

ENGINE <3.0 & 3.5L-SOHC-24 VALVE>**GENERAL INFORMATION**

| Items | | | Specifications |
|------------------------|---------------|---------------|-----------------------------|
| Type | | | V-type, Over Head Camshaft |
| Number of cylinders | | | 6 |
| Bore mm | | | 6G72 – 91.1 / 6G74 – 93.0 |
| Stroke mm | | | 6G72 – 76 / 6G74 – 85.8 |
| Piston displacement cc | | | 6G72 – 2,972 / 6G74 – 3,497 |
| Compression ratio | | | 9.0:1 |
| Firing order | | | 1-2-3-4-5-6 |
| Valve timing | Intake valve | Opens (BTDC) | 9° |
| | | Closes (ABDC) | 59° |
| | Exhaust valve | Opens (BBDC) | 47° |
| | | Closes (ATDC) | 21° |
| Valve overlap | | | 19° |
| Intake valve duration | | | 248° |
| Exhaust valve duration | | | 248° |

SERVICE SPECIFICATIONS

| Items | | | Standard value | Limit |
|--|---|-----------------------------|--|-------|
| Drive belt tension Nm | Alternator and A/C compressor V-ribbed type | When checked | 490–686 | – |
| | | When new belt is installed | 784–980 | – |
| | | When used belt is installed | 539–637 | – |
| | Power steering pump | When checked | 373–569 | – |
| | | When new belt is installed | 608–804 | – |
| | | When used belt is installed | 422–520 | – |
| Drive belt deflection <Reference value> mm | Alternator and A/C compressor V-ribbed type | When checked | 7.9–9.7 | – |
| | | When new belt is installed | 6.0–7.2 | – |
| | | When used belt is installed | 8.2–9.3 | – |
| | Power steering pump | When checked | 11.0–14.2 | – |
| | | When new belt is installed | 8.4–9.3 | – |
| | | When used belt is installed | 11.7–13.4 | – |
| Basic ignition timing at idle | | | 5° BTDC ± 3° | – |
| Actual ignition timing at curb idle | | | Approx. 15° BTDC <6G72>, 10° BTDC <6G74> | – |
| CO contents % | | | 0.5 or less | – |
| HC contents ppm | | | 100 or less | – |
| Curb idle speed r/min | | | 700±100 | – |

ENGINE – Service Specifications/Sealant/Special Tools

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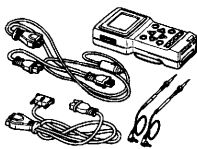

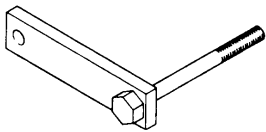
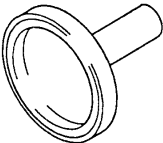
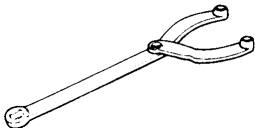
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| Items | | Standard value | Limit |
|---|---|----------------|----------|
| Compression pressure (250–400 r/min) kPa | | 1,200 | min. 890 |
| Compression pressure difference of all cylinder kPa | | – | max. 100 |
| Intake manifold vacuum at curb idle kPa | | – | min. 60 |
| Timing belt | Amount of projection of auto tensioner rod mm (Distance between the tensioner arm and auto tensioner body) | 3.8–5.0 | – |
| Oil pressure at curb idle speed | | 80 kPa or more | – |

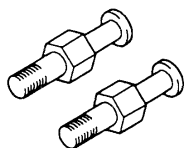

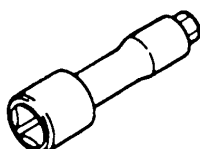
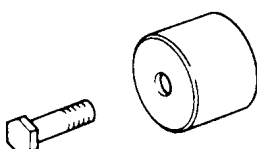
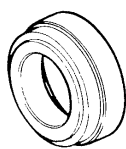
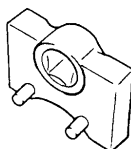
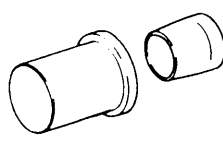
SEALANT

| Items | Recommended sealant |
|---------|---|
| Oil pan | MD970389 / Loctite 587 Ultra blue or equivalent |

SPECIAL TOOLS

| Tool | Tool number and name | Supersession | Application |
|---|--|--------------|---|
|  | MB991502 (MUT-II) | – | Checking of engine idling speed |
|  | ROM pack | – | |
|  | MD998781 Flywheel stopper | – | Drive plate supporting |
|  | MD998718 Crankshaft rear oil seal installer | EMD998718 | Installation of the crankshaft rear oil seal |
|  | MB990767 End yoke holder | EMB990767 | Supporting the sprocket and shaft pulley during removal and installation Use with EMD998715 |

ENGINE – Special Tools

| Tool | Tool number and name | Supersession | Application |
|---|---|--------------|---|
|  | MD998715 Pulley holding pins | EMD998715 | Supporting the crankshaft pulley when crankshaft bolt and pulley are removed or reinstalled. Use together with EMB990767 |
|  | MD998769 Crankshaft sprocket spacer | — | Used if the crankshaft needs to be rotated to attach the timing belt, etc. |
|  | MB998051 Crankshaft pulley wrench | E1139 | Loosening and tightening of cylinder head bolt |
|  | MD998713 Camshaft oil seal installer | EMD998713 | Camshaft oil seal installation |
|  | MB991559 Camshaft oil seal installer | EMB991559 | Press fitting the camshaft oil seal (For left bank) |
|  | MD998767 Tension pulley socket wrench | EMD998767 | Adjustment of the timing belt |
|  | MD998717 Crankshaft front oil seal installer | EMD998717 | Press-fitting of crankshaft front oil seal |

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TROUBLESHOOTING

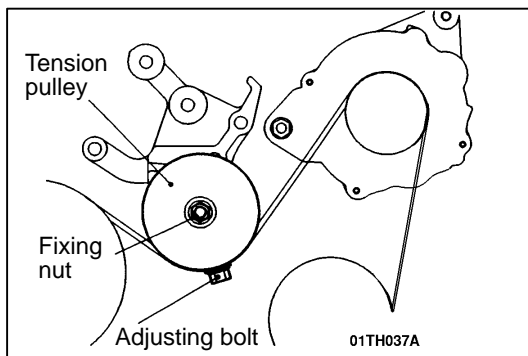
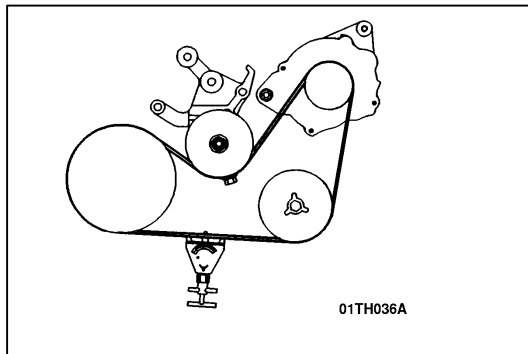
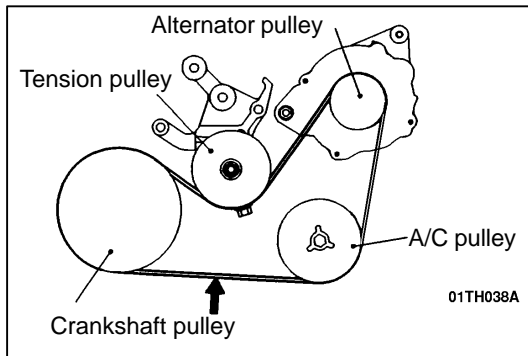
| Trouble Symptom | Probable Cause | Remedy |
|---|---|---|
| Compression is too low | Blown cylinder head gasket | Replace the gasket. |
| | Worn or damaged piston rings | Replace the rings. |
| | Worn piston or cylinder | Repair or replace the piston and/or the cylinder block. |
| | Worn or damaged valve seat | Repair or replace the valve and/or the seat ring |
| Drop in oil pressure | Engine oil level is too low | Check the engine oil level. |
| | Malfunction of oil pressure switch | Replace the oil pressure switch. |
| | Clogged oil filter | Install a new filter. |
| | Worn oil pump gears or cover | Replace the gears and/or the cover. |
| | Thin or diluted engine oil | Change the engine oil to the correct viscosity. |
| | Stuck (open) oil relief valve | Repair the relief valve. |
| | Excessive bearing clearance | Replace the bearings. |
| Oil pressure too high | Stuck (closed) oil relief valve | Repair the relief valve. |
| Noisy valves | Malfunction of lash adjuster | Replace the lash adjuster. |
| | Thin or diluted engine oil (low oil pressure) | Change the engine oil. |
| | Worn or damaged valve stem or valve guide | Replace the valve and/or the guide. |
| Connecting rod noise/main bearing noise | Insufficient oil supply | Check the engine oil level. |
| | Thin or diluted engine oil | Change the engine oil. |
| | Excessive bearing clearance | Replace the bearings. |

ON VEHICLE SERVICE**DRIVE BELT TENSION CHECK AND ADJUSTMENT**

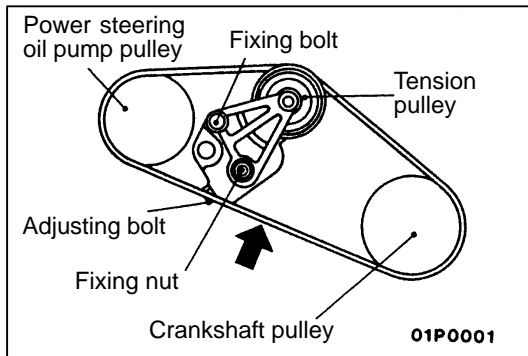
Check the belt tension by using a belt-tension gauge or apply 98 N of force to the belt midway between the pulleys as shown in the illustration, and measure the deflection.

Standard value:

| Item | | Check value | Adjustment value new belt | Adjustment value used belt |
|------------------------|---------------------------------|-------------|---------------------------|----------------------------|
| For alternator and A/C | Tension N | 490-686 | 784-980 | 539-637 |
| | Deflection <Reference value> mm | 7.9-9.7 | 6.0-7.2 | 8.2-9.3 |
| For power steering | Tension N | 373-569 | 608-804 | 422-520 |
| | Deflection <Reference value> mm | 11.0-14.2 | 8.4-9.3 | 11.7-13.4 |

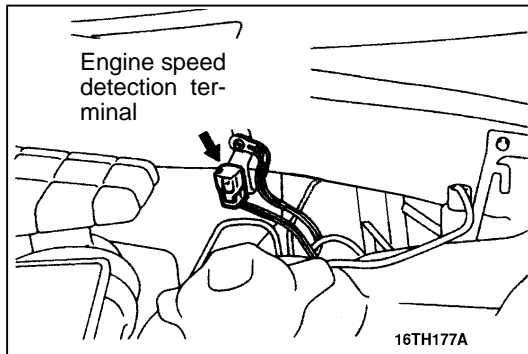
**ALTERNATOR AND AIR-CONDITIONING COMPRESSOR DRIVE BELT TENSION ADJUSTMENT**

1. Loosen the tension pulley fixing nut.
2. Adjust the belt tension using the adjusting bolt.
3. Tighten the fixing nut.
4. Crank the engine once or more.
5. Check the belt tension.



POWER STEERING OIL PUMP BELT TENSION ADJUSTMENT

1. Loosen the tension pulley fixing nut.
2. Adjust the belt tension using the adjusting bolt.
3. Tighten the fixing nut.
4. Crank the engine once or more.
5. Check the belt tension.



IGNITION TIMING CHECK

1. Before inspection, set the vehicle to the following condition.
 - Engine coolant temperature: 80–95°C
 - Lights and all accessories: OFF
 - Transmission: Neutral (P range)
2. Insert a paper clip into the No. 3 terminal of the 3 pin connector shown.
3. Connect a primary voltage detection type tachometer to the paper clip.
4. Install the timing light.
5. Start the engine and run at idle.
6. Check that the idle speed is about 700 r/min.
7. Turn the ignition switch to OFF.
8. Connect the MUT–II to the data link connector.
9. Start the engine and run it at idle.
10. Select the MPI system Actuator Test from the MUT–II menu and scroll to item 17 – Basic Ignition Timing.
11. Press the “Y” Key and check that the basic ignition timing is the standard value.

Standard value: 5° BTDC ± 3°

12. If the ignition timing value is not within the standard value range refer to [GROUP 13A – On-vehicle Inspection of MPI Components and check the crank angle sensor](#).
13. Press the MUT–II “C” key and check that the idling ignition timing is at the correct value.

Standard value: Approx. 15° BTDC <6G72>, 10° BTDC <6G74>

NOTE

1. Ignition timing is variable within about ±8°, even under normal operating conditions.
2. And it is automatically further advanced by about 5° from 15° BTDC at higher altitudes.

CURB IDLE SPEED CHECK

1. Before inspection, set the vehicle to the following condition.
 - Engine coolant temperature: 80–95°C
 - Lights and all accessories: OFF
 - Transmission: Neutral (P for A/T)
2. Check the basic ignition timing.

Standard value: 5° BTDC±3°

3. After turning the ignition switch to OFF, connect a tachometer or the MUT-II to the data link connector (white).

NOTE

For the procedures for setting the tachometer, refer to [P.11A-8](#).

4. Start the engine and run it at idle.
5. Run the engine at idle for 2 minutes.
6. Check the curb idle speed.

Standard value: 700±100 r/min

NOTE

The idle speed is adjusted automatically by the idle speed control (ISC) system.

7. If there is a deviation from the standard value refer to [GROUP 13A – Inspection Chart Classified by Trouble Symptoms](#), and check the MPI components.

IDLE MIXTURE CHECK

1. Before inspection, set the vehicle to the following condition.
 - Engine coolant temperature: 80–95°C
 - Lights and all accessories: OFF
 - Transmission: Neutral (P range)
2. Check to be sure that the basic ignition timing is at the standard value.

Standard value: 5° BTDC \pm 3°

3. After turning the ignition switch to OFF, connect a tachometer, or connect the MUT-II to the data link connector.

NOTE

For the procedures for setting the tachometer, refer to [P.11A-8](#).

4. Start the engine and race it at an engine speed of 2,500 r/min for two minutes.
5. Connect a CO and HC tester.
6. Check the CO contents and the HC contents while the engine is idling.

Standard value:

CO contents: 0.5% or less

HC contents: 100 ppm or less

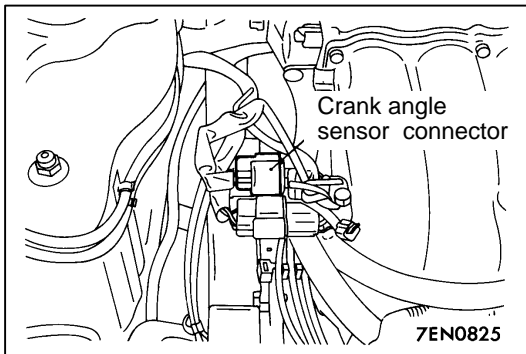
7. If the concentrations are outside the standard values, check the following items.
 - Diagnosis output
 - Closed loop control
(If closed loop control is being carried out normally, the heated oxygen sensor output signal will vary between 0–400 mV and 600–1,000 mV while the engine is idling.)
 - Fuel pressure
 - Injectors
 - Ignition coil, spark plug cables, spark plugs
 - Evaporative emission control system
 - Compression pressure

NOTE

If the results of the checks for all items are normal but the CO and HC concentrations still exceed the standard values, replace the three-way catalyst.

COMPRESSION PRESSURE CHECK

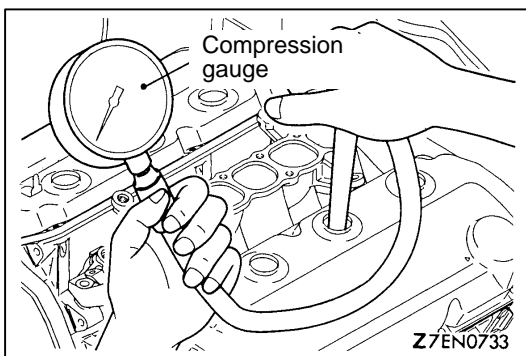
1. Before inspection, check that the engine oil, starter and battery are normal. Also, set the vehicle to the following condition.
 - Engine coolant temperature: 80–95°C
 - Lights and all accessories: OFF
 - Transmission: P range
2. Disconnect the spark plug cables.
3. Remove all of the spark plugs.



4. Disconnect the crank angle sensor connector.
5. Cover the spark plug hole with a rag, and after the engine has been cranked, check that no foreign material is adhering to the rag.

Caution

1. Keep away from the spark plug hole when cranking.
2. Do not let water, oil, fuel, etc. enter the cylinder, as these heated materials will gush out from the spark plug hole, which is dangerous.



6. Set the compression gauge to a spark plug mounting hole.
7. Crank the engine with the throttle valve fully open and measure the compression pressure.

Standard value: 1200 kPa/250–400 r/min

Limit: min. 890 kPa/250–400 r/min

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

Limit: max. 100 kPa

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

11. Reinstall the spark plugs and spark plug cables.
12. Use the MUT–II to erase the diagnosis codes, or disconnect the negative battery cable for 10 seconds or more and then re-connect it.

NOTE

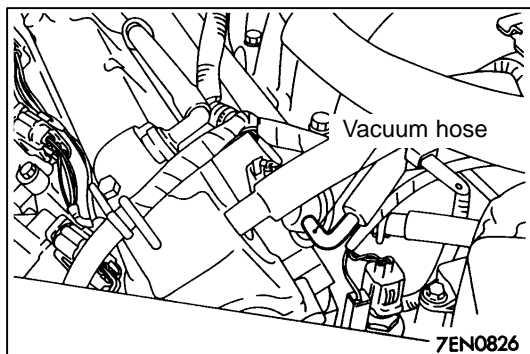
This will erase the diagnosis code resulting from the crank angle sensor connector being disconnected.

MANIFOLD VACUUM CHECK

1. Before inspection, set the vehicle to the following condition.
 - Engine coolant temperature: 80–95°C
 - Lights and all accessories: OFF
 - Transmission: Neutral P range
2. Connect a tachometer or connect the MUT–II to the data link connector.

NOTE

For the procedures for setting the tachometer, refer to [P.11A-8](#).



3. Connect a three-way joint to the vacuum hose between the intake manifold plenum and the fuel-pressure regulator, and then connect a vacuum gauge.
4. Start the engine and check that the idle speed is within the standard value range.
Take a reading of the vacuum gauge.

Limit: min. 60 kPa

LASH ADJUSTER CHECK

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

NOTE

- An abnormal noise due to malfunction of the lash adjuster is produced immediately after starting the engine and changes with engine speed, regardless of the engine load. If the abnormal noise is not produced immediately after starting the engine, or does not change with the engine speed, or it changes with the engine load, malfunction of the lash adjuster is not the cause for the abnormal noise.
 - When the lash adjuster is malfunctioning, the abnormal noise is rarely eliminated by continuing the warming-up of the engine at idle speed. However, the abnormal noise may disappear only when seizure is caused by oil sludge in the engine if the oil is not maintained properly.
1. Start the engine.
 2. Check if abnormal noise produced immediately after starting the engine changes with the change in the engine speed. If the abnormal noise is not produced immediately after starting the engine or it does not change with the engine speed, malfunction of the lash adjuster is not the cause for the noise. Therefore, investigate other causes. If the abnormal noise does not change with the engine speed, it is probably caused by some parts other than the engine. (In this case, the valve lash adjuster is in good condition.)
 3. With the engine idling, change the engine load (shift from N to D, range for example) to make sure that there is no change in the level of abnormal noise.
If there is a change in the level of abnormal noise, a tapping noise due to worn crankshaft bearing or connecting rod bearing is suspected. (In this case, the lash adjuster is in good condition.)
 4. After the engine is warmed up, run it at idle and check for abnormal noise. If the noise is reduced or disappears, clean the lash adjuster (refer [P.11B-33](#)) as the noise may be caused by a seized or sticking lash adjuster. If there is no change in the level of the abnormal noise, proceed to Step 5.
 5. Run the engine to bleed the lash adjuster system, refer [P.11A-14](#).
 6. If the abnormal noise does not disappear after performing the air bleeding operation, clean the lash adjuster, (refer [P.11B-33](#))

BLEEDING THE LASH ADJUSTER SYSTEM**NOTE**

- Parking the vehicle on a grade for a long time may leak oil from the lash adjuster, causing air to enter the high pressure chamber when starting the engine.
- After being parked for many hours, oil may run out from the oil passage. It takes time before oil is supplied to the lash adjuster, causing air to enter the high pressure chamber.
- In the above cases, eliminate the abnormal noise by bleeding the lash adjusters as follows:

1. Check the engine oil. Add or change oil if required.

NOTE

- If the engine oil level is low, air is sucked from the oil screen, causing air to enter the oil passage.
- If the engine oil level is higher than specification, oil may be stirred by the crankshaft causing oil to be mixed with air.
- If oil is deteriorated, air is not easily separated from the oil, increasing the quantity of air contained in the oil.

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

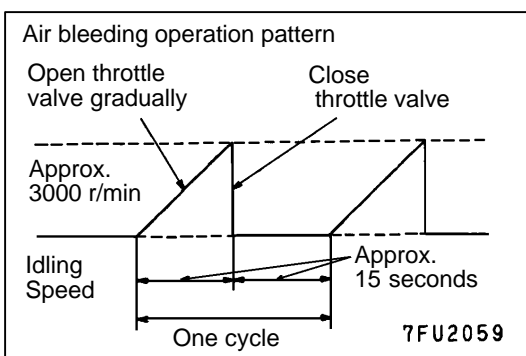
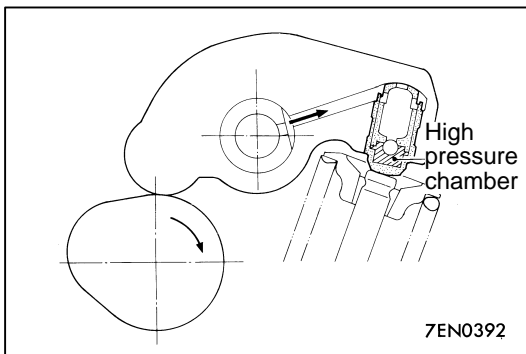
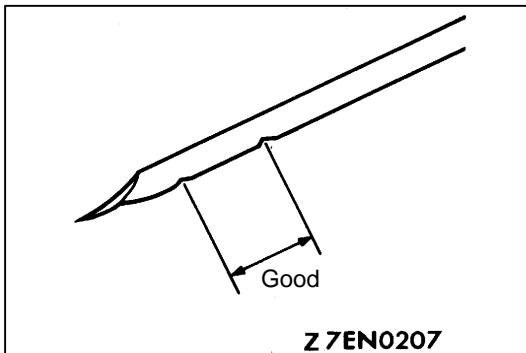
2. Idle the engine for 1 to 3 minutes.

3. Repeat the operation pattern shown at left at no load to check for abnormal noise.

(Typically the abnormal noise is eliminated after repeating the operation 10 to 30 times.

If no change is observed in the abnormal noise after repeating the operation 30 times, it is suspected that the abnormal noise is due to some other factors.)

4. After elimination of abnormal noise, repeat the operation shown at left five more times.
5. Run the engine at idle for 1 to 3 minutes to make sure that the abnormal noise has been eliminated.
6. If abnormal noise is not eliminated, clean the lash adjuster, refer [P.11B-33](#).



ENGINE ASSEMBLY

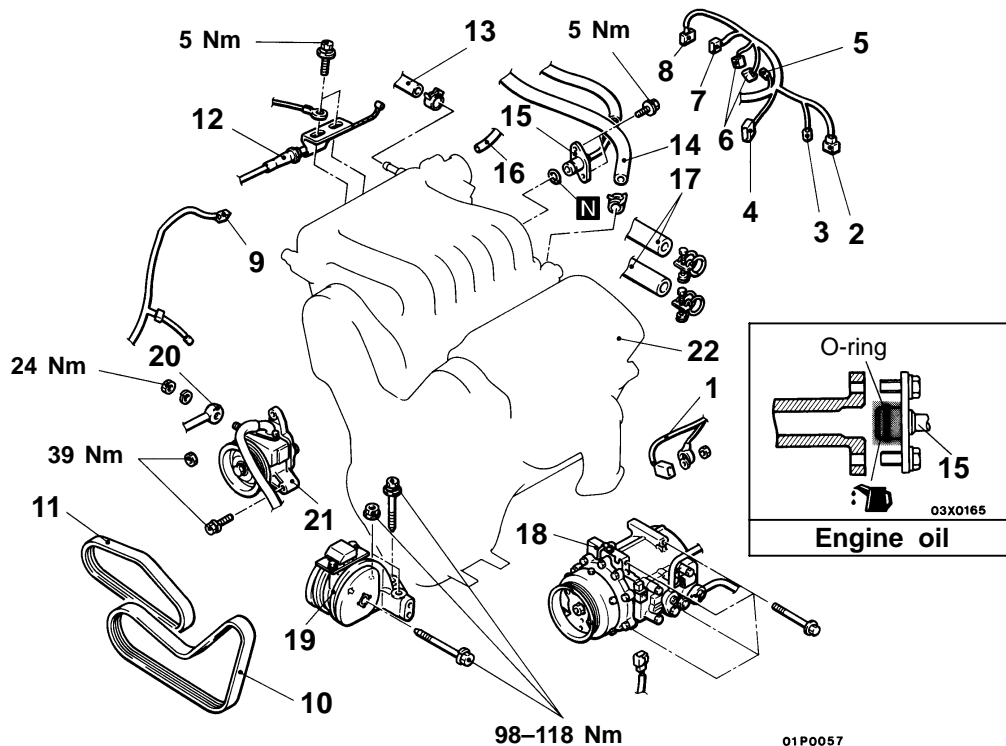
REMOVAL AND INSTALLATION

Pre-removal Operation

- Hood Removal (Refer to [GROUP 42.](#))
- Air Cleaner Removal (Refer to [GROUP 15.](#))
- Drainage of Coolant (Refer to [GROUP 14 – Maintenance Service.](#))
- Radiator Removal (Refer to [GROUP 14.](#))
- Fuel Flow Prevention (Refer to [GROUP 13A – On-Vehicle Service.](#))
- Drainage of Power Steering Fluid (Refer to [GROUP 37A – On-Vehicle Service.](#))
- Front Exhaust Pipe (Refer to [GROUP 15.](#))
- Washer Tank Removal (Refer to [GROUP 51.](#))
- Engine Cover Removal (Refer to [P.11B-14](#))
- Transmission Assembly Removal (Refer to [GROUP 23.](#))

Post-installation Operation

- Transmission Installation (Refer to [GROUP 23A.](#))
- Engine Cover Installation (Refer to [P.11B-14.](#))
- Washer Tank Installation (Refer to [GROUP 51.](#))
- Front Exhaust Pipe Installation (Refer to [GROUP 15.](#))
- Filling with Power Steering Fluid (Refer to [GROUP 37A – On-Vehicle Service.](#))
- Radiator Installation (Refer to [GROUP 14.](#))
- Filling with Coolant (Refer to [GROUP 14 – Maintenance Service.](#))
- Air Cleaner Installation (Refer to [GROUP 15.](#))
- Accelerator Cable Adjustment (Refer to [GROUP 17.](#))
- Hood Installation (Refer to [GROUP 42.](#))

**Removal Steps**

1. Alternator connector
2. Water temperature connector
3. Water temperature gauge connector
4. Injector harness connector
5. Condenser connector
6. Distributor connector
7. ISC servo connector
8. TPS connector
9. Crank angle sensor connector
10. Drive belt (for alternator and A/C)
11. Drive belt (for power steering)
12. Connection of the accelerator cable

13. Connection of brake booster vacuum hose
14. Connection of fuel return hose
15. Connection of fuel high pressure hose
16. Connection of the purge hose
17. Connection of heater hose
18. A/C compressor
19. Engine mount
20. Pressure hose
21. Power steering oil pump
22. Engine assembly



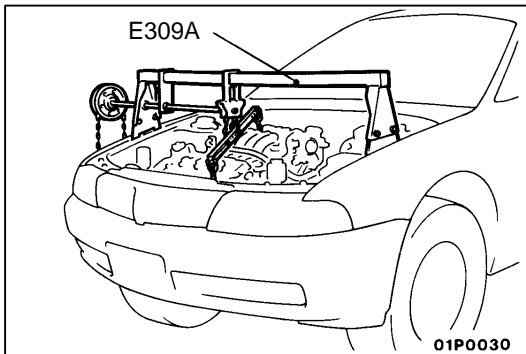
REMOVAL SERVICE POINTS

◀A▶ COMPRESSOR <A/C>/OIL PUMP (POWER STEERING) REMOVAL

Remove the oil pump and air conditioning compressor (with the hose attached).

NOTE

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



◀B▶ ENGINE MOUNT BRACKET

1. place a garage jack against the engine oil pan through a square bar so that the weight of the engine is not placed on the engine mount bracket.
2. Remove the special tool (used during removal of the transmission assembly).
3. Hold the engine assembly with a chain block.
4. Detach the engine mount bracket.

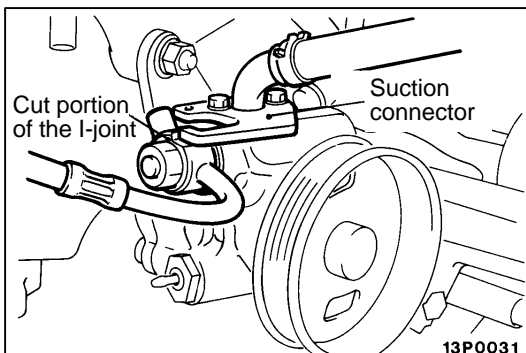
◀C▶ ENGINE ASSEMBLY REMOVAL

1. Check that all cables, hoses, harness connectors, etc. are disconnected from the engine.
2. 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. When doing so, check carefully that all pipes and hoses are connected, and that none are twisted, damaged, etc.

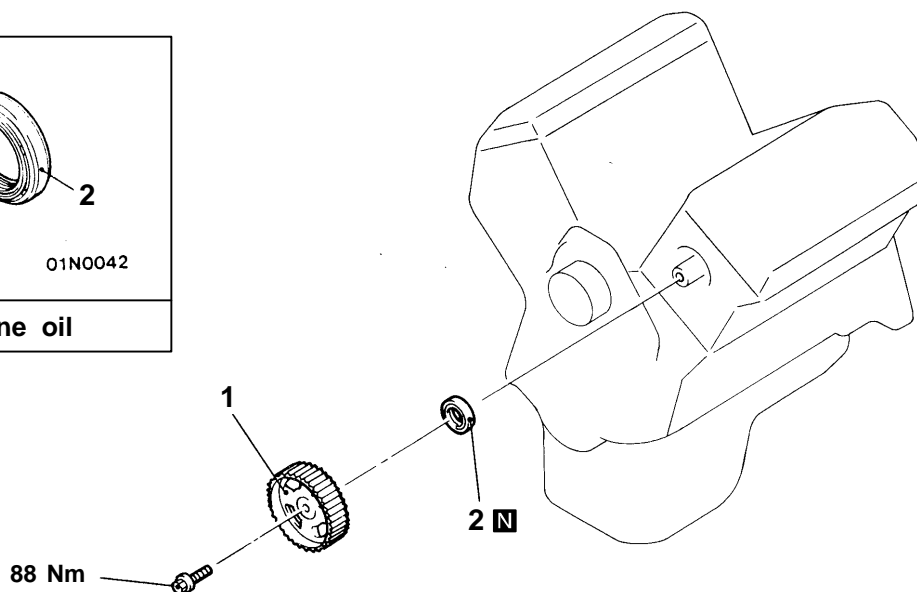
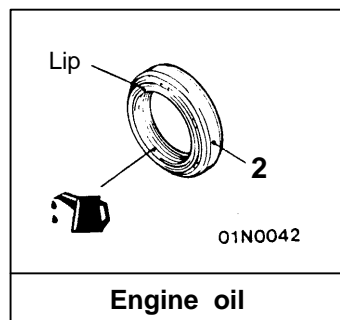


▶B▶ PRESSURE HOSE

1. Apply a small amount of new engine oil to the o-ring.

CAMSHAFT OIL SEAL**REMOVAL AND INSTALLATION****Pre-removal and Post-installation operation**

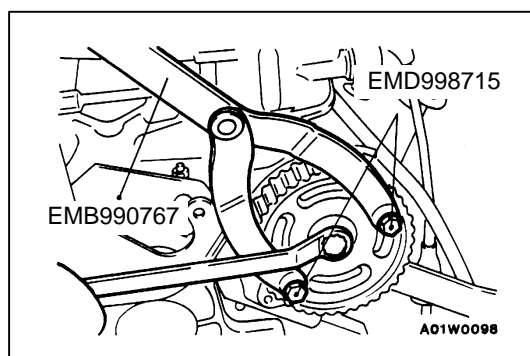
- Timing Belt Removal and Installation
(Refer to [P.11B-17.](#))



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Removal steps

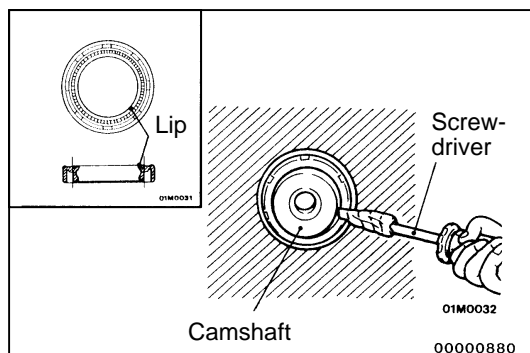
1. Camshaft sprocket
2. Camshaft oil seals

**REMOVAL SERVICE POINTS****◀A▶ CAMSHAFT SPROCKET REMOVAL****◀B▶ CAMSHAFT OIL SEAL REMOVAL**

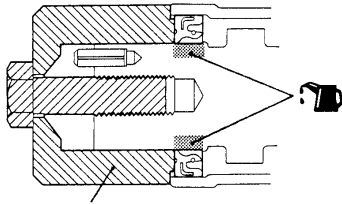
1. Cut out a portion in the camshaft oil seal lip.
2. Cover the tip of a screwdriver with a cloth and apply it to the cut out in the oil seal to pry off the oil seal.

Caution

Use care not to damage the camshaft and cylinder head.



<Right bank side>



EMD998713

A01X0075

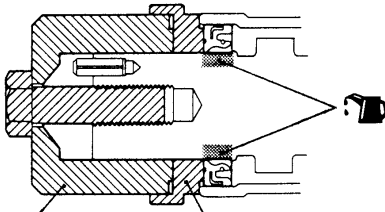
INSTALLATION SERVICE POINTS

►A◄ CAMSHAFT OIL SEAL INSTALLATION

Coat engine oil on the whole circumference of the oil seal lip section.

Using the special tool, press-fit the oil seal.

<Left bank side>

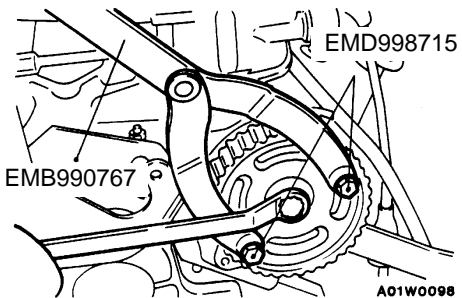


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MD991559

A01X0076

►B◄ CAMSHAFT SPROCKET INSTALLATION



EMD998715

EMB990767

A01W0098

CRANKSHAFT OIL SEALS

FRONT OIL SEAL

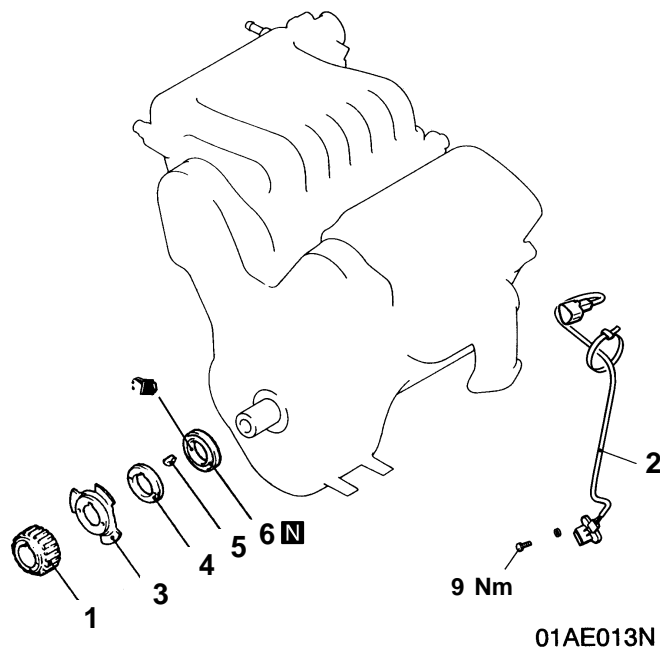
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Timing Belt Removal and Installation (Refer to P.11B-17.)

Adjustment

- Engine Adjustment

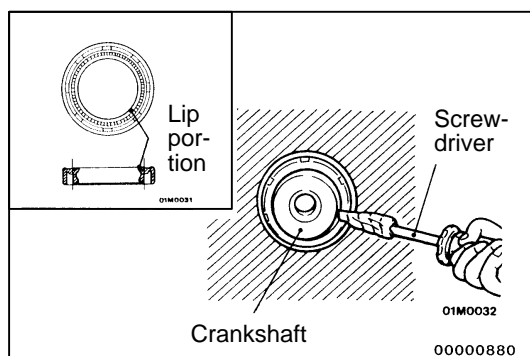


Removal Steps

1. Crankshaft sprocket
2. Crank angle sensor
3. Crankshaft sensing blade

4. Crankshaft spacer
5. Key

6. Crankshaft front oil seal



REMOVAL SERVICE POINT

◀A▶ OIL SEAL REMOVAL

1. Cut out a portion in the crankshaft oil seal lip.
2. Cover the tip of a screwdriver with a cloth and apply it to the cut out in the oil seal to pry off the oil seal.

Caution

Take care not to damage the crankshaft and oil pump case.

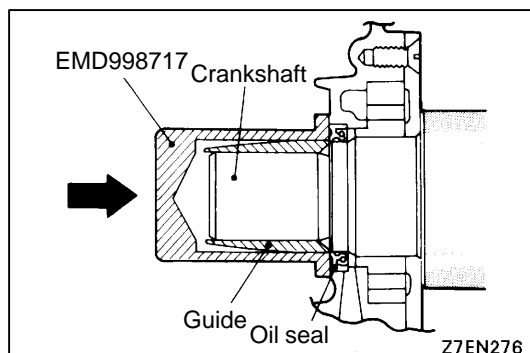
INSTALLATION SERVICE POINT

▶A◀ OIL SEAL INSTALLATION

Using the special tool, knock the oil seal into the oil pump case.

NOTE

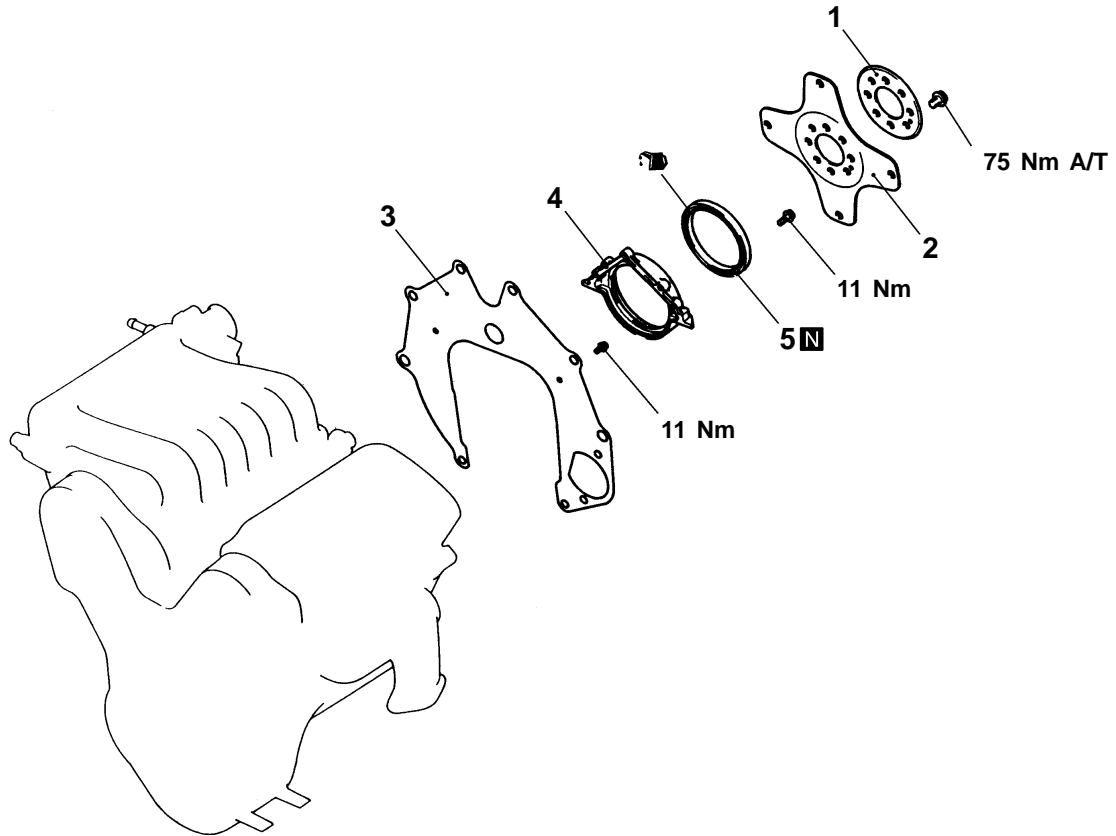
Knock it as far as the surface.



REAR OIL SEAL REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

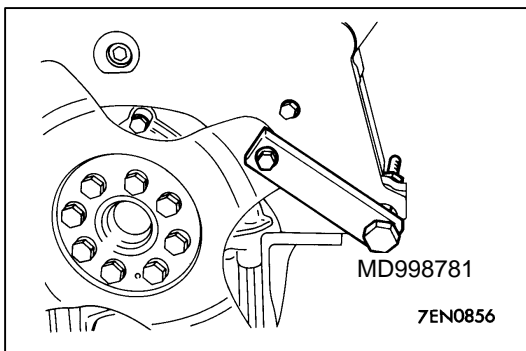
- Transmission Removal and Installation
(Refer to [GROUP 23 – Automatic Transmission.](#))



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Removal Steps

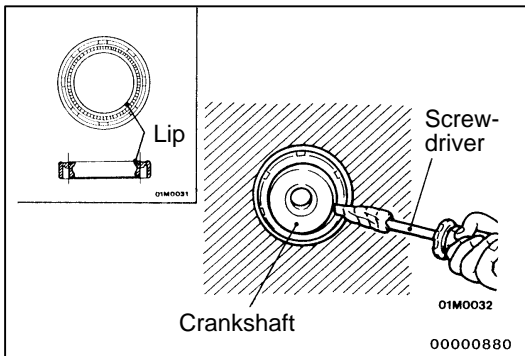
- | | |
|---------|------------------|
| ◀A▶ ▶B▶ | 1. Adaptor plate |
| | 2. Drive plate |
| | 3. Rear plate |
| | 4. Oil seal case |
| ◀B▶ ▶A▶ | 5. Oil seal |



REMOVAL SERVICE POINTS

◀A▶ DRIVE PLATE ADAPTOR PLATE REMOVAL

Use the special tool to secure the drive plate, and remove the bolt.



◀B▶ OIL SEAL REMOVAL

1. Cut out a portion in the crankshaft oil seal lip.
2. Cover the tip of a screwdriver with a cloth and apply it to the cut out in the oil seal to pry off the oil seal.

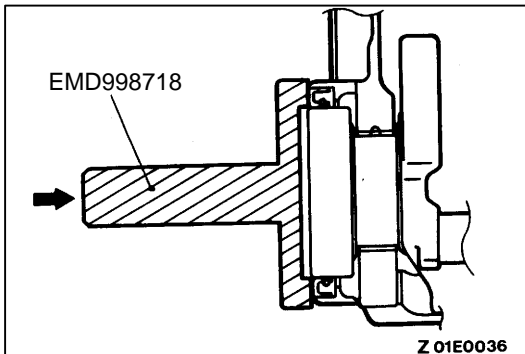
Caution

Take care not to damage the crankshaft and oil seal case.

INSTALLATION SERVICE POINTS

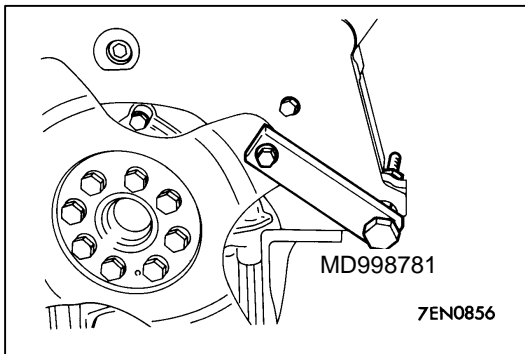
▶A◀ OIL SEAL INSTALLATION

Using the special tool, press-fit a new crankshaft rear oil seal into the oil seal case.



▶B◀ DRIVE PLATE ADAPTOR PLATE INSTALLATION

Use the special tool to secure the drive plate, and tighten the bolts.

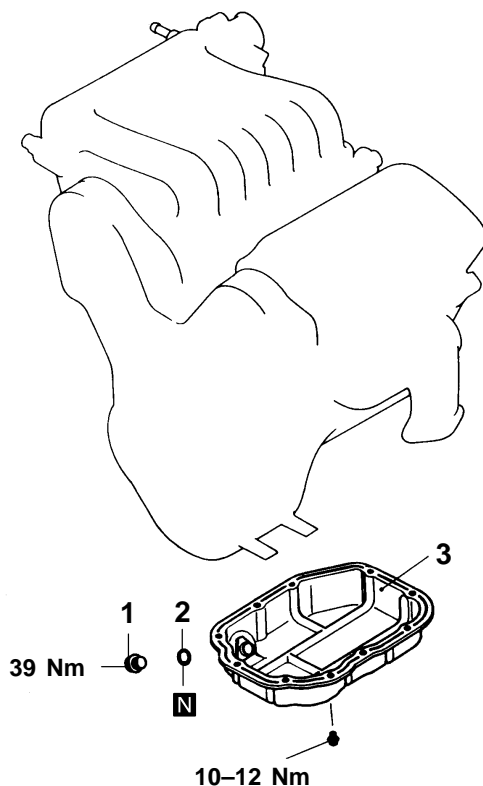


OIL PAN, LOWER

REMOVAL AND INSTALLATION

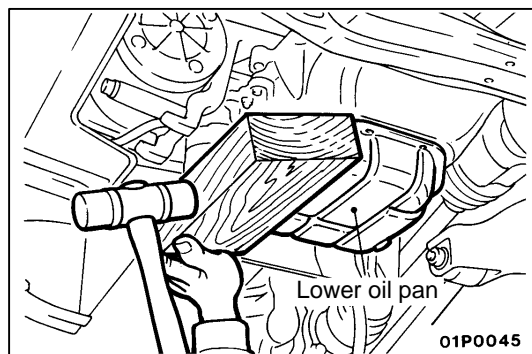
Pre-removal and Post-installation Operation

- Front Exhaust Pipe (Refer to [GROUP 15.](#))
- Draining and Filling Engine Oil (Refer to [GROUP 12 – Maintenance Service.](#))



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- ◀A▶ ▶A▶
1. Drain plug
 2. Drain plug gasket
 3. Oil pan, lower



REMOVAL SERVICE POINT

◀A▶ OIL PAN, LOWER REMOVAL

1. Remove the oil pan, lower installation bolt.
2. Place a wooden block against the oil pan, lower as shown in the figure and remove by tapping with a hammer.

Caution

The use of an oil pan remover can damage the oil pan, upper (aluminium made).

INSTALLATION SERVICE POINT

▶A◀ OIL PAN, LOWER INSTALLATION

1. Remove sealant from oil pan and cylinder block mating surfaces.
2. Degrease the sealant-coated surface and the engine mating surface.
3. Apply the specified sealant around the gasket surface of oil pan as specified in illustration.

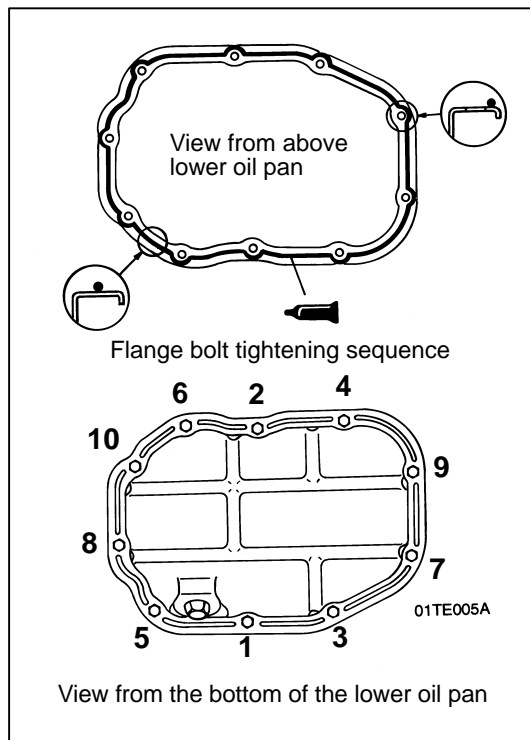
Specified sealant:

MITSUBISHI GENUINE PART No. MD970389 / Loctite 587 Ultra blue or equivalent

NOTE

The sealant should be applied in a continuous bead approximately 4 mm in diameter.

4. Assemble oil pan to cylinder block within 30 minutes after applying the sealant.
5. Tighten the oil pan mounting bolt in the order illustrated (left).

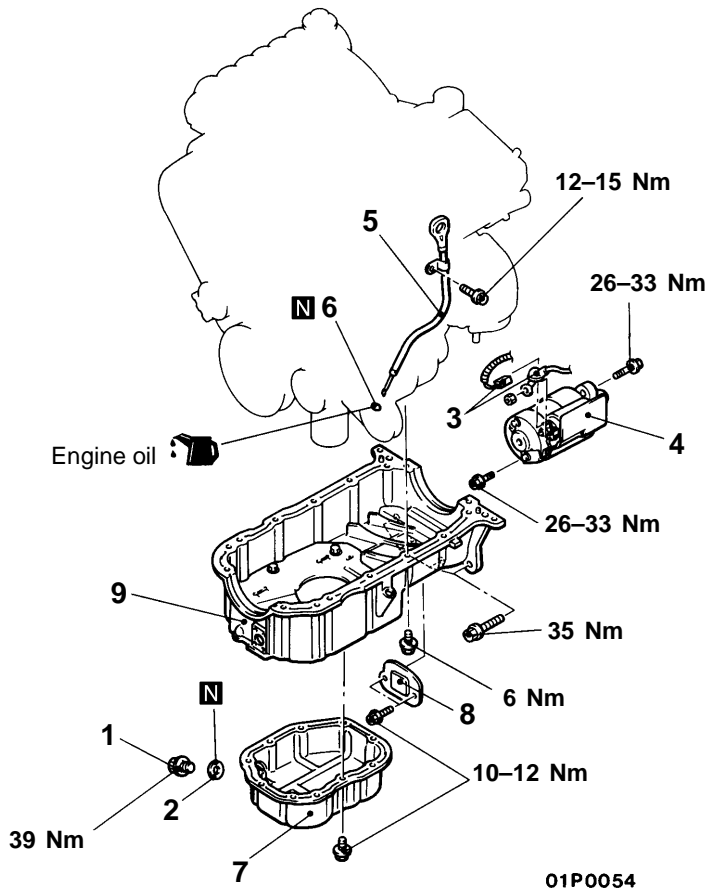


OIL PAN, UPPER

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

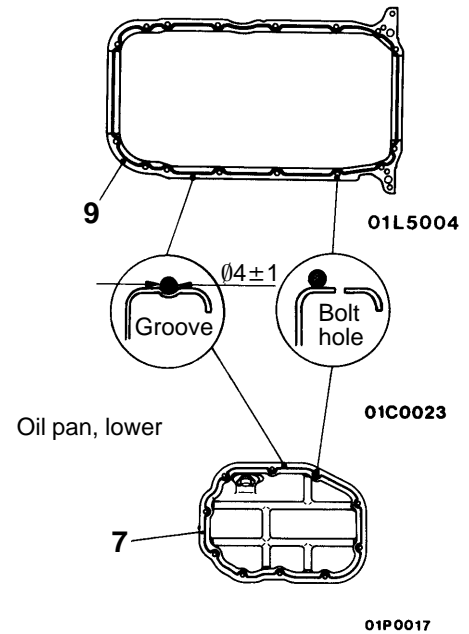
- Draining and Filling with Engine Oil (Refer to [GROUP 12 – On-Vehicle Service.](#))
- Oil pan, Lower (Refer to [P.11A-22.](#))

**Removal steps**

1. Drain plug
2. Drain plug gasket
3. Starter connector
4. Starter
5. Oil gauge and guide

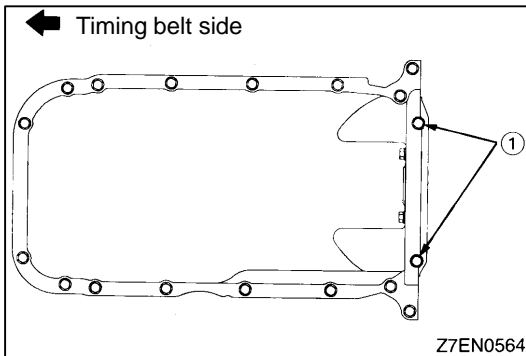


Oil pan, upper



Sealant: MITSUBISHI GENUINE
PART NO. MD970389 / Loctite 587
ultra blue or equivalent

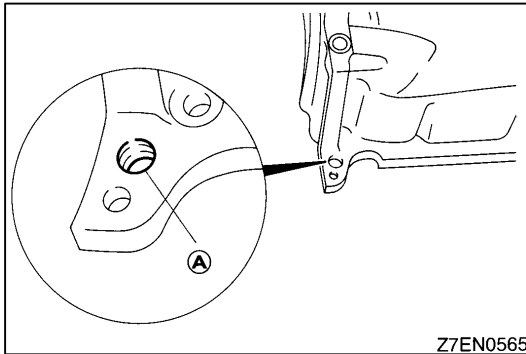
6. O-ring
7. Oil pan, lower
8. Cover
9. Oil pan, upper



REMOVAL SERVICE POINT

◀A▶ OIL PAN, UPPER REMOVAL

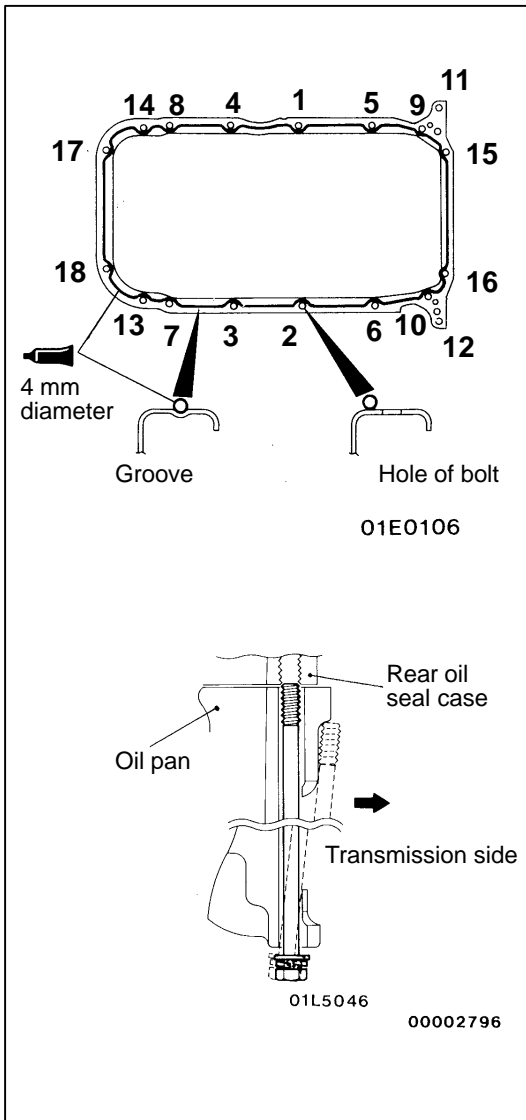
1. Detach the bolt (1) shown at left.
2. Detach all other bolts.



3. Screw a bolt into bolt hole (A) shown (at both ends) to remove the oil pan.

Caution

The use of an oil pan remover (J37228) can damage the oil pan, upper (aluminium made).



INSTALLATION SERVICE POINT

▶A◀ OIL PAN, UPPER INSTALLATION

1. Remove the sealant from the oil pan and cylinder block mating surfaces.
2. Degrease the sealant-coated surface and the engine mating surface.
3. Apply specified sealant around the gasket surface of the oil pan as shown in the illustration.

Specified sealant:

**MITSUBISHI GENUINE PART No. MD970389 /
Loctite 587 Ultra blue or equivalent**

NOTE

The sealant should be applied in a continuous bead approximately 4 mm in diameter.

4. Install the oil pan to the cylinder block within 30 minutes after applying the sealant.
5. Tighten the oil pan mounting bolts in the order shown in the illustration at left.

Caution

The bolt holes for bolts 15 and 16 in the illustration are cut away on the transmission side, so be careful not to insert these bolts at an angle.

INSPECTION

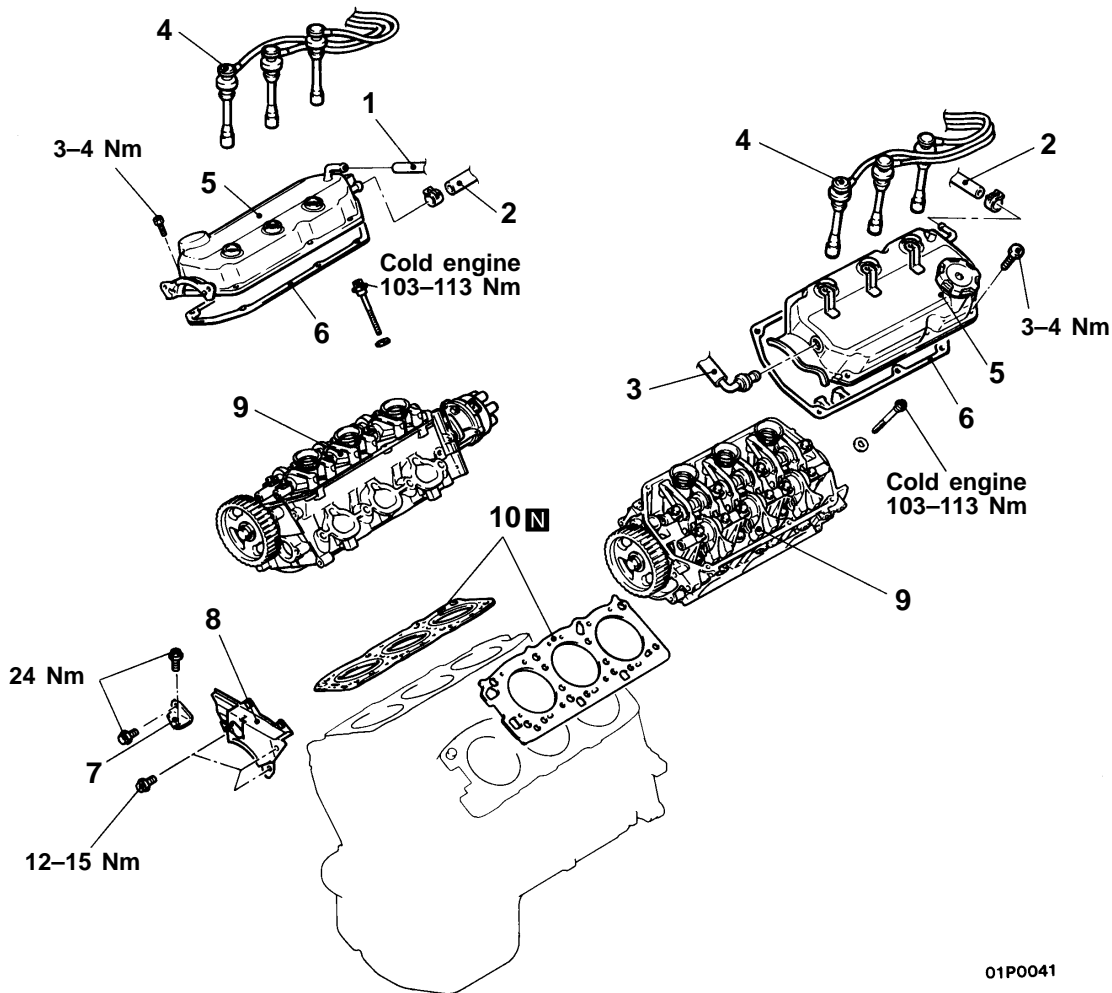
- Check the oil pan for cracks.
- Check the sealant-coated surface of the oil pan for damage and deformation.

CYLINDER HEAD GASKET

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Engine Coolant Draining and Supplying (Refer to [GROUP 14 – Engine Cooling.](#))
- Intake Manifold Removal and Installation (Refer to [GROUP 15 – Intake Manifold.](#))
- Exhaust Manifold Removal (Refer to [P.11B-27](#))
- Water Hose Pipe Removal (Refer to [GROUP 14](#))
- Timing Belt Removal and Installation (Refer to [P.11B-17.](#))



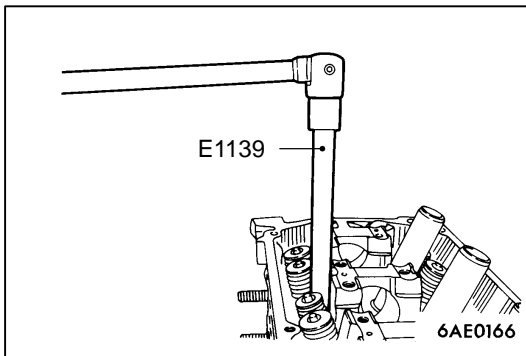
01P0041

Removal steps

1. Breather hose
2. Blow-by hose
3. PCV hose
4. Spark plug cable
5. Rocker cover



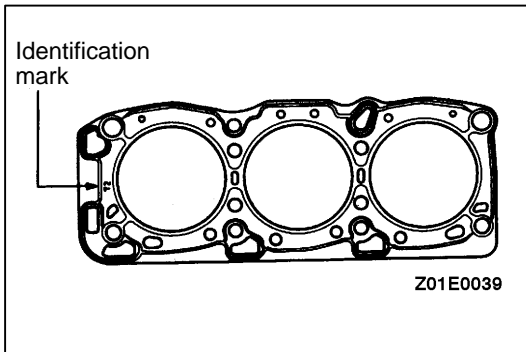
6. Rocker cover gasket
7. Bracket
8. Timing belt cover (rear centre)
9. Cylinder head
10. Cylinder head gasket



REMOVAL SERVICE POINT

◀A▶ CYLINDER HEAD ASSEMBLY REMOVAL

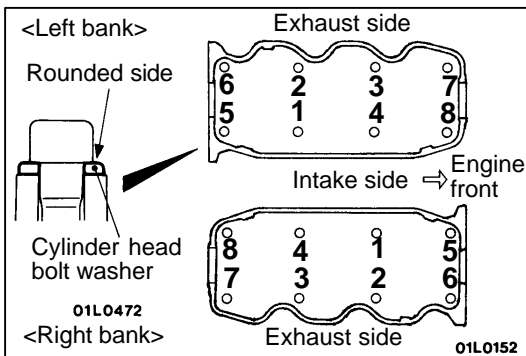
Using the special tool, after loosening the bolts (in 2 or 3 cycles), remove the cylinder head assembly.



INSTALLATION SERVICE POINTS

▶A◀ CYLINDER HEAD GASKET INSTALLATION

1. Degrease the mounting surface of the cylinder head gasket.
2. Lay the cylinder head gasket on cylinder block with the identification mark at front top.



▶B◀ CYLINDER HEAD ASSEMBLY INSTALLATION

Using the special tool, tighten the bolts in the order shown in two or three steps.

Caution

Attach the head bolt washer in the direction shown in the figure.