ENGINE

CONTENTS

GENERAL INFORMATION

Items			4G93
Total displacement mℓ			1,834
Bore × Stroke mm			81.0 ×89.0
Compression ratio			12.5
Combustion chamber			Pentroof + ball-in-piston
Camshaft arrangement			DOHC
Number of valve	Intake		8
	Exhaust		8
Valve timing	Intake	Opening	BTDC 15°
		Closing	ABDC 56°
	Exhaust	Opening	BBDC 55°
		Closing	ATDC 15°
Fuel system			Electronically controlled multipoint fuel injection
Rocker arm			Roller type
Auto-lash adjuster			Equipped

SERVICE SPECIFICATIONS

Items			Standard value	Limit
Alternator drive belt tension	Vibration frequency Hz	When checked	151–195	–
		When a used belt is installed	163–185	–
		When a new belt is installed	195–230	–
	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	8.0–10.5	–
		When a used belt is installed	8.5–10.0	–
		When a new belt is installed	7.0–8.0	–
Power steering oil pump 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 mm	When checked	10.0–12.0	–
		When a used belt is installed	10.0–11.0	–
		When a new belt is installed	7.0–9.0	–
Basic ignition timing			5° BTDC ± 3°	–
Ignition timing			Approx. 16°BTDC	–

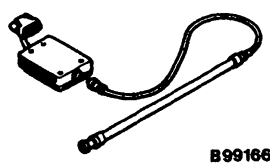
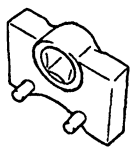
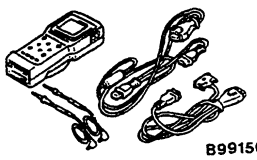
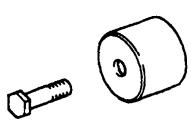
Items		Standard value	Limit
Idle speed r/min	M/T	600 ± 50 – 800 ± 50*	–
	A/T	650 ± 50	–
CO contents %		0.5 or less	–
HC contents ppm		100 or less	–
Compression pressure kPa – r/min		1,569 – 300	1,334 – 300
Compression pressure difference of all cylinder kPa		–	Max. 100
Intake manifold vacuum kPa		–	Min. 37
Cylinder head bolt shank length mm		–	99.4
Timing belt tension torque Nm (Reference value)		2.5	–
Auto-tensioner rod protrusion amount mm		3.8 – 4.5	–

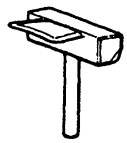
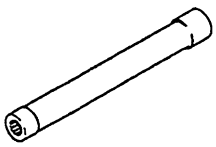
*: Varies depending on the transmission oil temperature. For details, refer to P. 11A-9.

SEALANTS

Items	Specified sealants	Remarks
Oil pan Thermostat case Cam position sensor support	MITSUBISHI GENUINE PART MD970389 or equivalent	Semi-drying sealant

SPECIAL TOOLS

Tool	Number	Name	Use
	MB991668	Belt tension meter set	Measuring the drive belt tension (used together with the MUT-II)
	MD998767	Tension pulley socket wrench	Timing belt tension adjustment
	MB991502	MUT-II sub assembly	• Measuring the drive belt tension • Checking the ignition timing • Checking the idle speed • Erasing diagnosis code
	MD998713	Camshaft oil seal installer	Press-in of the camshaft oil seal

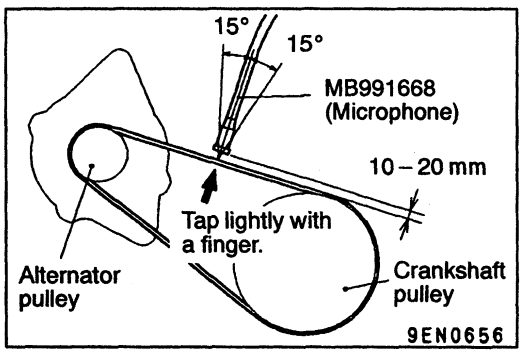
Tool	Number	Name	Use
	MD998727	Oil pan remover	Removal of oil pan
	MB991653	Cylinder head bolt wrench	Cylinder head bolt removal and installation

ON-VEHICLE SERVICE

DRIVE BELT TENSION CHECK AND ADJUSTMENT

ALTERNATOR DRIVE BELT TENSION CHECK

Check the drive belt tension by the following procedure.

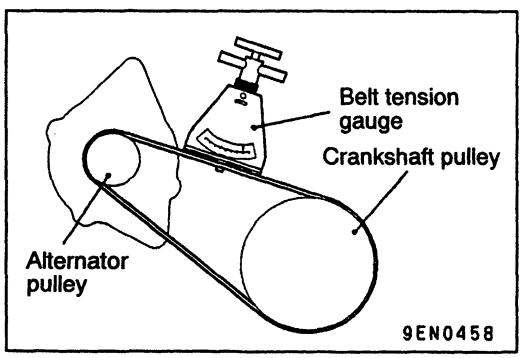


<When using the MUT-II>

1. Connect the special tool (belt tension meter kit) to the MUT-II.
2. Connect the MUT-II to the diagnosis connector.
3. Turn the ignition switch to ON and select "Belt Tension Measurement" from the menu screen.
4. Hold the microphone to the middle of the drive belt between the pulleys (at the place indicated by the arrow), about 10 – 20 mm away from the rear surface of the belt and so that it is perpendicular to the belt (within an angle of ± 15°).
5. Gently tap the middle of the belt between the pulleys (the place indicated by the arrow) with your finger as shown in the illustration, and check that the vibration frequency of the belt is within the standard value.

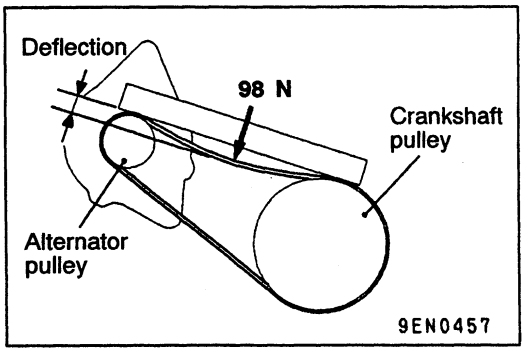
Caution

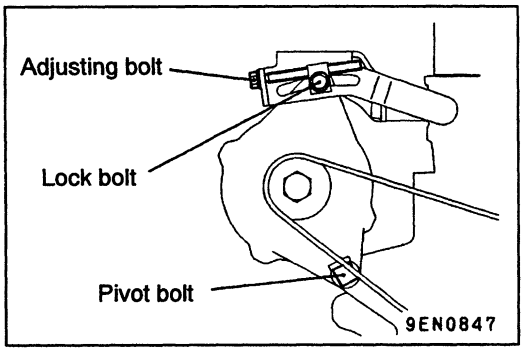
(1) The temperature of the surface of the belt should be as close as possible to normal temperature.
(2) Do not let any contaminants such as water or oil get onto the microphone.
(3) If strong gusts of wind blow against the microphone or if there are any loud sources of noise nearby, the values measured by the microphone may not correspond to actual values.
(4) If the microphone is touching the belt while the measurement is being made, the values measured by the microphone may not correspond to actual values.
(5) Do not take the measurement while the vehicle's engine is running.



<When using a tension gauge>

Use a belt tension gauge to check that the belt tension is within the standard value.





<Belt deflection check>

Apply 98 N of force to the middle of the drive belt between the pulleys (at the place indicated by the arrow) and check that the amount of deflection is within the standard value.

Standard value:

Vibration frequency Hz	151 – 195
Tension N	294 – 490
Deflection (Reference value) mm	8.0 – 10.5

ALTERNATOR DRIVE BELT TENSION ADJUSTMENT

1. Loosen the nut of the alternator pivot bolt.
2. Loosen the lock bolt.
3. Use the adjusting bolt to adjust the belt tension and belt deflection to the standard values.

   Standard value:

Items	When a used belt is installed	When a new belt is installed
Vibration frequency Hz	163 – 185	195 – 230
Tension N	343 – 441	490 – 686
Deflection (Reference value) mm	8.5 – 10.0	7.0 – 8.0

   NOTE
   Refer to P.11A-5 concerning the measurement procedure of the alternator drive belt tension.

4. Tighten the nut of the alternator pivot bolt.

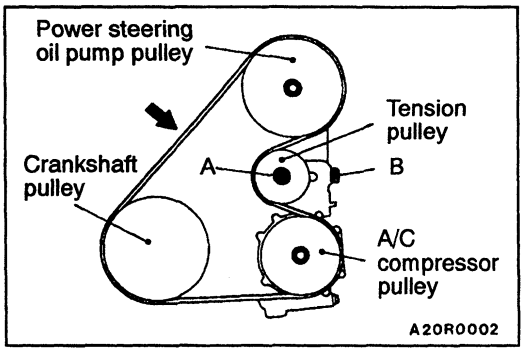
   Tightening torque: 44 Nm

5. Tighten the lock bolt.

   Tightening torque: 22 Nm

6. Tighten the adjusting bolt.

   Tightening torque: 10 Nm



POWER STEERING OIL PUMP AND AIR CONDITIONER COMPRESSOR DRIVE BELT TENSION CHECK AND ADJUSTMENT

1. Check the drive belt tension by the following procedure.

<When using the MUT-II>

Gently tap the middle of the belt between the pulleys (the place indicated by the arrow) with your finger as shown in the illustration, and check that the vibration frequency of the belt is within the standard value range.

NOTE
Refer to P.11A-5 for details on the method of measuring the vibration frequency using the MUT-II.

<When using a tension gauge>

Use a belt tension gauge to check that the belt tension is within the standard value.

<Belt deflection check>

Apply 98 N of force to the middle of the drive belt between the pulleys (at the place indicated by the arrow) and check that the amount of deflection is within the standard value.

Standard value:

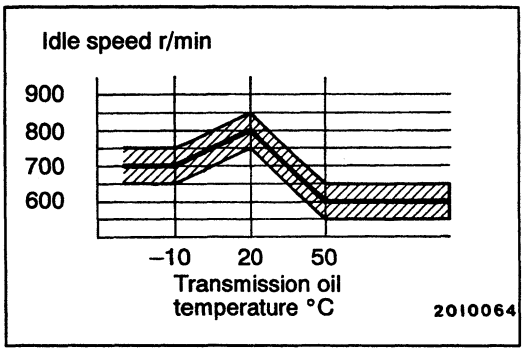
Items	When checked	When a used belt is installed	When a new belt is installed
Vibration frequency Hz	114 – 139	121 – 133	145 – 166
Tension N	392–588	441–539	637–833
Deflection mm	10.0–12.0	10.0–11.0	7.0–9.0

2. If outside the standard value, adjust by the following procedure.
   (1) Loosen the tensioner pulley fixing bolt A.
   (2) Adjust the amount of belt deflection using adjusting bolt B.
   (3) Tighten the fixing bolt A

   Tightening torque: 25 Nm

   (4) Check the belt deflection amount and tension, and readjust if necessary.

   Caution
   Check after turning the crankshaft once or more clockwise (right turn).



IGNITION TIMING CHECK

1. Before inspection, set the vehicle to the pre-inspection condition.
2. Connect the MUT-II to the diagnosis connector.
3. Set up a timing light.
4. Start the engine and run at idle.
5. Check that engine idle speed is within the standard value.

   Standard value:

Items	Idle speed r/min
M/T	600±50 – 800±50*
A/T	650±50

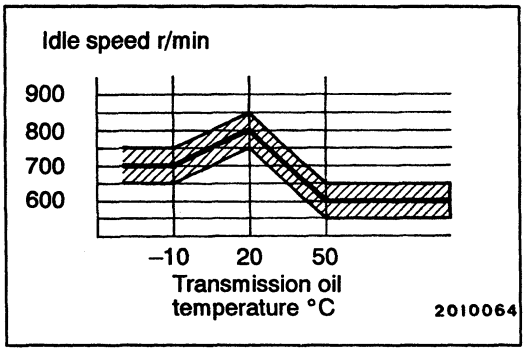
   NOTE
   (1) *: The idle speed in vehicles with manual transmission varies as shown in the table above in accordance with the transmission oil temperature.
   (2) After 4 minutes or more have passed in the idle running condition, the idle speed will become 750 r/min.
6. Select No.17 of the MUT-II Actuator test.

   NOTE
   At this time, the engine speed will become approximately 750 r/min.
7. Check that basic ignition timing is within the standard value.

   Standard value: 5° BTDC±3°
8. If the basic ignition timing is outside the standard value, inspect the GDI system while referring to GROUP 13J – Troubleshooting.
9. Press the MUT-II clear key (Select a forced driving cancel mode) to release the Actuator test.

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

    Standard value: approx. 6°BTDC



IDLE SPEED CHECK

1. Before inspection, set the vehicle to the pre-inspection condition.
2. Connect the MUT-II to the diagnosis connector.
3. Check the basic ignition timing.

   NOTE
   Refer to P.11A-8 concerning the check procedure of the basic ignition timing.

   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.

   Standard value:

Items	Idle speed r/min
M/T	600±50 – 800±50*
A/T	650±50

   NOTE
   (1) *: The idle speed in vehicles with manual transmission varies as shown in the table above in accordance with the transmission oil temperature.
   (2) After 4 minutes or more have passed in the idle running condition, the idle speed will become 750 r/min.
   (3) The idle speed is controlled automatically adjusted by the idle speed control (ISC) system.
6. If the idle speed is outside the standard value, inspect the GDI components by referring to GROUP 13J – Troubleshooting.

IDLE MIXTURE CHECK

1. Before inspection, set the vehicle to the pre-inspection condition.
2. Connect the MUT-II to the diagnosis connector.
3. Check that the basic ignition timing is within the standard value.

   NOTE
   Refer to P.11A-8 concerning the check procedure of the basic ignition timing.

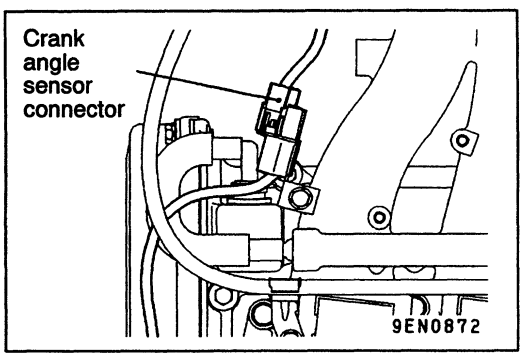
   Standard value: 5° BTDC±3°
4. Run the engine at 2,500 r/min for 2 minutes.
5. Set the CO, HC tester.
6. Check the CO contents and the HC contents at idle.

   NOTE
   This measurement should be performed in less than approximately 4 minutes since the engine speed become the idle speed.

   Standard value
   CO contents: 0.5% or less
   HC contents: 100 ppm or less

7. If there is a deviation from the standard value, check the following items:
   - Diagnosis output
   - Fuel pressure
   - Injector
   - Ignition coil, spark plug
   - Leak in the EGR system and in the EGR control servo
   - Evaporative emission control system
   - Compression pressure

   NOTE
   Replace the three way catalyst when the CO and HC contents are not within the standard value, even though the result of the inspection is normal on all items.

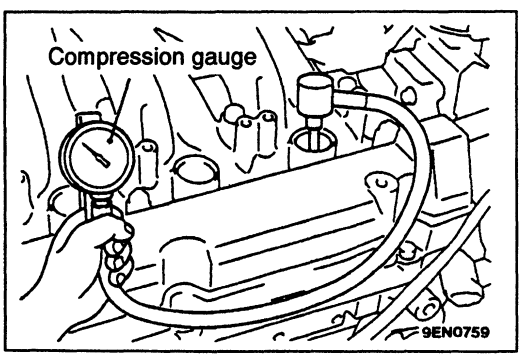


COMPRESSION PRESSURE CHECK

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 ignition coils and 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 300 r/min):
   1,569 kPa

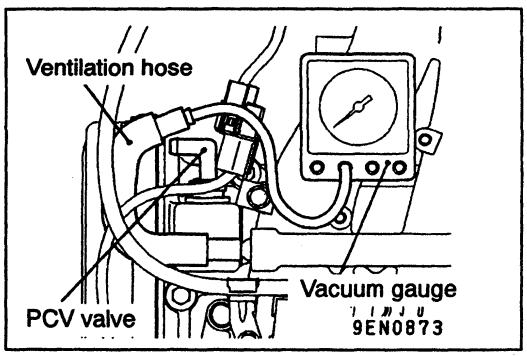
   Limit (at engine speed of 300 r/min):
   Min. 1,334 kPa

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

   Limit: Max. 100 kPa

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 6 and 7.
   (1) If the compression increases after oil is added, the cause of the malfunction is a worn or damaged piston ring and/or cylinder inner surface.
   (2) If the compression does not rise after oil is added, the cause is a burnt or defective valve seat, or pressure is leaking from the gasket.
9. Connect the crank angle sensor connector.
10. Install the spark plugs and ignition coils.
11. Use the MUT-II to erase the diagnosis codes.

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



MANIFOLD VACUUM CHECK

1. Before inspection, set the vehicle to the pre-inspection condition.
2. Connect the MUT-II to the diagnosis connector.
3. Disconnect the ventilation hose from the positive crankcase ventilation (PCV) valve, and then connect a vacuum gauge to the ventilation hose.
4. Check that the idle speed is approximately 600 r/min <M/T> or approximately 650 r/min <A/T>.
5. Check the intake manifold negative pressure while the engine is idling.

   Limit: Min. 37 kPa

LASH ADJUSTER CHECK

If an abnormal noise (knocking) that seems to be coming from the lash adjuster is heard after starting the engine and does not stop, carry out the following check.

NOTE
(1) The abnormal noise which is caused by a problem with the lash adjusters is generated after the engine is started, and will vary according to the engine speed. However, this noise is not related to the actual engine load.
Because of this, if the noise does not occur immediately after the engine is started, if it does not change in accordance with the engine speed, or if it changes in accordance with the engine load, the source of the noise is not the lash adjusters.
(2) If there is a problem with the lash adjusters, the noise will almost never disappear, even if the engine has been run at idle to let it warm up.
The only case where the noise might disappear is if the oil in the engine has not been looked after properly and oil sludge has caused the lash adjusters to stick.

1. Start the engine.
2. Check that the noise occurs immediately after the engine is started, and that the noise changes in accordance with changes in the engine speed.
If the noise does not occur immediately after the engine is started, or if it does not change in accordance with the engine speed, the problem is not being caused y the lash adjusters, so check for some other cause of the problem. Moreover, if the noise does not change in accordance with the engine speed, the cause of the problem is probably not with the engine. (In these cases, the lash adjusters are normal.)
3. While the engine is idling, check that the noise level does not change when the engine load is varied (for example, by shifting from N → D).
If the noise level changes, the cause of the noise is probably parts striking because of worn crankshaft bearings or connecting rod bearings. (In such cases, the lash adjusters are normal.)
4. After the engine has warmed up, run it at idle and check if any noise can be heard.
If the noise has become smaller or has disappeared, the cause of the noise was probably that oil sludge had caused the lash adjusters to become stuck. If this happens, carry out the following check. If the noise level does not change, go to step 5.
(1) Let the engine cool down sufficiently.
(2) Turn the crankshaft two full revolutions.

(3) Carry out lash adjuster simple check. (Refer to P.11A-14.)
- If any of the rocker arms can be pushed down easily during the lash adjuster simple check, replace the corresponding lash adjusters.
- If the lash adjuster simple check has been carried out but all lash adjusters are normal (if none of the rocker arms could be pushed down easily), check for some other cause of the problem.

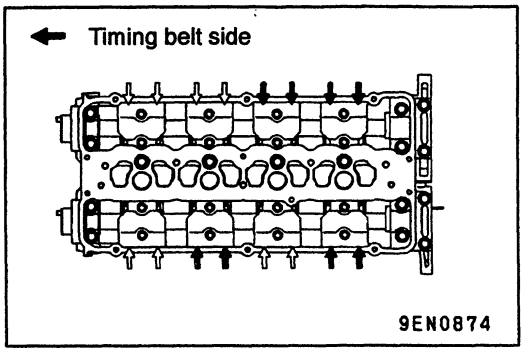
NOTE
You can check whether the lash adjusters are normal or not by carrying out a leak-down test. (Refer to the Engine Workshop Manual.)

Caution
Make sure that the air has been fully bled before installation of a new lash adjuster. (Refer to the Engine Workshop Manual.)

5. Bleed the air from the lash adjusters. (Refer to P.11A-14.)
6. If the noise does not disappear even after the air has been bled from the lash adjusters, carry out the following check.
   Carry out lash adjuster simple check. (Refer to P.11A-14.)
   - If one of the rocker arms can be pushed down easily during the lash adjuster simple check, replace the corresponding lash adjuster.
   - If two or more of the rocker arms can be pushed down easily during the lash adjuster simple check, the cause may be that the oil passage to the cylinder head is blocked.
     Check for blockages in the oil passage, and clear the blockages if any are found. If there are no blockages, replace the lash adjusters.
   - If the lash adjuster simple check has been carried out but all lash adjusters are normal (if none of the rocker arms could be pushed down easily), check for some other cause of the problem.

   NOTE
   You can check whether the lash adjusters are normal or not by carrying out a leak-down test. (Refer to the Engine Workshop Manual.)

   Caution
   Make sure that the air has been fully bled before installation of a new lash adjuster. (Refer to the Engine Workshop Manual.)
7. Start the engine and check that the abnormal noise has disappeared. If necessary, bleed the air from the lash adjusters. (Refer to P.11A-14.)

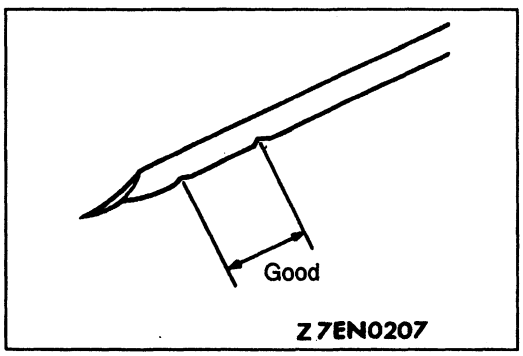


<LASH ADJUSTER SIMPLE CHECK>

1. Stop the engine.
2. Remove the rocker cover.
3. Set the No.1 cylinder to the compression top dead centre position.
4. Check the rocker arms indicated by white arrows in the illustration by the procedures given below.
   Check whether the rocker arm moves downwards when the part of the rocker arm which touches the top of the lash adjuster is pushed.
   - If the rocker arm moves down easily when it is pushed, make a note of which is the corresponding lash adjuster.
   - If the rocker arm feels extremely stiff when it is pushed and does not move down, the lash adjuster is normal, so check for some other cause of the problem.
5. Slowly turn the crankshaft 360° in the clockwise direction.
6. Check the rocker arms indicated by black arrows in the illustration in the same way as explained in step 4.

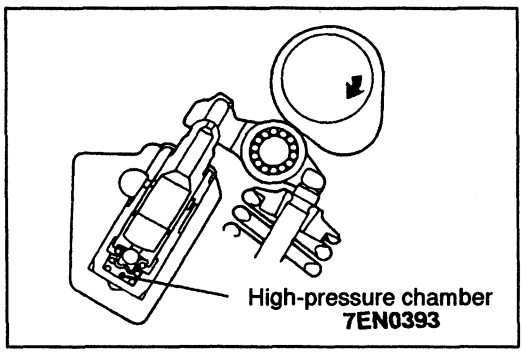
<LASH ADJUSTER AIR BLEEDING>

NOTE
(1) If the vehicle is parked on a slope for a long period of time, the amount of oil inside the lash adjuster will decrease, and air may get into the high pressure chamber when starting the engine.
(2) After parking the vehicle for long periods, the oil drains out of the oil passage, and it takes time for the oil to be supplied to the lash adjuster, so air can get into the high pressure chamber.
(3) If either of the above situations occur, the abnormal noise can be eliminated by bleeding the air from inside the lash adjusters.

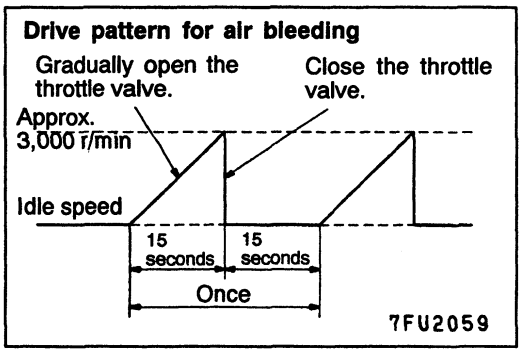


1. Check the engine oil and replenish or replace the oil if necessary.

NOTE
(1) If there is a only small amount of oil, air will be drawn in through the oil screen and will get into the oil passage.
(2) If the amount of oil is greater than normal, then the oil will being mixed by the crankshaft and a large amount of air may get mixed into the oil.
(3) If the oil is degenerated, air and oil will not separate easily in oil, and the amount of air mixed into the oil will increase.



(4) If the air which has been mixed in with the oil due to any of the above reasons gets into the high pressure chamber of the lash adjuster, the air inside the high pressure chamber will be compressed when the valve is open and the lash adjuster will over-compress, resulting in abnormal noise when the valve closes. This is the same effect as if the valve clearance is adjusted to be too large by mistake. If the air inside the lash adjusters is then released, the operation of the lash adjusters will return to normal.

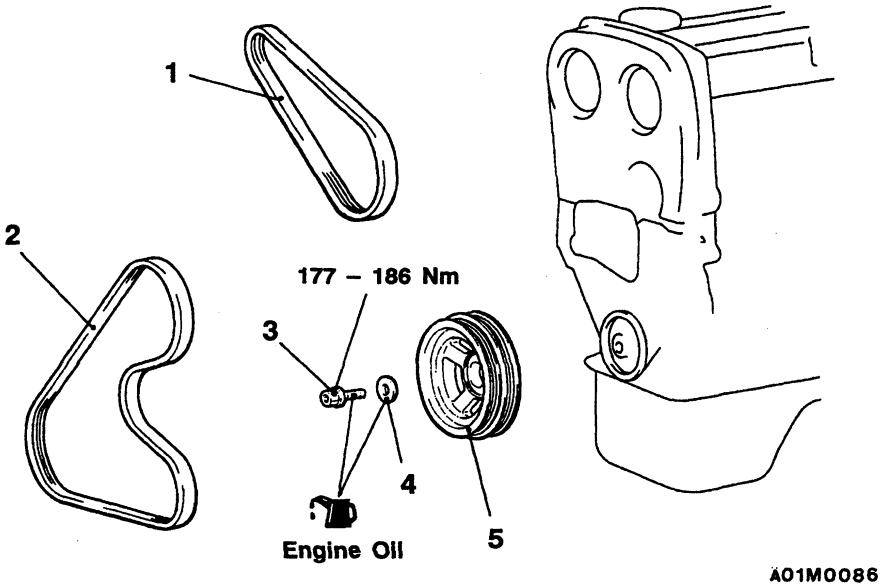


2. Run the engine at idle for 1 – 3 minutes to let it warm up.
3. With no load on the engine, repeat the drive pattern shown in the illustration at left and check if the abnormal noise disappears. (The noise should normally disappear after 10 – 30 repetitions, but if there is no change in the noise level after 30 repetitions or more, the problem is probably not due to air inside the lash adjusters.)
4. After the noise has disappeared, repeat the drive pattern shown in the illustration at left a further 5 times.
5. Run the engine at idle for 1 – 3 minutes and check that the noise has disappeared.

CRANKSHAFT PULLEY

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Under Cover (R.H.) Removal and Installation



Removal steps
- Drive belt tension adjustment

1. Drive belt (Power steering and A/C)
2. Drive belt (Alternator)

◀A▶ ▶A◀ 3. Crankshaft pulley bolt

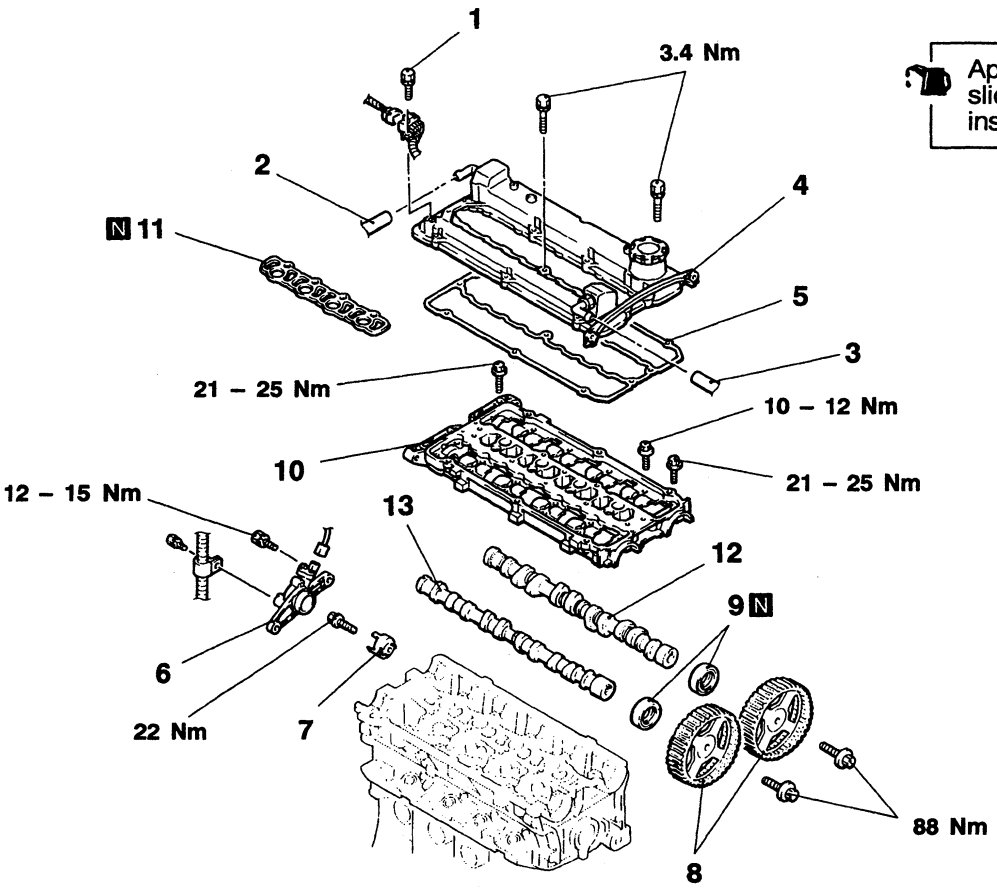
4. Crankshaft pulley washer
5. Crankshaft pulley

NOTE
Removal and installation service points are the same as before.

CAMSHAFT AND CAMSHAFT OIL SEAL

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Air Intake Hose Removal and Installation
- Timing Belt Removal and Installation
- Engine Coolant Draining and Supplying
- Intake Manifold Removal and Installation (Refer to GROUP 15.)
- Fuel Pump Removal and Installation
- Drive Belt Tension Adjustment

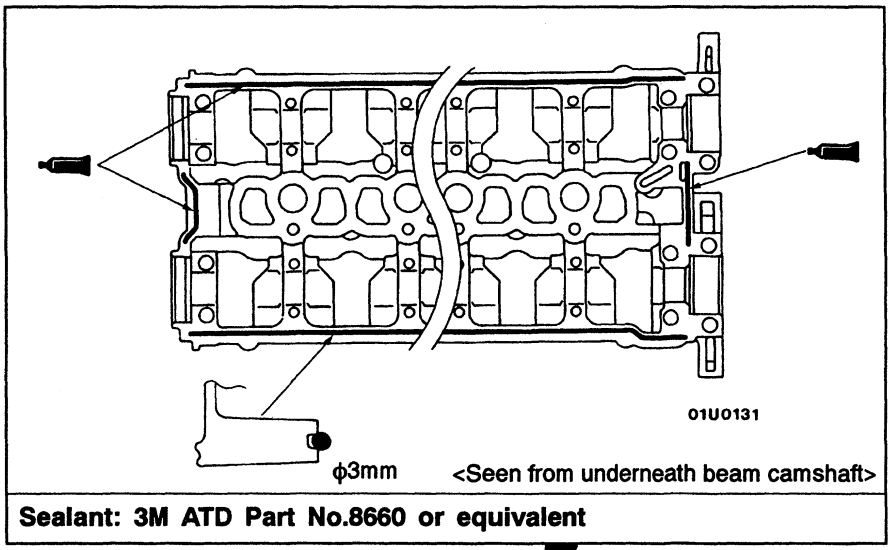


Removal steps

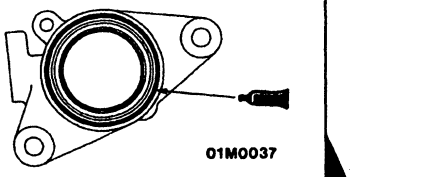
1. Connector bracket mounting bolt (Injector harness)
2. Breather hose connection
3. PCV hose connection
4. Rocker cover
5. Rocker cover gasket
6. Cam position sensor support
7. Cam position sensing cylinder
◀A▶ ▶D◀ 8. Camshaft sprocket
▶C◀ 9. Camshaft oil seal
▶B◀ 10. Beam camshaft cap
11. Beam camshaft cap gasket
▶A◀ 12. Camshaft (exhaust side)
▶A◀ 13. Camshaft (intake side)

NOTE
Removal and installation service points which are not listed in this manual are the same as before.

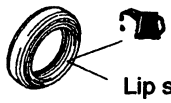
Lubrication points



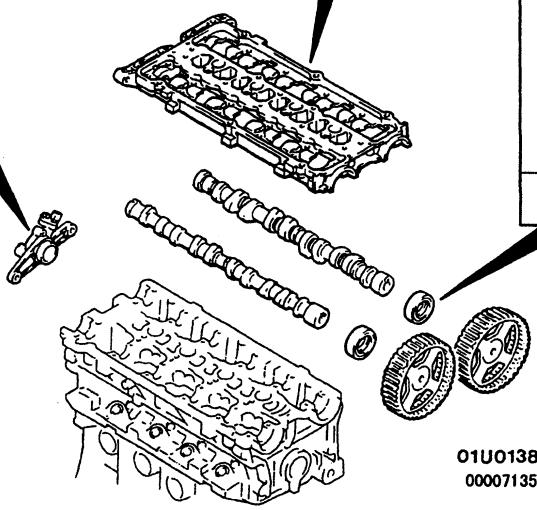
Sealant: 3M ATD Part No.8660 or equivalent

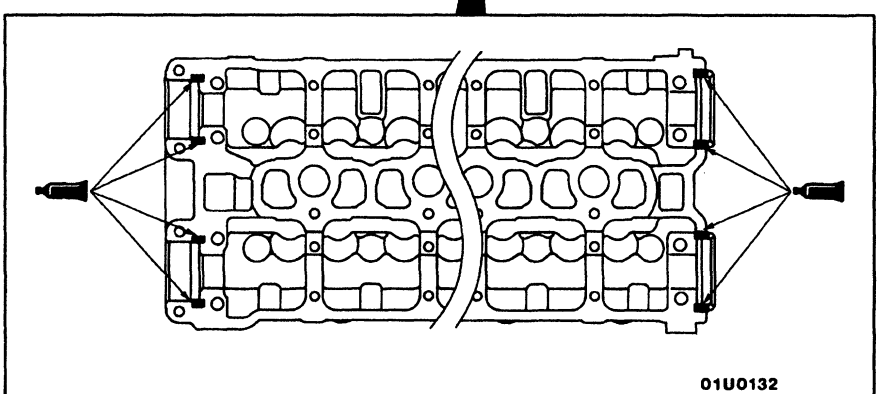


Sealant:
MITSUBISHI GENUINE PART
MD970389 or equivalent

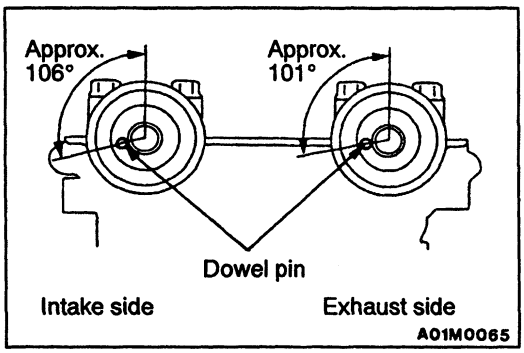


Engine oil





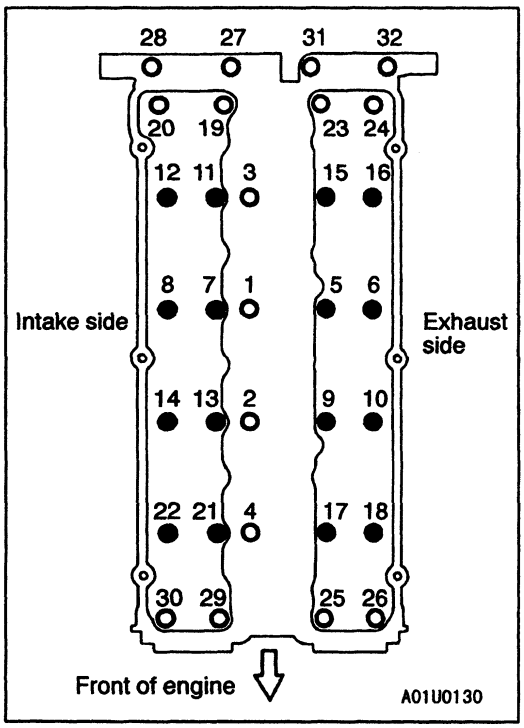
Sealant: 3M ATD Part No.8660 or equivalent



INSTALLATION SERVICE POINTS

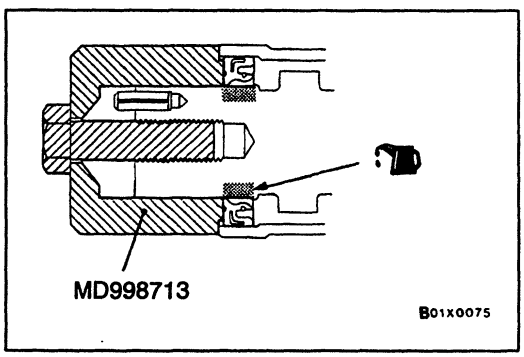
▶B◀ BEAM CAMSHAFT CAP INSTALLATION

1. Place the camshaft dowel pin as shown in the illustration.



2. Tighten the beam camshaft cap mounting bolts to the specified torque in the order shown in the illustration.

Tightening torque:
- ● : **10 – 12 Nm**
- ○ : **21 – 25 Nm**



▶C◀ CAMSHAFT OIL SEAL INSTALLATION

1. Apply engine oil to the entire circumference of the oil seal lip.
2. Press-fit the oil seal as shown in the illustration.

▶D◀ CAMSHAFT SPROCKET INSTALLATION

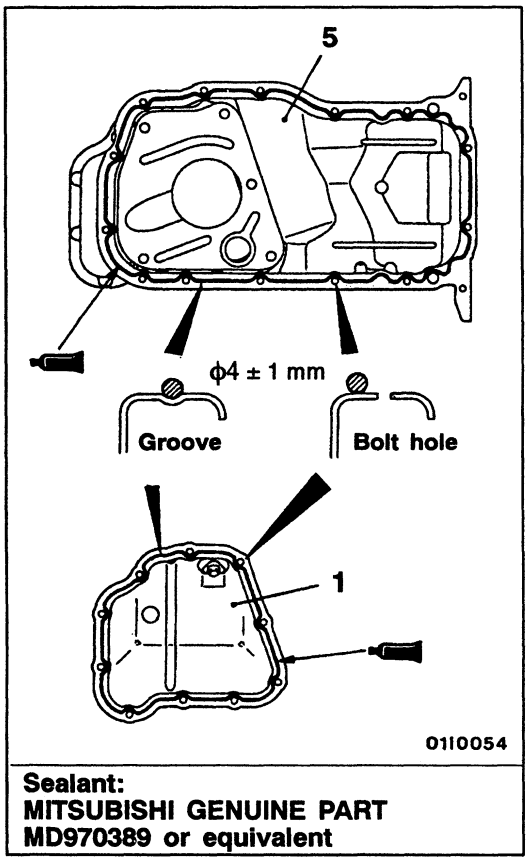
Use the special tool to secure the camshaft sprocket in the same way as during removal, and then tighten the bolt to the specified torque.

Tightening torque: 88 Nm

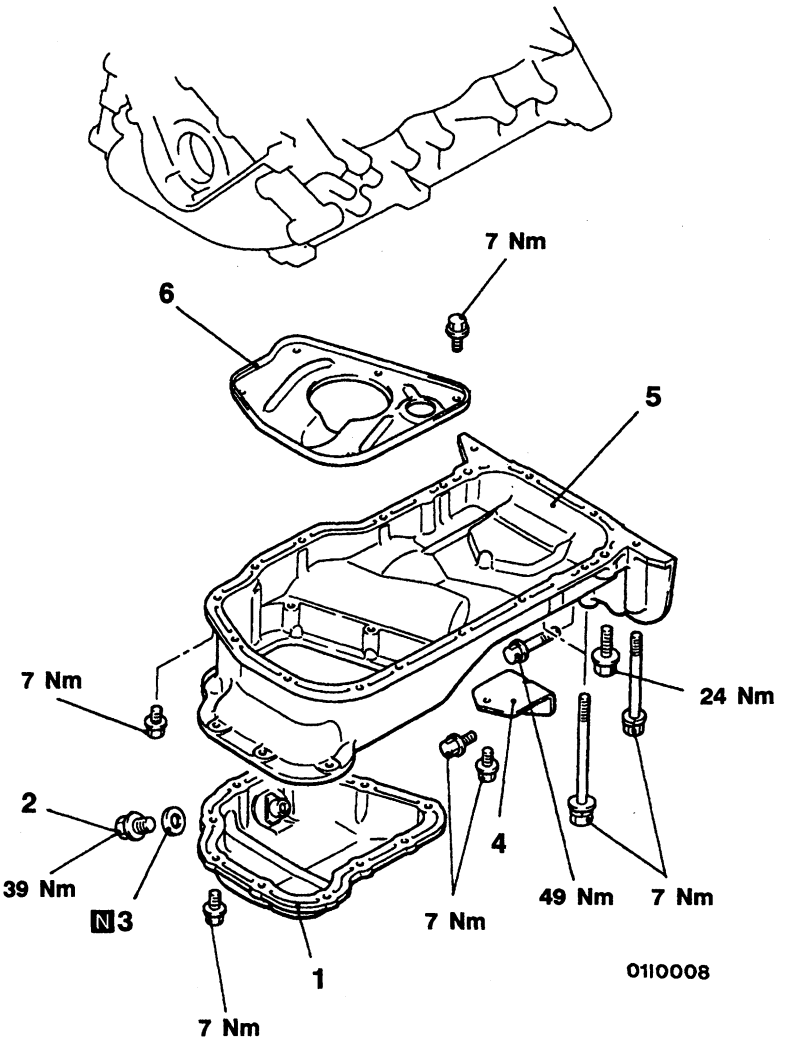
OIL PAN

REMOVAL AND INSTALLATION

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



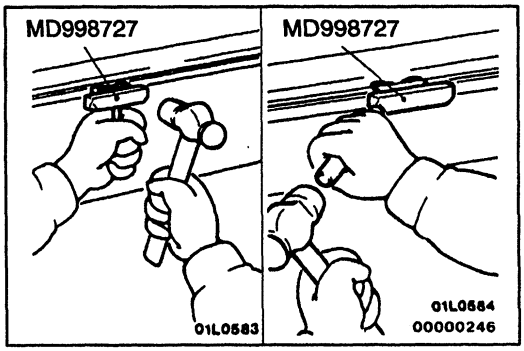
Sealant:
MITSUBISHI GENUINE PART
MD970389 or equivalent



Removal steps

◀A▶ 1. Lower oil pan
2. Drain plug
▶A◀ 3. Gasket
4. Cover
◀B▶ 5. Upper oil pan
6. Baffle plate

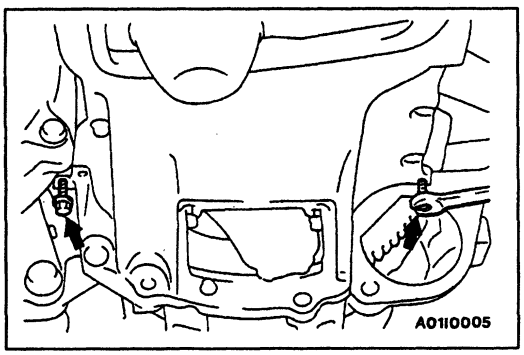
NOTE
Removal and installation service points which are not listed in this manual are the same as before.



REMOVAL SERVICE POINTS

◀A▶ LOWER OIL PAN REMOVAL

Caution
Do not bend the flange of the lower oil pan or damage the upper oil pan.



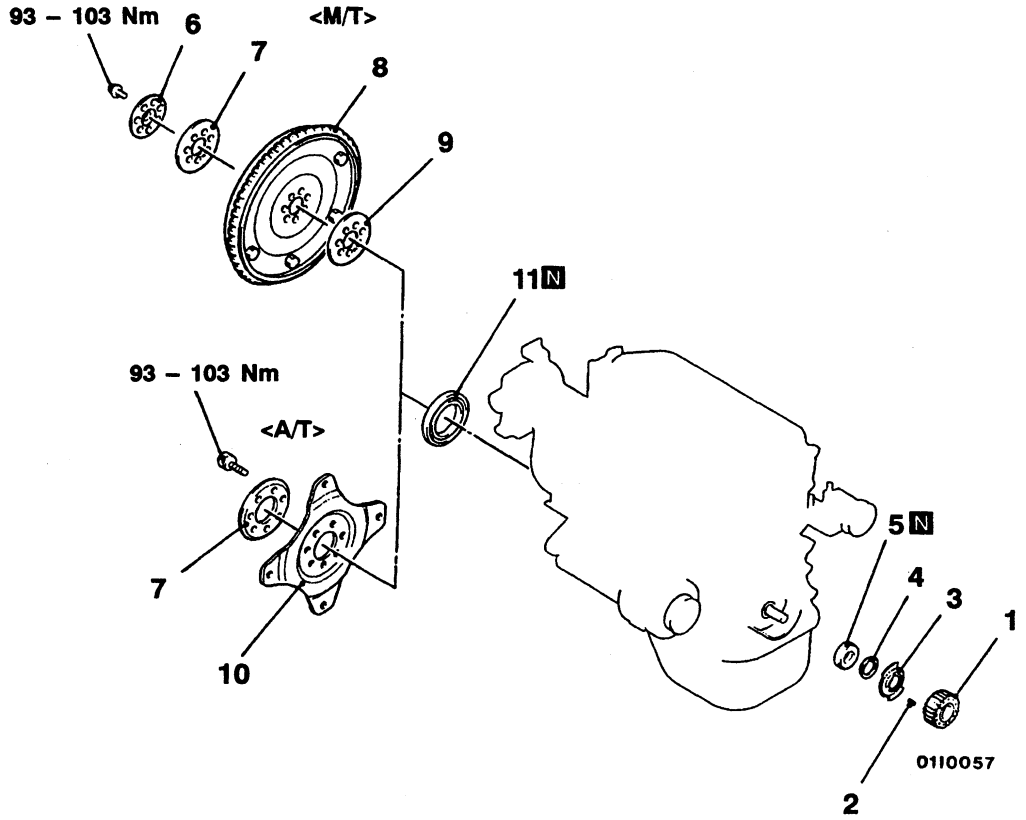
◀B▶ UPPER OIL PAN REMOVAL

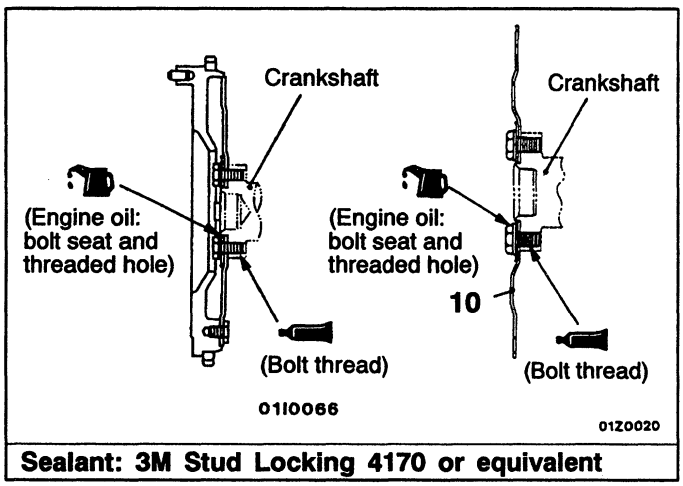
After removing all of the mounting bolts, screw the bolts into the places shown in the illustration and then remove the upper oil pan.

Caution
Because the upper oil pan used is made from aluminium, the oil pan remover (MB998727) should not be used.

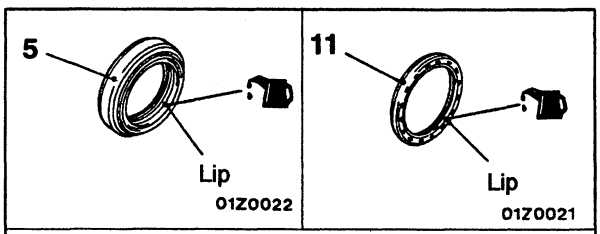
CRANKSHAFT OIL SEAL

REMOVAL AND INSTALLATION





Sealant: 3M Stud Locking 4170 or equivalent



Engine oil

00005845

Crankshaft front oil seal removal steps

- Timing belt (refer to 11A-27.)
- Crank angle sensor

1. Crankshaft sprocket
2. Key
3. Crankshaft sensing blade
4. Crankshaft spacer
5. Crankshaft front oil seal

Crankshaft rear oil seal removal steps

- Transmission assembly
- Clutch cover, disc <M/T>

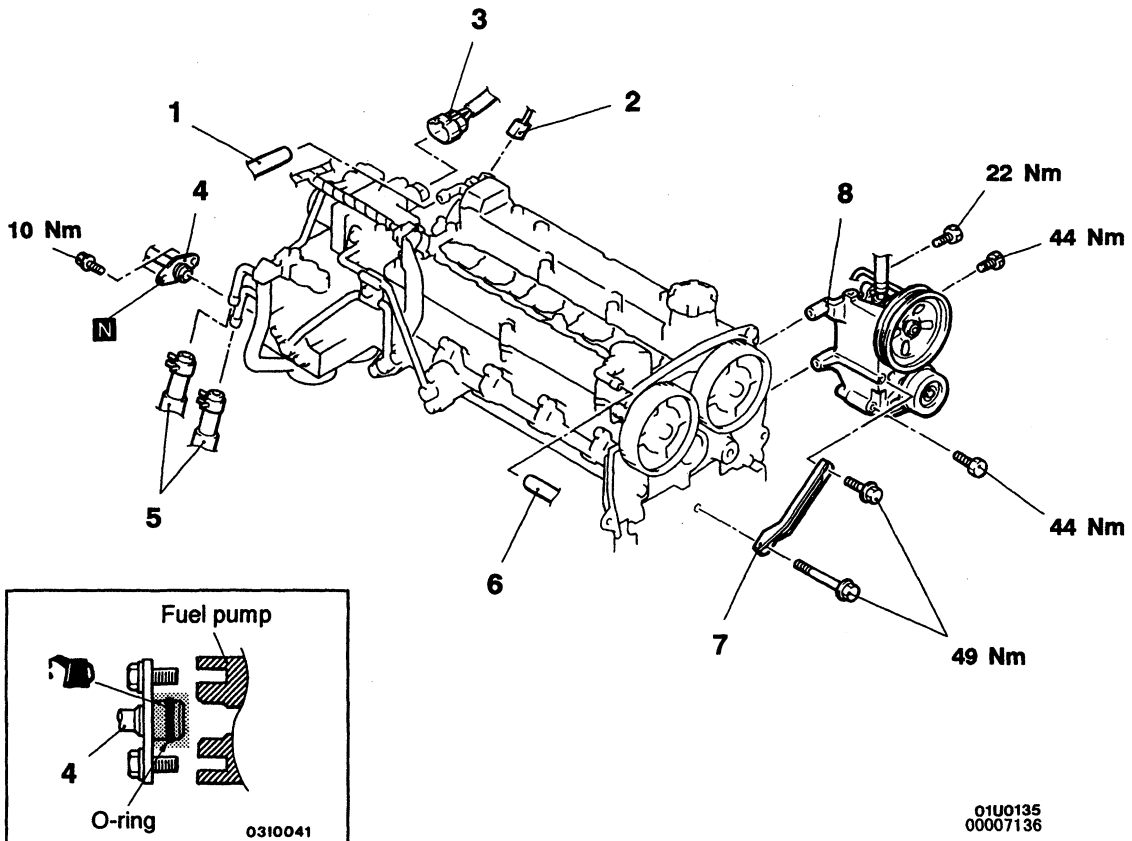
◀B▶ ▶B◀ 6. Plate <M/T>
◀B▶ ▶B◀ 7. Adapter plate
◀B▶ ▶B◀ 8. Flywheel assembly <M/T>
◀B▶ ▶B◀ 9. Adapter plate <M/T>
◀B▶ ▶B◀ 10. Drive plate <A/T>
▶A◀ 11. Crankshaft rear oil seal

NOTE
Removal and installation service points are the same as before.

CYLINDER HEAD GASKET

REMOVAL AND INSTALLATION

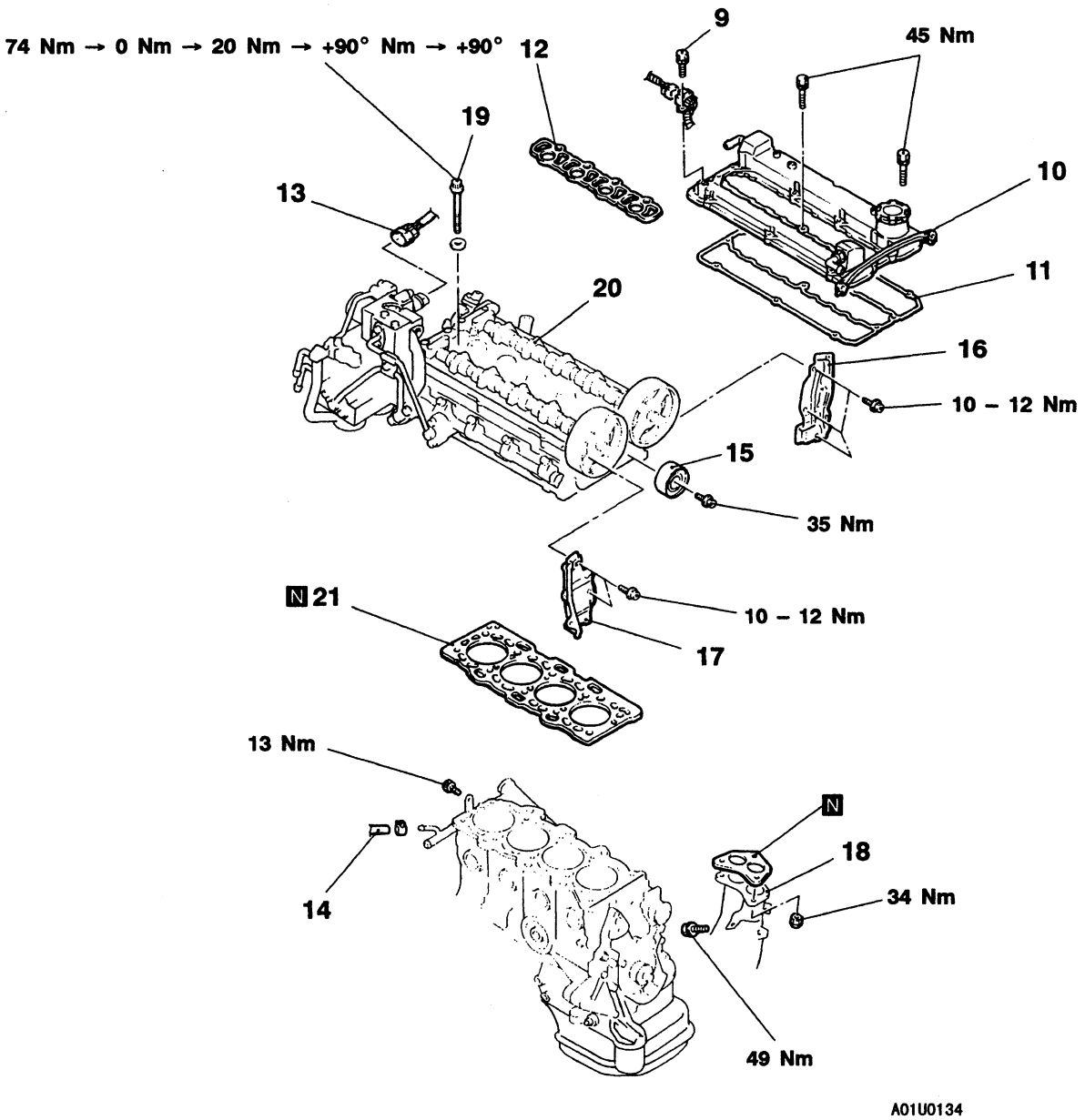
Pre-removal and Post-installation Operation
- Prevention of fuel discharge <before removal only>
- Engine Coolant Draining and Supplying
- Engine Oil Draining and Supplying
- Air Intake Hose Assembly Removal and Installation
- Engine Cover Removal and Installation
- Thermostat Case Assembly Removal and Installation
- Intake Manifold Removal and Installation (Refer to GROUP 15.)
- EGR Pipe Removal and Installation
- Timing Belt Removal and Installation
- Drive Belt Tension Adjustment



Engine oil

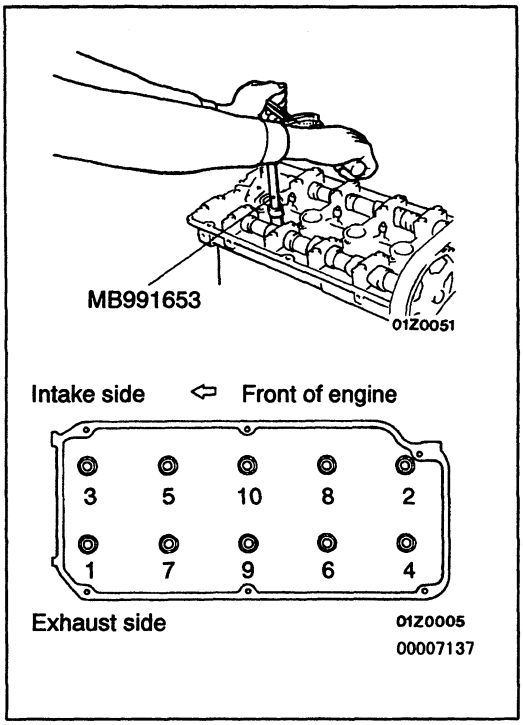
Removal steps

1. Breather hose connection
2. Cam position sensor connector
3. Fuel pump connector
- ▶C◀ 4. High-pressure fuel hose
5. Fuel return hose
- ◀A▶ 6. PCV hose connection
7. Power steering oil pump bracket stay
8. Power steering oil pump bracket assembly



9. Connector bracket mounting bolt (injector harness)
10. Rocker cover
11. Rocker cover gasket
12. Beam camshaft cap gasket
13. Engine coolant temperature sensor connector
14. Water hose connection
15. Idler pulley
16. Timing belt rear left cover
17. Timing belt rear right cover
18. Front exhaust pipe connection
◀B▶ ▶B◀ 19. Cylinder head bolt
20. Cylinder head assembly
▶A◀ 21. Cylinder head gasket

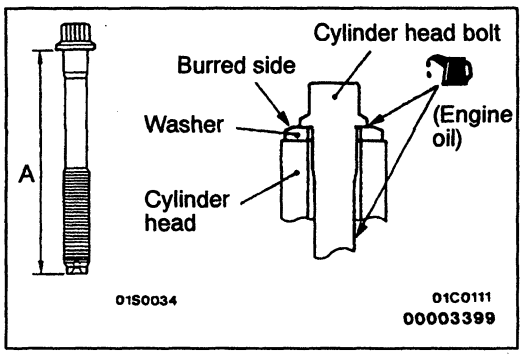
NOTE
Removal and installation service points which are not listed in this manual are the same as before.



REMOVAL SERVICE POINT

◀B▶ CYLINDER HEAD BOLT REMOVAL

Use the special tool to loosen the bolts in two or three stages in the order of the numbers shown in the illustration, and then remove the bolts.



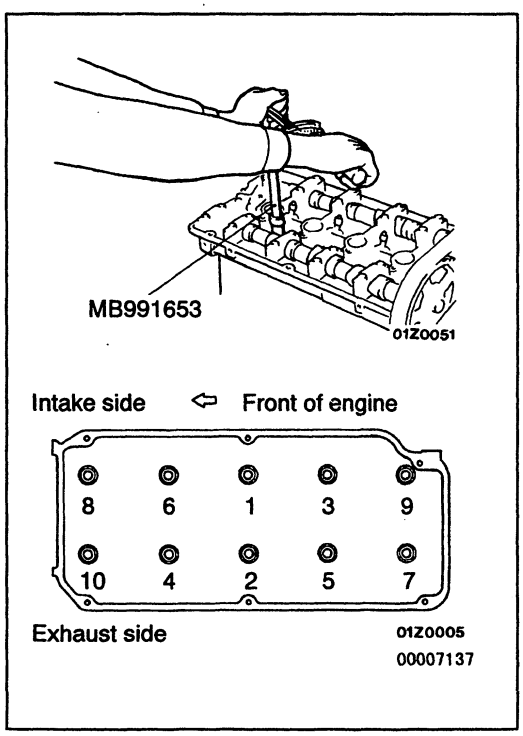
INSTALLATION SERVICE POINT

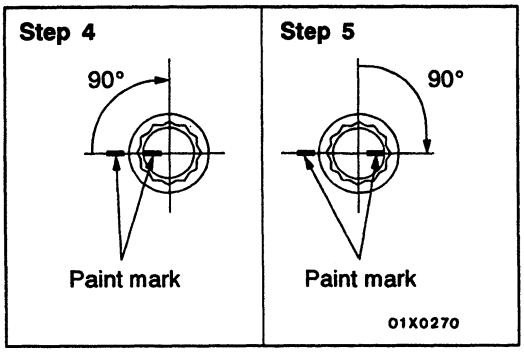
▶B◀ CYLINDER HEAD BOLT INSTALLATION

1. Check that the shank length of the cylinder head bolts are at or below the limit value. If the lengths are above the limit value, replace the bolts with new ones.

   Limit (A): 96.4 mm

2. Install the cylinder head bolt washers so that the burrs caused by tapping the washers are facing upwards.
3. Apply a small amount of engine oil to the threads of the cylinder head bolts and to the washers.
4. Use the special tool to tighten the bolts by the following procedure (over the plastic region).
   (1) Tighten the bolts to 74 Nm in the order shown in the illustration.
   (2) Fully loosen the bolts in the reverse order to the order shown in the illustration.
   (3) Tighten the bolts to 20 Nm in the order shown in the illustration.





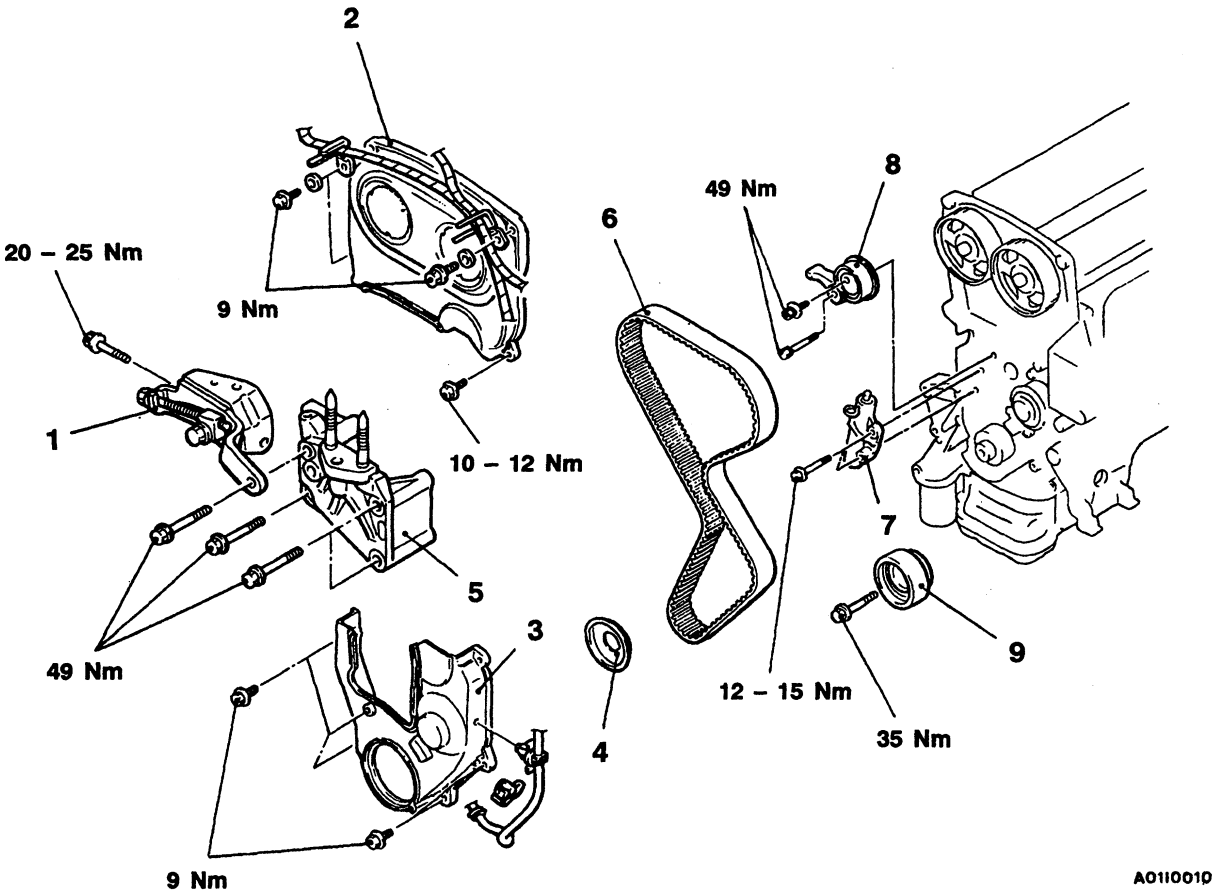
(4) Make paint marks on the heads of the cylinder head bolts and on the cylinder head, and then tighten the bolts a further 90° in the order shown in the illustration.
(5) Tighten the bolts 90° in the order shown in the illustration and check that the paint marks on the bolt heads are in a straight line with the paint marks on the cylinder head.

Caution
(1) If the tightening angle for any bolt is less than 90°, that bolt will not be sufficiently tight.
(2) If it is more than 90°, remove all of the bolts and repeat the procedure from step (1).

TIMING BELT

REMOVAL AND INSTALLATION

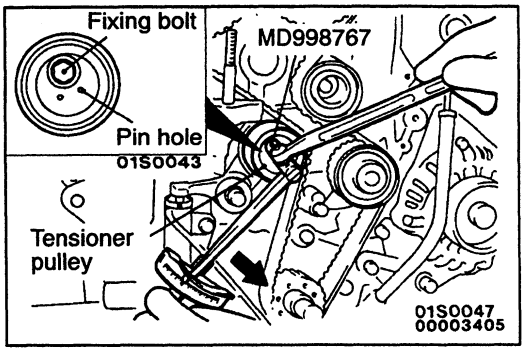
Pre-removal and Post-installation Operation
- Under Cover Removal and Installation
- Crankshaft Pulley Removal and Installation
- Drive Belt Tension Adjustment

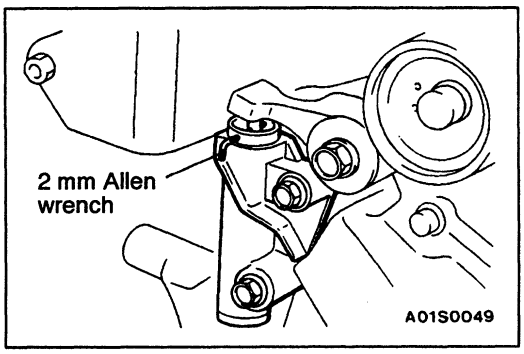


Removal steps

1. Alternator brace
2. Timing belt front upper cover
3. Timing belt front lower cover
4. Front flange
5. Engine support bracket
   - ▶C◀ ▶B◀ Timing belt tension adjustment
6. ◀A▶ Timing belt
7. ▶A◀ Auto tensioner
8. Tensioner pulley and arm assembly
9. Idler pulley

NOTE
Removal and installation service points are the same as before.





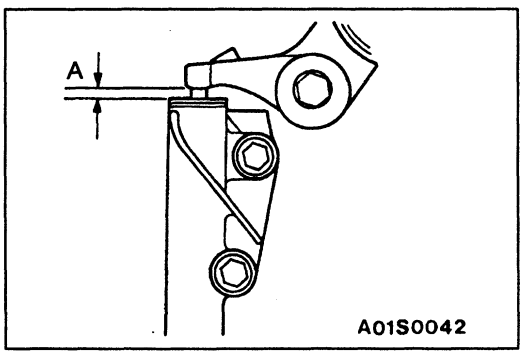
INSTALLATION SERVICE POINT

▶C◀ TIMING BELT TENSION ADJUSTMENT

1. After turning the crankshaft a 1/4 turn anti-clockwise, turn it clockwise to the position where the timing marks are aligned.
2. Loosen the fixing bolt of the tensioner pulley and using the special tool and a torque wrench, apply tension to the timing belt; then tighten the fixing bolt at the specified torque.

   Standard Value:
   2.5 Nm {timing belt tension torque (reference value)}

   Caution
   When tightening the fixing bolt, ensure that the tensioner pulley shaft doesn't rotate with the bolt.
3. Take out the 2 mm Allen wrench from the auto tensioner. At this time, check to be sure that 2 mm Allen wrench can be pulled out easily.
   Turn the crankshaft clockwise 2 turns, and after leaving it in this position for 5 minutes or more, clock again to be sure that the auto tensioner 2 mm Allen wrench can be pulled out or inserted easily.



NOTE
Even if the 2 mm Allen wrench cannot be easily inserted, then it is satisfactory if the amount of protrusion of the auto tensioner rod is within the standard value.

Standard value (A): 3.8 – 4.5 mm

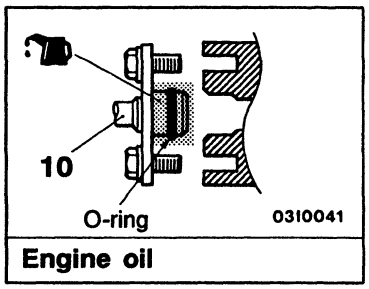
If it is outside the standard value, repeat the operations in step 1 to 4.

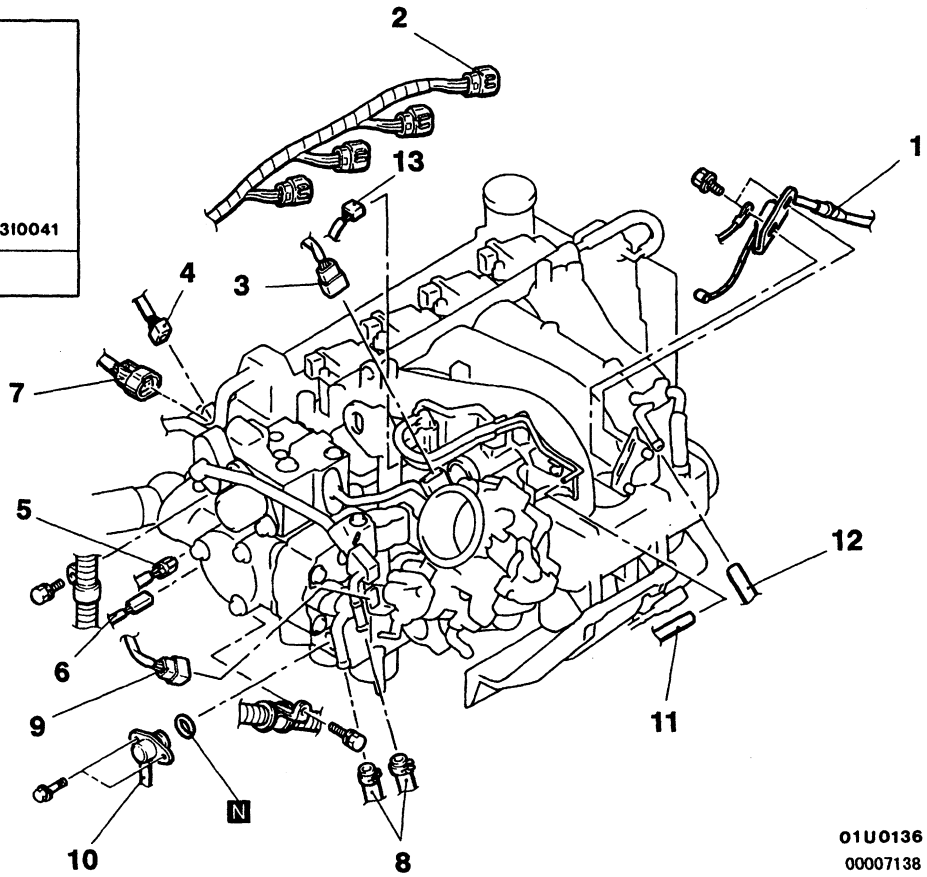
4. Check to be sure that the timing marks on all sprockets are aligned.

ENGINE ASSEMBLY

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Prevention of fuel discharge <before removal only>
- Engine Coolant Draining and Supplying
- Hood Removal and Installation
- Air Intake Hose Assembly Removal and Installation
- Radiator Assembly Removal and Installation
- Engine Cover Removal and Installation
- Under Cover Removal and Installation
- Front Exhaust Pipe Removal and Installation (Refer to GROUP 15.)
- Accelerator Cable Adjustment <after installation only>

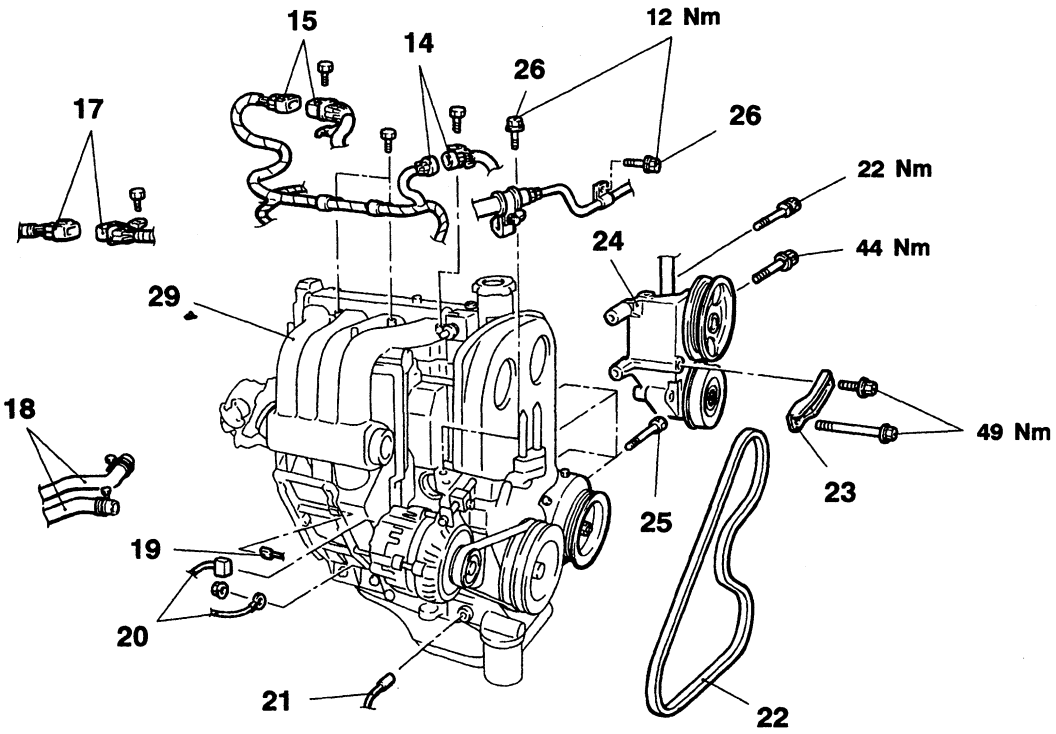


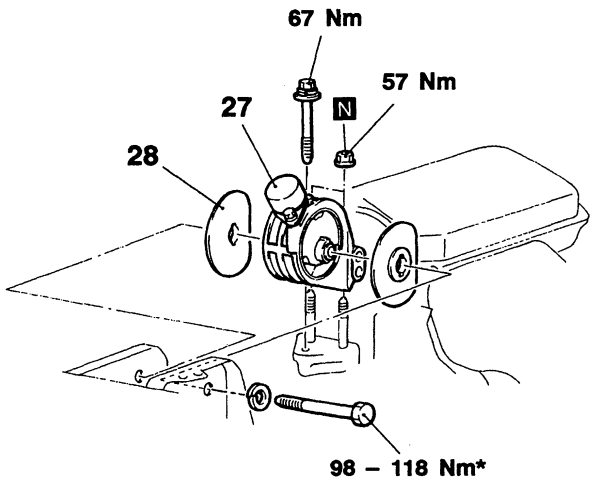


Removal steps
1. Accelerator cable
2. Ignition coil connector
3. Throttle position sensor connector
4. Cam position sensor connector
5. Engine coolant temperature sensor connector
6. Engine coolant temperature gauge unit connector
7. Fuel pump connector
8. Fuel return hose connection
9. ISC connector

▶D◀ 10. High-pressure fuel hose connection

11. Vacuum hose connection
12. Brake booster vacuum hose connection
13. Purge solenoid valve connector





14. Crank angle sensor connector
15. Injector harness connector
16. Purge solenoid valve connector
17. Air by-pass valve harness connector
18. Heater hose connection
19. Oxygen sensor connector
20. Alternator connector
21. Engine oil pressure switch connector
- Drive belt tension adjustment
22. Drive belt (for power steering oil pump, A/C compressor)
23. Power steering oil pump bracket stay

◀A▶ 24. Power steering oil pump bracket assembly

◀B▶ 25. A/C compressor mounting bolt

26. Oil pressure hose and pipe clamp mounting bolt

◀C▶ ◀D▶ ◀E▶
- Transmission assembly

▶C◀ 27. Engine mount bracket

▶B◀ 28. Engine mount stopper

▶A◀ 29. Engine assembly

Caution
Mounting locations marked by * should be provisionally tightened, and then fully tightened when the vehicle body is supporting the full weight of the engine.

NOTE
Removal and installation service points are the same as before.