ENGINE <6G7>

Click on the applicable bookmark to selected the required model year.

ENGINE <6G7>

CONTENTS

11109000849

GENERAL INFORMATION

11100010612

Items		Specifications
Total displacement mL		2,972
Bore x Stroke mm		91.1 x 76.0
Compression ratio		9.0
Combustion chamber		Pentroof type
Camshaft arrangement		SOHC
Number of valve	Intake	12
	Exhaust	12
Valve timing	Intake	Opening BTDC 19°, Closing ABDC 45°
	Exhaust	Opening BBDC 49°, Closing ATDC 15°
Fuel system		Electronic control multipoint fuel injection
Rocker arm		Roller type
Auto-lash adjuster		Equipped

SERVICE SPECIFICATIONS

11100030687

Items			Standard value	Limit
Alternator drive belt tension	Vibration frequency Hz	When checked	At A: 197 – 241 At B: 133 – 164	–
		When a used belt is installed	At A: 209 – 231 At B: 142 – 157	–
		When a new belt is installed	At A: 279 – 311 At B: 189 – 211	–
	Tension N	When checked	At A: 392 – 588 At B: 392 – 588	–
		When a used belt is installed	At A: 441 – 539 At B: 441 – 539	–
		When a new belt is installed	At A: 784 – 980 At B: 784 – 980	–
	Deflection (Reference value) mm	When checked	At A: 6.5 – 9.0 At B: 9.0 – 12.5	–
		When a used belt is installed	At A: 7.0 – 8.5 At B: 10.0 – 12.0	–
		When a new belt is installed	At A: 4.0 – 5.5 At B: 6.0 – 7.5	–
Power steering oil pump drive belt tension	Vibration frequency Hz	When checked	90 – 117	–
		When a used belt is installed	98 – 111	–
		When a new belt is installed	117 – 138	–
	Tension N	When checked	294 – 490	–
		When a used belt is installed	343 – 441	–
		When a new belt is installed	490 – 686	–
	Deflection (Reference value) mm	When checked	13.0 – 17.0	–
		When a used belt is installed	14.0 – 16.0	–
		When a new belt is installed	11.0 – 13.0	–
A/C compressor drive belt tension	Vibration frequency Hz	When checked	207 – 232	–
		When a used belt is installed	207 – 232	
		When a new belt is installed	243 – 264	–
	Tension N	When checked	392 – 490	–
		When a used belt is installed	392 – 490	–
		When a new belt is installed	539 – 637	–
	Deflection (Reference value) mm	When checked	5.6 – 6.4	–
		When a used belt is installed	5.6 – 6.4	–
		When a new belt is installed	4.3 – 5.1	–

Items	Standard value	Limit
Basic ignition timing mm	5° BTDC ± 3°	–
Ignition timing	Approx. 15° BTDC	–
Idle speed r/min	700 ± 100	–
CO contents %	0.5 or less	–
Compression pressure (at engine speed of 250 – 400 r/min) kPa	1,180	Min. 875
Compression pressure difference of all cylinder kPa	–	Max. 100
Intake manifold vacuum kPa	–	Min. 60
Auto tensioner rod depth (mm)	Within 1	–
Timing belt tension torque Nm	4.4	–
Auto tensioner rod protrusion amount mm	3.8 – 5.0	–

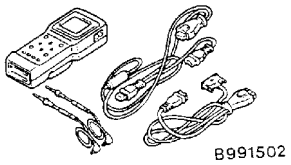
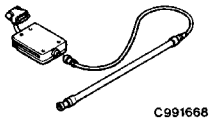
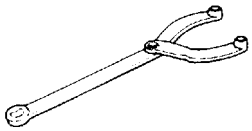
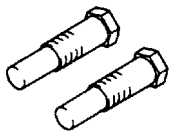
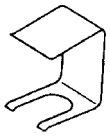
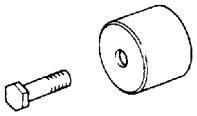
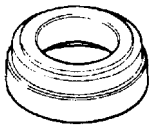
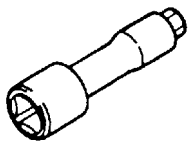
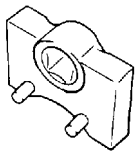
SEALANT

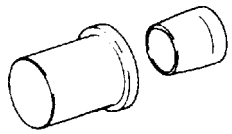
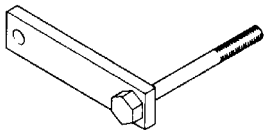
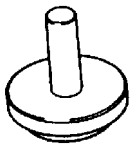
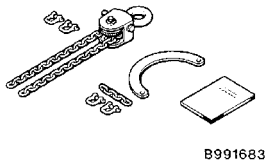
11100050447

Items	Specified sealant	Remarks
Oil pan	MITSUBISHI GENUINE PART MD970389 or equivalent	Semi-drying sealant

SPECIAL TOOLS

11100060662

Tool	Number	Name	Use
 B991502	MB991502	MUT-II sub assembly	• Measuring drive belt tension • Checking the ignition timing • Checking the idle speed
 C991668	MB991668	Belt tension meter set	Measuring drive belt tension (used together with MUT-II)
	MB990767	End yoke holder	• Supporting of crankshaft pulley • Supporting of camshaft sprocket
	MD998715	Crankshaft pulley holder pin	
	MD998443	Auto-lash adjuster holder	Supporting of auto-lash adjuster
	MD998713	Camshaft oil seal installer	Press-in of the camshaft oil seal
	MB991559	Camshaft oil seal adapter	Press-fitting the camshaft oil seal (left bank side)
	MD998051	Cylinder head bolt wrench	Removal and installation of the cylinder head bolt
	MD998767	Tension pulley socket wrench	Timing belt tension adjustment

Tool	Number	Name	Use
	MD998717	Crankshaft front oil seal installer	Press-in of the crankshaft front oil seal
	MD998769	Crankshaft pulley spacer	Operating the crankshaft when installing the timing belt
	MD998781	Flywheel stopper	Securing the flywheel
	MD998718	Crankshaft rear oil seal installer	Press-fitting the crankshaft rear oil seal
 B991683	MB991683	Sling chain set	Removal and installation of engine assembly

ON-VEHICLE SERVICE

11100090623

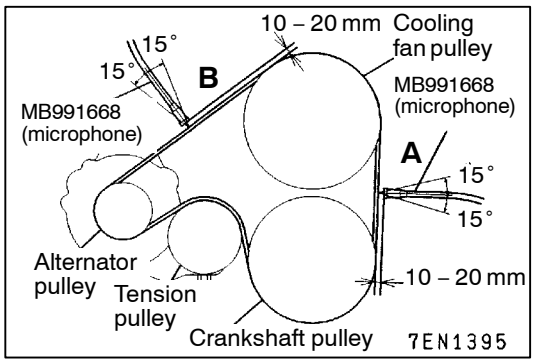
DRIVE BELT TENSION CHECK AND ADJUSTMENT

ALTERNATOR DRIVE BELT TENSION CHECK

Inspect the drive belt following the instructions below.

Standard value:

Vibration frequency Hz	At A	197 – 241
	At B	133 – 164
Tension N	At A	392 – 588
	At B	392 – 588
Deflection (Reference value) mm	At A	6.5 – 9.0
	At B	9.0 – 12.5

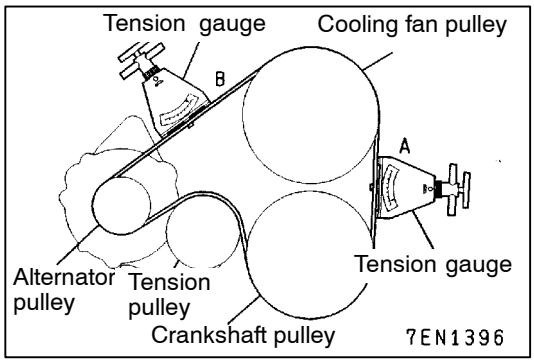


<When using MUT-II>

1. Connect the special tool (belt tension meter set) to the MUT-II.
2. Connect the MUT-II to the diagnosis connector.
3. Turn on the ignition switch and select "Belttension measurement" from the MUT-II menu screen.
4. As shown in the illustration, keep the microphone (MB991668) 10 to 20mm away from the back side of the belt perpendicularly (within an inclination of ± 15 degrees).
5. With your finger tip lightly tap the centre of the belt between the pulleys in the location shown by the arrow in the illustration to check whether the belt frequency is within the standard.

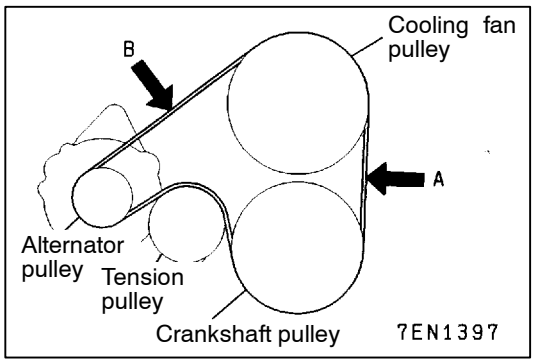
Caution

1. **Measure when the belt surface temperature is close to room temperature.**
2. **Make sure that water or oil, etc., does not get on the microphone.**
3. **If a strong wind blows or noise is made close to the microphone during measure, the meter will show a value that differs from the actual value.**
4. **If the measurement is taken with the microphone touching the belt, the meter will show a value that differs from the actual value.**
5. **Do not measure while the engine is running.**



<When using a tension meter>

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



<When checking the deflection>

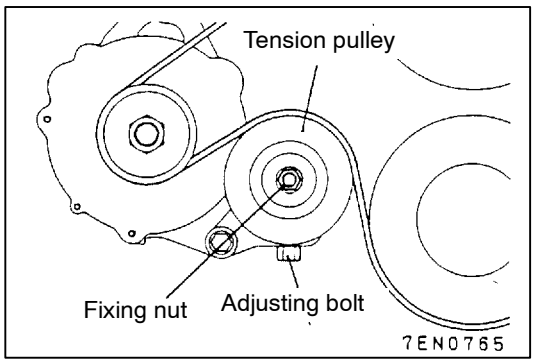
Apply 98N of pressure against the location between the pulleys shown by the arrow in the illustration to check if the deflection is within the standard value.

ALTERNATOR DRIVE BELT TENSION ADJUSTMENT

1. Loosen the nut of the alternator pivot bolt.
2. Loosen the lock bolt.
3. Turn the adjusting bolt to adjust the belt tension frequency, to put the belt tension or deflection within the standard value.

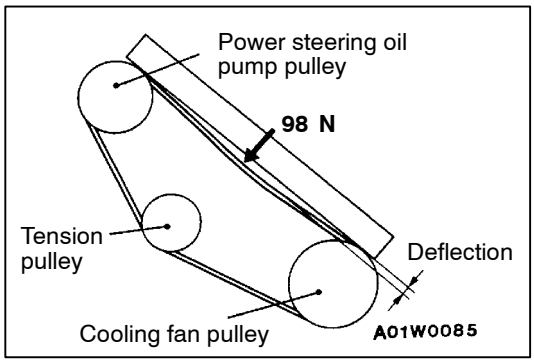
   Standard value:

Items		When a used belt is installed	When a new belt is installed
Vibration frequency	At A	209 – 231	279 – 311
	At B	142 – 157	189 – 211
Tension N	At A	441 – 539	784 – 980
	At B	441 – 539	784 – 980
Deflection mm (reference value)	At A	7.0 – 8.5	4.0 – 5.5
	At B	10.0 – 12.0	6.0 – 7.5



4. Tighten the fixing nut.

   Tightening torque: 49 Nm



POWER STEERING OIL PUMP DRIVE BELT TENSION CHECK AND ADJUSTMENT

11100110237

1. Check if the belt tension is within the standard value using one of the methods below.

Standard value:

Items	When checked	When a new belt is installed	When a used belt is installed
Vibration frequency Hz	90 – 117	117 – 138	98 – 111
Tension N	294 – 490	490 – 686	343 – 441
Deflection (reference value) mm	13.0 – 17.0	11.0 – 13.0	14.0 – 16.0

<When measuring the vibration frequency>

With your finger tip lightly tap the centre of the belt between the pulleys in the location shown by the arrow in the illustration and then measure the belt vibration frequency.

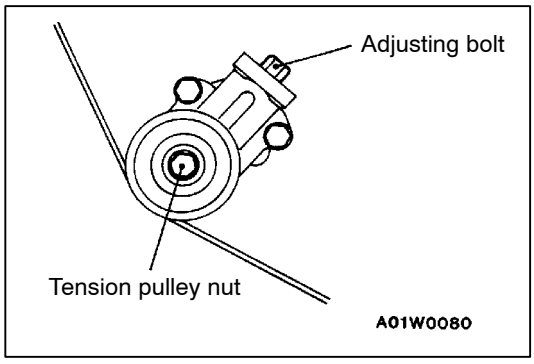
NOTE
Refer to P.11A-8 for information regarding the vibration freqency measurement method using the MUT-II.

<When measuring the tension>

Use a belt tension gauge to measure the belt tension.

<When measuring the deflection>

Apply 98N of pressure against the location between the pulleys shown by the arrow in the illustration and then measure the deflection.

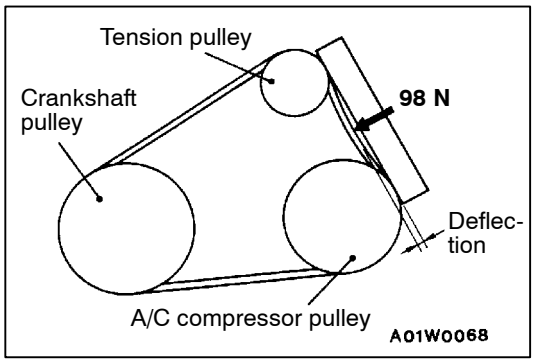


2. If the tension or deflection is outside the standard value, adjust by the following procedure.
   (1) Loosen the tension pulley nut.
   (2) Adjust the amount of belt deflection using adjusting bolt.
   (3) Tighten the tension pulley nut.

   Tightening torque: 48 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).



AIR CONDITIONER COMPRESSOR DRIVE BELT TENSION CHECK AND ADJUSTMENT 11100100265

1. Check if the belt tension is within the standard value using one of the methods below.

Standard value:

Items	When checked	When a new belt is installed	When a used belt is installed
Vibration frequency Hz	207 – 232	243 – 264	207 – 232
Tension N	392 – 490	539 – 637	392 – 490
Deflection (reference value) mm	5.6 – 6.4	4.3 – 5.1	5.6 – 6.4

<When measuring the vibration frequency>

With your finger tip lightly tap the centre of the belt between the pulleys in the location shown by the arrow in the illustration and then measure the belt vibration frequency.

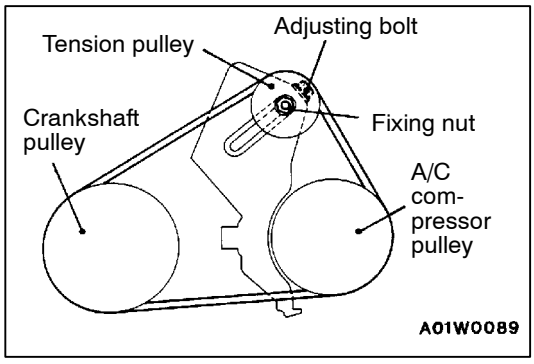
NOTE
Refer to P.11A-8 for information regarding the vibration frequency measurement method using the MUT-II.

<When measuring the tension>

Use a belt tension gauge to measure the belt tension.

<When measuring the deflection>

Apply 98N of pressure against the location between the pulleys shown by the arrow in the illustration and then measure the deflection.



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

11100170488

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: 700 ± 100 r/min

6. Select No. 17 of the MUT-II Actuator test.
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 MPI system while referring to GROUP 13A – 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. 15° BTDC

    NOTE
    (1) Ignition timing is variable within about ± 7°, even under normal operating.
    (2) And it is automatically further advanced by about 5° from standard value at higher altitudes.

IDLE SPEED CHECK

11100190590

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

   Standard value: 5° BTDC ± 3°

4. Run the engine at idle for 2 minutes.
5. Check the idle speed. Select item No. 22 and take a reading of the idle speed.

   Curb idle speed: 700 ± 100 r/min

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

6. If the idle speed is outside the standard value, inspect the MPI components by referring to GROUP 13A – Troubleshooting.

IDLE MIXTURE CHECK

11100210548

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

   Standard value: 5° BTDC ± 3°
4. Run the engine at 2500 r/min for 2 minutes.
5. Set the CO, HC tester.
6. Check the CO contents and the HC contents at idle.

   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
   - Closed-loop control (When the closed-loop control is normal, the output signal of the oxygen sensor changes between 0 – 400 mV and 600 – 1,000 mV at idle.)
   - Fuel pressure
   - Injector
   - Ignition coil, spark plug cable, spark plug
   - Evaporative emission control system
   - Compression pressure

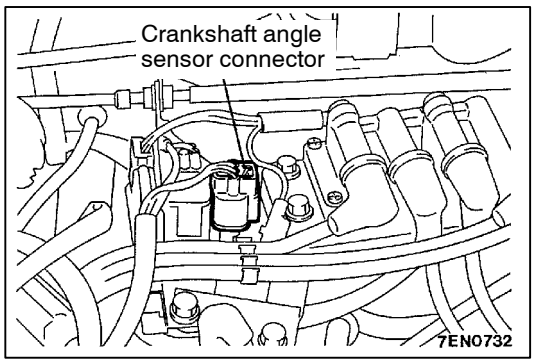
   NOTE
   Replace the three way catalyst when the CO contents are not within the standard value, even though the result of the inspection is normal on all items.

COMPRESSION PRESSURE CHECK

11100260703

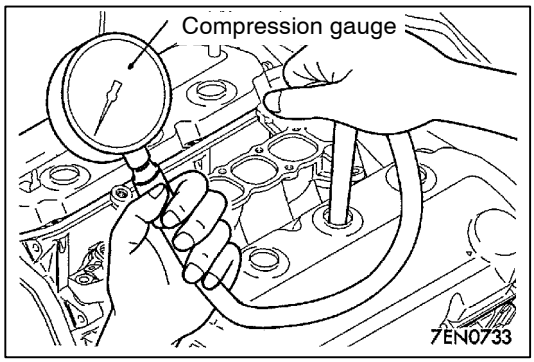
1. Before inspection, check engine oil, the starter and battery are normal. Also, set the vehicle to the pre-inspection condition.
2. Remove all the spark plugs.
3. Disconnect the crankshaft angle sensor connector.

   NOTE
   Doing this will prevent the engine control unit from carrying out ignition and fuel injection.



4. Cover the spark plug hole with a shop towel etc. and crank the engine. Then 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 hole.
6. Turn over the engine and measure the compression pressure.

   Standard value (at engine speed of 250 – 400 r/min): 1,180 kPa

   Limit (at engine speed of 250 – 400 r/min): Min. 875 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

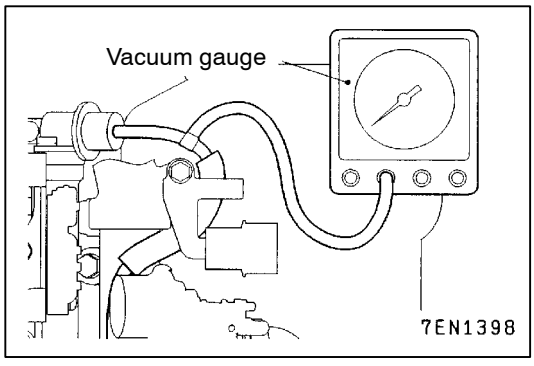
8. If there is a cylinder with compression or a compression difference that is outside the limit, pour a small amount of engine oil through the spark plug hole, and repeat the operations in step 6 and 7.
   (1) If the compression increases after oil is added, the cause of the malfunction is a worn or 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.
    Use the MUT-II to erase the self-diagnosis codes or disconnect the battery cable from the battery (–) terminal for 10 seconds or more and then reconnect the cable.

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

MANIFOLD VACUUM CHECK

11100270577

1. Start the engine and allow it to warm up until the temperature of the engine coolant reaches 85 to 95°C.
2. Connect the MUT-II to the diagnosis connector.



3. Attach a three-way union to the vacuum hose between the fuel pressure regulator and the air intake plenum, and connect a vacuum gauge.
4. Start the engine and check that idle speed is within the standard valve.

   Standard value: 700 ± 100 r/min

5. Check the intake manifold vacuum.

   Limit: Min. 60 kPa

LASH ADJUSTER CHECK

11100290672

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.

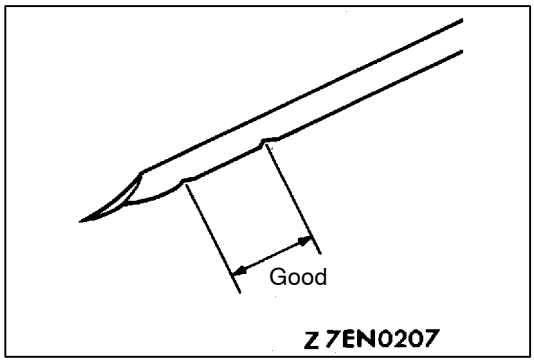
NOTE
(1) The abnormal noise which is caused by a problem with the lash adjusters is generated after the engine is started, and will vary according to the engine speed. However, this noise is not related to the actual engine load.
Because of this, if the noise does not occur immediately after the engine 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, clean the lash adjusters (Refer to Engine Workshop Manual). If the noise level does not change, go to step 5.

5. Bleed the air from the lash adjusters. (Refer to P.11A-16.)
6. If the noise does not disappear even after the air has been bled from the lash adjusters, clean the lash adjusters (Refer to Engine Workshop Manual).

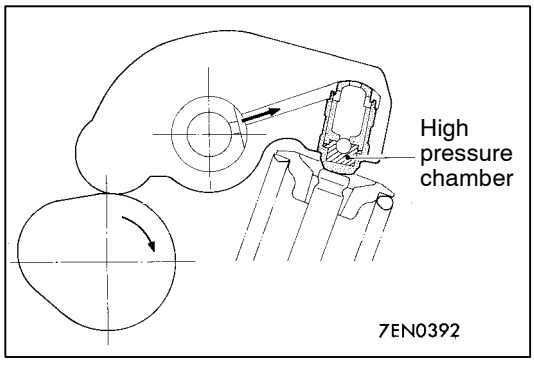
<LASH ADJUSTER AIR BLEEDING>

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.



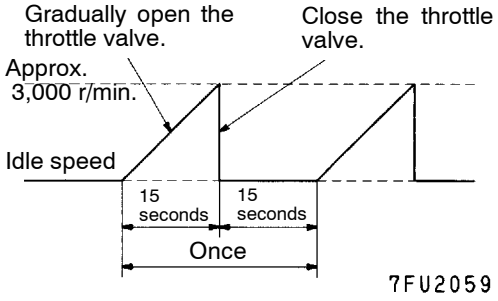
1. Check the engine oil and replenish or replace the oil if necessary.

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.

Drive pattern for air bleeding



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.

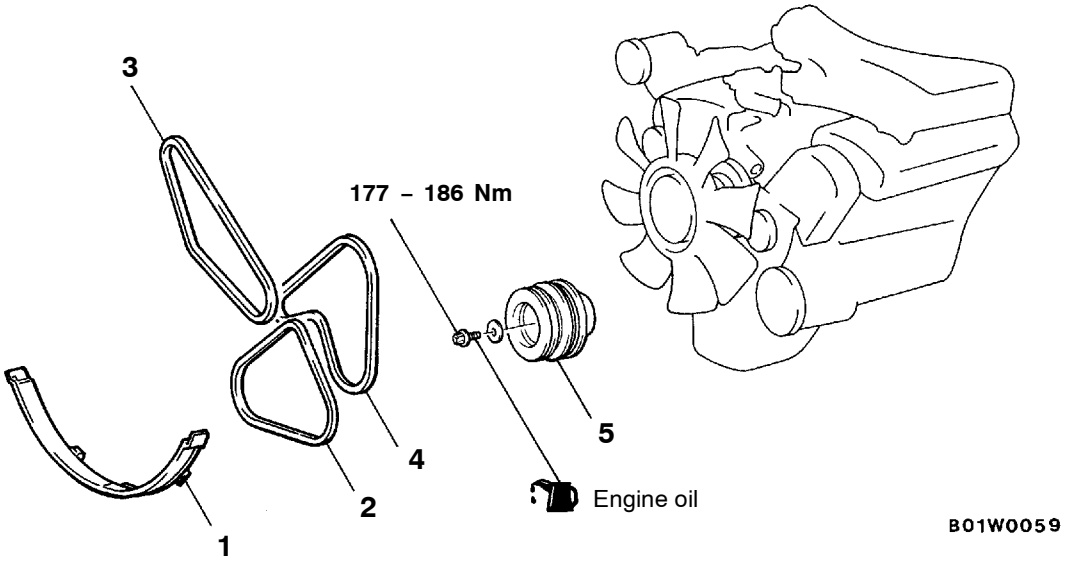
CRANKSHAFT PULLEY

11200160433

REMOVAL AND INSTALLATION

Pre-removal Operation
- Skid Plate and Under Cover Removal

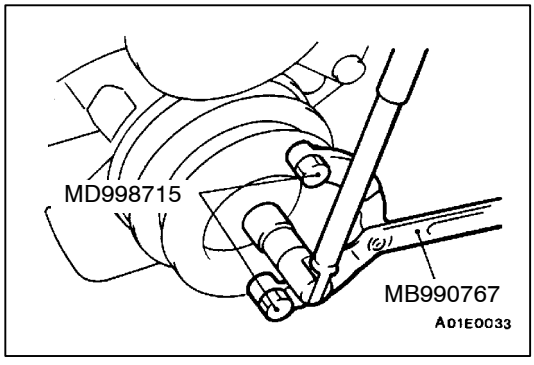
Post-installation Operation
- Drive Belt Tension Adjustment (Refer to P.11A-8.)
- Skid Plate and Under Cover Installation



Removal steps

1. Radiator shroud cover
2. Drive belt (for A/C)
3. Drive belt (for power steering oil pump)
4. Drive belt (for alternator)

◀A▶ ▶A◀ 5. Crankshaft pulley



REMOVAL SERVICE POINT

◀A▶ CRANKSHAFT PULLEY REMOVAL

Use special tools to remove the crankshaft pulley from the crankshaft.

INSTALLATION SERVICE POINT

▶A◀ CRANKSHAFT PULLEY INSTALLATION

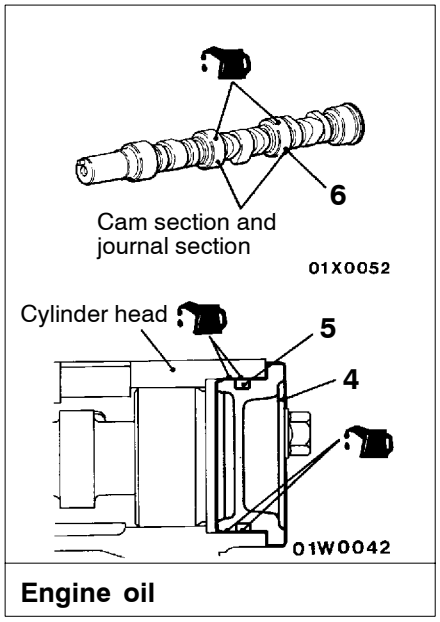
Use special tools in the same way as during removal to install the crankshaft pulley.

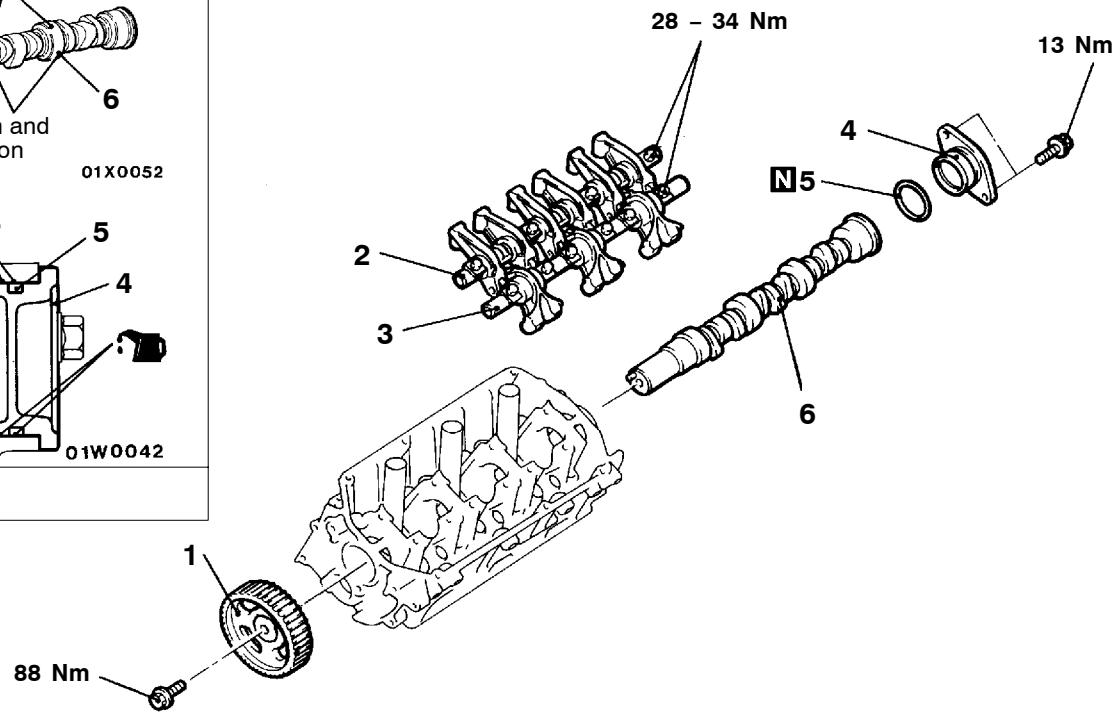
CAMSHAFT

11200190661

REMOVAL AND INSTALLATION

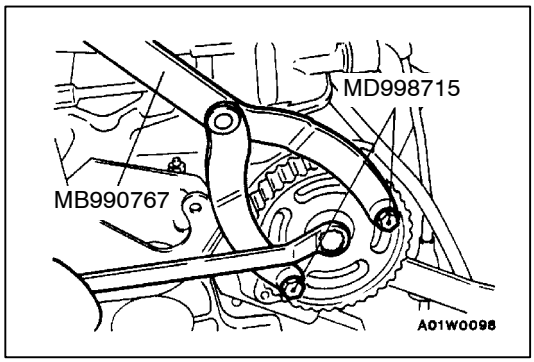
Pre-removal and Post-installation Operation
- Cylinder Head Assembly Removal and Installation (Refer to P.11A-25.)





Removal steps

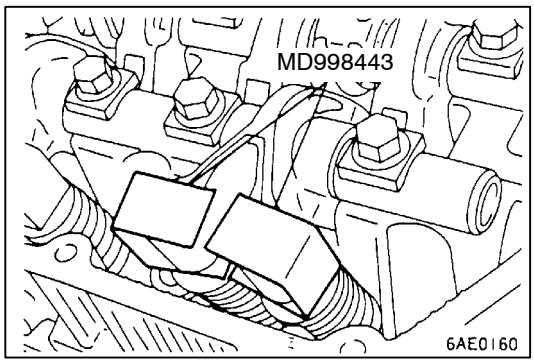
◀A▶ ▶B◀ 1. Camshaft sprocket
◀B▶ ▶A◀ 2. Rocker arm and shaft assembly (intake side)
◀B▶ ▶A◀ 3. Rocker arm and shaft assembly (exhaust side)
4. Thrust case
5. O-ring
6. Camshaft



REMOVAL SERVICE POINTS

◀A▶ CAMSHAFT SPROCKET REMOVAL

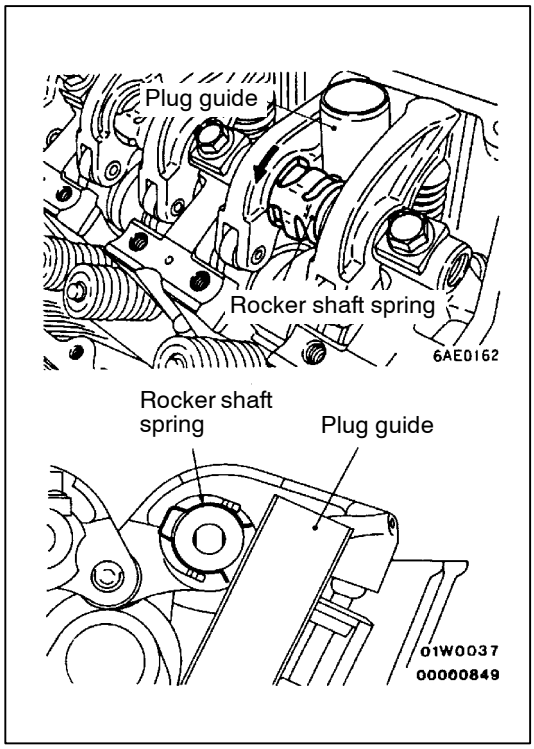
Use special tools to remove the camshaft sprocket.



◀B▶ ROCKER ARM AND SHAFT ASSEMBLY REMOVAL

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

Caution
Never disassemble the rocker arm and shaft assembly.



INSTALLATION SERVICE POINTS

▶A◀ ROCKER ARM AND SHAFT ASSEMBLY INSTALLATION

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

   NOTE
   Install the rocker shaft spring before installing the rocker arm and rocker arm shaft on the exhaust side.
3. Tighten the rocker arm and shaft assembly mounting bolt to the specified torque.

   Tightening torque: 28 – 34 Nm
4. Remove the special tool for fixing the lash adjuster.

▶B◀ CAMSHAFT SPROCKET INSTALLATION

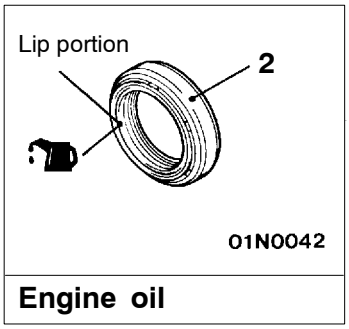
Use special tools in the same way as during removal to install the camshaft sprocket.

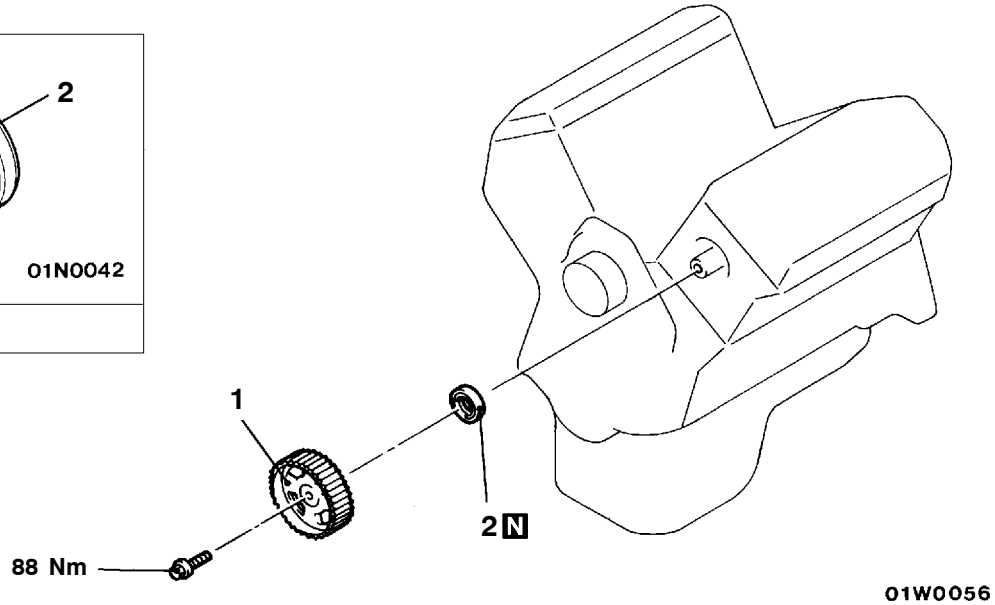
CAMSHAFT OIL SEAL

11200200012

REMOVAL AND INSTALLATION

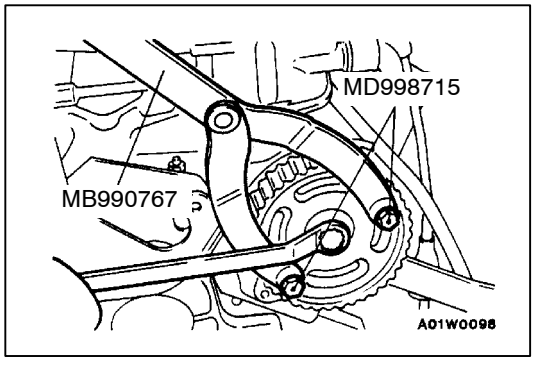
Pre-removal and Post-installation Operation
- Timing Belt Removal and Installation (Refer to P.11A-28.)





Removal steps

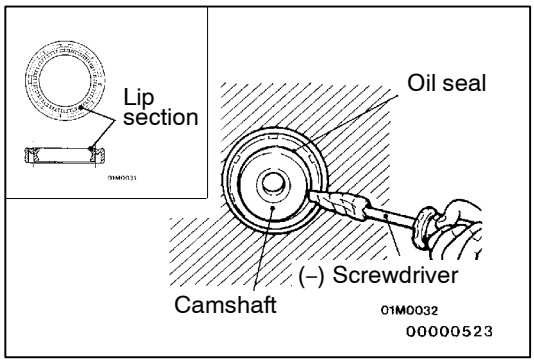
◀A▶ ▶B◀ 1. Camshaft sprocket
◀B▶ ▶A◀ 2. Camshaft oil seal



REMOVAL SERVICE POINTS

◀A▶ CAMSHAFT SPROCKET REMOVAL

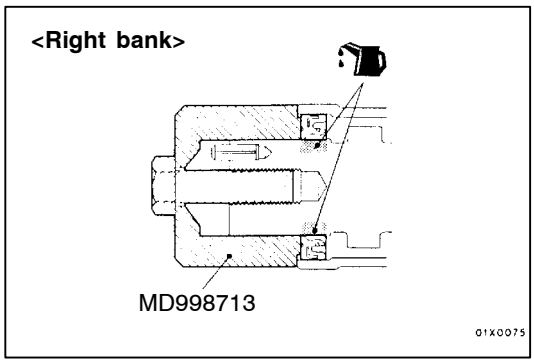
Use special tools to remove the camshaft sprocket.

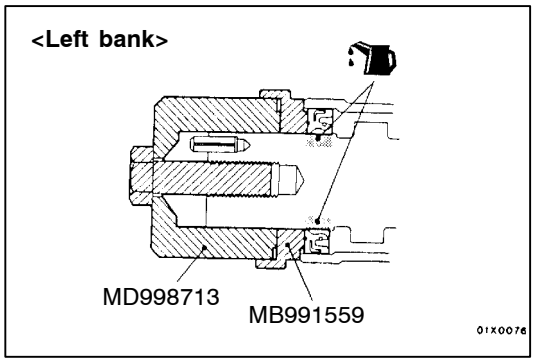


◀B▶ CAMSHAFT OIL SEAL REMOVAL

1. Make a notch in the oil seal lip section with a knife, etc.
2. Cover the end of a flat-tipped screwdriver with a shop towel and insert into the notched section of the oil seal, and pry out the oil seal to remove it.

Caution
Be careful not to damage the camshaft and the cylinder head.





INSTALLATION SERVICE POINTS

▶A◀ CAMSHAFT OIL SEAL INSTALLATION

1. Apply engine oil to the camshaft oil seal lip.
2. Use special tools to press-fit the camshaft oil seal.

▶B◀ CAMSHAFT SPROCKET INSTALLATION

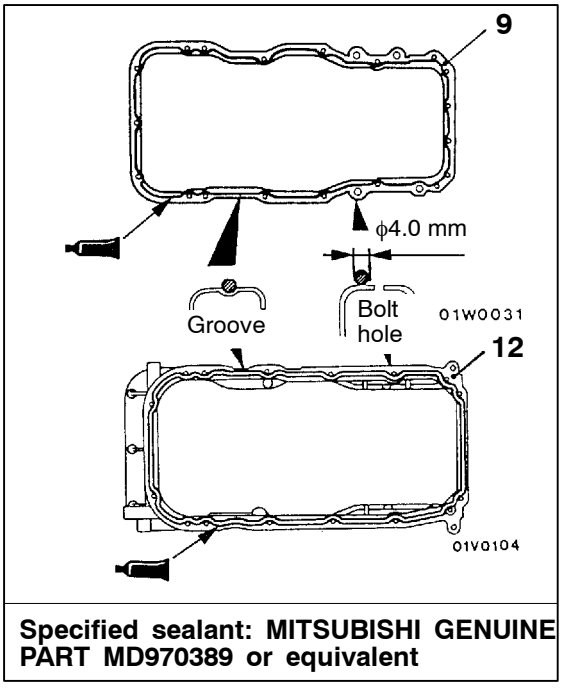
Use special tools in the same way as during removal to install the camshaft sprocket.

OIL PAN AND OIL SCREEN

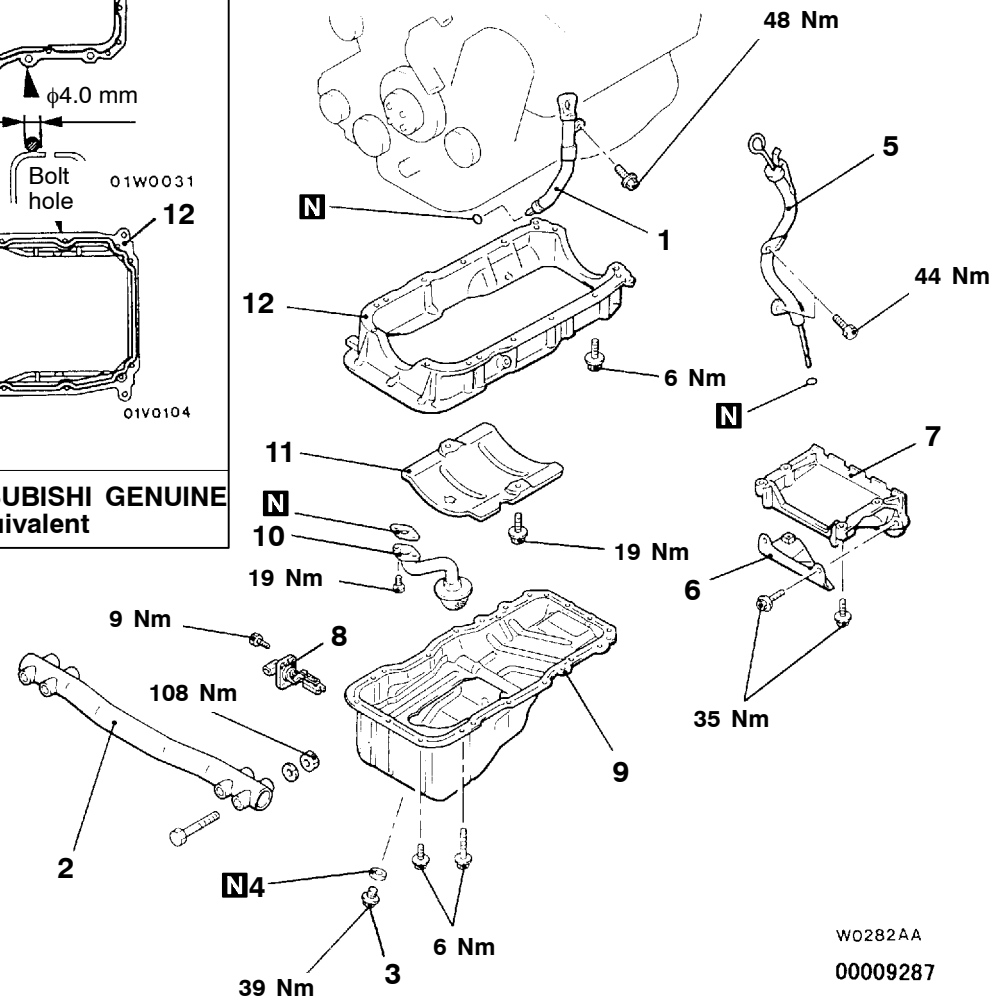
11200250468

REMOVAL AND INSTALLATIN

Pre-removal and Post-installation Operation
- Skid Plate and Under Cover Removal and Installation
- Engine Oil Draining and Refilling (Refer to GROUP 12 – On-vehicle Service.)
- Alternator Removal and Installation (Refer to GROUP 16 – Alternator.)
- Stabilizer Bar Removal and Installation (Refer to GROUP 33A – Stabilizer Bar.)
- Front Exhaust Pipe Removal and Installation (Refer to GROUP 15 – Exhaust Pipe and Main Muffler.)
- Actuator Assembly and Heat Protector Removal and Installation (Refer to GROUP 26 – Inner Shaft.)



Specified sealant: MITSUBISHI GENUINE PART MD970389 or equivalent



Removal steps

1. Oil dipstick assembly
2. Crossmember assembly
3. Drain plug

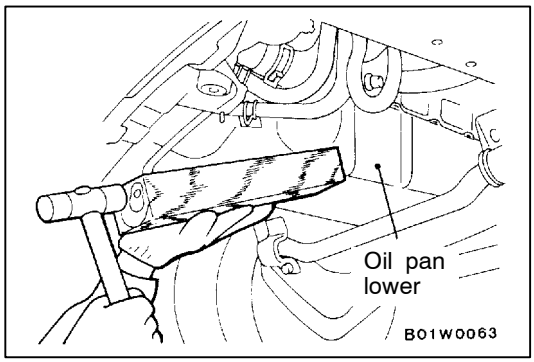
▶C◀ 4. Drain plug gasket

5. A/T oil dipstick assembly
6. Exhaust pipe support bracket

▶B◀ 7. Transmission stay
8. Oil level sensor

◀A▶ ▶A◀ 9. Oil pan lower
10. Oil screen
11. Baffle plate

▶A◀ 12. Oil pan upper

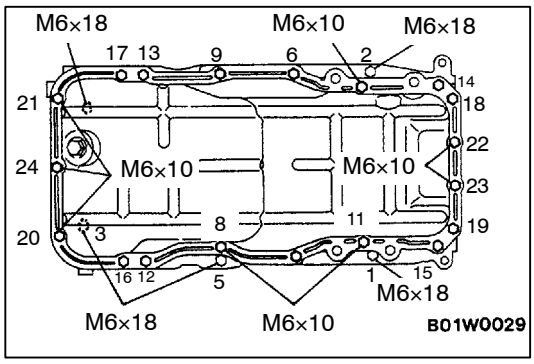


REMOVAL SERVICE POINT

◀A▶ OIL PAN LOWER REMOVAL

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

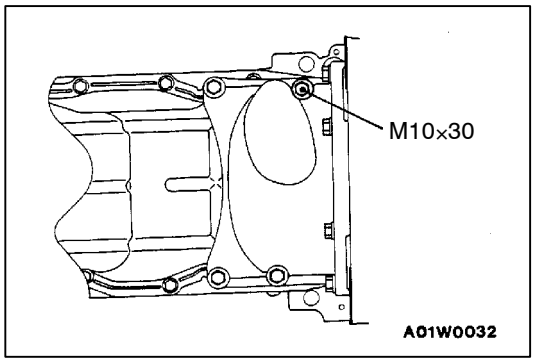
Caution
The use of an oil pan remover (MD998727) can damage the oil pan, upper (aluminum made).



INSTALLATION SERVICE POINTS

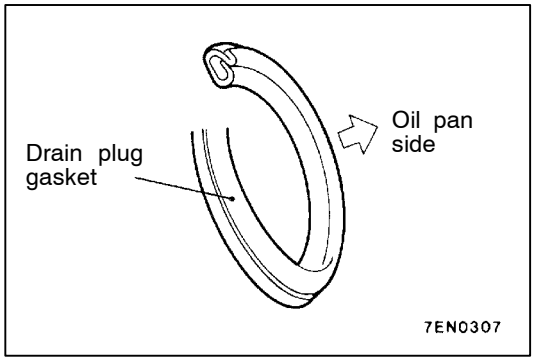
▶A◀ OIL PAN LOWER INSTALLATION

1. Tighten the bolts in order of the numbers shown in the illustration.
2. Be careful when installing, as there are two different lengths of bolt.



▶B◀ TRANSMISSION STAY INSTALLATION

Be careful when installing, as the bolts indicated in the illustration have different lengths from the other bolts.



▶C◀ DRAIN PLUG GASKET INSTALLATION

Replace the gasket with a new gasket. Install the new gasket in the direction shown in the illustration.

INSPECTION

11200260089

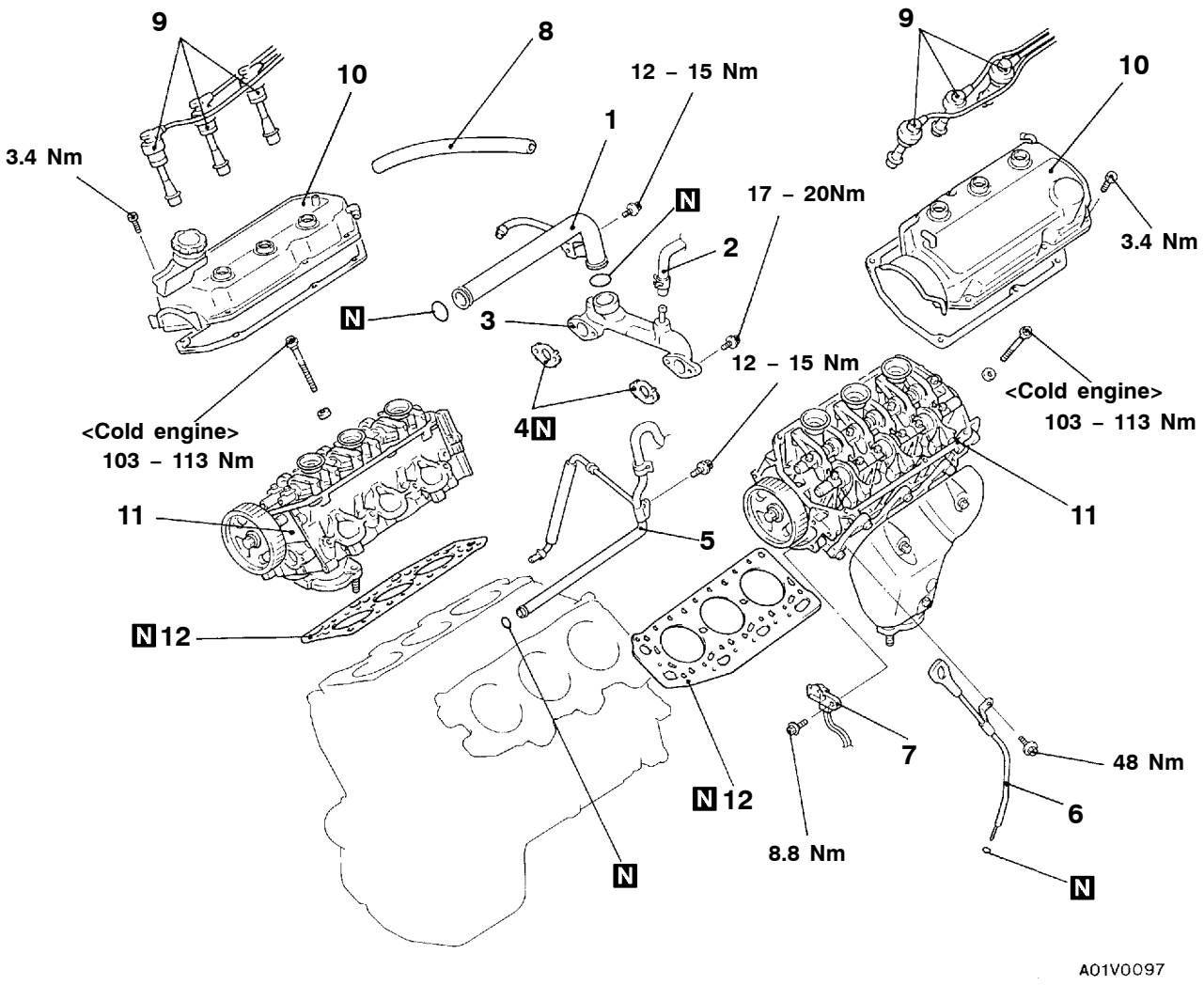
- Check the oil pan for cracks.
- Check the oil pan sealant-coated surface for damage and deformation.
- Check the oil screen for cracked, clogged or damaged wire net and pipe.

CYLINDER HEAD GASKET

11200401048

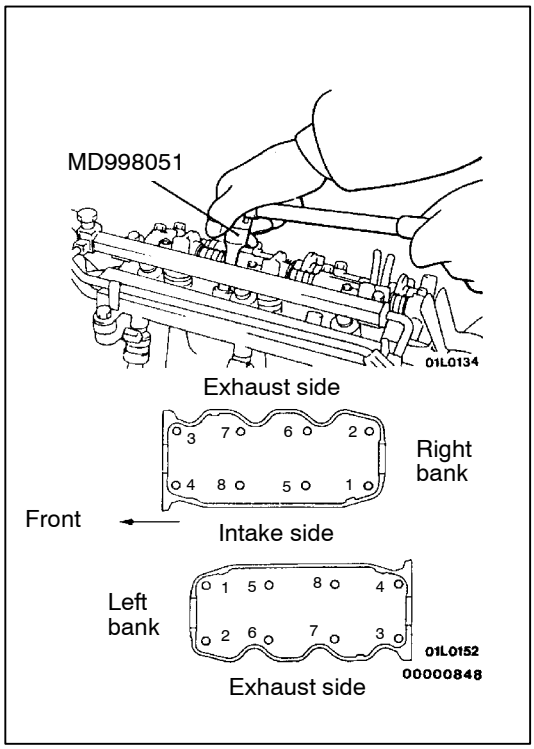
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Intake Manifold Removal and installation (Refer to GROUP 15 – Intake Manifold.)
- Timing Belt Removal and installation (Refer to P.11A-28.)
- Front Exhaust Pipe Removal and Installation (Refer to GROUP 15 – Exhaust Pipe and Main Muffler.)



Removal steps

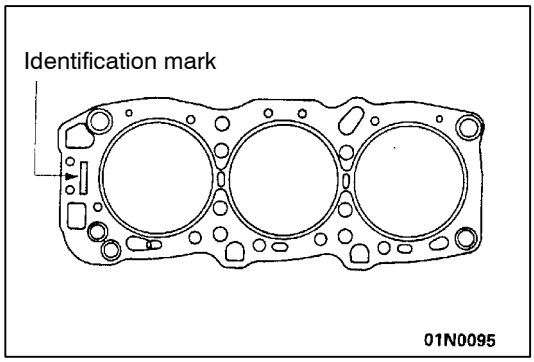
1. Water outlet pipe assembly
2. Heater hose connection
▶C◀ 3. Water passage assembly
▶C◀ 4. Gasket
5. Water pipe and hose assembly
6. Oil dipstick assembly <when removing left bank only>
7. Camshaft position sensor <when removing left bank only>
8. Breather hose
9. Spark plug cable
10. Rocker cover
◀A▶ ▶B◀ 11. Cylinder head assembly
▶A◀ 12. Cylinder head gasket



REMOVAL SERVICE POINTS

◀A▶ CYLINDER HEAD ASSEMBLY REMOVAL

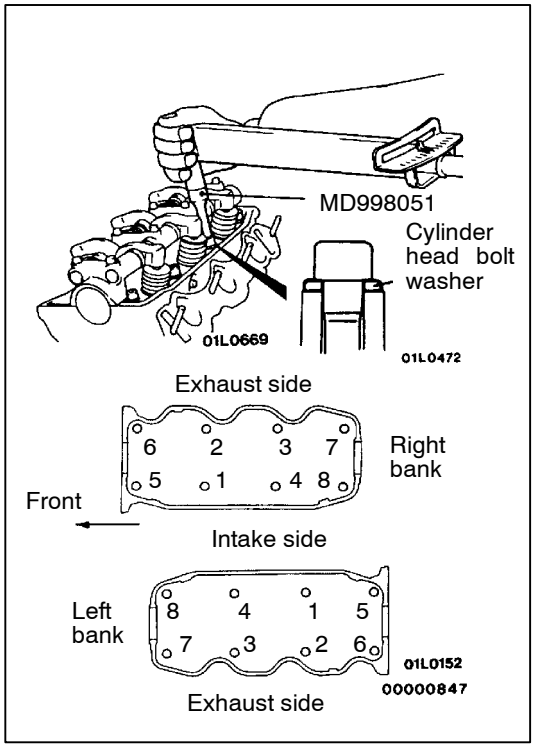
Use special tool to tighten each bolt two or three steps in the order shown in the illustration.



IINSTALLATION SERVICE POINTS

▶A◀ CYLINDER HEAD GASKET INSTALLATION

1. Degrease the cylinder head and cylinder block gasket mounting surfaces.
2. Make sure that the gasket has the proper identification mark for the engine.
3. Lay the cylinder head gasket on the cylinder block with the identification mark at the front top.



▶B◀ CYLINDER HEAD ASSEMBLY INSTALLATION

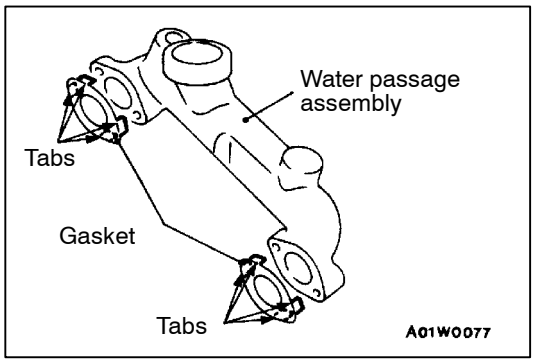
1. Use a scraper to clean the gasket surface of the cylinder head assembly.

   Caution
   Be careful that no foreign material gets into the cylinder, coolant passages or oil passages. Engine damage may result.

2. Using special tool and a torque wrench, tighten the bolts to the specified torque in the order shown in the illustration. (in two or three cycles)

   Tightening torque: 103 – 113 Nm

   Caution
   Install the head bolt washers with the beveled side facing upwards as shown in the illustration.



▶C◀ GASKET/WATER PASSAGE ASSEMBLY INSTALLATION

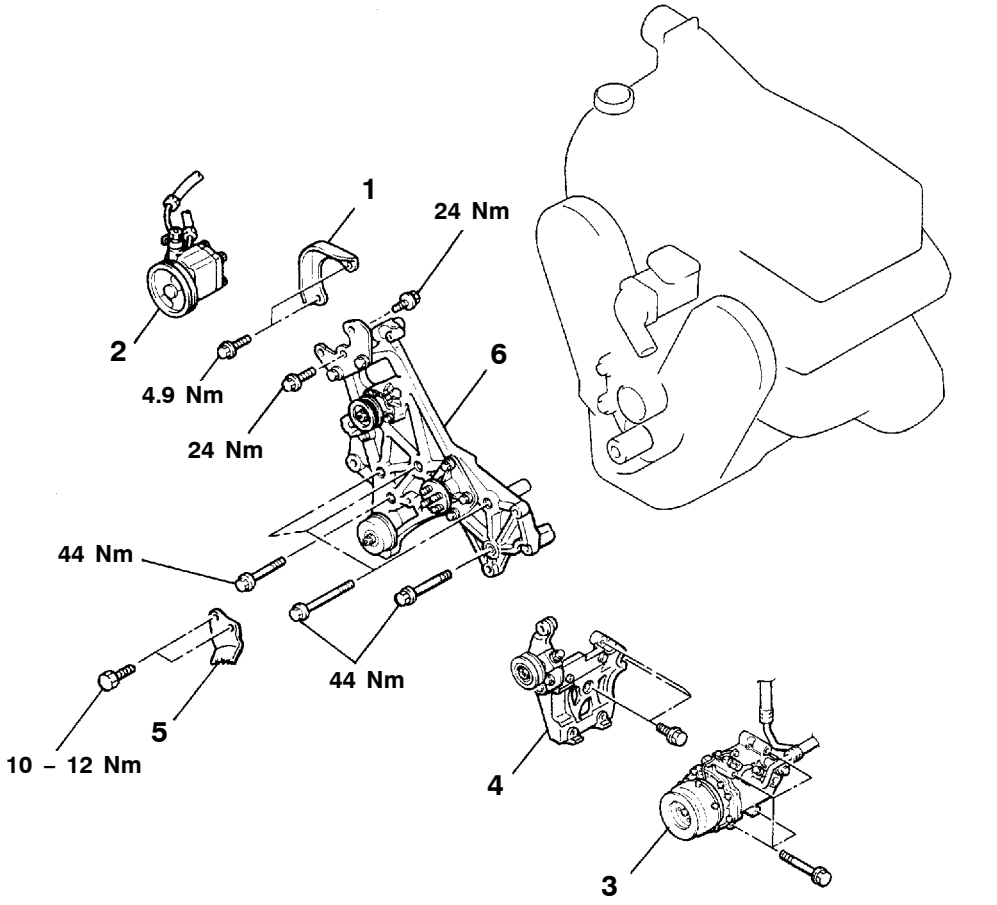
Bend the tabs onto the water passage assembly. Then install the water passage assembly to the cylinder head so that the gasket doesn't slip.

TIMING BELT

11200430800

REMOVAL AND INSTALLATION

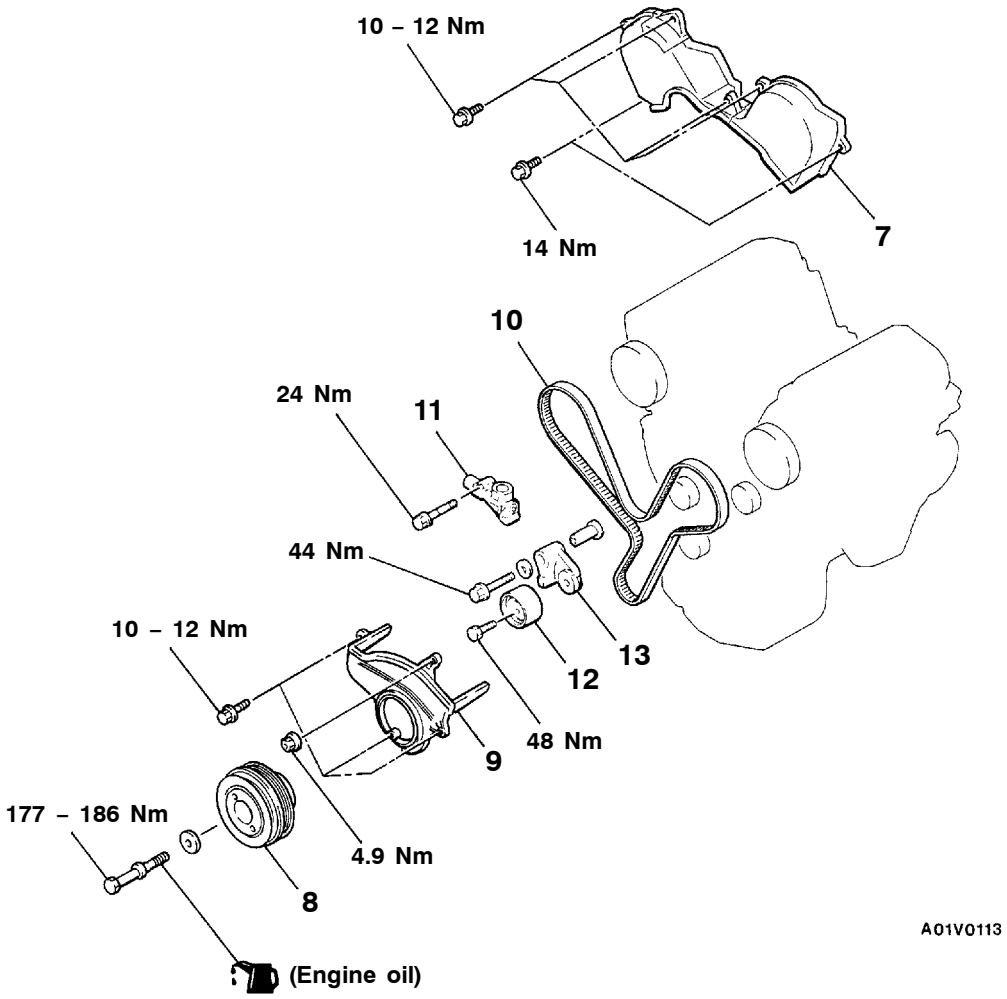
Pre-removal Operation
- Engine Coolant Draining and Refilling (Refer to GROUP 14 – On-vehicle Service.)
- Cooling Fan Removal (Refer to GROUP 14 – Cooling Fan.)
- Alternator Removal and Installation (Refer to GROUP 16 – Alternator.)



A01V0122

Removal steps

1. Cover
◀A▶ 2. Power steering oil pump assembly
◀A▶ 3. A/C compressor assembly
4. Compressor bracket
5. Timing indicator bracket
6. Accessory mount assembly

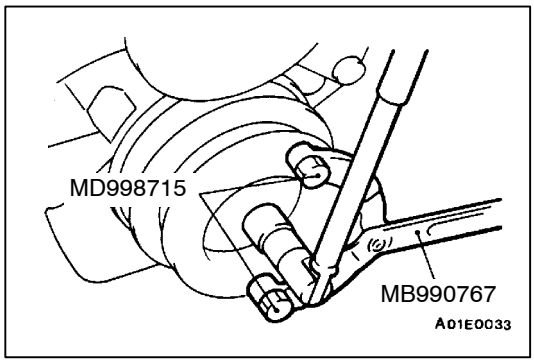


7. Timing belt upper cover assembly
◀B▶ ▶C◀ 8. Crankshaft pulley
9. Timing belt lower cover assembly
◀C▶ ▶B◀ 10. Timing belt
▶A◀ 11. Auto-tensioner
12. Tension pulley
13. Tensioner arm assembly

REMOVAL SERVICE POINTS

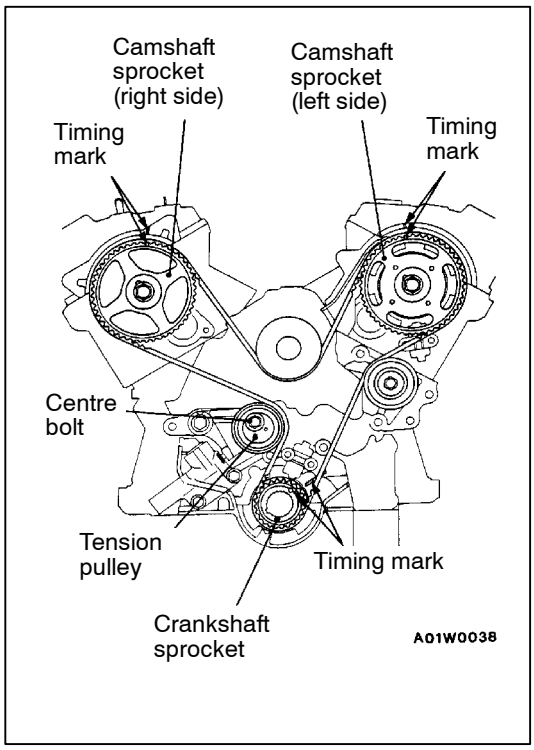
◀A▶ POWER STEERING OIL PUMP ASSEMBLY / A/C COMPRESSOR ASSEMBLY REMOVAL

1. Do not disconnect the hoses to remove the pump and compressor.
2. Support the removed pump and compressor with a wire, etc. so that they will not get in the way while working.



◀B▶ CRANKSHAFT PULLEY REMOVAL

Use special tools to remove the crankshaft pulley from the crankshaft.

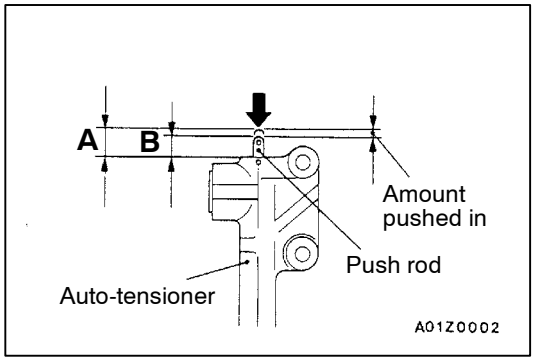


◀C▶ TIMING BELT REMOVAL

1. Turn the crankshaft clockwise to align each timing mark and to set the No. 1 cylinder to compression top dead centre.

   Caution
   Never turn the crankshaft counterclockwise.

2. If the timing belt is to be reused, chalk mark the flat side of the belt with an arrow indicating the clockwise direction.
3. Loosen the centre bolt of the tension pulley, and then remove the timing belt.



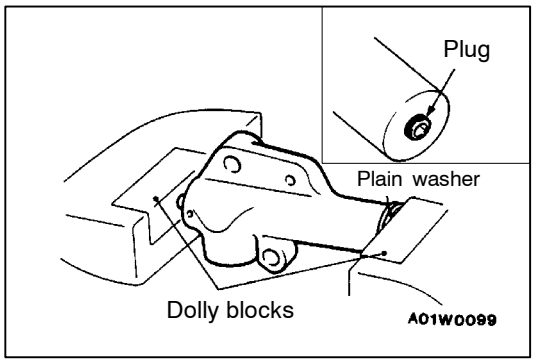
INSTALLATION SERVICE POINTS

▶A◀ AUTO-TENSIONER INSTALLATION

1. While holding the auto-tensioner by hand, press the end of the push rod against a metal surface (such as the cylinder block) with a force of 98 – 196 Nm and measure how far the push rod is pushed in.

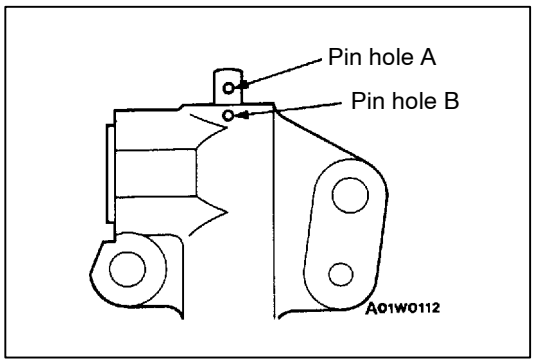
   Standard value: Within 1 mm
   A: Length when no force is applied
   B: Length when force is applied
   A – B: Amount pushed in

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



3. Place two dolly blocks in a vice as shown in the illustration, and then place the auto-tensioner in the vice.

Caution
(1) Place the auto-tensioner perpendicular to the jaws of the vice.
(2) If there is a plug at the base of the aut-tensioner, insert a plain washer onto the end of the auto-tensioner to protect the plug.



4. Slowly compress the push rod of the auto-tensioner until pin hole A in the push rod is aligned with pin hole B in the cylinder.

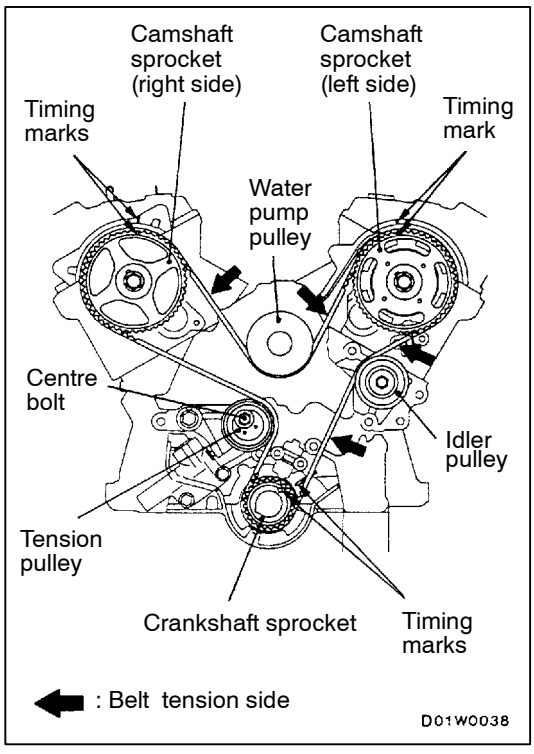
Caution
Never compress the push rod too fast, or the push rod may be damaged.

5. Insert the setting pin into the pin holes once they are aligned.

NOTE
If replacing the auto-tensioner, the pin will already be inserted into the pin holes of the new part.

6. Install the auto-tensioner to the engine.

Caution
Do not remove the setting pin from the auto-tensioner.

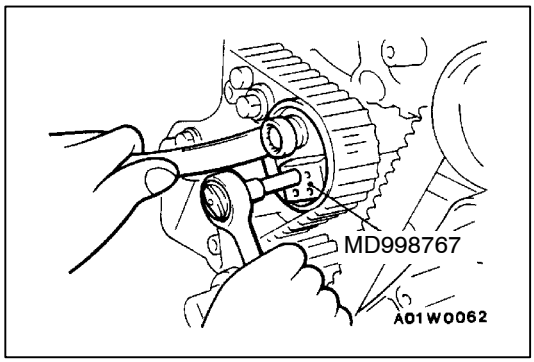


▶B◀ TIMING BELT INSTALLATION

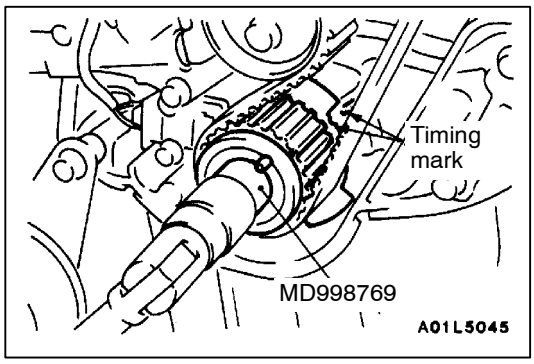
1. Align the timing marks of the camshaft sprocket with those of crankshaft sprocket.
2. Install the timing belt by the following procedure so that there is no deflection in the timing belt between each sprocket and pulley.
   (1) Crankshaft sprocket
   (2) Idler pulley
   (3) Camshaft sprocket (Left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

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

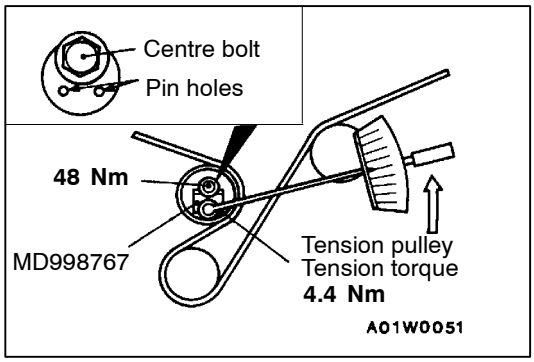
3. Turn the camshaft sprocket counterclockwise until the tension side of the timing belt is firmly stretched. Check all timing marks again.



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



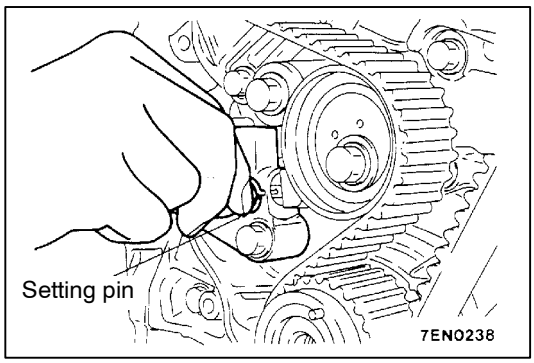
5. Use special tool to turn the crankshaft 1/4 turn counterclockwise and then turn it again clockwise until the timing marks are aligned.



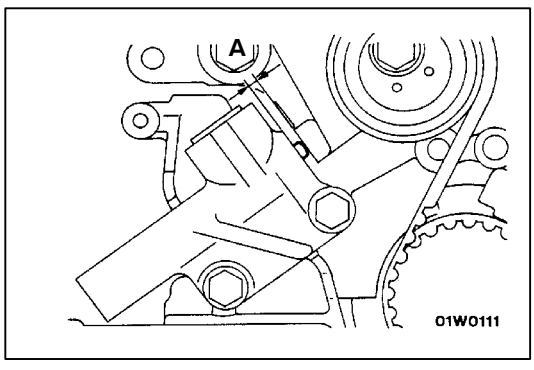
6. Loosen the centre bolt of the tensioner pulley. Use special tool and a torque wrench to apply the standard torque to the timing belt as shown in the illustration. Then tighten the centre bolt to the specified torque.

   Standard value: 4.4 Nm
   <Timing belt tension torque>

   Caution
   When tightening the centre bolt, be careful that the tensioner pulley does not turn with the bolt.



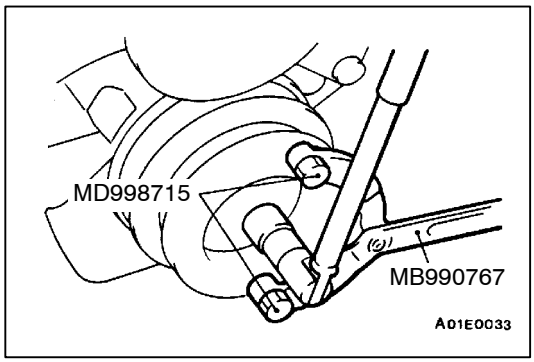
7. Remove the setting pin that has been inserted into the auto-tensioner.
8. Turn the crankshaft two turns clockwise to align the timing marks.



9. Wait for at least five minutes, and then check that the auto-tensioner pushrod extends within the standard value.

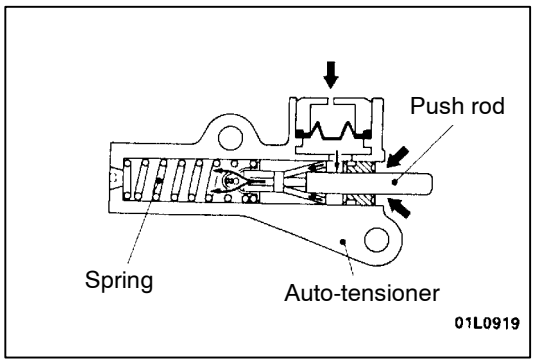
   Standard value (A): 3.8 – 5.0 mm

10. If no, repeat the operation in steps (5) to (9) above.
11. Check again that the timing marks of each sprocket are aligned.



▶C◀ CRANKSHAFT PULLEY INSTALLATION

Use special tools to install the crankshaft pulley.



INSPECTION

11200440131

AUTO-TENSIONER

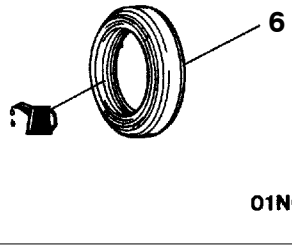
- Check the auto-tensioner for possible leaks.
- Check the push rod for cracks.

CRANKSHAFT FRONT OIL SEAL

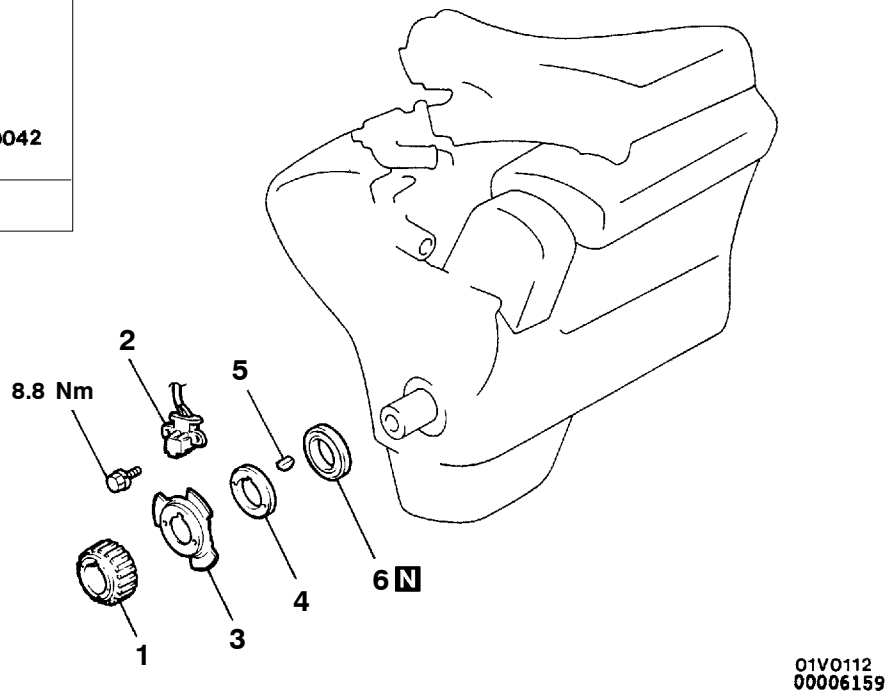
11200340462

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Timing Belt Removal and Installation (Refer to P.11A-28.)



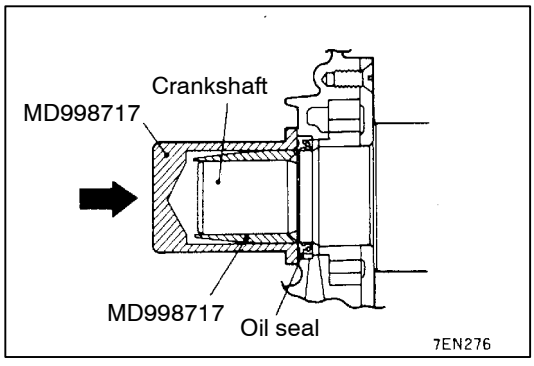
Engine oil



Removal steps

1. Crankshaft sprocket
2. Crankshaft angle sensor
3. Crankshaft sensing blade
4. Crankshaft spacer
5. Key

▶A◀ 6. Crankshaft front oil seal



INSTALLATION SERVICE POINT

▶A◀ CRANKSHAFT FRONT OIL SEAL INSTALLATION

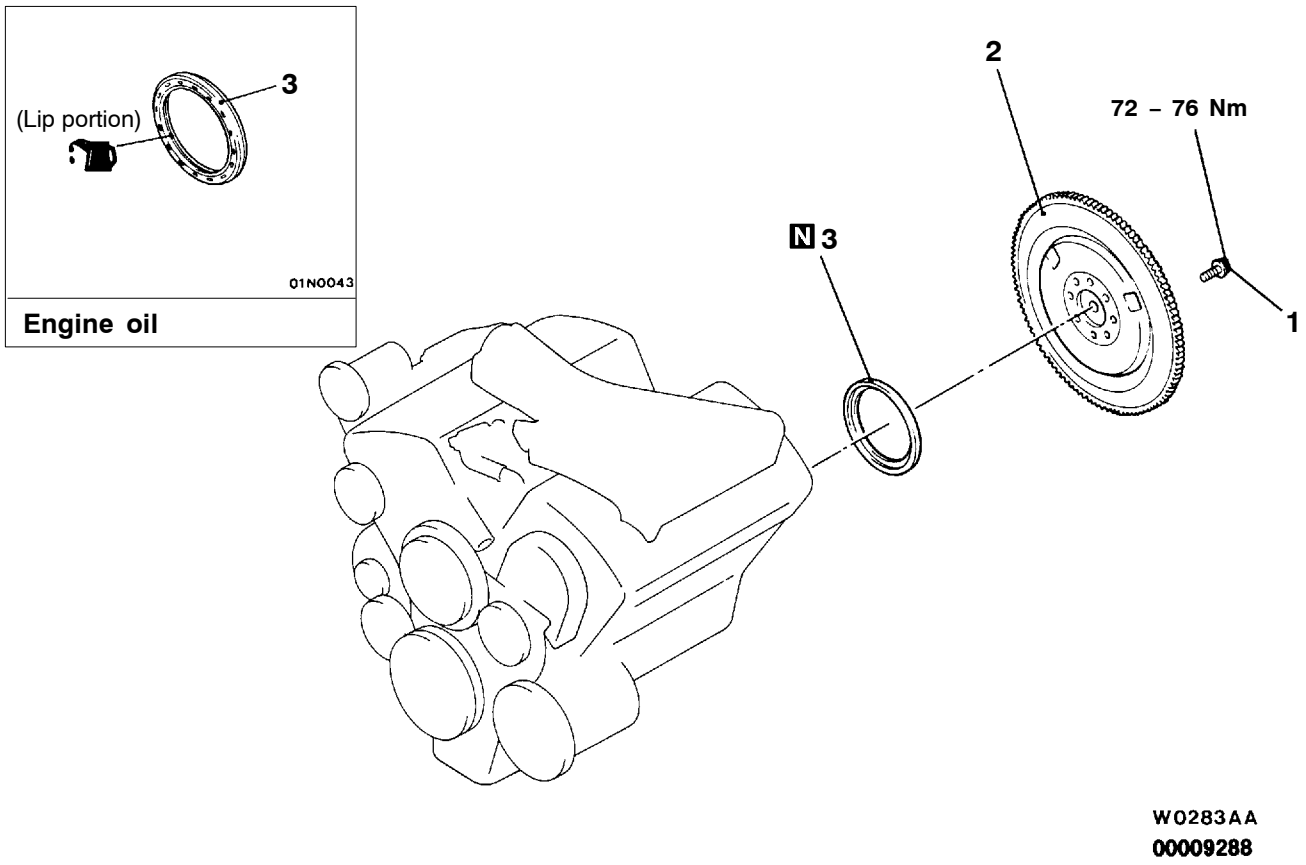
1. Apply a small amount of engine oil to the oil seal lip and then insert.
2. Using special tool, tap the oil seal into the front case.

CRANKSHAFT REAR OIL SEAL

11200370577

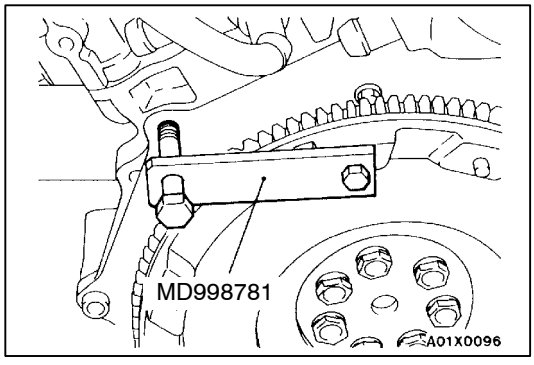
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Transmission and Transfer Assembly Removal and Installation (Refer to GROUP 22 – Transmission Assembly.)



Removal steps

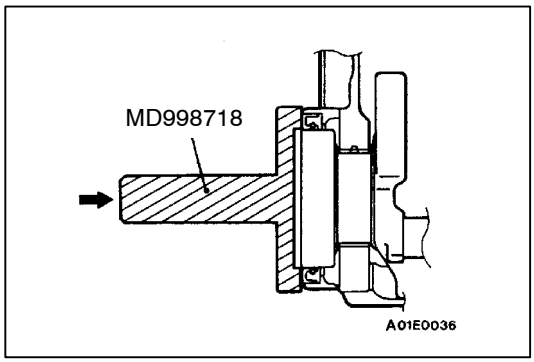
- Clutch cover and clutch disc
- ◀A▶ ▶B◀ 1. Flywheel bolt
- 2. Flywheel
- ▶A◀ 3. Crankshaft rear oil seal



REMOVAL SERVICE POINT

◀A▶ FLYWHEEL BOLT REMOVAL

Use special tool to secure the flywheel and remove the flywheel bolt.



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. Use special tool to tap in the oil seal as shown in the illustration.

▶B◀ FLYWHEEL BOLT INSTALLATION

Use special tool in the same way as during removal to install the flywheel bolt.

ENGINE ASSEMBLY

11200100992

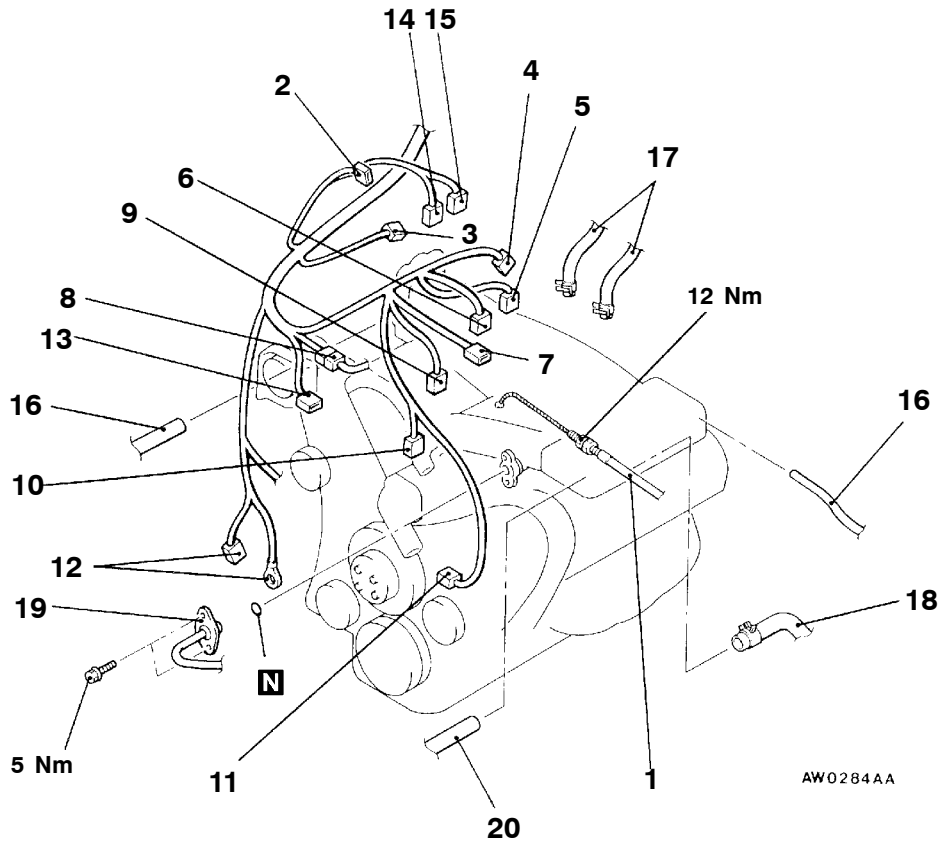
REMOVAL AND INSTALLATION

Caution

***: Indicates parts which should be initially tightened, and then fully tightened after placing the vehicle horizontally and loading the full weight of the engine on the vehicle body.**

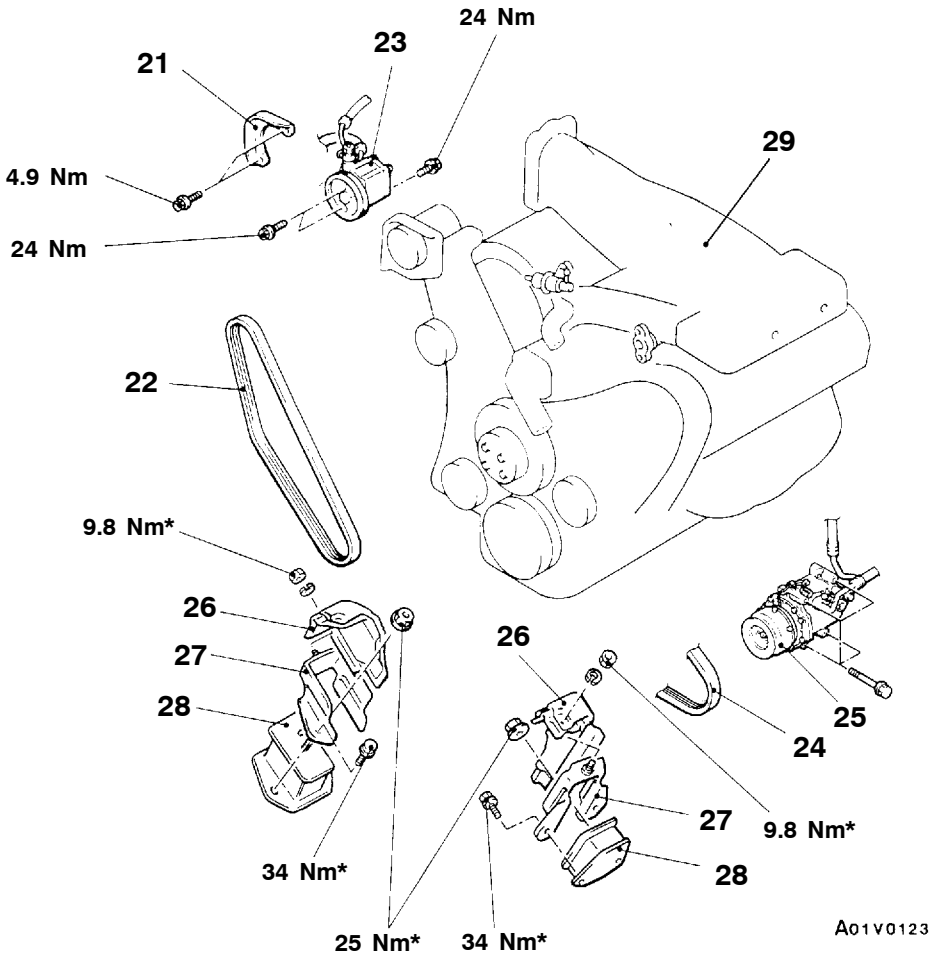
Pre-removal Operation
- Hood Removal (Refer to GROUP 42 – Hood.)
- Fuel Line Pressure Releasing (Refer to GROUP 13A – On-vehicle Service.)
- Air Cleaner and Air Intake Hose Removal (Refer to GROUP 15 – Air Cleaner.)
- Battery Removal
- Radiator Removal (Refer to GROUP 14 – Radiator.)
- Front Exhuast Pipe Removal (Refer to GROUP 15 – Exhaust Pipe and Main Muffler.)
- Transmission Assembly Removal (Refer to GROUP 22 – Transmission Assembly.)

Post-installation Operation
- Transmission Assembly Installation (Refer to GROUP 22 – Transmission Assembly.)
- Front Exhaust Pipe Installation (Refer to GROUP 15 – Exhaust Pipe and Main Muffler.)
- Radiator Installation (Refer to GROUP 14 – Radiator.)
- Battery installation
- Air Cleaner and Air Intake Hose Installation (Refer to GROUP 15 – Air Cleaner.)
- Hood Installation (Refer to GROUP 42 – Hood.)
- Drive Belt Tension Adjustment (Refer to P.11A-8.)
- Accelerator Cable Adjustment (Refer to GROUP 17 – On-vehicle Service.)



Removal steps

1. Accelerator cable connection
2. Throttle position sensor connector
3. Idle speed control servo connector
4. Power transistor connector
5. Camshaft position sensor connector
6. Crank angle sensor connector
7. Capacitor connector
8. Injector harness connector
9. Engine coolant temperature gauge unit connector
10. Engine coolant temperature sensor connector
11. Oil pressure switch connector
12. Alternator connector
13. Ignition coil connector
14. EGR solenoid valve
15. Purge control solenoid valve
16. Vacuum hose connection
17. Heater hose connection
18. Fuel return hose connection
19. High-pressure fuel hose connection
20. PCV hose connection



21. Power steering drive belt cover
22. Drive belt (for power steering)
◀A▶ 23. Power steering oil pump assembly
24. Drive belt (for A/C)
◀A▶ 25. A/C compressure assembly
26. Heat protector
27. Front insulator stopper
▶B◀ 28. Front engine support insulator
◀B▶ ▶A◀ 29. Engine assembly

REMOVAL SERVICE POINTS

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

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

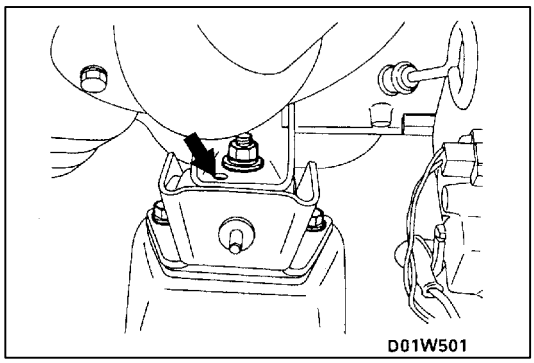
◀B▶ ENGINE ASSEMBLY REMOVAL

1. Check that all cables, hoses, harness connectors, etc. are disconnected from the engine.
2. Lift the special tool (MB991683) and chain block slowly to remove the engine assembly upward from the engine compartment.

INSTALLATION SERVICE POINT

▶A◀ ENGINE ASSEMBLY INSTALLATION

Install the engine assembly. When doing so, check carefully that all pipes and hoses are connected, and that none are twisted, damaged, etc.



▶B◀ FRONT ENGINE SUPPORT INSULATOR INSTALLATION

Make sure that the locating boss and hole are in alignment.

Caution
Do not distort rubber portions, and never stain rubber portions with fuel or oil.

Service Bulletins

Click on the applicable bookmark to select the Service Bulletin.

SERVICE BULLETIN

MITSUBISHI MOTORS

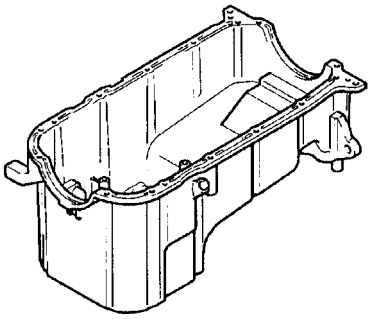
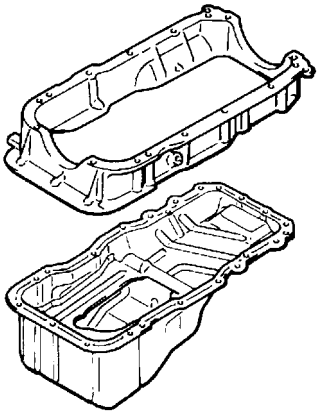
AFTER SALES SERVICE & CS PROMOTION
INTERNATIONAL CAR ADMINISTRATION OFFICE. MITSUBISHI MOTORS CORPORATION

SERVICE BULLETIN	NO. : MSB-00E11-001	
	DATE : 2000-07-20	<MODEL> (EC)MONTERO SPORT/PAJERO SPORT(K80W,K90W) <M/Y> 99-10
SUBJECT : REMOVAL & INSTALLATION PROCEDURES FOR INTEGRAL TYPE OIL PAN		
GROUP : ENGINE	DRAFTNO. : 00SY051217	

INFORMATION	INTERNATIONAL CAR ADMINISTRATION OFFICE	Tomoaki Nitta T. NITTA - PROJECT LEADER AFTER SALES SERVICE & CS PROMOTION

1. Description:

The oil pan for the 6G72 engine has been changed from the separate type to an integral type. With this change, the removal and installation procedures for the integral type oil pan have been established.

<New> Integral type oil pan	<Old> Separate type oil pan
	

2. Applicable Manuals:

Manual	Pub. No.	Page
'99 PAJERO SPORT Workshop Manual	PWJE9812 (English)	11A-23, 24
'99 MONTERO SPORT Workshop Manual	PWJS9813 (Spanish)	
'99 PAJERO SPORT Workshop Manual	PWJF9814 (French)	
	PWJG9815 (German)	

3. Effective Date:

From April 22, 2000
Effective model: LY6620 and up
Part numbers: MD370209 (without OLS)
MD370210 (with OLS)

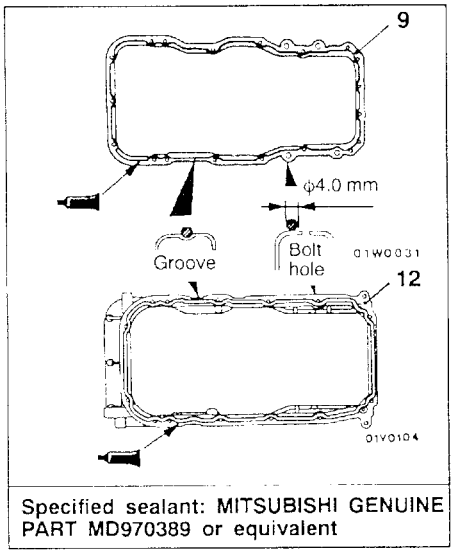
4. Details:

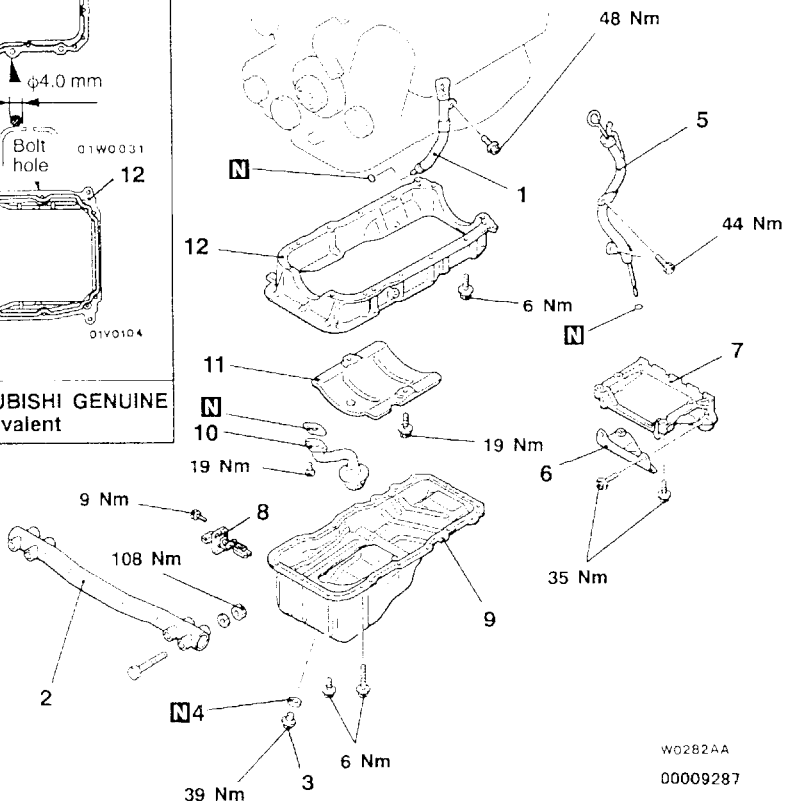
OIL PAN AND OIL SCREEN
REMOVAL AND INSTALLATIN

<Vehicles equipped with separate type oil pan> **<Added>**

11200250468

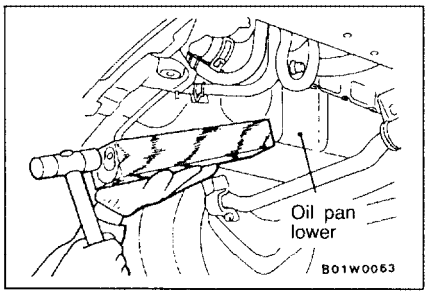
Pre-removal and Post-installation Operation
- Skid Plate and Under Cover Removal and Installation
- Engine Oil Draining and Refilling (Refer to GROUP 12 – On-vehicle Service.)
- Alternator Removal and Installation (Refer to GROUP 16 – Alternator.)
- Stabilizer Bar Removal and Installation (Refer to GROUP 33A – Stabilizer Bar.)
- Front Exhaust Pipe Removal and Installation (Refer to GROUP 15 – Exhaust Pipe and Main Muffler.)
- Actuator Assembly and Heat Protector Removal and Installation (Refer to GROUP 26 – Inner Shaft.)





Removal steps

1. Oil dipstick assembly
2. Crossmember assembly
3. Drain plug
▶C◀ 4. Drain plug gasket
5. A/T oil dipstick assembly
6. Exhaust pipe support bracket
▶B◀ 7. Transmission stay
8. Oil level sensor
◀A▶ ▶A◀ 9. Oil pan lower
10. Oil screen
11. Baffle plate
▶A◀ 12. Oil pan upper



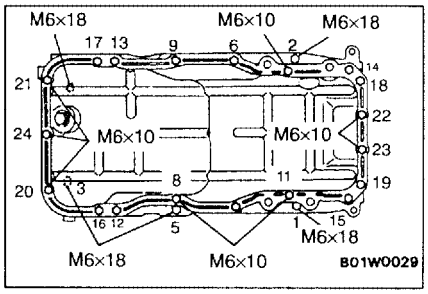
REMOVAL SERVICE POINT

◀A▶ OIL PAN LOWER REMOVAL

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

Caution
The use of an oil pan remover (MD998727) can damage the oil pan, upper (aluminum made).

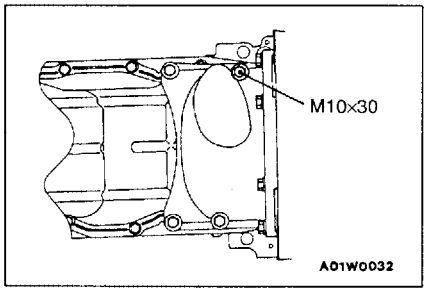
OIL PAN UPPER / <Added>



INSTALLATION SERVICE POINTS

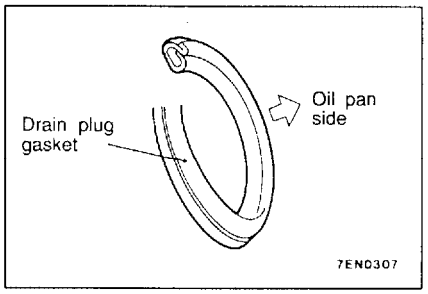
▶A◀ OIL PAN LOWER INSTALLATION

1. Tighten the bolts in order of the numbers shown in the illustration.
2. Be careful when installing, as there are two different lengths of bolt.



▶B◀ TRANSMISSION STAY INSTALLATION

Be careful when installing, as the bolts indicated in the illustration have different lengths from the other bolts.



▶C◀ DRAIN PLUG GASKET INSTALLATION

Replace the gasket with a new gasket. Install the new gasket in the direction shown in the illustration.

INSPECTION

11200260089

- Check the oil pan for cracks.
- Check the oil pan sealant-coated surface for damage and deformation.
- Check the oil screen for cracked, clogged or damaged wire net and pipe.

Following two pages to be added.

<Added>

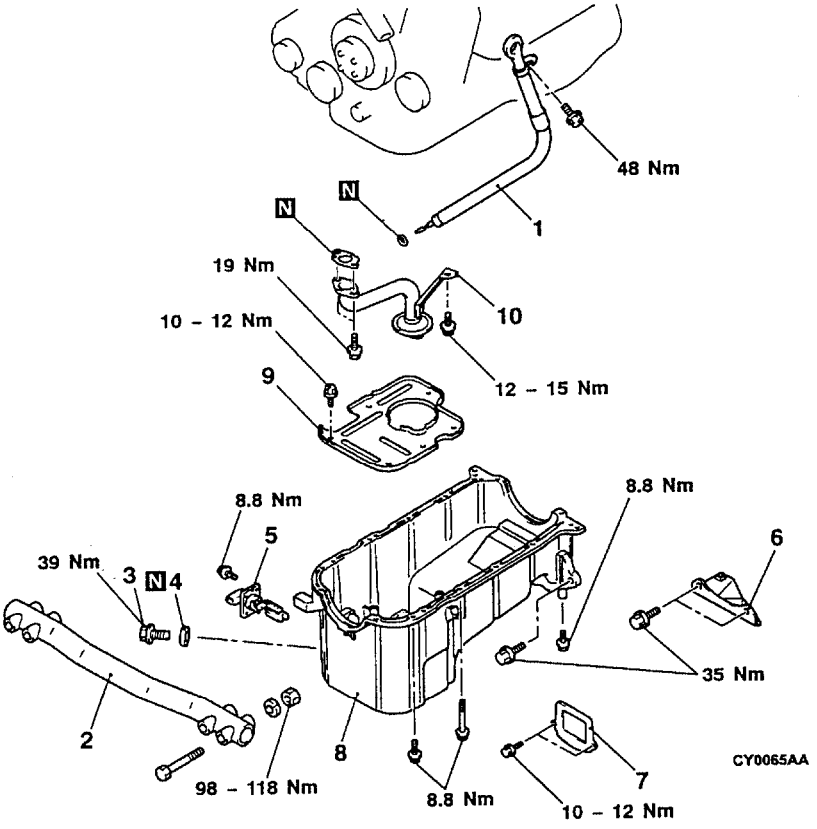
ENGINE <6G7> - Oil Pan and Oil Screen

<Vehicles equipped with integral type oil pan>

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Skid Plate and Under Cover Removal and Installation
- Engine Oil Draining and Refilling (Refer to GROUP 12 - On-vehicle Service.)
- Front Differential Gear Oil Draining and Refilling
- Relay Rod Removal and Installation (Refer to GROUP 37A - Steering Linkage.)
- Front Suspension Crossmember, Front Differential, Housing Tube and Differential Mounting Bracket <RH> Assembly Removal and Installation (Refer to GROUP 26 - Differential Carrier.)
- Transmission Oil Cooler Pipe Clamp Removal and Installation <A/T>
- Starter Removal and Installation (Refer to GROUP 16.)
- Front Exhaust Pipe <LH> Removal and Installation (Refer to GROUP 15.)



Removal steps

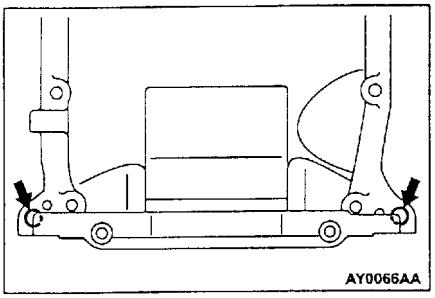
1. Oil dipstick assembly
2. Crossmember assembly
3. Drain plug
4. Drain plug gasket
5. Oil level sensor

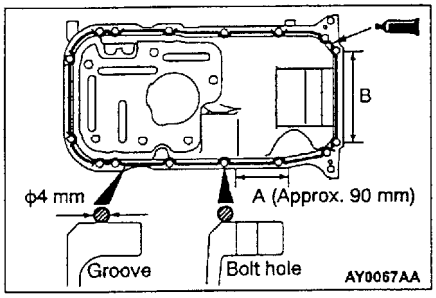
◀A▶ ▶A◀ ▶A◀ ▶A◀

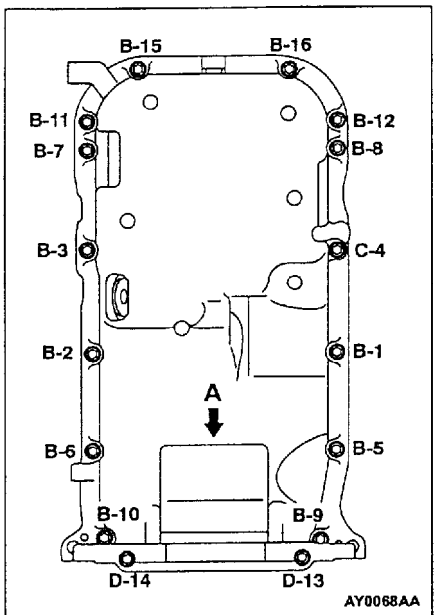
6. Exhaust pipe support bracket
7. Oil pan cover
8. Oil pan
9. Baffle plate
10. Oil screen

<Added>

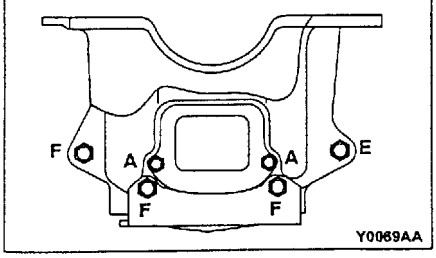
ENGINE <6G7> - Oil Pan and Oil Screen







View A



REMOVAL SERVICE POINT

◀A▶ OIL PAN REMOVAL

Screw the bolts (M10 x 1.25 mm) into the threaded holes as shown to remove the oil pan.

Caution
The use of an oil pan remover (MD998727) can damage the aluminum oil pan.

INSTALLATION SERVICE POINT

▶A◀ OIL PAN / OIL PAN COVER / EXHAUST PIPE SUPPORT BRACKET INSTALLATION

1. Using a scraper, wire brush, etc., remove the gasket adhering to the oil pan and the cylinder block.
2. Apply specified sealant in a continuous bead around the mounting surface of the oil pan as shown in the illustration.

   Specified sealant:
   MITSUBISHI GENUINE PART No. MD970389 or equivalent
3. Install the oil pan to the cylinder block using care that sealant will not come out of oil pan flanges A and B.
4. Install the oil pan, oil pan cover and exhaust pipe support bracket bolts as shown in the illustration, and tighten them to the specified torque. At this time, tighten flange bolts B and C and washer assembled bolts D in the numerical order shown in the illustration.

Part name	Mark	Q'ty	Dimensions (mm) (nominal diameter x nominal length)	Tightening torque Nm
Flange bolt	A	2	6 x 10	10 - 12
	B	13	6 x 18	8.8
	C	1	6 x 75	
Washer assembled bolt	D	2	6 x 18	
	E	1	10 x 35	35
	F	3	10 x 38	

INSPECTION

11200260089

- Check the oil pan for cracks.
- Check the oil pan sealant-coated surface for damage and deformation.
- Check the oil screen for cracked, clogged or damaged wire net and pipe.

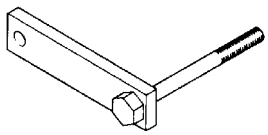
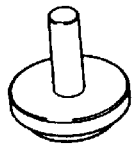
GROUP 11A
ENGINE<6G7>

GENERAL

OUTLINE OF CHANGE

- The following service procedures have been added due to the addition of vehicles with 6G7 <A/T>.

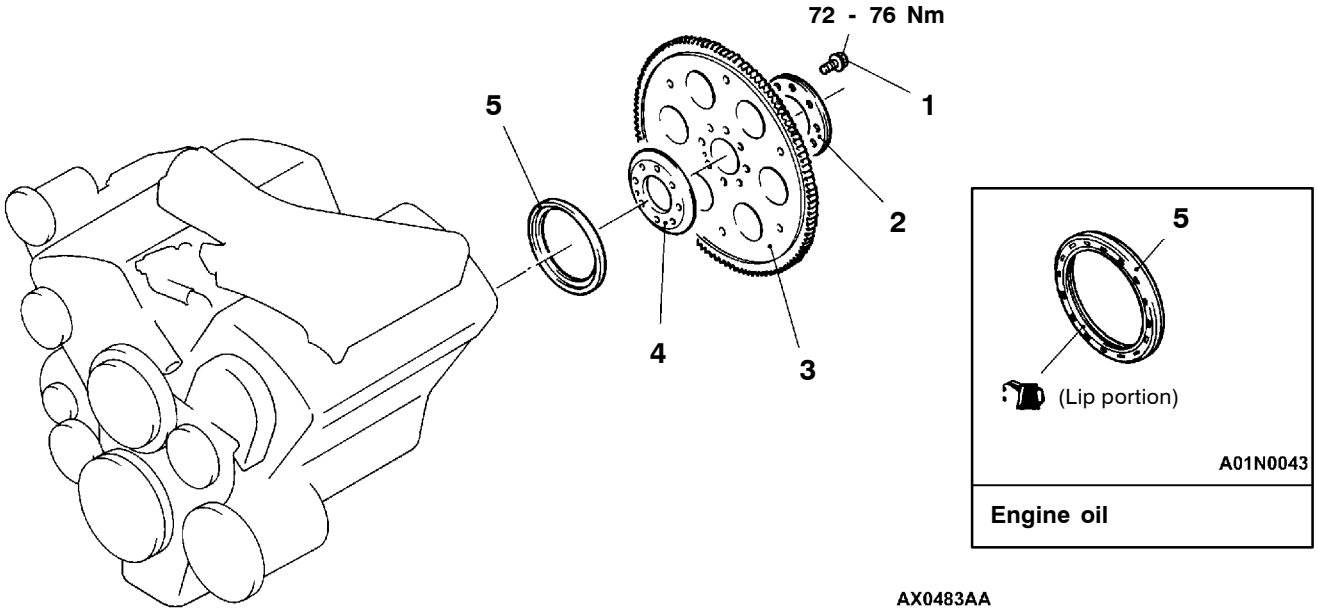
SPECIAL TOOLS

Tool	Number	Name	Use
	MD998781	Flywheel stopper	Securing the flywheel
	MD998718	Crankshaft rear oil seal installer	Press-fitting the crankshaft rear oil seal

CRANKSHAFT REAR OIL SEAL

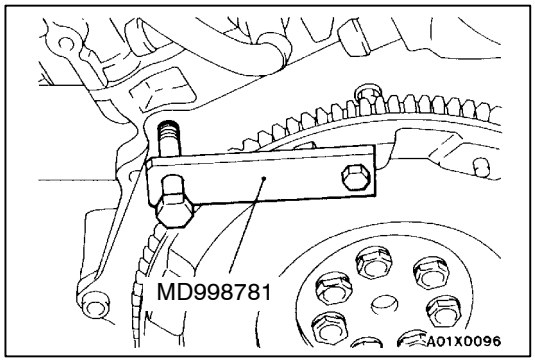
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
Transmission and Transfer Aaaembly Removal and Installation (Refer to GROUP 23 - Transmission Assembly.)



Removal steps

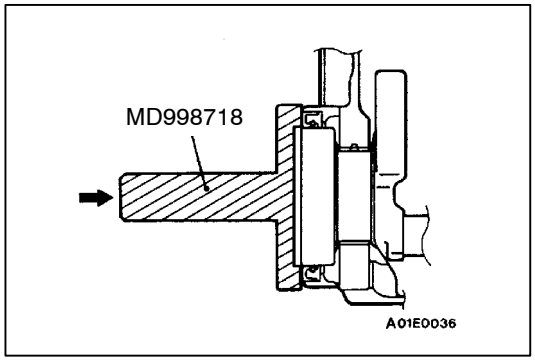
◀A▶ ▶B◀ 1. Drive plate bolt
2. Adaptor plate
3. Drive plate
4. Crankshaft adaptor
▶A◀ 5. Crankshaft rear oil seal



REMOVAL SERVICE POINT

◀A▶ DRIVE PLATE BOLT REMOVAL

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



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. Use special tool to tap in the oil seal as shown in the illustration.

▶B◀ DRIVE PLATE BOLT INSTALLATION

Use special tool in the same way as during removal to install the drive plate bolt.