ENGINE

CONTENTS

ENGINE <4D5-Step III>

GENERAL

OUTLINE OF CHANGES

Some service procedures have been revised as the following changes have been made to comply to the Emission Regulation Step III.

- The injection timing check and adjustment procedure and the idle speed check procedure have been changed.
- The oil pan has a cover in order to reduce noise due to an enhanced engine output.
- A crank angle sensor and crankshaft sensing blade have been added due to the introduction of an electronic-controlled fuel injection pump. Due to this change, the timing belt front lower cover has been reshaped.
- The tightening torque of the cylinder head bolts and the cylinder head gasket have been changed.

GENERAL INFORMATION

Items			4D56
Total displacement mL			2,477
Bore x Stroke mm			91.1 x 95.0
Compression ratio			21
Combustion chamber			Vortex chamber type
Camshaft arrangement			SOHC
Number of valve	Intake		4
	Exhaust		4
Valve timing	Intake	Opening	BTDC 20°
	Exhaust	Closing	ABDC 49°
	Intake	Opening	BBDC 55°
	Exhaust	Closing	ATDC 22°
Fuel system			Electronically controlled type injection pump
Rocker arm			Roller type
Adjusting screw			Elephant foot type

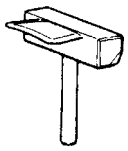
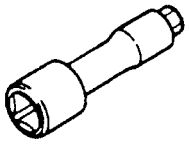
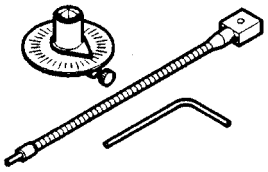
SERVICE SPECIFICATIONS

Items	Standard value
Timing belt tension mm	4 - 5
Timing belt B tension mm	4 - 5
Idle speed r/min	750 ± 30

SEALANT

Items	Specified sealant	Remarks
Oil pan	MITSUBISHI GENUINE PART MD970389 or equivalent	Semi-drying sealant
Semi-circular packing and rocker cover seal, and cylinder head seal	3M ATD Part No. 8660 or equivalent	

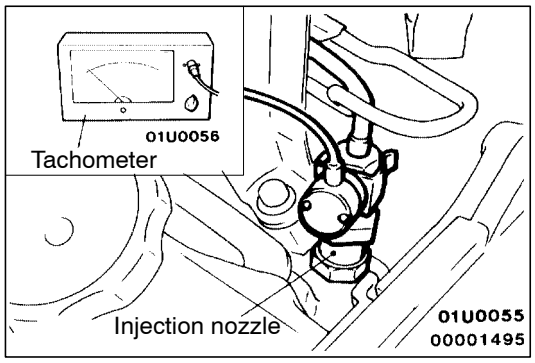
SPECIAL TOOLS

Tools	Number	Name	Use
	MD998727	Oil pan remover	Removal of oil pan
	MD998721	Crankshaft pulley holder	Holding the crankshaft pulley
	MD998051	Cylinder head bolt wrench	Removal and installation of the cylinder head bolt
	MB991614	Angle gauge	Tightening of the cylinder head bolts

ON-VEHICLE SERVICE

INJECTION TIMING CHECK AND ADJUSTMENT

The cold start device (wax type) has been discontinued as an electronically controlled injection pump has been used. The other inspection and adjustment procedures are the same as before.



IDLE SPEED CHECK

1. Set the vehicle to the pre-inspection condition.
2. Turn the ignition switch to “LOCK” (OFF) position, and connect the diagnosis connector to the MUT-II.
   If the MUT-II is not used, connect a tachometer to the injection nozzle or the pipe.
3. Start the engine, and let it run at idle.
4. Check the idle speed.

   Standard value: 750 ± 30 r/min

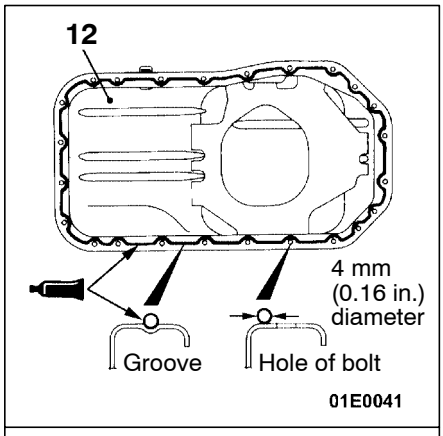
5. If the idle speed is not within the standard value, refer to 13C - Troubleshooting to check the electronic controlled fuel injection system.

   NOTE
   The idle speed is controlled by the engine-ECU.

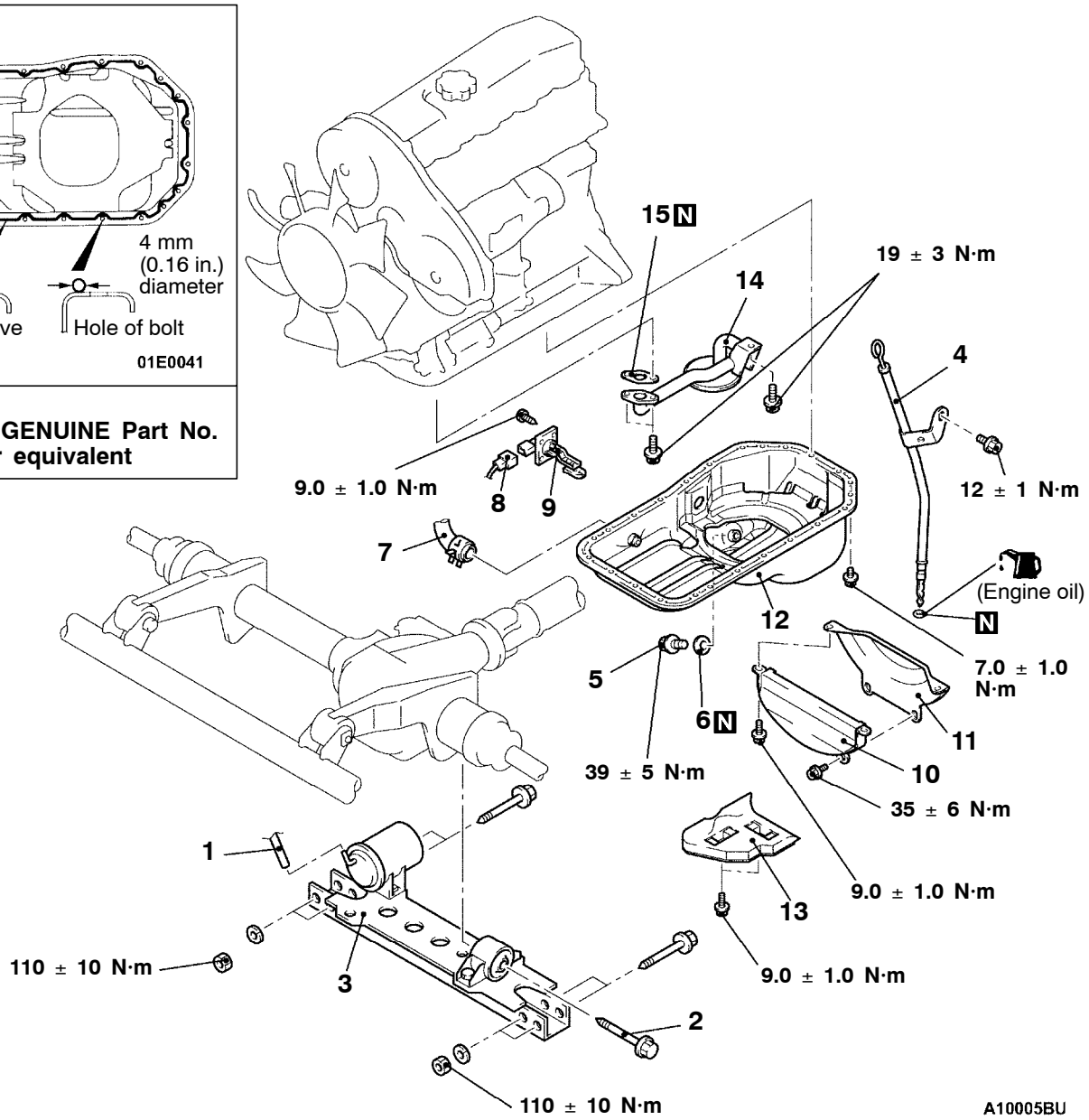
OIL PAN AND OIL SCREEN

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Skid Plate and Under Cover Removal and Installation.
- Front Exhaust Pipe Removal and Installation (Refer to GROUP 15 - Exhaust Pipe and Muffler.)
- Engine Oil Draining and Supplying.

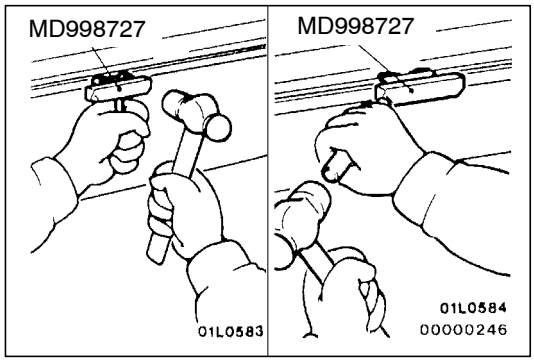


Sealant:
MITSUBISHI GENUINE Part No. MD997110 or equivalent



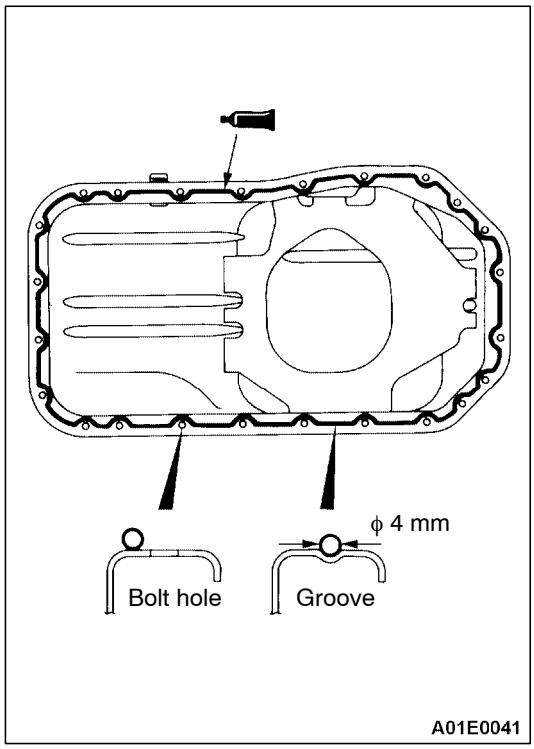
Removal steps

1. Vacuum hose connection
2. Bolt
3. Front suspension crossmember
4. Engine oil level gauge and guide assembly
5. Drain plug
▶B◀ 6. Drain plug gasket
7. Alternator vacuum pump oil return hose connection
8. Oil level sensor connector
9. Oil level sensor
10. Space rubber
11. Bell housing cover
◀A▶ ▶A◀ 12. Oil pan
13. Oil pan cover
14. Oil screen
15. Oil screen gasket



REMOVAL SERVICE POINT

◀A▶ OIL PAN REMOVAL



INSTALLATION SERVICE POINTS

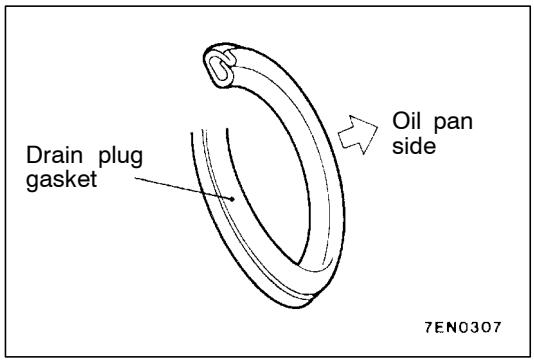
▶A◀ OIL PAN INSTALLATION

1. Remove sealant from oil pan and cylinder block mating surfaces.
2. Degrease the sealant-coated surface and the engine mating surface.
3. Apply a continuous bead of the specified sealant to the oil pan mating surface as shown.

   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 oil pan to cylinder block within 15 minutes after applying the sealant.

   Caution
   After installing the oil pan, wait at least 1 hour before starting the engine.



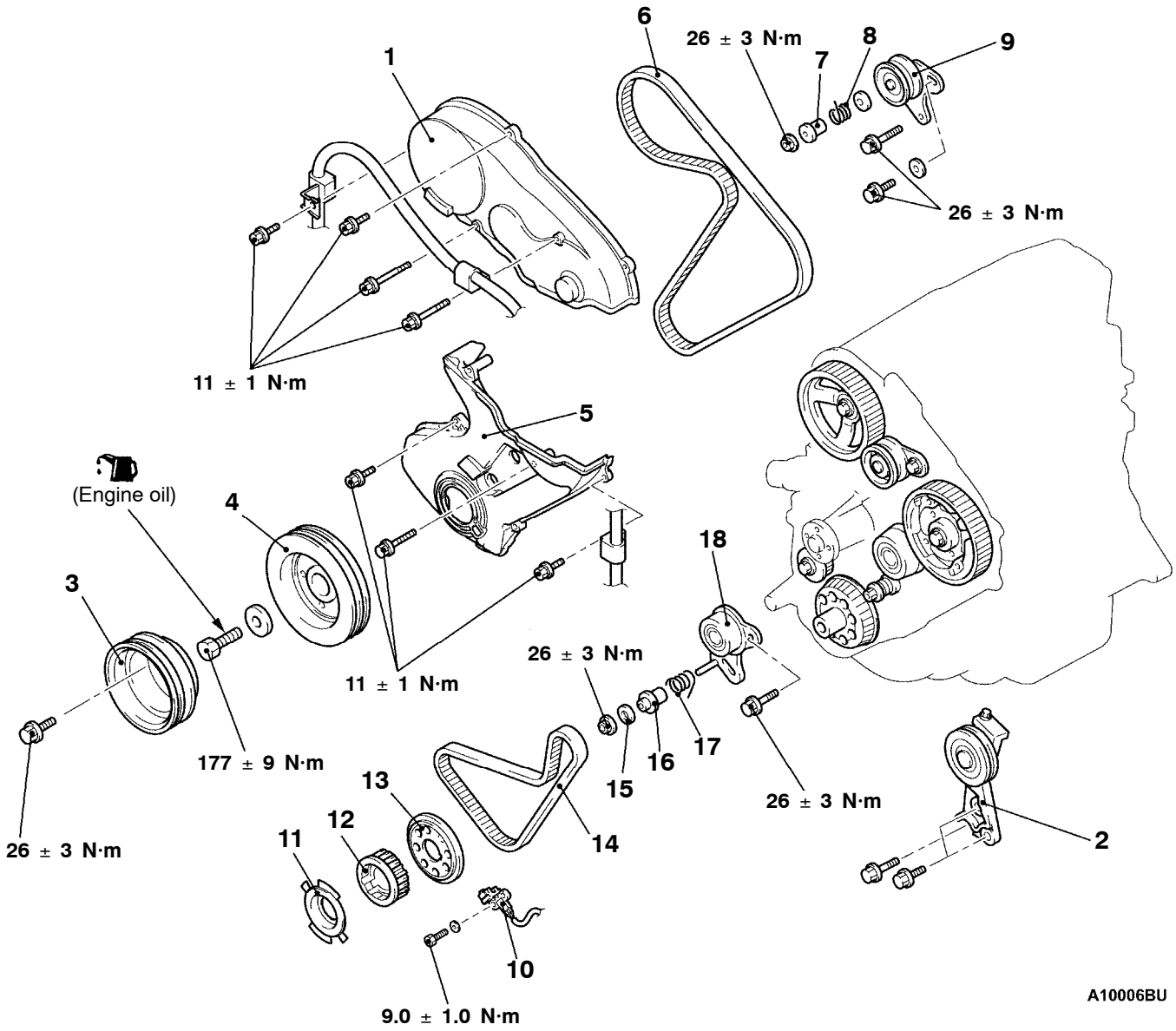
▶B◀ DRAIN PLUG GASKET INSTALLATION

Install a new gasket in the direction so that it faces as shown in the illustration.

TIMING BELT AND TIMING BELT B

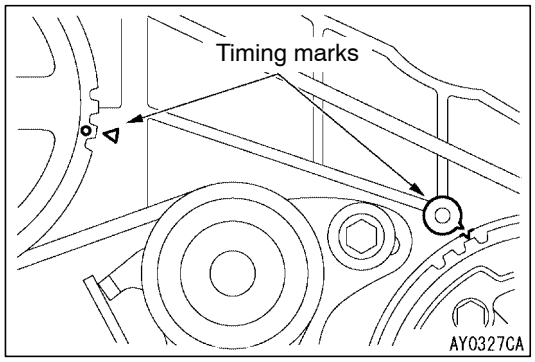
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Intercooler Removal and Installation (Refer to GROUP 15.)
- Cooling Fan Removal and Installation.



Removal steps

- ▶C◀ 1. Timing belt front upper cover
- 2. Tension pulley and tension pulley bracket assembly
- 3. Crankshaft pulley (for power steering and A/C)
- ◀A▶ ▶D◀ 4. Crankshaft pulley
- ▶C◀ 5. Timing belt front lower cover
- ◀B▶ ▶B◀ 6. Timing belt
- 7. Tensioner spacer
- 8. Tensioner spring
- 9. Timing belt tensioner
- 10. Crank angle sensor
- 11. Crankshaft sensing blade
- 12. Crankshaft sprocket
- 13. Flange
- ◀C▶ ▶A◀ 14. Timing belt B
- 15. Gasket
- 16. Tensioner spacer B
- 17. Tensioner spring B
- 18. Timing belt tensioner B

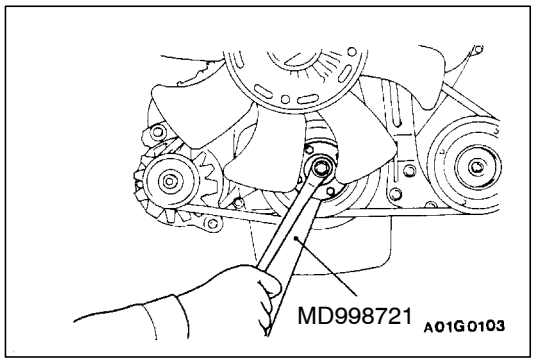


REMOVAL SERVICE POINTS

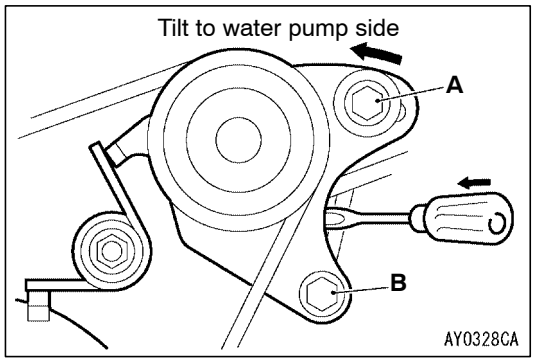
◀A▶ CRANKSHAFT PULLEY REMOVAL

1. Turn the crankshaft clockwise, align the timing marks to set No.1 cylinder to TDC of its compression stroke.

   Caution
   Never turn the crankshaft anticlockwise.

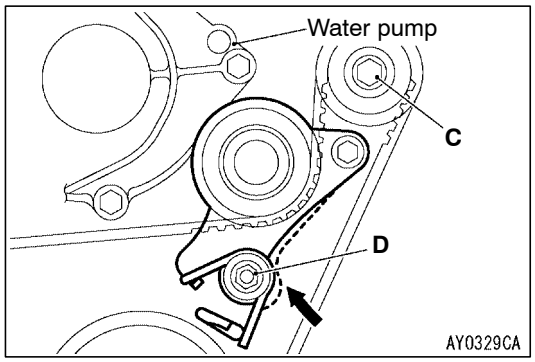


2. Use the special tool to keep crankshaft from turning and remove the bolts.



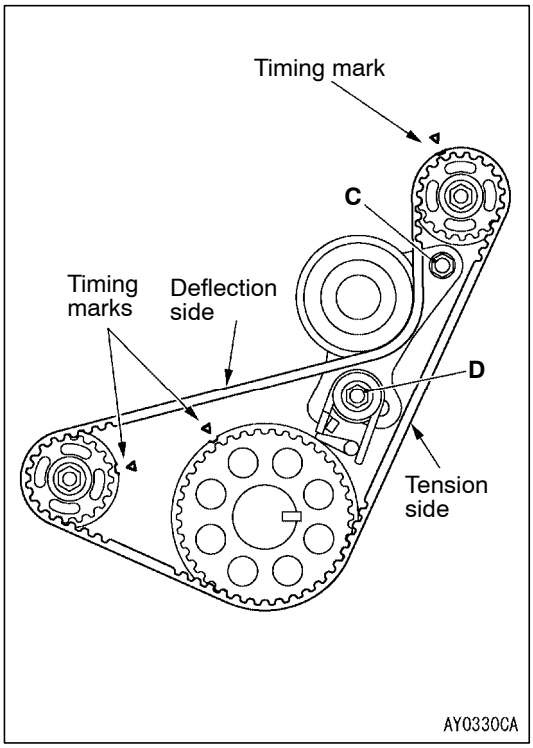
◀B▶ TIMING BELT REMOVAL

1. When reinstalling timing belt, mark an arrow at the belt to show rotation direction.
2. Loosen the tensioner mounting bolt A and B.
3. Push timing belt tensioner to water pump side and tighten the tensioner mounting bolt A and B. Secure so that tensioner will not move back.



◀C▶ TIMING BELT B REMOVAL

1. When reinstalling timing belt B, mark an arrow at the belt to show rotation direction.
2. Loosen the tensioner mounting bolt C and nut D.
3. Push timing belt tensioner to water pump side and tighten the tensioner mounting bolt C and nut D. Secure so that tensioner will not move back.

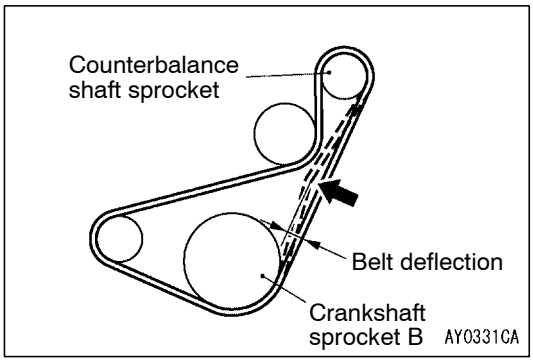


INSTALLATION SERVICE POINTS

▶A◀ TIMING BELT B INSTALLATION

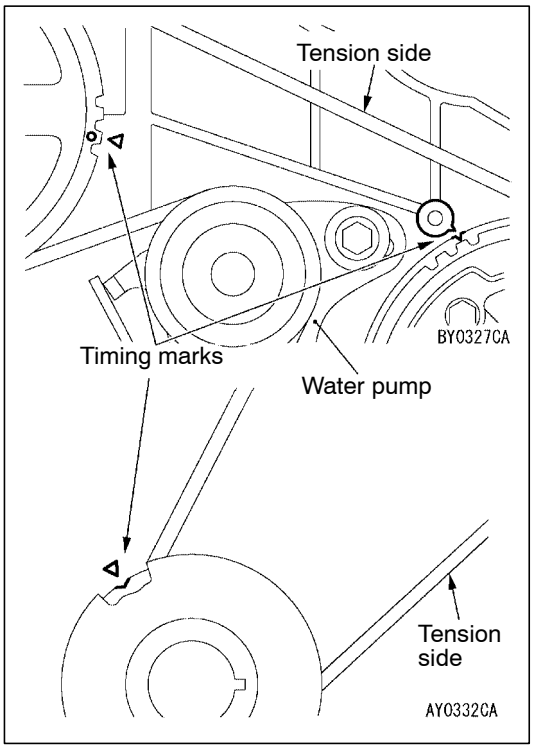
1. Align the timing marks of the 3 sprockets.
2. When reusing timing belt B, make sure the arrow mark is pointing in the same direction as when the belt was removed.
3. Install timing belt B and make sure there is no deflection on the tension side.
4. Press the deflection side of timing belt B with the hand and fully stretch the tensioner side.
5. Make sure that the timing marks are aligned.
6. Loosen the tensioner mounting bolt and nut so that only the pressure of the spring is applied to timing belt B.
7. Tighten the tensioner mounting bolt C and nut D, tightening the nut first. If the bolt is tightened first, the tensioner will move and tension the belt.

   Tightening torque: 26 ± 3 N·m



8. Press in the direction of the arrow in the figure with the index finger to check the amount of deflection.

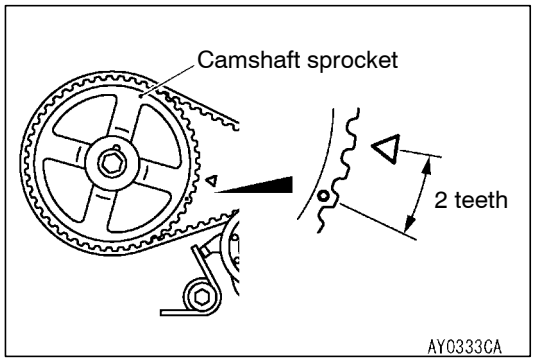
   Standard value: 4 - 5 mm



▶B◀ TIMING BELT INSTALLATION

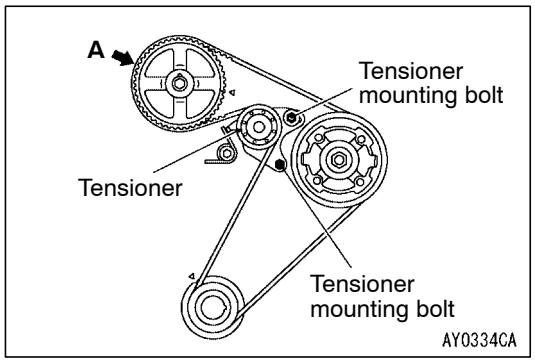
1. Align the timing marks of the 3 sprockets.
2. When reusing timing belt, make sure the arrow mark is pointing in the same direction as when the belt was removed.
3. Install the timing belt to the crankshaft sprocket, to injection pump sprocket, to tensioner and to camshaft sprocket in that order. Being careful not to allow deflection on the tension side of the timing belt.

   Caution
   (1) Engage the belt on the various sprockets while maintaining tension on the belt of tension side.
   (2) Align the injection pump sprocket with the timing mark, hold the sprocket so that is does not turn and engage the belt.
4. Loosen the tensioner mounting bolts and apply tension with the spring.

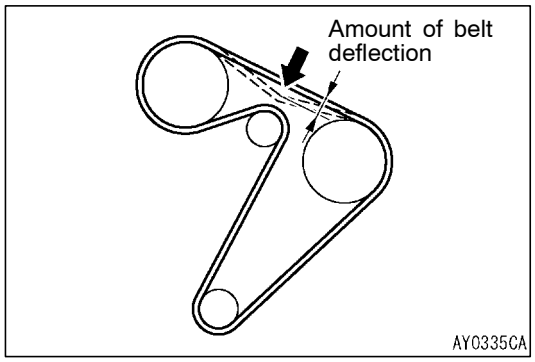


5. Turn the crankshaft clockwise and stop at the second lobe of the camshaft sprocket.

Caution
(1) When turning the crankshaft in item (5), strictly observe the specified amount of rotation (2 teeth on the camshaft sprocket) in order to apply a constant force to the tension side of the belt.
(2) Do not turn the crankshaft counterclockwise.
(3) Do not touch the belt during adjustment.

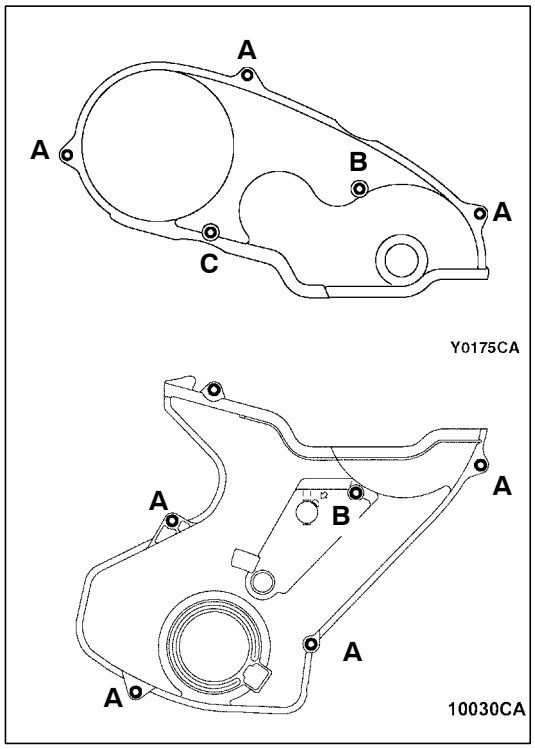


6. Make sure that the part indicated by arrow A does not float upward.
7. Tighten the tensioner mounting bolts, starting with the bolt in the elongated hole. If the lower bolt is tightened first, belt tension will become too tight.
8. Turn the crankshaft anticlockwise and align the timing mark. Next, make sure that the timing marks of all sprockets are aligned.



9. Press on the center of the bolt with an index finger to check the amount of deflection.

Standard value: 4 - 5 mm



▶C◀ TIMING BELT FRONT LOWER COVER/TIMING BELT FRONT UPPER COVER INSTALLATION

Install the bolts to the timing belt cover at the shown positions.

Name	Symbols	Size mm (d × l)
Flange bolt	A	6 × 22
	B	6 × 50
	C	6 × 60

d=Nominal diameter
l=Nominal length

▶D◀ CRANKSHAFT PULLEY INSTALLATION

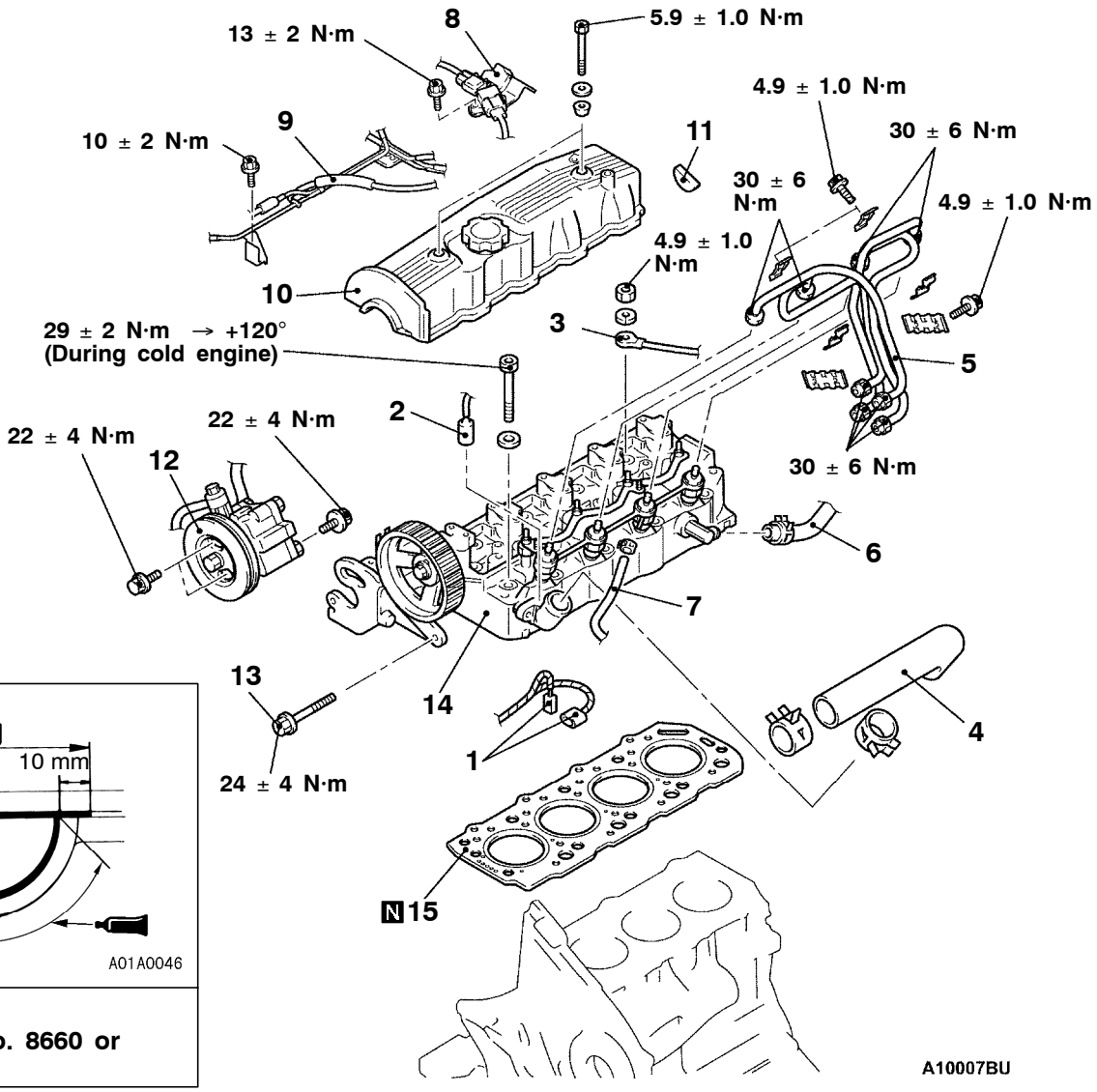
Using the special tool to install the crankshaft pulley as same as removal procedure.

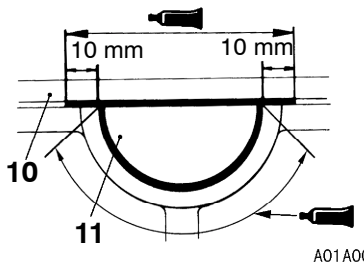
CYLINDER HEAD GASKET

REMOVAL AND INSTALLATION

Pre-removal Operation
- Intake and Exhaust Manifold Removal (Refer to GROUP 15.)
- Timing Belt Removal (Refer to P.11-4.)
- Engine Coolant Draining.

Post-installation Operation
- Timing Belt Installation (Refer to P.11-4.)
- Intake and Exhaust Manifold Installation (Refer to GROUP 15.)
- Fuel Line Air Bleeding (Refer to GROUP 13 - On-vehicle Service.)
- Engine Coolant Filling





Sealant:
3M ATD Part No. 8660 or equivalent

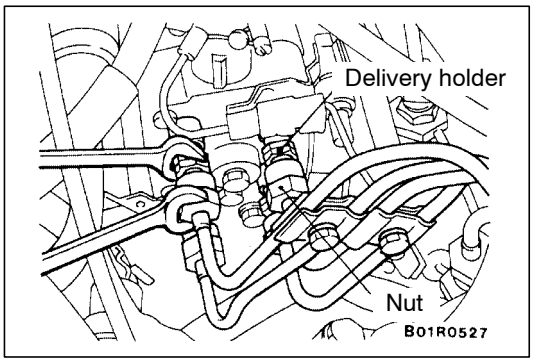
Removal steps

1. Engine coolant temperature switch connector (for A/C)
2. Engine coolant temperature gauge unit and sensor connector
3. Glow plug terminal
◀A▶ ▶D◀ 4. Radiator upper hose
◀B▶ ▶C◀ 5. Fuel injection pipe
6. Heater hose or water by-pass hose connection
7. Fuel hose connection
8. Boost sensor and bracket assembly
9. Vacuum hose and pipe assembly
10. Rocker cover
11. Semi-circular packing
◀C▶ 12. Power steering oil pump assembly
13. Power steering oil pump bracket bolt
◀D▶ ▶B◀ 14. Cylinder head assembly
▶A◀ 15. Cylinder head gasket

REMOVAL SERVICE POINTS

◀A▶ RADIATOR UPPER HOSE DISCONNECTION

After making mating marks on the radiator upper hose and the hose clamp, disconnect the radiator upper hose.



◀B▶ FUEL INJECTION PIPE REMOVAL

When loosening nuts at both ends of injection pipe, hold the delivery holder (for pump side) and the injection nozzle assembly (for nozzle side) with wrench and loosen nut.

Caution
After disconnecting the injection pipe, plug the opening so that no foreign particles get inside the pump or into the injection nozzle.

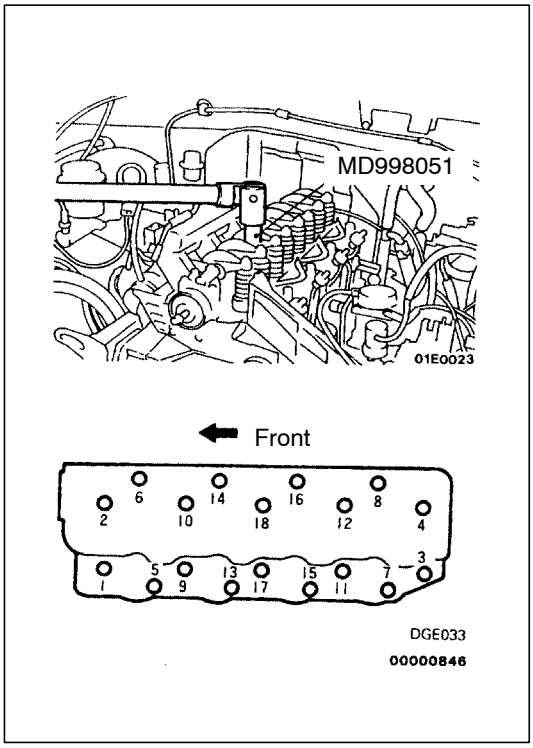
◀C▶ POWER STEERING OIL PUMP REMOVAL

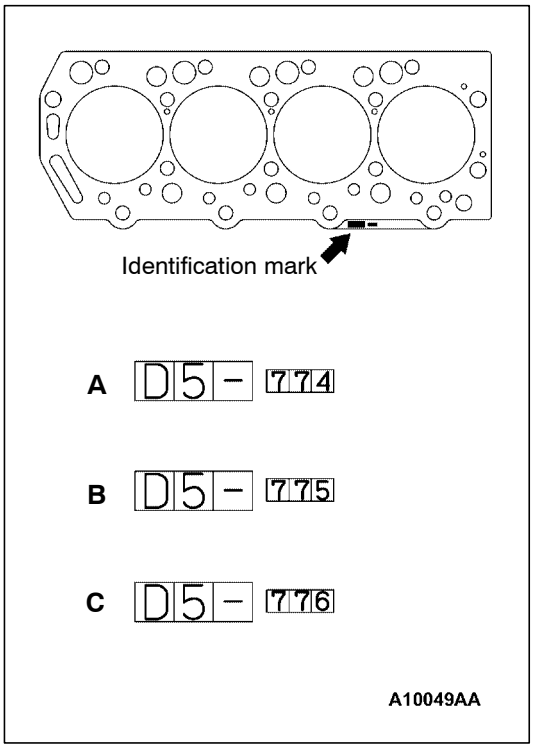
Remove the power steering oil pump from the bracket with the hose attached.

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.

◀D▶ CYLINDER HEAD ASSEMBLY REMOVAL

Use the special tool to tighten each bolt 2 - 3 times in the order shown in the illustration.





INSTALLATION SERVICE POINTS

▶A◀ CYLINDER HEAD GASKET INSTALLATION

When replacing the cylinder head gasket only, confirm the gasket identification mark, and then select a replacement part according to the table below:

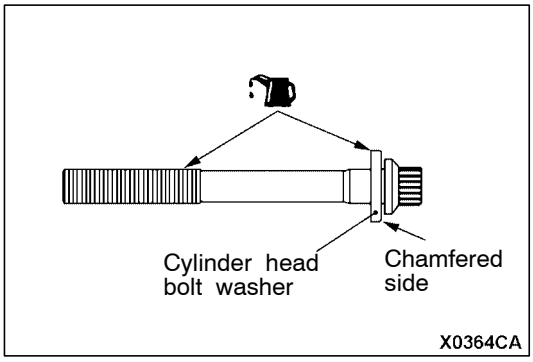
Spec	Identification mark (size)	Parts number
A	D5-774 (fitted thickness 1.45 ± 0.04)	MD377774
B	D5-775 (fitted thickness 1.50 ± 0.04)	MD377775
C	D5-776 (fitted thickness 1.55 ± 0.04)	MD377776

Caution
The thickness of the original cylinder head gasket is selected according to the protrusion amount of the piston. Therefore, if the piston or the connecting rod is replaced, the protrusion amount may be changed. Always select a correct gasket by measuring the protrusion amount. (For details, refer to the Engine Workshop Manual.)

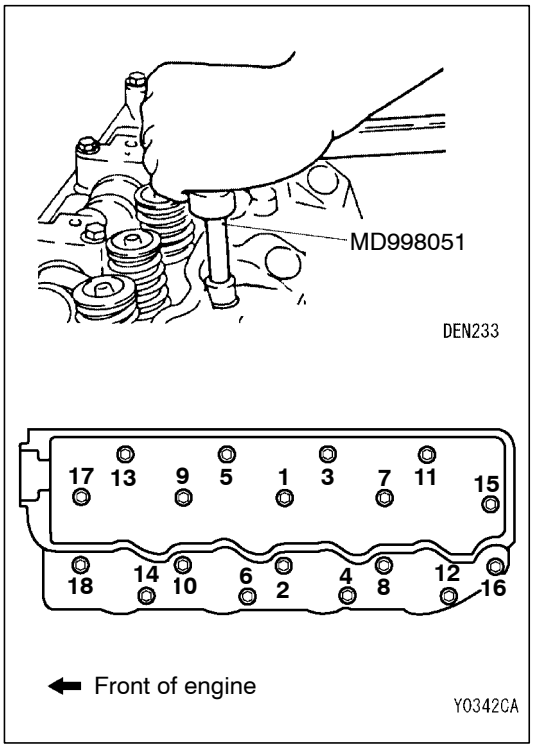
▶B◀ CYLINDER HEAD INSTALLATION

1. Select a cylinder head gasket of correct specification.
2. Clean the cylinder head assembly and the cylinder block mating surfaces with a scraper or a wire brush.

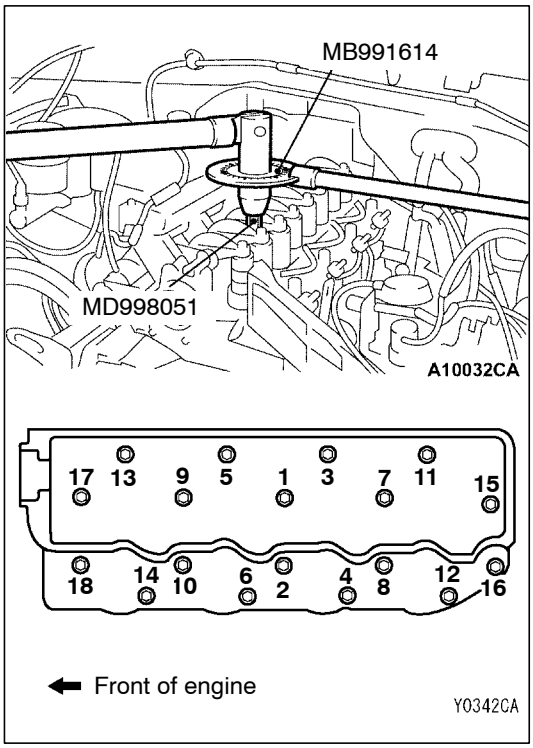
   Caution
   Do not allow foreign material to enter the engine coolant or oil passages and the cylinder.



3. Install the cylinder head bolt washer to the cylinder head bolt so that the washer chamfered side faces as shown.
4. Apply a small amount of engine oil to the cylinder head bolt thread and the washer.



5. Tighten the cylinder head bolts according to the following procedure (angle-tightening procedure.)
   (1) Use the special tool to tighten the cylinder head bolts in the order of the illustrated numbers to 29 ± 2 N·m.



   (2) Place the special tool in a wrench to tighten the cylinder head bolt in the order of the illustrated numbers to 120°.

▶C◀ FUEL INJECTION PIPE INSTALLATION

When tightening the nuts at both ends of the fuel injection pipe, hold the delivery holder (for pump side) and the injection nozzle assembly (for nozzle side) with a wrench, and tighten the nuts to the specified torque.

Tightening torque: 30 ± 6 N·m

▶D◀ RADIATOR UPPER HOSE CONNECTION

To reuse the radiator upper hose, align the mating marks that were made during removal, and then install the hose clamp.