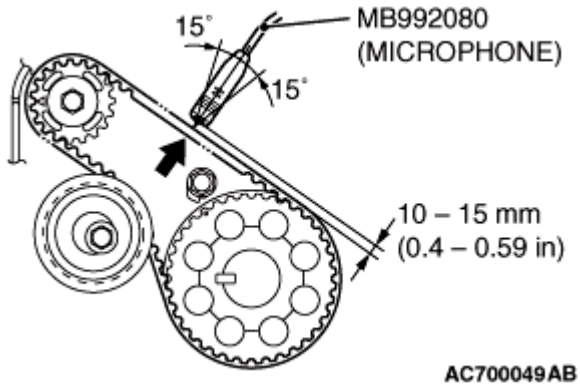



**Fig. 102: Checking Belt Tension Pressure Using Special Tool (1 Of 2)**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

2. Apply a pressure of 59 N (13 pounds) at the center (arrow area in illustration) between the sprocket as shown in the figure, then check whether the belt deflection is within the standard value.

   **Standard value: 8 - 12 mm (0.31 - 0.47 inch)**

4. If not within the standard value, adjust the belt tension again.

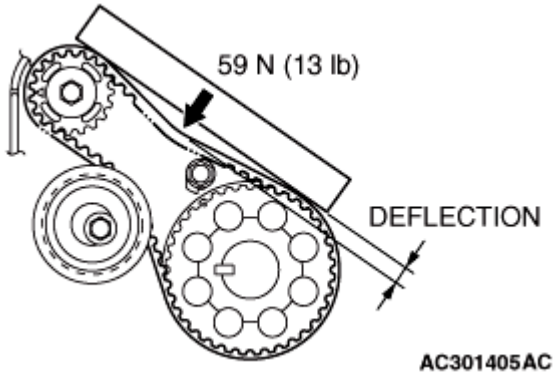



**Fig. 103: Checking Belt Tension Pressure Using Special Tool (2 Of 2)**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**>>C << CRANKSHAFT ANGLE SENSING BLADE/CRANKSHAFT CAMSHAFT DRIVE SPROCKET/CRANKSHAFT PULLEY WASHER/CRANKSHAFT PULLEY CENTER BOLT INSTALLATION**

1. Clean or degrease the crankshaft, the crankshaft angle sensing blade, the crankshaft camshaft drive sprocket and crankshaft pulley washer as shown in figure.

   **NOTE: Also clean the degreased surfaces.**

2. Install the crankshaft angle sensing blade and crankshaft camshaft drive sprocket in the direction shown in figure.
3. Place the larger chamfer side of the crank shaft pulley washer in the direction shown in the figure and

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then assemble on the crank shaft pulley center bolt.

4. Apply a small of engine oil to the crank shaft pulley center bolt bearing surface and screw.

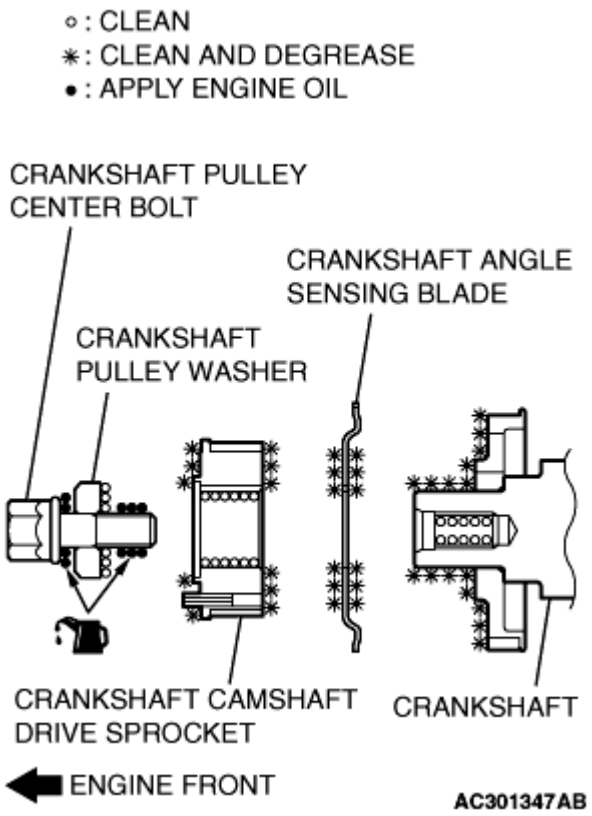



**Fig. 104: Identifying Crankshaft/Camshaft Degreased Surfaces Area**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

5. Hold the crankshaft camshaft drive sprocket with special tools MB991367 and MB991385 in the same manner as removal.
6. Tighten the crankshaft pulley center bolts to the specified torque.

**Tightening torque: 167 N.m (123 ft-lb)**

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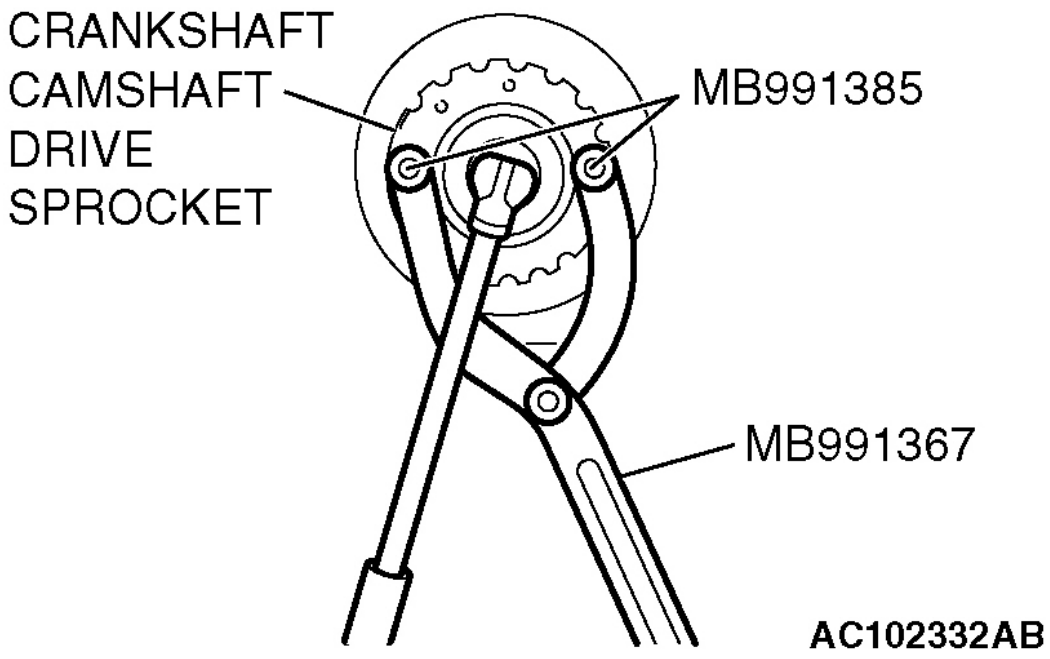



**Fig. 105: Loosening Crankshaft Pulley Center Bolt**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**>>D << TIMING BELT TENSIONER ADJUSTER INSTALLATION**

1. Set according to the following procedures when the timing belt tensioner adjuster rod is fully extended.

**CAUTION: If the compression is too fast the procedure may damage the rod. Make a point to slowly and thoroughly compress.**

1. Slowly compress the timing belt tensioner adjuster rod using a press or vice, then align the set hole A of the rod with set hole B of the timing belt tensioner adjuster cylinder.

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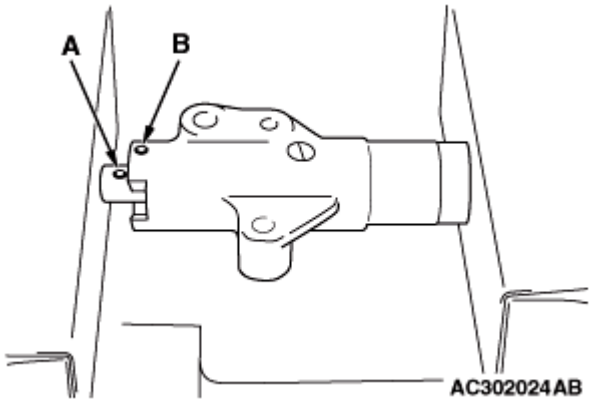



**Fig. 106: Aligning Set Hole A Of Rod With Set Hole B**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

2. Insert a wire or pin in the set hole aligned.

**NOTE: When replacing the timing belt tensioner adjuster with new parts, the timing belt tensioner adjuster is set with a pin.**

2. Install the timing belt tensioner adjuster to the engine and then tighten the mounting bolt to the specified torque. Do not remove the wire or pin until the tension of the valve timing belt is adjusted.

**Tightening torque: 23 ± 3 N.m (17 ± 2 ft-lb)**

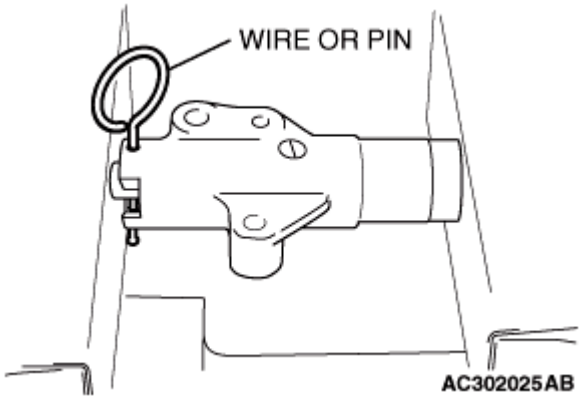



**Fig. 107: Inserting Wire Or Pin In Set Hole Aligned**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**>>E << TIMING BELT TENSIONER PULLEY INSTALLATION**

Temporarily tighten the timing belt tensioner pulley as shown in figure.

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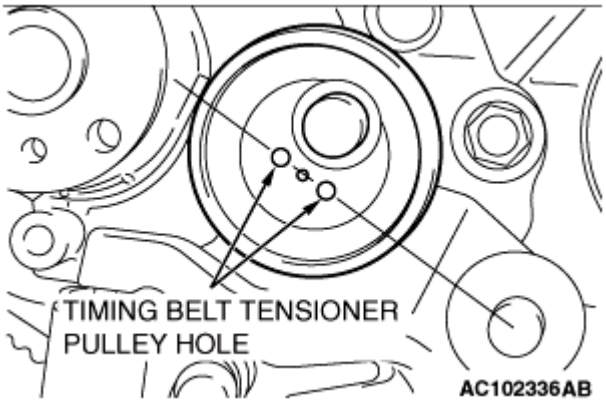



**Fig. 108: Tightening Timing Belt Tensioner Pulley**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**>>F << VALVE TIMING BELT INSTALLATION**

1. Align the timing marks on the camshaft sprocket, crankshaft camshaft drive sprocket and engine oil pump sprocket.

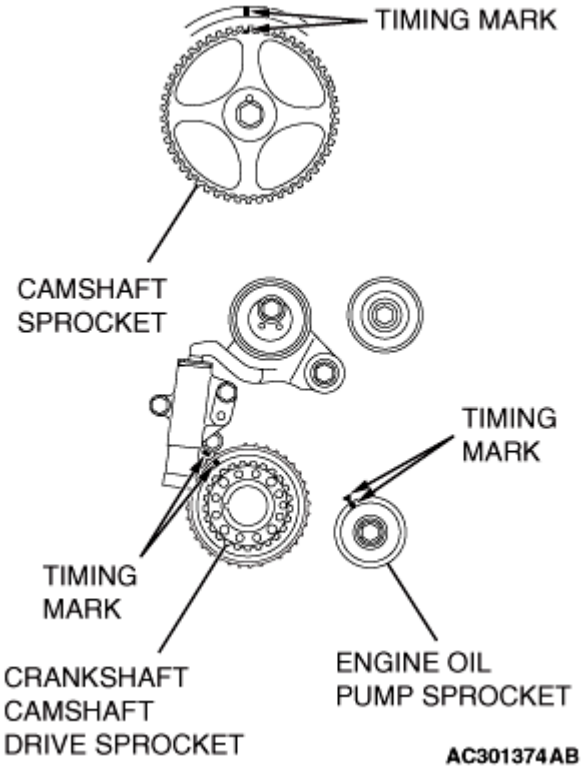



**Fig. 109: Aligning Timing Marks On Camshaft Sprocket**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

2. Adjust the timing mark of the engine oil pump sprocket. Unplug the cylinder block plug. Insert a bolt (M6, section width 10 mm, nominal length 45 mm) from the plug hole. If the bolt comes in contact with

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the balancer shaft, turn the engine oil sprocket one rotation. Re-adjust the timing mark and then check that the bolt fits. Do not remove the bolt until the valve timing belt is assembled.

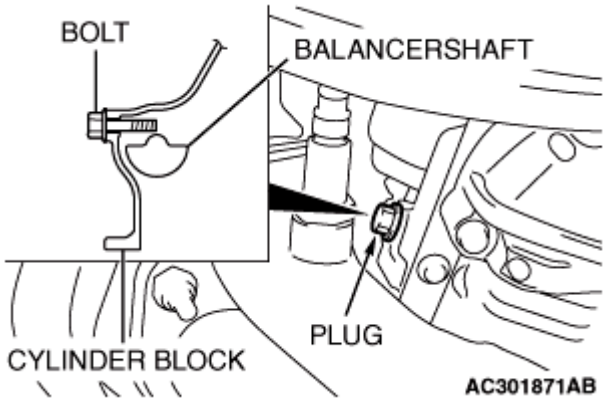



**Fig. 110: Removing Plug**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

3. Incorporate the valve timing belt in the following manner so that the tensile force of the belt is not lax.
    1. Place the valve timing belt on the timing belt tensioner pulley and crankshaft camshaft driver sprocket and then support it with your left hand so it does not slide.
    2. Place the valve timing belt on the engine oil pump sprocket while pulling it with the right hand.
    3. Place the valve timing belt on the timing belt idler pulley.

    **CAUTION: Incorporate the valve timing belt. Then apply reverse rotation (counterclockwise rotation) pressure to the cam shaft sprocket. Re-check that each timing mark is aligned while the tension side of the belt is right.**

    4. Place the valve timing belt on the camshaft sprocket.

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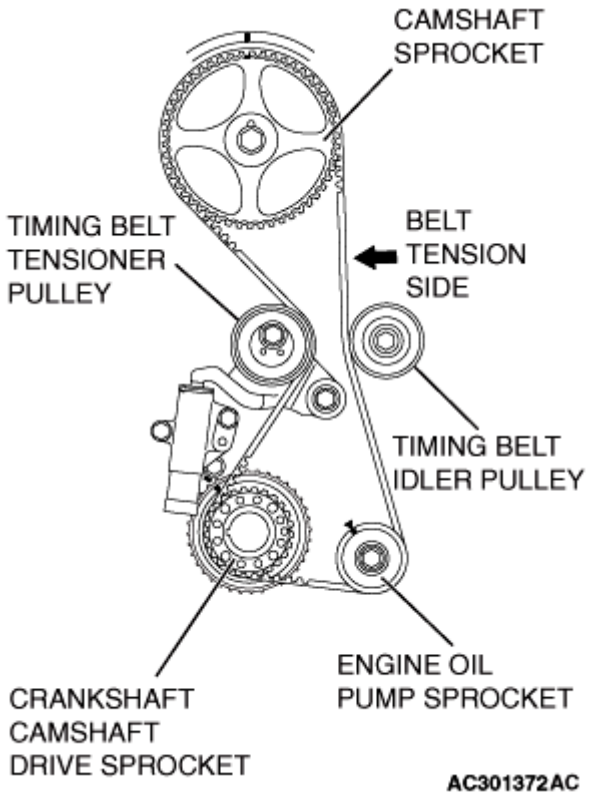



**Fig. 111: Installing Valve Timing Belt**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

4. Turn the timing belt tensioner pulley in the direction shown in the figure using special tool MD998767 to apply tension to the valve timing belt. Then temporarily tighten and fix the timing belt tensioner pulley mounting bolt.

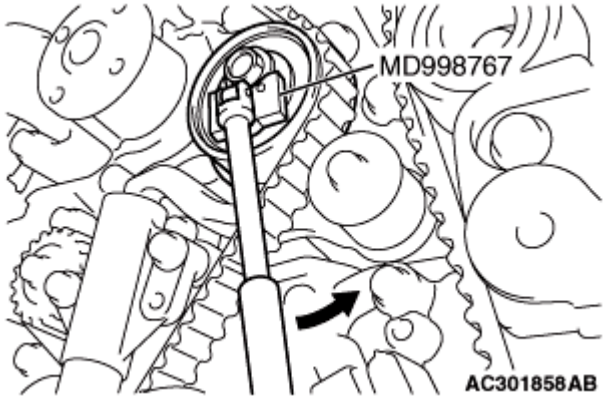



**Fig. 112: Turning Timing Belt Tensioner Pulley**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

5. Check that the timing marks are aligned.

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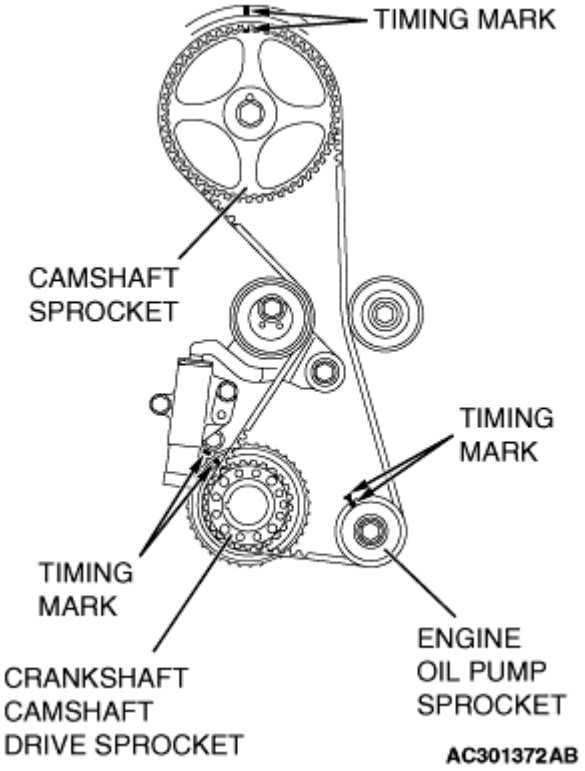



**Fig. 113: Checking Timing Marks Aligned**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

6. Remove the bolt inserted in Step 2 above, then assemble the cylinder block plug.
7. Tighten the cylinder block plug to the specified torque.

   **Tightening torque: 30 ± 3 N.m (23 ± 2 ft-lb)**

8. Adjust the valve timing belt tension.

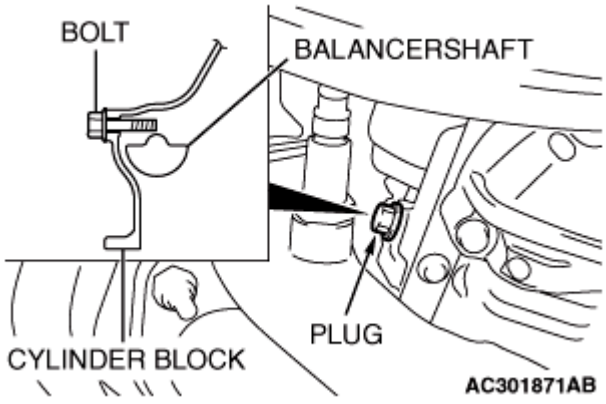



**Fig. 114: Removing Plug**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

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**>>G << VALVE TIMING BELT TENSION ADJUSTMENT**

1. Set special tool MD998738 used when removing the valve timing belt.

**CAUTION: Always screw in special tool MD998738 in with your hands, since use of a spanner or other tools may damage the wire or pin inserted in the timing belt tensioner adjuster.**

2. Gradually screw in special tool MD998738 to a position in which the wire or pin inserted in the timing belt tensioner adjuster lightly moves.

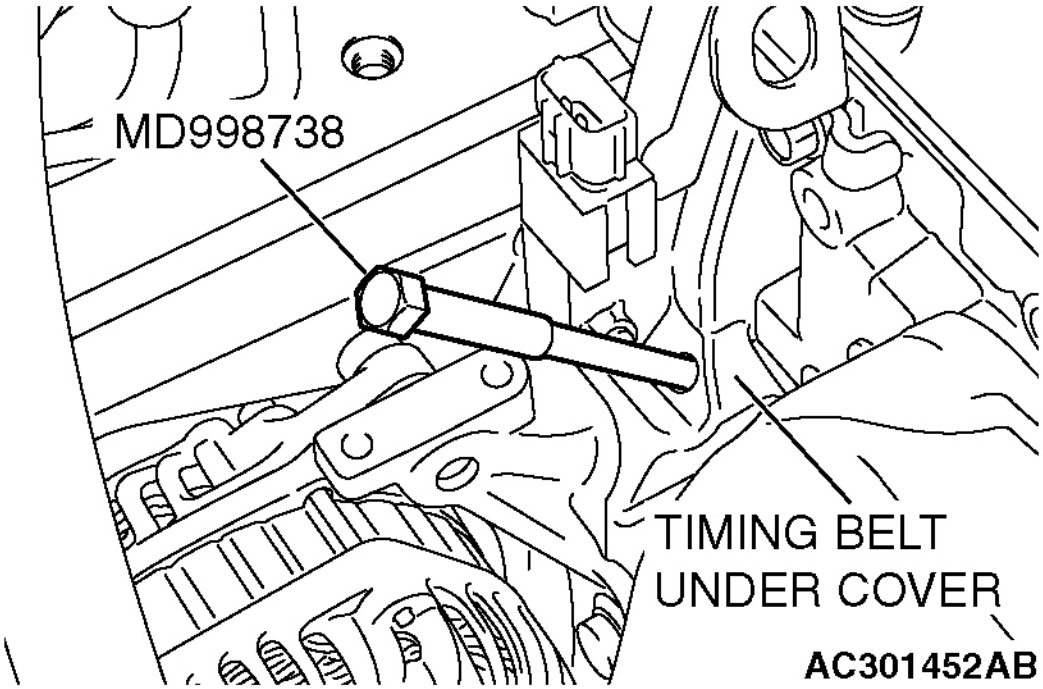



**Fig. 115: Removing Timing Belt Under Cover Rubber Plug**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

3. Turn the crankshaft 1/4 of a revolution in the counterclockwise direction.
4. Turn the crankshaft in the clockwise direction, align each timing mark to set number 1 cylinder to TDC of its compression stroke.
5. Loosen the timing belt tensioner pulley mounting bolt.

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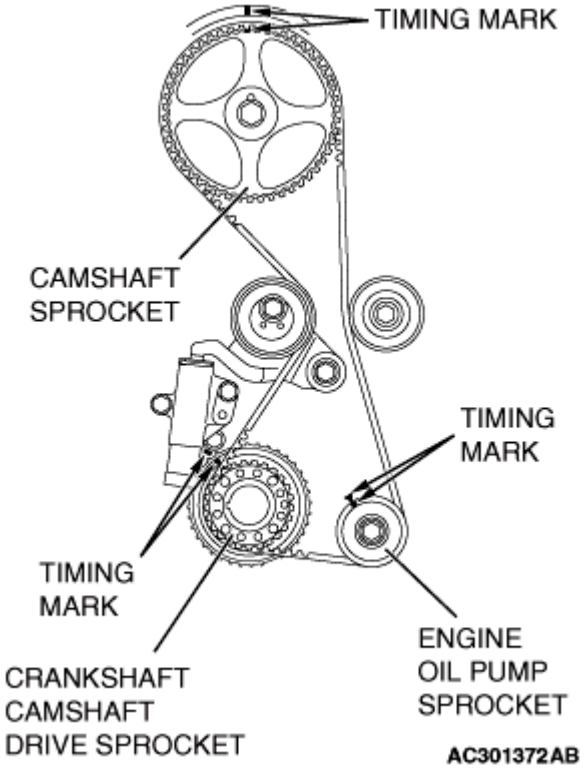



**Fig. 116: Checking Timing Marks Aligned**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**CAUTION: When tightening the mounting bolt, ensure that the timing belt tensioner pulley does not rotate with the bolt. Allowing it to rotate with the bolt can cause deficient tension of the belt.**

6. With special tool MD998767 and torque wrench, apply tension torque [3.5 N.m (31 in-lb)] to the valve timing belt, and tighten the timing belt tensioner pulley mounting bolt to the specified torque.

**Tightening torque: 48 ± 5 N.m (36 ± 3 ft-lb)**

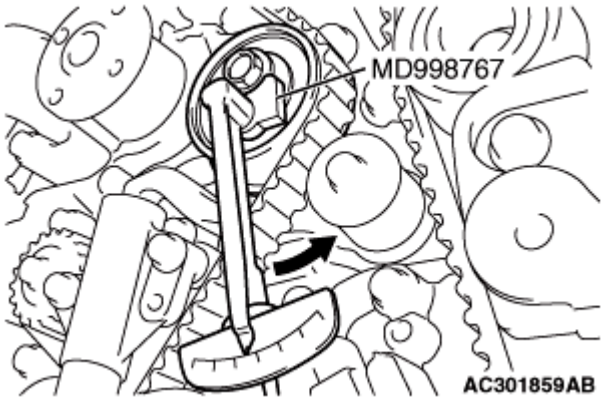



**Fig. 117: Tightening Timing Belt Tensioner Pulley Mounting Bolt**

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**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

7. Remove wire or pin inserted to timing belt tensioner adjuster.

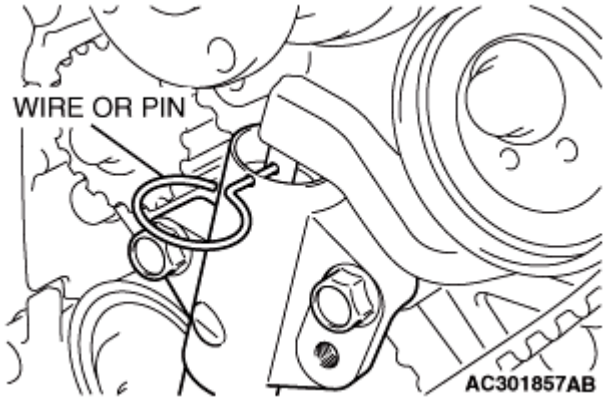



**Fig. 118: Pin Inserted To Timing Belt Tensioner Adjuster**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

8. Remove special tool MD998738, and install the rubber plug to the timing belt under cover.
9. Rotate crankshaft clockwise two turns, and leave it for about 15 minutes.

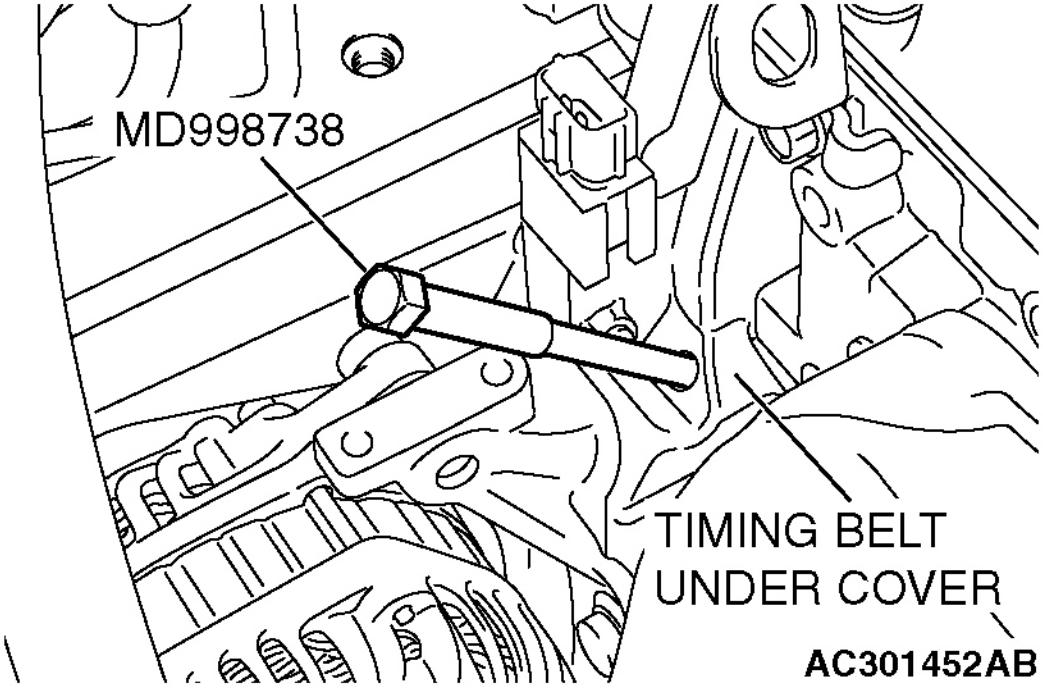



**Fig. 119: Removing Timing Belt Under Cover Rubber Plug**

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**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

10. Insert wire or pin removed in Step 7 again, and ensure that it can be pulled out with a light load. When wire or pin can be lightly removed, appropriate tension is applied on timing belt. In this case, remove wire or pin.

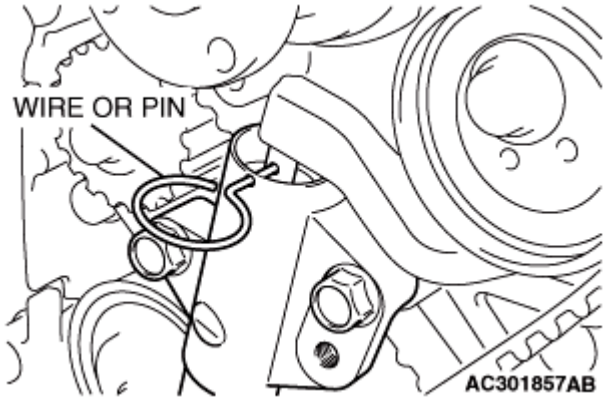



**Fig. 120: Inserting Wire And Pin**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

Also the projection of timing belt tensioner adjuster rod (A) is within the standard value, appropriate tension is applied.

**Standard value (A): 3.8 - 4.5 mm (0.15 - 0.17 inch)**

11. If wire or pin cannot be easily pulled out, repeat Step 1 through Step 9 to reach proper valve timing belt tension.

**CAUTION: Always check the tightening torque of the crank shaft pulley center bolt when turning the crank shaft pulley center bolt counterclockwise. Re-tighten if it is loose.**

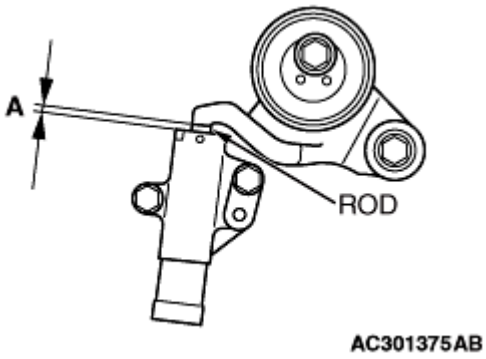



**Fig. 121: Checking Valve Timing Belt Tension**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

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12. Check again that the timing marks on sprockets are aligned.

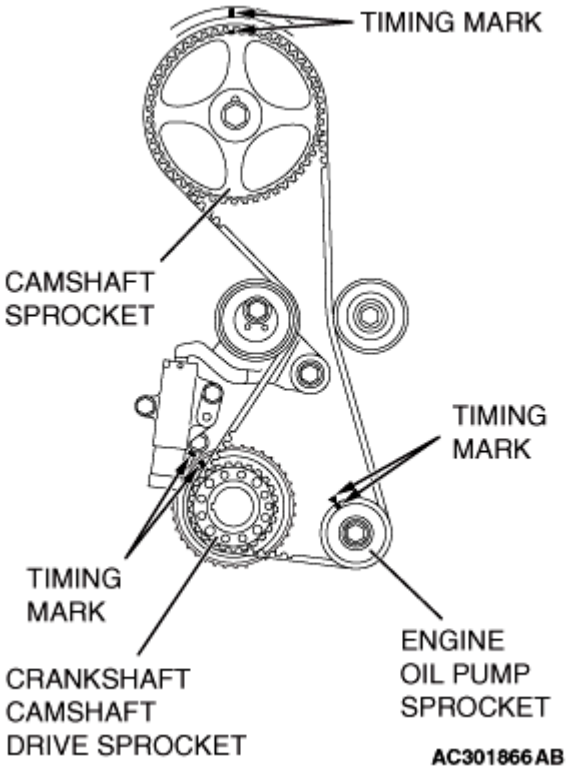



**Fig. 122: Aligning Timing Mark On Sprockets**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

## INSPECTION

### TIMING BELT TENSIONER ADJUSTER CHECK

1. Check for oil leak from seal, and replace it if a leak is detected.
2. Check for wear or damage at the top of the rod. Replace it, if required.
3. Hold the timing belt tensioner adjuster by hand, and press the top end of the rod onto the metal (e.g. cylinder block) with 98 - 196 N (22 - 44 pounds) of pressure, and measure the movement of the rod.

   **Standard value: Within 1 mm (0.039 inch)**

   **A: Length when it is free (not pressed)**

   **B: Length when it is pressed**

   **A - B: Movement**

4. If the measured value is out of the standard value, replace the timing belt tensioner adjuster.

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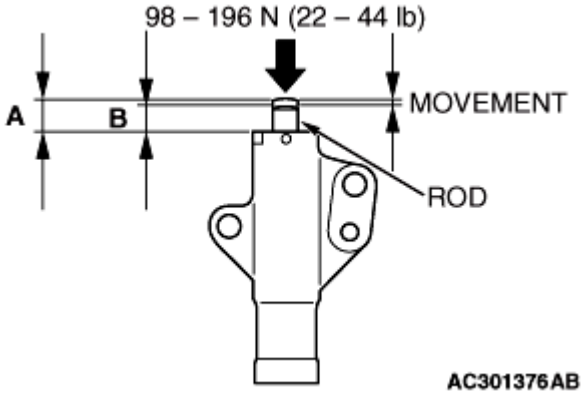



**Fig. 123: Checking Wear Or Damage At Top Of Rod**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

**BALANCER TIMING BELT TENSION CHECK**

**Required Special Tools:**

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

**CAUTION:**
- **When measuring the tension, make sure that the engine is cold.**
- **Measure the tension after turning the crankshaft clockwise two turns or more.**

Check the balancer timing belt tension in the following procedures.

1. With your finger tip lightly tap the center of the balancer timing belt between the sprockets in the location shown by the arrow in the illustration, then check whether the belt vibration frequency is within the standard value.

**NOTE:** **Refer to AUTO-TENSIONER CHECK , for information regarding the vibration frequency measurement method using special tool MB992080.**

**Standard value: 70 - 100 Hz**

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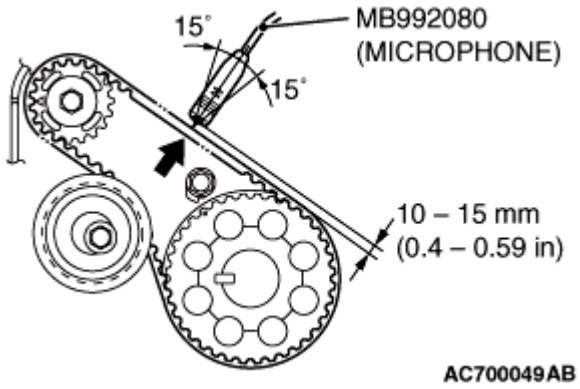



**Fig. 124: Checking Belt Tension Pressure Using Special Tool (1 Of 2)**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

2. Apply a pressure of 59 N (13 pounds) at the center (arrow area in illustration) between the sprocket as shown in the figure, then check whether the belt deflection is within the standard value.

   **Standard value: 8 - 12 mm (0.31 - 0.47 inch)**

3. If not within the standard value, adjust the belt tension. (Refer to **TIMING BELT** ).

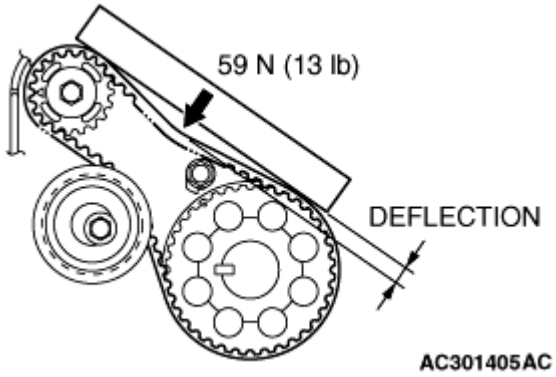



**Fig. 125: Checking Belt Tension Pressure Using Special Tool (2 Of 2)**
**Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.**

# SPECIFICATIONS

## FASTENER TIGHTENING SPECIFICATIONS

**ITEM SPECIFICATION**

| ITEM | SPECIFICATION |
|---|---|
| **Camshaft and valve stem seal** | |
| Accumulator assembly | 44 ± 5 N.m (33 ± 3 ft-lb) |
| Camshaft position sensing cylinder bolt | 22 ± 4 N.m (16 ± 3 ft-lb) |
| Camshaft position sensor support bolt | 14 ± 1 N.m (120 ± 13 in-lb) |
| | |

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| | | |
|---|---|---|
| Camshaft sprocket bolt | | 89 ± 9 N.m (65 ± 7 ft-lb) |
| Connector bracket bolt | | 11 ± 1 N.m (98 ± 8 in-lb) |
| Control wiring harness bolt | | 9.0 ± 2.0 N.m (80 ± 17 in-lb) |
| Control wiring harness protector bolt | | 5.0 ± 1.0 N.m (44 ± 9 in-lb) |
| Cylinder head plug | | 47 ± 7 N.m (35 ± 5 ft-lb) |
| Engine oil control valve bolt | | 11 ± 1 N.m (98 ± 8 in-lb) |
| Engine oil pressure switch | | 10 ± 2 N.m (89 ± 17 in-lb) |
| Exhaust rocker arm shaft bolt | | 13 ± 1 N.m (115 ± 9 in-lb) |
| Intake rocker arm shaft bolt | | 31 ± 3 N.m (23 ± 2 ft-lb) |
| Rocker cover assembly bolt | | 3.5 ± 0.5 N.m (31 ± 4 in-lb) |
| Spark plug | | 25 ± 4 N.m (18 ± 3 ft-lb) |
| **Crankshaft oil seal** | | |
| A/T drive plate bolt | | 132 ± 5 N.m (98 ± 3 ft-lb) |
| **Crankshaft pulley** | | |
| Crankshaft damper pulley bolt | | 25 ± 4 N.m (18 ± 3 ft-lb) |
| **Cylinder head gasket** | | |
| Camshaft sprocket bolt | | 89 ± 9 N.m (65 ± 7 ft-lb) |
| Control wiring harness bolt | | 9.0 ± 2.0 N.m (80 ± 17 in-lb) |
| Control wiring harness protector bolt | | 5.0 ± 1.0 N.m (44 ± 9 in-lb) |
| Cylinder head bolt <Cold engine> | | 78 ± 2 N.m to 0 N.m to 20 ± 2 N.m to +90° to +90° (58 ± 1 ft-lb to 0 in-lb to 15 ± 1 ft-lb to +90° to +90°) |
| Engine oil dipstick guide bolt | | 13 ± 1 N.m (115 ± 9 in-lb) |
| Generator terminal nut | | 12 ± 2 N.m (102 ± 22 in-lb) |
| Intake manifold stay bolt | | 31 ± 3 N.m (23 ± 2 ft-lb) |
| Knock sensor connector bracket bolt | | 11 ± 1 N.m (98 ± 8 in-lb) |
| Pressure hose clamp bolt | | 12 ± 2 N.m (102 ± 22 in-lb) |
| Radiator lower hose clamp bolt | | 11 ± 1 N.m (98 ± 8 in-lb) |
| Water hose clamp bolt | | 11 ± 1 N.m (98 ± 8 in-lb) |
| **Engine assembly** | | |
| ATF warmer (transmission fluid cooler) bracket bolt | | 23 ± 3 N.m (17 ± 2 ft-lb) |
| Battery terminal nut | | 5.0 ± 1.0 N.m (44 ± 9 in-lb) |
| Control wiring harness bolt and nut | | 9.0 ± 2.0 N.m (80 ± 17 in-lb) |
| Control wiring harness protector bolt | | 5.0 ± 1.0 N.m (44 ± 9 in-lb) |
| Engine front mounting bracket bolt | M10 | 58 ± 7 N.m (43 ± 5 ft-lb) |
| Engine front mounting bracket bolt and nut | M12 | 83 ± 12 N.m (61 ± 9 ft-lb) |
| Grounding cable bolt | | 9.0 ± 2.0 N.m (80 ± 17 in-lb) |
| Power steering oil pump bracket bolt | | 24 ± 4 N.m (18 ± 3 ft-lb) |
| Power steering oil pump bracket nut | | 44 ± 10 N.m (33 ± 7 ft-lb) |
| Pressure hose clamp bolt | | 12 ± 2 N.m (102 ± 22 in-lb) |
| **Oil pan** | | |


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| | | |
|---|---|---|
| Baffle plate bolt (bolt, flange) | M6 | 10 ± 2 N.m (89 ± 17 in-lb) |
| | M8 | 24 ± 4 N.m (18 ± 2 ft-lb) |
| Baffle plate bolt (bolt, washer assembled) | M6 | 9.0 ± 2.0 N.m (80 ± 17 in-lb) |
| | M8 | 22 ± 4 N.m (16 ± 2 ft-lb) |
| Engine oil pan bolt | | 9.0 ± 3.0 N.m (80 ± 26 in-lb) |
| Engine oil pan drain plug | | 39 ± 5 N.m (29 ± 3 ft-lb) |
| Engine oil pan strainer bolt | | 19 ± 3 N.m (14 ± 2 ft-lb) |
| Torque converter housing front lower cover bolt (bolt, flange) | M10 | 26 ± 5 N.m (19 ± 4 ft-lb) |
| Torque converter housing front lower cover bolt (bolt, washer assembled) | M6 | 9.0 ± 1.0 N.m (80 ± 9 in-lb) |
| **Timing belt** | | |
| Auto-tensioner bolt (bolt, washer assembled) | M8 | 22 ± 4 N.m (16 ± 3 ft-lb) |
| | M10 | 44 ± 10 N.m (33 ± 7 ft-lb) |
| Balancer timing belt tensioner bolt | | 19 ± 3 N.m (14 ± 2 ft-lb) |
| Connector bracket bolt | | 11 ± 1 N.m (98 ± 8 in-lb) |
| Crankshaft pulley center bolt | | 167 N.m (123 ft-lb) |
| Cylinder block plug | | 30 ± 3 N.m (23 ± 2 ft-lb) |
| Generator terminal nut | | 12 ± 2 N.m (102 ± 22 in-lb) |
| Idler pulley bolt | | 79 ± 5 N.m (59 ± 3 ft-lb) |
| Timing belt idler pulley bolt | | 35 ± 6 N.m (26 ± 4 ft-lb) |
| Timing belt lower cover bolt (bolt, flange) | M6 | 11 ± 1 N.m (98 ± 8 in-lb) |
| Timing belt lower cover bolt (bolt, washer assembled) | M6 | 9.0 ± 1.0 N.m (80 ± 9 in-lb) |
| Timing belt lower cover bracket bolt | | 8.5 ± 0.5 N.m (76 ± 4 in-lb) |
| Timing belt lower cover nut | | 11 ± 1 N.m (98 ± 8 in-lb) |
| Timing belt tensioner adjuster bolt | | 23 ± 3 N.m (17 ± 2 ft-lb) |
| Timing belt tensioner arm bolt | | 21 ± 4 N.m (16 ± 2 ft-lb) |
| Timing belt tensioner pulley bolt | | 48 ± 5 N.m (36 ± 3 ft-lb) |
| Timing belt upper cover bolt (bolt, flange) | M6 | 11 ± 1 N.m (98 ± 8 in-lb) |
| | M8 | 14 ± 1 N.m (120 ± 13 in-lb) |
| Water pump pulley bolt | | 8.8 ± 1.0 N.m (78 ± 9 in-lb) |

## SERVICE SPECIFICATIONS

## ITEM SPECIFICATION

| ITEM | | STANDARD VALUE | LIMIT |
|---|---|---|---|
| Drive belt tension (Reference) | Vibration frequency Hz | 120 - 154 | - |
| | Tension N (lb) | 340 - 562 (76 - 126) | - |
| Valve clearance (at hot) mm (in) | Intake valve | 0.20 (0.008) | - |
| | Exhaust valve | 0.30 (0.012) | - |
| | | | |


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| | | | |
|---|---|---|---|
| Actual ignition timing at idle | | Approximately 10° BTDC | - |
| Basic ignition timing at idle | | 5°BTDC ± 3° | - |
| CO content% | | 0.5 or less | - |
| HC contents ppm | | 100 or less | - |
| Curb idle speed r/min | | 700 ± 100 | - |
| Compression pressure (250 - 400 r/min) kPa (psi) | | 1,560 (226) | Minimum 1,130 (164) |
| Intake manifold vacuum at curb idle kPa (in Hg) | | - | Minimum 60 (18) |
| Cylinder head bolt nominal length mm (in) | | - | 99.4 (3.91) |
| Balancer timing belt tension | Vibration frequency Hz | 70 - 100 | - |
| | Deflection mm (in) | 8 - 12 (0.31 - 0.47) | - |
| Timing belt tensioner adjuster rod protrusion amount mm (in) | | 3.8 - 4.5 (0.15 - 0.17) | - |
| Timing belt tensioner adjuster rod movement mm (in) | | Within 1 (0.039) | - |

**SEALANTS**

**ITEM SPECIFICATION**

| ITEM | SPECIFIED SEALANT |
|---|---|
| Camshaft position sensor support | 3M™ AAD Part No. 8672, 3M™ AAD Part No. 8679/8678 or equivalent |
| Engine oil pressure switch | |
| Engine oil pan | 3M™ AAD Part No. 8672, 8704, 3M™ AAD Part No. 8679/8678 or equivalent |

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