
ENGINE

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SERVICE SPECIFICATIONS

Items	Standard value	Limit
Basic ignition timing	5° BTDC ± 3°	–
Ignition timing (at idle)	Approx. 5° BTDC	–
Idle speed rpm	850 ± 50	–
CO contents %	0.6 or less	–
HC contents ppm	300 or less	–
Compression pressure kg/cm ² – rpm	11.5 – 250	Min. 9.7 – 250
Compression pressure difference of all cylinders kg/cm ²	–	Max. 1.0
Intake manifold vacuum kPa {mmHg}	–	Min. 55 {410}
Cylinder head bolt shank length mm	–	99.4

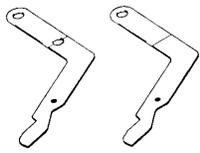
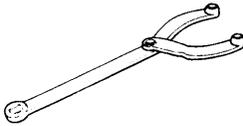
SEALANTS

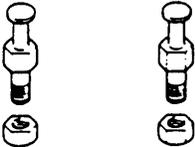
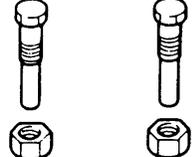
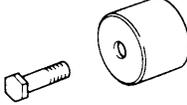
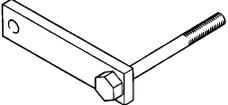
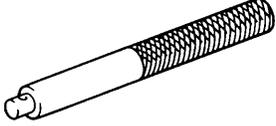
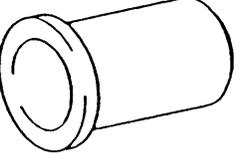
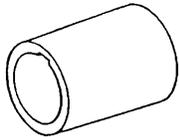
Items	Specified sealants
Rocker cover	Semi-drying sealant: THREEBOND 1207D [MZ 100168] (containing 150 g)
Oil pan	Semi-drying sealant: THREEBOND 1207F [MZ 100191] (containing 150 g)

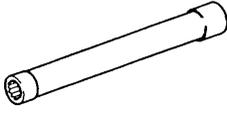
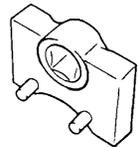
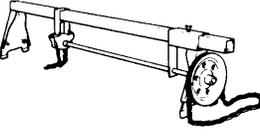
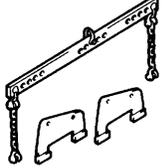
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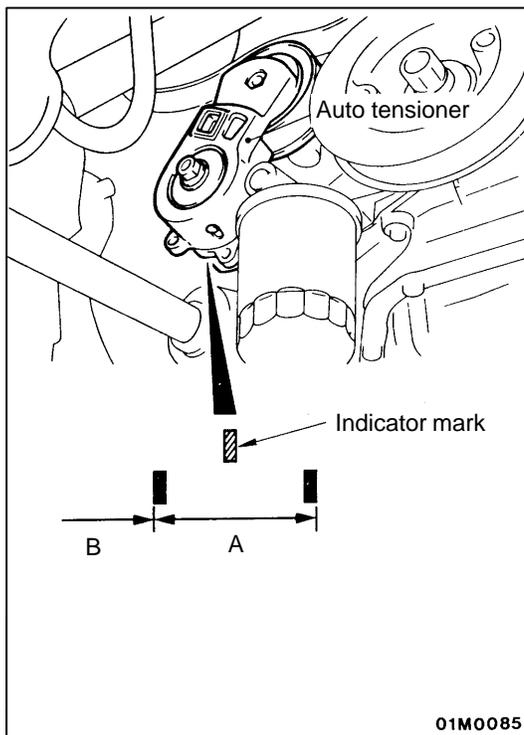
Given in [] are MITSUBISHI GENUINE PART numbers.

SPECIAL TOOLS

Tool	Number	Name	Use
	MD998782	Valve lifter set	Replacing the lash adjuster
	MB990767	End yoke holder	<ul style="list-style-type: none"> ● Holding the crankshaft pulley ● Holding the camshaft sprocket

Tool	Number	Name	Use
	MD998719	Crankshaft pulley holder pin	<ul style="list-style-type: none"> ● Holding the crankshaft pulley ● Holding the camshaft sprocket
	MD998715	Pulley holder pin	
	MD998713	Camshaft oil seal installer	Pressfitting the camshaft oil seal
	MD998727	Oil pan remover	Removing the oil pan
	MD998781	Flywheel stopper	Securing the flywheel or drive plate
	MD998776	Crankshaft rear oil seal installer	Pressfitting the crankshaft rear oil seal
	MB990938	Handle	
	MD998382	Crankshaft front oil seal installer	Installing the crankshaft front oil seal
	MD998285	Crankshaft front oil seal guide	

Tool	Number	Name	Use
	MB991654	Cylinder head bolt wrench	Removing and reinstalling the cylinder head bolt
	MD998767	Tensioner pulley socket wrench	Timing belt tension adjustment
	Recommended tool MZ203826 by Anzen Jidosha or MZ203827 by Banzai	Engine lifter	Supporting the engine assembly during removal and installation of the transmission
	MD991453	Engine hanger assembly	



ENGINE ADJUSTMENTS

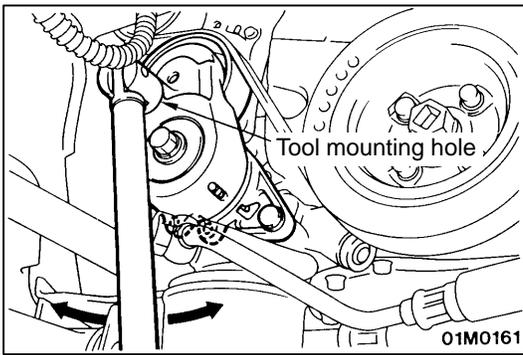
1. DRIVE BELT TENSION CHECK

NOTE

Use of the auto tensioner eliminates the need for belt tension adjustment. Check that the indicator mark on the auto tensioner is in the range of A shown.

If it is outside the specified range (i.e., in range of B shown), replace the drive belt.

(For the removal and installation of the drive belt, refer to P.11-9.)



2. AUTO TENSIONER CHECK

- (1) Stop the engine from the idle speed and check that the belt rests within the auto tensioner pulley width.
- (2) Remove the drive belt.
(For the removal of the drive belt, refer to P.11-9.)
- (3) Fit a spinner handle or similar tool into the tool mounting hole of the auto tensioner and turn the tensioner clockwise and counterclockwise to ensure that it does not bind.
- (4) If step (1) or (3), or both, have been checked abnormally, replace the auto tensioner.
- (5) Reinstall the drive belt.

3. LASH ADJUSTER CHECK

NOTE

If an unusual knocking noise can be heard immediately after the engine has started or while it is running and if that is probably attributable to the lash adjuster, make the following checks.

- (1) Check the engine oil and add or change oil as necessary.

NOTE

- (1) If the engine oil level is low, air is taken in through the oil screen, entering the oil passage.
- (2) If the oil level is too high, the cranks agitate oil causing oil to trap a large amount of air.
- (3) Air does not easily separate from a deteriorated oil that can contain an increased amount of air.

When air trapped in oil for these reasons gets into the high-pressure chamber of the lash adjuster, the air in the high-pressure chamber is compressed to shrink the lash adjuster excessively while the valve is opening, resulting in an unusual noise occurring. This is the same symptom developing when the valve clearance is adjusted to an excessive value.

The problem in this case is gone when air is released from the lash adjuster.

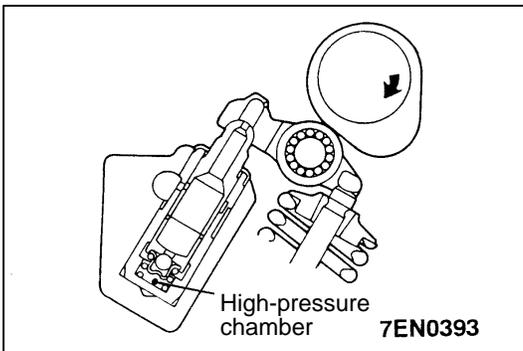
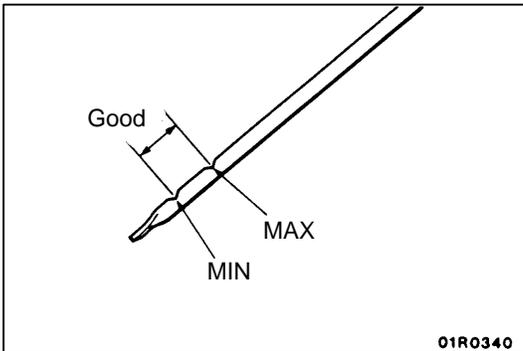
- (2) Start the engine and carry out several cycles (10 or less) of mild racing*.

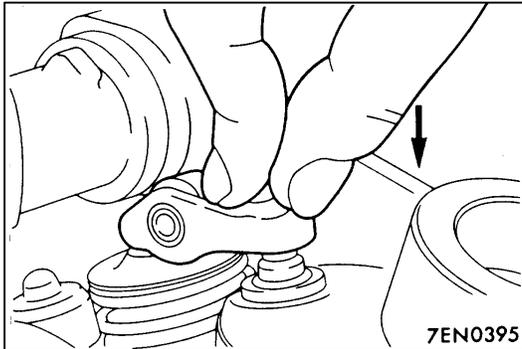
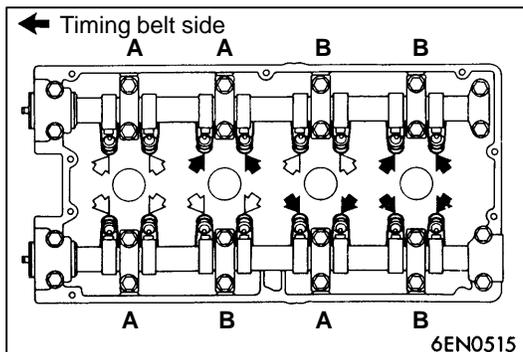
If the noise is gone after racing, it indicates that air has been released from the high-pressure chamber of the lash adjuster, restoring the lash adjuster to normal operating conditions.

*: Gradually (extending over a 30-sec. period) increase the engine speed from idle speed to 3,000 r/min and then reduce it down to the idle speed gradually (extending over a 30-sec. period).

NOTE

- (1) If the vehicle is parked on a slope for a long time, the amount of oil in the lash adjuster will decrease, causing air to get into the high-pressure chamber when the engine is started.
- (2) After the vehicle has been parked for a long time, oil drains out of the oil passage and it takes a long time for the oil to reach the lash adjuster. This can cause air to get into the high-pressure chamber.



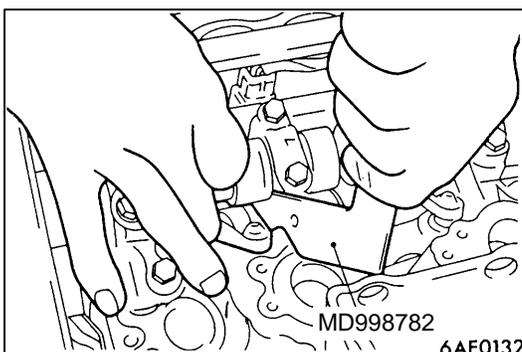
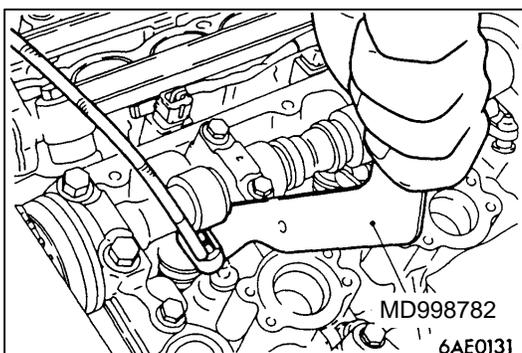


- (3) If the noise is not eliminated by racing, follow these steps to check the lash adjuster.
- Stop the engine.
 - Bring no. 1 cylinder to TDC on the compression stroke.
 - Push the rocker arms indicated by arrow A on the left to see if they go down.
 - Slowly turn the crankshaft clockwise 360°.
 - Perform the same step as step c for rocker arms indicated by arrow B.

- Push the part of the rocker arm which contacts the top of the lash adjuster. If the rocker arm can be easily moved down to the bottom, the lash adjuster is defective, requiring replacement. When the lash adjuster is replaced, be sure first to bleed the lash adjuster of air before installation. Then, perform steps a through e to ensure that no abnormal symptoms are noted.

NOTE

- The leak-down test is an effective means to accurately determine if the lash adjuster is operational or not.
- For the leak-down test and bleeding procedures, refer to ENGINE WORKSHOP MANUAL. If the rocker arm is felt binding and cannot be pushed downward as you push it, the lash adjuster is operational. Check for other possible causes for the noise.



- (4) Lash adjuster replacement

Caution

From the cylinder from which the lash adjuster is to be removed, turn the crankshaft to lower the piston, as the valve contacts the piston when pushed down. A rocker arm cannot be removed if it is lifted by the cam. If this is the case, turn the crankshaft so that the arm is not lifted.

- Using the special tool, push the valve downward to remove the roller rocker arm.
- Remove the lash adjuster from the cylinder head.
- Mount a brandnew lash adjuster which has been bled of air in the cylinder head.
- Using the special tool, lower the valve and install the roller rocker arm.

NOTE

To mount the roller rocker arm, first place the pivot side of the rocker arm on the lash adjuster, then push down the valve; next, place the slipper side of the rocker arm on the valve system side.

4. LASH ADJUSTER REPLACEMENT

Refer to (4) of the preceding paragraph.

5. IGNITION TIMING CHECK

Check that ignition timing is at the standard value.

Standard value: approx. 5° BTDC

NOTE

Ignition timing is variable within about $\pm 7^\circ$, even under normal operating.

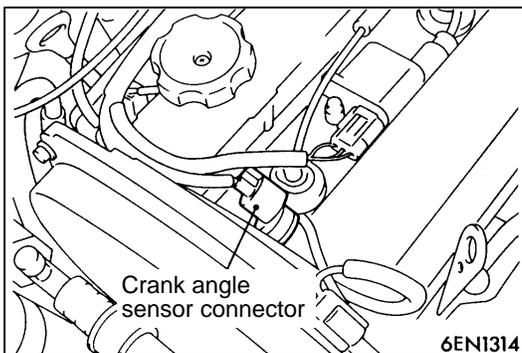
6. IDLE SPEED CHECK AND IDLE MIXTURE CHECK

- (1) Run the engine at 2,000 to 3,000 r/min for 2 minutes.
- (2) Check the CO and HC contents at idle.

Standard value

CO contents: 0.6% or less

HC contents: 300 ppm or less



7. COMPRESSION PRESSURE CHECK

- (1) Before inspection, check that the engine oil, starter and battery are normal. In addition, set the vehicle to the pre-inspection condition.
- (2) Remove all of the spark plugs.
- (3) Disconnect the crank angle sensor connector.

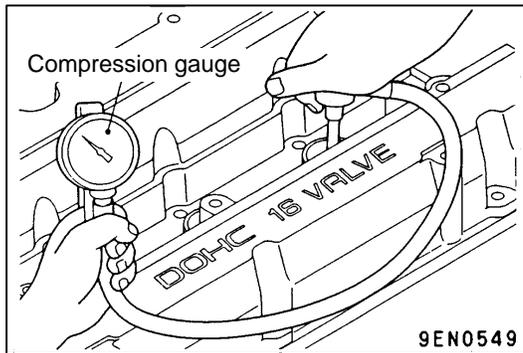
NOTE

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

- (4) Cover the spark plug hole with a shop towel etc., 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) If compression is measured with water, oil, fuel, etc., that has come from cracks inside the cylinder, these materials will become heated and will gush out from the spark plug hole, which is dangerous.



- (5) Set 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 250 r/min): 11.5 kg/cm²

Limit (at engine speed of 250 r/min): 9.7 kg/cm²

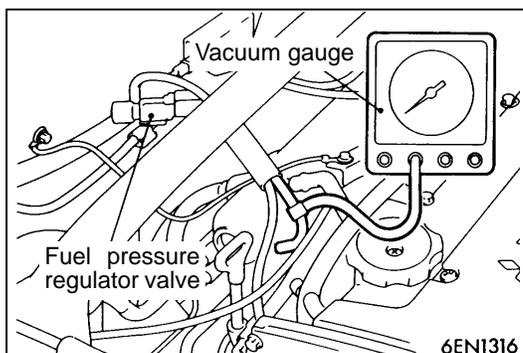
- (7) Measure the compression pressure for all the cylinders, and check that the pressure differences of the cylinders are below the limit.

Limit: Max. 1.0 kg/cm²

- (8) If there is a cylinder with compression or a compression difference that is outside the limit, pour a small amount of engine oil through the spark plug hole, and repeat the operations in steps (5) through (7).
 - a. 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.
 - b. 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 crank angle sensor connector.
- (10) Install the spark plugs.
- (11) Install the ignition coil and connect the ignition coil connector.
- (12) Erase the diagnosis codes by keeping the battery minus (–) cable disconnected for more than 10 seconds.

NOTE

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



8. MANIFOLD VACUUM CHECK

- (1) Before inspection, set the vehicle to the pre-inspection condition.
- (2) Connect a tachometer connector.
- (3) Attach a three-way union to the vacuum hose between the fuel pressure regulator valve and the intake manifold, and connect a vacuum gauge.
- (4) Start the engine and check that idle speed is within standard value.

Standard value: 850 ± 50 r/min

5. Check the manifold vacuum at idling.

Limit: Min. 55 kPa {410 mmHg}

CRANKSHAFT PULLEY

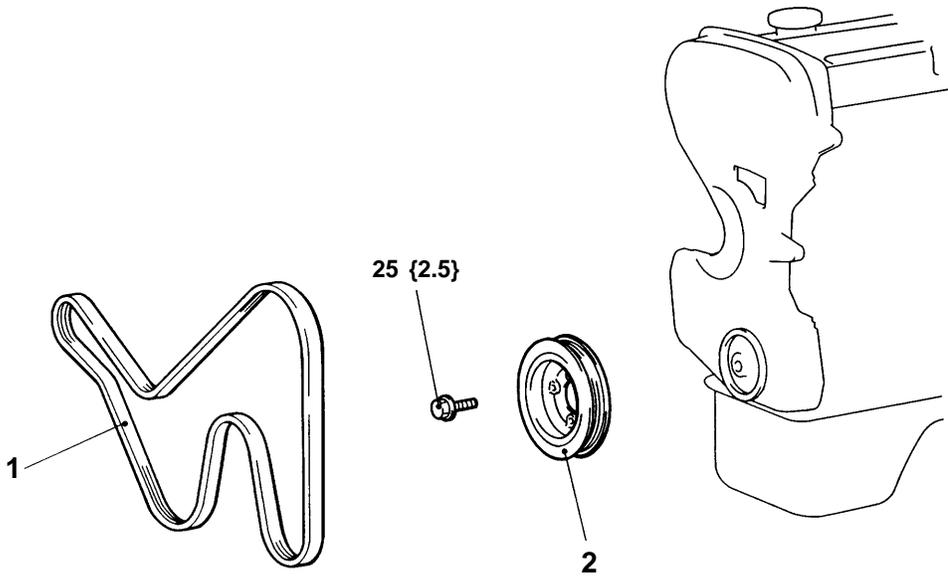
REMOVAL AND INSTALLATION

Pre-removal Operation

- Under Cover Removal

Post-installation Operation

- Drive Belt Tension Adjustment (Refer to P.11-4.)
- Under Cover Installation



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Unit: Nm {kgf · m}

Removal steps

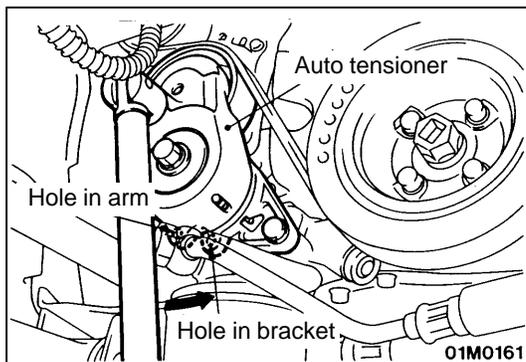


1. Drive belt
2. Crankshaft pulley

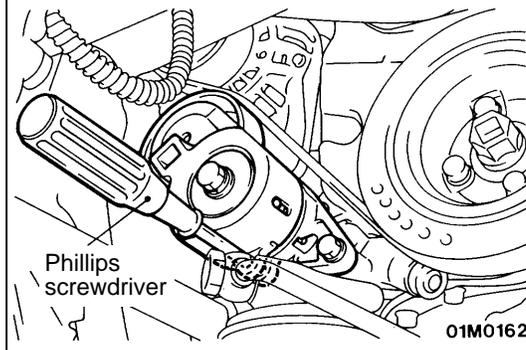
REMOVAL SERVICE POINT

◀▶ DRIVE BELT REMOVAL

- (1) Align the hole in the auto tensioner bracket with that in the arm and insert a screwdriver into the holes.
- (2) Remove the drive belt.



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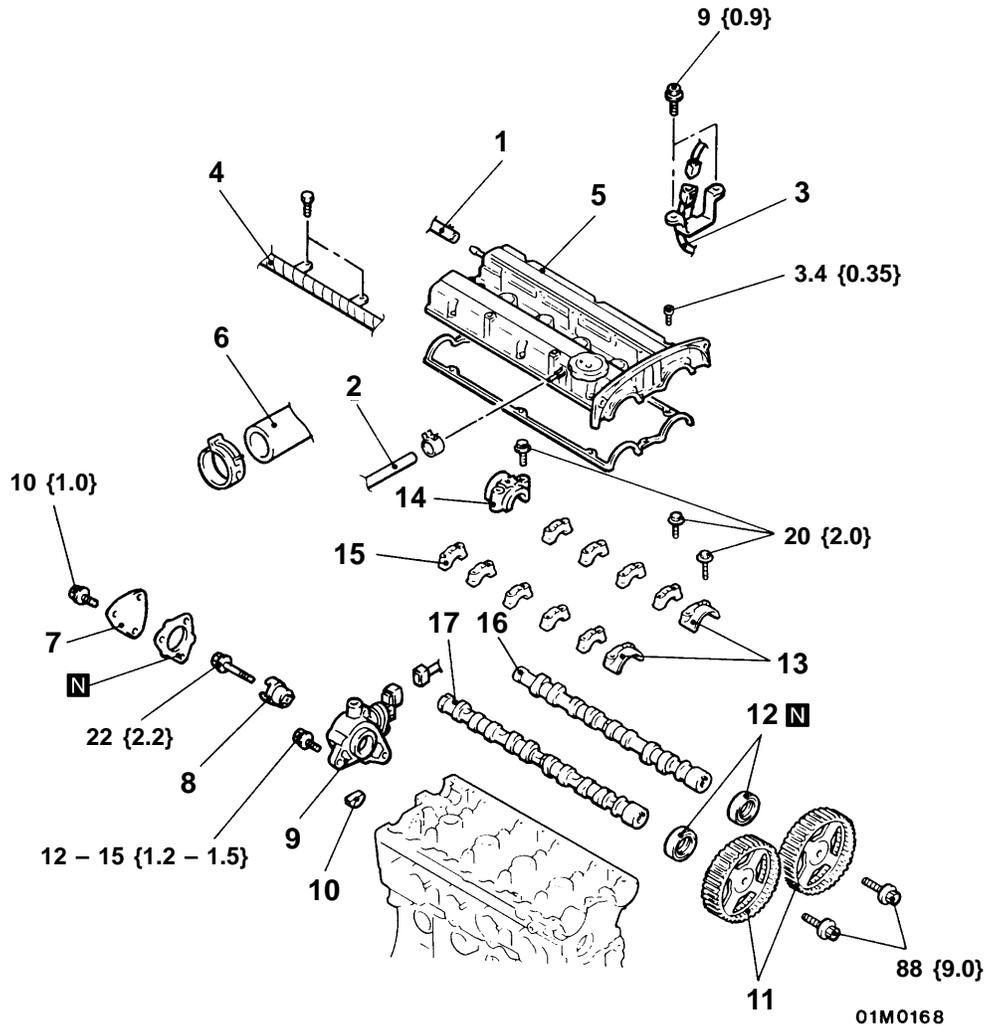
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CAMSHAFT AND CAMSHAFT OIL SEAL

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- | | |
|---|--|
| <ul style="list-style-type: none"> (1) Engine Coolant Draining and Refilling (2) Air Hose C Removal and Installation (Refer to GROUP 15 – Intercooler.) (3) Spark Plug Cable and Ignition Coil Assembly Removal and Installation | <ul style="list-style-type: none"> (4) Air Pipe Removal and Installation (Refer to GROUP 15 – Air Control Valve.) (5) Timing Belt Removal and Installation (Refer to P.11-21.) |
|---|--|



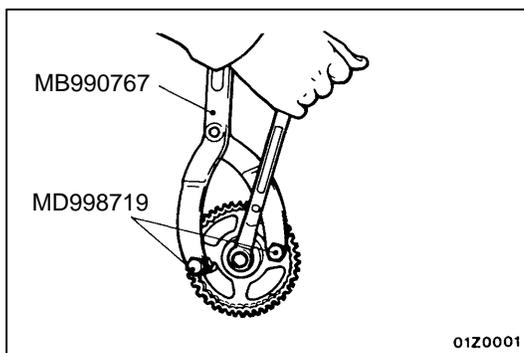
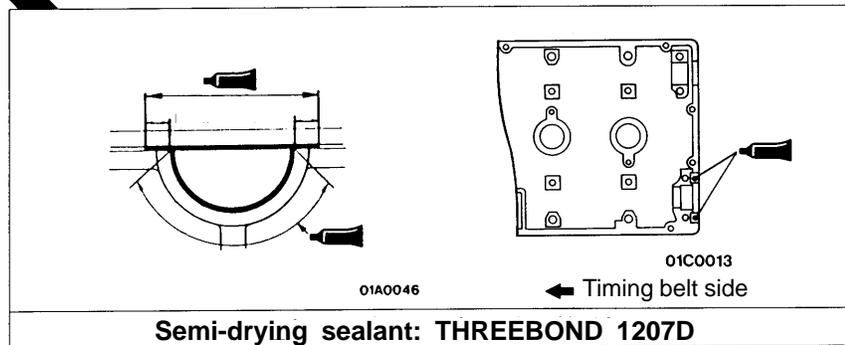
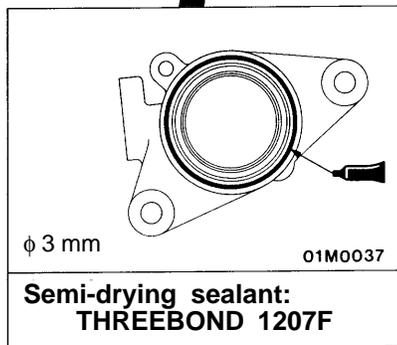
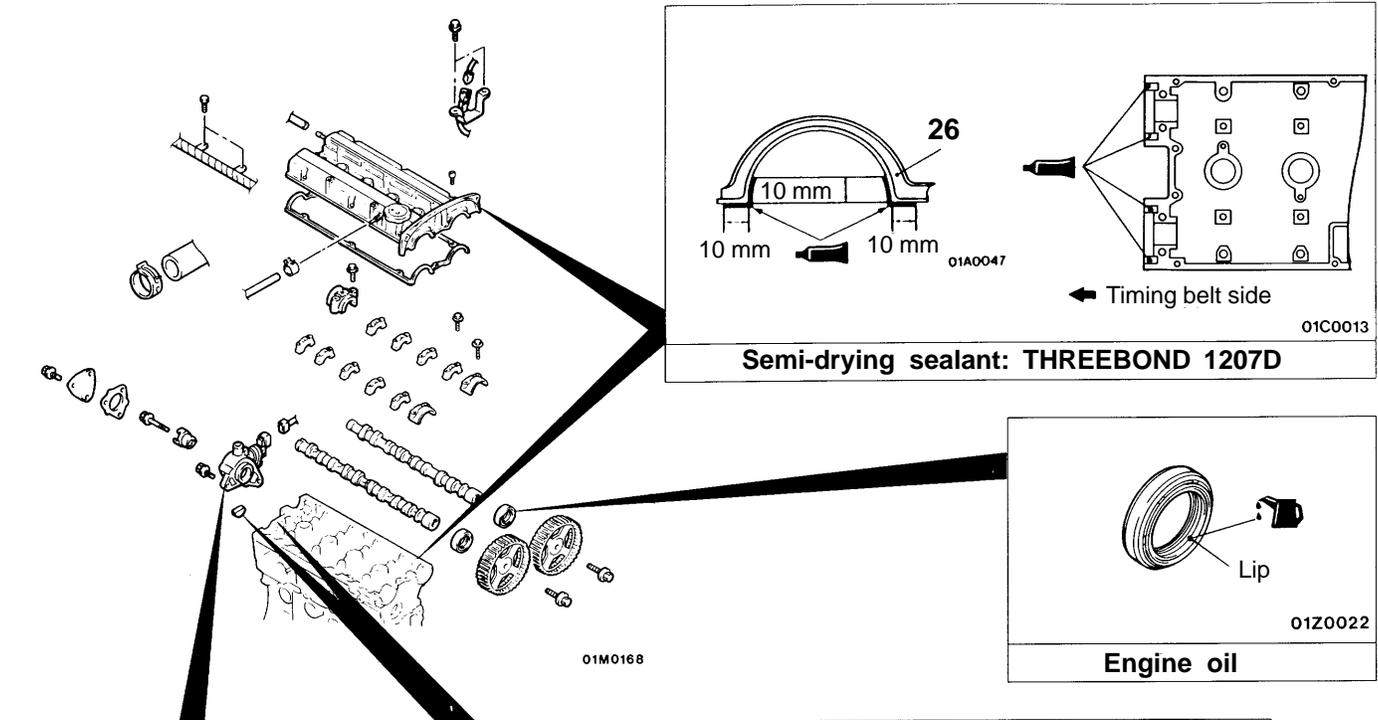
Unit: Nm {kgf·m}

Removal steps

- | | |
|--|--|
| <ul style="list-style-type: none"> 1. Breather hose connection 2. PCV hose connection 3. Crank angle sensor bracket connection 4. Control harness connection 5. Rocker cover 6. Radiator upper hose connection 7. Cover 8. Cam position sensing cylinder | <ul style="list-style-type: none"> 9. Cam position sensor support 10. Semi-circular packing 11. Camshaft sprocket 12. Camshaft oil seal 13. Front cam cap 14. Rear cam cap 15. Cam cap 16. Camshaft (exhaust side) 17. Camshaft (intake side) |
|--|--|

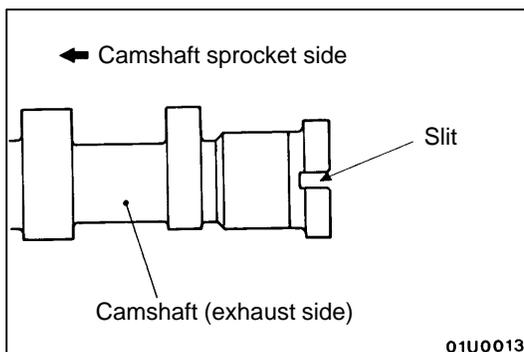


Grease and adhesive application points



REMOVAL SERVICE POINT

◀A▶ **CAMSHAFT SPROCKET REMOVAL**



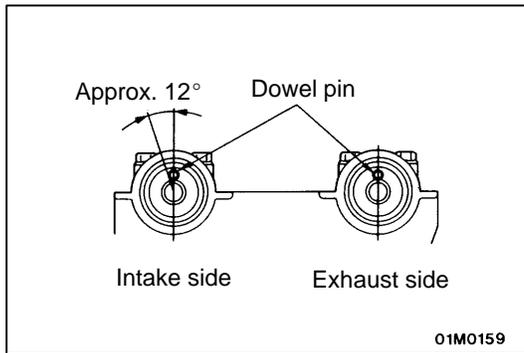
INSTALLATION SERVICE POINTS

▶A◀ **CAMSHAFT INSTALLATION**

- (1) Apply engine oil to the cams and journals of the camshaft.
- (2) Mount the camshaft on the cylinder head.

Caution

Make sure that the camshaft has a unique orientation for installation, the intake side and exhaust side. The exhaust camshaft has a slit in the rear end face.

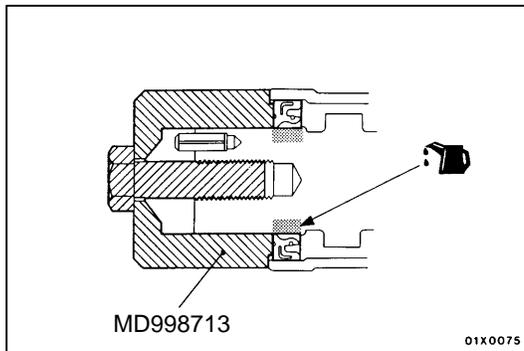


►B◄ CAM CAP / REAR CAP / FRONT CAM CAP INSTALLATION

(1) Locate the camshaft dowel pins as illustrated.

(2) Temporarily tighten cam cap in two to three steps, then torque it to specification.

Tightening torque: 20 Nm {2.0 kgf·m}



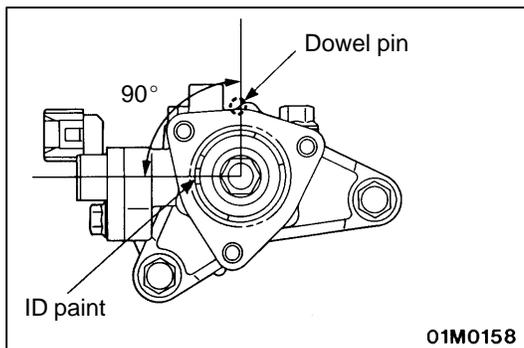
►C◄ CAMSHAFT OIL SEAL INSTALLATION

- (1) Apply engine oil to the entire periphery of the oil seal lip.
- (2) Pressfit the oil seal as shown.

►D◄ CAMSHAFT SPROCKET INSTALLATION

As you did during removal, secure the camshaft sprocket with the special tool and tighten bolt to specification.

Tightening torque: 88 Nm {9.0 kgf·m}



►E◄ CAM POSITION SENSING CYLINDER

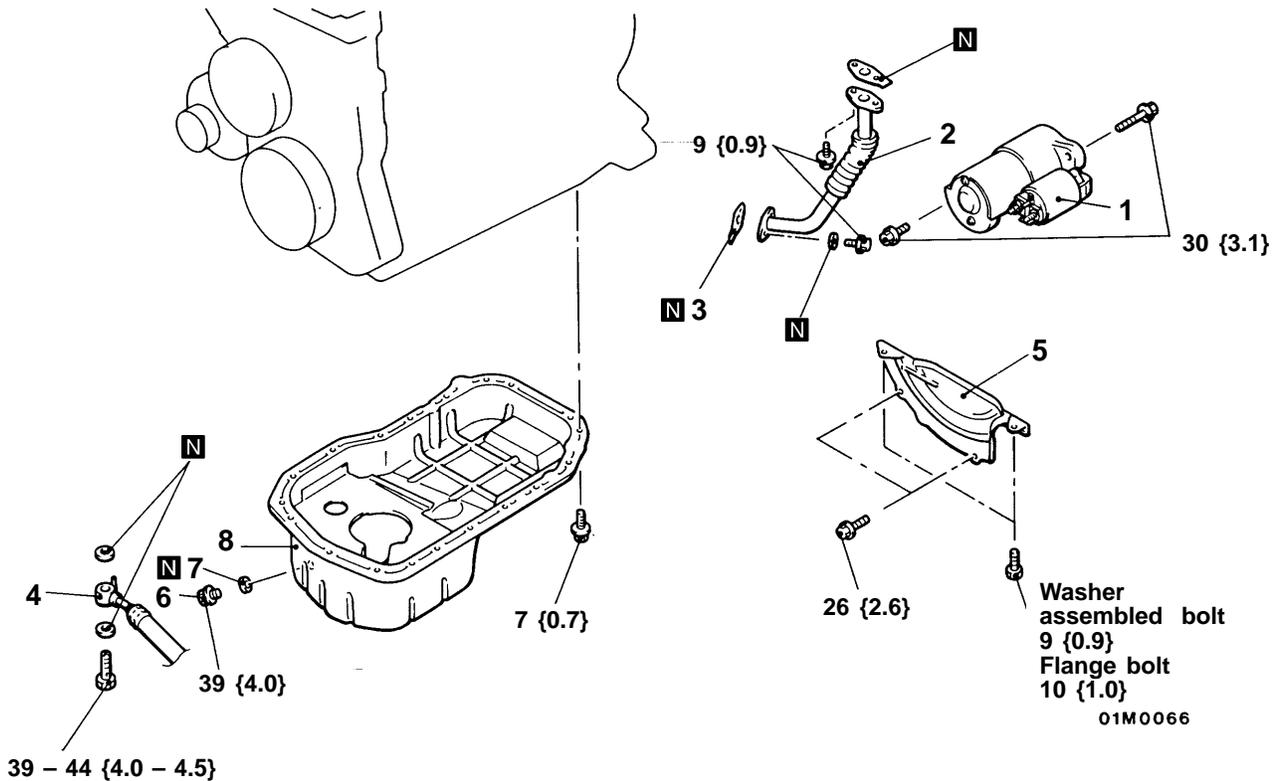
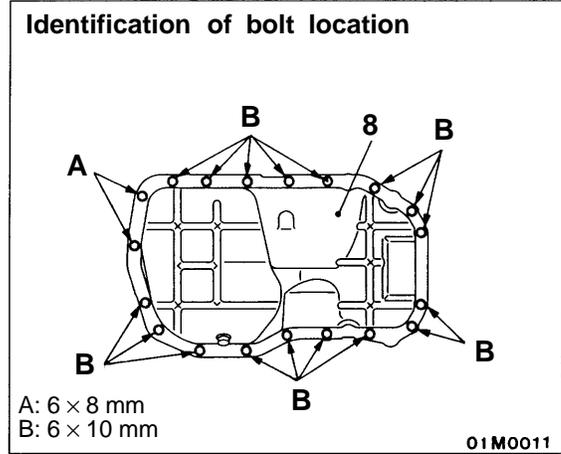
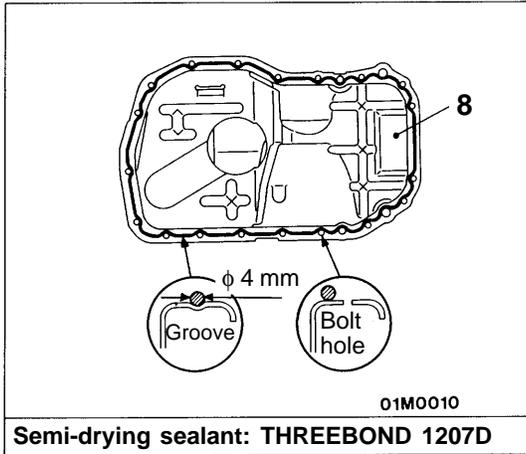
Install the cam position sensing cylinder so that the ID paint on the cam position sensing cylinder is 90° with respect to the camshaft dowel pin as shown.

OIL PAN

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- (1) Under Cover Removal and Installation
- (2) Front Exhaust Pipe Removal and Installation
- (3) Oil Level Gauge Removal and Installation
- (4) Engine Oil Draining and Supplying (Refer to GROUP 15.)

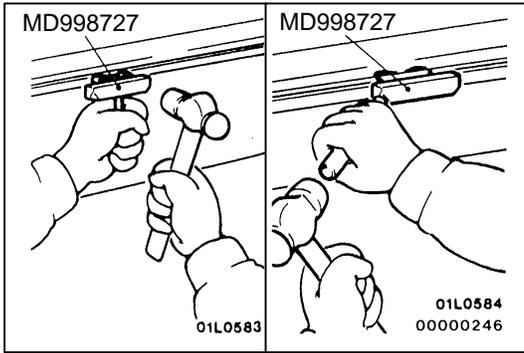


Unit: Nm {kgf · m}

Removal steps

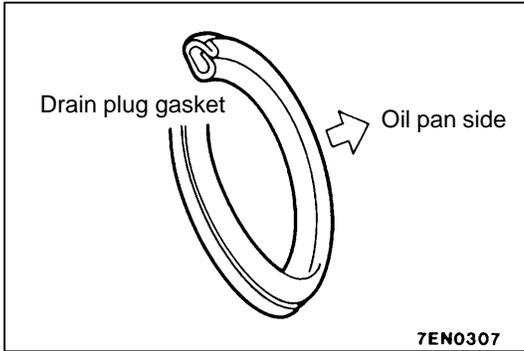
- 1. Starter
- 2. Oil return pipe
- ▶B◀ 3. Oil return pipe gasket
- 4. Engine oil cooler return pipe

- ▶A◀ 5. Bell housing cover
- 6. Drain plug
- 7. Drain plug gasket
- ▶A◀ 8. Oil pan



REMOVAL SERVICE POINT

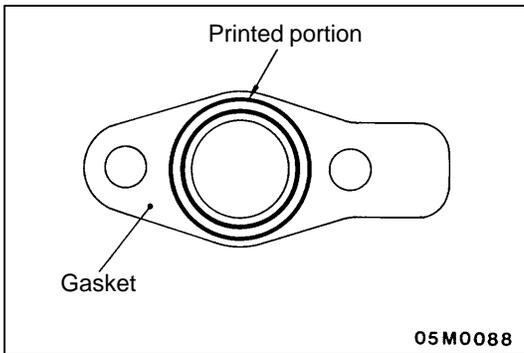
◀A▶ OIL PAN REMOVAL



INSTALLATION SERVICE POINTS

▶A◀ DRAIN PLUG GASKET INSTALLATION

Install the drain plug gasket in the direction so that it faces as shown in the illustration.

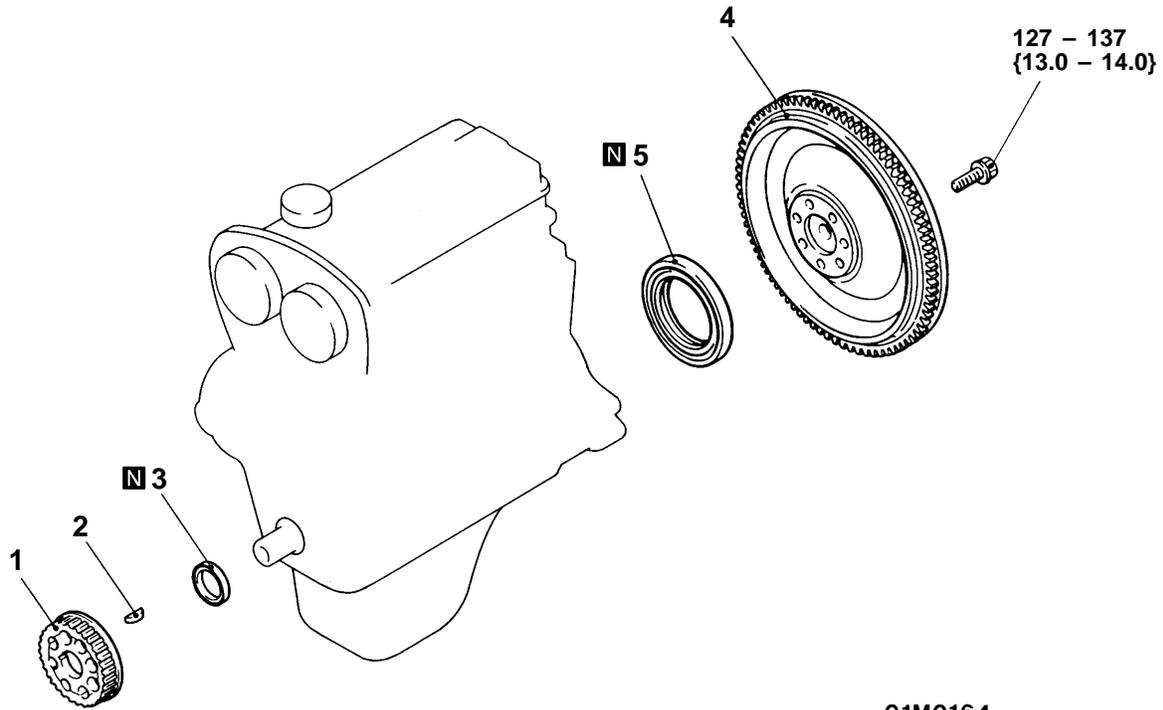


▶B◀ OIL RETURN PIPE GASKET INSTALLATION

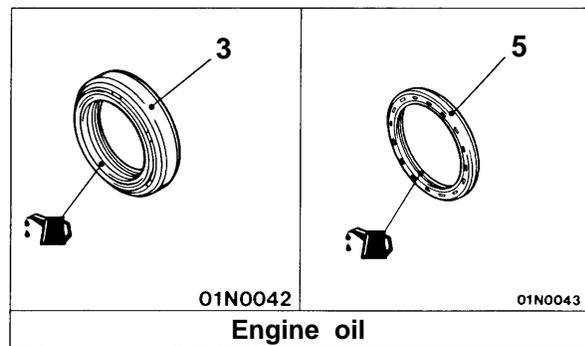
Install the gasket with the printed portion toward the oil pan.

CRANKSHAFT OIL SEAL

REMOVAL AND INSTALLATION



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Unit: Nm {kgf·m}

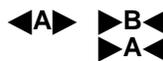
Crankshaft front oil seal removal steps

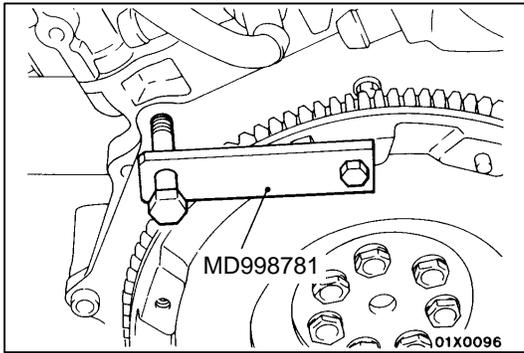
- Timing belt and timing belt B (Refer to P.11-21.)
 - Crank angle sensor (Refer to GROUP 16.)
1. Crankshaft sprocket B
 2. Key
 3. Crankshaft front oil seal



Crankshaft rear oil seal removal steps

- Transmission assembly
 - Clutch cover and disc
4. Flywheel
 5. Crankshaft rear oil seal

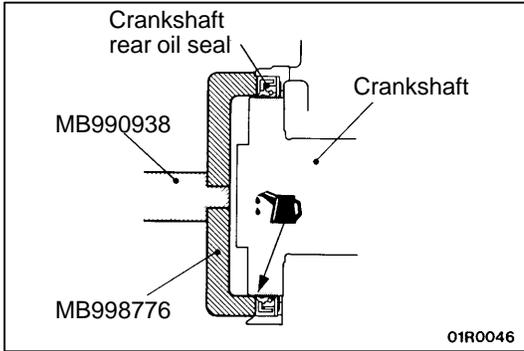




REMOVAL SERVICE POINT

◀A▶ FLYWHEEL ASSEMBLY REMOVAL

Use the special tool to secure the flywheel assembly and remove the bolts.



INSTALLATION SERVICE POINTS

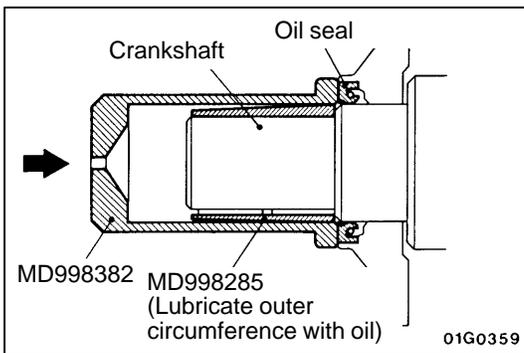
▶A◀ CRANKSHAFT REAR OIL SEAL INSTALLATION

- (1) Apply a small amount of engine oil to the entire circumference of the oil seal lip.
- (2) Install the oil seal with the special tool as far as the chamfered position of the oil seal case as shown in the illustration.

▶B◀ FLYWHEEL ASSEMBLY INSTALLATION

Use the special tool to hold the flywheel in the same manner as removal, and install the bolt. Tighten the bolts to the specification.

Tightening torque: 127 – 137 Nm {13.0 – 14.0 kgf·m}



▶C◀ CRANKSHAFT FRONT OIL SEAL INSTALLATION

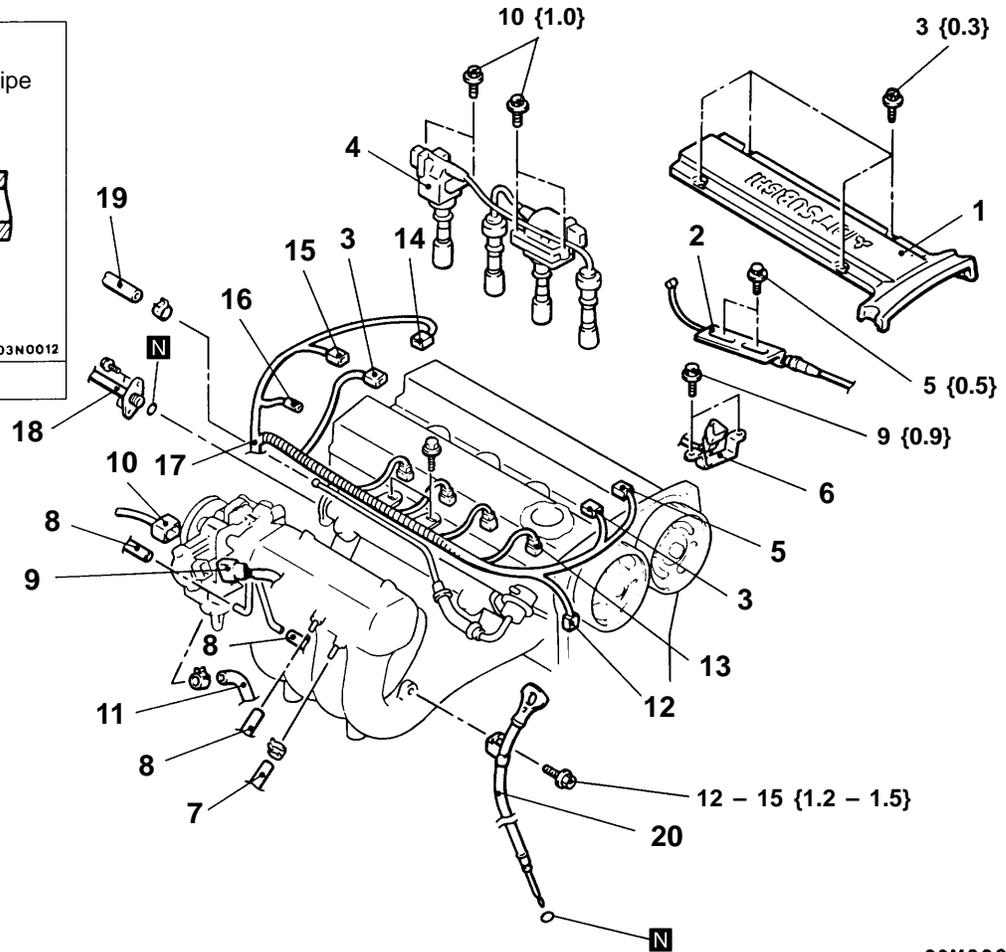
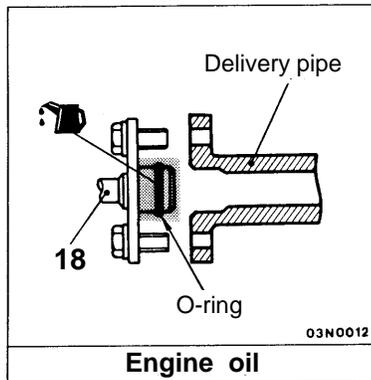
Apply a small amount of engine oil to the entire circumference of the oil seal lip. Pressfit the oil seal until it is flush with the chamfered end of the oil pump case.

CYLINDER HEAD GASKET**REMOVAL AND INSTALLATION****Pre-removal Operation**

- (1) Fuel Discharge Prevention
- (2) Engine Oil Removal
- (3) Strut Tower Bar Removal
- (4) Timing Belt Removal (Refer to P.11-21.)
- (5) Thermostat Case Assembly Removal
(Refer to GROUP 14 – Water Hose Pipe.)
- (6) Front Exhaust Pipe Removal (Refer to GROUP 15.)

Post-installation Operation

- (1) Front Exhaust Pipe Installation
(Refer to GROUP 15.)
- (2) Thermostat Case Assembly Installation
(Refer to GROUP 14 – Water Hose Pipe.)
- (3) Engine Oil Filling
- (4) Timing Belt Installation (Refer to P.11-21.)
- (5) Strut Tower Bar Installation
- (6) Accelerator Cable Adjustment



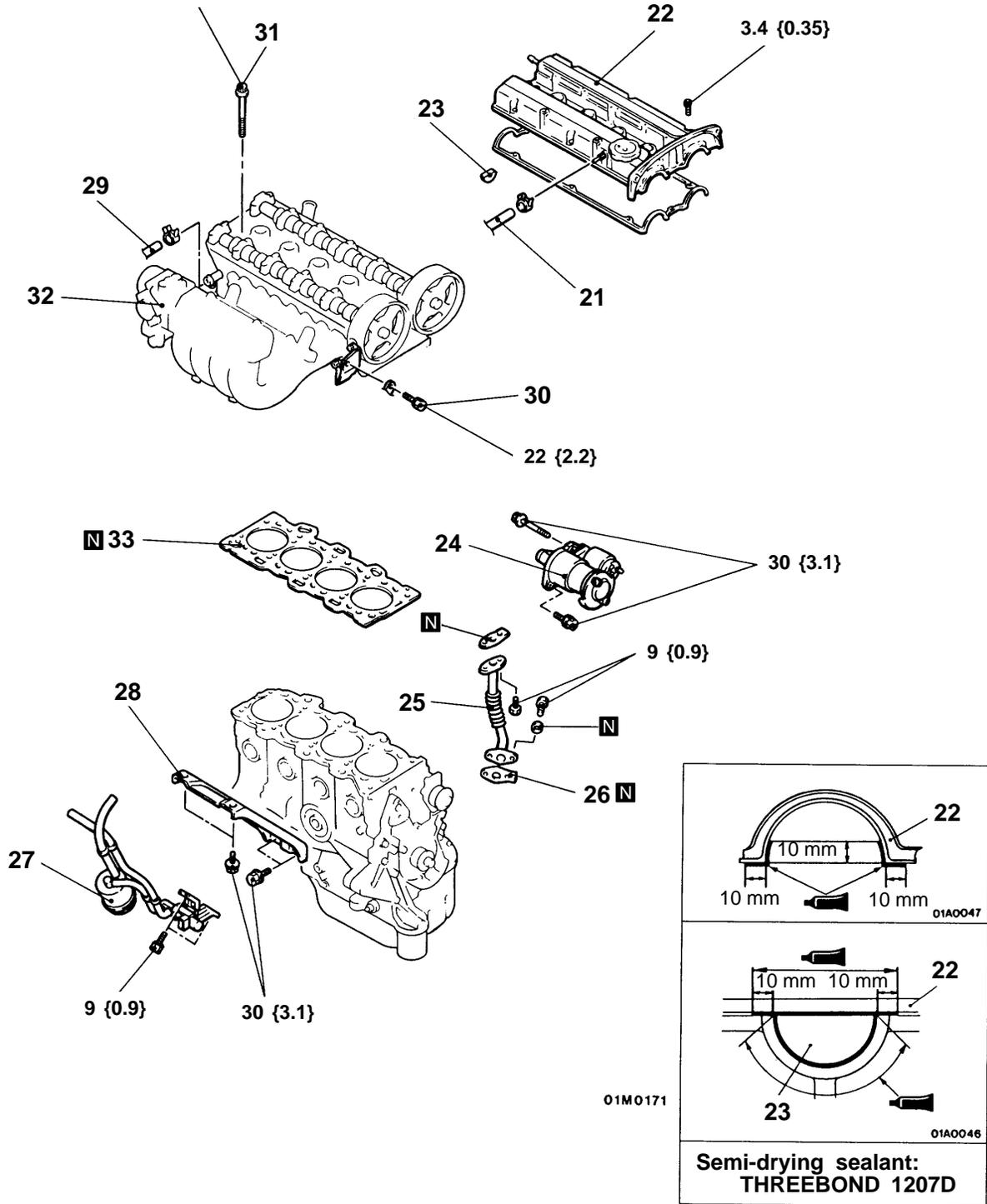
02M0009

Unit: Nm {kgf · m}

Removal steps

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. Center cover 2. Accelerator cable connection 3. Ignition coil connector 4. Ignition coil 5. Crank angle sensor connector 6. Crank angle sensor bracket connection 7. Brake booster vacuum hose connection 8. Vacuum hose connection 9. TPS connector 10. ISC motor connector | <ol style="list-style-type: none"> 11. Water hose connection 12. Oxygen sensor connector 13. Injector connector 14. Cam position sensor connector 15. Coolant temperature sensor connector 16. Water temperature gauge unit connector 17. Control harness 18. Fuel pipe pressure hose connection 19. Fuel return hose connection 20. Oil level gauge guide assembly |
|--|---|

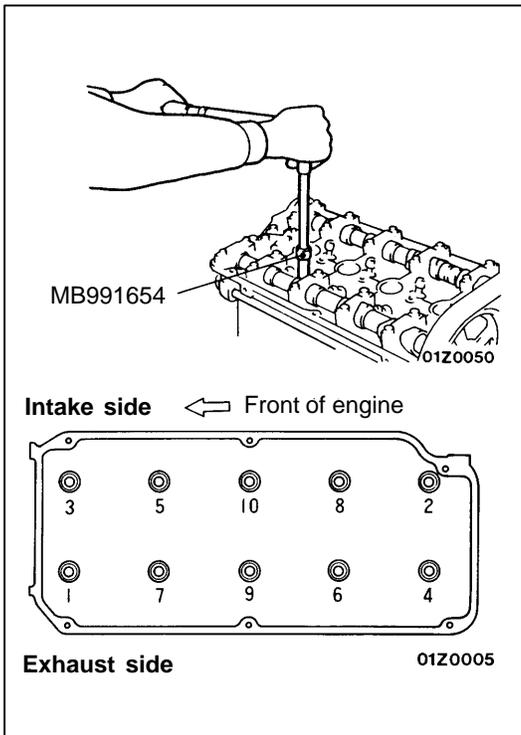
78 → 0 → 20 → +90° → +90°
 {8.0 → 0 → 2.0 → +90° → +90°}



Unit: Nm {kgf·m}

Removal steps

- 21. PCV hose connection
- 22. Rocker cover
- 23. Semi-circular packing
- 24. Starter
- 25. Oil return pipe
- ▶C◀ 26. Oil return pipe gasket
- 27. Vacuum tank/solenoid valve/vacuum hose assembly
- 28. Intake manifold stay
- 29. Heater hose connection
- 30. Alternator brace stay mounting bolt
- ▶A▶ ▶B◀ 31. Cylinder head bolt
- ▶A◀ 32. Cylinder head assembly
- 33. Cylinder head gasket



REMOVAL SERVICE POINT

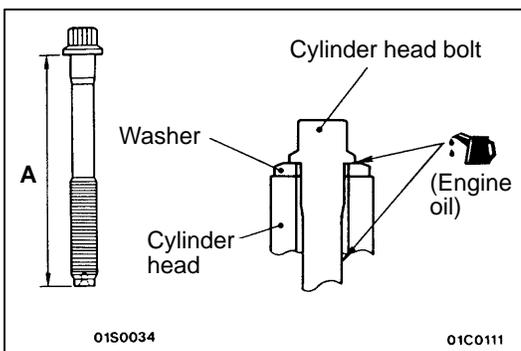
◀A▶ CYLINDER HEAD BOLT REMOVAL

Loosen the bolts in 2 or 3 steps in order of the numbers shown in the illustration, and remove the cylinder head assembly.

INSTALLATION SERVICE POINTS

▶A▶ CYLINDER HEAD GASKET INSTALLATION

- (1) Wipe off all oil and grease from the gasket mounting surface.
- (2) Install so that the shapes of the cylinder head holes match the shapes of the respective cylinder head gasket holes.

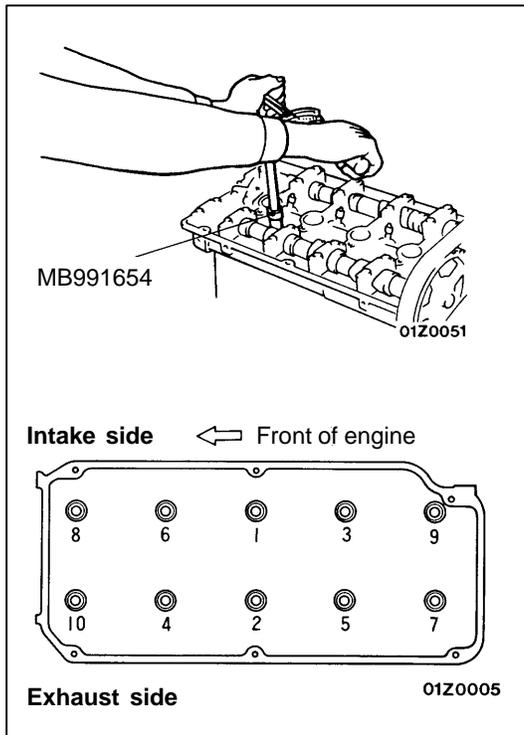


▶B▶ CYLINDER HEAD BOLT INSTALLATION

- (1) When installing the cylinder head bolts, the length below the head of the bolts should be within the limit. If it is outside the limit, replace the bolts.

Limit (A): 99.4 mm

- (2) Apply a small amount of engine oil to the thread section and the washer of the cylinder head bolt.

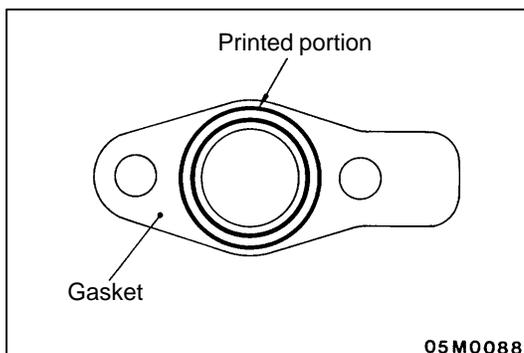
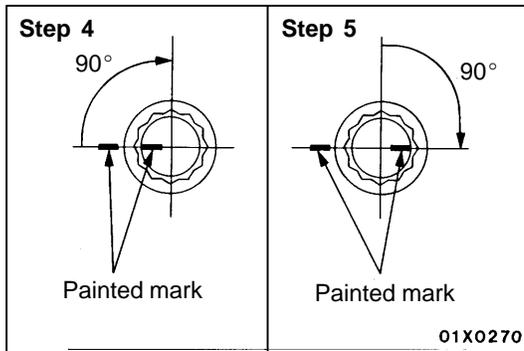


(3) Tighten the bolts by the following procedure.

Step	Operation
1	Tighten to 78 Nm {8.0 kgf·m} in the order shown in the illustration.
2	Fully loosen in the reverse order of that shown in the illustration.
3	Tighten to 20 Nm {2.0 kgf·m} in the order shown in the illustration.
4	Mark the head of the cylinder head bolt and cylinder head by paint, then tighten 90° of a turn in the order shown in the illustration.
5	Tighten 90° of a turn in the order shown in the illustration. Check that the painted mark of the head bolt is lined up with that of the cylinder head.

Caution

- (1) Always make a tightening angle just 90°. If it is less than 90°, the head bolt will be loosened.
- (2) If it is more than 90°, remove the head bolt and repeat the procedure from step 1.



▶◀ OIL RETURN PIPE GASKET INSTALLATION

Install the gasket with the printed portion toward the oil pan.

▶◀ HIGH-PRESSURE FUEL HOSE INSTALLATION

- (1) Apply a small amount of new engine oil to the O-ring, then fit the O-ring in the delivery pipe.

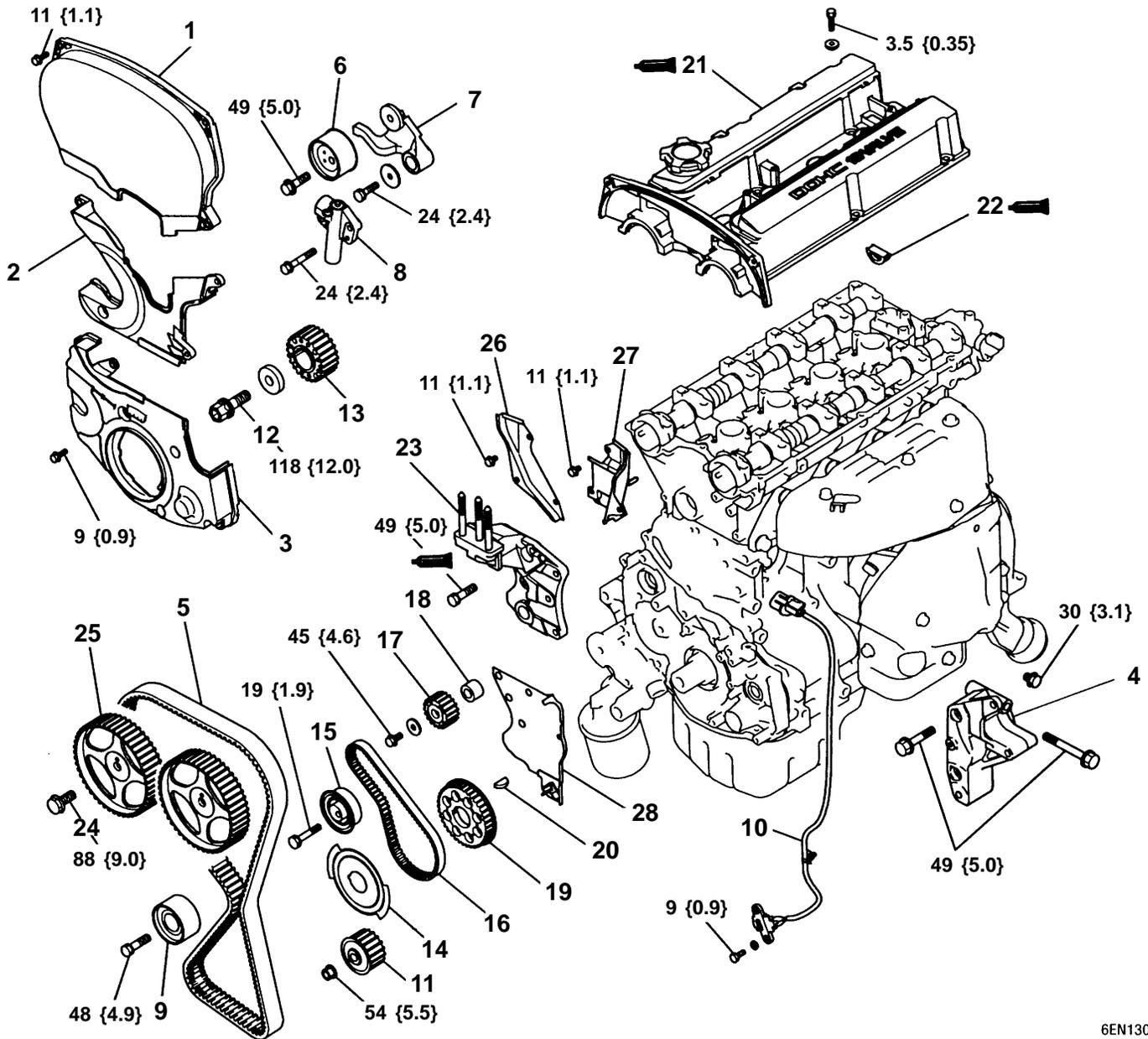
Caution

Do not let any engine oil get into the delivery pipe.

- (2) Check that the high pressure hose turns smoothly. If the hose does not turn smoothly, the O-ring is probably being clamped. Disconnect the high-pressure fuel hose and check the O-ring for damage. After this, re-install the hose to the delivery pipe and check that the hose turns smoothly.
- (3) Tighten the mounting bolts to the specification.

TIMING BELT

REMOVAL AND INSTALLATION

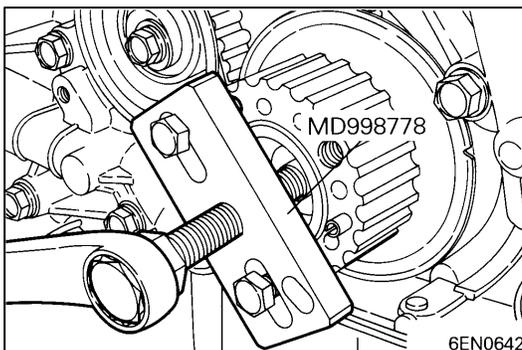
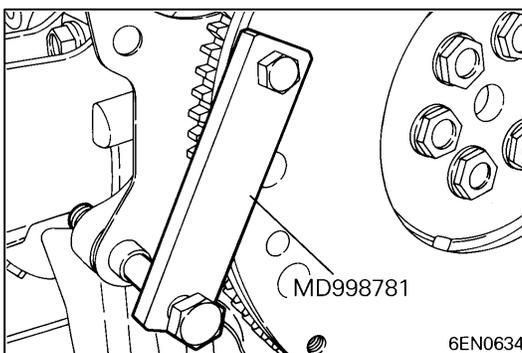
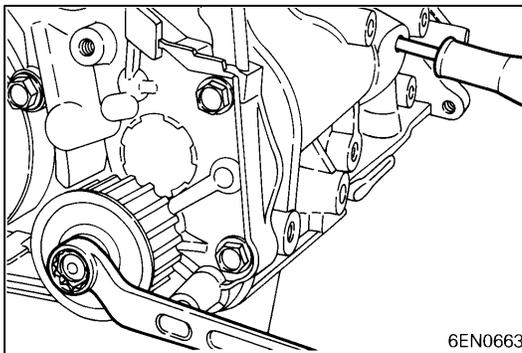
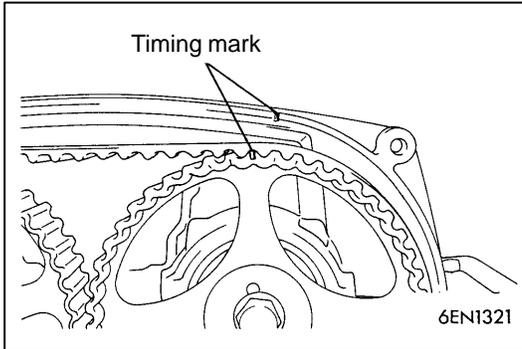
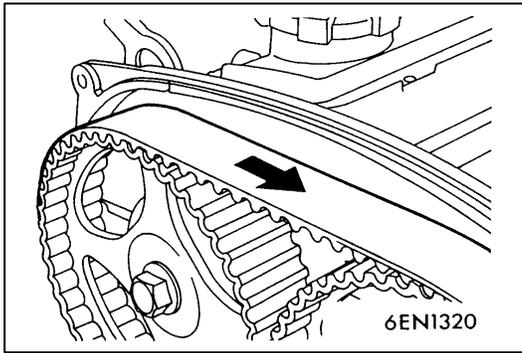


6EN1301

Unit: Nm {kgf·m}

Removal steps

- | | |
|--------------------------------|---------------------------------------|
| 1. Front upper cover | 15. Tensioner B |
| 2. Front center cover | 16. Timing belt B |
| 3. Front lower cover | 17. Counterbalance shaft sprocket |
| 4. Bracket | 18. Spacer |
| 5. Timing belt | 19. Crankshaft sprocket B |
| 6. Tensioner pulley | 20. Crankshaft key |
| 7. Tensioner arm | 21. Rocker cover |
| 8. Auto tensioner | 22. Semi-circular packing |
| 9. Idle pulley | 23. Engine support bracket |
| 10. Crankshaft position sensor | 24. Camshaft sprocket bolt |
| 11. Oil pump sprocket | 25. Camshaft sprocket |
| 12. Crankshaft bolt | 26. Timing belt rear right cover |
| 13. Crankshaft sprocket | 27. Timing belt rear left upper cover |
| 14. Sensing blade | 28. Timing belt rear left lower cover |



REMOVAL SERVICE POINTS

◀A▶ TIMING BELT REMOVAL

- (1) If the timing belt is to be reused, chalk an arrow mark on the back surface of the belt so that the belt can be reinstalled in the same direction.
- (2) Place the exhaust camshaft sprocket in a position where the timing mark for No. 1 cylinder is positioned about one tooth before the top dead center of the compression stroke.

Caution

The camshaft sprocket on the exhaust side can turn very easily because of the valve spring tension. Use care not to allow your fingers to get caught by the sprocket.

- (3) Loosen the lock nut of the tensioner pulley, then remove the timing belt.

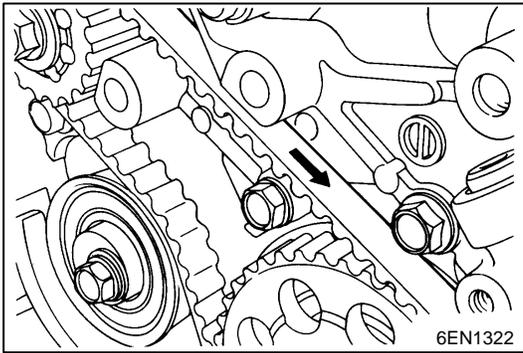
◀B▶ OIL PUMP SPROCKET REMOVAL

- (1) Remove the plug on the left side of cylinder block.
- (2) Insert a screwdriver (shank diameter 8 mm) to block the counterbalance shaft.
- (3) Loosen the flange bolt.
- (4) Remove the oil pump sprocket.

◀C▶ CRANKSHAFT BOLT LOOSENING

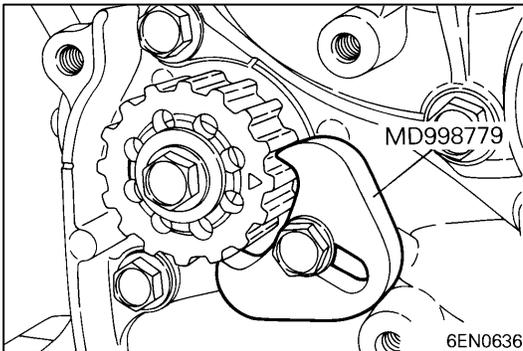
◀D▶ CRANKSHAFT SPROCKET REMOVAL

If it is difficult to remove the sprocket, use the special tool.

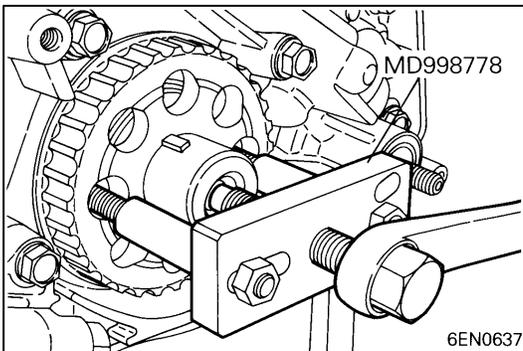


◀E▶ TIMING BELT “B” REMOVAL

Make an arrow 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.

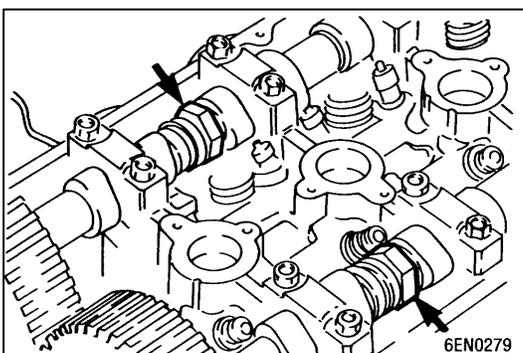


◀F▶ COUNTERBALANCE SHAFT SPROCKET REMOVAL



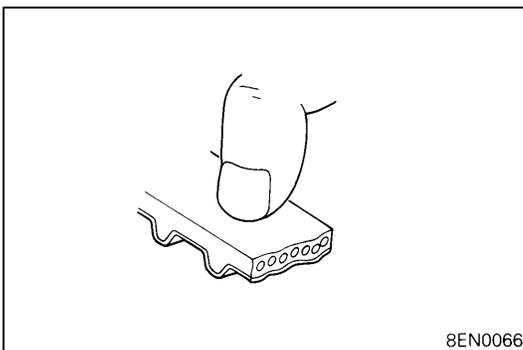
◀G▶ CRANKSHAFT SPROCKET “B” REMOVAL

If it is difficult to remove the sprocket, use the special tool.



◀H▶ CAMSHAFT SPROCKET BOLT LOOSENING

Use a wrench to hold the hexagonal part of the camshaft, and then remove the camshaft sprocket mounting bolt.

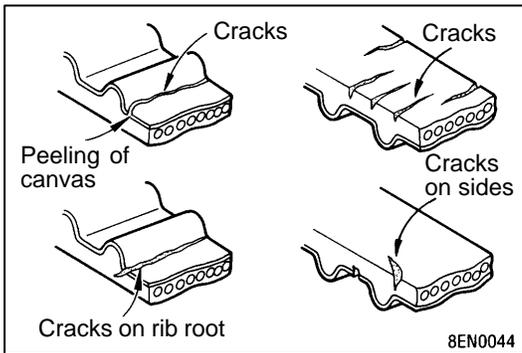


INSPECTION

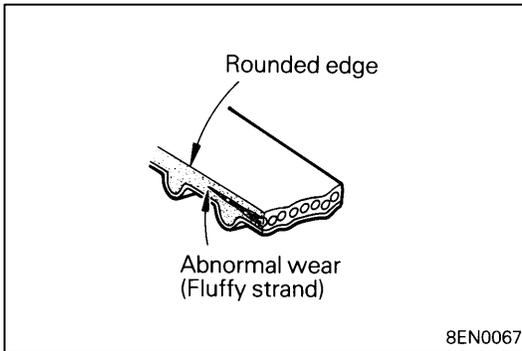
TIMING BELT

Replace belt if any of the following conditions exist.

- (1) Hardening of back rubber.
Back side is glossy without resilience and leaves no indent when pressed with fingernail.



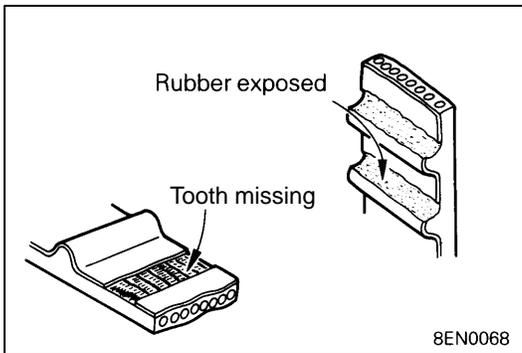
- (2) Cracks on rubber back.
- (3) Cracks of canvas.
- (4) Cracks on rib root.
- (5) Cracks on belt sides.



- (6) Abnormal wear of belt sides.

NOTE

The sides are normal if they are sharp as if cut by a knife.



- (7) Abnormal wear on teeth.

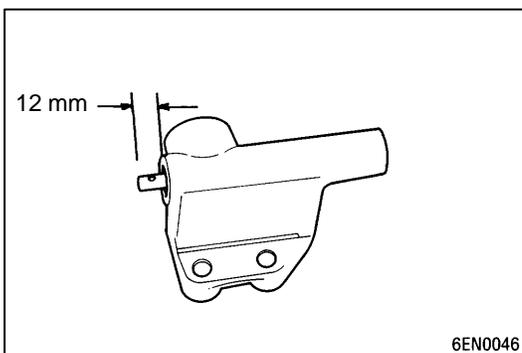
Initial stage:

Canvas on load side tooth flank worn (Fluffy canvas fibers, rubber gone and color changed to white, and unclear canvas texture)

Final stage:

Canvas on load side tooth flank worn down and rubber exposed (tooth width reduced)

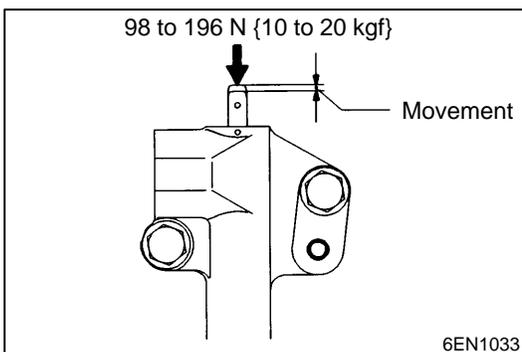
- (8) Missing tooth.



AUTO TENSIONER

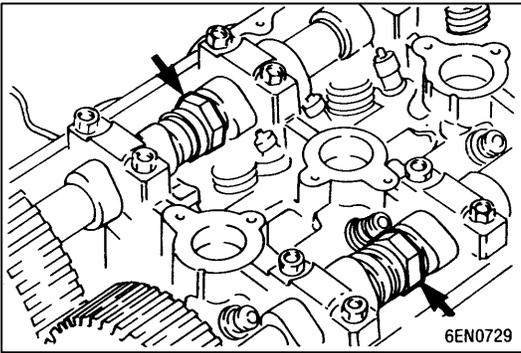
- (1) Check the auto tensioner for possible leaks and replace as necessary.
- (2) Check the rod end for wear or damage and replace as necessary.
- (3) Measure the rod protrusion. If it is out of specification, replace the auto tensioner.

Standard value: 12 mm



- (4) Press the rod with a force of 98 – 196 N {10 – 20 kgf} and measure its protrusion. If it is out of specification, replace the auto tensioner.

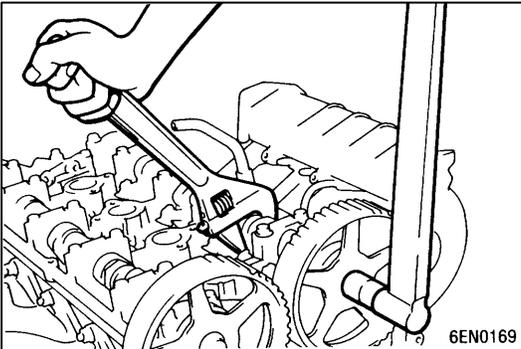
Standard value: 1 mm or less

**INSTALLATION SERVICE POINTS****▶A◀ CAMSHAFT SPROCKET BOLT TIGHTENING**

Using a wrench, hold the camshaft at its hexagon and tighten the bolt to the specification.

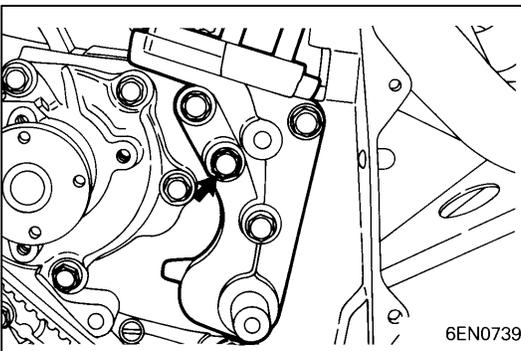
Caution

Locking the camshaft sprocket with a tool damages the sprocket.

**▶B◀ ENGINE SUPPORT BRACKET LEFT INSTALLATION**

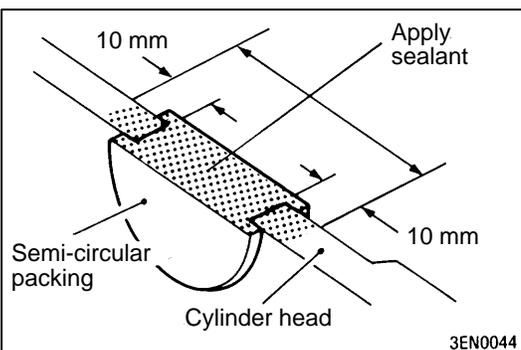
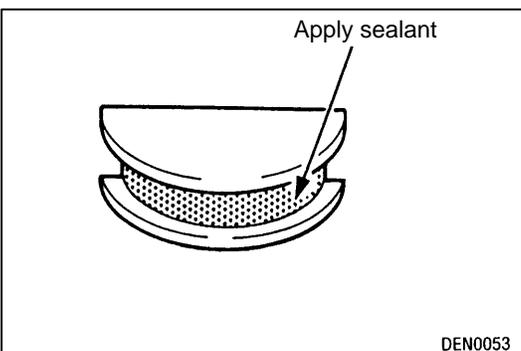
Coat the bolts illustrated with sealant before tightening.

Specified sealant: THREEBOND 1207F or equivalent

**▶C◀ SEALANT APPLICATION ON SEMI-CIRCULAR PACKING**

Apply sealant to the areas indicated in the illustration.

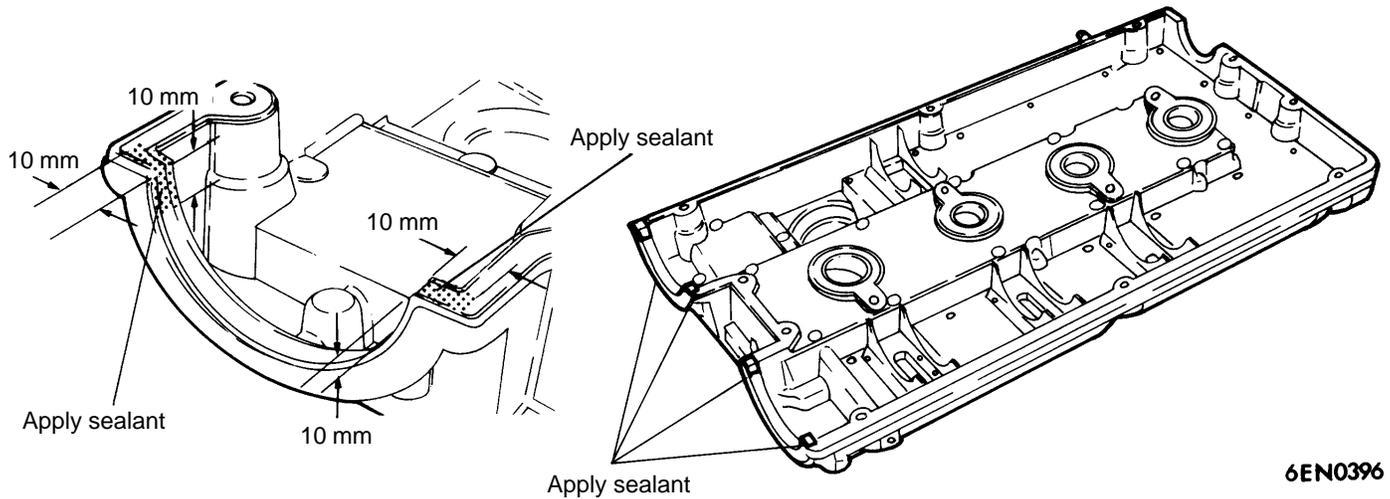
Specified sealant: THREEBOND 1212D or equivalent



►D◄ SEALANT APPLICATION ON ROCKER COVER

Apply sealant to the areas indicated in the illustration.

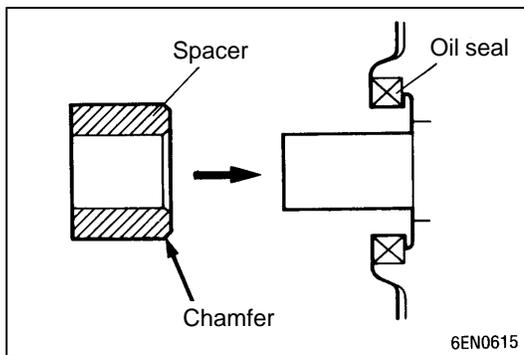
Specified sealant: THREEBOND 1212D or equivalent



6EN0396

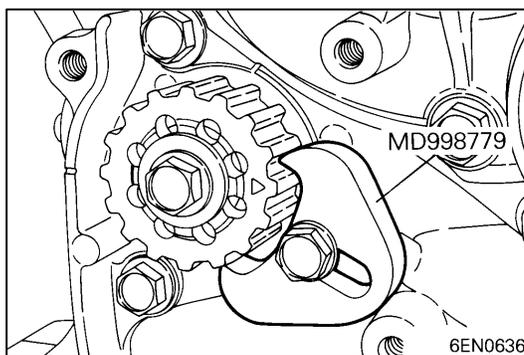
►E◄ SPACER INSTALLATION

- (1) Apply very thin coat of oil to the outer periphery of the spacer (oil seal contacting surface).
- (2) Install the spacer with the chamfered end toward the oil seal. Mounting in the reverse direction can damage the oil seal lip.



6EN0615

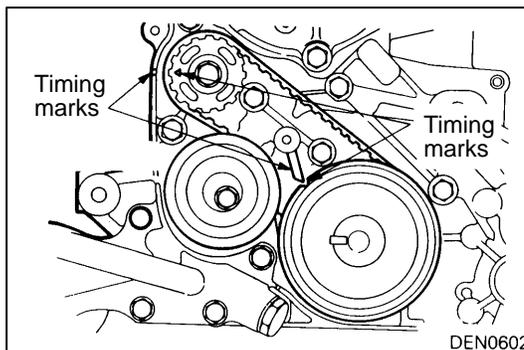
►F◄ COUNTERBALANCE SHAFT SPROCKET INSTALLATION



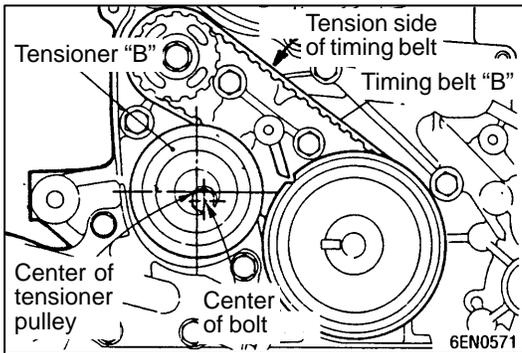
6EN0636

►G◄ TIMING BELT “B” INSTALLATION

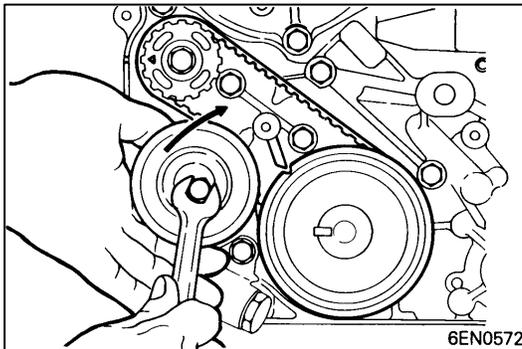
- (1) Align timing marks on the crankshaft sprocket “B” and counterbalance shaft sprocket with the marks on the front case respectively.
- (2) Install the timing belt “B” on the crankshaft sprocket “B” and counterbalance shaft sprocket. There should be no slack on the tension side.



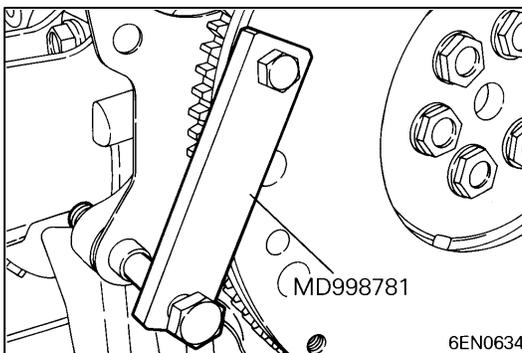
DEN0602



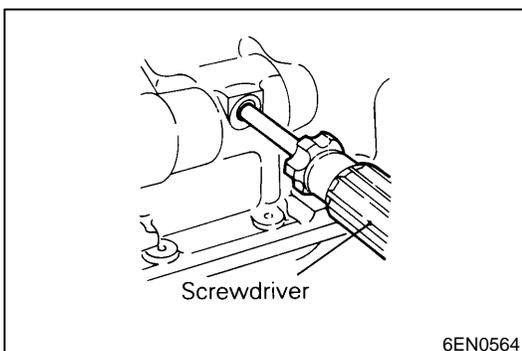
- (3) Make sure that the relationship between the tensioner pulley center and the bolt center is as shown in the illustration.



- (4) Move the tensioner "B" in the direction of arrow while lifting with a finger to give a sufficient tension to the tension side of timing belt. In this condition, tighten bolt to secure tensioner "B". When the bolt is tightened, use care to prevent shaft from turning together. If shaft is turned together, belt will be overtensioned.

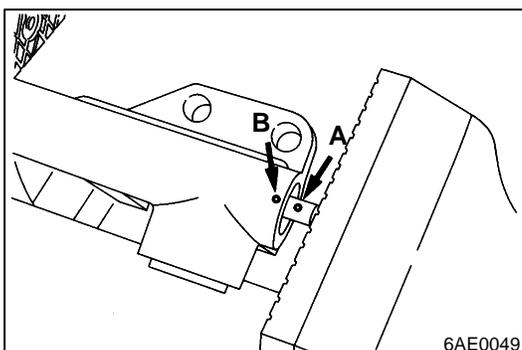


►H◄ CRANKSHAFT BOLT TIGHTENING



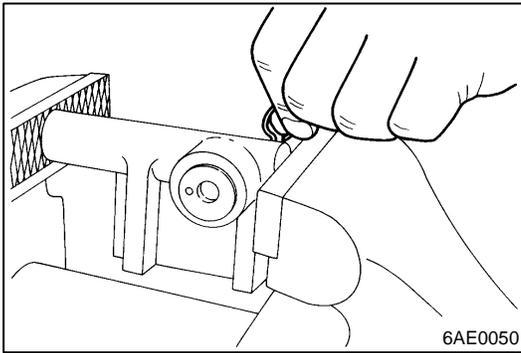
►I◄ OIL PUMP SPROCKET INSTALLATION

- (1) Block the counterbalance shaft in the same way as at the disassembly to prevent it from turning.
- (2) Install the oil pump sprocket.
- (3) Apply a proper amount of engine oil to the bearing surfaces of the flange nuts.
- (4) Tighten the flange nuts to the specified torque.

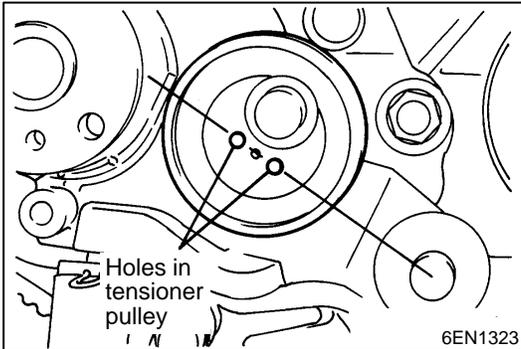


►J◄ AUTO TENSIONER INSTALLATION

- (1) If the auto tensioner rod is in its fully extended position, reset it as follows.
 - a. Clamp the auto-tensioner in the vise with soft jaws.
 - b. Push in the rod little by little with the vise until the set hole A in the rod is aligned with the hole B in the cylinder.

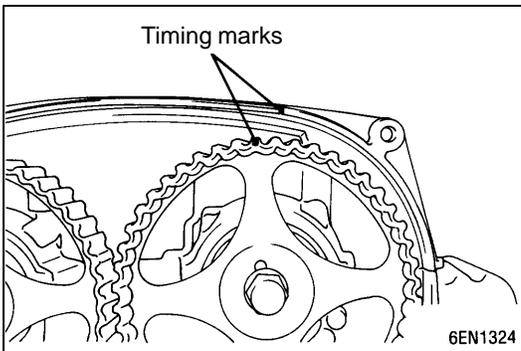


- c. Insert a wire (1.4 mm in diameter) into the set holes.
 - d. Unclamp the auto tensioner from the vise.
- (2) Install the auto tensioner. Leave the wire installed in the auto tensioner until the timing belt is installed.



►K◄ TENSIONER PULLEY INSTALLATION

Install the tensioner pulley as shown in the illustration.

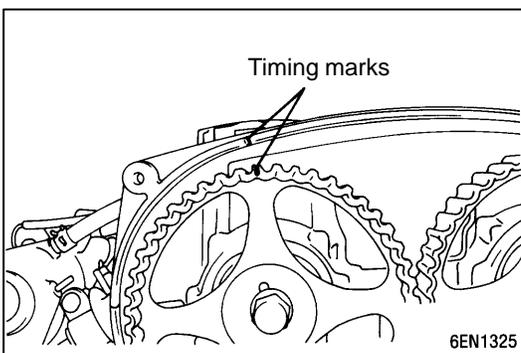


►L◄ TIMING BELT INSTALLATION

- (1) Place the exhaust side camshaft sprocket in a position where its timing mark is one tooth offset from the timing mark on the rocker cover in the counterclockwise direction.

NOTE

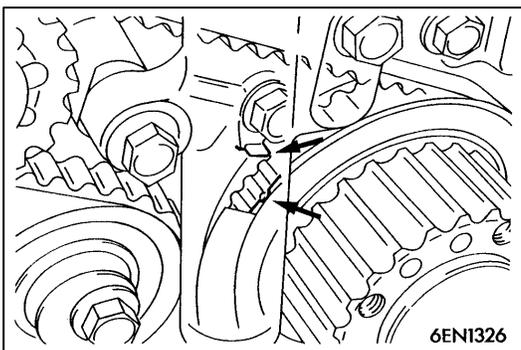
Even if the timing marks on the sprocket and the rocker cover are brought into alignment, the exhaust camshaft is forced back by the valve spring tension. It is stabilized at a position one tooth before the timing mark.



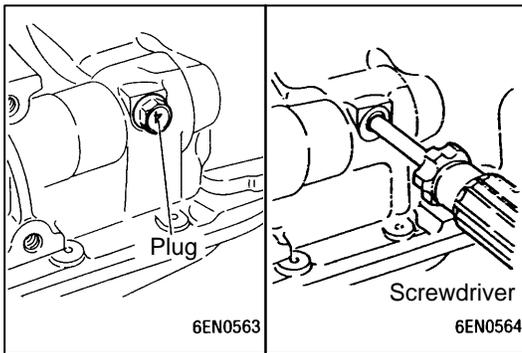
- (2) Align the timing mark on the intake side camshaft sprocket with that on the rocker cover.

NOTE

Even if the timing marks on the sprocket and the cover are brought into alignment, the intake camshaft is forced to turn one tooth in the clockwise direction by the valve spring tension and stabilized there.

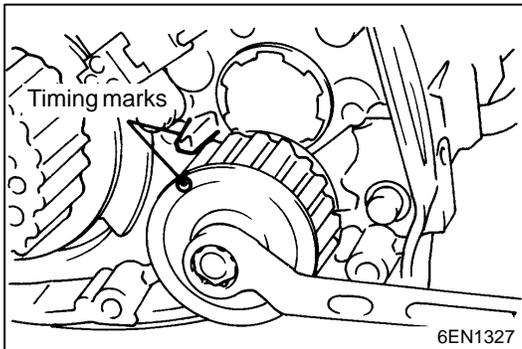


- (3) Place the timing mark on the crankshaft sprocket one tooth this side from the mated timing mark as in the case of the camshaft sprocket.

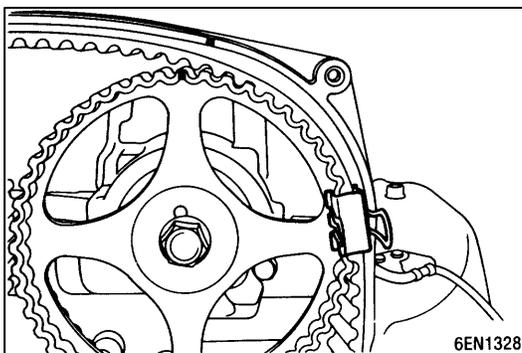


- (4) Align the timing mark on the oil pump sprocket with its mating mark.
- (5) Remove the plug on the left side of the cylinder block and insert a Phillips screwdriver (shank diameter 8 mm) through the hole.

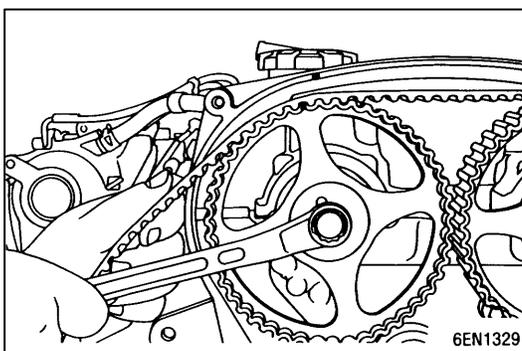
If it can be inserted as deep as 60 mm or more, the timing marks are correctly aligned. If the inserted depth is only 20 – 25 mm, turn the oil pump sprocket one turn and realign timing marks. Then check to ensure that the screwdriver can be inserted 60 mm or more.



- (6) Remove the Phillips screwdriver. Place the oil pump sprocket in a position where its timing mark is one tooth offset from the mated timing mark in the counterclockwise direction.



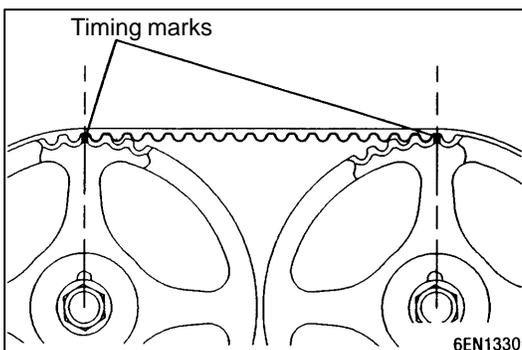
- (7) Fit the timing belt over the exhaust side camshaft sprocket, and secure it at the illustrated position using a paper clip.



- (8) Turn the intake side camshaft sprocket as shown to a position where its timing mark is one tooth offset from the mated timing mark in the counterclockwise direction. Then, fit the timing belt over the sprocket and secure it with a paper clip.

NOTE

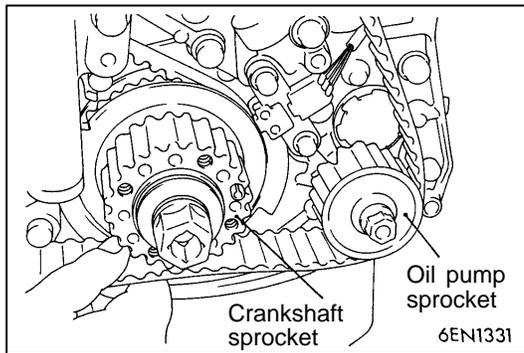
The intake camshaft will be turned a little clockwise by the valve spring tension and stabilized in position even if the belt is clipped at one tooth offset position.



- (9) Check to ensure that the timing marks on the intake camshaft sprocket side are in alignment when the exhaust camshaft sprocket is turned clockwise to align the timing marks.

NOTE

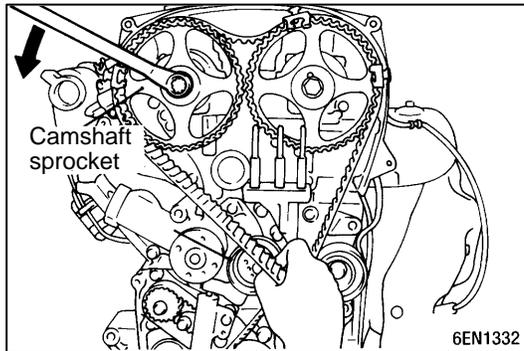
The timing belt span between the intake and exhaust sprockets will have 17 cogs.



- (10) Fit the timing belt over the idler pulley, oil pump sprocket and crankshaft sprocket in this order.

NOTE

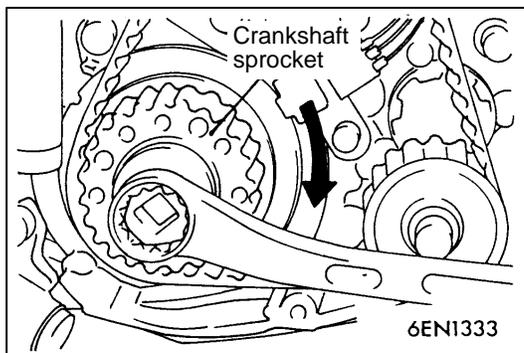
Be careful that the belt does not become slack.



- (11) Fit the timing belt over the tensioner pulley.

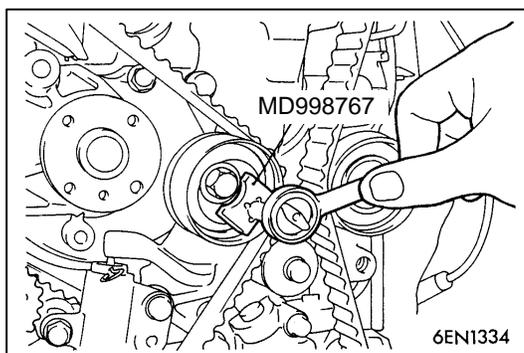
NOTE

When fitting the timing belt over the tensioner pulley, turn the intake side camshaft sprocket a little counterclockwise, as this will facilitate the work.



- (12) Turn the crankshaft pulley a little in the illustrated direction to pull up the timing belt at the idler pulley side.

- (13) Check to ensure that the timing marks on the crankshaft sprocket, oil pump sprocket and exhaust camshaft sprocket are all offset one tooth from the corresponding timing marks in the counterclockwise direction.

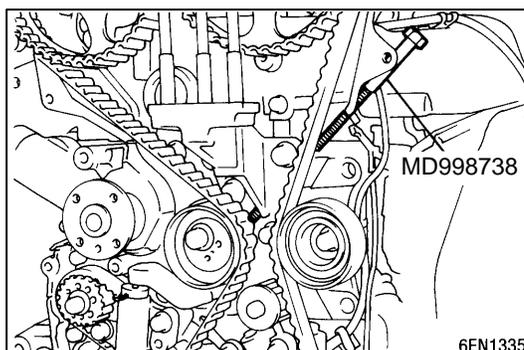


- (14) Using the special tool, turn the tensioner pulley in the illustrated direction to strain the timing belt. Then, secure the tensioner temporarily by tightening the retaining bolt lightly.

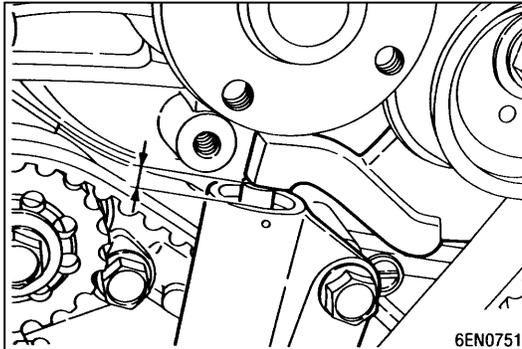
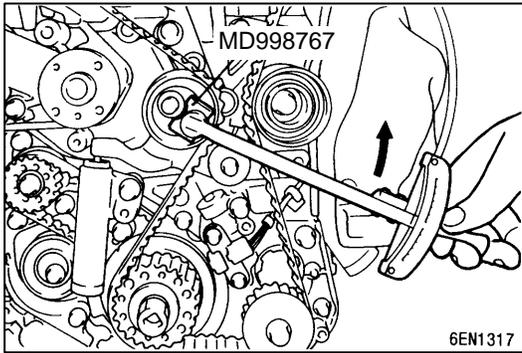
NOTE

There must be no slack in the timing belt between the intake and exhaust camshafts.

- (15) Turn the crankshaft to align the timing mark with the mark for No. 1 cylinder top dead center in the compression stroke.



- (16) Set the special tool as shown and screw it in up to the position where the wire inserted in the auto-tensioner when installing it can be moved lightly.



(17) Loosen the retaining bolt of the tensioner pulley.

Caution

Loosening the retaining bolt can cause the intake and exhaust camshafts to turn, resulting in slackened timing belt. Use care that the timing belt does not come off the sprockets at this time.

(18) Pull up the slack of the timing belt by turning the tensioner in illustrated direction using the special tool and a torque wrench (0 – 5 Nm {0 – 0.5 kgf·m}).

(19) From this position, turn back the tensioner until the torque wrench reading becomes 3.5 Nm {0.36 kgf·m}, then secure it by tightening the retaining bolt.

(20) Remove the special tool attached in step (16).

(21) Rotate the crankshaft clockwise 2 turns. Then, leave it intact 15 minutes.

(22) Check to see that the wire inserted when installing the auto-tensioner can be pulled out lightly. If it can be pulled out lightly, the timing belt is being tensioned properly. If so, remove the wire. In addition, check that the rod protrusion from the auto-tensioner meets the standard value, which is also an indication of properly tensioned timing belt.

Standard value: 3.8 – 4.5 mm

(23) If the wire cannot be removed with a light force, repeat steps (16) through (21) until the proper belt tensioner is obtained.

ENGINE ASSEMBLY

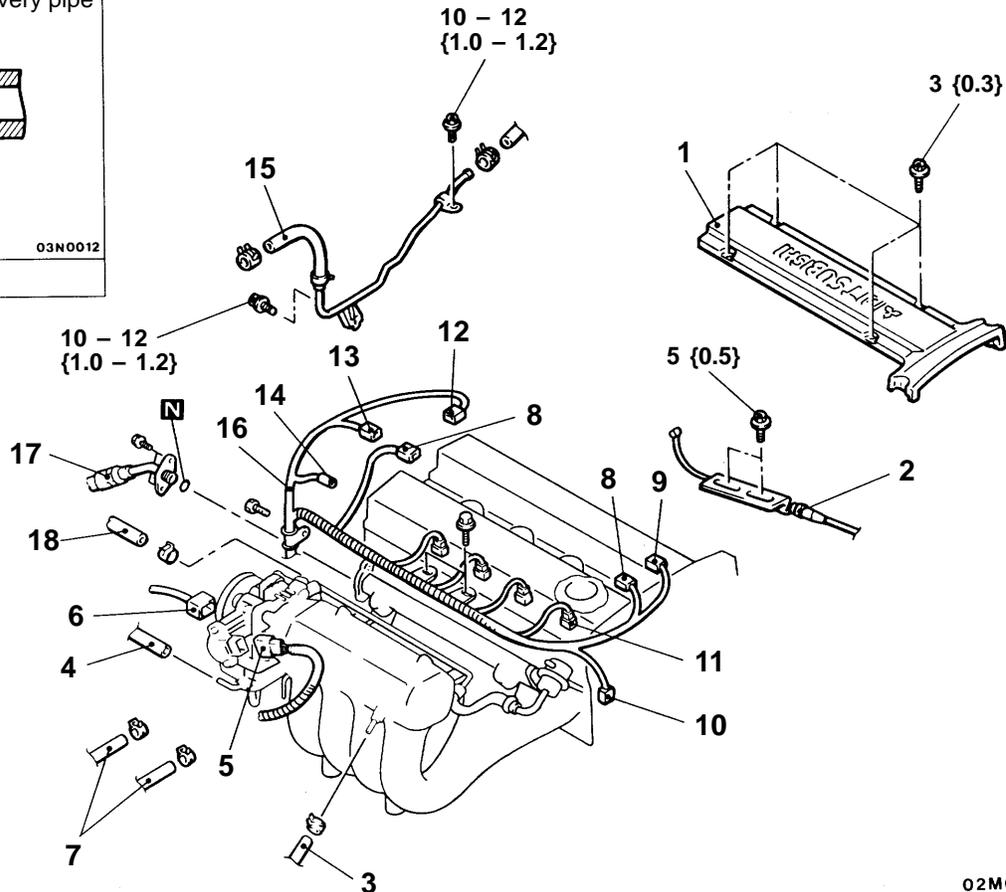
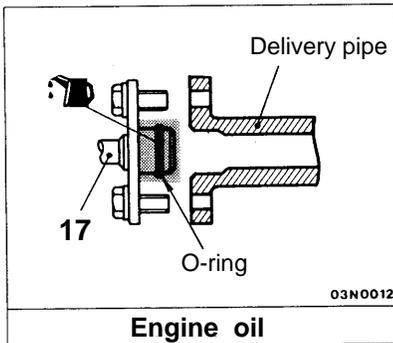
REMOVAL AND INSTALLATION

Pre-removal Operation

- (1) Fuel Discharge Prevention
- (2) Hood Removal
- (3) Strut Tower Bar Removal
- (4) Air Hose C Removal
(Refer to GROUP 15 – Intercooler.)
- (5) Radiator Assembly Removal (Refer to GROUP 14.)
- (6) Under Cover Removal
- (7) Front Exhaust Pipe Removal (Refer to GROUP 15.)

Post-installation Operation

- (1) Front Exhaust Pipe Installation
(Refer to GROUP 15.)
- (2) Under Cover Installation
- (3) Radiator Assembly Installation
(Refer to GROUP 14.)
- (4) Accelerator Cable Adjustment
- (5) Air Hose C Installation
(Refer to GROUP 15 – Intercooler.)
- (6) Strut Tower Bar Installation
- (7) Hood Installation



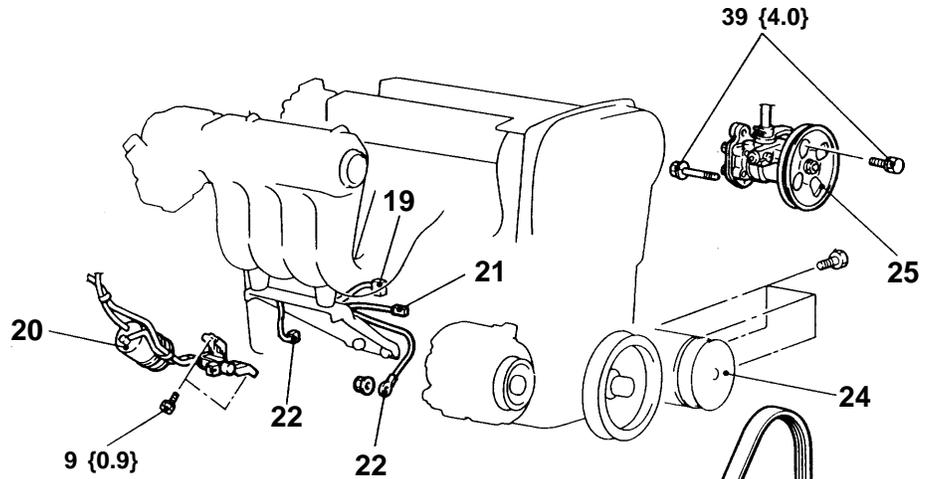
02M0006

Unit: Nm {kgf·m}

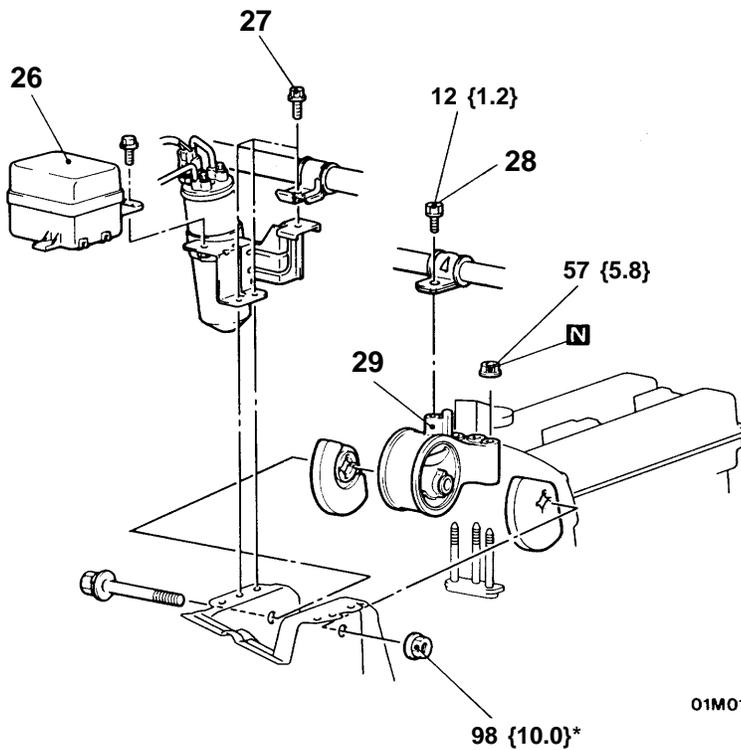
Removal steps

- | | |
|---|--|
| 1. Center cover | 11. Injector connector |
| 2. Accelerator cable | 12. Cam position sensor connector |
| 3. Brake booster vacuum hose connection | 13. Coolant temperature sensor connector |
| 4. Vacuum hose connection | 14. Coolant temperature gauge unit connector |
| 5. Throttle position sensor connector | 15. Vacuum pipe/hose assembly |
| 6. Idle speed control motor connector | 16. Control harness |
| 7. Heater hose connection | 17. High-pressure fuel hose connection |
| 8. Ignition coil connector | 18. Fuel return hose connection |
| 9. Crank angle sensor connector | |
| 10. Oxygen sensor connector | |





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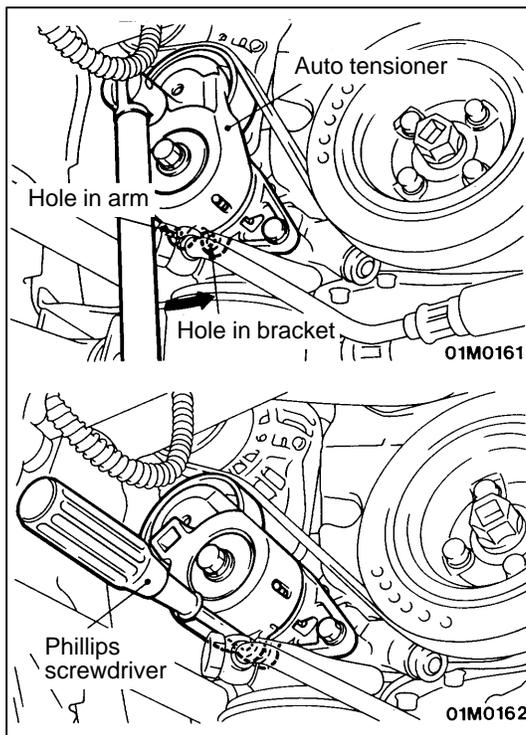
Unit: Nm {kgf · m}

- 19. Solenoid valve connector
- 20. Vacuum tank/solenoid valve/vacuum hose assembly
- 21. Oil pressure switch connector
- 22. Alternator connector
 - Drive belt tension inspection (Refer to P.11-4.)
- 23. Drive belt
- 24. A/C compressor
- 25. Power steering oil pump
 - Transmission assembly

- 26. A/C relay box
- 27. A/C receiver bracket mounting bolt
- 28. Oil pressure hose mounting bolt
- 29. Engine mount bracket
- 30. Engine assembly



Caution
 Mounting locations marked by * should be provisionally tightened, and then fully tightened after placing the vehicle horizontally and loading the full weight of the engine on the vehicle body.



REMOVAL SERVICE POINTS

◀A▶ DRIVE BELT REMOVAL

- (1) Align the hole in the auto tensioner bracket with that in the arm and insert a screwdriver into the holes.
- (2) Remove the drive belt.

◀B▶ POWER STEERING OIL PUMP REMOVAL

Remove the power steering oil pump from the bracket with the hose attached.

NOTE

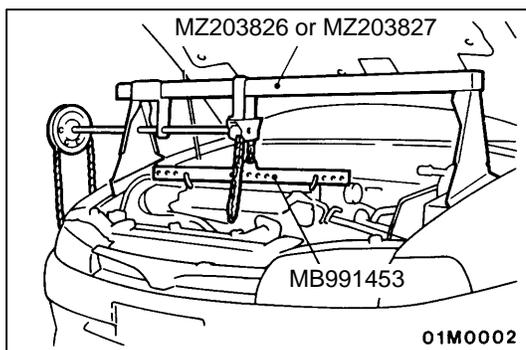
Place the removed power steering oil pump in a place where it will not be a hindrance when removing and installing the engine assembly, and tie it with a cord.

◀C▶ A/C COMPRESSOR REMOVAL

Disconnect the A/C compressor connector and remove the compressor from the compressor bracket with the hose still attached.

NOTE

Place the removed A/C compressor where it will not be a hindrance when removing and installing the engine assembly, and tie it with a cord.



◀D▶ ENGINE MOUNT BRACKET REMOVAL

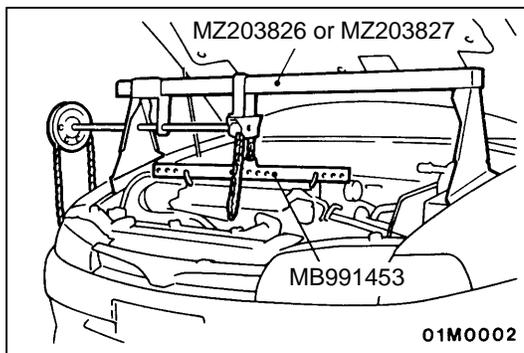
- (1) Support the engine with a garage jack.
- (2) Remove the special tool which was attached when the transmission assembly was removed.
- (3) Hold the engine assembly with a chain block or similar tool.
- (4) Place a garage jack against the engine oil pan with a piece of wood in between, jack up the engine so that the weight of the engine is no longer being applied to the engine mount bracket, and then remove the engine mount bracket.

◀E▶ ENGINE ASSEMBLY REMOVAL

After checking that all cables, hoses and harness connectors, etc., 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, checking that the cables, hoses, and harness connectors are not clamped.

**▶B▶ ENGINE MOUNT BRACKET INSTALLATION**

- (1) Place a garage jack against the engine oil pan with a piece of wood in between, and install the engine mount bracket while adjusting the position of the engine.
- (2) Support the engine with the garage jack.
- (3) Remove the chain block and support the engine assembly with the special tools.

▶C▶ HIGH-PRESSURE FUEL HOSE INSTALLATION

- (1) Apply a small amount of new engine oil to the O-ring, then fit the O-ring in the delivery pipe.

Caution

Do not let any engine oil get into the delivery pipe.

- (2) Check that the high pressure hose turns smoothly. If the hose does not turn smoothly, the O-ring is probably being clamped. Disconnect the high-pressure fuel hose and check the O-ring for damage. After this, re-install the hose to the delivery pipe and check that the hose turns smoothly.
- (3) Tighten the mounting bolt to the specification.