ENGINE

CONTENTS

E11AA--

NOTES

SPECIFICATIONS

GENERAL SPECIFICATIONS

E11CA--

Items	4G64	6G72–12 VALVE	6G72–24 VALVE	6G74
Total displacement cm³ (cu.in.)	2,351 (143.5)	2,972 (181.4)	2,972 (181.4)	3,497 (213.3)
Bore x Stroke mm (in.)	86.5 x 100 (3.41 x 3.94)	91.1 x 76 (3.59 x 2.99)	91.1 x 76 (3.59 x 2.99)	93 X 85.8 (3.66 X 3.38)
Compression ratio	8.5	8.9	9.0	9.5
Firing order	1-3-4-2	1-2-3-4-5-6	1-2-3-4-5-6	1-2-3-4-5-6
Combustion chamber	Compact type	Compact type	Pentroof type	Pentroof type
Valve mechanism	Single camshaft	Double camshaft	Double camshaft	Four camshaft
Camshaft drive by	Cogged belt	Cogged belt	Cogged belt	Cogged belt
Valve timing				
Intake	Open: BTDC20° Close: ABDC64°	Open: BTDC19° Close: ABDC59°	Open: BTDC19° Close: ABDC45°	Open: BTDC11.5° Close: ABDC60.5°
Exhaust	Open: BBDC64° Close: ATDC20°	Open: BBDC59° Close: ATDC19°	Open: BBDC49° Close: ATDC15°	Open: BBDC43.5° Close: ATDC20.5°
Rocker arm	Slipper type	Roller follower type	Roller follower type	Roller follower type
Lash adjuster	Equipped	Equipped	Equipped	Equipped
Spark plug				
NGK	BPR6ES-11	BPR5ES-11	PFR6J-11	PFR5J-11
NIPPON DENSO	W20EPR11	W16EPR11	PK20PR-P11	PK16PR-P11

Items	4D56	4M40
Total displacement cm³ (cu.in.)	2,477 (151.2)	2,835 (173.0)
Bore x Stroke mm (in.)	91.1 x 95 (3.59 x 3.74)	95 x 100 (3.74 x 3.94)
Compression ratio	21	21
Injection order	1-3-4-2	1-3-4-2
Combustion chamber	Swirl type	Swirl type
Valve mechanism	Single camshaft	Single camshaft
Camshaft drive by	Cogged belt	Double chain
Valve timing		
Intake	Open: BTDC20° Close: ABDC49°	Open: BTDC19° Close: ABDC53°
Exhaust	Open: BBDC55° Close: ATDC22°	Open: BBDC60° Close: ATDC16°
Rocker arm	Roller follower type	–
Lash adjuster	Not-equipped	Not-equipped

SERVICE SPECIFICATIONS

E11CB--

Items	4G64	6G72–12 VALVE	6G72–24 VALVE	6G74
Standard value				
Drive belt tension mm (in.)				
Alternator-V ribbed type				
When checked	–	8–10 (0.31–0.39)	A: 5–7 (0.20–0.28) B: 8.5–10.5 (0.33–0.41)	A: 5–7 (0.20–0.28) B: 8.5–10.5 (0.33–0.41)
When a new belt is installed	–	6.5–8 (0.26–0.31)	A: 5.5–6.5 (0.22–0.26) B: 8–9 (0.31–0.35)	A: 5.5–6.5 (0.22–0.26) B: 8–9 (0.31–0.35)
When the used belt is installed	–	9 (0.35)	A: 4–5 (0.16–0.20) B: 5.5–7.5 (0.22–0.30)	A: 4–5 (0.16–0.20) B: 5.5–7.5 (0.22–0.30)
Alternator-V type				
When inspecting and installing when the belt is reused	7–10 (0.28–0.39)	–	–	–
When a new belt is installed	7–10 (0.28–0.39)	–	–	–
Power steering oil pump				
When checked	6–10 (0.24–0.39)	9–14.5 (0.35–0.57)	10.5–14.5 (0.41–0.57)	13–17 (0.51–0.67)
When a new belt is installed	5.5 (0.22)	8.0 (0.31)	9.5–11.5 (0.37–0.45)	11–13 (0.55–0.63)
When the used belt is installed	7.0 (0.28)	10 (0.39)	11.5–13.5 (0.45–0.53)	14–16 (0.55–0.67)
Air-conditioner compressor				
When checked and the used belt is installed	6.5–7.5 (0.26–0.30)	6.5–7.5 (0.26–0.30)	6.5–7.5 (0.26–0.30)	6.5–7.5 (0.26–0.30)
When a new belt is installed	5–6 (0.20–0.24)	5–6 (0.20–0.24)	5–6 (0.20–0.24)	5–6 (0.20–0.24)
Basic ignition timing	5°BTDC ± 2°	5°BTDC ± 2°	5°BTDC ± 3°	5°BTDC ± 3°
Idle speed r/min.	750 ± 100	700 ± 100	700 ± 100	700 ± 100
CO concentration and HC concentration at idle				
CO concentration %	0.5 or less	0.5 or less	0.5 or less	0.5 or less
HC concentration ppm	100 or less	100 or less	100 or less	100 or less
Compression pressure kPa (kg/cm^2, psi) [250–400 r/min.]	1,180 (12.0, 171)	1,180 (12.0, 171)	1,180 (12.0, 171)	1,270 (13.0, 185)
Intake manifold vacuum kPa (mmHg, in.Hg)	67 (500, 20)	69 (520, 20)	69 (520, 20)	69 (515, 20)
Timing belt tension mm (in.)	14 (0.55)	–	–	–
Timing belt "B" tension mm (in.)	5–7 (0.20–0.28)	–	–	–

NOTE
A : Between the water pump pulley and the crankshaft pulley
B : Between the water pump pulley and the alternator pulley

Items	4G64	6G72–12 VALVE	6G72–24 VALVE	6G74
Limit				
Compression pressure kPa (kg/cm^2, psi)	min. 870 (8.9, 127)	min. 870 (8.9, 127)	min. 870 (8.9, 127)	min. 900 (9.2, 131)
Compression pressure difference of all cylinders kPa (kg/cm^2, psi)	max. 98 (1.0, 14)	max. 98 (1.0, 14)	max. 98 (1.0, 14)	max. 98 (1.0, 14)

Items	4D56	4M40
Standard value		
Drive belt tension mm (in.)		
Alternator-V type		
When checked	11–14 (0.43–0.55) 15–18 (0.59–0.71)*1	8–11 (0.31–0.43)
When a new belt is installed	9–12 (0.35–0.47) 13–16 (0.51–0.63)*1	8–9 (0.31–0.35)
When the used belt is installed	11–14 (0.43–0.55) 15–18 (0.59–0.71)*1	9–11 (0.35–0.43)
Power steering oil pump		
V type		
When checked	8–13.5 (0.31–0.53)	–
When a new belt is installed	7.0 (0.28)	–
When the used belt is installed	9.5 (0.37)	–
V ribbed type		
When checked	8–12 (0.31–0.47)	–
When a new belt is installed	6–8 (0.24–0.31)	–
When the used belt is installed	9–11 (0.35–0.43)	–
Air-conditioner compressor		
When checked and the used belt is installed	6.5–7.5 (0.26–0.30)	6–8 (0.24–0.31)
When a new belt is installed	5–6 (0.20–0.24)	5–6 (0.20–0.24)
Injection timing	7°ATDC, 9°ATDC*2	12°ATDC, 6°ATDC*2
Stroke of injection pump plunger mm (in.)	1±0.03 (0.0394±0.0012)	1±0.03 (0.0394±0.0012)
Idle speed r/min.	750±100	800±100
Idle up speed (for anti-skid brake) r/min.	1900±100	–
Idle up speed (for air conditioner) r/min.	900±50	900±50

NOTE
*1: Double belt type
*2: Vehicles with supercharging pressure control system.

Items	4D56	4M40
Standard value		
Compression pressure kPa (kg/cm², psi) [250–400 r/min.]	2,650 (27.0, 384) 3,040 (31.0, 441)*1	2,840 (29.0, 412)
Valve clearance (at hot) mm (in.)	0.25 (0.001)	0.25 (0.001)*2 0.35 (0.014)*3
Timing belt tension mm (in.)	4–5 (0.16–0.20)	
Timing belt "B" tension mm (in.)	4–5 (0.16–0.20)	
Limit		
Compression pressure kPa (kg/cm², psi)	min. 1,920 (19.2, 273) 2,240 (22.4, 319)*1	min. 2,260 (23, 327)
Compression pressure difference of all cylinders kPa (kg/cm², psi)	max. 300 (3.0, 43)	max. 290 (3.0, 43)

NOTE
*1: Vehicles with water cooled turbocharger
*2: Intake side
*3: Exhaust side

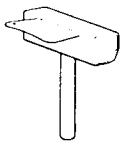
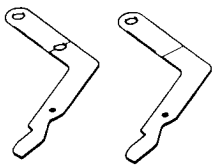
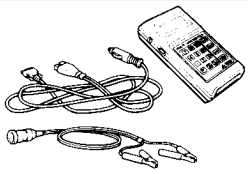
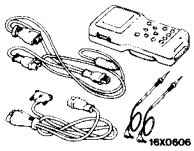
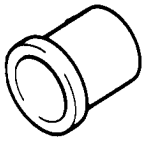
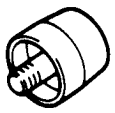
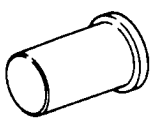
SEALANTS AND ADHESIVES

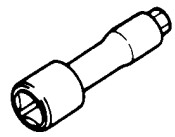
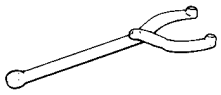
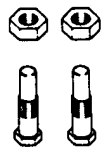
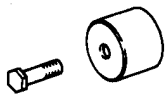
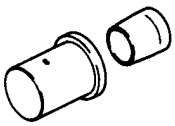
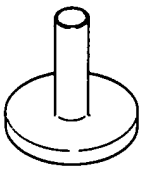
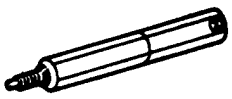
E11CE--

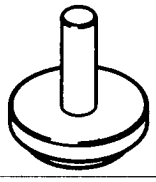
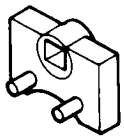
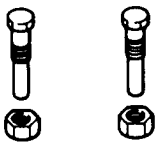
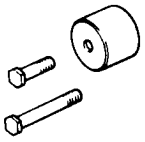
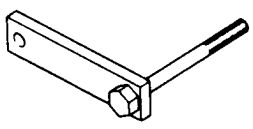
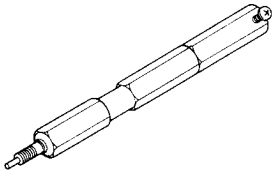
Item	Specified sealant and adhesive	Remarks
Oil pan	MITSUBISHI GENUINE PART No. MD997110 or equivalent	Semi-drying sealant
Rocket cover Semi-circular packing	3M ATD Part No. 8660 or equivalent	
Timing belt cover gasket	3M ATD Part No. 8001 or equivalent	Drying adhesive

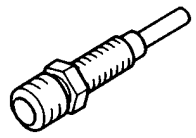
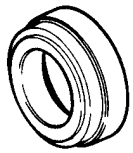
SPECIAL TOOLS

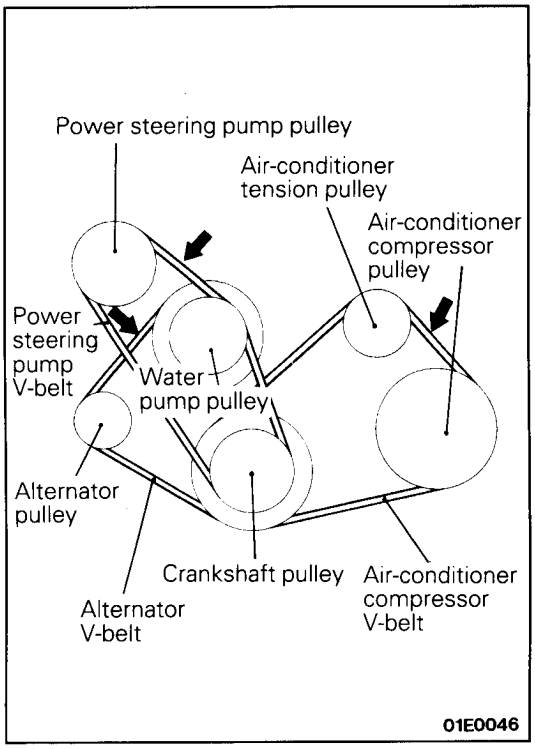
E11DA--

Tool	Number	Name	Use
	MD998727	Oil pan sealer cutter	Removal of oil pan
	MD998782	Valve lifter set	Removal of roller rocker arm
	MB991341	Multi-use tester sub assembly	Checking of the engine idling speed <Vehicles built up to October, 1993>
	MB991360	ROM pack	
 16X0606	MB991502	MUT-II sub assembly	Idle speed inspection <All models>
 16X0607		ROM pack	
	MD998306	Camshaft oil seal installer	Guide for installing camshaft oil seal
	MD998307	Camshaft oil seal guide	
	MD998375	Crankshaft front oil seal installer	Installation of crankshaft front oil seal
	MD998285	Crankshaft front oil seal guide	

Tool	Number	Name	Use
	MD998051	Wrench, cylinder head bolt	Loosening and tightening of cylinder head bolt
	MB990767	End yoke holder	Supporting the sprocket and shaft pulley when attaching or detaching them
	MD998715	Pin	Supporting the sprocket when the camshaft sprocket bolt is loosened. Used together with MB990767 <6G72>
	MD998716	Crankshaft wrench	Used if the crankshaft needs to be rotated to attach the timing belt, etc. When the piston and connecting rod assembly is assembled. <6G72>
	MD998713	Camshaft oil seal installer	Press fitting the camshaft oil seal <6G72>
	MD998717	Crankshaft front oil seal installer	Press fitting crankshaft front oil seal <6G72>
	MD998718	Crankshaft rear oil seal installer	Press fitting crankshaft rear oil seal
	MD998384	Prestroke measuring adapter	Adjusting injection timing <4D56>
	MD998721	Crankshaft pulley holder	Removal and installation of crankshaft pulley
	MD998381	Camshaft oil seal installer	Installation of camshaft oil seal <4D56>

Tool	Number	Name	Use
	MD998382	Crankshaft front oil seal guide	Installation of crankshaft front oil seal <4D56>
	MD998383	Crankshaft front oil seal installer	
	MD998376	Crankshaft rear oil seal installer	Installation of crankshaft oil seal <4G64>
	MD998769	Crankshaft pulley spacer	Used if the crankshaft needs to be rotated to attach the timing belt etc.
	MD998767	Socket wrench	Adjustment of timing belt
	MD998754	Crankshaft pulley holder	Supporting the crankshaft pulley when crankshaft bolt and pulley are removed or reinstalled. Use together with MB990767 <6G74, 4M40>
	MD998761	Camshaft oil seal installer	Installation of camshaft oil seal <6G74>
	MD998781	Flywheel stopper	Holding of drive plate
	MH063302	Measuring device	Inspection and adjustment of fuel injection timing <4M40>

Tool	Number	Name	Use
	MH062393	Compression gauge adapter	Measurement of compression pressure <4M40>
	MB991559	Camshaft oil seal installer	Press fitting the camshaft oil seal (For 6G72–24 VALVE engine left bank)



ENGINE <4G64>

SERVICE ADJUSTMENT PROCEDURES

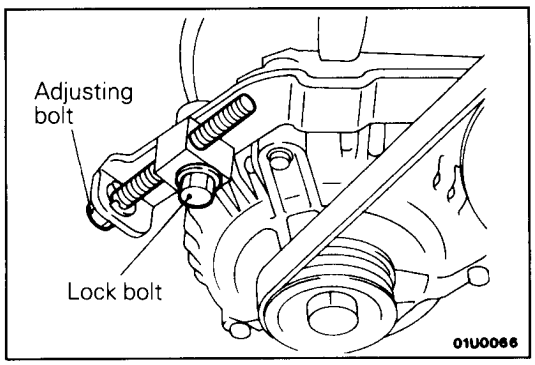
DRIVE BELTS TENSION INSPECTION AND ADJUSTMENT

E11FQBD

(1) Check that the belts are not damaged
(2) Check the tension by pulling or pushing at the centre of the belt between pulleys with a force of 100 N (10 kg, 22 lbs.) as shown in the figure. Measure the drive belt flexion.

Standard value:

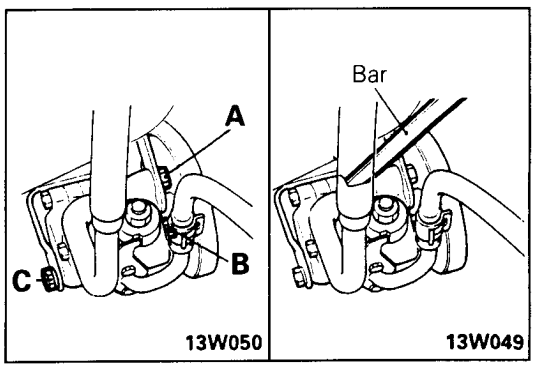
Alternator	**7–10 mm (0.28–0.39 in.)**
Power steering oil pump	**6–10 mm (0.24–0.39 in.)**
Air-conditioner compressor	**6.5–7.5 mm (0.26–0.30 in.)**



TENSION ADJUSTMENT OF THE ALTERNATOR DRIVE BELT

(1) Loosen the nut on the alternator pivot bolt.
(2) Loosen the lock bolt.
(3) Turn the adjusting bolt to adjust the belt so that the amount of flexion is at the standard value.
(4) Tighten the lock bolt.
(5) Tighten the nut on the alternator pivot bolt.
(6) Crank the engine once or more.
(7) Check the belt tension.

Standard value: 7–10 mm (0.28–0.39 in.)

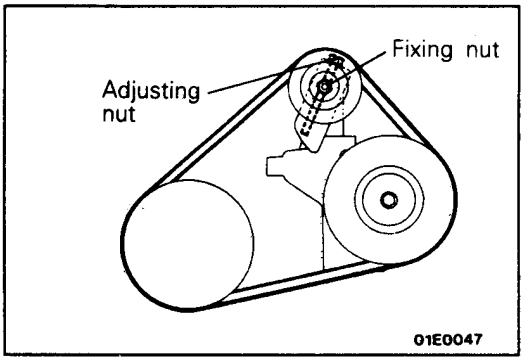


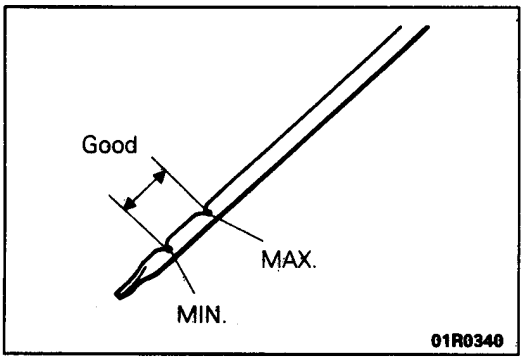
TENSION ADJUSTMENT OF POWER STEERING OIL PUMP DRIVE BELT

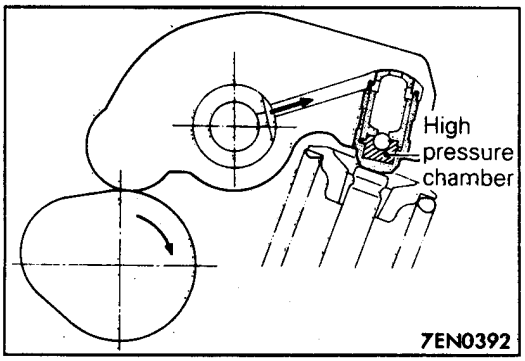
(1) Loosen power steering pump fixing bolts (A), (B) and (C).
(2) Move power steering pump, tension belt moderately and adjust.
(3) Tighten the fixing bolts (A), (B) and (C) in that order.
(4) Crank the engine once or more.
(5) Check the belt tension.

Standard value:

Used belt	**7 mm (0.28 in.)**
New belt	**5.5 mm (0.22 in.)**







TENSION ADJUSTMENT OF AIR CONDITIONER COMPRESSOR DRIVE BELT

(1) Loosen tension pulley fixing nut.
(2) Adjust belt tension.
(3) Tighten fixing nut.
(4) Crank the engine once or more.
(5) Check the belt tension.

Standard value:

Used belt	**6.5–7.5 mm (0.26–0.30 in.)**
New belt	**5–6 mm (0.20–0.29 in.)**

LASH ADJUSTERS INSPECTION E11FBAH

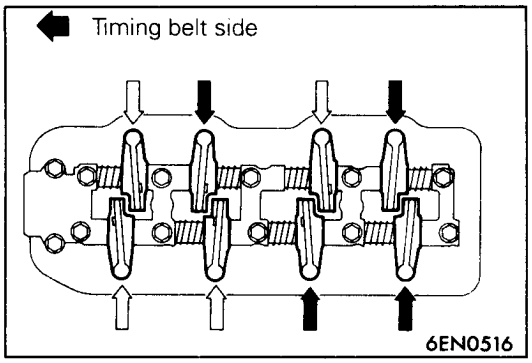
NOTE
Directly after starting the engine or while the engine is running, if an abnormal sound (clattering) that seems to be coming from the auto-lash adjuster is heard and doesn't stop, carry out the following inspection.

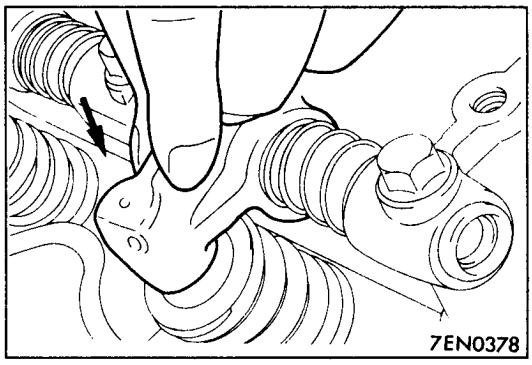
(1) Check the engine oil and refill or replace the oil if necessary.
NOTE
1. If there is a small amount of oil, air is being sucked in through the oil strainer and is getting into the oil passage.
2. If the amount of oil is greater than specified then the oil is mixed by the crankshaft and a large amount of air is mixed into the oil.
3. Air and oil will not separate easily in oil that has degenerated, and the amount of air mixed into the oil will increase.

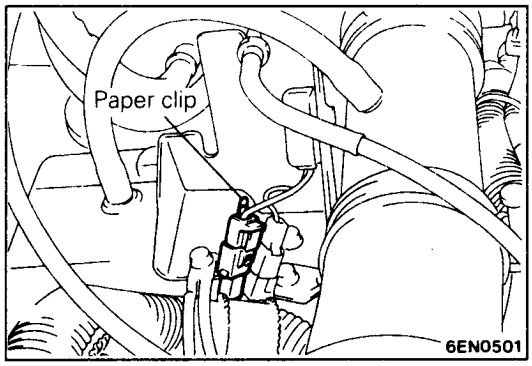
If the air mixed in with the oil due to the above reasons gets into the high pressure chamber of the auto-lash adjuster, the air inside the high pressure chamber will be compressed when the valve is open and the auto-lash adjuster will overcompress, resulting in an abnormal noise when the valve closes. This is the same effect as if the valve clearance is adjusted to be too large by mistake.
In this case, when the air that has got into the auto-lash adjuster is expelled, the condition will return to normal.

(2) Start the engine and gently race* the engine several times (10 times or less).
If the abnormal noise is stopped by the racing, air has been released from the high pressure chamber, and the functioning of the auto-lash adjuster has returned to normal.
* After gradually increasing the engine speed from idle speed to 3,000 r/min (in 30 seconds), gradually reduce the engine speed back to idle speed (in 30 seconds).

NOTE
1. If the vehicle is parked on a slope for a long time, the oil will be sometimes reduced in the auto-lash adjuster, and air will enter the high-pressure chamber when the engine is started.
2. After the vehicle is parked for a long time, the oil will go out of the oil passage. Since it takes a little time to supply oil to the auto-lash adjuster, air sometimes enters the high-pressure chamber.



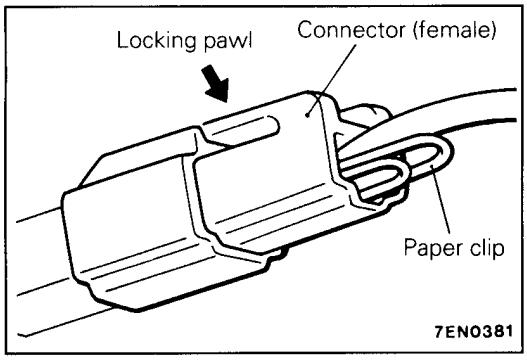




(3) If the abnormal noise is not stopped by the racing, check the auto-lash adjuster by the following procedure.
   1 Stop the engine.
   2 Set the engine No. 1 cylinder to the compressing top dead centre position.
   3 Push the rocker arm in the locations indicated by ⇦ in the illustration at left to check if the rocker arm moves down or not.
   4 Slowly turn the crankshaft 360° clockwise.
   5 Check the rocker arm in the locations indicated by ⬅ in the illustration at left using the same procedure in step 3.
   6 If the rocker arm moves down when it is pushed, replace the auto-lash adjuster;
   When replacing the auto-lash adjuster, install after bleeding the air from all of the auto-lash adjusters, and then carry out the checks in steps 1 to 5.
   In addition, if the rocker arm feels extremely stiff when it is pushed and does not move down, the autolash adjuster is normal, so investigate for some other cause of the abnormality.
   NOTE
   For the procedure for bleeding the air from the autolash adjusters, refer to the Engine Workshop Manual.

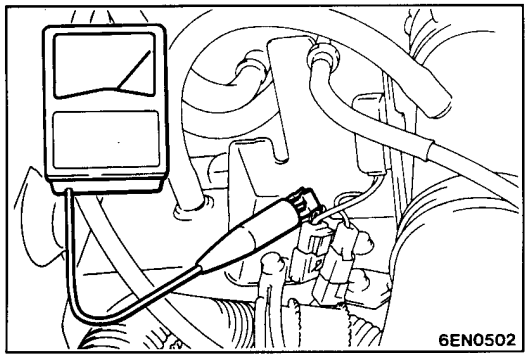
IGNITION TIMING INSPECTION AND ADJUSTMENT E11FUBC

(1) Perform inspection and adjustment with the vehicle in the following condition.
- Engine coolant temperature: 80–95°C (176–203°F)
- Lights and all accessories: OFF
- Transmission: Neutral
- Steering wheel: Straight forward position



(2) Insert a paper clip into the 1-pin connector between the primary side of the ignition coil and the noise filter. The connector should not be disconnected.

Caution
Insert the paper clip along the terminal from the opposite side to the locking pawl of the female connector, as shown in the illustration.



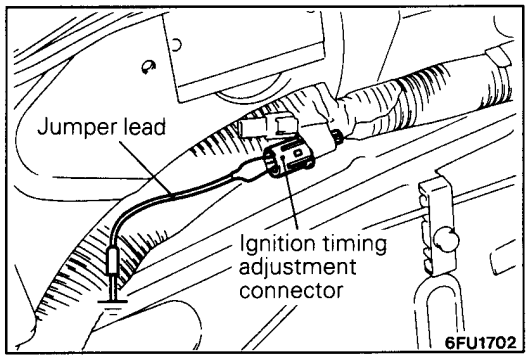
(3) Connect a primary voltage detection-type speedometer to the paper clip.

NOTE
Do not use the multi-use tester (MUT) or MUT-II. When the multi-use tester or MUT-II is connected to the diagnosis connector, the ignition timing will be unchanged, instead of reverting to the standard ignition timing.

(4) Start the engine and run it at idle speed.
(5) Check that the idle speed is at the standard value.

Standard value: 750±100 r/min

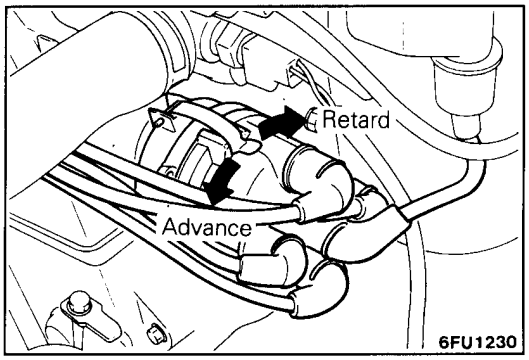
(6) Turn the ignition switch to "OFF".
(7) Install the timing light.
(8) Remove the waterproof female connector from the ignition timing adjustment connector (brown).
(9) Use a jumper lead to earth the ignition timing adjustment terminal.



NOTE
Earthing the ignition timing adjustment terminal will change the ignition timing to standard.

(10) Start the engine and run it at idle speed.
(11) Inspect the standard ignition timing.

Standard value: 5°BTDC±2°



(12) If the timing is outside the standard value, adjust by turning the distributor.

NOTE
The ignition timing will be retarded if the distributor is turned in a clockwise direction, and advanced if it is turned in an anti-clockwise direction.

(13) After adjusting the ignition timing, tighten the mounting nut, being careful not to move the distributor.
(14) Stop the engine, remove the jumper lead from the ignition timing adjustment connector (brown), and return the connector to its original condition.

(15) Start the engine and check that ignition timing is at the standard value.

Standard value: Approx. 8°BTDC

NOTE
1. Ignition timing is variable within about ±7°, even under normal operating conditions.
2. Also, it is automatically advanced further by about 5° to 10°BTDC at higher altitudes.

(16) Sealing tape is to be attached to the fitting nut for vehicles for Switzerland.

NOTE
Sealing tape has been attached at the factory for all other vehicles.

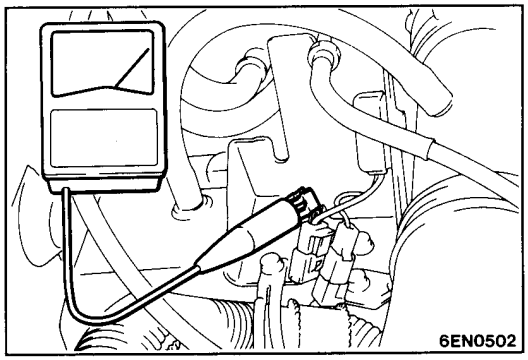
IDLE SPEED INSPECTION E11FXCT

(1) Perform inspection and adjustment with the vehicles in the following condition.
- Engine coolant temperature: 80–95°C (176–203°F)
- Lights and all accessories: OFF
- Transmission: Neutral

(2) Check that the standard ignition timing is at the standard value, and adjust if it is outside the standard value.

Standard value: 5°BTDC±2°

(3) After turning the ignition switch to OFF, connect the multi-use tester (MUT) or MUT-II to the diagnosis connector (white).



(4) Start the engine and run it at idle speed.

(5) Let it idle for 2 minutes.

(6) Select item no. 22 on the MUT or MUT-II and take a reading of the idle speed.

Curb idle speed: 750±100 r/min

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

(7) If it is outside the standard value, refer to GROUP 13 – Check Chart Classified by Problem Symptoms and check the MPI components.

IDLE MIXTUTRE INSPECTION

(1) Before inspection and adjustment, set vehicles in the following condition:
- Engine coolant temperature: 80–95°C (176–203°F)
- Lamps, electric cooling fan and all accessories: OFF
- Transmission: Neutral

(2) Verify if the basic ignition timing is within the standard value.

Standard value: 5°±2° BTDC

(3) After turning the ignition switch to OFF, connect either MUT or MUT-II to the diagnosis connector (white).
(4) Start the engine and run it at 2,500 r/min for 2 minutes.
(5) Set the CO, HC tester.
(6) Check the CO concentration and the HC concentration at idle.

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

(7) If the concentrations are outside the standard value, check the following items:
- Self-diagnosis output
- Feed back control (When the feedback control is carried out normally, the output signal of the oxygen sensor changes between 0–400mV and 600–1,000mV at idle.)
- Combustion pressure
- Injector
- Ignition coil, spark plug cable, spark plug
- Leak in the EGR system and in the EGR valve
- Evaporative emission control system
- Compression pressure

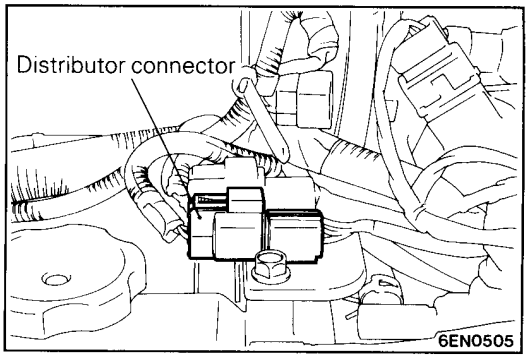
NOTE
Change the three-way catalyst when the CO and HC concentrations do not remain inside the standard value, even though the result of the inspection is normal on all items.

COMPRESSION PRESSURE INSPECTION E11FGBO

(1) Before inspection, check that the engine oil, starter and battery are normal. Also, set the vehicle to the following condition:
- Engine coolant temperature: 80–95°C (176–203°F)
- Lights and all accessories: OFF
- Transmission: Neutral

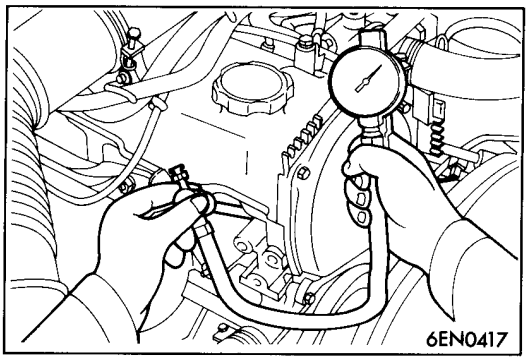
(2) Disconnect the spark plug cables.
(3) Remove all of the spark plugs.
(4) Disconnect the distributor connector.

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



(5) Cover the spark plug hole with a rag etc., and after the engine has been cranked, check that no foreign material is adhering to the rag.

Caution
1. **Keep away from the spark plug hole when cranking.**
2. **If compression is measured while water, oil, fuel, etc., that has come from cracks is inside the cylinder, these materials will become heated and will gush out from the spark plug hole, which is dangerous.**



(6) Set the compression gauge to one of the spark plug mounting holes.
(7) Crank the engine with the throttle valve fully open and measure the compression pressure.

Standard value: 1180 kPa (12.0 kg/cm^2, 171 psi.)
Limit: 870 kPa (8.9 kg/cm^2, 127 psi.) minimum

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

Limit: 98 kPa (1.0 kg/cm^2, 14 psi.) maximum

(9) If there is a cylinder with compression or a compression difference that is outside the limit, pour a small amount of engine oil through the spark plug hole, and repeat the operations in steps (7) and (8).
- ① If the compression increases after oil is added, the cause of the malfunction is a worn or damaged piston ring and/or cylinder inner surface.
- ② If the compression does not rise after oil is added, the cause is a burnt or defective valve seat, or pressure is leaking from the gasket.

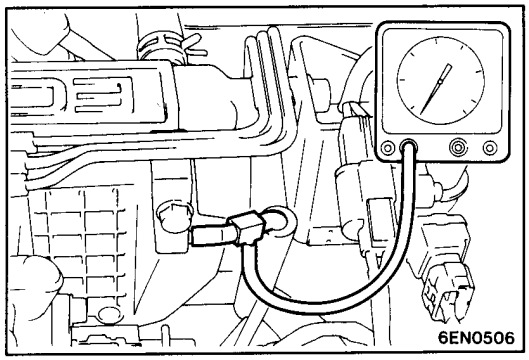
(10) Connect the distributor connector.
(11) Install the spark plugs and spark plug cables.
(12) Use the multi-use tester to erase the self-diagnosis codes.

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

MANIFOLD VACUUM INSPECTION E11FWAU

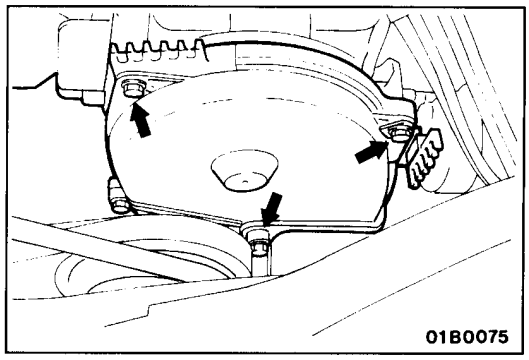
(1) Perform inspection and adjustment with the vehicle in the following condition.
- Engine coolant temperature: 80–95°C (176–203°F)
- Lights and all accessories: OFF
- Transmission: Neutral
- Steering wheel: Straight forward position

(2) Check that the idle speed is at the standard value.
Standard value: 750±100 r/min


6EN0506

(3) Install the T-joint to the vacuum hose between the air intake plenum and the fuel pressure regulator, and connect the vacuum gauge.
(4) Check the negative pressure when the engine is idling.
Standard pressure: 67 kPa (500 mmHg, 20 in.Hg)
(5) If not within specification, refer to following chart for cause and repair.

Symptom	Probable cause	Remedy
Vacuum gauge reads under standard value but pointer is stable.	• Delayed ignition timing.	• Adjust ignition timing.
Vacuum gauge pointer fluctuates slowly.	• Idle mixture concentration too rich.	• Check fuel injection system.
Vacuum gauge reading decreases irregularly.	• Idle mixture concentration too lean.	• Check fuel injection system.
Vacuum gauge pointer decreases about 4–21 kPa (30–160 mmHg, 1.18–6.30 in.Hg) intermittently.	• Burned, warped or pitted valves.	• Install new valves.
Vacuum gauge pointer suddenly decreases about 33 kPa (250 mmHg, 9.84 in.Hg) from standard value and then returns.	• Blown cylinder head gasket.	• Install new cylinder head gasket.

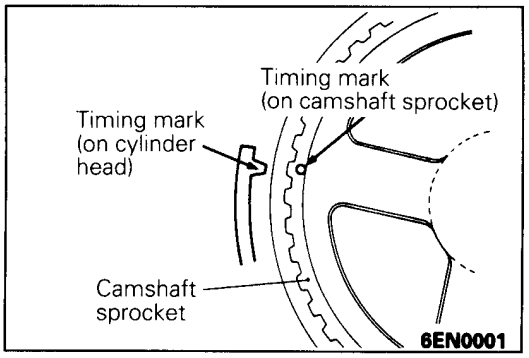


TIMING BELTS TENSION ADJUSTMENT E11FFDE

Two access holes are provided in the timing belt front lower cover. Therefore, timing belt tension can be readjusted following the procedure below without removing the timing belt front lower cover. However, timing belt "B", which drives the right silent shaft, cannot be adjusted without removing the cover.

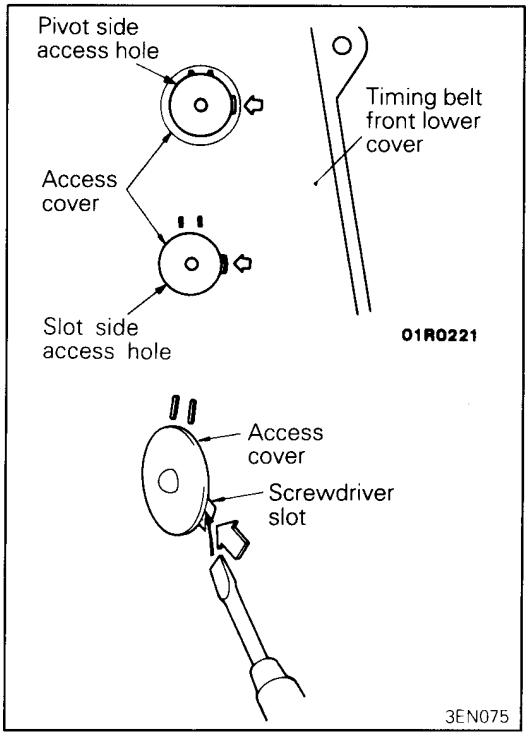
(1) Remove the timing belt front upper cover.

(2) Turn the crankshaft in the clockwise direction and check the timing belt around its entire circumference for abnormalities.



(3) Align the timing mark on the camshaft sprocket with the timing mark on the cylinder head.

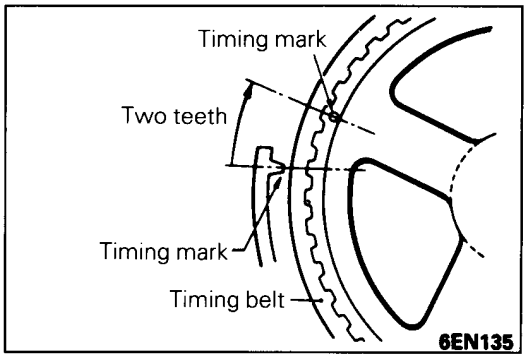
Caution
When aligning the timing mark, be sure not to turn the crankshaft in the counterclockwise direction as this can cause improper belt tension.



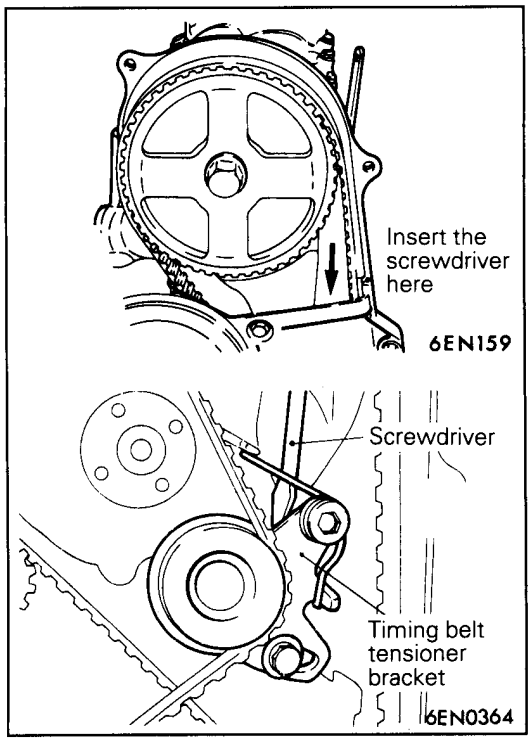
(4) Remove the air conditioner compressor drive belt and the alternator drive belt.

(5) Remove the 2 access covers from timing belt front lower cover. There are easily removed by inserting a screwdriver into the slots indicated by the raised arrows in the timing belt cover and twisting.

(6) Insert a special tool (MD998051) through the pivot side access hole and loosen the tensioner spacer (used also as the tensioner locking nut) 1/2-1 turn. Next insert a 14 mm (0.55 in.) socket wrench through the slot side access hole and loosen the tensioner locking bolt 1/2-1 turn.



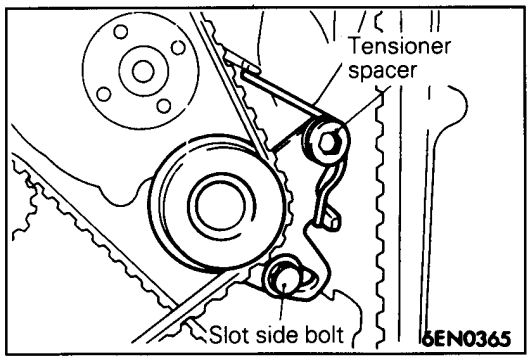
(7) Turn the crankshaft and the camshaft sprocket clockwise two teeth.



(8) Timing belt tension should be automatically adjusted by the preceding steps. However, in the event the timing belt tensioner has become stuck, loosen it by inserting a flat-tip screwdriver into the top of timing belt front lower cover and pushing the tensioner bracket in the direction of belt tension.

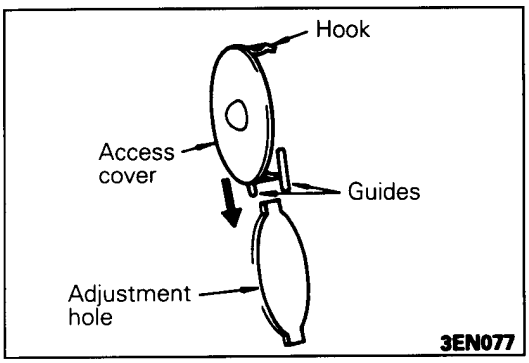
Caution
As the object here is merely to loosen the stuck tensioner, be sure not to apply any more pressure with the screwdriver than is required.

NOTE
For purposes of explanation, the illustration at left shows the timing belt with the timing belt front lower cover removed.



(9) First tighten the tensioner slot side bolt, and then tighten the pivot side tensioner spacer.

Caution
If the pivot side tensioner spacer is tightened first, the tensioner will rotate with it and belt tension may become loose.



(10) Install the access covers to the access holes of timing belt front lower cover. The access cover may be easily installed by passing the hooks between the guides and sliding it in.
(11) Install the timing belt front upper cover.

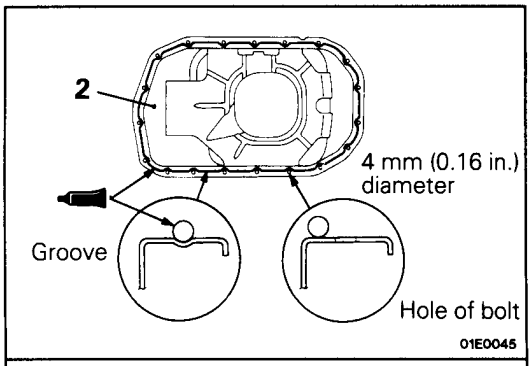
OIL PAN AND OIL SCREEN

REMOVAL AND INSTALLATION

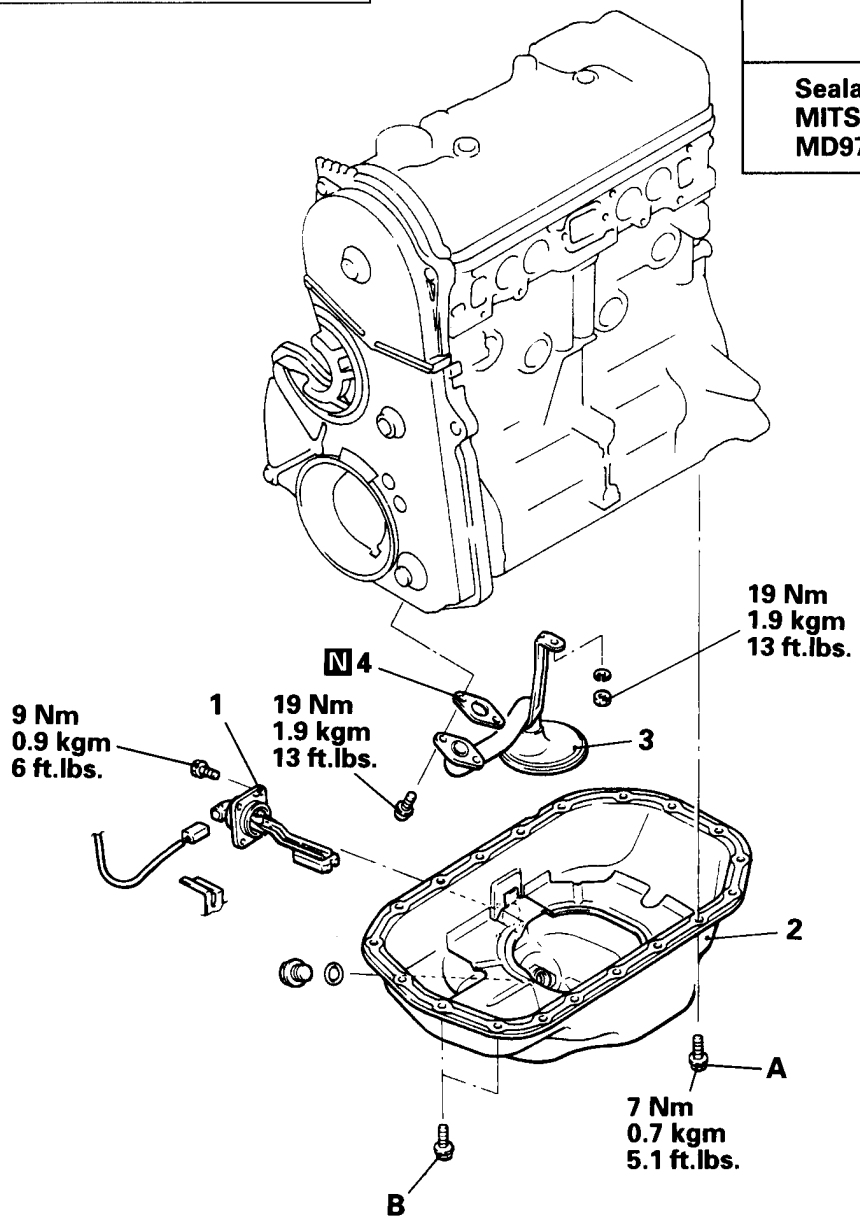
E11KA--

Pre-removal and Post-installation Operation
Removal and Installation
- Under Skid Plate, Undercover
- Front Exhaust Pipe (Refer to GROUP 15 – Exhaust Pipe and Mufflers.)

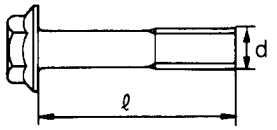
Draining and Supplying
- Engine Oil (Refer to GROUP 13 – Service Adjustment Procedures.)

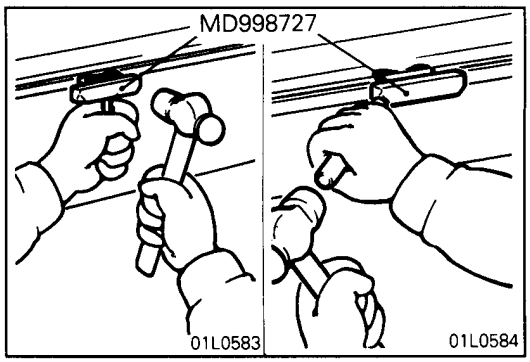


Sealant:
MITSUBISHI GENUINE Part No. MD970389 or equivalent



Removal steps
1. Engine oil level sensor
2. Oil pan
3. Oil screen
4. Gasket

Symbol	d × ℓ mm (in.)	Note
A	6 × 10 (0.24 × 0.39)	
B	6 × 8 (0.24 × 0.31)	



SERVICE POINTS OF REMOVAL E11KBBJ

2. REMOVAL OF OIL PAN/3. OIL SCREEN

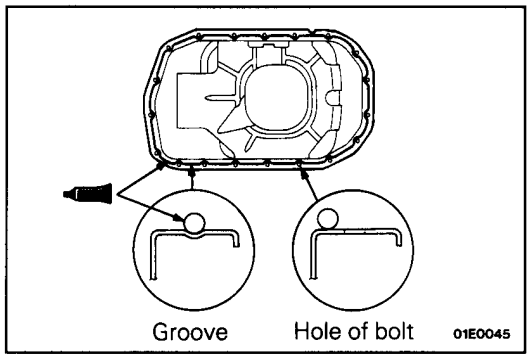
(1) Remove oil pan bolts.
(2) Tap the special tool in between the oil pan and cylinder block.
(3) Slide the special tool by tapping it at an angle to peel off the oil pan.

Caution
The use of a screwdriver or chisel in place of the special tool can damage the gasket seat surface and cause oil leakage.

(4) Slide the oil pan and remove the oil screen mounting bolts, and then remove the oil pan and the oil screen together.

INSPECTION E11KEAB1

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



SERVICE POINTS OF INSTALLATION E11KDBJ

3. INSTALLATION OF OIL SCREEN/2. OIL PAN

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

Specified sealant: MITSUBISHI GENUINE PART No. MD970389 or equivalent

NOTE
The sealant should be applied in a continuous bead approximately 4 mm (16 in.) in diameter.

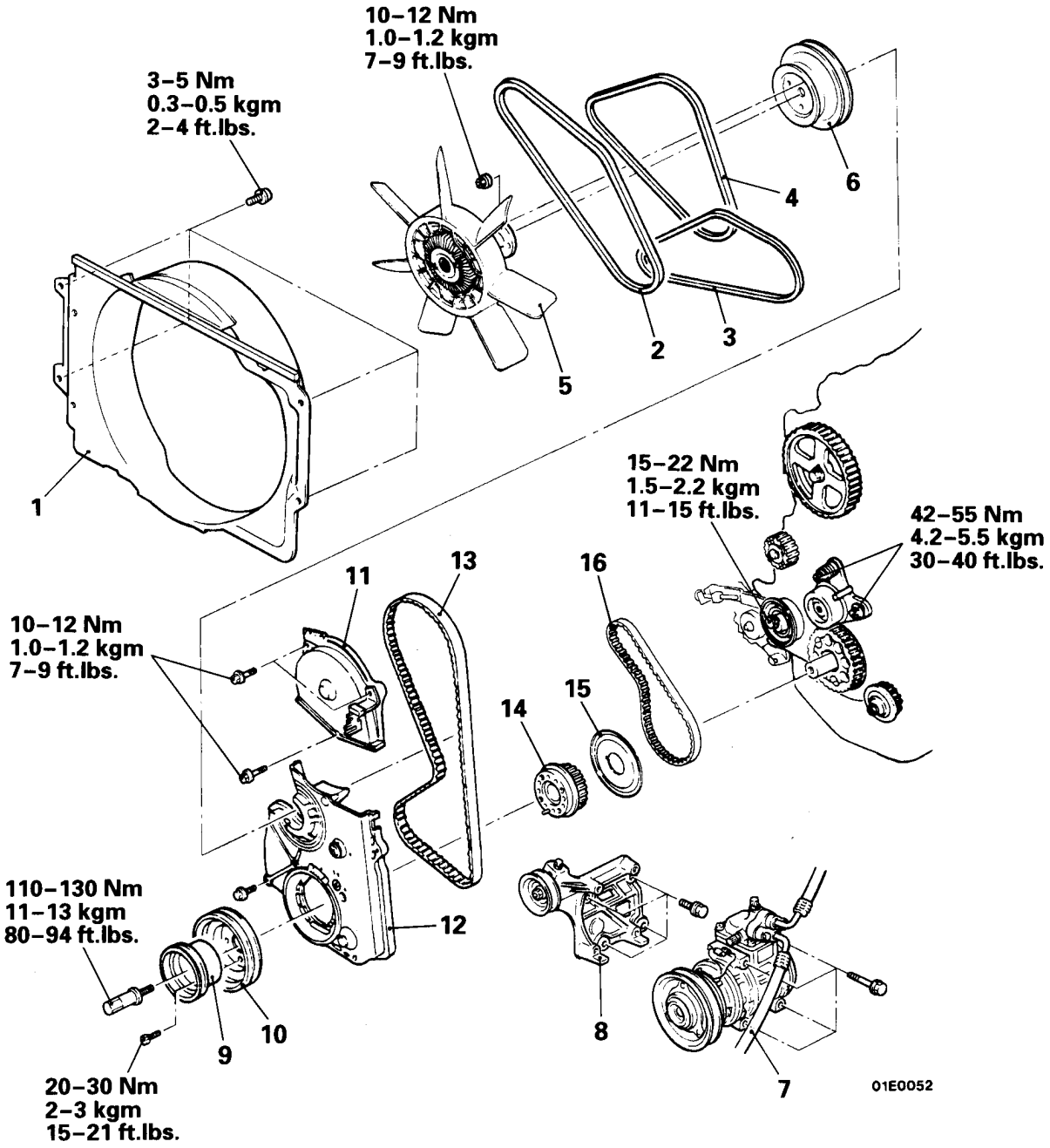
(4) Assemble oil pan and oil screen to cylinder block within 15 minutes after applying the sealant.

Caution
After installing the oil pan, wait at least 30 minutes before starting the engine.

TIMING BELT AND TIMING BELT "B"

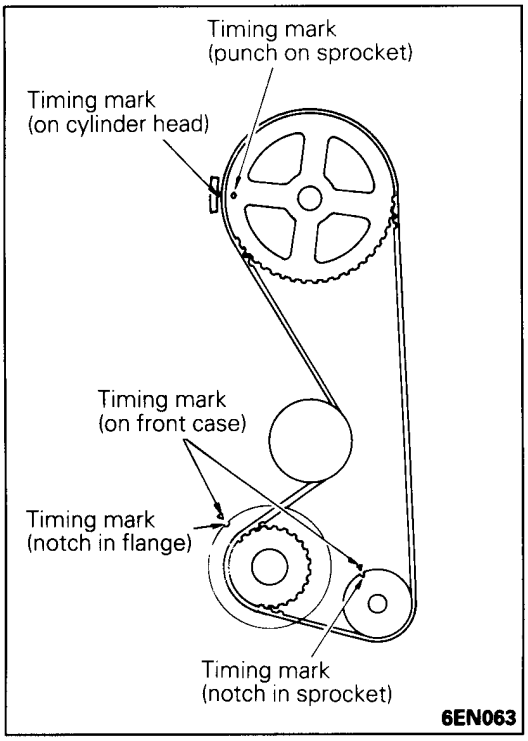
E11GA--

REMOVAL AND INSTALLATION



Removal steps

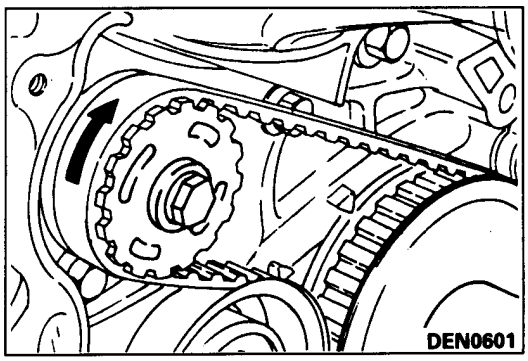
1. Radiator fan shroud
- Adjustment of Drive Belts Tension (Refer to P.11-6)
2. Drive belt (Power steering)
3. Drive belt <A/C>
4. Drive belt (Alternator)
5. Cooling fan assembly
6. Water pump pulley
7. Air conditioner compressor
8. Air conditioner compressor bracket
9. Power steering pump crankshaft pulley
10. Crankshaft pulley
11. Timing belt upper cover
12. Timing belt lower cover
13. Timing belt
14. Crankshaft sprocket
15. Flange
16. Timing belt "B"



SERVICE POINTS OF REMOVAL E11GBEC

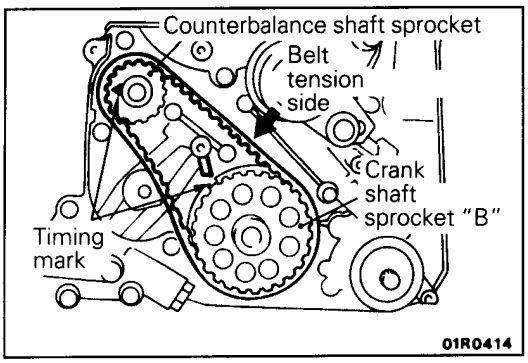
13. REMOVAL OF TIMING BELT

(1) Rotate the crankshaft clockwise and align the timing mark.
(2) If the timing belt is to be re-used, use chalk to mark (on its flat side) an arrow indicating the clockwise direction.



16. REMOVAL OF TIMING BELT "B"

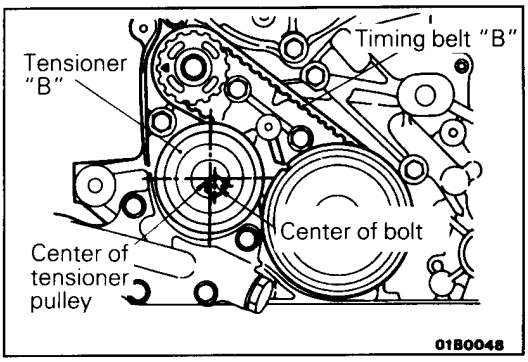
If the timing belt is to be re-used, use chalk to mark (on its flat side) an arrow indicating the clockwise direction.



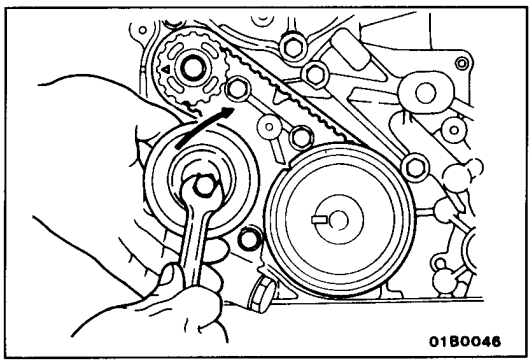
SERVICE POINTS OF INSTALLATION E11GDEC

16. INSTALLATION OF TIMING BELT "B"

(1) Ensure that crankshaft sprocket "B" timing mark and the counterbalance shaft sprocket timing mark are aligned.
(2) Fit timing belt "B" over crankshaft sprocket B and the counterbalance shaft sprocket. Ensure that there is no slack in the belt.

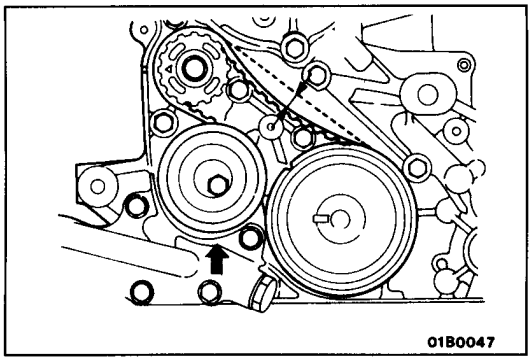


(3) Temporarily fix the timing belt "B" tensioner such that the center of the tensioner pulley is to the left and above the center of the installation bolt, and temporarily attach the tensioner pulley so that the flange is toward the front of the engine.



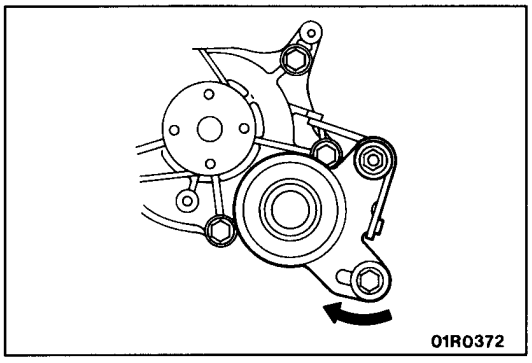
(4) Holding the timing belt "B" tensioner up with your finger in the direction of the arrow, place pressure on the timing belt so that the tension side of the belt is taut. Now tighten the bolt to fix the tensioner.

Caution
When tightening the bolt, ensure that the tensioner pulley shaft does not rotate with the bolt. Allowing it to rotate with the bolt can cause excessive tension on the belt.



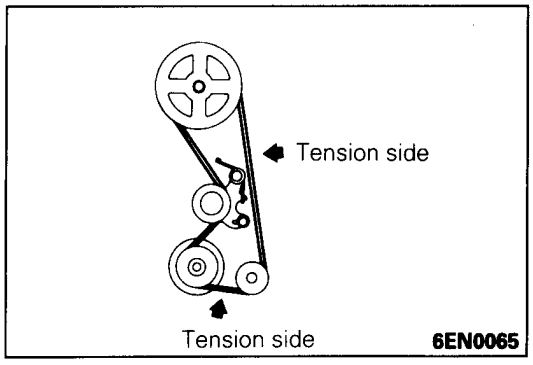
(5) Check to ensure that when center of span on tension side is depressed with index finger in direction of arrow, tension of belt is up to specification.

Standard value: 5–7 mm (0.20–0.28 in.)

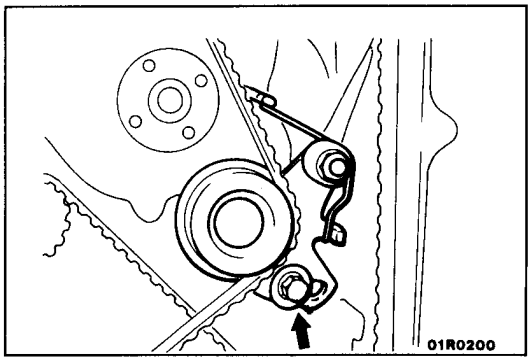


13. INSTALLATION OF TIMING BELT

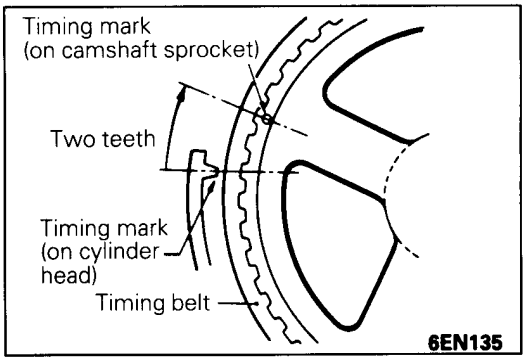
(1) Ensure that the timing marks of the camshaft sprocket, the crankshaft sprocket, and the oil pump sprocket are all aligned.
(2) Move tensioner pulley toward water pump and temporarily secure tensioner.



(3) Install timing belt. While making sure that tension side of belt is not slackened, install timing belt onto crankshaft sprocket, oil pump sprocket and camshaft sprocket in that order.

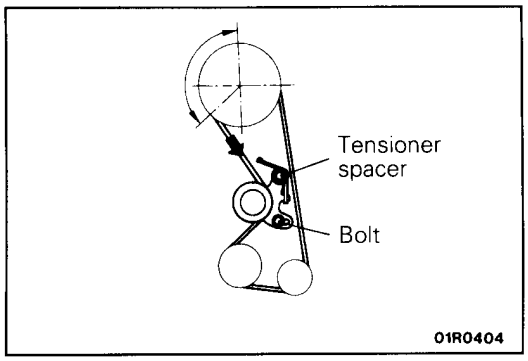


(4) Loosen tensioner mounting bolt. By so doing, tensioner will be moved by spring and will apply tension to belt.



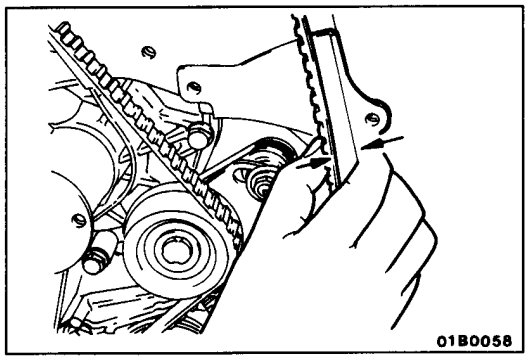
(5) Turn the crankshaft in normal direction (clockwise) by two teeth of the camshaft sprocket.

Caution
As the purpose of this procedure is to apply the proper amount of tension on the timing belt, be sure not to rotate the crankshaft counterclockwise or place pressure on the belt to check the amount of tension.



(6) Putting pressure clockwise on the tensioner (in the direction of the arrow) such that no portion of the belt raises out in portion A, place the belt on the camshaft sprocket such that the belt sprocket teeth are fully engaged. Tighten the tensioner bolt and tensioner spacer, in that order.

Caution
If the tensioner spacer is tightened first, the tensioner will rotate with it and belt tension be thrown out of adjustment. Always tighten the bolt first.



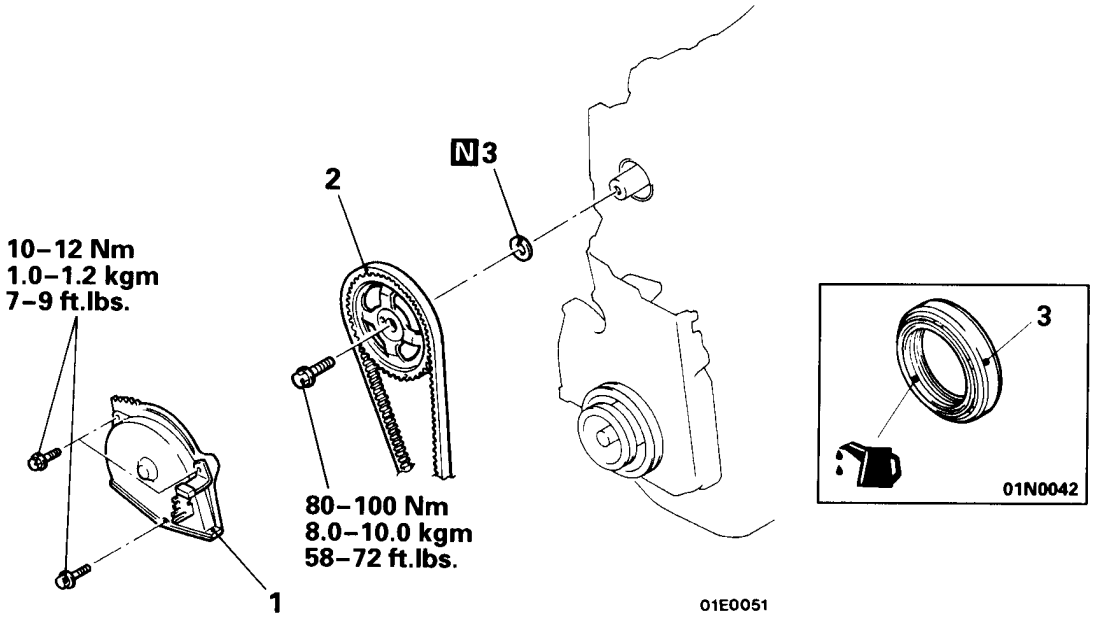
(7) Check to see that the clearance between the outside of the belt and the cover are within the standard value by grasping the tension side (between the camshaft sprocket and oil pump sprocket) of the center part of the timing belt between the thumb and index finger.

Standard value: 14 mm (0.55 in.)

CAMSHAFT OIL SEAL

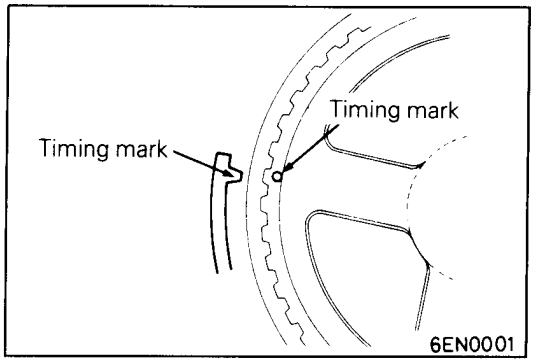
E11VA-A

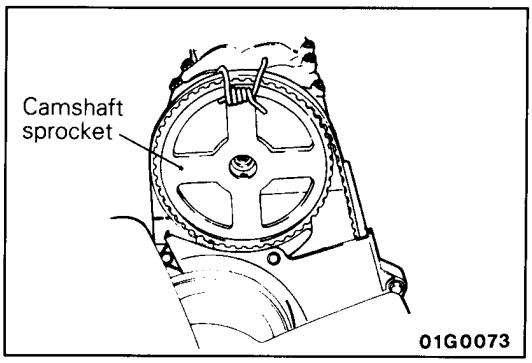
REMOVAL AND INSTALLATION



Removal steps

1. Timing belt upper cover
2. Camshaft sprocket
3. Camshaft oil seal





SERVICE POINTS OF REMOVAL

E11VBAC

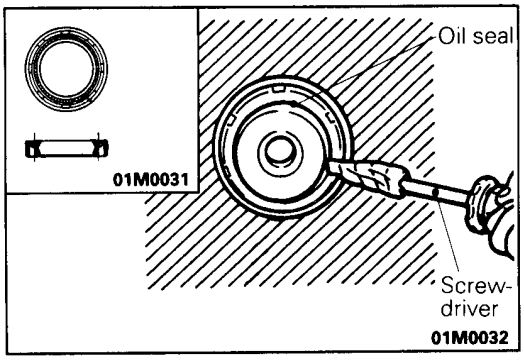
2. REMOVAL OF CAMSHAFT SPROCKET

(1) Remove camshaft clockwise (to the right) and align timing marks.

(2) Remove camshaft sprocket with timing belt and place it on timing belt front lower cover.

Caution
Do not rotate crankshaft after removing camshaft sprocket.

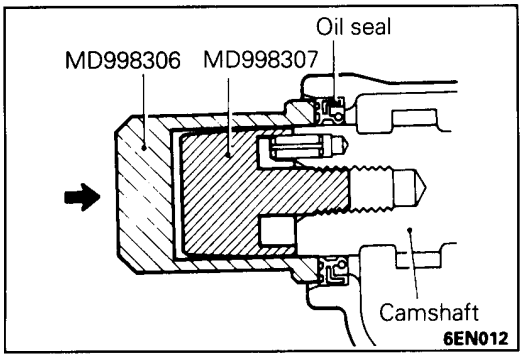
NOTE
Secure camshaft sprocket and timing belt with wire etc., to prevent them from slipping out of place.



3. REMOVAL OF CAMSHAFT OIL SEAL

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

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



SERVICE POINT OF INSTALLATION E11VCAC

3. INSTALLATION OF CAMSHAFT OIL SEAL

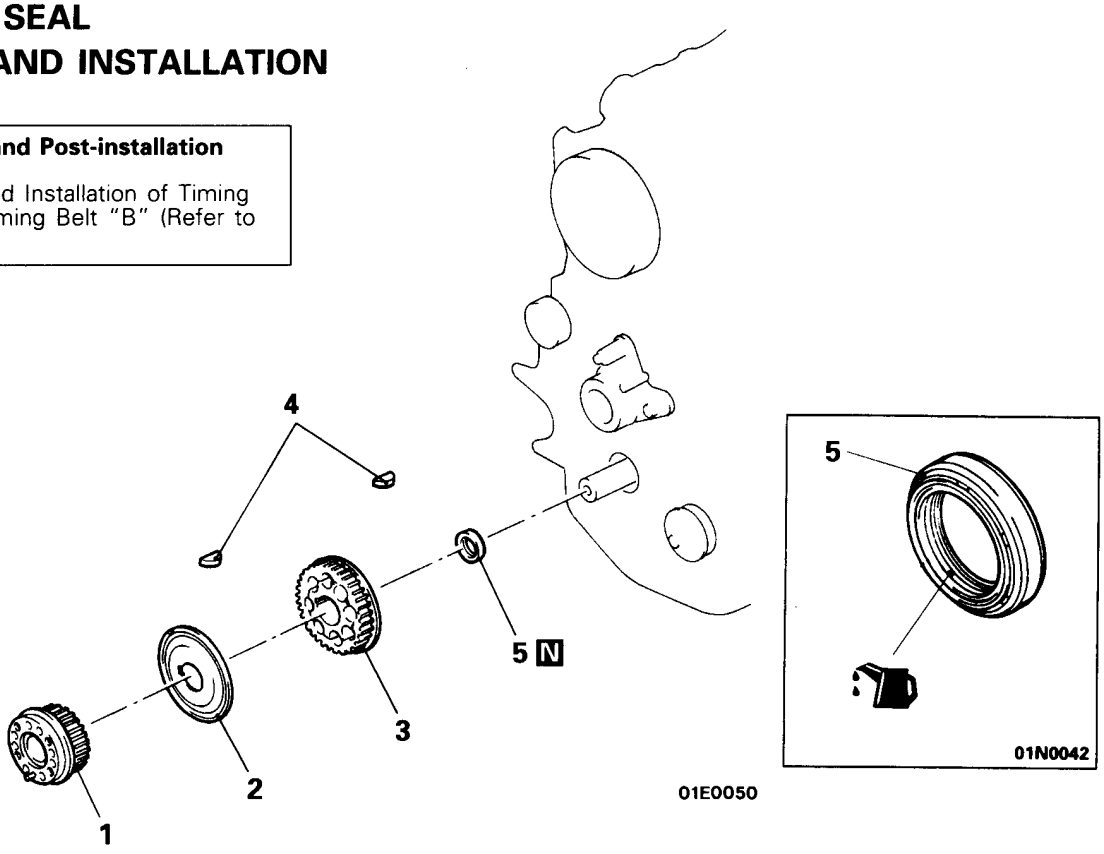
(1) Install special tool (camshaft oil seal guide) to the end of the camshaft and apply engine oil to the outer surface of special tool.
(2) Using special tool (camshaft oil seal installer) press-in the oil seal.

CRANKSHAFT OIL SEALS

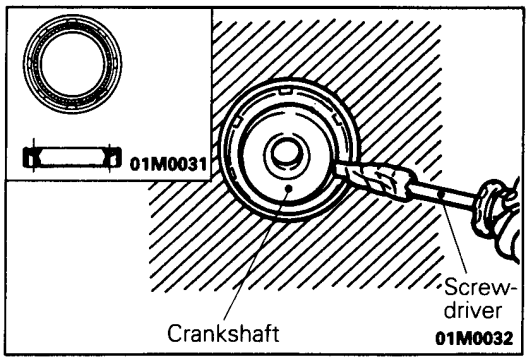
E11UA-A

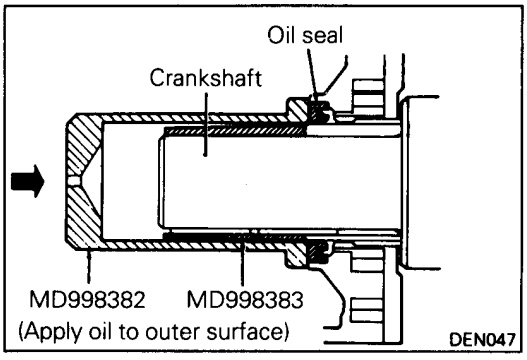
FRONT OIL SEAL
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Removal and Installation of Timing Belt and Timing Belt "B" (Refer to P.11-16.)



Removal steps
1. Crankshaft sprocket
2. Flange
3. Crankshaft sprocket "B"
4. Key
5. Oil seal





SERVICE POINT OF REMOVAL

E11UBAC

5. REMOVAL OF OIL SEAL

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

Caution
Take care not to damage the crankshaft and front case.

SERVICE POINT OF INSTALLATION

E11UCAF

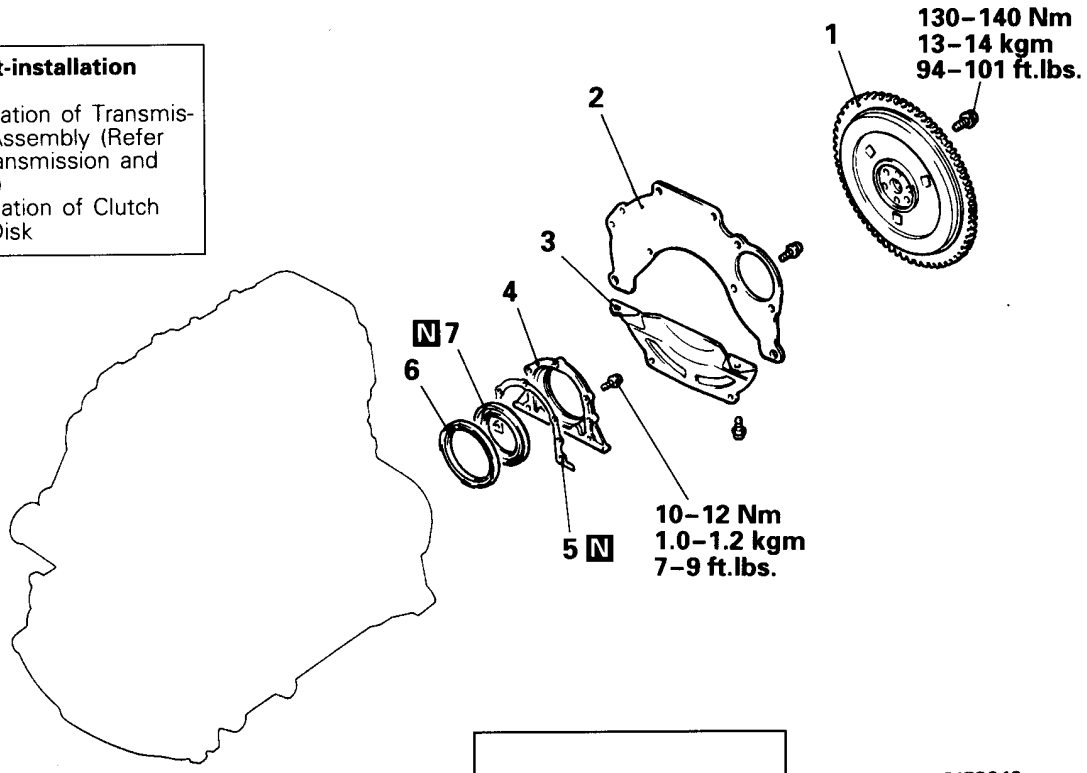
5. INSTALLATION OF OIL SEAL

Apply engine oil to the lip section of the oil seal, and use the special tool to press-fit the oil seal.

REAR OIL SEAL
REMOVAL AND INSTALLATION

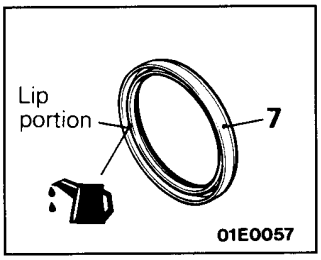
E11UA-D

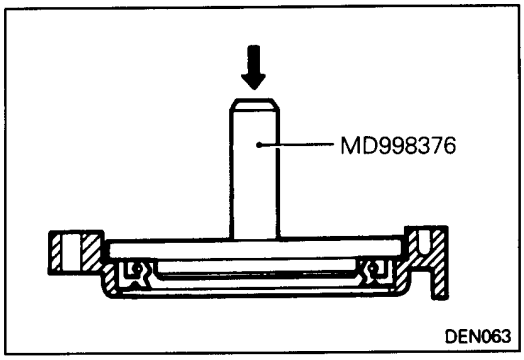
Pre-removal and Post-installation Operation
- Removal and Installation of Transmission and Transfer Assembly (Refer to GROUP 22 – Transmission and Transfer Assembly.)
- Removal and Installation of Clutch Cover and Clutch Disk



01E0049

Removal steps
1. Fly wheel assembly
2. Rear plate
3. Belhousing cover
4. Oil seal case
5. Gasket
◆◆ 6. Oil separator
◆◆ 7. Oil seal

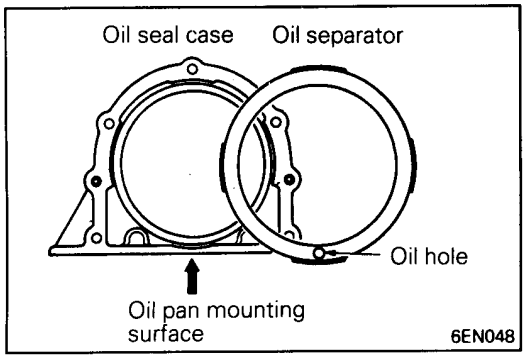




SERVICE POINT OF INSTALLATION

E11UCAG

7. INSTALLATION OF OIL SEAL



6. INSTALLATION OF OIL SEPARATOR

Press the oil separator into the oil seal case. Install it so that the separator oil hole is on the very bottom, as illustrated.

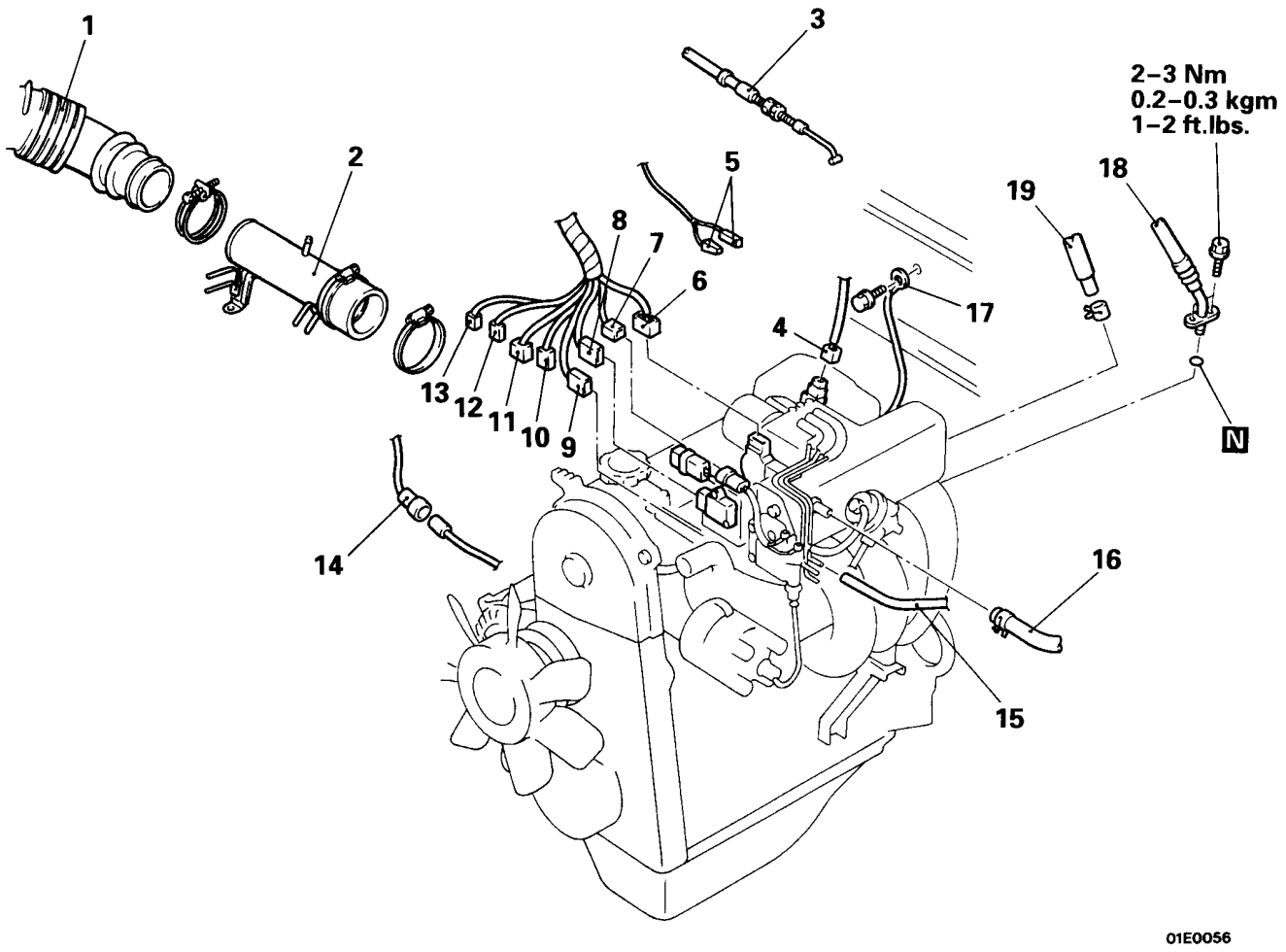
CYLINDER HEAD GASKET

E11JA--

REMOVAL AND INSTALLATION

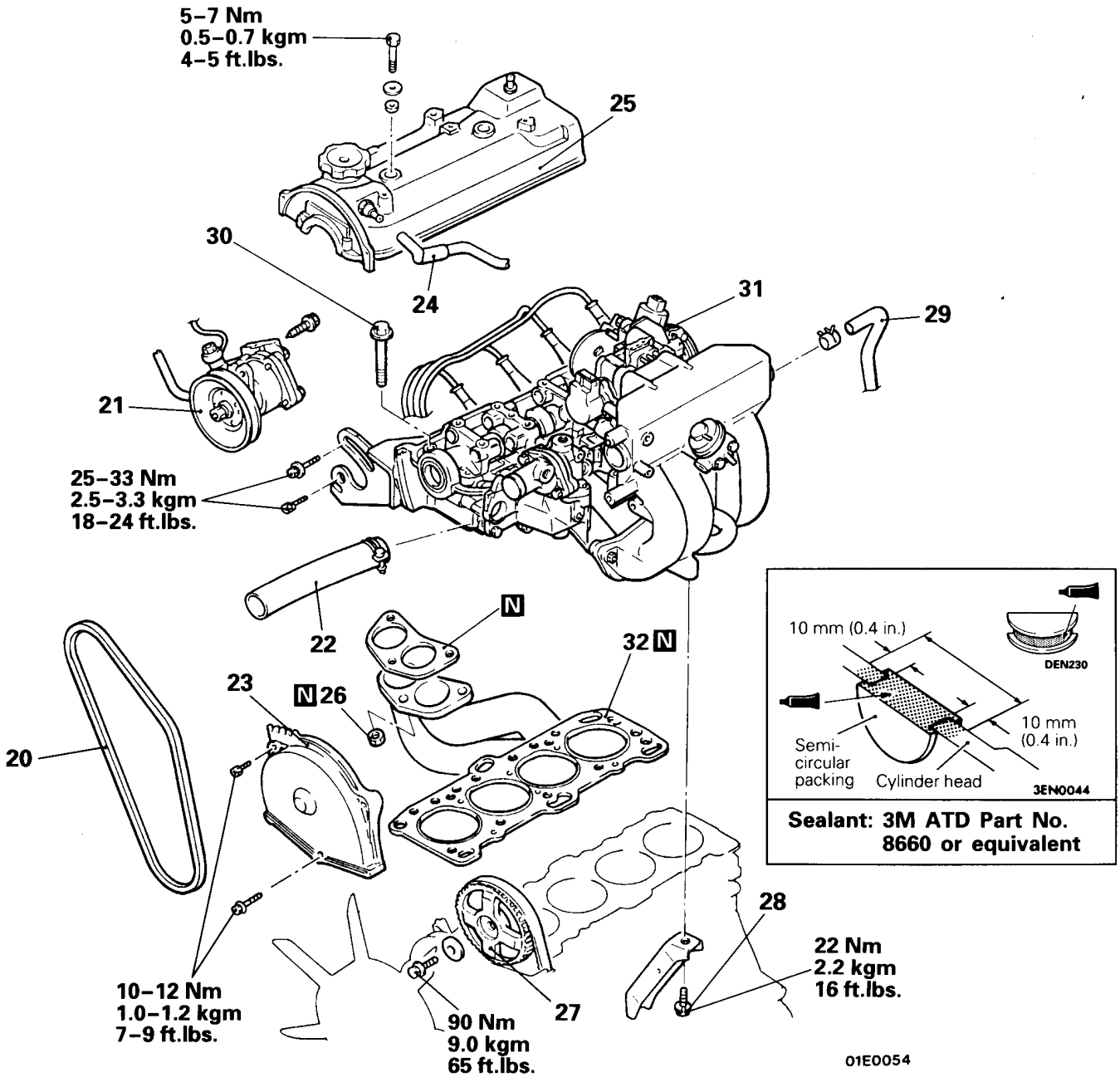
Pre-removal Operation
- Draining of the Engine Coolant (Refer to GROUP 14 – Service Adjustment Procedure.)

Post-installation Operation
- Filling of the Engine Coolant (Refer to GROUP 14 – Service Adjustment Procedure.)
- Adjustment of Accelerator Cable (Refer to GROUP 13 – Service Adjustment Procedures.)



Removal steps

1. Air intake hose
2. Air inlet pipe
3. Accelerator cable connection
4. ISC motor connector
5. Noise filter
6. TPS connector
7. Injector connector
8. Distributor connector
9. Ignition coil connector
10. Power transistor connector
11. Engine coolant temperature switch connector <A/C>
12. Engine coolant temperature gauge unit connector
13. Engine coolant temperature sensor connector
14. Oxygen sensor connection
15. Purge hose connection
16. Brake booster vacuum hose connection
17. Earth cable
18. High pressure fuel hose connection
19. Fuel return hose connection

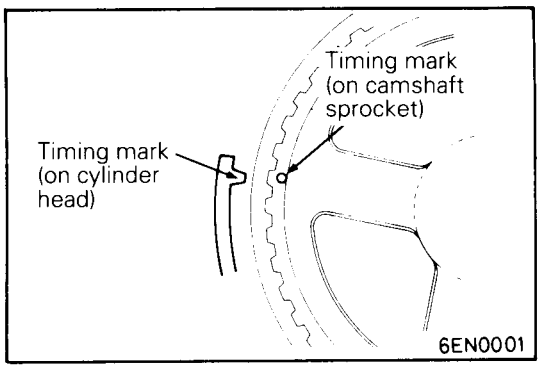


- Adjustment of drive belt tension (Refer to P.11-6.)
20. Drive belt (Power steering)
21. Power steering oil pump
22. Radiator upper hose
23. Timing belt upper cover
24. PCV hose connection
25. Rocker cover
26. Connection for exhaust manifold and front exhaust pipe
27. Camshaft sprocket
28. Intake manifold stay connection
29. Water hose
30. Cylinder head bolt
31. Cylinder head assembly
32. Cylinder head gasket

SERVICE POINTS OF REMOVAL E11JBCF

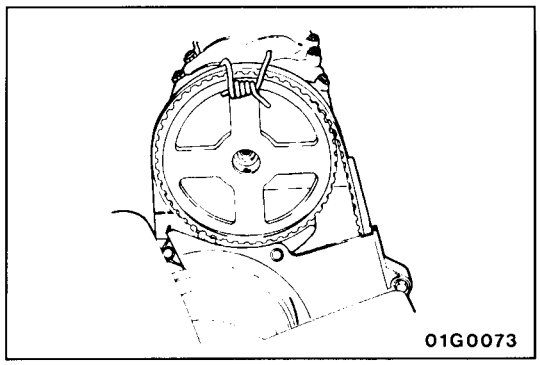
21. REMOVAL OF POWER STEERING OIL PUMP

(1) Remove the power steering oil pump (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 cylinder head.



27. REMOVAL OF CAMSHAFT SPROCKET

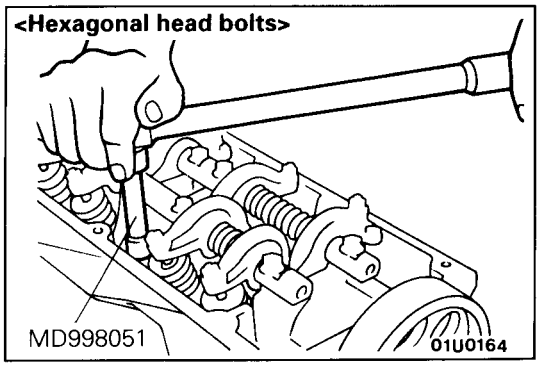
(1) Rotate the crankshaft and align the timing mark.



(2) Pull the camshaft sprocket (with the timing belt attached) out from the camshaft, and place it on top of the timing belt front lower cover.

Caution

1. **The crankshaft must not be rotated after the camshaft sprocket is pulled out from the camshaft.**
2. **Take care that there is no slack in the timing belt.**
3. **Use care so that the camshaft sprocket may not disengage from the belt and drop.**



30. REMOVAL OF CYLINDER HEAD BOLT

<Hexagonal head bolts>

Use the special tool to loosen the bolts in 2 or 3 steps, and remove the cylinder head assembly from the cylinder block.

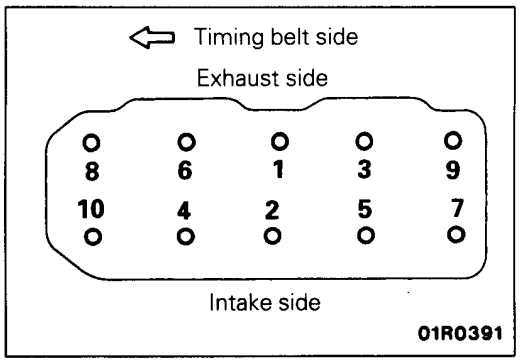
<12-point head bolts>

Using the 12 mm – 12 points socket wrench, loosen the cylinder head bolts. Loosen evenly, little by little.

SERVICE POINTS OF INSTALLATION E11JDCR

32. INSTALLATION OF CYLINDER HEAD GASKET

(1) Wipe off the oil on the mounting surface of the cylinder head gasket.
(2) Lay the cylinder head gasket on cylinder block with the identification at front top.

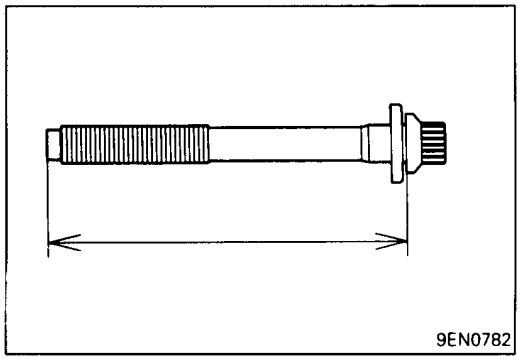


30. INSTALLATION OF CYLINDER HEAD BOLT

<Hexagonal head bolts>

Tighten in the numerical order indicated in the diagram in two or three groups with special tool (MD998051).

Tightening torque (cold engine): 105–115 Nm (10.5–11.5 kgm 76–83 ft.lbs.)

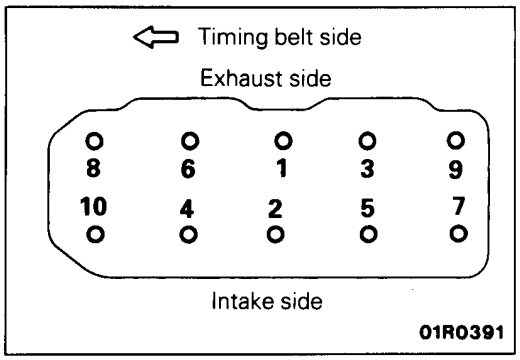


<12-point head bolts>

(1) When installing the cylinder head bolts, check that the shank length of each bolt meets the limit. If the limit is exceeded, replace the bolt.

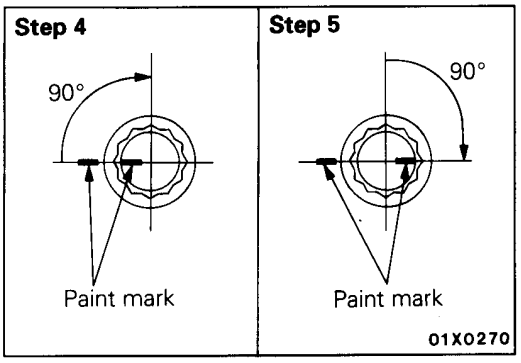
Limit: Max. 120.4 mm (4.74 in.)

(2) Apply engine oil to the threaded portions of bolts and to the washers.



(3) Tighten the bolts with a 12-mm double hexagon wrench by the following steps (angular tightening method).

Step	Operation	Remarks
1	Tighten to 78 Nm (8.0 kgm, 58 ft.lbs.)	In the order shown in the illustration.
2	Loosen fully.	In the reverse order of that shown in the illustration.
3	Tighten to 20 Nm (2.0 kgm, 15 ft.lbs.)	In the order shown in the illustration.
4	Tighten 90° of a turn.	In the order shown in the illustration. Mark the head of the cylinder head bolt and cylinder head by paint.
5	Tighten 90° of a turn.	In the order shown in the illustration. Check that the painted mark of the head bolt is lined up with that of the cylinder head.



Caution

1. **When the bolt is tightened less than 90°, the bolt will be loosened. Observe the tightening angle strictly.**
2. **When the bolt is tightened more than 90°, remove the bolt and repeat the procedure from the step (1).**

NOTES

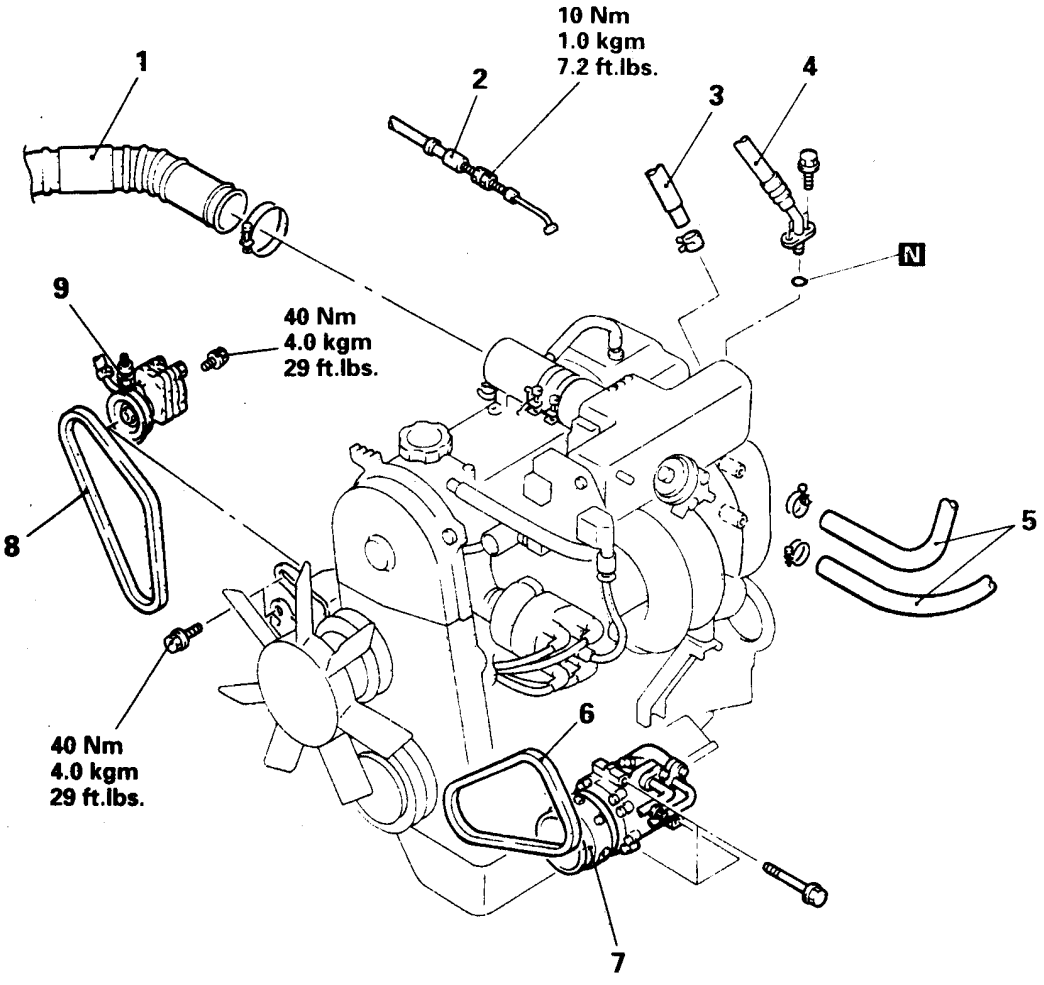
ENGINE ASSEMBLY

E11TA--

REMOVAL AND INSTALLATION

Pre-removal Operation
- Removal of the Hood (Refer to GROUP 42 – Hood.)
- Removal of the Transmission and Transfer Assembly (Refer to GROUP 22, 23 – Transmission Assembly.)
- Removal of the Radiator (Refer to GROUP 14 – Radiator.)
- Removal of Battery and Battery Tray

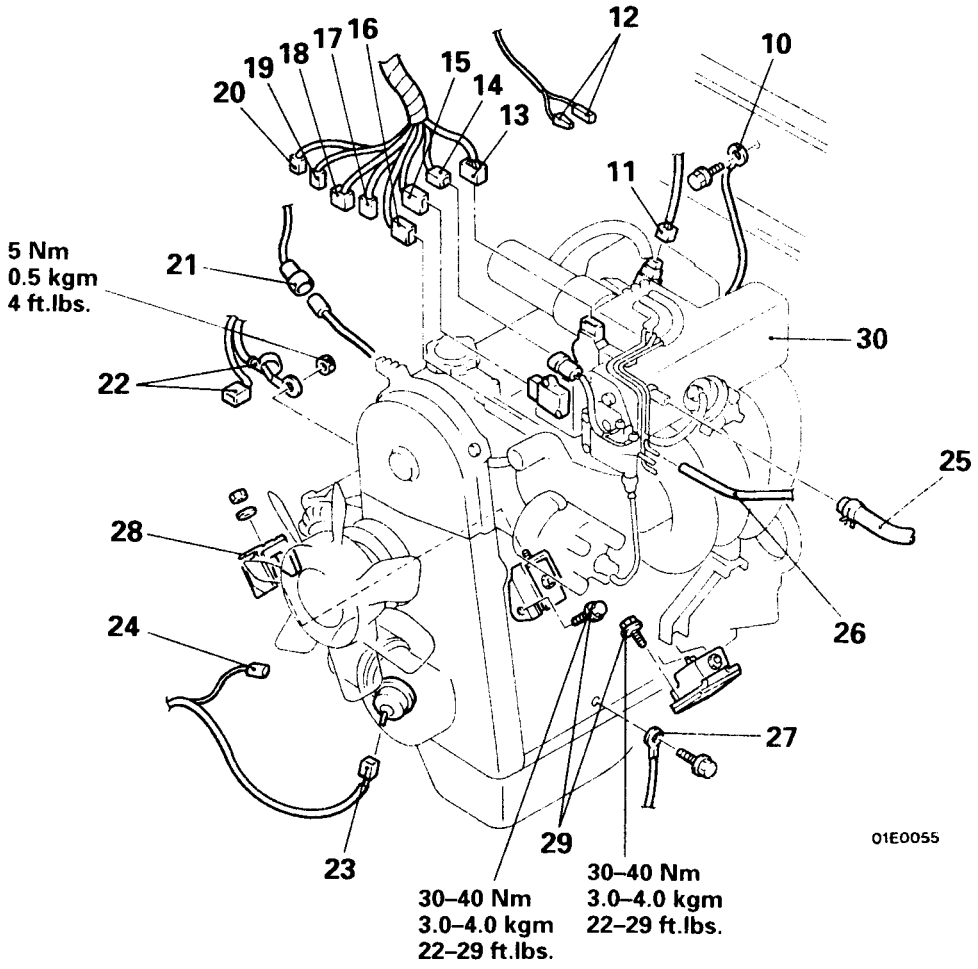
Post-installation Operation
- Installation of the Radiator (Refer to GROUP 14 – Radiator.)
- Installation of the Transmission and Transfer Assembly (Refer to GROUP 22, 23 – Transmission Assembly.)
- Installation of the Radiator
- Installation of Battery and Battery Tray
- Installation of the Hood
- Adjustment of the Engine (Refer to P.11-6.)



01E0076

Removal steps

1. Air intake hose
2. Accelerator cable connection
3. Fuel return hose connection
4. High pressure fuel hose connection
5. Heater hose connections
6. Drive belt } <A/C>
◆◆ 7. Compressor }
8. Drive belt } (Power Steering)
◆◆ 9. Oil pump }

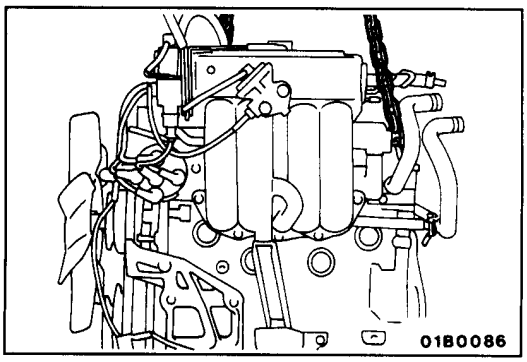


10. Earth cable
11. ISC motor connector
12. Noise filter connector
13. TPS connector
14. Injector harness connector
15. Distributor connector
16. Ignition coil connector
17. Power transistor
18. Engine coolant temperature gauge unit connector
19. Engine coolant temperature sensor connector
20. Engine coolant temperature switch connector <A/C>
21. Oxygen sensor connector
22. Alternator connector
23. Oil pressure gauge unit connector
24. Oil level sensor connector
25. Brake booster vacuum hose connection
26. Purge hose connection
27. Earth cable
28. Heat protector
29. Engine mounting bolt
◆◆ ◆◆ 30. Engine assembly

SERVICE POINTS OF REMOVAL E11TBAJ

7. REMOVAL OF COMPRESSOR <A/C>/9. OIL PUMP (POWER STEERING)

(1) Remove the oil pump and air conditioner 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.



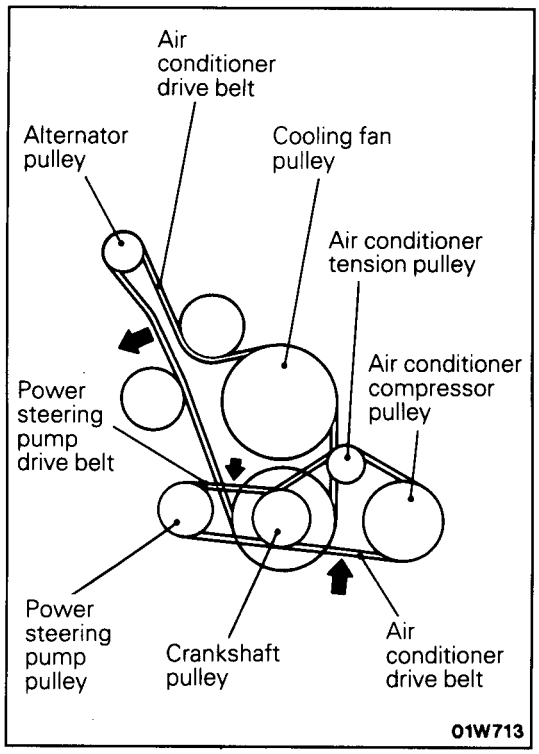
30. REMOVAL OF ENGINE ASSEMBLY

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

SERVICE POINTS OF INSTALLATION E11TDAL

30. INSTALLATION OF ENGINE ASSEMBLY

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



ENGINE <6G72>

SERVICE ADJUSTMENT PROCEDURES

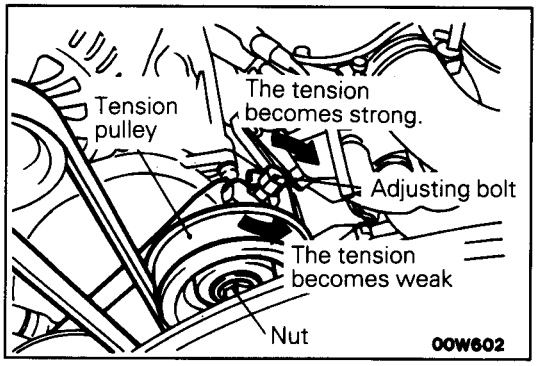
DRIVE BELTS TENSION INSPECTION AND ADJUSTMENT E11FQBE

<SOHC–12 VALVE>

Check the tension by pushing at the centre of the belt between pulleys with a force of 100 N (10 kg, 22 lbs.) as shown in the figure. Measure drive belt flexion.

Standard value:

Alternator	**8–10 mm (0.31–0.39 in.)**
Power steering oil pump	**9–14.5 mm (0.35–0.57 in.)**
Air conditioner compressor	**6.5–7.5 mm (0.26–0.30 in.)**



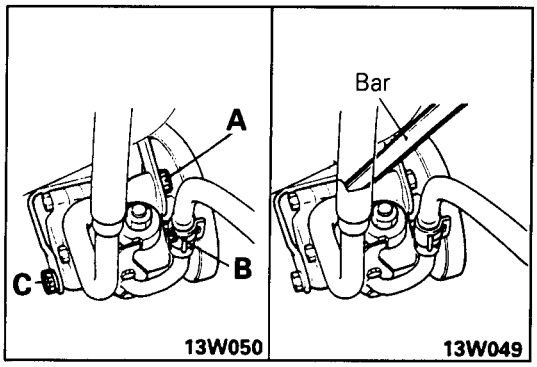
TENSION ADJUSTMENT OF ALTERNATOR DRIVE BELT

(1) Loosen tension pulley fixing nut.
(2) Adjust belt tension with adjusting bolt.

Standard value:

New belt	**6.5–8 mm (0.26–0.31 in.)**
Used belt (with corrected tension)	**9 mm (0.35 in.)**

(3) Tighten fixing nut.

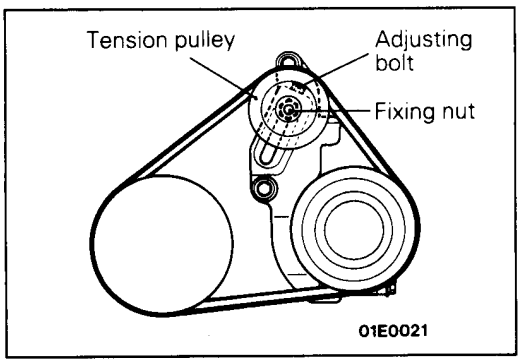


TENSION ADJUSTMENT OF POWER STEERING OIL PUMP DRIVE BELT

(1) Loosen power steering fixing bolts (A), (B) and (C).
(2) Move power steering pump and tension belt moderately and adjust.
(3) Tighten the fixing bolts (A), (B) and (C) in that order.
(4) Crank the engine once or more.
(5) Check the belt tension

Standard value:

Used belt	**10 mm (0.39 in.)**
New belt	**8.0 mm (0.31 in.)**



TENSION ADJUSTMENT OF POWER STEERING OIL PUMP DRIVE BELT

(1) Loosen tension pulley fixing nut.
(2) Adjust belt tension with adjusting nut.
(3) Tighten fixing bolt.
(4) Crank the engine once or more.
(5) Check the belt tension.

Standard value:

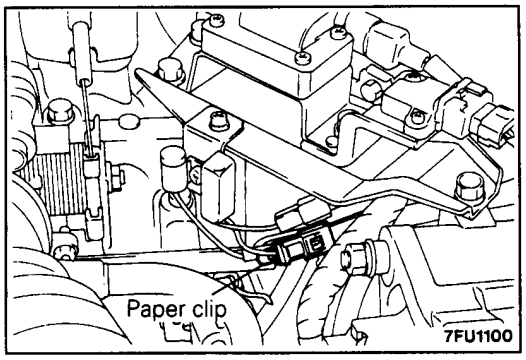
Used belt	**6.5–7.5 mm (0.26–0.30 in.)**
New belt	**5–6 mm (0.20–0.24 in.)**

<SOHC-24 VALVE>

For the inspection and adjustment procedures, refer to P.11-72.

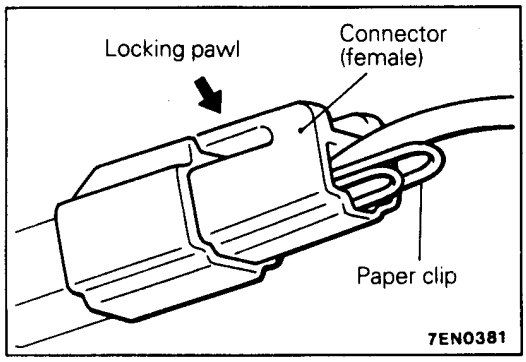
LASH ADJUSTERS INSPECTION E11FBAI

For the inspection procedures, refer to P. 11-7.



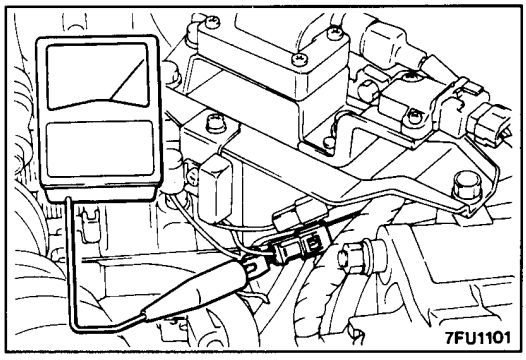
IGNITION TIMING INSPECTION AND ADJUSTMENT <SOHC–12 VALVE> E11FUBD

(1) Perform inspection and adjustment with the vehicle in the following condition.
- Engine coolant temperature: 80–95°C (176–203°F)
- Lights and all accessories: OFF
- Transmission: Neutral (P range for vehicles with an automatic transmission)
- Steering wheel: Straight forward position



(2) Insert a paper clip into the 1-pin connector between the primary side of the ignition coil and the noise filter. The connector should not be disconnected.

Caution
Insert the paper clip along the terminal from the opposite side to the locking pawl of the female connector, as shown in the illustration.



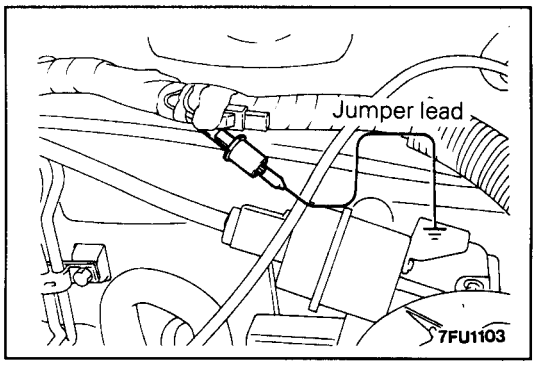
(3) Connect a primary voltage detection-type speedometer to the paper clip.

NOTE
Do not use the multi-use tester (MUT) or MUT-II. When the multi-use tester or MUT-II is connected to the diagnosis connector, the ignition timing will be unchanged, instead of reverting to the standard ignition timing.

(4) Start the engine and run it at idle speed.
(5) Check that the idle speed is at the standard value.

Standard value: 700±100 r/min

(6) Turn the ignition switch to "OFF".
(7) Install the timing light.
(8) Remove the waterproof female connector from the ignition timing adjustment connector (brown).

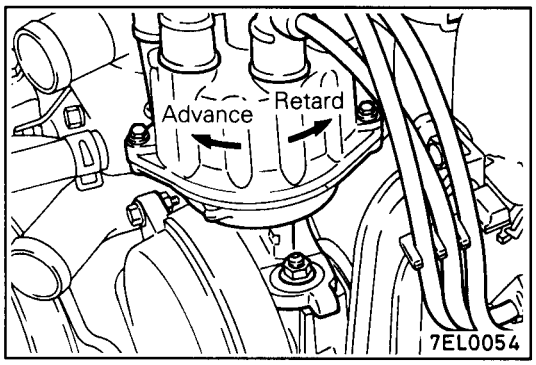


(9) Use a jumper lead to earth the ignition timing adjustment terminal.

NOTE
Earthing the ignition timing adjustment terminal will change the ignition timing to standard.

(10) Start the engine and run it at idle speed.
(11) Inspect the standard ignition timing.

Standard value: 5°BTDC±2°



(12) If the timing is outside the standard value, adjust by turning the distributor.

NOTE
The ignition timing will be advanced if the distributor is turned in a clockwise direction, and retarded if it is turned in an anti-clockwise direction.

(13) After adjusting the ignition timing, tighten the mounting nut, being careful not to move the distributor.
(14) Stop the engine, remove the jumper lead from the ignition timing adjustment connector (brown), and return the connector to its original condition.
(15) Start the engine and 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 10°BTDC at higher altitudes.

(16) Sealing tape is to be attached to the fitting nut only for vehicles for Switzerland.

NOTE
Sealing tape has been attached at the factory for all other vehicles.

IGNITION TIMING INSPECTION<SOHC–24 VALVE>

For the inspection procedures, refer to P.11-73.

IDLE SPEED INSPECTION

E11FXCU

<SOHC–12 VALVE>

Refer to P.11-8-2.

Curb idle speed: 700±100 r/min.

<SOHC–24 VALVE>

Refer to P.11-74.

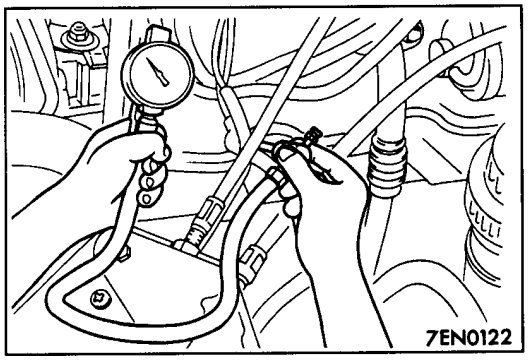
IDLE MIXTURE INSPECTION

<SOHC–12 VALVE>

Refer to P.11-9.

<SOHC–24 VALVE>

Refer to P.11-74.



COMPRESSION PRESSURE INSPECTION

<SOHC–12 VALVE>

Refer to P.11-10.

Standard value:
Compression pressure 1180 kPa (12.0 kg/cm^2, 171 psi)

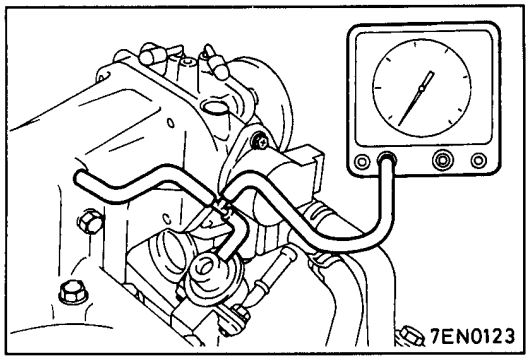
Limit:
Compression pressure min. 870 kPa (8.9 kg/cm^2, 127 psi)
Compression pressure difference between each cylinder max. 98 kPa (1.0 kg/cm^2, 14 psi)

<SOHC–24 VALVE>

Refer to P.11-75.

Standard value:
Compression pressure 1180 kPa (12.0 kg/cm^2, 171 psi)

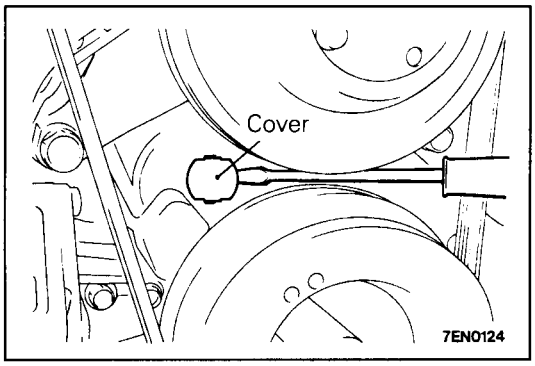
Limit:
Compression pressure min. 870 kPa (8.9 kg/cm^2, 127 psi)
Compression pressure difference between each cylinder max. 98 kPa (1.0 kg/cm^2, 14 psi)



MANIFOLD VACUUM INSPECTION

Refer to P.11-11.

Standard value: 69 kPa (520 mmHg, 20 in.Hg)

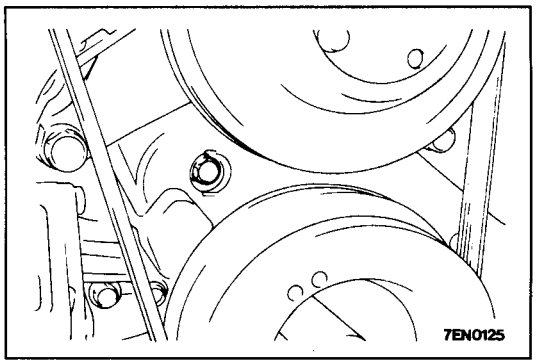


TIMING BELT TENSION ADJUSTMENT <SOHC–12 VALVE>

E11FFDF

(1) Turn the crankshaft so that the No. 1 cylinder is at top dead centre on compression stroke.
(2) Remove the cover from access hole of belt cover.

NOTE
Work will be made easier, if the air conditioning compressor belt is removed.



(3) Loosen the timing belt tensioner mounting bolt 1 or 2 turns.
(4) Turn the crankshaft two turns clockwise.
(5) Tighten the timing belt tensioner mounting bolt to the specified torque.

Tightening torque: 26 Nm (2.6 kgm, 19 ft.lbs.)

(6) Attach the cover to the access hole.

NOTES

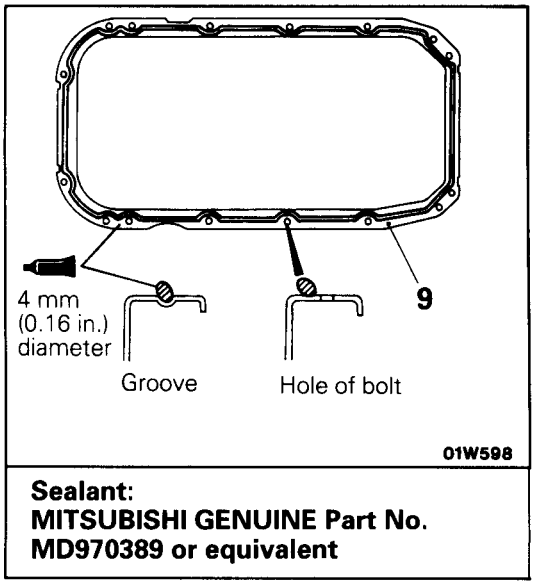
OIL PAN AND OIL SCREEN <SOHC–12 VALVE>

E11KA-B

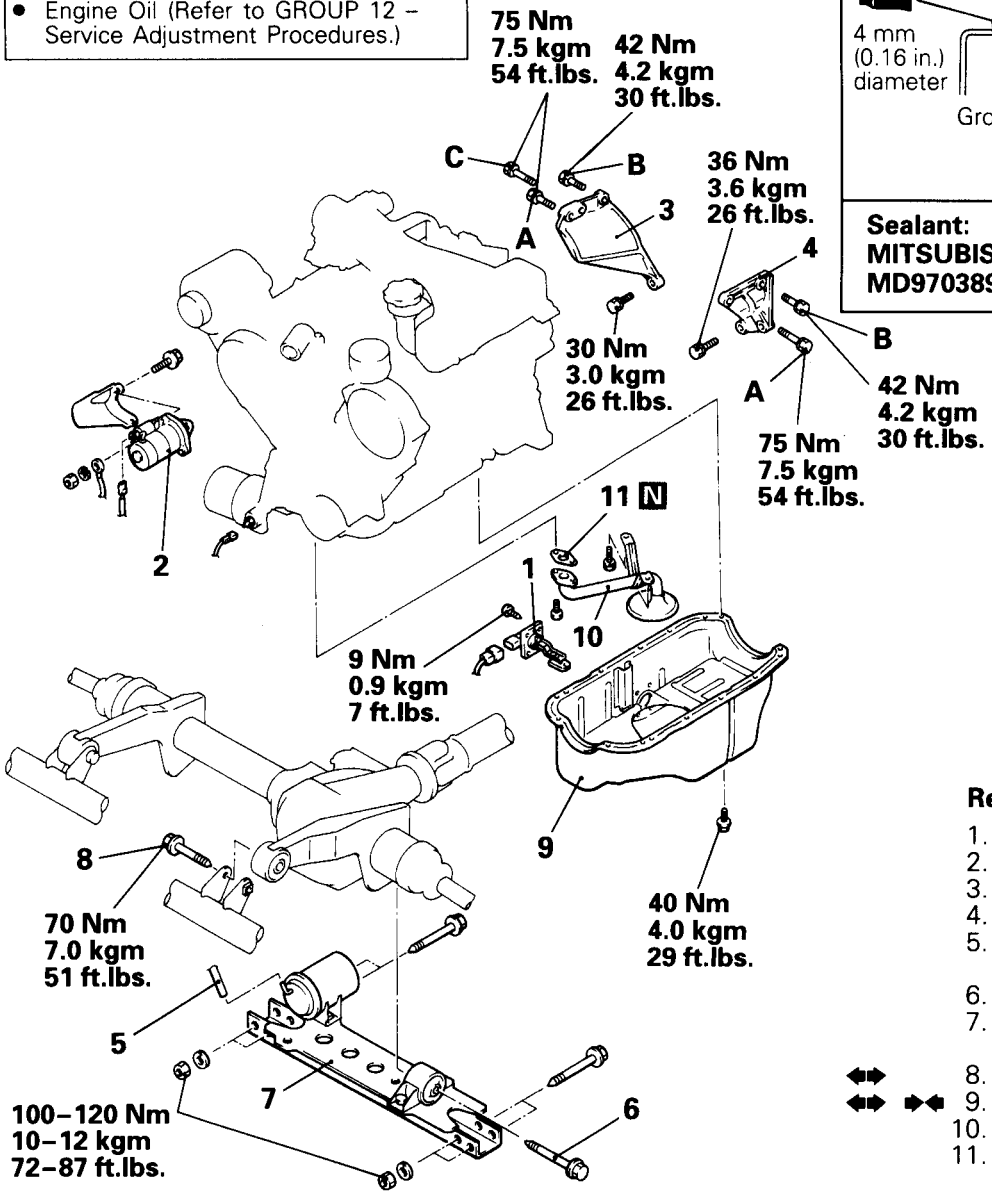
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
Removal and Installation
- Under Skid Plate, Undercover, Air-guide Plate
- Front Exhaust Pipe (Refer to GROUP 15 – Exhaust Pipe and Mufflers.)

Draining and Supplying
- Engine Oil (Refer to GROUP 12 – Service Adjustment Procedures.)

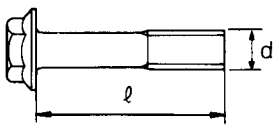


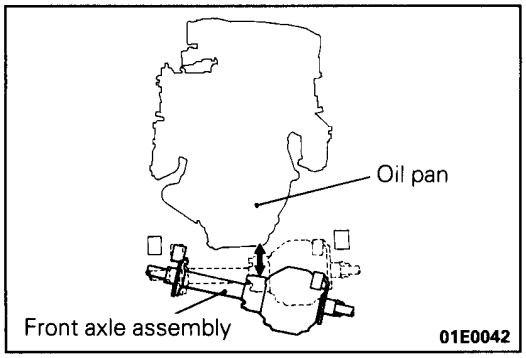
Sealant:
MITSUBISHI GENUINE Part No. MD970389 or equivalent



01E0024

Removal steps
1. Oil level sensor
2. Starter
3. Transmission stay (R.H.)
4. Transmission stay (L.H.)
5. Vacuum hose <Super select 4WD>
6. Bolt
7. Front suspension crossmember
8. Bolt
9. Oil pan
10. Oil screen
11. Oil screen gasket

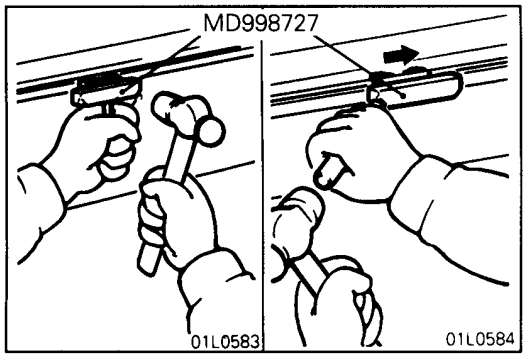
Symbol	d × ℓ mm (in.)	NOTE
A	12 × 35 (0.47 × 1.37)	
B	10 × 30 (0.39 × 1.18)	
C	12 × 50 (0.47 × 1.96)	



SERVICE POINTS OF REMOVAL E11KBBK

8. REMOVAL OF BOLT

After removing the mounting bolt, lower the front axle assembly as far as possible and so that there is enough space to remove the oil pan.



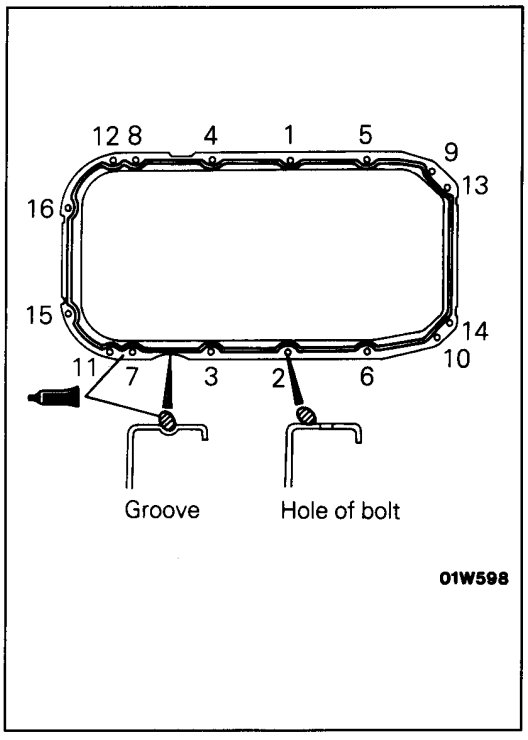
9. REMOVAL OF OIL PAN

(1) Remove oil pan bolts.
(2) Tap the special tool in between the oil pan and cylinder block.
(3) Slide the special tool by tapping it at an angle to remove the oil pan.

Caution
The use of a screwdriver or chisel in place of the special tool can damage the gasket seat surface and cause oil leakage.

INSPECTION E11KEAB2

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



SERVICE POINTS OF INSTALLATION E11KDBK

9. INSTALLATION OF OIL PAN

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

Specified sealant: MITSUBISHI GENUINE PART No. MD970389 or equivalent

NOTE
The sealant should be applied in a continuous bead approximately 4 mm (0.16 in.) in diameter.

(4) Assemble oil pan to cylinder block within 15 minutes after applying the sealant.

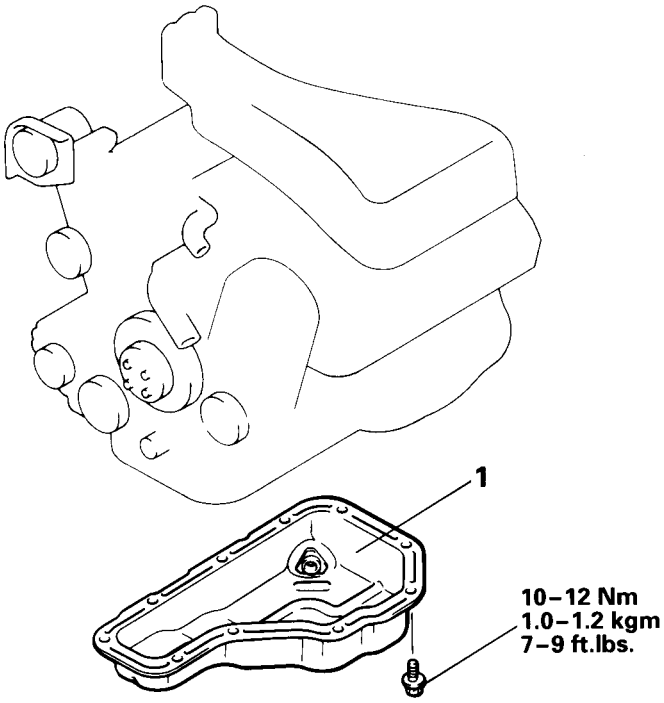
Caution
1. **Tighten the oil pan mounting bolt in the order illustrated.**
2. **After installing the oil pan, wait at least 30 minutes before starting the engine.**

OIL PAN AND OIL SCREEN <SOHC–24 VALVE>

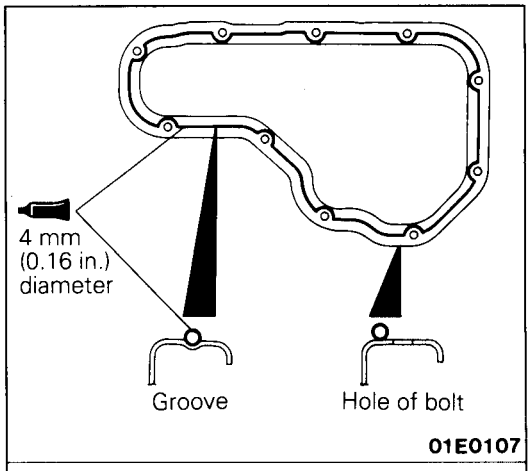
OIL PAN, LOWER
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
Removal and Installation
- Under Skid Plate, Undercover, Air-guide Plate
- Front Exhaust Pipe (Refer to GROUP 15 – Exhaust Pipe, Mufflers.)

Draining and Supplying
- Engine Oil (Refer to GROUP 12 – Service Adjustment Procedures.)



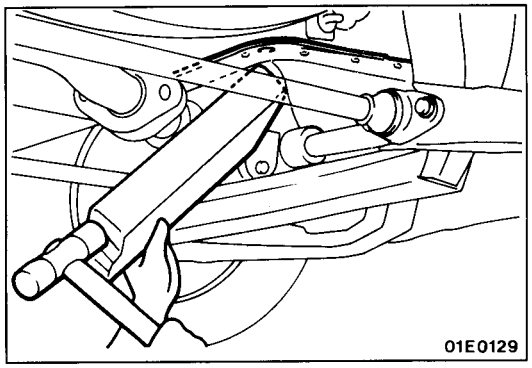
01E0152



01E0107

Sealant:
MITSUBISHI GENUINE Part No. MD970389 or equivalent

◆◆ ◆◆ 1. Oil pan, lower



01E0129

SERVICE POINT OF REMOVAL

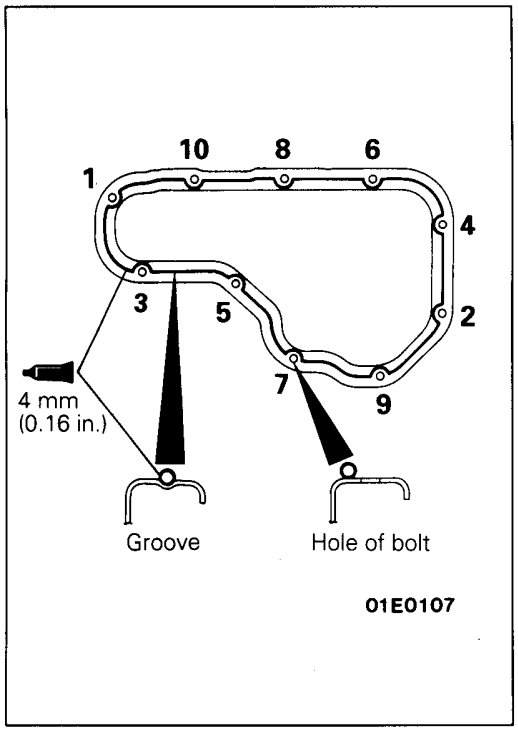
1. REMOVAL OF OIL PAN, LOWER

(1) Remove the lower oil pan 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).

INSPECTION

- Check oil pan for cracks.
- Check oil pan sealant-coated surface for damage and deformation.



SERVICE POINT OF INSTALLATION

1. INSTALLATION OF OIL PAN, LOWER

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

Specified sealant: MITSUBISHI GENUINE PART No. MD970389 or equivalent

NOTE
The sealant should be applied in a continuous bead approximately 4 mm (0.16 in.) in diameter.

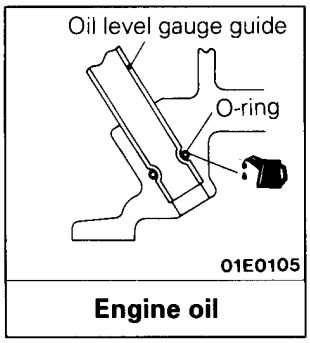
(4) Assemble oil pan to cylinder block within 15 minutes after applying the sealant.
(5) Tighten the oil pan mounting bolt in the order illustrated.

Caution
After installing the oil pan, wait at least 30 minutes before starting the engine.

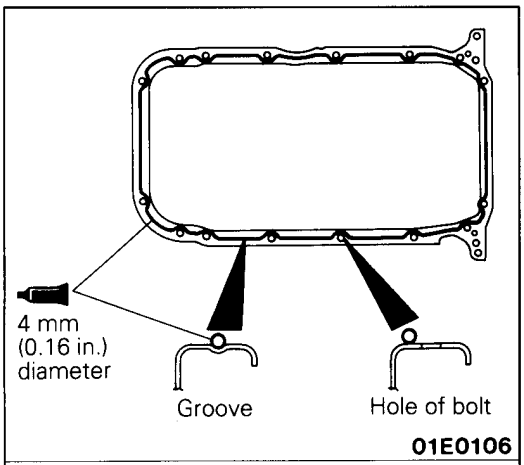
OIL PAN, UPPER AND OIL SCREEN

REMOVAL AND INSTALLATION

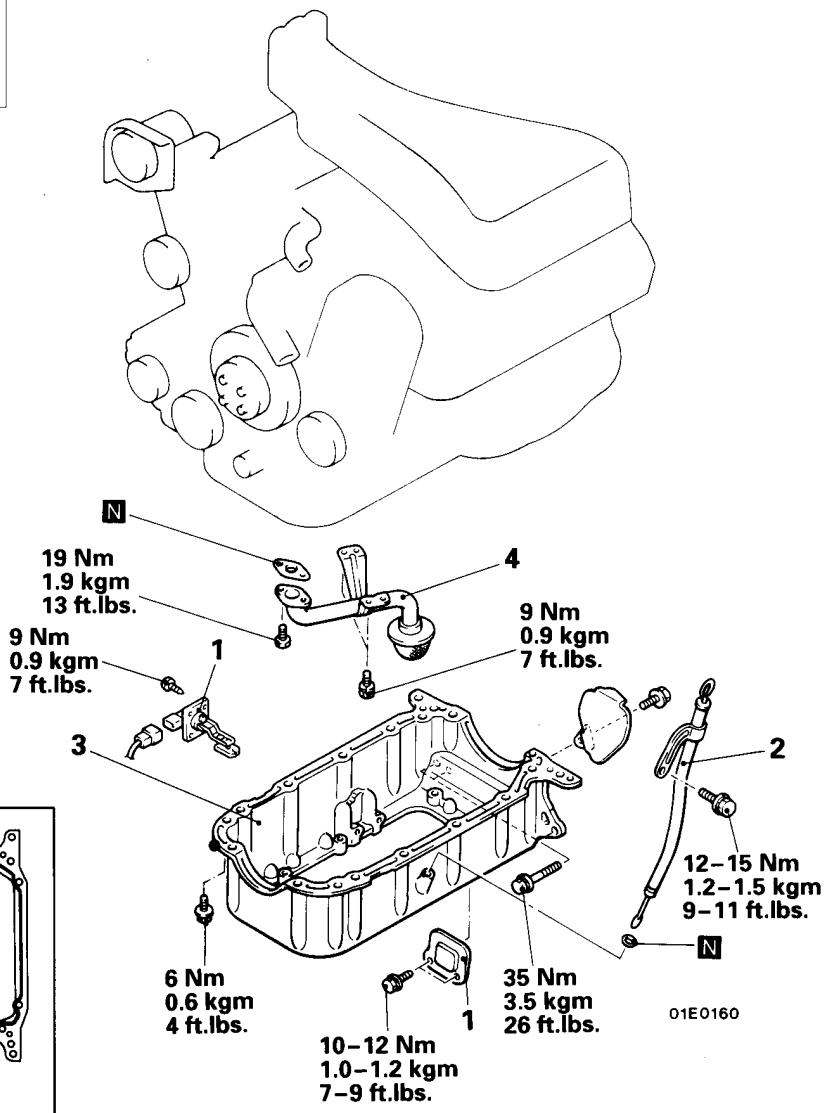
Pre-removal and Post-installation Operation
Removal and Installation
- Oil pan, Lower (Refer to P.11-35-1)
- Front Differential Carrier (Refer to GROUP 26 – Differential Carrier)



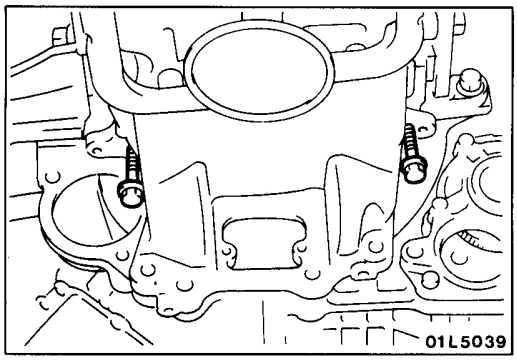
Engine oil



Sealant:
MITSUBISHI GENUINE Part No.
MD970389 or equivalent



Removal steps
1. Oil level sensor
2. Cover
3. Oil level gauge guide
4. Oil pan, upper
5. Oil screen



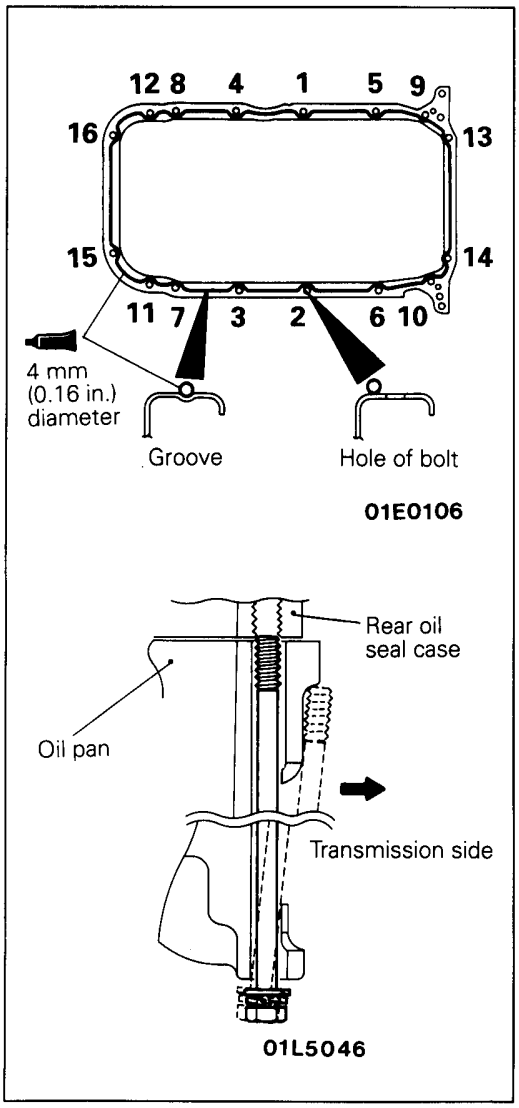
SERVICE POINT OF REMOVAL

4. REMOVAL OF OIL PAN, UPPER

Install a bolt [diameter x length: 10 x 38 mm (0.39 x 1.50 in.)] to link the oil pan, upper with the transmission in the hole of the oil pan, upper as shown in the illustration, and then tighten the bolt to remove the oil pan, upper.

INSPECTION

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



SERVICE POINT OF INSTALLATION

4. INSTALLATION OF OIL PAN, UPPER

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

Specified sealant: MITSUBISHI GENUINE PART No. MD970389 or equivalent

NOTE
The sealant should be applied in a continuous bead approximately 4 mm (0.16 in.) in diameter.

(4) Install the oil pan to the cylinder block within 15 minutes after applying the sealant.
(5) Tighten the oil pan mounting bolts in the order shown in the illustration at left.

Caution
The bolt holes for bolts 13 and 14 in the illustration are cut away on the transmission side, so be careful not to insert these bolts at an angle.

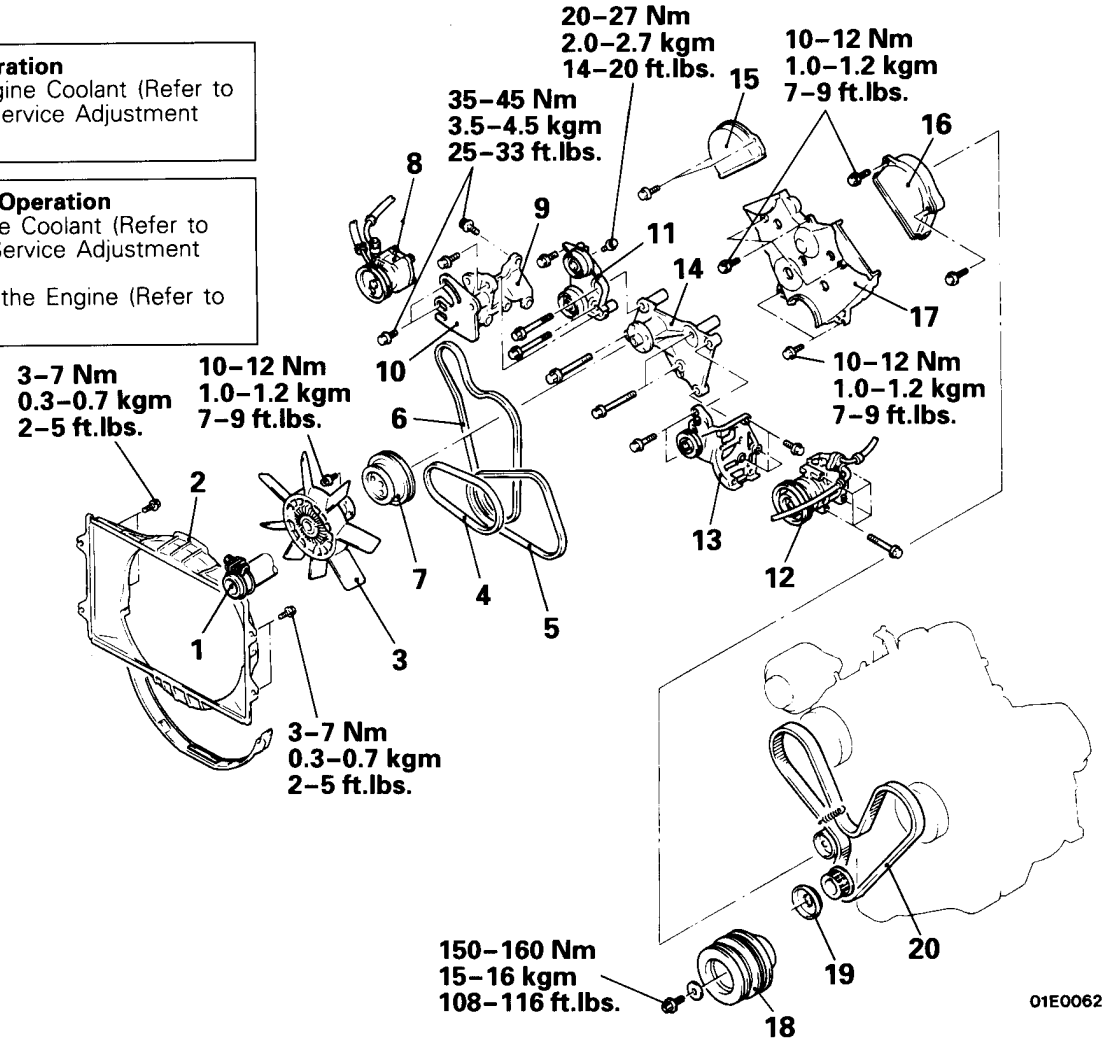
TIMING BELT <SOHC–12 VALVE>

E11GA-B

REMOVAL AND INSTALLATION

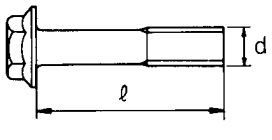
Pre-removal Operation
- Draining of Engine Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)

Post-installation Operation
- Filling of Engine Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)
- Adjustment of the Engine (Refer to P.11-30.)

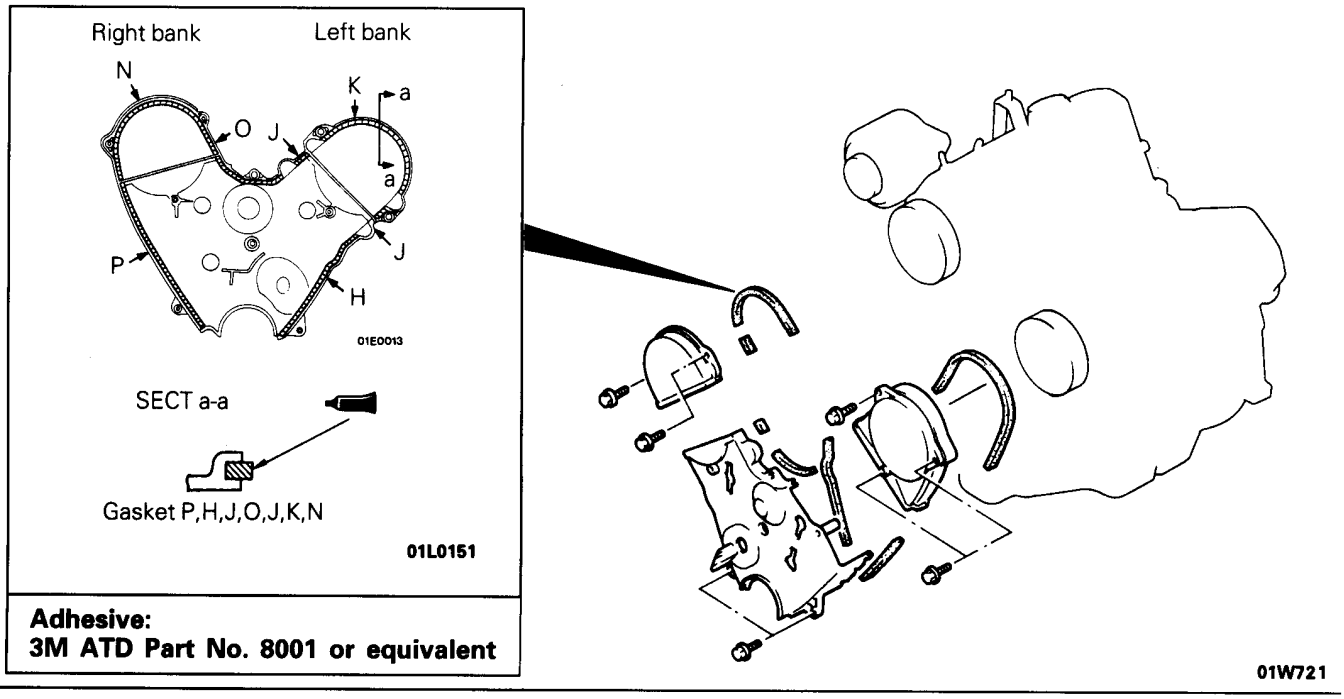


Removal steps

1. Radiator upper hose connection
2. Radiator shroud
3. Cooling fan clutch assembly
   - Adjustment of drive belt tension (Refer to P.11-30.)
4. Drive belt (Power steering)
5. Drive belt <A/C>
6. Drive belt (Alternator, Cooling fan)
7. Cooling fan pulley
8. Power steering oil pump
9. Oil pump bracket
10. Oil pump mounting bracket
11. Tension pulley bracket
12. Compressor } <A/C>
13. Compressor bracket }
14. Cooling fan bracket assembly
15. Timing belt cover outer (A)
16. Timing belt cover outer (B)
17. Timing belt cover outer (C)
18. Crankshaft pulley
19. Front flange
20. Timing belt

Symbol	Hardness category	d × ℓ mm (in.)	Torque Nm (kgm, ft.lbs.)	Note
A	7T	10 × 85 (0.39 × 3.34)	42 (4.2, 30)	 04U0025
B		10 × 95 (0.39 × 3.74)		
C		12 × 100 (0.47 × 3.93)	75 (7.5, 54)	
D		8 × 20 (0.31 × 0.79)	16 (1.6, 12)	
E	4T	6 × 20 (0.24 × 0.79)	10–20 (1.0–1.2, 7–9)	
F		6 × 55 (0.24 × 2.17)		
G		6 × 60 (0.24 × 2.36)		

ADHESIVE POINTS



SERVICE POINTS OF REMOVAL E11GBFE

8. REMOVAL OF POWER STEERING OIL PUMP

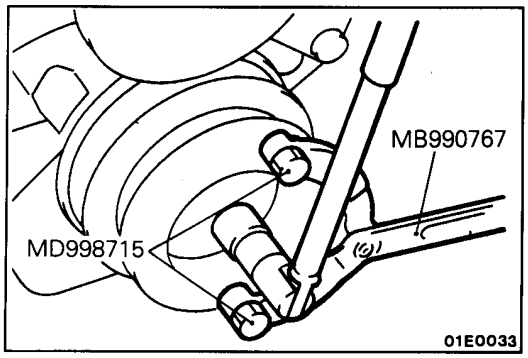
Remove the power steering oil pump from the bracket, and hold toward the body using wire or similar materials.

NOTE
Move the power steering oil pump with the pressure hose and return hose still attached.

12. REMOVAL OF COMPRESSOR <AIR CONDITIONER>

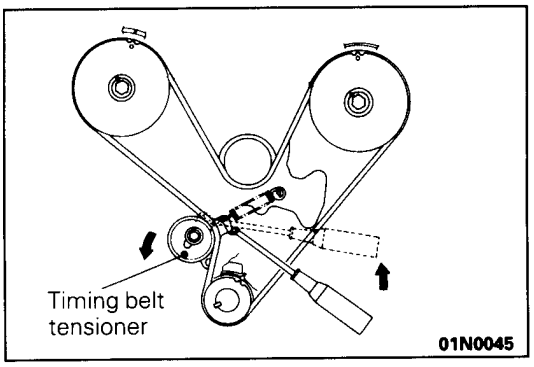
Remove the compressor from the bracket, and hold toward the body using wire or similar materials.

NOTE
Move the compressor with the high pressure hose and low pressure hose still attached.



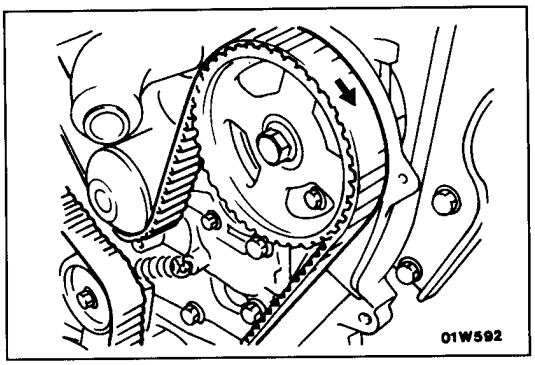
18. REMOVAL OF CRANKSHAFT PULLEY

Using the special tool, remove the crankshaft pulley from the crankshaft.



20. REMOVAL OF TIMING BELT

(1) Loosen the timing belt tensioner bolt and turn the timing belt tensioner anticlockwise along the elongated hole.



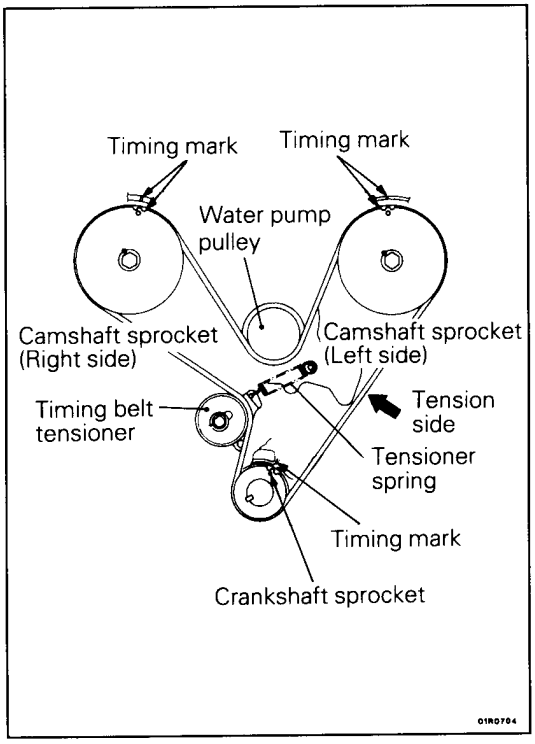
(2) When the timing belt is to be reused, in order to allow reinstallation of the belt so that it travels in the same direction as before it was removed, mark the direction of travel with an arrow before removing it.

Caution

1. **As water or oil on the belt can seriously reduce its usable life, ensure that the timing belt, sprocket, and tensioner stay clean and dry while removed, and never wash them. Parts that have become too dirty should be replaced.**
2. **When any of the parts are oily, check to see whether there are any oil leaks in any of the oil seals or the camshaft oil seal on the front of the engine.**

SERVICE POINTS OF INSTALLATION E11GDFE

20. INSTALLATION OF TIMING BELT

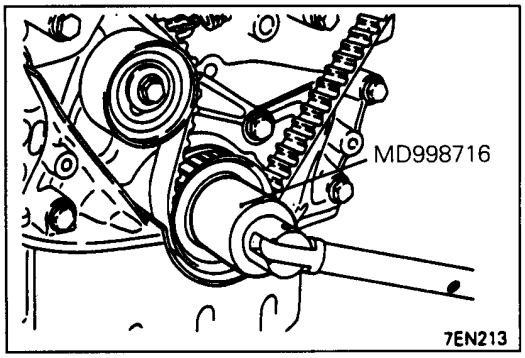


(1) Align the timing marks of the camshaft sprockets (on the right and left sides) and the crankshaft sprocket. (At the top dead point of the No. 1 cylinder compression stroke.)

(2) First, route the timing belt on the crankshaft sprocket, then on the camshaft sprocket on the side without slackness in the tight side.

(3) Next, run the timing belt onto the water pump pulley, the camshaft sprocket on the left side, and the timing belt tensioner.

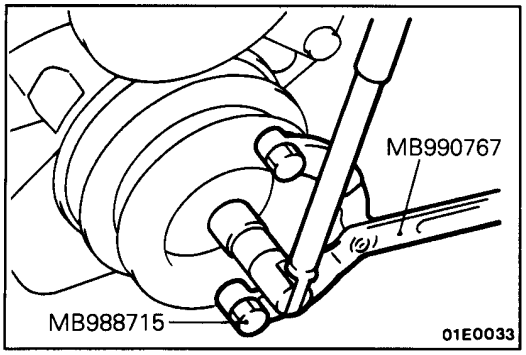
(4) Apply force anticlockwise to the camshaft sprocket on the right side. When the tight side of the belt is fault, check that the timing marks are all aligned.



(5) Attach the flange.
(6) Back off the fixing bolts of the temporarily tightened tensioner one or two turns and tighten the timing belt with the tensioner spring force.
(7) Using the special tool, turn the crankshaft two turns in the normal rotating direction (clockwise).

NOTE
Turn smoothly, but not in the opposite direction (anticlockwise).

(8) Re-align the sprockets timing marks and tighten the tensioner fixing bolts.



18. INSTALLATION OF CRANKSHAFT PULLEY

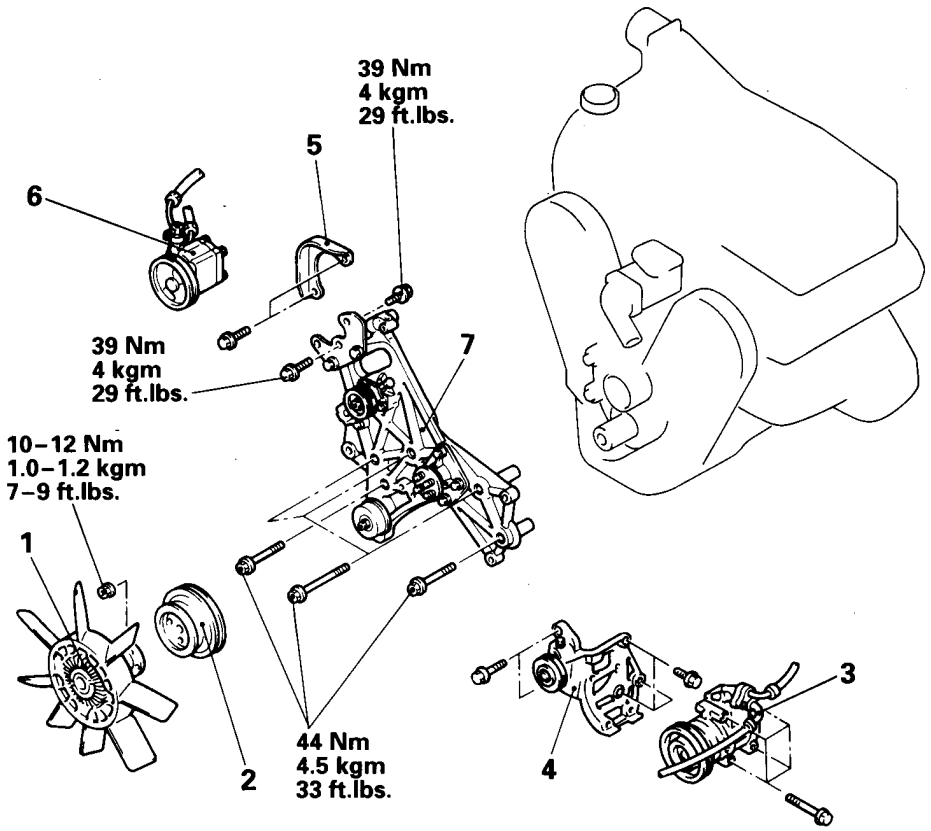
Using the special tool, attach the crankshaft pulley to the crankshaft.

TIMING BELT <SOHC–24 VALVE>

REMOVAL AND INSTALLATION

Pre-removal Operation
- Removal of Radiator (Refer to GROUP 14 – Radiator.)
- Removal of Alternator (Refer to GROUP 16 – Alternator.)

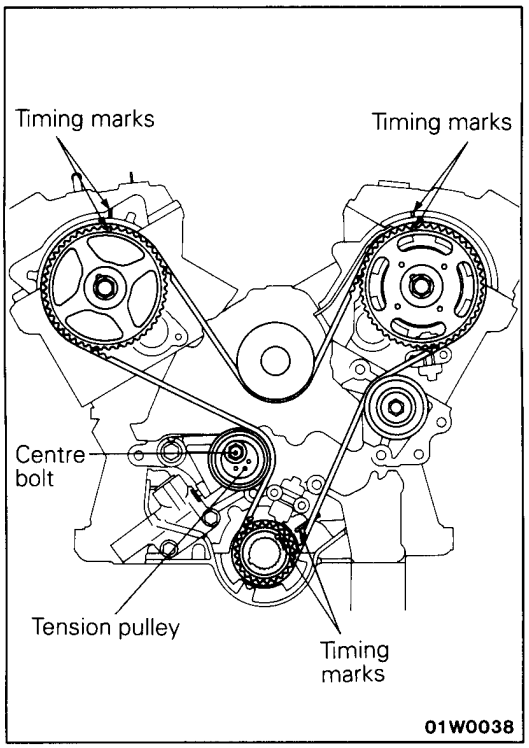
Post-installation Operation
- Installation of Alternator (Refer to GROUP 16 – Alternator.)
- Installation of Radiator (Refer to GROUP 14 – Radiator.)
- Adjustment of Engine (Refer to P.11-30.)



01W0074

Removal steps

1. Cooling fan clutch assembly
2. Water pump pulley
3. Compressor <A/C>
4. Compressor bracket <A/C>
5. Cover
6. Power steering oil pump
7. Accessory mount

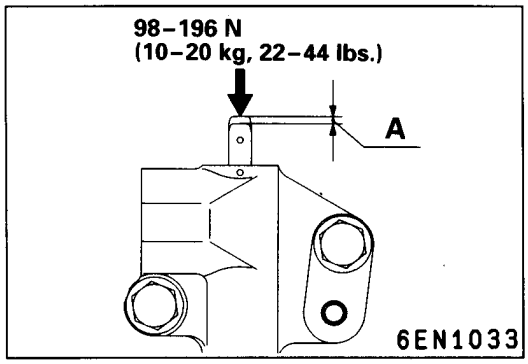


11. REMOVAL OF TIMING BELT

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

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

(3) When the timing belt is to be reused, in order to allow re-installation of the belt so that it travels in the same direction as before it was removed, mark the direction of travel with an arrow before removing it.



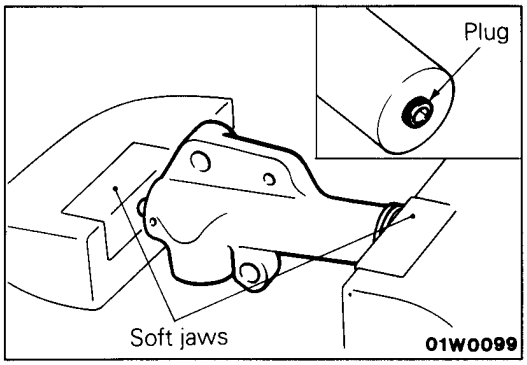
INSPECTION

AUTO TENSIONER

(1) Hold the auto-tensioner by hand. Then measure contraction (A) when pressing the tip of the rod on a steel (cylinder block, etc.) with a force of 98–196 N (10–20 kg, 22–44 lbs.).

Standard value (A):1 mm (0.04 in.) or less

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

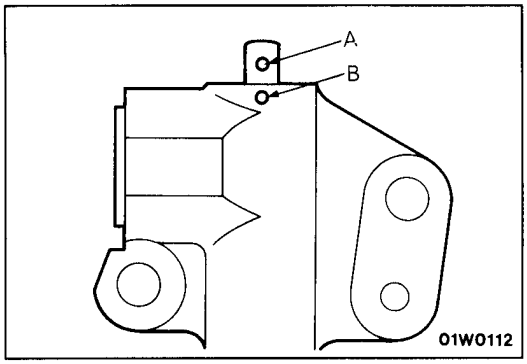


SERVICE POINTS OF INSTALLATION

12. INSTALLATION OF AUTO TENSIONER

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

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



3) Insert a wire [1.4 mm (0.055 in.) in diameter] into the set holes.

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

4) Unclamp the auto tensioner from the vice.

(2) Install the auto tensioner.

Caution
Leave the wire installed in the auto tensioner.

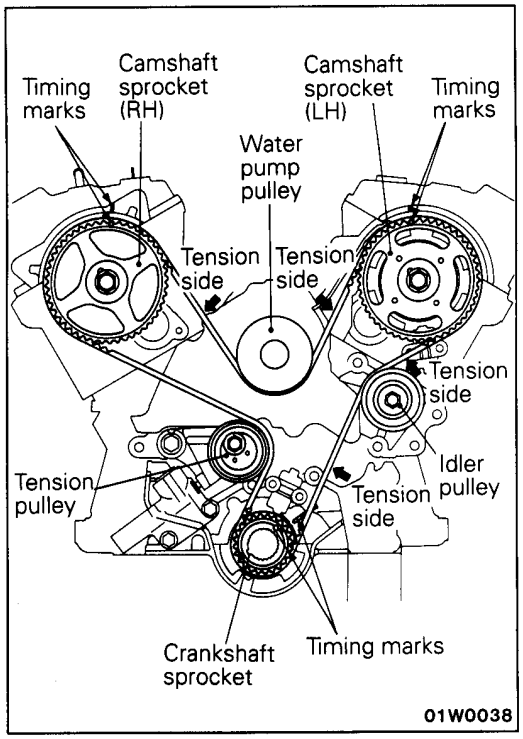
11. INSTALLATION OF TIMING BELT

(1) Align the crankshaft sprocket and camshaft sprocket timing marks.

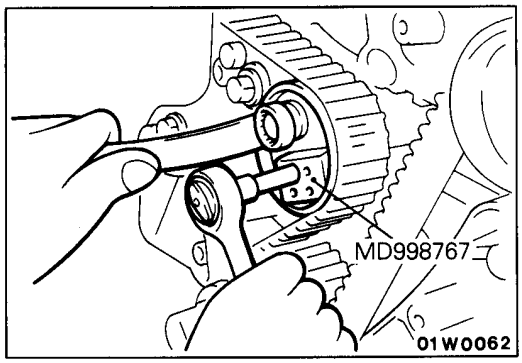
(2) Install the timing belt by the following steps so that the belt is not loosened between the sprockets and pulleys.
1. Crankshaft sprocket
2. Idler pulley
3. Camshaft sprocket (LH)
4. Water pump pulley
5. Camshaft sprocket (RH)
6. Tension pulley

Caution
Be careful not to pinch your finger, as the camshaft sprocket (RH) is turned easily by spring force.

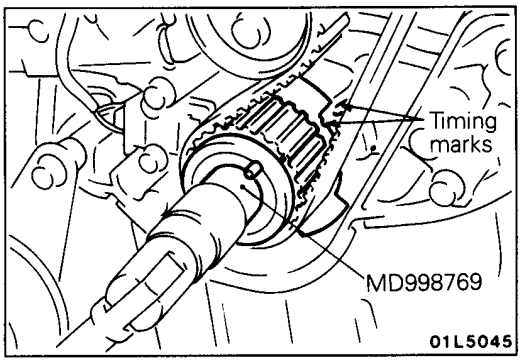
(3) Apply a anticlockwise force to the camshaft sprocket (RH) and recheck that the timing marks are aligned with the timing belt tight.

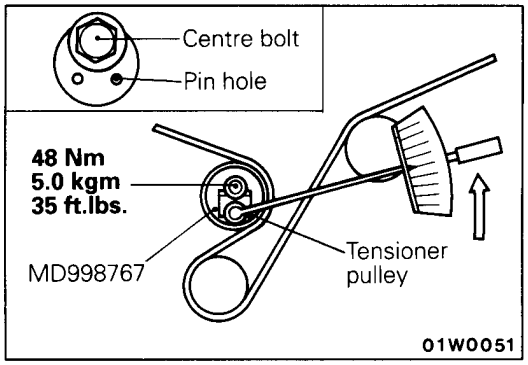


(4) Press the tension pulley onto the timing belt with the special tool and temporarily tighten the centre bolt.



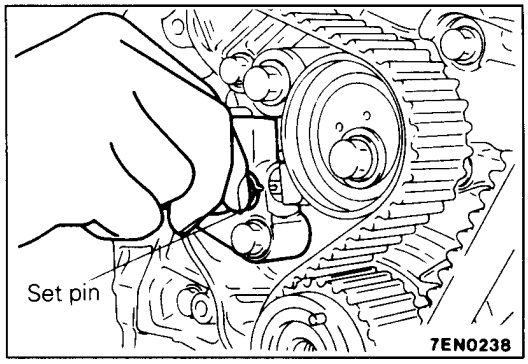
(5) Turn the crankshaft a 1/4 turn anti-clockwise with the special tool and align the timing mark by turning the crankshaft clockwise.



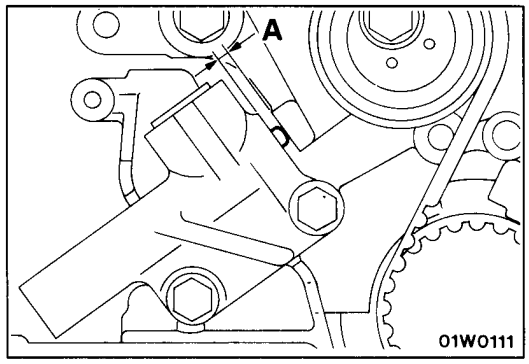


(6) Loosen the centre bolt on the tensioner pulley. Using the special tool and torque wrench, apply tensioning torque to the timing belt and, at the same time, tighten the centre bolt to specification.

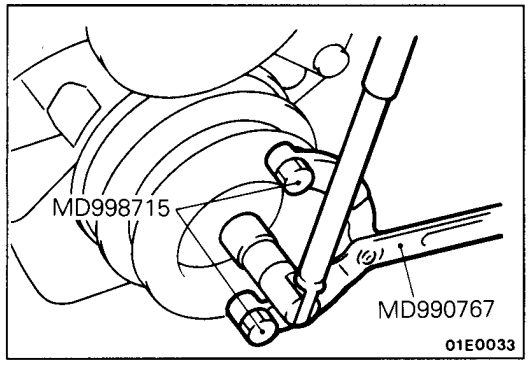
Reference value: 4.4 Nm (0.45 kgm, 3.3 ft.lbs.) (Timing belt tensioning torque)



(7) Remove the set pin which is inserted into the auto-tensioner.
(8) Turn the crankshaft clockwise twice to align the timing marks.



(9) Wait at least five minutes and check that the contraction of the auto-tensioner push rod is within the standard value.
Standard value (A): 3.8 to 4.5 mm (0.149 to 0.177 in.)
(10) If the protrusion is out of specification, repeat steps (5) to (9).
(11) Check again that timing marks on all sprockets are aligned properly.



9. INSTALLATION OF CRANKSHAFT PULLEY

Using the special tool, attach the crankshaft pulley to the crankshaft.

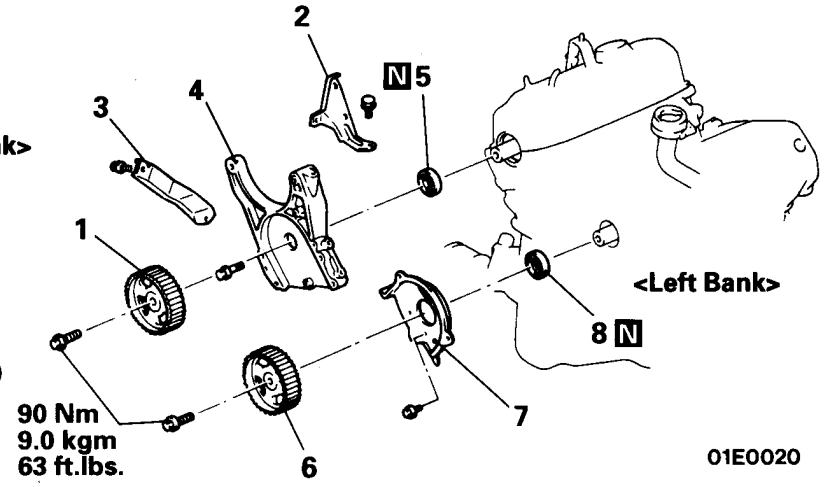
Caution
Use only the specified special tools, or the pulley damper will be damaged.

NOTES

CAMSHAFT OIL SEAL <SOHC–12 VALVE>

E11VA-B

REMOVAL AND INSTALLATION



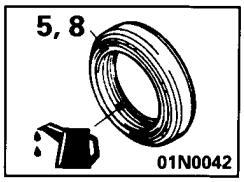
Removal steps <Right Bank>

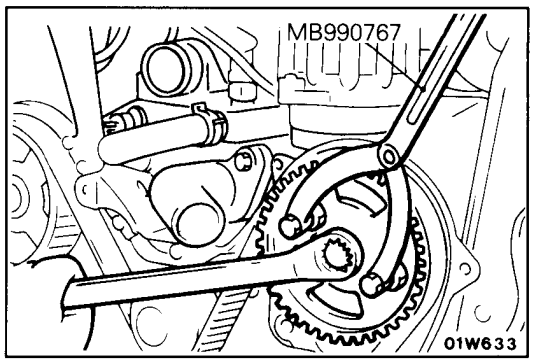
- Alternator (Refer to GROUP 16 – Alternator)
- Timing Belt (Refer to P.11-36.)

1. Camshaft sprocket
2. Cooling fan stay
3. Alternator bracket stay
4. Alternator bracket
5. Oil seal

Removal steps <Left bank>

6. Camshaft sprocket
7. Timing belt rear cover
8. Oil seal

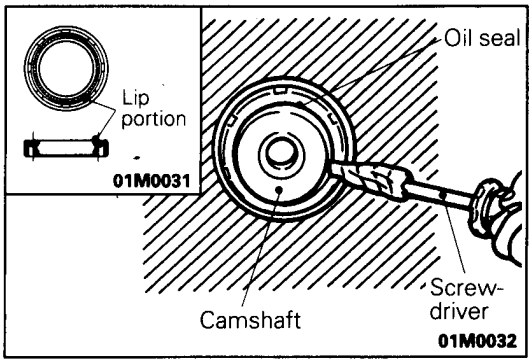




SERVICE POINTS OF REMOVAL

E11VBAP

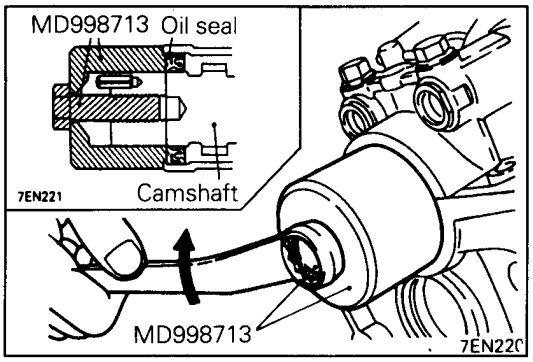
1./6. REMOVAL OF CAMSHAFT SPROCKET



5./8. REMOVAL OF OIL SEAL

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

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



SERVICE POINT OF INSTALLATION

E11VCAD

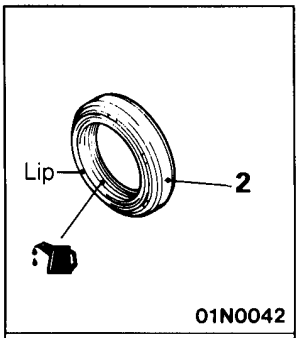
8./5. INSTALLATION OF OIL SEAL

(1) Apply a slight amount of engine oil all over the circumference of the camshaft oil seal lip section.
(2) Using the special tool, insert the oil seal.

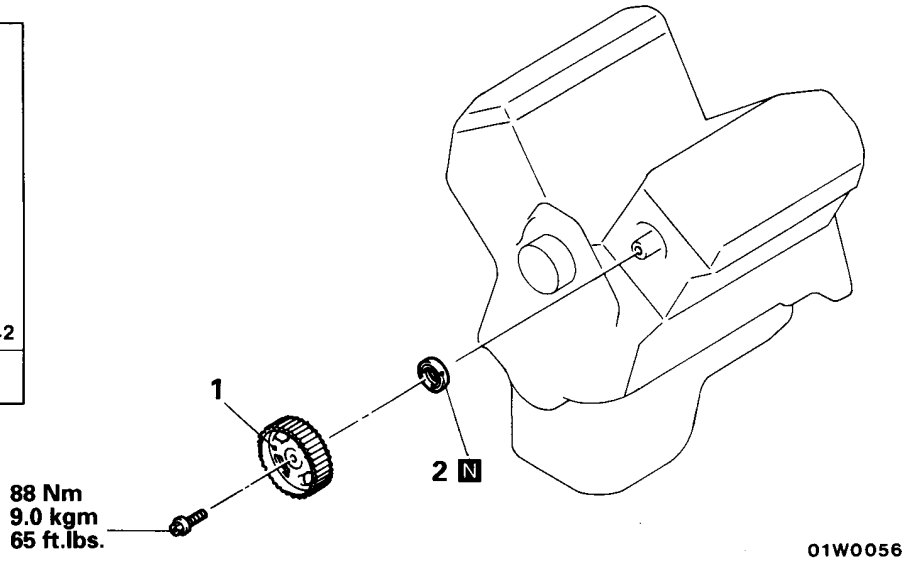
CAMSHAFT OIL SEAL <SOHC–24 VALVE>

REMOVAL AND INSTALLATION

Pre-removal and Post-installation operation
- Removal and Installation of Timing Belt (Refer to GROUP 11-39-1)

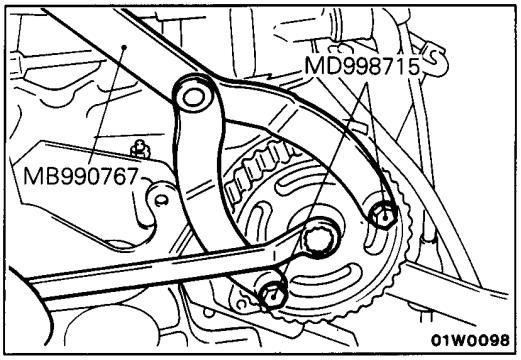


Engine oil



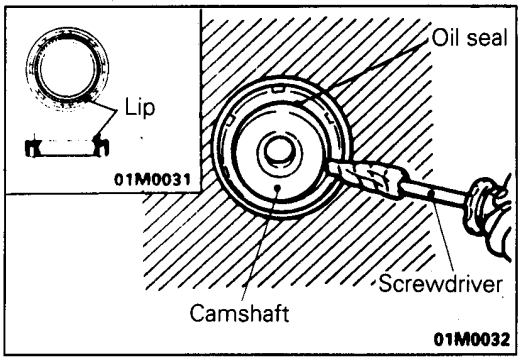
Removal steps

1. Camshaft sprocket
2. Camshaft oil seals



SERVICE POINTS OF REMOVAL

1. REMOVAL OF CAMSHAFT SPROCKET

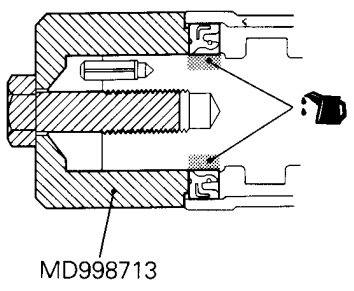


2. REMOVAL OF CAMSHAFT OIL SEAL

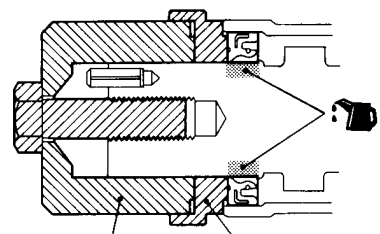
(1) Cut out a portion in the camshaft oil seal lip.
(2) Cover the tip of a screwdriver with a cloth and apply it to the cutout in the oil seal to pry off the oil seal.

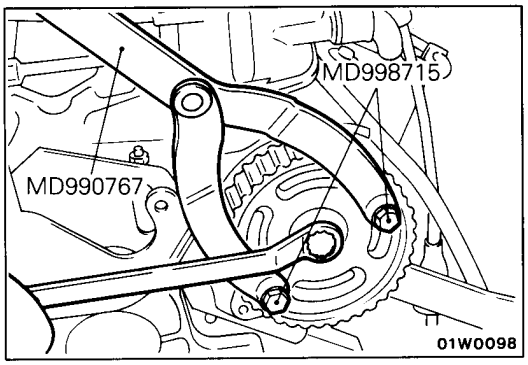
Caution
Use care not to damage the camshaft and cylinder head.

<Right bank side>



<Left bank side>





SERVICE POINTS OF INSTALLATION

2. INSTALLATION OF CAMSHAFT OIL SEAL

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

1. INSTALLATION OF CAMSHAFT SPROCKET

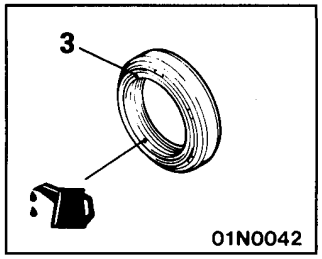
CRANKSHAFT OIL SEALS <SOHC-12 VALVE>

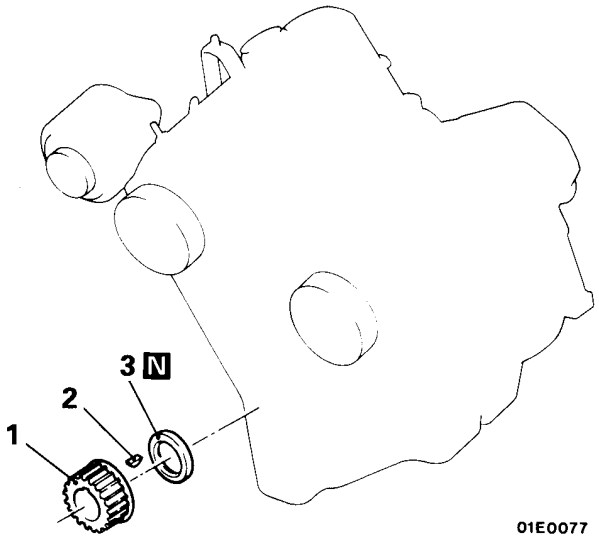
E11UA-B

FRONT OIL SEAL
REMOVAL AND INSTALLATION

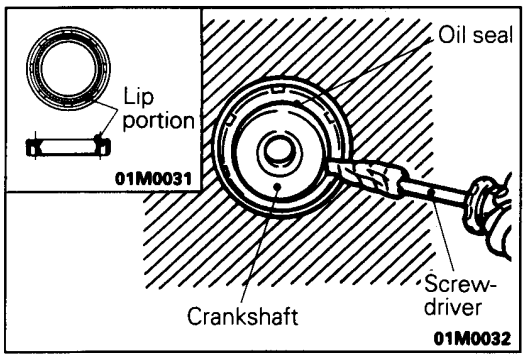
Pre-removal and Post-installation Operation
- Removal of the Timing Belt (Refer to P.11-36.)

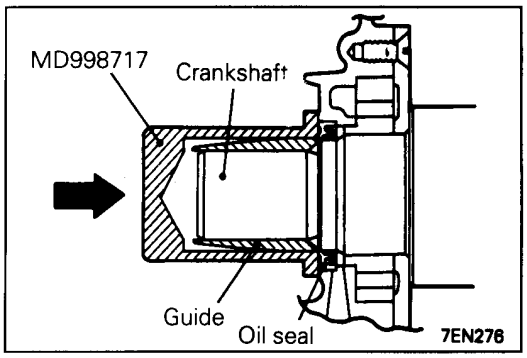
Adjustment
- Engine Adjustment (Refer to P.11-30.)





Removal steps
1. Crankshaft sprocket
2. Key
3. Oil seal





SERVICE POINTS OF REMOVAL

E11UBAD

3. REMOVAL OF OIL SEAL

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

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

SERVICE POINTS OF INSTALLATION

E11UCAH

3. INSTALLATION OF OIL SEAL

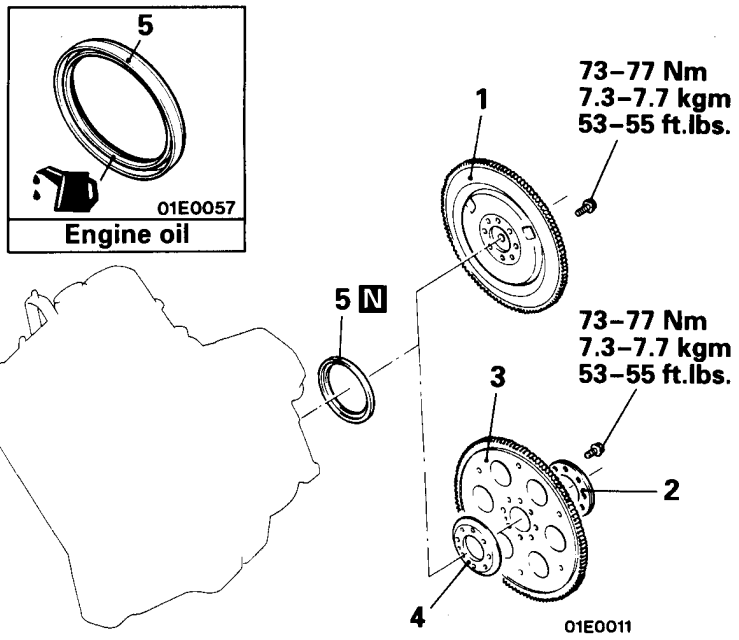
Using the special tool, knock the oil seal into the oil pump case.

NOTE
Knock it as far as the surface.

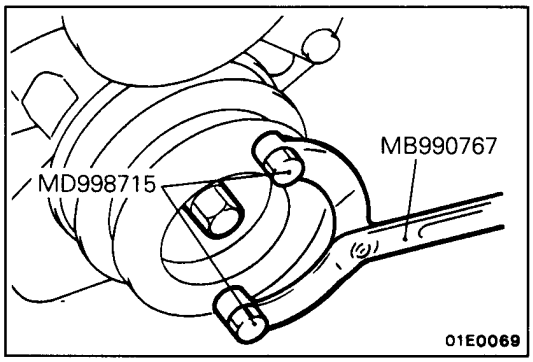
REAR OIL SEAL
REMOVAL AND INSTALLATION

E11UA-E

Pre-removal and Post-installation Operation
Removal and Installation
- Transmission (Refer to GROUP 22, 23 – Transmission and Transfer Assembly.)
- Clutch <M/T>



Removal steps
1. Flywheel assembly <M/T>
2. Adaptor plate A
3. Drive plate <A/T>
4. Adaptor plate B
5. Oil seal

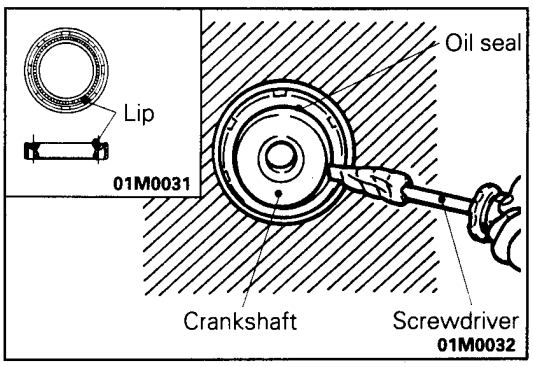


SERVICE POINTS OF REMOVAL

E11UBAE

1. REMOVAL OF FLYWHEEL ASSEMBLY <M/T>/2. ADAPTOR PLATE A <A/T>/3. DRIVE PLATE <A/T>/4. ADAPTOR PLATE B <A/T>

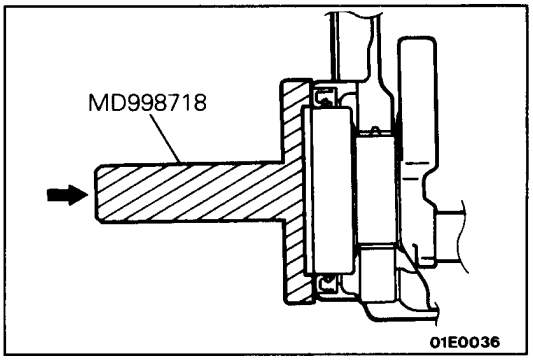
Stop the crankshaft pulley from turning with the special tool, and remove the flywheel, the adaptor plate and the drive plate.



5. REMOVAL OF OIL SEAL

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

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



SERVICE POINTS OF INSTALLATION

E11UCAI

7. INSTALLATION OF OIL SEAL

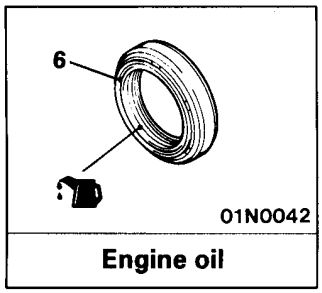
Using the special tool, press-fit a new crankshaft rear oil seal into the oil seal case.

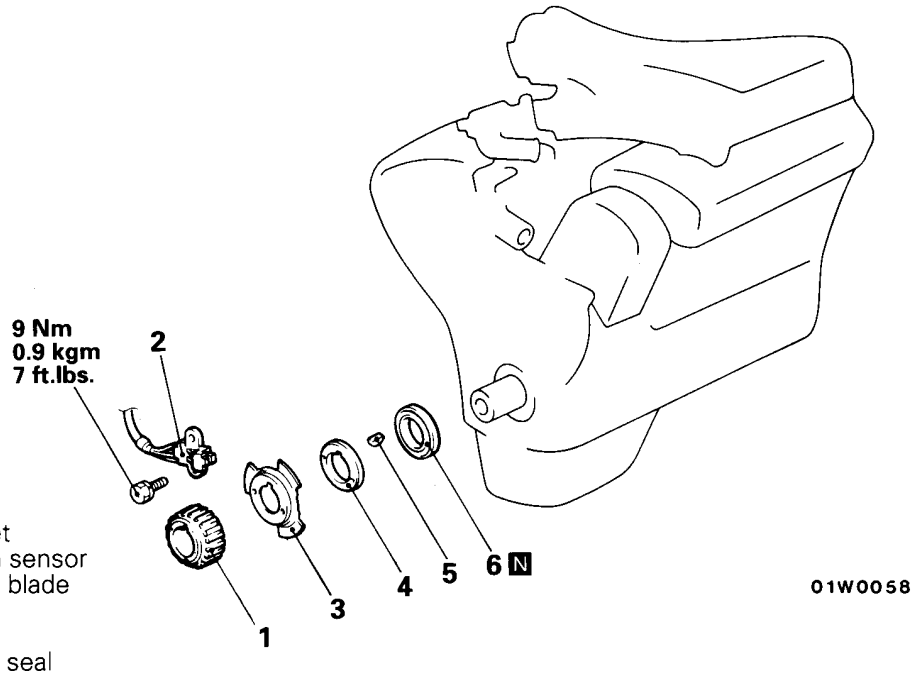
CRANKSHAFT OIL SEALS <SOHC–24 VALVE>

FRONT OIL SEAL REMOVAL AND INSTALLATION

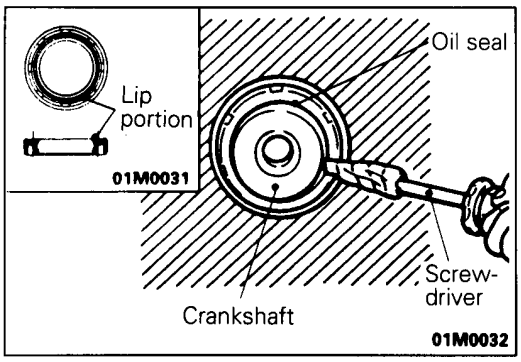
Pre-removal and Post-installation Operation
- Removal and Installation of Timing Belt (Refer to P.11-39-1)

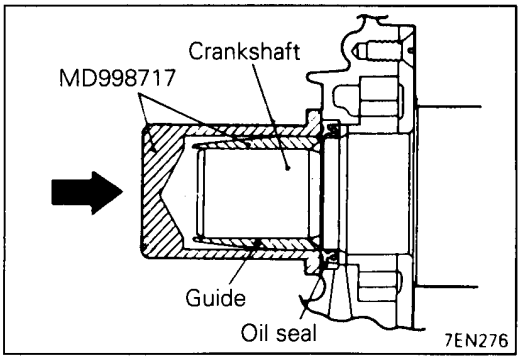
Adjustment
- Engine Adjustment (Refer to P.11-30)





Removal steps
1. Crankshaft sprocket
2. Crankshaft position sensor
3. Crankshaft sensing blade
4. Crankshaft spacer
5. Key
6. Crankshaft front oil seal





SERVICE POINT OF REMOVAL

2. REMOVAL OF OIL SEAL

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

Caution
Use care not to damage the crankshaft and oil pump case.

SERVICE POINT OF INSTALLATION

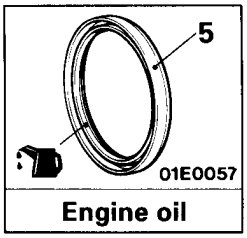
6. INSTALLATION OF OIL SEAL

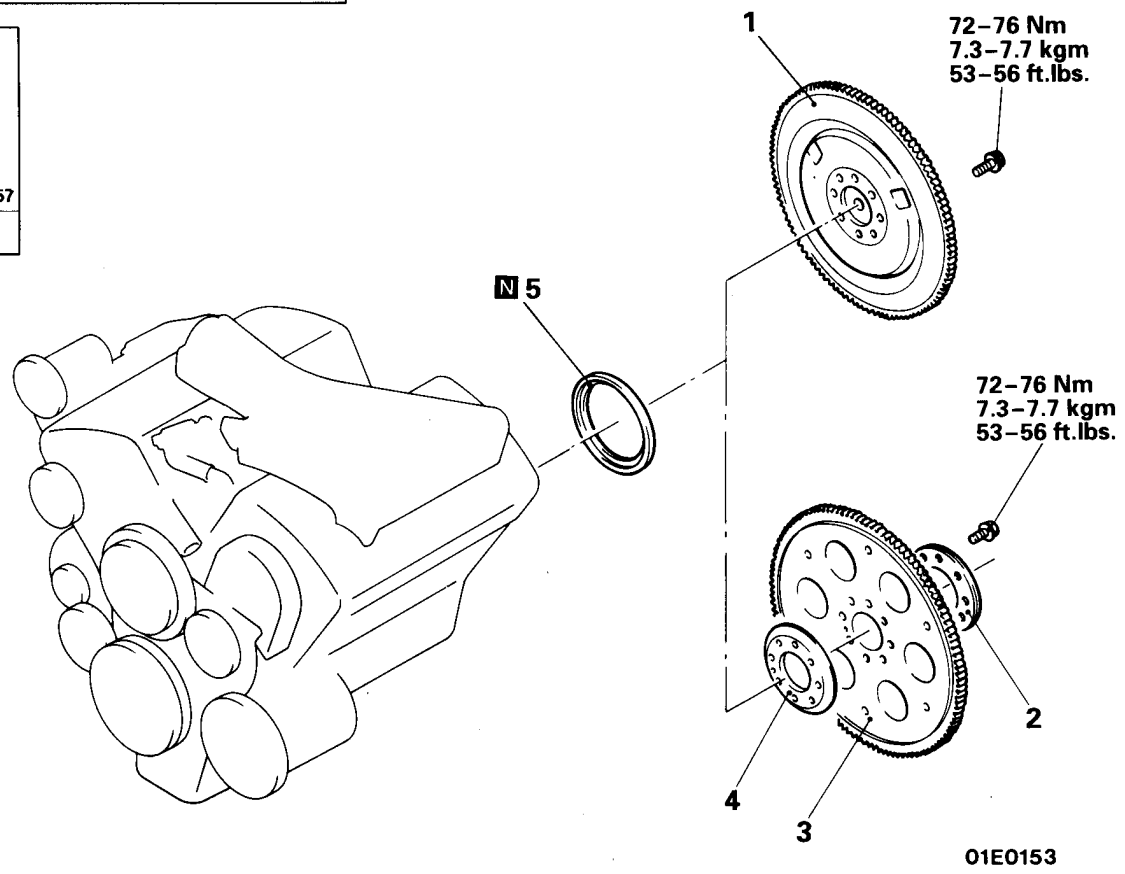
Using the special tool, knock the oil seal into the oil pump case.

NOTE
Knock it as far as the surface.

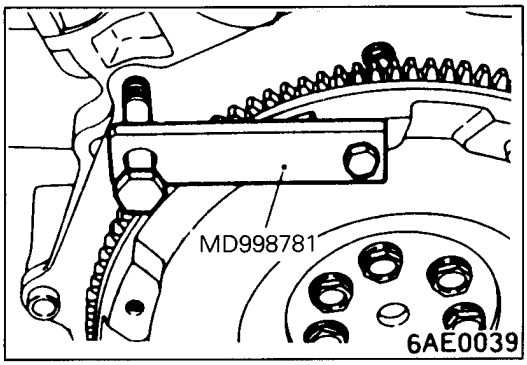
REAR OIL SEAL
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Removal and Installation of Transmission
  (M/T: Refer to GROUP – 22 Transmission and Transfer Assembly)
  (A/T: Refer to GROUP 23 – Transmission and Transfer Assembly)
- Removal and Installation of Clutch <M/T>





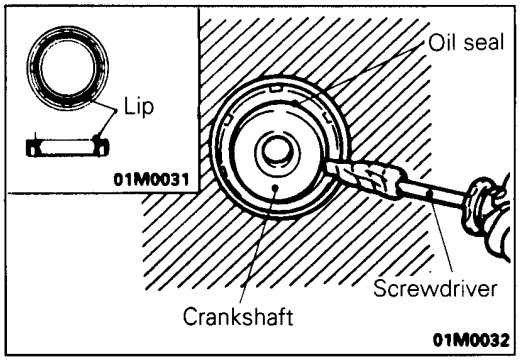
Removal steps
1. Flywheel assembly <M/T>
2. Adaptor plate A <A/T>
3. Drive plate <A/T>
4. Adaptor plate B <A/T>
5. Oil seal



SERVICE POINTS OF REMOVAL

1. REMOVAL OF FLYWHEEL ASSEMBLY <M/T>/2. ADAPTOR PLATE A <A/T>/3. DRIVE PLATE <A/T>/4. ADAPTOR PLATE B

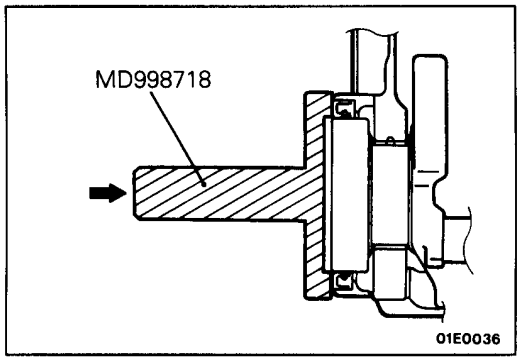
Use the special tool to secure the flywheel assembly or drive plate, and remove the bolt.



5. REMOVAL OF OIL SEAL

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

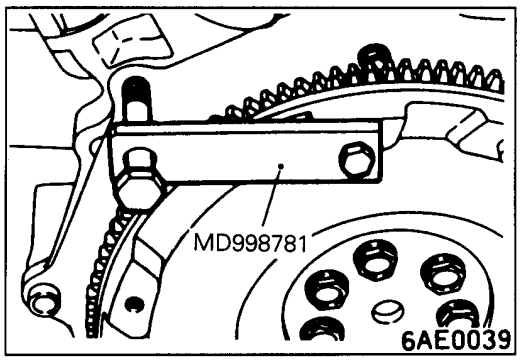
Caution
Take care not to damage the crankshaft and oil seal case.



SERVICE POINTS OF INSTALLATION

5. INSTALLATION OF OIL SEAL

Using the special tool, press-fit a new crankshaft rear oil seal into the oil seal case.



4. INSTALLATION OF ADAPTOR PLATE B <A/T>/3. DRIVE PLATE <A/T>/2. ADAPTOR PLATE A <A/T>/1. FLYWHEEL ASSEMBLY <M/T>

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

NOTES

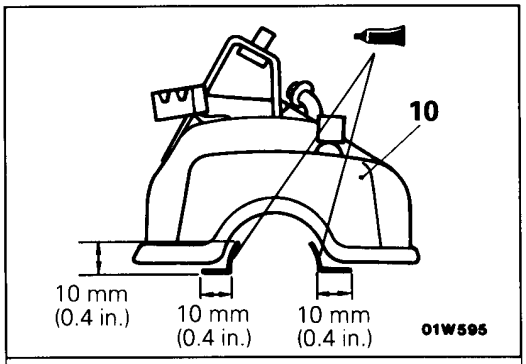
CYLINDER HEAD GASKET <SOHC–12 VALVE>

E11JA-B

REMOVAL AND INSTALLATION

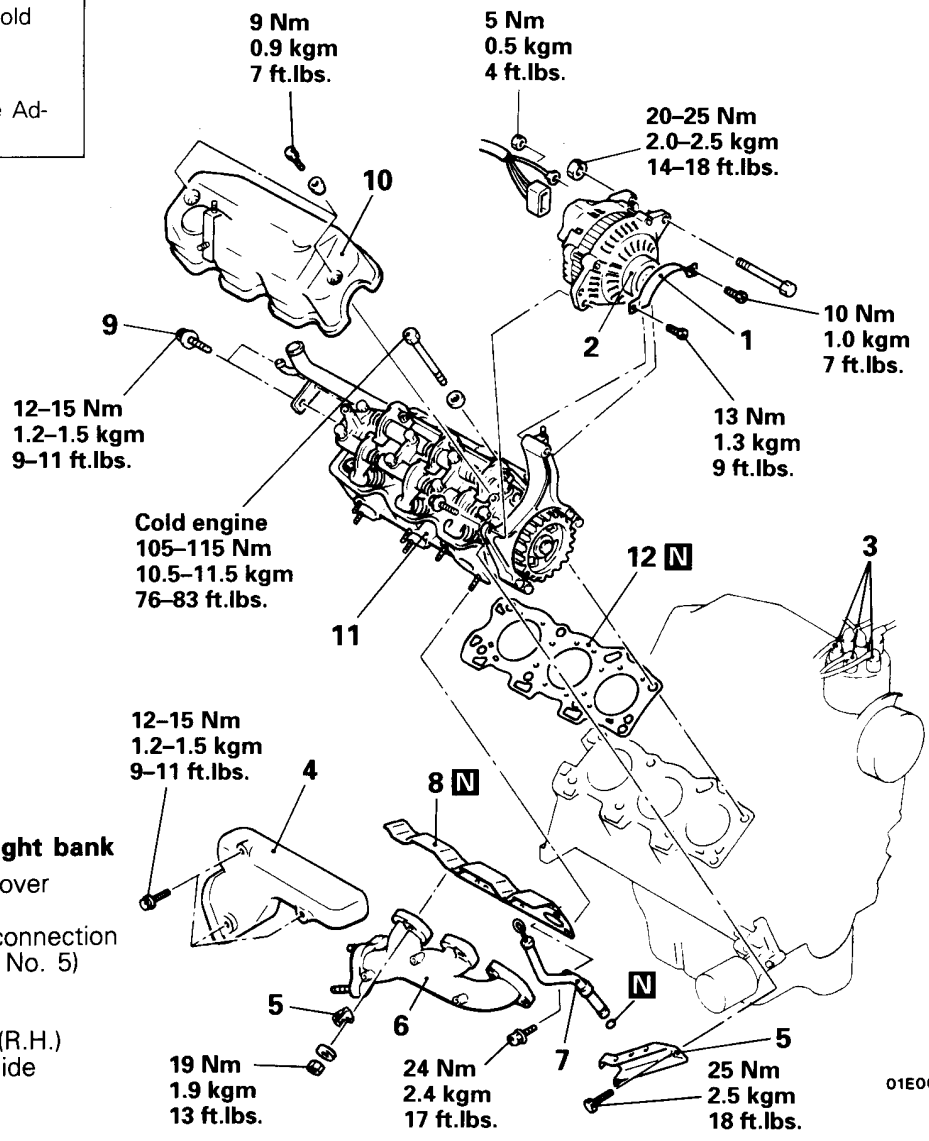
Pre-removal Operation
- Draining of Engine Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)
- Removal of the Timing Belt (Refer to P.11-36.)
- Removal of the Intake Manifold
- Removal of the Under Skid Plate, Undercover, Air Guide Plate and Transfer Case Protector
- Removal of the Front Exhaust Pipe (Refer to GROUP 15 – Exhaust Pipe and Mufflers.)

Post-installation Operation
- Installation of the Front Exhaust Pipe (Refer to GROUP 15 – Exhaust Pipe and Mufflers.)
- Installation of the Under Skid Plate, Undercover, Air Guide Plate and Transfer case Protector
- Installation of the Intake Manifold
- Installation of the Timing Belt (Refer to P.11-36.)
- Supplying of Engine Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)



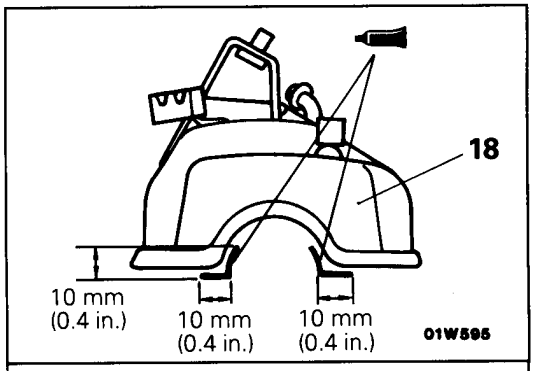
Sealant: 3M ATD Part No. 8660 or equivalent

<Right bank>



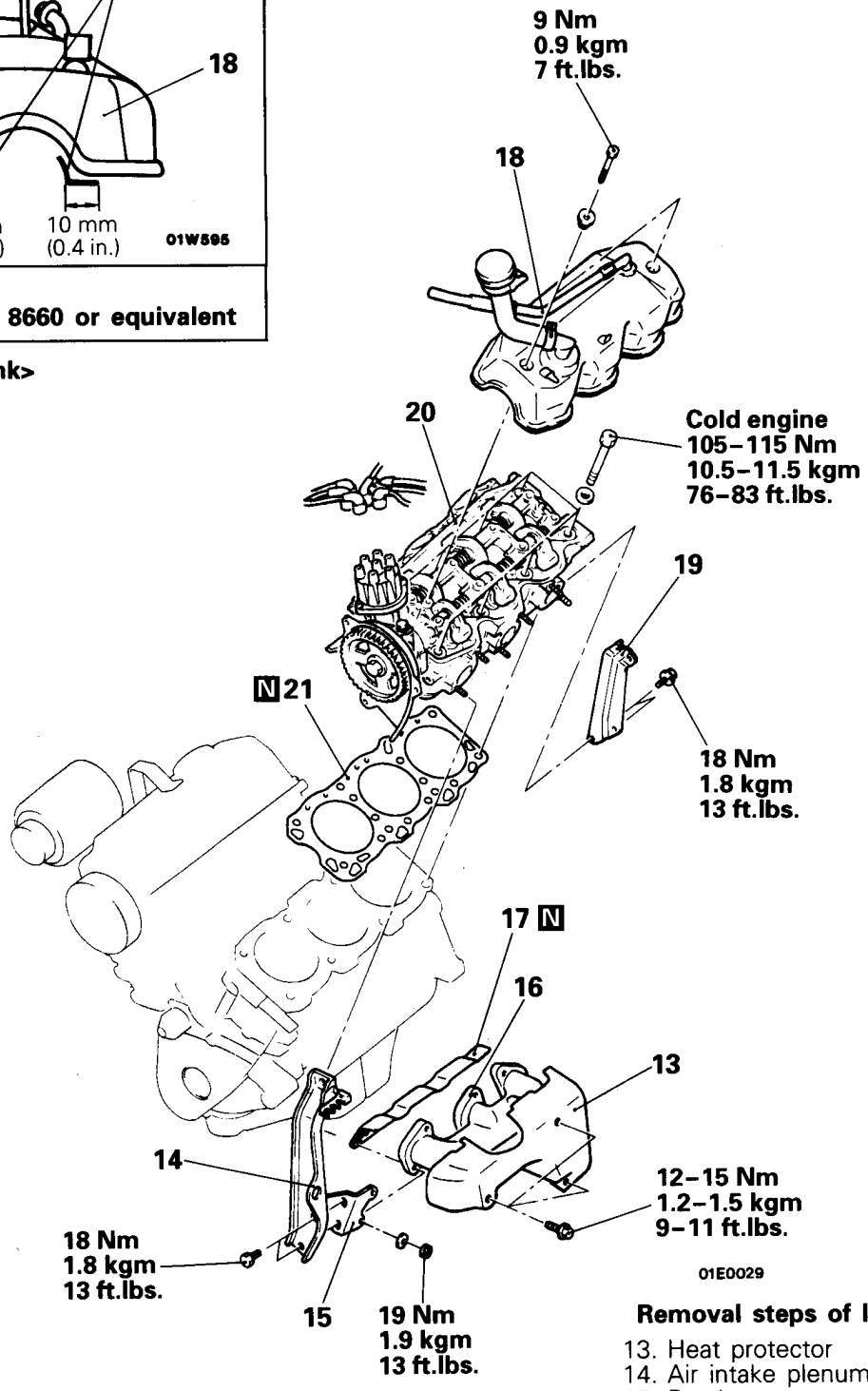
Removal steps of right bank
1. Alternator pulley cover
2. Alternator
3. Spark plug cable connection (No. 1, No. 3 and No. 5)
4. Heat protector
5. Alternator stay
6. Exhaust manifold (R.H.)
7. Oil level gauge guide
8. Gasket
9. Bolt
10. Rocker cover

◀▶ ▶◀ 11. Cylinder head assembly
▶◀ 12. Cylinder head gasket



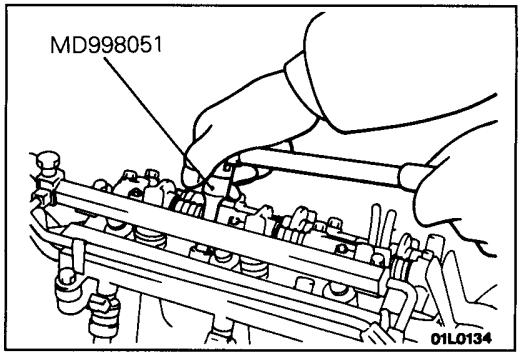
Sealant:
3M ATD Part No. 8660 or equivalent

<Left bank>



Removal steps of left bank

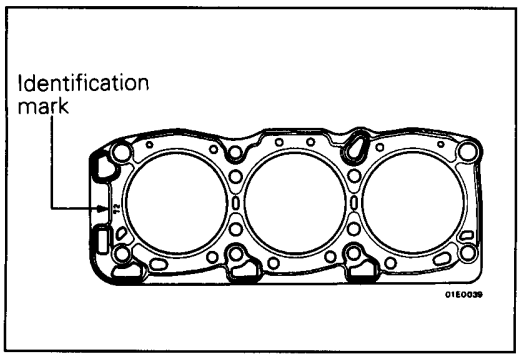
13. Heat protector
14. Air intake plenum stay (Front)
15. Bracket
16. Exhaust manifold (L.H.)
17. Gasket
18. Rocker cover
19. Air intake plenum stay (Rear)
20. Cylinder head assembly
21. Cylinder head gasket



SERVICE POINTS OF REMOVAL E11JBCG

11./20. REMOVAL OF CYLINDER HEAD ASSEMBLY

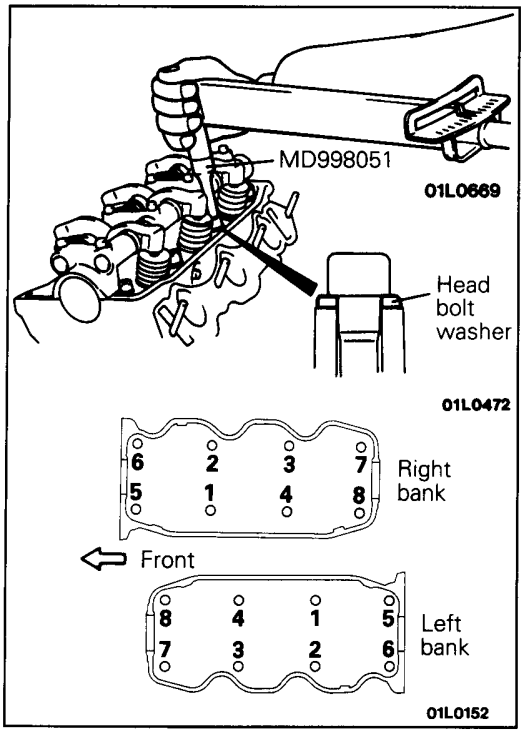
Using the special tool, after loosening the bolts in the order shown in the figure (in 2 or 3 cycles), remove, and then remove the cylinder head assembly.



SERVICE POINTS OF INSTALLATION E11JDCS

21./12. INSTALLATION OF CYLINDER HEAD GASKET

(1) Degrease the mounting surface of the cylinder head gasket.
(2) Lay the cylinder head gasket on cylinder block with the identification mark at front top.



20./11. INSTALLATION OF CYLINDER HEAD ASSEMBLY

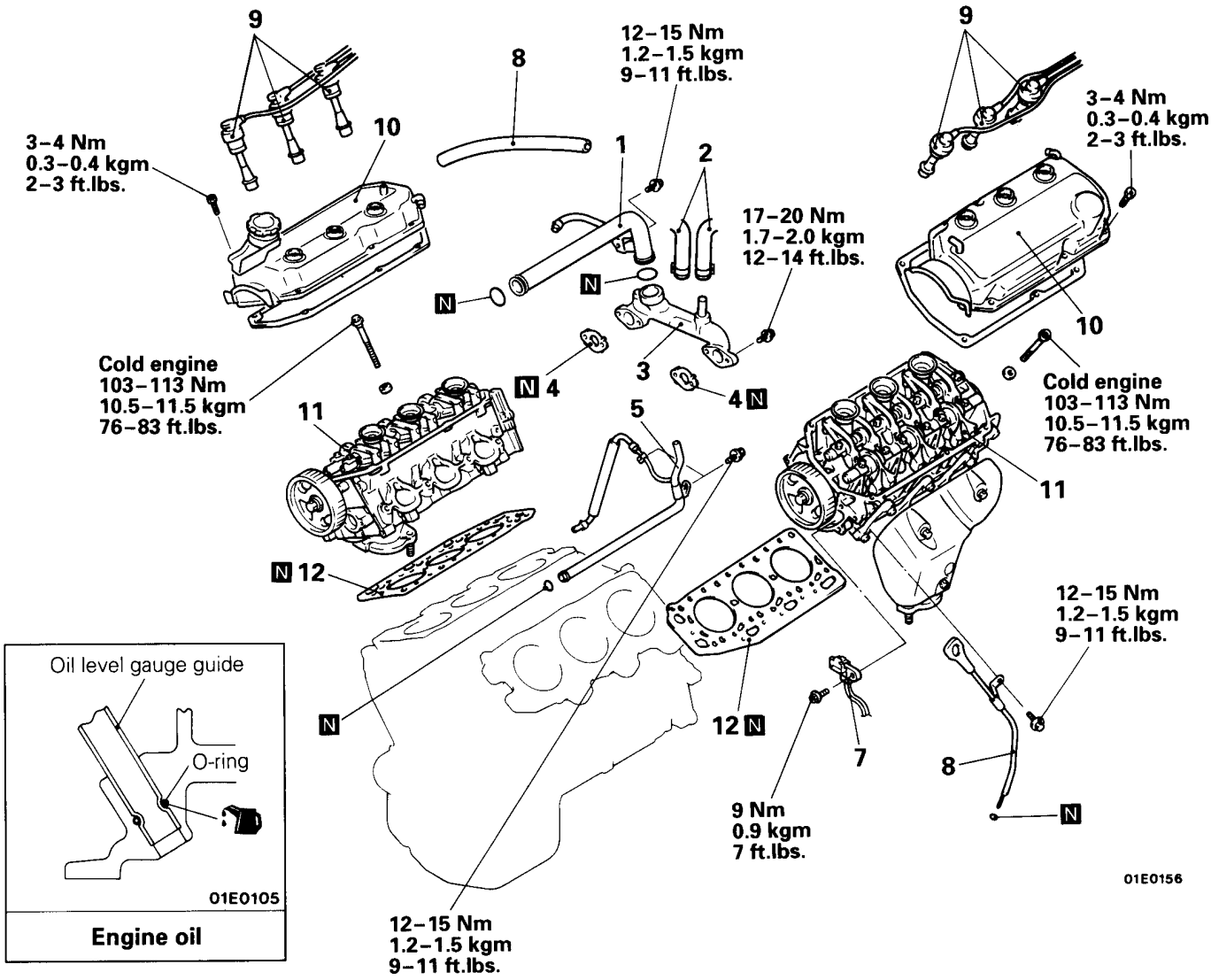
Using the special tool, tighten the bolts in the order shown in two or three steps.

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

CYLINDER HEAD GASKET <SOHC-24 VALVE>

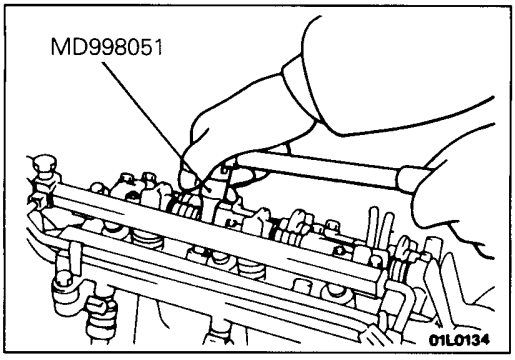
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Supplying (Refer to GROUP 14 – Service Adjustment procedures.)
- Removal and Installation of Timing Belt (Refer to P.11-39-1)
- Removal and Installation of Intake Manifold (Refer to GROUP 15 – Intake Manifold.)



Removal steps

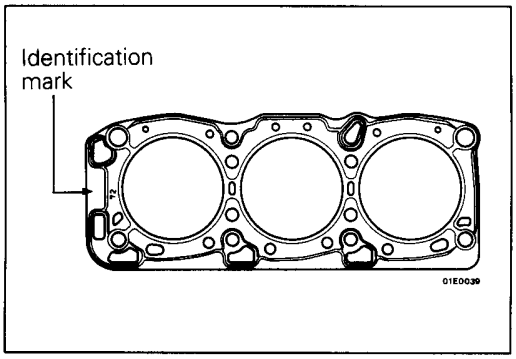
- 1. Water outlet pipe
- 2. Heater hose
- 3. Water passage
- 4. Gasket
- 5. Water pipe and hose assembly
- 6. Oil level gauge guide <Only when removing the left side bank>
- 7. Camshaft position sensor <Only when removing the left side bank>
- 8. Ventilation hose
- 9. Spark plug cable
- 10. Rocker cover
- 11. Cylinder head assembly
- 12. Cylinder head gasket



SERVICE POINT OF REMOVAL

11. REMOVAL OF CYLINDER HEAD ASSEMBLY

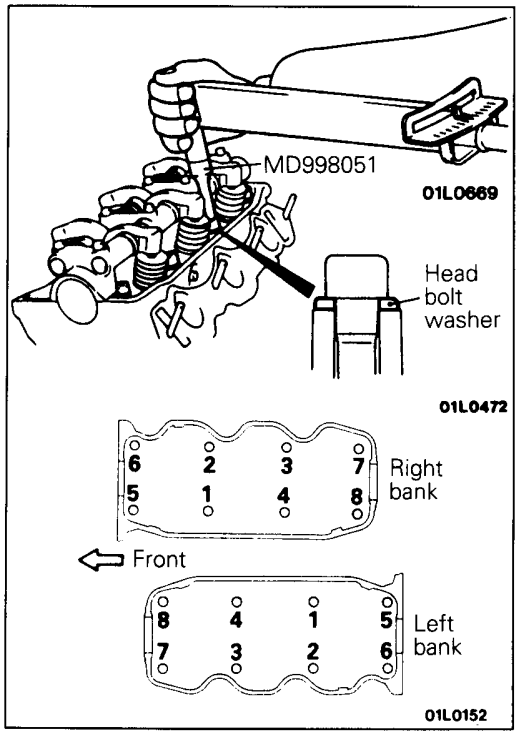
Using the special tool, after loosening the bolts (in 2 or 3 cycles), remove, and then remove the cylinder head assembly.



SERVICE POINTS OF INSTALLATION

12. INSTALLATION OF CYLINDER HEAD GASKET

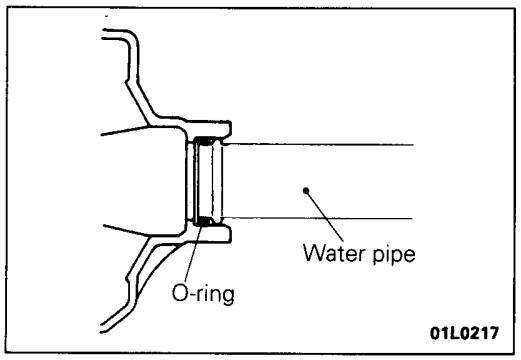
(1) Degrease the mounting surface of the cylinder head gasket.
(2) Lay the cylinder head gasket on cylinder block with the identification mark at front top.



11. INSTALLATION OF CYLINDER HEAD ASSEMBLY

Using the special tool, tighten the bolts in the order shown in two or three steps.

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

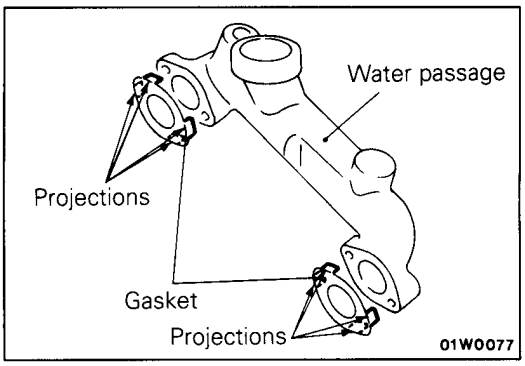


5. INSTALLATION OF WATER PIPE AND HOSE ASSEMBLY/1. WATER OUTLET PIPE

Rinse the mounting location of the O-ring and water pipe with water, and install the O-ring and water pipe.

Caution

1. **Do not apply oil and grease to water pipe O-ring.**
2. **Keep the water pipe connections free of stand, dust, etc.**
3. **Insert water pipe until its end bottoms.**



4. INSTALLATION OF GASKET/3. WATER PASSAGE

Hook the gasket projections to the water passage and install the water passage to the cylinder head.

NOTES

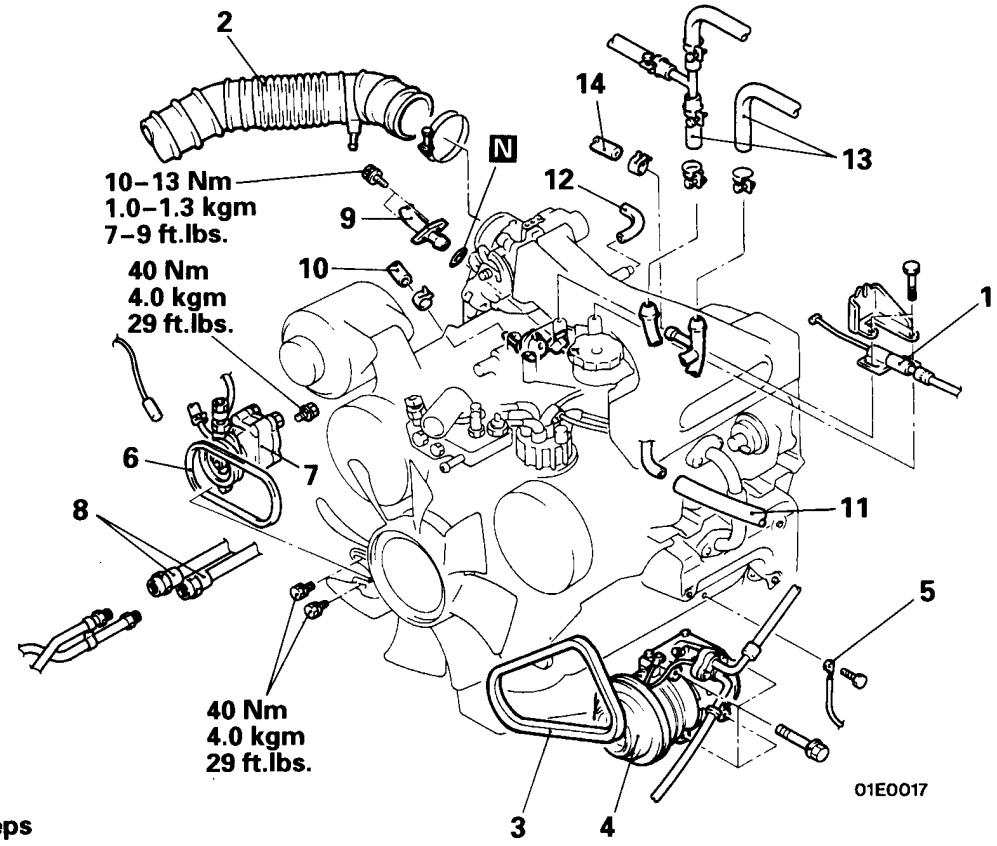
ENGINE ASSEMBLY <SOHC–12 VALVE>

E11TA-B

REMOVAL AND INSTALLATION

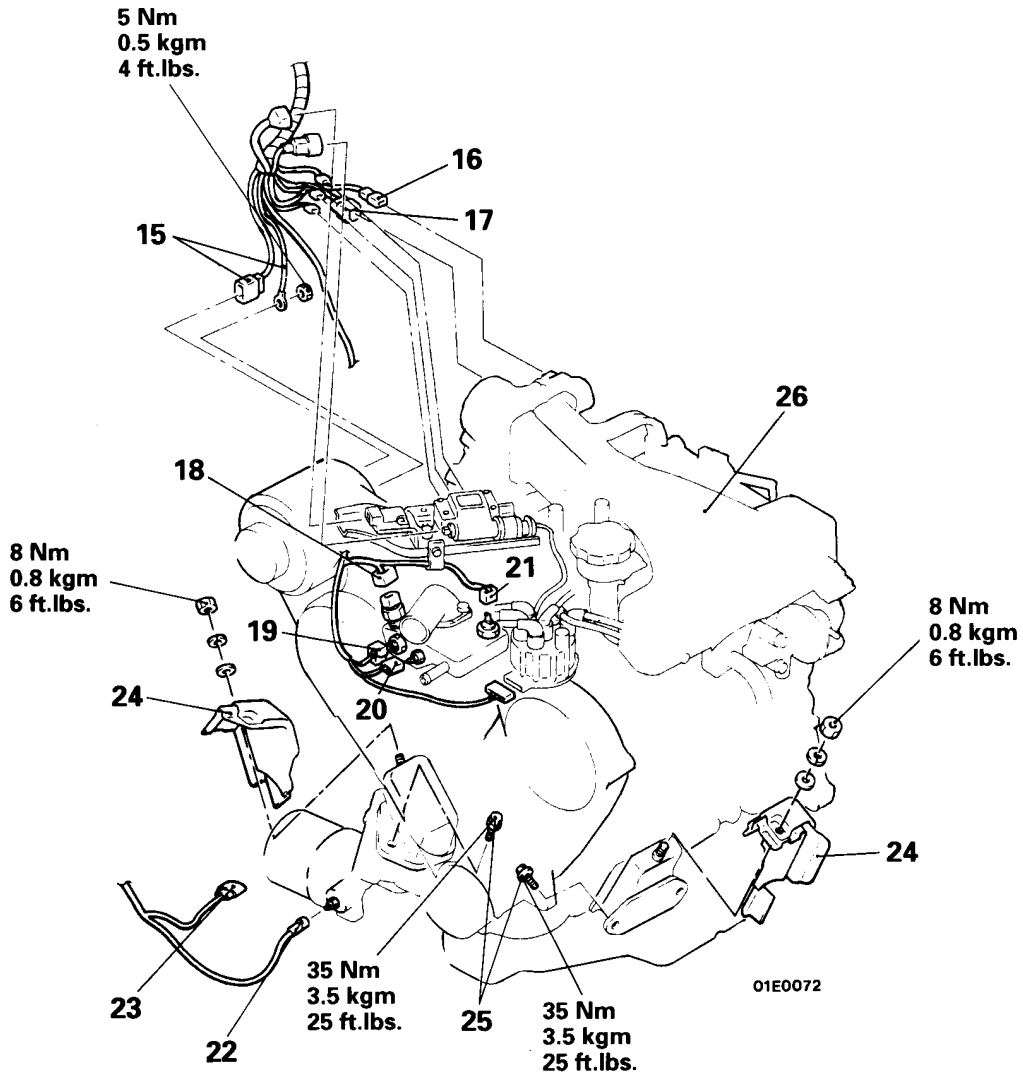
Pre-removal Operation
- Removal of the Hood (Refer to GROUP 42 – Hood.)
- Removal of the Radiator (Refer to GROUP 14 – Radiator.)
- Removal of the Under Skid Plate, Undercover, Air guide Plate
- Removal of the Front Exhaust Pipe (Refer to GROUP 15 – Exhaust Pipe and Mufflers.)
- Removal of the Transmission and Transfer Assembly (Refer to GROUP 22, 23 – Transmission and Transfer Assembly.)

Post-installation Operation
- Installation of the Transmission and Transfer Assembly (Refer to GROUP 22, 23 – Transmission and Transfer Assembly.)
- Installation of the Front Exhaust Pipe (Refer to GROUP 15 – Exhaust Pipe and Mufflers.)
- Installation of the Under Skid Plate and Undercover
- Installation of the Radiator (Refer to GROUP 14 – Radiator.)
- Installation of the Hood (Refer to GROUP 42A – Hood.)
- Adjustment of the engine (Refer to P.11-30.)
- Adjustment of Accelerator cable (Refer to GROUP 13 – Service Adjustment Procedures.)



Removal steps

1. Accelerator cable connection
2. Air intake hose
3. Drive belt } <A/C>
4. Compressor } <A/C>
5. Connection for earth cable
6. Drive belt } (Power steering)
7. Oil pump } (Power steering)
8. Oil cooler hose connection
9. High pressure fuel hose connection
10. Fuel return hose connection
11. Vacuum hose connection
12. Brake booster vacuum hose connection
13. Heater hose connections
14. Heater hose connection (Vehicles with rear heater)



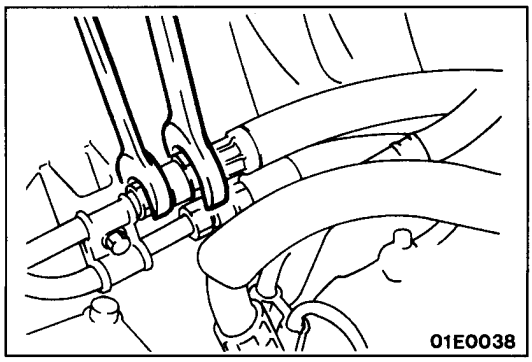
15. Alternator connector
16. ISC motor connector
17. TPS connector
18. Engine coolant temperature switch connector <A/C>
19. Engine coolant temperature sensor connector
20. Thermo switch connector <A/T>
21. Engine coolant temperature gauge unit connector
22. Oil pressure gauge unit connector
23. Oil level sensor connector
24. Heat protectors
25. Engine mounting bolt
26. Engine assembly

SERVICE POINTS OF REMOVAL E11TBAK

4. REMOVAL OF COMPRESSOR <A/C>/7. OIL PUMP (POWER STEERING)

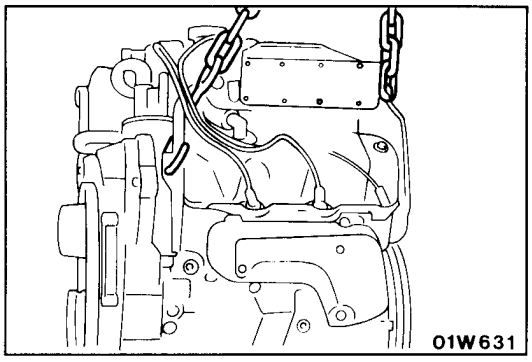
Remove the oil pump and air conditioner compressor (with the hose attached).

NOTE
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.



8. REMOVAL OF OIL COOLER HOSE CONNECTION

Use a spanner or similar tool to remove the oil cooler hose connection.



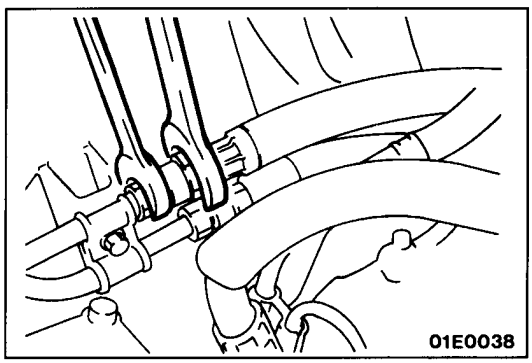
26. REMOVAL OF ENGINE ASSEMBLY

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

SERVICE POINTS OF INSTALLATION E11TDAM

26. INSTALLATION OF ENGINE ASSEMBLY

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



8. CONNECTION OF OIL COOLER HOSE

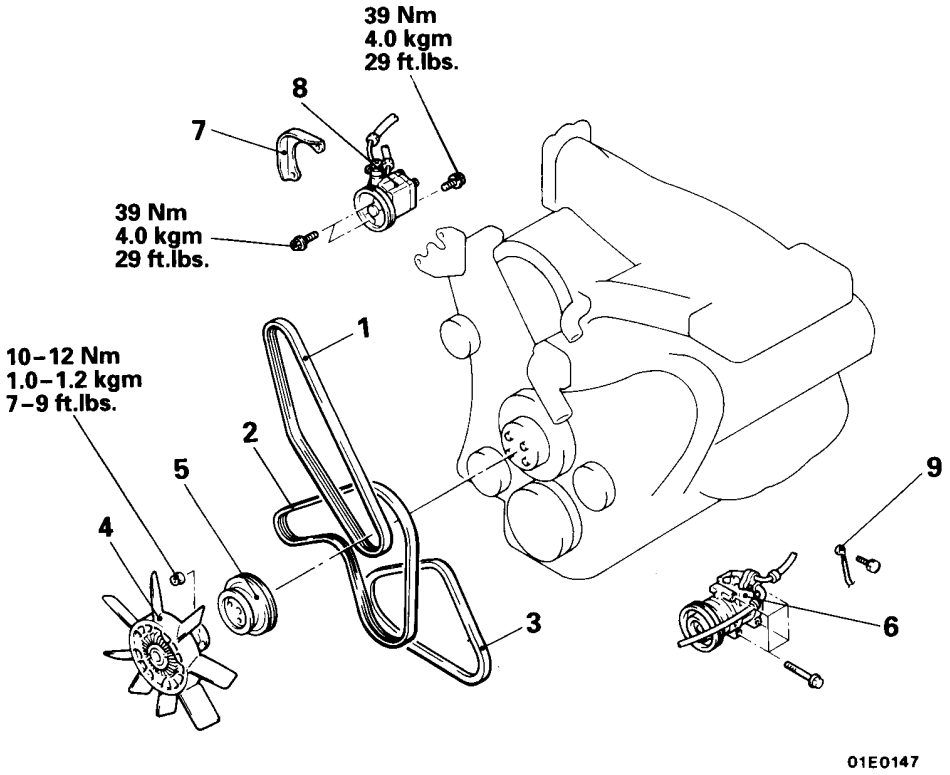
Use a spanner or similar tool to connect the oil cooler hose.

ENGINE ASSEMBLY <SOHC–24 VALVE>

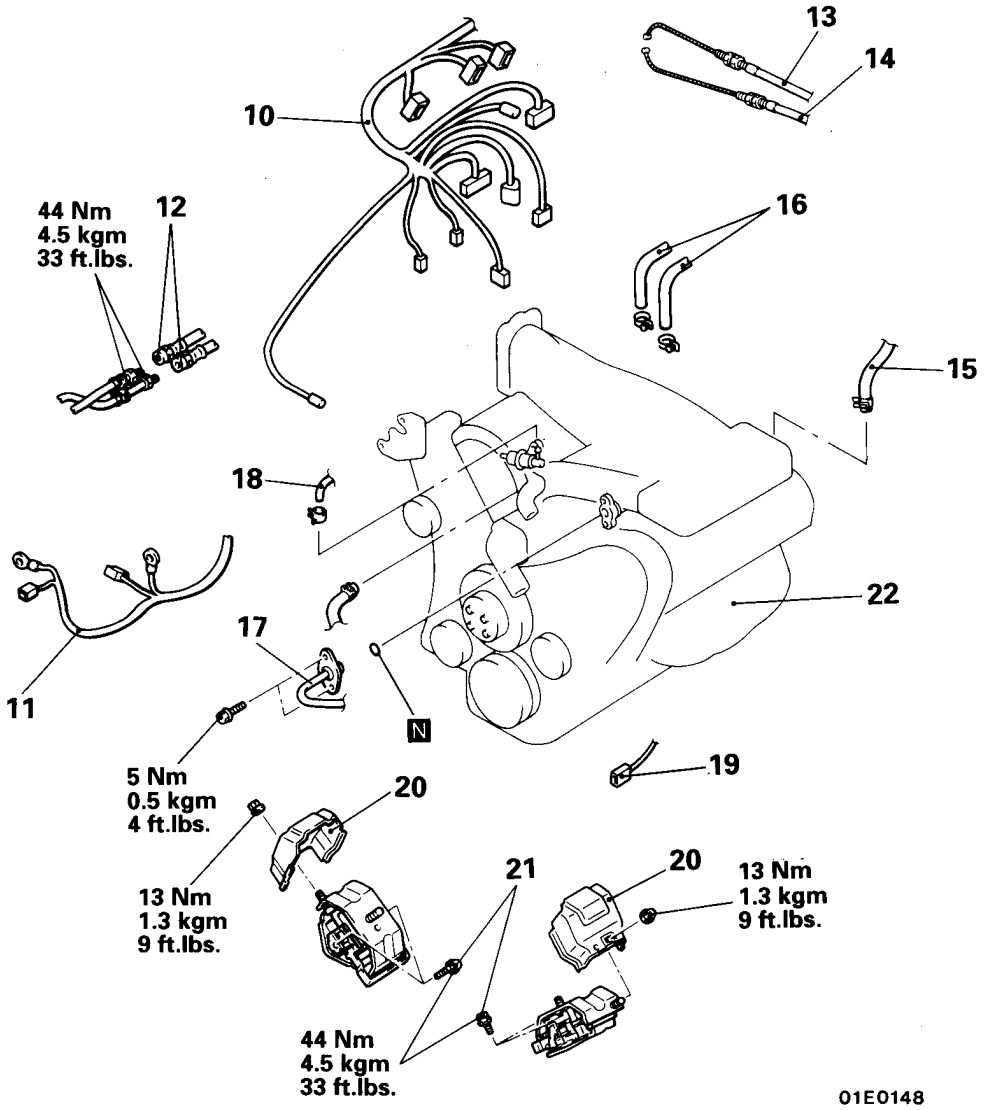
REMOVAL AND INSTALLATION

Pre-removal Operation
- Removal of Hood
  (Refer to GROUP 42 – Hood.)
- Removal of Battery and Battery Tray
- Removal of Auto-Cruise Control Intermediate Link
  (Refer to GROUP 13 – Auto-Cruise Control.)
- Removal of Radiator
  (Refer to GROUP 14 – Radiator.)
- Removal of Front Exhaust Pipe
  (Refer to GROUP 15 – Exhaust Pipe and Muffler.)
- Removal of Transmission and Transfer Assembly
  (M/T: Refer to GROUP 22 – Transmission and Transfer Assembly)
  (A/T: Refer to GROUP 23 – Transmission and Transfer Assembly.)

Post-installation Operation
- Installation of Transmission and Transfer Assembly
  (M/T: Refer to GROUP – 22 Transmission and Transfer Assembly)
  (A/T: Refer to GROUP 23 – Transmission and Transfer Assembly.)
- Installation of Front Exhaust Pipe
  (Refer to GROUP 15 – Exhaust Pipe and Muffler.)
- Installation of Radiator (Refer to GROUP 14 – Radiator.)
- Installation of Battery and Battery Tray
- Installation and Adjustment of Auto-Cruise Control Intermediate Link (Refer to GROUP 13 – Auto-Cruise Control.)
- Installation of Hood (Refer to GROUP 42 – Hood.)
- Adjustment of Engine (Refer to P.11-30.)
- Adjustment of Accelerator Cable
  (Refer to GROUP 13 – Service Adjustment Procedures.)
- Adjustment of Throttle Cable <A/T>
  (Refer to GROUP 23 – Service Adjustment Procedures.)
- Engine Oil Supplying and Checking



Removal steps
1. Power steering drive belt
2. Alternator drive belt
3. A/C drive belt
4. Cooling fan
5. Water pump pulley
6. A/C compressor ◆◆
7. Cover
8. Power steering oil pump ◆◆
9. Earth cable connection



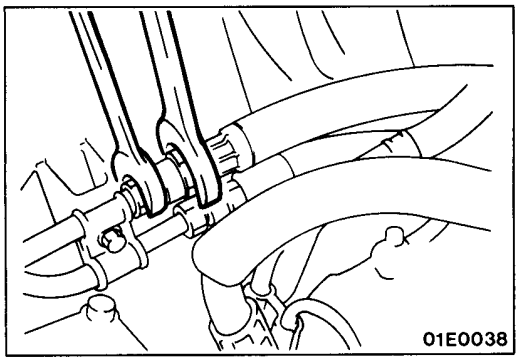
10. Engine control harness connection
11. Alternator and starter harness connection
12. Engine oil cooler hose connection
13. Accelerator cable connection
14. Throttle cable connection
15. Brake booster vacuum hose connection
16. Heater hose connection
17. Fuel hose connection
18. Fuel return hose connection
19. Oil pressure switch harness connection
20. Heat protectors
21. Engine mounting bolt
22. Engine assembly

SERVICE POINTS OF REMOVAL

6. REMOVAL OF COMPRESSOR <A/C>/8. OIL PUMP (POWER STEERING)

Remove the oil pump and air conditioning compressor (with the hose attached).

NOTE
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.



12. DISCONNECTION OF OIL COOLER HOSE

Use a spanner or similar tool to disconnect the oil cooler hose.

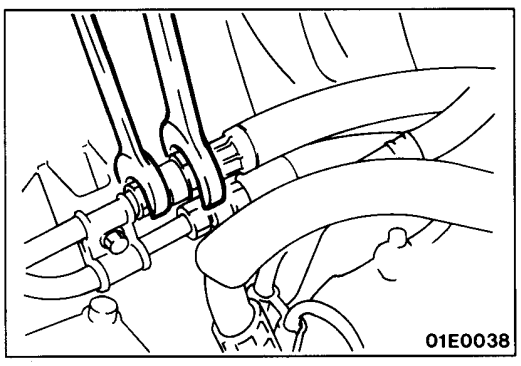
22. REMOVAL OF ENGINE ASSEMBLY

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

SERVICE POINTS OF INSTALLATION

22. INSTALLATION OF ENGINE ASSEMBLY

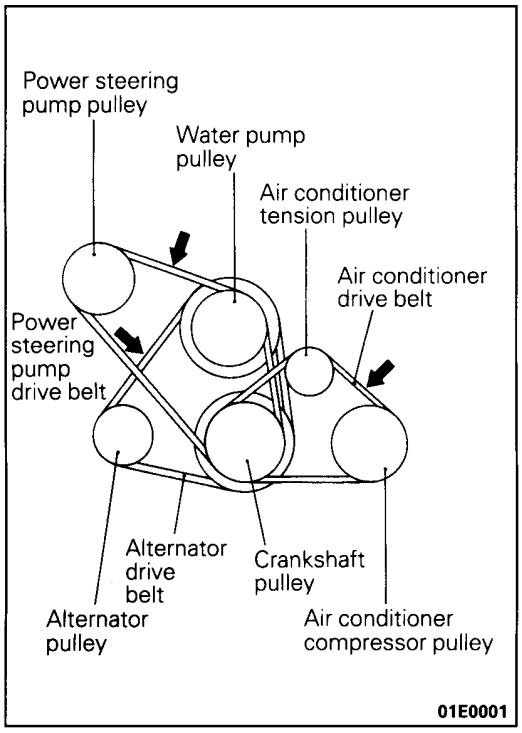
Install the engine assembly. When doing so, check carefully that all pipes and hoses are connected, and that none are twisted, damaged, etc.



12. CONNECTION OF OIL COOLER HOSE

Use a spanner or similar tool to connect the oil cooler hose.

NOTES



ENGINE <4D56>

SERVICE ADJUSTMENT PROCEDURES

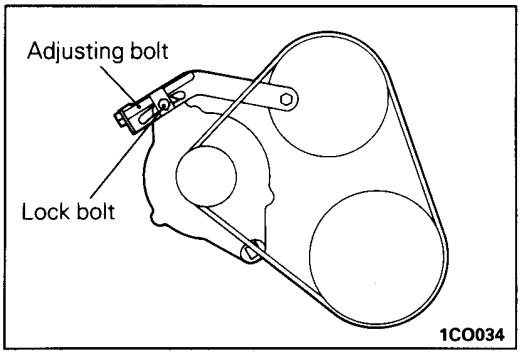
DRIVE BELTS TENSION INSPECTION AND ADJUSTMENT

E11FQBF

Check the tension by pushing at the centre of the belt between pulleys with a force of 100 N (10 kg, 22 lbs.) as shown in the figure. Measure drive belt flexion.

Standard value:

Alternator	
Single belt type	**11–14 mm (0.43–0.55 in.)**
Double belt type	**15–18 mm (0.59–0.71 in.)**
Power steering oil pump	
V type	**8–13.5 mm (0.31–0.53 in.)**
V ribbed type	**8–12 mm (0.31–0.47 in.)**
Air conditioner compressor	**6.5–7.5 mm (0.26–0.30 in.)**



TENSION ADJUSTMENT OF ALTERNATOR DRIVE BELT

(1) Loosen the nut on the alternator pivot bolt.
(2) Loosen the lock bolt.
(3) Turn the adjusting bolt to adjust the belt so that the amount of flexion is at the standard value.

Standard value:

Single belt type

If former belt (with corrected tension) is used
11–14 mm(0.43–0.55 in.)

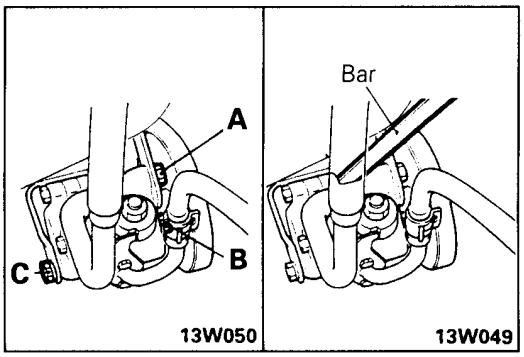
If a new belt is used **9–12 mm (0.35–0.47 in.)**

Double belt type (for each belt)

If former belt (with corrected tension) is used
15–18 mm (0.59–0.71 in.)

If a new belt is used
13–16 mm (0.51–0.63 in.)

(4) Tighten the lock nut.
(5) Tighten the nut on the alternator pivot bolt.



TENSION ADJUSTMENT OF POWER STEERING OIL PUMP DRIVE BELT

(1) Loosen power steering oil pump fixing bolt (A), (B) and (C).
(2) Move power steering oil pump tension belt moderately and adjust belt tension.
(3) Tighten the fixing bolts (A), (B) and (C) in that order.
(4) Crank the engine once or more.
(5) Check the belt tension.

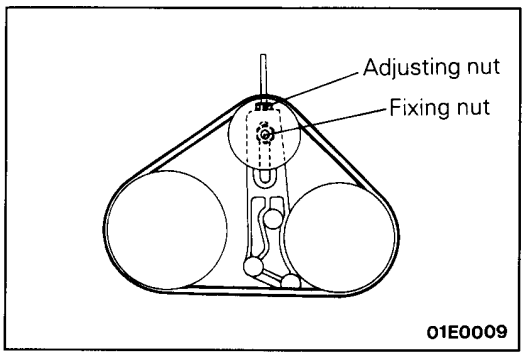
Standard value:

V type

Used belt	**9.5 mm (0.37 in.)**
New belt	**7.0 mm (0.28 in.)**

V ribbed type

Used belt	**9–11 mm (0.35–0.43 in.)**
New belt	**6–8 mm (0.24–0.31 in.)**

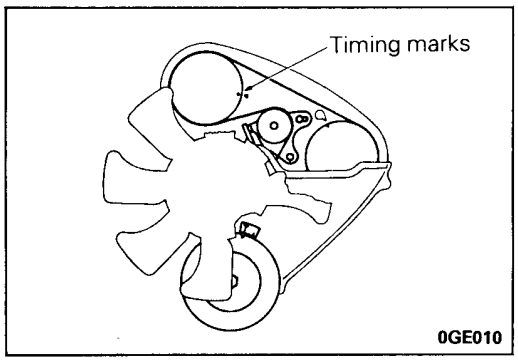


TENSION ADJUSTMENT OF THE AIR CONDITIONER COMPRESSOR DRIVE BELT

(1) Loosen tension pulley fixing nut.
(2) Adjust belt tension with adjusting nut.
(3) Tighten fixing nut.
(4) Crank the engine once or more.
(5) Check the belt tension.

Standard value:

Used belt	**6.5–7.5 mm (0.26–0.30 in.)**
New belt	**5–6 mm (0.20–0.24 in.)**



VALVE CLEARANCE INSPECTION AND ADJUSTMENT

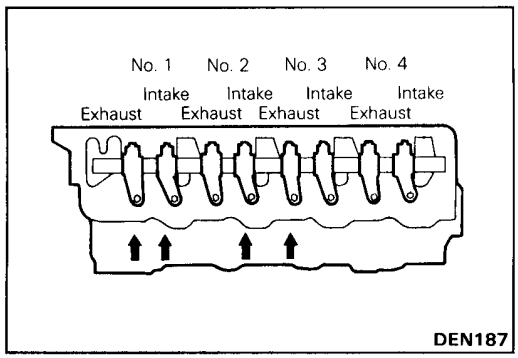
E11FDAV

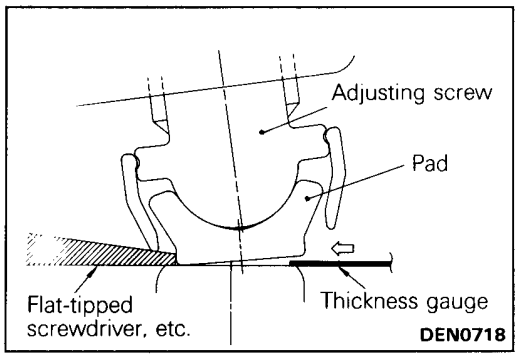
(1) Start the engine and allow it to warm up until the engine coolant temperature reaches 80 to 95°C (176 to 203°F).
(2) Remove the timing belt upper cover.
(3) Remove the rocker cover.
(4) Align the camshaft sprocket timing marks and set the No.1 cylinder at top dead centre.

Caution
The crankshaft should always be turned in a clockwise direction.

(5) Measure the valve clearance at the places indicated by arrows in the illustration.

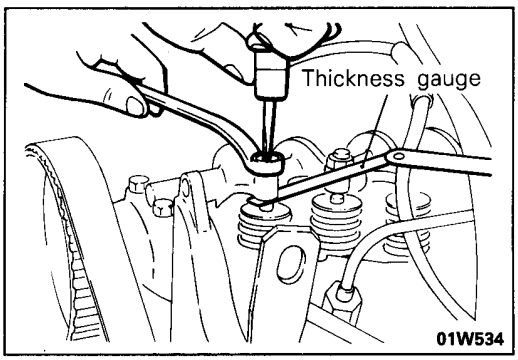
Standard value: 0.25 mm (0.010 in.)



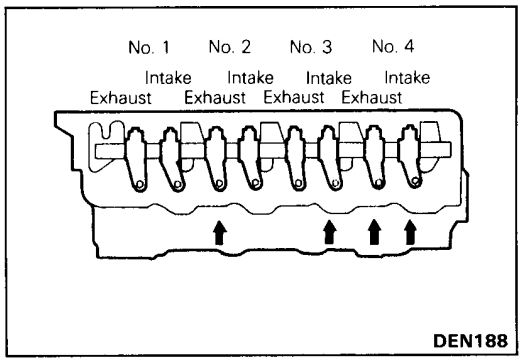


(6) If the clearance is outside the standard value, loosen the lock nut of the rocker arm and adjust by turning the adjusting screw while using a thickness gauge to measure the clearance.

NOTE
<Vehicles with supercharging pressure relief solenoid valve>
When inserting the thickness gauge, push the pad from the opposite side from the thickness gauge insertion side with a flat-tipped screwdrive or similar tool to make a gap, and then insert the thickness gauge.



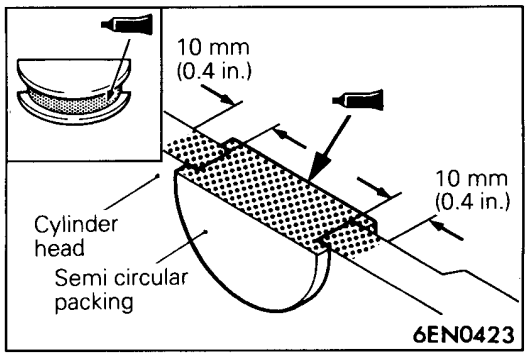
(7) Tighten the lock nut while holding the adjusting screw with a screwdriver so that it doesn't turn.
(8) Turn the crankshaft 360° to bring No.4 cylinder to the top dead centre position.



(9) Measure the valve clearance at the place indicated by the arrow in the illustration.

Standard value: 0.25 mm (0.010 in.)

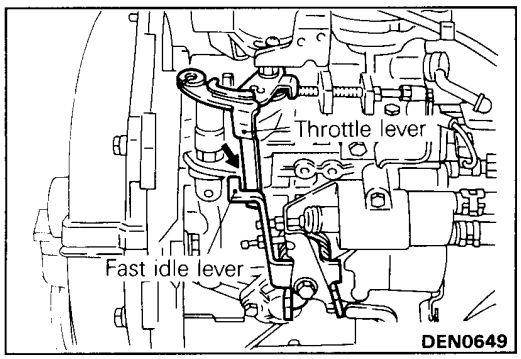
(10) If the clearance is outside the standard value, adjust by following steps (6)–(7) above.



(11) Apply specified sealant to the section of the semi-circular packing shown in the illustration.

Specified sealant: 3M ATD Part No. 8660 or equivalent

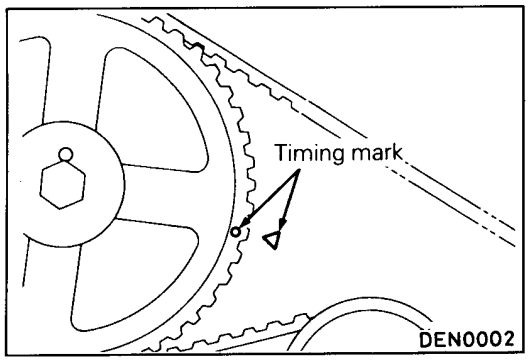
(12) Install the rocker cover.
(13) Install the timing belt upper cover.



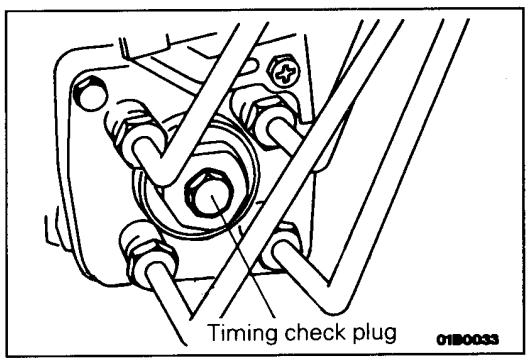
INJECTION TIMING INSPECTION AND ADJUSTMENT

E11FUAJ

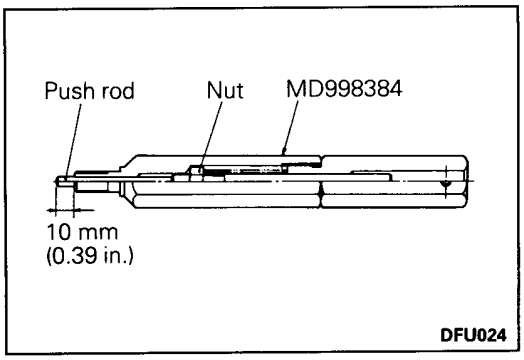
(1) Warm up the engine and then check to be sure that the fast idle lever is separated from the throttle lever. <Vehicles with cold start device>
(2) Remove all of the glow plugs.
(3) Remove the timing belt upper cover.



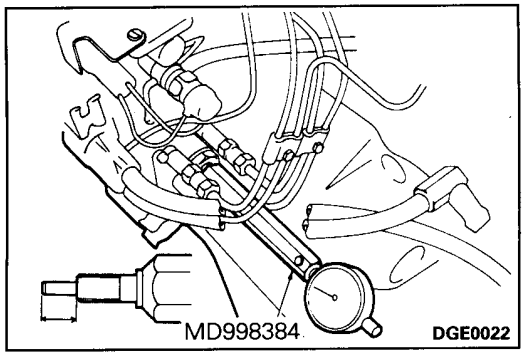
(4) Align the timing marks of the camshaft sprocket and set the No. 1 cylinder to the top dead centre position.



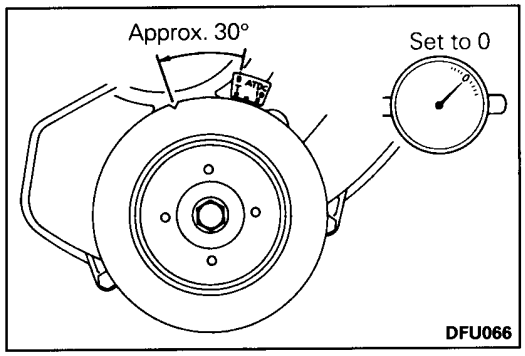
(5) Remove the timing check plug at the rear of the injection pump.



(6) Before installation of special tool, make sure that push rod is protruding by 10 mm (0.39 in.). Protrusion of push rod can be adjusted with an inner nut.
(7) Connect the dial gauge to the special tool.

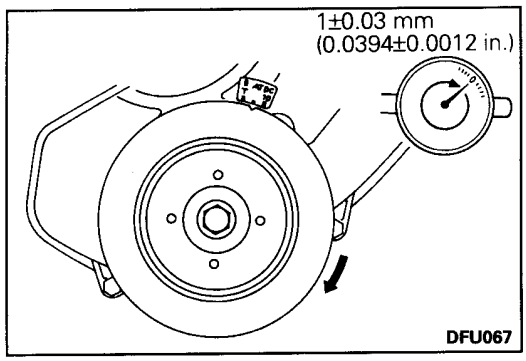


(8) Install the special tool to the check plug at the rear of the injection pump.



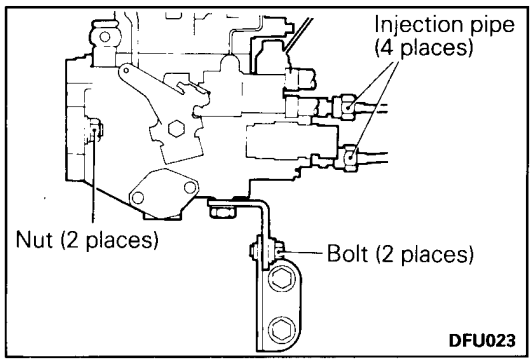
(9) Turn the crankshaft clockwise to move the No.1 cylinder approximately 30° before compression top dead centre.
(10) Set the needle of the dial gauge to 0.
(11) Check that the needle doesn't move even if the crankshaft is turned slightly (2–3°) both clockwise and anti-clockwise.

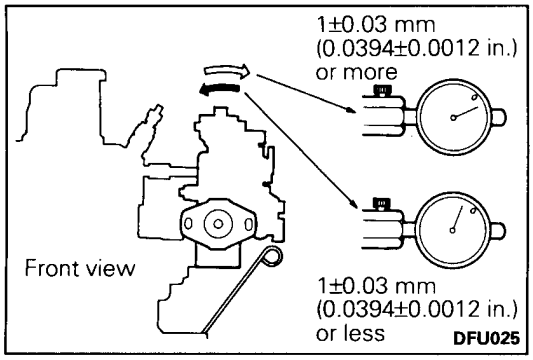
NOTE
If the needle moves, the notch is not positioned properly, so once more move the No.1 cylinder approximately 30° before compression top dead centre.

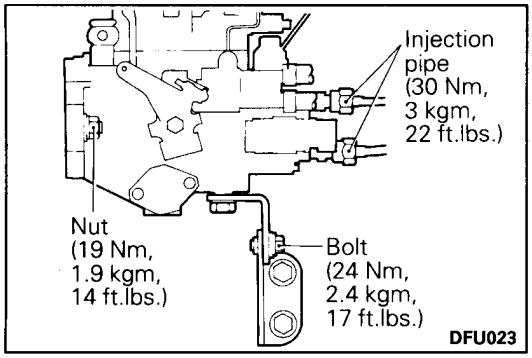


(12) Turn the crankshaft clockwise to align the No.1 cylinder to 7° ATDC (for the vehicles with oil cooled turbocharger) or to 9° ATDC (for the vehicles with water cooled turbocahrger).
(13) Check that the needle of the dial gauge is displaying the standard value.

Standard value: 1 ± 0.03 mm (0.0394 ± 0.0012 in.)







(14) If the needle is outside the standard value, adjust the injection timing by the following procedure.

① Loosen the injection pipe union nuts (4 places) on the injection pump. (Do not remove the union nuts.)

Caution
When loosening the nuts, hold the delivery valve holders with a spanner so that they don't turn at the same time.

② Loosen the upper mounting nut and the lower mounting bolt of the injection pump. (Do not remove the nut and bolt.)

③ Tilt the injection pump to the left and right and adjust the needle on the dial gauge so that the display value is uniform.

④ Provisionally tighten the mounting nut and bolt of the injection pump.

⑤ Repeat steps (9)–(13) to check if the adjustment has been made correctly.

⑥ Tighten the mounting nut and bolt to the specified torque.

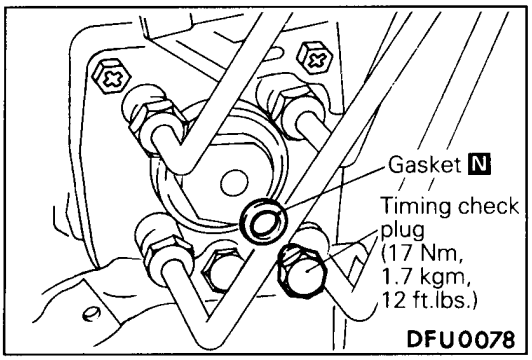
Specified torque:
Injection pump mounting bolt
24 Nm (2.4 kgm, 17 ft.lbs.)
Injection pump mounting nut
19 Nm (1.9 kgm, 14 ft.lbs.)

⑦ Tighten the injection pump union nuts to the specified torque.

Specified torque: 30 Nm (3 kgm, 22 ft.lbs.)

Caution
When tightening the nuts, hold the delivery valve holders with a spanner so that they don't turn at the same time.

(15) Remove the special tool.

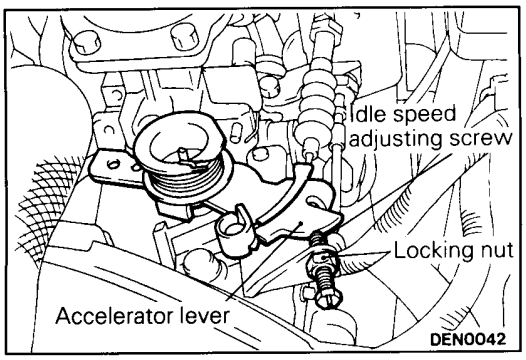


(16) Install a new gasket to the timing check plug.
(17) Tighten the timing check plug to the specified torque.

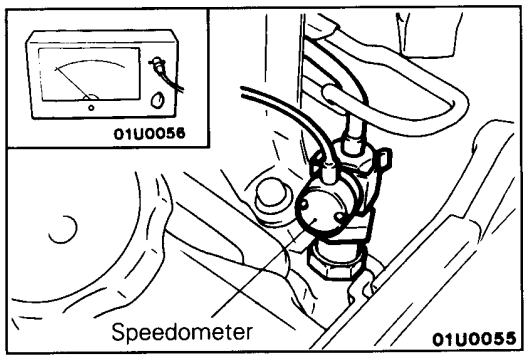
Specified torque: 17 Nm (1.7 kgm, 12 ft.lbs.)

IDLE SPEED INSPECTION AND ADJUSTMENT
E11FXCV

NOTE
Carry out inspection and adjustment of the idle speed after checking that the ignition and injection timing are normal.



(1) Carry out inspection and adjustment with the vehicle in the following condition.
- Engine coolant temperature: 80–95°C (176–203°F)
- Lights and all accessories: OFF
- Transmission: Neutral (P range for vehicles with automatic transmission)
- Steering wheel: Straight forward position



(2) Connect the speedometer to the injection nozzle or the injection pipe.

Caution
When the speedometer is connected to the injection pipe, the pipe mounting clamps should all be removed.

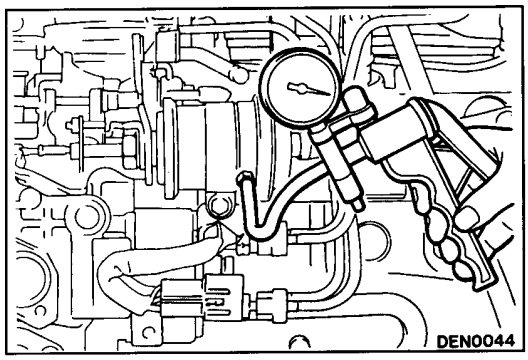
(3) Start the engine and run it at idle speed.
(4) Check engine idle speed.

Cub idle speed: 750±100 r/min.

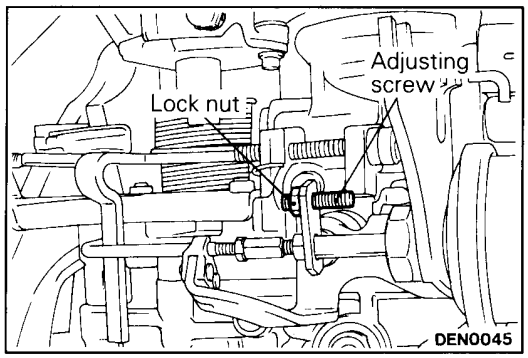
(5) If not within the standard value, loosen idle adjusting screw lock nut and adjust the idle speed by rotating adjusting screw. And after adjustment, tighten locking nut.

THROTTLE OPENER INSPECTION AND ADJUSTMENT — FOR ABS
E11FCAA

(1) Perform inspection and adjustment with the vehicles in the following condition.
- Engine coolant temperature: 80–95°C (176–203°F)
- Lights and all accessories: OFF
- Transmission: Neutral (P range for vehicles with an automatic transmission)
- Steering wheel: Straight forward position



(2) Inspect and adjust the idle speed.
(3) Remove the vacuum hose (for anti-skid brake: blue) from the idle-up actuator.
(4) Connect a hand vacuum pump to the nipple of the removed vacuum hose.
(5) Connect the speedometer.
(6) Start the engine and run it at idle speed.



(7) Check the engine speed when a negative pressure of 87 kPa (650 mmHg, 26 in.Hg) is applied.

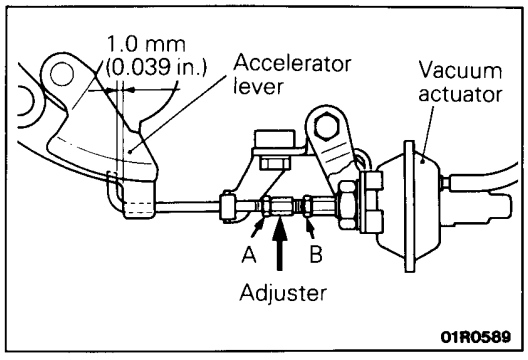
Standard value: 1900±100 r/min

(8) If the engine speed is outside the standard value, loosen the lock nut on the actuator rod and adjust by turning the adjusting screw.
(9) Tighten the lock nut while making sure that the adjusting screw doesn't turn.

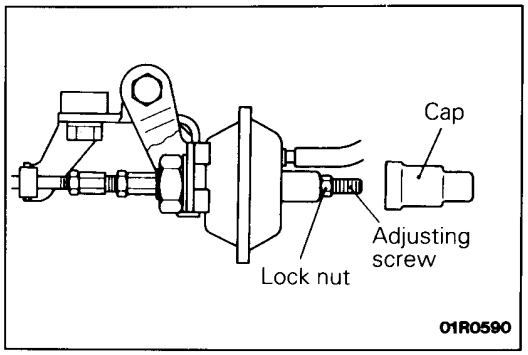
THROTTLE OPENER INSPECTION AND ADJUSTMENT — FOR A/C E11FCAB

1. Place the vehicle in the following condition before inspecting and adjusting.
   (1) Coolant temperature: 80–95°C (176–203°F)
   (2) Lights and all accessories: OFF
   (3) Transmission: Neutral. (A/T: P)
2. Inspect and adjust the idling speed.
3. Connect a tachometer.
4. Turn on the air-conditioner switch and check whether or no the engine speed is the standard value.

   Standard value: 900±50 rpm
5. When the engine speed is not the standard value, adjust using the following procedure.



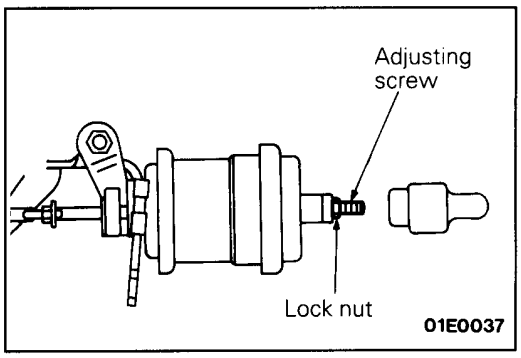
<Vehicles without ABS, Vehicles with ABS–A/T>
(1) Loosen lock nuts A and B of the vacuum actuator.
(2) Adjust the adjuster so that the gap between the tip of the vacuum actuator rod and the accelerator lever is approximately 1.0 mm (0.04 in.).
(3) Tighten lock nuts A and B.
(4) Start the engine and make sure that the rod contacts the accelerator lever when the air-conditioner switch is on and does not contact the accelerator lever when the air-conditioner switch is turned off.



(5) Remove the vacuum actuator cap and loosen the lock nut.
(6) Turn the adjusting screw and adjust the engine speed to the standard value.

Caution
Do not push the adjusting screw deeper than the surface of the lock nut.

(7) Tighten the lock nut and install the cap.



<Vehicles with ABS-M/T>

(1) Loosen the lock nut.
(2) Turn the adjusting screw and adjust the engine speed to the standard value.

Caution
Do not push the adjusting screw deeper than the surface of the lock nut.

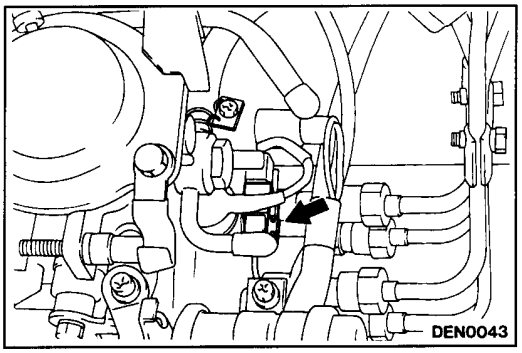
(3) Tighten the lock nut.

COMPRESSION PRESSURE INSPECTION E11FGAK

(1) Perform inspection and adjustment with the vehicle in the following condition.
- Engine coolant temperature: 80–95°C (176–203°F)
- Lights and all accessories: OFF
- Transmission: Neutral (P range for vehicles with an automatic transmission)

(2) Remove all of the glow plugs.

Caution
Be careful not to subject the glow plugs to any shock.

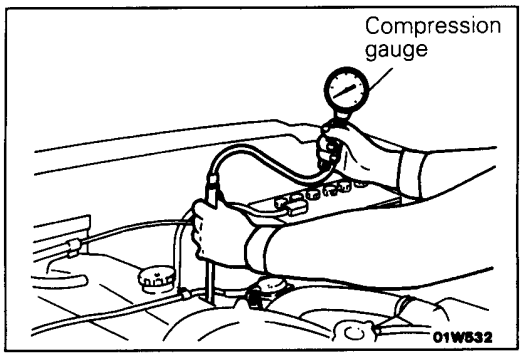


(3) Disconnect the fuel cut solenoid valve connector.

NOTE
Doing this will stop carrying out ignition and fuel injection.

(4) Cover the glow plug holes with a rag etc., and after the engine has been cranked, check that no foreign material is adhering to the rag.

Caution
1. **Keep away from the glow plug holes when cranking.**
2. **If compression is measured while water, oil, fuel, etc., that has come from cracks is inside the cylinder, these materials will become heated and will gush out from the glow plug hole, which is dangerous.**



(5) Set the compression gauge to one of the glow plug holes.
(6) Crank the engine and measure the compression pressure.

Standard value:
2650 kPa (27.0 kg/cm², 384 psi.)
<Vehicles with oil cooled turbocharger>
3040 kPa (31.0 kg/cm², 441 psi.)
<Vehicles with water cooled turbocharger>

Limit: 1880 kPa (19.2 kg/cm², 273 psi.) minimum
<Vehicles with oil cooled turbocharger>
2200 kPa (22.4 kg/cm², 319 psi.) minimum
<Vehicles with water cooled turbocharger>

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

Limit: 290 kPa (3.0 kg/cm^2, 43 psi.)

(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 glow 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 or pressure is leaking from the gasket.

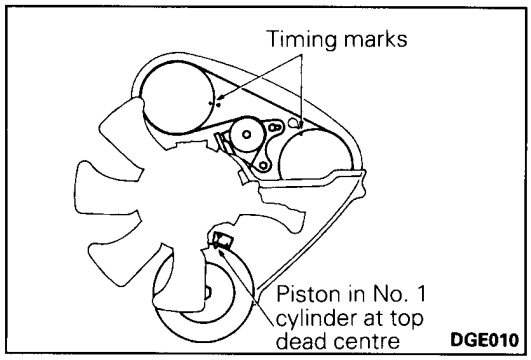
(9) Connect the fuel cut solenoid valve connector.

(10)Install the glow plugs.

TIMING BELT TENSION ADJUSTMENT E11FFDG

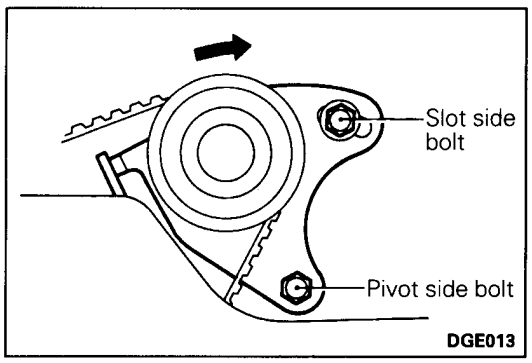
(1) Remove timing belt upper cover.

(2) Turn the crankshaft in the clockwise direction and check the timing belt around its entire circumference for abnormalities.

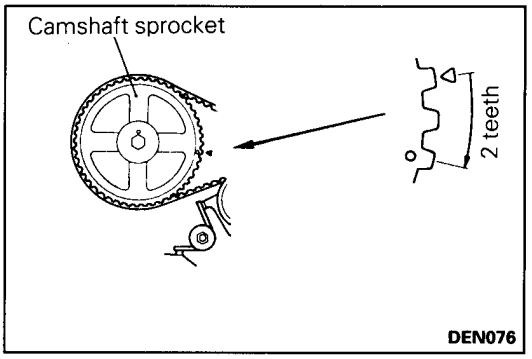


(3) Align the timing mark on the sprockets with the timing mark on the front upper case.

Caution
When aligning the timing mark, be sure not to turn the crankshaft in the counterclockwise direction as this can cause improper belt tension.



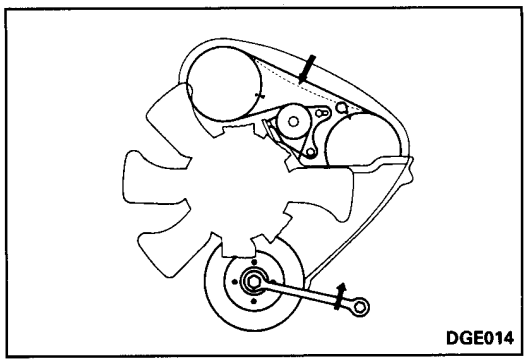
(4) Loosen the tensioner pivot side bolt 1 turn and slot side bolt 1 or 2 turns.



(5) Turn the crankshaft and the camshaft sprocket clockwise two teeth.

(6) first tighten tensioner slot side bolt, and then tighten pivot side bolt to specified torque.

Tightening torque: 26 Nm (2.6 kgm, 19 ft.lbs.)

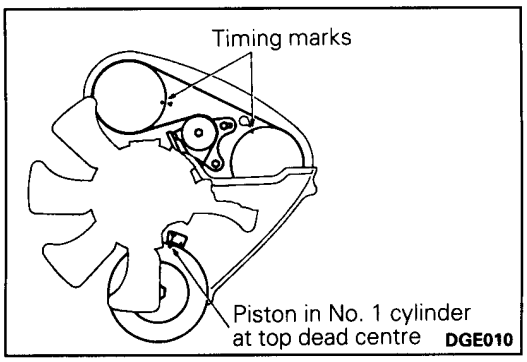

DGE014

(7) Turn the crankshaft anti-clockwise to align the timing marks.
(8) Push down belt at a point halfway with forefinger to check that tension of belt is up to standard value.

Standard value: 4–5 mm (0.16–0.20 in.)

(9) Mount the timing belt upper cover.

TIMING BELT "B" TENSION ADJUSTMENT E11FFBF

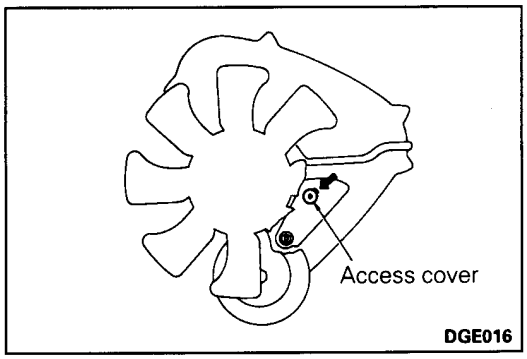


DGE010

(1) Remove timing belt upper cover.
(2) Turn the crankshaft in the clockwise direction and check the timing belt around its entire circumference for abnormalities.
(3) Align the timing mark on the sprockets with the timing mark on the front upper case.

Caution
When aligning the timing mark, be sure not to turn the crankshaft in the counterclockwise direction as this can cause improper belt tension.

(4) Remove the access cover.

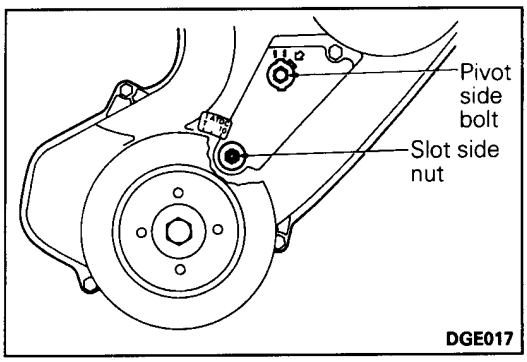


DGE016

(5) Loosen the tensioner pivot side bolt 1 turn and slot side nut 1 or 2 turns.
(6) First tighten tensioner slot side nut, and then tighten pivot side bolt to specified torque.

Tightening torque:

Bolt	**24 Nm (2.4 kgm, 17 ft.lbs.)**
Nut	**26 Nm (2.6 kgm, 19 ft.lbs.)**



DGE017

(7) Mount the access cover.
(8) Mount the timing belt upper cover.

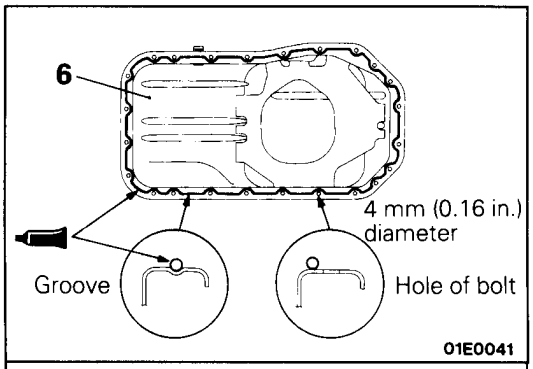
OIL PAN AND OIL SCREEN

E11KA-C

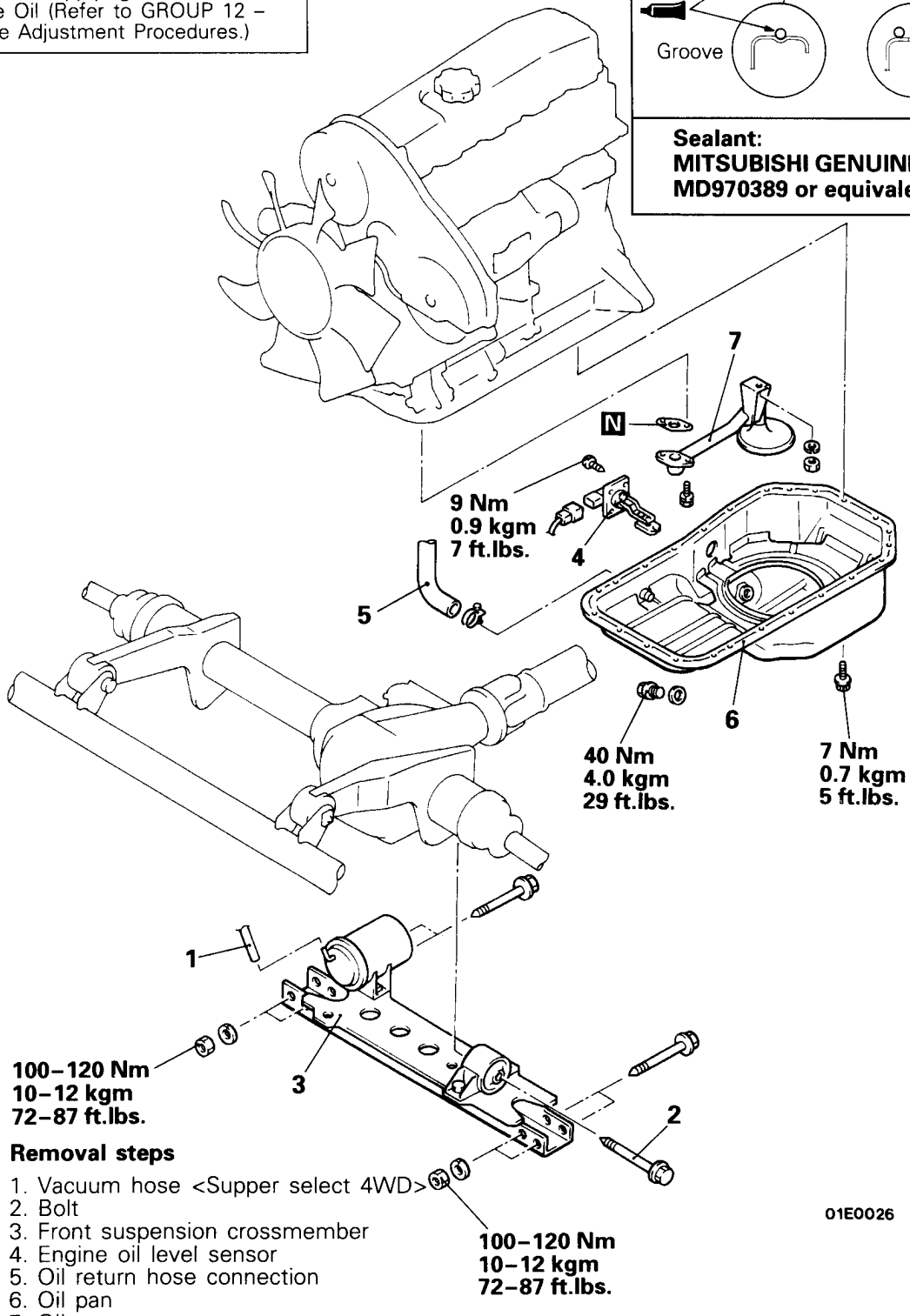
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
Removal and Installation
- Under Skid Plate, Undercover
- Front Exhaust Pipe (Refer to GROUP 15 – Exhaust Pipe and Mufflers.)

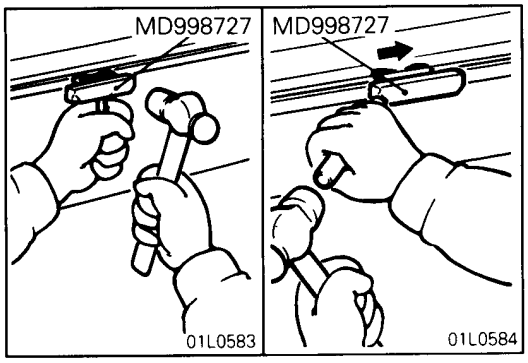
Draining and Supplying
- Engine Oil (Refer to GROUP 12 – Service Adjustment Procedures.)



Sealant:
MITSUBISHI GENUINE Part No. MD970389 or equivalent



Removal steps
1. Vacuum hose <Supper select 4WD>
2. Bolt
3. Front suspension crossmember
4. Engine oil level sensor
5. Oil return hose connection
6. Oil pan
7. Oil screen



SERVICE POINTS OF REMOVAL E11KBCB

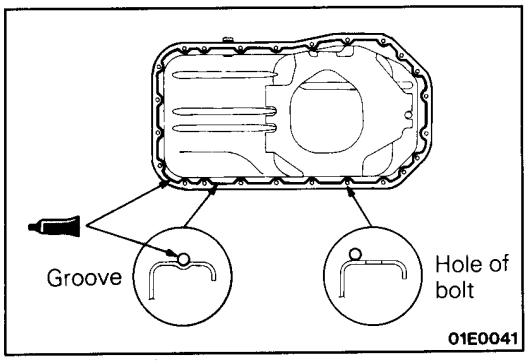
6. REMOVAL OF OIL PAN

(1) Remove oil pan bolts.
(2) Tap the special tool in between the oil pan and cylinder block.
(3) Slide the special tool by tapping it at an angle to remove the oil pan.

Caution
The use of a screwdriver or chisel in place of the special tool can damage the gasket seat surface and cause oil leakage.

INSPECTION E11KEAB3

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



SERVICE POINTS OF INSTALLATION E11KDCA

6. INSTALLATION OF OIL PAN

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

Specified sealant: MITSUBISHI GENUINE PART No. MD970389 or equivalent

NOTE
The sealant should be applied in a continuous bead approximately 4 mm (0.16 in.) in diameter.

(4) Assemble oil pan to cylinder block within 15 minutes after applying the sealant.

Caution
After installing the oil pan, wait at least 30 minutes before starting the engine.

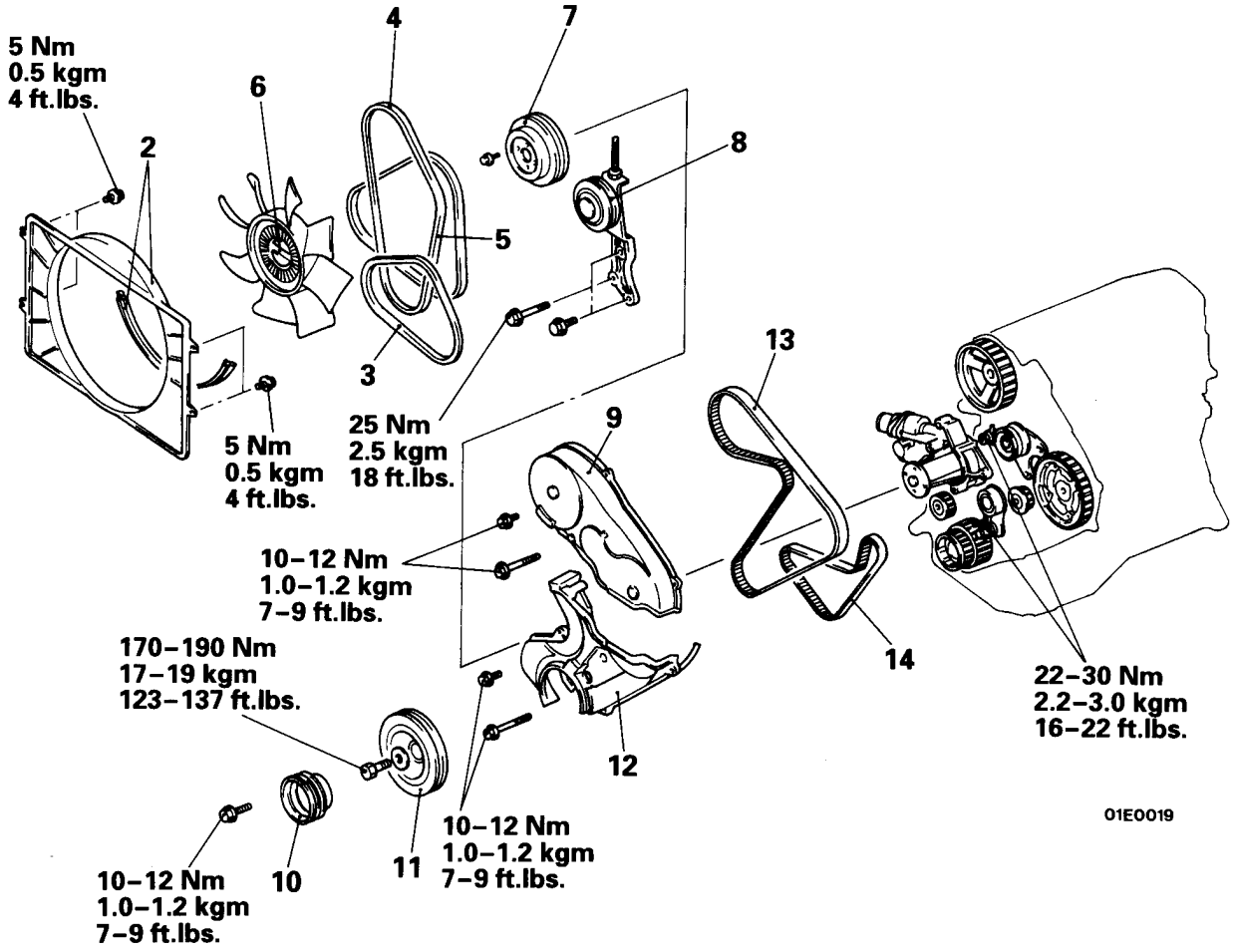
TIMING BELT AND TIMING BELT "B"

E11GA-C

REMOVAL AND INSTALLATION

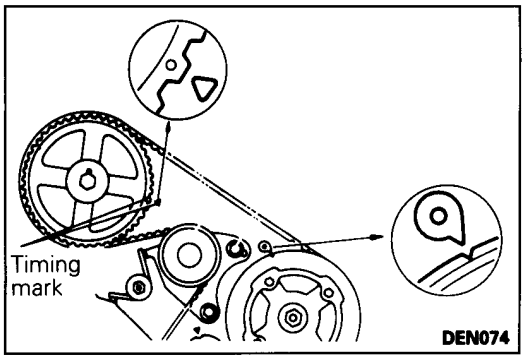
Pre-removal Operation
- Removal of the Intercooler (Refer to GROUP 15 – Intercooler.)
- Removal of the Under Skid Plate and Undercover
- Draining of the Engine Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)

Post-installation Operation
- Installation of the Intercooler (Refer to GROUP 15 – Intercooler.)
- Installation of the Under Skid Plate and Undercover
- Filling of the Engine Coolant (Refer to GROUP 14 – Service Adjustment Procedure.)
- Adjustment of the Engine (Refer to P.11-49.)



Removal steps

1. Radiator upper hose
2. Radiator fan shroud
- Adjustment of drive belt (Refer to P.11-49.)
3. Drive belt <A/C>
4. Drive belt (Power steering)
5. Drive belt (Alternator)
6. Cooling fan and fan clutch
7. Cooling fan pulley
8. Tension pulley bracket
9. Timing belt front upper cover
10. Crankshaft pulley (A/C /Power steering)
11. Crankshaft pulley
12. Timing belt front lower cover
13. Timing belt
14. Timing belt B

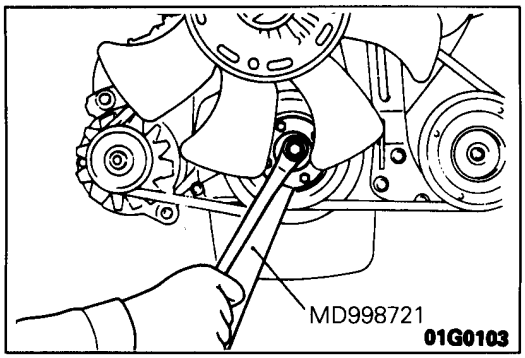


SERVICE POINTS OF REMOVAL E11GBDN

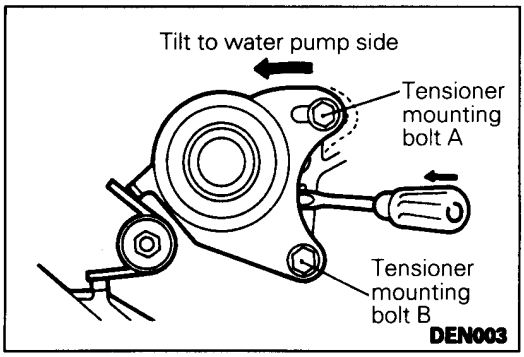
11. REMOVAL OF CRANKSHAFT PULLEY

(1) Position the No. 1 cylinder at compression TDC and remove the crankshaft pulley.

NOTE
The No. 1 cylinder is at compression TDC when the marks are aligned as shown in the figure.

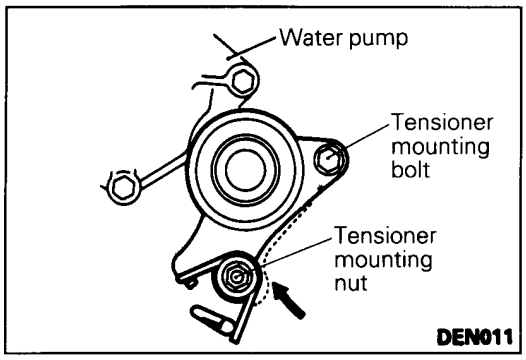


(2) Use the special tool to keep crankshaft from turning and remove the bolts.



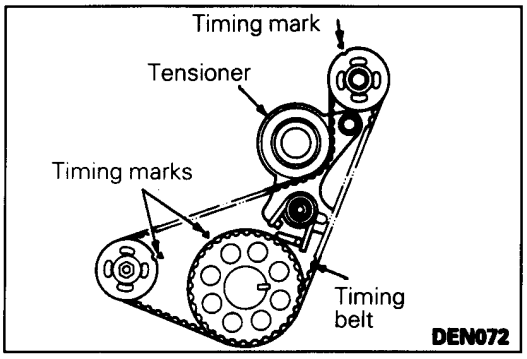
13. REMOVAL OF TIMING BELT

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



14. REMOVAL OF TIMING BELT "B"

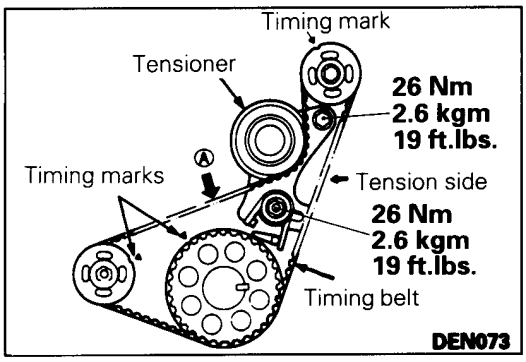
(1) When reinstalling timing belt "B", mark an arrow at the belt to show rotation direction.
(2) Loosen the tensioner mounting bolt and nut.
(3) Push timing belt tensioner to water pump side and tighten the tensioner mounting bolt and nut. Secure so that tensioner will not move back.

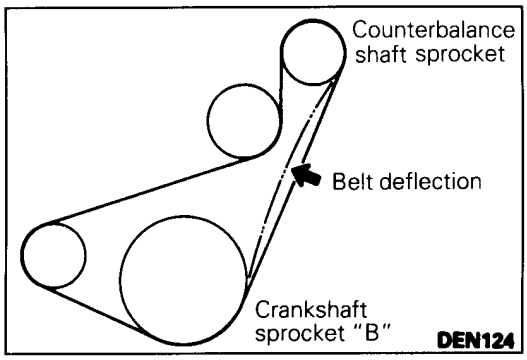


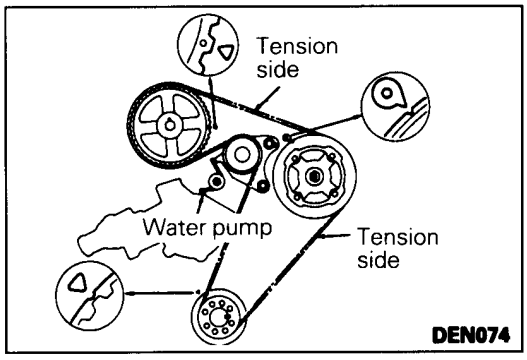
SERVICE POINTS OF INSTALLATION E11GDDL

14. INSTALLATION OF TIMING BELT "B"

(1) Align the timing marks of the 3 sprockets.
(2) When reusing timing belt "B", make sure the arrow mark is pointing in the same direction as when the belt was removed.







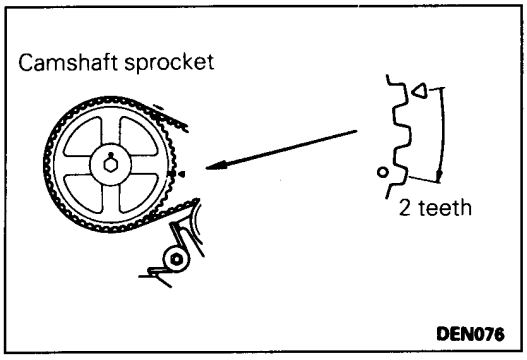
(3) Install timing belt B and make sure there is no deflection on the tension side.
(4) Press the deflection side of timing belt B (indicated by arrow (A)) with the hand and fully stretch the tensioner side.
(5) Make sure that the timing marks are aligned.
(6) Loosen the tensioner mounting bolt and nut so that only the pressure of the spring is applied to timing belt B.
(7) Tighten the tensioner mounting bolt and nut, tightening the nut first. If the bolt is tightened first, the tensioner will move and tension the belt.
(8) Press in the direction of the arrow in the figure with the index finger to check the amount of deflection.

Standard value: 4–5 mm (0.16–0.20 in.)

13. INSTALLATION OF TIMING BELT

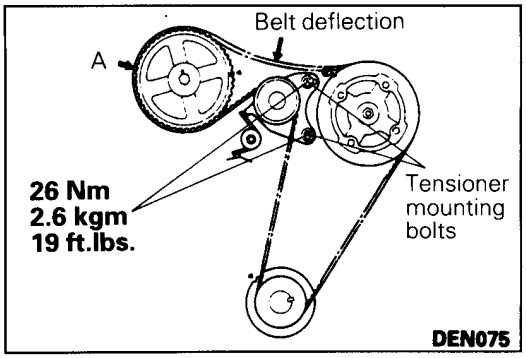
(1) Align the timing marks of the 3 sprockets.
(2) When reusing timing belt, make sure the arrow mark is pointing in the same direction as when the belt was removed.
(3) Install the timing belt to the crankshaft sprocket, to injection pump sprocket, to tensioner and to camshaft sprocket in that order,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

Caution
1. **Engage the belt on the various sprockets while maintaining tension on the belt of tension side.**
2. **Align the injection pump sprocket with the timing mark, hold the sprocket so that it does not turn and engage the belt.**

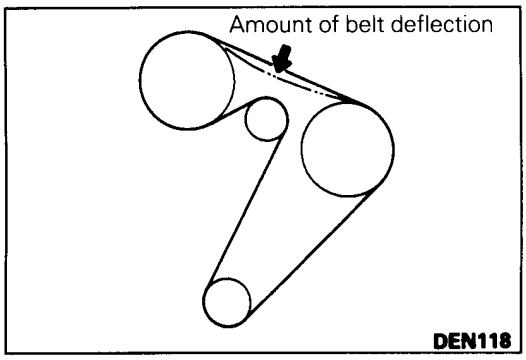


(4) Loosen the tensioner mounting bolts and apply tension with the spring.
(5) Turn the crankshaft clockwise and stop at the second lobe of the camshaft sprocket.

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



(6) Inspect to make sure that the part indicated by arrow A does not float upward.
(7) Tighten the tensioner mounting bolts, starting with the bolt in the elongated hole. If the lower bolt is tightened first, belt tension will become too tight.

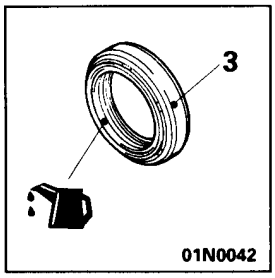


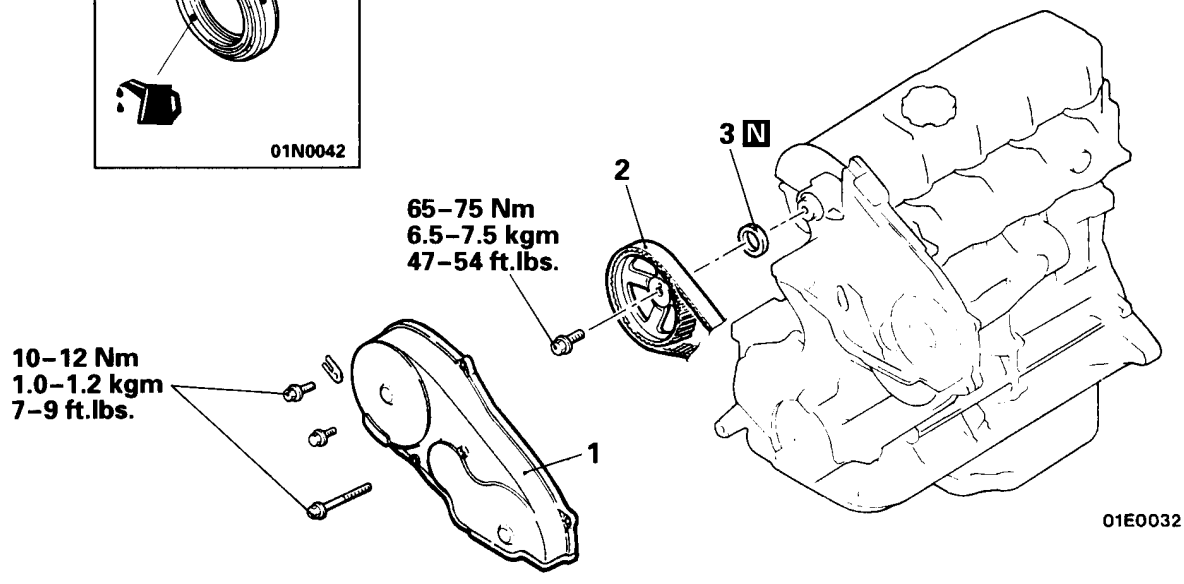
(8) Turn the crankshaft anticlockwise and align the timing mark. Next, make sure that the timing marks of all sprockets are aligned.
(9) Press on the centre of the belt with an index finger to check the amount of deflection.
Standard value: 4–5 mm (0.16–0.20 in.)

CAMSHAFT OIL SEAL

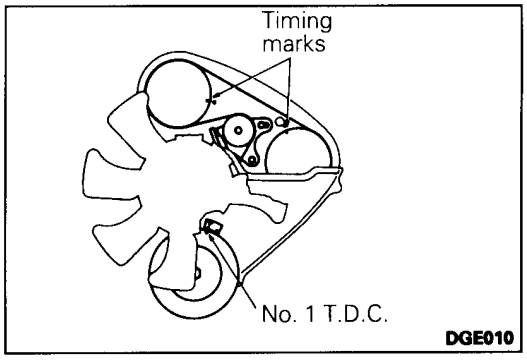
E11VA-C

REMOVAL AND INSTALLATION





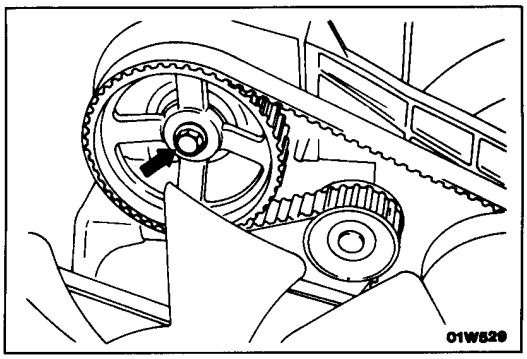
1. Timing belt upper cover
2. Camshaft sprocket
3. Oil seal



SERVICE POINT OF REMOVAL E11VBBA

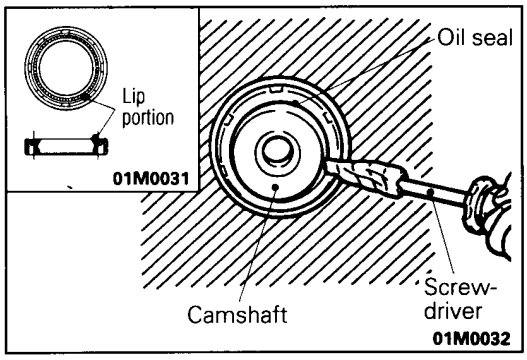
2. REMOVAL OF CAMSHAFT SPROCKET

(1) Rotate crankshaft clockwise (to the right) and align timing marks.



(2) Remove camshaft sprocket with timing belt and place it on timing belt front lower cover.

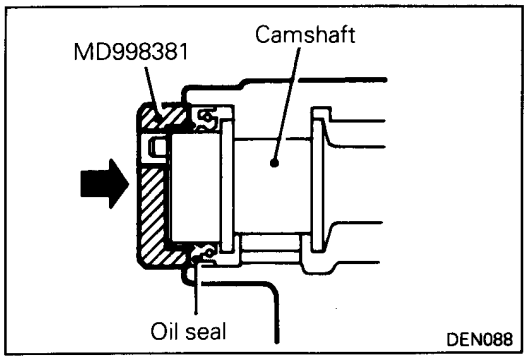
NOTE
1. Secure timing belt to sprocket with wire etc., to prevent them from slipping out of place.
2. Do not rotate crankshaft after removing camshaft sprocket.



3. REMOVAL OF OIL SEAL

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

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



SERVICE POINT OF INSTALLATION E11VCBA

3. INSTALLATION OF OIL SEAL

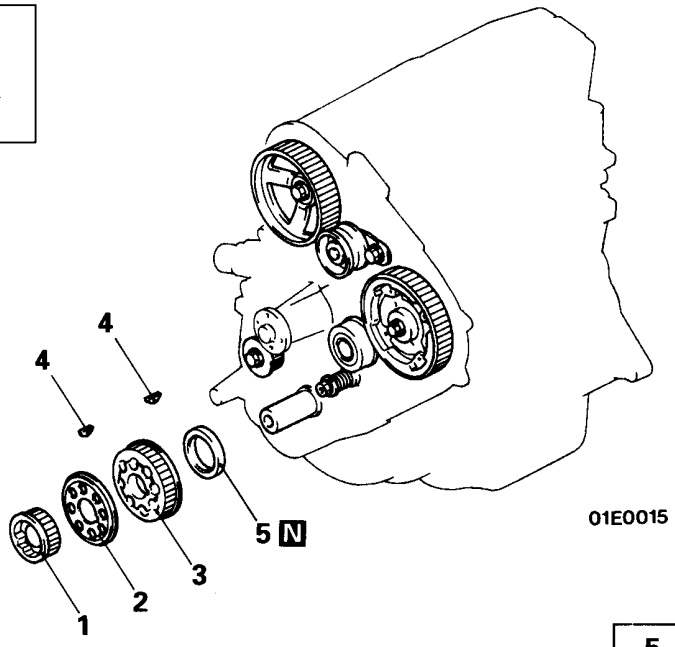
(1) Apply oil to the oil seal lips.
(2) Using special tool, press-fit a new camshaft oil seal into the front bearing cap.

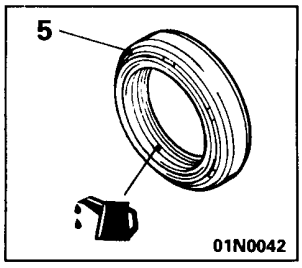
CRANKSHAFT OIL SEALS

E11UA-C

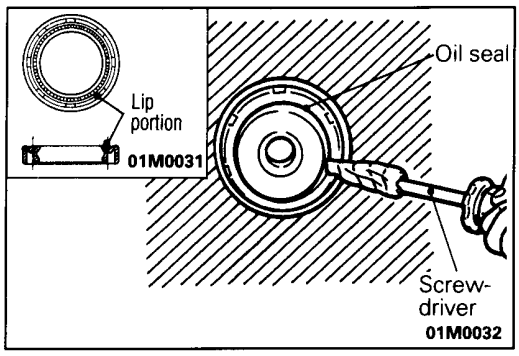
FRONT OIL SEAL
REMOVAL AND INSTALLATION

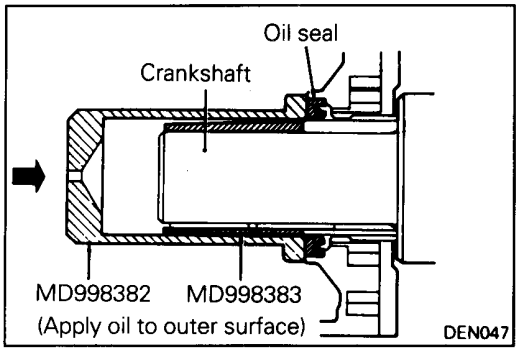
Pre-removal and Post-installation Operation
- Removal and installation of Timing Belt and Timing Belt "B" (Refer to P.11-60.)





Removal steps
1. Crankshaft sprocket
2. Flange
3. Crankshaft sprocket "B"
4. Key
5. Oil seal





SERVICE POINT OF REMOVAL

E11UBBA

5. REMOVAL OF OIL SEAL

(1) Cutout of a portion in the crankshaft oil seal lip.
(2) Cover the tip of a screwdriver with a cloth and apply it to the cutout in the oil seal to pry off the oil seal.

Caution
Take care not to damage the crankshaft and front case.

SERVICE POINT OF INSTALLATION

E11UCBB

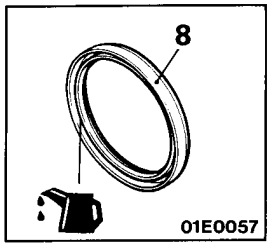
5. INSTALLATION OF OIL SEAL

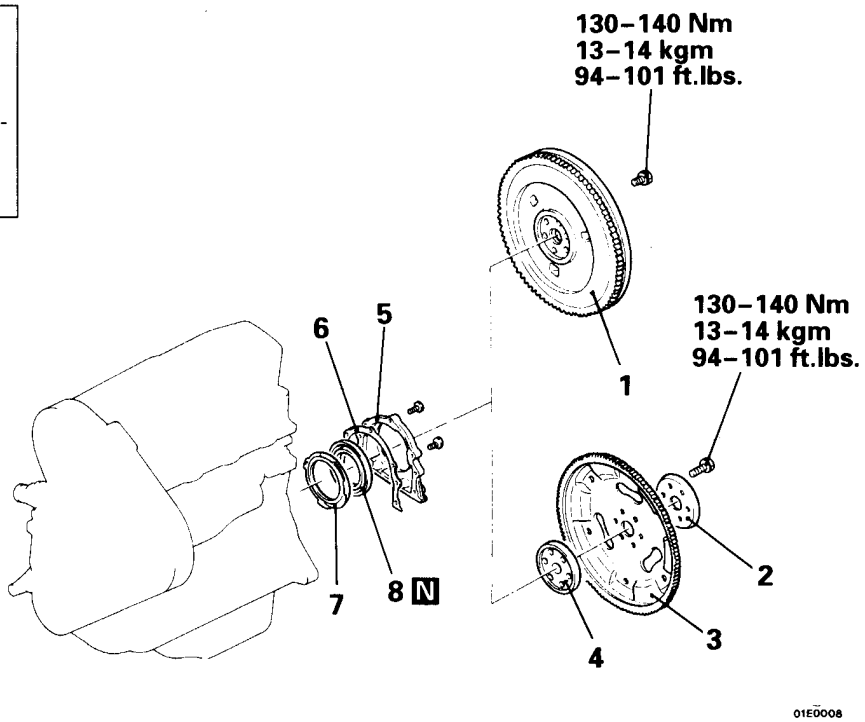
Apply engine oil to the outside of the special tool (MD998283) and to the oil seal lip, and use the special tool to press-fit the oil seal.

REAR OIL SEAL
REMOVAL AND INSTALLATION

E11UA-F

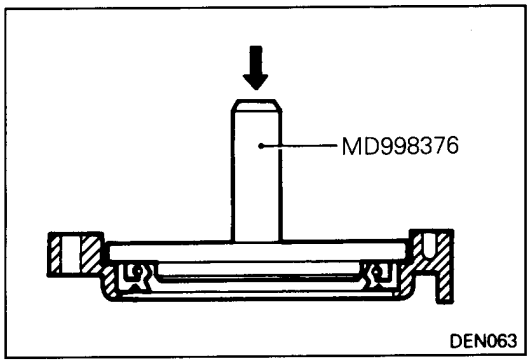
Pre-removal and Post-installation Operation
- Removal and Installation of Oil Pan (Refer to P.11-58.)
- Removal and Installation of Transmission and Transfer Assembly (Refer to GROUP 22, 23 – Transmission and Transfer Assembly.)





Removal steps

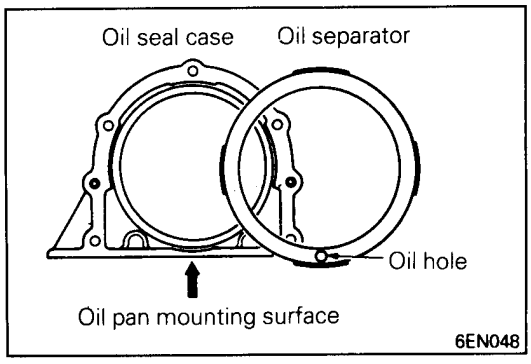
1. Flywheel assembly <M/T>
2. Adaptor plate
3. Drive plate <A/T>
4. Crankshaft adaptor
5. Oil seal case
6. Gasket
7. Oil separator
8. Oil seal



SERVICE POINTS OF INSTALLATION

E11UCBO

8. INSTALLATION OF OIL SEAL



7. INSTALLATION OF OIL SEPARATOR

Install the oil separator in such a way that its oil hole come at the case bottom (indicated by an arrow in illustration).

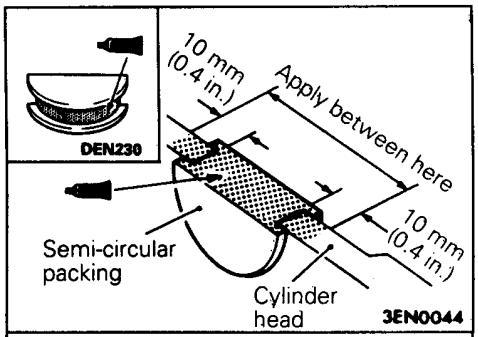
CYLINDER HEAD GASKET

E11JA-C

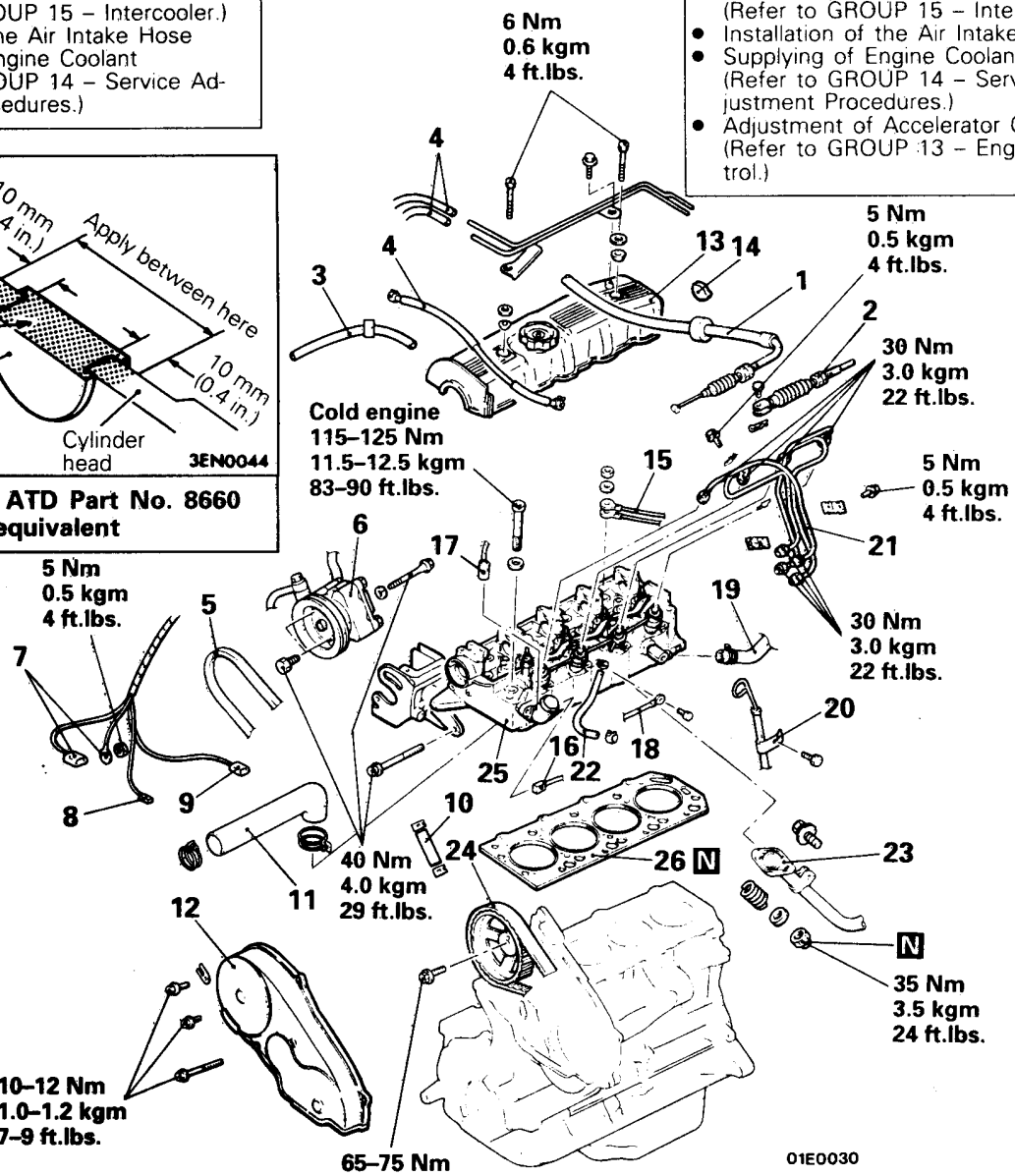
REMOVAL AND INSTALLATION

Pre-removal Operation
- Removal of the Intercooler (Refer to GROUP 15 – Intercooler.)
- Removal of the Air Intake Hose
- Draining of Engine Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)

Post-installation Operation
- Installation of the Intercooler (Refer to GROUP 15 – Intercooler.)
- Installation of the Air Intake Hose
- Supplying of Engine Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)
- Adjustment of Accelerator Cable (Refer to GROUP 13 – Engine Control.)



Sealant: 3M ATD Part No. 8660 or equivalent



Removal steps

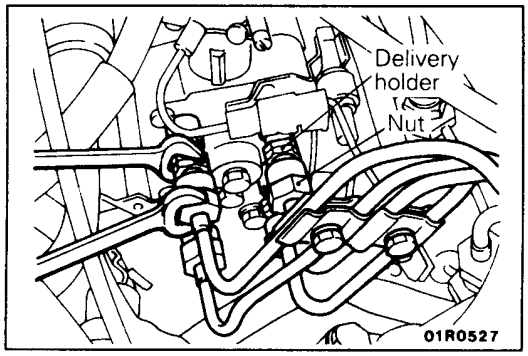
1. Accelerator cable connection
2. Kick down cable connection
3. Breather hose connection
4. Vacuum hose connection
- Adjustment of drive belt tension (Refer to P.11-49)

5. Drive belt } <Power steering>
◀▶ 6. Oil pump }
7. Alternator harness connector
8. Oil pressure gauge unit connector
9. Oil level sensor connector
10. Oil return hose connection
11. Radiator upper hose
12. Timing belt front upper cover
13. Rocker cover
14. Semi-circular packing
15. Glow plug harness connector
16. Engine coolant temperature switch connector <A/C>
17. Engine coolant temperature sensor connector
18. Earth cable connection
19. Heater hose
20. Oil level gauge and gauge guide
◀▶ 21. Injection pipes
22. Fuel return hose
23. Front exhaust pipe connection
◀▶ ◀▶ 24. Camshaft sprocket
◀▶ ◀▶ 25. Cylinder head assembly
◀▶ 26. Cylinder head gasket

SERVICE POINTS OF REMOVAL E11JBBH

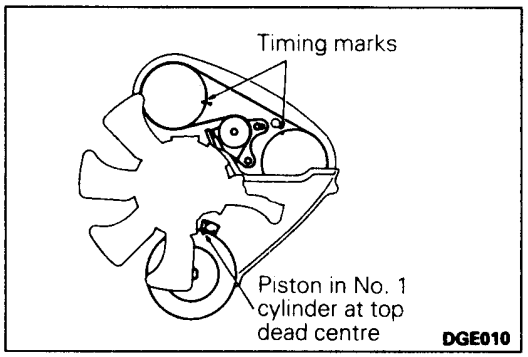
6. REMOVAL OF OIL PUMP <POWER STEERING>

(1) Remove the power steering oil pump. (with the hose attached)
(2) Suspend the remove oil pump (by using wire or similar material) at a place where no damaged will be caused during removal/installation of the cylinder head.



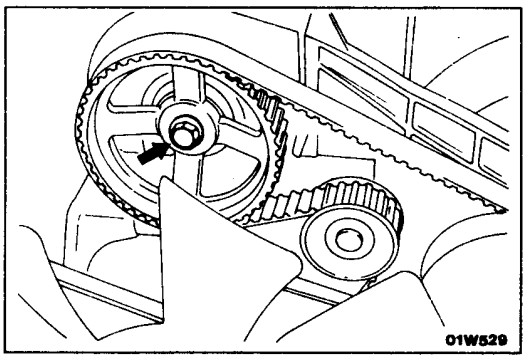
21. DISCONNECTION OF INJECTION PIPE

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



24. REMOVAL OF CAMSHAFT SPROCKET

(1) Rotate the crankshaft clockwise and check that the camshaft sprocket's timing mark and the injection sprocket's timing mark are aligned.

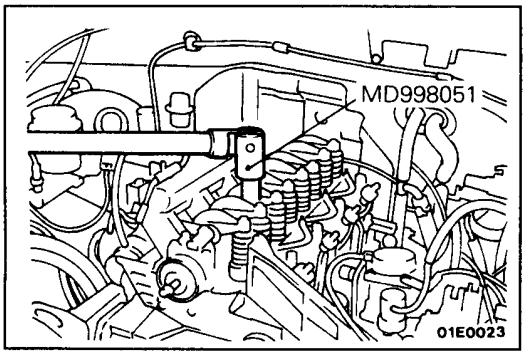


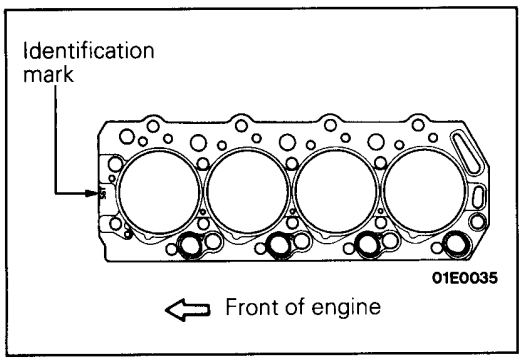
(2) Pull the camshaft sprocket (with the timing belt attached) out from the camshaft, and place it on top of the timing belt front lower cover.

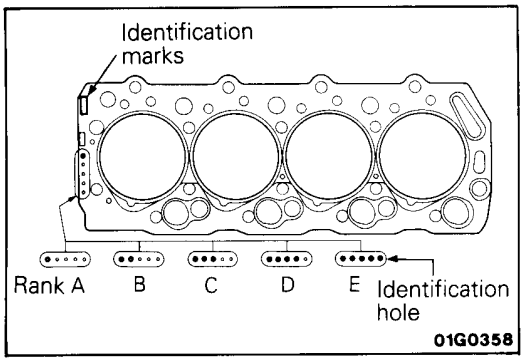
Caution
1. **The crankshaft must not be rotated after the camshaft sprocket is pulled out from the camshaft.**
2. **Take care that there is no slack in the timing belt.**
3. **Use care so that the camshaft sprocket may not disengage from the belt and drop.**

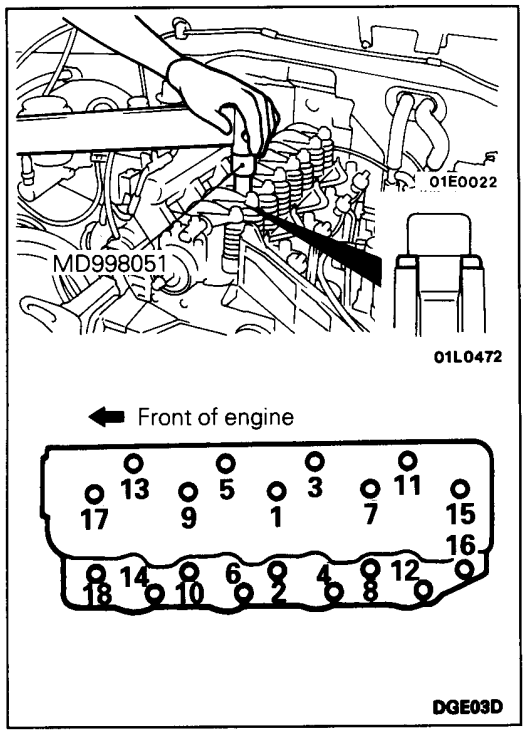
25. REMOVAL OF CYLINDER HEAD ASSEMBLY

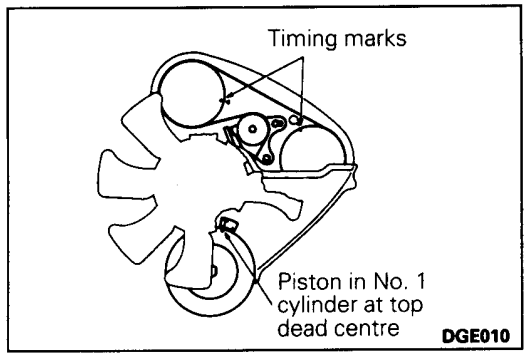
(1) Using the special tool, loosen the bolts in 2 or 3 steps, and then remove them.
(2) Suspend the chain block-and-tackle from a hanger, and remove the cylinder head assembly from the cylinder block.











SERVICE POINTS OF INSTALLATION E11JDBI

26. INSTALLATION OF CYLINDER HEAD GASKET

<Without identification hole>

(1) Clean both gasket surfaces of cylinder head and cylinder block.
(2) Lay the cylinder head gasket on cylinder block with the identification mark at front top.

<With identification hole>

(1) Wipe off any oil or grease from the gasket mounting surface.
(2) Identify a rank by the number of the identification hole and select a gasket having the same rank.

NOTE
The ranks are described in "PARTS CATALOGUE".

(3) Place the cylinder head gasket on top of the cylinder block so that the identification mark is facing upwards as in the illustration.

25. INSTALLATION OF CYLINDER HEAD ASSEMBLY

(1) Using the special tool, tighten the bolts (in the order indicated in the figure) in 2 or 3 steps, and finally tighten at the specified torque.

Caution
Install the head bolt washers as shown with shear drop upward.

24. INSTALLATION OF CAMSHAFT SPROCKET

Install the camshaft sprocket to the camshaft. Check that the camshaft sprocket's timing mark and the injection sprocket's timing mark are aligned.

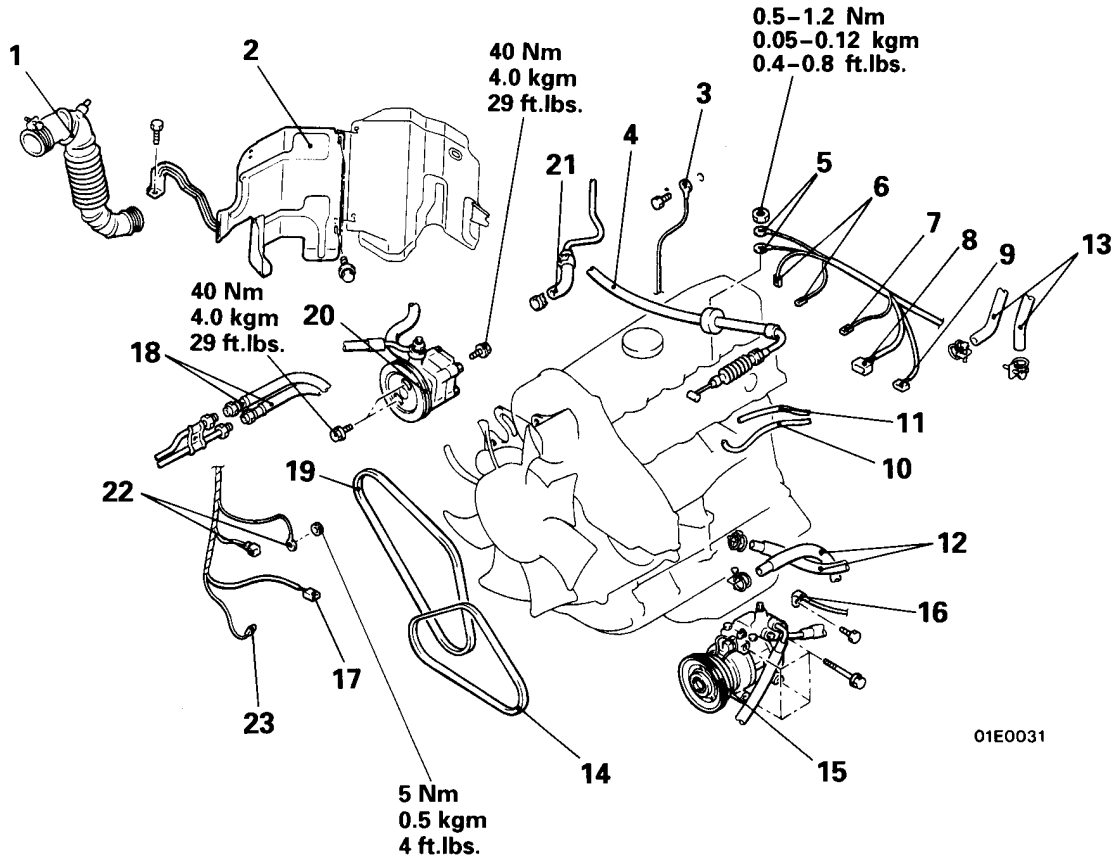
ENGINE ASSEMBLY

E11TA-C

REMOVAL AND INSTALLATION

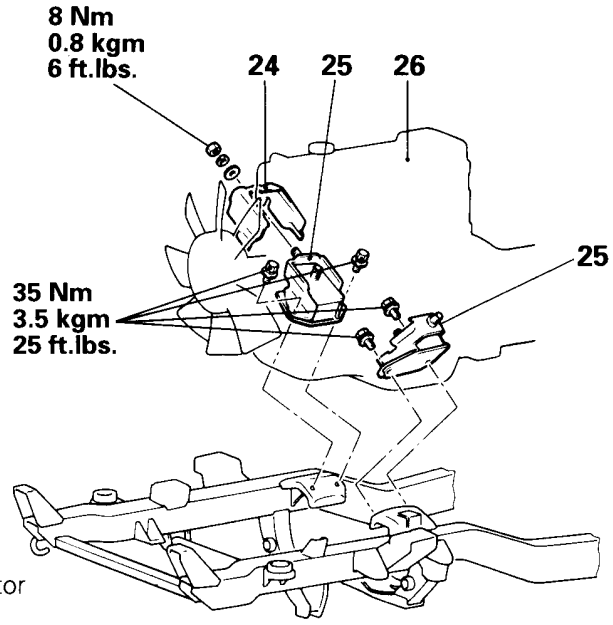
Pre-removal Operation
- Removal of the Hood (Refer to GROUP 42 – Hood.)
- Removal of the Transmission and Transfer Assembly (Refer to GROUP 22, 23 – Transmission Assembly.)
- Removal of the Intercooler (Refer to GROUP 15 – Intercooler.)
- Removal of the Radiator (Refer to GROUP 14 – Radiator.)
- Removal of Battery and Battery Tray

Post-installation Operation
- Installation of the Transmission and Transfer Assembly (Refer to GROUP 22, 23 – Transmission Assembly.)
- Installation of the Radiator
- Installation of the Intercooler (Refer to GROUP 15 – Intercooler.)
- Installation of Battery and Battery Tray
- Installation of the Hood (Refer to GROUP 42 – Hood.)
- Air bleeding of Fuel System (Refer to GROUP 13 – Service Adjustment Procedures.)
- Adjustment of Drive Belt Tension (Refer to P.11-49.)



Removal steps

1. Air cleaner cover and air intake hose assembly
2. Heat protector
3. Earth cable
4. Accelerator cable connection ◆◆
5. Glow plug harness connector
6. Engine coolant temperature switch connectors <A/C>
7. Lever position switch connector <A/T-A/C>
8. Lever position sensor connector ◆◆
9. Sensor connector
10. Vacuum hose <ABS>
11. Vacuum hose <A/C>
12. Fuel hose connections
13. Heater hose connections
14. Drive belt } <A/C>
15. Compressor }
16. Earth cable
17. Oil level sensor connector
18. Engine oil cooler hose connection
19. Drive belt } <Power steering>
20. Oil pump }
21. Brake booster vacuum hose connection
22. Alternator connector
23. Oil pressure gauge unit connector



24. Heat protector
25. Engine mounting front insulator attaching bolt
◀■▶ ▶■◀ 26. Engine assembly

SERVICE POINTS OF REMOVAL E11TBAL

15. REMOVAL OF COMPRESSOR <A/C>/20. OIL PUMP (POWER STEERING)

(1) Remove the oil pump and air conditioner 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.

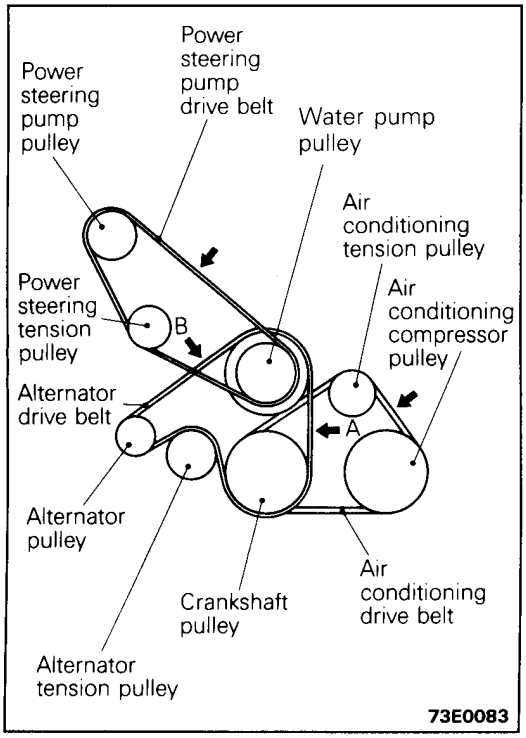
26. REMOVAL OF ENGINE ASSEMBLY

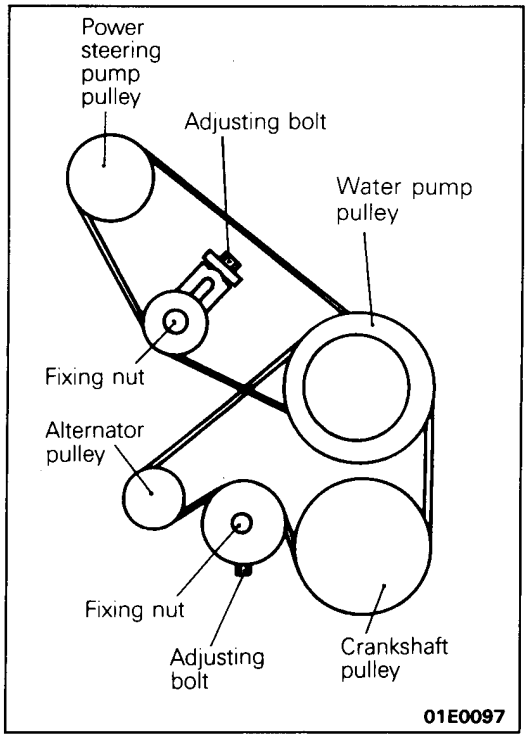
(1) Check that all cables, hoses, harness connectors, etc. are disconnected from the engine.
(2) Lift the chain block slowly to remove the engine assembly upward from the engine compartment.

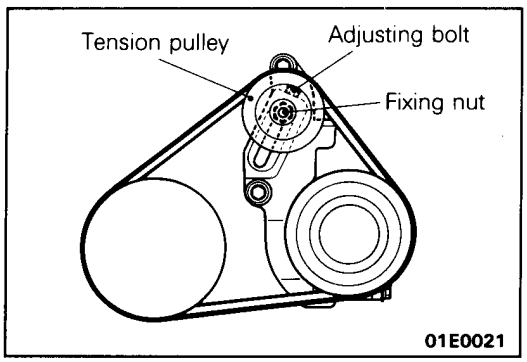
SERVICE POINTS OF INSTALLATION E11TDAN

26. INSTALLATION OF ENGINE ASSEMBLY

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







ENGINE <6G74>

SERVICE ADJUSTMENT PROCEDURES

DRIVE BELTS TENSION INSPECTION AND ADJUSTMENT

Apply 100 N force to the belt back midway between the pulleys as shown in the illustration, and use a belt-tension gauge to measure the deflection or the belt tension.

Standard value:

Item		Check value	Adjustment value	
			Used belt	New belt
For alternator	A mm (in.)	5.0–7.0 (0.20–0.28)	6.0 (0.23)	4.0–5.0 (0.16–0.20)
	B mm (in.)	8.5–10.5 (0.33–0.41)	8.5 (0.33)	5.5–7.5 (0.22–0.30)
For power steering	Deflection mm (in.)	13.0–17.0 (0.51–0.67)	14.0–16.0 (0.55–0.67)	11.0–13.0 (0.55–0.63)
For A/C	Deflection mm (in.)	6.5–7.5 (0.26–0.30)	6.5–7.5 (0.26–0.30)	5.0–6.0 (0.20–0.24)

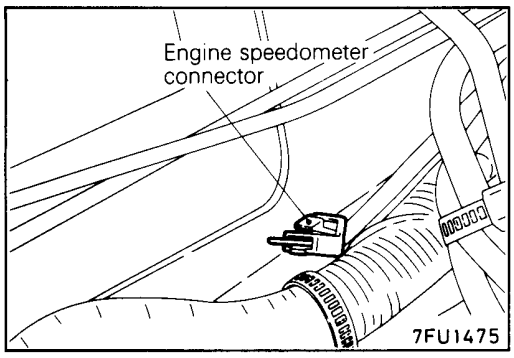
A: Between the water pump pulley and the crankshaft pulley
B: Between the water pump pulley and the alternator pulley

TENSION ADJUSTMENT OF ALTERNATOR DRIVE BELT AND POWER STEERING OIL PUMP DRIVE BELT

(1) Loosen the tension pulley fixing nut.
(2) Adjust belt tension with the adjusting bolt.
(3) Tighten the fixing nut.
(4) Crank the engine once or more.
(5) Check the belt tension.

TENSION ADJUSTMENT OF AIR CONDITIONING COMPRESSOR DRIVE BELT

(1) Loosen the tension pulley fixing nut.
(2) Adjust belt tension with the adjusting bolt.
(3) Tighten the fixing nut.
(4) Crank the engine once or more.
(5) Check the belt tension.



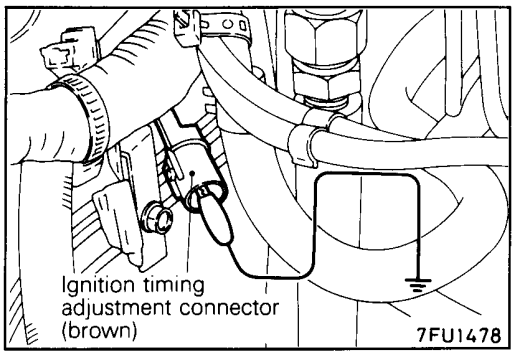
IGNITION TIMING INSPECTION

(1) Before inspection and adjustment, set the vehicle to the following condition.
- Engine coolant temperature: 80–95°C (176–203°F)
- Lights and all accessories: OFF
- Transmission: Neutral (A/T: P range)

(2) Insert a paper clip into the 1-pin connector (blue) as shown in the illustration at left.
(3) Connect a primary voltage detection type tachometer to the paper clip.

NOTE
Do not use the MUT-II. When the MUT-II is connected to the diagnosis connector, the ignition timing will be unchanged instead of reverting to the basic ignition timing.

(4) Install the timing light.
(5) Start the engine and run it at idle.
(6) Check to be sure that the idle speed is approximately 700 ± 100 r/min.
(7) Turn the ignition switch to OFF.



(8) Disconnect the waterproof female connector from the ignition timing adjustment connector (brown).
(9) Use jumper leads to earth the ignition timing adjustment terminal.

NOTE
Earthing the ignition timing adjustment terminal will change the ignition timing to basic ignition timing.

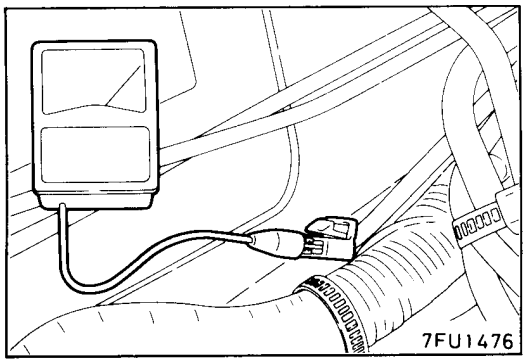
(10) Check the basic ignition timing.

Standard value: 5°BTDC ± 3°

(11) If the ignition timing is outside the standard value, check the MPI System while referring to GROUP 13 – Service Adjustment Procedures.
(12) Disconnect the jumper lead from the ignition timing adjustment connector (brown), and return the connector to its original condition.
(13) Check that the 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 10°BTDC at higher altitudes.



IDLE SPEED INSPECTION

(1) Perform inspection and adjustment with the vehicles in the following condition.
- Engine coolant temperature: 80–95°C (176–203°F)
- Lights and all accessories: OFF
- Transmission: Neutral (For A/T: P range)

(2) Check that the standard ignition timing is at the standard value.

Standard value: 5°BTDC ± 3°

(3) After turning the ignition switch to OFF, connect the MUT-II to the diagnosis connector (white).
(4) Start the engine and run it at idle speed.
(5) Let it idle for 2 minutes.
(6) Check idling speed.

Curb idle speed: 700 ± 100 r/min

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

(7) If it is outside the standard value, refer to GROUP 13 – Check Chart Classified by Problem Symptoms and check the MPI components.

IDLE MIXTURE INSPECTION

(1) Before inspection, set the vehicle to the following condition.
- Engine coolant temperature: 80–95°C (176–203°F)
- Lights, power cooling fan and all accessories: OFF
- Transmission: Neutral (A/T: P range)

(2) Check that the basic ignition timing is at the standard value.

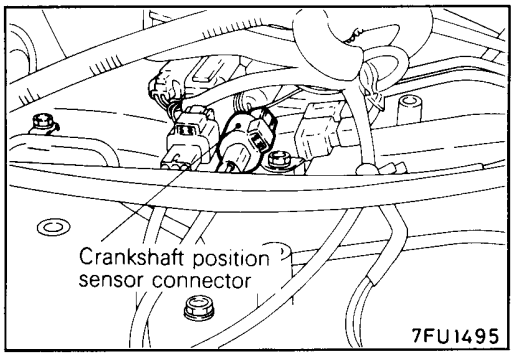
Standard value: 5°BTDC ± 3°

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

NOTE
For the connection procedure for the tachometer, refer to P.11-73.

(4) Start the engine and race it at an engine speed of 2,500 r/min for two minutes.
(5) Connect a CO and HC tester.
(6) Check the CO concentration and the HC concentration while the engine is idling.

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



COMPRESSION . PRESSURE INSPECTION

(1) Before inspection, check that the engine oil, starter and battery are normal. Also, set the vehicle to the following condition:
- Engine coolant temperature: 80–95°C (176–203°F)
- Lights and all accessories: OFF
- Transmission: Neutral (P range for vehicles with automatic transmission)

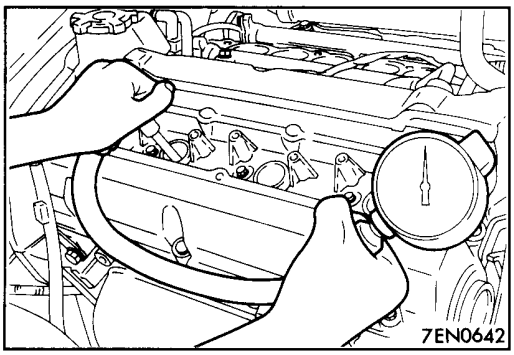
(2) Remove all of the spark plugs.

(3) Disconnect the crankshaft position 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 rag etc., and after the engine has been cranked, check that no foreign material is adhering to the rag.

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:
1270 kPa (13.0 kg/cm^2, 185 psi) – [250–400 r/min.]
Limit:
min. 900 kPa (9.2 kg/cm^2, 131 psi) – [250–400 r/min.]

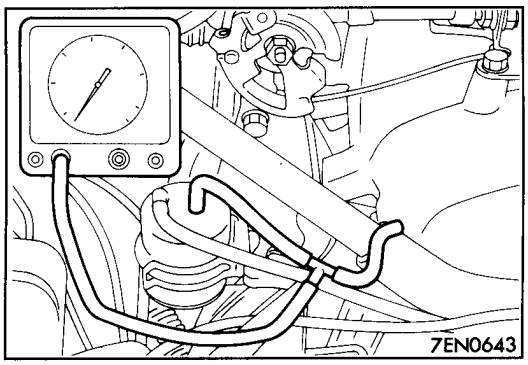
(7) Measure the compression pressure for all the cylinders, and check that the pressure differences of the cylinders are below the limit.

Limit: max. 98.0 kPa (1.0 kg/cm^2, 14 psi)

(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 crankshaft position sensor.
(10) Install all spark plugs.
(11) Use the MUT-II to erase the self-diagnosis codes or reconnect the minus (–) cable of the battery after disconnecting it more than 10 seconds.

NOTE
This makes malfunction codes caused by disconnecting the crankshaft position sensor be erased.



MANIFOLD VACUUM INSPECTION

(1) Perform inspection and adjustment with the vehicle in the following condition.
- Engine coolant temperature: 80–95°C (176–203°F)
- Lights and all accessories: OFF
- Transmission: Neutral (P range for vehicles with an automatic transmission)

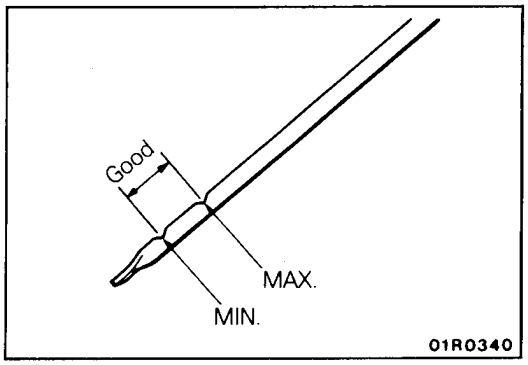
(2) Check to be sure that the idle speed is at the standard value.

Standard value: 700 ± 100 r/min.

(3) Install a T-joint to the vacuum hose between the air intake plenum and the vacuum motor, and then connect a vacuum gauge.
(4) Inspect the vacuum (negative pressure) when the engine is idling.

Limit: min. 69 kPa (515 mmHg, 20 in.Hg)

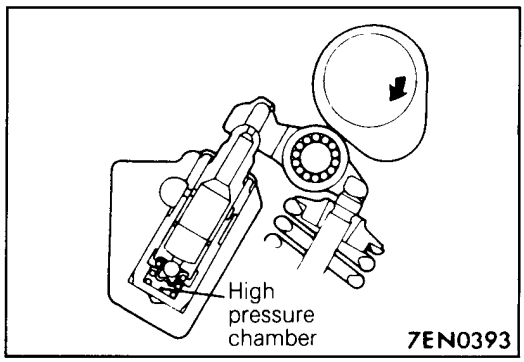
(5) If the idle speed is outside the standard value, refer to the following chart for cause and repair.



LASH ADJUSTER INSPECTION

NOTE
Directly after starting the engine or while the engine is running, if an abnormal sound (clattering) that seems to be coming from the auto-lash adjuster is heard and doesn't stop, carry out the following inspection.
(1) Check the engine oil and refill or replace the oil if necessary.

NOTE
1. If there is a small amount of oil, air is being sucked in through the oil strainer and is getting into the oil passage.
2. If the amount of oil is greater than specified then the oil is mixed by the crankshaft and a large amount of air is mixed into the oil.
3. Air and oil will not separate easily in oil that has degenerated, and the amount of air mixed into the oil will increase.

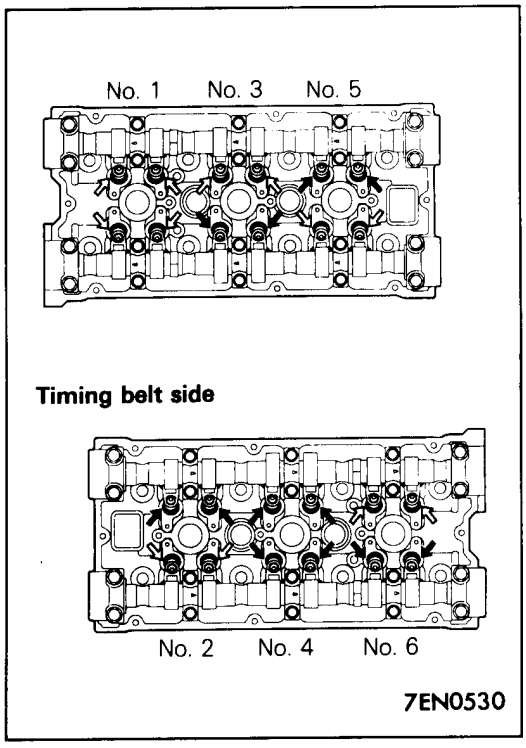


If the air mixed in with the oil due to the above reasons gets into the high pressure chamber of the auto-lash adjuster, the air inside the high pressure chamber will be compressed when the valve is open and the auto-lash adjuster will over-compress, resulting in an abnormal noise when the valve closes. This is the same effect as if the valve clearance is adjusted to be too large by mistake.
In this case, when the air that has got into the auto-lash adjuster is expelled, the condition will return to normal.

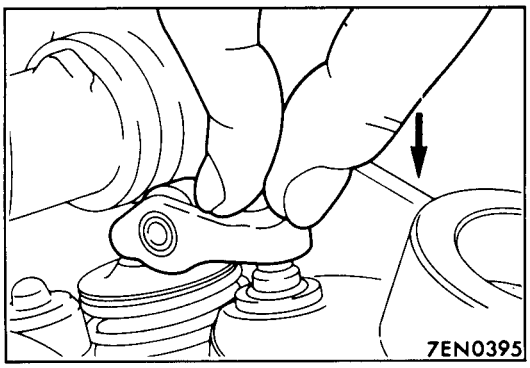
(2) Start the engine and gently race* the engine several times (10 times or less).
If the abnormal noise is stopped by the racing, air has been released from the high pressure chamber, and the functioning of the auto-lash adjuster has returned to normal.

* After gradually increasing the engine speed from idle speed to 3,000 r/min (in 30 seconds), gradually reduce the engine speed back to idle speed (in 30 seconds).

NOTE
1. If the vehicle is parked on a slope for a long time, the oil will be sometimes reduced in the auto-lash adjuster, and air will enter the high-pressure chamber when the engine is started.
2. After the vehicle is parked for a long time, the oil will go out of the oil passage. Since it takes a little time to supply oil to the auto-lash adjuster, air sometimes enters the high-pressure chamber.



(3) If the abnormal noise is not stopped by the racing, check the auto-lash adjuster by the following procedure.
1. Stop the engine.
2. Set the engine No.1 cylinder to the compressing top dead centre position.
3. Push the rocker arm in the locations indicated by ⇦ in the illustration at left to check if the rocker arm moves down or not.
4. Slowly turn the crankshaft 360° clockwise.
5. Check the rocker arm in the locations indicated by ⬅ in the illustration at left using the same procedure in step 3.

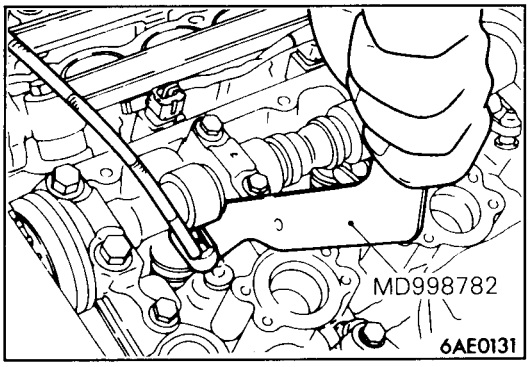


6. If the rocker arm moves down when it is pushed, replace the auto-lash adjuster.
   When replacing the auto-lash adjuster, install after bleeding the air from all of the auto-lash adjusters, and then carry out the checks in steps 1 to 5.
   In addition, if the rocker arm feels extremely stiff when it is pushed and does not move down, the auto-lash adjuster is normal, so investigate for some other cause of the abnormality.

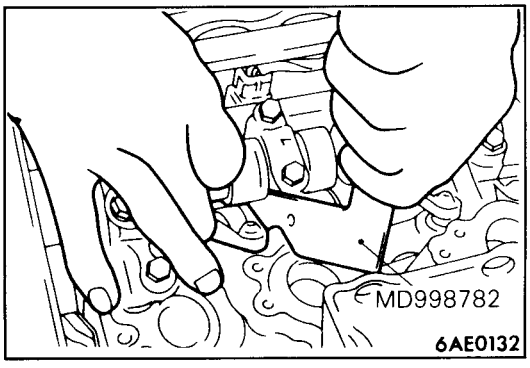
   NOTE
   For the procedure for bleeding the air from the auto-lash adjusters, refer to the Engine Workshop Manual.

(4) Lash adjuster replacement procedure

Caution
In the cylinders which are being removed, the valves will touch the pistons when the valves are pushed down, so the crankshaft should be turned to lower the piston positions.
In addition, places where the rocker arms are lifted by the cams cannot be removed. In these cases, the crankshaft should be turned so that the rocker arms are not lifted.



① Use the special tool to push down the valve, and then remove the roller rocker arm.
② Remove the lash adjuster from the cylinder head.
③ Install a new lash adjuster from which the air has been bled to the cylinder head.



④ Use the special tool to push down the valve, and then install the roller rocker arm.

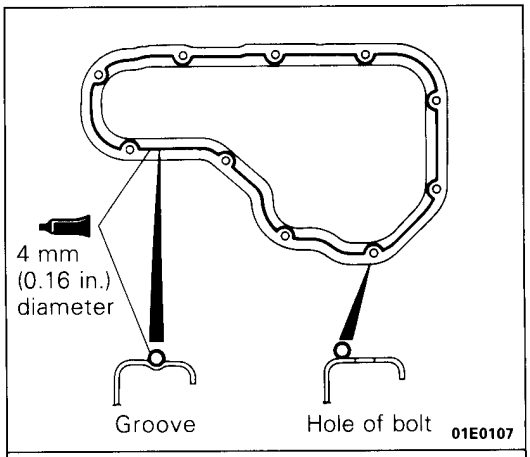
NOTE
When installing the roller rocker arm, first set the pivot side of the rocker arm onto the top of the lash adjuster, and then after pushing down the valve, set the slipper side of the rocker arm on the end of the valve stem.

OIL PAN AND OIL SCREEN

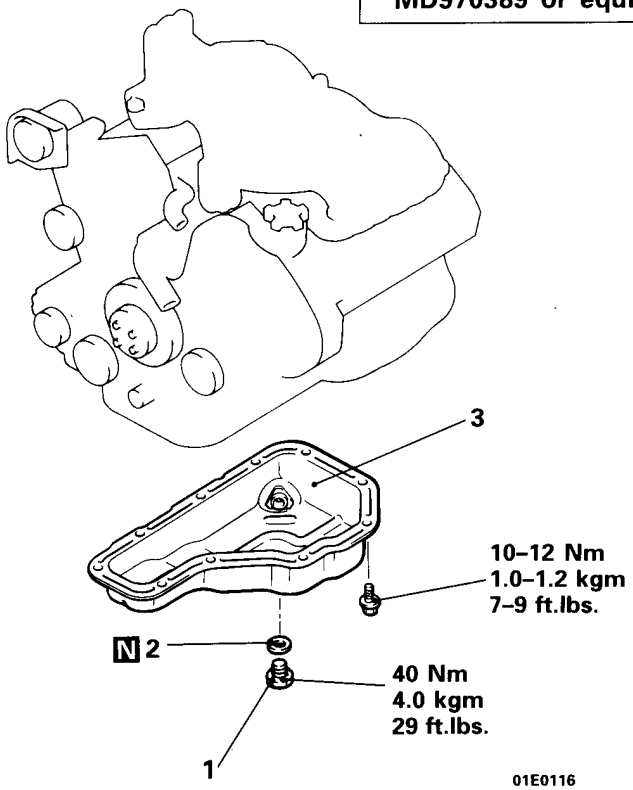
OIL PAN, LOWER
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
Removal and Installation
- Under Skid Plate, Undercover, Air Guide Plate
- Front Exhaust Pipe (Refer to GROUP 15 – Exhaust Pipe, Mufflers and Catalytic Converter.)

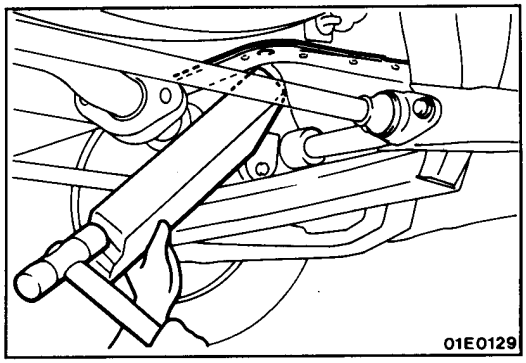
Draining and Supplying
- Engine Oil (Refer to GROUP 12 – Service Adjustment Procedures.)



Sealant:
MITSUBISHI GENUINE PART NO. MD970389 or equivalent



Removal steps
1. Drain plug
2. Gasket
3. Oil pan, lower



SERVICE POINTS OF REMOVAL

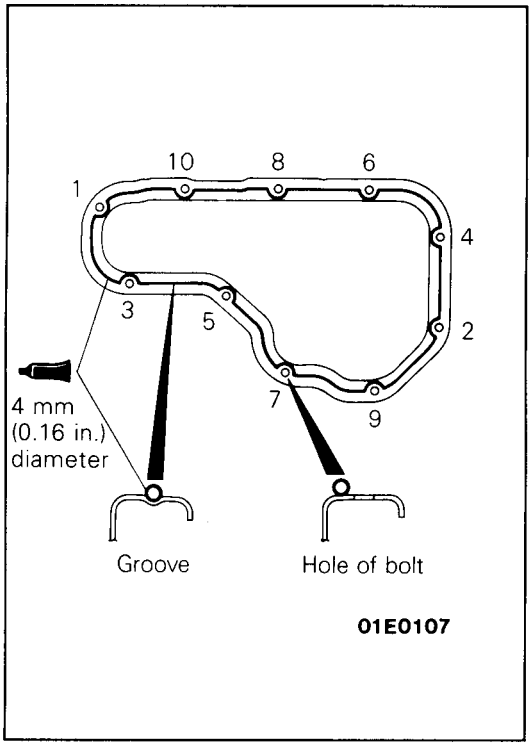
3. REMOVAL OF OIL PAN, LOWER

(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).

INSPECTION

- Check oil pan for cracks.
- Check oil pan sealant-coated surface for damage and deformation.



SERVICE POINTS OF INSTALLATION

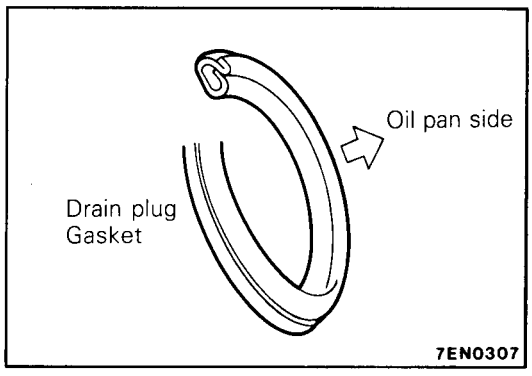
3. INSTALLATION OF OIL PAN, LOWER

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

Specified sealant: MITSUBISHI GENUINE PART No. MD970389 or equivalent

NOTE
The sealant should be applied in a continuous bead approximately 4 mm (0.16 in.) in diameter.

(4) Assemble oil pan to cylinder block within 30 minutes after applying the sealant.
(5) Tighten the oil pan mounting bolt in the order illustrated (left).



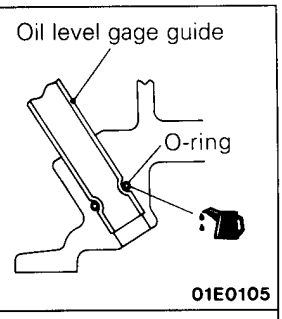
2. INSTALLATION OF GASKET

Replace the gasket with a new gasket, and install it in the direction shown in the illustration.

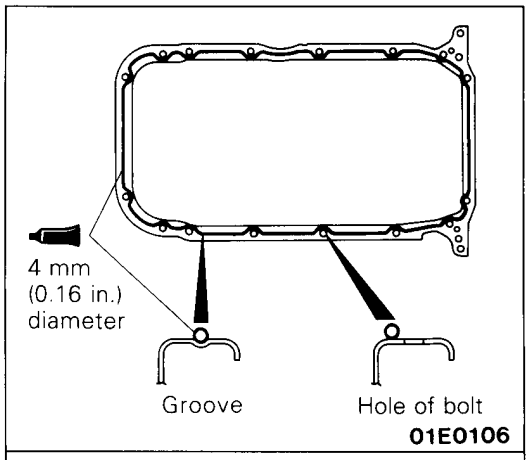
OIL PAN, UPPER AND OIL SCREEN

REMOVAL AND INSTALLATION

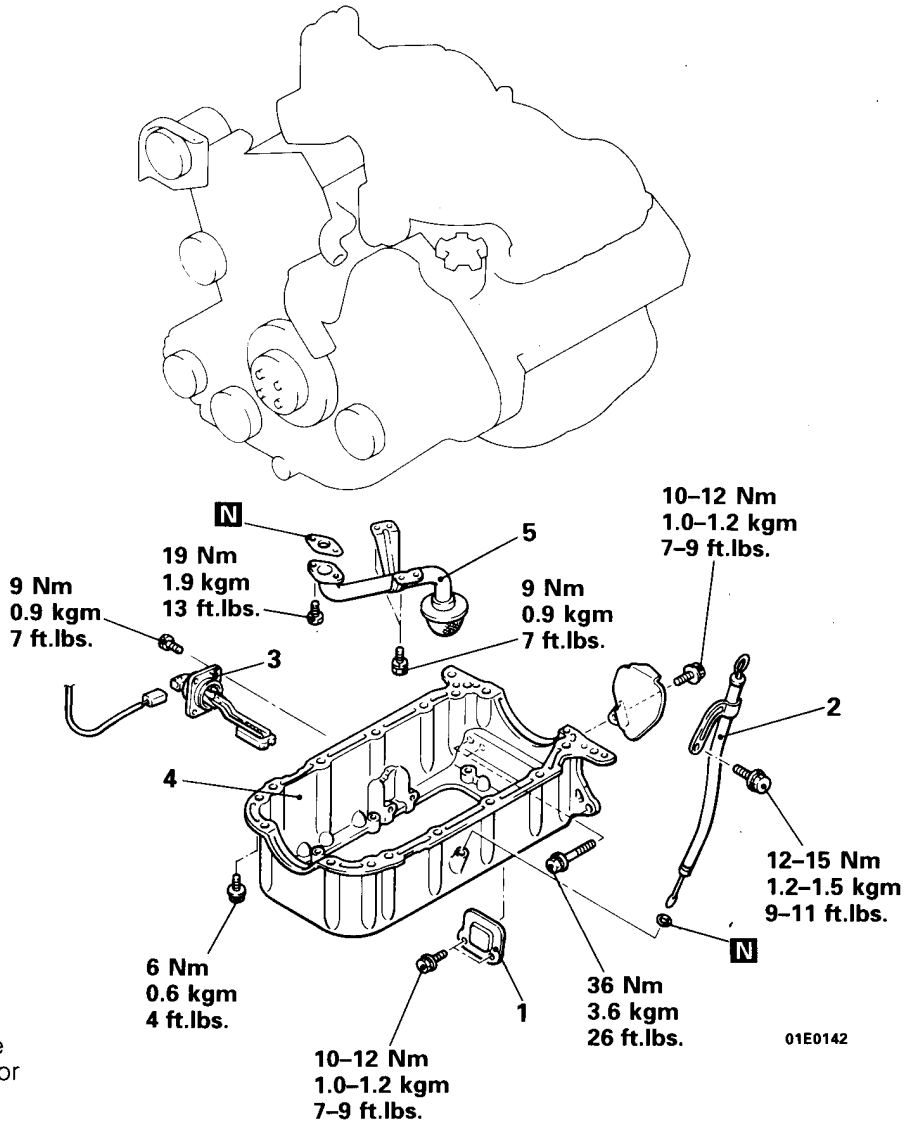
Pre-removal and Post-installation Operation
Removal and Installation
- Oil pan, Lower (Refer to P.11-79.)
- Front Differential Carrier (Refer to GROUP 26 – Differential Carrier)



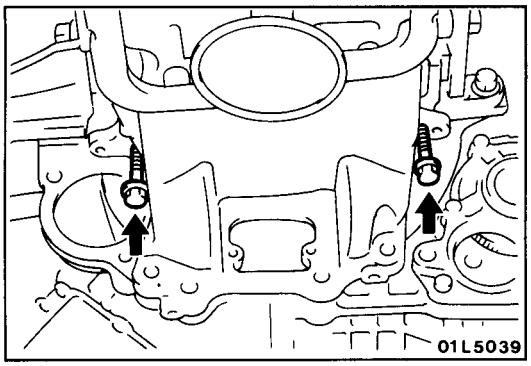
Engine oil



Sealant:
MITSUBISHI GENUINE PART NO. MD970389 or equivalent



Removal steps
1. Cover
2. Oil level gauge guide
3. Engine oil level sensor
◆◆ ◆◆ 4. Oil pan, upper
5. Oil screen



SERVICE POINTS OF REMOVAL

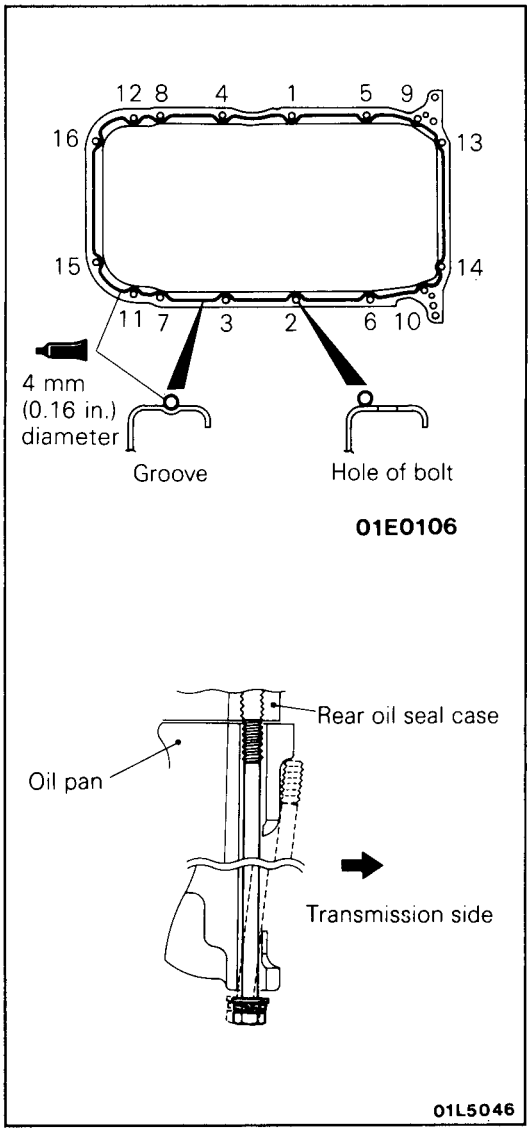
4. REMOVAL OF OIL PAN, UPPER

Install the bolt [bolt diameter × length : 10 × 38 mm (0.39 × 1.50 in.)] that links the oil pan, upper with the transmission in the hole of the oil pan, upper as shown in the figure and tighten the bolt to remove the oil pan, upper.

INSPECTION

M11HCAG

- Check oil pan for cracks.
- Check oil pan sealant-coated surface for damage and deformation.



SERVICE POINTS OF INSTALLATION

4. INSTALLATION OF OIL PAN, UPPER

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

Specified sealant: MITSUBISHI GENUINE PART No. MD970389 or equivalent

NOTE
The sealant should be applied in a continuous bead approximately 4 mm (0.16 in.) in diameter.

(4) Assemble oil pan to cylinder block within 30 minutes after applying the sealant.
(5) Tighten the oil pan mounting bolt in the order illustrated (left).

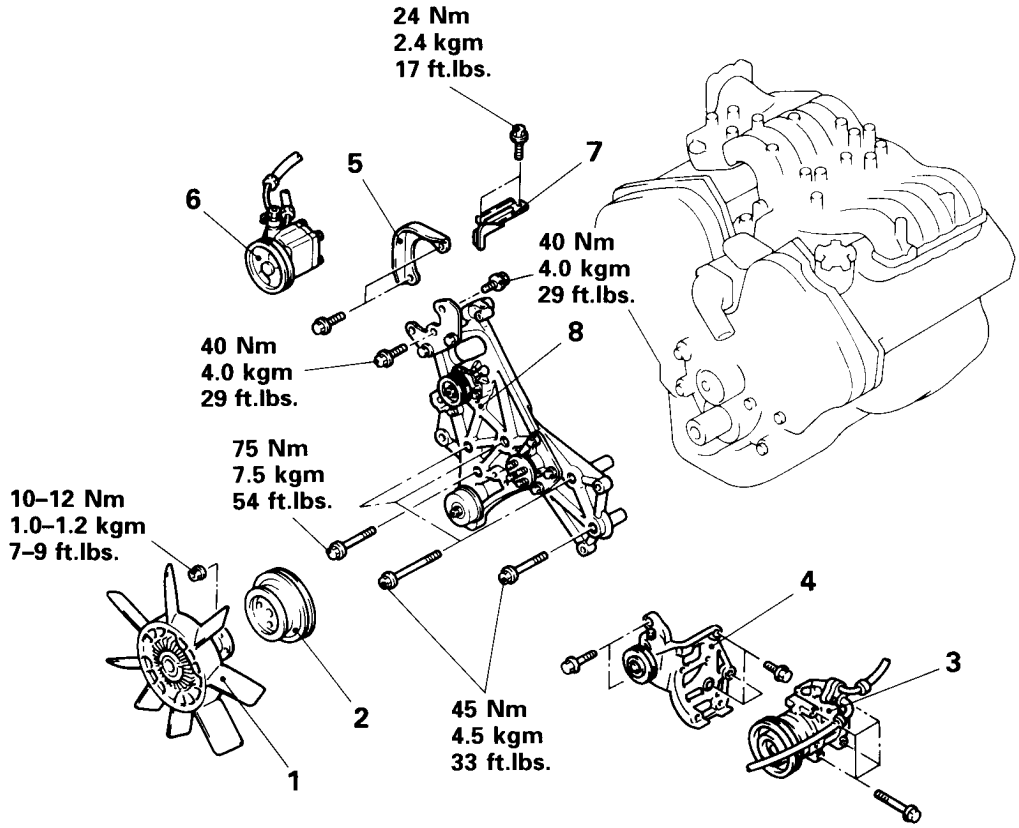
Caution
Insert the bolts Nos. (13) and (14) to the holes adequately, or the edge of the transmission may be damaged.

TIMING BELT

REMOVAL AND INSTALLATION

Pre-removal Operation
- Removal of Radiator (Refer to GROUP 14 – Radiator.)
- Removal of Alternator (Refer to GROUP 16 – Alternator.)
- Removal of Battery and Battery Tray
- Removal of the Under Skid Plate, Undercover, Air Guide Plate

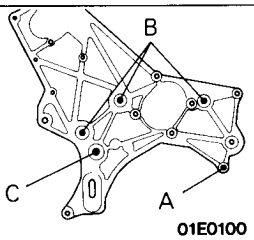
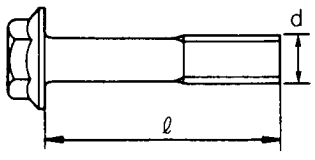
Post-installation Operation
- Installation of the Under Skid Plate, Undercover, Air Guide Plate
- Installation of Battery and Battery Tray
- Installation of Alternator (Refer to GROUP 16 – Alternator.)
- Installation of the Radiator (Refer to GROUP 14 – Radiator.)
- Adjustment of the Engine (Refer to P.11-72.)

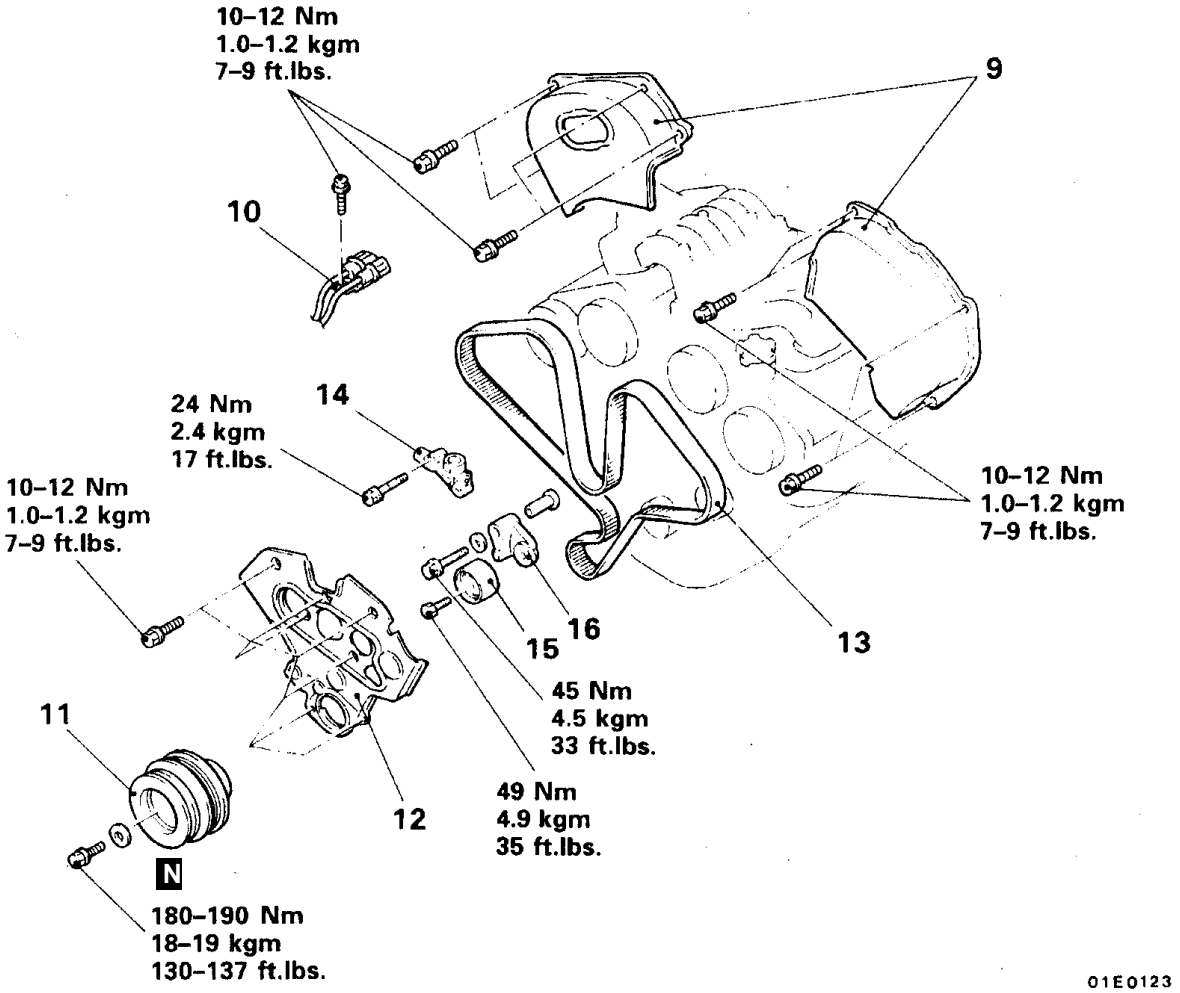


01E0124

Removal steps

1. Cooling fan clutch assembly
2. Water pump pulley
- ◆◆ 3. Compressor } <A/C>
4. Compressor bracket } <A/C>
5. Cover
- ◆◆ 6. Power steering oil pump
7. Accessory mount stay
8. Accessory mount

Symbol	Hardness category	d x ℓ mm	NOTE
A	7T	10 × 80 (0.39 × 3.15)	 01E0100  04U0025
B		10 × 100 (0.39 × 3.93)	
C		12 × 100 (0.47 × 3.93)	



9. Timing belt upper cover
10. Crankshaft position sensor connector

10a! Crankshaft pulley bolt – Заменяйте его на новый при каждом снятии!!! (Информационное письмо ИР-01-003Т)

11. Crankshaft pulley
12. Timing belt lower cover
    • Adjustment of timing belt tension
13. Timing belt
14. Auto tensioner
15. Tension pulley
16. Tension arm assembly

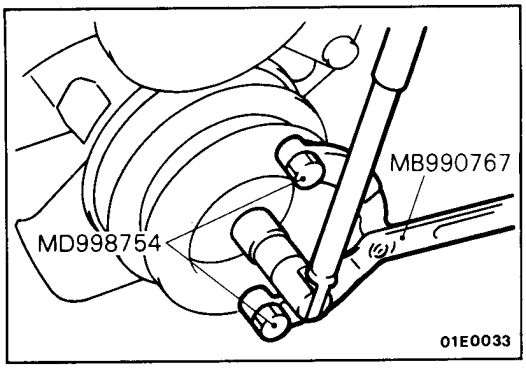
SERVICE POINTS OF REMOVAL

3. REMOVAL OF COMPRESSOR <A/C>/6. OIL PUMP (POWER STEERING)

Remove the oil pump and air conditioning compressor (with the hose attached)

NOTE

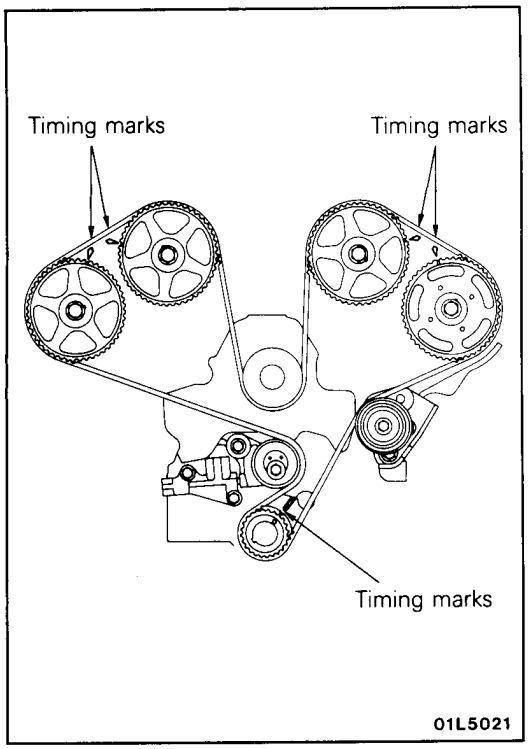
Suspend the removed oil pump (by using wire or similar material) at a place where no damage will be caused during removal/installation of the engine assembly.



11. REMOVAL OF CRANKSHAFT PULLEY

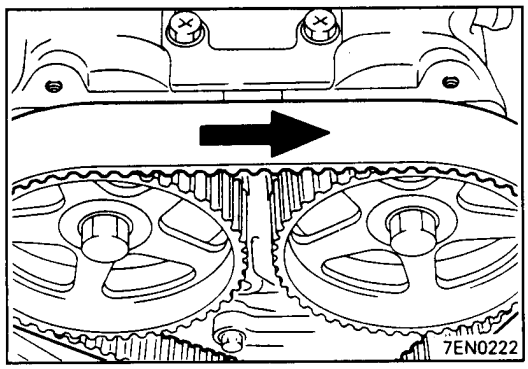
Using special tools, remove the crankshaft pulley from the crankshaft.

Caution
Use only the specified special tools, or a damaged pulley damper could result.



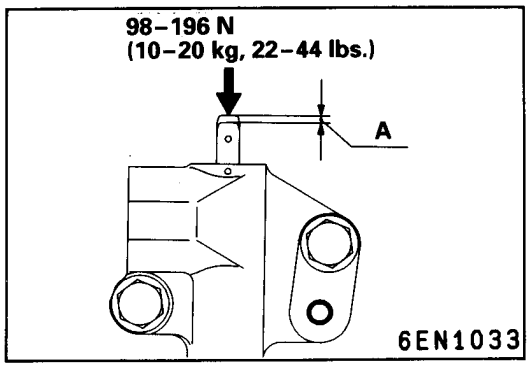
13. REMOVAL OF TIMING BELT

(1) Align the timing marks.



(2) Loosen the center bolt on the tensioner pulley to remove the timing belt.

Caution
1. **Make a mark on the back of the timing belt indicating the direction of rotation so it may be reassembled in the same direction if it is to be reused.**
2. **The cam of the front bank camshaft lifts the valve by means of the rocker arm, the spring force of the valve will easily turn the sprocket, so be careful not to insert your fingers, etc.**



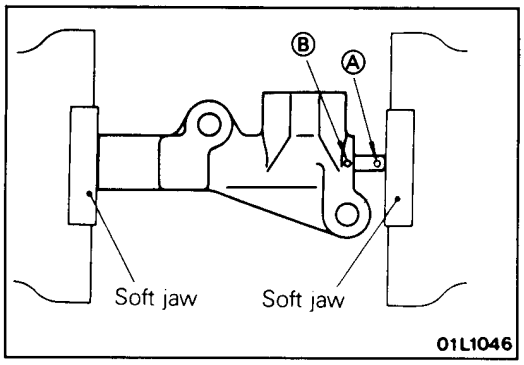
INSPECTION

AUTO TENSIONER

(1) Hold the auto-tensioner by hand and measure contraction (A) when pressing the tip of the rod on a steel (cylinder block, etc.) with a force of 98–196 N (10–20 kg, 22–44 lbs.).

Standard value (A): 1 mm (0.04 in.) or less

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



SERVICE POINTS OF INSTALLATION

14.INSTALLATION OF AUTO TENSIONER

(1) If the auto tensioner rod is in its fully extended position, reset it as follows.

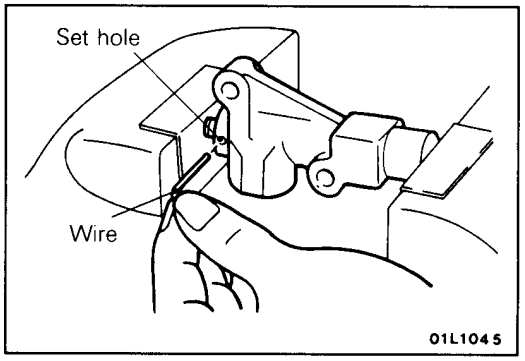
① Keep the auto tensioner level and, in that position, clamp it in the vise with soft jaws.

② Push in the rod little by little with the vise until the set hole Ⓐ in the rod is aligned with that Ⓑ in the cylinder.

Caution

1. The auto tensioner must be placed at a right angle to the pressing surface of press or vise.

2. Push in the rod slowly to prevent the push rod from being damaged.



③ Insert a wire [1.4 mm (0.055 in.) in diameter] into the set holes.

NOTE

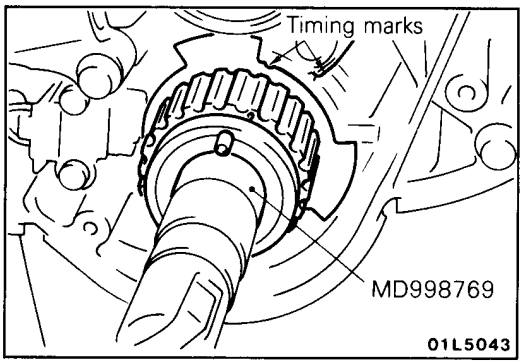
The wire should be as stiff as possible (such as piano wire, etc.), and should be bent into the shape of an "L".

④ Unclamp the auto tensioner from the vise.

(2) Install the auto tensioner.

Caution

Leave the wire installed in the auto tensioner.

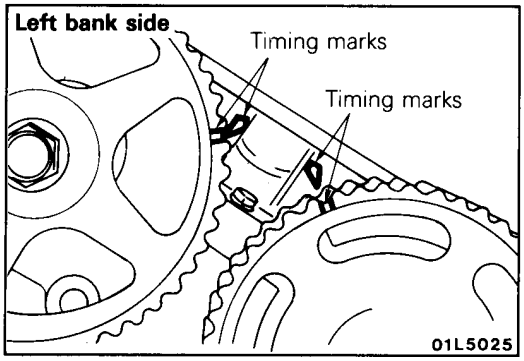


13.INSTALLATION OF TIMING BELT

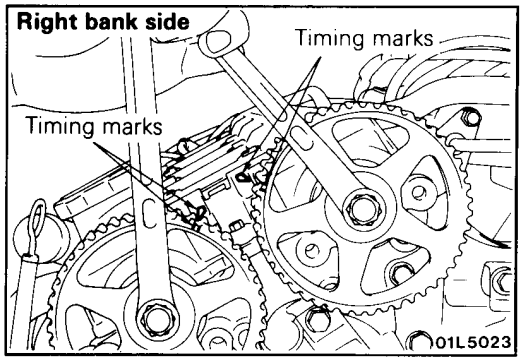
(1) Install the crankshaft pulley and turn the crankshaft sprocket timing mark forward 3 teeth to move the piston slightly past No.1 cylinder top dead centre.

Caution

When the camshaft sprocket is turned with No.1 cylinder top dead centre, there is a danger that the valve and piston will interfere.



(2) Align the timing mark of the left bank side camshaft sprocket.

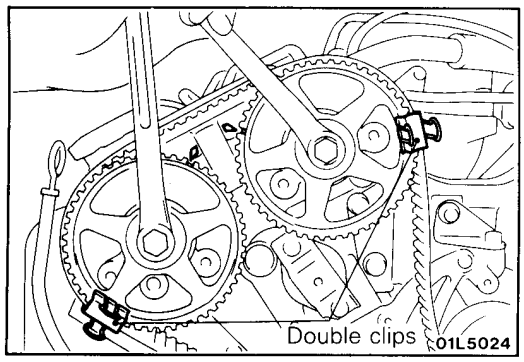


(3) Align the timing mark of the right bank side camshaft sprocket and .support it not to rotate with a closed wrench.

Caution

1. The camshaft sprocket will easily turn because of the valve spring force, so be careful not to insert your fingers, etc.

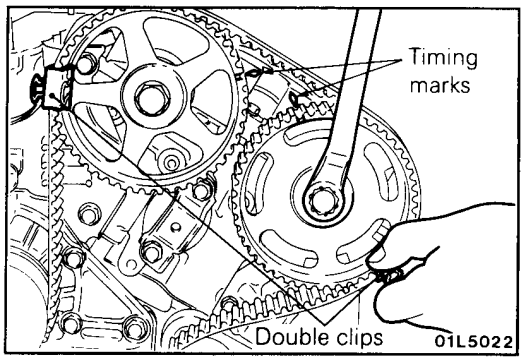
2. If the sprocket on one side of the right bank is turned one full revolution while the sprocket timing marks on the opposite side of the right bank are aligned, the intake and exhaust valves may cause interference.



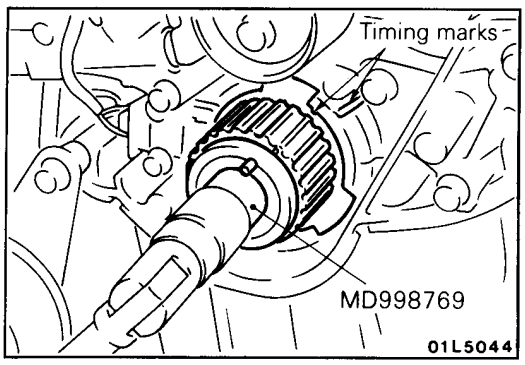
(4) Check that the camshaft sprocket timing mark of the right bank side is aligned and clamp timing belt with double clips.

Caution

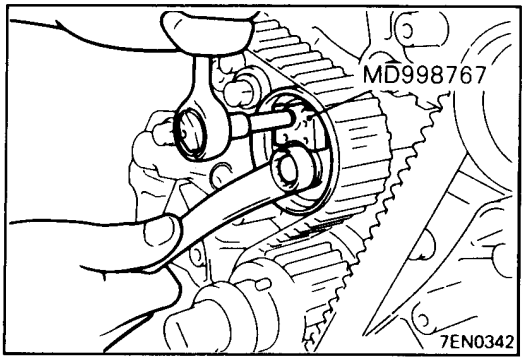
If the timing belt is reused, install so that the arrow marked on it at the time of removal is pointing in the clockwise direction.



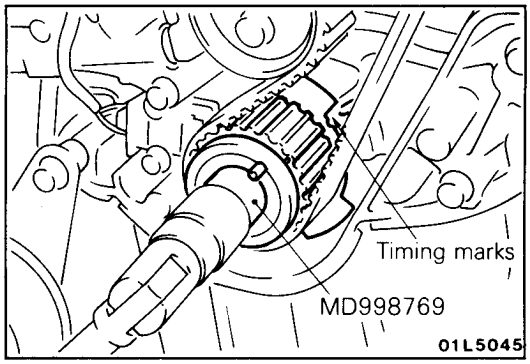
(5) Set the timing belt onto the water pump pulley.
(6) Check that the camshaft sprocket timing mark of the left bank side is aligned and clamp the timing belt with double clips.
(7) Set the timing belt onto the idler pulley.



(8) After aligning the crankshaft sprocket timing marks, turn the crankshaft one touch anticlockwise.
(9) Set the timing belt onto the crankshaft sprocket.
(10) Set the timing belt onto the tensioner pulley.

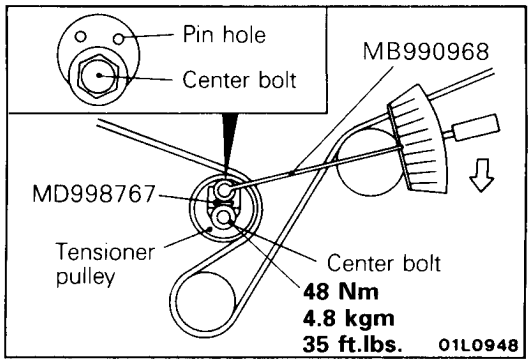


(11) Place the tensioner pulley pin hole so that it is towards the top. Press the tensioner pulley onto the timing belt, .and provisionally tighten the fixing bolt.
(12) Align the crankshaft sprocket timing marks.
(13) Check that each of the sprocket timing mark is aligned.
(14) Remove the 4 double clips.



• ADJUSTMENT OF TIMING BELT TENSION

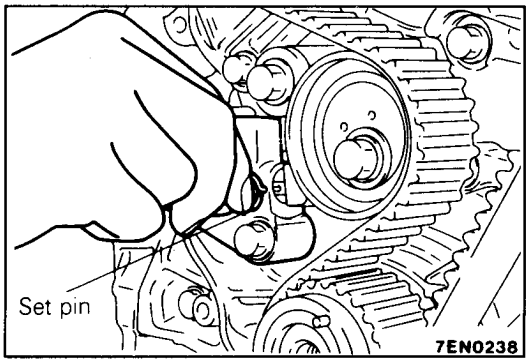
(1) After turning the crankshaft a 1/4 turn anticlockwise, turn it clockwise to the position where the timing marks are aligned.



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

Reference value: 9.4 Nm (0.96 kgm, 7 ft.lbs.)
(Timing belt tensioning torque)

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



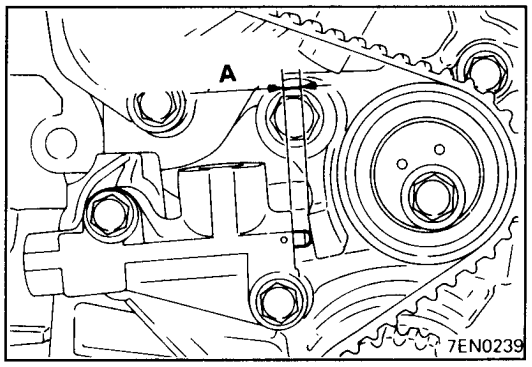
(3) Remove the set pin from the auto tensioner. At this time, make sure that the set pin can be easily removed.
(4) Rotate the crankshaft two turns clockwise and leave it as is for five minutes or more. Then, check again that the set pin can be easily removed from, and installed to, the auto tensioner.

NOTE
Even if the set pin cannot be easily inserted, the auto tensioner is normal if its rod protrusion is within specification.

Standard value (A): 3.8–4.5 mm (0.149–0.177 in.)

If the protrusion is out of specification, repeat steps (1) to (4).

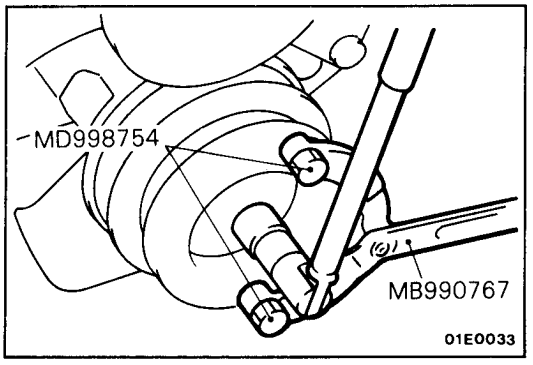
(5) Check again that timing marks on all sprockets are aligned properly.



11. INSTALLATION OF CRANKSHAFT PULLEY

Using the special tool, attach the crankshaft pulley to the crankshaft.

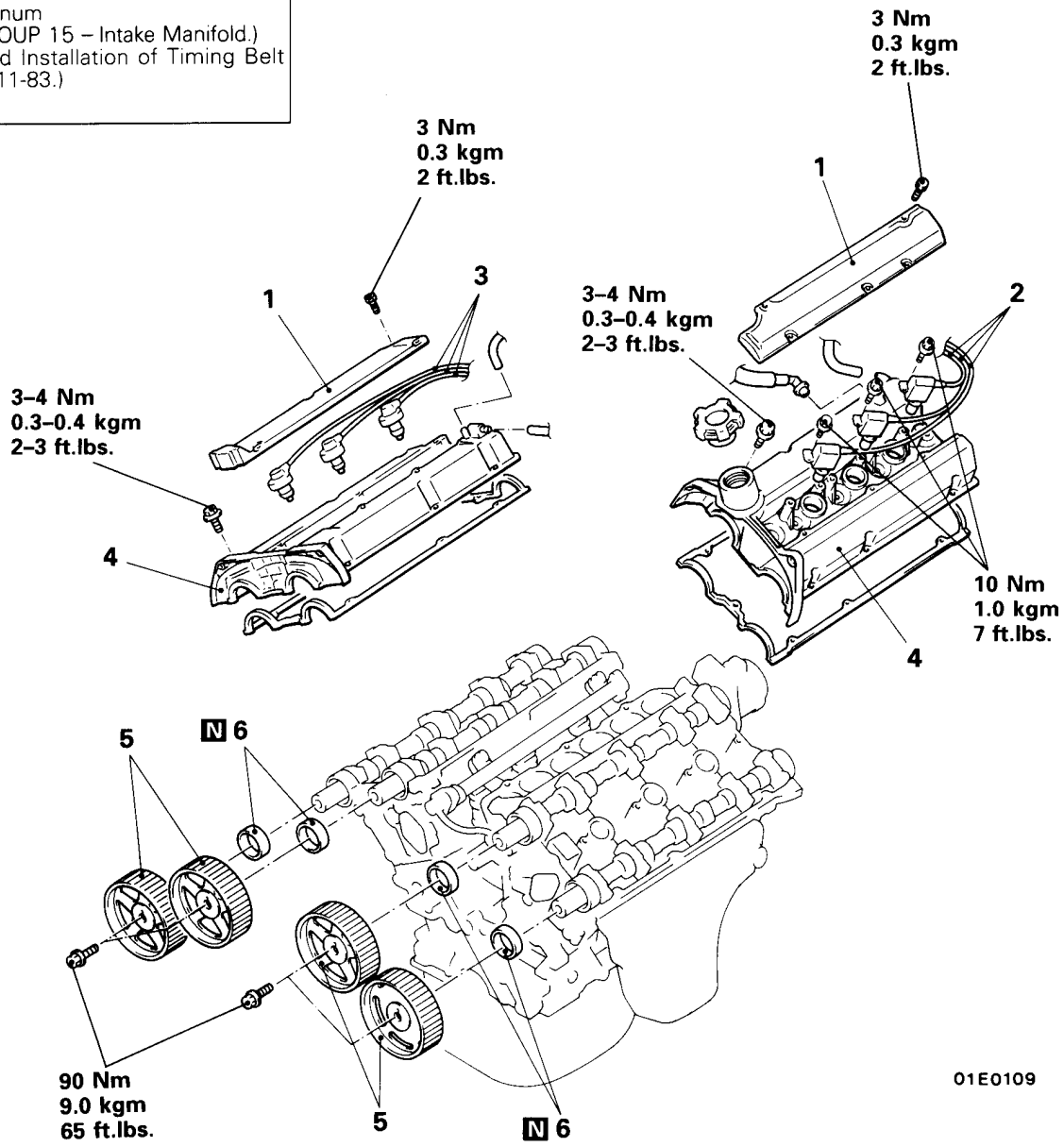
Caution
Use only the specified special tools, otherwise a damaged pulley damper could result.



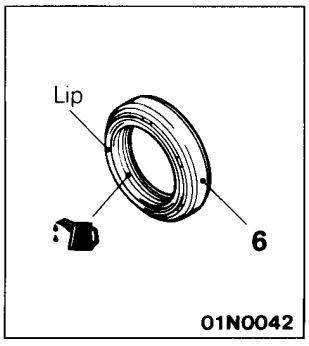
CAMSHAFT OIL SEAL

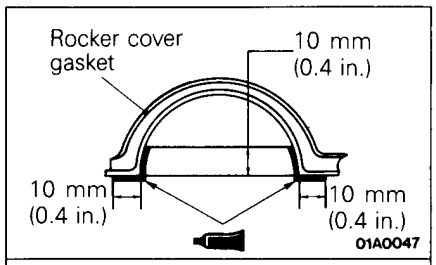
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Removal and Installation of the Intake Manifold Plenum (Refer to GROUP 15 – Intake Manifold.)
- Removal and Installation of Timing Belt (Refer to P.11-83.)

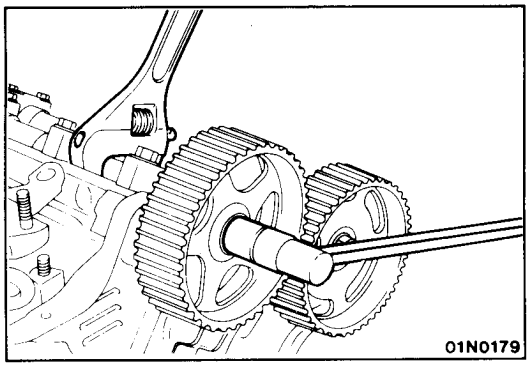


Removal steps
1. Center cover
2. Ignition coil
3. Spark plug cable
4. Rocker cover
5. Camshaft sprocket
6. Camshaft oil seals





Sealant: 3M ATD Part No. 8660 or equivalent

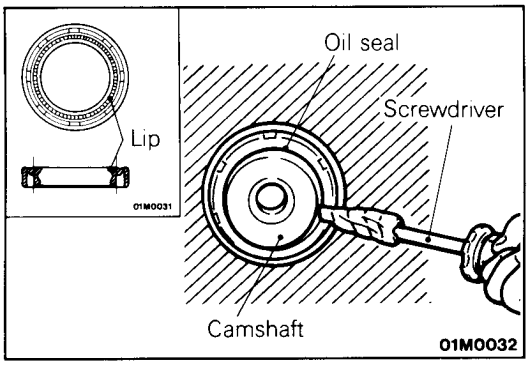


SERVICE POINTS OF REMOVAL

5. REMOVAL OF CAMSHAFT SPROCKET

Using a wrench at the hexagonal part of the camshaft (to prevent the crankshaft from turning), loosen the camshaft sprocket bolt.

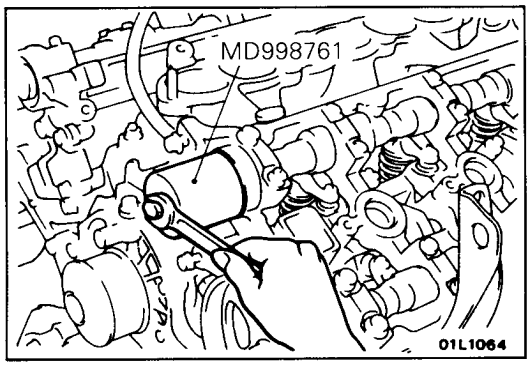
Caution
Do not hold the camshaft sprocket with a tool, or a damaged sprocket could result.



6. REMOVAL OF CAMSHAFT OIL SEAL

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

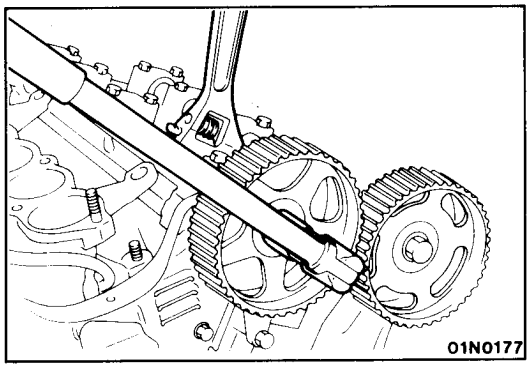
Caution
Use care not to damage the camshaft and cylinder head.



SERVICE POINTS OF INSTALLATION

6. INSTALLATION OF CAMSHAFT OIL SEAL

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



5. INSTALLATION OF CAMSHAFT SPROCKET

Using a wrench at the hexagonal part of the camshaft (to prevent the crankshaft from turning), tighten the camshaft sprocket bolt.

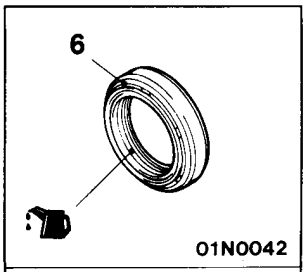
Caution
Do not hold the camshaft sprocket with a tool, or a damaged sprocket could result.

CRANKSHAFT OIL SEALS

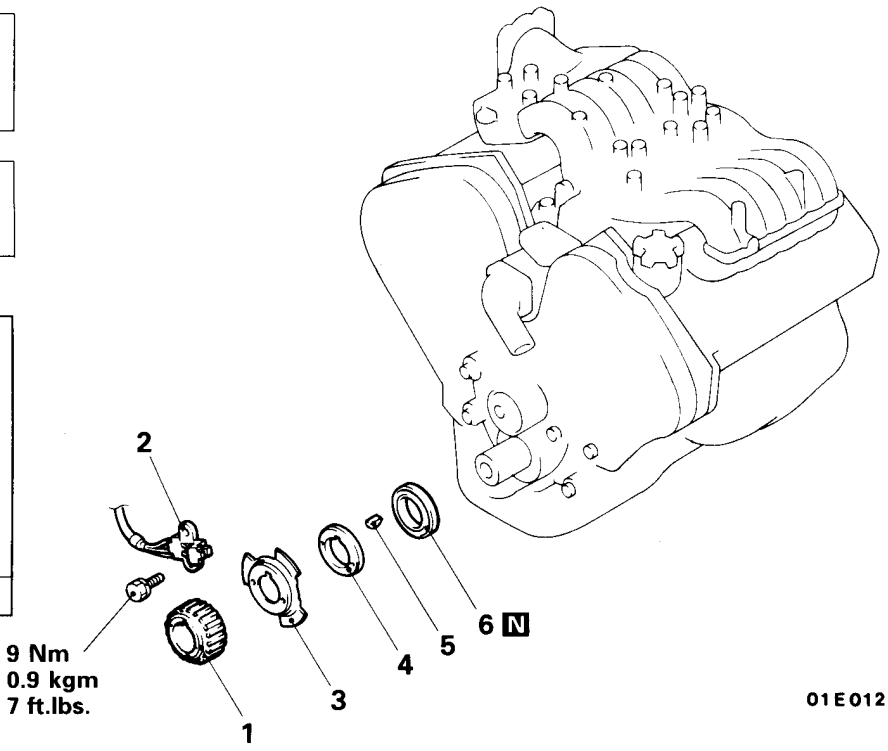
FRONT OIL SEAL
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Removal and Installation of Timing Belt (Refer to P.11-83.)

Adjustment
- Engine Adjustment (Refer to P.11-72.)

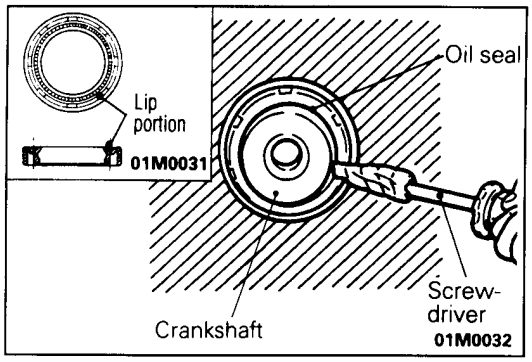


Engine oil



Removal steps
1. Crankshaft sprocket
2. Crankshaft position sensor
3. Crankshaft sensing blade
4. Crankshaft spacer
5. Key

◀■▶ ▶■◀ 6. Crankshaft front oil seal

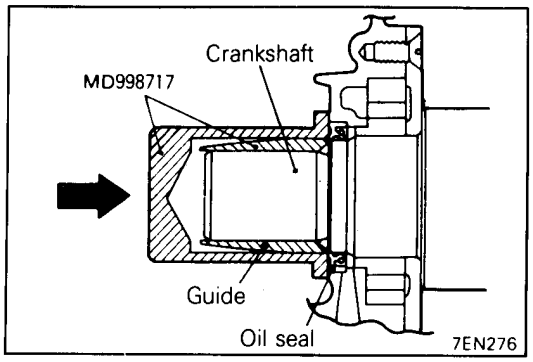


SERVICE POINT OF REMOVAL M11ZLAC

6. REMOVAL OF OIL SEAL

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

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



SERVICE POINTS OF INSTALLATION M11ZNAC

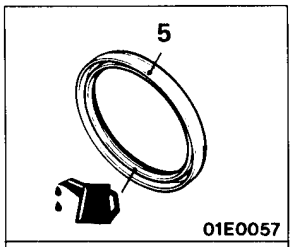
6. INSTALLATION OF OIL SEAL

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

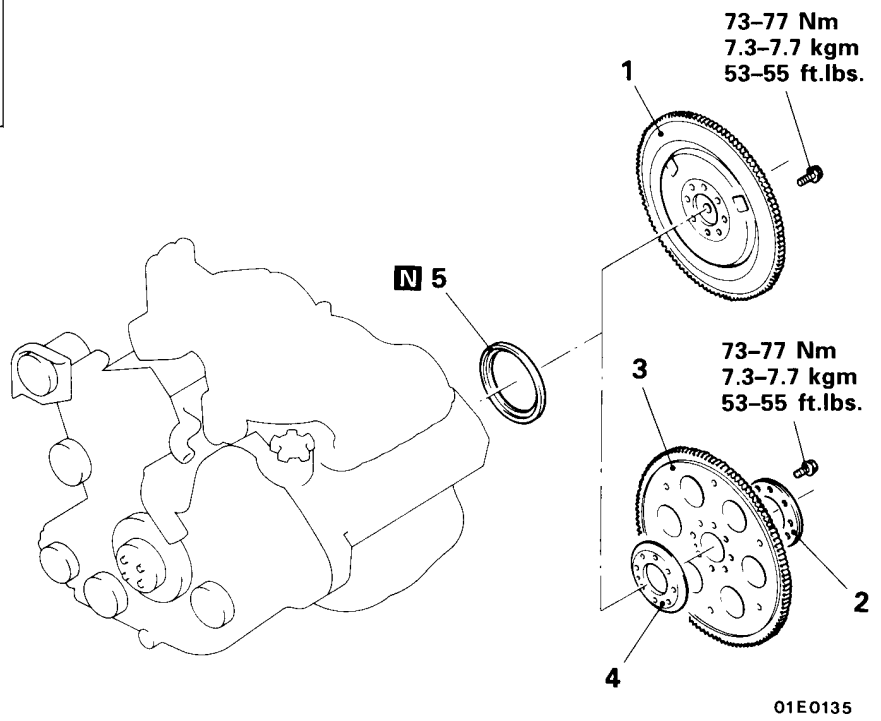
NOTE
Knock it as far as the surface.

REAR OIL SEAL
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
Removal and Installation
- Transmission
  (Refer to GROUP 22, 23 – Transmission and Transfer Assembly.)
- Clutch <M/T>

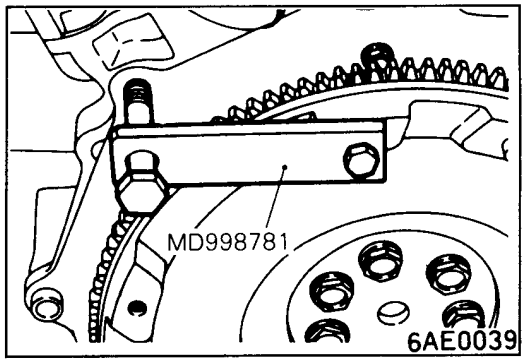


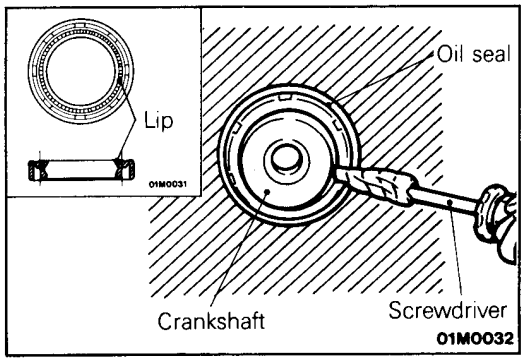
Engine oil



Removal steps

◆◆ ◆◆ 1. Flywheel assembly <M/T>
◆◆ ◆◆ 2. Adaptor plate A } <A/T>
◆◆ ◆◆ 3. Drive plate } <A/T>
◆◆ ◆◆ 4. Adaptor plate B } <A/T>
◆◆ ◆◆ 5. Oil seal





SERVICE POINTS OF REMOVAL

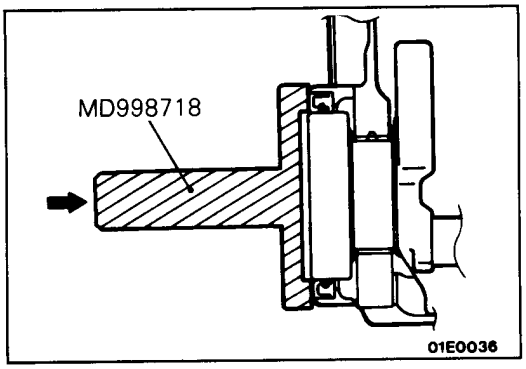
1. REMOVAL OF FLYWHEEL ASSEMBLY <M/T>/3. DRIVE PLATE <A/T>

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

5. REMOVAL OF OIL SEAL

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

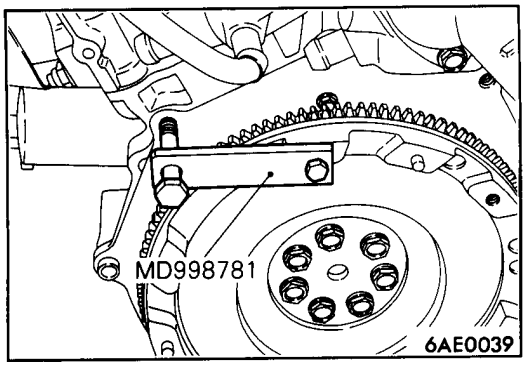
Caution
Take care not to damage the crankshaft and oil seal case.



SERVICE POINTS OF INSTALLATION

5. INSTALLATION OF OIL SEAL

Using the special tool, press-fit a new crankshaft rear oil seal into the oil seal case.



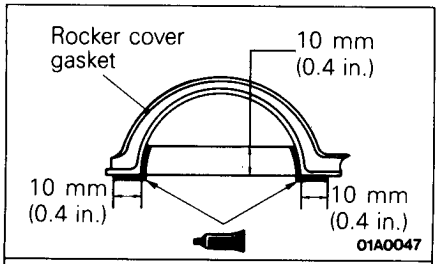
3. INSTALLATION OF DRIVE PLATE <A/T> / 1. FLYWHEEL ASSEMBLY <M/T>

Use the special tool to secure the flywheel or drive plate, and then tighten the bolt to the specified torque.

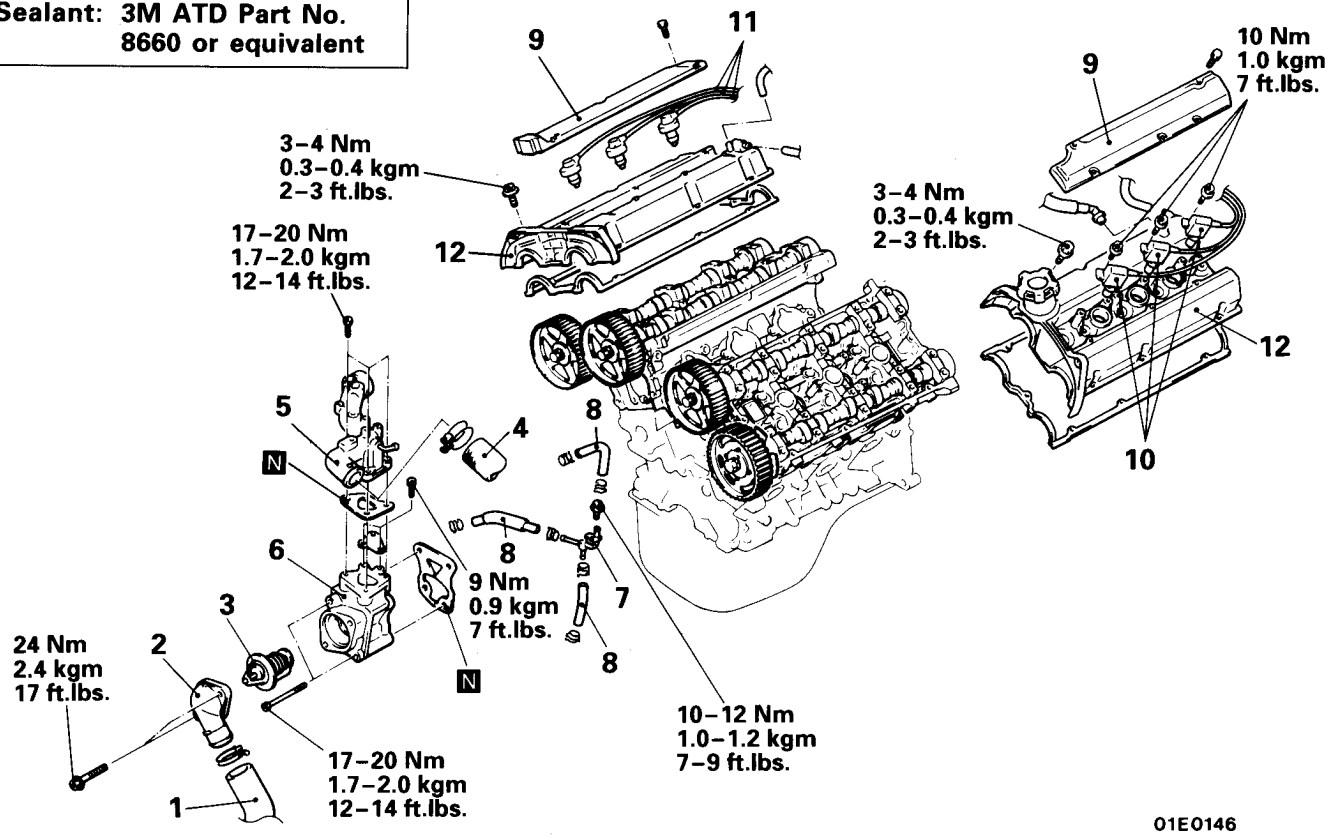
CYLINDER HEAD GASKET

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Supplying (Refer to GROUP 14 – Service Adjustment procedures.)
- Removal and Installation of Timing Belt (Refer to P.11-83)
- Removal and Installation of Intake Manifold (Refer to GROUP 15 – Intake Manifold.)
- Removal and Installation of Exhaust Manifold (Refer to GROUP 15 – Exhaust Manifold.)

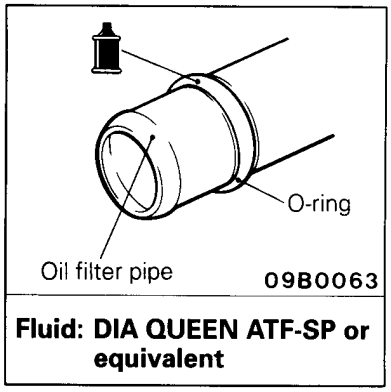


Sealant: 3M ATD Part No. 8660 or equivalent

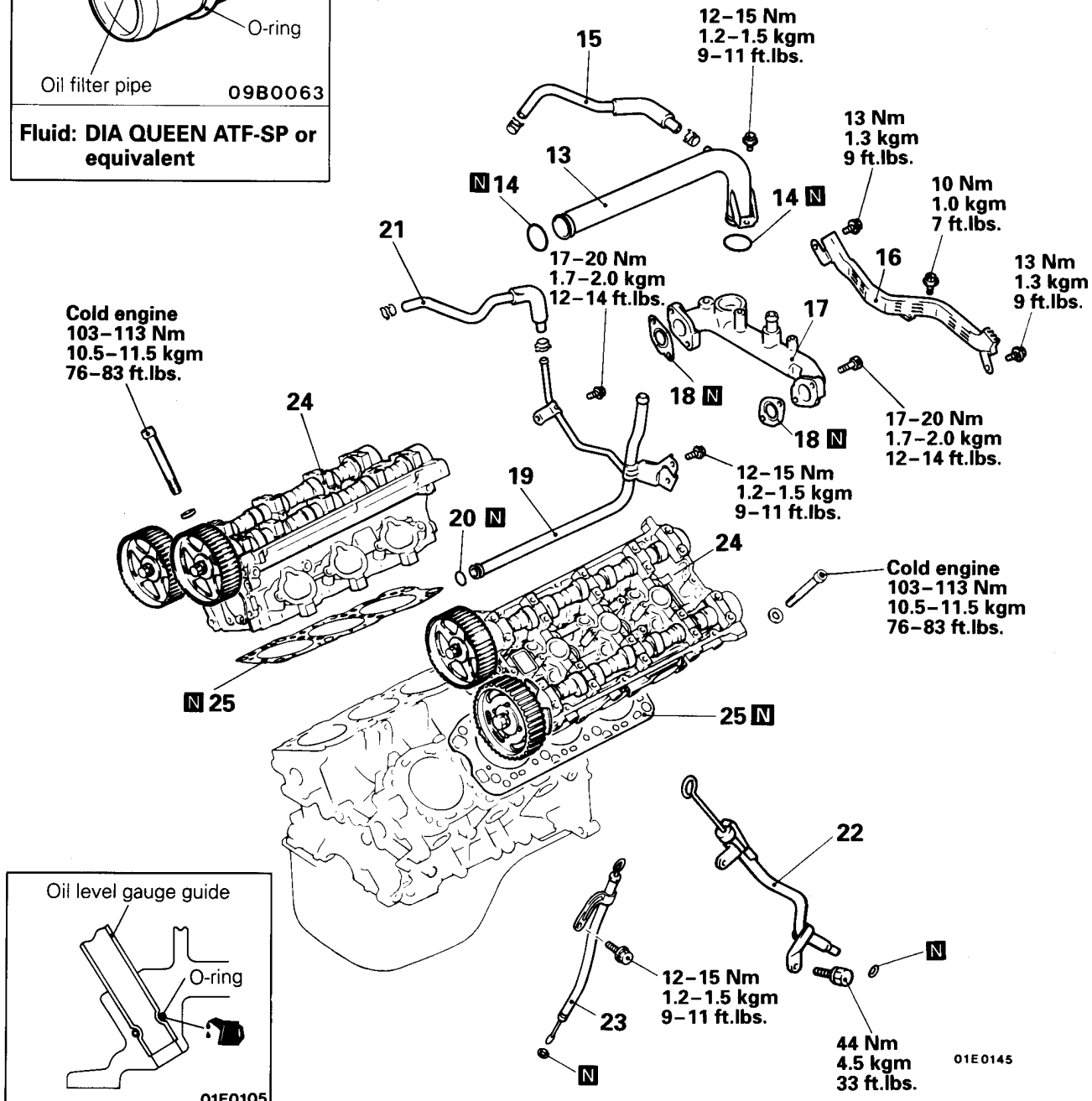


Removal steps

1. Radiator lower hose connection
2. Water inlet fitting
3. ◆◆ Thermostat
4. Radiator upper hose connection
5. Water outlet fitting
6. Thermostat case
7. Water line joint
8. Water hose
9. Centre cover
10. Ignition coil
11. Spark plug cable
12. Rocker cover

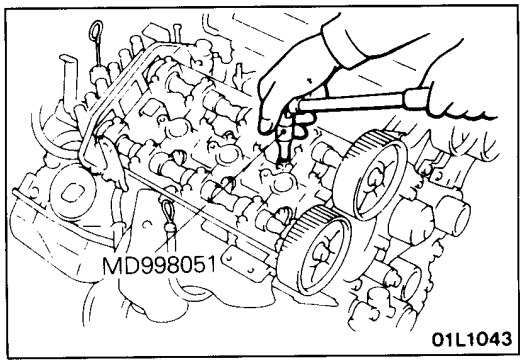


Fluid: DIA QUEEN ATF-SP or equivalent



Engine oil

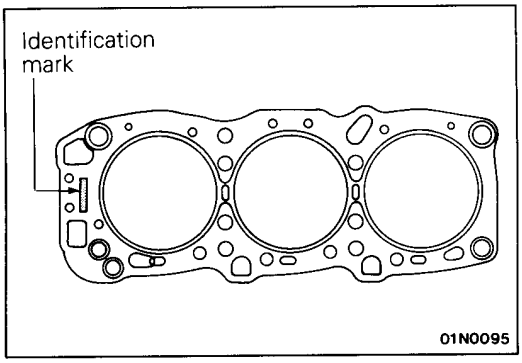
13. Water outlet pipe
14. O-ring
15. Water hose
16. Spark plug cable support
17. Water passage
18. Gasket
19. Water pipe assembly
20. O-ring
21. Water hose
22. Oil filler pipe
23. Oil level gauge guide
24. Cylinder head assembly
25. Cylinder head gasket



SERVICE POINTS OF REMOVAL

24. REMOVAL OF CYLINDER HEAD ASSEMBLY

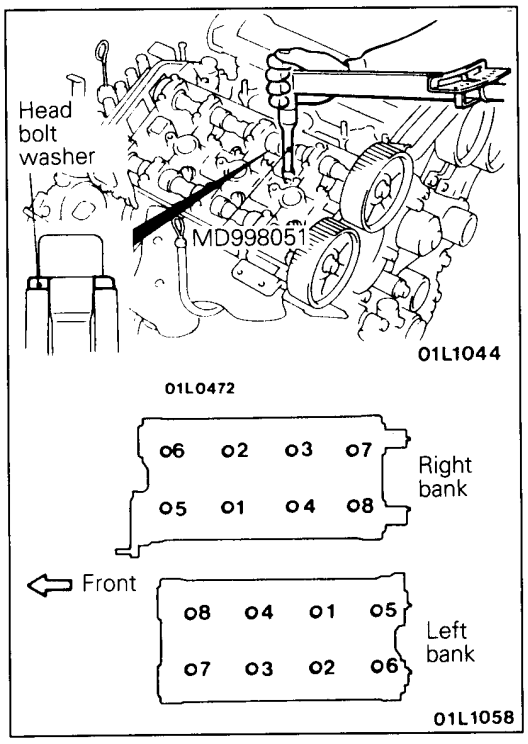
Using the special tool, after loosening the bolts (in 2 or 3 cycles), remove, and then remove the cylinder head assembly.



SERVICE POINTS OF INSTALLATION

25. INSTALLATION OF CYLINDER HEAD GASKET

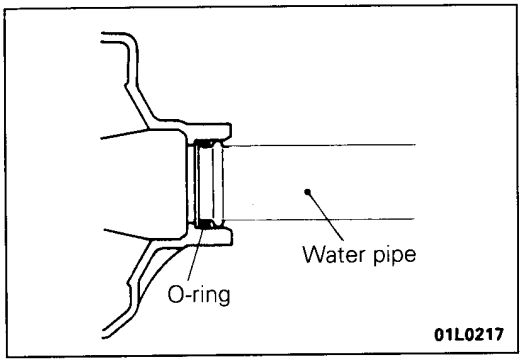
(1) Degrease the mounting surface of the cylinder head gasket.
(2) Lay the cylinder head gasket on cylinder block with the identification mark at front top.



24. INSTALLATION OF CYLINDER HEAD ASSEMBLY

Using the special tool, tighten the bolts in the order shown in two or three steps.

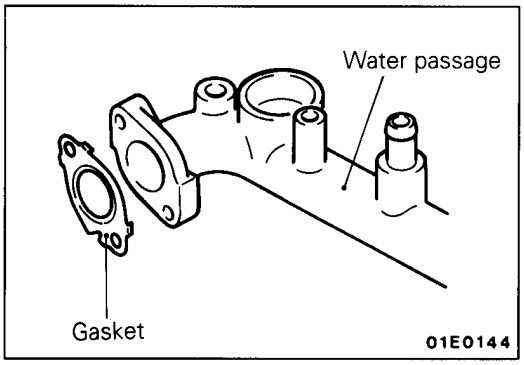
Caution
Attach the head bolt washer in the direction shown in the figure.



20./14. INSTALLATION OF O-RINGS

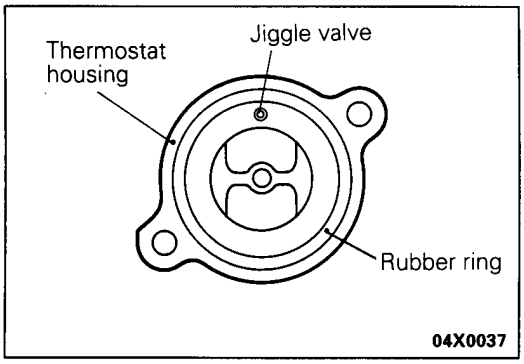
Rinse the mounting location of the O-ring and water pipe with water, and install the O-ring and water pipe.

Caution
1. **Do not apply oil and grease to water pipe O-ring.**
2. **Keep the water pipe connections free of stand, dust, etc.**
3. **Insert water pipe until its end bottoms.**



18. INSTALLATION OF GASKET/17. WATER PASSAGE

(1) Install the gasket to the cylinder head as shown in the figure.
(2) Install the water passage to the cylinder head.



3. INSTALLATION OF THERMOSTAT

Install the thermostat so that the jiggle valve is facing straight up and is aligned with the mark on the thermostat case as shown in the illustration.

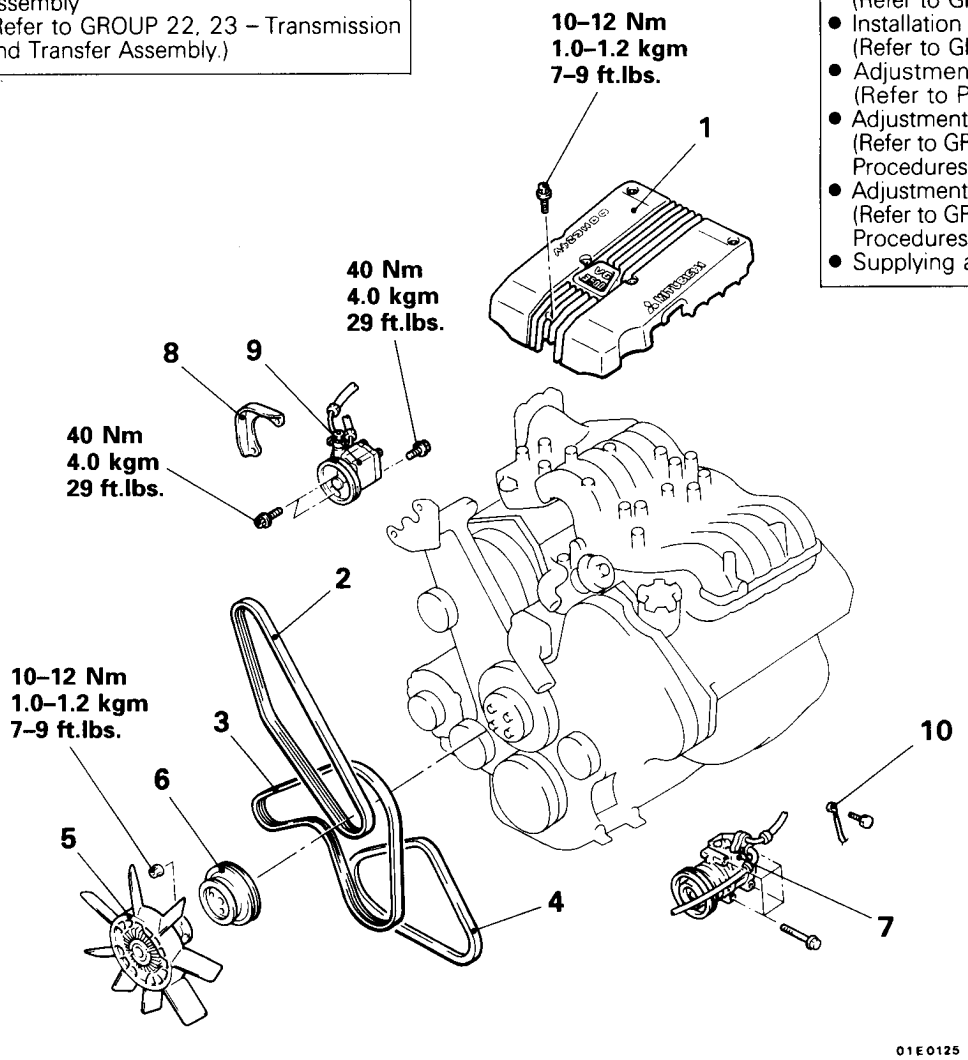
Caution
Make absolutely sure that no oil is adhering to the rubber ring of the thermostat. In addition, be careful not to fold over or scratch the rubber ring when inserting.

ENGINE ASSEMBLY

REMOVAL AND INSTALLATION

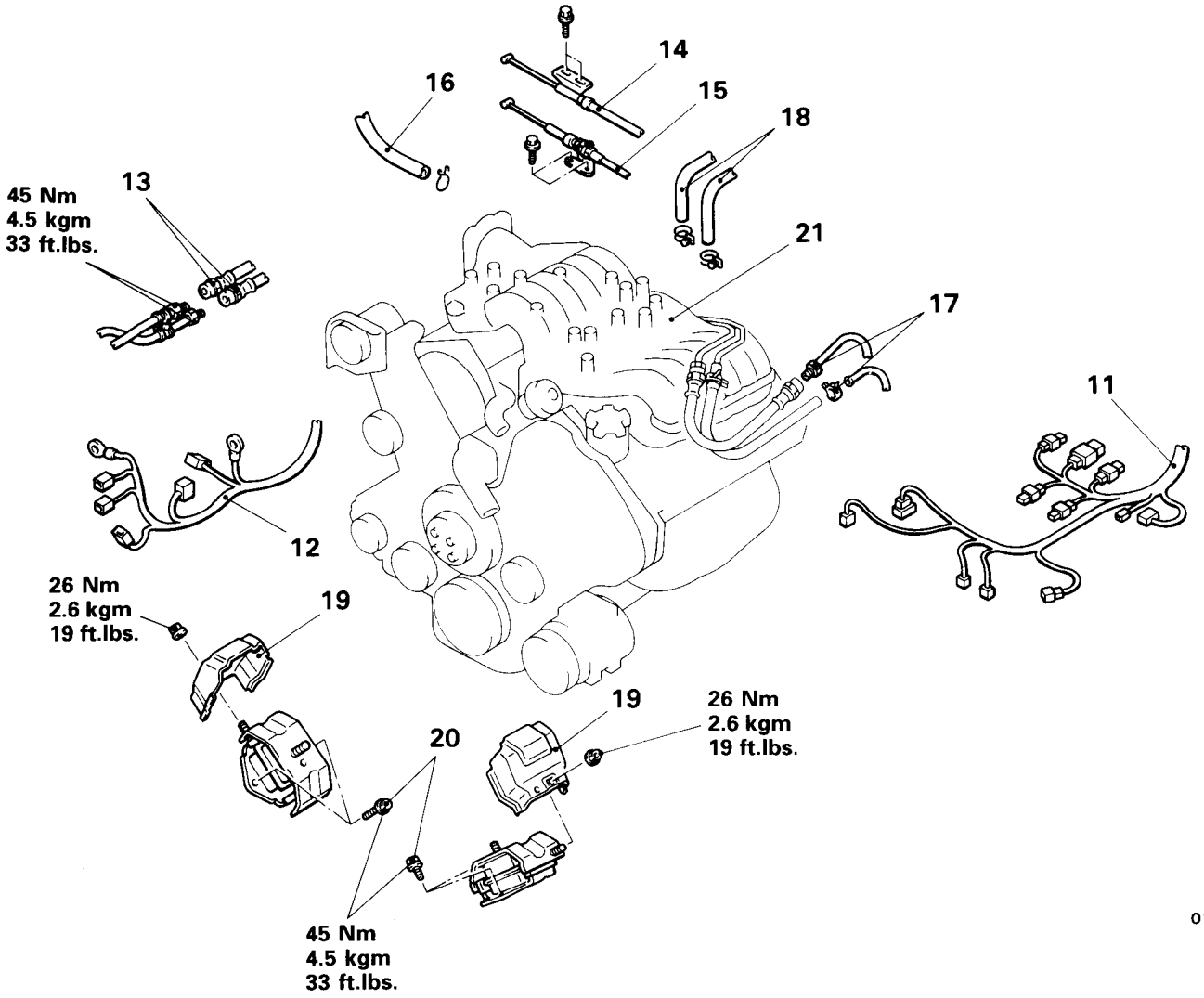
Pre-removal Operation
- Removal of Hood
  (Refer to GROUP 42 – Hood.)
- Removal of Battery and Battery Tray
- Removal of Cruise Control Intermediate Link
  (Refer to GROUP 13 – Cruise Control.)
- Removal of Radiator
  (Refer to GROUP 14 – Radiator.)
- Removal of the Under Skid Plate, Undercover, Air Guide Plate
- Removal of Front Exhaust Pipe
  (Refer to GROUP 15 – Exhaust Pipe, Muffler and Catalytic Converter.)
- Removal of Transmission and Transfer Assembly
  (Refer to GROUP 22, 23 – Transmission and Transfer Assembly.)

Post-installation Operation
- Installation of Transmission and Transfer Assembly
  (Refer to GROUP 22, 23 – Transmission and Transfer Assembly.)
- Installation of Front Exhaust Pipe
  (Refer to GROUP 15 – Exhaust Pipe, Muffler and Catalytic Converter.)
- Installation of the Under Skid Plate, Undercover, Air Guide Plate
- Installation of Radiator
  (Refer to GROUP 14 – Radiator.)
- Installation of Battery and Battery Tray
- Installation and Adjustment of Cruise-Control Intermediate Link
  (Refer to GROUP 13 – Cruise Control.)
- Installation of Hood
  (Refer to GROUP 42 – Hood.)
- Adjustment of Engine
  (Refer to P.11-72)
- Adjustment of Accelerator Cable
  (Refer to GROUP 13 – Service Adjustment Procedures.)
- Adjustment of Throttle Cable
  (Refer to GROUP 23 – Service Adjustment Procedures.)
- Supplying and Checking of Engine Oil



Removal steps

1. Intake air plenum cover
2. Power steering drive belt
3. Alternator drive belt
4. Air conditioner drive belt
5. Cooling fan
6. Water pump pulley
7. Air conditioner compressor
8. Cover
9. Power steering oil pump
10. Earth cable connection



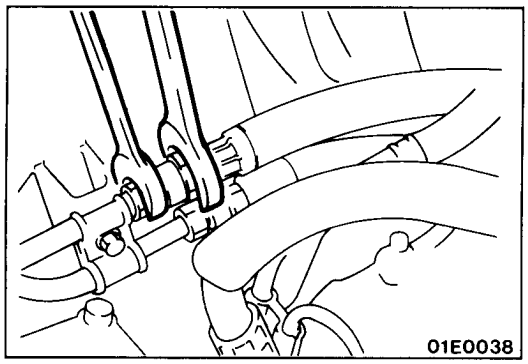
11. Engine control harness connection
12. Alternator & starter harness connection
13. Engine oil cooler hose connection
14. Accelerator cable connection
15. Throttle cable connection
16. Brake booster vacuum hose connection
17. Fuel hose connection
18. Heater hose connection
19. Heat protectors
20. Engine mounting bolts
21. Engine assembly

SERVICE POINTS OF REMOVAL

7. REMOVAL OF COMPRESSOR <A/C>/9. OIL PUMP (POWER STEERING)

Remove the oil pump and air conditioner compressor (with the hose attached).

NOTE
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.



13. REMOVAL OF OIL COOLER HOSE CONNECTION

Use a spanner or similar tool to remove the oil cooler hose connection.

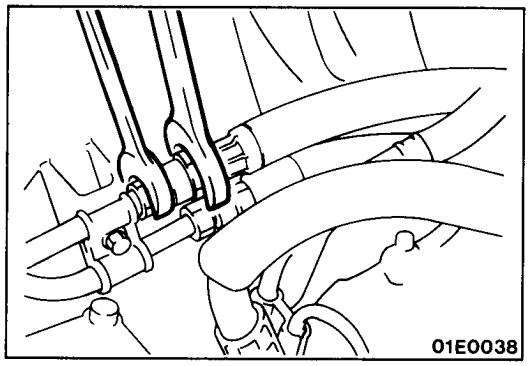
21. REMOVAL OF ENGINE ASSEMBLY

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

SERVICE POINTS OF INSTALLATION M11SDBE

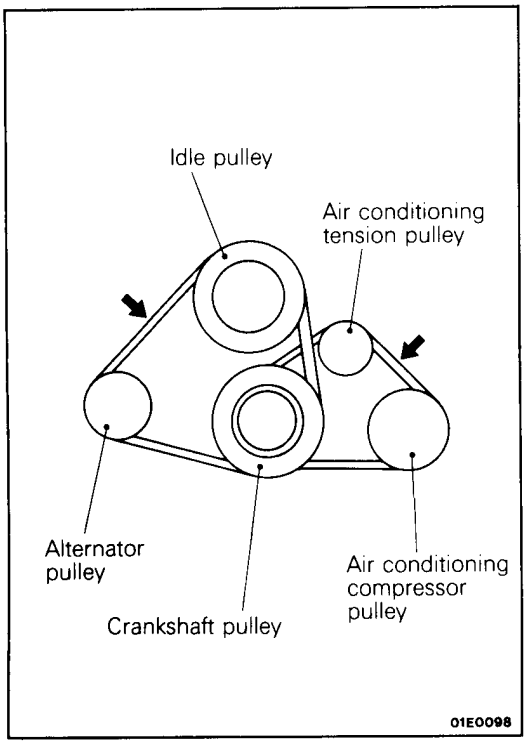
21. INSTALLATION OF ENGINE ASSEMBLY

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



13. CONNECTION OF OIL COOLER HOSE

Use a spanner or similar tool to connect the oil cooler hose.



ENGINE <4M40>

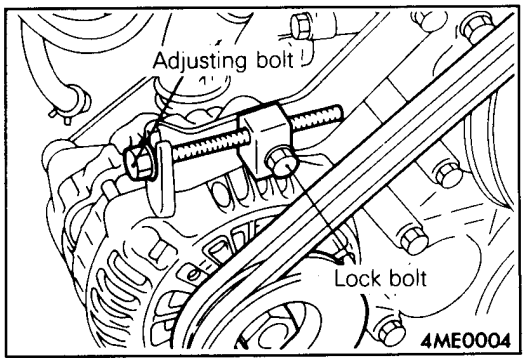
SERVICE ADJUSTMENT PROCEDURES

DRIVE BELTS TENSION INSPECTION AND ADJUSTMENT

Check the tension by pushing at the centre of the belt between pulleys with a force of 100 N (10 kg, 22 lbs.) as shown in the figure. Measure drive belt flexion.

Standard value:

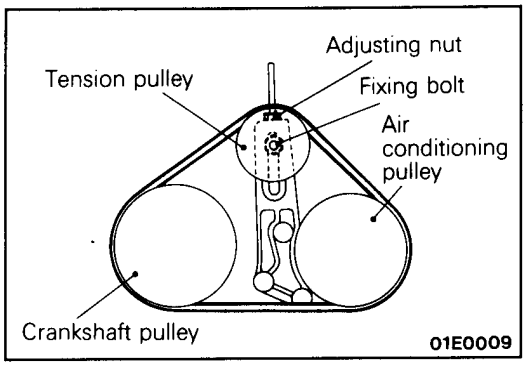
Item	Check value	Adjustment value	
		Used belt	New belt
For alternator	8.0–11.0 mm (0.31–0.43 in.)	9.0–11.0 mm (0.35–0.43 in.)	8.0–9.0 mm (0.31–0.35 in.)
For A/C	6.0–8.0 mm (0.24–0.31 in.)	6.0–8.0 mm (0.24–0.31 in.)	5.0–6.0 mm (0.20–0.24 in.)



ALTERNATOR DRIVE BELT TENSION ADJUSTMENT

(1) Loosen the nut on the alternator pivot bolt.
(2) Loosen the lock bolt.
(3) Turn the adjusting bolt to adjust the belt so that the amount of flexion is at the standard value.
(4) Tighten the lock nut and pivot nut to the specified torques.
(5) Crank the engine one or more turns in the clockwise direction, and then check the amount of belt deflection.

Caution
Always replace the two V-belts together as a set, and do not apply any oil to the belts.

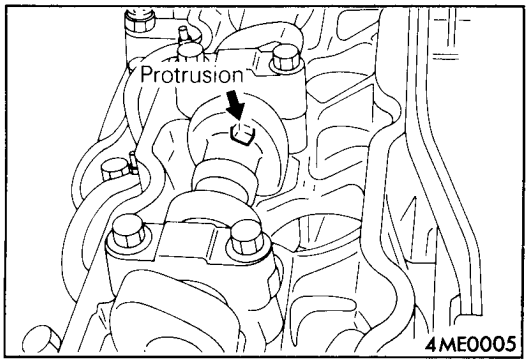


A/C COMPRESSOR DRIVE BELT TENSION ADJUSTMENT

(1) Loosen the tension pulley fixing bolt.
(2) Adjust belt tension with the adjusting nut.
(3) Tighten the fixing bolt.
(4) Crank the engine once or more.
(5) Check the belt tension.

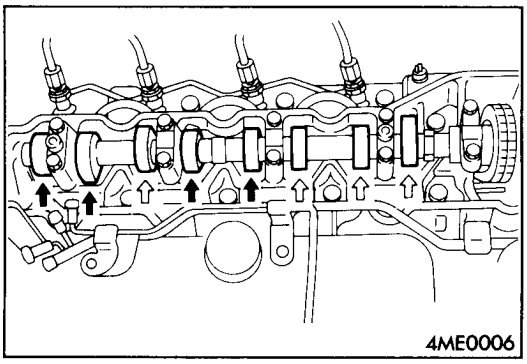
VALVE CLEARANCE INSPECTION AND ADJUSTMENT

(1) Warm up the engine until the engine coolant temperature is 80–95°C. (176–203°F)
(2) Remove the rocker cover.
(3) Remove the glow plug plate and all of the glow plugs from the cylinder head.



(4) Align the notch of the crankshaft pulley with the "0" timing mark to set the No. 1 or No. 4 cylinder to the compression top dead centre position.

NOTE
If the protrusion on the camshaft is pointing directly upwards, the No. 1 cylinder will be at the compression top dead centre position. If the crankshaft is then turned once, the No. 4 cylinder will then be at the compression top dead centre position.



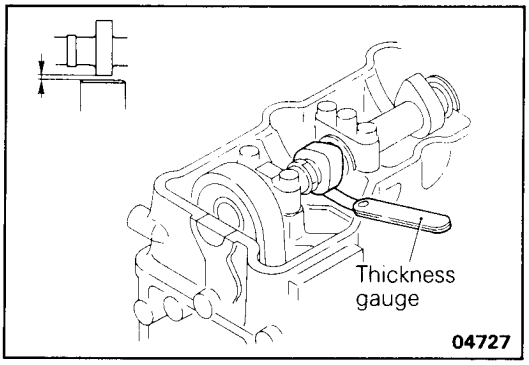
(5) Check the valve clearances at the places indicated by arrows in the illustration by the following procedure.

⇦ : When No. 1 cylinder is at compression top dead centre position
⬅ : When No. 4 cylinder is at compression top dead centre position

① Use a thickness gauge to measure the valve clearance.

Standard value
Intake side: 0.25 mm (0.010 in.)
Exhaust side: 0.35 mm (0.014 in.)

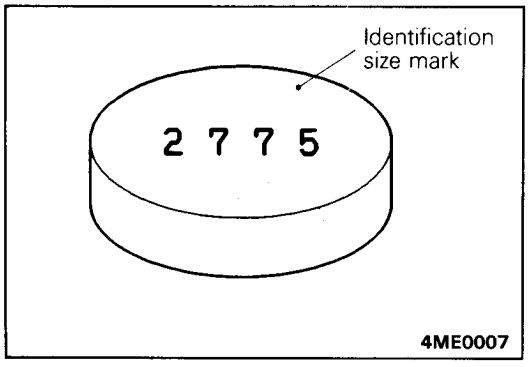
NOTE
There should be a certain amount of resistance against the thickness gauge when taking the measurements.
If the thickness gauge is moving too smoothly, a correct measurement cannot be obtained.



② Re-measure places which are outside the standard value, and make a note of these measurements.
③ Use the measured values as a reference for selecting adjustment/shims which will bring the incorrect valve clearances to the standard value.

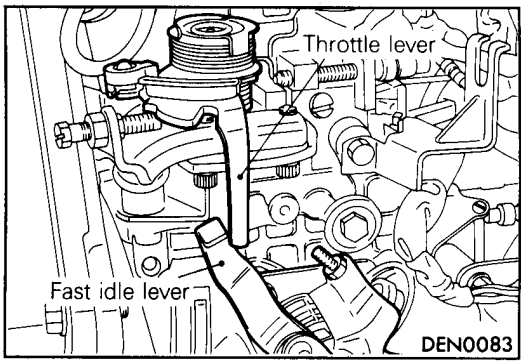
Adjustment shim thickness = Thickness of installed shims + (measured value – Standard value)

NOTE
- The thicknesses of the adjustment shims are between 2.250–3.150 mm (0.089–0.124 in.) (37 types which increase in thickness by 0.025 mm (0.001 in.))
- Size identification mark. "2775" = 2.775 mm (0.109 in.) thickness



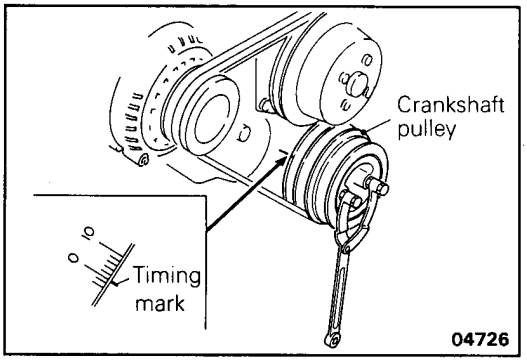
④ Remove the camshaft and install the shim which was selected in step ③.
⑤ Re-measure the valve clearances and check that they are all at the standard value.

(6) Turn the crankshaft once to align the notch of the crankshaft pulley with the timing mark "0".
(7) Check and adjust the other valve clearances according to the step (5).

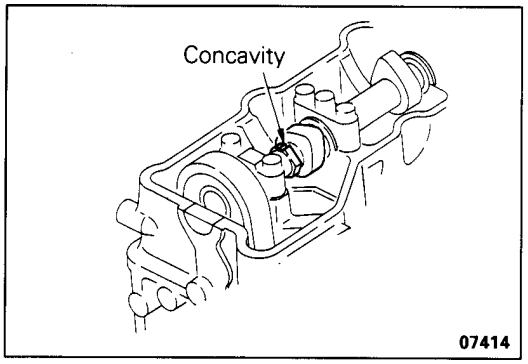


INJECTION TIMING INSPECTION AND ADJUSTMENT

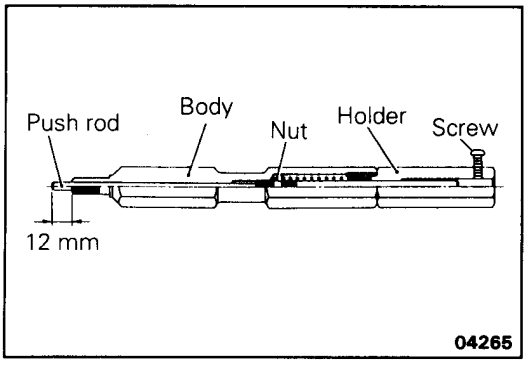
(1) Warm up the engine and then check that the fast idle lever is separated from the throttle lever.
(2) Remove all of the glow plugs.



(3) Align the notch of the crankshaft pulley with the "0" timing mark to set the No. 1 cylinder to the compression top dead centre position.



Caution
When the concavity of the camshaft hexagonal part faces upward, the No. 1 piston is at compression dead top centre.
Never turn the crankshaft counterclockwise, or the timing chain adjusting tensioner will be damaged. If the crankshaft turns anticlockwise, remove the tensioner and install again by the procedure.



(4) Check that the push rod of the special tool is protruding 12 mm (0.472 in.) from the edge of the body of the special tool.

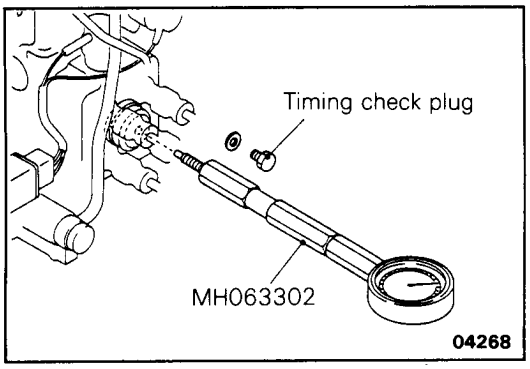
NOTE
If the amount of protrusion is outside the standard value, adjust by turning the nut inside the body of the special tool.

(5) Insert a dial gauge into the holder.

NOTE
Do not insert the dial gauge more than 5 mm. The diameter of the dial gauge should be less than 45 mm.

(6) Hold the dial gauge by its screw at the position where the dial gauge touches the push rod and its needle starts moving.

NOTE
The needle should not move more than 0.5 mm.

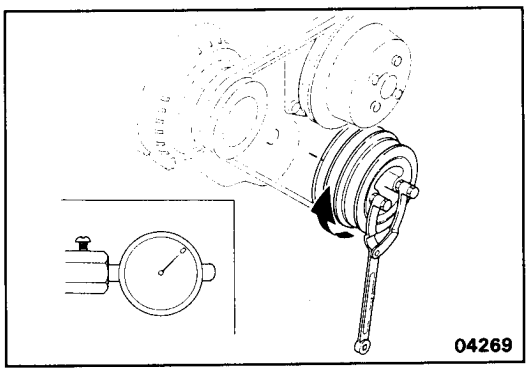


(7) Remove the timing check plug of the injection pump and the gasket, and then install the special tool.

NOTE
- Check that the timing check plug is attached to the gasket which was removed.
- If it is not attached, it may have fallen down or still be attached to the pump, so it should be checked.

(8) Hold the special tool at the position where the needle of the dial gauge starts moving.

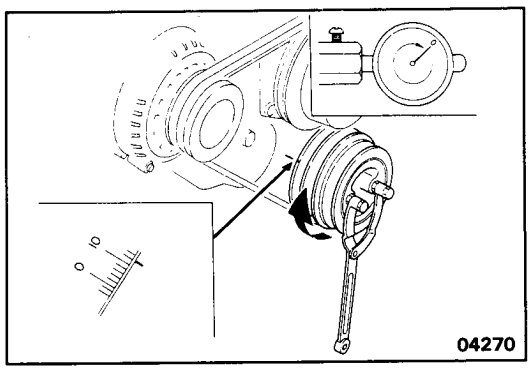
NOTE
If the dial gauge is hard to read, hold the special tool at the position where the special tool is screwed in less than one turn after the needle of the dial gauge starts moving.



(9) Turn the crankshaft once more clockwise to set the No. 1 cylinder 30° before the compression top dead centre position.

(10) Set the needle of the dial gauge to 0.

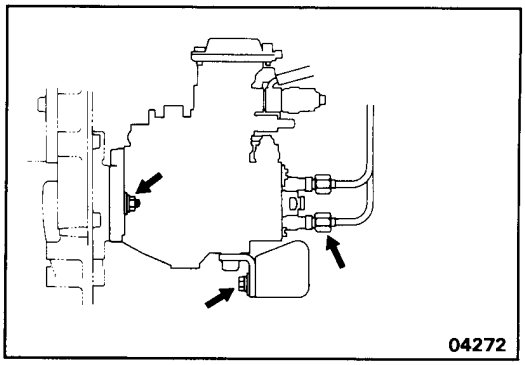
(11) Check that the needle doesn't move even if the crankshaft is turned slightly (2°–3°) both clockwise and anti-clockwise.

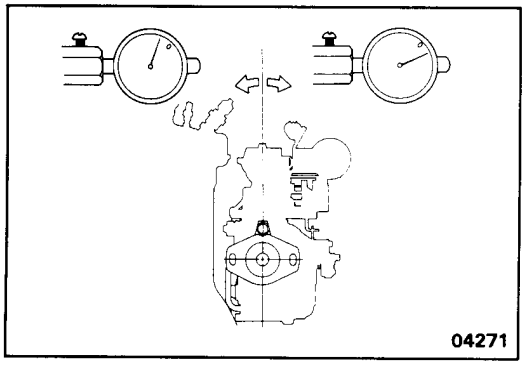


(12) Turn the crankshaft clockwise to align the crankshaft notch to 12° ATDC (vehicles without supercharging pressure control system) or 6° ATDC (vehicles with supercharging pressure control system).

(13) Take a reading of the value displayed on the dial gauge and check that it is within the standard value.

Standard value: 1±0.03 mm (0.0394±0.0012 in.)





(14) If the value is outside the standard value, adjust the injection timing by the following procedure.
① Loosen the injection pipe union nuts and the injection pump fixing bolts and nuts in that order.

NOTE
- When loosening the union nuts, hold the delivery valve holders with a spanner so that they don't turn at the same time.
- The nuts or bolts should only be loosened, not removed.

② Tilt the injection pump to the left and right to adjust its position so that the value displayed on the dial gauge is at the standard value.

③ Temporarily tighten the injection pump mounting nuts and bolts.
④ Repeat steps (9) – (13) to check if the adjustment has been made correctly.
⑤ Securely tighten the injection pump mounting nuts and bolts.
⑥ Securely tighten the injection pipe union nuts.

NOTE
When tightening the nuts, hold the delivery valve holders with a spanner so that they don't turn at the same time.

(15) Remove the special tool.
(16) Replace the gasket with a new gasket.
(17) Securely tighten the timing check plug.

IDLE SPEED INSPECTION AND ADJUSTMENT

Refer to P.11-53. 750

Standard value: ~~800~~ ± 100 r/min

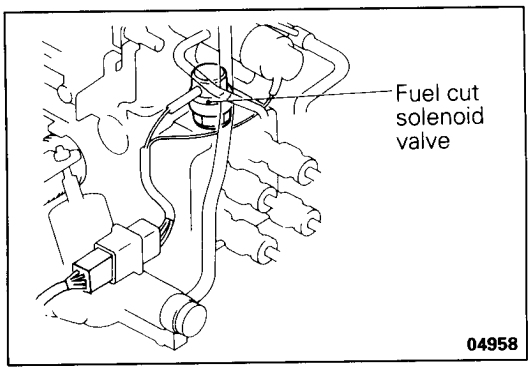
THROTTLE OPENER INSPECTION AND ADJUSTMENT <A/C>

Services and maintenances are the same as those for 4D56 engine.

COMPRESSION PRESSURE CHECK

(1) Before check, ensure that oil, starter, motor, battery are normal and set the vehicle to the following condition:
Engine coolant temperature: 80–95°C (176–203°F)
Lamps and accessories: OFF
Transmission: Neutral (for A/T, P range)
Steering wheel: Neutral

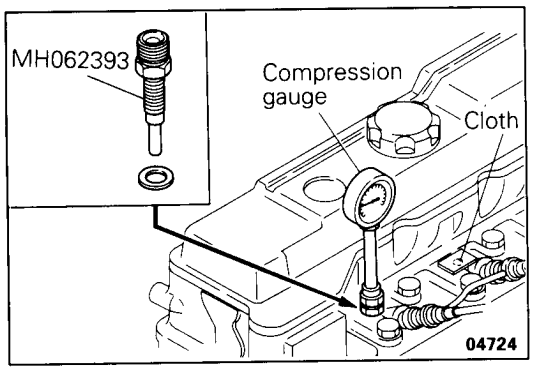
(2) Remove the glow plugs.
(3) Disconnect the fuel cut solenoid valve connector.



NOTE
Doing this will prevent the injection nozzle from injecting fuel.

(4) Cover the glow plug installation hole with a cloth and check that no foreign material adhere to the cloth after cranking the engine.

Caution
1. **Keep away from the glow plug installation hole when cranking.**
2. **If the cylinder is cracked, water, oil or fuel will gush out from the cracks when measuring compression. This leads to a serious injury.**



(5) Insert the special tool to the glow plug installation hole and install the compression gauge.
(6) Open the accelerator lever fully and measure compression pressure by cranking the engine.

Standard value:	**2,840 kPa (29 kg/cm^2, 422 psi) at 280 r/min.**
Limit:	**minimum 2,260 kPa (23 kg/cm^2, 327 psi) at 280 r/min.**

(7) Measure the compression pressure of all the cylinders and check that the pressure differences among the cylinders are within the limit.
Limit: maximum 290 kPa (3 kg/cm^2, 43 psi)

(8) If the compression pressure or pressure difference exceeds the limit, pour a small amount of engine oil from the glow plug installation hole and repeat the above steps (6) and (7).
① If the compression rises, the piston ring and/or cylinder wall may be worn or damaged.
② If the compression does not rise, the valve or valve set may be burned or defective, or pressure may be leaking from the gasket.

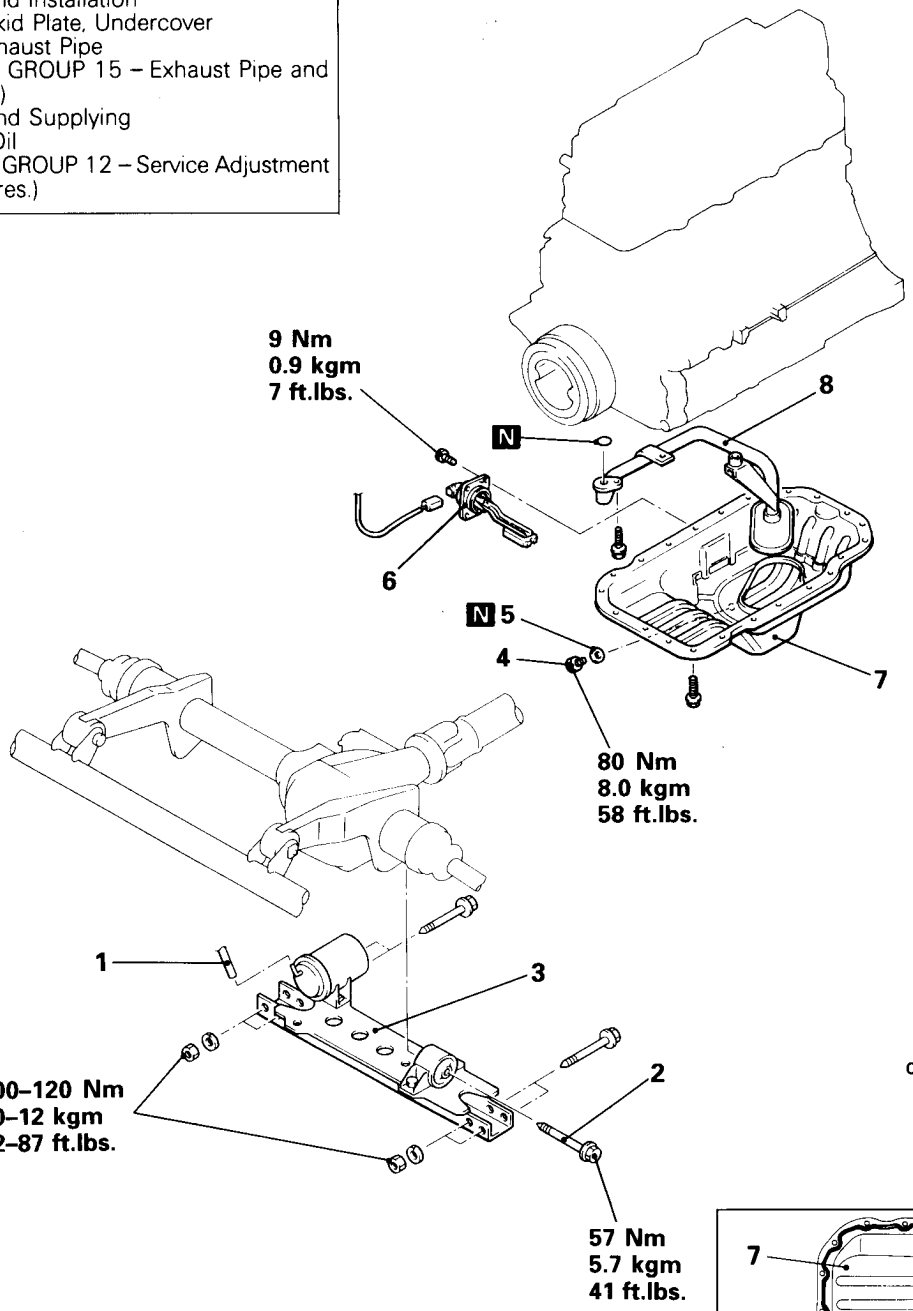
NOTES

OIL PAN AND OIL SCREEN

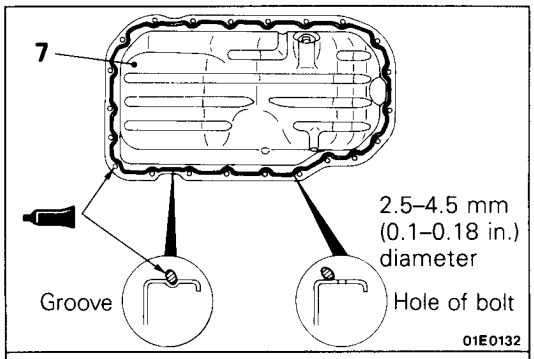
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
Removal and Installation
- Under Skid Plate, Undercover
- Front Exhaust Pipe
  (Refer to GROUP 15 – Exhaust Pipe and Mufflers.)

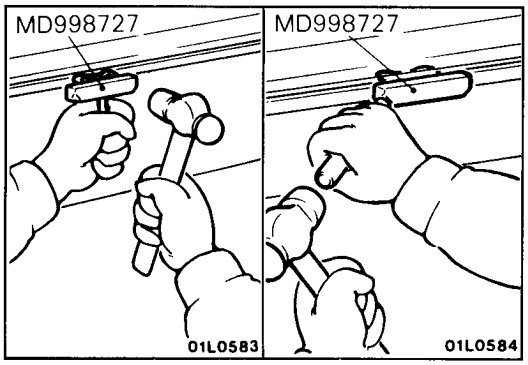
Draining and Supplying
- Engine Oil
  (Refer to GROUP 12 – Service Adjustment Procedures.)



Removal steps
1. Vacuum hose <Super Select 4WD>
2. Bolt
3. Front suspension crossmember
4. Drain plug
◆◆ 5. Gasket
6. Engine oil level sensor
◆◆ ◆◆ 7. Oil pan
8. Oil screen



Sealant:
MITSUBISHI GENUINE Part No. MD970389 or equivalent



SERVICE POINTS OF REMOVAL

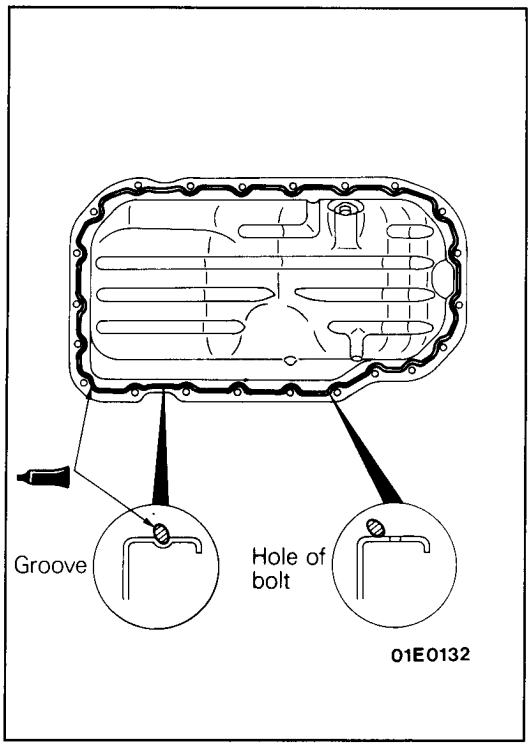
7. REMOVAL OF OIL PAN

(1) Remove oil pan bolts.
(2) Tap the special tool in between the oil pan and cylinder block.
(3) Slide the special tool by tapping it at an angle to remove the oil pan.

Caution
The use of a screwdriver or chisel in place of the special tool can damage the gasket seat surface and cause oil leakage.

INSPECTION

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



SERVICE POINTS OF INSTALLATION

7. INSTALLATION OF OIL PAN

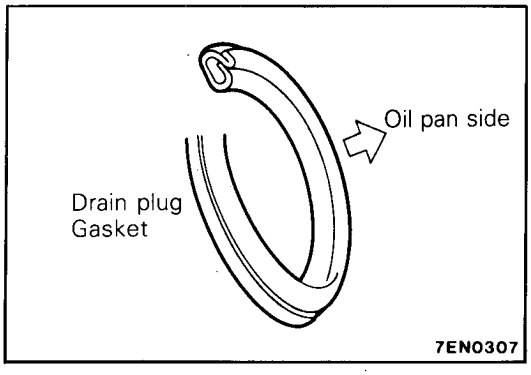
(1) Remove sealant from oil pan and cylinder block mating surfaces.
(2) Degrease the sealant-coated surface and the engine mating surface.
(3) Apply the specified sealant around the gasket surface of oil pan as specified in illustration.

Specified sealant: MITSUBISHI GENUINE PART No. MD970389 or equivalent

NOTE
The sealant should be applied in a continuous bead approximately 2.5–4.5 mm (0.10–0.18 in.) in diameter.

(4) Assemble oil pan to cylinder block within 3 minutes after applying the sealant.

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



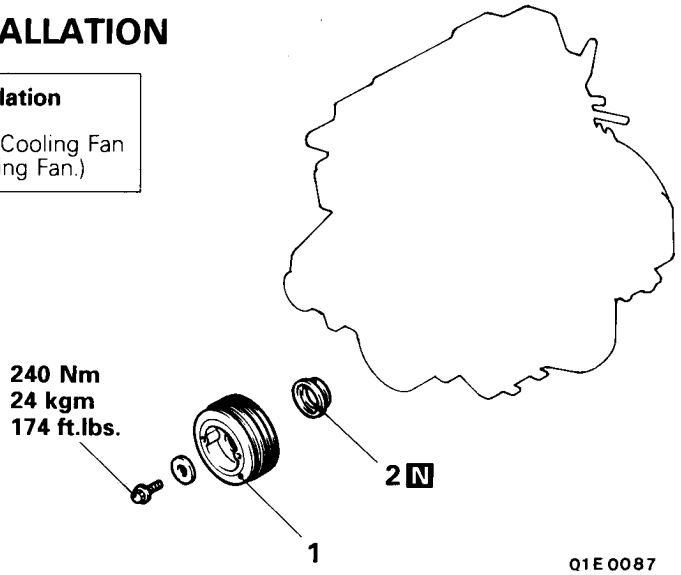
5. INSTALLATION OF GASKET

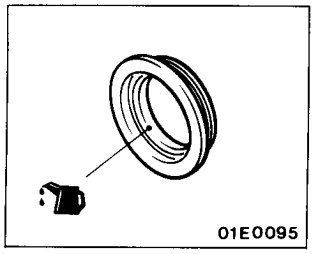
Replace the gasket with a new gasket, and install it in the direction shown in the illustration.

CRANKSHAFT OIL SEALS

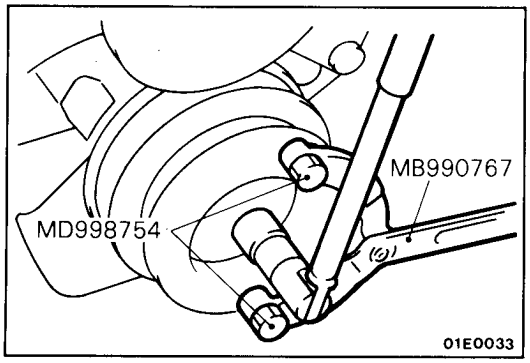
FRONT OIL SEAL
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Removal and Installation of Cooling Fan (Refer to GROUP 14 – Cooling Fan.)





Removal steps
1. Crankshaft pulley
2. Oil seal

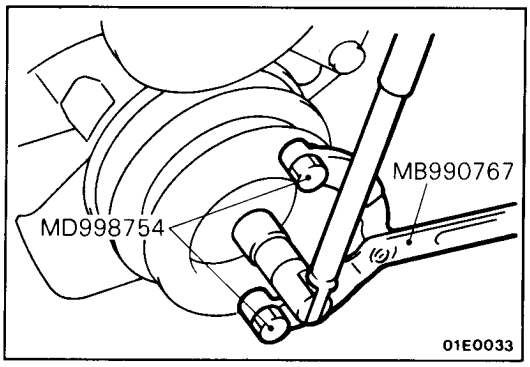


SERVICE POINTS OF REMOVAL

1. REMOVAL OF CRANKSHAFT PULLEY

Using special tools, remove the crankshaft pulley from the crankshaft.

Caution
Use only the specified special tools, or a damaged pulley damper could result.



SERVICE POINTS OF INSTALLATION

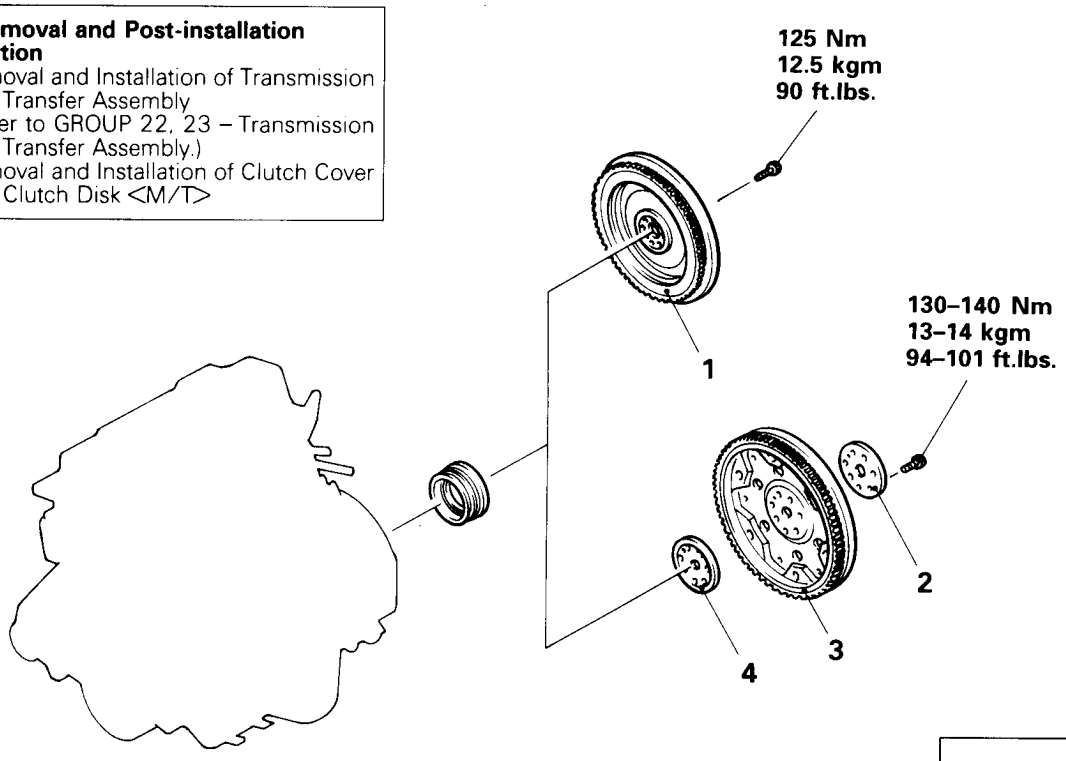
1. INSTALLATION OF CRANKSHAFT PULLEY

Using the special tool, attach the crankshaft pulley to the crankshaft.

Caution
Use only the specified special tools, otherwise a damaged pulley damper could result.

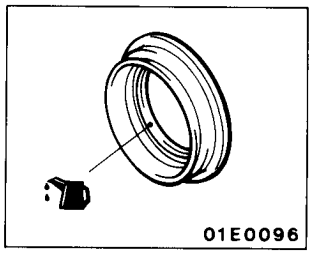
REAR OIL SEAL
REMOVAL AND INSTALLATION

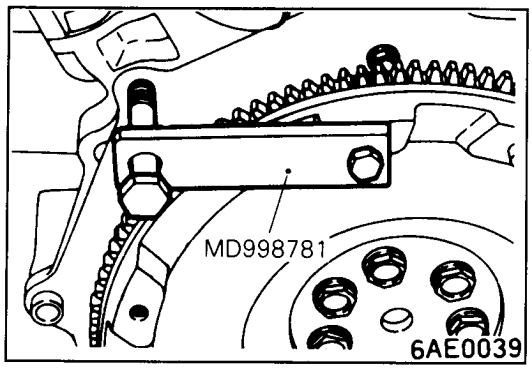
Pre-removal and Post-installation Operation
- Removal and Installation of Transmission and Transfer Assembly (Refer to GROUP 22, 23 – Transmission and Transfer Assembly.)
- Removal and Installation of Clutch Cover and Clutch Disk <M/T>



Removal steps
1. Flywheel assembly <M/T>
2. Adaptor plate
3. Drive plate <A/T>
4. Crankshaft adaptor <A/T>
5. Oil seal

01E0086

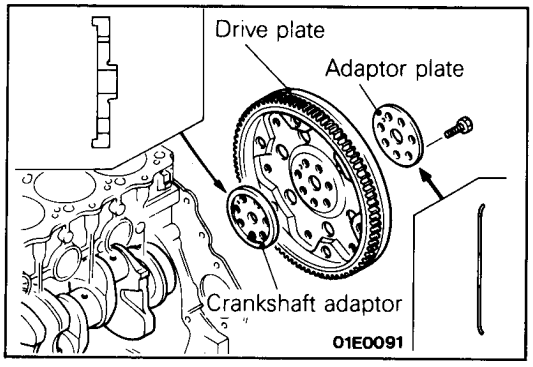




SERVICE POINTS OF REMOVAL

1. REMOVAL OF FLYWHEEL ASSEMBLY <M/T>/3. DRIVE PLATE <A/T>

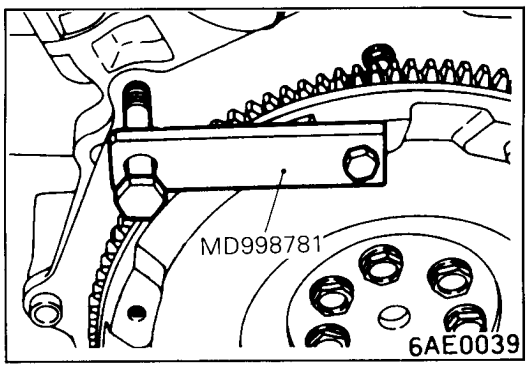
Use the special tool to secure the flywheel or drive plate, and then remove the bolt.



SERVICE POINTS OF INSTALLATION

4. INSTALLATION OF CRANKSHAFT ADAPTOR / 2. ADAPTOR PLATE

Install the crankshaft adaptor and adaptor plate so that they face as shown in the illustration.



3. INSTALLATION OF DRIVE PLATE <A/T>/1. FLYWHEEL ASSEMBLY <M/T>

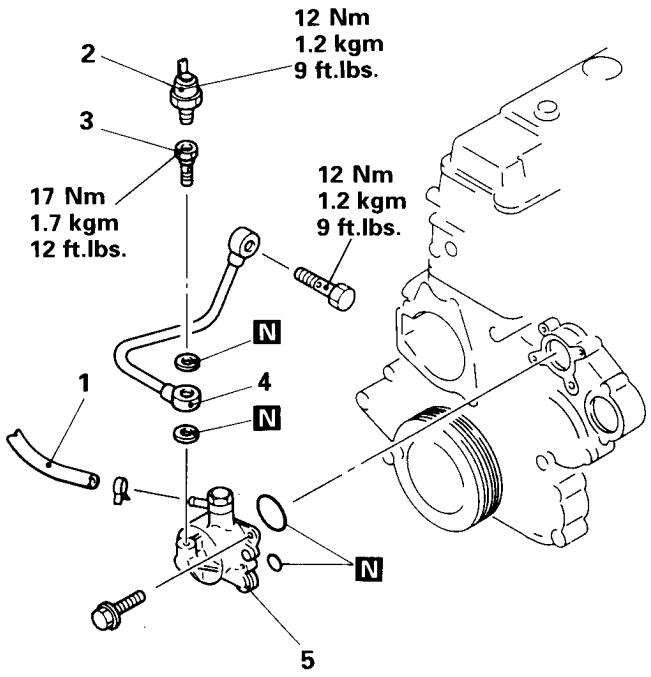
Use the special tool to secure the flywheel or drive plate, and then tighten the bolt to the specified torque.

VACUUM PUMP

REMOVAL AND INSTALLATION

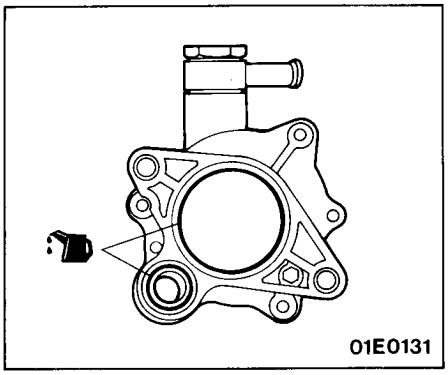
Pre-removal Operation
- Removal of Intercooler

Post-installation Operation
- Installation of Intercooler
- Inspection and Filling of Engine Oil



01E0139

Removal steps
1. Vacuum hose
2. Oil pressure switch
3. Connector
4. Oil pipe
5. Vacuum pump

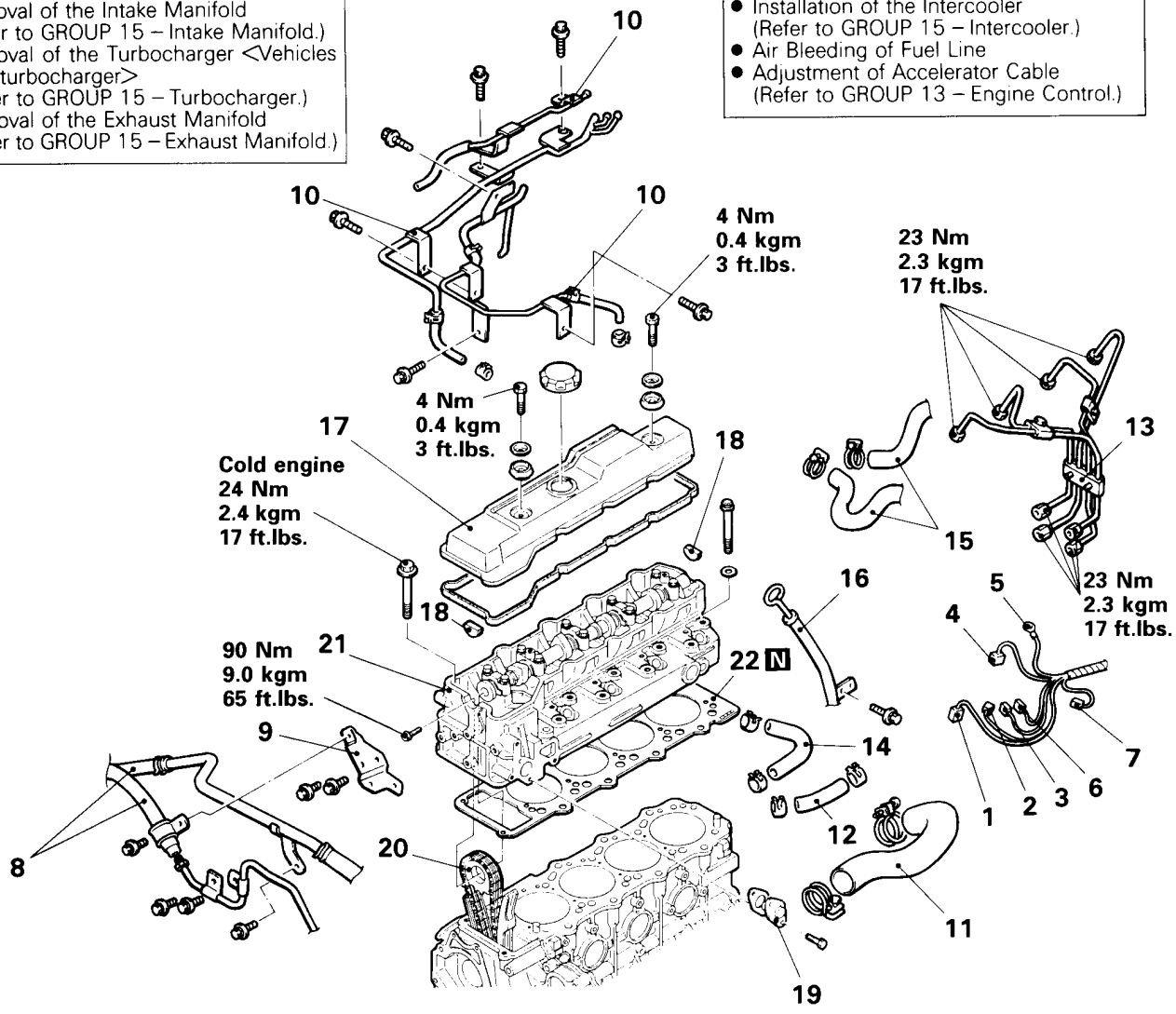


CYLINDER HEAD GASKET

REMOVAL AND INSTALLATION

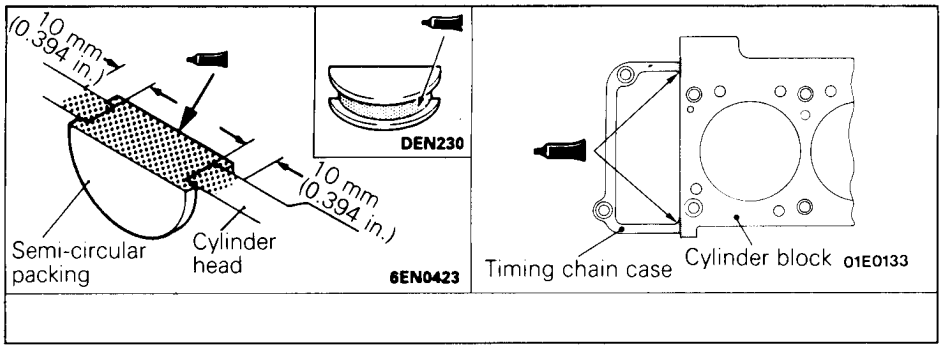
Pre-removal Operation
- Draining of Engine Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)
- Removal of the Intercooler <Vehicles with turbocharger> (Refer to GROUP 15 – Intercooler.)
- Removal of the Intake Manifold (Refer to GROUP 15 – Intake Manifold.)
- Removal of the Turbocharger <Vehicles with turbocharger> (Refer to GROUP 15 – Turbocharger.)
- Removal of the Exhaust Manifold (Refer to GROUP 15 – Exhaust Manifold.)

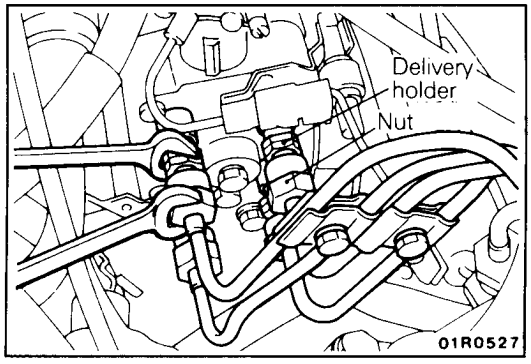
Post-installation Operation
- Installation of the Exhaust Manifold (Refer to GROUP 15 – Exhaust Manifold.)
- Installation of the Turbocharger (Refer to GROUP 15 – Turbocharger.)
- Installation of the Intake Manifold (Refer to GROUP 15 – Intake Manifold.)
- Installation of the Intercooler (Refer to GROUP 15 – Intercooler.)
- Air Bleeding of Fuel Line
- Adjustment of Accelerator Cable (Refer to GROUP 13 – Engine Control.)



Removal steps

1. Oil pressure switch or oil pressure gauge unit connector
2. Engine coolant temperature switch connector <A/C>
3. Thermo switch connector <A/C>
4. Engine coolant temperature sensor and gauge unit connector
5. Glow plug terminal
6. Lever position switch connector <A/T>
7. Lever position sensor
8. Power steering pipe
9. Bracket
10. Vacuum pipe and boost pipe
11. Radiator upper hose
12. Water hose
13. Injection pipe
14. Fuel hose
15. Heater hose
16. Oil level gauge guide
17. Rocker cover
18. Semi-circular packing
19. Timing chain tensioner
20. Camshaft sprocket
21. Cylinder head assembly
22. Cylinder head gasket

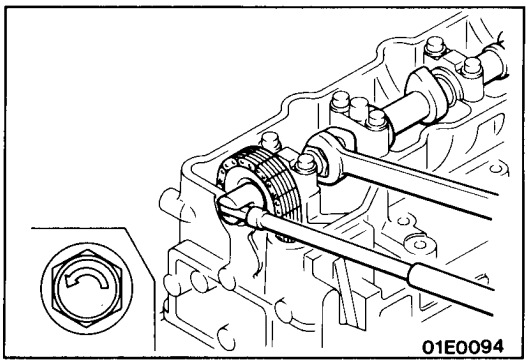




SERVICE POINTS OF REMOVAL

13. DISCONNECTION OF INJECTION PIPE

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



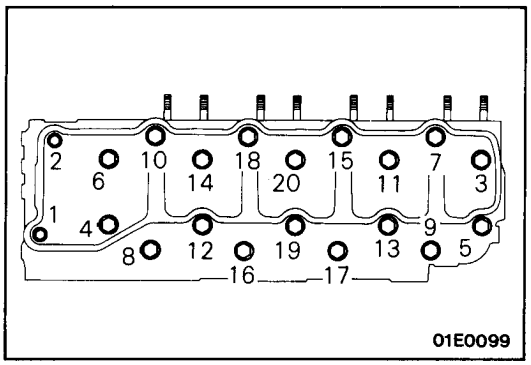
20. REMOVAL OF CAMSHAFT SPROCKET

Loosen the camshaft sprocket bolt while holding the hexagonal section of the camshaft with a wrench, and then remove the camshaft sprocket with the timing chain still around it.

Caution

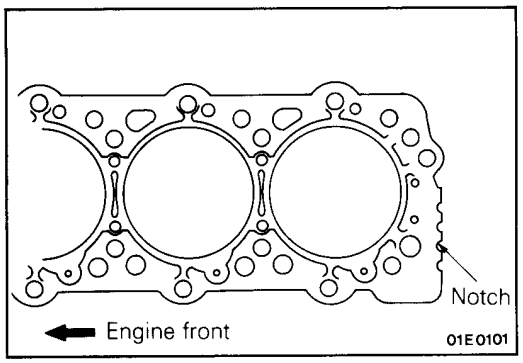
(1) The sprocket bolt is a left-hand thread, and the head of the bolt is marked with an arrow which indicates the direction to turn the bolt during installation. Because of this, turn the bolt in the opposite direction to the direction of the arrow during removal.

(2) The timing chain should not be used to stop the camshaft from turning.



21. REMOVAL OF CYLINDER HEAD ASSEMBLY

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

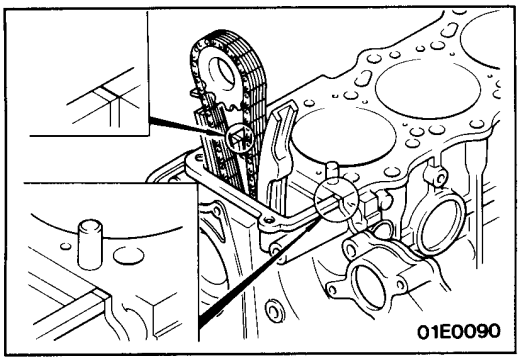


SERVICE POINTS OF INSTALLATION

22.INSTALLATION OF CYLINDER HEAD GASKET/21. CYLINDER HEAD ASSEMBLY

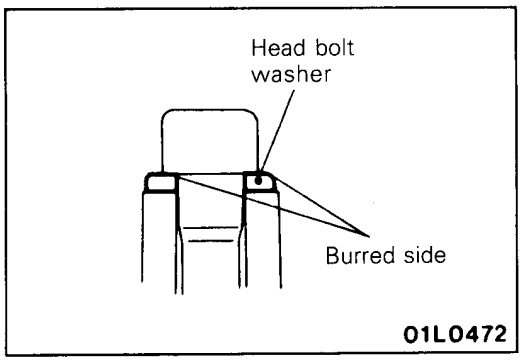
(1) Count the number of notches on the cylinder head gasket which was removed and select a new cylinder head gasket which has the same number of notches.

(2) Wipe off any oil or grease from the gasket mounting surface.

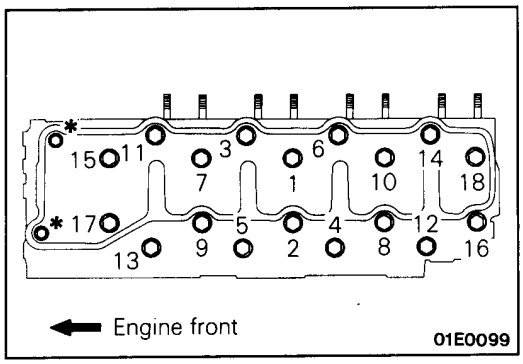


(3) Apply sealant to the mating surfaces of the timing gear case and cylinder block as shown in the illustration, and then install the cylinder head assembly to the cylinder block together with the cylinder head gasket within three minutes of applying the sealant.

Sealant: 3M ATD Part No. 8660 or equivalent

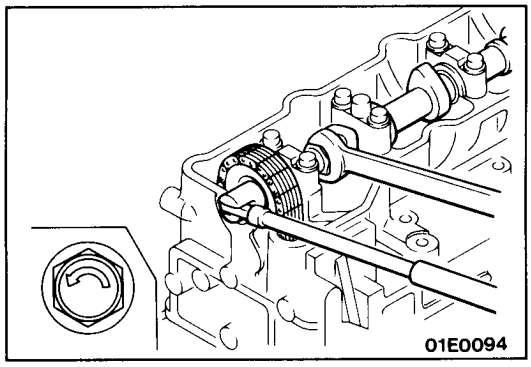


(4) The head bolt washer should be installed so that the burred side resulting from the tapping out is facing upwards.



(5) Install the bolts in the following order.

Procedure	Operation
①	Tighten the bolts to 100 Nm (10 kgm, 72 ft.lbs) in the order shown in the illustration.
②	Fully loosen the bolts in the reverse order to that shown in the illustration.
③	Tighten the bolts to 50 Nm (5.0 kgm, 36 ft.lbs.) in the order shown in the illustration.
④	Tighten by 1 / 4 turn (90°) in the order shown in the illustration.
⑤	Tighten by 1 / 4 turn (90°) in the order shown in the illustration.
⑥	Tighten the bolts marked with * to 24 Nm (2.4 kgm, 17 ft.lbs.).



20. INSTALLATION OF CAMSHAFT SPROCKET

Install the camshaft sprocket with the timing chain still around it, and then tighten the camshaft sprocket bolt while holding the hexagonal section of the camshaft with a wrench.

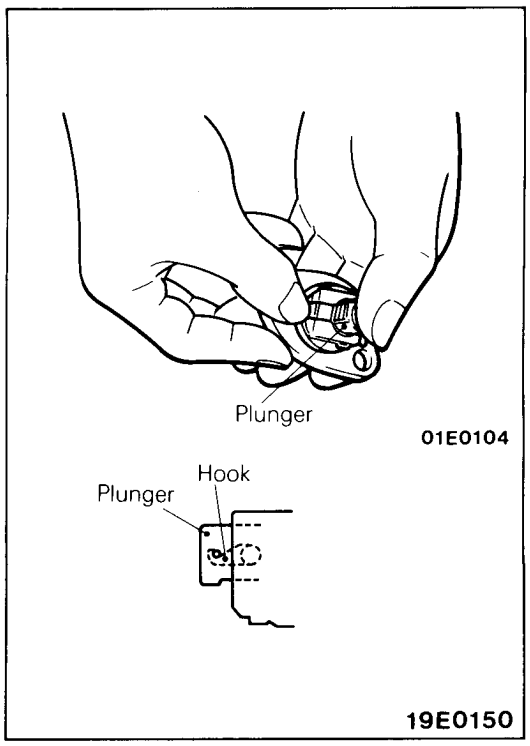
Caution

(1) The sprocket bolt is a left-hand thread, and the head of the bolt is marked with an arrow which indicates the direction to turn the bolt during installation.

(2) The timing chain should not be used to stop the camshaft from turning.

19. INSTALLATION OF TIMING CHAIN TENSIONER

(1) Raise up the pawl, and then push in the plunger and lock it with the hook as shown in the illustration.



(2) Install the tensioner to the cylinder head assembly.

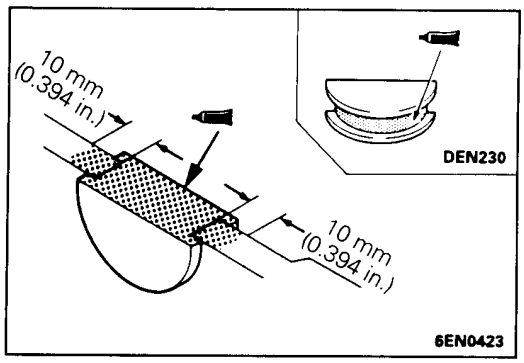
(3) Turn the crankshaft in the clockwise direction.

NOTE

If the engine is cranked in the clockwise direction after the tensioner has been installed, the hook will automatically release and the tension of the timing chain will be determined by the internal ratchet mechanism.

Caution

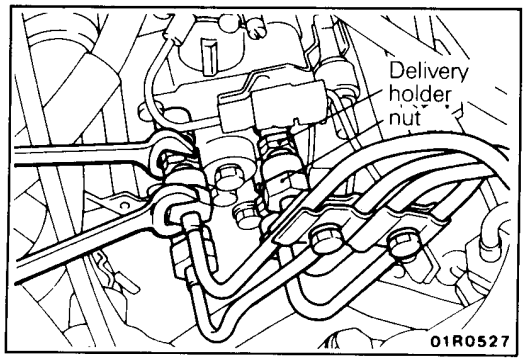
- **Be careful not to install the tensioner without first pushing in the plunger, as to do so will cause excessive tension to be applied to the timing chain, which could cause damage.**
- **If the engine is cranked in an anti-clockwise direction after the tensioner has been installed, it will cause excessive pressure to be applied to the plunger. This will cause the plunger to overrun the ratchet mechanism, resulting in a malfunction.**



18. INSTALLATION OF SEMI-CIRCULAR PACKING

Apply sealant to the semi-circular packing as shown in the illustration, install the semi-circular packing, and then install the rocker cover to the cylinder head assembly within three minutes after applying the sealant.

Caution
Do not start the engine for 1 hour after installing the rocker cover.



13. INSTALLATION OF INJECTION PIPE

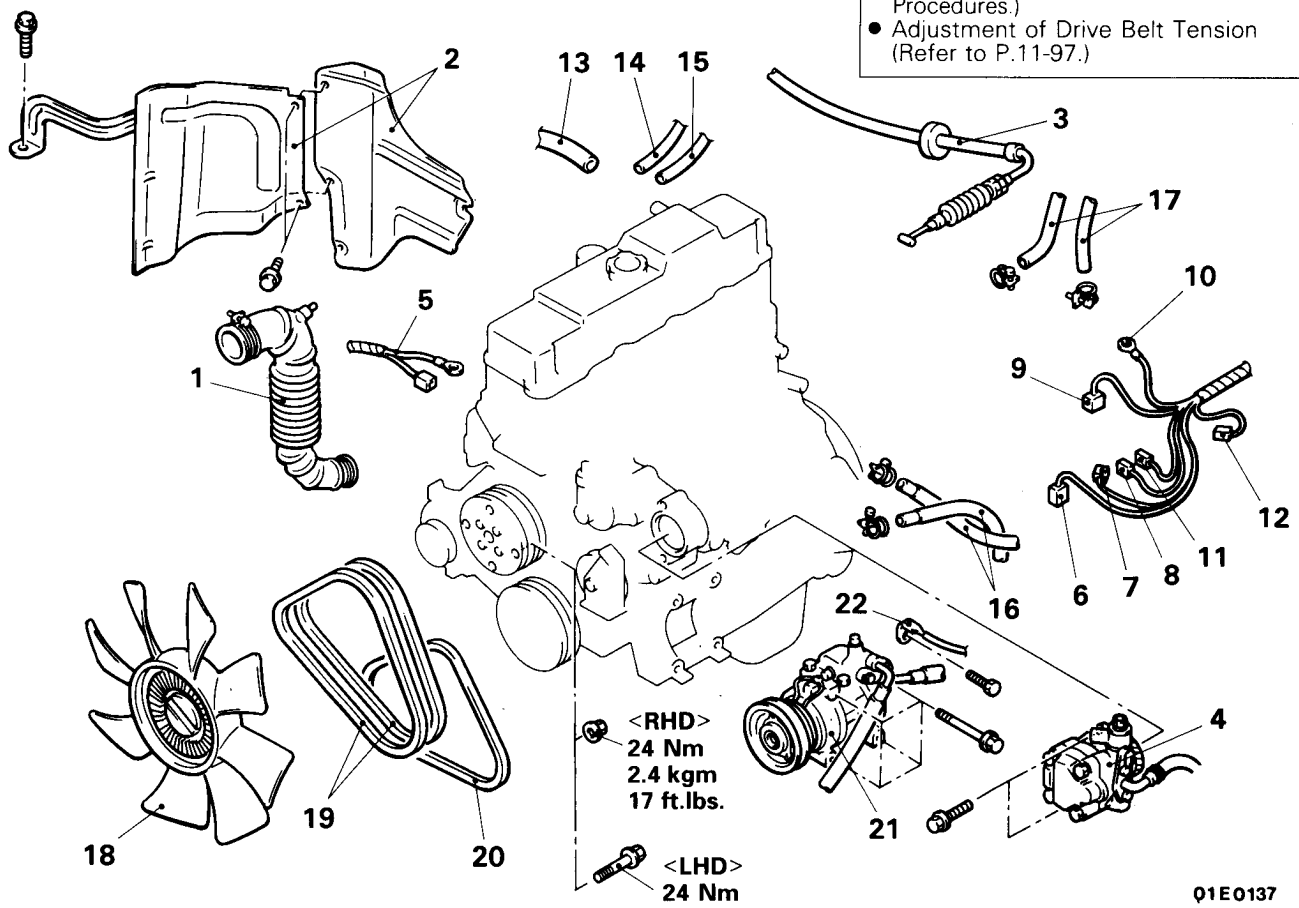
When tightening the nuts at both ends of the injection pipe, tighten the nuts to the specified torque while holding the nuts on the other side (delivery holder on pump side, nozzle holder on nozzle side) with a spanner to stop them from turning.

ENGINE ASSEMBLY

REMOVAL AND INSTALLATION

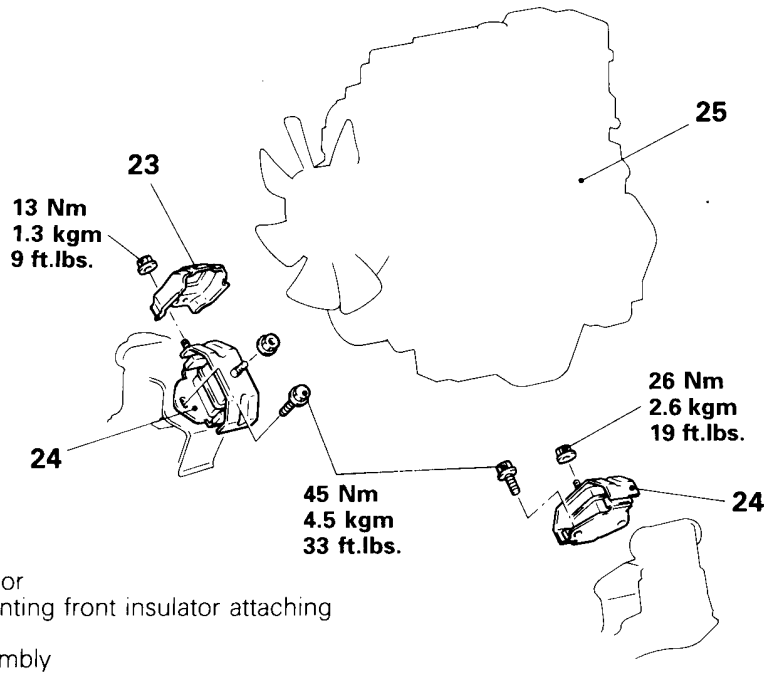
Pre-removal Operation
- Removal of the Hood
  (Refer to GROUP 42 – Hood.)
- Removal of the Transmission and Transfer Assembly
  (Refer to GROUP 22, 23 – Transmission Assembly.)
- Removal of the Intercooler
  (Refer to GROUP 15 – Intercooler.)
- Removal of the Radiator
  (Refer to GROUP 14 – Radiator.)
- Removal of Battery and Battery Tray
- Removal of Cruise-Control Intermediate Link
  <Vehicles with cruise-control.>

Post-installation Operation
- Installation of the Transmission and Transfer Assembly
  (Refer to GROUP 22, 23 – Transmission Assembly.)
- Installation of the Radiator
- Installation of the Intercooler
  (Refer to GROUP 15 – Intercooler.)
- Installation of Battery and Battery Tray
- Installation of the Cruise-Control Intermediate Link <Vehicles with cruise-control>
- Installation of the Hood
  (Refer to GROUP 42 – Hood.)
- Adjustment of the Accelerator Cable
- Air Bleeding of Fuel System
  (Refer to GROUP 13 – Service Adjustment Procedures.)
- Adjustment of Drive Belt Tension
  (Refer to P.11-97.)



Removal steps

1. Air cleaner cover and air intake hose assembly
2. Heat protector
3. Accelerator cable connection
4. ◆◆ Power steering oil pump <Power steering>
5. Alternator connector
6. Oil pressure switch or oil pressure gauge unit connector
7. Engine coolant temperature switch connector <A/C>
8. Thermo switch <A/T>
9. Engine coolant temperature switch and gauge unit connector
10. Glow plug terminal
11. Lever position switch connector <A/T–A/C>
12. Lever position sensor connector
13. Breather hose
14. Vacuum hose
15. Vacuum hose
16. Fuel hose connections
17. Heater hose connections
18. ◆◆ ◆◆ Cooling fan
19. Alternator drive belt
20. A/C drive belt
21. ◆◆ A/C compressor
22. Earth cable



23. Heat protector
24. Engine mounting front insulator attaching bolt
◆◆ ◆◆ 25. Engine assembly

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SERVICE POINTS OF REMOVAL

4. REMOVAL OF POWER STEERING OIL PUMP/21. A/C COMPRESSOR

(1) Remove the oil pump and air conditioner 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.

18. REMOVAL OF COOLING FAN <R.H. DRIVE VEHICLES>

Loosen the cooling fan mounting nut while holding the fan clutch of the cooling fan with a spanner or similar tool.

25. REMOVAL OF ENGINE ASSEMBLY

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

SERVICE POINTS OF INSTALLATION

25. INSTALLATION OF ENGINE ASSEMBLY

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

18. INSTALLATION OF COOLING FAN

Tighten the cooling fan mounting nut while holding the fan clutch of the cooling fan with a spanner or similar tool.