ENGINE <6G7>

CONTENTS

GENERAL INFORMATION

Items		Specifications
Total displacement mℓ		2,972
Bore x Stroke mm		91.1 x 76.0
Compression ratio		9.0
Combustion chamber		Pentroof type
Camshaft arrangement		SOHC
Number of valves	Intake	12
	Exhaust	12
Valve timing	Intake	Opening BTDC 9°, Closing ABDC 59°
	Exhaust	Opening BBDC 47°, Closing ATDC 21°
Fuel system		Electronic control multipoint fuel injection
Rocker arm		Roller type
Auto-lash adjuster		Equipped

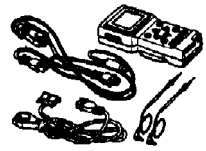
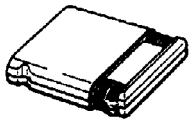
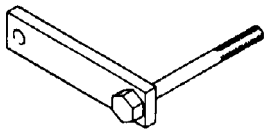
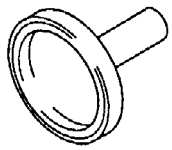
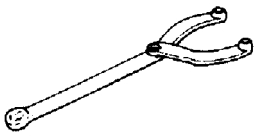
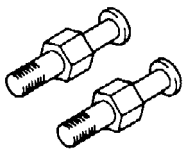
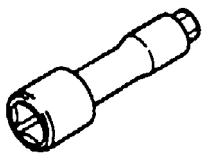
SERVICE SPECIFICATIONS

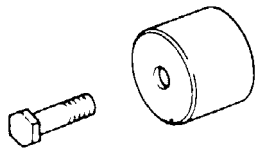
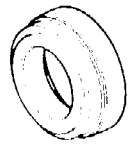
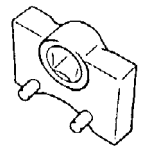
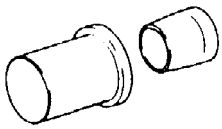
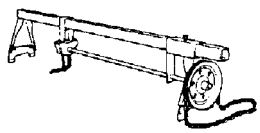
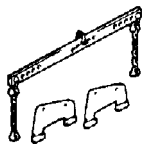
Items			Standard value	Limit
Alternator and A/C compressor drive belt tension	Tension N	When checked	392–588	–
		When a used belt is installed	441–539	–
		When a new belt is installed	637–833	–
	Deflection (Reference value) mm	When checked	5.0–7.0	–
		When a used belt is installed	5.5–6.5	–
		When a new belt is installed	4.0–5.0	–
Power steering oil pump drive belt tension	Tension N	When checked	294–490	–
		When a used belt is installed	343–441	–
		When a new belt is installed	490–686	–
	Deflection (Reference value) mm	When checked	13.0–17.0	–
		When a used belt is installed	14.0–16.0	–
		When a new belt is installed	11.0–13.0	–
Basic ignition timing at idle			5° BTDC ± 3°	–
Actual ignition timing at curb idle			Approx. 15° BTDC	–
Curb idle speed r/min			700±100	–
CO contents %			0.5 or less	–
Compression pressure (at engine speed of 250–400 r/min) kPa			1200	Min. 890
Compression pressure difference of all cylinder kPa			–	Max. 98
Intake manifold vacuum kPa			–	Min. 60
Timing belt tension torque Nm			4.4	–
Auto tensioner rod protrusion amount mm			3.8–5.0	–

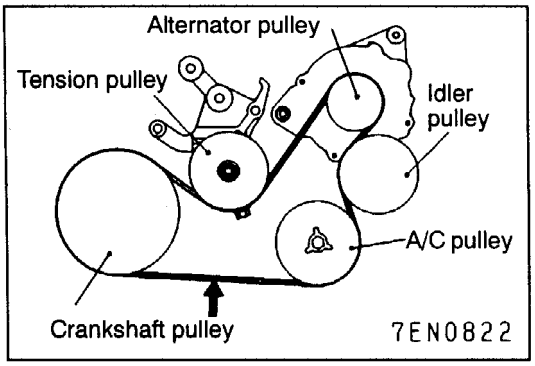
SEALANT

Items	Recommended sealant
Oil pan	MITSUBISHI GENUINE Part No. MD970389 or equivalent

SPECIAL TOOLS

Tool	Number	Name	Use
	MB991502	MUT-II sub-assembly	Checking ignition timing
	–	ROM pack	
	MD998781	Flywheel stopper	Securing the flywheel <M/T> or the drive plate <A/T>
	MD998718	Crankshaft rear oil seal installer	Installation of the crankshaft rear oil seal
	MB990767	End yoke holder	Supporting the sprocket and shaft pulley during removal and installation Use with MD998715
	MD998715	Pulley holding pins	Supporting the crankshaft pulley when crankshaft bolt and pulley are removed or reinstalled. Use together with MB990767 Camshaft pulley supporting
	MD998769	Crankshaft sprocket spacer	Used if the crankshaft needs to be rotated to attach the timing belt, etc.
	MD998051	Wrench, cylinder head bolt	Loosening and tightening of cylinder head bolt

Tool	Number	Name	Use
	MD998713	Camshaft oil seal installer	Camshaft oil seal installation
	MB991559	Camshaft oil seal installer	Press fitting the camshaft oil seal (For left bank)
	MD998767	Tension pulley socket wrench	Adjustment of the timing belt
	MD998717	Crankshaft front oil seal installer	Press-fitting of crankshaft front oil seal
 Z203827	GENERAL SERVICE TOOL MZ203827	Engine lifter	Supporting the engine assembly during removal and installation of the transmission
 B991453	MB991453	Engine hanger	

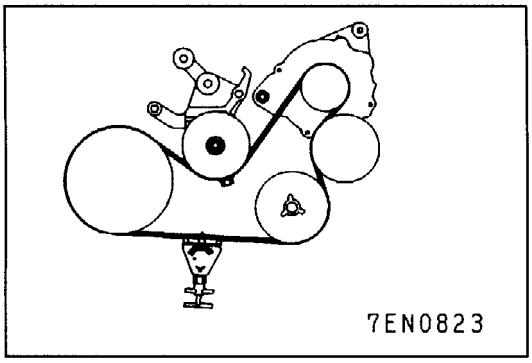


ON-VEHICLE SERVICE

DRIVE BELT TENSION CHECK AND ADJUSTMENT

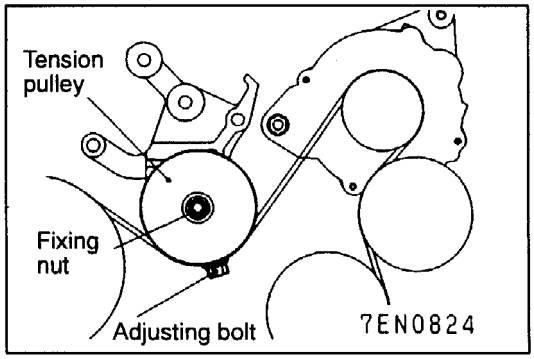
ALTERNATOR AND AIR CONDITIONER COMPRESSOR DRIVE BELT TENSION CHECK

Use a belt tension gauge to check that the belt tension is at the standard value at a point as shown in the illustration. In addition, press this section with a force of 98N and check that the amount of belt deflection is at the standard value.



Standard value (for each belt):

Tension N	392–588
Deflection (Reference value) mm	5.0–7.0



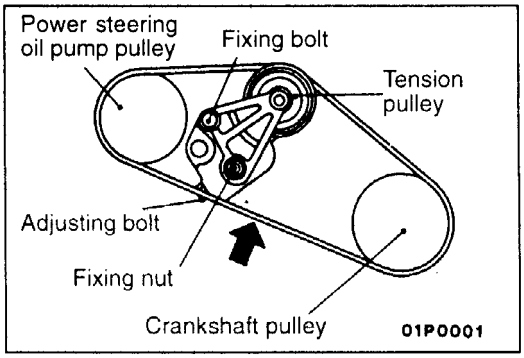
ALTERNATOR AND AIR–CONDITIONING COMPRESSOR DRIVE BELT TENSION ADJUSTMENT

1. Loosen the tension pulley fixing nut.
2. Adjust the belt tension using the adjusting bolt.
3. Tighten the fixing nut.

Standard value:

Items	When a used belt is installed	When a new belt is installed
Tension N	441–539	637–833
Deflection (Reference value) mm	5.5–6.5	4.0–5.0

4. Crank the engine once or more.
5. Check the belt tension.



POWER STEERING OIL PUMP BELT TENSION CHECK AND ADJUSTMENT

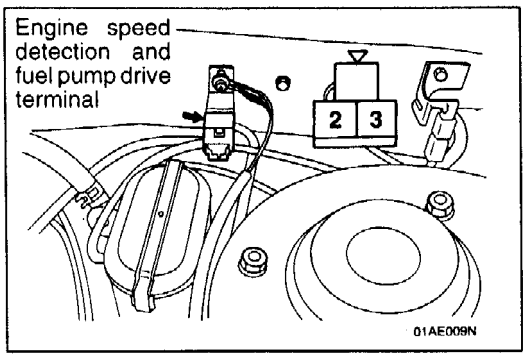
1. Use a belt tension gauge to check that the belt tension is at the standard value at a point half-way between the two pulleys (indicated by an arrow in the illustration). In addition, press this section with a force of 98N and check that the amount of belt deflection is at the standard value.

Standard value:

Items	When checked	When a used belt is installed	When a new belt is installed
Tension N	294–490	343–441	490–686
Deflection (Reference value) mm	13.0–17.0	14.0–16.0	11.0–13.0

2. If the tension or deflection is outside the standard value, adjust by the following procedure.
   (1) Loosen the tension pulley nut.
   (2) Adjust the amount of belt deflection using adjusting bolt.
   (3) Tighten the tension pulley nut.

   Tightening torque: 48Nm
   (4) Rotate the crankshaft once or more.
   (5) Check the belt deflection amount and tension, and readjust if necessary.



IGNITION TIMING CHECK

1. Before inspection, set the vehicle to the pre-inspection condition.
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 diagnosis 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.

13. Press the MUT-II clear key (Select forced driving cancel mode) to release the Actuator test.

    Caution
    If the test is not cancelled, forced driving will continue for 27 minutes. Driving under this condition may damage the engine.
14. Check that the idling ignition timing is at the correct value.

    Standard value: Approx. 15°BTDC

    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.

IDLE SPEED CHECK

1. Before inspection, set the vehicle to the pre-inspection condition.
2. Turn the ignition switch to OFF and connect the MUT-II to the diagnosis connector.
3. Check the basic ignition timing. Adjust if necessary.

   Standard value: 5° BTDC ± 3°
4. Run the engine at idle for 2 minutes.
5. Check the idle speed. Select item No. 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 speed control (ISC) system.
6. If the idle speed is outside the standard value, inspect the MPI components by referring to GROUP 13A – Troubleshooting.

IDLE MIXTURE CHECK

1. Before inspection, set the vehicle to the pre-inspection condition.
2. Check to be sure that the basic ignition timing is at the standard value.

   Standard value: 5° BTDC±3°

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

   NOTE
   For the procedures for setting the tachometer, refer to P.11-6.

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.

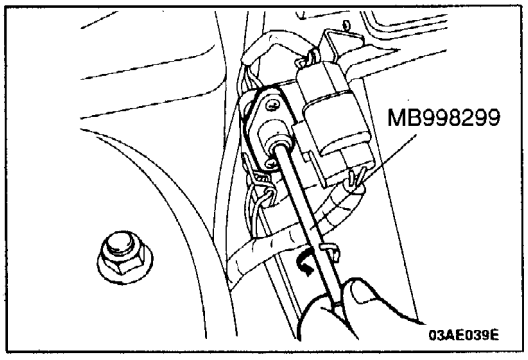
   Standard value:
   CO contents:
   0.5% or less <Vehicles with catalytic converter>
   1.5 ± 0.5% <Vehicles without catalytic converter>

7. If the concentrations are outside the standard values, check the following items.

<Vehicles with catalytic converter>

- Diagnosis output
- Closed loop control
  (If closed loop control is being carried out normally, the 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

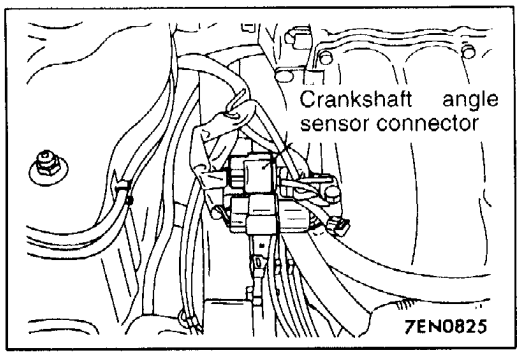
NOTE
If the results of the checks for all items are normal but the CO concentration still exceeds the standard value, replace the three-way catalyst.

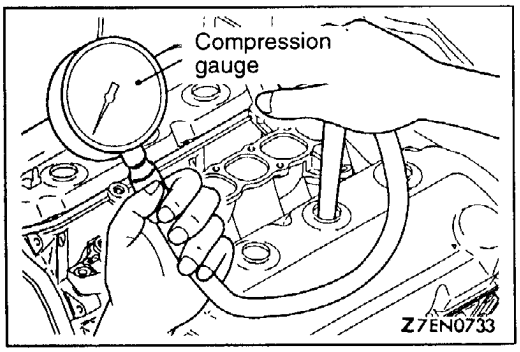


<Vehicles without catalytic converter>

Adjust CO concentration to specifications by using the variable resistor adjusting screw.

COMPRESSION PRESSURE CHECK





1. Before inspection, check that the engine oil, starter and battery are normal. Also, set the vehicle to the pre-inspection condition.
2. Disconnect the spark plug cables.
3. Remove all of the spark plugs.
4. Disconnect the crankshaft angle sensor connector.

   NOTE
   Doing this will prevent the Engine-ECU from carrying out ignition and fuel injection.

5. Cover the spark plug hole with a shop towel or similar, and after the engine has been cranked, check that no foreign material is adhering to the shop towel.

   Caution
   1. Keep away from the spark plug hole when cranking.
   2. Do not let water, oil, fuel, etc. enter the cylinder through cracks, or 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.

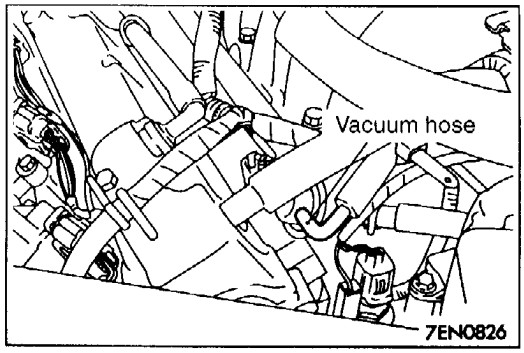
   Limit: max. 100 kPa

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 crankshaft 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 crankshaft 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 diagnosis connector.

   NOTE
   For the procedures for setting the tachometer, refer to P.11-6.
3. Connect a three-way joint to the vacuum hose between the air intake manifold 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.
   Check the vacuum gauge reading.

   Limit: min. 60 kPa

LASH ADJUSTER CHECK

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

NOTE
(1) An abnormal noise due to malfunction of the lash adjuster is produced immediately after starting the engine and changes with the engine speed, irrespective of the engine load.
If, therefore, 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.
(2) When the lash adjuster is malfunctioning, the abnormal noise is rarely eliminated by continuing the warming-up of the engine at idle speed.
However, the abnormal noise may disappear only when seizure is caused by oil sludge in the engine whose oil is not maintained properly.

1. Start the engine.
2. Check if 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. For your information, the abnormal noise is probably caused by some other parts than the engine proper if it does not change with the engine speed. (In this case, the lash adjuster is in good condition.)
3. With the engine idling, change the engine load (shift from N to D range, for example) to make sure that there is no change in the level of abnormal noise.
If there is a change in the level of abnormal noise, suspect a tapping noise due to worn crankshaft bearing or connecting rod bearing. (In this case, the lash adjuster is in good condition.)
4. After completion of warming-up, run the engine at idle to check for abnormal noise.
If the noise is reduced or disappears, make the following check as it is suspected that the noise is due to seizure of the lash adjuster. If there is no change in the level of the abnormal noise, proceed to step 5.
   (1) Cool the engine sufficiently.
   (2) Give two turns to the crankshaft.

(3) Perform simple check of the lash adjuster. (Refer to P.11-13)
- Replace the lash adjuster which allows the rocker arm to be pushed down easily.
- If the lash adjuster is found normal as a result of simple lash adjuster check (the rocker arm is not pushed down easily), investigate other causes for the abnormal noise.

NOTE
The lash adjuster can be judged correctly by the leak down test whether it is good or bad.
(Refer to ENGINE WORKSHOP MANUAL)

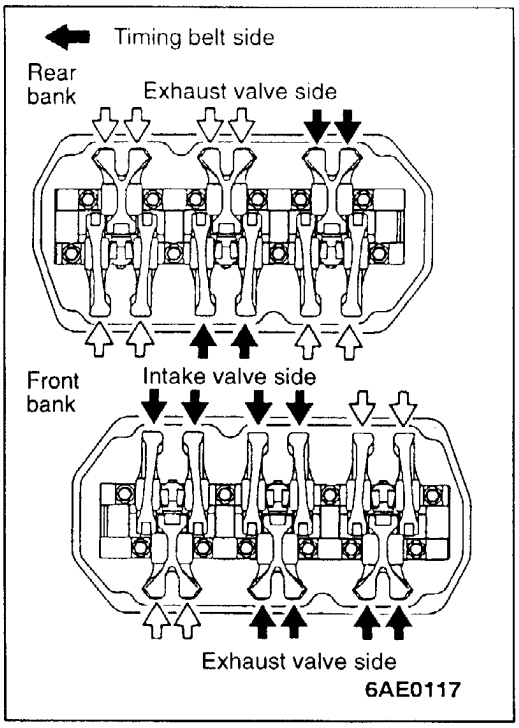
Caution
Before installation of a new lash adjuster, be sure to bleed air from the adjuster.
(Refer to ENGINE WORKSHOP MANUAL.)

5. Run the engine to bleed the lash adjuster system. (Refer to P.11-14)
6. If the abnormal noise does not disappear after air bleeding operation, perform the following check.
   (1) Perform simple lash adjuster check. (Refer to P.11-13)
   - If only one of the lash adjusters is found abnormal in the simple lash adjuster check (the rocker arm is pushed down easily), replace the lash adjuster.
   - If two or more lash adjusters are found abnormal (the rocker arm is pushed down easily), clogged oil passage in the cylinder head is suspected. Check for clogged oil passage and repair the passage if it is clogged.
     If the passage is not clogged, replace the lash adjusters.
   - If all the lash adjusters are found normal (the rocker arms are hard to push down) as a result of simple lash adjuster check, investigate other causes for the abnormal noise.

NOTE
The lash adjuster can be judged correctly by the leak down test whether it is good or bad.
(Refer to ENGINE WORKSHOP MANUAL)

Caution
Before installation of a new lash adjuster, be sure to bleed air from the adjuster.
(Refer to ENGINE WORKSHOP MANUAL.)

7. Start the engine and make sure that the abnormal noise has disappeared. Perform air bleeding operation if required. (Refer to P.11-14)



<Simple Lash Adjuster Check>
1. Stop the engine.
2. Remove the rocker cover.
3. Set the piston in No. 1 cylinder at top dead center of the compression stroke.
4. Check the rocker arms indicated by a white arrow in left figure by the following procedure.

<Except checking of Y-shaped rocker arm>
(1) Check if the rocker arm can be pushed down when pushing it at the portion right above the lash adjuster.
- If the rocker arm can be pushed down easily, record the corresponding lash adjuster as a defective.
- If the rocker arm cannot be pushed down (it feels very stiff), the lash adjuster is in good condition. Therefore, investigate other causes of the abnormal noise.

<Checking of Y-shaped rocker arm>

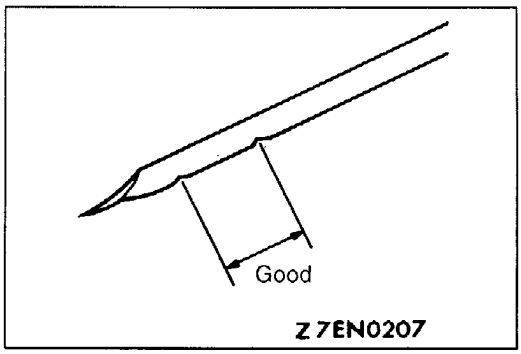
NOTE
The Y-shaped rocker arm on exhaust valve side cannot be pushed down if either of the lash adjusters is in good condition.
Therefore, use a feeler gauge to make a check by the following procedure.

(1) Check if a 0.1 – 0.2 mm leaf of the feeler gauge can be inserted between the valve and the lash adjuster.
(2) Record the corresponding lash adjuster as a defective if the leaf of the feeler gauge can be inserted easily.
(3) If the feeler gauge leaf cannot be inserted easily, the lash adjuster is in good condition. Therefore, investigate other cause of the abnormal noise.

5. Slowly turn the crankshaft 360° clockwise.
6. Follow the same procedure as step 4 to check the rocker arms indicated by a black arrow in left figure.

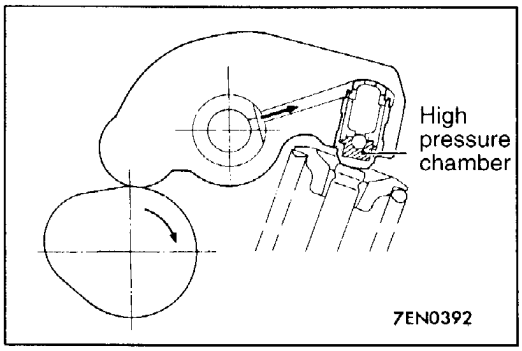
<Bleeding lash adjuster system>

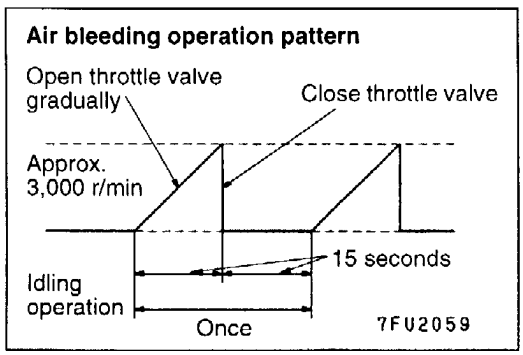
NOTE
(1) Parking the vehicle on a grade for a long time may decrease oil in the lash adjuster, causing air to enter the high pressure chamber when starting the engine.
(2) After parking for many hours, oil may run out from the oil passage and take time before oil is supplied to the lash adjuster, causing air to enter the high pressure chamber.
(3) In the above cases, abnormal noise can be eliminated by bleeding the lash adjuster system.



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

NOTE
(1) If the engine oil level is low, air is sucked from the oil screen, causing air to enter the oil passage.
(2) If the engine oil level is higher than specification, oil may be stirred by the crankshaft, causing oil to be mixed with a large quantity of air.
(3) If oil is deteriorated, air is not easily separated from oil, increasing the quantity of air contained in oil.
(4) If air mixed with oil enters the high pressure chamber inside the lash adjuster from the above causes, air in the high pressure chamber is compressed excessively while the valve is opened, resulting in production of abnormal noise at closing of the valve. This is the same phenomenon as that observed when the valve clearance has become excessive. The lash adjuster can resume normal function when air entered the lash adjuster is removed.





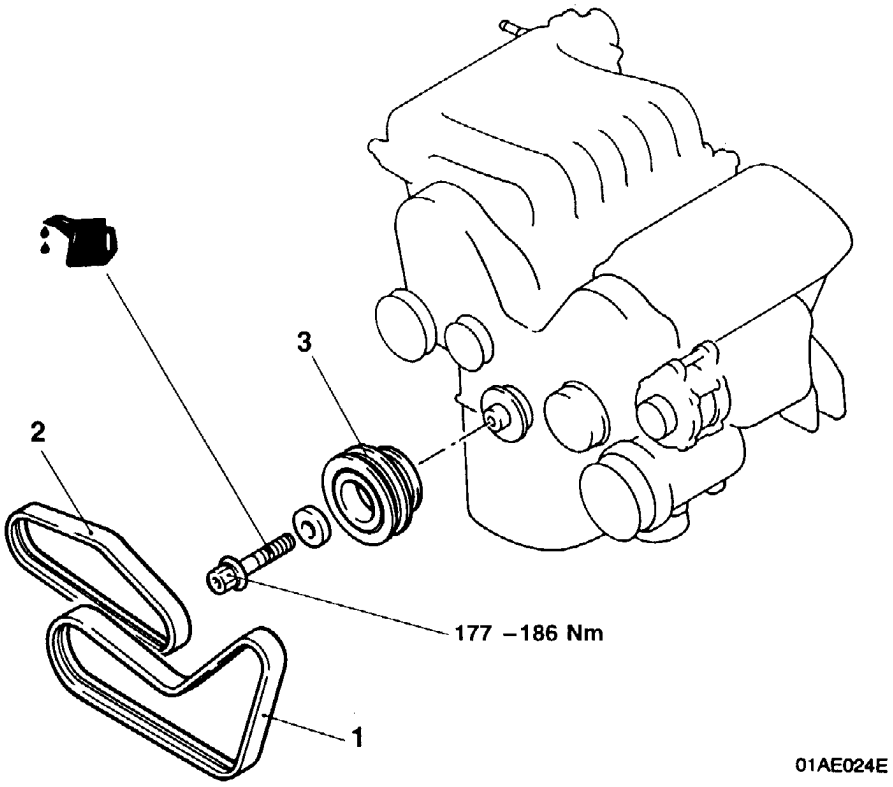
2. Idle the engine for one to three minutes to warm it up.
3. Repeat the operation pattern, shown in left figure, at no load to check for abnormal noise. (Normally the abnormal noise is eliminated after repetition of the operation 10 to 30 times. If, however, no change is observed in the level of abnormal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

CRANKSHAFT PULLEY

REMOVAL AND INSTALLATION

Pre-removal Operation
- Under Cover Removal

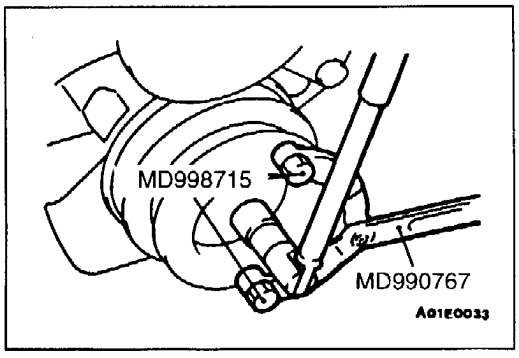
Post-installation Operation
- Drive Belt Tension Adjustment (Refer to P.11-5.)
- Under Cover Installation



Removal Steps

1. Drive belt (for alternator and A/C)
2. Drive belt (for power steering oil pump)

◀A▶ ▶A◀ 3. Crankshaft pulley



REMOVAL SERVICE POINT

◀A▶ CRANKSHAFT PULLEY REMOVAL

INSTALLATION SERVICE POINT

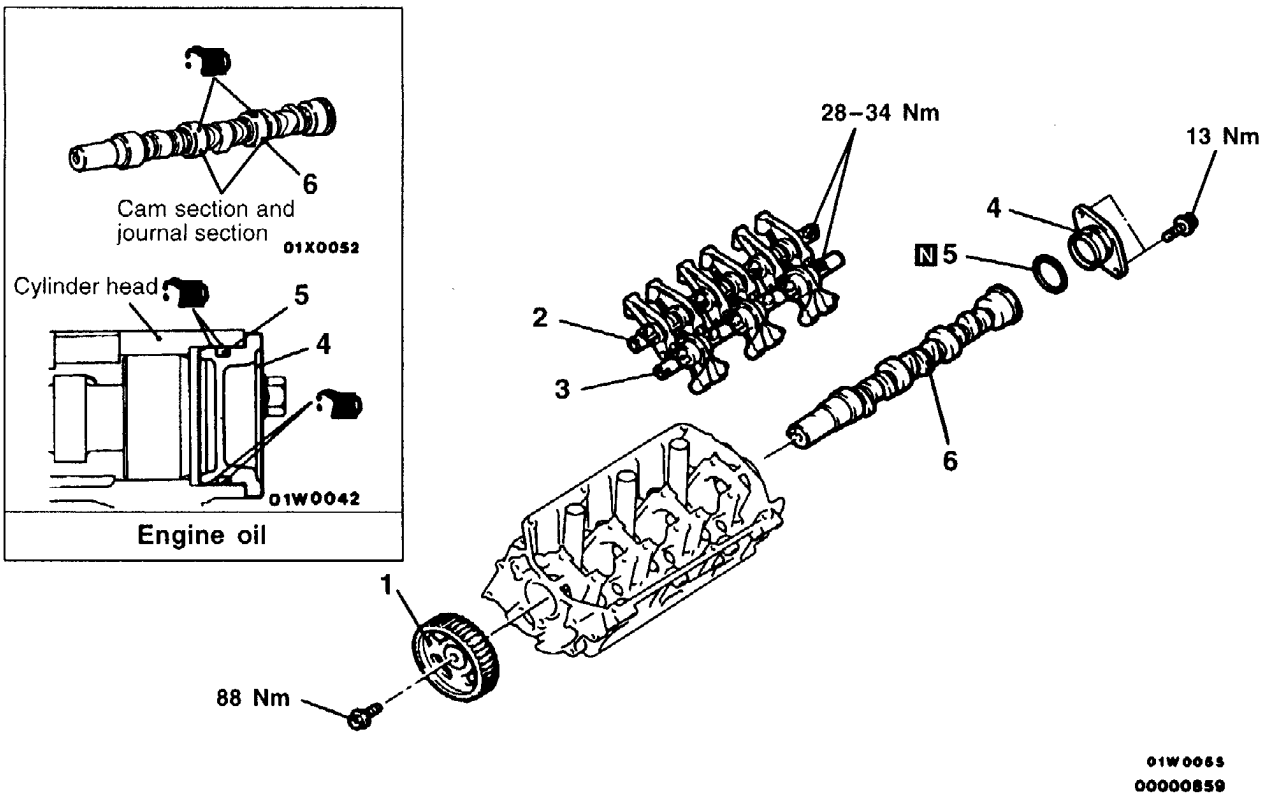
▶A◀ CRANKSHAFT PULLEY INSTALLATION

Use special tools and install the crankshaft pulley.

CAMSHAFT

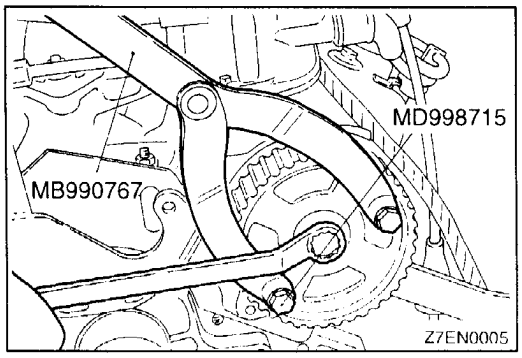
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Cylinder Head Assembly Removal and Installation (Refer to P.11-24.)



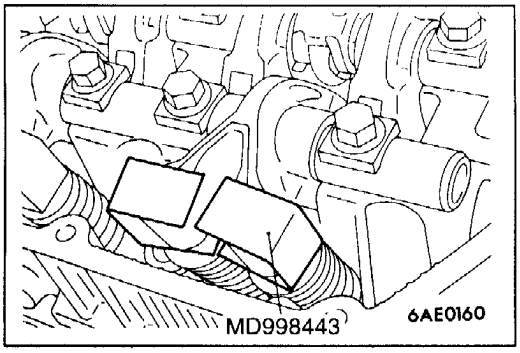
Removal steps

◀A▶ ▶B◀ 1. Camshaft sprocket
◀B▶ ▶A◀ 2. Rocker arm and shaft assembly (Intake side)
◀B▶ ▶A◀ 3. Rocker arm and shaft assembly (Exhaust side)
4. Thrust case
5. O-ring
6. Camshaft



REMOVAL SERVICE POINTS

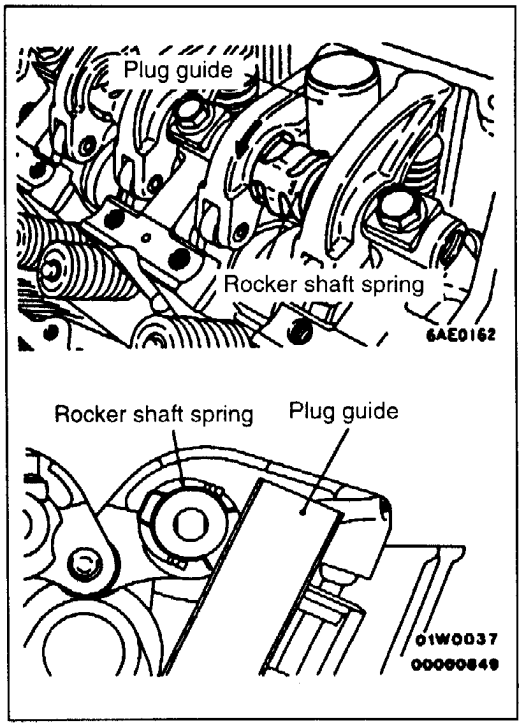
◀A▶ CAMSHAFT SPROCKET REMOVAL



◀B▶ ROCKER ARM AND SHAFT ASSEMBLY REMOVAL

1. Install the special tools as shown in the illustration so that the lash adjusters will not fall out.
2. Loosen the rocker arm and shaft assembly mounting bolt, and then remove the rocker arm and shaft assembly with the bolt still attached.

Caution
Never disassemble the rocker arm and shaft assembly.



INSTALLATION SERVICE POINTS

▶A◀ ROCKER ARM AND SHAFT ASSEMBLY INSTALLATION

1. Temporarily tighten the rocker shaft with the bolt so that all rocker arms on the inlet valve side do not push the valves.
2. Fit the rocker shaft spring from the above and position it so that it is at right angles to the plug guide.

NOTE
Install the rocker shaft spring before installing the rocker arm and rocker arm shaft on the exhaust side.

3. Tighten the rocker arm and shaft assembly mounting bolt to the specified torque

Tightening torque: 28 – 34 Nm

4. Remove the special tool for fixing the lash adjuster.

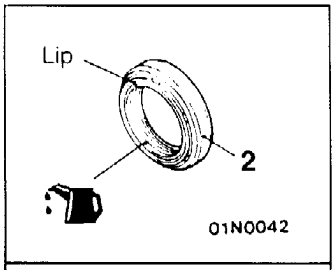
▶B◀ CAMSHAFT SPROCKET INSTALLATION

Use the special tool in the same way as during the removal to install the camshaft sprocket.

CAMSHAFT OIL SEAL

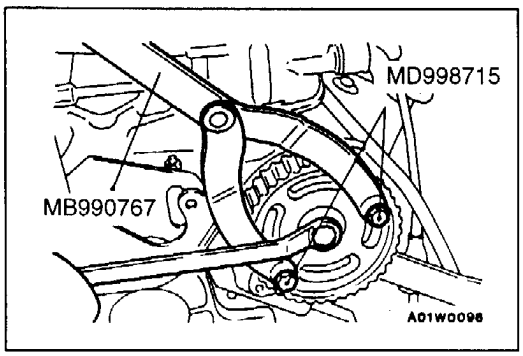
REMOVAL AND INSTALLATION

Pre-removal and Post-installation operation
- Timing Belt Removal and Installation (Refer to P.11-26.)



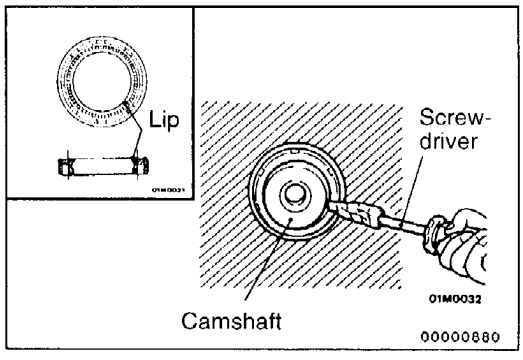
Removal steps

◀A▶ ▶B◀ 1. Camshaft sprocket
◀B▶ ▶A◀ 2. Camshaft oil seals



REMOVAL SERVICE POINTS

◀A▶ CAMSHAFT SPROCKET REMOVAL

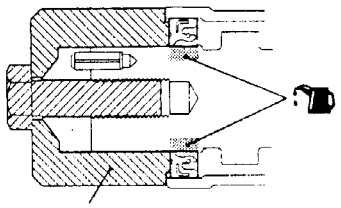


◀B▶ CAMSHAFT OIL SEAL REMOVAL

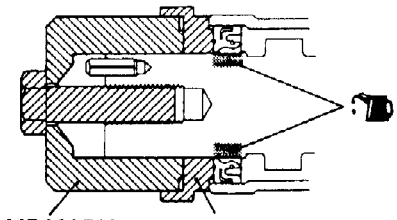
1. Cut out a portion in the camshaft oil seal lip.
2. Cover the tip of a screwdriver with a cloth and apply it to the cutout in the oil seal to pry off the oil seal.

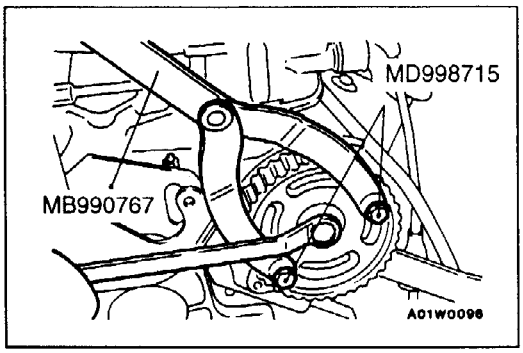
Caution
Use care not to damage the camshaft and cylinder head.

<Rear bank side>



<Front bank side>





INSTALLATION SERVICE POINTS

▶A◀ CAMSHAFT OIL SEAL INSTALLATION

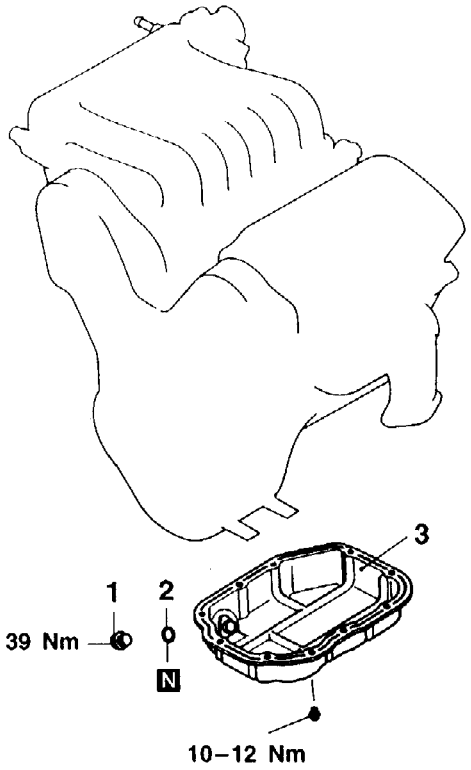
Coat engine oil on the whole circumference of the oil seal lip section.
Using the special tool, press-fit the oil seal.

▶B◀ CAMSHAFT SPROCKET INSTALLATION

OIL PAN, LOWER

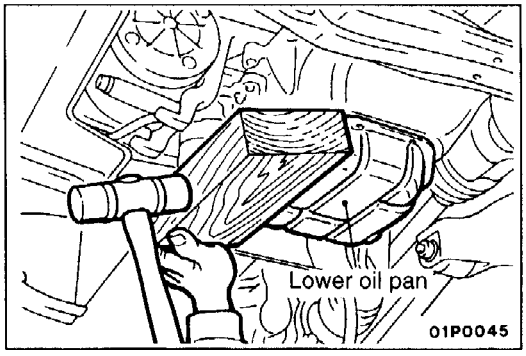
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Front Exhaust Pipe Removal and Installation (Refer to GROUP 15.)
- Draining and Filling with Engine Oil (Refer to GROUP 12 – On-vehicle Service.)



01AE011N

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

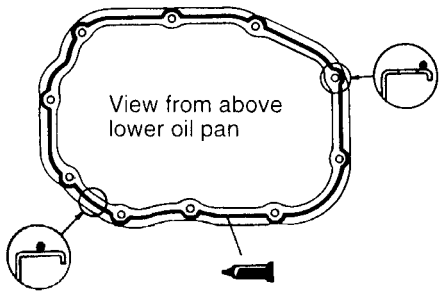


REMOVAL SERVICE POINT

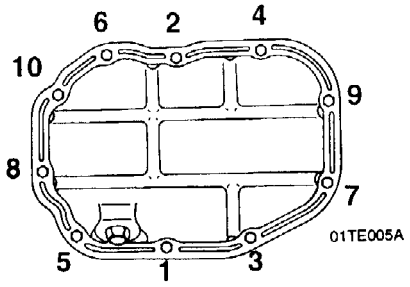
◀A▶ OIL PAN, LOWER REMOVAL

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 (MD998727) can damage the aluminium upper oil pan.



Flange bolt tightening sequence



View from the bottom of the lower oil pan

INSTALLATION SERVICE POINT

▶A◀ OIL PAN, LOWER INSTALLATION

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

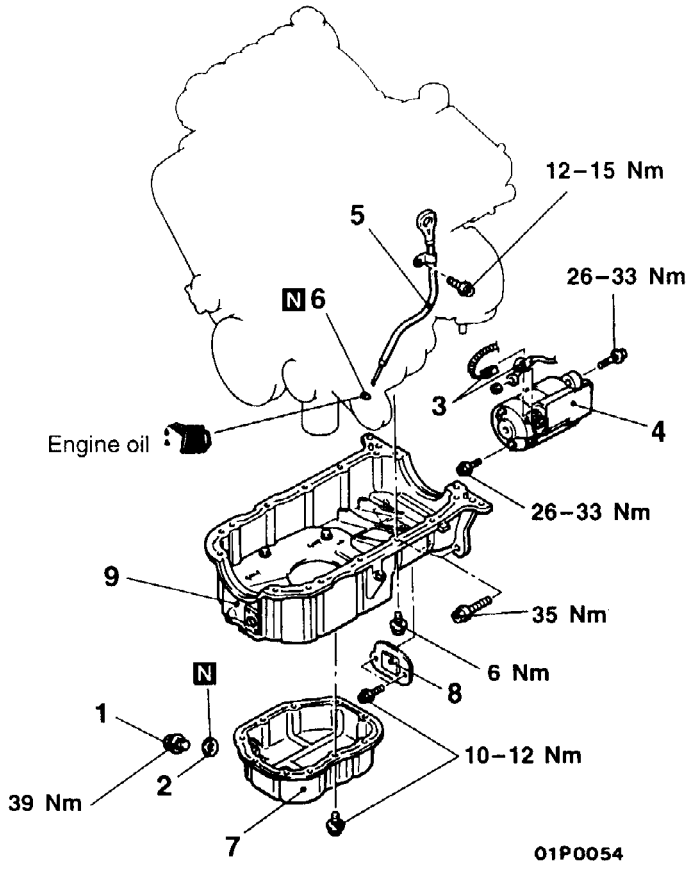
   Specified sealant:
   MITSUBISHI GENUINE PART No. MD970389 or equivalent

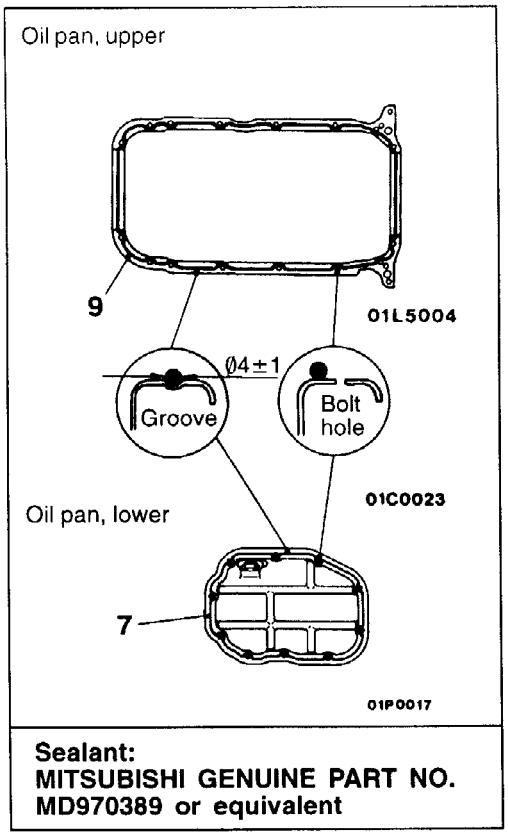
   NOTE
   The sealant should be applied in a continuous bead approximately 4 mm in diameter.
4. Assemble the lower oil pan to the upper oil pan within 30 minutes after applying the sealant.
5. Tighten the oil pan mounting bolt in the order illustrated (left).

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.)

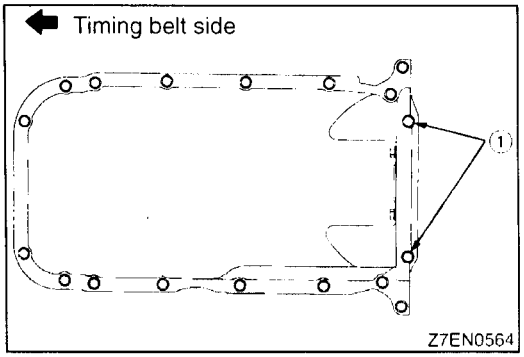




Sealant:
MITSUBISHI GENUINE PART NO. MD970389 or equivalent

Removal steps
1. Drain plug
2. Drain plug gasket
3. Starter connector
4. Starter
5. Oil gauge and guide
6. O-ring
7. Oil pan, lower (Refer to P.11-20.)
8. Cover

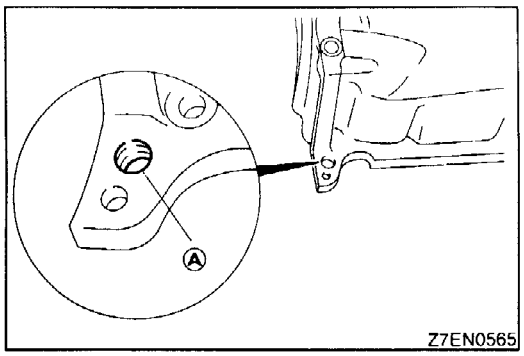
◀A▶ ▶A◀ 9. Oil pan, upper



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 (MD998727) can damage the aluminium upper oil pan.

INSTALLATION SERVICE POINT

▶A◀ OIL PAN, UPPER INSTALLATION

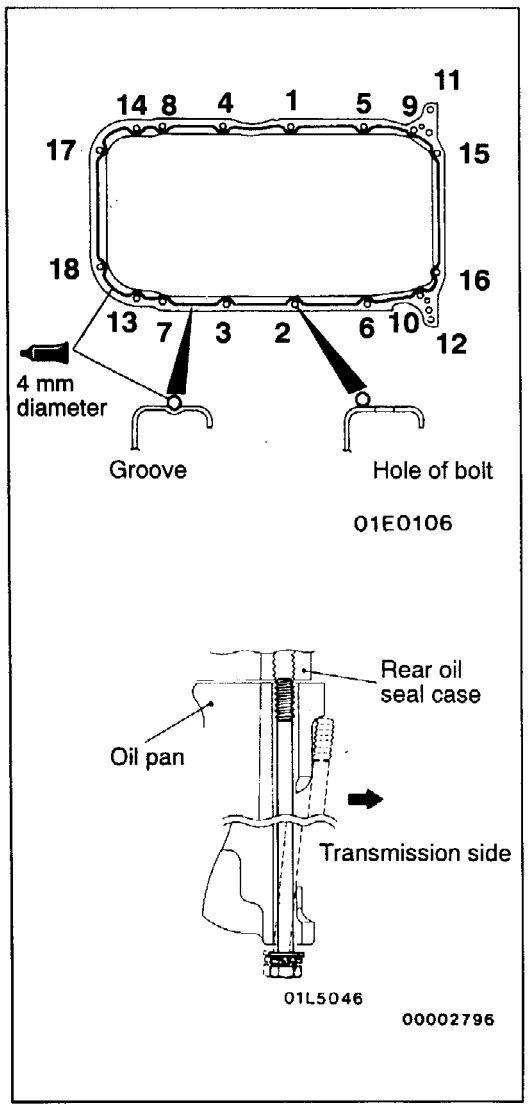
1. Remove the sealant from the oil pan and cylinder block mating surfaces.
2. Degrease the sealant-coated surface and the engine mating surface.
3. Apply specified sealant around the gasket surface of the oil pan as shown in the illustration.

Specified sealant:
MITSUBISHI GENUINE PART No. MD970389 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.



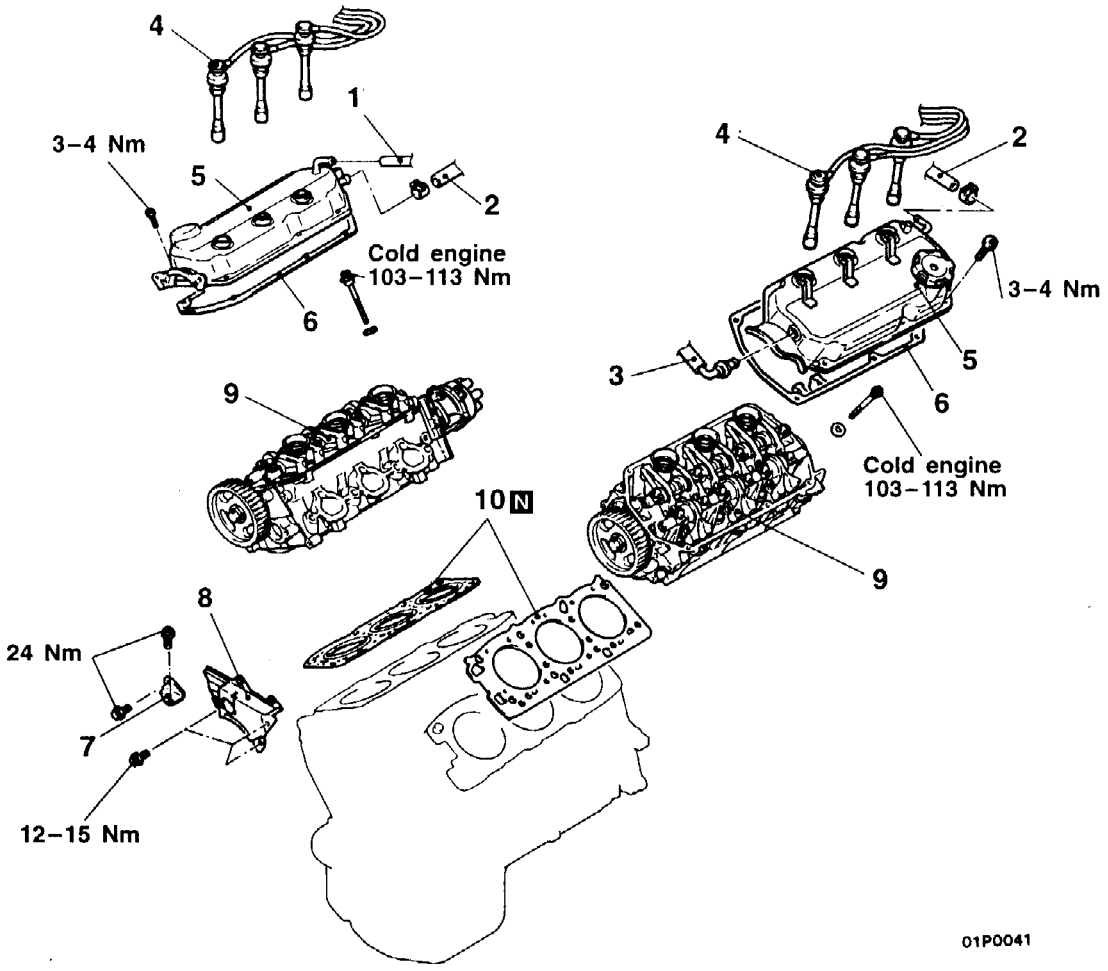
INSPECTION

- 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
- Intake Manifold Removal and Installation (Refer to GROUP 15 – Intake Manifold.)
- Water Hose Pipe Removal (Refer to GROUP 14)
- Timing Belt Removal and Installation (Refer to P.11-26.)
- Front Exhaust Pipe Removal and Installation (Refer to GROUP 15 – Exhaust Pipe and Main Muffler)

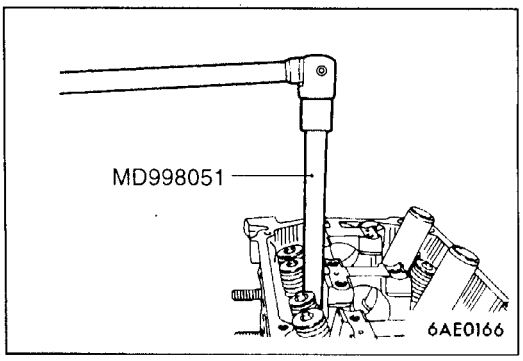


Removal steps

1. Breather hose
2. Blow-by hose
3. PVC hose
4. Spark plug cable
5. Rocker cover
6. Rocker cover gasket
7. Bracket
8. Timing belt cover (rear centre)

◀A▶ ▶B◀ 9. Cylinder head

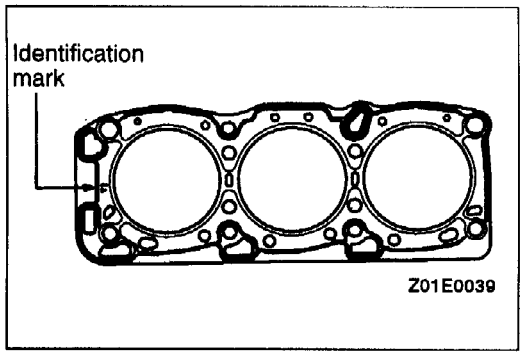
▶A◀ 10. Cylinder head gasket



REMOVAL SERVICE POINT

◀A▶ CYLINDER HEAD ASSEMBLY REMOVAL

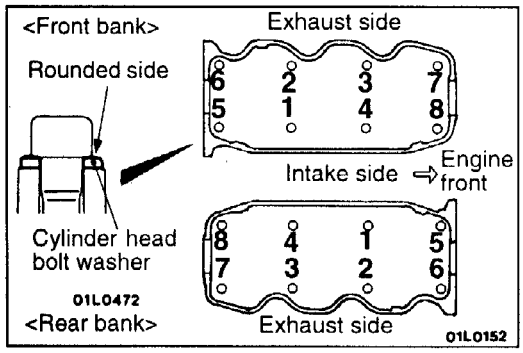
Using the special tool, after loosening the bolts (in 2 or 3 cycles), remove the cylinder head assembly.



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.

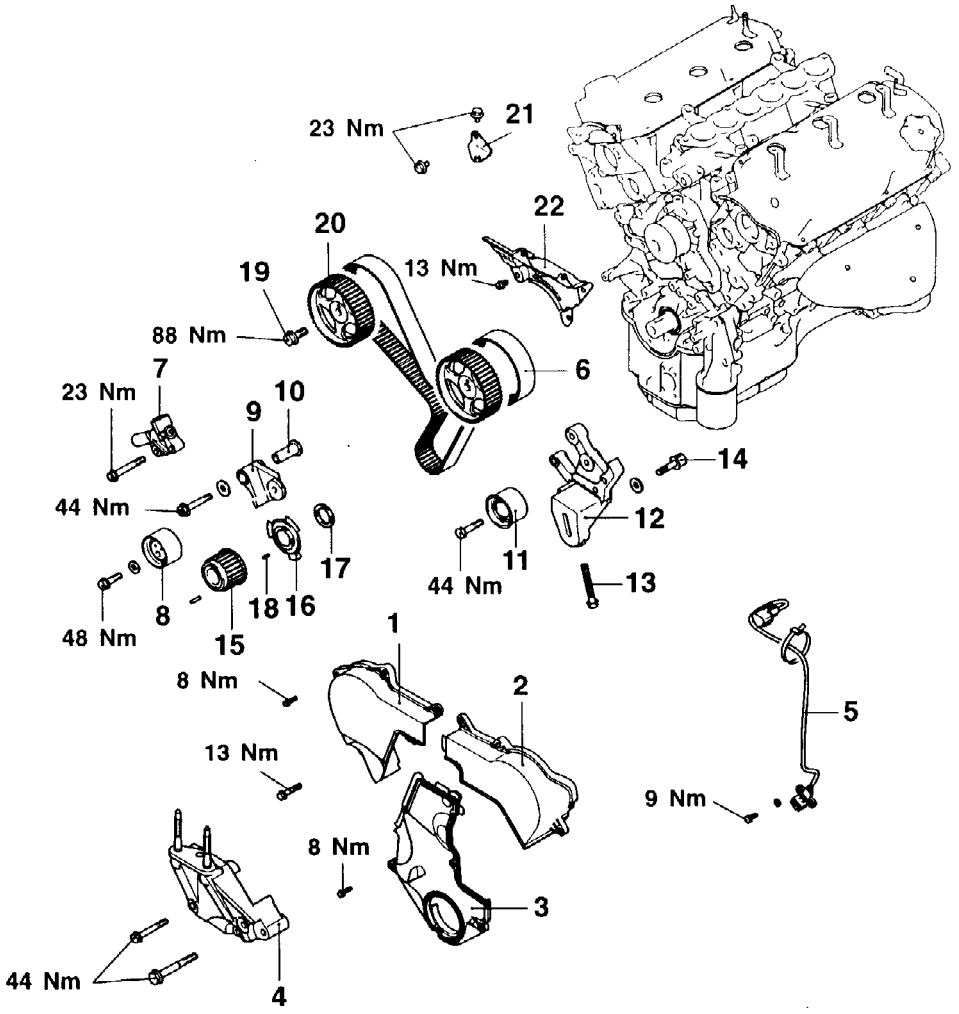
Caution

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

TIMING BELT

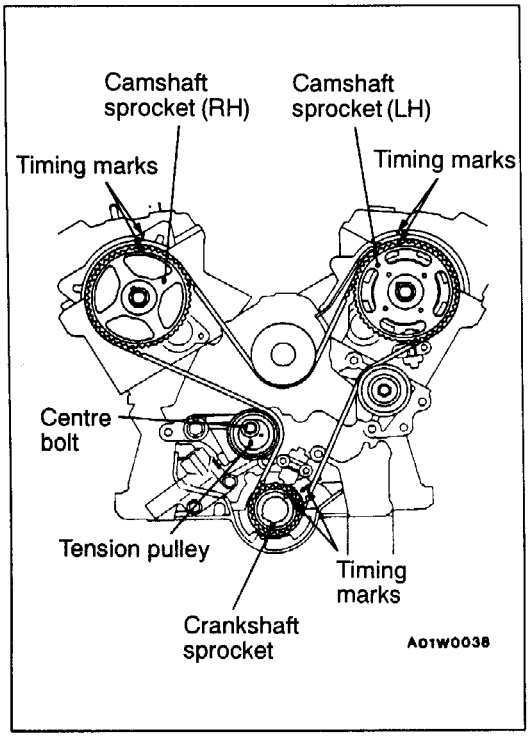
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Crankshaft Pulley Removal and installation (Refer to P.11-15.)



Removal steps

1. Timing belt front upper cover, rear
2. Timing belt front upper cover, front
3. Timing belt front lower cover
4. Engine support bracket
5. Crankshaft angle sensor
◀A▶ ▶B◀ 6. Timing belt
▶A◀ 7. Auto tensioner
8. Tensioner pulley
9. Tensioner arm
10. Shaft
11. Idler pulley
12. Idler pulley adjusting bracket
13. Adjusting bolt
14. Adjusting stud
15. Crankshaft sprocket
16. Sensing blade
17. Crankshaft spacer
18. Crankshaft key
19. Camshaft sprocket bolt
20. Camshaft sprocket
21. Bracket
22. Timing belt rear cover

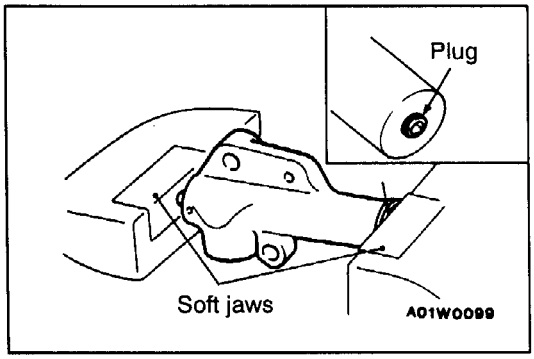


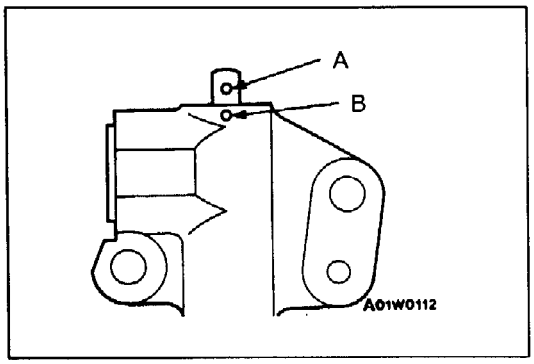
REMOVAL SERVICE POINT

◀A▶ TIMING BELT REMOVAL

1. Align the timing marks.
2. Loosen the centre bolt on the tension pulley to remove the timing belt.

Caution
Make a mark on the back of the timing belt, indicating the direction of rotation, so it may be reassembled in the same direction, if it is to be reused.





INSTALLATION SERVICE POINTS

▶A◀ AUTO TENSIONER INSTALLATION

1. If the auto tensioner rod is in its fully extended position, reset it as follows.
   (1) Keep the auto tensioner level and, in that position, clamp it in the vice with soft jaws.
   (2) Push in the rod little by little with the vice until the set hole A in the rod is aligned with that B in the cylinder.

Caution
1. **The auto tensioner must be placed at a right angle to the pressing surface of press or vice.**
2. **Push in the rod slowly to prevent the push rod from being damaged.**

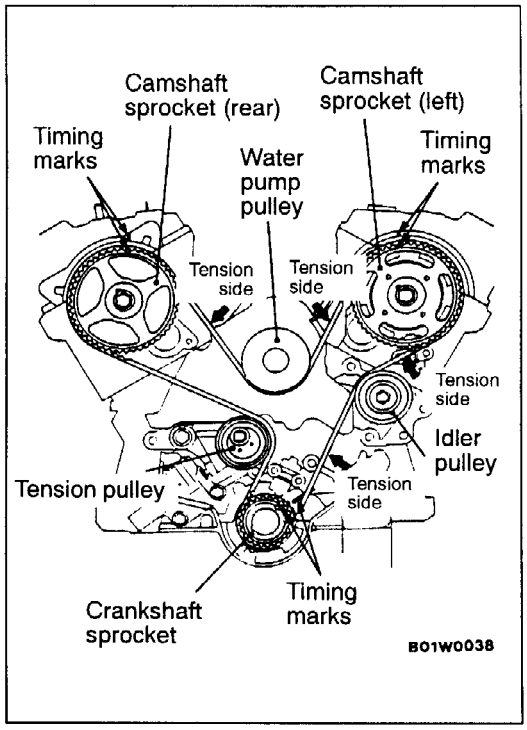
(3) Insert a wire [1.4 mm in diameter] into the set holes.

NOTE
The wire should be as stiff as possible (such as piano wire, etc.), and should be bent into the shape of an "L".

(4) Unclamp the auto tensioner from the vice.

2. Install the auto tensioner.

Caution
Leave the wire installed in the auto tensioner.

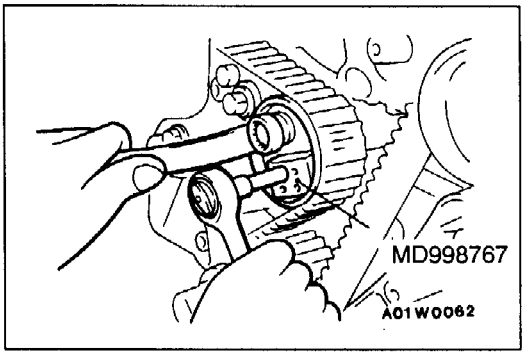


▶B◀ TIMING BELT INSTALLATION

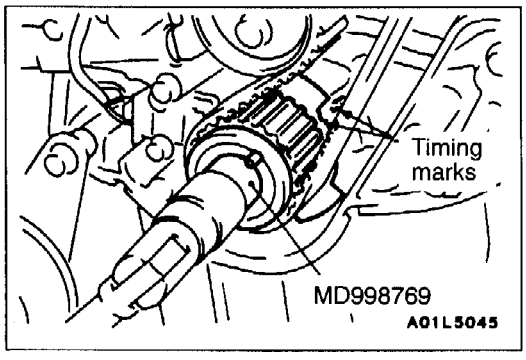
1. Align the timing marks of the camshaft sprockets and crankshaft sprocket.
2. Install the timing belt by the following procedure so that there is no deflection in the timing belt between each sprocket and pulley.
   (1) Crankshaft sprocket
   (2) Idler pulley
   (3) Camshaft sprocket (front side)
   (4) Water pump pulley
   (5) Camshaft sprocket (rear side)
   (6) Tension pulley

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

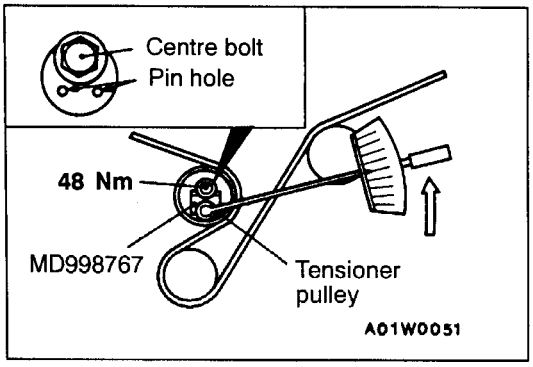
3. Turn the camshaft sprocket (right side) anti-clockwise until the tension side of the timing belt is firmly stretched, and then check again that all timing marks are aligned.



4. Use the special tool to push the tension pulley into the timing belt, and then temporarily tighten the centre bolt.



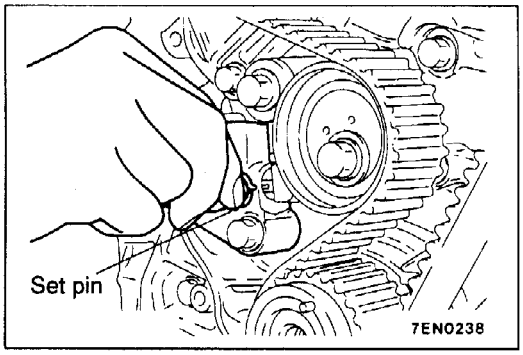
5. Use the special tool to turn the crankshaft 1/4 of a turn anti-clockwise and then turn it again clockwise until the timing marks are aligned.



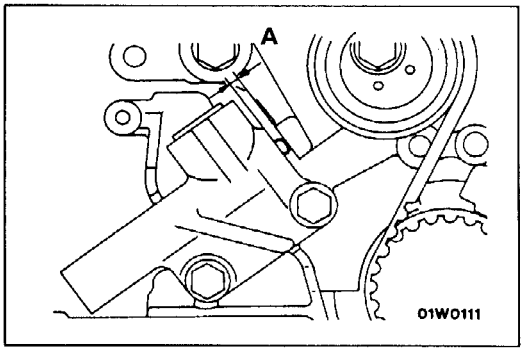
6. Loosen the centre bolt on the tensioner pulley. Using the special tool and torque wrench, apply tensioning torque to the timing belt and, at the same time, tighten the centre bolt to specification.

Reference value:
4.4 Nm (Timing belt tensioning torque)

Caution
When tightening the centre bolt, make sure that the tensioner pulley is not rotated together.



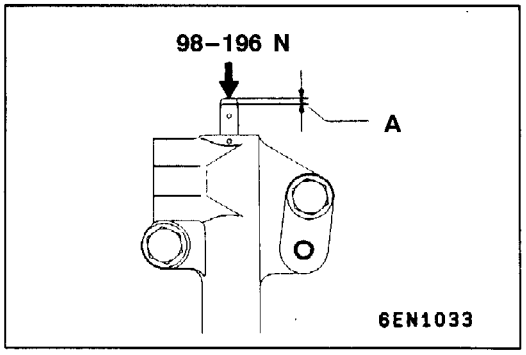
7. Remove the setting pin that has been inserted into the auto tensioner.
8. Turn the crankshaft two turns clockwise to align the timing marks.



9. Leave everything in this condition for five minutes or more, and then check that the protrusion of the auto tensioner push rod is within the range of the standard value.

Standard value (A): 3.8 – 5.0 mm

10. If the protrusion is out of specification, repeat steps (5) to (9).
11. Check again that timing marks on all sprockets are aligned properly.



INSPECTION

AUTO TENSIONER

1. Hold the auto tensioner by hand and measure contraction (A) when pressing the tip of the rod on a steel (cylinder block; etc.) with a force of 98–196 N.

Standard value (A): 1 mm

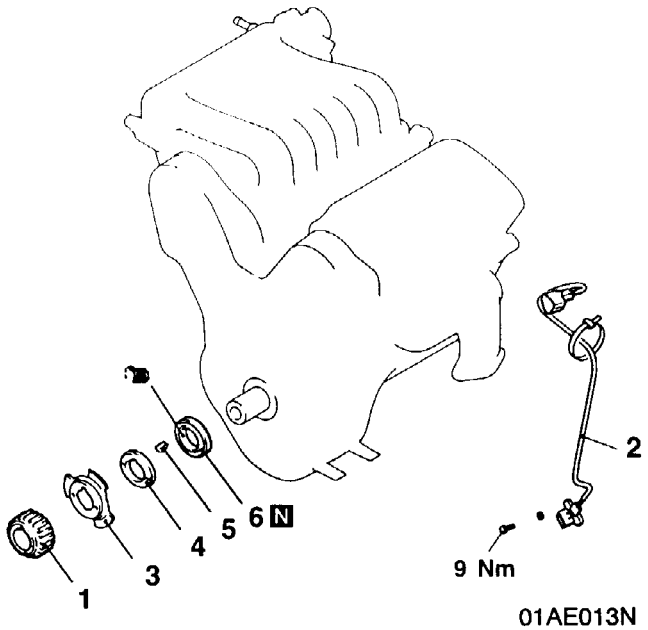
2. If not within the standard value, replace the auto tensioner.

CRANKSHAFT FRONT OIL SEAL

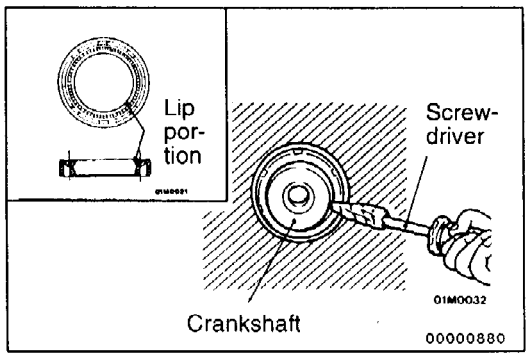
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Timing Belt Removal and Installation (Refer to P.11-26.)

Adjustment
- Engine Adjustment – Ignition Timing Check



Removal Steps
1. Crankshaft sprocket
2. Crank angle sensor
3. Crankshaft sensing blade
4. Crankshaft spacer
5. Key
◀A▶ ▶A◀ 6. Crankshaft front oil seal

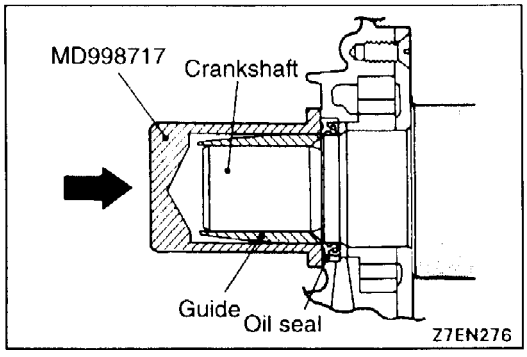


REMOVAL SERVICE POINT

◀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 cutout 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

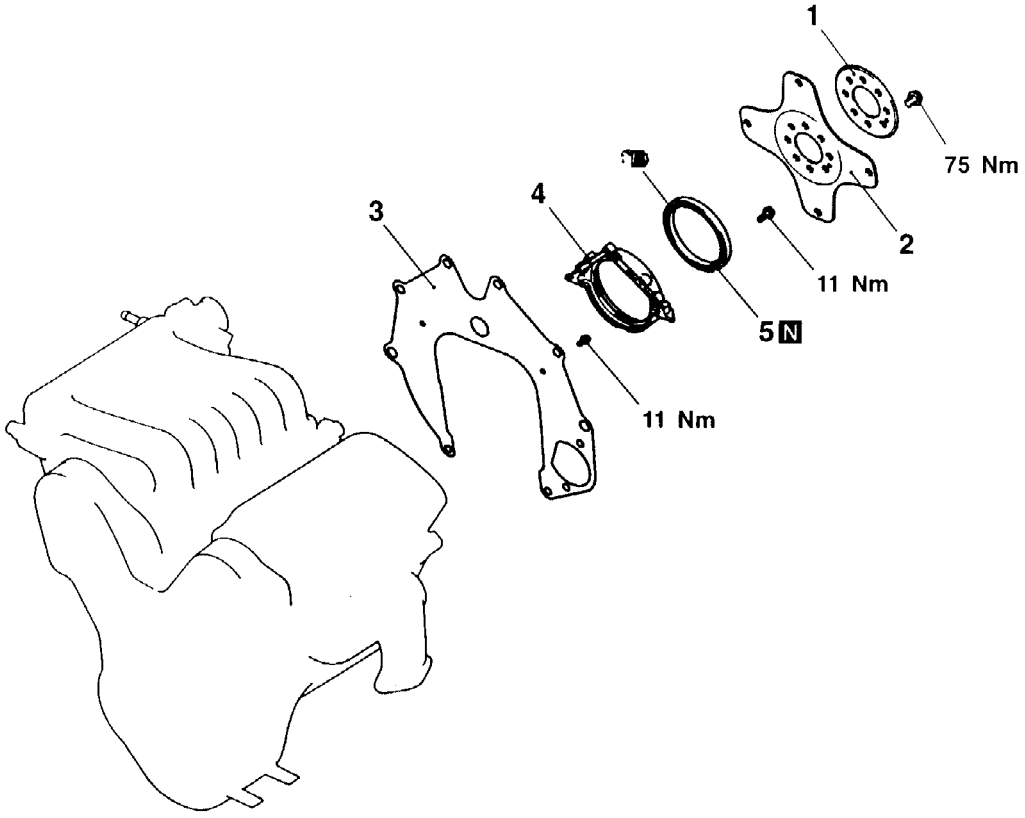
Using the special tool, knock the oil seal into the oil pump case.

NOTE
Knock it in until it is flush with the surface.

CRANKSHAFT REAR OIL SEAL

REMOVAL AND INSTALLATION

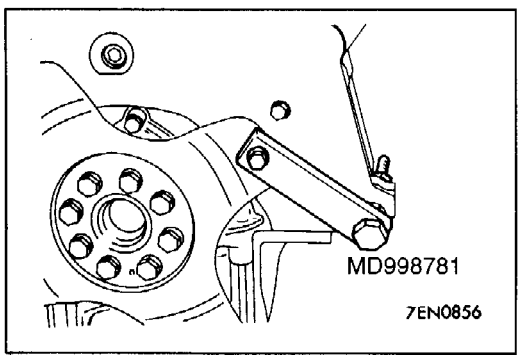
Pre-removal and Post-installation Operation
- Transmission Removal and Installation (Refer to GROUP 22 – Manual Transmission or GROUP 23 – Automatic Transmission.)



01AE010N

Removal Steps

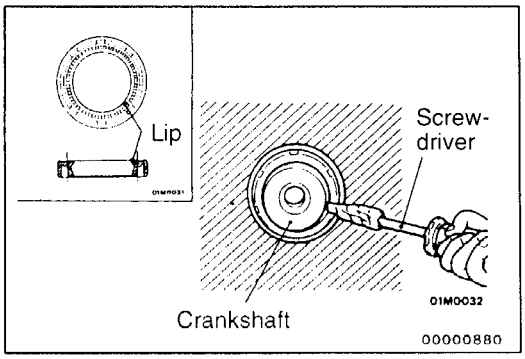
◀A▶ ▶B◀ 1. Adaptor plate
◀A▶ ▶B◀ 2. Drive plate
3. Rear plate
4. Oil seal case
◀B▶ ▶A◀ 5. Oil seal



REMOVAL SERVICE POINTS

◀A▶ ADAPTOR PLATE/DRIVE PLATE REMOVAL

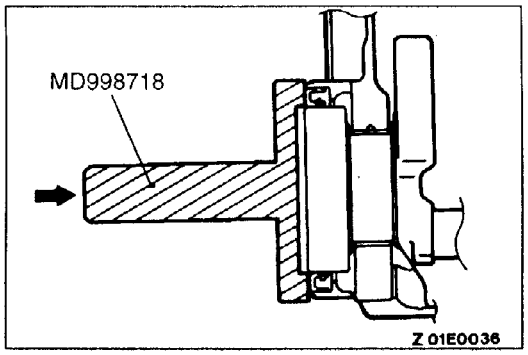
Use the special tool to secure the drive plate, and remove the bolt.



◀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 cutout in the oil seal to pry off the oil seal.

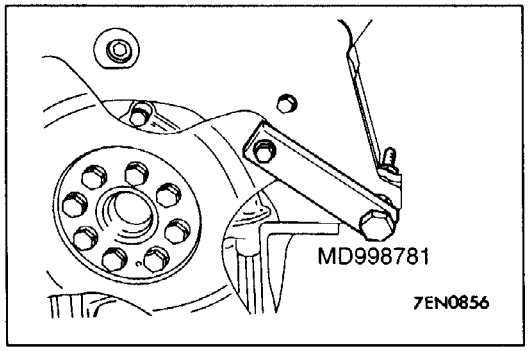
Caution
Take care not to damage the crankshaft and oil seal case.



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

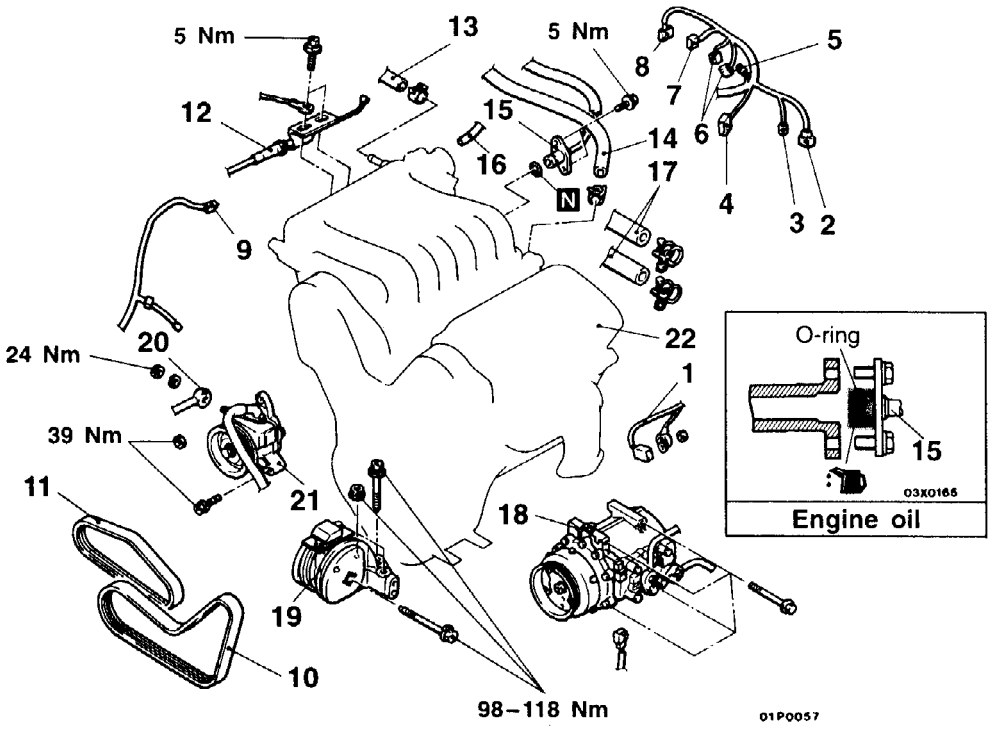
Use the special tool to secure the drive plate, and tighten the bolts.

ENGINE ASSEMBLY

REMOVAL AND INSTALLATION

Pre-removal Operation
- Hood Removal (Refer to GROUP 42 Hood.)
- Air Cleaner Removal (Refer to GROUP 15)
- Drainage of Coolant (Refer to GROUP 14.)
- 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.)
- Transmission Assembly Removal (Refer to GROUP 22 or 23.)

Post-installation Operation
- Transmission Installation (Refer to GROUP 23.)
- 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 – On-vehicle 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

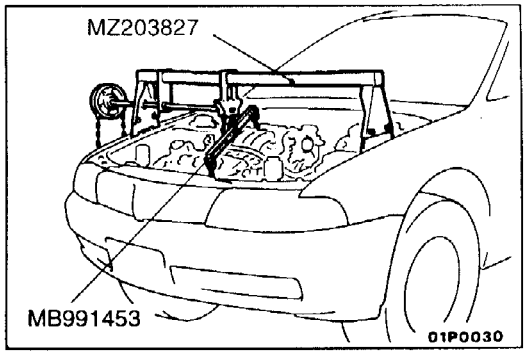
◀A▶ 18. A/C compressor
◀B▶ 19. Engine mount
▶B◀ 20. Pressure hose
◀A▶ 21. Power steering oil pump
◀C▶ ▶A◀ 22. Engine assembly

REMOVAL SERVICE POINTS

◀A▶ A/C COMPRESSOR/POWER STEERING OIL PUMP 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 REMOVAL

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.
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.

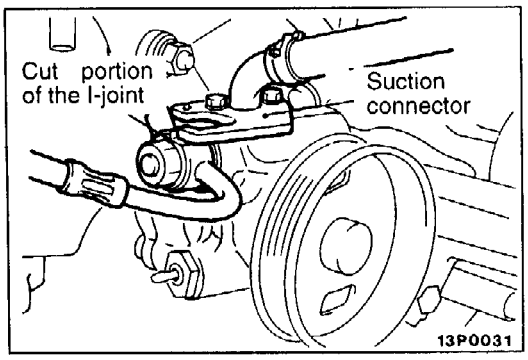
◀C▶ ENGINE ASSEMBLY REMOVAL

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 INSTALLATION

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